



# **OPERATING MANUAL**

## **EMI Test Receiver**

### **R3000**

REVISION LEVEL 1.6

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## AFJ R3000 EMI TEST RECEIVER

### 1. • GENERAL INFORMATION

The information contained herein, is provided in connection with the installation software of **AFJ R3000** EMI receiver. Members of the AFJ R3000 family are:

<b>R3010</b>	<b>9 kHz</b>	<b>to</b>	<b>30 MHz</b>
<b>R3030</b>	<b>9 kHz</b>	<b>to</b>	<b>300 MHz</b>

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All efforts have been made to ensure the accuracy of the contents of this document. However, the supplier can assume no liability whatsoever for any errors in this manual or their consequences, direct and/or indirect.

### 2. • SCOPE AND ORGANIZATION OF THE MANUAL

This Manual contains information and procedures required to install and operate the members of the AFJ R3000 family of EMI Receivers. The contents are generic for all models of Interference Measuring Receivers: specific paragraphs, or parts thereof, will describe functionalities and operating modes pertinent to the single models, whenever appropriate. The manual is divided into six sections as follows:

<b>Section A</b>	<b>RF Emission Testing</b>
<b>Section B</b>	<b>R3000 General Information</b>
<b>Section C</b>	<b>System Installation</b>
<b>Section D</b>	<b>Operating Instruction</b>
<b>Section E</b>	<b>Report and Applications Notes</b>
<b>Section F</b>	<b>Manual Operations</b>
<b>Section G</b>	<b>Troubleshooting</b>

### 3. • STATEMENT OF COMPLIANCE

The AFJ R3000 receivers are designed and built in accordance with CISPR Publication 16-1-1: “Specification for radio disturbance and immunity measuring apparatus and methods - Part 1: Radio disturbance and immunity measuring apparatus”.

### 4. • WARRANTY

Systems, options and accessories thereof, manufactured and shipped under the AFJ Instruments brand name, are warranted to be free from manufacturing defects for a period of twelve (12) months from the date of shipment. AFJ Instruments certifies that all products are tested and inspected to comply with the published specifications originating from the company. Calibration procedure includes Calculation of uncertainty using ISO model and traceability. – Warranty is provided “Ex-Works”: therefore, AFJ Instruments will be responsible of the Amendment of failures arising from ascertained manufacturing defects only.

- Warranty will not be applicable in case of mishandling, unauthorized opening of the cabinets, improper use, and unauthorized repairs. In such cases, the warranty will be terminated.
- A repair under warranty will not extend the original term of validity of the warranty itself.

- All products or parts thereof, to be subject to a warranty operation, shall be shipped to the appropriate AFJ Instruments Warranty Centre, at Customer's charge.
- If a delivery back to the supplier is necessary we recommend keeping the original transport case. In such case, refer to the following Return Procedure.

## 5. • RETURN PROCEDURE

To return the R3000 receiver to AFJ Instruments, use the following procedure:

- Briefly describe the problem in writing (Service Requested form). Include the serial number of the item being returned;
- Give details regarding the observed symptom(s), and whether the problem is constant or intermittent in nature. If you have talked previously to AFJ representative about the problem, provide such information also;
- Package the unit carefully, using the original boxes and packing materials, if possible. If not, use the most protective envelope at disposal (Damages due to transport are not covered from any guarantee);
- Before return the system back to AFJ, wait for RMA number (Returned Material Authorization).

The SW provided with the systems, is released "as-is" and is not covered by any warranty, not expressed, nor implied. However, AFJ Instruments is committed to correct, in a reasonable timeframe, all possible discrepancies reported with respect to the product specifications, through appropriate SW releases, free-of-charge.

Any changes, additions, extensions of the SW or FW originally supplied, will render the system warranty invalid.

## 6. • DISCLAIMER OF LIABILITY

In no event shall AFJ Instruments be held liable for incidental or consequential damages of any kind whatsoever caused, or alleged to be caused directly or indirectly by the usage and operation of products herein, to customers or any third party, including, but not limited to, loss of use, loss of profit or any commercial loss. Products described herein, do not imply any stated or alleged fitness for use, or any feasibility for business purpose, or expectation of profit. AFJ Instruments sole and only commitment is the compliance with the published product specifications. All information in this manual is given in good faith. However, AFJ Instruments shall not be liable for any loss or damage whatsoever arising from the use of this manual, or any errors or omissions herein.

## 7. • WORKING CONDITIONS

The allowed temperature range during use of the device is +0°C to +45°C. In cases of storage or transport this range may exceed by -20°C to +70°C.

Working relative humidity shall be 30% to 75%, atmospheric pressure shall be 86 kPa to 106 kPa (860 to 1060 mba). System is not influenced by direct solar radiation.

The EMI receiver is to use in dry and clean rooms. Avoid conditions like dust, air-humidity, danger of explosion and aggressive chemical environment. During use a sufficient air circulation is to realize. It is possible that condense water originates inside the device due to storage or transport conditions. In this case realize a period of 2 hours for acclimatize without use.

Do not cover the ventilation holes. A distance of about 20 cm must to be maintained between the rear panel of R3000 and any wall and about 5 cm between the sides of R3000 and any equipment or walls.

NOTICE: The R3000 receiver is supplied in proper special packaging due to its heavy weight. We strongly recommend you to save packaging for next transport.



## MANUFACTURER DECLARATION OF CONFORMITY

The AFJ EMI receivers:

R3010 / R3030

is herewith confirmed to comply with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to:

- **Electromagnetic Compatibility, Directive 2004/108/EC**
  - IEC 61000-6-1 Electromagnetic compatibility (EMC) - Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments
  - IEC 61000-6-3 Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments
  - IEC 61326-1 Electrical equipment for measurement, control and laboratory use -EMC requirements - Part 1: General requirements
- **Low Voltage Equipment Directive (2006/95/EC) and EN 61010-1 ("Safety of Electrical Measuring Apparatus").**

The following Standards were applied:

EMC Directive 2004/108/EC	
EMISSION	IMMUNITY
IEC 61000-6-3: Electromagnetic compatibility (EMC) - Generic standards - Emission standard for residential, commercial and light-industrial environments	IEC 61000-6-1: Electromagnetic compatibility (EMC) - Generic standards - Immunity for residential, commercial and light-industrial environments
Conducted and Radiated Emissions EN 55022 class A (1994)	Electrostatic Discharge EN 61000-4-2: 1995
Conducted and Radiated Emissions EN 55011 Group I Class A (1991)	Radiated Immunity EN 61000-4-3: 1995
Current Harmonic EN 61000-3-2 (1995)	Electrical Fast Transients EN 61000-4-4: 1995
Voltage Fluctuation EN 61000-3-3 (1995)	Surge Immunity EN 61000-4-5: 1995

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## SECTION A: RF EMISSION TESTING

### A.1 • EMI

EMI (ElectroMagnetic Interference) is the disruption of operation of an electronic device when it is in the vicinity of an electromagnetic field (EM field) in the radio frequency (RF) spectrum that is caused by another electronic device.

The internal circuits of personal computers generate EM fields in the RF range. Also, cathode ray tube (CRT) displays generate EM energy over a wide band of frequencies. These emissions can interfere with the performance of sensitive wireless receivers nearby. If you have a wireless receiver of any kind and use it at the same time as you operate your personal computer, you will probably hear RF noise in the receiver that originates in the PC system.

Moderate or high-powered wireless transmitters can produce EM fields strong enough to upset the operation of electronic equipment nearby. If you live near a broadcast station or in the downtown area of a large city, you have probably experienced EMI from radio or television transmitters. Cordless telephones, home entertainment systems, computers, and certain medical devices can fail to work properly in the presence of strong RF fields.

Problems with EMI can be minimized by ensuring that all electronic equipment is operated with a good electrical ground system. In addition, cords and cables connecting the peripherals in an electronic or computer system should, if possible, be shielded to keep unwanted RF energy from entering or leaving. Specialized components such as line filters, capacitors, and inductors can be installed in power cords and interconnecting cables to reduce the EMI susceptibility of some systems.

Radio frequency EMI emission tests are a common feature for EMC compliance of most electronic and electrical products. The purpose of these tests is not so much to check the operation of the product, as to ensure the protection of users of the radio spectrum when the product is used in their neighborhood. All commercial products, including some automotive applications, will be tested against the CISPR standards.

### A.2 • CISPR 16-1-1 INSTRUMENTATION

IEC CISPR publication 16-1-1: "Specification for radio disturbance and immunity measuring apparatus and methods - Part 1: Radio disturbance and immunity measuring apparatus", specifies the characteristics and performance of equipment for measuring EMI in the frequency range 9 kHz to 1 GHz. It includes specifications for:

- The Quasi Peak, Peak, CISPR Average, RMS / CISPR RMS measuring receivers
- Artificial mains networks – LISN
- Current probes
- Voltage probes
- Absorbing clamps
- Antenna
- Tests Sites

All commercial standards refer to CISPR 16-1-1 systems. The EMI receiver is the key element of either conducted or radiated emission measurements.

#### A.2.1 • CISPR 16-1-1 RECEIVER

The principal measuring receiver CISPR parameters are listed in Table 1.

EMI receiver is similar to superhetrodyne spectrum analyser in all aspects, with additional features like pre-selector, pre-amplifier and different types of detectors like peak, Quasi Peak and

Average. The pre-selector consists of an input attenuator and a tunable band pass filter. It prevents the input mixer of the receiver from overloading and also it improves the dynamic range of the receiver. The pre-amplifier is a low noise amplifier, which is used to improve the sensitivity of the receiver. The main section of the EMI receiver are the IF filter and detector. The mainly three types of detector used for EMC measurements namely Peak, Quasi Peak and Average. Peak detector responds instantaneously to the peak value of the signal and discharges rapidly. The Quasi Peak detector is nothing but a Peak detector with weighted charge and discharge times which correct for the subjective human response to the pulse type interference. The Average detector measurements the Average value of the signal.

Parameter	Frequency Range			
	9 ÷ 150 kHz	0.15 ÷ 30 MHz	30 ÷ 1000 MHz	1 ÷ 18 GHz
<b>Quasi Peak</b>				
Charge time	45 ms	1 ms	1 ms	Not defined
Discharge time	500 ms	160 ms	550 ms	Not defined
Overload factor	24 dB	30 dB	43.5 dB	--
<b>Peak</b>				
$\tau_{\text{Discharge}} / \tau_{\text{Charge}}$	$1.89 \times 10^4$	$1.25 \times 10^6$	$1.67 \times 10^7$	$1.34 \times 10^8$
<b>General</b>				
Bandwidths (-6 dB)	200 Hz	9 kHz	120 kHz	1 MHz
Sine Wave accuracy	$< \pm 2$ dB	$< \pm 2$ dB	$< \pm 2$ dB	$< \pm 2.5$ dB

**Table A.1: CISPR 16-1-1 instrumentation characteristics**

## A.2.2 • BANDWIDTHS

If an interference signal spectrum is wider than the bandwidth of the instrument which measures it, then the indicated value will depend on that bandwidth. If it is narrower, then the indicated value is independent of bandwidth. This is the basis of the distinction between “narrowband” and “broadband” interference. If you are measuring known radio signals then you can tailor the measurement bandwidth to the characteristics of the signal, but this is not possible for EMC measurements, since the characteristic of the interference is almost by definition not known in advance. Therefore the measuring receiver specification must include a defined value not only for the bandwidth, but for the shape of the filter that determines this bandwidth. The CISPR bandwidths are given in table A1. These are bandwidths at which the receiver response is -6dB relative to the centre frequency.

Only a receiver whose bandwidth characteristics fully comply with this specification should be used for full compliance measurements. However, if you are only measuring narrowband interference, such as individual emissions from the harmonics of microprocessor clocks, the actual performance of the receiver filters will have little or no effect on the outcome. This is the root of much of the confusion over bandwidth requirements.

## A.2.3 • DETECTORS

In nature, interference emissions are not continuous at a fixed level. A carrier signal may be amplitude modulated, and both a carried and the broadband emission may be pulsed.

That is, the measured level indicated for different types of modulation will depend on the type of detector in use. As a result, test receivers should have man-like response built-in: they must have a Quasi Peak weighting display to show the human perception of interference as a measured value.

CISPR 16-1-1 specifies five principal detector types, Peak, Quasi Peak, CISPR Average, RMS and CISPR RMS. Radiated emissions limits are specified by standards using the Quasi Peak detector. Conducted emissions limits are specified for the Quasi Peak, the Average and RMS detectors. Full compliance measurements must use only the correct detectors. The difference between the detectors resides in how they respond to pulsed or modulated signals. All five types of detector

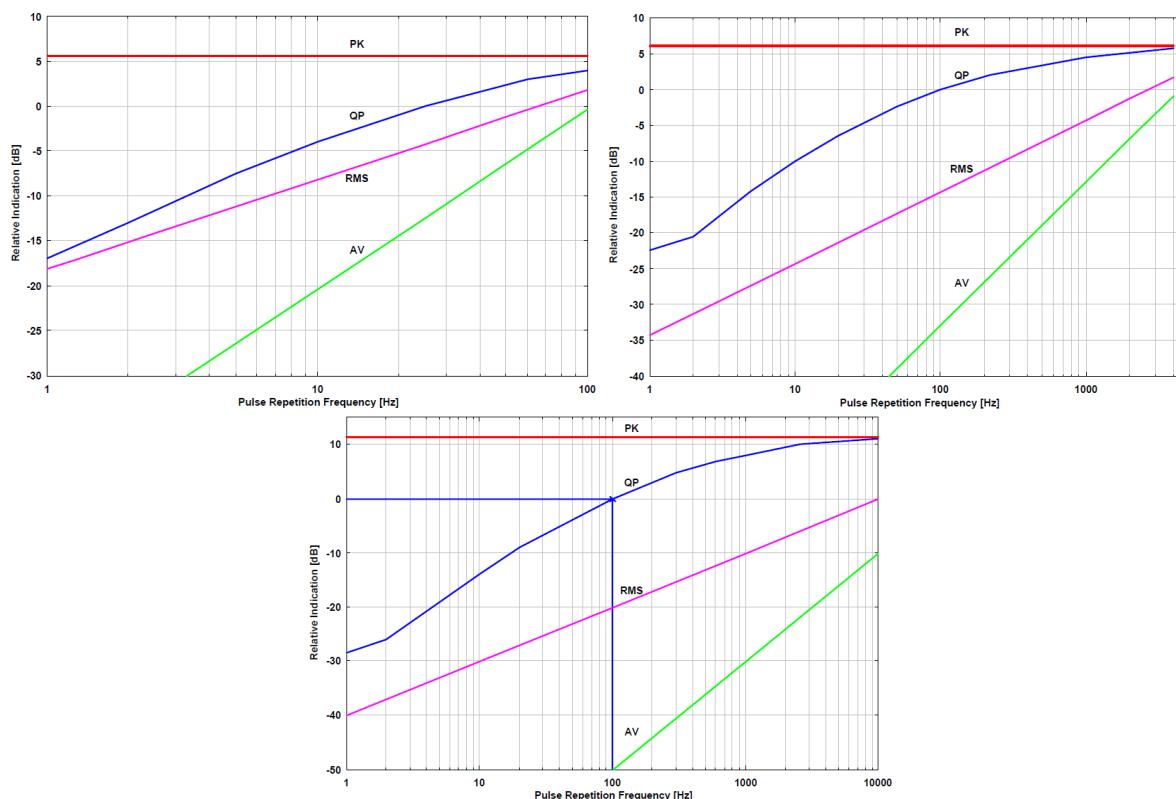


give the same response to continuous unmodulated signals. The Quasi Peak and Average detectors weight the indicated value according to its pulse repetition frequency (PRF).

The RMS detector, specified at § 7 of CISPR 16-1-1, indicates a value proportional to the square root of the PRF: this corresponds to a RMS reading increasing by 10 dB when PRF increases by a factor 10 (1 decade), or an increase by 3 dB per octave (factor 2) of the PRF. The Average detector, specified at § 6 of CISPR 16-1-1, indicates a value proportional to the PRF, namely an increase in reading by 20 dB if the PRF increases by a factor 10 (1 decade), or an increase by 6 dB if the PRF is doubled (octave).

The indicated level of pulsed interference is reduced by the degree in figure A1, as a result of the time constant and bandwidths given in table 1.

The Quasi Peak detector weights the indicated value in terms of its perceived “annoyance factor”: low pulse repetition frequencies (PRF) are less annoying when experienced on broadcast radio and TV channels than high PRFs. The detector is specified in terms of its attack and decay time constants, and these are fairly straightforward to implement. The Average detector simply returns the Average value rather than the peak value of the interference with which it is presented. This can in principle be achieved with a simple low-pass filter whose time constant is slower than the slowest pulse repetition frequency of the input. A receiver is calibrated using pulses of defined impulse area, spectral density and repetition rate.



**Fig. A.1: PRF of PK, QP, RMS and Average detectors in CISPR Band A, B and C-D**

Most initial measurements are made with the Peak detector, which as its name implies responds almost instantly to the peak value of the interference signal seen at its input. Provided that the receiver dwell on each frequency for long enough to capture the maximum emission (this depend on the EUT’s emission cycle time) the Peak detector will always give the maximum output level. A list of frequencies at which high emission are detected, could be created, and these frequencies are measured with the Quasi Peak (and with Average for conducted emission) detectors, which

will give the reading which should be compared against the limit.  
As an example, most emission standards follow the simple procedure in figure A2.

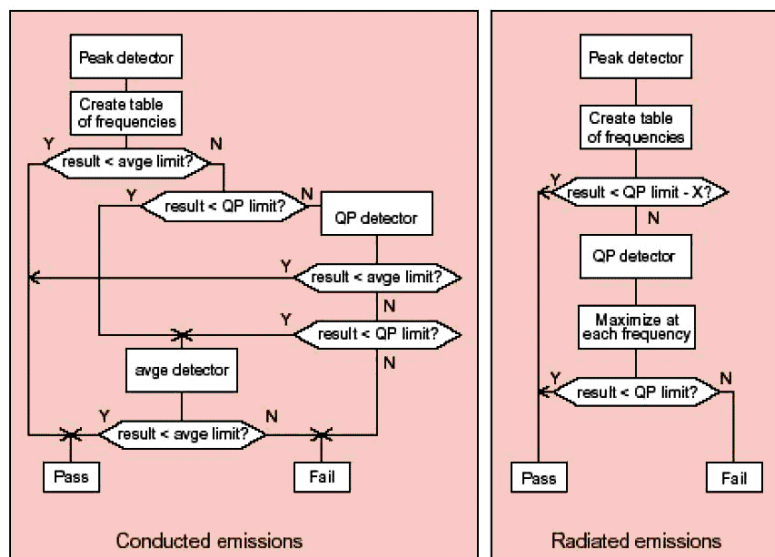


Fig. A.2: Flow chart for use of detectors

#### A.2.4 • OVERLOAD FACTOR

The linear dynamic range of the RF circuits before the detector, and of the detector itself, must be at least equal to the dynamic range of the desired pulse weighting since the pulses are not to be compressed. This dynamic range according to the CISPR 16-1 specification (table 1) can approach up to 43.5 dB, which means closer to 60dB in the receiver design. If the receiver did not adjust its gain continually to achieve the optimum level at the detector – acting as a spectrum analyzers, for instance – then the needed dynamic range would be increased by several tens of dB.

#### A.2.5 • VSWR

Still part of the CISPR 16-1 spec, is the requirement on input VSWR (Voltage Standing Wave Ratio). This is specified to be 2.0:1 with no input attenuation, dropping to 1.2:1 with  $\geq 10$ dB attenuation in the range 9 kHz to 1 GHz; in the range 1 GHz to 18 GHz to be 3.0:1 with no input attenuation, dropping to 2.0:1 with  $\geq 10$ dB attenuation. VSWR is directly related to measurement error due to mismatch. For a broad spectrum receiver (9kHz to 30MHz is more than three decades) the spec of 2:1 without attenuation is quite hard to meet – many ordinary radio receivers can't achieve this even over a narrow range. It's easy enough if you allow yourself some attenuation at the input, but then the receiver sensitivity is degraded. The sensitivity requirement in CISPR 16-1 is expressed in the form that the noise component should not degrade the measurement accuracy by more than 1 dB, which implies that the system noise floor must be at least 6 dB below the lowest level it is desired to measure accurately. The system noise floor is the receiver noise plus the losses imposed by the transducer or antenna factor and connecting cables. In practice, the limiting performance is usually found at the top end of the radiated test around 1 GHz.

## SECTION B: R3000 GENERAL INFORMATION

This Section contains a general description of the AFJ R3000 family, including: associated and optional accessories, equipment specifications and safety precautions.

**REFER TO MANUAL. THIS MANUAL IS AN INTEGRAL PART OF THE R3000 RECEIVER. THE SAFETY RULES AND PRECAUTIONS IN THE MANUAL MUST BE OBSERVED. AFJ INSTRUMENTS AND THEIR REPRESENTATIVES ACCEPT NO RESPONSIBILITY FOR DAMAGES TO PERSONS AND EQUIPMENT AS RESULTS OF NON-OBSERVATION OF THE RULES PRECAUTIONS IN THIS MANUAL.**

### B.1 • EQUIPMENT DESCRIPTION

The R3000 is a family of microprocessor-controlled, super heterodyne-type manual / automatic test receivers covering the frequency range from 9 kHz to 300 MHz. These instruments are ideally suited for measurement of electromagnetic interference (in accordance with the requirements of CISPR 16-1-1) and field strength. The receiver can also be used as a selective RF voltmeter with a level range of 10 to +127 dB $\mu$ V in 50  $\Omega$  coaxial systems.



**Fig.B.1: AFJ R3010 EMI Receiver**

The AFJ R3000 receivers are supplied with the following STANDARD ACCESSORIES:

	Description	Qty
1	110 / 230Vac, 50 / 60Hz, 50VA Class I power cord	1
2	Unit-to-PC, LAN cross – cable, L=1.0 m (communication cable)	1
3	Stylus pen for EMI Receiver touch screen display	1
4	F 3,15A FUSE	2
5	3.5mm (Male) To 2.5mm (Female) stereo audio jack adapter	1
6	AFJ EMI Software USB Stick (containing: Operating Manual & Operating SW)	1
7	R3000 Certificate of Calibration	1

## B.2 • USAGE OF EXTERNAL PULSE LIMITER / ATTENUATOR

High spikes produced by either LISN output or power supply transient noises, could damage the input stage of EMI receiver. R3000 receiver maximum allowed RF input is +127 dBμV in CW 50 Ω coaxial systems.

WE STRONGLY RECOMMEND THE USAGE OF EXTERNAL PAT 20M (20dB/1W ATTENUATOR AND PULSE LIMITER), SUPPLIED OPTIONALLY AND SEPARATELY WITH THE R3000 RECEIVER.

The PAT 20M has been designed to fit between the LISN and the measuring instrument to protect the instrument from mains transients interface. The LISN itself will attenuate most of the transients on the mains supply – the real problem is the connection and disconnection of the EUT, which can cause up to 400V transients to appear at the RF outputs.

WARNING: WHEN USING R3000 RECEIVER WITHOUT PAT 20M ATTENUATOR (OR SIMILAR FIXED ATTENUATORS), ANY DAMAGE AT THE INPUT STAGE OF RECEIVER, IS NOT COVERED BY AFJ WARRANTY.



Fig. B.2: PAT20M 1 W 20 dB attenuator & pulse limiter



Fig. B.3: AFJ R3000 Receiver and PAT 20M

### B.3 • PRODUCT STRUCTURE AND MODULAR APPROACH

The AFJ R3000 family of receivers makes use of the super heterodyne approach, converting the RF input signal into an intermediate frequency (IF), before detection. The main instrument subsystems are:

- The pre-selector filters, tuned on the RF input frequency, to avoid spurious signals;
- The attenuators and Preamplifier, to regulate the input signal;
- The local oscillator, with a frequency lower or higher, with respect to the input signal;
- The mixers, where the input signal and the local signal are intermixed, to generate the IF;
- The ADC converter, to convert analog input signal to digital signal for DSPU;
- The DSPU (Digital Signal Processing Unit), to elaborate the digital input signal giving the output signal with the basic functions that are processed by SW, providing the experimental values and, if requested the audio signal (this subsystem includes digital filters and detectors).

The modular approach followed, enables the user to customize the system configuration according to his specific needs:

- Model **R3010**, is suitable for measurements in the **CISPR 16** frequency bands **A/B**, from **9 kHz** to **30 MHz**.
- Model **R3030**, can perform measurements across the **CISPR 16** bandwidth **A/B/C** from **9 kHz** to **300 MHz**.

### B.4 • OPTIONAL ACCESSORIES

In order to fulfill all set-up requirements, as specified in the relevant sections of CISPR 16-1 and the applicable Product Standard, the following OPTIONAL ACCESSORIES are made available:

Item	Description	Order Code
1	20dB/1W Attenuator and pulse limiter	PAT 20M
2	High voltage probe, 30 dB attenuation	HVP-1/1000
3	LISN, 9 kHz to 30 MHz single-phase, 2x16 A	LS 16C/10
4	LISN, 9 kHz to 30 MHz three-phase, 4x32 A	LT 32C/10
5	Absorbing clamp, 30 MHz to 1000 MHz (CISPR 14)	MDS 21B
6	Triple-Loop antenna from 9kHz to 30MHz for magnetic field measurements (CISPR 15)	VVL 1530
7	CDN from 30 MHz to 300 MHz for radiated emission measurements (CISPR 15)	M2/M3-B (for example)
8	Dummy lamps for insertion loss measurement	Linear Type (for example)
9	Balance-to-unbalance transformer for insertion loss measurement	BUT
10	Van Der Hoofden test head from 20kHz to 10MHz for human exposure to electromagnetic fields measurement	VDH 30
11	Broadband antenna, from 30MHz to at least 3000MHz	Any brand
12	Near field probes (Large area)	Any brand

## B.5 • RELATED DOCUMENTS

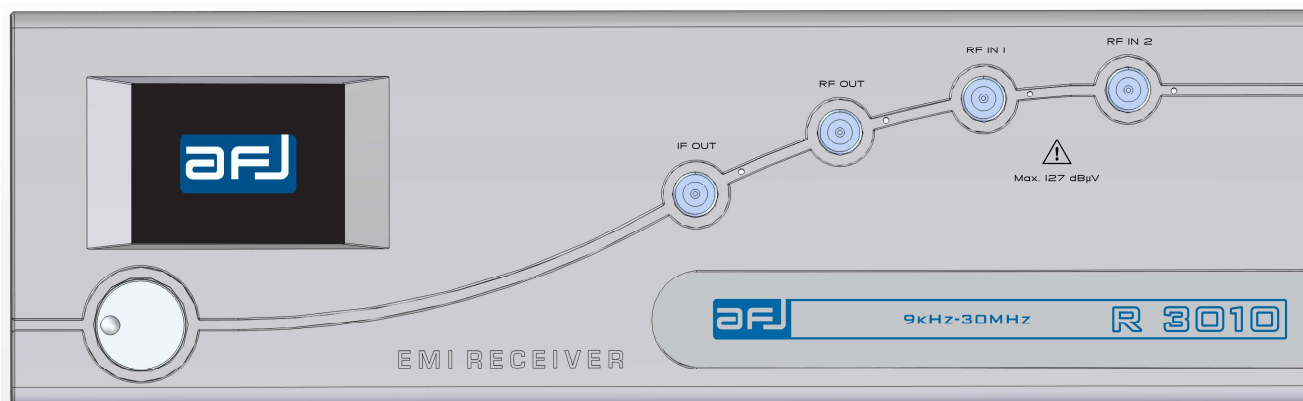
The EMI receivers belonging to the AFJ R3000 Family described herein, perform electromagnetic compatibility measurements in the domain of radiated noise, in accordance with (but not limited to) the following Harmonized European EMC Standards:

<b>CISPR 10</b>	<b>Organization, rules and procedures of the CISPR:</b> Gives the historical background, terms of reference, composition, organization, and types of documents of the International Special Committee on Radio Interference (CISPR).
<b>CISPR 11</b>	<b>Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics -Limits and methods of measurement:</b> The limits and methods of measurement laid down in this International Standard apply to industrial, scientific and medical (ISM) equipment as defined in clause 2, and to spark erosion equipment.
<b>CISPR 12</b>	<b>Vehicles, motorboats and spark-ignited engine-driven devices - Radio disturbance characteristics -Limits and methods of measurement:</b> The limits in this standard are designed to provide protection for broadcast receivers in the frequency range of 30 MHz to 1000 MHz when used in a residential environment. Compliance with this standard may not provide adequate protection for new types of radio transmissions or receivers used in the residential environment nearer than 10 m to the vehicle, boat or device
<b>CISPR 13</b>	<b>Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement:</b> Applies to the generation of electromagnetic energy from sound and television receivers for the reception of broadcast and similar transmissions and from associated equipment. The frequency range covered extends from 9 kHz to 400 GHz.
<b>CISPR 14-1</b>	<b>Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and electric apparatus - Part 1: Emission.</b> This Standard applies to the conduction and the radiation of radio-frequency disturbances from appliances whose main functions are performed by motors and switching or regulating devices, unless the r.f. energy is intentionally generated or intended for illumination. It includes such equipment as: household electrical appliances, electric tools, regulating controls using semiconductor devices, motor-driven electro-medical apparatus, electric toys, automatic dispensing machines as well as cinema or slide projectors. The frequency range covered extends from 9 kHz to 400 GHz.
<b>CISPR 15</b>	<b>Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.</b> This Standard applies to the emission (radiated and conducted) of radio frequency disturbances from: all lighting equipment with a primary function of generating and/or distributing light intended for illumination purposes, and intended either for connection to the low voltage electricity supply or for battery operation; the lighting part of multi-function equipment where one of the primary functions of this is illumination; independent auxiliaries exclusively for use with lighting equipment; UV and IR radiation appliances; neon advertising signs; street/flood lighting intended for outdoor use; transport lighting (installed in buses and trains) The frequency range covered extends from 9 kHz to 400 GHz.
<b>CISPR 16-1-1</b>	<b>Specification for radio disturbance and immunity measuring apparatus and methods Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus.</b> This part of CISPR 16 is designated a basic standard, which specifies the characteristics and performance of equipment for the measurement of radio disturbance voltages, currents and fields in the frequency range 9 kHz to 18 GHz. In addition, requirements are specified for specialized equipment for discontinuous disturbance measurements. The requirements include the measurement of broadband and narrowband types of radio disturbance. The requirements include the measurement of broadband and narrowband types of radio disturbance.
<b>CISPR 16-1-2</b>	<b>Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances.</b> This part of CISPR 16 is designated a basic standard, which specifies the characteristics and performance of equipment for the measurement of radio disturbance voltages and currents in the frequency range 9 kHz to 1 GHz. Specifications for ancillary apparatus are included for: artificial mains networks, current and voltage probes and coupling units for current injection on cables.



<b>CISPR 19</b>	<p><b>Guidance on the Use of the Substitution Method for Measurements of Radiation from Microwave Ovens for Frequencies Above 1 GHz</b></p> <p>Describes a method of measurement for small microwave ovens (largest dimension less than 1 m) and a separate method of measurement for large microwave ovens (largest dimension exceeding 1 m).</p>
<b>CISPR 22</b>	<p><b>Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.</b></p> <p>This Standard applies to information technology equipment (ITE). Procedures are given for the measurement of the levels of spurious signals generated by the ITE and limits are specified for the frequency range 9 kHz to 400 GHz for both class A and class B equipment. No measurements need be performed at frequencies where no limits are specified. The intention of this publication is to establish uniform requirements for the radio disturbance level of the equipment contained in the scope, to fix limits of disturbance, to describe methods of measurement and to standardize operating conditions and interpretation of results.</p>
<b>CISPR 25</b>	<p><b>Vehicles, boats and internal combustion engines - Radio disturbance characteristics - Limits and methods of measurement for the protection of on-board receivers.</b></p> <p>This Standard contains limits and procedures for the measurement of radio disturbances in the frequency range of 150 kHz to 2500 MHz. The standard applies to any electronic/electrical component intended for use in vehicles, trailers and devices. Refer to International Telecommunications Union (ITU) publications for details of frequency allocations. The limits are intended to provide protection for receivers installed in a vehicle from disturbances produced by components/modules in the same vehicle.</p>
<b>CISPR/TR 28</b>	<p><b>Industrial, scientific and medical equipment (ISM) - Guidelines for emission levels within the bands designated by the ITU.</b></p> <p>This technical report provides the guidelines for emission levels within the bands designated by the International Telecommunication Union (ITU) for industrial, scientific and medical (ISM) application.</p>
<b>CISPR/TR 31</b>	<p><b>Database on the characteristics of radio services.</b></p> <p>This Technical Report covers the rationale behind the actual database covering the characteristics of radio services. The objective of the database is to register those characteristics which are relevant for derivation and specification of limits for disturbance emissions from electric and/or electronic equipment, systems and installations. Committees responsible for generic and/or product emission EMC standards should use this information together with CISPR 23.</p>
<b>IEC 61000-6-3</b>	<p><b>Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments.</b></p> <p>This part of IEC 61000 for EMC emission requirements applies to electrical and electronic apparatus intended for use in residential, commercial and light-industrial environments. Emission requirements in the frequency range 0 Hz to 400 GHz are covered. No measurement needs to be performed at frequencies where no requirement is specified.</p>
<b>IEC 61000-6-4</b>	<p><b>Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.</b></p> <p>This part of IEC 61000 for EMC emission requirements applies to electrical and electronic apparatus intended for use in industrial environments as described below. Emission requirements in the frequency range 0 Hz to 400 GHz are covered. No measurement needs to be performed at frequencies where no requirement is specified. This generic EMC emission standard is applicable if no relevant dedicated product or product-family EMC emission standard exists. This standard applies to a apparatus intended to be connected to a power network supplied from a high or medium voltage transformer dedicated to the supply of an installation feeding manufacturing or similar plant, and intended to operate in or in proximity to industrial locations.</p>

## B.6 • R3000 FRONT PANEL CONTROLS AND INDICATORS



**Fig. B.4: AFJ R3010 Front Panel**

1 – STATUS INDICATORS LEDs (from left to right):

COLOUR	NAME	FUNCTION
RED	IF-OUT	The LED is lit during measurements
RED	RF OUT	The LED is lit when the tracking generator is activated
RED	RF IN 1	The LED is lit during measurements in the bands A-B
RED	RF IN 2	The LED is lit during measurements in the bands C

2 – IF OUT: 10.7 MHz Intermediate Frequency signal (from 9 kHz to 30 MHz) and 18.5 MHz (from 30 to 300 MHz). It can also allow to see wave shapes with an oscilloscope, signal levels with a spectrum analyzer and to connect a single channel click meter.

3 – RF OUT: Tracking generator output. Test signal from 50dBuV to 90dBuV, frequency range according to the receiver.

4 – RF IN 1: N-type 50Ω input connector for all AFJ R3000 series EMI Test Receiver with CISPR band A and B,  $f=9\text{ kHz}\div 30\text{MHz}$ .

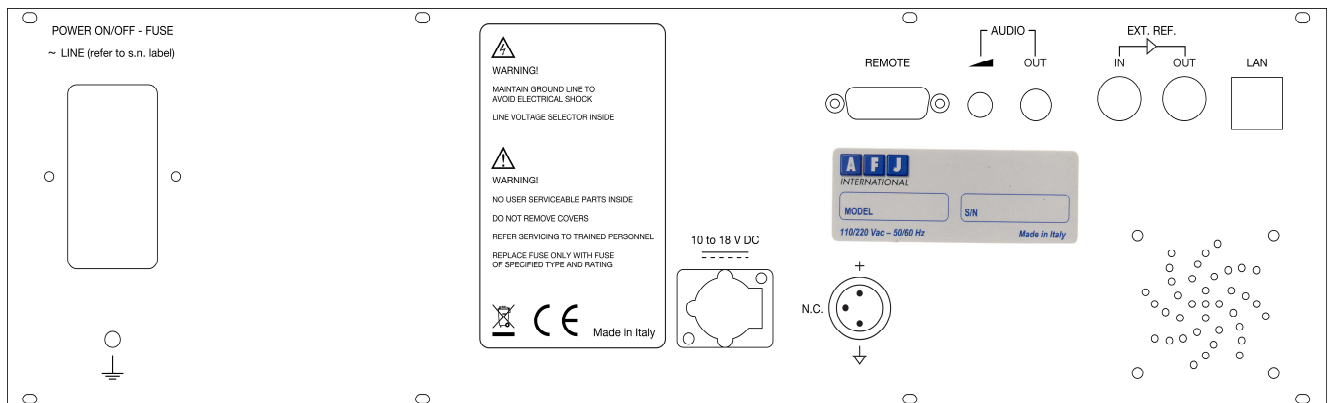
5 – RF IN 2: N-type 50Ω input connector for all AFJ R3000 series EMI Test Receiver with CISPR band C,  $f=30\text{MHz}\div 300\text{MHz}$ .

6 – Touch screen display for manual operations.

7 – Knob button for usage during manual operations.



## B.7 • R3000 REAR PANEL CONNECTIONS



**Fig.B.5: AFJ R3010 Rear Panel**

1 – POWER ON/OFF - FUSE, including power-on switch and two 5x20mm, 1 A slow-blow fuses and Socket for power cord (use Class I type only).

2 – SYSTEM GROUND CONNECTOR: before connecting the remote cable, be sure both receiver and LISN are connected to a proper ground.

3 – WARNING Labels: Maintain Ground Line to Avoid Electrical Shock & Line Voltage Selector Inside; No User Serviceable Parts Inside; Do Not Remove Covers; Refer Servicing To Trained Personnel; Replace Fuse Only With Fuse of Specified Type and Rating. Recycling Warning; CE marking; Made in Italy statement.

4 – External power supply 10 to 18 V dc connector (N.C. not connected central pin), especially suited for measurements *on field*.

5 – REMOTE CONTROL CONNECTOR for AFJ external devices (e.g. LS16C and LT32C).

6 – AFJ Product Label showing equipment Model, Serial Number, rated voltage and frequency of power supply.

7 – AUDIO / OUT external audio demodulation output with volume adjusting control and loudspeaker (1 W RMS).

8 – EXT. REF. IN and OUT (signal amplifier).

9 – INSTRUMENT-TO-PC CONNECTOR Unit-to-PC, LAN port (RJ-45 connector + Standard Category 5e cross – cable or better).

**Note:** ALWAYS leave sufficient space behind the instrument to allow enough air circulation. Do not cover the ventilation holes. A distance of about 20 cm must to be maintained between the rear panel of R3000 series and any wall.

## **SECTION C: SYSTEM INSTALLATION**

Check the outside of the carton package to assess possible shipping damage: in case of damage, possibly remove the device from the packaging, in presence of the Carrier. Keep the packaging material available for further inspection with the Carrier, in case the damage shows up after unpacking. In case of damage, immediately notify Carrier and local AFJ Distributor or Sales Office, for report. Do not try to install a damaged unit. After checking for device integrity, verify that all items listed and ticked on the CHECK LIST put inside the packaging, are duly present. If not, send immediate report to your vendor. If everything is OK, proceed in the INSTALLATION routine.

### **C.1 • PREVENTION AND SAFETY NOTE**

The test instrument is SAFETY CLASS I equipment, and must be connected to an approved power supply socket, with proper earth wiring. Never interpose an extender cable without earth wire, between the socket and the device. The protection fuses must be replaced exclusively with fuses of the same type, rating and speed specifications.

Any adjustment, maintenance or repair operation on the receiver, implying opening of the case, should possibly be carried out without power: if this turns impossible, such operations should be carried out by an authorized person, well aware of the hazards involved.

The user is sole responsible of undertaking all necessary provisions for the safe usage of the receiver.

Power source check: on the rear panel, you will find a type plate. Please check whether the receiver has been prepared for the correct power line voltage of your public power. If the power supply voltage is different please inform AFJ Instruments or your AFJ representatives.

Connecting the receiver to the power line: please use the supplied power cord for connecting the R3000 receiver to your public power supply. The power supply must have an earth safety wire. Please check the earth connection on your power outlet before you connect and turn on your AFJ R3000 Test receiver.

### **C.2 • A VERY IMPORTANT SAFETY NOTE FOR USAGE OF LISN**

Because of the lethally-high earth-leakage currents created by the 8  $\mu$ F capacitors, LISNs have two independent protective earth connections in place before the mains voltage is applied to them. Each protective earth connection must be rated for the full value of the possible fault current (i.e. the maximum current if the live supply should short-circuit directly to the chassis). Staff training in the safe and correct use of LISNs is strongly recommended, and untrained people and third parties must not be allowed to be within reach of LISNs or equipment or cables connected to them. A regular and documented safety check of the integrity of both the protective earth bonds is also recommended.

### **C.3 • INSTALLATION PROCEDURE**

#### **C.3.1 • SYSTEM REQUIREMENTS**

For the processing of test data coming from any of the AFJ R3000 Family instruments minimal system requirements for PC are:

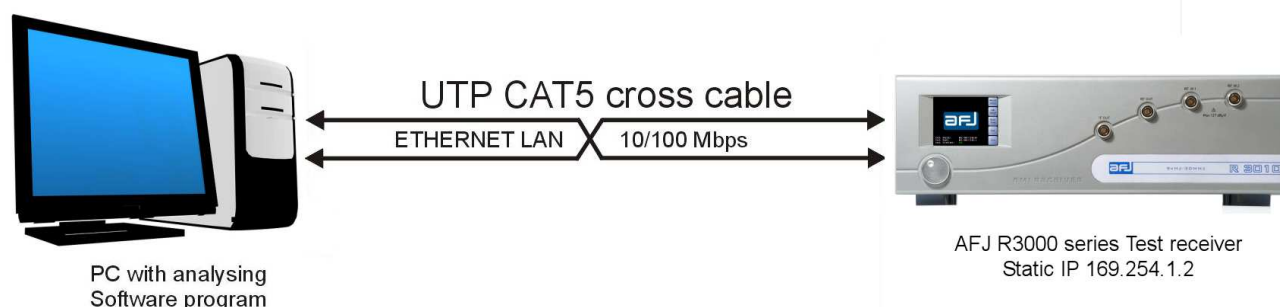
- PC®- compatible system, with PENTIUM IV® or AMD® processor, 400 MHz or above
- 512 MB-RAM or higher
- 1024 x 768 pixel monitor (suggested)
- LAN port
- OS VERSIONS: WINDOWS™ XP Service Pack 3, Vista and Windows 7 (Home Premium, Professional and Ultimate)

Regardless of Receiver model and SW version selected, a CD-R is provided. Please contact AFJ Instruments or your local AFJ distributor for information about software updates and upgrades.

The calibration data of the receiver are stored directly on NVM (non-volatile memory) of the R3000 receiver, so they do not need to be managed by the user. Indeed, when installation is completed, the software reads the receiver serial number, and relates such number to its relevant calibration data (that is uploaded from equipment to PC during runtime).

### C.3.2 • CONNECTION PROCEDURE – STARTUP

The AFJ R3000 Family has a direct connection via LAN-Ethernet to hosting PC, through a Category 5 cross-cable (Cross cable is included in the delivery).



Therefore it is necessary to set the PC to obtain a dynamic IP address: in the *Internet protocol (TCP/IP) Properties* (from Control panel => “Local Area Connection Properties”) choose: “*Obtain an IP address automatically*” and the same for the DSN server address. Leave all other properties as their default: in particular, set enable the DHCP (Dynamic Host Configuration Protocol): “DHCP Enabled” in the “Advanced Property”. For IP-address of your AFJ R3000 Test receiver, see next paragraph.

**Note:** When the receiver is connected via LAN cross cable, it is normal to receive a Limited or no connectivity warning: anyhow the communication between PC and receiver is active and running properly.

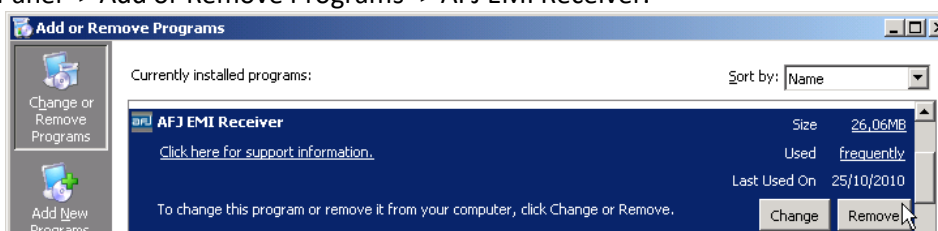


### C.3.3 • SOFTWARE INSTALLATION

PERFORM THE FOLLOWING STEPS

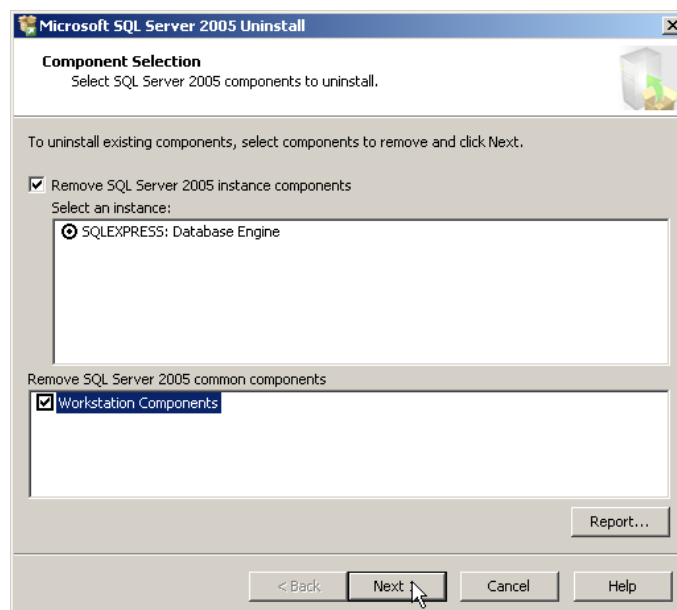
**STEP 1** - After connecting the receiver to an appropriately grounded mains, ensure that all the electrically powered devices connected to the R3000 in the measurement set-up, be connected to a common ground. Connect the PC power cord to a grounded outlet, too.

**STEP 2** – Preparation of PC (necessary only if you have already installed previous version of AFJ Software)  
To install Software from version 4.10 (12/2010), please uninstall any previous software version (e.g. 4.09) from Control Panel -> Add or Remove Programs -> AFJ EMI Receiver.



**Fig. C.1: Uninstall previous version of AFJ EMI receiver Software**

Uninstall also Microsoft SQL Server 2005 (installed by AFJ Software version 4.9), being careful to remove all its components (SQL Express Database Engine 2005 and Workstation components, if any), see Fig. C.2.



**Fig. C.2: Uninstall SQL Server 2005**

In case you don't want to uninstall Microsoft SQL Server 2005 to retain compatibility with old programs, please refer to *Section G => Manual Installation of SQL Server 2008*.

STEP 3 – From *Windows Explorer*, locate the folder “/Software” of your AFJ USB Stick and double click on “Setup” file (Fig. C.3).



**Fig. C.3 – Windows Explorer of AFJ USB Stick**

STEP 4 – Complementary Software Installation.

Now the Installation Wizard start automatically: please click “Accept” on next window, as it appears.

See below Fig. C.4 and C.5.

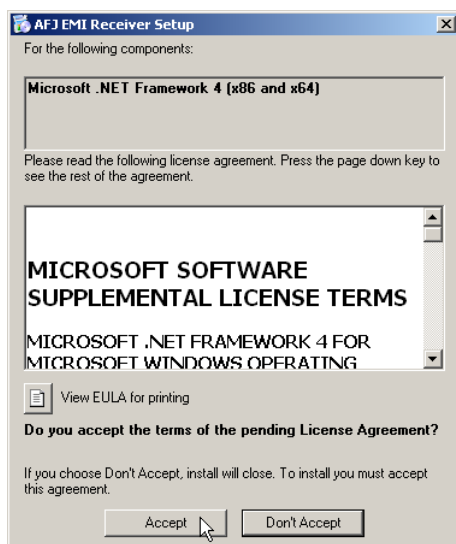


Fig. C.4: Installation of .NET Framework 4.0

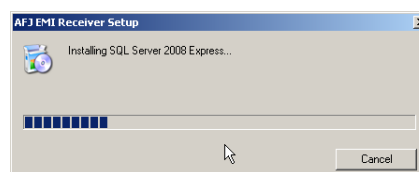


Fig. C.5: Installation of SQL 2008 Express Edition

The installation of the last complementary application installs the local SQL-database which contains all measurements data saved by the R3000 Family for further reference.

Wait until the procedure will forward you to the proper receiver installation, in the next step.

STEP 5 – AFJ EMI receiver software installation.

The *Installation Wizard* starts automatically.

On next window, to proceed forward click “Next >” (click “Cancel” to exit installation), see Fig. C.6.

On next window, see Fig. C.7, you can accept the default parameters or as alternative “Browse...” a different path (or write directly a different folder name) for storing the installation files.

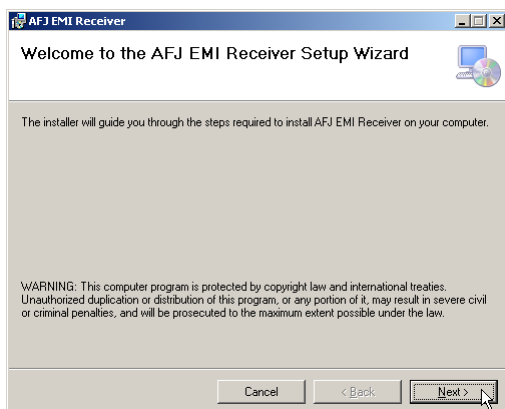


Fig. C.6: AFJ EMI Receiver Setup Wizard window

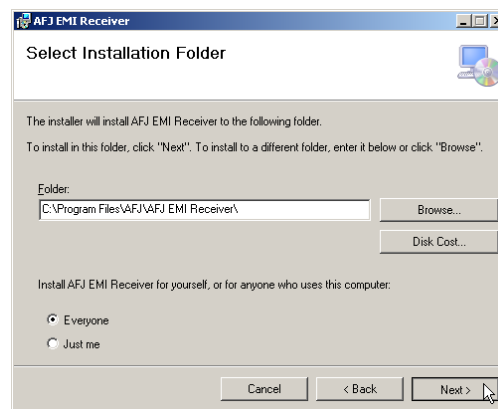


Fig. C.7: Select Installation Folder window

Here you can also calculate the necessary disk space by clicking “Disk Cost” (about 9.1 Mb for AFJ EMI receiver software).

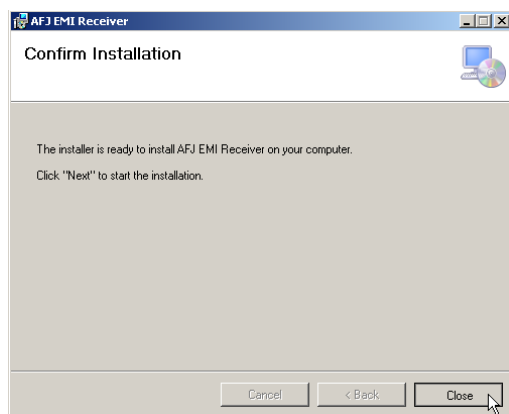
You can install AFJ EMI Receiver for Everyone (all *User Accounts* listed in the *Control Panel*) as suggested, or only for the current user (not recommended).

Now the installer is ready to install AFJ EMI Receiver Software on your computer.

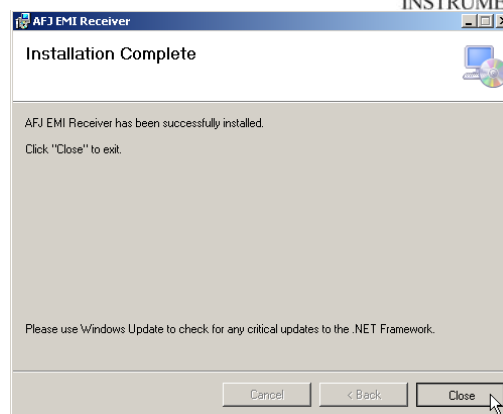
You can also go back to revise previous step by clicking “< Back” (or click “Cancel” to exit installation: this is the last warning).

Please click “Next >” to complete the installation.

At the end, the message “AFJ EMI Receiver has been successful installed” appears, The *Installation Complete* window appears (Fig. C.8).



**Fig. C.8: Confirm Installation window**



**Fig. C.9: Installation Complete window**

Now click *Close* to exit the installation procedure.

Please, use *Windows Update* to check for any critical updates to the .NET Framework, which time to time are released to fix security issues, software bugs, etc.

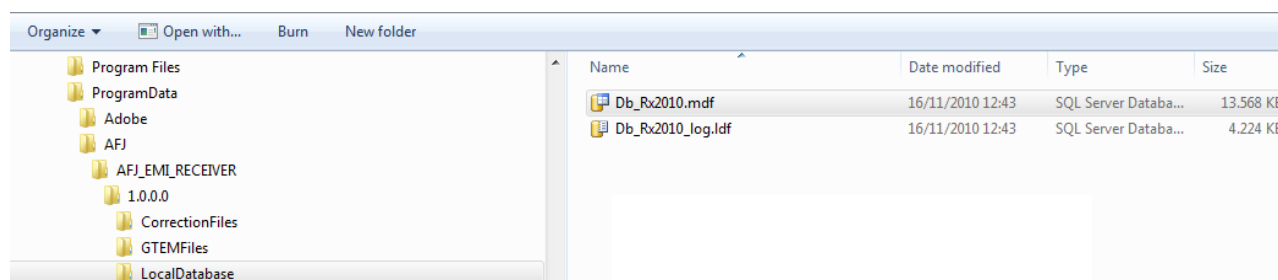
**Note:** at the end of EMI receiver installation, please ensure you have the correct permissions to run the AFJ SQL Database for your user. To do so, please locate the AFJ Database in the directory C:\ProgramData (or similar for your system).

In an installation under Windows XP Service Pack 3 the AFJ Database will be located in the following path:

C:\Documents and Settings\All Users\Application Data\AFJ\AFJ\_EMI\_RECEIVER\1.0.0.0\LocalDatabase

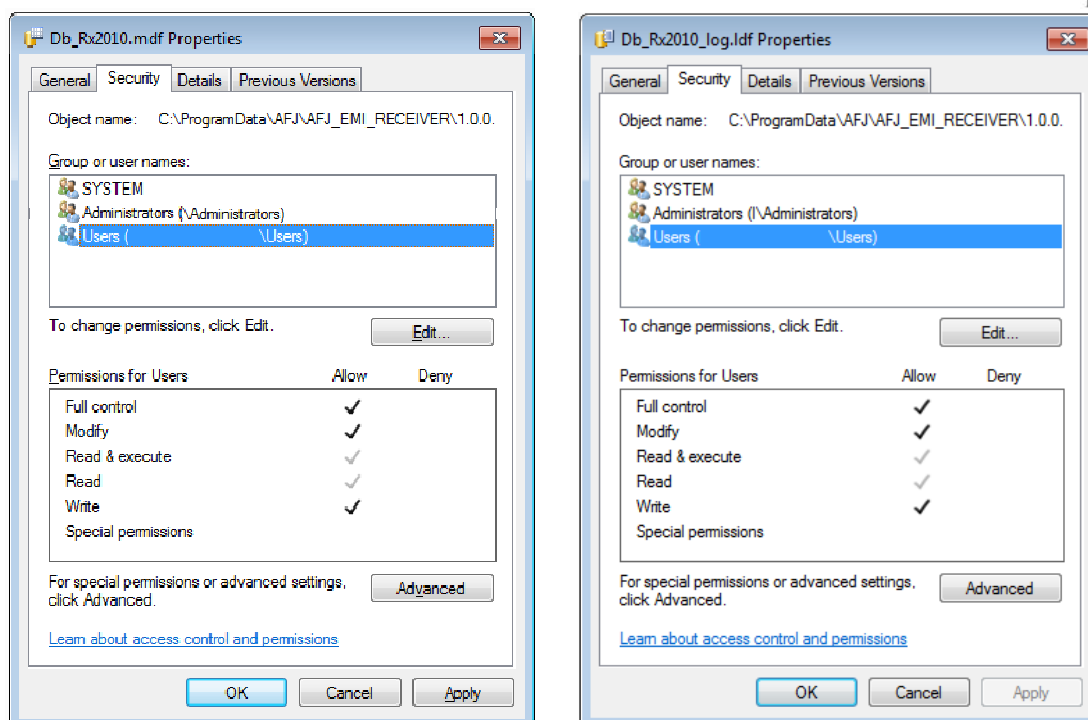
while in an installation under Windows Vista / 7 the path is:

C:\ProgramData\AFJ\AFJ\_EMI\_RECEIVER\1.0.0.0\LocalDatabase



**Fig. C.10: Locating AFJ Local Database in Windows™ 7 and Vista**

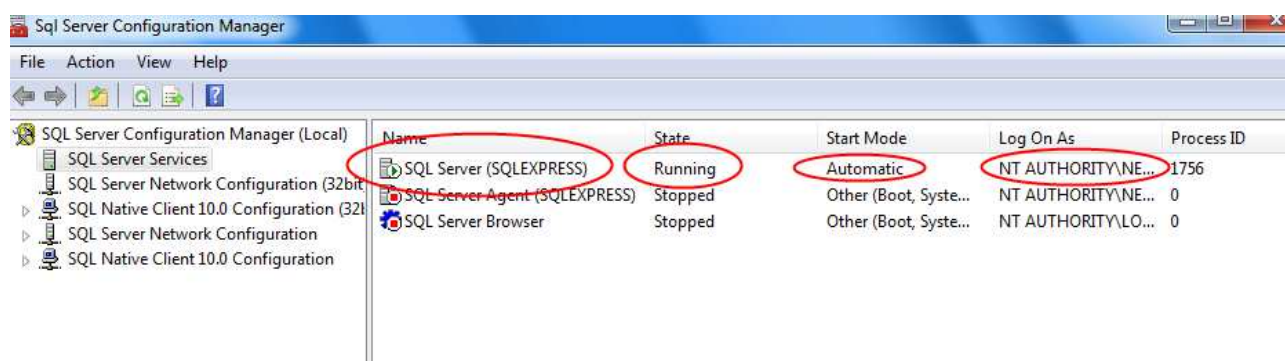
Here you find two files: Db Rx2010.mdf and Db Rx2010 log.mdf. Right click on each one at turn, setting their Properties => Security. Below you can find an example of the Security property you need to run the AFJ EMI Receiver Database for current user.



**Fig. C.11: Setting permissions for the Db\_Rx2010.mdf / .log files in Windows™ 7 and Vista**

AFJ R3000 software and AFJ Database need to have enable a specific instance of SQL Server 2008 to run properly. For checking and in case setting this instance, called SQLEXPRESS, please access to the SQL Server 2008 Configuration Manager to the following path:

Start->All Programs->Microsoft SQL Server 2008->Configuration Tools->SQL Server Configuration Manager



**Fig. C.12: SQLEXPRESS instance setting on SQL Server 2008 Configuration Manager**

Fig. C.12 shows SQL server 2008 configuration manager with enable SQLEXPRESS instance (the name of the instance is in brackets). In case the instance was stopped, to enable it please double click on SQL Server (SQLEXPRESS) icon in the first position of the “Name” column.

You can now safely run the AFJ EMI Receiver software for the first time (refer to next section D).

## SECTION D: OPERATING INSTRUCTIONS

### D.1 • START OF THE APPLICATION

Once the installation procedure has been successfully completed, the start of the application will result from the following sequence.

You can find a link to the AFJ EMI Receiver software directly as a Windows Desktop *icon* or as an alternative, selecting *Start => Programs => AFJ EMI Receiver* under the Windows graphic user interface:



Fig. D.1: Starting the AFJ EMI Receiver application

When the program is loaded, the software window appears (Fig. D.2 for the R3010 EMI Receiver, and similarly for other receivers of the AFJ R3000 EMI Receivers series):



Fig. D.2: EMI R3010 Receiver Start-up window



Fig. D.3: Local Database Connection window

In the right side of this window you find the *Database* section: by clicking the button *Connection Test* (leave *Local* selection for the time being) you test the presence of the connection to local database stored in your PC. The result should always be *Test OK!* for a successful installation (Fig. D.3). If this is not the case, please refer to previous *Section C: System Installation* or to the final *Section G: Troubleshooting*.

It is possible to select a remote database by selecting *Remote* in the *Database* section, and then supplying the IP number of the remote SQL-Database available on your network. If the remote node is reachable, this will connect to another data set residing on a remote PC network.

This is a very useful tool for Remote Data Analysis and a convenient way for Remote Storage.

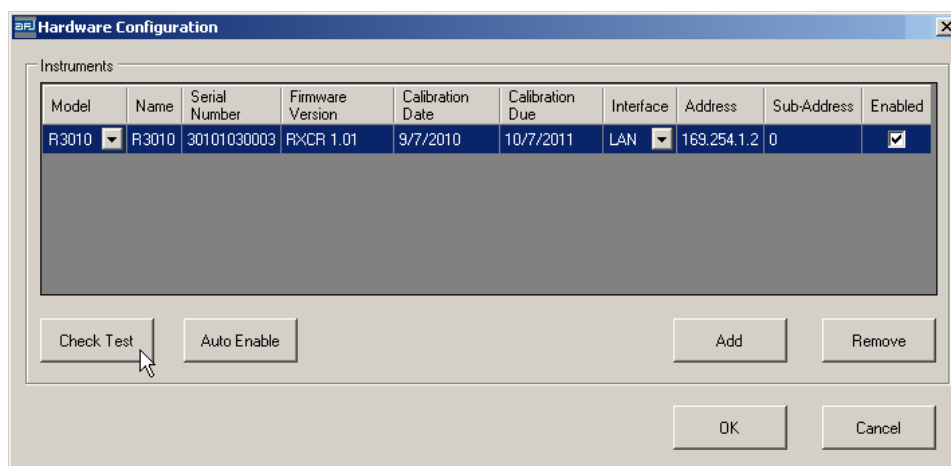
Now you can check your *Hardware Configuration* and *System Configuration*, by clicking the related button on the *Configuration* section (Fig. D.2).

### D.2 • HARDWARE AND SYSTEM CONFIGURATION

Press *Hardware Configuration* button (Fig. D.2.).

Please, ensures you match the relevant parameters explained in Fig. D.4 or similar for your own equipment.





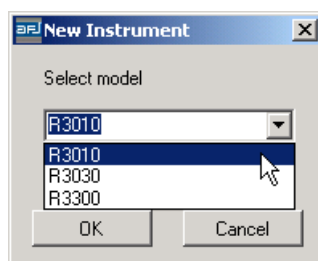
**Fig. D.4: Hardware Configuration window**

Here you can change the equipment IP address to match 169.254.1.2.

**Note:** This IP address is guaranteed not to conflict with routable addresses, being within the standard IP-addresses for APIPA (Automatic Private IP Addressing) as reserved by the Internet Assigned Numbers Authority (IANA).

By pressing Check Test, automatically the Serial Number and Firmware Version will match your own equipment and so do for Calibration Date/Due. Please, leave Sub-Address 0 and Enabled "checked" as the default, if you have only one AFJ EMI Receiver.

If more than one equipment is connected, press *Auto Enable* button to identify other equipment. With the *Add* button you can instead add any other model of the AFJ R3000 series (this is also useful for the use of any of AFJ R3000 EMI Receiver series in DEMO mode). Choose a model from the *New Instrument* drop-down list (Fig. D.5).

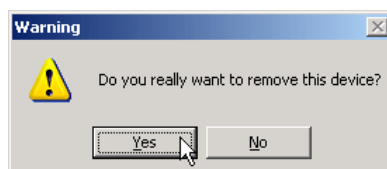


**Fig. D.5: Adding an instrument in Hardware Configuration**

A new Demo instrument has IP address equal to 192.168.1.1, its calibration date is set to the current day, no firmware version nor serial number are added, new instrument is *Enabled* by default.

**Note:** Please remember that only one device enabled at once is allowed!

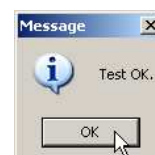
With the *Remove* button you can remove any previously selected Instrument. You are prompted to confirm this operation:



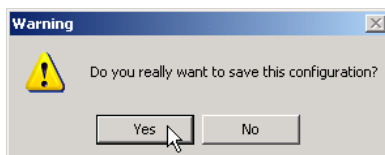
**Fig. D.6: Removing an instrument in Hardware Configuration**

When you have finished, please press Check Test (Fig. D.4).

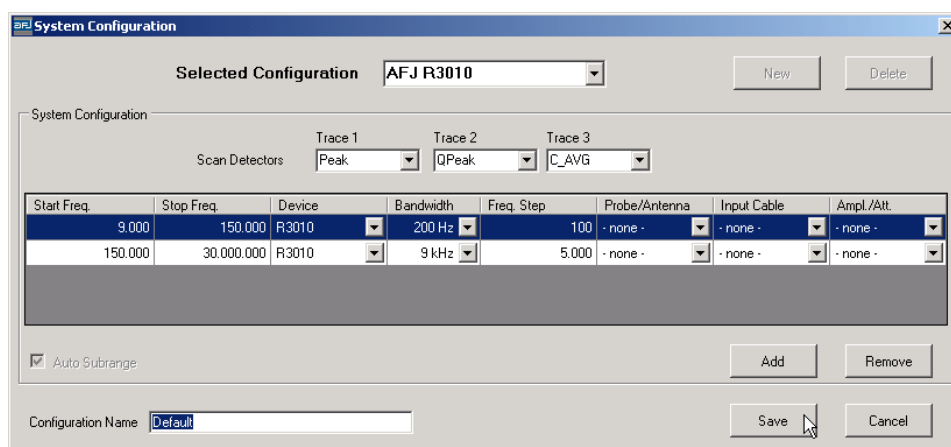
If the following window appears, your equipment is properly connected:



By pressing the *OK* button in the Hardware Configuration (Fig. D.4) you are prompted to save the current configuration. Choose *Yes*:



The *Hardware Configuration* is now completed and you can go on with the *System Configuration* (Fig. D.7).



**Fig. D.7 - System Configuration window**

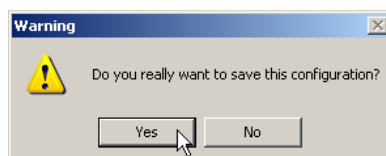
It is possible to select up to three *Scan Detectors* for *Trace 1..3*, chosen within *Peak*, *QPeak* (Quasi Peak), *C\_AVG* (CISPR Average), *RMS* and *C\_RMS* (CISPR RMS). This choice is kept for all ranges.

You can change the *Start / Stop Freq.* (frequencies) of your sweeps, their *Bandwidth* (RBW), the *Frequency Step* of the scan, and eventually select a *Probe/Antenna*, an *Input Cable*, an *Amplifier / Attenuator*, in the case they have been already set up in the *Workspace* (see next: *Input Device calibration* paragraph).

It is possible to press *Add* to add a new row with different parameters, to *Remove* any selected row and to *Save* the whole *System Configuration* with any chosen *Configuration Name* (initially it is *Default*).

**Note:** During a Run test, all listed set scans are performed in the precise sequence, starting from the first row.

When you have finished editing your *System Configuration* of Fig. D.7, press the *Save* button. So this window appears:



Choose *Yes* to confirm the actual data you have input.

Now you are ready to open the receiver either in *RUN* mode (for a *real time* data acquisition) or *DEMO* Mode (for *offline* analysis).

### D.2.1 • DEMO MODE

By pressing the *DEMO* button, AFJ Software will run standalone, with no connection to any receiver.

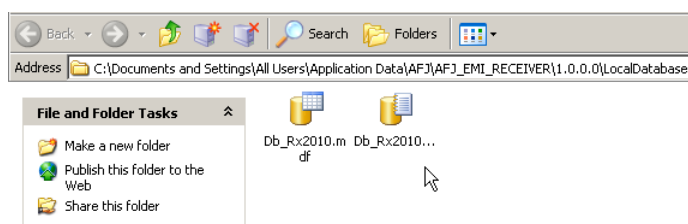
Beside the demonstrative tasks, this mode is especially useful for off-line analysis of run data and updating of the *Local Database* (see § D.5).

To share a *Database* from one PC to another one, just locate two files onto your hard disk:

Db\_Rx2010.mdf and Db\_Rx2010\_log.mdf.

In an installation under Windows XP Service Pack 3 you can find those files under the following path:

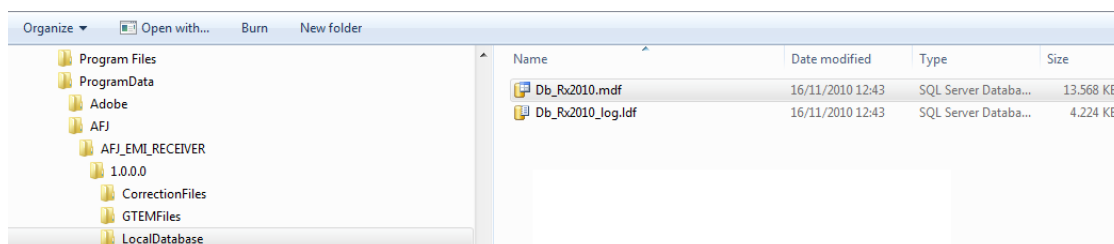
C:\Documents and Settings\All Users\Application Data\AFJ\AFJ\_EMI\_RECEIVER\1.0.0.0\LocalDatabase



**Fig. D.8: Locating AFJ Local Database in Windows™ XP Service Pack 3**

while in an installation under Windows Vista / 7 the path is:

C:\ProgramData\AFJ\AFJ\_EMI\_RECEIVER\1.0.0.0\LocalDatabase



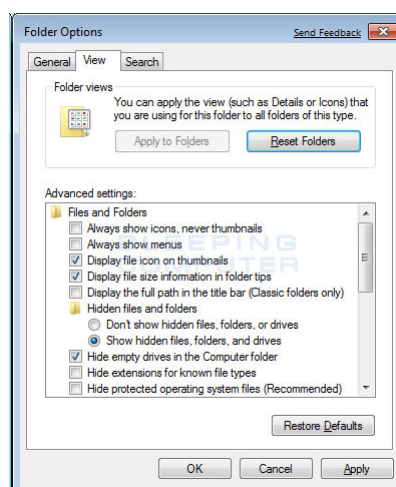
**Fig. D.9: Locating AFJ Local Database in Windows™ 7 and Vista**

You can manually transfer these files from one installation to another, by copying or replacing them under these directory. The AFJ EMI receiver software will automatically import the new database.

**Note:** In order to view these files in Windows Vista / 7, you must enable the viewing of hidden and protected system files in Windows Vista / 7 please follow these steps:

1. From your desktop, Click on the Start button and open the **Control Panel** menu option.
2. Now click on the **Appearance and Personalization** link.
3. You will now be in the *Appearance and Personalization* control panel.
4. Now click on the *Show hidden files and folders* option.
5. Under the *Hidden files and folders* section select the radio button labeled *Show hidden files, folders, and drives*.
6. Remove the checkmark from the checkbox labeled **Hide extensions for known file types**.
7. Remove the checkmark from the checkbox labeled *Hide protected operating system files (Recommended)*.

Once this is done, your Folder Options screen should look similar to the Fig. D.10:



**Fig. D.10: Folder Options settings**

Now press the *Apply* button and then the *OK* button.

**Note:** the software is able to manage \*.txt files with American indication (comma to separate thousands; dot to separate decimals), please leave unchanged the international settings of the PC with default configuration.

### D.3 • RUN MODE

From the initial window Fig. D.2, if you now choose RUN, the connection with AFJ R3000 Receiver series is made active.

In fact, by pressing “RUN”, all necessary internal routine tests inside your equipment are performed in three subsequent steps:

- Communication Test** ..... presence of LAN-to-PC communication is tested.
- Connection to Database** ..... presence of connection to Local/Remote Database is tested and the chosen database is here activated.
- Loading Calibration Data** ..... presence of calibration data is tested and these data are uploaded to PC while the *Loading Device Information* window appears (Fig. D.11).

If any of the above tests fails, you will get an Error warning (e.g. *Communication test with R3010 failed. Check Hardware Configuration*).

If all above tests are completed successfully, next time you enter in the configuration start-up window, it will show the information about these tests on its bottom (Fig. D.12).

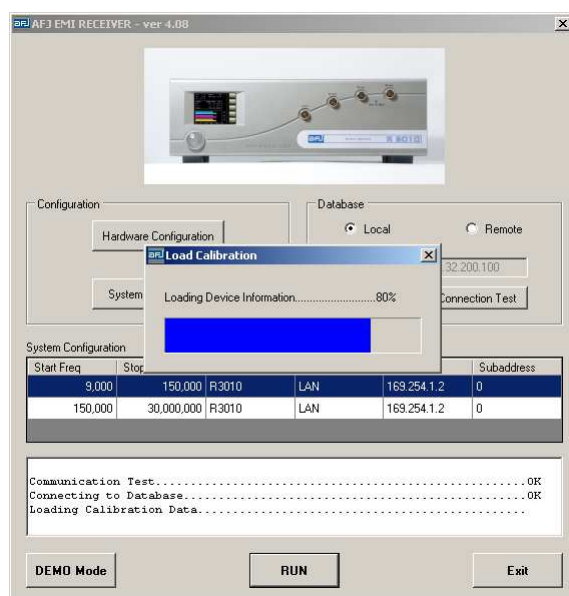


Fig. D.11: Loading Device Information Data

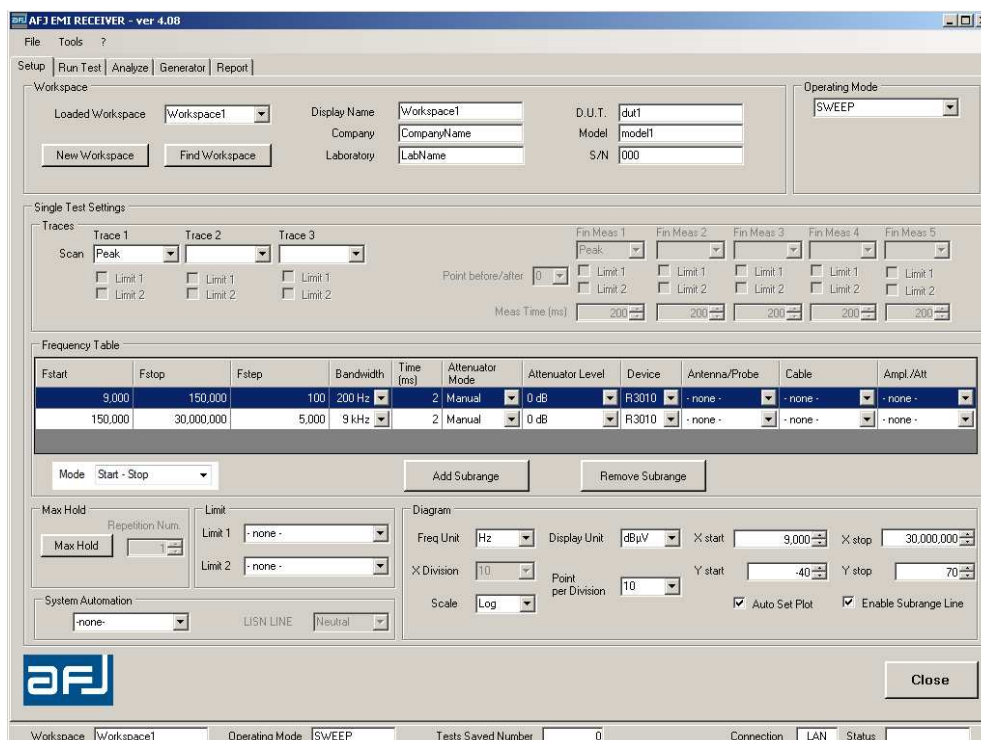


Fig. D.12: EMI R3010 Receiver Start-up window

### D.4 • THE SETUP BOX

After all test are completed successfully, the *Setup* box of the R3000 EMI Receiver appears (Fig. D.13).

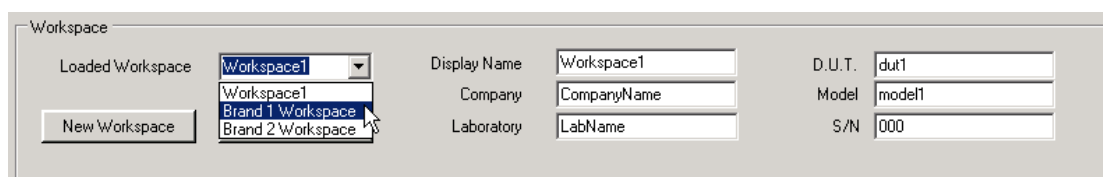
This screen, with its five options *Setup*, *Run Test*, *Analyze*, *Generator* and *Report*, constitutes the so-called cockpit.



**Fig. D.13: The Setup box of the AFJ EMI Receiver cockpit**

The upper portion of *Setup* window is labeled *Workspace* and is filled with default data you can easily change to fit your own needs.

You can create a new workspace or select one of the stored workspace data already created, Fig. D.14:

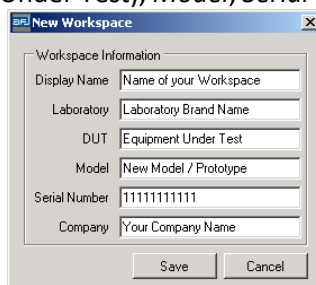


**Fig. D.14: Setup Workspace section**

**Note:** You cannot change directly the data written in the workspace section, as they derive from the underlying database.

You can create a new workspace by pressing the *New Workspace* button or from menu *File => New Workspace*.

In both cases the window *Workspace Information* appears and you can fill it with the following data: *Display Name*, *Laboratory*, *DUT* (Device Under Test), *Model*, *Serial Number* (S/N) and *Company* (Fig. D.15).

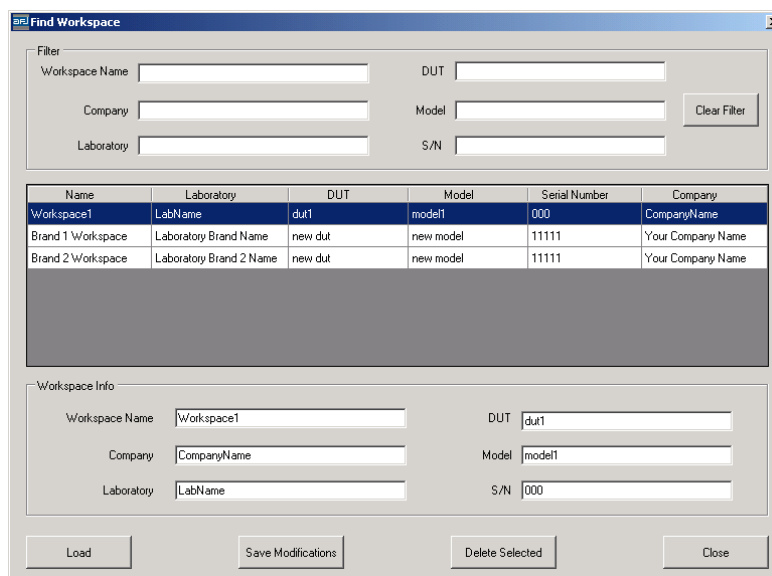


**Fig. D.15: Setup New Workspace**

By pressing *Save* the new workspace data appear in your current workspace.

You can also manage to find/filter, list, load/modify, and delete your saved Workspaces, by pressing the *Find Workspace* button or from menu *File => Find Workspace*. In both cases the window *Find Workspace* in (Fig. D.16) appears. This window is subdivided in the three sections: *Filter* (for research tasks), *Workspace list* and *Workspace Info*.

The current workspace is already highlighted (selected) and its data are listed in the *Workspace Info*.



The **Find Workspace** window contains a filter section at the top with input fields for Workspace Name, Company, Laboratory, DUT, Model, and S/N, along with a 'Clear Filter' button. Below this is a table listing workspaces:

Name	Laboratory	DUT	Model	Serial Number	Company
Workspace1	LabName	dut1	model1	000	CompanyName
Brand 1 Workspace	Laboratory Brand Name	new dut	new model	11111	Your Company Name
Brand 2 Workspace	Laboratory Brand 2 Name	new dut	new model	11111	Your Company Name

Below the table is the **Workspace Info** section, which mirrors the data of the selected workspace (Workspace1) with fields for Name, Company, Laboratory, DUT, Model, and S/N. At the bottom are buttons for 'Load', 'Save Modifications', 'Delete Selected', and 'Close'.

**Fig. D.16: Find Workspace window.**

Any operation on workspaces can be performed easily, being the meaning of different fields intuitive for the user.

You can filter your data according to one or more fields as *Workspace Name*, *Company*, *Laboratory*, *DUT*, *Model*, *S/N*: the found data appear immediately in the list and the first found in the *Workspace Info* section. This *Filter* is especially useful when you have many *workspaces*, which cannot fit in just a screen, and it enables you to find out your saved data in a fast way.

You can select another workspace from the list by clicking on it: you can now *Load* or *Delete Selected* workspace with the below buttons. When a workspace is selected, all its data appears on the *Workspace Info*, so enabling you to modify them. After done that, press *Save Modifications* to store new data, *Close* to go back to main workspace screen.

**Note:** Please, be aware that *any modification* you make on *any saved workspace*, will have an impact on all the data stored in that workspace and consequently in the whole *Database* you are working with. On the other hand, it is easy to make changes on all data taken during a measurement session.

#### D.4.1 • OPERATING MODES, LIMITS AND SCAN TRACES

Referring again to main Setup window (Fig. D.13), focus now on its upper right portion *Operating Mode*.

Here you can choose one of the three most important operating modes: *Sweep*, *Peak+Quasi Peak* and *Smart Sweep*.

Another mode is *Filter* (see chapter D.8).

These modes can be selected from the drop-down menu *Operating Mode* (Fig. D.17).

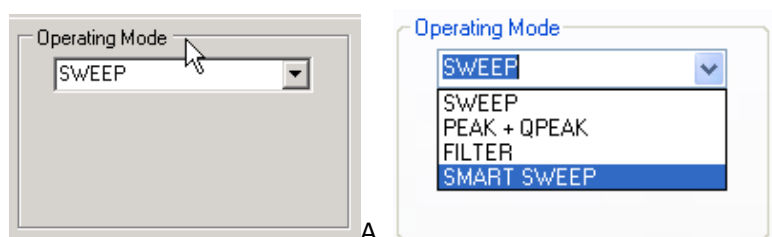


Figure D.17 shows two views of the **Operating Mode** section. View (A) shows the 'Sweep' mode selected in a drop-down menu. View (B) shows the full list of available modes: 'SWEEP', 'PEAK + QPEAK', 'FILTER', and 'SMART SWEEP'.

**Fig. D.17: Setup Operating Mode section: Sweep (A) / Peak + QPeak / Filter options (B)**

## SWEEP Mode

The *Sweep* can be operated with up to two different Limits (1 and 2). These limits are selected in the section *Limit* of Setup box (Fig. D.18).

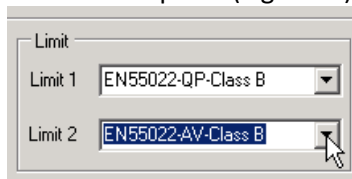


Fig. D.18: Setup Limit section

In the *Sweep* mode, up to three different detectors out of five can be selected. Refer to the left portion of *Single Test Settings* section for *Trace 1*, *Trace 2* and *Trace 3*. Each trace is checked against one of two limits (Fig. D.19):

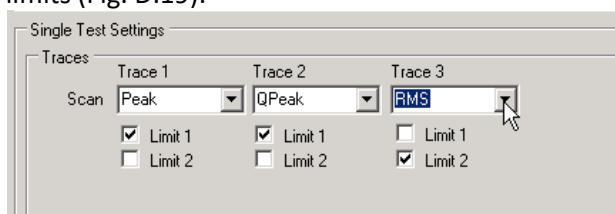


Fig. D.19: Setup Single Test Settings section for Sweep mode

## PEAK+QUASI PEAK Mode

In the *Peak+Quasi Peak* mode can work only with *Limit 1*, as reminded by the following pop-up window shown at Fig. 20:

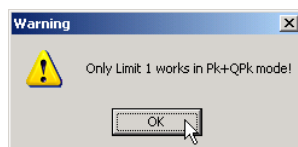


Fig. D.20: Peak+Quasi Peak mode warning message

In *Peak+Quasi Peak* mode *Trace 1* with *Peak* detector and *Limit 1* is selected (Fig. D.21). The user can set the *Threshold From Limit* [dB] and *Qpeak Time* [ms].

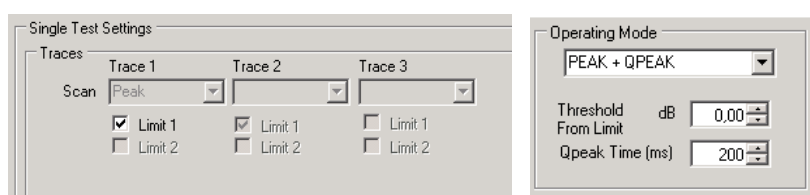


Fig. D.21: Setup Single Test Settings section for Peak + Quasi Peak mode

The detector sweeps within each frequency sub range defined in the Frequency Tables, in Peak mode. As soon as the Peak detector reads a value beyond the limit threshold inside a sub-range, it starts immediately the measure in that sub range with the Quasi Peak detector, returning back to the Peak mode in the sub range thereafter.

**Note:** The Peak+Quasi Peak mode provides a substantial operating advantage to the user, with respect to the usage of Peak and Quasi Peak detectors working in parallel. Peak+Quasi Peak mode makes shorter the complete test time.

## SMART SWEEP Mode

See § D.4.2



## D.4.2 • SMART SWEEP

This quite innovative function allows you to operate with the so-called *Smart Sweep*. In this operating mode, only one *Scan* detector for *Trace 1* can be selected (that is usually *Peak* detector, similarly to the *Peak+Quasi Peak* mode, above) working with either *Limit 1* or *Limit 2*, while the other *Traces 2 and 3* are grayed out (Fig. D.22). A panel of an active *Smart Sweep* measurement is the following:

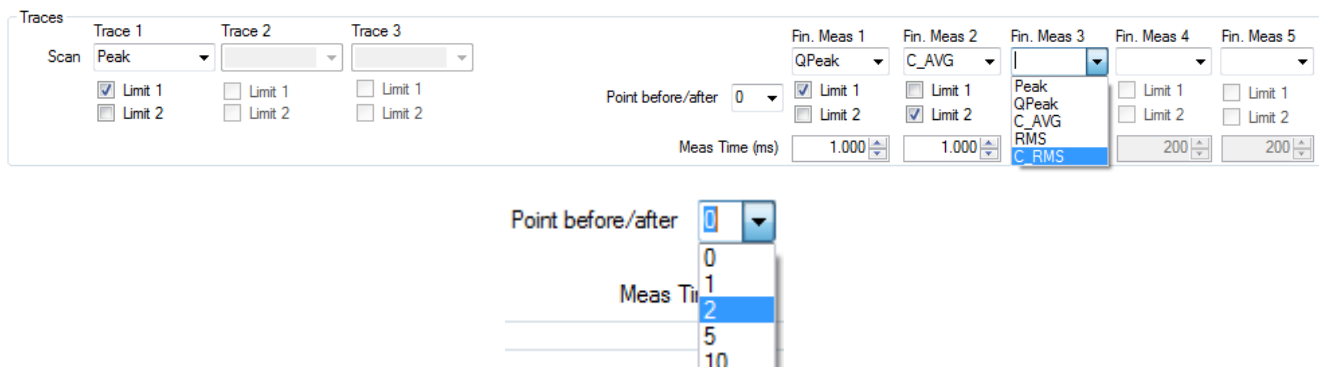


Fig. D.22: Setup Smart Sweep section

If the upper *Smart Sweep* is selected with measurements of 0 up to 10 points before and after the found peaks (these peaks are selected during the *Trace 1/Scan*) and the final measurements in these points with up to five detectors (*Peak*, *Quasi Peak*, *CISPR Average*, *RMS* and *CISPR RMS*).

It is possible to set up a *Limit* (1 or 2) and the *Measuring Time* for each selected detector.

The Max Hold function (see § D.4.3) can also be enabled for researching the worst case.

As it is apparent, this is the most convenient way to follow for the compliance to new emission Standards. More about this on Analysis paragraph.

## D.4.3 • MAX HOLD AND SYSTEM AUTOMATION

You can use the Max Hold function by clicking *Hold* button in the *Max Hold* section of the *Setup* box and set the repetition number of measurement you wish (2, 3, etc.).

Pressing button *Hold* will activate and the Max Hold button will switch its name to “Reset” in red color (see Fig. D.23).

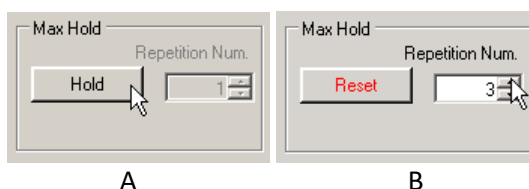


Fig. D.23: Setup Max Hold section. A: Max Hold inactive; B: Max Hold active, *Repetition Num.* 3.

At this point, all traces and limits in the *Single Test Setting* are frozen to their current states, and the same is true for the *Frequency Table* subranges: any change to them is impossible while Max Hold is active.

Click *Reset* to make *Max Hold* inactive and go back to single scan measurements. The red script *Max Hold Active* reminds you the *Max Hold* active state.

You can also add the System Automation (Fig. D.24).

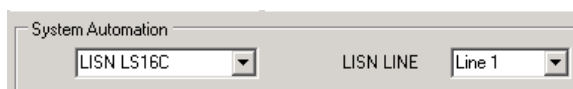


Fig. D.24: Setup System Automation section for an AFJ LISN choice

For AFJ R3000 EMI Receiver series you can add either an AFJ LISN LS16C or an AFJ LISN LT32C.

Then you can choose the *LISN LINE* to measure. Possible choices are:

- *Line 1* or *neutral* for LISN LS16C (single-phase ISN);
- *Line 1*, *Line 2*, *Line 3* or *Neutral* for LISN LT32C (three-phase ISN).

The phase is switched after you press the Start button in the Run Test box (the led on LISN front panel will switch on).



You can also choose the *SyA Script* function for the System Automation. In this case the LISN LINE gray out (Fig. D.25).



**Fig. D.25: Setup System Automation section for LISN choices**

This function requires a text script files to be programmed; this file allows you to make an automatic sequence of measurements. In this file you change test name, operator name, test conditions and specifications, test notes and you can send commands to RS232 serial port via the host PC.

As soon START is pushed into 'Run Test', the SyA Script Log window appears and it is required to load the \*.txt file that contains all the commands.

Commands syntax is the following:

<u>OPEN232 COM1,9600,N,8,1</u>	Open COM1 port with baud rate=9600, parity=None, data bits=8, stop bit=1.
<u>Wait 2000</u>	Wait for 2000 ms
<u>WR TN Test Name1</u>	Write 'Test Name1' into Test Name field (TN = test name)
<u>WR OP Operator Name1</u>	Write 'Operator Name1' into Operator field (OP = operator)
<u>WR CO Test Conditions1</u>	Write 'Test Conditions1' into Conditions field (CO =condition)
<u>WR SP Test Specifications1</u>	Write 'Test Specifications1' into Specifications field (SP= specification)
<u>WR NO Test note1</u>	Write 'Test note1' into Test Note field (More Info button)
<u>WRITE232 COM1 *idn?</u>	Send the string '*idn?' plus the blank space ' ' to COM1 port
<u>SWEEP</u>	Run the test with Frequency Table settings
<u>//</u>	Comments on single text line

Serial port settings syntax commands:

<u>OPEN232</u>	baud_rate, parity, data_bits, stop_bits
Baud rate port settings:	2400, 4800, 9600, ..., 115200
<u>Parity:</u>	None → N / Even → E / Mark → M / Odd → O / Space → S
<u>Data bits:</u>	Set either 8 or 7.
<u>Stop bits:</u>	To set nothing insert N, otherwise 1,1.5 or 2.

LISN and Max hold settings syntax commands:

<u>LISN 0</u>	select line N
<u>LISN 1</u>	select line L1
<u>LISN 2</u>	select line L2 (for LT32C only)
<u>LISN 3</u>	select line L3 (for LT32C only)
<u>HOLD SET 2</u>	enable MAX Hold and set the repetition number to 2 (defined by user)
<u>HOLD RST</u>	disable Max hold

#### D.4.4 • AN EXAMPLE OF SYA SCRIPT FILE

The below script allows you to make 2 sweeps for both LISN lines, at the end saving Max hold of 4 scans. The final result is saved as “Test Lisc 1 – L1”.

```
WR OP Operator1
WR NO SyA Script: Script1.txt
WR SP Max Hold 2 Rep.
WR CO LISN LINE 0
LISN 0          // Set LISN on N-line
WR TN Test Lisc 1 – L0
HOLD RST        // Max Hold Reset, delete previous traces
HOLD SET 2      // Enable Max Hold with two repetitions
SWEEP           // Sweep with two Max hold repetitions
LISN 1          // Set LISN on L1-line
WR CO LISN LINE 1
WR TN Test Lisc 1 – L1
SWEEP           // Sweep with two Max hold repetitions
```

The below script allows you to make two sweeps for each LISN line saving the max hold of two repetitions on line L0 in a file (“Test Lisc 2 – L0”) and the Max hold of two repetitions of line L1 in another file “Test Lisc 2 – L1”.

The main difference is the HOLD RST command of the third row from the end.

```
WR OP Operator Name
WR NO SyA Script: Script2.txt
WR SP Max Hold 2 Rep.
WR CO LISN LINE 0
LISN 0
WR TN Test Lisc 2 – L0
HOLD RST
HOLD SET 2
SWEEP
LISN 1
WR CO LISN LINE 2
WR TN Test Lisc 2 – L1
HOLD RST
HOLD SET 2
SWEEP
```

Another example runs two different tests with their names, operators, conditions, specifications. Between two tests the software runs a command to serial port, for example for settings an external hardware.

```
OPEN232 COM1,9600,n,8,1
WAIT 2000
WR TN Test Name1
WR OP Operator Name1
WR CO Conditions1
WR SP Specifications1
WR NO Test notel
WRITE232 com1 *idn?
WAIT 2000
SWEEP
WR TN Test Name2
WR OP Operator Name2
WR CO Conditions2
WR SP Specifications2
WR NO Test note2
WRITE232 COM1 *idn?
WAIT 2000
SWEEP
```

Of course mode tests can be added to the file.

## D.4.5 • FREQUENCY TABLE

In the *Frequency Table* section of the Workspace (center of the window) you can change the *Frequency Start / Stop* and *Frequency Step* parameters of your scan, their *Bandwidth* (RBW), scan *Time*, *Attenuator Level* (*Manual* attenuator mode only, please notice that an *AUTO* Attenuator mode is not foreseen), and your *Antenna / Probes*, *Cables* and *Amplifiers / Attenuator* of your actual emission chain.

The *Frequency Table* section appears usually subdivided in two subranges, but you can remove one of them or add another subrange at your will with the *Add Subrange* and *Remove Subrange* buttons (Fig. D.26).

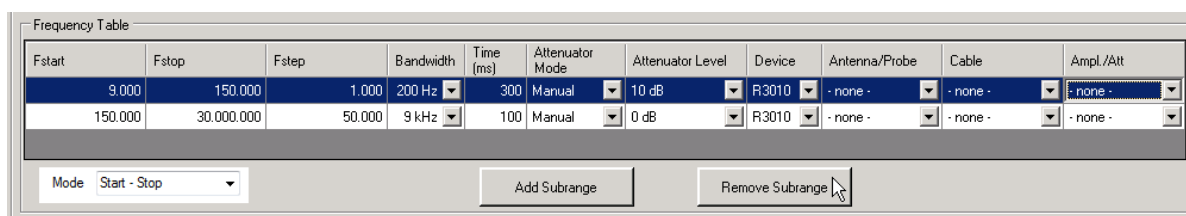


Fig. D.26: Frequency Table in Diagram Section

With the Mode Function you can select if you want to use either all the frequencies (*Start – Stop*) or the central frequency only (*Center – Span*) of each subrange (D.27).

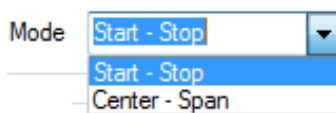


Fig. D.27: Mode Function in Frequency Table

In the section Diagram of the workspace you can set the parameters for graphical data presentation of final spectrum (in the next window *Run Test*):

Frequency Unit: Hz, kHz, MHz, GHz

Display Unit: dBμV, dBm, dBμV/m, dBμA/m, dBA/m, dBμA, dBpW

X-axis (Frequency) Start / Stop limits (**Note:** these limits are only valid for the output graphic)

Y-axis Start / Stop (**Note:** as above)

Point per division: 1, 2, 5, 10, 20 points per division

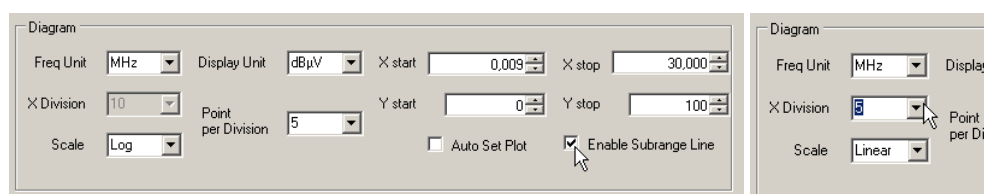
X division: 2, 5, 10, 20 divisions of X-axis

**Note:** this option is available only with the *Linear scale* for X-axis choice as obvious.

Scale: *Linear* or *Logarithmic* scales for X-axis: with the usual Log scale the *X Division* will grey out, while for Linear scale the *X Division* can be set 2 – 5 – 10 – 20 (Fig. D.28);

Autoset Plot: with this option enabled, the graphic will show all measured points, according to X- and Y-axis limits set by the user;

Enable Subrange Line: with this option enabled, a red vertical (dotted) separation line at the crossings of the subranges appears in the graphic during run-time.



D.28: Diagram window. Left: Log scale for X-axis. Right: Linear scale for X-axis.

If you now click on the *Run Test* label you see the effect on your diagram.

#### D.4.6 • INPUT DEVICE EDITOR

Before running your test, you probably want to set-up your *Antenna or Probe*, measurement *Cable*, and *Attenuator/Amplifier*.

This task is easily done with the *Input Device Editor* that you find on the menu:

Tools => Input Device Calibration => Input Device Editor (Fig. D.29)

**Note:** This upper menu is always present in any of the cockpit boxes.

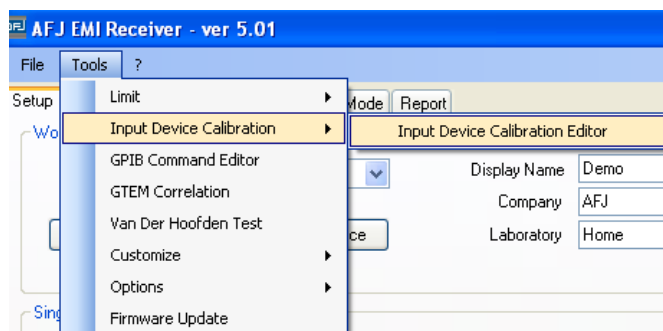


Fig. D.29: Input Device Editor choice

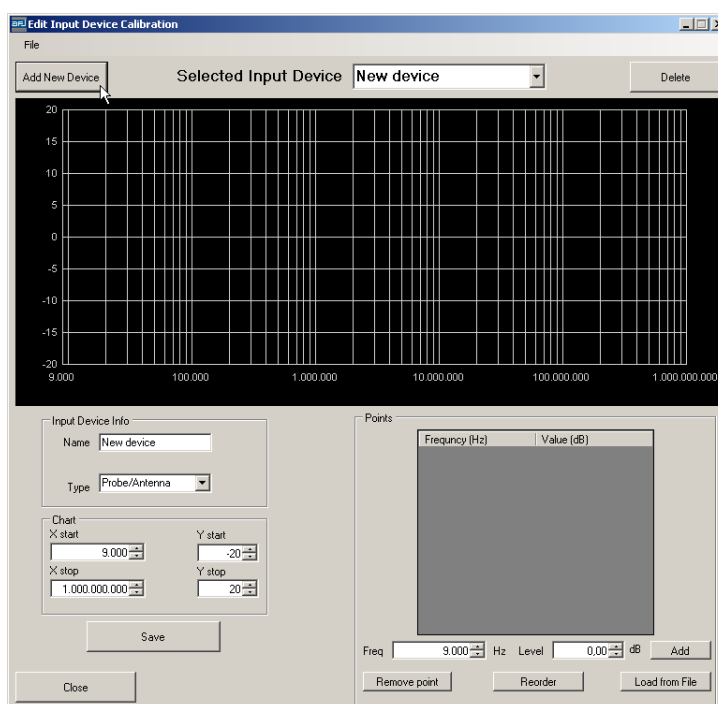
The window of Fig. D.30 now appears.

First of all you have to press the *Add New Device* button (on left-top of the window): so doing, a *New Device* will appear in the *Selected Input device* drop-down menu and you can edit all its properties.

In the middle section *Input Device Info* you can choose a different *Name* and *Type* of your device in use among *Antenna/Probe*, *Cable* or *Amplifier/ Attenuator*.

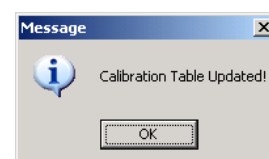
You can adapt the range for X-axis, namely frequency in Hz (by default, this is the full range 9 kHz up to 1 GHz) and the range for Y-axis, namely *Level* in dB (by default, this is  $\pm 20$  dB). For this task, you can use the up/down arrow (in this case the graphic will be updated automatically), or directly editing the values with the keyboard and then pressing *Enter* to redraw the graphic.

On the *Points* section you can enter the couple *Frequency / Level* [dB], and press *Add*. The data points are ordered as you enter them, but you can *Reorder* or *Remove point*.

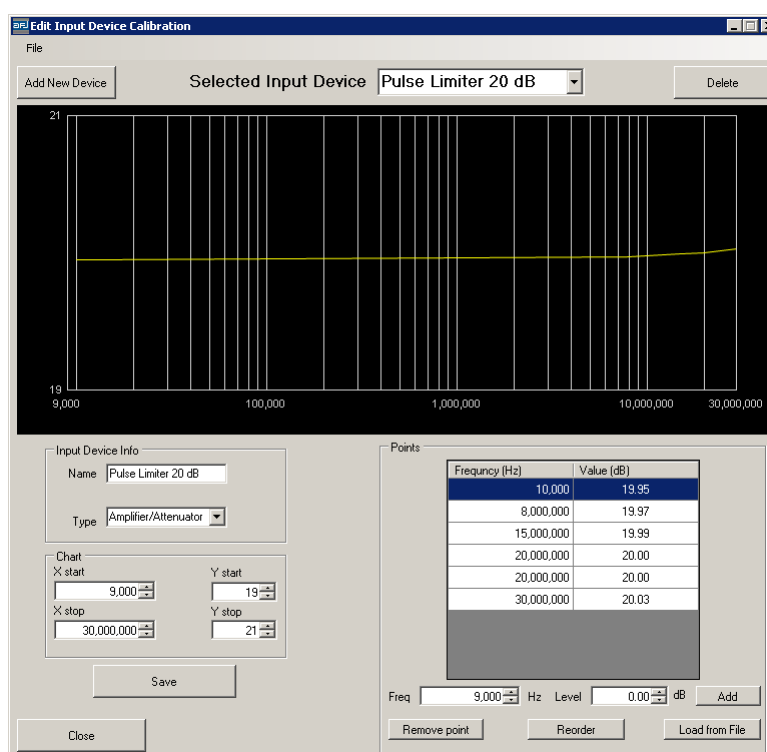


D.30: Edit Input Device Calibration window

You can press the *Save* button to store your data, the following message appears:



In the below window we have set the typical parameters for the device calibration of a AFJ PAT20M 20 dB Attenuator and Pulse Limiter (Fig. D.31).



**D.31: Input Device Calibration parameters for a 20 dB Attenuator and Pulse Limiter**

The *Load from File* button allows you to import data from a file. The file must contain all the couples *Frequency / Value (dB)*, separated by a blank space.

#### D.4.7 • LIMIT EDITOR

AFJ EMI Receiver software comes already with many measurements limits according to emission standards CISPR/EN55011, 14, 15, 19, 22, etc. but in case of need, you can create your own limit.

This task is easily done with the *Limit Editor* that you find on the menu:

Tools => Limit => Limit Editor

In this box you can change the parameters of the current test Limit and its display configuration, Add New Limit, Select another Limit, Delete Limit.

The overall functionality is similar to the Input Device Editor, so it does not need further explanation.

At the end of editing, you can press the *Save* button to store your data and then the *Close* button to exit (Fig. D.32).

You can also Import / Export limits in XML format (version 1.0, *Standalone*) for using them in different XML-parsing programs (Fig. D.33).

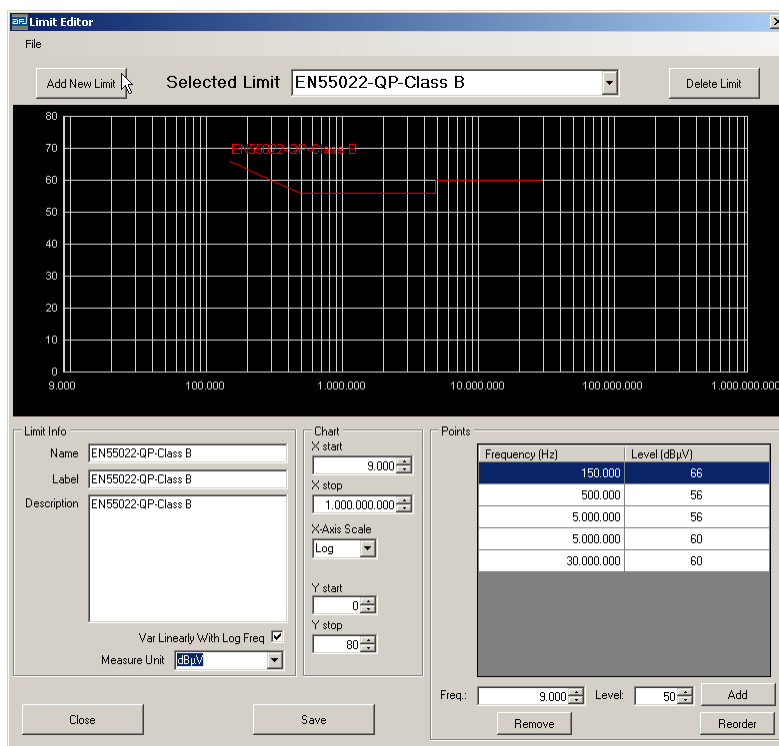


Fig. D.32: Limit Editor parameters for EN55022 Quasi Peak Class B Standard limit

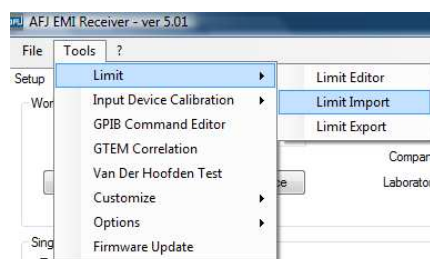


Fig. D.33: Limit Import / Export options

With this two options (Import / Export) for Limit lines, different limits can be exchanged between two different databases (local or remote ones, no matter), allowing maximum flexibility for any EMI Receiver installation (Fig. D.34).

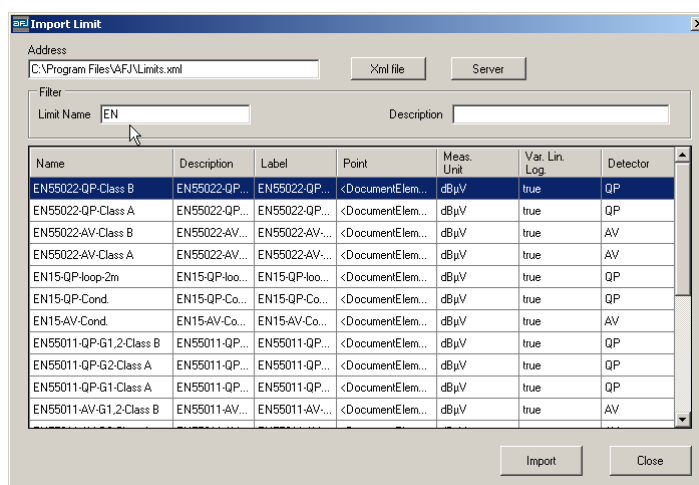


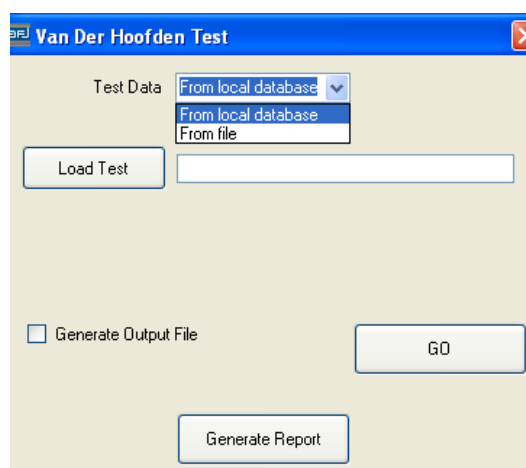
Fig. D.34: Limit Import of an XML-file

In the Import Limit an XML file can be loaded and filtered according to *Limit Name* and its *Description*. After highlighting a Limit, press Import to import it onto your database.

#### D.4.8 • OTHER TOOLS MENU OPTIONS (GPIB, GTEM, VAN DER HOOFDEN TEST, CUSTOMIZE, FIRMWARE UPDATE)

The other commands found in the Tools menu are:

- |                      |  |
|----------------------|--|
| GPIB Command Editor  | for commanding and controlling GPIB controlled receivers.  |
| GTEM Correlation     | for storing correlation parameters for GTEM (Gigahertz Transverse Electromagnetic Cell) in comparison with OATS (Open Area Test Site) for radiated emissions measurements.   |
| Van Der Hoofden Test | for calculating F factor from peak detector measurement sweep into the frequency range $f=20\text{kHz}\div 10\text{MHz}$ when using AFJ EMI Receiver with Van Der Hoofden Test Head model AFJ VDH 30 according to IEC 62493 standard ("Assessment of lighting equipment related to human exposure to electromagnetic fields") (Fig. D.35). |



**Fig. D.35: Van Der Hoofden Test Software Tool**

With *Test Data* you select where to find (either from local database or from file) the measurement result obtained with VDH 30.

With *Load Test* the measurement result is selected and loaded.

Pushing *GO* you get the F factor with either "PASS" ( $F < 0.85$ ) or "FAIL" ( $F > 0.85$ ) indication (Fig. D.36), with the possibility to generate at the same time an output \*.txt file (*Generate Output File*) with the following information:

*frequency (Hz); test level (dB $\mu$ V); current density  $J_{cap}(f)$  (A)*

With *Generate Report* you create automatically the report with all the information about measurement with VDH 30.

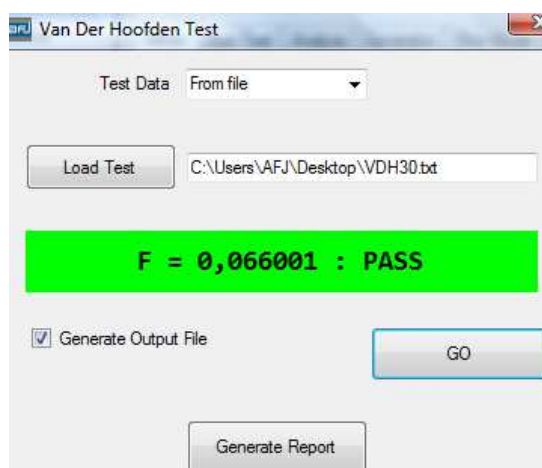


Fig. D.36: Van Der Hoofden Test Result

- Customize => Colors      Here you can change colors for Plotter, Report (with 64 custom color), and customize them all-at-once with the Color Theme Editor (Classic Black and Classic White are the two options by default).
- Customize => Report      Edit Report options (Title, Comments, Show Date and Time, Show Device Table, Show Subrange Settings).
- Firmware Update          Install a new AFJ EMI Receivers firmware with this option.
- Options (1)                *Peak Search Settings* lists the parameters for *Peak Search* (appropriate for evident peaked spectra) and *Max Search* (for smoothed spectra, with no evident peaks). A limit must be set to get results of both searches. *Threshold* (dBμV), *Peak Escl* (dB), *Maximum Peak Number* and *Threshold From Limit* (dB) (Fig. D.37).

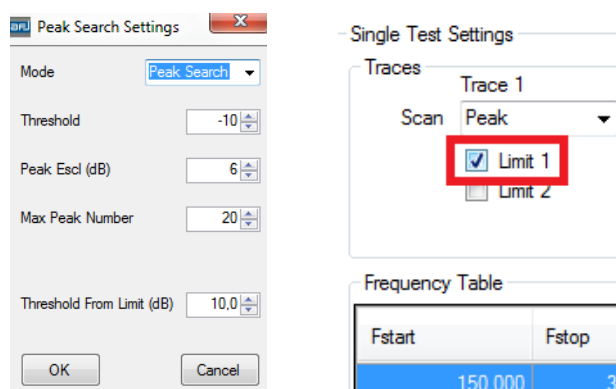


Fig. D.37: Peak Search Settings

**Threshold (dBμV):** this parameter allows to set a lower limit to the max/peak search routine, i.e. no peaks are considered below this level. The default value is -10dBμV, which, in practice, means that all peaks are considered. This line settles the threshold under what the peaks must be cut out from the inquiry, it is a factor which distinguish a peak from the nears.

**Peak Escl (dBμV):** this parameter allows to search only the peaks having a difference of more than [Peak Excursion] from the local minima just aside the peak. The default value of this parameter is 6dB.

**Maximum Peak Number:** is the number of peaks to retain for each scan: this field allows setting an upper limit to the number of peaks to be considered in the table.

**Threshold From Limit (dB):** this parameter allows to set the distance from the limit for considering the max/peak search routine, i.e. peaks with a distance from the limit bigger than this value are not considered. The default value is 10dB.



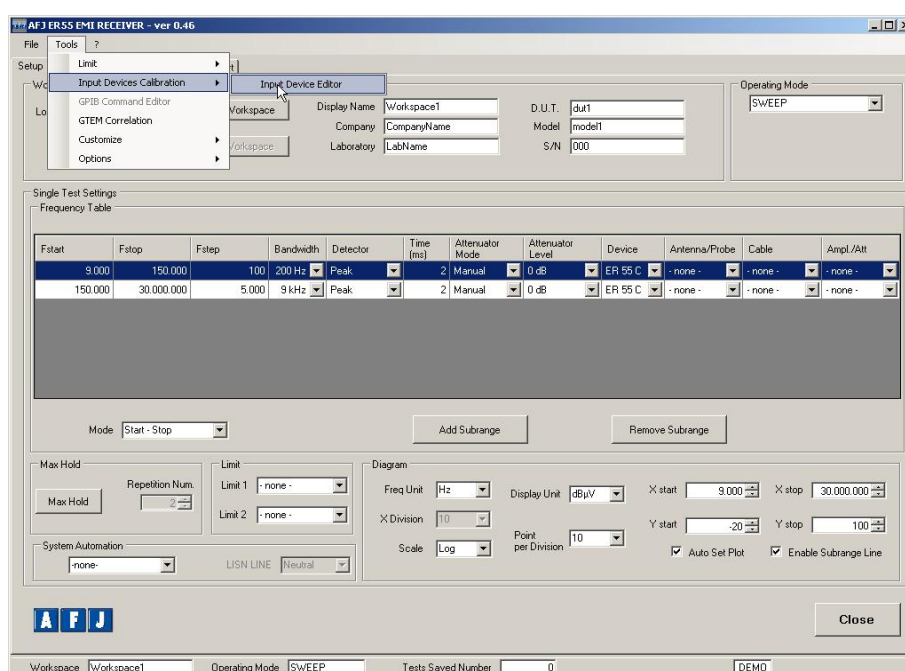
**Note:** “Peak Escl”, “Threshold” and “Threshold From Limit” parameters distinguish various kinds of peaks and their max. values, to help the choice of the most significant disturbances. Due to difficulty of automatic max peak selection, it is always possible to approach and complete in manual mode the inquiry.

Options (2) *Plot Screenshot Settings* lists Width/Height pixel size for the output bitmap of the working spectrum (default *Plot Screenshot Size* is 710 x 425 pixel).

Option (3) *Language* selection between English (default) and Chinese

#### D.4.9 • GTEM CORRELATION (OPTIONAL)

To run the correlation, first of all it is necessary to insert GTEM-OATS correction factors. To do that, open Input Device Calibration Editor (Fig. D.38) as explained in § D.4.6.



**Fig. D.38: Input Device Editor**

Push 'Add New Device'.

Insert into the 'Name' field the name of the correction factor to identify the correction factor for horizontal polarization, for example “Correction\_h”, and to be sure to select “Probe/Antenna” type.

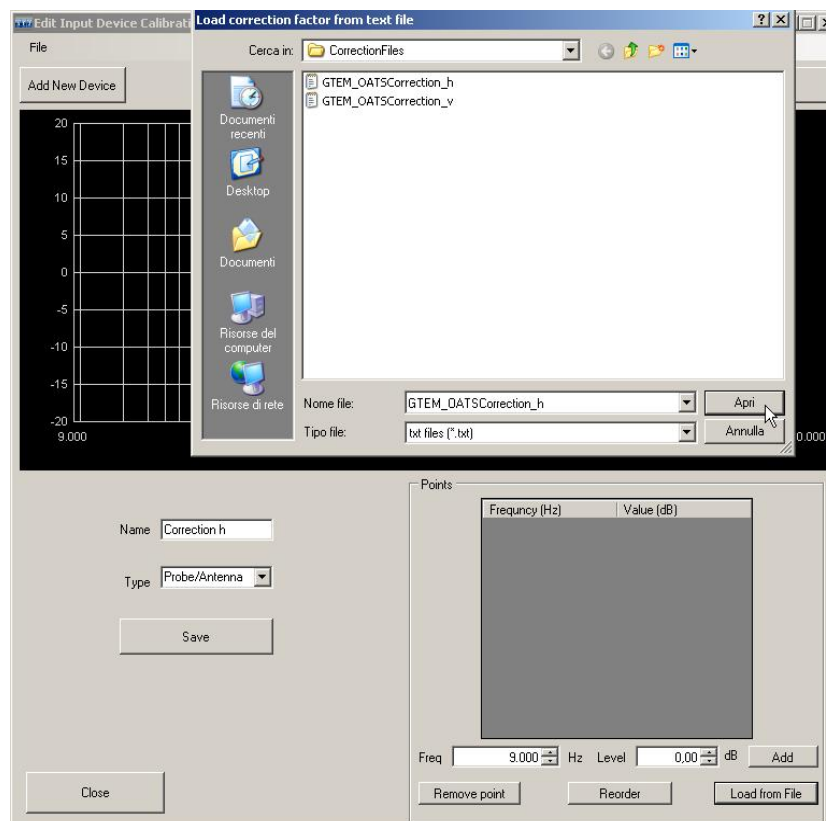
Insert the correction factor like any input device. It is also possible to import these data from \*.txt file. To import data from file, into the 'Points' window push 'Load from File' and then select the file with correction factors values inside. Into the table and on the diagram correction factor points will appear. Push save to store all the data.

Repeat the same procedure for the correction factor for vertical polarization and this time load the “Correction\_v” factor.

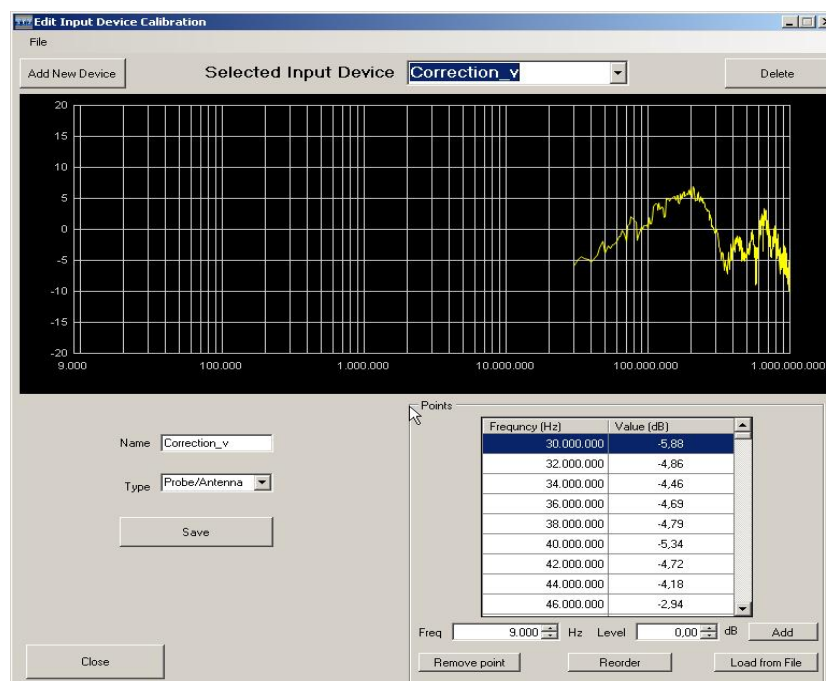
\*.txt files with correction factors shall be into the following format:

```
<frequency> 'blank space or tab' <value in dB>
<frequency> 'blank space or tab' <value in dB>
<frequency> 'blank space or tab' <value in dB>
```

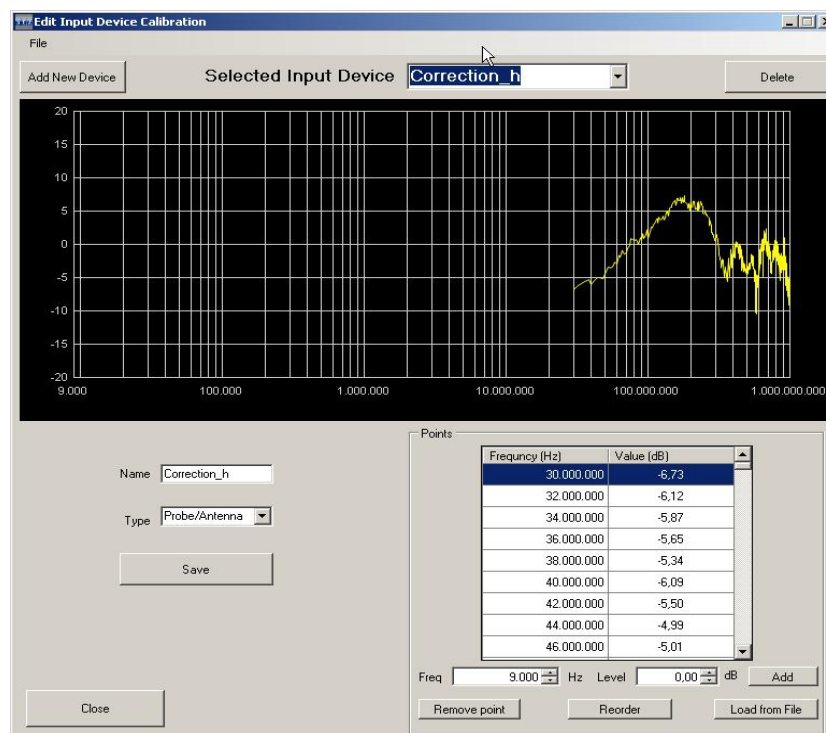
Using the software in demo mode it is possible to load two correction factors called “Correction\_h” and “Correction\_v”, already loaded by default into the software.



**Fig. D.39: Load correction factor from text file**



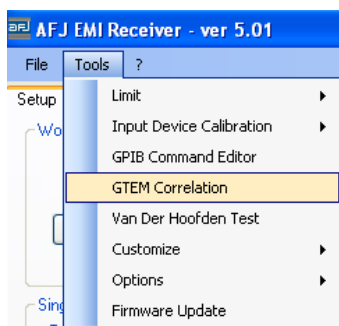
**Fig. D.40: Edit Input device Calibration box with the imported correction factor data**



**Fig. D.41: Load correction factor from text file**

At this point it is necessary to perform the three measurements inside the GTEM (with EUT oriented on X, Y and Z axis), taking care to select into the frequency table on SET UP window “GTEM” type on Antenna/Probe column.

From main form select 'Tools->GTEM Correlation' (Fig. D.42).



**Fig. D.42: Tools => GTEM Correlation**

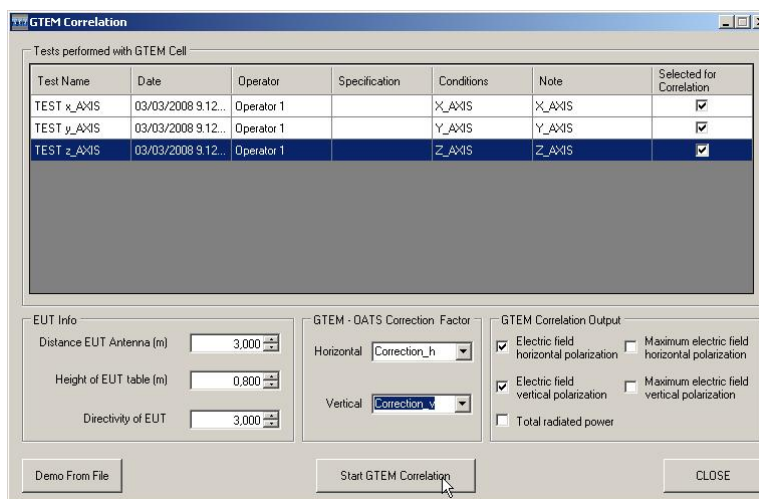
The table will show only the tests (under the same workspace) executed with Antenna/Probe set to “GTEM” type.

At this point:

- Select the three executed tests
- Be sure to select the proper correction factors
- Select tests that will be generated (GTEM Correlation Output Section)
- Push 'Start GTEM Correlation' (Fig. D.43).

All the tests selected on 'GTEM Correlation Output' section will be generated and they will be visualized either on Analyze or Report window.

**Note:** Using the software in demo mode it is possible to load three different tests already stored into the software pushing “Demo From File”.



**Fig. D.43: GTEM correlation window**

Now you are ready to run your first test.

The parameters you can set about EUT (*Equipment Under Test*) are: Distance EUT – Antenna (m); Height of EUT table (m); Directivity of EUT.

You can also set parameters for Horizontal / Vertical GTEM / OATS Correction factor, and GTEM Correlation Output, choose among Electric field horizontal/vertical polarization, Total radiated power, Maximum electric field horizontal/vertical polarization.

Once you have added all parameters, press Start GTEM Correlation button to start calculation, then Close to exit.

## D.5 • RUN TEST BOX

In the *Run Test* box (second label of the cockpit), you can make a measurement and analyze it in a quick but still effective way.

To begin the run procedure, select the *Start* button in the *Frequency* section (by default, it shows the last performed measurement), the following box appears:



Fig. D.44: Frequency section of Run Test Box

The scan/sweep will now proceed according to all the parameters (frequency ranges, detectors, limits, traces, etc.) you have chosen in the previous paragraphs.

At the end of the measurement you can save the test with its name and perform a quick analysis directly from this window (for a detailed analysis, please, refer to next § D.5.1).

The result of the actual measurement is shown in the below window as seen from the *Run Test* box:



Fig. D.45: Run Test box

## D.5.1 • RUN TEST SECTIONS (SETUP, QUICK ANALYZE & TEST INFO)

The *Setup* section shows:

- *Detectors* in use, namely *PK* (green), *QP* (yellow), *C\_AVG* (violet) and value of the internal *Attenuator* (0 dB in our case);
- the absence of any *Probe/Antennas* in use during the measurement;
- the absence of any *Cable*;
- the use of an external pulse limiter (PAT20M attenuator & pulse limiter) as *Amplifier/Attenuator*.

The *Quick Analyze* section is the most important section where the measurements can be checked (Fig. D.46).



Fig. D.46: Quick Analyze section

It is possible to make a manual *Zoom* in any spectrum window in two steps: 1) holding down the *Shift*-key (↑) and then left-clicking and moving the mouse in a rectangle while holding the mouse button (Fig. D.47 A); 2) after you release it a blue rectangle appears and the area is zoomed (Fig. D.47 B):

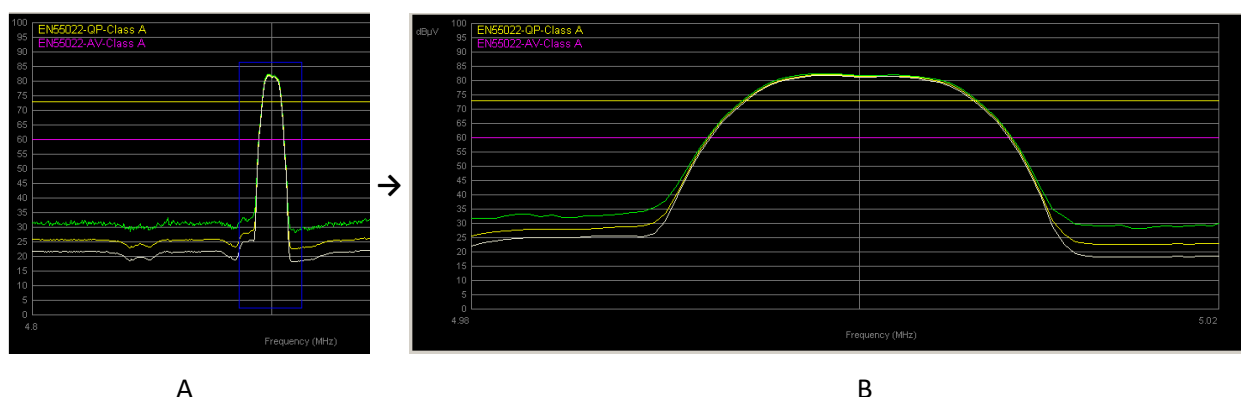


Fig. D.47: Manual Zoom on Emission Spectrum

If you want to come back to the initial view (without Zoom), you can press the *Reset Zoom* button in the *Quick Analyze* section (Fig. D.46).

By pressing *Screenshot* button, it enables the saving of the measurement diagrams on a \*.JPG, \*.PNG, or \*.BMP file. A *Save as type* dialog opens with Browse for directory and filename. In order not to lose any detail of your image, but still save disk space, the PNG-format for your plot is suggested (Fig D.48 and D.49).

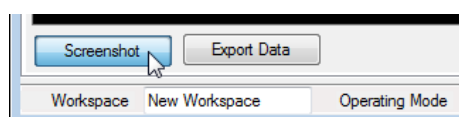


Fig. D.48 Screenshot and Export Data buttons

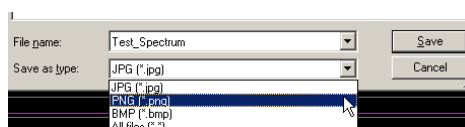
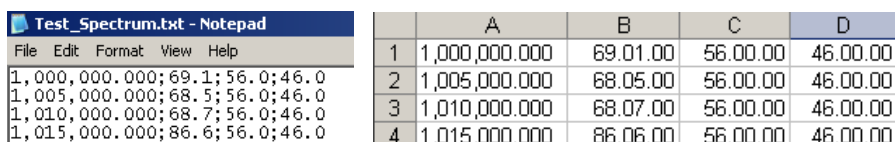


Fig. D.49 Saving in JPG/PNG/BMP files

The *Clear Ref. Curve* button in the *Quick Analyze* section (Fig. D.46) allows to clear the spectrum loaded checking the *Load As Reference Curve in Run Test Mode* flag from the *Test Management* window in the *Analyze* box (see section D.6, Fig. D.65).

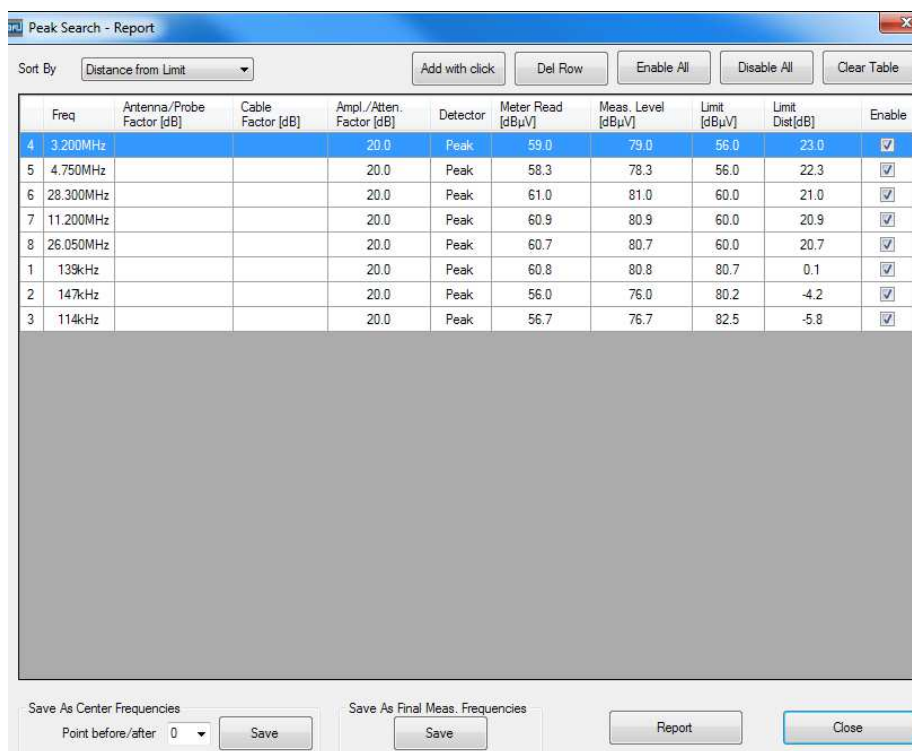
By pressing *Export Data* button, it enables the saving of the measurement data on a text file \*.txt that can be opened by Windows Notepad or similar Editor program, or can be imported in any spreadsheet application, being each field separated by semicolon (Fig. D.50).



	A	B	C	D
1	1,000,000.000	69.01.00	56.00.00	46.00.00
2	1,005,000.000	68.05.00	56.00.00	46.00.00
3	1,010,000.000	68.07.00	56.00.00	46.00.00
4	1,015,000.000	66.06.00	56.00.00	46.00.00

**Fig. D.50: Text file saved with Export Data and imported in a spreadsheet (Excel)**

The *Peak Search* function will show the following table sorted by Distance From Limit (Fig. D.51).



	Freq	Antenna/Probe Factor [dB]	Cable Factor [dB]	Ampl./Atten. Factor [dB]	Detector	Meter Read [dBμV]	Meas. Level [dBμV]	Limit [dBμV]	Limit Dist [dB]	Enable
4	3.200MHz			20.0	Peak	59.0	79.0	56.0	23.0	<input checked="" type="checkbox"/>
5	4.750MHz			20.0	Peak	58.3	78.3	56.0	22.3	<input checked="" type="checkbox"/>
6	28.300MHz			20.0	Peak	61.0	81.0	60.0	21.0	<input checked="" type="checkbox"/>
7	11.200MHz			20.0	Peak	60.9	80.9	60.0	20.9	<input checked="" type="checkbox"/>
8	26.050MHz			20.0	Peak	60.7	80.7	60.0	20.7	<input checked="" type="checkbox"/>
1	139kHz			20.0	Peak	60.8	80.8	80.7	0.1	<input checked="" type="checkbox"/>
2	147kHz			20.0	Peak	56.0	76.0	80.2	-4.2	<input checked="" type="checkbox"/>
3	114kHz			20.0	Peak	56.7	76.7	82.5	-5.8	<input checked="" type="checkbox"/>

**Fig. D.51: Peak Search table of the actual spectrum, ordered by Distance From Limit**

**Note:** A sort by either Frequency or Amplitude (in ascendant order, from the lowest value) is also possible from the *Sort By* drop-down menu.

It is possible to add manually more peaks to include on the measurement report.

For manually modifying the results of the *Peak Search* function:

- Selecting “Add with click” and with mouse right-click on the graphic it is possible to add a row to the table;
- “Del Row” deletes the selected row;
- “Enable All” enables the visualization on the graphic of all the peaks included into the table;
- “Disable All” disables the visualization on the graphic of all the peaks included into the table;
- “Clear Table” deletes all the rows of the table.

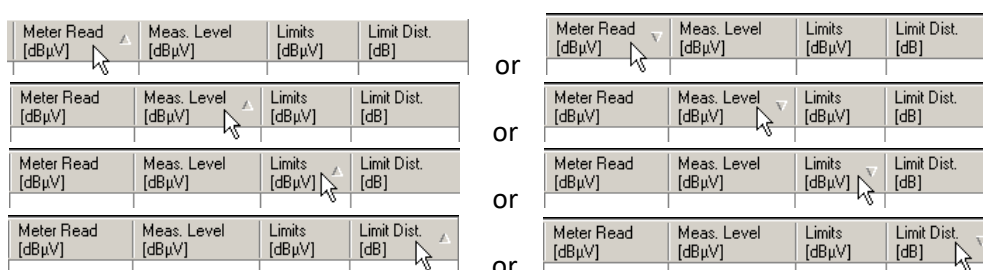


*Save As Center Frequencies* function allows to save as subranges center frequencies into the *Frequency Table* section of the Workspace all the frequencies of the *Peak Search* result table, giving the possibility to repeat the measurements at these frequencies only (with measurements of 0 up to 10 points before and after the found peaks).

*Save as Final Meas. Frequencies* function allows to save a frequencies table giving the possibility to repeat the final measurements at these frequencies only.

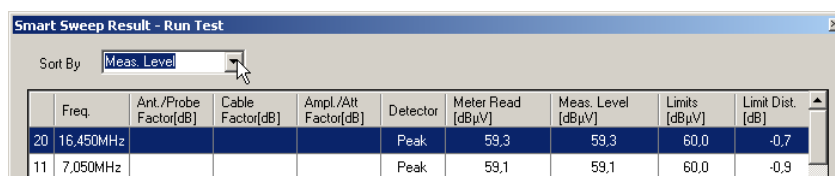
*Report* function allows to generate a report including measurement sweep and peak search table.

You have also the choices or by clicking directly on the table headers labeled as *Meter Read* [dBμV], namely the reading at main receiver RF-input, *Measured Level* [dBμV], namely the overall chain reading (including the effect due to any cables, antennas, amplifier/attenuators), *Limits* [dBμV] and *Limit Distance* [dBμV] (namely the difference between the measured level and the limit at one frequency), clicking once for descendant order and twice for ascendant order:



**Fig. D.52: Ordering Peak Search table by *Meter Read*., *Meas. Level*, *Limits*, *Limit Distance*.**

If you have selected *Smart Sweep* and this one is just performed, the following *Smart Sweep Result* table showing test results is automatically opened (Fig. D.53).



	Freq.	Ant./Probe Factor[dB]	Cable Factor[dB]	Ampl./Att Factor[dB]	Detector	Meter Read [dBμV]	Meas. Level [dBμV]	Limits [dBμV]	Limit Dist. [dB]
20	16,450MHz				Peak	59,3	59,3	60,0	-0,7
11	7,050MHz				Peak	59,1	59,1	60,0	-0,9

**Fig. D.53: Smart Sweep Result – Run Test table**

The peaks are ordered according their *Measured Level* (or Frequency), progressively numbered accordingly to ascendant frequency and with a different symbol for each detector.

The highest peak of the spectrum is red-colored, the other ones have a color according to their detector in use (by default green for Peak detectors, cyan for RMS detector, yellow for Quasi Peak detector, fuchsia for CISPR Average detector, beige for CISPR RMS detector).

*Save As Center Frequencies* function allows to save as subranges center frequencies into the *Frequency Table* section of the Workspace all the frequencies of the *Smart Sweep Result* table, giving the possibility to repeat the measurements at these frequencies only (with measurements of 0 up to 10 points before and after the found peaks).

If you close the *Smart Sweep Result* window, you can open it again for a later use by clicking the button *Show Smart Sweep* in the Quick Analyze section (Fig. D.46).

With the *Smart Sweep* it is possible to repeat the final measurements.

When a sweep is performed using the *Smart Sweep* operating mode, the frequencies of all the detected peaks are displayed on the “Final Measure List”, as shown on the right side of Fig. D.54, showing the *Run Test* box when the *Smart Sweep* is selected.





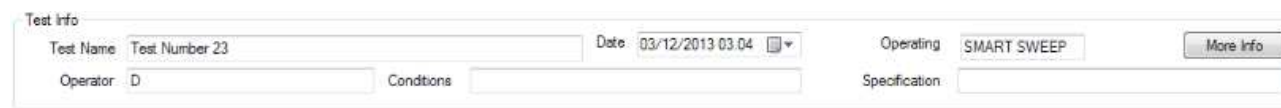
**Fig. D.54: Run Test box with Smart Sweep Result**

Enabling the “Only Fin. Meas” check box on the left side of the *Run Test* box, it is possible to add more points on the frequencies list selecting “Add with click” and using the mouse right-click on the graphic.

If the “Only Fin. Meas” check box is enabled, pushing the Start button the measurements will be performed at all the frequencies of the list only.

“Delete Row” button allows to remove a selected frequency from the list and the “Clear Table” button allows to delete all the frequencies of the list.

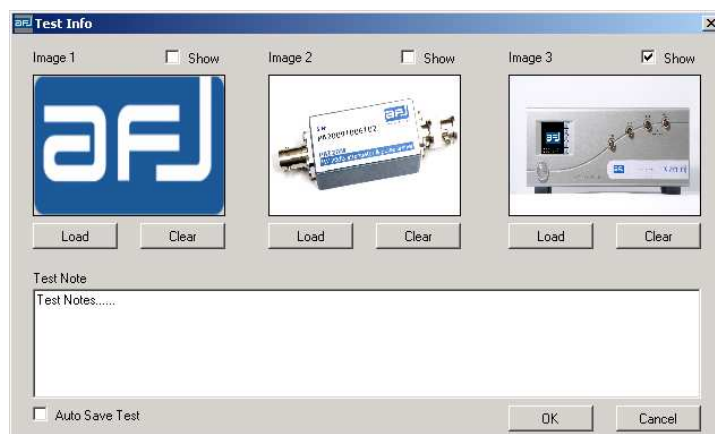
In the *Test Info* section of the *Run Test* box (Fig. D.55) you can write your personalized *Test Name* (default is *Test Number* with a progressive number), the *Date* of test (default is the current system date), the name of the *Operator*, the *Conditions* (usually the ambient test conditions) and *Specification* (Standards, limits, etc...).



**Fig. D.55: Test Info section of Run Test box**

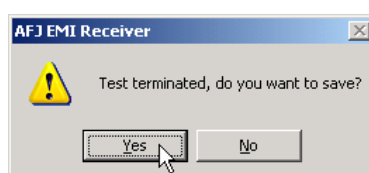
Now you can click to *More Info* button and the *Test Info* window opens (Fig. D.56).

Here you can load up to three image sketches (in JPEG, PNG or Bitmap-format). They will appear in each of the three separate windows and one of them can be shown (check *Show*) in your main *Run Test* box (see Fig. D.45), and you can add your *Test Note* about the current performed test.



**Fig. D.56: Test Info window with three loaded images**

If *Auto Save Test* is not flagged (default choice), then at the end of each measurement, the following window appears:

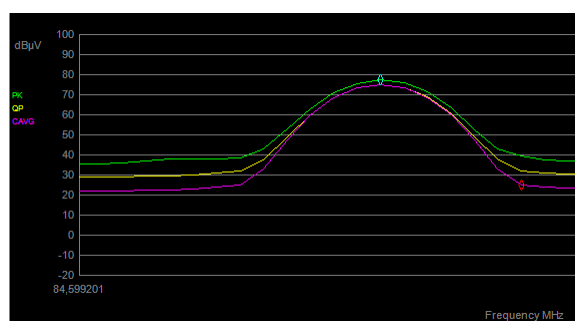


If *Auto Save Test* check is flagged, automatically saving of test results without user confirmation is enable.



**Fig. D.57: Showing your *Test Info* image on Quick Analyze;**

You can easily work with one or two markers, by left- and/or right-clicking in any part of the displayed spectrum window. Once activated, the first marker (red color) is driven by mouse left-click: you can put or drag-and-drop in any point of the spectrum to read its frequency and level. A mouse right-click will add the second marker (light-blue color) that behaves similarly at all, so enabling to make a second measurement. The two markers on the spectrum appear as apparent in Fig. D. 58.



**Fig. D.58: Markers MK1 (red) and MK2 (light blue) in a spectrum**

The relative measurements of the enabled detectors values will be put in the upper right portion of the spectrum as depicted in Fig. D.59.

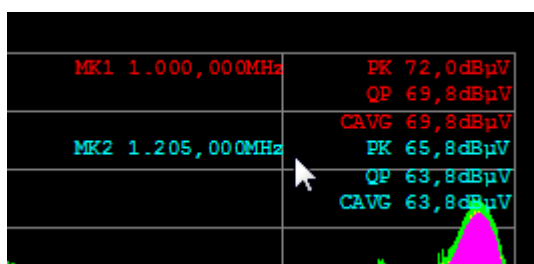


Fig. D.59: Marker 1 and 2 readings in the displayed spectrum

If the *SyA Script* function is selected on the System Automation box (Fig. D.25), on the *Run Test* window (Fig. D.45) a check box to show the SyA Script Log window appears (Fig. D.60 and D.61).



Fig. D.60: Show SyA Script Log check box

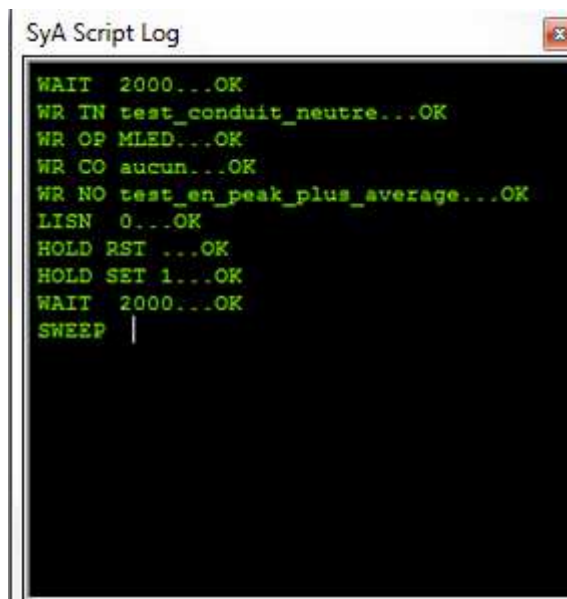


Fig. D.61: SyA Script Log window

## D.6 • ANALYZE BOX

The Analyze box is useful for making an accurate analysis of your noise spectrum. It includes a single-frequency real-time measurement with up to three different detectors and a handy scope mode with a time-domain chart. The initial appearance of the Analyze Box is apparent from Fig. D.62.



Fig. D.62: The Analyze Test Box

### D 6.1 • THE MANUAL SETTINGS SECTION

In the *Manual Setting* section you can manually change the *Frequency*, you can modify your frequency *Step*, choose one of the internal *Attenuators*, enable an *Input Offset* or leave it in *Auto* mode and set the *BW Filters* amplitude of your measurement. By pressing *Detectors* button, you can choose up to three from five available detectors, by flagging their names. There is a sketch of the Analyze section with three detectors (Peak, QPeak, C\_AVG), see Fig. D.63.

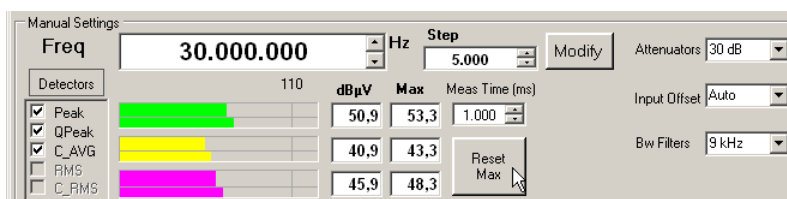


Fig. D.63: Manual Settings of frequency, step, detectors, attenuators, etc.

The maximum value of the peak level is continuously recorded in the Max column. To reset it, press the *Reset Max* button.

The measuring time in ms can also be set by user.

By pressing *Modify* you can choose the working frequency entering its value and then choosing the unit: GHz, MHz, kHz, Hz.

E.g. *Modify* => write "10" => press "MHz" to set 10 MHz => 10.000.000 Hz is displayed as *Freq*

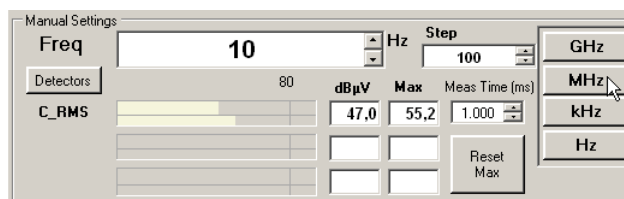


Fig. D.64: Modify Frequency in GHz, MHz, kHz and Hz units

## D.6.2 • THE ON TIME CHART SECTION

In the section *On Time Chart* you can use the receiver in the time-oscilloscope mode with a time-domain chart with Manual Settings.

You can easily activate it by choosing *Scope Mode* from the *Type* drop-down menu, and set its scale in 500 ms/division, 1 s/division or 2 s/division (Fig. D.65).

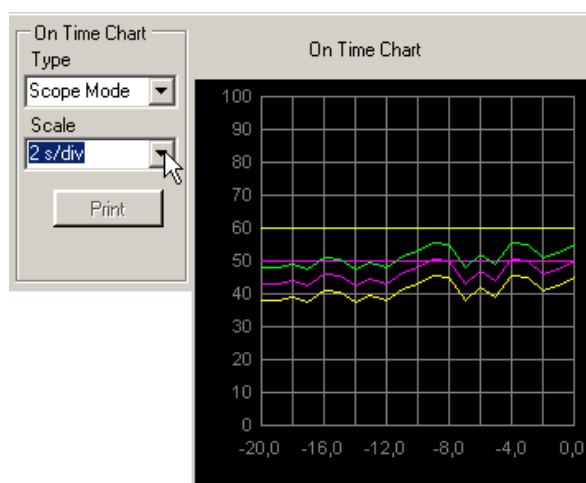


Fig. D.65: On Time Chart display

## D.6.3 • TEST INFO SECTION (ANALYZE BOX)

The *Test Info* section of *Analyze box* can *Load a Test*, *Print* it, *Clear Reference curve* and *Show Smart Sweep* if they are present in the measurements (Fig. D.66).

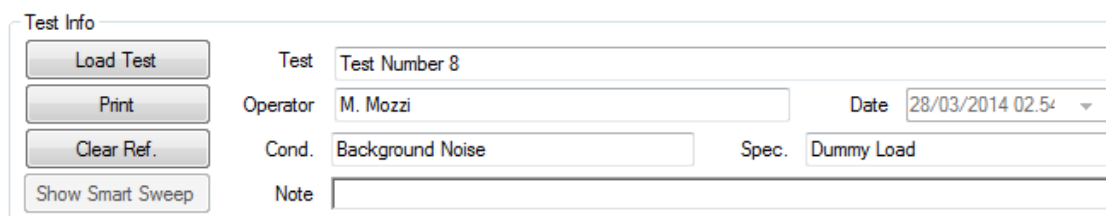


Fig. D.66: *Test Info* section of *Analyze box*

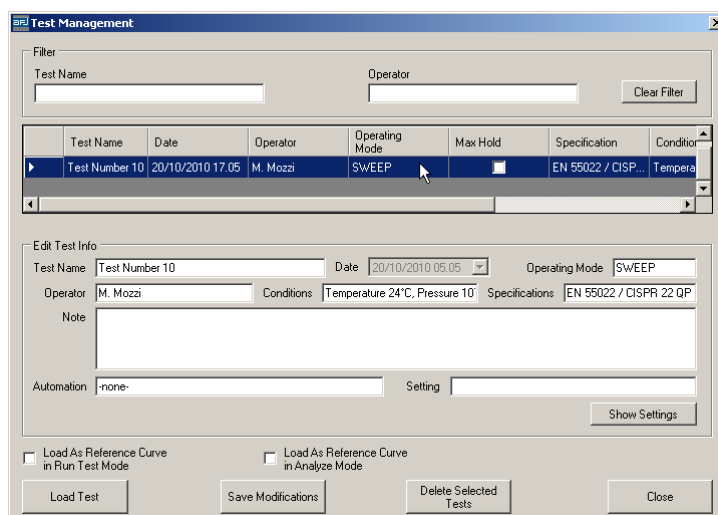
The intuitive *Print* button reverse the color of current spectrum (giving the negative image) and opens the system *Page Setup* Print dialogue box, default page orientation is landscape, with 10 mm distance from all margins.

The *Clear Ref.* button allows to clear the spectrum loaded checking the *Load As Reference Curve in Analyze Mode* flag from the *Test Management* window (Fig. D.67).

In case of a test run with *Smart Sweep*, you can show them here again.

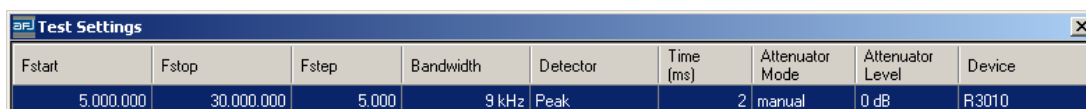
The *Load Test* button instead has much utility and different options. It opens the *Test Management* window where you can load any of performed tests (Fig. D.67).

Exactly as seen for the *Find Workspace* window, here you can use *Filter* for filtering your tests by Test Name / Operator, select one run test and change its stored data with *Edit Info* (press *Save Modification* for storing permanently your changes), you can *Load a Test* and use it as a reference spectrum for run-time / data analysis (it will superimpose to your actual test), *Delete Selected Tests* (you can select more than one Test by clicking on each Test while holding down the *Ctrl* button) and *Close*.



**Fig. D.67: Test Management table for Load Test**

Pressing *Show Settings* button for the selected test, a window with all information on run test opens (Fig. D.68).



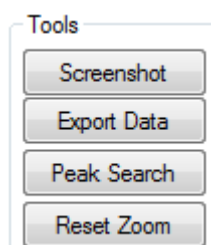
Fstart	Fstop	Fstep	Bandwidth	Detector	Time (ms)	Attenuator Mode	Attenuator Level	Device
5.000.000	30.000.000	5.000	9 kHz	Peak	2	manual	0 dB	R3010

**Fig. D.68: Test Settings for a Load Test**

From *Test management* screen you can also load a spectrum for comparison analysis in both *Run* mode and *Analyze* mode by checking the *Load As Ref. Curve for Run Test Mode* flag or *Load As Ref. Curve for Analyze Mode* flag respectively.

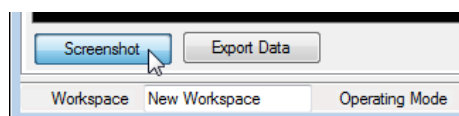
#### D.6.4 • TOOLS SECTION (SCREENSHOT, EXPORT DATA, PEAK SEARCH, ZOOM, MARKERS)

The *Tools* section is the most important section where the measurements can be checked (Fig. D.69).

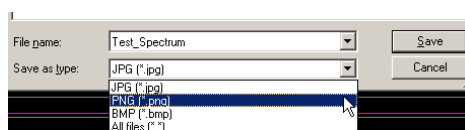


**Fig. D.69: Tools section**

By pressing *Screenshot* button, it enables the saving of the measurement diagrams on a \*.JPG, \*.PNG, or \*.BMP file. A *Save as type* dialog opens with Browse for directory and filename. In order not to lose any detail of your image, but still save disk space, the PNG-format for your plot is suggested (Fig D.70 and D.71).



**Fig. D.70 Screenshot and Export Data buttons**



**Fig. D.71 Saving in JPG/PNG/BMP files**

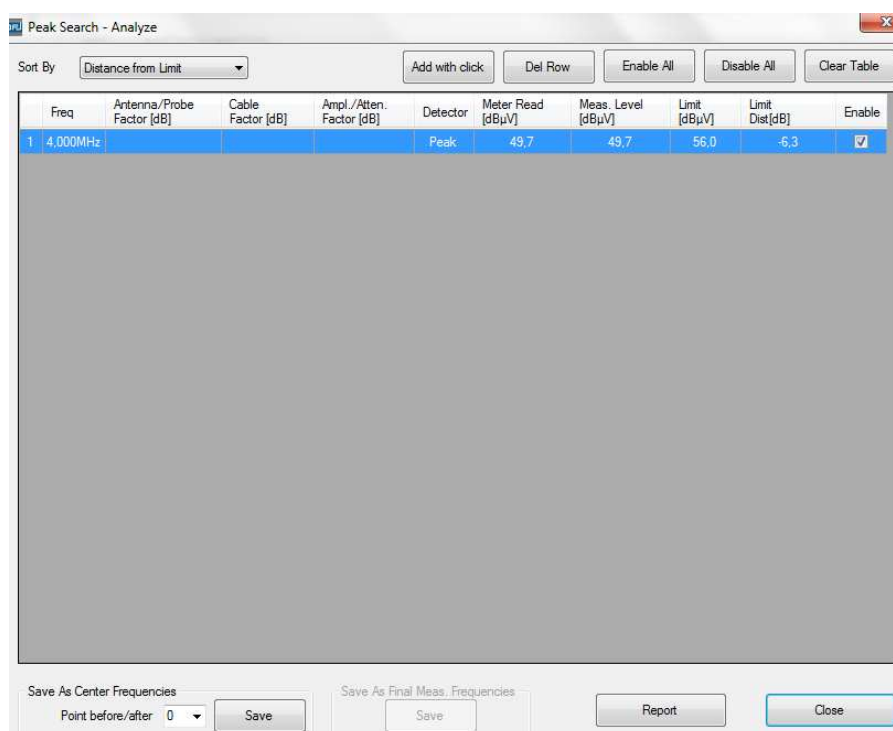
By pressing *Export Data* button, it enables the saving of the measurement data on a text file \*.txt that can be opened by Windows Notepad or similar Editor program, or can be imported in any spreadsheet application, being each field separated by semicolon (Fig. D.72).

Test_Spectrum.txt - Notepad				
File	Edit	Format	View	Help
1,000,000.000;69.1;56.0;46.0				
1,005,000.000;68.5;56.0;46.0				
1,010,000.000;68.7;56.0;46.0				
1,015,000.000;86.6;56.0;46.0				

	A	B	C	D
1	1,000,000.000	69.01.00	56.00.00	46.00.00
2	1,005,000.000	68.05.00	56.00.00	46.00.00
3	1,010,000.000	68.07.00	56.00.00	46.00.00
4	1,015,000.000	86.06.00	56.00.00	46.00.00

**Fig. D.72: Text file saved with Export Data and imported in a spreadsheet (Excel)**

The *Peak Search* function will show the following table sorted by Distance From Limit (Fig. D.73).



	Freq	Antenna/Probe Factor [dB]	Cable Factor [dB]	Ampl./Atten. Factor [dB]	Detector	Meter Read [dBμV]	Meas. Level [dBμV]	Limit [dBμV]	Limit Dist[dB]	Enable
1	4,000MHz				Peak	49.7	49.7	56.0	-6.3	<input checked="" type="checkbox"/>

**Fig. D.73: Peak Search table of the actual spectrum, ordered by Distance From Limit**

**Note:** A sort by either Frequency or Amplitude (in ascendant order, from the lowest value) is also possible from the *Sort By* drop-down menu.

It is possible to add manually more peaks to include on the measurement report.  
For manually modifying the results of the *Peak Search* function:

- Selecting “Add with click” and with mouse right-click on the graphic it is possible to add a row to the table;
- “Del Row” deletes the selected row;
- “Enable All” enables the visualization on the graphic of all the peaks included into the table;
- “Disable All” disables the visualization on the graphic of all the peaks included into the table;
- “Clear Table” deletes all the rows of the table.

*Save As Center Frequencies* function allows to save as subranges center frequencies into the *Frequency Table* section of the Workspace all the frequencies of the *Peak Search* result table, giving the possibility to repeat the measurements at these frequencies only (with measurements of 0 up to 10 points before and after the found peaks).

*Report* function allows to generate a report including measurement sweep and peak search table.

You have also the choices or by clicking directly on the table headers labeled as *Meter Read* [dBμV], namely the reading at main receiver RF-input, *Measured Level* [dBμV], namely the overall chain reading (including the effect due to any cables, antennas, amplifier/attenuators), *Limits* [dBμV] and *Limit Distance* [dBμV] (namely the difference between the measured level and the limit at one frequency), clicking once for descendant order and twice for ascendant order:

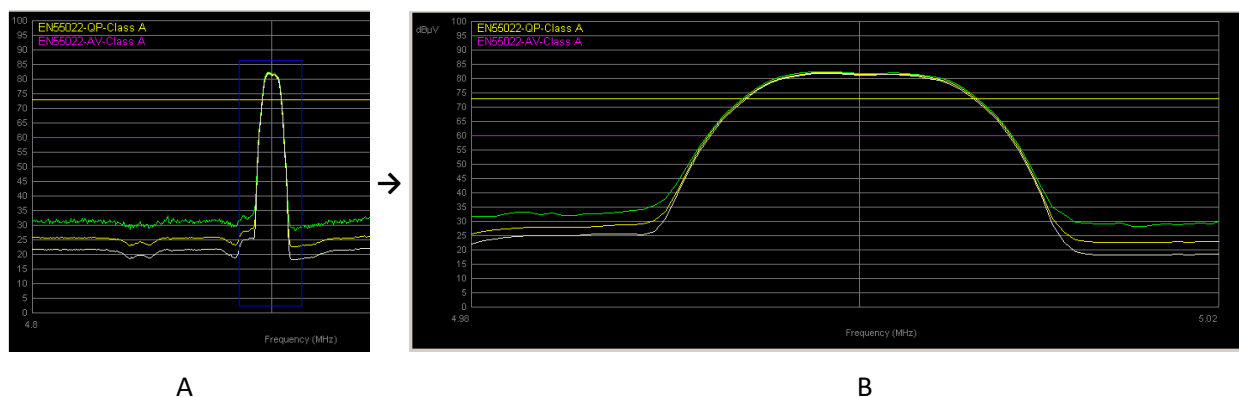
Meter Read [dBμV] ▲	Meas. Level [dBμV]	Limits [dBμV]	Limit Dist. [dB]
Meter Read [dBμV]	Meas. Level [dBμV] ▲	Limits [dBμV]	Limit Dist. [dB]
Meter Read [dBμV]	Meas. Level [dBμV]	Limits [dBμV] ▲	Limit Dist. [dB]
Meter Read [dBμV]	Meas. Level [dBμV]	Limits [dBμV]	Limit Dist. [dB] ▲

or

Meter Read [dBμV] ▼	Meas. Level [dBμV]	Limits [dBμV]	Limit Dist. [dB]
Meter Read [dBμV]	Meas. Level [dBμV] ▼	Limits [dBμV]	Limit Dist. [dB]
Meter Read [dBμV]	Meas. Level [dBμV]	Limits [dBμV] ▼	Limit Dist. [dB]
Meter Read [dBμV]	Meas. Level [dBμV]	Limits [dBμV]	Limit Dist. [dB] ▼

**Fig. D.74: Ordering Peak Search table by *Meter Read.*, *Meas. Level*, *Limits*, *Limit Distance*.**

It is possible to make a manual *Zoom* in any spectrum window in two steps: 1) holding down the *Shift-key* (↑) and then left-clicking and moving the mouse in a rectangle while holding the mouse button (Fig. D.75 A); 2) after you release it a blue rectangle appears and the area is zoomed (Fig. D.75 B):



**Fig. D.75: Manual Zoom on Emission Spectrum**

If you want to come back to the initial view (without Zoom), you can press the *Reset Zoom* button in the *Tools* section (Fig. D.69).



Also into the Analyze window you can easily work with one or two markers with the same procedure described into the *Run Test* box (see section D.5.1, Fig. D.58 and D.59).

## D.7 • FILTER MODE BOX

This optional feature is especially suited to perform CISPR 15 Insertion Loss Measurements.

After selecting into SET UP window FILTER Mode operating mode, into FILTER MODE window will be possible to select “CISPR 15 Insertion Loss Measurement” mode that sets automatically the software set up, to allow CISPR 15 insertion loss measurements on lamps and to visualize the limit curve.

It will be necessary to set “CISPR 15 Insertion Loss Measurement” into the MODE combo, then push 'Normalize' and when normalization is complete, push 'Start'.

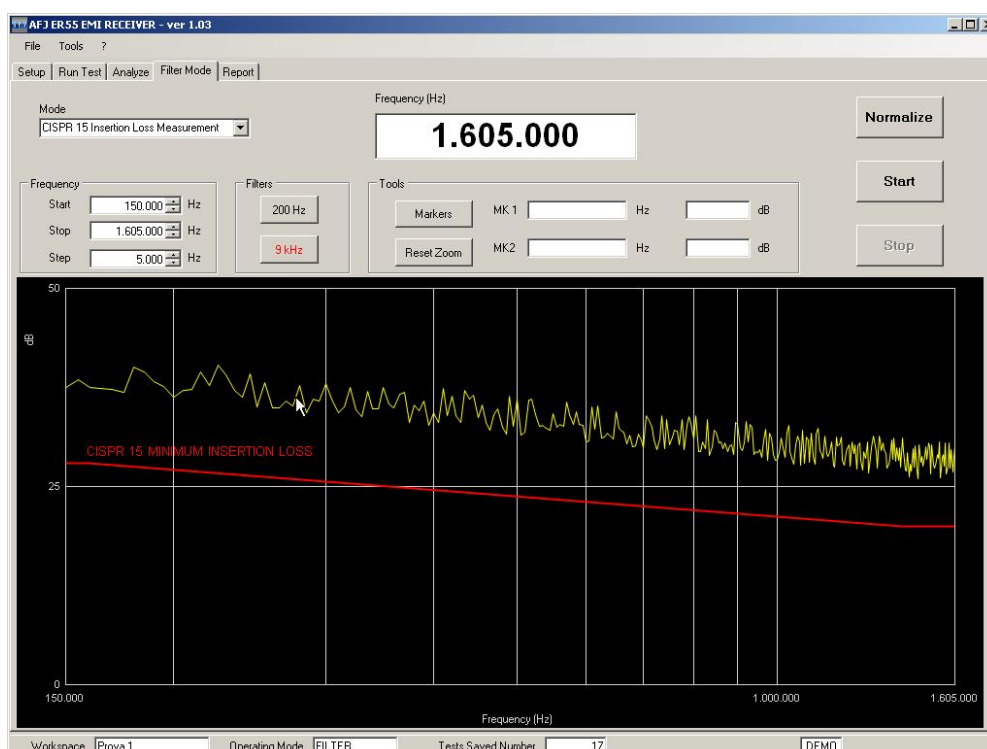


Fig. D.76: CISPR 15 Insertion Loss Measurements normalized

## D.8 • CW GENERATOR BOX

The initial *Generator* Box is depicted in Fig. D.77.

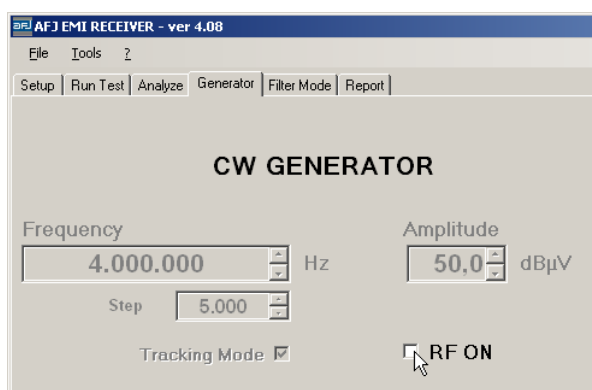
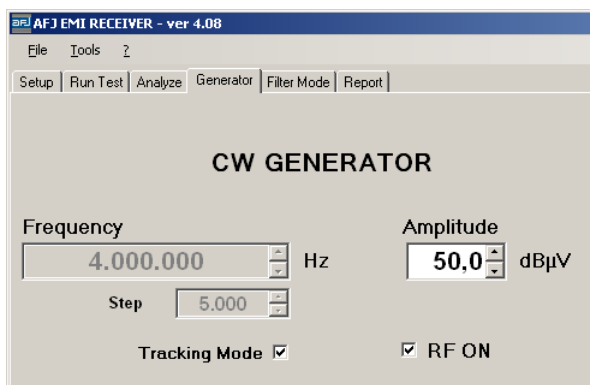
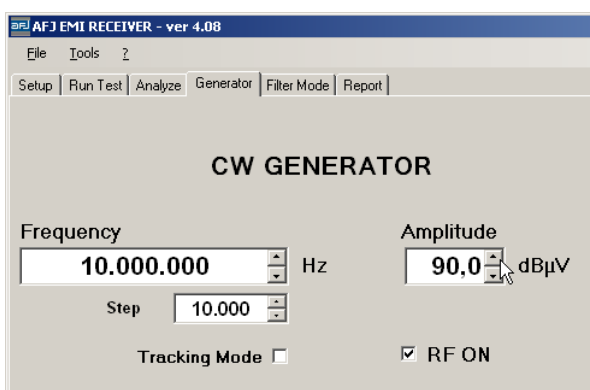


Fig. D.77: CW Generator Box

The CW Generator has to be activated by checking flag RF ON and then choosing the *Tracking Mode* (Fig. D.78), in this case a sweep is activated, or *Single Frequency Mode* (Fig. D.79).



**Fig. D.78: Tracking Generator Enable**



**Fig. D.79: Single Frequency Generator Enable**

## SECTION E: REPORT AND APPLICATION NOTES

### E.1 • REPORT BOX

The *Report* box of the cockpit is the place you can summarize your test results in a form suitable for reporting and presentation (Fig. E.1).

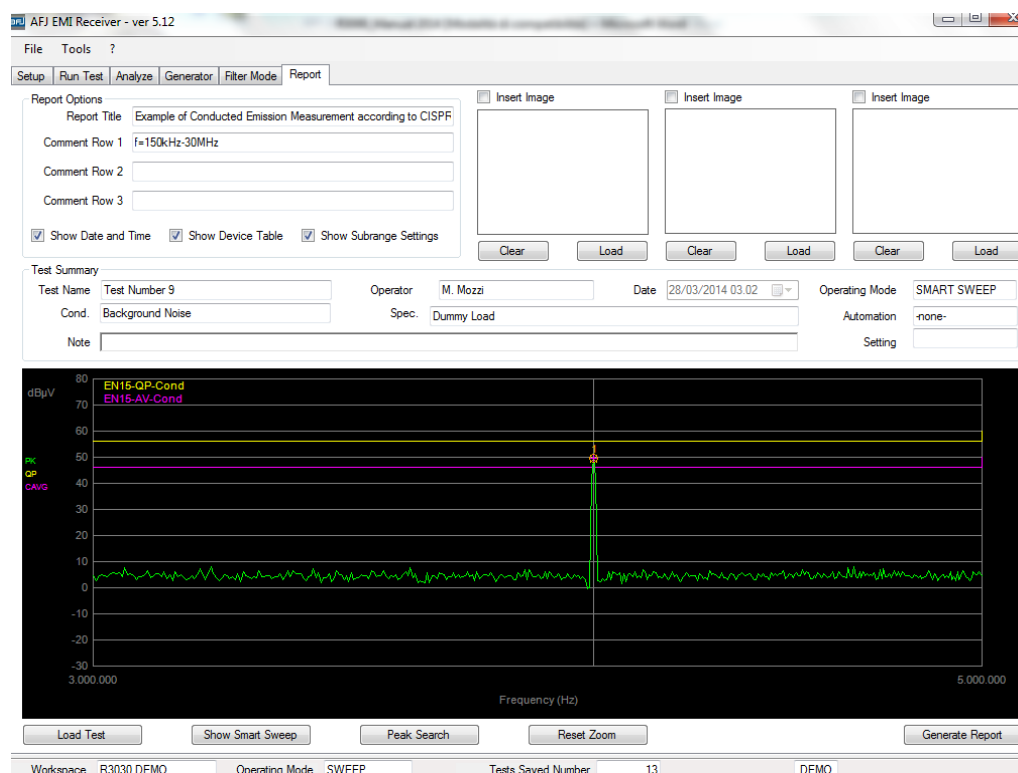


Fig. E.1: The Report Box

In the *Report* box you can *Load Test*, *Show Smart Sweep* (if the measurements was carried out with Smart Sweep), make a *Peak Search* and *Generate Report* (see next paragraph E.2).

Loading a Test will open the well-known *Test Management* table (Fig. E.2), where the two options *Load as Reference Curve ...* are grayed out.

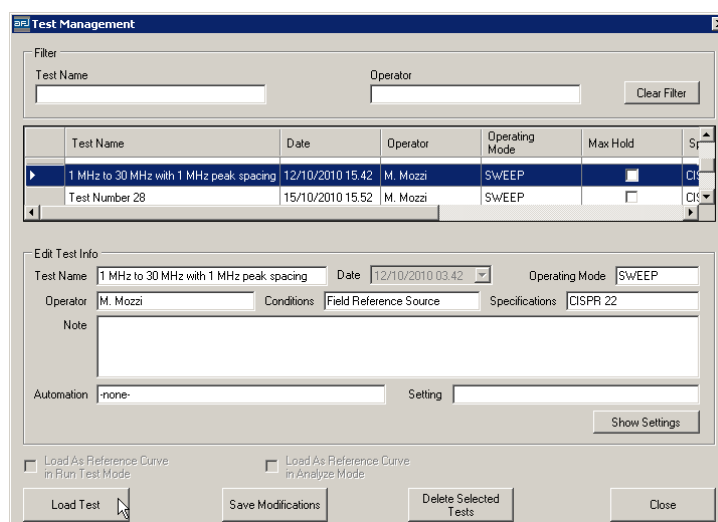
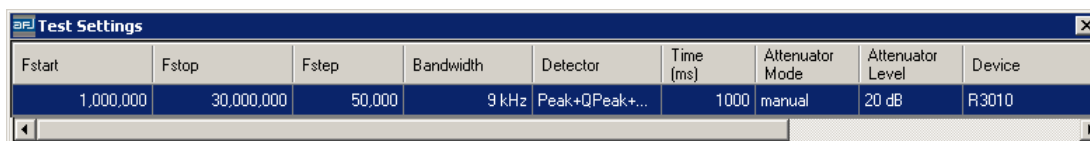


Fig. E.2: Test Management in Report box

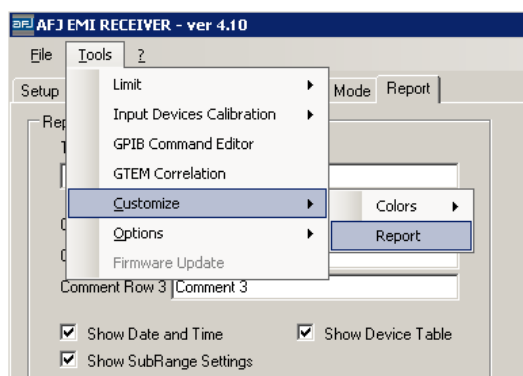
Here you can Load/delete a Test and Save Modifications to it, as usual. Pressing the *Show Settings* button, a summary of Test Settings is presented as a Table, with all information about measurement settings (Fig. E.3).



Fstart	Fstop	Fstep	Bandwidth	Detector	Time (ms)	Attenuator Mode	Attenuator Level	Device
1,000,000	30,000,000	50,000	9 kHz	Peak+QPeak+...	1000	manual	20 dB	R3010

**Fig. E.3: Test Settings in Report box**

You can customize the *Report Options* information, under the menu *Tools => Customize => Report* (Fig. E.4).



**Fig. E.4: Customize your Report information**

A window summarizing the following information is apparent:

*Title*

*Comment 1 to Comment 3*

Show Date and Time

Show Device Table

Show Subrange Settings

See Fig. E.5 for details.

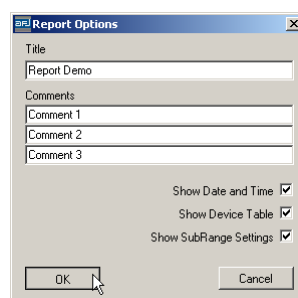
Add a title to your Report

Add three lines of comments to your Report

Add current date and time to your Report

Add auxiliary device characteristics to your Report

Add subrange information to your Report



**Fig. E.5: Report Options window**

## E.2 • GENERATE A REPORT

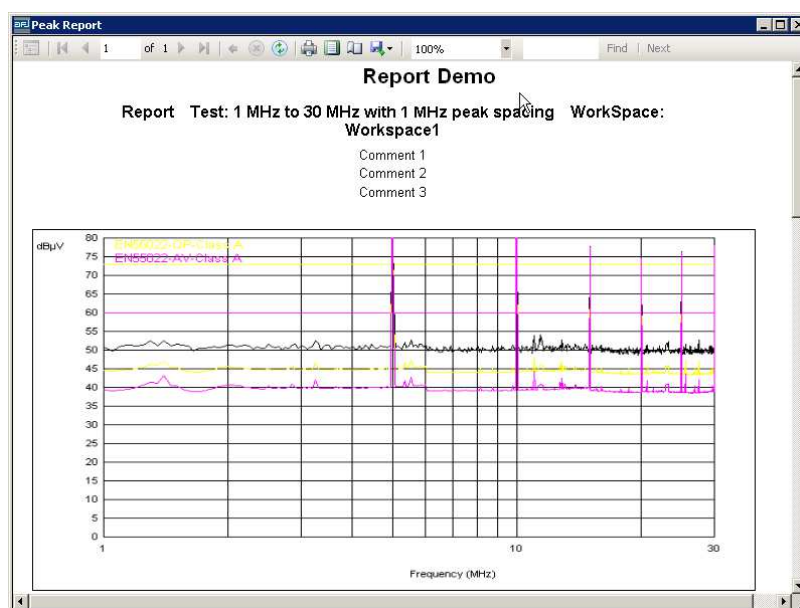
Once you have loaded a test and set all your supplementary information, you can easily generate a report by pressing the Generate Report button.

After a few instants a window opens with your customized test (Fig. E.6).

Here you can make many actions as

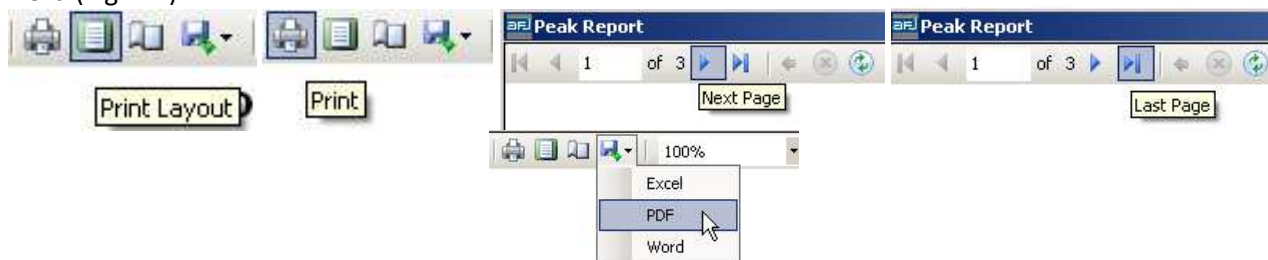
Export

Export as an Excel, PDF and Word file



**Fig. E.6: Report Demo window**

In the headings you can navigate on different pages, Print on papers, and save it as a PDF files, Excel file and Word (Fig. E.7).



**Fig. E.7: Navigation, Print, Print layout, Export as Excel / PDF / Word file**

Report can be opened in Word (any version starting from Word 2000), see next pages.

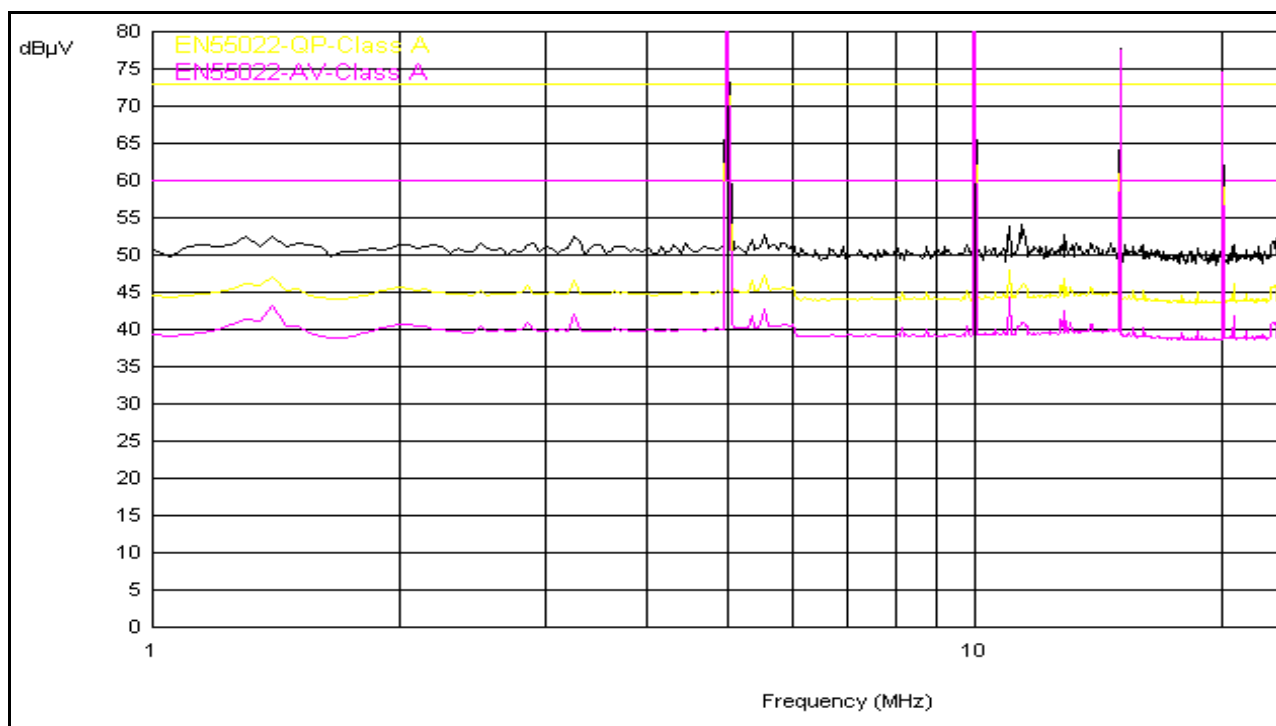
## Report Demo

**Report**   **Test:** 1 MHz to 30 MHz with 1 MHz peak spacing   **Workspace:**  
**Workspace1**

Comment1

Comment 2

Comment 3



ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit	Limit Dist.
----	-----------	-------	-------	--------	----------	------------	------------	-------	-------------

### Test Summary

<b>WorkSpace</b>	Workspace1	<b>Test Name</b>	1 MHz to 30 MHz with 1 MHz peak spacing
<b>Laboratory</b>	LabName	<b>Date</b>	12/10/2010 03.42
<b>DUT</b>	dut1	<b>Operator</b>	M. Mozzi
<b>Company</b>	Company Name	<b>Test Type</b>	SWEEP
<b>Model</b>	Model 1	<b>Specification</b>	CISPR 22
<b>Serial</b>	000	<b>Condition</b>	Field Reference Source

<b>Note</b>	Notes
<b>Autom.</b>	-none-
<b>Setting</b>	

Settings SubRange Summary

<b>Range N: 1</b>					
<b>Freq Start:</b>	1000000Hz	<b>Freq Stop:</b>	30000000Hz	<b>Freq Step:</b>	50000Hz
<b>Trace 1:</b>	Peak	<b>Trace 2:</b>	QPeak	<b>Trace 3:</b>	C_AVG
<b>BandWidth:</b>	9kHz	<b>TimeDetector:</b>	1000 ms	<b>Attenuator:</b>	20 dB
<b>Probe:</b>	- none -	<b>Cable:</b>	Cable Suhner 1+0.5 m	<b>AmpAtt:</b>	Pulse Limiter 20 dB

Device Summary

Range	Name	Serial Number	Cal. Date (dd/mm/yy)	Cal. Due (dd/mm/yy)	Interface	Address
1	R3010	30101030000	07/09/10	07/09/11	LAN	169.254.1.2

## SECTION F: MANUAL OPERATIONS

### F.1. TOUCH SCREEN DISPLAY FUNCTIONALITY

The AFJ R3000 EMI Receiver series have a display with touch-screen technology that can be operated without the need of the communication software to perform all the common tasks as Setup of the peripherals (LAN, Date, Time), the yearly calibration and the measurements with up to 3 detectors at once.

This new added feature is extremely useful for its employ as stand-alone equipment for measurements on the field.

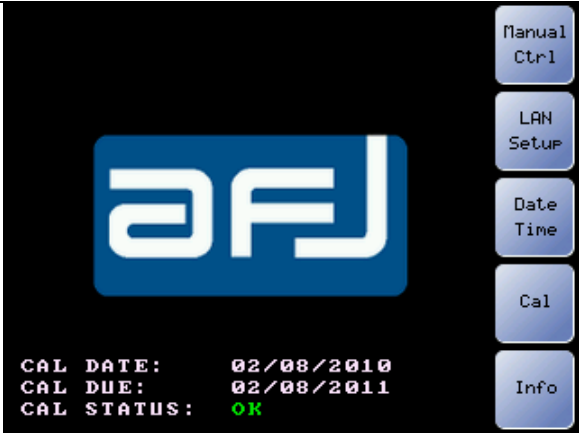


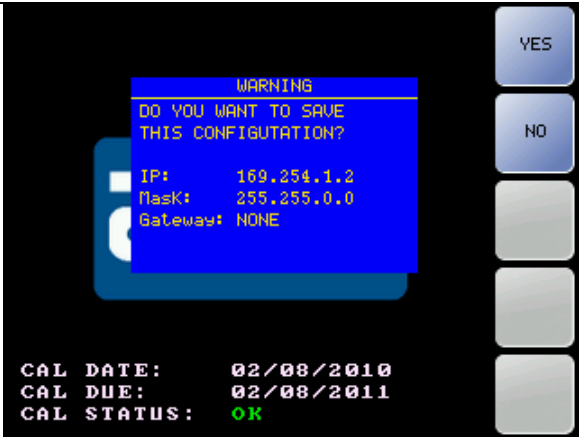


	<p>Main screen of AFJ R3000 Receiver series. When the receiver is remote controlled by PC-communication, you can click one of the following buttons:</p> <ul style="list-style-type: none"> <li>0. Manual Ctrl</li> <li>1. LAN Setup</li> <li>2. Date Time</li> <li>3. Cal</li> <li>4. Info</li> </ul>
	<ul style="list-style-type: none"> <li>1. LAN Setup</li> </ul> <p>Here you can setup</p> <ul style="list-style-type: none"> <li>1.1 IP - address</li> <li>1.2 Mask - address</li> <li>1.3 Gateway</li> <li>- Save</li> <li>- Previous Menu</li> </ul>
	<p>1.1 IP address / Mask /Gateway (1/3)</p> <p>Here you can set the IP address of the equipment. Only IP-addresses in the range 169.254.0.0 to 169.254.255.255 are within the standard IP-addresses for APIPA (Automatic Private IP Addressing) as reserved by the Internet Assigned Numbers Authority (IANA), so guaranteed not to conflict with routable addresses. Similarly you can change the Mask address and the Gateway (<i>None</i> by default).</p>

Fig. F.3: Screen 3



	<p>1.1 Save: IP address / Mask /Gateway (2/3)</p> <p>Save the configuration Confirmation Window. To save the new configuration: please, press YES. To exit without saving, press NO.</p>
	<p>1.1 Restart: IP address / Mask /Gateway (3/3)</p> <p>Main LAN Reboot Request. After saving the new configuration, you are requested to restart system to apply changes. The new changes will take effect only after this restart. You can restart the system immediately or in a second moment.</p>

## Date Time Section

	<p>2. Date Time</p> <p>Here you can change the date and time of the equipment. To set a new date, click on Date Setup. To set a new time, click on Time Setup.</p> <p>Prev Menu goes back to Screen 1 (Fig. F.1)</p>
---	--

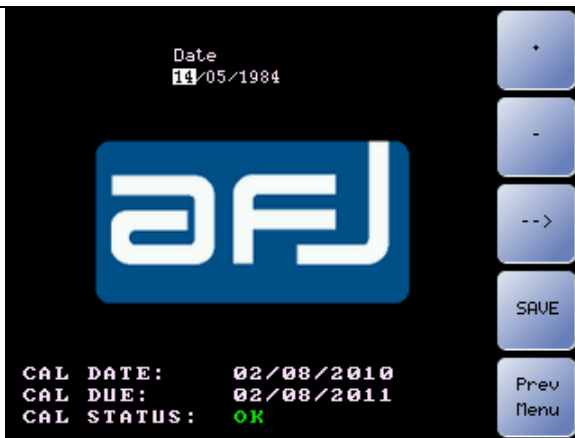


Fig. F.7: Screen 7

### 2.1 Date Setup

To set a new date, enter it in the proper format.

Date format is DD/MM/YYYY: DD for the day (two figures, leading zero), MM for the month (as before), YYYY for the year (four figures).

**Note:** All + (Up) / - (Down) functions can be duplicated by the receiver Rotary Knob.

- Save: press Save to store new date.
- Prev Menu goes back to Screen 1



Fig. F.8: Screen 8

### 2.2 Time Setup

To set a new time, enter it in the proper format HH/mm/ss.

Time format is hh/mm/ss where hh is the hour (24 hours per day, leading zero), mm are the minutes, ss are the second.

- Save: press Save to store new time.
- Prev Menu goes back to Screen 1

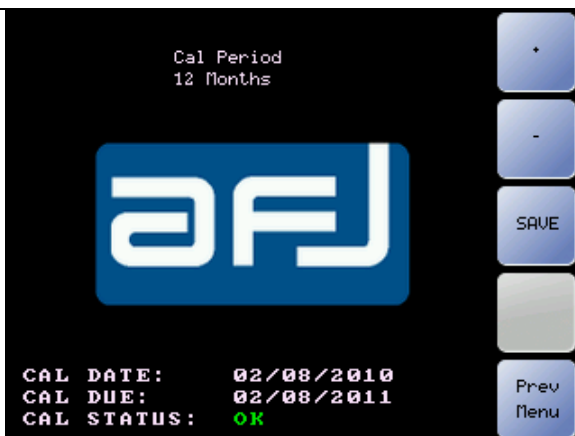


Fig. F.9: Screen 9

### 3. Cal Period

This screen defines the Main Calibration Period of validity in Months as unit of measures.

A value not exceeding 13 months is warmly recommended.

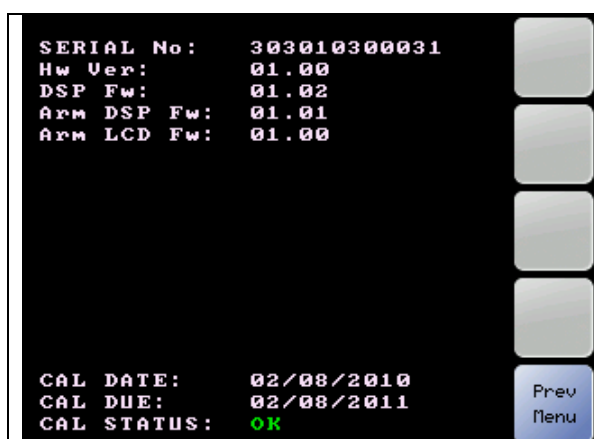


Fig. F.10: Screen 10

#### 4. Info

This screen resumes the main information about the receiver, namely:

Serial number  
 HW version  
 DSP Firmware version  
 Arm DSP Firmware version  
 Arm LCD Firmware version  
 Last Calibration Date  
 Next Calibration Due Date  
 Calibration Status (OK or Out-of-date)  
 (inside or outside a valid date calibration range)

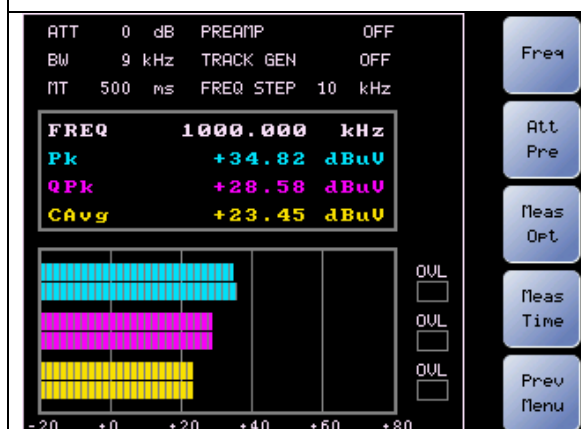


Fig. F.11: Screen 11

#### 5. Measurement: Main (1 / 6)

The default screen presents a measurement with 3 detectors (Pk, QPk, CAvg) at a fixed frequency (1000 kHz) with BW 9 kHz, measuring time MT 500 ms, Preamplifier OFF, Tracking Generator OFF, Frequency Step 10 kHz.

Here you can set:

- 5.1 Frequency
- 5.2 Attenuation/Preamplifier
- 5.3 Measurements options
- 5.4 Measuring time.

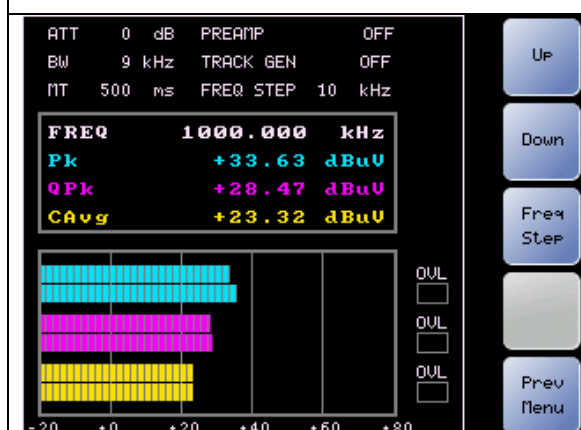


Fig. F.12: Screen 12

#### 5.1 Measurement: Freq (2 / 6)

In this screen you can set:

Frequency, from 9 kHz up to 30 MHz;  
 Frequency step (in decades): 1 Hz, 10 Hz, 100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz, 10 MHz, 100 MHz.

Up and Down will increment the frequency of one frequency step (10 kHz for default).

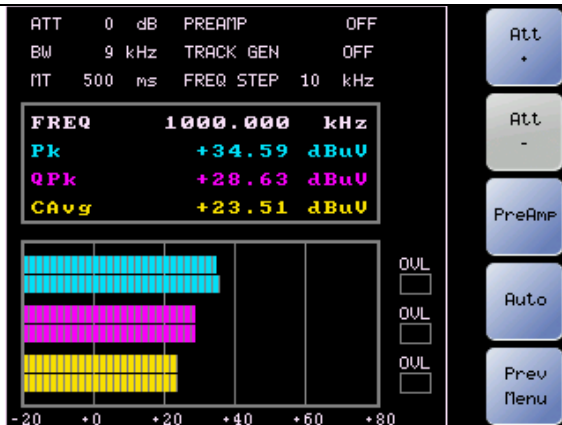


Fig. F.13: Screen 13

## 5.2 Measurement: Att Pre (4 / 6)

In this screen you can change:

Attenuator, in 10 db-step, up to 50 dB

Preamplifier, ON / OFF

Auto: ON / OFF

This will set the Attenuator to Automatic and Preamplifier to OFF.

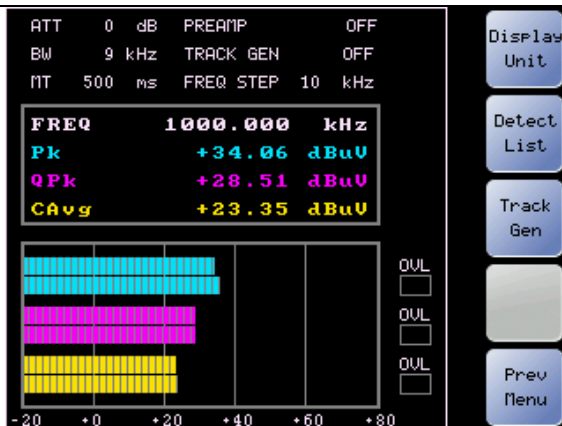


Fig. F.14: Screen 14

## 5.3 Measurement: Meas Opt (5 / 6)

In this screen you can set:

Display Unit: dBuV, dBm, dBpW, dBuA

Detectors List: Pk, QPk, CAvg, RMS, CRMS

Tracking Generator: ON / OFF

The tracking generator button will highlight when activated.

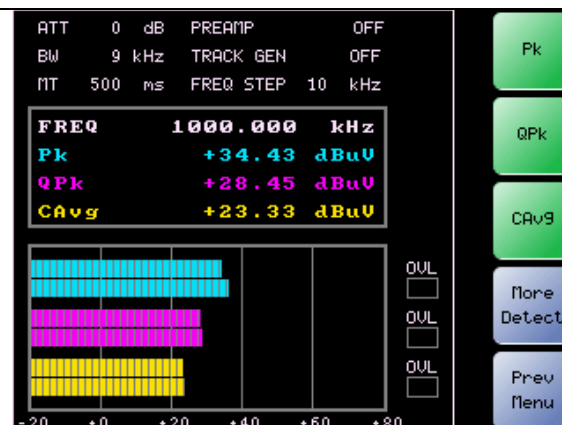


Fig. F.15: Screen 15

## 5.4 Detectors List (1 / 2)

In this screen you can change the active detectors list (up to three are selectable):

Pk: Peak detector

QPk: Quasi Peak detector

CAvg: CISPR Average detector

For More Detect see screen 16.

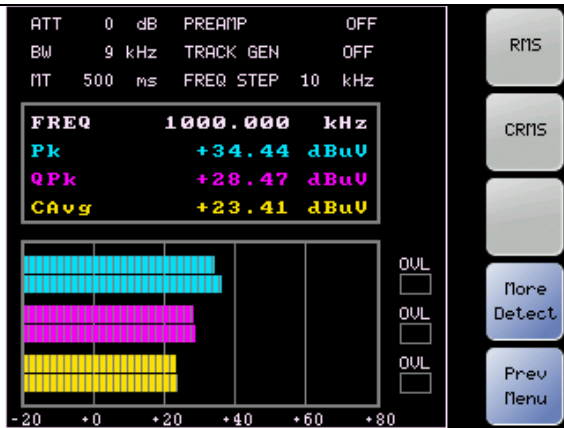


Fig. F.16: Screen 16

#### 5.4 Detectors List (2 / 2)

More Detect option (Fig. F.15) shows:

RMS: RMS detector

CRMS: CISPR RMS detector

Up to three detectors can be activated

Previous Menu: return to Detector list

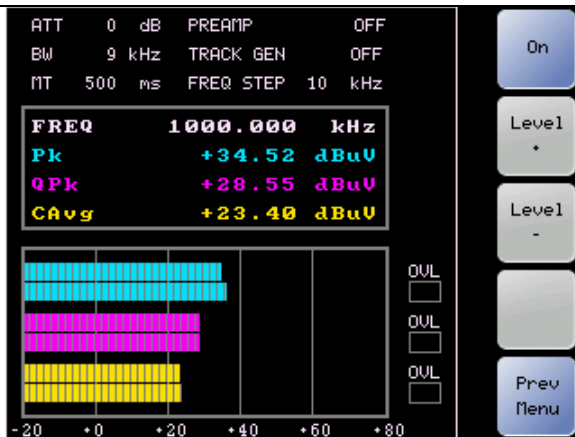


Fig. F.17: Screen 17

#### 5.5 Tracking generator

ON / OFF

Level + / Level -: test level is increased / decreased with 1dB step

Previous Menu: return to Meas Opt

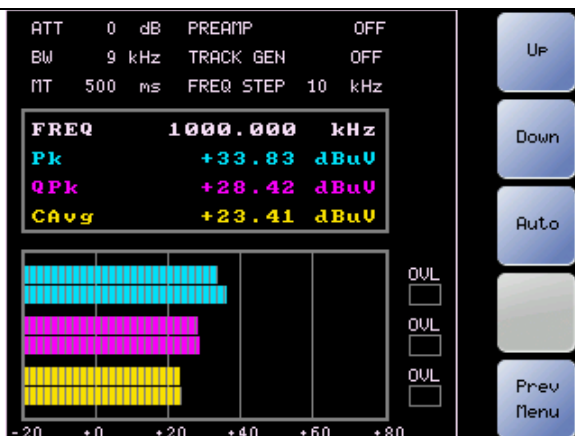


Fig. F.18: Screen 18

#### 5.6 Measurement: Meas Time (6 / 6)

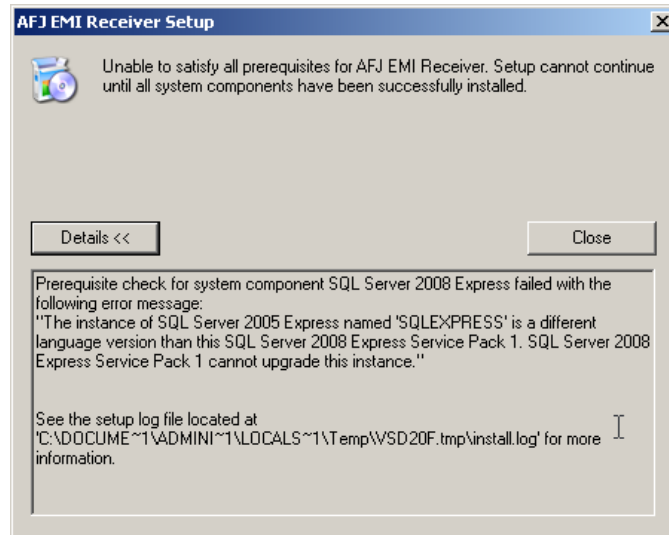
Up / Down: measurement time is increased / decreased with 1ms step starting from a minimum allowed time of 250ms  
Auto: 250ms default value setting

Previous Menu: return to Main Menu

## SECTION G: TROUBLESHOOTING

### G.1 • MANUAL INSTALLATION OF SQL SERVER 2008

AFJ Software version 4.10 utilizes the database Sql Server 2008 Express. When you attempt to install this version on a PC with older SQL Server 2005 (localized version) already installed, you get this error:



**Fig. G.1: Error installing SQL 2008 Express on a system running SQL 2005**

That happens because, as documented by Microsoft, a localized version of SQL server cannot be upgraded to a version in different language (English).

Any previous versions of AFJ Software installed SQL Server 2005 in Italian language, while with version 4.10 and later, it is distributed with SQL Server 2008 in English. The same happens with any localized version of SQL Server 2005 in a different language than English.

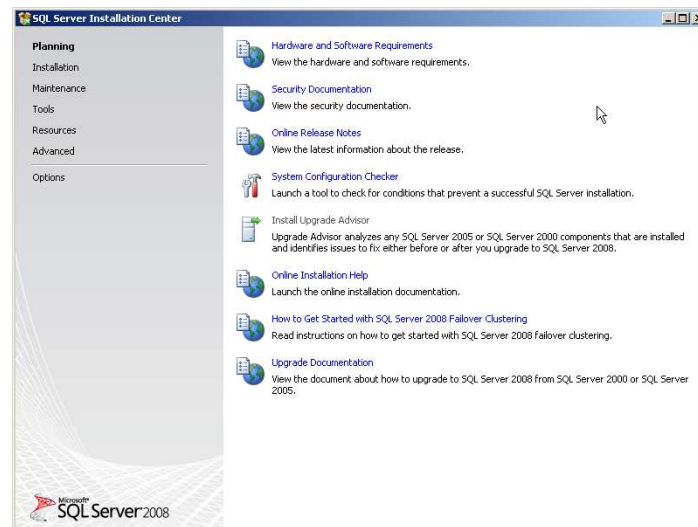
In the case you don't want to uninstall Microsoft SQL Server 2005 for compatibility with old programs, it is necessary to manually install SQL Server 2008 with all its prerequisites.

From AFJ CD-Rom, please perform the following steps:

- Windows Installer 4.5. Open the folder "WindowsInstaller4\_5" and double click on the file: "WindowsXP-KB942288-v3-x86.exe". This is not necessary for installation on Windows 7.
- Framework .NET v4.0. Open the directory "DotNetFX40" and double click on file: dotNetFx40\_Full\_x86\_x64.exe
- Sql server 2008 Express. Opne the directory "SqlExpress2008" and double click on one of the files: SQLEXP32\_x86\_ENU.EXE (if your operative system is Windows 32 bit) or SQLEXP\_x64\_ENU.EXE (if your operative system is Windows 64 bit).

Follow these below instructions to install SQL Server 2008 Express:

First window of installation program SQL Server 2008.



**Fig. G.2: SQL 2008 Express: first installation window (SQL Server Installation Center: Planning)**

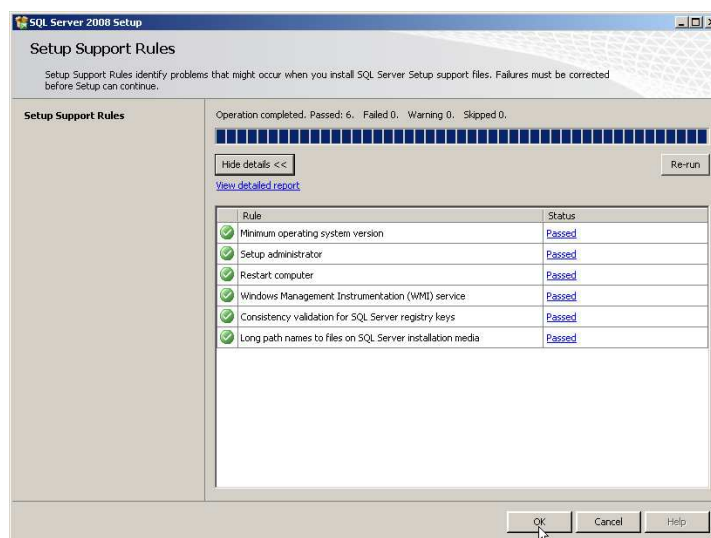
On left portion of window, click on “Installation” (Fig. G.2).

In the next window, click on the first option “New Sql stand-alone installation or add features to an existing installation” (Fig. G.3).



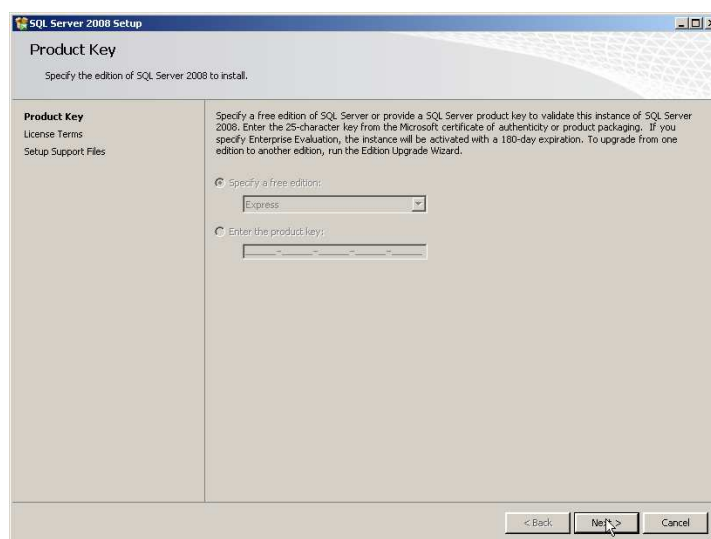
**Fig. G.3: SQL 2008 Express: second installation window (SQL Server Installation Center: Installation)**

Go on by clicking “OK”.



**Fig. G.4: SQL 2008 Express: third installation window (Setup Support Rules)**

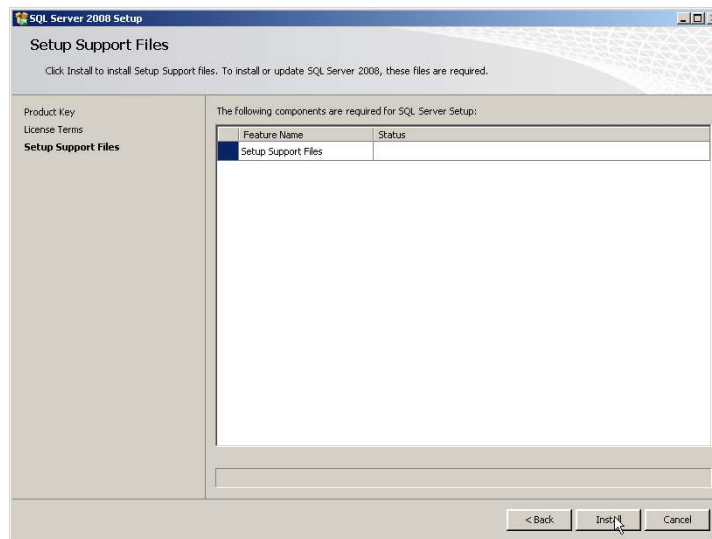
Please go on by clicking on “Next” (Fig. G.5).



**Fig. G.5: SQL 2008 Express: fourth installation window (Product Key)**

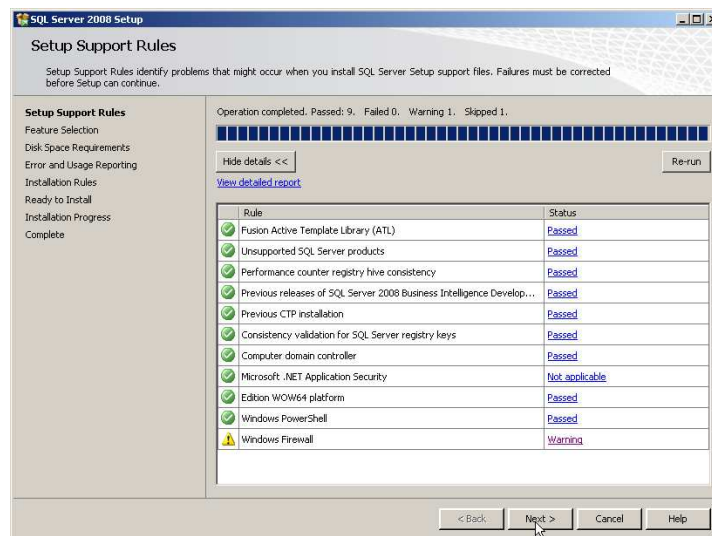


The *Setup Support Files* window now opens (Fig. G.6).



**Fig. G.6: SQL 2008 Express: fifth installation window (Setup Support Files)**

Please go on by clicking on “Install” (Fig. G.7).



**Fig. G.7: SQL 2008 Express: fifth installation window (Setup Support Files)**

Please go on by clicking on “Next”.

Select all the features you need to install (at least choose *Database Engine Services*). Please go on by clicking on “Next”.

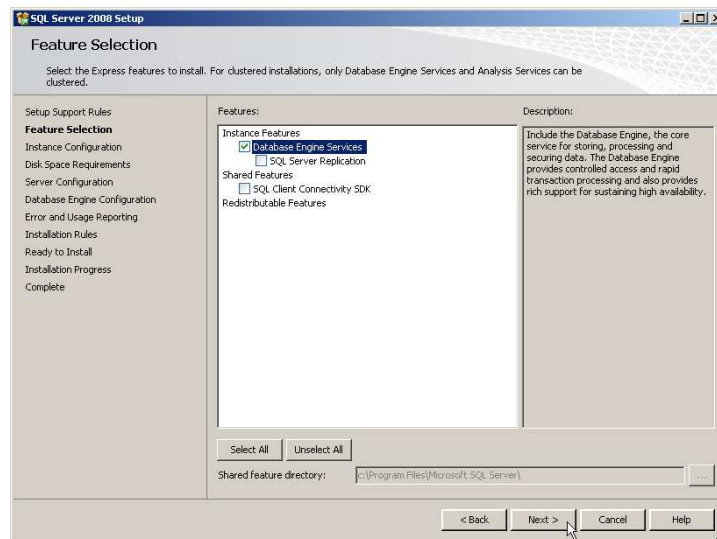


Fig. G.8: SQL 2008 Express: sixth installation window (Feature Selection)

Important: In the following screen please select the option Default Instance. Then go on by clicking on “Next”.

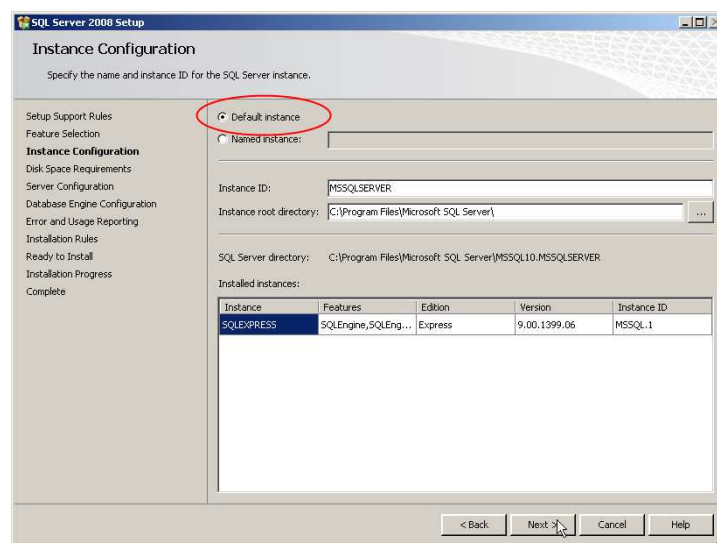
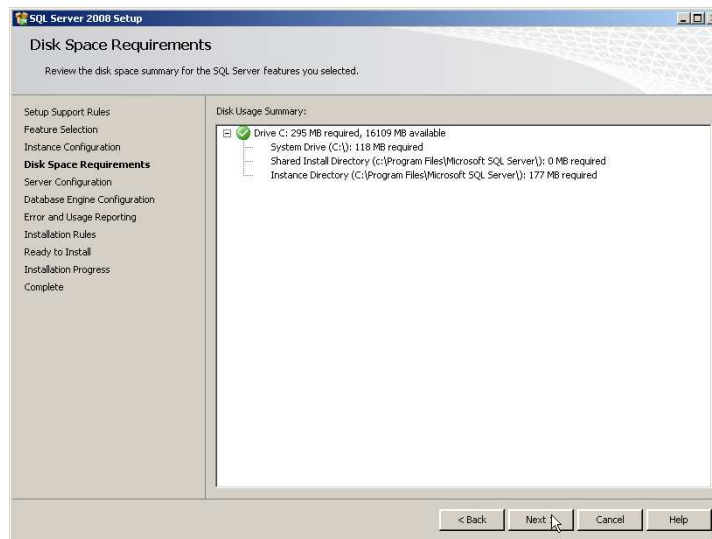


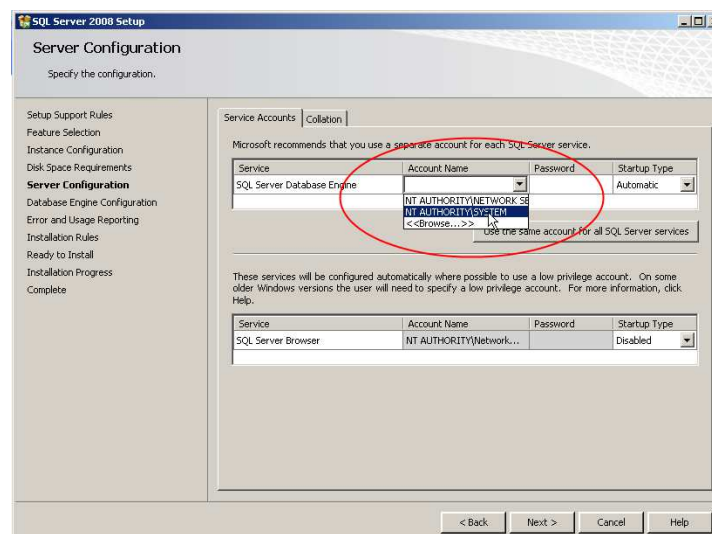
Fig. G.9: SQL 2008 Express: sixth installation window (Feature Selection)

Please go on by clicking on “Next”.



**Fig. G.10: SQL 2008 Express: seventh installation window (Disk Space Requirements)**

In the following screen select the Account Name as shown in below picture. Press then *Add Current User*. Please go on by clicking on “Next” (Fig. G.11).



**Fig. G.11: SQL 2008 Express: eighth installation window (Server Configuration)**

Leave selected the default option *Windows Authentication mode* and press *Add Current User*.

Please go on by clicking on “Next”.

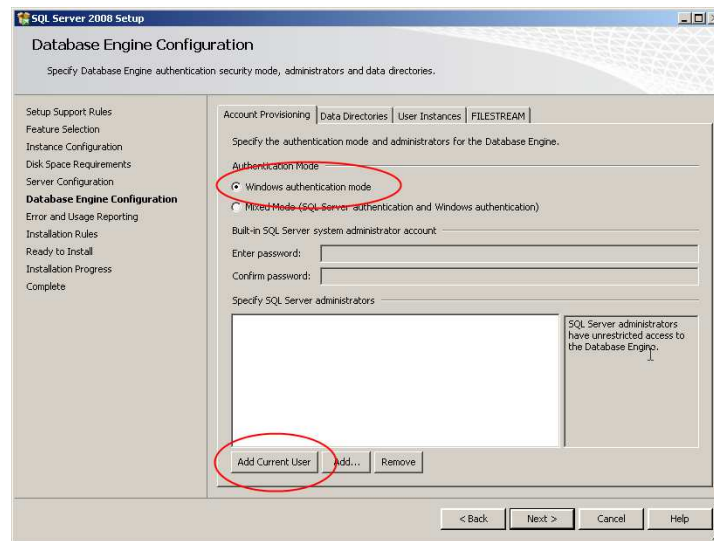


Fig. G.12: SQL 2008 Express: ninth installation window (Database Engine Configuration)

Here select the user discretionary options, then click on “Next”.

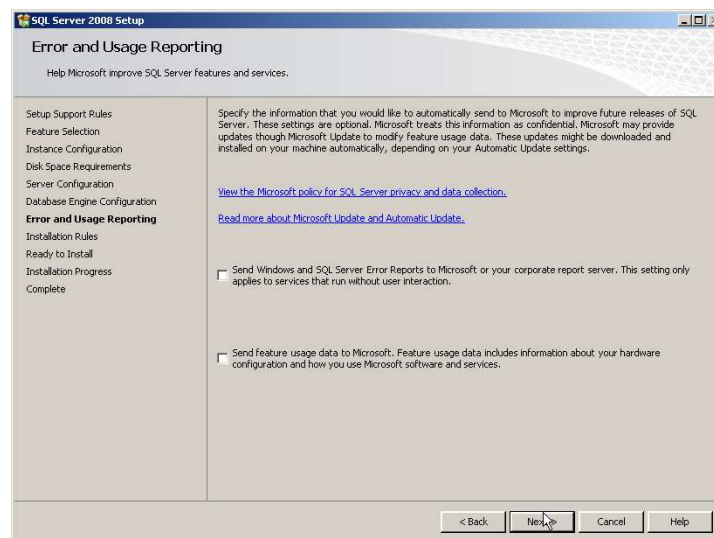
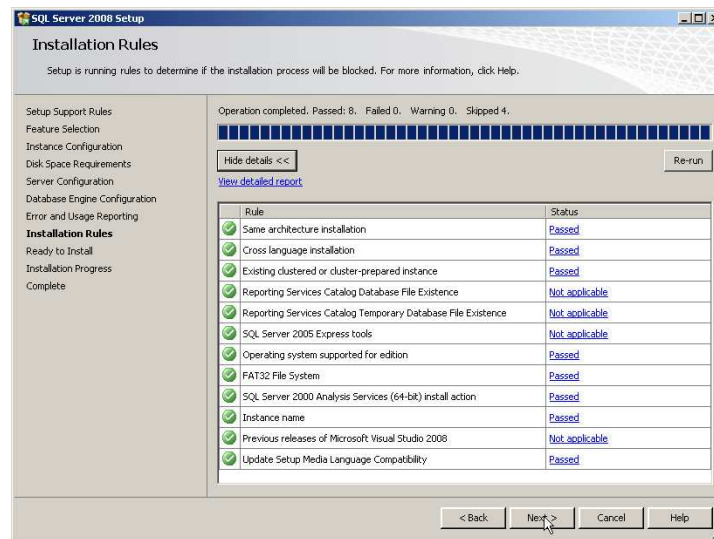


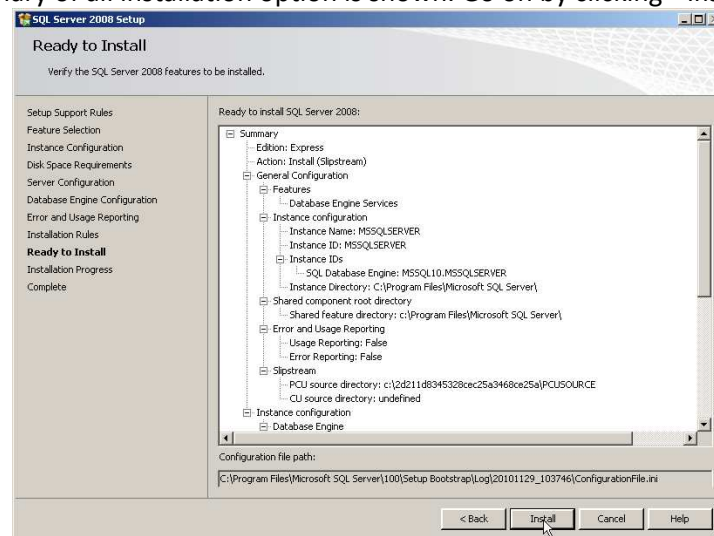
Fig. G.13: SQL 2008 Express: tenth installation window (Error and Usage Reporting)

Please go on by clicking on “Next”.



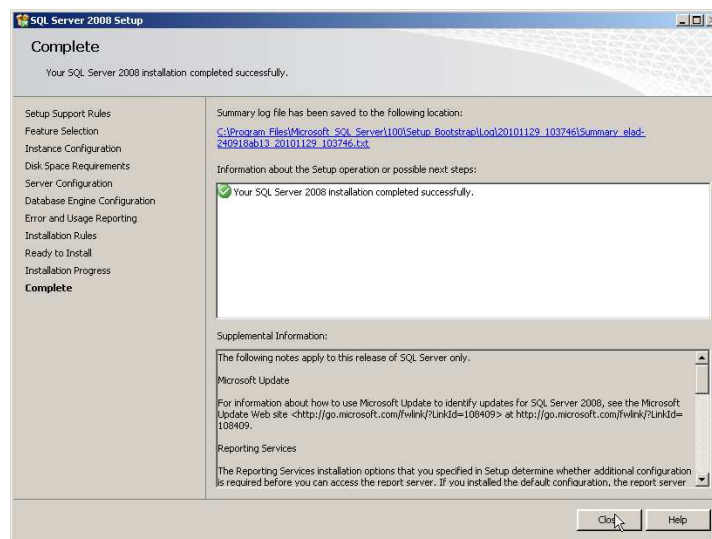
**Fig. G.14: SQL 2008 Express: eleventh installation window (Error and Usage Reporting)**

In next screen, a summary of all installation option is shown. Go on by clicking “Install”:



**Fig. G.15: SQL 2008 Express: twelfth installation window (Ready to Install)**

Wait for the process of installation.  
At the end you will see the following screen:



**Fig. G.16: SQL 2008 Express: thirteenth installation window (Complete Installation)**

At this point, you have to install the *C++ 2010 Runtime Libraries*.  
Open the directory “*vcredist\_x86*” and double click on file *vcredist\_x86.exe*.

Now install AFJ Receiver Software Version 4.10 by double click on the file *AFJ\_ER\_Setup.msi* only.

**Note:** If you attempt to install it launching the file *setup.exe* the error of first screen appears again.

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