

# Test report

**377878TRFWL**

Date of issue: 2019-07-17

Applicant:

**MATICA Technologies AG**

**Theresienhoehe 30 – 80339 Munich – Germany**

Product:

**Professional CARD printer**

Model:

**MC 660**

FCC ID:

**2AT78-MC660**

IC Registration number:

**25413-MC660**

Specifications:

**FCC 47 CFR Part 15.225**

Operation within the band 13.110–14.010 MHz

**RSS-210 Issue 9, August 2016, Annex B.6**

Devices operating in 13.110–14.010 MHz frequency band for any application


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*The phase of sampling / collection of equipment under test is carried out by the customer.*

#### 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 test site registration number: 682159, IC: 9109A (10 m semi anechoic chamber)

Tested by (name, function and signature)	P. Barbieri	(project handler)	
Reviewed by (name, function and signature)	D. Guarnone	(verifier)	
Date	2019-07-17		

#### Limits of responsibility

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# Table of contents

<b>Table of contents .....</b>	<b>3</b>
<b>Section 1. Report summary .....</b>	<b>4</b>
1.1 Applicant and manufacturer .....	4
1.2 Test specifications .....	4
1.3 Statement of compliance .....	4
1.4 Exclusions .....	4
1.5 Test report revision history .....	4
<b>Section 2. Summary of test results .....</b>	<b>5</b>
2.1 FCC Part 15 Subpart C, general requirements test results .....	5
2.2 FCC Part 15 Subpart C, intentional radiators test results .....	5
2.3 IC RSS-GEN, Issue 5, test results .....	5
2.4 IC RSS-210, Issue 9, test results .....	5
<b>Section 3. Equipment under test (EUT) details .....</b>	<b>6</b>
3.1 Sample information .....	6
3.2 EUT information .....	6
3.3 Technical information .....	6
3.4 Product description and theory of operation .....	6
3.5 EUT exercise details .....	6
3.6 EUT setup diagram .....	7
3.7 EUT sub assemblies .....	7
<b>Section 4. Engineering considerations .....</b>	<b>8</b>
4.1 Modifications incorporated in the EUT .....	8
4.2 Technical judgment .....	8
4.3 Deviations from laboratory tests procedures .....	8
<b>Section 5. Test conditions .....</b>	<b>9</b>
5.1 Atmospheric conditions .....	9
5.2 Power supply range .....	9
<b>Section 6. Measurement uncertainty .....</b>	<b>10</b>
6.1 Uncertainty of measurement .....	10
<b>Section 7. Test equipment .....</b>	<b>11</b>
7.1 Test equipment list .....	11
<b>Section 8. Testing data .....</b>	<b>12</b>
8.1 FCC 15.207(a) and RSS-Gen 8.8 AC power line conducted emissions limits .....	12
8.2 FCC 15.215(c) and RSS-Gen 6.7 Occupied (Emission) bandwidth .....	15
8.3 FCC 15.225(a–c) and RSS-210 B.6 (a–c) Field strength within the 13.110–14.010 MHz band .....	18
8.4 FCC 15.225(d) and RSS-210 B.6(d) Field strength of emissions outside 13.110–14.010 MHz band .....	20
8.5 FCC 15.225(e) and RSS-210 B.6 Frequency tolerance of the carrier signal .....	25
<b>Section 9. Block diagrams of test set-ups .....</b>	<b>26</b>
9.1 Radiated emissions set-up .....	26
9.2 Conducted emissions set-up .....	27
<b>Section 10. Photos .....</b>	<b>28</b>
10.1 Photos of the test set-up .....	28
10.2 Photos of the EUT .....	30

## Section 1. Report summary

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### 1.1 Applicant and manufacturer

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Company name	MATICA Technologies AG
Address	Theresienhoehe 30
City	Munich
Province/State	Germany
Postal/Zip code	80339

### 1.2 Test specifications

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FCC 47 CFR Part 15, Subpart C, Clause 15.225	Operation in the 13.110–14.010 MHz
RSS-210 Issue 9, August 2016, Annex B.6	Devices operating in 13.110–14.010 MHz frequency band for any application
RSS-Gen Issue 5, March 2019	General Requirements for Compliance of Radio Apparatus

### 1.3 Statement of compliance

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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.

### 1.4 Exclusions

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None

### 1.5 Test report revision history

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Revision #	Details of changes made to test report
377878TRFWL	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 <sup>1</sup>
\$15.203	Antenna requirement	Pass <sup>2</sup>
\$15.215(c)	20 dB bandwidth	Pass

Notes: <sup>1</sup> Measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, was performed with the supply voltage varied between 85 % and 115 % of the nominal rated supply voltage. No noticeable output power variation was observed

<sup>2</sup> 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
\$15.225(a)	Field strength within 13.553–13.567 MHz band	Pass
\$15.225(b)	Field strength within 13.410–13.553 MHz and 13.567–13.710 MHz bands	Pass
\$15.225(c)	Field strength within 13.110–13.410 MHz and 13.710–14.010 MHz bands	Pass
\$15.225(d)	Field strength outside 13.110–14.010 MHz band	Pass
\$15.225(e)	Frequency tolerance of carrier signal	Pass

Notes: None

### 2.3 IC RSS-GEN, Issue 5, test results

Part	Test description	Verdict
6.6	Occupied bandwidth	Pass
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: <sup>1</sup> According to sections 5.2 and 5.3 of RSS-Gen, Issue 5 the EUT does not have a stand-alone receiver neither scanner receiver, therefore exempt from receiver requirements.

### 2.4 IC RSS-210, Issue 9, test results

Annex	Test description	Verdict
B.6 (a)	The field strength within the band 13.553–13.567 MHz	Pass
B.6 (b)	The field strength within the bands 13.410–13.553 MHz and 13.567–13.710 MHz	Pass
B.6 (c)	The field strength within the bands 13.110–13.410 MHz and 13.710–14.010 MHz	Pass
B.6 (d)	The field strength outside the band 13.110–14.010 MHz	Pass
B.6	Carrier frequency stability	Pass

Notes: None

## Section 3. Equipment under test (EUT) details

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### 3.1 Sample information

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Receipt date	2019-07-15
Nemko sample ID number	377878-1/2

### 3.2 EUT information

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Product name	Professional CARD printer
Model	MC 660
Serial number	MTDW00600425

### 3.3 Technical information

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Operating band	13.553–13.567 MHz
Operating frequency	13.56 MHz
Modulation type	ASK
Occupied bandwidth (99 %)	224 Hz
Power requirements	-45.47 dBm EIRP
Emission designator	224HA1D
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

### 3.4 Product description and theory of operation

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The EUT is a Desktop Card Printers Equipped with RFID Kit Smart Ribbon.

### 3.5 EUT exercise details

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The EUT use a dedicated internal software to put the radio module in continues transmission mode. After pressing the MENU button for few second, from Optional Mode menu, select the item IC R/W1 with the SET buttons. After pressing SET button on the item Card Feed Test, the EUT starts to read the cards continuously.

3.6 EUT setup diagram

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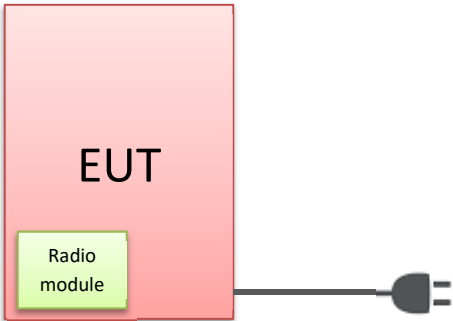


Figure 3.6-1: Setup diagram

3.7 EUT sub assemblies

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Table 3.7-1: EUT sub assemblies

Description	Brand name	Model/Part number	Serial number
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**Section 4. Engineering considerations**

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**4.1 Modifications incorporated in the EUT**

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

**4.2 Technical judgment**

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None

**4.3 Deviations from laboratory tests procedures**

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No deviations were made from laboratory procedures.



## Section 5. Test conditions

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### 5.1 Atmospheric conditions

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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	2019-01	2021-01
Thermohygrometer data loggers	Testo	175-H2	38203337/703	2019-01	2021-01
Barometer	MSR	MSR145B	330080	2019-05	2020-05

### 5.2 Power supply range

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The normal test voltage for equipment to be connected to the mains shall be the nominal mains voltage. For the purpose of the present document, the nominal voltage shall be the declared voltage, or any of the declared voltages  $\pm 5\%$ , for which the equipment was designed.

## Section 6. Measurement uncertainty

### 6.1 Uncertainty of measurement

EUT	Type	Test	Range and Setup features	Measurement Uncertainty	Notes
Transmitter	Conducted	Frequency error	0.001 MHz ÷ 40 GHz	0.08 ppm	(1)
		Carrier power RF Output Power	10 kHz ÷ 30 MHz	1.0 dB	(1)
			30 MHz ÷ 18 GHz	1.5 dB	(1)
			18 MHz ÷ 40 GHz	3.0 dB	(1)
		Adjacent channel power	1 MHz ÷ 18 GHz	1.6 dB	(1)
		Conducted spurious emissions	10 kHz ÷ 26 GHz	3.0 dB	(1)
			26 GHz ÷ 40 GHz	4.5 dB	(1)
		Intermodulation attenuation	1 MHz ÷ 18 GHz	2.2 dB	(1)
		Attack time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Attack time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Release time – frequency behaviour	1 MHz ÷ 18 GHz	2.0 ms	(1)
		Release time – power behaviour	1 MHz ÷ 18 GHz	2.5 ms	(1)
		Transient behaviour of the transmitter– Transient frequency behaviour	1 MHz ÷ 18 GHz	0.2 kHz	(1)
		Transient behaviour of the transmitter – Power level slope	1 MHz ÷ 18 GHz	9%	(1)
		Frequency deviation - Maximum permissible frequency deviation	0.001 MHz ÷ 18 GHz	1.3%	(1)
		Frequency deviation - Response of the transmitter to modulation frequencies above 3 kHz	0.001 MHz ÷ 18 GHz	0.5 dB	(1)
		Dwell time	-	3%	(1)
		Hopping Frequency Separation	0.01 MHz ÷ 18 GHz	1%	(1)
		Occupied Channel Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
		Modulation Bandwidth	0.01 MHz ÷ 18 GHz	2%	(1)
	Radiated	Radiated spurious emissions	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
			26.5 GHz ÷ 40 GHz	8.0 dB	(1)
		Effective radiated power transmitter	10 kHz ÷ 26.5 GHz	6.0 dB	(1)
Receiver	Radiated	Radiated spurious emissions	26,5 GHz ÷ 40 GHz	8.0 dB	(1)
			10 kHz ÷ 26.5 GHz	6.0 dB	(1)
	Radiated	Sensitivity measurement	1 MHz ÷ 18 GHz	6.0 dB	(1)
			10 kHz ÷ 26 GHz	3.0 dB	(1)
	Conducted	Conducted spurious emissions	26 GHz ÷ 40 GHz	4.5 dB	(1)

(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)	Rohde & Schwarz	ESU8	100202	2019-01	2020-01
EMI receiver (	Rohde & Schwarz	ESW44	101620	2018-05	2019-07
Trilog Broadband Antenna	Schwarzbeck	VULB 9162	9162-025	2018-07	2021-07
Loop antenna	Teseq	HLA6121+PI6121	45749	2017-07	2020-07
Antenna mast	Rohde & Schwarz	HCM	836 529/05	NCR	NCR
Controller	Rohde & Schwarz	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
LISN three phase (9 kHz to 30 MHz)	Rohde & Schwarz	ESH2-Z5	872 460/041	2018-09	2019-09
Shielded room	Siemens	10m control room	1947	NCR	NCR
Climatic chamber	MSL	EC5000DA	15022	2019-01	2020-01

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  $\mu$ H/50  $\Omega$  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, dB $\mu$ V	
	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	2019-07-16	Temperature	25 °C
Test engineer	P. Barbieri	Air pressure	1015 mbar
Verdict	Pass	Relative humidity	60 %

#### 8.1.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

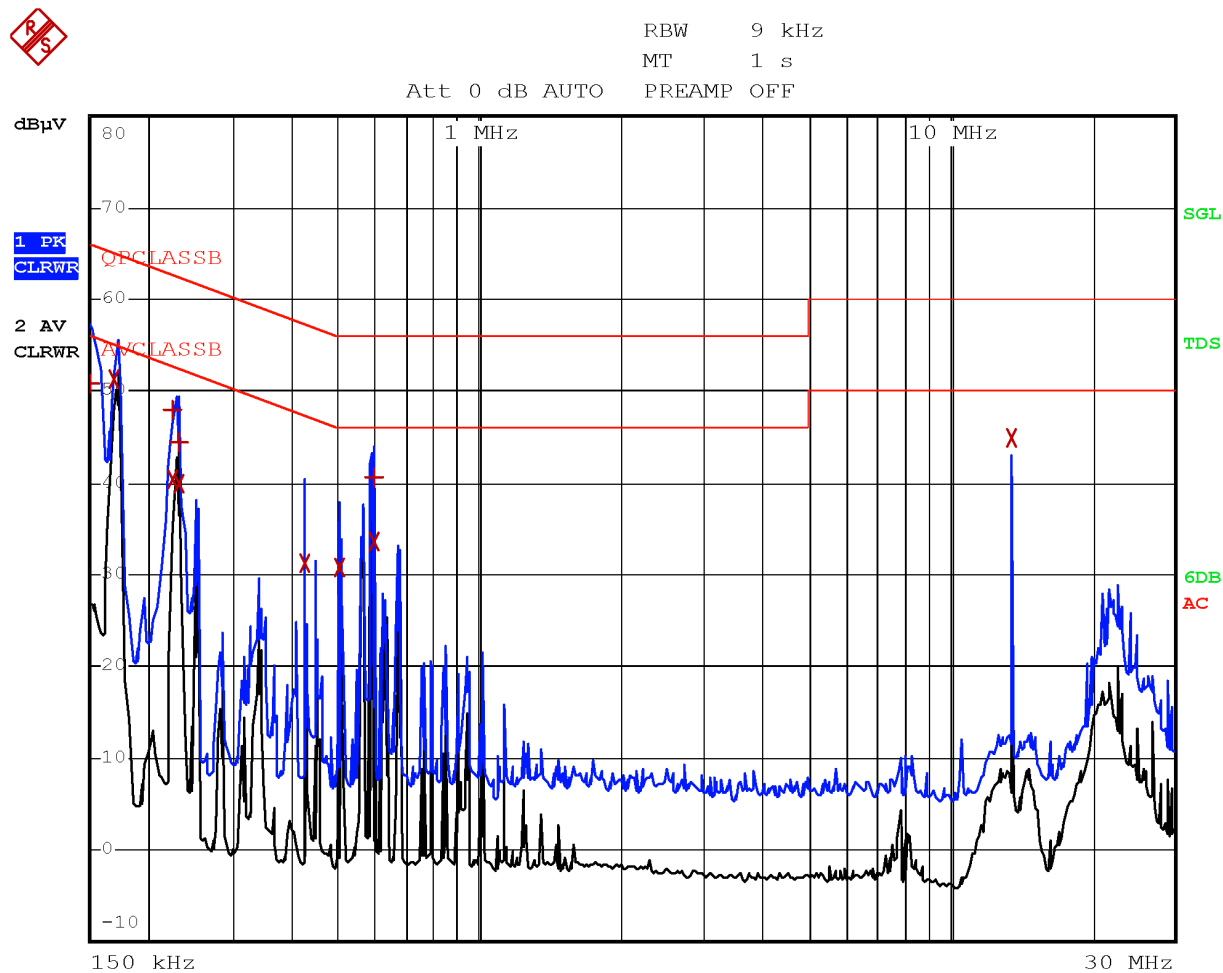
The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

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.

Test receiver settings:

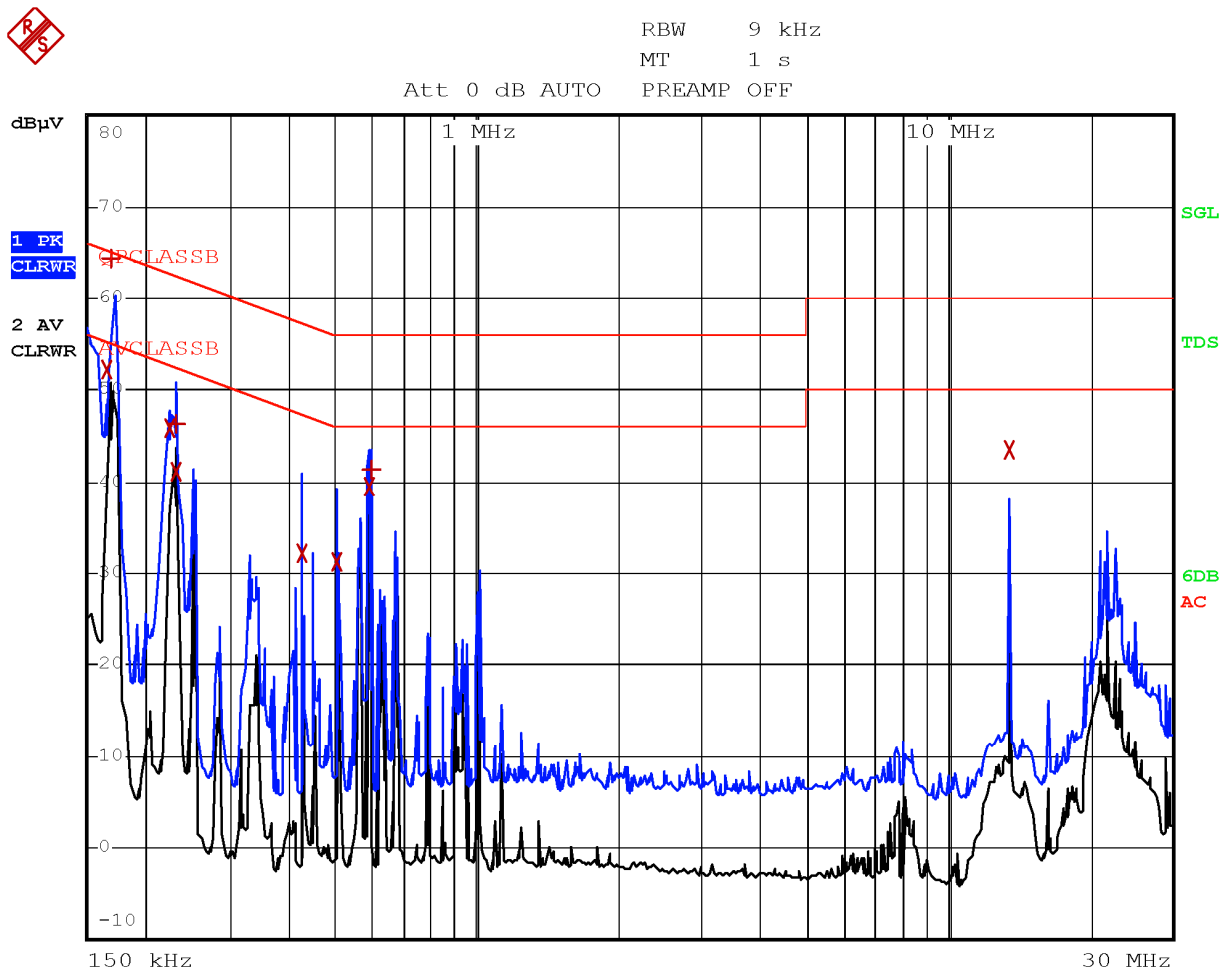
Frequency span	150 kHz to 30 MHz
Detector mode	Peak and Average (preview mode); Quasi-Peak (final measurements)
Resolution bandwidth	9 kHz
Video bandwidth	30 kHz
Trace mode	Max Hold
Measurement time	1000 ms

8.1.4 Test data



Plot 8.1-1: Conducted emissions on phase line

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
0.1500	50.9	66.0	-15.1	QP
0.1700	51.4	55.0	-3.6	Av
0.2260	47.9	62.6	-14.6	QP
0.2260	40.6	52.6	-12.0	Av
0.2300	44.6	62.4	-17.9	QP
0.2300	40.0	52.4	-12.5	Av
0.4260	31.3	47.3	-16.0	Av
0.5060	30.7	46.0	-15.3	Av
0.5940	40.8	56.0	-15.2	QP
0.5940	33.5	46.0	-12.5	Av
13.5620	44.9	50.0	-5.1	Av



Plot 8.1-2: Conducted emissions on neutral line

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
0.1660	52.3	55.2	-2.9	Av
0.1700	64.2	65.0	-0.7	QP
0.2260	46.0	52.6	-6.6	Av
0.2300	46.3	62.4	-16.1	QP
0.2300	41.3	52.4	-11.2	Av
0.4260	32.2	47.3	-15.1	Av
0.5060	31.4	46.0	-14.6	Av
0.5900	39.5	46.0	-6.5	Av
0.5940	41.3	56.0	-14.7	QP
13.5620	43.6	50.0	-6.4	Av

## 8.2 FCC 15.215(c) and RSS-Gen 6.7 Occupied (Emission) bandwidth

### 8.2.1 Definitions and limits

#### FCC

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

#### IC

When the occupied bandwidth limit is not stated in the applicable RSS or reference measurement method, the transmitted signal bandwidth shall be reported as the 99% emission bandwidth, as calculated or measured.

### 8.2.2 Test summary

Test date	2019-07-16	Temperature	25 °C
Test engineer	P. Barbieri	Air pressure	1015 mbar
Verdict	Pass	Relative humidity	60 %

### 8.2.3 Observations, settings and special notes

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	≥1 % of span
Video bandwidth	RBW × 3
Trace mode	Max Hold

### 8.2.4 Test data

**Table 8.2-1: Lower 20 dBc frequency cross result**

Fundamental frequency, MHz	Lower 20 dBc frequency cross, MHz	Limit, MHz	Margin, kHz
13.560	13.5598	13.553	-6.8

**Table 8.2-2: Upper 20 dBc frequency cross result**

Fundamental frequency, MHz	Upper 20 dBc frequency cross, MHz	Limit, MHz	Margin, kHz
13.560	13.5601	13.567	-6.9

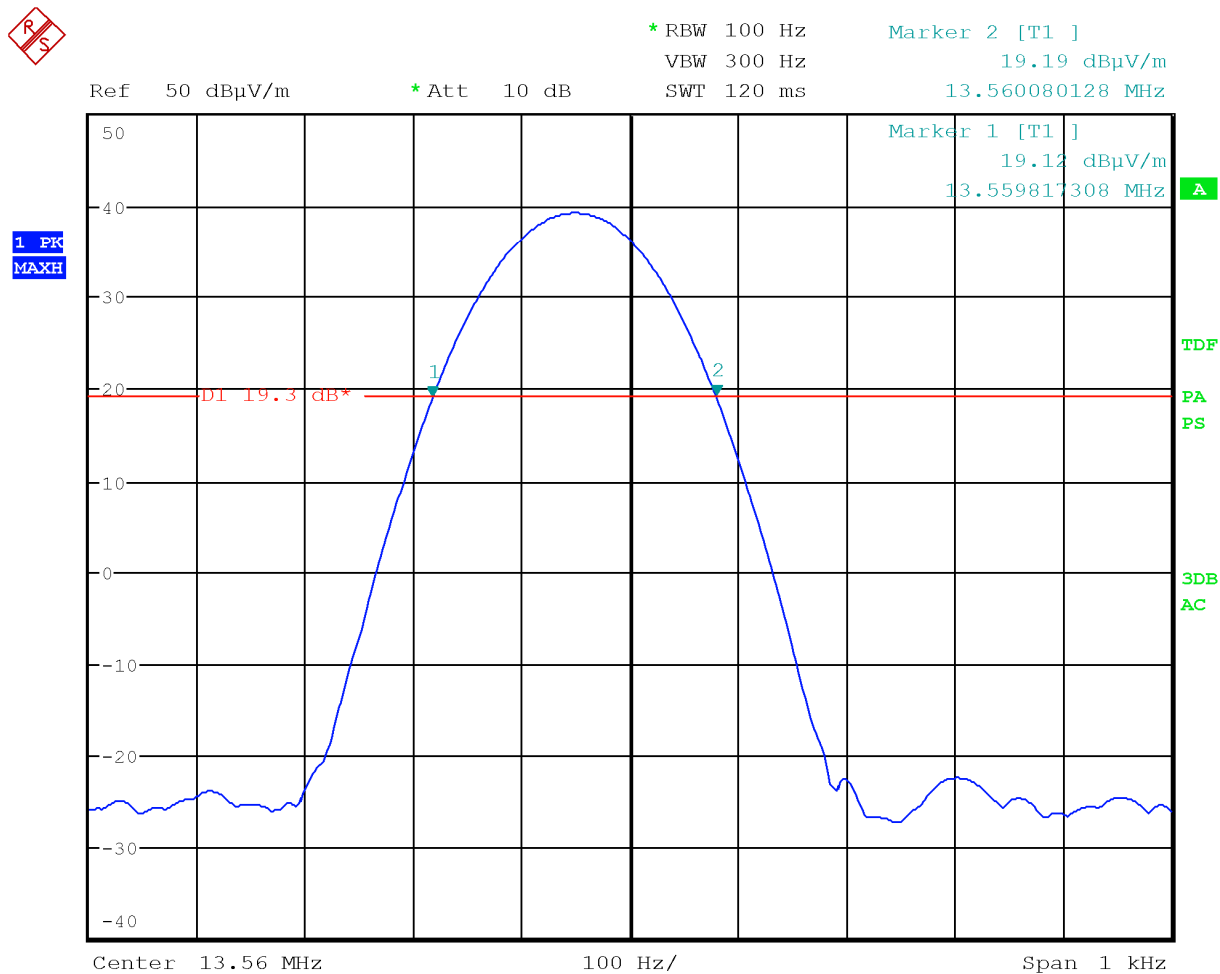


Figure 8.2-1: 20 dB bandwidth



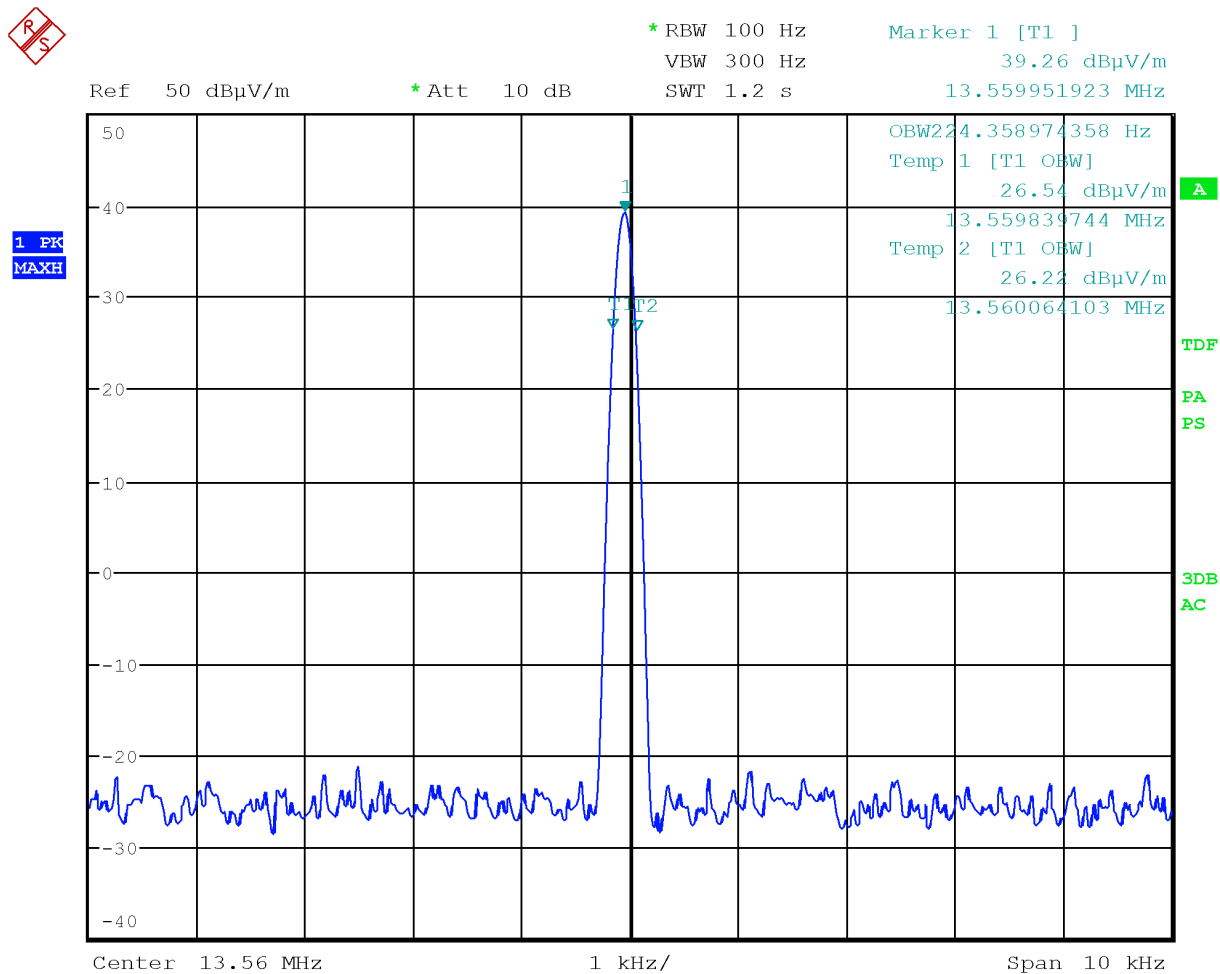
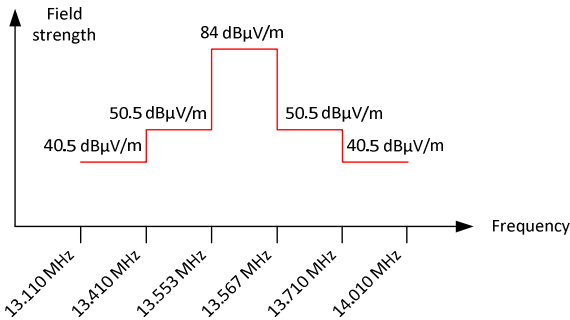


Figure 8.2-2: 99% dB bandwidth

**8.3 FCC 15.225(a-c) and RSS-210 B.6 (a-c) Field strength within the 13.110–14.010 MHz band**

**8.3.1 Definitions and limits**

- a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15848  $\mu\text{V/m}$  (84 dB $\mu\text{V/m}$ ) at 30 m.  
b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334  $\mu\text{V/m}$  (50.5 dB $\mu\text{V/m}$ ) at 30 m.  
c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106  $\mu\text{V/m}$  (40.5 dB $\mu\text{V/m}$ ) at 30 m.



**Figure 8.3-1: In-band spurious emissions limit**

**8.3.2 Test summary**

Test date	2019-07-15	Temperature	23 °C
Test engineer	P. Barbieri	Air pressure	1010
Verdict	Pass	Relative humidity	59 %

**8.3.3 Observations/special notes**

The measurements were performed at the distance of 10 m. 40 dB distance correction factor\* was applied to the measurement result in order to comply with 30 m limits.

\* 30 m to 10 m distance correction factor calculation (for 13 MHz band):

$$40 \times \text{Log}_{10} (10 \text{ m}/30 \text{ m}) = 40 \times \text{Log}_{10} (0.33) = -19.1 \text{ dB}$$

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	10 kHz
Video bandwidth	30 kHz
Trace mode	Max Hold

8.3.4 Test data

Table 8.3-1: Field strength measurements results

Frequency range, MHz	Frequency, MHz	Field strength at 10 m, dBμV/m	Calculated field strength at 30 m, dBμV/m	Limit, dBμV/m	Margin, dB
13.553–13.567	13.56	39.3	20.2	84.0	-63.8
13.410–13.553	13.48	19.3	0.2	50.5	-50.3
13.567–13.710	13.67	20.4	1.3	50.5	-42.9
13.110–13.410	13.24	20.4	1.3	40.5	-39.0
13.710–14.010	13.78	19.5	0.4	40.5	-40.1

Note: Calculated field strength at 30 m = Measured field strength at 10 m – 19.1 dB

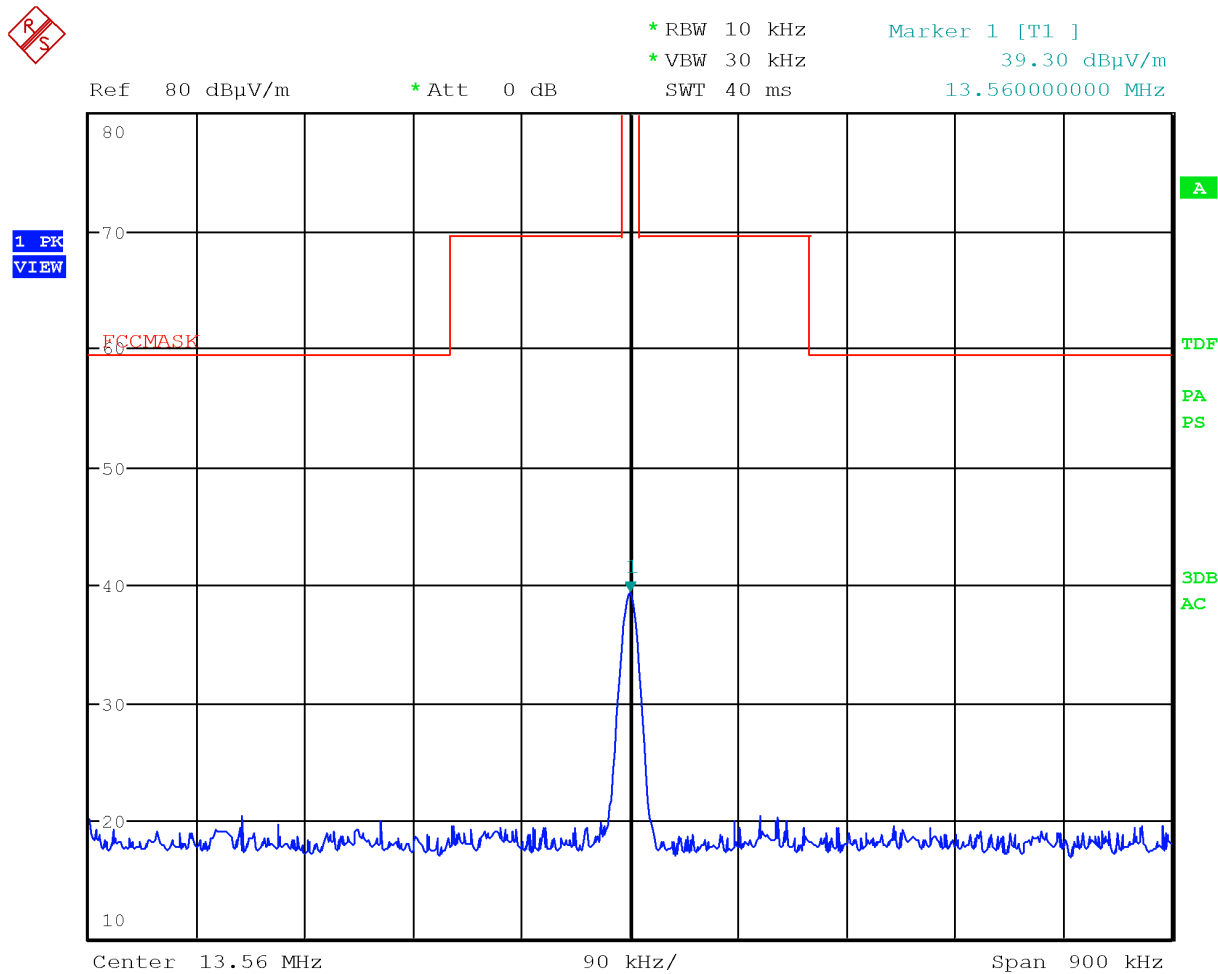


Figure 8.3-2: Field strength within 13.110–14.010 MHz band

## 8.4 FCC 15.225(d) and RSS-210 B.6(d) Field strength of emissions outside 13.110–14.010 MHz band

### 8.4.1 Definitions and limits

**FCC:**

The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209. The field strength of emissions appearing within restricted bands (as specified in §15.205) shall not exceed the limits from §15.209.

**ISED:**

RSS-Gen general field strength limits for frequencies outside the band 13.110–14.010 MHz.

**Table 8.4-1: 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 8.4-2: IC restricted frequency bands**

MHz	MHz	MHz	GHz
0.090–0.110	12.57675–12.57725	399.9–410	7.25–7.75
0.495–0.505	13.36–13.41	608–614	8.025–8.5
2.1735–2.1905	16.42–16.423	960–1427	9.0–9.2
3.020–3.026	16.69475–16.69525	1435–1626.5	9.3–9.5
4.125–4.128	16.80425–16.80475	1645.5–1646.5	10.6–12.7
4.17725–4.17775	25.5–25.67	1660–1710	13.25–13.4
4.20725–4.20775	37.5–38.25	1718.8–1722.2	14.47–14.5
5.677–5.683	73–74.6	2200–2300	15.35–16.2
6.215–6.218	74.8–75.2	2310–2390	17.7–21.4
6.26775–6.26825	108–138	2483.5–2500	22.01–23.12
6.31175–6.31225	149.9–150.05	2655–2900	23.6–24.0
8.291–8.294	156.52475–156.52525	3260–3267	31.2–31.8
8.362–8.366	156.7–156.9	3332–3339	36.43–36.5
8.37625–8.38675	162.0125–167.17	3345.8–3358	Above 38.6
8.41425–8.41475	167.72–173.2	3500–4400	
12.29–12.293	240–285	4500–5150	
12.51975–12.52025	322–335.4	5.35–5.46	

Note: Certain frequency bands listed in table above 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

**Section 8**  
**Test name**  
**Specification**

Testing data  
FCC 15. 225(d) and RSS-210 B6(d) Field strength of emissions outside 13.110–14.010 MHz band  
FCC Part 15 Subpart C and RSS-210 Issue 9



**Table 8.4-3:** 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			

#### 8.4.2 Test summary

Test date	2019-07-15	Temperature	23 °C
Test engineer	P. Barbieri	Air pressure	1010 mbar
Verdict	Pass	Relative humidity	59 %

#### 8.4.3 Observations, settings and special notes

The spectrum was searched from 9 kHz to 1 GHz.  
Radiated measurements were performed at a distance of 10 m below 30 MHz and 3 m above 30 MHz.

Spectrum analyzer settings for frequencies below 30 MHz:

Detector mode	Quasi-Peak
Resolution bandwidth	9 kHz
Trace mode	Max Hold
Measurement time	1 s

Spectrum analyzer settings for frequencies above 30 MHz:

Detector mode	Quasi-Peak
Resolution bandwidth	120 kHz
Trace mode	Max Hold
Measurement time	1 s

8.4.4 Test data

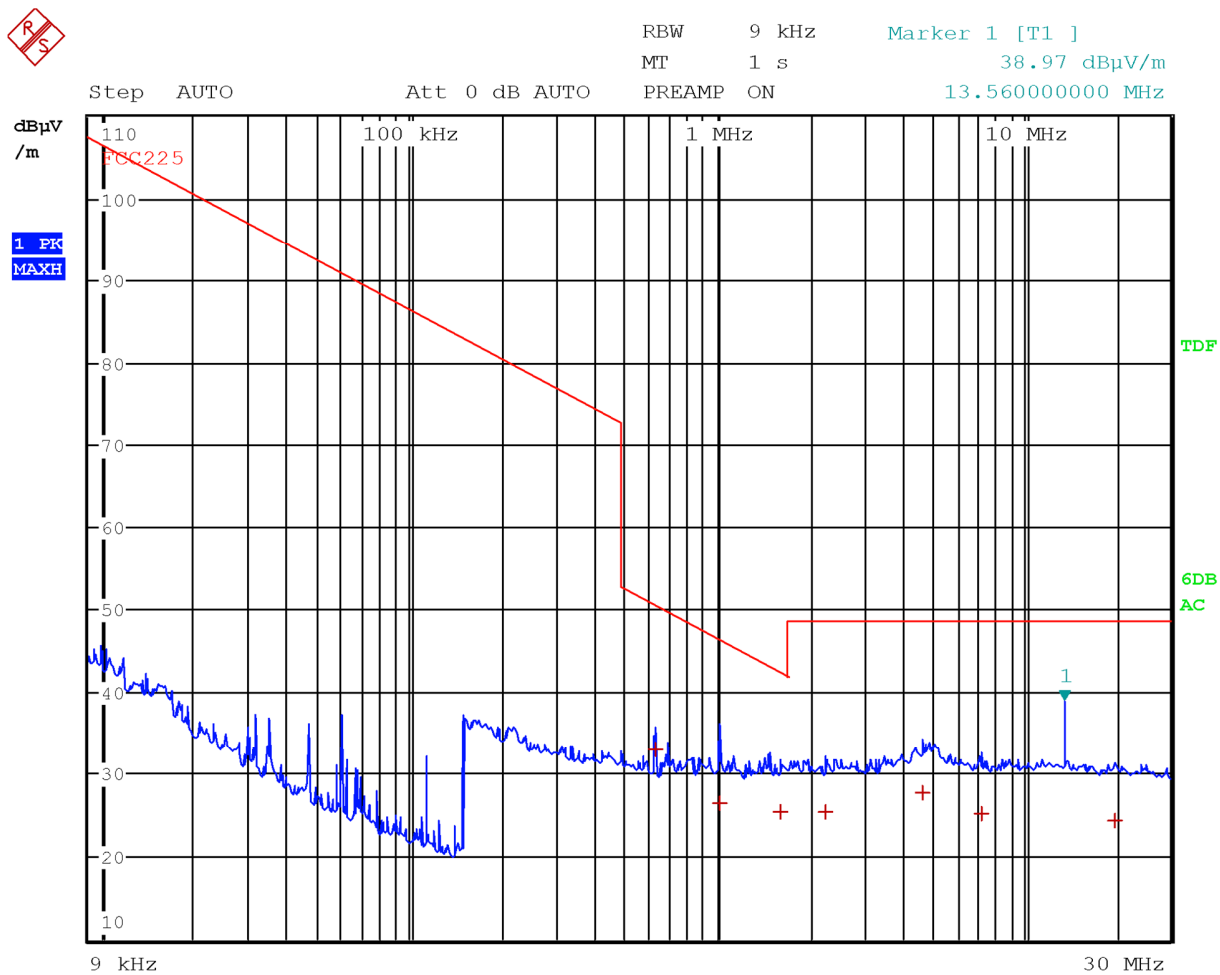


Figure 8.4-1: Field strength of spurious emissions below 30 MHz

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
0.6270	33.0	50.8	-17.8	QP
1.0163	26.4	46.6	-20.1	QP
1.6013	25.6	42.6	-17.1	QP
2.2560	25.6	48.6	-23.0	QP
4.6680	27.7	48.6	-20.9	QP
7.2510	25.2	48.6	-23.4	QP
19.7160	24.4	48.6	-24.2	QP

Section 8  
Test name  
Specification

Testing data  
FCC 15. 225(d) and RSS-210 B6(d) Field strength of emissions outside 13.110–14.010 MHz band  
FCC Part 15 Subpart C and RSS-210 Issue 9

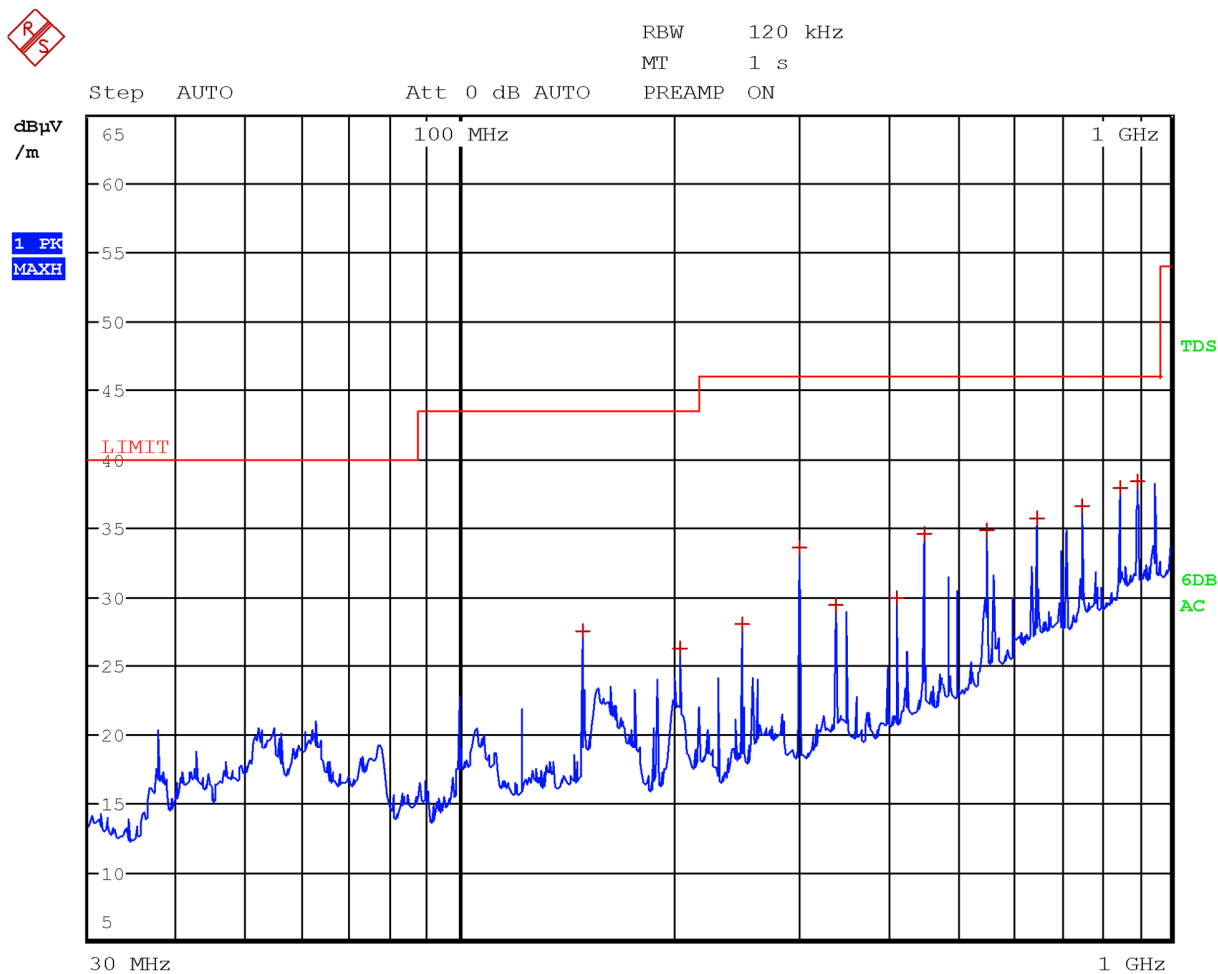


Figure 8.4-2: Field strength of spurious emissions above 30 MHz with antenna in horizontal polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
149.1600	27.6	43.5	-15.9	QP
203.4000	26.2	43.5	-17.3	QP
249.9900	28.1	46.0	-17.9	QP
300.0000	33.6	46.0	-12.4	QP
337.5000	29.4	46.0	-16.6	QP
412.5000	30.0	46.0	-16.0	QP
450.0000	34.6	46.0	-11.4	QP
549.9900	34.9	46.0	-11.1	QP
650.0100	35.8	46.0	-10.2	QP
750.0000	36.6	46.0	-9.4	QP
849.9900	38.0	46.0	-8.0	QP
900.0000	38.7	46.0	-6.9	QP

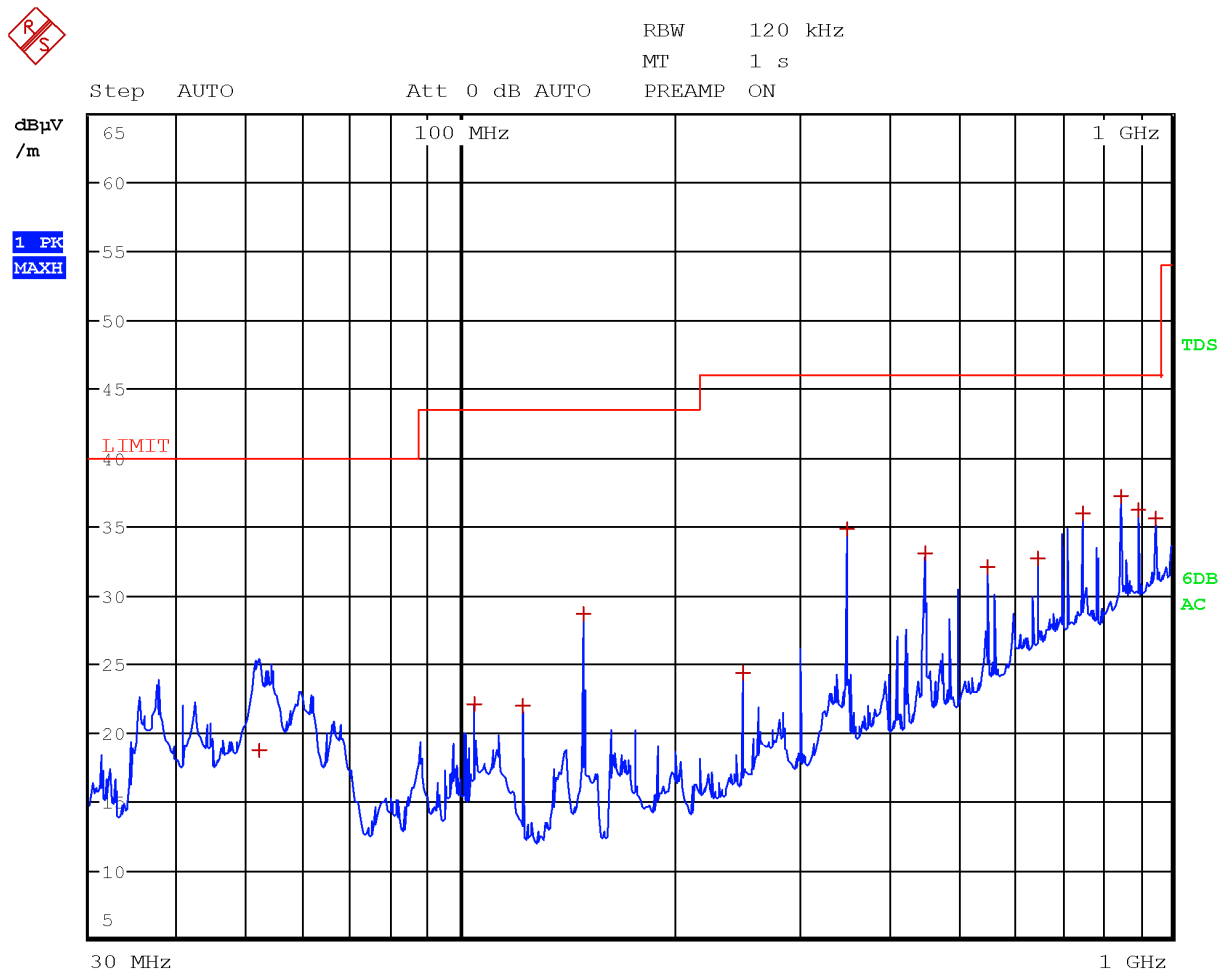


Figure 8.4-3: Field strength of spurious emissions above 30 MHz with antenna in vertical polarization

Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
52.0800	18.7	40.0	-21.3	QP
104.4900	22.2	43.5	-21.3	QP
122.0400	22.0	43.5	-21.5	QP
149.1600	28.7	43.5	-14.8	QP
250.0200	24.4	46.0	-21.6	QP
350.0100	34.9	46.0	-11.1	QP
450.0000	33.1	46.0	-12.9	QP
549.9900	32.0	46.0	-14.0	QP
650.0100	32.8	46.0	-13.2	QP
750.0000	36.0	46.0	-10.0	QP
849.9900	37.2	46.0	-8.8	QP
900.0000	36.3	46.0	-9.7	QP
949.9800	35.7	46.0	-10.3	QP



## 8.5    FCC 15.225(e) and RSS-210 B.6 Frequency tolerance of the carrier signal

### 8.5.1    Definitions and limits

The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  ( $\pm 100$  ppm) of the operating frequency over a temperature variation of  $-20^\circ\text{C}$  to  $+50^\circ\text{C}$  at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of  $20^\circ\text{C}$ . For battery operated equipment, the equipment tests shall be performed using a new battery.

### 8.5.2    Test summary

Test date	2019-07-16	Temperature	25 °C
Test engineer	P. Barbieri	Air pressure	1015 mbar
Verdict	Pass	Relative humidity	60 %

### 8.5.3    Observations, settings and special notes

Spectrum analyzer settings:

Detector mode	Peak
Resolution bandwidth	$\geq 1\%$ of emission bandwidth
Video bandwidth	RBW $\times 3$
Trace mode	Max Hold

### 8.5.4    Test data

**Table 8.5-1:** Frequency drift measurements results

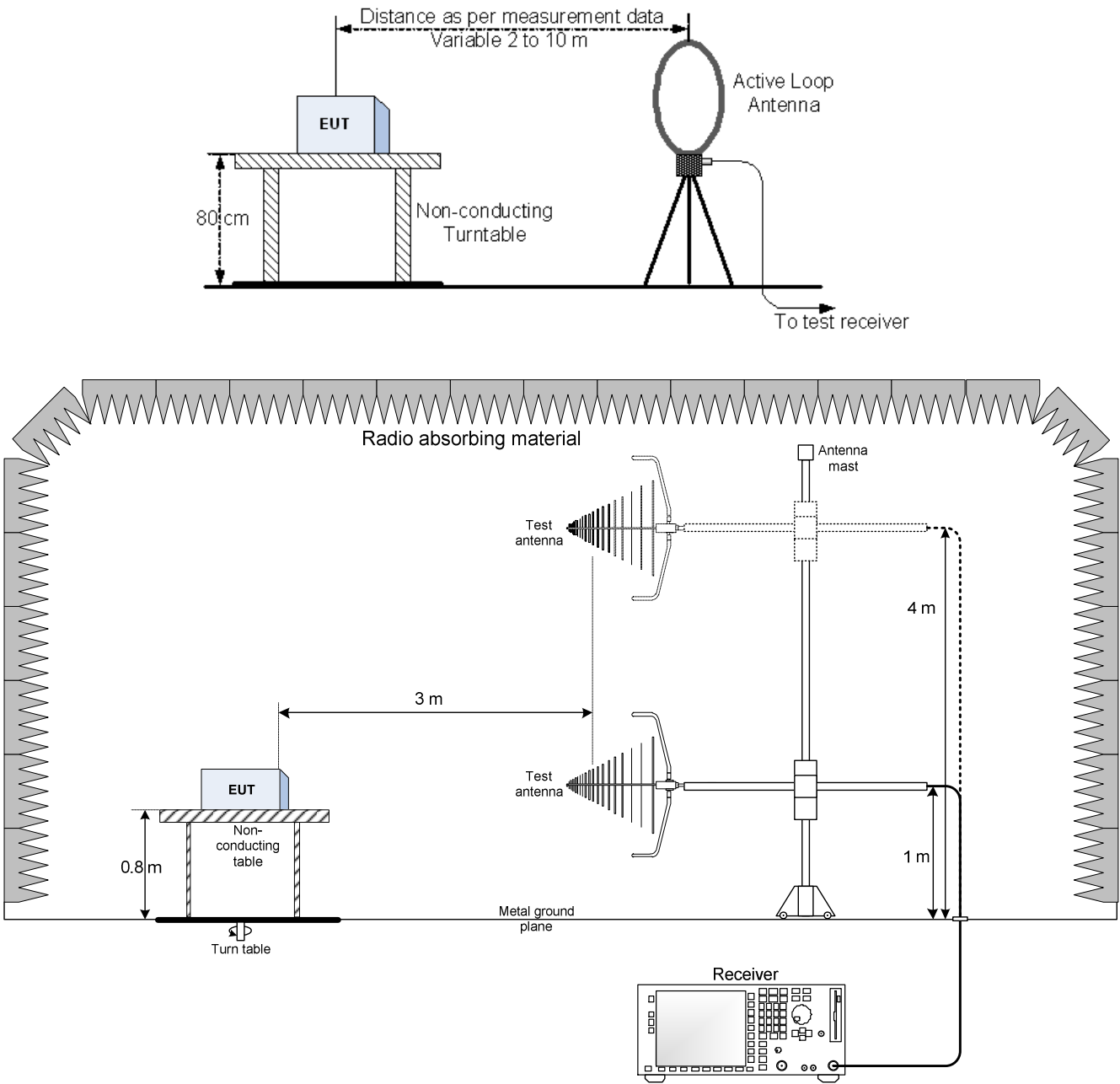
Test conditions	Frequency, MHz	Frequency drift, $\pm$ ppm	Limit, $\pm$ ppm	Margin, ppm
+50 °C, Nominal	13.559920	3.3	100	-96.7
+20 °C, +15 %	13.559964	0	100	-100
+20 °C, Nominal	13.559964	Reference	Reference	Reference
+20 °C, -15 %	13.559964	0	100	-100
-20 °C, Nominal	13.560024	4.5	100	-95.5

Note: frequency drift was calculated as follows:

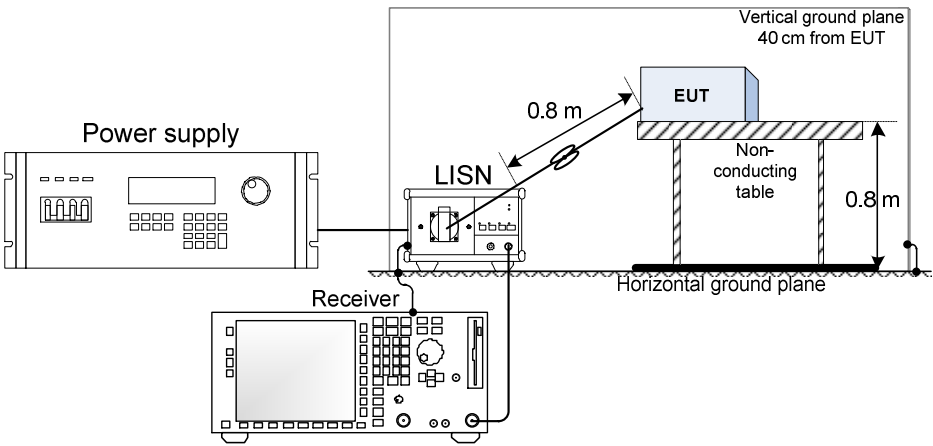
$$\text{Frequency drift (ppm)} = ((F_{\text{measured}} - F_{\text{reference}}) \div F_{\text{reference}}) \times 1 \times 10^6$$

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up



9.2 Conducted emissions set-up

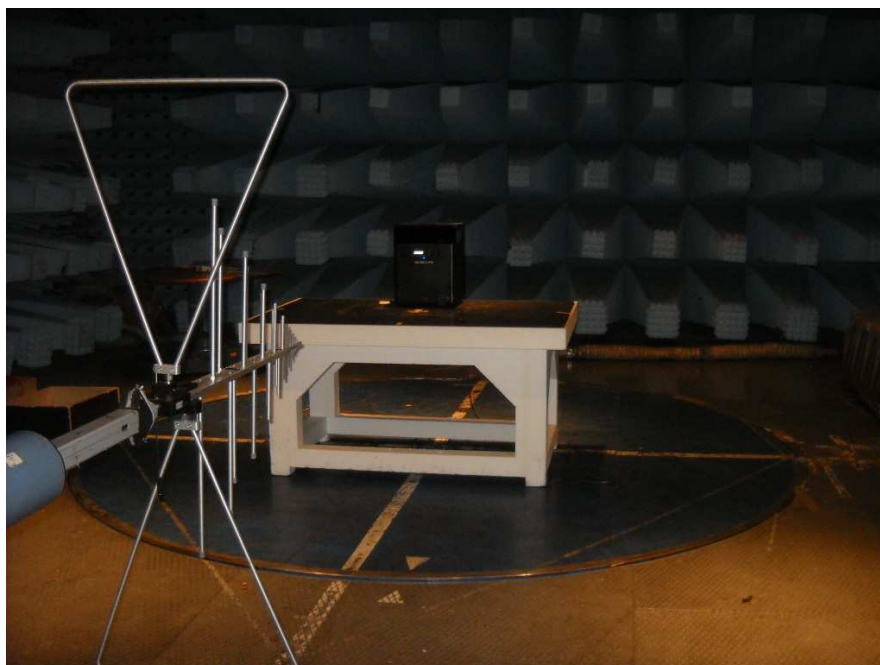
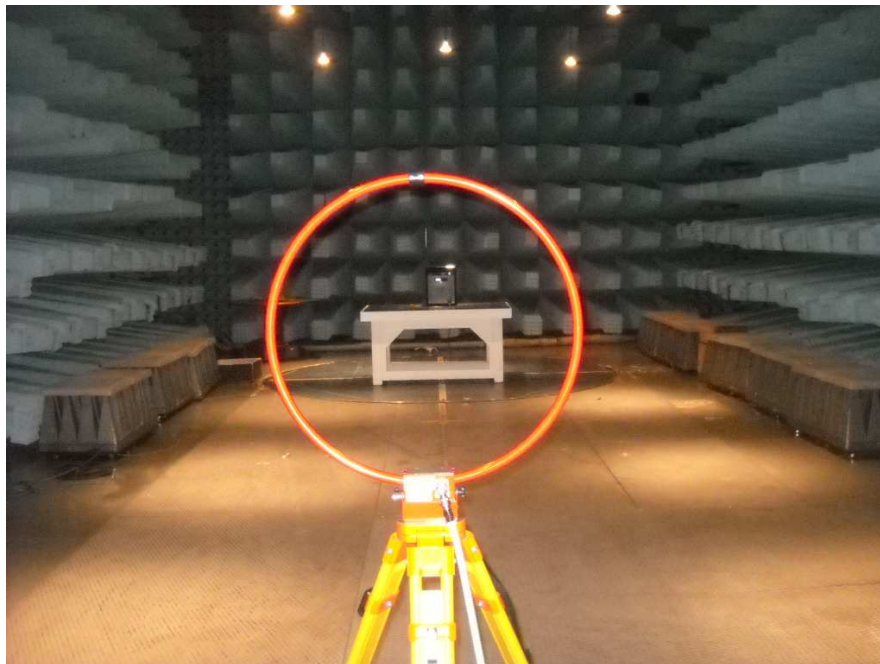


## Section 10. Photos

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### 10.1 Photos of the test set-up

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10.2 Photos of the EUT

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End of report