R&S®SMW-K542
Baseband Power Sweep
User Manual

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Test & Measurement

User Manual

ROHDE&SCHWARZ

This document describes the following software option:

- R&S®SMW-K542
  1413.9876.02

This manual describes firmware version FW 3.50.103.xx and later of the R&S®SMW200A.

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The following abbreviations are used throughout this manual: R&S®SMW200A is abbreviated as R&S SMW.

Contents

1 Preface

1.1 About this Manual

This User Manual provides all information **specific to the option R&S SMW-K542**. The general instrument functions and settings common to all applications and operating modes are described in the main R&S SMW user manual.

The main focus in this manual is on the provided settings and the tasks required to generate a signal. The following topics are included:

- **Welcome to the Baseband Power Sweep option R&S SMW-K542**
  Introduction to and getting familiar with the option
- **About the Baseband Power Sweep**
  Background information on basic terms and principles in the context of the signal generation
- **Configuration and Settings**
  A concise description of all functions and settings available to configure signal generation with their corresponding remote control command
- **Remote Control Commands**
  Remote commands required to configure and generate a signal in a remote environment, sorted by tasks
  (Commands required to set up the instrument or to perform common tasks on the instrument are provided in the main R&S SMW user manual)
  Programming examples demonstrate the use of many commands and can usually be executed directly for test purposes
- **Annex**
  Reference Material
- **List of remote commands**
  Alphabetical list of all remote commands described in the manual
- **Index**

1.2 Documentation Overview

This section provides an overview of the R&S SMW user documentation. You find it on the product page at:

www.rohde-schwarz.com/product/SMW200A > "Downloads"

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.

Online help including tutorials

The online help offers quick, context-sensitive access to the complete information for the base unit and the software options directly on the instrument.

The tutorials offer guided examples and demonstrations on operating the R&S SMW.

User manual

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 **online version** of the user manual provides the complete contents for immediate display on the Internet.

Service manual

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

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

Instrument security procedures manual

Deals with security issues when working with the R&S SMW in secure areas.

Basic safety instructions

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

Data sheet and brochure

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

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

Release notes and open source acknowledgment (OSA)

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

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

See www.rohde-schwarz.com/product/SMW200A > "Downloads" > "Firmware"

Application notes, application cards, white papers, etc.

These documents deal with special applications or background information on particular topics, see www.rohde-schwarz.com/appnotes.

1.3 Conventions Used in the Documentation

1.3.1 Typographical Conventions

The following text markers are used throughout this documentation:

Convention	Description
"Graphical user interface elements"	All names of graphical user interface elements on the screen, such as dialog boxes, menus, options, buttons, and softkeys are enclosed by quotation marks.
KEYS	Key names are written in capital letters.
`File names, commands, program code`	File names, commands, coding samples and screen output are distinguished by their font.
Input	Input to be entered by the user is displayed in italics.
Links	Links that you can click are displayed in blue font.
"References"	References to other parts of the documentation are enclosed by quotation marks.

1.3.2 Conventions for Procedure Descriptions

When describing how to operate the instrument, several alternative methods may be available to perform the same task. In this case, the procedure using the touchscreen is described. Any elements that can be activated by touching can also be clicked using an additionally connected mouse. The alternative procedure using the keys on the instrument or the on-screen keyboard is only described if it deviates from the standard operating procedures.

The term "select" may refer to any of the described methods, i.e. using a finger on the touchscreen, a mouse pointer in the display, or a key on the instrument or on a keyboard.

1.3.3 Notes on Screenshots

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

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 Welcome to the Baseband Power Sweep

The R&S SMW-K542 is a firmware application that enables you to generate a linear slope ramp waveform with the baseband generator.

The R&S SMW-K542 features:

- High degree of amplitude linearity
- Fast varying values
- High accuracy
- Dynamic range of 40 dB to 50 dB at the RF output.

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 the product page at:

www.rohde-schwarz.com/product/SMW200A > "Downloads" > "Manuals".

Installation

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

2.1 Accessing the Baseband Power Sweep Dialog

Access:

► Select "Baseband > Misc > Power Sweep...".

A dialog box opens that displays the provided general settings.

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

2.2 Scope

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

In particular, it includes:

- Managing settings and data lists, like storing and loading settings, creating and accessing data lists, or accessing files in a particular directory.
- Information on regular trigger, marker and clock signals as well as 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.

3 About the Baseband Power Sweep

The instrument generates a digital I/Q signal which varies the power values cyclically between the start and end values. The values change according to a predefined signal shape.

An upstream pre-sweep and RF off time allows the signal to achieve a steady state before sweep signal generation starts, and remains steady throughout the sweep cycle. The RF signal is adjusted once at signal start and requires no further control by the RF level hardware control systems.

The main application fields of signals generated with baseband power sweep are amplifier tests.

3.1 Required Options

The equipment layout for processing of digital power sweep includes:

- Option Standard or Wideband Baseband Generator (R&S SMW-B10/-B9) per signal path
- Option Baseband main module, one/two I/Q paths to RF (R&S SMW-B13/-B13T) or Option Wideband baseband main module two I/Q paths to RF (R&S SMW-B13XT)
- Option Baseband Power Sweep (R&S SMW-K542) per signal path

3.2 Correlating Parameters

This section describes the characteristic parameters of the baseband power sweep, explained by means of a stair-step sweep signal. In addition, the function calculates the constant power value of the sweep signal relative to the set RF level, and you can display the results in the graph, see "Constant mode" on page 14.

The characteristic parameters at a glance

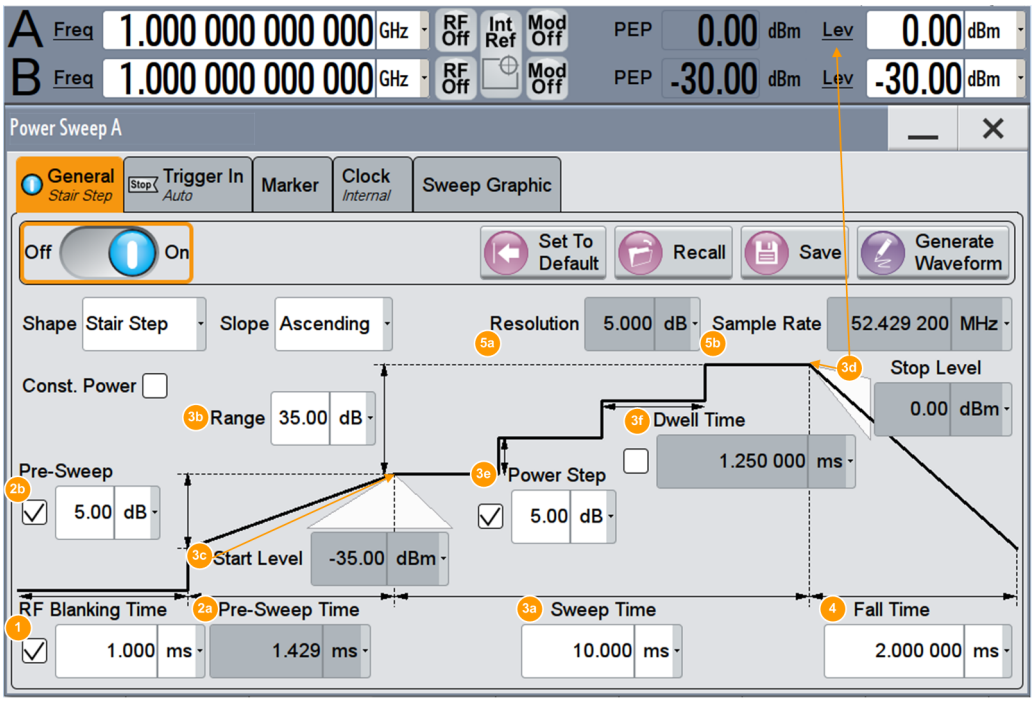


Figure 3-1: Characteristic parameters defining the power sweep

1 = RF Blanking
2a, 2b = Pre-Sweep
3a, 3b, 3c, 3d, 3e, 3f = active power sweep
4 = Rise / Fall time
5a, 5b = additional signal characteristics

Table 3-1: Correlating parameters of the baseband power sweep

Functions	Description
RF Blanking	"RF Blanking Time (1)" Lead time before pre-sweep
Pre-Sweep	Start of sweep signal generation • Provides settling of the signal before the actual measurement • the power value "Pre-Sweep (2b)" defines the starting point • "Pre-sweep (2b)" level, "Start Level (3a)" and the internal dwell time determine the indicated "Pre-sweep Time (2a)"
Power sweep	• "Sweep Time (3a)", the time of active measurement • "Range (3b)" – The sweep range the measurement is performed – RF Blanking and Pre-Sweep are not considered – The upper level value always corresponds to the set RF level (3d), the corresponding lower level is derived from the upper level and the range – With ascending slope, the "Stop Level (3d) = RF level", and the "Start Level (3c)" is derived Vice versa for a falling slope, the power sweep starts at the RF level, see Example "Baseband Power Sweep with descending slope" on page 14. – "Power Step (3e)" and "Dwell Time (3f)" define either the power step size, or the sweep step length for "Stair Step" sweeps. One of the two parameters can be optionally set, the other is calculated and displayed accordingly.

Functions	Description
Fall / Rise Time (Post-sweep time)	"Fall Time (4)" • The time span the signal requires to return from the "Stop Level" to the initial level at sweep start • With ascending slope, the graph shows the fall time at the end of the sweep The "Rise Time" appears, when you generate the signal with descending slope, see Example "Baseband Power Sweep with descending slope" on page 14.
Sweep range	Defined level value range
"Sweep Time"	Defined duration of a sweep cycle
Additional signal characteristics	Indicated relevant key parameters: • "Resolution (5a)" Resolution of the instrument hardware, which determines the current increment of the configured sweep signal • "Sample Rate (5b)" Number of samples, resulting from the resolution
"Slope"	Direction (rising or falling) of the power sweep signal

Example: Baseband Power Sweep with descending slope

The following figure shows the example from above with the same settings, but descending slope.

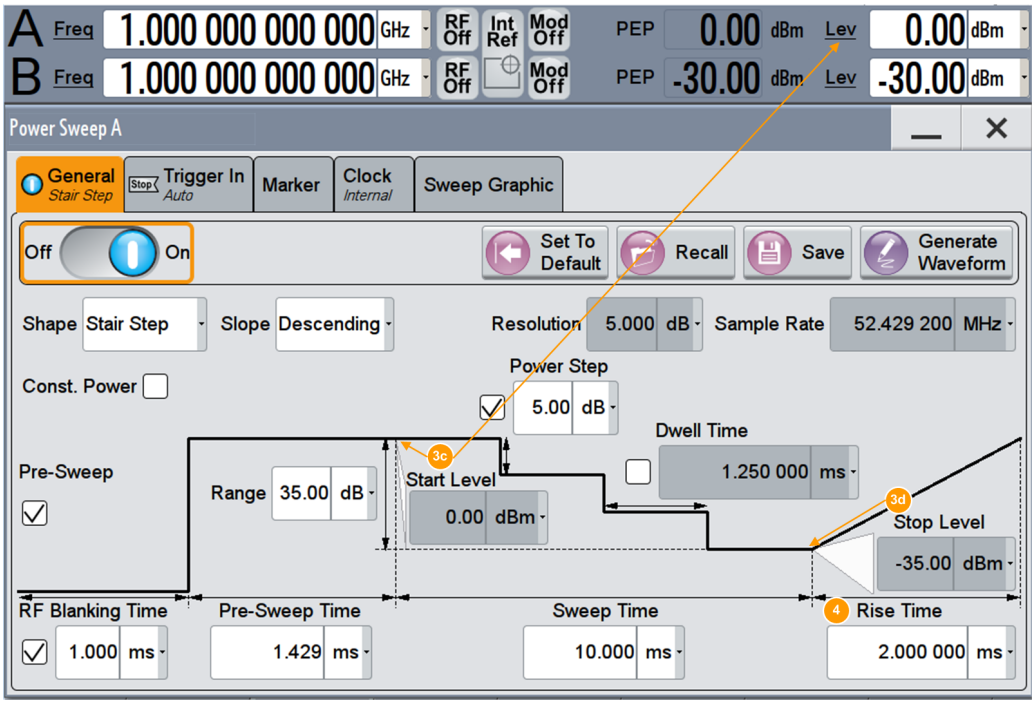


Figure 3-2: Example of a stair step power sweep with descending slope

3c, 3d = changed upper and lower level (start & stop)
4 = Rise instead of Fall time (post-sweep time)

The sweep starts at the upper power value ("Start Level (3c)"), the RF level, and stops at the low value ("Stop Level (3d)"). The "Rise Time (4)" is the time span the signal requires to return to the start level (post-sweep time).

Constant mode

You can define an attenuation value in constant mode. Based on the RF level, the function calculates the constant sweep power over the sweep range. The following figure shows the corresponding parameters on the example of a "Stair Step" sweep.

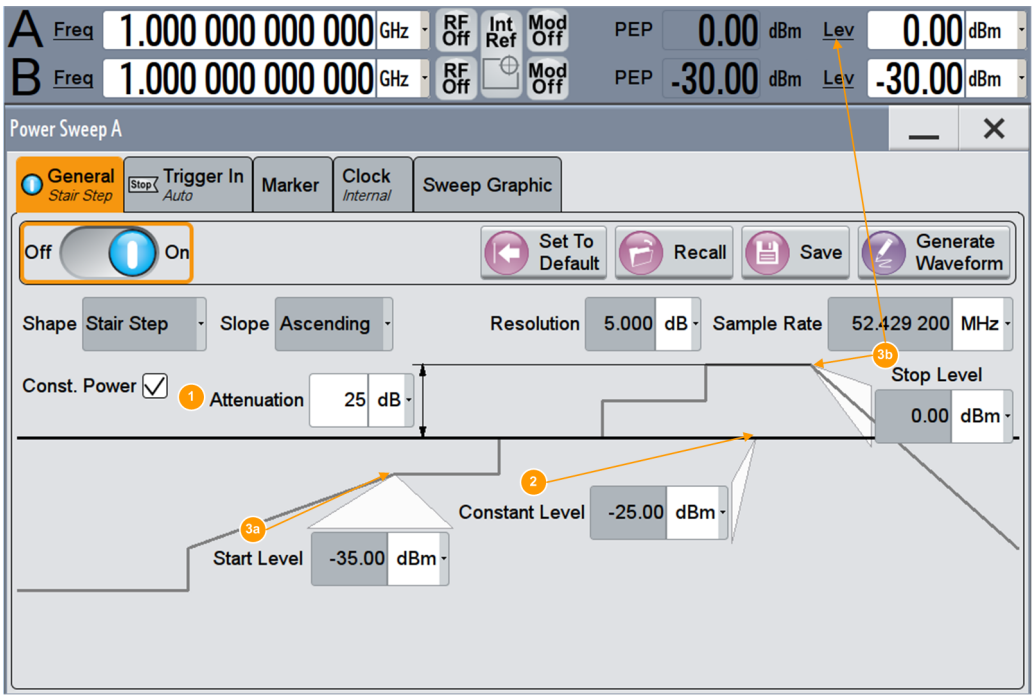


Figure 3-3: Characteristic parameters defining the power sweep

1 = constant power attenuation
2 = constant sweep power
3a, 3b = range

Apart from the parameters mentioned under Chapter 3.2, "Correlating Parameters", on page 11, the following distinctive features apply to constant mode.

Table 3-2: Correlating parameters of constant power sweep

Functions	Description
Attenuation	"Attenuation (1)" • Adjustable constant attenuation related to the RF level • Both parameters determine the resulting constant sweep power "(2)" • Relates to the active sweep range, that means from "Start Level (3a)" to "Stop Level (3b)" • RF Blanking and Pre-Sweep are not considered
Constant Sweep Power	"Constant sweep power (2)" • Derived from the RF level and the attenuation • Relates to the sweep range, i.e. the active measurement • RF Blanking and Pre-Sweep are not considered

4 Baseband Power Sweep Configuration and Settings

Access:

► Select "Baseband > Misc > Power Sweep".

The remote commands required to define these settings are described in Chapter 6, "Remote-Control Commands", on page 36.

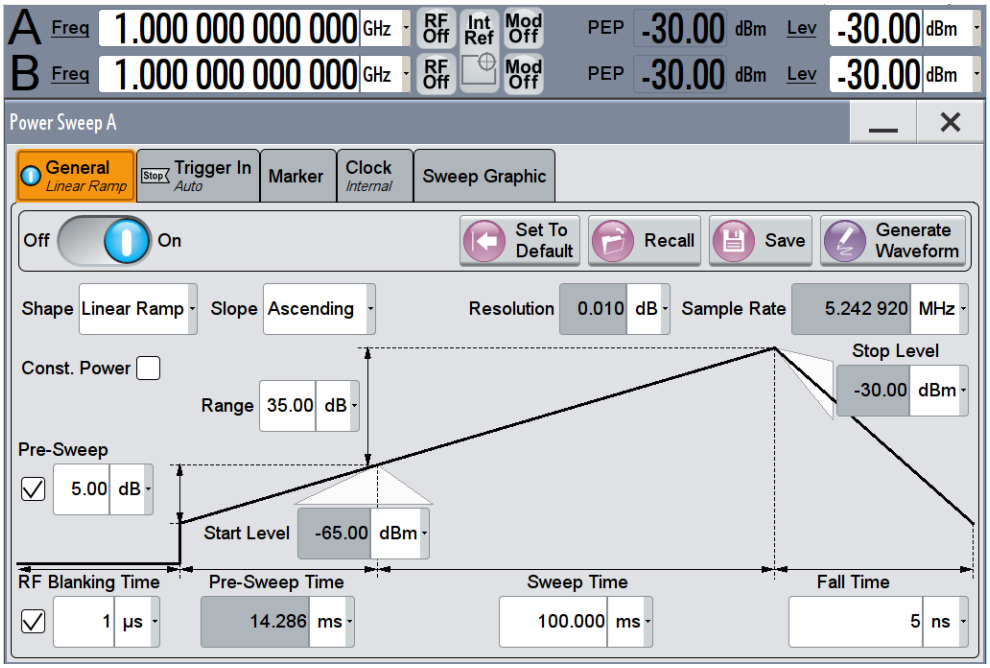
Settings:

4.1 General Settings

Access:

► Select "Baseband > Misc > Power Sweep".

This tab provides access to the default and the "Save/Recall" settings, as well as the settings for configuring the I/Q power sweep of the digital baseband signal.



The remote commands required to define these settings are described in Chapter 6.2, "General Commands", on page 41.

Settings:

State
Activates the power sweep.

Switching on this option, turns off all the other sweeps in the corresponding signal path.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:STATe` on page 43

Set to Default
Sets the default settings, see Chapter A.1, "Baseband Power Sweep Default Values", on page 57.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:PRESet` on page 41

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

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

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

The power sweep settings are stored as files with the predefined file extension `*.pwr_ramp`.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:SETTing:CATalog?` on page 42
`[:SOURce<hw>]:BB:PRAMp:SETTing:LOAD` on page 42
`[:SOURce<hw>]:BB:PRAMp:SETTing:STORe` on page 42
`[:SOURce<hw>]:BB:PRAMp:SETTing:DELete` on page 42

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

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

Remote command:
`[:SOURce<hw>]:BB:PRAMp:WAVeform:CREate` on page 43

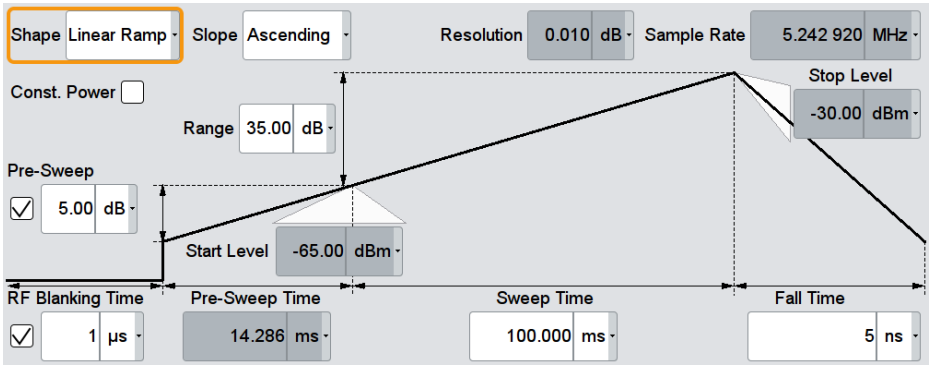
4.2 Power Sweep Settings

Access:

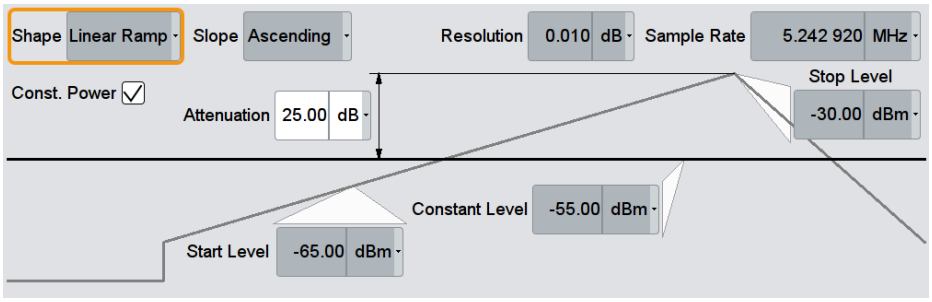
► Select "Baseband > Misc > Power Sweep > General".

Table 4-1: Power sweep settings and the correlating constant level indication

Linear Ramp



Constant value of linear ramp



The center of the "General" tab shows the sweep signal graphically according to the selected Shape. You can perform the settings directly in the diagram. Impacts or interactions between the parameters are adjusted immediately (see also Chapter 3.2, "Correlating Parameters", on page 11). For the graphical representation of all available power sweep shapes, see Representation of the Power Sweep Shapes in the Settings Dialog.

The remote commands required to define these settings are described in Chapter 6.3, "Power Sweep Commands", on page 43.

Settings:

Shape
Selects the form of the sweep curve.

"Linear Ramp" The sweep sequence resembles a sawtooth.
A sweep runs from the initial level to stop level and returns to the initial level in the specified fall time.

"Stair Step" The sweep sequence proceeds step-by-step.
A sweep runs from the initial level and switches automatically to the next step when the Dwell Time has elapsed. When the top level is reached the signal returns to the initial level in the specified fall time.

"Triangle" The sweep sequence resembles a triangle with the ascending and descending sides of equal length.
A sweep runs from the initial level to top level and back.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:RAMP:SHAPe` on page 47

Slope
Defines the direction (rising or falling) of the power sweep signal.

"Ascending" The waveform is rising, that means, the sweep starts from the bottom up (positive slope).

"Descending" The waveform is falling. The sweep starts from the top down (negative slope).

Remote command:
`[:SOURce<hw>]:BB:PRAMp:RAMP:SLOPe` on page 48

Resolution
Displays how the instrument resolves the power step size for the currently set power sweep.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:RAMP:RESolution?` on page 47

Sample Rate
Displays the internally derived sample rate.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:RAMP:SAMPlerate?` on page 47

Const. Power
Selects the display of constant power (see "Constant mode" on page 14.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:CONStmode on page 45

Attenuation ← Const. Power
Sets a constant attenuation for the power sweep. This value refers to the RF level set in the instrument.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:ATTenuation on page 44

Constant Level ← Const. Power
Displays the constant power of the power sweep. The value is derived from the RF signal level of the instrument and the attenuation over the sweep range (see also "Constant mode" on page 14).

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:LEVel? on page 45

Range
Determines the sweep range.

The upper and lower sweep power values are calculated relative to the signal level set in the instrument.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:RANGe on page 46

Start Level / Stop Level
Indicates the power values at the beginning and the end of the measurement.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:STARtlevel? on page 49
[:SOURce<hw>]:BB:PRAMp:RAMP:STOPlevel? on page 49

Pre-Sweep
Activates the pre-sweep and displays the input filed to specify the start level value for the pre-sweep.

The pre-sweep level value, expressed in dB, is added to the start level. Thus the signal generation starts before the actual measurement, and the signal has therefore a certain ramp-up time to achieve a steady state, see also Sweep Graphic.

The instrument indicates the internally derived ramp-up time on the time axis.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep:STATe on page 46
[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep[:LEVel] on page 46
[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep:TIME on page 46

RF Blanking Time
Activates RF output blanking, and then indicates the input field to specify the duration for RF blanking.

Blanking switches off the RF signal temporarily, until the signal has settled to a steady state, see Sweep Graphic.

Using this function, you can protect a sensitive DUT as you feed a stable signal at the start of the measurement.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk[:STATe] on page 44
[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk:TIME on page 44

Power Step
Activates the "Power Step" for stair step shapes, and thus the edit mode for the level input field to specify the increment of a power step (step size).

Note: The instrument calculates either the power step, or the Dwell Time on the basis of the sweep time and level sweep range. It depends on the parameter you want to specify, enabled by the checkbox.
You can determine only one of the two values.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP[:STATe] on page 49
[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP:LEVel on page 49

Dwell Time
Activates the "Dwell Time" for stair step shapes, and thus the edit mode for the input field to specify the duration of a sweep step.

Note: The instrument calculates either the dwell time, or the Power Step on the basis of the sweep time and level sweep range. It depends on the parameter you want to specify, enabled by the checkbox. Therefore, you can determine only one of the two values.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl[:STATe] on page 48
[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl:TIME on page 48

Sweep Time
Determines the measurement duration of a sweep cycle.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:SWEep:TIME on page 50

Fall Time / Rise Time / Post-Sweep Time
Specifies the time the signal needs to return from the "Stop Level" to the initial level.

The initial level is the "Pre-Sweep Level", if set, or the "Start Level".

Note: Triangle sweep signals without pre-sweep generally return to the "Start Level". The next sweep starts when the "Pre-Sweep Time" has elapsed. The R&S SMW displays the "Pre-Sweep Time" instead of "Fall or Rise Time" (see Chapter A.2, "Representation of the Power Sweep Shapes in the Settings Dialog", on page 58).

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:FALL:TIME on page 45

4.3 Trigger Settings

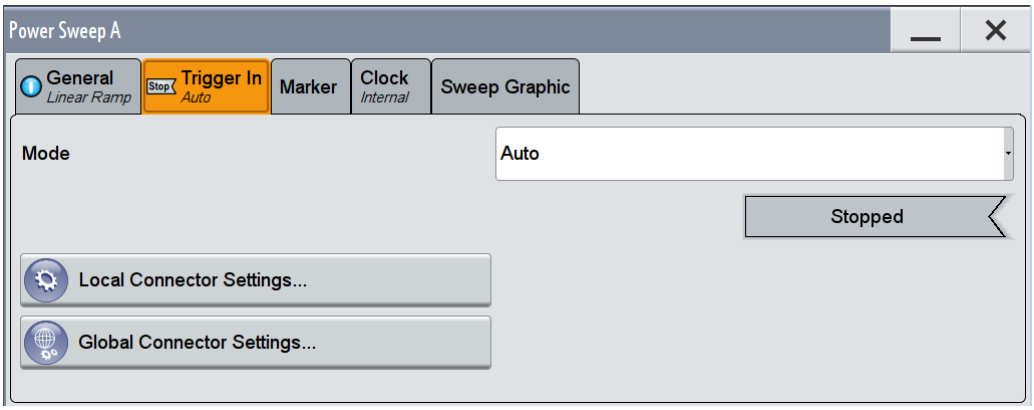
Access:

► Select "Baseband > Misc > Power Sweep > Trigger In".

This tab provides access to the settings necessary to select and configure the trigger, like trigger source, trigger delay, as well as to arm or trigger an internal trigger manually. The current signal generation status is displayed in the header of the tab together with information on the enabled trigger mode. As in the "Marker" and "Clock" tabs, this tab provides also access to the settings of the related connectors.

This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



The remote commands required to define these settings are described in Chapter 6.4, "Trigger Commands", on page 50.

Routing and enabling a trigger

The provided trigger signals are not dedicated to a particular connector. Trigger signals can be mapped to one or more globally shared USER or local T/M connectors.

Use the Local and Global Connector Settings to configure the signal mapping, the polarity, the trigger threshold and the input impedance of the input connectors.

To route and enable a trigger signal, perform the following *general steps*:

- Define the signal source and the effect of a trigger event.
  Select the "Trigger In > Mode" and "Trigger In > Source".
- Define the connector (USER or T/M) where the selected signal is provided.
  Use the Local and Global Connector 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 ← Trigger Settings Common to All Basebands
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 with 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 with 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.

Note: Furthermore, you can specify a certain number of repetitions of the power sweep (1 to N):

Select "Single" mode, and set the parameter "Signal Duration". The R&S SMW repeats the sweep cycle continuously according to the set signal duration.

Remote command:
[:SOURce<hw>]:BB:PRAMp[:TRIGger]:SEQuence on page 50

Signal Duration Unit ← Trigger Settings Common to All Basebands
Defines the unit for describing the length of the signal sequence to be output in the "Single" trigger mode.

Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger:SLUNit on page 53

Trigger Signal Duration ← Trigger Settings Common to All Basebands
Enters the length of the signal sequence to be output in the "Single" trigger mode.

Use this parameter to output part of the signal deliberately, an exact sequence of the signal, or a defined number of repetitions of the signal.

Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger:SLENgth on page 52

Running/Stopped ← Trigger Settings Common to All Basebands
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:PRAMp:TRIGger:RMODe? on page 52

Arm ← Trigger Settings Common to All Basebands
Stops the signal generation until subsequent trigger event occurs.

Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger:ARM:EXECute on page 51

Execute Trigger ← Trigger Settings Common to All Basebands
For internal trigger source, executes trigger manually.

Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger:EXECute on page 51

Trigger Source ← Trigger Settings Common to All Basebands
Selects 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 1 / 2"

The trigger event is the active edge of an external trigger signal provided and configured at the global USER connectors.

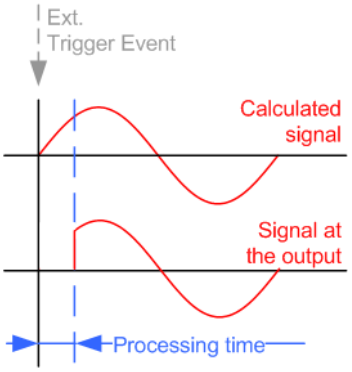
- "External Local Trigger"
  The trigger event is the active edge of an external trigger signal provided and configured at the local T/M/C connector.
  With coupled trigger settings, the signal has to be provided at the T/M/C1/2/3 connectors.
- "External Local Clock"
  The trigger event is the active 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.

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

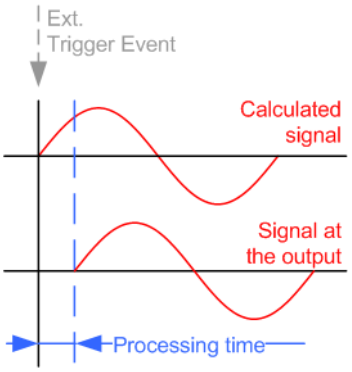
Remote command:
`[:SOURce<hw>]:BB:PRAMp:TRIGger:SOURce` on page 53

Sync. Output to External Trigger ← Trigger Settings Common to All Basebands
For an external trigger signal, enables/disables the output of a signal synchronous to the external trigger event.

- "On"
  Corresponds to the default state of this parameter.
  The signal calculation starts simultaneously with the external 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.



Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger:EXTernal:SYNChronize:OUTPut on page 51

External Trigger Inhibit ← Trigger Settings Common to All Basebands
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:PRAMp:TRIGger[:EXTernal<ch>]:INHibit on page 54
[:SOURce<hw>]:BB:PRAMp:TRIGger:OBASeband:INHibit on page 52

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

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

Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger[:EXTernal<ch>]:DELay on page 54
[:SOURce<hw>]:BB:PRAMp:TRIGger:OBASeband:DELay on page 51

4.4 Marker Settings

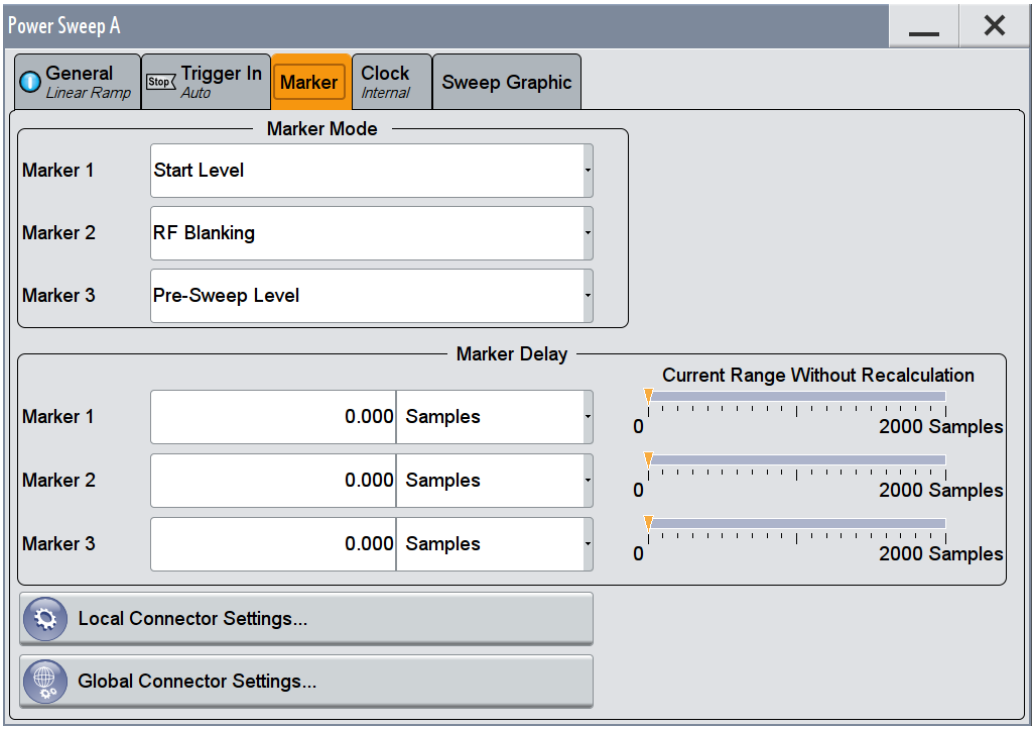
Access:

► Select "Baseband > Misc > Power Sweep > Marker".

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

This section focuses on the available settings.

For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



The remote commands required to define these settings are described in Chapter 6.5, "Marker Commands", on page 54.

Routing and enabling a marker

The provided marker signals are not dedicated to a particular connector. They can be mapped to one or more globally shared USER or local 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 (USER or T/M) where the selected signal is provided. Use the Local and Global Connector Settings.

Settings:

Marker Mode
Marker configuration for up to 3 marker channels. The settings are used to select the marker mode defining the shape and periodicity of the markers. The contents of the dialog change with the selected marker mode; the settings are self-explanatory.

"Unchanged" The marker signal remains unchanged.

"RF Blanking" Generates a marker signal when RF blanking starts.

"Pre-Sweep Level" Generates a marker signal when the sweep signal passes the pre-sweep power value.

"Start level" Generates a marker signal when the sweep signal passes the set start power.

"Stop Level" Generates a marker signal when the sweep signal reaches the defined stop power.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut<ch>:MODE` on page 55

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, regardless of the indication "Current Range without Recalculation".

Remote command:
`[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut<ch>:DELay` on page 54

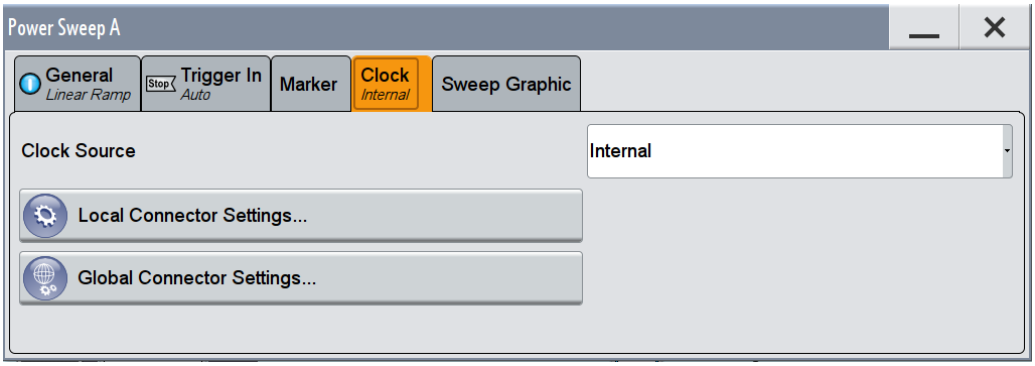
4.5 Clock Settings

Access:

► Select "Baseband > Misc > Power Sweep > Clock".

This tab provides access to the settings necessary to select and configure the clock signal, like the clock source and clock mode.

This section focuses on the available settings.
For information on how these settings affect the signal, refer to section "Basics on ..." in the R&S SMW user manual.



The remote commands required to define these settings are described in Chapter 6.6, "Clock Commands", on page 55.

Defining the Clock

The provided clock signals are not dedicated to a particular connector. They can be mapped to one or more globally shared USER and the local T/M/C connectors.

Use the Local and Global Connector Settings to configure the signal mapping, the polarity, the trigger threshold, and the input impedance of the input connectors.

To route and enable a trigger signal, perform the following *general steps*:

- Define the signal source, that is select the "Clock > Source".
- Define the connector (USER or T/M) where the selected signal is provided. Use the Local and Global Connector Settings.

Settings:

Clock Source

Selects the clock source.

- "Internal"
  The instrument uses its internal clock reference.
- "External Local Clock"
  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:PRAMp:CLOCk:SOURce` on page 56

Clock Mode

(requires R&S SMW-B10)

Sets the type of externally supplied clock.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:CLOCk:MODE` on page 55

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

Remote command:
`CLOCk:INPut:FREQuency?`

4.6 Local and Global Connector Settings

Each of the "Trigger In", "Marker" and "Clock" dialogs as well as the "Trigger Marker Clock" dialog provides a quick access to the related local and global connector settings.

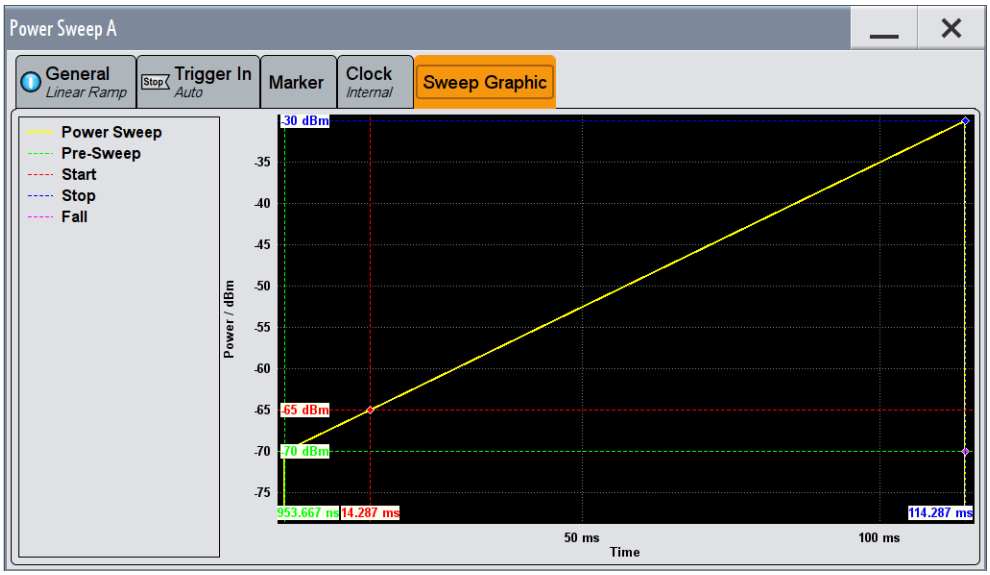
For more information, refer to the description R&S SMW User Manual, section "Local and Global Connectors".

4.7 Sweep Graphic

Access:

► Select "Baseband > Misc > Power Sweep > General".

This tab graphically displays the currently configured signal.



This representation enables you to verify the configured power sweep signal quickly.

Example:

The example shows the resulting power and time parameters of the sweep by means of a staircase shape, see Graphical representation of the configuration example.

The settings deviating from default are denoted by a different color, performed with the function "Mark all parameters changed from Preset".

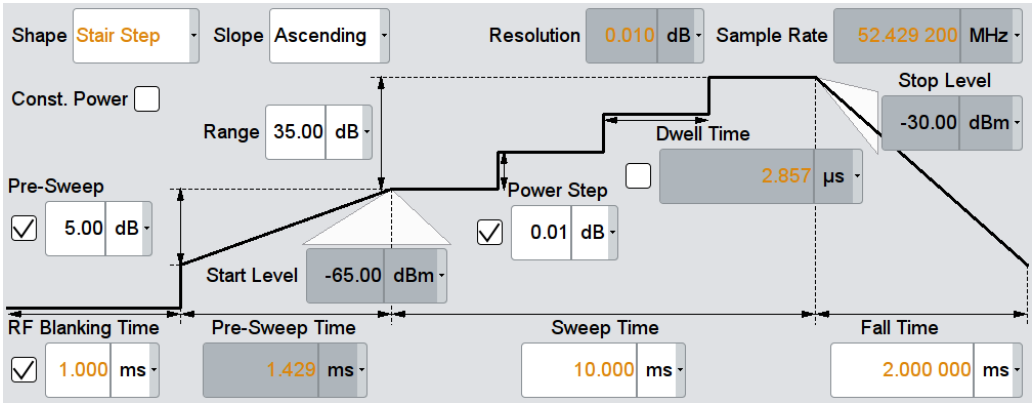


Figure 4-1: Configuration example for a power sweep

The R&S SMW immediately adjusts the settings display in the "Sweep Graphic" tab.

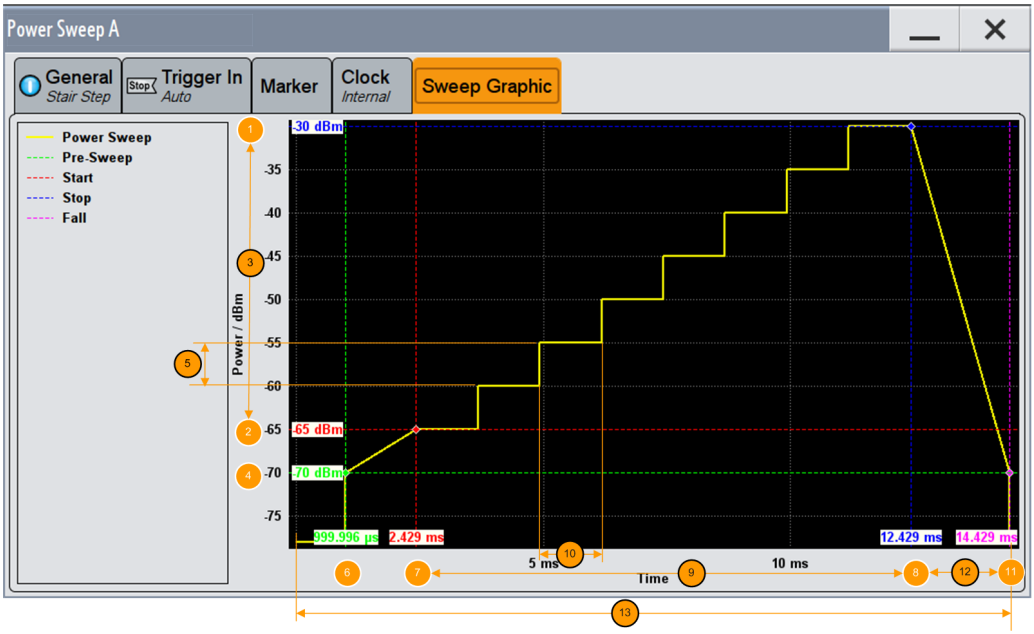


Figure 4-2: Graphical representation of the configuration example

1, 2 = Stop / Start level
3 = Range
4 = Pre-sweep level
5 = Power step
6 = RF Blanking time
7 = Sweep start time (Pre-sweep time)
8 = Sweep stop time
9 = Sweep time
10 = Dwell time

11 = Sweep restart (end of sweep cycle)
12 = Fall time
13 = Sweep cycle

Let us now have a look at the settings, to verify quickly the signal with the values shown in the graph:

(1) *Stop level = RF level = -30 dB* (upper level = "RF Lev")

(2) *Start level = Stop level - Range = -30 dBm - 35 dB = -65 dBm*

(4) *Pre-sweep level = Start level - Pre-Sweep = --65 dBm - 5 dBm = -70 dBm*

(5) RF blanking time = 1 ms (setting)

(6) Pre-sweep time = 1,429 (internally derived)

(7) *Sweep start time = Pre-Sweep time + RF Blanking time = 1 ms + 1,429 ms = 2,429 ms*

(9) *Sweep stop time = Sweep start time + Sweep time = 2,429 ms + 10 ms = 12,429 ms*

(11) *Sweep restart = Sweep stop time + Fall time = 12,429 + 2 ms = 14,429 ms*

(12) *Fall time = Sweep restart time - Sweep stop time = 2 ms*

(13) Complete sweep interval = RF Blanking time + Pre-Sweep time + Sweep Time + Fall time

5 Application Example

The main application fields of signals generated with baseband power sweep are amplifier tests, e.g. to determine the 1 dB compression point of an amplifier.

An ideal device amplifies the signal from the input to the output in strict proportion. But above a certain input level, a real amplifier achieves saturation, resulting in non-linearity. To determine this maximum input level, the intercept point determination is used.

The 1dB compression point is obtained graphically by tracing the output power versus the input power in logarithmic scale [dBm]. This representation shows the linearity by means of 1 dB nominal gain. When the maximum input level is exceeded, the output power decreases, and the amplifier behaves non-linear. The point where the curve intersects is the intercept point.

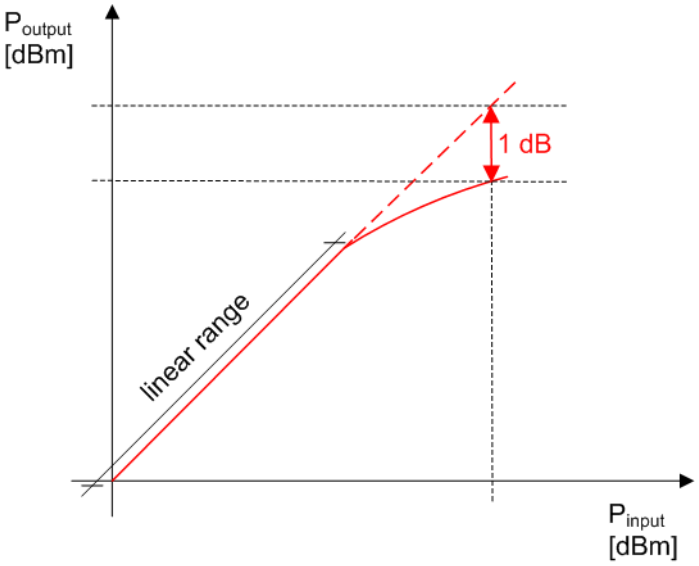
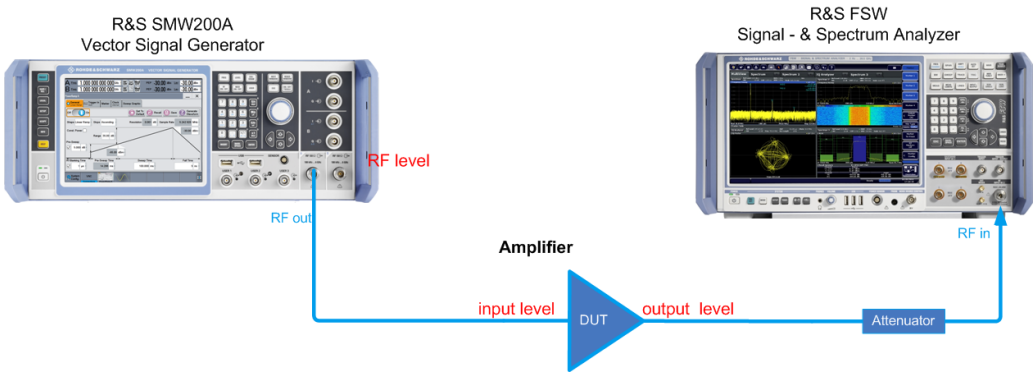


Figure 5-1: Correlation between the input power and output power of an amplifier with the 1 dB compression point

Determining the 1dB compression point of an amplifier

The following example briefly explains the main steps to be taken for setting up a measurement in order to determine the 1 dB compression point of an amplifier.



The test setup consists of the R&S SMW, a signal analyzer, for example the R&S FSW, and the amplifier as the device under test (DUT). The signal generator creates a baseband power ramp signal with varying signal level. The frequency remains constant. The signal analyzer measures the amplifier's output signal.

The example below focuses on the power sweep settings to provide the test signal.

It is assumed that ...

- The test setup has been established, including the connections for marker signals.
- The maximum input power of the analyzer is considered accordingly, e.g. protected by the attenuator
- The test setup has been calibrated.

For details, see the application note "Measuring with Modern Spectrum Analyzers" (1MA201_08e) for a detailed description on setting up the measurement.

To configure power sweep signal...

As a typical application example, configure the signal as follows:

1. In the status bar, select "Freq > 2 GHz" and "Lev > 0 dBm".
2. In the block diagram, select "RF > Off".
3. Select "Baseband > Misc > Power Sweep...".

   The "Power Sweep" dialog opens.
4. In the "General" tab, select "Set To default" to start from an initial state.
5. Select "RF Blanking Time > 1 ms".
6. Select "Sweep Time > 1 s".
7. In the context sensitive menu, select "Mark all parameters changed from Preset" to indicate the modified settings.

   All modified settings and parameters are colorized.
8. In the "Marker" tab, select "Marker 1 > Pre-sweep level", "Marker 2 > Start Level" and "Marker 3 > Stop Level".

   Using the marker signals, you can see when the sweep signal passes the significant thresholds, and thus supports you when evaluating the signal response of the amplifier (see also Chapter 4.4, "Marker Settings", on page 27).
9. Via the "Local or Global connector settings", assign the marker signals to the corresponding outputs.
10. Select "State > On".
11. In the block diagram, select "RF State > On".

6 Remote-Control Commands

The following commands are required to generate signals with the R&S SMW-K542 option in a remote environment. It is assumed that, the R&S SMW is connected to a network for remote control, as described in the R&S SMW documentation. Basic knowledge of the remote control and the SCPI command syntax is required.

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 .. 4	Entity in a multiple entity configuration `ENTity3|4` require option R&S SMW-K76
`SOURce<hw>`	[1]|4	Available baseband signals
`OUTPut<ch>`	1 .. 3	Available markers

Using SCPI command aliases for advanced mode with multiple entities

You can address multiple entities configurations by using the SCPI commands starting with the keyword `SOURce` or the alias commands starting with the keyword `ENTity`.

Note that the meaning of the keyword `SOURce<hw>` changes in the second case.

For details, see section "SCPI Command Aliases for Advanced Mode with Multiple Entities" in the R&S SMW user manual.

The following commands specific to the R&S SMW-K542 are described here:

6.1 Programming Examples

The corresponding sections of the same title provide simple programming examples for the R&S SMW. 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 examples 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 programs, it is recommended that you perform an instrument reset to set the R&S SMW to a defined state. The commands `*RST` and `SYSTem:PRESet` are equivalent for this purpose. `*CLS` also resets the status registers and clears the output buffer.

In the examples, it is assumed that:

- A remote PC is connected to the instrument
- The remote PC and the instrument are switched on
- The connection between them is established
- The security setting "System Config > Setup > Security > SCPI over LAN" is enabled

Example: Save/Recall Files with user settings

This example shows how to query and load settings files, stored with the save/recall function.

```
// ********************************************************************
// Reset instrument first
// ********************************************************************
*RST; *CLS

MMEM:CDIR '/var/user/'
SOURce1:BB:PRAMp:SETTing:CATalog?
// Response: pramp_lin_settings,pramp_trian_settings, pramp_stairstep_settings
SOURce1:BB:PRAMp:SETTing:STORe 'pramp_stairstep_settings_new'
SOURce1:BB:PRAMp:SETTing:LOAD 'pramp_stairstep_settings_new'
SOURce1:BB:PRAMp:SETTing:DELete 'pramp_stairstep_settings'
SOURce1:BB:PRAMp:SETTing:CATalog?
// Response: ramp_lin_settings,pramp_trian_settings,
//           pramp_stairstep_settings_new

// Generate and store a waveform file in the current directory
SOURce1:BB:PRAMp:WAVeform:CREate "wv_pramp_stairstep"
```

Example: Configure a power sweep

This example shows how to configure a power sweep resembling a stair step shape.

```
// ***************************************
// Set the instrument to a predefined state.
// ***************************************
SOURce1:BB:PRAMp:PRESet

// ***************************************
// Select the sweep shape, the sweep range,
// and define the sweep step power size.
// ***************************************
SOURce1:BB:PRAMp:RAMP:SHAPe STAirstep
// SOURce1:BB:PRAMp:RAMP:SHAPe LINear
// SOURce1:BB:PRAMp:RAMP:SHAPe TRIangle
SOURce1:BB:PRAMp:RAMP:SLOPe ASCending
// SOURce1:BB:PRAMp:RAMP:SLOPe DESCending
SOURce1:BB:PRAMp:RAMP:RANGe 30
SOURce1:BB:PRAMp:RAMP:STARt:LEVel?
// Response: -60
// SOURce1:BB:PRAMp:RAMP:STOP:LEVel?
// Response: -30
SOURce1:BB:PRAMp:RAMP:STAir:DWEll:STATe 1
SOURce1:BB:PRAMp:RAMP:STAir:DWEll:TIMe 0.001
// SOURce1:BB:PRAMp:RAMP:STAir:STEP:STATe 1
// SOURce1:BB:PRAMp:RAMP:STAir:STEP:LEVel 0.01
// SOURce1:BB:PRAMp:RAMP:SAMPlerate?

// ***************************************
// Activate pre-sweep and RF blanking,
// and set the parameters.
// ***************************************
SOURce1:BB:PRAMp:RAMP:PRESweep:STATe 1
SOURce1:BB:PRAMp:RAMP:PRESweep:LEVel 4
SOURce1:BB:PRAMp:RAMP:PRESweep:TIME?
// Response: 13.333
SOURce1:BB:PRAMp:RAMP:BLANk:STATe 1
SOURce1:BB:PRAMp:RAMP:BLANk:TIME 0.000002
SOURce1:BB:PRAMp:RAMP:PRESweep:TIME?
// 14.285

// ***************************************
// Switch to constant mode, set the attenuation.
// Query the resulting constant power, the
// resolution and the start/stop level values
// of the active measurement.
// ***************************************
SOURce1:BB:PRAMp:RAMP:CONStmode 1
BB:PRAMp:RAMP:ATTenuation -20
SOURce1:BB:PRAMp:RAMP:LEVel?
```

```
// Response: -50
SOURce1:BB:PRAMp:RAMP:STARt:LEVel?
// Response: -65
SOURce1:BB:PRAMp:RAMP:STOP:LEVel?
// Response: -30
SOURce1:BB:PRAMp:RAMP:RESolution?
// Response: 0.02
```

Example: Adjusting clock, marker and trigger settings

The following examples present the available commands:

```
// ********************************************************************
// Clock settings
// ********************************************************************
SOURce1:BB:PRAMp:CLOCk:SOURce INTernal
// SOURce1:BB:PRAMp:CLOCk:SOURce ELCL
SOURce1:BB:PRAMp:CLOCk:MODe SAMPle
SOURce1:BB:PRAMp:CLOCk:MODe?
// SAMP

// ********************************************************************
// Marker settings
// ********************************************************************
SOURce1:BB:PRAMp:TRIGger:OUTPut1:MODE STARt
// SOURce1:BB:PRAMp:RAMP:STARt:LEVel?
// -35
SOURce1:BB:PRAMp:TRIGger:OUTPut2:MODE PRESweep
// SOURce1:BB:PRAMp:RAMP:PRESweep:STATe 1
// SOURce1:BB:PRAMp:RAMP:PRESweep?
// 5
SOURce1:BB:PRAMp:TRIGger:OUTPut3:MODE RFBLanking
// SOURce1:BB:PRAMp:RAMP:BLANk:STATe 1
// SOURce1:BB:PRAMp:RAMP:BLANk:TIME?
// 0.000001
SOURce1:BB:PRAMp:TRIGger:OUTPut1:MODE UNCHanged
SOURce1:BB:PRAMp:TRIGger:OUTPut2:MODE STOP
// SOURce1:BB:PRAMp:RAMP:STOP:LEVel?
// 0
SOURce1:BB:PRAMp:TRIGger:OUTPut2:DELay 16
// delays the marker signal output

// ********************************************************************
// Trigger settings
// ********************************************************************
SOURce1:BB:PRAMp:TRIGger:SEQuence SINGLe
SOURce1:BB:PRAMp:TRIGger:SLUNit SEQ
SOURce1:BB:PRAMp:TRIGger:SLENgth 200
// the first 200 samples will be output after the next trigger event

SOURce1:BB:PRAMp:TRIGger:SEQuence RETrigger
SOURce1:BB:PRAMp:TRIGger:SOURce EGT1
// external trigger signal must be provided at the connector
// configured for the External Global Trigger 1 signal
// SOURce1:BB:PRAMp:TRIGger:SOURce EXTernal
// SOURce1:BB:PRAMp:TRIGger:EXTernal:SYNChronize:OUTPut ON
// SOURce1:BB:PRAMp:TRIGger:EXTernal:DELay 200
// SOURce1:BB:PRAMp:TRIGger:EXTernal:INHibit 100
```

```
SOURce1:BB:PRAMp:TRIGger:SOURce INTB
// the internal trigger signal from the other path must be used
// SOURce1:BB:PRAMp:TRIGger:OBASeband:DELay 25
// SOURce1:BB:PRAMp:TRIGger:OBASeband:INHibit 10

SOURce1:BB:PRAMp:TRIGger:SOURce INTernal
SOURce1:BB:PRAMp:TRIGger:SEQuence ARETrigger
SOURce1:BB:PRAMp:TRIGger:EXECute
// executes a trigger, signal generation starts
SOURce1:BB:PRAMp:TRIGger:ARM:EXECute
// signal generation stops
SOURce1:BB:PRAMp:TRIGger:EXECute
// executes a trigger, signal generation starts again

SOURce1:BB:PRAMp:TRIGger:SEQuence AAUTo
SOURce1:BB:PRAMp:TRIGger:EXEC
SOURce1:BB:PRAMp:TRIGger:RMODe?
// RUN
```

Example: Enable signal generation

The following example configures automatic triggering and activates signal generation:

```
SOURce1:BB:PRAMp:TRIGger:SEQuence AUTO
SOURce1:BB:PRAMp:TRIGger:SOURce INTernal
SOURce1:BB:PRAMp:STAT ON
```

6.2 General Commands

This section contains the commands for the general settings of the baseband power sweep, e.g. preset, or file handling commands for save/recall settings files.

Commands:

[:SOURce<hw>]:BB:PRAMp:PRESet

Sets the parameters of the power sweep to their default values (`*RST` values specified for the commands).

Not affected is the state set with the command `[:SOURce<hw>]:BB:PRAMp:STATe`.

Example: See Example "Configure a power sweep" on page 38.

Usage: Event

Manual operation: See "Set to Default" on page 17

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

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

Return values:

<Catalog> string

Returns a string of file names separated by commas.

Example: See Example "Save/Recall Files with user settings" on page 37

Usage: Query only

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

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

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

Setting parameters:

<Filename> string

File name or complete file path

Example: See Example "Save/Recall Files with user settings" on page 37

Usage: Setting only

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

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

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

Setting parameters:

<Filename> string

File name or complete file path; file extension can be omitted

Example: See Example "Save/Recall Files with user settings" on page 37

Usage: Setting only

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

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

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

Setting parameters:

<Filename> string

File name or complete file path

Example: See Example "Save/Recall Files with user settings" on page 37

Usage: Setting only

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

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

Activates power sweep signal generation, and deactivates all digital standards, digital modulation modes and other sweeps in the corresponding path.

Parameters:

<State> 0 | 1 | OFF | ON

*RST: 0

Example: See Example "Enable signal generation" on page 41.

Manual operation: See "State" on page 17

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

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

Setting parameters:

<Filename> string

file name or complete file path; file extension is assigned automatically

Example: See Example "Save/Recall Files with user settings" on page 37

Usage: Setting only

Manual operation: See "Generate Waveform File" on page 18

6.3 Power Sweep Commands

This section lists the remote-control commands, necessary to configure the power sweep signal.

Commands:

[:SOURce<hw>]:BB:PRAMp:RAMP:ATTenuation <ConstAtten>

Sets the attenuation in constant power sweep mode.

Parameters:

<ConstAtten> float

Range: 0.01 to 60
Increment: 0.01
*RST: 25

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Attenuation" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk:TIME <RfBlanking>

Sets the RF blanking time.

To activate RF blanking, use command `[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk[:STATe]`.

Parameters:

<RfBlanking> float

Range: 5E-9 to 1E-3
Increment: 5E-9
*RST: 1E-6
Default unit: s

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "RF Blanking Time" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk[:STATe] <EnableRfBlank>

Activates the RF blanking.

To determine the blanking interval, use command `[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk[:STATe]`.

Parameters:
<EnableRfBlank> 0 | 1 | OFF | ON
*RST: 1

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "RF Blanking Time" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:CONStmode <ConstMode>

Enables power constant mode.

Parameters:
<ConstMode> 0 | 1 | OFF | ON
*RST: 0

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Const. Power" on page 20

[:SOURce<hw>]:BB:PRAMp:RAMP:FALL:TIME <Falltime>

Sets the fall time of the power sweep signal.

Parameters:
<Falltime> float
Range: 5E-9 to 1
Increment: 5E-9
*RST: 5E-9

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Fall Time / Rise Time / Post-Sweep Time" on page 22

[:SOURce<hw>]:BB:PRAMp:RAMP:LEVel?

Queries the resulting constant power value of the power sweep.

Return values:
<ConstLevel> float
Range: -145 to 30
Increment: 0.01
*RST: 0

Example: See Example "Configure a power sweep" on page 38.

Usage: Query only

Manual operation: See "Constant Level" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep:STATe <EnablePreSweep>

Activates the pre-sweep.

To determine the pre-sweep power, use command `[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep[:LEVel]`.

Parameters:

<EnablePreSweep> 0 | 1 | OFF | ON
*RST: 1

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Pre-Sweep" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep:TIME <PreSweepTime>

Queries the calculated pre-sweep time.

Parameters:

<PreSweepTime> float
Range: 0 to 20
Increment: 5E-9
*RST: 0

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Pre-Sweep" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep[:LEVel] <PresweepLevel>

Sets the pre-sweep power.

To activate pre-sweep, use command `[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep:STATe`.

Parameters:

<PresweepLevel> float
Range: 0 to 20
Increment: 0.01
*RST: 5
Default unit: dB

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Pre-Sweep" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:RANGe <Range>

Sets the power sweep range.

Parameters:

<Range> float

Range: 0.01 to 50
Increment: 0.01
*RST: 35
Default unit: dB

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Range" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:RESolution?

Queries the resolution of the power steps.

Return values:

<PowerResolution> float

Range: 0 to 60
Increment: 1E-3
*RST: 0.01

Example: See Example "Configure a power sweep" on page 38.

Usage: Query only

Manual operation: See "Resolution" on page 20

[:SOURce<hw>]:BB:PRAMp:RAMP:SAMPlerate?

Queries the calculated sample rate.

Return values:

<SampleRate> float

Range: 0 to 20
Increment: 5E-9
*RST: 1310730

Example: See Example "Configure a power sweep" on page 38.

Usage: Query only

Manual operation: See "Sample Rate" on page 20

[:SOURce<hw>]:BB:PRAMp:RAMP:SHAPe <Shape>

Selects the power sweep shape.

Parameters:

<Shape> LINear | STAir | TRIangle

LINear
The sweep curve resembles a sawtooth.

STAir
The sweep curve resembles a stair step with definable "Dwell time" or "Power step", see `[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl:TIME` and `[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP:LEVel`.

TRIangle
The sweep curve resembles a triangle.

*RST: LINear

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Shape" on page 20

[:SOURce<hw>]:BB:PRAMp:RAMP:SLOPe <Slope>

Sets the slope direction (increasing or decreasing).

Parameters:

<Slope> ASCending | DESCending

*RST: ASCending

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Slope" on page 20

[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELI:TIME <Dwelltime>

Sets the dwell time for a power step.

To activate the dwell time, use command . `[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl[:STATe]`.

Parameters:

<Dwelltime> float

Range: 5E-9 to 20
Increment: 5E-9
*RST: 0.000057110
Default unit: s

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Dwell Time" on page 22

[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELI[:STATe] <EnableDwell>

Activates the edit mode to set the dwell time.

To determine the dwell time, use command `[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl:TIME`.

Parameters:

<EnableDwell> 0 | 1 | OFF | ON
*RST: 0

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Dwell Time" on page 22

[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP:LEVel <Step>

Sets the power step size.

Parameters:

<Step> float
Range: 0.01 to 10
Increment: 0.01
*RST: 1
Default unit: dB

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Power Step" on page 22

[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP[:STATe] <EnablePowerStep>

Activates the edit mode to set the power step.

To determine the power step size, use command `[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP:LEVel` on page 49.

Parameters:

<EnablePowerStep> 0 | 1 | OFF | ON
*RST: 1

Manual operation: See "Power Step" on page 22

[:SOURce<hw>]:BB:PRAMp:RAMP:STARtlevel?
[:SOURce<hw>]:BB:PRAMp:RAMP:STOPlevel?

Queries the start or end power values of the active measurement.

Return values:

<StopLevel> float
Range: -145 to 30
Increment: 0.01
*RST: 0

Example: See Example "Configure a power sweep" on page 38.

Usage: Query only

Manual operation: See "Start Level / Stop Level" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:SWEep:TIME <SweepTime>

Sets the time of one sweep cycle.

Parameters:

<SweepTime> float

Range: 1E-6 to 20
Increment: 1E-6
*RST: 0.1

Example: See Example "Configure a power sweep" on page 38.

Manual operation: See "Sweep Time" on page 22

6.4 Trigger Commands

This section lists the remote-control commands, necessary to configure the trigger.

Commands:

[:SOURce<hw>]:BB:PRAMp[:TRIGger]:SEQuence <Sequence>

Selects the trigger mode:

- `AUTO` = auto
- `RETRigger` = retrigger
- `AAUTo` = armed auto
- `ARETrigger` = armed retrigger
- `SINGle` = single

Selects the trigger mode.

Parameters:

<Sequence> AUTO | RETRigger | AAUTo | ARETrigger | SINGle

*RST: AUTO

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Trigger Mode" on page 24

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

Stops signal generation; a subsequent internal or external trigger event restarts signal generation.

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Usage: Event

Manual operation: See "Arm" on page 25

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

Executes a trigger.

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Usage: Event

Manual operation: See "Execute Trigger" on page 25

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

Enables output of the signal synchronous to the external trigger event.

Parameters:

<Output> 0 | 1 | OFF | ON

*RST: 1

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Sync. Output to External Trigger" on page 26

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

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

Parameters:

<Delay> float

Range: 0 to 16777215
Increment: 0.01
*RST: 0

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Trigger Delay" on page 27

[:SOURce<hw>]:BB:PRAMp:TRIGger:OBASeband:INHibit <Inhibit>

For triggering via the other path, specifies the number of samples by which a restart is to be inhibited following a trigger event.

Parameters:

<Inhibit> integer

Range: 0 to 67108863
*RST: 0
Default unit: sample

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "External Trigger Inhibit" on page 27

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

Queries the status of signal generation.

Return values:

<RMode> STOP | RUN

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Usage: Query only

Manual operation: See "Running/Stopped" on page 25

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

Defines the length of the signal sequence to be output in the `SINGle` trigger mode, see `[:SOURce<hw>]:BB:PRAMp[:TRIGger]:SEQuence`.

Parameters:

<SLength> integer

Range: 1 to 7000
*RST: 1
Default unit: symbol

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Trigger Signal Duration" on page 25

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

Defines the unit for the entry of the length of the signal sequence to be output in the `Single` trigger mode, see `[:SOURce<hw>]:BB:PRAMp[:TRIGger]:SEQuence`.

Parameters:

<SLunit> FRAMe | SEQuence

FRAMe
Unit Frame. A single frame is generated after a trigger event.

SEQuence
Unit Sequence Length. A single sequence is generated after a trigger event.

*RST: SEQuence

Manual operation: See "Signal Duration Unit" on page 25

[:SOURce<hw>]:BB:PRAMp: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`)
- `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

*RST: INTernal

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Trigger Source" on page 25

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

Specifies the trigger delay.

Parameters:

<Delay> float

Range: 0 to 16777215
Increment: 0.01
*RST: 0
Default unit: samples

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Trigger Delay" on page 27

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

Specifies the duration by which a restart is inhibited.

Specifies the number of samples by which a restart is to be inhibited following an external trigger event.

Parameters:

<Inhibit> integer

Range: 0 to 196297143
*RST: 0
Default unit: sample

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "External Trigger Inhibit" on page 27

6.5 Marker Commands

This section lists the remote-control commands, necessary to configure the markers.

Commands:

[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut<ch>:DELay <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, regardless of the indication "Current Range without Recalculation".

Parameters:

<Delay> float

Range: 0 to 16777215
Increment: 0.01
*RST: 0
Default unit: samples

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Marker x Delay" on page 29

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

Defines the signal for the selected marker output.

Parameters:

<Mode> UNCHanged | RFBLanking | PRESweep | STARt | STOP

UNCHanged
Provides the standard marker signal.

RFBLanking
Returns the marker signal when the RF blanking is active.

PRESweep
Returns the marker signal when the power sweep reaches the pre-sweep level.

STARt
Returns the marker signal when the power sweep reaches the stop level.

*RST: UNCHanged

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Manual operation: See "Marker Mode" on page 29

6.6 Clock Commands

This section lists the remote-control commands, necessary to configure the clock.

Commands:

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

Sets the type of externally supplied clock.

Parameters:

<Mode> SAMPle

*RST: SAMPle

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Options: R&S SMW-B10

Manual operation: See "Clock Mode" on page 30

[:SOURce<hw>]:BB:PRAMp:CLOCk:SOURce <Source>

Selects the clock source:

- `INTernal`: Internal clock reference
- `ELCLock`: External local clock
- `EXTernal = ELCLock`: Setting only
  Provided for backward compatibility with other Rohde & Schwarz signal generators

Parameters:

<Source> INTernal | ELCLock | EXTernal

*RST: INTernal

Example: See Example "Adjusting clock, marker and trigger settings" on page 40.

Options: ELCLock requires R&S SMW-B10

Manual operation: See "Clock Source" on page 30

Annex

A References

This section includes an overview of the power sweep defaults, and the graphical representations of all sweep signal shapes in the setting dialog box as well as in the graphic.

A.1 Baseband Power Sweep Default Values

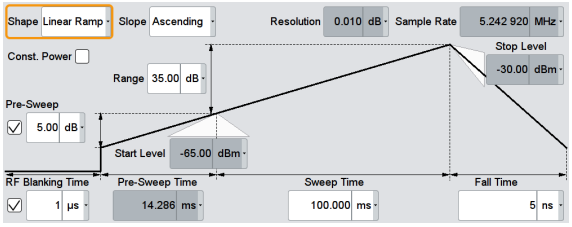
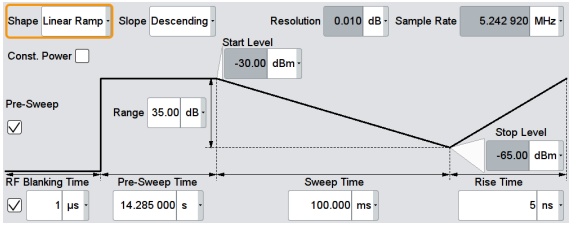
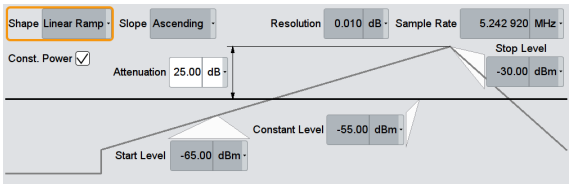
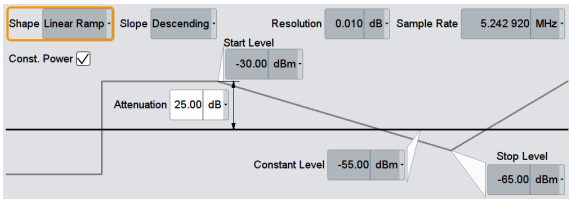
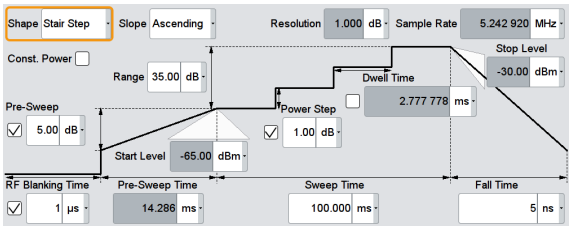
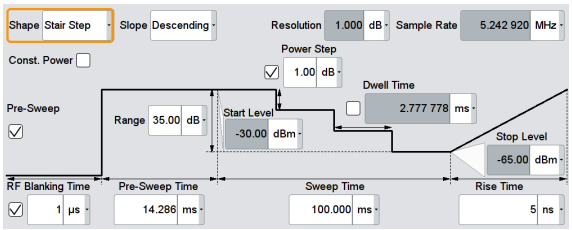
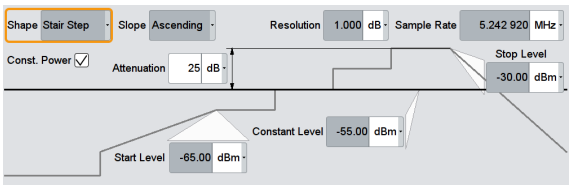
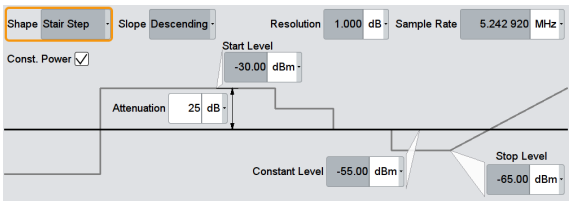
Table A-1: Power Sweep default values

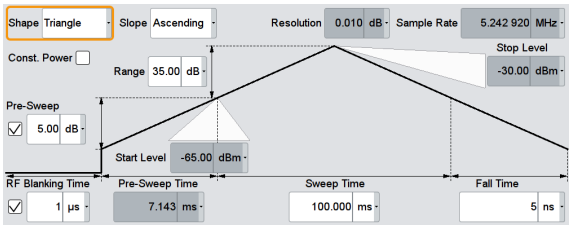
Parameter	**Value**
State	Off
Shape	Linear ramp
Pre-Sweep	On
RF-Blanking	On
Const. Power	Off
Trigger	Auto, Internal
Marker	Start level
Shape Settings	
Slope	Ascending
Resolution	0.010 dB
Range	35 dB
Sample Rate	1.310730 MHz
Attenuation	25 dB
Pre-Sweep level	5 dB
RF Blanking Time	1 µs
Pre-Sweep Time	14.285 s
Sweep Time	100 ms
Fall Time	5 ns
Stop Level	RF signal level

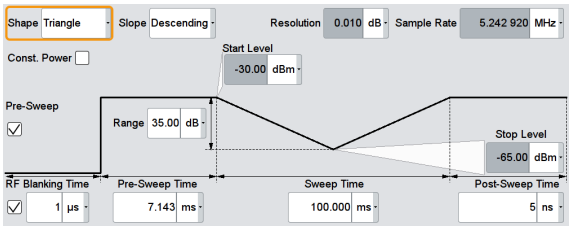
A.2 Representation of the Power Sweep Shapes in the Settings Dialog

The shown variants of the power sweep settings dialog are based on default values, except of the last example, that shows the "Post-Sweep Time" for "Triangle" shapes without "Pre-Sweep".

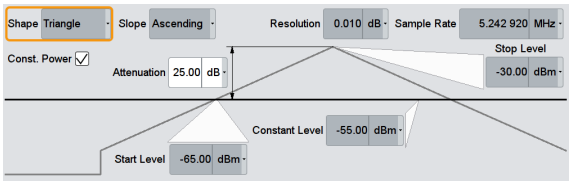
Table A-2: Available Power Sweep shapes and their correlating constant level indication

Linear Ramp, ascending	**Linear Ramp, descending**
	
Constant mode 	Constant mode 
Stair Step, ascending	**Stair Step, descending**
	
Constant mode 	Constant mode 
Triangle with Pre-Sweep, ascending	**Triangle with Pre-Sweep, descending**

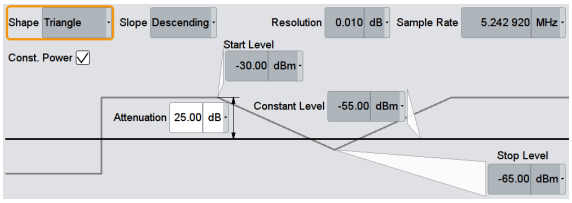




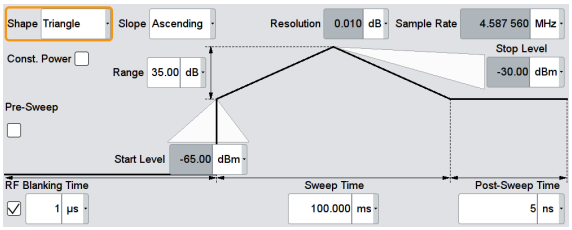
Constant mode



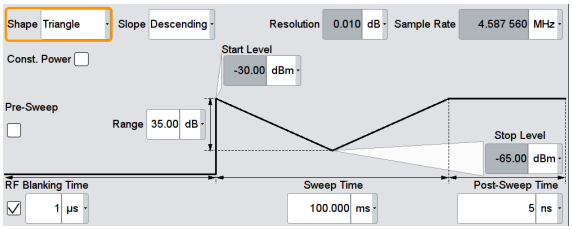
Constant mode



Triangle without Pre-Sweep, ascending



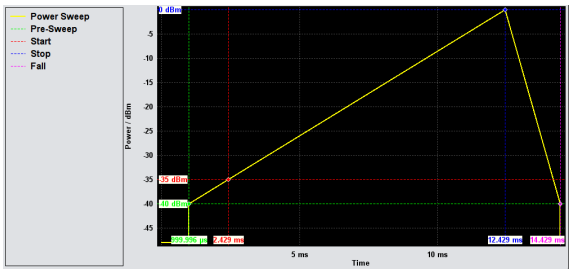
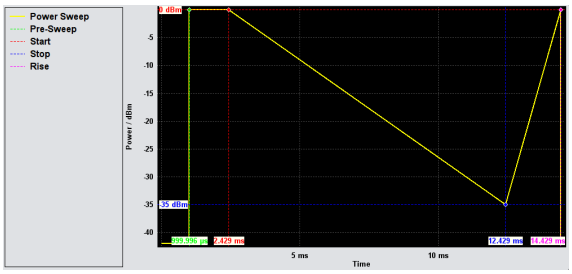
Triangle without Pre-Sweep, descending



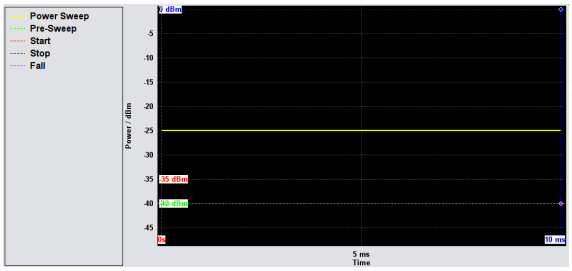
A.3 Representation of the Power Sweep Graphics

The shown variants of the power sweep graphics are not based on default settings. The settings are configured, especially to illustrate as much of the provided functions and interactions. The graphics represent therefore not necessarily realistic test signals.

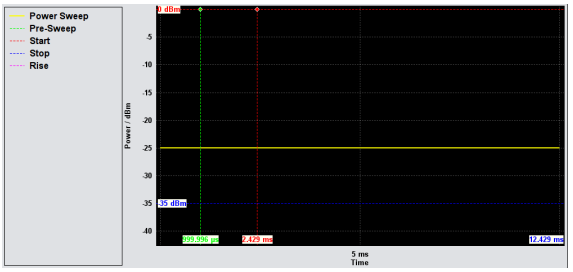
Table A-3: Sweep graphics of the Power Sweep shapes

Linear Ramp, ascending	**Linear Ramp, descending**
	

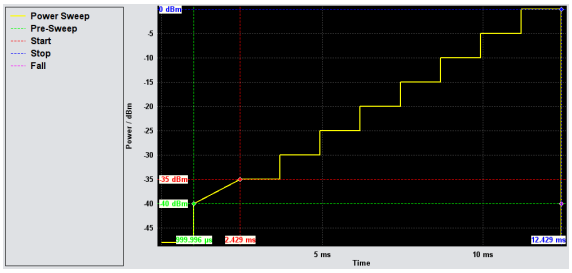
Constant mode



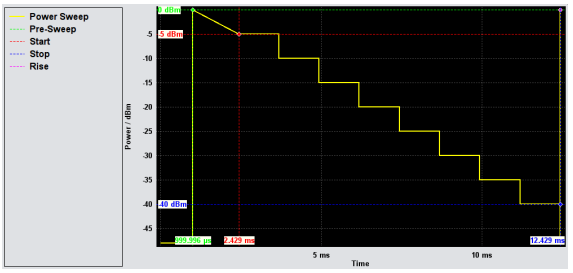
Constant mode



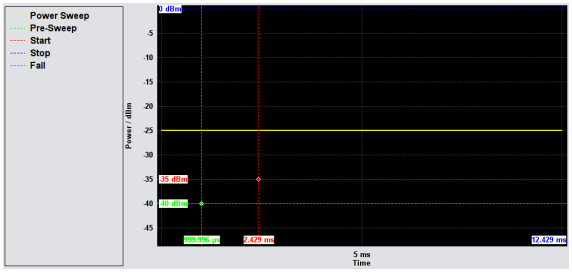
Stair Step, ascending



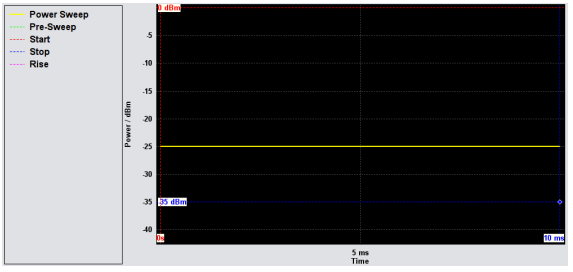
Stair Step, descending



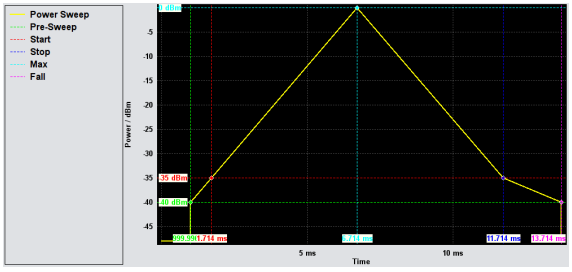
Constant mode



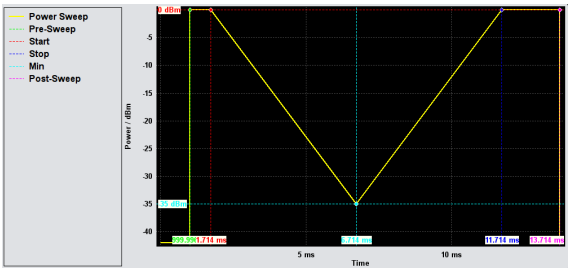
Constant mode



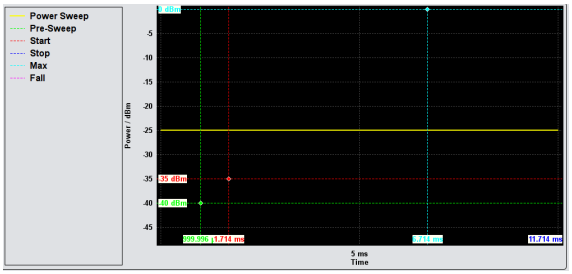
Triangle, ascending



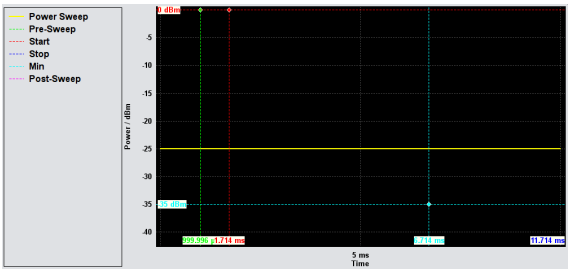
Triangle, descending



Constant mode



Constant mode



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