



FCC ID: SDL-PS1000R1

Registration No. DAT-P-207/05

EMI -- TEST REPORT

- FCC Part 15.509 -

Test Report No. :	T33552-01-02KJ	06. October 2010 Date of issue
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Type / Model Name : PS1000

Product Description : UWB Ground Penetrating Radar / In-wall imaging Device

Applicant : Hilti Corporation

Address : Feldkircherstrasse 100

FL-9494 Schaan

Manufacturer : Escatec Switzerland AG

Address : Heinrich-Wild-Strasse

CH-9435 Heerbrugg

Licence holder : Hilti Corporation

Address : Feldkircherstrasse 100

FL-9494 Schaan

Test Result according to the standards listed in clause 1 test standards:	POSITIVE
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The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

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1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15, Subpart A - General (October, 2009)

Part 15, Subpart A, Section 15.31	Measurement standards
Part 15, Subpart A, Section 15.33	Frequency range of radiated measurements
Part 15, Subpart A, Section 15.35	Measurement detector functions and bandwidths

FCC Rules and Regulations Part 15, Subpart C - Intentional Radiators (October, 2009)

Part 15, Subpart C, Section 15.203	Antenna requirement
Part 15, Subpart C, Section 15.204	External radio frequency power amplifiers and antenna modifications
Part 15, Subpart C, Section 15.207	Conducted limits
Part 15, Subpart C, Section 15.209	Radiated emission limits, general requirements
Part 15, Subpart C, Section 15.509	Technical requirements for ground penetrating radars and wall imaging systems
Part 15, Subpart C, Section 15.521	Technical requirements to all UWB devices

OET Bulletin 65, 65A, 65B, 65C Edition 97-01, August 1997 – Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields.

ANSI C63.4: 2009	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C95.1: 1992	IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz
CISPR 16-4-2: 2003	Uncertainty in EMC measurement
CISPR 22: 2005 EN 55022: 2006	Information technology equipment

2 SUMMARY

GENERAL REMARKS:

None

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 12 July 2010

Testing concluded on : 16 July 2010

Checked by:

Tested by:

Klaus Gegenfurtner
Dipl.-Ing.(FH)
Manager: Radio Group

Josef Knab

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EUT - Detailed photos see attachment A

3.2 Power supply system utilised

Power supply voltage: : 115 V / 60 Hz / 1 ϕ
Battery 7.4 V DC:

3.3 Short description of the Equipment under Test (EUT)

PS 1000 is a field disturbance sensor, designed to examine and map subsurface (or interior wall) structures, which are embedded in (reinforced) concrete. The device is a hand held operated tool, which is designed to operate when in direct contact with the ground (or wall). The device is equipped with a manually operated switch and automatic movement detection provisions that cause the transmitter to cease operation practically instantly when the device is not being operated. The device is equipped with a displayed (LCD) for imaging and evaluation purposes.

Number of tested samples: 2
Serial number: R0 000118V319.05.10 003 (Radiated measurements)
R0 000118V319.05.10 004 (Conducted measurements)

EUT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- Continuous transmission

EUT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- Monitor (Rugged PC)	Model : PSA 100
- Charger (for Monitor)	Model : PRA 85
- Battery Pack	Model : PSA 81
- USB Mouse	Model : Microsoft IntelliMouse
- Interface Cables	Model : PSA 50 / PSA 51
-	Model :

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 STRASSKIRCHEN
GERMANY

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature: 15-35 ° C

Humidity: 30-60 %

Atmospheric pressure: 86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader may notice that tolerances within the calibration of the equipment and facilities may cause additional uncertainty. The measurement uncertainty is calculated for all measurements listed in this test report acc. to CISPR 16-4-2 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurement“ and documented in the mikes-testingpartners gmbh quality system acc. to DIN EN ISO/IEC 17025. For all measurements shown in this report, the measurement uncertainty of the test laboratory, mikes-testingpartners gmbh, is below the measurement uncertainty as defined by CISPR. Therefore, no special measures must be taken into consideration with regard to the limits according to CISPR. Furthermore, component diversity and modifications in production process of devices may result in additional deviation. If necessary, refer to the test lab for the actual measurement uncertainty for the specific test. The manufacturer has the sole responsibility of continued compliance of the EUT.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test methodology

Conducted and radiated disturbance testing is performed according to the procedures set out by the International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

4.4.1.2 Justification

The equipment under test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

General Standard information

The test methods used comply with CISPR Publication 22, EN 55022 - "Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". In compliance with 47 CFR Part 15 Subpart A, Section 15.38 testing for FCC compliance may be achieved by following the procedures set out in ANSI C63.4 and applying the CISPR 22 limits.

4.4.3 Conducted emission

Description of measurement

The final level, expressed in dB μ V, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC limit or to the CISPR limit.

To convert between dB μ V and μ V, the following conversions apply:

$$\begin{aligned} \text{dB}\mu\text{V} &= 20 \cdot \log(\mu\text{V}); \\ \mu\text{V} &= 10^{(\text{dB}\mu\text{V}/20)}; \end{aligned}$$

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EUT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50 Ω /50 μ H (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimetres above the floor and is positioned 40 centimetres from the vertical ground plane (wall) of the screen room. If the minimum limit margin of a peak mode measurement appears to be less than 20 dB, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

4.4.4 Radiated emission (electrical field 30 MHz - 1 GHz)

Description of measurement

Spurious emissions from the EUT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarised antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 m non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The setup of the equipment under test is established in accordance with ANSI C63.4. The interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so that they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screened room located outside the test area. The antenna is positioned 3, 10 or 30 meters horizontally from the EUT and is repeated vertically. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters and the EUT is rotated 360 degrees.

The final level in dB μ V/m is calculated by taking the reading from the EMI receiver (Level dB μ V) and adding the correction factors and cable loss factor (dB). The FCC or CISPR limit is subtracted from this result in order to provide the limit margin listed in the measurement protocol.

The resolution bandwidth setting:

30 MHz – 1000 MHz: RBW: 120 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level (dBμV/m)	-	CISPR Limit (dBμV/m)	=	Delta (dB)
719.0	75.0	+	32.6	=	107.6	-	110.0	=	-2.4

4.4.5 Radiated emission (electrical field 960 MHz - 12 GHz)

Description of measurement

In a real world application scenario the main amount of energy from a GPR radar will radiate into the ground. A part of the energy will leak into free space – and is unwanted due to the following reasons:

- The leaked energy will not contribute to the GPR measurement – it is lost.
- Due to reciprocal signal path laws leakage means also that the GPR measurement can be influenced by the same amount from the outside.

To measure radiation from UWB GPR radar in a typical application scenario, the device under test is placed on a sandbox. The unwanted radiations are measured by an antenna mounted at a defined distance from the surface of the sandbox. To capture and the highest amount and the corresponding direction of the unwanted emission, the measurement antenna is moved along half a circle (in defined inclinations / angles) pointing always to the UWB GPR radar and the sandbox. Furthermore the receiver antenna was set up to capture polarization wise the highest amount of spectral power from the DUT on the sandbox.

5 TEST CONDITIONS AND RESULTS

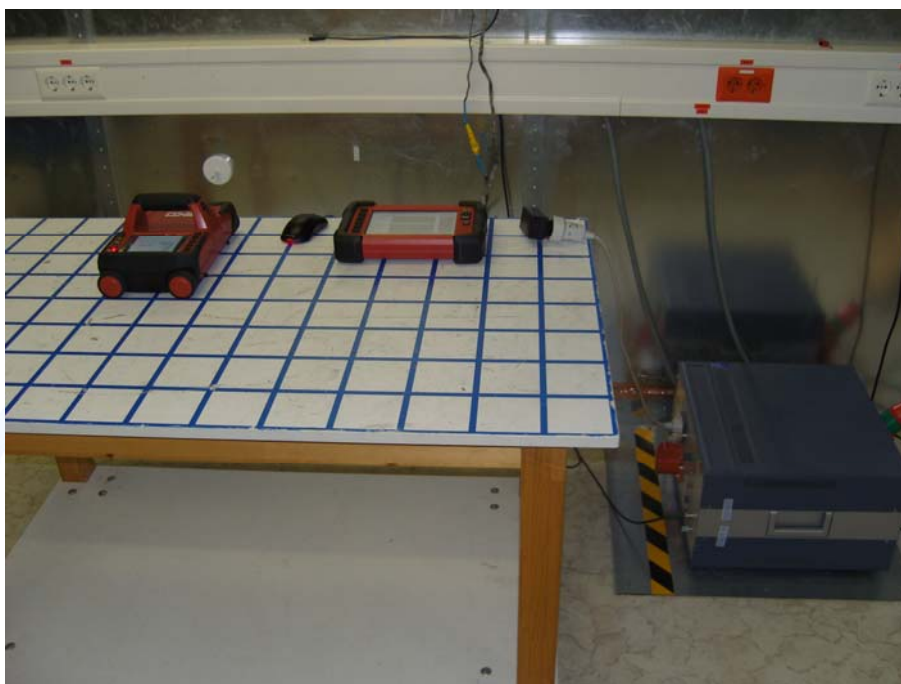
5.1 Conducted emissions

For test instruments and accessories used see section 6 Part A 4.

5.1.1 Description of the test location

Test location: Shielded Room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Applicable standard

According to FCC Part 15, Section 15.207(a):

Except as shown in paragraphs (b) and (c) of this Section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the given limits.

5.1.4 Description of Measurement

The measurements are performed following the procedures set out in ANSI C63.4 described under item 4.4.3. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.5 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin > 5 dB

FCC ID: SDL-PS1000R1

Limit according to FCC Part 15, Section 15.207(a):

Frequency of Emission (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

The requirements are **FULFILLED**.

Remarks: For detailed test result please refer to following test protocols.

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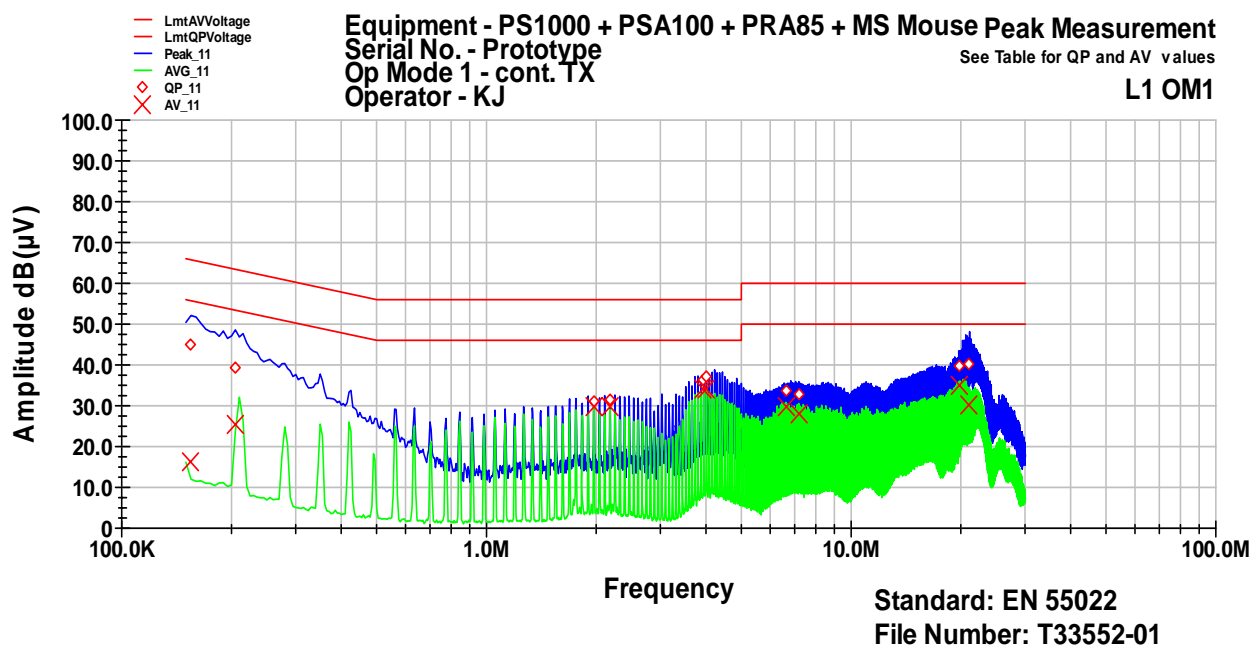
FCC ID: SDL-PS1000R1

5.1.6 Test protocol

Test point: L1
Operation mode: Continuous transmission
Remarks: PS1000 + PSA100 + PRA85 + Microsoft Mouse
Date: 16. July 2010
Tested by: Josef Knab

Result: passed

Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.155	45.1	-20.6	65.7	16.1	-39.7	55.7
0.205	39.4	-24.0	63.4	25.4	-28.0	53.4
1.97	31.1	-24.9	56.0	29.6	-16.4	46.0
2.18	31.7	-24.3	56.0	29.7	-16.3	46.0
3.94	36.3	-19.7	56.0	33.9	-12.1	46.0
4.01	37.3	-18.7	56.0	34.3	-11.7	46.0
6.615	33.7	-26.3	60.0	29.8	-20.2	50.0
7.18	33.0	-27.0	60.0	28.1	-21.9	50.0
19.845	39.9	-20.1	60.0	35.0	-15.0	50.0
21.115	40.2	-19.8	60.0	30.4	-19.6	50.0

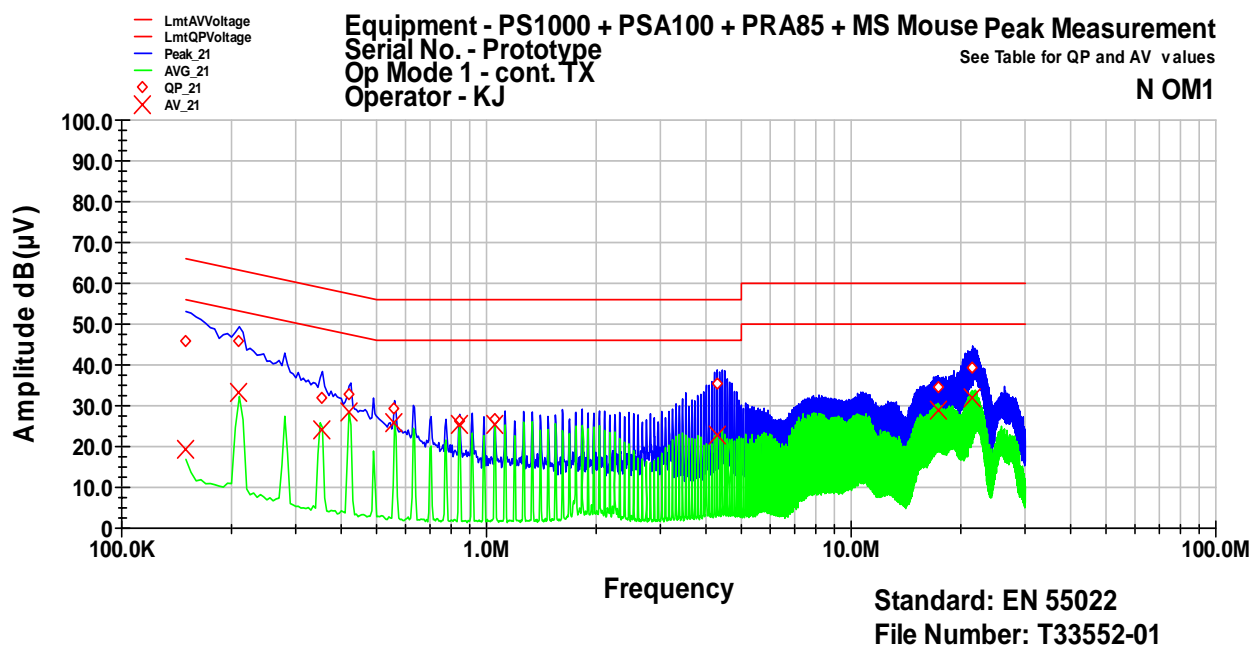


FCC ID: SDL-PS1000R1

Test point: N
Operation mode: Continuous transmission
Remarks: PS1000 + PSA100 + PRA85 + Microsoft Mouse
Date: 13. July 2010
Tested by: Josef Knab

Result: passed

Frequency MHz	QP Level dB(μV)	QP Margin dB	QP Limit dB	AV Level dB(μV)	AV Margin dB	AV Limit dB
0.15	46.0	-20.0	66.0	19.5	-36.5	56.0
0.21	45.8	-17.4	63.2	33.1	-20.1	53.2
0.355	32.0	-26.8	58.8	24.2	-24.6	48.8
0.42	33.0	-24.5	57.4	28.3	-19.1	47.4
0.56	29.2	-26.8	56.0	25.9	-20.1	46.0
0.845	26.4	-29.6	56.0	25.3	-20.7	46.0
1.055	26.8	-29.2	56.0	25.5	-20.5	46.0
4.29	35.4	-20.6	56.0	23.0	-23.0	46.0
17.305	34.4	-25.6	60.0	29.0	-21.0	50.0
21.525	39.5	-20.5	60.0	32.0	-18.0	50.0



5.2 Spurious emissions (magnetic field) 9 kHz – 30 MHz

For test instruments and accessories used see section 6 Part SER 1.

5.2.1 Description of the test location

Test location: OATS1
Test distance: 3 metres

5.2.2 Photo documentation of the test set-up



5.2.1 Applicable standard

According to FCC Part 15C, Section 15.209:

The emissions from shall not exceed the effective field strength limits.

5.2.2 Description of Measurement

The magnetic field strength from the EUT will be measured on an open area test site in the frequency range of 9 kHz to 30 MHz using a tuned receiver and a shielded loop antenna. The set up of the Equipment under test will be in accordance to ANSI C63.4. The antenna was positioned 3, 10 or 30 meters horizontally from the EUT. Measurements have been made in all three orthogonal axes and the shielded loop antenna was rotated to locate the maximum of the emissions. In the case where larger measuring distances are required the results will extrapolated based on the values measured on the closer distances according to Section 15.31(f)(2)(2). The final measurement will be performed with an EMI Receiver set to Quasi Peak detector except for the frequency bands 9 kHz to 90 kHz and 110 to 490 kHz where an average detector will be used according to Section 15.209(d)(2).

The resolution bandwidth during the measurement is as follows:

9 kHz – 150 kHz: RBW: 200 Hz
150 kHz – 30 MHz: RBW: 9 kHz

FCC ID: SDL-PS1000R1

5.2.3 Test result

Frequency (MHz)	Level QP (dBµV)	Bandwidth (kHz)	Correct. factor (dB)	Corrected level dB(µV/m)	Effective limit dB(µV/m)	Delta (dB)
0.009 – 0.150	<-10	0.2	20	<10		
0.15 - 30	<-10	10.0	20	<10		

Limit according to FCC Part 15C Section 15.209(a):

Frequency (MHz)	Field strength of spurious emissions		Measurement distance (metres)
	(µV/m)	dB(µV/m)	
0.009-0.490	2400/F(kHz)	--	300
0.490-1.705	24000/F (kHz)	--	30
1.705-30.0	30	29.5	30

The requirements are **FULFILLED**.

Remarks: All unwanted emissions in the frequency range from 9 kHz to 30 MHz are below 10 dBµV/m at a test distance of 3 metres.

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5.3 Spurious emissions radiated (electric field)

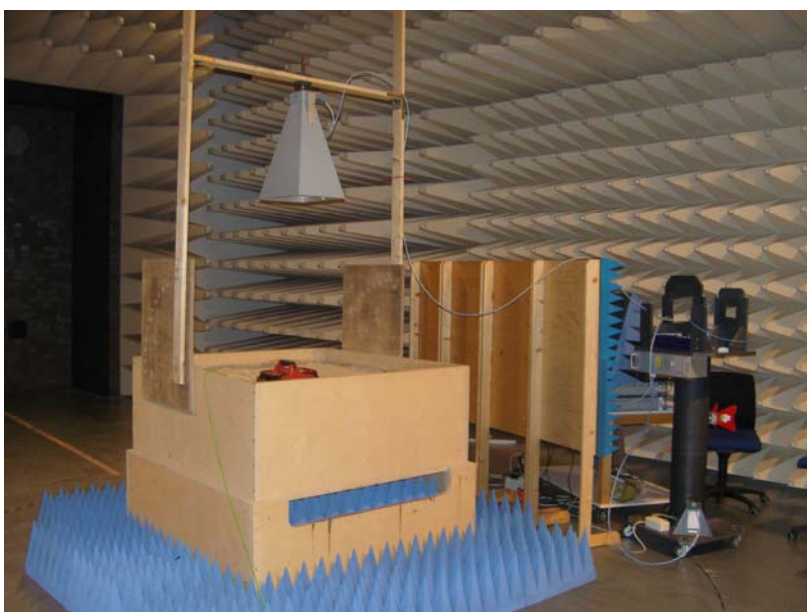
For test instruments and accessories used see section 6 Part SER 2, SER 3, CPC 3.

5.3.1 Description of the test location

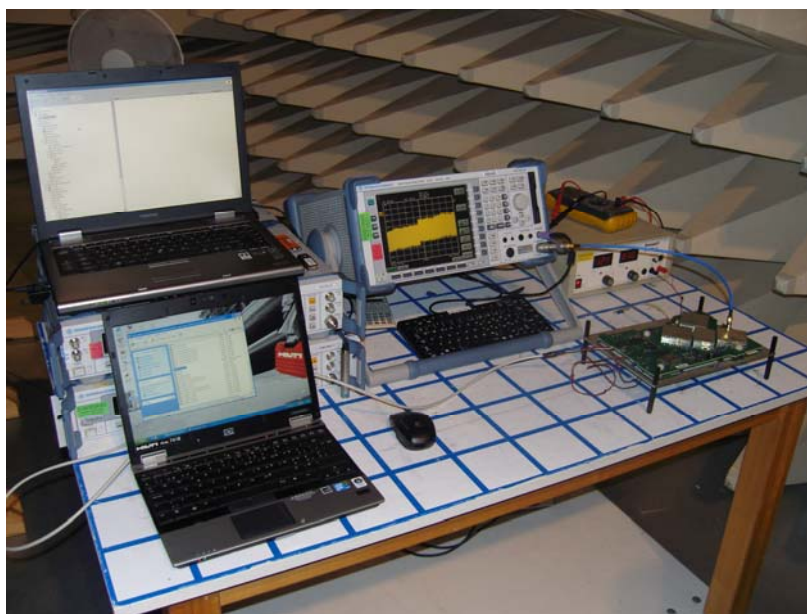
Test location: OATS1
Test distance: 3 metres

Test location: Anechoic Chamber A1
Test distance: 1 metre

5.3.2 Photo documentation of the test set-up



FCC ID: SDL-PS1000R1



5.3.3 Applicable standard

According to FCC Part 15C, Section 15.209(a) and FCC Part 15F, Section 15.509 (d)(e)

5.3.4 Description of Measurement

The radiated power of the spurious emission from the EUT is measured in a test setup following the procedures set out in ANSI C63.4. If the emission level of the EUT in peak mode complies with the average limit is 20 dB lower, then testing will be stopped and peak values of the EUT will be reported, otherwise the emission will be measured in average mode again and reported. The emission >960 MHz were measured in a typical setup, in a sandbox scenario.

Instrument settings:

30 MHz – 960 MHz:	RBW: 120 kHz
960 MHz – 12000 MHz	RBW: 1 MHz
1164 – 1240 MHz and 1559 – 1610 MHz	RBW: 1 kHz

Example:

Frequency (MHz)	Level (dBμV)	+	Factor (dB)	=	Level dB(μV/m)	-	Limit dB(μV/m)	=	Delta (dB)
170.5	5	+	20	=	25	-	30	=	-5

5.3.5 Test result f < 960 MHz

Frequency (MHz)	Level QP (dBμV)	Bandwidth (kHz)	Correct. factor (dB)	Corrected level dB(μV/m)	Effective limit dB(μV/m)	Delta (dB)
30-960		120		<30		

5.3.6 Test result f > 960 MHz

Frequency (MHz)	L: PK dBm/MHz	Bandwidth (kHz)	Limit AV dBm/MHz	Delta (dB)
2441,25	-57.8	1000	-51.3	-6,5

Limit according to FCC Part 15C Section 15.509(d):

The radiated emissions at or below 960 MHz shall not exceed the emissions levels in § 15.209.

Frequency (MHz)	15.209 Limits (µV/m)	15.209 Limits dB(µV/m)
30 - 88	100	40
88 - 216	150	43,5
216 - 960	200	46

The radiated emissions above 960 MHz shall not exceed the following average Limits when measured using a resolution bandwidth of 1 MHz.

Frequency range (MHz)	Maximum mean e.i.r.p. density (dBm/MHz)
960 to 1610	-65.3
1610 to 1990	-53.3
1990 to 3100	-51,3
3100 to 10600	-41,3
> 10600	-51.3

Limit according to FCC Part 15C Section 15.509(e):

In addition to the radiated emission limits specified in the above tables, UWB transmitters shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz.

Frequency range (MHz)	Maximum mean e.i.r.p. density (dBm/kHz)
1164 to 1240	-75.3
1559 to 1610	-75.3

Limit according to FCC Part 15C Section 15.509(f):

For UWB devices where the frequency at which the highest radiated emission occurs, f_m , is above 960 MHz, there is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on f_m . That limit is 0 dBm EIRP.

Note: According 15.521 (g) it is allowed to calculate the 0 dBm / 50 MHz EIRP Peak limit with the formula $20 \log (1\text{MHz}/50) \text{ dBm}$ to -34 dBm/MHz. Due to the test results in this section the max. measured emission is at 2441.25 MHz = -57.8 dBm/MHz.

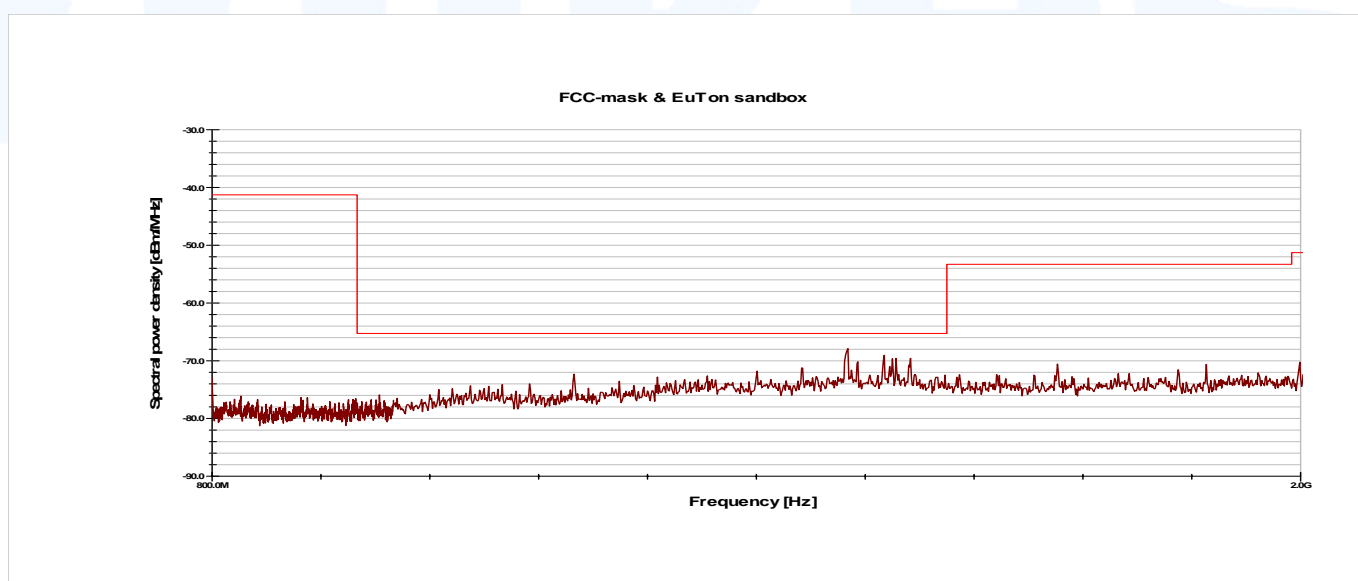
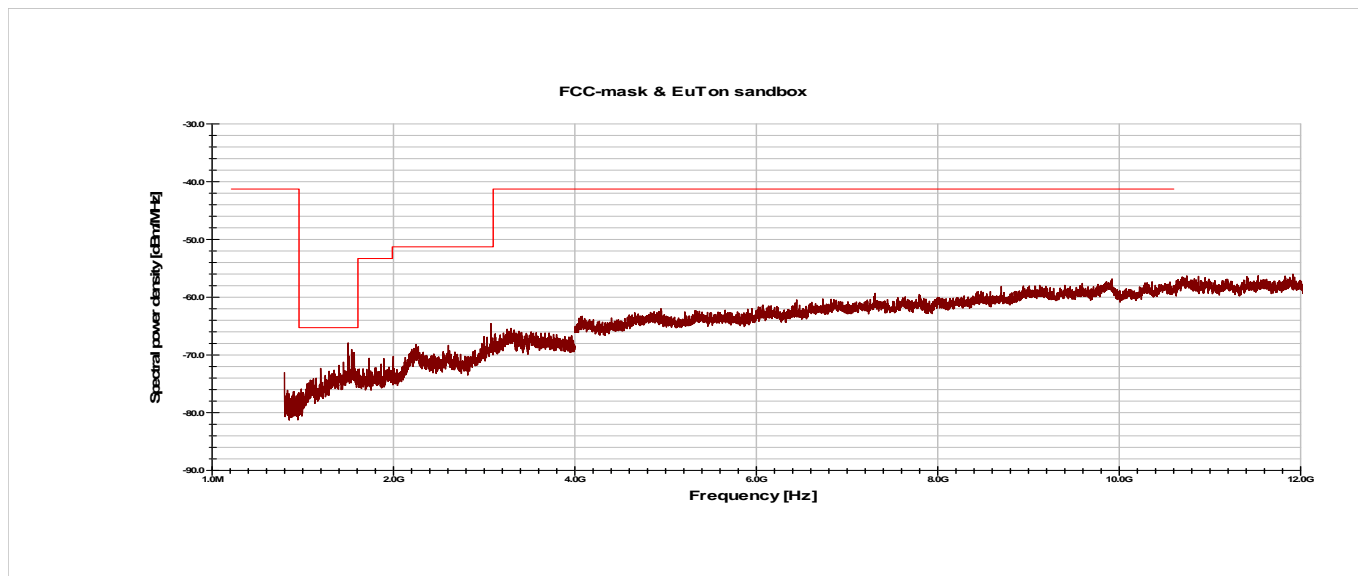
The requirements are **FULFILLED**.

Remarks: For detailed test results please refer to following test protocols.

All other emissions in the frequency range of 30 MHz – 18000 GHz were at least 10 dB under the specified limits

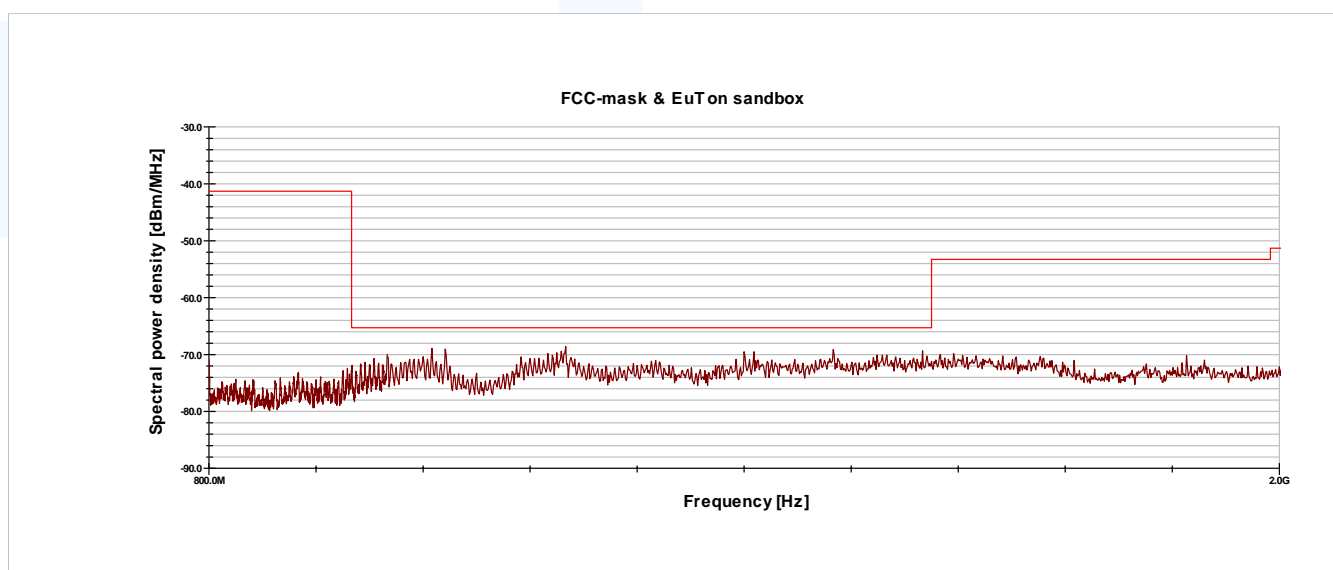
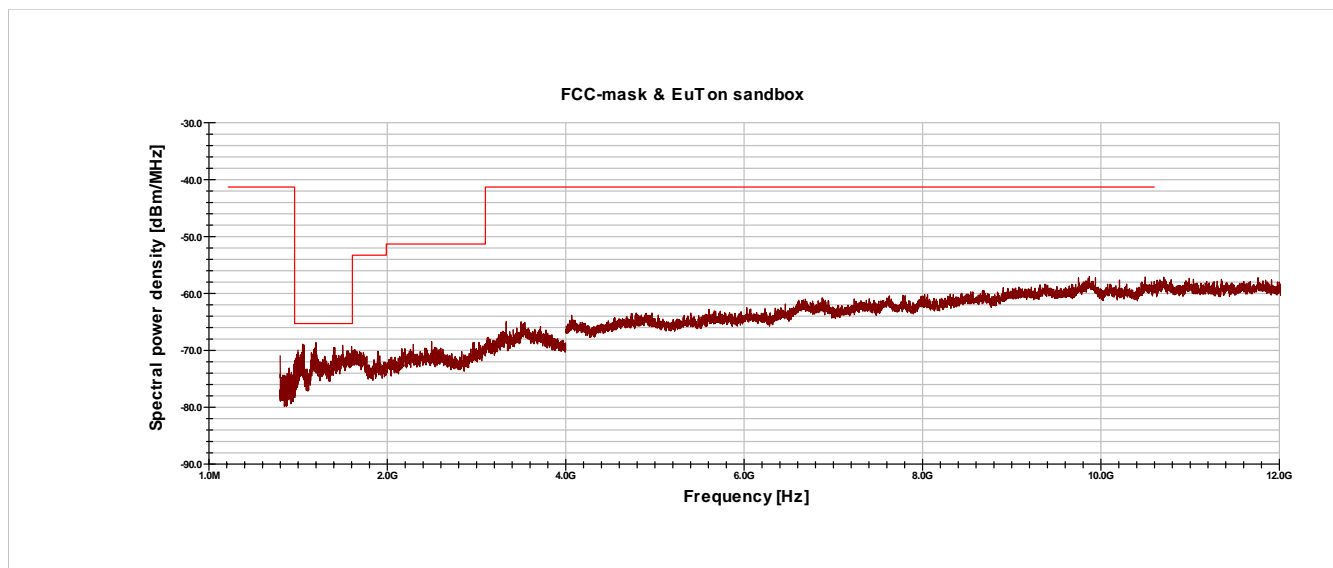
5.3.7 Test protocol

Radiated emissions plots Horizontal 0°



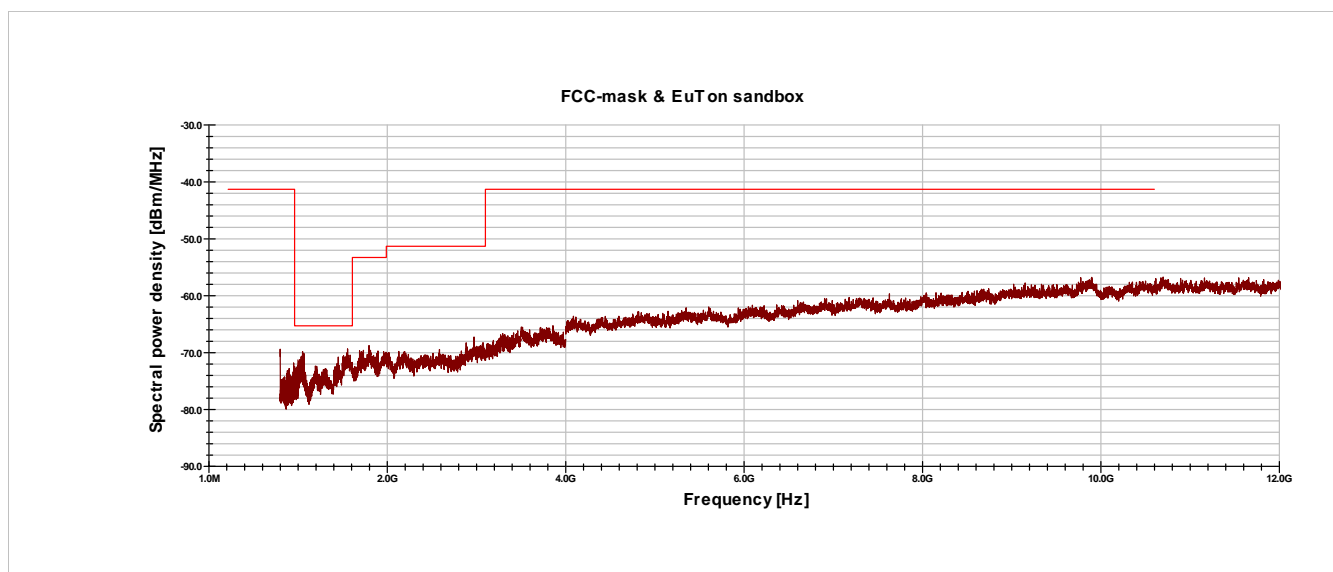
FCC ID: SDL-PS1000R1

Vertical 0°

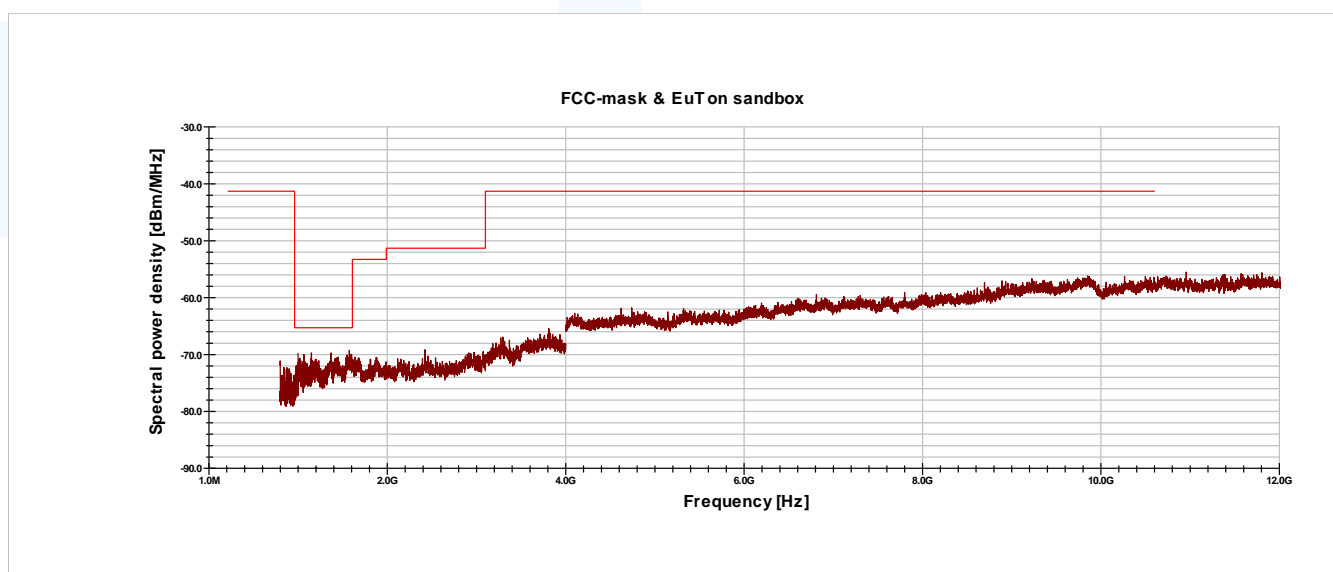


FCC ID: SDL-PS1000R1

Vertical 30°

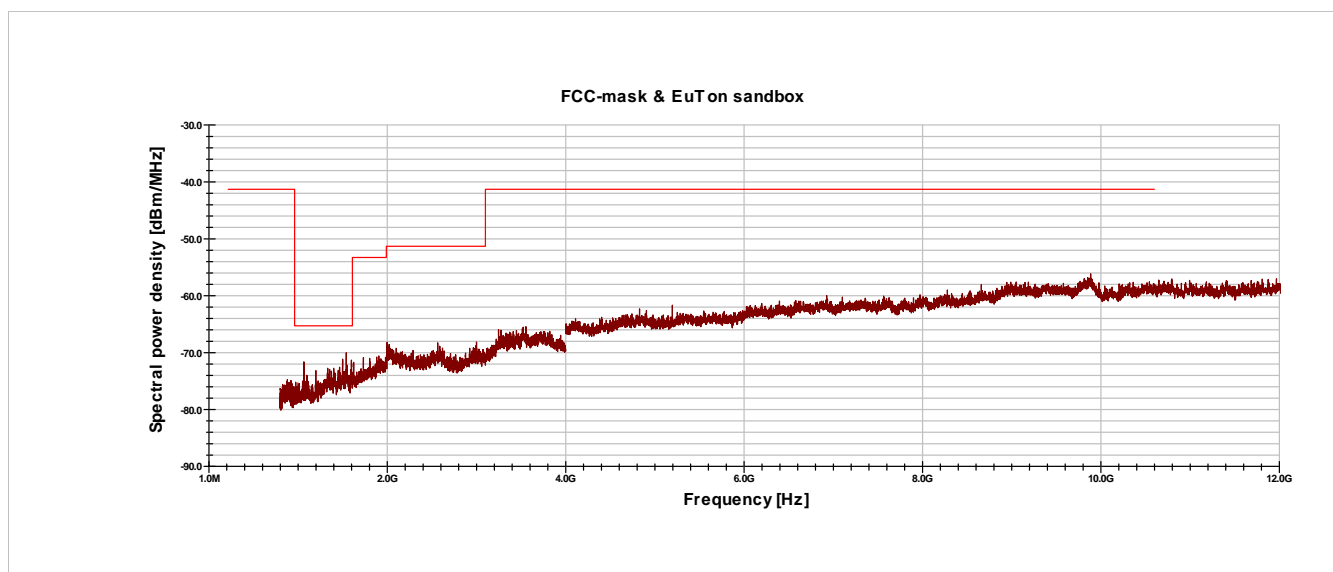


Vertical 60°

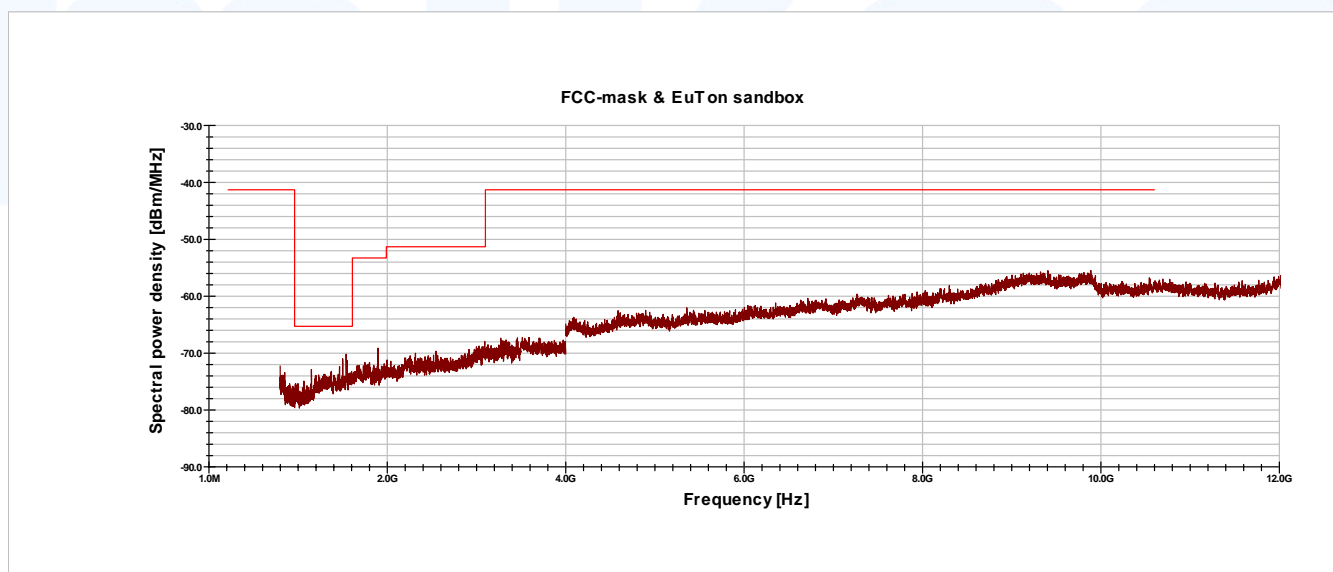


FCC ID: SDL-PS1000R1

Horizontal 30°



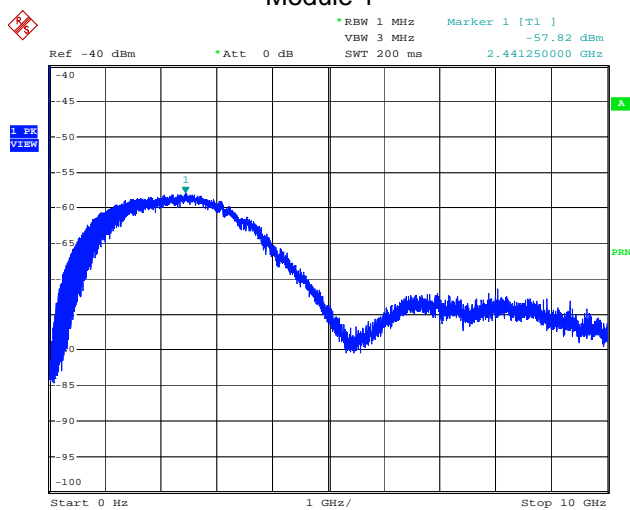
Horizontal 60°



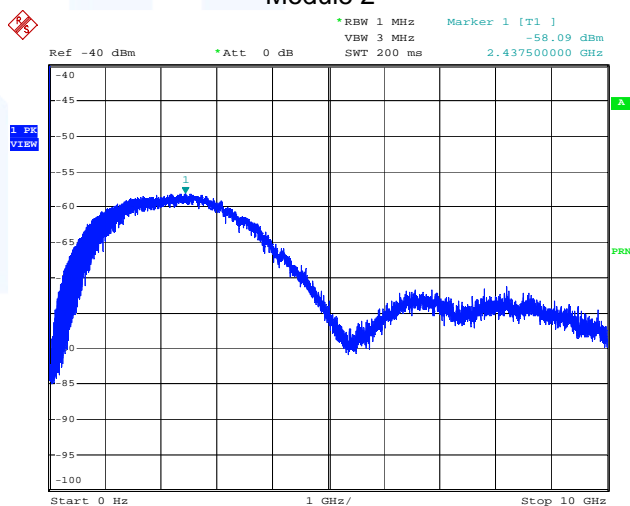
FCC ID: SDL-PS1000R1

Max. Mean Power density Conducted Measurement

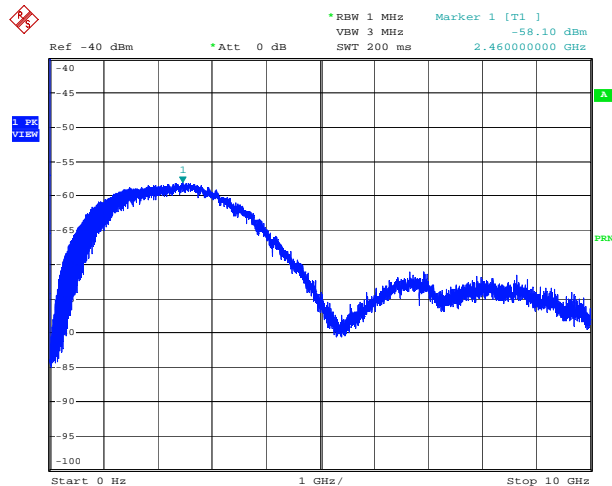
Module 1



Module 2



Module 3



FCC ID: SDL-PS1000R1

1 kHz spectral density output power

FCC demands a 10dB more stringent limit for radiated output power when measured with a 1 kHz RBW compared to the output power measured with a 1MHz RBW in the following restricted frequency bands:

Restricted band 1: 1164...1240 MHz

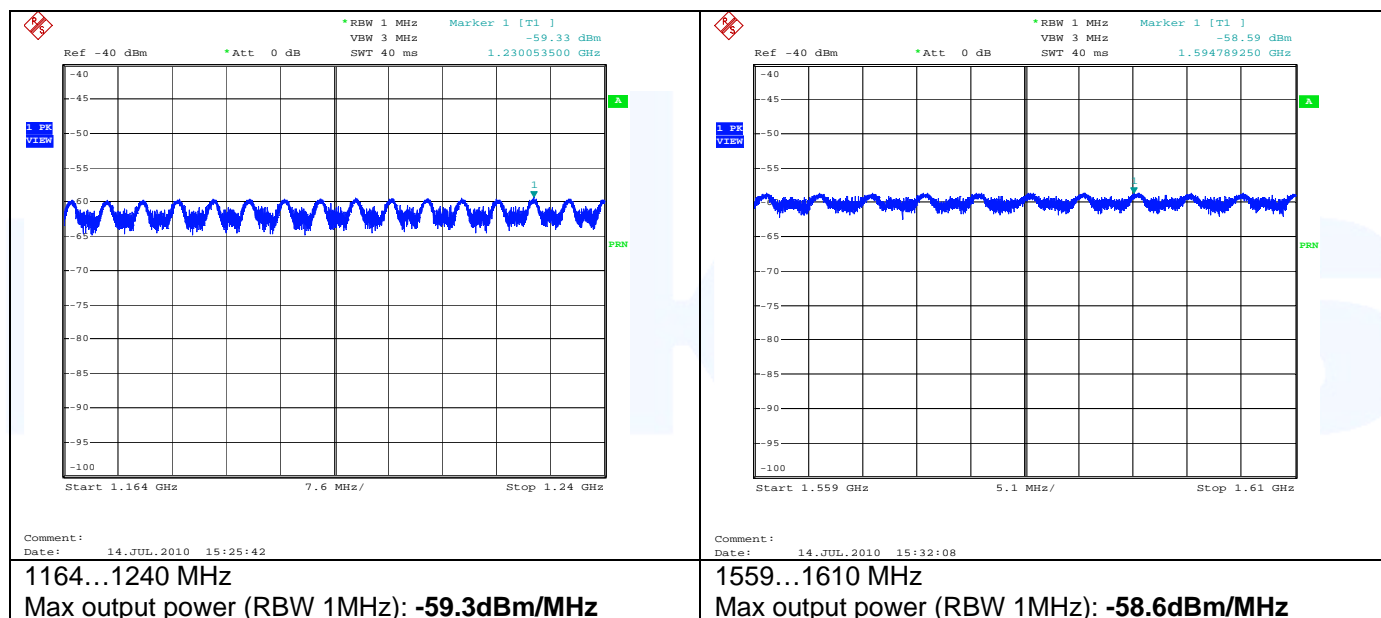
Restricted band 2: 1559...1610 MHz

With this conducted measurement it is proven that the output power of the DUT with a 1 kHz RBW has at least 10dB less power compared to a measured output power with a RBW of 1MHz.

Together with a successful and compliant radiated scenario measurements executed with a RBW of 1MHz, compliance according FCC will be assured.

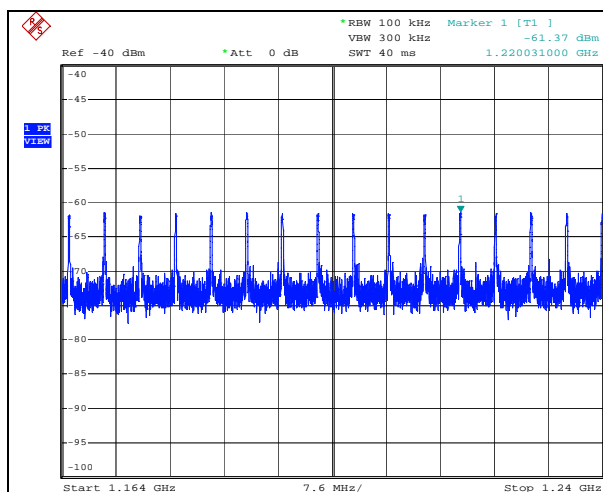
Due to the fact that the three individual modules of the DUT are practically identical, the measurement on a single Module (CH1) was performed. Device under test is PS1000 Main board with SNr.: R0 000118V319.05.10 004

In the first step the conducted output power measured with a RBW of 1MHz and the peak value is recorded



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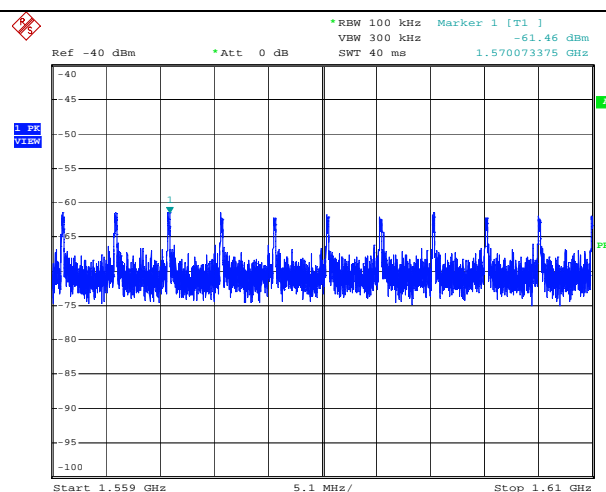
In the second step the conducted output power is measured with a RBW of 100kHz and the frequency of the peak value is recorded



Comment:
Date: 14.JUL.2010 15:27:12

1164...1240 MHz

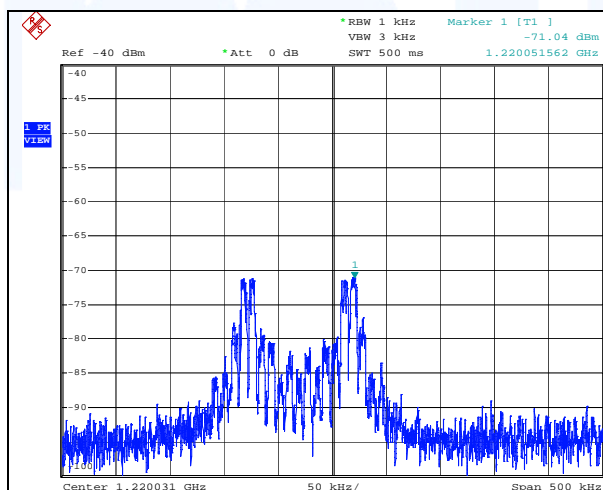
Max output power (RBW 100kHz) is at frequency:
1220.031 MHz → here is the highest peak



Comment:
Date: 14.JUL.2010 15:34:00

1559...1610 MHz

Max output power (RBW 100kHz) is at frequency:
1570.0734 MHz → here is the highest peak

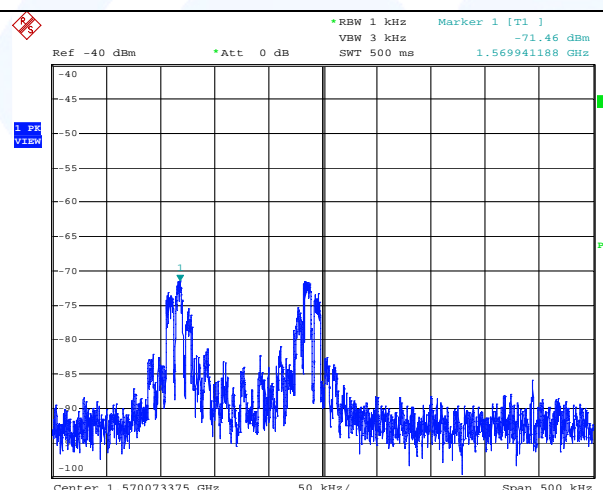


Comment:
Date: 14.JUL.2010 15:29:28

Detail measurement with 1kHz RBW of the highest peak within restricted band 1

Output power (conducted): -71.0 dBm/kHz

→ The highest 1kHz spectral power component is therefore 11.7 dB (71.0 – 59.3) below the 1MHz spectral component



Comment:
Date: 14.JUL.2010 15:35:49

Detail measurement with 1kHz RBW of the highest peak within restricted band 2

Output power (conducted): -71.5 dBm/kHz

→ The highest 1kHz spectral power component is therefore 12.9 dB (71.5 – 58.6) below the 1MHz spectral component

5.4 Emission bandwidth radiated

For test instruments and accessories used see section 6 Part MB.

5.4.1 Description of the test location

Test location: Anechoic Chamber A1

5.4.2 Photo documentation of the test set-up



Note: The EuT orientation and that the measurement is only possible with a special test software that enables emission for test purposes.

Emission under normal operation is only possible if the user presses a button AND moves the radar over a surface / wall. Under normal operation the emissions cease within less than 1s after the user stops moving the device.

This test was carried out to evaluate the power spectral density parameters of the UWB device when the DUT is directly radiating into the air.

5.4.3 Applicable standard

According to FCC Part 15C, Section 15.509(a):
The bandwidth of the emission shall not exceed the effective limits.

5.4.4 Description of Measurement

The measurement was performed radiated with intentional modulation using a spectrum analyser. The analyser span was set wide enough to capture the most of the power envelope of the signal. The function "10-dB-down" is used to determine the BW.

Instrument settings:

RBW: 1 MHz

VBW: 3 MHz

5.4.5 Test result

Centre frequency (MHz)	10dB bandwidth f_1 (MHz)	10dB bandwidth f_2 (MHz)	Measured bandwidth (MHz)	Limit
2441	1000	4300	3300	BW < 10.6 GHz

Limit according to FCC Part 15C Section 15.509(a):

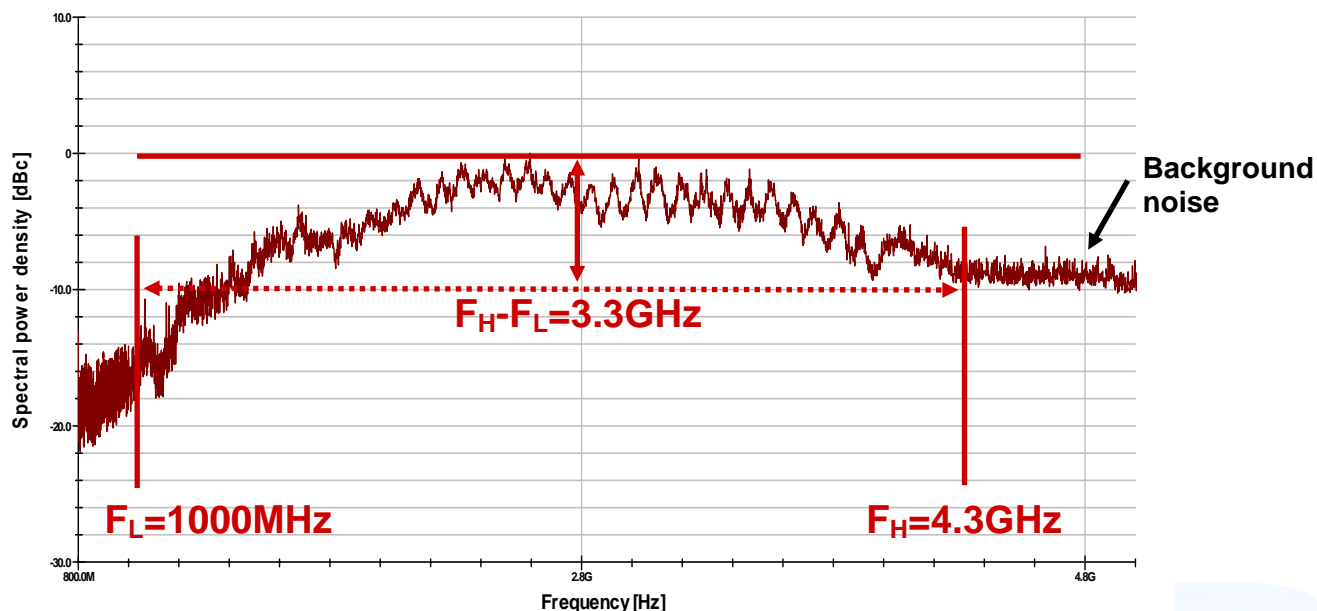
The UWB bandwidth of an imaging system operating under the provisions of this section must be below 10.6 GHz

The requirements are **FULFILLED**.

Remarks: For detailed results, please see the test protocol below.

5.4.6 Test protocol

Emission bandwidth FCC Part 15C, Section 15.509(a)



5.5 Signal deactivation

For test instruments and accessories used see section 6 Part MB.

5.5.1 Description of the test location

Test location: AREA4

5.5.2 Photo documentation of the test set-up



5.5.3 Applicable standard

According to FCC Part 15C, Section 15.509(c):

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter not exceeding the defined on time limit.

5.5.4 Description of Measurement

The duration of transmission is measured with the spectrum analyzer. The sweep points were set to maximum for higher the time resolution. The signal is modulated; the marker of the analyzer is set to maximum amplitude at normal temperature and zero span. The analyser was set to single sweep and triggered on the button, the marker was set to the edges in order to measure the duration time and then recorded.

5.5.5 Test result

By pressing the start button and not moving the DUT, the GPR emissions cease in approx. 40ms. If user presses start button and moves device for approx. 2 seconds, the device detects that it is not moving anymore and ceases UWB GPR emissions in the before measured 40ms.

Limit according to FCC Part 15C, Section 15.509(c):

A GPR that is designed to be operated while being hand held and a wall imagine system shall contain a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator.

FCC ID: SDL-PS1000R1

In lieu of a switch located on the imaging system, it is permissible to operate an imaging system by remote control provided the imaging system ceases transmission within 10 seconds of the remote switch being released by the operator.

The requirements are **FULFILLED**.

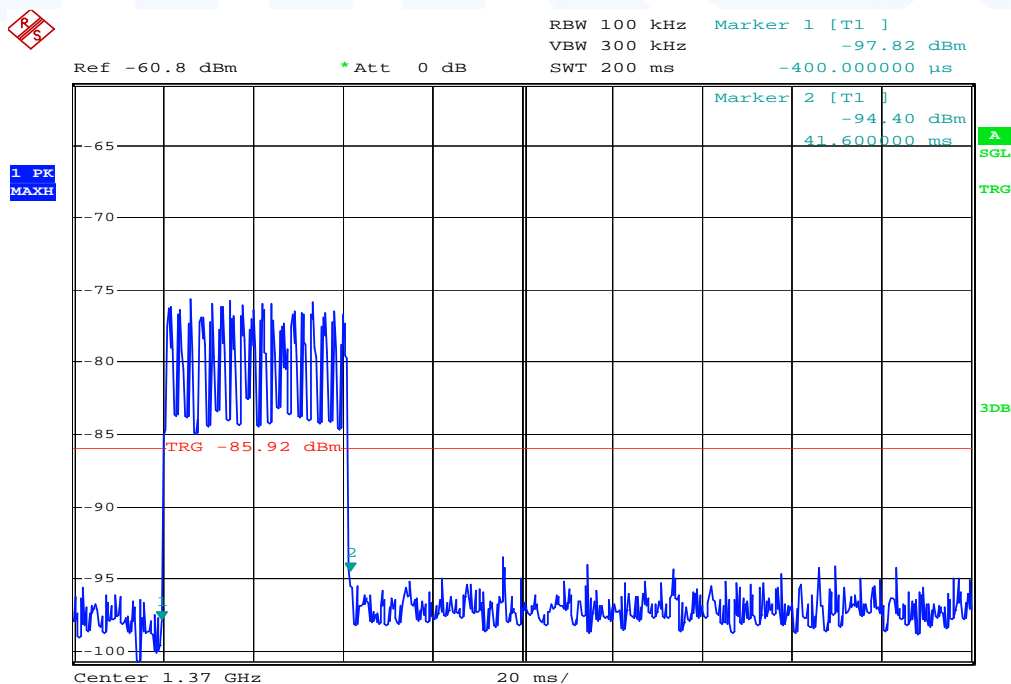
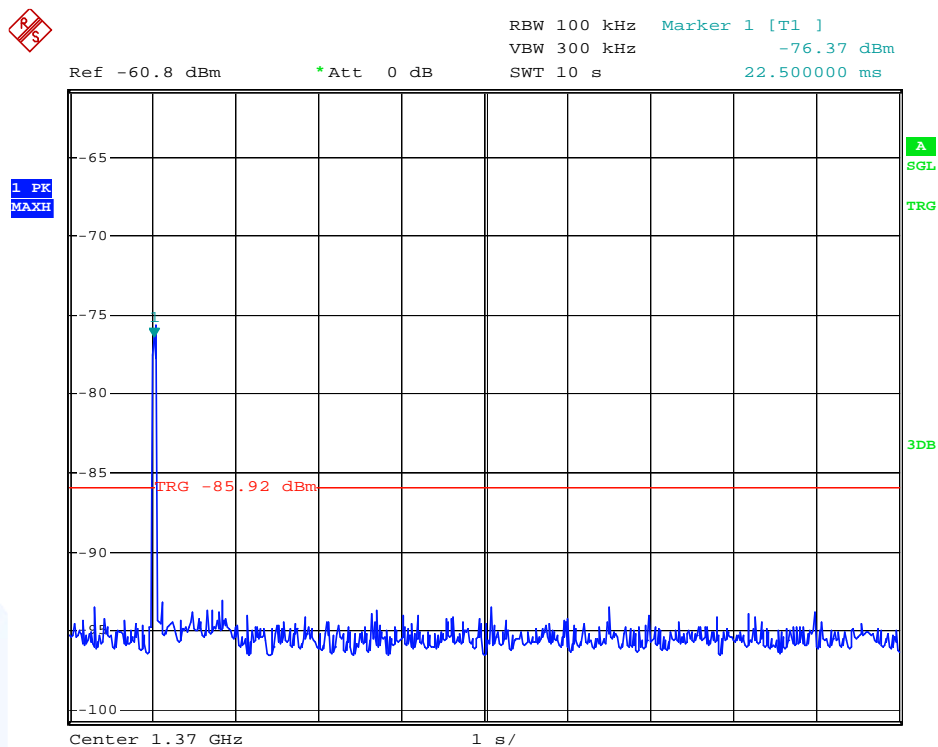
Remarks: For detailed test results, please see the test protocol below.

mikes

FCC ID: SDL-PS1000R1

5.5.6 Test protocol

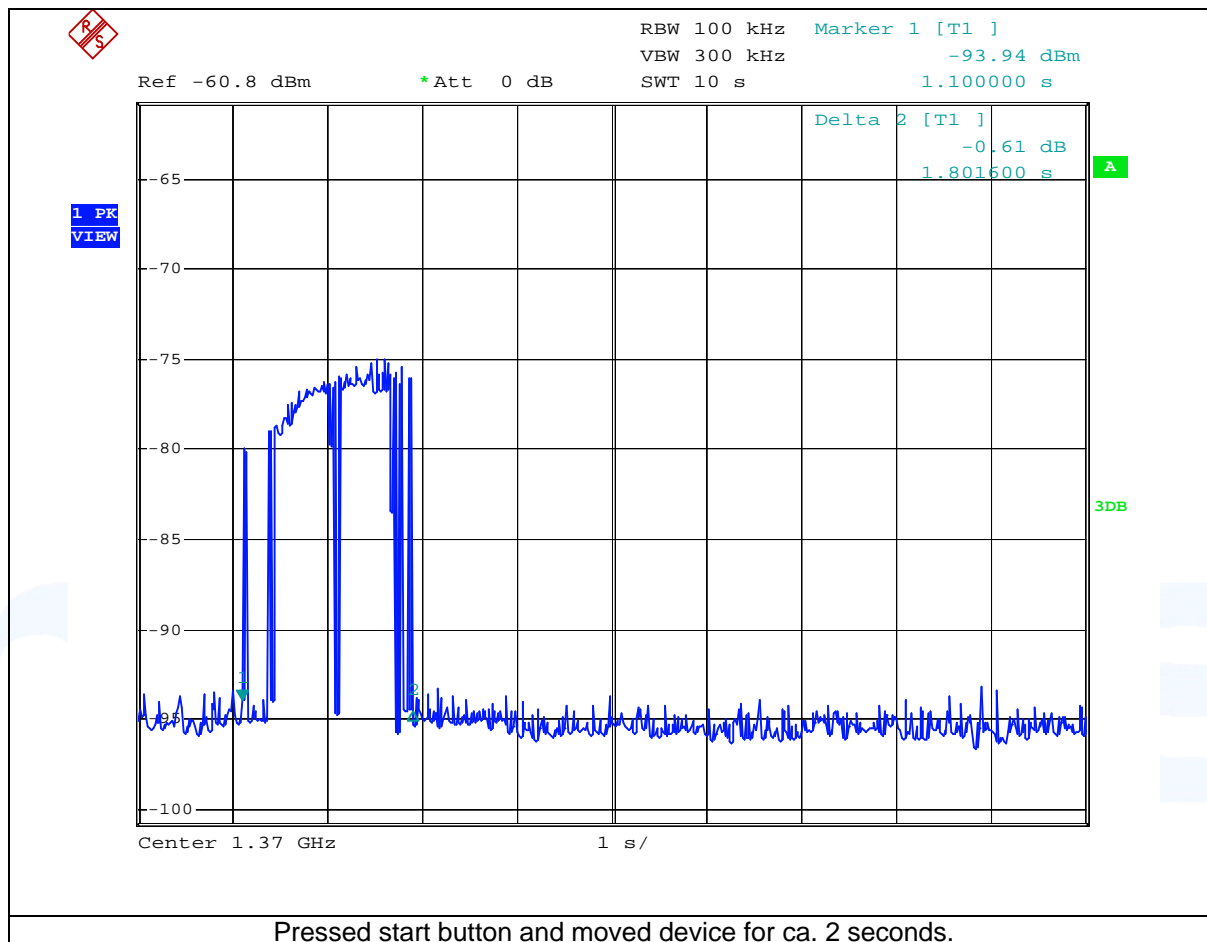
Signal deactivation FCC Part 15C, Section 15.509(c)



Pressed start button and no movement.

FCC ID: SDL-PS1000R1

Signal deactivation
FCC Part 15C, Section 15.509(c)



6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used are calibrated and verified regularly. The calibration history is available on request.

Test ID	Model / Type	Kind of Equipment	Manufacturer	Equipment No.
A 4	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	ESH 2 - Z 5	LISN	Rohde & Schwarz München	02-02/20-05-004
	N-4000-BNC	RF Cable	mikes-testingpartners gmbh	02-02/50-05-138
	N-1500-N	RF Cable	mikes-testingpartners gmbh	02-02/50-05-140
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-155
CPC 3	FSP 30	Spectrum Analyser	Rohde & Schwarz München	02-02/11-05-001
	LNG32-3	Power Supply	Heinzinger electronic GmbH	02-02/50-07-034
MB	3115	Horn Antenna 1 - 18 GH	EMCO Elektronik GmbH	01-02/24-01-011
	FSP 30	Spectrum Analyser	Rohde & Schwarz München	02-02/11-05-001
	LNG32-3	Power Supply	Heinzinger electronic GmbH	02-02/50-07-034
SER 1	FMZB 1516	Magnetic Field Antenna	Schwarzbeck Mess-Elektron	01-02/24-01-018
	ESCI	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog Broadband Antenn	Schwarzbeck Mess-Elektron	02-02/24-05-005
	S10162-B	RF Cable 33 m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20 m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 3	SML 01	Signal Generator	Rohde & Schwarz München	01-02/05-04-007
	SMR 20	Signal Generator	Rohde & Schwarz München	01-02/05-05-002
	3115	Horn Antenna 1 - 18 GH	EMCO Elektronik GmbH	01-02/24-01-011
	FSP 30	Spectrum Analyser	Rohde & Schwarz München	02-02/11-05-001
	AFS4-01000400-10-10P-4	RF Amplifier 1 - 4 GHz	PARZICH GMBH	02-02/17-05-003
	AMF-4F-04001200-15-10P	RF Amplifier 4 - 12 GHz	PARZICH GMBH	02-02/17-05-004
	BBHA 9120 E 251	Broadband Horn Antenn	Schwarzbeck Mess-Elektron	02-02/24-05-006
	BBHA 9120	Broadband Horn Antenn	Schwarzbeck Mess-Elektron	02-02/24-05-031
	WBH2-18NHG	Broadband Horn Antenn	Q-par Angus Ltd	02-02/24-08-002
	Sucoflex N-2000-SMA	RF Cable	novotronik Signalverarbeit	02-02/50-05-075
	Multiflex 141-SMA-N-1500	Coaxcable	novotronik Signalverarbeit	02-02/50-09-015
	Multiflex 141-SMA-N-1500	Coaxcable	novotronik Signalverarbeit	02-02/50-09-016

Test ID	Model Type	Equipment No.	Next Calib.	Last Calib.	Next Verif.	Next Verif.
A 4	ESHS 30	02-02/03-05-002	18/06/2011	18/06/2010		
	ESH 2 - Z 5	02-02/20-05-004	13/03/2011	13/03/2008	11/12/2010	11/06/2010
	ESH 3 - Z 2	02-02/50-05-155			07/10/2010	07/04/2010
CPC 3	FSP 30	02-02/11-05-001	04/05/2011	04/05/2010		
MB	3115	01-02/24-01-011	08/05/2013	08/05/2008		
	FSP 30	02-02/11-05-001	04/05/2011	04/05/2010		
SER 1	ESCI	02-02/03-05-005	10/11/2010	10/11/2009		
	FMZB 1516	01-02/24-01-018			15/02/2011	15/02/2010
SER 2	ESVS 30	02-02/03-05-006	11/06/2011	11/06/2010		
	VULB 9168	02-02/24-05-005	06/05/2011	06/05/2008	01/10/2010	01/04/2010
SER 3	SML 01	01-02/05-04-007	27/07/2012	27/07/2010		
	SMR 20	01-02/05-05-002	25/02/2011	25/02/2010		
	3115	01-02/24-01-011	08/05/2013	08/05/2008		
	FSP 30	02-02/11-05-001	04/05/2011	04/05/2010		
	BBHA 9120 E 251	02-02/24-05-006			09/02/2011	09/08/2010
	BBHA 9120	02-02/24-05-031			18/01/2011	18/01/2010
	WBH2-18NHG	02-02/24-08-002	03/05/2011	03/05/2010	03/11/2010	03/05/2010