

R&S[®] SMW-K60/-K117

Bluetooth[®] Enhanced Data Rate, Bluetooth[®] 5.x

User Manual



1175680302

This document describes the following software options:

- R&S®SMW-K60/-K117
1413.4239.xx, 1414.3336.xx

This manual describes firmware version FW 4.70.026.xx and later of the R&S®SMW200A.

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The following abbreviations are used throughout this manual: R&S®SMW200A is abbreviated as R&S SMW, R&S®WinIQSIM2™ is abbreviated as R&S WinIQSIM2; the license types 02/03/07/11/13/16/12 are abbreviated as xx.

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1 Preface

1.1 Documentation Overview

This section provides an overview of the R&S SMW user documentation. Unless specified otherwise, you find the documents on the R&S SMW product page at:

www.rohde-schwarz.com/manual/smw200a

1.1.1 Getting Started Manual

Introduces the R&S SMW and describes how to set up and start working with the product. Includes basic operations, typical measurement examples, and general information, e.g. safety instructions, etc. A printed version is delivered with the instrument.

1.1.2 User Manuals and Help

Separate manuals for the base unit and the software options are provided for download:

- Base unit manual
Contains the description of all instrument modes and functions. It also provides an introduction to remote control, a complete description of the remote control commands with programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.
- Software option manual
Contains the description of the specific functions of an option. Basic information on operating the R&S SMW is not included.

The contents of the user manuals are available as help in the R&S SMW. The help offers quick, context-sensitive access to the complete information for the base unit and the software options.

All user manuals are also available for download or for immediate display on the Internet.

1.1.3 Tutorials

The R&S SMW provides interactive examples and demonstrations on operating the instrument in form of tutorials. A set of tutorials is available directly on the instrument.

1.1.4 Service Manual

Describes the performance test for checking the rated specifications, module replacement and repair, firmware update, troubleshooting and fault elimination, and contains mechanical drawings and spare part lists.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS, <https://gloris.rohde-schwarz.com>).

1.1.5 Instrument Security Procedures

Deals with security issues when working with the R&S SMW in secure areas. It is available for download on the Internet.

1.1.6 Basic Safety Instructions

Contains safety instructions, operating conditions and further important information. The printed document is delivered with the instrument.

1.1.7 Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S SMW. It also lists the options and their order numbers and optional accessories.

The brochure provides an overview of the instrument and deals with the specific characteristics.

See www.rohde-schwarz.com/brochure-datasheet/smw200a

1.1.8 Release Notes and Open Source Acknowledgment (OSA)

The release notes list new features, improvements and known issues of the current firmware version, and describe the firmware installation.

The open source acknowledgment document provides verbatim license texts of the used open source software.

See www.rohde-schwarz.com/firmware/smw200a

1.1.9 Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics.

See www.rohde-schwarz.com/application/smw200a and www.rohde-schwarz.com/manual/smw200a

2 Welcome to the Bluetooth Options

The R&S SMW-K60 is a firmware application that adds functionality to generate signals in accordance with the Bluetooth version 4.2.

Option R&S SMW-K60 provides Bluetooth signals for basic rate (BR) and enhanced data rate (EDR) burst types. In addition, it provides also low energy (LE) signals limited to LE 1 Msymbol/s physical layer.

The following BR and EDR features are supported within **R&S SMW-K60**:

- Support for three transport modes, the ACL+EDR, SCO, eSCO+EDR transport modes.
- Support of all packet types for both the basic rate and the enhanced data rate modes.
- Generation of signals with up to 5238 frames sequence length.
- Configuration of the packet contents with a convenient packet editor or all data packets, both with optional data whitening.
- Generation of signals in accordance to the "Dirty Transmitter Test" specification for both, the basic and enhanced data rates. The test enables you to change the start phase, the frequency drift rate and the frequency drift deviation.
- Power ramp control with possibilities to choose ramp time, rise and fall offset
- Configuration of the clipping, filter and modulation settings

The following LE features are supported within R&S SMW-K60:

- Support for two channel types, the "Advertising" and "Data" channel types.
- Support of all Bluetooth packet types for LE 1 Msymbol/s physical layer (LE 1M PHY).
- Convenient packet editor for all supported packet types including optional data whitening.
- Dirty transmitter test, compliant to the RF test specification with options to change start phase, frequency drift rate and frequency drift deviation.
- Support of CRC corruption for every 2nd packet
- Power ramp control with configurable ramp time, rise and fall offsets.
- Clipping, filter and modulation settings supported.

Option R&S SMW-K117 adds support for Bluetooth LE signals according to the core specification v 5.1 for Bluetooth wireless technology. This option is an extension of R&S SMW-K60.

The following LE features are supported within **R&S SMW-K117**:

- Support for two channel types, the "Advertising" and "Data" channel types.
- Support of all Bluetooth packet types for uncoded LE 2 Msymbol/s physical layer (LE 2M PHY)
- Support of all Bluetooth packet types for LE coded 1 Msymbol/s physical layer (LE coded PHY)
- Support of CRC corruption for every 2nd packet

- Convenient packet editor for all supported packet types including optional data whitening.
- Dirty transmitter test, compliant to the RF test specification with options to change start phase, frequency drift rate, frequency drift deviation, and modulation index mode.
- Support of Bluetooth Direction Finding using Constant Tone Extension methods Angle of Arrival or Angle of Departure

This user manual contains a description of the functionality that the application provides, including remote control operation.

All functions not discussed in this manual are the same as in the base unit and are described in the R&S SMW user manual. The latest version is available at:

www.rohde-schwarz.com/manual/SMW200A

Installation

You can find detailed installation instructions in the delivery of the option or in the R&S SMW service manual.

2.1 Accessing the Bluetooth Dialog

To open the dialog with Bluetooth settings

- ▶ In the block diagram of the R&S SMW, select "Baseband > Bluetooth".

A dialog box opens that displays the provided general settings.

The signal generation is not started immediately. To start signal generation with the default settings, select "State > On".

2.2 Scope



Tasks (in manual or remote operation) that are also performed in the base unit in the same way are not described here.

In particular, it includes:

- Managing settings and data lists, like storing and loading settings, creating and accessing data lists, or accessing files in a particular directory.
- Information on regular trigger, marker and clock signals and filter settings, if appropriate.
- General instrument configuration, such as checking the system configuration, configuring networks and remote operation
- Using the common status registers

For a description of such tasks, see the R&S SMW user manual.

2.3 Notes on Screenshots

When describing the functions of the product, we use sample screenshots. These screenshots are meant to illustrate as many as possible of the provided functions and possible interdependencies between parameters. The shown values may not represent realistic usage scenarios.

The screenshots usually show a fully equipped product, that is: with all options installed. Thus, some functions shown in the screenshots may not be available in your particular product configuration.

3 About the Bluetooth Options

The R&S SMW provides you with the ability to generate signals in accordance with the core specification 5.1 for Bluetooth wireless technology.

This section lists required options and provides background information on basic terms and principles used in Bluetooth technology.

3.1 Required Options

The basic equipment layout for generating Bluetooth signals includes the:

- Standard Baseband Generator (R&S SMW-B10)
- Baseband main module (R&S SMW-B13/-B13T)
- Frequency option (e.g. R&S SMW-B1003)
- Option Bluetooth EDR (R&S SMW-K60) per signal path
- Option Bluetooth 5.x (R&S SMW-K117) per signal path

To play back a signal from a waveform file created by the simulation software R&S WinIQSIM2, the corresponding R&S WinIQSIM2 digital standard option must be installed.

For more information, see data sheet.

3.2 About Bluetooth BR/EDR

The frequency band defined for Bluetooth devices is the unlicensed 2.4 GHz Industrial, Scientific and Medical (ISM) frequency band.

Table 3-1: Operating band

Regulatory range	RF channels k and center frequencies f
2400.0 MHz to 2483.5 MHz	$k = 0$ to 78 , $f = k * 1 \text{ MHz} + 2402 \text{ MHz}$

Two modulation modes are used for Bluetooth: the mandatory basic rate (BR) and the optional enhanced data rate (EDR). The BR mode uses binary FM modulation and provides a data rate of 1 Mbps. The EDR mode uses two types of PSK modulation, the $\pi/4$ -DQPSK or 8DPSK, and achieves data rates of 2 Mbps and 3 Mbps, respectively. All modulation schemes have the symbol rate equal to 1 Msymbol/s.

A time division duplex (TDD) scheme for duplex transmission is defined for both modes.

The following sections describe signal characteristics in detail:

- [Bluetooth Packet Types for BR/EDR](#).....13
- [Bluetooth Transport Modes](#).....16
- [Packet Structure and Fields](#).....16
- [Bluetooth Modulation Schemes](#).....19

3.2.1 Bluetooth Packet Types for BR/EDR

3.2.1.1 ACL Packets

The ACL packets are used for asymmetric links and they contain user data or control data. The table and the figures below give an overview of the ACL packets and their structure.

Table 3-2: ACL packet - basic rate

Type	Payload Header (bytes)	User Payload (bytes)	FEC	CRC	Slot number
DM1	1	0-17	2/3	Yes, 16-bit	1
DH1		0-27	no		
DM3	2	0-121	2/3		3
DH3		0-183	no		
DM5		0-224	2/3		
DH5		0-339	no		
AUX1	1	0-29		no	5

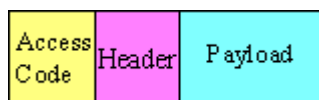


Figure 3-1: Packet structure of ACL packets - basic rate

Table 3-3: ACL packets - enhanced rate

Type	Payload Header (bytes)	User Payload (bytes)	FEC	CRC	Slot number
2-DH1	2	0-54	no	Yes, 16-bit	1
2-DH3		0-367			3
2-DH5		0-679			5
3-DH1		0-83			1
3-DH3		0-552			3
2-DH5		0-1021			5



Figure 3-2: Packet structure of ACL packets - enhanced data rate

3.2.1.2 SCO and eSCO Packets

The SCO and eSCO packets are used for symmetric links. The SCO packets are used for 64 kb/s speech transmission and for transparent synchronous data. The eSCO packets are also used for 64kb/s speech transmission and transparent data at 64 kb/s but also at other rates.

The tables and the figures below give an overview of the SCO and eSCO packets and their structure.

Table 3-4: SCO packets

Type	Payload Header (bytes)	User Payload (bytes)	FEC	CRC	Slot number
HV1	n.a.	10	1/3	no	n.a.
HV2		20	2/3		
HV3		30			
DV	1 (data only)	10+(0-9)	2/3 (data only)	Yes, 16-bit (data only)	

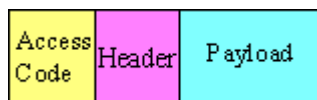


Figure 3-3: Packet structure SCO packets

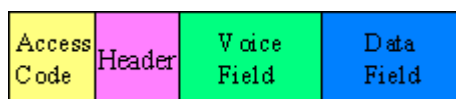


Figure 3-4: Packet structure SCO packets (data only)

Table 3-5: eSCO packets - basic rate

Type	Payload Header (bytes)	User Payload (bytes)	FEC	CRC	Slot number
EV3	n.a.	1-30	no	Yes, 16-bit (Data only)	1
EV4		1-120	2/3		3
EV5		1-180	no		3

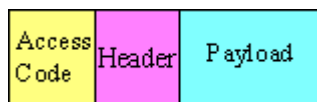


Figure 3-5: Packet structure eSCO packets - basic rate

Table 3-6: eSCO packets - basic rate

Type	Payload Header (bytes)	User Payload (bytes)	FEC	CRC	Slot number
2-EV3	n.a.	1-60	no	Yes, 16-bit	1
2-EV5		1-360			3
3-EV3		1-90			1
3-EV5		1-540			3

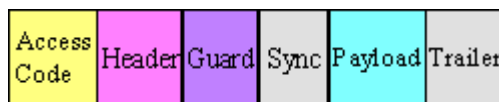


Figure 3-6: Packet structure eSCO packets - enhanced data rate

3.2.1.3 Link Control Packets for ACL, SCO, eSCO Transport Modes

There are some common kinds of packet types. An overview of these packet types is given in the table below.

Table 3-7: Common link control packets

Transport modes	Type	Payload Header (bytes)	FEC	CRC	Application
SCO, eSCO, ACL	ID	n.a.	n.a.	n.a.	Paging, inquiry, response
SCO, eSCO, ACL	NULL				Carries Link information to the source, e.g. about successfully received signal (ARQN) or the state of the receiving buffer (FLOW)
SCO, eSCO, ACL	POLL				Similar to NULL packet, used by master to poll the slaves, must be confirmed
SCO, ACL	FHS	18	2/3	Yes	Page master response, inquiry response, in roll switch

Table 3-8: Common link control packets: packet structure

Packet Type ID	Packet Types NULL and PULL	Packet Types FHS
Access Code (DAK or IAC)	Access Code Header	Access Code Header Payload

3.2.2 Bluetooth Transport Modes

There are three different transport modes defined in the Bluetooth core specification, each of them with special applications:

- Synchronous connection-oriented (SCO)
The SCO transport mode is used for a symmetric point-to-point link establishment between a master and a specific slave in the piconet.
- Extended synchronous connection-oriented (eSCO)
The eSCO transport mode is used for a symmetric or asymmetric, point-to-point link establishment between the master and a specific slave.
- Asynchronous connection less (ACL)
The ACL transport mode is used for a point-to-multipoint link establishment between the master and all slaves participating on the piconet.

There are some common transmitted packets used by all transport modes and some specific packets defined for each transport mode.

3.2.3 Packet Structure and Fields

Almost all Bluetooth transmitted packets have standard format and consist of the access code, the header and the payload with useful information. The exceptions are the ID packet which consists of the access code only and NULL and POLL packets which carry only the access code and the header.

3.2.3.1 Access Code

The access code is used for synchronization, DC offset compensation and identification. The fields of the access code are shown in the figure below and their meaning is explained in the table below.

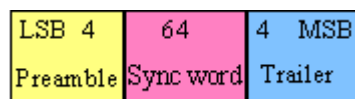


Table 3-9: The access code fields

Field	Description	Packets
Preamble	A fixed zero-one pattern of 4 symbols, used to facilitate DC compensation	All packets
Sync word	A 64-bit code word derived from a 24-bit address, improves timing acquisition	All packets
Trailer	A fixed zero-one pattern of four symbols, extended DC compensation	All packets, except ID

3.2.3.2 Header

The header contains link control information. The fields of the header are shown in the figure and their meaning is explained in the table below.

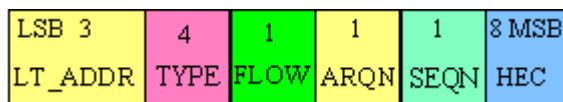


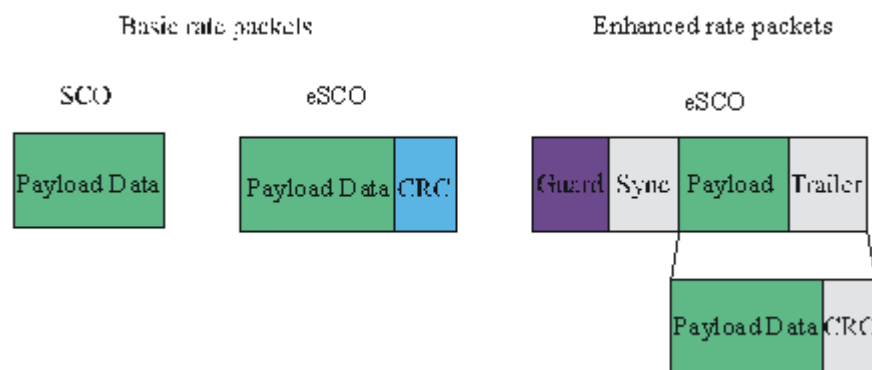
Table 3-10: The header fields

Field	Description	Packets
LT_ADDR	Logical transport address, indicates the destination slave for a packet in a master-to-slave transmission slot and the source slave for a slave-to-master transmission slot	
TYPE	Type code, specifies which packet type is used	
FLOW	Flow control, used for flow control of packets over the ACL logical transport. When the RX buffer in the recipient is full, a STOP indication must be returned. When the RX buffer can accept data, a "Go" indication must be returned.	All packets, except ID
ARQN	Automatic repeat request number, acknowledgement indication, used to inform the source of a successful transfer of payload data with CRC can be positive acknowledged ACK or negative acknowledged NAK,	
SEQN	Sequential numbering scheme to order the data packet stream	
HEC	Header-error-check to check the header integrity	

3.2.3.3 Payload Format

The payload structure depends on the type of the data field and the data rate. Two fields are defined in the payload: the synchronous data field and the asynchronous data field. The ACL packets only have the asynchronous data field and the SCO and eSCO packets only have the synchronous data field. The exception is DV of SCO transport mode which has both data fields, synchronous and asynchronous.

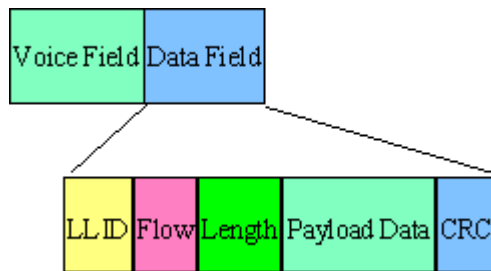
Synchronous data fields



Asynchronous data fields



Synchronous and asynchronous data fields



The meaning of some payload fields is given in the table below.

Table 3-11: The payload fields

Field	Description
CRC	The cyclic redundancy error check
Guard, sync	The guard time and synchronization sequence, used for physical layer change of modulation scheme
LLID	The logical link identifier, specifies the logical link
Flow	Field which controls the flow on the logical channels

The payload format and content of the FHS packet are different from other packets. The fields of the FHS packet are shown in the figure below and their meaning is explained in the table below.

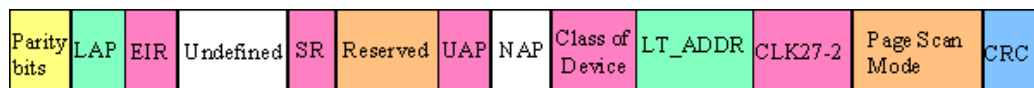


Table 3-12: The payload fields for the FHS packet

Field	Description
Parity bits	Form the first part of the sync word of the access code of the device that sends the FHS packet
LAP	Contains the lower address part of the device that sends the FHS packet
EIR	An extended inquiry response, provides miscellaneous information during the inquiry response procedure
Undefined	Reserved for future use and must be set to zero
SR	The scan repetition field, indicates the interval between two consecutive page scan windows
Reserved	Must be set to 10
UAP	Contains the upper address part of the device that sends the FHS packet
NAP	Contains the non-significant address part of the device that sends the FHS packet
Class of device	Contains the class of device of the device that sends the FHS packet. This field is defined in Bluetooth assigned numbers.
LT_ADDR	Contains the logical transport address

Field	Description
CLK27-2	Contains the value of the native clock of the device that sends the FHS packet, sampled at the beginning of the transmission of the access code of this FHS packet
Page scan mode	Indicates which scan mode is used by default by the sender of the FHS packet

3.2.4 Bluetooth Modulation Schemes

The modulation used for the basic data rate packets is GFSK (Gaussian Frequency Shift Keying) with a bandwidth bit period product $BT = 0.5$. The modulation index is between 0.28 and 0.35.

The modulation scheme used for enhanced data rate packets changes within the packet. The access code and packet header have a GFSK modulation scheme and are transmitted with the basic rate 1Mbps. The subsequent synchronization sequence, payload and trailer sequence have a PSK type of modulation and are transmitted with a data rate of 2 Mbps or optionally 3 Mbps.

The PSK modulation, namely $\pi/4$ rotated differential encoded quaternary phase shift keying ($\pi/4$ -DQPSK) is defined for the 2 Mbps transmission.

The PSK modulation, namely differential encoded 8-ary phase shift keying (8DPSK), is defined for the 3Mbps transmission.

The modulation types and corresponding packet types are given in the table below.

Table 3-13: The modulation types and corresponding packet types

Modulation type	Packet types
GFSK	ID, NULL, POLL, FHS, DM1, DH1, DM3, DH3, DM5, DH5, AUX1, HV1, HV2, HV3, DV, EV3, EV4, EV5
GFSK + $\pi/4$ -DQPSK	2-DH1, 2-DH3, 2-DH5, 2-EV3, 2-EV5
GFSK + 8DPSK	3-DH1, 3-DH3, 3-DH5, 3-EV3, 3-EV5

3.3 About Bluetooth LE

The R&S SMW provides you with the ability to generate signals in accordance with the Low Energy (LE) specification for Bluetooth wireless technology.

Bluetooth LE provides data transfer from low-power devices running on the smallest of batteries to a larger device, such as a PC, a mobile phone, or a PDA. Bluetooth LE establishes a connection, e.g. to a wristwatch, a heart rate sensor, or a data transfer from a digital camera. The generated packets do not support audio content.

A time division duplex (TDD) scheme for duplex transmission is defined. The frequency band defined for Bluetooth devices is the unlicensed 2.4 GHz "Industrial, Scientific and Medical" (ISM) frequency band.

Table 3-14: Operating band

Regulatory range	RF channels k and center frequencies f
2400.0 MHz to 2483.5 MHz	k = 0 to 39, f = k * 2 MHz + 2402 MHz

Table 3-15: Channel index

RF channel	RF center frequency in MHz	Data channel index	Advertising channel index
0	2402	-	37
1 to 11	2404 to 2424	0 to 10	-
12	2426	-	38
13 to 38	2428 to 2478	11 to 36	-
39	2480	-	39



Figure 3-7: RF channels

red = advertising channels (primary)
 blue = data channels and secondary advertising channels

The core specification of Bluetooth wireless technology defines the limits of output power level at the maximum power setting. The minimum output power is limited to -20 dBm. The maximum output power for LE is limited to 10 dBm.

The maximum output power for LE is limited to 20 dBm.

The following sections describe signal characteristics in detail:

- Packet Formats for LE..... 20
- Packet Types for LE..... 22
- Packet Structure and Fields..... 23
- Modulation Scheme..... 26
- Direction Finding..... 27

3.3.1 Packet Formats for LE

Packet formats for LE uncoded PHY

The following packet format is defined for the LE uncoded PHYs and is used for both advertising channel packets and data channel packets.

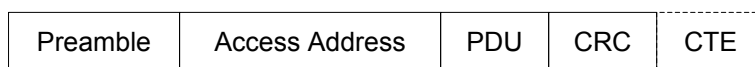


Figure 3-8: LE uncoded PHY packet format

Each packet consists of four mandatory fields: preamble, access address, PDU, and CRC. For Bluetooth [Direction Finding](#), the optional field Constant Tone Extension (CTE) is added at the end.

Table 3-16: Packet format for LE uncoded PHY

Physical layer	Preamble	Access address	PDU	CRC	CTE
LE 1 Msymbol/s	1 octet	4 octets	2 to 257 octets	3 octets	16 μ s to 160 μ s
LE 2 Msymbol/s	2 octets	4 octets	2 to 257 octets	3 octets	16 μ s to 160 μ s

The preamble is transmitted first, followed by the access address, followed by the PDU followed by the CRC and optionally followed by CTE. The entire packet is transmitted at the same symbol rate. Option R&S SMW-K60 supports LE uncoded 1 Msymbol/s (LE 1M) physical layer (PHY).

Option R&S SMW-K117 supports optional modulation scheme LE uncoded 2 Msymbol/s (LE 2M) PHY.

Packets take between 44 μ s and 2120 μ s to transmit. An additional 16 μ s to 160 μ s period

Packet formats for LE coded PHY

The following packet format is defined for the LE coded PHY and is used for both advertising channel packets and data channel packets.

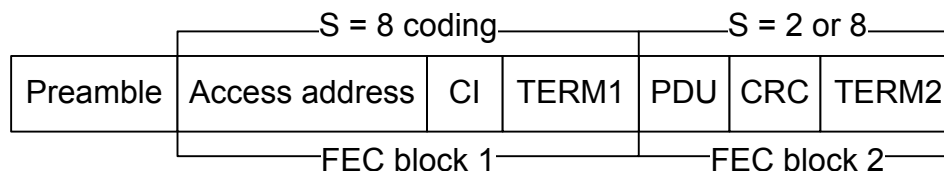


Figure 3-9: LE coded PHY packet format

Each packet consists of the preamble, FEC block 1, and FEC block 2. The preamble is not coded. The FEC block 1 consists of three fields: access address, coding indicator (CI), and TERM1. These fields use the S=8 coding scheme. The CI field determines which coding scheme is used for FEC block 2. The FEC block 2 consists of three fields: PDU, CRC, and TERM2. These fields use either the S=2 or S=8 coding scheme, depending on the value of the CI field.

The entire packet is transmitted with 1 Msymbol/s modulation. The following table captures the size and duration of the data packet fields.

Table 3-17: Packet format for LE coded PHY

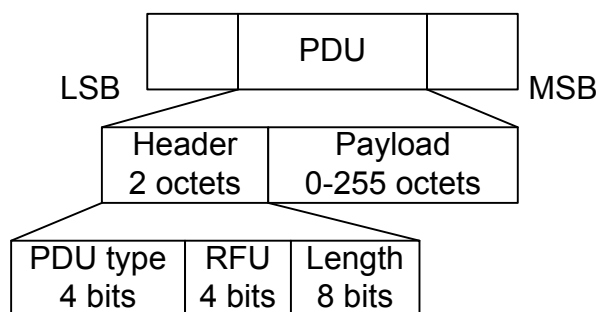
	Pream-ble	Access address	CI	TERM1	PDU	CRC	TERM2
Number of uncoded bits	80	32	2	3	16 - 2056	24	3
Duration in μ s for S=8 coding	80	256	16	24	128 - 16448	192	24
Duration in μ s for S=2 coding	80	256	16	24	32 - 4112	48	6

Packets take between 462 and 17040 μ s to transmit.

3.3.2 Packet Types for LE

Test packet types

The test packet PDU is subdivided into a PDU header and the payload field. The PDU header indicates the payload content type and the payload length expresses in octets. RFU field means reserved for future use.



LE test packets are described in the "Air Interface Packets" section of core specification for Bluetooth wireless technology, volume 6, part B.

Advertising channel packet types

The advertising channel PDU has a 16-bit header and a variable size payload. The header fields of the advertising channel PDU are as shown in "Header" on page 23.

Table 3-18: Advertising packet types:

ADV_IND	SCAN_REQ
ADV_DIRECT_IND	SCAN_RSP
ADV_NONCONN_IND	CONNECT_IND
ADV_SCAN_IND	

Table 3-19: Additional advertising packet types within R&S SMW-K117:

ADV_EXT_IND	AUX_SCAN_REQ
AUX_ADV_IND	AUX_SCAN_RSP
AUX_CHAIN_IND	AUX_CONNECT_REQ
AUX_SYNC_IND	AUX_CONNECT_RSP

Data channel packet types

The data channel PDU has a 16-bit header, a variable size payload, and can include a message integrity check (MIC) field as shown in "Header" on page 26.

The MIC field is not included in an unencrypted link layer (LL) connection, or in an encrypted LL connection with a data channel PDU with a zero length payload. The MIC

field is included in an encrypted LL connection, with a data channel PDU with a non-zero length payload. The MIC calculation is specified in the section 1 of core specification for Bluetooth wireless technology, volume 6, part E.

Besides the data packet type, instrument supports the following CONTROL_DATA packet types.

Table 3-20: Control data packet types

Opcode	CONTROL_DATA	Opcode	CONTROL_DATA
0x00	LL_CONNECTION_UPDATE_IND	0x07	LL_UNKNOWN_RSP
0x01	LL_CHANNEL_MAP_IND	0x08	LL_FEATURE_REQ
0x02	LL_TERMINATE_IND	0x09	LL_FEATURE_RSP
0x03	LL_ENC_REQ	0x0A	LL_PAUSE_ENC_REQ
0x04	LL_ENC_RSP	0x0B	LL_PAUSE_ENC_RSP
0x05	LL_START_ENC_REQ	0x0C	LL_VERSION_IND
0x06	LL_START_ENC_RSP	0x0D	LL_REJECT_IND

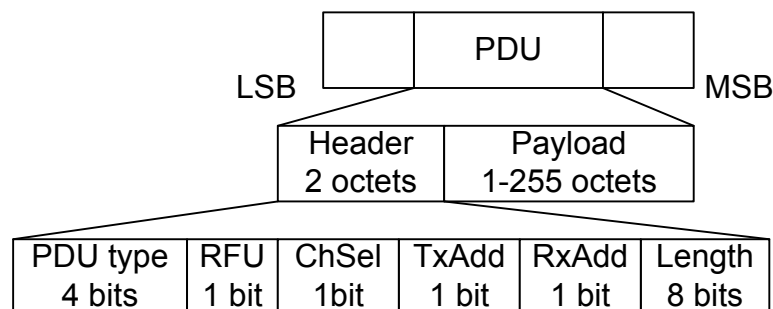
Table 3-21: Additional control data packet types within R&S SMW-K117:

Opcode	CONTROL_DATA	Opcode	CONTROL_DATA
0x0E	LL_SLAVE_FEAT_REQ	0x14	LL_LENGTH_REQ
0x0F	LL_CONNECTION_PARAM_REQ	0x15	LL_LENGTH_RSP
0x10	LL_CONNECTION_PARAM_RSP	0x16	LL_PHY_REQ
0x11	LL_REJECT_EXT_IND	0x17	LL_PHY_RSP
0x12	LL_PING_REQ	0x18	LL_PHY_UPDATE_IND
0x13	LL_PING_RSP	0x19	LL_MIN_USED_CHANNELS_IND

3.3.3 Packet Structure and Fields

3.3.3.1 Advertising Channel Packet Structure

Header



- The possible **PDU types**, indicated in the header of advertising channel PDU, are listed in the previous tables, see [Table 3-18](#).

The following table shows which channels are supported by which PHYs.

Table 3-22: PDU type vs. PHYs

PDU type	PDU name	Channel	Permitted PHY		
			LE 1M	LE 2M	LE coded
0000b	ADV_IND	Primary advertising	x	-	-
0001b	ADV_DIRECT_IND	Primary advertising	x	-	-
0010b	ADV_NONCONN_IND	Primary advertising	x	-	-
0011b	SCAN_REQ	Primary advertising	x	-	-
	AUX_SCAN_REQ	Secondary advertising	x	x	x
0100b	SCAN_RSP	Primary advertising	x	-	-
0101b	CONNECT_IND	Primary advertising	x	-	-
	AUX_CONNECT_REQ	Secondary advertising	x	x	x
0110b	ADV_SCAN_IND	Primary advertising	x	-	-
0111b	ADV_EXT_IND	Primary advertising	x	-	x
	AUX_ADV_IND	Secondary advertising	x	x	x
	AUX_SCAN_RSP	Secondary advertising	x	x	x
	AUX_SYNC_IND	Secondary advertising	x	x	x
	AUX_CHAIN_IND	Secondary advertising	x	x	x
1000b	AUX_CONNECT_RSP	Secondary advertising	x	x	x
Others	Reserved for future use				
x marks supported PHYs					

- The **ChSel**, **TxAdd** and **RxAdd** fields contain information specific to the PDU type. If the ChSel, TxAdd or RxAdd fields are not defined as used in a given PDU then they are considered Reserved for Future Use.
- The **Length** field indicates the payload field length in octets.

Payload

The advertising channel PDU types can be divided into the following three groups.

Table 3-23: Advertising channel PDU types

Advertising PDUs	ADV_IND, ADV_DIRECT_IND, ADV_NONCONN_IND, ADV_SCAN_IND within R&S SMW-K117 also ADV_EXT_IND, AUX_ADV_IND, AUX_SYNC_IND, AUX_CHAIN_IND
Scanning PDUs	SCAN_REQ, SCAN_RSP within R&S SMW-K117 also AUX_SCAN_REQ, AUX_SCAN_RSP
Initiating PDUs	CONNECT_IND within R&S SMW-K117 also AUX_CONNECT_REQ, AUX_CONNECT_RSP

The following parameters are transmitted in the advertising PDU:

- **AdvA, AdvData** for ADV_IND, ADV_NONCONN_IND and ADV_SCAN_IND
- **AdvA, TargetA** (formerly InitA) for ADV_DIRECT_IND
- **Extended header length, AdvMode, extended header, AdvData** for ADV_EXT_IND, AUX_ADV_IND, AUX_SYNC_IND and AUX_CHAN_IND
Extended header contains
 - **AdvA, TargetA, ADI, AuxPtr, Sync Info, Tx power, ACAD,** and **AdvData** fields

The following parameters are transmitted in the scanning PDU:

- **ScanA, AdvA** for SCAN_REQ
Within R&S SMW-K117 also for AUX_SCAN_REQ
- **AdvA, ScanRspData** for SCAN_RSP
- **Extended header length, AdvMode, extended header, AdvData** for AUX_SCAN_RSP
Extended header contains
 - **AdvA, TargetA, ADI, AuxPtr, Sync Info, Tx power, ACAD,** and **AdvData** fields

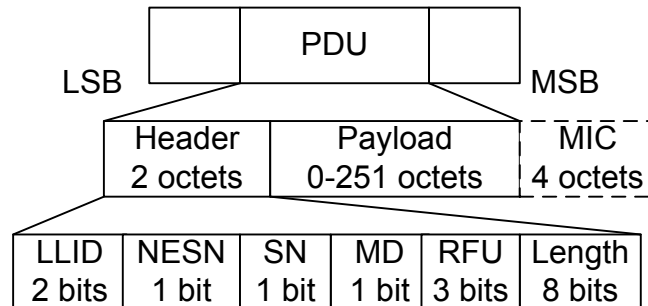
The following parameters are transmitted in the initiating PDU:

- **InitA, AdvA, LLData** for CONNECT_IND
Within R&S SMW-K117 also for AUX_CONNECT_REQ
LLData contains
 - **AA, CRCinit, WinSize, WinOffset, Interval, Latency, Timeout, ChM, Hop,** and **SCA** fields
- **Extended header length, AdvMode, extended header, AdvData** for AUX_CONNECT_RSP
Extended header contains
 - **AdvA, TargetA, ADI, AuxPtr, Sync Info, Tx power, ACAD,** and **AdvData** fields

For more details, refer to in the section 2.3 Advertising Channel PDU of core specification for Bluetooth wireless technology, volume 6, part B.

3.3.3.2 Data Channel Packet Structure

Header



The 16-bit header field consists of five fields:

- The **LLID** field of the header specifies the payload format , refer to "[Payload](#)" on page 26.
- The **NESN** bit indicates a nextExpectedSeqNum used by the peer to acknowledge the last PDU sent, or to request resending.
- The **SN** bit indicates a transmitSeqNum to identify packets sent by the link layer.
- The **MD** bit indicates, whether the device has more data to send.
- The **Length** field indicates the length of the payload and MIC if included.

Payload

- An **LL data PDU** is used to send L2CAP data. The LLID field is set to either 01b or 10b.
 - For the LLID field set to 01b, the LL data PDU is a continuation fragment of an L2CAP message, or an empty PDU. The master's LL sends an empty PDU to the slave to allow the slave to respond with any data channel PDU, including an empty PDU.
 - For the LLID field set to 10b, the LL data PDU is a start of an L2CAP message or a complete L2CAP message with no fragmentation.
- An **LL control PDU** is used to control the LL connection. The payload consists of Opcode and CtrData fields. All LL control PDUs have a fixed length, depending on the Opcode. The Opcode field identifies different types of LL Opcode PDU, see [Table 3-20](#).

For more details, refer to in the section 2.4 Data Channel PDU of core specification for Bluetooth wireless technology, volume 6, part B.

3.3.4 Modulation Scheme

The modulation is Gaussian frequency shift keying (GFSK) with a bandwidth bit period product $BT = 0.5$. The modulation index has to be between 0.45 and 0.55. The mandatory modulation scheme is 1 Msymbol/s modulation. It uses a shaped, binary FM to minimize transceiver complexity.

Option R&S SMW-K60 supports LE uncoded 1 Msymbol/s (LE 1M) physical layer (PHY).

Option R&S SMW-K117 supports LE coded 1 Msymbol/s PHY and optional modulation scheme LE uncoded 2 Msymbol/s (LE 2M) PHY.

3.3.5 Direction Finding

Since Bluetooth version 5.1, a Bluetooth LE device can transmit its direction information to a Bluetooth receiver. The information is transmitted in direction finding enabled packets in the LE uncoded PHY. In combination with location information sent on profile-level, the Bluetooth LE receiver can calculate its position.

Angle of Arrival (AoA) Method

A Bluetooth LE transmitter sends direction finding enabled packets using a single antenna. A receiving Bluetooth LE peer device consists of an antenna array linked to an RF switch which forwards the combined antennae signal to a Bluetooth LE receiver.

The peer device switches its antennae while receiving parts of the packets and capturing I/Q samples. The I/Q samples are used to calculate the phase difference of the radio signal received by different antennae of the array. For an array of two antennae with distance d , frequency f of the radio signal and speed of light c , the phase difference ψ calculates as follows:

$$\psi = 2\pi d * \cos(\Theta) * f / c$$

The angle of arrival Θ is calculated as follows:

$$\Theta = \arccos((\psi * c) / (2\pi d * f))$$

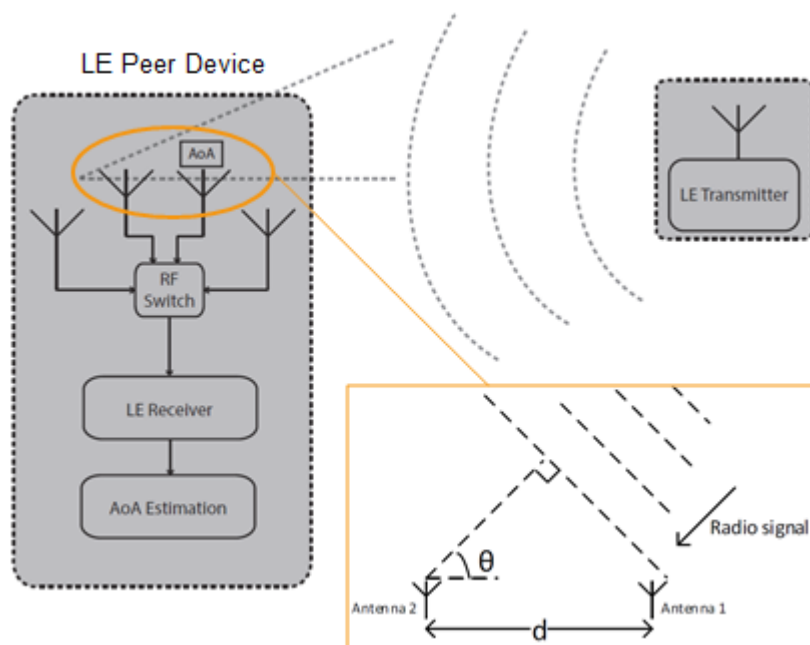


Figure 3-10: Angle of Arrival method

Angle of Departure (AoD) Method

A Bluetooth LE transmitter sends direction finding enabled packets using an antenna array. A receiving Bluetooth LE device, consisting of a single antenna, captures I/Q samples and the geometry of the antenna array from profile-level information.

For an array with two antennae with distance d , frequency f of the radio signal and speed of light c , the phase difference ψ calculates as follows:

$$\psi = 2\pi d * \cos(\Theta) * f / c$$

The angle of departure Θ is calculated as follows:

$$\Theta = \arccos((\psi * c) / (2\pi d * f))$$

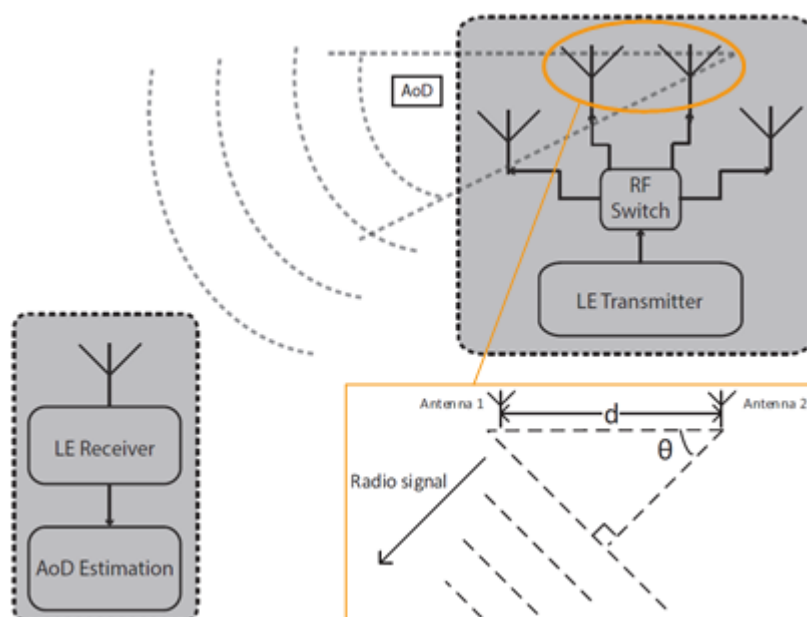


Figure 3-11: Angle of Departure method



The geometry of the antenna array is information that is shared between Bluetooth LE transmitter and receiver on a profile-level. The antenna switching pattern and the method of angle estimation is specified by Constant Tone Extension.

For more information, refer to section 8 Direction Finding Using Bluetooth Low Energy of core specification for Bluetooth wireless technology, volume 1, part A.

Constant Tone Extension

To transmit direction finding information in packets in the Bluetooth LE Uncoded PHYs, the link layer packet format is extended by an optional field Constant Tone Extension (CTE) as illustrated in Figure 3-8. The field has a length between 16 μ s and 160 μ s and consists of a constantly modulated series of unwhitened 1s. This modulation results in a CW tone shifted by 250 kHz (LE1M) or 500 kHz (LE2M) from the LE channel center frequency.

The presence, type and length of CTE is specified in the CTEInfo field available for ADV_SYNC_IND and ADV_CHAIN_IND PDUs.

CTEInfo (8 bit)		
CTETime	RFU	CTEType

Figure 3-12: CTEInfo field

The parts of the CTEInfo field are described in the table below. CTEType specifies, if AoA or AoD method is used for direction finding.

CTEInfo field	Length	Value	Description
CTETime	5 bit	2 to 20	CTE length = $8 \mu\text{s} * \text{Value}$ Other values are reserved for future use.
RFU	1 bit	1 to 2	Reserved for future use
CTEType	2 bit	0	AoA Constant Tone Extension
		1	AoD Constant Tone Extension with $1 \mu\text{s}$ slots
		2	AoD Constant Tone Extension with $2 \mu\text{s}$ slots
		3	Reserved for future use

If Bluetooth LE devices support AoA/AoD CTE, the antennae within the array follow a switching pattern specified by the Host. After a guard and reference period, time slots of $1 \mu\text{s}$ or $2 \mu\text{s}$ provide periods for antenna switching and I/Q sampling.

The following figure illustrates the CTE structure for AoA method. On the transmitting side, there is no antenna switching. On the receiving side, antenna switching and I/Q sampling alternate in the time slots after the guard and reference period.

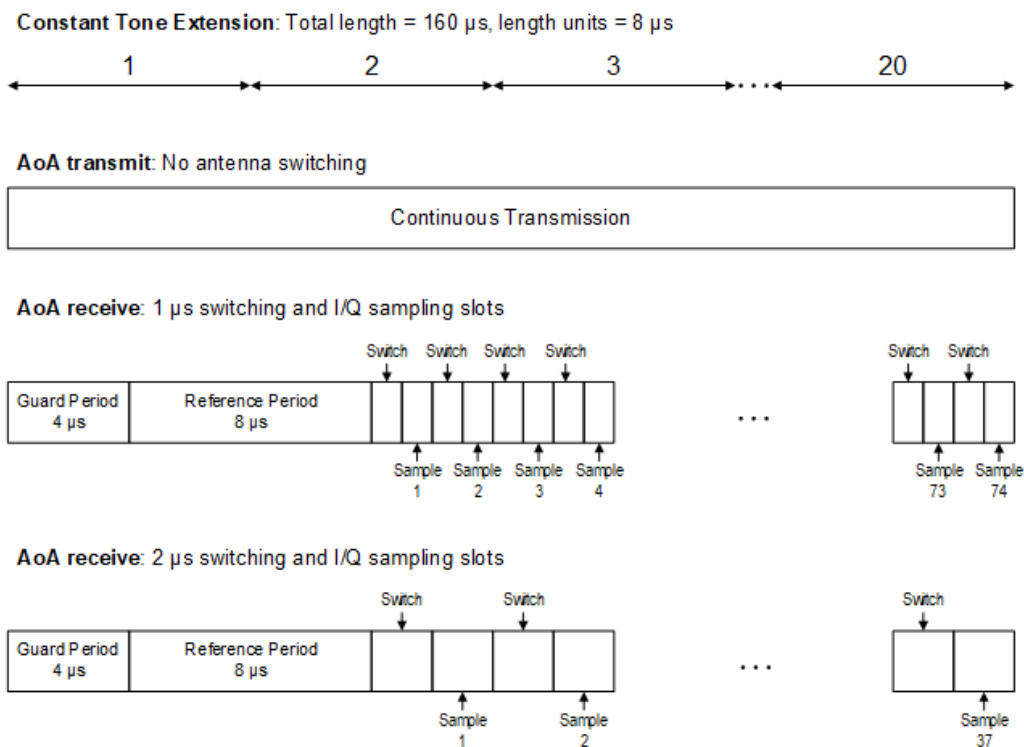


Figure 3-13: CTE structure for AoA method

The following figure illustrates the CTE structure for AoD method. On the transmitting side, antenna switching and I/Q sampling alternate in the time slots after the guard and reference period. On the receiving side, I/Q sampling only is performed in every second time slot after the guard and reference period.

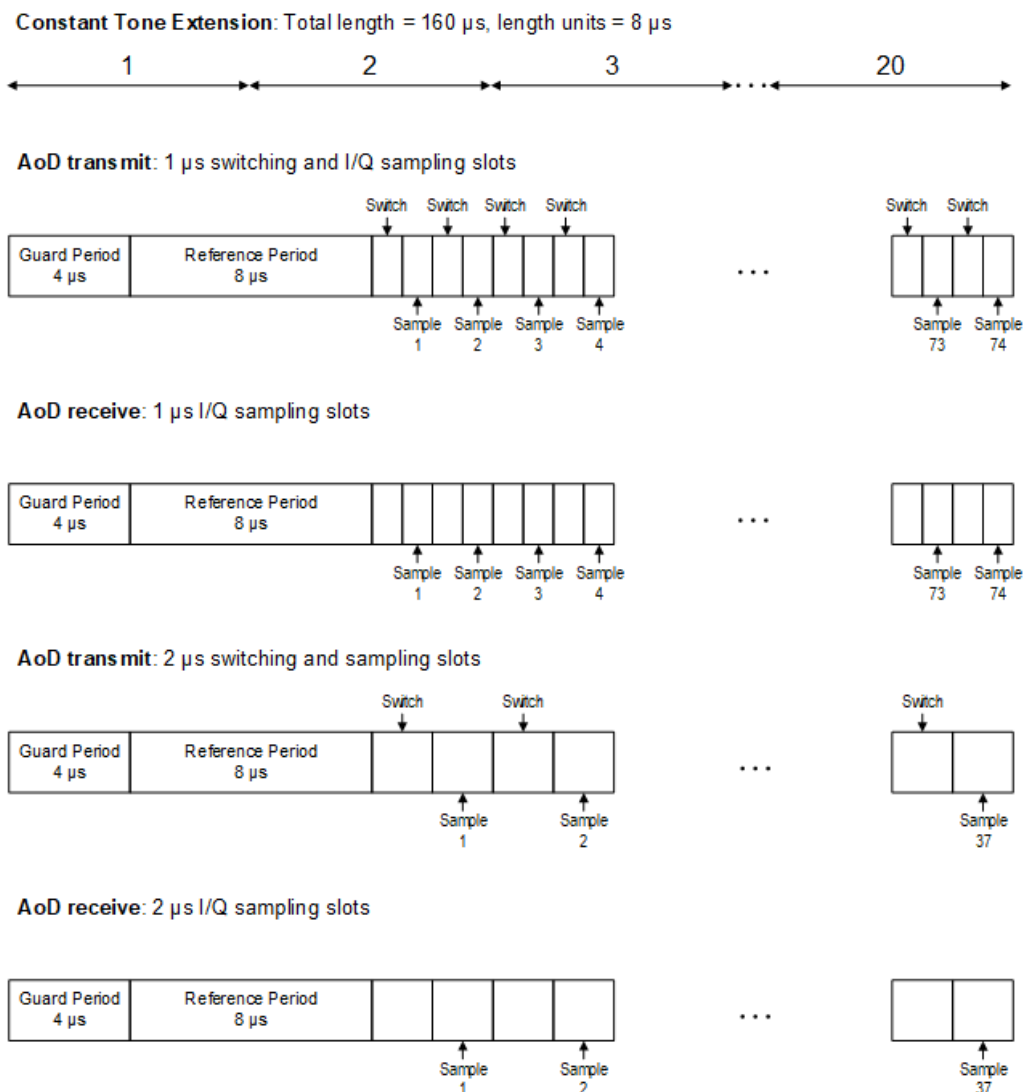


Figure 3-14: CTE structure for AoD method

For more information, refer to section 2.5 Constant Tone Extension and IQ Sampling of core specification for Bluetooth wireless technology, volume 6, part B.

4 Bluetooth Configuration and Settings

Access:

- ▶ Select "Baseband > Bluetooth".

The remote commands required to define these settings are described in [Chapter 6, "Remote-Control Commands"](#), on page 108.

Contents

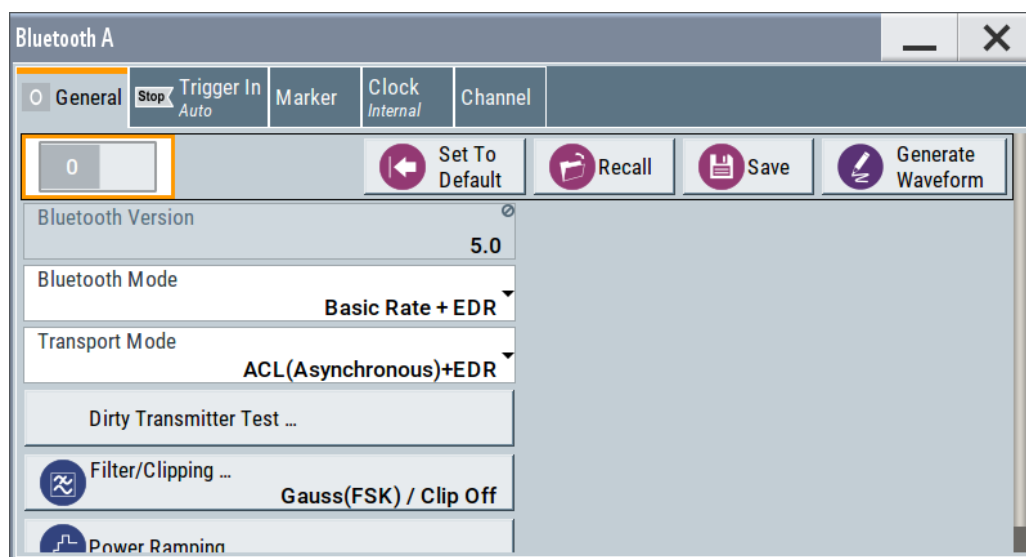
• General Settings	32
• Dirty Transmitter Test	35
• Channel Settings - BR/EDR	40
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4.1 General Settings

Access:

- ▶ Select "Baseband > Bluetooth".

The tab provides access to the default and the "Save/Recall" settings. The selected Bluetooth mode and transport mode determine the available parameters.



Settings:

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State

Activates the standard and deactivates all the other digital standards and digital modulation modes in the same path.

Remote command:

[:SOURce<hw>] :BB:BT0oth:STATe on page 127

Set To Default

Calls the default settings. The values of the main parameters are listed in the following table.

Parameter	Value
State	Not affected by "Set to default"
Bluetooth Version	4.2 5.x with R&S SMW-K117
Bluetooth Mode	Basic Rate + EDR
Transport mode	ACL (Asynchronous) + EDR
Packet Type	DH1
Sequence Length	1 Frames
Slot Timing	Tx Test Mode
Packet Configuration	Packet Editor/ Whitening off
Dirty Transmitter Test	Not in Use
Filter	Gauss (FSK)
Clipping	Clipping off
Power Ramping	Cosine / 1 Symbols
Trigger	Auto
Marker	Restart
Clock	Internal

Remote command:

[:SOURce<hw>] :BB:BT0oth:PRESet on page 125

Save/Recall

Accesses the "Save/Recall" dialog, that is the standard instrument function for saving and recalling the complete dialog-related settings in a file. The provided navigation possibilities in the dialog are self-explanatory.

The filename and the directory, in which the settings are stored, are user-definable; the file extension is however predefined.

See also, chapter "File and Data Management" in the R&S SMW user manual.

Remote command:

[:SOURce<hw>] :BB:BT00th:SETTing:CATalog on page 126

[:SOURce<hw>] :BB:BT00th:SETTing:LOAD on page 126

[:SOURce<hw>] :BB:BT00th:SETTing:STORe on page 126

[:SOURce<hw>] :BB:BT00th:SETTing:DELeTe on page 126

Generate Waveform

With enabled signal generation, triggers the instrument to store the current settings as an ARB signal in a waveform file. Waveform files can be further processed by the ARB and/or as a multi-carrier or a multi-segment signal.

The filename and the directory it is stored in are user-definable; the predefined file extension for waveform files is * .wv.

Remote command:

[:SOURce<hw>] :BB:BT00th:WAVEform:CREate on page 128

Bluetooth Version

Displays the current version of the standard.

The default settings and parameters provided are oriented towards the specifications of the version displayed.

The displayed version for Bluetooth wireless technology depends on installed options.

E.g "Bluetooth Version = 5.1" in accordance with Bluetooth core specification v5.1, requires R&S SMW-K117.

Remote command:

[:SOURce<hw>] :BB:BT00th:VERSion? on page 127

Bluetooth Mode

Determines the Bluetooth mode.

"Basic Rate +EDR"

Selects the standard Bluetooth mode (BR+EDR).

Specific settings of the basic mode are described in [Chapter 4.3, "Channel Settings - BR/EDR"](#), on page 40.

"Bluetooth Low Energy"

Selects the Bluetooth LE mode. Specific settings of this mode are described in [Chapter 4.5, "Channel Settings - LE"](#), on page 49.

Remote command:

[:SOURce<hw>] :BB:BT00th:BMODE on page 125

Transport Mode

Only available for "Bluetooth Mode " set to "Basic Rate + EDR"

Selects the transport mode.

"ACL+EDR" The transport mode selected is used for a point-to-multipoint link establishment between the master and all the slaves participating on the piconet.

"SCO" The transport mode selected is used for a point-to-point link establishment between a master and a single slave in the piconet.

"eSCO+EDR" The transport mode selected is used for a symmetric or asymmetric point-to-point link establishment between a master and a specific slave.

Remote command:

[:SOURce<hw>] :BB:BT0oth:TMODE on page 127

Dirty Transmitter Test

Accesses the [Dirty Transmitter Test](#) dialog, see [page 35](#).

Filter / Clipping

Accesses the dialog for setting baseband filtering, the modulation settings and clipping, see [Chapter 5.1, "Filter/Clipping Settings"](#), on page 92.

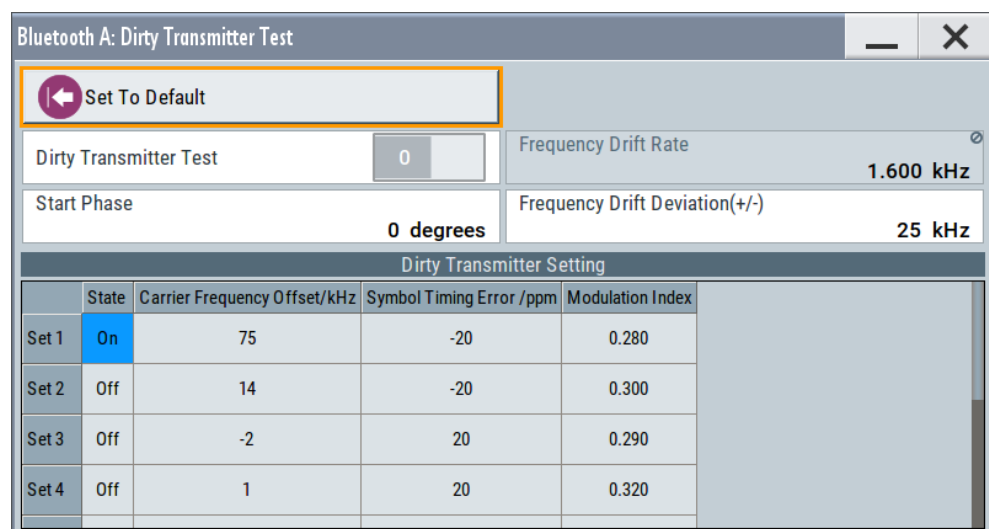
Power Ramping

Accesses the [Power Ramping Settings](#) dialog, see [page 97](#).

4.2 Dirty Transmitter Test

Access:

- ▶ Select "Bluetooth > General > Dirty Transmitter Test"



The dialog contains the parameters for configuring the "Dirty Transmitter Test" settings.

These settings contain parameters you can change for the master signal. It is used to test the connection under 'dirty transmitter' conditions, and to define the influence on the receiver quality (bit error rate tests).

Dirty transmitter parameters according to the Bluetooth test specification are given in the following tables.

Table 4-1: Dirty transmitter for BR according to the test specification

Set	Frequency offset in kHz	Symbol timing error in ppm	Modulation index
1	75	-20	0.28
2	14	-20	0.30
3	-2	20	0.29
4	1	20	0.32
5	39	20	0.33
6	0	-20	0.34
7	-42	-20	0.29
8	74	-20	0.31
9	-19	-20	0.28
10	-75	20	0.35

Table 4-2: Dirty transmitter for EDR according to the test specification

Set	Frequency offset in kHz	Symbol timing error in ppm
1	0	0
2	65	20
3	-65	-20

Table 4-3: Dirty transmitter for LE according to the test specification

Set	Frequency offset in kHz	Symbol timing error in ppm	Modulation index (standard)
1	100	-50	0.45
2	19	-50	0.48
3	-3	50	0.46
4	1	50	0.52
5	52	50	0.53
6	0	-50	0.54
7	-56	-50	0.47
8	97	-50	0.50
9	-25	-50	0.45
10	-100	50	0.55

Table 4-4: Additional parameters for LE dirty transmitter according to the test specification

Set	Stable modulation index
1	0.495
2	0.498
3	0.496
4	0.502
5	0.503
6	0.504
7	0.497
8	0.500
9	0.495
10	0.505

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Number of Packets per Set.....	38
Dirty Transmitter Setting.....	39
L State.....	39
L Carrier Frequency Offset kHz.....	39
L Symbol Timing Error.....	39
L Modulation Index.....	39

Set to Default

Calls the default settings for the dirty transmitter test. Default settings are according to the specification for Bluetooth wireless technology. The setting corresponds the selected Bluetooth mode.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:DTTest:STDefault` on page 130

Dirty Transmitter Test

Activates or deactivates the dirty transmitter test.

The setting is available for the following packet types:

- **BR:** DH1, DH3, DH5
- **EDR:** 2-DH1, 2-DH3, 2-DH5, 3-DH1, 3-DH3, 3-DH5, 2-EV3, 2-EV5, 3-EV3, 3-EV5
- **LE:** Test packets and all advertising packet types listed in tables 4-5 and 4-6

For basic rate packets, each enabled set of parameters in the "Dirty Transmitter Setting" is used for a duration of 20 ms. After 20 ms, the following enabled set is used, continuing with the first enabled set after the sequence is completed.

For EDR packets, the parameter sets apply for 20 packets each.

For LE, each enabled set of parameters in the "Dirty Transmitter Setting" is used. After the specified [Number of Packets per Set](#) (specification defines 50 packets) is transmitted, a following enabled set is used. After the sequence is completed, the transmission continues with the first enabled set.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:DTTest:DTTState](#) on page 128

Start Phase

Enters a start phase.

The start phase of the sine wave used to drift the modulated Bluetooth signal around center frequency + carrier frequency offset is set here.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:DTTest:SPHase](#) on page 130

Modulation Index Mode

Option R&S SMW-K117

For "Bluetooth Mode = Bluetooth Low Energy", specifies which one of the two possible modulation index modes are used for dirty transmitter signal.

- Standard mode determines the range of modulation index $h = 0.450$ to 0.550
- Stable mode determines the range of modulation index $h = 0.495$ to 0.505

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:DTTest:MIMode](#) on page 129

Frequency Drift Rate

Enters a frequency drift rate.

A sine wave is used to drift the modulated Bluetooth signal around center frequency + carrier frequency offset with the set frequency drift rate.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:DTTest:FDRate](#) on page 129

Frequency Drift Deviation (+/-)

Enters a frequency drift deviation.

A sine wave is used to drift the modulated Bluetooth signal around center frequency + carrier frequency offset. The maximum deviation reached during the drift equals the set frequency drift deviation.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:DTTest:FDDeviation](#) on page 129

Number of Packets per Set

For "Bluetooth Mode = Bluetooth Low Energy", specifies the number of test packets to be transmitted per enabled dirty transmitter set.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:DTTest:NPPSet](#) on page 130

Dirty Transmitter Setting

Indicates the dirty transmitter parameters according to the Bluetooth BR test specification.

State ← Dirty Transmitter Setting

Activates or deactivates the corresponding parameter set.

If deactivated, the parameters are skipped in the sequence, and the next active set is used.

Remote commands `...:LONG:SET<ch>:...` are used for BR and LE packets. The instrument provides configuration of up to 10 sets (SET1 to SET10).

Remote commands `...:SHORT:SET<ch>:...` are used for EDR packets. The instrument provides configuration of up to 3 sets (SET1 to SET3).

For basic rate packets, each enabled set applies to 20ms of signal. For EDR packets, each enabled set applies to 20 packets.

For LE, each enabled set applies to 50 test packets.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:STATE`

on page 132

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TABLE:SHORT:SET<ch>:STATE`

on page 133

Carrier Frequency Offset kHz ← Dirty Transmitter Setting

Determines a carrier frequency offset.

The center frequency of the modulated RF carrier is offset by the specified value.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:CFOffset`

on page 131

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TABLE:SHORT:SET<ch>:CFOffset`

on page 133

Symbol Timing Error ← Dirty Transmitter Setting

Sets the symbol timing error in ppm.

The symbol timing error modifies the symbol clock frequency by the specified value.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:STError`

on page 132

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TABLE:SHORT:SET<ch>:STError`

on page 133

Modulation Index ← Dirty Transmitter Setting

(Only for basic rate packets)

Sets the modulation index.

The modulation index **h** specifies the frequency deviation, defined as:

$$k_2 = \frac{2\Delta f}{f_{symbol}}$$

Where f_{symbol} is the "symbol rate" and Δf is the "frequency deviation".

According to the Bluetooth specification, the modulation index can vary between 0.28 and 0.35.

Remote command:

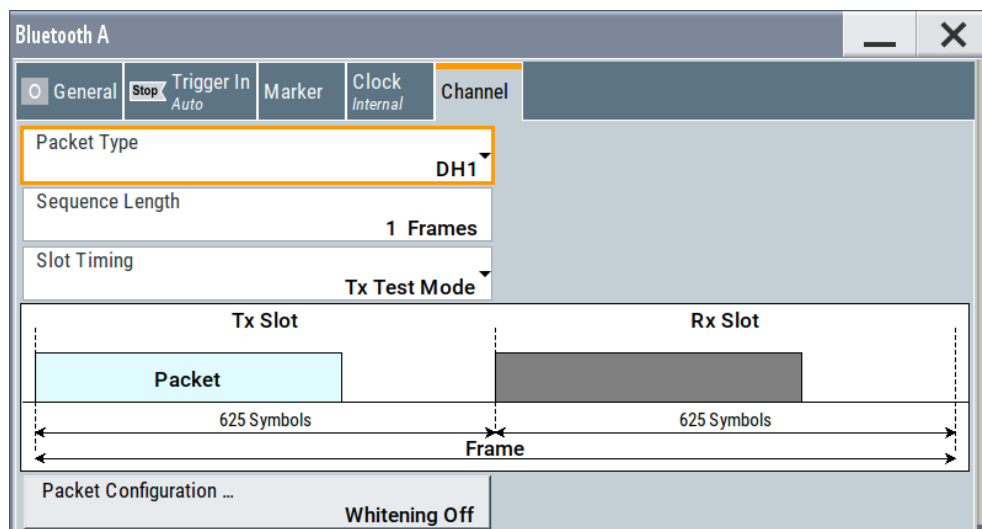
[:SOURce<hw>] :BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:MINdex
on page 131

4.3 Channel Settings - BR/EDR

This dialog provides access to the "Bluetooth Basic Rate + EDR" settings. For LE settings, refer to [Chapter 4.5, "Channel Settings - LE"](#), on page 49.

Access:

1. Select "Bluetooth > General > Bluetooth Mode > Basic Rate + EDR".
2. Select "Channel".



The dialog contains the parameters to define the packet type and provides access to the packet type configuration dialog. The graphic shows the frame structure of the selected packet type.

Settings:

Packet Type	41
Sequence Length	41
Slot Timing	41
Packet Configuration	41

Packet Type

Selects the packet type.

The available packets depend on the selected [Transport Mode](#).

All packet types as defined in the Bluetooth specification are supported. For an overview, see [Chapter 3.2.1, "Bluetooth Packet Types for BR/EDR"](#), on page 13.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:PTYPe` on page 150

Sequence Length

Selects the sequence length in frames of the generated signal. The signal repeats after the specified number of frames.

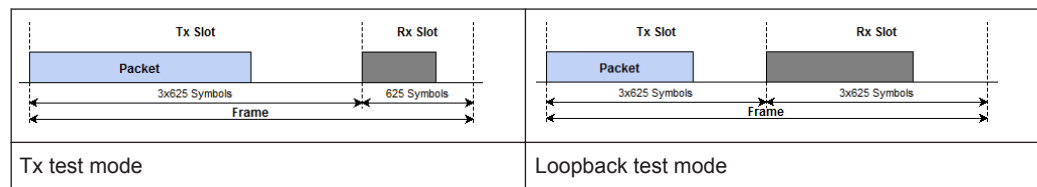
Remote command:

`[:SOURce<hw>] :BB:BT0oth:SEnGth` on page 150

Slot Timing

Selects the timing mode for the Rx slot.

The graphic below shows the frame structure of the selected [Packet Type](#) and slot timing.



A transmitted packet has a duration of $N \times 625 \mu\text{s}$ where N is an odd integer larger than 0. N depends on the type of the transmitted packet. In "Tx Test" mode, $N = 1$ for Rx slots.

"Tx Test Mode"

The transmitted Rx package takes 625 symbols, regardless of the selected packet type.

"Loopback Test Mode"

Extends the Rx slot time according to the selected packet type. For example, the Rx slot of [Packet Type > DH3](#) takes 3×625 symbols.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:STIMing` on page 150

Packet Configuration

Access the "Packet Configuration" dialog, see [Chapter 4.4, "Packet Configuration - BR/EDR"](#), on page 42.

The current data source for packet and the data whitening state are displayed next to the button.

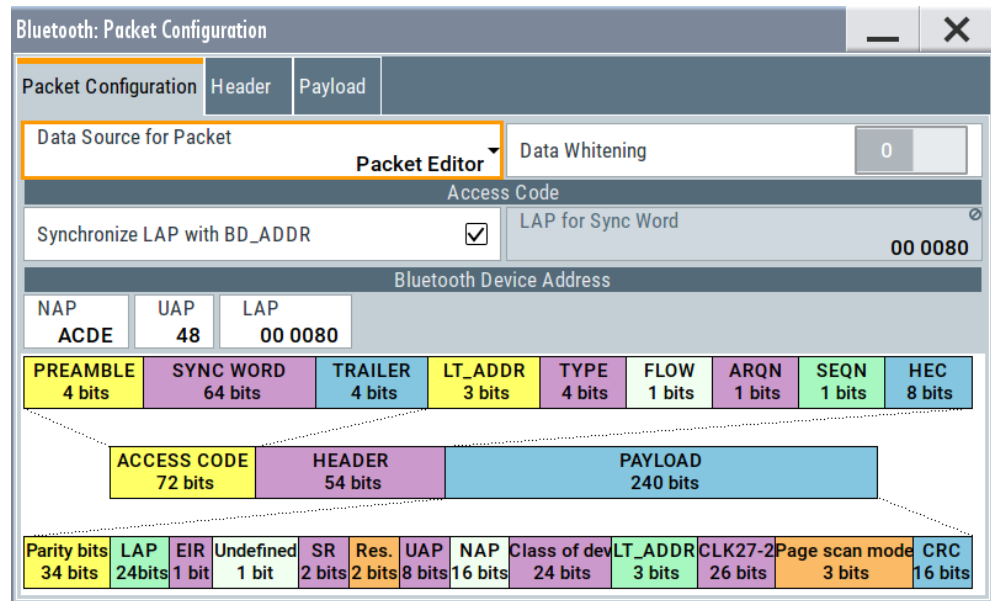
Remote command:

n.a.

4.4 Packet Configuration - BR/EDR

Access:

1. Select "Bluetooth > General > Bluetooth Mode > Basic Rate + EDR".
2. Select "Bluetooth > Channel > Packet Configuration".



The dialog contains the parameters for configuring the packet type. The available parameters vary according to the selected [Packet Type](#) and data source.

Settings:

Packet Configuration.....	43
L Data Source for Packet.....	43
L Data Whitening.....	43
L Synchronize LAP with BD_ADDR.....	43
L LAP for Sync Word.....	43
L Bluetooth Device Address (BD_ADDR).....	43
Header.....	44
L Logical Transport Address.....	44
L Flow Control.....	44
L Acknowledgment.....	44
L SEQN Start Value.....	45
Payload.....	45
L Data Source.....	45
L Data Length.....	46
L EIR packet follows.....	46
L Flow Control.....	46
L Scan Repetition Mode.....	46
L Class of Device.....	47
DV Payload.....	47

L Data Source (Voice Field).....	47
L Data Source.....	48
L Data Length.....	48
L Flow Control.....	49
Data.....	49
L Packet Length.....	49

Packet Configuration

In this section, specify general Bluetooth BR/EDR packet properties.

Data Source for Packet ← Packet Configuration

The data sent for each packet can be comfortably edited with the packet editor, or filled with a predefined ALL data sequence.

"Packet Editor" Enables the edit mode to configure the packet fields individually.

"All Data" Fills the generated packets with the selected data source. This mode is useful if you need to load predefined data contents from a data list file or the data contents of the packet are not of interest.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DSFPacket](#) on page 155

Data Whitening ← Packet Configuration

Activates the data whitening.

Evenly distributed white noise is ideal for the transmission, and real data can be forced to look similar to white noise with different methods called "Data Whitening".

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DWhitening](#) on page 156

Synchronize LAP with BD_ADDR ← Packet Configuration

(Available for FHS packets)

Activates synchronization of the [LAP for Sync Word](#) and the [Bluetooth Device Address > LAP](#).

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:SLAP](#) on page 159

LAP for Sync Word ← Packet Configuration

(Available for FHS packets)

Sets the 24 bits lower address part (LAP) in the 64 bits sync word separately, if "Synchronize LAP with BD_ADDR > OFF".

The LAP is obtained automatically from the Bluetooth device address "BD_ADDR > LAP", if "Synchronize LAP with BD_ADDR > ON".

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:LFSWord](#) on page 157

Bluetooth Device Address (BD_ADDR) ← Packet Configuration

Enters the Bluetooth device address. Each Bluetooth device has allocated a unique 48-bit Bluetooth device address (BD_ADDR).

The BD_ADDR can take any values except the 64 reserved LAP values: 0x9E8B00 – 0x9E8B3F.

"NAP"	Selects non-significant address part. The length of NAP is 16 bits or 4 hexadecimal figures.
"UAP"	Selects upper address part. The length of UAP is 8 bits or two hexadecimal figures.
"LAP"	Selects lower address part. The length of LAP is 24 bits or 6 hexadecimal figures.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:BDANap](#) on page 152

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:BDAUap](#) on page 153

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:BDALap](#) on page 152

Header

Access:

Select "Bluetooth > General > Bluetooth Mode > Basic Rate + EDR > Packet Configuration > Header".

Packet Configuration	Header	Payload
LT Address	0	Flow Control
Acknowledgment	ACK	SEQN Start Value
		GO
		1

Logical Transport Address ← Header

(Available for all packet types except ID)

Enters the logical transport address for the header.

Each slave active in a piconet is assigned a primary logical transport address (LT_ADDR). The all-zero LT_ADDR is reserved for broadcast messages.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:LTAddress](#) on page 157

Flow Control ← Header

(Available for all packet types except ID)

Sets the FLOW bit in the header. This bit indicates start or stop of transmission of packets over the ACL logical transport.

"Go" Allows the other devices to transmit new data.

"Stop" Stops the other devices from transmitting data temporarily.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:HFControl](#) on page 157

Acknowledgment ← Header

(Available for all packet types except ID)

Sets the ARQN bit of the packet header.

"NAK" Request to retransmit the previous payload.

"ACK" Previous payload has been received successfully.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:ACKnowledgement](#) on page 151

SEQN Start Value ← Header

(Available for all packet types except ID)

Sets the start value of the header SEQN bit.

The SEQN bit is present in the header to filter out retransmissions in the destination. The signal generator is altering this bit automatically on consecutive frames, if a sequence length of at least two frames is set.

"0" The SEQN bit starts with 0.

"1" The SEQN bit starts with 1.

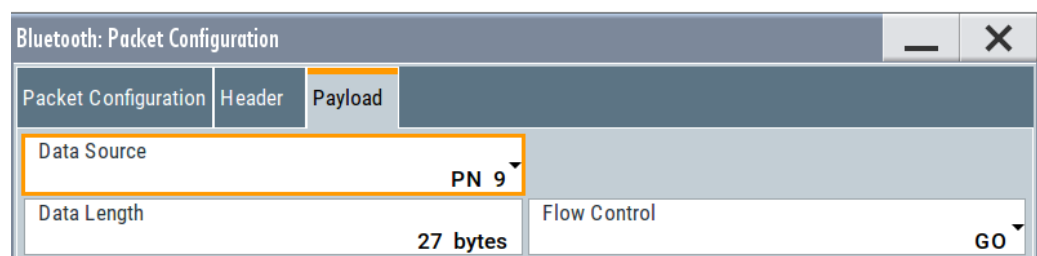
Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:SNValue](#) on page 159

Payload

Access:

Select "Bluetooth > General > Bluetooth Mode > Basic Rate + EDR > Packet Configuration > Payload".



Data Source ← Payload

(Available for all packet types except ID, POLL, NULL and FHS packets)

Selects the data source used for the payload.

The following standard data sources are available:

- "All 0, All 1"
An internally generated sequence containing 0 data or 1 data.
- "PNxx"
An internally generated pseudo-random noise sequence.
- "Pattern"
An internally generated sequence according to a bit pattern.
Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
A binary data from a data list, internally or externally generated.
Select "Select DList" to access the standard "Select List" dialog.
 - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.

- Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
- Use the standard "File Manager" function to transfer external data lists to the instrument.

See also:

- Section "Modulation Data" in the R&S SMW user manual.
- Section "File and Data Management" in the R&S SMW user manual.
- Section "Data List Editor" in the R&S SMW user manual

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA](#) on page 153

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA:DPATtern](#) on page 154

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA:DSElection](#) on page 154

Data Length ← Payload

(Available for all packet types except ID, POLL, NULL and FHS packets)

Enters the payload data length in bytes.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DLENgth](#) on page 155

EIR packet follows ← Payload

(Available for FHS packets)

Indicates that an extended inquiry response packet can follow.

"Yes" Indicates that an EIR packet follows.

"No" Indicates that EIR does not follow.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:EIRPacketfollows](#)
on page 156

Flow Control ← Payload

(Available for all packets types except ID, POLL, NULL, FHS, HV1, HV2, HV3, EV3, EV4, EV5, 2-EV3, 2-EV5, 3-EV3, 3-EV5 packets.)

Sets the FLOW bit in the payload (flow control per logical link)

"Go" Indicates start of transmission of ACL packets after a new connection has been established.

"Stop" Indicates stop of transmission of ACL packets before an additional amount of payload data is sent.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:PFControl](#) on page 158

Scan Repetition Mode ← Payload

(Available for FHS packets)

The 2-bit scan repetition field indicates the interval between two consecutive page scan windows, determines the behavior of the paging device.

"R0" The scan interval is equal to the scan window T_w page scan (continuous scan) and maximal 1.28s.

"R1" The scan interval is maximal 1.28s.

"R2" The scan interval is maximal 2.56s.

Remote command:

[:SOURce<hw>] :BB:BT0oth:PCONfiguration:SRMode on page 159

Class of Device ← Payload

(Available for FHS packets)

A parameter received during the device discovery procedure, indicates the type of device and which types of service that are supported.

Remote command:

[:SOURce<hw>] :BB:BT0oth:PCONfiguration:CODevice on page 153

DV Payload

Access:

Select "Bluetooth > Transport Mode = SCO > Channel > Packet Type = DV > Packet Configuration > Data Source for Packet = Packet Editor > DV Payload".

Voice Field	
Data Source	PN 9

Data Field	
Data Source	Pattern
Data Length	9 bytes
Data Pattern	0...
Flow Control	GO

Data Source (Voice Field) ← DV Payload

(Available for DV packets)

Selects the data source for the voice field.

The following standard data sources are available:

- "All 0, All 1"
An internally generated sequence containing 0 data or 1 data.
- "PNxx"
An internally generated pseudo-random noise sequence.
- "Pattern"
An internally generated sequence according to a bit pattern.
Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
A binary data from a data list, internally or externally generated.
Select "Select DList" to access the standard "Select List" dialog.

- Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
- Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
- Use the standard "File Manager" function to transfer external data lists to the instrument.

See also:

- Section "Modulation Data" in the R&S SMW user manual.
- Section "File and Data Management" in the R&S SMW user manual.
- Section "Data List Editor" in the R&S SMW user manual

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:VDATA](#) on page 160

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA:VDPattern](#) on page 154

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA:VDSElection](#)
on page 155

Data Source ← DV Payload

(Available for all packet types except ID, POLL, NULL and FHS packets)

Selects the data source used for the payload.

The following standard data sources are available:

- "All 0, All 1"
An internally generated sequence containing 0 data or 1 data.
- "PNxx"
An internally generated pseudo-random noise sequence.
- "Pattern"
An internally generated sequence according to a bit pattern.
Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
A binary data from a data list, internally or externally generated.
Select "Select DList" to access the standard "Select List" dialog.
 - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
 - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
 - Use the standard "File Manager" function to transfer external data lists to the instrument.

See also:

- Section "Modulation Data" in the R&S SMW user manual.
- Section "File and Data Management" in the R&S SMW user manual.
- Section "Data List Editor" in the R&S SMW user manual

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA](#) on page 153

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA:DPATtern](#) on page 154

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DATA:DSElection](#) on page 154

Data Length ← DV Payload

(Available for all packet types except ID, POLL, NULL and FHS packets)

Enters the payload data length in bytes.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:DLENgth](#) on page 155

Flow Control ← DV Payload

(Available for all packets types except ID, POLL, NULL, FHS, HV1, HV2, HV3, EV3, EV4, EV5, 2-EV3, 2-EV5, 3-EV3, 3-EV5 packets.)

Sets the FLOW bit in the payload (flow control per logical link)

"Go" Indicates start of transmission of ACL packets after a new connection has been established.

"Stop" Indicates stop of transmission of ACL packets before an additional amount of payload data is sent.

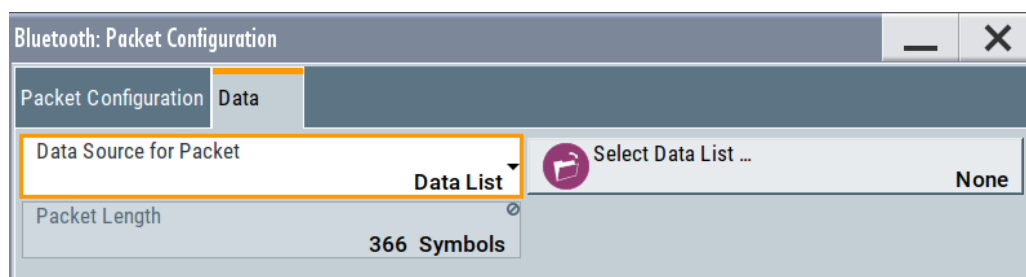
Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:PFControl](#) on page 158

Data

Access:

Select "Packet Configuration > Data Source for Packet = All Data > Data".



Packet Length ← Data

(Available in "All Data" mode and for all packet types except ID packet)

Enters the packet length in symbols.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:PCONfiguration:PLENgth](#) on page 158

4.5 Channel Settings - LE

This dialog provides access to the Bluetooth Low Energy (LE) settings. For BR/EDR settings, refer to [Chapter 4.3, "Channel Settings - BR/EDR"](#), on page 40.

Access:

1. Select "Bluetooth > General > Bluetooth Mode > Bluetooth Low Energy".
2. Select "Channel".

The "Channel" dialog varies depending on the selected "Channel Type"

<p>Bluetooth LE "Channel Type Advertising"</p>	<p>Bluetooth LE "Channel Type Data"</p>

The dialogs contain the parameters to define the packet type and provide access to the packet type configuration dialogs. The graphic shows the frame structure of the selected packet type.

Settings:

- Channel Type..... 50
- Packet Type..... 50
- Packet Format..... 52
- Duty Cycle..... 52
- Sequence Length..... 53
- Bluetooth Controller Role..... 53
- Bluetooth Controller State..... 53
- Corrupted CRC Every 2nd Packet..... 54
- Payload Type..... 54
- Duration..... 54
- Modulation Format..... 54
- Event / Frame Configuration..... 54
- Test Packet Configuration..... 54

Channel Type

Determines the channel type. Advertising and data are available. Refer to [Chapter 4.6, "Event / Frame Configuration - LE"](#), on page 54 for setting the respective parameters.

- "Advertising" Selects channel type advertising.
- "Data" Selects the data channel type.
Devices in a connected state transmit the data channel packets in connection events with a start point and an interval.

Remote command:

[:SOURce<hw>] :BB:BT0oth:CTYPe on page 161

Packet Type

Selects the packet type.

The available packet types depend on the selected channel type, as shown in the tables below ([Table 4-5](#)).

Table 4-5: Packet types of the respective channel types:

Packet type	Adver- tising	Data	Packet type	Adver- tising	Data
ADV_IND	x	-	CONNECT_IND	x	-
ADV_DIRECT_IND	x	-	DATA	-	x
ADV_NONCONN_IND	x	-	all CONTROL_DATA ...	-	x
ADV_SCAN_IND	x	-	TEST PACKET	x	x
SCAN_REQ	x	-	CONTINUOUS	x	x
SCAN_RSP	x	-			

Table 4-6: Additional packet types within R&S SMW-K117:

Packet type	Adver- tising	Data	Packet type	Adver- tising	Data
ADV_EXT_IND *)	x	-	AUX_SCAN_REQ	x	-
AUX_ADV_IND	x	-	AUX_SCAN_RSP	x	-
AUX_CHAIN_IND	x	-	AUX_CONNECT_REQ	x	-
AUX_SYNC_IND	x	-	AUX_CONNECT_RSP	x	-

*) Packet type ADV_EXT_IND is only supported with LE 1M and LE coded PHY. All remaining packet types are supported with LE 1M, LE 2M and LE coded PHY

Depending on the [Bluetooth Controller Role](#) (master or slave), you can determine in detail the information of the "CONTROL_DATA", as shown in the following tables [Table 4-7](#).

Table 4-7: Control information, available for master or slave.

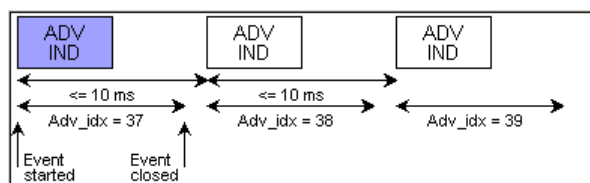
CONTROL_DATA	Master	Slave	CONTROL_DATA	Master	Slave
LL_CONNEC- TION_UPDATE_IND	x	-	LL_UNKNOWN_RSP	-	x
LL_CHANNEL_MAP_IND	x	-	LL_FEATURE_REQ	x	-
LL_TERMINATE_IND	x	x	LL_FEATURE_RSP	-	x
LL_ENC_REQ	x	-	LL_PAUSE_ENC_REQ	x	-
LL_ENC_RSP	-	x	LL_PAUSE_ENC_RSP	-	x
LL_START_ENC_REQ	x	x	LL_VERSION_IND	x	x
LL_START_ENC_RSP	x	x	LL_REJECT_IND	x	x

Table 4-8: Additional control information within R&S SMW-K117:

CONTROL_DATA	Master	Slave	CONTROL_DATA	Master	Slave
LL_SLAVE_FEAT_REQ	-	x	LL_PHY_RSP	-	x
LL_CONNEC- TION_PARAM_REQ	x	x	LL_PHY_UPDATE_IND	x	-

CONTROL_DATA	Master	Slave	CONTROL_DATA	Master	Slave
LL_CONNEC-TION_PARAM_RSP	-	x	LL_MIN_USED_CHAN-NELS_IND	-	x
LL_REJECT_EXT_IND	x	x	LL_CTE_REQ	x	x
LL_PING_REQ	x	x	LL_CTE_RSP	x	x
LL_PING_RSP	x	x	LL_PERIODIC_SYNC_IND	x	x
LL_LENGTH_REQ	x	x	LL_CLOCK_ACCU-RACY_REQ	x	x
LL_LENGTH_RSP	x	x	LL_CLOCK_ACCU-RACY_RSP	x	x
LL_PHY_REQ	x	x			

The graphic shows the frame structure of the selected packet type.



Remote command:

`[:SOURCE<hw>] :BB:BT0oth:UPTYPE` on page 162

Packet Format

The R&S SMW provides packets for LE uncoded 1 Msymbol/s (LE 1M) physical layer (PHY), LE coded 1 Msymbol/s PHY and LE uncoded 2 Msymbol/s (LE 2M) PHY. See also [Table 3-22](#).

Option R&S SMW-K117 is required for LE 2M PHY and LE coded PHY.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:PFORmat` on page 162

Duty Cycle

Specifies duty cycle for directed advertising. Information is signaled via ADV_DIRECT_IND.

Low: The packet is transmitted respecting advertising event interval

`SOURCE1:BB:BT0oth:ECONfiguration:AEINterval` and advertising event delay

High: The packet is transmitted respecting advertising event interval

`SOURCE1:BB:BT0oth:ECONfiguration:ADINterval`

Option R&S SMW-K117 is required.

See also "[Advertising Event Interval](#)" on page 57.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:DCYCLE` on page 162

Sequence Length

Selects the number of frames or events depending on the packet type. The signal repeats after the specified number of frames/events.

Almost all packet types use sequence length in "Events".

Only for the following packet types, the sequence length is expressed in "Frames":

- SCAN_REQ
- CONNECT_IND
- AUX_SCAN_REQ
- AUX_CONNECT_REQ

For LL_TERMINATE_IND packets, a default value according to the specification is given:

- Master: 'SlaveLatency + 6'
- Slave: '6'

For all other packet types, the sequence length is expressed in "Events".

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:USLength](#) on page 164

Bluetooth Controller Role

Determines the controller role.

Depending on the channel type, the field either displays the appropriate role or you can select one:

- "Advertiser"
 - Displays the controller role corresponding to the packet type:
 - "Advertiser" for TEST PACKET and for all ADV-xxx packet types and SCAN_RSP.
Within R&S SMW-K117 also for all AUX-xxx packet types except for AUX_SCAN_REQ and AUX_CONNECT_REQ
 - "Scanner" for SCAN_REQ packet type.
Within R&S SMW-K117 also for AUX_SCAN_REQ
 - "Initiator" for CONNECT_IND packet type
Within R&S SMW-K117 also for AUX_CONNECT_REQ

See also ["Payload"](#) on page 24.

- "Data"
 - Assigns a role to the controller:
 - "Master"
 - "Slave"

See also [Table 4-7](#).

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:BCRole](#) on page 161

Bluetooth Controller State

Shows the state of the Bluetooth controller. See also ["Payload"](#) on page 24.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:BCText?](#) on page 124

Corrupted CRC Every 2nd Packet

If enabled, sets the ratio of packets with CRC faults to 50%. 50% of packets are generated with correct CRC. This setting is appropriate for packet error rate (PER) report integrity tests.

Remote command:

[:SOURCE<hw>] :BB:BT00th:CCRC:STATE on page 161

Payload Type

Specifies the pattern to be transmitted continuously for the [Packet Type](#) set to CONTINUOUS. The packet header is not transmitted. For the supported payload types, refer to "[Payload Type](#)" on page 90.

Duration

Specifies the transmission duration of CONTINUOUS packet.

Remote command:

[:SOURCE<hw>] :BB:BT00th:DURATION on page 165

Modulation Format

Specifies the physical layer used for CONTINUOUS packet.

Remote command:

[:SOURCE<hw>] :BB:BT00th:MFORMAT on page 164

Event / Frame Configuration

Access the "Event Configuration" dialog, if the sequence length of the packet type is expressed in events, and accordingly, the "Frame Configuration" dialog, if it is expressed in frames, see [Chapter 4.6, "Event / Frame Configuration - LE"](#), on page 54.

The data whitening state is displayed next to the button, refer to "[Data Whitening](#)" on page 64.

Test Packet Configuration

For "Bluetooth Mode = Bluetooth Low Energy", accesses "Test Packet Configuration" dialog for packet type "TEST PACKET".

See [Chapter 4.8, "Test Packet Configuration - LE"](#), on page 88.

4.6 Event / Frame Configuration - LE

Access:

1. Select "Bluetooth > General > Bluetooth Mode > Bluetooth Low Energy"
2. Select "Channel > Event / Frame Configuration".

The "Event" or "Frame" dialogs vary, depending on the used channel type:

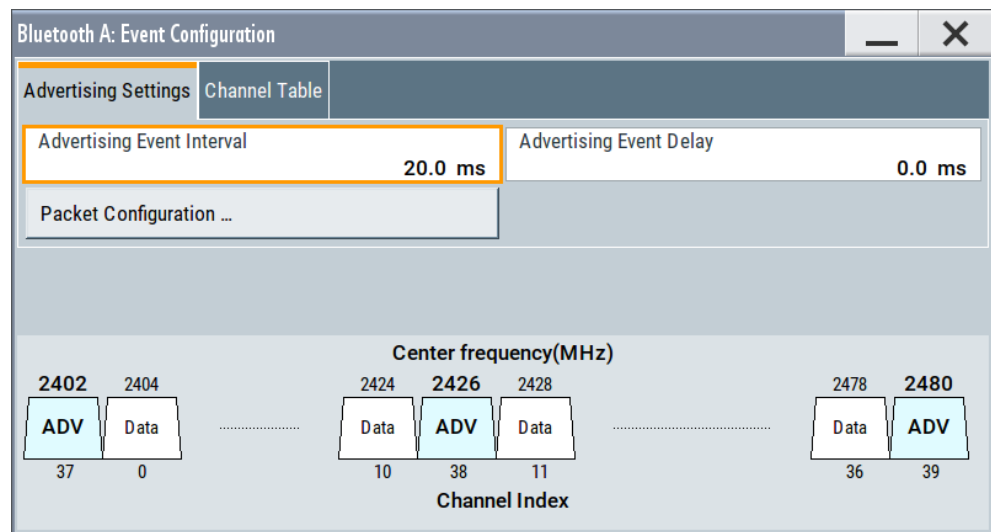


Figure 4-1: Event configuration dialog of the advertising channel type (advertiser)

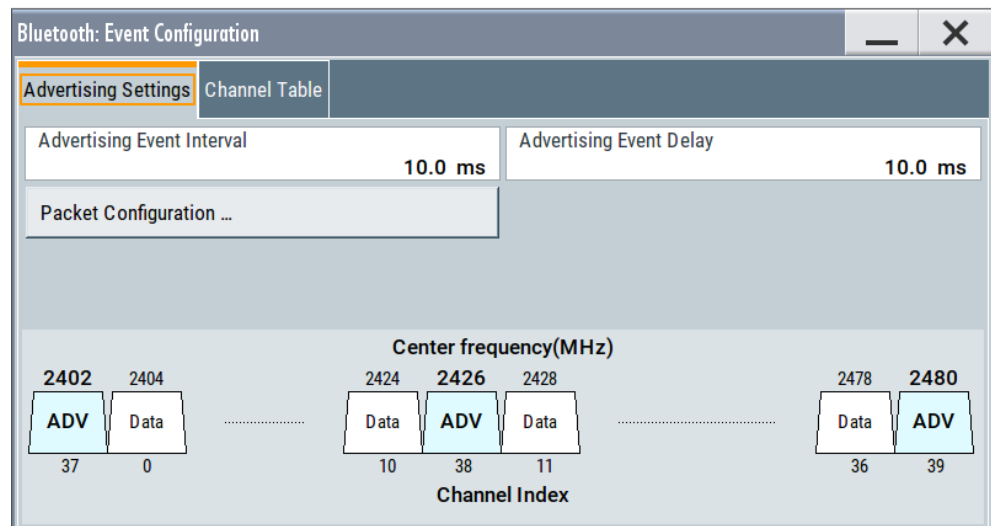


Figure 4-2: Frame configuration dialog of the advertising channel type (scanner)

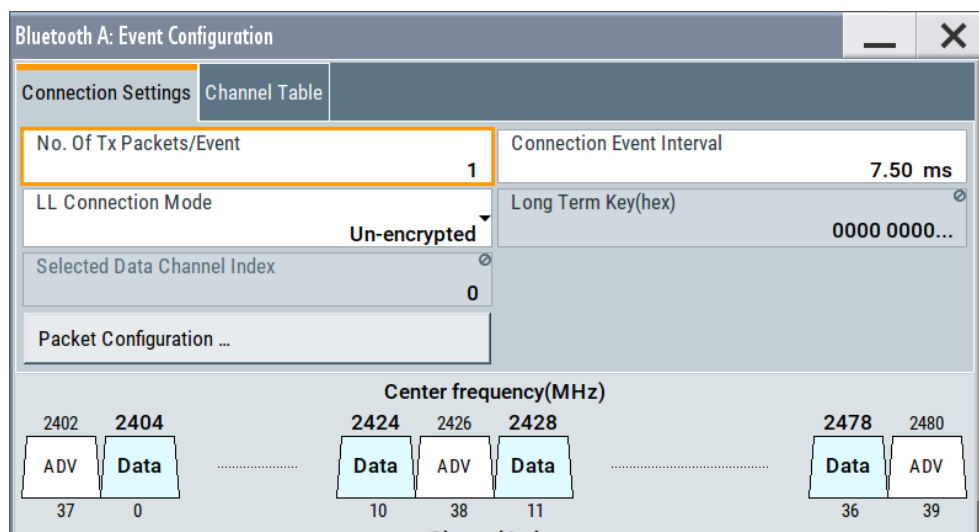


Figure 4-3: Event configuration dialog of the data channel type

The dialogs contain the parameters to configure the event or frame settings, and provide access to the packet configuration dialogs. The graphics show the distribution of the packets, the physical channel mapping and the channel indices. The channel table gives an overview of the used channels and their assignments.

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- Advertising Event / Frame Settings.....56
- Data Event Settings..... 59
- Channel Table Settings..... 61

4.6.1 Advertising Event / Frame Settings

The following section describes the parameters necessary for the advertising event or frame configuration.

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- Advertising Event Interval..... 57
- Periodic Advertising Interval.....57
- Advertising Event Delay..... 57
- Scan Window..... 57
- Scan Interval..... 57
- Advertising Packet Interval.....58
- Transmit Window Offset..... 58
- Transmit Window Size..... 58
- Packet Configuration..... 58
- Channel Table..... 59

Advertising Event Interval

Sets the time interval between two consecutive advertising events, regarding the starting points.

Note: This parameter is relevant for advertising event configuration and for the packet types ADV_IND, ADV_DIRECT_IND, ADV_NONCONN_IND and ADV_SCAN_IND. Within the option R&S SMW-K117, the following packet types are also relevant for the setting: ADV_EXT_IND, AUX_ADV_IND, AUX_CHAIN_IND.

Remote command:

For packet type "ADV_DIRECT_IND" and duty cycle high:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:ADINterval` on page 167

For all others:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:AEINterval` on page 167

Periodic Advertising Interval

Sets the time interval between the start of two AUX_SYNC_IND PDUs from the same advertising set.

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PAINterval` on page 170

Advertising Event Delay

Sets a time delay between the start times of two consecutive advertising events. The value is added to the advertising event interval.

Note: This parameter is relevant for advertising event configuration and for the packet types ADV_IND, ADV_DIRECT_IND with low duty cycle, ADV_NONCONN_IND and ADV_SCAN_IND.

Within the option R&S SMW-K117, the following packet types are also relevant for the setting: ADV_EXT_IND, AUX_ADV_IND, AUX_CHAIN_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:AEDelay` on page 166

Scan Window

Sets the length of the window during which the scanner is operating in the advertising channel.

Note that the scan window is less or equal to the value of the scan interval.

Note: This parameter is relevant for advertising frame configuration and for the packet type SCAN_REQ.

Within the option R&S SMW-K117, the packet type AUX_SCAN_REQ is also relevant for the setting.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:SWINdow` on page 172

Scan Interval

Sets the time interval between the starting points of two consecutive windows during which the scanner is operating in an advertising channel.

Note: This parameter is relevant for advertising frame configuration and for the packet type SCAN_REQ.

Within the option R&S SMW-K117, the packet type AUX_SCAN_REQ is also relevant for the setting.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:SIInterval` on page 172

Advertising Packet Interval

Sets the time interval between packets starting points of two consecutive packets in the advertising channel.

Note: This parameter is relevant for advertising frame configuration and for the packet type SCAN_RSP.

Within the option R&S SMW-K117, the packet type AUX_SCAN_RSP is also relevant for the setting.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:APIInterval` on page 167

Transmit Window Offset

Displays the start point of the transmit window.

Note: This parameter is relevant for advertising frame configuration and for the packet type CONNECT_IND.

Within the option R&S SMW-K117, the following packet types are also relevant for the setting: AUX_CONNECT_REQ, AUX_CONNECT_RSP.

This parameter is set in the packet configuration dialog, see "[Transmit Window Offset](#)" on page 74.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:WOffset` on page 203

Transmit Window Size

Indicates the size of the transmit window, regarding to the start point.

Note that the scan window size is less or equal to the value of the connection interval.

Note: This parameter is relevant for advertising frame configuration and for the packet type CONNECT_IND.

Within the option R&S SMW-K117, the following packet types are also relevant for the setting: AUX_CONNECT_REQ, AUX_CONNECT_RSP.

The parameter is set in the packet configuration dialog, see "[Transmit Window Size](#)" on page 74.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:WSInfo?` on page 173

Packet Configuration

Opens the dialog for setting the corresponding packet configuration.

This dialog is described in [Chapter 4.7, "Packet Configuration - LE"](#), on page 63.

Channel Table

Selects the channel to be used for configured packets. The description is covered in [Chapter 4.6.3, "Channel Table Settings"](#), on page 61.

4.6.2 Data Event Settings

The following section describes the parameters necessary for the data event connection.

Settings:

No. of Tx Packets per Event.....	59
Connection Event Interval	59
LL Connection Mode.....	59
Long Term key (hex).....	61
Selected Data Channel Index.....	61

No. of Tx Packets per Event

Sets the number of Tx packets per event. Each connection contains at least one data channel packet. The maximum number of packets per event is determined by the duration of the connection event interval.

Note: This parameter is relevant for data event connection settings.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PNUMBER` on page 171

Connection Event Interval

Set the time interval between the start points of two consecutive connection events. Subsequent transmissions within an event are separated by this parameter to separate connecting event starting points in time.

Note: This parameter is relevant for data event connection settings and advertising frame configuration with the packet type DATA and all CONTROL_DATA packet types.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CINterval`
on page 186

LL Connection Mode

Select the link layer connection mode. To provide safe transmission of payload data, the data in the packet can be encrypted. If activated, the payload data follows MIC (message authentication code).

Note: This parameter is relevant for data event connection settings.

The following table shows which types of packets can be encrypted and / or unencrypted.

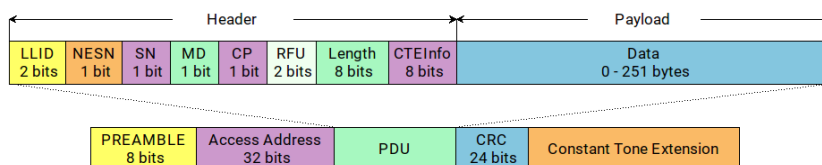
Table 4-9: Data packet encryption

Packet type	encrypted	unencrypted	Packet type	encrypted	unencrypted
DATA	x	x	LL_UNKNOWN_RSP	x	x
LL_CONNECTION_UPDATE_IND	x	x	LL_FEATURE_REQ	x	x
LL_CHANNEL_MAP_IND	x	x	LL_FEATURE_RSP	x	x
LL_TERMINATE_IND	x	x	LL_PAUSE_ENC_REQ	-	x
LL_ENC_REQ	-	x	LL_PAUSE_ENC_RSP	x	-
LL_ENC_RSP	-	x	LL_VERSION_IND	x	x
LL_START_ENC_REQ	-	x	LL_REJECT_IND	x	x
LL_START_ENC_RSP	x	-			

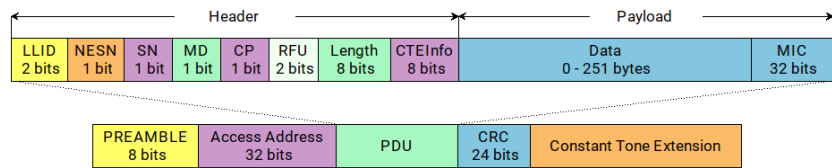
Table 4-10: Encryption of additional packet types within R&S SMW-K117:

Packet type	encrypted	unencrypted	Packet type	encrypted	unencrypted
LL_SLAVE_FEATURE_REQ	x	x	LL_PHY_RSP	x	x
LL_CONNECTION_PARAM_REQ	x	x	LL_PHY_UPDATE_IND	x	x
LL_CONNECTION_PARAM_RSP	x	x	LL_MIN_USE_CHANNELS_IND	x	x
LL_REJECT_EXT_IND	x	x	LL_CTE_REQ	x	x
LL_PING_REQ	x	x	LL_CTE_RSP	x	x
LL_PING_RSP	x	x	LL_PERIODIC_SYNC_IND	x	x
LL_LENGTH_REQ	x	x	LL_CLOCK_ACCURACY_REQ	x	x
LL_LENGTH_RSP	x	x	LL_CLOCK_ACCURACY_RSP	x	x
LL_PHY_REQ	x	x			

"Un-encrypted" Payload data is transmitted without encoding. Example of packet type data:



"Encrypted" The link layer connection runs in encrypted mode. Example of packet type data:



Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:LCMode` on page 168

Long Term key (hex)

Indicates the time the controller needs to receive the long-term key from the host. After this time, the controller is ready to enter into the last phase of encryption mode setup.

Note: This parameter is relevant for data event connection settings. In encrypted mode, the code can be edited.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:LTKey` on page 168

Selected Data Channel Index

Indicates the number of the first active data channel.

The data channel is selected for each connection event. The master and slave determine the used data channel by selecting from the list of used channels (see "[Channel Table](#)" on page 62).

Note: This parameter is relevant for data event connection settings.

Displays the data channel index currently selected.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:SDCI?` on page 171

4.6.3 Channel Table Settings

Access:

1. Follow the directions in [Chapter 4.6, "Event / Frame Configuration - LE"](#), on page 54.

2. Select "Channel Table"

The screenshot shows a dialog box titled "Bluetooth A: Event Configuration" with two tabs: "Advertising Settings" and "Channel Table". The "Channel Table" tab is active and contains the following table:

	Center Frequency /MHz	Channel Index	Channel Type	Channel State
Channel 0	2402	37	Advertising	Used
Channel 1	2426	38	Advertising	Unused
Channel 2	2480	39	Advertising	Unused

Below the table is a graphical representation of the channel indices and their corresponding center frequencies and data/advertising positions. The diagram shows three groups of boxes representing channels. The first group is centered at 2402 MHz (Index 37) and shows an "ADV" box at index 37 and a "Data" box at index 0. The second group is centered at 2426 MHz (Index 38) and shows "Data" boxes at indices 10 and 11, and an "ADV" box at index 38. The third group is centered at 2480 MHz (Index 39) and shows "Data" boxes at indices 36 and 39, and an "ADV" box at index 39.

The dialog varies, depending on the used channel type.

The channel table displays all possible channels and with their characteristics and selects the channels to be used for generated packets. Channel frequencies are indicated above the channel table.

Settings:**Channel Table**

The channel table displays configured parameters characterizing the channel and the current state.

Every channel is represented with bit positioned as per the data channel index. LSB represents data channel index 0 and the bit in position 36 represents data channel index 36.

If the channel is used, its channel bit is to be set to '1'. Bit value '0' indicates that the channel is unused.

The bits in positions 37, 38 and 39 must be set to zero upon transmission and ignored upon receipt.

"Center Frequency"

Indicates the center frequency of a channel. The graphical representation is displayed above the channel table.

"Channel Index"

Indicates the channel index. The graphical representation is displayed above the channel table.

"Channel Type"

Indicates the channel type. The graphical representation of possible transmission position is displayed above the channel table.

"Channel State"

Specifies the channels to be used for generated packets.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:ACTable:CHANnel<ch0>: STATE` on page 166

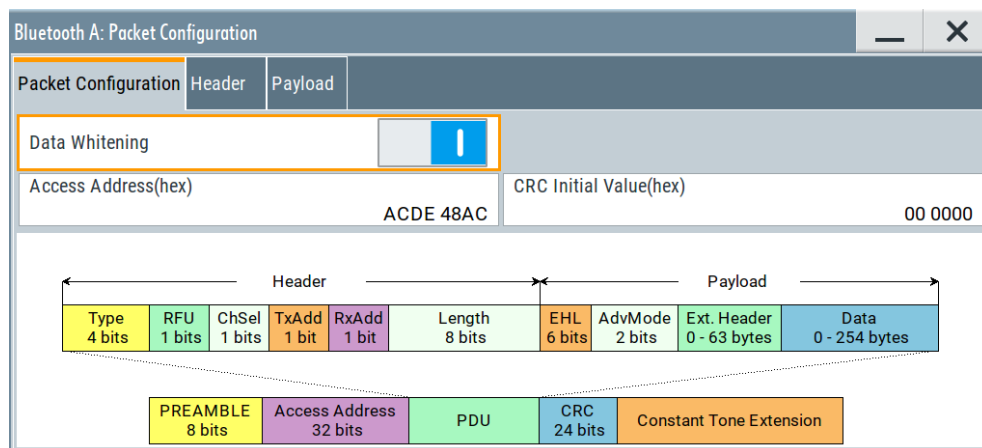
`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:DCTable:CHANnel<ch0>: STATE` on page 166

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:DCMTable: CHANnel<ch0>: STATE` on page 166

4.7 Packet Configuration - LE

Access:

1. Select "Bluetooth > General > Bluetooth Mode > Bluetooth LE".
2. Select "Channel > Channel Type, Packet Type > DATA > Event/Frame Configuration", according to the selected packet type.
3. In the corresponding "Event" or "Frame" dialog, select "Packet Configuration".



The dialog contains the parameters for configuring the selected packet type.

Contents:

- [General Packet Configuration](#)..... 63
- [Header Configuration](#)..... 64
- [Main Payload Configuration Dialog](#)..... 67
- [Additional Payload Configuration Dialogs](#)..... 84

4.7.1 General Packet Configuration

This section describes the upper part of configuration dialog - "Packet Configuration".

Settings:

Data Whitening.....	64
Access Address.....	64

Data Whitening

Activates or deactivates the data whitening.

Evenly distributed white noise is ideal for the transmission and real data can be forced to look similar to white noise with different methods called "Data Whitening". Applied to the PDU and CRC fields of all packet types, whitening is used to avoid long equal sequences in the data bit stream.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:DWHitening`
on page 174

Access Address

Sets the access address of the link layer connection.

Bluetooth LE transmissions are based on an interface packet format, that consists of a preamble (8 bits), the access address (32 bits), the PDU and CRC (24 bits).

Access address is used to identify communications on a physical channel, and to exclude or ignore packets on different physical channels that are using the same PHY channels in physical proximity.

The structure of access address depends on the packet type:

- Data channel packets
The access address is a pseudo-random LL connection address, generated by the initiator of the LL connection. The address has to follow some specific rules, which are described in the Bluetooth LE technology.
- Advertising channel packets
The address is fixed to 0110101101111011001000101110001 with the leftmost bit sent first and being the LSB.

Note: This parameter is relevant for all available package types specified in event or frame configuration of a data or advertiser channel.

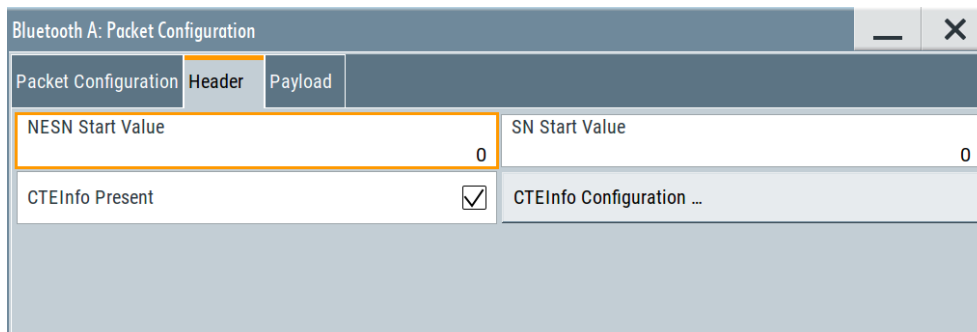
Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:AADdress`
on page 174

4.7.2 Header Configuration

1. Follow the description in [Chapter 4.7, "Packet Configuration - LE"](#), on page 63.

2. Select "Header".



This description covers the "Header" section of the configuration dialog.

Settings:

NESN Start Value.....65
 SN Start Value.....65
 Channel Selection.....65
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 CTEInfo Present.....66
 CTEInfo Configuration.....66
 L CTETime.....66
 L CTEType.....67
 Devices Tx/Rx Address Type.....67

NESN Start Value

Sets the start value of the next expected packet from the same device in the LL connection ("Next Expected Sequence Number"). This parameter can be set in the first event. From the second event, this field is not indicated.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:NSValue`
 on page 175

SN Start Value

Sets the sequence number of the packet. This parameter can be set in the first event. From the second event, this field is not indicated.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SSValue`
 on page 176

Channel Selection

Specifies the algorithm of channel selection signaled via advertising packet types.

Channel selection "Algorithm #1" only supports connection events.

"Algorithm #2" supports channel selection for connection events and periodic advertising packets.

Option R&S SMW-K117 is required.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CSElection
```

CRC Initial

Sets the initialization value for the 24 bits cyclic redundancy check (CRC) calculation. A packet has been received correctly, when it has passed the CRC check.

Note: This parameter is relevant for data channel types and for advertising packet type CONNECT_IND.

Within R&S SMW-K117 also for AUX_CONNECT_REQ.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CIValue
```

on page 174

CTEInfo Present

Activates the CTEInfo field in the header of Bluetooth LE data packets in the LE un-coded PHY.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

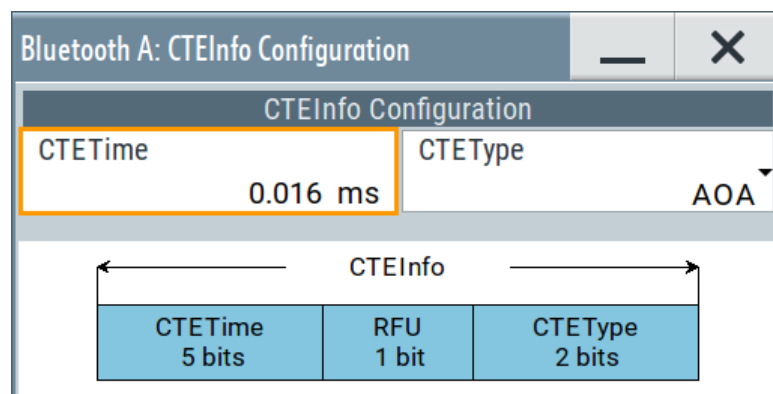
```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CPresent
```

on page 176

CTEInfo Configuration

Requires "CTEInfo Present = On".

Accesses the CTEInfo configuration dialog, in which you define CTE length and the CTE method used for direction finding.



Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

CTETime ← CTEInfo Configuration

Sets the CTETime comprising the length of constant tone extension field of the Bluetooth LE PDU.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CTIME`
on page 176

CTEType ← CTEInfo Configuration

Sets the type of constant tone extension. The type specifies the CTE AoA/AoD method and for AoD the length of the switching and I/Q sampling slots.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CTYPE`
on page 177

Devices Tx/Rx Address Type

Selects the address type of a Bluetooth LE device. Depending on the Bluetooth controller role, either the Tx or Rx or both address types are assigned.

The format of the device address differs depending on the selected address type.

Note: This parameter is relevant for advertising event or frame configuration. The Bluetooth controller role and the packet type determine the available entries.

Device address type and corresponding packet types:

- **Tx** for the packet types ADV_IND, ADV_DIRECT_IND, ADV_NONCONN_IND, ADV_SCAN_IND, SCAN_REQ, SCAN_RSP and CONNECT_IND
Within R&S SMW-K117 also with the packet types ADV_EXT_IND, AUX_ADV_IND, AUX_CHAIN_IND, AUX_SYNC_IND, AUX_SCAN_REQ, AUX_SCAN_RSP and AUX_CONNECT_REQ
- **Rx** for the packet types ADV_DIRECT_IND, SCAN_REQ and CONNECT_IND

"Public" Allocates a unique 48-bit address to each Bluetooth LE device. Public addresses use an organizationally unique identifier (OUI) obtained from the IEEE registration authority.

"Random" Allocates a 48-bit random static device address to each Bluetooth LE device. A random address is optional. It can be directly generated by the beacon.

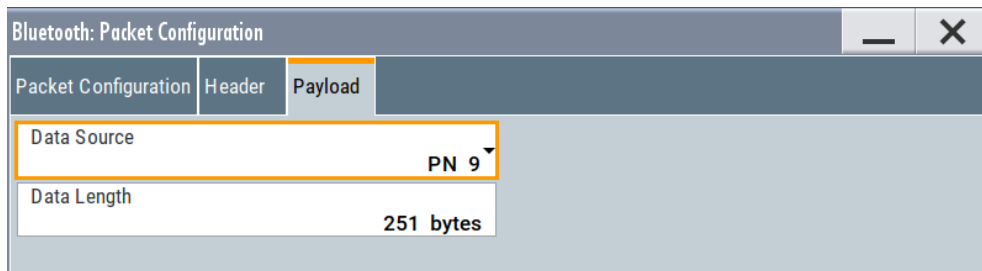
Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TAType`
on page 199

4.7.3 Main Payload Configuration Dialog

1. Follow the description in [Chapter 4.7, "Packet Configuration - LE"](#), on page 63.

2. Select "Payload".



This description covers the "Payload" section of the configuration dialog.

Settings:

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PHY.....	83
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CTETypeReq.....	83
Graph.....	83

Device Address

Sets the Bluetooth device address. A device address for the LE physical channel is defined in volume 6, part B, section 1.3 of the core specification for Bluetooth wireless technology.

Devices are identified using a device address. Devices use a public device address or a random device address, refer to "[Devices Tx/Rx Address Type](#)" on page 67.

With Bluetooth wireless technology up to the version 4.2, the following address formats are defined:

- "Public Address Type" is the unique 48-bits identity address of each Bluetooth LE device.
The public address is given from the registration authority IEEE and is composed of:
 - LSB: 24 bits = company_assigned
 - MSB: 24 bits = company_id
- "Random Address Type" is an optional 48-bits random static device address.
- "Private Address Type" is a resolvable 48-bits optional address.
A private address is composed of:
 - LSB: 24 bits = hash
 - MSB: 24 bits = random

Since the version 5.0, the device address format is in accordance with BD_ADDR for BR/EDR with the exception that LAP values does not apply unless the public device address is also used for a BR/EDR controller.

- **NAP**: Selects non-significant address part. The length of NAP is 16 bits or 4 hexadecimal figures.
- **UAP**: Selects upper address part. The length of UAP is 8 bits or two hexadecimal figures.

- **LAP:** Selects lower address part. The length of LAP is 24 bits or 6 hexadecimal figures.

The NAP+UAP can take any values except the 64 reserved LAP values: #H9E8B00 – #H9E8B3F.

Option R&S SMW-K117 is required for the address formats since Bluetooth version 5.0.

For advertising channel PDU types refer to "[Payload](#)" on page 24.

Remote command:

Company_Assigned and Company_Id in advertisers device address

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACID`

on page 181

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACASsigned`

on page 181

Company_Assigned and Company_Id in scanner's device address

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SCASsigned`

on page 181

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SCID`

on page 181

Company_Assigned and Company_Id in initiator's device address

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ICASsigned`

on page 181

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ICID`

on page 181

NAP+UAP and LAP in advertisers device address

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ANUap`

on page 183

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ALAP`

on page 182

NAP+UAP and LAP in initiators device address

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:INUap`

on page 183

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ILAP`

on page 182

NAP+UAP and LAP in scanners device address

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SNUap`

on page 183

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SLAP`

on page 182

NAP+UAP and LAP in scanner's or initiator's target device address (TargetA) to which the advertisement is directed.

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TNUap`

on page 183

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TLAP`

on page 182

Data Source

Selects the data source used for the payload.

Note: This parameter is relevant for event configuration and packet types DATA, ADV_IND, ADV_NONCONN_IND and ADV_SCAN_IND.

The following standard data sources are available:

- "All 0, All 1"
An internally generated sequence containing 0 data or 1 data.
- "PNxx"
An internally generated pseudo-random noise sequence.
- "Pattern"
An internally generated sequence according to a bit pattern.
Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
A binary data from a data list, internally or externally generated.
Select "Select DList" to access the standard "Select List" dialog.
 - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
 - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
 - Use the standard "File Manager" function to transfer external data lists to the instrument.

See also:

- Section "Modulation Data" in the R&S SMW user manual.
- Section "File and Data Management" in the R&S SMW user manual.
- Section "Data List Editor" in the R&S SMW user manual

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:DATA`
on page 186

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:DATA:DPATtern` on page 187

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:DATA:DSElection` on page 187

Data Length

Enters the payload data length in bytes.

Note: This parameter is relevant for event configuration with packet types ADV_IND, ADV_NONCONN_IND and ADV_SCAN_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:DLEnghth`
on page 188

Unknown Type (hex)

Enables that an invalid control packet is indicated.

The "CtrType" field indicates the value of the LL control packet that caused the transmission of this packet.

This parameter is relevant for data event configuration with the packet type LL_UNKNOWN_RSP (slave).

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:UTYPE`
on page 202

Slave Latency

Sets the number of consecutive connection events the slave can ignore for asymmetric link layer connections.

Note: This parameter is relevant for data event and advertising frame configuration with the packet types LL_CONNECTION_UPDATE_IND and CONNECT_IND. Within R&S SMW-K117 also for AUX_CONNECT_REQ.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SLATency`
on page 201
`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:NSLatency`
on page 197

LL Connection Timeout

Defines the maximum time between two correctly received Bluetooth LE packets in the LL connection before the connection is considered lost.

Note: This parameter is relevant for data event and advertising frame configuration with the packet types LL_CONNECTION_UPDATE_IND and CONNECT_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:LCTimeout`
on page 193
`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:NLCTimeout`
on page 196

Connection Evt Interval

Sets new connection event interval between the start points of two consecutive connection events. Subsequent transmissions within an event are separated by this parameter in order to separate connecting event starting points in time.

Note: This parameter is relevant for data event connection settings and advertising frame configuration with the packet types LL_CONNECTION_UPDATE_IND and CONNECT_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:NCInterval`
on page 196

Connection Instant

Sets a connection instant for indicating the connection event at which the new connection parameters are taken in use.

Both the master and the slave have a 32-bit connection event counter per LL connection. It is reset to zero on the first connection event of the LL connection and incremented by one on every elapsed connection event interval of the LL connection.

Note: This parameter is relevant for data event configuration with the packet types LL_CONNECTION_UPDATE_IND and LL_CHANNEL_MAP_IND.

Within the option R&S SMW-K117, the following data packet types are also relevant for the setting: LL_PHY_UPDATE_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CINStant`
on page 186

Show / Hide Data Channel (Mapping) Table

In data event and advertising frame configuration with the packet types LL_CHANNEL_MAP_IND and CONNECT_IND, calls / hides the channel map table that displays the used channels and their parameters.

The channel table is described in [Chapter 4.6.3, "Channel Table Settings"](#), on page 61.

Remote command:

n.a.

Hop Length

Sets the difference from the current channel to the next channel. The master and slave devices determine the data channel in use for every connection event from the channel map. Hop_length is set for the LL connection and communicated in the CONNECT_IND packets.

Note: This parameter is relevant for data event and advertising frame configuration with the packet type CONNECT_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:HLENgth`
on page 193

Random Vector (hex)

Sets the random vector of the master for device identification.

The parameter is an initialization vector provided by the host in the HCI_ULP_Start_Encryption command.

Note: This parameter is relevant for data event configuration with the packet type LL_ENC_REQ.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:RVEctor`
on page 200

Encrypted Diversifier (hex)

Sets the encrypted diversifier of the master for device identification. The parameter is an initialization vector provided by the host in the HCI_ULP_Start_Encryption command.

Note: This parameter is relevant for data event configuration with the packet type LL_ENC_REQ.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:EDIVersifier`
on page 189

Session Key ID (hex)

Sets the master's or the slave's portion of the session key diversifier (SKDm/SKDs).

Note: This parameter is relevant for data event configuration with the packet types LL_ENC_REQ (master) and LL_ENC_RSP (slave).

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MSKD`
on page 194

Initialization Vector (hex)

Sets the master's or the slave's portion of the initialization vector (IVm/IVs).

Note: This parameter is relevant for data event configuration with the packet types LL_ENC_REQ (master) and LL_ENC_RSP (slave).

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MIVector`
on page 193

Feature Set Length

Specifies the length of feature set for master (LL_FEATURE_REQ) or slave.

For feature set setting within the option R&S SMW-K117, refer to "[FeatureSet Configuration](#)" on page 87.

Note: This parameter is signaled via LL_FEATURE_REQ (master) and LL_FEATURE_RSP (slave).

Within the option R&S SMW-K117, it is signaled also via LL_SLAVE_FEATURE_REQ.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:FSLength`
on page 192

Transmit Window Size

Sets the size of the transmit window, regarding to the start point.

Note that the scan window size is less or equal to the value of the connection interval, see "[Connection Evt Interval](#)" on page 72.

Note: This parameter is relevant for advertising frame configuration for the packet type CONNECT_IND and for data packet type LL_CONNECTION_UPDATE_IND.

Within the option R&S SMW-K117, the following data packet types are also relevant for the setting: AUX_CONNECT_REQ, AUX_CONNECT_RSP.

This parameter is also indicated in the "Frame Configuration Dialog".

Remote command:

For advertising channels:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:WSIZE`
on page 204

For data channels:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:NWSize`
on page 198

Transmit Window Offset

Sets the start point of the transmit window.

Note: This parameter is relevant for advertising frame configuration and for the packet types CONNECT_IND and LL_CONNECTION_UPDATE_IND.

This parameter is also indicated in the "Frame Configuration Dialog".

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:WOffset`
on page 203

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:NWOffset`
on page 197

Sleep Clock Accuracy

Defines the masters clock accuracy with specified encoding. This parameter is used by the slave to determine required listening windows in the LL connection. It is a controller design parameter known by the controller.

Note: This parameter is relevant for advertising frame configuration and the packet types CONNECT_IND and LL_PERIODIC_SYNC_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SCACcuracy`
on page 200

Error Code

Sets the error code value to inform the remote device why the connection is about to be terminated in case of LL_TERMINATE_IND packet. On the other hand, this parameter for LL_REJECT_IND packet is used for the reason a request was rejected. An 8-bit value is set.

Note: This parameter is relevant for data frame configuration and the packet type LL_TERMINATE_IND and LL_REJECT_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ECODE`
on page 188

Company ID

Sets the company identifier of the manufacturer of the Bluetooth controller. A 16-bit value is set.

Note: This parameter is relevant for data frame configuration and for the packet type LL_VERSION_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CID`
on page 185

Version Number

Sets the version of the Bluetooth controller specification (8 bits).

Note: This parameter is relevant for data frame configuration and the packet type LL_VERSION_IND

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:VNUMBER`
on page 203

Sub Version Number

Sets a unique value for each implementation or revision of an implementation of the Bluetooth controller.

A 16-bit value is set.

Note: This parameter is relevant for data frame configuration and for the packet type LL_VERSION_IND.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:SVNumber`
on page 202

Advertising Mode

Indicates the mode of the advertisement. All modes defined in specification are supported.

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:AMODE`
on page 183

Target's Device Address

TargetA parameter, refer to "Device Address" on page 69.

Extended Header

Enables / disables extended header for advertising packets with scanning PDUs. If enabled, the following parameters are displayed in the table below. These parameters are signaled via ADV_EXT_IND, AUX_ADV_IND, AUX_SCAN_RSP, AUX_SYNC_IND, AUX_CHAIN_IND, AUX_CONNECT_RSP.

Extended Header											
AdvA (NAP/UAP)	(LAP)	TargetA (NAP/UAP)	(LAP)	CTE Info	AdvData Info	Aux Ptr	Sync Info	TxPow (dBm)	ACAD Length	ACAD	AList / Pattern
<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
AC DE48	00 0080	AC DE48	00 0080	Conf...	Conf...	Conf...	Conf...	0	26	PN 9	

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:EHeader:STATE`
on page 189

AdvA ← Extended Header

If enabled, the R&S SMW includes the signaling of non-significant advertising address part (NAP), upper address part (UAP) and lower address part (LAP). The setting of NAP, UAP and LAP is covered in the section "Device Address" on page 69.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:EHFlags:AADDRESS:STATE`
on page 189

TargetA ← Extended Header

Enables / disables the signaling of non-significant address part (NAP), upper address part (UAP) and lower address part (LAP). The setting of NAP, UAP and LAP is covered in the section "[Device Address](#)" on page 69.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT00th:ECOnfiguration:PCOnfiguration:EHFLags:
TADdress:STATe on page 191
```

CTE Info ← Extended Header

Activates the CTEInfo field in the header of Bluetooth LE data packets in the LE uncodded PHY.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

"Config" accesses the CTEInfo configuration dialog, in which you define CTE length and the CTE method used for direction finding.

The setting is covered in the section "[CTEInfo Configuration](#)" on page 66.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT00th:ECOnfiguration:PCOnfiguration:EHFLags:
CINfo:STATe on page 190
```

AdvData Info ← Extended Header

Enables / disables the signaling of advertising data information consisting of "Advertising Data ID" and "Advertising Set ID". The setting is covered in the section "[AdvDataInfo Configuration](#)" on page 84.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT00th:ECOnfiguration:PCOnfiguration:EHFLags:
ADINfo:STATe on page 190
```

AuxPtr ← Extended Header

Enables / disables the secondary advertising channel. The setting is covered in the section "[AuxPtr Configuration](#)" on page 85.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT00th:ECOnfiguration:PCOnfiguration:EHFLags:
APTR:STATe on page 190
```

SyncInfo ← Extended Header

Enables / disables the signaling of SyncInfo. The presence of the SyncInfo field indicates the presence of a periodic advertisement. The setting is covered in the section "[SyncInfo Configuration](#)" on page 86.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT00th:ECOnfiguration:PCOnfiguration:EHFLags:
SINfo:STATe on page 191
```

TxPow ← Extended Header

Enables and sets the signaling of required transmit power.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:EHFLags:TPower:STate` on page 191

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TPower` on page 202

ACAD Length ← Extended Header

Specifies the length of additional controller advertising data (ACAD) field.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ALENght` on page 182

ACAD ← Extended Header

Specifies the pattern used for additional controller advertising data (ACAD).

The following standard data sources are available:

- "All 0, All 1"
An internally generated sequence containing 0 data or 1 data.
- "PNxx"
An internally generated pseudo-random noise sequence.
- "Pattern"
An internally generated sequence according to a bit pattern.
Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
A binary data from a data list, internally or externally generated.
Select "Select DList" to access the standard "Select List" dialog.
 - Select the "Select Data List > navigate to the list file *.dm_iqd > Select" to select an existing data list.
 - Use the "New" and "Edit" functions to create internally new data list or to edit an existing one.
 - Use the standard "File Manager" function to transfer external data lists to the instrument.

See also:

- Section "Modulation Data" in the R&S SMW user manual.
- Section "File and Data Management" in the R&S SMW user manual.
- Section "Data List Editor" in the R&S SMW user manual

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD` on page 179

AList / Pattern ← Extended Header

Specifies the path of internal data list for **ACAD** = "Data List" or

Sets the user-defined ACAD pattern for **ACAD** = "Pattern".

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD:APATtern` on page 180

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD:ASElection` on page 180

Min. / Max. Interval

Specifies the minimum / maximum allowed connection interval.

Note: These parameters are signaled via LL_CONNECTION_PARAM_REQ and LL_CONNECTION_PARAM_RSP.

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MNINterval`
on page 169

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MXINterval`
on page 169

Preferred Periodicity

Specifies a value the connection interval is preferred to be a multiple of.

Note: This parameter is signaled via LL_CONNECTION_PARAM_REQ and LL_CONNECTION_PARAM_RSP.

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PPERiodicity`
on page 171

Ref. Connection Event Count

Specifies connection event counter relative to which all the valid Offset0 to Offset5 fields have been calculated. See also [Offset Setting Table](#).

Note: This parameter is signaled via LL_CONNECTION_PARAM_REQ and LL_CONNECTION_PARAM_RSP.

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:RCECount`
on page 171

Offset Setting Table

Specifies the possible positions of the anchor points of the LE connection with the updated connection parameters relative to the [Ref. Connection Event Count](#).

Note: These parameters are signaled via LL_CONNECTION_PARAM_REQ and LL_CONNECTION_PARAM_RSP.

Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:OFFSet<ch0>:STATe`
on page 169

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:OFFSet<ch0>:VALue`
on page 170

Max Rx Octets / Max Tx Octets

Specifies the maximum allowed payload length of a packet to be received (Rx) or transmitted (Tx).

Note: These parameters are signaled via LL_LENGTH_REQ and LL_LENGTH_RSP. Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MROctets`
on page 194

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MTOctets`
on page 194

Max Rx Time / Max Tx Time

Specifies the maximum allowed time to receive (Rx) or transmit (Tx) a packet.

Note: These parameters are signaled via LL_LENGTH_REQ and LL_LENGTH_RSP. Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MRTime`
on page 195

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MTTime`
on page 195

Rx PHY / Tx PHY

Specifies preferred physical layers in receive (Rx) and transmit (Tx) direction. For permitted PHYs, refer to [Table 3-22](#).

Note: These parameters are signaled via LL_PHY_REQ and LL_PHY_RSP. Option R&S SMW-K117 is required.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:RPHYs:L1M:STATE` on page 199

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:RPHYs:L2M:STATE` on page 199

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:RPHYs:LCOD:STATE` on page 199

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TPHYs:L1M:STATE` on page 199

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TPHYs:L2M:STATE` on page 200

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:TPHYs:LCOD:STATE` on page 200

M_TO_S_PHY / S_TO_M_PHY

Specifies the physical layers to be used in master-to-slave (M_TO_S) and slave-to-master (S_TO_M) direction. For permitted PHYs, refer to [Table 3-22](#).

Note: This parameter is signaled via LL_PHY_UPDATE_IND. Option R&S SMW-K117 is required.

Remote command:

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MTSPHy:L1M:STATe on page 195

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MTSPHy:L2M:STATe on page 195

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MTSPHy:LCOD:STATe on page 195

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:STMPHy:L1M:STATe on page 195

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:STMPHy:L2M:STATe on page 196

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:STMPHy:LCOD:STATe on page 196

Reject Opcode

Specifies the Opcode of rejected LL control PDU. For Opcode, refer to [Table 3-20](#).

Note: This parameter is signaled via LL_REJECT_EXT_IND.

Option R&S SMW-K117 is required.

Remote command:

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ROPCode on page 199

PHYs

Specifies the physical layers for which the slave has a [Min Used Channels](#) requirement.

Note: These parameters are signaled via LL_MIN_USED_CHANNELS_IND.

Option R&S SMW-K117 is required.

Remote command:

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PHYS:L1M:STATe on page 198

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PHYS:L2M:STATe on page 198

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PHYS:LCOD:STATe on page 198

Min Used Channels

Specifies the minimum number of channels to be used on the specified [PHYs](#).

Note: This parameter is signaled via LL_MIN_USED_CHANNELS_IND.

Option R&S SMW-K117 is required.

Remote command:

[:SOURce<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MUChannels on page 195

ID(hex)

Specifies the ID of the identifier specified by the Host in the CtrData field. The value is set in hexadecimal representation.

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:ID`
on page 204

SyncInfo Configuration

Accesses the "SyncInfo Configuration" dialog. See "[SyncInfo Configuration](#)" on page 86.

Connection Event Count

Specifies the connEventCount field in the CtrData field.

The count value is specified within the following range:

$\text{currEvent} - 2^{14} < \text{connEventCount} < \text{currEvent} + 2^{14}$

CurrEvent is the counter value for the connection event during (re-)transmission of the LL_PERIODIC_SYNC_IND PDU.

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:CECount`
on page 204

Last Pa Event Counter

Specifies the lastPaEventCounter field in the CtrData field.

The lastPaEventCounter value is typically set to the PaEventCounter value in the AUX_SYNC_IND PDU.

Specified are the following values for lastPaEventCounter and EventCounter:

- Equal values
- Values with a difference of 1 (modulo 65536)
- Values representing LL_PERIODIC_SYNC_IND and AUX_SYNC_IND timing of less than 5 seconds

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:LPECounter`
on page 205

SID(hex)

Specifies the SID field in the CtrData field. The value is set in hexadecimal representation.

The SID is typically set to the Advertising SID subfield of the advertising set pointing to periodic advertising.

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:SID`
on page 206

Address Type

Specifies the address type in the CtrData field.

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ATYPe`
on page 204

PHY

Specifies the PHY field in the CtrData field. The value is set in hexadecimal representation.

The PHY information is used to indicate the PHY type used by periodic advertising. The selection is exclusive, i.e. enabling one PHY disables the other enabled PHY.

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PHY:L1M:STATe` on page 205

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PHY:L2M:STATe` on page 206

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:PHY:LCOD:STATe` on page 206

Sync Connection Event Counter

Note: This parameter is signaled via LL_PERIODIC_SYNC_IND control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SCECounter`
on page 206

MinCTELenReq

Specifies the minimum CTE length in the CtrData field.

Note: This parameter is signaled via LL_CTE_REQ control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MCLReq`
on page 205

CTETypeReq

Specifies the minimum CTE length in the CtrData field.

Note: This parameter is signaled via LL_CTE_REQ control data PDU.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CTReq`
on page 176 `[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:MCLReq`
on page 205

Graph

The figure in the packet configuration dialog shows the packet structure of the currently selected packet type.

4.7.4 Additional Payload Configuration Dialogs

Option R&S SMW-K117.

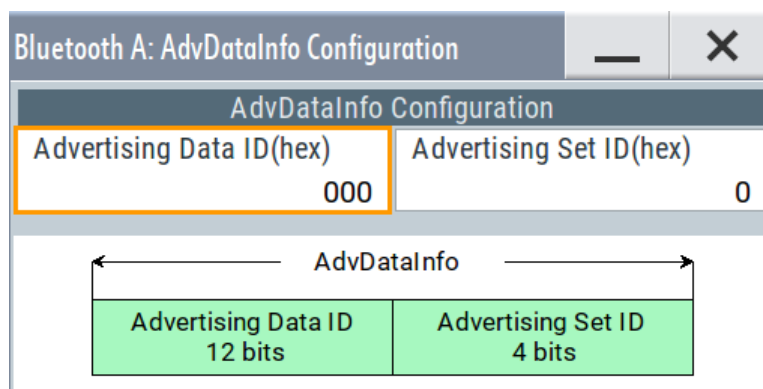
The following additional dialogs can be accessed from the packet configuration dialog.

AdvDataInfo Configuration.....	84
AuxPtr Configuration.....	85
L Channel Table.....	85
L Clock Accuracy.....	85
L Offset Units.....	85
L Aux Offset.....	85
L AUX PHY.....	86
SyncInfo Configuration.....	86
L Sync Packet Offset.....	86
L Offset Units.....	86
L Offset Adjust.....	86
L Periodic Adv Interval.....	87
L Secondary Advertising Channel Map Table.....	87
L Sleep Clock Accuracy.....	87
L Access Address.....	87
L CRC Initial Value.....	87
L Event Counter.....	87
FeatureSet Configuration.....	87

AdvDataInfo Configuration

Specifies advertising data information consisting of "Advertising Data ID" and "Advertising Set ID". The structure of data is displayed also graphically.

These parameters are signaled within an extended header, refer to "Extended Header" on page 76.



Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ADID`
on page 182

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ASID`
on page 185

AuxPtr Configuration

The presence of the AuxPtr field indicates that some or all advertisement data is in a subsequent auxiliary packet. The contents of the AuxPtr field describe this packet. The structure of data is displayed also graphically.

These parameters are signaled within an extended header, refer to "[Extended Header](#)" on page 76.

Bluetooth A: AuxPtr Configuration						
AuxPtr Configuration	Secondary Advertising Channel Table					
Clock Accuracy	Offset Units					
51 ppm to 500 ppm	30 us					
AUX Offset	AUX PHY					
245.70 ms	LE 1M					
<p style="text-align: center;">← AuxPtr →</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Channel Index 6 bits</td> <td style="text-align: center;">CA 1 bit</td> <td style="text-align: center;">Offset Units 1 bit</td> <td style="text-align: center;">AUX Offset 13 bits</td> <td style="text-align: center;">AUX PHY 3 bits</td> </tr> </table>		Channel Index 6 bits	CA 1 bit	Offset Units 1 bit	AUX Offset 13 bits	AUX PHY 3 bits
Channel Index 6 bits	CA 1 bit	Offset Units 1 bit	AUX Offset 13 bits	AUX PHY 3 bits		

Channel Table ← AuxPtr Configuration

Selects the channel to be used as secondary advertising channel (auxiliary packet). Every channel is represented with a bit positioned as per the data channel index. The settings are identical with data channel table described in [Chapter 4.6.3, "Channel Table Settings"](#), on page 61.

Clock Accuracy ← AuxPtr Configuration

Specifies the clock accuracy of the advertiser used between the packet containing this data and the auxiliary packet.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CACCuracy
on page 185
```

Offset Units ← AuxPtr Configuration

Indicates the units used by the [Aux Offset](#) parameter.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:AOUNits
on page 184
```

Aux Offset ← AuxPtr Configuration

Specifies the time from the start of the packet containing the AuxPtr field to the approximate start of the auxiliary packet.

The parameter unit of time is specified by the [Offset Units](#). The offset is determined by multiplying the value by the unit. Set the value at least to the length of the packet plus 300 µs.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:AOFFset
on page 184
```

AUX PHY ← AuxPtr Configuration

Specifies the physical layer used to transmit the auxiliary packet.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:APHY
```

on page 184

SyncInfo Configuration

The presence of the SyncInfo field indicates the presence of a periodic advertisement (using AUX_SYNC_IND PDUs). The contents of the SyncInfo field describe this periodic advertisement. The structure of data is displayed also graphically.

The parameters are configurable via AUX_ADV_IND. They are signaled within an extended header, refer to "Extended Header" on page 76.

Bluetooth A: SyncInfo Configuration		Secondary Advertising Channel Map Table							
Sync Packet Offset	245.70 ms	Offset Units	30 us						
Offset Adjust	<input type="checkbox"/>	Periodic Adv Interval	20.00 ms						
Sleep Clock Accuracy	251 ppm - 500 ppm	Access Address(hex)	ACDE 48AC						
CRC Initial Value(hex)	00 0000	Event Counter	0 Events						
SyncInfo									
Sync Packet Offset	Offset Units	Offset Adjust	RFU	Interval	ChM	SCA	AA	CRCInit	Event Counter
13 bits	1 bit	1 bit	1 bit	16 bits	37 bits	3 bits	32 bits	24 bits	16 bits

Sync Packet Offset ← SyncInfo Configuration

Specifies the time from the start of the AUX_ADV_IND packet containing the SyncInfo field to the start of the AUX_SYNC_IND packet.

The sync packet offset consists of multiples of the set [Offset Units](#).

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SPOffset
```

on page 201

Offset Units ← SyncInfo Configuration

Sets the offset units of the [Sync Packet Offset](#) parameter.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECOnfiguration:PCOnfiguration:SOUNits
```

on page 201

Offset Adjust ← SyncInfo Configuration

Adjusts the "Sync Packet Offset" automatically to the next value, which is a multiple of the "Offset Units".

If "Offset Adjust = On", the "Sync Packet Offset" is set to 2.4567 s and "Offset Units = 300 μs".

If "Offset Units > 30 μs", the offset adjust is deactivated.

Remote command:

[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:OADJust
on page 198

Periodic Adv Interval ← SyncInfo Configuration

Refer to "[Periodic Advertising Interval](#)" on page 57.

Secondary Advertising Channel Map Table ← SyncInfo Configuration

Selects the channel to be used as secondary advertising channel (auxiliary packet). Every channel is represented with a bit positioned as per the data channel index. The settings are identical with data channel table described in [Chapter 4.6.3, "Channel Table Settings"](#), on page 61.

Sleep Clock Accuracy ← SyncInfo Configuration

Refer to "[Sleep Clock Accuracy](#)" on page 75.

Access Address ← SyncInfo Configuration

Refer to "[Access Address](#)" on page 64.

CRC Initial Value ← SyncInfo Configuration

Refer to "[CRC Initial](#)" on page 66.

Event Counter ← SyncInfo Configuration

Counts the AUX_SYNC_IND packets that the SyncInfo field describes.

Remote command:

[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ECOUNTER
on page 188

FeatureSet Configuration

Specifies the supported feature set. Information is transmitted via LL_FEATURE_REQ, LL_FEATURE_RSP, and LL_SLAVE_FEATURE_REQ.

The following features are configurable:

- **0:** LE encryption
- **1:** Connection parameter request procedure
- **2:** Extended reject indication
- **3:** Slave-initiated feature exchange
- **4:** LE ping
- **5:** LE data packet length extension
- **5:** LL privacy
- **7:** Extended scanner filter policies
- **8:** LE 2M PHY
- **9:** Stable modulation index - transmitter
- **10:** Stable modulation index - receiver
- **11:** LE coded PHY
- **12:** LE extended advertising
- **13:** LE periodic advertising
- **14:** Channel selection algorithm #2
- **15:** LE power class 1
- **16:** Minimum Number of Used Channels procedure

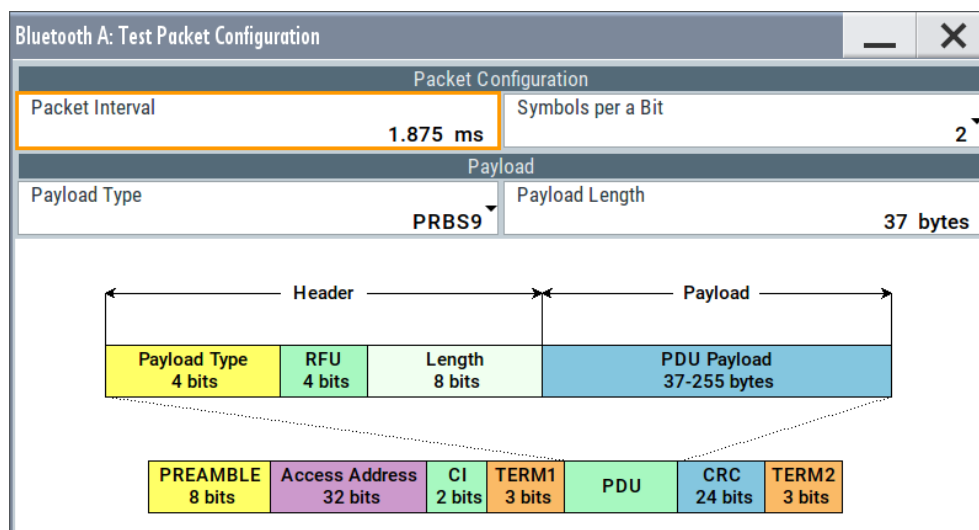
Remote command:

```
[ :SOURce<hw>] :BB:BT0oth:ECONfiguration:PCONfiguration:
FSBit<ch0>:STATe on page 191
```

4.8 Test Packet Configuration - LE

Access:

1. Select "Bluetooth > General > Bluetooth Mode > Bluetooth Low Energy"
2. Select "Channel > Packet Type > TEST PACKET"
3. Select "Test Packet Configuration"



The dialog contains the parameters for configuring the test packet type. The graphic shows its structure and fields.



When you configure a "Dirty Transmitter Test", you also have direct access to the test packet dialog.

Settings:

Packet Configuration.....	89
L Packet Interval.....	89
L Symbols per a Bit.....	89
Header.....	89
L CTEInfo Present.....	89
L CTEInfo Configuration.....	89
L CTETime.....	90

L CTEType.....	90
Payload Type.....	90
Payload Length.....	90

Packet Configuration

In this section, configure general packet settings.

Packet Interval ← Packet Configuration

Sets the time interval between two consecutive test packets, regarding the starting points.

Test packet interval

Note: This parameter is relevant for test packet types only.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:DTTest:TPConfiguration:TPInterval
```

on page 207

Symbols per a Bit ← Packet Configuration

Specifies a coding for LE coded packets. The specification for Bluetooth wireless technology defines two values S for forward error correction: S = 2 symbols/bit and S = 8 symbols/bit.

Option R&S SMW-K117 is required.

Remote command:

```
[ :SOURCE<hw> ] :BB:BT0oth:ECONfiguration:PCONfiguration:SPBit
```

on page 207

Header

In this section, configure header settings of the test packet.

CTEInfo Present ← Header

Activates the CTEInfo field in the header of Bluetooth LE data packets in the LE uncodded PHY.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

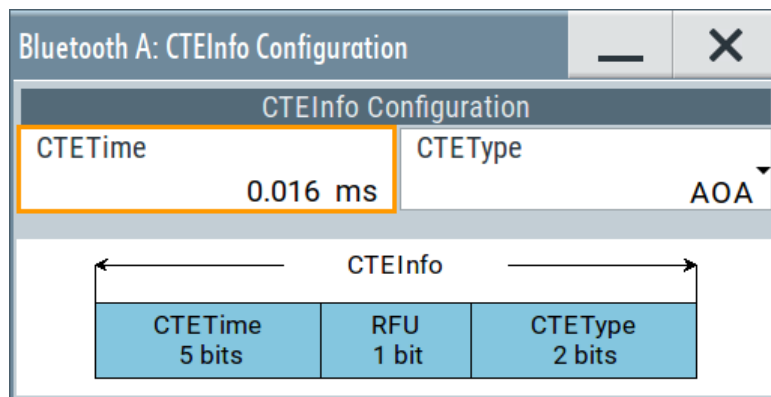
```
[ :SOURCE<hw> ] :BB:BT0oth:ECONfiguration:PCONfiguration:CPresent
```

on page 176

CTEInfo Configuration ← Header

Requires "CTEInfo Present = On".

Accesses the CTEInfo configuration dialog, in which you define CTE length and the CTE method used for direction finding.



Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

CTETime ← CTEInfo Configuration ← Header

Sets the CTETime comprising the length of constant tone extension field of the Bluetooth LE PDU.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CTIME`
on page 176

CTEType ← CTEInfo Configuration ← Header

Sets the type of constant tone extension. The type specifies the CTE AoA/AoD method and for AoD the length of the switching and I/Q sampling slots.

Note: This parameter is relevant for data event configuration and all data channel packet types except TEST PACKET.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:CTYPE`
on page 177

Payload Type

Selects the data source used for the payload test packets.

Note: This parameter is relevant for test packet types only.

"PRBS 9, 15" Pseudo-random bit sequences of the length 9 or 15 - transmission of identical packet series.

"Predefined pattern"

11110000, 10101010, 11111111, 00000000, 00001111, or 01010101

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TPConfiguration:UPSource`
on page 208

Payload Length

Sets the payload length.

Note: This parameter is relevant for test packet types only.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:DTTest:TPConfiguration:UPLength`
on page 207

5 Signal Control and Signal Characteristics

This section lists settings provided for configuring the baseband filter and configuring power ramping of bluetooth bursts. Also settings are listed for defining the signal generation start and for generating signals necessary for synchronization with other instruments.

It covers the following topics:

• Filter/Clipping Settings	92
• Power Ramping Settings	97
• Trigger Settings	99
• Marker Settings	104
• Clock Settings	106
• Local and Global Connector Settings	107

5.1 Filter/Clipping Settings

Access:

- ▶ Select "Baseband > Bluetooth > General > Filter/Clipping".

The dialog comprises the settings, necessary to configure the baseband filter, the modulation settings and to enable clipping.

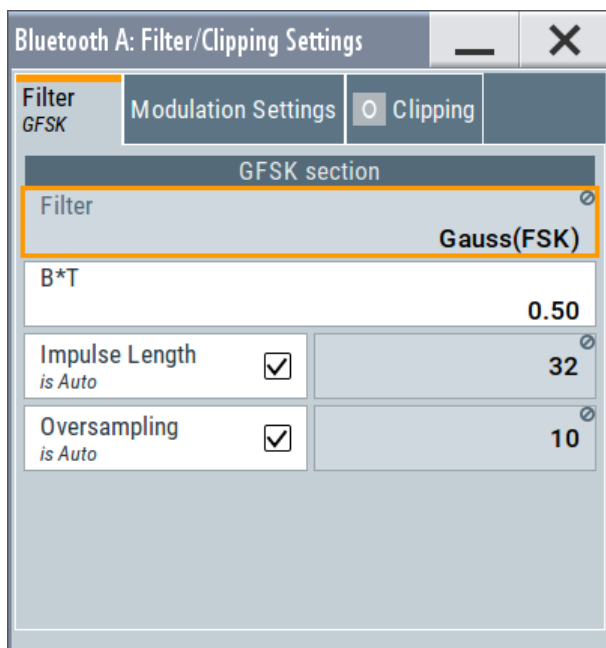
Settings:

• Filter Settings	92
• Modulation Settings	94
• Clipping Settings	96

5.1.1 Filter Settings

Access:

- ▶ Select "Baseband > Bluetooth > General > Filter/Clipping > Filter".



The dialog contains the parameters required for configuring the baseband filter.

Settings:

Filter.....	93
Roll Off Factor / B xT.....	93
Cut Off Frequency Factor.....	94
Impulse Length.....	94
Oversampling	94
Filter ($\pi/4$ DQPSK section).....	94

Filter

Indicates the filter used for GFSK part.

Remote command:

n.a.

Roll Off Factor / B xT

Sets the filter parameter.

The filter parameter ("Roll off Factor" or "BxT") depends on the currently selected filter type. This parameter is preset to the default for each of the predefined filters.

Remote command:

- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:APCO25 on page 138
- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:COSine on page 138
- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:FGAuss on page 138
- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:GAUSSs on page 138
- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:PGAuss on page 139
- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:RCOSine on page 139
- [:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:SPHase on page 140

Cut Off Frequency Factor

(available for filter parameter Lowpass only)

Sets the value for the cutoff frequency factor. The cutoff frequency of the filter can be adjusted to reach spectrum mask requirements.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:FILTer:PARAmeter:LPASs` on page 139

Impulse Length

Displays the number of filter tabs.

If enabled, the most sensible parameter values are selected. The value depends on the coherence check.

Disable it to set the values manually.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:FILTer:ILENgtH:AUTO [:STATe]` on page 136

`[:SOURce<hw>] :BB:BT0oth:FILTer:ILENgtH` on page 136

Oversampling

Sets the upsampling factor.

If enabled, the most sensible parameter values are selected. The value depends on the coherence check.

Disable it to change the value manually.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:FILTer:OSAMpling:AUTO [:STATe]` on page 137

`[:SOURce<hw>] :BB:BT0oth:FILTer:OSAMpling` on page 136

Filter ($\pi/4$ DQPSK section)

Selects the filter used for DQPSK/8DPSK sections with EDR packets.

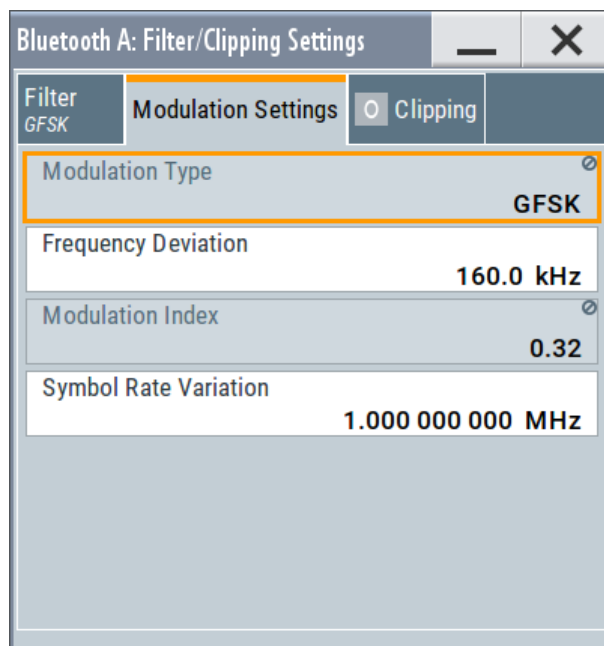
Remote command:

`[:SOURce<hw>] :BB:BT0oth:FILTer:TYPE` on page 135

5.1.2 Modulation Settings

Access:

- ▶ Select "Baseband > Bluetooth > General > Filter/Clipping > Modulation Settings".



The dialog comprises the settings, necessary to configure the modulation settings.

Settings:

Modulation Type.....	95
Frequency Deviation.....	95
Modulation Index.....	95
Symbol Rate Variation.....	96

Modulation Type

Displays the modulation type used for the current packet selection.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:FILTer:MTYPE` on page 137

Frequency Deviation

Enter the frequency deviation of the frequency modulated part.

The frequency deviation can be varied in a range from 100.0 kHz to 200.0 kHz according to Bluetooth specification.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:MSETtings:FDEVIation` on page 137

Modulation Index

Displays the modulation index resulting from the entered frequency deviation value.

Modulation index is calculated from the given frequency deviation and symbol rate values.

The modulation index **h** is defined as:

$$h_2 = \frac{2\Delta f}{f_{\text{symbol}}}$$

Where f_{symbol} is the "symbol rate" and Δf is the "frequency deviation".

According to the Bluetooth specification, the modulation index is allowed to vary between 0.28 and 0.35.

Remote command:

[:SOURce<hw>] :BB:BT0oth:FILTer:MINdex on page 137

Symbol Rate Variation

Enter the symbol rate.

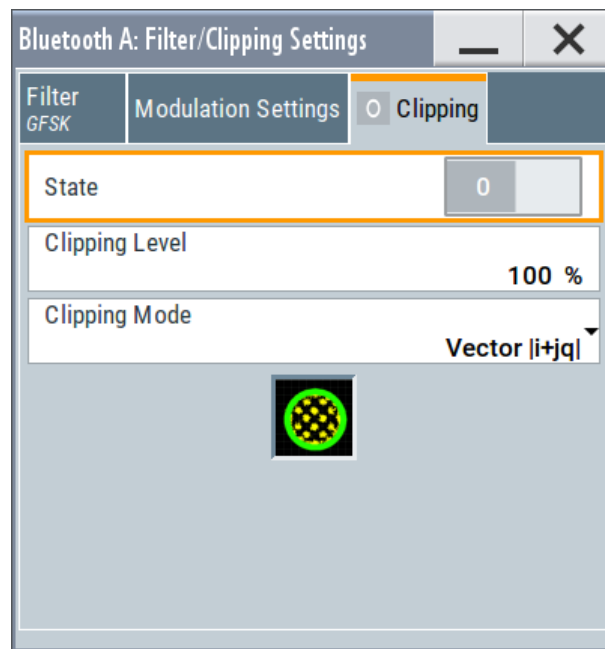
Remote command:

[:SOURce<hw>] :BB:BT0oth:SRATe:VARiation on page 140

5.1.3 Clipping Settings

Access:

- ▶ Select "Baseband > Bluetooth > General > Filter/Clipping > Clipping".



The dialog contains the settings necessary to configure the clipping.

Settings:

Clipping State.....	97
Clipping Level.....	97
Clipping Mode.....	97

Clipping State

Switches baseband clipping on and off.

Baseband clipping is a simple and effective way of reducing the crest factor of the signal. Since clipping is done before filtering, the procedure does not influence the spectrum. The EVM however increases.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:CLIPping:STATe](#) on page 135

Clipping Level

Sets the limit for clipping.

This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Remote command:

[\[:SOURCE<hw>\]:BB:BT0oth:CLIPping:LEVel](#) on page 134

Clipping Mode

Selects the clipping method. The dialog displays a graphical illustration on how this two methods work.

- "Vector $|i + jq|$ "
The limit is related to the amplitude $|i + q|$. The I and Q components are mapped together, the angle is retained.
- "Scalar $|i|, |q|$ "
The limit is related to the absolute maximum of all the I and Q values $|i| + |q|$. The I and Q components are mapped separately, the angle changes.

Remote command:

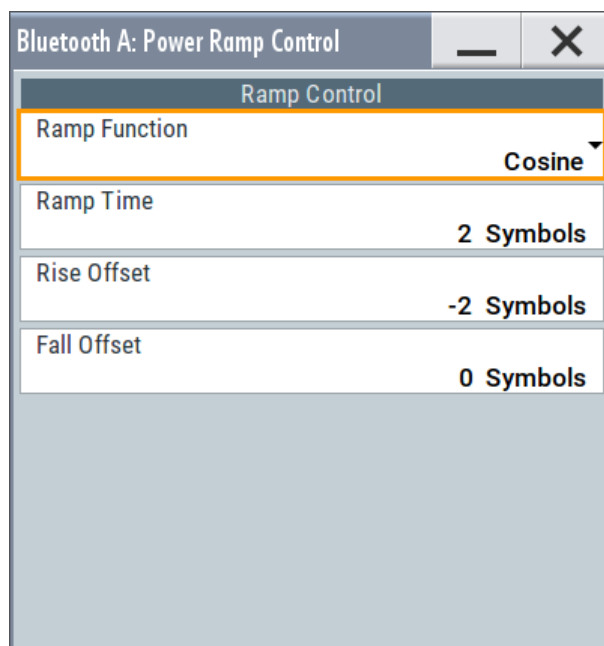
[\[:SOURCE<hw>\]:BB:BT0oth:CLIPping:MODE](#) on page 135

5.2 Power Ramping Settings

Access:

- ▶ Select "Bluetooth > General > Power Ramping".

The dialog comprises the settings, necessary to configure power ramping.

**Settings:**

Ramp Function.....	98
Ramp Time.....	98
Rise Offset.....	99
Fall Offset.....	99

Ramp Function

Selects the form of the transmitted power, i.e. the shape of the rising and falling edges during power ramp control.

- "Linear" The transmitted power rises and falls with linear fashion.
- "Cosine" The transmitted power rises and falls with a cosine-shaped edge. This setting causes a more favorable spectrum than the "Linear" setting.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:PRAMping:RFUNction` on page 149

Ramp Time

Sets the ramp time, which extends the burst by a corresponding number of 0 padding symbols at the beginning and the end of a burst. During this period of time, power ramping is based on the specified ramp function.

Do not switch the transmitted power abruptly at the end or the start of a burst, since the switching operation generates excessively strong non-harmonics. The switching operation is therefore stretched over several symbol clocks.

Remote command:

`[:SOURCE<hw>] :BB:BT0oth:PRAMping:RTIME` on page 149

Rise Offset

Sets the offset of the rising edge of a burst. The offset is specified by the selected number of symbols.

Negative values shift the rising edge to earlier positions, which results in a corresponding number of added 0 padding symbols before the burst.

Positive values shift the rising edge to later positions, which results in a corresponding number of skipped symbols at the beginning of the burst.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:PRAMping:ROFFset` on page 149

Fall Offset

Sets the offset of the falling edge of a burst. The offset is specified by the selected number of symbols.

Negative values shift the falling edge to earlier positions, which results in a corresponding number of skipped symbols at the end of the burst.

Positive values shift the falling edge to later positions, which results in a corresponding number of added 0 padding symbols following the burst.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:PRAMping:FOFFset` on page 148

5.3 Trigger Settings

Access:

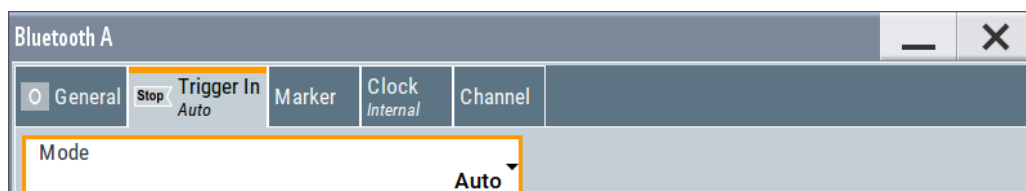
- ▶ Select "Baseband > Bluetooth > Trigger In".

The dialog provides access to the trigger settings, like trigger source, mode, delay, or suppression, as well as to arm or trigger manually. The current signal generation status is displayed in the header of the tab together with information on the enabled trigger mode. As in the "Marker" and "Clock" tabs, this tab provides also access to the settings of the related connectors.



This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.





Routing and enabling a trigger

The provided trigger signals are not dedicated to a particular connector. Trigger signals can be mapped to one or more USER x or T/M connectors.

Use the [Local and Global Connector Settings](#) to configure the signal mapping, the polarity, the trigger threshold and the input impedance of the input connectors.

To route and enable a trigger signal, perform the following *general steps*:

- Define the signal source and the effect of a trigger event.
Select the "Trigger In > Mode" and "Trigger In > Source".
- Define the connector where the selected signal is provided.
Use the "Global Connectors" settings.

Settings:

Trigger Settings Common to All Basebands	100
Trigger Mode	100
Signal Duration Unit	101
Trigger Signal Duration	101
Running/Stopped	101
Arm	101
Execute Trigger	101
Trigger Source	102
Sync. Output to Ext. Trigger/Sync. Output to Trigger	102
External Trigger Inhibit	103
Trigger Delay	103

Trigger Settings Common to All Basebands

To enable simultaneous signal generation in all basebands, the R&S SMW couples the trigger settings in the available basebands in any instrument's configuration involving signal routing with signal addition. For example, in MIMO configuration, routing and summing of basebands or of streams.

The icon  indicates that common trigger settings are applied.

You can access and configure the common trigger source and trigger mode settings in any of the basebands. An arm or a restart trigger event applies to all basebands, too. You can still apply different delay to each of the triggers individually.

Trigger Mode

Selects trigger mode, i.e. determines the effect of a trigger event on the signal generation.

For more information, refer to chapter "Basics" in the R&S SMW user manual.

- "Auto"
The signal is generated continuously.
- "Retrigger"
The signal is generated continuously. A trigger event (internal or external) causes a restart.
- "Armed Auto"
The signal is generated only when a trigger event occurs. Then the signal is generated continuously.

An "Arm" stops the signal generation. A subsequent trigger event (internal or external) causes a restart.

- "Armed Retrigger"
The signal is generated only when a trigger event occurs. Then the signal is generated continuously. Every subsequent trigger event causes a restart.
An "Arm" stops signal generation. A subsequent trigger event (internal or external) causes a restart.
- "Single"
The signal is generated only when a trigger event occurs. Then the signal is generated once to the length specified at "Signal Duration".
Every subsequent trigger event (internal or external) causes a restart.

Remote command:

`[:SOURce<hw>] :BB:BT0oth [:TRIGger] :SEQuence` on page 144

Signal Duration Unit

Defines the unit for describing the length of the signal sequence to be output in the "Single" trigger mode.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger:SLUNit` on page 142

Trigger Signal Duration

Enters the length of the signal sequence to be output in the "Single" trigger mode.

Use this parameter to output part of the signal deliberately, an exact sequence of the signal, or a defined number of repetitions of the signal.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger:SLENgth` on page 142

Running/Stopped

With enabled modulation, displays the status of signal generation for all trigger modes.

- "Running"
The signal is generated; a trigger was (internally or externally) initiated in triggered mode.
- "Stopped"
The signal is not generated and the instrument waits for a trigger event.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger:RMODe` on page 142

Arm

Stops the signal generation until subsequent trigger event occurs.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger:ARM:EXECute` on page 141

Execute Trigger

For internal trigger source, executes trigger manually.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger:EXECute` on page 141

Trigger Source

The following sources of the trigger signal are available:

- "Internal"
The trigger event is executed manually by the "Execute Trigger".
- "Internal (Baseband A/B)"
The trigger event is provided by the trigger signal from the other basebands. If common trigger settings are applied, this trigger source is disabled.
- "External Global Trigger"
The trigger event is the active edge of an external trigger signal provided and configured at the USER x connectors.
- "External Local Trigger"
The trigger event is the active edge of an external trigger signal provided and configured at the local T/M/C connector.
With coupled trigger settings, the signal has to be provided at the T/M/C1/2/3 connectors.
- "External Local Clock"
The trigger event is the active edge of an external local clock signal provided and configured at the local T/M/C connector.
With coupled trigger settings, the signal has to be provided at the T/M/C1 connector.
- "Baseband Sync In"
Option: R&S SMW-B9
In master-slave mode, slave instruments are triggered by the active edge of the synchronization signal.

"External Local Clock/Trigger" require R&S SMW-B10.

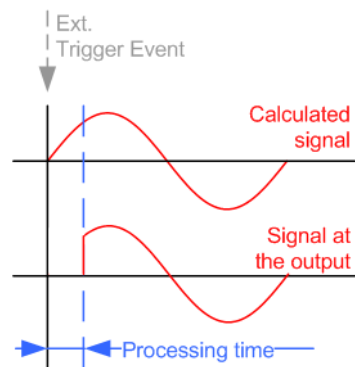
Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:SOURce](#) on page 143

Sync. Output to Ext. Trigger/Sync. Output to Trigger

Enables signal output synchronous to the trigger event.

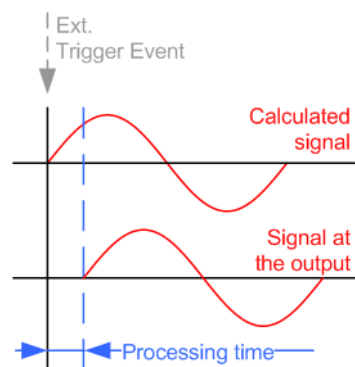
- "On"
Corresponds to the default state of this parameter.
The signal calculation starts simultaneously with the trigger event. Because of the processing time of the instrument, the first samples are cut off and no signal is output. After elapsing of the internal processing time, the output signal is synchronous to the trigger event.



- "Off"

The signal output begins after elapsing of the processing time. Signal output starts with sample 0. The complete signal is output.

This mode is recommended for triggering of short signal sequences. Short sequences are sequences with signal duration comparable with the processing time of the instrument.



In master-slave mode, this setting ensures that once achieved, synchronization is not lost if the baseband signal sampling rate changes.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger [:EXTernal] :SYNChronize:OUTPut`
on page 141

External Trigger Inhibit

Applies for external trigger signal or trigger signal from the other path.

Sets the duration with that any following trigger event is suppressed. In "Retrigger" mode, for example, a new trigger event does not cause a restart of the signal generation until the specified inhibit duration does not expire.

For more information, see chapter "Basics" in the R&S SMW user manual.

Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger [:EXTernal] :INHibit` on page 143
`[:SOURce<hw>] :BB:BT0oth:TRIGger:OBASeband:INHibit` on page 141

Trigger Delay

Delays the trigger event of the signal from:

- The external trigger source
- The other path
- The other basebands (internal trigger), if common trigger settings are used.

Use this setting to:

- Synchronize the instrument with the device under test (DUT) or other external devices
- Postpone the signal generation start in the basebands compared to each other
- Compensate delays and align the signal generation start in multi-instrument setup

For more information, see chapter "Basics on ..." in the R&S SMW user manual.

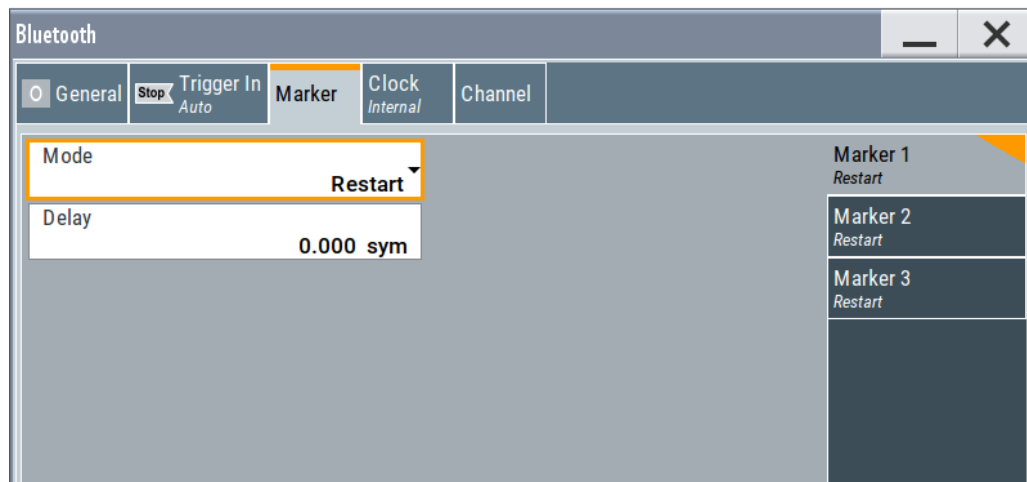
Remote command:

`[:SOURce<hw>] :BB:BT0oth:TRIGger [:EXTernal] :DELay` on page 143
`[:SOURce<hw>] :BB:BT0oth:TRIGger:OBASeband:DELay` on page 141

5.4 Marker Settings

Access:

- ▶ Select "Baseband > Bluetooth > Marker".



This tab provides access to the settings necessary to select and configure the marker output signal, like the marker mode or marker delay settings.



This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



Routing and enabling a marker

The provided marker signals are not dedicated to a particular connector. They can be mapped to one or more USER x or T/M connectors.

To route and enable a marker signal, perform the following *general steps*:

- Define the shape of the generated marker, i.e. select the "Marker > Mode".
- Define the connector where the selected signal is provided.
Use the [Local and Global Connector Settings](#).

Settings:

Marker Mode	104
Marker x Delay	105

Marker Mode

Marker configuration for up to 3 markers. The settings are used to select the marker mode defining the shape and periodicity of the markers. The contents of the dialog change with the selected marker mode; the settings are self-explanatory.

"Restart" A marker signal is generated at the start of each signal sequence.

"Event/Frame Start" A marker signal is generated at the start of each event/frame. The term event corresponds to a Bluetooth LE event, the term frame corresponds to a Bluetooth BR/EDR frame.

"Event/Frame Active Part/Event/Frame Inactive Part"

The marker masks the active/inactive part of the event/frame.

At the start of each burst, the marker signal changes to high/low. It changes back to low/high after the end of each burst.

Shift the marker signal at the start/end of each burst with the parameters "Rising/Falling Edge Shift".

Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:FESHift](#) on page 145

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:RESHift](#) on page 147

"Pulse" A regular marker signal is generated. The pulse frequency is defined by entering a divider. The frequency is derived by dividing the sample rate by the divider. The input box for the divider opens when "Pulse" is selected, and the resulting pulse frequency is displayed below it.

Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:PULSe:DIVider](#)

on page 146

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:PULSe:FREQuency?](#)

on page 147

"Pattern " A marker signal that is defined by a bit pattern is generated. The pattern has a maximum length of 32 bits and is defined in an input field which opens when pattern is selected.

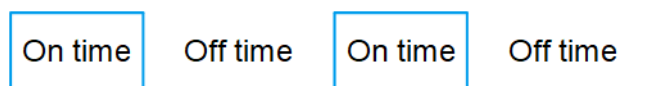
Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:PATtern](#) on page 146

"On/Off Ratio"

A regular marker signal that is defined by an On/Off ratio is generated. A period lasts one On and Off cycle.

If "Marker Mode > On/Off Ratio", specify the "On Time" and "Off Time", which are expressed as number of samples.



Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:ONTime](#) on page 146

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:OFFTime](#) on page 146

Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:MODE](#) on page 145

Marker x Delay

Delays the marker signal at the marker output relative to the signal generation start.

Variation of the parameter "Marker x Delay" causes signal recalculation.

Remote command:

[\[:SOURce<hw>\]:BB:BT0oth:TRIGger:OUTPut<ch>:DELay](#) on page 144

5.5 Clock Settings

Access:

- ▶ Select "Baseband > Bluetooth > Clock".

This tab provides access to the settings necessary to select and configure the clock signal, like the clock source and clock mode.



This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



Defining the clock

The provided clock signals are not dedicated to a particular connector. They can be mapped to one or more USER x and T/M/C connectors.

Use the [Local and Global Connector Settings](#) to configure the signal mapping, the polarity, the trigger threshold, and the input impedance of the input connectors.

To route and enable a trigger signal, perform the following *general steps*:

- Define the signal source, that is select the "Clock > Source".
- Define the connector where the selected signal is provided.
Use the [Local and Global Connector Settings](#).

Settings:

Clock Source	106
Clock Mode	107
Measured External Clock	107

Clock Source

Selects the clock source.

- "Internal"
The instrument uses its internal clock reference.
- "External Local Clock"
Option: R&S SMW-B10
The instrument expects an external clock reference at the local T/M/C connector.
"External Local Clock" requires R&S SMW-B10.

Remote command:

[:SOURce<hw>] :BB:BT0oth:CLOCK:SOURce on page 148

Clock Mode

Option: R&S SMW-B10

Sets the type of externally supplied clock.

Remote command:

[:SOURce<hw>] :BB:BT0oth:CLOCK:MODE on page 147

Measured External Clock

Provided for permanent monitoring of the enabled and externally supplied clock signal.

Remote command:

CLOCK:INPut:FREQuency?

5.6 Local and Global Connector Settings

Each of the "Trigger In", "Marker" and "Clock" dialogs and the "Trigger Marker Clock" dialog provides a quick access to the related connector settings.



See also chapter "Local and Global Connector Settings" in the user manual.

6 Remote-Control Commands

The following commands are required to perform signal generation with the Bluetooth options in a remote environment. We assume that the R&S SMW has already been set up for remote operation in a network as described in the R&S SMW documentation. A knowledge about the remote control operation and the SCPI command syntax are assumed.



Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote Control Commands" in the R&S SMW user manual.

The commands in the `SOURCE1:BB:BT00th` subsystem are described in three sections, separated into general remote commands, commands for packet configuration settings and commands for dirty transmitter test settings.

This subsystem contains commands for the primary and general settings of the Bluetooth standard. The settings comprise activation and deactivation of the standard, filter, clock, trigger and clipping settings. Also, settings for defining the symbol rate variation and the sequence length, as well as the preset and power adjust setting are provided.

Common suffixes

The following common suffixes are used in remote commands:

Suffix	Value range	Description
ENTity<ch>	1 to 4	entity in a multiple entity configuration with separate baseband sources <code>ENTity3 4</code> require option R&S SMW-K76
SOURCE<hw>	[1] to 4	available baseband signals only <code>SOURCE1</code> possible, if the keyword <code>ENTity</code> is used
OUTPut<ch>	1 to 3	available markers



Using SCPI command aliases for advanced mode with multiple entities

You can address multiple entities configurations by using the SCPI commands starting with the keyword `SOURCE` or the alias commands starting with the keyword `ENTity`.

Note that the meaning of the keyword `SOURCE<hw>` changes in the second case.

For details, see section "SCPI Command Aliases for Advanced Mode with Multiple Entities" in the R&S SMW user manual.

The following commands specific to the Bluetooth are described here:

Contents

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• Channel Configuration Commands - BR/EDR.....	150
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6.1 Programming Examples

The following sections provide programming examples for the Bluetooth options.

6.1.1 Performing General Tasks

The Bluetooth options are programmed as follows:

- The application is controlled by SCPI commands with the following syntax: `...:BB:BT0oth:....`
- After a `*RST`, the Bluetooth signal is switched off.
To activate the Bluetooth signal, use `SOURcel:BB:BT0oth:STATe ON`.
Query the cell state using `SOURcel:BB:BT0oth:STATe?`. The result `1` indicates that the Bluetooth signal is available.
- The default time unit of timing and delay commands is millisecond. You can set time unit to millisecond (MS) or to second (S) via `SOURcel:BB:BT0oth:UNIT:TIME`

6.1.1.1 Initialization

```
// *****
// Initial system-reset
// *****
*RST; *OPC?
*CLS; *OPC?
```

6.1.1.2 Save and Recall Settings

```
// *****
// Save and Recall settings
// *****
MMEM:CDIR "/var/user/"
SOURcel:BB:BT0oth:PRESet
SOURcel:BB:BT0oth:SETTing:STORe "/var/user/Bluetooth_EDR"
SOURcel:BB:BT0oth:SETTing:CATalog?
// Bluetooth_EDR,Bluetooth_SCO,BTO_test
SOURcel:BB:BT0oth:SETTing:DELeTe "BTO_test"
SOURcel:BB:BT0oth:SETTing:LOAD "BTO_dl"
SOURcel:BB:BT0oth:SETTing:CATalog?
// Bluetooth_EDR,Bluetooth_SCO
```

6.1.2 General Commands for BR/EDR

```
// *****
// Set time unit to ms.
// *****
SOURcel:BB:BT0oth:UNIT:TIME MS
// *****
// Set frequency and level,
// Set BR/EDR PHY and transport modes,
// Query the version of the digital standard,
// generate and store a waveform file in the current directory.
// *****
SOURcel:FREQuency:CW 240200000
SOURcel:POWer:POWer -50
SOURcel:BB:BT0oth:BMODE BAS
SOURcel:BB:BT0oth:TMODE ACL
// SOURcel:BB:BT0oth:TMODE SCO
// SOURcel:BB:BT0oth:TMODE ESCO
SOURcel:BB:BT0oth:VERSion?
// Response: Supported Bluetooth version in the current instrument software.
SOURcel:BB:BT0oth:STATe ON
SOURcel:BB:BT0oth:WAVEform:CREate "Bluetooth_EDR"
```

6.1.3 General Commands for LE

```
// *****
// Set frequency and level,
// Set LE PHY and query the version of the digital standard,
// generate and store a waveform file in the current directory.
// *****
SOURcel:FREQuency:CW 240200000
SOURcel:POWer:POWer -10
SOURcel:BB:BT0oth:BMODE BLEN
```

```

SOURcel:BB:BT0oth:VERSion?
// Response: Supported Bluetooth version in the current instrument software.
SOURcel:BB:BT0oth:STATe ON
SOURcel:BB:BT0oth:WAVeform:CREate "Bluetooth_LE"

```

Example: Dirty transmitter

```

// *****
// Set modulation index mode to stable.
// *****
SOURcel:BB:BT0oth:DTTest:MIMode STAB

// *****
// Reset dirty transmitter. Set frequency drift rate, start phase,
// frequency drift deviation and number of packets
// per dirty transmitter set (LE only). Enable dirty transmitter
// *****
SOURcel:BB:BT0oth:DTTest:STDefault
SOURcel:BB:BT0oth:DTTest:FDRate 1.25
SOURcel:BB:BT0oth:DTTest:SPHase 0
SOURcel:BB:BT0oth:DTTest:FDDeviation 50
SOURcel:BB:BT0oth:DTTest:NPPSet NP50

// *****
// Enable all long sets for LE or BR dirty transmitter.
// *****
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET1:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET2:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET3:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET4:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET5:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET6:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET7:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET8:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET9:STATe 1
SOURcel:BB:BT0oth:DTTest:TABLE:LONG:SET10:STATe 1

// *****
// Enable dirty transmitter
// *****
SOURcel:BB:BT0oth:DTTest:DTTState 1

```

6.1.4 Trigger Commands

This section is not relevant for R&S WinIQSIM2.

Example: Trigger configuration

```
// *****
// Configure trigger in armed retrigger mode, set source, enable
// synchronization to external trigger, set external
// inhibit and delay.
// *****
SOURCEl:BB:BT0oth:TRIGger:SEQuence ARET
SOURCEl:BB:BT0oth:TRIGger:SOURce EGT1
SOURCEl:BB:BT0oth:TRIGger:EXTernal:SYNChronize:OUTPut 1
SOURCEl:BB:BT0oth:TRIGger:EXTernal:INHibit 100
SOURCEl:BB:BT0oth:TRIGger:EXTernal:DELay 10

// *****
// Alternatively configure trigger in single mode.
// Set source to internal, specify signal duration
// unit and duration.
// *****
SOURCEl:BB:BT0oth:TRIGger:SEQuence SING
SOURCEl:BB:BT0oth:TRIGger:SOURce INT
SOURCEl:BB:BT0oth:TRIGger:SLUNit SEQ

SOURCEl:BB:BT0oth:TRIGger:SLUNit FRAME
SOURCEl:BB:BT0oth:TRIGger:SLENgth 2

// *****
// Alternatively configure trigger in armed retrigger mode.
// Set source to internal. Enable Bluetooth signal, start
// the trigger - signal generation starts.
// Stop signal generation and wait for a trigger
// event to restart signal generation.
// Query the current trigger signal generation status.
// *****
SOURCEl:BB:BT0oth:TRIGger:SEQuence ARETrigger
SOURCEl:BB:BT0oth:TRIGger:SOURce INT
SOURCEl:BB:BT0oth:STATe 1
SOURCEl:BB:BT0oth:TRIGger:EXEcute

SOURCEl:BB:BT0oth:TRIGger:ARM:EXEcute
// trigger event restarts signal generation
SOURCEl:BB:BT0oth:TRIGger:RMODE?
// 1 (running)
SOURCEl:BB:BT0oth:TRIG:SOUR OBAS
// sets triggering by the other path
SOURCEl:BB:BT0oth:TRIG:INH 200
// sets a restart inhibit for 200 chips following a trigger event
SOURCEl:BB:BT0oth:TRIG:OBAS:DEL 50
// sets a delay of 50 symbols for the trigger
```


6.1.5 Marker Commands

Example: Marker configuration

```
// *****
// Configure marker mode: set a marker at ARB sequence start.
// *****
SOURCE1:BB:BT00th:TRIGger:OUTPut1:MODE REStart
// SOURCE1:BB:BT00th:TRIGger:OUTPut1:MODE StArt
// SOURCE1:BB:BT00th:TRIGger:OUTPut1:MODE ACTive
// *****
// Alternatively configure pulse marker. Set pulse
// divider and frequency
// *****
SOURCE1:BB:BT00th:TRIGger:OUTPut1:MODE PULSe
SOURCE1:BB:BT00th:TRIGger:OUTPut1:PULSe:DIVider 2
SOURCE1:BB:BT00th:TRIGger:OUTPut1:PULSe:FREQuency?
// 500000

// *****
// Alternatively configure bit pattern marker. Specify pattern.
// *****
SOURCE1:BB:BT00th:TRIGger:OUTPut1:MODE PATtern
SOURCE1:BB:BT00th:TRIGger:OUTPut1:PATtern #H2,2
// *****
// Alternatively configure on/off ratio marker. Set on/off time.
// *****
SOURCE1:BB:BT00th:TRIGger:OUTPut1:MODE RAT
SOURCE1:BB:BT00th:TRIGger:OUTPut1:ONTime 40000
SOURCE1:BB:BT00th:TRIGger:OUTPut1:OFFTime 20000
```

Example: Marker delay

```
// *****
// Enable fixed marker delay. Query the limit for minimum and maximum
// marker delay. Set delay for the marker signal output.
// *****
SOURCE1:BB:BT00th:TRIGger:OUTPut1:DELay 1600
```

6.1.6 Clock Settings

This section is not relevant for R&S WinIQSIM2.

Example: Clock configuration

```
// *****
// Select internal clock.
// *****
SOURCE1:BB:BT00th:CLOCK:SOURCE INTernal
// *****
// Alternatively select external clock. Set its mode.
// *****
SOURCE1:BB:BT00th:CLOCK:SOURCE ELCL
SOURCE1:BB:BT00th:CLOCK:MODE SAMP
```

6.1.7 Channel Settings for LE

```
// *****
// Set time unit to ms.
// *****
SOURCE1:BB:BT00th:UNIT:TIME MS
// *****
// Select channel type, test packet, packet format, sequence length,
// controller role. Enable CRC corruption for every second packet.
// *****
SOURCE1:BB:BT00th:CTYPE DATA
SOURCE1:BB:BT00th:UPTYPE TPAC
SOURCE1:BB:BT00th:PFORMAT L2M
SOURCE1:BB:BT00th:USLENGTH 2
SOURCE1:BB:BT00th:BCROLE MAST
SOURCE1:BB:BT00th:CCRC:STATE 1

// *****
// Alternatively set duty cycle for ADV_DIRECT_IND
// *****
SOURCE1:BB:BT00th:CTYPE ADV
SOURCE1:BB:BT00th:UPTYPE ADIN
SOURCE1:BB:BT00th:DCYCLE LOW

// *****
// Set modulation format, pattern, and duration
// for continuous payload transmission.
// *****
SOURCE1:BB:BT00th:UPTYPE CONT
SOURCE1:BB:BT00th:MFORMAT L1M
SOURCE1:BB:BT00th:DTTEST:TPConfiguration:UPSource PN15
SOURCE1:BB:BT00th:DURATION 10

// *****
// Alternatively select modulation format LE coded, set
// its coding.
// *****
SOURCE1:BB:BT00th:MFORMAT LCOD
SOURCE1:BB:BT00th:ECONfiguration:PCONfiguration:SPBit TWO
```

Example: Test packet configuration

```
// *****
// Set pattern, payload length, time interval.
// *****
SOURCE1:BB:BT00th:CTYPE DATA
SOURCE1:BB:BT00th:UPTYPE TPAC
SOURCE1:BB:BT00th:DTTest:TPConfiguration:TPInterval 12.5
SOURCE1:BB:BT00th:DTTest:TPConfiguration:UPSource PAT3
SOURCE1:BB:BT00th:DTTest:TPConfiguration:UPLength 255

/ *****
// Alternatively select packet type LE coded and set
// its coding.
// *****
SOURCE1:BB:BT00th:PFORMAT LCOD
SOURCE1:BB:BT00th:ECONfiguration:PCONfiguration:SPBit TWO
```

6.1.7.1 Configure Advertising Packets

```
// *****
// Configure signal for ADV_SCAN_IND: select channel type,
// packet type, packet format, sequence length, enable
// CRC corruption.
// *****
SOURCE1:BB:BT00th:CTYPE ADV
SOURCE1:BB:BT00th:UPTYPE ADC
SOURCE1:BB:BT00th:PFORMAT LIM
SOURCE1:BB:BT00th:USLENGTH 12
SOURCE1:BB:BT00th:CCRC:STATE 1
```

Example: Event / frame configuration

```

// *****
// For ADV_SCAN_IND, select advertising event interval.
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe ADC
SOURCEl:BB:BT0oth:ECONfiguration:AEINterval 20
// *****
// Alternatively set advertising event interval for ADV_DIRECT_IND
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe ADIN
SOURCEl:BB:BT0oth:ECONfiguration:ADINterval 3.75
// *****
// Set advertising event delay, activate channel 37.
// *****
SOURCEl:BB:BT0oth:ECONfiguration:AEDelay 0
SOURCEl:BB:BT0oth:ECONfiguration:ACTable:CHANnel0:STATe 1
// *****
// For packet type SCAN_REQ, set length of the window,
// time interval.
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe SREQ
SOURCEl:BB:BT0oth:ECONfiguration:SWINdow 10
SOURCEl:BB:BT0oth:ECONfiguration:SINterval 3500

// *****
// For packet type CONNECT_IND set transmit window,
// start point of the transmit window,
// LL connection timeout and time interval.
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe CREQ
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:WSIZe 8.25
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:WOffset 800
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:LCTimeouT 7500
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:CINterval 6400

// *****
// Alternatively select packet type LL_CONNECTION_UPDATE_IND,
// set transmit window, start point of the transmit
// window, LL connection timeout and time interval.
// *****
SOURCEl:BB:BT0oth:CTYPe DATA
SOURCEl:BB:BT0oth:UPTYPe CUR
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:NWSIZe 8.25
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:NWOffset 800
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:NLCTimeouT 7500
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:NCINterval 6400

```

```
// *****  
// Set time interval for advertising channel and events.  
// Set time delay for advertising events.  
// *****  
SOURCE1:BB:BT0oth:ECOntfiguration:APInterval 1.3  
SOURCE1:BB:BT0oth:ECOntfiguration:AEInterval 15  
SOURCE1:BB:BT0oth:ECOntfiguration:AEDelay 5
```

Example: Packet configuration

```
// *****
// Configure packet for ADV_SCAN_IND: switch off whitening,
// set Tx device address type, AdvA, data source and length
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe ADC
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:DWhitening 0
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:TATYPe PUBL
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:ANUap #H017412,24
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:ALAP #H9E8B00,24
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:DATA PN09
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:DLENgth 31

// *****
// Alternatively set periodic advertising interval for AUX_SYNC_IND
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe ASIN
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:PAINterval

// *****
// Select packet type AUX_ADV_IND. (All parameters of
// extended header are configurable with AUX_ADV_IND packet
// type.) Set channel selection,
// Tx device address type, advertising mode.
// Enable extended header for advertising PDUs. Enable all
// flags: AdvA, TargetA, AdvData Info, Aux Ptr, Sync Info,
// TxPow. Set Tx power value and ACAD length and pattern.
// *****
SOURCEl:BB:BT0oth:CTYPe ADV
SOURCEl:BB:BT0oth:UPTYPe AAIN
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:CSElection CS1
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:TATYPe PUBL
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:AMODE NCNS
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:EHEader:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCON:EHFLags:AADDRESS:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCON:EHFLags:TADDRESS:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCON:EHFLags:ADINFO:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCON:EHFLags:APTR:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCON:EHFLags:SINFO:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCON:EHFLags:TPOWER:STATE ON
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:TPOWER -100
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:ALENgth 16
SOURCEl:BB:BT0oth:ECONfiguration:PCONfiguration:ACAD PN16

// *****
// Alternatively set user-defined pattern.
// *****
```

```

SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ACAD PATtern
SOURcel:BB:BT0oth:ECONfiguration:PCON:ACAD:APATtern #B011000011,9
// *****
// Alternatively set pattern from data list.
// *****
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ACAD DLISt
SOURcel:BB:BT0oth:ECON:PCON:ACAD:ASEL "p:/pattern1.dm_iqd

// *****
// Enable AdvData Info flag, set advertising data ID and
// advertising data set ID.
// *****
SOURcel:BB:BT0oth:ECONfiguration:PCON:EHLFlags:ADINfo:STATe ON
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ADID #H01FF,12
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ASID #H0F,4
// *****
// Enable and specify AuxPtr for the secondary advertising
// channel: select AUX channel, set clock accuracy, offset unit,
// AUX offset, AUX PHY.
// *****
SOURcel:BB:BT0oth:ECONfiguration:PCON:EHLFlags:APTR:STATe ON
SOURcel:BB:BT0oth:ECONfiguration:DCTable:CHANnel0:STATe 1
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:CACCuracy T500
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:AOUNits U30
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:AOFFset 100
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:APHY L1M
// *****
// Enable and specify SyncInfo field for the AUX_SYNC_IND
// packet: set sync packet offset, offset unit, periodic adv
// interval, sleep clock accuracy, access address, CRC initial
// value. Reset event counter. Configure channel map.
// *****
SOURcel:BB:BT0oth:ECONfiguration:PCON:EHLFlags:SINfo:STATe ON
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:PAINterval 20
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SCACCuracy SCA0
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:AADDRESS #HACDE48AC,32
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:CIV #H000000,24
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SPOFFset 100
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SOUNits U30
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:OADJust 1
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SPOFFset?
// 99.9
SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ECOUNTER 0
SOURcel:BB:BT0oth:ECONfiguration:PCON:DCMTable:CHANnel0:STATe 1

```

6.1.7.2 Configure Data Packets

```

// *****
// Configure signal for DATA: select channel type, packet type,

```

```
// packet format, sequence length, role, enable CRC corruption.  
// *****  
SOURCEl:BB:BT0oth:CTYPe DATA  
SOURCEl:BB:BT0oth:UPTYPe CUR  
SOURCEl:BB:BT0oth:PFORmat L1M  
SOURCEl:BB:BT0oth:USLength 12  
SOURCEl:BB:BT0oth:BCRole MAST  
SOURCEl:BB:BT0oth:CCRC:STATe 1
```


Example: Packet configuration

```
// *****
// Configure packet type DATA: access address, CRC initial,
// NESN start, SN start values, data source, data length
// *****
SOURCE1:BB:BT0oth:CTYPe DATA
SOURCE1:BB:BT0oth:UPTYPe DATA
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:AADDRESS #HDAB85479,32
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CIVALUE #H000000,24
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NSVALUE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:SSVALUE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:DATA PN09
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:DLENGth 251

// *****
// Configure payload of LL_CONNECTION_UPDATE_IND: transmit
// window size and offset, connection event interval, slave
// latency, LL connection timeout, connection instant.
// *****
SOURCE1:BB:BT0oth:CTYPe DATA
SOURCE1:BB:BT0oth:UPTYPe CUR
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:AADDRESS #HDAB85479,32
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CIVALUE #H000000,24
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NSVALUE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:SSVALUE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NWSIZE 1.25
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NWOFFset 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NCINTERval 7.5
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NSLATency 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NLCTIMEout 100
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CINSTant 0

// *****
// Configure the payload of LL_FEATURE_REQ: set packet
// type, feature set length and configure feature set.
// *****
SOURCE1:BB:BT0oth:CTYPe DATA
SOURCE1:BB:BT0oth:UPTYPe FREQ
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSLENGTH 8
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT0:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT1:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT2:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT3:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT4:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT5:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT6:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT7:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT8:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT9:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT10:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBIT11:STATE 0
```

```

SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBit12:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBit13:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBit14:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBit15:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:FSBit16:STATE 0

// *****
// Configure the payload of LL_CONNECTION_PARAM_REQ: max. and min.
// interval, slave latency, LL connection timeout, preferred
// periodicity, reference connection even count
// *****
SOURCE1:BB:BT0oth:CTYPE DATA
SOURCE1:BB:BT0oth:UPTYPE CPR
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MXInterval 10
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MNInterval 7.5
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NSLatency 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:NLCTimeout 100
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:PPERiodicity 1.25
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:RCECount 10
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET0:STATE ON
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET0:VALUE 3.75
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET1:STATE ON
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET1:VALUE 5
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET2:STATE ON
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET2:VALUE 6.25
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET3:STATE OFF
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET4:STATE OFF
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSET5:STATE OFF

// *****
// Configure the payload of LL_LENGTH_REQ: max. Rx and TX
// payload octets, max. time to receive and transmit a packet.
// *****
SOURCE1:BB:BT0oth:CTYPE DATA
SOURCE1:BB:BT0oth:UPTYPE LREQ
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MROctets 27
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MTOctets 27
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MRTime 0.328
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MTTime 0.328

// *****
// Set the payload of LL_PHY_REQ: specify preferred Tx, Rx PHYs.
// *****
SOURCE1:BB:BT0oth:CTYPE DATA
SOURCE1:BB:BT0oth:UPTYPE PREQ
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:L1M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:L2M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:LCOD:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYs:L1M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYs:L2M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYs:LCOD:STATE 0

```

```

// *****
// Set the payload of LL_PHY_UPDATE_IND: specify PHYs for
// master-to-slave and slave-to-master direction and instant.
// *****
SOURCE1:BB:BT0oth:CTYPe DATA
SOURCE1:BB:BT0oth:UPTYpe PUIN
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MTSPHy:L1M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MTSPHy:L2M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MTSPHy:LCOD:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:STMPHy:L1M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:STMPHy:L2M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:STMPHy:LCOD:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CINStant 1

// *****
// Set the payload of LL_REJECT_EXT_IND: set reject opcode
// *****
SOURCE1:BB:BT0oth:CTYPe DATA
SOURCE1:BB:BT0oth:UPTYpe REIN
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:ROPCode #H02,8

// *****
// Set the payload of LL_MIN_USED_CHANNELS_IND: set the controller
// role to slave, set the packet type, specify PHYs and minimum
// used channels requirement
// *****
SOURCE1:BB:BT0oth:CTYPe DATA
SOURCE1:BB:BT0oth:BCRole SLAV
SOURCE1:BB:BT0oth:UPTYpe MUCH
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:PHYS:L1M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:PHYS:L2M:STATE 1
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:PHYS:LCOD:STATE 0
SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:MUCHannels 2

// *****
// Set header and payload of LL_PERIODIC_SYNC_IND: enable CTE and
// configure CTE method, set event counter properties, specify PHYs
// and address type.
// *****
:SOURCE1:BB:BT0oth:CTYPe DATA
:SOURCE1:BB:BT0oth:UPTYpe PSIN
:SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CPreSent 1
:SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CTIME 0.016
:SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:CTYPe AOA
:SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:ID #HAAAA,16
:SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:SPOFfset 245.7
:SOURCE1:BB:BT0oth:ECONfiguration:PCONfiguration:SOUNits U30

```

```

:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:OADJust 1
// Enabling offset adjust sets the Sync packet offset to 300 µs.
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SOUNits U300
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:CECount 65535
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:LPECounter 65535
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SID #H1,4
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ATYPe PUBL
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SCACcuracy SCA0
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:L1M:STATe 1
// Enabling another PHY automatically disables the previous PHY.
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:L2M:STATe 1
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:LCOD:STATe 1
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:L1M:STATe? 0
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:L2M:STATe? 0
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:ACASigned #H000080,24
:SOURcel:BB:BT0oth:ECONfiguration:PCONfiguration:SCECounter 65535

```

6.2 General Commands

This section contains commands for the general settings of the Bluetooth standard. The settings contain activation and deactivation of the standard, setting the burst type and transport mode, as well as the preset and power adjust setting.

[:SOURce<hw>]:BB:BT0oth:BCText?	124
[:SOURce<hw>]:BB:BT0oth:BMODE	125
[:SOURce<hw>]:BB:BT0oth:PRESet	125
[:SOURce<hw>]:BB:BT0oth:SETTing:CATalog	126
[:SOURce<hw>]:BB:BT0oth:SETTing:DELete	126
[:SOURce<hw>]:BB:BT0oth:SETTing:LOAD	126
[:SOURce<hw>]:BB:BT0oth:SETTing:STORe	126
[:SOURce<hw>]:BB:BT0oth:STATe	127
[:SOURce<hw>]:BB:BT0oth:TMODE	127
[:SOURce<hw>]:BB:BT0oth:UNIT:TIME	127
[:SOURce<hw>]:BB:BT0oth:VERSion?	127
[:SOURce<hw>]:BB:BT0oth:WAVEform:CREate	128

[:SOURce<hw>]:BB:BT0oth:BCText?

Queries the state and controller role.

Return values:

<BcText> string
 Connected
 (only data channel type)

Advertiser

(only advertising channel type)

ADV_IND, ADV_DIRECT_IND, ADV_NONCONN_IND,
ADV_SCAN_INDWithin R&S SMW-K117 also ADV_EXT_IND, AUX_ADV_IND,
AUX_SYNC_IND, AUX_CHAIN_IND**Scanner**

(only advertising channel type)

SCAN_REQ, SCAN_RSP

Within R&S SMW-K117 also AUX_SCAN_REQ,
AUX_SCAN_RSP**Initiator**

(only advertising channel type)

CONNECT_IND

Within R&S SMW-K117 also AUX_CONNECT_REQ,
AUX_CONNECT_RSP**Example:** SOUR:BB:BTO:BCT?**Usage:** Query only**Manual operation:** See ["Bluetooth Controller State"](#) on page 53**[:SOURce<hw>]:BB:BT0oth:BMODE <BMode>**

Determines the Bluetooth mode.

Parameters:

<BMode> BASic | BLEnergy

BASic

Selects Bluetooth mode BR + EDR.

BLEnergy

Selects Bluetooth LE.

*RST: BASic

Example: See [Chapter 6.1.2, "General Commands for BR/EDR"](#),
on page 110.**Manual operation:** See ["Bluetooth Mode"](#) on page 34**[:SOURce<hw>]:BB:BT0oth:PRESet**

Sets the parameters of the digital standard to their default values (*RST values specified for the commands).

Not affected is the state set with the command SOURce<hw>:BB:BT0oth:STATE.

[\[:SOURce<hw>\]:BB:BT0oth:STATE](#)**Example:** See [Chapter 6.1.1.2, "Save and Recall Settings"](#), on page 110.**Usage:** Event

Manual operation: See ["Set To Default"](#) on page 33

[[:SOURce<hw>]:BB:BT0oth:SETTing:CATalog <Catalog>

Queries the files with settings in the default directory. Listed are files with the file extension *.bto.

Parameters:

<Catalog> string
Returns a string of file names separated by commas.

Example: See [Chapter 6.1.1.2, "Save and Recall Settings"](#), on page 110.

Manual operation: See ["Save/Recall"](#) on page 34

[[:SOURce<hw>]:BB:BT0oth:SETTing:DELeTe <Filename>

Deletes the selected file from the default or specified directory. Deleted are files with the file extension *.bto.

Parameters:

<Filename> string
file name or complete file path; file extension can be omitted

Example: See [Chapter 6.1.1.2, "Save and Recall Settings"](#), on page 110.

Manual operation: See ["Save/Recall"](#) on page 34

[[:SOURce<hw>]:BB:BT0oth:SETTing:LOAD <Filename>

Loads the selected file from the default or the specified directory. Loaded are files with extension *.bto.

Parameters:

<Filename> string
file name or complete file path; file extension can be omitted

Example: See [Chapter 6.1.1.2, "Save and Recall Settings"](#), on page 110.

Manual operation: See ["Save/Recall"](#) on page 34

[[:SOURce<hw>]:BB:BT0oth:SETTing:STORe <Filename>

Stores the current settings into the selected file; the file extension (*.bto) is assigned automatically.

Setting parameters:

<Filename> string
file name or complete file path

Example: See [Chapter 6.1.1.2, "Save and Recall Settings"](#), on page 110.

Usage: Setting only

Manual operation: See ["Save/Recall"](#) on page 34

[[:SOURce<hw>]:BB:BT0oth:STATe <State>

Activates the standard and deactivates all the other digital standards and digital modulation modes in the same path.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: SOURce1:BB:BT0oth:STATe

Manual operation: See ["State"](#) on page 33

[[:SOURce<hw>]:BB:BT0oth:TMODe <TMode>

Selects the transport mode.

Parameters:

<TMode> ACL | SCO | ESCO

ACL

Asynchronous connection-less mode used for a point-to-point multipoint link between a master and all slaves.

SCO

Synchronous connection-oriented mode used for a point-to-point link between a master and a specific slave.

ESCO

Enhanced synchronous connection-oriented mode used for a symmetric or asymmetric point-to-point link between a master and a specific slave.

*RST: ACL

Example: See [Chapter 6.1.2, "General Commands for BR/EDR"](#), on page 110.

Manual operation: See ["Transport Mode"](#) on page 34

[[:SOURce<hw>]:BB:BT0oth:UNIT:TIME <Time>

Sets the time unit for remote control commands.

Parameters:

<Time> S | MS
 *RST: MS

[[:SOURce<hw>]:BB:BT0oth:VERSion?

Queries the version of the specification for Bluetooth wireless technology underlying the definitions.

Return values:

<Version> string

Example:

```
BB:BT0:VERS?
// Response: "5.1"
Queries the Bluetooth version.
```

Usage:

Query only

Options:

5.1 requires R&S SMW-K117.

Manual operation:

See ["Bluetooth Version"](#) on page 34

[:SOURce<hw>]:BB:BT0oth:WAVeform:CREate <Filename>

Creates a waveform using the current "Bluetooth" settings. The file name is entered with the command. The file is stored with the predefined file extension *.wv. The file name and the directory are user-definable.

Setting parameters:

<Filename> string

Example:

See [Chapter 6.1.2, "General Commands for BR/EDR"](#), on page 110.

Usage:

Setting only

Manual operation:

See ["Generate Waveform"](#) on page 34

6.3 Dirty Transmitter Configuration

[:SOURce<hw>]:BB:BT0oth:DTTest:DTTState	128
[:SOURce<hw>]:BB:BT0oth:DTTest:FDDeviation	129
[:SOURce<hw>]:BB:BT0oth:DTTest:FDRate	129
[:SOURce<hw>]:BB:BT0oth:DTTest:MIMode	129
[:SOURce<hw>]:BB:BT0oth:DTTest:NPPSet	130
[:SOURce<hw>]:BB:BT0oth:DTTest:SPHase	130
[:SOURce<hw>]:BB:BT0oth:DTTest:STDefault	130
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE	131
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:CFOFset	131
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:MINDex	131
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:STATE	132
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:LONG:SET<ch>:STERror	132
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:SHORT:SET<ch>:CFOFset	133
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:SHORT:SET<ch>:STATE	133
[:SOURce<hw>]:BB:BT0oth:DTTest:TABLE:SHORT:SET<ch>:STERror	133

[:SOURce<hw>]:BB:BT0oth:DTTest:DTTState <DttState>

Activates the "Dirty Transmitter Test".

For EDR packets, the parameter sets apply for 20 packets each.

Parameters:

<DttState> 0 | 1 | OFF | ON
 *RST: 0

Example:

BB:BTO:DTT:DTTS ON
 activates the "Dirty Transmitter Test".

Manual operation: See "[Dirty Transmitter Test](#)" on page 37

[:SOURce<hw>]:BB:BTOoth:DTTTest:FDDeviation <FdDeviation>

Sets a frequency drift rate.

A sine wave is used to drift the modulated Bluetooth signal around center frequency + carrier frequency offset. The maximum deviation reached during the drift equals the set frequency drift deviation.

Parameters:

<FdDeviation> integer
 Range: -100 to 100
 *RST: 25

Example:

BB:BTO:DTT:FDD 25
 enters frequency drift deviation.

Manual operation: See "[Frequency Drift Deviation \(+/-\)](#)" on page 38

[:SOURce<hw>]:BB:BTOoth:DTTTest:FDRate <FdRate>

Sets a frequency drift rate.

A sine wave is used to drift the modulated Bluetooth signal around center frequency + carrier frequency offset with the set frequency drift rate.

Parameters:

<FdRate> 0.3 KHz | 0.5 KHz | 1.6 KHz | 10 KHz
 Range: depends on packet type to depends on packet type
 Increment: 0.001
 *RST: depends on packet type

Example:

BB:BTO:DTT:FDR 1.6
 enters frequency drift rate.

Manual operation: See "[Frequency Drift Rate](#)" on page 38

[:SOURce<hw>]:BB:BTOoth:DTTTest:MIMode <MIMode>

Determines standard or stable mode for the modulation index of dirty transmitter according to the Bluetooth core specification.

Parameters:

<MIMode> STANdard | STABle
 *RST: STANdard

Example: See [Example "Dirty transmitter"](#) on page 111

Options: R&S SMW-K117

Manual operation: See ["Modulation Index Mode"](#) on page 38

[:SOURce<hw>] :BB:BT0oth:DTTest:NPPSet <NumPack>

Specifies the number of packets to be transmitted per dirty transmitter set.

Parameters:

<NumPack> NP50 | NP2 | NP1
 50, 2 packets or 1 packet per set
 *RST: NP50

Example: See [Example "Dirty transmitter"](#) on page 111

Manual operation: See ["Number of Packets per Set"](#) on page 38

[:SOURce<hw>] :BB:BT0oth:DTTest:SPHase <SPHase>

The command enters a start phase.

The start phase of the sine wave used to drift the modulated Bluetooth signal around center frequency + carrier frequency offset is set here.

Parameters:

<SPHase> integer
 Range: 0 to 359
 Increment: 1
 *RST: 0
 Default unit: degree

Example: BB:BT0:DTT:SPH 0
 enters a start phase.

Manual operation: See ["Start Phase"](#) on page 38

[:SOURce<hw>] :BB:BT0oth:DTTest:STDefault

The command calls the default settings for the Dirty Transmitter Test.

Example: BB:BT0:DTT:STD
 calls the default settings.

Usage: Event

Manual operation: See ["Set to Default"](#) on page 37

[:SOURce<hw>]:BB:BT0oth:DTTTest:TABLE <Table>

Opens the table settings.

Parameters:

<Table> NOTable | SHORt | LONG

Example:

BB:BT0:PTYP DH1
calls the default settings.
BB:BT0:DTT:TABL LONG
calls the default settings.

[:SOURce<hw>]:BB:BT0oth:DTTTest:TABLE:LONG:SET<ch>:CFOffset <CfOffset>

Sets a carrier frequency offset.

The carrier frequency offset shows the deviation of the transmitted initial center frequency from carrier frequency.

Parameters:

<CfOffset> integer
Range: -150 to 150
*RST: 1
Default unit: kHz

Example:

BB:BT0:PTYP DH1
sets the packet type.
BB:BT0:DTT:TABL LONG
sets the table type
BB:BT0:DTT:TABL:LONG:SET2:CFOF 14
sets a carrier frequency offset.

Manual operation: See "[Carrier Frequency Offset kHz](#)" on page 39

[:SOURce<hw>]:BB:BT0oth:DTTTest:TABLE:LONG:SET<ch>:MINDex <MIndex>

Sets the modulation index, that specifies the frequency deviation.

The modulation index h is defined as:

$$h = \frac{2\Delta f}{f_{\text{symbol}}}$$

with

f_{symbol} = "symbol rate", set with the command [\[:SOURce<hw>\]:BB:BT0oth:SRATE:VARIation](#)

Δf = "frequency deviation", set with the command [\[:SOURce<hw>\]:BB:BT0oth:MSETtings:FDEVIation](#)

According to the Bluetooth standard, the modulation index is allowed to vary between 0.28 and 0.35.

Parameters:

<MIndex> float
 Range: 0.28 to 0.55
 Increment: 0.01
 *RST: 0.28

Example:

BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:DTT:TABL LONG
 enters the table type
 BB:BTO:DTT:TABL:LONG:SET2:MIND 0.3
 enters a modulation index.

Manual operation: See "[Modulation Index](#)" on page 39

[[:SOURce<hw>]:BB:BTOoth:DTTtest:TABLE:LONG:SET<ch>:STATE <State>

Activates the corresponding parameter set for the long table.

For basic rate packets, each set applies to 20ms of signal.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 1

Example:

BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:DTT:TABL LONG
 sets the table type
 BB:BTO:DTT:TABL:LONG:SET2:STAT ON
 activates the set 2 in the long table.

Manual operation: See "[State](#)" on page 39

[[:SOURce<hw>]:BB:BTOoth:DTTtest:TABLE:LONG:SET<ch>:STERror <StError>

Sets a symbol timing error in ppm.

This parameter modifies the symbol clock frequency by the set value.

Parameters:

<StError> integer
 Range: -150 to 150
 *RST: 1
 Default unit: ppm

Example:

BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:DTT:TABL LONG
 sets the table type
 BB:BTO:DTT:TABL:LONG:SET2:STER -20
 sets a symbol timing error.

Manual operation: See ["Symbol Timing Error"](#) on page 39

[[:SOURce<hw>]:BB:BTOoth:DTT:TABLE:SHORT:SET<ch>:CFOffset <CfOffset>

Sets a carrier frequency offset.

The carrier frequency offset shows the deviation of the transmitted initial center frequency from carrier frequency.

Parameters:

<CfOffset> integer
 Range: -150 to 150
 *RST: 1
 Default unit: kHz

Example:

BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:DTT:TABL SHOR
 sets the table type
 BB:BTO:DTT:TABL:SHOR:SET2:CFOF 65
 sets a carrier frequency offset.

Manual operation: See ["Carrier Frequency Offset kHz"](#) on page 39

[[:SOURce<hw>]:BB:BTOoth:DTT:TABLE:SHORT:SET<ch>:STATE <State>

Activates the corresponding parameter set in the short table. If a set deactivated, its parameters are skipped in the sequence. Instead, the next active set is used.

For EDR packets, each set applies to 20 packets.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 1

Example:

BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:DTT:TABL SHOR
 sets the table type
 BB:BTO:DTT:TABL:SHOR:SET2:STAT ON
 activates the set 2 in the short table.

Manual operation: See ["State"](#) on page 39

[[:SOURce<hw>]:BB:BTOoth:DTT:TABLE:SHORT:SET<ch>:STERror <StError>

Sets a symbol timing error in ppm.

The Symbol Timing Error modifies the symbol clock frequency by the set amount.

Parameters:

<StError> integer
 Range: -150 to 150
 Increment: 1
 *RST: 1

Example:

BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:DTT:TABL SHOR
 enters the table type
 BB:BTO:DTT:TABL:SHOR:SET2:STER 20
 enters a symbol timing error.

Manual operation: See "Symbol Timing Error" on page 39

6.4 Filter/Clipping Settings

[SOURce<hw>]:BB:BT0oth:CLIPping:LEVel.....	134
[SOURce<hw>]:BB:BT0oth:CLIPping:MODE.....	135
[SOURce<hw>]:BB:BT0oth:CLIPping:STATE.....	135
[SOURce<hw>]:BB:BT0oth:FILTer:TYPE.....	135
[SOURce<hw>]:BB:BT0oth:FILTer:ILENght.....	136
[SOURce<hw>]:BB:BT0oth:FILTer:ILENght:AUTO[:STATE].....	136
[SOURce<hw>]:BB:BT0oth:FILTer:OSAMpling.....	136
[SOURce<hw>]:BB:BT0oth:FILTer:OSAMpling:AUTO[:STATE].....	137
[SOURce<hw>]:BB:BT0oth:FILTer:MINDex.....	137
[SOURce<hw>]:BB:BT0oth:FILTer:MTYPE.....	137
[SOURce<hw>]:BB:BT0oth:MSETtings:FDEVIation.....	137
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:APCO25.....	138
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:COsine.....	138
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:FGAuss.....	138
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:GAUSS.....	138
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:LPASs.....	139
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:PGAuss.....	139
[SOURce<hw>]:BB:BT0oth:FILTer:PARAmeter:RCOSine.....	139
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[SOURce<hw>]:BB:BT0oth:CLIPping:LEVel <Level>

Sets the limit for level clipping (Clipping). This value indicates at what point the signal is clipped. It is specified as a percentage, relative to the highest level. 100% indicates that clipping does not take place.

Parameters:

<Level> integer
 Range: 1 to 100
 Increment: 1
 *RST: 100
 Default unit: PCT

Example:

```
BB:BTO:CLIP:LEV 80
sets the limit for level clipping to 80% of the maximum level.
BB:BTO:CLIP:STAT ON
activates level clipping.
```

Manual operation: See "[Clipping Level](#)" on page 97

[[:SOURce<hw>]:BB:BTOoth:CLIPping:MODE <Mode>

The command sets the method for level clipping (Clipping).

Parameters:

<Mode> VECTor | SCALar
VECTor
 The reference level is the amplitude | i+jq |.
SCALar
 The reference level is the absolute maximum of the I and Q values.
 *RST: VECTor

Example:

```
BB:BTO:CLIP:MODE VECT
sets the amplitude as reference level.
```

Manual operation: See "[Clipping Mode](#)" on page 97

[[:SOURce<hw>]:BB:BTOoth:CLIPping:STATe <State>

The command activates level clipping (Clipping). The value is defined with the command `BB:BTO:CLIPping:LEVel`, the mode of calculation with the command `BB:BTO:CLIPping:MODE`.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: OFF

Example:

```
BB:BTO:CLIP:STAT ON
activates level clipping.
```

Manual operation: See "[Clipping State](#)" on page 97

[[:SOURce<hw>]:BB:BTOoth:FILTer:TYPE <Type>

Selects the filters used for $\pi/4$ DQPSK and 8DPSK modulations. This opens a selection window containing all the filters available to the instrument.

Parameters:

<Type> RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 |
 COEqualizer | COFequalizer | C2K3x | APCO25 | SPHase |
 RECTangle | PGAuss | LPASs | DIRac | ENPShape |
 EWPSshape
 *RST: RCOSine

Example:

BB:BTO:FILT:TYPE RCOS
 sets the filter type RCOSine.

Manual operation: See "[Filter \(\$\pi/4\$ DQPSK section\)](#)" on page 94

[:SOURce<hw>]:BB:BTOoth:FILTer:ILENgtH <Length>

Sets the impulse length (the number of filter taps).

Parameters:

<Length> integer
 Range: 1 to depends on oversampling
 *RST: 32

Example:

BB:BTO:FILT:ILEN 10
 sets the number of filter tabs to 10.

Manual operation: See "[Impulse Length](#)" on page 94

[:SOURce<hw>]:BB:BTOoth:FILTer:ILENgtH:AUTO[::STATe] <State>

Activates the impulse length state. If activated, the most sensible parameter values are selected. The value depends on the coherence check.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 1

Example:

BB:BTO:FILT:ILEN:AUTO ON
 selects the most sensible parameters automatically.

Manual operation: See "[Impulse Length](#)" on page 94

[:SOURce<hw>]:BB:BTOoth:FILTer:OSAMplng <OSampling>

Sets the upsampling factor.

Parameters:

<OSampling> integer
 Range: 1 to 32
 *RST: 10

Example:

BB:BTO:FILT:OSAM 10
 sets the upsampling factor to 10.

Manual operation: See "[Oversampling](#)" on page 94

[[:SOURce<hw>]:BB:BTOoth:FILTer:OSAMpling:AUTO[:STATe] <State>

Activates the upsampling factor state. If activated, the most sensible parameter values are selected. The value depends on the coherence check. If deactivated, the values can be changed manually.

Parameters:

<State> 0 | 1 | OFF | ON
*RST: 1

Example:

BB:BTO:FILT:OSAM:AUTO ON
the most sensible parameters are selected automatically.

Manual operation: See ["Oversampling"](#) on page 94

[[:SOURce<hw>]:BB:BTOoth:FILTer:MINDeX <MIndex>

Queries the modulation index resulting from the entered frequency deviation value.

Parameters:

<MIndex> string

Example:

BB:BTO:FILT:MIND
Queries the modulation index
Response: 0.5

Manual operation: See ["Modulation Index"](#) on page 95

[[:SOURce<hw>]:BB:BTOoth:FILTer:MTYPe <MType>

Queries the modulation type used for the current packet selection.

Parameters:

<MType> string

Example:

BB:BTO:FILT:MTYP?
Queries the modulation type

Manual operation: See ["Modulation Type"](#) on page 95

[[:SOURce<hw>]:BB:BTOoth:MSETtings:FDEVIation <FDeviation>

Sets the frequency deviation.

Parameters:

<FDeviation> float
Range: Depends on Bluetooth mode
Increment: 0.1
*RST: Depends on Bluetooth mode

Example:

BB:BTO:MSET:FDEV 160
Sets a frequency deviation of 160 kHz.

Manual operation: See ["Frequency Deviation"](#) on page 95

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:APCO25 <Apco25>

Sets the roll-off factor for filter type APCO25.

Parameters:

<Apco25> float
 Range: 0.05 to 0.99
 Increment: 0.01
 *RST: 0.2

Example: BB:BTO:FILT:PAR:APCO25 0.2
 sets the roll-off factor to 0.2 for filter type APCO25.

Manual operation: See "Roll Off Factor / B xT" on page 93

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:COSine <Cosine>

Sets the roll-off factor for the Cosine filter type.

Parameters:

<Cosine> float
 Range: 0 to 1
 Increment: 0.01
 *RST: 0.1

Example: BB:BTO:FILT:PAR:COS 0.35
 sets the roll-off factor to 0.35 for filter type Cosine.

Manual operation: See "Roll Off Factor / B xT" on page 93

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:FGAuss <FGauss>

Sets the B x T for the Gauss filter type.

Parameters:

<FGauss> float
 Range: 0.15 to 2.5
 Increment: 0.01
 *RST: 0.5

Example: BB:BTO:FILT:PAR:FGA 0.5
 sets B x T to 0.5 for the Gauss filter type for the GFSK section of the packet.

Manual operation: See "Roll Off Factor / B xT" on page 93

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:GAUSS <Gauss>

Sets the B x T for the Gauss filter type.

Parameters:

<Gauss> float
 Range: 0.15 to 2.5
 Increment: 0.01
 *RST: 0.5

Example:

BB:BTO:FILT:PAR:GAUS 0.5
 sets B x T to 0.5 for the Gauss filter type for $\pi/4$ DQPSK or 8DPSK sections.

Manual operation: See ["Roll Off Factor / B x T"](#) on page 93

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:LPASs <LPass>

Sets the cut off frequency factor for a lowpass filter (ACP Opt.).

Parameters:

<LPass> float
 Range: 0.05 to 2
 Increment: 0.01
 *RST: 0.5

Example:

BB:BTO:FILT:PAR:LPAS 1
 sets the cut off frequency factor for a lowpass filter

Manual operation: See ["Cut Off Frequency Factor"](#) on page 94

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:PGAuss <PGauss>

Sets the B x T for the Pure Gauss filter type.

Parameters:

<PGauss> float
 Range: 0.15 to 2.5
 Increment: 0.01
 *RST: 0.5

Example:

BB:BTO:FILT:PAR:PGA 0.5
 sets B x T to 0.5 for the Pure Gauss filter type.

Manual operation: See ["Roll Off Factor / B x T"](#) on page 93

[[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:RCOSine <RCosine>

Sets the roll-off factor for the Root Cosine filter type.

Parameters:

<RCosine> float
 Range: 0 to 1
 Increment: 0.01
 *RST: 0.4

Example: `BB:BTO:FILT:PAR:RCOS 0.22`
sets the roll-off factor to 0.22 for filter type Root Cosine.

Manual operation: See ["Roll Off Factor / B x T"](#) on page 93

[:SOURce<hw>]:BB:BTOoth:FILTer:PARAmeter:SPHase <SPHase>

Sets the B x T for the Split Phase filter type.

Parameters:

<SPHase> float
Range: 0.15 to 2.5
Increment: 0.01
*RST: 2

Example: `BB:BTO:FILT:PAR:SPH 0.5`
sets B x T to 0.5 for the Split Phase filter type.

Manual operation: See ["Roll Off Factor / B x T"](#) on page 93

[:SOURce<hw>]:BB:BTOoth:SRATe:VARiAtion <Variation>

Sets the symbol rate.

Parameters:

<Variation> float
Range: 4E2 to 15E6
Increment: 1E-3
*RST: 1E6

Example: `BB:BTO:SRAT:VAR 1`
sets the symbol rate variation to 1 MHz.

Manual operation: See ["Symbol Rate Variation"](#) on page 96

6.5 Trigger Commands

<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:ARM:EXECute</code>	141
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:EXECute</code>	141
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger[:EXTernal]:SYNChronize:OUTPut</code>	141
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:OBASeband:DELay</code>	141
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:OBASeband:INHibit</code>	141
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:RMODE</code>	142
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:SLENgth</code>	142
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:SLUNit</code>	142
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger:SOURce</code>	143
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger[:EXTernal]:DELay</code>	143
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger[:EXTernal]:INHibit</code>	143
<code>[:SOURce<hw>]:BB:BTOoth:TRIGger[:SEQuence</code>	144

[:SOURce<hw>]:BB:BT0oth:TRIGger:ARM:EXECute

Stops signal generation; a subsequent trigger event restarts signal generation.

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Usage: Event

Manual operation: See ["Arm"](#) on page 101

[:SOURce<hw>]:BB:BT0oth:TRIGger:EXECute

Executes a trigger.

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Usage: Event

Manual operation: See ["Execute Trigger"](#) on page 101

[:SOURce<hw>]:BB:BT0oth:TRIGger[:EXTernal]:SYNChronize:OUTPut <Output>

Enables signal output synchronous to the trigger event.

Parameters:

<Output> 0 | 1 | OFF | ON
*RST: 1

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["Sync. Output to Ext. Trigger/Sync. Output to Trigger"](#) on page 102

[:SOURce<hw>]:BB:BT0oth:TRIGger:OBASeband:DELay <Delay>

Sets the trigger delay (expressed as a number of samples) for triggering by the trigger signal from the second path.

Parameters:

<Delay> float
Range: 0 to 2147483647
Increment: 0.01
*RST: 0

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["Trigger Delay"](#) on page 103

[:SOURce<hw>]:BB:BT0oth:TRIGger:OBASeband:INHibit <Inhibit>

For triggering via the other path, specifies the duration by which a restart is inhibited.

Parameters:

<Inhibit> integer
 Range: 0 to 67108863
 *RST: 0

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["External Trigger Inhibit"](#) on page 103

[[:SOURce<hw>]:BB:BT0oth:TRIGger:RMODE <RMode>

Queries signal generation status for all trigger modes with Bluetooth modulation on.

Parameters:

<RMode> RUN | STOP
 *RST: STOP

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["Running/Stopped"](#) on page 101

[[:SOURce<hw>]:BB:BT0oth:TRIGger:SENGth <SLength>

Defines the length of the signal sequence that is output in the `SINGLE` trigger mode.

Parameters:

<SLength> integer
 Range: 1 to 7000
 *RST: 1

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["Trigger Signal Duration"](#) on page 101

[[:SOURce<hw>]:BB:BT0oth:TRIGger:SLUNit <SIUnit>

Defines the unit for the entry of the signal sequence length.

Parameters:

<SIUnit> FRAME | SEQUENCE | EVENT

FRAME

A single frame is generated after a trigger event.

SEQUENCE

A single sequence is generated after a trigger event.

*RST: SEQUENCE

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["Signal Duration Unit"](#) on page 101

[:SOURce<hw>]:BB:BT0oth:TRIGger:SOURce <Source>

Selects the trigger signal source and determines the way the triggering is executed. Provided are:

- Internal triggering by a command (INTernal)
- External trigger signal via one of the local or global connectors
 - EGT1|EGT2: External global trigger
 - EGC1|EGC2: External global clock
 - ELTRigger: External local trigger
 - ELClock: External local clock
- Internal triggering by a signal from the other basebands (INTA|INTB)
- In master-slave mode, the external baseband synchronization signal (BBSY)
- OBASeband|BEXTernal|EXTernal: Setting only
 Provided only for backward compatibility with other Rohde & Schwarz signal generators.
 The R&S SMW accepts these values and maps them automatically as follows:
 EXTernal = EGT1, BEXTernal = EGT2, OBASeband = INTA or INTB
 (depending on the current baseband)

Parameters:

<Source> INTB|INTernal|OBASeband|EGT1|EGT2|EGC1|EGC2|ELTRigger|INTA|ELCLock|BEXTernal|EXTernal | BBSY
 *RST: INTernal

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Options: ELTRigger|ELCLock require R&S SMW-B10
 BBSY require R&S SMW-B9

Manual operation: See ["Trigger Source"](#) on page 102

[:SOURce<hw>]:BB:BT0oth:TRIGger[:EXTernal]:DELay <Delay>

Sets the trigger delay.

Parameters:

<Delay> float
 Range: 0 to 2147483647
 Increment: 0.01
 *RST: 0

Example: See [Chapter 6.1.4, "Trigger Commands"](#), on page 111.

Manual operation: See ["Trigger Delay"](#) on page 103

[:SOURce<hw>]:BB:BT0oth:TRIGger[:EXTernal]:INHibit <Inhibit>

Specifies the number of samples by which a restart is to be inhibited following an external trigger event.

Parameters:

<Inhibit> integer
 Range: 0 to 21.47*symbRate
 *RST: 0

Example: See [Example "Trigger configuration"](#) on page 112.

Manual operation: See ["External Trigger Inhibit"](#) on page 103

[:SOURce<hw>]:BB:BT0oth[:TRIGger]:SEQUence <Sequence>

Selects the trigger mode:

- AUTO = auto
- RETRigger = retrigger
- AAUTo = armed auto
- ARETrigger = armed retrigger
- SINGle = single

Parameters:

<Sequence> AUTO | RETRigger | AAUTo | ARETrigger | SINGle
 *RST: AUTO

Example: See [Example "Trigger configuration"](#) on page 112.

Manual operation: See ["Trigger Mode"](#) on page 100

6.6 Marker Commands

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:DELay	144
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:FESHift	145
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:MODE	145
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:ONTime	146
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:OFFTime	146
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:PATtern	146
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:PULSe:DIVider	146
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:PULSe:FREQuency?	147
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:RESHift	147

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:DELay <Delay>

Defines the delay between the signal on the marker outputs and the start of the signals.

Parameters:

<Delay> float
 Range: 0 to 16777215
 Increment: 0.001
 *RST: 0

Example: See [Example "Marker delay"](#) on page 113.

Manual operation: See ["Marker x Delay"](#) on page 105

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:FESHift <Shift>

Shifts the falling edge of the marker the specified number of samples. Negative values result in a shift back of the marker edge.

Parameters:

<Shift> float
 Range: dynamic to dynamic
 Increment: 1E-6
 *RST: 0

Example: SOURce1:BB:BT0:TRIG:OUTP1:FESH 10
 Shifts the falling edge of marker 1 by 75 samples.

Manual operation: See ["Marker Mode"](#) on page 104

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:MODE <Mode>

Defines the signal for the selected marker output.

Parameters:

<Mode> REStArt | StARt | ACTive | PULSe | PATTern | RATio | IACTive

REStArt

A marker signal is generated at the start of each signal sequence.

StARt

A marker signal is generated at the start of each event/frame.

ACTive

The marker masks the active part of the event/frame. At the start of each burst, the marker signal changes to high. It changes back to low after the end of each burst.

PULSe

A regular marker signal is generated. The clock frequency is defined by entering a divider. The frequency is derived by dividing the symbol rate by the divider. The input box for divider opens when "Pulse" is selected, and the resulting pulse frequency is displayed below.

PATTern

A marker signal that is defined by a bit pattern is generated. The pattern has a maximum length of 32 bits and is defined in an input field which opens when pattern is selected.

RATio

A regular marker signal corresponding to the "Time Off" / "Time On" specifications in the commands

SOURce:BB:BT0:TRIGger:OUTPut:OFFTime and

SOURce:BB:BT0:TRIGger:OUTPut:ONTime is generated.

IActive

The marker masks the inactive part of the event/frame. At the start of each burst, the marker signal changes to low. It changes back to high after the end of each burst.

*RST: REStart

Example: See [Chapter 6.1.5, "Marker Commands"](#), on page 113.

Manual operation: See ["Marker Mode"](#) on page 104

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:ONTime <OnTime>
[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:OFFTime <OffTime>

Sets the duration of the ON and OFF periods.

*) If R&S SMW-B9 is installed, the minimum marker duration depends on the sample/symbol rate.

See chapter "Basics on ..." in the R&S SMW user manual.

Parameters:

<OffTime> integer
 Range: 1 (R&S SMW-B10) / 1* (R&S SMW-B9) to 16777215
 *RST: 1

Example: See [Chapter 6.1.5, "Marker Commands"](#), on page 113.

Manual operation: See ["Marker Mode"](#) on page 104

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:PATtern <Pattern>, <BitCount>

Selects the data for a pattern.

Parameters:

<Pattern> numeric
 *RST: #H2
 <BitCount> integer
 Range: 1 to 64
 *RST: 2

Example: See [Chapter 6.1.5, "Marker Commands"](#), on page 113.

Manual operation: See ["Marker Mode"](#) on page 104

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:PULSe:DIVider <Divider>

Sets the divider for the clock frequency.

*) If R&S SMW-B9 is installed, the minimum marker duration depends on the sample/symbol rate.

See chapter "Basics on ..." in the R&S SMW user manual.

Parameters:

<Divider> integer
 Range: 2 (R&S SMW-B10) / 2* (R&S SMW-B9) to 1024
 *RST: 2

Example: See [Chapter 6.1.5, "Marker Commands"](#), on page 113.

Manual operation: See ["Marker Mode"](#) on page 104

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:PULSe:FREQuency?

Queries the marker pulse frequency.

Return values:

<Frequency> float
 Range: 2 to 1024
 Increment: 1E-3
 *RST: 2

Example: See [Chapter 6.1.5, "Marker Commands"](#), on page 113.

Usage: Query only

Manual operation: See ["Marker Mode"](#) on page 104

[:SOURce<hw>]:BB:BT0oth:TRIGger:OUTPut<ch>:RESHift <Shift>

Shifts the rising edge of the marker the specified number of samples. Negative values result in a shift back of the marker edge.

Parameters:

<Shift> float
 Range: dynamic to dynamic
 Increment: 1E-6
 *RST: 0

Example: SOURce1:BB:BT0:TRIG:OUTPut2:RESH -20
 Shifts back the rising edge of marker 2 by 20 samples.

Manual operation: See ["Marker Mode"](#) on page 104

6.7 Clock Commands

This section lists the remote control commands, necessary to configure the clock.

[\[:SOURce<hw>\]:BB:BT0oth:CLOCK:MODE.....](#) 147
[\[:SOURce<hw>\]:BB:BT0oth:CLOCK:SOURce.....](#) 148

[:SOURce<hw>]:BB:BT0oth:CLOCK:MODE <Mode>

Sets the type of externally supplied clock.

Parameters:

<Mode> SAMPLE
 *RST: SAMPLE

Example: See [Chapter 6.1.6, "Clock Settings"](#), on page 113.

Options: R&S SMW-B10

Manual operation: See ["Clock Mode"](#) on page 107

[:SOURce<hw>]:BB:BT0oth:CLOCK:SOURce <Source>

Selects the clock source:

- INTernal: Internal clock reference
- ELCLock: External local clock
- EXTERNAL = ELCLock: Setting only
 Provided for backward compatibility with other Rohde & Schwarz signal generators

Parameters:

<Source> INTernal|ELCLock|EXTernal
 *RST: INTernal

Example: See [Chapter 6.1.6, "Clock Settings"](#), on page 113.

Options: ELCLock requires R&S SMW-B10

Manual operation: See ["Clock Source"](#) on page 106

6.8 Power Ramping Commands

[:SOURce<hw>]:BB:BT0oth:PRAMPing:FOFFset	148
[:SOURce<hw>]:BB:BT0oth:PRAMPing:RFUNction	149
[:SOURce<hw>]:BB:BT0oth:PRAMPing:ROFFset	149
[:SOURce<hw>]:BB:BT0oth:PRAMPing:RTIME	149

[:SOURce<hw>]:BB:BT0oth:PRAMPing:FOFFset <FOffset>

Sets the offset of the falling edge of a burst. The offset is specified by the selected number of symbols.

Negative values shift the falling edge to earlier positions, which results in a corresponding number of skipped symbols at the end of the burst.

Positive values shift the falling edge to later positions, which results in a corresponding number of added 0 padding symbols following the burst.

Parameters:

<FOffset> integer
 Range: -32 to 32
 Increment: 1
 *RST: 0

Example: `BB:BTO:PRAM:FOFF 8`
Adds eight symbols at the end of the burst.

Manual operation: See "[Fall Offset](#)" on page 99

[:SOURce<hw>]:BB:BTOoth:PRAMping:RFUNction <RFunction>

The command selects the form of the transmitted power, i.e. the shape of the rising and falling edges during power ramp control.

Parameters:

<RFunction> LINear | COSine
*RST: COSine

Example: `BB:BTO:PRAM:RFUN LIN`
sets linear shape for the rising and falling edges during power ramp control.

Manual operation: See "[Ramp Function](#)" on page 98

[:SOURce<hw>]:BB:BTOoth:PRAMping:ROFFset <ROffset>

Sets the offset of the rising edge of a burst. The offset is specified by the selected number of symbols.

Negative values shift the rising edge to earlier positions, which results in a corresponding number of added 0 padding symbols before the burst.

Positive values shift the rising edge to later positions, which results in a corresponding number of skipped symbols at the beginning of the burst.

Parameters:

<ROffset> integer
Range: -32 to 32
Increment: 1
*RST: -2

Example: `BB:BTO:PRAM:ROFF 8`
Skips eight symbols at the beginning of the burst.

Manual operation: See "[Rise Offset](#)" on page 99

[:SOURce<hw>]:BB:BTOoth:PRAMping:RTIME <RTIME>

Sets the ramp time, which extends the burst by a corresponding number of 0 padding symbols at the beginning and the end of a burst. During this period of time, power ramping is based on the specified ramp function.

Parameters:

<RTIME> integer
Range: 1 to 32
Increment: 1
*RST: 2

Example: `BB:BTO:PRAM:TIME 2`
 Extends the burst by 2 symbols at the beginning and end of the burst.

Manual operation: See "[Ramp Time](#)" on page 98

6.9 Channel Configuration Commands - BR/EDR

[:SOURce<hw>]:BB:BT0oth:PTYPE	150
[:SOURce<hw>]:BB:BT0oth:SLENgth	150
[:SOURce<hw>]:BB:BT0oth:STIMing	150

[:SOURce<hw>]:BB:BT0oth:PTYPE <PType>

The available packets depend on the selected transport mode. All packet types as defined in the Bluetooth specifications are supported.

Parameters:

<PType> ID | NULL | POLL | FHS | DM1 | DH1 | DM3 | DH3 | DM5 | DH5 |
 AUX1 | ADH1 | ADH3 | ADH5 | AEDH1 | AEDH3 | AEDH5 |
 HV1 | HV2 | HV3 | DV | EV3 | EV4 | EV5 | EEV3 | EEV5 |
 EEEV3 | EEEV5
 *RST: DH1

Example: `BB:BTO:PTYP NULL`
 sets the packet type.

Manual operation: See "[Packet Type](#)" on page 41

[:SOURce<hw>]:BB:BT0oth:SLENgth <SLength>

Sets the sequence length of the Bluetooth signal in number of frames. This signal is calculated in advance and output in the arbitrary waveform generator.

Parameters:

<SLength> integer
 Range: depends on the number of states in dirty transmitter
 test to dynamic
 *RST: 1

Example: `BB:BTO:SLEN 10`
 sets the sequence length to 10 frames.

Manual operation: See "[Sequence Length](#)" on page 41

[:SOURce<hw>]:BB:BT0oth:STIMing <SlotTiming>

Selects the Rx slot timing mode.

Parameters:

<SlotTiming> TX | LOOPback
 *RST: TX

Example:

BB:BTO:PTYP DH3
 sets the packet type.
 BB:BTO:STIM LOOP
 selects loopback test mode.

Manual operation: See "Slot Timing" on page 41

6.10 Packet Configuration Commands - BR/EDR

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[SOURce<hw>]:BB:BT0oth:PCONfiguration:BDALap.....	152
[SOURce<hw>]:BB:BT0oth:PCONfiguration:BDANap.....	152
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[SOURce<hw>]:BB:BT0oth:PCONfiguration:CODevice.....	153
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[SOURce<hw>]:BB:BT0oth:PCONfiguration:DATA:DPATtern.....	154
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[SOURce<hw>]:BB:BT0oth:PCONfiguration:ACKNOWLEDgement <Acknowledgement>

Sets the ARQN bit of the packet header..

Parameters:

<Acknowledgement> NAK | ACK

NAK

Request to retransmit the previous payload.

ACK

Previous payload has been received successfully.

*RST: ACK

Example:

BB:BTO:PTYP DH1
selects the packet type DH1.
BB:BTO:PCON:DSFP PED
enable packet editor under data source for packet
BB:BTO:PCON:ACKN ACK
sets positive acknowledgement

Manual operation: See "[Acknowledgment](#)" on page 44

[:SOURCE<hw>]:BB:BTObth:PCONfiguration:BDALap <BdaLap>, <BitCount>

Sets the lower address part of Bluetooth Device Address. The length of LAP is 24 bits or 6 hexadecimal figures.

Parameters:

<BdaLap>	numeric
	Range: #H000000 to #HFFFFFF
	*RST: 80
<BitCount>	integer
	Range: 8 to 24
	*RST: 24

Example: BB:BTO:PCON:BDAL #H000000,24
Sets the lower address part.

Manual operation: See "[Bluetooth Device Address \(BD_ADDR\)](#)" on page 43

[:SOURCE<hw>]:BB:BTObth:PCONfiguration:BDANap <BdaNap>, <BitCount>

Enters the non-significant address part of Bluetooth Device Address. The length of NAP is 16 bits or 4 hexadecimal figures.

Parameters:

<BdaNap>	numeric
	Range: #H0000 to #HFFFF
	*RST: ABCD
<BitCount>	integer
	Range: 16 to 16
	*RST: 16

Example: BB:BTO:PCON:BDAN #H0000,16
Sets the non-significant address part.

Manual operation: See "[Bluetooth Device Address \(BD_ADDR\)](#)" on page 43

[:SOURce<hw>]:BB:BT0oth:PCONfiguration:BDAUap <BdaUap>, <BitCount>

Enters the upper address part of Bluetooth Device Address. The length of UAP is 8 bits or 2 hexadecimal figures.

Parameters:

<BdaUap> numeric
 Range: #H00 to #HFF
 Increment: 1
 *RST: 48

<BitCount> integer
 Range: 8 to 8
 *RST: 8

Example: BB:BT0:PCON:BDAN #H00,8
 Sets the non-significant address part.

Manual operation: See "[Bluetooth Device Address \(BD_ADDR\)](#)" on page 43

[:SOURce<hw>]:BB:BT0oth:PCONfiguration:CODevice <CoDevice>, <BitCount>

A parameter received during the device discovery procedure, indicates the type of device and which types of service that are supported.

Parameters:

<CoDevice> numeric
 Range: #H000000 to #HFFFFFFF
 *RST: #H0

<BitCount> integer
 Range: 24 to 24
 *RST: 24

Example: BB:BT0:PTYP FHS
 Sets the packet type.
 BB:BT0:PCON:DSFP PED
 Enables the packet editor under data source for the packet.
 BB:BT0:PCON:COD #H020104,24
 Sets the class of device.

Manual operation: See "[Class of Device](#)" on page 47

[:SOURce<hw>]:BB:BT0oth:PCONfiguration:DATA <Data>

Selects the data source used for the payload.

Parameters:

<Data> ALL0 | ALL1 | PATtern | PN09 | PN11 | PN15 | PN16 | PN20 |
 PN21 | PN23 | DLISt
 *RST: PN09

Example: BB:BTO:PTYP FHS
sets the packet type
BB:BTO:PCON:DSFP PED
enable packet editor under data source for packet
BB:BTO:PCON:DATA ALL1
sets the data type.

Manual operation: See "[Data Source](#)" on page 45

**[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:DATA:DPATtern <DPattern>,
<BitCount>**

Selects the data for a pattern.

Parameters:

<DPattern> numeric
*RST: #H0

<BitCount> integer
Range: 1 to 64
*RST: 1

Example: BB:BTO:PCON:DATA PATT
Sets the data type.
BB:BTO:PCON:DATA:DPAT #B010101,6
Selects the data for a pattern with the length of 6 bits.

Manual operation: See "[Data Source](#)" on page 45

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:DATA:DSElection <DSelection>

The command selects data list file.

Parameters:

<DSelection> string
Increment: 1

Example: BB:BTO:PCON:DATA DLIS
selects the data type.
BB:BTO:PCON:DSEL bluetooth_1
selects the file for the data.

Manual operation: See "[Data Source](#)" on page 45

**[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:DATA:VDPATtern <VdPattern>,
<BitCount>**

Sets the bit pattern for the voice data.

Parameters:

<VdPattern> numeric
*RST: #H0

<BitCount> integer
 Range: 1 to 64
 *RST: 1

Example: BB:BTO:PCON:DATA:PATT
 Selects the data type.
 BB:BTO:PCON:DATA:VDPA #B010101,6
 Selects the bit pattern for the voice data with the length of 24 bits.

Manual operation: See ["Data Source \(Voice Field\)"](#) on page 47

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:DATA:VDSElection <VdSelection>

Selects the data list for voice data.

Parameters:

<VdSelection> string

Example: BB:BTO:PCON:VDAT DLIS
 selects the data type.
 BB:BTO:PCON:VDSE bluetooth_1
 selects the file for the data.

Manual operation: See ["Data Source \(Voice Field\)"](#) on page 47

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:DLENgth <DLength>

Sets the payload data length in bytes.

Parameters:

<DLength> integer
 Range: 0 to depends on packet type
 Increment: 1
 *RST: depends on packet type

Example: BB:BTO:PTYP DH1
 sets the packet type.
 BB:BTO:PCON:DSFP PED
 enable packet editor under data source for packet
 BB:BTO:PCON:DLEN 25
 sets the data length.

Manual operation: See ["Data Length"](#) on page 46

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:DSFPacket <DsfPacket>

Selects the data source for the selected packet type.

Parameters:

<DsfPacket> PEDit | ADATa

PED

Enables the "Packet Editor". All packet fields can be configured individually.

ADAT

Fills the generated packets with the selected data source. Useful if predefined data contents are loaded with a data list file or the data contents of the packet are not of interest.

*RST: PEDit

Example:

BB:BTO:PCON:DSFP PED

enables packet editor under data source for packet.

Manual operation: See ["Data Source for Packet"](#) on page 43

[:SOURCE<hw>]:BB:BTOoth:PCONfiguration:DWHitening <DWhitening>

Activates the "Data Whitening".

Parameters:

<DWhitening> 0 | 1 | OFF | ON

*RST: 0

Example:

BB:BTO:PCON:DWH ON

activates data whitening.

Manual operation: See ["Data Whitening"](#) on page 43

[:SOURCE<hw>]:BB:BTOoth:PCONfiguration:EIRPacketfollows <EirPacketFollow>

Indicates that an extended inquiry response packet can follow.

Parameters:

<EirPacketFollow> YES | NO

YES

Indicates that EIR packet follows.

NO

Indicates that EIR packet does not follow.

*RST: NO

Example:

BB:BTO:PCON:PTYP FHS

sets the packet type.

BB:BTO:PCON:DSFP PED

enables the packet editor under data source for the packet

BB:BTO:PCON:EIRP YES

the EIR packet follows.

Manual operation: See ["EIR packet follows"](#) on page 46

[[:SOURce<hw>]:BB:BT0oth:PCONfiguration:HFControl <HfControl>

The command sets the FLOW bit in the header. This bit indicates start or stop of transmission of packets over the ACL logical transport.

Parameters:

<HfControl> GO | STOP

GO

Allows the other devices to transmit new data.

STOP

Stops the other devices from transmitting data temporarily.

*RST: GO

Example:

BB:BT0:PCON:PTYP DH1

sets the packet type.

BB:BT0:PCON:DSFP PED

enable packet editor under data source for packet.

BB:BT0:PCON:HFC GO

allows the other devices to transmit new data.

Manual operation: See "[Flow Control](#)" on page 44

[[:SOURce<hw>]:BB:BT0oth:PCONfiguration:LFSWord <LapForSW>, <BitCount>

Sets the lower address part (LAP) of the sync word for FHS packets. The length of LAP is 24 bits or 6 hexadecimal figures.

Parameters:

<LapForSW> numeric

Range: #H000000 to #FFFFFFF

*RST: #H000080

<BitCount> integer

Range: 8 to 24

*RST: 24

Example:

BB:BT0:PCON:LFSW #H000080,24

Sets the lower address part.

Manual operation: See "[LAP for Sync Word](#)" on page 43

[[:SOURce<hw>]:BB:BT0oth:PCONfiguration:LTAddress <LtAddress>

The command enters the logical transport address for the header. Each slave active in a piconet is assigned a primary logical transport address (LT_ADDR). The all-zero LT_ADDR is reserved for broadcast messages.

Parameters:

<LtAddress> integer
 Range: 0 to 7
 Increment: 1
 *RST: 0

Example:

BB:BTO:PCON:PTYP DH1
 sets the packet type.
 BB:BTO:PCON:DSFP PED
 enable packet editor under data source for packet
 BB:BTO:PCON:LTAD 0
 sets the logical transport address equal zero.

Manual operation: See "[Logical Transport Address](#)" on page 44

[:SOURCE<hw>]:BB:BTOoth:PCONfiguration:PFControl <PfControl>

The command sets the FLOW bit in the payload (flow control per logical link).

Parameters:

<PfControl> GO | STOP
GO
 Indicates the start of transmission of ACL packets after a new connection has been established.
STOP
 Indicates the stop of transmission of ACL packets before an additional amount of payload data is sent.
 *RST: GO

Example:

BB:BTO:PCON:PTYP DH1
 sets the packet type.
 BB:BTO:PCON:DSFP PED
 enable packet editor under data source for packet
 BB:BTO:PCON:PFC GO
 allows the flow per logical link.

Manual operation: See "[Flow Control](#)" on page 46

[:SOURCE<hw>]:BB:BTOoth:PCONfiguration:PLENgtH <PLength>

Sets the packet length in symbols.

Parameters:

<PLength> integer
 Range: 1 to depends on packet type
 Increment: 1
 *RST: depends on packet type

Example: BB:BTO:PCON:DSFP ADAT
fills the all data under data source for packet.
BB:BTO:PCON:PLEN 1
sets the packet length.

Manual operation: See "[Packet Length](#)" on page 49

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:SLAP <State>

Activates synchronization of the lower address part (LAP) of the sync word and Bluetooth device address.

Parameters:
<State> 0 | 1 | OFF | ON
*RST: 1

Example: BB:BTO:PCON:SLAP 0
deactivates LAP synchronization.
BB:BTO:PCON:LFSW #H000080,24
sets LAP of the sync word separately.

Manual operation: See "[Synchronize LAP with BD_ADDR](#)" on page 43

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:SNSValue <SnSvalue>

Sets the start value of the header SEQN bit. The SEQN bit is present in the header to filter out retransmissions in the destination. The signal generator is altering this bit automatically on consecutive frames, if a sequence length of at least 2 frames is set.

Parameters:
<SnSvalue> integer
Range: 0 to 1
*RST: 1

Example: BB:BTO:PCON:PTYP DH1
sets the packet type.
BB:BTO:PCON:DSFP PED
enables packet editor under data source for packet.
BB:BTO:PCON:SNSV ONE
sets the SEQN bit of the first CRC data packet at the start of a connection.

Manual operation: See "[SEQN Start Value](#)" on page 45

[:SOURCE<hw>]:BB:BT0oth:PCONfiguration:SRMode <SrMode>

The command indicates the interval between two consecutive page scan windows, determines the behavior of the paging device.

Parameters:
<SrMode> R0 | R1 | R2

R0

The scan interval is equal to the scan window T w page scan (continuous nscan) and maximal 1.28s.

R1

The scan interval is maximal 1.28s.

R2

The scan interval is maximal 2.56s.

*RST: R0

Example:

BB:BTO:PCON:PTYP FHS

sets the packet type.

BB:BTO:PCON:DSFP PED

enables packet editor under data source for packet.

BB:BTO:PCON:SRM R0

sets the scan repetition mode.

Manual operation: See "[Scan Repetition Mode](#)" on page 46

[:SOURce<hw>]:BB:BT0oth:PCONfiguration:VDATa <VData>

Selects the data source for the voice field.

Parameters:

<VData>

ALL0 | ALL1 | PATtern | PN09 | PN11 | PN15 | PN16 | PN20 |
PN21 | PN23 | DLISt

*RST: PN09

Example:

BB:BTO:PCON:VDAT ALL1

sets the voice data type.

Manual operation: See "[Data Source \(Voice Field\)](#)" on page 47

6.11 Channel Configuration Commands - LE

[:SOURce<hw>]:BB:BT0oth:BCRole	161
[:SOURce<hw>]:BB:BT0oth:CCRC:STATe	161
[:SOURce<hw>]:BB:BT0oth:CTYPe	161
[:SOURce<hw>]:BB:BT0oth:DCYClE	162
[:SOURce<hw>]:BB:BT0oth:PFORmat	162
[:SOURce<hw>]:BB:BT0oth:UPTYPe	162
[:SOURce<hw>]:BB:BT0oth:USLength	164
[:SOURce<hw>]:BB:BT0oth:MFORmat	164
[:SOURce<hw>]:BB:BT0oth:DURation	165

[[:SOURce<hw>]:BB:BT0oth:BCRole <BcRole>

Determines the controller role. Depending on the selected channel type different roles are assigned to the controller. For channel type "Data", master or slave can be assigned. If channel type "Advertising" is selected, the parameter is read only and displayed directly above the graph.

Parameters:

<BcRole> MASTer | SLAVe | ADVertiser | SCANner | INITiator

MASTER

Assigns master role to the controller.

SLAVE

Selects slave as controller role.

ADVERTISER|SCANNER|INITIATOR

Assigned roles depending on the selected packet type of the respective channel type.

*RST: MASTer

Example:

SOUR:BB:BT0:BCR MAST

master as controller role.

SOUR:BB:BT0:BCR SLAV

slave as controller role.

Manual operation: See ["Bluetooth Controller Role"](#) on page 53

[[:SOURce<hw>]:BB:BT0oth:CCRC:STATE <State>

Enables/disables the corruption of CRC for every second generated packet. If enabled, only 50% of packets are generated with correct CRC.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114

Manual operation: See ["Corrupted CRC Every 2nd Packet"](#) on page 54

[[:SOURce<hw>]:BB:BT0oth:CTYPe <CType>

Determines the channel type. Advertising and data are available.

Parameters:

<CType> ADVERTising | DATA

ADVERTISING

Selects channel type Advertising.

DATA

Selects channel type Data. Devices in a connected state transmit data channel packets in connection events with a start point and an interval.

*RST: ADVertising

Example:

SOUR:BB:BTO:CTYP ADV
channel type Advertising.
SOUR:BB:BTO:CTYP DATA
channel type Data.

Manual operation: See ["Channel Type"](#) on page 50

[:SOURce<hw>]:BB:BTOoth:DCYCLE <DCycle>

Specifies duty cycle for directed advertising (packet type ADV_DIRECT_IND).

Parameters:

<DCycle> LOW | HIGH
*RST: HIGH

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114

Options: R&S SMW-K117

Manual operation: See ["Duty Cycle"](#) on page 52

[:SOURce<hw>]:BB:BTOoth:PFORmat <PFormat>

Specifies the physical layer of LE signal.

Parameters:

<PFormat> L1M | L2M | LCOD
L1M: LE 1M
L2M: LE 2M
LCOD: LE coded
*RST: L1M

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114

Options: R&S SMW-K117

Manual operation: See ["Packet Format"](#) on page 52

[:SOURce<hw>]:BB:BTOoth:UPTYPE <UpType>

Selects the packet type. The available packets depend on the selected channel type.

Parameters:

<UpType> AIND | ADINd | ANINd | SREQ | SRSP | CREQ | ADCind |
DATA | CUReq | CMReq | TIND | EREQ | ERSP | SEReq |
SERSp | URSP | FREQ | FRSP | TPACKet | PEReq | PERSp |
VIND | RIND | PREQ | PRSP | PUIN | LREQ | LRSP | SFR |
CPR | CPRS | REIN | PIR | PIRS | AEINd | AAInD | ACINd |
ASINd | ASReq | ASPSp | ACRSp | ACReq | MUCH | CONT |
CTEQ | CTEP | PSINd | CAReq | CARSp
AINd: ADV_IND

ADINd: ADV_DIRECT_IND
ANINd: ADV_NONCONN_IND
SREQ: SCAN_REQ
SRSP: SCAN_RSP
CREQ: CONNECT_IND
ADCind: ADV_SCAN_IND
DATA: DATA
CUReq: LL_CONNECTION_UPDATE_IND
CMReq: LL_CHANNEL_MAP_IND
TIND: LL_TERMINATE_IND
EREQ: LL_ENC_REQ
ERSP: LL_ENC_RSP
SEReq: LL_START_ENC_REQ
SERSp: LL_START_ENC_RSP
URSP: LL_UNKNONW_RSP
FREQ: LL_FEATURE_REQ
FRSP: LL_FEATURE_RSP
TPACket: TEST PACKET
PEReq: LL_PAUSE_ENC_REQ
PERSp: LL_PAUSE_ENC_RSP
VIND: LL_VERSION_IND
RIND: LL_REJECT_IND
PREQ: LL_PHY_REQ
PRSP: LL_PHY_RSP
PUIN: LL_PHY_UPDATE_IND
LREQ: LL_LENGTH_REQ
LRSP: LL_LENGTH_RSP
SFR: LL_SLAVE_FEATURE_REQ
CPR: LL_CONNECTION_PARAM_REQ
CPRS: LL_CONNECTION_PARAM_RSP
REIN: LL_REJECT_EXT_IND
PIR: LL_PING_REQ
PIRS: LL_PING_RSP
AEINd: ADV_EXT_IND
AAINd: AUX_ADV_IND
ACINd: AUX_CHAIN_IND
ASINd: AUX_SYNC_IND
ASReq: AUX_SCAN_REQ
ASPSp: AUX_SCAN_RSP
ACRSp: AUX_CONNECT_RSP
ACReq: AUX_CONNECT_REQ
MUCH: LL_MIN_USED_CHANNELS_IND
CONT: CONTINUOUS
CTEQ: LL_CTE_REQ
CTEP: LL_CTE_RSP
PSIND: LL_PERIODIC_SYNC
CAReq: LL_CLOCK_ACCURACY_REQ
CARSp: LL_CLOCK_ACCURACY_RSP
***RST:** AIND

- Example:** See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114
- Options:** PREQ, PRSP, PUIIN, LREQ, LRSP, SFR, CPR, CPRS, REIN, PIR, PIRS, AEIN, AAIN, ACIN, ASIN, ASR, ASPs, ACRS, ACR, MUCH, CTEQ, CTEP, PSIND, CAReq, CARSp require R&S SMW-K117
- Manual operation:** See ["Packet Type"](#) on page 50

[:SOURce<hw>]:BB:BT0oth:USLength <UsLength>

Selects the number of frames or events depending on the packet type. The signal repeats after the specified number of frames/events.

For SCAN_REQ and CONNECT_IND packet, the sequence length is expressed in "Frames".

For AUX_SCAN_REQ and AUX_CONNECT_REQ packet, the sequence length is expressed in "Frames".

For LL_TERMINATE_IND packets, a default value according to the specification is given:

Master: 'SlaveLatency + 6'

Slave: '6'

For all other packet types the sequence length is expressed in "Events".

Parameters:

<UsLength> integer
 Range: depends on the number of states in dirty transmitter test to dynamic
 *RST: 1

Example: SOUR:BB:BT0:USL 1000

Manual operation: See ["Sequence Length"](#) on page 53

[:SOURce<hw>]:BB:BT0oth:MFORmat <ModFmt>

Specifies the physical layer used for CONTINUOUS payload transmission.

Parameters:

<ModFmt> L1M | L2M | LCOD
L1M: LE 1M
L2M: LE 2M
LCOD: LE coded
 *RST: L1M

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114

Options: R&S SMW-K117 required for L2M, LCOD

Manual operation: See ["Modulation Format"](#) on page 54

[:SOURce<hw>]:BB:BT0oth:DURation <Duration>

Specifies the transmission duration of CONTINUOUS payload transmission.

Command sets the values in ms. Query returns values in s.

Parameters:

<Duration> float
 Range: depending on modulation format, symbols per a bit and payload type
 Default unit: ms

Example:

SOURce1:BB:BT0oth:DURation 10

Sets the duration of 10 ms.

See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Duration"](#) on page 54

6.12 Event and Frame Configuration Commands - LE



The time unit of timing and delay commands is ms by default. You can change the time unit to s with the command [Chapter 6.2, "General Commands"](#), on page 124.

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:ACTable:CHANnel<ch0>:STATe.....	166
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:DCTable:CHANnel<ch0>:STATe.....	166
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DCMTable: CHANnel<ch0>:STATe.....	166
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:AEDelay.....	166
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:ADINterval.....	167
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:AEINterval.....	167
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:APINterval.....	167
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:LCMode.....	168
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:LTKey.....	168
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MNINterval.....	169
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MXINterval.....	169
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSet<ch0>:STATe.....	169
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSet<ch0>:VALue.....	170
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:PAINterval.....	170
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:PPERiodicity.....	171
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RCECount.....	171
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PNUMBER.....	171
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:SDCI?.....	171
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:SINterval.....	172
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:SWINdow.....	172
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:WOINfo?.....	173
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:WSINfo?.....	173

```
[ :SOURce<hw>]:BB:BT0oth:ECOnfiguration:ACTable:CHANnel<ch0>:STATe
<State>
```

```
[ :SOURce<hw>]:BB:BT0oth:ECOnfiguration:DCTable:CHANnel<ch0>:STATe
<State>
```

```
[ :SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCOnfiguration:DCMTable:
CHANnel<ch0>:STATe <State>
```

Indicates used and unused data channels.

Note: The previously used syntax `. . . :SET<ch>:STATe` has been replaced by `. . . :CHANnel<ch>:STATe`. Compatibility to the previous commands is given.

This parameter is relevant for data event and advertising frame configuration with the packet types LL_CHANNEL_MAP_IND, CONNECT_IND.

Within the option R&S SMW-K117, the following packet types are also relevant for the setting: AUX_CONNECT_IND, AUX_EXT_IND, AUX_ADV_IND, AUX_CHAIN_IND, AUX_SYNC_IND, AUX_SCAN_RSP.

Parameters:

```
<State>          0 | 1 | OFF | ON
*RST:            0
```

Example:

```
SOUR:BB:BT0:ECON:ACT:CHAN:STAT ON
State in Advertising Channel Table and Secondary Advertising
Channel Table
SOURce:BB:BT0:ECON:DCT:CHAN:STAT ON
State in Data Channel Table and Secondary Advertising Chan-
nel Table
SOUR:BB:BT0:ECON:PCON:DCMT:CHAN:STAT ON
State in Data Channel Map Table
```

Manual operation: See "[Channel Table](#)" on page 62

```
[ :SOURce<hw>]:BB:BT0oth:ECOnfiguration:AEDelay <AeDelay>
```

Sets a time delay between the start times of two consecutive advertising events. The value is added to the advertising event interval.

Command sets the values in ms. Query returns values in s.

Parameters:

```
<AeDelay>       float
Range:          0 s to 10E-3 s
Increment:      0.1E-3 s
*RST:           0 s
Default unit:   ms
```

Example:

```
SOUR:BB:BT0:ECON:AEDelay 5
Sets a delay of 5 ms.
See Chapter 6.1.7, "Channel Settings for LE", on page 114.
```

Manual operation: See "[Advertising Event Delay](#)" on page 57

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:ADINterval <AdInterval>

Sets the time interval between two consecutive advertising events for packet type "ADV_DIRECT_IND" and duty cycle high.

Command sets the values in ms. Query returns values in s.

Parameters:

<AdInterval> float
 Range: 1.05E-3 s to 3.75E-3 s
 Increment: 0.01E-3 s
 *RST: 3.75E-3 s
 Default unit: ms

Example:

SOUR:BB:BT0:ECOn:ADIN 13

Sets a time interval of 13 ms.

See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Advertising Event Interval"](#) on page 57

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:AEINterval <AeInterval>

Sets the time interval between two consecutive advertising events, with regard to the starting points.

Command sets the values in ms. Query returns values in s.

Parameters:

<AeInterval> float
 Range: 5E-3 s to depends on oversampling
 Increment: 0.1E-3 s
 *RST: 20E-3 s
 Default unit: ms

Example:

SOUR:BB:BT0:ECOn:AEIN 15

Sets a time interval of 15 ms.

See [Chapter 6.1.7.1, "Configure Advertising Packets"](#), on page 115.

Manual operation: See ["Advertising Event Interval"](#) on page 57

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:APINterval <ApInterval>

Sets the time interval between packets starting points of two consecutive packets in the advertising channel.

Command sets the values in ms. Query returns values in s.

Parameters:

<ApInterval> float
 Range: 1.3E-3 s to 10E-3 s
 Increment: 0.1E-3 s
 *RST: 10E-3 s
 Default unit: ms

Example:

```
SOUR:BB:BTO:ECON:APIN 1.3
```

Sets a time interval of 1.3 ms.

See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Advertising Packet Interval"](#) on page 58

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:LCMode <LcMode>

Selects the link layer connection mode. In order to provide safe transmission of payload data, the data in the packet can be encrypted. If activated, the payload data follows MIC (Message authentication Code).

Parameters:

<LcMode> UENC | ENC
UENC
 Payload data is transmitted without encoding.
ENC
 The link layer connection runs in encrypted mode.
 *RST: UENC

Example:

```
SOUR:BB:BTO:ECON:LCM UENC
```

without encoding.

```
SOUR:BB:BTO:ECON:LCM ENC
```

in encrypted mode.

Manual operation: See ["LL Connection Mode"](#) on page 59

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:LTKKey <LtKey>, <BitCount>

Indicates the time the controller needs to receive the long-term key from the host. After this time, the controller is ready to enter into the last phase of encryption mode setup.

Parameters:

<LtKey> numeric
 *RST: #H0
 <BitCount> integer
 Range: 128 to 128
 *RST: 128

Example:

```
SOUR:BB:BTO:ECON:LCM ENC
```

```
SOUR:BB:BTO:ECON:LTK
```

```
#H00000000000000000000000000000000,128
```

In encrypted mode, the code can be edited.

Manual operation: See ["Long Term key \(hex\)"](#) on page 61

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MNINterval
 <MNInterval>

Specifies the minimum allowed connection interval.

Command sets the values in ms. Query returns values in s.

Parameters:

<MNInterval> float
 Range: 7.5E-3 s to depending on Max. Interval
 Increment: 1.25E-3 s
 *RST: 7.5E-3 s

Example: BT0oth:ECONfiguration:PCONfiguration:MNINterval 7.5
 Sets a time interval of 7.5 ms.
 See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See ["Min. / Max. Interval"](#) on page 79

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MXINterval
 <MInterval>

Specifies the maximum allowed connection interval.

Command sets the values in ms. Query returns values in s.

Parameters:

<MInterval> float
 Range: 7.5E-3 s to 4000E-3 s
 Increment: 1.25E-3 s
 *RST: 7.5E-3 s

Example: BT0oth:ECONfiguration:PCONfiguration:MXINterval 12.5
 Sets a time interval of 12.5 ms.
 See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See ["Min. / Max. Interval"](#) on page 79

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSet<ch0>:
 STATE <State>

Enables / disables Offset0 to Offset5 of the offset setting table.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See "[Offset Setting Table](#)" on page 79

**[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:OFFSet<ch0>:
VALue <Offset>**

Specifies Offset0 to Offset5 of the offset setting table.

Command sets the values in ms. Query returns values in s.

Parameters:

<Offset> float
 Range: 0 s to depending on Max. Interval
 Increment: 1.25
 *RST: 0
 Default unit: ms

Example:

```
SOUR:BB:BT0:ECON:PCON:OFFSet0:VALue 7
SOUR:BB:BT0:ECON:PCON:OFFSet0:VALue?
\\ 7.5
```

Sets the Offset0 to 7.5 ms. The setting 7 ms is automatically changed to the closest multiple of 1.25 ms, which is 7.5 ms. See [Example "Packet configuration"](#) on page 121.

Options: R&S SMW-K117

Manual operation: See "[Offset Setting Table](#)" on page 79

**[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:PAINterval
<Interval>**

Sets the time interval between the start of two AUX_SYNC_IND PDUs from the same advertising set.

Command sets the values in ms. Query returns values in s.

Parameters:

<Interval> float
 Range: 7.5E-3 s to depending on oversampling
 Increment: 0.01E-3 s
 *RST: 20E-3 s
 Default unit: ms

Example:

```
SOURce:BB:BT0oth:ECON:PCON:PAINterval 10
```

Sets a time interval of 10 ms.

See [Chapter 6.1.7.1, "Configure Advertising Packets"](#), on page 115.

Manual operation: See "[Periodic Advertising Interval](#)" on page 57

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PPERiodicity
 <PPERiodicity>

Specifies a value the connection interval is preferred to be a multiple of.

Parameters:

<PPERiodicity> float
 Range: 0 to depends on Max. Interval
 Increment: 0.01E-3
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See ["Preferred Periodicity"](#) on page 79

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:RCECount
 <RCECount>

Specifies the ReferenceConnEventCount field of LL_CONNECTION_PARAM_REQ.

Parameters:

<RCECount> integer
 Range: 0 to 65535
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See ["Ref. Connection Event Count"](#) on page 79

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PNUMBER <PNumber>

Sets the number of Tx packets per event. Each connection contains at least one data channel packet. The maximum number of packets per event is determined by the duration of the connection event interval.

Parameters:

<PNumber> integer
 Range: 1 to depends on connection event interval
 *RST: 1

Example: SOUR:BB:BT0:ECON:PNUM 2580
 sets the number of Tx packets per event.

Manual operation: See ["No. of Tx Packets per Event"](#) on page 59

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:SDCI?

Queries the number of the first active data channel.

Return values:

<SelectedChannel> integer
 Range: 0 to 36
 *RST: 0

Example: SOURce1:BB:BT0oth:ECOnfiguration:SDCI?

Usage: Query only

Manual operation: See "[Selected Data Channel Index](#)" on page 61

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:SINTerval <SInterval>

Sets the time interval between the starting points of two consecutive windows during which the scanner is operating in an advertising channel.

Command sets the values in ms. Query returns values in s.

Parameters:

<SInterval> float
 Range: 10E-3 s to depends on oversampling and the number of advertising channel table states
 Increment: 0.625E-3 s
 *RST: 10E-3 s
 Default unit: ms

Example: SOUR:BB:BT0:ECOn:SINT 3.5
 Sets a time interval of 3.5 ms.
 See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See "[Scan Interval](#)" on page 57

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:SWINdow <SWindow>

Sets the length of the window during which the scanner is operating in the advertising channel. Note that the scan window is less or equal to the value of the scan interval.

Command sets the values in ms. Query returns values in s.

Parameters:

<SWindow> float
 Range: 10E-3 s to 10240E-3 s
 Increment: 0.625E-3 s
 *RST: 10E-3 s
 Default unit: ms

Example: SOUR:BB:BT0:ECOn:SWIN 10
 Sets the length of the window to 10 ms.
 See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See "[Scan Window](#)" on page 57

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:WOInfo?

(for data event and advertising frame configuration with the packet type CONNECT_IND)

Queries the start point of the transmit window.

Return values:

<WoInfo> string

Example:

SOUR:BB:BTO:UPTY CREQ

Sets packet type CONNECT_IND

SOUR:BB:BTO:ECON:PCON:WOIN?

Queries the start point of the transmit window.

Usage:

Query only

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:WSInfo?

(for data event and advertising frame configuration with the packet type CONNECT_IND)

Queries the size of the transmit window, regarding to the start point.

Return values:

<WsInfo> string

Example:

SOUR:BB:BTO:UPTY CREQ

Sets packet type CONNECT_IND

SOUR:BB:BTO:ECON:PCON:WSIN?

Queries the size of the transmit window.

Usage:

Query only

Manual operation: See "[Transmit Window Size](#)" on page 58

6.13 Packet Configuration Commands - LE



The time unit of timing and delay commands is ms by default. You can change the time unit to s with the command [Chapter 6.2, "General Commands"](#), on page 124.

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6.13.1 General Configuration

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<code>[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:AADDRESS</code>	174
<code>[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:CIValue</code>	174

`[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:DWHitening` <DWhitening>

Activates or deactivates the Data Whitening. Evenly distributed white noise is ideal for the transmission and real data can be forced to look similar to white noise with different methods called Data Whitening. Applied to the PDU and CRC fields of all packet types, whitening is used to avoid long equal sequences in the data bit stream.

Parameters:

<DWhitening> 0 | 1 | OFF | ON
*RST: 0

Example:

BB:BTO:ECON:PCON:DWH ON
activates data whitening.

Manual operation: See "[Data Whitening](#)" on page 64

`[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:AADDRESS` <AAddress>, <BitCount>

Sets the access address of the link layer connection (32-bit string).

Parameters:

<AAddress> numeric
*RST: #HACDE48AC

<BitCount> integer
Range: 32 to 32
*RST: 32

Example:

SOUR:BB:BTO:ECON:PCON:AADD #H00000000, 32
Sets an access address.

Manual operation: See "[Access Address](#)" on page 64

`[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:CIValue` <CiValue>, <BitCount>

Sets the initialization value for the CRC (Cyclic Redundancy Check, 24 bits) calculation. A packet has been received correctly, when it has passed the CRC check.

Parameters:

<CiValue> numeric
*RST: #H0

<BitCount> integer
 Range: 24 to 24
 *RST: 24

Example: SOUR:BB:BTO:ECON:PCON:CIV #H000000,24
 Sets the initialization value for the CRC.

Manual operation: See "CRC Initial" on page 66

6.13.2 Header Configuration

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[SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CSElection
 <CSelection>

Specifies the algorithm of channel selection.

Parameters:

<CSelection> CS1 | CS2
 Algorithm #1 or algorithm #2
 *RST: CS1

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See "[Channel Selection](#)" on page 65

[SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:NSValue <NsValue>

Sets the start value of the next expected packet from the same device in the LL connection ("N"ext"E"xpected "S"equence "N"umber). This parameter can be set in the first event. From the second event this field is not indicated.

Parameters:

<NsValue> integer
 Range: 0 to 1
 *RST: 1

Example: SOUR:BB:BTO:ECON:PCON:NSV 1
 Start Value is 1.

Manual operation: See "[NESN Start Value](#)" on page 65

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SSValue <SsValue>

Sets the sequence number of the packet. This parameter can be set in the first event. From the second event, this field is not indicated.

Parameters:

<SsValue> integer
 Range: 0 to 1
 *RST: 0

Example:

SOUR:BB:BT0:ECON:PCON:SSV 1
 sets the sequence number of the packet.

Manual operation: See "SN Start Value" on page 65

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CPResent <State>

Activates the CTEInfo field in the header of Bluetooth LE data packets in the LE un-coded PHY.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example:

See [Example "Event / frame configuration"](#) on page 116.

Manual operation: See "CTEInfo Present" on page 66

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CTIME <CTime>

Sets the CTETime comprising the length of constant tone extension field of the Bluetooth LE PDU.

Parameters:

<CTime> float
 Range: 16E-6 to 160E-6
 Increment: 8E-6
 *RST: 16E-6

Example:

See [Example "Event / frame configuration"](#) on page 116.

Manual operation: See "CTETime" on page 66

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CTReq <CTReq>

Sets the CTE type in the CTETypeReq field of the CtrData field of the LL_CTE_REQ PDU.

Parameters:

<CTReq> AOD1 | AOA | AOD2
AOA
 AoA Constant Tone Extension

AOD1AoD Constant Tone Extension with 1 μ s time slots**AOD2**AoD Constant Tone Extension with 2 μ s time slots

*RST: AOA

Example: See [Example "Event / frame configuration"](#) on page 116.**Manual operation:** See ["CTETypeReq"](#) on page 83**[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CTYPE <CType>**

Sets the type of constant tone extension. The type specifies the CTE AoA/AoD method and for AoD the length of the switching and I/Q sampling slots.

Parameters:

<CType>

AOD1 | AOA | AOD2

AOA

AoA Constant Tone Extension

AOD1AoD Constant Tone Extension with 1 μ s time slots**AOD2**AoD Constant Tone Extension with 2 μ s time slots

*RST: AOA

Example: See [Example "Event / frame configuration"](#) on page 116.**Manual operation:** See ["CTEType"](#) on page 67

6.13.3 Payload Configuration

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<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ROPCode</code>	199
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYs:L1M:STATe</code>	199
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYs:L2M:STATe</code>	199
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYs:LCOD:STATe</code>	199
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:L1M:STATe</code>	199
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:L2M:STATe</code>	200
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:LCOD:STATe</code>	200
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RVEctor</code>	200
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SCACcuracy</code>	200
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SLATency</code>	201
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SOUNits</code>	201
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SPOffset</code>	201
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SVNumber</code>	202
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPOWER</code>	202
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:UTYPE</code>	202
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:VNUMber</code>	203
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:WOFFset</code>	203
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:WSIZE</code>	204
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ATYPE</code>	204
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CECount</code>	204
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ID</code>	204
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:LPECounter</code>	205
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MCLReq</code>	205
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:L1M:STATe</code>	205
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:L2M:STATe</code>	206
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:PHY:LCOD:STATe</code>	206
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SCECounter</code>	206
<code>[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SID</code>	206

`[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ACAD <Data>`

Specifies the pattern source used for additional controller advertising data (ACAD).

Parameters:

`<Data>` `ALL0 | ALL1 | PATtern | PN09 | PN11 | PN15 | PN16 | PN20 |`
 `PN21 | PN23 | DLISt`

ALL0 / ALL1

All 0 or all 1 pattern

PATtern

User-defined pattern. The pattern can be specified via:

`[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ACAD:APATtern` on page 180

PNxx

Pseudo-random bit sequences (PRBS) of a length of xx bits.
 The length in bit can be 9, 11, 15, 16, 20, 21, or 23.

DLIST

Internal ACAD data list is used. The data list can be specified via:

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD:ASELectio` on page 180

*RST: PN09

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["ACAD"](#) on page 78

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD:APATtern`
`<DPattern>, <BitCount>`

Specifies user-defined pattern. The settings is relevant for

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD`
`PATtern`

Parameters:

`<DPattern>` numeric

*RST: #H0

`<BitCount>` integer

Range: 1 to 64

*RST: 1

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AList / Pattern"](#) on page 78

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACAD:ASELectio`
`<DSelection>`

Specifies data list file. The settings is relevant for

`[:SOURCE<hw>] :BB:BT0oth:ECOnfiguration:PCOnfiguration:ACADDLIST`

Parameters:

`<DSelection>` string

Path and file name.

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AList / Pattern"](#) on page 78

```

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:ACID <Acid>,
  <BitCount>
[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:ACASigned
  <AcAssigned>, <BitCount>
[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:SCASigned
  <ScAssigned>, <BitCount>
[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:SCID <Scid>,
  <BitCount>
[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:ICASigned
  <IcAssigned>, <BitCount>
[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:ICID <Icid>,
  <BitCount>

```

Sets the advertiser's device address. For advertising channel packets, the format of the device address differs, depending on the selected address type.

- "Public Address Types"
The public address is given from the registration authority IEEE and is composed of:
 - LSB: 24 bits = company_assigned
 - MSB: 24 bits = company_id
- "Random Address Type" is a 48-bits random static device address.
- "Private Address Type"
A private address is optional and composed of:
 - LSB: 24 bits = hash
 - MSB: 24 bits = random

Parameters:

```

<Icid>          numeric
                *RST:    #HACDE48

<BitCount>     integer
                Range:   24 to 24
                *RST:    24

```

Example:

```

SOUR:BB:BTO:ECON:PCON:ACID #H000000,24
SOUR:BB:BTO:ECON:PCON:ACAS #H000000,24
Company_Assigned and Company_Id in Advertiser's Device
Address)
SOUR:BB:BTO:ECON:PCON:SCAS #H000000,24
SOUR:BB:BTO:ECON:PCON:SCID #H000000,24
Company_Assigned and Company_Id in Scanners Device
Address)
SOUR:BB:BTO:ECON:PCON:ICAS #H000000,24
SOUR:BB:BTO:ECON:PCON:ICID #H000000,24
Company_Assigned and Company_Id in Initiators Device
Address)

```

Manual operation: See "[Device Address](#)" on page 69

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:ADID <Adid>, <BitCount>

Specifies "Advertising Data ID" in hexadecimal format to be signaled within an extended header.

Parameters:

<Adid>	numeric
	*RST: #H000
<BitCount>	integer
	Range: 12 to 12
	*RST: 12

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AdvDataInfo Configuration"](#) on page 84

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:ALAP <Lap>, <BitCount>

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:ILAP <Lap>, <BitCount>

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:SLAP <Lap>, <BitCount>

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:TLAP <Lap>, <BitCount>

Sets the lower address part (LAP) of Bluetooth device address. Commands for the advertising . . . :ALAP, initiating . . . :ILAP, scanning . . . :SLAP PDUs of advertising channel type are provided. In addition, a command is provided for scanner's or initiator's target device address to which the advertisement is directed . . . :TLAP.

Parameters:

<Lap>	numeric
	*RST: #H000080
<BitCount>	integer
	Range: 24 to 24
	*RST: 24

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Device Address"](#) on page 69

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:ALENgtH <Length>

Specifies the length of ACAD data pattern.

Parameters:

<Length> integer
 Range: 0 to 62
 *RST: 27

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["ACAD Length"](#) on page 78

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:AMODE <AMode>

Indicates the mode of the advertisement.

Parameters:

<AMode> NCNS | CNS | NCS
NCNS: Non-connectable, non-scannable
CNS: Connectable, non-scannable
NCS: Non-connectable, non-scannable
 *RST: NCNS

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Advertising Mode"](#) on page 76

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ANUap <NapUap>, <BitCount>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:INUap <NapUap>, <BitCount>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SNUap <NapUap>, <BitCount>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TNUap <NapUap>, <BitCount>

Sets the non-significant address part (NAP) and upper address part (UAP) of Bluetooth device address. Commands for the advertising . . : ANUap, initiating . . : INUap, and scanning . . : SNUap PDUs of advertising channel type are provided. In addition, a command is provided for scanner's or initiator's target device address to which the advertisement is directed . . : TNUap.

Parameters:

<NapUap> numeric
 *RST: #HACDE48
 <BitCount> integer
 Range: 24 to 24
 *RST: 24

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Device Address"](#) on page 69

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:AOffSet <AOffset>

Specifies the time from the start of the packet containing the AuxPtr field to the approximate start of the auxiliary packet. The offset is determined by multiplying the value by the unit, see

[\[:SOURce<hw>\]:BB:BT0oth:ECOnfiguration:PCONfiguration:AOUNits](#)

Parameters:

<AOffset> float
Range: 0 to 245.7 or 246 to 2457 depending on offset unit

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Aux Offset"](#) on page 85

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:AOUNits <Unit>

Indicates the units used by the "Aux Offset" parameter, see

[\[:SOURce<hw>\]:BB:BT0oth:ECOnfiguration:PCONfiguration:AOffSet](#)

Parameters:

<Unit> U30 | U300
U30: 30 µs
U300: 300 µs
*RST: U30

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Offset Units"](#) on page 85

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:APHY <APhy>

Specifies the physical layer used to transmit the auxiliary packet.

Parameters:

<APhy> L1M | L2M | LCOD
LE 1M, LE 2M, LE coded PHY
*RST: L1M

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AUX PHY"](#) on page 86

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:ASID <Asid>, <BitCount>

Specifies the "Advertising Set ID" in hexadecimal format to be signaled within an extended header.

Parameters:

<Asid> numeric
 *RST: #H0

<BitCount> integer
 Range: 4 to 4
 *RST: 4

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AdvDataInfo Configuration"](#) on page 84

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:CACCuracy <CAccuracy>

Specifies the clock accuracy of the advertiser used between the packet containing this data and the auxiliary packet.

Parameters:

<CAccuracy> T500 | T50
 T500: 51 ppm to 500 ppm
 T50: 0 ppm to 50 ppm
 *RST: T500

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Clock Accuracy"](#) on page 85

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:CID <Cid>, <BitCount>

Sets the company identifier of the manufacturer of the Bluetooth Controller. A 16 bit value is set.

Note: This parameter is relevant for data frame configuration and for the packet type LL_VERSION_IND.

Parameters:

<Cid> numeric
 *RST: 0

<BitCount> integer
 Range: 16 to 16
 *RST: 16

Example: SOUR:BB:BTO:ECON:PCON:CID #H0000,16
 Sets the company ID.

Manual operation: See "[Company ID](#)" on page 75

[:SOURce<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:CINstant
 <CInstant>

Sets a connection instant for indicating the connection event at which the new connection parameters are taken in use.

Parameters:

<CInstant> integer
 Range: 1 to depends on sequence length
 *RST: 1

Example: SOUR:BB:BTO:ECON:PCON:CINS 2
 sets a connection instant.

Manual operation: See "[Connection Instant](#)" on page 72

[:SOURce<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:CINterval
 <CInterval>

Sets the time interval between the start points of two consecutive connection events for the packet type DATA and all CONTROL_DATA packet types.

Command sets the values in ms. Query returns values in s.

Parameters:

<CInterval> float
 Range: 7.5E-3 s to depends on oversampling
 Increment: 1.25E-3 s
 *RST: 7.5E-3 s
 Default unit: ms

Example: SOUR:BB:BTO:ECON:PCON:CINT 7.0
 Sets a time interval of 7 ms.
 See [Example "Packet configuration"](#) on page 121.

Manual operation: See "[Connection Event Interval](#)" on page 59

[:SOURce<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:DATA <Data>

Selects the pattern source used for the payload.

Parameters:

<Data> ALL0 | ALL1 | PATtern | PN09 | PN11 | PN15 | PN16 | PN20 |
 PN21 | PN23 | DLISt

ALL0 / ALL1

All 0 or all 1 pattern

PATtern

User-defined pattern. The pattern can be specified via:

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DATA:DPATtern on page 187

PNxx

Pseudo-random bit sequences (PRBS) of a length of xx bits. The length in bit can be 9, 11, 15, 16, 20, 21, or 23.

DLISt

Internal data list is used. The data list can be specified via:

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DATA:DSELection on page 187

*RST: PN09

Example:

```
SOUR:BB:BTO:ECON:PCON:DATA ALL0 | ALL1
SOUR:BB:BTO:ECON:PCON:DATA PATT
SOUR:BB:BTO:ECON:PCON:DATA:DPAT #H3F,8
SOUR:BB:BTO:ECON:PCON:DATA PN09
SOUR:BB:BTO:ECON:PCON:DATA DLIS
SOUR:BB:BTO:ECON:PCON:DATA:DSEL 'bluetooth-le'
```

Manual operation: See "Data Source" on page 70

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DATA:DPATtern
 <DPattern>, <BitCount>

Specifies the user-defined pattern. The setting is relevant for

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DATA
PATtern**Parameters:**

<DPattern> numeric
 *RST: #H0

<BitCount> integer
 Range: 1 to 64
 *RST: 1

Example:

```
BB:BTO:ECON:PCON:DATA PATT
BB:BTO:ECON:PCON:DATA:DPAT #B010101,6
```

Manual operation: See "Data Source" on page 70

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DATA:DSELection
 <DSelection>

Specifies data list file. The setting is relevant for

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:DATA:DLISt

Parameters:`<DSelection>` string**Example:**

```
BB:BTO:ECON:PCON:DATA DLIS
BB:BTO:ECON:PCON:DSEL Bluetooth-le
```

Manual operation: See ["Data Source"](#) on page 70

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:DLENGTH
<DLength>

Sets the payload data length in bytes.

Parameters:

`<DLength>` integer
 Range: 0 to 255 (advertiser) or 251 (data)
 *RST: 31

Example: See [Example "Packet configuration"](#) on page 121**Manual operation:** See ["Data Length"](#) on page 71

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:ECODE `<ECode>`,
<BitCount>

Sets the error code value to inform the remote device why the connection is about to be terminated in case of LL_TERMINATE_IND packet. On the other hand, this parameter for LL_REJECT_IND packet is used for the reason a request was rejected. A 8 bit value is set.

Note: This parameter is relevant for data frame configuration and the packet type:

- LL_TERMINATE_IND
- LL_REJECT_IND

Parameters:

`<ECode>` numeric
 *RST: #H00

`<BitCount>` integer
 Range: 8 to 8
 *RST: 8

Example: SOUR:BB:BTO:ECON:PCON:ECOD #H00,8
 Sets the error code.

Manual operation: See ["Error Code"](#) on page 75

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:ECOUNTER
<ECOUNTER>

Counts the AUX_SYNC_IND packets that the SyncInfo field describes.

Parameters:

<ECounter> integer
 Range: 0 to 65535
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Event Counter"](#) on page 87

[:SOURCE<hw>]:BB:BTObth:ECONfiguration:PCONfiguration:EDIVersifier
 <EDiversifier>, <BitCount>

Sets the encrypted diversifier of the master for device identification. The parameter is an initialization vector provided by the host in the HCI_ULP_Start_Encryption command.

Parameters:

<EDiversifier> numeric
 *RST: #H0000

<BitCount> integer
 Range: 16 to 16
 *RST: 16

Example: SOUR:BB:BTObth:ECON:PCON:EDIV #H0000,16
 Sets the encrypted diversifier of the master.

Manual operation: See ["Encrypted DIVersifier \(hex\)"](#) on page 73

[:SOURCE<hw>]:BB:BTObth:ECONfiguration:PCONfiguration:EHEader:STATe
 <State>

Enables / disables extended header for advertising packets with scanning PDUs.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 1

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Extended Header"](#) on page 76

[:SOURCE<hw>]:BB:BTObth:ECONfiguration:PCONfiguration:EHFLags:
 AADDRESS:STATe <State>

If enabled, the R&S SMW includes the signaling of non-significant advertising address part (NAP) and upper address part (UAP).

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AdvA"](#) on page 76

[:SOURCE<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:EHFLags:ADINfo:STATE <State>

Enables / disables the signaling of advertising data information consisting of "Advertising Data ID" and "Advertising Set ID".

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AdvData Info"](#) on page 77

[:SOURCE<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:EHFLags:APTR:STATE <State>

Enables / disables secondary advertising channel.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["AuxPtr"](#) on page 77

[:SOURCE<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:EHFLags:CINfo:STATE <State>

Activates the CTEInfo field in the extended header of Bluetooth LE advertising packets in the LE uncoded PHY.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Event / frame configuration"](#) on page 116.

Manual operation: See ["CTE Info"](#) on page 77

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:EHFLags:SINFo:STATe <State>

Enables / disables the signaling of SynclInfo field for periodic advertisement.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["SynclInfo"](#) on page 77

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:EHFLags:TADDRESS:STATe <State>

Enables / disables the signaling of non-significant address part (NAP) and upper address part (UAP) of a target address.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["TargetA"](#) on page 77

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:EHFLags:TPOWER:STATe <State>

Enables the signaling of required transmit power.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["TxPow"](#) on page 77

[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:FSBit<ch0>:STATe <State>

Enables / disables the features 0 to 16 for the used feature set.

Information is transmitted via LL_FEATURE_REQ, LL_FEATURE_RSP, LL_SLAVE_FEATURE_REQ.

The following features are configurable:

- `...FSBit0...`: LE encryption
- `...FSBit1...`: Connection parameter request procedure
- `...FSBit2...`: Extended reject indication
- `...FSBit3...`: Slave-initiated feature exchange
- `...FSBit4...`: LE ping
- `...FSBit5...`: LE data packet length extension
- `...FSBit6...`: LL privacy
- `...FSBit7...`: Extended scanner filter policies
- `...FSBit8...`: LE 2M PHY
- `...FSBit9...`: Stable modulation index - transmitter
- `...FSBit10...`: Stable modulation index - receiver
- `...FSBit11...`: LE coded PHY
- `...FSBit12...`: LE extended advertising
- `...FSBit13...`: LE periodic advertising
- `...FSBit14...`: Channel selection algorithm #2
- `...FSBit15...`: LE power class 1
- `...FSBit16...`: Minimum Number of Used Channels procedure

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Chapter 6.1.7.2, "Configure Data Packets"](#), on page 119

Options: R&S SMW-K117

Manual operation: See ["FeatureSet Configuration"](#) on page 87

[:SOURce<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:FSLength
 <FsLength>

Enables that the feature set length is indicated.

Parameters:

<FsLength> integer
 Range: 1 to 26
 *RST: 8

Example: SOUR:BB:BTO:ECON:PCON:FSL 12
 Feature set length is 12.

Manual operation: See ["Feature Set Length"](#) on page 74

**[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:HLENGth
<HLength>**

(for data event and advertising frame configuration with the packet type CONNECT_IND)

Sets the difference from the current channel to the next channel. The master and slave devices determine the data channel in use for every connection event from the channel map. Hop_length is set for the LL connection and communicated in the CONNECT_IND and LL_CHANNEL_MAP_IND packets.

Parameters:

<HLength> integer
 Range: 5 to 16
 *RST: 5

Example:

```
SOUR:BB:BT0:UPTY CREQ
sets packet type CONNECT_IND
SOUR:BB:BT0:ECON:PCON:HLEN 10
hop length is 10.
```

Manual operation: See "[Hop Length](#)" on page 73

**[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:LCTimeout
<LcTimeout>**

Defines the maximum time between two correctly received Bluetooth LE packets in the LL connection before the connection is considered lost for the packet type CONNECT_IND.

Command sets the values in ms. Query returns values in s.

Parameters:

<LcTimeout> float
 Range: 100E-3 s to 32000E-3 s
 Increment: 10E-3 s
 *RST: 100E-3 s
 Default unit: ms

Example:

```
SOUR:BB:BT0:ECON:PCON:LCT 75
Sets LL connection timeout to 75 ms.
See Chapter 6.1.7, "Channel Settings for LE", on page 114.
```

Manual operation: See "[LL Connection Timeout](#)" on page 72

**[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MIVector
<MiVector>, <BitCount>**

**[[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SIVector
<SiVector>, <BitCount>**

Sets the master's or the slave's portion of the initialization vector(IVm/IVs).

Parameters:

<SiVector> numeric
 *RST: #H0

<BitCount> integer
 Range: 32 to 32
 *RST: 32

Example:

SOUR:BB:BTO:ECON:PCON:MIV #H0000000000000000,32
 (Master).
 SOUR:BB:BTO:ECON:PCON:SIV #H0000000000000000,32
 (Slave).

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:MROctets
 <MROctets>

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:MTOctets
 <MTOctets>

Specifies the maximum allowed payload length of a packet to be received (. . :MROctets) or transmitted (. . :MTOctets). Information is signaled via LL_LENGTH_REQ and LL_LENGTH_RSP.

Parameters:

<MTOctets> integer
 Range: 27 to 251
 *RST: 27

Example: See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See ["Max Rx Octets / Max Tx Octets"](#) on page 79

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:MSKD <Mskd>,
 <BitCount>

[:SOURCE<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:SSKD <Sskd>,
 <BitCount>

Sets the master's or the slave's portion of the session key diversifier (SKDm/SKDs).

Parameters:

<Sskd> numeric
 *RST: #H0

<BitCount> integer
 Range: 64 to 64
 *RST: 64

Example: SOUR:BB:BTO:ECON:PCON:MSKD
 #H0000000000000000,64
 (Master).
 SOUR:BB:BTO:ECON:PCON:SSKD
 #H0000000000000000,64
 (Slave).

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MRTime <MRTime>
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MTTime <MTTime>

Specifies the maximum allowed time to receive (. . .:MRTime) or transmit (. . .:MTTime) a packet. Information is signaled via LL_LENGTH_REQ and LL_LENGTH_RSP.

Parameters:

<MTTime> float
 Range: 0.328E-3 to 17.04E-3
 Increment: 0.001E-3
 *RST: 17.04E-3

Example: See [Example "Packet configuration"](#) on page 121

Options: R&S SMW-K117

Manual operation: See ["Max Rx Time / Max Tx Time"](#) on page 80

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MUCHannels
 <Muchannels>

Specifies the minimum number of channels to be used on the specified PHYs, see

[\[:SOURce<hw>\]:BB:BT0oth:ECONfiguration:PCONfiguration:PHYS:L1M:STATE](#) etc.

Parameters:

<Muchannels> integer
 Range: 2 to 37
 *RST: 2

Example: See [Chapter 6.1.7.2, "Configure Data Packets"](#), on page 119

Options: R&S SMW-K117

Manual operation: See ["Min Used Channels"](#) on page 81

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MTSPHy:L1M:STATE <MTSP>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MTSPHy:L2M:STATE <MTSP>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:MTSPHy:LCOD:STATE <MTSP>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:STMPHy:L1M:STATE <STMP>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:STMPHy:L2M:STATE <STMP>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:STMPHy:LCOD:STATE <STMP>

Specifies the physical layers in master-to-slave (. . :MTSPHy: . .) or slave-to-master (. . :STMPHy: . .) direction. Information is signaled via LL_PHY_UPDATE_IND.

You can enable one or more PHYs: :L1M: for LE uncoded 1 Msymbol/s PHY, :L2M: for LE uncoded 2 Msymbol/s PHY, and :LCOD: for LE coded 1 Msymbol/s PHY.

Parameters:

<STMP> 0 | 1 | OFF | ON
*RST: 0

Example: See [Chapter 6.1.7.2, "Configure Data Packets"](#), on page 119

Options: R&S SMW-K117

Manual operation: See "[M_TO_S_PHY / S_TO_M_PHY](#)" on page 80

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:NCInterval <NcInterval>

Sets the time interval new connection events for the packet types CONNECT_IND and LL_CONNECTION_UPDATE_IND.

Command sets the values in ms. Query returns values in s.

Parameters:

<NcInterval> float
Range: 7.5E-3 s to depends on oversampling
Increment: 1.25E-3 s
*RST: 7.5E-3 s
Default unit: ms

Example: SOUR:BB:BT0:ECON:PCON:NCIN 7.0
Sets a time interval of 7 ms.
See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See "[Connection Evt Interval](#)" on page 72

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:NLCTimeout <NlcTimeout>

Defines the maximum time between two correctly received Bluetooth LE packets in the LL connection before the connection is considered lost only for the packet type LL_CONNECTION_UPDATE_IND.

Command sets the values in ms. Query returns values in s.

Parameters:

<NlcTimeout> float
 Range: 100E-3 s to 32000E-3 s
 Increment: 10E-3 s
 *RST: 100E-3 s
 Default unit: ms

Example:

SOUR:BB:BTO:ECON:PCON:NLCT 75
 Sets LL connection timeout to 75 ms.
 See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See "[LL Connection Timeout](#)" on page 72

[:SOURce<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:NSLatency
 <Nslatency>

(for data event and advertising frame configuration with the packet type LL_CONNECTION_UPDATE_IND)

Sets the number of consecutive connection events the slave can ignore for asymmetric link layer connections.

Parameters:

<Nslatency> integer
 Range: 0 to depends on LL connection timeout and connection event interval
 *RST: 0

Example:

SOUR:BB:BTO:UPTY CUR
 sets packet type LL_CONNECTION_UPDATE_IND
 SOUR:BB:BTO:ECON:PCON:NSL 10
 sets the number of consecutive connection events.

Manual operation: See "[Slave Latency](#)" on page 72

[:SOURce<hw>]:BB:BTOoth:ECONfiguration:PCONfiguration:NWOffset
 <Nwoffset>

Sets the start point of the transmit window for data event and advertising frame configuration with the packet type LL_CONNECTION_UPDATE_IND.

Command sets the values in ms. Query returns values in s.

Parameters:

<Nwoffset> float
 Range: 0 s to depends on connection event interval
 Increment: 1.25E-3 s
 *RST: 0
 Default unit: ms

Example:

SOUR:BB:BTO:ECON:PCON:NWOF 10
 Sets the start point of the transmit window to 10 ms.
 See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Transmit Window Offset"](#) on page 74

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:NWSize <NwSize>

Sets the size of the transmit window, regarding to the start point for data event and advertising frame configuration with the packet type LL_CONNECTION_UPDATE_IND.

Parameters:

<NwSize> float
 Range: 1.25E-3 to depends on connection event interval
 Increment: 1.25E-3
 *RST: 1.25E-3

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Transmit Window Size"](#) on page 74

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:OADJust <State>

Adjusts the "Sync Packet Offset" automatically to the next value, which is a multiple of the ""Offset Units".

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Manual operation: See ["Offset Adjust"](#) on page 86

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PHYS:L1M:STATe <State>

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PHYS:L2M:STATe <State>

[[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PHYS:LCOD:STATe <State>

Specifies the physical layers for which the slave has a minimum number of used channels requirement. Information is signaled via LL_MIN_USED_CHANNELS_IND.

You can enable one or more PHYs: :L1M: for LE uncoded 1 Msymbol/s PHY, :L2M: for LE uncoded 2 Msymbol/s PHY, and :LCOD: for LE coded 1 Msymbol/s PHY.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Chapter 6.1.7.2, "Configure Data Packets"](#), on page 119

Options: R&S SMW-K117

Manual operation: See ["PHYs"](#) on page 81

```
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TAType <TaType>
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RAType <RaType>
```

Selects the address type of the controller device. Depending on the Bluetooth controller role either Tx or Rx or both address types are assigned. Subdivided into private and random, a Bluetooth LE device address consists of 48 bits. The format of the device address differs depending on the selected address type.

Parameters:

<RaType> PUBLIC | RANDom

PUBLIC

Allocates a unique 48 bit address to each Bluetooth LE device. The public address is given from the registration authority IEEE.

RANDom

Allocates a 48-bit address to each Bluetooth LE device. A random address is optional.

*RST: PUBLIC

Example:

```
SOUR:BB:BT0:ECON:PCON:TATY PUBL
SOUR:BB:BT0:ECON:PCON:RATY RAND
```

```
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ROPCode
<ROpcode>, <BitCount>
```

Specifies the Opcode of rejected LL control PDU. information is signaled via LL_REJECT_EXT_IND.

Parameters:

<ROpcode> numeric

*RST: #H00

<BitCount> integer

Range: 8 to 8

*RST: 8

Example: See [Chapter 6.1.7.2, "Configure Data Packets"](#), on page 119

Options: R&S SMW-K117

Manual operation: See ["Reject Opcode"](#) on page 81

```
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYS:L1M:STATe
<RPhys>
```

```
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYS:L2M:STATe
<RPhys>
```

```
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RPHYS:LCOD:
STATe <RPhys>
```

```
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYS:L1M:STATe
<TPhys>
```

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:L2M:STATe
<TPhys>

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:TPHYs:LCOD:
STATe <TPhys>

Specifies preferred physical layers in Rx (. . . :RPHYs: . . .) or Tx (. . . :TPHYs: . . .) direction. Information is signaled via LL_PHY_REQ and LL_PHY_RSP.

You can enable one or more PHYs: :L1M: for LE uncoded 1 Msymbol/s PHY, :L2M: for LE uncoded 2 Msymbol/s PHY, and :LCOD: for LE coded 1 Msymbol/s PHY.

Parameters:

<TPhys> 0 | 1 | OFF | ON
*RST: 0

Example: See [Chapter 6.1.7.2, "Configure Data Packets"](#), on page 119

Options: R&S SMW-K117

Manual operation: See ["Rx PHY / Tx PHY"](#) on page 80

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:RVEctor
<RVector>, <BitCount>

Sets the random vector of the master for device identification. The parameter is an initialization vector provided by the Host in the HCI_ULP_Start_Encryption command.

Parameters:

<RVector> numeric
*RST: #H0

<BitCount> integer
Range: 64 to 64
*RST: 64

Example: SOUR:BB:BT0:ECON:PCON:RVEC
#H0000000000000000,64
Sets the random vector of the master.

Manual operation: See ["Random Vector \(hex\)"](#) on page 73

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SCACcuracy
<ScAccuracy>

Defines the master's clock accuracy with specified encoding. This parameter is used by the slave to determine required listening windows in the LL connection. It is a controller design parameter known by the Controller.

Parameters:

<ScAccuracy> SCA0 | SCA1 | SCA2 | SCA3 | SCA4 | SCA5 | SCA6 | SCA7
*RST: SCA0

Example: SOUR:BB:BT0:ECON:PCON:SCAC SCA1
sets the encoding value

Manual operation: See ["Sleep Clock Accuracy"](#) on page 75

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SLATency
<SLatency>

(For data event and advertising frame configuration with the packet type CONNECT_IND)

Sets the number of consecutive connection events the slave can ignore for asymmetric link layer connections.

Parameters:

<SLatency>	integer
Range:	0 to depends on LL connection timeout and connection event interval
*RST:	depends on LL connection timeout and connection event interval

Example:

```
SOUR:BB:BT0:UPTY CREQ
Sets packet type CONNECT_IND
SOUR:BB:BT0:ECON:PCON:SLAT 10
Sets the number of consecutive connection events.
```

Manual operation: See ["Slave Latency"](#) on page 72

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SOUNits <Unit>

Indicates the units used by the "Sync Packet Offset" parameter, see

[\[:SOURce<hw>\]:BB:BT0oth:ECONfiguration:PCONfiguration:SPOffset](#)

Parameters:

<Unit>	U30 U300
U30:	30 μ s
U300:	300 μ s
*RST:	U30

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Offset Units"](#) on page 86

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SPOffset
<SPOffset>

Specifies the time from the start of the AUX_ADV_IND packet containing the SyncInfo field to the start of the AUX_SYNC_IND packet. The offset is determined by multiplying the value by the unit, see

[\[:SOURce<hw>\]:BB:BT0oth:ECONfiguration:PCONfiguration:SOUNits](#)

Parameters:

<SPOffset> float
 Range: 0 to 245.7 or 246 to 2457 depending on offset unit

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["Sync Packet Offset"](#) on page 86

[:SOURCE<hw>]:BB:BT0oth:ECOnfiguration:PCOnfiguration:SVNumber
 <SvNumber>, <BitCount>

Sets a unique value for each implementation or revision of an implementation of the Bluetooth Controller. A 16 bit value is set.

Note: This parameter is relevant for data frame configuration and for the packet type: LL_VERSION_IND.

Parameters:

<SvNumber> numeric
 *RST: 0

<BitCount> integer
 Range: 16 to 16
 *RST: 16

Example: SOUR:BB:BT0:ECON:PCON:SVN #H0000,16
 Sets the sub version number.

Manual operation: See ["Sub Version Number"](#) on page 76

[:SOURCE<hw>]:BB:BT0oth:ECOnfiguration:PCOnfiguration:TPower <TPower>

Sets the required transmit power to be signaled within an extended header.

Parameters:

<TPower> integer
 Range: -127 to 126
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 118.

Options: R&S SMW-K117

Manual operation: See ["TxPow"](#) on page 77

[:SOURCE<hw>]:BB:BT0oth:ECOnfiguration:PCOnfiguration:UTYPE <UType>,
 <BitCount>

Enables that an invalid control packet is indicated. The CtrType field indicates the value of the LL control packet that caused the transmission of this packet.

Parameters:

<UType> numeric
 *RST: #H0

<BitCount> integer
 Range: 8 to 8
 *RST: 8

Example:

SOUR:BB:BTO:ECON:PCON:UTYP #H00,8
 Enables that an invalid control packet is indicated.

Manual operation: See "[Unknown Type \(hex\)](#)" on page 71

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:VNUMBER
 <VNumber>, <BitCount>

Sets the company identifier of the manufacturer of the Bluetooth Controller. A 8 bit value is set.

Note: This parameter is relevant for data frame configuration and for the packet type LL_VERSION_IND.

Parameters:

<VNumber> numeric
 *RST: 0

<BitCount> integer
 Range: 8 to 8
 *RST: 8

Example:

SOUR:BB:BTO:ECON:PCON:VNUM #H00,8
 Sets the version number.

Manual operation: See "[Version Number](#)" on page 75

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:W0FFset
 <W0ffset>

Sets the start point of the window transmit for data event and advertising frame configuration with the packet type CONNECT_IND.

Command sets the values in ms. Query returns values in s.

Parameters:

<W0ffset> float
 Range: 0 s to depending on connection event interval
 Increment: 1.25E-3 s
 *RST: 0 s
 Default unit: ms

Example:

SOUR:BB:BTO:ECON:PCON:W0FFset 10
 Sets the the start point of the window transmit to 10 ms.
 See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Transmit Window Offset"](#) on page 58

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:WSize <WSize>

Sets the size of the transmit window, regarding to the start point for data event and advertising frame configuration with the packet type CONNECT_IND.

Parameters:

<WSize> float
 Range: 1.25E-3 to depends on connection event interval
 Increment: 1.25E-3
 *RST: 1.25E-3

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Transmit Window Size"](#) on page 74

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:AType <AType>

Sets the address type in the payload of Bluetooth LE LL_PERIODIC_SYNC_IND packets.

Parameters:

<AType> PUBLIC | RANDom
 *RST: PUBLIC

Example: See [Example "Event / frame configuration"](#) on page 116.

Manual operation: See ["Address Type"](#) on page 82

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:CECount <CECount>

Specifies the connection event count in the CtrData field of the LL_PERIODIC_SYNC_IND control data PDU.

Parameters:

<CECount> integer
 Range: 0 to 65535
 *RST: 0

Example: See [Example "Event / frame configuration"](#) on page 116.

Manual operation: See ["Connection Event Count"](#) on page 82

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:ID <Id>, <BitCount>

Specifies the ID in the CtrData field of the LL_PERIODIC_SYNC_IND PDU.

Parameters:

<Id> numeric
 *RST: #HAAAA

<BitCount> integer
 Range: 16 to 16
 *RST: 16

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["ID\(hex\)"](#) on page 81

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:LPECOUNTER
 <LPECOUNTER>

Specifies the lastPaEventCounter field in the CtrData field of the LL_PERIODIC_SYNC_IND PDU.

Parameters:

<LPECOUNTER> integer
 Range: 0 to 65535
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["Last Pa Event Counter"](#) on page 82

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:MCLReq
 <MCLReq>

Specifies the minimum CTE length in the CtrData field of the LL_CTE_Req PDU.

Parameters:

<MCLReq> float
 Range: 16E-6 to 160E-6
 Increment: 8E-6
 *RST: 16E-6

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["MinCTELenReq"](#) on page 83

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PHY:L1M:STATe
 <State>

Sets the LE 1M PHY in the CtrData field of the LL_PERIODIC_SYNC_IND PDU.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["PHY"](#) on page 83

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PHY:L2M:STATe
 <State>

Sets the LE 2M PHY in the CtrData field of the LL_PERIODIC_SYNC_IND PDU.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["PHY"](#) on page 83

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:PHY:LCOD:STATe
 <State>

Sets the LE Coded PHY in the CtrData field of the LL_PERIODIC_SYNC_IND PDU.

Parameters:

<State> 0 | 1 | OFF | ON
 *RST: 0

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["PHY"](#) on page 83

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:SCECounter
 <SCECounter>

Parameters:

<SCECounter> integer
 Range: 0 to 65535
 *RST: 0

Manual operation: See ["Sync Connection Event Counter"](#) on page 83

[:SOURce<hw>]:BB:BT0oth:ECOnfiguration:PCONfiguration:SID <Sid> ,
 <BitCount>

Specifies the SID in the CtrData field of the LL_PERIODIC_SYNC_IND.

Parameters:

<Sid> numeric
 *RST: #H0

<BitCount> integer
 Range: 4 to 4
 *RST: 4

Example: See [Example "Packet configuration"](#) on page 121.

Manual operation: See ["SID\(hex\)"](#) on page 82

6.14 Test Packet Configuration Commands - LE



The time unit of timing and delay commands is ms by default. You can change the time unit to s with the command [Chapter 6.2, "General Commands"](#), on page 124.

[:SOURce<hw>]:BB:BT0oth:DTTest:TPConfiguration:TPInterval.....	207
[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SPBit.....	207
[:SOURce<hw>]:BB:BT0oth:DTTest:TPConfiguration:UPLength.....	207
[:SOURce<hw>]:BB:BT0oth:DTTest:TPConfiguration:UPSource.....	208

[:SOURce<hw>]:BB:BT0oth:DTTest:TPConfiguration:TPInterval <TpInterval>

Sets the time interval between two consecutive test packets, regarding the starting points.

Command sets the values in ms. Query returns values in s.

Parameters:

<TpInterval>	float
Range:	0.625E-3 s to 27.5E-3 s - depends on packet characteristics
Increment:	0.625E-3 s
*RST:	0.625E-3 s
Default unit:	ms

Example:

SOUR:BB:BT0:DTT:TPC:TPIN 1.0

Sets a time interval of 1.0 ms.

See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114.

Manual operation: See ["Packet Interval"](#) on page 89

[:SOURce<hw>]:BB:BT0oth:ECONfiguration:PCONfiguration:SPBit <SPB>

Specifies a coding for LE coded packets. The specification for Bluetooth wireless technology defines two values S for forward error correction: S = 2 symbol/bit and S = 8 symbol/bit.

Parameters:

<SPB>	TWO EIGHT
*RST:	TWO

Example: See [Chapter 6.1.7, "Channel Settings for LE"](#), on page 114

Options: R&S SMW-K117

Manual operation: See ["Symbols per a Bit"](#) on page 89

[:SOURce<hw>]:BB:BT0oth:DTTest:TPConfiguration:UPLength <UpLength>

Sets the payload length.

Parameters:

<UpLength> integer
 Range: 0 to 255
 *RST: 37

Example: See [Example "Test packet configuration"](#) on page 115

Manual operation: See ["Payload Length"](#) on page 90

[:SOURce<hw>]:BB:BTOoth:DTTest:TPConfiguration:UPSource <UpSource>

Selects the data source used for the payload test packets.

Parameters:

<UpSource> PN09 | PAT1 | PAT2 | PN15 | PAT3 | PAT4 | PAT5 | PAT6
PN9 / PN15
 Pseudo-random bit sequences (PRBS) of a length of xx bits.
 The length in bit can be 9 or 15.

PAT1

Predefined pattern: 11110000

PAT2

Predefined pattern: 10101010

PAT3

Predefined pattern: 11111111

PAT4

Predefined pattern: 00000000

PAT5

Predefined pattern: 00001111

PAT6

Predefined pattern: 01010101

*RST: PN09

Example:

SOUR:BB:BTO:DTT:TPC:UPS PN09
 PRBS-modulated data sequence for testing.

Manual operation: See ["Payload Type"](#) on page 90

Glossary: Specifications

Symbols

[1]: Bluetooth SIG: Bluetooth Core Specification v5.1

<https://www.bluetooth.com/specifications/bluetooth-core-specification>

List of Commands

[:SOURce<hw>]:BB:BT00th:BCRole.....	161
[:SOURce<hw>]:BB:BT00th:BCText?.....	124
[:SOURce<hw>]:BB:BT00th:BMODE.....	125
[:SOURce<hw>]:BB:BT00th:CCRC:STATe.....	161
[:SOURce<hw>]:BB:BT00th:CLIPping:LEVel.....	134
[:SOURce<hw>]:BB:BT00th:CLIPping:MODE.....	135
[:SOURce<hw>]:BB:BT00th:CLIPping:STATe.....	135
[:SOURce<hw>]:BB:BT00th:CLOCK:MODE.....	147
[:SOURce<hw>]:BB:BT00th:CLOCK:SOURce.....	148
[:SOURce<hw>]:BB:BT00th:CTYPe.....	161
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