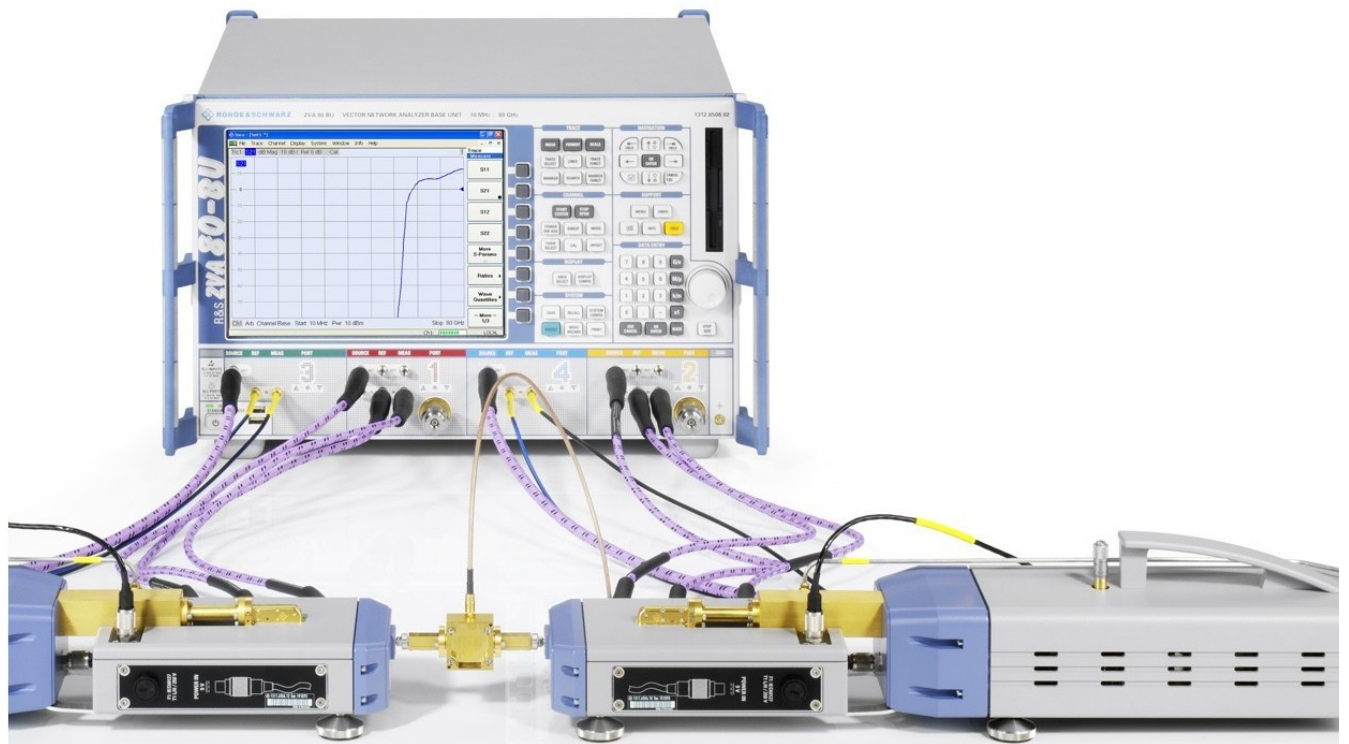


R&S® ZVA80

Basic Operation

Application Sheet



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The following abbreviations are used throughout this guide: R&S®ZVAxx as R&S ZVAxx, R&S®ZVTxx as R&S ZVTxx, R&S®ZVA-BU as R&S ZVA-BU, R&S®ZVA-ZD80 as R&S ZVA-ZD80, R&S®ZVA-Zxxx as R&S ZVA-Zxxx, R&S®ZV-Zxxx as R&S ZV-Zxxx, R&S®ZV-WRxx as R&S ZV-WRxx.

1 Basic Operation

This application sheet describes the use of an R&S ZVA80 vector network analyzer with two external test sets for 2-port transmission measurements.

One-port reflection measurements can be performed in a similar way using a single external test set.

1.1 Required Equipment

The R&S ZVA80 system is delivered with all measurement equipment needed. An additional 1 mm calibration kit is required for calibration.

1.2 Measurement Principle

The measurement involves the following steps:

1. Activation of the "ZVA80-BU" mode for measurements with external test set
2. Connection of the external test sets
3. Calibration using a suitable calibration kit
4. Connection of the DUT and measurement

1.3 Activating the ZVA80-BU Measurement Mode

After a factory preset, the R&S ZVA80 base unit is in the "ZVA80-BU" mode, which is the operating mode for measurements with external test sets. The sweep range corresponds to the full frequency range of the analyzer up to 80 GHz. The ZVA80-BU mode can be disabled, e.g. in order to perform 2-port measurements with internal test sets.

To re-activate the ZVA80-BU mode,

1. Click "System > System Config ..." and open the "Frequency Converter" tab of the "System Configuration" dialog.
2. Select "Type : ZVA80-BU".
3. Click "Apply" to activate the mode and "Close".



Analyzer settings with active ZVA80-BU mode

In "ZVA80-BU" mode, the frequency and level settings of the network analyzer are automatically set to be compatible with the external test sets. "Low Phase Noise" is enabled, Automatic Level Control (ALC) is disabled. The frequency and levels of all ports are displayed in the "Port Configuration" dialog ("Channel > Mode > Port Config ...").

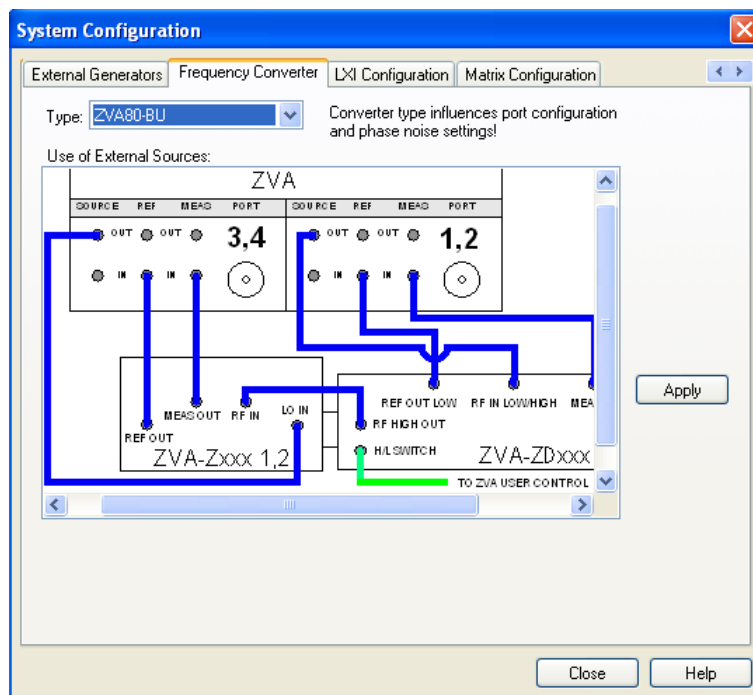


Fig. 1-1: Frequency Converter dialog

1.4 Connecting the External Test Sets

Each of the external test sets must be connected to the R&S ZVA80 base unit, the power supply and the DUT.

- Control connection: Connect "H/L Switch" cable between the USER CONTROL connector on the rear panel of the R&S ZVA80 base unit and the H/L SWITCH connector on the top side of each diplexer.
- Analyzer ports: Connect each of the two external test sets as shown in the "Frequency Converter" tab of the "System Configuration" dialog using the cables supplied with the instrument.
- Power supply: Connect the external DC power supply provided with the external test sets to the "9 V / 0.5 A" DC inputs.
- DUT (usually connected after calibration): Screw on the 1 mm test port connectors at the front of the diplexers.

The title page of this application sheet shows an R&S ZVA80 with all necessary connections. Refer to the quick start guide R&S ZVA80, "Broadband Measurements using 1 mm External Test Sets", stock no. 1312.6808.62 for details.

1.5 Calibration

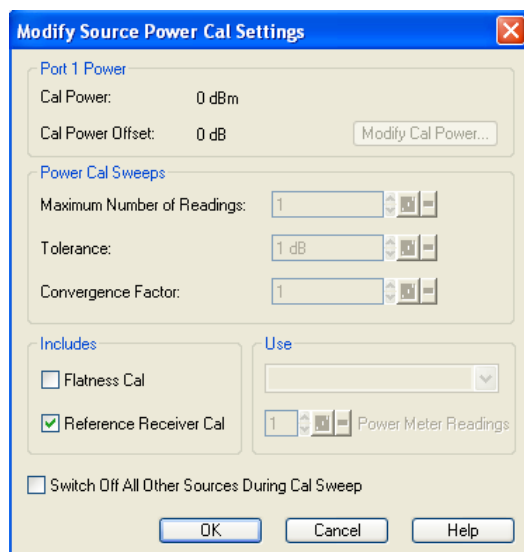
A source power calibration for an external test set requires an appropriate external power meter, to be connected to the converter's 1 mm test port connector. The power meter is configured in the ordinary way using the "System Configuration > External Power Meters" tab.

In the low frequency domain below approx. 50 GHz, power calibration can be performed in the usual way; refer to your analyzer's help system for details.

In the high frequency domain above approx. 50 GHz, the output power of the external test set can be varied manually (at the converter) only, therefore the standard source power calibration eliminating frequency response errors in the signal path between the source and the reference plane (external power meter) is not possible.

A power calibration of the reference receiver (a-wave) using an appropriate external power meter, however, is possible and recommended for measurements concerning the wave quantities a and b. Proceed as follows:

1. Ensure that the output power of the frequency converter is not attenuated (adjust the knurled knob at the top of the converter to 2 mm).
2. Connect the power meter to the 1 mm test port connector of the external test set and open the "Channel > Calibration > Start Power Cal > Source Power Cal" dialog.
3. Click "Modify Settings" and disable "Flatness Cal", leaving "Reference Receiver Cal" checked.



4. Start the calibration sweep.

This power calibration procedure ensures a reasonable accuracy of the reference power readings over a wide range of converter output powers (i.e. even if the adjusting screw is used to reduce the powers). A receiver power calibration of the b-waves (without external power meter, using the "Receiver Power Calibration" dialog) is possible after completed power calibration of the a-wave.

After the power calibration procedure a system error correction is recommended. Due to the physical properties of the mm-waves and the 1 mm test set connectors, measurements with external test sets require a special calibration kit for system error correction.

1.6 Measurement

After power calibration and system error correction, the mm-wave measurement can be performed like any other network analyzer measurement. The "Port Configuration" settings (together with the "Stimulus" settings), determine the sweep range of the converted signals (i.e. the input and output frequencies at the DUT ports). All measured quantities (S-parameters, wave quantities, ratios etc.) and other trace settings are available.

The following restrictions hold for measurements in high frequency mode:

- The measurement is performed at fixed RF source and LO power. No power sweep is possible.
- To adjust the actual output power of the converters (e.g. for measuring wave quantities or testing compression effects), use the adjusting knob on top of the converters.

The following example shows a transmission measurement on a through connection in the frequency range between 10 MHz and 80 GHz.

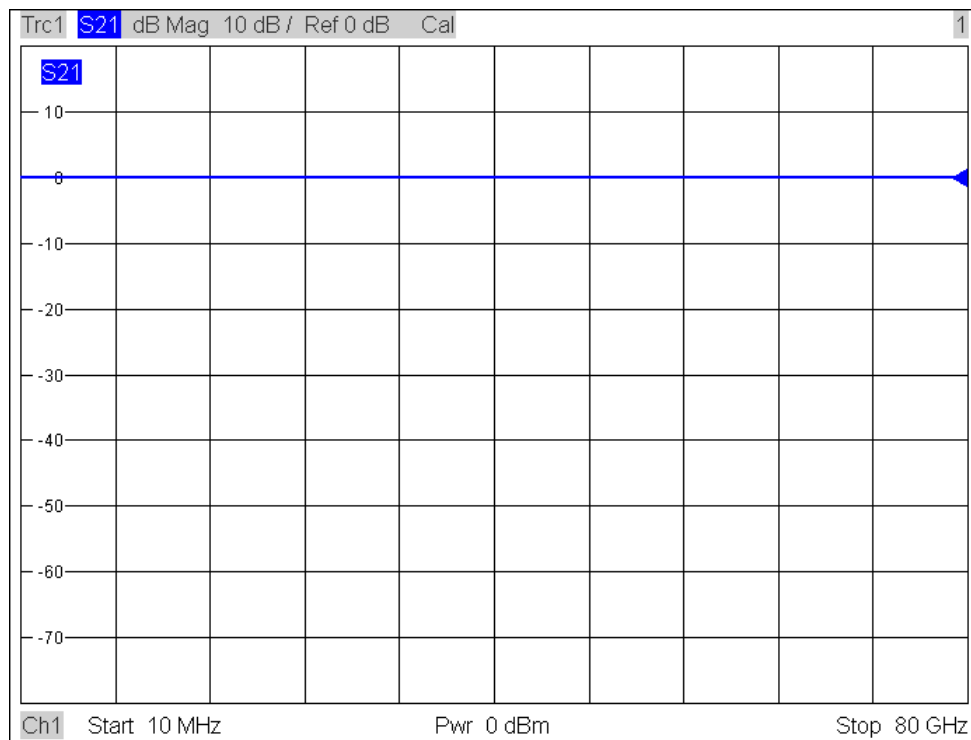


Fig. 1-2: Transmission measurement with an R&S ZVA80

1.7 Additional Information

For a comprehensive description of R&S ZVA analyzers including frequency conversion and remote control refer to the R&S ZVA help system or to the printable operating manual, which is available for download at <http://www.rohde-schwarz.com/product/zva>.

For an description of the R&S ZVA80 connectors and safety instructions refer to the R&S ZVA80 Quick Start Guide.

Application notes related to frequency converters are also available for download, see <http://www.rohde-schwarz.com/product/zva-z>.