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Test report

361381-1TRFWL

Date of issue: 2018-10-15

Applicant:

Mares Spa

Salita Bonsen, 4 – 16035 Rapallo (GE) – Italy

Product:

Dive computer

Model:

GENIUS

FCC ID: 2AIKSGENIUS

IC Registration number: 21499-GENIUS

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.247

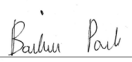
  Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz

- RSS-247, Issue 2, Feb 2017, Section 5

  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs)
  and Licence-Exempt Local Area Network (LE-LAN) Devices
  5) Standard specifications for frequency hopping systems and digital transmission systems operating in the bands 902–928 MHz, 2400–2483.5 MHz and 5725–5850 MHz

Test location

Company name	Nemko Spa
Address	Via del Carroccio, 4
City	Biassono
Province	MB
Postal code	20853
Country	Italy
Telephone	+39 039 220 12 01
Facsimile	+39 039 220 12 21
Website	www.nemko.com
Site number	FCC: 481407; IC: 9109A-1 (10 m semi anechoic chamber)

Tested by (name, function and signature)	P. Barbieri	(project handler)	
Reviewed by (name, function and signature)	D. Guarnone	(verifier)	
Review date	2018-10-15		

Limits of responsibility

Note that the results contained in this report relate only to the items tested and were obtained in the period between the date of initial receipt of samples and the date of issue of the report. This test report has been completed in accordance with the requirements of ISO/IEC 17025. All results contain in this report are within Nemko Spa's ISO/IEC 17025 accreditation.

Copyright notification

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Mares Spa
Address	Salita Bonsen 4
City	Rapallo
Province/State	GE
Postal/Zip code	16035
Country	Italy

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.247	Operation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–585 MHz
RSS-247, Issue 2, Feb 2017, Section 5	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

1.3 Test methods

558074 D01 DTS Meas Guidance v03r05 (April 8, 2016)	Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
662911 D01 Multiple Transmitter Output v02r01 (October 31, 2013)	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
DA 00-705, Released March 30, 2000	Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems
ANSI C63.10 v2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.4 Statement of compliance

In the configuration tested, the EUT was found compliant.

Testing was completed against all relevant requirements of the test standard. Results obtained indicate that the product under test complies in full with the requirements tested. The test results relate only to the items tested.

See “Summary of test results” for full details.

1.5 Exclusions

EUT tested partially. The EUT contains Bluetooth radio module FCC ID: 2AIKSBLNK IC:21499-BLNK
Refer to test data contained in the separate application FCC ID: 2AIKSBLNK IC:21499-BLNK.

1.6 Test report revision history

Revision #	Details of changes made to test report
TRF	Original report issued

Section 2. Summary of test results

2.1 FCC Part 15 Subpart C, general requirements test results

Part	Test description	Verdict
§15.207(a)	Conducted limits	Pass
§15.31(e)	Variation of power source	Pass[1]
§15.203	Antenna requirement	Pass[2]

Notes: [1] The EUT has been tested with the rechargeable battery pack full charged.

[2] The Antennas are located within the enclosure of EUT and not user accessible.

2.2 FCC Part 15 Subpart C, intentional radiators test results

Part	Test description	Verdict
§15.247(a)(1)(i)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(a)(1)(ii)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
§15.247(a)(1)(iii)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
§15.247(a)(2)	Minimum 6 dB bandwidth for systems using digital modulation techniques	Not tested
§15.247(b)(1)	Maximum peak output power of frequency hopping systems operating in the 2400–2483.5 MHz band and 5725–5850 MHz band	Not applicable
§15.247(b)(2)	Maximum peak output power of Frequency hopping systems operating in the 902–928 MHz band	Not applicable
§15.247(b)(3)	Maximum peak output power of systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands	Pass
§15.247(c)(1)	Fixed point-to-point operation with directional antenna gains greater than 6 dBi	Not applicable
§15.247(c)(2)	Transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams	Not applicable
§15.247(d)	Spurious emissions	Pass
§15.247(e)	Power spectral density for digitally modulated devices	Not tested
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Notes: EUT tested partially

2.3 ISED RSS-GEN, Issue 4, test results

Part	Test description	Verdict
7.1.2	Receiver radiated emission limits	Not applicable
7.1.3	Receiver conducted emission limits	Not applicable
8.8	Power Line Conducted Emissions Limits for Licence-Exempt Radio Apparatus	Pass

Notes: [1] According to sections 5.2 and 5.3 of RSS-Gen, Issue 4 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

2.4 ISED RSS-247, Issue 2, test results

Part	Test description	Verdict
5.1	Frequency Hopping Systems (FHSs)	
5.1 (a)	Bandwidth of a frequency hopping channel	Not applicable
5.1 (b)	Minimum channel spacing for frequency hopping systems	Not applicable
5.1 (c)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.1 (d)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Not applicable
5.1 (e)	Frequency hopping systems operating in the 5725–5850 MHz band	Not applicable
5.2	Digital Transmission Systems (DTSs)	
5.2 (a)	Minimum 6 dB bandwidth	Not tested
5.2 (b)	Maximum power spectral density	Not tested
5.3	Hybrid Systems	
5.3 (a)	Digital modulation turned off	Not applicable
5.3 (b)	Frequency hopping turned off	Not applicable
5.4	Transmitter output power and e.i.r.p. requirements	
5.4 (a)	Frequency hopping systems operating in the 902–928 MHz band	Not applicable
5.4 (b)	Frequency hopping systems operating in the 2400–2483.5 MHz band	Pass
5.4 (c)	Frequency hopping systems operating in the 5725–5850 MHz	Not applicable
5.4 (d)	Systems employing digital modulation techniques	Not tested
5.4 (e)	Point-to-point systems in 2400–2483.5 MHz and 5725–5850 MHz band	Not applicable
5.4 (f)	Transmitters which operate in the 2400–2483.5 MHz band with multiple directional beams	Not applicable
5.5	Unwanted emissions	Pass

Notes: EUT tested partially

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	2018-10-12
Nemko sample ID number	361381-1/1

3.2 EUT information

Product name	Dive computer
Model	GENIUS
Model variant	--
Serial number	361381-1/1 (Number assigned by Nemko Spa)

3.3 Technical information

Applicant IC company number	21499-
IC UPN number	GENIUS
All used IC test site(s) Reg. number	9109A-1
RSS number and Issue number	RSS-247 Issue 2, Feb 2017
Frequency band	2400–2483.5 MHz
Frequency Min (MHz)	2402 MHz
Frequency Max (MHz)	2480 MHz
RF power Min (W), EIRP	0.0006
RF power Max (W), EIRP	0.0010
Field strength, Units @ distance	N/A
Measured BW (kHz) (6 dB)	--
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	BLE
Emission classification (F1D, G1D, D1D)	G2D
Transmitter spurious, Units @ distance	47.3 dBµV/m @ 3 m
Power requirements	3.7 V DC from internal batteries
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

The EUT is a Dive computer with BLE radio module power by an internal battery pack. It's provided with a color LCD display and four buttons. The battery pack is recharge by a dedicated AC/DC adapter not usable in the normal working of the EUT (only in recharging mode).

3.5 EUT exercise details

The firmware has been modified to put the EUT in continues transmission mode a max power.

3.6 EUT setup diagram

The EUT is a stand-alone device power by internal batteries.

Figure 3.6-1: ***Setup diagram***

3.7 EUT sub assemblies

Table 3.7-1: ***EUT sub assemblies***

Description	Brand name	Model/Part number	Serial number
--	--	--	--

The EUT is composed by a single unit

Section 4. Engineering considerations

4.1 Modifications incorporated in the EUT

There were no modifications performed to the EUT during this assessment.

4.2 Technical judgment

None

4.3 Deviations from laboratory tests procedures

No deviations were made from laboratory procedures.

Section 5. Test conditions

5.1 Atmospheric conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Temperature	18–33 °C
Relative humidity	30–60 %
Air pressure	980–1060 mbar

Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
Thermohygrometer data loggers	Testo	175-H2	20012380/305	2016-12	2018-12
Thermohygrometer data loggers	Testo	175-H2	38203337/703	2016-12	2018-12
Barometer	MSR	MSR145B	330080	2018-04	2019-04

5.2 Power supply range

The EUT has been tested with the rechargeable battery pack full charged.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 3m, 10m Chamber	Antenna distance 1m, 3m, 10m (30÷200) MHz	5.0 dB	(1)
	Antenna distance 1m, 3m, 10m (0.2÷6) GHz	5.2 dB	(1)
	Antenna distance 1m, 3m (6÷18) GHz	5.8 dB	(1)
	Antenna distance 1m, 3m (18÷40) GHz	7.2 dB	(1)
Conducted Disturbance	9 kHz ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	9 kHz ÷ 30 MHz with current probe	2.9 dB	(1)

NOTES:

(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k = 2 which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;

Section 7. Test equipment

7.1 Test equipment list

Table 7.1-1: ***Equipment list***

Equipment	Manufacturer	Model no.	Asset no.	Cal cycle	Next cal.
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202	2018-01	2019-01
EMI receiver (2 Hz ÷ 44 GHz)	R&S	ESW44	101620	2018-05	2019-05
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Bilog antenna (1 ÷ 18 GHz)	Schwarzbeck	STLP 9148	9148-123	2018-07	2021-07
Broadband preamplifier	Schwarzbeck	BBV 9718	9718-137	2018-08	2019-08
Antenna mast	R&S	HCM	836 529/05	NCR	NCR
Controller	R&S	HCC	836 620/7	NCR	NCR
Hydraulic revolving platform	Nemko	RTPL 01	4.233	NCR	NCR
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530	2018-09	2021-09
Shielded room	Siemens	10m control room	1947	NCR	NCR

Note: NCR - no calibration required, VOU - verify on use

Section 8. Testing data

8.1 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits

8.1.1 Definitions and limits

FCC:
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 limits in the following table, as measured using a 50 µH/50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

IC:
A radio apparatus that is designed to be connected to the public utility (AC) power line shall ensure that the radio frequency voltage, which 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 limits in table below.

Unless the requirements applicable to a given device state otherwise, for any radio apparatus equipped to operate from the public utility AC power supply either directly or indirectly (such as with a battery charger), the radio frequency voltage of emissions conducted back onto the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in table below. The more stringent limit applies at the frequency range boundaries.

Table 8.1-1: ***Conducted emissions limit***

Frequency of emission, MHz	Conducted limit, dBµV	
	Quasi-peak	Average**
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

Note: * - The level decreases linearly with the logarithm of the frequency.
** - A linear average detector is required.

8.1.2 Test summary

Test date	2018-10-11	Temperature	24 °C
Test engineer	P. Barbieri	Air pressure	1020 mbar
Verdict	Pass	Relative humidity	50 %

8.1.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

A preview measurement was generated with the receiver in continuous scan mode. Emissions detected within 6 dB or above limit were re-measured with the appropriate detector against the correlating limit and recorded as the final measurement.

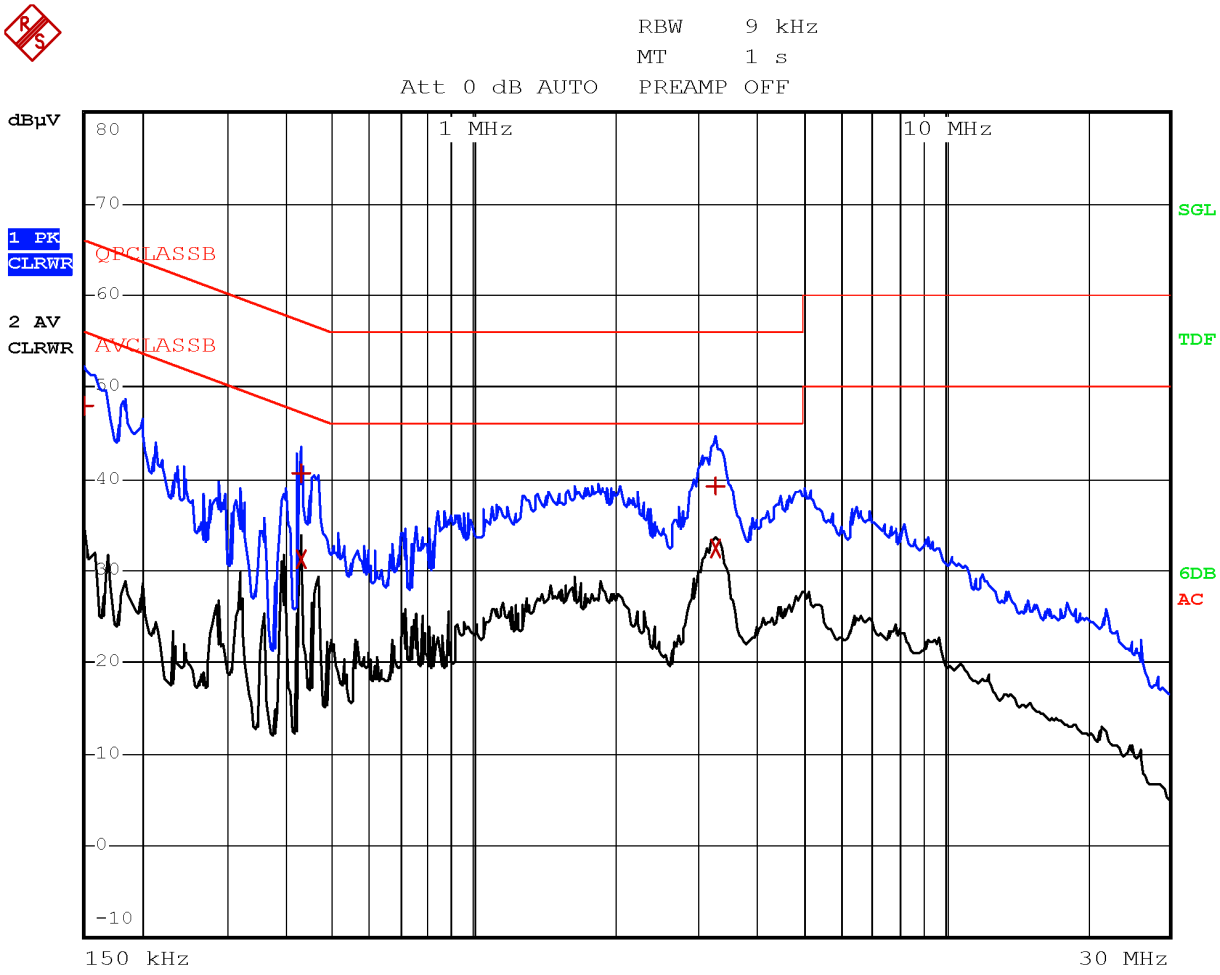
Receiver settings for preview measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Peak and Average
Trace mode	Max Hold
Measurement time	1000 ms

Receiver settings for final measurements:

Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Detector mode	Quasi-Peak and Average
Trace mode	Max Hold
Measurement time	1000 ms

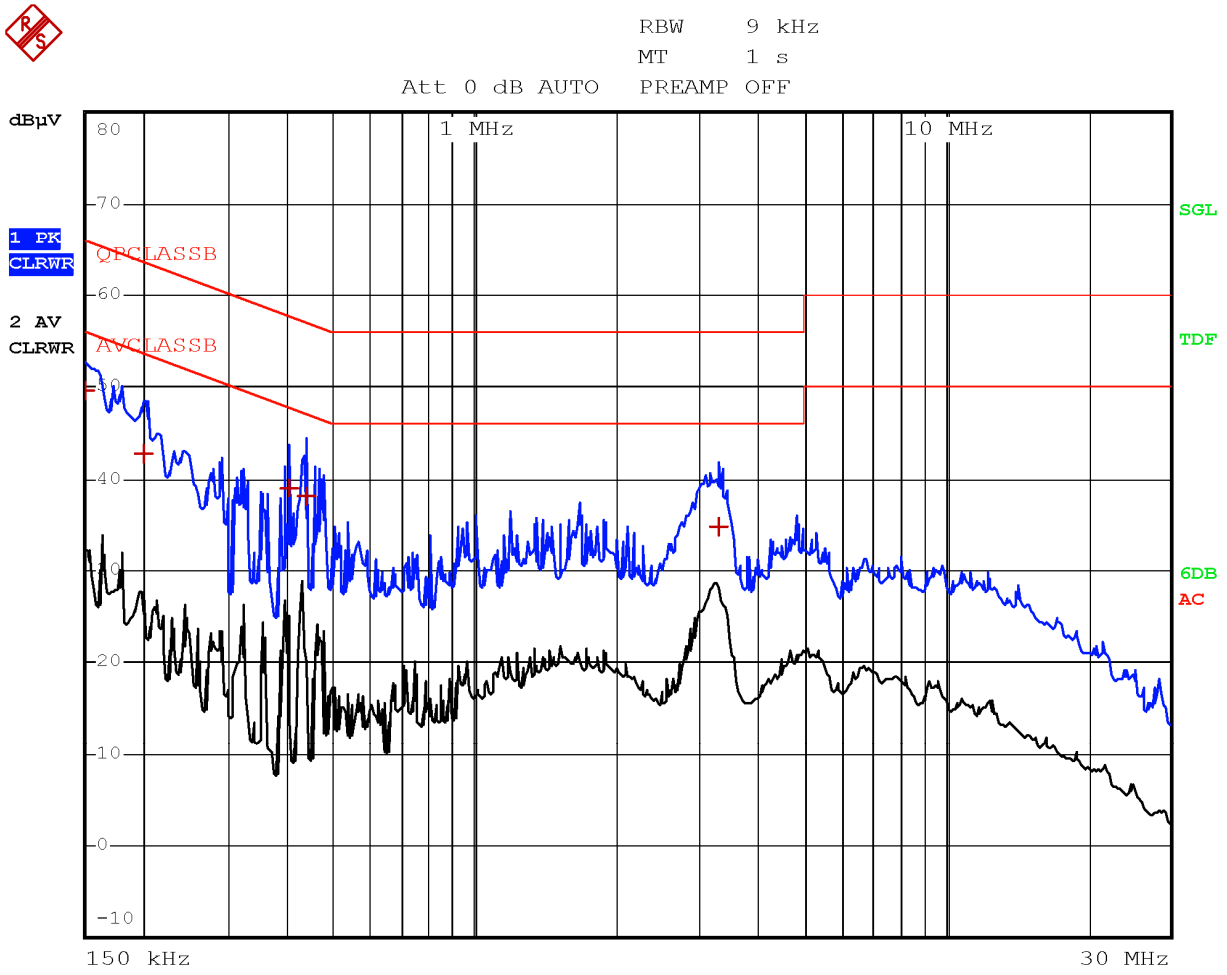
8.1.4 Test data



Plot 8.1-1: Conducted emissions on phase line (Recharging mode)

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1500	48.0	66.0	-18.0	QP
0.4300	40.6	57.3	-16.6	QP
0.4300	31.4	47.3	-15.9	Av
3.2740	32.4	46.0	-13.6	Av
3.2860	39.3	56.0	-16.7	QP

Table 8.1-2: Quasi-Peak and Average conducted emissions results on phase line



Plot 8.1-2: Conducted emissions on neutral line (Recharging mode)

Frequency (MHz)	Level (dBµV)	Limit (dBµV)	Margin (dB)	Detector
0.1500	49.8	66.0	-16.2	QP
0.2020	42.8	63.5	-20.7	QP
0.4020	39.1	57.8	-18.7	QP
0.4380	38.2	57.1	-18.9	QP
3.3020	34.8	56.0	-21.2	QP

Table 8.1-3: Quasi-Peak and Average conducted emissions results on neutral line

8.2 FCC 15.247(b) and RSS-247 5.4 (b) Transmitter output power and e.i.r.p. requirements

8.2.1 Definitions and limits

FCC:

(b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

(1) For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band: 1 watt (30 dBm). For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts (21 dBm).

(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

ISED:

For FHSs operating in the band 2400–2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W (30 dBm) if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W (21 dBm) if the hopset uses less than 75 hopping channels. The e.i.r.p. shall not exceed 4 W (36 dBm), except as provided in section 5.4(e).

Section 5.4(e)

Fixed point-to-point systems in the bands 2400–2483.5 MHz and 5725–5850 MHz are permitted to have an e.i.r.p. higher than 4 W provided that the higher e.i.r.p. is achieved by employing higher gain directional antennas and not higher transmitter output powers. Point-to-multipoint systems, omnidirectional applications and multiple co-located transmitters transmitting the same information are prohibited from exceeding an e.i.r.p. of 4 W.

8.2.2 Test summary

Test date	2018-10-12	Temperature	24 °C
Test engineer	P. Barbieri	Air pressure	1020 mbar
Verdict	Pass	Relative humidity	50 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings for output power:

Resolution bandwidth	> the 20 dB bandwidth of the emission being measured
Video bandwidth	≥ RBW
Frequency span	approximately 5 times the 20 dB bandwidth, centered on a hopping channel
Detector mode	Peak
Trace mode	Max Hold

8.2.4 Test data

Table 8.2-1: ***Output power and EIRP results***

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
2402	-2.1	30.00	-32.1	-1.5	-3.6	36.00	-39.6
2440	0.2	30.00	-29.8	-1.5	-1.3	36.00	-37.3
2480	-2.0	30.00	-32.0	-1.5	-3.5	36.00	-39.5

Output power [dBm] = Field Strength [dBµV/m] − 95.23 [dB] − Antenna gain [dBi]

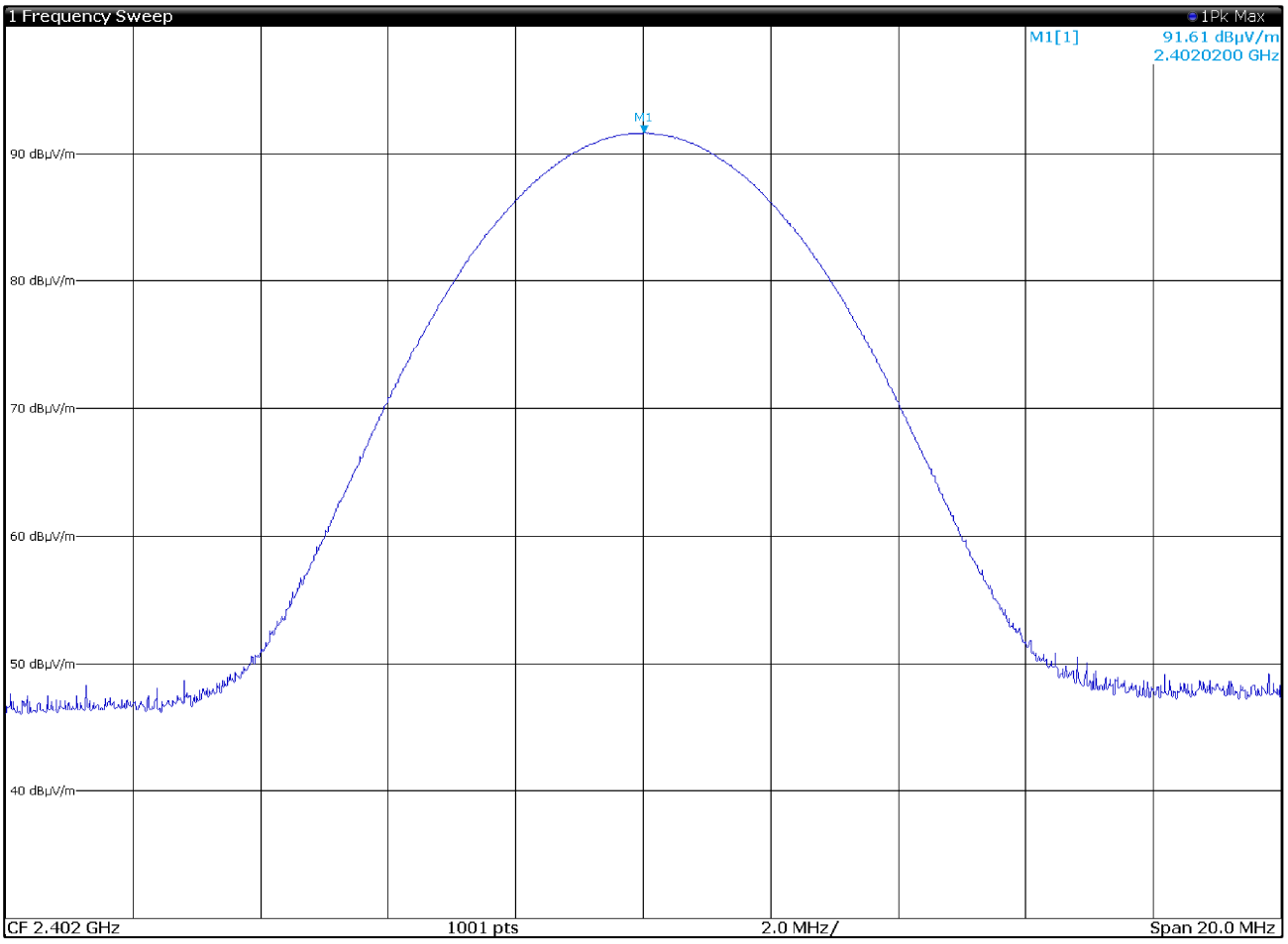


Figure 8.2-1: ***Output power on low channel***

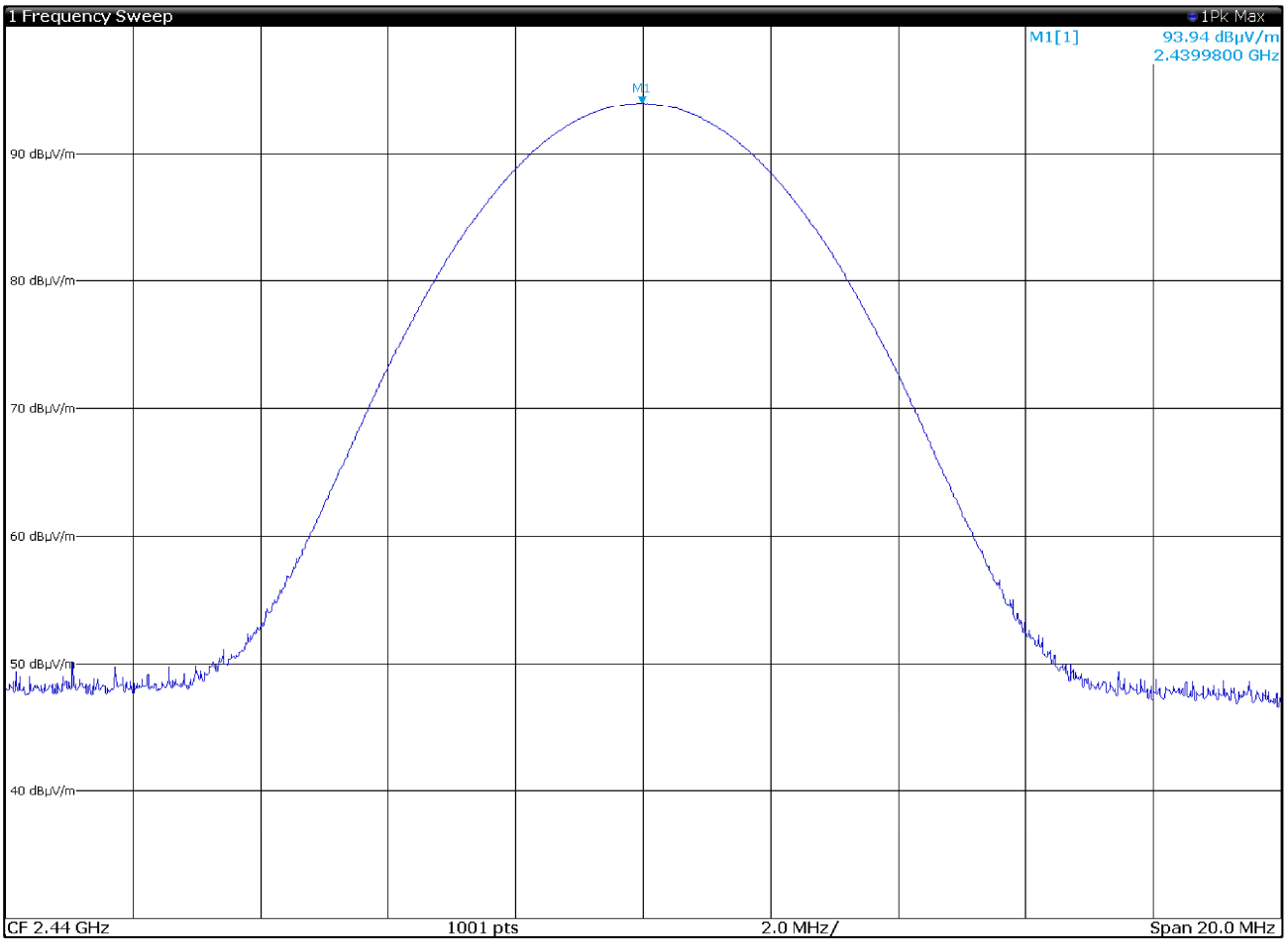


Figure 8.2-2: ***Output power on mid channel***

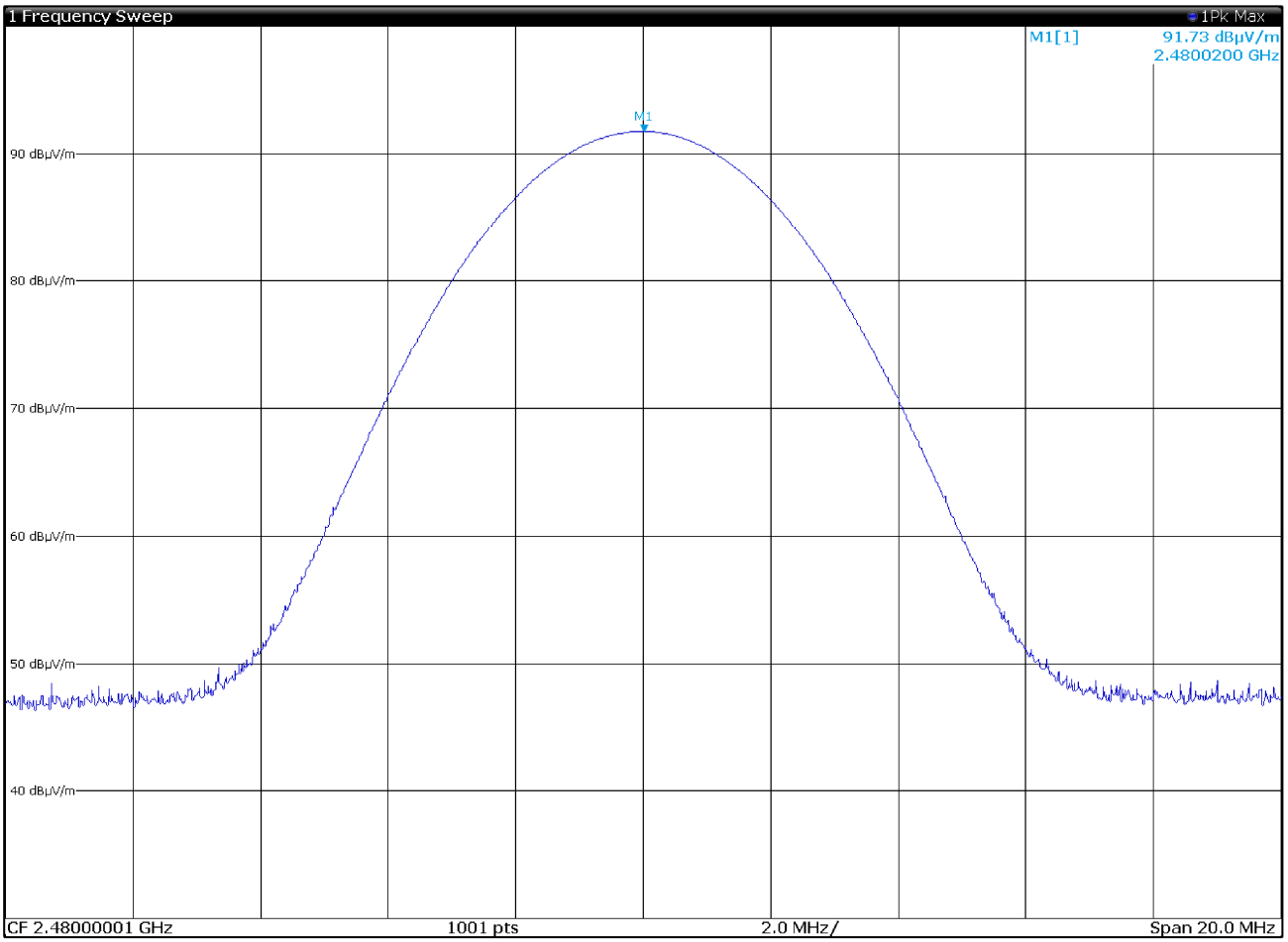


Figure 8.2-3: ***Output power on high channel***

8.3 FCC 15.247(d) and RSS-247 5.5 Spurious (out-of-band) unwanted emissions

8.3.1 Definitions and limits

FCC:
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

ISED:
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

Table 8.3-1: ***FCC §15.209 and RSS-Gen – Radiated emission limits***

Frequency, MHz	Field strength of emissions		Measurement distance, m
	µV/m	dBµV/m	
0.009–0.490	2400/F	$67.6 - 20 \times \log_{10}(F)$	300
0.490–1.705	24000/F	$87.6 - 20 \times \log_{10}(F)$	30
1.705–30.0	30	29.5	30
30–88	100	40.0	3
88–216	150	43.5	3
216–960	200	46.0	3
above 960	500	54.0	3

Notes: In the emission table above, the tighter limit applies at the band edges.
For frequencies above 1 GHz the limit on peak RF emissions is 20 dB above the maximum permitted average emission limit applicable to the equipment under test

Table 8.3-2: ***ISED restricted frequency bands***

MHz	MHz	MHz	GHz
0.090–0.110	12.51975–12.52025	399.9–410	5.35–5.46
2.1735–2.1905	12.57675–12.57725	608–614	7.25–7.75
3.020–3.026	13.36–13.41	960–1427	8.025–8.5
4.125–4.128	16.42–16.423	1435–1626.5	9.0–9.2
4.17725–4.17775	16.69475–16.69525	1645.5–1646.5	9.3–9.5
4.20725–4.20775	16.80425–16.80475	1660–1710	10.6–12.7
5.677-5.683	25.5–25.67	1718.8–1722.2	13.25–13.4
6.215–6.218	37.5–38.25	2200–2300	14.47–14.5
6.26775–6.26825	73–74.6	2310–2390	15.35–16.2
6.31175–6.31225	74.8–75.2	2655–2900	17.7–21.4
8.291–8.294	108–138	3260–3267	22.01–23.12
8.362–8.366	156.52475–156.52525	3332–3339	23.6–24.0
8.37625–8.38675	156.7–156.9	3345.8–3358	31.2–31.8
8.41425–8.41475	240–285	3500–4400	36.43–36.5
12.29–12.293	322–335.4	4500–5150	Above 38.6

Note: Certain frequency bands listed in Table 8.3-2 and above 38.6 GHz are designated for low-power licence-exempt applications. These frequency bands and the requirements that apply to the devices are set out in this Standard

Table 8.3-3: ***FCC restricted frequency bands***

MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	Above 38.6
13.36–13.41			

8.3.2 Test summary

Test date	2018-10-12	Temperature	24 °C
Test engineer	P. Barbieri	Air pressure	1020 mbar
Verdict	Pass	Relative humidity	50 %

8.3.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
EUT was set to transmit with 100 % duty cycle.
Radiated measurements were performed at a distance of 3 m.
Since fundamental power was tested using peak method, the spurious emissions limit is −20 dBc/100 kHz

Spectrum analyser settings for radiated measurements within restricted bands below 1 GHz:

Resolution bandwidth:	100 kHz
Video bandwidth:	300 kHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for peak radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	Peak
Trace mode:	Max Hold

Spectrum analyser settings for average radiated measurements within restricted bands above 1 GHz:

Resolution bandwidth:	1 MHz
Video bandwidth:	3 MHz
Detector mode:	RMS (power averaging)
Trace mode:	Average

8.3.4 Test data

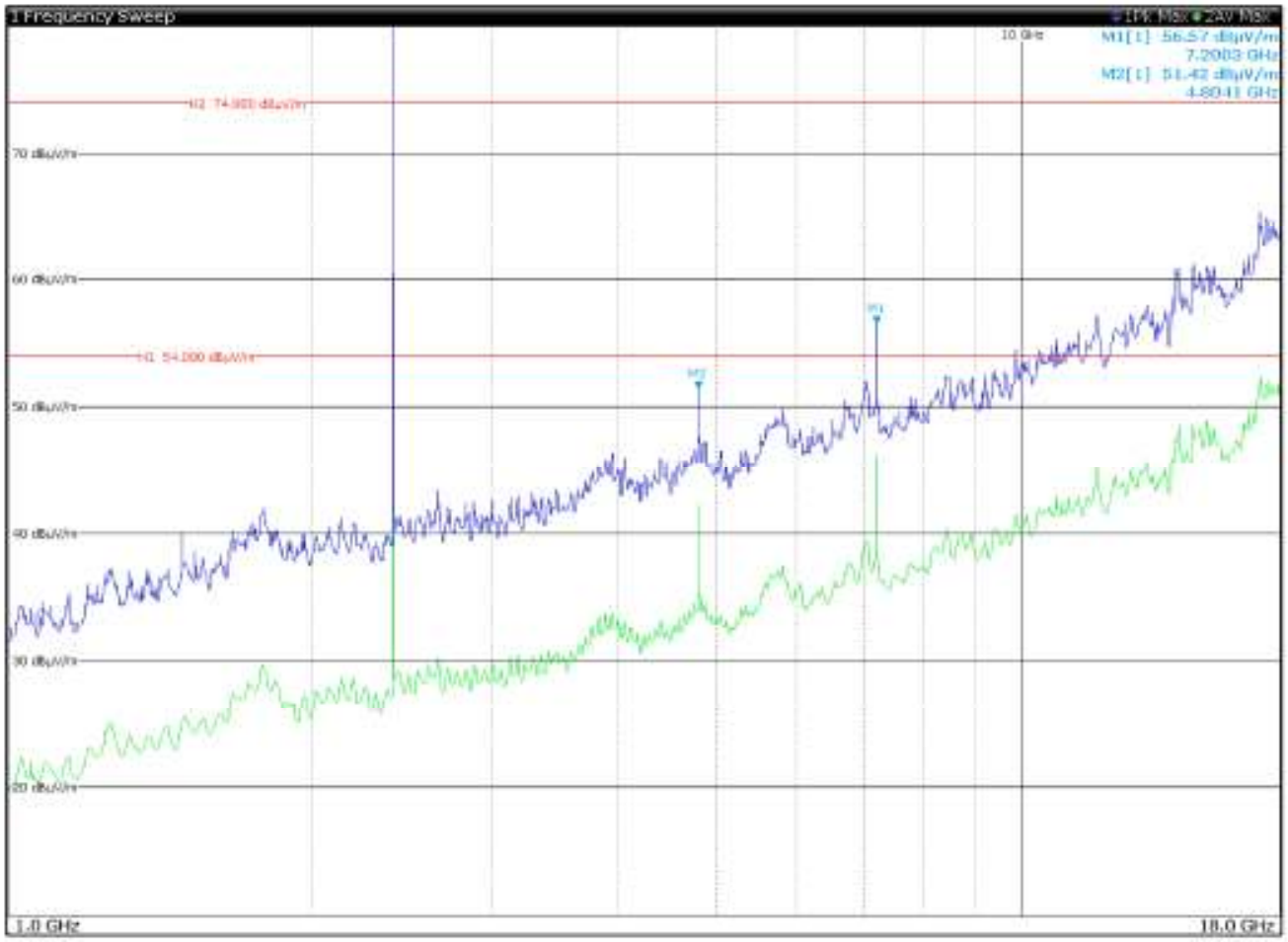


Figure 8.3-1: Radiated spurious emissions for antenna in horizontal polarization, low channel

Table 8.3-4: Radiated field strength measurement results for antenna in horizontal polarization

Channel	Frequency, MHz	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Measured	Limit	
Low	4804	51.5	74.00	-22.5	42.9	54.00	-11.1
Low	7200	56.6	74.00	-17.4	47.3	54.00	-6.7

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

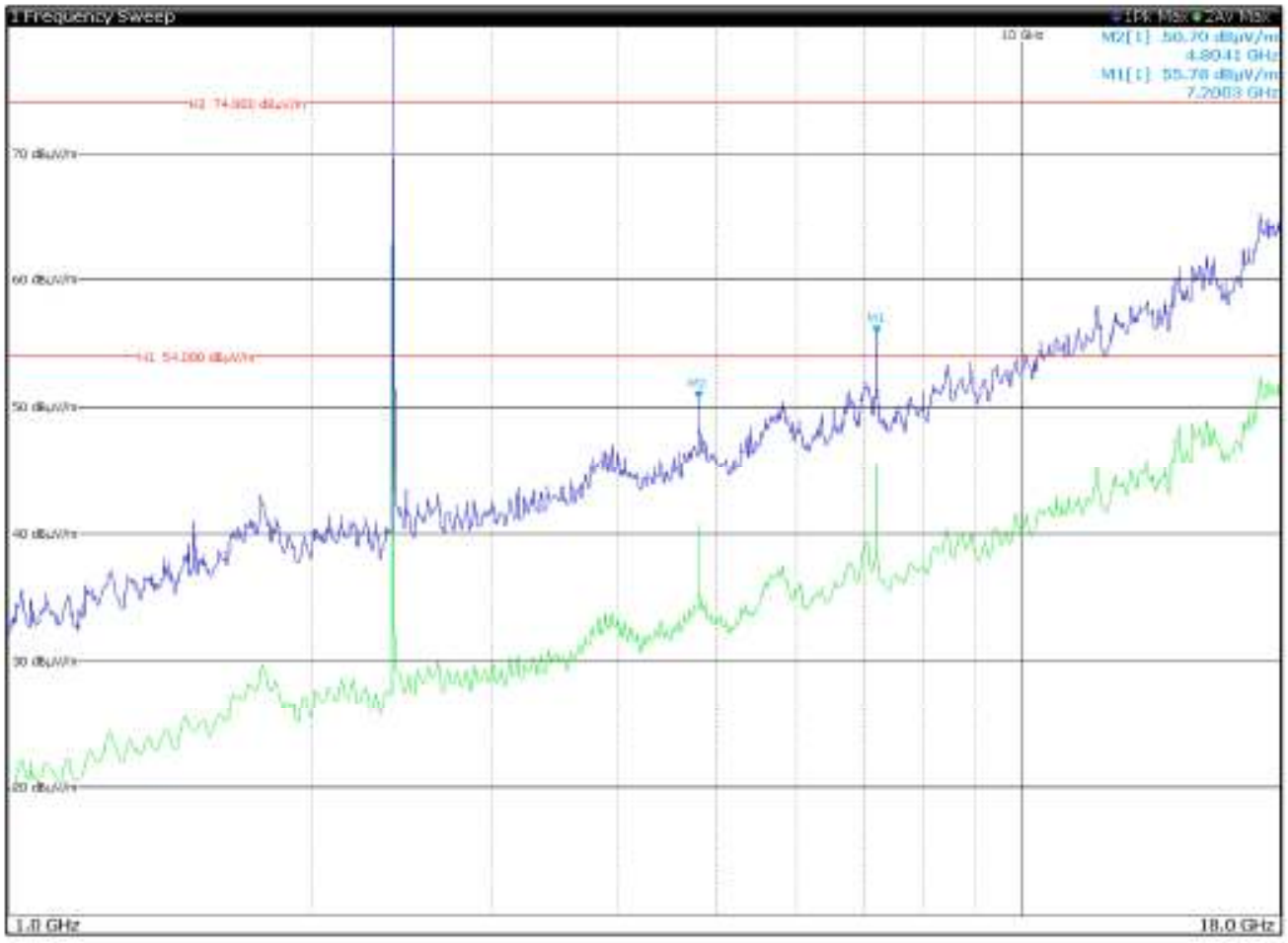


Figure 8.3-2: Radiated spurious emissions for antenna in vertical polarization, low channel

Table 8.3-5: Radiated field strength measurement results for antenna in vertical polarization

Channel	Frequency, MHz	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Measured	Limit	
Low	4804	50.8	74.00	-23.2	41.7	54.00	-12.3
Low	7200	55.8	74.00	-18.2	46.5	54.00	-7.5

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

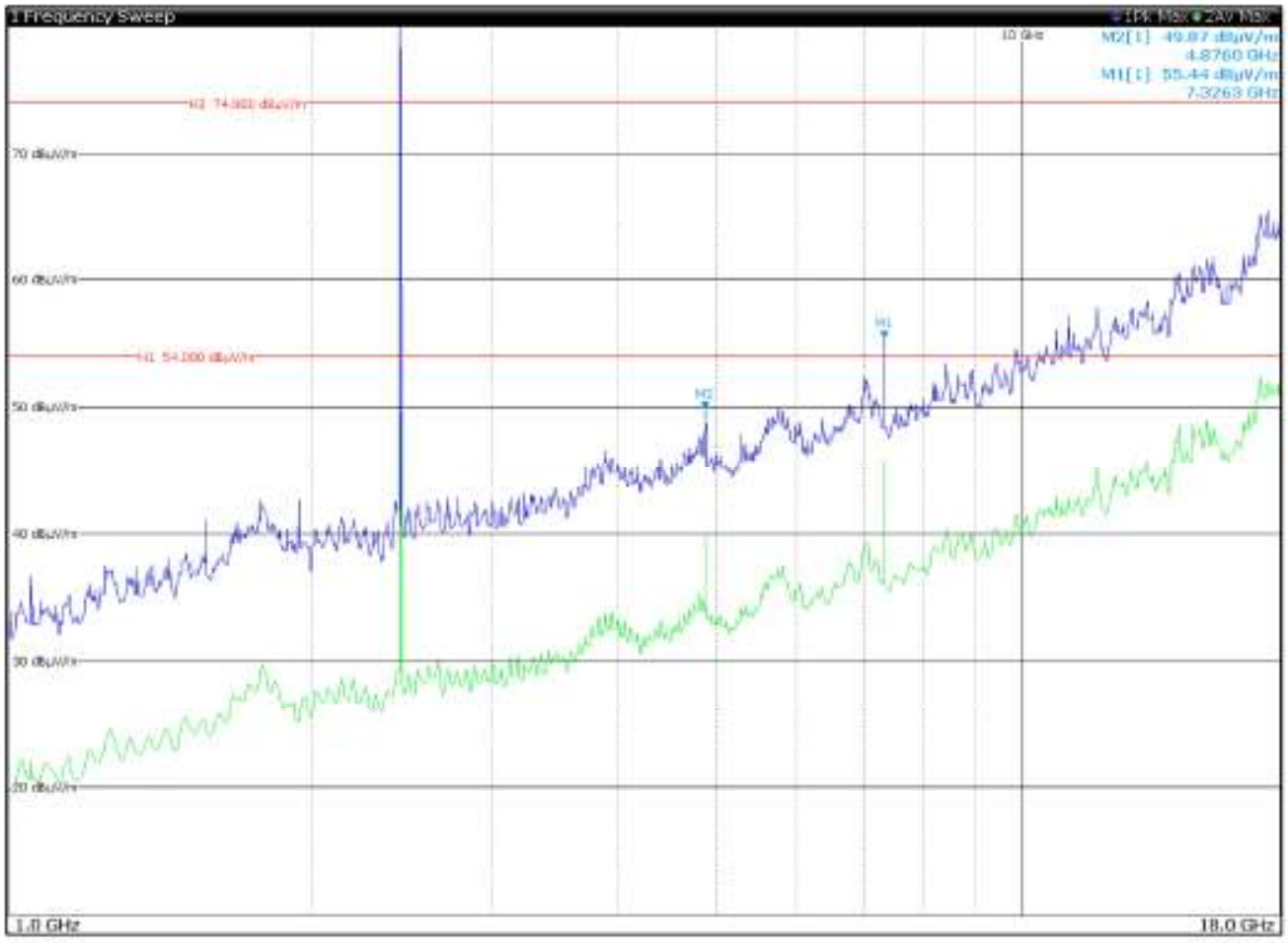


Figure 8.3-3: Radiated spurious emissions for antenna in horizontal polarization, mid channel

Table 8.3-6: Radiated field strength measurement results for antenna in horizontal polarization

Channel	Frequency, MHz	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Measured	Limit	
Mid	4876	49.9	74.00	-24.1	41.0	54.00	-13.0
Mid	7326	55.5	74.00	-18.5	46.7	54.00	-7.3

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

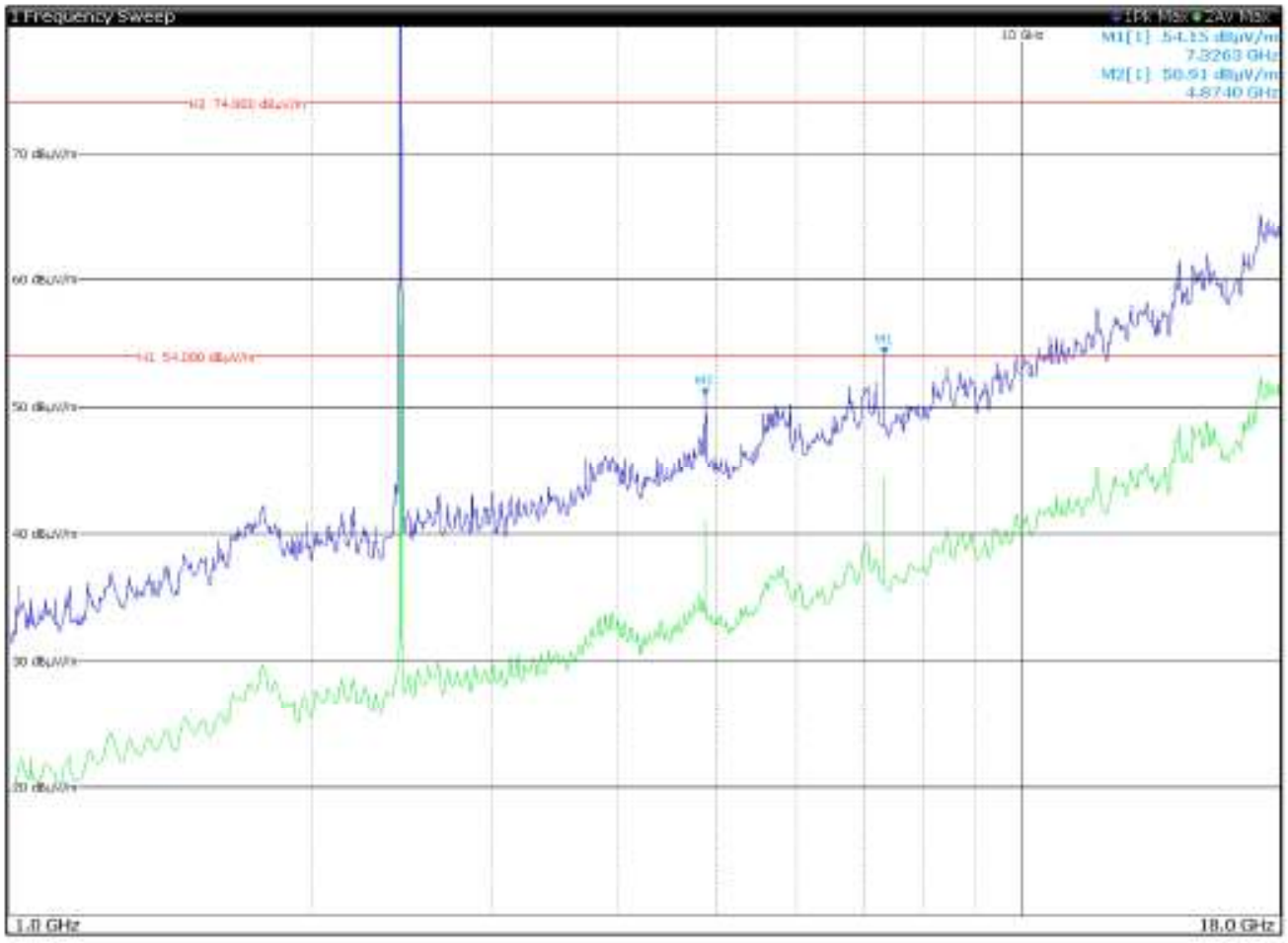


Figure 8.3-4: Radiated spurious emissions for antenna in vertical polarization, mid channel

Table 8.3-7: Radiated field strength measurement results for antenna in vertical polarization

Channel	Frequency, MHz	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Measured	Limit	
Mid	4874	50.9	74.00	-23.1	41.5	54.00	-12.5
Mid	7326	54.1	74.00	-19.9	45.3	54.00	-8.7

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

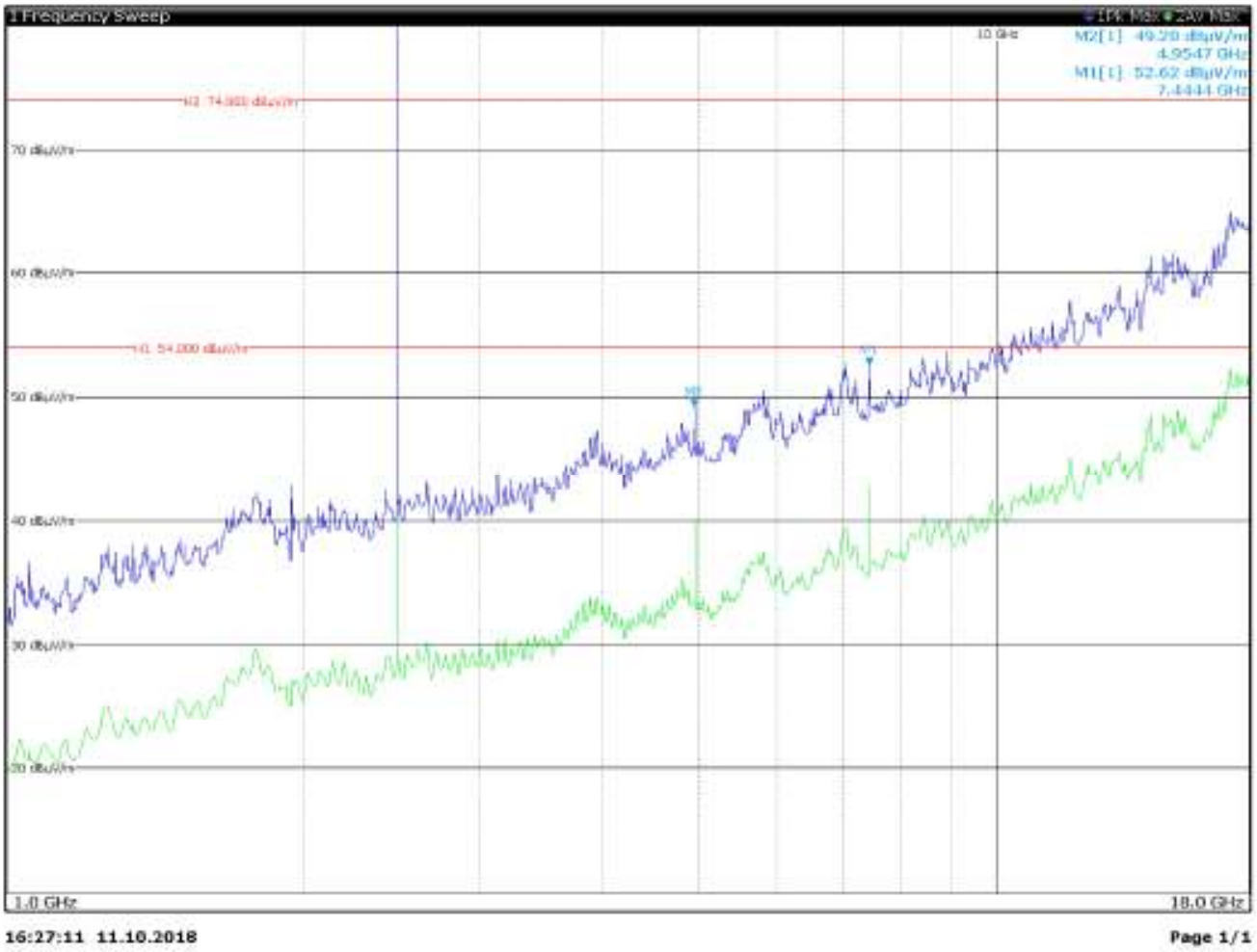


Figure 8.3-5: Radiated spurious emissions for antenna in horizontal polarization, high channel

Table 8.3-8: Radiated field strength measurement results for antenna in horizontal polarization

Channel	Frequency, MHz	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Measured	Limit	
High	4954	49.3	74.00	-24.7	40.3	54.00	-33.7
High	7444	52.6	74.00	-21.4	43.6	54.00	-10.4

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

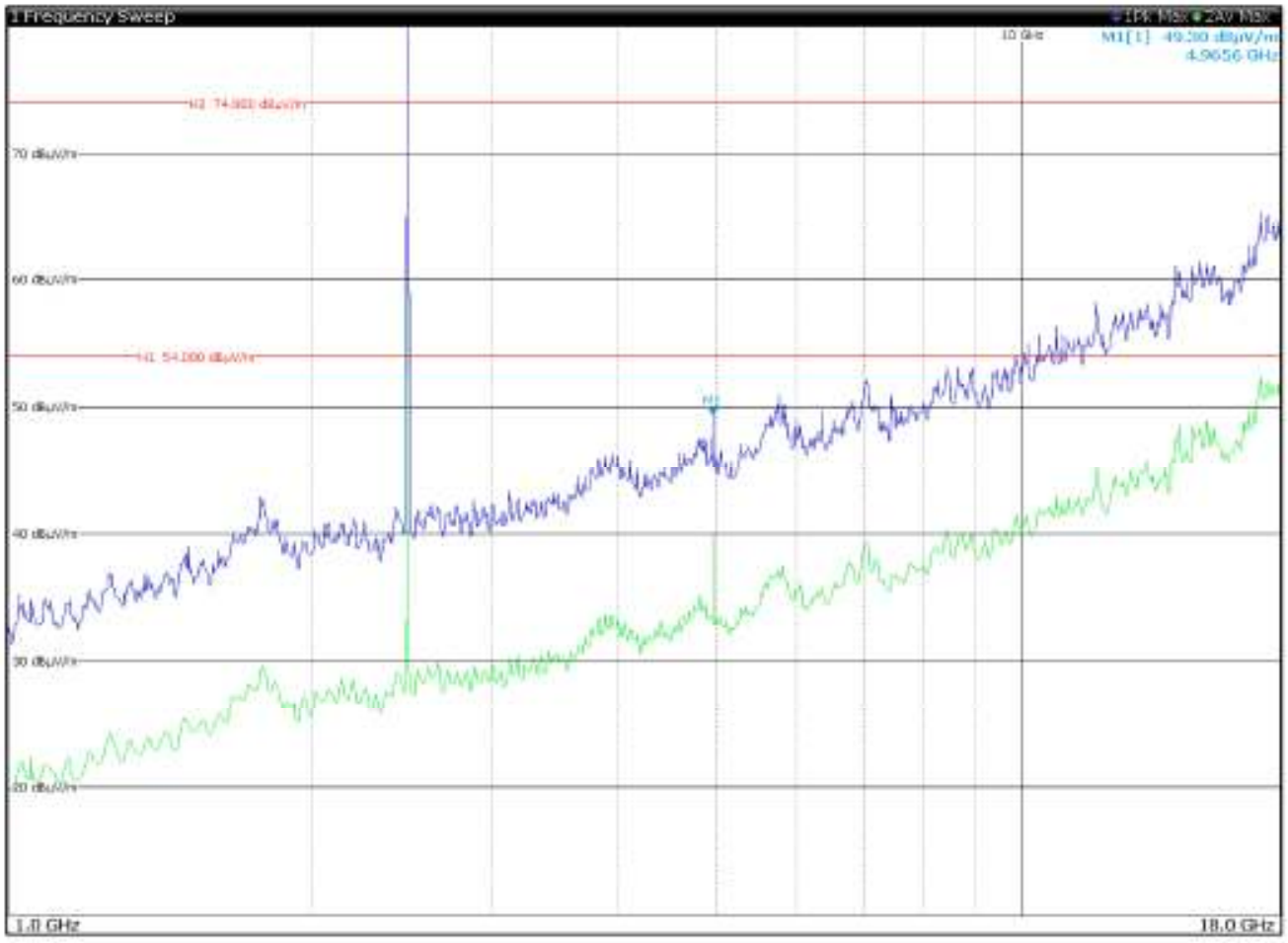


Figure 8.3-6: Radiated spurious emissions for antenna in vertical polarization, high channel

Table 8.3-9: Radiated field strength measurement results for antenna in vertical polarization

Channel	Frequency, MHz	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Measured	Limit	
High	4965	49.3	74.00	-24.7	40.5	54.00	-13.5

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

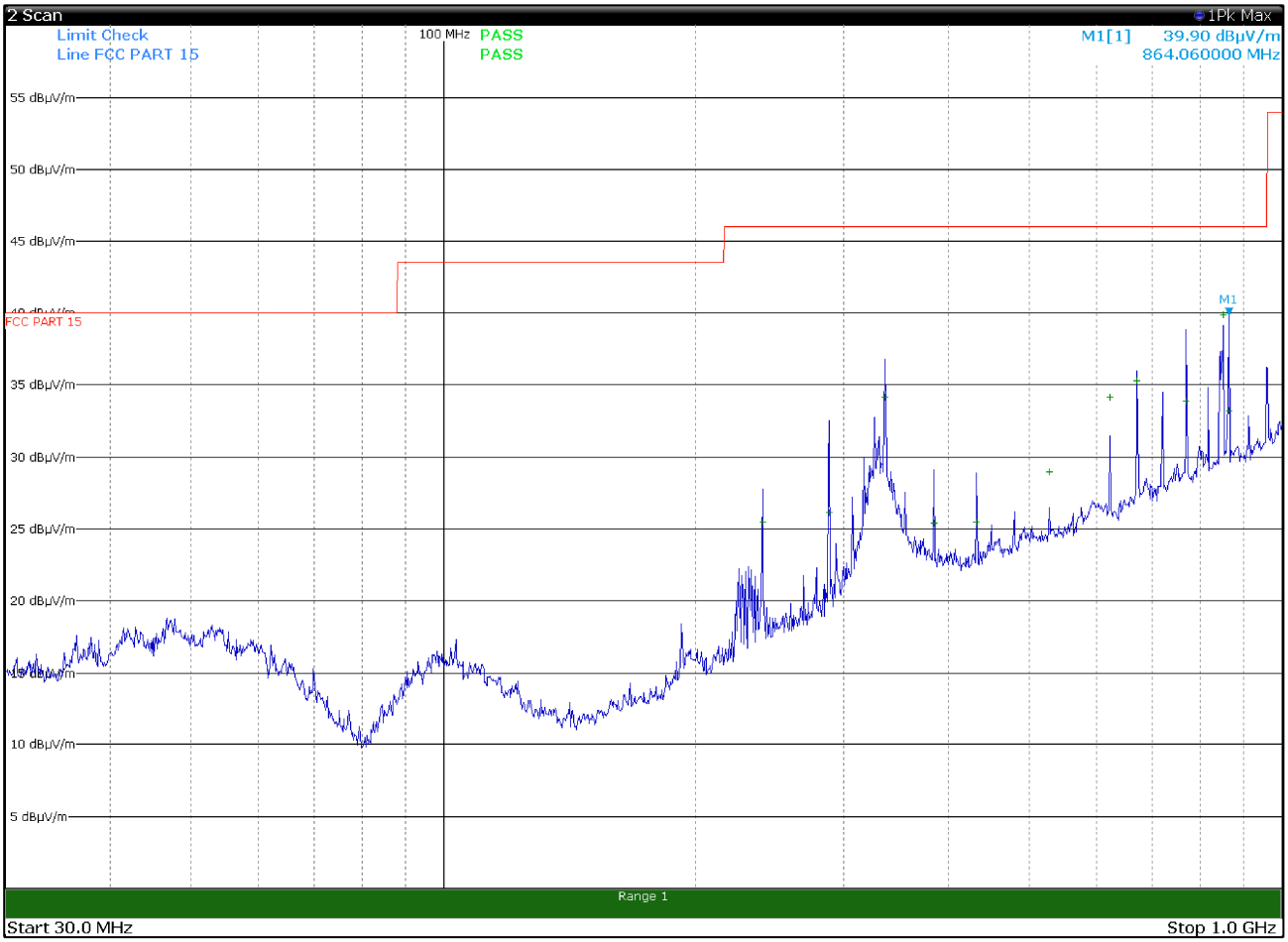


Figure 8.3-7: Radiated spurious emissions for antenna in horizontal polarization, mid channel

Table 8.3-10: Radiated field strength measurement results for antenna in horizontal polarization, mid channel

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
240.0000	25.5	46.0	-20.5	QP
288.0300	26.2	46.0	-19.8	QP
336.0000	34.2	46.0	-11.8	QP
384.0000	25.5	46.0	-20.5	QP
432.0000	25.5	46.0	-20.5	QP
528.0300	29.0	46.0	-17.0	QP
624.0000	34.2	46.0	-11.8	QP
672.0300	35.3	46.0	-10.7	QP
767.9100	33.9	46.0	-12.1	QP
851.3700	39.9	46.0	-6.1	QP
864.0600	33.2	46.0	-12.8	QP

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

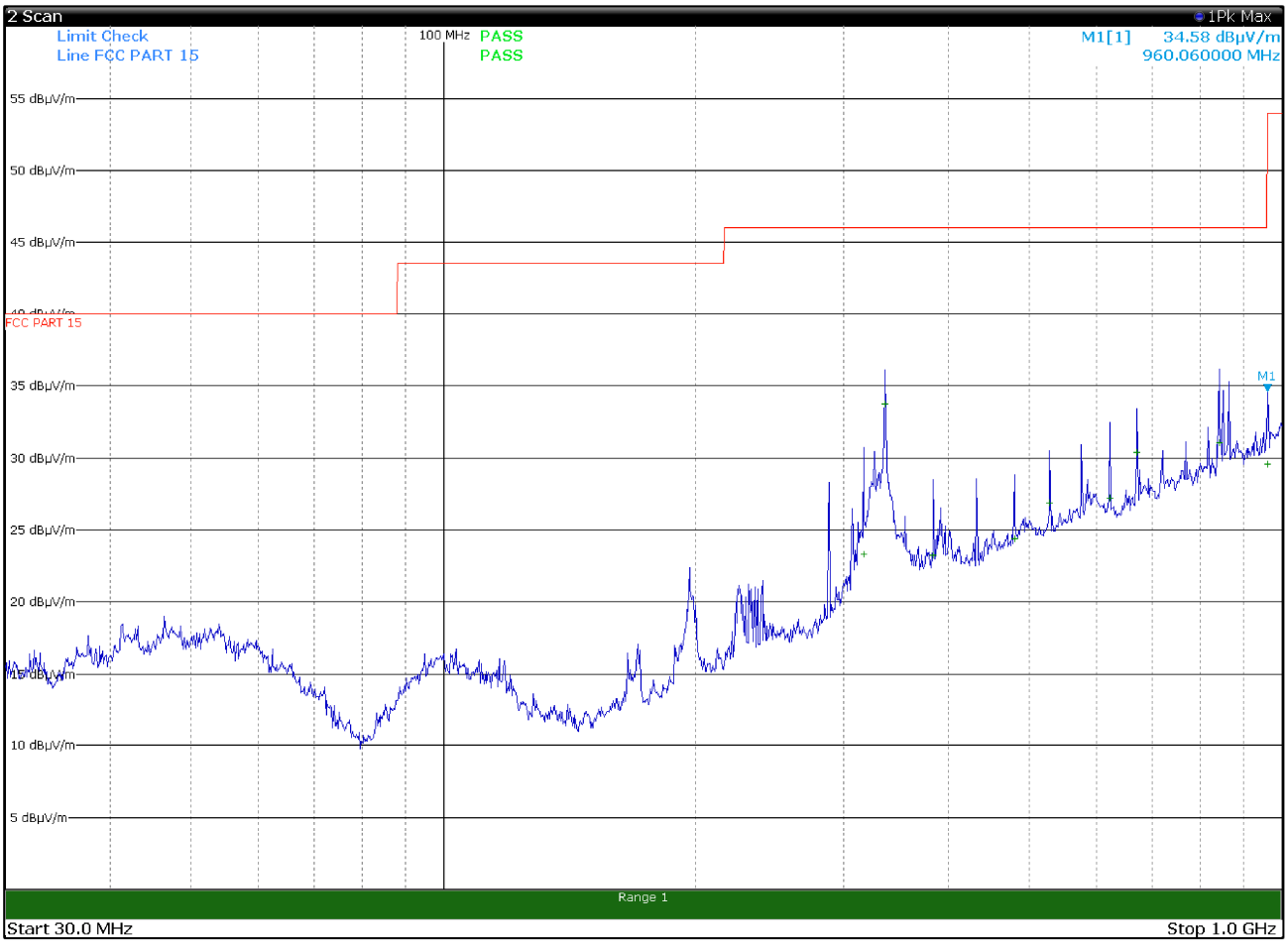


Figure 8.3-8: Radiated spurious emissions for antenna in vertical polarization, mid channel

Table 8.3-11: Radiated field strength measurement results for antenna in vertical polarization, mid channel

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector
316.8300	23.4	46.0	-22.6	QP
336.0300	33.8	46.0	-12.2	QP
383.9700	23.3	46.0	-22.7	QP
480.0300	24.4	46.0	-21.6	QP
528.0900	26.9	46.0	-19.1	QP
624.0300	27.2	46.0	-18.8	QP
672.0300	30.4	46.0	-15.6	QP
842.6400	31.1	46.0	-14.9	QP
960.0600	29.6	53.9	-24.3	QP

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.

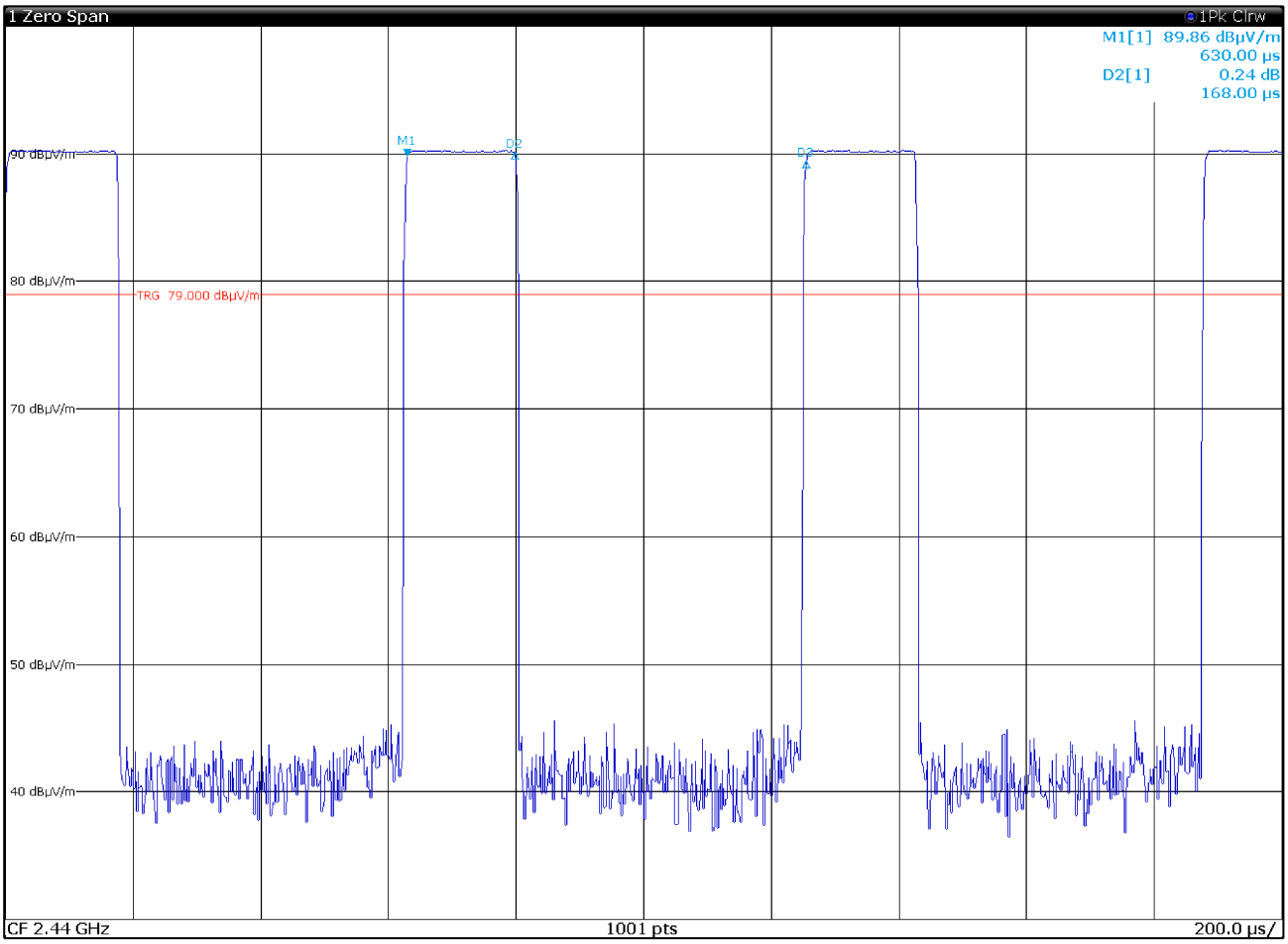


Figure 8.3-9: Duty cycle in normal working condition, mid channel

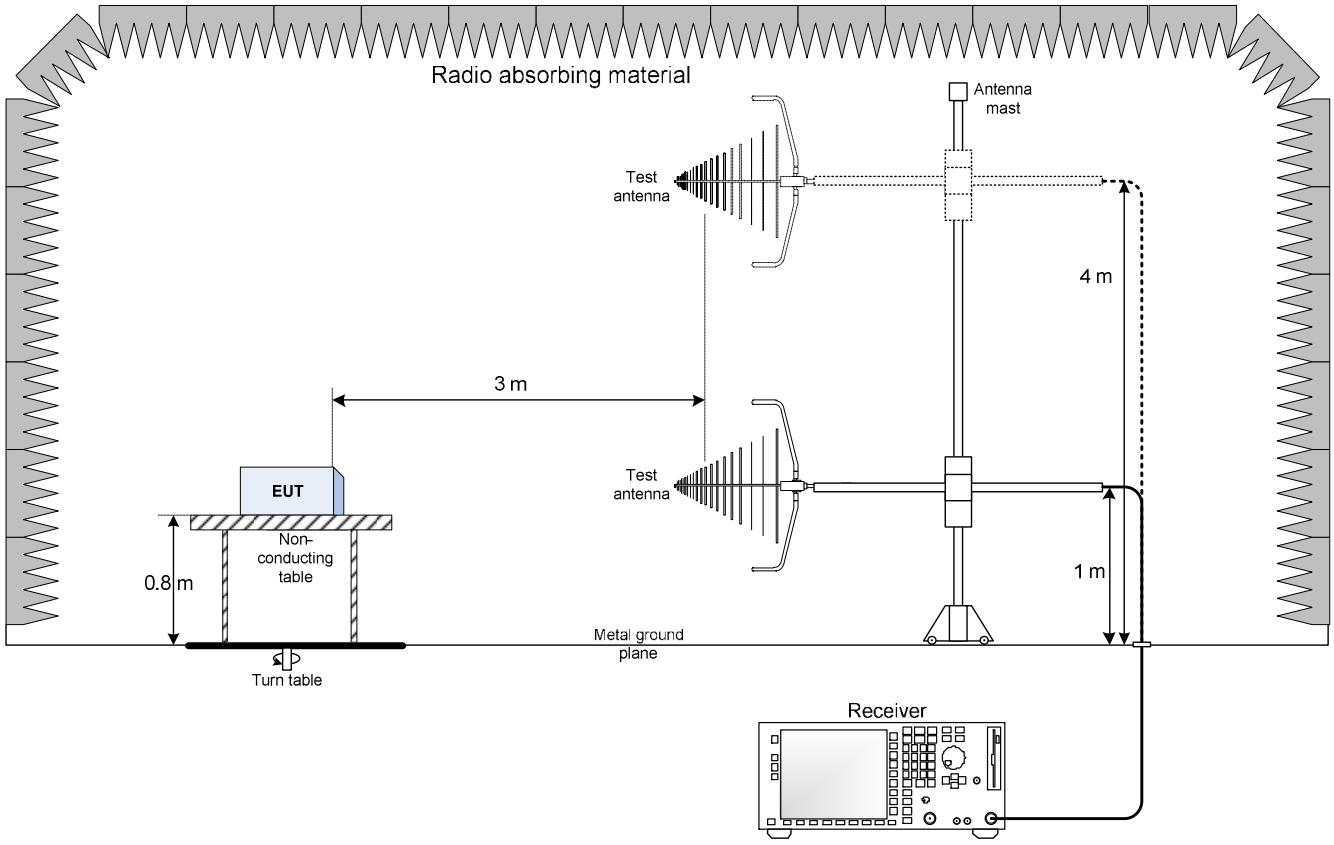
2 Marker Table

Type	Ref	Trc	X-Value	Y-Value	Function	Function Result
M1		1	630.0 µs	89.86 dBµV/m		
D2	M1	1	168.0 µs	0.24 dB		
D3	M1	1	624.0 µs	-0.39 dB		

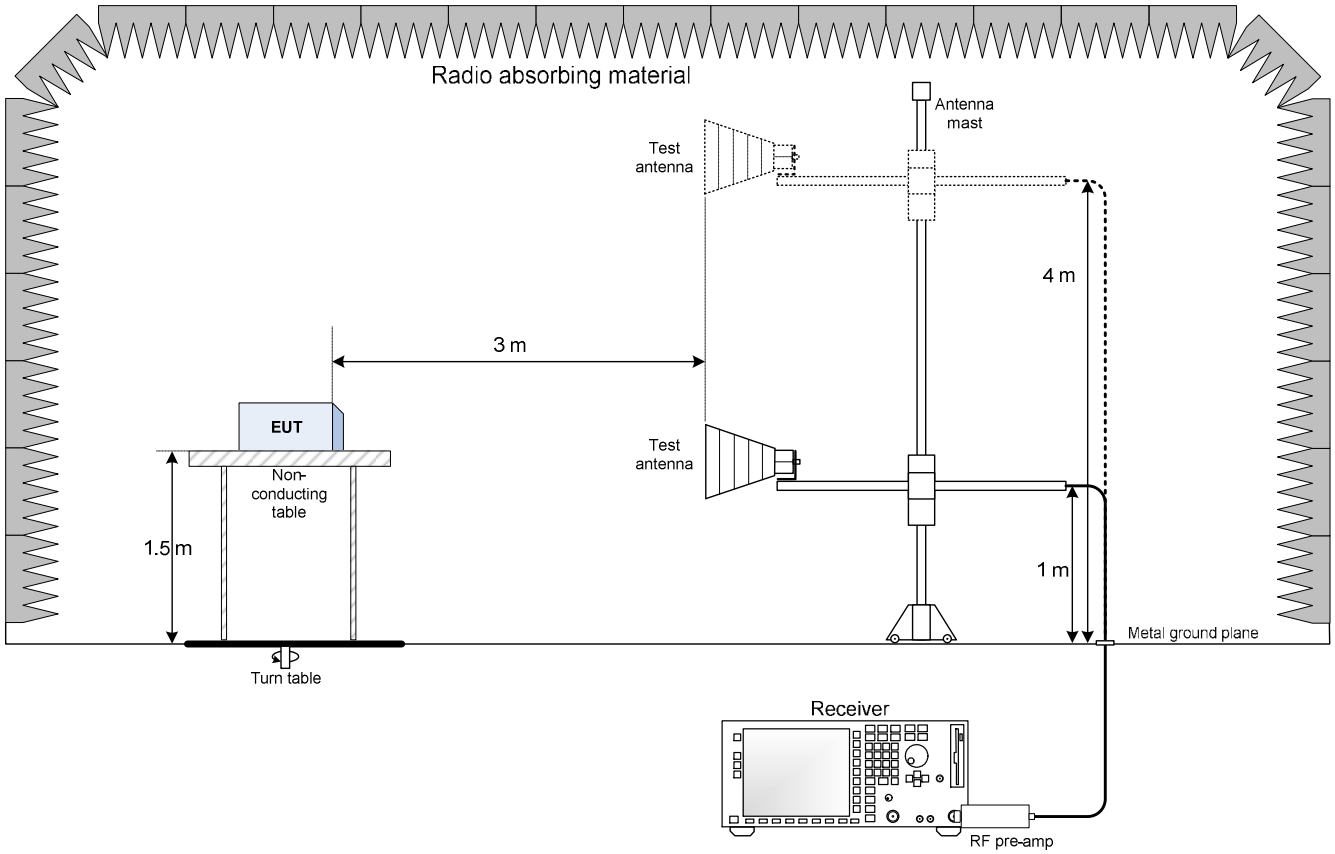
For the tests, EUT was set to transmit with 100 % duty cycle.

Section 9. Block diagrams of test set-ups

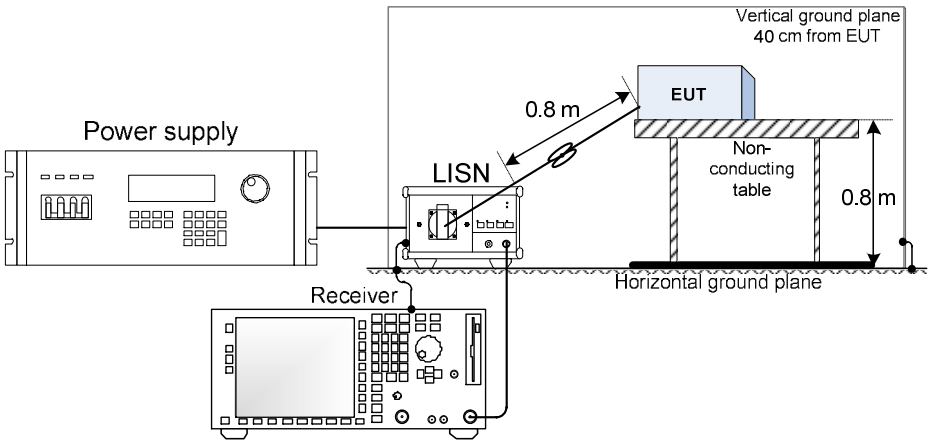
9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz



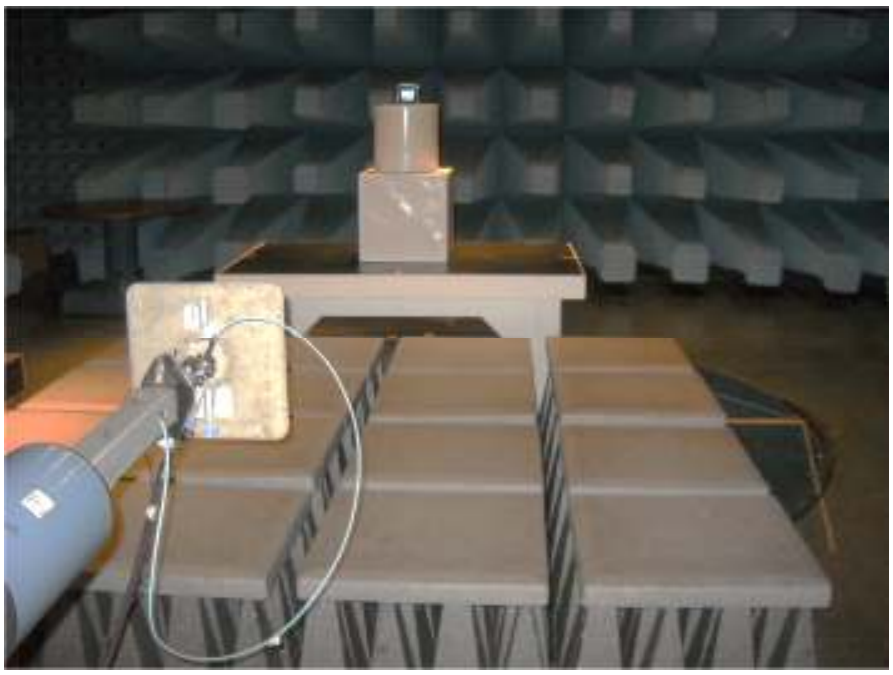
9.3 Conducted emissions set-up

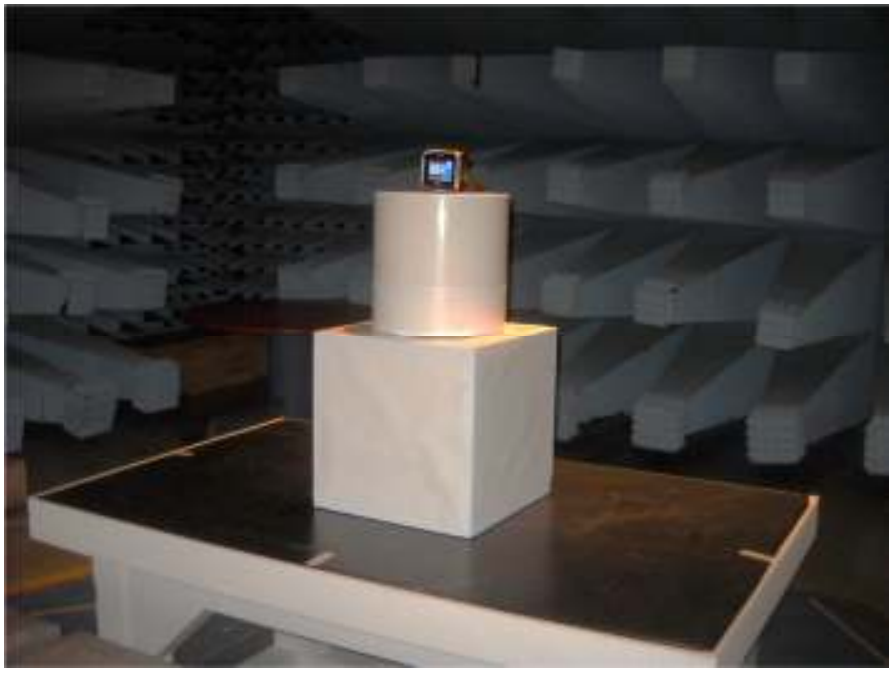


Section 10. Photos

10.1 Photos of the test set-up

Section 10: Photos





10.2 Photos of the EUT

End of report