



SNA – 3050

400 kHz – 2.5 GHz Scalar Network Analyzer



User Manual

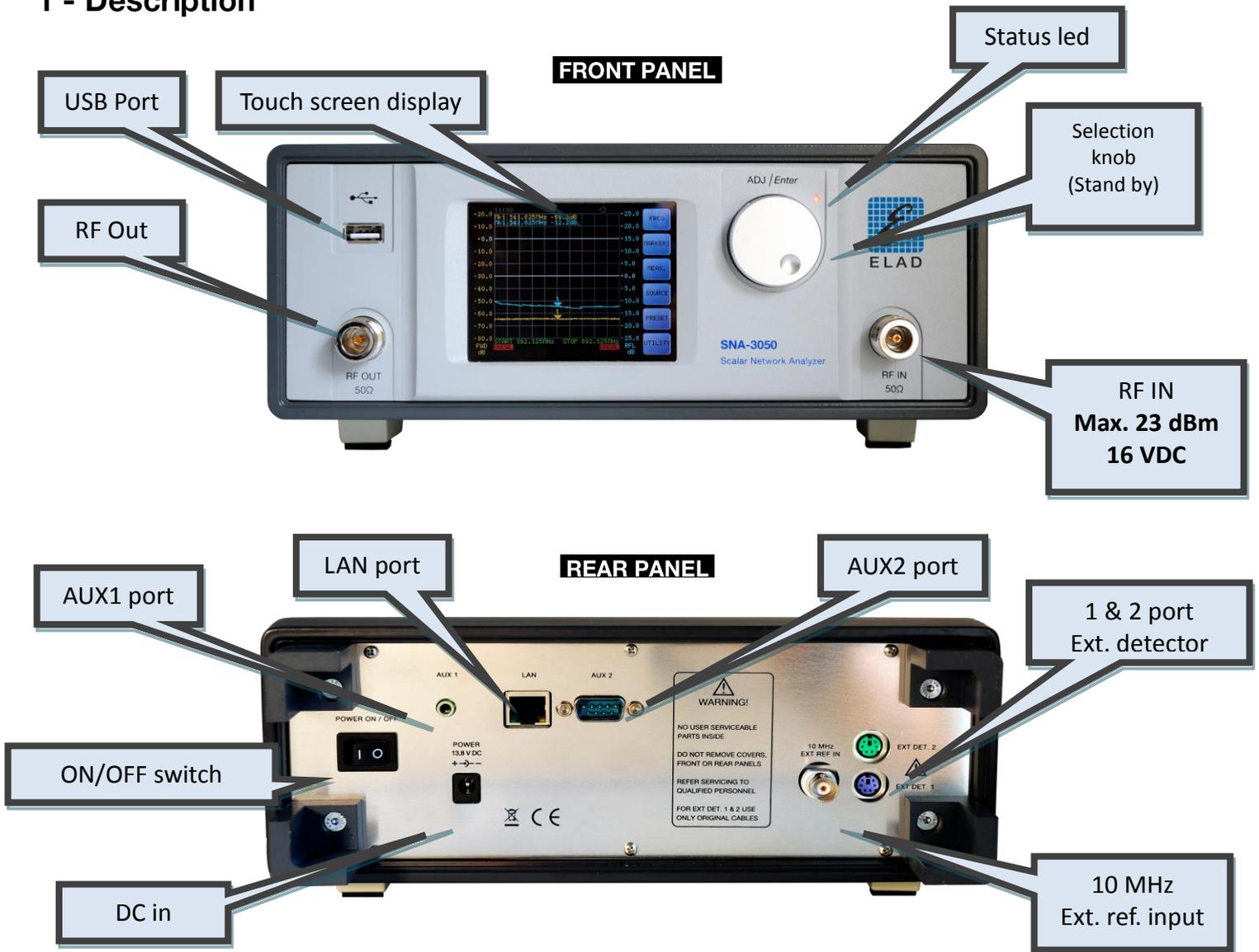
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1 - Description



The SNA-3050 network analyzer is an instrument that can measure the impedance matching and gain circuits to nominal impedance of 50 ohms.

The measure is obtained by generating an un-modulated sine wave of known amplitude and frequency and measuring the incoming signal with a detector broadband. This method has some limitations for the dynamics of the detector at low levels, but has the major advantage of being able to easily measure the conversion gain of circuits where the input frequency is different from the output (e.g. converters, frequency multipliers and dividers).

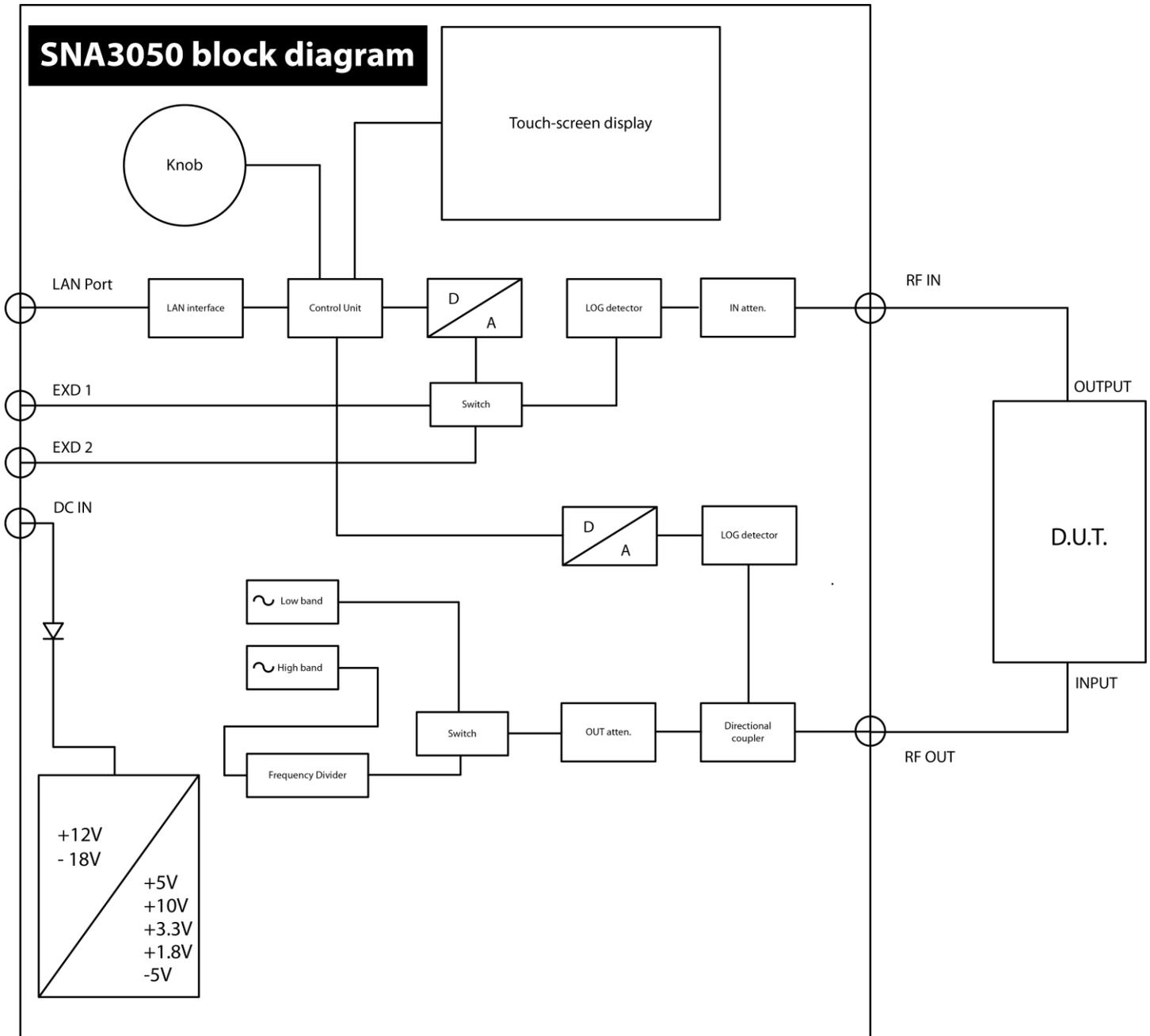
It has two N connectors for connecting the device to be measured:

- RF OUT port (internal generator output) to connect to the input of the object to be tested
- RF IN port (internal detector) to be connected to the output of the object to be tested

The RF OUT port is connected to a bridge circuit for measuring impedance adaptation, including a second detector bandwidth.

It can be used in stand-alone or PC-controlled via LAN (PC mode, there are some additional processing functions, and measurement functions are identical in the two modes).

2 - SNA 3050 block diagram



3 - Contents

- 1 SNA-3050 Scalar Network Analyzer
- 1 300 mm. semi-rigid RF cable
- 1 Short Circuit (N connector)
- 1 Certificate of calibration and conformity

- Nr. 1 accessories bag including:
 - 1 AC power supply
 - A stylus for touch screens
 - A LAN cable (cross cable)
 - 1 CD software

- Options:
 - D04 400 kHz – 450 MHz
-70 ÷ +10 dBm detector

4 - Technical specifications

| Description | Value |
|---------------------------------------|--|
| Measurements taken | Gain - Impedance matching |
| Frequency range | 0,4 – 2.500 MHz nominal (0,1 – 2.600 MHz reduced performance) |
| Signal level | From -26 dBm to +5dBm (1 dB step) |
| Accuracy of the level generated | - 0,4 - 900 MHz: +/- 1 dB - 900 - 2500 MHz: +/- 1,5 dB (CW mode) |
| Resolution of the frequency generated | Less than 1 Hz (the measurement is performed on 801 equidistant points in low speed or 201 points in high speed) |
| Accuracy of the frequency generated | + / - 10 ppm (+ / - 0.001%) with temperature compensation |
| Full scale of the measured signal | +3 To +33 dBm in 1 dBm steps (greater than +23 dBm signals only with duty cycle less than 0,1) |
| Measuring accuracy | + / - 3 dB before calibration; + / - 1 dB after calibration for measurements on devices that are not converting the frequency |
| Dynamic range gain | - Frequencies from 0.4 to 100 MHz: -60 dB from full scale - Frequencies from 100 MHz to 2500: from full scale to -50 dB |
| Dynamic range of impedance matching | 30 dB from 0,4 to 100 MHz; 25 dB from 100 to 450 MHz 20 dB from 450 to 2000 MHz 15 dB from 2000 to 2500 MHz |
| External power supply | 17 – 19 V DC 1 A |
| Operating temperature | 5 ÷ 35 °C |
| Storage temperature | -10 ÷ 45 °C |

5 - Theoretical background

For people not familiar with usual conventions applicable to network analyzer measurements, we revise some definitions and theoretical concepts:

A. Definition of ratio expressed in dB

a. Voltage ratio: V_1 / V_2 (dB) = $20 \times \log (V_1 / V_2)$

b. Power ratio: P_1 / P_2 (dB) = $10 \times \log (P_1 / P_2)$

B. Definition of gain

$G_p = P_{out} / P_{in}$ (gain = output power / input power of the device under test)

C. Definition of insertion loss

$G_p = P_{in} / P_{out}$ (insertion loss = input power / output power of the device under test)

D. Definition of voltage standing wave ratio (V.S.W.R.)

In the presence of an impedance mismatching, a bi-directional energy flux is present: from the generator to the load (feed circuit) and in the opposite direction from the load (circuit) back to the generator; in this situation, the relationship between voltage and current is not constant along the line connecting generator and load, but we can find points where voltage is high and current is low and vice versa; we define as voltage standing wave ratio (V.S.W.R.) the ratio between the maximum and the minimum voltage value present along the line; this ratio is ∞ (infinite) for a load impedance equal to zero or infinite, and is 1 for a load impedance purely resistive and equal to both the internal generator impedance (also purely resistive) and the characteristic impedance of the transmission line connecting them (perfect impedance matching condition)

E. Definition of reflection loss

In the presence of a bi-directional energy flux above described, we define as reflection loss the ratio (normally expressed in dB) between the power coming back from the load to the generator (reverse) and the power going out from the generator toward the load (forward).

F. Definition of dB μ V

Ratio in dB between the voltage to be expressed and the reference voltage of 1 μ V

G. Definition of dBm

Ratio in dB between the power to be expressed and the reference voltage of 1mW

The need of impedance matching can be summarized with the following reasons:

- Gain maximizing

It is possible to demonstrate mathematically that we obtain the maximum gain when the output impedance of the generator and the input impedance of the subsequent amplifier have the same real (resistive) part and opposite imaginary part (reactive); the same relation holds true also for the combination output of the amplifier and load.

- Reduction of alterations on gain versus frequency relationship

The correct frequency response of amplifiers and filters is strongly influenced from impedances seen by their input and output ports: impedances different from the desired ones can modify the tuning of these equipments.

- **Distortion minimization**

The amplifiers are capable to generate the maximum output power with the minimum distortion only if the load impedance is the exact value specified by the designer

- **Minimization of self – oscillations risk**

Not exact impedances can generate dangerous self – oscillations or high level of noise from amplifiers.

5.1 - Conversion tables

5.1.1 Table reports of tension and power expressed in dB

| Ratio of tensions | Corresponding value in dB |
|-------------------|---------------------------|
| 0,001 | - 60 |
| 0,01 | - 40 |
| 0,1 | - 20 |
| 0,2 | - 13,98 |
| 0,3 | - 10,46 |
| 0,5 | - 6,02 |
| 0,7 | -3,1 |
| 0,8 | - 1,94 |
| 0,9 | - 0,92 |
| 1 | 0 |
| 1,1 | 0,83 |
| 1,2 | 1,58 |
| 2 | 6,02 |
| 3 | 9,54 |
| 4 | 12,04 |
| 5 | 13,98 |
| 6 | 15,56 |
| 7 | 16,90 |
| 8 | 18,06 |
| 9 | 19,08 |
| 10 | 20 |
| 100 | 40 |
| 1000 | 60 |

| Ratio of tensions | Corresponding value in dB |
|-------------------|---------------------------|
| 0,001 | - 30 |
| 0,01 | - 20 |
| 0,1 | - 10 |
| 0,2 | - 6,99 |
| 0,3 | - 5,23 |
| 0,5 | - 3,01 |
| 0,7 | - 1,55 |
| 0,8 | - 0,97 |
| 0,9 | - 0,46 |
| 1 | 0 |
| 1,1 | 0,41 |
| 1,2 | 0,79 |
| 2 | 3,01 |
| 3 | 4,77 |
| 4 | 6,02 |
| 5 | 6,99 |
| 6 | 7,78 |
| 7 | 8,45 |
| 8 | 9,03 |
| 9 | 9,54 |
| 10 | 10 |
| 100 | 20 |
| 1000 | 30 |

5.1.2 Correlation table mV / dB microvolt / dBm

| Voltage mV | Voltage dB μ V | Power dBm on 50 ohm |
|------------|--------------------|---------------------|
| 0,001 | 0 | - 106.99 |
| 0,001122 | 1 | - 105.99 |
| 0,00126 | 2 | - 104.98 |
| 0,00141 | 3 | - 104.01 |
| 0,00158 | 4 | - 103.02 |
| 0,00178 | 5 | - 101.98 |
| 0,00199 | 6 | - 101.01 |
| 0,00224 | 7 | - 99.98 |
| 0,00251 | 8 | - 99.00 |
| 0,00281 | 9 | - 98.02 |
| 0,00316 | 10 | - 97.01 |
| 0,00354 | 11 | - 96.01 |
| 0,00398 | 12 | - 94.99 |
| 0,00446 | 13 | - 94.00 |
| 0,00501 | 14 | - 92.99 |
| 0,00562 | 15 | - 91.99 |
| 0,01 | 20 | - 86.99 |
| 0,0178 | 25 | - 81.98 |
| 0,0316 | 30 | - 77.01 |
| 0,0562 | 35 | - 72.01 |
| 0,1 | 40 | - 66.99 |
| 0,178 | 45 | - 61.98 |
| 0,316 | 50 | - 57.00 |
| 0,562 | 55 | - 51.99 |
| 1,0 | 60 | - 46.99 |
| 1,78 | 65 | - 41.98 |
| 3,16 | 70 | - 37.00 |
| 5,62 | 75 | - 31.99 |
| 10,0 | 80 | - 26.99 |
| 17,78 | 85 | - 21.99 |
| 31,62 | 90 | - 16.99 |
| 56,23 | 95 | - 11.99 |
| 100,0 | 100 | - 6.99 |
| 177,8 | 105 | - 1.99 |
| 316,2 | 110 | + 3.00 |
| 562,3 | 115 | + 8.01 |
| 1000,0 | 120 | + 13.01 |

5.1.3 Relation table ROS / attenuation / resistance load

| Resistance value (ohm) | R.O.S. | Attenuation of the reflection (dB) | Gain lost by reflection (dB) |
|------------------------|-----------|------------------------------------|------------------------------|
| 0.660 | 75,9 : 1 | 0,229 | 12,89 |
| 7 | 7,14 : 1 | 2,45 | 3,801 |
| 25 | 1,99 : 1 | 9,551 | 0,510 |
| 33 | 1,5 : 1 | 13,97 | 0,177 |
| 50 | 1,0 : 1 | ∞ (infinita) | 0 (zero) |
| 67 | 1,34 : 1 | 16,75 | 0,089 |
| 100 | 1,99 : 1 | 9,551 | 0,510 |
| 400 | 8,00 : 1 | 2,180 | 4,037 |
| 670 | 13,38 : 1 | 1,299 | 5,872 |
| 6600 | 132,0 : 1 | 0,013 | 23,98 |

6 - Tips for the set up of a test bench

Even it is an instrument designed for a trouble-free operation; the sensitivity of the measures to be carried out makes it possible to cause significant measurement errors if you do not take necessary precautions:

A. RF IN port is a meter wide band: so any incoming signal is measured and could alter the result of the measurement. So take care to possible pairs of the circuit under test with mobile phones, cordless phones or other sources of noise, even at very low frequencies such as unshielded switching power supplies. Use high shielding connecting cables (avoid if possible connections between terminals shielded and eventually use appropriate filters between circuits and SNA).

B. Long cables with high losses significantly alter the measurement of reflection: any dB loss reduces of 2 dB the reflected power: always use low loss cables.

C. Nonlinear devices, followed by selective filters can generate significant harmonic components and simulate responses of the filters submultiples frequencies of those filters. Pay particular attention to frequency converters bipolar transistor.

D. If the circuit under test requires to operate an undistorted input level of less than 80 dB μ V, the measurement of reflection loss of accuracy: in this case it is better to make measurements of the gain at a low level and then perform the measurement of reflection generated by bringing the level to 80 dB μ V.

E. If the device under test is a passive filter with high losses, to take advantage of the full dynamic range of instrument, it is helpful to include a wide-band amplifier well suited in impedance between the output of the filter and the RF IN port. Similar is the case of a filter with low loss in pass band and high band attenuation. In this case we perform two steps: in the normal way to measure the bandwidth attenuation and with the amplifier added to measure the attenuation outside the bandwidth.

Note: as a precautionary measure use an amplifier with an output power that will not dBmage the instrument

F. If the device under test is an high power nonlinear circuit exceeding the power limit allowed to the RF IN port, the measurement must be performed by inserting an attenuator between the output of the circuit and the RF IN port. The attenuator must handle the power generated by the circuit and have an attenuation value greater than or equal to: (maximum voltage coming out of the circuit in dB μ V) - (full voltage scale of the instrument in microvolt)

(Note: valid for signals expressed in tensions. If the levels are in power you get the same result by entering values in dBm in place in dB μ V)

7 - Turning on and off the instrument

7.1 - Turning on

- Toggle the switch on the rear panel to "ON".
- The instrument switches on standby. At this stage the LED will turn on
- Press the encoder knob. It starts the startup procedure during which the LED flashes quickly. ELAD logo appears on the display and after a few seconds the main menu screen. When the system is booted, the LED turns off.

7.2 - Turning off

- Press the encoder knob for 3 seconds
- It starts the shutdown procedure and the display shows the message "System shutdown". During this stage the LED flashes quickly.
- Wait until the instrument goes into standby mode (LED lit or slow blinking).
- Toggle the switch on the rear panel to "OFF".

7.3 - Detailed description of the LED functioning

- Fixed ON: instrument in stand-by mode and powered through the power supply
- Fast blinking (150 ms): during the switch on and off the LED flashes quickly.

7.4 - Using the external power supply

- The instrument is equipped with a power supply with output at about 18 V. If you wish to use an external power source different from the one provided, please refer to the manufacturer for the selection of a suitable unit. The manufacturer is not responsible for dBmages due to incorrect power supply.

8 - Stand Alone mode

In this chapter we will describe in detail the various menus of the graphical interface of the instrument.

8.1 - Main Menu

The splash screen that appears at power on:



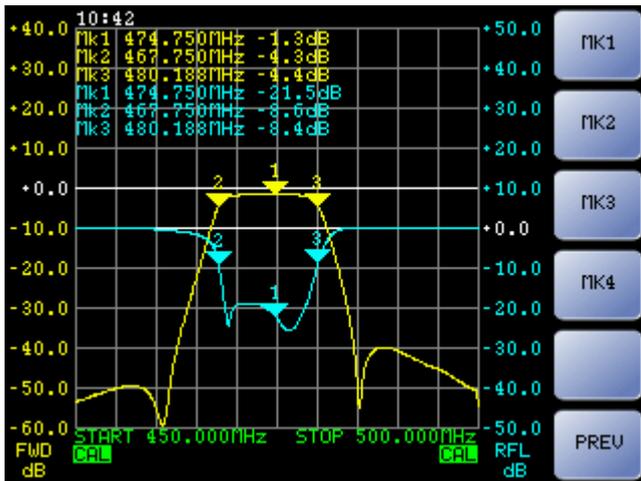
- “FREQ”: Enter the menu to set up the frequency range
- “MARKERS”: Enter the menu to set up the markers
- “MEAS”: Enter the setup menu of measuring and displaying on the screen
- “SOURCE”: Enter the setup menu setting parameters of output power and input attenuation
- “PRESET”: Enter the list of presets saved in the device or USB memory connected
- “UTILITY”: Enter the calibration menu, the instrument configuration and data storage

8.2 - Frequency Menu



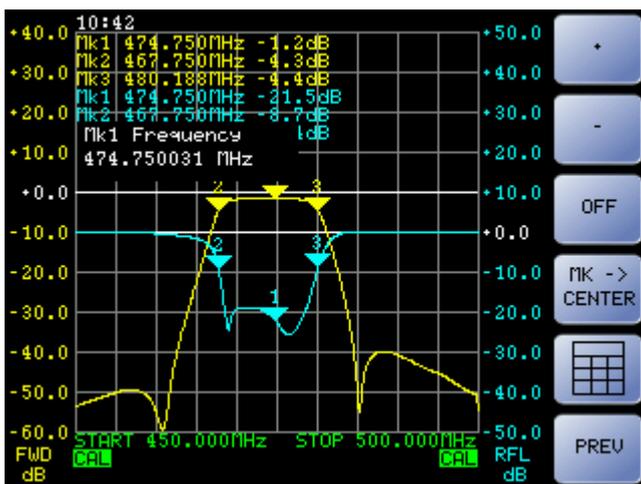
- “START”: Set the start frequency of the measuring range
- “STOP”: Set the stop frequency of the measuring range
- “CENTER”: Set the center frequency of the measuring range
- “SPAN”: Set the width of the measuring range
- “PREV”: Returns to Main Menu

8.3 - Marker Menu



- “MK1”, “MK2”, “MK3”, “MK4”: Access the menu to set the frequency of the markers
- “PREV”: Returns to Main Menu

8.4 - MK1 – MK2 – MK3 - MK4 Menu



- “+”, “-“: Increase, decrease the frequency of the marker of a measuring point on the graph (1 / 200 or 1 / 800 of the frequency depending on the sweep)
- “OFF”: Turn off the selected marker; to turn it on again just re-select it
- “Mk -> CENTER”: Modify the center frequency to the position of the selected marker
- “”: Set the marker frequency using the numeric keypad
- “PREV”: Returns to Main Menu

8.5 - Measure Menu



- “MEAS 1”: Enter the Measure 1 setup menu
- “MEAS 2”: Enter the Measure 2 setup menu
- “SCALE”: Enter the graph scale setup menu (for both measures)
- “PREV”: Returns to Main Menu

8.6 - Measure 1 Menu



- “FWD”: Assign to measure 1 the reading of direct power detector
- “EXD1”: If an external detector EXD1 is connected to the back port, it assign to measure 1 the reading of EXD1 (when it detects the external detector the display shows EXD1 below the chart)
- “OFF”: Turn off measure 1
- “PREV”: Returns to Measure Menu

8.7 - Measure 2



- “RFL”: Assign to measure 2 the reading of the reflected power
- “EXD2”: If EXD2 is connected, it assign to measure 2 the EXD2 reading (as port EXD1)
- “OFF”: Turn off measure 2
- “PREV”: Returns to Measure Menu

8.8 - Scale Menu



- “dB/div Meas 1”: Enter the menu to change the scale of measure 1
- “REF LEV Meas 1”: Enter the menu to change the reference level of measure 1
- “REF POS Meas 1”: Enter the menu to change the position of the reference level of measure 1
- “-> Meas 2”: Enter the menu to change the scale of measure 2

8.8.1 Scale > Meas 2 Menu



- “dB/div Meas 2”: Enter the menu to change the scale of measure 2
- “REF LEV Meas 2”: Enter the menu to change the reference level of measure 2
- “REF POS Meas 2”: Enter the menu to change the position of the reference level of measure 2
- “SWR”: Set the unit of measurement of the reflected as SWR. If measure is already set as SWR, the text becomes "dB "; pressing the key it switches back the measure as dB (only available for measure 2).
- “-> Meas 1”: Back to the edit menu of the scale of measure 1

8.9 - Source Menu



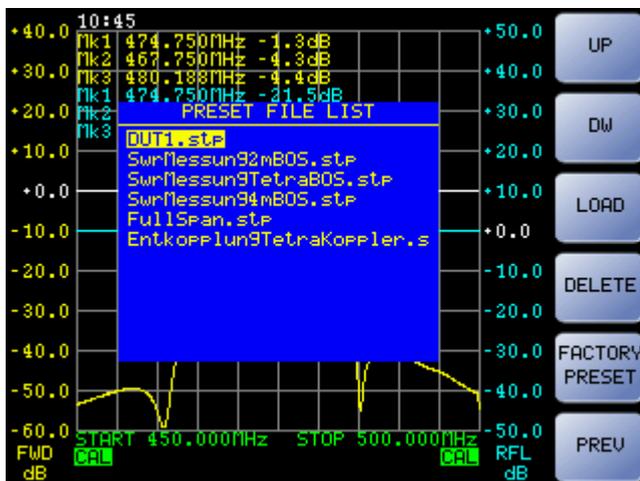
- “POWER”: Enter the setup menu of the output power (after entering, the button “” allow to set the output level in dBm from -26 dBm to +5 dBm. The output level can be read only at this stage of setting)
- “RX ATT.”: Enter the setup menu of the input attenuation (after entering, the button “” allow to set the output level in dBm from 0 dBm to +31 dBm. The output level can be read only at this stage of setting)
- “SWEEP”: Enter “SWEEP” Menu
- “PREV”: Returns to Main Menu

8.10 - Sweep Menu



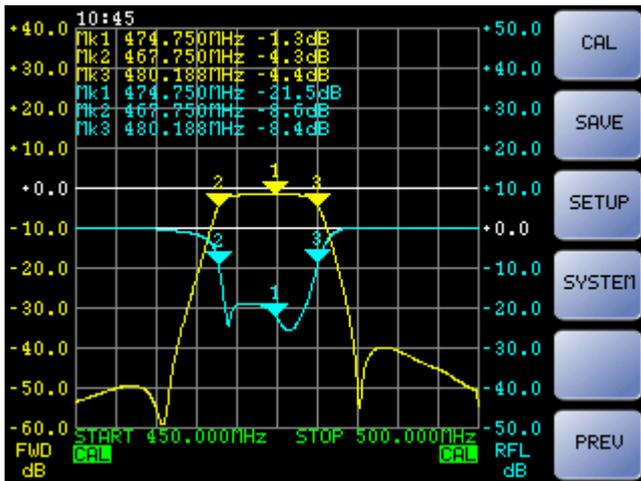
- “HIGH SWEEP” (“LOW SPEED”): Switches between the high-speed mode / low frequency resolution (201 points) and low speed / high frequency resolution (801 points)
- “CW Mode”: Enables / disables the CW mode (single frequency). Output generates an unmodulated carrier with fixed frequency.
- “PREV”: Back to “SOURCE” Menu

8.11 - Preset Menu



- “UP”: Change the selected preset of one step up
- “DW”: Change the selected preset of one step down
- “LOAD”: Apply the setting of the selected preset
- “DELETE”: remove the selected preset
- “FACTORY PRESET”: Apply the default settings

8.12 - Utility Menu



- “CAL”: Enter the calibration menu
- “SAVE”: Enter the Save data menu
- “SETUP”: Enter the General setting Menu
- “SYSTEM”: Enter the System setting Menu
- “PREV”: Back to Main Menu

8.13 - Calibration Menu



- “CAL FWD”: Start the Forward power measure calibration
- “CAL RFL”: Start the Reflected power measure calibration
- “CAL RESET”: Discard the performed calibrations
- “PREV”: Back to Utility Menu

8.14 - Save Menu



- “GRAPH.”: Save an image of the chart by changing size and color to optimize viewing and printing
- “REPORT”: save a text file containing the positions and the readings of the active marker
- “GR+REP”: Save an image of chart and report with positions and readings of the marker
- “PREV”: Back to Utility Menu

8.15 - Setup Menu



- “LAN”: Enter menu to set the parameters of the network connection (LAN)
- “SYSTEM TIME”: Enter menu to set system date and time
- “PREV”: Back to Utility Menu

8.16 - LAN Menu



- “IP”: Enter menu to set the IP address
- “MASK”: Enter menu to set the Subnet mask
- “GATEWAY”: Enter menu to set the Gateway
- “DNS”: Enter menu to set the DNS
- “PREV”: Back to Setup Menu

8.17 - System Time Menu



- “Date”: Enter menu to set the System Date
- “Time”: Enter menu to set the System Time
- “PREV”: Back to Setup Menu

8.18 - System Menu



- “SYSTEM INFO”: View serial number and firmware versions of the various installed components on SNA
- “POWER SUPPLY”: Enter the menu to set the Auto-Off timeout
- “SYSTEM UPDATE”: Performs a firmware update from remote. SNA try to connect to the server to check for updates. To make it possible the instrument must have access to an Internet connection.

8.19 - Mode Menu



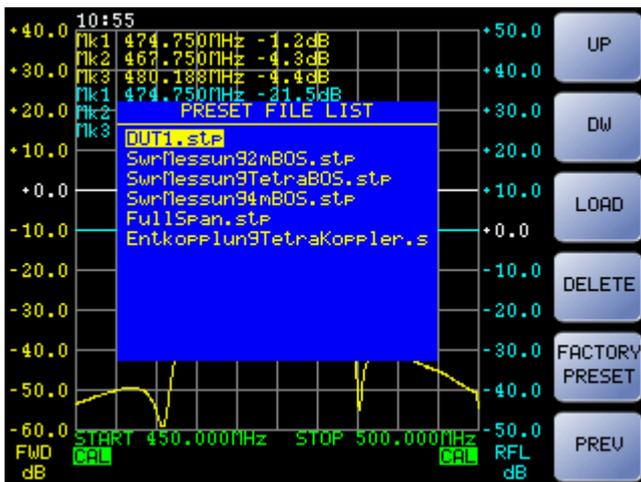
- “NETWORK ANALYZER”: Set the function mode as Scalar Network Analyzer

9 - Performing basic measurements in Stand Alone mode

In this chapter you will learn how to make simple measures with the SNA-3050 in standalone mode.

9.1 - Preset loading

One of the most useful functions for installers and maintenance personnel is the ability to load one of the presets stored in the device. SNA comes with some factory presets stored in memory. From the initial screen, press "PRESET" to access to list of saved presets:



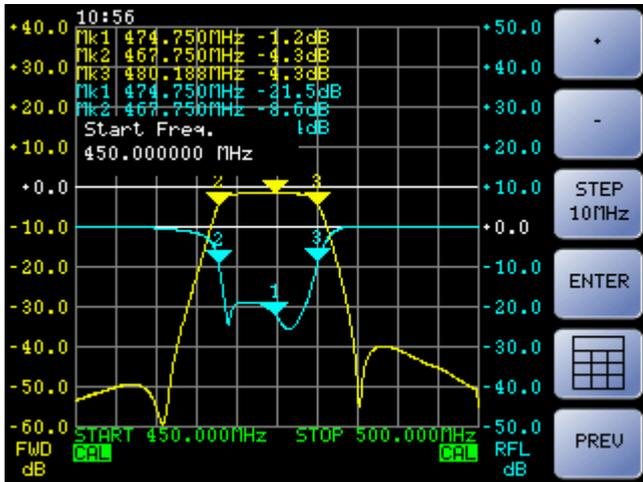
Select the desired setup using "UP", "DW" and click on "LOAD" to apply the setup.

9.2 - Changing the frequency range

If the frequency range of the preset is not what you like, you can change it. From initial screen press "FREQ."



Press "START" to modify the start frequency



Adjust the value using the "+" and "-" to increase / decrease the frequency of the step displayed in the third button, or use the scroll wheel. To change the step click on "STEP"(there are 6 possible step values, selected in sequence by pressing the button "STEP ": 100Hz, 1kHz, 10kHz, 100kHz, 1MHz, 10 MHz). Alternatively, press “” and insert the desired value using the numeric keypad



Screen shot with numeric keypad displayed

9.3 - Calibration

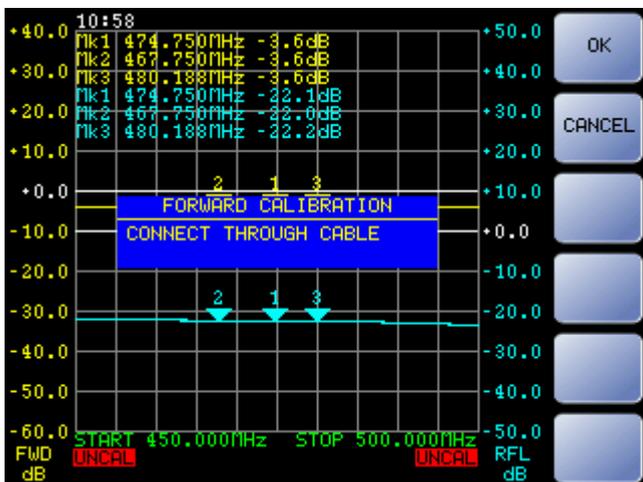
For maximum measurement accuracy, you should calibrate the instrument (using the supplied cables or even better the ones that will be used in the measurement). To calibrate the instrument proceed as follows by accessing the Calibration menu.

- From the main menu press on “UTILITY”-> “CAL”.



9.3.1 Direct Power Calibration

- Press “CAL FWD”



- Connect the calibration cable provided, or with the cable (s) to be used for following measures, the output and input RF IN and RF OUT and click "OK" when ready. The direct measurement curve (yellow) moves to the line at 0 dB and the CAL text on a green background appears in the lower left corner of the chart.



9.3.2 Reflected Power Calibration

- Press “CAL RFL”



Note: The OPEN status refers to a not connected RF OUT connector. It must be done without connecting cables or adapters even if left open on one side. These sections of transmission line introduce parasitic capacitance and may also act as a small antenna capable of detect the reflected power.

- Press “OPEN”

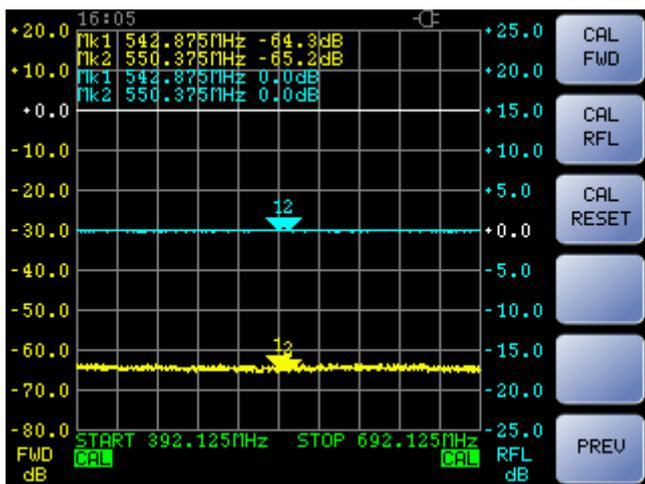


- Leave open (not connected)the RF OUT port and press “OK” when ready.
- Press “SHORT”



- Connect the short connector provided to the RF OUT port and press “OK” when ready.
- Press “DONE” to save the calibration

The curve of the reflected measure (blue) moves to the line at 0 dB and a green the CAL text on a green background appears in the lower right corner of the chart.



9.3.3 Calibration Status

The written to the lower left and lower right corners of the graph, describe the status of calibration, respectively of Measure 1 and Measure 2.

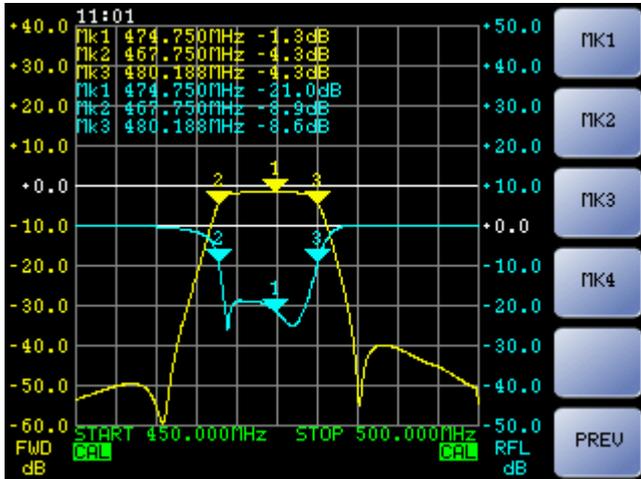
- **CAL**: The measure is calibrated
- **UNCAL**: The measure is not calibrated, a calibration was not performed or the setup of the instrument was changed after calibration.
- **CAL?**: The measure is calibrated and the instrument setup has not changed. However, the SNA has been turned off and on again so it is recommended to repeat the calibration.

Note:

If the measure is performed using cables with a significant length respect to the wave length, it is recommended to connect directly (or in the shortest way using max. one adapter) the input of the device under test (DUT) to the RF OUT port and to connect the longest connection between the output of the DUT and the RF IN port of SNA.

9.4 - Marker's Positioning

- From main menu press "MARKERS"



- Press on "MK1" or "MK2" or "MK3" or "MK4" to select the desired marker



Once selected you can change the marker position by pressing the "+" and "-", using the knob or by pressing the button "⌨" and entering the value using the numeric keypad. Press "OFF" to deactivate the marker.

9.5 - Saving the measure

Access Save data menu:

- From Main menu press “UTILITY” and then on “SAVE”



- “GRAPH.”: Save a screen shot file of the measure
- “REPORT”: Save a text file containing marker’s measures
- “GR+REP”: Save a screen shot file of the measure and a text file containing marker’s measures

Select the desired option. Now you are then asked where you want to save data:



- “FTP”: Save the data in a folder that can be accessed through FTP (File Transfer Protocol). Use this option if you intend to use the PC software to upload data from SNA (Concerning this please see the chapter [PC Software Mode](#) to load data from SNA).
- If on the USB port it has been connected a USB memory, a “USB” button will be displayed. Press this to save data in.
- After completing the saving, the button “OK” will be displayed. Push the button to complete the operation. Please note that the file of the chart is in bitmap format, and the report file is in text format (notepad).

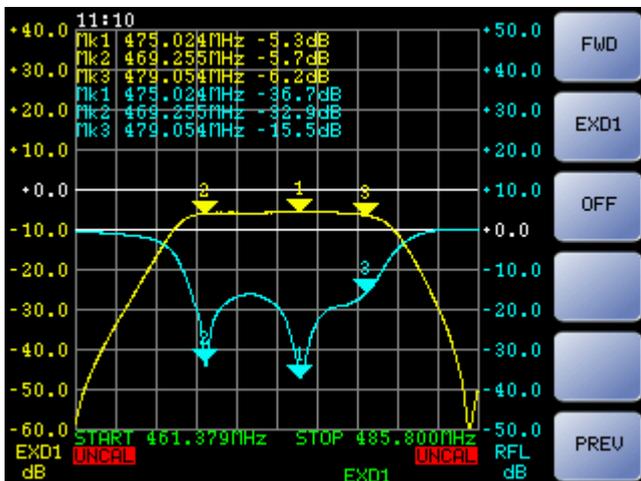
9.6 - Use with external detectors

Using the external detector EXD1 and EXD2 you can extend the capabilities of the instrument.

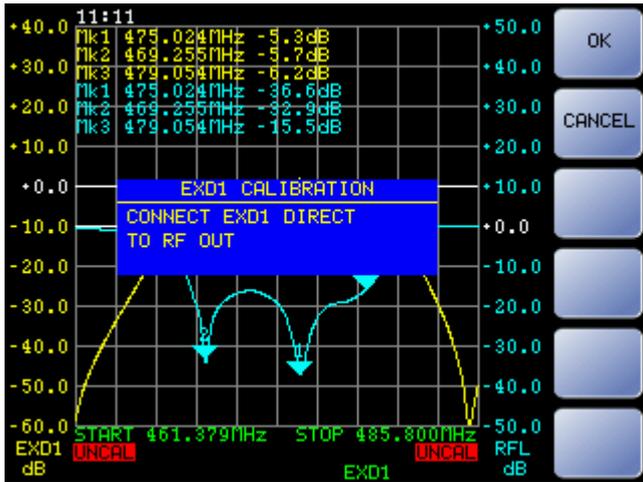
- Connect an external detector to the "EXD1" ("EXD2") port on the rear panel
- Wait loading data setup and calibration of the detector (about 20 seconds)
- When the upload is finished the writing EXD1(EXD2) appears in the lower part of the chart



- If SNA is turned on with an external detector connected, and the setup provides for their use, the external detector is automatically selected. Otherwise if you like to use the EXD1 (EXD2) from the home screen, press "MEAS" and then "MEAS1" ("MEAS2")



- Press "EXD1" ("EXD2") to allow to measure 1 (measure 2) to read data through the external detector.
- Then proceed with calibration: enter the CAL menu (see [Calibration](#)) and then press "CAL EXD1" ("CAL EXD2")



- Connect with the same cable used for the measures the “EXD1”(“ EXD2”) to RF OUT port and press "OK" when ready

Note:

The external detector may have to use a frequency band lower than the one of the instrument; in such case you should limit the measure and therefore the calibration frequency range to a compatible range with the detector used.

10 - Installing PC software

! Compatibility Notes: Windows XP / Windows Vista / Windows 7/ 32 & 64 bits.

Open the folder containing the installation package and then double-click the file setup.exe. The installer will proceed by installing the main application and the required components (. NET Framework 4.0, Microsoft SQL Server Express 2008, Microsoft Report Viewer)

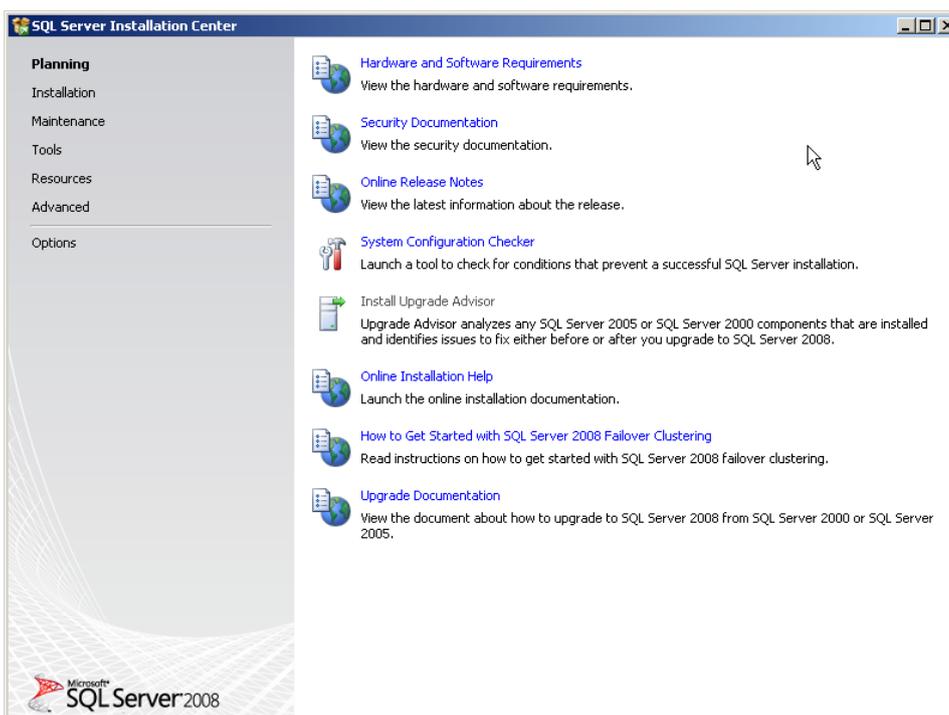
! Note: If you already have a version of SNA3500 you'll need to remove from menu Control Panel -> Add / Remove Programs (Windows XP) / Programs and Features (Windows Vista and Win7)

10.1 - SQL Server Express 2008 manual installation

The simultaneous use of SQL Server Express 2008 with earlier versions may cause malfunctions and data loss. Anyway, if you do not want to uninstall an already installed version of SQL Server (e.g. SQL Server 2005) to avoid problems with other software that use it, you need to manually install SQL Server 2008 and all the prerequisites:

- **Windows Installer 4.5.** Open the folder “WindowsInstaller4_5” and double click on file: “WindowsXP-KB942288-v3-x86.exe” (not necessary on Windows 7)
- **.NET Framework 4.0.** Open the folder “DotNetFX40” and double click on file: “dotNetFx40_Full_x86_x64.exe”
- **SQL Server Express 2008.** Open the folder “SqlExpress2008” and double click on file: “SQLEXP32_x86_ENU.E.exe” (in case of 32 bit OS) or “SQLEXP_x64_ENU.exe” (in case of 64 bit OS).

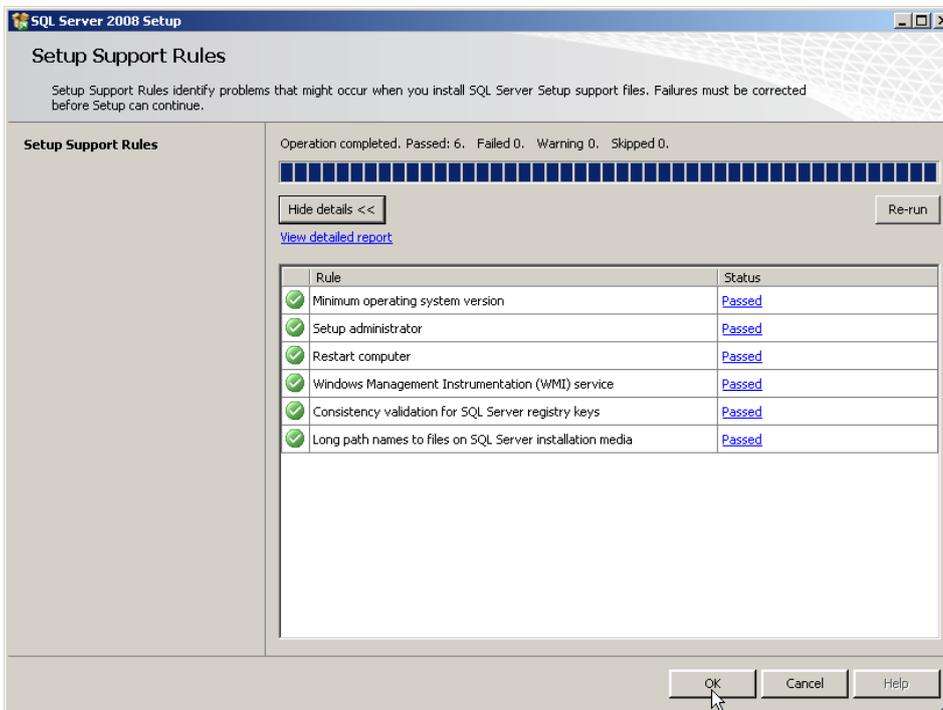
Follow the instructions below to install SQL Server 2008 Express:



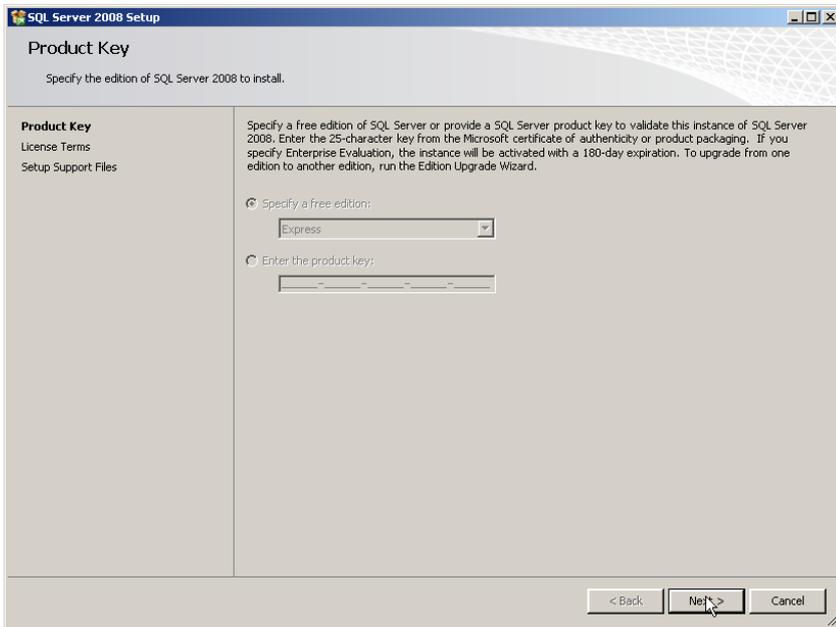
On the left side of the screen to click on Installation and then click the first option “New SQL stand-alone installation or add features to an existing installation”:



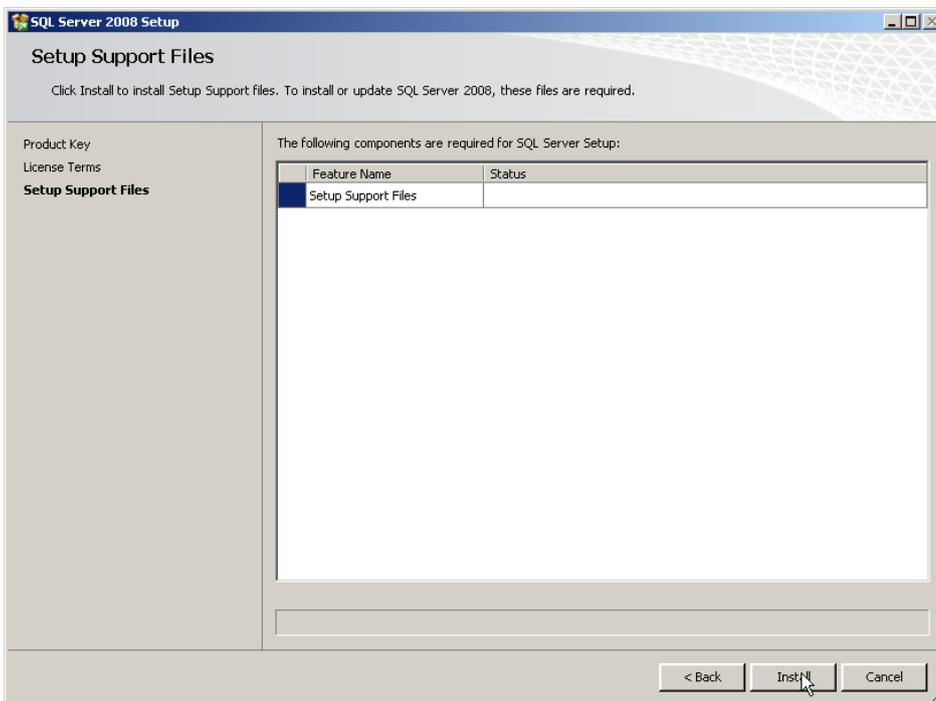
Proceed by clicking OK:



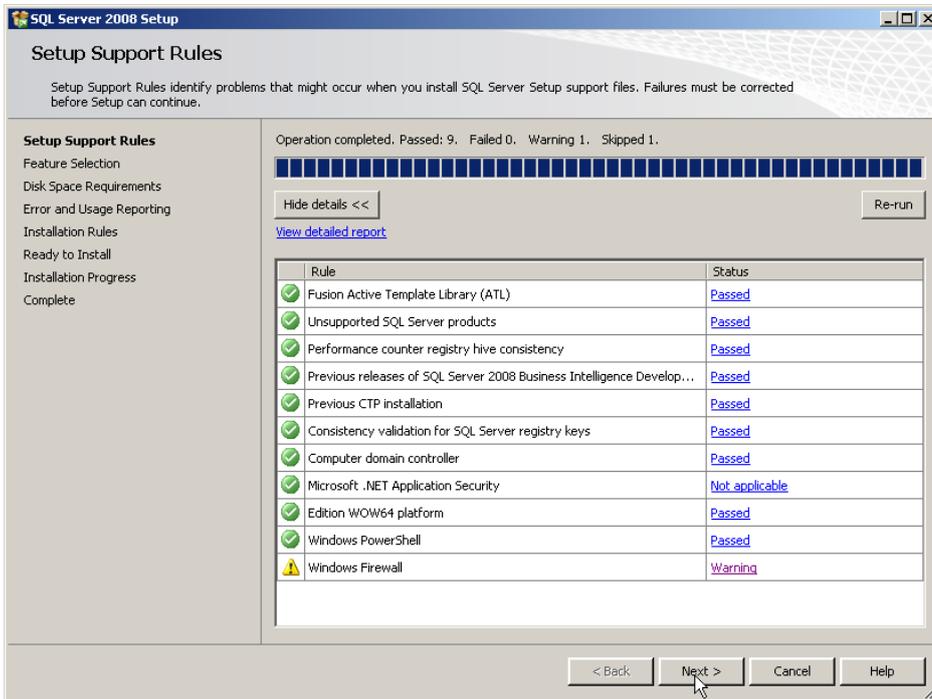
Proceed by clicking Next:



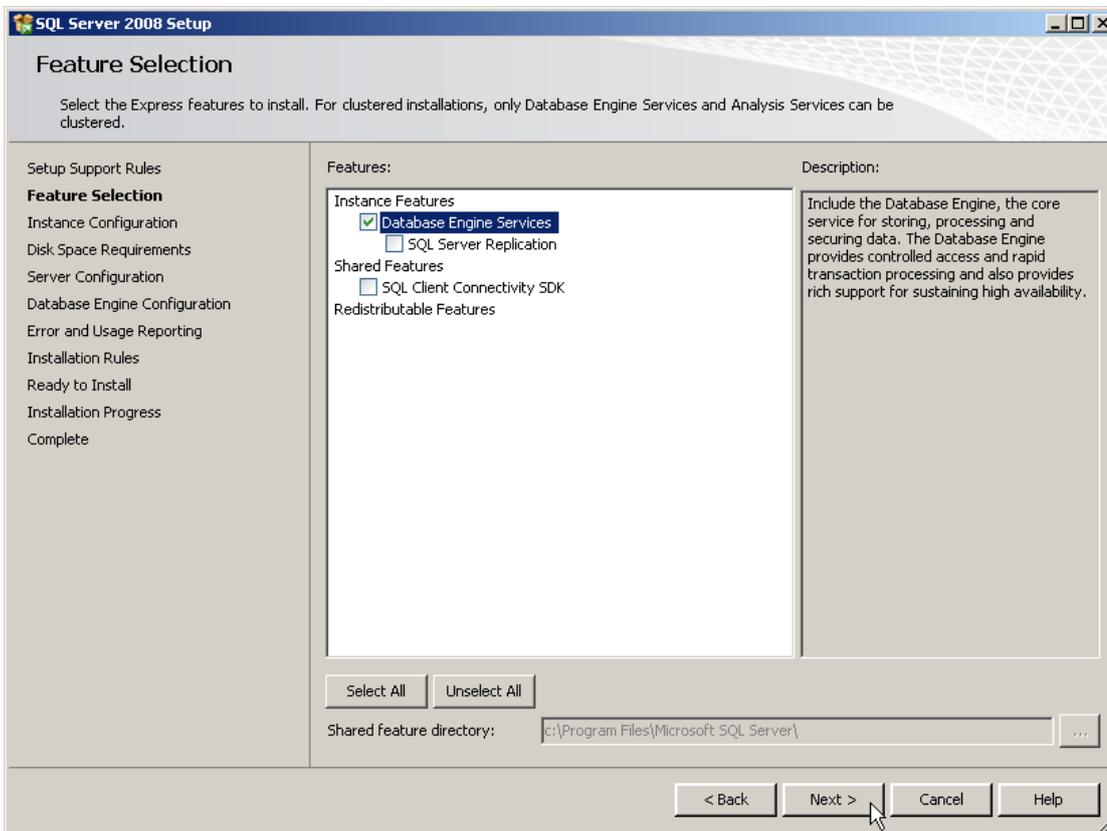
Proceed by clicking Next:



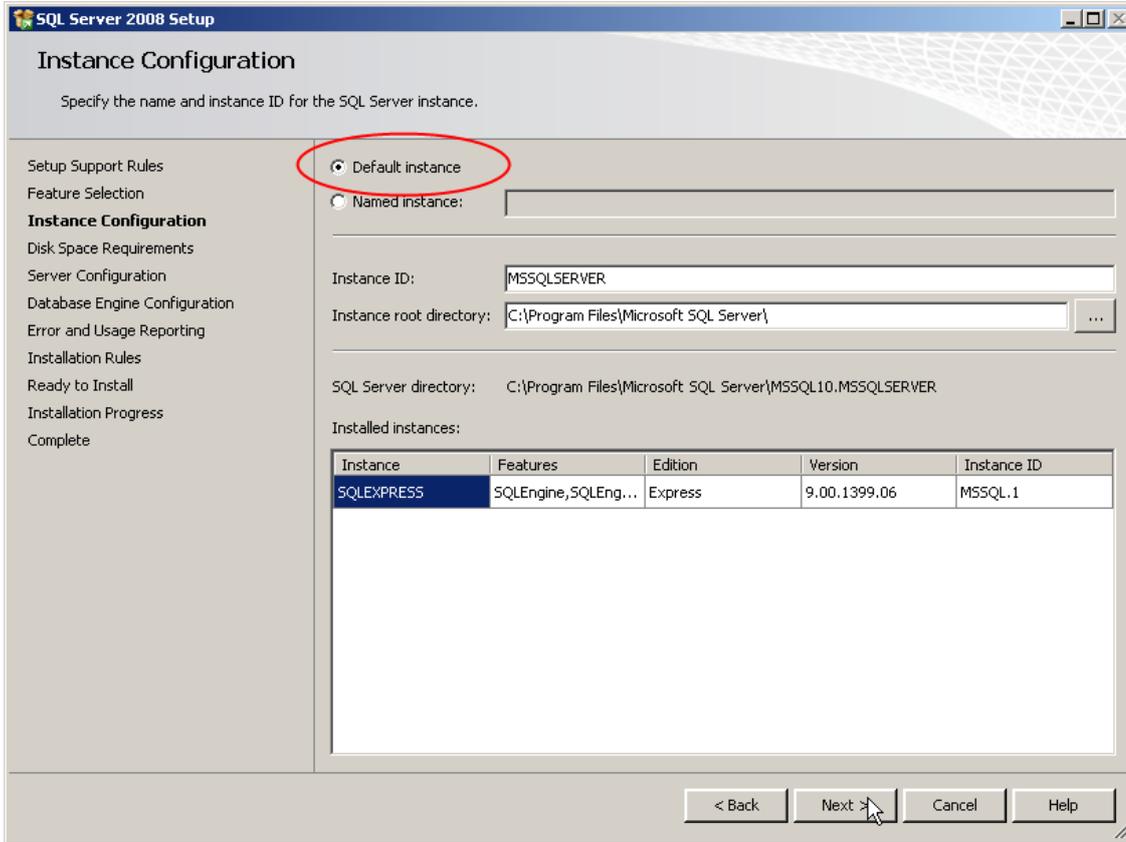
Proceed by clicking Next:



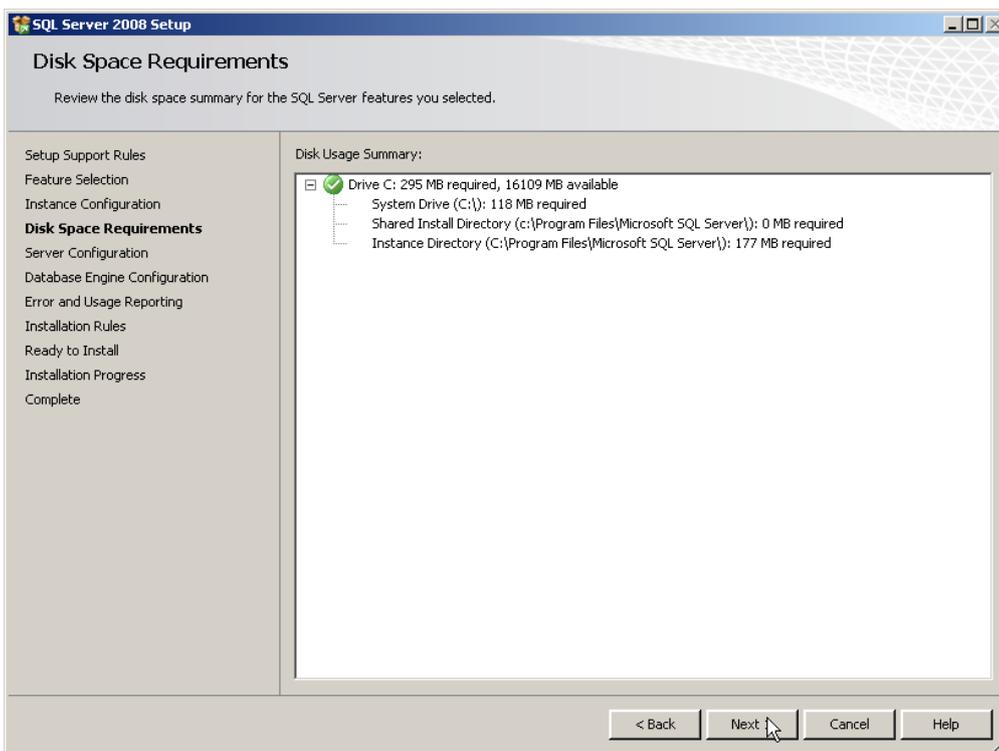
Select features to install (the minimum is Database Engine Services). Proceed by clicking Next:



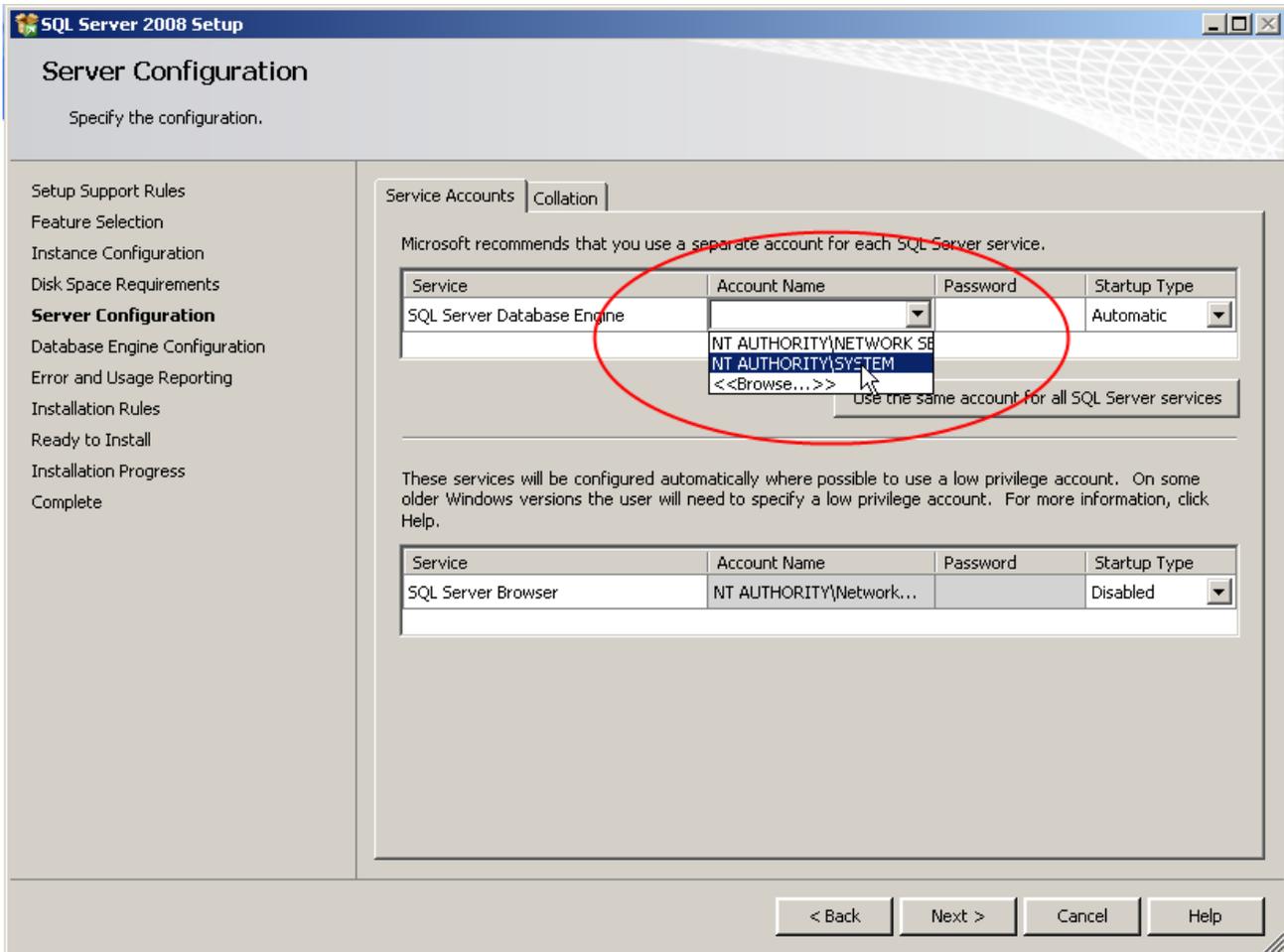
Important! In the next screen, select **Default Instance**. Proceed by clicking Next:



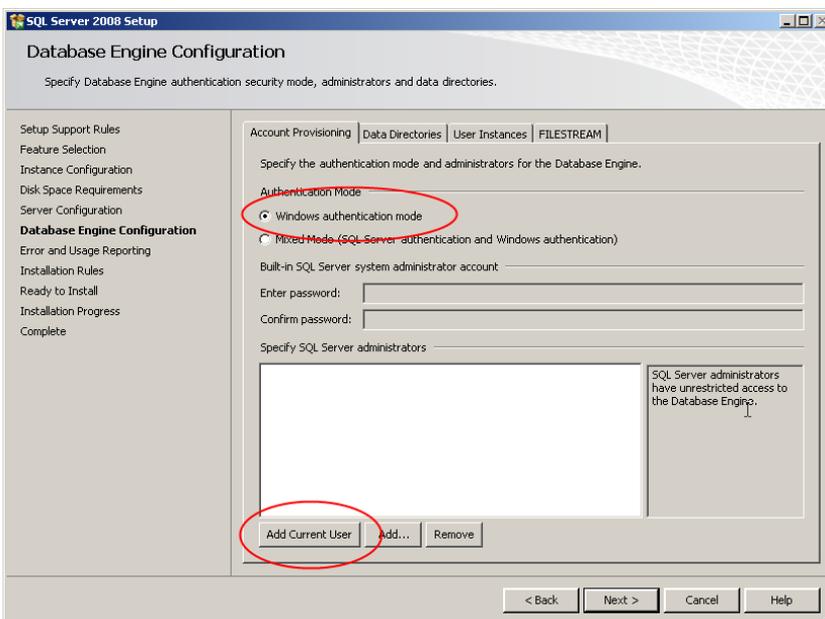
Proceed by clicking Next:



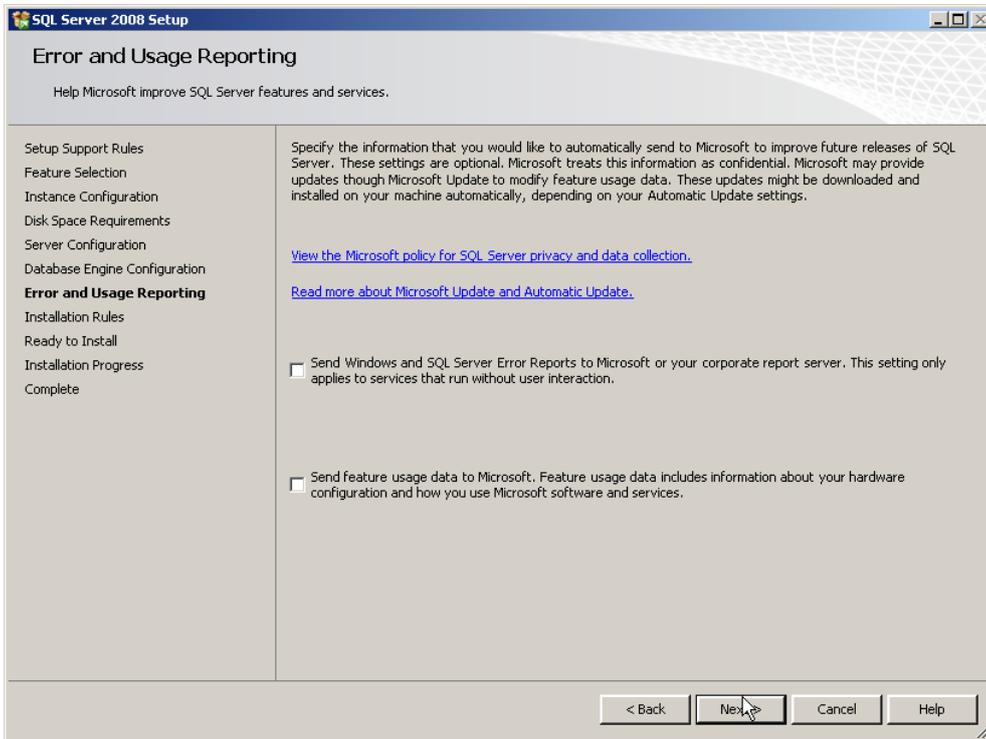
In the next screen, select the option on the account name as shown on figure. Proceed by clicking Next:



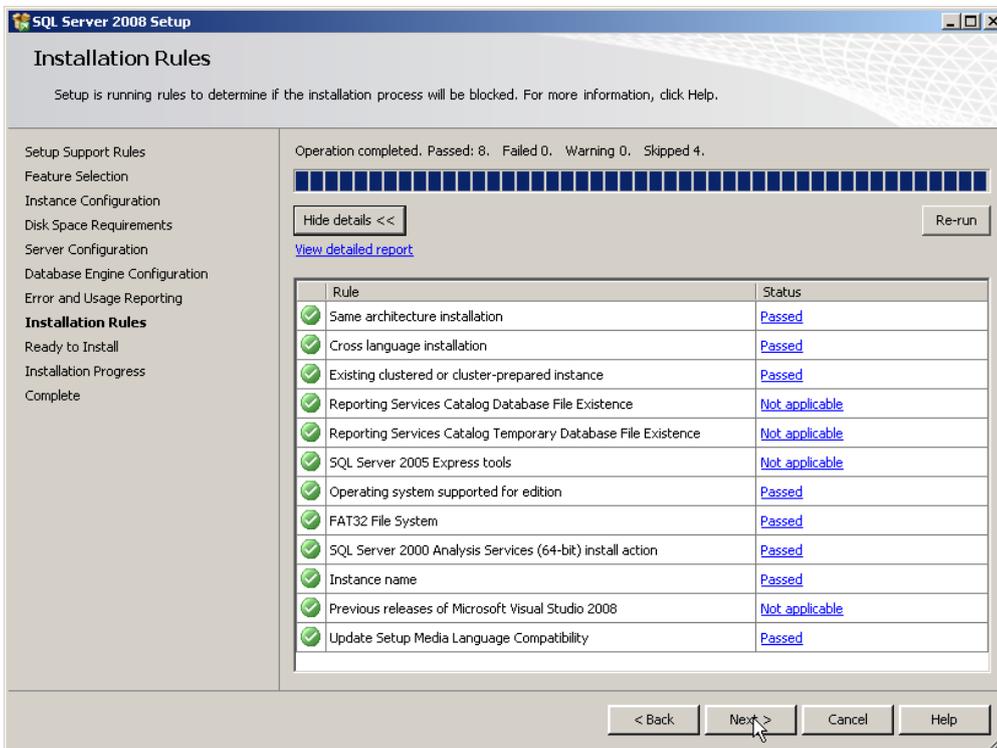
Leave selected the default option “Windows authentication mode”, then click Add Current User. Proceed by clicking Next:



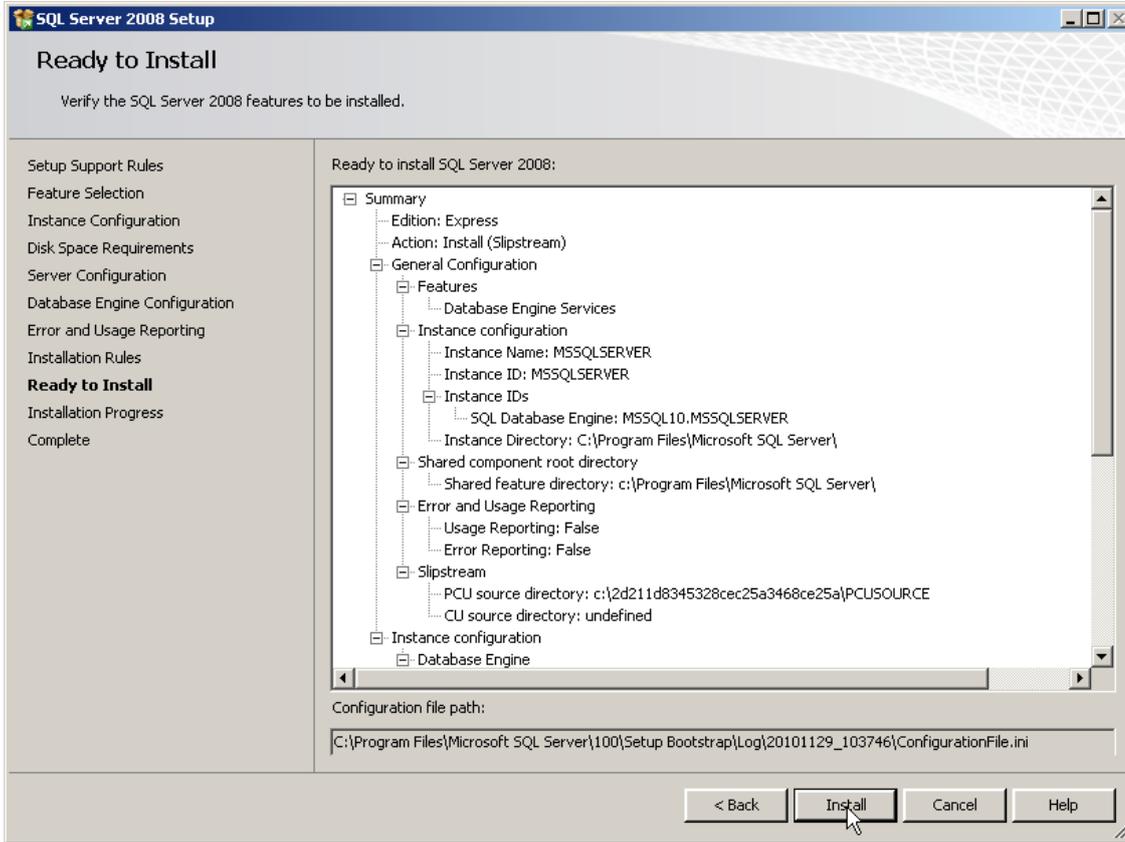
Select the desired options, then proceed by clicking Next:



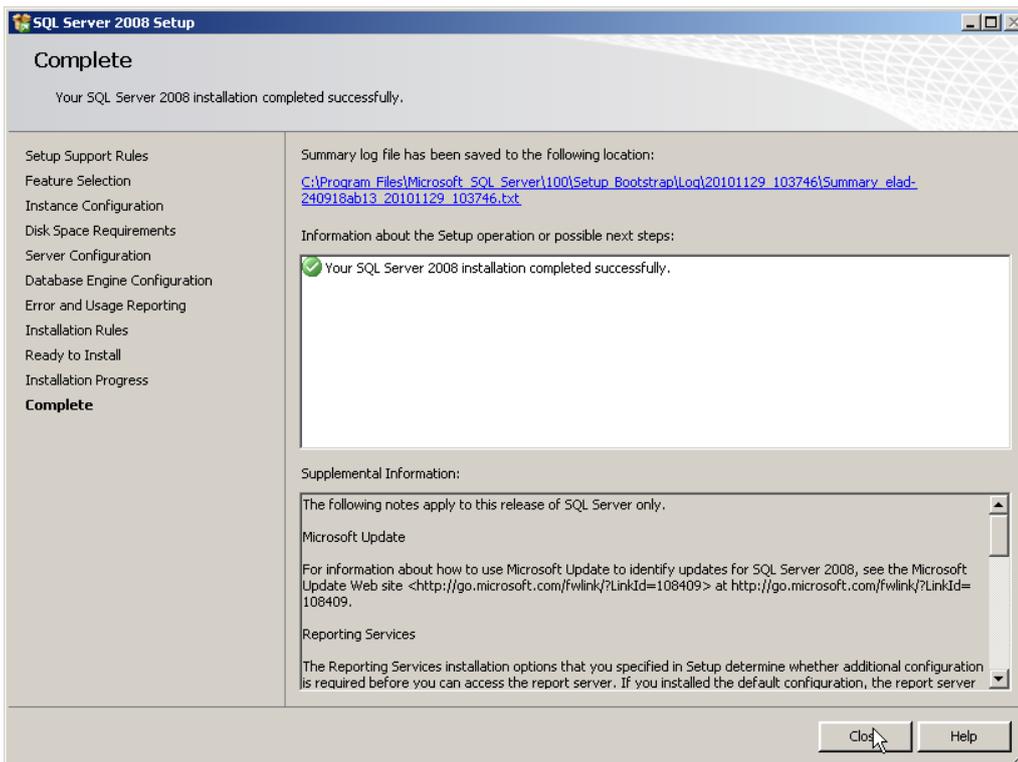
Proceed by clicking Next:



The installation summary will be displayed. Proceed by clicking Install:



Wait until the end of installation. At the end the following screen appears:



Now you can install the SNA software by double clicking **SNA3500Setup.msi**.

10.2 - Minimum requirements of PC and OS

- Windows XP/Vista/Win7 32/64 bit
- Personal Computer AT-compatible
- Intel Pentium 4 1.8 GHz or equivalent
- 128 MB RAM
- 100 MB Hard Disk free space
- LAN port
- Graphic video board 1024 X 768 pixel, 65.536 (16/32 bit) colors

10.3 - Setting parameters for network connection

In order to control the SNA3500 with PC software, you must properly configure the parameters of the network connection of the instrument.

Using the touch screen you can set the parameters of the SNA network connection.

From initial screen to access to the menu by pressing in sequence on LAN UTILITY-> Setup-> LAN.



Press the button that corresponding to the parameter you want to change, then change the value of the cursor with the keys '+' and '-' or using the scroll wheel. Press '-->' to change the parameter field to be edited

192.168.2.219 '->' 192.168.2.219.



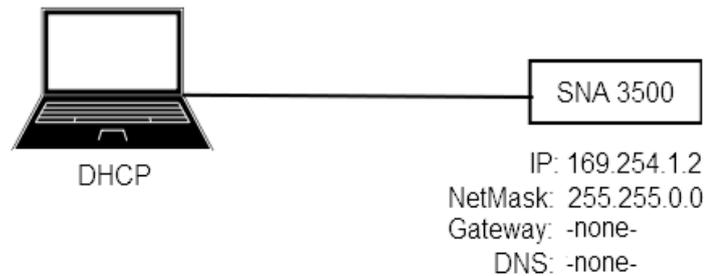
Press "SAVE" to save the configuration

! Note: The changes will take effect only after restarting the SNA.

In the case to changing the DNS and Gateway parameters, by pressing 'NONE' it is set a null value. The configuration without the DNS and Gateway is the default one and is recommended to use the SNA connected to a PC via a cross cable.

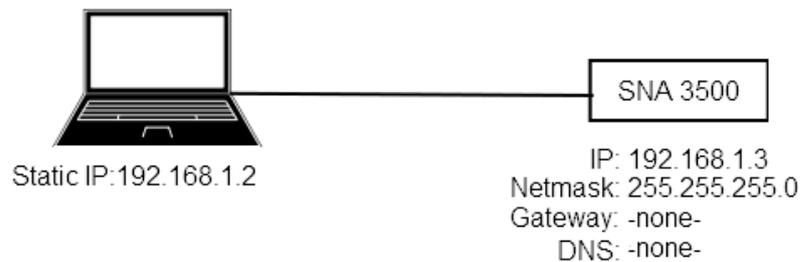
10.4 - No LAN, PC on DHCP mode, SNA connected to PC via cross cable

If your PC is set to DHCP and does not detect a DHCP server able to assign an IP address, for example if it is connected via a cross cable to SNA, Windows acts giving the PC an IP address with the type 169.254.xy, with Net Mask 255.255.0.0.
Additional documentation could be found searching for "APIPA (Automatic Private IP Addressing) on the Web.



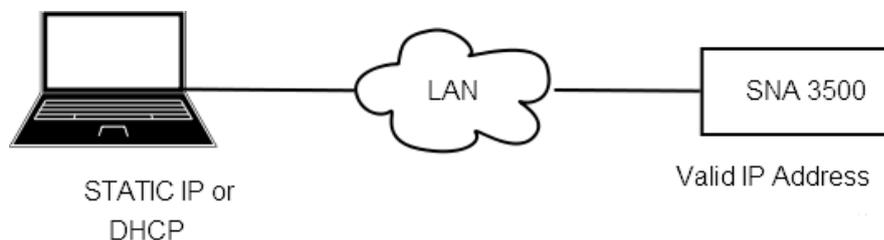
10.5 - No LAN, PC with static IP, SNA connected to PC via cross cable (default)

In this case you must set on SNA an IP address that is in the same subnet than the PC



10.6 - Configuring with LAN

In this case it must be set on SNA the IP address, NetMask, Gateway and DNS provided by your network administrator.

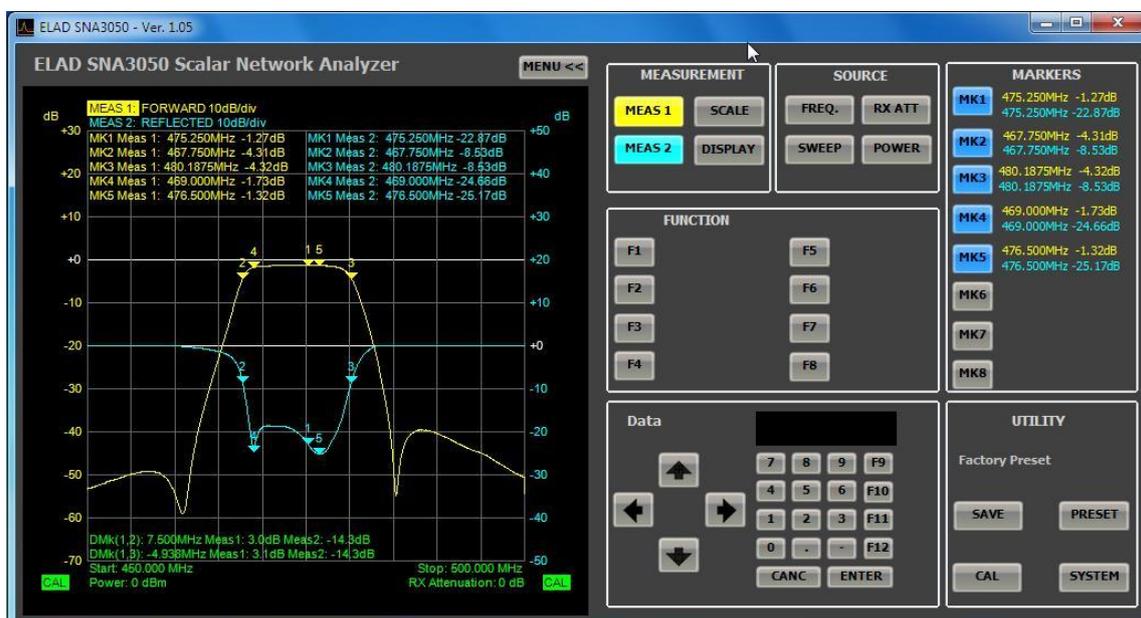


10.7 - Running SNA3500 software

- Run the SNA3500 software from the list of programs, if present, or from the desktop shortcut (if necessary verify correspondence between the PC and SNA IP addresses)
- You'll see a startup screen to select the normal operating mode or demo: click the LAN mode and press START



- You will see the initial screen of the program (the buttons and arrows on the screen can be selected only with the mouse)



- SNA3500 will display "REMOTE CONTROL"; until the software is open, you cannot bring back the SNA3500 in stand-alone mode by pressing the "LOCAL"



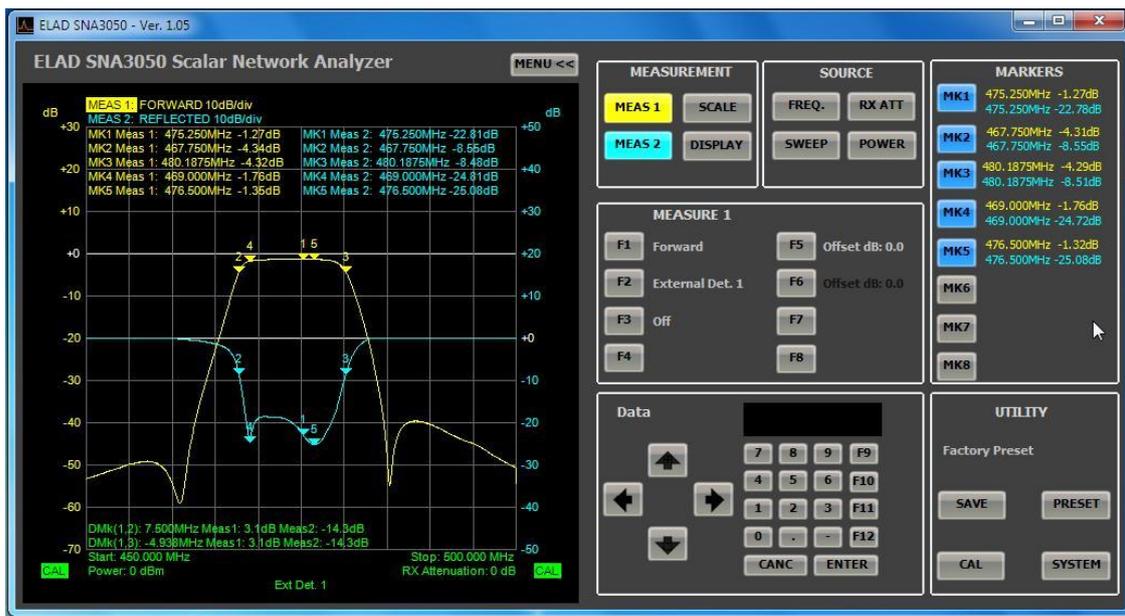
- Once you close the program, to return to stand-alone mode, press "LOCAL" on SNA3500 (the text "REMOTE CONTROL" will disappear).

11 - PC Software Mode

In this chapter we will describe in detail the various menus of the GUI software.

11.1 - MEAS 1 Menu

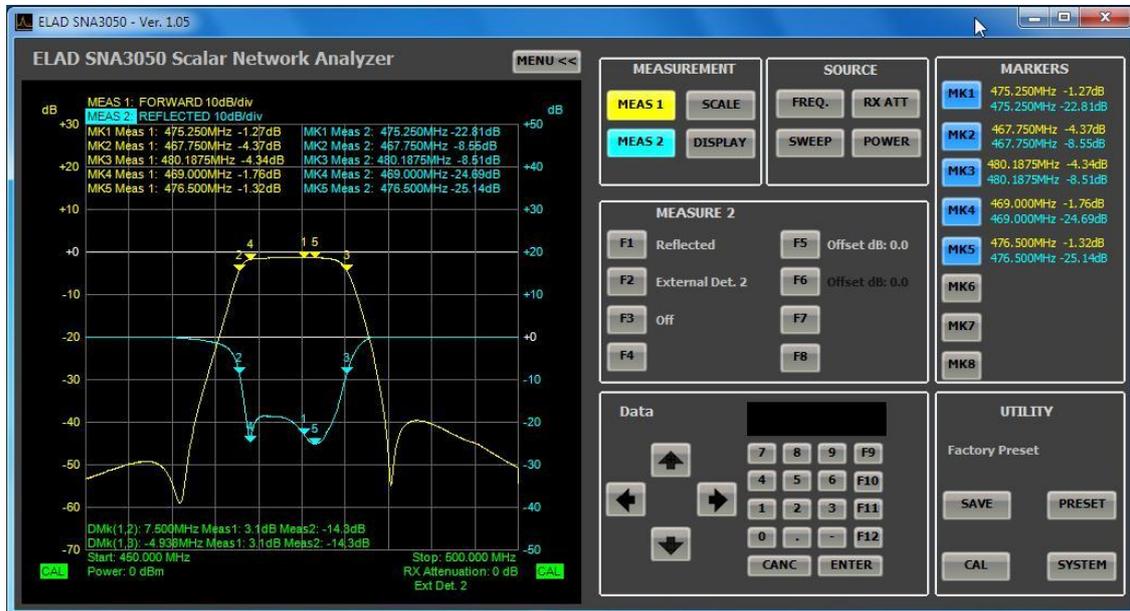
Allocation of measure 1:



- F1: Set to Measure 1 the reading of the direct power
- F2: Set to Measure 1 the reading of EXD1 (if connected)
- F3: Disable measure 1
- F5: Set an offset to the measure of direct power. Enter the value using the keypad on the software or the numeric keypad of the PC.
- F6: Set an offset to the measure of EXD1. Enter the value using the keypad on the software or the numeric keypad of the PC.

11.2 - MEAS 2 Menu

Allocation of measure 2:

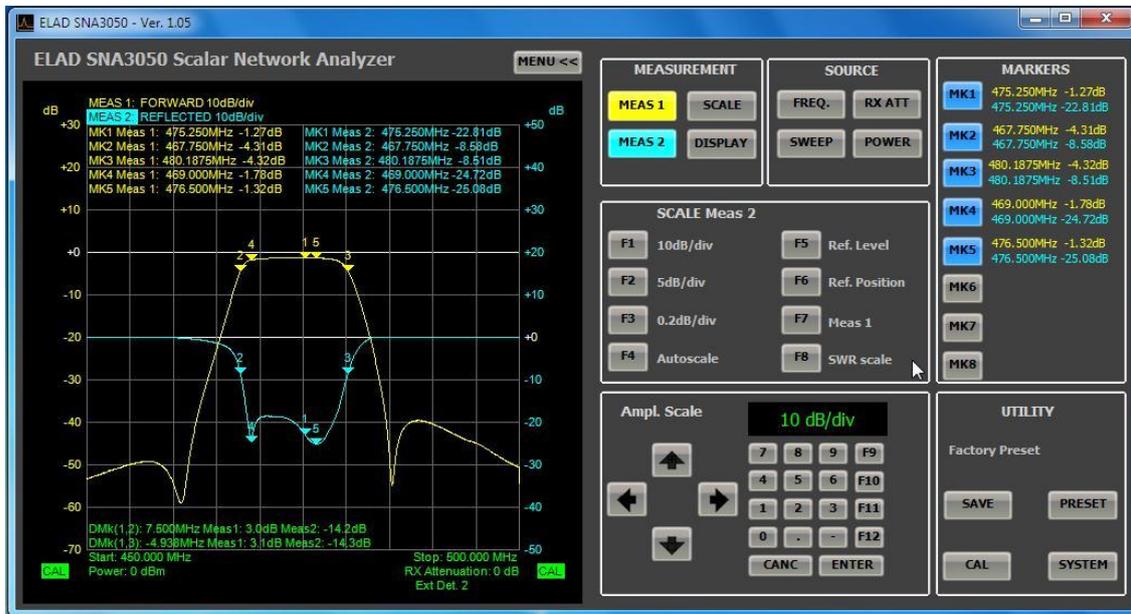


- F1: Set to Measure 2 the reading of the reflected power
- F2: Set to Measure 2 the reading of EXD2 (if connected)
- F3: Disable measure 2
- F5: Set an offset to the measure of the reflected power. Enter the value using the keypad on the software or the numeric keypad of the PC.
- F6: Set an offset to the measure of EXD2. Enter the value using the keypad on the software or the numeric keypad of the PC.

11.3 - SCALE Menu

Setting parameters of the chart.

The function keys pane shows the selected measure. To select an alternative measure click on "F7".

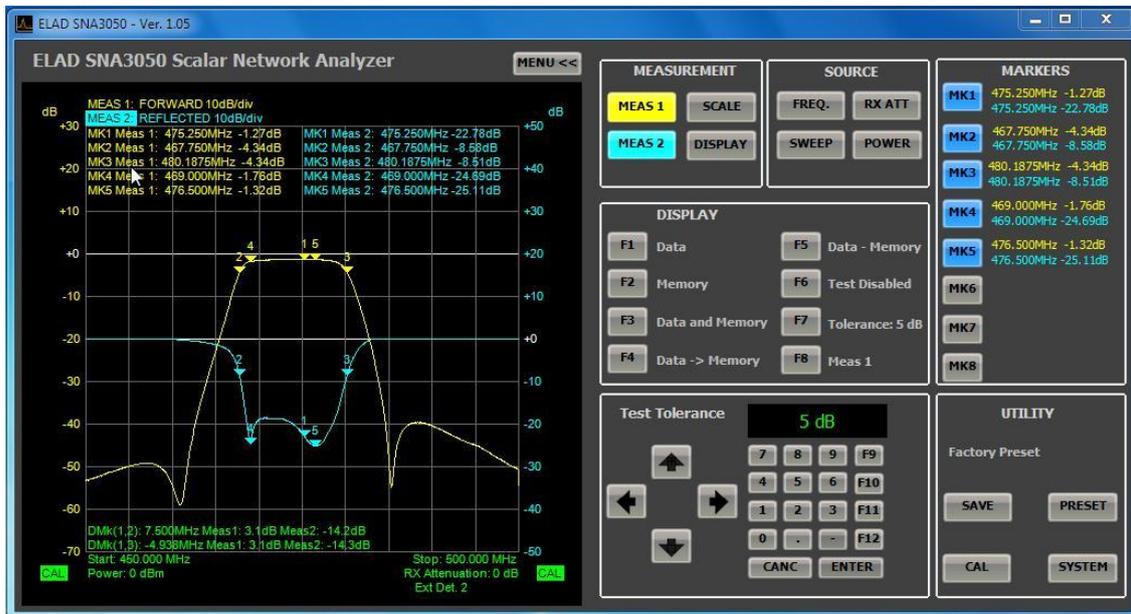


- F1: Set 10dB/division to the selected measure
- F2: Set 5dB/division to the selected measure
- If you want to set a different value of dB / div click F3 and enter the value using the keypad of the software or the keypad. The value entered is saved and is recallable by clicking the "F3"
- F4: Automatically changes the vertical scale factor in order to have maximum and minimum value measured respectively the top and bottom of the graph
- F5: Assign the level associated with the reference position. Enter the value using the keypad of the software or the keypad of the PC
- F6: Assign the reference position. Enter the value (0 to 10) using the keypad of the software or the keypad of the PC
- F7: Toggles the selected Measure 1 -> Measure 2 and vice versa.
- F8: Switches the SWR in dB scale and vice versa only if Measure 2 is selected and only measures the reflected power.

11.4 - DISPLAY Menu

Controls the display of the curves of the chart and sets the parameters for the "PASS / FAIL Test".

You can choose whether to store data and run tests to measure or both.



- F1: Set it to display only the current reading of the measure
- F2: Set it to display only the stored measurement
- F3: Sets the simultaneous display of the current measure and the stored measure
- F4: Save the current measure.
- F5: View a trace obtained as a difference (in dB) between the current and the stored measure.
- F6: Enable / disable the PASS / FAIL test on the whole extent or only on the active marker (in sequence "Test on Mem / Test on Mk / Test Disabled")
- F7: Set the threshold for the feature PASS / FAIL Test
- F8: Toggles the selection of the measure, Meas1 -> Meas2 and vice versa.

11.4.1 PASS/FAIL Test

11.4.1.1 Tests on the full extent

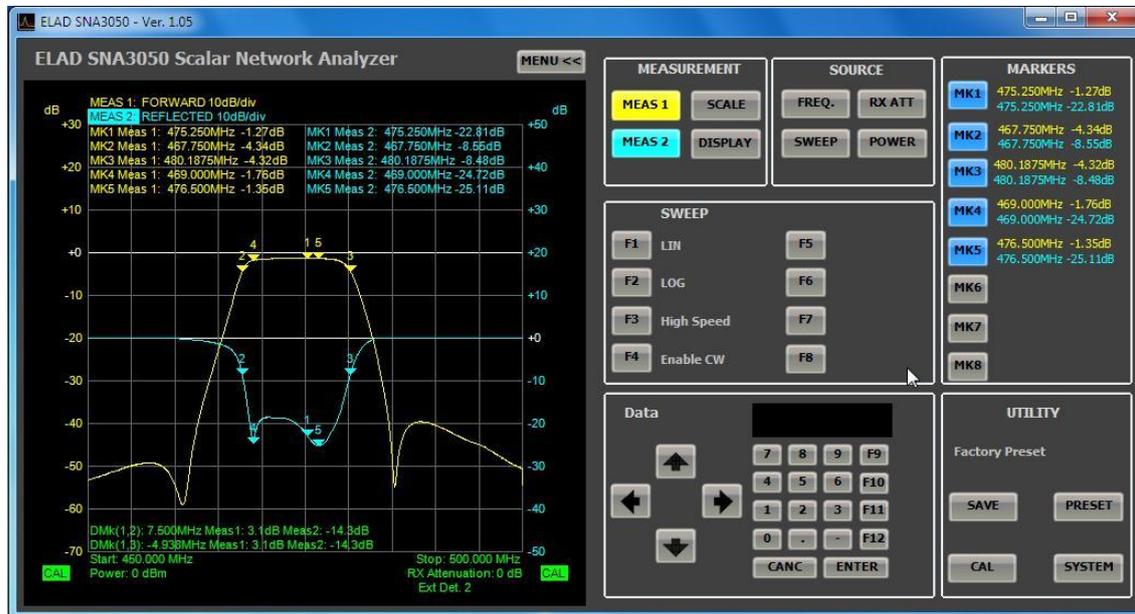
The test will return **PASS** result if the current reading for each frequency is in the range (measure stored) + / - (threshold of tolerance). Otherwise the results will be **FAIL**

11.4.1.2 Testing the marker

The test results will return **PASS** if the frequencies in which markers are positioned the current reading is in the range (measure stored) + / - (threshold of tolerance). Otherwise the results will be **FAIL**

11.6 - SWEEP Menu

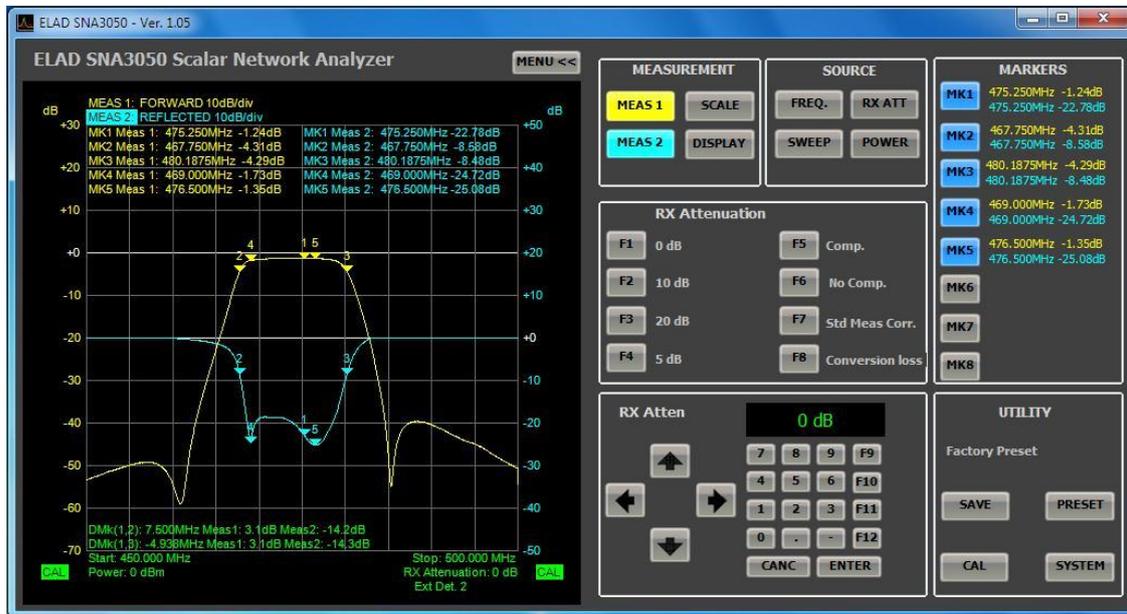
Scan parameters.



- F1: Select the linear scale for the frequency axis
- F2: Select the logarithmic scale for the frequency axis
- F3: Switches the mode of high-speed scanning / low frequency resolution (201 points) or low speed / high frequency resolution (801 points)
- F4: Enable / Disable mode CW (Continuous Wave) @ single frequency. In CW mode the instrument generates an unmodulated carrier with fixed frequency.

11.7 - RX ATTENUATION Menu

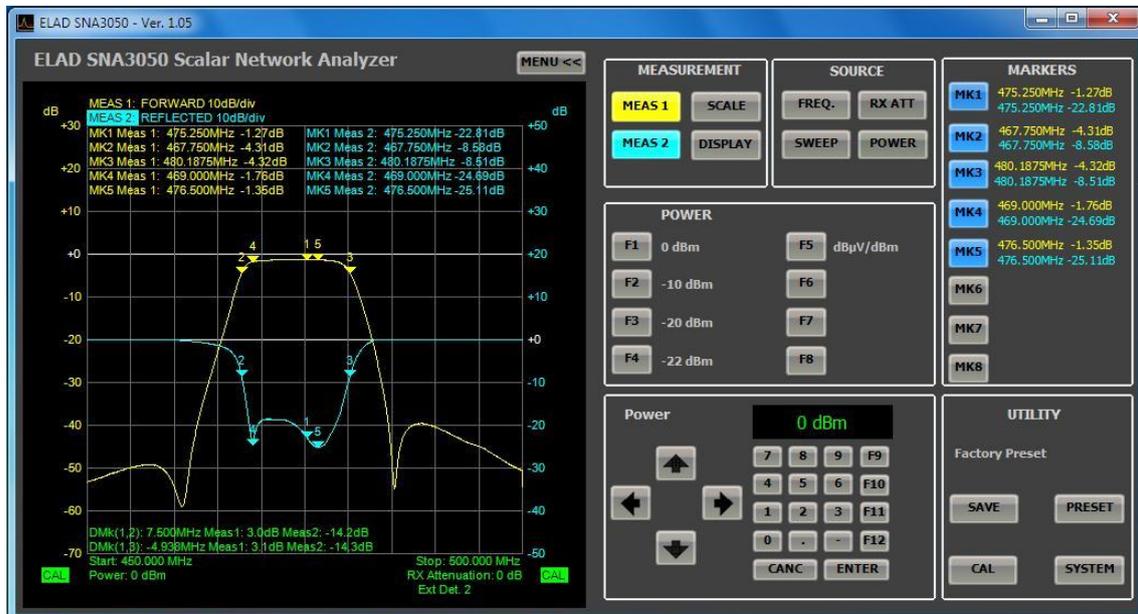
Allows you to select the input attenuation of the RF IN port.
It would be possible to insert attenuation from 0 to 31 dB in 1 dB steps.



- F1: Sets 0 dB attenuation
- F2: Sets 10 dB attenuation
- F3: Sets 20 dB attenuation
- If you wish to have a different attenuation value, click F4 and enter the desired value using the keypad on the software or the keypad of the PC. The value entered is saved and will be opened by clicking on F4
- F5: Enable the compensation of the attenuation in the reading of the measure. Measure displayed = measure read + inserted attenuation
- F6: Disable the compensation of the attenuation in the reading of the measure. Measure displayed = measure read
- F7: Use this setting if there are no conversions in frequency (frequency generated equal to the frequency applied to RF IN)
- F8: Use this setting to measure the loss / gain of converting a circuit with frequency conversion (e.g. mixer)

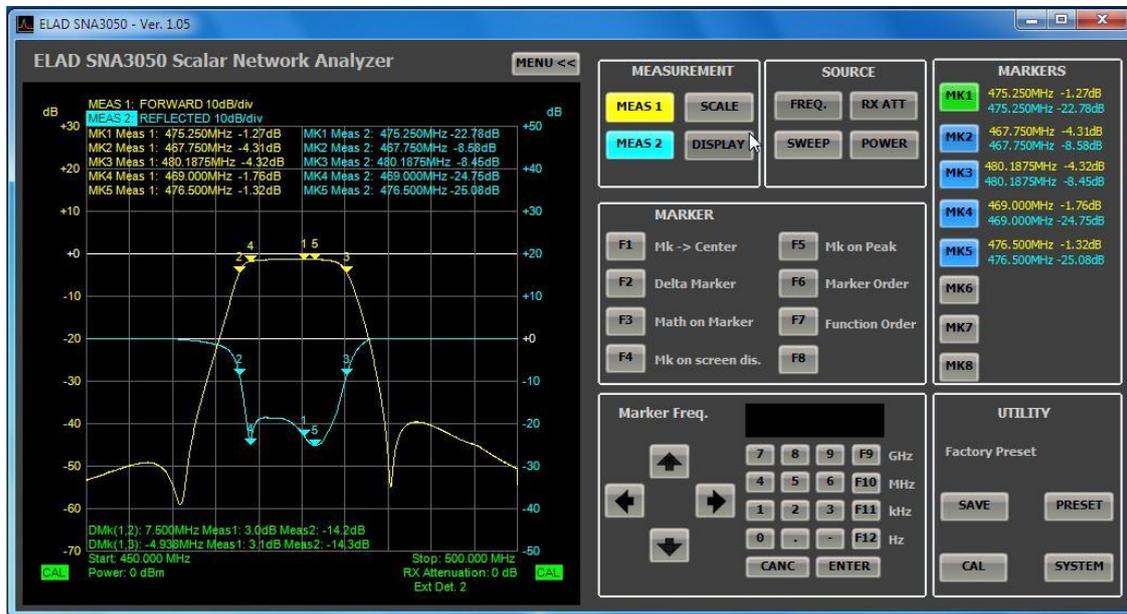
11.8 - POWER Menu

Set the output level on RF OUT. The minimum output level is -26 dBm, the maximum level is 5 dBm (only when the ext. detector D04 is connected).



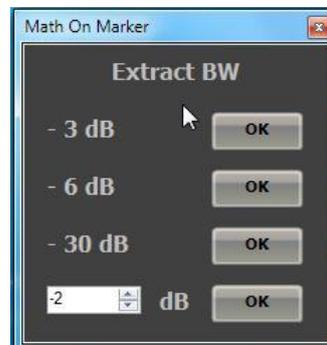
- F1: Set an output level of 0 dBm (107 dB μ V)
- F2: Set an output level of 10 dBm (97 dB μ V)
- F3: Set an output level of 20 dBm (87 dB μ V)
- If you wish to have a different output level click F4 and enter the desired value using the keypad on the software or the keypad of the PC.
- F5: Toggles dBm to dB μ V and vice versa

11.9 - MARKERS Menu



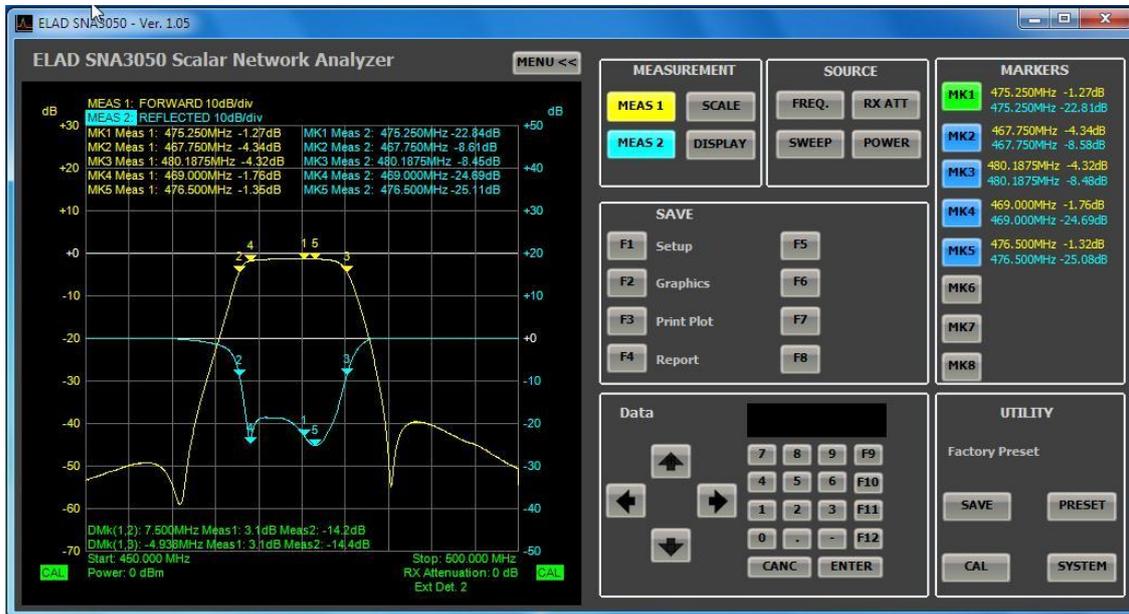
The menu is recalled by clicking on one of the keys of the box MARKERS.

- F1: Moves the center frequency at the same frequency of the active marker, leaving span the same
- F2: Allows you to make measures (frequency and amplitude) between marker 1 and the active marker. The result is displayed in the lower left of the chart; you can activate more Delta Marker
- F3: Allows you to automatically extract the -3dB bandwidth (or -6dB, -30dB or other value) of a filter or an amplifier. For proper operation must be active at least 3 markers and the frequency span must be large enough.

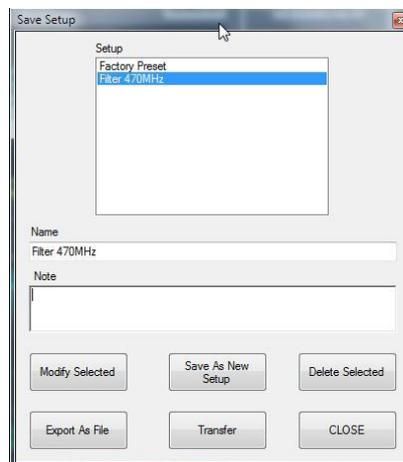


- F4: Enable / Disable the display of marker values on the chart. The values are always visible in the Markers pane.
- F5: Automatically moves the active marker on the point of maximum gain
- F6: Place the viewing written on the chart ordered by number of markers
- F7: Place the viewing written on the chart ordered by track: measure 1 to the left and measure 2 to the right

11.11 - SAVE Menu

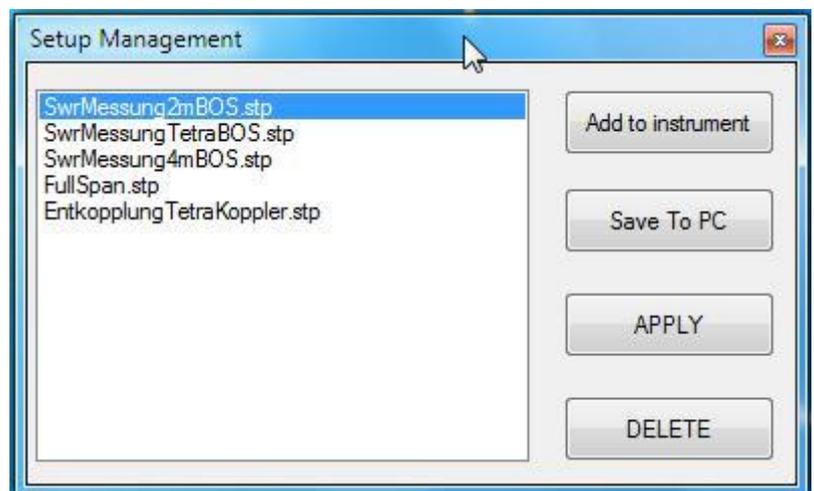
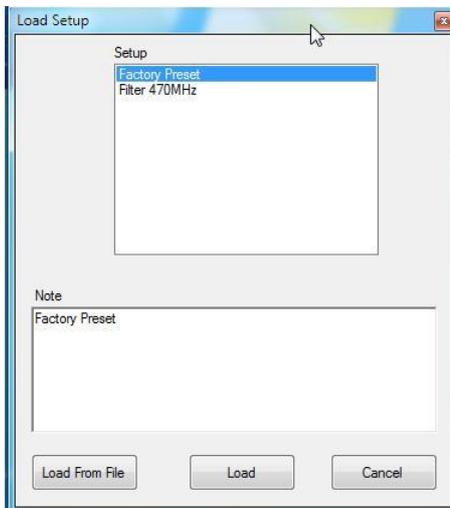
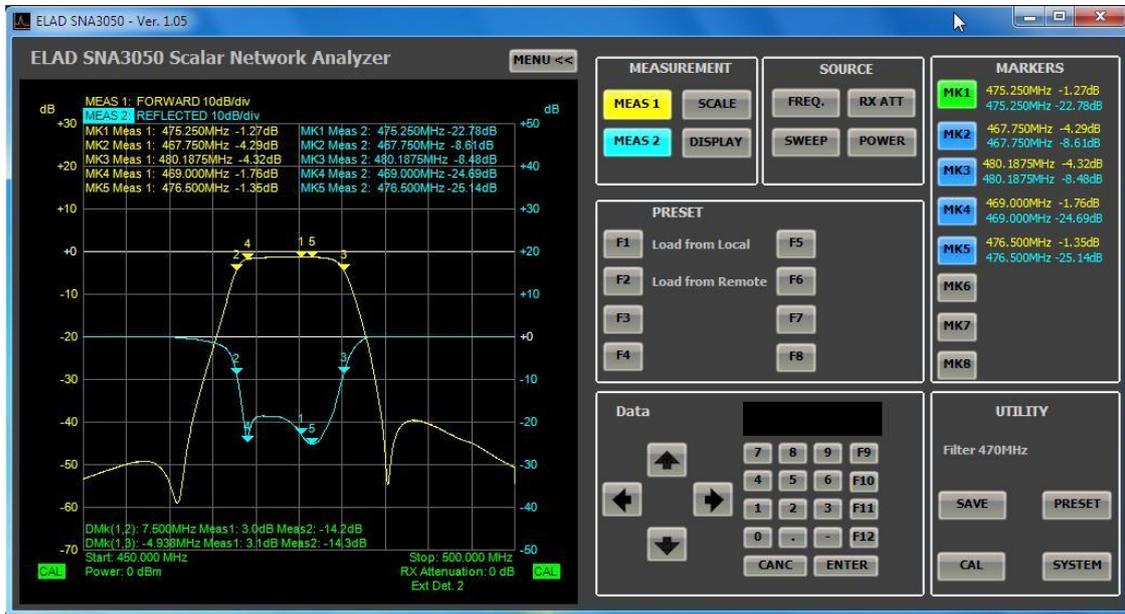


- F1: Save the current setup in the database. This opens the Save Setup. Select the setup you want to change by applying the current settings in the Setup panel, or click on "Save As New Setup" to create a new preset



- "Modify Selected": Changing the setup selected in the setup panel
 - "Save As New Setup": Adds a new setup in the database
 - "Delete Selected": Delete the setup selected in the setup panel
 - "Export As File": Save the setup to a .stp file format
 - "Transfer": Allow to transfer to SNA a .stp setup file
 - "CLOSE": Close the window
- F2: Save the chart to an image. The available formats are jpg, png, and bmp.
 - F3: Opens a print preview that allows you to print out the chart
 - F4: Creates a report. For details see chapter ["PC BASED measurements" – Generating a report.](#)

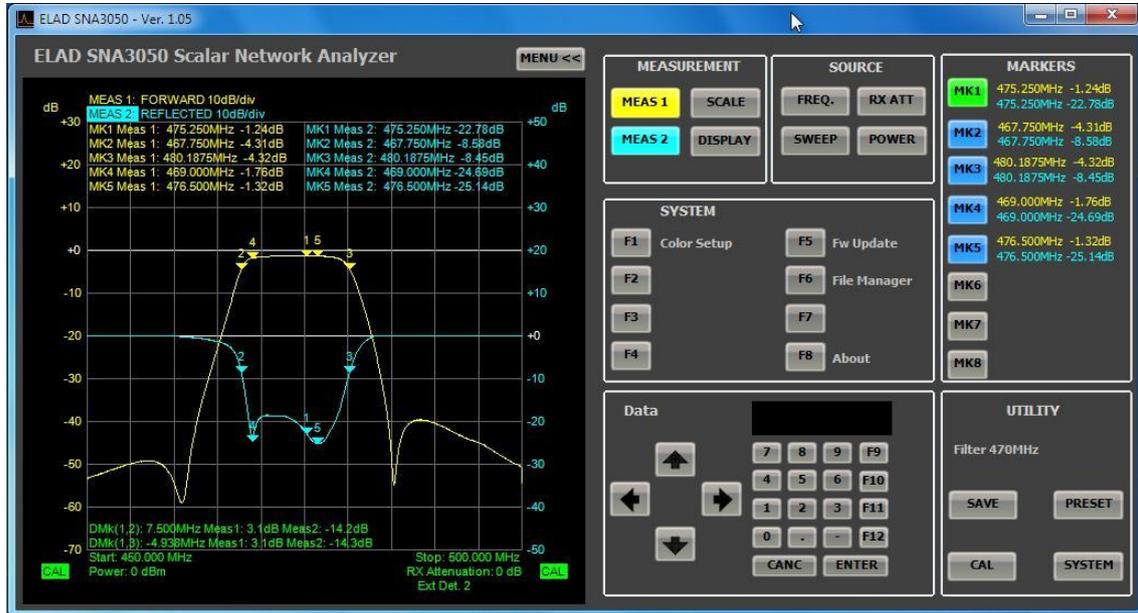
11.12 - PRESET Menu



- **F1:** Allows to load a setup .stp file from the PC database:
 - “Load “: Apply the setup selected in the Setup panel
 - “Load From File”: Loads a setup .stp file
 - “Cancel”: Close the form

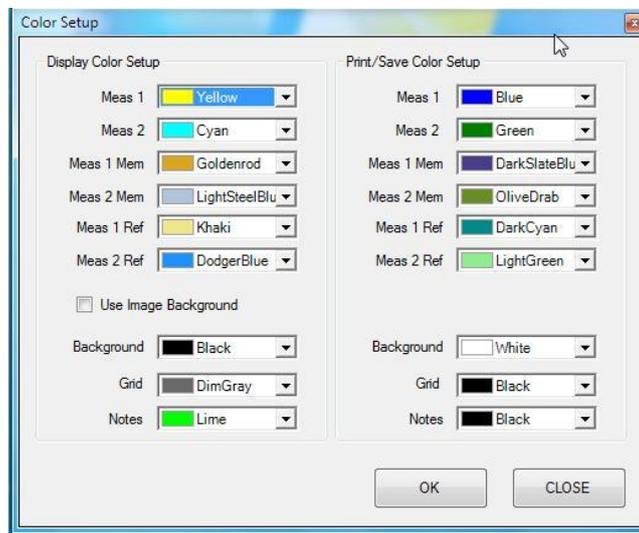
- **F2:** Load a setup .stp file saved in SNA; pane displays the setup saved on SNA
 - “Add to instrument”: Allows to select a .stp setup file and to transfer it to SNA
 - “Save To PC”: Transfer a .stp setup file from SNA to PC
 - “Apply”: Applies to PC the setup selected on the right panel. In this case setup is not saved both on database and on .stp file.
 - “DELETE”: Removes from SNA the selected setup

11.13 - SYSTEM Menu



11.13.1 F1: Color Setup menu

Open a window to change the colors of the tracks both on screen and for printing.



In the left panel you can set the colors for the software displaying. In the right panel you can set the colors when saving as a picture, reports and printing.

Using the option "Use Background Image" a custom background an image will be used on the chart.

11.13.2 F2: Network Analyzer Mode

Open a menu to work in Network Analyzer Mode

11.13.3 F5: Fw Update (firmware update) Menu

Open a window to select the folder containing the firmware update previously downloaded.

11.13.4 F6: File Manager Menu

Open a window displaying the setup stored in the SNA memory. It allows save on PC and delete operations.

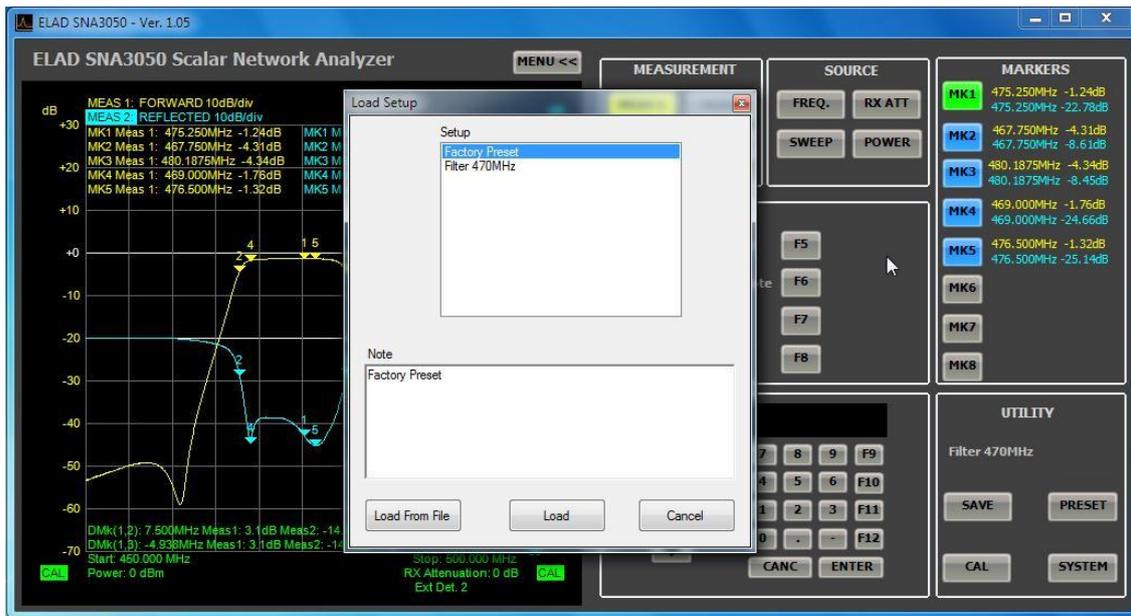
11.13.5 F8: About

Displays information about the software version, serial number of the connected device, firmware version of SNA and of the other components (DSP Encoder).

12 - PC – Based measurements

In this chapter you will learn how to make simple measurements with the SNA3500 controlled through the software.

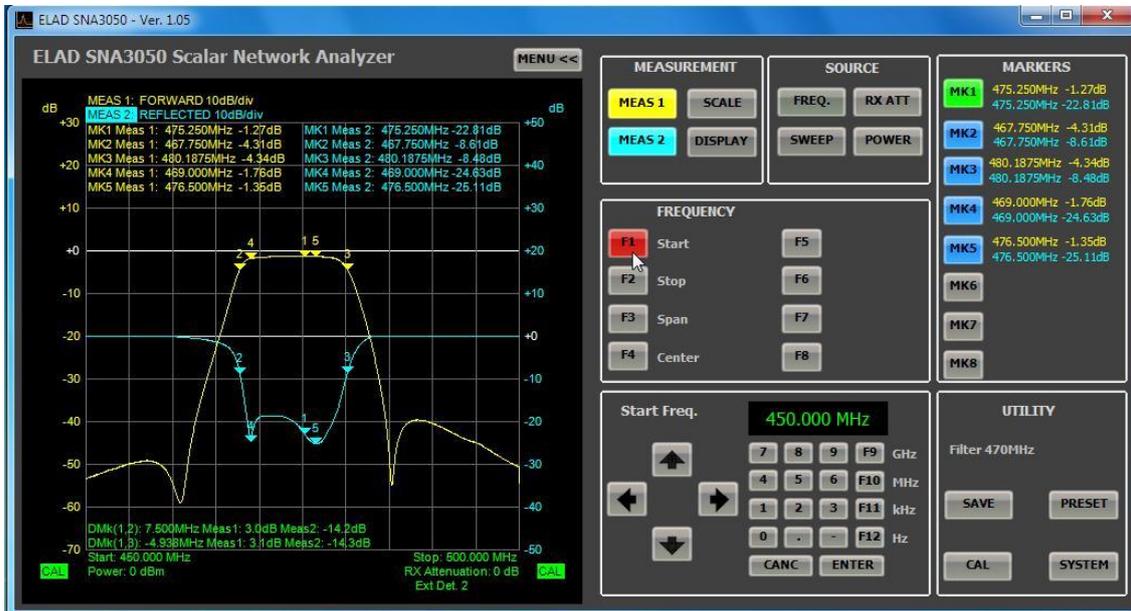
12.1 - Loading preset from database



To load a setup saved on local database click on the "PRESET" and then "F1" Load from Local. This opens the "Load Setup". In this window, select a setup in the top panel and click the button "Load" to apply the selected setup or click on "Load From File" to load a previously saved setup file

12.2 - Changing the Frequency range

If the frequency range of the preset is not what you like, you can change it. Click on the "FREQ" to access the menu to set the frequency.

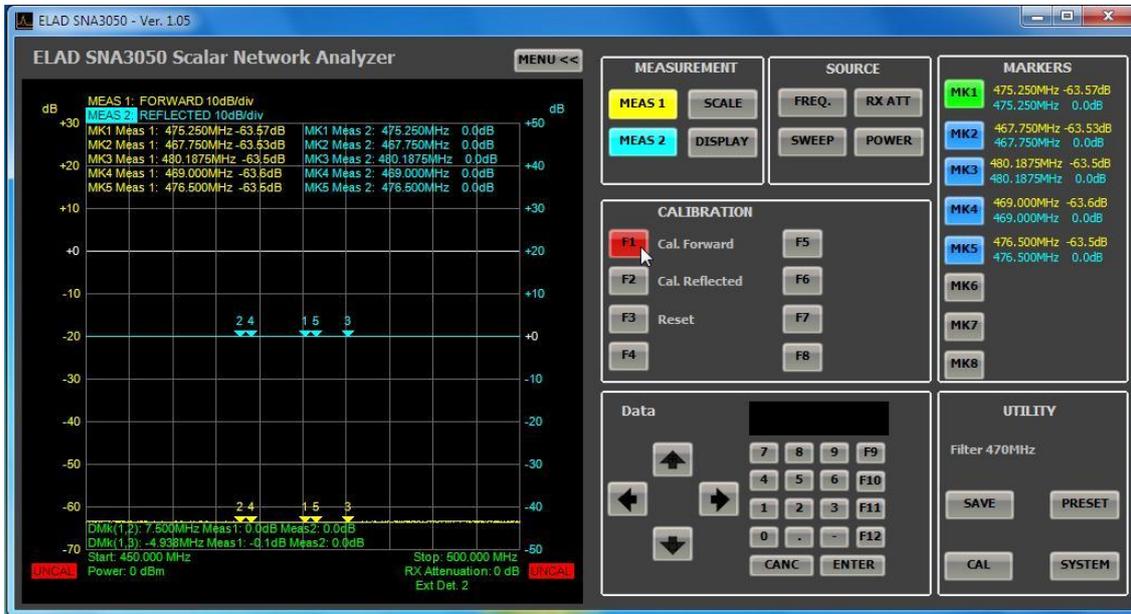


- Click on "F1" Start to modify the start frequency
- Then enter the desired value using the keypad or the keypad of the software on your PC.
- In a similar way you can change the end frequency ("F2 " Stop) or the center frequency ("F4" Center) and the magnitude of range ("F3" Span)

12.3 - Calibration

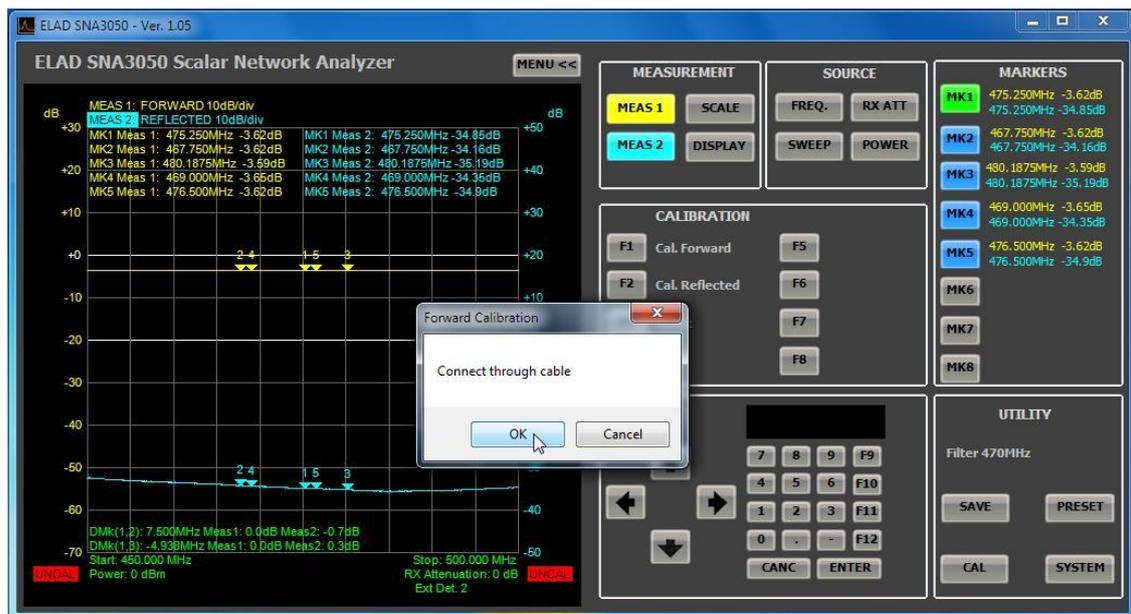
For maximum measurement accuracy, you should calibrate the instrument using the cables that will be used in the measurement. To calibrate the instrument proceed as follows:

- Click "CAL" on the "UTILITY" panel.

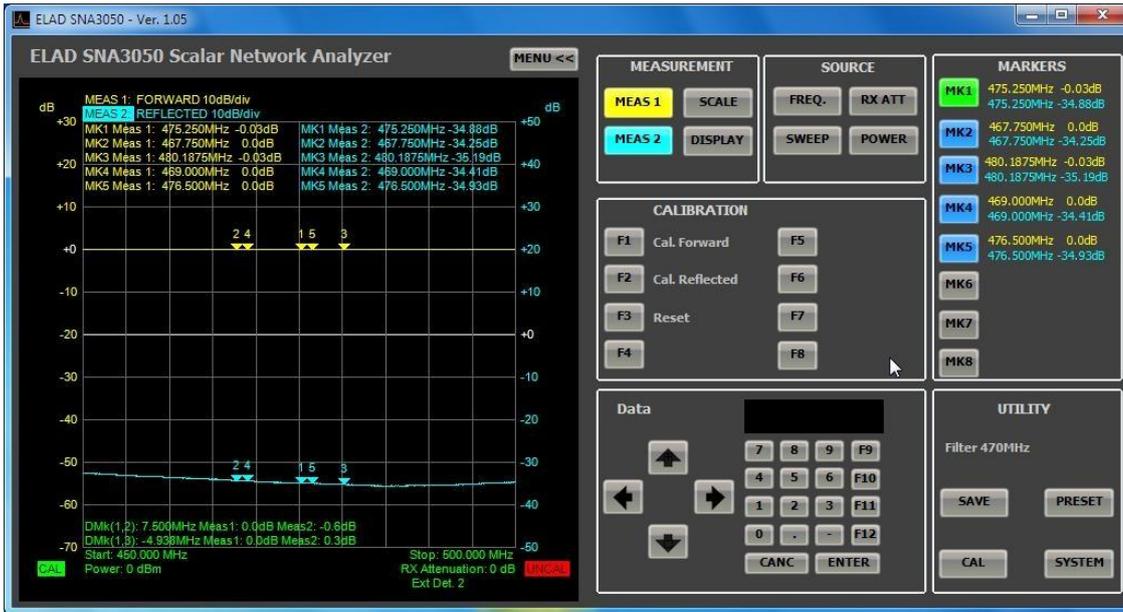


12.3.1 Direct power measure calibration

To calibrate the direct measurement, click on the button "F1 " Cal. Forward.

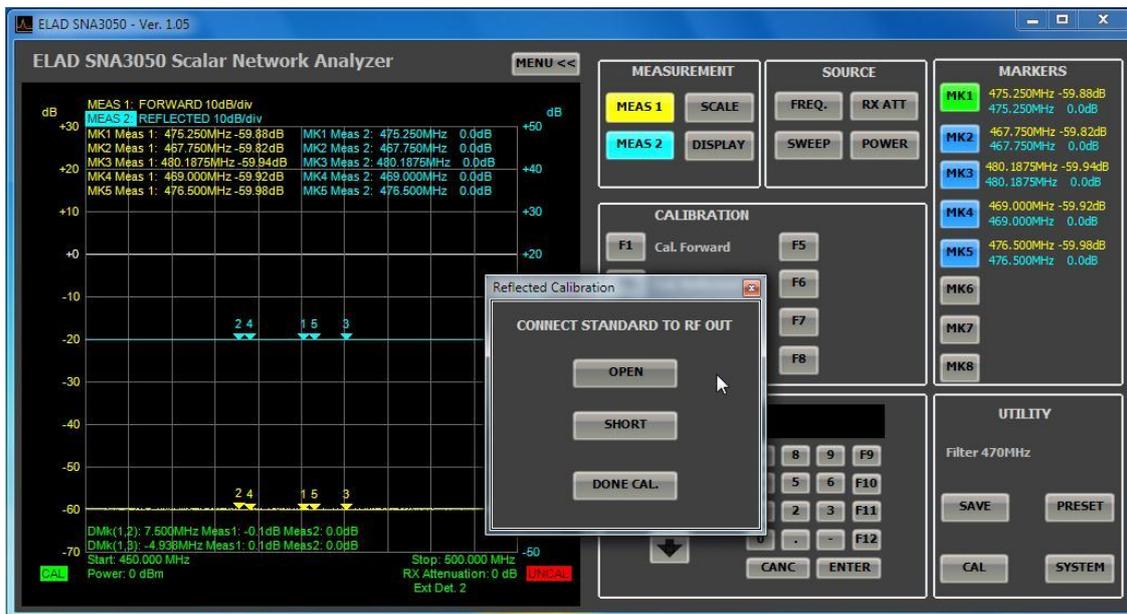


- Connect the cables used for measuring, the output and input RF IN and RF OUT and click "OK" when ready. The direct measurement curve (yellow) moves to the line at 0 dB and the CAL text on a green background appears in the lower left corner of the chart.

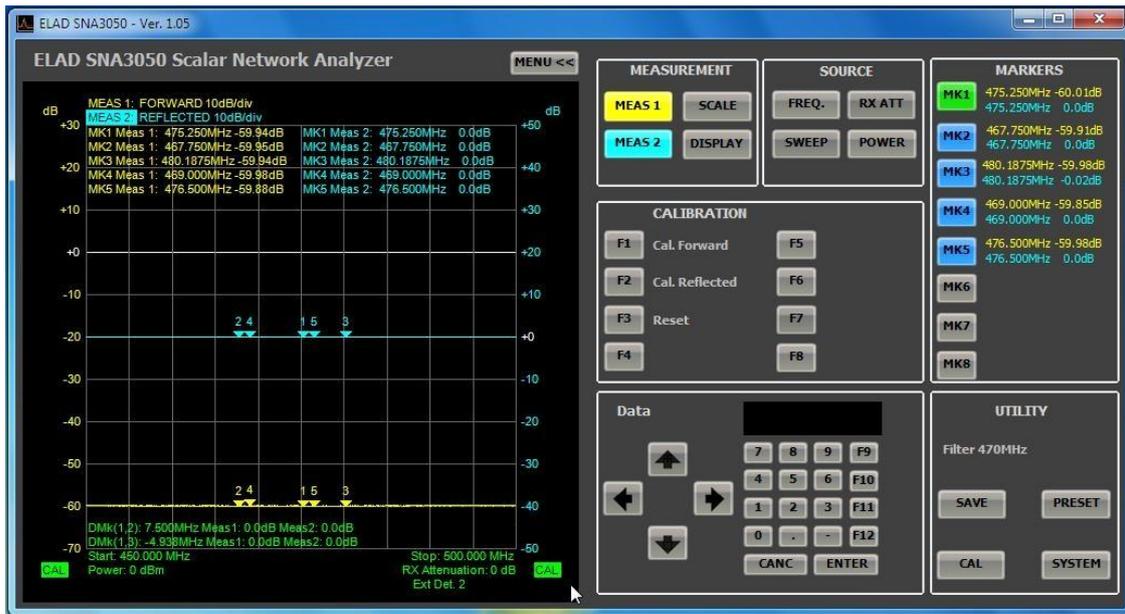


12.3.2 Reflected power measure calibration

To calibrate the reflected power measure, click on “F2” Cal Reflected.



- Leave open the RF OUT port, then click “OPEN”
- Connect the short connector to RF OUT then click “SHORT”
- Click on “DONE CAL.” To save calibration



The curve of the reflected measure (blue) moves to the line at 0 dB and a green the CAL text on a green background appears in the lower right corner of the chart.

12.3.3 Calibration Status

The written to the lower left and lower right corners of the graph, describe the status of calibration, respectively of Measure 1 and Measure 2.

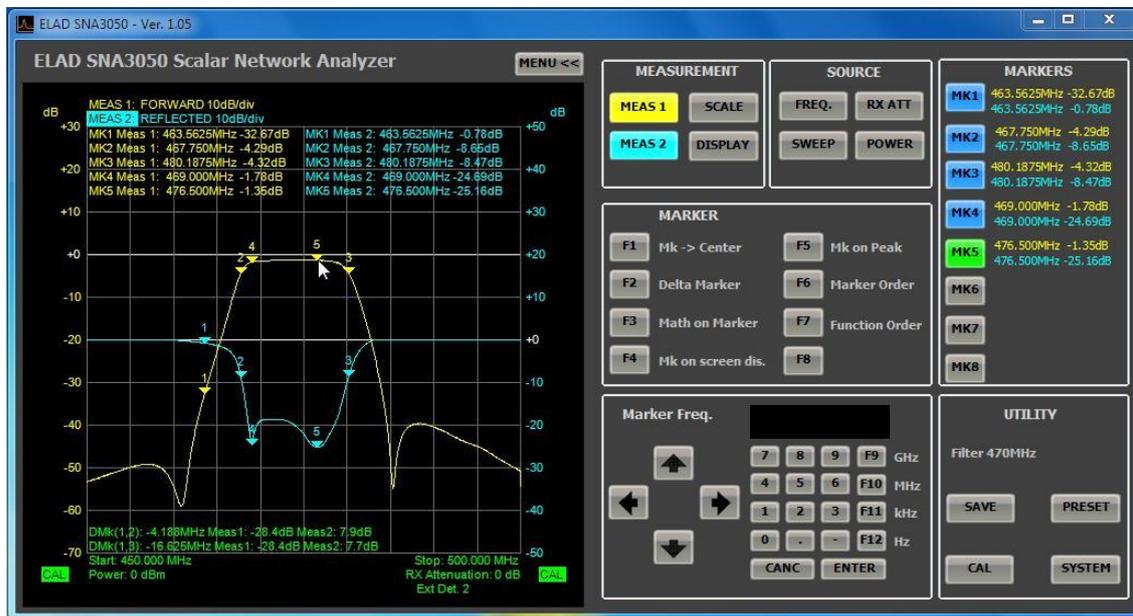
- **CAL**: The measure is calibrated
- **UNCAL**: The measure is not calibrated, a calibration was not performed or the setup of the instrument was changed after calibration.
- **CAL?**: The measure is calibrated and the instrument setup has not changed. However, the SNA has been turned off and on again so it is recommended to repeat the calibration.

Note:

If the measure is performed using cables with a significant length respect to the wave length, it is recommended to connect directly (or in the shortest way using max. one adapter) the input of the device under test (DUT) to the RF OUT port and to connect the longest connection between the output of the DUT and the RF IN port of SNA.

12.4 - Marker positioning

The setup also includes the placement of the marker, but you can change its position.



First click on “MK1” ... “MK8” to activate a marker.

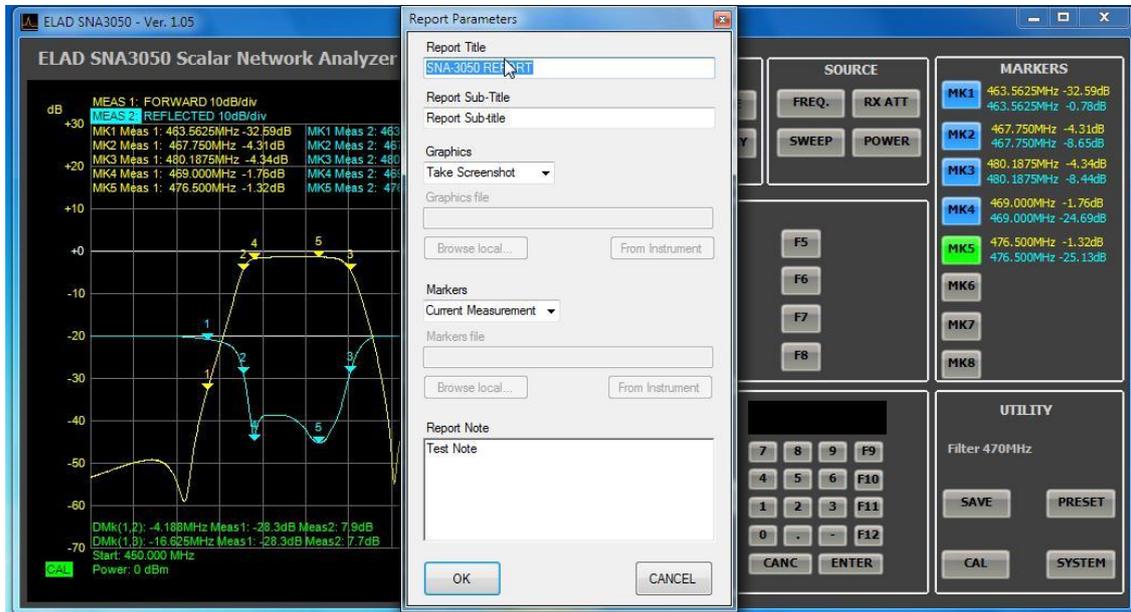
When the marker is active and selected, the corresponding button turns green and you can place a point on the curve by clicking on the chart. When a marker is active (that appears on the chart) but not selected, the corresponding button turns blue.

Alternatively you can enter the frequency at which you want to place the marker with the number keys on the software in the "Marker Freq." or the numeric keypad on the PC. In this case, the marker will be placed at a frequency as close as possible to the one you entered.

To deactivate a marker, click the corresponding button to select it (the button turns green) and click again to disable it (the button turns gray).

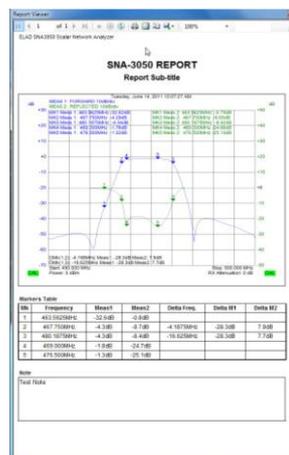
12.5 - Generating a report

To generate a report with the results of a measure click on the button "SAVE" and then "F4" report. A window appears where some parameters could be set:



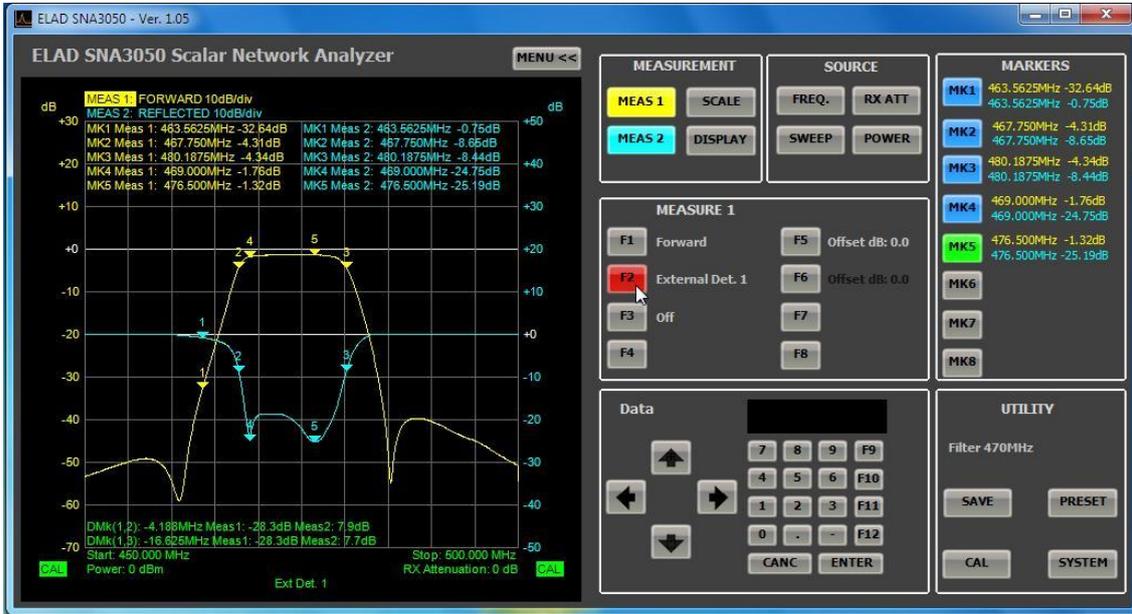
To obtain a report of the current measure:

- You can customize the report by entering the title (Title Report) and subtitle (Report Sub-Title) that will be re-proposed in following saves. It is also possible to place notes as desired (Report Note).
- In the Graphics combo box select "Take Screenshot", in Markers combo box select "Current Measurement".
- By clicking on "OK" the report is generated and opened with the report viewer of Windows. Using this component you can also save the report to Word, Excel or Acrobat (PDF).
- If you want to get the report of a measurement made previously and stored in the instrument, in the combo box Graphics select "From File" and in the Markers combo box select "From File". Click on "From Instrument" in the combo box Graphics and select the file saved, then click "Load". Follow the same procedure for the box Markers and then click OK. If the file is saved on a USB key, select the file by clicking on "Browse Local".



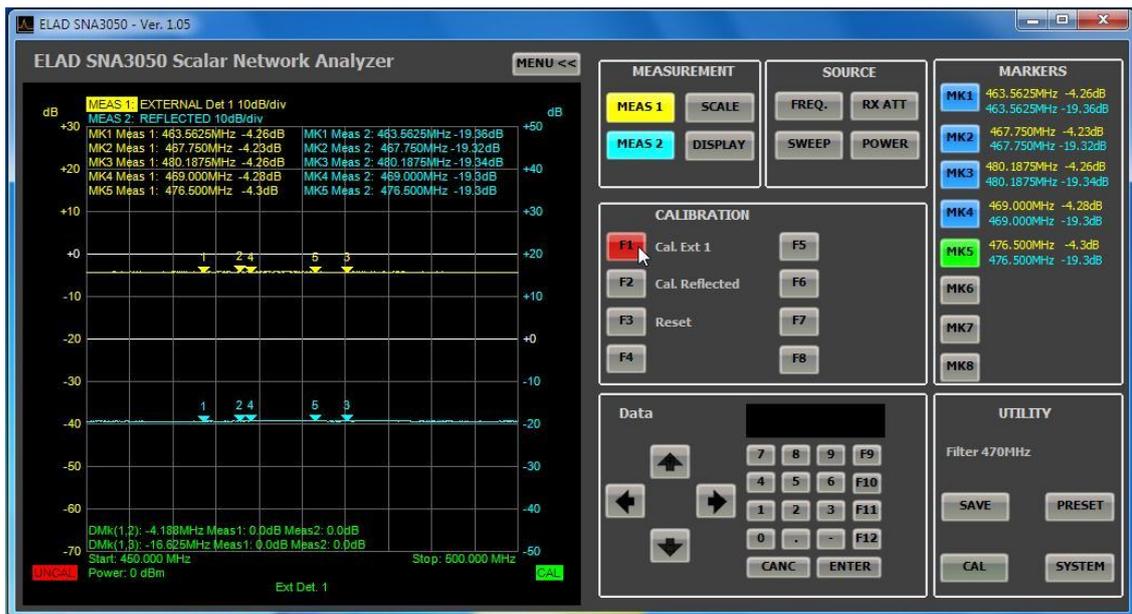
12.6 - Using external detectors

Using the external detector EXD1 EXD2 you can get a dynamic measure up to 80 dB (75 dB in case of attenuation measures) for frequencies from 100kHz to 470MHz.
 Connect an external detector to the "EXD1" ("EXD2") on the rear panel. Wait for the data load of the detector (about 20 seconds). When the upload is finished writing EXD1 (EXD2) appears in the chart at the bottom center.

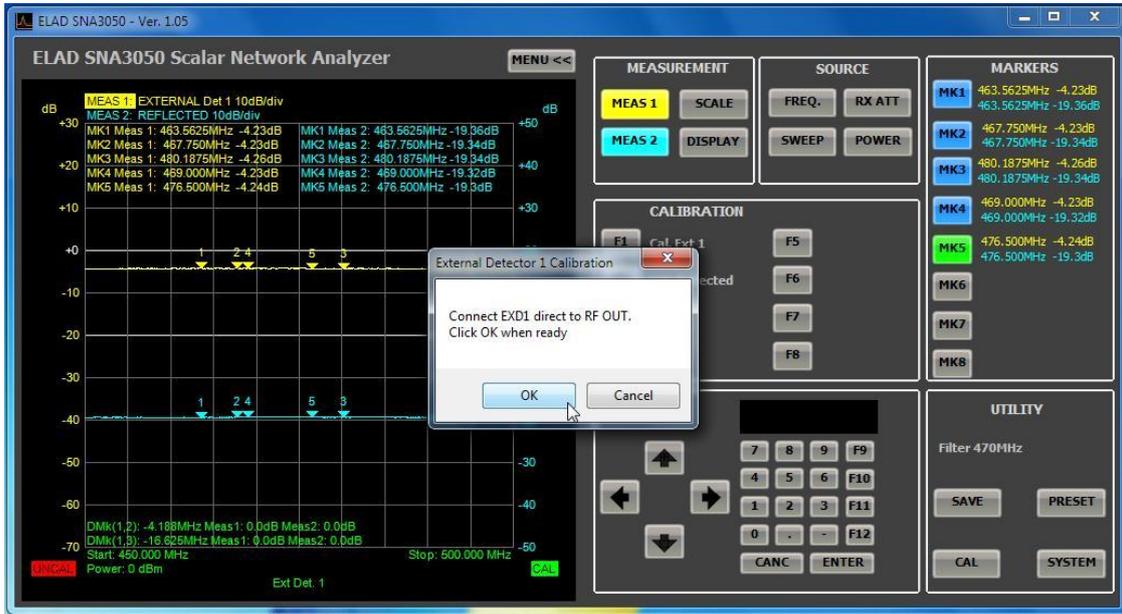


If SNA is turned on with an external detector connected, and the setup provides for their use, the external detector is automatically selected. Otherwise, if you want to use the EXD1 (EXD2), click on the "MEAS 1" ("MEAS 2") then "F3" EXD1 ("F3" EXD2).

Now you can calibrate the measure. Click on "CAL" then on "EXD1" ("EXD2")



If you are planning a direct measure of the power, connect the external detector to the RF OUT connector and then click "OK " when ready.

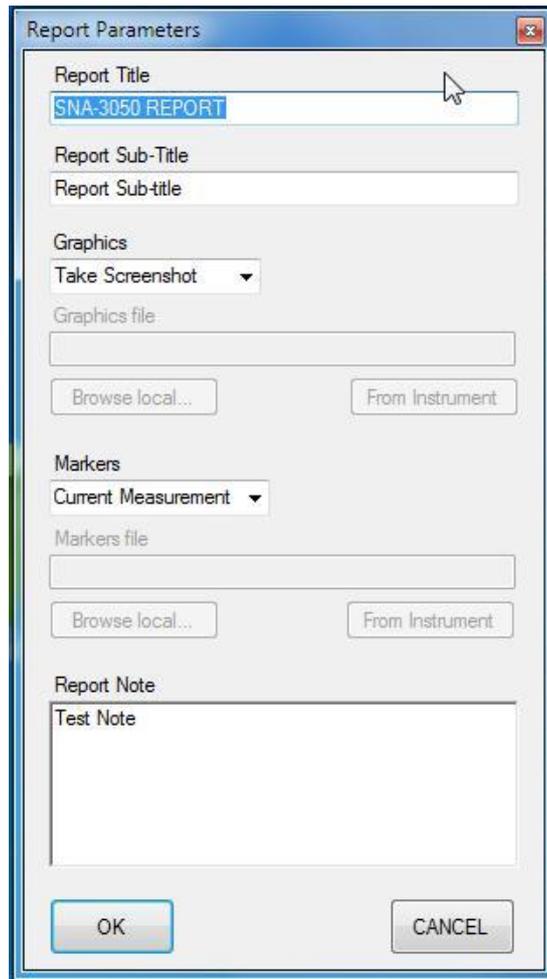


The yellow curve (blue) moves to the line at 0 dB and CAL text appears on a green background in the lower left (right) of the chart.

13 - Using PC Software to load data from SNA

13.1 - Generating a report

Using the software it is possible to generate reports containing data stored on SNA. Before proceeding, make sure you have saved data on SNA ([See Saving Measure](#))
Enter the SAVE menu clicking on the "F4" Report:

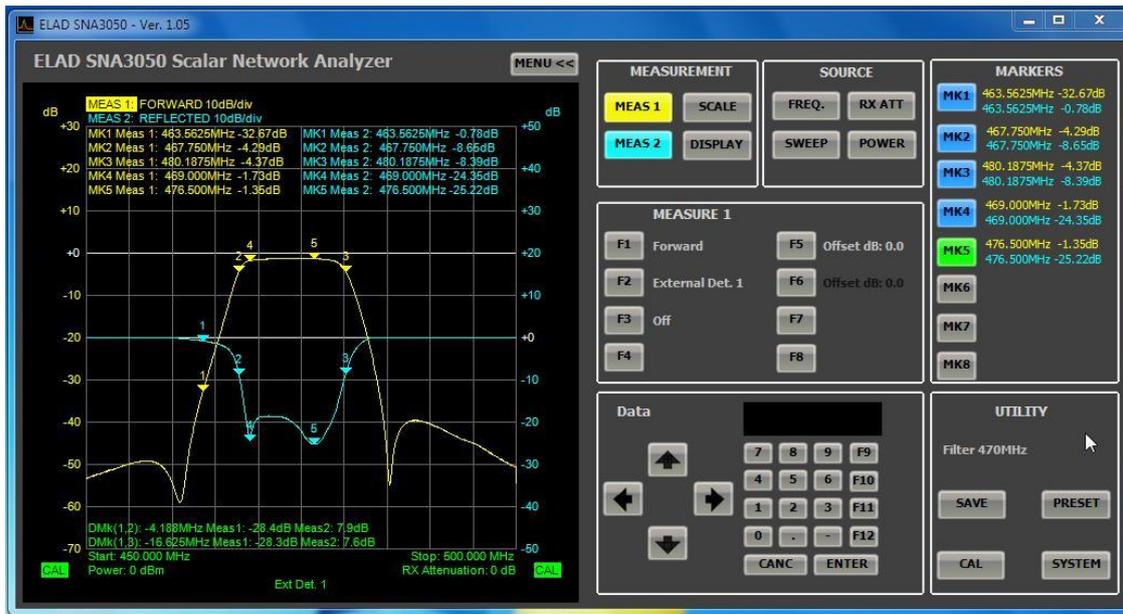


- You can customize the report by entering the title (Title Report) and subtitle (Report Sub-Title) that will be re-proposed in following saves. It is also possible to place notes as desired (Report Note).
- Choose on the combo box "Graphics" the option "From file".
- Click "Browse local ..." if you want a screen-shot of the chart saved on your PC (or on a USB key connected to the PC).
- Click on "From instrument" if you want a screen-shot saved in SNA memory (save destination ftp)
- Choose in the combo box "Markers" the option "From file".
- Click "Browse local..." if you want a marker table saved on your PC (or on a USB key connected to the PC).
- Click on "From instrument" if you want a marker table saved in SNA memory (save destination ftp)
- Click OK to generate the report.

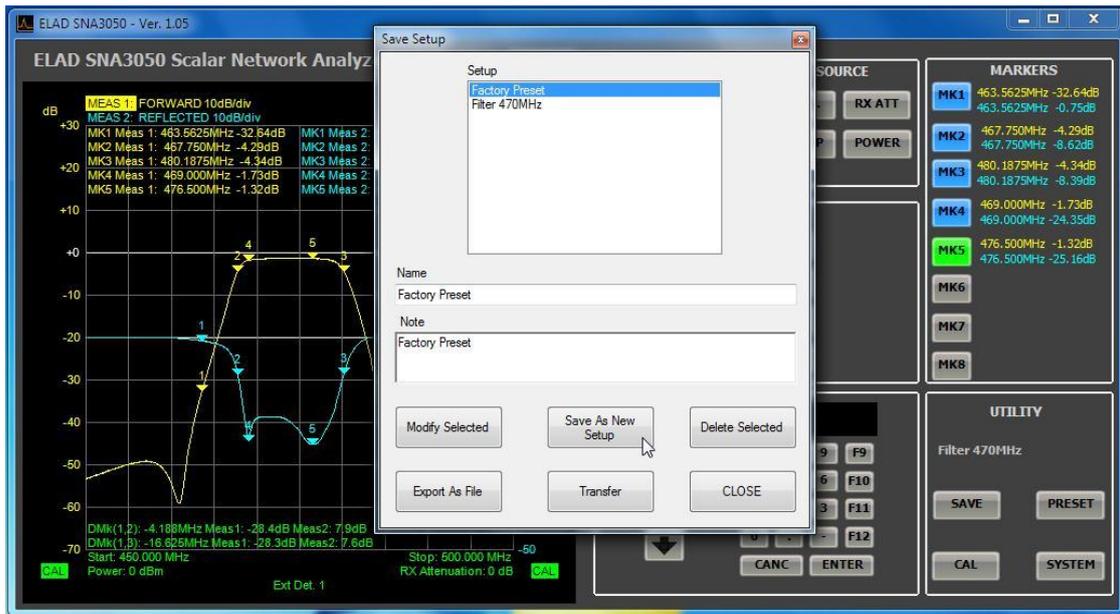
14 - Examples of practical use

14.1 - Prepare a setup on PC and then upload it to SNA

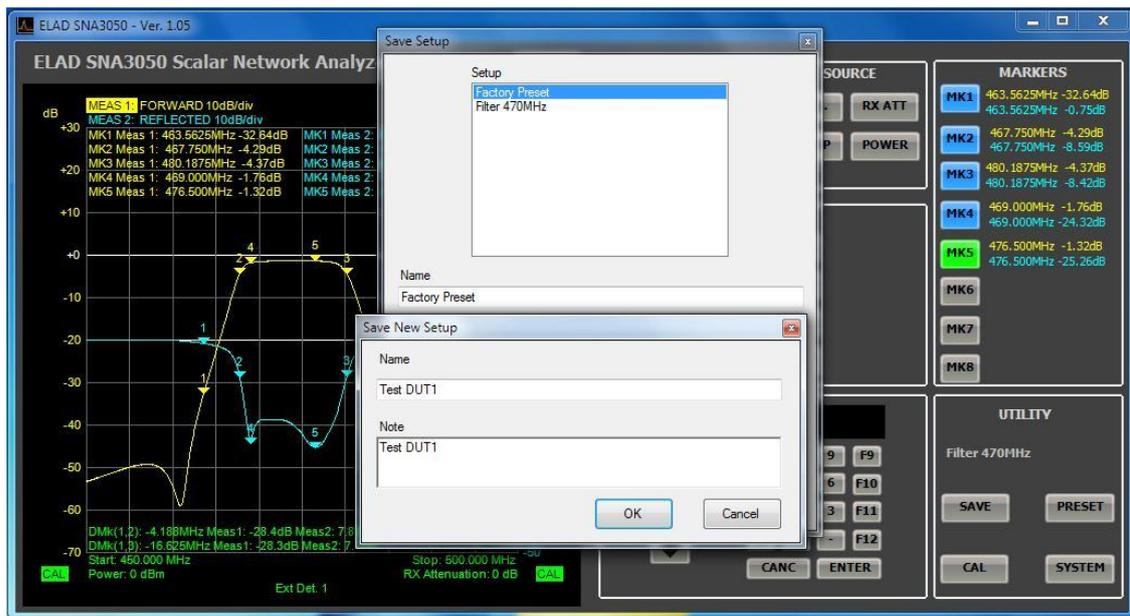
- Assign the two tracks MEAS 1 (MEAS 2) to read the measurement of direct (reflected) or via EXD1 (EXD2). If you want to display a single measure you can exclude the other



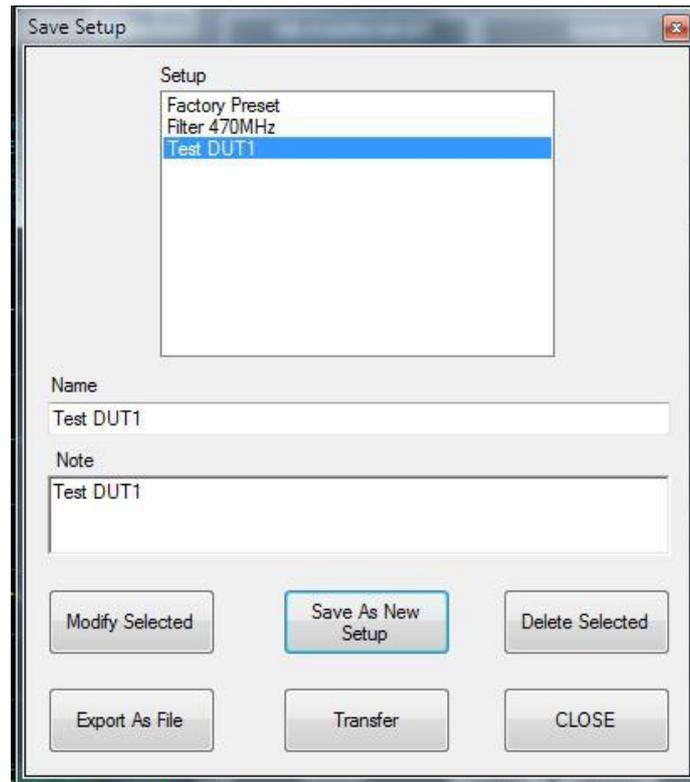
- Set the frequency range for measuring
- Set POWER and RX parameters: these parameters are connected to the type of DUT and the measurement to be performed (determine before the acceptable input and output levels of the DUT).
- Adjust the parameters of the chart (menu SCALE) for optimal viewing of the curves
- Place the markers. The SNA on standalone mode support (for reasons of space) only 4 markers, but in PC-based mode 8 markers are available. For this reason on SNA will be considered only the first 4 active markers. For example, if on the SWPC you've activated all markers, the markers displayed on SNA will be only MK1-MK4.
- Once you have an Optimal setup for the measure, save it in the local database. Click "SAVE" and then F1 "Setup", then proceed as explained in [Save Menu](#)



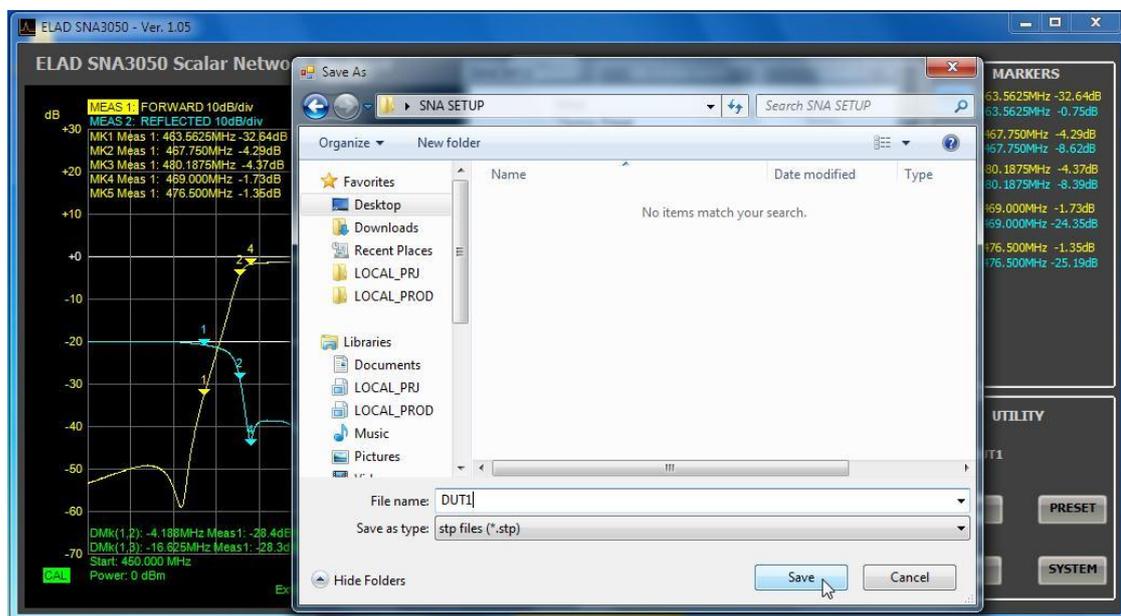
- Click "Save As New Setup" to add a new setup in the database, or select a setup in the "Setup" pane. Click "Modify Selected" to change a previously saved setup



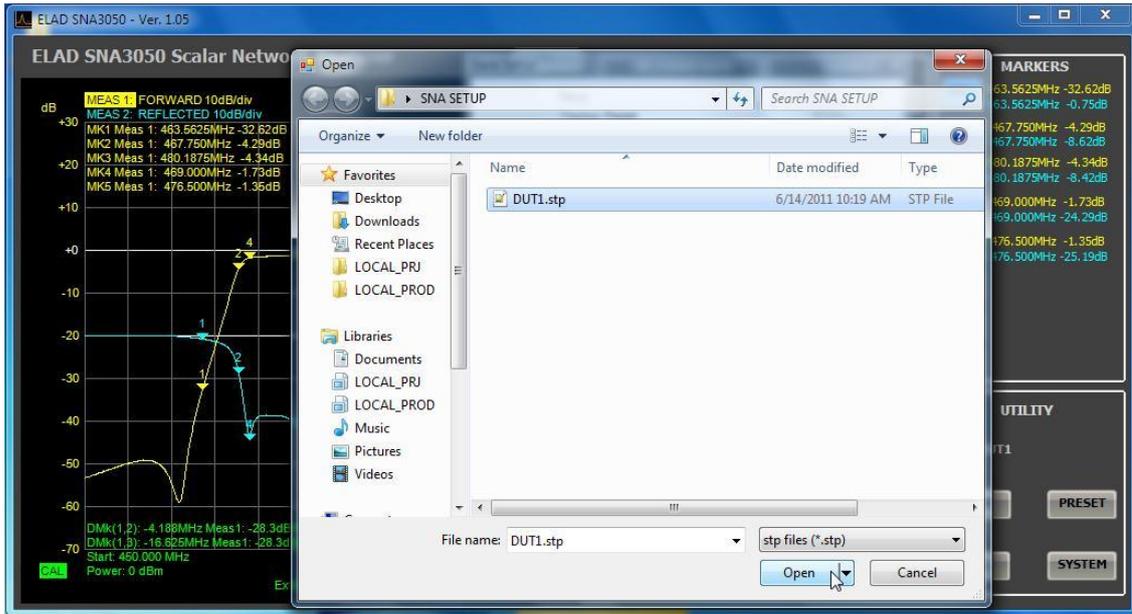
- Write a setup name and then click on OK. The setup will be saved on the database.



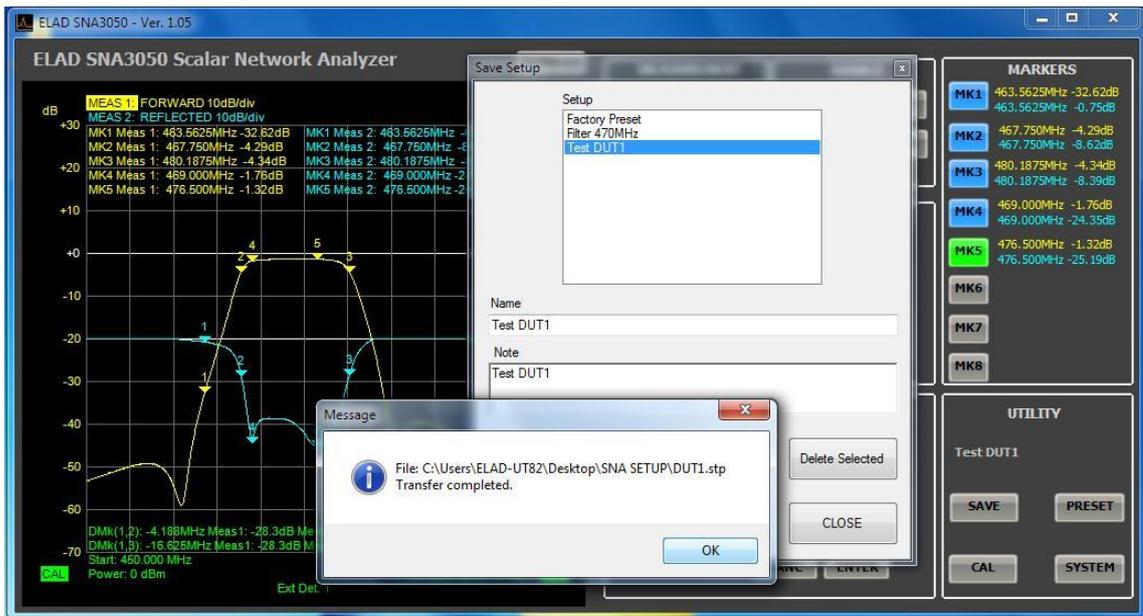
- Now it is necessary to export the setup in a .stp file. Click on “Export As File”:



- Then transfer the file to SNA. In the Save Setup window click on Transfer and select the file you just saved



- The file is transferred on SNA using FTP protocol.



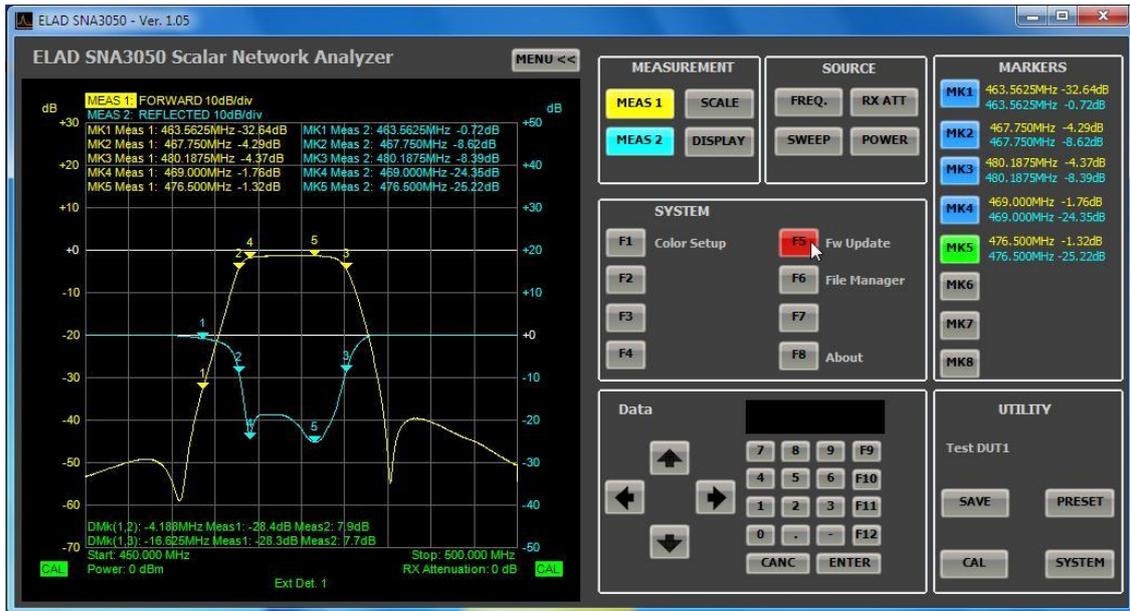
Now the file (TestDUT.stp on image below) has been saved on SNA memory and could be recalled from Preset menu (after closing the PC software).



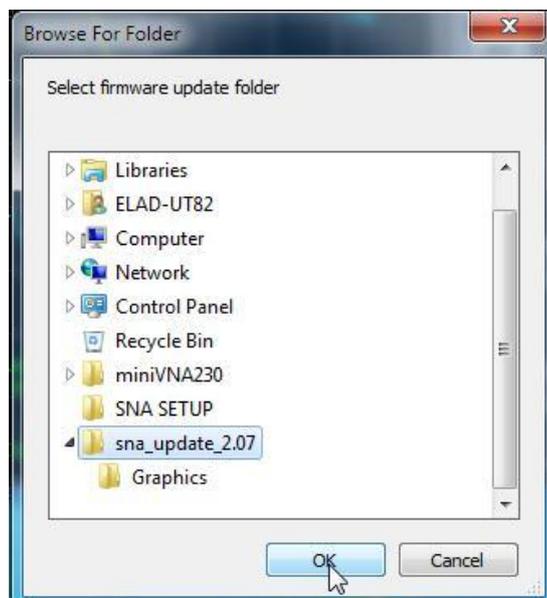
15 - SNA firmware update

Using the PC software you can upgrade the SNA firmware. To proceed with the upgrade:

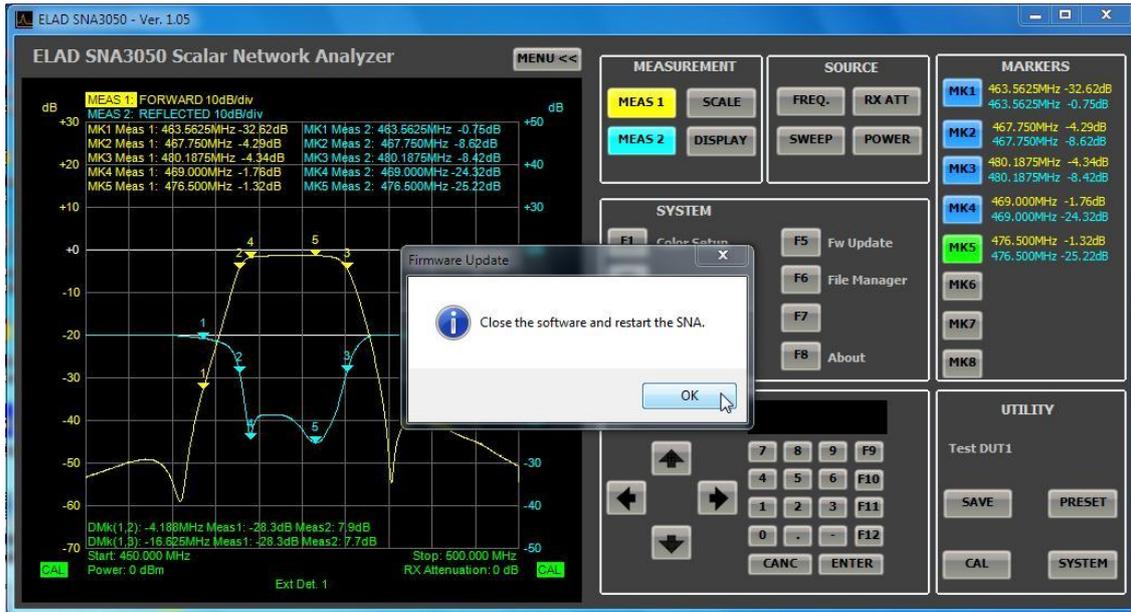
- Click on “SYSTEM” then on “F5” Fw Update



- You are prompted to select the folder containing the update files:



- Once you select the folder the update proceed by copying the files on SNA.
- Press OK and restart SNA software



16 - Credits

- Windows 2000, Windows XP, Windows Vista and Windows 7 are trademarks of Microsoft Corporation
- USB 2.0 is a trademark of USB IF
- ELAD is a registered mark of ELAD Srl - Italy

