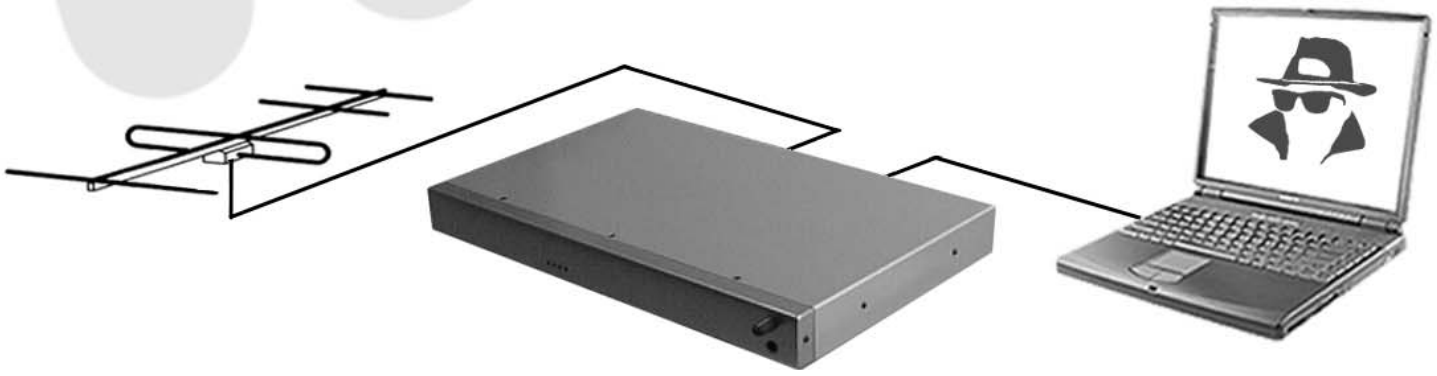
MEDIA ENGINEERING

"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 all RDS data
- 4 alarm outputs via photocoupler
- the most cost effective measuring device for P_{MPX} and Δf

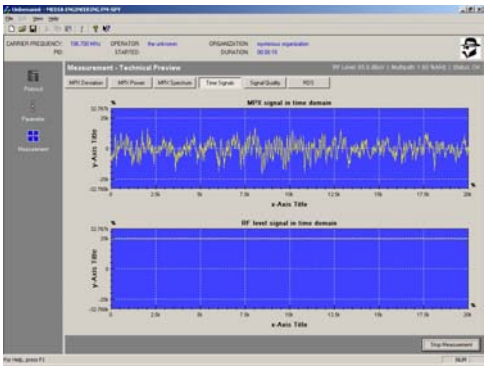
! PROFESSIONAL ! COST EFFECTIVE ! FEATURE LOADED ! ONLY 19"/1RU !

"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 possible to trigger alarm signals automatically.

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

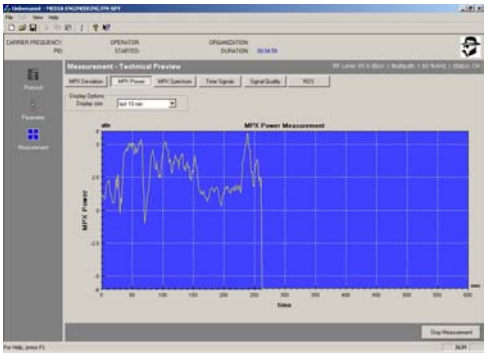


presentation in the frequency domain ► as the result of a 1024 point FFT. Clearly visible are the stereo pilot tone and the DSSC signal at 38kHz as well as the RDS and the DARC signal.

BASIC CONCEPT

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

The FM demodulated MPX signal as well as the signal S representing the receiving RF signal strength are brought to two 14-Bit 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 is approximate 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.

graphic presentation in the MPX/S-plain ► (RF amplitude versus RF frequency)

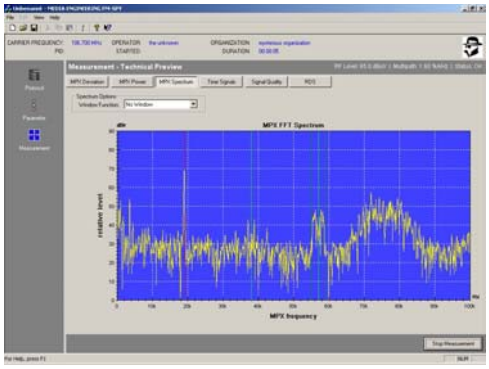
The panorama scan function in the "FM-SPY" is presenting an overview of all FM signals to receive plus the RF signal strength of these stations. Scans are possible within any band limits in the FM band in steps of 25kHz, 50kHz or 100kHz. A spectral diagram shows the RF-level versus the receiving frequency and - if RDS is broadcasted - the radio stations name.

"FM-SPY"

After setting the tuner to the receiving frequency to measure 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 the further measurements is calculated. The default threshold values are set according to recommendations of the ITU-R but they can be changed to any numbers at any time. 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 the actual date, the time, the measuring location, the duration, the 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, ITU-R SM.1268-1.

◄ representation in the time domain (repeated clips of 2ms duration)



FEATURE LOADED SOFTWARE

The different measurements of the „FM-SPY“ are selected with „*tab controls*“:

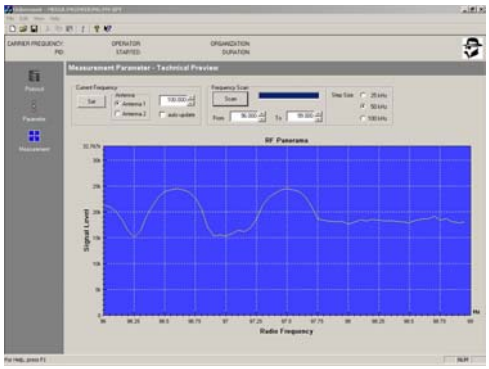
In the tab ***DEVIATION*** peak frequency deviation measurements are shown as bar graphs and statistical analysis of these measurements in the form of a histogram of the density function and a plot of the inverse density distribution.

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.

◄ continuous presentation of the 60sec integration of the power of the MPX signal as a curve-trace and as bar graphs with faster integration times

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. Different frequency band limits are clearly marked in the graphic in order to identify MPX signal frequency components easily.

In the tab ***SIGNAL*** an oscilloscope-like representation of repeatedly sampled 2msec clips of the MPX or S signal are shown.



In the tab ***RDS*** all demodulated and decoded RDS data are listed as well as the Bit-Error-Rate BER of the RDS data stream.

In the tab ***SIGNAL QUALITY*** the RF receiving signal quality is shown. The amount of multipath is quantified with the maximum reflection factor [%] and with the maximum gradient of the RF amplitude versus RF frequency [%/kHz] plus the 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 ***TUNER CONTROL*** the receiving frequency and the proper antenna input A or B are selectable as well as the band limits and the step width for panorama scans in the FM band. The graphic presentation of the RF FM spectrum is useful for the searching of specific stations and for monitoring purposes as well as for the detection of jamming signals in the vicinity of the carrier frequency or at plus or minus the IF.

The most cost effective P_{MPX} measuring device!

"FM-SPY"

TECHNICAL SPECIFICATIONS

ANTENNAE INPUTS

Number of Antennae Inputs 2
Antenna Input Impedance..... 75 Ω
Antenna Connector Type ..... F (female receptacle)
Circuit ..... RF transformer balanced earthfree
Antenna Selector Switch ..... computer controlled solid state switch

FM RECEIVER

Receiving Frequency Bandlimits ..... 87.500MHz - 108.000MHz
Receiving Frequency Tuning Step Width 25/50/100kHz
Sensitivity ..... 5uV@30dB$_{SINAD}$
Intermodulation ..... 5mV (73dB) separation

COMPUTER INTERFACE

Type USB1.1
Datarate ..... approximate 7Mbit/sec
Maximum Cable Length ..... 5 meter

ALARM OUTPUTS

Connector Type ..... Chassis D-type, male, 15 pin
Number of Alarm Outputs ..... 4 photocouplers
load capacity ..... U_{CEmax} = 60V / I_{Cmax} = 50mA
Additional DC Output ..... +5.0 VDC, stabilized
Fusing of additional DC Output ..... PTC, I_{hold} = 0.5A

POWER SUPPLY

Mains Power Voltage ..... 100V - 250 VAC
Mains Power Line Frequency ..... 47 - 63 Hz
Power Surge ..... < 25 Watt

PHYSICAL DIMENSIONS

Width x Depth x Height ..... 380 x 240 x 44 mm
Weight ..... 4.5 kg

INCLUDED ACCESSORIES:

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

subject to change

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