AFJ INSTRUMENTS

R3000 EMI TEST RECEIVERS

Fully IF digital EMI Receivers family for measurement of electromagnetic interference from 9kHz to 3GHz

Data Sheet

Compact designed and manufactured in compliance with CISPR 16-1-1, for measurements of electromagnetic interference in accordance with the requirements of EMI standards such as CISPR, EN 550xx standards, continuously active pre-selectors, advanced software for EMC automation.

R3000 EMI Receivers are PC based microprocessor controlled with advanced software for EMC automation. Fitted with continuously active pre-selectors that allow excellent dynamic range and precise EMC measurements covering the frequency range from 9kHz to 3GHz. These receivers are ideally suited for measurement of electromagnetic interference in accordance with the requirements of **CISPR** and **EN**.

EMI MEASUREMENTS TO STANDARD

Optimized easy-to-use EMI measurement concept.

Fitted with the internal pre-selector/ preamplifier all AFJ R3000 models feature an excellent dynamic range and are, therefore, able to perform precise EMC tests.

Measurements to commercial EMI standards such **as CISPR, EN 550xx,** shall be carried out directly by comparing the EMI spectrum with the associated limit lines and switching on the appropriate detectors.

MAIN FEATURES

- Peak, Quasi-Peak, CISPR Average, RMS and CISPR RMS
- Correct pulse weighting to CISPR 16-1-1 from PRF of 1Hz
- High measurement speed and fast detection of critical frequencies (dwell time down to 2msec)
- EMI measurement bandwidths 200Hz, 9kHz, 120kHz , 1MHz
- High sensitivity
- Large-signal immunity
- Low measurement uncertainty
- High measurement speed
- Correction values for attenuator / amplifier cables loss, coupling networks, GTEM correction and antenna k factors
- Overload indicator
- Touch screen display for on site stand alone usage
- Tracking generator

CISPR COMPLIANCE

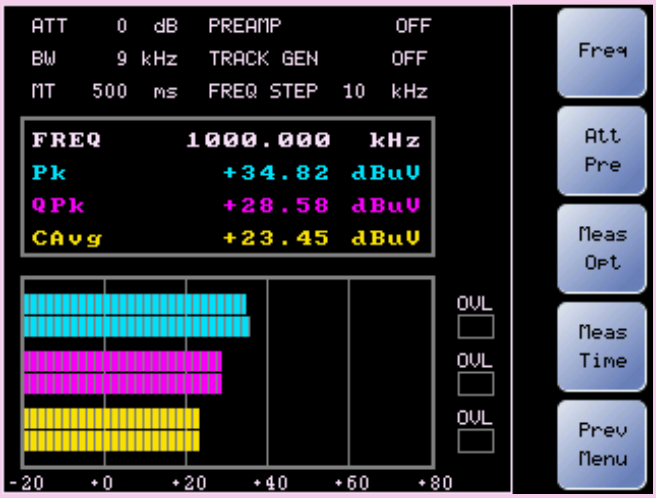
R3000 EMI Receivers fully complies with CISPR 16-1-1 and CISPR 16-1-2.
The response of R3000 Quasi-Peak Detector in terms of both **absolute calibration** and **relative calibration** lays between the tolerances of CISPR 16-1-1.
The pulse weighting conformity meets down to the minimum value of the Pulse Repetition Frequency (PRF) coming from the DUT, **of 1Hz**.

Accuracy and reproducibility are key parameters for AFJ R3000 EMI Receivers application.

R3000 EMI Receivers are PC-based and totally controlled by easy-running WINDOWS™ software.
Software enables the operator to set all parameters and set-up the EMI Receiver as requested by CISPR 16-1-1 or to tailor it according to his specific needs.
Some examples are:

- Frequency range and frequency step
- Detectors (Peak, Quasi Peak, CISPR Average, RMS, CISPR RMS and combination of them)
- Limits set by European and other Standards
- Correction factors
- GTEM correction factors

DATA BASE
Receiver settings, measurements set-up, tests and measurements, frequency tables, external devices correction factors are automatically saved into powerful **data base** according to the proper **work spaces** defined by the user.



Touch screen display for on site stand alone usage

PRE-SELECTION FILTERS

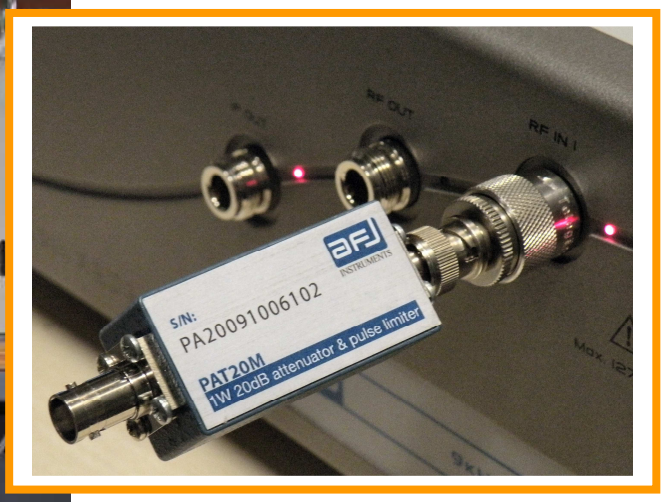
The input bandwidth of the front end is limited by pre-selection filters to reduce the total voltage level at the input mixer to an extent compatible with the wide dynamic range required for quasi-peak detection in the CISPR frequency range.

Up to 15 **fixed and tuned pre-selector filters** guarantee more than 40dB of attenuation for intermediate frequency, image frequency and intermodulation effects.

DETECTORS

Five different types of HW detectors and combinations of them can be selected by the user.
In addition to that, each detector type can be associated with a selectable timing, corresponding to the endurance of the measurement aperture gate.

In the Manual Mode, the bar graph, with current detector value and Max Hold display, shows the results of manual circuit adjustment an when DUT cabling is arranged for maximum emission.



Technical Specifications

Frequency Range	0Hz÷30MHz
Low pass filter up to	100MHz
Max continuous input power	1W
Max pulse input energy	1Ws (500µs)
Input / Output VSWR	1.05 / 1.15
Characteristic Impedance	50Ω
Insertion loss	20dB ± 0.3dB
In / Out RF connectors	BNC (f / m)
Dimensions	96x28x23mm
Weight	70g
Nominal Temperature range	–10°C÷+45°C
Storage temperature range	–25°C÷+70°C

A **Pulse Limiter/Attenuator** is required to protect the RF input stages of sensitive equipment from unpredictable spikes generated during conducted emission testing of a DUT.

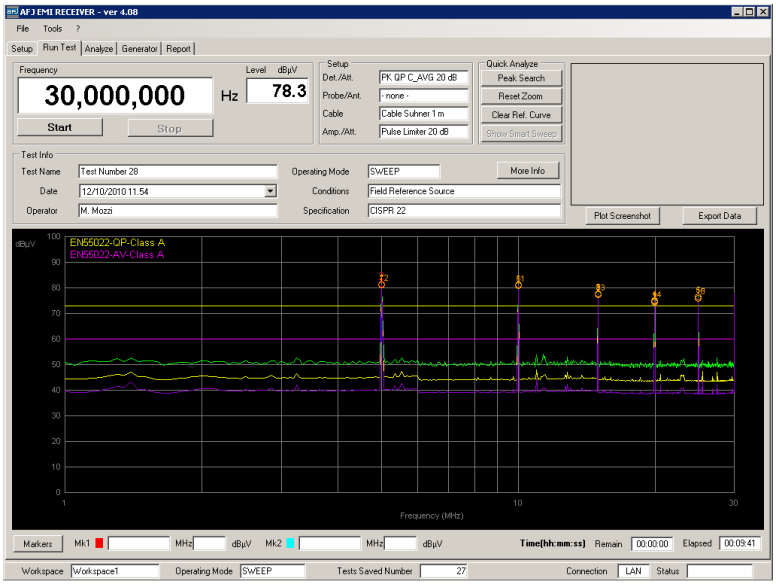
We recommend the utilization of our Pulse Limiter/Attenuator with all our EMI receivers, in particular whenever DUT are tested for the first time.

These Spikes with high spectral density/Pulse energy can seriously damage all input stages such as, attenuators, pre-amplifier, preselector or mixer of our or other receivers as well as other RF sensitive equipment such as Spectrum Analysers.

PAT20M 20dB Attenuator is designed to stand Pulse Voltages up to 1Ws.

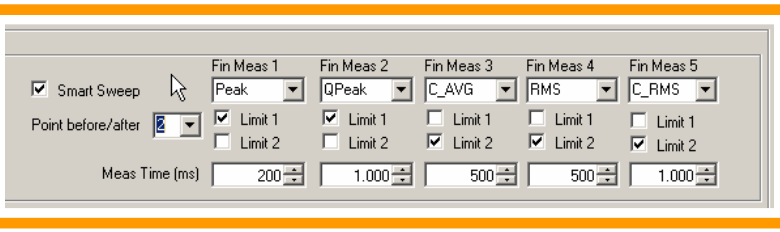
SWEEP MODE

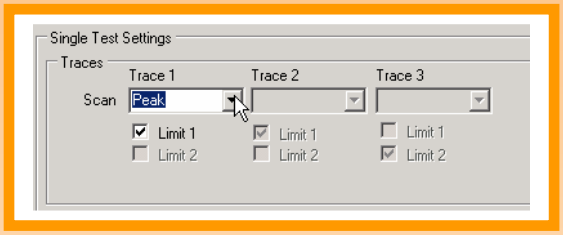
Fast overview measurements with logarithmic or linear frequency scale with tuning in user defined frequency step with selectable measuring time.

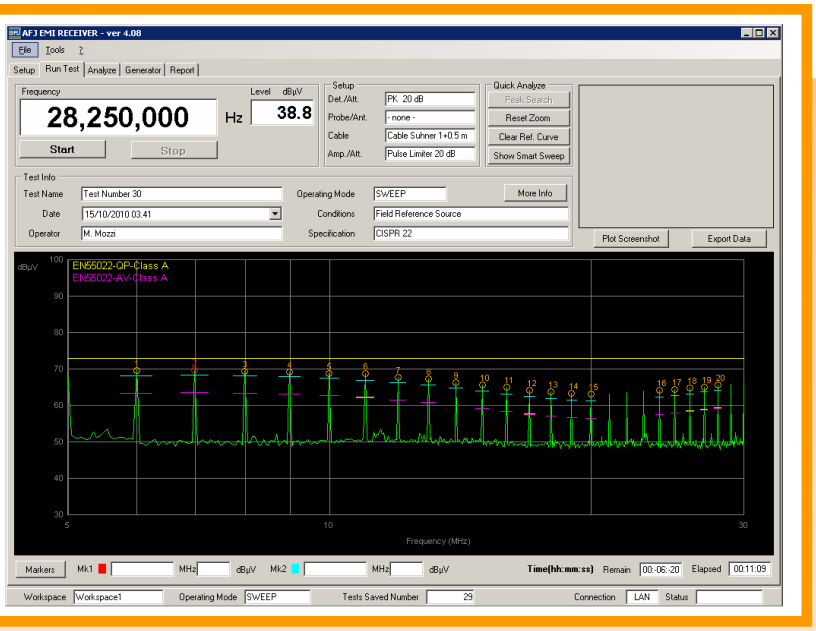


SMART SWEEP

First measurement with one detector (usually Peak) and after peak searching the final measurement is repeated in these peaks with up to five detectors. Each peak can be check up to 10 points before / after, setting a Limit and a Measuring Time for each selected detector.

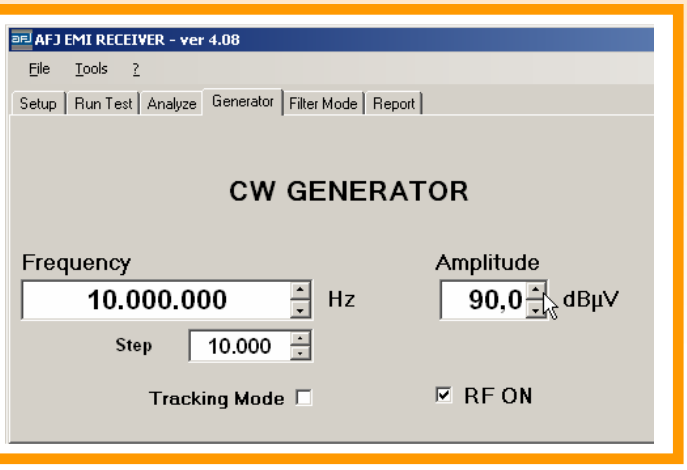






TRACKING GENERATOR

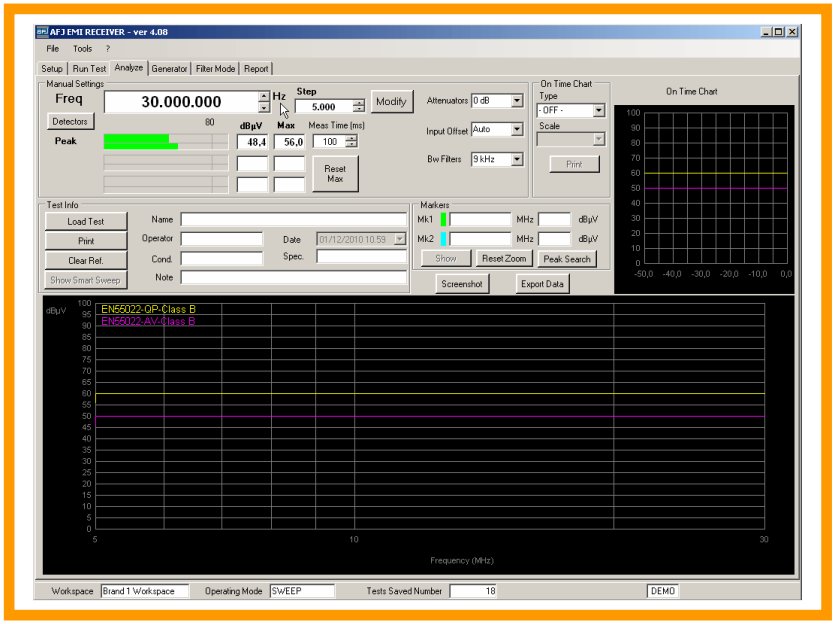
CW Generator has to be activated by checking flag RF ON and then choosing the Tracking Mode (in this case a sweep is activated) or Single Frequency Mode.

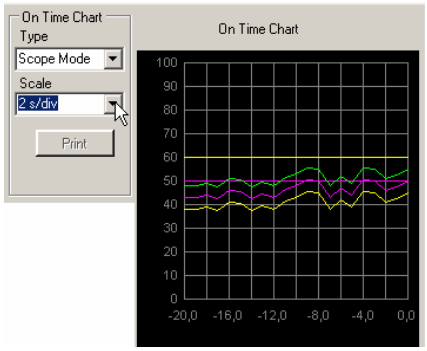


Software Windows

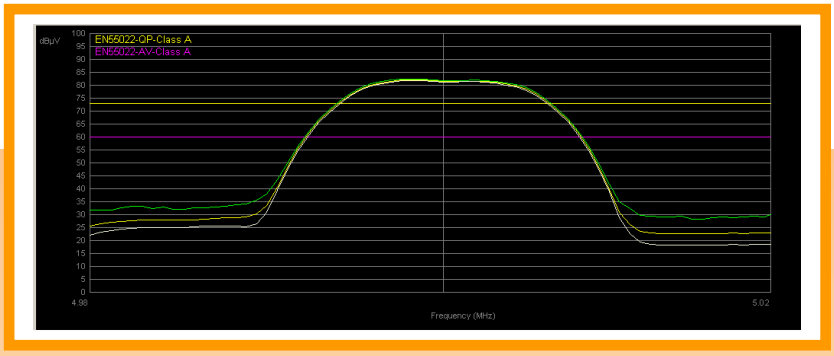
ANALYZE MODE

The purpose of the ANALYZE mode is to load old tests and measurements and perform monitoring of the events occurring on selected frequency through MANUAL settings, checking full sweep with MARKERS, PEAK SEARCH and ZOOM functions.



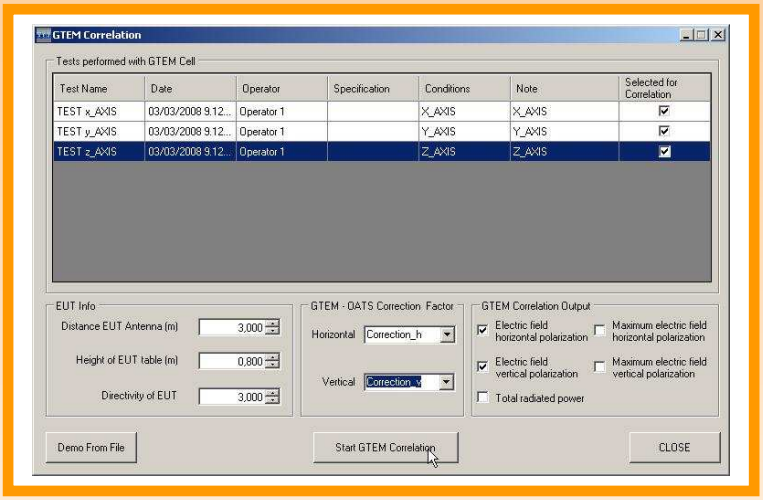


The **TIME DOMAIN** option allows to analyze the interference level on selected frequency in the time domain.



ZOOM MODE

Performs a zooming operation on the diagram part that is selected pushing shift button of the keyboard and left key of the mouse at the same time. The new diagram can be checked with all ANALYZE MODE functions.

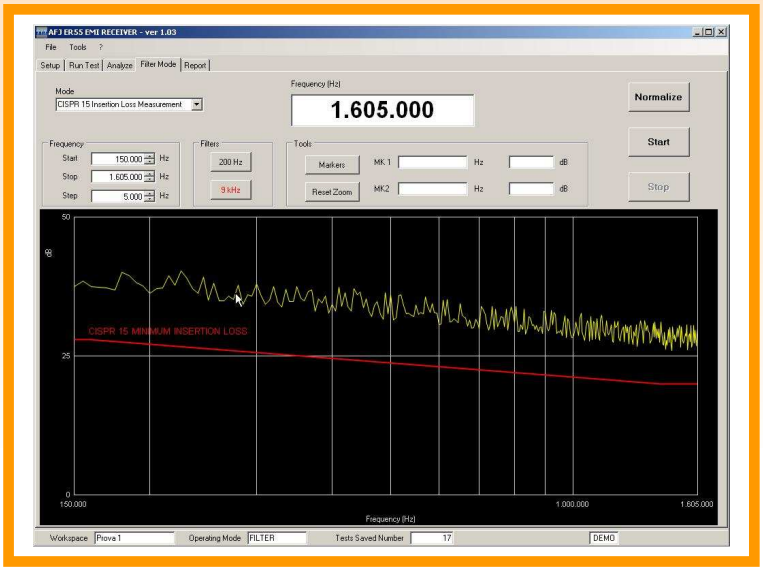


GTEM CORRELATION

Software option allows end user to perform radiated emission measurements in GTEM cells and calculate final result through correlation algorithmic using measurement results and GTEM correction factors.

CISPR 15 INSERTION LOSS

Software option allows end user to perform insertion loss measurements according to CISPR 15, selecting FILTER operating mode into the SET UP window.



Test Routine

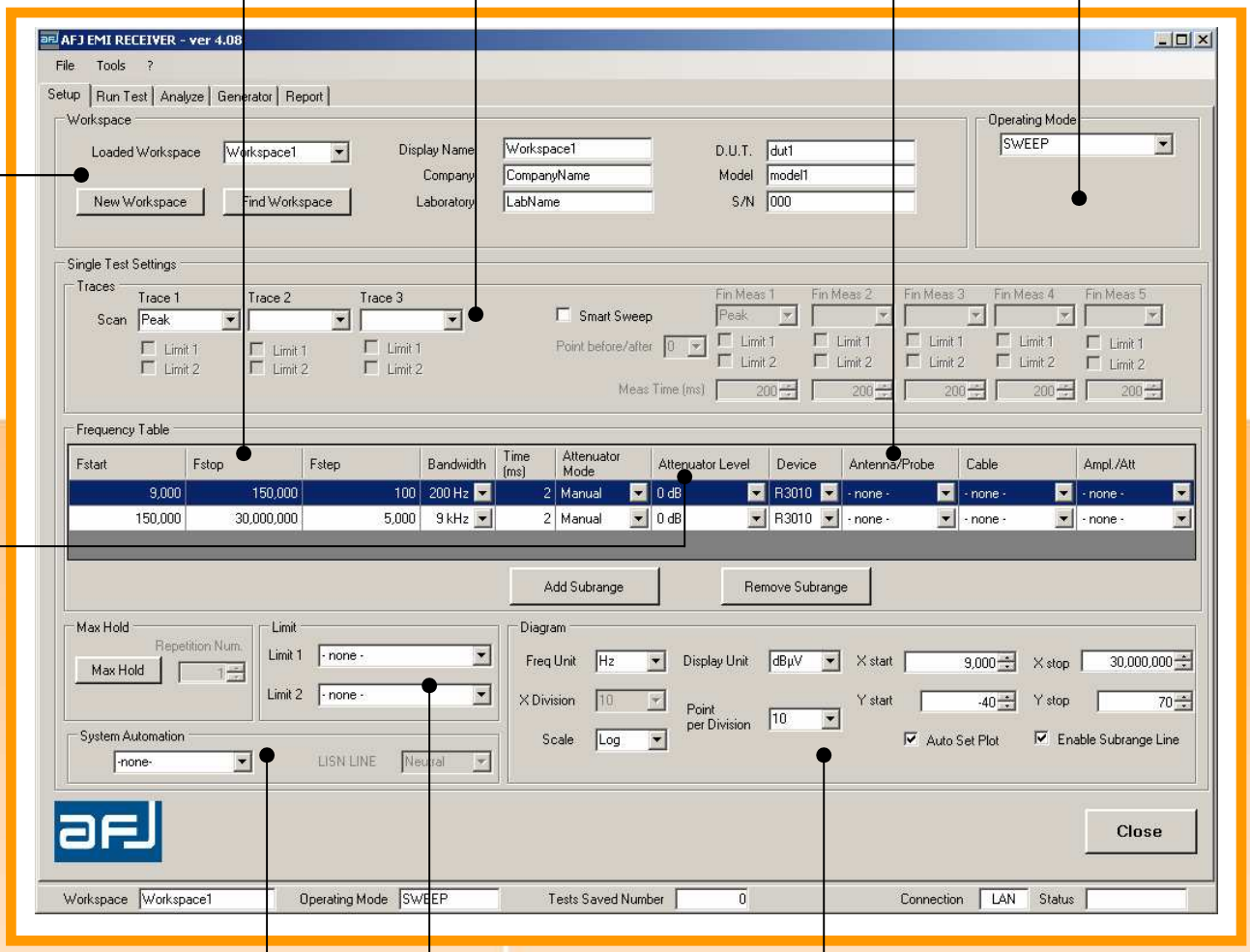
OPERATING MODE
To enables the selection of the measure conditions under which the R3000 Receiver will operate to perform the analysis
SWEEP, **PEAK + QPEAK, FILTER**

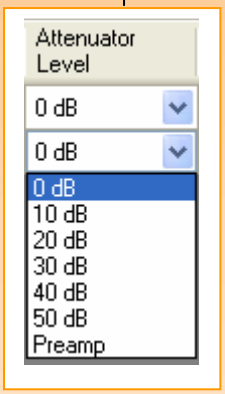
TRACES
Five different types of HW detectors can be selected by the user to define up to three traces at the same time. Smart sweep can be activated and its parameters defined (points before / after, Limit and a Measuring Time for each selected detector.

WORKSPACE
To define and set all data base work space parameters where all data and results will be automatically saved.

ANTENNA/PROBE, CABLE, Ampl/Att
To set Antenna/Probe correction factors, Cabling calibration files and additional device files (Amplifier and Attenuators).

FREQUENCY TABLE
To set the parameters that will affect the **SWEEP MODE**.



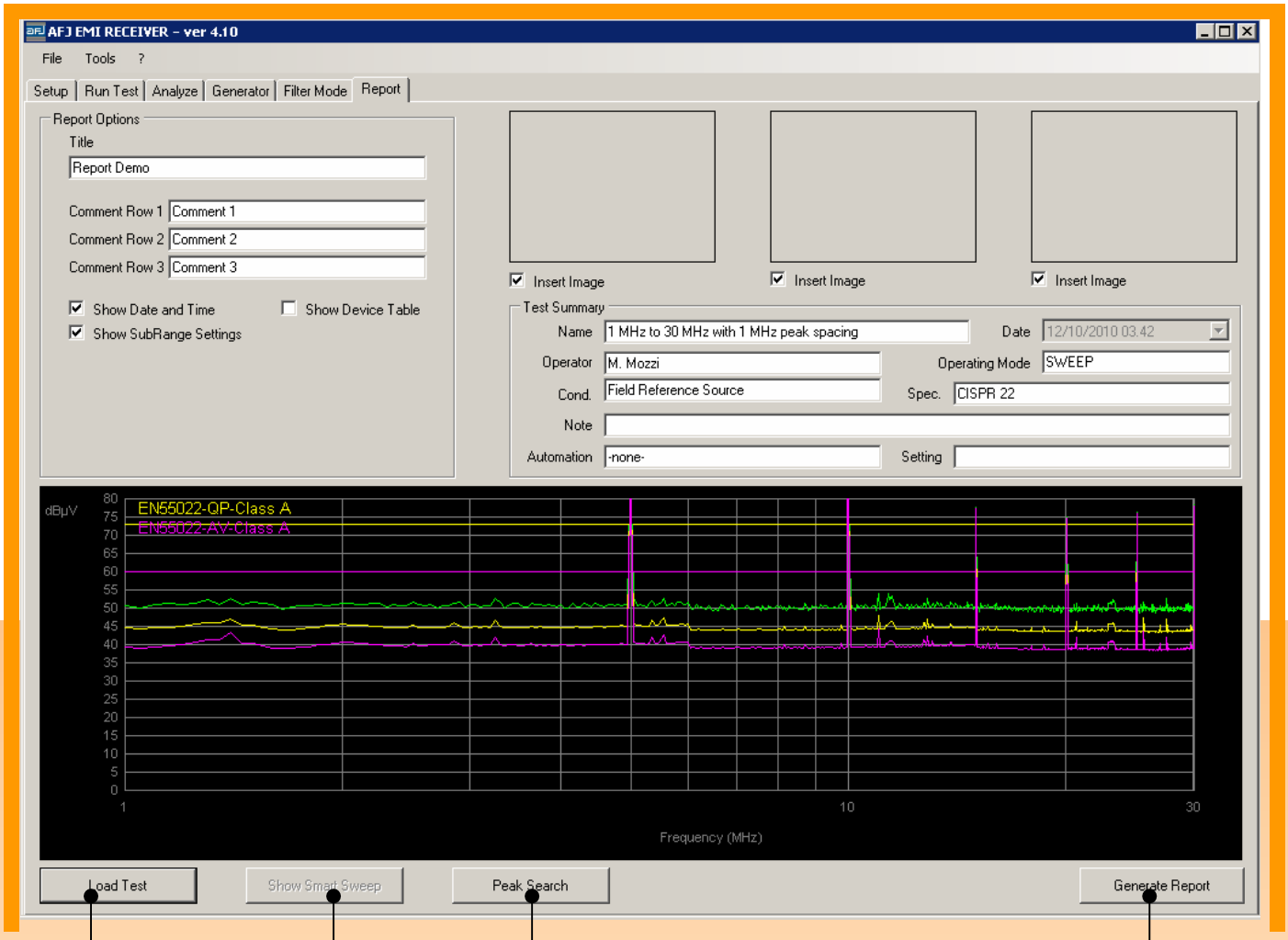


MANUAL ATTENUATION MODE
To set the right internal attenuation of the receiver to have the better dynamic range during measurement, with possibility to insert +20dB internal Preamplifier. All changes in this section, automatically affect the correction by a consistent extent.

LIMIT
To recall of all possible **LIMIT files** that can be built using the **EDIT LIMIT** function.

DIAGRAM
To set all necessary parameters for diagram settings.

SYSTEM AUTOMATION
To control foreign equipment associated with the measurement site set-up, such as **LISN**, **Controller for Antenna Mast, Turntable and Slide Bar.**



LOAD TEST
To load old tests and measurements and set all the necessary parameters and information for the test report.

SHOW SMART SWEEP
To show smart sweep results (sweep and peaks table).

PEAK SEARCH
To search the peaks to insert into the test report.

GENERATE REPORT
To create the test report according to the information set by the user.

R3000 receiver offers all functions that are required for in-house tests to perform EMC diagnostic measurement as quickly, easily and as accurately as necessary and to document the test results.

- Manual measurement through Manual Mode function
- On site stand alone usage through touch screen display
- Semi automatic measurement with predefined scan and sweep tables allowing interactive interruption
- Individual of critical frequencies using markers and zoom functions
- Fully automatic interference measurements in conjunction of external devices, as LISN, turn table, antenna mast, slide bar controllers

The EMC compliance test then will be just a formality.

	R3010	R3030
Frequency Range	9kHz÷30MHz	9kHz÷300MHz
Frequency Setting	1Hz (9kHz÷30MHz)	1Hz (9kHz÷300MHz)
Internal Reference Frequency		
Aging per Year	2×10^{-6}	
Temperature Drift	15×10^{-5} (+10 ℃ to +40 ℃)	
External Reference Frequency	10 MHz	
Frequency Display Local And Remote (manual mode)	Numeric Display	
Resolution	1Hz	
Frequency Display Remote (sweep mode)	Graphic Display on PC SW	
Resolution	Frequency Step (zoom function)	
Measurement Time (manual mode)	2ms to 90min	
Resolution	1ms (< 60sec)	
	1sec (> 60sec)	
Measurement Time (sweep mode)	2ms to 60s	
Resolution	1ms	
Digital EMI Filters BW	200Hz (-6dB Bandwidth)	
	9kHz (-6dB Bandwidth)	
	120kHz (-6dB Bandwidth)	
Hardware Filters BW	15kHz	
	1MHz	
Fixed & Tunable Preselection Filters	9 kHz to 150kHz	9 kHz to 150kHz
	150 kHz to 2MHz	150 kHz to 2MHz
	2MHz to 6MHz	2MHz to 6MHz
	6MHz to 15MHz	6MHz to 15MHz
	15MHz to 30MHz	15MHz to 30MHz
		30 MHz to 60 MHz
		60 MHz to 140 MHz
		140 MHz to 300 MHz
Maximum Input Level		
DC Voltage	50V (AC-coupled)	
CW RF Power	+20dBm	
Pulse Spectral Density	+97dBµV/MHz	
Immunity to Interference		
Image Frequency	> 60dB	
Intermediate Frequency	> 70dB	
RF Shielding	3V/m (50Ω termination)	

Noise Floor	IF 200 Hz	IF 9kHz	IF 120kHz (R3030)
Peak	< -10dBµV	< 10dBµV	< 10dBµV
Quasi Peak	< -15dBuV	< 5dBuV	< 5dBuV
CISPR Average	< -20dBuV	< 0dBuV	< 5dBuV
RMS	< -20dBuV	< 0dBuV	< 5dBuV
CISPR RMS	< -20dBuV	< 0dBuV	< 5dBuV

FRONT PANEL with Knob		
Display	3,5 Inch TFT with Touch Panel	
Features	Virtual Keyboard	
Level Display (digital)	Numeric (resolution 0,01dB)	
Level Display (analog)	Bargraph	
Detectors	Peak, Quasi-Peak, CISPR Average, RMS, CISPR RMS	
Number of Contemporary Detectors	3	
Display Units	dBµV, dBm, dBµV/m, dBµA/m, dBA/m, dBµA, dBpW	
RF Input Impedance	50Ω	
RF Input Connector(s)	N female (RF 9kHz to 30MHz)	N female (RF 9kHz to 30MHz)
		N female (RF 30MHz to 300MHz)
RF Input VSWR	2,0 to 1,0 (attenuation 0dB)	
	1,2 to 1,0 (attenuation ≥ 10dB)	
RF Input Attenuator	0dB to 50dB in 10dB steps	
IF Output Impedance	50Ω	
IF Output Connector	N female	
IF Frequency	10,7 MHz	10,7MHz (< 30MHz)
		18MHz (> 300MHz)
Tracking Generator	+50÷+95dBµV	+50÷+95dBµV (9kHz÷150MHz)
Interface	Ethernet 10/100 MB (TCP Port: 1893)	
PC Requirement	Pentium Dual Core Processor	
	Above 1GB RAM (min)	
	Ethernet 10/100 MB Network Board	
	WIN XP, WIN VISTA, WIN 7 OS	
Power Supply	230Vac ± 10% 50-60Hz	
Power Consumption	50VA	
Operating Temperature	0°to 45℃	
Storage Temperature	-20°to 70℃	
Size (W x H x D)	450x135x436mm.	
Weight	14kg	15kg

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