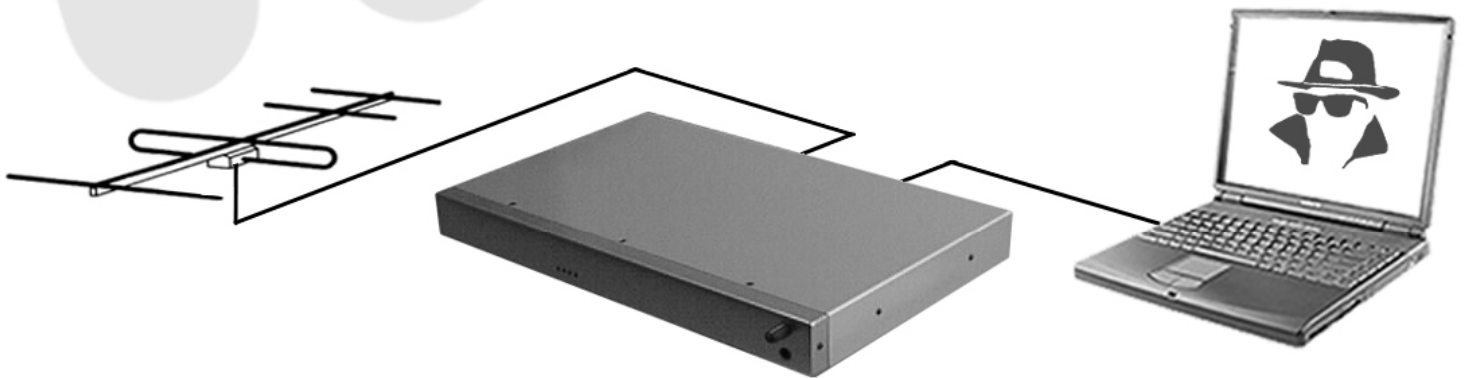# MEDIA ENGINEERING

"FM-SPY"

A computer controlled measuring device for FM sound broadcasting signals

USB based FM MODULATION ANALYSER

- ➢ built-in precision FM tuner
- ➢ headphones output with volume control
- ➢ 2 RF transformer balanced antenna inputs
- ➢ USB interface for host computer
- ➢ „FM-SPY" application program
- ➢ computer controlled RF scans and panorama
- ➢ measuring of the RF signal strength
- ➢ measuring the amount of multipath
- ➢ presentation of the MPX signal in the time & frequency domain
- ➢ calculating the frequency deviation & the power of the MPX signal
- ➢ complete decoding and listing of RDS data
- ➢ alarm outputs via photocouplers
- ➢ the most cost effective measuring device for P_{MPX} and Δf

! PROFESSIONAL ! COST EFFECTIVE ! FEATURE LOADED ! ONLY 19"/1RU !

FM-SPY

With the new development "FM-SPY" the company MEDIA ENGINEERING is introducing a very versatile and cost effective measuring device suitable for obtaining and assessing quality parameters of FM sound broadcasting transmissions. It has been developed under strict consideration of recommendations of the ITU-R as well as own experiences in this field of engineering.

The "FM-SPY" is equally suitable for daily operational measurements as well as for control measurements in the laboratory, in the workshop or in the field. Thanks to its simple concept it is very easy to install and to put into operation. The "FM-SPY" features a multitude of functions, all of which are important for measuring and evaluating the characteristics of FM sound broadcasting transmissions. Especially the precise seizing of frequency deviation Δf and the power of the multiplex signal P_{MPX} can be outperformed according to recommendations of the ITU-R. The results can be printed out or saved for later use and it's also possible to program various alarm signals.

The "FM-SPY" needs to be connected to a MS WINDOWS® computer with a USB-port and with a FM broadcasting receiving antenna.

BASIC CONCEPT

The precision FM tuner built into the "FM-SPY" receives the signal to measure via one of two antenna inputs. The selection of the proper receiving FM frequency as well as the antenna input is outperformed with the help of the host computer connected to the "FM-SPY".

The FM demodulated MPX signal as well as the signal S representing the receiving RF signal strength are brought to two 14bit analog-to-digital converters. The resulting 14bit data words are transferred via the USB interface to the connected computer 400'000 times per second. The data rate on this interconnection can be as high as approximately 7Mbit/sec.

EASY OPERATION

The MS WINDOWS® application program "FM-SPY" allows the control of the device and the selection of the measurements. The FM receiving frequency to measure can be keyed in directly while the inputted data is rounded automatically to the smallest tuning step width of 25kHz.

The panorama scan function in the "FM-SPY" is representing an overview of all FM signals which can be received plus the RF signal strength of these stations. Scans are possible within any band limits in the FM band in steps of 25kHz, 50kHz or 100kHz. A spectral diagram shows the RF-level versus the receiving frequency plus PSNS labels.

After setting the tuner to the receiving frequency the RF signal is automatically analysed. The „FM-SPY" checks the receiving signal for a minimum signal strength and for the amount of multipath reception. The resulting quality parameters are compared with predefined values and a GO/NOGO decision for further measurements is calculated. The default threshold values are set according to recommendations of the ITU-R. The „FM-SPY" can measure independent of the result of this decision but the criterion GO or NOGO is repeated on all measurement records together with other measuring parameters like actual date, time, measuring location, duration, operators name ect.

During these preliminary decisions as well as during the following measurements the „FM-SPY" is working in strict conformity to relevant recommendations and internationally ratified specifications, in particular to Rec. CCIR-641, ITU-R BS.450-2, ITU-R BS. 412-9 and ITU-R SM.1268-1
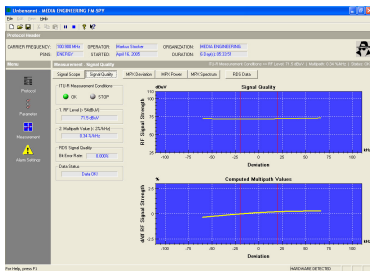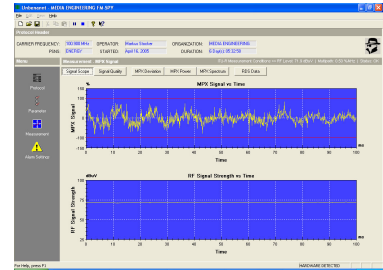
FEATURE LOADED SOFTWARE

In the FM-SPY application program the various measurements rsp. displays are selected with „*tab controls*":

FM-SPY

In the tab **SIGNAL** an oscilloscope-like representation of repeatedly sampled clips of the MPX and S signal are shown.

In the tab **SIGNAL QUALITY** the RF receiving signal quality is shown. The amount of multipath is quantified with the maximum gradient of the RF amplitude versus RF frequency [%/kHz] plus the bit error rate BER of the RDS data stream (if present) as a numerical value. The presentation is useful for monitoring purposes or while setting up antennae.

In the tab **DEVIATION** the peak frequency deviation measurements are shown as a bar graph and statistical analysis of these measurements in the form of a histogram of the density function and a plot of the inverse density distribution.
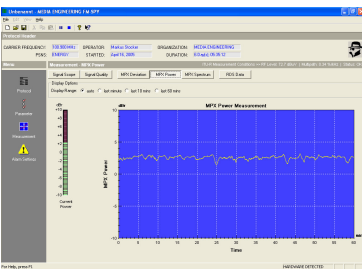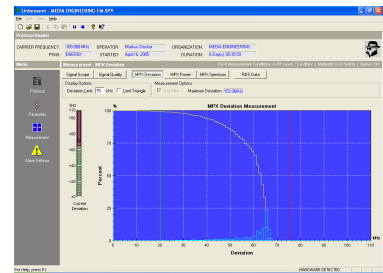
In the tab **MPX POWER** a curve plot is presenting the power of the MPX signal integrated over the last 60 seconds. The ordinate is scaled in dBr and its 0dBr mark corresponds to the +/-19kHz frequency deviation reference of a pure sinewave modulation as recommended and specified through the ITU-R.

In the tab **SPECTRUM** the MPX signal is represented in the frequency domain as the result of a 1024 point FFT for which diverse windowing functions are selectable. Frequency band limits are marked in the graphic in order to identify MPX signal frequency components easily.
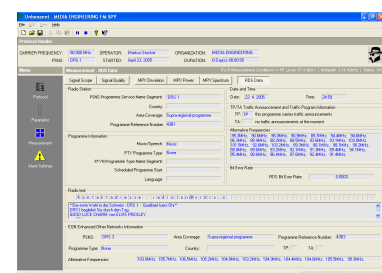
In the tab **RDS** all demodulated and decoded RDS data is listed as well as the Bit-Error-Rate BER of the RDS data stream.

FM-SPY

TECHNICAL SPECIFICATIONS "FM-SPY"

ANTENNAE INPUTS

number of antennae inputs 2
antenna input impedance …….. 75 Ω
antenna input connector type.. F (receptacle)
antenna input circuit.. transformer balanced earthfree
antenna selecting switch: …………….………………………. the unused input is matched to 75 Ω

FM RECEIVER

receiving frequency range ....……………... 87.500MHz - 108.000MHz
receiving frequency step width ...……………….……….….. 25kHz
sensitivity .... 5uV@30dB$_{SINAD}$
intermodulation ..…... 5mV (73dB) suppression

COMPUTER INTERFACE

Type USB1.1
Datarate ....……....... ca. 7Mbit/sec.
Maximum Cable Length .... 5 meters

ALARM OUTPUTS

Connector Type …….....................................……………. chassis D type, female receptacle, 25 pins
Number of Alarm Outputs .... 7 photocouplers
Load Capacity .... U$_{CEmax}$ = 35V / I$_{Cmax}$ = 50mA
Additional DC Output ....…………………….. +15.0 VDC, stabilized
Fusing of additional DC Output ....……………..... PTC, I$_{hold}$ = 0.5A

POWER SUPPLY

mains power voltage ....…….... 90 - 250 VAC
mains power line frequency .... 47 - 63 Hz
power consumption …………... < 25 Watt

PHYSICAL DIMENSIONS

width x depth x height ....…….. 380 x 260 x 44 mm
weight .... 4.5 kg

INCLUDED ACCESSORIES:

1 pcs. power cord, 3 wire
2 pcs. antenna connector adapter type "F-male" ⇔ "IEC-male"
2 pcs. 19"/1RU rack mount kit
1 pcs. USB connection cable, length: 2m
1 pcs. user's manual
1 pcs. CD-ROM with application program "FM-SPY" for MS WINDOWS[®]

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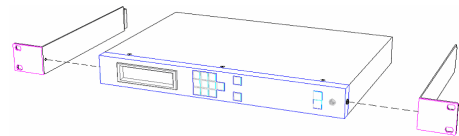
subject to change

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