IMQ S.p.A. con socio unico
Via Quintiliano, 43
20138 MILANO - I

LAB N° 0121
Signatory of EA, IAF and ILAC
Mutual Recognition Agreements

TELECOMMUNICATIONS & TELEMATICS FOR TRANSPORTS LABORATORY

TEST REPORT
No. ARSL00296/1

performed in accordance with

FCC Rules: Code of Federal Regulations (CFR) no. 47
Part 15 Subpart F Section 15.509

PRODUCT	Ground penetrating radar
MODEL(s) TESTED	TRHFNA
FCC ID	UFW- TRHFNA
TRADE MARK(s)	IDS INGEGNERIA DEI SISTEMI S.p.A

APPLICANT	IDS INGEGNERIA DEI SISTEMI S.p.A. Via E. Calabresi, 20 – I-56121 PISA

Tested by	Robertino Torri	Robertino Torri
Approved by	Marco De Angelis *[Area Manager]*	Marco De Angelis

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2011-12-21	First edition

1. GENERAL DATA

SAMPLE		
Samples received on	**2011-11-29**	**(item sent and sampling by applicant)**
IMQ reference samples	**BEM**	**61894**
Samples tested No.	1	
Object under analysis recognition	**Not carried out** Except where stated, characteristics of products were taken from client description and were not verified by the laboratory	
TEST LOCATION		
Testing dates	2011-11-29 ÷ 2011-11-30	
Testing laboratory.	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
Testing site	Viale Lombardia, 20 – I-20021 Bollate (MI)	
ENVIRONMENTAL CONDITIONING		
Parameter	***Measured***	
Ambient Temperature	0 ÷ 10 °C	
Relative Humidity	60 ÷ 75 %	
Atmospheric Pressure	900 ÷ 1000 mbar	

2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
☒	47 CFR Part 15	2008	Radio Frequency Device
☒	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 C63.10 (*)	2009	American National Standard for Testing Unlicensed Wireless Devices
☒	FCC Order, ET Docket No. 98-153 (FCC 02-48) (*)	2002	Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems
☒	KDB Publication No. 393764 (*)	2007	UWB Compliance Measurements

(*)	not accredited by ACCREDIA

3. UNIT UNDER TEST (EUT) DETAILS

GENERAL DATA

Model	TRHFNA
FCC ID	UFW- TRHFNA

Manufacturer	IDS INGEGNERIA DEI SISTEMI S.p.A. Via E. Calabresi, 20 – I-56121 PISA

EUT classification	Ground penetrating radar (GPR)
General overwiew	The TRHFNA system is a Ground penetrating radar (GPR) system, i.e., according to the FCC definition, a field disturbance sensor that is designed to operate only when in contact with the ground for the purpose of detecting or obtaining the images of buried objects or determining the physical properties within the ground. The energy from the GPR is intentionally directed down into the ground for this purpose. The TRHFNA product includes • The TRHFNA antenna (including one couple of transmitting and receiving dipoles) • The control unit (hereinafter referred as D.A.D – Digital Antenna Driver) that is linked to a laptop computer for storing the collected data.
Power supply type	DC 12 V battery supplied
Operating frequency	976 ÷ 2489,6MHz (10 dB Bandwidth)
Channel Spacing	Not applicable
Pulse Repetition Frequency (PRF)	400 KHz
Antenna description	Integral permanently attached
Antenna Type	Dipole

4. TEST CONFGURATION OF UNIT UNDER TEST

EUT CONFIGURATION

The Equipment under test was powered with a battery and placed directly on the dry sand with no ground plane under it.

STATE OF THE EUT DURING TESTS

Ref.	Mode	Description
#1	Operating	Continuous transmission with the antenna fitted in a manner typical of normal indented use.

SUPPORT EQUIPMENT

Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

Equipment	Manufacturer	Model
None	/	/

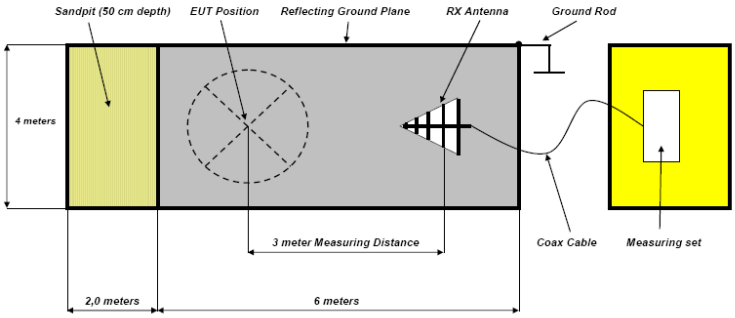
EUT TECHNICAL DOCUMENTATION

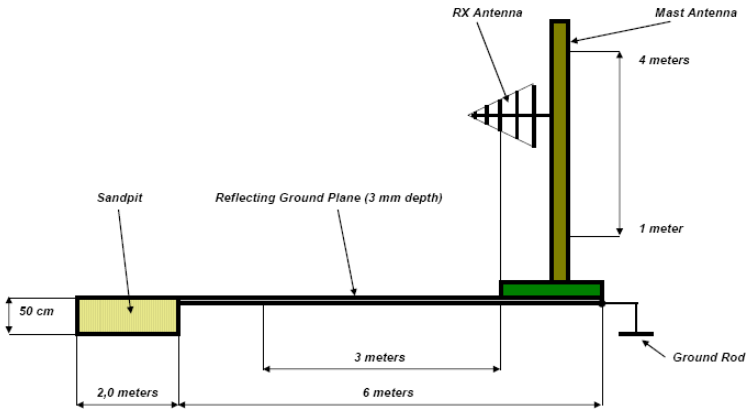
Document	Reference
DAD & antenna block diagrams	/
User's Guide	Protocol: MN/2011/067 rev. 1.0
Technical description of the system	Technical description of the unit - TRHFNA

5. TEST SET-UP DESCRIPTION

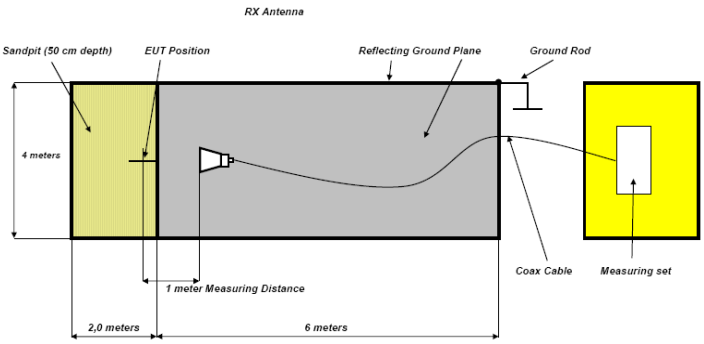
Type of test facilities	Open Area Test Site (OATS) The test site is flat and the level area is clear of overhead wires and reflecting structures, it is sufficiently large to permit measuring antenna placement at specified distance. Adequate spacing distance is assured between the EUT and measuring antenna to any adjacent large reflecting structures.
Test distance	• 3 meters measuring distance. • 1 meter above 960 MHz for measurement to device not placed on the ground plane with the antenna pointed in the direction of the radiating head.
Ground plane	Galvanized sheet steel soldered panels is installed on the floor, electric contact between the individual plates is provided via continues metallic strips. Dimensions: 6.0m x 4.0m x 3.0mm (LxWxD)
Antenna positioner	Semi-Automatic remotely controlled Antenna mast, scan over a range of 1 to 4 meters above the ground plane. Manual antenna polarization change.
Sandpit	2.0m x 4.0m x 50cm (LxWxD) sandpit area filled with dry sand placed in front of the ground plane (test on UWB Ground penetrating radar).

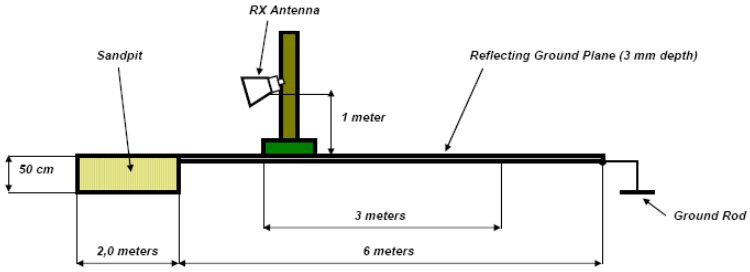
Drawing





Radiated measurement below 960 MHz





Radiated measurement above 960 MHz

6. SUMMARY OF TEST RESULTS

POSSIBLE TEST CASE VERDICTS:	
Test object does meet the requirement	PASS
Test object does not meet the requirement	FAIL
Test case does not apply to the test object	N.A.
Test not performed	N.P.

CFR47 Part 15	TITLE	RESULT
§ 15.207(a)	Conducted Emission	N.A.[1]
§ 15.505	Cross reference	PASS
§ 15.507	Marketing of UWB equipment	PASS
§ 15.509	Pulse Repetition Frequency (PRF)	PASS
§ 15.509(a)	UWB Bandwidth	PASS
§ 15.509(c)	Transmission duration	PASS
§ 15.509(c) § 15.209	Radiated emission ≤ 960 MHz	PASS
§ 15.509(d)	Radiated emission > 960 MHz	PASS
§ 15.509(e)	Radiated emission in GPS bands	PASS
§ 15.509(f)	Highest radiated emission at f_M	PASS
§ 15.521	Technical requirements applicable to all UWB devices	PASS
§ 15.525 § 15.509(b)	Coordination requirement	PASS

Note 1	Port not present, battery operating device

7. TEST RESULTS

7.1 CROSS REFERENCE

TEST REQUIREMENT
a) Except where specifically stated otherwise within this subpart, the provisions of Subparts A and B and of Sections 15.201 through 15.204 and Section 15.207 of Subpart C of this part apply to unlicensed UWB intentional radiators. The provisions of Sections 15.35(c) and 15.205 do not apply to devices operated under this subpart. The provisions of Footnote US 246 to the Table of Frequency Allocations contained in Section 2.106 of this chapter does not apply to devices operated under this subpart. b) The requirements of Subpart F apply only to the radio transmitter, i.e., the intentional radiator, contained in the UWB device. Other aspects of the operation of a UWB device may be subject to requirements contained elsewhere in this chapter. In particular, a UWB device that contains digital circuitry not directly associated with the operation of the transmitter also is subject to the requirements for unintentional radiators in Subpart B of this chapter. Similarly, an associated receiver that operates (tunes) within the frequency range 30 MHz to 960 MHz is subject to the requirements in Subpart B of this chapter.

REQUIREMENT	DESCRIPTION
15.505(a)	Equipment under test complies with all the relevant and applicable requirements of Subpart A, Subpart B and Section 15.201 through 15.204 and Section 15.207 of Subpart C.
15.505(b)	The Digital circuitry portion of the EUT has been tested and verified to comply with 47 CFR Part 15, subpart B.

TEST RESULT
The EUT meets the requirements of sections 15.505.

7.2 MARKETING OF UWB EQUIPMENT

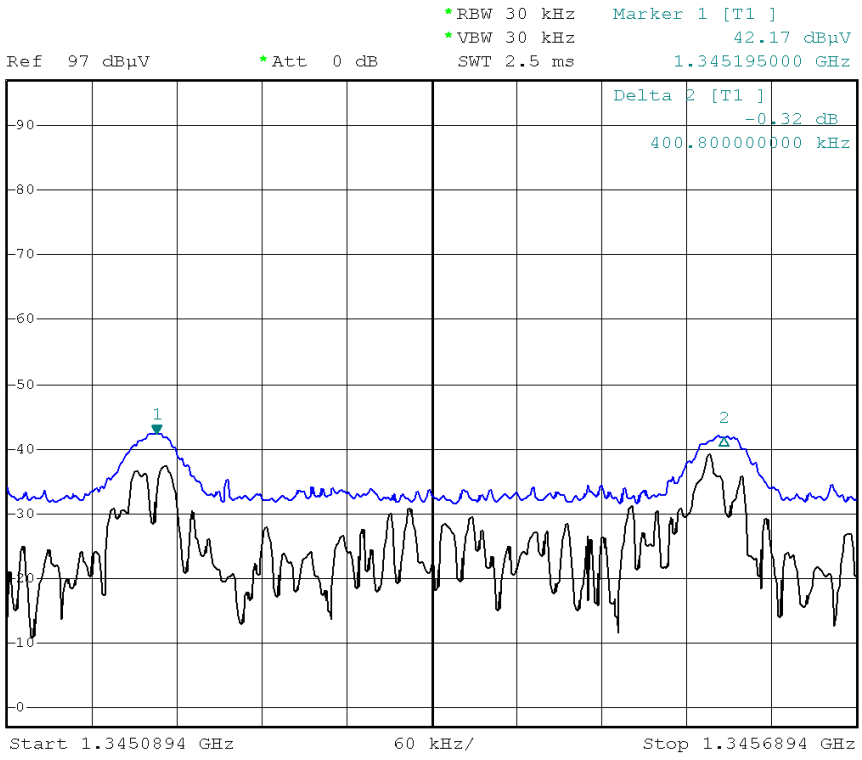
TEST REQUIREMENT
In some cases, the operation of UWB devices is limited to specific parties, *e.g.*, law enforcement, fire and rescue organizations operating under the auspices of a state or local government. The marketing of UWB devices must be directed solely to parties eligible to operate the equipment. The responsible party, as defined in Section 2.909 of this chapter, is responsible for ensuring that the equipment is marketed only to eligible parties. Marketing of the equipment in any other manner may be considered grounds for revocation of the grant of certification issued for the equipment

REQUIREMENT	DESCRIPTION
§ 15.507 § 2.909	The responsible party is properly informed about the responsible for ensuring that the equipment is marketed only to eligible parties, and provide correct information on the customers and users. (See Important note for the US customers of the "TRHFNA - User manual")

TEST RESULT
The EUT meets the requirements of sections 15.507.

7.3 PULSE REPETITION FREQUENCY (PRF)

TEST REQUIREMENT	
Test definition	Pulse Repetition Frequency (PRF) is the trigger repetition frequency
Test setup	ANSI C63.4
Test facility	Open Area Test Site (OATS)
Test distance	3 meters
RBW bandwidth	30 kHz
VBW bandwidth	30 kHz
Detector	A-Peak
Deviation to test procedure	None
EUT operating condition	#1
Remark	None



PRF Declared	PRF Measured	Result
400 kHz	400 kHz	PASS

7.4 UWB BANDWIDTH

TEST REQUIREMENT	
UWB definition	The bandwidth of a UWB emission is defined by the points on the emission spectrum where the amplitude is 10 dB below the maximum emission amplitude (i.e., the -10 dB points). In cases where the measured emission spectrum contains multiple (more than two) -10 dB points, the outermost points define the bandwidth (i.e., the widest bandwidth is assumed).
Test setup	ANSI C63.4
Test facility	Open Area Test Site (OATS)
Test distance	3 meters
RBW bandwidth	1 MHz
VBW bandwidth	3 MHz
Detector	Peak
Deviation to test procedure	None
EUT operating condition	#1
Remark	Frequency span is large enough to display a full spectrum of the RF emission

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

TEST PROCEDURE

1) The receiving antenna which varied from 1 to 4 m to find the highest emission is positioned 3 m away from the EUT.
2) Measure the Highest radiated emission at f_M as described in the test No. 8.
3) Recorded the upper and lower frequency that are at the side of the band bounded by the points at 10 dB below the highest radiated UWB emission level.
   Measuring the bandwidth of a UWB device using a radiated test set-up, it is imperative that appropriate adjustments be made to the measured amplitude levels to account for the frequency-dependent components of the measurement system (e.g., antenna gain or factor, pre-amplifier gain, cable loss, etc). Since UWB emissions can have bandwidths several GHz wide, these frequency-dependent characteristics can vary dramatically over the fundamental emission.
   According to the nature of the broadband emission characteristics, significant care mast be taken to capture the true spectrum of emission, extremely narrow sweep widths is recommended.
4) The UWB bandwidth is the different of the upper and lower frequency recorded.

SUMMURY OF TEST RESULT DATA

Frequency of Maximum emission level f_M	Receiver Antenna polarization	Maximum emission level @ 1 MHz RBW (Peak/QP)	Lower and Upper -10 dB frequencies		10 dB Bandwidth	Result
			Lower f_L	Upper f_H		
(MHz)	[V/H]	(dBµV/m)	(MHz)	(MHz)	(MHz)	
1345.60	V	48.52	976	2489.6	1513.6	PASS

TEST RESULT

The EUT meets the requirements of sections 15.509(a)

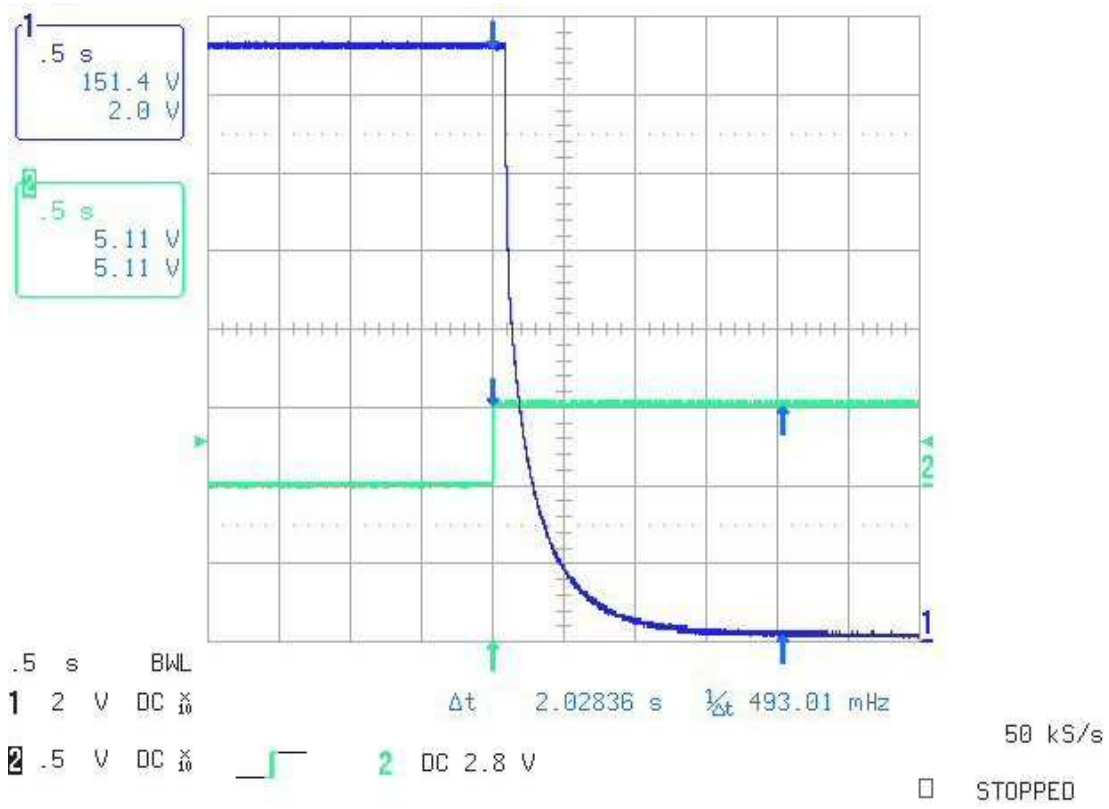
7.5 TRANSMISSION DURATION

TEST REQUIREMENT

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

DESCRIPTION

The EUT is provided with a manually operated switch ("dead-man switch") that causes the transmitter to cease operation within 10 seconds of being released by the operator.



Green line: Trigger for the interruption of normal use (equipment deactivated) – pin 6j9 in the power supply high voltage monitor;
Blue line: Transmitter power supply signal – pin 1j25 in DAD functional scheme.

The measured time of switch-off is: < 2 seconds

TEST RESULT
The EUT meets the requirements of sections 15.509(c)

7.5 RADIATED DISTURBANCES ≤ 960 MHz

TEST REQUIREMENT	
Test definition	The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in Section 15.209
Test setup	ANSI C63.4
Test facility	Open Area Test Site (OATS)
Test distance	3 meters
RBW bandwidth	120 kHz
VBW bandwidth	1 MHz
Detector	Quasi-Peak
EUT operating condition	#1
Remark	None

LIMITS

Frequency (MHz)	Field Strengths Limits (dBµV/m)	Measuring RBW (kHz)	Distance (meters)
0.009-0.490	67.6-20*Logf(kHz)	1	300
0.490-1.705	87.6-20*Logf(kHz)	9	30
1.705-30	29.5	9	30
30-88	40.0	120	3
88-216	43.5	120	3
216-960	46.0	120	3

TEST PROCEDURE

1) The EUT was placed on sandpit area filled with dry sand initially placed in front of the ground plane (0° degree position)
2) The receiving antenna which varied from 1 to 4 m to find the highest emission is positioned 3 m away from the EUT.
3) The receiving antenna was positioned in horizontal polarization.
4) The measurements were made with the detector set to peak with a bandwidth of 120 kHz during monitoring the frequency range below 960 MHz.
5) Upon detection of a suspect emission signal, its amplitude and frequency were noted.
6) It is recommended to demodulate the received signals for suitable discrimination of the ambient emission from the EUT emission.
7) At the worst case combination of the EUT operating mode and antenna height , the field strength measure was recorded. At each of the frequencies were a field strength was recorded the final measurement was performed with a Quasi-Peak detector.
8) The receiving antenna was positioned in vertical polarization and the steps 2 to 6 was repeated.
9) The EUT was rotating from 0° to 360° degrees with 45° step increment and the st eps 4 to 7 was repeated.
10) All the worst case combination field strength emissions founded of each EUT position and antenna polarization was recorded in the following table and compared with the applicable limits.

SUMMURY OF TEST RESULT DATA

Frequency (MHz)	EUT Position (angle °)	Antenna Polarization (V/H)	Correcting reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
41.00	0	H	36.97	40	-3.03	PASS
61.00	315	V	38.53	40	-1.47	PASS
68.00	315	V	38.93	40	-1.07	PASS
71.80	315	V	38.83	40	-1.17	PASS
124.00	0	H	38.85	43.5	-4.65	PASS
150.00	315	V	42.32	43.5	-1.18	PASS
332.64	45	V	34.94	46	-11.06	PASS
404.42	180	H	32.40	46	-13.60	PASS
441.20	0	H	36.86	46	-9.14	PASS
875.04	270	H	37.75	46	-8.25	PASS
916.58	225	V	37.33	46	-8.67	PASS

Remark: Ambient signal were detected in the different frequency ranges, each of measured signal close or above the limits was examined with relation to the EUT.

TEST RESULT

The EUT meets the requirements of sections 15.509(d) and 15.209.

TEST DATA DETAILS

EUT Position (angle °)			0	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	**20.49**	16.3	0.18	0	36.97	40.00	-3.03
61.00	24.82	10.3	0.26	0	35.38	40.00	-4.62
68.00	20.08	8.5	0.30	0	28.88	40.00	-11.12
71.80	24.52	8.5	0.32	0	33.34	40.00	-6.66
124.00	20.13	11	0.33	0	31.46	43.50	-12.04
150.00	24.22	8.8	0.41	0	33.43	43.50	-10.07
332.64	14.45	14.3	0.48	0	29.23	46.00	-16.77
404.42	17.90	15.7	0.77	0	32.40	46.00	-13.60
441.20	19.74	16.3	0.82	0	36.86	46.00	-9.14
875.04	13.36	21.6	0.88	0	35.84	46.00	-10.16
916.58	13.74	22.5	0.91	0	37.15	46.00	-8.85

EUT Position (angle °)			45	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	15.69	16.3	0.18	0	32.17	40.00	-7.83
61.00	23.85	10.3	0.26	0	34.41	40.00	-5.59
68.00	19.66	8.5	0.30	0	28.46	40.00	-11.54
71.80	22.79	8.5	0.32	0	31.61	40.00	-8.39
124.00	20.05	11	0.33	0	31.38	43.50	-12.12
150.00	25.75	8.8	0.41	0	34.96	43.50	-8.54
332.64	16.49	14.3	0.48	0	31.27	46.00	-14.73
404.42	18.90	15.7	0.77	0	32.40	46.00	-13.60
441.20	17.55	16.3	0.82	0	34.67	46.00	-11.33
875.04	13.66	21.6	0.88	0	36.14	46.00	-9.86
916.58	13.10	22.5	0.91	0	36.51	46.00	-9.49

EUT Position (angle °)			90	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	17.22	16.3	0.18	0	33.70	40.00	-6.30
61.00	26.94	10.3	0.26	0	37.50	40.00	-2.50
68.00	18.69	8.5	0.30	0	27.49	40.00	-12.51
71.80	21.79	8.5	0.32	0	30.61	40.00	-9.39
124.00	20.94	11	0.33	0	32.27	43.50	-11.23
150.00	25.43	8.8	0.41	0	34.64	43.50	-8.86
332.64	17.65	14.3	0.48	0	32.43	46.00	-13.57
404.42	19.25	15.7	0.77	0	32.40	46.00	-13.60
441.20	18.45	16.3	0.82	0	35.57	46.00	-10.43
875.04	12.67	21.6	0.88	0	35.15	46.00	-10.85
916.58	13.64	22.5	0.91	0	37.05	46.00	-8.95

EUT Position (angle °)			135	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	17.40	16.3	0.18	0	33.88	40.00	-6.12
61.00	26.27	10.3	0.26	0	36.83	40.00	-3.17
68.00	11.74	8.5	0.30	0	20.54	40.00	-19.46
71.80	21.65	8.5	0.32	0	30.47	40.00	-9.53
124.00	22.21	11	0.33	0	33.54	43.50	-9.96
150.00	25.47	8.8	0.41	0	34.68	43.50	-8.82
332.64	13.67	14.3	0.48	0	28.45	46.00	-17.55
404.42	19.30	15.7	0.77	0	32.40	46.00	-13.60
441.20	19.19	16.3	0.82	0	36.31	46.00	-9.69
875.04	13.37	21.6	0.88	0	35.85	46.00	-10.15
916.58	12.50	22.5	0.91	0	35.91	46.00	-10.09

EUT Position (angle °)			180	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	15.93	16.3	0.18	0	32.41	40.00	-7.59
61.00	23.71	10.3	0.26	0	34.27	40.00	-5.73
68.00	16.44	8.5	0.30	0	25.24	40.00	-14.76
71.80	19.52	8.5	0.32	0	28.34	40.00	-11.66
124.00	17.25	11	0.33	0	28.58	43.50	-14.92
150.00	18.46	8.8	0.41	0	27.67	43.50	-15.83
332.64	14.40	14.3	0.48	0	29.18	46.00	-16.82
404.42	19.52	15.7	0.77	0	32.40	46.00	-13.60
441.20	19.39	16.3	0.82	0	36.51	46.00	-9.49
875.04	13.77	21.6	0.88	0	36.25	46.00	-9.75
916.58	13.17	22.5	0.91	0	36.58	46.00	-9.42

EUT Position (angle °)			225	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	17.74	16.3	0.18	0	34.22	40.00	-5.78
61.00	20.86	10.3	0.26	0	31.42	40.00	-8.58
68.00	19.52	8.5	0.30	0	28.32	40.00	-11.68
71.80	22.52	8.5	0.32	0	31.34	40.00	-8.66
124.00	19.33	11	0.33	0	30.66	43.50	-12.84
150.00	24.41	8.8	0.41	0	33.62	43.50	-9.88
332.64	13.08	14.3	0.48	0	27.86	46.00	-18.14
404.42	18.59	15.7	0.77	0	32.40	46.00	-13.60
441.20	19.56	16.3	0.82	0	36.68	46.00	-9.32
875.04	13.44	21.6	0.88	0	35.92	46.00	-10.08
916.58	13.03	22.5	0.91	0	36.44	46.00	-9.56

EUT Position (angle °)			270	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	17.07	16.3	0.18	0	33.55	40.00	-6.45
61.00	23.15	10.3	0.26	0	33.71	40.00	-6.29
68.00	19.41	8.5	0.30	0	28.21	40.00	-11.79
71.80	21.94	8.5	0.32	0	30.76	40.00	-9.24
124.00	18.22	11	0.33	0	29.55	43.50	-13.95
150.00	22.10	8.8	0.41	0	31.31	43.50	-12.19
332.64	15.39	14.3	0.48	0	30.17	46.00	-15.83
404.42	18.39	15.7	0.77	0	32.40	46.00	-13.60
441.20	18.67	16.3	0.82	0	35.79	46.00	-10.21
875.04	15.27	21.6	0.88	0	37.75	46.00	-8.25
916.58	12.37	22.5	0.91	0	35.78	46.00	-10.22

EUT Position (angle °)			315	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	15.72	16.3	0.18	0	32.20	40.00	-7.80
61.00	22.49	10.3	0.26	0	33.05	40.00	-6.95
68.00	21.33	8.5	0.30	0	30.13	40.00	-9.87
71.80	23.87	8.5	0.32	0	32.69	40.00	-7.31
124.00	19.13	11	0.33	0	30.46	43.50	-13.04
150.00	23.95	8.8	0.41	0	33.16	43.50	-10.34
332.64	14.19	14.3	0.48	0	28.97	46.00	-17.03
404.42	17.02	15.7	0.77	0	32.40	46.00	-13.60
441.20	18.07	16.3	0.82	0	35.19	46.00	-10.81
875.04	13.88	21.6	0.88	0	36.36	46.00	-9.64
916.58	12.58	22.5	0.91	0	35.99	46.00	-10.01

EUT Position (angle °)			0	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	16.41	16.3	0.18	0	32.89	40.00	-7.11
61.00	26.15	10.3	0.26	0	36.71	40.00	-3.29
68.00	26.82	8.5	0.30	0	35.62	40.00	-4.38
71.80	29.28	8.5	0.32	0	38.10	40.00	-1.90
124.00	27.52	11	0.33	0	38.85	43.50	-4.65
150.00	30.14	8.8	0.41	0	39.35	43.50	-4.15
332.64	19.84	14.3	0.48	0	34.62	46.00	-11.38
404.42	17.06	15.7	0.77	0	32.40	46.00	-13.60
441.20	13.45	16.3	0.82	0	30.57	46.00	-15.43
875.04	13.32	21.6	0.88	0	35.80	46.00	-10.20
916.58	13.03	22.5	0.91	0	36.44	46.00	-9.56

EUT Position (angle °)			45	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	16.50	16.3	0.18	0	32.98	40.00	-7.02
61.00	25.09	10.3	0.26	0	35.65	40.00	-4.35
68.00	26.52	8.5	0.30	0	35.32	40.00	-4.68
71.80	25.79	8.5	0.32	0	34.61	40.00	-5.39
124.00	24.94	11	0.33	0	36.27	43.50	-7.23
150.00	29.90	8.8	0.41	0	39.11	43.50	-4.39
332.64	**20.16**	14.3	0.48	0	34.94	46.00	-11.06
404.42	16.67	15.7	0.77	0	32.40	46.00	-13.60
441.20	14.18	16.3	0.82	0	31.30	46.00	-14.70
875.04	13.91	21.6	0.88	0	36.39	46.00	-9.61
916.58	13.00	22.5	0.91	0	36.41	46.00	-9.59

EUT Position (angle °)			90	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	15.89	16.3	0.18	0	32.37	40.00	-7.63
61.00	23.54	10.3	0.26	0	34.10	40.00	-5.90
68.00	24.40	8.5	0.30	0	33.20	40.00	-6.80
71.80	28.60	8.5	0.32	0	37.42	40.00	-2.58
124.00	26.39	11	0.33	0	37.72	43.50	-5.78
150.00	30.02	8.8	0.41	0	39.23	43.50	-4.27
332.64	19.21	14.3	0.48	0	33.99	46.00	-12.01
404.42	17.75	15.7	0.77	0	32.40	46.00	-13.60
441.20	15.52	16.3	0.82	0	32.64	46.00	-13.36
875.04	12.83	21.6	0.88	0	35.31	46.00	-10.69
916.58	13.21	22.5	0.91	0	36.62	46.00	-9.38

EUT Position (angle °)			135	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	16.23	16.3	0.18	0	32.71	40.00	-7.29
61.00	24.29	10.3	0.26	0	34.85	40.00	-5.15
68.00	23.84	8.5	0.30	0	32.64	40.00	-7.36
71.80	23.65	8.5	0.32	0	32.47	40.00	-7.53
124.00	25.78	11	0.33	0	37.11	43.50	-6.39
150.00	29.27	8.8	0.41	0	38.48	43.50	-5.02
332.64	16.57	14.3	0.48	0	31.35	46.00	-14.65
404.42	16.32	15.7	0.77	0	32.40	46.00	-13.60
441.20	13.41	16.3	0.82	0	30.53	46.00	-15.47
875.04	13.16	21.6	0.88	0	35.64	46.00	-10.36
916.58	13.58	22.5	0.91	0	36.99	46.00	-9.01

EUT Position (angle °)			180	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	18.16	16.3	0.18	0	34.64	40.00	-5.36
61.00	23.91	10.3	0.26	0	34.47	40.00	-5.53
68.00	24.31	8.5	0.30	0	33.11	40.00	-6.89
71.80	21.30	8.5	0.32	0	30.12	40.00	-9.88
124.00	25.50	11	0.33	0	36.83	43.50	-6.67
150.00	28.99	8.8	0.41	0	38.20	43.50	-5.30
332.64	15.68	14.3	0.48	0	30.46	46.00	-15.54
404.42	14.60	15.7	0.77	0	32.40	46.00	-13.60
441.20	14.71	16.3	0.82	0	31.83	46.00	-14.17
875.04	14.11	21.6	0.88	0	36.59	46.00	-9.41
916.58	13.40	22.5	0.91	0	36.81	46.00	-9.19

EUT Position (angle °)			225	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	19.98	16.3	0.18	0	36.46	40.00	-3.54
61.00	23.56	10.3	0.26	0	34.12	40.00	-5.88
68.00	22.85	8.5	0.30	0	31.65	40.00	-8.35
71.80	27.29	8.5	0.32	0	36.11	40.00	-3.89
124.00	24.69	11	0.33	0	36.02	43.50	-7.48
150.00	29.82	8.8	0.41	0	39.03	43.50	-4.47
332.64	13.95	14.3	0.48	0	28.73	46.00	-17.27
404.42	15.08	15.7	0.77	0	32.40	46.00	-13.60
441.20	13.74	16.3	0.82	0	30.86	46.00	-15.14
875.04	13.00	21.6	0.88	0	35.48	46.00	-10.52
916.58	13.92	22.5	0.91	0	37.33	46.00	-8.67

EUT Position (angle °)			270	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	19.65	16.3	0.18	0	36.13	40.00	-3.87
61.00	26.81	10.3	0.26	0	37.37	40.00	-2.63
68.00	22.25	8.5	0.30	0	31.05	40.00	-8.95
71.80	26.87	8.5	0.32	0	35.69	40.00	-4.31
124.00	26.22	11	0.33	0	37.55	43.50	-5.95
150.00	31.35	8.8	0.41	0	40.56	43.50	-2.94
332.64	16.36	14.3	0.48	0	31.14	46.00	-14.86
404.42	14.95	15.7	0.77	0	32.40	46.00	-13.60
441.20	18.10	16.3	0.82	0	35.22	46.00	-10.78
875.04	13.66	21.6	0.88	0	36.14	46.00	-9.86
916.58	13.24	22.5	0.91	0	36.65	46.00	-9.35

EUT Position (angle °)			315	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
41.00	17.12	16.3	0.18	0	33.60	40.00	-6.40
61.00	27.97	10.3	0.26	0	38.53	40.00	-1.47
68.00	30.13	8.5	0.30	0	38.93	40.00	-1.07
71.80	30.01	8.5	0.32	0	38.83	40.00	-1.17
124.00	25.28	11	0.33	0	36.61	43.50	-6.89
150.00	33.11	8.8	0.41	0	42.32	43.50	-1.18
332.64	19.58	14.3	0.48	0	34.36	46.00	-11.64
404.42	16.34	15.7	0.77	0	32.40	46.00	-13.60
441.20	15.51	16.3	0.82	0	32.63	46.00	-13.37
875.04	12.99	21.6	0.88	0	35.47	46.00	-10.53
916.58	12.95	22.5	0.91	0	36.36	46.00	-9.64

7.6 RADIATED DISTURBANCES > 960 MHz

TEST REQUIREMENT	
Test definition	The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz.
Test setup	ANSI C63.4
Test facility	Open Area Test Site (OATS)
Test distance	1 meter
RBW bandwidth	1 MHz
VBW bandwidth	1 MHz
Detector	RMS
EUT operating condition	#1
Remark	None

LIMITS

Frequency (MHz)	EIRP @ 3 meters (1 MHz BW) (dBm)	Field strength @ 3 meters (1 MHz BW) (dBµV/m)	Field strength @ 1 meters (1 MHz BW) (dBµV/m)
960-1610	-65.3	29.9	39.4
1610-1990	-53.3	41.9	51.4
1990-3100	-51.3	43.9	53.4
3100-10600	-41.3	53.9	63.4
Above 10600	-51.3	43.9	53.4

Note: The limits were converted from EIRP to field strength at 3 and 1 meter according to FCC 15.503(k).

TEST PROCEDURE

1) The EUT was placed on sandpit area filled with dry sand initially placed in front of the ground plane (0° degree position)
2) The receiving antenna is placed at 1 meter away from the EUT and it is pointed in the direction of the radiating head with an inclination of -10°to find the highest emission.
3) The receiving antenna was positioned in horizontal polarization.
4) The measurements were made with the detector set to RMS with a bandwidth of 1 MHz during monitoring the frequency range above 960 MHz.
5) Upon detection of a suspect emission signal, its amplitude and frequency were noted.
6) It is recommended to demodulate the received signals for suitable discrimination of the ambient emission from the EUT emission.
7) At the worst case combination of the EUT operating mode and antenna height , the field strength measure was recorded.
8) The receiving antenna was positioned in vertical polarization and the steps 2 to 6 was repeated.
9) The EUT was rotating from 0° to 360° degrees with 45° step increment and the st eps 4 to 7 was repeated.
10) All the worst case combination field strength emissions founded of each EUT position and antenna polarization was recorded in the following table and compared with the applicable limits.

SUMMURY OF TEST RESULT DATA

All maximum Field strength emission are found at the following test set-up conditions

Frequency (MHz)	EUT Position (angle °)	Antenna Polarization (V/H)	Correcting reading (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
1 051	180	H	37.35	39.4	-2.05	PASS
1 106	315	V	34.72	39.4	-4.68	PASS
1 386	315	V	37.18	39.4	-2.22	PASS
1 494	270	V	36.89	39.4	-2.51	PASS
1 638	225	V	37.52	51.4	-13.88	PASS
1 990	135	V	38.48	51.4	-12.92	PASS
2 094	90	V	37.32	53.4	-16.08	PASS
2 370	315	V	45.51	53.4	-7.89	PASS
2 626	180	H	37.81	53.4	-15.59	PASS
2 750	270	V	37.36	53.4	-16.04	PASS
2 970	225	V	37.09	53.4	-16.31	PASS

TEST RESULT

The EUT meets the requirements of sections 15.509(d)

TEST DATA DETAILS

EUT Position (angle °)			0	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	47.85	24.50	1.30	38.82	34.83	39.40	-4.57
1 106	47.75	24.60	1.42	38.83	34.94	39.40	-4.46
1 386	41.42	24.80	1.57	38.85	28.94	39.40	-10.46
1 494	41.95	25.50	1.64	38.85	30.24	39.40	-9.16
1 638	43.67	25.80	1.70	38.50	32.67	51.40	-18.73
1 990	43.86	26.40	1.85	37.47	34.64	51.40	-16.76
2 094	41.99	26.40	1.94	37.50	32.83	53.40	-20.57
2 370	45.70	27.50	2.08	37.50	37.78	53.40	-15.62
2 626	43.73	28.00	2.18	37.52	36.39	53.40	-17.01
2 750	38.46	28.80	2.26	37.59	31.93	53.40	-21.47
2 970	37.51	28.80	2.40	37.30	31.41	63.40	-31.99

EUT Position (angle °)			45	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	48.17	24.50	1.30	38.82	35.15	39.40	-4.25
1 106	45.59	24.60	1.42	38.83	32.78	39.40	-6.62
1 386	40.41	24.80	1.57	38.85	27.93	39.40	-11.47
1 494	39.25	25.50	1.64	38.85	27.54	39.40	-11.86
1 638	43.68	25.80	1.70	38.50	32.68	51.40	-18.72
1 990	43.60	26.40	1.85	37.47	34.38	51.40	-17.02
2 094	40.74	26.40	1.94	37.50	31.58	53.40	-21.82
2 370	45.83	27.50	2.08	37.50	37.91	53.40	-15.49
2 626	43.84	28.00	2.18	37.52	36.50	53.40	-16.90
2 750	36.89	28.80	2.26	37.59	30.36	53.40	-23.04
2 970	39.47	28.80	2.40	37.30	33.37	53.40	-20.03

EUT Position (angle °)			90	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	49.13	24.50	1.30	38.82	36.11	39.40	-3.29
1 106	45.95	24.60	1.42	38.83	33.14	39.40	-6.26
1 386	40.05	24.80	1.57	38.85	27.57	39.40	-11.83
1 494	42.53	25.50	1.64	38.85	30.82	39.40	-8.58
1 638	45.60	25.80	1.70	38.50	34.60	51.40	-16.80
1 990	41.99	26.40	1.85	37.47	32.77	51.40	-18.63
2 094	40.61	26.40	1.94	37.50	31.45	53.40	-21.95
2 370	46.85	27.50	2.08	37.50	38.93	53.40	-14.47
2 626	42.98	28.00	2.18	37.52	35.64	53.40	-17.76
2 750	42.05	28.80	2.26	37.59	35.52	53.40	-17.88
2 970	40.36	28.80	2.40	37.30	34.26	53.40	-19.14

EUT Position (angle °)			135	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	49.76	24.50	1.30	38.82	36.74	39.40	-2.66
1 106	46.69	24.60	1.42	38.83	33.88	39.40	-5.52
1 386	42.73	24.80	1.57	38.85	30.25	39.40	-9.15
1 494	43.63	25.50	1.64	38.85	31.92	39.40	-7.48
1 638	46.90	25.80	1.70	38.50	35.90	51.40	-15.50
1 990	45.34	26.40	1.85	37.47	36.12	51.40	-15.28
2 094	42.73	26.40	1.94	37.50	33.57	53.40	-19.83
2 370	46.11	27.50	2.08	37.50	38.19	53.40	-15.21
2 626	44.41	28.00	2.18	37.52	37.07	53.40	-16.33
2 750	38.27	28.80	2.26	37.59	31.74	53.40	-21.66
2 970	40.04	28.80	2.40	37.30	33.94	53.40	-19.46

EUT Position (angle °)			180	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	50.37	24.50	1.30	38.82	37.35	39.40	-2.05
1 106	45.82	24.60	1.42	38.83	33.01	39.40	-6.39
1 386	44.49	24.80	1.57	38.85	32.01	39.40	-7.39
1 494	43.35	25.50	1.64	38.85	31.64	39.40	-7.76
1 638	46.27	25.80	1.70	38.50	35.27	51.40	-16.13
1 990	44.28	26.40	1.85	37.47	35.06	51.40	-16.34
2 094	42.20	26.40	1.94	37.50	33.04	53.40	-20.36
2 370	46.93	27.50	2.08	37.50	39.01	53.40	-14.39
2 626	45.15	28.00	2.18	37.52	37.81	53.40	-15.59
2 750	37.92	28.80	2.26	37.59	31.39	53.40	-22.01
2 970	38.19	28.80	2.40	37.30	32.09	53.40	-21.31

EUT Position (angle °)			225	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	48.69	24.50	1.30	38.82	35.67	39.40	-3.73
1 106	45.58	24.60	1.42	38.83	32.77	39.40	-6.63
1 386	41.33	24.80	1.57	38.85	28.85	39.40	-10.55
1 494	39.19	25.50	1.64	38.85	27.48	39.40	-11.92
1 638	44.33	25.80	1.70	38.50	33.33	51.40	-18.07
1 990	43.60	26.40	1.85	37.47	34.38	51.40	-17.02
2 094	43.32	26.40	1.94	37.50	34.16	53.40	-19.24
2 370	46.94	27.50	2.08	37.50	39.02	53.40	-14.38
2 626	43.09	28.00	2.18	37.52	35.75	53.40	-17.65
2 750	37.13	28.80	2.26	37.59	30.60	53.40	-22.80
2 970	39.02	28.80	2.40	37.30	32.92	53.40	-20.48

EUT Position (angle °)			270	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	47.95	24.50	1.30	38.82	34.93	39.40	-4.47
1 106	45.41	24.60	1.42	38.83	32.60	39.40	-6.80
1 386	41.94	24.80	1.57	38.85	29.46	39.40	-9.94
1 494	41.47	25.50	1.64	38.85	29.76	39.40	-9.64
1 638	44.87	25.80	1.70	38.50	33.87	51.40	-17.53
1 990	43.95	26.40	1.85	37.47	34.73	51.40	-16.67
2 094	42.27	26.40	1.94	37.50	33.11	53.40	-20.29
2 370	44.89	27.50	2.08	37.50	36.97	53.40	-16.43
2 626	42.67	28.00	2.18	37.52	35.33	53.40	-18.07
2 750	38.61	28.80	2.26	37.59	32.08	53.40	-21.32
2 970	39.24	28.80	2.40	37.30	33.14	53.40	-20.26

EUT Position (angle °)			315	Antenna Polarization			H
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	47.69	24.50	1.30	38.82	34.67	39.40	-4.73
1 106	45.47	24.60	1.42	38.83	32.66	39.40	-6.74
1 386	40.81	24.80	1.57	38.85	28.33	39.40	-11.07
1 494	40.71	25.50	1.64	38.85	29.00	39.40	-10.40
1 638	44.71	25.80	1.70	38.50	33.71	51.40	-17.69
1 990	43.96	26.40	1.85	37.47	34.74	51.40	-16.66
2 094	41.44	26.40	1.94	37.50	32.28	53.40	-21.12
2 370	47.75	27.50	2.08	37.50	39.83	53.40	-13.57
2 626	43.98	28.00	2.18	37.52	36.64	53.40	-16.76
2 750	39.13	28.80	2.26	37.59	32.60	53.40	-20.80
2 970	40.64	28.80	2.40	37.30	34.54	53.40	-18.86

EUT Position (angle °)			0	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	48.85	24.50	1.30	38.82	35.83	39.40	-3.57
1 106	45.41	24.60	1.42	38.83	32.60	39.40	-6.80
1 386	46.19	24.80	1.57	38.85	33.71	39.40	-5.69
1 494	47.96	25.50	1.64	38.85	36.25	39.40	-3.15
1 638	47.54	25.80	1.70	38.50	36.54	51.40	-14.86
1 990	45.90	26.40	1.85	37.47	36.68	51.40	-14.72
2 094	44.57	26.40	1.94	37.50	35.41	53.40	-17.99
2 370	52.16	27.50	2.08	37.50	44.24	53.40	-9.16
2 626	42.59	28.00	2.18	37.52	35.25	53.40	-18.15
2 750	43.37	28.80	2.26	37.59	36.84	53.40	-16.56
2 970	42.46	28.80	2.40	37.30	36.36	53.40	-17.04

EUT Position (angle °)			45	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	46.85	24.50	1.30	38.82	33.83	39.40	-5.57
1 106	46.04	24.60	1.42	38.83	33.23	39.40	-6.17
1 386	48.94	24.80	1.57	38.85	36.46	39.40	-2.94
1 494	48.07	25.50	1.64	38.85	36.36	39.40	-3.04
1 638	46.52	25.80	1.70	38.50	35.52	51.40	-15.88
1 990	47.14	26.40	1.85	37.47	37.92	51.40	-13.48
2 094	45.54	26.40	1.94	37.50	36.38	53.40	-17.02
2 370	53.21	27.50	2.08	37.50	45.29	53.40	-8.11
2 626	44.25	28.00	2.18	37.52	36.91	53.40	-16.49
2 750	43.30	28.80	2.26	37.59	36.77	53.40	-16.63
2 970	42.38	28.80	2.40	37.30	36.28	53.40	-17.12

EUT Position (angle °)			90	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	47.68	24.50	1.30	38.82	34.66	39.40	-4.74
1 106	46.20	24.60	1.42	38.83	33.39	39.40	-6.01
1 386	47.06	24.80	1.57	38.85	34.58	39.40	-4.82
1 494	46.54	25.50	1.64	38.85	34.83	39.40	-4.57
1 638	47.35	25.80	1.70	38.50	36.35	51.40	-15.05
1 990	47.64	26.40	1.85	37.47	38.42	51.40	-12.98
2 094	46.48	26.40	1.94	37.50	37.32	53.40	-16.08
2 370	51.27	27.50	2.08	37.50	43.35	53.40	-10.05
2 626	43.28	28.00	2.18	37.52	35.94	53.40	-17.46
2 750	43.27	28.80	2.26	37.59	36.74	53.40	-16.66
2 970	41.72	28.80	2.40	37.30	35.62	63.40	-27.78

EUT Position (angle °)			135	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	49.14	24.50	1.30	38.82	36.12	39.40	-3.28
1 106	46.67	24.60	1.42	38.83	33.86	39.40	-5.54
1 386	46.20	24.80	1.57	38.85	33.72	39.40	-5.68
1 494	45.07	25.50	1.64	38.85	33.36	39.40	-6.04
1 638	45.26	25.80	1.70	38.50	34.26	51.40	-17.14
1 990	47.70	26.40	1.85	37.47	38.48	51.40	-12.92
2 094	46.07	26.40	1.94	37.50	36.91	53.40	-16.49
2 370	51.26	27.50	2.08	37.50	43.34	53.40	-10.06
2 626	43.09	28.00	2.18	37.52	35.75	53.40	-17.65
2 750	43.67	28.80	2.26	37.59	37.14	53.40	-16.26
2 970	42.26	28.80	2.40	37.30	36.16	63.40	-27.24

EUT Position (angle °)			180	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	48.23	24.50	1.30	38.82	35.21	39.40	-4.19
1 106	46.91	24.60	1.42	38.83	34.10	39.40	-5.30
1 386	44.91	24.80	1.57	38.85	32.43	39.40	-6.97
1 494	46.95	25.50	1.64	38.85	35.24	39.40	-4.16
1 638	48.16	25.80	1.70	38.50	37.16	51.40	-14.24
1 990	47.12	26.40	1.85	37.47	37.90	51.40	-13.50
2 094	44.06	26.40	1.94	37.50	34.90	53.40	-18.50
2 370	52.61	27.50	2.08	37.50	44.69	53.40	-8.71
2 626	43.48	28.00	2.18	37.52	36.14	53.40	-17.26
2 750	43.76	28.80	2.26	37.59	37.23	53.40	-16.17
2 970	43.07	28.80	2.40	37.30	36.97	63.40	-26.43

EUT Position (angle °)			225	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	49.53	24.50	1.30	38.82	36.51	39.40	-2.89
1 106	47.12	24.60	1.42	38.83	34.31	39.40	-5.09
1 386	46.39	24.80	1.57	38.85	33.91	39.40	-5.49
1 494	48.14	25.50	1.64	38.85	36.43	39.40	-2.97
1 638	48.52	25.80	1.70	38.50	37.52	51.40	-13.88
1 990	46.76	26.40	1.85	37.47	37.54	51.40	-13.86
2 094	46.18	26.40	1.94	37.50	37.02	53.40	-16.38
2 370	51.40	27.50	2.08	37.50	43.48	53.40	-9.92
2 626	42.74	28.00	2.18	37.52	35.40	53.40	-18.00
2 750	43.86	28.80	2.26	37.59	37.33	53.40	-16.07
2 970	43.19	28.80	2.40	37.30	37.09	63.40	-26.31

EUT Position (angle °)			270	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	48.95	24.50	1.30	38.82	35.93	39.40	-3.47
1 106	46.65	24.60	1.42	38.83	33.84	39.40	-5.56
1 386	49.28	24.80	1.57	38.85	36.80	39.40	-2.60
1 494	48.60	25.50	1.64	38.85	36.89	39.40	-2.51
1 638	46.09	25.80	1.70	38.50	35.09	51.40	-16.31
1 990	46.54	26.40	1.85	37.47	37.32	51.40	-14.08
2 094	45.94	26.40	1.94	37.50	36.78	53.40	-16.62
2 370	52.40	27.50	2.08	37.50	44.48	53.40	-8.92
2 626	43.25	28.00	2.18	37.52	35.91	53.40	-17.49
2 750	43.89	28.80	2.26	37.59	37.36	53.40	-16.04
2 970	42.31	28.80	2.40	37.30	36.21	63.40	-27.19

EUT Position (angle °)			315	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1 051	49.10	24.50	1.30	38.82	36.08	39.40	-3.32
1 106	47.53	24.60	1.42	38.83	34.72	39.40	-4.68
1 386	49.66	24.80	1.57	38.85	37.18	39.40	-2.22
1 494	48.18	25.50	1.64	38.85	36.47	39.40	-2.93
1 638	46.06	25.80	1.70	38.50	35.06	51.40	-16.34
1 990	46.74	26.40	1.85	37.47	37.52	51.40	-13.88
2 094	45.91	26.40	1.94	37.50	36.75	53.40	-16.65
2 370	53.43	27.50	2.08	37.50	45.51	53.40	-7.89
2 626	42.51	28.00	2.18	37.52	35.17	53.40	-18.23
2 750	43.00	28.80	2.26	37.59	36.47	53.40	-16.93
2 970	42.29	28.80	2.40	37.30	36.19	63.40	-27.21

7.7 RADIATED EMISSION IN GPS BANDS

TEST REQUIREMENT	
Test definition	In addition to the radiated emission limits specified for frequency above 960 MHz, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz in the GPS frequency bands.
Test setup	ANSI C63.4
Test facility	Open Area Test Site (OATS)
Test distance	1 meter
RBW bandwidth	1 kHz
VBW bandwidth	3 MHz
Detector	RMS
EUT operating condition	#1
Remark	None

LIMITS

Frequency (MHz)	EIRP @ 3 meters (1 MHz BW) (dBm)	Field strength @ 3 meters (1 MHz BW) (dBµV/m)	Field strength @ 1 meters (1 MHz BW) (dBµV/m)
1164-1240	-75.3	19.9	29.4
1559-1610	-75.3	19.9	29.4

Note: The limits were converted from EIRP to field strength at 3 and 1 meter according to FCC 15.503(k).

TEST PROCEDURE

1) The EUT was placed on sandpit area filled with dry sand initially placed in front of the ground plane (0° degree position)
2) The receiving antenna is placed at 1 meter away from the EUT and it is pointed in the direction of the radiating head with an inclination of -10°to find the highest emission.
3) The receiving antenna was positioned in horizontal polarization.
4) The measurements were made with the detector set to RMS with a bandwidth of 1 kHz during monitoring the GPS frequency ranges.
5) Upon detection of a suspect emission signal, its amplitude and frequency were noted.
6) It is recommended to demodulate the received signals for suitable discrimination of the ambient emission from the EUT emission.
7) At the worst case combination of the EUT operating mode and antenna height , the field strength measure was recorded.
8) The receiving antenna was positioned in vertical polarization and the steps 2 to 6 was repeated.
9) The EUT was rotating from 0° to 360° degrees with 45° step increment and the st eps 4 to 7 was repeated.
10) All the worst case combination field strength emissions founded of each EUT position and antenna polarization was recorded in the following table and compared with the applicable limits.

SUMMURY OF TEST RESULT DATA

All maximum Field strength emission are found at the following test set-up conditions

EUT Position (angle °)			315	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1176.31	19.64	24.70	1.92	38.79	7.47	29.40	-21.93
1194.40	20.05	24.70	1.93	38.79	7.89	29.40	-21.51
1210.36	18.93	24.70	1.93	38.79	6.77	29.40	-22.63
1227.68	18.89	24.75	1.94	38.80	6.82	29.40	-22.58

EUT Position (angle °)			270	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1561.14	15.58	25.30	2.16	37.96	5.08	29.40	-24.32
1576.74	17.27	25.30	2.16	37.96	6.77	29.40	-22.63
1588.78	17.46	25.30	2.18	37.94	7.00	29.40	-22.40
1593.99	17.27	25.30	2.18	37.94	7.00	29.40	-22.40

TEST RESULT

The EUT meets the requirements of sections 15.509(d)

7.8 HIGHEST RADIATED EMISSION AT f_M

TEST REQUIREMENT	
Test definition	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.
Test setup	ANSI C63.4
Test facility	Open Area Test Site (OATS)
Test distance	3 meters
RBW bandwidth	1 MHz
VBW bandwidth	3 MHz
Detector	Peak
EUT operating condition	#1
Remark	None

LIMITS

The peak emission level contained within a 50 MHz bandwidth cantered on f_M mast be limited to a maximum of 0 dBm EIRP.

EIRP limit (dBm)	Field strength limit @ 3 meters (dBµV/m)	Field strength limit @ 3 meters (measured with 1 MHz RBW) (dBµV/m)
0	95.2	61.2

Note: The limits were converted from EIRP to field strength at 3 meter according to FCC 15.503(k). As the measurement was employed with a 1 MHz resolution bandwidth the applicable limit is adjusted with a 20log(1/50) dB factor.

TEST PROCEDURE

1) The EUT was placed on sandpit area filled with dry sand initially placed in front of the ground plane (0° degree position)
2) The receiving antenna which varied from 1 to 4 m to find the highest emission is positioned 3 m away from the EUT.
3) The receiving antenna was positioned in horizontal polarization.
4) The measurements were made with the detector set to peak with a bandwidth of 1 MHz during monitoring the frequency range inside the UWB of the EUT..
5) At the worst case combination of the EUT operating mode and antenna height , the field strength measure was recorded.
6) The receiving antenna was positioned in vertical polarization and the steps 4 to 6 was repeated.
7) The EUT was rotating from 0° to 360° degrees with 45° step increment and the st eps 4 to 7 was repeated.
8) Record the peak emission from the EUT.

SUMMURY OF TEST RESULT DATA

Maximum Peak emission contained within 50 MHz is found at the following test set-up conditions

EUT Position (angle °)			315	Antenna Polarization			V
Frequency	Reading value	Antenna Factor	Cable Loss	Pre-Amp. Gain	Correcting reading	Limit	Margin
(MHz)	(dBµV)	(dB1/m)	(dB)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
1345.60	59.63	25.00	1.89	38.00	48.52	61.2	-12.68

TEST RESULT

The EUT meets the requirements of sections 15.509(f)

7.9 TECHNICAL REQUIREMENTS APPLICABLE TO ALL UWB DEVICES

REQUIREMENT	DESCRIPTION
§ 15.521(a)	The EUT is not employed for the operation of toys, operation onboard an aircraft, ship and satellite.
§ 15.521(b)	Permanent attached antenna, no External radio frequency power amplifiers and antenna modifications are permitted.
§ 15.521(c)	The Digital circuitry portion of the EUT has been tested and verified to comply with 47 CFR Part 15, subpart B.
§ 15.521(d)	Considered
§ 15.521(e)	The fM, frequency at which the highest radiated emission occurs is contained within the measured UWB bandwidth.
§ 15.521(f)	The EUT is not intended to detection of tags or the transfer or data or voice information.
§ 15.521(g)	Considered
§ 15.521(h)	Considered
§ 15.521(i)	Prohibition in Sections 2.201(f) and 15.5(d) of this chapter against Class B (damped wave) emissions is not applied.
§ 15.521(j)	Battery operating device not connected to AC power lines.

TEST RESULT
The EUT meets the requirements of sections 15.521.

7.10 COORDINATION REQUIREMENT

TEST REQUIREMENT
(a) UWB imaging systems require coordination through the FCC before the equipment may be used. The operator shall comply with any constraints on equipment usage resulting from this coordination. (b) The users of UWB imaging devices shall supply operational areas to the FCC Office of Engineering and Technology, which shall coordinate this information with the Federal Government through the National Telecommunications and Information Administration. (c) The manufacturers, or their authorized sales agents, must inform purchasers and users of their systems of the requirement to undertake detailed coordination of operational areas with the FCC prior to the equipment being operated. (d) Users of authorized, coordinated UWB systems may transfer them to other qualified users. and to different locations upon coordination of change of ownership or location to the FCC and coordination with existing authorized operations. (e) The FCC/NTIA coordination report shall identify those geographical areas within which the operation of an imaging system requires additional coordination or within which the operation of an imaging system is prohibited. (f) The coordination of routine UWB operations shall not take longer than 15 business days from the receipt of the coordination request by NTIA.

REQUIREMENT	DESCRIPTION
§ 15.525 § 15.509(b)	The responsible party is properly informed about the required coordination requirement and provide correct information to the customers and users about their specific care and legislative obligations. (See Important note for the US customers of the “TRHFNA - User manual”)

TEST RESULT
The EUT meets the requirements of sections 15.525 and 15.509(b).

8. MEASUREMENTS AND TESTS UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the IMQ procedure No. IO-DT-U01 and requirement of NIST Technical Note 1297 and NIS 81: 1994 "The Treatment of Uncertainty in EMC Measurements"

Methods	Expanded Uncertainty	Unit	confidence level	Coverage factor	Degree of freedom
Radiated emission (30 ÷ 1000 MHz)	4.77	dB	95 %	2	9
Radiated emission (above 1000 MHz)	3.53	dB	95 %	2	9

9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

IMQ Serial Number	Instrument	Manufacturer	Type	Last Cal.	Cal. Period.	Calibration Company
S03463	Horn Antenna	Schwarzbeck	BBHA 9120D	09-11	36	NPL
S03511	Log-Per. Antenna	Ara	LPB-2520/1	06-09	36	NPL
S05562	EMI Receiver	Rohde & Schwarz	ESU 8	06-11	12	I.N.RI.M.
S03629	Spectrum Analyzer	Rohde & Schwarz	FSP40	09-11	12	I.N.RI.M.
S03542	Preamplifier	Hewlett Packard	HP 8449B	02-11	24	IMQ
S04193	Preamplifier	Bonn Elektronik	BLNA 0110-15C35	02-11	12	IMQ
S04322	RF Coax Cable	Rosenberger micro-coax	N 50 Ohm	/	/	/
S03745	Oscilloscope	Yokogawa	DL 7200	06-11	12	AVIATRONIK
S04159	Multimenter	Fluke	45	01-11	12	IMQ
S00735	Meter-graph	Salmoiraghi	1656/2B	01-11	12	IMQ
P01723	Antenna Mast	Sunol Sciences	TWR 93-4	/	/	/

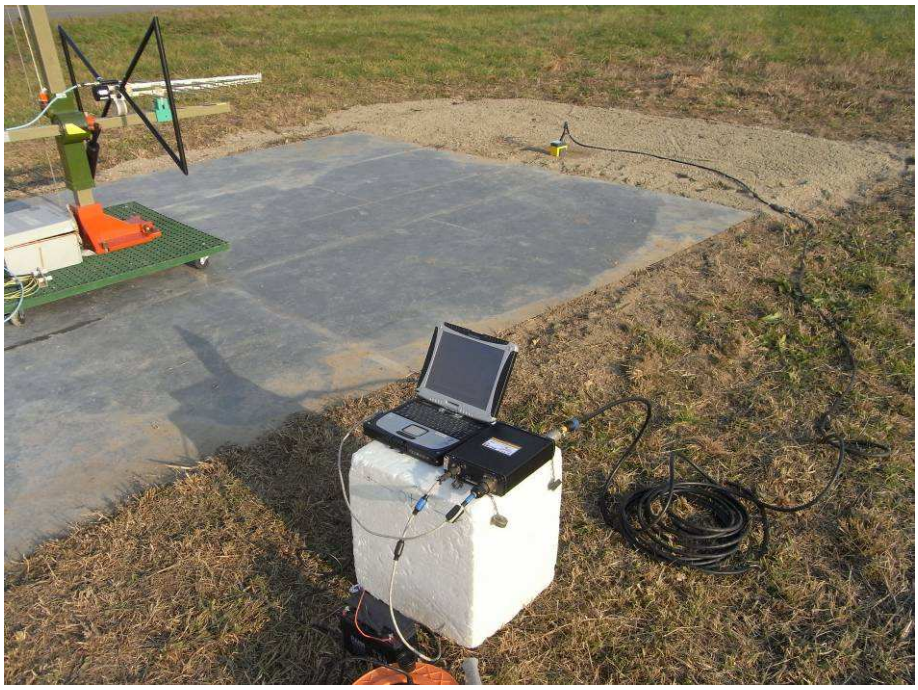
Note: The IMQ instruments are tested and calibrated according to UNI EN 45001, the IMQ procedure IP-037 "Calibration test equipment and measurement" and according to plans set on IMQ operating instruction IO-FT-034 “Criteria for the calibration of test equipment and measurement” which are an integral part of the Quality Manual of IMQ

10. PHOTOGRAPHIC DOCUMENTATION

EUT IDENTIFICATION

SET-UP

Test set-up below 960 MHz



Test set-up above 960 MHz

END OF REPORT