



INSTRUMENTS

## FFT 3100 & 3300 EMI TEST RECEIVERS

Fully digital IF EMI Receivers for measurement of radiated electromagnetic interference from 30MHz to 3GHz



Compact designed and manufactured compliant to CISPR 16 International Standard, using FFT Scan Mode for fast measurements of radiated electromagnetic interference in accordance with requirements of EMI International, European and Product standards, pre-selectors and advanced software for EMC testing.

**Easy  
EMC**

# FFT 3100 & 3300

## EMI TEST RECEIVERS

Based on a PC integrated architecture with WINDOWS 7 Embedded OS, FFT 3100 & 3300 EMI Receivers are ready to operate with advanced software for EMC testing, fitted with pre-selectors that allow excellent dynamic range and precise radiated emission measurements covering the frequency range from 30MHz to 3GHz. Remote control with an external PC is also possible.

Optimized easy-to-use EMI measurement concept.

Fitted with the internal pre-selector / preamplifier AFJ FFT 3100 & 3300 units feature an excellent dynamic range and are, therefore, able to perform precise EMC tests.

Measurements to commercial EMI International, European and Product standards, shall be carried out directly by comparing the EMI spectrum with the associated limit lines and switching on the appropriate detectors.

### MAIN FEATURES

- ◆ FFT Scan Mode
- ◆ Peak, Quasi-Peak, CISPR Average, RMS and CISPR RMS numerical detectors
- ◆ Automatic attenuation insertion in case of saturation condition during measurement sweep
- ◆ Precise digital overload detector to avoid saturation effects during analyzing function
- ◆ 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 1msec)
- ◆ High sensitivity
- ◆ Large-signal immunity
- ◆ Low measurement uncertainty
- ◆ High measurement speed
- ◆ Correction values for cables loss, attenuator/amplifier, coupling networks, GTEM correction and antenna factors
- ◆ Integrated signal generator
- ◆ 10MHz External reference frequency
- ◆ Software option for AM / FM / WBFM digital demodulations



### CISPR COMPLIANCE

FFT 3100 & 3300 EMI Receivers fully comply with CISPR 16-1-1. The response of FFT 3100 & 3300 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. The FFT Scan Mode is compliant to CISPR 16-3.

**Accuracy and reproducibility are key parameters for AFJ FFT 3100 & 3300 EMI Receivers application.**

Software enables the operator to set all parameters and set-up FFT 3100 & 3300 EMI Receivers as requested by CISPR 16-1-1 or to tailor them according to his specific needs.

Some examples are:

- ◆ Frequency range
- ◆ Numerical Detectors upgradable by software  
(Peak, Quasi Peak, CISPR Average, RMS, CISPR RMS and combination of them)
- ◆ Limits set by International, European and Product standards
- ◆ Dwell measurement time
- ◆ Correction factors
- ◆ GTEM correction factors



## TUNABLE PRE-SELECTION FILTERS

The input bandwidth of the front end is limited by pre-selection filters to reduce the energy at the input stage of the internal tuner to guarantee the wide dynamic range required for quasi-peak detection.

## FFT FUNCTION

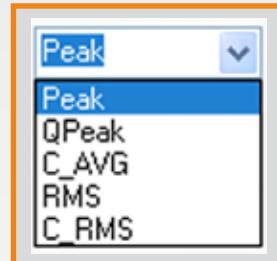
Compliant to CISPR 16-3, FFT is applied to the wideband IF signal with the advantages of Fast Scan Mode and the possibility to use the equipment in the standard receiver modes (SWEEP and SMART SWEEP).

## FILTERS

Digital CISPR EMI Filters BW (120kHz and 1MHz) do not need any periodic adjustment and maintenance.

## 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.

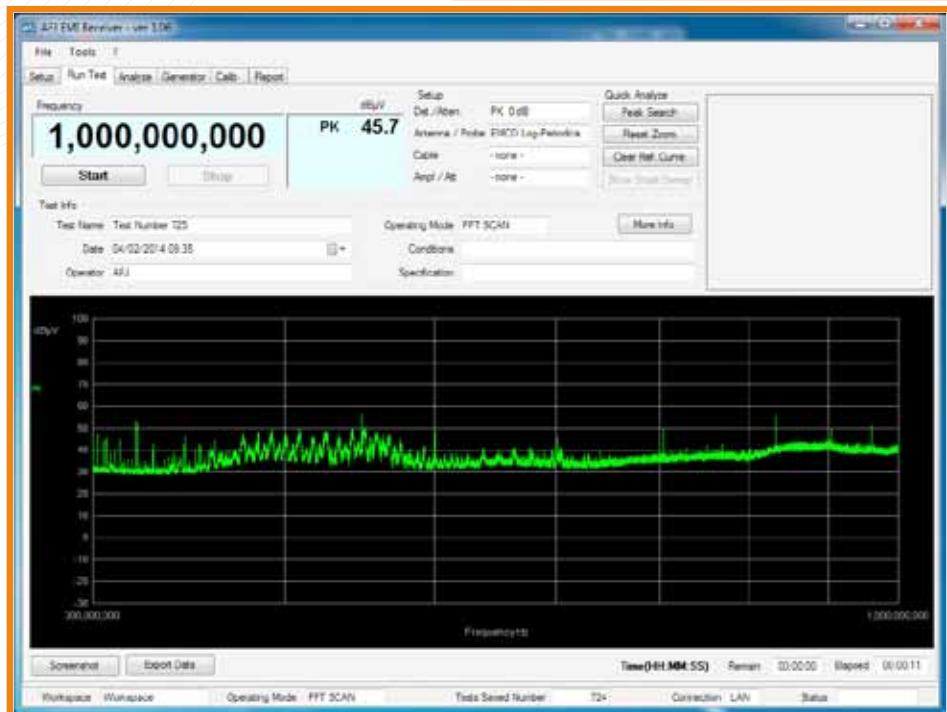


## DETECTORS

Due to digital IF technology, five different types of numerical detectors (upgradable by software) 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 Analyze Mode, the bar graph, with current detector value and Max Hold display, shows the results of manual circuit adjustment when DUT cabling is arranged for maximum emission.

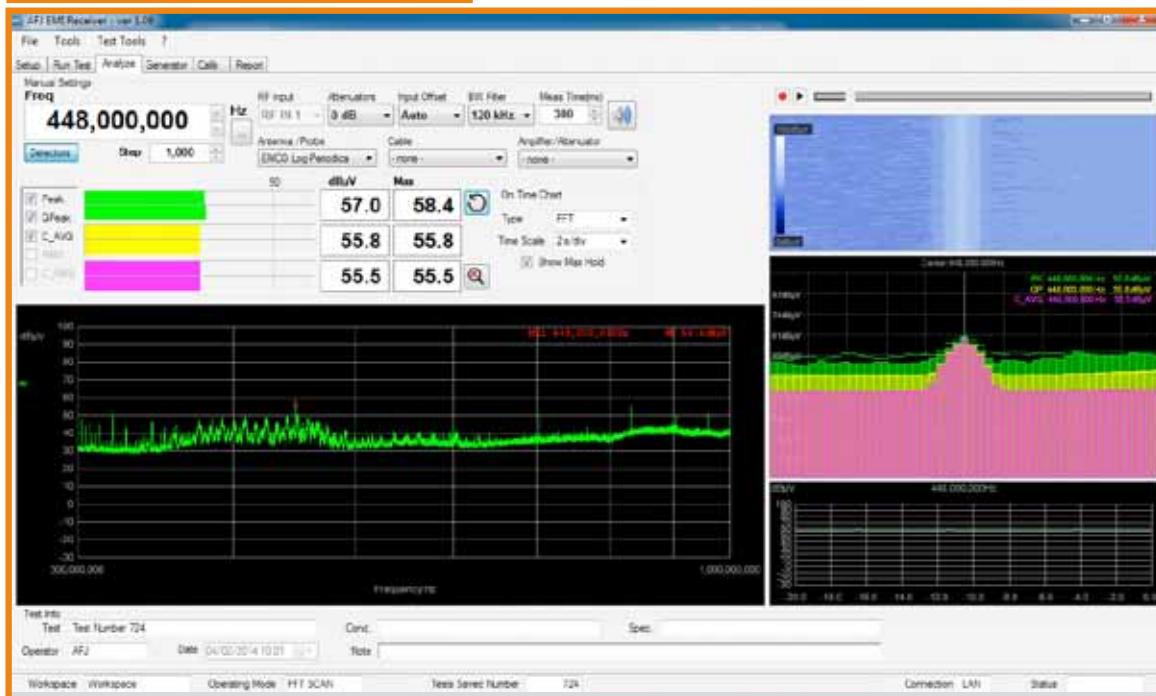
## SWEEP WITH FFT SCAN MODE



## FFT SCAN MODE

Fast Scan Mode with 49 simultaneous parallel detectors increases the measurement speed by a factor 49 compared to the measurement speed of the traditional EMI receivers.

## ANALYZE WITH FFT FUNCTION



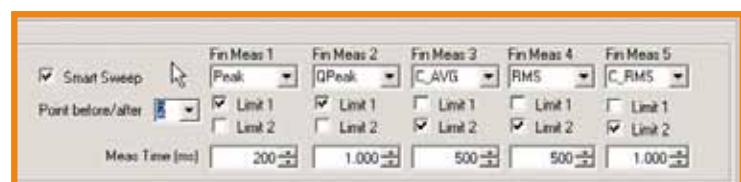


## SWEET MODE

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

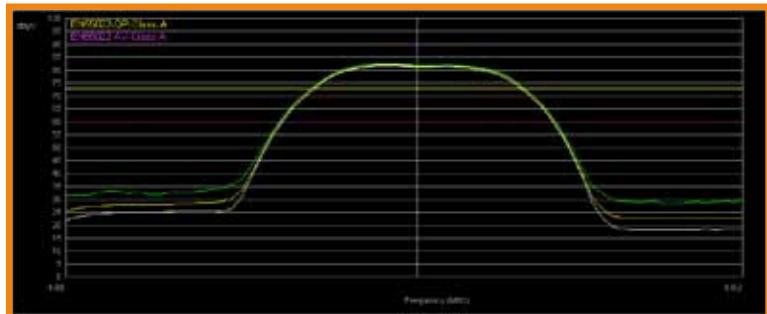
## SMART SWEEP

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



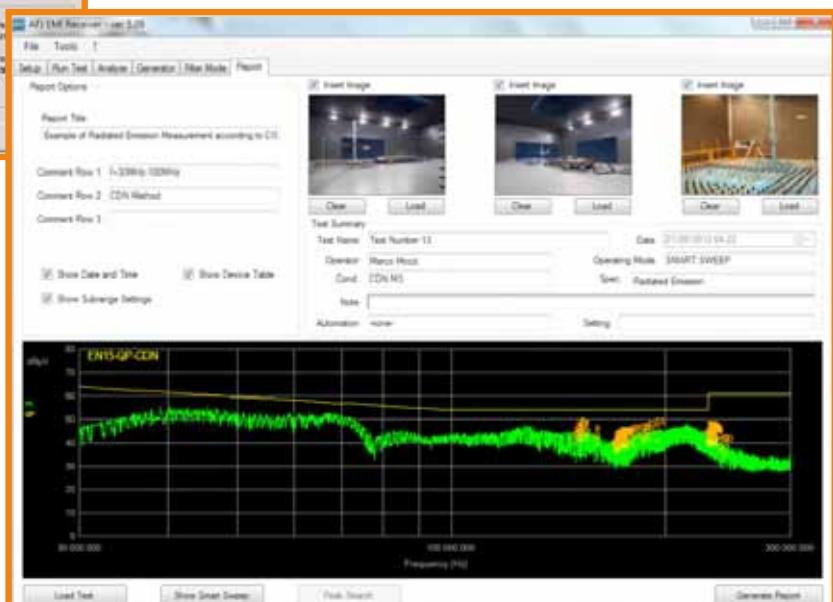
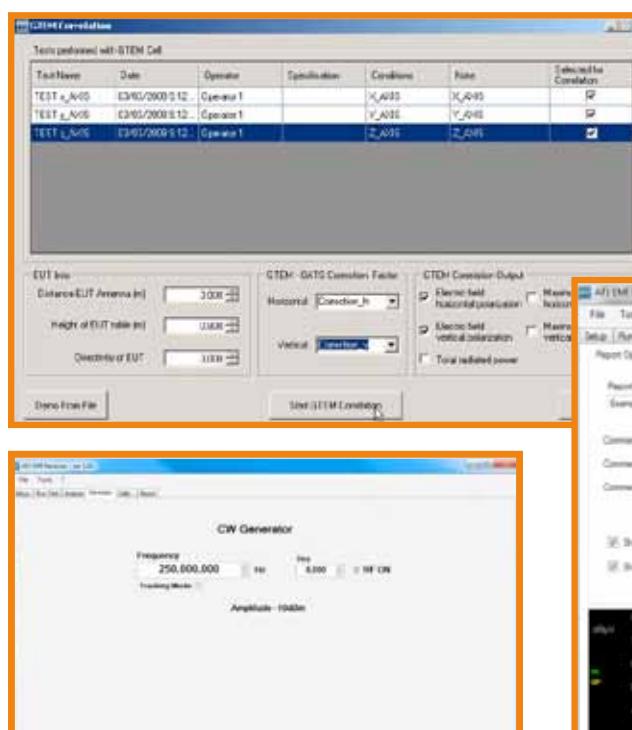
## ZOOM MODE

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.



## INTEGRATED SIGNAL 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.

### LOAD TEST

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

### 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.

### SHOW SMART SWEEP

To show smart sweep results (sweep and peaks table).

**FFT 3100 & 3300 EMI Receivers** offer 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. The EMC compliance test then will be just a formality.

**WORKSPACE**

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

**OPERATING MODE**

To enables the selection of the measure conditions under which the FFT 3100 & 3300 Receivers will operate to perform the analysis **SWEEP, PEAK + QPEAK, FILTER, SMART SWEEP, FFT SCAN**.

**FREQUENCY TABLE**

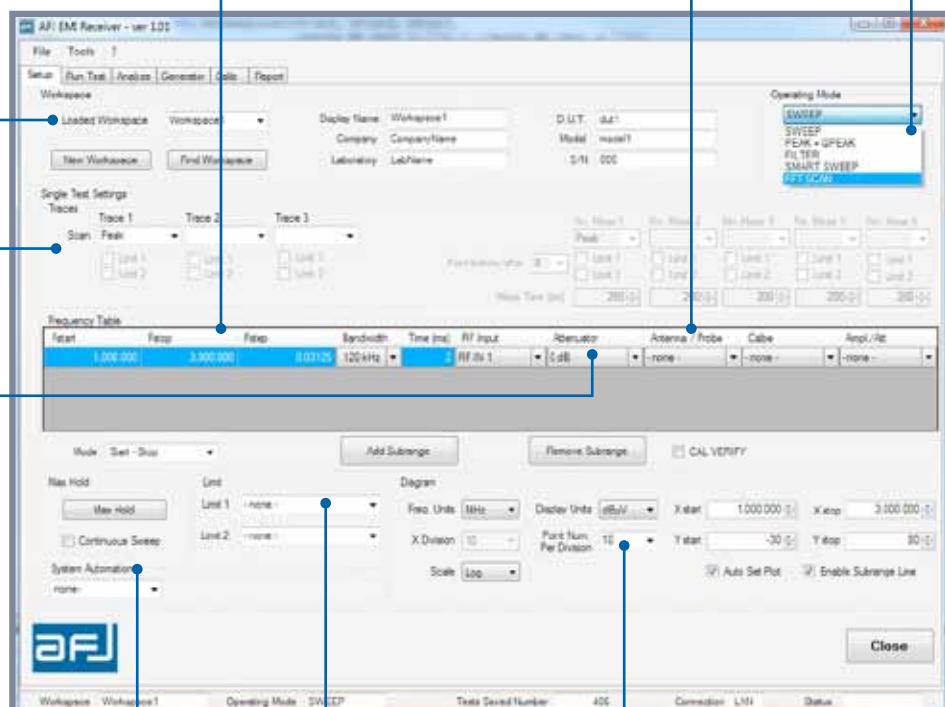
To set the parameters that will affect the selected **OPERATING MODE**.

**ANTENNA/PROBE, CABLE, Ampl/Att**

To set Antenna/Probe correction factors, Cabling calibration files and additional device files (Amplifier and Attenuators).

**TRACES**

Different types of numerical 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).



**ATTENUATORS**

0 dB
0 dB
10 dB
20 dB
30 dB
Preamp

**LIMIT**

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

**ATTENUATION SETTINGS**

To set the minimum level of internal attenuation of the receiver to have the better dynamic range during measurement, with possibility to insert +10dB internal Preamplifier. In case of saturation condition, automatic attenuation insertion is used. All changes in this section, automatically affect the correction by a consistent extent.

**DIAGRAM**

To set all necessary parameters for diagram settings.

**SYSTEM AUTOMATION**

This function requires a text script files to be programmed; this file allows to make an automatic sequence of measurements.

# TECHNICAL SPECIFICATION

	FFT 3100	FFT 3300
<b>FREQUENCY</b>		
<b>Frequency Range</b>	30MHz÷1000MHz	30MHz÷3000MHz
<b>Frequency Setting</b>	1Hz	1Hz (30MHz÷1000MHz) 10Hz (1000MHz÷3000MHz)
<b>Internal Reference Frequency</b>		
Aging per Year	$2 \times 10^{-6}$	$2 \times 10^{-6}$
Temperature Drift	$15 \times 10^{-5}$ (+10°C to +40°C)	$15 \times 10^{-5}$ (+10 °C to +40 °C)
<b>External Reference Frequency</b>	10MHz	10MHz
<b>Measurement Time (manual mode)</b>		
Resolution	1ms to 90min 1ms (< 60s) 1sec (> 60s)	1ms to 90min 1ms (< 60s) 1sec (> 60s)
<b>Measurement Time (sweep mode)</b>	1ms to 60s	1ms to 60s
Resolution	1ms	1ms
<b>RESOLUTION BANDWIDTHS</b>		
<b>Digital CISPR EMI Filters BW</b>	120kHz (-6dB Bandwidth)	120kHz (-6dB Bandwidth) 1MHz (-6dB Bandwidth)
<b>PRESELECTION</b>		
<b>Tunable Filters</b>	30MHz to 150MHz 150MHz to 350MHz 350MHz to 700MHz 700MHz to 1000MHz	30MHz to 150MHz 150MHz to 350MHz 350MHz to 700MHz 700MHz to 1000MHz
<b>LEVEL</b>		
<b>Maximum Input Level</b>		
DC Voltage	50V (AC-coupled)	50V (AC-coupled)
CW RF Power	+17dBm (Input Attenuation 0dB) +27dBm (Input Attenuation ≥ 10dB)	+17dBm (Input Attenuation 0dB) +27dBm (Input Attenuation ≥ 10dB)
<b>Immunity to Interference</b>		
Image Frequency	> 60dB	> 60dB
Intermediate Frequency	> 70dB	> 70dB
RF Shielding	3V/m (50 Ω termination)	3V/m (50Ω termination)
<b>Noise Floor</b>	BW 120kHz	BW 120kHz BW 1MHz
<i>50 Ω termination, Input Attenuation 0dB, Preamplifier OFF</i>		
Peak	< 18dB <sub>μ</sub> V	< 18dB <sub>μ</sub> V < 20dB <sub>μ</sub> V
Quasi Peak	< 12dB <sub>μ</sub> V	< 12dB <sub>μ</sub> V
CISPR Average	< 7dB <sub>μ</sub> V	< 7dB <sub>μ</sub> V < 9dB <sub>μ</sub> V
RMS	< 8dB <sub>μ</sub> V	< 8dB <sub>μ</sub> V < 10dB <sub>μ</sub> V
CISPR RMS	< 8dB <sub>μ</sub> V	< 8dB <sub>μ</sub> V < 10dB <sub>μ</sub> V
<i>50 Ω termination, Input Attenuation 0dB, Preamplifier ON</i>		
Peak	< 8dB <sub>μ</sub> V	< 8dB <sub>μ</sub> V
Quasi Peak	< 2dB <sub>μ</sub> V	< 2dB <sub>μ</sub> V
CISPR Average	< 0dB <sub>μ</sub> V	< 0dB <sub>μ</sub> V
RMS	< 0dB <sub>μ</sub> V	< 0dB <sub>μ</sub> V
CISPR RMS	< 0dB <sub>μ</sub> V	< 0dB <sub>μ</sub> V
<b>FFT SCAN MODE</b>		
<b>Dual A/D Converter Resolution</b>	14 bit	14 bit
<b>Sampling Rate</b>	80MHz	80MHz
<b>FFT Span</b>	2MHz	2MHz
<b>Simultaneous detectors in parallel</b>	49	49
<b>FFT Frequency Resolution</b>	31,250kHz	31,250kHz
<b>INPUT &amp; OUTPUT</b>		
<b>RF Input</b>		
Impedance	50Ω	50Ω
Connector(s)	N female (RF 30MHz to 1000MHz)	N female (RF 30MHz to 3000MHz) Optional (RF 30MHz to 3000MHz)
VSWR	<1.5 (RF 30MHz to 1000MHz, Input Attenuation 0dB) <1.2 (RF 30MHz to 1000MHz, Input Attenuation ≥ 10dB)	<1.5 (RF 30MHz to 1000MHz, Input Attenuation 0dB) <1.2 (RF 30MHz to 1000MHz, Input Attenuation ≥ 10dB) <2.6 (RF 1000MHz to 3000MHz, Input Attenuation 0dB) <1.5 (RF 1000MHz to 3000MHz, Input Attenuation ≥ 10dB)
Input Attenuator	0dB to 30dB in 10dB steps	0dB to 30dB in 10dB steps
<b>Integrated Signal Generator</b>	97dB <sub>μ</sub> V (-10dBm) from 30MHz to 1000MHz	97dB <sub>μ</sub> V (-10dBm) from 30MHz to 3000MHz
<b>GENERAL</b>		
<b>Interface</b>	Ethernet 10/100 MB Remotable LAN (LXI Level 0 Protocol)	Ethernet 10/100 MB Remotable LAN (LXI Level 0 Protocol)
<b>Power Supply</b>	230Vac ± 10% 50-60Hz	230Vac ± 10% 50-60Hz
<b>Power Consumption</b>	50VA	50VA
<b>Operating Temperature</b>	0° to 45°C	0° to 45°C
<b>Storage Temperature</b>	-20° to 70°C	-20° to 70°C
<b>Size (WxHxD)</b>	450 x 135 x 436mm	450 x 135 x 436mm
<b>Weight</b>	12,5kg	12,5kg



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*Subject to change without notice.*