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ELECTRICAL TESTING
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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C §15.249 and subpart B; RSS-210 Issue 9:2016; RSS-Gen Issue 5:2018, ICES-003 Issue 6:2016

FOR:

RealView Imaging Ltd.
3D Control Device
Model: HOLOSCOPE™i
FCC ID: 2AVYSRV3D001
IC: 24096-RV3D001

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.

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1 Applicant information

Client name:	RealView Imaging Ltd.
Address:	Hatnufa 4, P.O. Box 83, Industrial Zone Yokneam, Israel, 2069202
Telephone:	+972-72-2200176
E-mail:	yehudit@realviewimaging.com
Contact name:	Mrs. Yehudit Kraizer

2 Equipment under test attributes

Product name:	3D Control Device
Product type:	Transceiver
Model:	HOLOSCOPE™i
Serial number:	100001
Part number:	BUY000501
Hardware version:	01
Driver version:	10.5.6
Receipt date	May 2018

3 Manufacturer information

Manufacturer name:	RealView Imaging Ltd.
Address:	Hatnufa 4, P.O. Box 83, Industrial Zone Yokneam, Israel, 2069202
Telephone:	+972-72-2200176
E-Mail:	yehudit@realviewimaging.com
Contact name:	Mrs. Yehudit Kraizer

4 Test details

Project ID:	31023
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	22-May-18
Test completed:	01-Jul-18
Test specifications:	FCC 47CFR part 15 subpart C §15.249 and subpart B; RSS-210 Issue 9:2015; RSS-Gen Issue 5:2018, ICES-003 Issue 6:2016

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions	Pass
Section 15.215(c) / RSS-Gen, section 6.7, Occupied bandwidth	Pass
Section 15.249(d)/RSS-210, section B10(b), Band edge emissions	Pass
Section 15.207(a)/RSS-Gen, section 8.8, Conducted emission	Not required
Section 15.203 / RSS-Gen, section 6.8, Antenna requirement	Pass
Unintentional emissions	
Section 15.107/ RSS-Gen, section 7.2 / ICES-003, Class B, Conducted emission at AC power port	Not required
Section 15.109/RSS-Gen, section 7.3 / ICES-003, Class B, Radiated emission	Pass
Section 15.111/RSS-Gen, section 7.4, Conducted emission at receiver antenna port	Not required

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/fail decision was based on nominal values.

This test report is based on the test report REARAD_FCC.31023_rev2 issued by Hermon Laboratories assuming that the EUT approved under IC: 24096-RV3D001 for product approval completion for FCC ID approval procedure.

According to manufacturer's declaration provided in Appendix G of the test report, models 3D controller and 3D Control Device are electrically /electronically identical and differ only with the names market.

	Name and Title	**Date**	**Signature**
Tested by:	Mr. A. Morozov, test engineer	July 01, 2018	
Reviewed by:	Mrs. S Peysahov Sheynin test engineer EMC & Radio	25 March 20	v
Approved by:	Mr. S. Samokha, technical manager, EMC and Radio	26 March 20	

6 EUT description

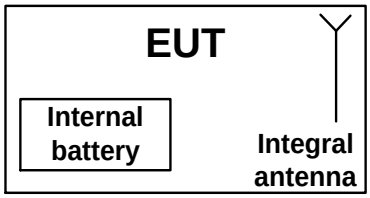
6.1 General information

The EUT is a 3D mouse comprising 2.4 GHz radio.

6.2 Operating frequencies

Source	Frequency, MHz					
Tx/Rx	2404	2425	2442	2463	2477	NA

6.3 Test configuration



6.4 Changes made in EUT

No changes were implemented in the EUT during the testing.

6.5 Transmitter characteristics

Type of equipment	
X	Stand-alone (Equipment with or without its own control provisions)
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)
	Plug-in card (Equipment intended for a variety of host systems)

Assigned frequency range	2400 – 2483.5 MHz
Operating frequencies	2404 MHz, 2425 MHz, 2442 MHz, 2463 MHz, 2477 MHz
Maximum field strength of carrier	94.32 dB(µV/m) at 3 m distance

Is transmitter output power variable?					
	X	No			
		Yes		continuous variable	
				stepped variable with stepsize	
			minimum RF power		dBm
			maximum RF power		dBm

Antenna connection				
unique coupling	standard connector	X	integral	with temporary RF connector
				X without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Integrated	FCF	PIFA antenna	-2.36 dBi

Type of modulation			GFSK		
Transmitter duty cycle supplied for test			100%		
Transmitter power source					
X	Battery	**Nominal rated voltage**	3.7 V	Battery type	
	DC	**Nominal rated voltage**			
	AC mains	**Nominal rated voltage**		Frequency	

Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 requirements

7.1 Field strength of emissions

7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.1.1, Table 7.1.2 and Table 7.1.3.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Peak	Average	Quasi-Peak
2400 – 2483.5	114.0	94.0	NA

Table 7.1.2 Harmonics limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
2400 – 2483.5	74.0	54.0

Table 7.1.3 Radiated spurious emissions limits (other than harmonics)

Frequency, MHz	Field strength at 3 m, dB(μV/m)*			
	Peak	Quasi Peak	Average	Attenuation below carrier
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	50 dBc (whichever is the less stringent)
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
Above 1000	74.0	NA	54.0	

*- The limit for 3 m test distance was calculated using the inverse square distance extrapolation factor as follows:

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

**- The limit decreases linearly with the logarithm of frequency.

Note: The above field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.

Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

7.1.2 Test procedure for spurious emission field strength measurements in 9 kHz to 30 MHz band

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.2.2 The measurements were performed in typical EUT position.

7.1.2.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna was rotated around its vertical axis.

7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz

7.1.3.1 The EUT was set up as shown in Figure 7.1.2, Figure 7.1.3, energized and the performance check was conducted.

7.1.3.2 The measurements were performed in typical EUT position.

7.1.3.3 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

Test specification:	**Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1008 hPa	**Power:** 3.7 VDC
Remarks:			

Figure 7.1.1 Setup for spurious emission field strength measurements below 30 MHz

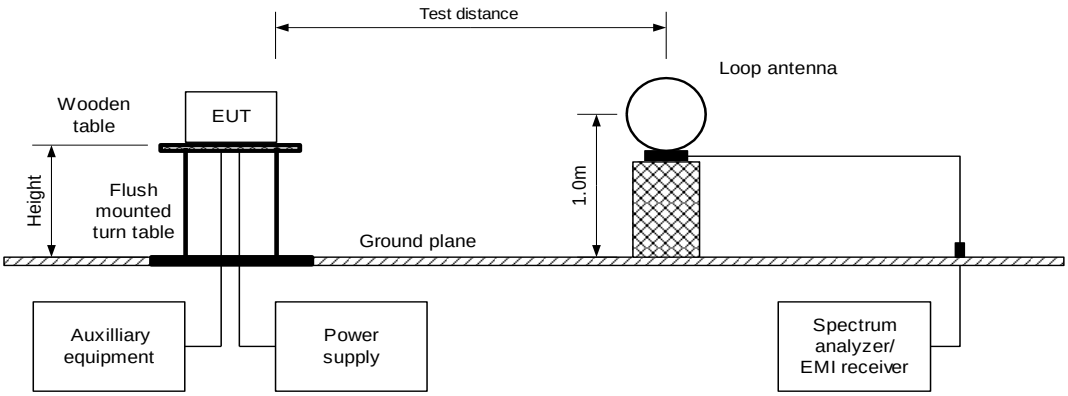
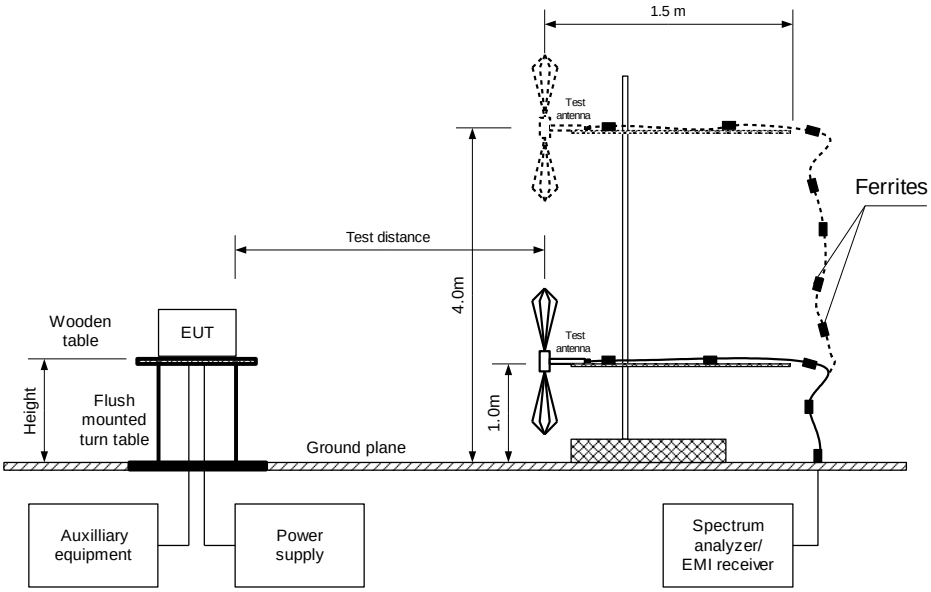
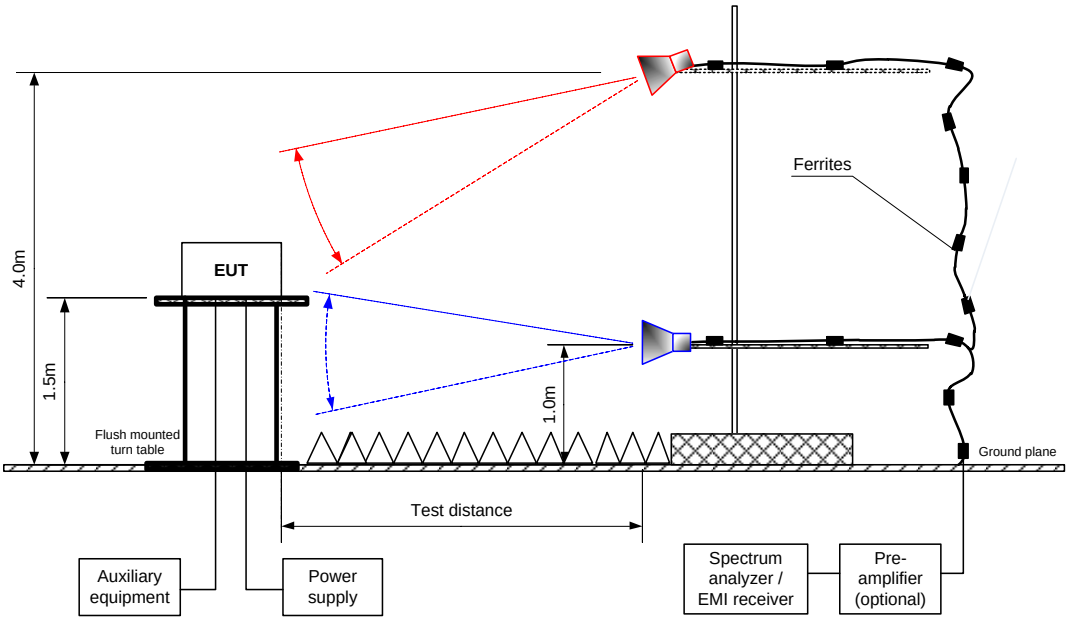


Figure 7.1.2 Setup for spurious emission field strength measurements from 30 to 1000 MHz



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Figure 7.1.3 Setup for spurious emission field strength measurements above 1000 MHz



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Table 7.1.4 Field strength of fundamental emission and spurious emissions

TEST DISTANCE: 3 m
MODULATION: GFSK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
INVESTIGATED FREQUENCY RANGE: 0.009 – 25000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1.0 kHz (9 kHz – 150 kHz)
9.0 kHz (150 kHz – 30 MHz)
120 kHz (30 MHz – 1000 MHz)
1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Freq., MHz	Antenna		Azimuth, degrees*	Peak field strength			Avr factor, dB	Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**		Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Fundamental emission											
2404.0	V	293.0	-94.0	93.65	114.0	-20.35	-18.54	75.11	94.0	-18.89	Pass
2442.0	V	382.0	-69.0	94.29	114.0	-19.71	-18.54	75.75	94.0	-18.25	Pass
2477.0	V	300.0	-70.0	94.32	114.0	-19.68	-18.54	75.78	94.0	-18.22	Pass
Spurious emissions at low frequency											
4808.0	V	154.0	-90.0	50.76	74.0	-23.24	-18.54	32.22	54.0	-21.78	Pass
7212.0	H	235.0	-6.0	58.14	74.0	-15.86	-18.54	39.60	54.0	-14.40	
Spurious emissions at mid frequency											
4884.0	V	182.0	-96.0	51.14	74.0	-22.86	-18.54	32.60	54.0	-21.40	Pass
7326.0	H	318.0	-5.0	58.55	74.0	-15.45	-18.54	40.01	54.0	-13.99	
Spurious emissions at high frequency											
4954.0	V	183.0	-8.0	49.64	74.0	-24.36	-18.54	31.10	54.0	-22.90	Pass
7431.0	H	320.0	0.0	58.63	74.0	-15.37	-18.54	40.09	54.0	-13.91	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin, dB =Measured (calculated) value, dB(μV/m)-Limit, dB(μV/m).

Table 7.1.5 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
0.341	0.921	31.941	100.0	100	-18.56

*- Average factor for pulse train shorter than 100 ms was calculated as follows:

$$Average\,factor = 20 \times \log_{10}\left(\frac{Pulse\,duration}{Pulse\,period} \times \frac{Burst\,duration}{Train\,duration} \times Number\,of\,bursts\,within\,pulse\,train\right)$$

Reference numbers of test equipment used

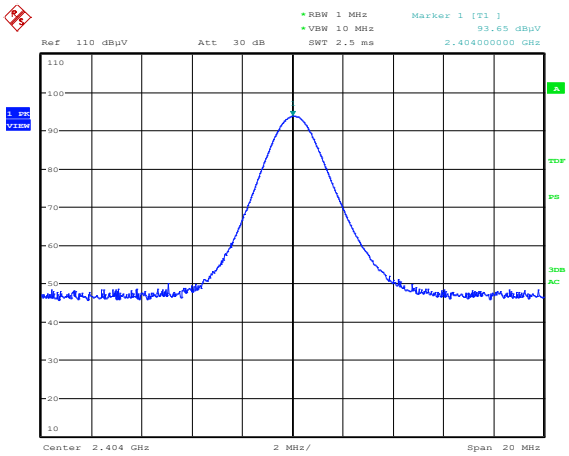
HL 0446	HL 3615	HL 4277	HL 4360	HL 4933	HL 4956	HL 5111	HL 5288

Full description is given in Appendix A.

Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

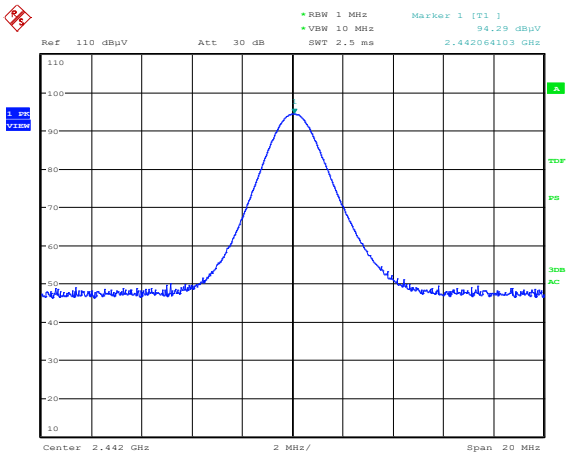
Plot 7.1.1 Radiated emission measurements at the fundamental low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical



Plot 7.1.2 Radiated emission measurements at the fundamental mid frequency

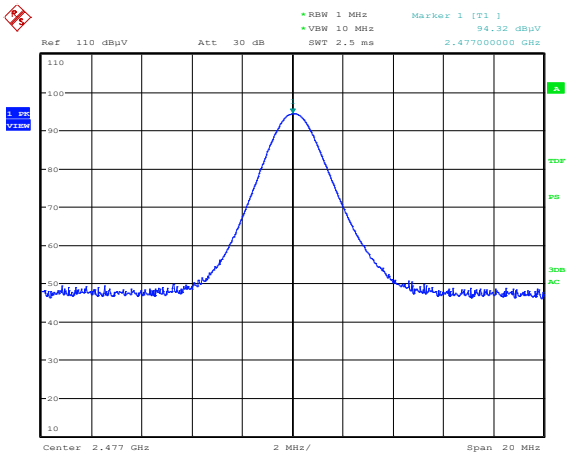
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical



Test specification:	**Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions**		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1008 hPa	**Power:** 3.7 VDC
Remarks:			

Plot 7.1.3 Radiated emission measurements at the fundamental high frequency

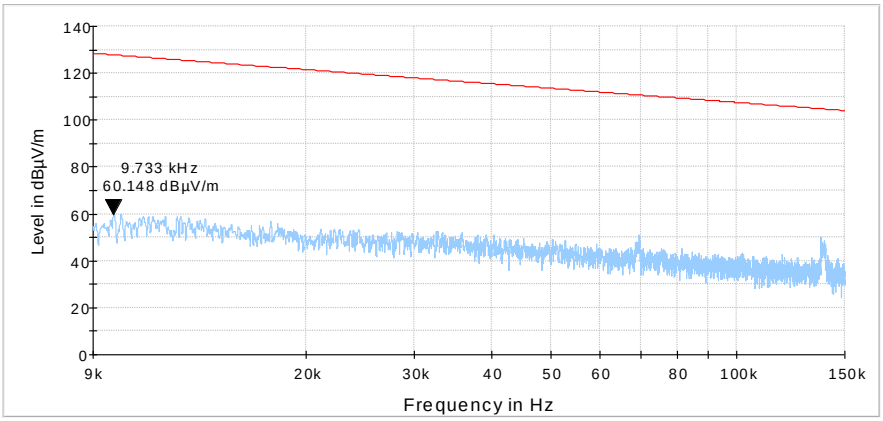
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

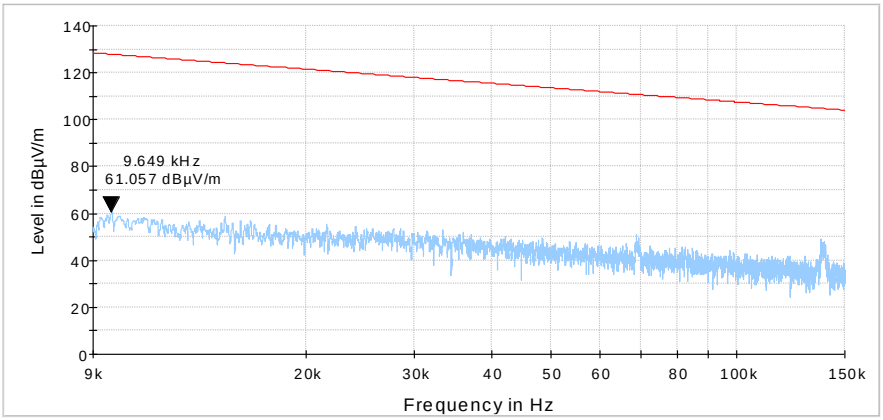
Plot 7.1.4 Radiated emission measurements from 9 to 150 kHz, low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical



Plot 7.1.5 Radiated emission measurements from 9 to 150 kHz, mid frequency

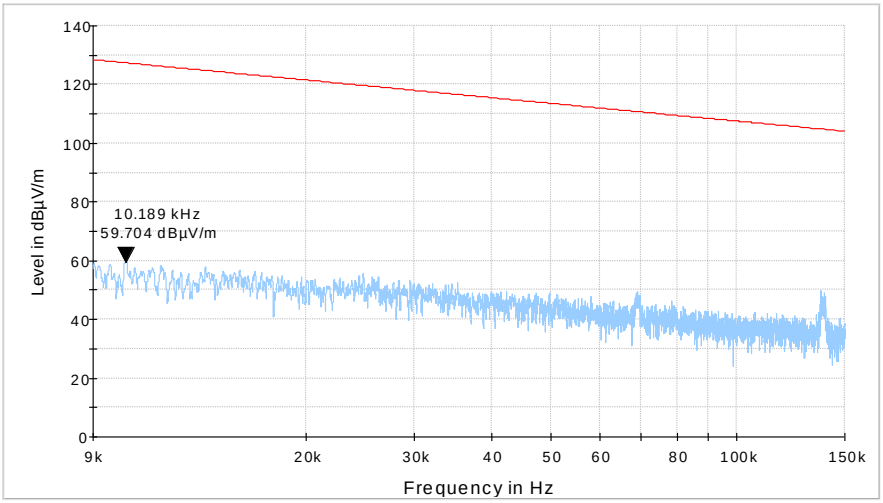
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

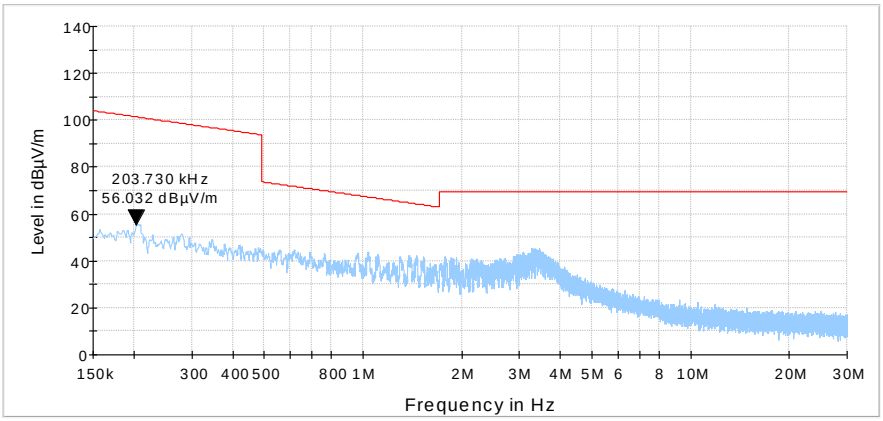
Plot 7.1.6 Radiated emission measurements from 9 to 150 kHz, high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical



Plot 7.1.7 Radiated emission measurements from 0.15 to 30 MHz, low frequency

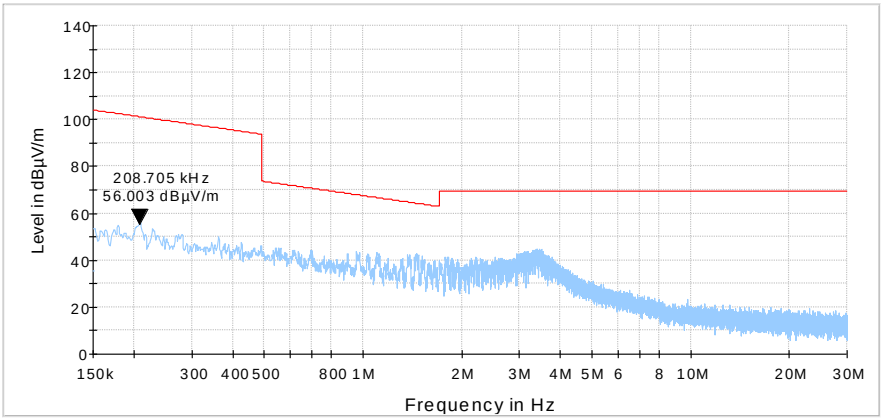
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

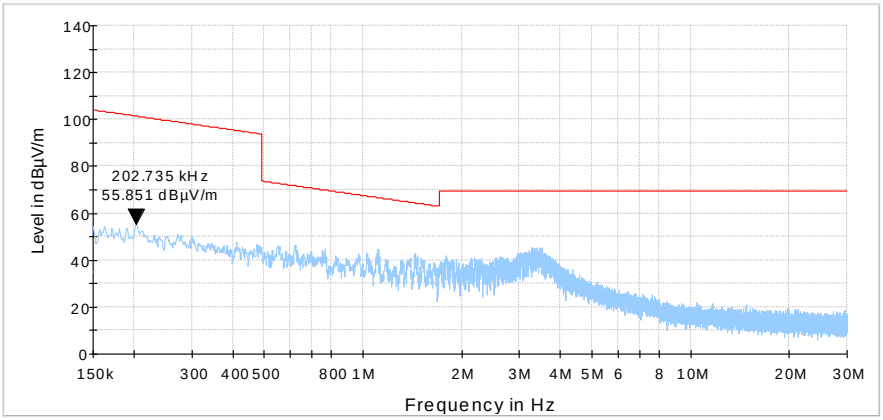
Plot 7.1.8 Radiated emission measurements from 0.15 to 30 MHz, mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.1.9 Radiated emission measurements from 0.15 to 30 MHz, high frequency

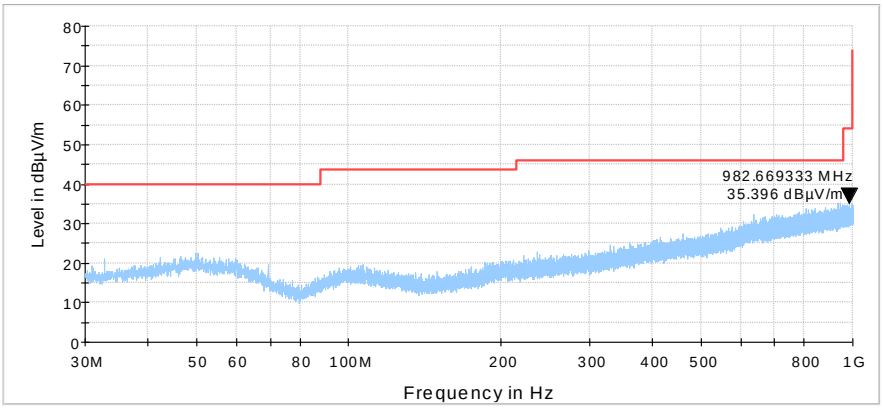
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

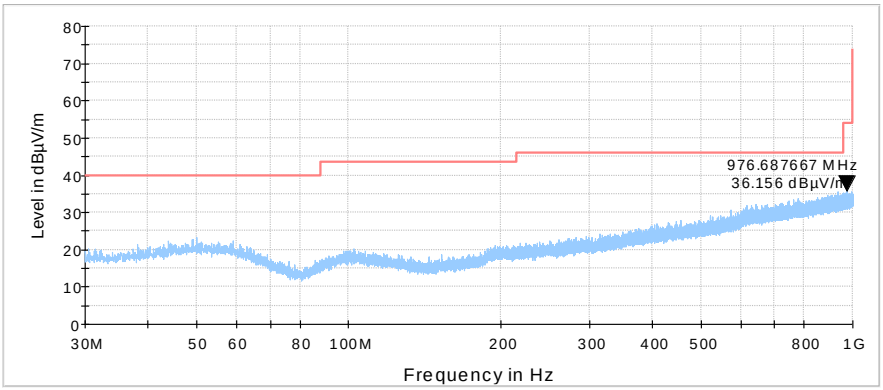
Plot 7.1.10 Radiated emission measurements from 30 to 1000 MHz, low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.1.11 Radiated emission measurements from 30 to 1000 MHz, mid frequency

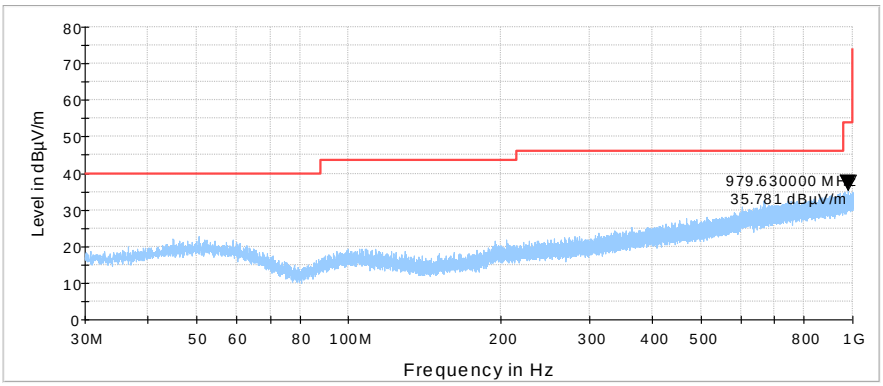
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

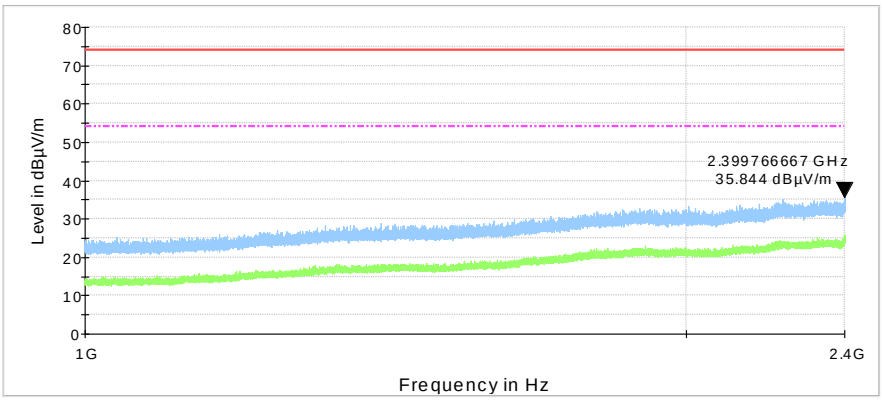
Plot 7.1.12 Radiated emission measurements from 30 to 1000 MHz, high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.1.13 Radiated emission measurements from 1.0 to 2.4 GHz, low frequency

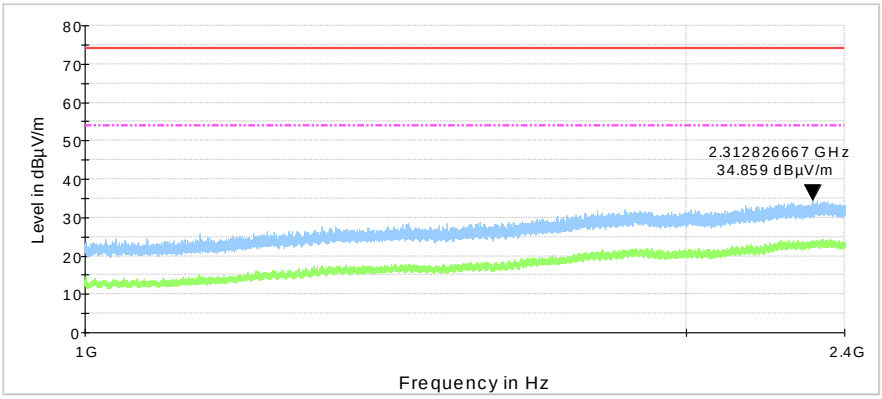
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

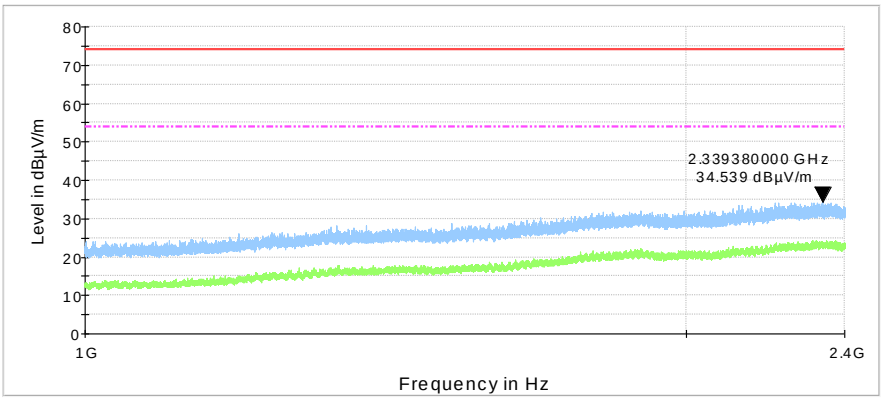
Plot 7.1.14 Radiated emission measurements from 1.0 to 2.4 GHz, mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.15 Radiated emission measurements from 1.0 to 2.4 GHz, high frequency

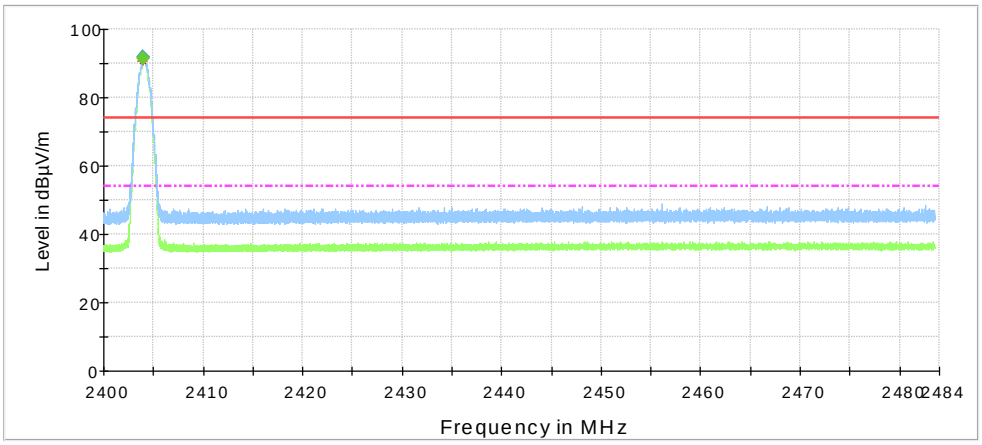
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

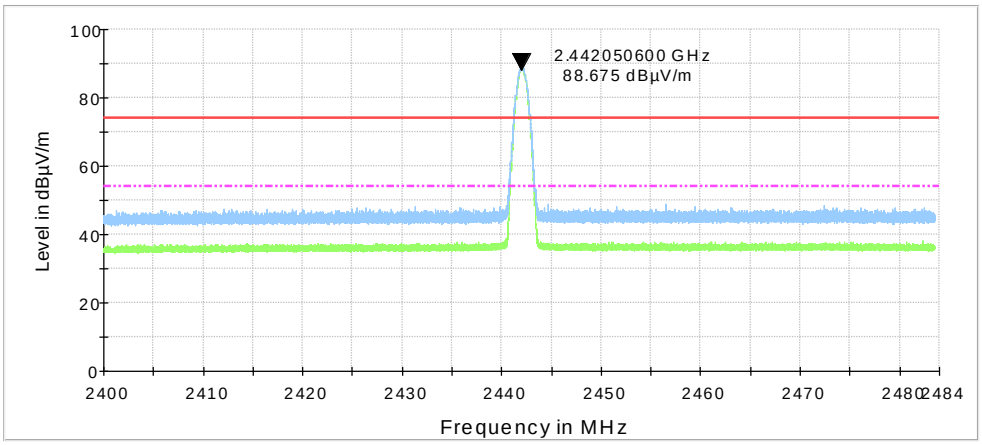
Plot 7.1.16 Radiated emission measurements from 2.4 to 2.4835 GHz, low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.17 Radiated emission measurements from 2.4 to 2.4835 GHz, mid frequency

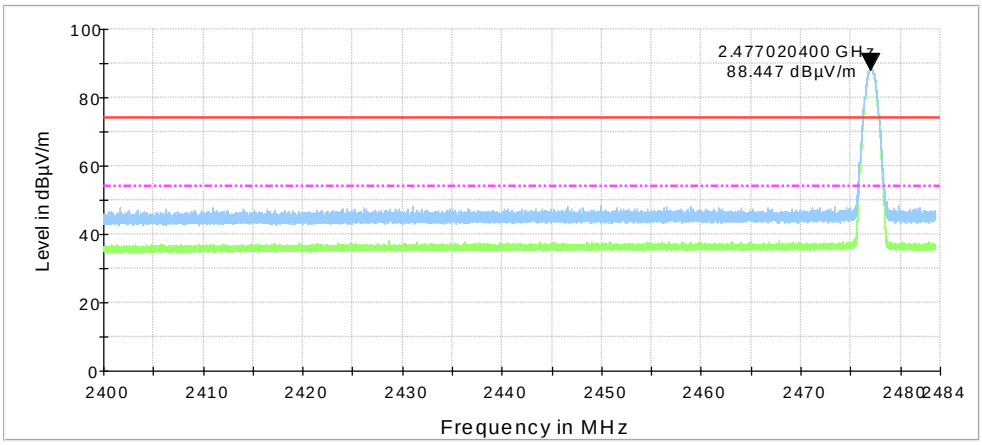
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

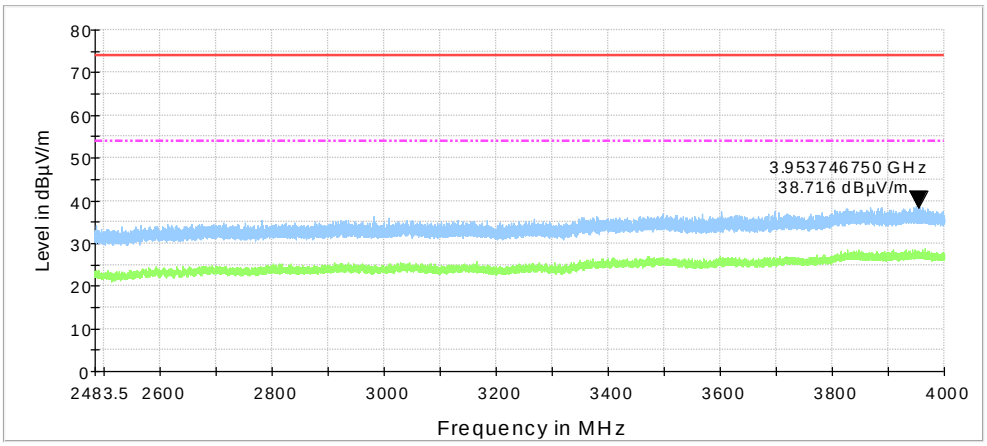
Plot 7.1.18 Radiated emission measurements from 2.4 to 2.4835 GHz, high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.19 Radiated emission measurements from 2.4835 – 4 GHz, low frequency

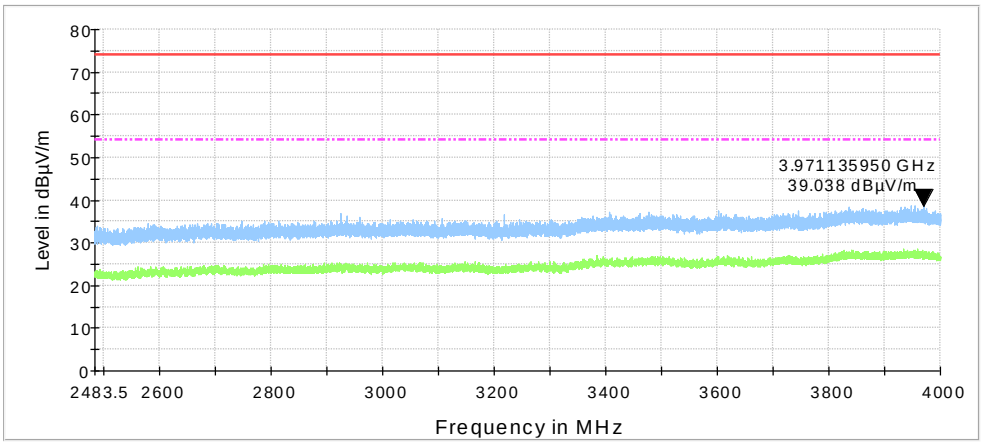
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

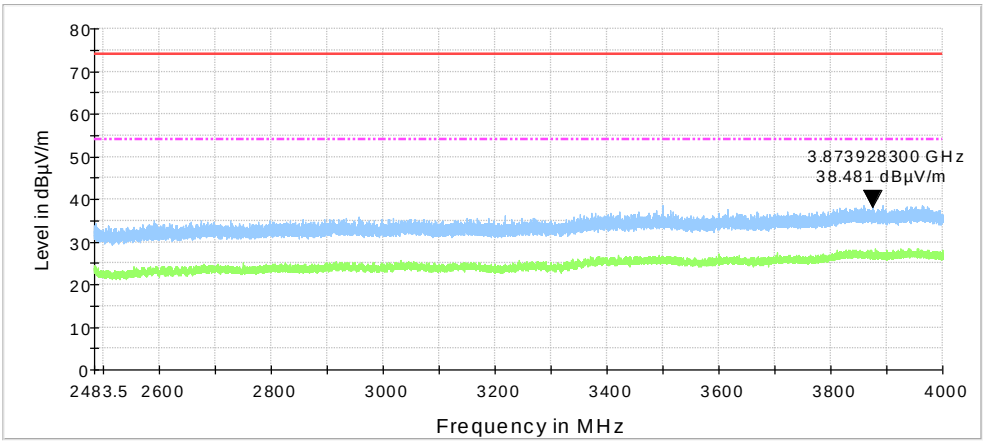
Plot 7.1.20 Radiated emission measurements from 2.4835 – 4 GHz, mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.21 Radiated emission measurements from 2.4835 – 4 GHz, high frequency

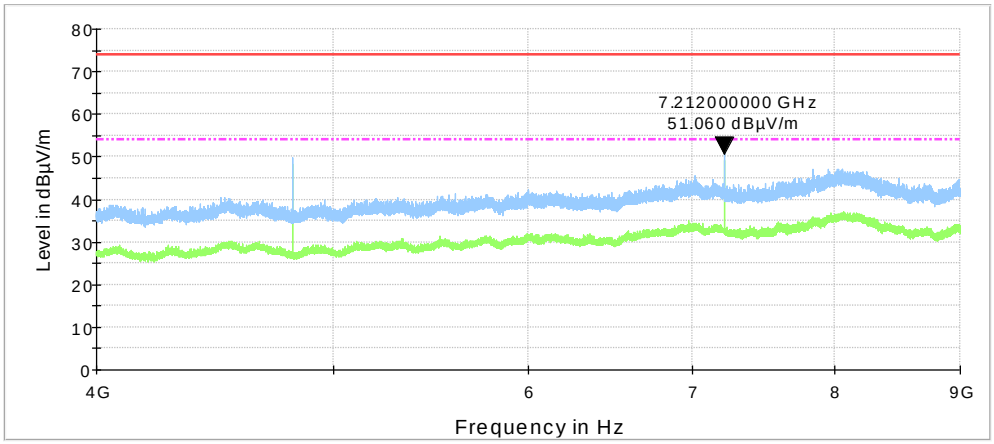
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

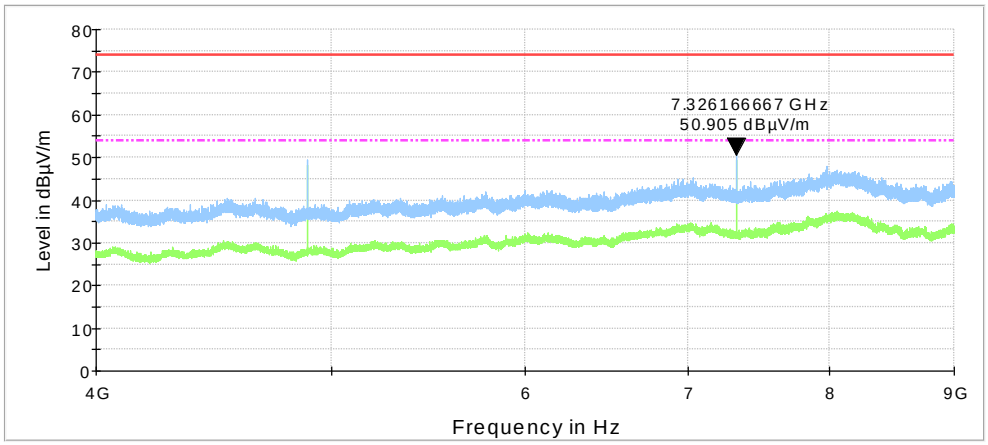
Plot 7.1.22 Radiated emission measurements from 4 -9 GHz, low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.23 Radiated emission measurements from 4 -9 GHz, mid frequency

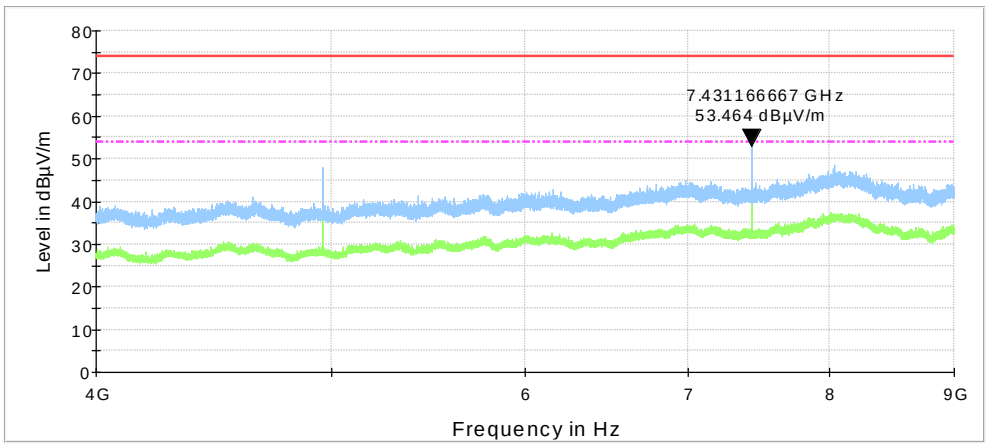
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

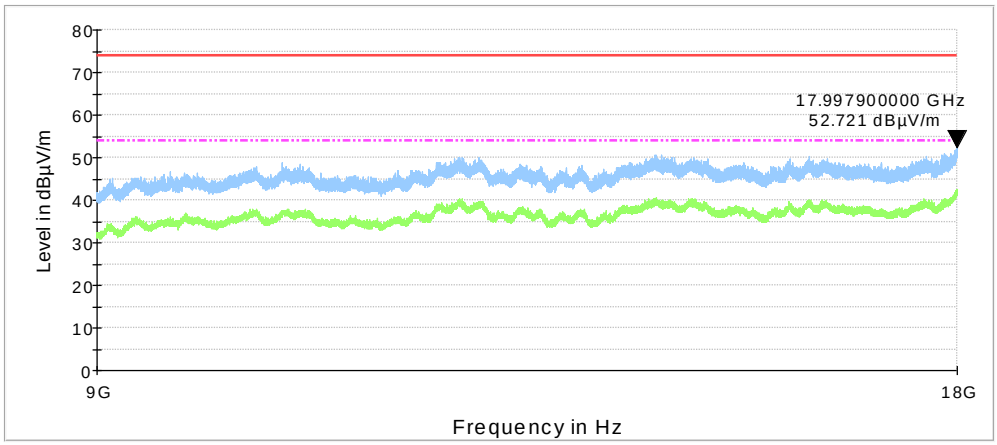
Plot 7.1.24 Radiated emission measurements from 4 -9 GHz, high frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.25 Radiated emission measurements from 9 - 18 GHz, low frequency

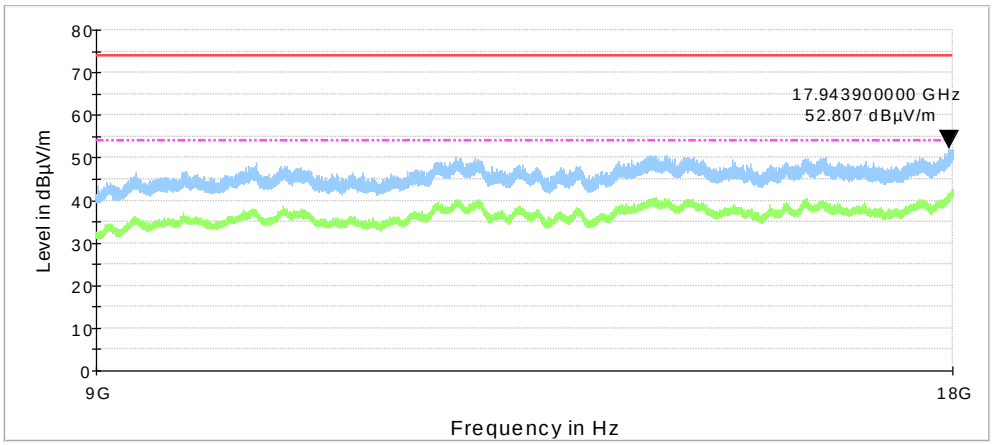
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

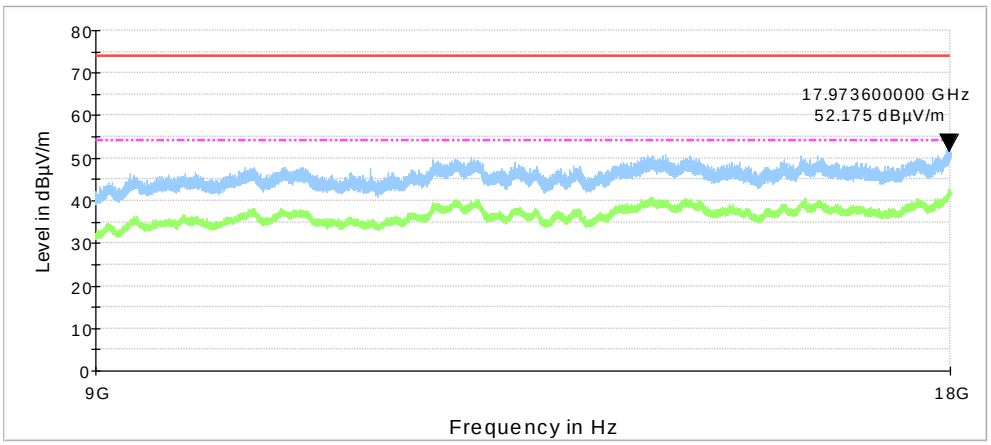
Plot 7.1.26 Radiated emission measurements from 9 - 18 GHz, mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.1.27 Radiated emission measurements from 9 - 18 GHz, high frequency

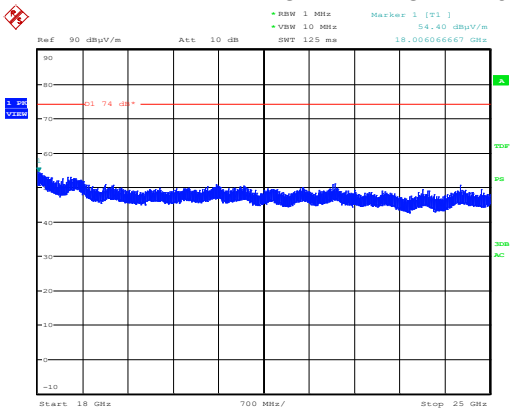
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



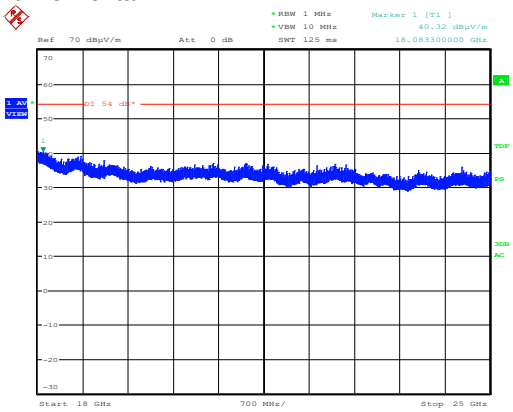
Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.1.28 Radiated emission measurements from 18.0 to 25 GHz, low frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



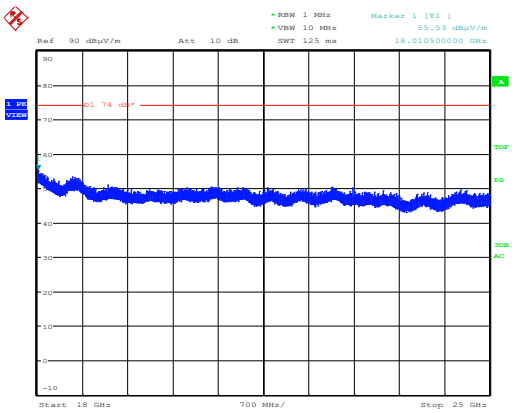
Date: 1.JUL.2018 07:54:33



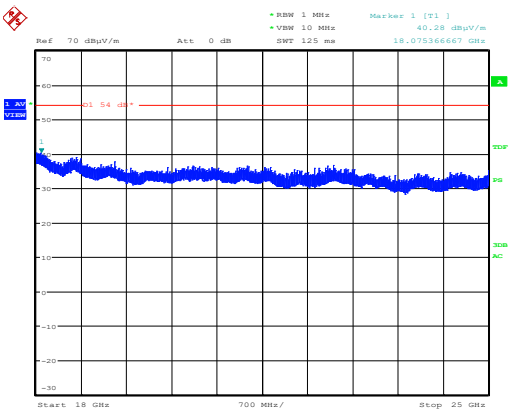
Date: 1.JUL.2018 07:58:26

Plot 7.1.29 Radiated emission measurements from 18.0 to 25 GHz, mid frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Date: 1.JUL.2018 08:06:08

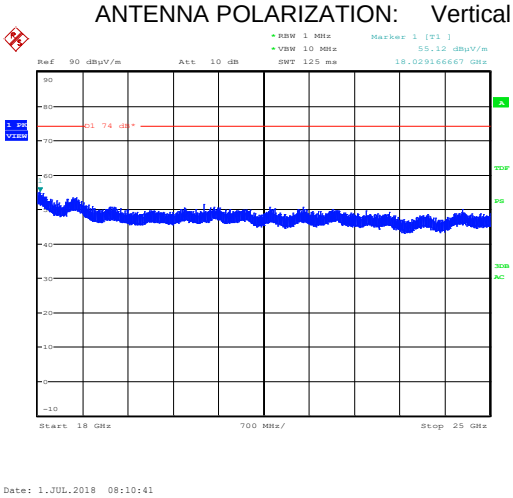


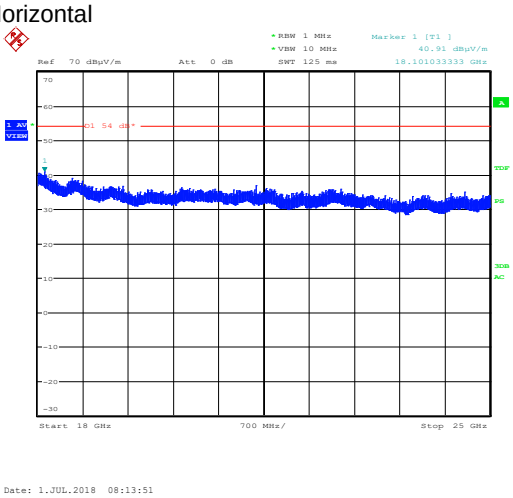
Date: 1.JUL.2018 08:03:03

Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.1.30 Radiated emission measurements from 18.0 to 25 GHz, high frequency

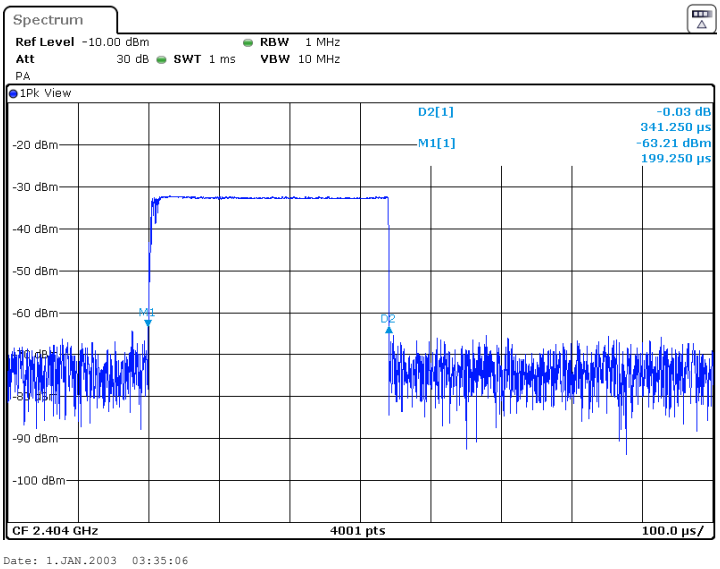
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



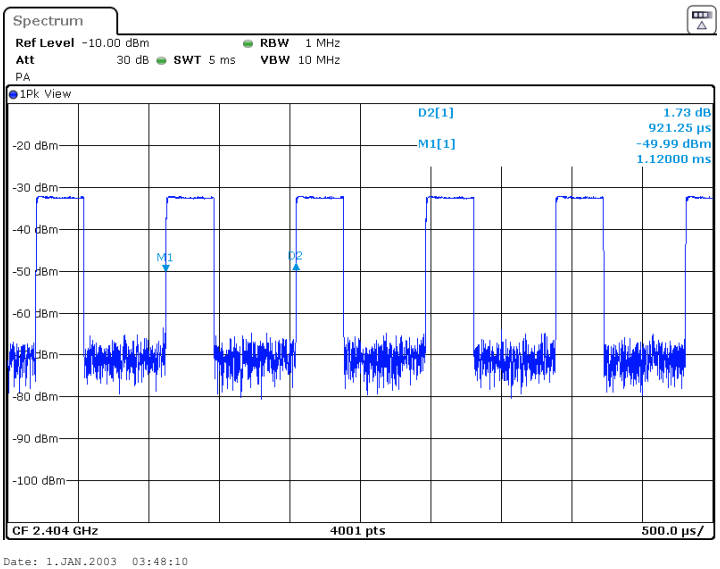


Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.1.31 Transmission pulse duration

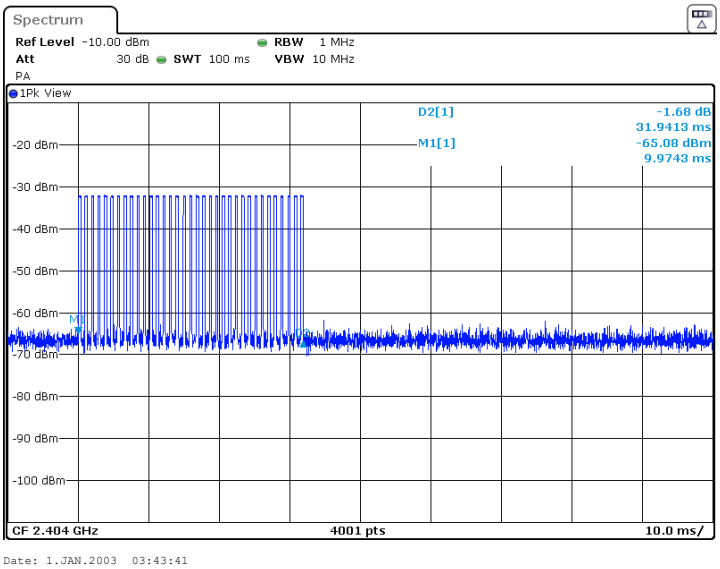


Plot 7.1.32 Transmission pulse period

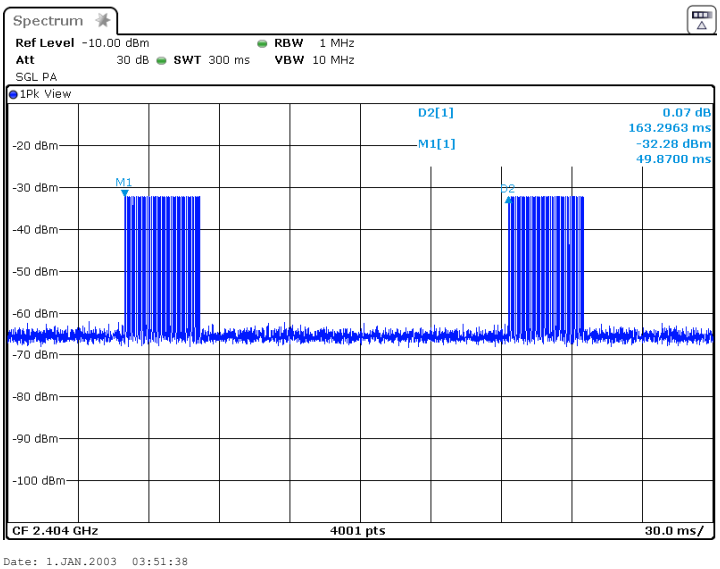


Test specification:	Section 15.249(a)(d)/RSS-210, section B10(a)(b), Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.1.33 Transmission burst duration



Plot 7.1.34 Transmission burst period



Test specification:	Section 15.215(c) / RSS-Gen, Section 6.7, Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 26 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Modulation envelope reference points, %
902 - 928	20.0	99%
2400 – 2483.5		
5725 – 5875		
24000 – 24250		

*- Modulation envelope reference points provided in terms of attenuation below modulated carrier.

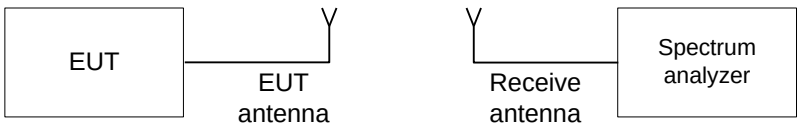
7.2.2 Test procedure

7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.2.2.3 The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.2.2 and associated plot.

Figure 7.2.1 Occupied bandwidth test setup



Test specification:	Section 15.215(c) / RSS-Gen, Section 6.7, Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 26 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND 2400.0 – 2483.5 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
MODULATION ENVELOPE REFERENCE POINTS: 99%
MODULATION: GFSK

Frequency, MHz	OBW, kHz	Maximum OBW, kHz*	OBW limit, kHz*	Verdict
2404.0	155.33	NA	NA	NA
2442.0	152.58	NA	NA	NA
2477.0	151.08	NA	NA	NA

* Channel bandwidth declared by manufacturer

Table 7.2.3 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND 2400.0 – 2483.5 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
MODULATION ENVELOPE REFERENCE POINTS: 20 dBc
MODULATION: GFSK

Frequency, MHz	OBW under normal conditions, kHz	Maximum OBW, kHz*	OBW limit, kHz**	Verdict
2404.0	148.84	NA	NA	NA
2442.0	145.56	NA	NA	NA
2477.0	144.35	NA	NA	NA

* Channel bandwidth declared by manufacturer

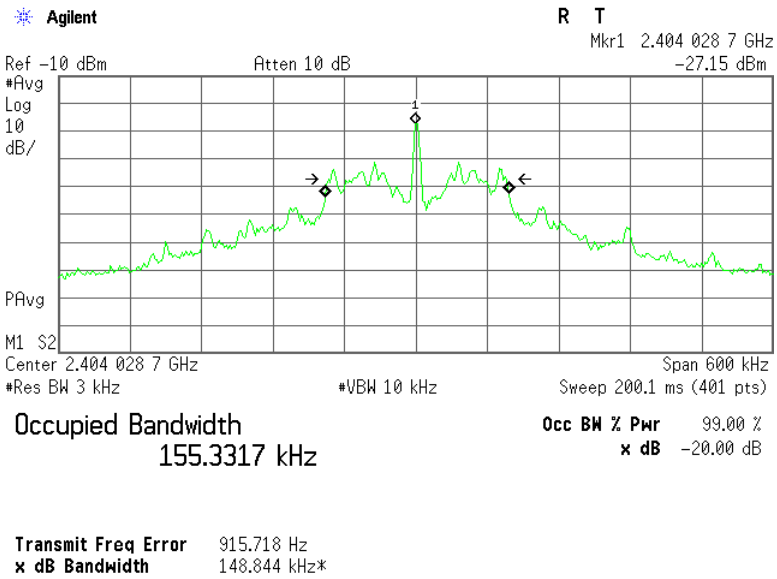
Reference numbers of test equipment used

HL 3903	HL 3818	HL 4136						

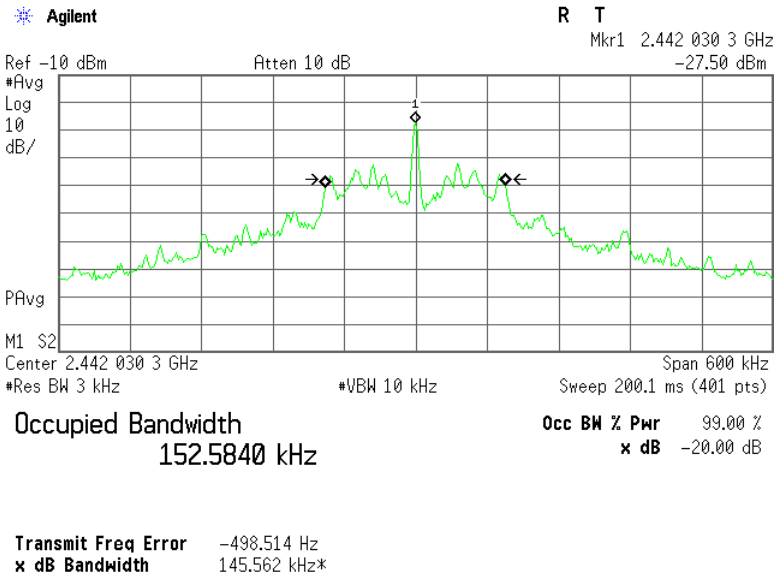
Full description is given in Appendix A.

Test specification:	Section 15.215(c) / RSS-Gen, Section 6.7, Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 26 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at the low frequency

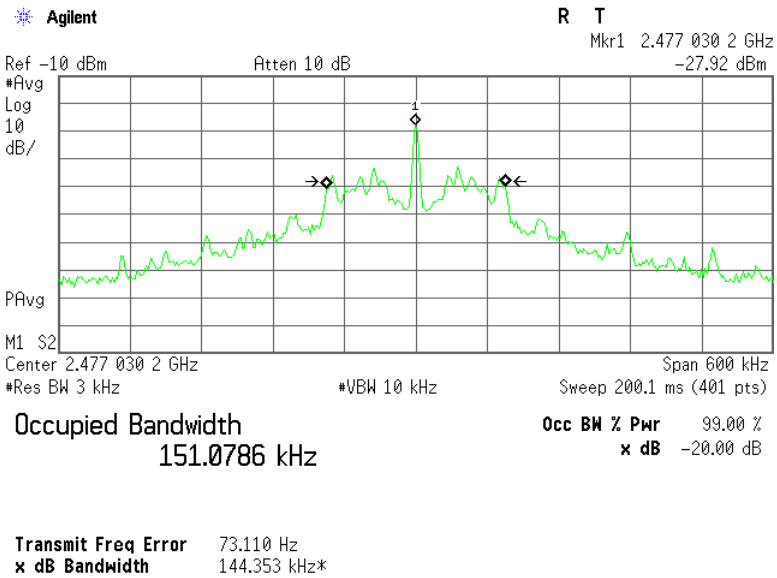


Plot 7.2.2 Occupied bandwidth test result at the mid frequency



Test specification:	Section 15.215(c) / RSS-Gen, Section 6.7, Occupied bandwidth		
Test procedure:	ANSI C63.10 section 6.9.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 26 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at the high frequency



Test specification:	Section 15.249(d)/RSS-210, section B10(b), Band edge emissions		
Test procedure:	ANSI C63.10 section 6.10		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

7.3 Band edge emission

7.3.1 General

This test was performed to verify the EUT band edge emission including all associated side bands was attenuated at least 50 dB below the unmodulated carrier level or below the general spurious emission limit. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Band edge emission limits

Frequency band, MHz	Field strength limit at 3 m, dBµV/m		Attenuation below carrier, dBc
	Peak	Average	
2400.0 – 2483.5	74.0	54.0	50

7.3.2 Test procedure

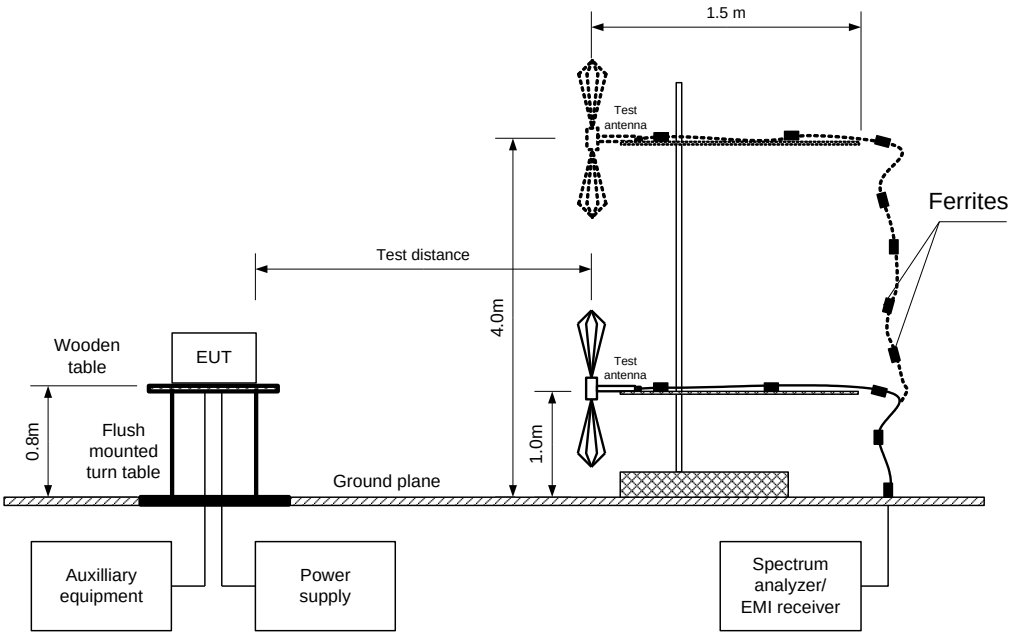
7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and the performance check was conducted.

7.3.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.3.2.3 The frequency of modulation envelope points beyond which power level drops below the band edge emission limit was measured.

7.3.2.4 The test results were recorded in Table 7.3.2 and shown in the associated plots.

Figure 7.3.1 Band edge emission measurement set up



Test specification:	**Section 15.249(d)/RSS-210, section B10(b), Band edge emissions**		
Test procedure:	ANSI C63.10 section 6.10		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	**Relative Humidity:** 46 %	**Air Pressure:** 1008 hPa	**Power:** 3.7 VDC
Remarks:			

Table 7.3.2 Band edge emission test results

OPERATING FREQUENCY RANGE: 2404-2477 MHz
DETECTOR USED: Peak hold
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 3 MHz
MODULATION: GFSK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Modulation envelope		Peak field strength			Average field strength			Verdict
Edge	Frequency, MHz	Measured, dBµV/m	Limit, dBµV/m	Margin, dB*	Measured, dBµV/m	Limit, dBµV/m	Margin, dB*	
Low	2399.777	35.84	74.00	-38.16	35.84	54.00	-18.16	Pass
High	2484.814	34.27	74.00	-39.73	34.27	54.00	-19.73	Pass

* - Margin = Measured value – Limit

Reference numbers of test equipment used

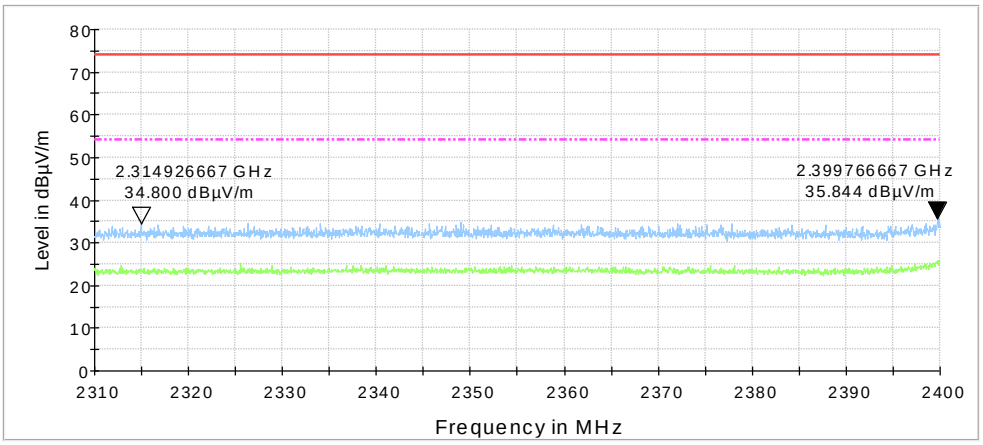
HL 4277	HL 4360	HL 4933	HL 5111				

Full description is given in Appendix A.

Test specification:	Section 15.249(d)/RSS-210, section B10(b), Band edge emissions		
Test procedure:	ANSI C63.10 section 6.10		
Test mode:	Compliance	Verdict:	PASS
Date(s):	01-Jul-18		
Temperature: 24 ºC	Relative Humidity: 46 %	Air Pressure: 1008 hPa	Power: 3.7 VDC
Remarks:			

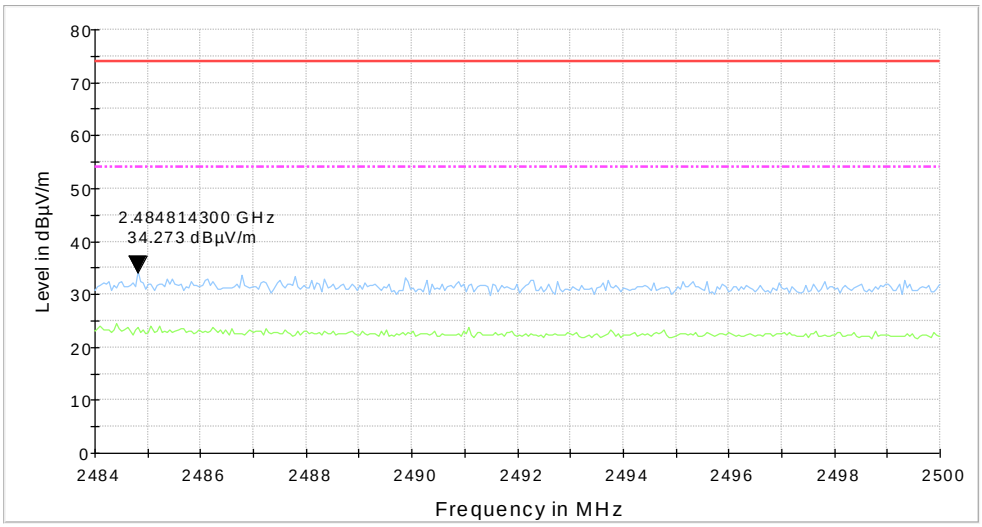
Plot 7.3.1 Low band edge emission test result

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Plot 7.3.2 High band edge emission test result

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical



Test specification:	**Section 15.203/ RSS-Gen, Section 6.8, Antenna requirement**		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	30-May-18		
Temperature: 26 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1012 hPa	**Power:** 3.7 VDC
Remarks:			

7.4 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.4.1.

Table 7.4.1 Antenna requirements

Requirement	Rationale	Verdict
The transmitter antenna is permanently attached	Visual inspection	Comply
The transmitter employs a unique antenna connector	NA	
The transmitter requires professional installation	NA	

Test specification:	Section 15.109/RSS-Gen, section 7.3, ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-May-18		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 3.7 VDC
Remarks:			

8 Unintentional emissions

8.1 Radiated emission measurements

8.1.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.1.1, Table 8.1.2.

Table 8.1.1 Radiated emission test limits according to FCC Part 15, Section 109 and ICES-003, Section 6.2

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
Above 960	43.5*	54.0	49.5	60.0*

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,
where S_1 and S_2 – standard defined and test distance respectively in meters.

Table 8.1.2 Radiated emission limits according to RSS-Gen, Section 7.3

Frequency, MHz	Field strength limit at 3 m test distance, dB(μV/m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
960 – 5th harmonic**	54.0

** - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

8.1.2 Test procedure

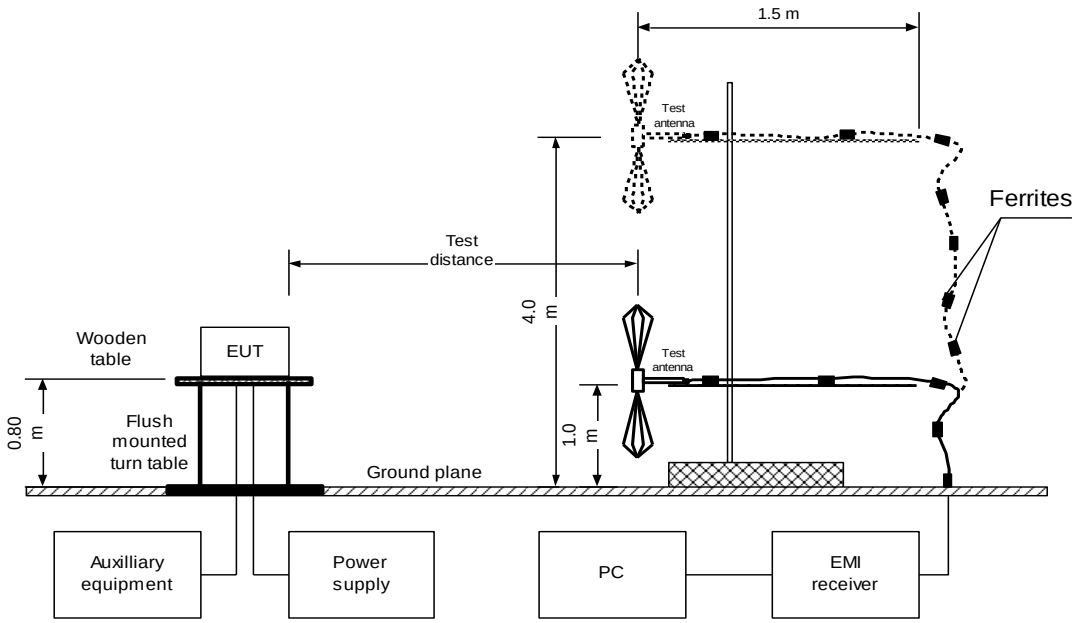
8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.

8.1.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

8.1.2.3 The worst test results (the lowest margins) were recorded in Table 8.1.3 and shown in the associated plots.

Test specification:	Section 15.109/RSS-Gen, section 7.3, ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-May-18		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 3.7 VDC
Remarks:			

Figure 8.1.1 Setup for radiated emission measurements



Test specification:	Section 15.109/RSS-Gen, section 7.3, ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-May-18		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 3.7 VDC
Remarks:			

Table 8.1.3 Radiated emission test results

EUT SET UP: TABLE-TOP
LIMIT: Class B
EUT OPERATING MODE: Receive
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found								Pass

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 12500 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No emissions were found										Pass

*- Margin = Measured emission - specification limit.
**- EUT front panel refer to 0 degrees position of turntable.

Reference numbers of test equipment used

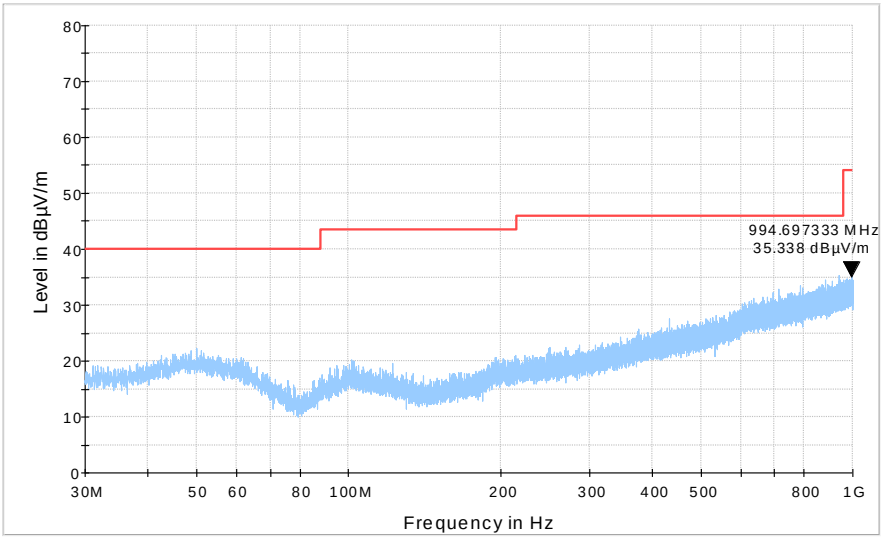
HL 3615	HL 4360	HL 4933	HL 5111	HL 5288			

Full description is given in Appendix A.

Test specification:	Section 15.109/RSS-Gen, section 7.3, ICES-003, Class B, Radiated emission		
Test procedure:	ANSI C63.4, Sections 8.3 and 12.2.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	22-May-18		
Temperature: 23 ºC	Relative Humidity: 48 %	Air Pressure: 1009 hPa	Power: 3.7 VDC
Remarks:			

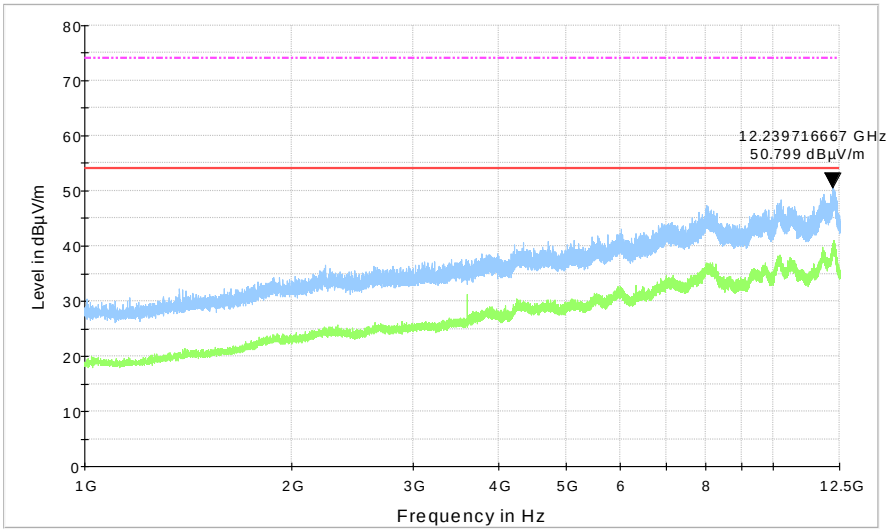
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical & horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



Plot 8.1.2 Radiated emission measurements above 1000 MHz, vertical & horizontal antenna polarization

TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive



9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	11-Feb-18	11-Feb-19
3615	Cable RF, 6.5 m, N type-N type, DC-6 GHz	Suhner Switzerland	RG 214/U	NA	10-Jun-18	10-Jun-19
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	28-May-18	28-May-19
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	07-Feb-18	07-Feb-19
4136	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000137	04-Apr-18	04-Apr-19
4277	Test Cable , DC-18 GHz, 3.05 m, N/M - N/M	Mini-Circuits	APC-10FT-NMNM+	0748A	10-Sep-17	10-Sep-18
4360	EMI Test Receiver, 20 Hz to 40 GHz	Rohde & Schwarz	ESU40	100322	26-Dec-17	26-Dec-18
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	04-Jan-18	04-Jan-19
4956	Active horn antenna, 18 to 40 GHz	COM-POWER CORPORATION	AHA-840	105004	11-Jan-18	11-Jan-19
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502493/2EA	09-Apr-18	09-Apr-19
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	809	21-Jan-18	21-Jan-19

10 APPENDIX B Test equipment correction factors

HL 0446: Active Loop Antenna
EMCO, model: 6502, s/n 2857

Frequency, kHz	Measured antenna factor, dBS/m	Measurement uncertainty, dB
10	-33.4	±1.0
20	-37.8	±1.0
50	-40.5	±1.0
75	-41.0	±1.0
100	-41.2	±1.0
150	-41.2	±1.0
250	-41.1	±1.0
500	-41.2	±1.0
750	-41.3	±1.0
1000	-41.3	±1.0

Frequency, kHz	Measured antenna factor, dBS/m	Measurement uncertainty, dB
2000	-41.4	±1.0
3000	-41.4	±1.0
4000	-41.5	±1.0
5000	-41.5	±1.0
10000	-41.7	±1.0
15000	-42.1	±1.0
20000	-42.7	±1.0
25000	-44.2	±1.0
30000	-45.8	±1.0

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμA/m.

HL 4933: Active Horn Antenna
COM-POWER CORPORATION, model: AHA-118, s/n 701046

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
1000	-16.1
1500	-15.1
2000	-10.9
2500	-11.9
3000	-11.1
3500	-10.6
4000	-8.6
4500	-8.3
5000	-5.9
5500	-5.7
6000	-3.3
6500	-4.0
7000	-2.2
7500	-1.7
8000	1.1
8500	-0.8
9000	-1.5
9500	-0.2

Frequency, MHz	Measured antenna factor (with preamplifier), dB/m
10000	1.8
10500	1.0
11000	0.3
11500	-0.5
12000	3.1
12500	1.4
13000	-0.3
13500	-0.4
14000	2.5
14500	2.2
15000	1.9
15500	0.5
16000	2.1
16500	1.2
17000	0.6
17500	3.1
18000	4.2

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/m.

HL 4956: Active Horn Antenna
COM-POWER Corp., model: AHA-840, s/n 105004

Frequency, MHz	Measured antenna factor, dB/m	Frequency, MHz	Measured antenna factor, dB/m
18000	5.1	29500	1.4
18500	3.6	30000	2.9
19000	2.2	30500	2.9
19500	0.7	31000	2.9
20000	0.7	31500	1.2
20500	0.8	32000	0.7
21000	0.5	32500	0.2
21500	-1.3	33000	-1.7
22000	-2.1	33500	-2.2
22500	-2.0	34000	2.3
23000	-1.6	34500	-1.1
23500	-2.9	35000	0.7
24000	-2.3	35500	-1.1
24500	-2.6	36000	0.1
25000	-1.8	36500	1.4
25500	-1.2	37000	3.7
26000	-0.5	37500	5.8
26500	-1.2	38000	6.6
27000	-0.1	38500	7.3
27500	-1.0	39000	6.5
28000	-0.7	39500	7.3
28500	0.5	40000	7.1

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/m.

HL 5288: Antenna factor Trilog Antenna, 30 MHz - 1 GHz, 100W
Frankonia, model: ALX-8000E, s/n: 00809

Frequency, MHz	Antenna factor, dB/m
30	14.96
35	15.33
40	16.37
45	17.56
50	17.95
60	16.87
70	13.22
80	10.56
90	13.61
100	15.46
120	14.03
140	12.23
160	12.67
180	13.34
200	15.40
250	16.42
300	17.28
400	19.98
500	21.11
600	22.90
700	24.13
800	25.25
900	26.35
1000	27.18

The antenna factor shall be added to receiver reading in dBμV to obtain field strength in dBμV/m.

HL 4277: Test Cable
Mini-Circuits, model: APC-10FT-NMNM+, s/n 0748A

Set / Applied, MHz	Measured, dB	Uncertainty, dB
0.1	0.26	+0.07 / -0.07 dB
50	0.27	+0.07 / -0.07 dB
100	0.38	+0.07 / -0.07 dB
200	0.55	+0.07 / -0.07 dB
300	0.69	+0.08 / -0.09 dB
400	0.80	+0.08 / -0.09 dB
500	0.91	+0.08 / -0.09 dB
600	1.00	+0.08 / -0.09 dB
700	1.08	+0.08 / -0.09 dB
800	1.17	+0.08 / -0.09 dB
900	1.24	+0.08 / -0.09 dB
1000	1.32	+0.08 / -0.09 dB
1100	1.39	+0.12 / -0.13 dB
1200	1.45	+0.12 / -0.13 dB
1300	1.52	+0.12 / -0.13 dB
1400	1.58	+0.12 / -0.13 dB
1500	1.65	+0.12 / -0.13 dB
1600	1.71	+0.12 / -0.13 dB
1700	1.77	+0.12 / -0.13 dB
1800	1.82	+0.12 / -0.13 dB
1900	1.88	+0.12 / -0.13 dB
2000	1.93	+0.12 / -0.13 dB
2100	1.99	+0.12 / -0.13 dB
2200	2.05	+0.12 / -0.13 dB
2300	2.10	+0.12 / -0.13 dB
2400	2.15	+0.12 / -0.13 dB
2500	2.20	+0.17 / -0.18 dB
2600	2.25	+0.17 / -0.18 dB
2700	2.30	+0.17 / -0.18 dB
2800	2.35	+0.17 / -0.18 dB
2900	2.40	+0.17 / -0.18 dB
3000	2.44	+0.17 / -0.18 dB
3100	2.49	+0.19 / -0.2 dB
3200	2.54	+0.19 / -0.2 dB
3300	2.58	+0.19 / -0.2 dB
3400	2.62	+0.19 / -0.2 dB
3500	2.66	+0.19 / -0.2 dB
3600	2.71	+0.19 / -0.2 dB
3700	2.75	+0.19 / -0.2 dB
3800	2.79	+0.19 / -0.2 dB
3900	2.84	+0.19 / -0.2 dB
4000	2.88	+0.19 / -0.2 dB

Set / Applied, MHz	Measured, dB	Uncertainty, dB
4100	2.84	+0.19 / -0.2 dB
4200	2.88	+0.19 / -0.2 dB
4300	2.92	+0.3 / -0.33 dB
4400	2.96	+0.3 / -0.33 dB
4500	3.01	+0.3 / -0.33 dB
4600	3.05	+0.3 / -0.33 dB
4700	3.09	+0.3 / -0.33 dB
4800	3.13	+0.3 / -0.33 dB
4900	3.18	+0.3 / -0.33 dB
5000	3.21	+0.3 / -0.33 dB
5100	3.25	+0.3 / -0.33 dB
5200	3.30	+0.3 / -0.33 dB
5300	3.34	+0.3 / -0.33 dB
5400	3.39	+0.3 / -0.33 dB
5500	3.44	+0.3 / -0.33 dB
5600	3.48	+0.3 / -0.33 dB
5700	3.53	+0.3 / -0.33 dB
5800	3.57	+0.3 / -0.33 dB
5900	3.60	+0.3 / -0.33 dB
6000	3.65	+0.3 / -0.33 dB
6100	3.68	+0.3 / -0.33 dB
6200	3.72	+0.3 / -0.33 dB
6300	3.77	+0.3 / -0.33 dB
6400	3.83	+0.3 / -0.33 dB
6500	3.86	+0.3 / -0.33 dB
6600	3.92	+0.3 / -0.33 dB
6700	3.96	+0.3 / -0.33 dB
6800	4.00	+0.3 / -0.33 dB
6900	4.04	+0.3 / -0.33 dB
7000	4.08	+0.3 / -0.33 dB
7100	4.11	+0.3 / -0.33 dB
7200	4.16	+0.3 / -0.33 dB
7300	4.20	+0.3 / -0.33 dB
7400	4.24	+0.3 / -0.33 dB
7500	4.29	+0.3 / -0.33 dB
7600	4.33	+0.3 / -0.33 dB
7700	4.38	+0.3 / -0.33 dB
7800	4.42	+0.3 / -0.33 dB
7900	4.51	+0.3 / -0.33 dB
8000	4.52	+0.3 / -0.33 dB
8100	4.55	+0.34 / -0.36 dB
8200	4.55	+0.34 / -0.36 dB

HL 4277: Test cable

Set / Applied, MHz	Measured, dB	Uncertainty, dB
8300	4.57	+0.34 / -0.36 dB
8400	4.60	+0.34 / -0.36 dB
8500	4.60	+0.34 / -0.36 dB
8600	4.63	+0.34 / -0.36 dB
8700	4.63	+0.34 / -0.36 dB
8800	4.64	+0.34 / -0.36 dB
8900	4.65	+0.34 / -0.36 dB
9000	4.67	+0.34 / -0.36 dB
9100	4.69	+0.34 / -0.36 dB
9200	4.71	+0.34 / -0.36 dB
9300	4.73	+0.34 / -0.36 dB
9400	4.76	+0.34 / -0.36 dB
9500	4.78	+0.34 / -0.36 dB
9600	4.81	+0.34 / -0.36 dB
9700	4.85	+0.34 / -0.36 dB
9800	4.87	+0.34 / -0.36 dB
9900	4.89	+0.34 / -0.36 dB
10000	4.93	+0.34 / -0.36 dB
10100	4.96	+0.4 / -0.44 dB
10200	4.99	+0.4 / -0.44 dB
10300	5.02	+0.4 / -0.44 dB
10400	5.05	+0.4 / -0.44 dB
10500	5.08	+0.4 / -0.44 dB
10600	5.11	+0.4 / -0.44 dB
10700	5.14	+0.4 / -0.44 dB
10800	5.17	+0.4 / -0.44 dB
10900	5.19	+0.4 / -0.44 dB
11000	5.22	+0.4 / -0.44 dB
11100	5.25	+0.4 / -0.44 dB
11200	5.28	+0.4 / -0.44 dB
11300	5.31	+0.4 / -0.44 dB
11400	5.34	+0.4 / -0.44 dB
11500	5.38	+0.4 / -0.44 dB
11600	5.41	+0.4 / -0.44 dB
11700	5.45	+0.4 / -0.44 dB
11800	5.49	+0.4 / -0.44 dB
11900	5.53	+0.4 / -0.44 dB
12000	5.56	+0.4 / -0.44 dB
12100	5.60	+0.4 / -0.44 dB
12200	5.63	+0.4 / -0.44 dB
12300	5.68	+0.4 / -0.44 dB
12400	5.72	+0.4 / -0.44 dB
12500	5.75	+0.47 / -0.52 dB
12600	5.80	+0.47 / -0.52 dB
12700	5.84	+0.47 / -0.52 dB
12800	5.93	+0.47 / -0.52 dB
12900	5.94	+0.47 / -0.52 dB
13000	5.98	+0.47 / -0.52 dB
13100	6.03	+0.47 / -0.52 dB

Set / Applied, MHz	Measured, dB	Uncertainty, dB
13200	6.09	+0.47 / -0.52 dB
13300	6.17	+0.47 / -0.52 dB
13400	6.27	+0.47 / -0.52 dB
13500	6.37	+0.47 / -0.52 dB
13600	6.49	+0.47 / -0.52 dB
13700	6.57	+0.47 / -0.52 dB
13800	6.60	+0.47 / -0.52 dB
13900	6.61	+0.47 / -0.52 dB
14000	6.59	+0.47 / -0.52 dB
14100	6.57	+0.47 / -0.52 dB
14200	6.54	+0.47 / -0.52 dB
14300	6.53	+0.47 / -0.52 dB
14400	6.49	+0.47 / -0.52 dB
14500	6.48	+0.47 / -0.52 dB
14600	6.46	+0.47 / -0.52 dB
14700	6.46	+0.47 / -0.52 dB
14800	6.49	+0.47 / -0.52 dB
14900	6.51	+0.47 / -0.52 dB
15000	6.54	+0.47 / -0.52 dB
15100	6.57	+0.47 / -0.52 dB
15200	6.62	+0.47 / -0.52 dB
15300	6.64	+0.47 / -0.52 dB
15400	6.68	+0.47 / -0.52 dB
15500	6.71	+0.47 / -0.52 dB
15600	6.78	+0.47 / -0.52 dB
15700	6.79	+0.47 / -0.52 dB
15800	6.82	+0.47 / -0.52 dB
15900	6.88	+0.47 / -0.52 dB
16000	6.89	+0.47 / -0.52 dB
16100	6.96	+0.47 / -0.52 dB
16200	6.97	+0.47 / -0.52 dB
16300	7.02	+0.47 / -0.52 dB
16400	7.07	+0.47 / -0.52 dB
16500	7.12	+0.47 / -0.52 dB
16600	7.17	+0.47 / -0.52 dB
16700	7.20	+0.47 / -0.52 dB
16800	7.22	+0.47 / -0.52 dB
16900	7.23	+0.47 / -0.52 dB
17000	7.24	+0.47 / -0.52 dB
17100	7.27	+0.47 / -0.52 dB
17200	7.28	+0.47 / -0.52 dB
17300	7.28	+0.47 / -0.52 dB
17400	7.30	+0.47 / -0.52 dB
17500	7.34	+0.47 / -0.52 dB
17600	7.35	+0.47 / -0.52 dB
17700	7.39	+0.47 / -0.52 dB
17800	7.41	+0.47 / -0.52 dB
17900	7.41	+0.47 / -0.52 dB
18000	7.44	+0.47 / -0.52 dB

HL 5111: RF cable
Huber-Suhner, SF102EA/11SK/11SK/5500MM, s/n 502493/2EA

Set / Applied, MHz	Measured, dB	Uncertainty, dB
100	0.70	±0.07
200	0.99	±0.08
300	1.21	±0.08
500	1.56	±0.08
1000	2.20	±0.08
1500	2.69	±0.08
2000	3.11	±0.08
2500	3.50	±0.10
3000	3.85	±0.10
3500	4.16	±0.10
4000	4.47	±0.10
4500	4.74	±0.10
5000	5.03	±0.10
5500	5.30	±0.10
6000	5.57	±0.10
6500	5.76	±0.10
7000	6.00	±0.10
7500	6.20	±0.10
8000	6.44	±0.10
8500	6.67	±0.10
9000	6.82	±0.10
9500	7.04	±0.10
10000	7.18	±0.10
10500	7.36	±0.10
11000	7.55	±0.10
11500	7.75	±0.10
12000	7.90	±0.10
12500	8.08	±0.13
13000	8.19	±0.13
13500	8.39	±0.13
14000	8.58	±0.13
14500	8.76	±0.18
15000	8.92	±0.18
15500	9.03	±0.18
16000	9.18	±0.18
16500	9.34	±0.18
17000	9.51	±0.18
17500	9.66	±0.18
18000	9.80	±0.18
18500	9.94	±0.23
19000	10.05	±0.23
19500	10.22	±0.23

Set / Applied, MHz	Measured, dB	Uncertainty, dB
20000	10.32	±0.23
20500	10.48	±0.23
21000	10.60	±0.23
21500	10.73	±0.23
22000	10.87	±0.23
22500	10.97	±0.29
23000	11.09	±0.29
23500	11.26	±0.29
24000	11.37	±0.29
24500	11.50	±0.29
25000	11.61	±0.23
25500	11.72	±0.23
26000	11.87	±0.23
26500	11.99	±0.23
27000	12.09	±0.33
27500	12.24	±0.33
28000	12.34	±0.40
28500	12.47	±0.40
29000	12.61	±0.40
29500	12.70	±0.40
30000	12.86	±0.40
30500	12.92	±0.33
31000	13.09	±0.33
31500	13.16	±0.33
32000	13.33	±0.33
32500	13.40	±0.33
33000	13.62	±0.33
33500	13.70	±0.33
34000	13.88	±0.33
34500	13.97	±0.40
35000	14.05	±0.40
35500	14.23	±0.40
36000	14.25	±0.40
36500	14.46	±0.40
37000	14.49	±0.33
37500	14.72	±0.33
38000	14.77	±0.33
38500	14.97	±0.33
39000	15.04	±0.33
39500	15.22	±0.33
40000	15.63	±0.47

11 APPENDIX C Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

12 APPENDIX D Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-10808 for OATS, R-1082 for anechoic chamber, G-10869 for RE measurements above 1 GHz, C-10845 for conducted emissions site, T-11606 for conducted emissions at telecommunication ports). The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Michael Nikishin, EMC and radio group manager

13 APPENDIX E Specification references

47CFR part 15: 2017	Radio Frequency Devices.
ANSI C63.2: 2006	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
RSS-210 Issue 9:2016	Licence- Exempt Radio Apparatus:Category I Equipment
RSS-Gen Issue 5: 2018	General Requirements for Compliance of Radio Apparatus
ICES-003 Issue 6: 2016	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

15 APPENDIX G Manufacturer's declaration

Declaration of Identity

We, the undersigned,

Company: **RealView Imaging Ltd.**
Address: **4 Hatnufa Street, Yokneam Industrial Zone, 2069202**
Country: **Israel**
Telephone number: **+ 972-72-2200176**
Fax number: None

declare under our sole responsibility that the following equipment:

Brand/Item	Model	Short Product description
3D controller	HOLOSCOPE™i	The EUT is a 3D mouse comprising 2.4 GHz radio.

is electronically/electrically/mechanically identical to the following equipment (including Software/Hardware version(s)):

Brand/Item	Model	Short Product description
3D Control Device	HOLOSCOPE™i	The EUT is a 3D mouse comprising 2.4 GHz radio.

The reason for name change is: Uniformity of names market wise.

March 29, 2020

Yehudit Kraizer

VP QA/RA

REAL VIEW Deep Perception™ Live Holography

END OF DOCUMENT