OPERATING MANUAL

EMI Receivers

FFT 3010 9 kHz ÷ 30 MHz

FFT 3030 9 kHz ÷ 300 MHz

REVISION LEVEL 3.5

Index

AFJ FFT 3010 AND FFT 3030 EMI RECEIVERS

1. • GENERAL INFORMATION

The information contained herein, is provided in connection with the usage of hardware and software of **AFJ FFT 3010** and **FFT 3030** EMI receivers. Members of the AFJ FFT 3000 family are:

FFT 3010	**9 kHz**	**to**	**30 MHz**
FFT 3030	**9 kHz**	**to**	**300 MHz**
FFT 3110	**9 kHz**	**to**	**1000 MHz**
FFT 3100	**30 MHz**	**to**	**1000 MHz**

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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 FFT 3000 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:

Section A	**RF Emission Testing and FFT-Based EMI Receivers**
Section B	**General Information**
Section C	**System Installation**
Section D	**Operating Instruction**
Section E	**Report and Applications Notes**
Section F	**Manual Operations**
Section G	**Troubleshooting**

3. • STATEMENT OF COMPLIANCE

The AFJ FFT 3010 and FFT 3030 EMI 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 FFT 3010 and FFT 3030 EMI receivers 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 86kPa to 106kPa (860 to 1060mba). 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 be maintained between the rear panel of FFT 3010 and FFT 3030 and any wall and about 5 cm between the sides of FFT 3010 and FFT 3030 and any other equipment or walls.
NOTICE: FFT 3010 and FFT 3030 EMI receivers are supplied in proper special packaging due to their heavy weight. We strongly recommend you to save packaging for next transport.

CE

CE MANUFACTURER DECLARATION OF CONFORMITY

Manufacturer	AFJ INSTRUMENTS SRL Via Gavirate 16 20148 Milano Italy
Product Types	EMI receivers models FFT 3010 and FFT 3030

We hereby declare that the aforementioned equipment complies with the requirements set out in the Council Directive on the Approximation of the Law of Member States relating to:

- Electromagnetic Compatibility, Directive 2014/30/EC

  IEC 61326-1 Electrical equipment for measurement, control and laboratory use - EMC requirements - Part 1: General requirements

  - IEC 61326-1 Class B (Emission)
  - IEC 61326-1 (Immunity, laboratory)

- Low Voltage Equipment Directive (2014/35/EC) and EN 61010-1 (“Safety of Electrical Measuring Apparatus”).

UKCA MANUFACTURER DECLARATION OF CONFORMITY

Manufacturer	AFJ INSTRUMENTS SRL Via Gavirate 16 20148 Milano Italy
Product Types	EMI receivers models FFT 3010 and FFT 3030

We hereby declare that the aforementioned equipment complies with the relevant requirements of the below referenced specifications. The unit complies with all applicable essential requirements of the directives.

Electromagnetic Compatibility Regulations 2016

Electrical Equipment (Safety) Regulations 2016

The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

EN 61326-1:2021 Electrical equipment for measurement, control and laboratory use – EMC requirements - Part 1: General requirements

- EN / IEC 61326-1 Class B (Emission)
- EN / IEC 61326-1 (Immunity, Laboratory)

EN 61010-1:2010 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

SECTION A: RF EMISSION TESTING AND FFT-BASED EMI RECEIVERS

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 18 GHz. It includes specifications for:

- The Peak, Quasi Peak, CISPR Average, RMS / CISPR RMS measuring receivers including **FFT-based EMI receivers** that can «sample and evaluate the signal continuously during measurement time» without any *blind gap,* like FFT 3010 and FFT 3030.
- 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 EMI RECEIVER

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

Parameter	Frequency Range			
	9 ÷150 kHz	0.15 ÷30 MHz	30 ÷ 1000 MHz	1 ÷ 18 GHz
Quasi Peak				
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	--
Peak				
$\tau_{Discharge} / \tau_{Charge}$	1.89×10^4	1.25×10^6	1.67×10^7	1.34×10^8
General				
Bandwidths (-6 dB)	200 Hz	9 kHz	120 kHz	1 MHz
Sine Wave accuracy	< ± 2 dB	< ± 2 dB	< ± 2 dB	< ± 2.5 dB

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

Traditional EMI receivers are similar to superheterodyne spectrum analysers 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 EMI receiver from overloading and also it improves the dynamic range. The pre-amplifier is a low noise amplifier, which it is used to improve the sensitivity of the EMI receiver. The main section of the EMI receiver are the IF filters and the detectors. The main detectors used for EMC measurements are 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.
This kind of measurements are very demanding and become very time consuming when large frequency ranges need to be swept or stepped or small resolution bandwidths are needed to achieve the necessary sensitivity. So, there was a strong request in reducing measuring time saving accuracy for this type of test. Besides, there was a felt need for time-domain measurements to evaluate the duration of discontinuous disturbances.
Both these tasks are now easily and effectively and conveniently performed by the time domain output of an FFT-based measuring receiver.

A.2.2 • FFT-BASED EMI RECEIVER

The possibility to record the temporal behavior of the signal directly in time domain by the use of fast ADCs (analog-to-digital converters) and to apply FFT (Fast Fourier Transform) was recently exploited by International Committees. The application of the FFT can be interpreted as a parallel implementation of many filters at different frequencies. This technique has been well known for decades, but the capability of modern ADCs has reached lately a level where the application to EMC emission measurements becomes feasible.
For CISPR-compliant emission measurements, FFT-based measuring instruments must sample and evaluate the signal continuously during the measurement time, as we have seen.
This task is the most stringent request for an EMI receiver.
In order to process the signal continuously and to enable the calculation of a real-time spectrogram, the frequency range from DC to 3 GHz is subdivided into many sub bands with a bandwidth of FFT-band each. Every sub band is digitally down-converted to the baseband and the sub bands are processed sequentially. The block diagram is shown in Figure A.2.

A polyphase decimation filter is used for the in phase and quadrature channel to reduce the sampling frequency and to fulfill the Nyquist criterion. The output sampling frequency is twice the FFT-band, while the bandwidth is fixed by the FFT implementation.

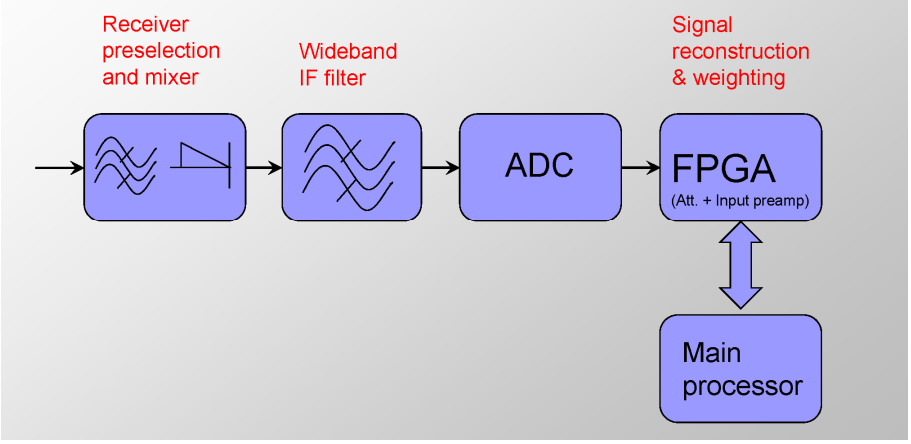


Fig. A.2: FFT-based EMI receiver block diagram

The following approach was proposed by Braun from the Technical University of Munich. The signal is digitized continuously by an Analogue-to-Digital Converter System. By a digital down conversion (DDC) the measured signal is limited in its bandwidth (some dozens of MHz) and the sampling rate is reduced. After that the data is processed in a continuous way with the STFFT (Short Time Fast Fourier Transform) algorithm. The evaluation of the obtained spectrogram can be performed at several frequencies, with a great reduction of the measurement time.
The system needs a digital dedicated hardware.
In the next step, the CISPR-detectors must be modelled. Peak, average and RMS are straight forward mathematical operations, while the quasi-peak, the RMS-AV, and the CISPR-AV detectors can be modelled (also as a digital filter to model the instrument time constant). The detailed architecture diagram is shown in Figure A.3.

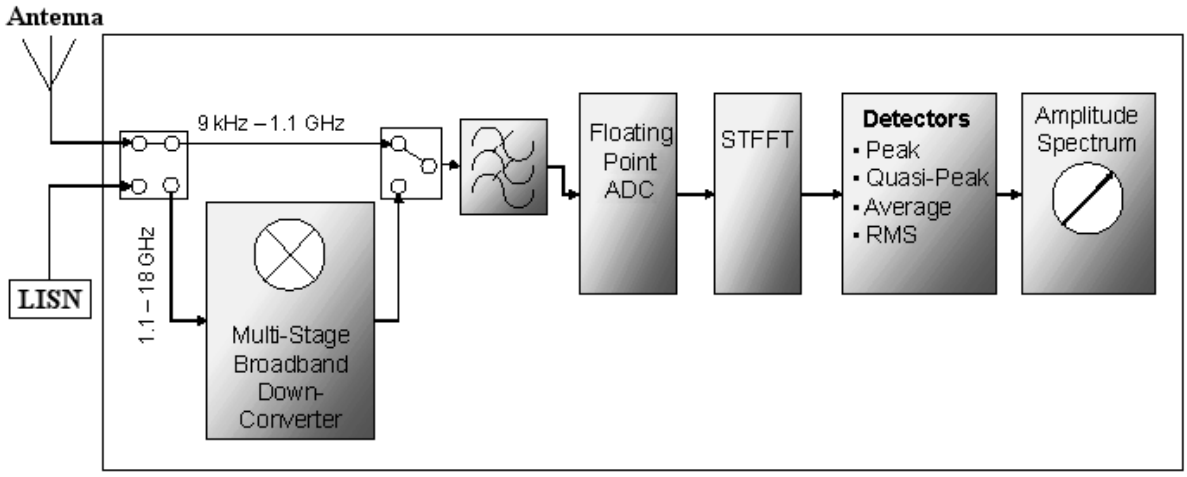


Fig. A.3: FFT-based EMI receiver architecture diagram

A.2.3 • 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 A.1. These are bandwidths at which the EMI receiver response is –6dB relative to the centre frequency.
Only an EMI 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 EMI receiver filters will have little or no effect on the outcome. This is the root of much of the confusion over bandwidth requirements.

A.2.4 • 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, EMI 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 usually 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 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 A.4, as a result of the time constant and bandwidths given in Table A.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. An EMI receiver is calibrated using pulses of defined impulse area, spectral density and repetition rate.

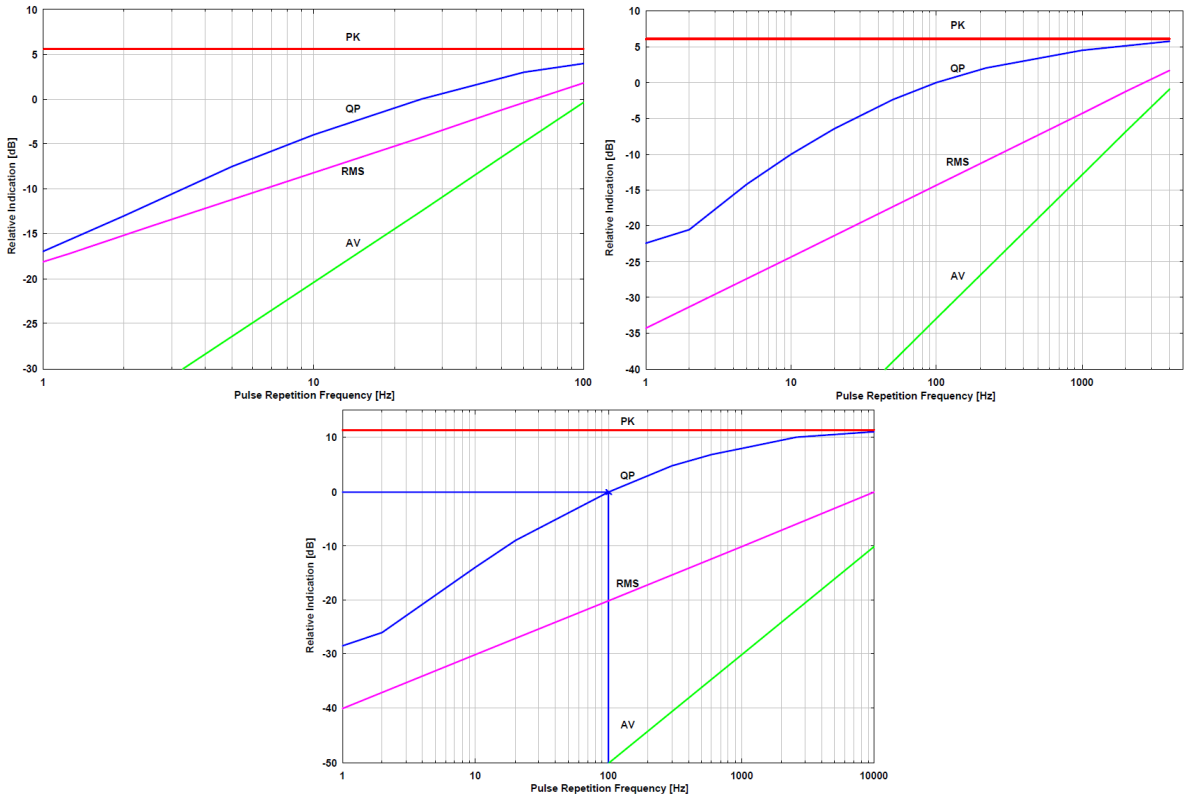


Fig. A.4: PRF of PK, QP, RMS and Average detectors in CISPR Band A, B and C/D

Most initial measurements are performed 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 EMI receiver dwell on each frequency for long enough to capture the maximum emission (this depends 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 requested 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 A.5.

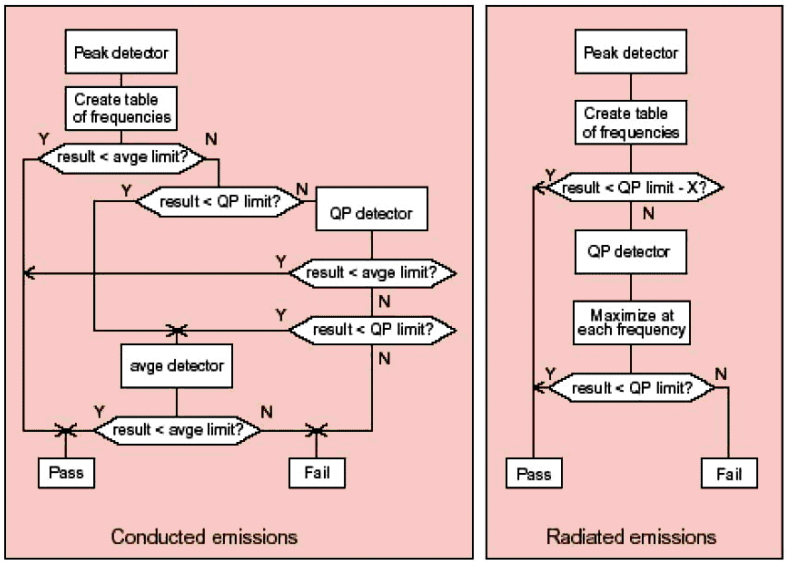


Fig. A.5: Flow chart for use of detectors

A.2.5 • 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 16-1-1 specification (see table 1) can approach up to 43.5 dB, which means closer to 60dB in the EMI receiver design. If the EMI receiver did not adjust its gain continually to achieve the optimum level at the detector – acting as a spectrum analyzer, for instance – then the needed dynamic range would be increased by several tens of dB.

A.2.6 • VSWR

Still part of the CISPR 16-1-1 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 ≥ 10dB 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 ≥ 10dB attenuation. VSWR is related directly to measurement error due to mismatch. For a broad-spectrum EMI receiver (30MHz to 3GHz is two decades) the spec of 2:1 without attenuation is quite hard to meet – many ordinary radio receivers cannot achieve this even over a narrow range. It is easy enough if you allow yourself some attenuation at the input, but then the EMI receiver sensitivity is degraded. The sensitivity requirement in CISPR 16-1-1 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 EMI 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÷3 GHz.

SECTION B: GENERAL INFORMATION

This Section contains a general description of the FFT 3010 and FFT 3030 EMI receivers, including: associated and optional accessories, equipment specifications and safety precautions.

REFER TO MANUAL. THIS MANUAL IS AN INTEGRAL PART OF FFT 3010 AND FFT 3030 EMI RECEIVERS. 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

FFT 3010 and FFT 3030 are microprocessor-controlled FFT-based EMI receiver covering the frequency range from 9 kHz to 30MHz / 300 MHz. These instruments are ideally suited for measurement of electromagnetic interference in accordance with the requirements of CISPR 16-1-1.
The EMI receivers can also be used as selective RF voltmeters with a level range from 10 to +127 dBµV in 50 Ω coaxial systems.

FFT 3010 and FFT 3030 EMI 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	F 3,15A FUSE	2
4	3.5mm (Male) To 2.5mm (Female) stereo audio jack adapter	1
5	AFJ EMI Software USB-key (containing: Operating Manual & Operating Software)	1
6	Certificate of Calibration	1

Fig. B.1: AFJ FFT 3010 EMI Receiver

Fig. B.2: AFJ FFT 3030 EMI Receiver

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. FFT 3010 and FFT 3030 EMI receivers maximum allowed RF input is +127 dBµV in CW 50 Ω coaxial systems.

WE STRONGLY RECOMMEND THE USAGE OF EXTERNAL PAT20M (20dB/1W ATTENUATOR AND PULSE LIMITER), SUPPLIED OPTIONALLY AND SEPARATELY WITH FFT 3010 AND 3030 EMI RECEIVERS.

The PAT20M 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 FFT 3010 AND FFT 3030 EMI RECEIVERS WITHOUT PAT20M ATTENUATOR (OR SIMILAR FIXED ATTENUATORS), ANY DAMAGE AT THE INPUT STAGE OF EMI RECEIVER IS NOT COVERED BY AFJ WARRANTY.

Fig. B.3: PAT20M 1 W 20 dB attenuator & pulse limiter

B.3 • PRODUCT STRUCTURE

The AFJ FFT 3000 family of equipment are FFT-based EMI receivers which 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 **FFT 3010**, is suitable for measurements across the **CISPR 16-1-1** frequency bands **A/B**, from **9 kHz** to **30 MHz**;
- Model **FFT 3030**, is suitable for measurements across the **CISPR 16-1-1** frequency bands **A/B/C** from **9 kHz** to **300 MHz**;
- Model **FFT 3110**, is suitable for measurements across the **CISPR 16-1-1** frequency bands **A/B/C/D** from **9 kHz** to **1000 MHz**;
- Model **FFT 3100**, is suitable for measurements across the **CISPR 16-1-1** frequency bands **C/D** from **30 MHz** to **1000 MHz**.

B.4 • OPTIONAL ACCESSORIES

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

Item	Description	Order Code
1	20dB/1W Attenuator and pulse limiter	PAT20M
2	High voltage probe, 30 dB attenuation	TK 9420
3	LISN, 9 kHz to 30 MHz single-phase, 2x16 A	LS16C/10
4	LISN, 9 kHz to 30 MHz three-phase, 4x32 A	LT32C/10
5	Absorbing clamp, 30 MHz to 1000 MHz (CISPR 14)	MDS 21B
6	Large Loop antenna system (LLAS) from 9kHz to 30MHz for magnetic field measurements (CISPR 15)	VVL 1530
7	CDNE from 30 MHz to 300 MHz for radiated emission measurements (CISPR 15)	M2 or M3 (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 measurements to electromagnetic fields	VDH 30
11	Broadband antenna, from 30MHz to at least 1000MHz	Any brand
12	Near field probes (Large area)	Any brand

B.5 • RELATED DOCUMENTS

The EMI receivers belonging to the AFJ FFT 3000 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:

CISPR 10	**Organization, rules and procedures of the CISPR:** Gives the historical background, terms of reference, composition, organization, and types of documents of the International Special Committee on Radio Interference (CISPR).
CISPR 11	**Industrial, scientific and medical (ISM) radio-frequency equipment - Electromagnetic disturbance characteristics -Limits and methods of measurement**: 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.
CISPR 12	**Vehicles, motorboats and spark-ignited engine-driven devices - Radio disturbance characteristics -Limits and methods of measurement:** 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
CISPR 13	**Sound and television broadcast receivers and associated equipment - Radio disturbance characteristics - Limits and methods of measurement**: 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.
CISPR 14-1	**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.** 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.
CISPR 15	**Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment**. 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.
CISPR 16-1-1	**Specification for radio disturbance and immunity measuring apparatus and methods Part 1-1: Radio disturbance and immunity measuring apparatus - Measuring apparatus**. 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.
CISPR 16-1-2	**Specification for radio disturbance and immunity measuring apparatus and methods - Part 1-2: Radio disturbance and immunity measuring apparatus - Ancillary equipment - Conducted disturbances.** 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.

CISPR 19	**Guidance on the Use of the Substitution Method for Measurements of Radiation from Microwave Ovens for Frequencies Above 1 GHz** 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).
CISPR 22	**Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement.** 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.
CISPR 25	**Vehicles, boats and internal combustion engines - Radio disturbance characteristics - Limits and methods of measurement for the protection of on-board receivers.** 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.
CISPR/TR 28	**Industrial, scientific and medical equipment (ISM) - Guidelines for emission levels within the bands designated by the ITU.** 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.
CISPR/TR 31	**Database on the characteristics of radio services.** 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. This second edition includes the replacement of CISPR 23 as reference standard for the determination of limits by CISPR 16-4-4:2007 on "model for the calculation of limits for the protection of radio services".
IEC 61000-6-3	**Electromagnetic compatibility (EMC) - Part 6-3: Generic standards - Emission standard for residential, commercial and light-industrial environments.** 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.
IEC 61000-6-4	**Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments.** 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.

B.6 • FFT 3010 AND FFT 3030 FRONT PANEL CONTROLS AND INDICATORS

Fig. B.4: AFJ FFT 3010 and FFT 3030 Front Panel

1 – POWER ON/OFF.

2 – RF OUT: Internal signal generator output. Test signal range +50 dBµV to +95 dBµV for the frequency range from 9 kHz to 30 MHz.

3 – RF IN: N-type 50Ω input connector

- for FFT 3010 EMI Receiver with CISPR Band A/B, f = 9 kHz ÷ 30 MHz;
- for FFT 3030 EMI Receiver with CISPR Band A/B/C, f = 9 kHz ÷ 300 MHz.

4 – STATUS INDICATORS LEDS (from left to right):

COLOUR	NAME	FUNCTION
RED	RF OUT	The LED is lit when the internal signal generator is activated
RED	RF IN	The LED is lit during measurements in the CISPR Bands

B.7 • FFT 3010 AND FFT 3030 REAR PANEL CONNECTIONS

Fig. B.5: AFJ FFT 3010 and FFT 3030 Rear Panel

1 – POWER SOCKET for power cord (use Class I type only).

2 – PC board with VGA/DVI interfaces, 4 USB ports, 3 audio jacks, 1 PS2-port for mouse/keyboard, LAN port (RJ-45 connector + Standard Category 5e cross – cable or better) for connecting the instrument to an external PC.

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 – REMOTE CONTROL CONNECTOR for AFJ external devices (e.g. LS16C/10 and LT32C/10).

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

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

7 – EXT. REF. 10MHz IN and OUT (signal amplifier).

8 – COOLING FAN.

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 be kept between the rear panel of FFT 3010 and FFT 3030 EMI receivers 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 PRODUCT 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 instruments are 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 devices. 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 EMI receivers, 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 EMI receivers.
Power source check: on the rear panel, you will find a type plate. Please check whether the EMI receivers have 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 EMI receivers to the power line: please use the supplied power cord for connecting FFT 3010 and FFT 3030 EMI receivers 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 equipment.

C.2 • INSTALLATION PROCEDURE

C.2.1 • SYSTEM

FFT 3010 and FFT 3030 EMI receivers incorporate a last generation PC with WINDOWS 10 Embedded OS. Regardless of EMI Receiver model and SW version selected, a USB-stick is provided. Please contact AFJ Instruments or your local AFJ distributor for information about software updates always available free of charge.
The calibration data are stored directly on NVM (non-volatile memory) of the FFT 3010 and FFT 3030 EMI receivers, so they do not need to be managed by the user.

For the processing of test data coming from any of the AFJ FFT 3000 family instruments the minimal system requirements for external remote control 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 8 (Home Premium, Professional and Ultimate) and Windows 10 (Pro, Enterprise)

C.2.2 • CONNECTION PROCEDURE

FFT 3010 and FFT 3030 EMI receivers need to be connected to external keyboard, mouse and monitor output (VGA/DVI) for standalone usage (preferred mode), as well a direct connection via LAN-Ethernet to hosting external remote control PC, through either a UTP Category 5 cross cable (included in the delivery) or a standard Ethernet LAN 10/100 MB cable as shown at Fig. C.1.

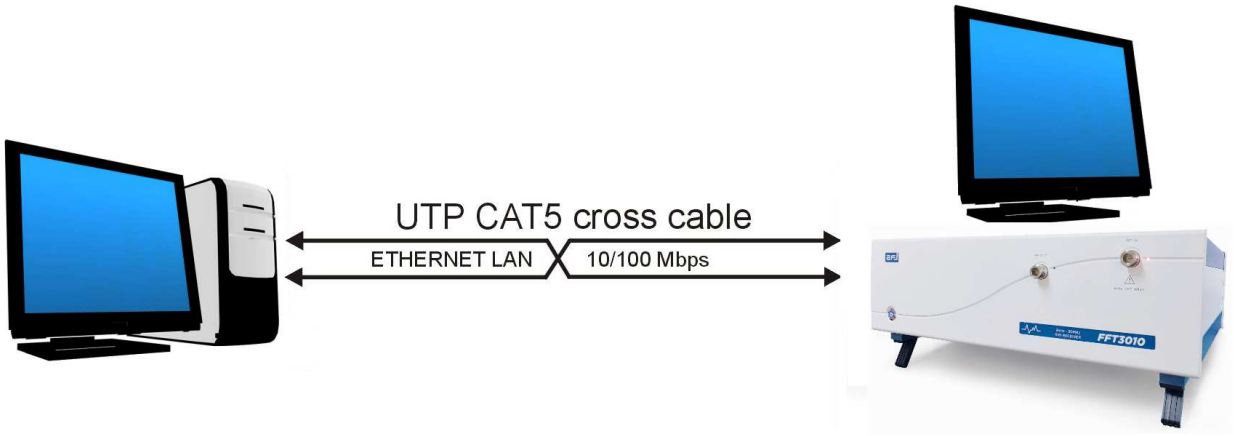


Fig. C.1: Connection procedure for FFT 3010 EMI receiver

C.2.2.1 • STAND ALONE USAGE

Once connected to external keyboard, mouse and monitor output (VGA/DVI) for stand alone usage, a working version of the operating software is already installed on the PC integrated in the FFT 3010 and FFT 3030 EMI receivers. The operating software consists of two parts: the server and the client software.
The server software starts automatically by itself at the start-up of the operative system (Fig. C.2):

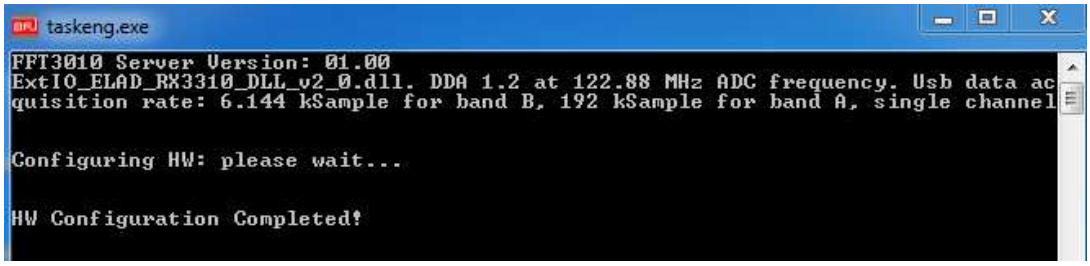


Fig. C.2: FFT 3010 EMI receiver system start-up

If it does not start automatically, it has to be either run manually by double clicking the AFJ_FFT 3010 (AFJ_FFT 3030) red icon (Fig. C.3) or recover the automatic start condition (see next paragraph C.2.2.3).

Fig. C.3: FFT 3010 EMI receiver server software icon

When the server software has completed the hardware configuration (Fig. C.2), also the client software starts automatically by itself. If it does not start automatically, you have just to start it manually either by double clicking the AFJ_FFT 3010 (AFJ_FFT 3030) blue *icon* on the Windows desktop or as an alternative, selecting *Start => Programs => AFJ_FFT 3010 (AFJ_FFT 3030)* under the Windows graphic user interface (Fig. C.4). It is possible to recover the automatic start condition with the creation of a basic task to run the client software at the start-up of the operative system (see next paragraph C.2.2.4).

Fig. C.4: Starting of the FFT 3010 EMI receiver client software

The following software window appears (Fig. C.5):

Fig. C.5: FFT 3010 EMI receiver IP address setting

The IP address of FFT 3010 and FTT 3030 EMI receivers is set by default to 127.0.0.1 and it does not need to be modified by the end user. TEST button allows to check the status of the communication between the equipment and the PC integrated inside with the indication of system information (Fig. C.6).

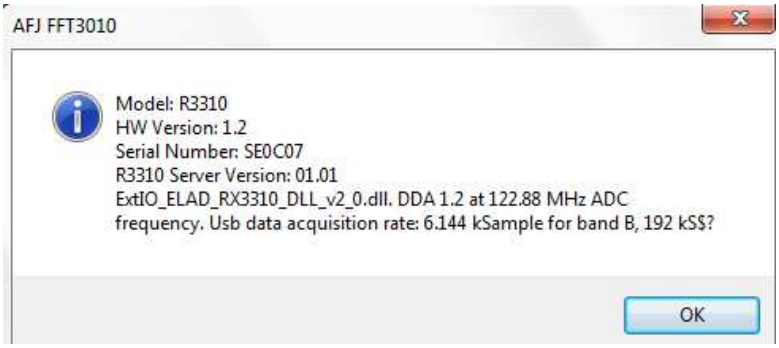


Fig. C.6: FFT 3010 EMI receiver system information

Push RUN button to access the operating software for the first time (refer to next section D). If *Show SW log* checkbox is flagged, the *Loading…* window appears showing the sequence of system information data loading when the equipment starts to communicate with the PC integrated inside (Fig. C.7).

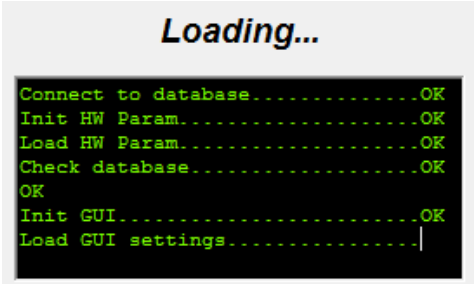


Fig. C.7: Sequence of system information data loading

C.2.2.2 • REMOTE CONTROL USAGE

In order to install the program to an external remote control PC with Ethernet port, please follow the next steps:

PERFORM THE FOLLOWING STEPS
STEP 1 - After connecting the EMI receiver to an appropriately grounded mains, ensure that all the electrically powered devices connected to the equipment in the measurement set-up are connected to a common ground. Connect the EMI receiver power cord to a grounded outlet, too.
Connect via LAN-Ethernet the device to an external remote control PC through either a UTP Category 5 cross cable or a standard Ethernet LAN 10/100 MB cable.

STEP 2 – Insert USB-stick in an USB port, from Windows Explorer, locate the "FFT 3010 Receiver (FFT 3030 Receiver)/Operating SW/AFJ_FFT 3010ClientSetup_XYZ_20XY (AFJ_FFT 3030ClientSetup_XYZ_20XY)" folder on your AFJ USB-stick and double click on "Setup" file (Fig. C.8).

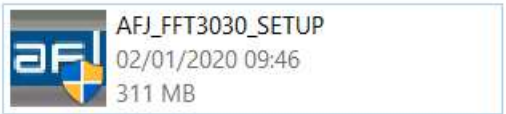


Fig. C.8 – Setup file for client software

STEP 3 – 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.9.
On next window, see Fig. C.10, 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.

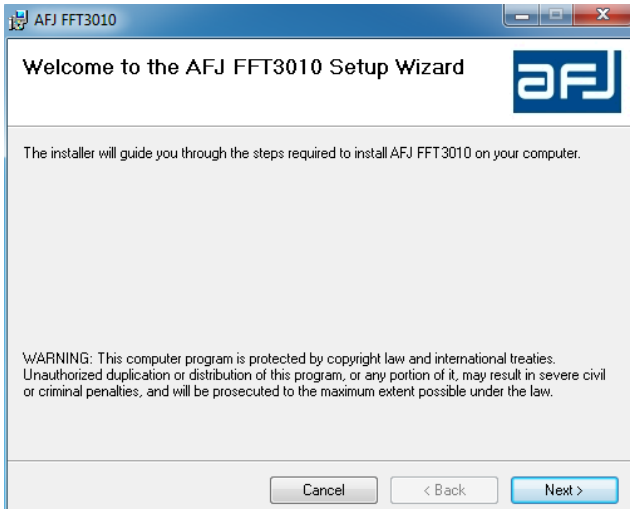


Fig. C.9: AFJ EMI Receiver Setup Wizard window

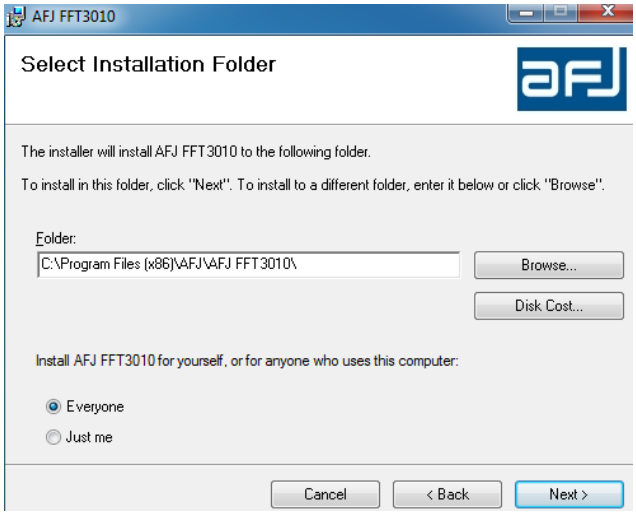


Fig. C.10: Select Installation Folder window

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 (Fig. C.11).
At the end, the message "AFJ EMI Receiver has been successful installed" appears, the Installation Complete window appears (Fig. C.12).

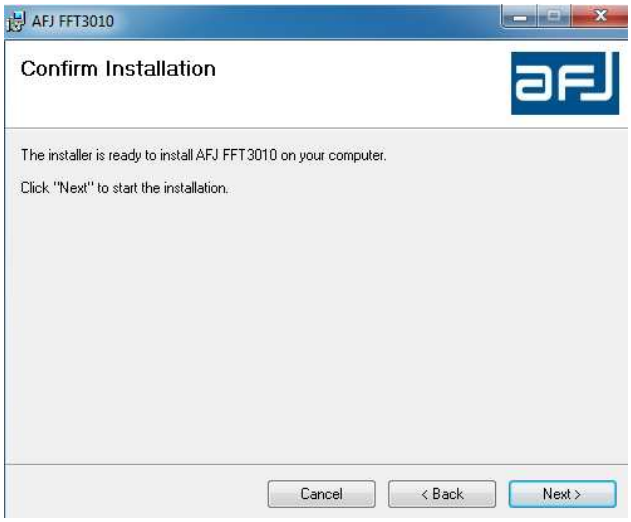


Fig. C.11: Confirm Installation window

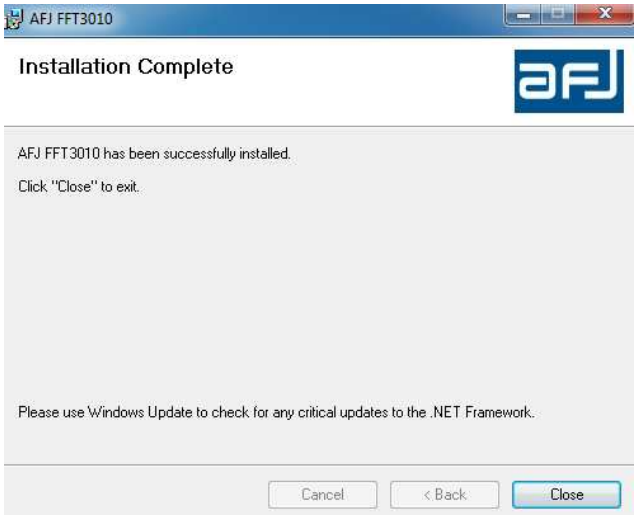


Fig. C.12: Installation Complete window

Now click Close to exit the installation procedure.

Note: nevertheless the equipment is remotely controlled by an external PC, the AFJ Local Database is always located on PC integrated in the FFT 3010 and FFT 3030 EMI receivers with WINDOWS 10 Embedded OS at the following path (Fig. C.13):

C:\Program Files\Microsoft SQL Server\MSSQL10_50.SQLEXPRESS\MSSQL\DATA

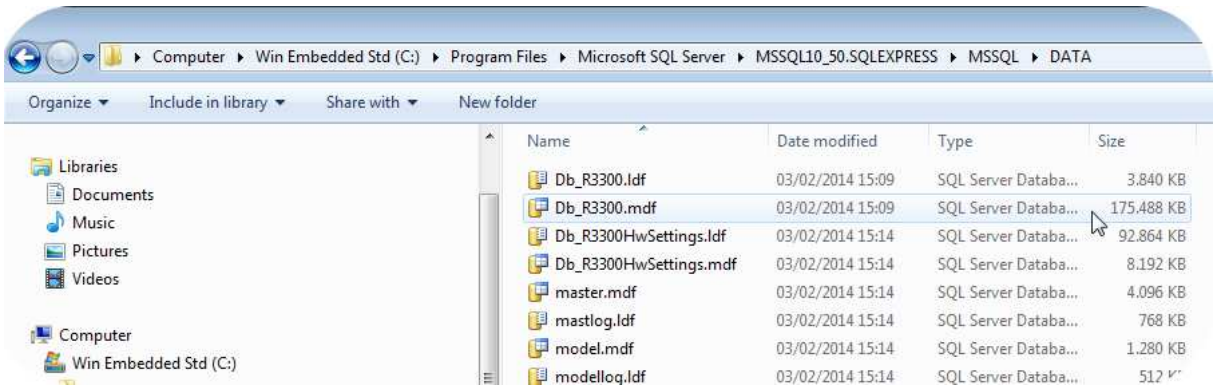


Fig. C.13: AFJ Local Database location

Here you find for example for FFT 3010 EMI receiver the following two files: Db_FFT 3010.ldf and Db_FFT 3010.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.

STEP 4 – AFJ EMI receiver software running.
Once the server software has completed the hardware configuration of EMI receiver (see paragraph C.2.2.1), in order to run the client software on the external remote control PC you have just to start it either by double clicking the AFJ_FFT 3010 (AFJ_FFT 3030) blue icon on the Windows desktop or as an alternative, selecting *Start => Programs => AFJ_FFT 3010 (AFJ_FFT 3030)* under the Windows graphic user interface (Fig. C.14).
Note: the client software has not to be run in the operating system of the equipment for standalone usage.

Fig. C.14: FFT 3030 EMI receiver client software icon

STEP 5 – When the client software is running, it automatically looks for the equipment connected to the external remote control PC (Fig. C.15).

Fig. C.15: FFT 3030 client software running

If the connection between client software and the equipment is not possible automatically, the next step is to insert manually the right IP address of the EMI receiver to get the communication between the equipment and the external remote control PC.

Pushing *Go to remote Panel* button, Fig. C.16 appears.

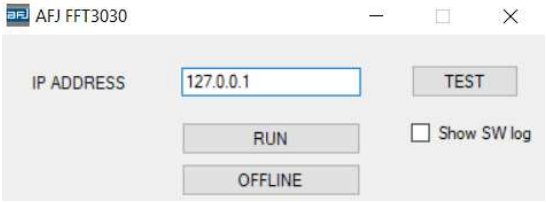


Fig. C.16: FFT 3030 EMI receiver IP address setting

To drive the EMI receiver by external remote control PC it is recommended to set static IP address in the Internet protocol (TCP/IP) Properties (from *Control panel => Local Area Connection Properties*) on both PC as follows:

1. PC integrated in the EMI receiver
   IP: 192.168.1.2
   Mask: 255.255.255.0
   Note: please disable the Firewall on this PC (Fig. C.17)

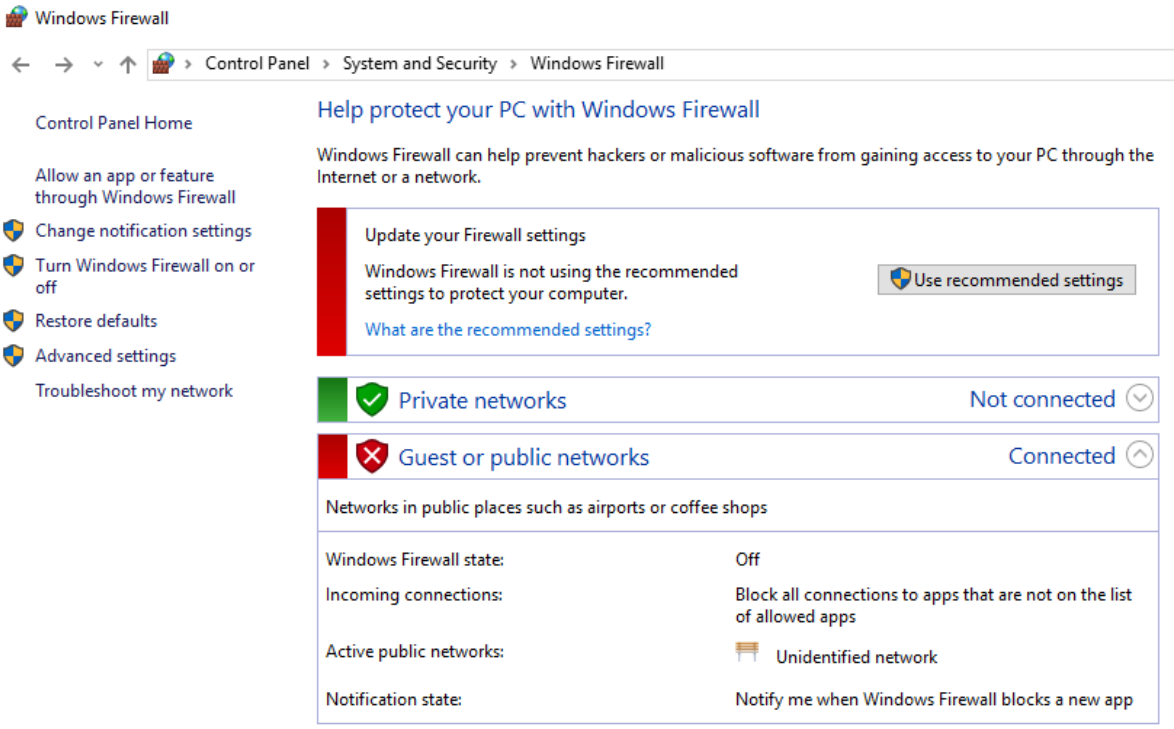


Fig. C.17: Firewall setting in the PC integrated in the EMI receiver

2. External remote control PC
   IP: 192.168.1.3
   Mask: 255.255.255.0

After typing the IP address of the PC integrated in the EMI receiver (Fig. C.18) push *RUN* button to access the operating software for the first time (refer to next section D).

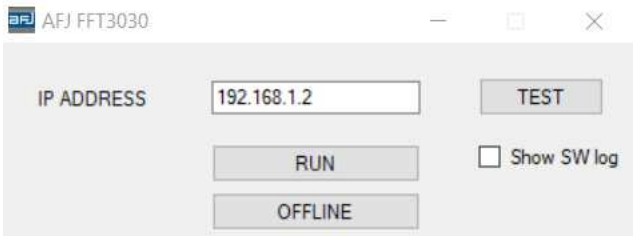


Fig. C.18: FFT 3030 EMI receiver IP address setting

TEST button allows to check the status of the communication between the equipment and the external remote control PC with the indication of system information (Fig. C.19).

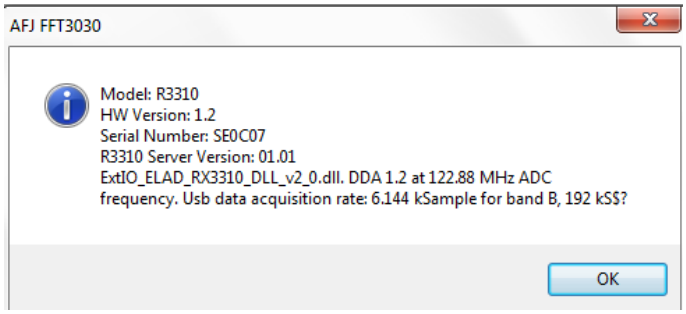


Fig. C.19: FFT 3030 EMI receiver system information

Push *OFFLINE* button to access the operating software in demo mode (*Setup* and *Report* pages only) (Fig. C.20) to display the measurement results and to manage the database (refer to next section D).

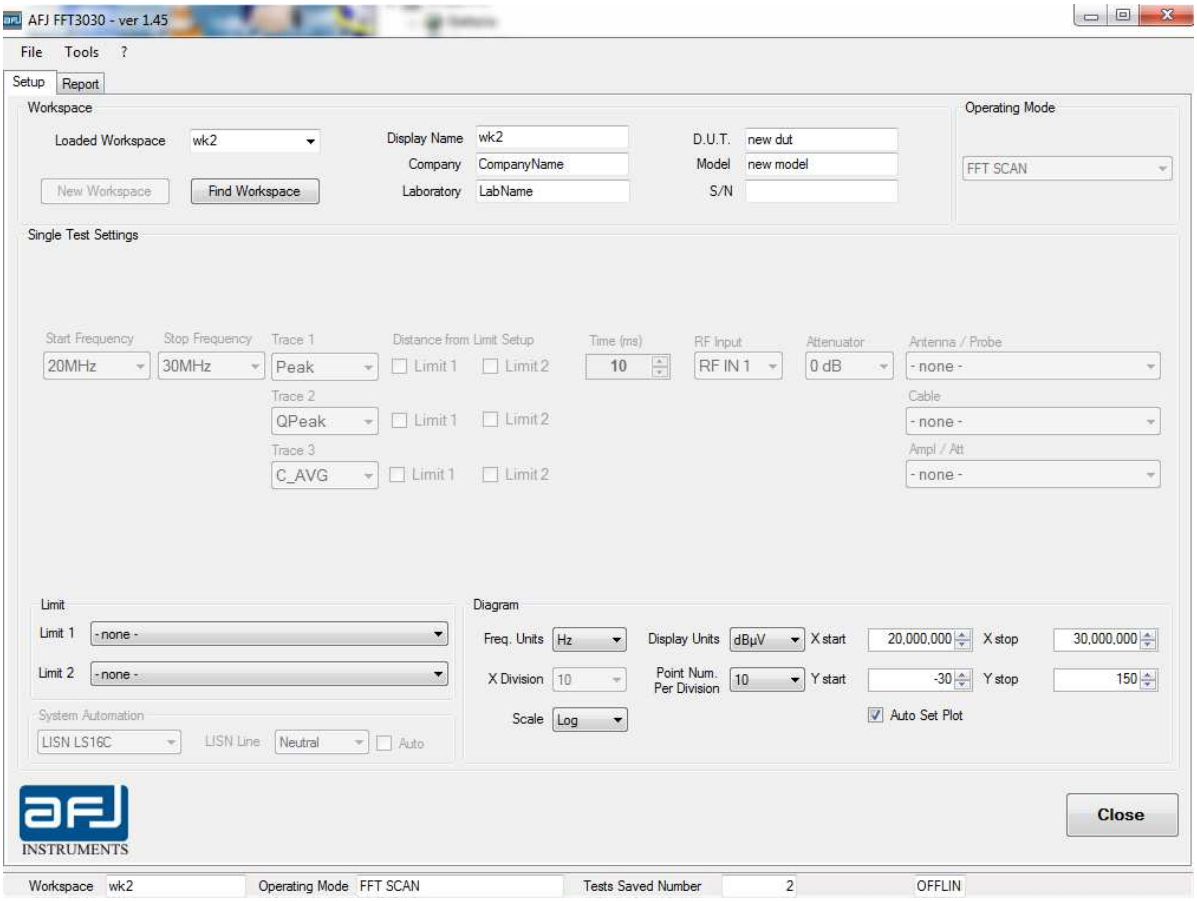


Fig. C.20: Operating software in OFFLINE mode

If *Show SW log* checkbox is flagged, the *Loading…* window appears showing the sequence of system information data loading when the equipment starts to communicate with the external remote control PC (Fig. C.21).

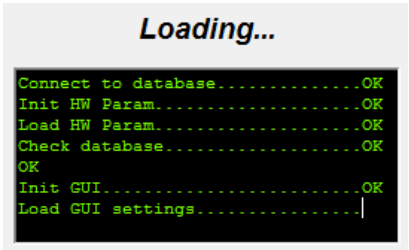


Fig. C.21: Sequence of system information data loading

Note: When the EMI receiver is connected via LAN cable (either cross or standard), it is normal to receive a Limited or no connectivity warning: anyhow the communication between PC and EMI receiver is active and running properly (Fig. C.22).

Fig. C.22: Limited or no connectivity warning indication

C.2.2.3 • RECOVER OF SERVER SOFTWARE AUTOMATIC START

To recover the automatic start condition of the server software, please follows the next steps:

STEP 1 – In the PC integrated in the equipment, please open

Control Panel -> System and Security -> Administrative tools ->Task Scheduler

and *Delete* the old *FFT3010Server (FFT3030Server)* task (Fig. C.23).

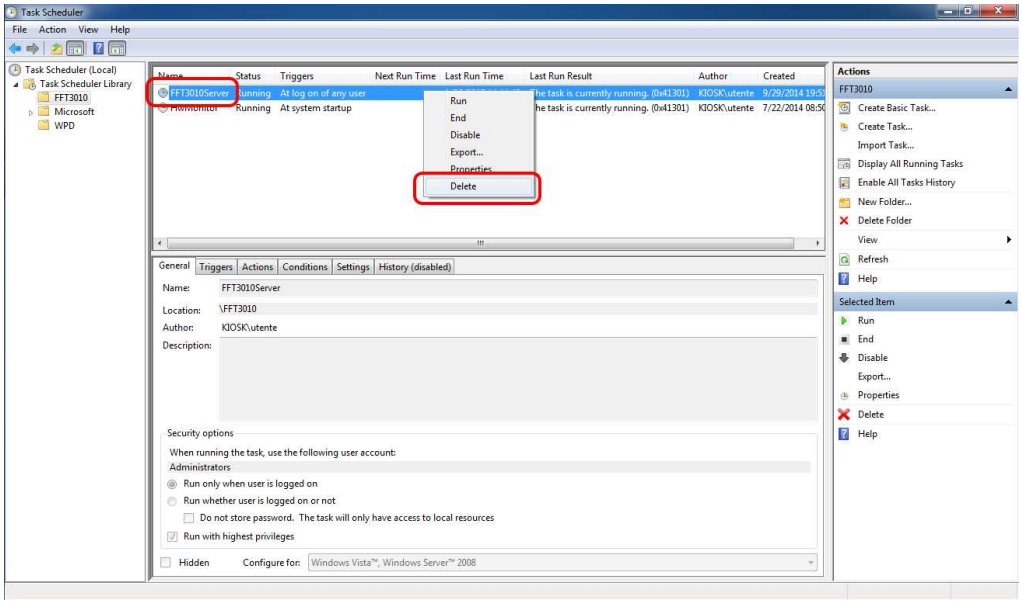


Fig. C.23: Delete of FFT 3030 Server task

STEP 2 – Create a new task (*Create Task…*) either with mouse right-click or with the command in the right panel (Fig. C.24).

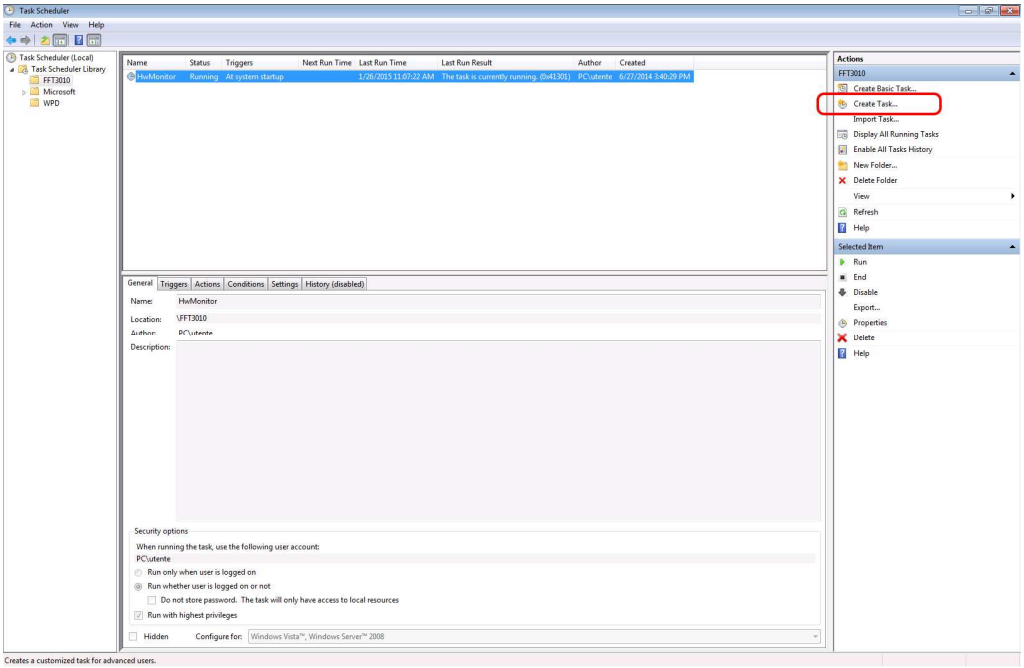


Fig. C.24: Creation of a new task

STEP 3 – In *Create Task* window please select *Tab General* and edit the name of the new task "*FFT3010Server (FFT3030Server)*". On *Security options* section select *Run whether the user is logged on or not* checkbox and confirm *Run with highest privileges* checkbox.
Proceed clicking on *Change User or Group* option (Fig. C.25).

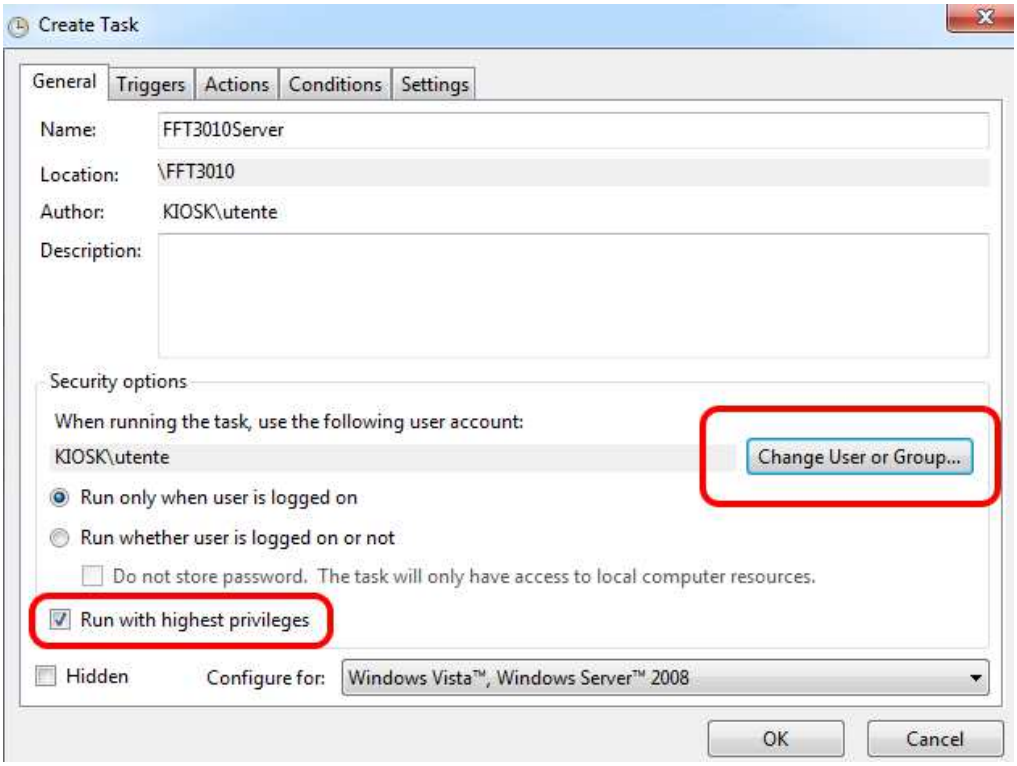


Fig. C.25: Tab General configuration

Proceed clicking on *Advanced* option (Fig. C.26).

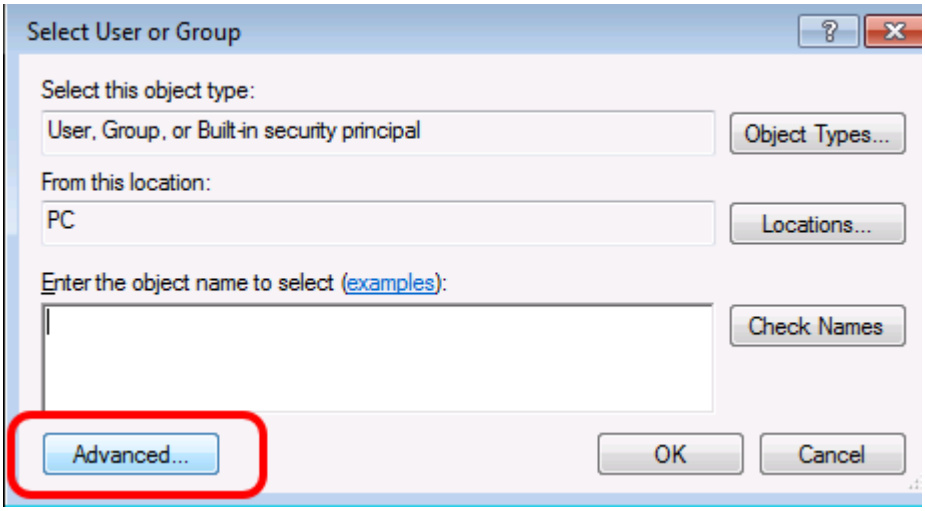


Fig. C.26: Advanced option selection

Proceed clicking on *Find Now* and select *Administrators* on *Search results* section (Fig. C.27).

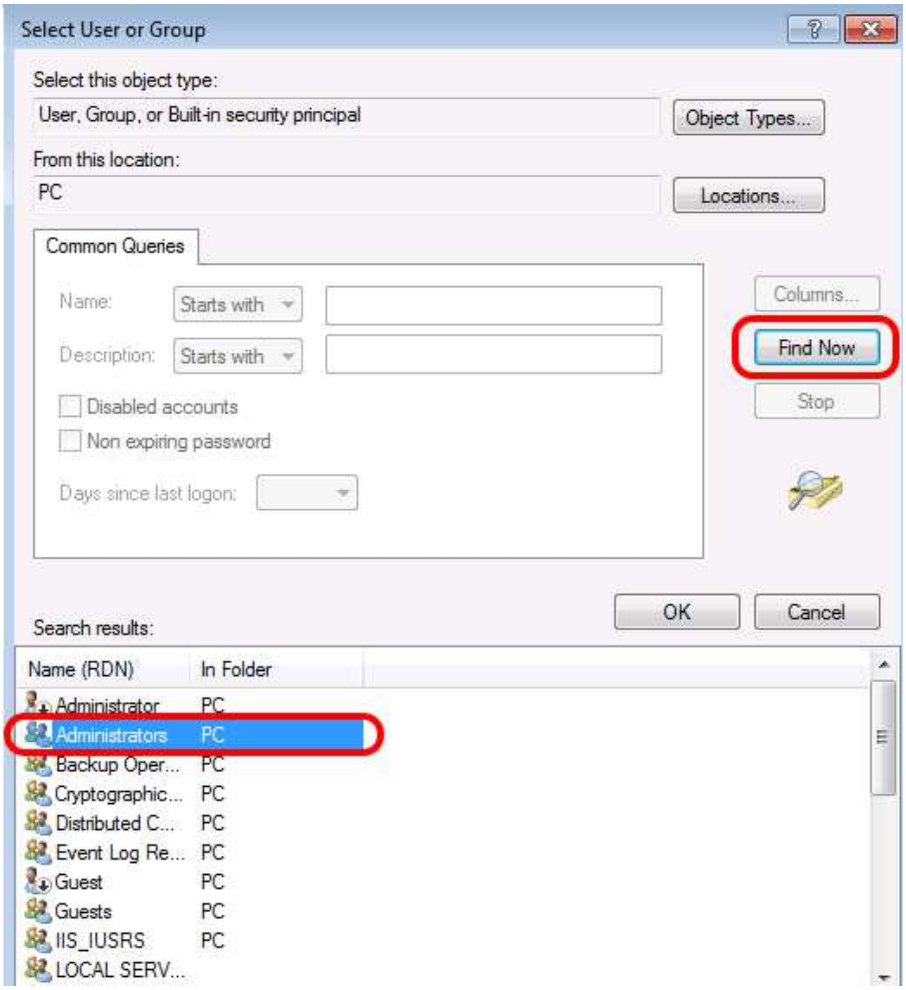


Fig. C.27: PC Administrators configuration

In the following window confirm with *OK* (Fig. C.28).

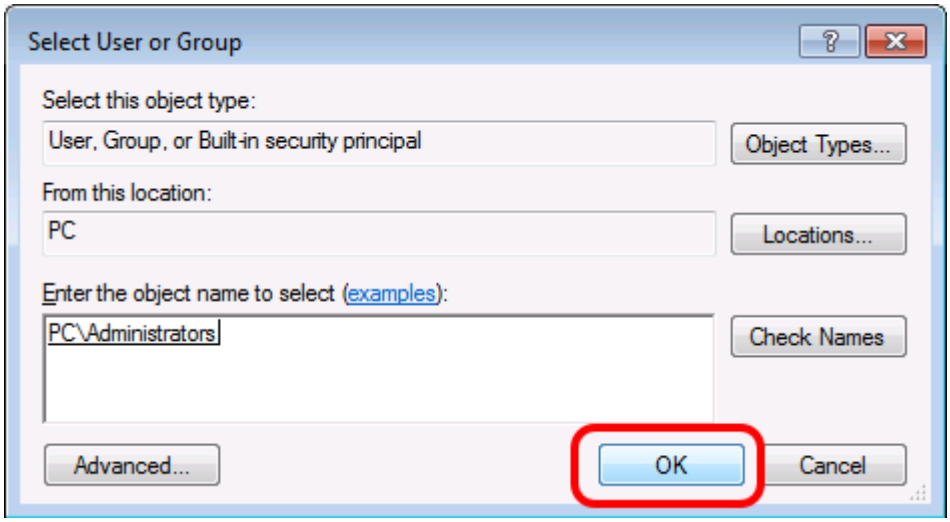


Fig. C.28: PC Administrators confirmation

STEP 4 – In *Create Task* window please select *Tab Triggers* to create a new trigger. Select *At log on* and *Any user*. Be sure *Enabled* checkbox is selected (Fig. C.29).

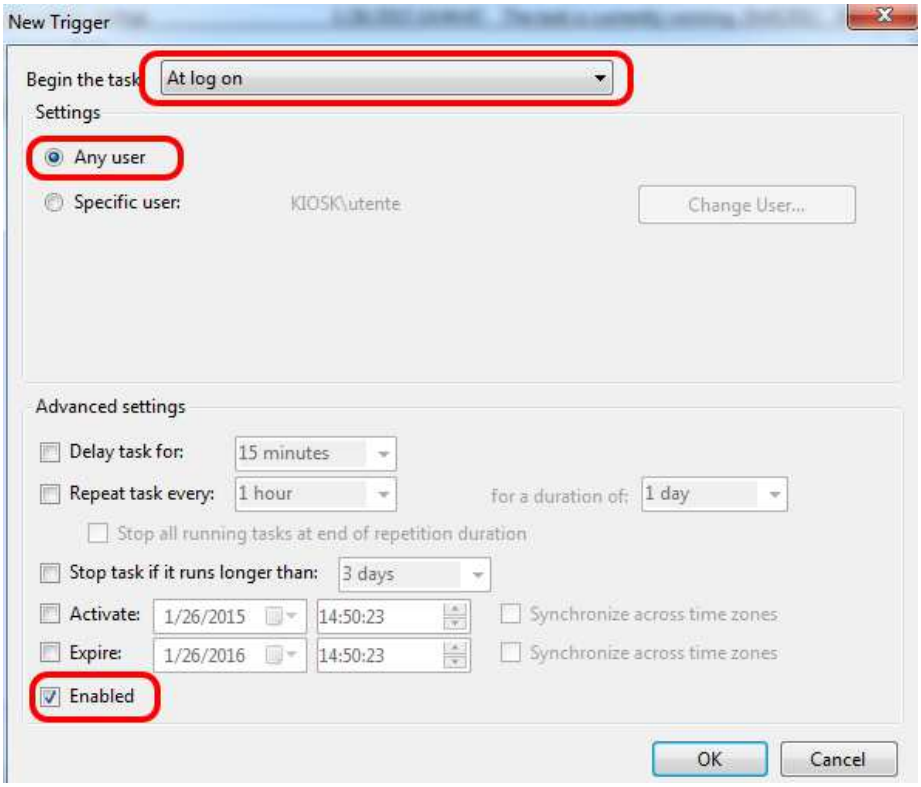


Fig. C.29: New Trigger configuration

STEP 5 – In *Create Task* window please select *Tab Actions* and click on *New….* to create a new action (Fig. C.30).

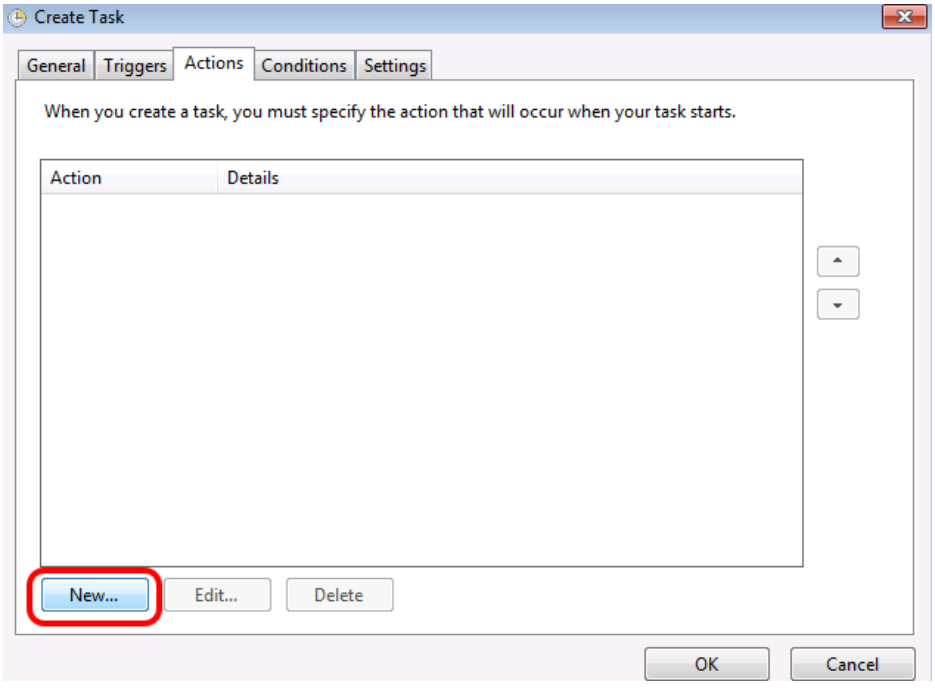


Fig. C.30: New Action creation

In the following window (Fig. C.31) select from the list of the available actions *Start a program*. Click on *Browse…* and select the file at the path

C:\Users\utente\Local\Server\AFJ_R3300_Server.exe

In *Start in (optional)* specify the directory

C:\Users\utente\Local\Server

and confirm with *OK*.

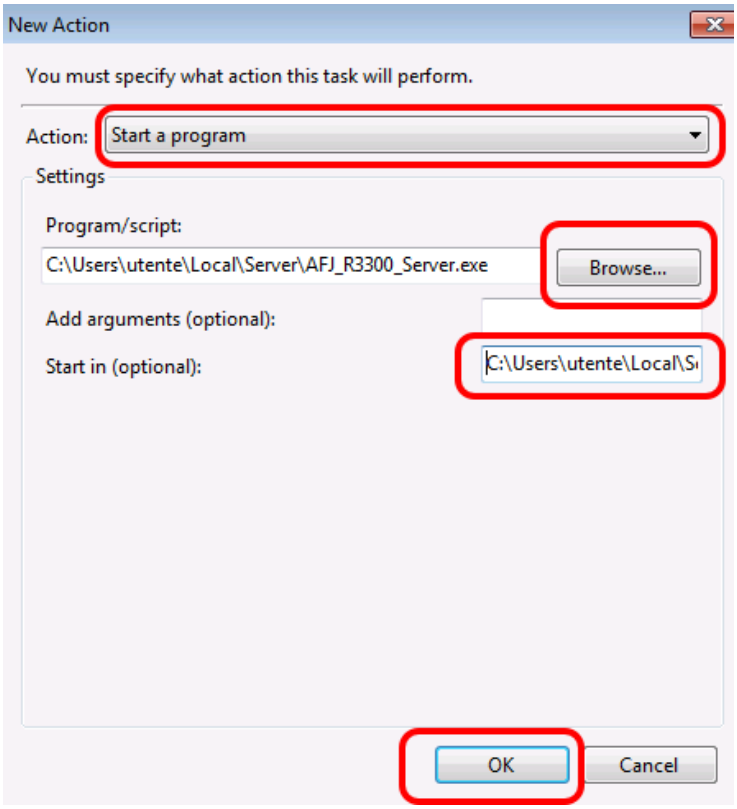


Fig. C.31: New Action configuration

STEP 6 – In *Create Task* window please select *Tab Conditions* and disable all the options (Fig. C.32).

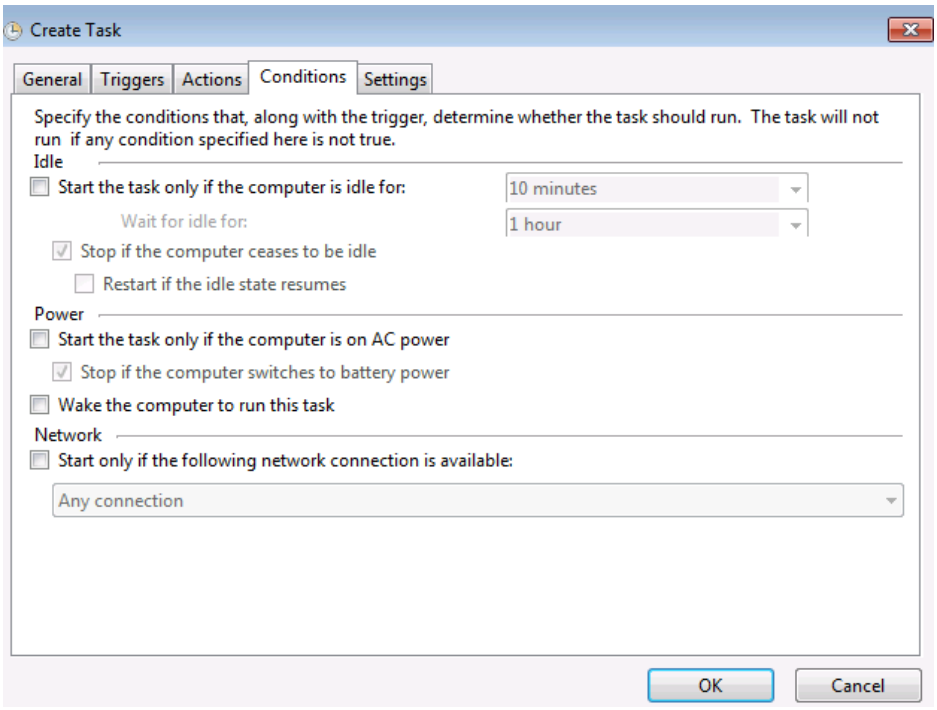


Fig. C.32: New Conditions configuration

STEP 7 – In *Create Task* window please select *Tab Settings*, select *Allow task to be run on demand* and *If running does not end when request force it to stop* checkboxes.
Confirm with *OK* (Fig. C.33).

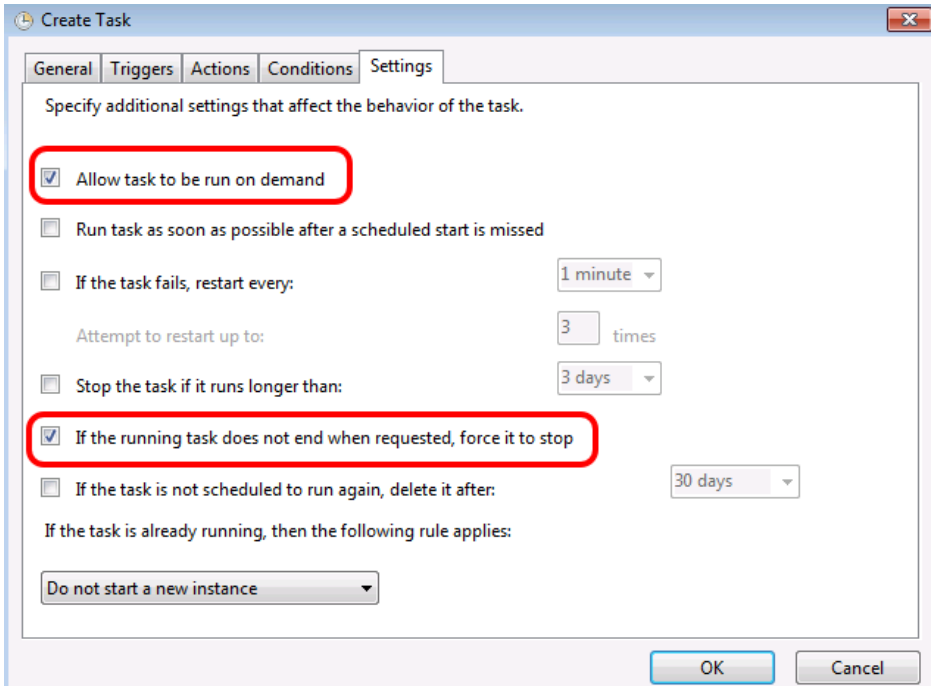


Fig. C.33: New Settings configuration

C.2.2.4 • RECOVER OF CLIENT SOFTWARE AUTOMATIC START

To recover the automatic start condition of the client software, it is necessary to create a basic task to run the client software at the start-up of the operative system.
Please follows the next steps:

STEP 1 – In the PC integrated in the equipment, please open

Control Panel -> System and Security -> Administrative tools -> Task Scheduler

Task Scheduler application can be also found from *Windows Start* menu (Fig. C.34).

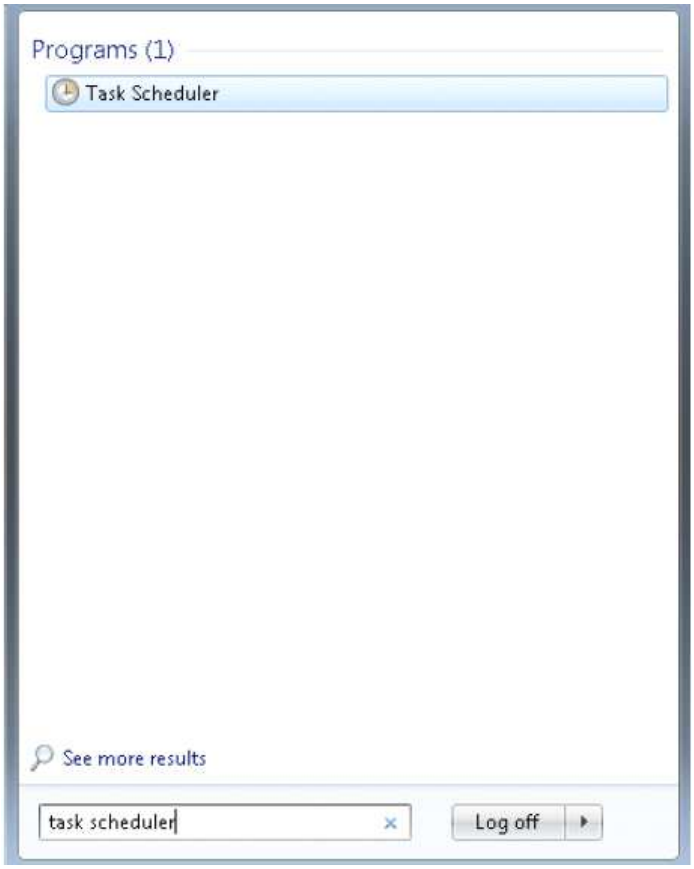


Fig. C.34: Windows Start menu

STEP 2 – In *Task Scheduler* window please create a new task to start client software selecting *FFT3010 (FFT 3030)* folder in the left panel and *Create Basic Task...* in the right panel (Fig. C.35).

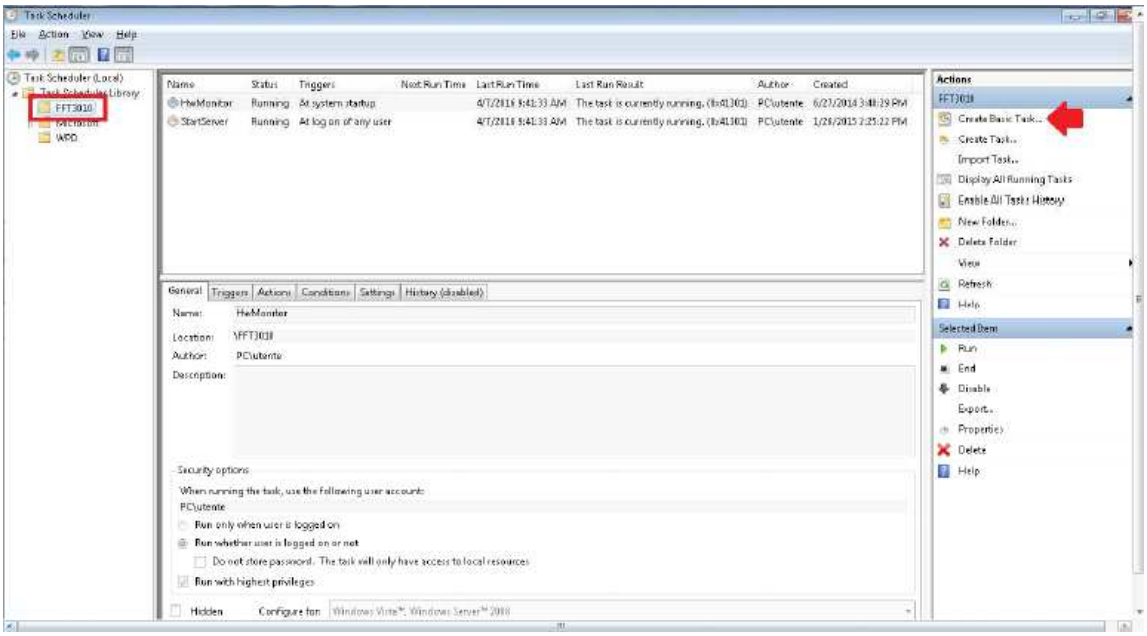


Fig. C.35: Task Scheduler window

STEP 3 – In *Create Basic Task Wizard* window please insert the task name and then click *Next* (Fig. C.36).

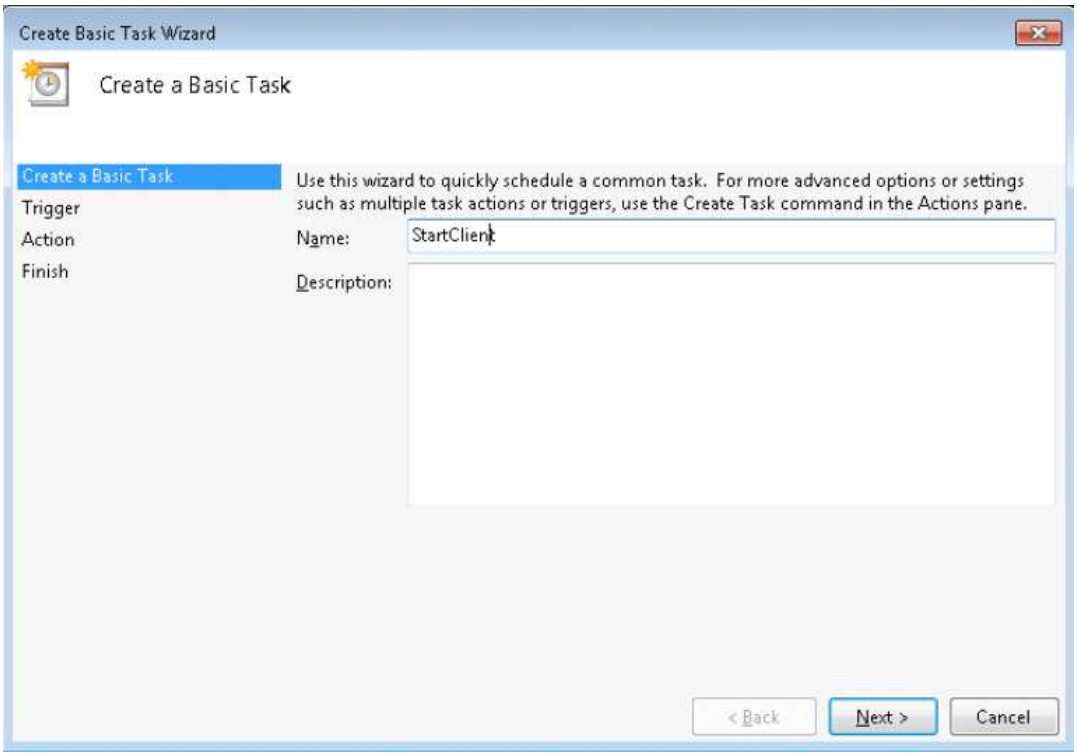


Fig. C.36: Create Basic Task Wizard window

STEP 4 – In *Create Basic Task Wizard* window please choose *When I log on* option in the *Trigger Task* panel and then click *Next* (Fig. C.37).

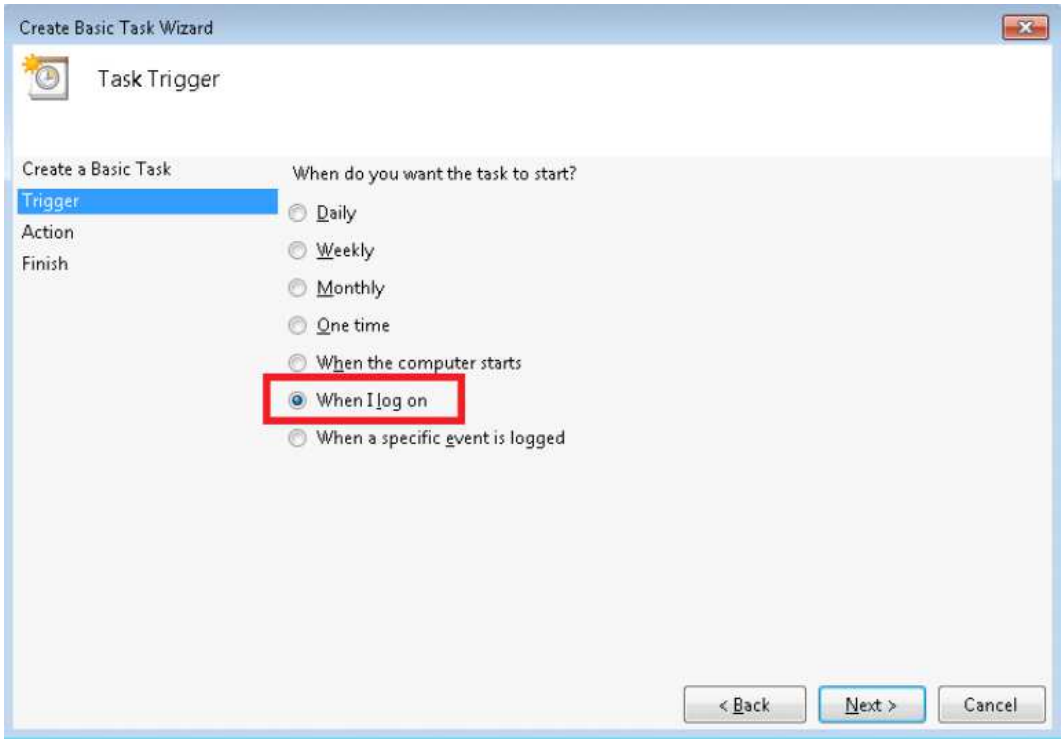


Fig. C.37: Task Trigger window

STEP 5 – In *Create Basic Task Wizard* window please choose *Start a program* option in the *Action* panel and then click *Next* (Fig. C.38).

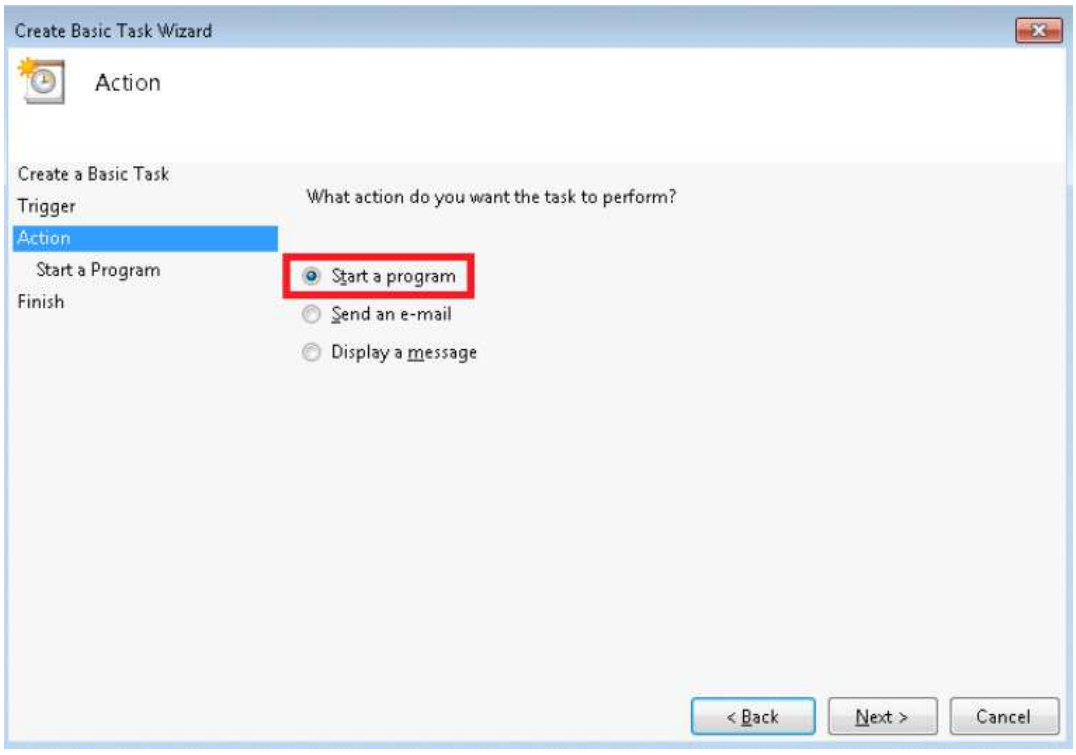


Fig. C.38: Action window

STEP 6 – In *Create Basic Task Wizard* window in *Start a Program* window please click on *Browse…* button (Fig. C.39).

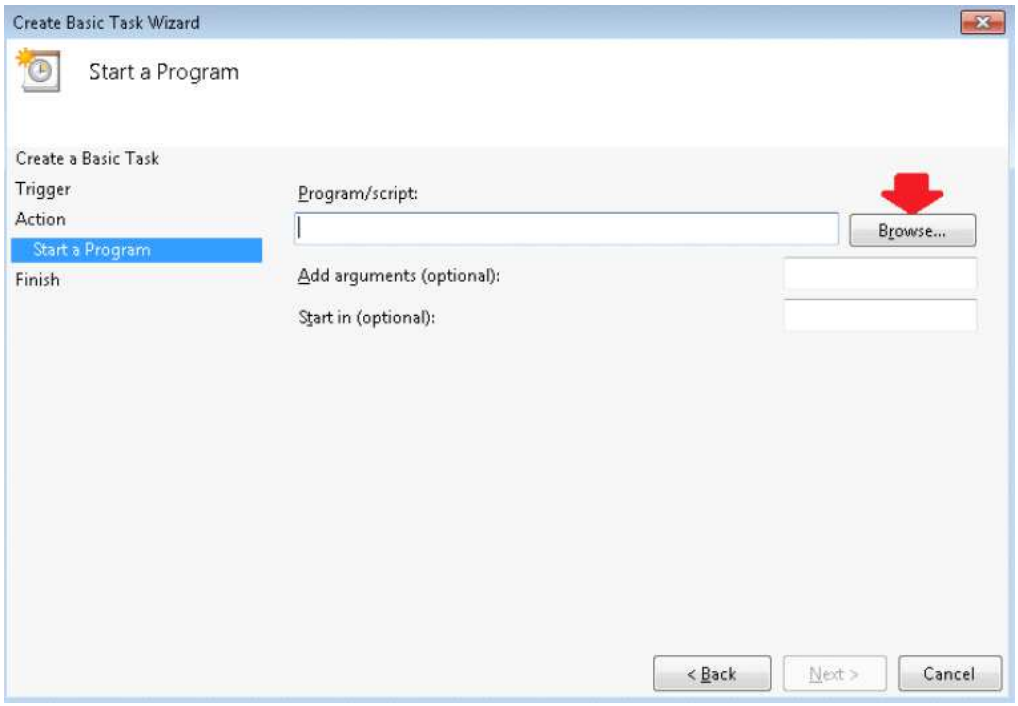


Fig. C.39: Start a Program window

STEP 7 – Please browse in *C:\Program Files (x86)\AFJ\AFJ FFT3010 (AFJ FFT3030)* folder, select *AFJ_R3310_RECEIVER.exe* application and then click Open (Fig. C.40).

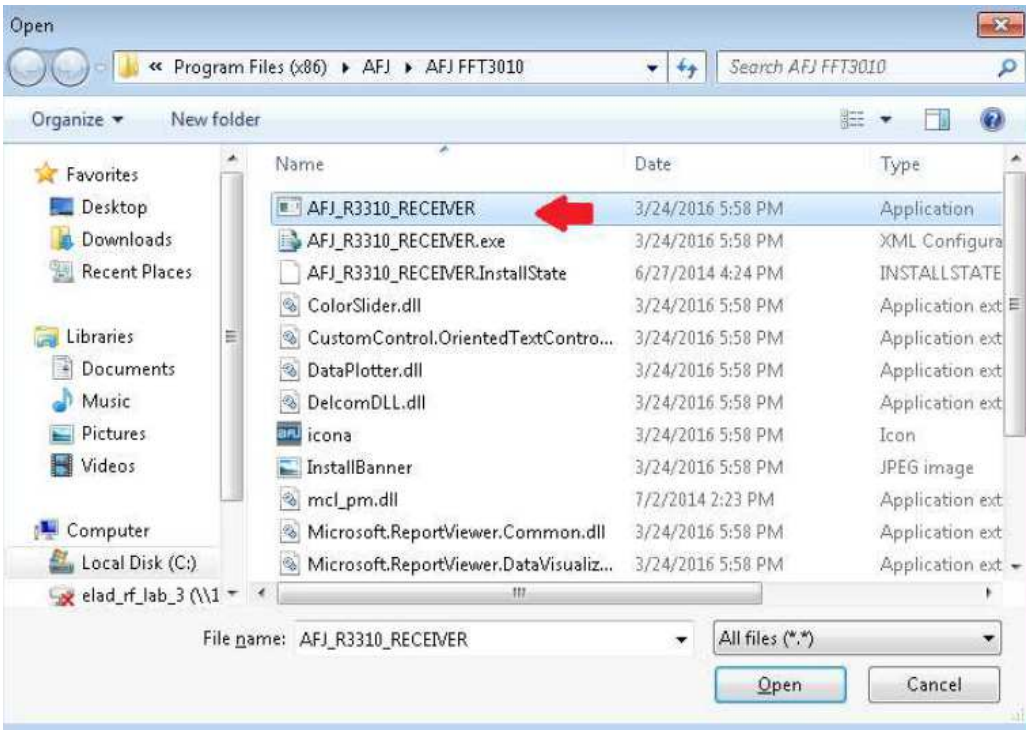


Fig. C.40: Browse window

STEP 8 – In *Create Basic Task Wizard* window after the selection of the required application please click *Next* (Fig. C.41).

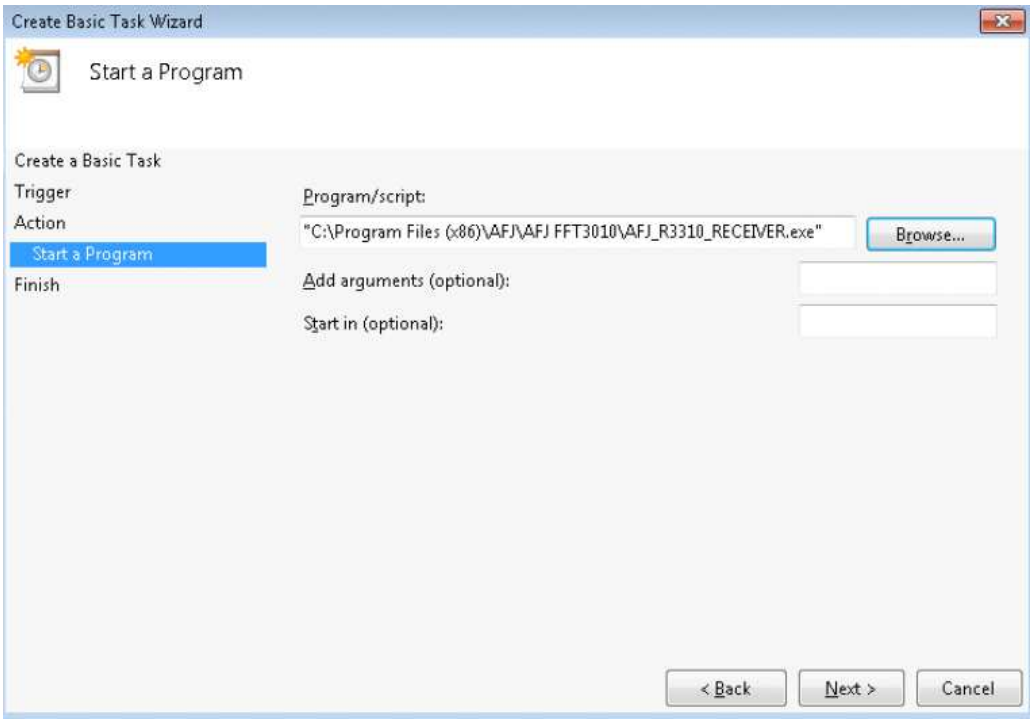


Fig. C.41: Selection of the required application

STEP 9 – In *Create Basic Task Wizard* window please select *Finish* panel, verify the *Name*, *Trigger* and *Action* fields, select *Open the Properties dialog for this task when I click Finish* option and then click *Finish* (Fig. C.42).

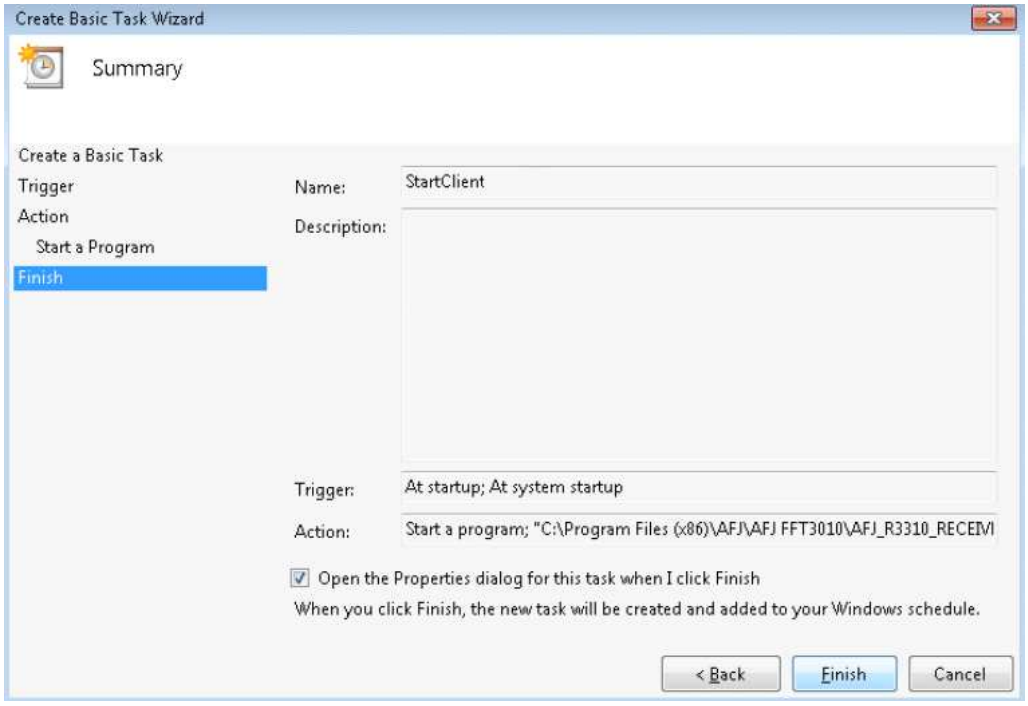


Fig. C.42: Finish window

STEP 10 – The new *StartClient* basic task is right now created and the *StartClient Properties* dialog box is open. Please select *General* tab and verify that *Run only when user is logged on* option is selected and then Select *Run with highest privileges* (Fig. C.43).

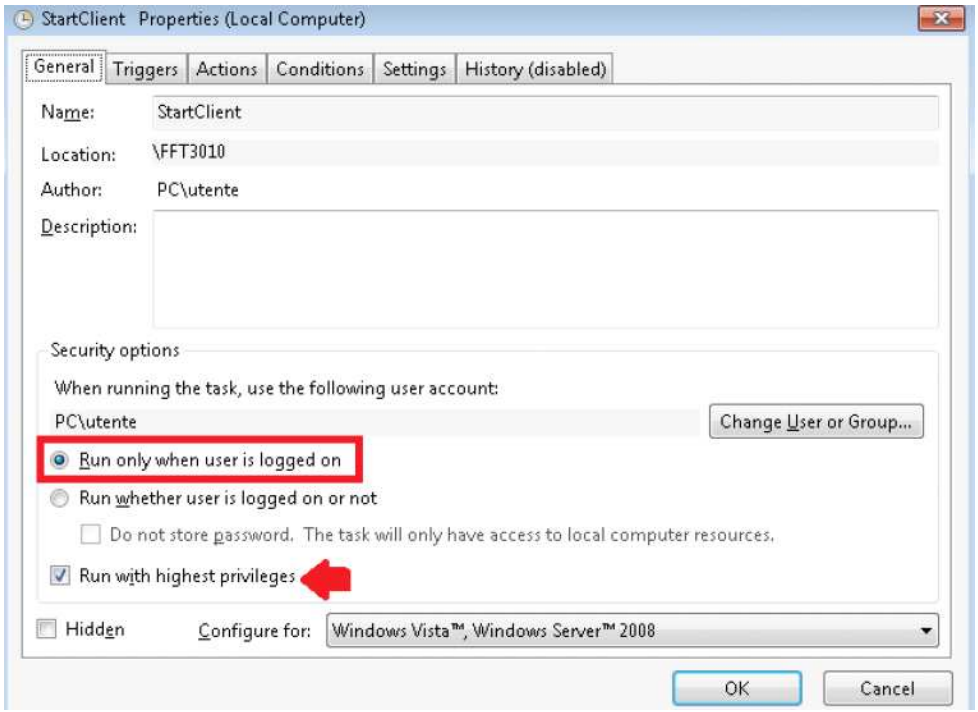


Fig. C.43: General tab

STEP 11 – Please select *Triggers* tab and click on *Edit* button to modify trigger settings (Fig. C.44).

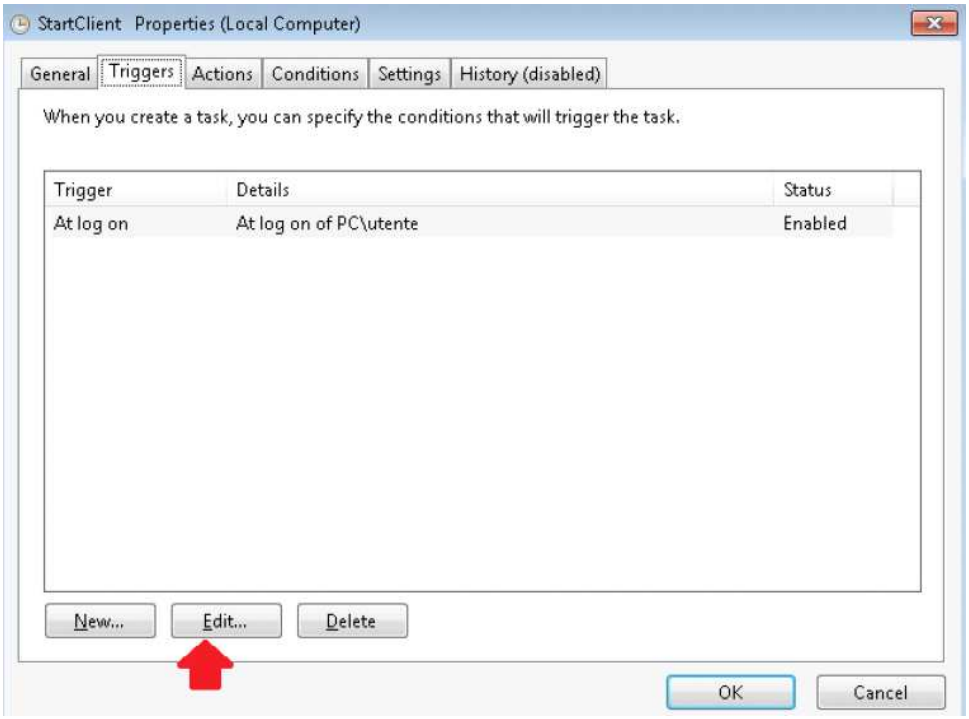


Fig. C.44: Triggers tab

STEP 12 – In *Edit Trigger* dialog box please verify that *Begin the task* field is set to *At log on*. In *Settings* section please select *Any user* option and click *OK* to confirm the new settings and to come back to *StartClient Properties* dialog box (Fig. C.45).

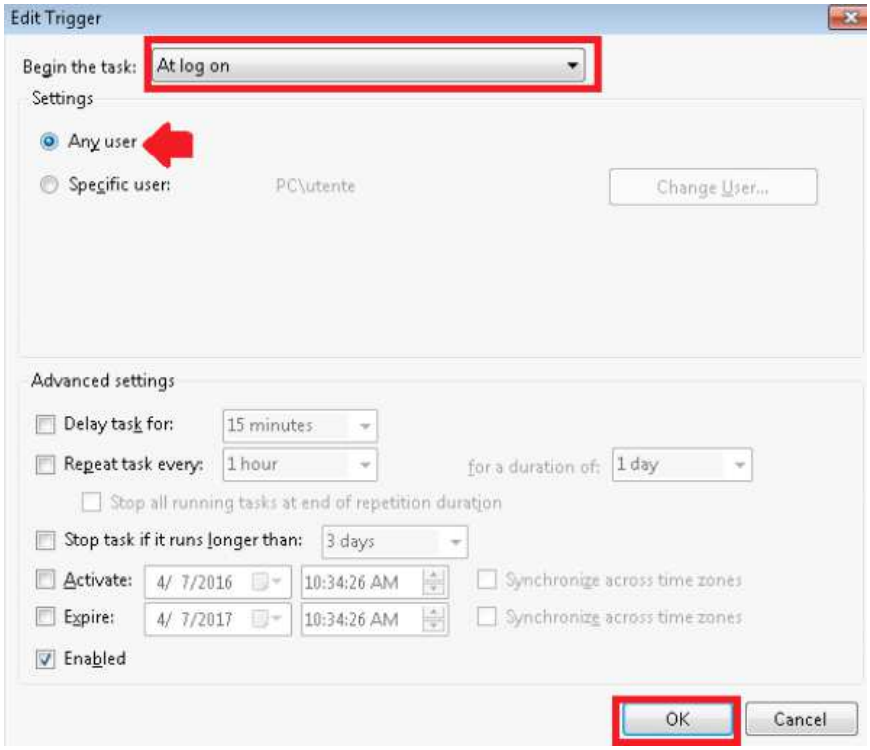


Fig. C.45: Edit Trigger dialog box

STEP 13 – Please select *Actions* tab and verify the status according to Fig. C.46.

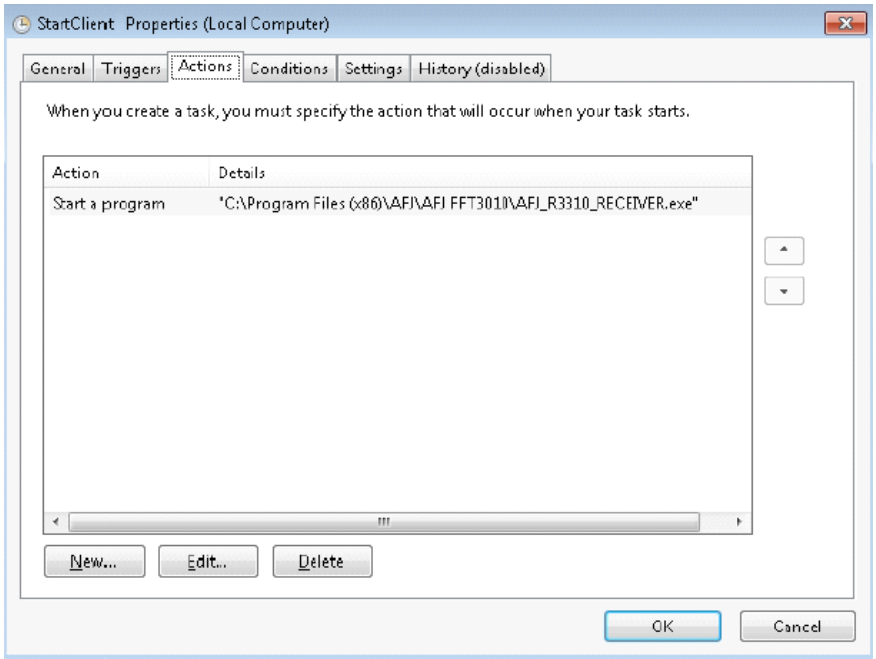


Fig. C.46: Actions tab

STEP 14 – Please select *Conditions* tab, in *Idle* section verify that *Start the task only if the computer is idle for* option is not checked and that *Stop if the computer ceases to be idle* is checked but the check box is not enabled. In *Power* settings deselect *Start the task only if computer is on AC power* and verify that Stop *if the computer switches to battery power* is checked but the check box is not enabled (Fig. C.47).

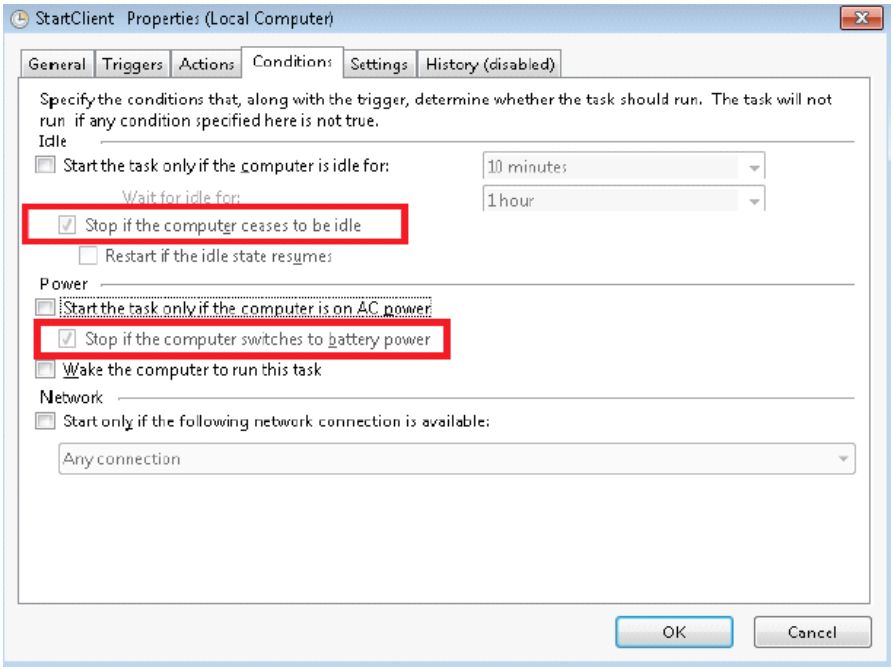


Fig. C.47: Conditions tab

STEP 15 – Please select *Settings t*ab and verify the options according to Fig. C.48.

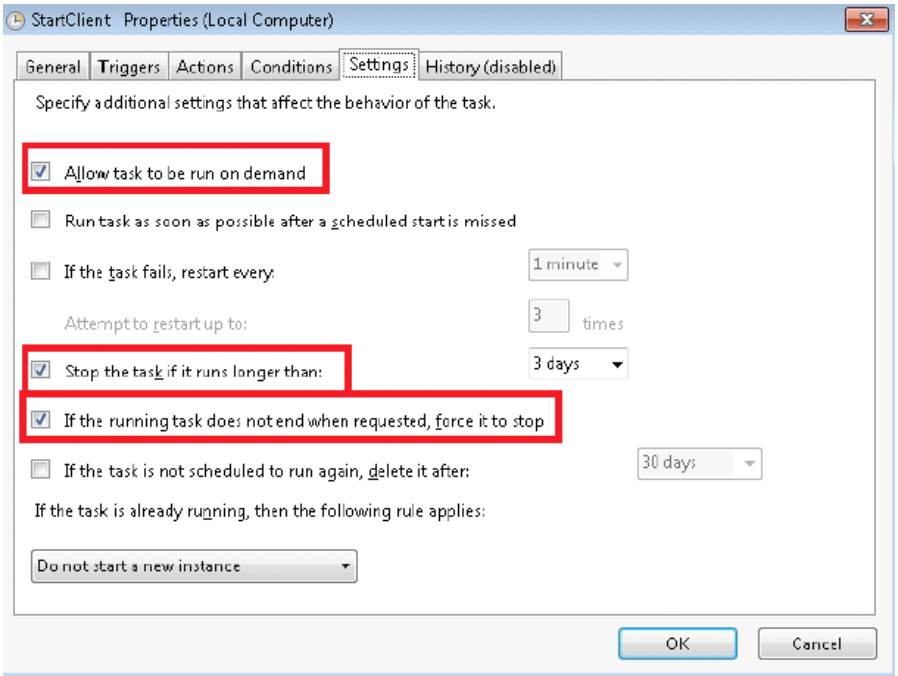


Fig. C.48: Settings tab

STEP 16 – Please select *History* tab, verify the options according to Fig. C.49, then click *OK* to confirm the changes in *StartClient Properties* and to come back to *Task Scheduler* application.

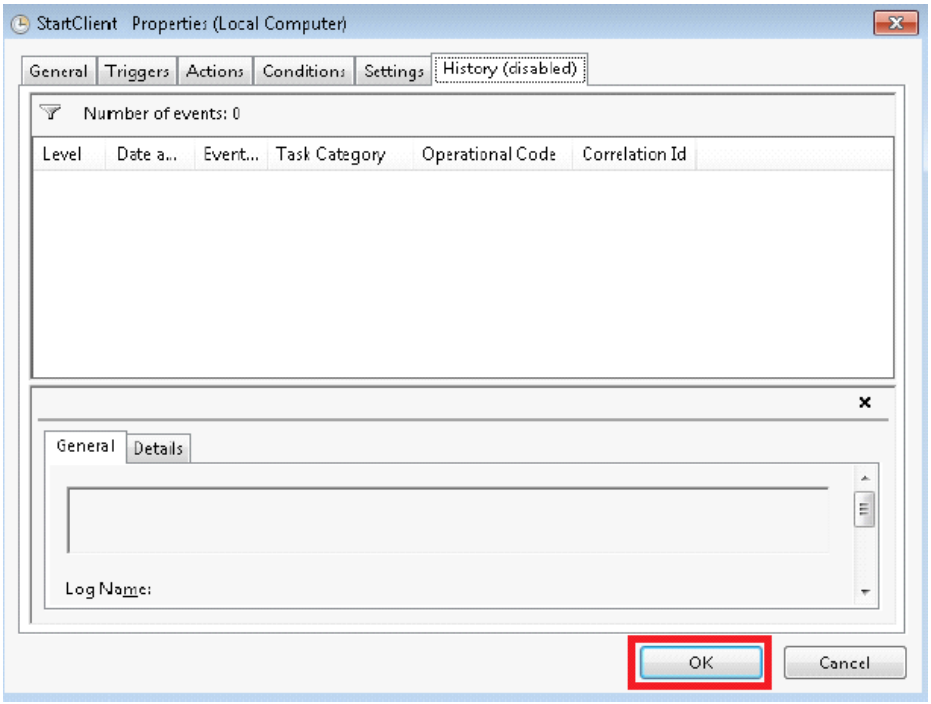


Fig. C.49: History tab

STEP 17 – Right now the *StartClient* task shall be set in *Running* status. In the central panel of *Task Scheduler* application, the new *StartClient* task is added but *Status* is set to *Ready* according to Fig. C.50. Please execute *Run* in the right panel to modify the status.

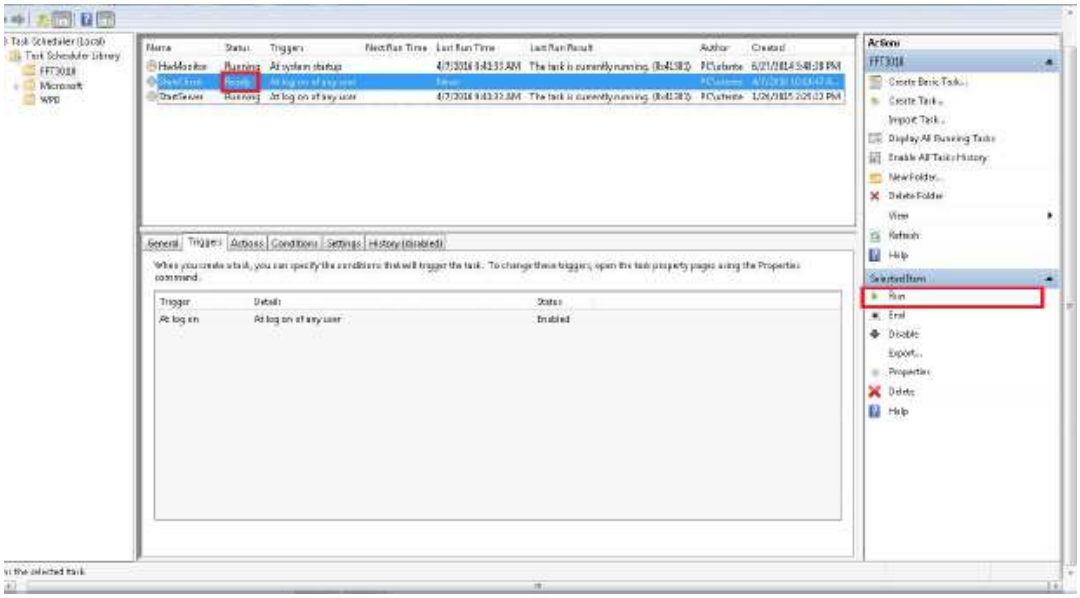


Fig. C.50: Status settings

STEP 18 – Right now the *StartClient* task has the proper status of *Running* (Fig. C.51).

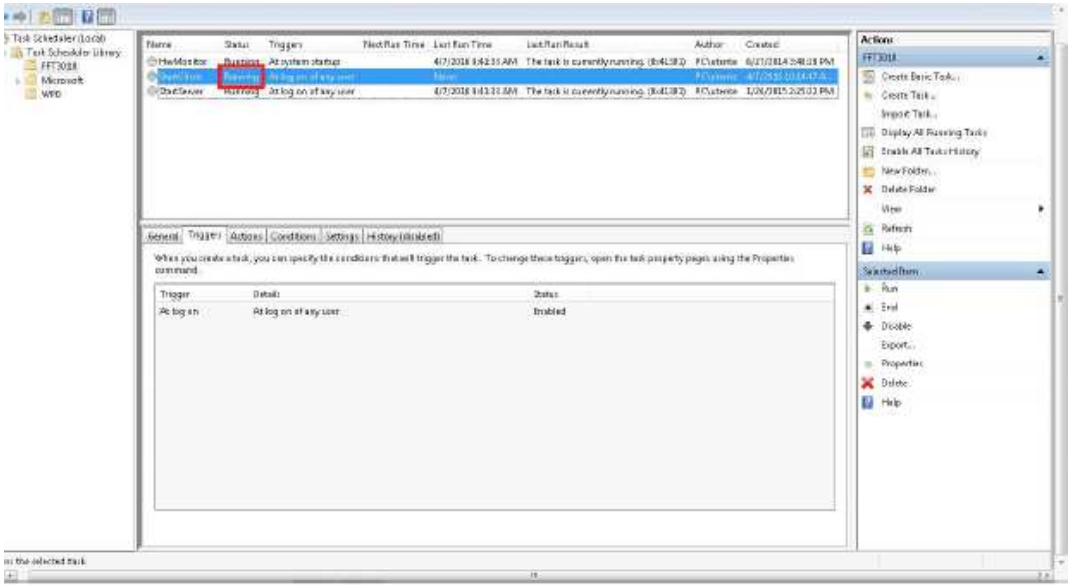


Fig. C.51: Status of Running for StartClient task

SECTION D: OPERATING INSTRUCTIONS

D.1 • START OF THE APPLICATION

When the operating software is running, it shows the *Setup* box of the EMI Receiver (Fig. D.1). This screen, with its five options *Setup*, *Run Test*, *Analyze*, *Generator* and *Report,* constitutes the so-called *cockpit*.

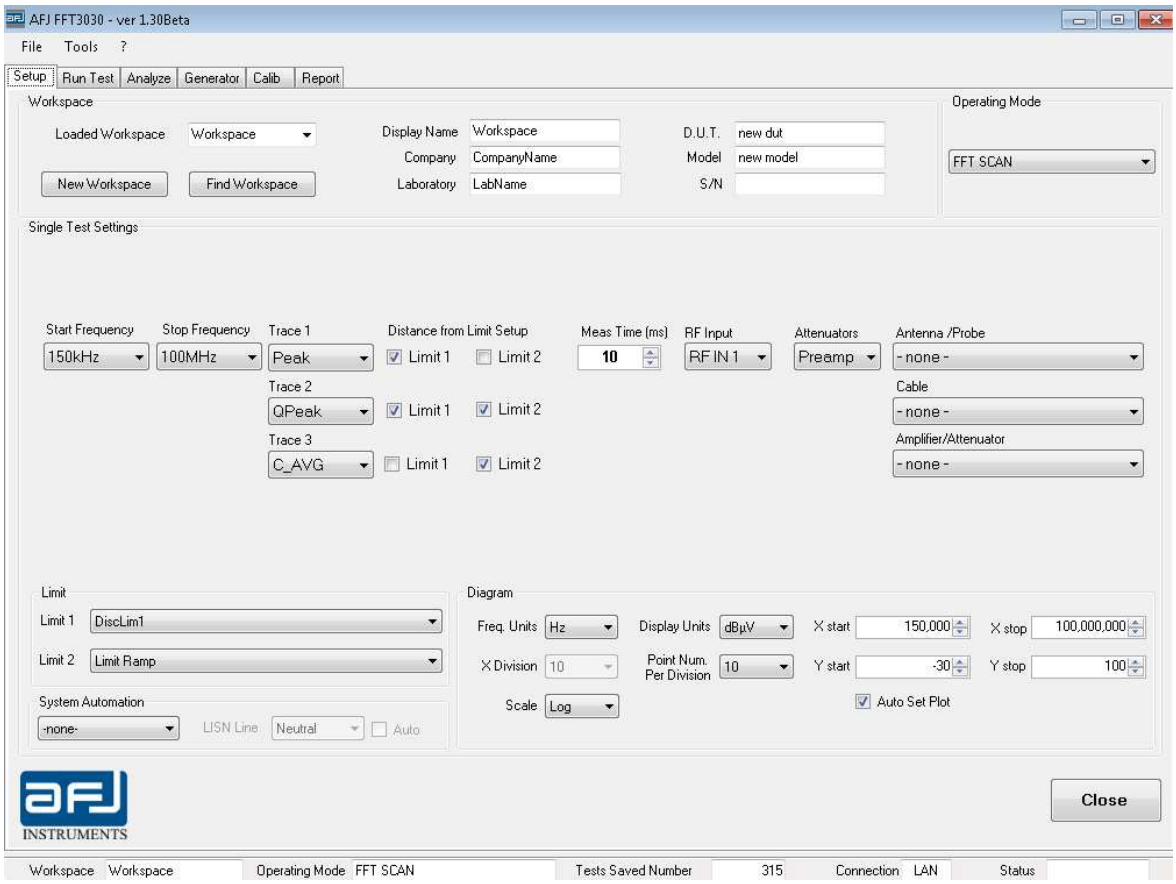


Fig. D.1: The Setup box of the FFT 3030 EMI Receiver cockpit

D.2 • THE SETUP BOX

The Fig. D.2 shows the *Setup* box of the FFT 3030 EMI Receiver.

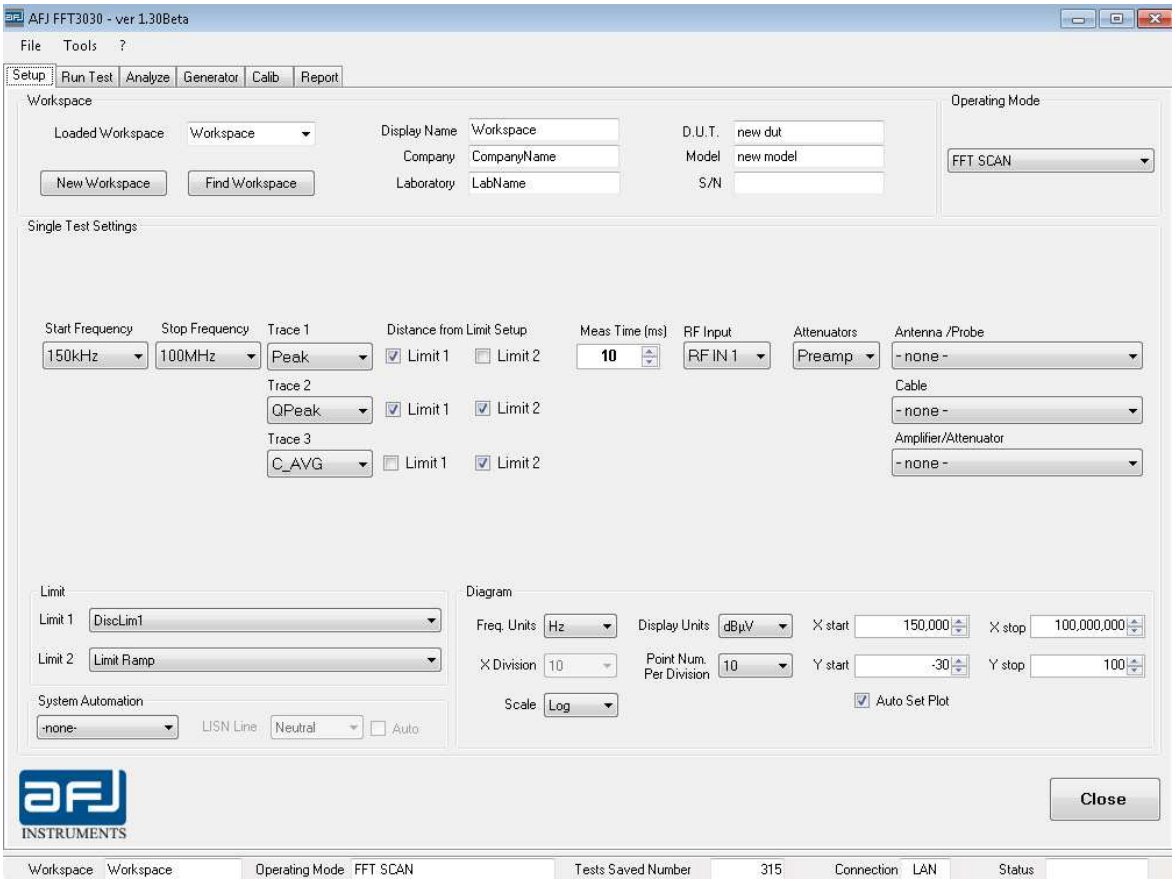


Fig. D.2: FFT 3030 EMI Receiver setup window

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

Note: You cannot change directly the data written in the workspace section, as they derive from the underlying database. You can instead create a new workspace or select one of the stored workspace data already created, by clicking **New Workspace** or **Find Workspace** respectively.

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*, *D.U.T.* (Device Under Test), *Model*, *S/N* (*Serial Number*) and *Company* (see Fig. D.3) in the **New Workspace** box.

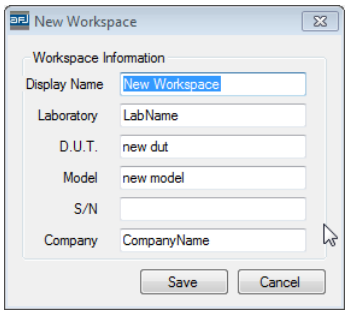


Fig. D.3: Setup New Workspace Information

By pressing *Save* the new workspace data will appear in your current workspace (see Fig. D.4).

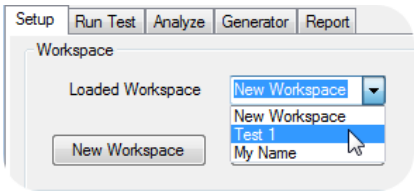


Fig. D.4: Choose your Workspace

You can also manage to list, filter, load, modify and delete your saved Workspaces, by pressing the *Find Workspace* button or from menu *File => Find Workspace*. In both cases, the *Workspace Management* window appears (see Fig. D.5). This window is subdivided in the three sections: *Filter* (for research tasks), *Workspace list* and *Workspace Information*. The current workspace is already highlighted (selected) and its data are listed in the *Workspace Information*.

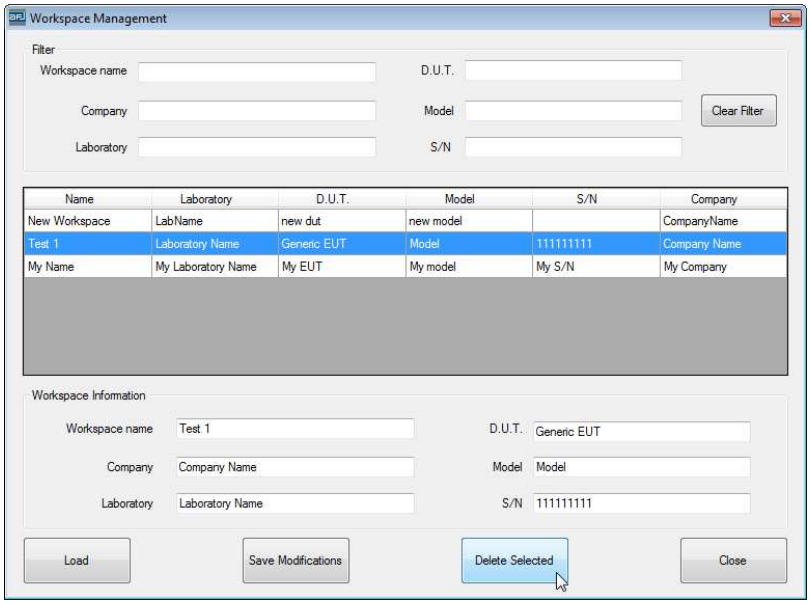


Fig. D.5: Workspace Management window

Any operation on workspaces can be performed easily, being the meaning of different fields intuitive for the user.
The *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 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.
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 1: 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.

Note 2: 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.2.1 • OPERATING MODES

Referring again to main Setup window (Fig. D.2), focus now on its upper right portion *Operating Mode.*
Here you can choose one of the three operating modes: *FFT Scan*, *Filter* and *Van Der Hoofden Test*.
These modes can be selected from the drop-down menu *Operating Mode* (Fig. D.6).

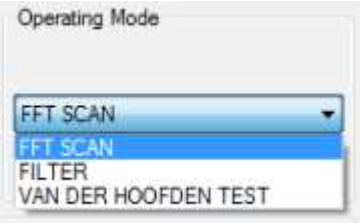


Fig. D.6: Operating Mode selection among FFT SCAN, FILTER and VAN DER HOOFDEN TEST options

FFT Scan Mode

This is the default mode, being the most convenient mode for usage in most situations, allowing for fast and still reliable measurements. It is an important opportunity for experimenting with the FFT scan for any kind of interferences and be able to compare the results with the classic EMI receiver Sweep Modes. This task can be done easily with FFT 3010 and FFT 3030 EMI Receivers.
FFT Scan Mode has a fixed frequency step of 46,875Hz from 9kHz up to 150kHz, 3kHz from 150kHz to 30MHz and 24kHz from 30MHz to 300MHz and it can be operated with up three detectors at the same time and two different Limits (*1* and *2*).
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 (see Fig. D.7).
In this mode, as well as the Sweep Mode, up to three different detectors can be selected at the same time.

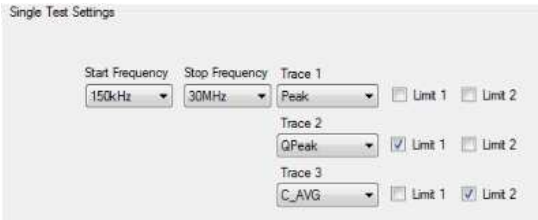


Fig. D.7: Setup of the Single Test Settings section for FFT Scan Mode with three traces at once

The limits must be selected in the *Limit* section (in the left-lower part of Setup box, see Fig. D.8).

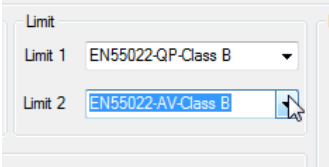


Fig. D.8: Selection of limits in the Limit section

Filter Mode

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

Van Der Hoofden Test

FFT 3010 and FFT 3030 EMI receivers are automatically set according to the requirements of IEC 62493 Ed. 2.0:2015-03 standard (*Assessment of lighting equipment related to human exposure to electromagnetic fields*) (Fig. D.9) for measurements with Van Der Hoofden Test Head model AFJ VDH 30.

Frequency range	B_6 according to CISPR 16-1-1	Measurement time	f_{step}	Detector
20 kHz – 150 kHz	200 Hz	100 ms	220 Hz	Peak
150 kHz – 10 MHz	9 kHz	20 ms	10 kHz	Peak

Fig. D.9: IEC 62493 Ed. 2.0:2015-03 standard requirements for measurement equipment

On the *Setup* box the *Single Test Settings* will be automatically grayed out (Fig. D.10).

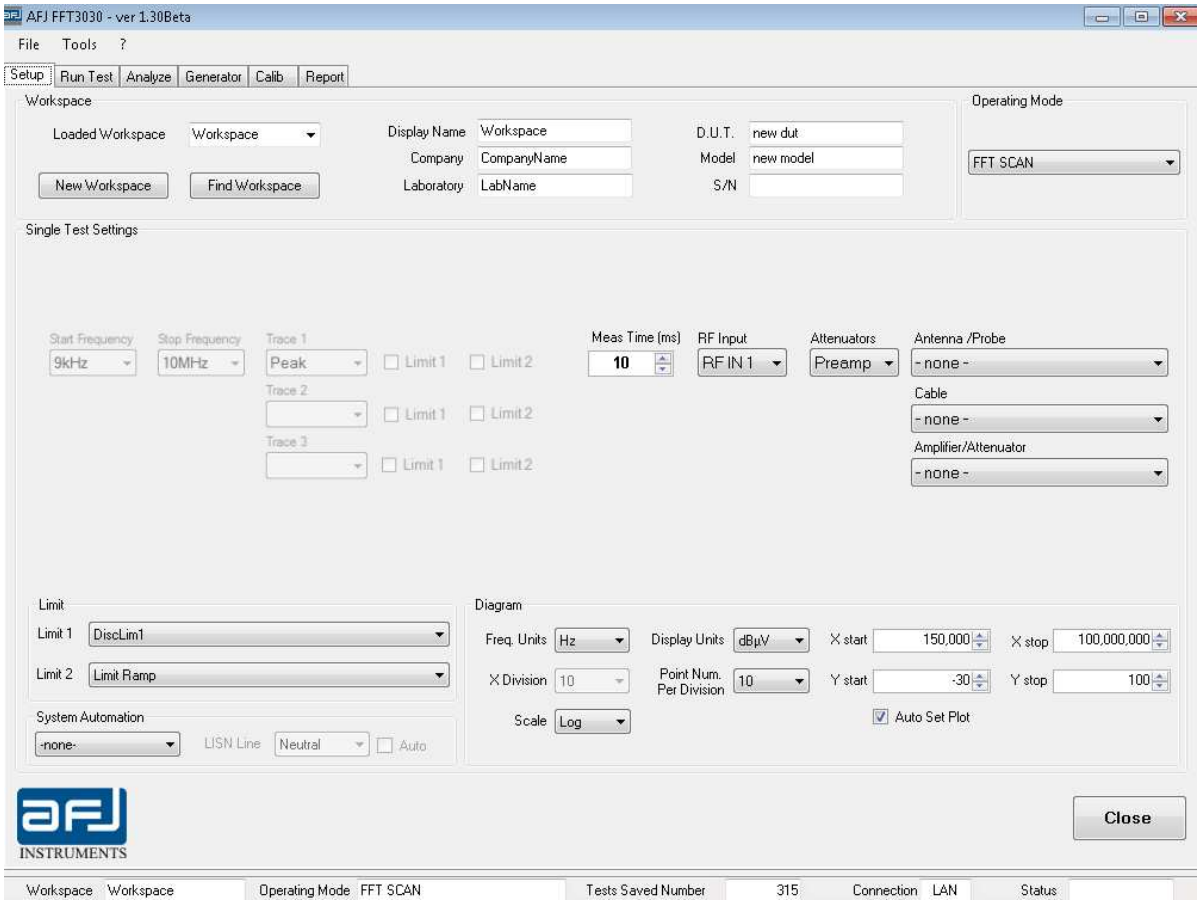


Fig. D.10: Setup box settings for Van Der Hoofden Test operating mode

D.2.2 • SYSTEM AUTOMATION

You can also add the System Automation (Fig. D.11).

Fig. D.11: Setup System Automation section for an AFJ LISN choice

For FFT 3010 and FFT 3030 EMI Receivers you can add either AFJ LISN LS16C/10 or AFJ LISN LT32C/10.
Then you can choose the *LISN LINE to measure*. Possible choices are:
- *Line 1* or *neutral* for LISN LS16C/10 (single phase LISN);
- *Line 1*, *Line 2*, *Line 3* or *Neutral* for LISN LT32C/10 (three phase LISN).
The phase is switched after you press the Start button in the Run Test box (the led on LISN front panel will switch on).
If *Auto* option is selected, the measurement will be performed in sequence automatically on all the phases of the selected AFJ LISN.

You can also choose the *SyA Script* function for the System Automation. In this case the LISN LINE gray out (Fig. D.12).

Fig. D.12: 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:

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

Serial port settings syntax commands:
OPEN232 baud_rate, parity, data_bits, stop_bits
Baud rate port settings: 2400, 4800, 9600, ..., 115200

Parity:	None → N / Even → E / Mark → M / Odd → O / Space → S
Data bits:	Set either 8 or 7.
Stop bits:	To set nothing insert N, otherwise 1,1.5 or 2.

LISN and Max hold settings syntax commands:

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

D.2.3 • 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 Lisn 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 Lisn 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 Lisn 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 Lisn 2 – L0`") and the Max hold of two repetitions of line L1 in another file "`Test Lisn 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 Lisn 2 – L0
HOLD RST
HOLD SET 2
SWEEP
LISN 1
WR CO LISN LINE 2
WR TN Test Lisn 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 note1
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.2.4 • LIMIT EDITOR (TOOLS MENU)

The client software comes already with many measurements limits according to emission standards CISPR/EN 55011, 14, 15, 19, 22 (both Average and Quasi Peak, Group 1/2, Class A/B where applicable). 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* (see Fig. D.13).

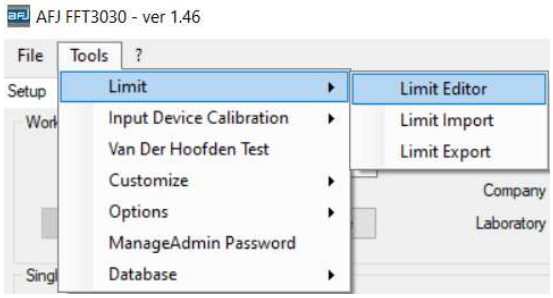


Fig. D.13: Limit Editor selection

In this box you can change the parameters of the current test Limit and its display configuration, with the possibility to *Add New Limit*, select another Limit (*Selected Limit*) and *Delete Limit*. It is possible to add a discontinuous limit according to the requirements for example of CISPR 25 standard with the definition of some frequency points with No Limit definition. A frequency point added with active *NoLim* flag allows to get a discontinuous gap from that frequency point up to the next one added with no active *NoLim* flag. The overall functionality (Fig. D.14) is similar to the *Input Device Calibration Editor* (See § D.2.6), 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.

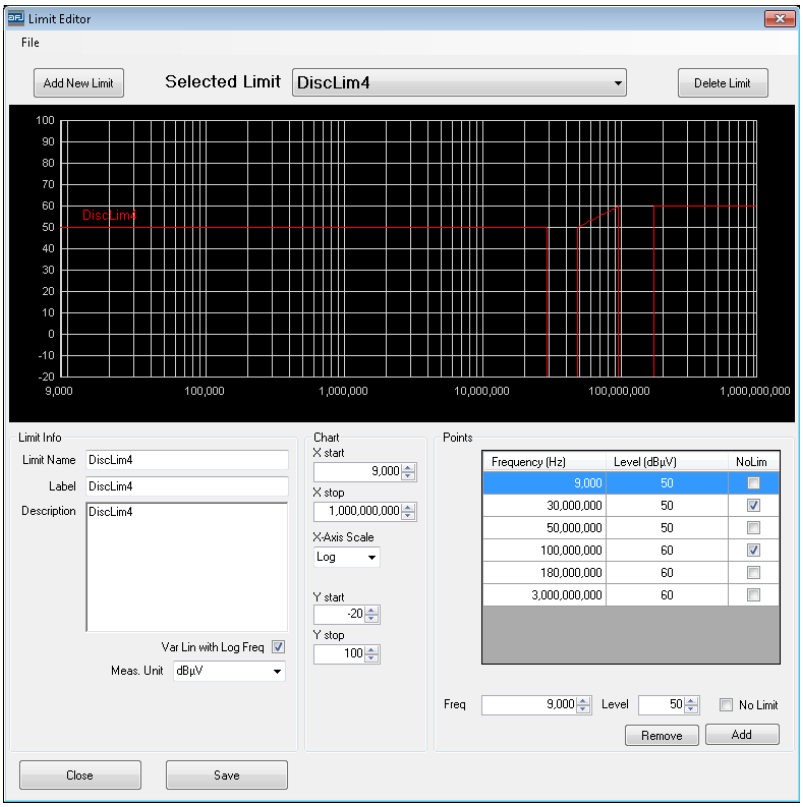


Fig. D.14: Limit Editor parameters for an example of discontinuous limit

You can also Import / Export limits in XML format (version 1.0, *Standalone*) for using them in different XML-parsing programs (Fig. D.15).

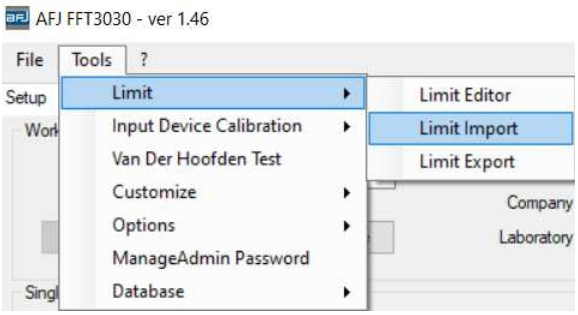


Fig. D.15: Limit Import / Export options

With these 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.16).

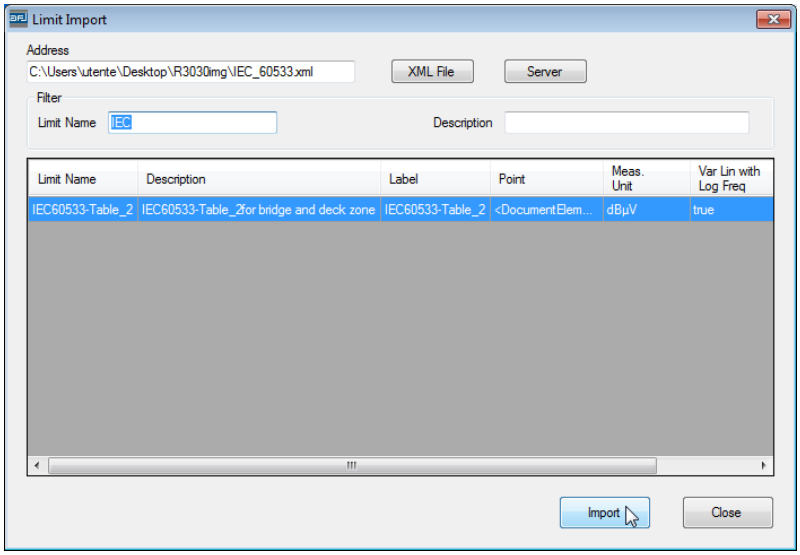


Fig. D.16: Limit Import

The XML-schema for a limit is:

<?xml version="1.0" standalone="yes"?>
<NewDataSet>
<Table> ... </Table>

For the newly created limit IEC 60533 we have the following syntax:

<Nome> *Name of the Standard (IEC60533-Table_2)* ***</Nome>***
<Descrizione> *Description (IEC60533-Table_2 for bridge and deck zone)* ***</Descrizione>***
<Etichetta> *Label (e.g. IEC60533-Table_2)* ***</Etichetta>***
<Punti> *Points <***DocumentElement***>* ***</Punti> e.g.***
<Point>1</Point><Frequency>00000000389C7C41</Frequency>><Level>0000000000004B40</Level>
<Unit_Misura> *dBµV* ***</Unit_Misura>***
<VarLinearLog> *true/false (true = Lin / false = Log)* ***</VarLinearLog>***
<Detector> *QP / Pk / C_RMS etc.* ***</Detector>***

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 (Fig. D.17).

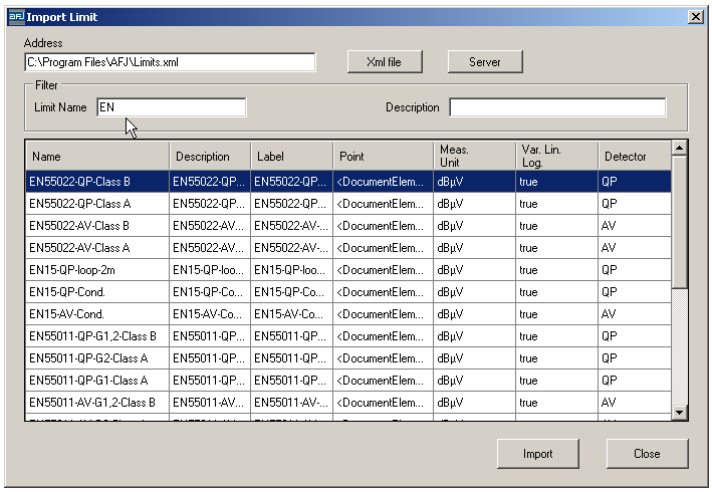


Fig. D.17: Limit Import of an XML-file

D.2.5 • SINGLE TEST SETTINGS

In the *Single Test Settings* section of the Setup window you can change the *Frequency Start* / *Stop* of your scan, *Measurement Time*, *RF Input* connector (*RF IN*), *Attenuator Level* (*Manual* attenuator mode only, please notice that AUTO Attenuator mode is not foreseen; *Preamplifier*) and *Antenna / Probes*, *Cables* and *Amplifiers / Attenuator* of the actual emission chain (Fig. D.18).

Fig. D.18: Single Test Settings section

Measurement Time can be set manually by the operator from 1ms to 5000ms when selecting a single trace with Peak detector only. When another detector is selected (Quasi Peak, CISPR Average, RMS, CISPR RMS or a combination of them), *Measurement Time* will be set automatically to 1000ms independently from the selection of Peak detector and the operator will get a *Warning* message (Fig. D19).

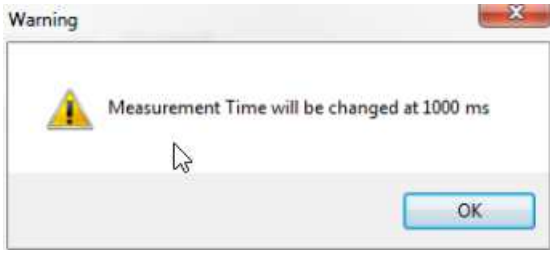


Fig. D.19: Measurement Time set automatically to 1000ms

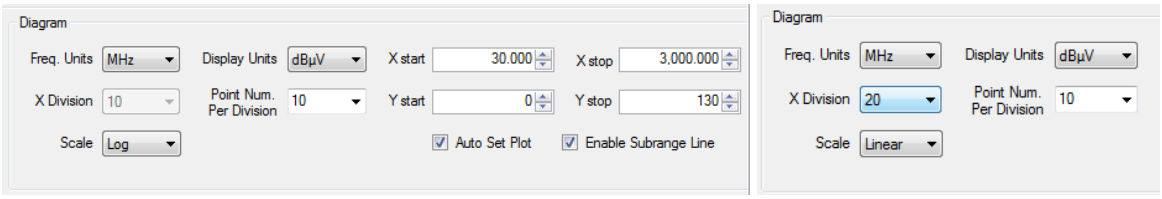
It is possible to select for each trace which limit (*Limit 1*, *Limit 2* or both) to consider during Peak Search function and so to display into the table of the results the *Distance from Limit* of each trace (Fig. D.50).

In the Diagram section of the Setup window 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 spectrum)
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

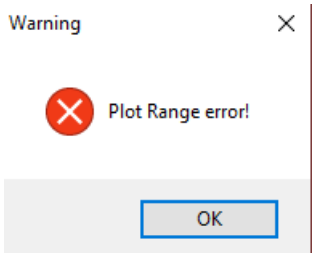
Note: this option is available only with the *Linear scale* for X-axis choice as obvious.

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.20);



D.20: Diagram window. Left: Log scale for X-axis. Right: Linear scale for X-axis.

Autoset Plot: with this option enabled, the graphic will show all measured points, according to X- and Y-axis limits set by the user. When this option is disabled, if the range of the X-axis (Frequency) does not match the frequency range set for the measurement a Message Box (Fig. D.21) will appear to indicate the wrong setting.



D.21: Plot Range error Message Box

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.

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

D.2.6 • INPUT DEVICE CALIBRATION EDITOR (TOOLS MENU)

Before running your test, typically it is necessary to setup your *Antenna or Probe,* measurement *Cable(s),* and optionally also an *Attenuator/Amplifier*.
This task is easily done with the *Input Device Editor* that you find on the menu:

Tools => Input Device Calibration => Input Device Calibration Editor (Fig. D.22)

Fig. D.22: Input Device Editor choice

The window of Fig. D.23 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 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 ±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*.

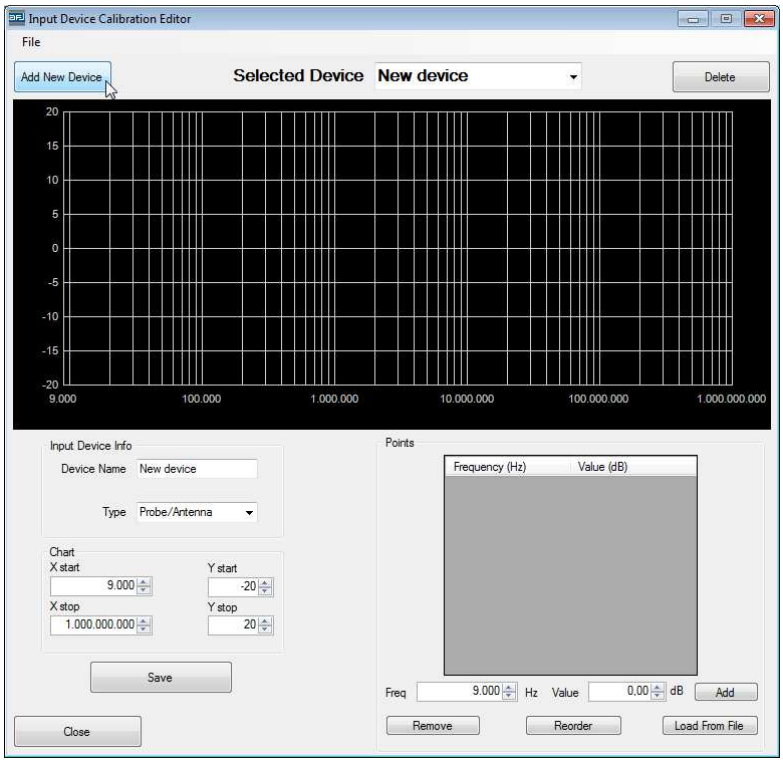


Fig. D.23: Edit Input Device Calibration window

You can press the *Save* button to store your data, the following message appears (Fig. 24):

Fig. D.24: Device calibration updated confirmation

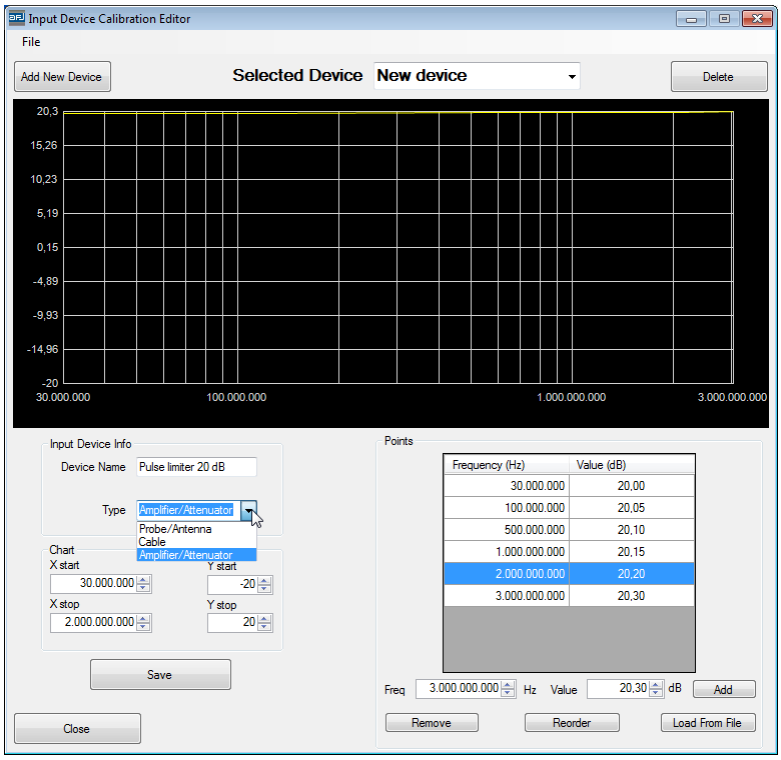
In the next page, we have set the typical parameters for the device calibration of an external attenuator 20 dB Attenuator (Fig. D.25) and one for a log-periodical antenna (Fig. D.26).

In the first case, all data were entered manually, by adding them directly in the *Input Device Calibration Editor*.

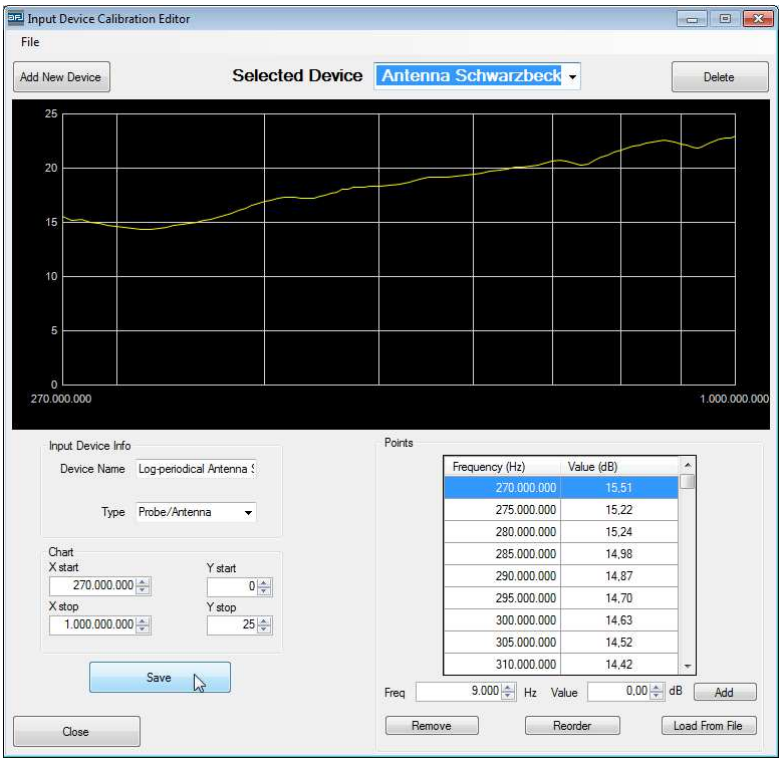
In the second case, the data were imported with the function “Load From File”. For this action, you need to write down a simple Text file with two tab delimited fields - use Export Text (tab delimited) from Excel, Notepad or a similar editor - with the couple values of frequency expressed in Hz and the antenna factor.

An example of a such file is here:

```
270000000     15.51
275000000     15.22
280000000     15.24
285000000     14.98
290000000     14.87 etc.
```



D.25: Input Device Calibration parameters for an external 20 dB Attenuator



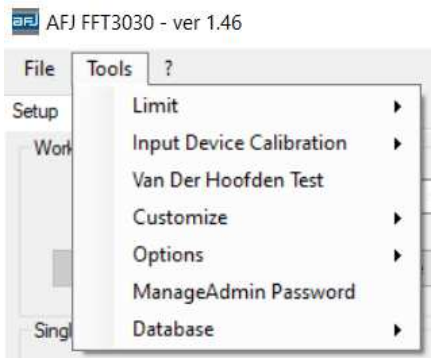
D.26: Input Device Calibration parameters for a log-periodical antenna

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.

It is possible to protect with User / Password the access to the *Input Device Calibration Editor* .
See § D.2.10 for further information.

D.2.7 • TOOLS MENU

The other commands found in the Tools menu are as shown in Fig. D.27:



D.27: Commands of the Tools menu

Van Der Hoofden Test for calculating F factor from peak detector measurement sweep into the frequency range f=20kHz÷10MHz when using FFT 3010 and FFT 3030 EMI Receivers with Van Der Hoofden Test Head model AFJ VDH 30 according to IEC 62493 Ed. 2.0:2015-03 standard (*Assessment of lighting equipment related to human exposure to electromagnetic fields*) (Fig. D.28).

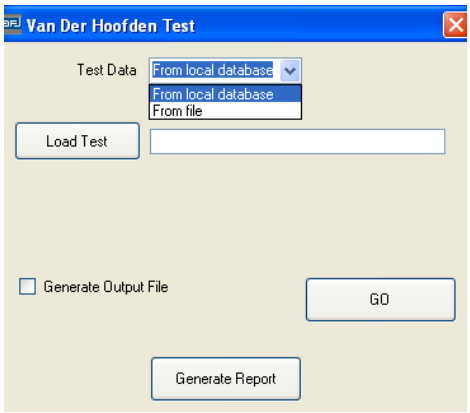


Fig. D.28: Van Der Hoofden Test Software Tool

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≤1) or “FAIL” (F>1) indication (Fig. D.29), with the possibility to generate at the same time an output *.txt file *(Generate Output File)* with the following information:

frequency (Hz); test level (dBµV); current density Jcap(f) (A/m^2); electric field Ecap(f) (V/m)

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

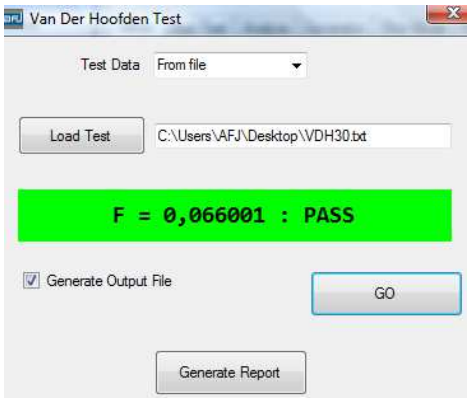


Fig. D.29: Van Der Hoofden Test Result

D.2.8 • CUSTOMIZE (TOOLS MENU)

From this menu, you can change the palette color appearance of the software windows/report and the information showed in the report.

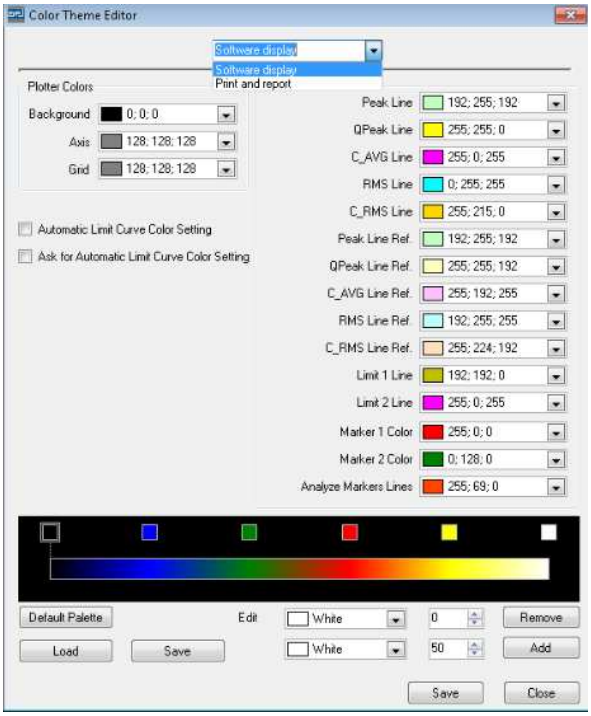
Customizing your Colors

Tools => Customize => Colors

Here you can change colors for Software Display and Print/ Report (Fig. D.30).

The colors for the lines and the Max Hold lines with different detectors (Peak, QPeak, C_AVG, RMS/C_RMS) as well as for limits 1 & 2 and the Reference line can be changed at will.

The Plotters colors refers to background, axis and grids of the spectrum in the Run/Analyze mode. For instance, you can set the background to white (255, 255, 255 RGB) instead of default black.



D.30: Color Theme Editor

The first time you open this window, the option “Ask for Automatic Limit Curve Color Setting” is checked. If you leave it such way, then the following window will appear (Fig. D.31):

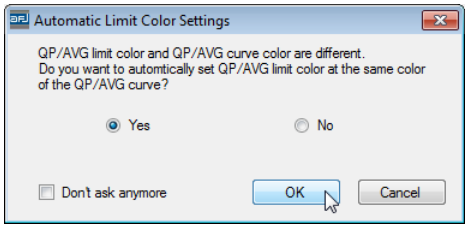


Fig. D.31: Automatic Limit Color Settings for QP/AVG limits

If you answer “Yes” then the other flag for “Automatic Limit Curve Color Setting” will be checked.
If you answer “No” and “Don’t ask anymore” then the flag for “Ask for Automatic Limit Curve Color Setting” will be unchecked.

Customizing your Reports

Tools => Customize => Report

In this window (Fig. D.32), you can edit some Report options, namely Report Title & Comments (three lines possible). You can set also the “Show Date and Time” & “Show Subrange Settings” options.

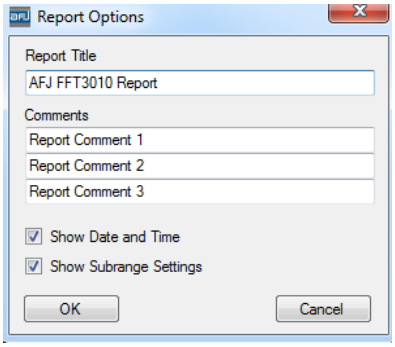


Fig. D.32: Report Options

D.2.9 • OPTIONS (TOOLS MENU)

Tools => Options => Peak Search Setting

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), *Max Peaks Number, Threshold From Limit (dB)* and *Show All Detected Peaks* (Fig. D.33).

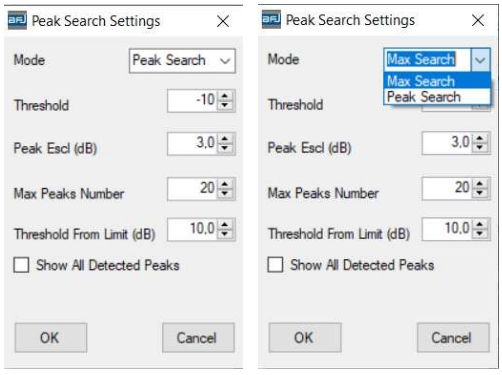


Fig. D.33: Peak Search Settings

Note: The Peak Search will be effective only if a Limit is selected and associated to the detector of the *Trace 1* in the Single Test Settings part of the *Setup* cockpit (Fig. D.34):

Fig. D.34: Limit selection on Single Test Settings section

***Threshold (dBμV)*:** this parameter allows to set a minimum limit to the max/peak search routine, i.e. no peaks are considered below this level. The default value is -10dBμV, which is below the noise limit. So, in practice, that 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 (dB): this parameter allows to search only the peaks having a difference of more than [Peak Escl] from the local minima just aside the peak. The default value of this parameter is 6dB.
Max Peaks 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 (max. 200 peaks).
***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.
***Show All Detected Peaks (dB)*:** all the values of the detectors used during the measurement associated to the detected peaks by the max/peak search routine will be shown.

Note: **"Threshold**", **"Peak Escl"** and "**Threshold From Limit**" parameters distinguish various kinds of peaks and their maximum 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 the inquiry in manual mode.

Tools => Options => Plot Screenshot Settings

The *Plot Screenshot Settings* window lists Width/Height pixel size for the output bitmap of the working spectrum. Default *Plot Screenshot Size* is 710 x 425 pixel but it is recommended to set it at least double (1420 x 850 pixel).

Tools => Options => Language

Selection between English (default) and Chinese.

D.2.10 • MANAGE ADMIN PASSWORD (TOOLS MENU)

It is possible to protect with User / Password the access to the *Input Device Calibration Editor* selecting:

Tools => Manage Admin Password (Fig. D.35)

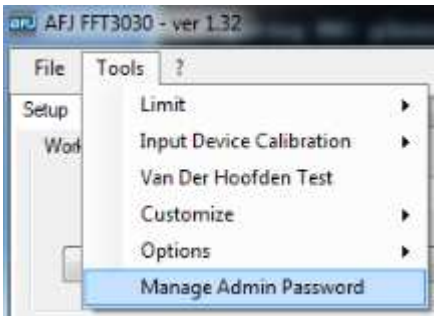


Fig. D.35: Manage Admin Password selection

User / Password are set by default to Admin / Admin and without any updating the User Name / Password Message Box will not appear when accessing the *Input Device Calibration Editor*.
For updating the Password it is necessary to input the old Password and the new Password with the consequent confirmation (Fig. D.36).

Fig. D.36: Password updating

After pushing *OK* the Message Box with *Updated Admin Password* confirmation will appear (Fig. D.37).

Fig. D.37: Updated Admin Password confirmation

After updating the Password when accessing the *Input Device Calibration Editor* the User / Password Message Box will appear (Fig. D.38).

Fig. D.38: User / Password Message Box

D.2.11 • DATABASE (TOOLS MENU)

When the database size exceeds 50% of the available space, a warning message appears at the bottom of the *Setup* box (Fig. D.39):

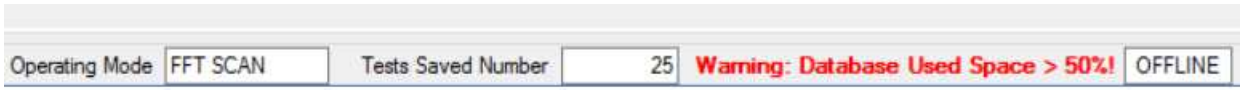


Fig. D.39: Warning message when database size exceeds 50% of the available space

In case the database size exceeds 80% of the available space, further the warning message at the bottom of the *Setup* box (Fig. D.40) another warning message in a separated window appears with the recommendation to delete some old or unnecessary test data to reduce the database size (Fig. D.41).

Fig. D.40: Warning message when database size exceeds 80% of the available space

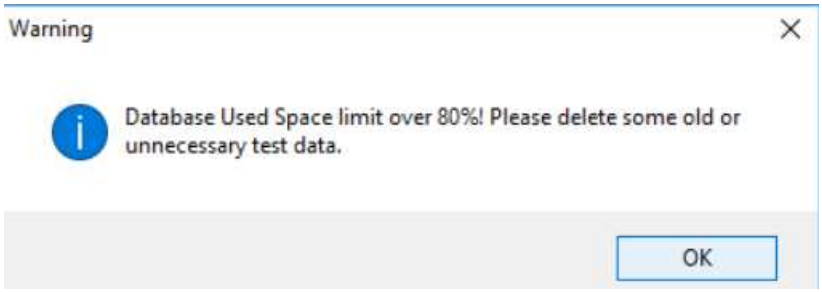


Fig. D.41: Warning window when database size exceeds 80% of the available space

It is possible to manage the database selecting:

Tools => Database (Fig. D.42)

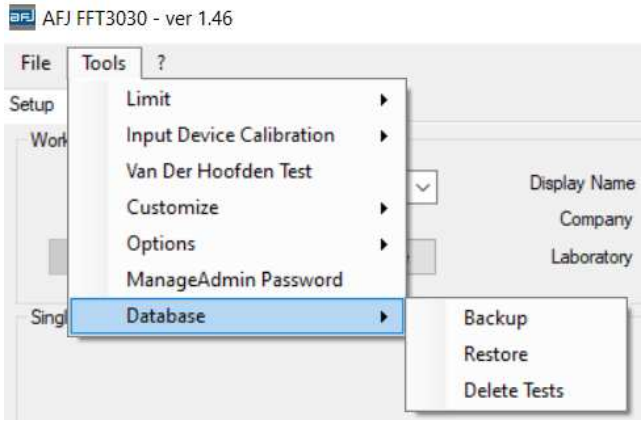


Fig. D.42: Database selection

Tools => Database => Backup

To copy the actual database in the backup folder created automatically by the software:

C:\Users\...\Documents\AFJ\DB\BACKUP

After completing successfully the backup of the actual data base (*.bak file) a confirmation message will appear (Fig. D.43).

Fig. D.43: Database backup confirmation

Tools => Database => Restore

To restore a previous copy of the database loading a *.bak file from the list (Fig. D.44).

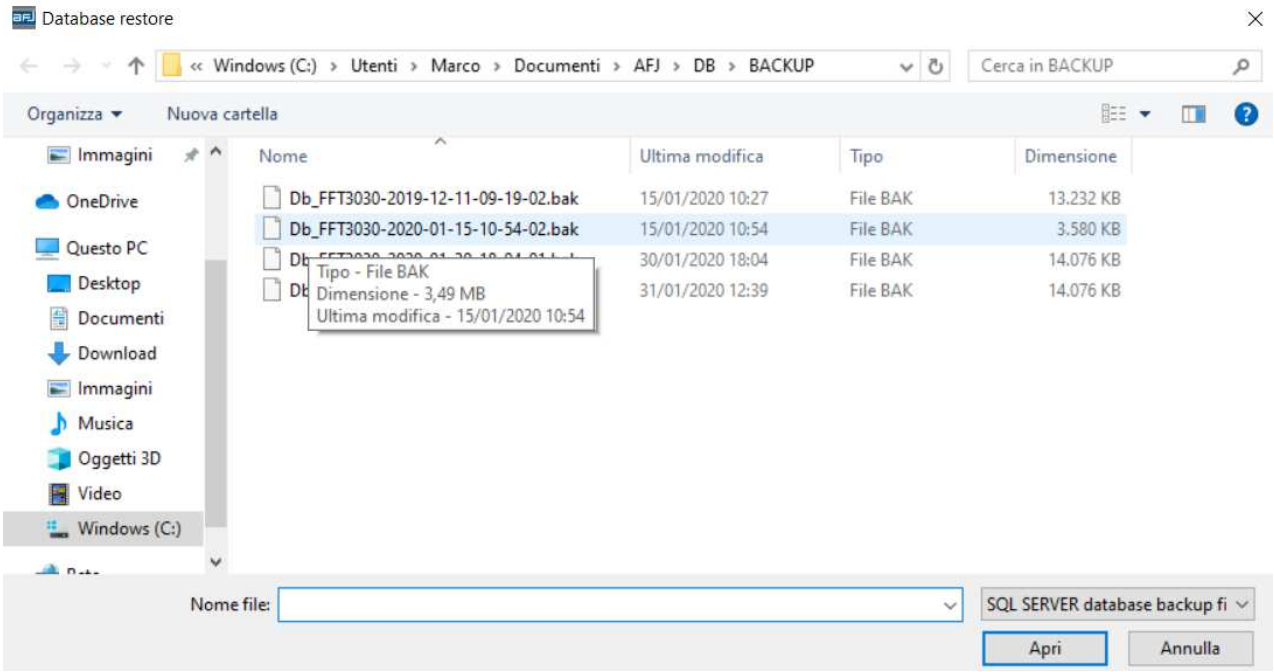


Fig. D.44: Selection of the database file to restore

After completing successfully the restore of a copy of the database (*.bak file) a confirmation message will appear (Fig. D.45).

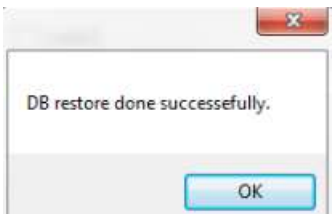


Fig. D.45: Database restore confirmation

Tools => Database => Delete Tests

To delete from the actual database all the tests before of a date selected by the operator (Fig. D.46).

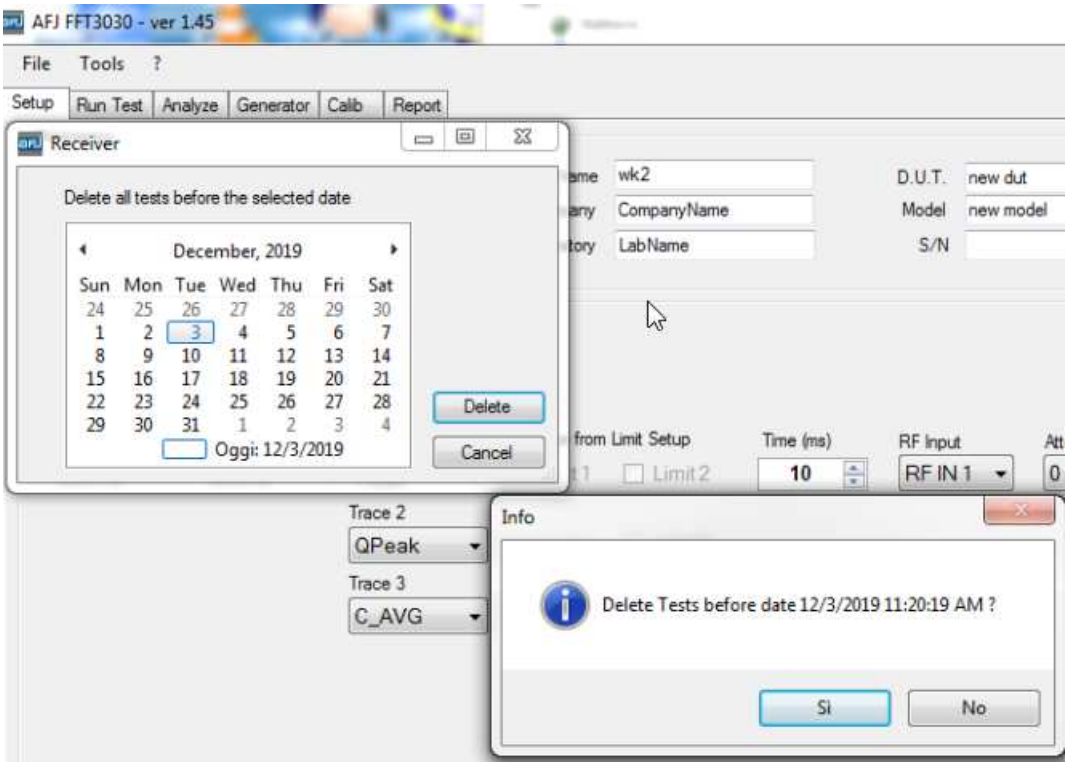


Fig. D.46: Delete tests before a date defined by the operator

After completing successfully the deletion of all the tests a confirmation message will appear (Fig. D.47).

Fig. D.47: Deletion confirmation

D.3 • 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 box depicted in Fig. D.48 will appears.

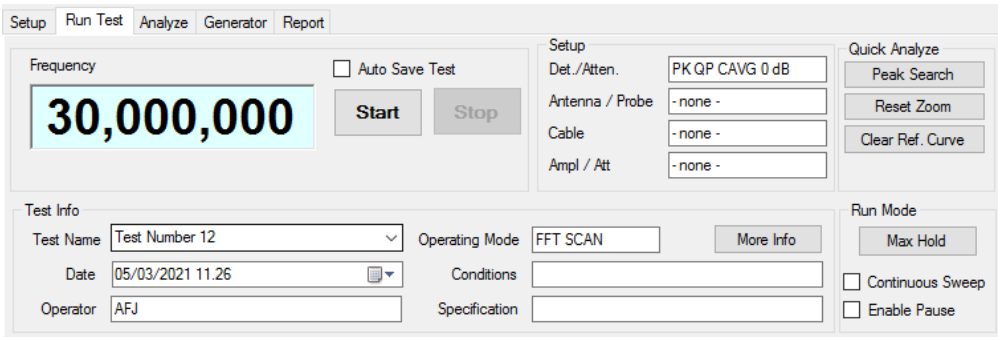


Fig. D.48: Frequency section of Run Test Box

The scan/sweep will now proceed according to all the parameters (frequency ranges, detectors, limits, traces, etc.) you have chosen in the previous paragraphs (Fig. D.49).

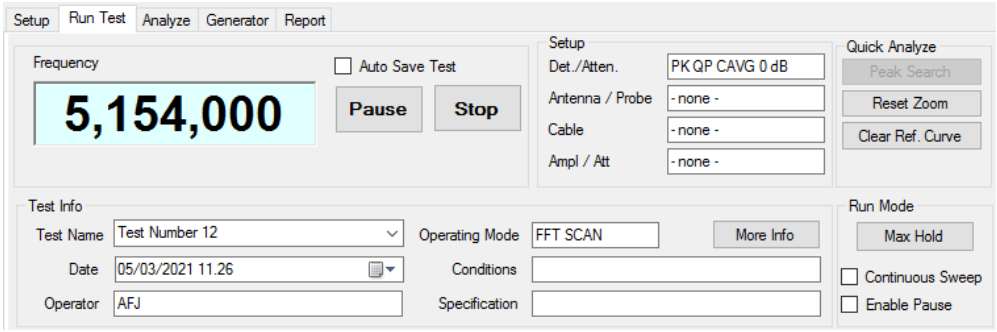


Fig. D.49: Frequency section of Run Test Box during measuring

Selecting *Pause* button the measurement will be interrupted manually by the operator and such button will become red indicating such condition (Fig. D.50).

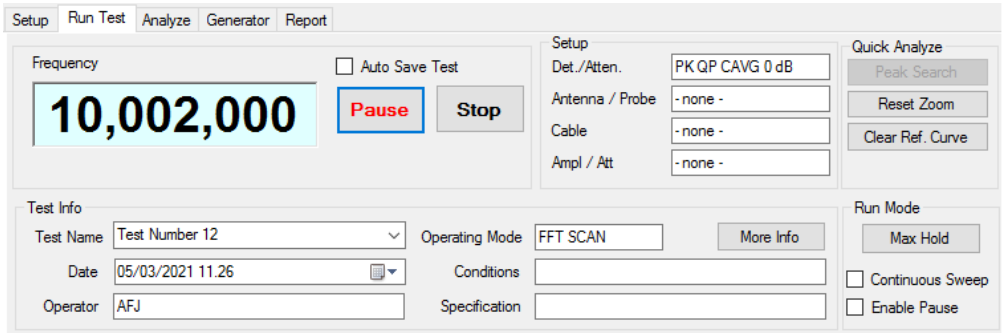


Fig. D.50: Frequency section of Run Test Box during pausing condition

Selecting again *Pause* button the measurement will continue, meanwhile with *Stop* button the measurement will be interrupted definitively by the operator.

If *Auto Save Test* is not flagged (default choice), then at the end of each measurement, the following window appears (Fig. D.51):

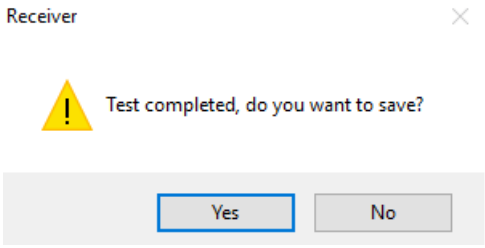


Fig. D.51: Test terminated saving confirmation

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

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.4).

In our example, the conducted emission measurement on the EUT is performed from 150 kHz to 30 MHz in the *FFT Scan* mode with Peak, Quasi Peak, CISPR Average, Bandwidth 9 kHz, with 1 s measuring time. The result of the actual measurement is shown in Fig. D. 52, as seen from the *Run Test* box.

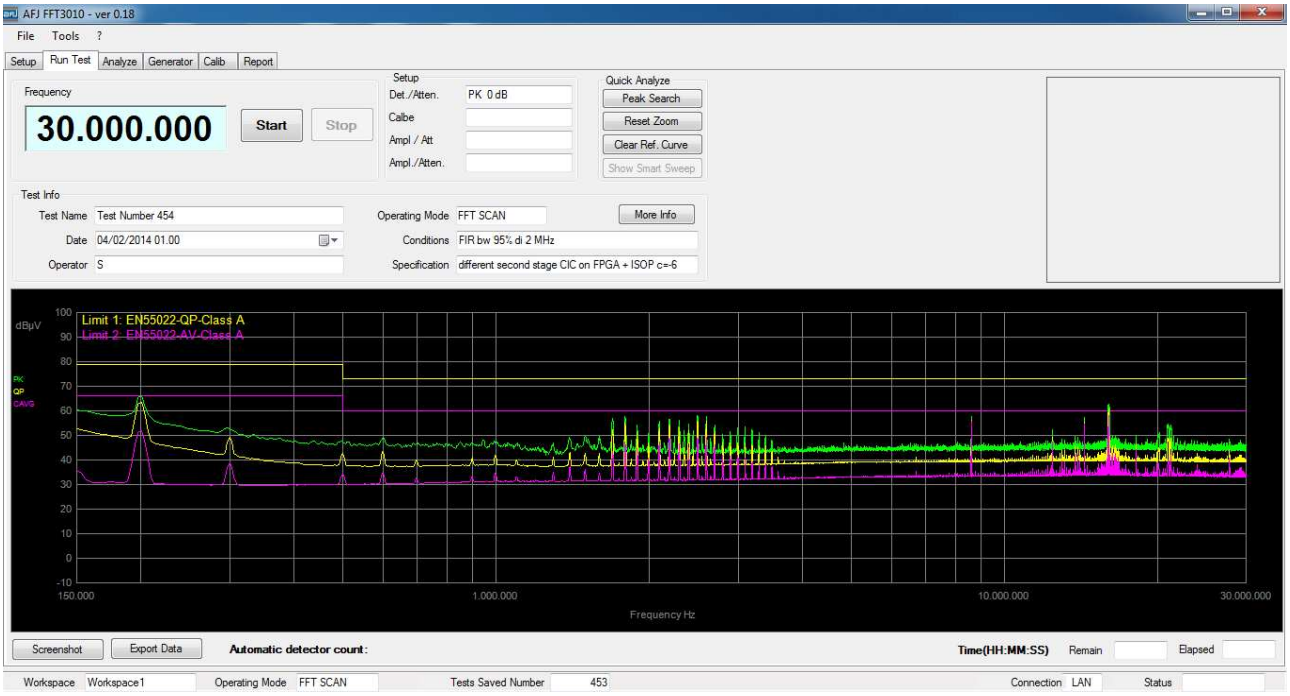


Fig. D.52: A frequency spectrum of conducted emission measurement from 150 kHz to 30 MHz

D.3.1 • RUN TEST SECTIONS

The *Setup* section shows:

- *Detectors* in use, namely *PK* (green), *QP* (yellow), *C_AVG* (violet) and the value of the internal *Attenuator* or the use of the internal preamplifier (Preamp);
- the presence / absence of any *Probe/Antennas* in use during the measurement;
- the presence / absence of any *Cable* in use during the measurement;
- the use of an external pulse limiter (for example AFJ PAT20M attenuator & pulse limiter) as *Amplifier/Attenuator*.

The *Quick Analyze* section is the most important section where the measurements can be checked (Fig. D.53).

Fig. D.53: Quick Analyze section

The *Peak Search* function will show the following table sorted by *Distance from Limit* (Fig. D.54).

Peak Search - Report

Sort By: Distance from Limit | Add with click | Del Row | Enable All | Disable All | Clear Table

	Freq	Antenna / Probe Factor [dB]	Cable Factor [dB]	Ampl / Att Factor [dB]	Detector	Meter Read [dBµV]	Meas. Level [dBµV]	Limit 1 [dBµV]	Limit Dist	Limit 2 [dBµV]	Limit 2 Dist	Enable
1	186kHz	0,05		19,94	QPeak	47,93	67,92	64,21	3,70			☑
2	261kHz	0,05		19,94	QPeak	44,99	64,98	61,40	3,58			☑
16	264kHz	0,05		19,94	QPeak	44,53	64,52	61,30	3,22			☑
3	336kHz	0,05		19,94	QPeak	40,64	60,63	59,30	1,33			☑
17	339kHz	0,05		19,94	QPeak	40,43	60,42	59,23	1,20			☑
4	411kHz	0,05		19,94	QPeak	34,85	54,84	57,63	-2,79			☑
18	414kHz	0,05		19,94	QPeak	34,68	54,67	57,57	-2,90			☑
5	483kHz	0,05		19,94	QPeak	30,48	50,47	56,29	-5,82			☑
19	486kHz	0,05		19,94	QPeak	29,97	49,96	56,24	-6,27			☑
6	633kHz	0,05		19,94	QPeak	29,05	49,04	56,00	-6,96			☑
20	636kHz	0,05		19,94	QPeak	28,75	48,74	56,00	-7,26			☑
7	558kHz	0,05		19,94	QPeak	28,59	48,58	56,00	-7,42			☑
21	561kHz	0,05		19,94	QPeak	27,67	47,66	56,00	-8,34			☑
8	150kHz	0,05		19,95	QPeak	36,62	56,62	66,00	-9,38			☑
9	22,119MHz	0,10		19,98	QPeak	28,62	48,70	60,00	-11,30			☑
10	780kHz	0,05		19,95	QPeak	20,67	40,67	56,00	-15,33			☑
22	783kHz	0,05		19,95	QPeak	20,57	40,57	56,00	-15,43			☑
11	855kHz	0,05		19,95	QPeak	18,86	38,86	56,00	-17,14			☑
24	711kHz	0,05		19,95	QPeak	18,57	38,57	56,00	-17,43			☑
12	453kHz	0,05		19,94	QPeak	19,38	39,37	56,82	-17,45			☑
25	858kHz	0,05		19,95	QPeak	18,46	38,46	56,00	-17,54			☑
23	450kHz	0,05		19,94	QPeak	18,96	38,95	56,88	-17,92			☑

Report | Close

Fig. D.54: 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.

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

If a Limit is not selected and associated to the detector of the *Trace 1* in the Single Test Settings part of the *Setup* cockpit, selecting the *Peak Search* function the following warning message will appear (Fig. D.55):

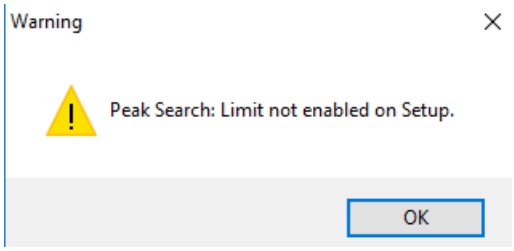


Fig. D.55: Peak Search function warning message

You have also the choices or by clicking directly on the table headers labeled as *Meter Read* [dBµV], namely the reading at main EMI 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:

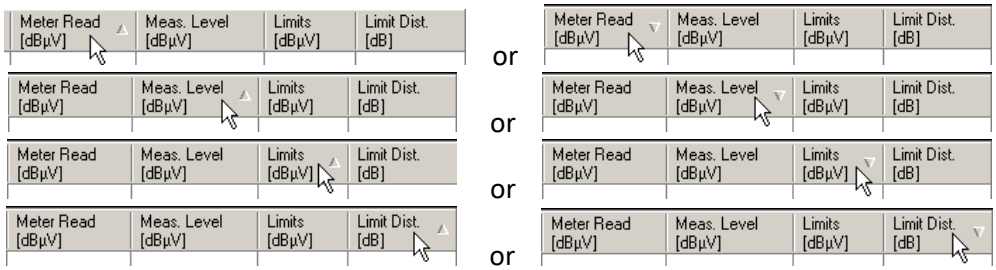
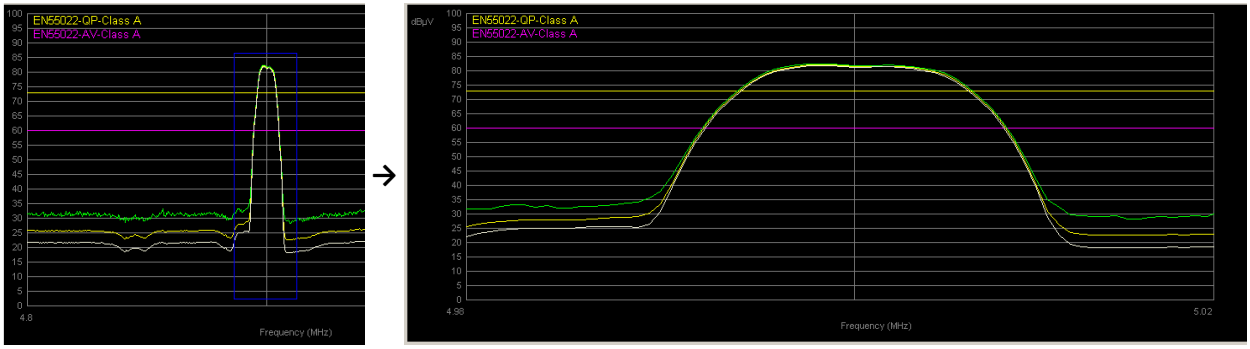


Fig. D.56: Ordering Peak Search table by *Meter Read.*, *Meas. Level*, *Limits*, *Limit Distance*.

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.57 A); 2) after you release it a blue rectangle appears and the area is zoomed (Fig. D.57 B):



A B

Fig. D.57: 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.53).

The *Clear Ref. Curve* button in the *Quick Analyze* section (Fig. D.53) allows to clear the spectrum loaded pressing *Load Reference* button in Run Test window and select a test from the list (Fig. D.60).

You can use the Max Hold function by clicking *Max Hold* button in the *Run Mode* section of the *Run Test* box and set if you want to perform a *Continuous Sweep* as well. Pressing *Max Hold* button the function will be activated and the button will switch its name to *Reset* in red color (Fig. D.58).

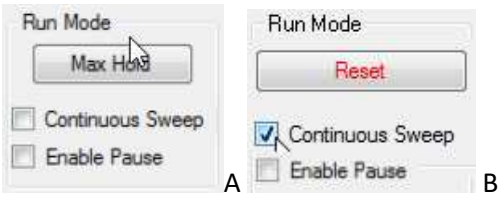


Fig. D.58: Setup Max Hold section. A: Max Hold inactive; B: Max Hold active, with *Continuous Sweep* ON

Selecting *Continuous Sweep* function the measurement sweep will be repeated until the operator stops the test manually; selecting "*Enable Pause*" function at the end of each measurement sweep the test system will be in "*Pause*" status showing a Message Box to give the possibility to decide when to continue with the next measurement sweep (Fig. D.59).

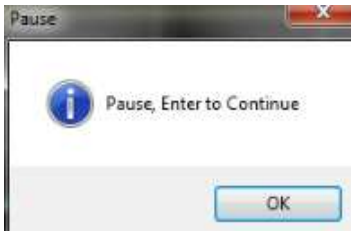


Fig. D.59: Pause Message Box

At this point, all traces and limits in the *Single Test Settings* are frozen to their current states and any change to them is not possible 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.

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 less any detail of your image, but still save disk space, the PNG-format for your plot is suggested (Fig D.60 and D.61).

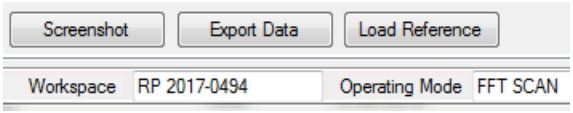


Fig. D.60: *Screenshot, Export Data* and *Load Reference* buttons

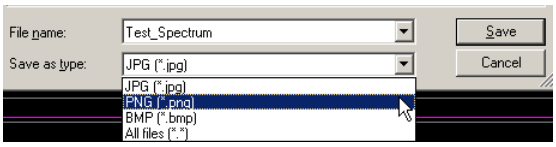


Fig. D.61: *Saving in JPG/PNG/BMP* files

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.62).

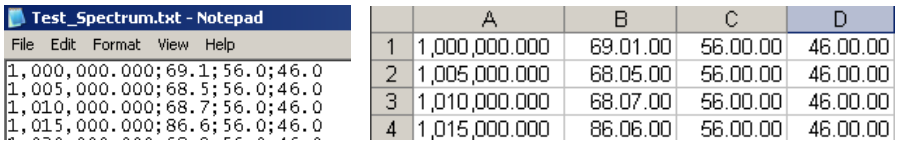


Fig. D.62: Text file saved with Export Data and imported in a spreadsheet (Excel)

In the *Test Info* section of the *Run Test* box (Fig. D.63) 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.).

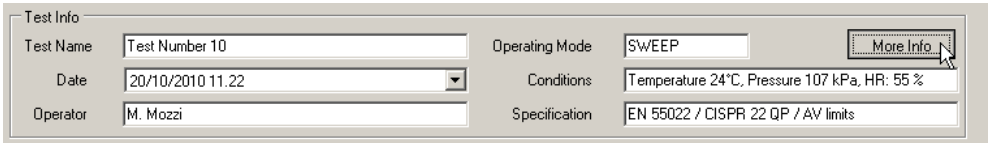


Fig. D.63: Test Info section of Run Test box

You can introduce a list of possible different *Test Name* loading into the following directory:

C:\Program Files (x86)\AFJ\AFJ FFT3010 (AFJ FFT3030)

a text file called *TestName.txt* according to the example shown in Fig. D.64.

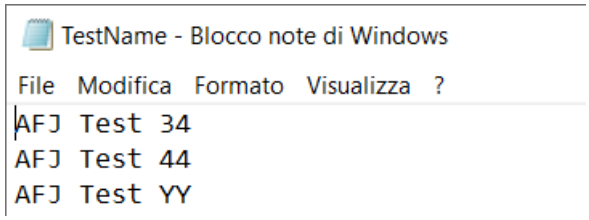


Fig. D.64: Example of *TestName.txt* file

After restarting the client software the *Test Info* section will show a list of possible different *Test Name* as per Fig. D.65.

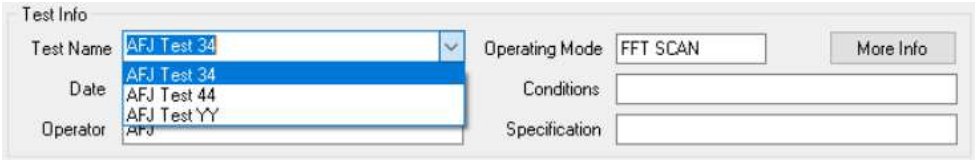


Fig. D.65: Test Info section of Run Test box

Now you can click to *More Info* button and the *Test Info* window opens (Fig. D.66).

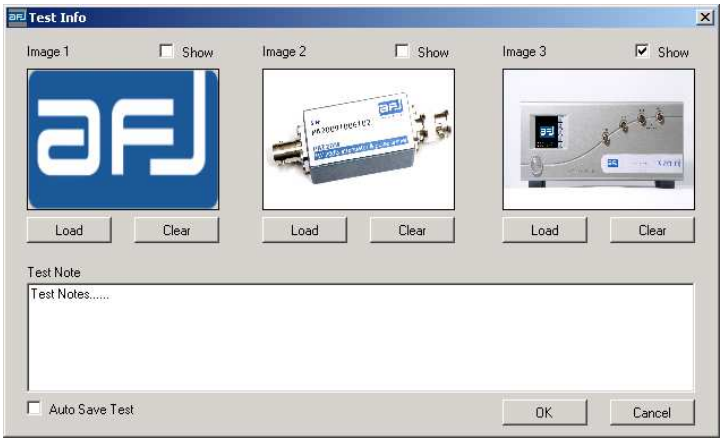


Fig. D.66: Test Info window with three loaded images

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* window (Fig. D.67), and you can add your *Test Note* about the current performed test.

Fig. D.67: Showing your *Test Info* image on *Run Test* window

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.68.

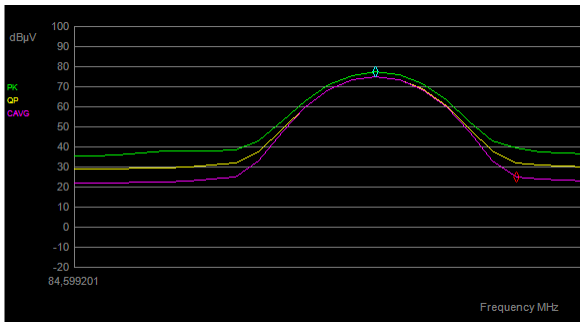


Fig. D.68: *Markers* MK1 (red) and MK2 (light blue) in a spectrum

The relative measurements of the enabled detectors values will be put in the upper right portion of the spectrum as depicted in Fig. D.69.

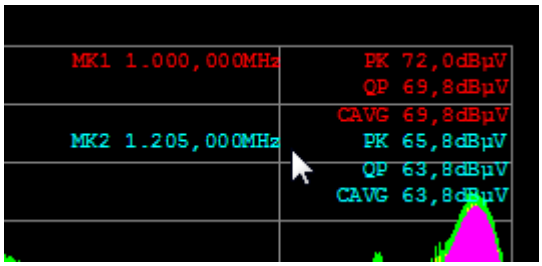


Fig. D.69: Marker 1 an 2 readings in the displayed spectrum

When Van Der Hoofden Test operating mode is selected, at the end of the measurement the software will automatically show the F factor with either “PASS” (F≤1) or “FAIL” (F>1) indication (Fig. D.70).

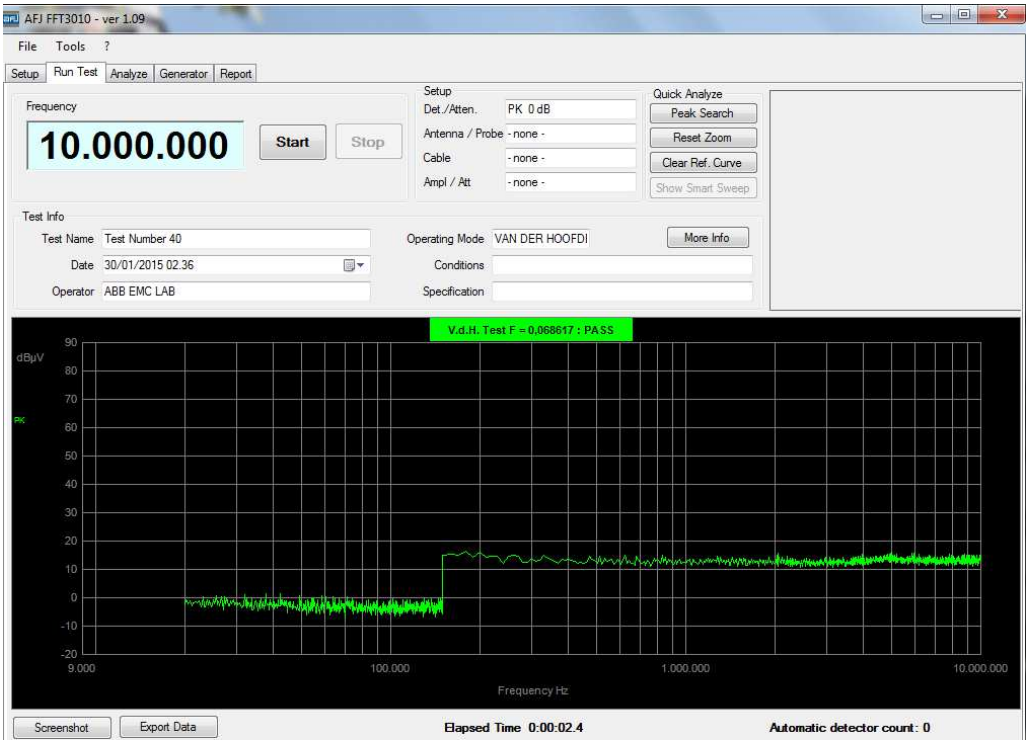


Fig. D.70: Van Der Hoofden Test result

After saving the measurement data, it will be possible to load it and calculate again the F factor with the possibility to generate a test report using the software tool described at the paragraph D.2.7.

If during a scan / sweep the SERVER COMMUNICATION FATAL ERROR message appears in the *Run Test* window (Fig. D.71), FTDI (Future Technology Devices International) component for internal USB communication of the equipment is not running properly and so please contact service center.

Fig. D.71: SERVER COMMUNICATION FATAL ERROR message in *Run Test* window

D.4 • 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 at the same time. The initial appearance of the Analyze Box is apparent from Fig. D.72.

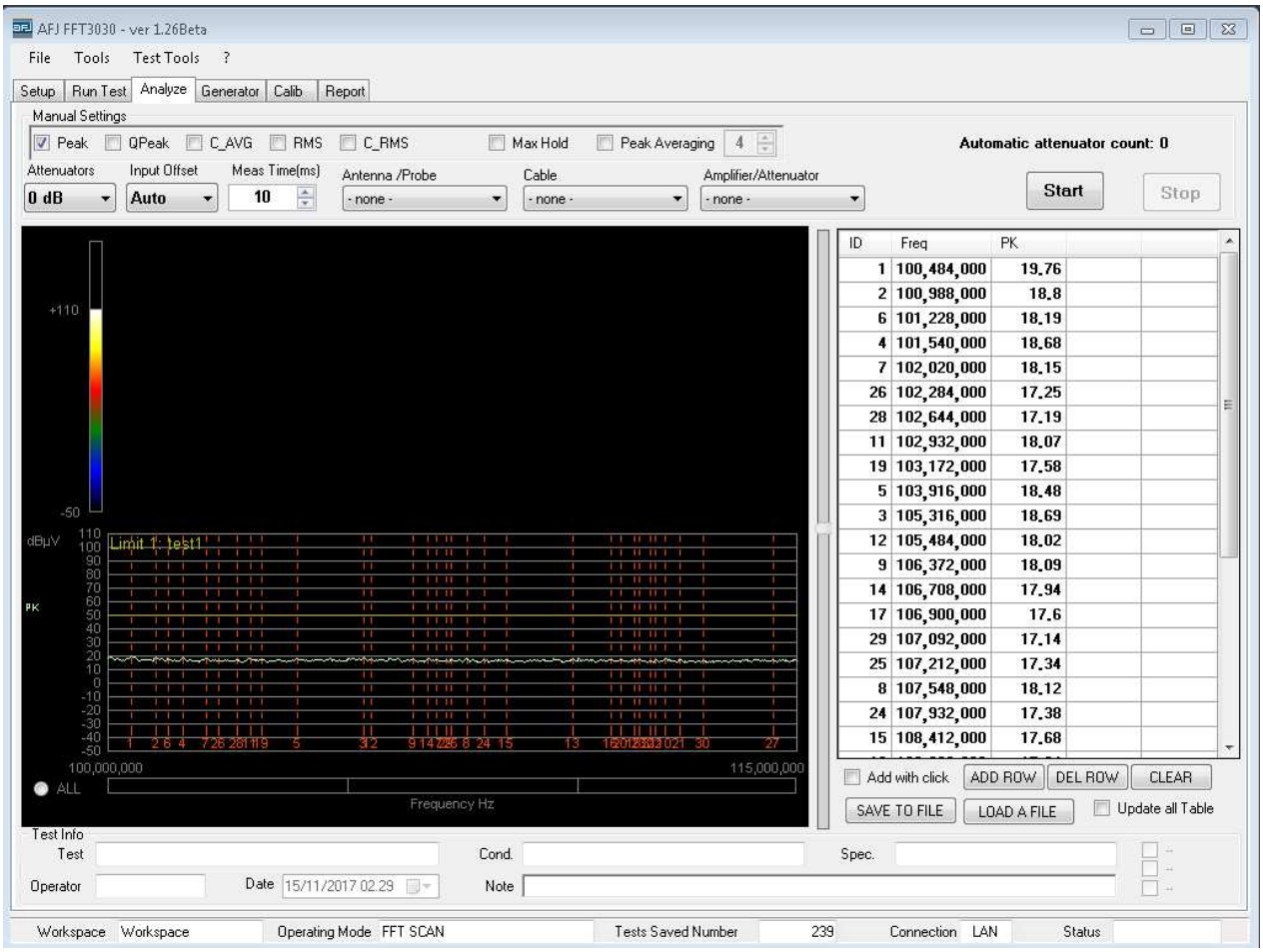


Fig. D.72: The Analyze Test Box

In the *Analyze box* you can *Load Test*, make a *Peak Search*, *Export Data, Generate Report*, make a *Screenshot*, *Print* and *Reset Zoom* (Fig. D.73).

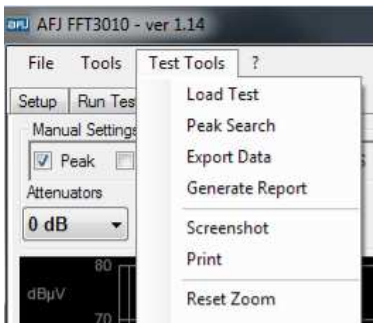


Fig. D.73: *Test Tools* menu of Analyze box

Load Test. This button has much utility and different options. It opens the *Test Management* window where you can load any of performed tests (Fig. D.74).
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 it will automatically use as a reference spectrum for data analysis (it will superimpose to your actual real time running test), *Delete Selected Tests* (you can select more than one Test by clicking on each Test while holding down the *Ctrl* button) and *Close*.

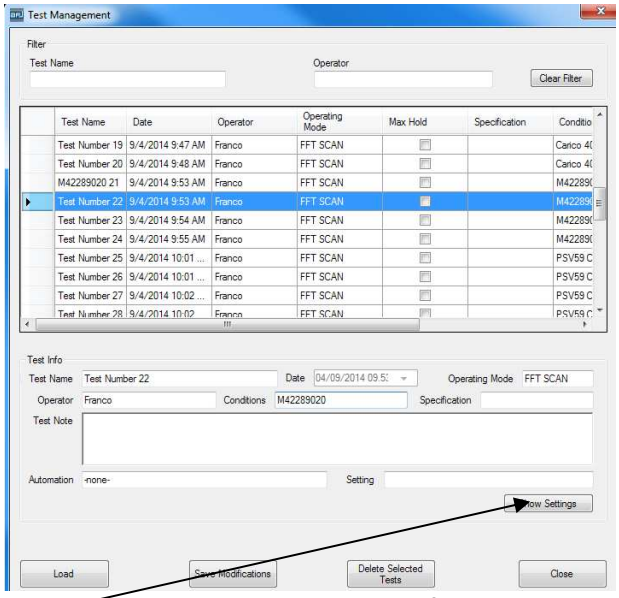


Fig. D.74: *Test Management* table for Load Test

Pressing *Show Settings* button for the selected test, a window with all information on run test opens (Fig. D.75).

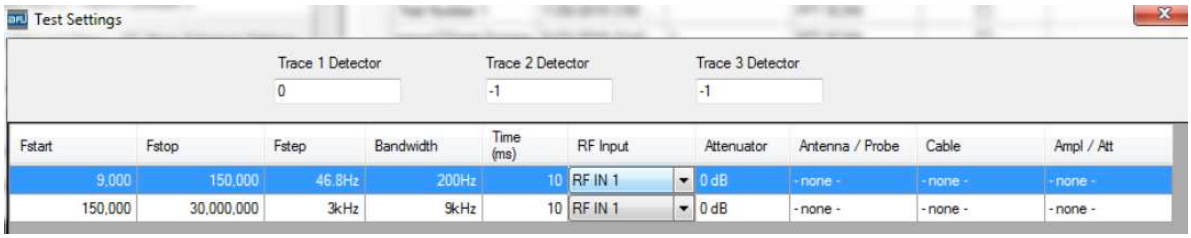
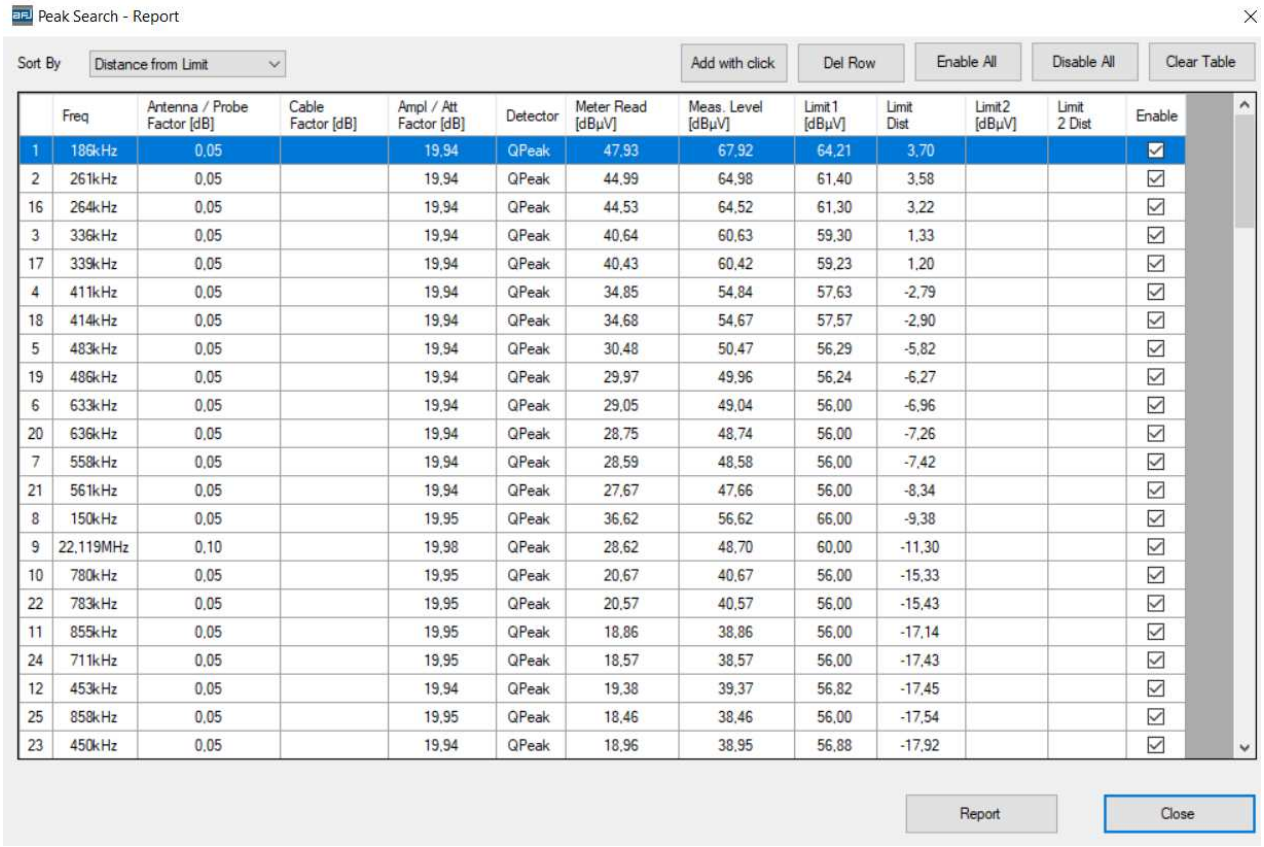


Fig. D.75: *Test Settings* for a Load Test

With reference to the example shown at Fig. D.71, the loaded Test is automatically use as a reference spectrum for data analysis reporting the waveforms with faded colors and the indication of the three detectors with (R), so PK(R), QP(R) and CAVG(R).
Pushing the *Start* button, the real time measurement will be performed reporting the waveforms with standard colors and the indication of the three detectors will be as usual PK, QP and CAVG. The actual real time running measurement will be compared with the reference spectrum. The waveforms of the reference spectrum of the loaded Test can be enable / disable using the checkbox on right-lower part of the Analyze box, see Fig. D.72.

Peak Search. This will open the Peak Search – Analyze window (Fig. D.76)



	Freq	Antenna / Probe Factor [dB]	Cable Factor [dB]	Ampl / Att Factor [dB]	Detector	Meter Read [dBµV]	Meas. Level [dBµV]	Limit1 [dBµV]	Limit Dist	Limit2 [dBµV]	Limit 2 Dist	Enable
1	186kHz	0,05		19,94	QPeak	47,93	67,92	64,21	3,70			☑
2	261kHz	0,05		19,94	QPeak	44,99	64,98	61,40	3,58			☑
16	264kHz	0,05		19,94	QPeak	44,53	64,52	61,30	3,22			☑
3	336kHz	0,05		19,94	QPeak	40,64	60,63	59,30	1,33			☑
17	339kHz	0,05		19,94	QPeak	40,43	60,42	59,23	1,20			☑
4	411kHz	0,05		19,94	QPeak	34,85	54,84	57,63	-2,79			☑
18	414kHz	0,05		19,94	QPeak	34,68	54,67	57,57	-2,90			☑
5	483kHz	0,05		19,94	QPeak	30,48	50,47	56,29	-5,82			☑
19	486kHz	0,05		19,94	QPeak	29,97	49,96	56,24	-6,27			☑
6	633kHz	0,05		19,94	QPeak	29,05	49,04	56,00	-6,96			☑
20	636kHz	0,05		19,94	QPeak	28,75	48,74	56,00	-7,26			☑
7	558kHz	0,05		19,94	QPeak	28,59	48,58	56,00	-7,42			☑
21	561kHz	0,05		19,94	QPeak	27,67	47,66	56,00	-8,34			☑
8	150kHz	0,05		19,95	QPeak	36,62	56,62	66,00	-9,38			☑
9	22,119MHz	0,10		19,98	QPeak	28,62	48,70	60,00	-11,30			☑
10	780kHz	0,05		19,95	QPeak	20,67	40,67	56,00	-15,33			☑
22	783kHz	0,05		19,95	QPeak	20,57	40,57	56,00	-15,43			☑
11	855kHz	0,05		19,95	QPeak	18,86	38,86	56,00	-17,14			☑
24	711kHz	0,05		19,95	QPeak	18,57	38,57	56,00	-17,43			☑
12	453kHz	0,05		19,94	QPeak	19,38	39,37	56,82	-17,45			☑
25	858kHz	0,05		19,95	QPeak	18,46	38,46	56,00	-17,54			☑
23	450kHz	0,05		19,94	QPeak	18,96	38,95	56,88	-17,92			☑

Fig. D.76: P*eak Search - Analyze* data, sorted by Distance from Limit

Remarks:

Antenna / Probe Factor [dB] is the antenna / probe factor expressed in dB

Cable factor [dB] is the cable factor expressed in dB

Ampl / Att Factor [dB] is the attenuator factor for cable or amplifier/attenuator at the selected frequency in dB

Detector is the type detector in use: Peak, Qpeak, C_AVG, RMS, C_RMS

Meter Read [dBµV] is the meter reading (V) expressed in dBµV

Meas. Level [dBµV] is the measured level (expressed in dBµV

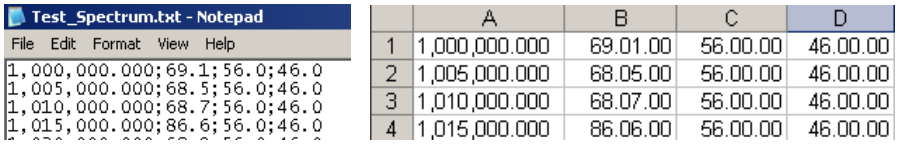
Limit1 [dBµV] is the value of the chosen limit 1 at the selected frequency

Limit1 Dist [dB] is the margin from limit 1 at the selected frequency: a negative value is below the limit (compliant), a positive value is over the limit (not compliant)

Limit2 [dBµV] is the value of the chosen limit 2 at the selected frequency

Limit2 Dist [dB] is the margin from limit 2 at the selected frequency: a negative value is below the limit (compliant), a positive value is over the limit (not compliant)

Export Data. 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.77).



	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.77: Text file saved with Export Data and imported in a spreadsheet (Excel)

Generate Report. It enables to easily create a report of the loaded test. After a few instants a window opens with your customized test report (See § E.2 for more details and information).

Screenshot. 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 less any detail of your image, but still save disk space, the PNG-format for your plot is suggested.

Print. This prints the display in a "XPS" document with the colors chosen in the Customize Colors => Print and Report section of the Color Theme Editor. Before printing, it opens the system *Page Setup* Print dialogue box, default page orientation is landscape, with 10 mm distance from all margins.

Reset Zoom. This restore the display to its original form, by resetting any previous zoom (it works only if a Zoom was active). 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.78 A); 2) after you release it, a blue rectangle appears and the area is zoomed (Fig. D.78 B):

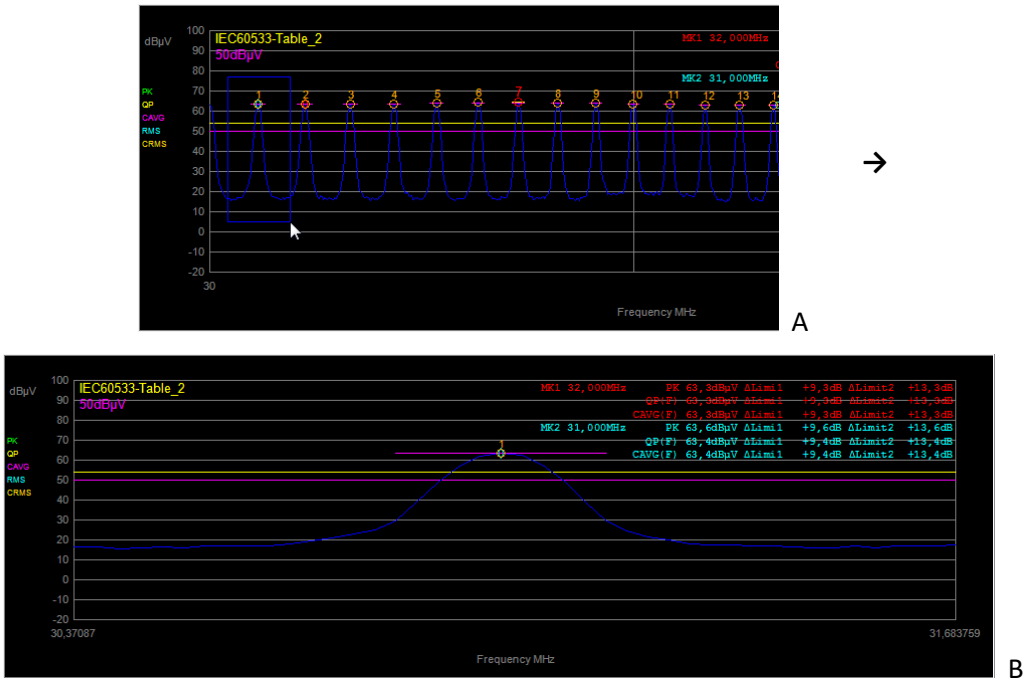


Fig. D.78: Manual Zoom on Emission Spectrum

If you want to come back to the initial view (without Zoom), you must choose *Test Tools* => *Reset Zoom* in the *Analyze* box.

Checking the right side of the *Analyze* box, it is possible to add manually more points on the frequencies list selecting "Add with click" and using the mouse right-click on the graphic (Fig. D.79).
Pushing the *Start* button, the real time measurement will be performed at all the frequencies of the list only with up to three different detectors at the same time. Pushing "Add Row" button, it is possible to add manually other new points on the frequencies list during the real time measurement (Fig. D.80).

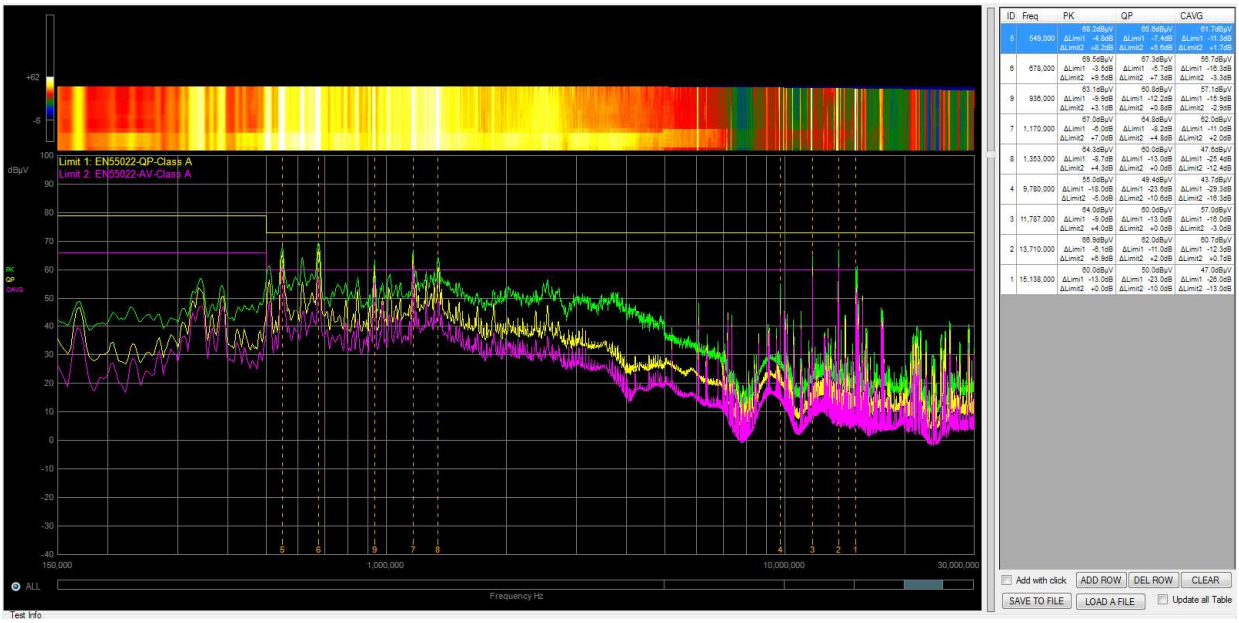


Fig. D.79: Manual addition of points on the frequencies list

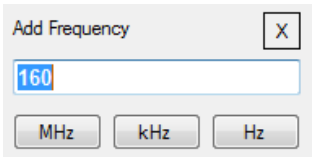


Fig. D.80: Manual addition of points on the frequencies list

"Delete Row" button allows to remove a selected frequency from the list and the "Clear" button allows to delete all the frequencies of the list.
"Save To File" button allows to save into a file the list of all the frequencies of the table with all the last real time measurements performed. Such file can be loaded again selecting "Load A File" button. To update the real time measurements of all the frequencies of the table it is necessary to select "Update all Table" checkbox.

The lowest part of the Analyze box window is the so-called *Test Info* (Fig. D.81), including the information saved in the *Test Management* window. These comprise *Test Name* (default one is *Test Number* with a progressive number), name of the *Operator, Date* of test (default is the current system date), *Conditions* (the ambient test conditions), *Specification* (Standards, limits, etc…) and *Note*.

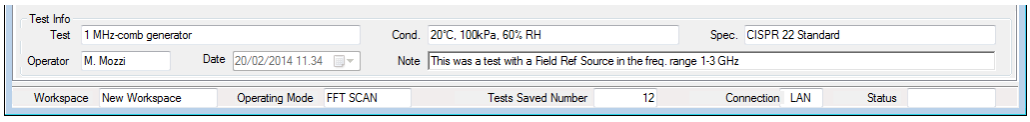


Fig. D.81: Test Info section of Run Test box

Also into the Analyze window you can easily work with one or two markers with the same procedure described into the Run Test box (section D.3.1, Fig. D.68 and D.69).

D.4.1 • THE MANUAL SETTINGS SECTION

In the *Manual Settings* section 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) at Fig. D.82.

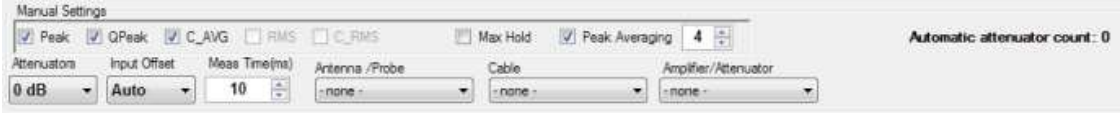


Fig. D.82: Manual Settings of detectors, attenuators, etc.

The Attenuators (0 / 10/ 20 / 30 dB or PREAMP), the Input Offset (Auto/Disabled) and the Measuring Time (ms) can also be set by the end user.
It is possible to include correction factors coming from external devices included into the measurement setup (Antenna/Probe, Cable, Amplifier/Attenuator).
You can use the Max Hold function by flagging *Max Hold* option.
It is possible to display on the diagram the average of the last N measurements with Peak detector only by flagging *Peak Averaging* option and introducing the number of measurements (in the example shown on Fig. D.82, N=4).
The Automatic attenuator count indication shows how many times the internal attenuators has been set automatically by the system during measurement.

D.4.2 • THE REAL TIME VISUALIZATION

Further than the numerical indication of the table on the right side of the *Analyze* box, during real time measurement it is also possible to check the measured signal amplitude at the selected frequencies through waterfall visualization (Fig. D.83). To obtain the waterfall visualization it is necessary to move down the cursor indicated on the red rectangle on Fig. D.83. Moving up and down the same cursor it is possible to adjust the visualization dimensions of both diagrams (waterfall and frequency sweep).

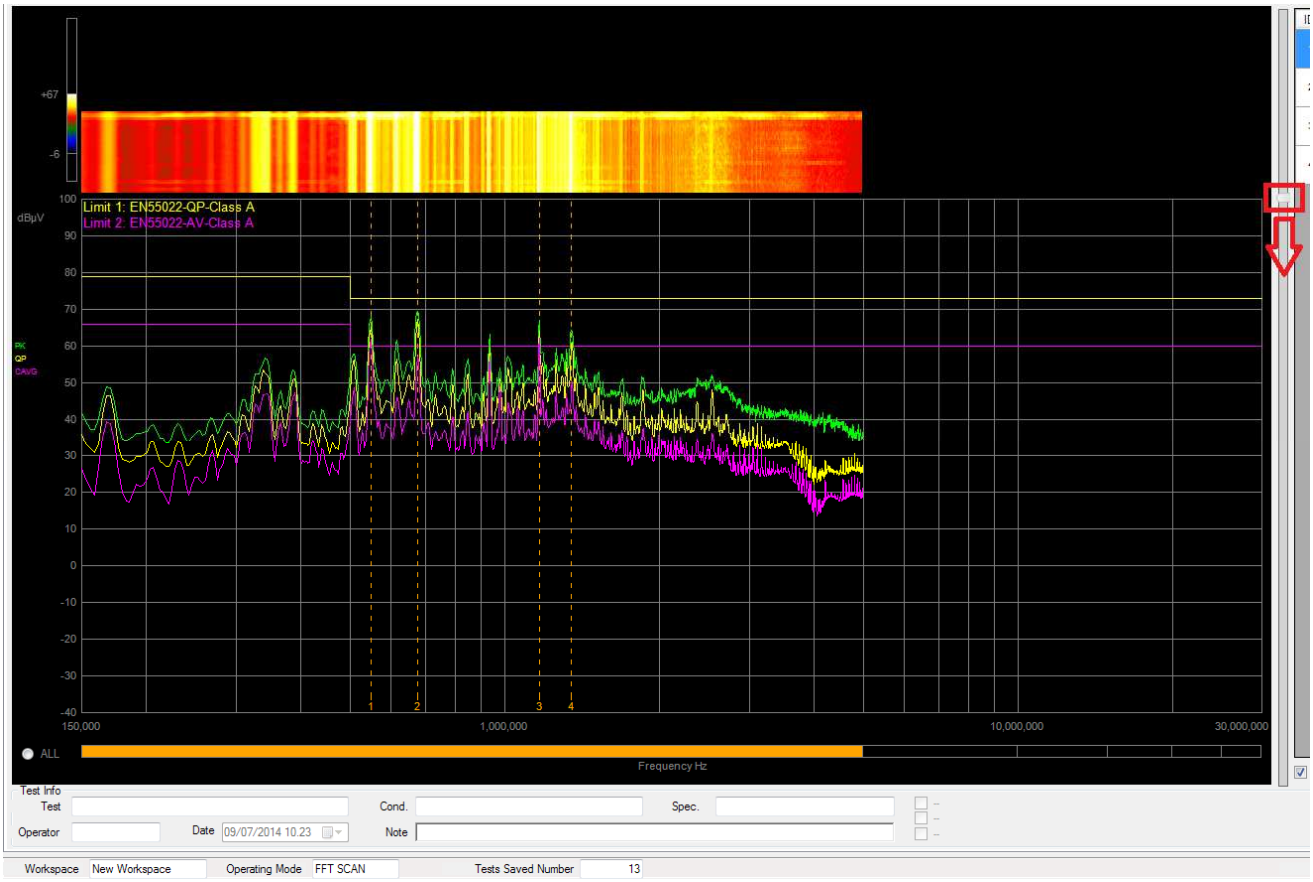


Fig. D.83: Waterfall visualization

With mouse right-click on the lower part of the graphic, it is possible to select one of the FFT bands of the whole frequency range and the real time measurement will be performed into the selected single FFT band.

Pushing “ALL” button, the real time measurement will be performed into the whole frequency range.

D.5 • CW GENERATOR BOX

CW Generator is the so-called *Internal Signal Generator* Box. It is depicted in Fig. D.84.

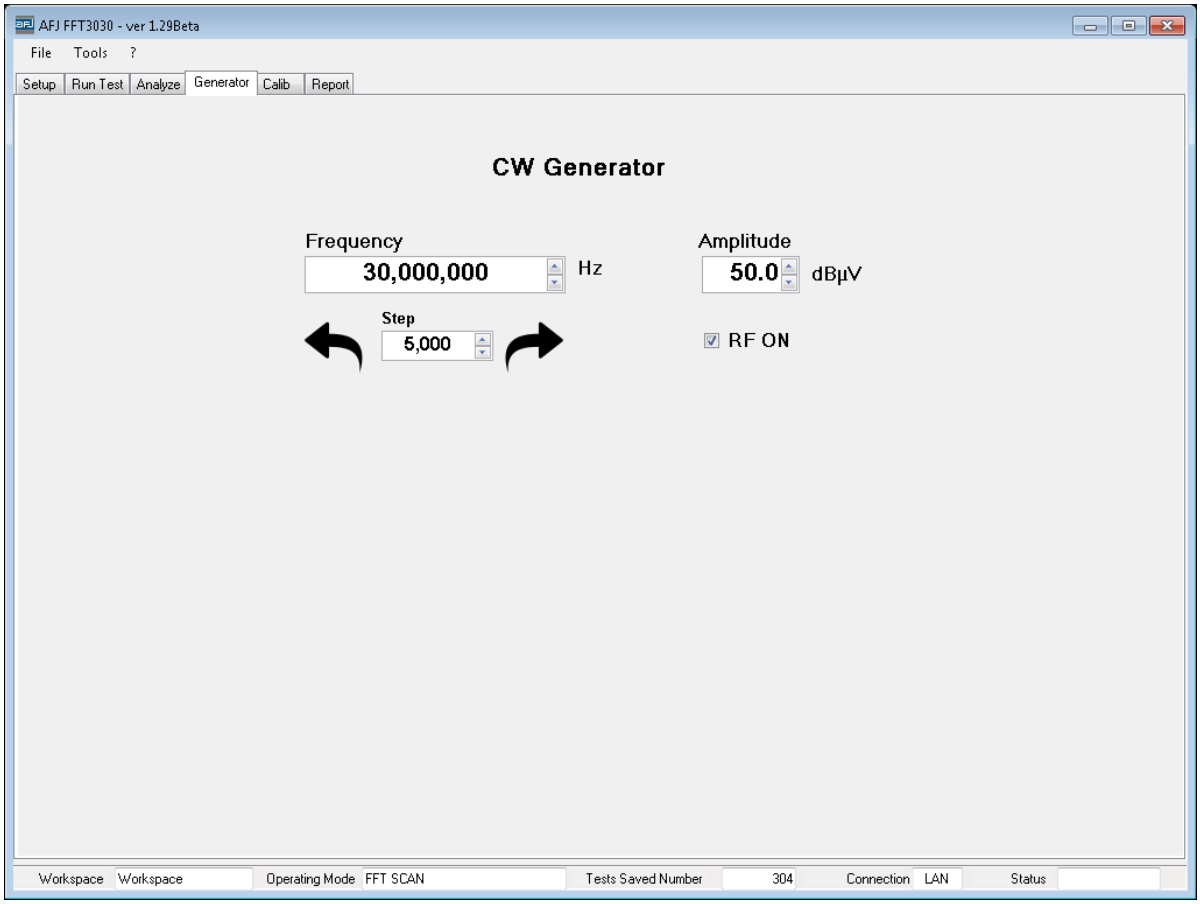


Fig. D.84: CW Generator Box

The CW Generator has to be activated by checking flag RF ON after setting the frequency and the amplitude.
The operator can quickly increase / decrease the value of the frequency according to the set frequency step pushing the black arrows.
The *Amplitude* range is from +50 dBµV to +90 dBµV for the *Frequency* range from 9 kHz to 110 MHz.

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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).

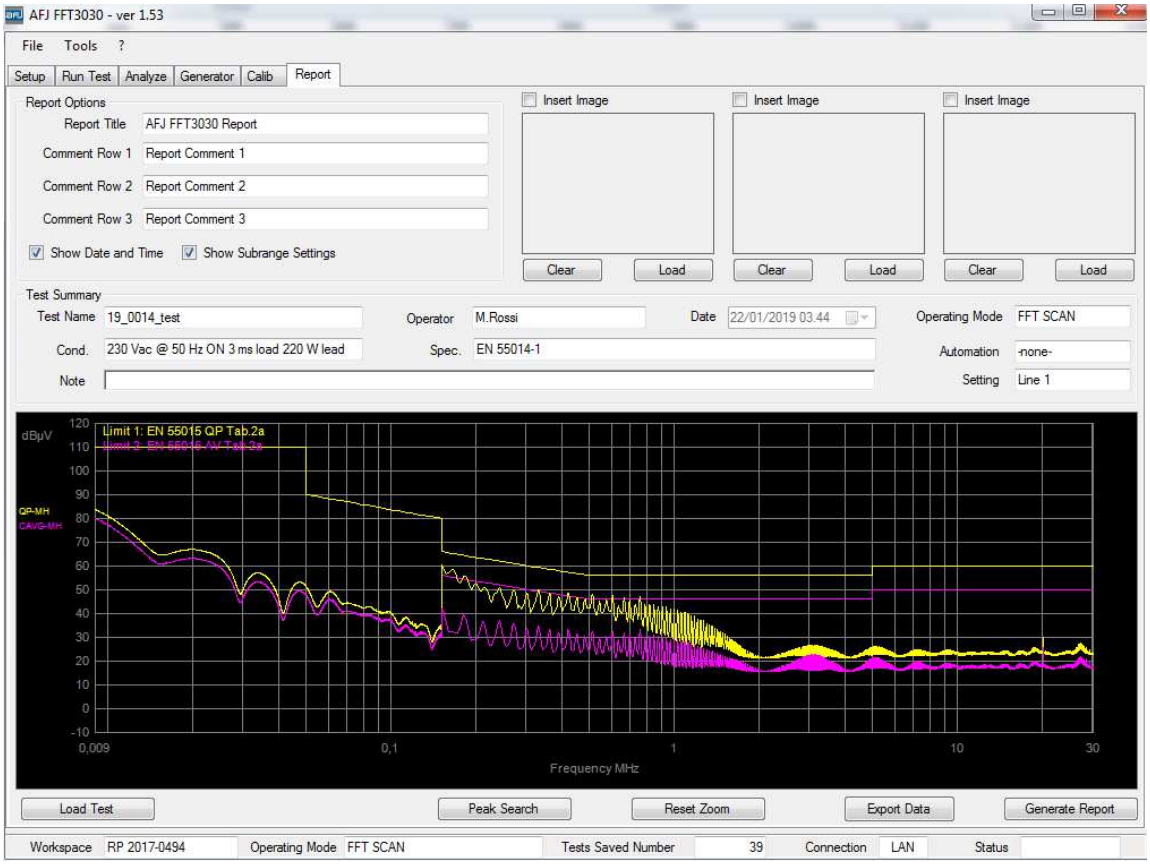


Fig. E.1: The Report Box

In the *Report* box you can *Load Test*, make a *Peak Search, Reset Zoom* (if any), *Export Data* and *Generate Report* (see next paragraph E.2).
Load Test will open the well-known *Test Management* table (Fig. E.2).

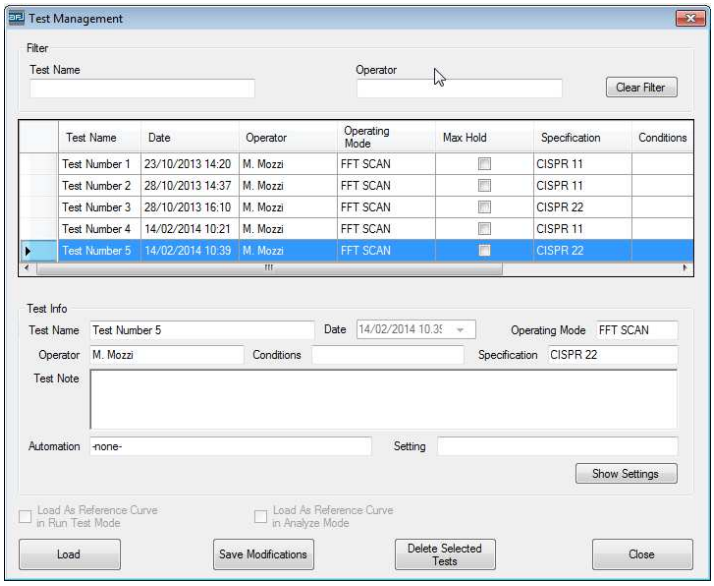


Fig. E.2: *Test Management* in *Report* box

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).

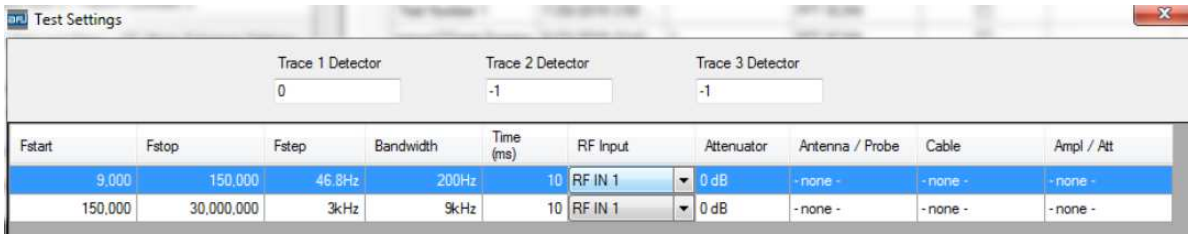


Fig. E.3: *Test Settings* in *Report* box

Remember that you can customize the *Report Options* information, under the menu:

Tools => *Customize* => *Report*.

A window summarizing the following information is apparent:

Title	Add a title to your Report
Comment 1 to *Comment 3*	Add three lines of comments to your Report
Show Date and Time	Add current date and time to your Report
Show Subrange Settings	Add subrange information to your Report

See Fig. E.5 for details.

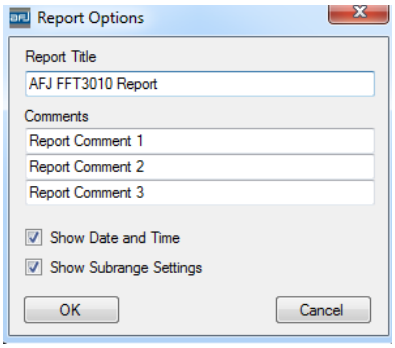


Fig. E.4: *Report* Options window

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 report (Fig. E.5).
Here you can make many actions as

Export	Export as an Excel, PDF and Word file

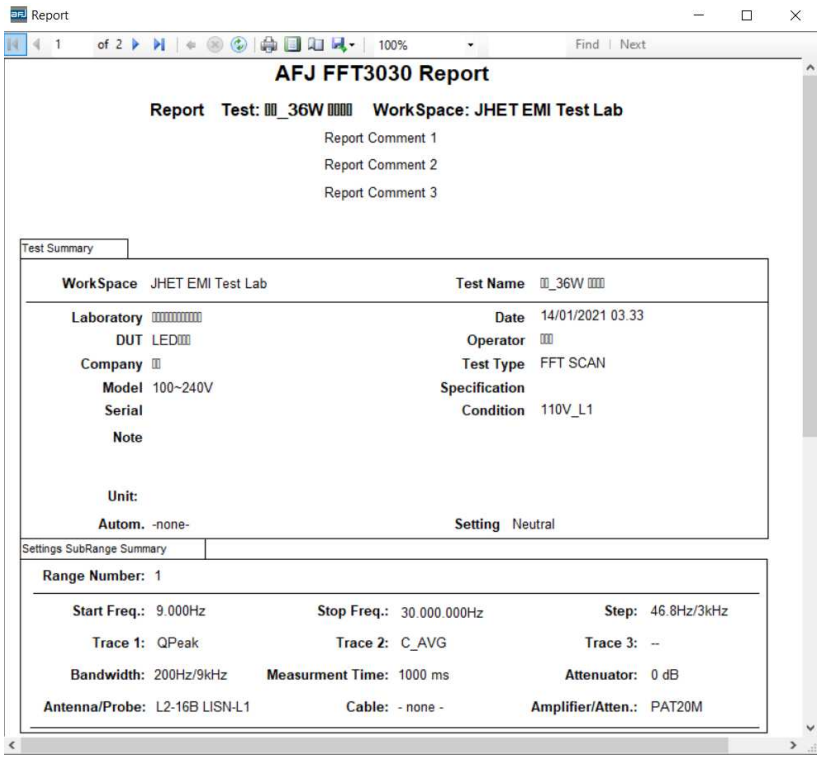


Fig. E.5A: *Report* window (Page 1 / 2)

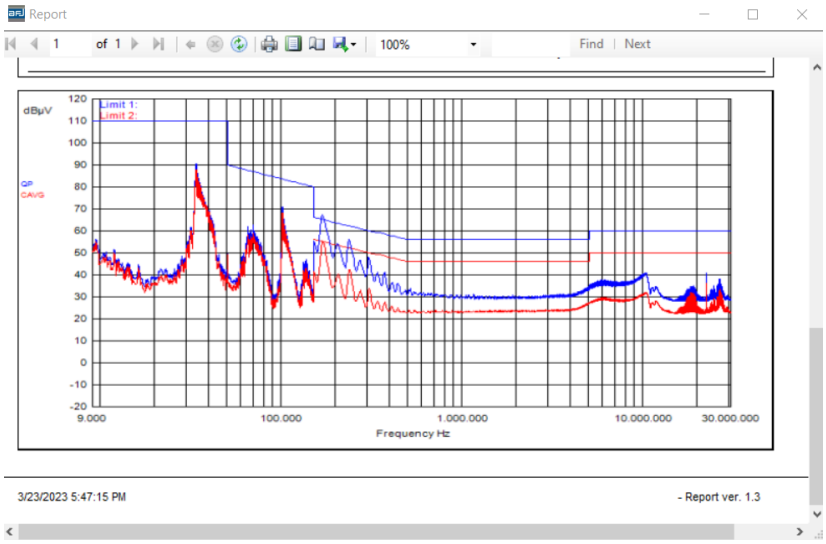


Fig. E.5B: *Report* window (Page 2 / 2)

In the headings you can navigate on different pages, print on paper, choose a print layout, see the page setup for different paper-format, and save it as a file: PDF, Excel and Word file are allowed (Fig. E.7).

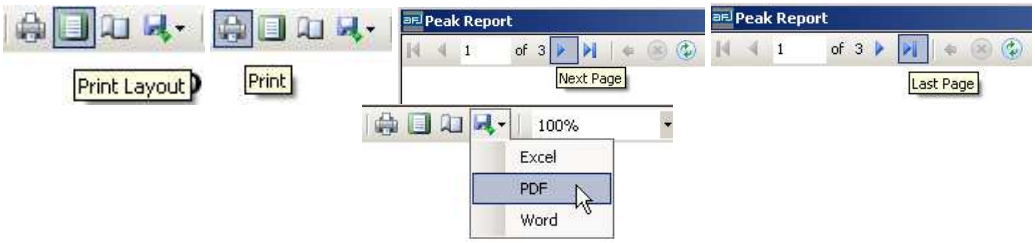


Fig. E.7: Navigation, Print, Print layout, Export as Excel / PDF / Word file

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

AFJ FFT3010 Report

Report Test: LED Device WorkSpace: AFJ EMI Test Lab

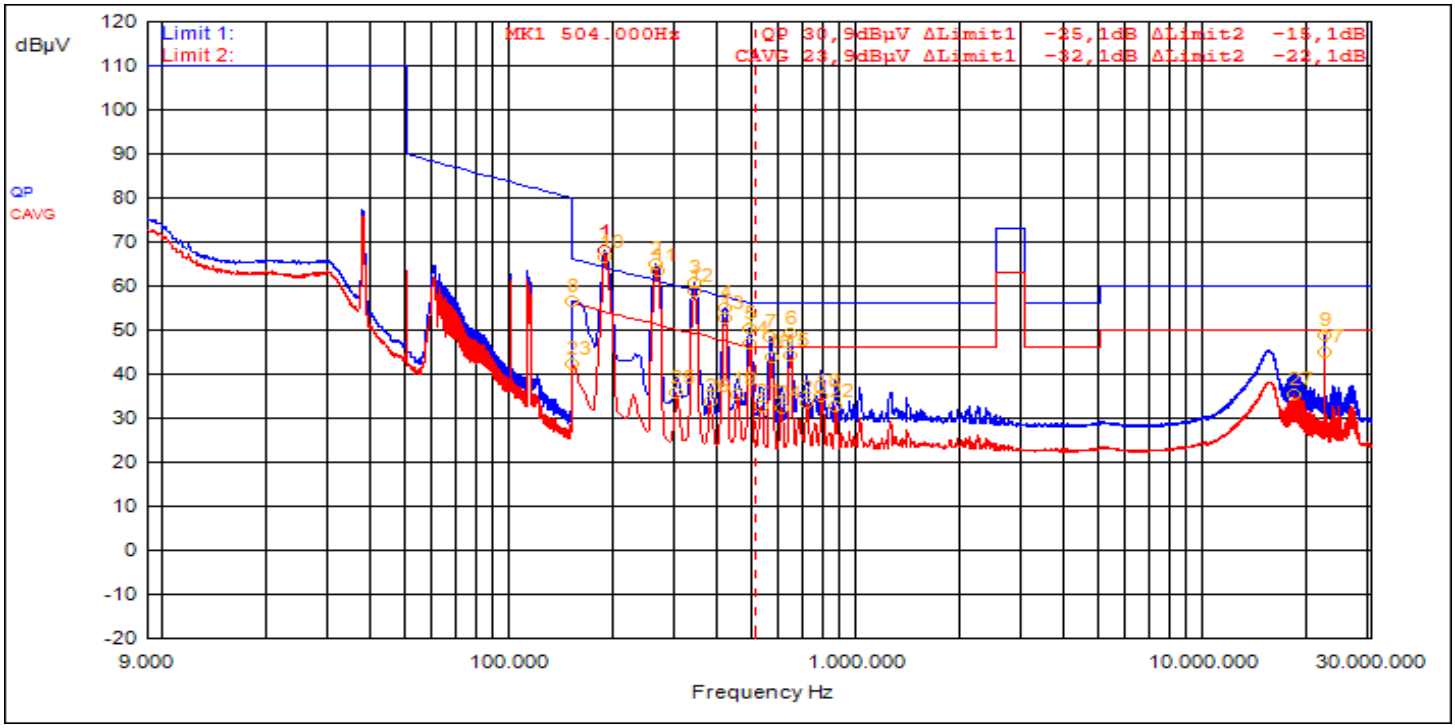
Test Summary

WorkSpace	AFJ EMI Test Lab	**Test Name**	LED Test
Laboratory	AFJ EMI Test Lab	**Date**	14/01/2021 03.38
DUT	LED Device	**Operator**	AFJ
Company	AFJ	**Test Type**	FFT SCAN
Model	100~240V	**Specification**	
Serial		**Condition**	220V_L2
Note			
Unit:	dBµV		
Autom.	-none-	**Setting**	Neutral

Settings SubRange Summary

Range Number: 1

Start Freq.:	9.000Hz	**Stop Freq.:**	30.000.000Hz	**Step:**	46.8Hz/3kHz
Trace 1:	QPeak	**Trace 2:**	C_AVG	**Trace 3:**	--
Bandwidth:	200Hz/9kHz	**Measurment Time:**	1000 ms	**Attenuator:**	0 dB
Antenna/Probe:	L2-16B LISN-L2	**Cable:**	- none -	**Amplifier/Atten.:**	PAT20M


dBµV
Limit 1:
Limit 2:
MK1 504.000Hz
QP 30,9dBµV ΔLimit1 -25,1dB ΔLimit2 -15,1dB
CAVG 23,9dBµV ΔLimit1 -32,1dB ΔLimit2 -22,1dB
QP
CAVG
120
110
100
90
80
70
60
50
40
30
20
10
0
-10
-20
9.000
100.000
1.000.000
10.000.000
30.000.000
Frequency Hz

ID	Frequency	Probe	Cable	Atten.	Detector	Meter Read	Meas Level	Limit 1	Limit 1 Dist.	Limit 2	Limit 2 Dist.	P/F
MU	MHz	dB	dB	dB	Type	dBuV	dBuV	dBuV	dB	dBuV	dB	P/F
1	186kHz	0,05		19,94	QPeak	47,93	67,92	64,21	3,70			F
2	261kHz	0,05		19,94	QPeak	44,99	64,98	61,40	3,58			F
3	336kHz	0,05		19,94	QPeak	40,64	60,63	59,30	1,33			F
4	411kHz	0,05		19,94	QPeak	34,85	54,84	57,63	-2,79			P
5	483kHz	0,05		19,94	QPeak	30,48	50,47	56,29	-5,82			P
6	633kHz	0,05		19,94	QPeak	29,05	49,04	56,00	-6,96			P
7	558kHz	0,05		19,94	QPeak	28,59	48,58	56,00	-7,42			P
8	150kHz	0,05		19,95	QPeak	36,62	56,62	66,00	-9,38			P
9	22,119	0,10		19,98	QPeak	28,62	48,70	60,00	-11,30			P
23	150kHz	0,05		19,95	C_AVG	22,21	42,21			56,00	-13,79	P
10	186kHz	0,05		19,94	C_AVG	46,67	66,66			54,21	12,45	F
11	264kHz	0,05		19,94	C_AVG	43,53	63,52			51,30	12,22	F
25	300kHz	0,05		19,94	C_AVG	15,87	35,86			50,24	-14,38	P
12	339kHz	0,05		19,94	C_AVG	38,88	58,87			49,23	9,64	F
26	375kHz	0,05		19,94	C_AVG	13,91	33,90			48,39	-14,49	P
13	414kHz	0,05		19,94	C_AVG	32,56	52,55			47,57	4,98	F
19	450kHz	0,05		19,94	C_AVG	15,28	35,27			46,88	-11,61	P
14	486kHz	0,05		19,94	C_AVG	26,94	46,93			46,24	0,69	F
21	525kHz	0,05		19,94	C_AVG	12,80	32,79			46,00	-13,21	P
16	561kHz	0,05		19,94	C_AVG	23,90	43,89			46,00	-2,11	P
24	600kHz	0,05		19,94	C_AVG	12,22	32,21			46,00	-13,79	P
15	636kHz	0,05		19,94	C_AVG	24,42	44,41			46,00	-1,59	P
20	711kHz	0,05		19,95	C_AVG	13,27	33,27			46,00	-12,73	P
18	783kHz	0,05		19,95	C_AVG	14,86	34,86			46,00	-11,14	P
22	858kHz	0,05		19,95	C_AVG	12,68	32,68			46,00	-13,32	P
27	18,051	0,10		19,98	C_AVG	15,38	35,46			50,00	-14,54	P
17	22,119	0,10		19,98	C_AVG	24,75	44,83			50,00	-5,17	P

Analytical Index