
Power and Modulation Measurements on VHF Transmitters

Example: Rohde & Schwarz
VHF-FM Transmitter SU115

Application Note 1EF09_1E

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Subject to change

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Products:

FMAB, FMA-B4



ROHDE & SCHWARZ

Problem definition

A whole series of measurements has to be carried out for drafting an acceptance test report for a VHF sound broadcasting transmitter in compliance with ARD Specifications 5/3.1 (= TL 5820-3018 of the Deutsche Bundespost). As in most cases parameters like transmitter output power, frequency stability, spurious modulation, etc. have to be measured in the two stereo channels of the transmitter separately and at different modulation frequencies and frequency deviation, manual-controlled measurements are very time-consuming. In addition, a great variety of test equipment eg AF generator, stereodecoder, level meter, etc. is required for the measurements.

Solution

FMAB with option FMA-B4 (AM/FM Calibrator / AF Generator) is ideally suitable for these measurements on VHF sound broadcasting receivers. The internal AF generator provides the signals required for the left and the right stereo channel. The MPX signal from the VHF transmitter is decoded by the built-in stereodecoder. As a result many of the tests and measurements required for the acceptance of VHF sound broadcasting receivers can be carried out without any additional test equipment being required.

To give an example, a test program running under the graphics user interface Microsoft Windows has been developed for carrying out automatic power and modulation measurements via a PC.

Test setup and device setting

FIG 1 shows a test setup with FMAB for amplitude and modulation measurements on a Rohde & Schwarz VHF-FM Transmitter SU 115.

Personal computer:

The IBM-compatible PC is fitted with an IEC/IEEE-bus interface card. The PC controls the FMAB, reads in measured values and displays them on the monitor.

FMAB:

Modulation Analyzer FMAB is connected to the PC via the IEC/IEEE-bus interface. For control via this bus, the FMAB has to be set for address 29. Signals from the internal AF generator are taken out at connectors AF1 and AF2 at the rear of the FMAB. AF1 is connected to the left, AF2 to the right input channel of SU 115.

VHF-FM transmitter:

The VHF transmitter to be tested (in our example the Rohde & Schwarz transmitter SU 115) produces a multiplexed stereo signal from the two AF input signals, which is modulated onto the carrier and amplified to an output level of 40 dBm (10 W). The MPX signal is applied to the RF input of the FMAB via a 20-dB attenuator. Before the measurement is started, the VHF transmitter has to be set as described below:

- Transmit frequency to 100 MHz
- Attenuator on front panel to 4.0 dB
- Preemphasis on
- Stereo on
- Pilot tone on

The test program tunes the transmitter to the nominal carrier frequency (100 MHz) and sets the output power (10 Watt = 40 dBm); transmit frequency, output power and frequency deviation are indicated on the transmitter.

No other settings of VHF-FM Transmitter SU 115 and FMAB are required during the measurement.

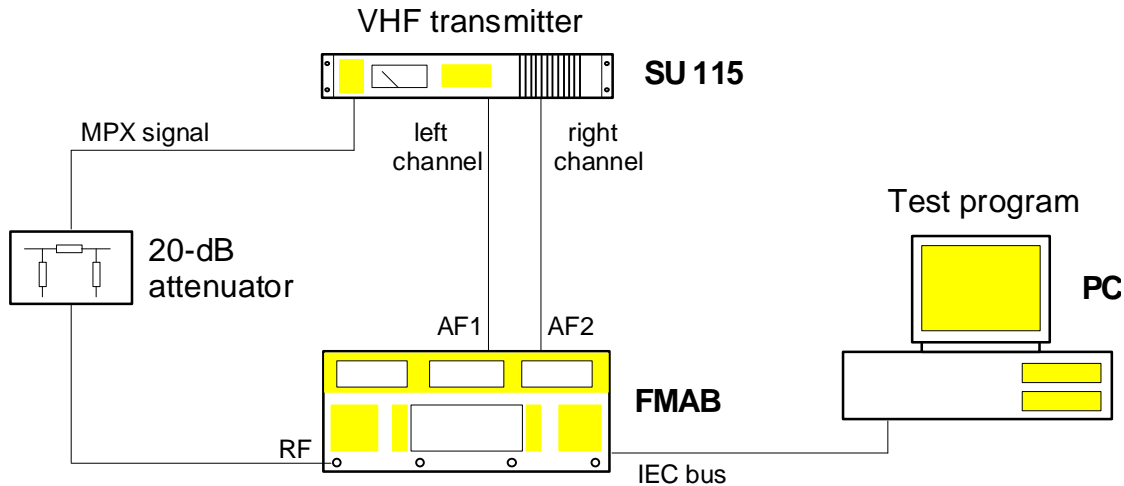


FIG 1 Test setup

Test program

Test program FMBDEMO.EXE permits RF power, preemphasis frequency response, amplitude deviation as well as unweighted and weighted S/N ratio of the SU 115 to be measured. The program runs on the graphics user interface Microsoft Windows (see **FIG 2**) and supports two different operating modes.

1. Measurements are called up individually one after the other using the menu item MESSUNG (measurement). A dialog window is displayed for each measurement. Values measured by the FMAB are entered in this window and standard-specification values are blended in for comparison.
2. In the automatic mode, measurements (one every 15 s) are called up automatically one after the other. Once the weighted S/N ratio measurement is completed, the measurement sequence is started again. Switchover between the two modes is with menu item OPTIONEN (options).

Menu item OPTIONEN-SENDERABGLEICH (options - transmitter tuning) has been provided as a tuning aid. Transmitter tuning is carried out in successive steps.

The following individual measurements can be triggered with the menu item MESSUNG (measurement):

RF power

With RF-LEISTUNG (RF power) selected in the menu, the FMAB measures the output power of the SU 115. Measured values are indicated in dBm.

Frequency response of preemphasis

With this function selected, the FMAB measures the frequency response of the preemphasis of transmitter SU 115, with lowpass filter / preemphasis switched on. Measurements are carried out in the left and the right channel between 40 Hz and 15 kHz; measurement results are displayed in a table (see **FIG 2**).

Amplitude deviation

With the aid of this function the FMAB measures the amplitude deviation of the transmitter from the rated characteristic, separately for the left and right channel at 40 Hz, 500 Hz, 5 kHz, 10 kHz and 15 kHz.

Unweighted S/N ratio

With this function selected, the FMAB measures the unweighted S/N ratio of transmitter SU 115 for the left and right channel. At a deviation of 40 kHz and a modulation frequency of 500 Hz, the unweighted noise voltage must be spaced by at least 66 dB from the wanted signal (see data sheet specs of SU 115).

Weighted S/N ratio

The weighted S/N ratio is also measured at

40 kHz deviation and a modulation frequency of 500 Hz. However, in this case the CCIR filter

selected in the FMAB causes the weighted instead of the unweighted S/N ratio to be displayed.

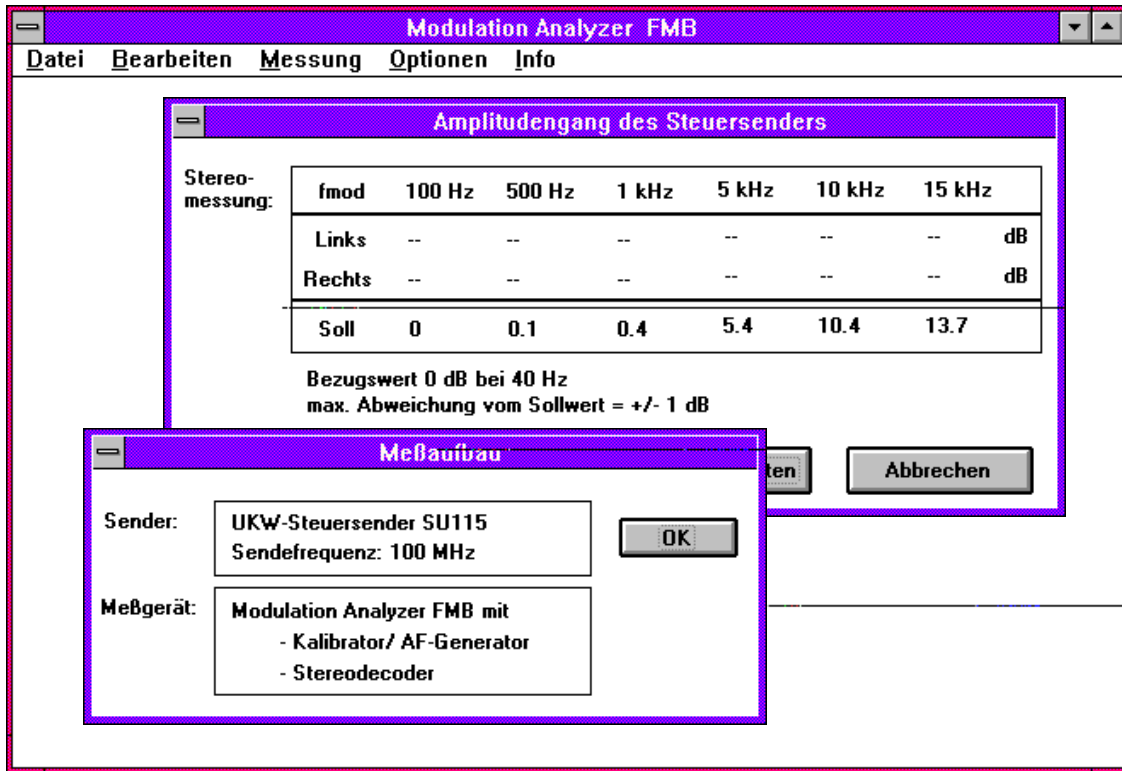


FIG 2 User interface of FMBDEMO test program

Hardware and software required

For running the test program on a PC, the following conditions have to be met:

- IBM-compatible PC with hard disk and mouse
- Keithley IEC/IEEE-bus card (KPC-488.2)
- MS-DOS version 3.30 and higher
- Microsoft Windows version 3.1

Installation and calling up the test program on PC

Two procedures are required before the test program can be called up:

1. A directory has to be installed on the hard disk, eg on drive C, using DOS command

```
mkdir c:\fma
```

2. The following two files have to be copied onto the hard disk, eg from a floppy in drive A, using commands

```
copy a:\fmbdemo.exe c:\fma
```

```
copy a:\win488.dll c:\fma
```

After these preparations, the test program FMBDEMO can be called up under Windows 3.1.

Availability of programs

All application programs mentioned in this application note are available at the nearest Rohde & Schwarz representative.

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