

# Application Note 3, Multiprobe EUT-Monitoring using EMC32

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## 1 Introduction

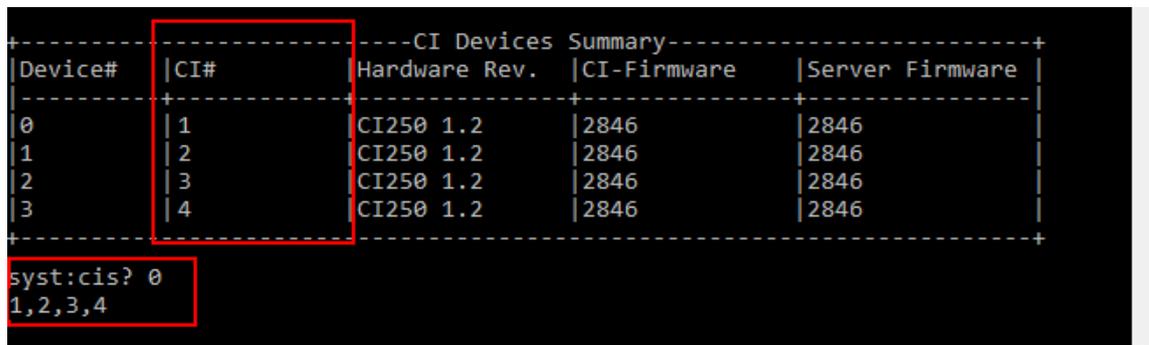
Using multiple E-field probes can improve both speed and accuracy of EMC measurements. This application note describes the EMC32 setup procedure for four LSProbe 1.2 E-field probes and one LSPM 1.0 powermeter. EMC32 supports using multiple E-field probes in two scenarios, both use cases are detailed in this document. :

- Additional E-field probes can be used as monitoring devices outside the E-field control loop.
- E-field values of four probes can be averaged for use inside the E-field control loop.

The E-field probes are identified using the unique serial numbers of the four Computer Interfaces. The serial numbers can be found out using either of the following methods.

- Find the serial number on the bottom side of each Computer Interface.
- As shown in Figure 1, use the serial numbers displayed in the table after starting the LSProbe 1.2 TCP server.
- As also shown in Figure 1, query the serial numbers using the “syst:cis? 0” command.

The use of the LSPM 1.0 powermeter is optional, its serial number is not required for the setup.



```
+-----+-----+-----+-----+
| Device# | CI# | Hardware Rev. | CI-Firmware | Server Firmware |
+-----+-----+-----+-----+
| 0 | 1 | CI250 1.2 | 2846 | 2846 |
| 1 | 2 | CI250 1.2 | 2846 | 2846 |
| 2 | 3 | CI250 1.2 | 2846 | 2846 |
| 3 | 4 | CI250 1.2 | 2846 | 2846 |
+-----+-----+-----+-----+

syst:cis? 0
1,2,3,4
```

Figure 1: Obtaining list of connected Computer Interfaces' serial numbers

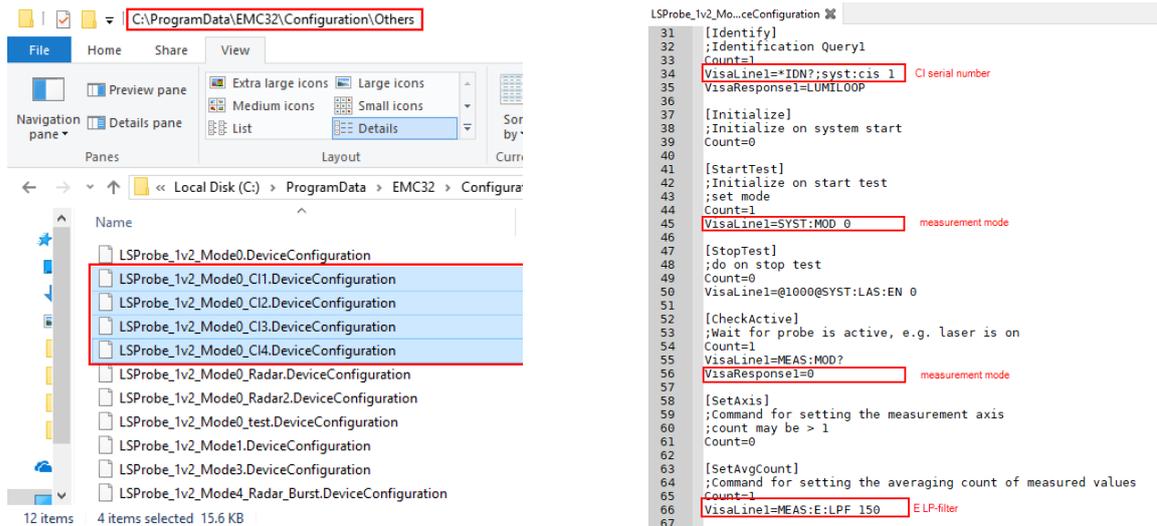
## 2 Preparation of the EMC32 .DeviceConfiguration Files

In a Multiprobe setup each E-field probe requires a unique .DeviceConfiguration file containing the Computer Interface's serial number. Create one .DeviceConfiguration file for each E-field probe using the following steps:

- Copy `'LSProbe_1v2_Mode0.DeviceConfiguration'` found in `..\EMC32\Configuration\Others` to `'LSProbe_1v2_Mode0_CIxxx.DeviceConfiguration'` where "xxx" is the serial number of the Computer Interface.
- Edit the `.DeviceConfiguration` file and change line 34 from `VisaLine1=*IDN?` to `VisaLine1=*IDN?;syst:cis xxx` where "xxx" is the serial number of the Computer Interface.
- Edit the `.DeviceConfiguration` file to reflect other field probe settings such as low-pass filter frequency (line 66) and E-field probe mode (line 45 and 56).
- four new device configuration files needed, one for each enumerated CI of the Field Probes (see Figure 2(a))
- measurement in Mode 0  
→ EMC32 device configuration file `'LSProbe_1v2_Mode0.DeviceConfiguration'` located in subdirectory of the EMC32 installation path as template used
- the following four files were created with the respective change in line 34 to set the active CI for the EMC32 field probe device using the specific configuration file:
- `LSProbe_1v2_Mode0_CI1.DeviceConfiguration`  
line 34: `VisaLine1=*IDN?;syst:cis 1`
- `LSProbe_1v2_Mode0_CI2.DeviceConfiguration`  
line 34: `VisaLine1=*IDN?;syst:cis 2`
- `LSProbe_1v2_Mode0_CI3.DeviceConfiguration`  
line 34: `VisaLine1=*IDN?;syst:cis 3`
- `LSProbe_1v2_Mode0_CI4.DeviceConfiguration`  
line 34: `VisaLine1=*IDN?;syst:cis 4`
- measurement mode is set to 0 and validated in line 45 resp. 56 in each file
- E-LP filter set to 150 in line 66 in each file (see Figure 2(b))

### 3 Preparation of the EMC32 Configured Devices list

- four **Generic Field Probes** to Configured Devices List added, named
  - LSProbe\_1
  - LSProbe\_2
  - LSProbe\_3
  - LSProbe\_4
- settings for each device:
  - General Tab:  
Interface Type: VISA



(a) EMC32 device configuration folder, new configuration files

(b) DeviceConfiguration file for CI 1

Figure 2: Preparation of LSProbe 1.2 device configuration files

VISA Device Identifier: TCP/IP0::127.0.0.1::10000::SOCKET as environment variables LSPROBE\_HOST and LSPROBE\_PORT are set to localhost and 10000

– Properties Tab:

RF Parameters: according to LSProbe 1.2 manual

CI specific configuration file loaded

(see Figure 3)

- LSProbe\_1, LSProbe\_2, LSProbe\_3, LSProbe\_4 are each set from virtual to physical  
⇒ serial number field in General Tab: string LUMILOOP, LSProbe,1.2,Mar 6 2018.. turned blue, for each new physical Field Probe a client connection was opened in LSProbe\_TCP\_Server, four in total, see Figure 4
- **Combined Field Probes** device out of **MultiFieldProbes** to Configured Devices List added, see Figure 5
- settings:
  - Properties Tab:
    - Field Probe Device Selection: LSProbe\_1, LSProbe\_2, LSProbe\_3, LSProbe\_4 set, see Figure 6
  - Test Tab:
    - set Field Probe Combination to Average to compute averaged E-field value over all selected Field Probe Devices, see Figure 6

Additional devices needed for simulated EUT test (see Figure 7)

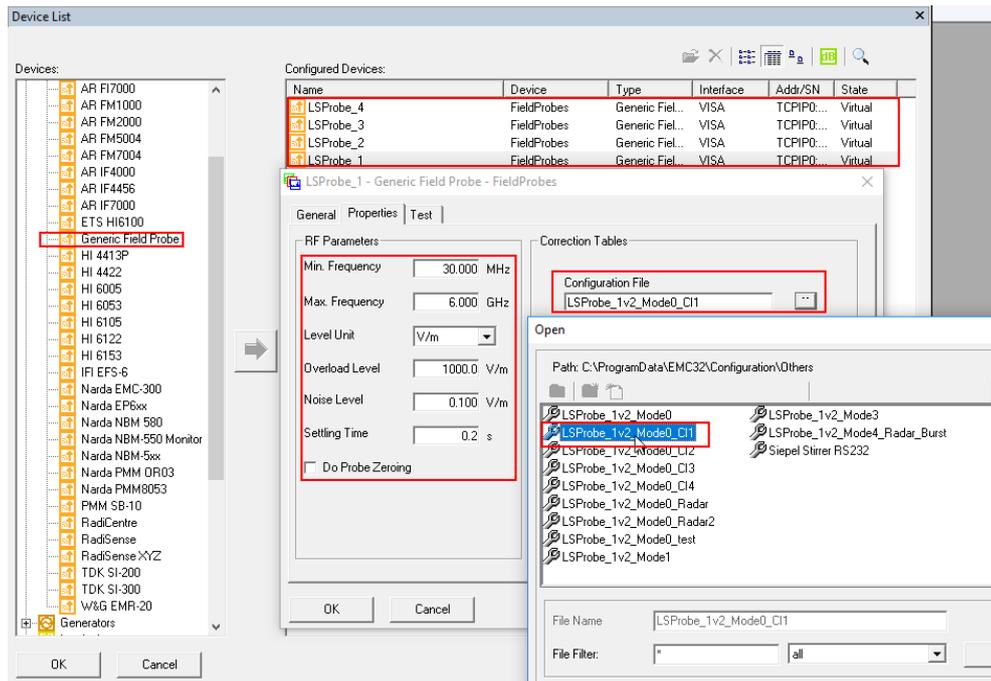


Figure 3: Four Generic Field Probe devices added, specific properties set and device configuration file loaded

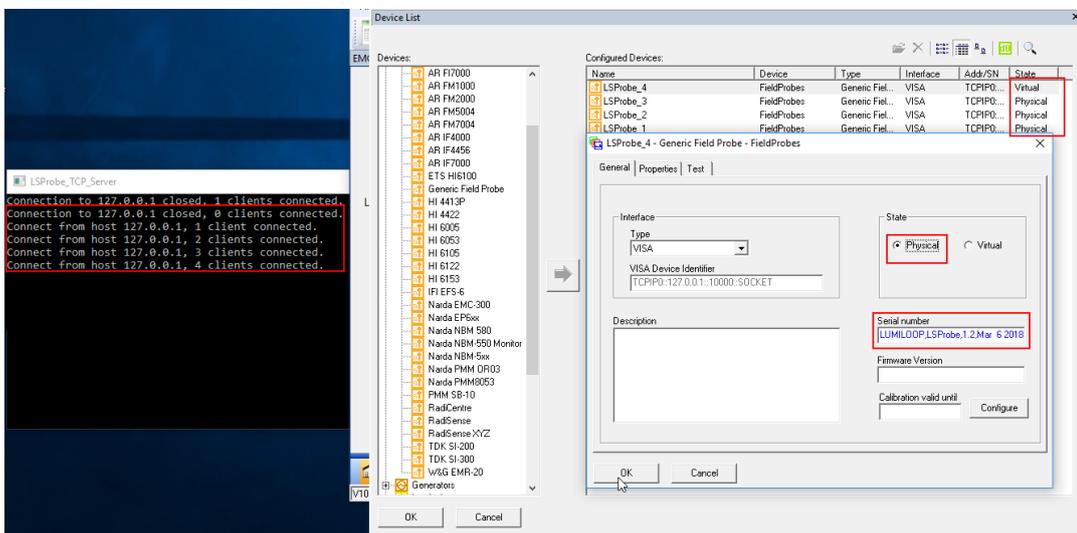


Figure 4: State of Field Probe devices changed from virtual to physical, four TCP client connections are established

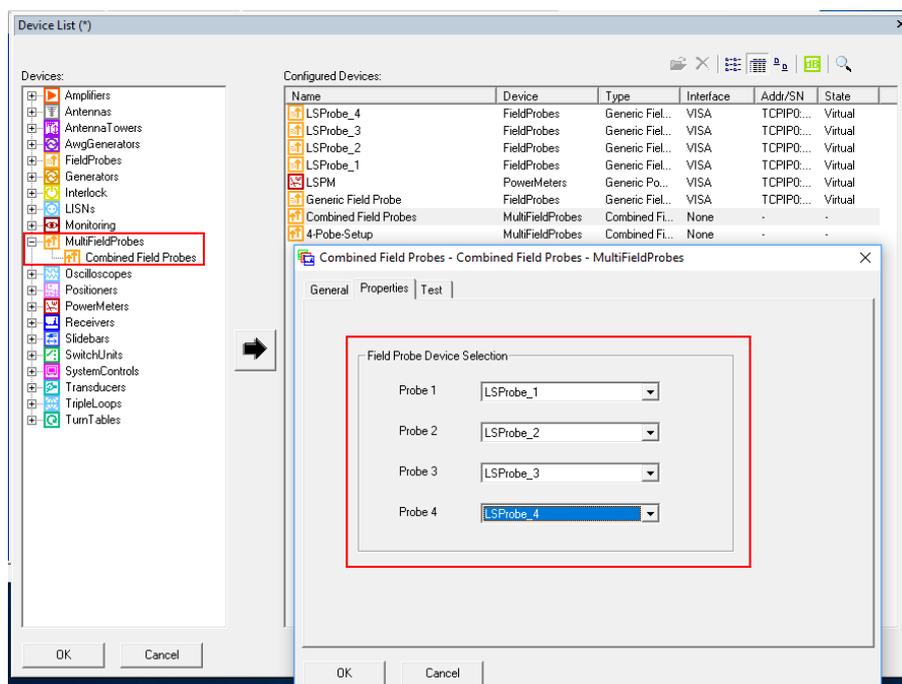


Figure 5: Combined Field Probe device added

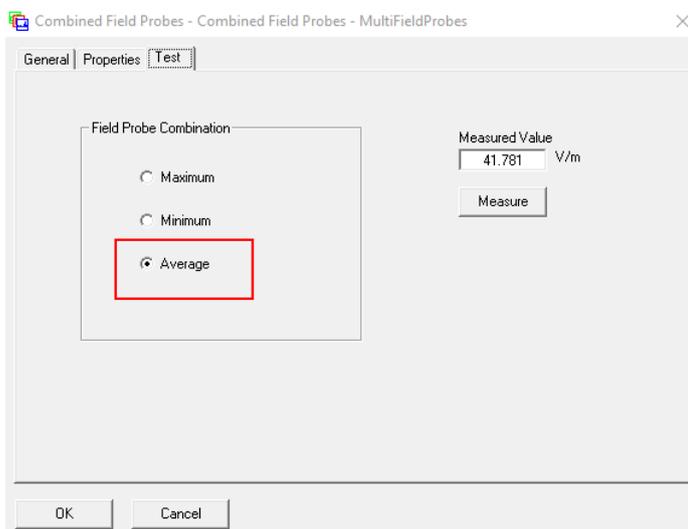


Figure 6: Field Probe combination set to Average

- Signal Generator: SMB100A
- Powermeter: NRP Channel A
- Amplifier: Generic Amplifier
- Antennae
- Interlock Circuit

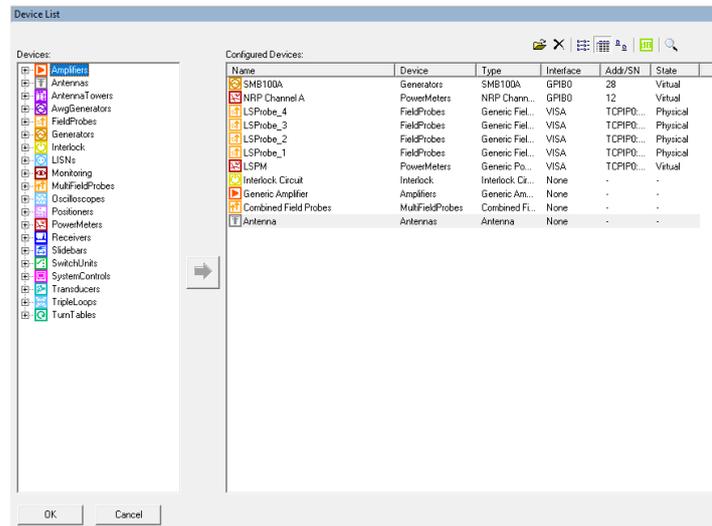


Figure 7: Final EMC32 Device list

## 4 Configuration of EMC32 EuT Monitoring Setup

Monitoring of four separate isotropic E-field values, named "4Probe\_EuT\_Monitoring+AVG", see Figure 8(a):

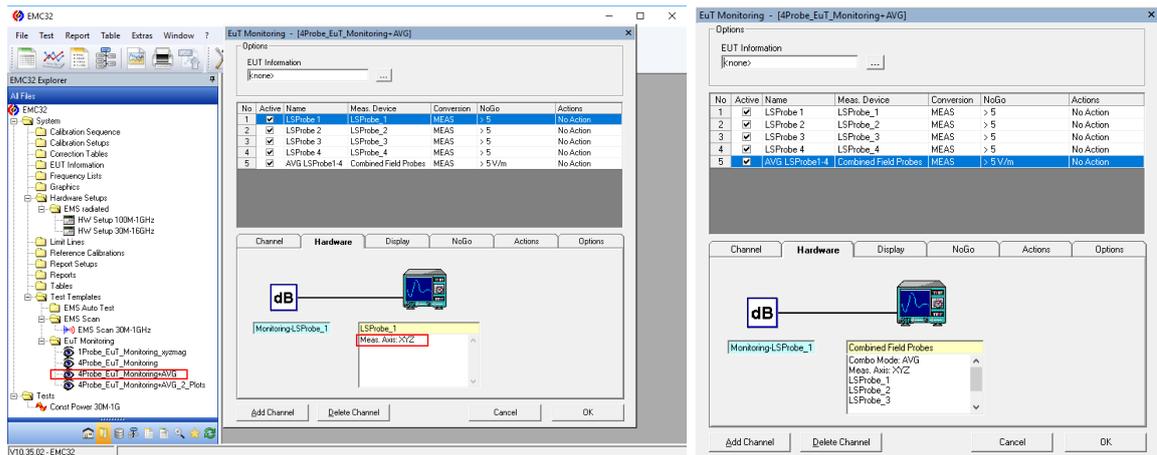
- four Channels added, named LSProbe 1, LSProbe 2, LSProbe 3 and LSProbe 4
- Measurement Axis each set to XYZ(isotropic)
- Display tab: each Y-Axis Maximum set to 100, Unit to be displayed set to V/m

Monitoring of averaged isotropic E-field value over the four field probes, see Figure 8(b):

- fifth Channel added, named AVG LSProbe1-4
- Measurement Axis to XYZ(isotropic)
- Display tab: each Y-Axis Maximum set to 100, Unit to be displayed set to V/m

## 5 Configuration of Hardware Setup for EMS radiated

- new Hardware Setup for EMS radiated named "HW Setup 100M-1GHz" added



(a) Single probe monitoring

(b) Averaged E-field monitoring

Figure 8: EUT-Monitoring setup

- frequency sweep is to be done between 100MHz and 1GHz  
 ⇒ in Modify Freqs subdirectory
  - Start Frequency set to 100MHz
  - Stop Frequency set to 1GHz

see Figure 9

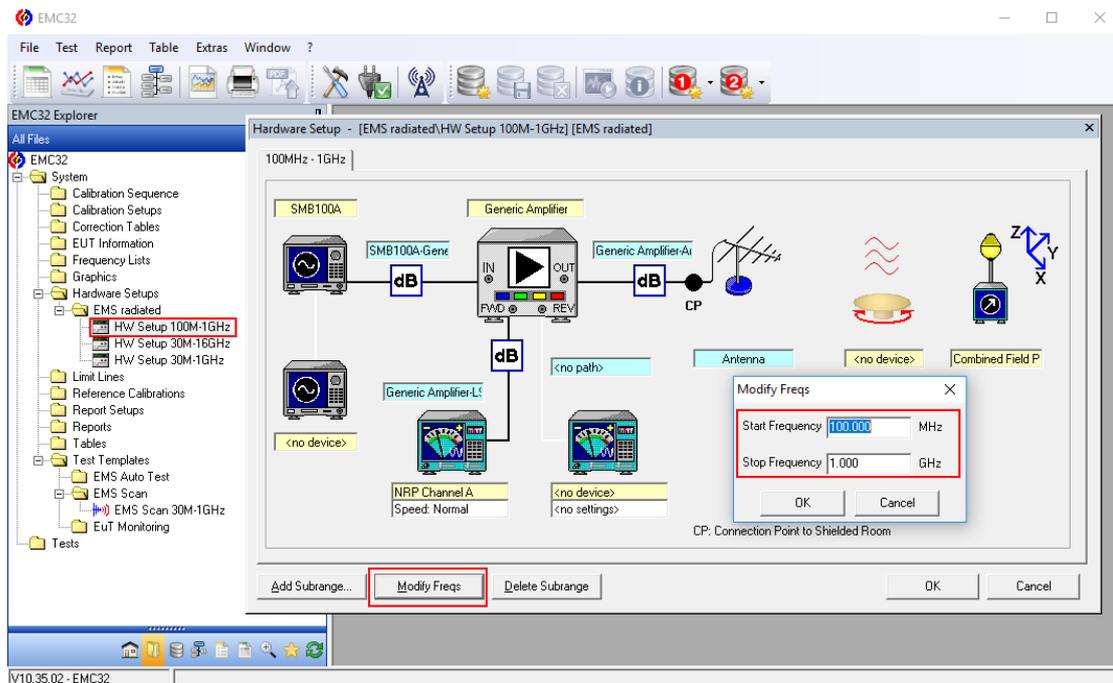


Figure 9: Hardware Setup "HW Setup 100M-1GHz"

## 6 Configuration of Template for EMS Scan

- new EMS Scan for EMS radiated added, named "EMS Scan 100MHz-1GHz", see Figure 10
- General Settings tab:
  - Hardware Setup: "HW Setup 100M-1GHz"
- Frequency Tab: Subrange added
  - Start Frequency: 100 MHz
  - Stop Frequency: 1 GHz
  - Setp Mode: LIN
  - Step Size: 100MHz
  - Dwell Time: 0s
 ⇒ 10 Measurement points
- Leveling Mode Tab:
  - LevelOn: Transducer Power
  - Power Measurement: Forward Power
- Level tab:
  - Immunity Level Unit: W
  - Constant Immunity Level: 50 Watt

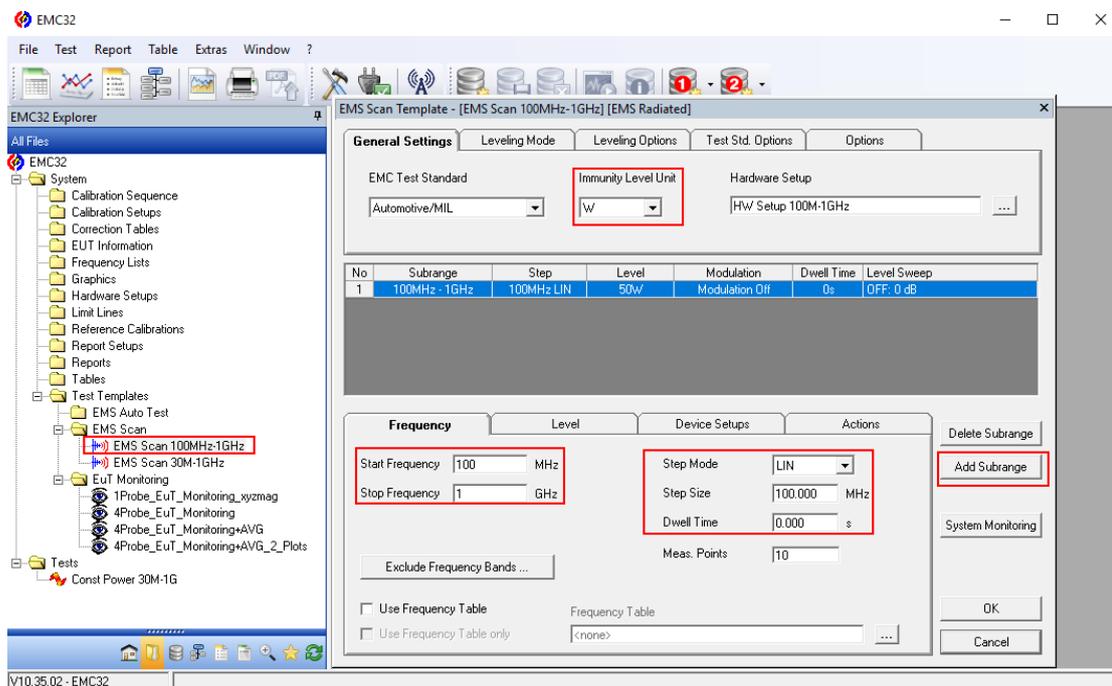


Figure 10: EMS Scan Template setup "EMS Scan 100MHz-1GHz"

## 7 Configuration of EMS radiated Test

- EMS radiated Test added, named "Const. Power 100MHz-1GHz", see Figure 11
- Template for Immunity Parameter: EMS Scan 100MHz-1GHz
- template for EUT Monitoring Parameters: 4Probe\_EuT\_Monitoring+AVG

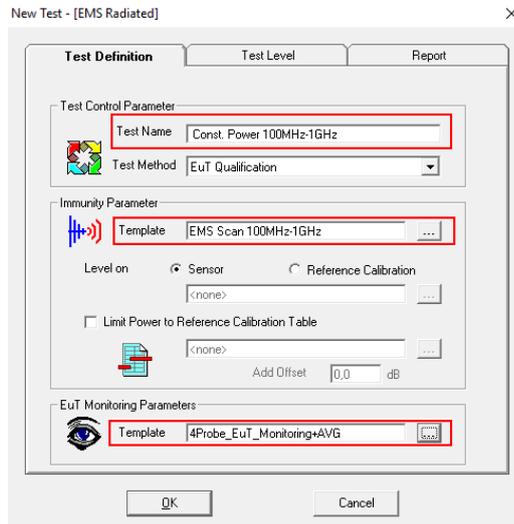


Figure 11: EMS radiated Test setup "Const. Power 100MHz-1GHz"

## 8 EMS radiated Test "Const. Power 100MHz-1GHz" results

After the Test was run in simulation mode the resulting plots depicted in Figure 12 were obtained.

The EuT Monitoring setup can be adapted to show the E-field values of the single probes in one graph and the averaged values in another one.

- duplicate "4Probe\_EuT\_Monitoring+AVG", named "4Probe\_EuT\_Monitoring+AVG\_2\_Plots"
- Display tab for Channel LSProbe 2, LSProbe 3, LSProbe 4:
  - uncheck Display Graphics Diagram by Default
  - check Show Trace in Graphics Channel with channel 1 selected, see Figure 13

Create new EMS radiated Test:

- EMS radiated Test added, named "Const. Power 100MHz-1GHz 2 Plots"
- template for Immunity Parameter: EMS Scan 100MHz-1GHz
- template for EuT Monitoring Parameters: "4Probe\_EuT\_Monitoring+AVG\_2\_Plots"

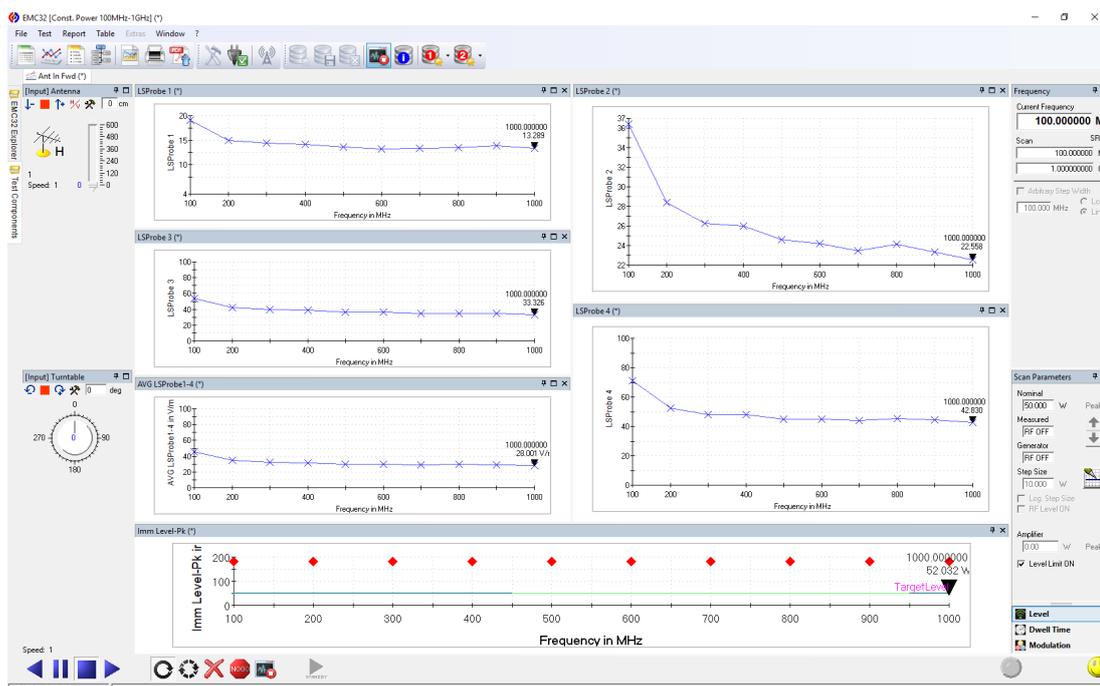


Figure 12: Test result of EMS radiated Test "Const. Power 100MHz-1GHz"

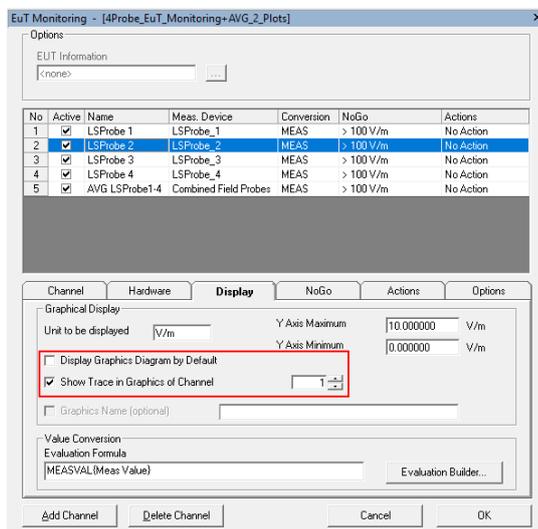


Figure 13: Plot all single field probe E-field values in single graph

After the Test is run the plots can be personalized, e.g. plot legend, symbol on trace at measurement points,... see Figure 14

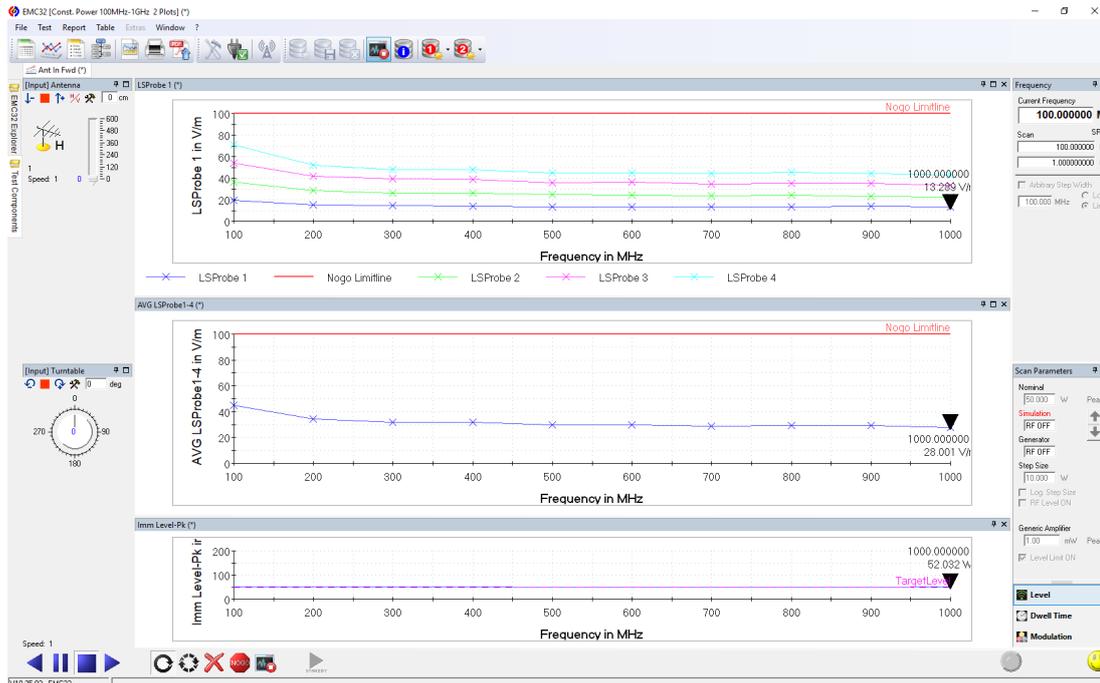


Figure 14: Test result of EMS radiated Test "Const. Power 100MHz-1GHz 2 Plots"