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Test report

336973-1TRFWL

Date of issue: September 4, 2018

Applicant:

Q-Free ASA

Product:

UHF base station

Model:

ITS950

FCC ID:

2AO69-950A

IC Registration number:

3610A-950A

Specifications:

- FCC 47 CFR Part 15 Subpart C, §15.247

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

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

  Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) Devices

Test location

Company name	Nemko Canada Inc.
Address	303 River Road
City	Ottawa
Province	Ontario
Postal code	K1V 1H2
Country	Canada
Telephone	+1 613 737 9680
Facsimile	+1 613 737 9691
Toll free	+1 800 563 6336
Website	www.nemko.com
Site number	FCC: CA2040; IC: 2040A-4 (3 m semi anechoic chamber)

Tested by	Kevin Rose, Wireless/EMC Specialist
Reviewed by	Andrey Adelberg, Senior Wireless/EMC Specialist
Review date	September 4, 2018
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

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Section 1. Report summary

1.1 Applicant and manufacturer

Company name	Q-Free ASA
Address	Strindfjordveien 1
City	RANHEIM
Province/State	–
Postal/Zip code	7053
Country	Norway

1.2 Test specifications

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

1.3 Test methods

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

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	Pass
§15.31(e)	Variation of power source	Pass[1]
§15.203	Antenna requirement	Pass[2]

Notes:[2] The Antennas is professionally installed using a reverse SMA connector the AC power variation statement

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	Pass
§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 applicable
§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	Pass
§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	Not applicable
§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 applicable
§15.247(f)	Time of occupancy for hybrid systems	Not applicable

Table 2.2-1: RSS-Gen results

Part	Test description	Verdict
7.3	Receiver radiated emission limits	Not applicable
7.4	Receiver conducted emission limits	Not applicable
6.9	Operating bands and selection of test frequencies	Pass
8.8	AC power-line conducted emissions limits	Pass

Notes: [1] 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.
EUT is an AC powered device.

2.3 IC RSS-247, Issue 2, test results

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

Notes: None

Section 3. Equipment under test (EUT) details

3.1 Sample information

Receipt date	September 27, 2017
Nemko sample ID number	1 and 2

3.2 EUT information

Product name	ITS 950 UHF base station
Model	ITS950
Serial number	00000010
Part number	A24BS001

3.3 Technical information

Applicant IC company number	3610A
IC UPN number	950A
All used IC test site(s) Reg. number	2040A-4
RSS number and Issue number	RSS-247 Issue 2, February 2017
Frequency band	902–928 MHz
Frequency Min (MHz)	902.055
Frequency Max (MHz)	927.95
RF power Min (W)	N/A
RF power Max (W), Conducted	(0.0091) 9.59 dBm
Field strength, Units @ distance	N/A
Measured BW (kHz) (20 dB) FHSS	4.12
Calculated BW (kHz), as per TRC-43	N/A
Type of modulation	FSK
Emission classification (F1D, G1D, D1D)	F1D
Transmitter spurious, Units @ distance	2745.15 MHz 52.25 dBµV/m @ 3 m
Power requirements	120 V_{AC} 60 Hz
Antenna information	Laird FG9023 with 5.14 dBi gain omni, and 3 dBi internal. The EUT uses a unique antenna coupling/ non-detachable antenna to the intentional radiator.

3.4 Product description and theory of operation

UHF base station receives message and forwards message from a back-office system

3.5 EUT exercise details

EUT was connected to Laptop transmit settings were set using Tera Term.

3.6 EUT setup diagram

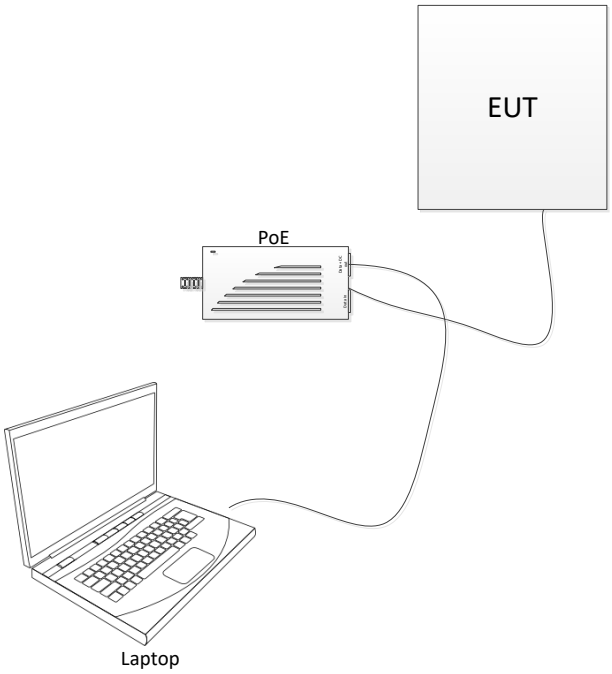


Figure 3.6-1: ***Setup diagram***

3.7 EUT sub assemblies

Table 3.7-1: ***EUT support equipment***

Description	Brand name	Model number	Serial number
Laptop	Thinkpad	T550	NA
Power supply 48 Vdc POE	CINCON	TRG60A	000029

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	FA002047	1 year	Dec. 9/18
Flush mount turntable	Sunol	FM2022	FA002082	—	NCR
Controller	Sunol	SC104V	FA002060	—	NCR
Antenna mast	Sunol	TLT2	FA002061	—	NCR
Receiver/spectrum analyzer	Rohde & Schwarz	ESU 26	FA002043	1 year	March 26/19
Bilog antenna (20–3000 MHz)	Sunol	JB3	FA002108	1 year	Oct. 1/18
Horn (1–18 GHz)	ETS-Lindgren	3117	FA002840	1 year	Jan. 7/19
AC Power source	Chenwa	2700M-10k	FA002716	—	VOU
LISN	Rohde & Schwarz	ENV216	FA002023	1 year	Aug 13/19

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.

ISED:
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	July 25, 2018	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	995 mbar
Verdict	Pass	Relative humidity	55 %

8.1.3 Observations, settings and special notes

The EUT was set up as tabletop configuration.

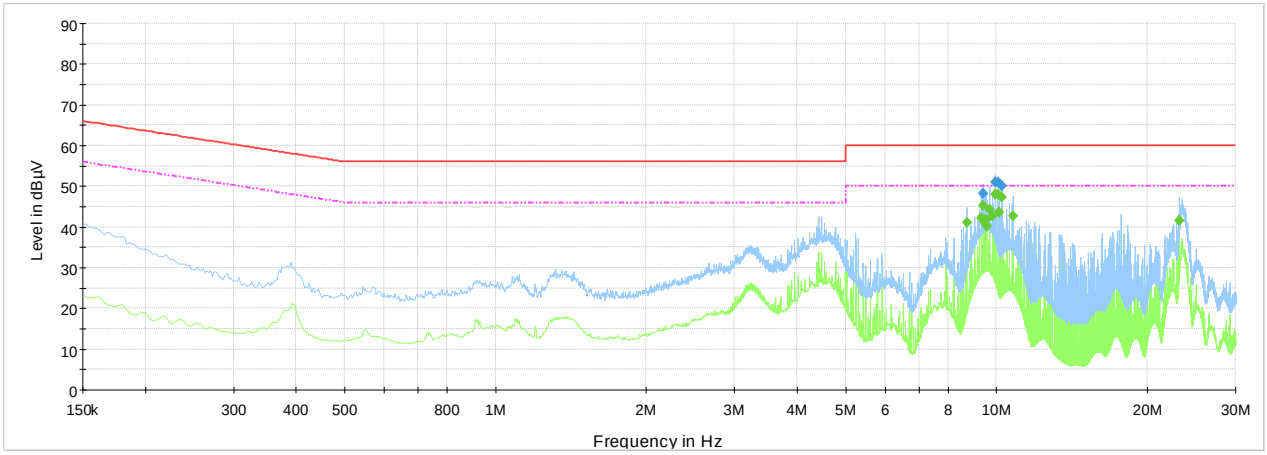
The spectral scan has been corrected with transducer factors (i.e. cable loss, LISN factors, and attenuators) for determination of compliance.

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.

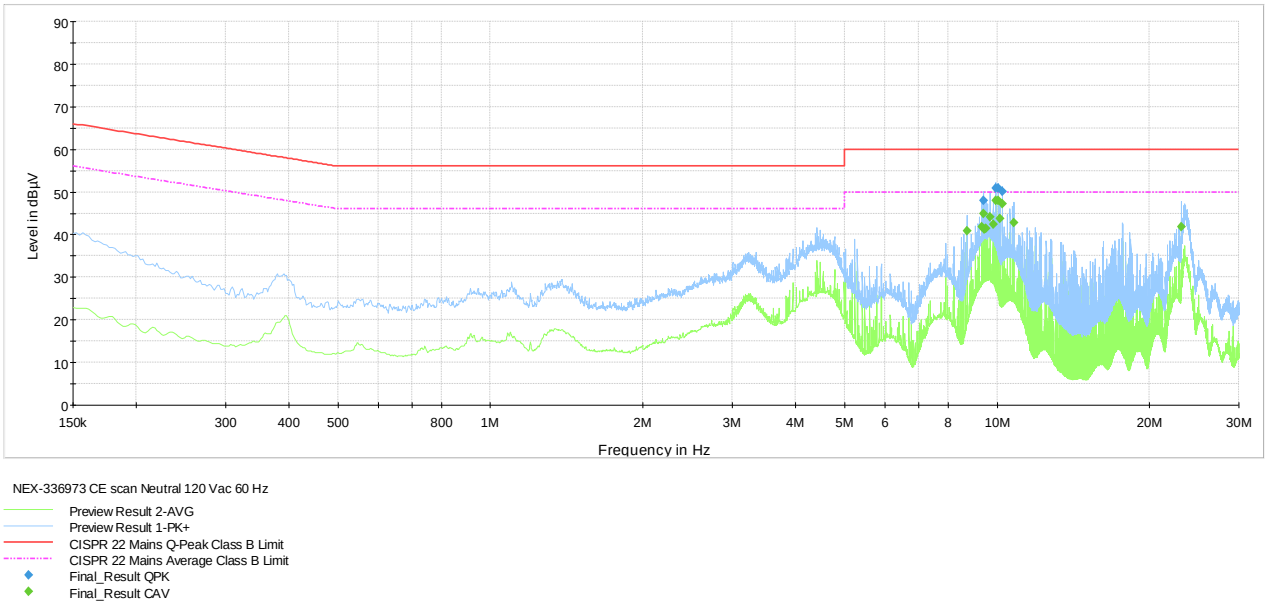
Test receiver settings:

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***



Plot 8.1-2: ***Conducted emissions on neutral line***

8.2 FCC 15.247(a)(1) and RSS-247 5.1(1) Frequency Hopping Systems requirements

8.2.1 Definitions and limits

FCC:

(1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(i) For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

IC:

1. The bandwidth of a frequency hopping channel is the −20 dB emission bandwidth, measured with the hopping stopped. The system's radio frequency (RF) bandwidth is equal to the channel bandwidth multiplied by the number of channels in the hopset. The hopset shall be such that the near-term distribution of frequencies appears random, with sequential hops randomly distributed in both direction and magnitude of change in the hopset, whereas the long-term distribution appears evenly distributed.
2. FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the −20 dB bandwidth of the hopping channel, whichever is greater. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.
3. For FHSs in the band 902–928 MHz: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 20-second period. If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping channels and the average time of occupancy on any channel shall not be greater than 0.4 seconds within a 10-second period. The maximum 20 dB bandwidth of the hopping channel shall be 500 kHz.

8.2.2 Test summary

Test date	February 21, 2018	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	995 mbar
Verdict	Pass	Relative humidity	55 %

8.2.3 Observations, settings and special notes

Spectrum analyser settings for carrier frequency separation:

Resolution bandwidth	≥ 1 % of the span
Video bandwidth	≥ RBW
Frequency span	wide enough to capture the peaks of two adjacent channels
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for number of hopping frequencies:

Resolution bandwidth	≥ 1 % of the span
Video bandwidth	≥ RBW
Frequency span	the frequency band of operation
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for time of occupancy (dwell time):

Resolution bandwidth	1 MHz
Video bandwidth	≥ RBW
Frequency span	Zero span
Detector mode	Peak
Trace mode	Max Hold

Spectrum analyser settings for 20 dB bandwidth:

Resolution bandwidth	≥ 1% of the 20 dB bandwidth
Video bandwidth	≥ RBW
Frequency span	approximately 2 to 3 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: ***20 dB bandwidth results***

20 dB bandwidth, kHz	Limit, kHz	Margin, kHz
4.1	500.0	495.9

Table 8.2-2: ***Carrier frequency separation results***

Carrier frequency separation, kHz	Minimum limit*, kHz	Margin, kHz
49.9	25	24.9

Note: minimum limit is 25 kHz or 20 dB BW, whichever is greater. 25 kHz.

Table 8.2-3: ***Number of hopping frequencies results***

Number of hopping frequencies	Minimum limit	Margin
900	50	850

Note: Customer declared number of channels

Table 8.2-4: ***Average time of occupancy results***

Dwell time of each pulse, ms	Number of pulses within period	Total dwell time within period, ms	Limit, ms	Margin, ms
75	4	300	400	100

Measurement Period is 20 s

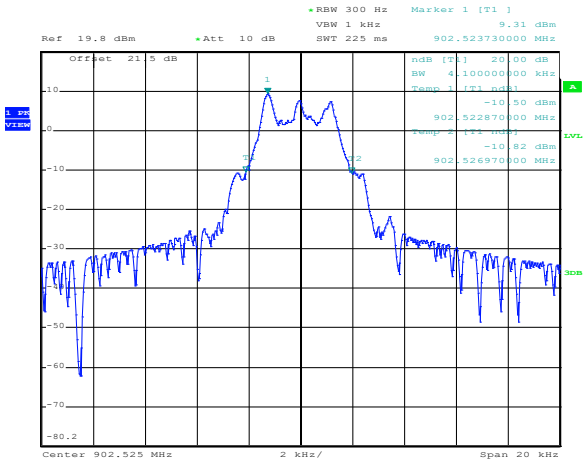


Figure 8.2-1: ***20 dB bandwidth***

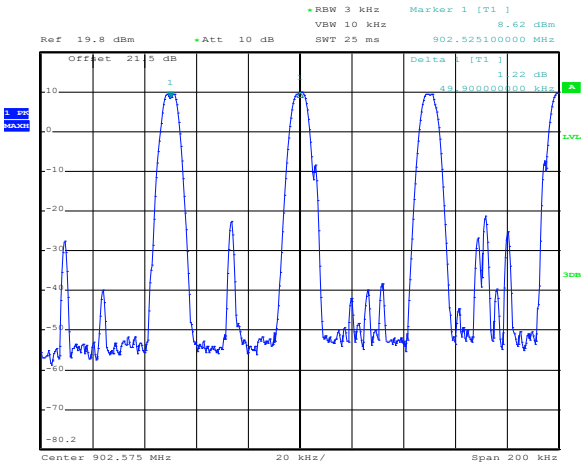


Figure 8.2-2: ***Carrier frequency separation***

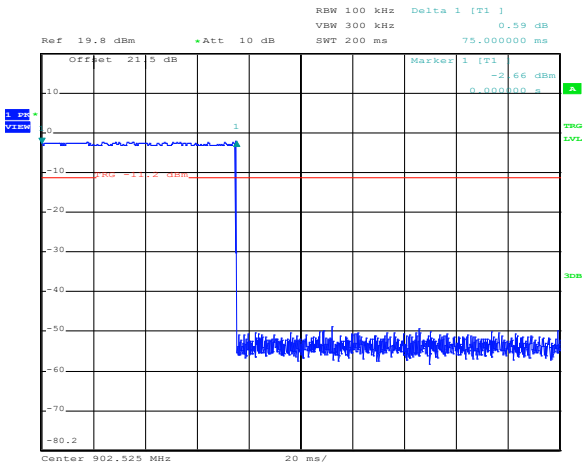


Figure 8.2-3: ***Dwell time (pulse width)***

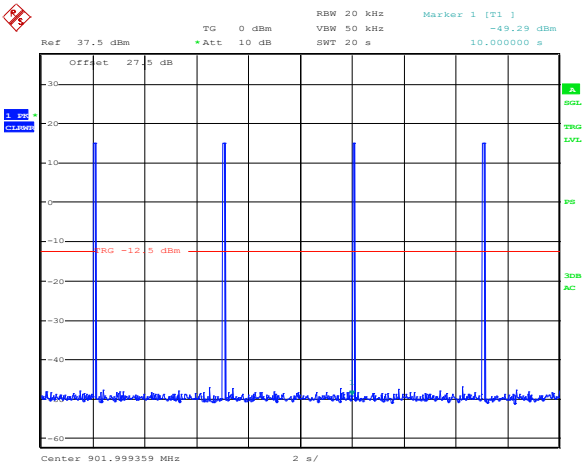


Figure 8.2-4: ***Dwell time (pulse repetition within 20 s)***

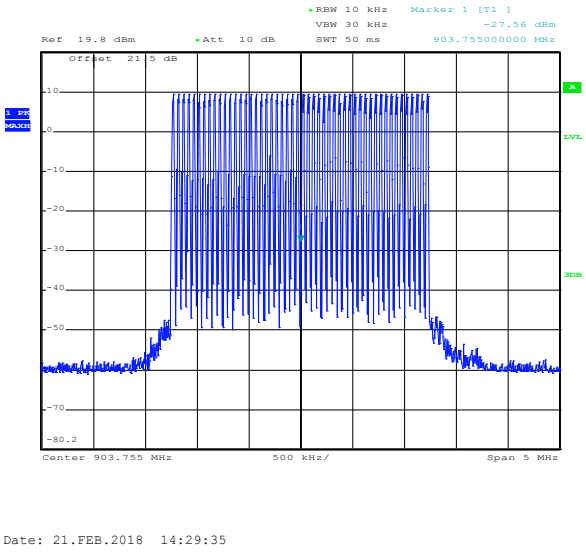


Figure 8.2-5: Number of hopping channels 50 per block, 18 blocks in spectrum

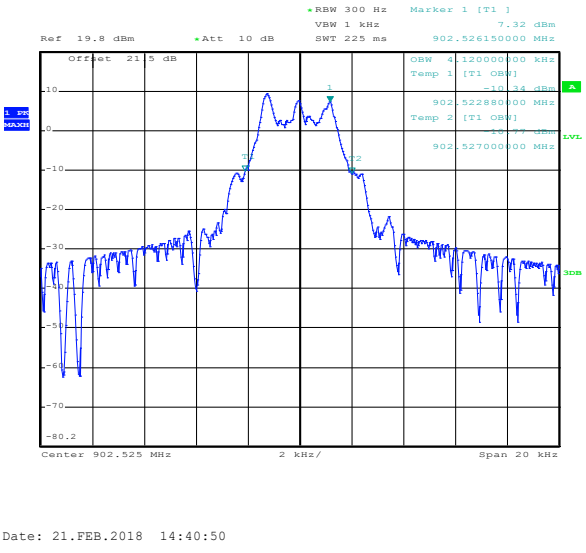


Figure 8.2-6: 99% bandwidth

Note: Customer declared there are 900 channels

a

8.3 FCC 15.247(b) and RSS-247 5.4 (1) Transmitter output power and e.i.r.p. requirements

8.3.1 Definitions and limits

FCC:

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

(2) For frequency hopping systems operating in the 902–928 MHz band: 1 watt (30 dBm) for systems employing at least 50 hopping channels; and, 0.25 watts (24 dBm) for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

(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.

IC:

For FHSs operating in the band 902–928 MHz, the maximum peak conducted output power shall not exceed 1.0 W (30 dBm), and the e.i.r.p. shall not exceed 4 W (36 dBm) if the hopset uses 50 or more hopping channels; the maximum peak conducted output power shall not exceed 0.25 W (24 dBm) and the e.i.r.p. shall not exceed 1 W (30 dBm) if the hopset uses less than 50 hopping channels.

8.3.2 Test summary

Test date	February 21, 2018	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	995 mbar
Verdict	Pass	Relative humidity	55 %

8.3.3 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

8.3.4 Test data

Table 8.3-1: ***Output power and EIRP internal antenna results***

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
902.525	9.59	30	20.41	3	12.59	36	23.41
915.000	9.13	30	20.87	3	12.13	36	23.87
925.000	8.66	30	21.34	3	11.66	36	24.34

EIRP = Output power + Antenna gain

Table 8.3-2: ***Output power and EIRP Omni antenna results***

Frequency, MHz	Output power, dBm	Output power limit, dBm	Margin, dB	Antenna gain, dBi	EIRP, dBm	EIRP limit, dBm	EIRP margin, dB
902.525	9.59	30	20.41	5.14	14.73	36	21.27
915.000	9.13	30	20.87	5.14	14.27	36	21.73
925.000	8.66	30	21.34	5.14	13.8	36	22.2

EIRP = Output power + Antenna gain

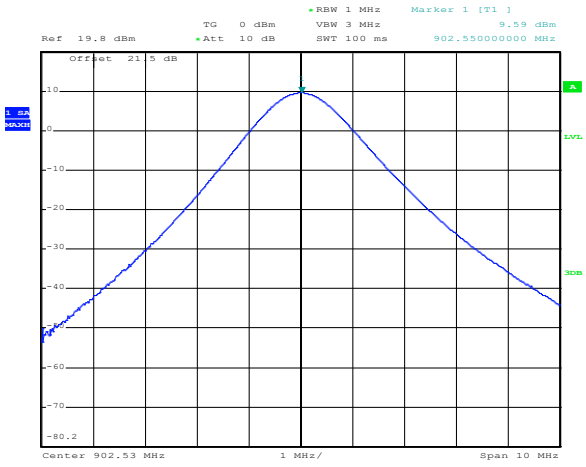


Figure 8.3-1: low channel Output power

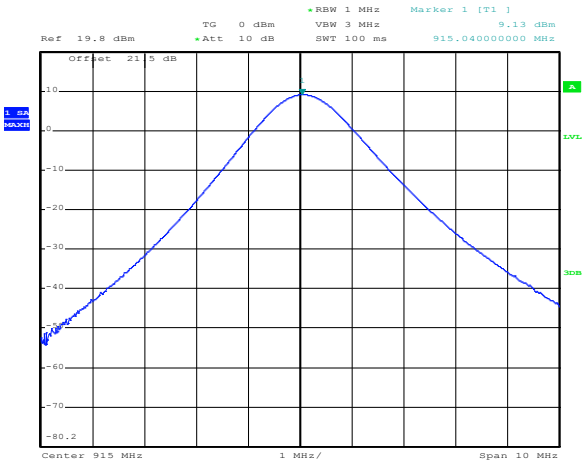


Figure 8.3-2: mid channel Output power

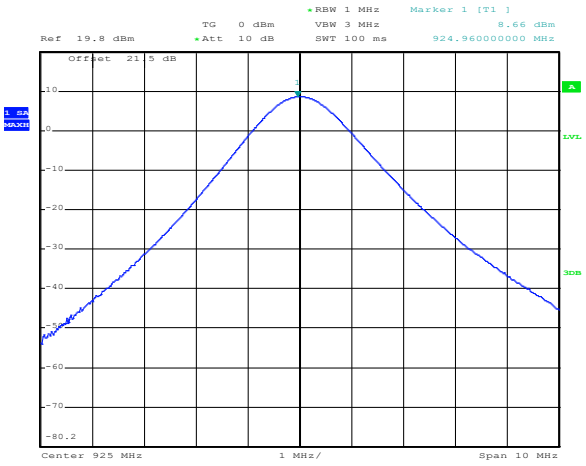


Figure 8.3-3: high channel Output power

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

8.4.1 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. 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)).

IC:
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. Attenuation below the general field strength limits specified in RSS-Gen is not required.

*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: ISED 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	5350–5460	

Note: Certain frequency bands listed in Table 8.4-2 and above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

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	February 21, 2018	Temperature	23 °C
Test engineer	Kevin Rose	Air pressure	1015 mbar
Verdict	Pass	Relative humidity	36 %

8.4.3 Observations, settings and special notes

The spectrum was searched from 30 MHz to the 10th harmonic.
EUT was transmitting was set to Low, Mid, and High
No radiated Peak emission exceeded the Average limits.

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 conducted spurious emissions measurements:

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

8.4.4 Test data

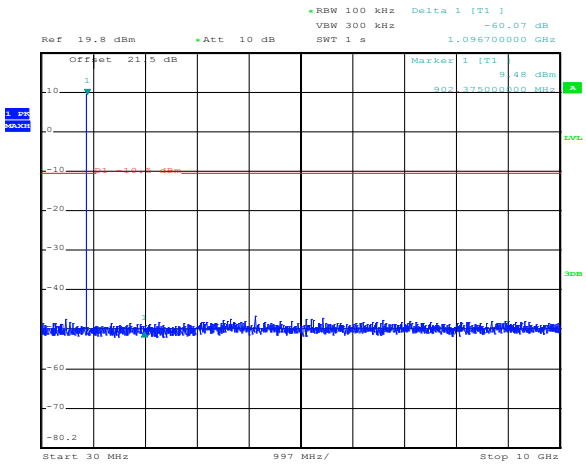


Figure 8.4-1: ***Conducted spurious emissions low channel***

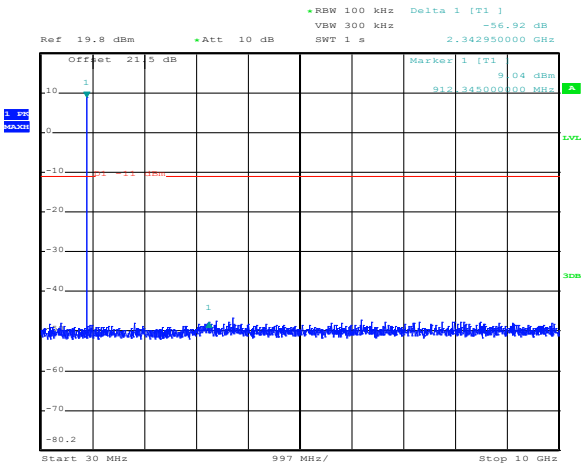


Figure 8.4-2: ***Conducted spurious emissions mid channel***

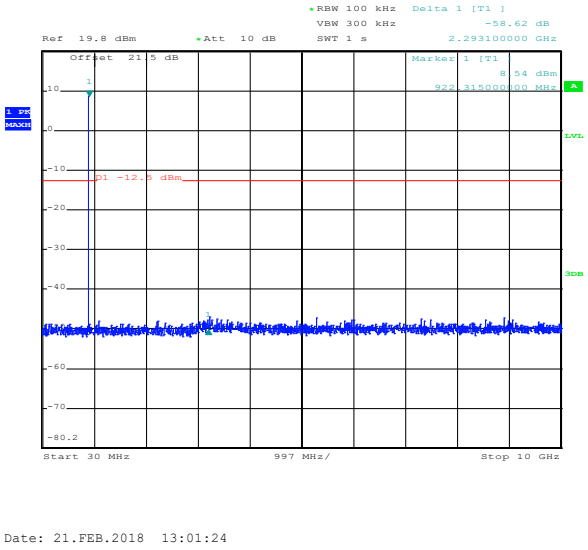
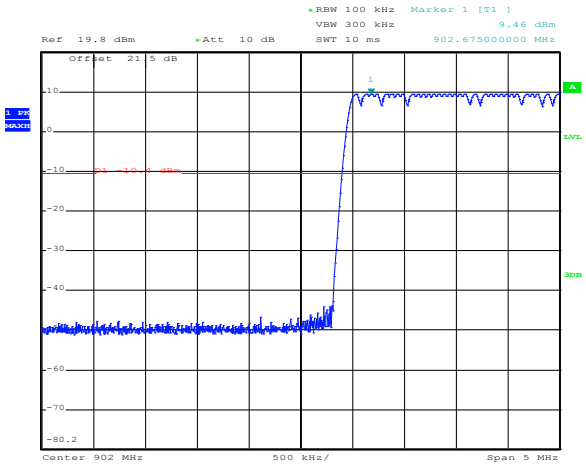
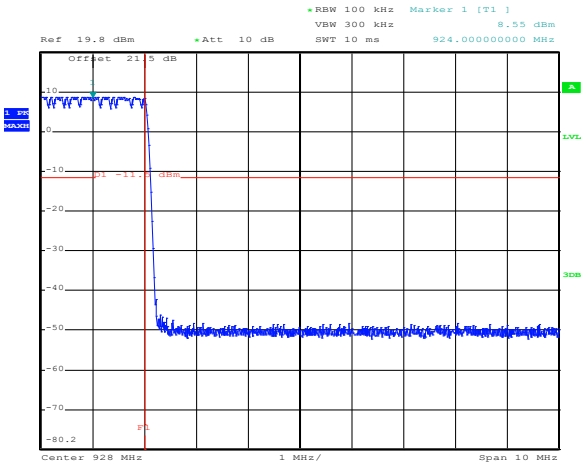


Figure 8.4-3: ***Conducted spurious emissions high channel***



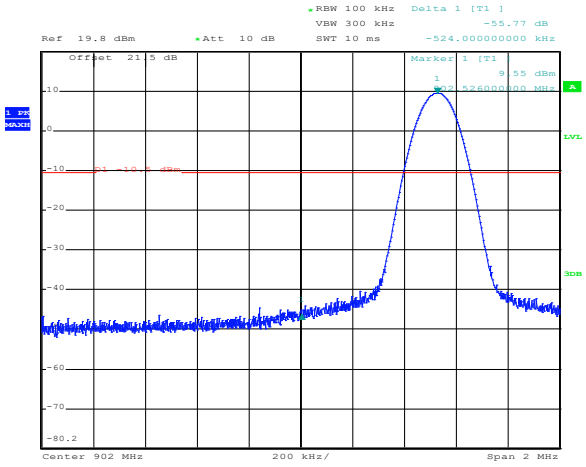
Date: 21.FEB.2018 14:20:37

Figure 8.4-4: ***Conducted spurious emissions at the lower band edge hopping***



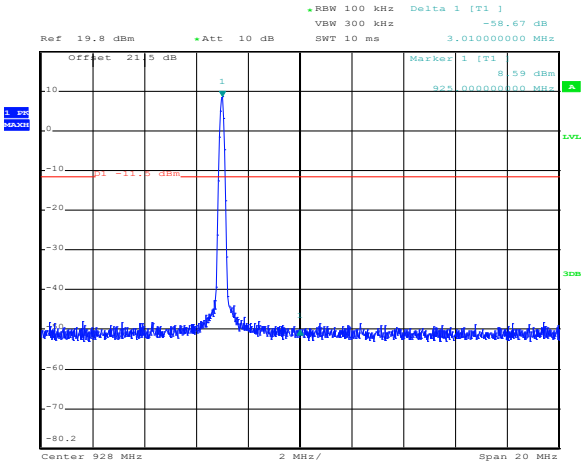
Date: 21.FEB.2018 14:18:10

Figure 8.4-5: ***Conducted spurious emissions at the upper band edge hopping***



Date: 21.FEB.2018 13:04:33

Figure 8.4-6: ***Conducted spurious emissions at the lower band edge***



Date: 21.FEB.2018 13:05:50

Figure 8.4-7: ***Conducted spurious emissions at the upper band edge***

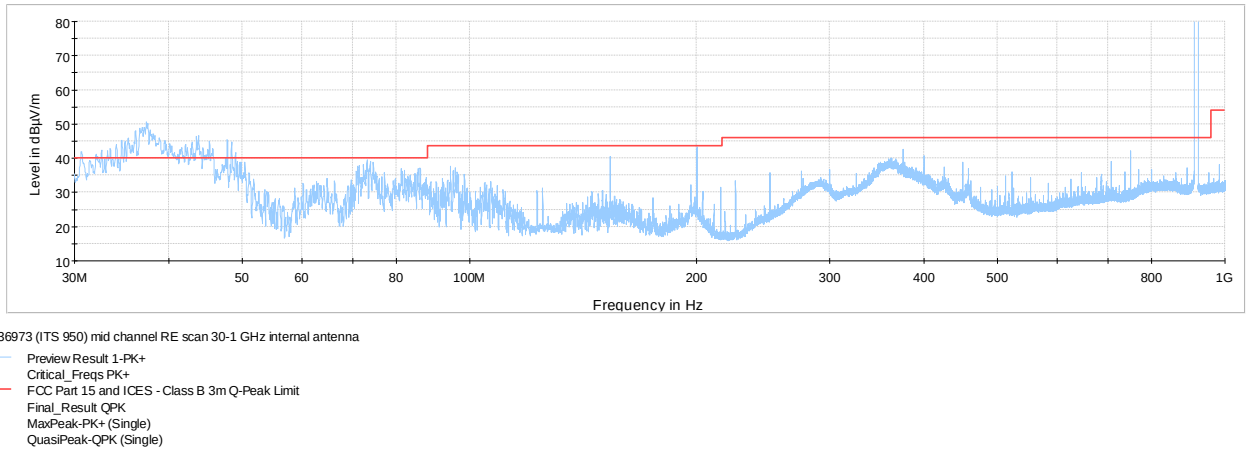


Figure 8.4-8: ***Radiated spurious emissions below 1 GHz***

Note: No transmitter related Emission exceed the General Emission limits. The EUT is a Class A digital device
Note: worst case Radiated Measurement from Low, Mid, and High measurements

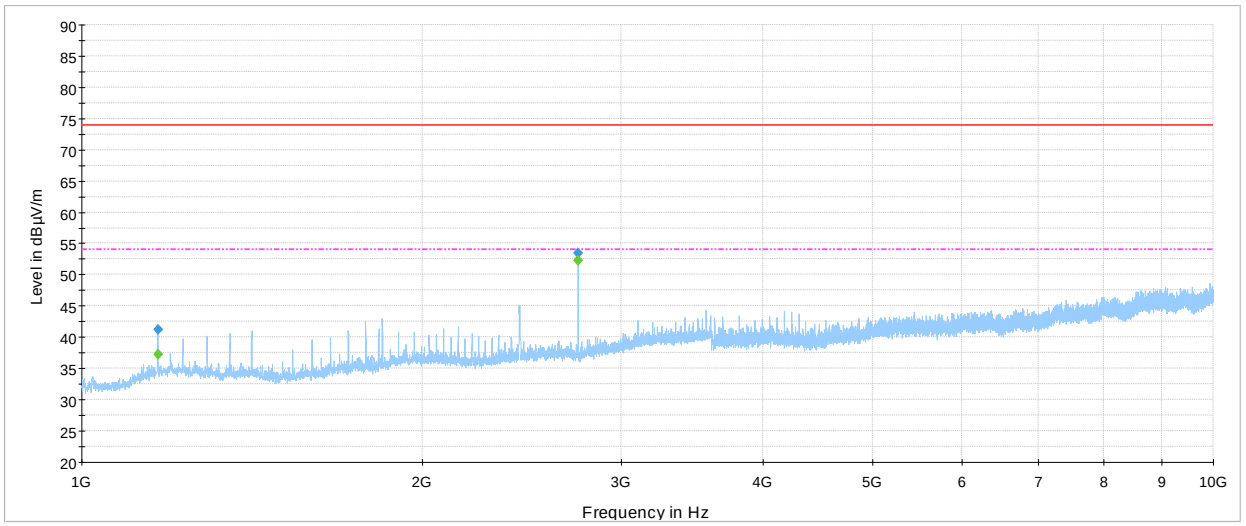


Figure 8.4-9: ***Radiated spurious emissions above 1 GHz***

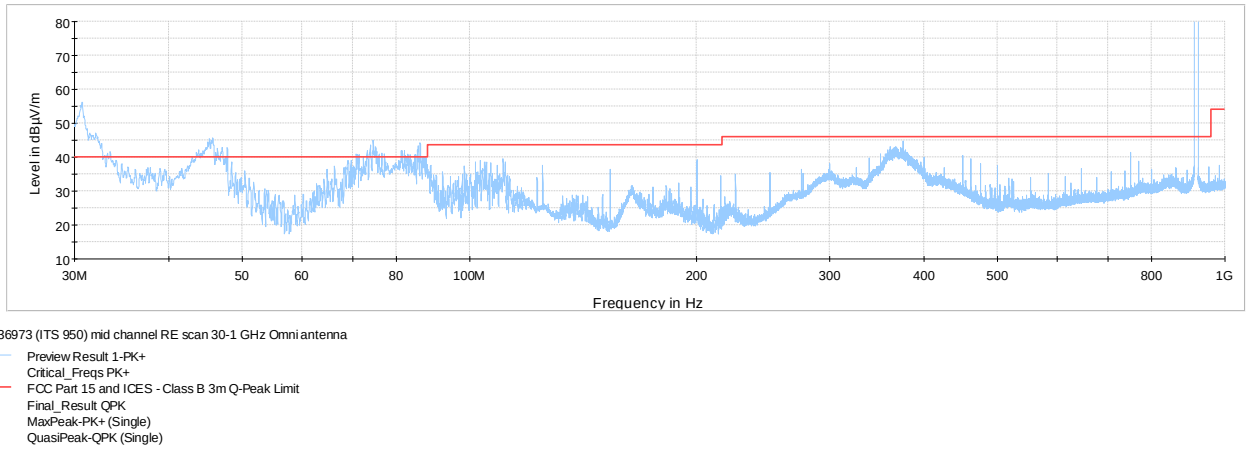


Figure 8.4-10: ***Radiated spurious emissions below 1 GHz***

Note: No transmitter related Emission exceed the General Emission limits. The EUT is a Class A digital device

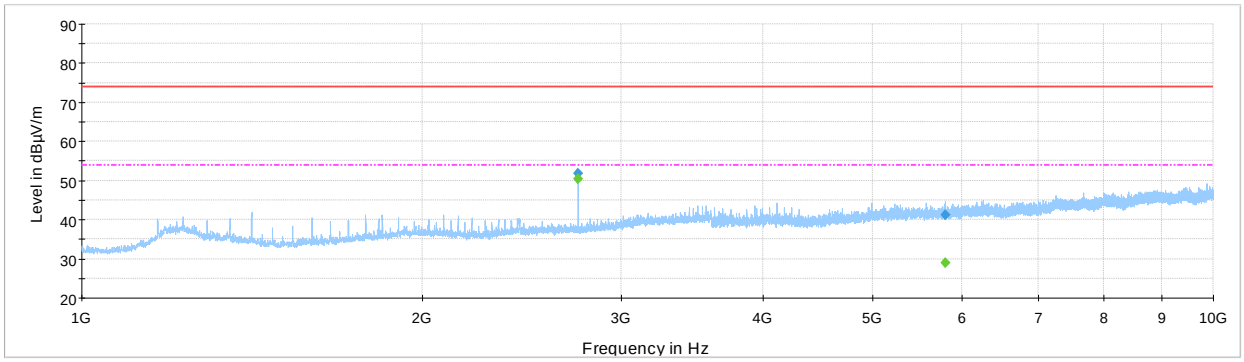
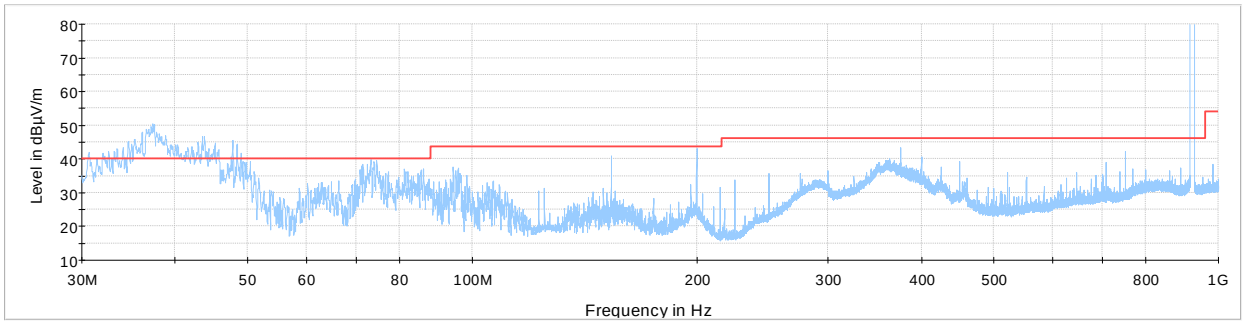


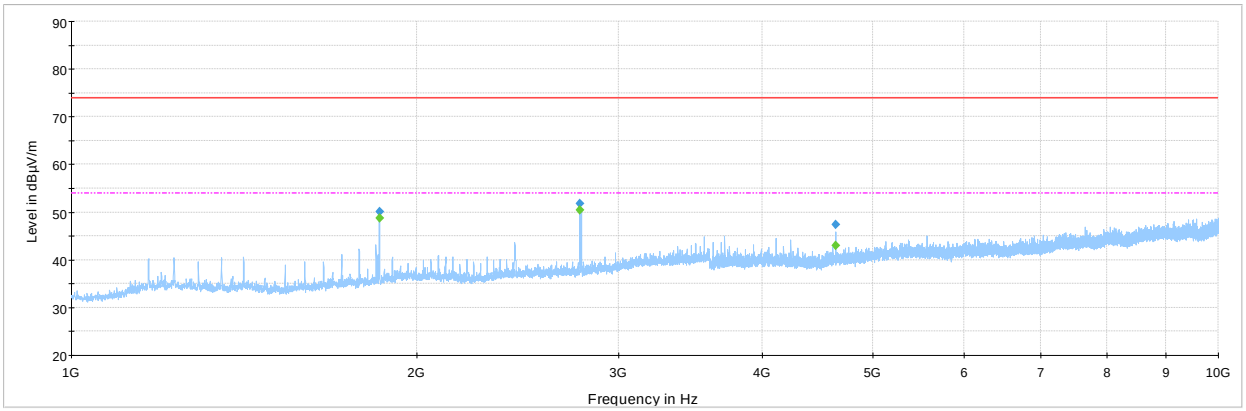
Figure 8.4-11: ***Radiated spurious emissions above 1 GHz***



NEX 336973 (ITS 950) high channel RE scan 30-1 GHz internal antenna
Preview Result 1-PK+
Critical_Freqs PK+
FCC Part 15 and ICES - Class B 3m Q-Peak Limit
Final_Result QPK
MaxPeak-PK+ (Single)
QuasiPeak-QPK (Single)

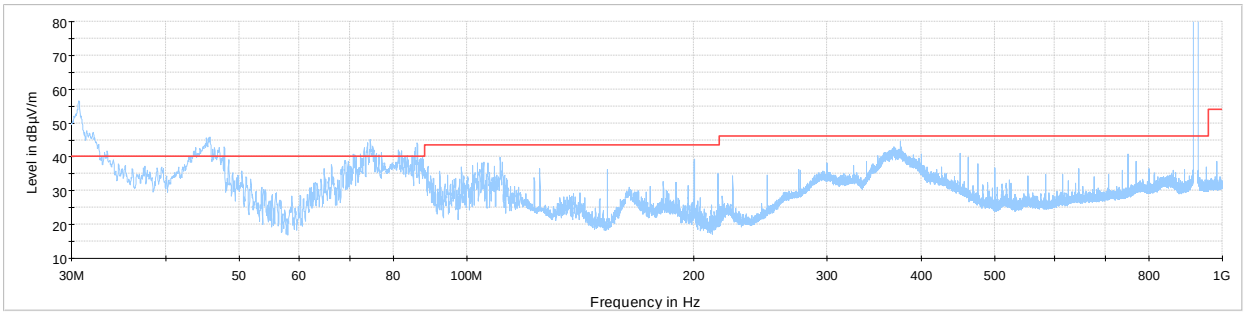
Figure 8.4-12: ***Radiated spurious emissions below 1 GHz***

Note: No transmitter related Emission exceed the General Emission limits. The EUT is a Class A digital device



NEX 336973 (ITS 950) High channel RE scan 1-10 GHz internal antenna
Preview Result 1-PK+
FCC Part 15 and ICES- Class B 3m Peak Limit
FCC Part 15 and ICES - Class B 3m Average Limit
Final_Result PK+
Final_Result CAV

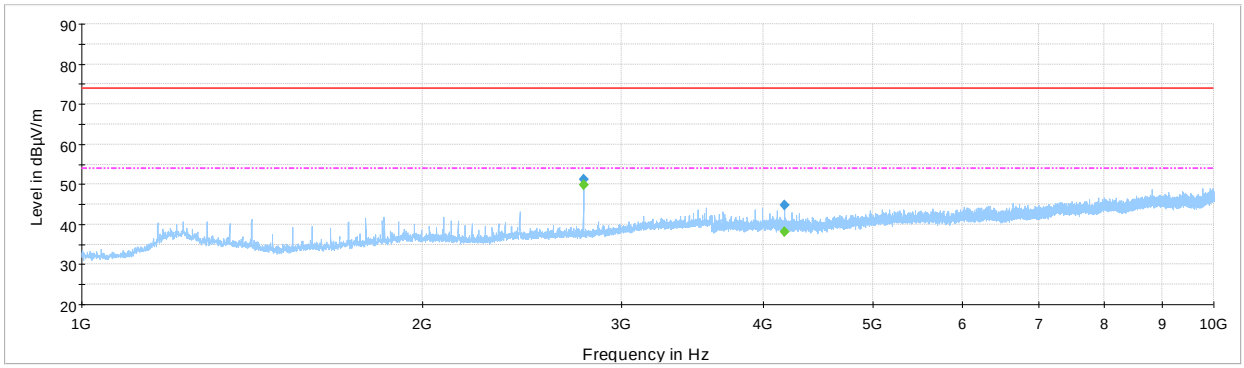
Figure 8.4-13: ***Radiated spurious emissions above 1 GHz***



NEX 336973 (ITS 950) high channel RE scan 30-1 GHz Omni antenna
Preview Result 1-PK+
Critical_Freqs PK+
FCC Part 15 and ICES - Class B 3m Q-Peak Limit
Final_Result QPK
MaxPeak-PK+ (Single)
QuasiPeak-QPK (Single)

Figure 8.4-14: ***Radiated spurious emissions below 1 GHz***

Note: No transmitter related Emission exceed the General Emission limits. The EUT is a Class A digital device



NEX 336973 (ITS 950) high channel RE scan 1-10 GHz Omni antenna
Preview Result 1-PK+
Critical_Freqs AVG
Critical_Freqs PK+
FCC Part 15 and ICES- Class B 3m Peak Limit
FCC Part 15 and ICES - Class B 3m Average Limit
Final_Result PK+
Final_Result CAV

Figure 8.4-15: ***Radiated spurious emissions above 1 GHz***

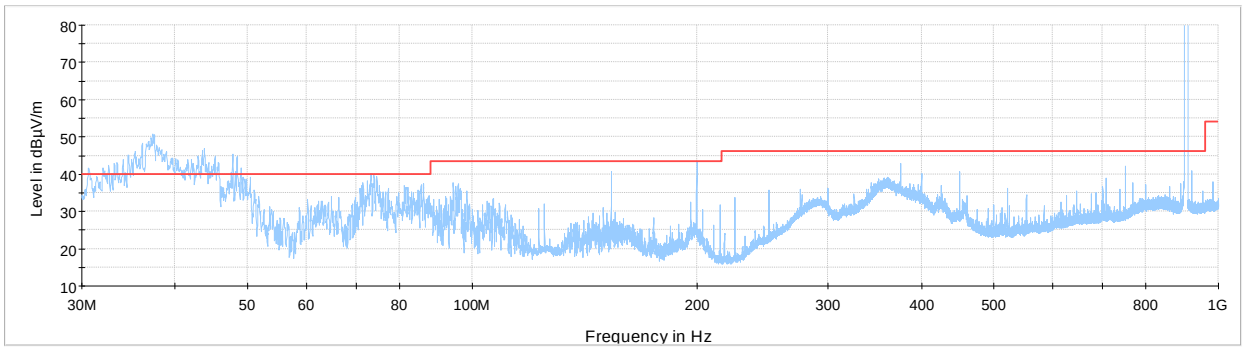


Figure 8.4-16: ***Radiated spurious emissions below 1 GHz***

Note: No transmitter related Emission exceed the General Emission limits. The EUT is a Class A digital device

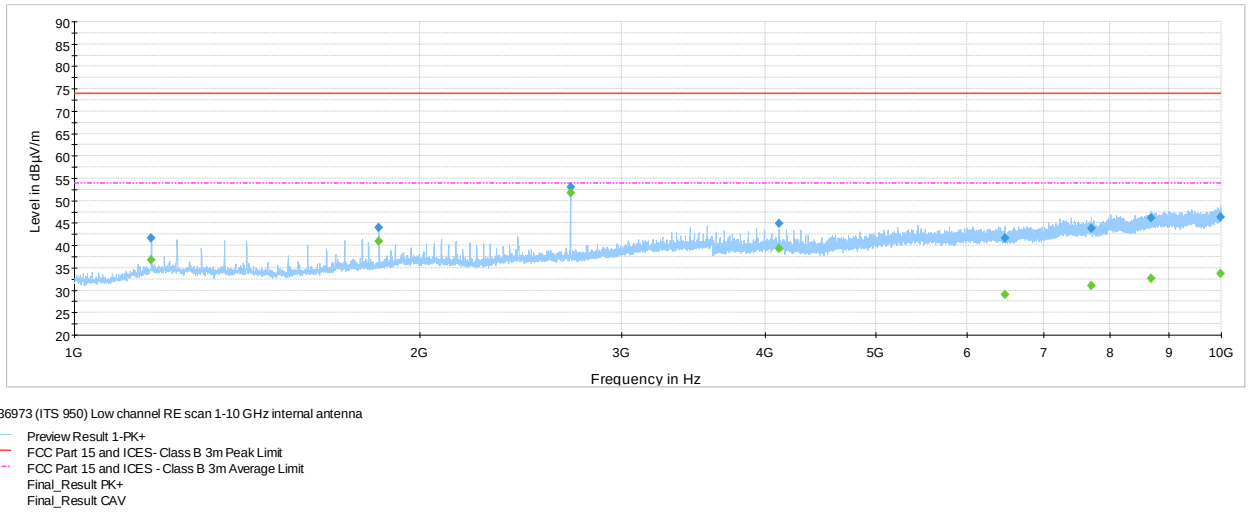


Figure 8.4-17: ***Radiated spurious emissions above 1 GHz***

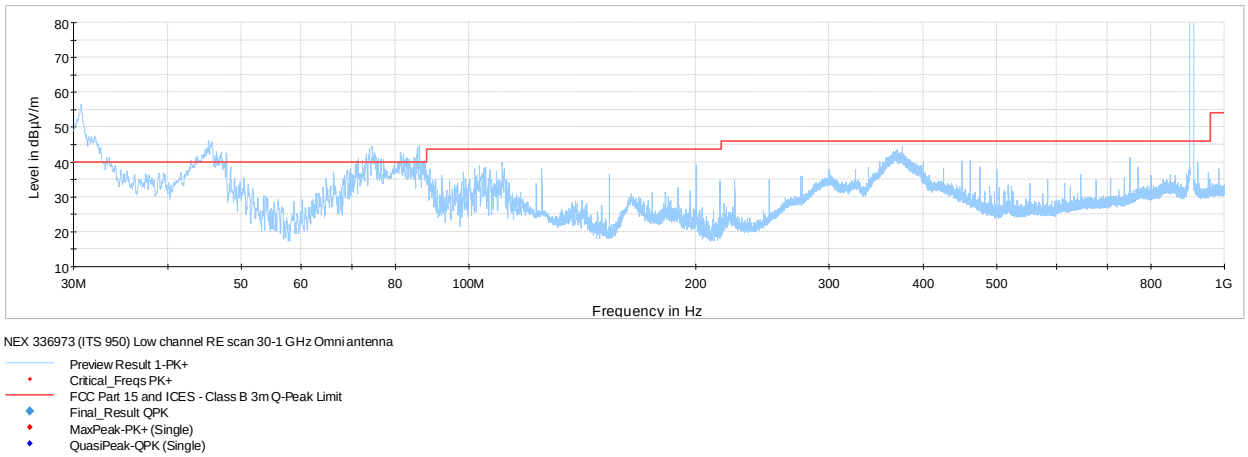


Figure 8.4-18: ***Radiated spurious emissions below 1 GHz***

Note: No transmitter related Emission exceed the General Emission limits. The EUT is a Class A digital device

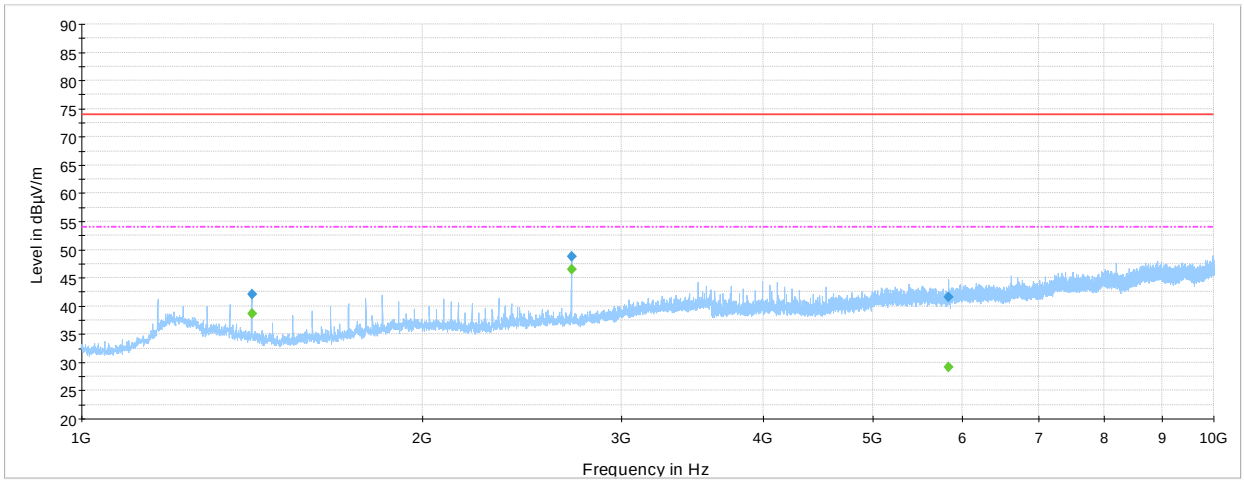
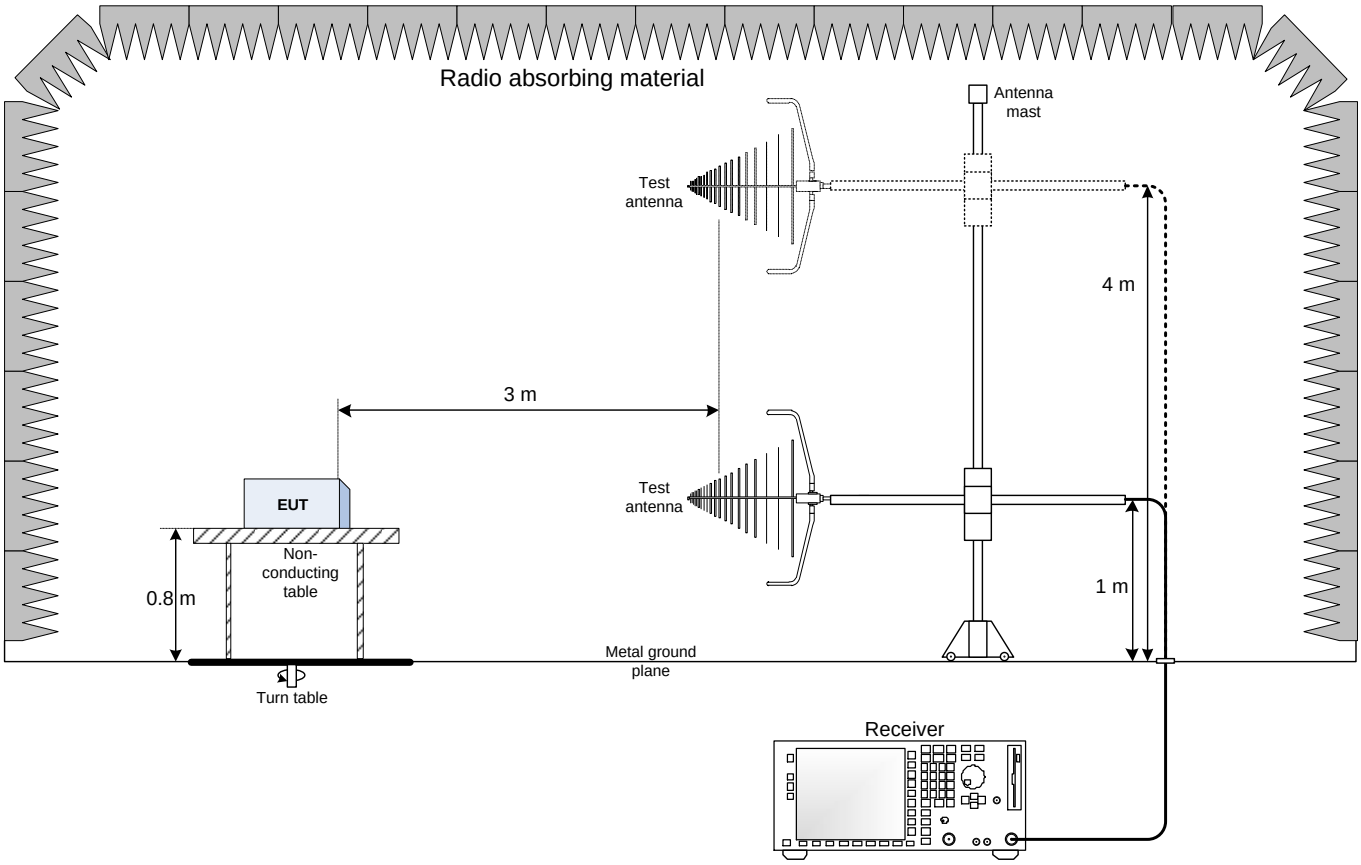


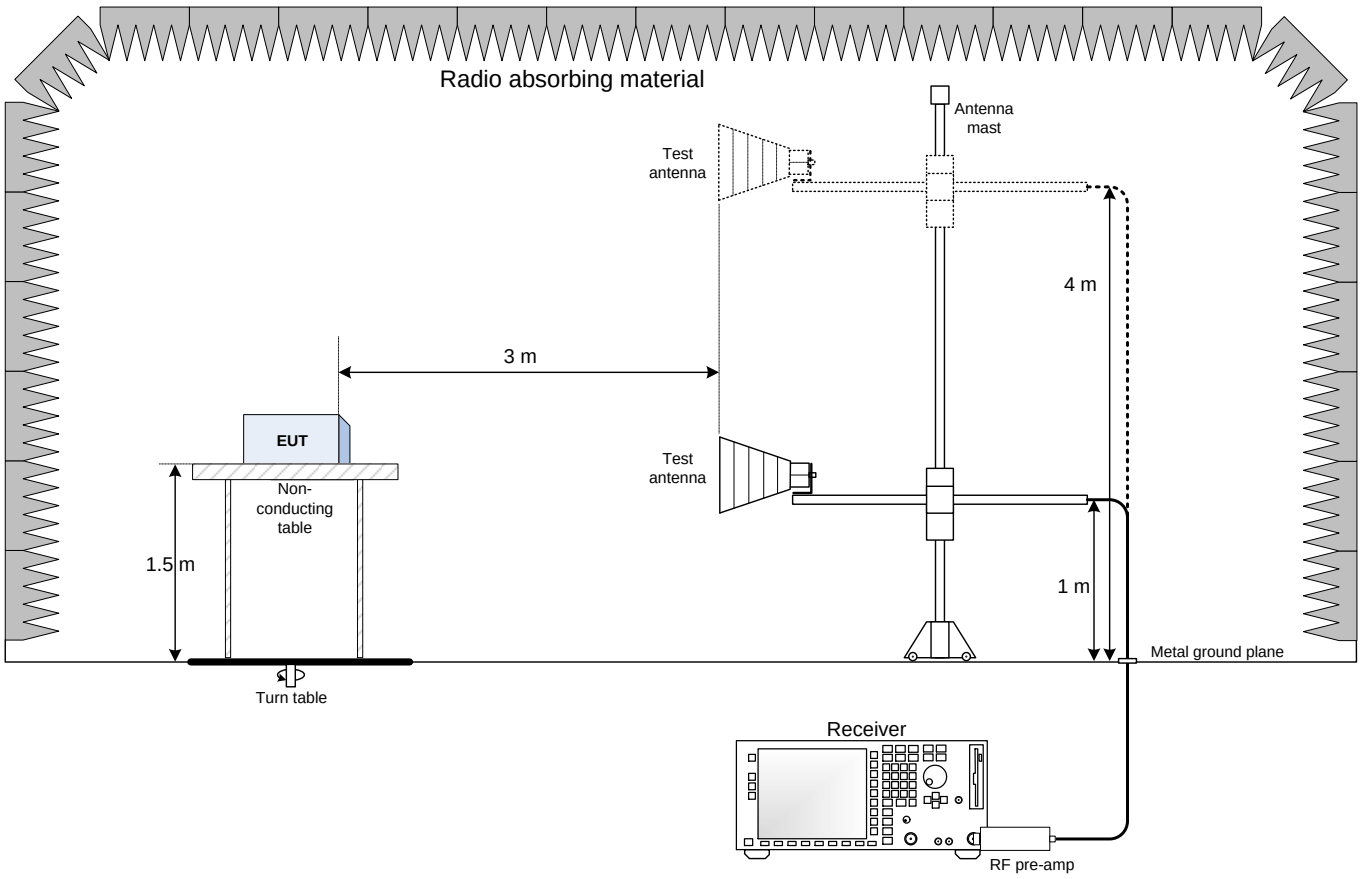
Figure 8.4-19: ***Radiated spurious emissions above 1 GHz***

Section 9. Block diagrams of test set-ups

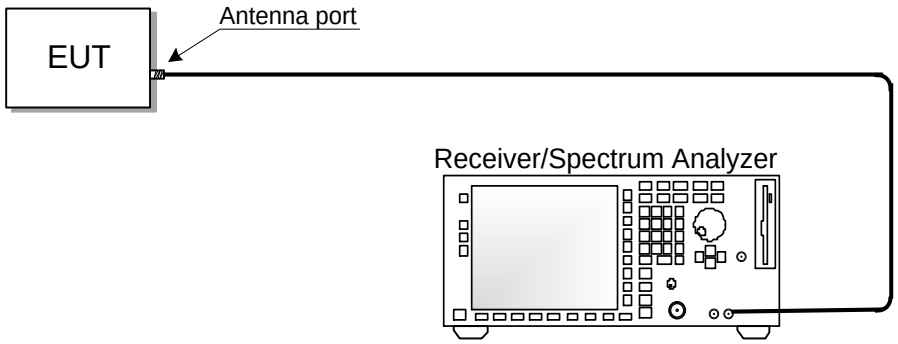
9.1 Radiated emissions set-up for frequencies below 1 GHz



9.2 Radiated emissions set-up for frequencies above 1 GHz



9.3 Conducted emissions set-up at the antenna port



9.4 Conducted emissions set-up at the AC mains port