R&S®FSMR3000
Measuring Receiver
Getting Started

1179010002
Version 01

ROHDE & SCHWARZ

Make ideas real

This document describes the following R&S®FSMR3000 models:

- R&S®FSMR3008 (1345.4004.08)
- R&S®FSMR3026 (1345.4004.26)
- R&S®FSMR3050 (1345.4004.50)

Contents

1   Safety and Regulatory Information

The product documentation helps you use the product safely and efficiently. Follow the instructions provided here and in the following chapters.

Intended use

The product is intended for the development, production and verification of electronic components and devices in industrial, administrative, and laboratory environments. Use the product only for its designated purpose. Observe the operating conditions and performance limits stated in the data sheet.

Where do I find safety information?

Safety information is part of the product documentation. It warns you of potential dangers and gives instructions on how to prevent personal injury or damage caused by dangerous situations. Safety information is provided as follows:

- In Chapter 1.1, "Safety Instructions", on page 7. The same information is provided in many languages as printed "Safety Instructions". The printed "Safety Instructions" are delivered with the product.

- Throughout the documentation, safety instructions are provided when you need to take care during setup or operation.

1.1   Safety Instructions

Products from the Rohde & Schwarz group of companies are manufactured according to the highest technical standards. To use the products safely, follow the instructions provided here and in the product documentation. Keep the product documentation nearby and offer it to other users.

Use the product only for its intended use and within its performance limits. Intended use and limits are described in the product documentation such as the data sheet, manuals and the printed "Safety Instructions". If you are unsure about the appropriate use, contact Rohde & Schwarz customer service.

Using the product requires specialists or specially trained personnel. These users also need sound knowledge of at least one of the languages in which the user interfaces and the product documentation are available.

Never open the casing of the product. Only service personnel authorized by Rohde & Schwarz are allowed to repair the product. If any part of the product is damaged or broken, stop using the product. Contact Rohde & Schwarz customer service at http://www.customersupport.rohde-schwarz.com.

Lifting and carrying the product

The product is heavy. Do not move or carry the product by yourself. A single person can only carry a maximum of 18 kg safely depending on age, gender and physical condition. Look up the maximum weight in the data sheet. Use the product handles to move or carry the product. Do not lift by the accessories mounted on the product. Accessories are not designed to carry the weight of the product.

To move the product safely, you can use lifting or transporting equipment such as lift trucks and forklifts. Follow the instructions provided by the equipment manufacturer.

Choosing the operating site

Only use the product indoors. The product casing is not waterproof. Water that enters can electrically connect the casing with live parts, which can lead to electric shock, serious personal injury or death if you touch the casing. If Rohde & Schwarz provides accessories designed for your product, e.g. a carrying bag, you can use the product outdoors.

Unless otherwise specified, you can operate the product up to an altitude of 2000 m above sea level. The product is suitable for pollution degree 2 environments where nonconductive contamination can occur. For more information on environmental conditions such as ambient temperature and humidity, see the data sheet.

Setting up the product

Always place the product on a stable, flat and level surface with the bottom of the product facing down. If the product is designed for different positions, secure the product so that it cannot fall over.

If the product has foldable feet, always fold the feet completely in or out to ensure stability. The feet can collapse if they are not folded out completely or if the product is moved without lifting it. The foldable feet are designed to carry the weight of the product, but not an extra load.

If stacking is possible, keep in mind that a stack of products can fall over and cause injury.

If you mount products in a rack, ensure that the rack has sufficient load capacity and stability. Observe the specifications of the rack manufacturer. Always install the products from the bottom shelf to the top shelf so that the rack stands securely. Secure the product so that it cannot fall off the rack.

Connecting to power

The product is an overvoltage category II product. Connect the product to a fixed installation used to supply energy-consuming equipment such as household appliances and similar loads. Keep in mind that electrically powered products have risks, such as electric shock, fire, personal injury or even death.

Take the following measures for your safety:

● Before switching on the product, ensure that the voltage and frequency indicated on the product match the available power source. If the power adapter does not adjust automatically, set the correct value and check the rating of the fuse.

● Only use the power cable delivered with the product. It complies with country-specific safety requirements. Only insert the plug into an outlet with protective conductor terminal.

● Only use intact cables and route them carefully so that they cannot be damaged. Check the power cables regularly to ensure that they are undamaged. Also ensure that nobody can trip over loose cables.

● If the product needs an external power supply, use the power supply that is delivered with the product or that is recommended in the product documentation or a power supply that conforms to the country-specific regulations.

● Only connect the product to a power source with a fuse protection of maximum 20 A.

● Ensure that you can disconnect the product from the power source at any time. Pull the power plug to disconnect the product. The power plug must be easily accessible. If the product is integrated into a system that does not meet these requirements, provide an easily accessible circuit breaker at the system level.

Connecting headphones

Take the following measures to prevent hearing damage. Before using headphones, check the volume and reduce it if necessary. If you monitor varying signal levels, take off the headphones and wait until the signal has settled. Then adjust the volume.

Cleaning the product

Use a dry, lint-free cloth to clean the product. When cleaning, keep in mind that the casing is not waterproof. Do not use liquid cleaning agents.

Meaning of safety labels

Safety labels on the product warn against potential hazards.

⚠	Potential hazard Read the product documentation to avoid personal injury or product damage.
⚠	Heavy product Be careful when lifting, moving or carrying the product. Carrying the product requires a sufficient number of persons or transport equipment.
⚡	Electrical hazard Indicates live parts. Risk of electric shock, fire, personal injury or even death.
♨	Hot surface Do not touch. Risk of skin burns. Risk of fire.
⏚	Protective conductor terminal Connect this terminal to a grounded external conductor or to protective ground. This connection protects you against electric shock if an electric problem occurs.

1.2   Warning Messages in the Documentation

A warning message points out a risk or danger that you need to be aware of. The signal word indicates the severity of the safety hazard and how likely it will occur if you do not follow the safety precautions.

WARNING

Potentially hazardous situation. Could result in death or serious injury if not avoided.

CAUTION

Potentially hazardous situation. Could result in minor or moderate injury if not avoided.

NOTICE

Potential risks of damage. Could result in damage to the supported product or to other property.

2   Documentation Overview

This section provides an overview of the R&S FSMR3 user documentation. Unless specified otherwise, you find the documents on the R&S FSMR3 product page at:

www.rohde-schwarz.com/product/FSMR3000.html/

2.1   Getting Started Manual

Introduces the R&S FSMR3 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. A PDF version is available for download on the Internet.

2.2   User Manuals and Help

Separate user manuals are provided for the base unit and the firmware applications:

● 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.

● Firmware application manual
  Contains the description of the specific functions of a firmware application, including remote control commands. Basic information on operating the R&S FSMR3 is not included.

The contents of the user manuals are available as help in the R&S FSMR3. The help offers quick, context-sensitive access to the complete information for the base unit and the firmware applications.

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

2.3   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):

2.4   Instrument Security Procedures

Deals with security issues when working with the R&S FSMR3 in secure areas. It is available for download on the Internet.

2.5   Printed Safety Instructions

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

2.6   Data Sheets and Brochures

The data sheet contains the technical specifications of the R&S FSMR3. It also lists the firmware applications and their order numbers, and optional accessories.

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

See www.rohde-schwarz.com/brochure-datasheet/FSMR3000/

2.7 Release Notes and Open-Source Acknowledgment (OSA)

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

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

See www.rohde-schwarz.com/firmware/FSMR3000/

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

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

See www.rohde-schwarz.com/application/FSMR3000/

3   Key Features

The R&S FSMR3000 combines the functionality of several instruments in one and is capable of calibrating all vital parameters of a signal generator. The R&S FSMR3000 offers full spectrum analyzer functionality, e.g. for measuring harmonics or phase noise.

Key features are:

- Level calibration with excellent linearity and stability
- Easy operation for level calibration over a wide level range
- Very high measurement speed
- Low phase noise
- Capacitive touchscreen with multi touch operation
- Multiple measurement applications can be run and displayed in parallel
- Optional measurement applications for demodulation of analog and digital modulated signals

For a detailed specification, refer to the data sheet.

4   Preparing for Use

Here, you can find basic information about setting up the product for the first time.

4.1   Lifting and Carrying

The carrying handles are designed to lift or carry the instrument. Do not apply excessive external force to the handles.

See "Lifting and carrying the product" on page 8.

4.2   Unpacking and Checking

1. Unpack the R&S FSMR3 carefully.

2. Retain the original packing material. Use it when transporting or shipping the R&S FSMR3 later.

3. Using the delivery notes, check the equipment for completeness.

4. Check the equipment for damage.

   If the delivery is incomplete or equipment is damaged, contact Rohde & Schwarz.

4.3 Choosing the Operating Site

Specific operating conditions ensure proper operation and avoid damage to the product and connected devices. For information on environmental conditions such as ambient temperature and humidity, see the data sheet.

See also "Choosing the operating site" on page 8.

Electromagnetic compatibility classes

The electromagnetic compatibility (EMC) class indicates where you can operate the product. The EMC class of the product is given in the data sheet under "General data".

- Class B equipment is suitable for use in:
  - Residential environments
  - Environments that are directly connected to a low-voltage supply network that supplies residential buildings
- Class A equipment is intended for use in industrial environments. It can cause radio disturbances in residential environments due to possible conducted and radiated disturbances. It is therefore not suitable for class B environments. If class A equipment causes radio disturbances, take appropriate measures to eliminate them.

4.4 Setting Up the Product

See also:
- "Setting up the product" on page 8
- "Intended use" on page 7

4.4.1   Placing the Product on a Bench Top

To place the product on a bench top

1. Place the product on a stable, flat and level surface. Ensure that the surface can support the weight of the product. For information on the weight, see the data sheet.

2. **WARNING!** A stack of products can fall over and cause injury. Never stack more than two products. Otherwise, mount them in a rack.

   Stack as follows:
   - All products must have the same dimensions (width and length).
   - Do not exceed a total load of 50 kg placed on the product at the bottom of the stack.
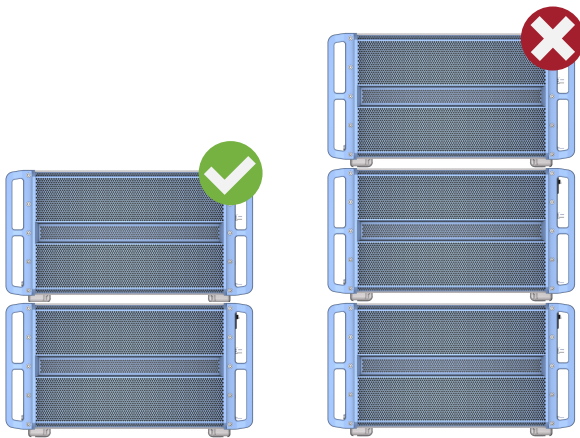
Left   = Stacked correctly
Right = Stacked incorrectly, too many products

3. **NOTICE!** Overheating can damage the product.

   Prevent overheating as follows:
   - Keep a minimum distance of 10 cm between the fan openings of the product and any object in the vicinity.
   - Do not place the product next to heat-generating equipment such as radiators or other products.

4.4.2   Mounting the R&S FSMR3 in a Rack

To prepare the rack

1. Observe the requirements and instructions in "Setting up the product" on page 8.

2. **NOTICE!** Insufficient airflow can cause overheating and damage the product.

   Design and implement an efficient ventilation concept for the rack.

To mount the R&S FSMR3 in a rack

1. Use an adapter kit to prepare the R&S FSMR3 for rack mounting.
   a) Order the rack adapter kit designed for the R&S FSMR3. For the order number, see the data sheet.
   b) Mount the adapter kit. Follow the assembly instructions provided with the adapter kit.

2. Lift the R&S FSMR3 to shelf height.

3. Grab the handles and push the R&S FSMR3 onto the shelf until the rack brackets fit closely to the rack.

4. Tighten all screws in the rack brackets with a tightening torque of 1.2 Nm to secure the R&S FSMR3 in the rack.

To unmount the R&S FSMR3 from a rack

1. Loosen the screws at the rack brackets.

2. Remove the R&S FSMR3 from the rack.

3. If placing the R&S FSMR3 on a bench top again, unmount the adapter kit from the R&S FSMR3. Follow the instructions provided with the adapter kit.

4.5   Connecting the AC Power

In the standard version, the R&S FSMR3 is equipped with an AC power supply connector.

The R&S FSMR3 can be used with different AC power voltages and adapts itself automatically to it. Refer to the datasheet for the requirements of voltage and frequency.

For safety information, see "Connecting to power" on page 9.

To connect the AC power

1. Plug the AC power cable into the AC power connector on the rear panel of the instrument. Only use the AC power cable delivered with the R&S FSMR3.

2. Plug the AC power cable into a power outlet with ground contact.

   The required ratings are listed next to the AC power connector and in the data sheet.

For details on the connector, refer to Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 45.

4.6 Switching the Instrument On and Off

Table 4-1: Overview of power states

Status	LED on Power key	Position of main power switch
Off	● gray	[0]
Standby	● orange	[I]
Ready	● green	[I]

To switch on the R&S FSMR3

The R&S FSMR3 is off but connected to power.

1. Set the switch on the power supply to position [I].
   See Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 45.

   The LED of the Power key is orange.
   See Chapter 5.1.1, "Power Key", on page 34.

2. Press the Power key.
    See Chapter 5.1.1, "Power Key", on page 34.

    The LED changes to green.
    The R&S FSMR3 boots.

    After booting, the instrument is ready for operation.

To shut down the product

The product is in the ready state.

►   Press the [Power] key.

    The operating system shuts down. The LED changes to orange.

ⓘ   If the instrument temperature exceeds the limit specified in the data sheet, the R&S FSMR3 automatically shuts down to protect the instrument from damage.

To disconnect from power

The R&S FSMR3 is in the standby state.

1. **NOTICE!** Risk of data loss. If you disconnect the product from power when it is in the ready state, you can lose settings and data. Shut it down first.

    Set the switch on the power supply to position [0].
    See Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 45.

    The LED of the Power key is switched off.

2. Disconnect the R&S FSMR3 from the power source.

4.7   Connecting to LAN

You can connect the instrument to a LAN for remote operation via a PC.

Provided the network administrator has assigned you the appropriate rights and adapted the Windows firewall configuration, you can use the interface, for example:

●   To transfer data between a controlling device and the test device, e.g. to run a remote control program

- To access or control the measurement from a remote computer using the "Remote Desktop" application (or a similar tool)
- To connect external network devices (e.g. printers)
- To transfer data from a remote computer and back, e.g. using network folders

Network environment

Before connecting the product to a local area network (LAN), consider the following:

- Install the latest firmware to reduce security risks.
- For internet or remote access, use secured connections, if applicable.
- Ensure that the network settings comply with the security policies of your company. Contact your local system administrator or IT department before connecting your product to your company LAN.
- When connected to the LAN, the product may potentially be accessed from the internet, which may be a security risk. For example, attackers might misuse or damage the product. For more information about IT security and how to operate the product in a secure LAN environment, see the Rohde & Schwarz white paper 1EF96: Malware Protection Windows 10.

► **NOTICE!** Risk of network failure.
Consult your network administrator before performing the following tasks:
  - Connecting the instrument to the network
  - Configuring the network
  - Changing IP addresses
  - Exchanging hardware

Errors can affect the entire network.

Connect the R&S FSMR3 to the LAN via the LAN interface on the rear panel of the instrument.

Windows automatically detects the network connection and activates the required drivers.

By default, the R&S FSMR3 is configured to use DHCP and no static IP address is configured.

The default instrument name is <Type><variant>-<serial_number>, for example, FSMR3026-123456. For information on determining the serial number, see Chapter 5.2.14, "Device ID", on page 48.

For more information on LAN configuration, see the R&S FSMR3 user manual.

4.8   Connecting a Keyboard

The keyboard is detected automatically when it is connected. The default input language is English – US.

However, you can also connect foreign language keyboards; currently the following languages are supported for the R&S FSMR3:

● German

● Swiss

● French

● Russian

To configure the keyboard language

1. To access the Windows operating system, press the Windows key on the external keyboard.

2. Select "Start > Settings > Time & language > Region & language > Add a language" .

4.9   Connecting an External Monitor

You can connect an external monitor (or projector) to the "DVI" or "Display port" connector on the rear panel of the R&S FSMR3 (see also Chapter 5.2.2, "Display Port and DVI", on page 45).

ⓘ **Screen resolution and format**

The touchscreen of the R&S FSMR3 is calibrated for a 16:10 format. If you connect a monitor or projector using a different format (e.g. 4:3), the calibration is not correct and the screen does not react to your touch actions properly.

The touchscreen has a screen resolution of 1280x800 pixels. Usually, the display of the external monitor is a duplicate of the instrument's monitor.

If you configure the external monitor to be used as the *only* display in the Windows configuration dialog box ("Show only on 2"), the maximum screen resolution of the monitor is used. In this case, you can maximize the R&S FSMR3 application window and see even more details. You cannot change the monitor's screen resolution via the standard Windows configuration dialog box.

However, you can restore the default instrument resolution (1280x800) on the monitor using the instrument function "Setup" > "Display" > "Configure Monitor" > "Screen Resolution: Restore to default".

The R&S FSMR3 supports a minimum resolution of 1280x768 pixels.

1. Connect the external monitor to the R&S FSMR3.

2. Press the [Setup] key.

3. Press the "Display" softkey.

4. Select the "Configure Monitor" tab in the "Display" dialog box.

   The standard Windows "Screen Resolution" dialog box is displayed.
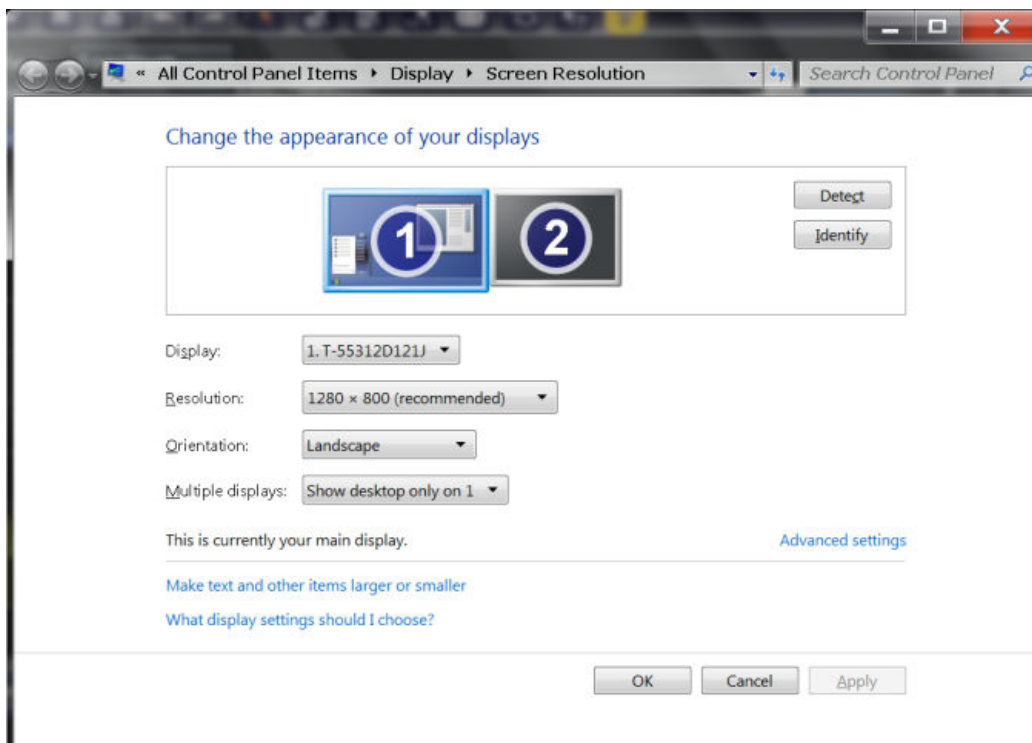
5. Select the instrument for display:
   - "Display 1": internal monitor only
   - "Display 2": external monitor only
   - "Duplicate": both internal and external monitor

6. Tap "Apply" to try out the settings before they are accepted permanently, then you can easily return to the previous settings, if necessary.

7. Select "OK" if the settings are suitable.

4.10   Windows Operating System

The instrument contains the Windows 10 operating system which has been configured according to the instrument's features and needs. Changes in the system setup are only required when peripherals like a keyboard or a printer are installed or if the network configuration does not comply with the default settings. After the R&S FSMR3 is started, the operating system boots and the instrument firmware is started automatically.

Tested software

The drivers and programs used on the instrument under Windows 10 are adapted to the instrument. Only install update software released by Rohde & Schwarz to modify existing instrument software.

You can install additional software on the instrument; however, additional software can impair instrument function. Thus, run only programs that Rohde & Schwarz has tested for compatibility with the instrument software.

The following program packages have been tested:
- Symantec Endpoint Security – virus-protection software
- FileShredder - for reliable deletion of files on the hard disk

Service packs and updates

Microsoft regularly creates security updates and other patches to protect Windows-based operating systems. These are released through the Microsoft Update website and associated update server. Instruments using Windows, especially those that connect to a network, should be updated regularly.

Firewall settings

A firewall protects an instrument by preventing unauthorized users from gaining access to it through a network. Rohde & Schwarz highly recommends the use of the firewall on your instrument. Rohde & Schwarz instruments are shipped with the Windows firewall enabled and preconfigured in such a way that all ports and connections for remote control are enabled.

Note that changing firewall settings requires administrator rights.

Virus protection

Take appropriate steps to protect your instruments from infection. Use strong firewall settings and scan any removable storage device used with a Rohde & Schwarz instrument regularly. It is also recommended that you install anti-virus software on the instrument. Rohde & Schwarz does NOT recommend running anti-virus software in the background ("on-access" mode) on Windows-based instruments, due to potentially degrading instrument performance. However, Rohde & Schwarz does recommend running it during non-critical hours.

For details and recommendations, see the following Rohde & Schwarz white paper:
- 1EF96: Malware Protection Windows 10

To access the "Start" menu

The Windows "Start" menu provides access to the Windows 10 functionality and installed programs.

► Select the "Windows" icon in the toolbar, or press the "Windows" key or the [CTRL + ESC] key combination on the (external) keyboard.

The "Start" menu and the Windows taskbar are displayed.

💡 The Windows taskbar also provides quick access to commonly used programs, for example Paint or WordPad. IECWIN, the auxiliary remote control tool provided free of charge and installed by Rohde & Schwarz, is also available from the taskbar or "Start" menu.

For details on the IECWIN tool, see the "Network and Remote Control" chapter of the R&S FSMR3 user manual.

All necessary system settings can be defined in the "Start > Settings" menu.

For required settings, refer to the Windows 10 documentation and to the hardware description.

4.11   Logging On

Windows 10 requires that users identify themselves by entering a user name and password in a login window. By default, the R&S FSMR3 provides two user accounts:

- **"Instrument"**: a standard user account with limited access
- **"Administrator"**: an administrator account with unrestricted access to the computer/domain

Some administrative tasks require administrator rights (e.g. the configuration of a LAN network). Refer to the description of the basic instrument Setup ([Setup] menu) to find out which functions are affected.

Passwords

For all default user accounts, the initial password is *894129*. Note that this password is very weak, and it is recommended that you change the password for both users after initial login. An administrator can change the password in Windows 10 for any user at any time via "Start > Settings > Account > SignIn Options > Password > Change".

Auto-login

When shipped, the instrument automatically logs on the default "Instrument" user to Windows 10 using the default password. This function is active until an administrator explicitly deactivates it or changes the password.

ⓘ **Changing the password and use of auto-login function**
Note that when you change the default password, the default auto-login function no longer works!
In this case, you must enter the new password manually to log on.

Adapting the auto-login function to a new password

If you change the password that is used during auto-login, this function no longer works. Adapt the settings for the auto-login function first.

1. Open the `C:\R_S\INSTR\USER\user\AUTOLOGIN.REG` file in any text editor (e.g. Notepad).

2. In the line `"DefaultPassword"="894129"`, replace the default password (`894129`) by the new password for automatic login.

3. Save the changes to the file.

4. In the Windows "Start" menu, select "Run".
   The "Run" dialog box is displayed.

5. Enter the command `C:\R_S\INSTR\USER\user\AUTOLOGIN.REG`.

6. Press the [ENTER] key to confirm.
   The auto-login function is reactivated with the changed password. It will be applied the next time the instrument is switched on.

Switching users when using the auto-login function

Which user account is used is defined during login. If auto-login is active, the login window is not displayed. However, you can switch the user account to be used even when the auto-login function is active.

1. Select the "Windows" icon in the toolbar to access the operating system of the R&S FSMR3 (see also "To access the "Start" menu" on page 27).

2. Press [CTRL] + [ALT] + [DEL], then select "Sign out".

   The "Login" dialog box is displayed, in which you can enter the different user account name and password.

For information on deactivating and reactivating the auto-login function, see the R&S FSMR3 user manual.

4.12   Checking the Supplied Options

The instrument can be equipped with both hardware and firmware options. To check whether the installed options correspond to the options indicated on the delivery note, proceed as follows.

1. Press the [SETUP] key.

2. Press the "System Config" softkey.

3. Switch to the "Versions + Options" tab in the "System Configuration" dialog box.

   A list with hardware and firmware information is displayed.

4. Check the availability of the hardware options as indicated in the delivery note.

4.13   Performing a Self-Alignment

When strong temperature changes occur in the environment of the R&S FSMR3, or after updating the firmware, you have to perform a self-alignment to align the data to a reference source.

During self-alignment, do not connect a signal to the RF input connector. Running a self-alignment with a signal connected to the RF input can lead to false measurement results.

Performing a self-alignment

Before performing this functional test, make sure that the instrument has reached its operating temperature (for details, refer to the data sheet).

A message in the status bar ("Instrument warming up...") indicates that the operating temperature has not yet been reached.

Depending on the installation settings, an automatic self-alignment is performed each time the instrument is switched on. A dialog is displayed indicating how much warm-up time is still required before self-alignment can be performed.

1. Press the [Setup] key.

2. Press the "Alignment" softkey.

3. Select the "Start Self Alignment" button in the "Alignment" dialog box.

   Once the system correction values have been calculated successfully, a message is displayed.

ⓘ **To display the alignment results again later**
- Press the [SETUP] key.
- Press the "Alignment" softkey.

4.14   Considerations for Test Setup

Cable selection and electromagnetic interference (EMI)

Electromagnetic interference (EMI) can affect the measurement results.

To suppress electromagnetic radiation during operation:

- Use high-quality shielded cables, for example, double-shielded RF and LAN cables.
- Always terminate open cable ends.
- Ensure that connected external devices comply with EMC regulations.

Signal input and output levels

Information on signal levels is provided in the data sheet. Keep the signal levels within the specified ranges to avoid damage to the R&S FSMR3 and connected devices.

5 Instrument Tour

On the instrument tour, you can learn about the different control elements and connectors on the front and back panel of the R&S FSMR3.

5.1 The Front Panel

This chapter describes the front panel, including all function keys and connectors.
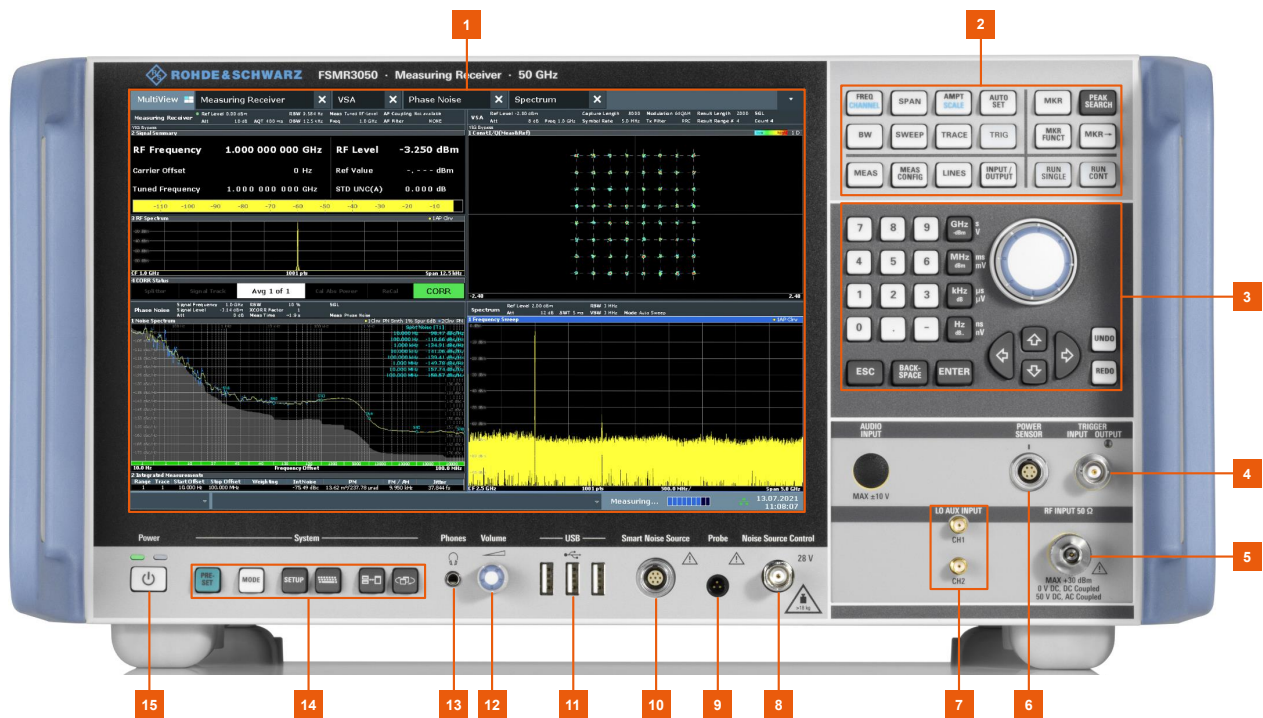
Figure 5-1: Front panel view of R&S FSMR3

1 = Touchscreen
2 = Function keys
3 = Navigation controls
4 = TRIGGER INPUT/OUTPUT
5 = RF INPUT 50 Ω
6 = POWER SENSOR connector
7 = LO AUX INPUT CH1/CH2
8 = NOISE SOURCE CONTROL
9 = PROBE connector

10 = SMART NOISE SOURCE connector
11 = USB connectors
12 = Volume control
13 = Headphones connector
14 = SYSTEM keys
15 = POWER key

Figure 5-2: Front panel view of R&S FSMR3

1 = Touchscreen
2 = Function keys
3 = Navigation controls
4 = TRIGGER INPUT/OUTPUT
5 = RF INPUT 50 Ω
6 = NOISE SOURCE CONTROL
7 = PROBE connector
8 = SMART NOISE SOURCE connector
9 = USB connectors
10 = Volume control
11 = Headphones connector
12 = SYSTEM keys
13 = POWER key

5.1.1 Power Key

The power key is on the lower left corner of the front panel. It starts up and shuts down the instrument.

See also "Connecting to power" on page 9.

5.1.2 USB

The front panel provides three female USB connectors (USB-A) to connect devices like a keyboard or a mouse. In addition, a memory stick can be connected to store and reload instrument settings and measurement data.

ⓘ The rear panel provides further USB connectors, including a male (USB-B) connector. See Chapter 5.2.4, "USB", on page 45.

All USB connectors support standard 2.0.

5.1.3 System Keys

System keys set the instrument to a predefined state, change basic settings, and provide print and display functions.

A detailed description of the corresponding functions is provided in the user manual.

Table 5-1: System keys

System key	Assigned functions
[Preset]	Resets the instrument to the default state.
[Setup]	Provides basic instrument configuration functions, e.g.: • Reference frequency (external/internal), noise source • Date, time, display configuration • LAN interface • Self-alignment • Firmware update and enabling of options • Information about instrument configuration incl. firmware version and System error messages • Service support functions (self-test etc.)
[Print]	Provides print and screenshot functions
[File]	Provides data management functions such as saving and recalling instrument settings or importing and exporting data.
⌨	Switches between the on-screen keyboard display: • At the top of the screen • At the bottom of the screen • Off
[Mode]	Provides the selection between applications

5.1.4   Touchscreen

All measurement results are displayed on the screen on the front panel. Additionally, the screen display provides status and setting information and allows you to switch between various measurement tasks. The screen is touch-sensitive, offering an alternative means of user interaction for quick and easy handling of the instrument.
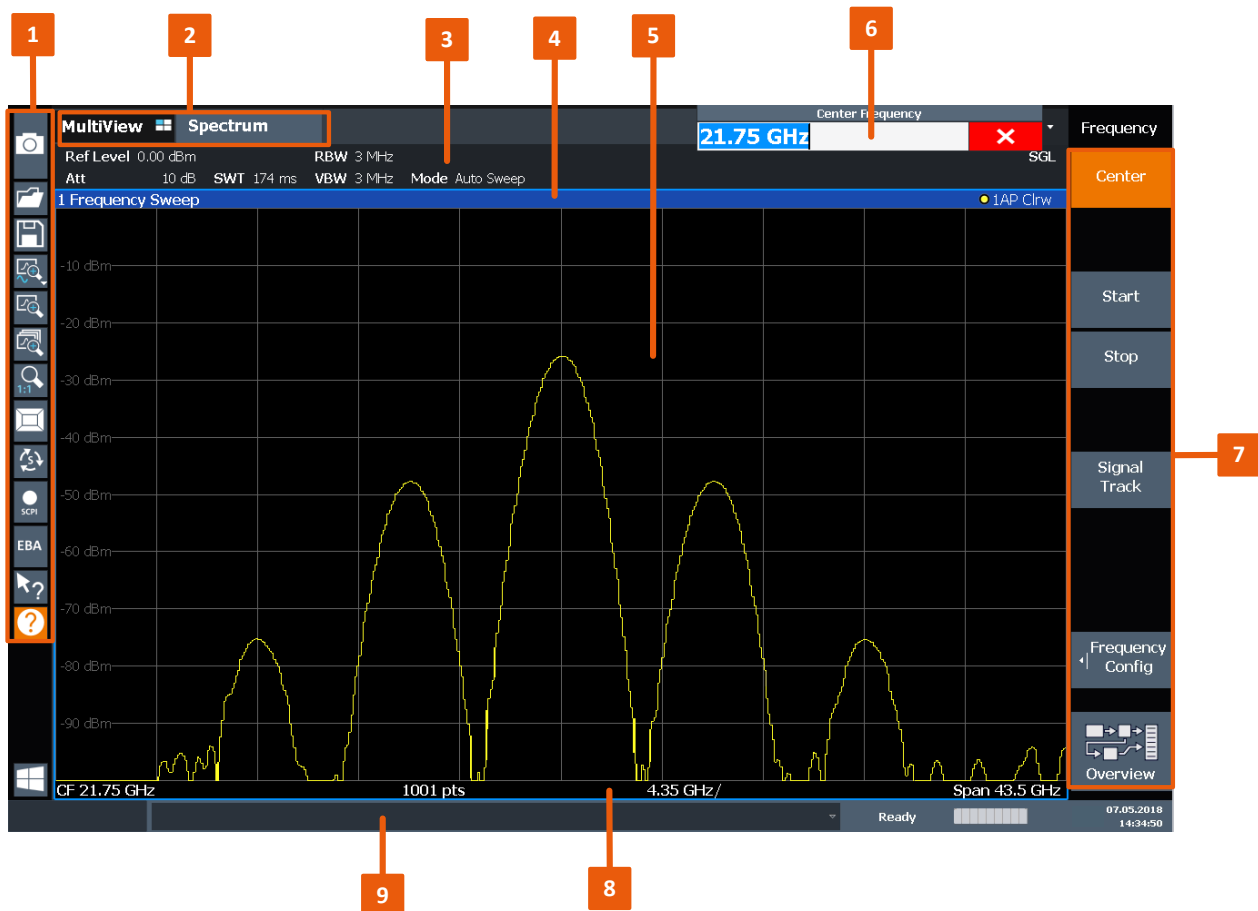
Figure 5-3: Touchscreen elements

1 = Toolbar with standard application functions, e.g. print, save/open file etc.
2 = Tabs for individual measurement channels
3 = Channel bar for firmware and measurement settings
4 = Window title bar with diagram-specific (trace) information
5 = Measurement results area
6 = Input field for measurement setting
7 = Softkeys for function access
8 = Diagram footer with diagram-specific information, depending on application
9 = Instrument status bar with error messages, progress bar and date/time display

All measurement results are displayed on the screen on the front panel. Additionally, the screen display provides status and setting information and allows you to switch between various measurement tasks. The screen is touch-sensitive, offering an alternative means of user interaction for quick and easy handling of the instrument. Any user interface elements that react to a click by a mouse pointer also react to a tap on the screen, and vice versa. Using touchscreen gestures, you can perform the following tasks:

● Changing a setting

- Changing the display

- Moving a marker

- Zooming into a diagram

- Selecting a new evaluation method

- Scrolling through a result list or table

- Saving or printing results and settings

To imitate a right-click by mouse using the touchscreen, for example to open a context-sensitive menu for a specific item, press the screen for about 1 second.

For details on touchscreen gestures, see Chapter 7.4, "Touchscreen Gestures", on page 92.

5.1.5 Function Keys

Function keys provide access to the most common measurement settings and functions.

A detailed description of the corresponding functions is provided in the user manual.

Table 5-2: Function keys

Function key	Assigned functions
Basic measurement settings	
[Freq.]	Sets the center frequency and the start and stop frequencies for the frequency range under consideration. This key is also used to set the frequency offset and the signal track function.
[Span]	Sets the frequency span to be analyzed.
[Ampt. / Scale]	Sets the reference level, the displayed dynamic range, the RF attenuation and the unit for the level display.
	Sets the level offset and the Input impedance.
	Activates the preamplifier (option RF Preamplifier, R&S FSMR3-B24).
[Auto Set]	Enables automatic settings for level, frequency or sweep type Mode.
[BW]	Sets the resolution bandwidth and the Video bandwidth.
[Sweep]	Sets the sweep time and the number of measurement points.
	Selects continuous measurement or single measurement.
[Trace]	Configures the measured data acquisition and the analysis of the measurement data.

Function key	Assigned functions
[Trigger]	Sets the trigger mode, the trigger threshold, the trigger delay, and the gate configuration for gated sweep.
Marker functions	
[Marker]	Sets and positions the absolute and relative measurement markers (markers and delta markers).
[Peak Search]	Performs a peak search for active marker. If no marker is active, normal marker 1 is activated and the peak search is performed for it.
[Marker Function]	Provides additional analysis functions of the measurement markers:
	Frequency counter (Sig Count)
	Fixed reference point for relative measurement markers (Ref Fixed)
	Noise marker (Noise Meas)
	Phase noise (Phase Noise)
	n dB down function
	AM/FM audio demodulation
	Peak list
[Marker ->]	Used for search functions of the measurement markers (maximum/minimum of the trace).
	Assigns the marker frequency to the center frequency, and the marker level to the reference level.
	Restricts the search area (Search Limits) and characterizes the maximum points and minimum points (Peak Excursion).
Measurement and evaluation functions	
[Meas]	Provides the measurement functions.
	Measurement of multicarrier adjacent channel power (Ch Power ACLR)
	Carrier to noise spacing (C/N C/N_0)
	Occupied bandwidth (OBW)
	Spectrum emission mask measurement (Spectrum Emission Mask)
	Spurious emissions (Spurious Emissions)
	Measurement of time domain power (Time Domain Power)
	Signal statistics: amplitude probability distribution (APD) and cumulative complementary distribution function (CCDF)
	Third-order intercept point (TOI)
	AM modulation depth (AM Mod Depth)
[Meas Config]	Used to define measurement configuration.

Function key	Assigned functions
[Lines]	Configures display lines and limit lines.
[Input/Output]	Displays softkeys for In/Out functions.
Measurement start functions	
[Run Single]	Starts a single new measurement (Single Sweep Mode).
[Run Cont.]	Starts a continuous measurement (Continuous Sweep Mode).
Function execution (in navigation controls area)	
[Undo]	Reverts last operation
[Redo]	Repeats previously reverted operation.

5.1.6   Navigation Controls

The navigation controls include a rotary knob, navigation keys, and Undo / Redo keys. They allow you to navigate within the display or within dialog boxes.

Navigating in tables

The easiest way to navigate within tables (both in result tables and configuration tables) is to scroll through the entries with your finger on the touchscreen.

5.1.6.1   Rotary Knob

The rotary knob has several functions:

● For numeric entries: increments (clockwise direction) or decrements (counterclockwise direction) the instrument parameter at a defined step width

● In lists: toggles between entries

● For markers, limit lines, and other graphical elements on the screen: moves their position

● For active scroll bars: moves the scroll bar vertically

● For dialog boxes: Same effect as the Enter key when pressed

5.1.6.2 Navigation Keys

The navigation keys can be used alternatively to the rotary knob to navigate through dialog boxes, diagrams or tables.

Arrow Up/Arrow Down Keys

The <arrow up> or <arrow down> keys do the following:

- For numeric entries: increments (Arrow Up) or decrements (Arrow Down) the instrument parameter at a defined step width
- In a list: scrolls forward and backward through the list entries
- In a table: moves the selection bar vertically
- In windows or dialog boxes with a vertical scroll bar: moves the scroll bar

Arrow Left/Arrow Right Keys

The <arrow left> or <arrow right> keys do the following:

- In an alphanumeric edit dialog box, move the cursor.
- In a list, scroll forward and backward through the list entries.
- In a table, move the selection bar horizontally.
- In windows or dialog boxes with horizontal scroll bar, move the scroll bar.

5.1.7 Undo/Redo Keys

- The [Undo] key reverts the previous action, i.e. the status before the previous action is retrieved.
  The Undo function is useful, for example, if you are performing a zero span measurement with several markers and a limit line defined and accidentally select a different measurement. In this case, many settings would be lost. However, if you press [Undo] immediately afterwards, the previous status is retrieved, i.e. the zero span measurement and all settings.
- The [Redo] key repeats the previously reverted action, i.e. the most recent action is repeated.

ⓘ The [Undo] function is not available after a [Preset] or "Recall" operation. When these functions are used, the history of previous actions is deleted.

5.1.8   Trigger Input / Output

Use the female Trigger 1 Input/Output connector to input an external trigger or gate data. Thus, you can control the measurement using an external signal. The voltage levels can range from 0.5 V to 3.5 V. The default value is 1.4 V. The typical Input impedance is 10 kΩ.

(i)   The rear panel provides two more Trigger Input / Output connectors, see Chapter 5.2.7, "Trigger 2/3 In/Out", on page 46.

5.1.9   RF Input 50 Ohm

Provides RF input from a connected device under test (DUT) to the R&S FSMR3, which is then analyzed in an RF measurement. Connect the DUT to the "RF Input" connector on the R&S FSMR3. Do not overload the input. For maximum allowed values, see the data sheet.

The RF input can be coupled to the DUT by alternating current (AC) or direct current (DC). AC coupling blocks any DC voltage from the input signal. This is the default setting to prevent damage to the instrument. However, some specifications require DC coupling. In this case, you must protect the instrument from damaging DC input voltages manually. For details, refer to the data sheet. For details on coupling, see the chapter on radio frequency input in the R&S FSMR3 user manual.

See also Chapter 4.14, "Considerations for Test Setup", on page 30.

5.1.10   Probe

The R&S FSMR3 provides a connector for supply voltages of +15 V to -12 V and ground for active probes and preamplifiers. A maximum current of 140 mA is available. This connector is suitable as a power supply for high-impedance probes.

5.1.11   AF Out and Volume

This option allows you to monitor demodulated audio frequencies in time domain measurements acoustically.

The AM and FM audio output is provided to the AF Out connector.

Connect headphones equipped with a miniature jack plug to the AF Out female connector. Set the output voltage using the "Volume" control above the female connector.

See also "Connecting headphones" on page 9.

5.1.12 Keypad

The keypad is used to enter alphanumeric parameters, including the corresponding units (see also Chapter 7.3.2, "Entering Alphanumeric Parameters", on page 90). It contains the following keys:

Table 5-3: Keys on the keypad

Type of key	Description
Alphanumeric keys	Enter numbers and (special) characters in edit dialog boxes.
Decimal point	Inserts a decimal point "." at the cursor position.
Sign key	Changes the sign of a numeric parameter. For an alphanumeric parameter, inserts a "-" at the cursor position.
Unit keys (GHz/-dBm MHz/ dBm, kHz/dB and Hz/dB)	Adds the selected unit to the entered numeric value and complete the entry. For level entries (e.g. in dB) or dimensionless values, all units have the value "1" as multiplying factor. Thus, they have the same function as an Enter key.
[Esc] key	Closes all kinds of dialog boxes, if the edit Mode is not active. Quits the edit Mode, if the edit Mode is active. In dialog boxes that contain a "Cancel" button it activates that button. For "Edit" dialog boxes the following mechanism is used: ● If data entry has been started, it retains the original value and closes the dialog box. ● If data entry has not been started or has been completed, it closes the dialog box.
Backspace key	If an alphanumeric entry has already been started, this key deletes the character to the left of the cursor.
Enter key	● Concludes the entry of dimensionless entries. The new value is accepted. ● With other entries, this key can be used instead of the "Hz/dB" unit key. ● In a dialog box, selects the default or focused element.

5.2 The Rear Panel

The rear panel contains various connectors for various purposes.

ⓘ The meanings of the labels on the R&S FSMR3 are described in Chapter 5.2.13, "Labels on R&S FSMR3", on page 48.

Figure 5-4: Rear panel view of R&S FSMR3

1 = see Chapter 5.2.2, "Display Port and DVI", on page 45
2 = see Chapter 5.2.2, "Display Port and DVI", on page 45
3 = see Chapter 5.2.3, "LAN", on page 45
4 = System Hard Drive
5 = see Chapter 5.2.4, "USB", on page 45
6 = see Chapter 5.2.1, "AC Power Supply Connection and Main Power Switch", on page 45
7 = see Figure 5-5
8 = Device ID with serial number and other labels
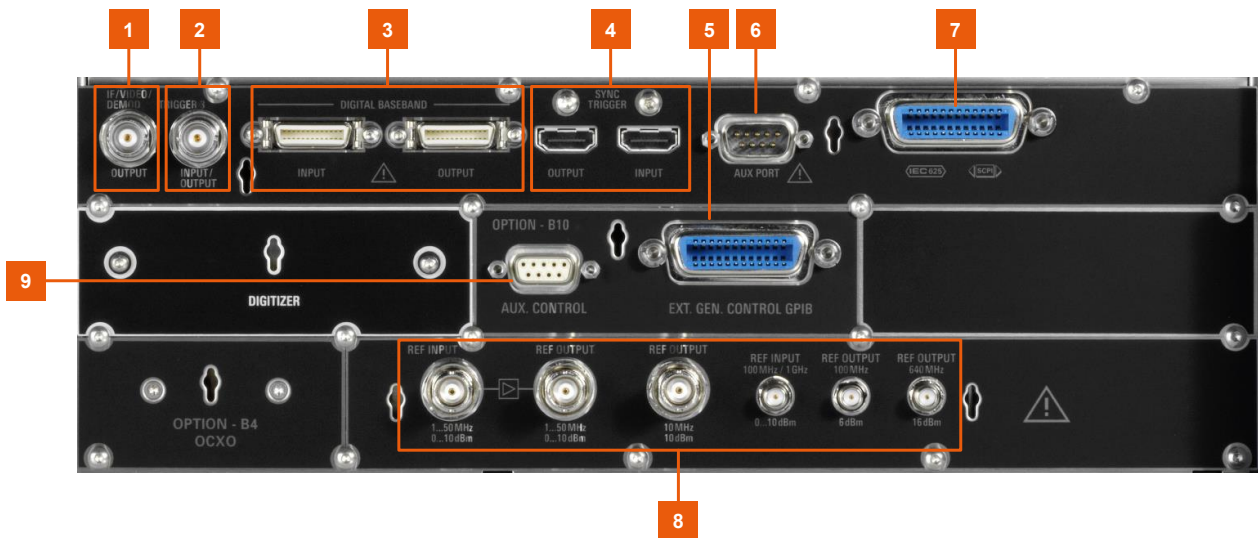
Figure 5-5: Rear panel view - extract 1

1 = IF/VIDEO/DEMOD connector
2 = TRIGGER 3 INPUT/OUTPUT connector
3 = DIGITAL BASEBAND INPUT/OUTPUT connectors (option B17)
4 = SYNC TRIGGER OUTPUT/INPUT
5 = EXT GEN CONTROL interface
6 = AUX PORT
7 = GPIB interface
8 = REF INPUT/OUTPUT connectors
9 = AUX CONTROL (option B10)

5.2.1 AC Power Supply Connection and Main Power Switch

An AC power supply connector and main power switch are located in a unit on the rear panel of the instrument.

Main power switch function:

Position 1: The instrument can be started via the Power key on the front panel.

The (optional) OCXO reference frequency is warmed up.

Position O: The entire instrument is disconnected from the AC power supply.

For details, refer to "Connecting to power" on page 9 and Chapter 4.5, "Connecting the AC Power", on page 19.

5.2.2 Display Port and DVI

You can connect an external monitor or other display device to the R&S FSMR3 to provide an enlarged display. Two different types of connectors are provided for this purpose:

- Display Port
- DVI (digital visual interface)

For details, see Chapter 4.9, "Connecting an External Monitor", on page 23.

5.2.3 LAN

The R&S FSMR3 is equipped with a 1 GBit Ethernet IEEE 802.3u network interface with Auto-MDI(X) functionality. The assignment of the RJ-45 connector supports twisted-pair category 5 UTP/STP cables in a star configuration (UTP stands for *unshielded twisted pair*, and STP for *shielded twisted pair*).

For details, see the R&S FSMR3 user manual.

5.2.4 USB

The rear panel provides four additional female USB (USB-A) connectors to connect devices like a keyboard, a mouse or a memory stick (see also Chapter 5.1.2, "USB", on page 34).

Furthermore, a male USB Device connector (USB-B) is provided optionally, for example to connect the R&S FSMR3 to a PC for remote control. The device connector requires R&S FSMR3-B114.

All USB connectors support standard 2.0.

5.2.5   GPIB Interface

The GPIB interface is in compliance with IEEE488 and SCPI. A computer for remote control can be connected via this interface. To set up the connection, a shielded cable is recommended. This interface is part of the "Additional Interfaces" hardware option.

For more details, refer to "Setting Up Remote Control" in the R&S FSMR3 user manual.

5.2.6   Noise Source Control

The Noise Source Control female connector is used to provide the supply voltage for an external noise source. For example, use it to measure the noise figure and gain of amplifiers and frequency converting devices. This connector requires option R&S FSMR3-B28V.

Conventional noise sources require a voltage of +28 V to be switched on and 0 V to be switched off. The output supports a maximum load of 100 mA.

5.2.7   Trigger 2/3 In/Out

The additional female BNC Trigger 2 In/Out connector and the optional Trigger 3 (output) connector allow the R&S FSMR3 to receive additional external signals or to provide signals to another device. The signals are TTL compatible (0 V / 5 V). You control the connector usage in the "Trigger" settings ([Trigger] key).

5.2.8   REF Input / REF Output

The REF Input connectors are used to provide an external reference signal to the R&S FSMR3.

The REF Output connectors can be used to provide an external reference signal (or the optional OCXO reference signal) from the R&S FSMR3 to other devices that are connected to this instrument.

Various connectors are provided for different reference signals:

Connector	Reference signal	Usage
REF Output 2	640 MHz 10 dBm	To provide the internal reference signal from the R&S FSMR3 to another device continuously. Also used to provide OCXO reference signal to another device.
REF Input 2	10 MHz - 1280 MHz 3 dBm - 13 dBm	To provide an external reference signal to the R&S FSMR3.
REF Output 1	1 MHz - 100 MHz > 0 dBm	To provide a 640 MHz reference signal from the R&S FSMR3 to another device.
REF Input 1	1 MHz - 100 MHz 0 dBm - 15 dBm	To provide an external reference signal to the R&S FSMR3.

5.2.9   IF Output

The female BNC connector can be used to output the intermediate frequency (IF).

For details, see the user manual.

5.2.10   Video Output

The female BNC connector can be used to provide video output (1 V).

For details, see the user manual.

5.2.11   Aux. Port

A 9-pole SUB-D male connector used to provide low-voltage TTL control signals (max. 5 V). The output signals can be used to control external devices. This connector is provided by the "Additional Interfaces" option R&S FSMR3-B5.

> **NOTICE**
>
> **Short-circuit hazard**
>
> Always observe the designated pin assignment. A short-circuit can damage the port.

5.2.12 Aux. Control

A 9-pole SUB-D male connector used as input for low-voltage TTL control signals (max. 5 V) from a controlling external device, such as an external generator. This connector is provided by the "Additional Interfaces" option R&S FSMR3-B5.

> **NOTICE**
>
> **Short-circuit hazard**
>
> Always observe the designated pin assignment. A short-circuit can damage the port.

5.2.13 Labels on R&S FSMR3

Labels on the casing inform about:

- Personal safety, see "Meaning of safety labels" on page 10
- Product and environment safety, see Table 5-4
- Identification of the product, see Chapter 5.2.14, "Device ID", on page 48

Table 5-4: Labels regarding R&S FSMR3 and environment safety

	Labeling in line with EN 50419 for disposal of electrical and electronic equipment after the product has come to the end of its service life. For more information, see the product user manual, chapter "Disposal".

5.2.14 Device ID

The unique device identifier is provided as a barcode sticker on the rear panel of the R&S FSMR3.

It consists of the device order number and a serial number.

The serial number is used to define the **default instrument name**, which is:

<Type><variant>-<serial_number>

For example, `FSMR3026-123456`.

The instrument name is required to establish a connection to the instrument in a LAN.

6   Trying Out the Instrument

This chapter introduces the most important functions and settings of the R&S FSMR3 step by step. The complete description of the functionality and its usage is given in the R&S FSMR3 User Manual. Basic instrument operation is described in Chapter 7, "Operating the Instrument", on page 74.

Prerequisites

● The instrument is set up, connected to the mains system, and started up as described in Chapter 4, "Preparing for Use", on page 16.

For these first measurements, you use the internal calibration signal, so you do not need any additional signal source or instruments. Try out the following:

6.1   Measuring a Basic Signal in the Spectrum Application

We will start out by measuring a basic signal, using the internal calibration signal as the input.

To display the internal 64 MHz calibration signal

1. Press the [PRESET] key to start out in a defined instrument configuration.

2. Press the [Setup] key on the front panel.

3. Tap the "Service + Support" softkey.

4. Tap the "Calibration Signal" tab.

5. Tap the "Calibration Frequency RF" option. Leave the frequency at the default 64 MHz, with a narrowband spectrum.

   The calibration signal is now sent to the RF input of the R&S FSMR3. By default, a continuous frequency sweep is performed, so that the spectrum of the calibration signal is now displayed in the standard level versus frequency diagram.
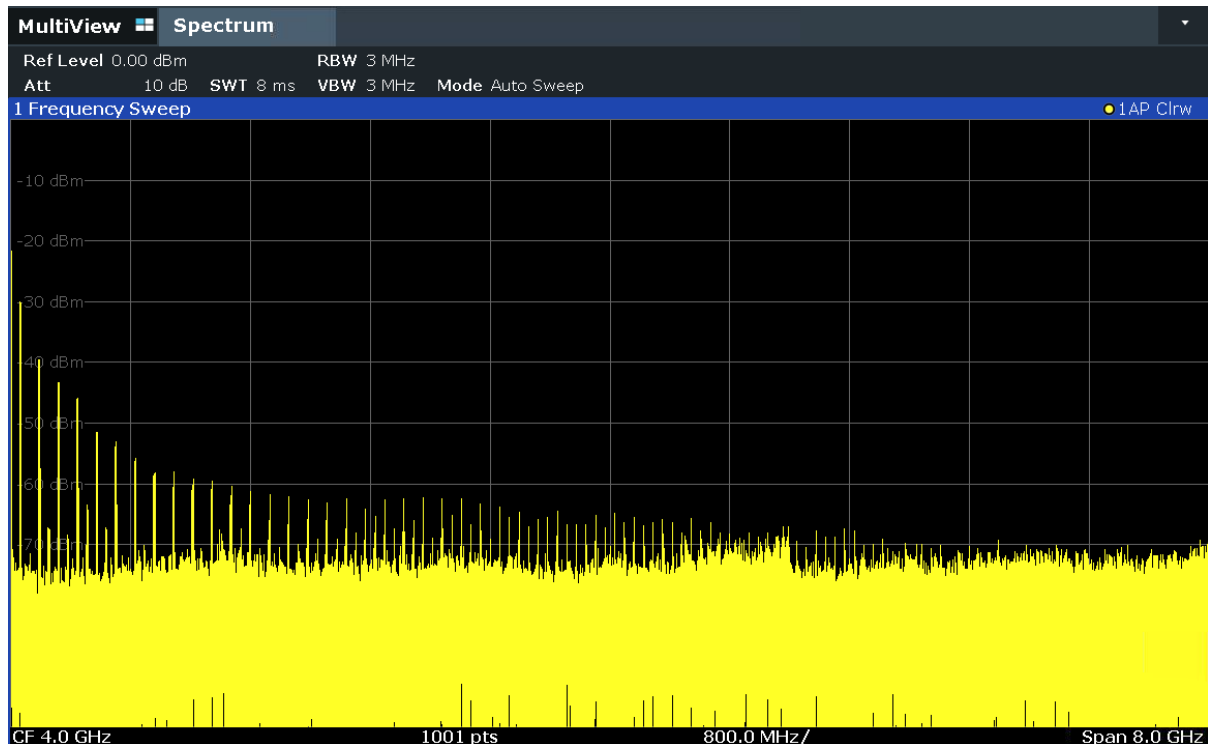
Figure 6-1: Calibration signal as RF input

ⓘ   **Instrument warmup time**

Note that the instrument requires an initial warmup time after switching it on. A message in the status bar ("Instrument warming up...") indicates that the operating temperature has not yet been reached. Wait until this message is no longer displayed before you start a measurement.

To optimize the display

To optimize the display for the calibration signal, we will adjust the main measurement settings.

1. Set the center frequency to the calibration frequency:
   a) Tap the "Overview" softkey to display the configuration "Overview".

b) Tap the "Frequency" button.

c) In the "Center" field, enter *64* on the number pad on the front panel.

d) Press the "MHz" key next to the number pad.

2. Reduce the span to 20 MHz:

a) In the "Span" field of the "Frequency" dialog box, enter *20 MHz*.

b) Close the "Frequency" dialog box.

3. Set the reference level to -25 dBm:

a) In the configuration "Overview", tap the "Amplitude" button.

b) In the "Value" field of the "Amplitude" dialog box, enter *-25 dBm*.

The display of the calibration signal is now improved. The maximum at the center frequency (=calibration frequency) of 64 MHz becomes visible.
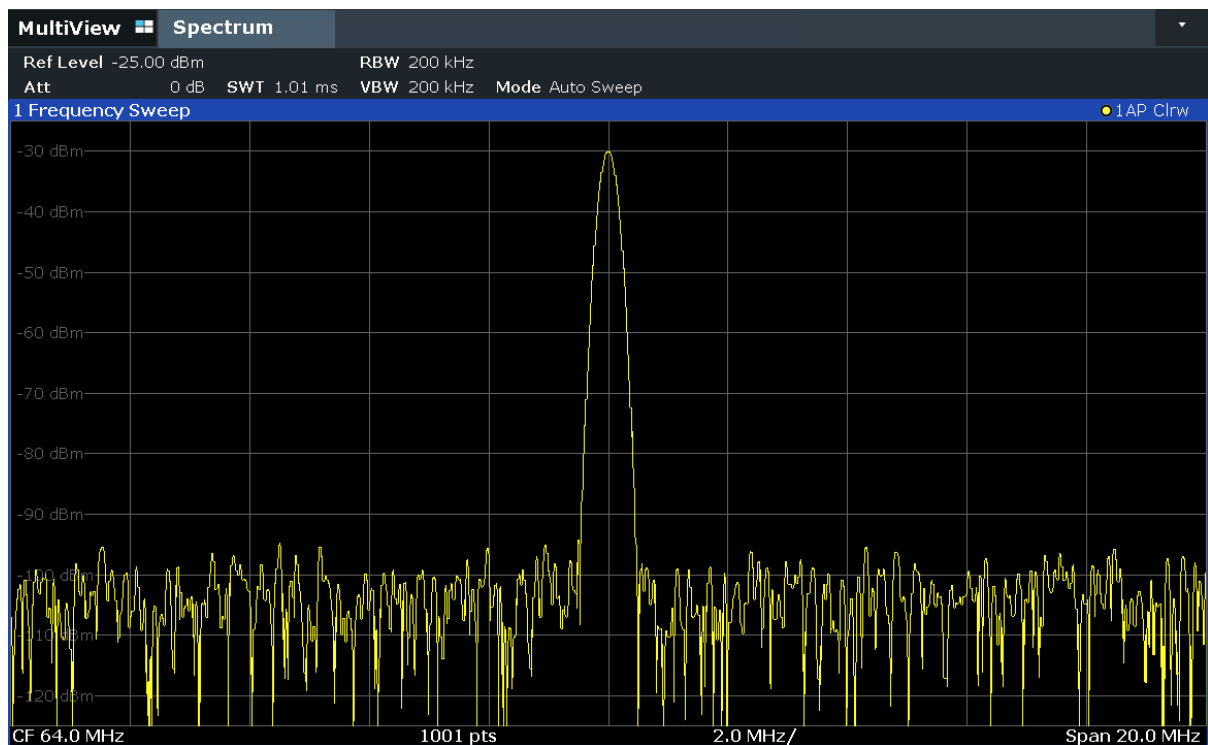
Figure 6-2: Calibration signal with optimized display settings

6.2   Displaying a Spectrogram
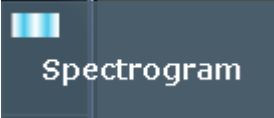
In addition to the standard "level versus frequency" spectrum display, the R&S FSMR3 also provides a spectrogram display of the measured data. A spectrogram shows how the spectral density of a signal varies over time. The x-axis

shows the frequency, the y-axis shows the time. A third dimension, the power level, is indicated by different colors. Thus you can see how the strength of the signal varies over time for different frequencies.

1. Tap the "Overview" softkey to display the general configuration dialog box.

2. Tap the "Display Config" button.

   The SmartGrid mode is activated, and the evaluation bar with the available evaluation methods is displayed.

3.

   Drag the "Spectrogram" icon from the evaluation bar to the diagram area. The blue area indicates that the new diagram would replace the previous spectrum display. Since we do not want to replace the spectrum, drag the icon to the lower half of the display to add an additional window instead.
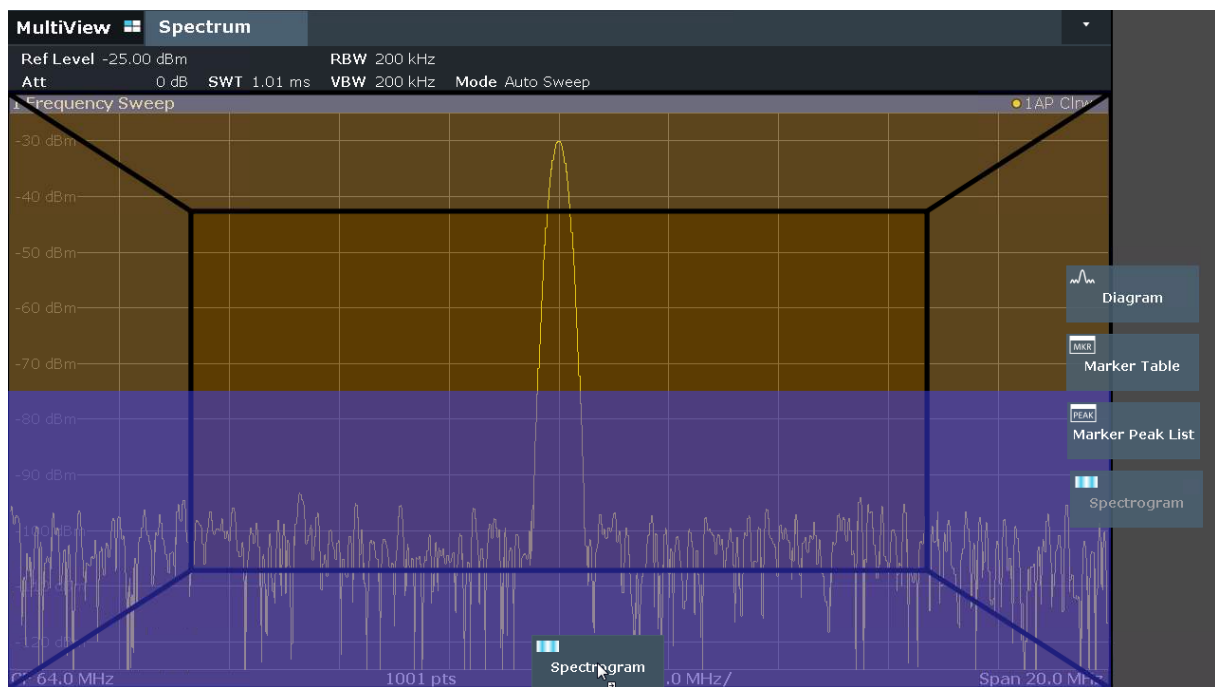
Figure 6-3: Adding a Spectrogram to the display

   Drop the icon.

4. Close the SmartGrid mode by tapping the "Close" icon at the top right corner of the toolbar.

You see the spectrogram compared to the standard spectrum display. Since the calibration signal does not change over time, the color of the frequency levels does not change over time, i.e. vertically. The legend at the top of the spectrogram window describes the power levels the colors represent.
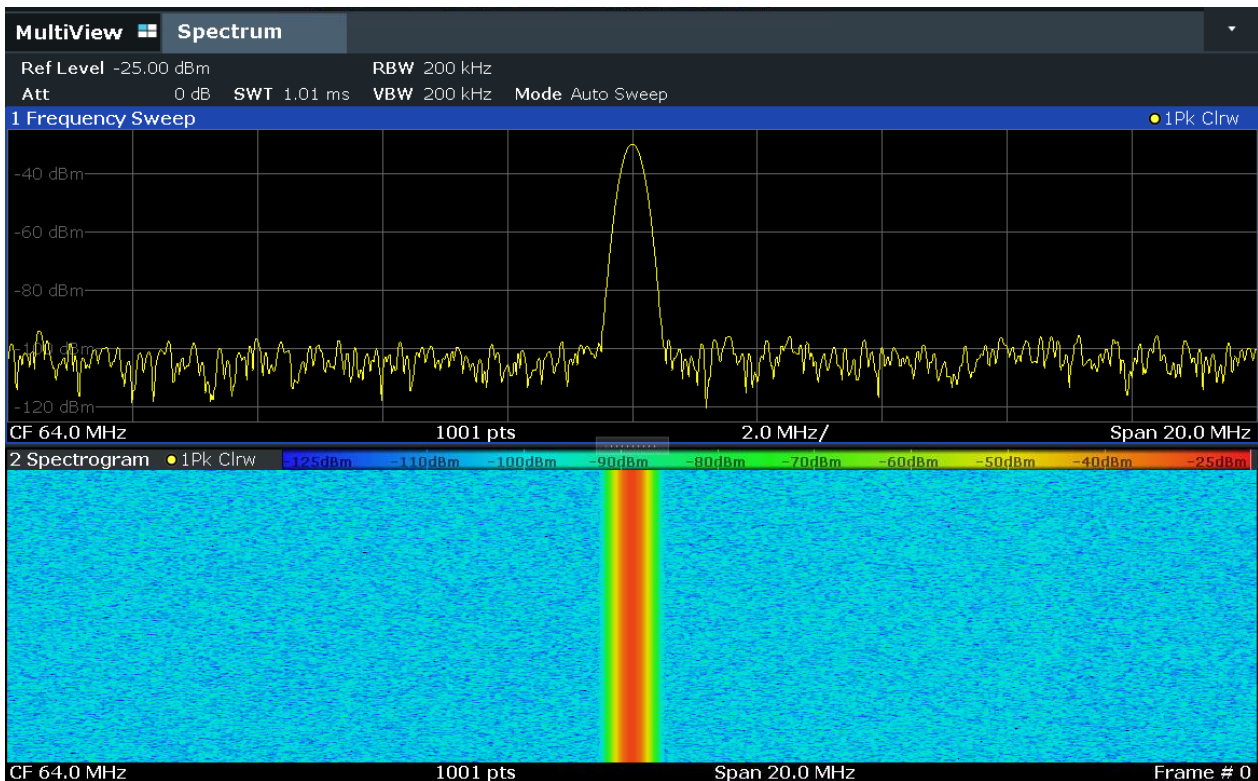
Figure 6-4: Spectrogram of the calibration signal

6.3   Activating Additional Measurement Channels

The R&S FSMR3 features multiple measurement channels, i.e. you can define several measurement configurations in parallel and then switch between the channels automatically to perform the measurements sequentially. We will demonstrate this feature by activating additional measurement channels for a different frequency range, a zero span measurement, and an I/Q analysis.

To activate additional measurement channels

1. Press the [Mode] key on the front panel.

2. On the "New Channel" tab of the "Signal + Spectrum Mode" dialog box, tap the "Spectrum" button.
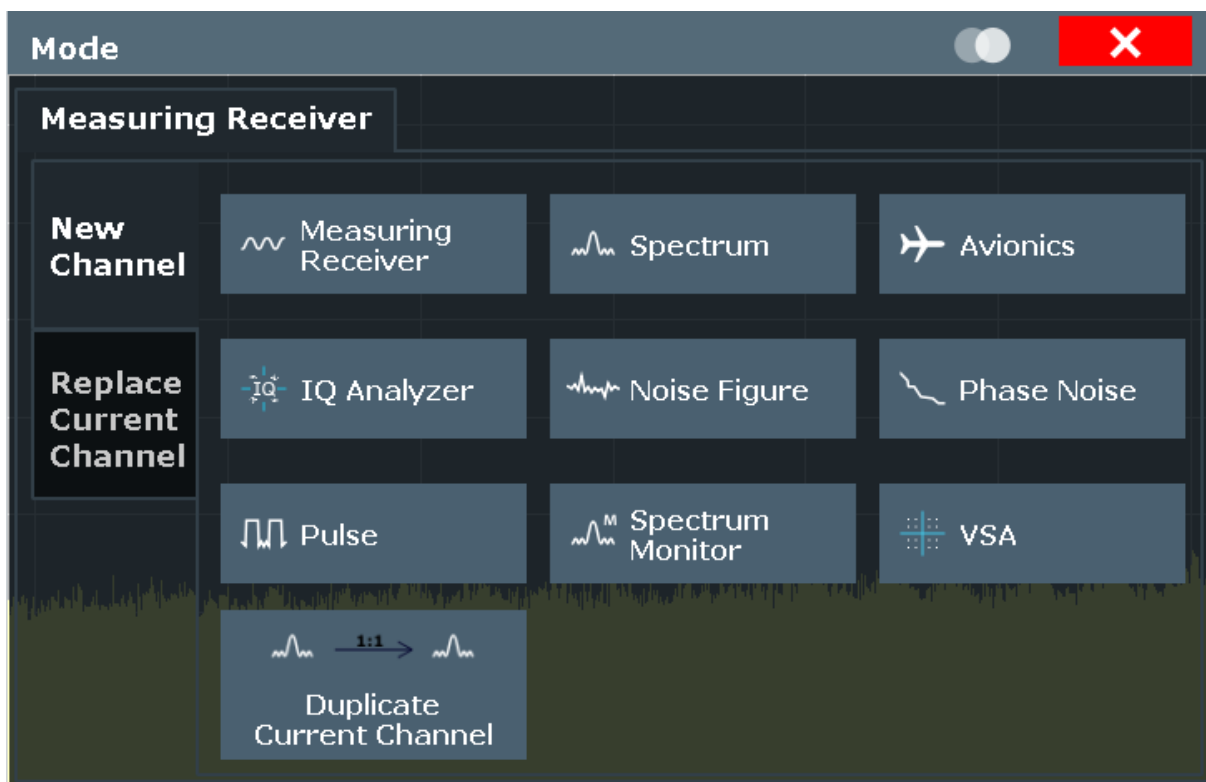
Figure 6-5: Adding a new measurement channel

3. Change the frequency range for this spectrum display:
   In the "Frequency" dialog box, set the **center frequency** to *500 MHz* and the **span** to *1 GHz*.
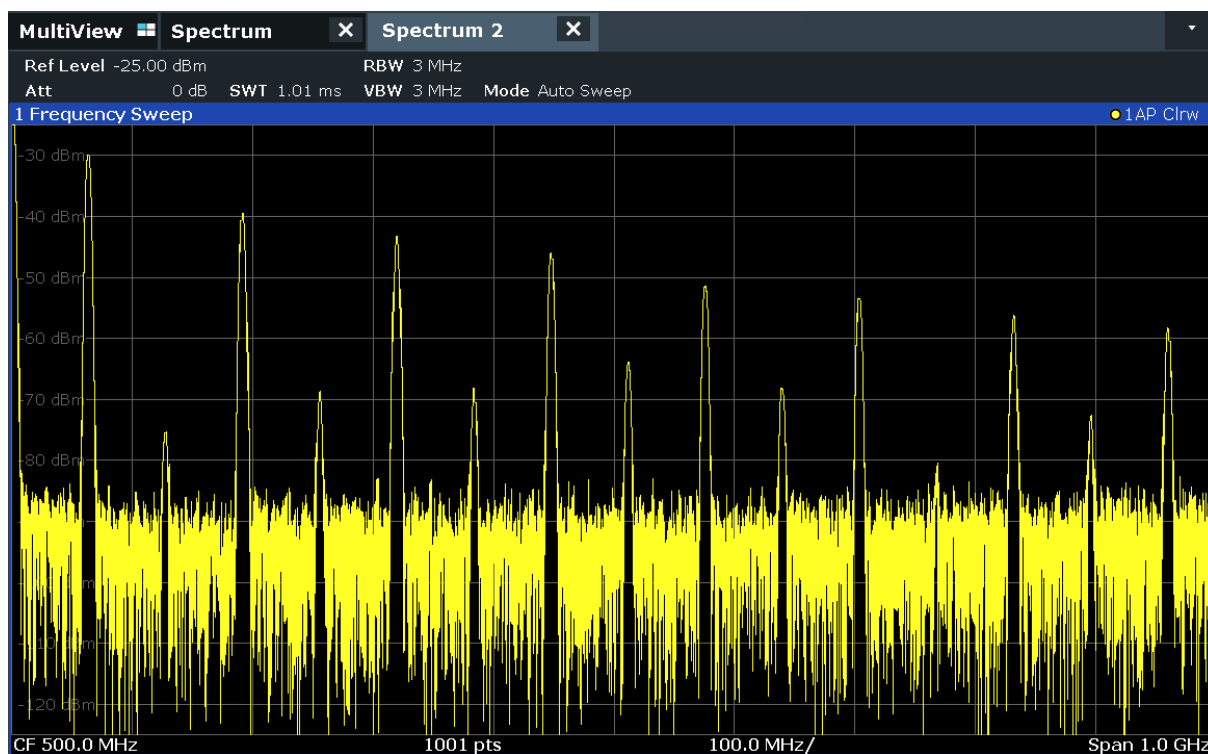
Figure 6-6: Frequency spectrum of the calibration signal with a larger span

4. Repeat the previous steps to activate a third Spectrum window.
   Change the frequency range for this spectrum display:
   In the "Frequency" dialog box, set the **center frequency** to *64 MHz* and tap "Zero Span".

   As the calibration signal does not vary over time, the level versus time diagram displays a straight line.

Figure 6-7: Time domain display of the calibration signal

5. Create a new channel for I/Q analysis:

   a) Press the [Mode] key.
   b) Tap the "IQ Analyzer" button to activate a channel for the I/Q Analyzer application.
   c) Tap the "Display Config" softkey to activate the SmartGrid mode.

d) Drag the "Real/Imag (I/Q)" icon from the evaluation bar to the SmartGrid.

Figure 6-8: Inserting a Real/Imag diagram for I/Q analysis

e) Close the SmartGrid mode.

The "IQ Analyzer" channel displays the real and imaginary signal parts in separate windows.

To display the MultiView tab

An overview of all active channels is provided in the "MultiView" tab. This tab is always displayed and cannot be closed.

► Tap the "MultiView" tab.

Figure 6-9: The "MultiView" tab

6.4　Performing Sequential Measurements

Although only one measurement can be performed at any one time, the measurements configured in the active channels can be performed sequentially, that means: one after the other, automatically, either once or continuously.

1.　

　　Tap the "Sequencer" icon in the toolbar.

2.　Toggle the "Sequencer" softkey in the "Sequencer" menu to "On".

　　A continuous sequence is started, i.e. each channel measurement is performed one after the other until the Sequencer is stopped.

Figure 6-10: "MultiView" tab with active Sequencer

In Figure 6-10, the "Spectrum 2" measurement is currently active (indicated by the "channel active" icon in the tab label).

3. Stop the Sequencer by tapping the "Sequencer" softkey again.

6.5 Setting and Moving a Marker

Markers are useful to determine the position of particular effects in the trace. The most common use is to determine a peak, which is the default setting when you activate a marker. We will set a marker on the peak in our first Spectrum measurement.

1. In the "MultiView" tab, double-tap the "Spectrum" window (frequency sweep with spectrogram display) to return to the "Spectrum" channel.

2. Tap the spectrum display to set the focus on that window.

3.

Press the "Split/Maximize" key on the front panel to maximize the spectrum window, as we currently do not need the spectrogram display.

4. Press the "RUN SINGLE" key on the front panel to perform a single sweep so we have a fixed trace to set a marker on.

5. Press the [MKR] key on the front panel to display the "Marker" menu.

Marker 1 is activated and automatically set to the maximum of trace 1. The marker position and value is indicated in the diagram area as M1[1].
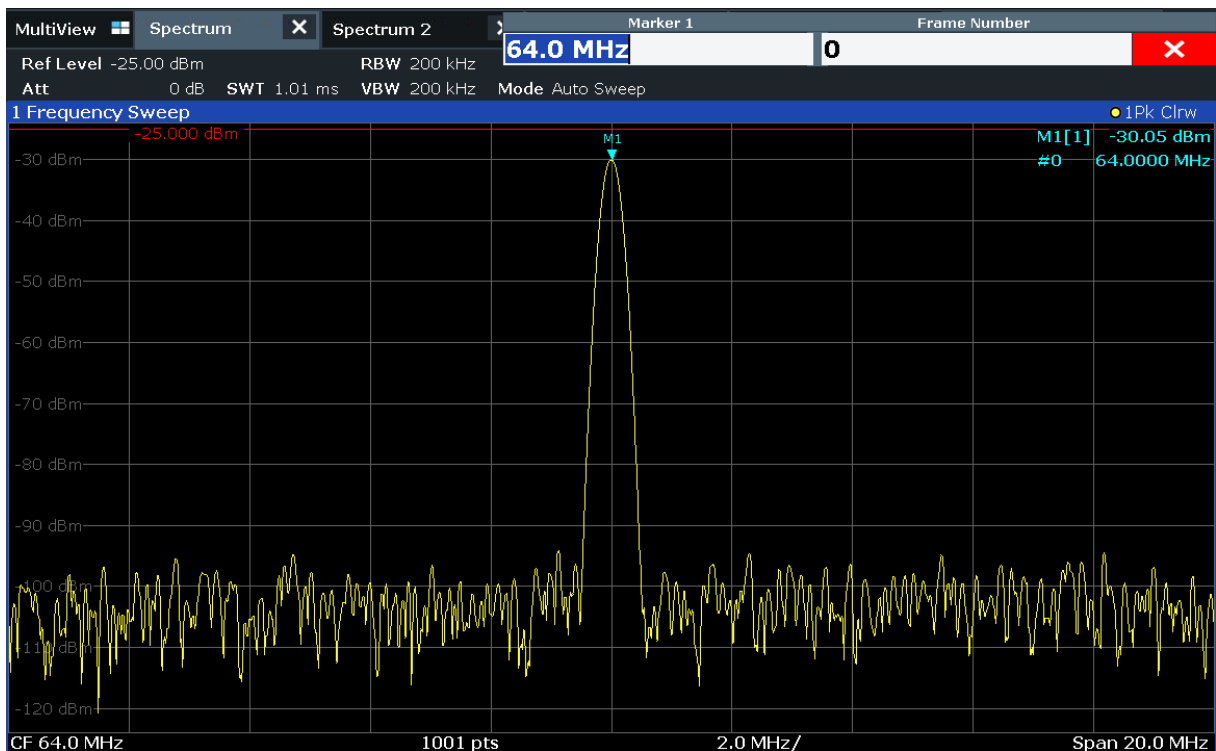
6. Now you can move the marker by tapping and dragging it to a different position. The current position is indicated by a dotted blue line. Notice how the position and value change in the marker area of the diagram.
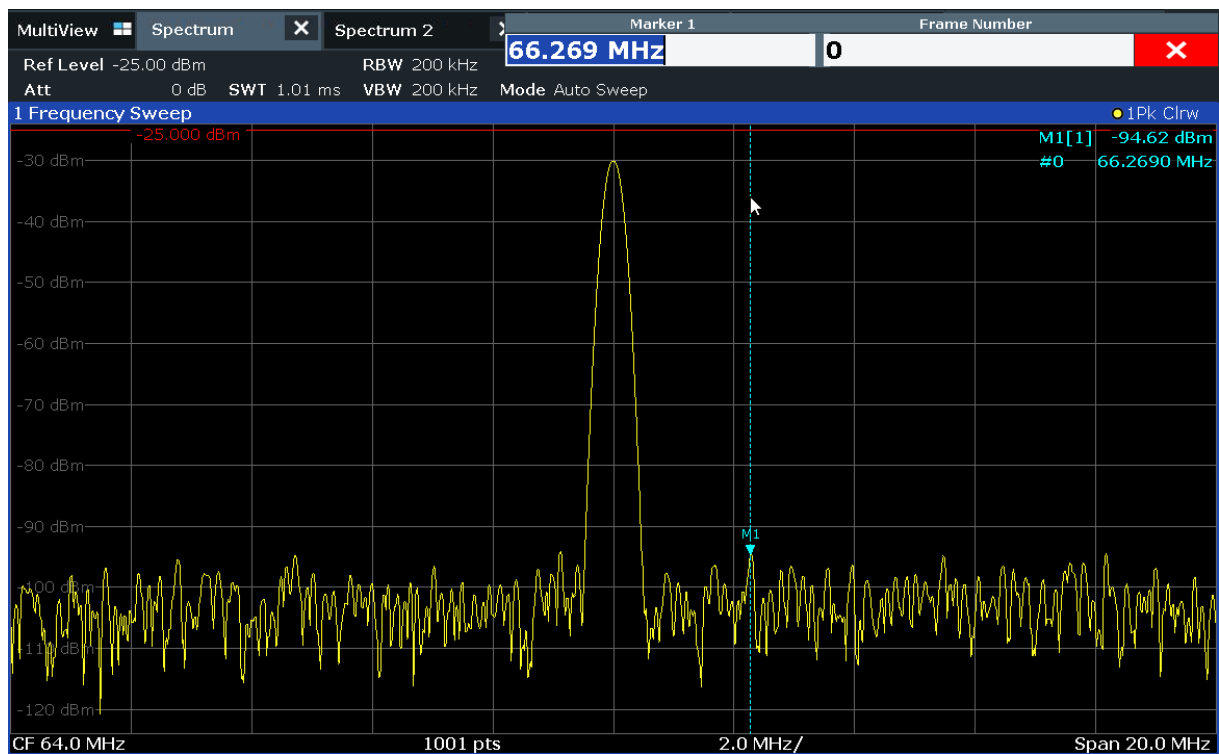
6.6   Displaying a Marker Peak List

The marker peak list determines the frequencies and levels of peaks in the spectrum automatically. We will display a marker peak list for the Spectrum 2 channel.

1. Tap the "Spectrum 2" tab.

2. Press the "RUN SINGLE" key on the front panel to perform a single sweep for which we will determine the peaks.

3.

    Tap the "SmartGrid" icon in the toolbar to activate SmartGrid mode.

4. Drag the "Marker Peak List" icon from the evaluation bar to the lower half of the display to add a new window for the peak list.

5. Close the SmartGrid mode.

6. To obtain a more conclusive peak list that does not contain noise peaks, for example, define a threshold that is higher than the noise floor:

    a) Press the [MKR] key on the front panel.

b) Tap the "Marker Config" softkey in the "Marker" menu.

c) Tap the "Search" tab in the "Marker" dialog box.

d) In the "Threshold" field, enter *-68 dBm*.

e) Tap the "State" box for "Threshold" to activate its use.

Only peaks that are larger than -68 dBm will be included in the peak list.

The marker peak list displays the determined peaks that are above the defined threshold.
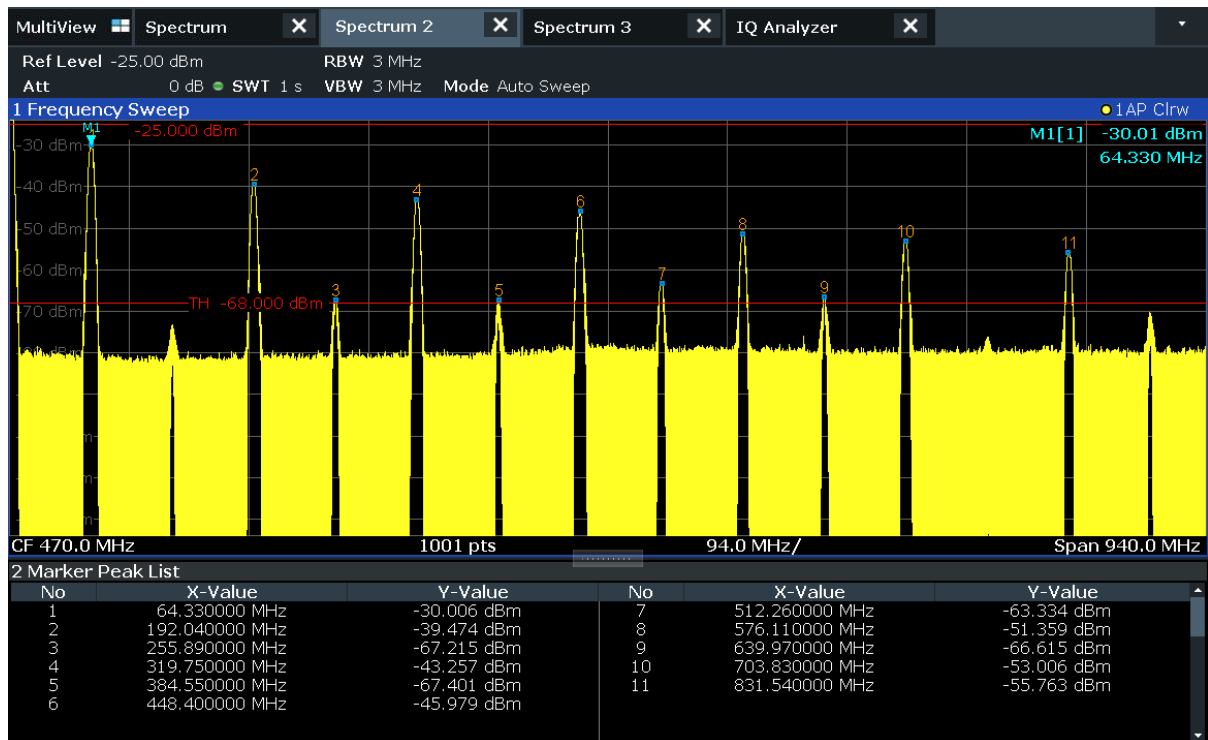
Figure 6-11: Marker Peak List

6.7   Zooming into the Display

To analyze the areas around the peak levels in more detail, we will zoom into the top 3 peaks.

1.

Tap the "Multiple Zoom" icon in the toolbar.

The icon is highlighted orange to indicate that multiple zoom mode is active.

2. Tap the diagram near the first peak and drag your finger to the opposite corner of the zoom area. A white rectangle is displayed from the point where you tapped to the current position.
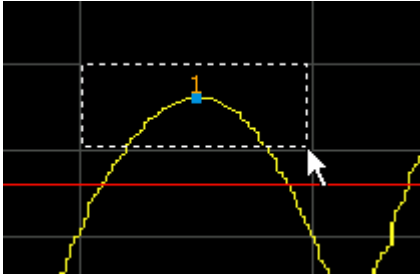
Figure 6-12: Defining the zoom area

When you remove your finger, the zoom area is enlarged in a second (sub-)window.
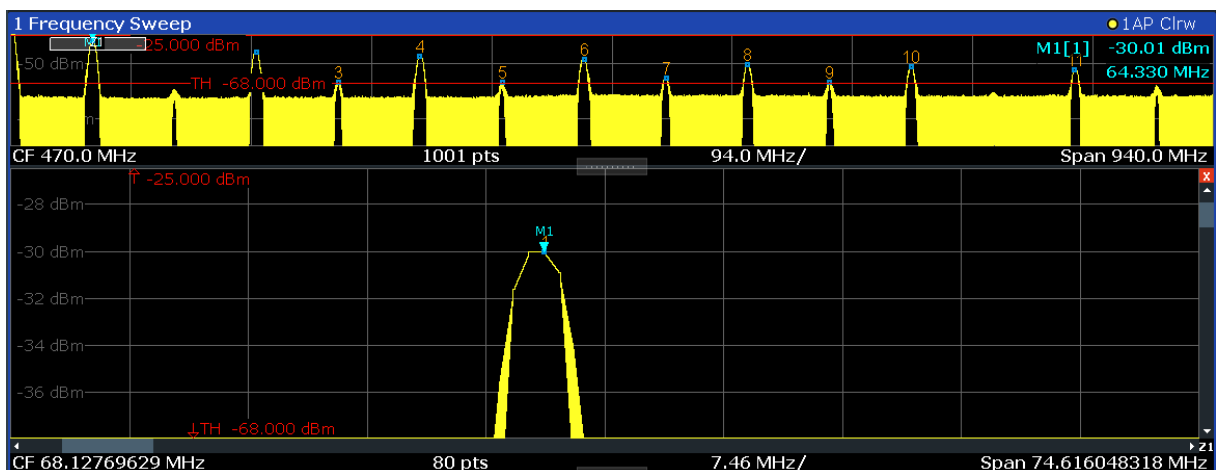
Figure 6-13: Zoomed display around a peak

3. In Figure 6-13, the enlarged peak is represented by a very thick trace. This is due to the insufficient number of sweep points. The missing sweep points for the zoomed display are interpolated, which provides poor results. To optimize the results, we will increase the number of sweep points from the default 1001 to 32001.

    a) Press the [Sweep] key on the front panel.
    b) Tap the "Sweep Config" softkey in the "Sweep" menu.
    c) In the "Sweep Points" field, enter *32001*.
    d) Press the RUN SINGLE key on the front panel to perform a new sweep with the increased number of sweep points.
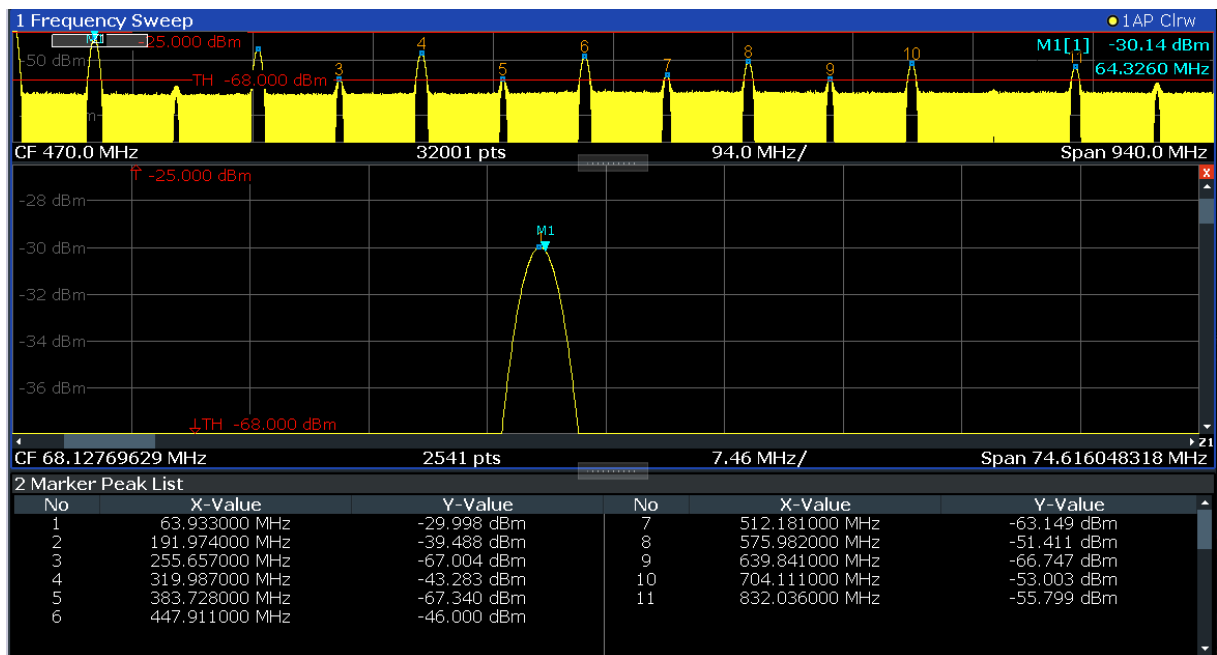
Figure 6-14: Zoomed peak with increased number of sweep points

Note that the trace becomes much more precise.

4.

Tap the "Multiple Zoom" icon in the toolbar again and define a zoom area around markers M4, M5 and M6.
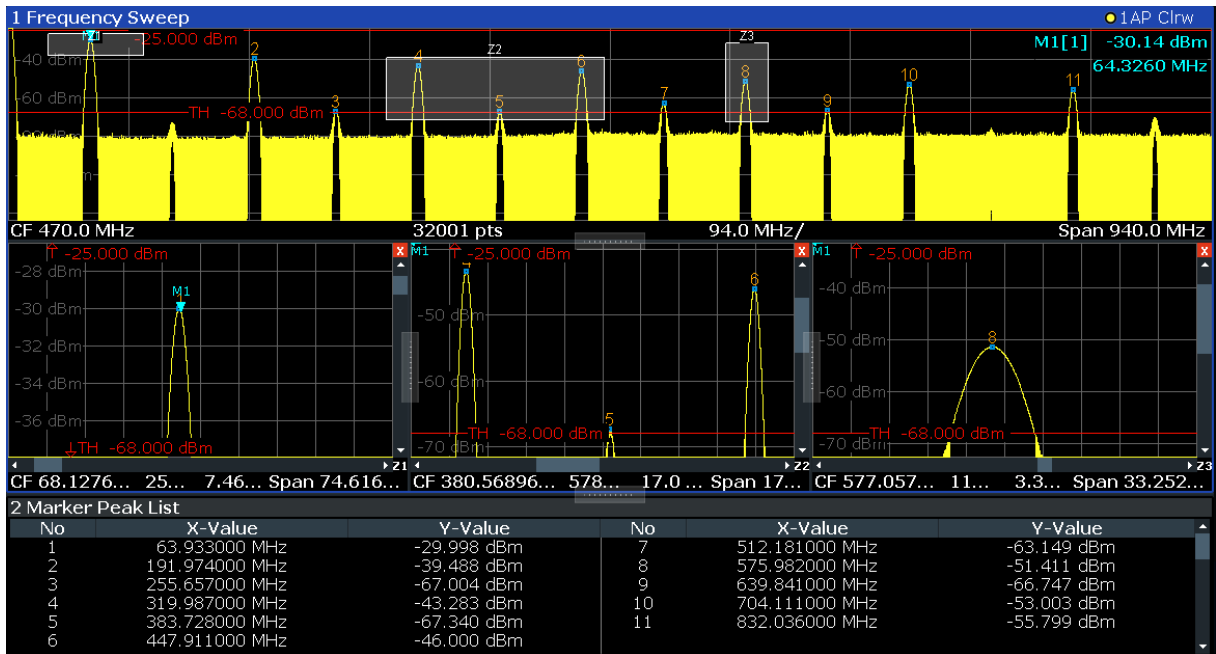
Figure 6-15: Multiple zoom windows

5. Tap the ⬚ "Multiple Zoom" icon in the toolbar again and define a zoom area around marker M8.

6. To increase the size of the third zoom window, drag the "splitter" between the windows to the left or right or up or down.

Figure 6-16: Enlarged zoom window

6.8   Zooming into the Display Permanently

The zoomed results from Chapter 6.7, "Zooming into the Display", on page 63 were only graphical changes to the display. Now we would like to change the measurement settings such that the zoomed result is maintained permanently. We will demonstrate this in the Spectrum channel.

1. Tap the "Spectrum" tab.

2. Double-tap the diagram close to the peak of the measurement.

   A peak marker (M1) is inserted at the detected peak.

3. Select the (graphical) zoom icon on the toolbar.

   Any subsequent touch gestures define the zoom area for the zoom display.

4. Place two fingers on the diagram, to the left and right of the marker, and stretch them apart.
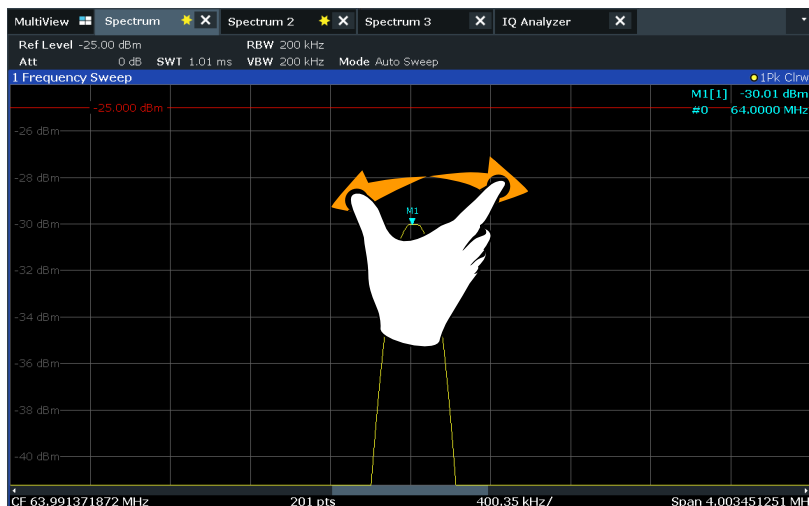
   The area around the marker is enlarged in the result display.

5. When the area has the size you require, remove your fingers from the display.

The displayed span and the number of displayed sweep points is smaller than before, all other measurement settings remain unchanged.

6. Tap the "Measurement Zoom" icon on the toolbar for a second or so.

A context menu with further options is displayed.

7. Select "Adapt Hardware to Zoom (selected diagram)".

The span of the measurement is changed, and due to the automatic coupling of the span to the sweep time, RBW and VBW, those values are also changed. The number of sweep points is restored to the default 1001. The range of the trace is the same as in the graphical zoom. However, due to the smaller RBW filter, the peak is narrower.
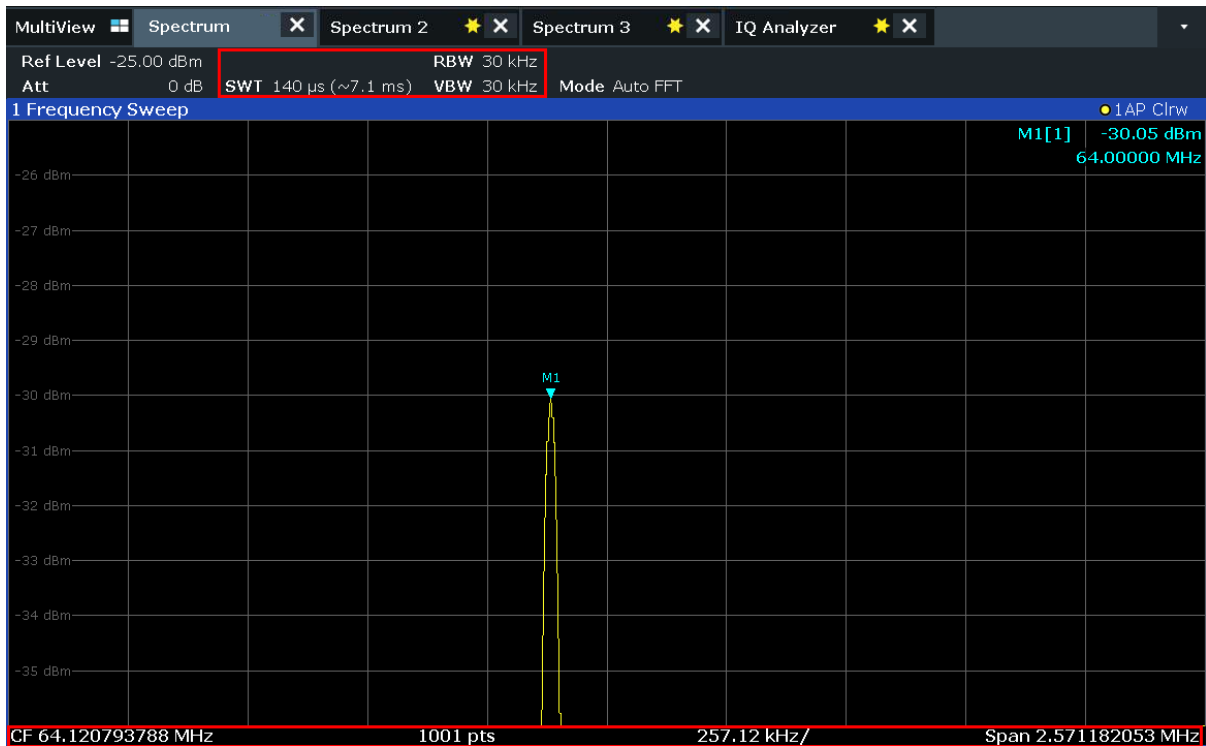
6.9   Saving Settings

To restore the results of our measurements later, we will store the instrument set-
tings to a file.

To save the instrument settings to a file

1.

    Tap the "Save" icon in the toolbar.

2.

    Press the keyboard key on the front panel to display the online keyboard, as
    you will have to enter text in the next step.

3. In the "Save" dialog box, tap the "File Name" field and enter *MyMultiView-
    Setup* using the keyboard.
    Keep the default "File Type" setting "Instrument with all Channels" to store the
    configuration of all channels.
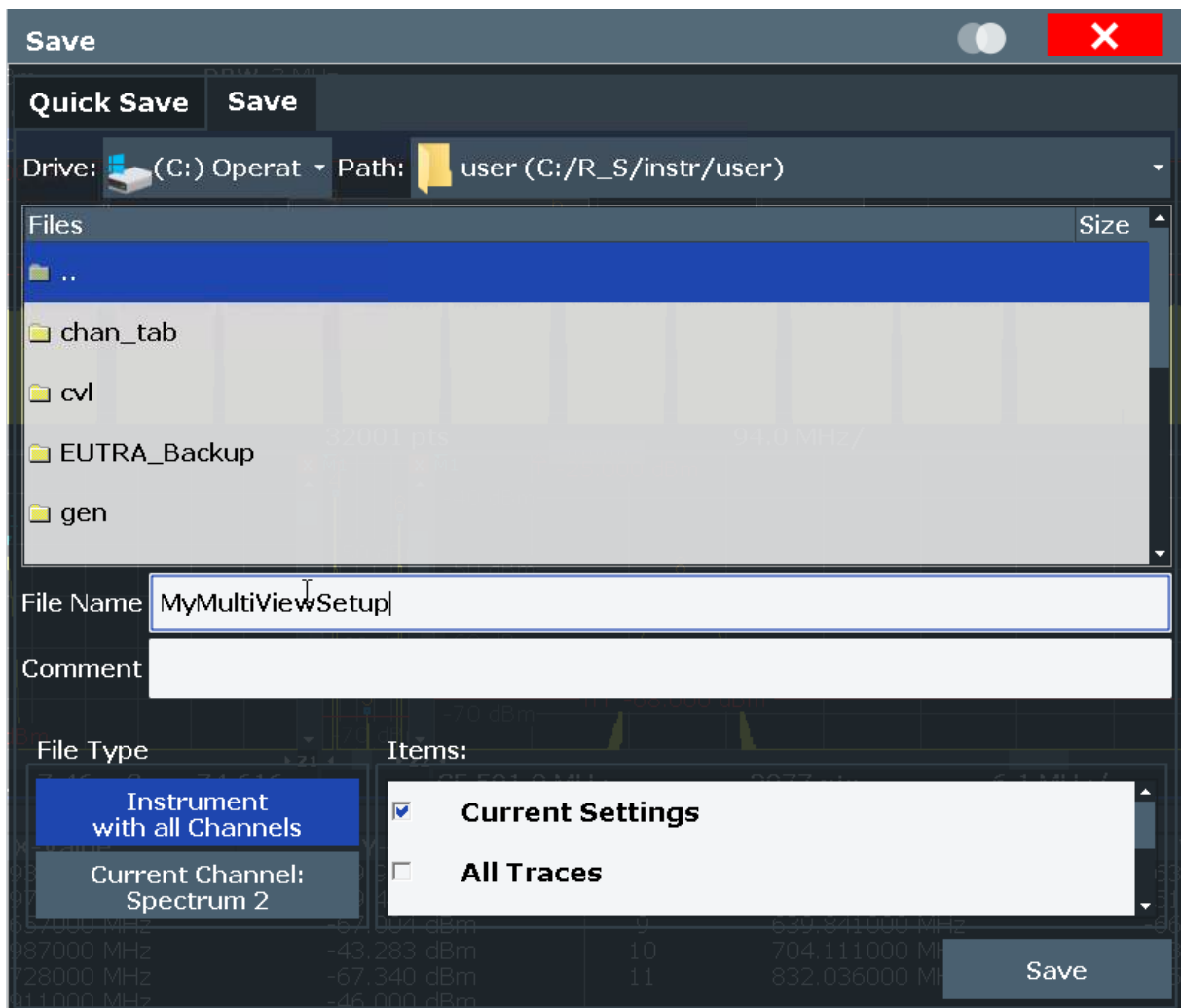
Figure 6-17: Saving the instrument settings to a file

4. Tap the "Save" button.

   The file `MyMultiViewSetup.dfl` is stored in the default directory `C:/R_S/ instr/user`.

To load stored instrument settings

You can restore the settings to the instrument at any time using the settings file.

1. Press the [PRESET] button to restore the default instrument settings so you can check that the stored user settings are actually restored afterwards.

2.

   Tap the "Load" icon in the toolbar.

3. In the "Load" dialog box, select the `MyMultiViewSetup.dfl` file in the default directory `C:/R_S/instr/user`.

4. Tap the "Load" button.

   All instrument settings are restored and the display should resemble Figure 6-16, which shows the instrument display right before the settings were stored.

6.10   Printing and Saving Results

Finally, after a successful measurement, we will document our results. First we will export the numeric trace data, then we will create a screenshot of the graphical display.

To export the trace data

1. Press the [TRACE] key on the front panel.

2. Tap the "Trace Config" softkey.

3. Tap the "Trace Export" tab.

4. Tap the "Export Trace to ASCII File" button.

5. Enter the file name *MyMultiViewResults*.

   The trace data is stored to `MyMultiViewResults.DAT`

To create a screenshot of the display

1.

   Tap the "Print immediately" icon in the toolbar.

   A screenshot of the current display is created. Note that the colors on the screen are inverted in the screenshot to improve printout results.

2. In the "Save Hardcopy as Portable Network Graphics (PNG)" dialog box, enter a file name, e.g. *MyMultiViewDisplay*.

   The screenshot is stored to `MyMultiViewDisplay.png`.
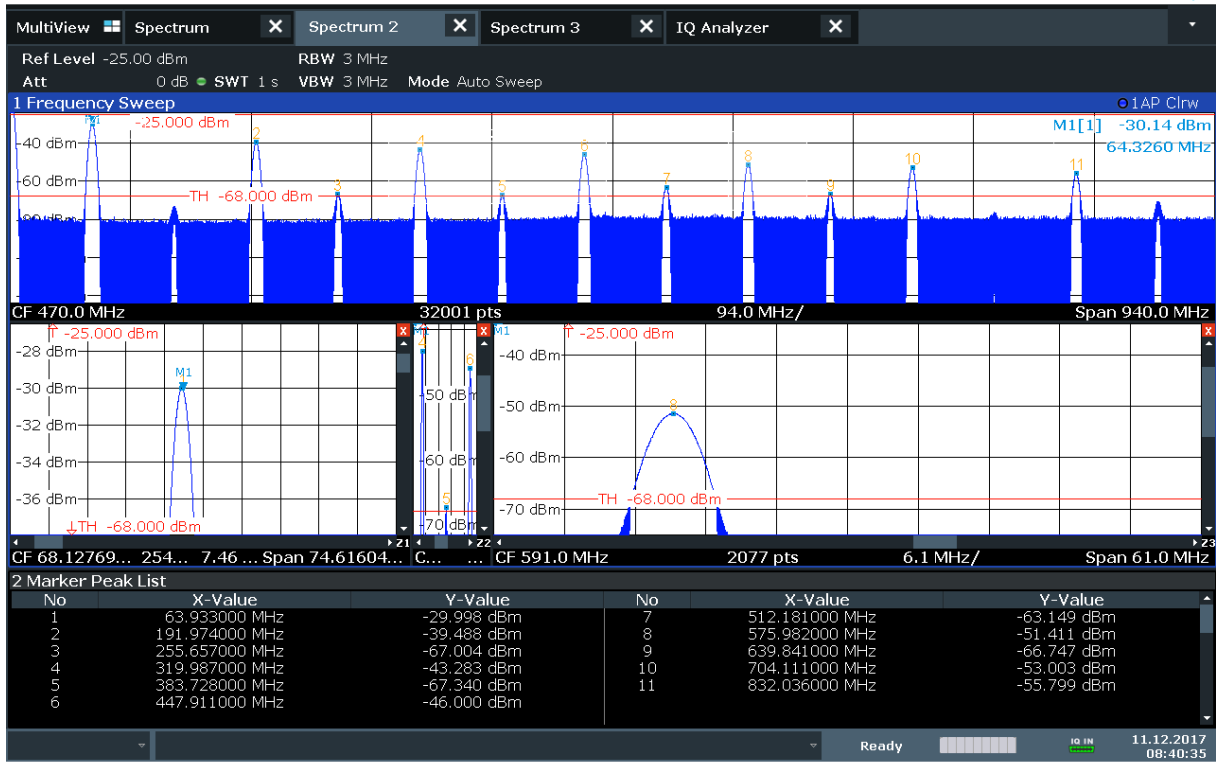
Figure 6-18: Screenshot of the current display

7   Operating the Instrument

This chapter provides an overview on how to work with the R&S FSMR3.

> ⓘ **Remote control**
>
> In addition to working with the R&S FSMR3 interactively, located directly at the instrument, it is also possible to operate and control it from a remote PC. Various methods for remote control are supported:
> * Connecting the instrument to a (LAN) network
> * Using the LXI browser interface in a LAN network
> * Using the Windows Remote Desktop application in a LAN network
> * Connecting a PC via the GPIB interface
>
> How to configure the remote control interfaces is described in the R&S FSMR3 user manual.

7.1   Understanding the Display Information

The following figure shows a measurement diagram in Spectrum mode. All different information areas are labeled. They are explained in more detail in the following sections.
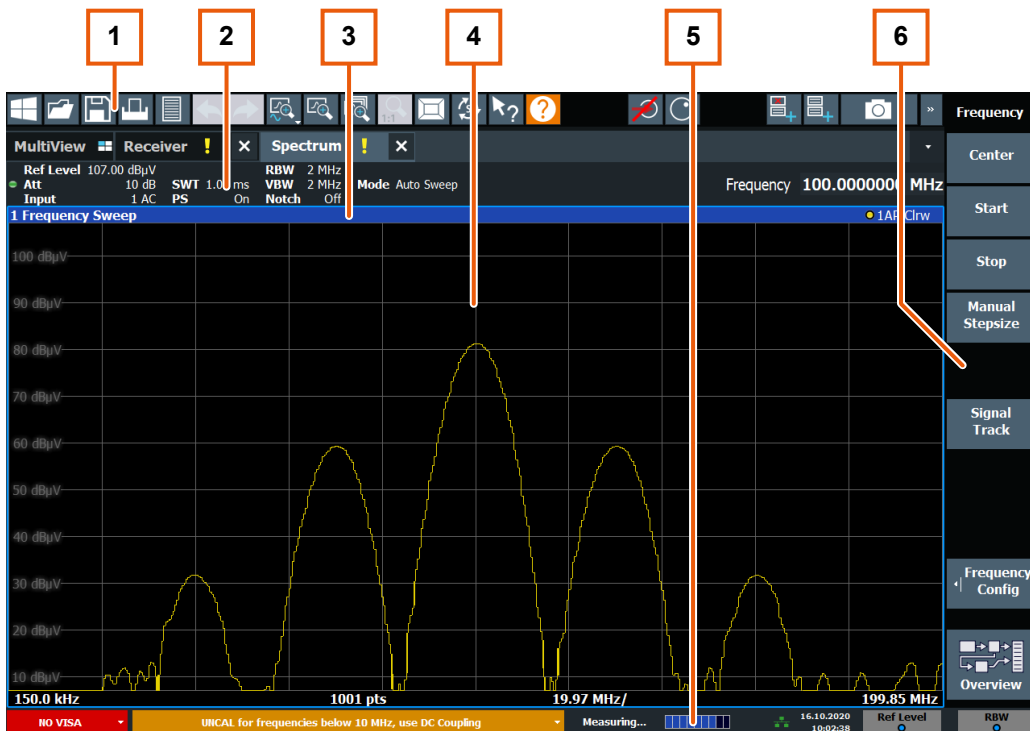
Figure 7-1: Screen layout of the noise figure measurement application

1 = Toolbar
2 = Channel bar
3 = Diagram header
4 = Result display
5 = Status bar
6 = Softkey bar

💡 **Hiding elements in the display**

You can hide some of the elements in the display, for example the status bar or channel bar, to enlarge the display area for the measurement results. ("Setup > Display > Displayed Items")

For details, see the R&S FSMR3 User Manual.

7.1.1   Channel Bar

Using the R&S FSMR3 you can handle several different measurement tasks (channels) at the same time (although they can only be performed asynchronously). For each channel, a separate tab is displayed on the screen. To switch from one channel display to another, simply select the corresponding tab.
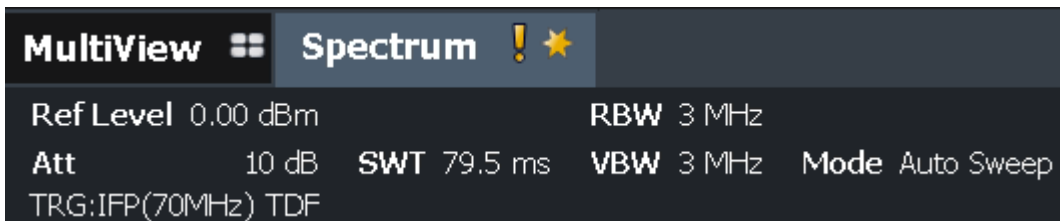
If many tabs are displayed, select the tab selection list icon at the right end of the channel bar. Select the channel you want to switch to from the list.
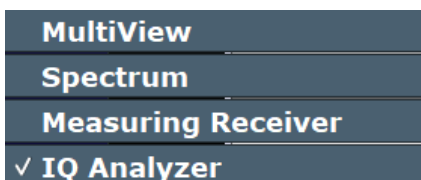
MultiView tab

An additional tab labeled "MultiView" provides an overview of all active channels at a glance. In the "MultiView" tab, each individual window contains its own channel bar with an additional button. Tap this button, or double-tap in any window, to switch to the corresponding channel display quickly.

Icons in the channel bar

The ⭐ yellow star icon on the tab label (sometimes referred to as a "dirty flag") indicates that invalid or inconsistent data is displayed, that is: the trace no longer matches the displayed instrument settings. Thiscan happen, for example, when you change the measurement bandwidth, but the displayed trace is still based on the old bandwidth. As soon as a new measurement is performed or the display is updated, the icon disappears.

The ⚠ icon indicates that an error or warning is available for that measurement channel. This is particularly useful if the MultiView tab is displayed.

The ⚙ icon indicates the currently active channel during an automatic measurement sequence (**Sequencer** functionality).

Channel-specific settings

Beneath the channel name, information on channel-specific settings for the measurement is displayed in the **channel bar**. Channel information varies depending on the active application.

In the Spectrum application, the R&S FSMR3 shows the following settings:

Table 7-1: Channel settings displayed in the channel bar in the Spectrum application

Ref Level	Reference level
m.+el.Att	Mechanical and electronic RF attenuation that has been set.
Ref Offset	Reference level offset
SWT	Sweep time that has been set.
	If the sweep time does not correspond to the value for automatic coupling, a bullet is displayed in front of the field. The color of the bullet turns red if the sweep time is set below the value for automatic coupling. In addition, the UNCAL flag is shown. In this case, the sweep time must be increased.
	For FFT sweeps, an estimated duration for data capture *and processing* is indicated behind the sweep time in the channel bar.
Meas Time/AQT	Measurement (acquisition) time, calculated from analysis bandwidth and number of samples (for statistics measurements)
RBW	Resolution bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet appears in front of the field.
VBW	Video bandwidth that has been set.
	If the bandwidth does not correspond to the value for automatic coupling, a green bullet is displayed in front of the field.
AnBW	Analysis bandwidth (for statistics measurements)
Compatible	Compatible device mode (FSP, FSU, default; default not displayed)
Mode	Indicates which sweep mode type is selected: • "Auto FFT": automatically selected FFT sweep mode • "Auto sweep": automatically selected swept sweep mode • "Sweep": manually selected frequency sweep mode • "FFT": manually selected FFT sweep mode

Icons for individual settings

A bullet next to the setting indicates that user-defined settings are used, not automatic settings. A green bullet indicates this setting is valid and the measurement is correct. A red bullet indicates an invalid setting that does not provide useful results.

Common settings

The channel bar above the diagram not only displays the channel-specific settings. It also displays information on instrument settings that affect the measurement results even though it is not immediately apparent from the display of the measured values. This information is displayed in gray font and only when applicable for the current measurement, as opposed to the channel-specific settings that are always displayed.
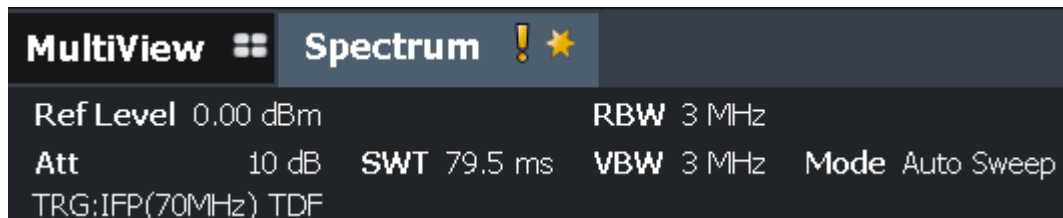
The following types of information are displayed, if applicable.

Table 7-2: Common settings displayed in the channel bar

"SGL"	The sweep is set to single sweep mode.
"Sweep Count"	The current signal count for measurement tasks that involve a specific number of subsequent sweeps (see "Sweep Count" setting in "Sweep settings" in the User Manual)
"TRG"	Trigger source (for details see "Trigger settings" in the User Manual) • **EXT**: External • **IFP**: IF power (+trigger bandwidth) • **PSE**: Power sensor • **RFP**: RF power • **SQL**: Squelch • **TIM**: Time • **VID**: Video
"6dB"/"RRC"/"CHN"	Filter type for sweep bandwidth (see "Bandwidth settings" in the User Manual)
"PA"/Ext "PA"	The preamplifier is activated. / Data compensation is performed using data from the (optional) external preamplifier.

"YIG Bypass"	The YIG filter is deactivated.
"GAT"	The frequency sweep is controlled via the TRIGGER INPUT connector.
"TDF"	The specified transducer factor is activated.
"75 Ω"	The input impedance of the instrument is set to 75 Ω.
"FRQ"	A frequency offset ≠ 0 Hz is set.
"DC/AC"	DC or AC coupling is used for the input.

Changing the Channel Name

The measurement channels are labeled with their default name. If that name already exists, a sequential number is added. You can change the name of the measurement channel by double-tapping the name in the channel bar and entering a new name.

Note: Channel name restrictions. Channel names can have a maximum of 31 characters, and must be compatible with the Windows conventions for file names. In particular, they must not contain special characters such as ":", "*", "?".

7.1.2   Window Title Bar

Each channel in the R&S FSMR3 display can contain several windows. Each window can display either a graph or a table as a result of the channel measurement. Which type of result evaluation is displayed in which window is defined in the display configuration (see Chapter 7.5, "Displaying Results", on page 96). The window title bar indicates which type of evaluation is displayed.

Double-tap the window title bar to enlarge the window temporarily. Double-tap it again to restore the original size.

See also Chapter 7.5.4, "Switching Between a Split and Maximized Window Display", on page 103.

Trace Information in Window Title Bar

Information on the displayed traces is indicated in the window title bar.
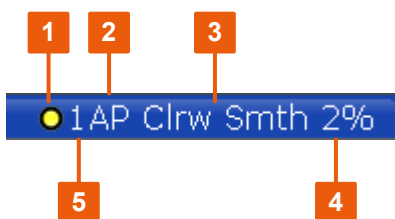
(1) **Trace color**		Color of trace display in diagram
(2) **Trace no.**		Trace number (1 to 6)
(3) **Detector**		Selected detector:
	AP	AUTOPEAK detector
	Pk	MAX PEAK detector
	Mi	MIN PEAK detector
	Sa	SAMPLE detector
	Av	AVERAGE detector
	Rm	RMS detector
	QP	QUASIPEAK detector
(4) **Trace Mode**		**Sweep mode:**
	Clrw	CLEAR/WRITE
	Max	MAX HOLD
	Min	MIN HOLD
	Avg	AVERAGE (Lin/Log/Pwr)
	View	VIEW
(5) **Smoothing factor**	Smth	Smoothing factor, if enabled.
Norm/NCor		Correction data is not used.

7.1.3　Marker Information

Marker information is provided either in the diagram grid or in a separate marker table, depending on the configuration.

Marker information in diagram grid

Within the diagram grid, the x-axis and y-axis positions of the last two markers or delta markers that were set are displayed, if available, as well as their index. The

value in the square brackets after the index indicates the trace to which the marker is assigned. (Example: M2[1] defines marker 2 on trace 1.) For more than two markers, a separate marker table is displayed beneath the diagram by default.

Marker information in marker table

In addition to the marker information displayed within the diagram grid, a separate marker table may be displayed beneath the diagram. This table provides the following information for all active markers:

Type	Marker type: N (normal), D (delta), T (temporary, internal), PWR (power sensor)
Ref	Reference (for delta markers)
Trc	Trace to which the marker is assigned
X-value	X-value of the marker
Y-value	Y-value of the marker
Func	Activated marker or measurement function
Func .Result	Result of the active marker or measurement function

The functions are indicated with the following abbreviations:

FXD	Fixed reference marker
PHNoise	Phase noise measurement
CNT	Signal count
TRK	Signal tracking
NOIse	Noise measurement
MDepth	AM modulation depth
TOI	Third order intercept measurement

7.1.4   Frequency and Span Information in Diagram Footer

The information in the diagram footer (beneath the diagram) depends on the current application, measurement, and result display.

For a default measurement in the Spectrum mode, the Diagram result display contains the following information, for example:

Label	Information
CF	Center frequency
Span	Frequency span (frequency domain display)
ms/	Time per division (time domain display)
Pts	Number of sweep points or (rounded) number of currently displayed points in zoom mode

7.1.5   Instrument and Status Information

Global instrument settings and functions (such as LXI configuration mode), the instrument status and any irregularities are indicated in the status bar beneath the diagram.

In the MultiView tab, the status bar always displays the information for the currently selected measurement.

The following information is displayed:

Instrument status

	The instrument is configured for operation with an external reference.

Progress

The progress of the current operation is displayed in the status bar.

ⓘ   In the MultiView tab, the progress bar indicates the status of the currently selected measurement, not the measurement a Sequencer is currently performing, for example.

Date and time

The date and time settings of the instrument are displayed in the status bar.

7.1.6 Error Information

If errors or irregularities are detected, a keyword and an error message, if available, are displayed in the status bar.

Depending on the type of message, the status message is indicated in varying colors.

Table 7-3: Status bar information - color coding

Color	Type	Description
Red	Error	An error occurred at the start or during a measurement, e.g. due to missing data or wrong settings, so that the measurement cannot be started or completed correctly.
Orange	Warning	An irregular situation occurred during measurement, e.g. the settings no longer match the displayed results, or the connection to an external device was interrupted temporarily.
Gray	Information	Information on the status of individual processing steps.
No color	No errors	No message displayed - normal operation.
Green	Measurement successful	Some applications visualize that the measurement was successful by showing a message.

ⓘ If any error information is available for a channel, an exclamation mark is displayed next to the channel name (⚠). This is particularly useful when the MultiView tab is displayed, as the status bar in the MultiView tab always displays the information for the currently selected channel only.

For a description of possible errors, see the R&S FSMR3 user manual.

7.2 Accessing the Functionality

All tasks necessary to operate the instrument can be performed using this user interface. Apart from instrument specific keys, all other keys that correspond to an external keyboard (e.g. arrow keys, ENTER key) operate conform to Microsoft.

For most tasks, there are at least 2 alternative methods to perform them:

- Using the touchscreen

- Using other elements provided by the front panel, e.g. the keypad, rotary knob, or arrow and position keys.

The measurement and instrument functions and settings can be accessed by selecting one of the following elements:

- System and function keys on the front panel of the instrument
- Softkeys on the touchscreen
- Context menus for specific elements on the touchscreen
- Icons on the tool bar in the touchscreen
- Displayed setting on the touchscreen

7.2.1   Toolbar

Standard functions can be performed via the icons in the toolbar at thetop of the screen.

You can hide the toolbar display, e.g. when using remote control, to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the R&S FSMR3 User Manual for details.

The following functions are available by default:

Table 7-4: Standard Application Functions in the Toolbar

Icon	Description
	Windows: displays the Windows "Start" menu and task bar
	Open: opens a file from the instrument ("Save/Recall" menu)
	Store: stores data on the instrument ("Save/Recall" menu)
	Print: defines print settings ("Print" menu)
	Undo: reverts last operation

Icon	Description
	Redo: repeats previously reverted operation
	Measurement zoom: applies to the next display you select;
	Displays a dotted rectangle in the diagram that can be expanded to define the zoom area; the selected diagram is replaced by a new diagram with adapted measurement settings which displays the selected extract of the trace.
	Also provides a context menu to determine the firmware behavior for touch gestures: "Level Lock" (Default:) The reference level (and thus the attenuation) remains unchanged during touch gestures on the screen. "X-Lock" The x-axis of the diagram is not changed during subsequent touch gestures. "Y-Lock" The y-axis of the diagram is not changed during subsequent touch gestures. "Adapt Measurement to Zoom (selected diagram)" Automatically adapts the measurement settings to the currently zoomed display
	(Graphical) Zoom mode: applies to the next display you select;
	Displays a dotted rectangle in the diagram that can be expanded to define the zoom area; the selected diagram is replaced by a new diagram which displays an enlarged extract of the trace.
	This function changes the behavior of finger gestures such as dragging or stretching a finger (see also "Touch gestures in diagrams change measurement settings" on page 94)
	Multiple (graphical) zoom mode: applies to the next display you select;
	Allows you to enlarge several different areas of the trace simultaneously.
	Displays a dotted rectangle in the diagram that can be expanded to define the zoom area; a subwindow is added to display an enlarged extract of the trace
	This function changes the behavior of finger gestures such as dragging or stretching a finger (see also "Touch gestures in diagrams change measurement settings" on page 94)
	Zoom off: displays the diagram in its original size
	This function only restores graphically zoomed displays. Measurement zooms, for which measurement settings were adapted, remain untouched.
	SmartGrid: activates "SmartGrid" mode to configure the screen layout
	Sequencer: opens the "Sequencer" menu to perform consecutive measurements
	Help (+ Select): allows you to select an object for which context-specific help is displayed

Icon	Description
?	Help: displays context-sensitive help topic for currently selected element
⊙	Print immediately: prints the current display (screenshot) as configured
In "SmartGrid" mode only:	
✕	Exit "SmartGrid" mode

7.2.2   Softkeys

Softkeys are virtual keys provided by the software. Thus, more functions can be provided than those that can be accessed directly via the function keys on the instrument. Softkeys are dynamic, i.e. depending on the selected function key, a different list of softkeys is displayed on the right side of the screen.

A list of softkeys for a certain function key is also called a menu. Softkeys can either perform a specific function or open a dialog box.

The "More" softkey indicates that the menu contains more softkeys than can be displayed at once on the screen. When pressed, it displays the next set of softkeys.

Recognizing the softkey status by color

Color	Meaning
Orange	Associated dialog box is open
Blue	Associated function is active; for toggle keys: currently active state
Gray	Instrument function is temporarily not available due to a specific setting or missing option

💡 You can hide the softkey display, e.g. when using remote control, to enlarge the display area for the measurement results ("Setup > Display > Displayed Items"). See the User Manual for details.

7.2.3   Context Menus

Several items in the diagram area have context menus, such as traces, markers, softkeys, or settings in the channel bar. If you right-click on one of these items (or tap it for about 1 second), a menu is displayed with context-specific menu items for the selected item.

If SCPI Recording is available, the context menu contains a link to the SCPI recorder functions and a link to a help topic for the specific item.

For details, see the R&S FSMR3 User Manual.
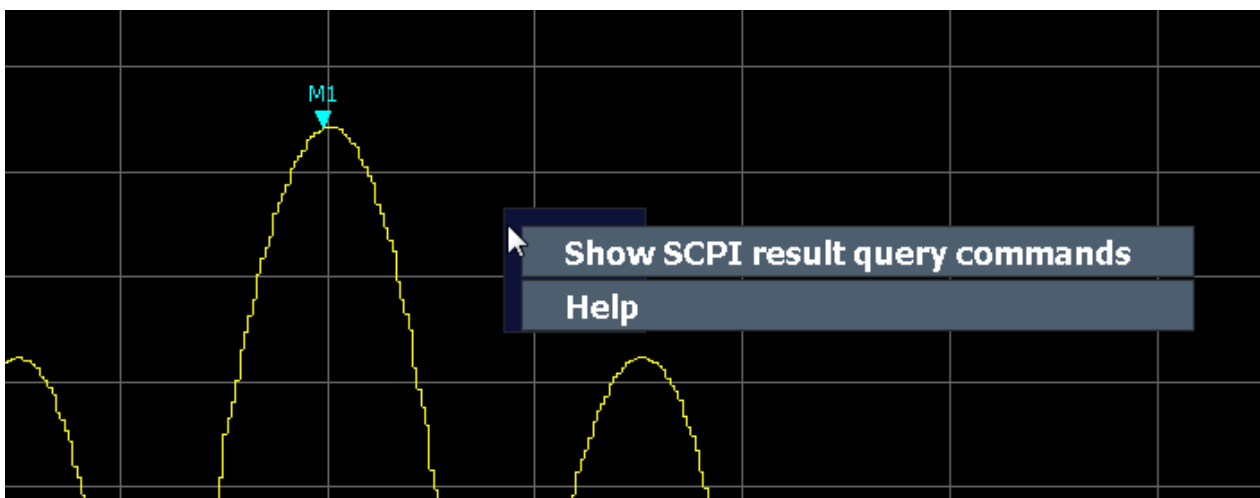
Figure 7-2: Context menu for a result display with SCPI Recorder functions

If SCPI Recorder functions are not available, for example for channel bar settings or in some applications, the context menu contains functions for the selected item. These functions correspond to the functions also provided for the item in softkey menus. This is useful, for example, when the softkey display is hidden.
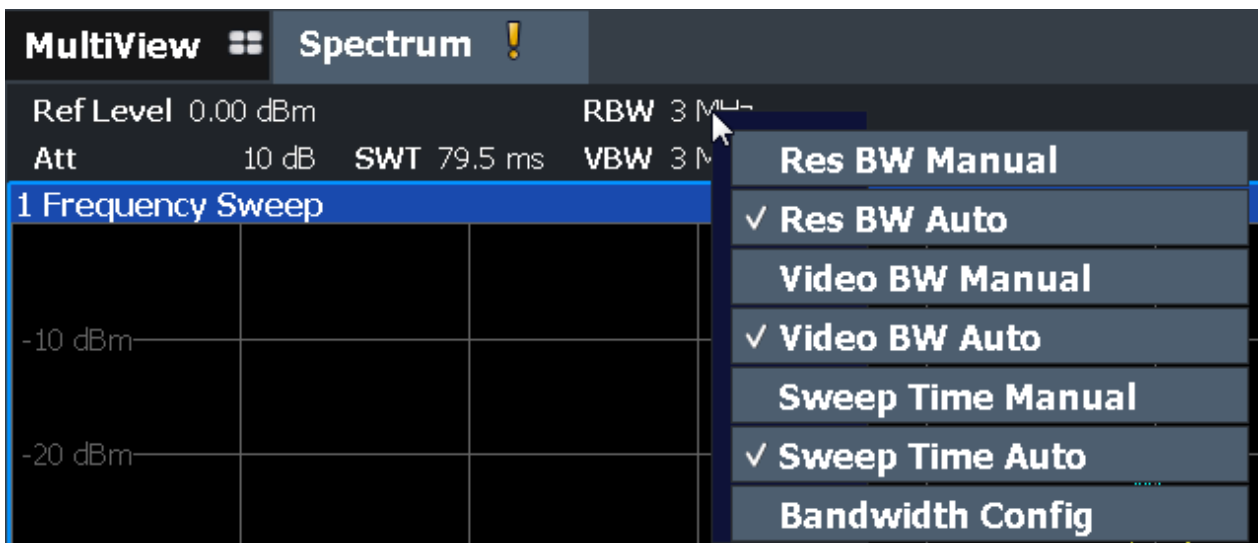
Figure 7-3: Context menu for channel bar setting

7.2.4   On-screen Keyboard

The on-screen keyboard is an additional means of interacting with the instrument without having to connect an external keyboard.
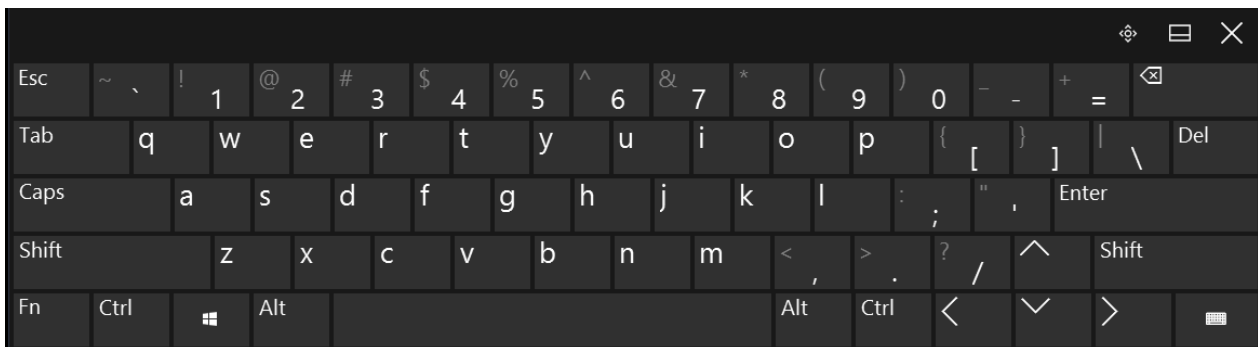
The on-screen keyboard display can be switched on and off as desired using the "On-Screen Keyboard" function key beneath the screen.

When you press this key, the display switches between the following options:

- Keyboard displayed at the top of the screen
- Keyboard displayed at the bottom of the screen
- No keyboard displayed

💡 You can use the TAB key on the on-screen keyboard to move the focus from one field to another in dialog boxes.

7.3　Entering Data

You can enter data in dialog boxes using any of the following methods:

- Using the touchscreen, via the on-screen keyboard
- Using other elements provided by the front panel, e.g. the keypad, rotary knob, or navigation keys
  The rotary knob acts like the [ENTER] key when it is pressed.
- Using a connected external keyboard

💡 **Transparent dialog boxes**

You can change the transparency of the dialog boxes to see the results in the windows behind the dialog box. Thus, you can see the effects that the changes you make to the settings have on the results immediately.

To change the transparency, select the transparency icon at the top of the dialog box. A slider is displayed. To hide the slider, select the transparency icon again.

(The title bar of the dialog box is always slightly transparent and is not affected by the slider.)

ⓘ **Particularities in Windows dialog boxes**

In some cases, e.g. if you want to install a printer, original Windows dialog boxes are used. In these dialog boxes, the rotary knob and function keys do not work. Use the touchscreen instead.

7.3.1　Entering Numeric Parameters

If a field requires numeric input, the keypad provides only numbers.

1. Enter the parameter value using the keypad, or change the currently used parameter value by using the rotary knob (small steps) or the [UP] or [DOWN] keys (large steps).

2. After entering the numeric value via keypad, press the corresponding unit key. The unit is added to the entry.

3. If the parameter does not require a unit, confirm the entered value by pressing the [ENTER] key or any of the unit keys.
   The editing line is highlighted to confirm the entry.

7.3.2   Entering Alphanumeric Parameters

If a field requires alphanumeric input, you can use the on-screen keyboard to enter numbers and (special) characters (see Chapter 7.2.4, "On-screen Keyboard", on page 88).

Alternatively, you can use the keypad. Every alphanumeric key represents several characters and one number. The decimal point key (.) represents special characters, and the sign key (-) toggles between capital and small letters. For the assignment, refer to Table 7-5.

💡 You can change the default behavior of the keypad for text input. This is useful if you frequently enter numeric values in text fields, for example to define file names consisting of numbers.

For details, see "System Configuration Setttings" in the R&S FSMR3000 base unit user manual.

To enter numbers and (special) characters via the keypad

1. Press the key once to enter the first possible value.

2. All characters available via this key are displayed.

3. To choose another value provided by this key, press the key again, until your desired value is displayed.

4. With every key stroke, the next possible value of this key is displayed. If all possible values have been displayed, the series starts with the first value again. For information on the series, refer to Table 7-5.

5. To change from capital to small letters and vice versa, press the sign key (-).

6. When you have chosen the desired value, wait for 2 seconds (to use the same key again), or start the next entry by pressing another key.

To enter a blank

► Press the "Space" bar, or press the "0" key and wait 2 seconds.

To correct an entry

1. Using the arrow keys, move the cursor to the right of the entry you want to delete.

2. Press the [BACKSPACE] key.

   The entry to the left of the cursor is deleted.

3. Enter your correction.

To complete the entry

► Press the [ENTER] key or the rotary knob.

To abort the entry

► Press the [ESC] key.
   The dialog box is closed without changing the settings.

Table 7-5: Keys for alphanumeric parameters

Key name (upper inscription)	Series of (special) characters and number provided
7	7 µ Ω ° € ¥ $ ¢
8	A B C 8 Ä ÆÅ Ç
9	D E F 9 É
4	G H I 4
5	J K L 5
6	M N O 6 Ň Ö
1	P Q R S 1
2	T U V 2 Ü
3	W X Y Z 3
0	<blank> 0 – @ + / \ < > = % &

Key name (upper inscription)	Series of (special) characters and number provided
.	. * : _ , ; " ' ? ( ) #
–	<toggles between capital and small letters>

7.4   Touchscreen Gestures

A touchscreen allows you to interact with the software using various finger gestures on the screen. The basic gestures supported by the software and most applications are described here. Further actions using the same gestures may be possible.

Tapping

Touch the screen quickly, usually on a specific element.

You can tap most elements on the screen; in particular, any elements you can also click on with a mouse pointer.
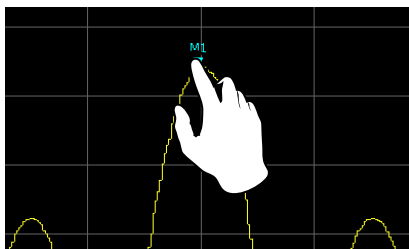
Figure 7-4: Tapping

Double-tapping

Tap the screen twice, in quick succession.

Double-tap a diagram or the window title bar to maximize a window in the display, or to restore the original size.

Dragging

Move your finger from one position to another on the display, keeping your finger on the display the whole time.

By dragging your finger over a table or diagram you can pan the displayed area of the table or diagram to show results that were previously out of view.
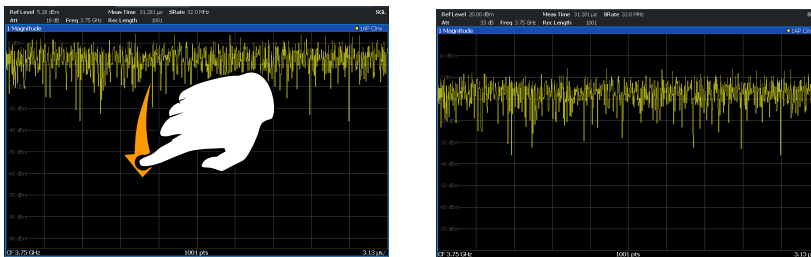
Figure 7-5: Dragging

 Pinching and spreading two fingers

Move two fingers together on the display (pinch) or move two fingers apart on the display (spread).

When you pinch two fingers in the display, you decrease the size of the currently displayed area, showing the surrounding areas previously out of view.

When you spread two fingers in the display, you increase the size of the currently displayed area, showing more details.

You can pinch or spread your fingers vertically, horizontally, or diagonally. The direction in which you move your fingers determines which dimension of the display is changed.
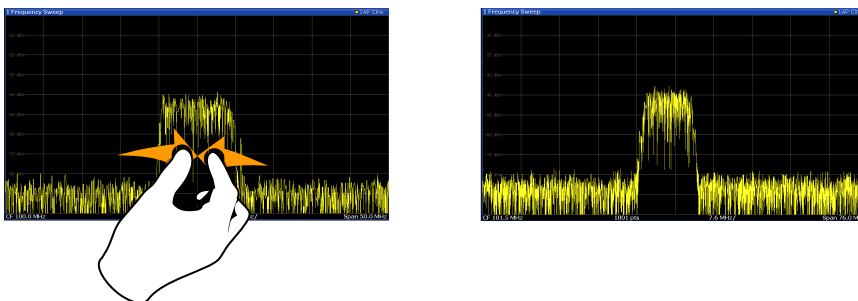
Figure 7-6: Pinching
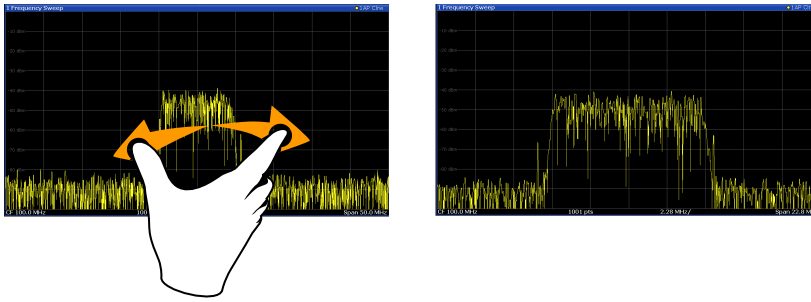
Figure 7-7: Spreading

ⓘ **Touch gestures in diagrams change measurement settings**

When you change the display using touch gestures, the corresponding measurement settings are adapted. This is different to selecting an area on the screen in zoom mode, where merely the resolution of the displayed trace points is changed temporarily (graphical zoom).

For example:

- Dragging horizontally in a spectrum display changes the center frequency.
- Dragging vertically in a power vs frequency (spectrum) or power vs. time display changes the reference level (for absolute scaling) or the min and max power values (for relative scaling).
- Dragging horizontally in a time domain display changes the trigger offset value (if available, not in free run).
- Spreading or pinching a spectrum display changes the center frequency and span (horizontal) or reference level and range (vertical), or a combination of these settings (diagonal).
- Spreading or pinching a time domain display changes the sweep time and trigger offset (horizontal) or reference level position and range (vertical), or a combination of these settings (diagonal).

You can prevent the firmware from changing specific settings using the options in the context menu for the measurement zoom icon. By default, the reference level is locked and thus not changed automatically due to touch gestures.

(See Chapter 7.2.1, "Toolbar", on page 84 and the R&S FSMR3 User Manual).
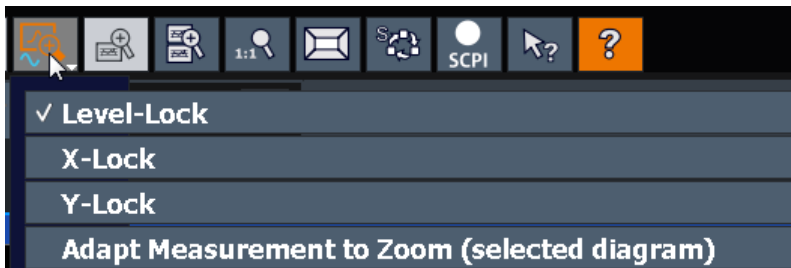
Mouse vs. touch actions

Any user interface elements that react to actions by a mouse pointer also react to finger gestures on the screen, and vice versa. The following touch actions correspond to mouse actions:

Table 7-6: Correlation of mouse and touch actions

Mouse operation	Touch operation
Click	Tap
Double-click	Double-tap
Click and hold	Touch and hold
Right-click	Touch, hold for 1 second and release
Drag-&-drop (= click and hold, then drag and release)	Touch, then drag and release
Mouse wheel to scroll up or down	Swipe
Dragging scrollbars to scroll up or down, left or right	Swipe

In (graphical) Zoom mode only: dragging the borders of the displayed rectangle to change its size	Touch, then drag and release

Example:

You can scroll through a long table in conventional mouse operation by clicking in the table's scrollbar repeatedly. In touch operation, you would scroll through the table by dragging the table up and down with your finger.

7.5   Displaying Results

The R&S FSMR3 provides several instrument applications for different analysis tasks and different types of signals, for example the Measuring Receiver application, the Spectrum application or the I/Q Analyzer. For each application, a new measurement channel is created and displayed in a separate tab on the screen.

The results of a measurement channel can be evaluated in many different ways, both graphically and numerically. For each evaluation method the results are displayed in a separate window in the tab.

The R&S FSMR3 allows you to configure the display to suit your specific requirements and optimize analysis.

7.5.1   Activating and Deactivating Channels

When you activate an application, a new measurement channel is created which determines the measurement settings for that application. The same application can be activated with different measurement settings by creating several channels for the same application. Whenever you switch channels, the corresponding measurement settings are restored. Each channel is displayed in a separate tab on the screen.

An additional tab ("MultiView") provides an overview of all currently active channels at once.

Only one measurement can be performed at any time, namely the one in the currently active channel. However, in order to perform the configured measurements consecutively, a Sequencer function is provided.
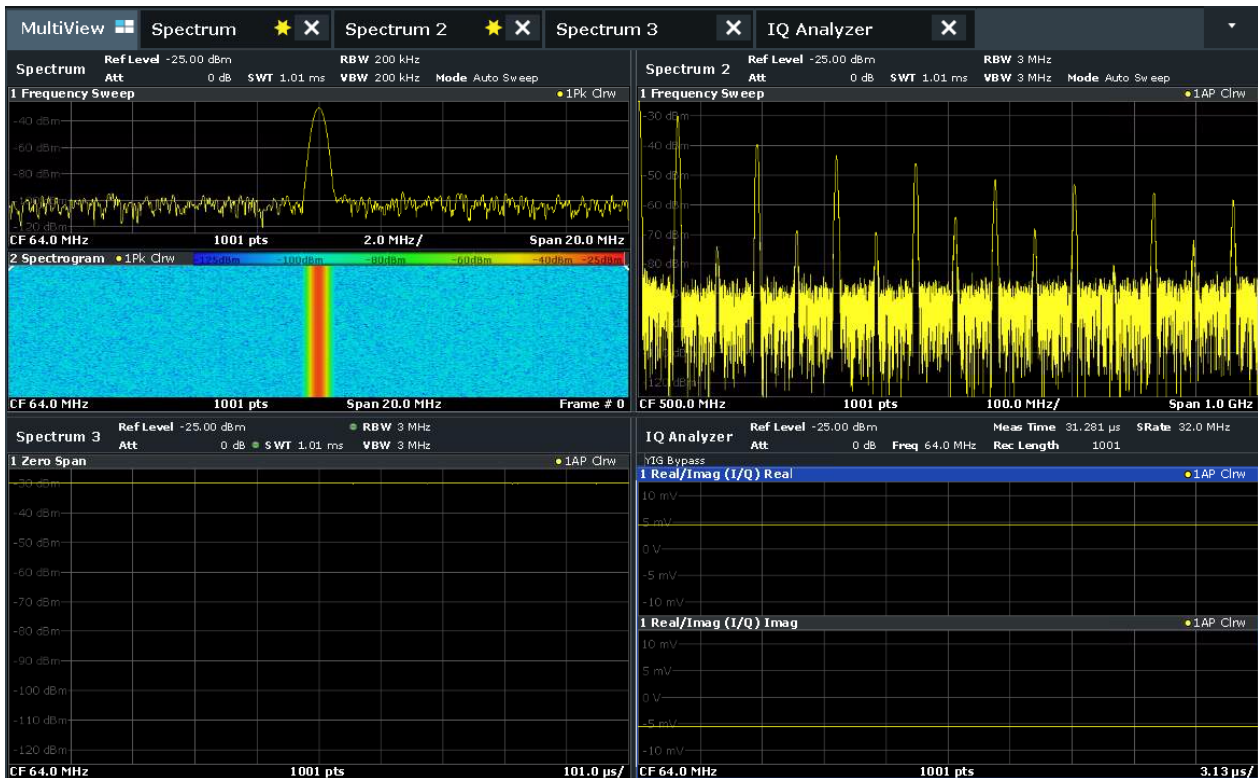
To start a new channel

1. Select the [Mode] key.

2. In the "Mode" dialog box, select the required application on the "New Channel" tab.
   A new tab is displayed for the new channel.

To change the application in an active channel

1. Select the tab of the channel you want to change.

2. Select the [Mode] key.

3. In the "Mode" dialog box, select the new application to be displayed on the "Replace Current Channel" tab.
   The selected application is displayed in the current channel.

To close a measurement channel

▶

Select the "Close" icon on the tab of the measurement channel.

The tab is closed, any running measurements are aborted, and all results for that channel are deleted.

7.5.2   Laying out the Result Display with the SmartGrid

Measurement results can be evaluated in many different ways, for example graphically, as summary tables, statistical evaluations etc. Each type of evaluation is displayed in a separate window in the channel tab. Up to 16 individual windows can be displayed per channel (i.e. per tab). To arrange the diagrams and tables on the screen, the Rohde & Schwarz SmartGrid function helps you find the target position simply and quickly.

(For details on evaluation methods see the User Manual.)

Principally, the layout of the windows on the screen is based on an underlying grid, the SmartGrid. However, the SmartGrid is dynamic and flexible, allowing for many different layout possibilities. The SmartGrid functionality provides the following basic features:

- Windows can be arranged in columns or in rows, or in a combination of both.
- Windows can be arranged in up to four rows and four columns.
- Windows are moved simply by dragging them to a new position on the screen, possibly changing the layout of the other windows, as well.
- All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar. If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. The same evaluation method can be displayed in multiple windows simultaneously.
- New windows are added by dragging an evaluation icon from the evaluation bar to the screen. The position of each new window depends on where you drop the evaluation icon in relation to the existing windows.
- All display configuration actions are only possible in SmartGrid mode. When SmartGrid mode is activated, the evaluation bar replaces the current softkey menu display. When the SmartGrid mode is deactivated again, the previous softkey menu display is restored.

7.5.2.1   Background Information: The SmartGrid Principle

SmartGrid display

During any positioning action, the underlying SmartGrid is displayed. Different colors and frames indicate the possible new positions. The position in the Smart-Grid where you drop the window determines its position on the screen.
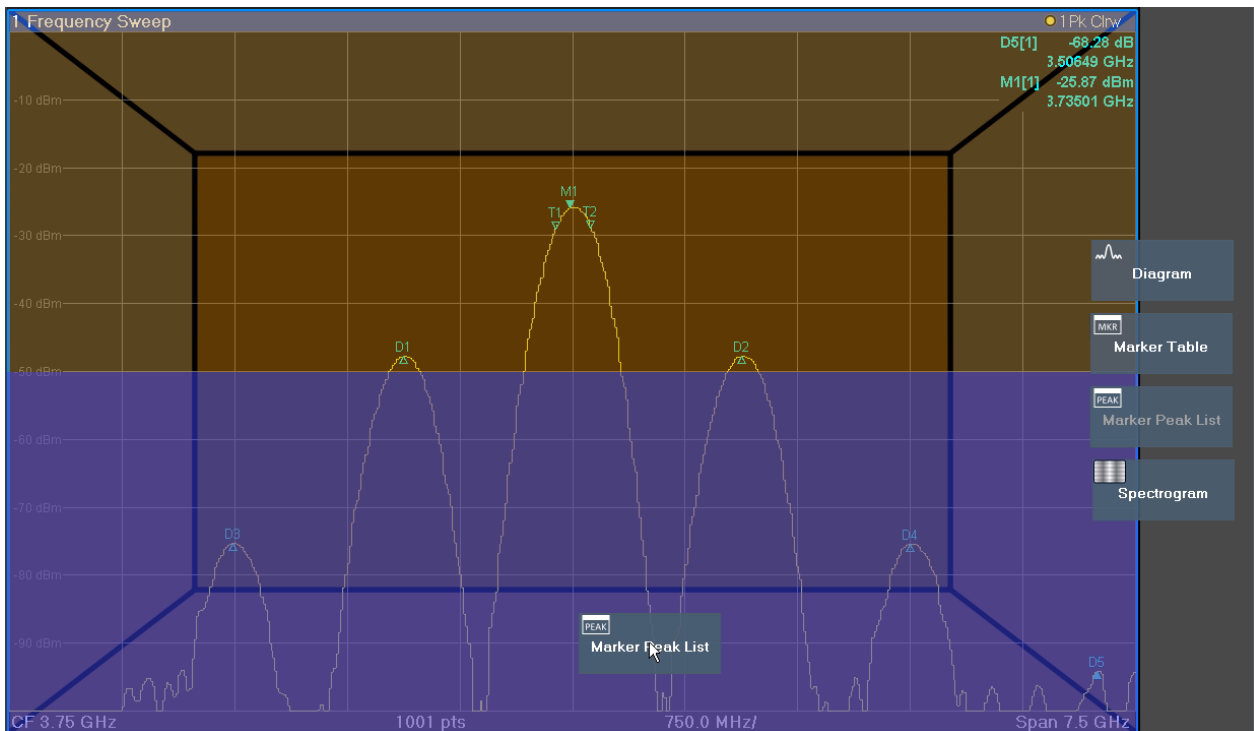
Figure 7-8: Moving a window in SmartGrid mode

The brown area indicates the possible "drop area" for the window, i.e. the area in which the window can be placed. A blue area indicates the (approximate) layout of the window as it would be if the icon were dropped at the current position. The frames indicate the possible destinations of the new window with respect to the existing windows: above/below, right/left or replacement (as illustrated in Fig-

ure 7-9). If an existing window would be replaced, the drop area is highlighted in a darker color shade.

Positioning the window

The screen can be divided into up to four rows. Each row can be split into up to four columns, where each row can have a different number of columns. However, rows always span the entire width of the screen and may not be interrupted by a column. A single row is available as the drop area for the window in the Smart-Grid. The row can be split into columns, or a new row can be inserted above or below the existing row (if the maximum of 4 has not yet been reached).
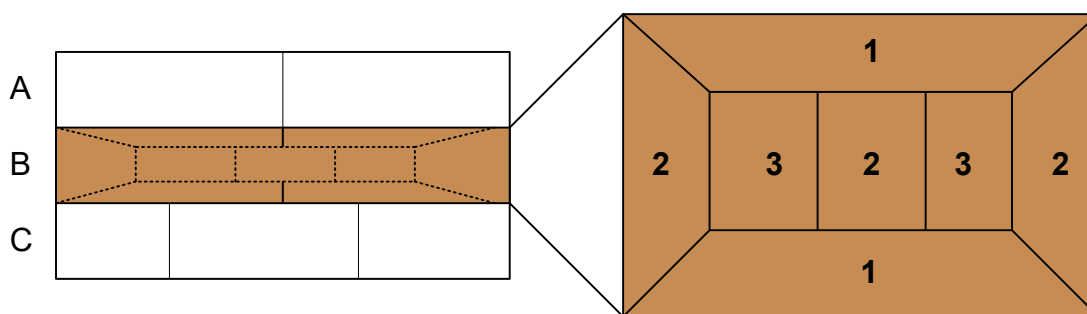
Figure 7-9: SmartGrid window positions

1 = Insert row above or below the existing row
2 = Create a new column in the existing row
3 = Replace a window in the existing row

SmartGrid functions

Once the evaluation icon has been dropped, icons in each window provide delete and move functions.

The "Move" icon allows you to move the position of the window, possibly changing the size and position of the other displayed windows.

The "Delete" icon allows you to close the window, enlarging the display of the remaining windows.

7.5.2.2 How to Activate SmartGrid Mode

All display configuration actions are only possible in SmartGrid mode. In Smart-Grid mode the evaluation bar replaces the current softkey menu display. When

the SmartGrid mode is deactivated again, the previous softkey menu display is restored.

► To activate SmartGrid mode, do one of the following:

- Select the "SmartGrid" icon from the toolbar.
- Select the "Display Config" button in the configuration "Overview".
- Select the "Display Config" softkey from the [Meas Config] menu.

The SmartGrid functions and the evaluation bar are displayed.

To close the SmartGrid mode and restore the previous softkey menu select the "Close" icon in the right-hand corner of the toolbar, or press any key.

7.5.2.3   How to Add a New Result Window

Each type of evaluation is displayed in a separate window. Up to 16 individual windows can be displayed per channel (i.e. per tab).

1. Activate SmartGrid mode.

   All evaluation methods available for the currently selected measurement are displayed as icons in the evaluation bar.

2. Select the icon for the required evaluation method from the evaluation bar. If the evaluation bar contains more icons than can be displayed at once on the screen, it can be scrolled vertically. Touch the evaluation bar between the icons and move it up or down until the required icon appears.

3. Drag the required icon from the evaluation bar to the SmartGrid, which is displayed in the diagram area, and drop it at the required position. (See Chapter 7.5.2.5, "How to Arrange the Result Windows", on page 102 for more information on positioning the window).

7.5.2.4   How to Close a Result Window

► To close a window, activate SmartGrid mode and select the "Delete" icon for the window.

7.5.2.5 How to Arrange the Result Windows

1. Select an icon from the evaluation bar or the "Move" icon for an existing evaluation window.

2. Drag the evaluation over the SmartGrid.
   A blue area shows where the window will be placed.

3. Move the window until a suitable area is indicated in blue.

4. Drop the window in the target area.

   The windows are rearranged to the selected layout, and "Delete" and "Move" icons are displayed in each window.

5. To close a window, select the corresponding "Delete" icon.

7.5.3 Changing the Size of Windows

Each channel tab may contain several windows to evaluate the measurement results using different methods. A "splitter" allows you to change the size of neighboring windows.
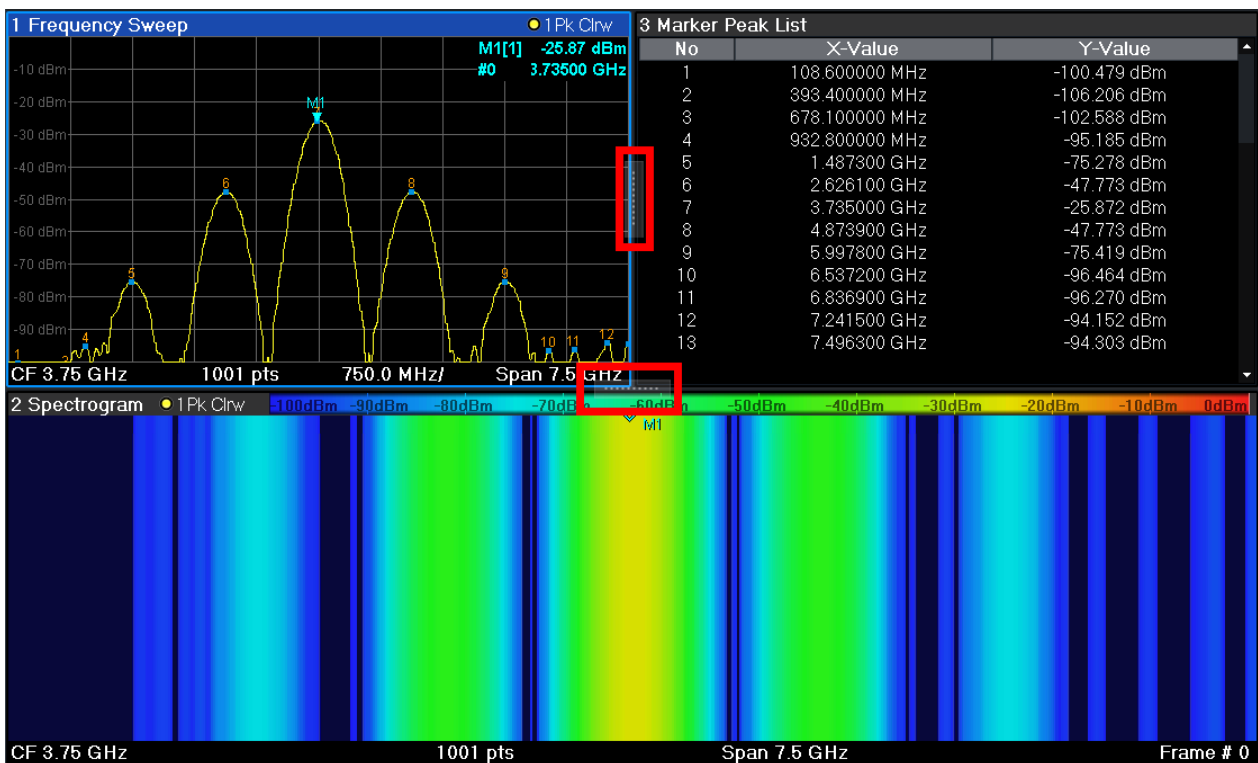
💡 The splitters are not available in SmartGrid mode.

► To change the size of two neighboring windows, drag the splitter between the windows in either direction.

7.5.4　Switching Between a Split and Maximized Window Display

To get an overview of the results, displaying several windows at the same time may be helpful. However, the individual windows may become rather small. In this case it is useful to maximize an individual window to the entire screen temporarily in order to analyze the results in more detail.

To switch between a split and a maximized display without having to close and re-open windows, press the [SPLIT/MAXIMIZE] key on the front panel. In maximized display, the currently focused window is maximized. In split display, all active windows are displayed.

Alternatively, double-tap the title bar of a window to maximize it.

7.5.5   Changing the Display

The display can be optimized for your individual needs. The following display functions are available and are described in detail in the User Manual.

- Displaying a simulation of the entire front panel of the instrument on the screen ("Front Panel")
- Displaying the main function hardkeys in a separate window on the screen ("Mini Front Panel")
- Hiding or showing various screen elements
- Selecting a display theme and colors
- Changing the display update rate
- Activating or deactivating the touch-sensitivity of the screen
- Zooming into the diagram

7.6   Getting Help

If any questions or problems concerning the R&S FSMR3 arise, an extensive online help system is provided on the instrument and can be consulted at any time. The help system is context-sensitive and provides information specifically for the current operation or setting to be performed. In addition, general topics provide an overview on complete tasks or function groups as well as background information.

The online help can be opened at any time by selecting one of the "Help" icons on the toolbar or by pressing the [F1] key on an external or the on-screen keyboard.

To call context-sensitive help

► To display the "Help" dialog box for the currently focused screen element, e.g. a softkey or a setting in an opened dialog box, select the "Help" icon on the toolbar.

The "Help" dialog box "View" tab is displayed. A topic containing information about the focused screen element is displayed.

If no context-specific help topic is available, a more general topic or the "Content" tab is displayed.

ⓘ For standard Windows dialog boxes (e.g. File Properties, Print dialog etc.), no context-sensitive help is available.

To display a help topic for a screen element not currently focused

1. Select the "Help pointer" icon on the toolbar.

   The pointer changes its shape to a "?" and an arrow.

2. Select the screen element to change the focus.

   A topic containing information about the selected (now focused) screen element is displayed.

8   Contacting Customer Support

Technical support – where and when you need it

For quick, expert help with any Rohde & Schwarz product, contact our customer support center. A team of highly qualified engineers provides support and works with you to find a solution to your query on any aspect of the operation, programming or applications of Rohde & Schwarz products.

Contact information

Contact our customer support center at www.rohde-schwarz.com/support, or follow this QR code:

Figure 8-1: QR code to the Rohde & Schwarz support page

Index