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Test report

296426-1TRFWL

Date of issue: February 3, 2016

Applicant:

Groupe Gecko Alliance Inc

Product:

Sussman Remote Dongle

Model:

RFMR-3

FCC ID: PTTRFMR-3

IC Registration number: 4095A-RFMR3

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.249

  Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz and 24.0–24.25 GHz

- RSS-210, Issue 8, December 2010, Annex 2.9

  Devices operating in 902–928, 2400–2483.5 and 5725–5875 MHz frequency bands for any application

Test location

Company name	Nemko Canada Inc.		
Designation number	FCC: 722545, IC: 2040G-5 (semi anechoic chamber)		
Facility Name	Ottawa	Montreal	Almonte
Address	303 River Road	292 Labrosse Ave	1500 Peter Robinson Rd.
City	Ottawa	Pointe-Claire	West Carleton
Province	ON	QC	ON
Postal code	K1V 1H2	H9R 5L8	K0A 1L0
Country	Canada	Canada	Canada
Telephone	+1 613 737 9680	+1 514 694 2684	+1 613 256-9117
Facsimile	+1 613 737 9691	+1 514 694 3528	+1 613 256-8848
Toll free	+1 800 563 6336		
Website	www.nemko.com		

Tested by	Avul Nzenza, EMC Engineer
Reviewed by	Andrey Adelberg, Senior Wireless/EMC Specialist
Review date	February 3, 2016
Reviewer signature	

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 Canada's ISO/IEC 17025 accreditation.

Copyright notification

Table of contents

Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Groupe Gecko Alliance inc.
Address	450 Des Canetons
City	Quebec
Province/State	Quebec
Postal/Zip code	G2E 5W6
Country	Canada

1.2 Test specifications

FCC 47 CFR Part 15, Subpart C, Clause 15.249	Operation in the 902–928 MHz, 2400–2483.5 MHz, 5725–5850 MHz and 24.0–24.25 GHz
RSS-210, Issue 8 Annex 2.9	Devices operating in 902–928, 2400–2483.5 and 5725–5875 MHz frequency bands for any application

1.3 Test methods

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

None

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	Not applicable
§15.31(e)	Variation of power source	Pass[1]
§15.203	Antenna requirement	Pass[2]
§15.215(c)	20 dB bandwidth	Pass

Notes: [1] All tests were performed with a DC source (Power supply).
[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
§15.249(a)	Radiated emissions not in restricted bands	Pass
§15.249(b)	Fixed Point-to-Point operation in the 24.0–24.25 GHz band	Not applicable
§15.249(d)	Spurious emissions (except harmonics)	Pass

2.3 IC RSS-GEN, Issue 4, 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	Not applicable

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 IC RSS-210, Issue 8, test results

Part	Test description	Verdict
§A2.9(a)	Radiated emissions not in restricted bands	Pass
§A2.9(b)	Spurious emissions (except harmonics)	Pass

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	November 2, 2015
Nemko sample ID number	133-001165

3.2 EUT information

Product name	Sussman Remote Dongle
Model	RFMR-3
Serial number	None

3.3 Technical information

Frequency band	902–928 MHz
Operating frequency	910–920 MHz
Field strength of fundamental, Units @ 3 m	91.81 dBµV/m (Peak)
Channel bandwidth (99%)	203.52 kHz
Type of modulation	FSK
Emission classification (F1D, G1D, D1D)	203KF1D
Transmitter spurious, Units @ 3 m	45.95 dBµV/m (average) at 2744.5 MHz @ 3 m
Power requirements	5 Vdc (From external source)
Antenna information	The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator, Antenna gain is 1.59 dBi, Manufacturer: Yageo

3.4 Product description and theory of operation

The UHF Dongle is the electronic circuitry that translates the RF communication data stream (from/to the Sussman UHF Remote Control) to a low frequency digital data stream from/to the Steam Electronic Controller. The UHF Dongle is located inside a plastic box. This plastic box is connected to the Steam Electronic Controller through a 8 wire miniDin cable that provide a +5 Vdc supply, a SPI serial communication link and a Infra-Red (IR) remote control protocol serial link. There is one Printed Circuit Boards in this UHF Dongle housing. It uses the same UHF transceiver, same RF switch, same onboard antenna and same components as the Sussman UHF remote controller. The main difference concerning the RF part is in the routing of the PCB and in the components used to match the impedance of the PCB track to the onboard antenna.

3.5 EUT exercise details

The unit requires an external 5 VDC source. A special cable is provided in order the supply the power through a custom mini-DIN type connector.
Once unit is powered, the RF transmission will start automatically and will not stop until the power is removed.
Pressing the pushbutton with a paperclip will toggle each test in order. The LED will blink at a repeat rate of 1 seconds to indicate the test being performed.
The blinking pattern is defined as the following

- 1 fast blink each second = test mode #1
- 2 fast blink each second = test mode #2
- 3 fast blink each second = test mode #3
- 4 fast blink each second = test mode #4

3.6 EUT setup diagram

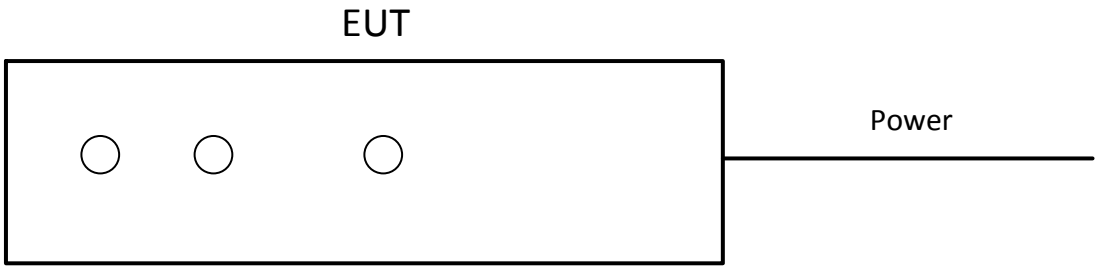


Figure 3.6-1: *Setup diagram*

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

Temperature	15–30 °C
Relative humidity	20–75 %
Air pressure	860–1060 mbar

When it is impracticable to carry out tests under these conditions, a note to this effect stating the ambient temperature and relative humidity during the tests shall be recorded and stated.

5.2 Power supply range

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 ±5 %, for which the equipment was designed.

Section 6. Measurement uncertainty

6.1 Uncertainty of measurement

Measurement uncertainty budgets for the tests are detailed below. Measurement uncertainty calculations assume a coverage factor of K = 2 with 95% certainty.

Test name	Measurement uncertainty, dB
All antenna port measurements	0.55
Conducted spurious emissions	1.13
Radiated spurious emissions	3.78
AC power line conducted emissions	3.55

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.
3 m EMI test chamber	TDK	SAC-3	FA002532	1 year	Jan. 25/16
Flush mount turntable	Sunol	FM2022	FA002550	—	NCR
Controller	Sunol	SC104V	FA002551	—	NCR
Antenna mast	Sunol	TLT2	FA002552	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 40	FA002071	1 year	April 7/16
Bilog antenna (20–2000 MHz)	Sunol	JB1	FA002517	1 year	Sept. 29/16
Horn antenna (1–18 GHz)	EMCO	3115	FA001452	1 year	Sept. 29/16
Pre-amplifier (0.5–18 GHz)	COM-POWER	PAM-118A	FA002561	1 year	May 6/16

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

Section 8. Testing data

8.1 FCC 15.215(c) and RSS-Gen 6.6 Occupied (Emission) bandwidth

8.1.1 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.

8.1.2 Test summary

Test date	February 1, 2016	Temperature	23.5 °C
Test engineer	Avul Nzenza	Air pressure	1010 mbar
Verdict	Pass	Relative humidity	33 %

8.1.3 Observations, settings and special notes

Spectrum analyser settings:

Resolution bandwidth	10 kHz
Video bandwidth	≥3 × RBW
Frequency span	1 MHz
Detector mode	Peak
Trace mode	Max Hold

8.1.4 Test data

Table 8.1-1: *Emission bandwidth measurement results*

Channels	20 dB BW (kHz)	99% Occupied BW (kHz)
High	134.61	197.11
Mid	126.60	203.52
Low	129.80	203.52

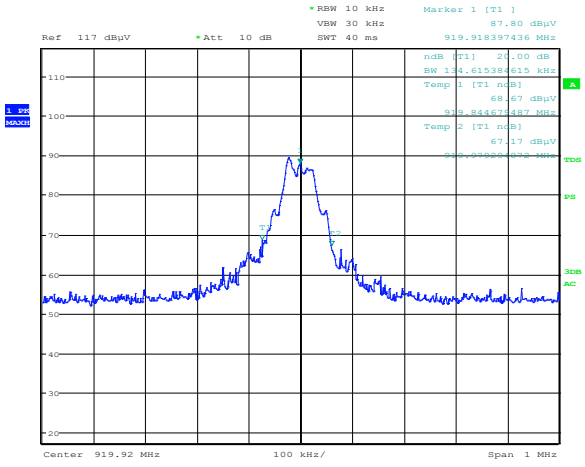


Figure 8.1-1: *20 dB bandwidth _ High channel Unit*

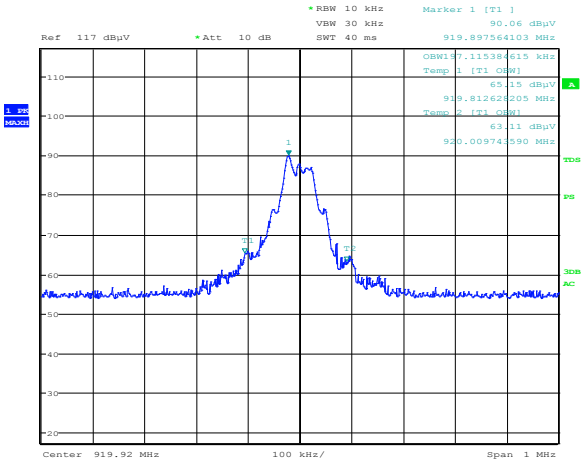


Figure 8.1-2: *99% occupied bandwidth _ High channel Unit*

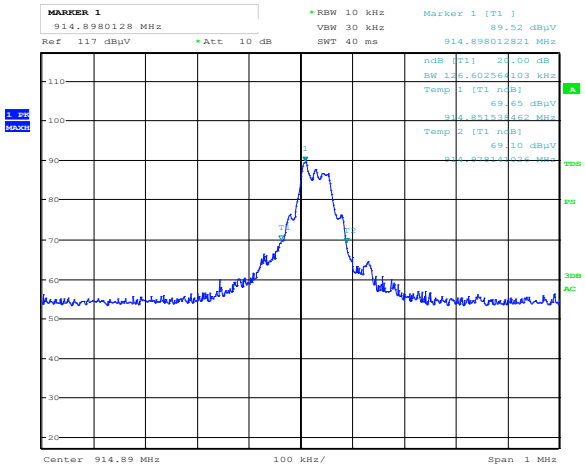


Figure 8.1-3: *20 dB bandwidth _ Mid channel Unit*

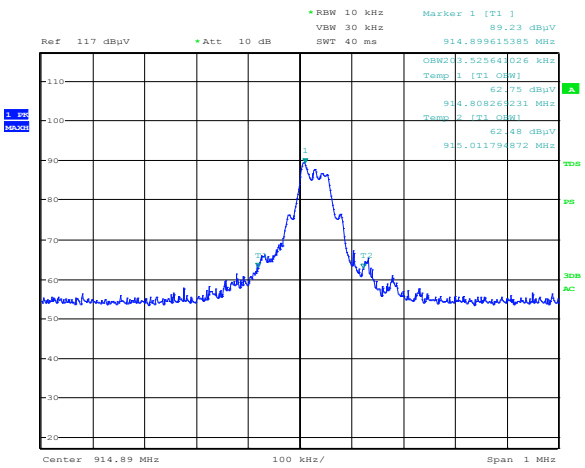


Figure 8.1-4: *99% occupied bandwidth _ Mid channel Unit*

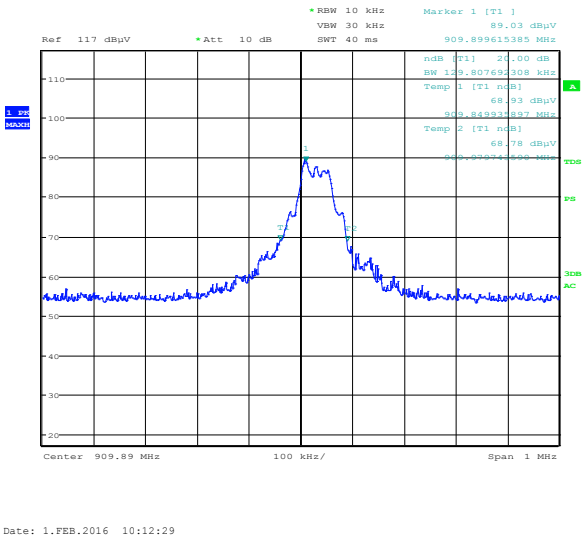


Figure 8.1-5: *20 dB bandwidth _ Low channel Unit*

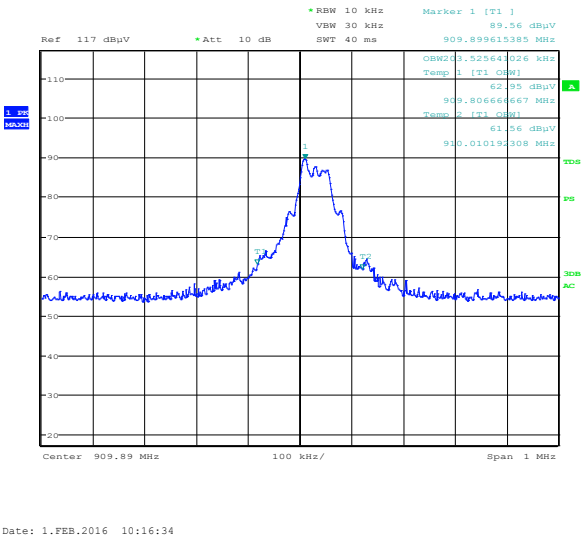


Figure 8.1-6: *99% occupied bandwidth _ Low channel Unit*

8.2 FCC 15.249(a) RSS 210 A2.9(a) Field strength of emissions not in restricted bands

8.2.1 Definitions and limits

In addition to the provisions of §15.205 and RSS-Gen the field strength of emissions from intentional radiators operated under this section shall not exceed the following table.

Table 8.2-1: *Field strength limits*

Fundamental frequency (MHz)	Field strength of fundamental (mV/m)	Field strength of fundamental (dBµV/m)	Field strength of spurious emissions (µV/m)	Field strength of spurious emissions (dBµV/m)
902–928	50	94	500	54
2400–2483.5	50	94	500	54
5725–5875	50	94	500	54
24.0–24.25	250	108	2500	68

(e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter (128 dBµV/m) at 3 meters along the antenna azimuth.

8.2.2 Test summary

Test date	December 17, 2015	Temperature	23.5 °C
Test engineer	Avul Nzenza	Air pressure	1009 mbar
Verdict	Pass	Relative humidity	33 %

8.2.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
Radiated measurements were performed at a distance of 3 m.
The product was scanned using horizontal and vertical antenna polarization. The maximum measured levels are provided in the report below.
Spectrum analyzer settings for peak radiated measurements:

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

Duty cycle correction factor (DCCF) was calculated as follows:
DCCF (dB) = 20 × Log_{10} ($Tx_{100\,ms}$ / 100 ms)

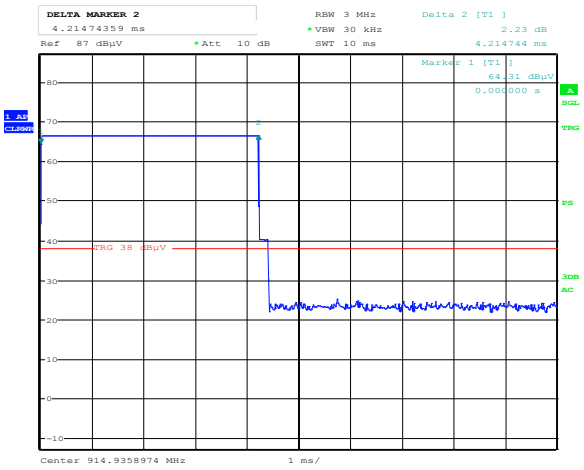


Figure 8.2-1: *Pulse width*

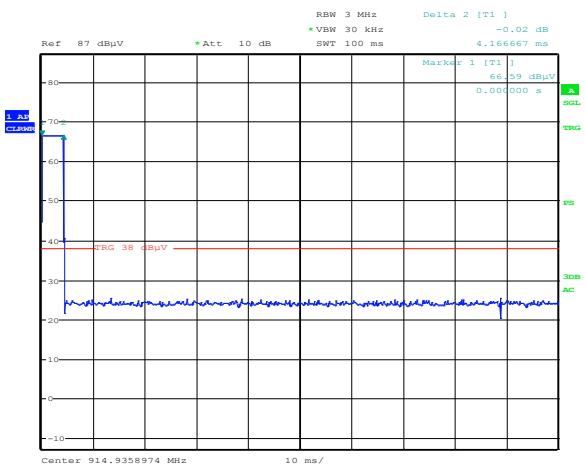


Figure 8.2-2: *100 ms transmission time frame*

DCCF (dB) = 20 × Log_{10} ($Tx_{100\,ms}$ / 100 ms) = 20 × Log_{10} (4.21/ 100) = −27.51 dB
A Maximum of -20 dB will be considered (per 15.35 (b))

8.2.4 Test data

Table 8.2-2: *Radiated field strength of fundamental measurement results*

Frequency, MHz	Polarization	Peak Field strength, dBµV/m		Margin, dB
		Measured	Limit	
919.80	V	91.79	94	2.21
914.89	V	90.54	94	3.46
909.97	V	91.81	94	2.19

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

Table 8.2-3: *Radiated field strength of harmonics measurement results-High channel unit*

Frequency, MHz	Polarization	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Calculated	Limit	
1839.9	V	48.39	74.00	25.61	28.39	54.00	25.61
2759.7	V	65.18	74.00	8.82	45.18	54.00	8.82
3679.8	V	54.77	74.00	19.23	34.77	54.00	19.23
4599.5	H	62.61	74.00	11.39	42.61	54.00	11.39
6436.7	H	61.48	74.00	12.52	41.48	54.00	12.52

Table 8.2-4: *Radiated field strength of harmonics measurement results-Mid channel unit*

Frequency, MHz	Polarization	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Calculated	Limit	
1829.5	H	48.79	74.00	25.21	28.79	54.00	25.21
2744.5	H	65.95	74.00	8.05	45.95	54.00	8.05
3660	H	54.65	74.00	19.35	34.65	54.00	19.35
4574.5	H	61.84	74.00	12.16	41.84	54.00	12.16
6404.4	H	61.22	74.00	12.78	41.22	54.00	12.78

Table 8.2-5: *Radiated field strength of harmonics measurement results-Low channel unit*

Frequency, MHz	Polarization	Peak Field strength, dBµV/m		Margin, dB	Average Field strength, dBµV/m		Margin, dB
		Measured	Limit		Calculated	Limit	
1819.6	H	48.78	74.00	25.22	28.78	54.00	25.22
2729.7	H	65.45	74.00	8.55	45.45	54.00	8.55
3639.6	H	57.17	74.00	16.83	37.17	54.00	16.83
4549.5	H	60.68	74.00	13.32	40.68	54.00	13.32
6369.5	H	61.81	74.00	12.19	41.81	54.00	12.19

Notes: Field strength includes correction factor of antenna, cable loss, amplifier, and attenuators where applicable.
Calculated Average results were calculated as follows: Peak Field strength + DCCF

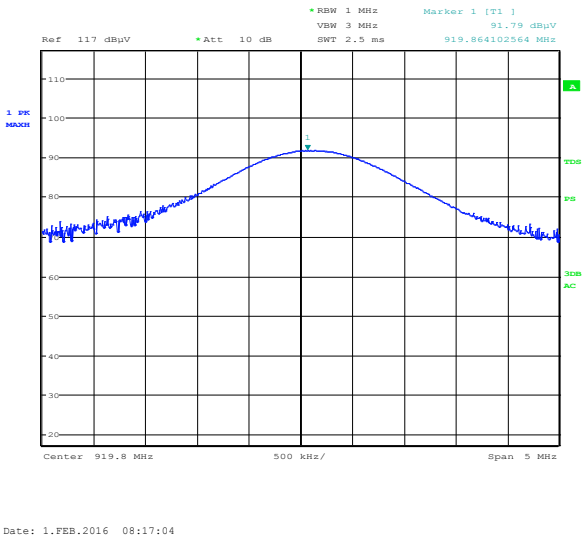


Figure 8.2-3: *Fundamental field strength measurement-High channel Unit*

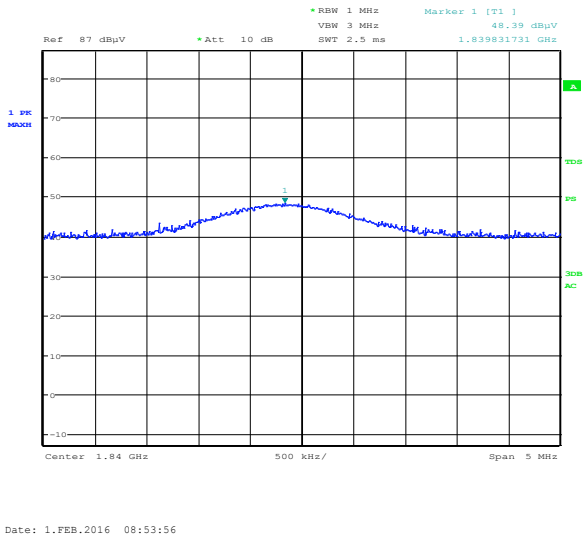


Figure 8.2-4: *2nd Harmonic field strength measurement- High channel Unit*

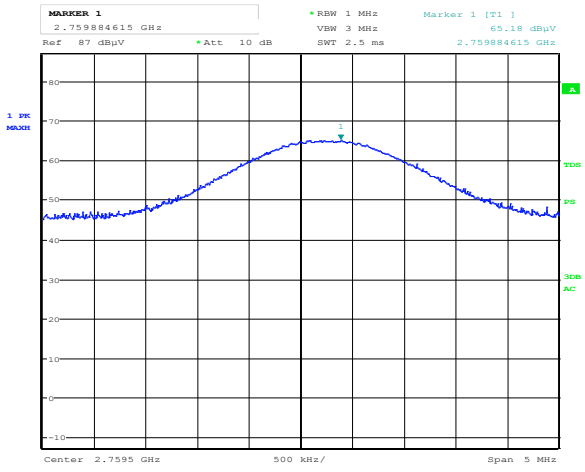


Figure 8.2-5: *3rd Harmonic field strength measurement- High channel Unit*

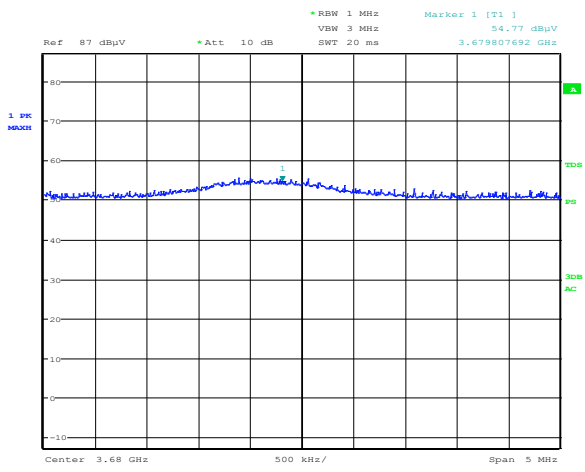


Figure 8.2-6: *4th Harmonic field strength measurement- High channel Unit*

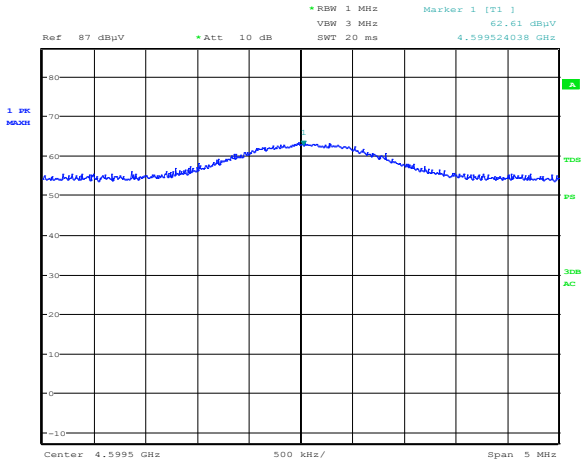


Figure 8.2-7: *5th Harmonic field strength measurement- High channel Unit*

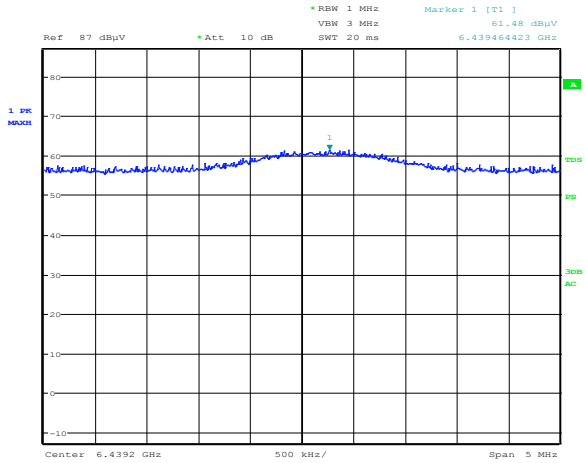


Figure 8.2-8: *7th Harmonic field strength measurement- High channel Unit*

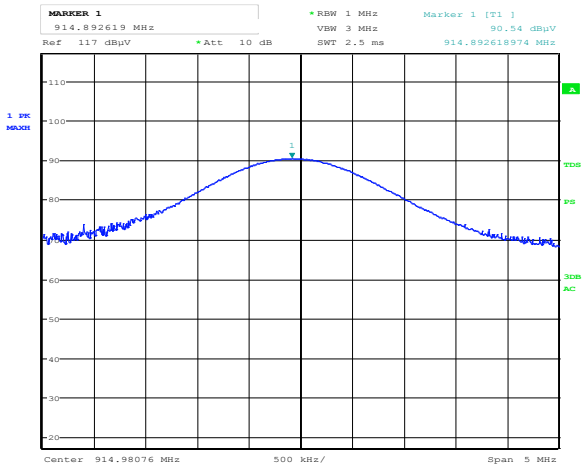


Figure 8.2-9: *Fundamental field strength measurement-Mid channel Unit*

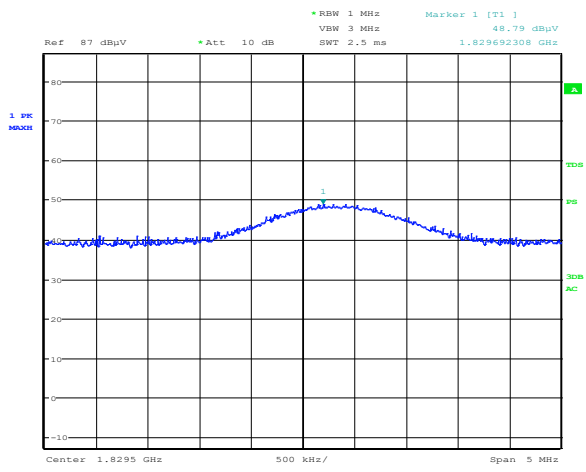


Figure 8.2-10: *2nd Harmonic field strength measurement- Mid channel Unit*

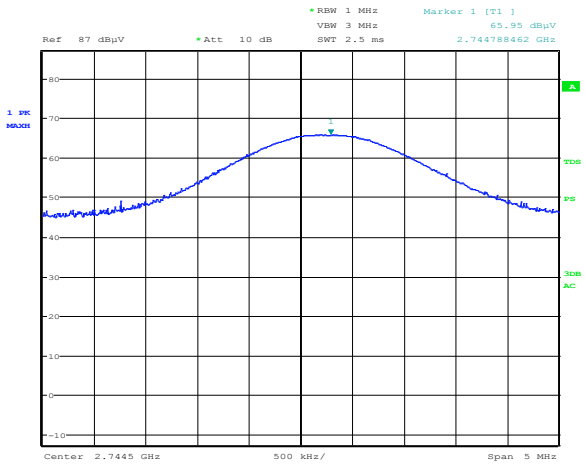


Figure 8.2-11: *3rd Harmonic field strength measurement- Mid channel Unit*

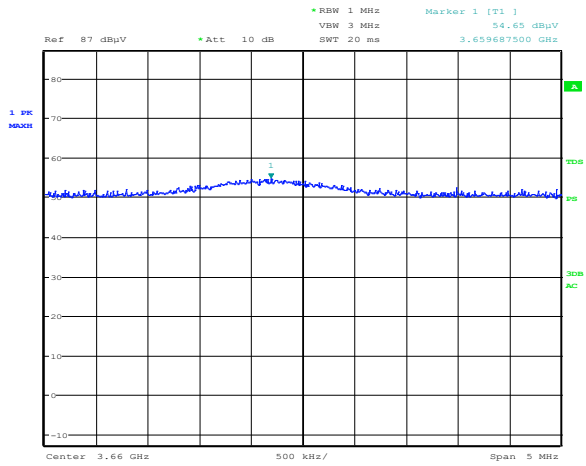


Figure 8.2-12: *4th Harmonic field strength measurement- Mid channel Unit*

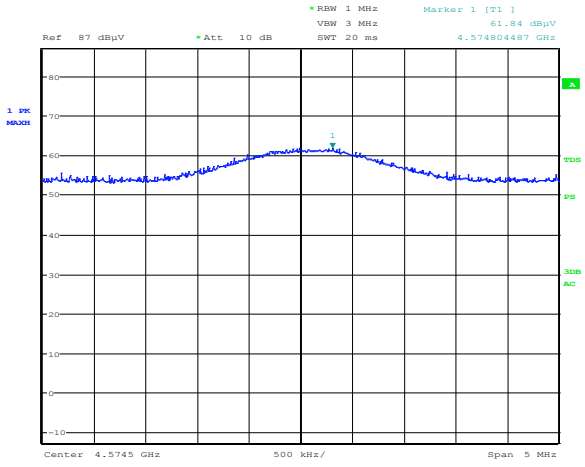


Figure 8.2-13: *5th Harmonic field strength measurement- Mid channel Unit*

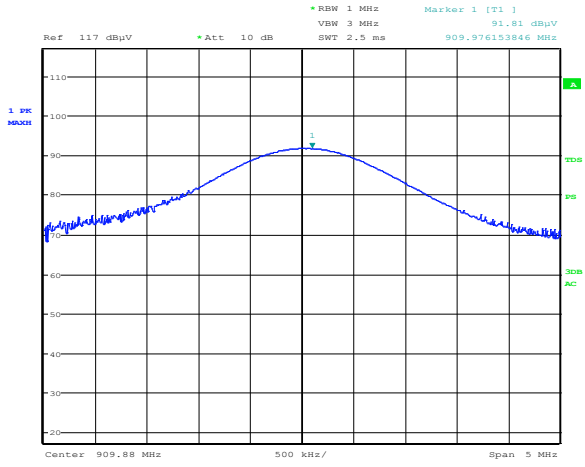


Figure 8.2-14: *Fundamental field strength measurement-Low channel Unit*

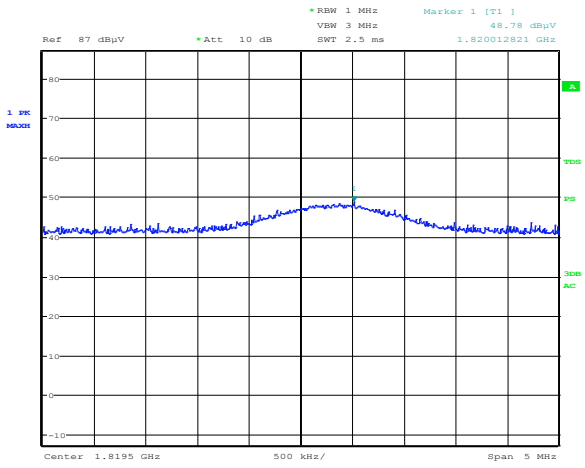


Figure 8.2-15: *2nd Harmonic field strength measurement- Low channel Unit*

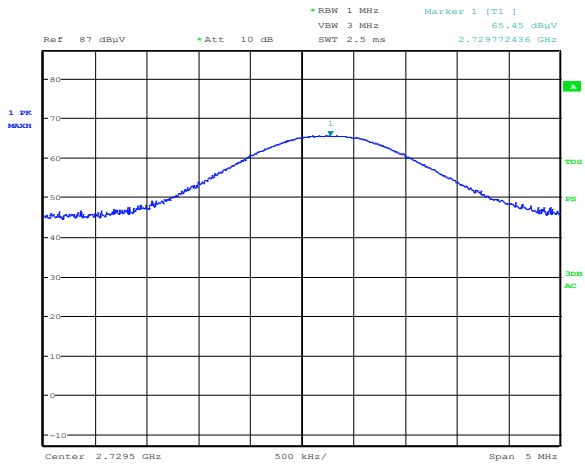


Figure 8.2-16: *3rd Harmonic field strength measurement- Low channel Unit*

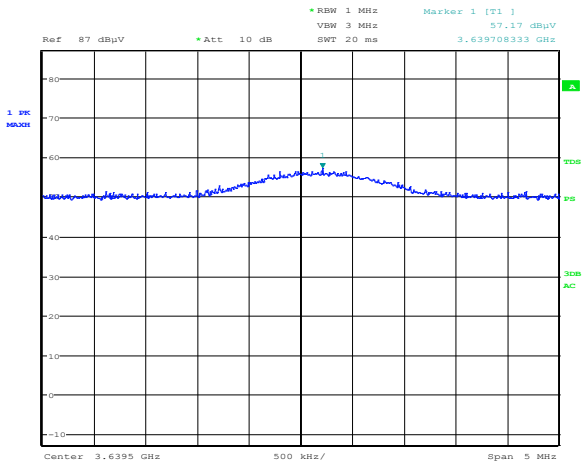


Figure 8.2-17: *4th Harmonic field strength measurement- Low channel Unit*

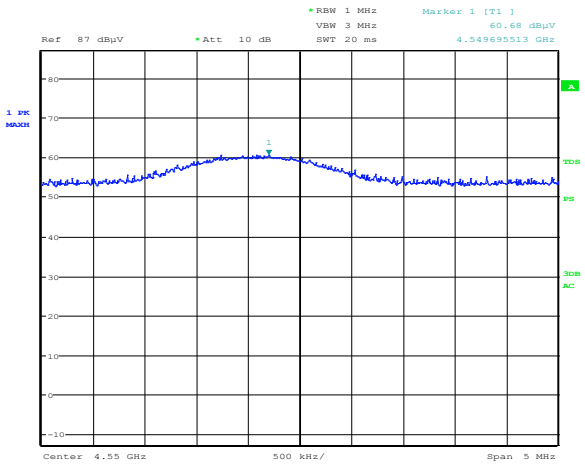


Figure 8.2-18: *6th Harmonic field strength measurement- Mid channel Unit*

8.3 FCC 15.249(d) RSS 210 A2.9(b) Spurious emissions (except for harmonics)

8.3.1 Definitions and limits

FCC:
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

IC:
Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

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: *IC 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 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

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	February 1, 2016	Temperature	23.5 °C
Test engineer	Avul Nzenza	Air pressure	1010 mbar
Verdict	Pass	Relative humidity	33 %

8.3.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
Radiated measurements were performed at a distance of 3 m
The product was scanned using horizontal and vertical antenna polarization. The maximum measured levels are provided in the report below.

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

8.3.4 Test data

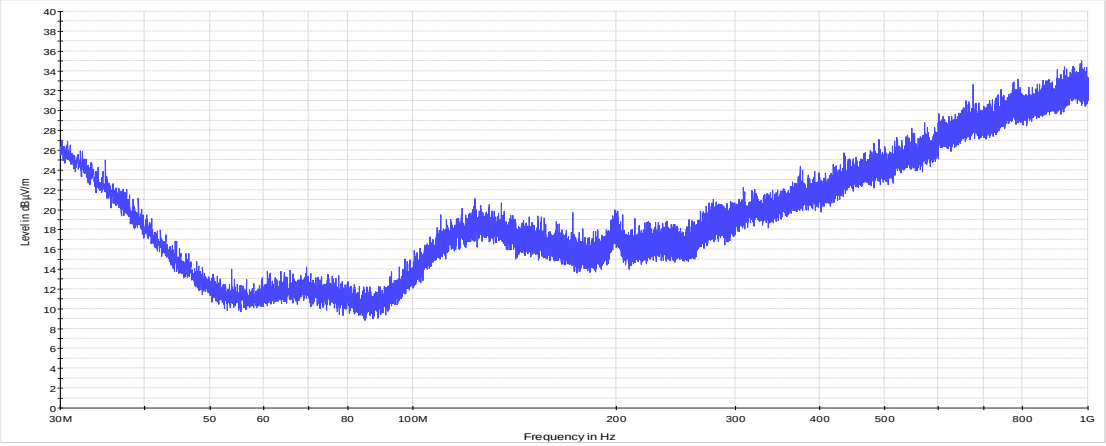


Figure 8.3-1: *Spurious emissions below 1 GHz - - High channel Unit*

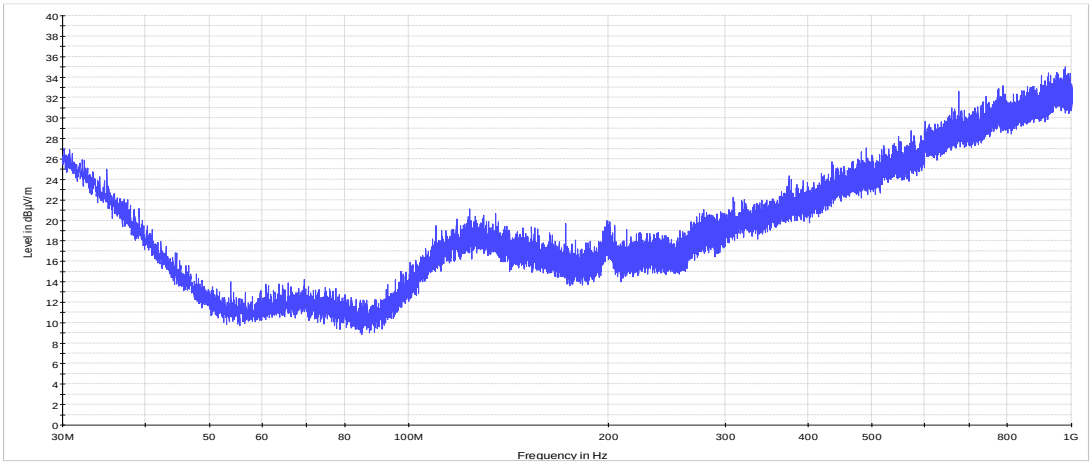


Figure 8.3 1: *Spurious emissions below 1 GHz - - Mid channel Unit*

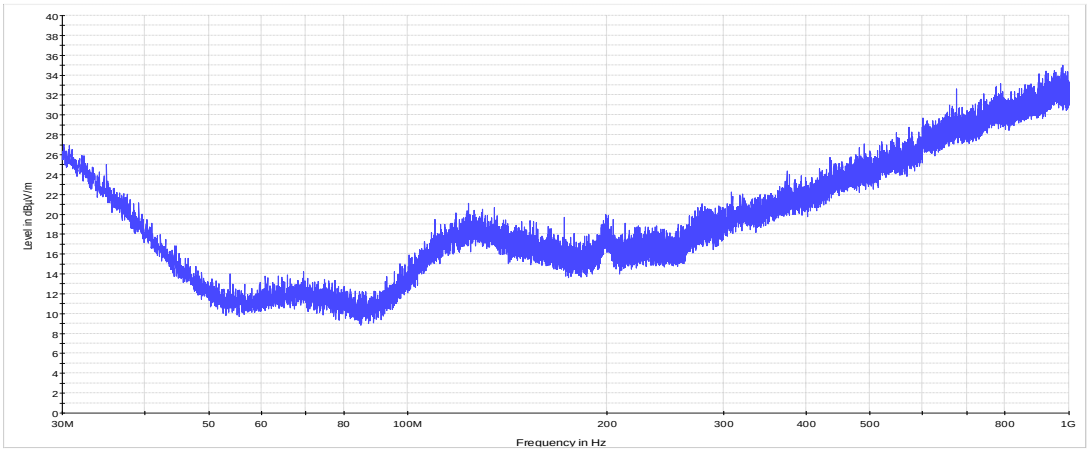


Figure 8.3-2: *Spurious emissions below 1 GHz - - Low channel Unit*

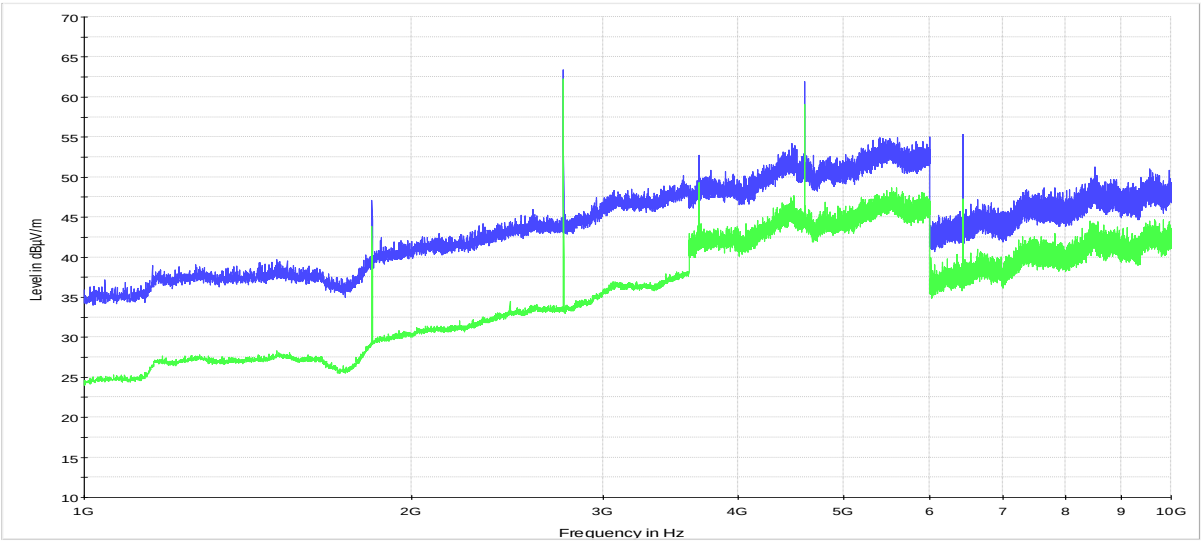


Figure 8.3-3: *Spurious emissions within 1–10 GHz- - High channel Unit*

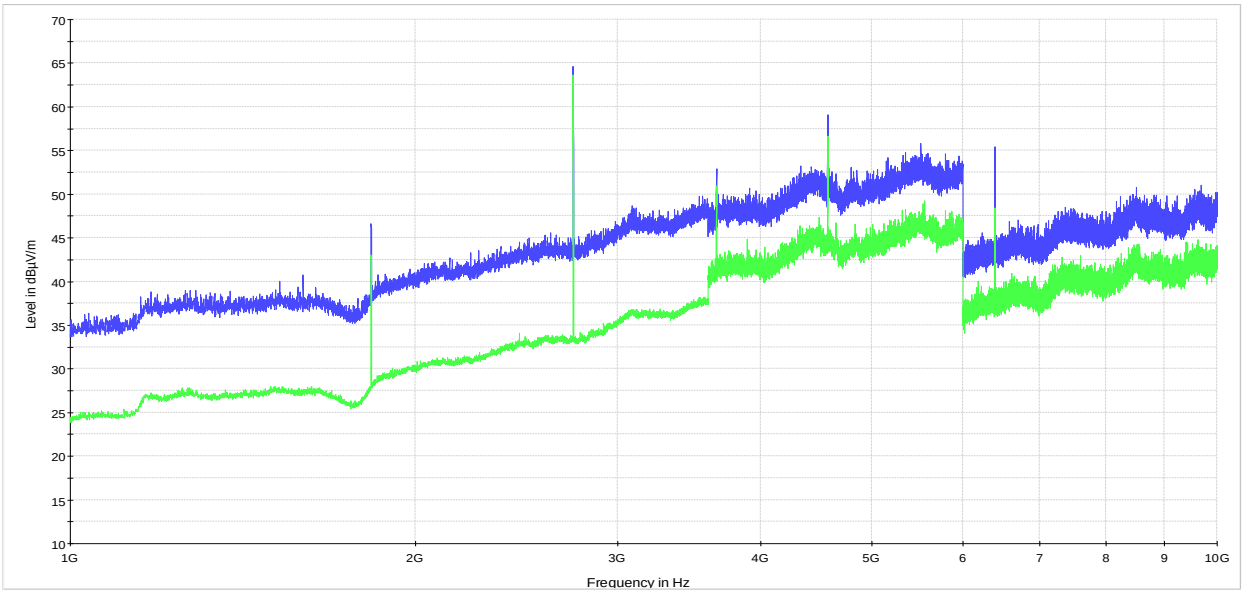


Figure 8.3-4: *Spurious emissions within 1–10 GHz- - Mid channel Unit*

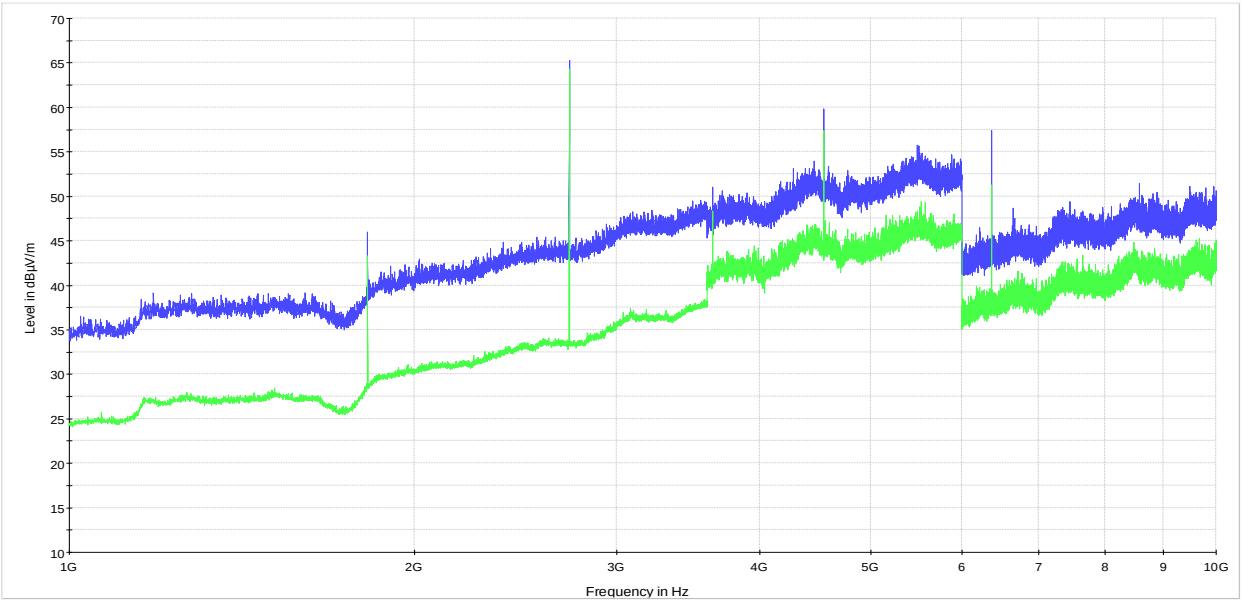


Figure 8.3-5: *Spurious emissions within 1–10 GHz- - Low channel Unit*

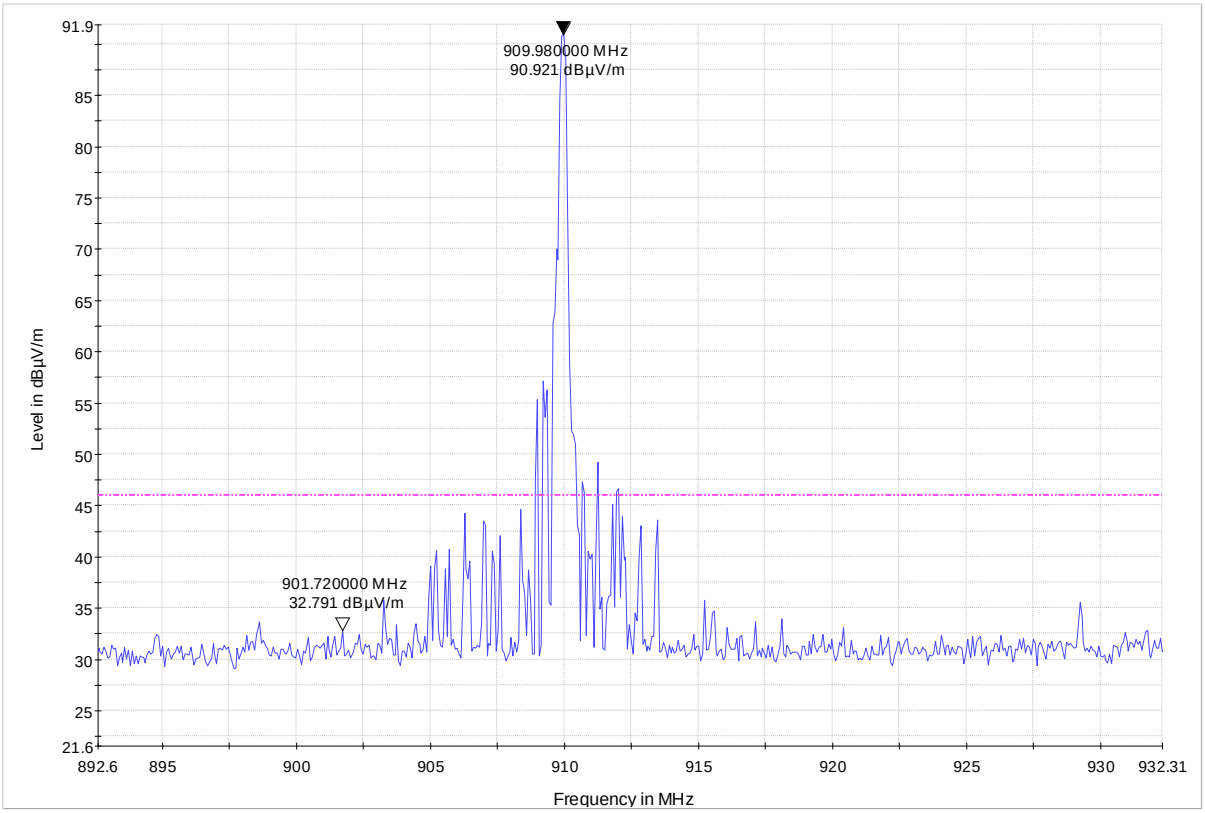


Figure 8.3-6: *Lower band edge emission at 902 MHz*

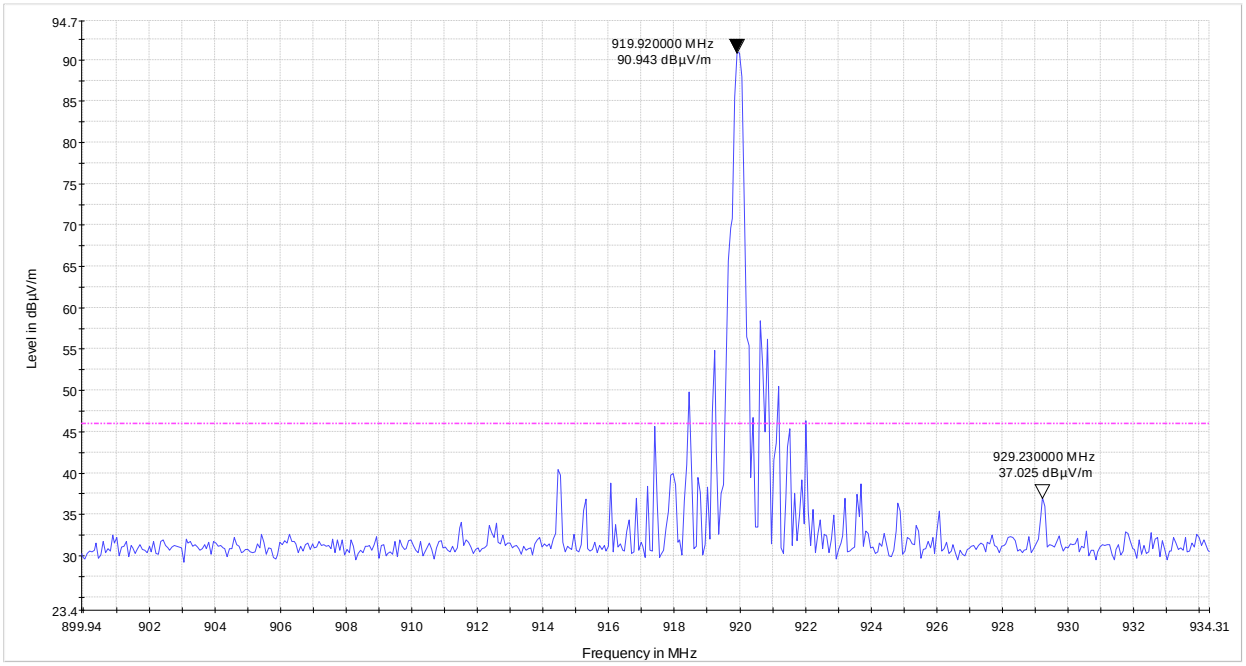
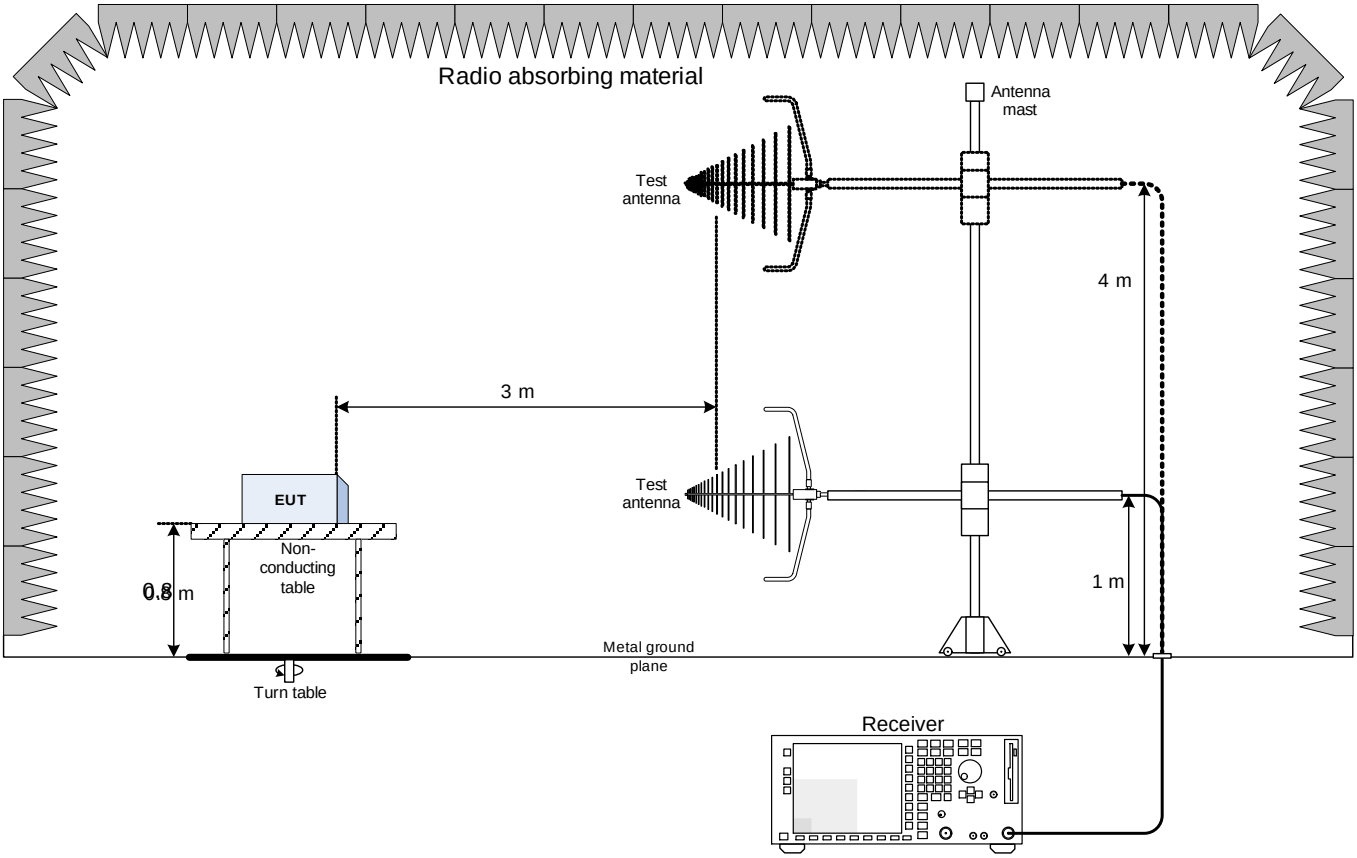
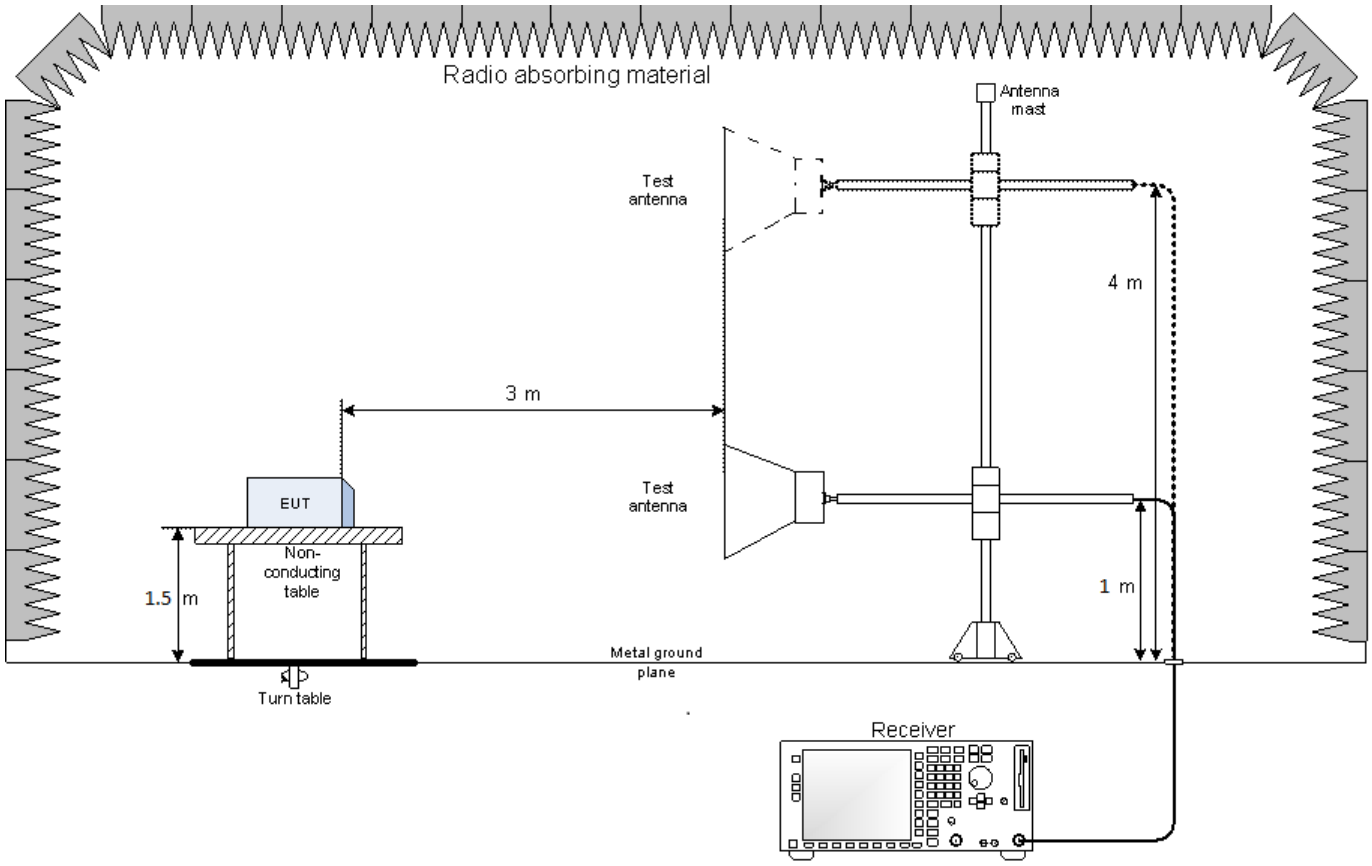


Figure 8.3-7: *Upper band edge emission at 928 MHz*

Section 9. Block diagrams of test set-ups

9.1 Radiated emissions set-up




Radio absorbing material
Antenna mast
Test antenna
4 m
3 m
Test antenna
EUT
Non-conducting table
1.5 m
1 m
Metal ground plane
Turn table
Receiver