

## FFT 3010 & 3030 EMI TEST RECEIVERS

Fully FFT digital EMI Receivers for measurement of conducted electromagnetic interference from 9kHz to 300MHz



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

# FFT 3010 & 3030

## EMI TEST RECEIVERS

Based on a PC integrated architecture with WINDOWS 7 Embedded OS, FFT 3010 & 3030 EMI Receivers are ready to operate with advanced software for EMC testing, fitted with pre-selectors that allow excellent dynamic range and precise conducted emission measurements covering the frequency range from 9kHz to 300MHz. 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 3010 & 3030 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 3010 & 3030 EMI Receivers fully comply with CISPR 16-1-1. The response of 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 3010 & 3030 EMI Receiver application.**

Software enables the operator to set all parameters and set-up FFT 3010 & 3030 EMI Receivers as requested by CISPR 16-1-1 or to tailor it 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 other Standards
- ◆ Dwell measurement time
- ◆ 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 signal with the advantages of Fast Scan Mode.

## FILTERS

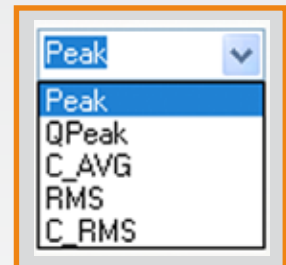
Digital CISPR EMI Filters BW (200Hz, 9kHz and 120kHz) do not need any periodic adjustment and maintenance.

## DATA BASE

Receivers 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 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.

### SINGLE TEST SETTINGS

To set the parameters that will affect the FFT SCAN MODE.



### TRACES

Different types of numerical detectors can be selected by the user to define up to three traces at the same time.

### OPERATING MODE

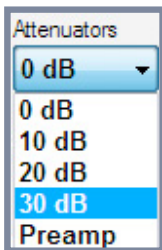
To enables the selection of the measure conditions under which the FFT 3010 Receiver will operate to perform the analysis **FFT SCAN, FILTER**.

### ANTENNA/PROBE, CABLE, Amplifier/Attenuator

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

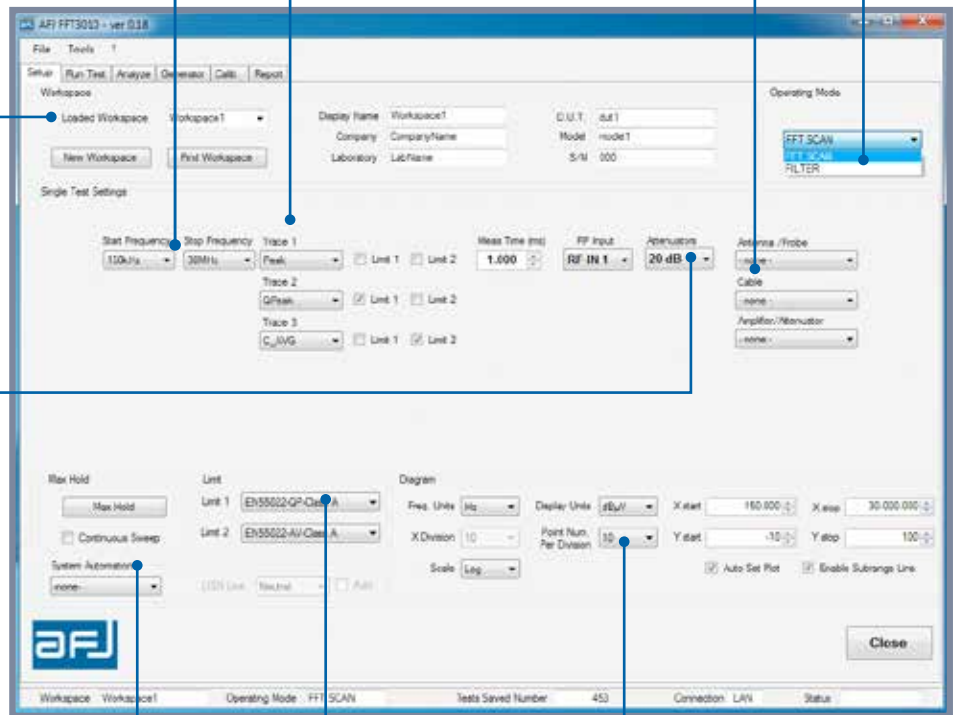
### WORKSPACE

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



### 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.



### 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

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

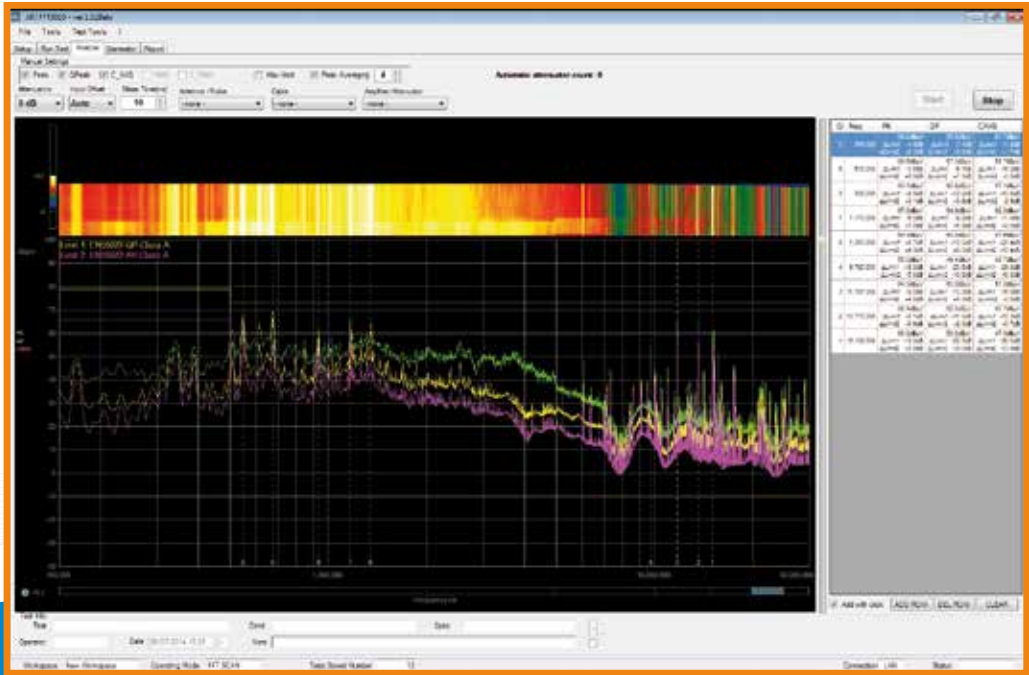


## FFT SCAN MODE

Fast Scan Mode with 3009 simultaneous detectors in parallel in Band A and 1669 simultaneous detectors in parallel in Band B increases the measurement speed by a factor 3009 in Band A and 1669 in Band B compared to the measurement speed of the traditional EMI receivers. 211 simultaneous detectors in parallel from 30 MHz to 300 MHz increase the measurement speed by a factor 211 in that frequency range compared to the measurement speed of the traditional EMI receivers.

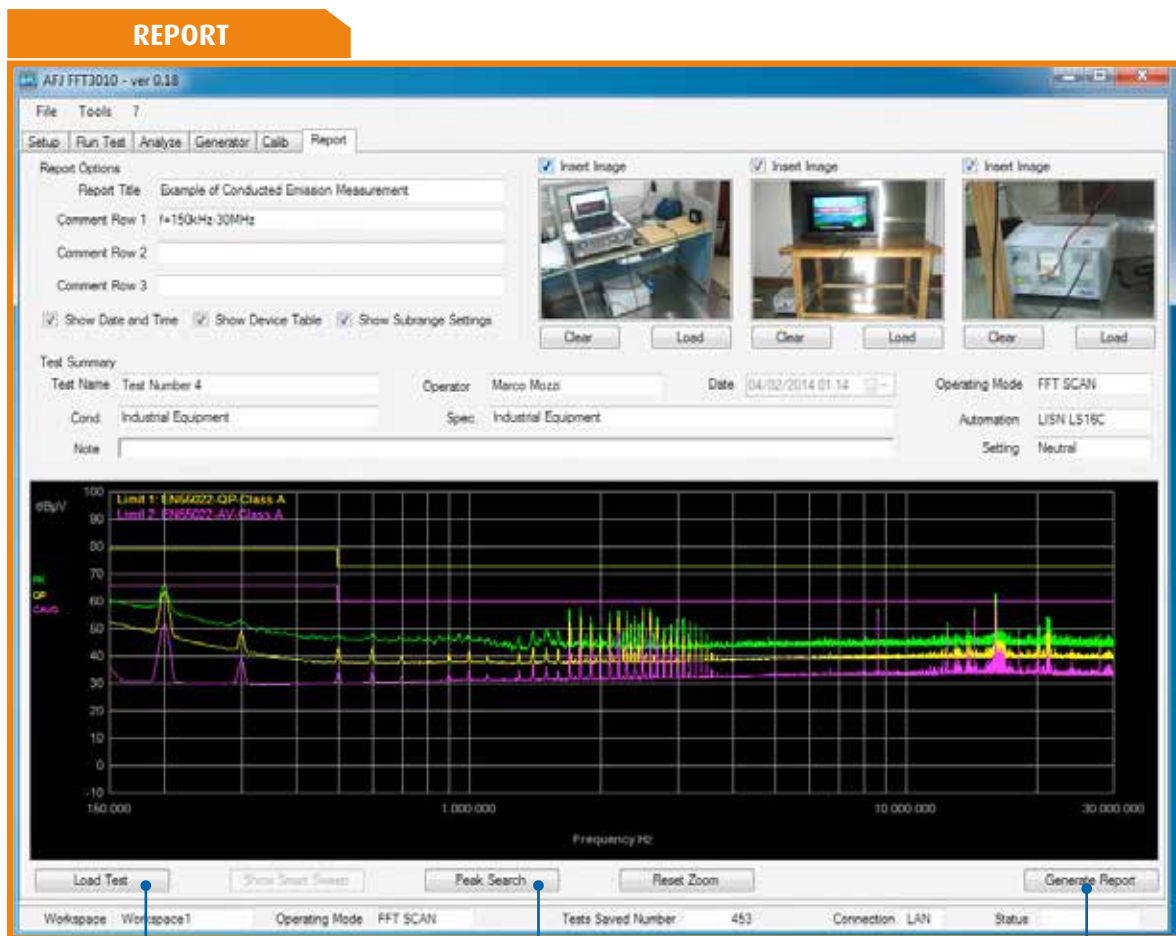


## ANALYZE



**FFT 3010 & 3030 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.



#### 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.

## FFT 3010 & 3030 EMI Receivers

**FFT 3030 EMI Receiver** is ideally suited for measurement of electromagnetic interference in accordance with the requirements of CISPR 14-1 (household appliances industry) and CISPR 15 (lighting equipment industry) standards.

Further to conducted emission measurements from 9kHz to 30MHz with LISN, CISPR 14-1 standard requires radiated power emission measurements from 30MHz to 300MHz with absorbing clamp, CISPR-15 standard requires radiated emission measurements from 30MHz to 300MHz with CDN method.



### FFT SCAN MODE



# TECHNICAL SPECIFICATION

## FFT 3010

## FFT 3030

FREQUENCY			
<b>Frequency Range</b>	9kHz-30MHz		
<b>Frequency Setting</b>	1Hz (9kHz-30MHz)		
<b>Internal Reference Frequency</b>	1Hz (9kHz-30MHz)		
Aging per Year	2 x 10 <sup>-6</sup>		
Temperature Drift	15 x 10 <sup>-5</sup> (+10 °C to +40 °C)		
<b>External Reference Frequency</b>	10MHz		
<b>Measurement Time (manual mode)</b>	1ms to 5s		
Resolution	1ms		
<b>Measurement Time (sweep mode)</b>	1ms to 5s		
Resolution	1ms		
RESOLUTION BANDWIDTHS			
<b>Digital CISPR EMI Filters BW</b>	200Hz (-6dB Bandwidth) 9kHz (-6dB Bandwidth)		
	200Hz (-6dB Bandwidth) 9kHz (-6dB Bandwidth) 120kHz (-6dB Bandwidth)		
PRESELECTION			
<b>Pre-Selector Filters</b>	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; border-right: 1px solid black; padding: 2px;">9 kHz to 150kHz 150 kHz to 5MHz 5MHz to 10MHz</td> <td style="width: 50%; padding: 2px;">10MHz to 15MHz 15MHz to 20MHz 20MHz to 30MHz</td> </tr> </table>	9 kHz to 150kHz 150 kHz to 5MHz 5MHz to 10MHz	10MHz to 15MHz 15MHz to 20MHz 20MHz to 30MHz
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LEVEL			
<b>Maximum Input Level</b>			
DC Voltage	50V (AC-coupled)		
CW RF Power	+17dBm (Input Attenuation 0dB) +27dBm (Input Attenuation ≥ 10dB)		
	50V (AC-coupled) +17dBm (Input Attenuation 0dB) +27dBm (Input Attenuation ≥ 10dB)		
<b>Immunity to Interference</b>			
Image Frequency	> 60dB		
RF Shielding	3V/m (50Ω termination)		
<b>Noise Floor</b>	BW 200Hz      BW 9kHz		
<i>50 Ω termination, Input Attenuation 0dB, Preamplicifier OFF</i>			
Peak	< 10dBμV      < 20dBμV		
Quasi Peak	< 0dBμV      < 15dBμV		
CISPR Average	< 0dBμV      < 10dBμV		
RMS	< 0dBμV      < 10dBμV		
CISPR RMS	< 0dBμV      < 10dBμV		
<i>50 Ω termination, Input Attenuation 0dB, Preamplicifier ON</i>			
Peak	< 0dBμV      < 10dBμV		
Quasi Peak	< -10dBμV      < 5dBμV		
CISPR Average	< -10dBμV      < 0dBμV		
RMS	< -10dBμV      < 0dBμV		
CISPR RMS	< -10dBμV      < 0dBμV		
<b>Measurement Accuracy with S/N &gt; 20dB</b>	± 0.8dB (9kHz-30MHz)		
	± 0.9dB (9kHz-30MHz) ± 1.4dB (30MHz-300MHz)		
FFT SCAN MODE			
<b>A/D Converter Resolution</b>	16 bit		
<b>Sampling Rate</b>	122,88MHz		
<b>FFT Span</b>	141kHz (Full CISPR Band A FFT) 5 MHz (Total 6 bands to cover Full CISPR Band B)		
	16 bit Variable 141kHz (Full CISPR Band A FFT) 5 MHz (Total 6 bands to cover Full CISPR Band B) 5 MHz (Total 54 bands to cover Band 30MHz-300MHz)		
<b>Full Compliant (1Hz) Sweep Measurement Time</b>	< 18s (Band A + Band B) < 15s (Band B)		
	< 18s (Band A + Band B) < 15s (Band B) < 150s (30MHz-300MHz)		
<b>Simultaneous detectors in parallel</b>	3009 (Band A) 1669 (Band B)		
	3009 (Band A) 1669 (Band B) 211 (30MHz-300MHz)		
<b>FFT Frequency Resolution</b>	46,875 Hz (Band A) 3kHz (Band B)		
	46,875 Hz (Band A) 3kHz (Band B) 24kHz (30MHz-300MHz)		
INPUT & OUTPUT			
<b>RF Input</b>	50Ω		
<b>RF Input Connector(s)</b>	N female (RF 9kHz to 30MHz)		
<b>RF Input VSWR</b>	< 2,0 : 1,0 (Input Attenuation 0dB) < 1,2 : 1,0 (Input Attenuation ≥ 10dB)		
	< 2,0 : 1,0 (Input Attenuation 0dB) < 1,2 : 1,0 (Input Attenuation ≥ 10dB)		
<b>RF Input Attenuator</b>	0dB to 30dB in 10dB steps		
<b>Integrated Signal Generator</b>	+50 ÷ +90dBμV		
	0dB to 30dB in 10dB steps +50 ÷ +90dBμV		
GENERAL			
<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		
<b>Power Consumption</b>	50VA		
<b>Operating Temperature</b>	0° to 45°C		
<b>Storage Temperature</b>	-20° to 70°C		
<b>Size (WxHxD)</b>	450 x 135 x 436mm		
<b>Weight</b>	12kg		
	450 x 135 x 436mm 12kg		



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*Subject to change without notice.*