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 3.20.390.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 perform signal generation 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

The user documentation for the R&S SMW consists of the following parts:

- Getting started, printed manual
- Online help system on the instrument, incl. tutorials
- User manuals and online manual, see the product page
- Service manual, provided on the internet for registrated users
- Instrument security procedures, see the product page
- General safety instructions, printed brochure
- Release notes, see the product page (download > firmware)

- Data sheet and brochures, see the product page (download > brochures and data sheets)
- Application notes, provided on the internet

You find the user documentation on the R&S SMW product page mainly at:
http://www.rohde-schwarz.com/product/SMW200A.html > "Downloads" > "Manuals"
Additional download paths are stated directly in the following abstracts of the documentation types.

Getting Started

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.

Online Help and Tutorials

The **online help** offers quick, context-sensitive access to the information needed for operation and programming. It contains the description for the base unit and the software options.

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

User Manual and Online Manual

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

- **Base unit** manual
  Contains the description of the graphical user interface, an introduction to remote control, the description of all SCPI remote control commands, programming examples, and information on maintenance, instrument interfaces and error messages. Includes the contents of the getting started manual.
- **Software option** manuals
  Describe the specific functions of an option. Basic information on operating the R&S SMW is not included.

The **online manual** provides the contents of the user manual 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).

Instrument Security Procedures

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

Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S SMW. Brochures provide an overview of the instrument and deal with the specific characteristics, see http://www.rohde-schwarz.com/product/SMW200A.html > "Download" > "Brochures and Data Sheets".

General Safety Instructions

Contains basic safety instructions in English, Spanish, German and French.

Release Notes

Describes the firmware installation, new and modified features and fixed issues according to the current firmware version. You find the latest version at:

http://www.rohde-schwarz.com/product/SMW200A.html > "Downloads" > "Firmware"

Application Notes, Application Cards, White Papers, etc.

These documents deal with special applications or background information on particular topics, see http://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 conveniently 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 R&S SMW product page >"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

► To access the baseband power sweep settings, 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, this includes:

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

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

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 field 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 Baseband Generator (R&S SMW-B10) per signal path
- option Baseband main module, one/two I/Q paths to RF (R&S SMW-B13/-B13T)
- option Baseband Power Sweep (R&S SMW-K542) per signal path

3.2 Correlating Parameters

This section describes the characteristical 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 characteristical parameters at a glance

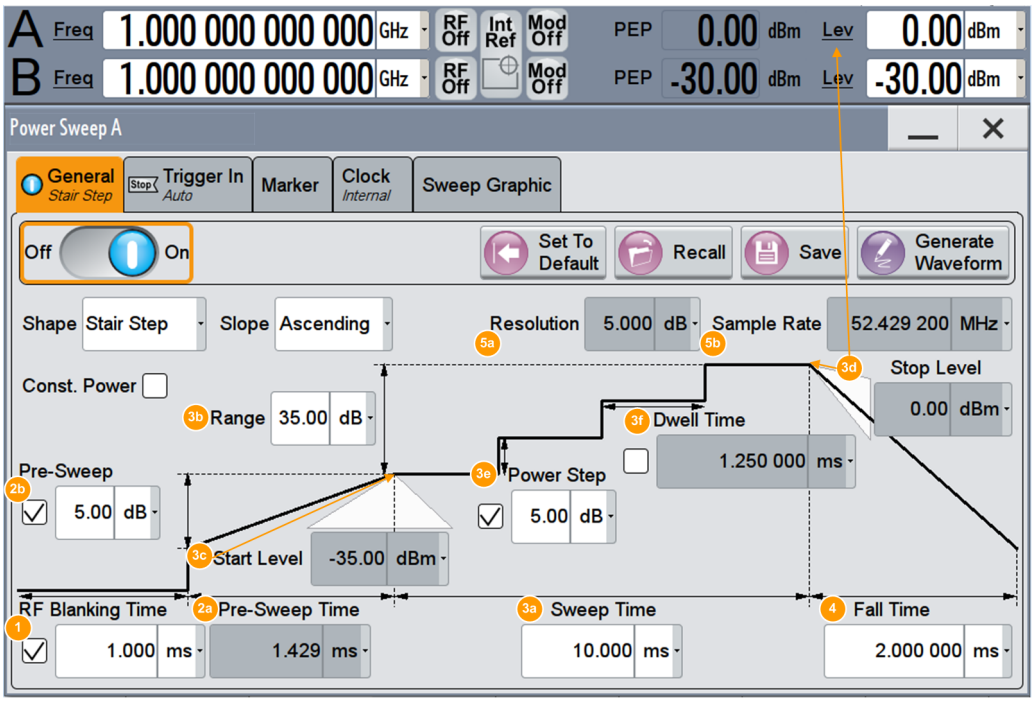


Figure 3-1: Characteristical parameters defining the power sweep

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 prior to pre-sweep
Pre-Sweep	Start of sweep signal generation • provides settling of the signal prior to 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 Accordingly 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.

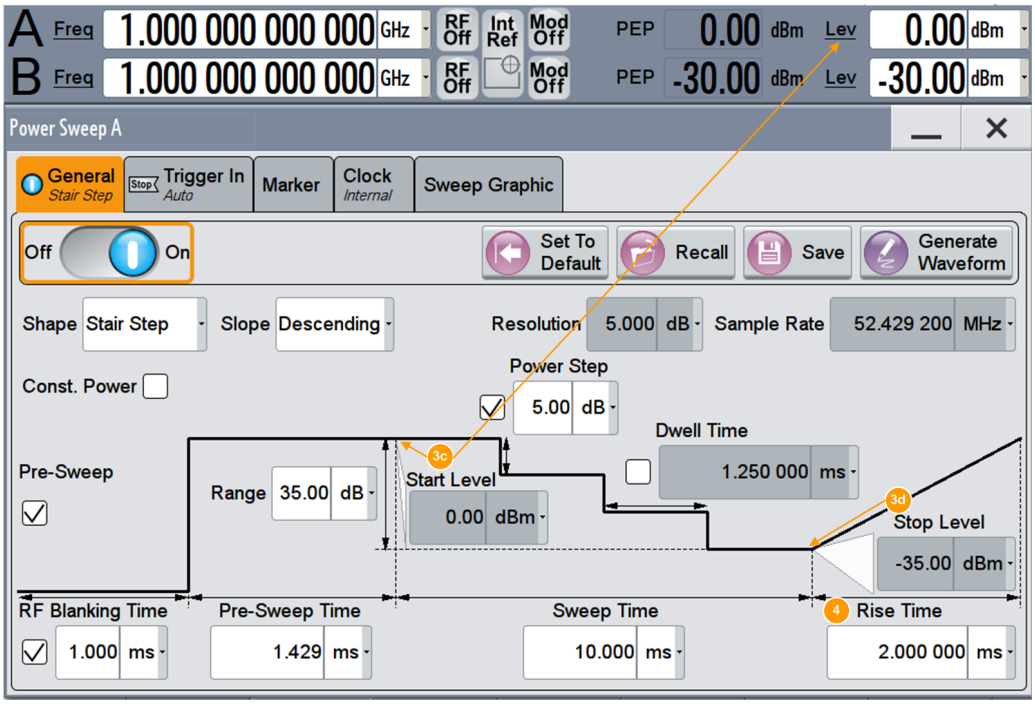


Figure 3-2: Example of a stair step power sweep with descending slope

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.

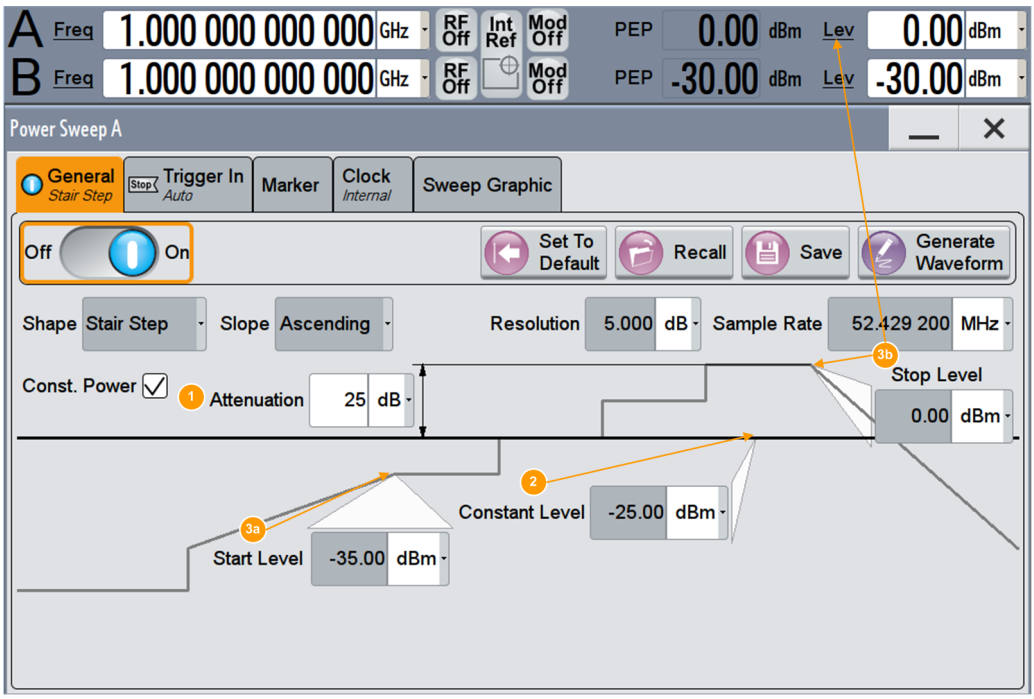


Figure 3-3: Characteristical parameters defining the power sweep

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

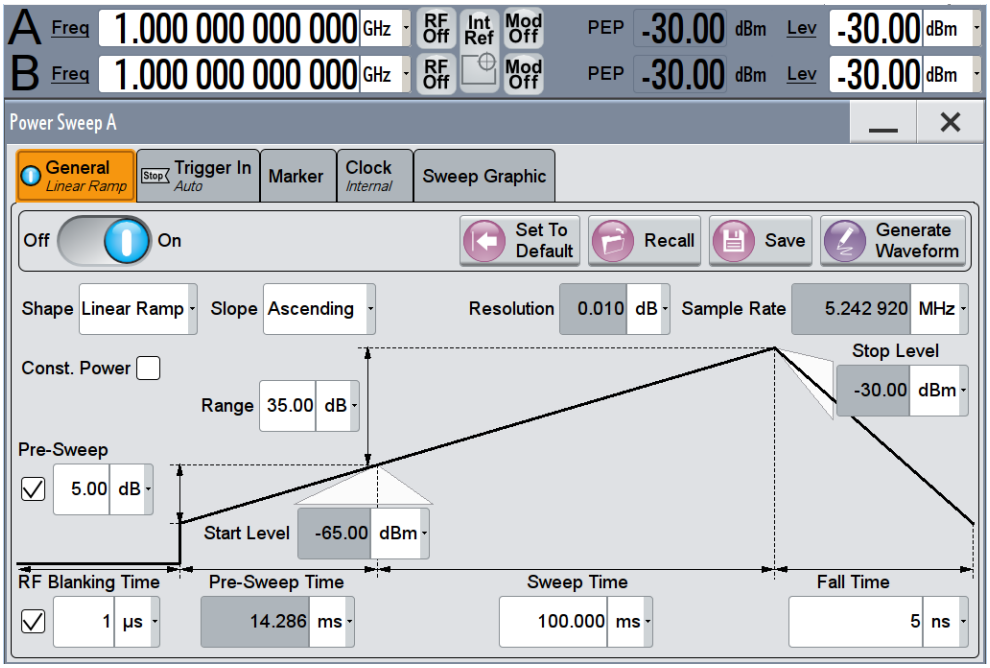
Apart from the parameters mentioned under Chapter 3.2, "Correlating Parameters", on page 11, the following distinctive features apply to constant mode.

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

► To access the baseband power sweep settings, select "Baseband > Misc > Power Sweep...".



The "Power Sweep" dialog contains all settings required to configure I/Q power sweep of the digital baseband signal.

The remote commands required to define these settings are described in Chapter 6, "Remote-Control Commands", on page 35.

4.1 General Settings

In the upper section of the "General" tab, you can activate signal generation, access the default and "Save/Recall" settings, or generate a waveform file.

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 42

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 40

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 file name 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 41
`[:SOURce<hw>]:BB:PRAMp:SETTing:LOAD` on page 41
`[:SOURce<hw>]:BB:PRAMp:SETTing:STORe` on page 41
`[:SOURce<hw>]:BB:PRAMp:SETTing:DELete` on page 41

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

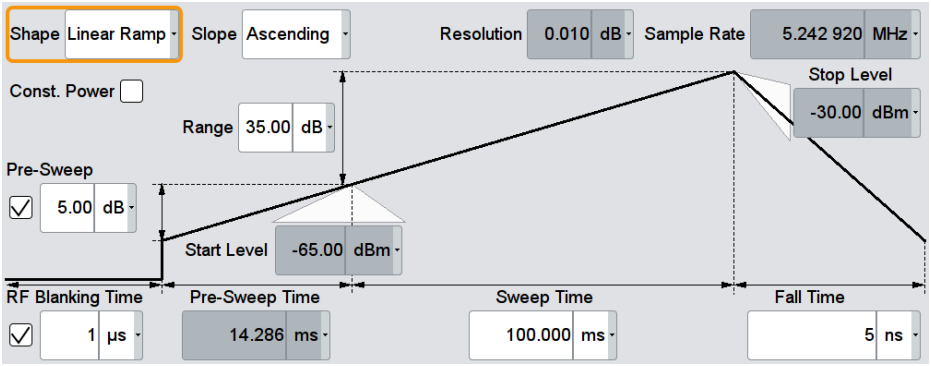
Remote command:
`[:SOURce<hw>]:BB:PRAMp:WAVeform:CREate` on page 42

4.2 Power Sweep Settings

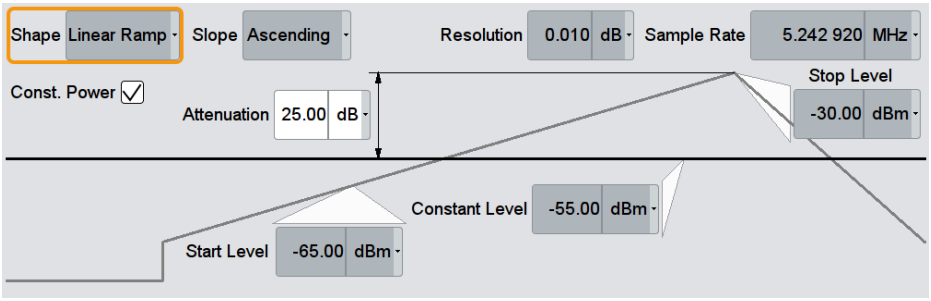
► To access these settings, select "Baseband > Misc > Power Sweep > General".

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.

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 46

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 47

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 46

Sample Rate
Displays the internally derived sample rate.

Remote command:
`[:SOURce<hw>]:BB:PRAMp:RAMP:SAMPlerate?` on page 46

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

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

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 43

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 44

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 45

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 48
[:SOURce<hw>]:BB:PRAMp:RAMP:STOPlevel? on page 48

Pre-Sweep
Activates the pre-sweep and then indicates 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 prior to 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 44
[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep[:LEVel] on page 45
[:SOURce<hw>]:BB:PRAMp:RAMP:PRESweep:TIME on page 45

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 very stable signal at the start of the measurement.

Remote command:
[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk[:STATe] on page 43
[:SOURce<hw>]:BB:PRAMp:RAMP:BLANk:TIME on page 43

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 48
`[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:STEP:LEVel` on page 47

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 47
`[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl:TIME` on page 47

Sweep Time
Determines the measurement duration of a sweep cycle.

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

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 44

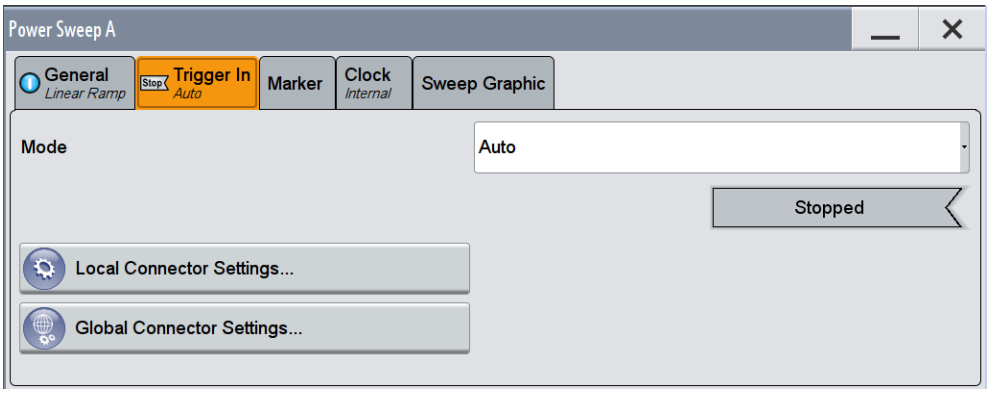
4.3 Trigger Settings

This tab provides access to the settings necessary to select and configure the trigger, like trigger source, mode, trigger delay, trigger suppression, 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" tab, 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.

► To access these settings, select "Baseband > Misc > Power Sweep > Trigger".



This dialog comprises the settings required for configuring the trigger signal.

Routing and Enabling a Trigger

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

Use the Local and Global Connector Settings to configure the signal mapping as well as 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, i.e. select the "Trigger In > Mode" and "Trigger In > Source"
- Define the connector, USER or T/M/(C), the selected signal is provided at, i.e. configure the Local and Global Connector 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 (e.g. MIMO configuration, routing and summing of basebands and/or 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 49

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 51

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 deliberately output part of the signal, 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 51

Running/Stopped ← Trigger Settings Common to All Basebands
For 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 51

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 50

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 50

Trigger Source ← Trigger Settings Common to All Basebands
Selects trigger source.

The following sources of the trigger signal are available:

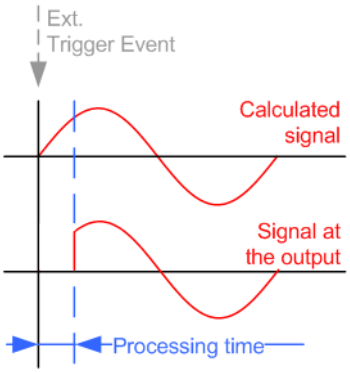
- "Internal"
  The trigger event is executed manually by the "Execute Trigger".
- "Internal (Baseband A/B)"
  The trigger event is provided by the trigger signal from the other basebands.
  If common trigger settings are applied, this trigger source is disabled.
- "External Global Trigger 1 / 2"
  The trigger event is the active edge of an external trigger signal provided and configured at the global USER connectors.
- "External Global Clock 1 / 2"
  The trigger event is the active edge of an external global clock 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/C 1/2/3 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/C 1 connector.

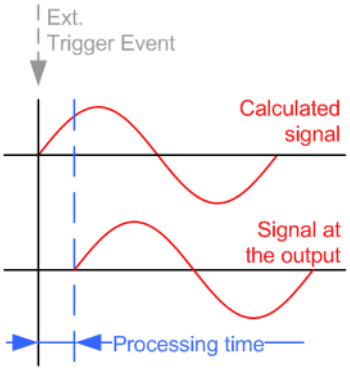
Remote command:
`[:SOURce<hw>]:BB:PRAMp:TRIGger:SOURce` on page 52

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 but because of the instrument's processing time 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 and starts with sample 0, i.e. the complete signal is output.
This mode is recommended for triggering of short signal sequences with signal duration comparable with the processing time of the instrument.



Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger:EXTernal:SYNChronize:OUTPut
on page 50

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 53
[:SOURce<hw>]:BB:PRAMp:TRIGger:OBASeband:INHibit on page 51

Trigger Delay ← Trigger Settings Common to All Basebands
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

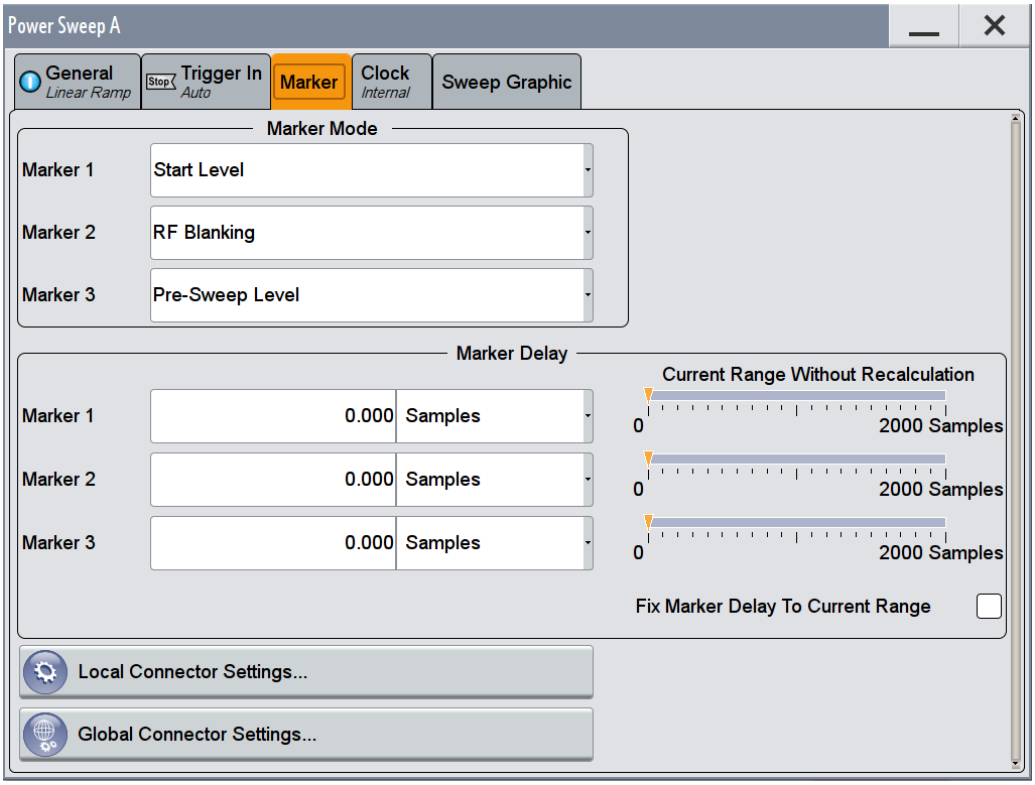
For more information, see chapter "Basics on ..." in the R&S SMW user manual.

Remote command:
[:SOURce<hw>]:BB:PRAMp:TRIGger[:EXTernal<ch>]:DELay on page 53
[:SOURce<hw>]:BB:PRAMp:TRIGger:OBASeband:DELay on page 50

4.4 Marker Settings

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

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



Routing and Enabling a Marker

The provided marker signals are not dedicated to a particular connector but can be mapped to one or more globally shared USER or local T/M/(C) 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/(C), the selected signal is output at, i.e. configure the Local and Global Connector 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
Defines the delay between the marker signal at the marker outputs relative to the signal generation start.

"Marker x" For the corresponding marker, sets the delay as a number of symbols.

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

"Current Range without Recalculation"
Displays the dynamic range within which the delay of the marker signals can be set without restarting the marker and the signal.
Move the setting mark to define the delay.

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

"Fix marker delay to current range"
Restricts the marker delay setting range to the dynamic range.

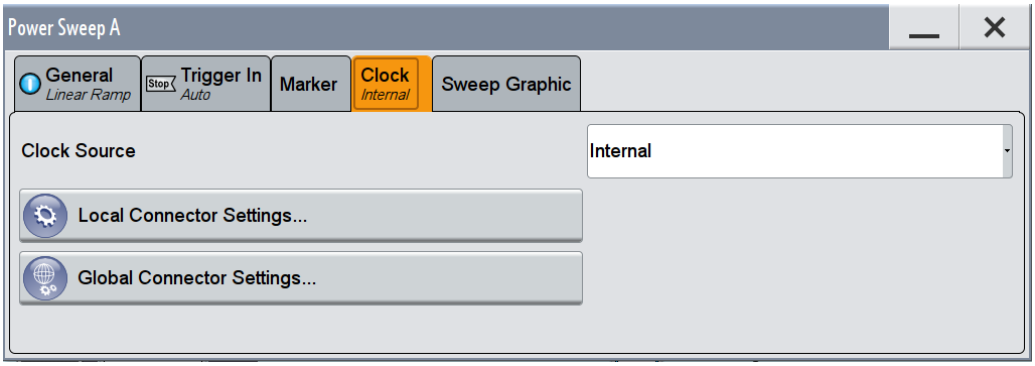
Remote command:
`[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut:DELay:FIXed` on page 53

4.5 Clock Settings

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

This section focuses on the available settings.

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



Defining the Clock

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

Use the Local and Global Connector Settings to configure the signal mapping and 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/C, the selected signal is provided at, that is configure the Local and Global Connector Settings.

Clock Source

Selects the clock source.

- "Internal"
  The instrument uses its internal clock reference.
- "External Global Clock 1/2"
  The instrument expects an external clock reference at the global USER connector, as configured in the "Global Connector Settings" dialog.
- "External Local Clock"
  The instrument expects an external clock reference at the local T/M/C connector.

Remote command:

`[:SOURce<hw>]:BB:PRAMp:CLOCk:SOURce` on page 56

Clock Mode

Selects the type of the externally supplied clock.

Remote command:

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

Clock Multiplier

Sets the multiplication factor for clock type "Multiple".

Remote command:
[:SOURce<hw>]:BB:PRAMp:CLOCk:MULTiplier on page 56

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

Remote command:
CLOCk:INPut:FREQuency?

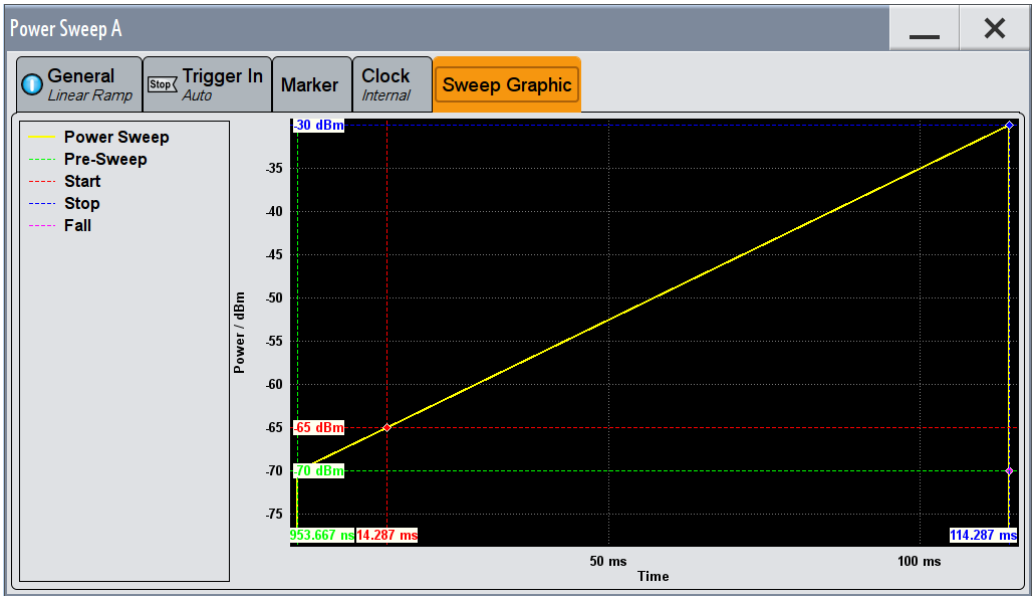
4.6 Local and Global Connector Settings

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

This tab graphically displays the currently configured signal.



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

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".

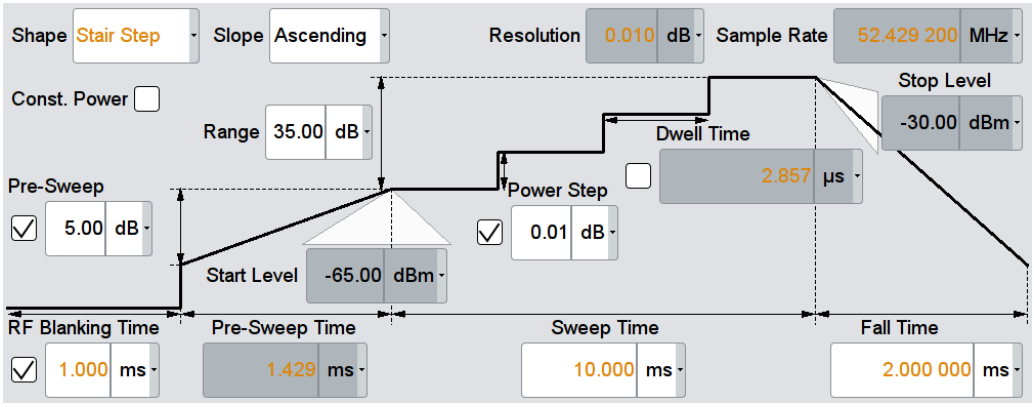


Figure 4-1: Configuration example for a power sweep

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

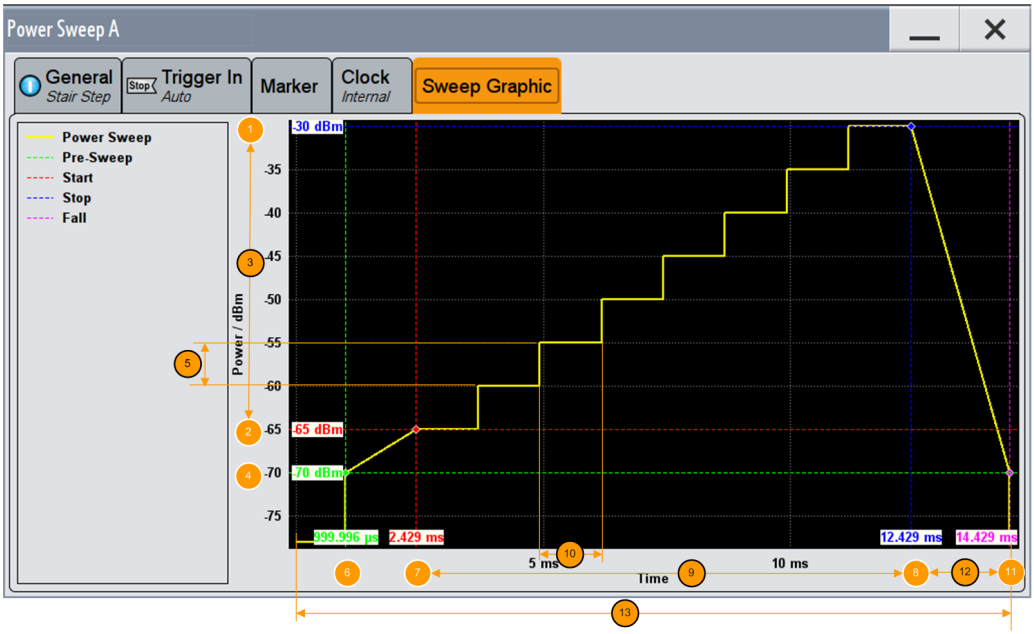


Figure 4-2: Graphical representation of the configuration example

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 quickly verify 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 field 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.

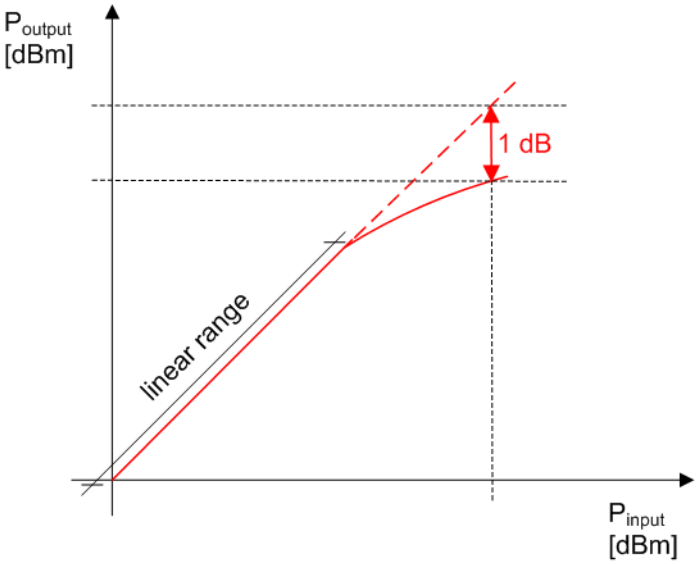
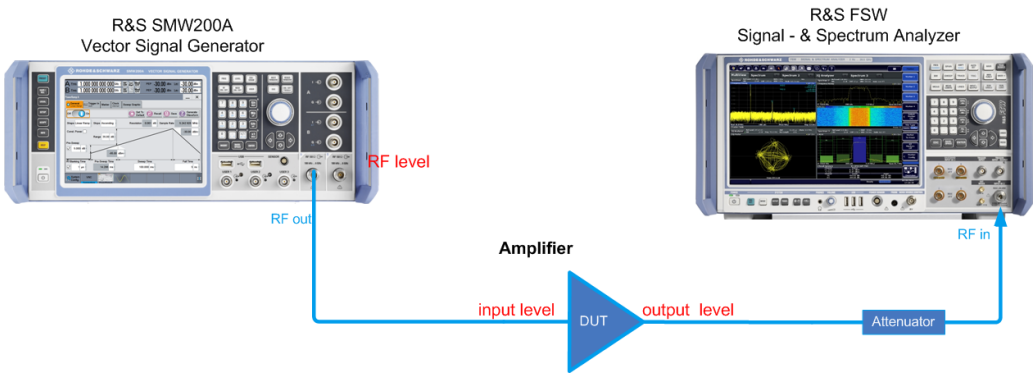


Figure 5-1: Correlation between the input power and output power of an amplifier with the 1 dB compression point

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 focusses 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 26).
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, seelect "RF State > On".

6 Remote-Control Commands

The following commands are required to perform signal generation with the R&S SMW-K542 option in a remote environment. We assume that the R&S SMW has already been set up for remote operation in a network as described in the R&S SMW documentation. A knowledge about the remote control operation and the SCPI command syntax are assumed.

Conventions used in SCPI command descriptions

For a description of the conventions used in the remote command descriptions, see section "Remote Control Commands" in the R&S SMW user manual.

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.

Programming Examples

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 program, an instrument (p)reset is recommended to set the R&S SMW 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.

In all of the examples we assume that a remote PC is connected to the instrument, the remote PC and the instrument are switched on, a connection between them is established and the security setting "System Config > Setup > Security > SCPI over LAN" is enabled.

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

Example: Save/Recall Files with user settings

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

```
*****************************************
MMEM:CDIR '/var/user/settings'
SOURce1:BB:PRAMp:SETTing:CATalog?
// Response: pramp_lin_settings,pramp_trian_settings, pramp_stairstep_settings
// There are three files in the /var/user/settings directory:
// pramp_lin_settings.pwr_ramp, pramp_trian_settings.pwr_ramp,
// pramp_stairstep_settings.pwr_ramp
SOURce1:BB:PRAMp:SETTing:STORe '/var/user/settings/pramp_stairstep_settings_new'
SOURce1:BB:PRAMp:SETTing:LOAD '/var/user/settings/pramp_stairstep_settings_new'
SOURce1:BB:PRAMp:SETTing:DELete '/var/user/settings/pramp_stairstep_settings'
// Deletes the file pramp_stairstep_settings.pwr_ramp
SOURce1:BB:PRAMp:SETTing:CATalog?
// Response: ramp_lin_settings,pramp_trian_settings,
//           pramp_stairstep_settings_new
```

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
// ********************************************************************
SOURce:BB:PRAMp:CLOCk:SOURce INTernal
// SOURce:BB:PRAMp:CLOCk:SOURce EGC1
// SOURce:BB:PRAMp:CLOCk:MODe MULT


// ********************************************************************
// Marker settings
// ********************************************************************
SOURce:BB:PRAMp:TRIGger:OUTPut1:MODE STARt
// SOURce:BB:PRAMp:RAMP:STARt:LEVel?
// -35
SOURce:BB:PRAMp:TRIGger:OUTPut2:MODE PRESweep
// SOURce:BB:PRAMp:RAMP:PRESweep:STATe 1
// SOURce:BB:PRAMp:RAMP:PRESweep?
// 5
SOURce:BB:PRAMp:TRIGger:OUTPut3:MODE RFBLanking
// SOURce:BB:PRAMp:RAMP:BLANk:STATe 1
// SOURce:BB:PRAMp:RAMP:BLANk:TIME?
// 0.000001
SOURce:BB:PRAMp:TRIGger:OUTPut1:MODE UNCHanged
SOURce:BB:PRAMp:TRIGger:OUTPut2:MODE STOP
// SOURce:BB:PRAMp:RAMP:STOP:LEVel?
// 0
SOURce:BB:PRAMp:TRIGger:OUTPut2:DELay 16
SOURce:BB:PRAMp:TRIGger:OUTPut:DELay:FIXed ON
SOURce:BB:PRAMp:TRIGger:OUTPut1:DELay:MINimum?
// 0
SOURce:BB:PRAMp:TRIGger:OUTPut1:DELay:MAXimum?
// 2000

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

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

```
// SOURce:BB:PRAMp:TRIGger:EXTernal:INHibit 100

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

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

Example: Enable signal generation

The following example configures automatic triggering and activates signal generation:

```
// ********************************************************************
SOURce:BB:PRAMp:TRIGger:SEQuence AUTO
SOURce:BB:PRAMp:TRIGger:SOURce INTernal
SOURce:BB:PRAMp:STAT ON
```

6.2 General Commands

This section contains commands for the primary and general settings of the power sweep. These settings concern activation and deactivation of the function, as well as the preset and save/recall settings.

[: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 37.

Usage: Event

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

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

Queries the available power sweep setting files in the default directory.

As response, you get a string containing the existing power sweep files `*.pwr_ramp`, separated by commas. To set the default directory, use command `MMEM:CDIRectory`.

Return values:
<Catalog> string

Example: See Example "Save/Recall Files with user settings" on page 36

Usage: Query only

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

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

Deletes the selected file with power sweep settings.

Setting parameters:
<Filename> string

Example: See Example "Save/Recall Files with user settings" on page 36

Usage: Setting only

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

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

Loads the selected power sweep settings file (`*.pwr_ramp`).

To select the directory, use command `MMEM:CDIRectory`.

Setting parameters:
<Filename> string

Example: See Example "Save/Recall Files with user settings" on page 36

Usage: Setting only

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

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

Saves the current power sweep settings in a file.

Specify only the filename, the instrument assigns the file extension `*.pwr_ramp` automatically.

Setting parameters:
<Filename> string

Example: See Example "Save/Recall Files with user settings" on page 36

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 40.

Manual operation: See "State" on page 17

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

Creates a waveform using the current power sweep settings.

Specify the filename, the instrument assigns the file extension `*.wv` automatically.

Setting parameters:

<Filename> string

Example: `MMEM:CDIR 'D:\user\waveform`
sets the default directory.
`BB:PRAM:WAV:CRE 'pramp_stairstep'`
creates the waveform file `pramp_stairstep.wv` in the default directory.

Usage: Setting only

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

6.3 Power Sweep Commands

The following commands are described here:

[: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 37.

Manual operation: See "Attenuation" on page 19

[: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 37.

Manual operation: See "RF Blanking Time" on page 20

[: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 37.

Manual operation: See "RF Blanking Time" on page 20

[: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 37.

Manual operation: See "Const. Power" on page 19

[: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 37.

Manual operation: See "Fall Time / Rise Time / Post-Sweep Time" on page 21

[: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 37.

Usage: Query only

Manual operation: See "Constant Level" on page 20

[: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 37.

Manual operation: See "Pre-Sweep" on page 20

[: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 37.

Manual operation: See "Pre-Sweep" on page 20

[: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 37.

Manual operation: See "Pre-Sweep" on page 20

[: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 37.

Manual operation: See "Range" on page 20

[: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 37.

Usage: Query only

Manual operation: See "Resolution" on page 19

[: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 37.

Usage: Query only

Manual operation: See "Sample Rate" on page 19

[: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 37.

Manual operation: See "Shape" on page 18

[: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 37.

Manual operation: See "Slope" on page 19

[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl: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 37.

Manual operation: See "Dwell Time" on page 21

[:SOURce<hw>]:BB:PRAMp:RAMP:STAir:DWELl[: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 37.

Manual operation: See "Dwell Time" on page 21

[: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 37.

Manual operation: See "Power Step" on page 21

[: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 47.

Parameters:

<EnablePowerStep> 0 | 1 | OFF | ON

*RST: 1

Manual operation: See "Power Step" on page 21

[: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 37.

Usage: Query only

Manual operation: See "Start Level / Stop Level" on page 20

[: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 37.

Manual operation: See "Sweep Time" on page 21

6.4 Trigger Commands

The following commands are described here:

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

Selects the trigger mode.

Parameters:

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

AUTO
The modulation signal is generated continuously.

RETRigger
The modulation signal is generated continuously. A trigger event (internal or external) causes a restart.

AAUTO
The modulation signal is generated only when a trigger event occurs. After the trigger event the signal is generated continuously. Signal generation is stopped with command `[:SOURce<hw>]:BB:PRAMp:TRIGger:ARM:EXECute` and started again when a trigger event occurs.

ARETrigger
The modulation signal is generated only when a trigger event occurs. The device automatically toggles to RETRIG mode. Every subsequent trigger event causes a restart. Signal generation is stopped with command `[:SOURce<hw>]:BB:PRAMp:TRIGger:ARM:EXECute` and started again when a trigger event occurs.

SINGle
The modulation signal is generated only when a trigger event occurs. After The trigger event The signal is generated once to The set sequence length (`[:SOURce<hw>]:BB:PRAMp:TRIGger:SLENgth`). Every subsequent trigger event causes a restart.

*RST: AUTO

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Trigger Mode" on page 23

[: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 39.

Usage: Event

Manual operation: See "Arm" on page 24

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

Executes a trigger.

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Usage: Event

Manual operation: See "Execute Trigger" on page 24

[: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 39.

Manual operation: See "Sync. Output to External Trigger" on page 25

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

Specifies 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 39.

Manual operation: See "Trigger Delay" on page 26

[: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 39.

Manual operation: See "External Trigger Inhibit" on page 26

[: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 39.

Usage: Query only

Manual operation: See "Running/Stopped" on page 24

[: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 39.

Manual operation: See "Trigger Signal Duration" on page 23

[: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 23

[: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 means of a command, external trigger signal via one of the provided local or global connectors and and triggering by a signal from the other paths.

Parameters:

<Source> INTB | INTernal | OBASeband | EGT1 | EGT2 | EGC1 | EGC2 | ELTRigger | INTA | ELCLock | BEXTernal | EXTernal

INTernal
Internal

INTA | INTB
Internal trigger from the other baseband

EGT1 | EGT2
External global trigger

EGC1 | EGC2
External global clock

ELTRigger
External local trigger

ELCLock
External local clock

OBASeband|BEXTernal|EXTernal
Provided only for backward compatibility with other R&S signal generators.
The R&S SMW accepts these values und maps them automatically as follows:
EXTernal = EGT1, BEXTernal = EGT2, OBASeband = INTA or INTB (depending on the current baseband)

*RST: INTernal

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Trigger Source" on page 24

[: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 39.

Manual operation: See "Trigger Delay" on page 26

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

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

Parameters:

<Inhibit> integer

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

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "External Trigger Inhibit" on page 26

6.5 Marker Commands

The following commands are described here:

[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut:DELay:FIXed <Fixed>

Restricts the marker delay setting range to the dynamic range. The setting always affects every marker.

Parameters:

<Fixed> 0 | 1 | OFF | ON

*RST: 0

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Marker x Delay" on page 28

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

Defines the delay between the signal on the marker outputs and the start of the signals.

You can use the command `[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut:DELay:FIXed` to restrict the range of valus to the dynamic range.

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 39.

Manual operation: See "Marker x Delay" on page 28

[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut<ch>:DELay:MAXimum

Queries the maximum marker delay.

Parameters:

<Maximum> float

Range: 0 to max
Increment: 1E-3
*RST: 2000

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Marker x Delay" on page 28

[:SOURce<hw>]:BB:PRAMp:TRIGger:OUTPut<ch>:DELay:MINimum?

Queries the minimum marker delay.

Return values:

<Minimum> float

Range: 0 to 16777215
Increment: 1E-3
*RST: 0

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Usage: Query only

Manual operation: See "Marker x Delay" on page 28

[: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 39.

Manual operation: See "Marker Mode" on page 27

6.6 Clock Commands

The following commands are described here:

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

Sets the type of the externally supplied clock signal.

Parameters:

<Mode> SAMPle | MULTisample

*RST: SAMPle

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Clock Mode" on page 29

[:SOURce<hw>]:BB:PRAMp:CLOCk:MULTiplier <Multiplier>

Determines the multiplication factor of an externally supplied multisampling clock signal.

Parameters:

<Multiplier> integer

Range: 1 to 64
*RST: 4

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Clock Multiplier" on page 29

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

Selects the clock source.

Parameters:

<Source> INTernal | EGC1 | EGC2 | ELCLock | EXTernal

INTernal
The instrument uses its internal clock reference.

EGC1|EGC2
External global clock.

ELCLock
External local clock.

EXTernal
`EXTernal = EGC1`
Setting only; provided for backward compatibility with other R&S signal generators.

*RST: INTernal

Example: See Example "Adjusting clock, marker and trigger settings" on page 39.

Manual operation: See "Clock Source" on page 29

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

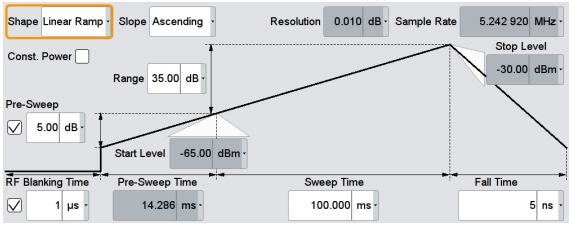
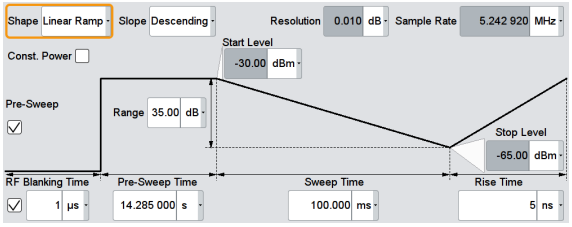
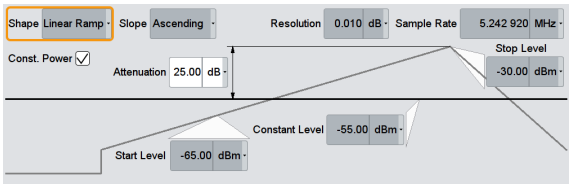
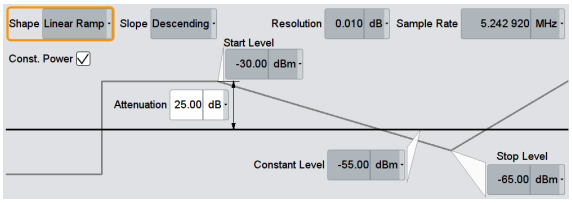
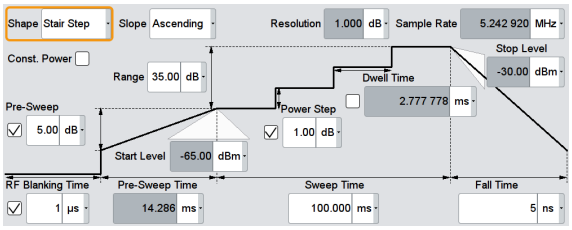
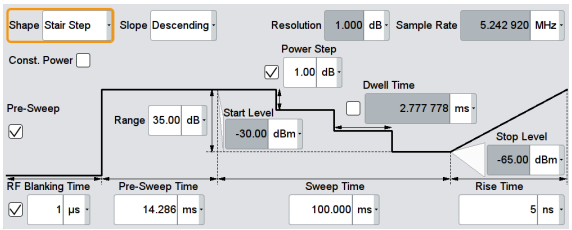
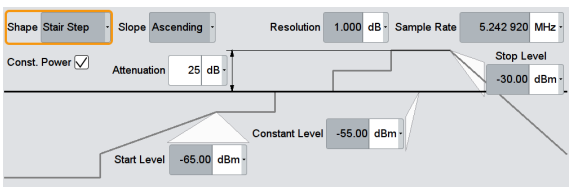
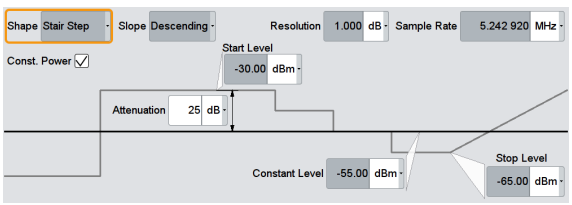
Table A-1: Power Sweep default values

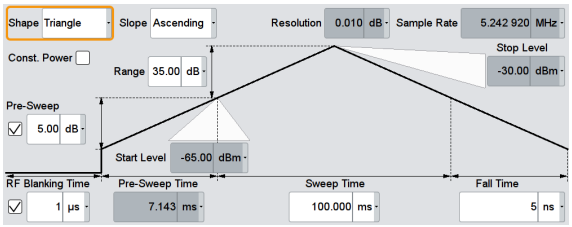
Parameter	**Value**
State	Off
Shape	Linear ramp
Pre-Sweep	On
RF-Blanking	On
Const. Power	Off
Trigger	Auto, Internal
Marker	Start level
Shape Settings	
Slope	Ascending
Resolution	0.010 dB
Range	35 dB
Sample Rate	1.310730 MHz
Attenuation	25 dB
Pre-Sweep level	5 dB
RF Blanking Time	1 µs
Pre-Sweep Time	14.285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

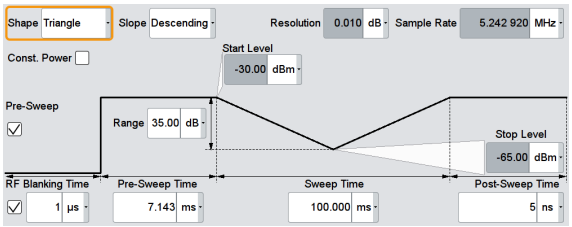
A.2 Representation of the Power Sweep Shapes in the Settings Dialog

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

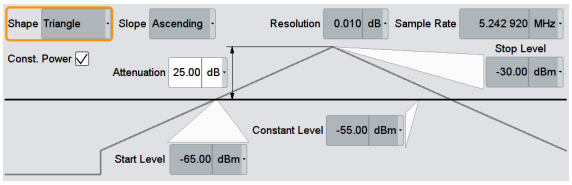
Table A-2: Available Power Sweep shapes and their correlating constant level indication

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**

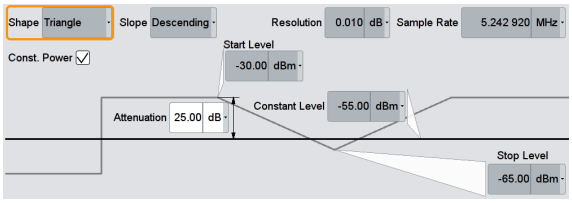




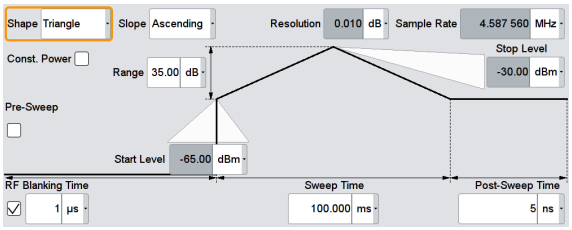
Constant mode



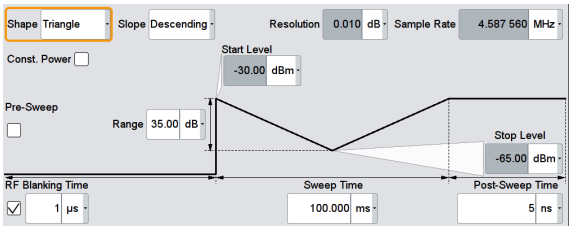
Constant mode



Triangle without Pre-Sweep, ascending



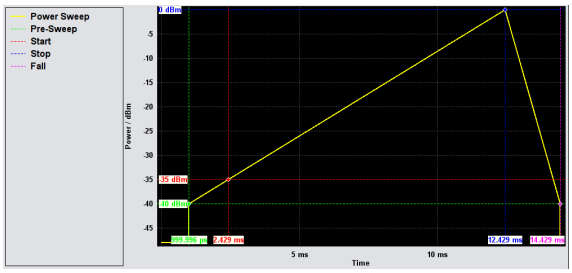
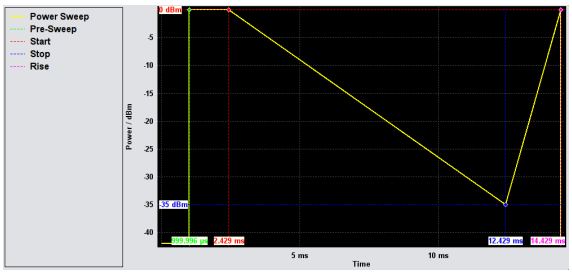
Triangle without Pre-Sweep, descending



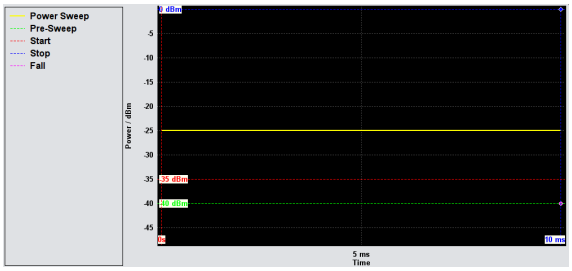
A.3 Representation of the Power Sweep Graphics

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.

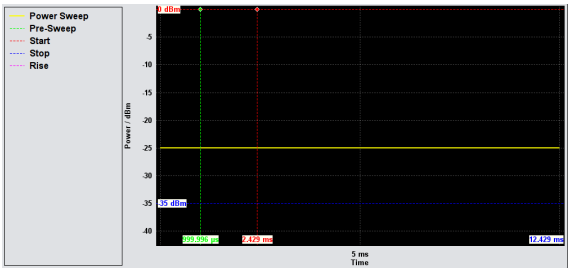
Table A-3: Sweep graphics of the Power Sweep shapes

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

Constant mode



Constant mode



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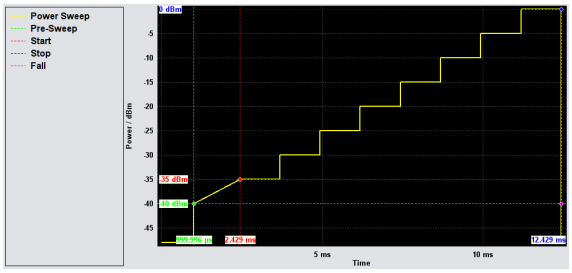

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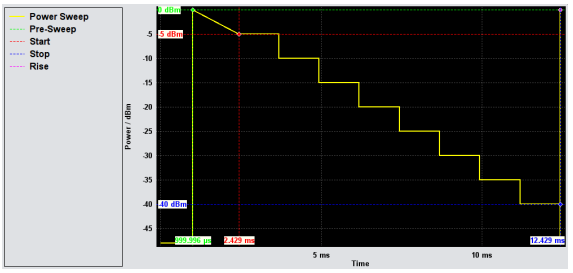

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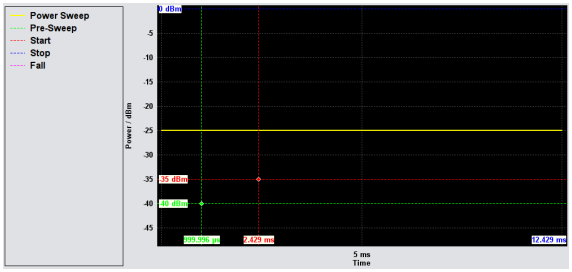

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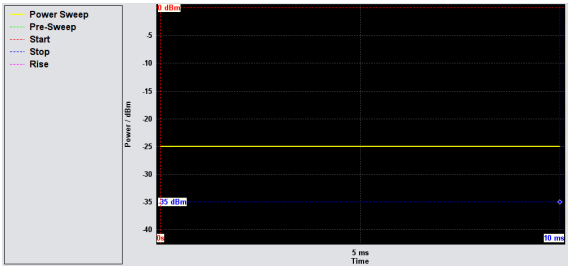
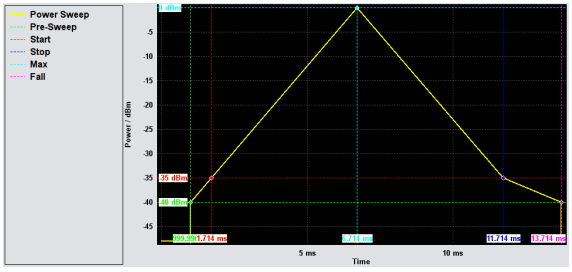


Triangle, ascending



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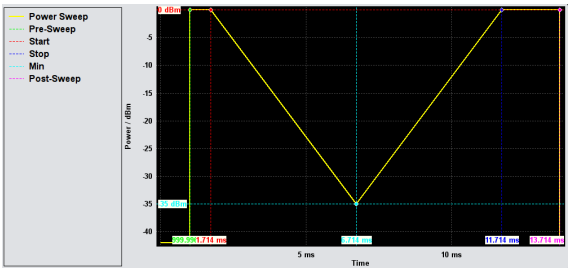

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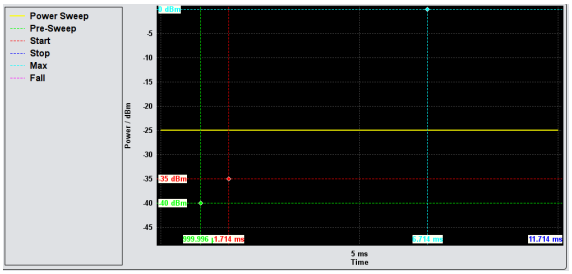

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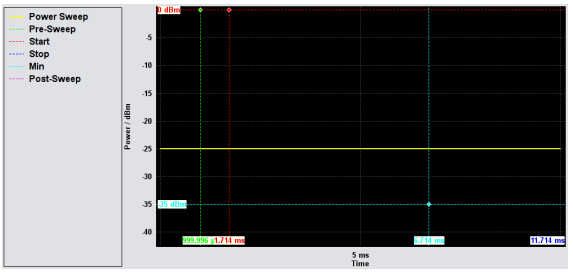

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