R&S®SMW-K52/-K116/-K169/-K176
Digital Video Broadcasting
User Manual

1175677802
Version 23

ROHDE&SCHWARZ
Make ideas real

This document describes the following software options:

- R&S®SMW-K52 DVB-H/T (1413.6090.xx)
- R&S®SMW-K116 DVB-S2/S2X (1414.2630.xx)
- R&S®SMW-K169 DVB-RCS2 (1413.8711.xx)
- R&S®SMW-K176 DVB-S2X-E (1413.8686.xx)

This manual describes firmware version FW 5.30.047.xx and later of the R&S®SMW200A.

© 2023 Rohde & Schwarz
Muehldorfstr. 15, 81671 Muenchen, Germany
Phone: +49 89 41 29 - 0
Email: info@rohde-schwarz.com
Internet: www.rohde-schwarz.com
Subject to change – data without tolerance limits is not binding.
R&S® is a registered trademark of Rohde & Schwarz GmbH & Co. KG.
All other trademarks are the properties of their respective owners.

1175.6778.02 | Version 23 | R&S®SMW-K52/-K116/-K169/-K176

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.

Contents

1 Welcome to the DVB options

The R&S SMW-K52/-K116 are firmware applications that add functionality to generate signals in accordance with:

- The DVB-H/T (Digital Video Broadcasting - Transmission System for Handheld Terminals) standard
- The standards describing the second-generation DVB system for satellite communication DVB-S2 and the optional extension DVB-S2X.

DVB (digital video broadcasting) provides a communications infrastructure for powerful transmission of MPEG-2-based data. Besides satellite-based (DVB-S), terrestrial (DVB-T) and cable-bound (DVB-C) transmission schemes, the version (DVB-H) is for portable/handheld terminals.

DVB-H is an extension to DVB and is compatible with the basic concept of the standard. The extensions bring advantages that are especially important for portable devices: low power consumption, small hardware and robustness against fading effects. For DVB-H the current firmware supports non-hierarchical coding only.

The DVB-S2 standard is introduced as successor the DVB-S for the transmission of digital video broadcasts over satellite links. The DVB-S2X standard is an optional extension of the DVB-S2 standard. DVB-S2X allows an efficiency gain of up to 51% compared to DVB-S2. With that, higher data rates can be transported over the same satellite transponder capacity.

The main advantages of the DVB-H / DVB-T digital standard option **R&S SMW-K52** are:

- Possibility to test both mobile communications standards (such as WCDMA 3GPP FDD, TD-SCDMA, GSM/EDGE) and DVB-H or DVB-T using only one signal generator
- Simple generation of standard-compliant DVB-H or DVB-T signals

Option **R&S SMW-K116** extends the functionalities with the following key features:

- Fully encoded DVB-S2 and DVB-S2X signal generation
- Support of the stream types: transport stream (TS), generic packetized (GP), generic continuos (GC), generic stream encapsulated high efficiency mode (GSE-HEM)
- Signal generation form arbitrary data sources and TS or GSE files
- Channel coding according to the standard, incl. scrambling, interleaving, outer code (BCH), inner code (LDPC) with varying code rates from 1/4 to 31/45
- Support of all specified Walsh-Hadamard sequences for VL-SNR (very low signal to noise ratio) mode
- Configurable header information, incl. baseband (BB) header, VL-SNR header, TS header, GSE header
- Supported modulation schemes:
  - For DVB-S2: QPSK, 8PSK, 16APSK, 32APSK
  - For DVB-S2X: QPSK, 8APSK, 8PSK, 16APSK, 32APSK, 64APSK, 128APSK, 256APSK

  - For VL-SNR: QPSK, pi/2 BPSK
- Pilot insertion and configuration
- Signals suitable for testing of satellite transponders, components and ground modems

Option **R&S SMW-K169** extends the functionalities with the following key features:

- Generating DVB-RCS2 signals according to ETSI EN 301 545-2
- Energy dispersal with predefined scrambling sequence CRC16 and CRC32
- Support of turbo FEC encoder linear modulation and Pi/2-BPSK, QPSK, 8PSK, 16QAM modulation schemes
- Support of linear modulation and spread spectrum linear modulation bursts
- Support of predefined waveforms as defined in Annex of ETSI EN 301 545-2
- Support of user-defined waveforms
- Support of multi-carrier and multi-section configuration.

Option **R&S SMW-K176** extends the functionalities with the following key features:

- Generating DVB-S2X-E signals
- Support of super-frame format 4, 5, 6, 7
- Physical layer header (PLH) according to Annex E of ETSI EN 302 307-2
- Support SF-pilot and special VL-SNR pilots
- Support of two ways scrambling
- Support of beam-hopping with configurable dwell time.

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.

1.1 Accessing the DVB dialog

To open the dialog with DVB settings

► In the block diagram of the R&S SMW, select "Baseband > DVB".

  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".

1.2 What's new

This manual describes firmware version FW 5.30.047.xx and later of the R&S®SMW200A.

Compared to the previous version, it provides the new features listed below:

- Added time based trigger function, see "Time Based Trigger" on page 76

1.3 Documentation overview

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

www.rohde-schwarz.com/manual/smw200a

1.3.1 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.

1.3.2 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.

1.3.3 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.

1.3.4 Service manual

Describes the performance test for checking compliance with rated specifications, firmware update, troubleshooting, adjustments, installing options and maintenance.

The service manual is available for registered users on the global Rohde & Schwarz information system (GLORIS):

https://gloris.rohde-schwarz.com

1.3.5 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.

1.3.6 Printed safety instructions

Provides safety information in many languages. The printed document is delivered with the product.

1.3.7 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

1.3.8 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 software makes use of several valuable open source software packages. An open-source acknowledgment document provides verbatim license texts of the used open source software.

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

1.3.9 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

1.3.10 Videos

Find various videos on Rohde & Schwarz products and test and measurement topics on YouTube: https://www.youtube.com/@RohdeundSchwarz

On the menu bar, search for your product to find related videos.

Figure 1-1: Product search on YouTube

1.4 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 saving 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.

1.5 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.

2 About the DVB options

The digital video broadcasting (DVB) suite of standards described methods for data and video signals transmission through different medium including cable, terrestrial, mobile and satellite.

This section lists required options and provides brief background information on basic terms and principles used in the DVB standards.

2.1 Required options

The basic equipment layout for generating DVB signals includes the:

- Standard or wideband Baseband Generator (R&S SMW-B10/-B9)
- Baseband main module (R&S SMW-B13) or wideband baseband main module (R&S SMW-B13XT)
- Frequency option (e.g. R&S SMW-B1003)
- Digital standard DVB-H / DVB-T (R&S SMW-K52)
- Digital standard DVB-S2 / DVB-S2X (R&S SMW-K116)
- DVB-RCS2 (R&S SMW-K169)
- DVB-S2X-E DVB-S2X Annex E (R&S SMW-K176)
  (requires R&S SMW-K116)

You can generate signals via play-back of waveform files at the signal generator. To create the waveform file using R&S WinIQSIM2, you do not need a specific option.

To play back the waveform file at the signal generator, you have two options:

- Install the R&S WinIQSIM2 option of the digital standard, e.g. R&S SMW-K255 for playing LTE waveforms
- If supported, install the real-time option of the digital standard, e.g. R&S SMW-K55 for playing LTE waveforms

For more information, see data sheet.

2.2 About DVB-H/T

The Digital Video Broadcasting - Handheld (DVB-H) standard is based on the earlier standard DVB-T, which is used for terrestrial digital broadcasting.

The block diagram on Figure 2-1 shows the components of the DVB-H transmission system.

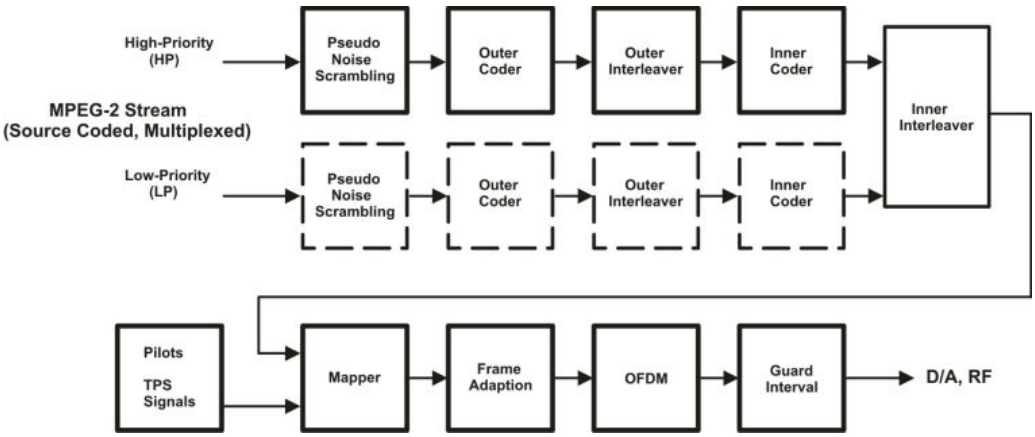


Figure 2-1: Components of the transmission system DVB-H

The current firmware does not support hierarchical coding including low-priority coding. The Low-Priority (LP) path of the MPEG-2 Stream indicates this by dotted squares of the low-priority coding procedure.

DVB-H provides features to meet the specific requirements for handheld, mobile terminals such as:

- Power off some part of the reception chain to increase the battery duration
- Ease access to the services when receivers switching to the next cell
- Mitigate the effects of man-maid noise and severe mobile multipath channels on the receiving capabilities
- Offer sufficient flexibility and scalability to allow reception of services at various speeds
- Offer the flexibility to be used in various transmission bands and channel bandwidths

The basic technical extensions that make it possible to receive digital video broadcasting services on handheld terminals are:

- 4K mode and in-depth interleavers
- Time-slicing
- Forward error correction for multiprotocol encapsulated data (MPE-FEC)

2.3 About DVB-S2/S2X

Figure 2-2 illustrates schematically the components of the DVB-S2/S2X transmission systems. The block diagram is a simplified version of the DVB-S2 system specified in the DVB standard.

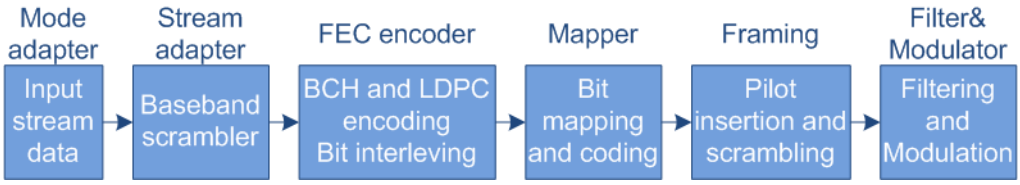


Figure 2-2: Components of the transmission system DVB-S2/S2X

FEC = Forward error correction
BCH = Bose-Chaudhuri-Hocquenghem multiple error correction binary block codes
LDPC = Low-density parity check

The main improvements of the second-generation DVB system for satellites (DVB-S2) compared to DVB-S are:

- Input stream adapter, suitable for operation with single and multiple input streams and different formats (packetized or continuous)
- FEC system based on LDPC codes concatenated with BCH codes
- Range of code rates (from 1/4 up to 9/10);
  Four constellations with different spectrum efficiency and optimized for operation over non-linear transponders
- Three predefined spectrum shapes with rolloff factors 0.35, 0.25 and 0.20
- Adaptive coding and modulation (ACM) functionality for optimized channel coding and modulation on a frame-by-frame basis.

The DVB-S2X is an extension to the DVB-S2 standard. The DVB-S2X reuses the DVB-S2 system architecture and improves it with the following:

- Adds finer MODCOD steps, higher-order modulations and complex constellations
- Three new sharper spectrum shapes
- Defines the VL-SNR (low signal to noise ratio) mode for example for mobile applications
- Optional periodic pilots and physical layer scrambles for easy synchronization
- GSE-Lite compliant signaling and streaming
- Adds a high-efficiency mode (GSE-HEM) intended to transport GSE and GSE-Lite packets

3 DVB configuration and settings

Access:

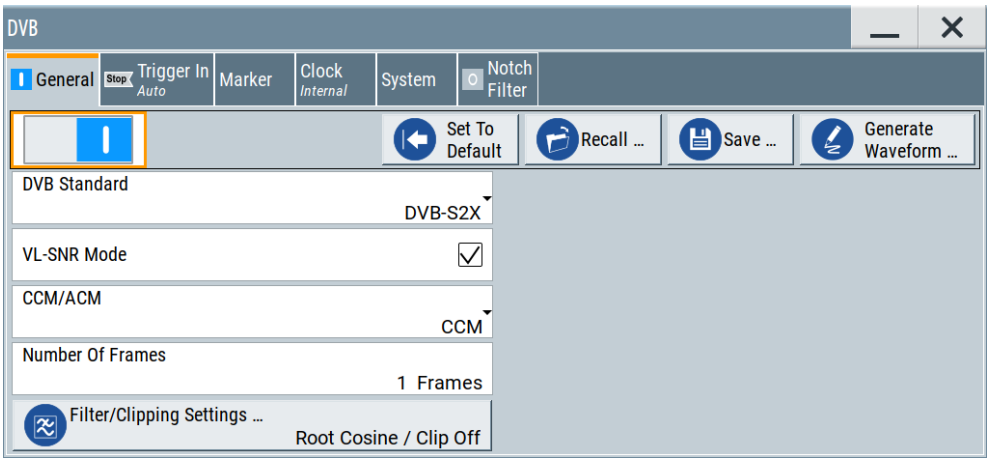
► Select "Baseband > DVB".

The remote commands required to define these settings are described in Chapter 5, "Remote-control commands", on page 84.

3.1 General settings

Access:

► Select "Baseband > DVB > General".



This dialog provides general settings, the default and the "Save/Recall" settings, and access to dialogs with further settings.

Settings:

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

Remote command:
`[:SOURce<hw>]:BB:DVB:STATe` on page 86

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"
Number of Super-Frames	1
Hierarchy Mode	Non-hierarchical
HP Source	PN 23
Filter Type	Cosine
Clipping	Off
Cell Identification	On
Time-Slicing	On
ID [4 hex]	0000
MPE-FEC	Off
PN Scrambler	On
Outer Coder	On
Outer Interleaver	On
Inner Coder	On
Rate	1/2
Inner Bit Interleaver	On

Parameter	Value
Inner Symbol Interleaver	On
Inner Interleaver Mode	Native
TX Mode	2 K
OFDM/RF Bandwidth	8 MHz
Modulation	QPSK
Alpha	1
Guard Interval	1/8

Remote command:
[:SOURce<hw>]:BB:DVB:PRESet on page 86

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 settings are saved in a file with predefined extension. You can define the filename and the directory, in that you want to save the file.

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

Remote command:
[:SOURce<hw>]:BB:DVB:SETTing:CATalog? on page 86
[:SOURce<hw>]:BB:DVB:SETTing:LOAD on page 87
[:SOURce<hw>]:BB:DVB:SETTing:STORe on page 87
[:SOURce<hw>]:BB:DVB:SETTing:DELete on page 87

Generate Waveform File
With enabled signal generation, triggers the instrument to save the current settings of an arbitrary waveform signal in a waveform file with predefined extension `*.wv`. You can define the filename and the directory, in that you want to save the file.

Using the ARB modulation source, you can play back waveform files and/or process the file to generate multi-carrier or multi-segment signals.

Remote command:
[:SOURce<hw>]:BB:DVB:WAVeform:CREate on page 87

DVB Standard
Selects the DVB standard to be used to generate the modulation signal.

Remote command:
[:SOURce<hw>]:BB:DVB:STANdard on page 88

Hierarchy Mode
Indicates the hierarchy coding mode, that is "Non-hierarchical".

The current firmware does not support hierarchical coding.

"Non-hierarchical"
The high priority input is used.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBH|DVBT:HMODe on page 105

VL-SNR Mode
(requires option R&S SMW-K116)

For "DVB Standard > DVB-S2X", includes the VL-SNR (very low - signal to noise ratio) header in the physical layer frame.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBX:VSMode on page 89

CCM/ACM
Option: R&S SMW-K116

Selects whether constant coding and modulation (CCM) or adaptive coding and modulation (ACM) communication is used.

In ACM mode, for instance, the receiver sends feedback information on received signal quality. Depending on this feedback, the channel coding and modulation is optimized on a frame-by-frame basis.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:CACM on page 130

Number of PL Frames
Option: R&S SMW-K116

For "DVB Standard > DVB-S2/S2X", sets the number of the transmitted frames.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:FRAMes on page 89

Number of Super Frames
Sets the number of the transmitted super frames.

- For DVB-S2X: Option: R&S SMW-K116
- For DVB-S2X-E: Option: R&S SMW-K176
- For DVB-H/-T: each super frame consists of four OFDM frames.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFRames on page 88
[:SOURce<hw>]:BB:DVB:DVBH|DVBT:SFRames on page 88

Number of Samples / Duration
Requires "DVB Standard > DVB-H/T" and "State > On".

Displays the number of the transmitted samples and the signal duration.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBH|DVBT:SAMPle:LENGth? on page 89
[:SOURce<hw>]:BB:DVB:DVBH|DVBT:DURation? on page 89

Sample Rate / Data Rate
Requires "DVB Standard > DVB-H/T" and "State > On".

Displays the sample rate and data rate.

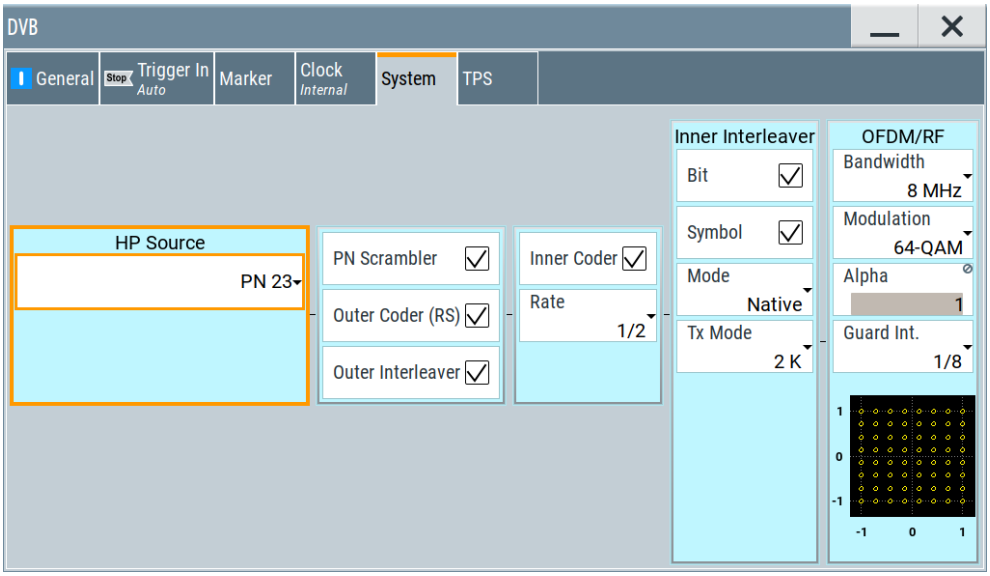
Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:SAMPle:RATE?` on page 90
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:DRATe?` on page 90

Filter/Clipping Settings
Accesses the dialog for setting baseband filtering and clipping, see Chapter 4.1, "Filter/clipping settings", on page 69.

3.2 DVB-T/DVB-H system settings

Access:

1. Select "DVB > DVB Standard > DVB-T/DVB-H"
2. Select "System".



The dialog provides settings to configure the DVB system. The DVB system is displayed in form of a block diagram including all parameters necessary to configure the high priority path of DVB the system.
Hierarchical coding is not supported, the low priority path is not configurable.

Settings:

HP Source, Select File
Selects the data source for the high priority path.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:DATA` on page 105
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:DATA:DSELection` on page 105

PN Scrambler
Activates PN scrambling. The data packets of the incoming transport stream are transformed to a pseudo random binary sequence (PRBS). This transformation is performed to obtain a bit sequence that has a positive effect on the transmitted RF spectrum.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:PNSCrambler[:STATe]`
on page 106

Outer Coder (RS)
Activates the outer coder. The outer coder applies a Reed-Solomon error correction code to the PRBS data stream.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:OCODer[:STATe]` on page 106

Outer Interleaver
Activates the outer convolutional interleaver.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:OINTerleaver[:STATe]`
on page 106

Inner Coder
Activates the inner coder. The inner coder is a punctured convolutional error-correcting coder.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:ICODer[:STATe]` on page 106

Rate
If "Inner Coder > On", selects the code rate of the inner coder.

For encoding incoming bits (m), the inner coder transforms the bits into a bit symbol containing n bits. The ratio m/n is the code rate.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:ICODer:RATE` on page 106

Inner Bit Interleaver
Activates the inner bit interleaver.

The inner interleaver consists of a bit-wise interleaving followed by symbol interleaving. Both interleaving processes are block based.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:BIT[:STATe]`
on page 107

Inner Symbol Interleaver
Activates the inner symbol interleaver.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:SYMBol[:STATe]`
on page 107

Inner Interleaver Mode
Selects the inner interleaver mode. Interleaver mode in-depth is available only for transmission mode 2K and 4K.

"Native" Available for all transmission modes ("Tx Mode").

"In-depth" Requires "Tx Mode > 2K/4K".

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:SYMBol:MODE`
on page 107

Inner Interleaver Tx Mode
Selects the transmission mode.

The transmission mode determines the number of the OFDM subcarriers.

For "Tx Mode > 8 K", the in-depth interleaver mode is not available. "Tx Mode > 4 K" is available only for "Standard > DVB-H".

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:SYMBol:TMODe`
on page 107

OFDM/RF Bandwidth
Selects the system bandwidth.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:BWIDth` on page 108

OFDM/RF Modulation
Selects the constellation for the OFDM modulation.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:MODulation` on page 108

OFDM/RF Alpha
Displays the alpha value, that is fixed to "1" for non-hierachical coding.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:ALPHa` on page 108

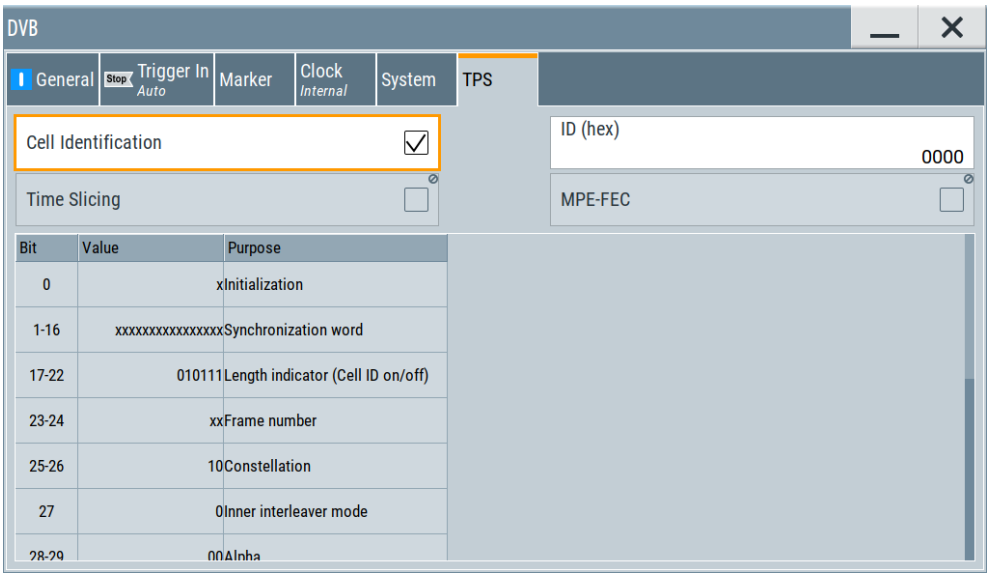
OFDM/RF Guard Int.
Selects the length of guard interval. The guard interval extends the length of the transmitted symbol. Guard interval values resemble fractions of a symbol period.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:GINTerval` on page 108

3.3 DVB-T/DVB-H TPS settings

Access:

1. Select "DVB > DVB Standard > DVB-T/DVB-H"
2. Select "TPS".



The dialog allows you to select the bits to transmit via the TPS signal and displays the status of the parameter bits.

Settings:

Cell Identification
Activates TPS cell identification. If activated, the cell from which the signal comes from is identified.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:STATe` on page 122

ID (hex)
Sets the cell ID for cell identification.

The cell ID identifies the cell from which the signal is transmitted. This value is read by the receiver if Cell Identification is activated.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:PATTern` on page 122

Time Slicing
Indicates the status of the time-slicing bit. If activated, the average power consumption of the terminal is reduced.

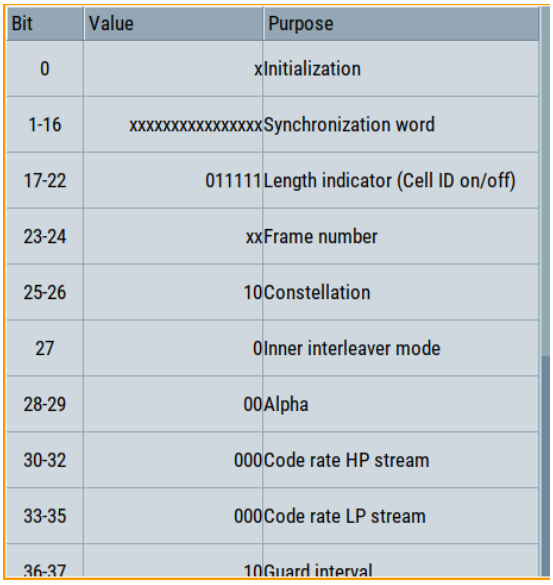
The current firmware does not support generation of time-slicing information. Time slicing is always used for DVB-H and permanently disabled for DVB-T.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:TSLicing[:STATe]?` on page 123

MPE FEC
Activates the multiprotocol encapsulation forward error correction bit. MPE-FEC must be performed in the transport stream. This implementation does not support MPE-FEC.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:MFEC[:STATe]` on page 123

TPS Table
The TPS parameter bit table displays the status of the transmitted TPS parameter bits.



Bit	Value	Purpose
0	x	Initialization
1-16	xxxxxxxxxxxxxxxx	Synchronization word
17-22	011111	Length indicator (Cell ID on/off)
23-24	xx	Frame number
25-26	10	Constellation
27	0	Inner interleaver mode
28-29	00	Alpha
30-32	000	Code rate HP stream
33-35	000	Code rate LP stream
36-37	10	Guard interval

Table 3-1: TPS signaling information transmitted in DVB-H

Bit number	Format	Purpose
0	0/1	Initialization bit for the differential 2PSK modulation. The modulation of the TPS initialization bit is derived from the PRBS sequence
1-16		Bits 1 to 16 of the TPS are the synchronization words for the TPS blocks in the super-frames:

Bit number	Format	Purpose
	0011010111101110	Synchronization word for the first and the third TPS block in each super-frame
	11001010000100001	Synchronization word for the second and the fourth TPS block in each super-frame
17-22		The first 6 bits of the TPS information is used as a TPS length indicator to signal the number of used bits of the TPS:
	010111	Cell identification is not transmitted (23 TPS bits in use)
	011111	Cell identification information is transmitted (31 TPS bits in use)
	100001	Cell identification information is transmitted for DVB-H (33 TPS bits in use)
23-24		Indicates the frame in the super-frame. Four frames constitute a super-frame.
	00	Frame 1 in the super-frame
	01	Frame 2 in the super-frame
	10	Frame 3 in the super-frame
	11	Frame 4 in the super-frame
25-26		Indicates the constellation
	00	QPSK
	01	16-QAM
	10	64-QAM
	11	Reserved
27		Indicates the interleaver mode. The in-depth interleaver can be used for 2K and 4K transmission mode. For transmission mode 8K, only the native interleaver is used:
	0	The native interleaver is used
	1	The in-depth interleaver is used
28-29		Indicates the hierarchical transmission and the value of the alpha-factor
	00	Transmission in non-hierarchical mode
	01	Alpha = 1
	10	Alpha = 2
	11	Alpha = 4
30-32		Indicates the code rate for the HP transmission stream
	000	1/2
	001	2/3
	010	3/4
	011	5/6

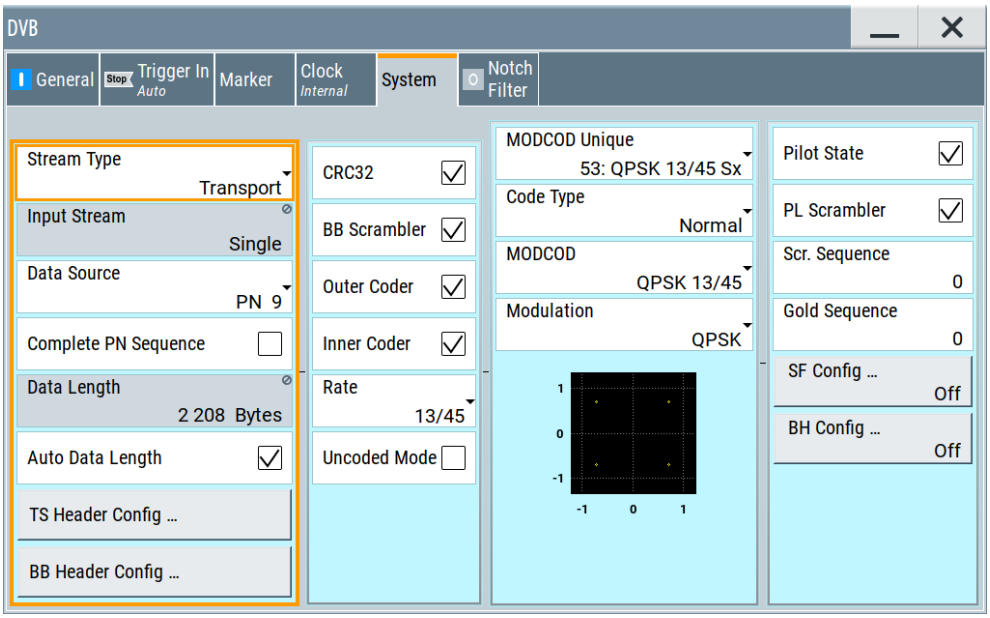
Bit number	Format	Purpose
	100	7/8
	101	reserved
	110	reserved
	111	reserved
33-35		Indicates the code rate for the LP transmission stream
	000	1/2
	001	2/3
	010	3/4
	011	5/6
	100	7/8
	101	reserved
	110	reserved
	111	reserved
36-37		Indicates the value for the guard interval
	00	1/32
	01	1/16
	10	1/8
	11	1/4
38-39		Indicates the transmission mode
	00	2K mode
	01	8K mode
	10	4K mode
	11	reserved
40-47	Cell_id	32 bits are used for the cell ID. Every frame contains 8 bits. The 8 bits are used to identify the cell from which the signal comes from.
48		Indicates the usage of time-slicing
	0	Time-slicing is not used
	1	At least one elementary stream uses time-slicing
49		Indicates the usage of MPE-FEC
	0	MPE-FEC is not used
	1	At least one elementary stream uses MPE-FEC
50-53	reserved	
54-67	xxxxxxxxxxxxxxx	BCH error protection

3.4 DVB-S2/DVB-S2X System settings

Option: R&S SMW-K116

Access:

1. Select "DVB > DVB Standard" > "DVB-S2/DVB-S2X".
2. Select "CCM/ACM":
   - "CCM" for constant coding and modulation
   - "ACM" for adaptive coding and modulation
3. Select "System".



The dialog provides settings to configure the DVB system. The DVB system is displayed in form of a block diagram including all related parameters.
The provided settings depend on the selected DVB Standard and on whether constant coding and modulation (CCM) or adaptive coding and modulation (ACM) communication is used.

The blocks indicate the first four logical signal processing parts:

- Mode adaptation:
  Input stream configuration, incl. configuration of the header information
- Stream adaptation:
  Baseband scrambling and FEC (forward error correction) encoding
- Constellation mapping:
  Modulation and coding
- Pilot:
  Insertion and scrambling of the optional pilot.

The last processing part is the baseband spectrum shaping. Find the required filter parameters in the "Filter" dialog, see Chapter 4.1.1, "Filter settings", on page 69.

Settings:

Stream Type
Selects the type of input stream.

"Transport"	Transport stream TS
"GP"	Generic packetized
"GC"	Generic continuous
"GSE-HEM"	Requires "DVB Standard > DVB-S2X". Generic stream encapsulation, high efficiency mode (HEM) packetized.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:STYPe` on page 112

Input Stream
Indicates that the input stream is single (SIS).

Multiple input streams (MIS) are not supported.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ISTReam? on page 112

Data Source, Select File
Selects the data source.

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

"TS File, Select File"
For "DVB Standard > DVB-S2", uses a transport stream (TS) file as data source. TS files are files with extension *.gts, *.ts or *.trp.

File extension	Format	Description
*.gts	Rohde & Schwarz proprietary	
*.trp	MPEG-2	Standard DVB file format for HD video transport Contains high definition transportation stream
*.ts	MPEG	Standard digital container format for transmission and storage of audio, video, and program and system information protocol (PSIP) data.

Select "Select File" to access the standard "File Select" dialog.

"GSE File, Select File"
For "DVB Standard > DVB-S2X", uses a generic stream encapsulation (GSE) file as data source. GSE files are files with extension *.gse.
Select "Select File" to access the standard "File Select" dialog.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA on page 113
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:
DSELection|TSELection|GSELection on page 113
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:PATTern on page 113

Complete PN Sequence
Requires "Data Source > PNxx".

Activates transmission of the complete sequence of pseudo-random noise bits within the baseband frame.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:CPNSequence:STATe on page 115

BB Frames
Requires "Data Source > PNxx" and "Complete PN Sequence > On".

Displays the number of baseband frames.

The number of baseband frames increases with the length of pseudo-random noise bit sequence, see Table 3-2.

Table 3-2: PN sequence length and number of BB frames

Data source	Number of baseband frames
PN 9	1
PN 11	1
PN 15	3
PN 16	5
PN 20	72
PN 21	143
PN 23	570

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BBFRames? on page 114

Data Length
If "Auto Data Length > Off", sets the data length in bytes.

The value is used to calculate the value of the parameter Total Length.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:LENGth on page 114

Auto Data Length
Defines, if the "Data Length" is set automatically or manually.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ADLength:STATe on page 114

TS Header Config
Requires "Stream Type > Transport". Accesses the transport stream header settings, see Chapter 3.6, "TS header configuration settings", on page 37.

GSE Header Config
Requires "Stream Type > GSE-HEM". Accesses the GSE header settings, see Chapter 3.7, "GSE header settings", on page 39.

BB Header Config
Accesses the baseband header settings, see Chapter 3.8, "BB header configuration settings", on page 41.

CRC32
Activates CRC-32 check sum calculation.

The CRC-32 check sum is calculated and appended to the baseband frame (BBFRAME). The BB header is excluded.

In detail, CRC-32 is calculated over the first (80+DFL-32) bits of the BBFRAME, and inserted into the final 32 bits of the data field. The technique guarantees, that any errors in the received BBFRAME can be reliably detected, as BCH error indicator is not reliable. The CRC polynomial is as follows:

x32 + x26 + x23 + x22 + x12 + x11 + x10 + x8 + x7 + x5 + x4 + x2 + x + 1

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:CRC[:STATe]` on page 115

BB Scrambler
Activates baseband scrambling.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BSCRambler[:STATe]` on page 115

Outer Coder
Enables the BCH outer coder.

BCH codes are Bose-Chaudhuri-Hocquenghem multiple error correction binary block codes.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:OCODer[:STATe]` on page 115

Inner Coder
Applies LDPC (low-density parity check) encoding to data bits.

The inner coder is a punctured convolutional coder with error-correction.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ICODer[:STATe]` on page 116

CCM settings
The following settings require mode "CCM/ACM > CCM".

Rate ← CCM settings
Selects the code rate of the inner LDPC coder.

The code rate is calculated as *code rate* = *m*/*n*, where:

- *m* is the number of incoming bits.
- *n* are the number of bits in the coded output symbol.

A wide range of code rates is specified. The available code rates depend on the selected "Modulation", modulation coder ("MODCOD") and if "VL-SNR Mode" is used or not.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ICODer:RATE` on page 116

SF ← CCM settings
Requires "DVB Standard > DVB-S2X", "VL-SNR Mode > On" and "Code Type > Short".

Sets the spreading factor. Per default, the VL-SNR mode uses "Modulation > pi/2 BPSK" and "SF = 2". The spreading factor of 2 means that encoded bits are repeated twice before they are mapped into the constellation.

Remote command:
CCM mode: `[:SOURce<hw>]:BB:DVB:DVBX:SFACtor` on page 117
ACM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:SFACtor?` on page 116

MODCOD Unique ← CCM settings
Selects a predefined modulation and coding scheme.

Setting this parameter changes the following parameters automatically: "MODCOD", modulation, code type and code rate. Also the setting allows you to set a correct setting without setting conflicts.

The selection is grouped into categories. Selectable values of the categories depend on the DVB standard and the state of the super frame, see Table 3-3.

Table 3-3: MODCOD Unique categories, DVB standard and super frame state

Category	"DVB Standard"	"Super Frame Active"	Option
S2 Classical (Normal)	"DVB-S2"	"On"/"Off"	R&S SMW-K116
S2 Classical (Short)	"DVB-S2"	"On"/"Off"	R&S SMW-K116
S2-X (Normal)	"DVB-S2X"	"On"/"Off"	R&S SMW-K116
S2-X (Short)	"DVB-S2X"	"On"/"Off"	R&S SMW-K116
S2-X VL-SNR	"DVB-S2X"	"On"/"Off"	R&S SMW-K116
SF Spread (Normal)	"DVB-S2"/"DVB-S2X"	"On"	R&S SMW-K176
SF Spread (Medium)	"DVB-S2"/"DVB-S2X"	"On"	R&S SMW-K176
SF Spread (Short)	"DVB-S2"/"DVB-S2X"	"On"	R&S SMW-K176

For all values, related modulation schemes and code rates, see Chapter A, "MODCOD Unique selection overview", on page 160.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MCUnique` on page 117

Code Type ← CCM settings
Selects the FEC code type.

"Code Type > Medium" requires "VL-SNR Mode > On".

In VL-SNR mode, the required Walsh-Hadamard sequence is selected automatically as function of the parameters "MODCOD" and "Code Type".

Remote command:
CCM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:CTYPe` on page 118
ACM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:CTYPe` on page 118

MODCOD ← CCM settings
Selects the "MODCOD" that is the modulation scheme and code rate.

In VL-SNR mode ("VL-SNR > On"), the required Walsh-Hadamard sequence is selected automatically as function of the parameters "MODCOD" and "Code Type".

Remote command:
CCM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MCOD` on page 118
ACM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:MCOD` on page 118

Modulation ← CCM settings
Selects the modulation scheme.

Suitable modulation schemes are selected automatically to fit the selected "MODCOD", see MODCOD.

The DVB-S2/S2X standards specify different modulation schemes, ranging in power and spectrum efficiency. The available values depend on the used "DVB Standard", the selected , "Code Type" and if "VL-SNR Mode" is used or not.

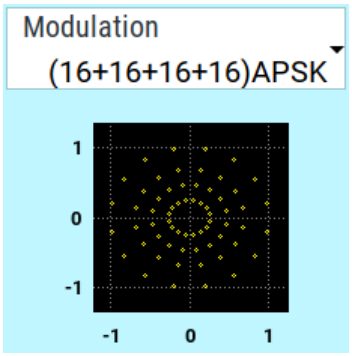
- "DVB Standard > DVB-S2":
  QPSK, 8PSK, 16APSK, 32APSK
- "DVB Standard > DVB-S2X":
  QPSK, 8APSK, 8PSK, 16APSK, 32APSK, 64APSK, 128APSK, 256APSK
- "DVB Standard > DVB-S2X" and "VL-SNR Mode > On":
  QPSK, pi/2 BPSK

The constellation diagram illustrates the selected modulation and coding.

Example:

"Modulation = (16 + 16 + 16 + 16) APSK" is an APSK modulation with 64 constellation points, distributed on 4 concentric rings with 16 constellation point each.

The radius of each ring is defined as function of the selected code rate.



Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MODulation` on page 119

Pilot State ← CCM settings
Activates/deactivates the pilot.

Remote command:
CCM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:PSTate[:STATe]` on page 120
ACM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:PSTate[:STATe]` on page 120

SF Config ← CCM settings
Requires "DVB Standard > DVB-S2/DVB-S2X" and "CCM/ACM > CCM".

Accesses the super frame configurtion settings, see Chapter 3.9, "Super frame configuration settings", on page 43.

BH Config ← CCM settings
Requires "DVB Standard > DVB-S2/DVB-S2X" and "CCM/ACM > CCM".

Accesses the beam-hopping configuration settings, see Chapter 3.10, "Beam hopping configuration settings", on page 48.

ACM settings
The following settings are available in "CCM/ACM > ACM" mode:

Bit Interleaver ← ACM settings
If enabled, the output of the LDPC encoder is bit interleaved using a block interleaver.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BINTerleaver[:STATe]` on page 117

MODCOD Table Config ← ACM settings
Opens the "MODCOD Table Configuration" dialog, where you can configure a set of different PLSCODEs. The PLSCODEs are processed cyclically.

See Chapter 3.5, "MODCOD table configuration settings", on page 35.

Uncoded Mode
Activates raw bit stream streaming.

If enabled, all parameters relevant for coding as well as header parameters are disabled.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:UCMode[:STATe]` on page 117

PL Scrambler
Activates physical layer scrambling.

Physical layer data is scrambled with the selected scrambling sequence (Scr. Sequence).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:PSCRambler[:STATe]` on page 120

Scr. Sequence
Requires "DVB Standard > DVB-S2X" and "Pilot State > On".

Sets the scrambling sequence. The setting of the scrambling sequence is a subset of the setting of the gold sequence. For details, see Table 3-4.

Table 3-4: Scrambling sequence and resulting gold sequence

Scrambling sequence	Gold sequence	
0	0	0x10949
1	10949	1x10949
2	21898	2x10949
3	32847	3x10949
4	43796	4x10949
5	54745	5x10949
6	65694	6x10949

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBX:SSEQuence` on page 120

Gold Sequence
Requires "Pilot State > On".

Sets the gold sequence.

For "DVB Standard > DVB-S2X", you can set predefined gold sequence values derived from the scrambling sequence first. If you set the scrambling sequence first, the resulting gold sequence is the scrambling sequence times 10949. For an overview, see Table 3-4.

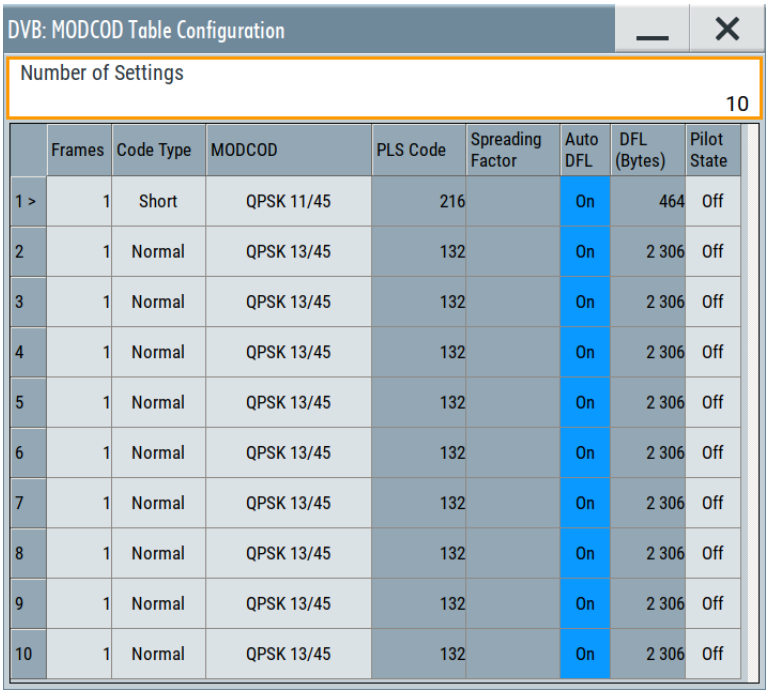
Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:GSEQuence` on page 121

3.5 MODCOD table configuration settings

Option: R&S SMW-K116

Access:

1. Select "DVB > DVB Standard > DVB-S2/DVB-S2X".
2. Select "CCM/ACM" > "ACM".
3. Select "System".
4. Select "MODCOD Table Config".



	Frames	Code Type	MODCOD	PLS Code	Spreading Factor	Auto DFL	DFL (Bytes)	Pilot State
1 >	1	Short	QPSK 11/45	216		On	464	Off
2	1	Normal	QPSK 13/45	132		On	2 306	Off
3	1	Normal	QPSK 13/45	132		On	2 306	Off
4	1	Normal	QPSK 13/45	132		On	2 306	Off
5	1	Normal	QPSK 13/45	132		On	2 306	Off
6	1	Normal	QPSK 13/45	132		On	2 306	Off
7	1	Normal	QPSK 13/45	132		On	2 306	Off
8	1	Normal	QPSK 13/45	132		On	2 306	Off
9	1	Normal	QPSK 13/45	132		On	2 306	Off
10	1	Normal	QPSK 13/45	132		On	2 306	Off

The dialog provides settings to configure a set of different PLSCODEs. The PLSCODEs are processed cyclically.

Settings:

Number of Settings
Sets the number of PLSCODEs, that can be configured.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:NOSettings on page 121

Frames
Sets the number of the transmitted frames.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:FRAMes on page 121

Code Type
Selects the FEC code type.

"Code Type > Medium" requires "VL-SNR Mode > On".

In VL-SNR mode, the required Walsh-Hadamard sequence is selected automatically as function of the parameters "MODCOD" and "Code Type".

Remote command:
CCM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:CTYPe on page 118
ACM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:CTYPe on page 118

MODCOD
Selects the "MODCOD" that is the modulation scheme and code rate.

In VL-SNR mode ("VL-SNR > On"), the required Walsh-Hadamard sequence is selected automatically as function of the parameters "MODCOD" and "Code Type".

Remote command:
CCM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MCOD on page 118
ACM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:MCOD on page 118

PLS Code
Indicates the PLS code for the selected MODCOD.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:PCOD? on page 121

SF
Requires "DVB Standard > DVB-S2X", "VL-SNR Mode > On" and "Code Type > Short".

Sets the spreading factor. Per default, the VL-SNR mode uses "Modulation > pi/2 BPSK" and "SF = 2". The spreading factor of 2 means that encoded bits are repeated twice before they are mapped into the constellation.

Remote command:
CCM mode: [:SOURce<hw>]:BB:DVB:DVBX:SFACtor on page 117
ACM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:SFACtor? on page 116

Auto DFL
Defines if the "DFL" is set automatically or manually.

Remote command:
CCM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:ADFL:STATe on page 132
ACM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:ADFL[:STATe] on page 132

DFL
If "Auto DFL > Off", sets the data field length (DFL).

Remote command:
CCM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:DFL on page 132
ACM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:DFL on page 132

Pilot State
Activates/deactivates the pilot.

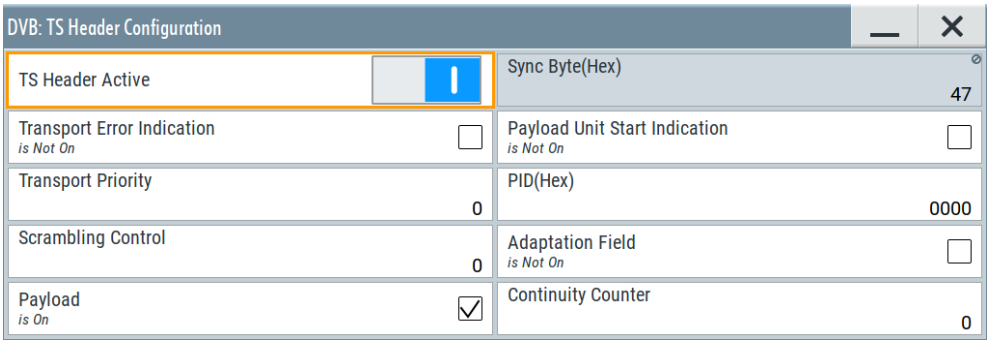
Remote command:
CCM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:PSTate[:STATe] on page 120
ACM mode: [:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:PSTate[:STATe] on page 120

3.6 TS header configuration settings

Option: R&S SMW-K116

Access:

1. Select "DVB > DVB Standard > DVB-S2/DVB-S2X".
2. Select "System".
3. Select "Stream Type > Transport".
4. Select "TS Header Config".



The dialog lists the transport stream header settings.

Settings:

TS Header Active
Inserts header information into the transport stream.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig[:STATe]` on page 123

Sync Byte (Hex)
Displays the information carried by the synchronization byte. The value is in a hexadecimal format.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:SBYTe?` on page 124

Transport Error Indication
Inserts transport error indication information in the header.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:TEINdication[:STATe]`
on page 124

Payload Unit Start Indication
If enabled, the PES (packetized elementary streams), PSI (program-specific information), or DVB-MIP (megaframe initialization) packet begin immediately after the header.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:PUS` on page 124

Transport Priority
Marks the current packet as high priority packet compared to packets with the same PID.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:TPRiority` on page 124

PID (Hex)
Sets the packet identifier PID in hexadecimal format.

Packet identifiers describe the payload data.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:PID:PATTern` on page 125

Scrambling Control
Sets the scrambling information.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:SCONtrol on page 125

Adaptation Field
Inserts an adaptation field in the packet.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:AFIeld[:STATe] on page 125

Payload
Adds a payload field in packet.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:PAYLoad[:STATe]
on page 126

Continuity Counter
Sets the sequence number of the first payload packet.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:CCOunter on page 126

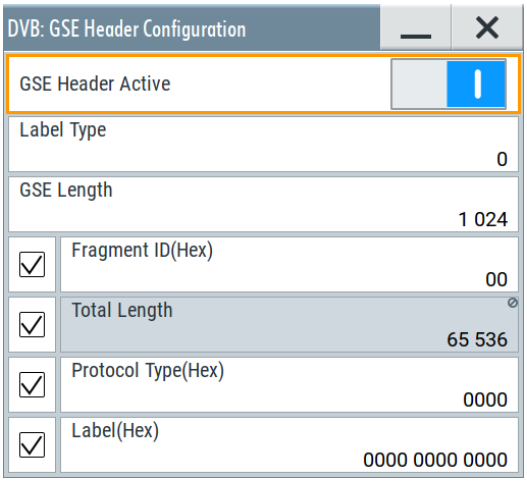
3.7 GSE header settings

Option: R&S SMW-K116

Access:

1. Select "DVB > DVB Standard > DVB-S2X"
2. Select "System".
3. Select "Stream Type > GSE-HEM".
4. Select a data source, that is not a GSE file, e.g. "Data Source > PN15".

5. Select "GSE Header Config".



The dialog provides settings to configure generic stream encapsulation (GSE) header settings.

Settings:

GSE Header Active
Inserts header information in the transport stream.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBX:GHConfig[:STATe]` on page 126

Label Type
Set the type of the used label field.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:LTYPe` on page 127

GSE Length
Sets the number of bytes following in the GSE packet.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:GLENgth` on page 127

Use, Fragment ID(Hex)
Indicates that a PDU fragment is included in the GSE packet.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:FID:PATTern on page 128
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:FIUSe[:STATe] on page 127

Use, Total Length
Indicates the total length in bytes, calculated as follows:

"Total Length" = PDU length ("Data Length") + [2 bytes if "Use Protocol Type > On"] + [6 (or 3) bytes if "Use Label > On"].

Extension headers are not supported and hence not included in the calculation.

Example:

If "Data Length = 4000", "Use Protocol Type > On" and "Use Label > Off", the "Total Length = 4002"

Remote command:
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:TLENgth? on page 128
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:TLUSe[:STATe] on page 128

Use, Protocol Type(Hex)
Indicates the payload type carried in the PDU.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:PTYPe:PATTern on page 128
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:PTUSe[:STATe] on page 129

Use, Label(Hex)
For "Label Type = 0 | 1", sets the label used for addressing.

The value range changes depending on the "Label Type".

"Label Type" value	"Label" value range
0	000000000000 to FFFFFFFFFFFF
1	000000 to FFFFFF

Remote command:
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:LABel:PATTern on page 129
[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:LUSE[:STATe] on page 129

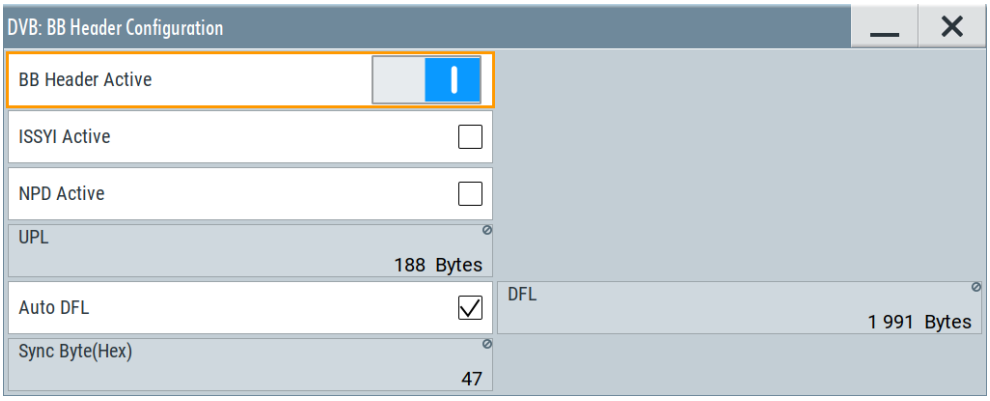
3.8 BB header configuration settings

Option: R&S SMW-K116

Access:

1. Select "DVB > DVB Standard > DVB-S2/DVB-S2X"
2. Select "CCM/ACM > CCM".

3. Select "BB Header Config".



The dialog provides settings to configure the baseband (BB) header.
Use the filter settings, to set the baseband filter parameter Roll-off factor and determine the roll-off bits of the BB header.

Settings:

BB Header Active
If enabled, the BB header is inserted into the set stream.

If disabled, BB header parameter settings, e.g. ISSYI, are still valid for the set stream.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig[:STATe]` on page 130

ISSYI Active
If enabled, sets the ISSYI (input stream synchronization indicator) bit to 1.

The ISSY field is inserted after the user packets (UP) or in the BB header of the GSE-HEM stream.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:IACTive[:STATe]`
on page 131

GSE-Lite Active
For Stream Type > "GSE-HEM", indicates that the GSE stream is GSE-Lite compliant.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBX:BHConfig:GLACtive[:STATe]` on page 131

NPD Active
Activates null-packet deletion (NPD).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:NACTive[:STATe]`
on page 131

UPL
Indicates the user packet length (UPL).

The user packet length depends on the "Stream Type":
- For "Transport", "UPL = 188 Bytes"
- For "GC", "UPL = 0 Bytes" which results in a continuous stream
- For "GP", UPL is a configurable value.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:UPL` on page 131

DFL
If "Auto DFL > Off", sets the data field length (DFL).

Remote command:
CCM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:DFL` on page 132
ACM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:DFL`
on page 132

Auto DFL
Defines if the "DFL" is set automatically or manually.

Remote command:
CCM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:ADFL:STATe`
on page 132
ACM mode: `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:ADFL[:STATe]` on page 132

Sync (Hex)
Indicates the user packet synchronization byte.

The value and the value range depend on the used Stream Type:
- For "TS" and "GP", "Sync = 47".
  This value indicates MPEG transport stream packets.
- For "GC", the value is configurable.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:SBYTe:PATTern` on page 132

3.9 Super frame configuration settings

Option: R&S SMW-K176

Access:

1. Select "DVB > DVB Standard > DVB-S2/DVB-S2X".

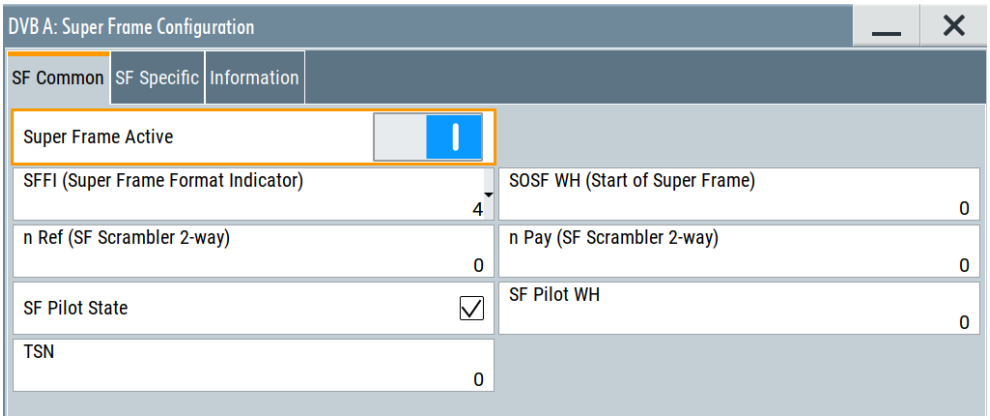
2. Select "CCM/ACM > CCM".
3. Select "System".
4. Select "SF Config".

   The super frame configuration dialog opens. It allows you to configure common and specific super frame settings and provides further information on super frames.

3.9.1 SF Common settings

Access:

► Select "SF Common".



The dialog provides settings to configure common super frame settings.

Super Frame Active
Activates the super frame.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:STATe` on page 134

SFFI (Super Frame Format Indicator)
Sets the super frame format indicator (SFFI).

"4"	Requires "Beam Hopping Active > Off". Define a fixed super frame length.
"5"	Define a custom super frame length.
"6" to "7"	Requires "Beam Hopping Active > On". Define a customized super frame length with activated beam hopping.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SFFI on page 134

SOSF WH (Start of Super Frame)
Sets the Walsh-Hadamard (WH) sequence for the symbols of the start of the super frame (SOSF).

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SOSF on page 135

n Ref (SF Scrambler 2-way)
Sets the scrambling code number for the reference data scrambler. Reference data refers to cell synchronization and frame format information.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:NREF on page 135

n Pay (SF Scrambler 2-way)
Sets the scrambling code number for the payload data scrambler.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:NPAY on page 135

SF Pilot State
Activates the pilot of the super frame (SF) for all transmitted super frames.

Activate super frame pilots if you want to use beam hopping.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PSTate on page 135

SF Pilot WH
Sets the Walsh-Hadamard (WH) sequence for the super frame pilots.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PWH on page 136

TSN
Sets the time slice number (TSN).

The TSN is identified in the wideband header. The TSN information determines which physical layer frames the receiver decodes and which frames the receiver discards.

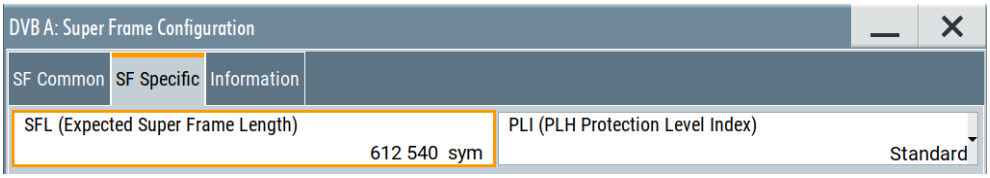
The dialog provides the setting of the time slice number (TSN) according to Annex M of ETSI EN 302 307-2.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:TSN on page 136

3.9.2 SF Specific settings

Access:

► Select "SF Specific".



The dialog provides settings to configure specific super frame settings.

SFL (Expected Super Frame Length)
Sets or displays the super frame length.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SFLength` on page 136

PLI (PLH Protection Level Index)
Selects the protection level indicator of the physical layer header.

"Standard" Standard protection of physical layer header using BPSK with spreading factor 1.

"Robust" Robust protection of physical layer header using BPSK with spreading factor 2.

"Very Robust" Very robust protection of physical layer header using BPSK with spreading factor 5.

"High Efficiency"
High efficiency protection of physical layer header using QPSK with puncturing. The selection applies only for 8PSK and higher "MODCOD" schemes refer to payload transfer.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PLI` on page 137

ST WH (Super Frame Trailer)
Requires "SF Common > SFFI > 4".

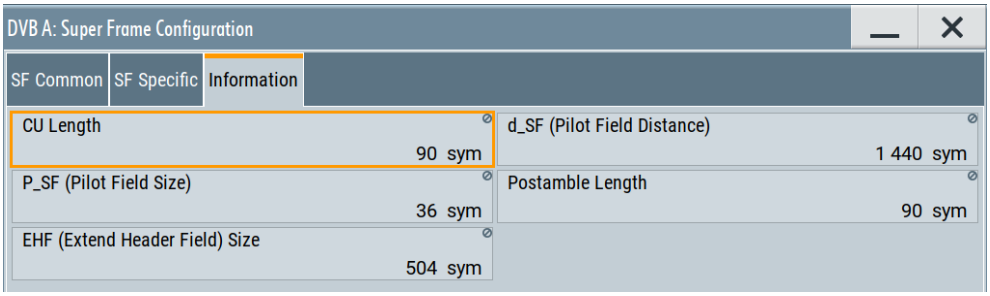
The super frame trailer (ST) extends the frame field in respect of the super frame header (SFH) with a Walsh-Hadamard (WH) sequence.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:STWH` on page 137

3.9.3 Super frame information

Access:

► Select "Information".



The dialog displays information on the super frame configuration.

CU Length
Displays the capacity unit length.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:CULength?` on page 137

d_SF (Pilot Field Distance)
Displays the distance between super frame start and start of pilot field in the super frame.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:DSF?` on page 138

P_SF (Pilot Field Size)
Displays the pilot field size.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PSF?` on page 138

Postamble Length
Displays the postamble length within the last super frame.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PLENgth?` on page 142

EHF (Extend Header Filed) Size
For SFFI (Super Frame Format Indicator) = 6 and "System" > "BH Config > Beam Hopping Active > On", indicates the extend header filed size.

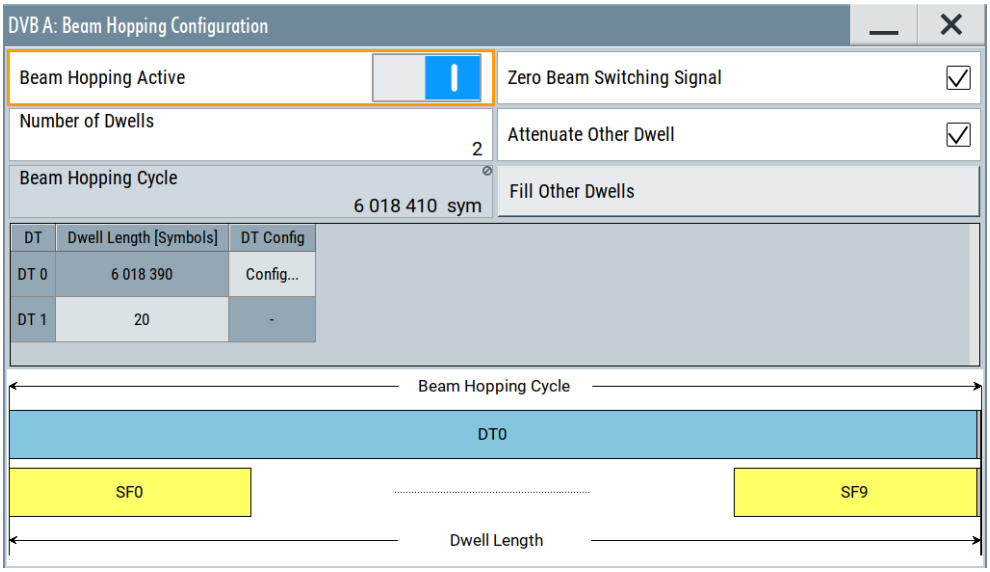
Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:EHFSize? on page 138

3.10 Beam hopping configuration settings

Option: R&S SMW-K176

Access:

1. Select "DVB > DVB Standard > DVB-S2/DVB-S2X".
2. Select "CCM/ACM > CCM".
3. Select "System".
4. Select "BH Config".



The dialog provides settings to configure the beam hopping. Also, the current beam hopping configuration is displayed graphically.

Beam Hopping Active
Activates the beam hopping.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:STATe on page 140

Zero Beam Switching Signal
Activates insertion of beam switching symbols. For test purposes, the output level of these symbols is zero.

The symbols are inserted between two dwells, after the postamble symbols.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:ZBSSignal on page 141

Number of Dwells
Sets the number of dwells. Also, the number defines the number of rows in the dwell time (DT) configuration table.

For a Beam Hopping Time Plan (BHTP), you can set up to 10 dwells ("DT0" to "DT9"). The first dwell ("DT0") contains real symbols with all framing and forward error correction (FEC). All other dwells transmit dummy data.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:NODWells on page 140

Attenuate Other Dwell
Activates attenuation for dwells "DT1" to "DT9". The frame with dwell time "DT0" is transmitted without attenuation.

Activate attenuation if you want to simulate a Beam Hopping Time Plan (BHTP) with different frequencies for the other dwells ("DT1" to "DT9").

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:AODWell on page 141

Beam Hopping Cycle
Displays the beam hopping cycle (BHC), that is the sum of the lengths of all dwells.

Also, a graphical representation of the BHC is displayed.

Example: Beam hopping cycle with two dwells

Figure 3-1 displays a BHC with two dwells "DT0" and "DT1". The first dwell "DT0" consists of two super frames and has a dwell length d_{DT0} = 617598 sym. The second dwell "DT1" consists of dummy data and has a dwell length d_{DT1} = 308799 symbols. The resulting length of the BHC d_{BHC} is:

$d_{BHC} = d_{DT0} + d_{DT1}$ = 926397 symbols

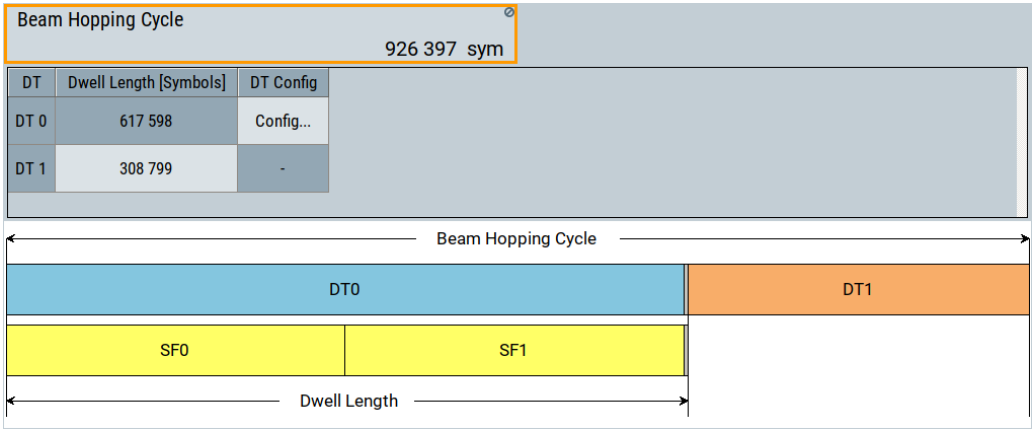


Figure 3-1: Beam hopping cycle: Two dwells, two super frames in first dwell

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:BHCycle?` on page 140

Fill Other Dwells
Fills automatically other dwells with DT0.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:FODT` on page 140

Dwell Time (DT) table
Lists the dwell time configuration for individual dwells in a table. The dwell time is expressed as the dwell length in symbols.

Each table row resembles the configuration for a specific dwell. Thus, the number of table rows equals the number of dwells, see "Number of Dwells" on page 49. The dwell configuration comprises dwell number, dwell length and, for the first dwell, access to further settings.

DT ← Dwell Time (DT) table
Displays the dwell number "DTx" with "x" ranging from "0" to "9".

Dwell Length [Symbols] ← Dwell Time (DT) table
Sets the dwell length in symbols, that is the dwell time.

The dwell length of the first dwell "DT0" is calculated automatically and depends on other settings. For all other dwells, you can configure the dwell length manually.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:DT<ch0>:DLENgth` on page 143

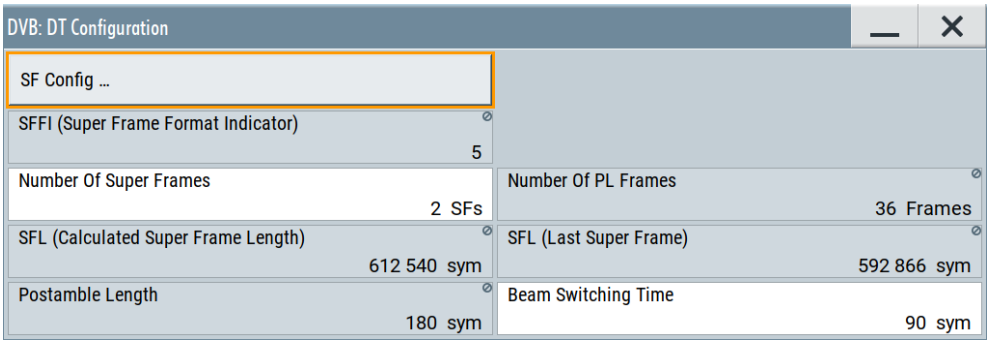
DT Config ← Dwell Time (DT) table
Accesses the dwell time configuration of the first dwell "DT0", see Chapter 3.11, "DT configuration settings", on page 51.

3.11 DT configuration settings

Option: R&S SMW-K176

Access:

1. Select "DVB > DVB Standard > DVB-S2/DVB-S2X > System > BH Config".
2. In the DT table, select "DT Config" > "Config".



The dialog lists the dwell time configuration settings.

SF Config
Requires "DVB Standard > DVB-S2/DVB-S2X" and "CCM/ACM > CCM".

Accesses the super frame configurtion settings, see Chapter 3.9, "Super frame configuration settings", on page 43.

SFFI (Super Frame Format Indicator)
Sets the super frame format indicator (SFFI).

"4" Requires "Beam Hopping Active > Off".
Define a fixed super frame length.

"5" Define a custom super frame length.

"6" to "7" Requires "Beam Hopping Active > On".
Define a customized super frame length with activated beam hopping.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SFFI on page 134

Number Of Super Frames
Sets the number of super frames within the first dwell "DT0", see "Dwell Time (DT) table" on page 50.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:NOSF on page 141

Number of PL Frames
Option: R&S SMW-K116

For "DVB Standard > DVB-S2/S2X", sets the number of the transmitted frames.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:FRAMes on page 89

SFL (Calculated Super Frame Length)
Requires more than one super frame set in the dwell ("Number Of Super Frames > 2" or higher).

Displays the calculated super frame length in symbols.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:CSFLength? on page 141

SFL (Last Super Frame)
Displays the length of the last super frame in symbols.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:LSFLength? on page 142

Postamble Length
Displays the postamble length within the last super frame.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PLENgth? on page 142

Beam Switching Time
Sets the beam switching time.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:BSTime on page 142

3.12 DVB-RCS2 SF configuration settings

Option: R&S SMW-K169

Access:

1. Select "DVB > DVB Standard > DVB-RCS2".
2. Select "SF Config".

   The dialog provies the settings to configure signal according to ETSI EN 301 545-2.

About the return link structure

In DVB-RCS2, the largest physical resource is the *superframe*. Superframes consist of frames that in turn span timeslots. A *timeslot* is a bundle of bandwidth-time units (BTUs) of the same type.

Frames within a superframe can span different number of timeslots and several frequency bands that do not have to be adjacent.

The DVB-RCS2 waveform is defined over a *time-frequency* grid that is a grid of multiple frequency carriers transmitted over a set of timeslots. The transmission can be or not continuous so that some timeslots are not allocated and the transmission is scheduled in a later time slot. The waveform can change between the timeslots.

In this implementation, the content is defined bottom up. That is, you define the transmission bursts and the frame content. The number of superframes, and their allocation in time and frequency are configured automatically, depending on the configured frames.

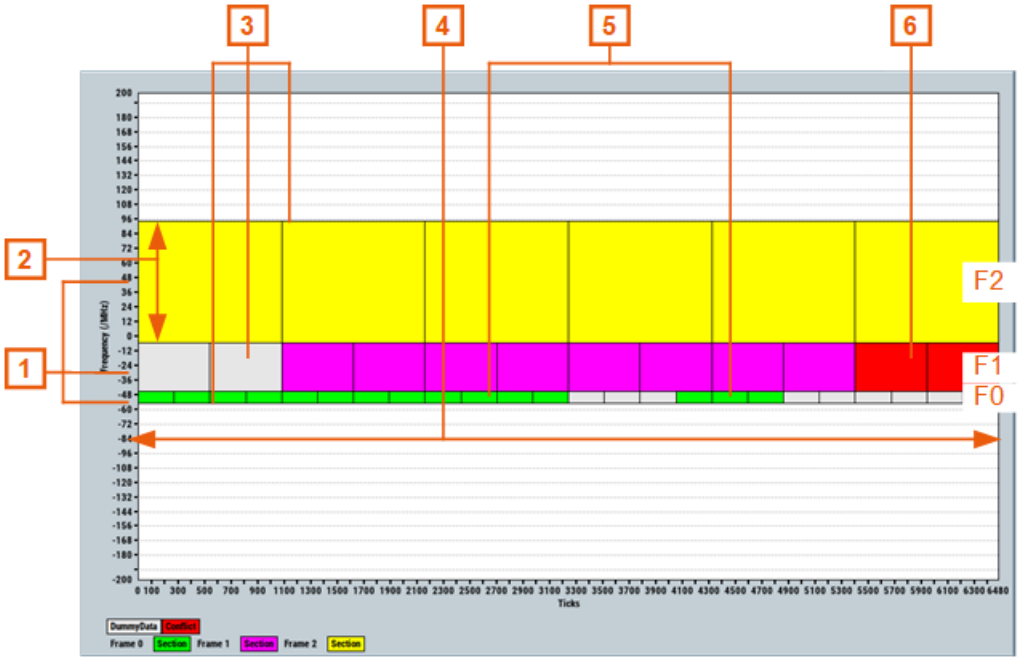


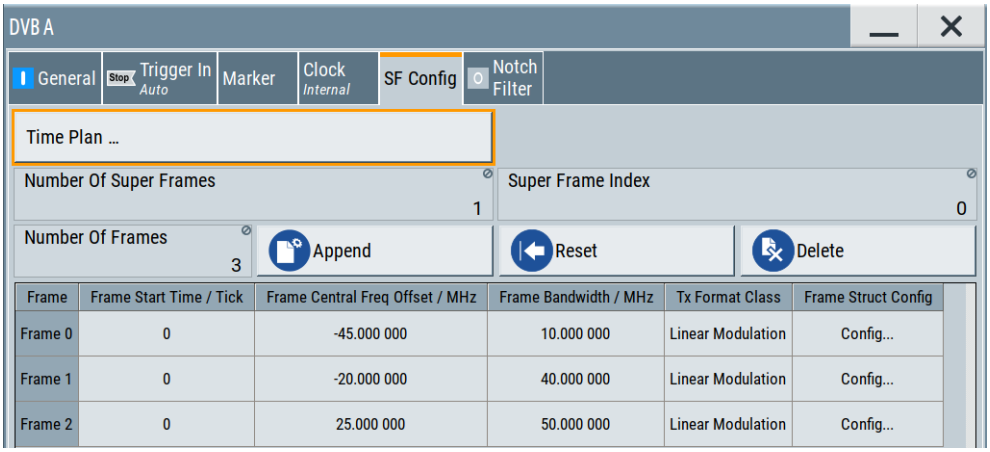
Figure 3-2: Example of DVB-RCS2 configuration (DVB Standard = DVB-RCS2 and SF Config >Time Plan)

1 = Three frames, F1, F2 and F3 with Frame Central Freq Offset f1 = -50 MHz, f2 = -25 MHz and f3 = 45 MHz
2 = Frames with different Frame Bandwidth and BTU Bandwidth, BW1 = 10 MHz, BW2 = 40 MHz and BW3 = 100 MHz (marked)
3 = BTU Duration of 270 Ticks, 540 Ticks and 1080 Ticks
4 = Time Unit Count that is number of BTUs within the frame = 24 (marked), 12 and 6 respectively
5 = Different sections within a frame, e.g. two in F0 and F1. There is one section in F3. Where and Start BTU and Timeslot Size set the start and the duration of each section, e.g. "Time Slot Size = 3" and "Start BTU = 10" for section#2 in F1
6 = Allocation conflict in F1, resulting from allocating section#0 and section#1 during the same BTUs

3.12.1 SF general settings

Access:

► Select "SF Config".



With the provided settings, you can configure the superframe, as defined by the super frame composition table (STC).

Superframe composition table (STC)

Superframe can have different type and comprises several frames.

The SCT specifies:

- The superframe type, where each type is indicated by the following:
  - a sequence
  - A centre frequency
  - An absolute start time expressed as an NCR (Network Clock Reference) value
  - A superframe count.
- How the superframe resources are divided into frames.

Each frame is of a specific frame type and its position within the super frame is defined relative to the centre frequency and start time of the associated super-frame.

Time Plan
Opens the time plan to display the current configuration.

See Figure 3-2.

Number of Super Frames
Indicates how many super frames are generated.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFRames` on page 145

Super Frame Index
Indicates the super frame index.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFINdex` on page 146

Number of Frames
Indicated of how many frames the superframe contains.

In the frame table, there is one table row per frame.

Add frames with "Append". The values "Number of Frames" is updated accordingly.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRAMes?` on page 146

Append
Adds a new frame to the frame table.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:APPend` on page 146

Reset
Deletes all row despite the first one and resets the frame configuration to the default values.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:RESet on page 146

Delete
Removes the last frame from the frame table.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:DELete on page 146

Frame table
Comprises the settings of the enabled frames. There is one table row per frame. Add a new row with "Append". The parameter "Number of Frames" indicates the current number of frames in the configuration.

Frame ← Frame table
Subsequent frame number.

Remote command:
Suffix FRConfig<st0>

Frame Start Time / Tick ← Frame table
Sets the start time of the selected frame, relative to the superframe start time. The value is expressed as NCR (Network Clock Reference) count intervals (ticks).

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:FRSTime on page 147

Frame Central Freq Offset ← Frame table
Sets the frequency offset for the selected frame, relative to the center frequency of the super frame. The greater the offset (absolute value) the bigger the distance on the Y-axis to the central frame.

Observe the "Time Plan" and the example of Figure 3-2.

In a subframe, frames are allocated starting from the lowest frequency (on the Y-axis). Hence, set the central frequency of first frame in frame table to occupy the highest negative or the lowest positive offset. Configure the central frequency of the reaming frames following the same principle. Consider that the selected frame and BTU bandwidths defines the minimal distance between the central frequencies of two subsequent frames.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:OFFSet on page 147

Frame Bandwidth ← Frame table
Sets the frequency bandwidth that the frame spans.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:FRBW on page 147

Tx Format Class ← Frame table
Indicates the transmission format class (`tx_format_class`) of all transmission types used in the frame.

The DVB-RCS2 specifies: turbo coded linear modulation (TC-LM), CPM, TC-LM-spread spectrum (TC-LM-SS) and continuous carrier (CC) transmissions.

This implementation supports: turbo coded linear modulation (TC-LM) burst transmission and spread-spectrum linear burst transmission (TC-LM-SS).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:TXFormat`
on page 148

Frame Struct Config ← Frame table
Opens the "Frame Structure" dialog, see Chapter 3.12.2, "Frame structure settings", on page 57.

3.12.2 Frame structure settings

Access:

1. Select "DVB > DVB Standard > DVB-RCS2".
2. Select "SF Config".
3. In the frame table, select "Frame Structure Config > Config".

   The "Frame Structure" dialog comprises the settings to configure the DVB-RCS2 frame.

Frame composition table version 2 (FCT2)

The FCT2 defines how the different frame types are organized in the time domain:

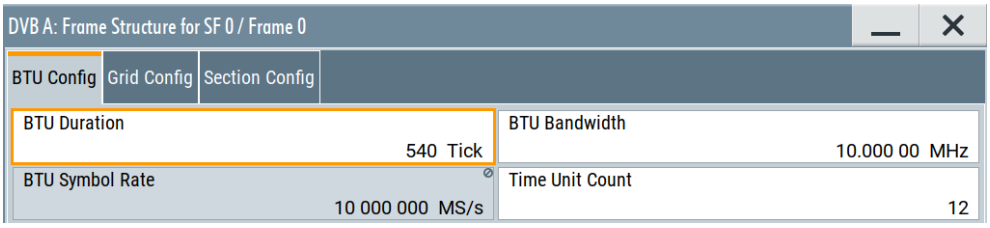
- Each frame type is divided into several timeslots, where the timeslots are numbered in a certain way.
- Each timeslot has a specific default transmission type and consists of one or more bandwidth-time-units (BTUs).
  The BTUs within a frame must be of the same type.
- The BTU determines the symbol rate of the frame and the occupied BW.

3.12.2.1 BTU configuration settings

Access:

1. Select "DVB > DVB Standard > DVB-RCS2".

2. Select "SF Config".
3. In the frame table, select "Frame Structure Config > Config".
4. Select "BTU Config".



The bandwidth-time unit (BTU) settings are part of the FCT2 (frame composition table 2) content that specifies the different frame types.

BTU Duration
Sets the duration of one bandwidth-time unit (BTU) (`btu_duration`, see Figure 3-2.

The value is expressed as NCR (Network Clock Reference) count intervals (ticks).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:DURation` on page 148

BTU Bandwidth
Sets the bandwidth occupied by one BTU (`btu_carrier_bw`). The max BTU bandwidth corresponds to the selected Frame Bandwidth of the respective frame.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:BW` on page 148

BTU Symbol Rate
For Tx Format Class > "Lienear Modulation", indicates the symbol rate used in one BTU (`btu_symbol_rate`).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:SYBRate?` on page 149

BTU Chip Rate
For Tx Format Class > "SS Lienear Modulation", indicates the chip rate used in one BTU.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:CHIRate?` on page 149

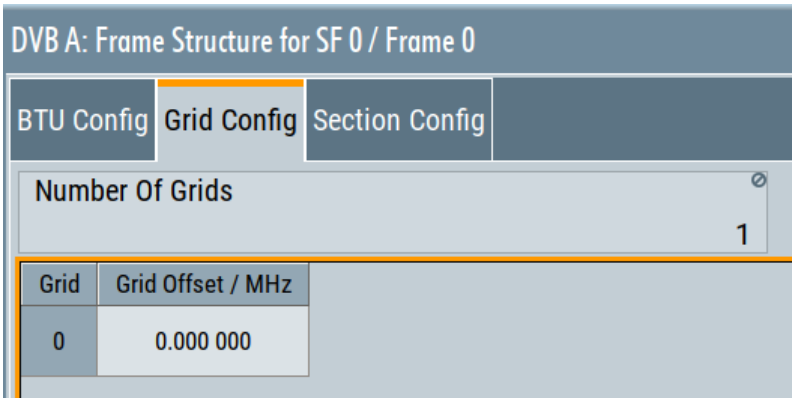
Time Unit Count
Sets the number of consecutive BTUs within a frame (`time_unit_count`), see Figure 3-2.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<s0t>:BTU:TUCount` on page 149

3.12.2.2 Grid configuration settings

Access:

1. Select "DVB > DVB Standard > DVB-RCS2".
2. Select "SF Config".
3. In the frame table, select "Frame Structure Config > Config".
4. Select "Grid Config".



Defines the grid configuration that is part of the FCT2 content, see "Frame composition table version 2 (FCT2)" on page 57.

Number of Grids
Sets the number of carriers of the selected frame (`grid_repeat_count`) and thus defines additional BTU grids in the frequency domain.

If "Number of Grids = 1", the BTU is placed at the frame centre frequency.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:GRIDs` on page 149

Grid table
Lists the grid number and grid offset in a table.

Grid ← Grid table
Displays the grid number.

Grid Offset ← Grid table
Sets the frequency offset for the corresponding BTU grid (`grid_frequency_offset`), relative to the frame centre frequency, see "Frame Central Freq Offset" on page 56.

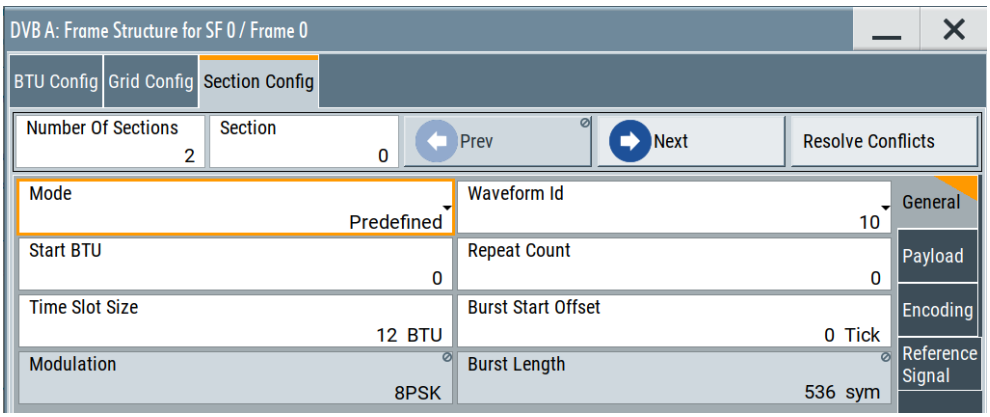
Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:GRID<di0>:OFFSet` on page 150

3.12.2.3 Section configuration settings

Access:

1. Select "DVB > DVB Standard > DVB-RCS2".
2. Select "SF Config".
3. In the frame table, select "Frame Structure Config > Config".
4. Select "Section Config".

   The displayed settings depend on the selected Tx Format Class.



Sections are defined by section type and have a predetermined content: preamble, pilot blocks, and postamble.

- Preamble: mandatory for every burst, with configurable pattern and length
- Pilot blocks: evenly distributed within the payload and configured as number of repetitions, size, interval and content.
  See "Payload section settings" on page 64.
- Postamble: optional, pattern and length are configurable

Number of Sections
Sets the number of the frame sections (`section_count`) within a frame.

If more than one section are enabled, sections are ordered according to a predefined scheme.

Frame sections are addressed incrementally according to ascending time and coarsely according to ascending frequency. The first section is the section that starts at the time offset specified for the frame (Frame Start Time / Tick) and resides at the lowest frequency defined for the frame (Frame Central Freq Offset).

Hence, to enable more than one section, set the duration of the section to be less than the frame duration (Timeslot Size < Time Unit Count).

See also Figure 3-2.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SECTions`
on page 151

Section
Selects the current section. All further settings in this dialog apply to the selected section.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SECidx`
on page 151

Prev/Next
Switches between the sections.

Remote command:
n.a.

Resolve Conflicts
Automatically reschedules resources so that overlapping in the time domain are resolved.

The rescheduling mechanism shifts subsequent sections in time to start right after the previous section ends. Conflicts cannot be resolved automatically and need manual reconfiguration, if there are no enough free physical resources (BTUs).

You recognize a conflict by the warning icon displayed beside "Resolve Conflicts".

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:RESolve` on page 152
See also: `[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:CONFlicts?` on page 151

General section settings
Access: in the "Frame Structure for SF X/ Frame X" dialog, select "Section Config > General".

Mode ← General section settings
Sets how the section is configured.

"Predefined" The general section configuration is defined by the selected "Waveform Id".

"User Defined" Reference waveform is disabled.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:MOD` on page 152

Waveform Id ← General section settings
Select a reference waveform, defined for the transmission format class.

Further parameters are set automatically and according to the waveform specification in Annex A of ETSI EN 301 545-2.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:WVID` on page 152

Start BTU ← General section settings
Defines the frame section start by defining a start BTU; thus, defines an offset from the first BTU of the frame (`Section_start_offset`).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:STBTu` on page 153

Repeat Count ← General section settings
Defines how many times the transmission type (`tx_type`) is repeated (`repeat_count`).

The maximum value of this parameter is the number of successive frame sections of a given type minus one.

Example:

"Repeat Count = 0" means no repetitions and thus one singular transmission.

"Repeat Count = 1" means one repetition and thus 2 transmission in total.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:REPCount` on page 153

Timeslot Size ← General section settings
Defines how many BTUs the timeslot spans.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:TSSize` on page 153

Burst Start Offset ← General section settings
Sets the nominal offset for burst start from the start of the timeslot (`tx_start_offset`).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:BSOFfset` on page 154

Modulation ← General section settings
For "Mode = Predefined", indicates the used modulation scheme, depending on the selected "Wavefom Id".

For "Mode = User Defined", sets the modulation scheme.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:MODU` on page 154

Burst Length ← General section settings
Indicates the burst length in symbols, depending on the selected "Wavefom Id". In user-defined mode, the value is calculated automatically.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:BSTLen?` on page 154

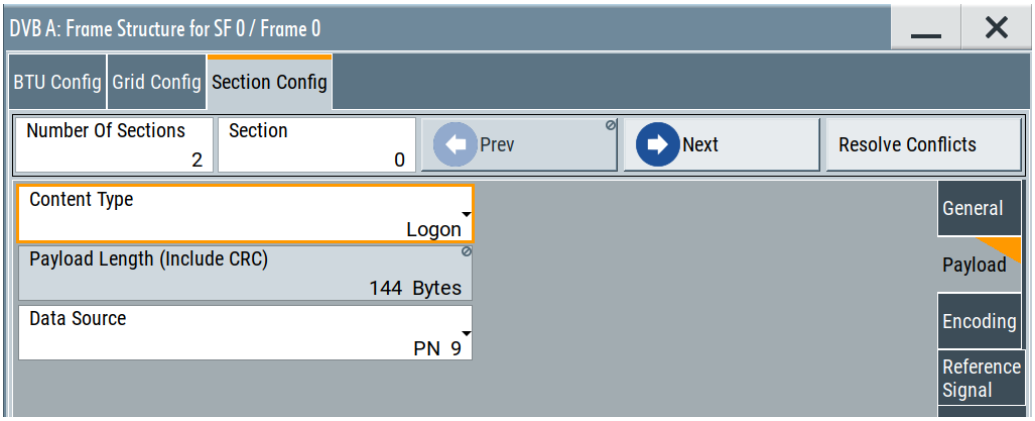
Spreading Factor
For Tx Format Class > "SS Lienear Modulation", indicates the spreading factor, depending on the selected "Wavefom Id".

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:SFACtor on page 155

Burst Length
Indicates the burst length in chips, depending on the selected "Wavefom Id". In user-defined mode, the value is calculated automatically.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:BLCHips? on page 155

Payload section settings
Access: in the "Frame Structure for SF X/ Frame X" dialog, select "Section Config > Payload".



Content Type ← Payload section settings
Sets the payload content type (`tx_content_type`).

"Logon", "Control"
Content types for L2S.

"Trafic" Higher layer traffic.

"Trafic / Control"
Higher layer traffic and L2S.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PALType on page 155

Payload Length (Include CRC) ← Payload section settings
Indicates the payload length for the selected "Content Type" and "Waferom Id".

For "Mode = User Defined", you can define the payload length.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PLEN on page 156

Data Source ← Payload section settings
Selects the data source for the payload.

The following standard data sources are available:

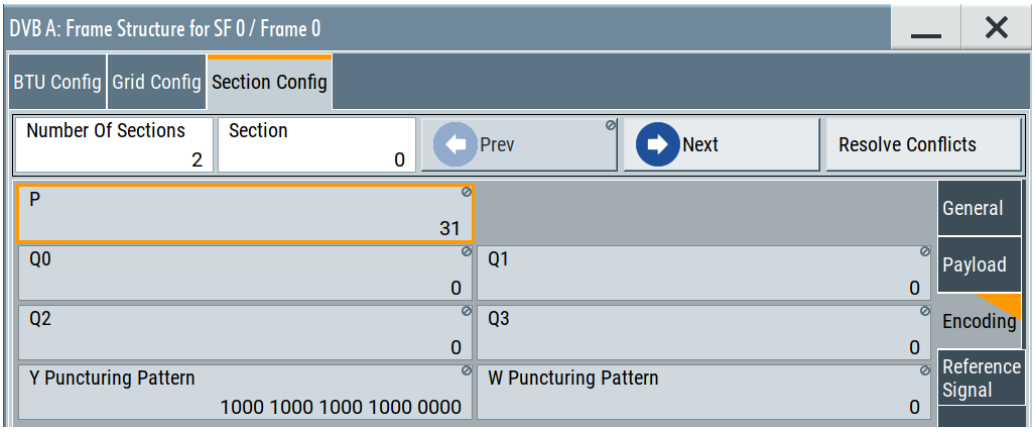
- "All 0, All 1"
  An internally generated sequence containing 0 data or 1 data.
- "PNxx"
  An internally generated pseudo-random noise sequence.
- "Pattern"
  An internally generated sequence according to a bit pattern.
  Use the "Pattern" box to define the bit pattern.
- "Data List/Select DList"
  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:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:DATA` on page 156
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:LISTsel` on page 156
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:DAPatt` on page 156

Encoding section settings
Access: in the "Frame Structure for SF X/ Frame X" dialog, select "Section Config > Encoding".



P ← Encoding section settings
Indicates the permutation parameter P.

In "Mode = Predefined", the values are set automatically depending on the selected "Waveform Id".

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:P` on page 157

Q0, Q1, Q2, Q3 ← Encoding section settings
Indicates the set of permutation parameters Q0-Q3.

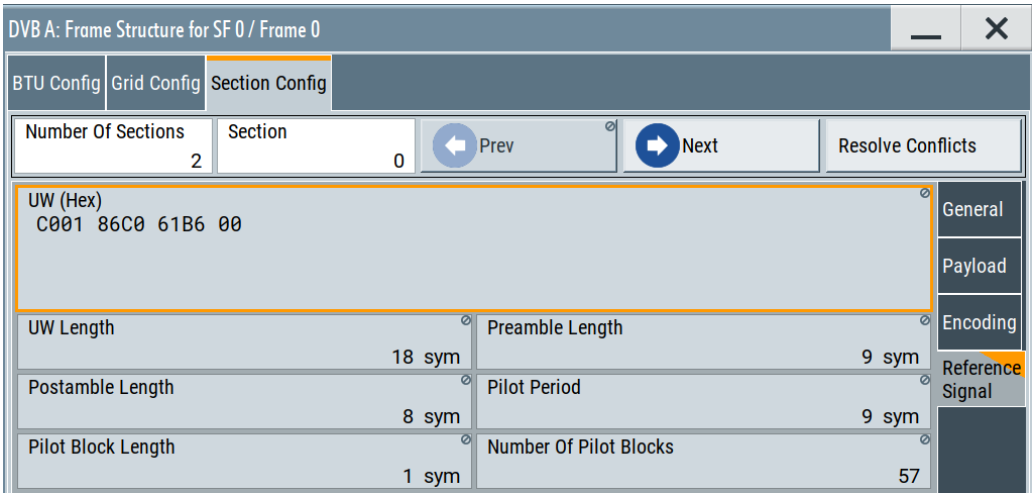
In "Mode = Predefined", the values are set automatically depending on the selected "Waveform Id".

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q0` on page 157
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q2` on page 157
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q1` on page 157
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q3` on page 157

Y Puncturing Pattern, W Puncturing Pattern ← Encoding section settings
Sets 1 bit in the contiguous sequence of bits specifying the puncturing pattern for first and second parity bits Y and W.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:YPAT` on page 157
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:WPAT` on page 157

Reference signal section settings
Access: in the "Frame Structure for SF X/ Frame X" dialog, select "Section Config > Reference Signal".



UW (Hex) ← Reference signal section settings
Displays the content of the unique word (UW).

The value depends on the current configuration.

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:UW` on page 158

UW Length ← Reference signal section settings
Indicates the length of the UW in symbols (`uw_length`), where:

"UW Length" = "Preamble Length" + "Pilot Block Length" + "Postamble Length".

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:UWLen?` on page 158

Preamble Length ← Reference signal section settings
Indicates the preamble length (`preamble_length`).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PRELen` on page 158

Postamble Length ← Reference signal section settings
Indicates the postamble length (`postamble_length`).

Remote command:
`[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:POSLen` on page 158

Pilot Period ← Reference signal section settings
Sets the insertion period of pilot blocks in symbols and thus the distance between the first symbol of two consecutive pilot blocks.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PPERiod on page 159

Pilot Block Length ← Reference signal section settings
Sets the number of symbols in each block of pilot symbols (pilot_block_len).

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PBLen on page 159

Number of Pilot Blocks ← Reference signal section settings
Sets the total number of pilot symbols to be inserted.

Remote command:
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:NPBLocks? on page 159

4 Signal generation control

This section lists settings for configuring the baseband filter, for defining the signal generation start and for generating signals necessary for synchronization with other instruments.

It covers the following topics:

4.1 Filter/clipping settings

Access:

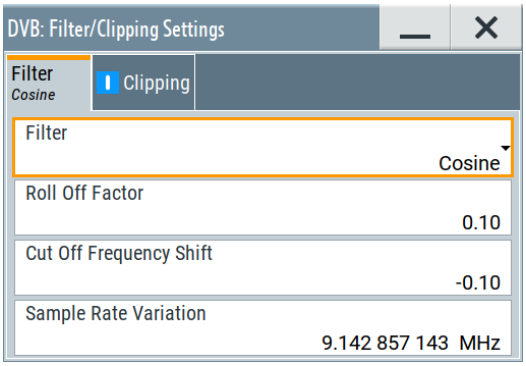
► Select "General > Filter/Clipping Settings".

The dialog provides settings to configure the baseband filter and to enable clipping.

4.1.1 Filter settings

Access:

► Select "Filter".



The dialog comprises the settings, necessary to configure the baseband filter.

Settings:

Filter
Selects the baseband filter.

The DVB-S2/S2X standards use the predefined root cosine (RC) filter to shape the baseband signal spectrum.

Remote command:
`[:SOURce<hw>]:BB:DVB:FILTer:TYPE` on page 91

Rolloff Range
Requires option R&S SMW-K116 and "DVB Standard > DVB-S2X".

Selects whether the high or the low filter roll-off range is used, see Table 4-1.

Remote command:
`[:SOURce<hw>]:BB:DVB:FILTer:RORange` on page 92

Rolloff Factor or BxT
Sets the filter parameter.

The rolloff factor affects the steepness of the filter slopes. A "Rolloff Factor = 0" results in the steepest slopes; values near to 1 make the slopes more flat.

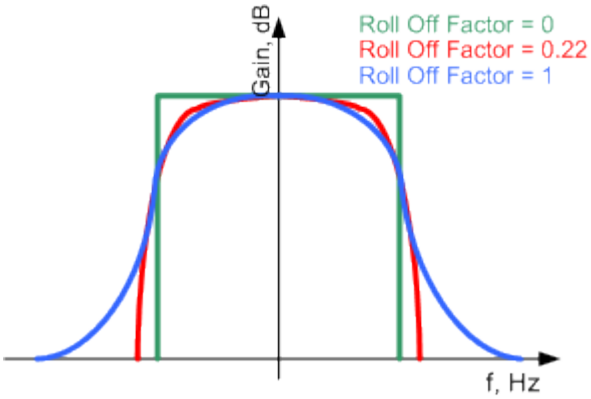


Figure 4-1: Example of the frequency response of a filter with different rolloff factors

For "DVB Standard > DVB-S2/S2X", the rolloff factors are predefined.

Table 4-1: Predefined sets of spectrum shapes

"DVB Standard"	"Roll Off Range"	"Roll Off Factor"
"DVB-S2"	-	0.35, 0.25, 0.2
"DVB-S2X"	Low	0.15, 0.1, 0.05
	High	0.35, 0.25, 0.2

Remote command:
`[:SOURce<hw>]:BB:DVB:FILTer:PARameter:RCOSine` on page 91
`[:SOURce<hw>]:BB:DVB:FILTer:PARameter:COSine` on page 91

[:SOURce<hw>]:BB:DVB:FILTer:PARameter:GAUSs on page 91
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:PGAuss on page 91
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:SPHase on page 91
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:APCO25 on page 91
[:SOURce<hw>]:BB:DVB:FILTer:ROFactor on page 92

Cutoff Frequency Shift
The cutoff frequency is a filter characteristic that defines the frequency at the 3 dB down point. The "Cut Off Frequency Shift" affects this frequency in the way that the filter flanks are "moved" and the transition band increases by "Cut Off Frequency Shift"*"Sample Rate".

- A "Cut Off Frequency Shift" = -1 results in a very narrow-band filter
- Increasing the value up to 1 makes the filter more broad-band
- By "Cut Off Frequency Shift" = 0, the -3 dB point is at the frequency determined by the half of the selected "Sample Rate".

Tip: Use this parameter to adjust the cutoff frequency and reach spectrum mask requirements.

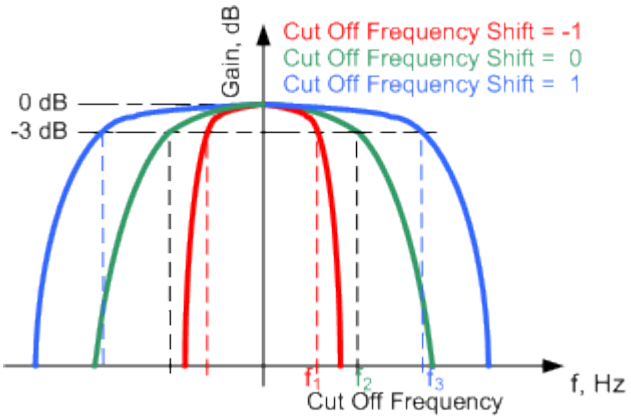


Figure 4-2: Example of the frequency response of a filter with different cutoff frequency shift

Remote command:
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:COSine:COFS on page 91

Cutoff Frequency Factor
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:DVB:FILTer:PARameter:LPASs on page 91
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:LPASSEVM on page 91

Sample/Symbol Rate Variation
"Sample Rate Variation" requires "DVB Standard > DVB-H/T", "Symbol Rate Variation" requires "DVB Standard > DVB-S2/S2X".

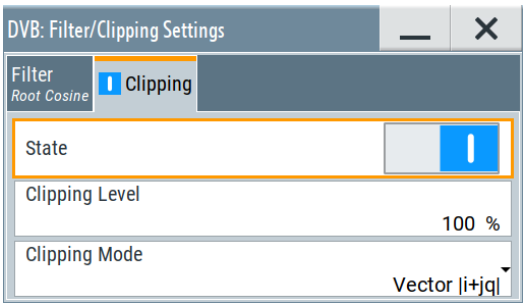
Sets the symbol/sample rate of the signal. A variation of the parameter affects the ARB clock rate; all other signal parameters remain unchanged.

Remote command:
[:SOURce<hw>]:BB:DVB:SRATe:VARiation on page 92

4.1.2 Clipping settings

Access:

► Select "Clipping".



The dialog provides settings to configure clipping.

DVB signals can have a high crest factor (~ 11 dBm) because of high amplitude variations that come along with OFDM signals having a noise-like spectrum. High crest factors entail two basic problems:

- The nonlinearity of the power amplifier (compression) causes intermodulation which expands the spectrum (spectral regrowth).
- Since the level in the D/A converter is relative to the maximum value, the average value is converted with a relatively low resolution. A low resolution results in a high quantization noise.

Both effects increase the adjacent-channel power.

Since clipping the signal not only changes the peak value but also the average value, the effect on the crest factor is unpredictable.

The following pictures demonstrate the effect of clipping with vector mode (`|i+jq|`), using the default signal configuration with a PN23 input sequence.

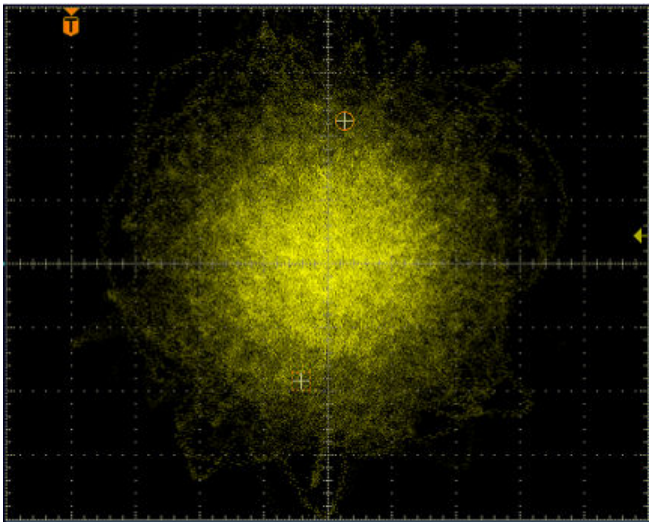


Figure 4-3: Constellation diagram of the signal without clipping, shows the level mapping

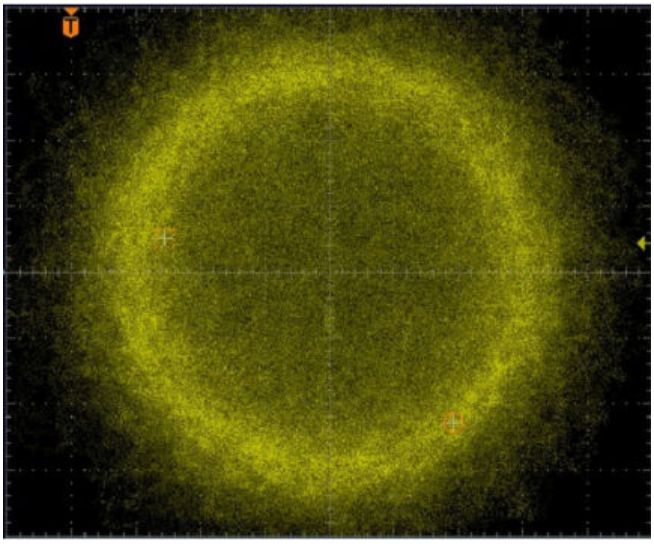


Figure 4-4: Constellation diagram with clipping level 10 %, clipping mode Vector |i+jq|)

Settings:

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 to filtering, the procedure does not influence the spectrum. The EVM however increases.

Remote command:
`[:SOURce<hw>]:BB:DVB:CLIPping:STATe` on page 93

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:DVB:CLIPping:LEVel` on page 93

Clipping Mode
Selects the clipping method. The dialog displays a graphical illustration on how this two methods work.

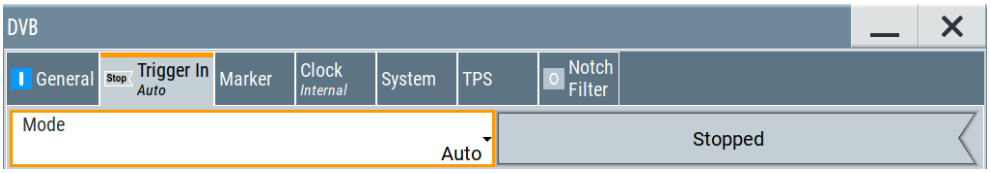
- "Vector | i + jq |"
  The limit is related to the amplitude | i + q |. The I and Q components are mapped together, the angle is retained.
- "Scalar | i | , | q |"
  The limit is related to the absolute maximum of all the I and Q values | i | + | q |. The I and Q components are mapped separately, the angle changes.

Remote command:
`[:SOURce<hw>]:BB:DVB:CLIPping:MODE` on page 93

4.2 Trigger settings

Access:

► Select "Baseband > DVB > Trigger In".



The dialog provides settings to select and configure the trigger, like trigger source and trigger mode, and to arm or trigger an internal trigger manually. The current signal generation status is displayed in the header of the dialog together with information on the enabled trigger mode. As in the "Marker" and "Clock" dialogs, this dialog 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.

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 connectors 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, proceed as follows:

- Define the signal source and the effect of a trigger event.
  Select "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
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:DVB[:TRIGger]:SEQuence` on page 99

Time Based Trigger
Requires trigger "Mode" > "Armed Auto"/"Single".

Activates time-based triggering with a fixed time reference.

The R&S SMW triggers signal generation when its operating system time ("Current Time") matches a specified time trigger ("Trigger Time"). As trigger source, you can use an internal trigger or an external global trigger.

How to: Chapter "Time-based triggering" in the R&S SMW user manual.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:TIME[:STATe]` on page 96

Trigger Time
Requires trigger "Mode" > "Armed Auto"/"Single".

Sets date and time for a time-based trigger signal.

Set a trigger time that is later than the "Current Time". The current time is the operating system time of the R&S SMW. If you set an earlier trigger time than the current time, time-based triggering is not possible.

How to: Chapter "Time-based triggering" in the R&S SMW user manual.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:TIME:TIME` on page 95
`[:SOURce<hw>]:BB:DVB:TRIGger:TIME:DATE` on page 95

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:DVB:TRIGger:SLUNit` on page 97

Signal Duration
Requires trigger "Mode" > "Single".

Enters the length of the trigger signal sequence.

Use this parameter, for example, for the following applications:

- To output the trigger signal partly.
- To output a predefined sequence of the trigger signal.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:SLENgth` on page 98

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:DVB:TRIGger:RMODe?` on page 97

Arm
Stops the signal generation until subsequent trigger event occurs.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:ARM:EXECute` on page 94

Execute Trigger
For internal trigger source, executes trigger manually.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:EXECute` on page 96

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

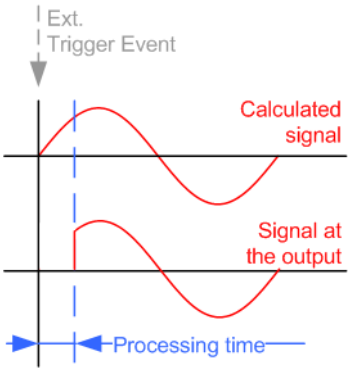
In primary-secondary instrument mode, secondary instruments are triggered by the active edge of the synchronization signal.

"External Local Clock/Trigger" require R&S SMW-B10.

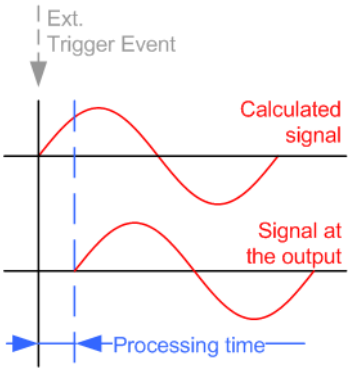
Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:SOURce` on page 98

Sync. Output to External 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 primary-secondary instrument mode, this setting ensures that once achieved, synchronization is not lost if the baseband signal sampling rate changes.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:EXTernal:SYNChronize:OUTPut`
on page 96

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:DVB:TRIGger[:EXTernal]:INHibit` on page 99
`[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:INHibit` on page 97

External / 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

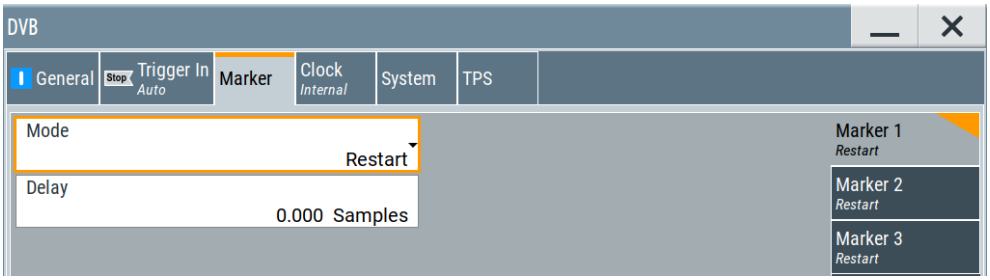
For more information, see chapter "Basics on ..." in the R&S SMW user manual.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal]:DELay` on page 99
`[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:DELay` on page 96

4.3 Marker settings

This dialog provides access to the settings necessary to select and configure the marker output signal, like the marker mode or marker delay settings.

► To access this dialog, select "Baseband > DVB > Marker".



The dialog provides settings to select and configure the marker output signal, like marker mode and the marker delay.

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 connectors settings.

Settings:

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.

"Restart" A marker signal is generated at the start of every sequence length loop.

"Super Frame Start" A marker signal is generated at the start of every super-frame period.

"Frame Start" A marker signal is generated at the start of each frame.

"Pulse" A regular marker signal is generated. The pulse frequency is derived by dividing the sample rate by the selected divider.

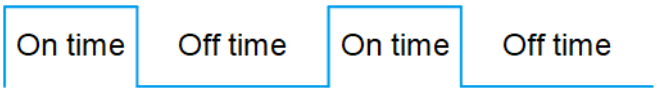
Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:DIVider` on page 101
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:FREQuency?` on page 102

"Pattern" A marker signal that is defined by a bit pattern is generated.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PATTern` on page 101

"On/Off Ratio"

A regular marker signal that is defined by an on/off ratio is generated. A period lasts one on-cycle and one off-cycle.



Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:ONTime` on page 101
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:OFFTime` on page 101

"SOSF" Option: R&S SMW-K116
If "DVB Standard = DVB-S2/DVB-S2X", marks the super frame start.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:MODE` on page 100

Super Frame Index
Option: R&S SMW-K116

If "DVB Standard = DVB-S2/DVB-S2X" and "Marker > Mode = SOSF", indicates the super frame index.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:SFINdex` on page 102

Marker x Delay
Delays the marker signal at the marker output relative to the signal generation start.

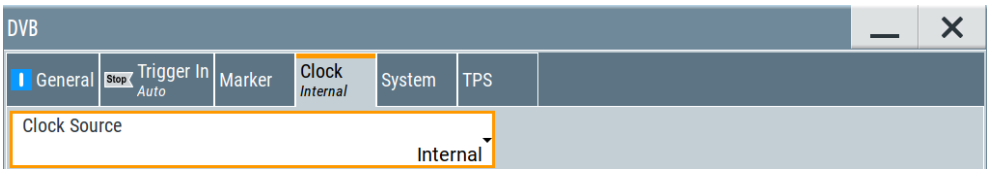
Variation of the parameter "Marker x" > "Delay" causes signal recalculation.

Remote command:
`[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:DELay` on page 102

4.4 Clock settings

Access:

► Select "Baseband > DVB > Clock".



The dialog provides settings 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 connectors 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 connectors settings.

Settings:

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:DVB:CLOCk:SOURce` on page 103

Clock Mode

Option: R&S SMW-B10

Sets the type of externally supplied clock.

Remote command:

`[:SOURce<hw>]:BB:DVB:CLOCk:MODE` on page 103

Measured External Clock

Provided for permanent monitoring of the enabled and externally supplied clock signal.

Remote command:

`CLOCk:INPut:FREQuency?`

4.5 Local and global connectors settings

Accesses a dialog to configure local connectors or global connectors.

The button is available in the following dialogs or tabs:

- "Trigger / Marker / Clock" dialog that is accessible via the "TMC" block in the block diagram.
- "Trigger In", "Marker" and "Clock" tabs that are accessible via the "Baseband" block in the block diagram.

See also chapter "Local and global connectors settings" in the user manual.

5 Remote-control commands

The following commands are required to perform signal generation with the DVB 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 is 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.

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 `ENTity3|4` require option R&S SMW-K76
`SOURce<hw>`	[1] to 4	Available baseband signals Only `:SOURce1` possible, if the keyword `ENTity` is used.
`OUTPut<ch>`	1 to 3	Available markers
`SET<st>`	1 to 100	MODCOD set

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.

Programming examples

This description provides simple programming examples. The purpose of the examples is to present **all** commands for a given task. In real applications, one would rather reduce the examples to an appropriate subset of commands.

The programming examples have been tested with a software tool which provides an environment for the development and execution of remote tests. To keep the example as simple as possible, only the "clean" SCPI syntax elements are reported. Non-executable command lines (e.g. comments) start with two // characters.

At the beginning of the most remote control program, an instrument preset or reset is recommended to set the instrument to a definite state. The commands `*RST` and

SYSTem:PRESet are equivalent for this purpose. *CLS also resets the status registers and clears the output buffer.

The following commands specific to the DVB are described here:

5.1 Common commands

Example: Saving and recalling settings

```
SOURce1:BB:DVB:STANdard DVBH
SOURce1:BB:DVB:DVBH:HMODe?
// Response: "NHI"
// Non-hierarchical coding mode
SOURce1:BB:DVB:DVBH:SFRames 10
SOURce1:BB:DVB:DVBH:STATe 1
SOURce1:BB:DVB:WAVeform:CREate "/var/user/dvbh.wv"
SOURce1:BB:DVB:DVBH:SAMPle:LENGth?
// 6266880
SOURce1:BB:DVB:DVBH:SAMPle:DURation?
// 0.68544
SOURce1:BB:DVB:DVBH:SAMPle:RATE?
// 9142857.14285714
SOURce1:BB:DVB:DVBH:SAMPle:DRATe?
// 16.5882352941176

SOURce1:BB:DVB:SETTing:STORe "/var/user/dvbh"
SOURce1:BB:DVB:PRESet
SOURce1:BB:DVB:SETTing:CATalog?
// dvbh,dvbt,dvb_h
SOURce1:BB:DVB:SETTing:DELete "dvb_h"
SOURce1:BB:DVB:SETTing:LOAD "/var/user/dvbt"
```

[:SOURce<hw>]:BB:DVB:STATe <State>

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

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 0

Example: See Example"Saving and recalling settings" on page 85.

Manual operation: See "State" on page 16

[:SOURce<hw>]:BB:DVB: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:DVB:STATe`.

Example: See Example"Saving and recalling settings" on page 85.

Usage: Event

Manual operation: See "Set to Default" on page 16

[:SOURce<hw>]:BB:DVB:SETTing:CATalog?

Queries the files with settings in the default directory. Listed are files with the file extension `*.dvb`.

Return values:

<Catalog> <filename1>,<filename2>,...

Returns a string of filenames separated by commas.

Example: See Example"Saving and recalling settings" on page 85.

Usage: Query only

Manual operation: See "Save/Recall" on page 17

[:SOURce<hw>]:BB:DVB:SETTing:DELete <Filename>

Deletes the selected file from the default or specified directory. Deleted are files with the file extension `*.dvb`.

Setting parameters:

<Filename> string

Filename or complete file path; file extension can be omitted

Example: See Example"Saving and recalling settings" on page 85.

Usage: Setting only

Manual operation: See "Save/Recall" on page 17

[:SOURce<hw>]:BB:DVB:SETTing:LOAD <Filename>

Loads the selected file from the default or the specified directory. Loaded are files with extension `*.dvb`.

Setting parameters:

<Filename> string

Filename or complete file path; file extension can be omitted

Example: See Example"Saving and recalling settings" on page 85.

Usage: Setting only

Manual operation: See "Save/Recall" on page 17

[:SOURce<hw>]:BB:DVB:SETTing:STORe <Filename>

Saves the current settings into the selected file; the file extension (`*.dvb`) is assigned automatically.

Setting parameters:

<Filename> string

Filename or complete file path

Example: See Example"Saving and recalling settings" on page 85.

Usage: Setting only

Manual operation: See "Save/Recall" on page 17

[:SOURce<hw>]:BB:DVB:WAVeform:CREate <Filename>

Saves the current settings as an ARB signal in a waveform file (`*.wv`).

Setting parameters:

<Filename> string

Filename or complete file path; file extension is assigned automatically

Example: See Example"Saving and recalling settings" on page 85.

Usage: Setting only

Manual operation: See "Generate Waveform File" on page 17

[:SOURce<hw>]:BB:DVB:STANdard <Standard>

Selects the DVB standard to be used.

Parameters:

<Standard> DVBH | DVBT | DVBS | DVBX | DVBR

*RST: DVBH

Example: See Example"Saving and recalling settings" on page 85.

Options: DVBS|DVBX require R&S SMW-K116
DVBR requires R&S SMW-K169

Manual operation: See "DVB Standard" on page 17

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:SFRames <SFrames>

Sets the number of super-frames to be transmitted.

Parameters:

<SFrames> integer

Range: 1 to 1633 (dynamic)
*RST: 1

Example: See Example"Saving and recalling settings" on page 85.

Manual operation: See "Number of Super Frames" on page 18

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFRames <SuperFrames>

For DVB-S2X standard, sets the number of the transmitted super frames.

Parameters:

<SuperFrames> integer

Range: 1 to 3263
*RST: 1

Options: R&S SMW-K116

Manual operation: See "Number of Super Frames" on page 18

[:SOURce<hw>]:BB:DVB:DVBX:VSMode <VSMode>

Includes the VL-SNR (very low - signal to noise ratio) header in the physical layer frame.

Parameters:

<VSMode> 1 | ON | 0 | OFF

*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Options: R&S SMW-K116

Manual operation: See "VL-SNR Mode" on page 18

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:FRAMes <Frames>

Sets the number of the transmitted frames.

Parameters:

<Frames> integer

Range: 1 to max

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Options: R&S SMW-K116

Manual operation: See "Number of PL Frames" on page 18

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:SAMPle:LENGth?

Queries the number of the transmitted samples.

Return values:

<Length> integer

Example: See Example"Saving and recalling settings" on page 85.

Usage: Query only

Manual operation: See "Number of Samples / Duration" on page 18

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:DURation?

Queries the signal duration.

Return values:
<Duration> float

Example: See Example"Saving and recalling settings" on page 85.

Usage: Query only

Manual operation: See "Number of Samples / Duration" on page 18

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:SAMPle:RATE?

Queries the sample rate.

Return values:
<Rate> float

Example: See Example"Saving and recalling settings" on page 85.

Usage: Query only

Manual operation: See "Sample Rate / Data Rate" on page 18

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:DRATe?

Queries the data rate.

Return values:
<DRate> float
Increment: 0.01

Example: See Example"Saving and recalling settings" on page 85.

Usage: Query only

Manual operation: See "Sample Rate / Data Rate" on page 18

5.2 Filter commands

[:SOURce<hw>]:BB:DVB:FILTer:TYPE <Type>

Selects the filter type.

Parameters:

<Type> RCOSine | COSine | GAUSs | LGAuss | CONE | COF705 | COEQualizer | COFequalizer | C2K3x | APCO25 | SPHase | RECTangle | PGAuss | LPASs | DIRac | ENPShape | EWPShape | LPASSEVM

*RST: COSine

Example:

```
:SOURce1:BB:DVB:STANdard DVBT
:SOURce1:BB:DVB:FILTer:TYPE COSine
:SOURce1:BB:DVB:FILTer:PARameter:COSine 0.1
:SOURce1:BB:DVB:FILTer:PARameter:COSF -0.1
:SOURce1:BB:DVB:SRATe:VARiation?
// Response: 9142857.14285714
```

Manual operation: See "Filter" on page 70

[:SOURce<hw>]:BB:DVB:FILTer:PARameter:APCO25 <Apco25>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:COSine <Cosine>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:COSine:COFS <Cofs>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:GAUSs <Gauss>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:LPASs <LPass>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:LPASSEVM <LPassEvm>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:PGAuss <PGauss>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:RCOSine <RCosine>
[:SOURce<hw>]:BB:DVB:FILTer:PARameter:SPHase <SPhase>

Sets the filter parameter.

Filter Type	Parameter	Parameter name	Min	Max	Increment	Default
APCO25	Rolloff factor	<Apco25>	0.05	0.99	0.01	0.2
COSine	Cutoff frequency shift	<Cosf>	-1	1	0.01	-0.1
COSine	Rolloff factor	<Cosine>	0	1	0.01	0.1
GAUSs	BxT	<Gauss>	0.15	2.5	0.01	0.5
LPASs	Cutoff frequency factor	<LPass>	0.05	2	0.01	0.5
LPASSEVM	Cutoff frequency factor	<LPassEvm>	0.05	2	0.01	0.5
PGAuss	BxT	<PGauss>	0.15	2.5	0.01	0.5
RCOSine	Rolloff factor	<RCosine>	0	1	0.01	0.22
SPHase	BxT	<SPhase>	0.15	2.5	0.01	2

Parameters:

<SPhase> float

Range: 0.15 to 2.5
Increment: 0.01
*RST: 2

Example: See [:SOURce<hw>]:BB:DVB:FILTer:TYPE on page 91

Manual operation: See "Rolloff Factor or BxT" on page 70

[:SOURce<hw>]:BB:DVB:FILTer:RORange <RORange>

Sets whether the high or the low filter roll-off range is used.

Parameters:

<RORange> HIGH | LOW

*RST: HIGH

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Options: R&S SMW-K116

Manual operation: See "Rolloff Range" on page 70

[:SOURce<hw>]:BB:DVB:FILTer:ROFactor <ROff>

Sets the filter parameter.

Parameters:

<ROff> RO35 | RO25 | RO20 | RO15 | RO10 | RO05

*RST: RO20

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Options: R&S SMW-K116

Manual operation: See "Rolloff Factor or BxT" on page 70

[:SOURce<hw>]:BB:DVB:SRATe:VARiation <Variation>

Sets the output sample/symbol rate.

Parameters:

<Variation> float

Range: 400 to 40E6
Increment: 0.001
*RST: 9142857.14

Example: See [:SOURce<hw>]:BB:DVB:FILTer:TYPE on page 91

Manual operation: See "Sample/Symbol Rate Variation" on page 71

5.3 Clipping commands

[:SOURce<hw>]:BB:DVB:CLIPping:LEVel <Level>

Sets the limit for level clipping. This value indicates at what point the signal is clipped.

Parameters:

<Level> integer

Value specified as a percentage, relative to the highest level. 100 PCT indicates that clipping does not take place.

Range: 1 to 100
*RST: 100

Example:

```
:SOURce1:BB:DVB:CLIPping:LEVel 80
:SOURce1:BB:DVB:CLIPping:MODE SCAL
:SOURce1:BB:DVB:CLIPping:STATe 1
```

Manual operation: See "Clipping Level" on page 74

[:SOURce<hw>]:BB:DVB:CLIPping:MODE <Mode>

Sets the method for level clipping.

Parameters:

<Mode> VECTor | SCALar

*RST: VECTor

Example: See `[:SOURce<hw>]:BB:DVB:CLIPping:LEVel` on page 93

Manual operation: See "Clipping Mode" on page 74

[:SOURce<hw>]:BB:DVB:CLIPping:STATe <State>

Activates level clipping.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 0

Example: See `[:SOURce<hw>]:BB:DVB:CLIPping:LEVel` on page 93

Manual operation: See "Clipping State" on page 73

5.4 Trigger commands

Example: Configuring trigger settings

```
SOURce1:BB:DVB:TRIGger:SOURce INTernal
SOURce1:BB:DVB:TRIGger:SEQuence ARETrigger
SOURce1:BB:DVB:STAT ON
SOURce1:BB:DVB:TRIGger:EXECute
SOURce1:BB:DVB:TRIGger:ARM:EXECute
SOURce1:BB:DVB:TRIGger:RMODe?
// stopped
SOURce1:BB:DVB:TRIGger:EXECute
SOURce1:BB:DVB:TRIGger:RMODe?
// run

SOURce1:BB:DVB:TRIGger:SEQuence SING
SOURce1:BB:DVB:TRIGger:SLUNit SEQ
SOURce1:BB:DVB:TRIGger:SLENgth 2


SOURce1:BB:DVB:TRIGger::SOURce EGT1
SOURce1:BB:DVB:TRIGger:EXTernal:SYNChronize:OUTPut 1
SOURce1:BB:DVB:TRIGger:EXTernal:INHibit 100
SOURce1:BB:DVB:TRIGger:EXTernal:DELay 10

SOURce1:BB:DVB:TRIGger:SOURce INTB
SOURce1:BB:DVB:TRIGger:OBASeband:DELay 100
SOURce1:BB:DVB:TRIGger:OBASeband:INHibit 10
```


[:SOURce<hw>]:BB:DVB:TRIGger:ARM:EXECute

Stops signal generation; a subsequent trigger event restarts signal generation.

Example: See Example"Configuring trigger settings" on page 94

Usage: Event

Manual operation: See "Arm" on page 77

[:SOURce<hw>]:BB:DVB:TRIGger:TIME:DATE <Year>, <Month>, <Day>

Sets the date for a time-based trigger signal. For trigger modes single or armed auto, you can activate triggering at this date via the following command:

`SOURce<hw>:BB:<DigStd>:TRIGger:TIME:STATe`

`<DigStd>` is the mnemonic for the digital standard, for example, `ARB`. Time-based triggering behaves analogously for all digital standards that support this feature.

Parameters:

<Year> integer
Range: 1980 to 9999

<Month> integer
Range: 1 to 12

<Day> integer
Range: 1 to 31

Example: See example "Configure a time-based trigger signal" in the subchapter "Trigger Commands" of the chapter "SOURce:BB:ARB subsystem" in the R&S SMW user manual.

Manual operation: See "Trigger Time" on page 76

[:SOURce<hw>]:BB:DVB:TRIGger:TIME:TIME <Hour>, <Minute>, <Second>

Sets the time for a time-based trigger signal. For trigger modes single or armed auto, you can activate triggering at this time via the following command:

`SOURce<hw>:BB:<DigStd>:TRIGger:TIME:STATe`

`<DigStd>` is the mnemonic for the digital standard, for example, `ARB`. Time-based triggering behaves analogously for all digital standards that support this feature.

Parameters:

<Hour> integer
Range: 0 to 23

<Minute> integer
Range: 0 to 59

<Second> integer
Range: 0 to 59

Example: See example "Configure a time-based trigger signal" in the subchapter "Trigger Commands" of the chapter "SOURce:BB:ARB subsystem" in the R&S SMW user manual.

Manual operation: See "Trigger Time" on page 76

[:SOURce<hw>]:BB:DVB:TRIGger:TIME[:STATe] <State>

Activates time-based triggering with a fixed time reference. If activated, the R&S SMW triggers signal generation when its operating system time matches a specified time.

Specify the trigger date and trigger time with the following commands:

`SOURce<hw>:BB:<DigStd>:TRIGger:TIME:DATE`

`SOURce<hw>:BB:<DigStd>:TRIGger:TIME:TIME`

`<DigStd>` is the mnemonic for the digital standard, for example, `ARB`. Time-based triggering behaves analogously for all digital standards that support this feature.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 0

Example: See example "Configure a time-based trigger signal" in the subchapter "Trigger Commands" of the chapter "SOURce:BB:ARB subsystem" in the R&S SMW user manual.

Manual operation: See "Time Based Trigger" on page 76

[:SOURce<hw>]:BB:DVB:TRIGger:EXECute

Executes a trigger.

Example: See Example"Configuring trigger settings" on page 94

Usage: Event

Manual operation: See "Execute Trigger" on page 77

[:SOURce<hw>]:BB:DVB:TRIGger:EXTernal:SYNChronize:OUTPut <Output>

Enables signal output synchronous to the trigger event.

Parameters:

<Output> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "Sync. Output to External Trigger/Sync. Output to Trigger" on page 78

[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:DELay <Delay>

Specifies the trigger delay for triggering by the trigger signal from the other path.

Parameters:

<Delay> float

Range: 0 to 2147483647
Increment: 0.01
*RST: 0

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "External / Trigger Delay" on page 79

[:SOURce<hw>]:BB:DVB:TRIGger:OBASeband:DELay <Delay>

Sets the trigger delay for triggering by the trigger signal from the second path.

Parameters:

<Delay> float

Range: 0 to 65535
Increment: 0.01
*RST: 0
Default unit: samples

Example: See Example"Configuring trigger settings" on page 94

[:SOURce<hw>]:BB:DVB: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
Default unit: samples

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "External / Trigger Inhibit" on page 79

[:SOURce<hw>]:BB:DVB:TRIGger:RMODe?

Queries the signal generation status.

Return values:

<RMode> STOP | RUN

Example: See Example"Configuring trigger settings" on page 94

Usage: Query only

Manual operation: See "Running/Stopped" on page 77

[:SOURce<hw>]:BB:DVB:TRIGger:SLUNit <SLunit>

Defines the unit for the entry of the signal sequence length.

Parameters:

<SLunit> FRAMe | SEQuence

*RST: SEQuence

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "Signal Duration Unit" on page 76

[:SOURce<hw>]:BB:DVB:TRIGger:SLENgth <SLength>

Defines the length of the signal sequence that is output in the `SINGle` trigger mode.

Parameters:

<SLength> integer

Range: 1 to 7000

*RST: 4

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "Signal Duration" on page 76

[:SOURce<hw>]:BB:DVB: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 primary-secondary instrument 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 Example"Configuring trigger settings" on page 94.

Options: ELTRigger|ELCLock require R&S SMW-B10

BBSY require R&S SMW-B9

Manual operation: See "Trigger Source" on page 77

[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal]:DELay <Delay>

Sets the trigger delay.

Parameters:

<Delay> float

Range: 0 to 2147483647
Increment: 0.01
*RST: 0
Default unit: samples

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "External / Trigger Delay" on page 79

[:SOURce<hw>]:BB:DVB:TRIGger[:EXTernal]:INHibit <Inhibit>

Specifies the duration by which a restart is inhibited.

Parameters:

<Inhibit> integer

Range: 0 to 21.47*sampRate
*RST: 0

Example: See Example"Configuring trigger settings" on page 94

Manual operation: See "External / Trigger Inhibit" on page 79

[:SOURce<hw>]:BB:DVB[: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"Configuring trigger settings" on page 94

Manual operation: See "Trigger Mode" on page 75

5.5 Marker commands

Example: Configuring marker settings

```
SOURce1:BB:DVB:TRIGger:OUTPut1:MODE PULS
// Sets a pulse marker.
SOURce1:BB:DVB:TRIGger:OUTPut1:PULSe:DIVider 2
SOURce1:BB:DVB:TRIGger:OUTPut1:PULSe:FREQuency?

SOURce1:BB:DVB:TRIGger:OUTPut1:MODE PATTern
// Sets a bit pattern marker.
SOURce1:BB:DVB:TRIGger:OUTPut1:PATTern #H2,2

SOURce1:BB:DVB:TRIGger:OUTPut1:MODE RAT
SOURce1:BB:DVB:TRIGger:OUTPut1:ONTime 10
SOURce1:BB:DVB:TRIGger:OUTPut1:OFFTime 10


SOURce1:BB:DVB:TRIGger:OUTPut2:DELay 1600
// delays the marker signal output
```

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:MODE <Mode>

Defines the signal for the selected marker output.

Parameters:

<Mode> RESTart | SFRame | SFRAMe | FRAMe | PULSe | PATTern | RATio | SOSF

RESTart
Marks the start of every sequence length loop. Restart mode is available only for ETI data source.

SFRame
Marks the start of every super-frame period.

FRAMe
Marks the start of every frame.

PULSe
Generated continuously according to the frequency and frequency divider.

PATTern
A marker signal according to a bit pattern

RATio
A regular marker signal that is defined by an on/off ratio

SOSF
If "DVB Standard = DVB-S2/DVB-S2X", marks the super frame start.

*RST: RESTart

Example: See Example"Configuring marker settings" on page 100

Options: SOSF requires R&S SMW-K116

Manual operation: See "Marker Mode" on page 80

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:ONTime <Ontime>
[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:OFFTime <OffTime>

Sets the number of samples during which the marker output is on or off.

*) 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 Example"Configuring marker settings" on page 100

Manual operation: See "Marker Mode" on page 80

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PATTern <Pattern>, <BitCount>

Defines the bit pattern used to generate the marker signal.

Parameters:

<Pattern> numeric

0 = marker off, 1 = marker on

*RST: #H2

<BitCount> integer

Range: 1 to 64

*RST: 2

Example: See Example"Configuring marker settings" on page 100

Manual operation: See "Marker Mode" on page 80

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:DIVider <Divider>

Sets the divider for pulse marker mode (`PULSe`).

*) 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 Example"Configuring marker settings" on page 100

Manual operation: See "Marker Mode" on page 80

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:PULSe:FREQuency?

Queries the pulse frequency of the pulsed marker signal `PULSe`.

Return values:

<Frequency> float

Example: See Example"Configuring marker settings" on page 100

Usage: Query only

Manual operation: See "Marker Mode" on page 80

[:SOURce<hw>]:BB:DVB: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"Configuring marker settings" on page 100

Manual operation: See "Marker x Delay" on page 81

[:SOURce<hw>]:BB:DVB:TRIGger:OUTPut<ch>:SFINdex <SuperFrameIndex>

Queries the super frame index.

Parameters:

<SuperFrameIndex> integer

Range: 0 to 3263
*RST: 0

Example:

```
SOURce1:BB:DVB:STANdard DVBX
SOURce1:BB:DVB:TRIGger:OUTPut1:MODE SOSF
SOURce1:BB:DVB:TRIGger:OUTPut1:SFINdex?
```

Options: R&S SMW-K116

Manual operation: See "Super Frame Index" on page 81

5.6 Clock commands

[:SOURce<hw>]:BB:DVB:CLOCk:MODE <Mode>

Sets the type of externally supplied clock.

Parameters:

<Mode> SAMP

*RST: SAMP

Example:
```
:SOURce1:BB:DVB:CLOCk:SOURce ELCL
:SOURce1:BB:DVB:CLOCk:MODE SAMP
```

Options: R&S SMW-B10

Manual operation: See "Clock Mode" on page 82

[:SOURce<hw>]:BB:DVB: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:
```
:SOURce1:BB:DVB:CLOCk:SOURce INTernal
```

Options: ELCLock requires R&S SMW-B10

Manual operation: See "Clock Source" on page 82

5.7 DVB-T/DVB-H system commands

Example: Configuring a DVB-H system

```
SOURce1:BB:DVB:STANdard DVBH
SOURce1:BB:DVB:DVBH:HMODe?
// Response: "NHI"
// Non-hierachical coding mode is supported only.
SOURce1:BB:DVB:DVBH:SFRames 10

SOURce1:BB:DVB:DVBH:HP:DATA?
// Response "DLIS"
SOURce1:BB:DVB:DVBH:HP:DATA:DSELection?
// Response: "/var/user/dvbh.gts"
SOURce1:BB:DVB:DVBH:HP:DATA PN23

SOURce1:BB:DVB:DVBH:HP:PNSCrambler:STATe 1
SOURce1:BB:DVB:DVBH:HP:OCODer:STATe 1
SOURce1:BB:DVB:DVBH:HP:OINTerleaver:STATe 1
SOURce1:BB:DVB:DVBH:HP:ICODer:STATe 1
SOURce1:BB:DVB:DVBH:HP:ICODer:RATE CR7D8

SOURce1:BB:DVB:DVBH:IINTerleaver:BIT:STATe 1
SOURce1:BB:DVB:DVBH:IINTerleaver:SYMBol:STATe 1
SOURce1:BB:DVB:DVBH:IINTerleaver:SYMBol:MODE IDEP
SOURce1:BB:DVB:DVBH:IINTerleaver:SYMBol:TMODe T8K

SOURce1:BB:DVB:DVBH:OFDM:BWIDth 8
SOURce1:BB:DVB:DVBH:OFDM:MODulation QAM64
SOURce1:BB:DVB:DVBH:OFDM:ALPHa 4
SOURce1:BB:DVB:DVBH:OFDM:GINTerval GI1D32

SOURce1:BB:DVB:STATe 1
```

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:HMODe <HMode>

Queries the mode for hierarchical coding, that is non-hierachical coding.

The current firmware does not support hierarchical coding.

Parameters:

<HMode> NHIerarchical

Non-hierchical coding using high priority input only.

*RST: NHIerarchical

Example: See Example"Configuring a DVB-H system" on page 104.

Manual operation: See "Hierarchy Mode" on page 17

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:DATA <Data>

Selects the data source to be used.

Parameters:

<Data> PAC0 | PAC1 | PN15 | PN23 | DLISt

ZERO
Internal 0 is used.

ONE
Internal 1 is used.

PN15/23
Internally generated PRBS data as per CCITT with period lengths between (2^9-1 and 2^{23}-1).

DLISt
Internal data from a TS file is used.

*RST: PN23

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "HP Source, Select File" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:DATA:DSELection <DSelection>

Selects an existing TS file from the default directory or from the specific directory.

TS files are files with extension `*.gts`, `*.ts`, or `*.trp`.

Parameters:

<DSelection> string

Filename incl. file extension or complete file path

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "HP Source, Select File" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:ICODer:RATE <Rate>

Selects the code rate of the inner coder.

Parameters:

<Rate> CR1D2 | CR2D3 | CR3D4 | CR5D6 | CR7D8
*RST: CR1D2

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Rate" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:ICODer[:STATe] <State>

Activates/deactivates the inner coder.

Parameters:

<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Inner Coder" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:OCODer[:STATe] <State>

Activates/deactivates the outer coder (RS).

Parameters:

<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Outer Coder (RS)" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:OINTerleaver[:STATe] <State>

Activates/deactivates the outer interleaver.

Parameters:

<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Outer Interleaver" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT[:HP|LP]:PNSCrambler[:STATe] <State>

Activates/deactivates the PN scrambler.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "PN Scrambler" on page 20

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:BIT[:STATe] <State>

Activates/deactivates the inner bit interleaver.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Inner Bit Interleaver" on page 21

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:SYMBol:MODE <Mode>

Selects the inner interleaver mode.

Parameters:

<Mode> NATive | NATIve | IDEPth

NATive
The interleaver interleaves the bits over one OFDMA symbol.

IDEPth
The interleaver interleaves the bits over two (4K transmission mode) or four (2K transmission mode) OFDMA symbols.

*RST: NATive

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Inner Interleaver Mode" on page 21

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:SYMBol:TMODe <TMode>

Selects the transmission mode.

Parameters:

<TMode> T2K | T4K | T8K

*RST: T2K

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Inner Interleaver Tx Mode" on page 21

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:IINTerleaver:SYMBol[:STATe] <State>

Activates/deactivates the inner symbol interleaver.

Parameters:
<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "Inner Symbol Interleaver" on page 21

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:ALPHa <Alpha>

Selects the α value. This value is used to shape the constellation of the modulation.

For DVB-H, this value is always 1.

Parameters:
<Alpha> 1 | 2 | 4
*RST: 1

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "OFDM/RF Alpha" on page 21

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:BWIDth <BWidth>

Selects the system bandwidth.

Parameters:
<BWidth> 5 | 6 | 7 | 8
*RST: 8 MHz

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "OFDM/RF Bandwidth" on page 21

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:GINTerval <GInterval>

Selects the OFDM/RF guard interval.

Parameters:
<GInterval> GI1D4 | GI1D8 | GI1D16 | GI1D32
*RST: GI1D8

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "OFDM/RF Guard Int." on page 22

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:OFDM:MODulation <Modulation>

Selects the constellation for the OFDM modulation.

Parameters:
<Modulation> QPSK | QAM16 | QAM64
*RST: QAM64

Example: See Example"Configuring a DVB-H system" on page 104

Manual operation: See "OFDM/RF Modulation" on page 21

5.8 DVB-S2/DVB-S2X system commands

Option: R&S SMW-K116

Example: Configuring DVB-S2X signal in CCM mode

```
SOURce1:BB:DVB:STANdard DVBX
SOURce1:BB:DVB:DVBX:VSMode 0
SOURce1:BB:DVB:DVBX:FRAMes 5
SOURce1:BB:DVB:DVBX:BHConfig:CACM CCM

SOURce1:BB:DVB:DVBX:STYPe TRAN
SOURce1:BB:DVB:DVBX:ISTReam?
// Response: "SINGle"
SOURce1:BB:DVB:DVBX:DATA PN9
SOURce1:BB:DVB:DVBX:CPNSequence:STATe 1
SOURce1:BB:DVB:DVBX:BBFRames?
// Response: "1"
// Complete transmission of PN9 data equals the length of one baseband frame.
SOURce1:BB:DVB:DVBX:ADLength:STATe?
// Response: "1"
SOURce1:BB:DVB:DVBX:DATA:LENGth 3000
SOURce1:BB:DVB:DVBX:CRC:STATe 1
SOURce1:BB:DVB:DVBX:BSCRambler:STATe 1
SOURce1:BB:DVB:DVBX:OCODer:STATe 1
SOURce1:BB:DVB:DVBX:ICODer:STATe 1
SOURce1:BB:DVB:DVBX:BINTerleaver:STATe 1
SOURce1:BB:DVB:DVBX:UCMode:STATe 0
SOURce1:BB:DVB:DVBX:CTYPe NORM
SOURce1:BB:DVB:DVBX:MCUNique MCU78
SOURce1:BB:DVB:DVBX:MODulation?
// Response: "APSK64_16_16_16_16"
SOURce1:BB:DVB:DVBX:MCOD?
// Response: "APSK64_X_N3245L"
SOURce1:BB:DVB:DVBX:ICODer:RATE?
// Response: "CR128D180"

// Set the spreading factor for short cody types.
SOURce1:BB:DVB:DVBX:CTYPe SHOR
SOURce1:BB:DVB:DVBX:SFACtor 1

SOURce1:BB:DVB:DVBX:PSTate:STATe 1
SOURce1:BB:DVB:DVBX:PSCRambler:STATe 1
SOURce1:BB:DVB:DVBX:SSEQuence 3
SOURce1:BB:DVB:DVBX:GSEQuence?
```

```
// Response: "32847"
// The gold sequence is 3 time 10949, where 3 is the scrambling sequence.

SOURce1:BB:DVB:DVBX:THConfig:TEINdication:STATe 1
SOURce1:BB:DVB:DVBX:THConfig:SBYTe?
// Response: "#47,8"
SOURce1:BB:DVB:DVBX:THConfig:PUS 1
SOURce1:BB:DVB:DVBX:THConfig:TPRiority 1
SOURce1:BB:DVB:DVBX:THConfig:PID:PATTern #H0A00,13
SOURce1:BB:DVB:DVBX:THConfig:SCONtrol 1
SOURce1:BB:DVB:DVBX:THConfig:AFIeld:STATe 1
SOURce1:BB:DVB:DVBX:THConfig:PAYLoad:STATe 1
SOURce1:BB:DVB:DVBX:THConfig:CCOunter 1
SOURce1:BB:DVB:DVBX:THConfig:STATe 1

SOURce1:BB:DVB:DVBX:BHConfig:STATe 1
SOURce1:BB:DVB:DVBX:BHConfig:IACTive:STATe 1
SOURce1:BB:DVB:DVBX:BHConfig:NACTive:STATe 1
SOURce1:BB:DVB:DVBX:BHConfig:UPL?
// Response: "188"
SOURce1:BB:DVB:DVBX:BHConfig:ADFL:STATe 0
SOURce1:BB:DVB:DVBX:BHConfig:DFL 464
SOURce1:BB:DVB:DVBX:BHConfig:SBYTe:PATTern?
// Response: "#47,8"

SOURce1:BB:DVB:DVBX:VSMode 1
SOURce1:BB:DVB:DVBX:STYPe GP
SOURce1:BB:DVB:DVBX:STYPe GHEM

SOURce1:BB:DVB:DVBX:GHConfig:LTYPe 1
SOURce1:BB:DVB:DVBX:GHConfig:GLENgth 2048
SOURce1:BB:DVB:DVBX:GHConfig:FID:PATTern #H01,8
SOURce1:BB:DVB:DVBX:GHConfig:FIUSe:STATe 1
SOURce1:BB:DVB:DVBX:GHConfig:TLUSe:STATe 1
SOURce1:BB:DVB:DVBX:GHConfig:TLENgth?
// Response: "3005"
SOURce1:BB:DVB:DVBX:GHConfig:PTYPe:PATTern #H0001,16
SOURce1:BB:DVB:DVBX:GHConfig:PTUSe:STATe 1
SOURce1:BB:DVB:DVBX:GHConfig:LABel:PATTern #H000011,24
SOURce1:BB:DVB:DVBX:GHConfig:LUSE:STATe 1
SOURce1:BB:DVB:DVBX:GHConfig:STATe 1
SOURce1:BB:DVB:DVBX:BHConfig:GLACtive:STATe 1
SOURce1:BB:DVB:DVBX:BHConfig:DFL 464
SOURce1:BB:DVB:DVBX:CTYPe MED
SOURce1:BB:DVB:DVBX:MCOD BPSK_X_VM1145

SOURce1:BB:DVB:FILTer:RORange LOW
SOURce1:BB:DVB:FILTer:ROFactor RO10
SOURce1:BB:DVB:CLIPping:STATe 1

SOURce1:BB:DVB:STATe 1
```

Example: Configuring DVB-S2X signal in ACM mode

```
SOURce1:BB:DVB:PRESet
SOURce1:BB:DVB:STANdard DVBX
SOURce1:BB:DVB:DVBX:VSMode 0
SOURce1:BB:DVB:DVBX:BHConfig:CACM ACM
SOURce1:BB:DVB:DVBX:PSCRambler:STATe 1
SOURce1:BB:DVB:DVBX:SSEQuence 1
SOURce1:BB:DVB:DVBX:GSEQuence?
// Response: "10949"
// The gold sequence is 1 times 10949, where 1 is the scrambling sequence.

SOURce1:BB:DVB:DVBX:CRC:STATe 1
SOURce1:BB:DVB:DVBX:NOSettings 3
SOURce1:BB:DVB:DVBX:MTAB:SET1:FRAMes 1
SOURce1:BB:DVB:DVBX:MTAB:SET1:CTYPe NORM
SOURce1:BB:DVB:DVBX:MTAB:SET1:MCOD APSK64_X_N3245L
SOURce1:BB:DVB:DVBX:MTAB:SET1:PCOD?
// Response: "184"
SOURce1:BB:DVB:DVBX:MTAB:SET1:ADFL:STATe 1
SOURce1:BB:DVB:DVBX:MTAB:SET1:DFL?
// Response: "5726"
SOURce1:BB:DVB:DVBX:MTAB:SET1:PSTate:STATe 1
SOURce1:BB:DVB:DVBX:MTAB:SET2:FRAMes 3
SOURce1:BB:DVB:DVBX:MTAB:SET2:CTYPe SHOR
SOURce1:BB:DVB:DVBX:MTAB:SET2:MCOD APSK32_X_S3245
SOURce1:BB:DVB:DVBX:MTAB:SET2:PCOD?
// Response: "248"
SOURce1:BB:DVB:DVBX:MTAB:SET2:DFL?
// Response: "1409"
SOURce1:BB:DVB:DVBX:MTAB:SET3:FRAMes 20
SOURce1:BB:DVB:DVBX:MTAB:SET3:MCOD APSK8_X_N2645L
SOURce1:BB:DVB:DVBX:MTAB:SET3:PCOD?
// Response: "140"
SOURce1:BB:DVB:DVBX:MTAB:SET3:ADFL:STATe 0
SOURce1:BB:DVB:DVBX:MTAB:SET3:DFL 4646
SOURce1:BB:DVB:DVBX:MTAB:SET3:PSTate:STATe 0

SOURce1:BB:DVB:STATe 1
SOURce1:BB:DVB:DVBX:FRAMes?
// Response: "24"
```

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:STYPe <SType>

Selects the input stream type.

Parameters:

<SType> TRANsport | GP | GC | GHEM
*RST: TRANsport

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Stream Type" on page 27

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ISTReam?

Queries the input stream type.

Return values:

<IStream> string

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Usage: Query only

Manual operation: See "Input Stream" on page 27

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA <Data>

Selects the data source.

Parameters:

<Data> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt | TFILe | GFILe

PATTern
To set the bit pattern, use the command `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:PATTern`.

DLISt|TFILe|GFILe
To select the data list, TS file or the GSE file, use the command `[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:DSELection|TSELection|GSELection`.

*RST: PN9

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Data Source, Select File" on page 28

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:PATTern <Pattern>, <BitCount>

Sets the the bit pattern.

Parameters:

<Pattern> numeric

*RST: #H0

<BitCount> integer

Range: 1 to 64
*RST: 1

Example:
```
SOURce1:BB:DVB:DVBX:DATA PATTern
SOURce1:BB:DVB:DVBX:DATA:PATTern #H39C,12
```

Manual operation: See "Data Source, Select File" on page 28

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:
DSELection|TSELection|GSELection <FSelection>

Selects an existing data list, transport file (TS) or GSE file from the default or from the specific directory.

- TS files are files with extension `*.gts`, `*.ts`, or `*.trp`.
- GSE files are files with extension `*.gse`
- Data lists are files with extension `*.dm_iqd`

Parameters:

<FSelection> string

Filename incl. file extension or complete file path

Example:
```
SOURce1:BB:DVB:DVBX:DATA TFILe
SOURce1:BB:DVB:DVBX:DATA:TSELection "/var/user/temp/dvb.gts"
```

Manual operation: See "Data Source, Select File" on page 28

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ADLength:STATe <State>

Defines if the data length is set automatically or manually.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Auto Data Length" on page 29

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:DATA:LENGth <DLength>

Sets the data length.

Parameters:

<DLength> integer

Range: 1 to 65536
*RST: 5000
Default unit: Bytes

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Data Length" on page 29

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BBFRames?

Queries the number of baseband frames.

The number is available for complete transmission of pseudo-random noise (PN) bits as data source. The number depends on the length of the PN bit sequence, see Table 3-2.

Return values:

<BBFrames> integer

Range: 1 to depends on settings
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Usage: Query only

Manual operation: See "BB Frames" on page 29

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:CPNSequence:STATe <CompletePNSeq>

Activates transmission of the complete sequence of pseudo-random noise bits within the baseband frame.

Parameters:
<CompletePNSeq> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Complete PN Sequence" on page 29

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:CRC[:STATe] <State>

Activates generation of CRC32.

Parameters:
<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "CRC32" on page 30

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BSCRambler[:STATe] <BScrambler>

Activates baseband scrambling.

Parameters:
<BScrambler> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "BB Scrambler" on page 30

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:OCODer[:STATe] <OCoder>

Enables the BCH outer coder.

Parameters:
<OCoder> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Outer Coder" on page 30

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ICODer[:STATe] <ICoder>

Activates the inner coder.

Parameters:

<ICoder> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Inner Coder" on page 30

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:ICODer:RATE <Rate>

Selects the code rate of the inner coder.

Parameters:

<Rate> CR1D4 | CR1D3 | CR2D5 | CR1D2 | CR3D5 | CR2D3 | CR3D4 | CR4D5 | CR5D6 | CR8D9 | CR9D10 | CR2D9 | CR13D45 | CR9D20 | CR90D180 | CR96D180 | CR11D20 | CR100D180 | CR104D180 | CR26D45 | CR18D30 | CR28D45 | CR23D36 | CR116D180 | CR20D30 | CR124D180 | CR25D36 | CR128D180 | CR13D18 | CR132D180 | CR22D30 | CR135D180 | CR140D180 | CR7D9 | CR154D180 | CR1D5 | CR11D45 | CR4D15 | CR14D45 | CR7D15 | CR8D15 | CR32D45

*RST: CR1D4

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Rate" on page 30

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:SFACtor?

Queries the spreading factor.

Return values:

<SFactor> float

Range: 1 to 2

*RST: 1

Example:

```
SOURce1:BB:DVB:DVBS:MTAB:SET1:SFACtor?
```

Usage: Query only

Manual operation: See "SF" on page 31

[:SOURce<hw>]:BB:DVB:DVBX:SFACtor <SFactor>

Sets the spreading factor.

Parameters:

<SFactor> integer

Range: 1 to 2
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "SF" on page 31

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BINTerleaver[:STATe] <BInterleaver>

Enables the bit interleaver.

Parameters:

<BInterleaver> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Bit Interleaver" on page 33

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:UCMode[:STATe] <State>

Enables raw bit streaming.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Uncoded Mode" on page 34

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MCUnique <ModCodUnique>

Sets predefined modulation and coding schemes.

Parameters:

<ModCodUnique> MCU1 | MCU2 | MCU3 | MCU4 | MCU5 | MCU6 | MCU7 | MCU8 | MCU9 | MCU10 | MCU11 | MCU12 | MCU13 | MCU14 | MCU15 | MCU16 | MCU17 | MCU18 | MCU19 | MCU20 | MCU21 | MCU22 | MCU23 | MCU24 | MCU25 | MCU26 | MCU27 | MCU28 | MCU29 | MCU30 | MCU31 | MCU32 | MCU33 | MCU34 | MCU35 | MCU36 | MCU37 | MCU38 | MCU39 | MCU40 | MCU41 | MCU42 | MCU43 | MCU44 | MCU45 | MCU46 | MCU47 | MCU48 | MCU49 | MCU50 | MCU51 | MCU52 | MCU53 | MCU54 | MCU55 | MCU56 | MCU57 | MCU58 | MCU59 | MCU60 | MCU61 | MCU62 | MCU63 | MCU64 | MCU65 | MCU66 | MCU67 | MCU68 | MCU69 | MCU70 | MCU71 | MCU72 | MCU73 | MCU74 | MCU75 | MCU76 | MCU77 | MCU78 | MCU79 | MCU80 | MCU81 | MCU82 | MCU83 | MCU84 | MCU85 | MCU86 | MCU87 | MCU88 | MCU89 | MCU90 | MCU91 | MCU92 | MCU93 | MCU94 | MCU95 | MCU96 | MCU97 | MCU98 | MCU99 | MCU100 | MCU101 | MCU102 | MCU103 | MCU104 | MCU105 | MCU106 | MCU107 | MCU108 | MCU109 | MCU110 | MCU111 | MCU112 | MCU113 | MCU114 | MCU115 | MCU116 | MCU117 | MCU118 | MCU119 | MCU120 | MCU121 | MCU122 | MCU123 | MCU124 | MCU125 | MCU126 | MCU127 | MCU128 | MCU129 | MCU130

*RST: MCU1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "MODCOD Unique" on page 31

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:CTYPe <CType>
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:CTYPe <CType>

Selects the code type.

Parameters:

<CType> NORMal | MEDium | SHORt

*RST: NORMal

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "Code Type" on page 32

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:MCOD <Modcod>
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MCOD <Modcod>

Selects the MODCOD.

Parameters:

<Modcod> QPSK_S_14 | QPSK_S_13 | QPSK_S_25 | QPSK_S_12 | QPSK_S_35 | QPSK_S_23 | QPSK_S_34 | QPSK_S_45 | QPSK_S_56 | QPSK_S_89 | QPSK_S_910 | PSK8_S_35 | PSK8_S_23 | PSK8_S_34 | PSK8_S_56 | PSK8_S_89 | PSK8_S_910 | APSK16_S_23 | APSK16_S_34 | APSK16_S_45 | APSK16_S_56 | APSK16_S_89 | APSK16_S_910 | APSK32_S_34 | APSK32_S_45 | APSK32_S_56 | APSK32_S_89 | APSK32_S_910 | QPSK_X_N1345 | QPSK_X_N920 | QPSK_X_N1120 | APSK8_X_N59L | APSK8_X_N2645L | PSK8_X_N2336 | PSK8_X_N2536 | PSK8_X_N1318 | APSK16_X_N12L | APSK16_X_N815L | APSK16_X_N59L | APSK16_X_N2645 | APSK16_X_N35 | APSK16_X_N35L | APSK16_X_N2845 | APSK16_X_N2336 | APSK16_X_N23L | APSK16_X_N2536 | APSK16_X_N1318 | APSK16_X_N79 | APSK16_X_N7790 | APSK32_X_N23L | APSK32_X_N3245 | APSK32_X_N1115 | APSK32_X_N79 | APSK64_X_N3245L | APSK64_X_N1115 | APSK64_X_N79 | APSK64_X_N45 | APSK64_X_N56 | APSK128_X_N34 | APSK128_X_N79 | APSK256_X_N2945L | APSK256_X_N23L | APSK256_X_N3145L | APSK256_X_N3245 | APSK256_X_N1115L | APSK256_X_N34 | QPSK_X_S1145 | QPSK_X_S415 | QPSK_X_S1445 | QPSK_X_S715 | QPSK_X_S815 | QPSK_X_S3245 | PSK8_X_S715 | PSK8_X_S815 | PSK8_X_S2645 | PSK8_X_S3245 | APSK16_X_S715 | APSK16_X_S815 | APSK16_X_S2645 | APSK16_X_S35 | APSK16_X_S3245 | APSK32_X_S23 | APSK32_X_S3245 | QPSK_X_VN29 | BPSK_X_VM15 | BPSK_X_VM1145 | BPSK_X_VM13 | BPSK_X_VS15S | BPSK_X_VS1145 | BPSK_X_VS15 | BPSK_X_VS415 | BPSK_X_VS13 | QPSK_X_M15

*RST: QPSK_S_14

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "MODCOD" on page 32

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MODulation <Modulation>

Selects the modulation scheme.

Parameters:

<Modulation> QPSK | APSK16 | APSK32 | PSK8 | P2BPsk | APSK16_8_8 | APSK32_4_12_16R | APSK64_8_16_20_20 | APSK8_2_4_2 | APSK32_4_8_4_16 | APSK64_16_16_16_16 | APSK64_4_12_20_28 | APSK128 | APSK256

*RST: QPSK

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Modulation" on page 32

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:PSTate[:STATe] <PState>
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:PSTate[:STATe] <PState>

Activates the pilot.

Parameters:

<PState> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "Pilot State" on page 33

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:PSCRambler[:STATe] <PScrambler>

Activates pilot scrambling.

Parameters:

<PScrambler> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "PL Scrambler" on page 34

[:SOURce<hw>]:BB:DVB:DVBX:SSEQuence <SSequence>

Sets the scrambling sequence for scrambling physical layer data.

Parameters:

<SSequence> integer
Range: 0 to 6
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "Scr. Sequence" on page 34

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:GSEQuence <GoldSeqIndex>

Sets the gold sequence as part of the scrambling sequence.

Parameters:

<GoldSeqIndex> integer

Range: 0 to 262141
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "Gold Sequence" on page 34

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:NOSettings <Settings>

Sets the number of PLSCODEs that can be configured.

Parameters:

<Settings> integer

Range: 1 to 100
*RST: 10

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "Number of Settings" on page 35

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:FRAMes <Frames>

Sets the number of the transmitted frames.

Parameters:

<Frames> integer

Range: 1 to max
*RST: 1

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "Frames" on page 36

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:PCOD?

Queries the PLS code.

Return values:

<PlsCode> integer

Range: 0 to 1000
*RST: 132

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Usage: Query only

Manual operation: See "PLS Code" on page 36

5.9 TPS commands

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:PATTern <Pattern>, <BitCount>

Sets the pattern for cell identification.

Parameters:

<Pattern> numeric
*RST: #H0000

<BitCount> integer
Range: 16 to 16
*RST: 16

Example:

```
:SOURce1:BB:DVB:STANdard DVBH
:SOURce1:BB:DVB:DVBH:HMODe?
// Response: NHI
:SOURce1:BB:DVB:DVBH|DVBT:TPS:TSLIcing:STATe?
// 1
:SOURce1:BB:DVB:DVBH|DVBT:TPS:ID:STATe?
// 1
:SOURce1:BB:DVB:DVBH:TPS:ID:PATTern #HAAAA,16
:SOURce1:BB:DVB:DVBH:TPS:MFEC:STATe 1
```

Manual operation: See "ID (hex)" on page 23

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:STATe <State>

Activates/deactivates the TPS cell identification.

Parameters:

<State> 1 | ON | 0 | OFF

Example: See `[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:PATTern` on page 122.

Manual operation: See "Cell Identification" on page 22

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:MFEC[:STATe] <State>

Activates/deactivates the multiprotocol encapsulation forward error correction bit.

Parameters:

<State> 1 | ON | 0 | OFF
*RST: 0

Example: See `[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:PATTern` on page 122.

Manual operation: See "MPE FEC" on page 23

[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:TSLicing[:STATe]?

Queries the time slicing state.

Return values:

<State> 0 | 1 | OFF | ON
Always 1 for DVB-H
Always 0 for DVB-T

Example: See `[:SOURce<hw>]:BB:DVB:DVBH|DVBT:TPS:ID:PATTern` on page 122.

Usage: Query only

Manual operation: See "Time Slicing" on page 23

5.10 TS header commands

Option: R&S SMW-K116

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig[:STATe] <State>

Inserts header information in the transport stream.

Parameters:

<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "TS Header Active" on page 38

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:SBYTe?

Queries the information carried by the synchronization byte.

Return values:
<SByte> 8 bits
Hexadecimal value

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Usage: Query only

Manual operation: See "Sync Byte (Hex)" on page 38

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:TEINdication[:STATe]
<TEIndication>

Inserts transport error indication information in the header.

Parameters:
<TEIndication> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Transport Error Indication" on page 38

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:PUS <PSUIndication>

If enabled, the PES (packetized elementary streams), PSI (program specific information), or DVB-MIP (megaframe initialization) packet begin immediately after the header.

Parameters:
<PSUIndication> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Payload Unit Start Indication" on page 38

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:TPRiority <TPriority>

Marks the current packet as high priority packet compared to packets with the same PID.

Parameters:

<TPriority> integer

Range: 0 to 1
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Transport Priority" on page 38

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:PID:PATTern <Pattern>, <BitCount>

Sets the packet identifier PID.

Parameters:

<Pattern> numeric

*RST: #H0000

<BitCount> integer

Range: 13 to 13
*RST: 13

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "PID (Hex)" on page 38

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:SCONtrol <SControl>

Sets the scrambling information.

Parameters:

<SControl> integer

Range: 0 to 3
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Scrambling Control" on page 39

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:AFIeld[:STATe] <AField>

Inserts an adaptation field in the packet.

Parameters:

<AField> 1 | ON | 0 | OFF

*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Adaptation Field" on page 39

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:PAYLoad[:STATe] <Payload>

Adds a payload field in packet.

Parameters:

<Payload> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Payload" on page 39

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:THConfig:CCOunter <CCounter>

Sets the sequence number of the first payload packet.

Parameters:

<CCounter> integer

Range: 0 to 15

*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Continuity Counter" on page 39

5.11 GSE header commands

Option: R&S SMW-K116

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig[:STATe] <GHActive>

Inserts header information in the transport stream.

Parameters:

<GHActive> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "GSE Header Active" on page 40

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:LTYPe <LType>

Set the type of the used label field.

Parameters:

<LType> integer

Range: 0 to 3
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Label Type" on page 40

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:GLENgth <GLength>

Sets the number of bytes following in the GSE packet.

Parameters:

<GLength> integer

Range: 1 to 4096
*RST: 1024

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "GSE Length" on page 40

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:FIUSe[:STATe] <FIUse>

Includes a PDU fragment in the GSE packet.

Parameters:

<FIUse> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Fragment ID(Hex)" on page 40

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:FID:PATTern <FId>, <BitCount>

Sets the PDU fragment ID.

Parameters:

<FId> numeric
*RST: #H00

<BitCount> integer
Range: 8 to 8
*RST: 8

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Fragment ID(Hex)" on page 40

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:TLENgth?

Queries the total length.

Return values:

<TLength> integer
Range: 1 to 65536
*RST: 1
Default unit: bytes

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Usage: Query only

Manual operation: See "Use, Total Length" on page 41

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:TLUSe[:STATe] <TLUse>

Includes the total length indication in the GSE header.

Parameters:

<TLUse> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Total Length" on page 41

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:PTYPe:PATTern <PType>, <BitCount>

Queries the payload type carried in the PDU.

Parameters:

<PType> numeric
*RST: #H0000

<BitCount> integer
Range: 16 to 16
*RST: 16

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Protocol Type(Hex)" on page 41

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:PTUSe[:STATe] <PTUse>

Includes the payload type indication in the GSE header.

Parameters:

<PTUse> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Protocol Type(Hex)" on page 41

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:LABel:PATTern <Pattern>, <BitCount>

Sets the label used for addressing.

Parameters:

<Pattern> numeric
*RST: #H000000000000

<BitCount> integer
Range: 48 to 48
*RST: 48

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Label(Hex)" on page 41

[:SOURce<hw>]:BB:DVB:DVBX:GHConfig:LUSE[:STATe] <LUse>

Includes the label indication in the GSE header.

Parameters:

<LUse> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Use, Label(Hex)" on page 41

5.12 BB header commands

Option: R&S SMW-K116

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig[:STATe] <State>

Inserts baseband header information in the stream.

Parameters:

<State> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "BB Header Active" on page 42

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:CACM <CAcm>

Selects whether constant coding and modulation (CCM) or adaptive coding and modulation (ACM) communication is used.

Parameters:

<CAcm> CCM | ACM

*RST: CCM

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Example: See Example"Configuring DVB-S2X signal in ACM mode" on page 111.

Manual operation: See "CCM/ACM" on page 18

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:IACTive[:STATe] <IActive>

Sets the ISSYI (input stream synchronization indicator) bit to 1.

Parameters:

<IActive> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "ISSYI Active" on page 42

[:SOURce<hw>]:BB:DVB:DVBX:BHConfig:GLACtive[:STATe] <GLActive>

Sets that the GSE stream is GSE-Lite compliant.

Parameters:

<GLActive> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "GSE-Lite Active" on page 42

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:NACTive[:STATe] <NActive>

Activates null-packet deletion (NPD).

Parameters:

<NActive> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "NPD Active" on page 43

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:UPL <UPLength>

Sets the user packet length (UPL).

Parameters:

<UPLength> integer
Range: 1 to 8192
*RST: 100

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "UPL" on page 43

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:ADFL[:STATe] <State>
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:ADFL:STATe <State>

Defines if the DFL is set automatically or manually.

Parameters:

<State> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Auto DFL" on page 36

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:MTAB:SET<st>:DFL <DFLength>
[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:DFL <DFLength>

Sets the data field length (DFL).

Parameters:

<DFLength> integer
Range: 1 to 7264
*RST: 1024

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "DFL" on page 37

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:BHConfig:SBYTe:PATTern <Sync>, <BitCount>

Sets the user packet synchronization byte.

Parameters:

<Sync> numeric
*RST: #H47

<BitCount> integer
Range: 8 to 8
*RST: 8

Example: See Example"Configuring DVB-S2X signal in CCM mode" on page 109.

Manual operation: See "Sync (Hex)" on page 43

5.13 Super frame configuration commands

Option: R&S SMW-K176

Example: Configuring DVB-S2x super frames

```
SOURce1:BB:DVB:STANdard DVBX
SOURce1:BB:DVB:DVBX:BHConfig:CACM CCM

SOURce1:BB:DVB:DVBX:SFBHconfig:STATe?
// "0"
// Beam hopping is deactivated, you can set SFFI4.
SOURce1:BB:DVB:DVBX:SFConfig:SFFI SFFI4
// Activate beam hopping.
SOURce1:BB:DVB:DVBX:SFBHconfig:STATe 1
SOURce1:BB:DVB:DVBX:SFConfig:SFFI?
// "SFFI5"
// SFFI4 is not supported for activated beam hopping. SFFI5 is set instead.

// Configure common super frame settings.
SOURce1:BB:DVB:DVBX:SFConfig:SOSF 255
SOURce1:BB:DVB:DVBX:SFConfig:NREF 1048574
SOURce1:BB:DVB:DVBX:SFConfig:NPAY 1048574
SOURce1:BB:DVB:DVBX:SFConfig:PSTate 1
SOURce1:BB:DVB:DVBX:SFConfig:PWH 31
SOURce1:BB:DVB:DVBX:SFConfig:TSN 255

// Configure specific super frame settings.
SOURce1:BB:DVB:DVBX:SFConfig:SFLength?
//  "612540"
// The length of the super frame is 612540 symbols.
SOURce1:BB:DVB:DVBX:SFConfig:PLI STD
// To set the super frame trailer, deactivate beam hopping and set SFFI4.
SOURce1:BB:DVB:DVBX:SFBHconfig:STATe 0
SOURce1:BB:DVB:DVBX:SFConfig:SFFI SFFI4
SOURce1:BB:DVB:DVBX:SFConfig:STWH 63

// Query super frame information.
SOURce1:BB:DVB:DVBX:SFConfig:CULength?
// "90"
// The capacity unit length is 90 symbols.
SOURce1:BB:DVB:DVBX:SFConfig:DSF?
// "1440"
// The distance between the start of the super frame and the start of the pilot
// field is 1440 symbols.
SOURce1:BB:DVB:DVBX:SFConfig:PSF?
// "36"
// The size of the pilot field is 36 symbols.
SOURce1:BB:DVB:DVBX:SFConfig:PLENgth?
// "180"
// The postamble length is 180 symbols.
// To query the extend header field, activate beam hopping ans set SFFI6
SOURce1:BB:DVB:DVBX:SFBHconfig:STATe 1
SOURce1:BB:DVB:DVBX:SFConfig:SFFI SFFI6
SOURce1:BB:DVB:DVBX:SFConfig:EHFSize?
```

```
// Activate super frames within the DVB-S2X signal.
SOURce1:BB:DVB:DVBX:SFConfig:STATe 1
SOURce1:BB:DVB:STATe 1
```


[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:STATe <SFState>

Activates the super frame.

Parameters:

<SFState> 1 | ON | 0 | OFF

*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "Super Frame Active" on page 44

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SFFI <SFFI>

Sets the super frame format indicator to a value coinside with format 0 to format 7.

Parameters:

<SFFI> SFFI4 | SFFI5 | SFFI6 | SFFI7

SFFI4
Requires deactivated beam hopping.
Sets a fixed super frame length.

SFFI5
Define a custom super frame length.

SFFI6 to SFFI7
Requires activated beam hopping.
Define a customized super frame length with activated beam hopping.

*RST: SFFI5

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "SFFI (Super Frame Format Indicator)" on page 44

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SOSF <SOSF>

Sets the start of super frame Walsh-Hadamard (WH) sequence.

Parameters:

<SOSF> integer

Range: 0 to 255
*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "SOSF WH (Start of Super Frame)" on page 45

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:NREF <NRef>

Sets the scrambling code number for the reference data scrambler.

Parameters:

<NRef> integer

Range: 0 to 1048574
*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "n Ref (SF Scrambler 2-way)" on page 45

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:NPAY <NPay>

Sets the scrambling code number for the payload data scrambler.

Parameters:

<NPay> integer

Range: 0 to 1048574
*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "n Pay (SF Scrambler 2-way)" on page 45

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PSTate <SFPilotState>

Sets the super frame pilot active.

Parameters:

<SFPilotState> 1 | ON | 0 | OFF

*RST: 1

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "SF Pilot State" on page 45

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PWH <SFPilotWH>

Sets the super frame pilot Walsh-Hadamard (WH) sequence set.

Parameters:

<SFPilotWH> integer

Range: 0 to 31
*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "SF Pilot WH" on page 45

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:TSN <TSN>

Sets the time slice number (TSN).

The TSN is identified in the wideband header. The TSN information determines which physical layer frames the receiver decodes and which frames the receiver discards.

The dialog provides the setting of the time slice number (TSN) according to Annex M of ETSI EN 302 307-2.

Parameters:

<TSN> integer

Range: 0 to 255
*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "TSN" on page 45

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:SFLength <SFLength>

Sets the super frame length.

SFFI 0 to 3 are not supported.

For SFFI = 5 to 7, the command sets the superframe length.

For SFFI = 4, this command is for query only.

Parameters:

<SFLength> integer

Range: 8856 to 612540
*RST: 612540

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "SFL (Expected Super Frame Length)" on page 46

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PLI <PLI>

Selects the protection level indicator of the physical layer header.

Parameters:

<PLI> STD | ROB | VROB | HEFF

STD
Standard protection of physical layer header using BPSK with spreding factor 1.

ROB
Robust protection of physical layer header using BPSK with spreding factor 2.

VROB
Very robust protection of physical layer header using BPSK with spreding factor 5.

HEFF
High efficiency protection of physical layer header using QPSK with punctering. The selection applies only for 8PSK and higher MODCOD schemes refer to payload transfer.

*RST: STD

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "PLI (PLH Protection Level Index)" on page 46

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:STWH <ST>

The super frame trailer (ST) extends the frame field in respect of the super frame header (SFH) with a Walsh-Hadamard (WH) sequence.

Parameters:

<ST> integer

Range: 0 to 63
*RST: 0

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Manual operation: See "ST WH (Super Frame Trailer)" on page 46

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:CULength?

Queries the capacity unit length.

Return values:

<CULength> integer

Range: 90 to 90
*RST: 90

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Usage: Query only

Manual operation: See "CU Length" on page 47

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:DSF?

Queries the distance between super frame start and start of pilot field in the super frame.

Return values:
<PilotFiledDis> integer
Range: 1440 to 1440
*RST: 1440

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Usage: Query only

Manual operation: See "d_SF (Pilot Field Distance)" on page 47

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PSF?

Queries the pilot field size.

Return values:
<PilotFieldSize> integer
Range: 36 to 36
*RST: 36

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Usage: Query only

Manual operation: See "P_SF (Pilot Field Size)" on page 47

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:EHFSize?

Quereis the extended header filed (EHF) size.

Return values:
<EHFSize> integer
Range: 504 to 504
*RST: 504

Example:
```
SOURce1:BB:DVB:DVBX:SFConfig:SFFI SFFI6
SOURce1:BB:DVB:DVBX:SFConfig:EHFSize?
```

Usage: Query only

Manual operation: See "EHF (Extend Header Filed) Size" on page 47

5.14 Beam hopping configuration commands

Option: R&S SMW-K176

Example: Configuring DVB-S2/DVB-S2X beam hopping

The following beam hopping configuration example uses the DVB-S2X standard. Configuration for DVB-S2 is analogous.

```
SOURce1:BB:DVB:STANdard DVBX
SOURce1:BB:DVB:DVBX:BHConfig:CACM CCM
SOURce1:BB:DVB:DVBX:SFBHconfig:STATe 1
// Activate zero beam switching signal.
SOURce1:BB:DVB:DVBX:SFBHconfig:ZBSSignal 1
SOURce1:BB:DVB:DVBX:SFBHconfig:AODWell 1

// Configure the dwell lengths in symbols for three dwells and
// query the length of the beam hopping cycle.
SOURce1:BB:DVB:DVBX:SFBHconfig:DT1:DLENgth 200000
SOURce1:BB:DVB:DVBX:SFBHconfig:DT2:DLENgth 300000
SOURce1:BB:DVB:DVBX:SFBHconfig:DT0:DLENgth?
// Response in symbols: "12052040"
// Query the accumulated length of the beam hopping cycle.
SOURce1:BB:DVB:DVBX:SFBHconfig:BHCycle?
// Response in symbols: "12552040"
// The result is the sum of dwell lengths DT0 to DT2.
SOURce1:BB:DVB:DVBX:SFBHconfig:FODT

// Configure and query settings of the first dwell DT0.
SOURce1:BB:DVB:DVBX:SFBHconfig:NOSF?
// Response: "8"
SOURce1:BB:DVB:DVBX:SFConfig:SFLength?
// Response: "612540"
SOURce1:BB:DVB:DVBX:SFBHconfig:LSFLength?
// Response: "599886"
SOURce1:BB:DVB:DVBX:SFConfig:CSFLength?
// Response: "612540"
SOURce1:BB:DVB:DVBX:SFBHconfig:PLENgth?
// Response: "180"
// Set a beam switching time of 500 symbols.
SOURce1:BB:DVB:DVBX:SFBHconfig:BSTime 500

SOURce1:BB:DVB:STATe 1
```

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:STATe <BeamHoppingStat>

Activates the beam hopping.

Parameters:

<BeamHoppingStat> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Beam Hopping Active" on page 49

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:NODWells <NumberOfDwells>

Sets the number of dwells.

Parameters:

<NumberOfDwells> integer
Range: 1 to 10
*RST: 1

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Number of Dwells" on page 49

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:BHCycle?

Displays the beam hopping cycle that is the cumulative result of all dwells length.

Return values:

<BHCycle> integer
Range: 0 to 2047974660
*RST: 0

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Usage: Query only

Manual operation: See "Beam Hopping Cycle" on page 49

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:FODT

Fills automatically other dwells with DT0.

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Usage: Event

Manual operation: See "Fill Other Dwells" on page 50

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:ZBSSignal <ZeroBeamSwitchS>

Activates the switching signal for zero beam state.

Parameters:

<ZeroBeamSwitchS> 1 | ON | 0 | OFF
*RST: 1

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Zero Beam Switching Signal" on page 49

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:AODWell <AttenuateOthDw>

Activates the attenuation of dwells DT1 to DT9.

Parameters:

<AttenuateOthDw> 1 | ON | 0 | OFF
*RST: 0

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Attenuate Other Dwell" on page 49

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:NOSF <NumberOfSF>

Sets the number of super frames.

Parameters:

<NumberOfSF> integer
Range: 1 to 25
*RST: 1

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Number Of Super Frames" on page 52

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:CSFLength?

Requires more than one super frame as set via the command `SOURce1:sBB:DVB:DVBS|DVBX:SFBHconfig:NOSF`.

Queries the calculated super frame length in symbols.

Return values:

<CalculatedSFL> integer
Range: 8856 to 612540
*RST: 612540

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Usage: Query only

Manual operation: See "SFL (Calculated Super Frame Length)" on page 52

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:LSFLength?

Queries the length of the last super frame.

Return values:

<LastSFLength> integer

Range: 8856 to 612540
*RST: 612540

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Usage: Query only

Manual operation: See "SFL (Last Super Frame)" on page 52

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFConfig:PLENgth?

Queries the postamble length.

Return values:

<PostambleLength> integer

Range: 90 to 900
*RST: 180

Example: See Example"Configuring DVB-S2x super frames" on page 133.

Usage: Query only

Manual operation: See "Postamble Length" on page 47

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:BSTime <BeamSwitchTime>

Sets the beam switching time.

Parameters:

<BeamSwitchTime> integer

Range: 1 to 1000
*RST: 90

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Beam Switching Time" on page 52

[:SOURce<hw>]:BB:DVB:DVBS|DVBX:SFBHconfig:DT<ch0>:DLENgth
<DwellLength>

Sets the dwell length.

Parameters:

<DwellLength> integer

Range: 0 to 2047974660
*RST: 0

Example: See Example"Configuring DVB-S2/DVB-S2X beam hopping" on page 139.

Manual operation: See "Dwell Length [Symbols]" on page 50

5.15 DVB-RCS2 SF configuration commands

Option: R&S SMW-K169

Example: Configuring DVB-RCS2 super frames

```
SOURce1:BB:DVB:STANdard DVBR
SOURce1:BB:DVBR:SFConfig0:RESet
SOURce1:BB:DVBR:SFRames 1
SOURce1:BB:DVBR:SFINdex 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:FRSTime 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:OFFSet -45000000
SOURce1:BB:DVBR:SFConfig0:FRConfig0:FRBW 10000000
SOURce1:BB:DVBR:SFConfig0:FRConfig0:TXFormat LM
SOURce1:BB:DVBR:SFConfig0:APPend
SOURce1:BB:DVBR:SFConfig0:APPend
SOURce1:BB:DVBR:SFConfig0:FRConfig1:FRSTime 0
SOURce1:BB:DVBR:SFConfig0:FRConfig1:OFFSet -25000000
SOURce1:BB:DVBR:SFConfig0:FRConfig1:FRBW 40000000
SOURce1:BB:DVBR:SFConfig0:FRConfig0:TXFormat LM
SOURce1:BB:DVBR:SFConfig0:FRConfig2:FRSTime 0
SOURce1:BB:DVBR:SFConfig0:FRConfig2:OFFSet 45000000
SOURce1:BB:DVBR:SFConfig0:FRConfig2:FRBW 50000000
SOURce1:BB:DVBR:SFConfig0:FRConfig0:TXFormat SSLM

SOURce1:BB:DVBR:SFConfig0:FRAMes?
// 3
```

Example: Configuring DVB-RCS2 frames

Configure the super frame for exmaple as in Example"Configuring DVB-RCS2 super frames" on page 143.

```
// BTU configuration in the first frame
SOURce1:BB:DVBR:SFConfig0:FRConfig0:BTU:DURation 270
SOURce1:BB:DVBR:SFConfig0:FRConfig0:BTU:TUCount 24
SOURce1:BB:DVBR:SFConfig0:FRConfig0:BW 10000000
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SYBRate?

// Grid configuration
SOURce1:BB:DVBR:SFConfig0:FRConfig0:GRID0 1
SOURce1:BB:DVBR:SFConfig0:FRConfig0:GRID0:OFFSet 0

// General confuration of two sections in the first frame
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SECTions 2
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SECidx 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:MOD USERD
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:STBTu 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:REPCount 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:TSSize 12
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:BSOFset 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:MODU QAM16
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SECidx 1
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:MOD PRED
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:WVID LM2
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:STBTu 15
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:REPCount 2
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:TSSize 3
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:BSOFset 0
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:MODU QPSK
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC1:BSTLen?
// 262

//
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:PALType LOGON
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:PLEN 38
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:DATA PN9
// SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:DATA PATT
// SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:DAPatt #H155,10
// SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:DATA DLIS
// SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:LISTsel "/var/user/dl"
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:P 17
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:Q0 9
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:Q1 5
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:Q2 14
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:Q3 1
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:YPAT #H,1
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:WAOT #H1,1
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:UW?
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:UWLen?
```

```
// 55
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:PRELen 27
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:POSLen 27
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:PPERiod 18
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:PBLen?
// 1
SOURce1:BB:DVBR:SFConfig0:FRConfig0:SEC0:NPBLocks?
// 13

// BTU configuration in the last frame with SS linear modulation (SSLM)
// configuration as for LM
// show merely dedicated SSLM commands
SOURce1:BB:DVBR:SFConfig0:FRConfig2:BTU:DURation 1080
SOURce1:BB:DVBR:SFConfig0:FRConfig2:BTU:TUCount 24
SOURce1:BB:DVBR:SFConfig0:FRConfig2:BW 10000000
SOURce1:BB:DVBR:SFConfig0:FRConfig2:CHIRate?
SOURce1:BB:DVBR:SFConfig0:FRConfig2:SECTions 1
SOURce1:BB:DVBR:SFConfig0:FRConfig2:SECidx 0
SOURce1:BB:DVBR:SFConfig0:FRConfig2:SEC0:MOD PRED
SOURce1:BB:DVBR:SFConfig0:FRConfig2:SEC0:WVID SSLM2
...
SOURce1:BB:DVBR:SFConfig0:FRConfig2:SEC0:SFACtor?
// SF_2
SOURce1:BB:DVBR:SFConfig0:FRConfig2:SEC0:BLCHips?
```


5.15.1 General configuration commands

[:SOURce<hw>]:BB:DVB:DVBR:SFRames <SFRames>

Queries the number of super frames.

Parameters:

<SFRames> integer

Range: 1 to 10
*RST: 1

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Manual operation: See "Number of Super Frames" on page 55

[:SOURce<hw>]:BB:DVB:DVBR:SFINdex <SFINdex>

Queries the super frame index.

Parameters:

<SFINdex> integer

Range: 0 to 9
*RST: 0

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Manual operation: See "Super Frame Index" on page 55

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRAMes?

Queries the numer of frames.

Return values:

<FRAMes> integer

Range: 1 to 10
*RST: 1

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Usage: Query only

Manual operation: See "Number of Frames" on page 55

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:DELete
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:APPend

Standard function to append or remove a frame from the table.

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Usage: Event

Manual operation: See "Append" on page 55

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:RESet

Resets the frame table, that is, removes all frames but the first one and presets the frame central frequency offset and frame bandwidth to the default values.

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Usage: Event

Manual operation: See "Reset" on page 55

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:FRSTime
<FRSTime>

Sets the start time of the selected frame, relative to the superframe start time.

Parameters:
<FRSTime> integer

Range: 0 to 1048576
*RST: 0

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Manual operation: See "Frame Start Time / Tick" on page 56

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:OFFSet
<OFFset>

Sets the frequency offset for the selected frame, relative to the center frequency of the super frame.

Parameters:
<OFFset> float

Range: -2E8 to 2E8
Increment: 100
*RST: 0

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Manual operation: See "Frame Central Freq Offset" on page 56

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:FRBW <FRBW>

Sets the frame bandwidth.

Parameters:
<FRBW> float

Range: 100 to 400E6
Increment: 100
*RST: 10E6

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Manual operation: See "Frame Bandwidth" on page 56

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:TXFormat <TXFormat>

Sets the Tx format class.

Parameters:

<TXFormat> LM | SSLM

LM
Linear modulation

SSLM
Spread-spectrum linear burst transmission (TC-LM-SS)

*RST: LM

Example: See Example"Configuring DVB-RCS2 super frames" on page 143.

Manual operation: See "Tx Format Class" on page 57

5.15.2 BTU and grid configuration commands

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:DURation <DURation>

Sets the duration of one bandwidth-time unit (BTU).

Parameters:

<DURation> integer

Range: 1 to 16777215
*RST: 540

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "BTU Duration" on page 58

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:BW <BW>

Sets the bandwidth occupied by one BTU.

Parameters:

<BW> float

Range: 10 to 400E6
Increment: 10
*RST: 10E6

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "BTU Bandwidth" on page 58

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:SYBRate?

Queries the symbol rate used in one BTU.

Return values:

<SYBRate> float

Range: 10 to 400E6
Increment: 10
*RST: 10E6

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Query only

Manual operation: See "BTU Symbol Rate" on page 58

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:BTU:CHIRate?

Queries the BTU chip rate.

Return values:

<ChipRate> float

Range: 10 to 400E6
Increment: 10
*RST: 10E6

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Query only

Manual operation: See "BTU Chip Rate" on page 58

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<s0t>:BTU:TUCount <TUCount>

Sets the number of consecutive BTUs within a frame.

Parameters:

<TUCount> integer

Range: 1 to 24
*RST: 12

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Time Unit Count" on page 59

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:GRIDs <GRIDs>

Queries the number of grids.

Parameters:

<GRIDs> integer

Range: 1 to 10
*RST: 1

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Number of Grids" on page 59

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:GRID<di0>:OFFSet <OFFSet>

Queries the frequency offset for the BTU grid, relative to the frame centre frequency.

Parameters:

<OFFSet> float

Range: -2E8 to 2E8
Increment: 10
*RST: 0

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Grid Offset" on page 60

5.15.3 Section configiration commands

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SECTions <SECTions>

Sets the nuber of sections.

Parameters:

<SECTions> integer

Range: 1 to 20
*RST: 1

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Number of Sections" on page 61

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SECidx <SECidx>

Selects the section whose settings are currently configured.

Parameters:

<SECidx> integer

Range: 0 to 19
*RST: 0

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Section" on page 61

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:CONFlicts?

Queries if there is a conflict.

Resolve conflicts with `[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:RESolve` on page 152.

Return values:

<CONFlicts> 1 | ON | 0 | OFF

*RST: 0

Example:

```
SOURCe0:BB:DVB:DVBR:SFConfig0:FRConfig0:CONFlicts?
// 1
// SOURce0:BB:DVB:DVBR:SFConfig0:FRConfig0:RESolve
```

Usage: Query only

Manual operation: See "Resolve Conflicts" on page 62

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:RESolve

Automatically reschedules resources so that overlapping in the time domain are resolved.

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Event

Manual operation: See "Resolve Conflicts" on page 62

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:MOD
<MOD>

Sets how the section is configured.

Parameters:

<MOD> PRED | USERD

PRED
The general section configuration is defined by the waveform selected with `[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:WVID`.

USERD
Reference waveform is disabled.

*RST: PRED

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Mode" on page 62

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:WVID
<WVId>

Select a reference waveform, defined for the transmission format class.

Parameters:

<WVId> LM1 | LM2 | LM3 | LM4 | LM5 | LM6 | LM7 | LM8 | LM9 | LM10 | LM11 | LM12 | LM13 | LM14 | LM15 | LM16 | LM17 | LM18 | LM19 | LM20 | LM21 | LM22 | LM32 | LM33 | LM34 | LM35 | LM36 | LM37 | LM38 | LM39 | LM40 | LM41 | LM42 | LM43 | LM44 | LM45 | LM46 | LM47 | LM48 | LM49 | SSLM1 | SSLM2 | SSLM3 | SSLM4 | SSLM5 | SSLM6 | SSLM7 | SSLM8 | SSLM9 | SSLM10 | SSLM11 | SSLM12 | SSLM13 | SSLM14 | SSLM15 | SSLM16 | SSLM17 | SSLM18 | SSLM19

LM<ID> or SSLM<ID> deoending on the selected Tx format class `[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:TXFormat`.

LM<ID>
<ID> is the waveform identifier according to specification in Annex A of ETSI EN 301 545-2
LM = linear modulation (the default Tx format class)

SSLM<ID>
<ID> is the waveform identifier according to specification in Annex A of ETSI EN 301 545-2
SSLM = SS linear modulation

*RST: LM1

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Waveform Id" on page 62

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:STBTu <STBtu>

Sets the frame section start by defining a start BTU.

Parameters:

<STBtu> integer

Range: 0 to 1000
*RST: 0

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Start BTU" on page 62

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:REPCount <REPCount>

Defines how many times the transmission type is repeated.

Parameters:

<REPCount> integer

`<REPCount> = 0` means no repetitions and thus one singular transmission.
`<REPCount> = 1` means one repetition and thus 2 transmission in total.

Range: 0 to 1000
*RST: 0

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Repeat Count" on page 63

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:TSSize <TSSize>

Defines how many BTUs the timeslot spans.

Parameters:

<TSSize> integer

Range: 1 to 24
*RST: 12

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Timeslot Size" on page 63

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:BSOFfset <BSOFfset>

Sets the nominal offset for burst start from the start of the timeslot.

Parameters:

<BSOFfset> integer

Range: 0 to 4096
*RST: 0

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Burst Start Offset" on page 63

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:MODU <MODU>

Sets the modulation scheme.

Parameters:

<MODU> BPSK | QPSK | PSK8 | QAM16

BPSK (pi/2 - BPSK), QPSK, 8PSK and 16QAM.

*RST: QPSK

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Modulation" on page 63

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:BSTLen?

Queries the burst length.

Return values:

<BSTLen> integer

Range: 1 to 1E4
*RST: 664

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Query only

Manual operation: See "Burst Length" on page 63

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:BLCHips?

Queries the burst length.

Return values:

<BurstLenInChips> integer

Range: 1 to 1E5
*RST: 3584
Default unit: Chips

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Query only

Manual operation: See "Burst Length" on page 64

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:SFACtor <SpreadFactor>

Queries the spreading factor.

Parameters:

<SpreadFactor> SF_2 | SF_4 | SF_8 | SF_16

*RST: SF_2

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Spreading Factor" on page 63

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PALType <PALType>

Sets the payload content type.

Parameters:

<PALType> LOGON | CTRL | TRAFFIC_CTRL | TRAFFIC

LOGON
Logon, content type for L2S.

CTRL
Control, content type for L2S.

TRAFFIC_CTRL
Higher layer traffic and L2S.

TRAFFIC
Higher layer traffic.

*RST: LOGON

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Content Type" on page 64

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PLEN <PLen>

Queries the payload length.

Parameters:

<PLen> integer

Range: 1 to 1000
*RST: 14

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Payload Length (Include CRC)" on page 64

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:DATA <DATA>

Selects the data source for the payload.

Parameters:

<DATA> ZERO | ONE | PATTern | PN9 | PN11 | PN15 | PN16 | PN20 | PN21 | PN23 | DLISt

*RST: PN9

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Data Source" on page 65

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:LISTsel <LISTsel>

Selects an existing data list file from the default directory or from the specific directory.

Parameters:

<LISTsel> string

Filename incl. file extension or complete file path

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Data Source" on page 65

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:DAPatt <DAPatt>, <BitCount>

Sets the bit pattern.

Parameters:

<DAPatt> numeric

*RST: #H0

<BitCount> integer

Range: 1 to 64
*RST: 1

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Data Source" on page 65

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:P <P>

Sets the permutation parameter P.

Parameters:

<P> integer

Range: 9 to 81
*RST: 17

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "P" on page 66

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q0
<Q0>
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q1
<Q1>
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q2
<Q2>
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:Q3
<Q3>

Sets the permutation parameters Q0-Q3.

Parameters:

<Q3> integer

Range: 0 to 5
*RST: 1

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Q0, Q1, Q2, Q3" on page 66

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:YPAT
<YPAT>
[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:WPAT
<WPAT>

Sets 1 bit in the contiguous sequence of bits specifying the puncturing pattern for first and second parity bits Y and W.

Parameters:

<WPAT> 1 bit

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Y Puncturing Pattern, W Puncturing Pattern" on page 66

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:UW <UW>, <BitCount>

Queries the content of the unique word (UW).

Parameters:

<UW> numeric

<BitCount> integer

Range: 1 to 512
*RST: 368

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "UW (Hex)" on page 67

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:UWLen?

Queries the length of the UW in symbols.

Return values:

<UWLen> integer

Range: 1 to 177
*RST: 26

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Query only

Manual operation: See "UW Length" on page 67

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PRELen <PRELen>

Sets the preamble length.

Parameters:

<PRELen> integer

Range: 8 to 155
*RST: 155

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Preamble Length" on page 67

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:POSLen <POSLen>

Sets the postamble length.

Parameters:
<POSLen> integer
Range: 8 to 41
*RST: 27

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Postamble Length" on page 67

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PPERiod <PPERiod>

Sets the insertion period of pilot blocks.

Parameters:
<PPERiod> integer
Range: 1 to 768
*RST: 18

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Pilot Period" on page 67

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:PBLen <PBL>

Sets the number of symbols in each block of pilot symbols.

Parameters:
<PBL> integer
Range: 1 to 24
*RST: 1

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Manual operation: See "Pilot Block Length" on page 68

[:SOURce<hw>]:BB:DVB:DVBR:SFConfig<ch0>:FRConfig<st0>:SEC<di0>:NPBLocks?

Sets the total number of pilot symbols to be inserted.

Return values:
<PBLocks> integer
Range: 0 to 12968
*RST: 26

Example: See Example"Configuring DVB-RCS2 frames" on page 144.

Usage: Query only

Manual operation: See "Number of Pilot Blocks" on page 68

Annex

A MODCOD Unique selection overview

For DVB-S2/DVB-S2X, the "MODCOD Unique" (MCU) parameter define a predefined setting of the modulation scheme and the code rate.

Table A-1 lists available MCU values and related modulation and code rate. Selectable values within a category depend on the DVB standard and the state of the super frame, see "MODCOD Unique" on page 31.

Table A-1: MODCOD Unique, modulation and code rate

Category	MCU index	MCU value	Modulation	Code rate
S2 Classical (Normal)	MCU1	01: QPSK 1/4 classical	QPSK	1/4
S2 Classical (Normal)	MCU2	02: QPSK 1/3 classical	QPSK	1/3
S2 Classical (Normal)	MCU3	03: QPSK 2/5 classical	QPSK	2/5
S2 Classical (Normal)	MCU4	04: QPSK 1/2 classical	QPSK	1/2
S2 Classical (Normal)	MCU5	05: QPSK 3/5 classical	QPSK	3/5
S2 Classical (Normal)	MCU6	06: QPSK 2/3 classical	QPSK	2/3
S2 Classical (Normal)	MCU7	07: QPSK 3/4 classical	QPSK	3/4
S2 Classical (Normal)	MCU8	08: QPSK 4/5 classical	QPSK	4/5
S2 Classical (Normal)	MCU9	09: QPSK 5/6 classical	QPSK	5/6
S2 Classical (Normal)	MCU10	10: QPSK 8/9 classical	QPSK	8/9
S2 Classical (Normal)	MCU11	11: QPSK 9/10 classical	QPSK	9/10
S2 Classical (Normal)	MCU12	12: 8PSK 3/5 classical	8PSK	3/5
S2 Classical (Normal)	MCU13	13: 8PSK 2/3 classical	8PSK	2/3
S2 Classical (Normal)	MCU14	14: 8PSK 3/4 classical	8PSK	3/4
S2 Classical (Normal)	MCU15	15: 8PSK 5/6 classical	8PSK	5/6
S2 Classical (Normal)	MCU16	16: 8PSK 8/9 classical	8PSK	8/9
S2 Classical (Normal)	MCU17	17: 8PSK 9/10 classical	8PSK	9/10
S2 Classical (Normal)	MCU18	18: 16APSK 2/3 classical	(4+12)APSK	2/3
S2 Classical (Normal)	MCU19	19: 16APSK 3/4 classical	(4+12)APSK	3/4
S2 Classical (Normal)	MCU20	20: 16APSK 4/5 classical	(4+12)APSK	4/5
S2 Classical (Normal)	MCU21	21: 16APSK 5/6 classical	(4+12)APSK	5/6
S2 Classical (Normal)	MCU22	22: 16APSK 8/9 classical	(4+12)APSK	8/9
S2 Classical (Normal)	MCU23	23: 16APSK 9/10 classical	(4+12)APSK	9/10
S2 Classical (Normal)	MCU24	24: 32APSK 3/4 classical	(4+12+16)APSK	3/4

Category	MCU index	MCU value	Modulation	Code rate
S2 Classical (Normal)	MCU25	25: 32APSK 4/5 classical	(4+12+16)APSK	4/5
S2 Classical (Normal)	MCU26	26: 32APSK 5/6 classical	(4+12+16)APSK	5/6
S2 Classical (Normal)	MCU27	27: 32APSK 8/9 classical	(4+12+16)APSK	8/9
S2 Classical (Normal)	MCU28	28: 32APSK 9/10 classical	(4+12+16)APSK	9/10
S2 Classical (Short)	MCU29	29: QPSK 1/4 classical	QPSK	1/4
S2 Classical (Short)	MCU30	30: QPSK 1/3 classical	QPSK	1/3
S2 Classical (Short)	MCU31	31: QPSK 2/5 classical	QPSK	2/5
S2 Classical (Short)	MCU32	32: QPSK 1/2 classical	QPSK	1/2
S2 Classical (Short)	MCU33	33: QPSK 3/5 classical	QPSK	3/5
S2 Classical (Short)	MCU34	34: QPSK 2/3 classical	QPSK	2/3
S2 Classical (Short)	MCU35	35: QPSK 3/4 classical	QPSK	3/4
S2 Classical (Short)	MCU36	36: QPSK 4/5 classical	QPSK	4/5
S2 Classical (Short)	MCU37	37: QPSK 5/6 classical	QPSK	5/6
S2 Classical (Short)	MCU38	38: QPSK 8/9 classical	QPSK	8/9
S2 Classical (Short)	MCU39	39: 8PSK 3/5 classical	8PSK	3/5
S2 Classical (Short)	MCU40	40: 8PSK 2/3 classical	8PSK	2/3
S2 Classical (Short)	MCU41	41: 8PSK 3/4 classical	8PSK	3/4
S2 Classical (Short)	MCU42	42: 8PSK 5/6 classical	8PSK	5/6
S2 Classical (Short)	MCU43	43: 8PSK 8/9 classical	8PSK	8/9
S2 Classical (Short)	MCU44	44: 16APSK 2/3 classical	(4+12)APSK	2/3
S2 Classical (Short)	MCU45	45: 16APSK 3/4 classical	(4+12)APSK	3/4
S2 Classical (Short)	MCU46	46: 16APSK 4/5 classical	(4+12)APSK	4/5
S2 Classical (Short)	MCU47	47: 16APSK 5/6 classical	(4+12)APSK	5/6
S2 Classical (Short)	MCU48	48: 16APSK 8/9 classical	(4+12)APSK	8/9
S2 Classical (Short)	MCU49	49: 32APSK 3/4 classical	(4+12+16)APSK	3/4
S2 Classical (Short)	MCU50	50: 32APSK 4/5 classical	(4+12+16)APSK	4/5
S2 Classical (Short)	MCU51	51: 32APSK 5/6 classical	(4+12+16)APSK	5/6
S2 Classical (Short)	MCU52	52: 32APSK 8/9 classical	(4+12+16)APSK	8/9
S2-X (Normal)	MCU53	53: QPSK 13/45 Sx	QPSK	13/45
S2-X (Normal)	MCU54	54: QPSK 9/20 Sx	QPSK	9/20
S2-X (Normal)	MCU55	55: QPSK 11/20 Sx	QPSK	11/20
S2-X (Normal)	MCU56	56: 8APSK 5/9-L Sx	(2+4+2)APSK	100/180
S2-X (Normal)	MCU57	57: 8APSK 26/45-L Sx	(2+4+2)APSK	104/180

Category	MCU index	MCU value	Modulation	Code rate
S2-X (Normal)	MCU58	58: 8PSK 23/36 Sx	8PSK	23/36
S2-X (Normal)	MCU59	59: 8PSK 25/36 Sx	8PSK	25/36
S2-X (Normal)	MCU60	60: 8PSK 13/18 Sx	8PSK	13/18
S2-X (Normal)	MCU61	61: 16APSK 1/2-L Sx	(8+8)APSK	90/180
S2-X (Normal)	MCU62	62: 16APSK 8/15_L Sx	(8+8)APSK	96/180
S2-X (Normal)	MCU63	63: 16APSK 5/9-L Sx	(8+8)APSK	100/180
S2-X (Normal)	MCU64	64: 16APSK 26/45 Sx	(4+12)APSK	26/45
S2-X (Normal)	MCU65	65: 16APSK 3/5 Sx	(4+12)APSK	3/5
S2-X (Normal)	MCU66	66: 16APSK 3/5-L Sx	(8+8)APSK	18/30
S2-X (Normal)	MCU67	67: 16APSK 28/45 Sx	(4+12)APSK	28/45
S2-X (Normal)	MCU68	68: 16APSK 23/36 Sx	(4+12)APSK	23/36
S2-X (Normal)	MCU69	69: 16APSK 2/3-L Sx	(8+8)APSK	20/30
S2-X (Normal)	MCU70	70: 16APSK 25/36 Sx	(4+12)APSK	25/36
S2-X (Normal)	MCU71	71: 16APSK 13/18 Sx	(4+12)APSK	13/18
S2-X (Normal)	MCU72	72: 16APSK 7/9 Sx	(4+12)APSK	140/180
S2-X (Normal)	MCU73	73: 16APSK 77/90 Sx	(4+12)APSK	154/180
S2-X (Normal)	MCU74	74: 32APSK 2/3-L Sx	(4+12+16rb)APSK	2/3
S2-X (Normal)	MCU75	75: 32APSK 32/45 Sx	(4+8+4+16)APSK	128/180
S2-X (Normal)	MCU76	76: 32APSK 11/15 Sx	(4+8+4+16)APSK	132/180
S2-X (Normal)	MCU77	77: 32APSK 7/9 Sx	(4+8+4+16)APSK	140/180
S2-X (Normal)	MCU78	78: 64APSK 32/45-L Sx	(16+16+16+16)APSK	128/180
S2-X (Normal)	MCU79	79: 64APSK 11/15 Sx	(4+12+20+28)APSK	132/180
S2-X (Normal)	MCU80	80: 64APSK 7/9 Sx	(8+16+20+20)APSK	7/9
S2-X (Normal)	MCU81	81: 64APSK 4/5 Sx	(8+16+20+20)APSK	4/5
S2-X (Normal)	MCU82	82: 64APSK 5/6 Sx	(8+16+20+20)APSK	5/6
S2-X (Normal)	MCU83	83: 128APSK 3/4 Sx	128APSK	135/180
S2-X (Normal)	MCU84	84: 128APSK 7/9 Sx	128APSK	140/180
S2-X (Normal)	MCU85	85: 256APSK 29/45-L Sx	256APSK	116/180
S2-X (Normal)	MCU86	86: 256APSK 2/3-L Sx	256APSK	20/30
S2-X (Normal)	MCU87	87: 256APSK 31/45-L Sx	256APSK	124/180
S2-X (Normal)	MCU88	88: 256APSK 32/45 Sx	256APSK	128/180
S2-X (Normal)	MCU89	89: 256APSK 11/15-L Sx	256APSK	22/30
S2-X (Normal)	MCU90	90: 256APSK 3/4 Sx	256APSK	135/180

Category	MCU index	MCU value	Modulation	Code rate
S2-X (Short)	MCU91	91: QPSK 11/45 Sx	QPSK	11/45
S2-X (Short)	MCU92	92: QPSK 4/15 Sx	QPSK	4/15
S2-X (Short)	MCU93	93: QPSK 14/45 Sx	QPSK	14/45
S2-X (Short)	MCU94	94: QPSK 7/15 Sx	QPSK	7/15
S2-X (Short)	MCU95	95: QPSK 8/15 Sx	QPSK	8/15
S2-X (Short)	MCU96	96: QPSK 32/45 Sx	QPSK	32/45
S2-X (Short)	MCU97	97: 8PSK 7/15 Sx	8PSK	7/15
S2-X (Short)	MCU98	98: 8PSK 8/15 Sx	8PSK	8/15
S2-X (Short)	MCU99	99: 8PSK 26/45 Sx	8PSK	26/45
S2-X (Short)	MCU100	100: 8PSK 32/45 Sx	8PSK	32/45
S2-X (Short)	MCU101	101: 16APSK 7/15 Sx	(4+12)APSK	7/15
S2-X (Short)	MCU102	102: 16APSK 8/15 Sx	(4+12)APSK	8/15
S2-X (Short)	MCU103	103: 16APSK 26/45 Sx	(4+12)APSK	26/45
S2-X (Short)	MCU104	104: 16APSK 3/5 Sx	(4+12)APSK	3/5
S2-X (Short)	MCU105	105: 16APSK 23/45 Sx	(4+12)APSK	32/45
S2-X (Short)	MCU106	106: 32APSK 2/3 Sx	(4+12+16rb)APSK	2/3
S2-X (Short)	MCU107	107: 32APSK 32/45 Sx	(4+12+16rb)APSK	32/45
S2-X VL-SNR	MCU108	108: VL1 QPSK 2/9 Sx	QPSK	2/9
S2-X VL-SNR	MCU109	109: VL1 BPSK 1/5 Sx	PI/2 BPSK	1/5
S2-X VL-SNR	MCU110	110: VL1 BPSK 11/45 Sx	PI/2 BPSK	11/45
S2-X VL-SNR	MCU111	111: VL1 BPSK 1/3 Sx	PI/2 BPSK	1/3
S2-X VL-SNR	MCU112	112: VL1 BPSK-S 1/5 Sx	PI/2 BPSK	1/5
S2-X VL-SNR	MCU113	113: VL1 BPSK-S 11/45 Sx	PI/2 BPSK	11/45
S2-X VL-SNR	MCU114	114: VL2 BPSK 1/5 Sx	PI/2 BPSK	1/5
S2-X VL-SNR	MCU115	115: VL2 BPSK 4/15 Sx	PI/2 BPSK	4/15
S2-X VL-SNR	MCU116	116: VL2 BPSK 1/3 Sx	PI/2 BPSK	1/3
SF Spread (Normal)	MCU117	117: QPSK 1/4 Spread 5 Sx	QPSK	1/4
SF Spread (Normal)	MCU118	118: QPSK 1/3 Spread 5 Sx	QPSK	1/3
SF Spread (Normal)	MCU119	119: QPSK 2/5 Spread 5 Sx	QPSK	2/5
SF Spread (Normal)	MCU120	120: QPSK 1/4 Spread 2 Sx	QPSK	1/4
SF Spread (Normal)	MCU121	121: QPSK 1/3 Spread 2 Sx	QPSK	1/3
SF Spread (Normal)	MCU122	122: QPSK 2/5 Spread 2 Sx	QPSK	2/5
SF Spread (Medium)	MCU123	123: QPSK 1/5 Spread 5 Sx	QPSK	1/5

Category	MCU index	MCU value	Modulation	Code rate
SF Spread (Medium)	MCU124	124: QPSK 1/5 Spread 2 Sx	QPSK	1/5
SF Spread (Short)	MCU125	125: QPSK 1/4 Spread 5 Sx	QPSK	1/4
SF Spread (Short)	MCU126	126: QPSK 1/3 Spread 5 Sx	QPSK	1/3
SF Spread (Short)	MCU127	127: QPSK 2/5 Spread 5 Sx	QPSK	2/5
SF Spread (Short)	MCU128	128: QPSK 1/4 Spread 2 Sx	QPSK	1/4
SF Spread (Short)	MCU129	129: QPSK 1/3 Spread 2 Sx	QPSK	1/3
SF Spread (Short)	MCU130	130: QPSK 2/5 Spread 2 Sx	QPSK	2/5

Glossary: Specifications

E

ETSI EN 301 545-2: Digital Video Broadcasting (DVB); Second Generation DVB Interactive Satellite System (DVB-RCS2); Part 2: Lower Layers for Satellite standard

ETSI EN 302 307-2: Digital Video Broadcasting (DVB); Second generation framing structure, channel coding and modulation systems for Broadcasting, Interactive Services, News Gathering and other broadband satellite applications; Part 2: DVB-S2 Extensions (DVB-S2X)

List of commands

Index

M

N

O

P

R

S

T

U

V

W