Product: Hand Held Spectrum Analyzer R&S FSH3

Effective Test Procedures for Installing and Maintaining RF Transmitter Sites

Application Note

This application note describes an effective method for generating test setups, performing measurements and producing test reports with the hand-held Spectrum Analyzer R&S FSH3.

ROHDE & SCHWARZ

Contents

1 Overview

During commissioning and maintenance of RF transmitter stations, various measurements have to be performed to ensure proper operation. To make the test results comparable between service teams or between maintenance periods, identical conditions and settings for the test equipment are necessary. Changes compared to earlier measurements are taken into account during maintenance, as these might possibly affect the operation of the transmitterin the future.

All measurements need to be documented and archived for customer approval or later comparison. In order to save time and costs, the measurements are automatically documented in a standardized test report. The R&S FSH3 provides tools for standardized test setups to enable easy and also customized test report generation.

This application note describes the typical steps, beginning with pre-defined test setups, right through to the generation of a customized report (using the FSH View software and a Microsoft Word macro) involved in automatic report generation.

For commissioning and maintaining RF transmitter sites, the following steps are necessary for measurement setups and documentation:

- Define test setups for different service teams

- Perform the measurements and store the results

- Prepare the test results for documentation

- Generate a test report for the specific transmitter site.

For each step, the R&S FSH3 provides the necessary functions and tools to minimize the workload and to avoid errors.

Version 5.0 or later for both the R&S FSH3 firmware and the FSH View software are required for the procedures described in this application note.

2 Definition of Test Setups

Generating the correct test setups is a prerequisite for performing measurements that are both straightforward and repeatable. This is particularly important if different individuals install or maintain transmitter sites. Different sites need to be tested in exactly the same way, both when installed, and during maintenancefor comparability both across site and onsite across time

With the R&S FSH3 the specific test setups need be generated only once in the central laboratory of a service organization or by the client of a service provider, for example. The test setups are generated by setting the measurement parameter on the instrument, which stores the data set together with the test result in the internal memory. Each data set is assigned an expressive name with up to 15 characters corresponding to the measurement such as

- Tx Power,

- Antenna VSWR,

- Cable DTF,

- Antenna Spectrum.

The R&S FSH3 automatically adds a 3-digit file extension to the name starting with 000. That way, different data sets of the same name are distinguishable and the storage of new data sets is very easy.

When recalling a data set for a specific measurement, the R&S FSH3 shows the test result which was stored with the data set, in order to ease identification. . One can activate the data set by pressing ACTIVATE. The R&S FSH3 then starts the measurement using the recalled setup.
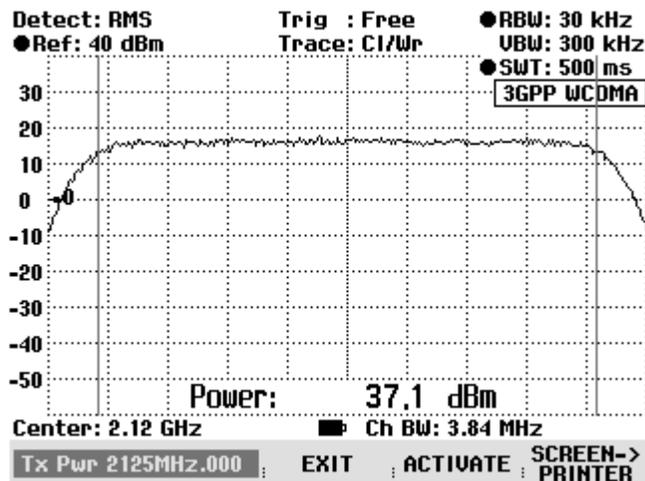
It is advisable to store data sets with real measurements to help identify the required data set as realistic example of what a correct test result should look like.
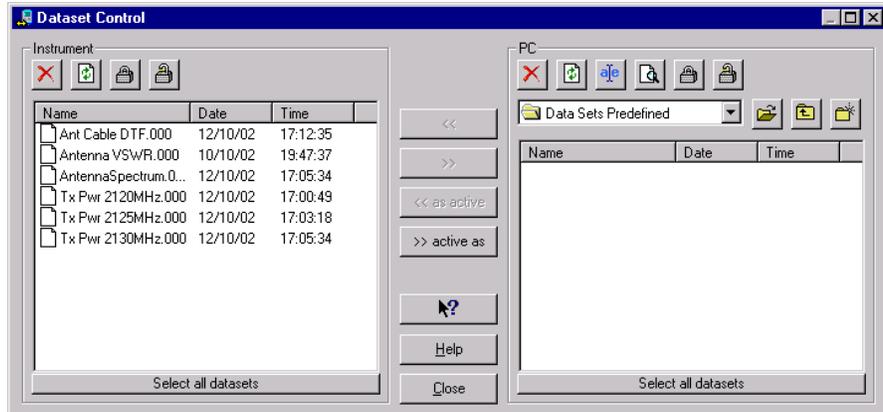
Using the FSH View software the setups to transfer to a PC (or Laptop).

1. Connect the R&S FSH3 to the PC via the optical RS-232 cable.

2. Run the FSH View software.

3. Select Data Set Control by selecting <Instrument: Data Set Control> in the tool bar menu or by clicking the data set control icon in the icon bar.

The FSH View software shows the data sets stored on the instrument.

4. Select the data sets to store.

• If all data sets in the instrument are to be used for on-site measurement click the 'Select all datasets' button at the bottom of the list.

All data sets are selected (names are highlighted).

• If you want to use only specific data sets, press the 'Crtl' key on the PC keyboard and click the data sets you require with the mouse.

The selected data sets are highlighted.

5. Lock the selected data sets by clicking the lock icon: .

The selected data sets are now locked. The lock icon is visible in front of the data set name. They cannot be changed or deleted in the instrument.

6. Transfer the selected data sets to the PC by clicking the transfer button: >> .

The data sets are now stored in the selected directory of the PC hard disk (Directory 'Data Sets Predefined' in the example below).
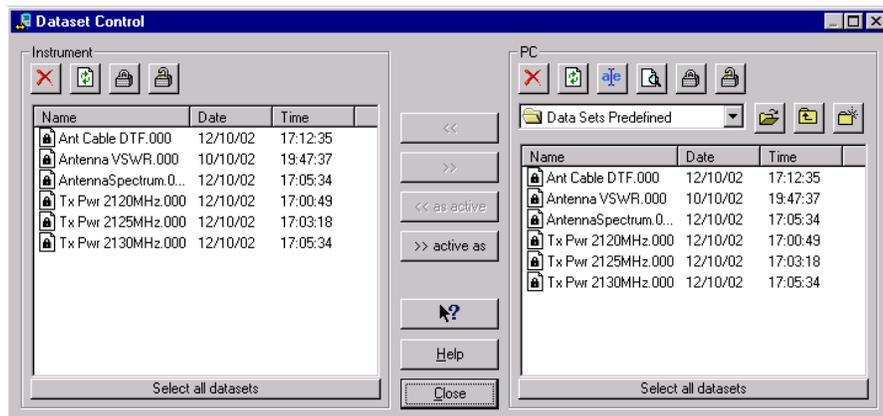
The pre-defined data sets are now ready for distribution, by sending them via email to the different service teams or by downloading them directly into different instruments.

Hint for firmware versions up to 4.3:
If cable models, limit lines or transducer factors are needed for the measurement, they too need to be distributed and downloaded to the other instruments. The R&S FSH3 does not store cable models, transducer factors or limit lines in the data set files, but refers to the name of the cable model, limit line or transducer factor used with the data set. The respective cable models, limit lines or transducer factors used in data sets must be available in the instrument.

Infirmware version 5.0, limit lines and transducer factors are stored together with the data set. Therfore, they do not need to be distributed separately.

3   Performing Measurements and Storage of Results

Standardized measurements in the field are most effectively performed using predefined setups. They minimize the operation steps and assure that only settings consistent with a defined test procedure are used.

To perform a measurement based on a data set:

1.   Press the SAVE/PRINT key.
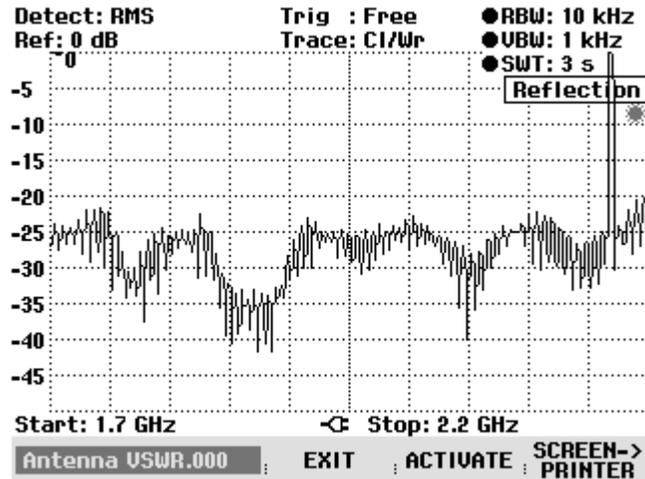
2.   Press the RECALL softkey.

The R&S FSH3 lists of the stored data sets.

3.   Select the data set to be used for a specific measurement.

4.   Press the RECALL softkey.

The R&S FSH3 shows the test results stored with the settings and the name of the data set (eg Antenna VSWR.000) in the lower left corner of the screen.

Use the rotary knob or the up and down keys to browse through the different data sets. The contents of the selected data set are shown on screen.

5. Press the sofkey ACTIVATE to enable the settings of the selected data set.
   The R&S FSH3 immediately starts the measurement using the settings from the data set. The trace stored along with the data set is copied into the memory trace. For comparison of the new measurement with the stored trace press TRACE: SHOW MEMORY.

Hint: *With Transmission measurement, Reflection measurement and Distance to Fault measurement a calibration is necessary to get correct test results. The calibration data are not stored in a data set. Therefore perform a calibration before starting the actual measurement.*

6. Perform the measurement using the settings from the recalled data set.

7. Press the SAVE/PRINT key.

8. Press the SAVE softkey.

The R&S FSH3 prompts for a name for the data set to be stored. It offers the name of most recent stored data set with the file extension number incremented by 1. By pressing the BACK key the R&S FSH3 browses the different names of the stored data sets and offers the respective name with the 1st free file extension for saving the measurement results.

9. Either accept the name or type in an alternative using the letters and numbers of the numeric keypad. The R&S FSH3 adds the numeric file extension automatically.

For really convenient and quick operation decide on a name for the data set for the whole test session, such as the name of the transmitter site, where the first test result hzad been saved. All the following test results use the same name and the R&S FSH3 increments the numeric file extension by 1 for each new data set. It is only necessary to confirm the proposed name instead of typing in a new name.

4 Preparing Test Results for Documentation

After the test session is finished and all the required test results are stored in the R&S FSH3, transfer the recorded data to a PC or a laptop.

1. Connect the R&S FSH3 to the PC via the optical RS-232 interface cable.

2. Run the FSH View software.

3. Select the Data Set control by selecting <Instrument: Data Set Control> in the tool bar menu or by clicking the data set control icon in the icon bar.

The FSH View software shows the data sets stored on the instrument.
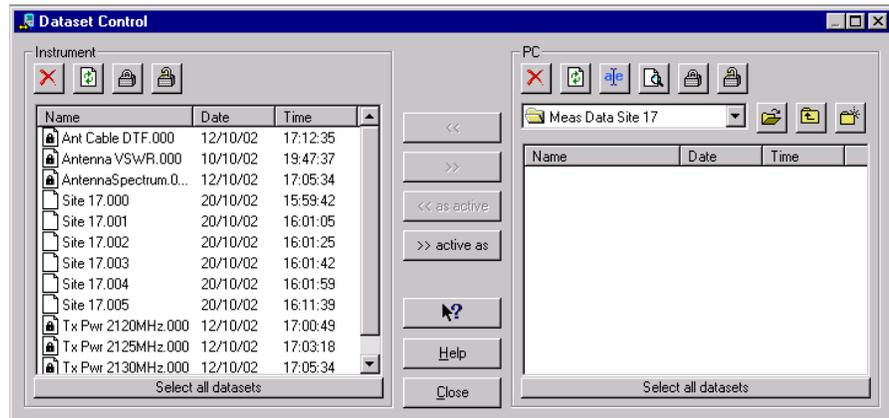
Note: The measured data is not locked in contrast to the predefined settings.

4. Select the measured data set by pressing the keyboard 'Crtl' key and clicking the respective data sets. To select measured data sets in a sequence, press the 'Shift' key and click the first one and then the last one.

5. Transfer the selected data sets to the PC by clicking the transfer button: [>>].

All measured data sets are stored now on the hard disk of the PC in the selected directory ("Meas Data Site 17" in the example).

Hint: To simplify the handling of measurement data from different sites it can be easier to store the test results in different directories.
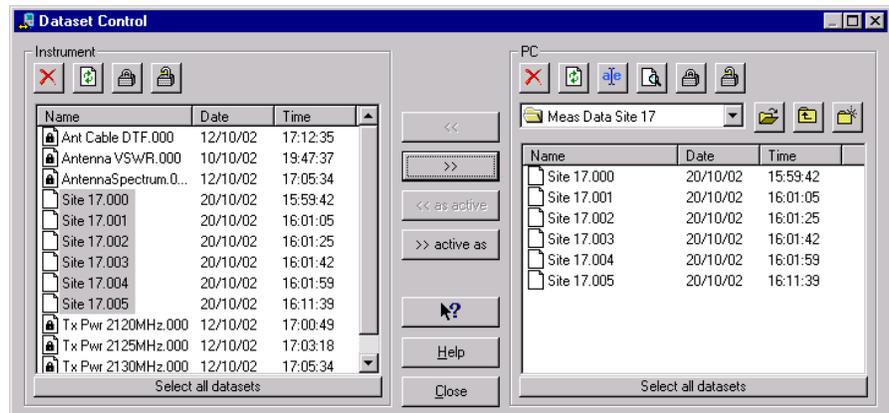
The measured data sets stored in the R&S FSH3 can be deleted now.

6. Click the delete icon in the Instrument section of the FSH View Data Set Control.

Hint: The R&S FSH3 can store up to 100 complete data sets. Therefore, the measured data sets need not be deleted. However, the shorter the data set list the easier it is to handle.

The data sets stored on the PC can used for documentation as required.

5 Generating a standardized Test Report

Generating a standardized Test Report from results on the PC hard disk

The FSH View software can load data sets generated with the R&S FSH3 for viewing, manipulating or storing in different graphic formats such as Bitmap (BMP), Windows Meta File (WMF), Portable Network Graphic (PNG), PC Paintbrush (PCX) or in Microsoft EXCEL™ (CSV) or ASCII (TXT) format.

For evaluating test results off-line, we recommend the following:

1. Run the FSH View software. An R&S FSH3 does not need to be connected to the PC. Click 'Cancel' in the Instrument Connect window that pops up during startup.

2. Select <File: Open> in the menu bar or click the file open icon.

3. Change the directory in the File Open control to the directory of the stored data sets.

4. Select a data set (file extension .rsd) and click the Open button.

The software opens the selected data set and shows the measurement results along with the associated settings.

5. Press the right mouse button to see options for manipulating the graphics.

• The Marker and Delta Marker are available for evaluating the trace: Position the markers by setting the mouse pointer on a marker line, pressing the left mouse button and drag the line to the position required. By clicking 'Select Markers...' a menu opens for selection of additional markers or delta markers.
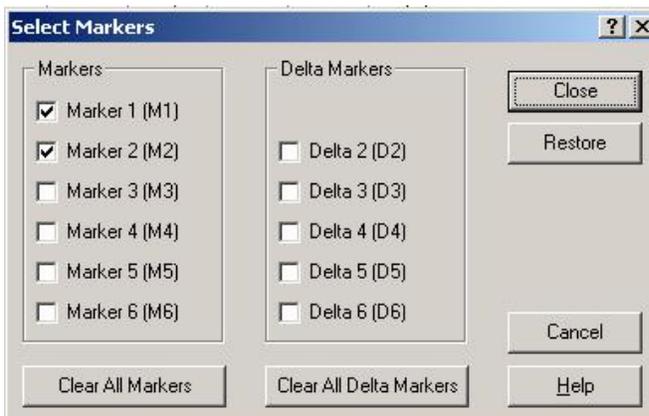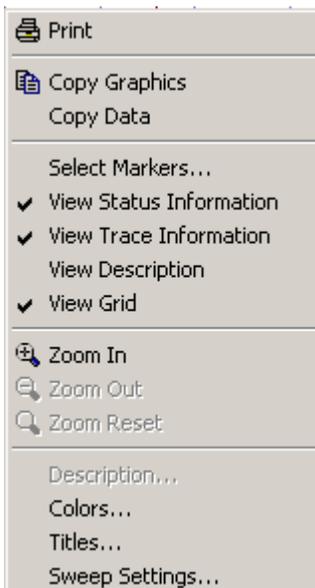
In addition to the markers already attached to the data from the R&S FSH3, additional markers and delta markers are available for a more detailed evaluation of the trace,

- The sweep window can be zoomed for higher trace resolution: Position the mouse cursor, press the left mouse button and create a zoom window.

- The level resolution can be changed (Sweep Settings...).

- Alter the reference level by setting the mouse pointer on the trace, clicking the left mouse button and dragging the trace vertically.

- Add up to 10 lines description at the bottom of the graphics for documentation.

- The color of the graphics can be set for the most favorable documentation.

- The graphic can be sent directly to a printer.

- The graphic or the trace data can be copied to the clipboard for pasting it into a test report.

A very convenient way to compare earlier measurements with new ones is by using the drag&drop function for traces.
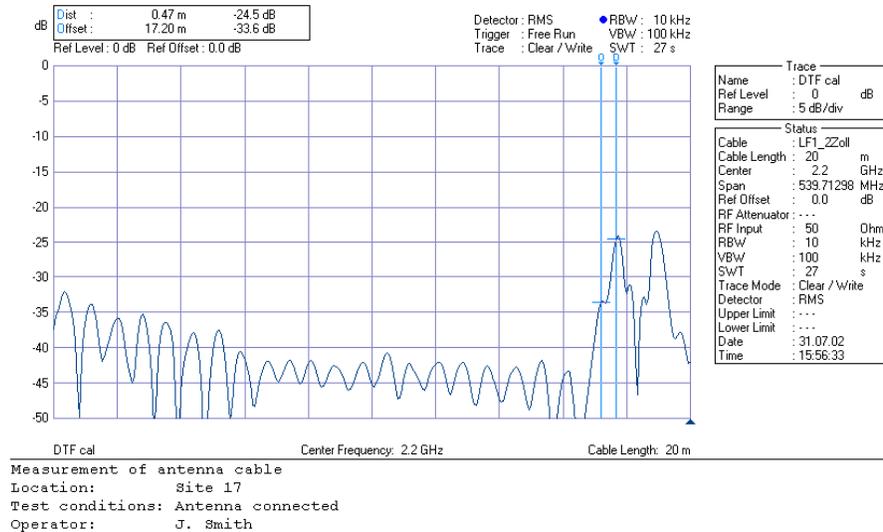
Ø Open the data sets to be compared.

The R&S FSH3 shows the measured traces in separate sweep windows.

Ø Put the mouse pointer on the trace to be moved for comparison.

Ø Press the left mouse key and drag the trace to the other sweep window.

Ø Release the left mouse key.

Both traces are shown now in one sweep window.

The copied trace can be shifted in vertical direction to attain a best fit to the to the measured trace in the window. Markers are related to the original trace.

After the graphic is configured it can be inserted into a prepared test report template via the clipboard or stored in a graphic or text file and inserted to the form.

```
Measurement of antenna cable
Location:       Site 17
Test conditions: Antenna connected
Operator:       J. Smith
```

Generating a Test Report from the R&S FSH3 Memory

To simplify the automated test report generation, a Microsoft Word macro comes with the FSH View software. It imports data sets from the FSH3 memory into a prepared test report. The additional report information such as company, operator or date can be prepared in advance for all test reports.

The macro consists of two files stored in the directory of the FSH View software: FSH Report.doc and FSH Report.dot. The FSH Report.dot file can be configured to specific requirements, by adding a company logo in the header or adapting the predefined fields for measurement specific information.

1. Connect the R&S FSH3 to the PC or Laptop with the optical RS-232 interface.

2. Select the Windows Start menu.

3. Select Programs.

4. Select FSH View.

5. Select FSH Report.

Microsoft Word is started.

6. Select 'Activate Macros' to activate the macro for report generation.

The macro in Microsoft Word has added two icons for automatic insert of R&S FSH3 data sets into the open Microsoft Word document, one for importing the instrument screen in color and one in black and white.

Insert b/w graphic from FSH3

Insert color graphic from FSH3

Insert graphic from data set on PC

7. Press the key SAVE/PRINT on the R&S FSH3.

8. Press the RECALL softkey.

9. Select the file to be put into the documentation.

10. Press the RECALL softkey.

The R&S FSH3 shows the test result along with the file name on screen.

Use the rotary knob or the up- or down key to browse through the different data sets.

11. Click the icon for color or black and white graphic import on the upper left hand corner of the Microsoft Word frame.
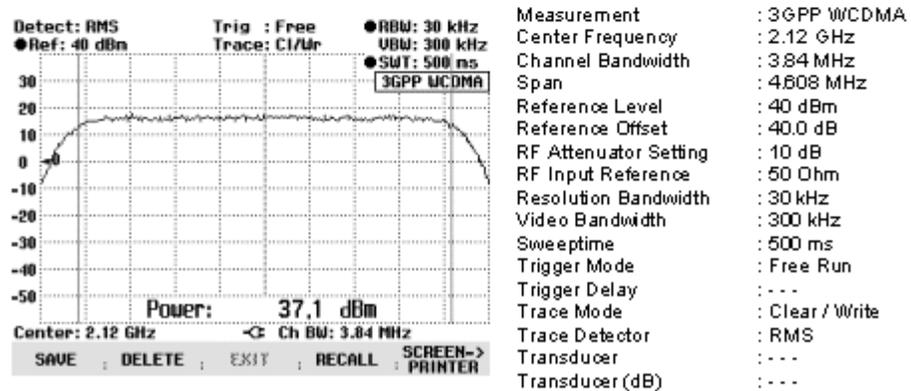
The Microsoft Word macro starts the FSH View software and the screen content of the R&S FSH3 is transferred to Microsoft Word form. In addition all settings used for measurement are displayed in a table beneath the graphic.

With this procedure as many test results as needed can be put into the template.

Generating a Test Report from stored Data Sets using the Word Macro FSH Report

A frequent procedure for generating test reports is to; perform and store measurements in the field, transfer data sets to the office and to generate a test report whilst new measurements are performed in the field. The Word macro FSH Report supports this procedure by reading stored data sets from the hard disk or floppy disk of a PC.

1. Select the Windows Start menu.

2. Select Programs.

3. Select FSH View.

4. Select FSH Report.
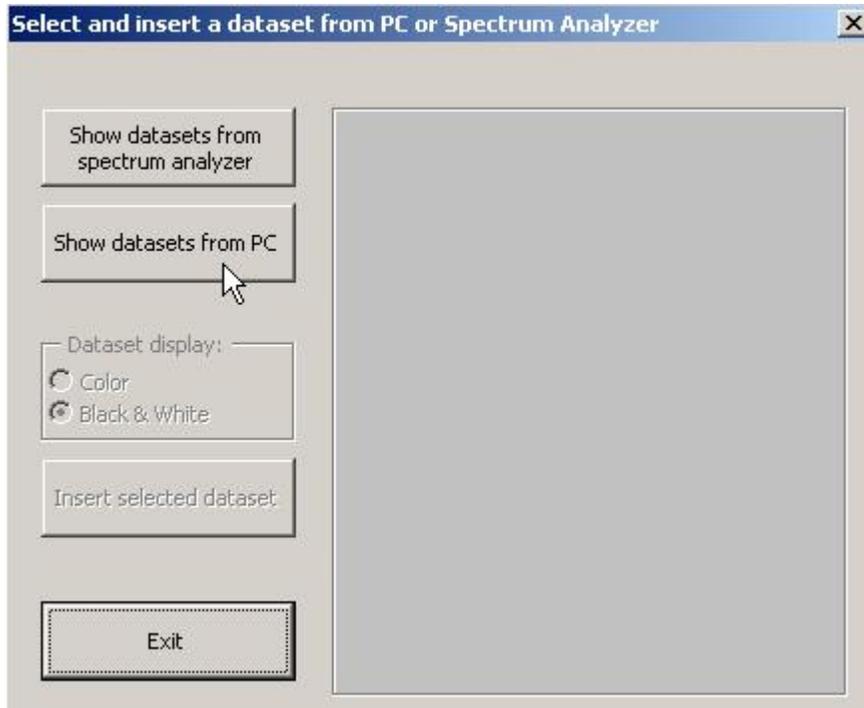
   Microsoft Word is started.

5. Select 'Activate Macros' to activate the macro for report generation.

    The macro in Microsoft Word has added icons for automatic insert of R&S FSH3 data sets into the open Microsoft Word document (see previous section).

6. Click the icon 'Insert Dataset'.

The Word macro opens a frame offering different selections:

7. Click Show datasets from PC.

The macro opens Windows Explorer.

8. Change to the directory with the data sets to be used for the report.

9. Select the data set to be inserted into the report document.

10. Click 'Open' in the Windows Explorer window.

The Word macro displays all data sets in the selected directory with the selected data set highlighted
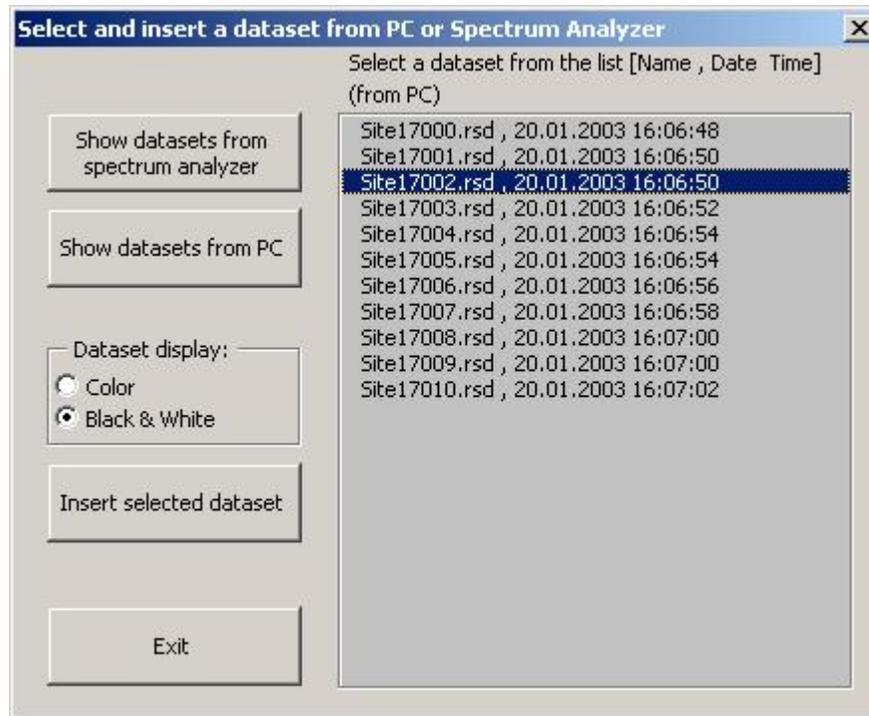
The data set can be inserted in b/w mode (click Black & White) or in color (click Color) mode. In color mode the colors for the data set graphic set up in FSH View are used.Click the button 'Insert selected data set'.
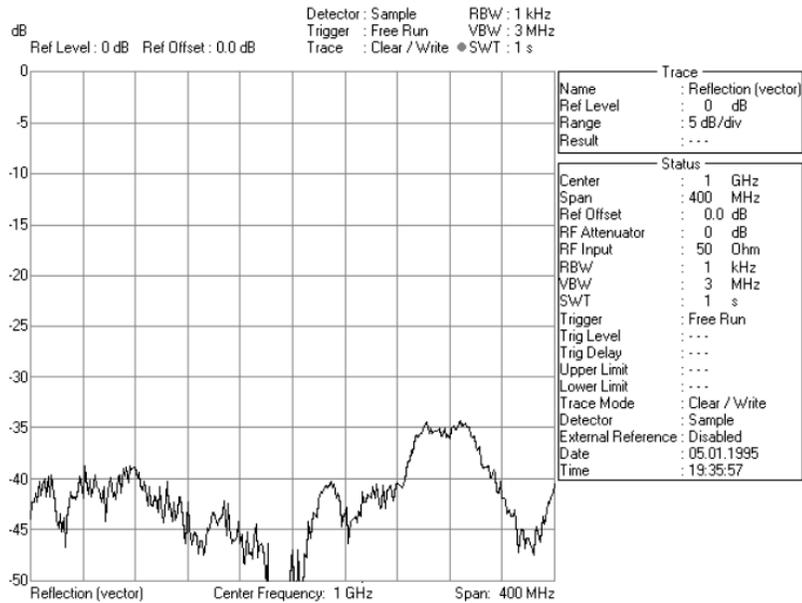
The Word macro inserts the graphic into the word document at the position of the word cursor.

Installation Test Report

Company: Rohde & Schwarz
Address: P.O.B. 801469, 81614 Munich

Client: Mobile Communication Enterprise

Location: Site 17

Operator: Jeff W. Smith
Phone: +49 89 4129 0
E-mail: jeff.w.smith@xxx.com

Date: 2003-06-09

Cable / Termination

Detector : Sample		RBW : 1 kHz	
Trigger : Free Run		VBW : 3 MHz	
Trace : Clear / Write		● SWT : 1 s	

Trace		
Name	: Reflection (vector)	
Ref Level	: 0	dB
Range	: 5 dB/div	
Result	: - - -	

Status		
Center	: 1	GHz
Span	: 400	MHz
Ref Offset	: 0.0	dB
RF Attenuator	: 0	dB
RF Input	: 50	Ohm
RBW	: 1	kHz
VBW	: 3	MHz
SWT	: 1	s
Trigger	: Free Run	
Trig Level	: - - -	
Trig Delay	: - - -	
Upper Limit	: - - -	
Lower Limit	: - - -	
Trace Mode	: Clear / Write	
Detector	: Sample	
External Reference	: Disabled	
Date	: 05.01.1995	
Time	: 19:35:57	

Reflection (vector)　　　Center Frequency: 1 GHz　　　Span: 400 MHz

Description:

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6   Ordering information

Type of instrument

		Ordering number
FSH3	Hand-held Spectrum Analyzer 100 kHz to 3 GHz	1145.5740.03
FSH3	Hand-held Spectrum Analyzer 100 kHz to 3 GHz, with Tracking Generator	1145.5740.13
FSH3	R&S FSH3 Hand-held Spectrum Analyzer 100 kHz to 3 GHz, with Tracking Generator and Preamplifier	1145.5850.23

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