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ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C §15.209

FOR:

Sensible Medical Innovations Ltd.

ReDS Pro System

Version: 2.7 Conf. C

Part number: GAS0047

FCC ID:2AONF-27C01

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:	Sensible Medical Innovations Ltd.
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Telephone:	058-6999563
Fax:	09-8654472
E-mail:	keren.d@sensible-medical.com
Contact name:	Mr. Keren Halperin

2 Equipment under test attributes

Product name:	ReDS Pro System
Product type:	Medical
Part number:	GAS0047
Serial number:	2009CVXWUK
Hardware version:	V2.7 Conf. C
Software release:	1.10
Receipt date	13 Aug 2019

3 Manufacturer information

Manufacturer name:	Sensible Medical Innovations Ltd.
Address:	P.O.Box 8702, Meir Ariel 6, intergama Building 1, Netanya, 4053942, Israel
Telephone:	058-6999563
Fax:	09-8654472
E-Mail:	keren.d@sensible-medical.com
Contact name:	Mr. Keren Halperin

4 Test details

Project ID:	34190
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	02-Dec-19
Test completed:	05-Dec-19
Test specification(s):	FCC 47CFR part 15, subpart C, §15.209

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.209, Field strength of emissions	Pass
FCC Part 15, Section 207, Conducted emission	Pass
FCC Part 15, Section 109, Radiated emission	Pass
FCC Part 15, Section 107, Conducted emission	Pass
FCC section 15.203, Antenna requirement	Pass

This test report supersedes the previously issued test report identified by Doc ID: SENRAD_FCC.34190_Rev1

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.

	Name and Title	**Date**	**Signature**
Tested by:	Mr. A. Morozov test engineer EMC & Radio	02-Dec-19 - 05-Dec-19	
Reviewed by:	Mrs. S Peysahov Sheynin test engineer EMC & Radio	25-Dec-19 – 21-Jan-20	
Approved by:	Mr. S. Samokha, technical manager, EMC and Radio	21-Jan-20	

6 EUT description

Note: The following data in this clause is provided by the customer and represents his sole responsibility

6.1 General information

The EUT, ReDS Pro System V2.7 Conf. C, is a non-invasive bedside monitor connected to a sensor unit and used for the measurement of lung fluid. The ReDS™ Pro System V2.7 Conf. C is comprised of a two Sensors Unit and a Bedside console.

The vest is designed to be adjusted to enable correct fit to an individual patient. The Sensor Unit is controlled and passes the data to the Bedside console via a cable.
In the ReDS Pro System V2.7 Conf. C, the tissue being examined is subjected to RF signals generated from a body coupled sensor. It does this by stepping a low power CW signal through 25 different frequencies between 950 MHz and 1.8 GHz (see attached table) the signal is generated in the RF TX-module connected via (fixed) Cable to the TX body matched sensor embedded in the Sensor Unit and attached during measurement to the patient thorax. The penetrating EM signal is collected with the RX-sensor, amplified, converted to Baseband, amplified and sampled by an A2D for later processing to detection of fluid content.
The EUT is powered from AC mains via AC/DC adapter. The AC/DC adapter manufactured by Adapter, part number ATM065TA150515202, serial number 1913000016 was used during the testing.

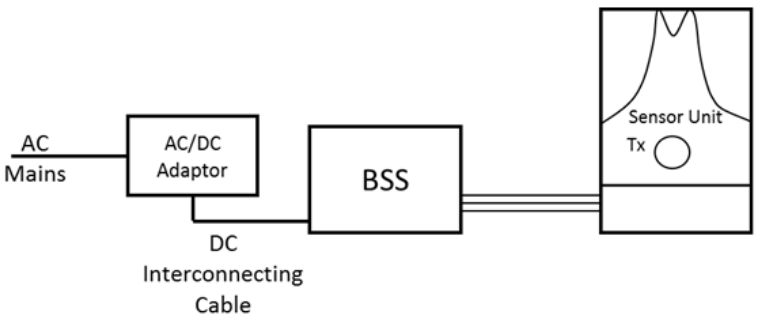
6.2 EUT parts

Description	Manufacturer	Part number	Serial number
ReDS system	Sensible Medical	GAS0047	2009CVXWUK

6.3 Operating frequencies

Source	Frequency, MHz				
900 MHz band	957	958	NA	NA	NA
1200-1400 MHz band	1242	1243	1256	1257	1292
	1293	1294	1295	1428	1429
	1430	1431	NA	NA	NA
1600 MHz band	1629	1635	1636	1655	1656
	1657	NA	NA	NA	NA
1700 MHz band	1711	1712	1716	1717	1718

6.4 Test configuration



6.5 Transmitter characteristics

Type of equipment	
V	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)

Operating frequencies;	Refer to section 6.3
Maximum field strength	60.93 dB(µV/m) at 3 m test distance

Is transmitter output power variable?	**V**	No			
		Yes		continuous variable	
				stepped variable with stepsize, software controlled	dB

Antenna connection				
unique coupling	standard connector	**V**	Integral	with temporary RF connector
				V without temporary RF connector

Antenna/s technical characteristics

Type	Manufacturer	Model number	Gain
internal	Sensible Medical Innovations	RX sensor EAS0039 Rev A TX Sensor EAS0040 rev A	about 10 dBi (in Air)

Type of modulation	stepped CW				
Transmitter duty cycle supplied for test	100%				

Transmitter power source					
	Battery	**Nominal rated voltage**		Battery type	
V	AC mains	**Nominal rated voltage**	120 VAC		
	DC	**Nominal rated voltage**			

Common power source for transmitter and receiver	**V**	yes	no

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C

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 Table 7.1.1. During the test Rx module was disabled, Tx module was active.

Table 7.1.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m, dB(μV/m) Within restricted bands		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
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	
1000 – 10th harmonic	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.

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

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 specified frequency range was investigated with a loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna was rotated around its vertical axis. The measuring antenna polarization was switched from vertical to horizontal.

7.1.2.3 The worst test results (the lowest margins) were recorded in Table 7.1.2 and shown in the associated plots.

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, energized and the performance check was conducted.

7.1.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.5 and shown in the associated plots.

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

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

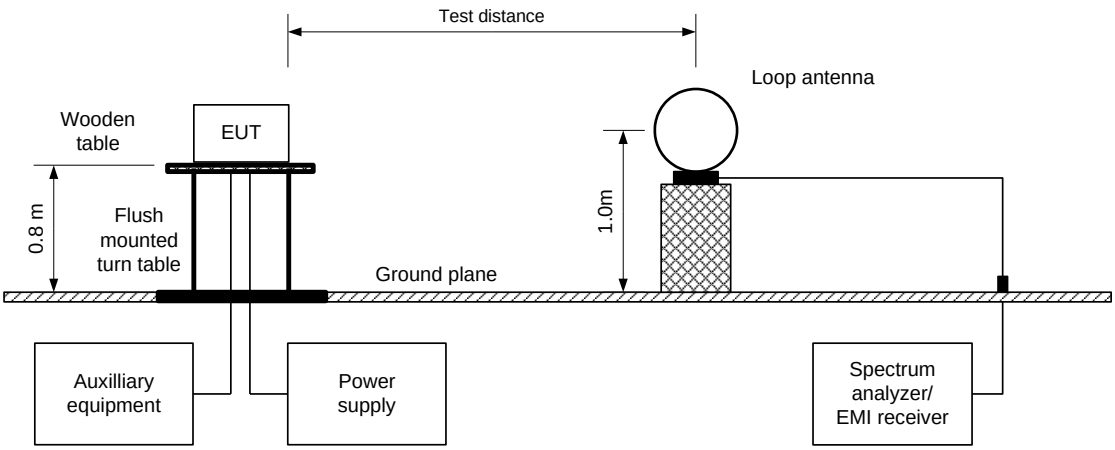
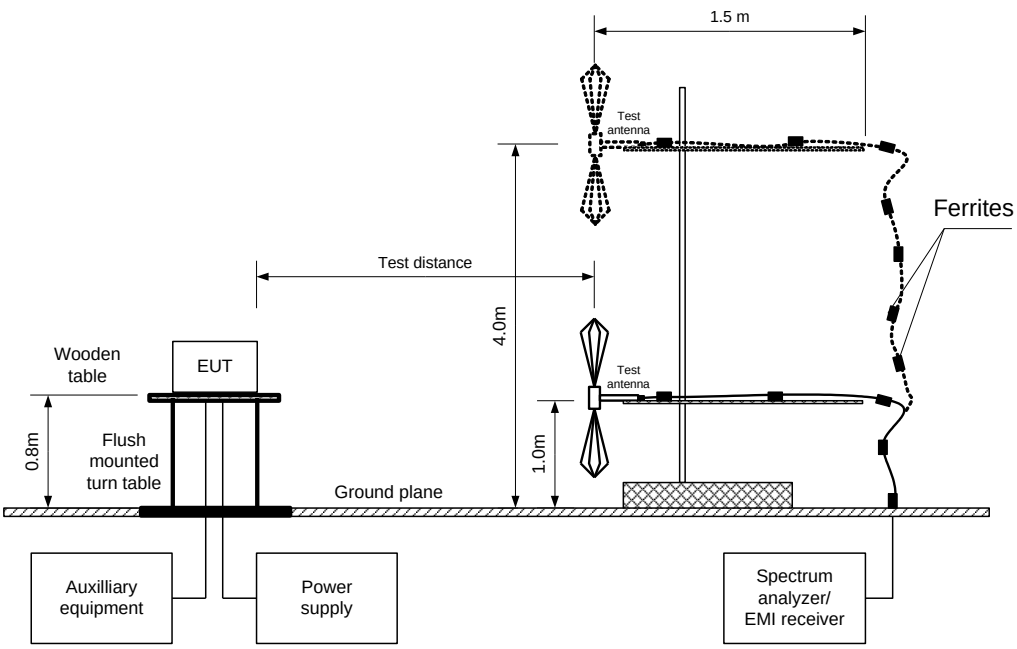
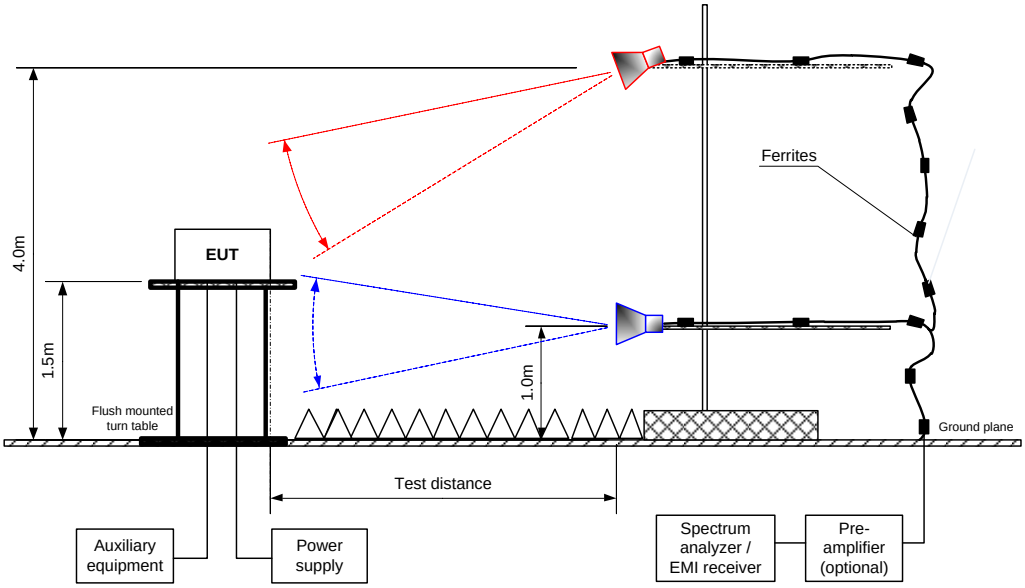


Figure 7.1.2 Setup for spurious emission field strength measurements from 30 to 1000 MHz



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Figure 7.1.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 7.1.2 Field strength of fundamental emission

TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT POSITION: Typical (Vertical)
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
VIDEO BANDWIDTH: ≥ Resolution bandwidth
FREQUENCY RANGE: 30-1000 MHz
DETECTOR USED: Quasi-peak
RESOLUTION BANDWIDTH: 120 kHz (30 MHz – 1000 MHz)
TEST ANTENNA TYPE: Biconilog
CARRIER FREQUENCY: Below 1 GHz
OPERATION MODE: CW Stopped

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*				
957.075	40.54	40.38	46.0	-5.62	Horizontal	1.75	226	Pass
958.084	40.24	40.09	46.0	-5.91	Vertical	1.04	178	

CARRIER FREQUENCY: Below 1 GHz
OPERATION MODE: CW Stepped

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*				
957.075	40.66	40.42	46.0	-5.58	Horizontal	1.75	226	Pass
958.084	41.01	40.88	46.0	-5.12	Vertical	1.04	178	

TEST ANTENNA TYPE: Double Rigged Horn
DETECTOR USED: Peak/Average
CARRIER FREQUENCY: Above 1 GHz
VIDEO BANDWIDTH: ≥ Resolution bandwidth
RESOLUTION BANDWIDTH: 1000 kHz
OPERATION MODE: CW Stopped

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
1241.917	Ver	1.92	185	53.13	74.00	-20.24	53.76	26.43	54.00	-27.57	Pass
1635.905	Hor	1.62	177	60.93	74.00	-13.07	60.93	33.60	54.00	-20.40	
1718.017	Hor	2.33	174	60.88	74.00	-13.12	60.88	33.55	54.00	-20.45	

CARRIER FREQUENCY: Above 1 GHz
OPERATION MODE: CW Stepped

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
1241.917	Ver	1.92	185	52.44	74.00	-21.56	52.44	25.11	54.0	-28.89	Pass
1635.905	Hor	1.62	177	58.73	74.00	-15.27	58.73	31.40	54.0	-22.60	
1718.017	Hor	2.33	174	59.61	74.00	-14.39	59.61	32.28	54.0	-21.72	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin (dB) = measured result - specification limit.

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 7.1.3 Average factor calculation

Frequencies	Number of transmission bursts within 100 ms	Transmission burst duration, ms	Average factor, dB
957 MHz 958 MHz	2	4.3	-21.31
1242 MHz 1636 MHz 1718 MHz	1	4.3	-27.33

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

Average factor = 20xlog ((Number of bursts within 100 ms x Burst duration)/100ms)

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

Table 7.1.4 Field strength of spurious emissions at carrier frequencies

TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	CW Stepped
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
VIDEO BANDWIDTH:	≥ Resolution bandwidth
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

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*				
35.961	32.57	30.44	40.0	-9.56	Vertical	1.02	82	Pass
55.633	38.47	36.87	40.0	-3.13	Vertical	1.02	81	
69.118	36.70	35.22	40.0	-4.78	Horizontal	3.21	183	
360.265	43.95	37.03	46.0	-8.97	Horizontal	1.00	14	
707.277	53.04	35.79	46.0	-10.21	Horizontal	1.04	24	
721.621	56.87	39.55	46.0	-6.45	Horizontal	1.00	13	
780.659	53.84	41.06	46.0	-4.94	Horizontal	1.02	360	

*****- Margin = Measured emission - specification limit.

******- EUT front panel refer to 0 degrees position of turntable.

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 7.1.5 Field strength of spurious emissions above 1 GHz

TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT POSITION:	Typical (Vertical)
MODULATING SIGNAL:	CW Stopped
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
VIDEO BANDWIDTH:	≥ Resolution bandwidth
RESOLUTION BANDWIDTH:	1000 kHz
INVESTIGATED FREQUENCY RANGE:	1 – 18 GHz
TEST ANTENNA TYPE:	Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Carrier frequency 957 MHz											
No emissions were found											Pass
Carrier frequency 958 MHz											
No emissions were found											Pass
Carrier frequency 1242 MHz											
No emissions were found											Pass
Carrier frequency 1636 MHz											
No emissions were found											Pass
Carrier frequency 1718 MHz											
No emissions were found											Pass

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

Table 7.1.6 Restricted bands according to FCC section 15.205

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138	1300 - 1427	3345.8 - 3358	15.35 - 16.2
4.17725 - 4.17775	12.57675 - 12.57725	149.9 - 150.05	1435 - 1626.5	3600 - 4400	17.7 - 21.4
4.20725 - 4.20775	13.36 - 13.41	156.52475 - 156.52525	1645.5 - 1646.5	4500 - 5150	22.01 - 23.12
6.215 - 6.218	16.42 - 16.423	156.7 - 156.9	1660 - 1710	5350 – 5460	23.6 - 24
6.26775 - 6.26825	16.69475 - 16.69525	162.0125 - 167.17	1718.8 - 1722.2	7250 - 7750	31.2 - 31.8
6.31175 - 6.31225	16.80425 - 16.80475	167.72 - 173.2	2200 - 2300	8025 – 8500	36.43 - 36.5
8.291 - 8.294	25.5 - 25.67	240 - 285	2310 - 2390	9000 - 9200	Above 38.6
8.362 - 8.366	37.5 - 38.25	322 - 335.4	2483.5 - 2500	9300 - 9500	

Reference numbers of test equipment used

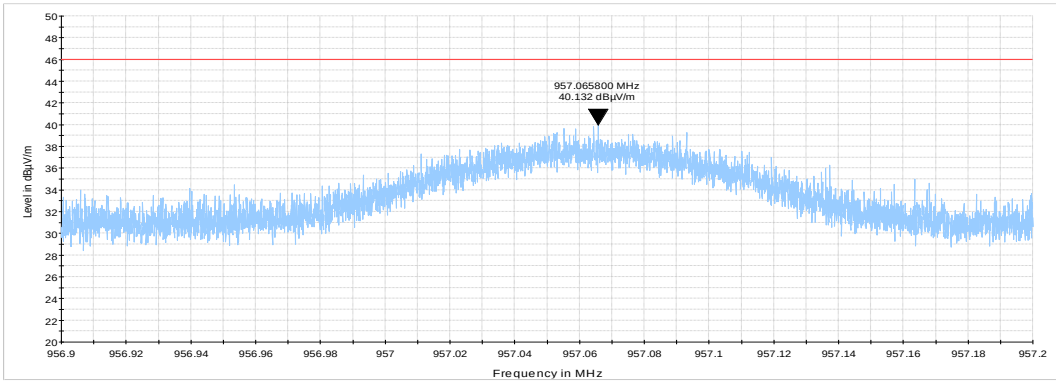
HL 0446	HL 3903	HL 4360	HL 4933	HL 5288	HL 5405		

Full description is given in Appendix A.

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

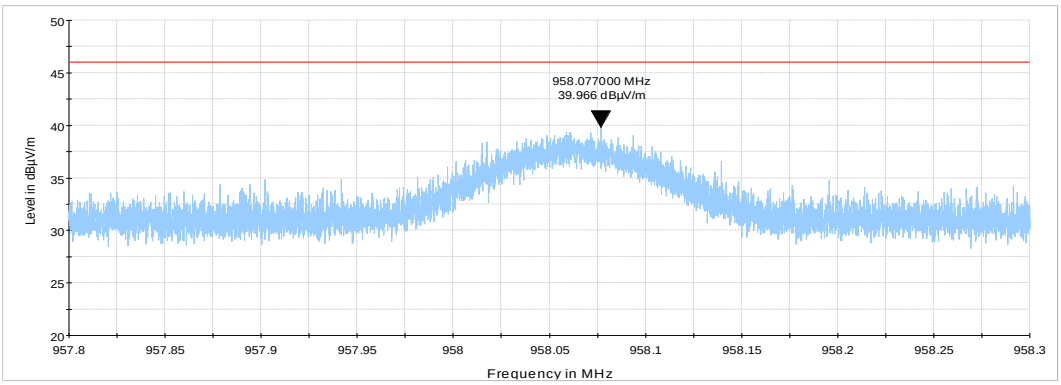
Plot 7.1.1 Radiated emission measurements at the fundamental frequency

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	957 MHz
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Plot 7.1.2 Radiated emission measurements at the fundamental frequency

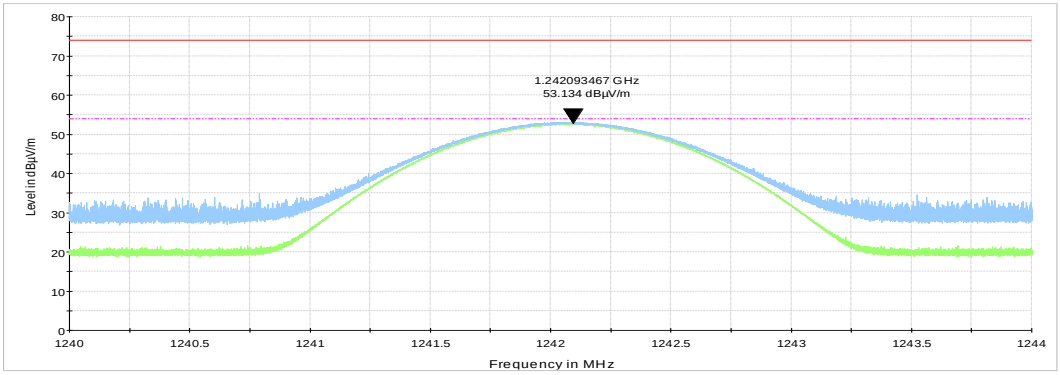
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	958 MHz
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.3 Radiated emission measurements at the fundamental frequency

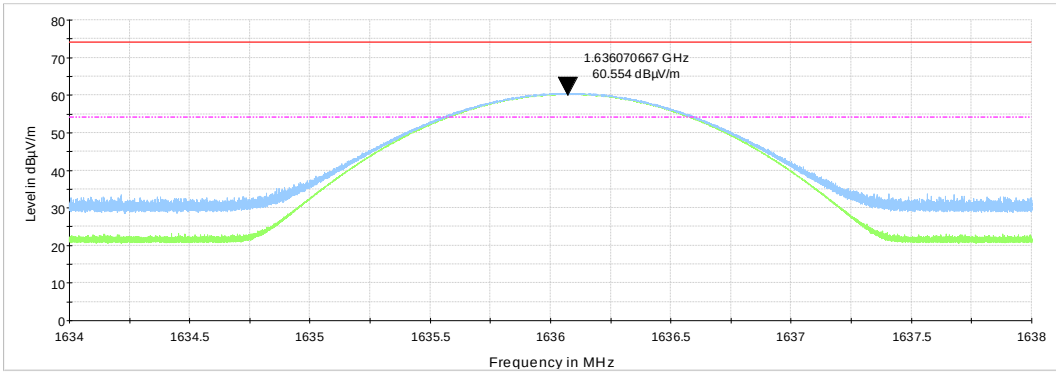
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1242 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Quasi Peak detector
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.4 Radiated emission measurements at the fundamental frequency

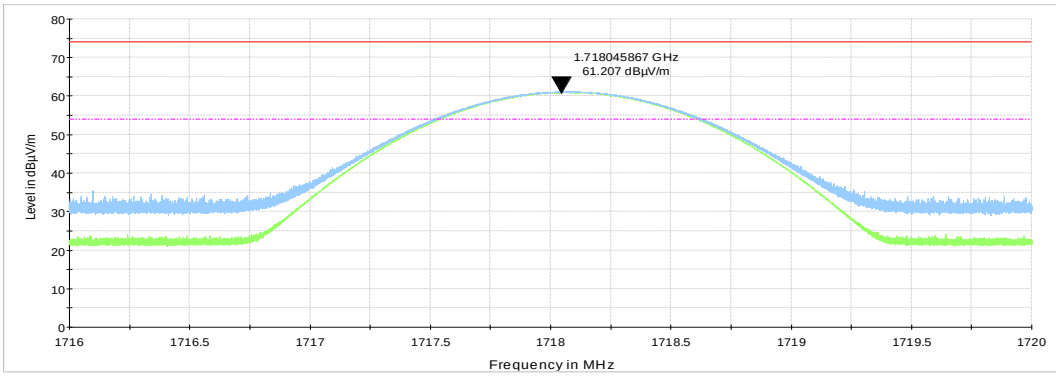
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1636 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Quasi Peak detector
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.5 Radiated emission measurements at the fundamental frequency

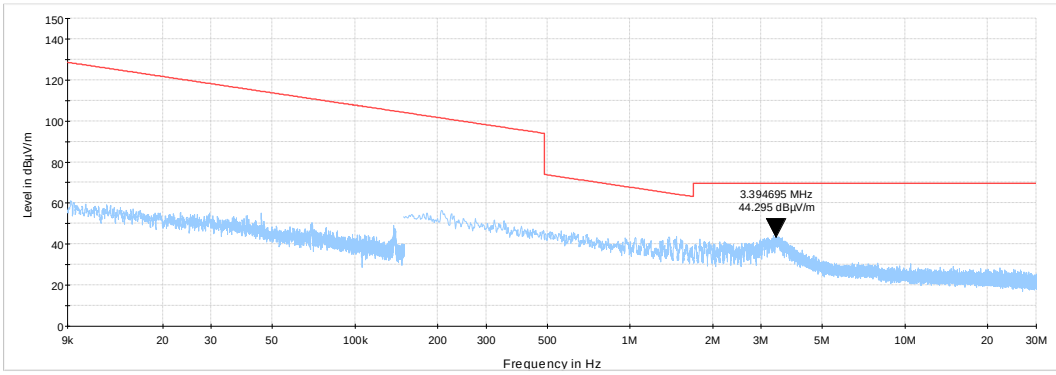
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1718 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Quasi Peak detector
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

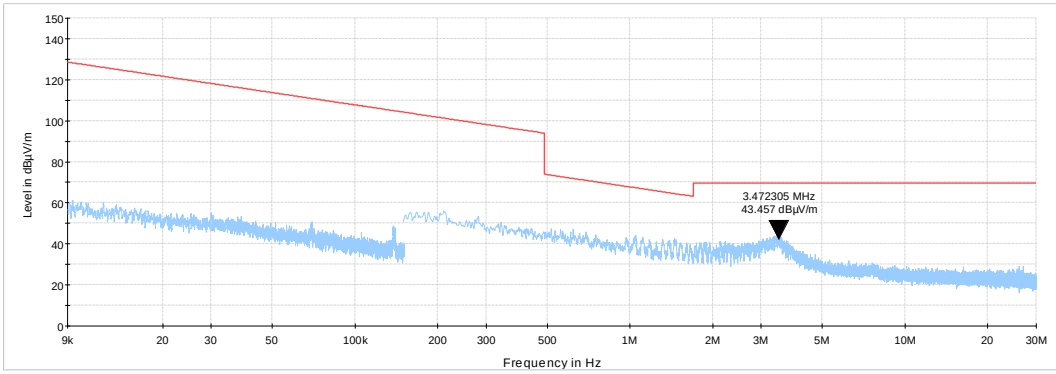
Plot 7.1.6 Radiated emission measurements from 9 kHz to 30 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
OPERATION MODE:	CW Stepped
RESOLUTION BANDWIDTH:	1 KHz / 10 KHz
VIDEO BANDWIDTH:	3 KHz / 30 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	100 - 200 Hz / 4.5 - 9 KHz
NUMBER OF POINTS:	1410 / 6634



Plot 7.1.7 Radiated emission measurements from 9 kHz to 30 MHz, Tx Mode Only

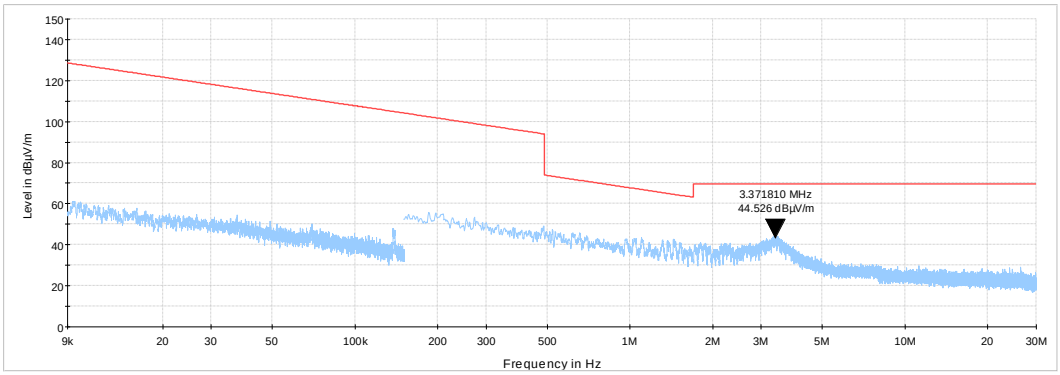
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	957 MHz
RESOLUTION BANDWIDTH:	1 KHz / 10 KHz
VIDEO BANDWIDTH:	3 KHz / 30 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	100 - 200 Hz / 4.5 - 9 KHz
NUMBER OF POINTS:	1410 / 6634



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

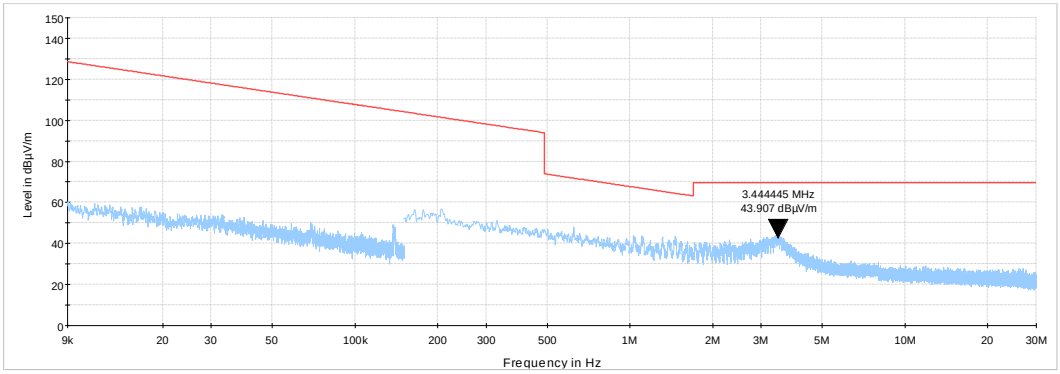
Plot 7.1.8 Radiated emission measurements from 9 kHz to 30 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	958 MHz
RESOLUTION BANDWIDTH:	1 KHz / 10 KHz
VIDEO BANDWIDTH:	3 KHz / 30 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	100 - 200 Hz / 4.5 - 9 KHz
NUMBER OF POINTS:	1410 / 6634



Plot 7.1.9 Radiated emission measurements from 9 kHz to 30 MHz, Tx Mode Only

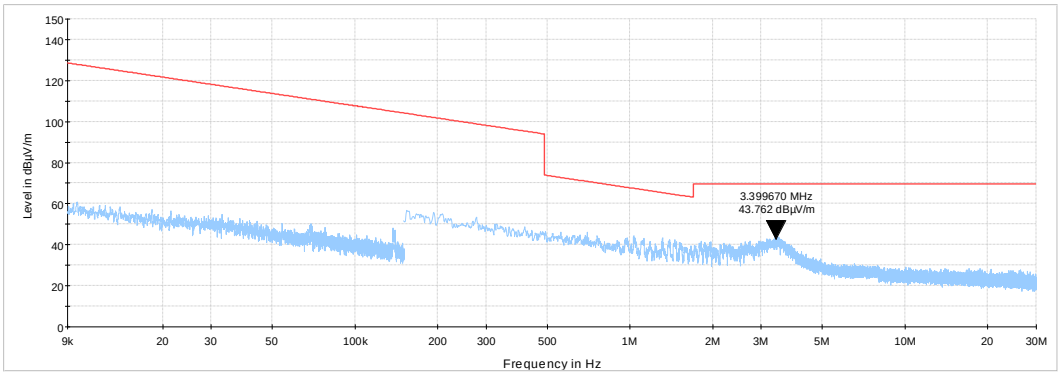
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1242 MHz
RESOLUTION BANDWIDTH:	1 KHz / 10 KHz
VIDEO BANDWIDTH:	3 KHz / 30 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	100 - 200 Hz / 4.5 - 9 KHz
NUMBER OF POINTS:	1410 / 6634



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

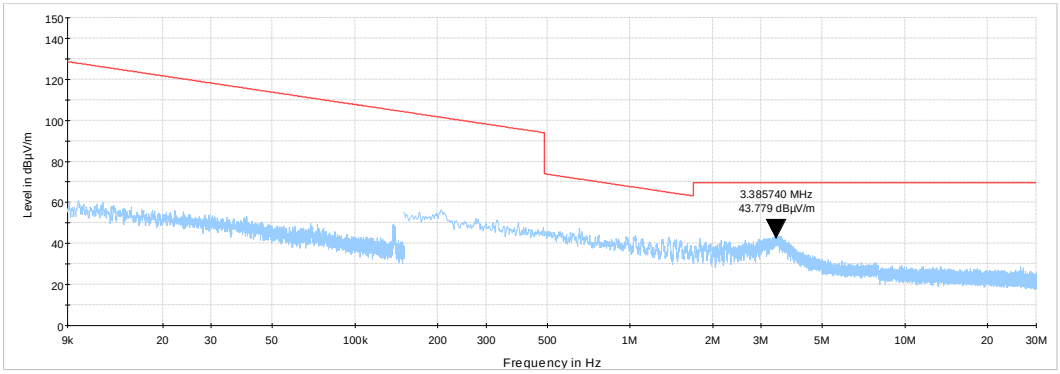
Plot 7.1.10 Radiated emission measurements from 9 kHz to 30 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1636 MHz
RESOLUTION BANDWIDTH:	1 KHz / 10 KHz
VIDEO BANDWIDTH:	3 KHz / 30 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	100 - 200 Hz / 4.5 - 9 KHz
NUMBER OF POINTS:	1410 / 6634



Plot 7.1.11 Radiated emission measurements from 9 kHz to 30 MHz, Tx Mode Only

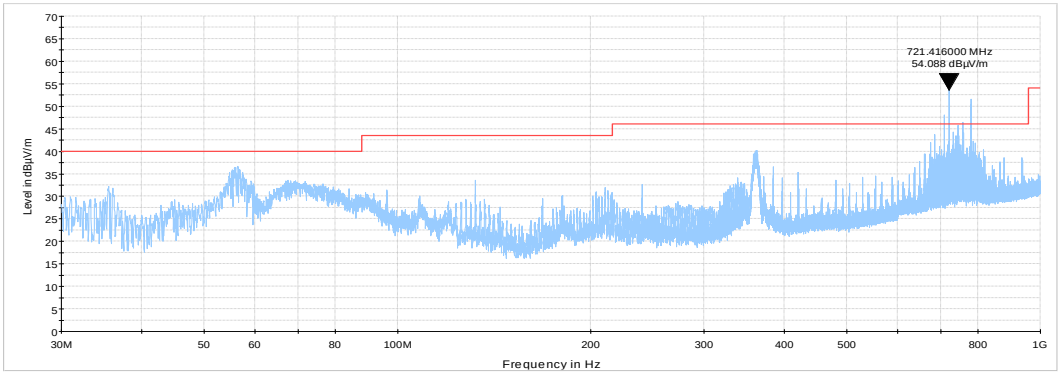
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1718 MHz
RESOLUTION BANDWIDTH:	1 KHz / 10 KHz
VIDEO BANDWIDTH:	3 KHz / 30 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	100 - 200 Hz / 4.5 - 9 KHz
NUMBER OF POINTS:	1410 / 6634



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.12 Radiated emission measurements from 30 to 1000 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stepped
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200

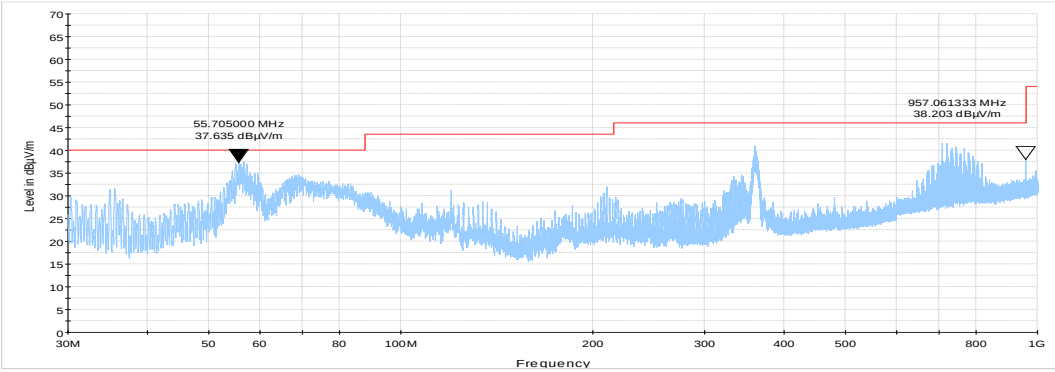


* Limit is in Quasi Peak, the Quasi Peak values are provided in Table 7.1.3

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.13 Radiated emission measurements from 30 to 1000 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	957 MHz
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200

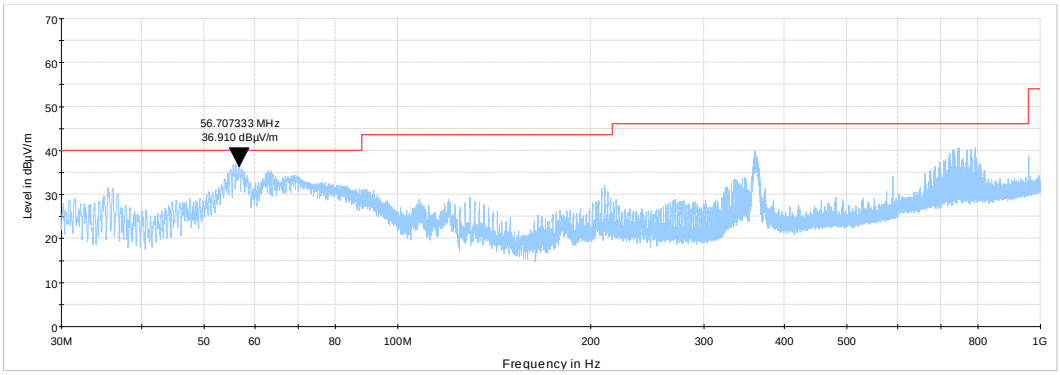


* Limit is in Quasi Peak, the Quasi Peak values are provided in Table 7.1.3

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.14 Radiated emission measurements from 30 to 1000 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	958 MHz
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200

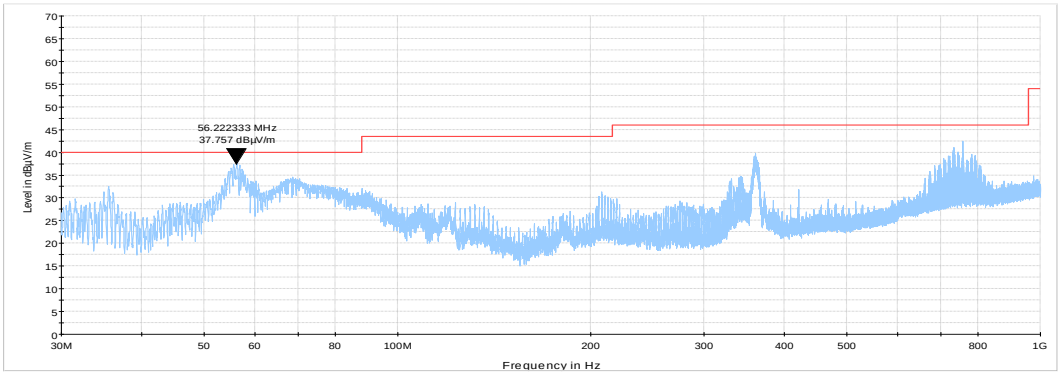


* Limit is in Quasi Peak, the Quasi Peak values are provided in Table 7.1.3

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.15 Radiated emission measurements from 30 to 1000 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1242 MHz
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200

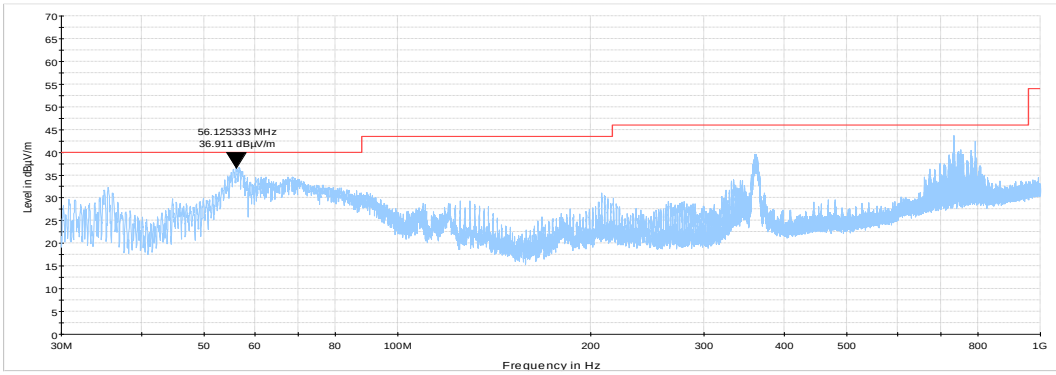


* Limit is in Quasi Peak, the Quasi Peak values are provided in Table 7.1.3

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.16 Radiated emission measurements from 30 to 1000 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1636 MHz
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200

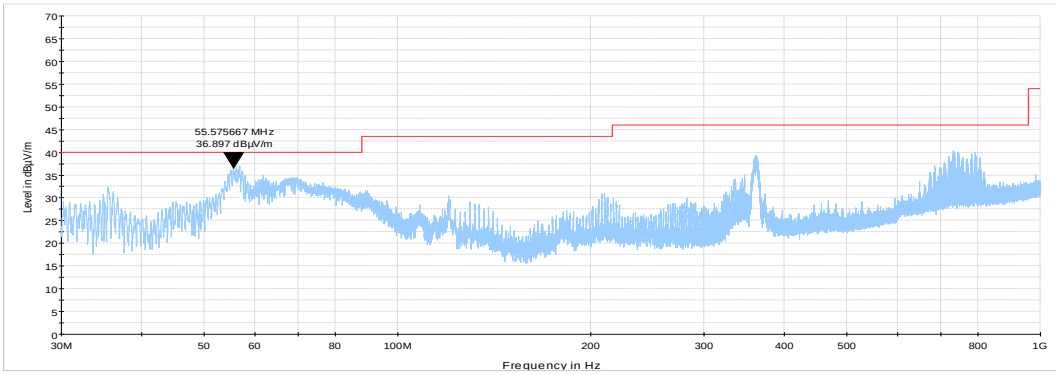


* Limit is in Quasi Peak, the Quasi Peak values are provided in Table 7.1.3

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.17 Radiated emission measurements from 30 to 1000 MHz, Tx Mode Only

TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1718 MHz
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200

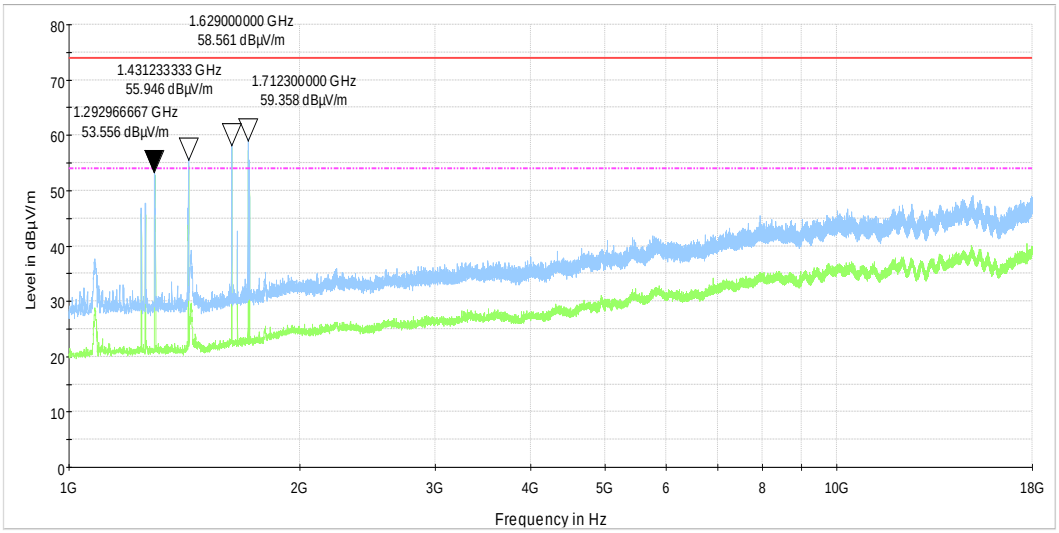


* Limit is in Quasi Peak, the Quasi Peak values are provided in Table 7.1.3

Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.18 Radiated emission measurements from 1 to 18 GHz, Tx Mode Only

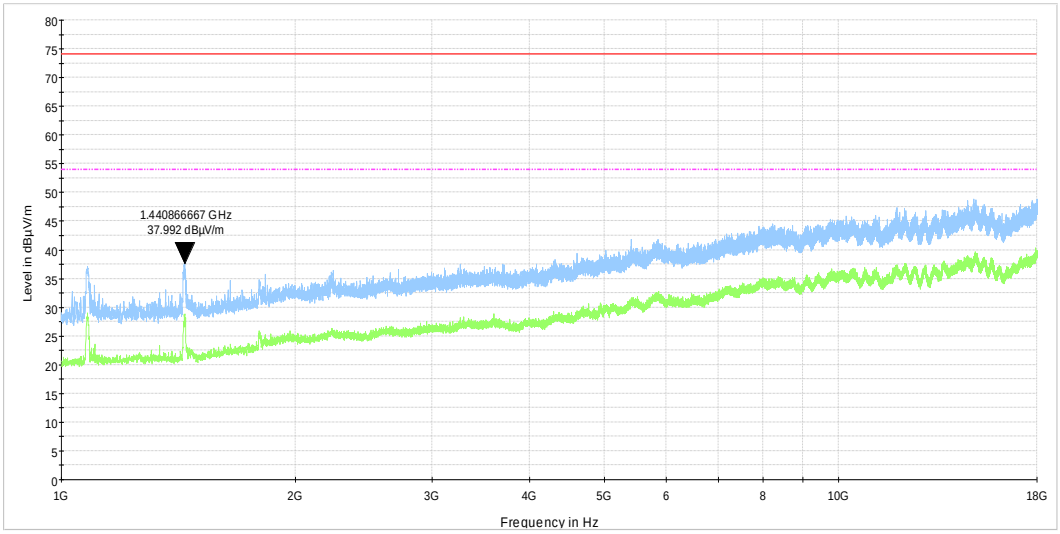
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stepped
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.19 Radiated emission measurements from 1 to 18 GHz, Tx Mode Only

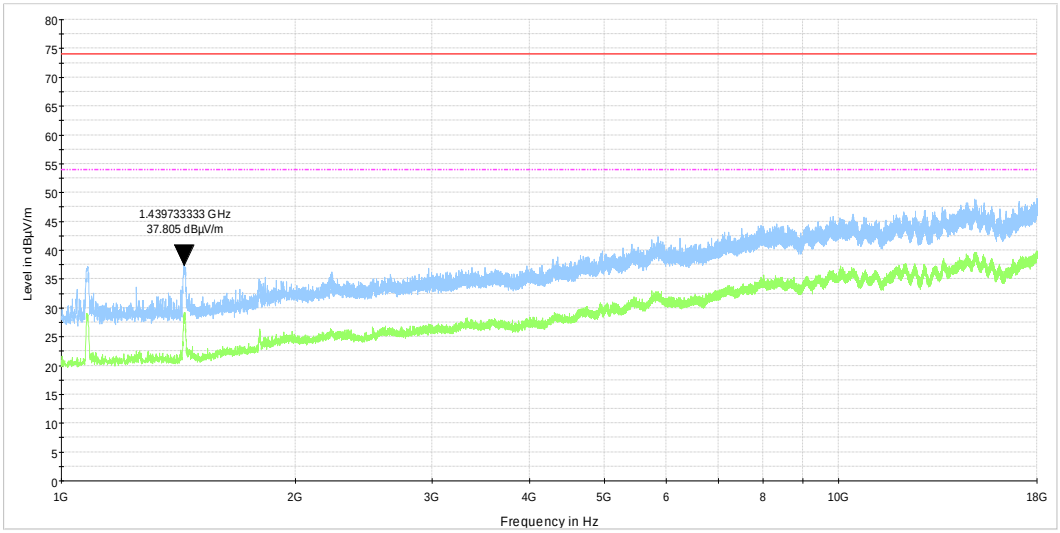
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	957 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.20 Radiated emission measurements from 1 to 18 GHz, Tx Mode Only

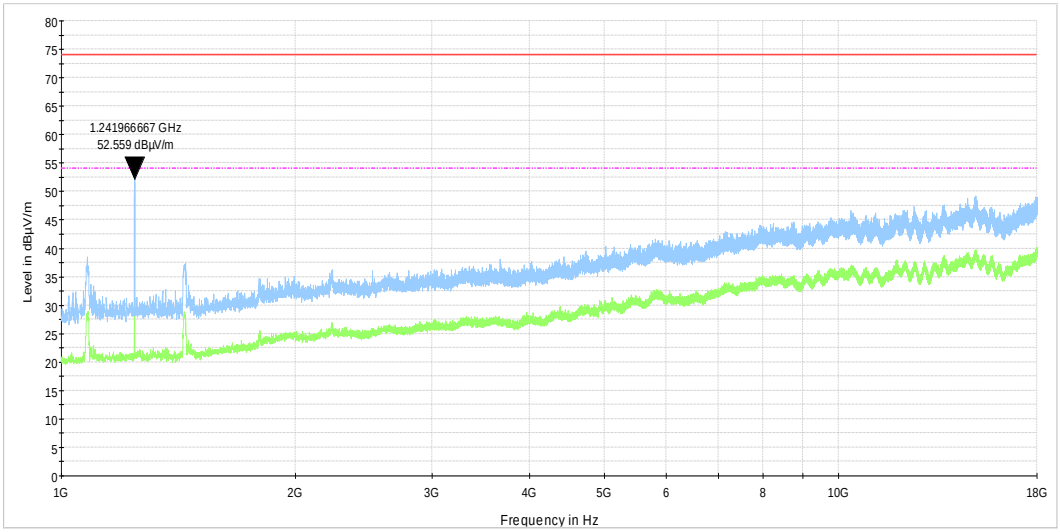
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	958 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.21 Radiated emission measurements from 1 to 18 GHz, Tx Mode Only

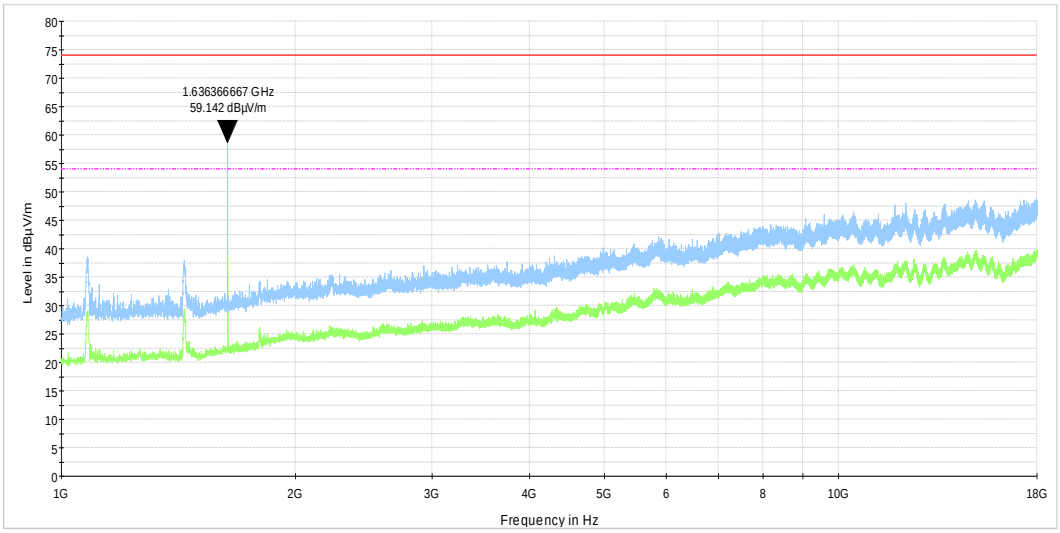
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1242 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.22 Radiated emission measurements from 1 to 18 GHz, Tx Mode Only

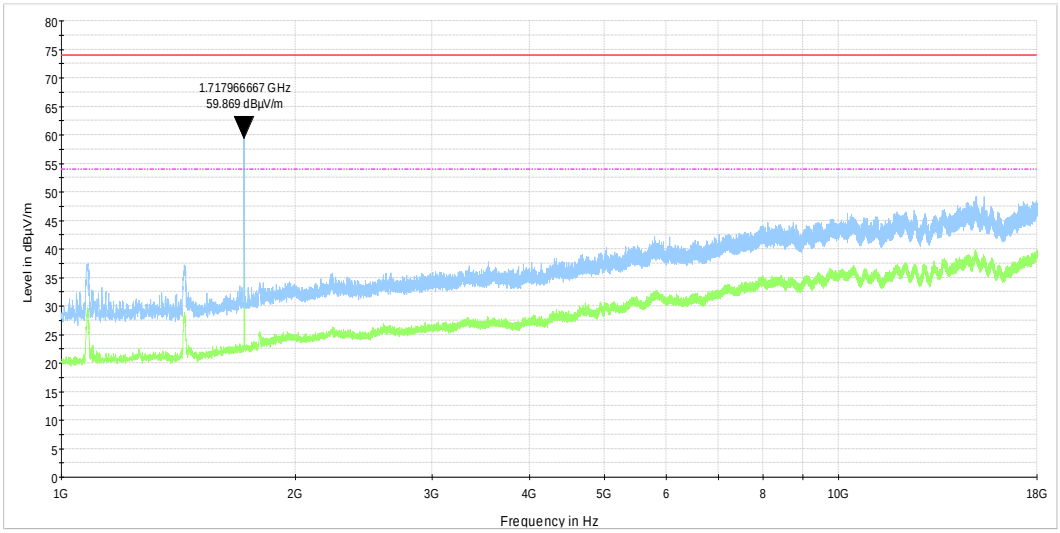
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1636 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.23 Radiated emission measurements from 1 to 18 GHz, Tx Mode Only

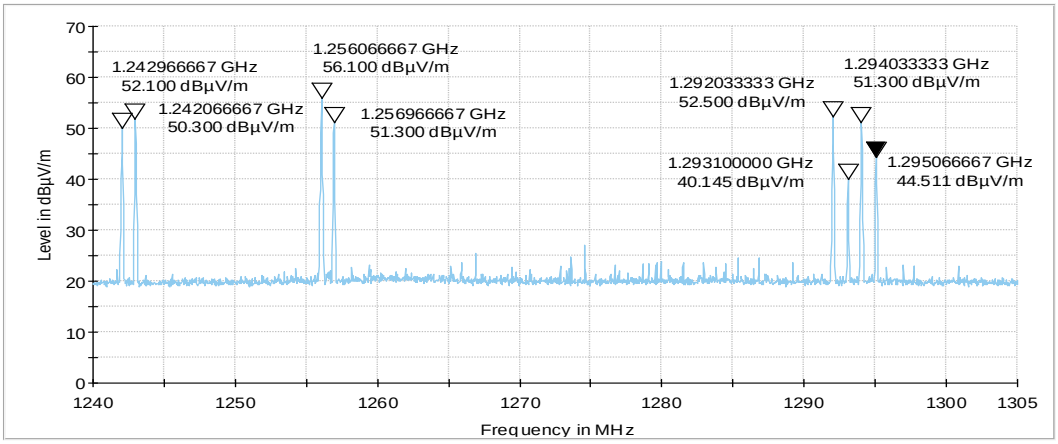
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stopped
CARRIER FREQUENCY:	1718 MHz
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

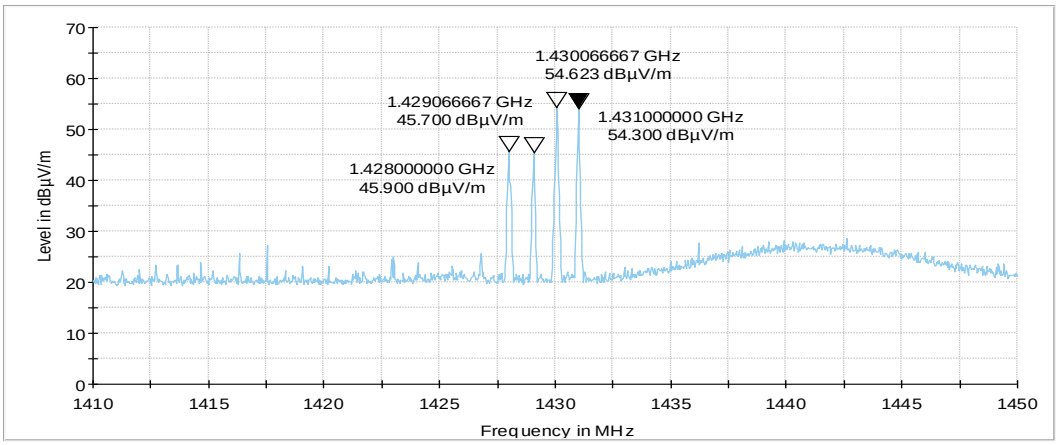
Plot 7.1.24 Radiated emission measurements from 1.24 to 1.305 GHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Plot 7.1.25 Radiated emission measurements from 1.41 to 1.45 GHz

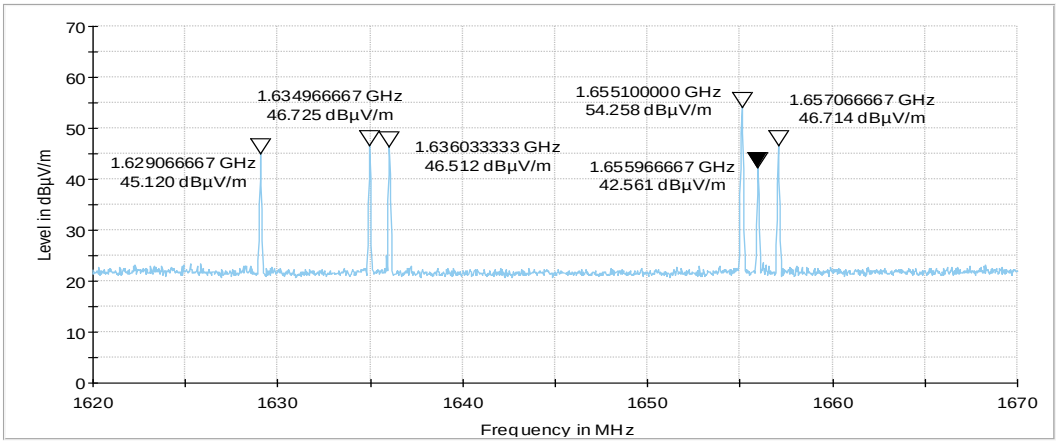
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

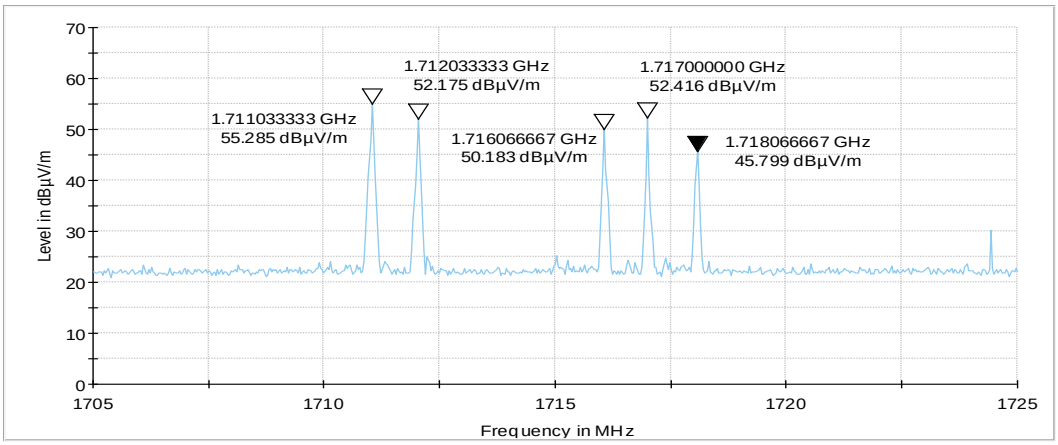
Plot 7.1.26 Radiated emission measurements from 1.62 to 1.67 GHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Plot 7.1.27 Radiated emission measurements from 1.705 to 1.725 GHz

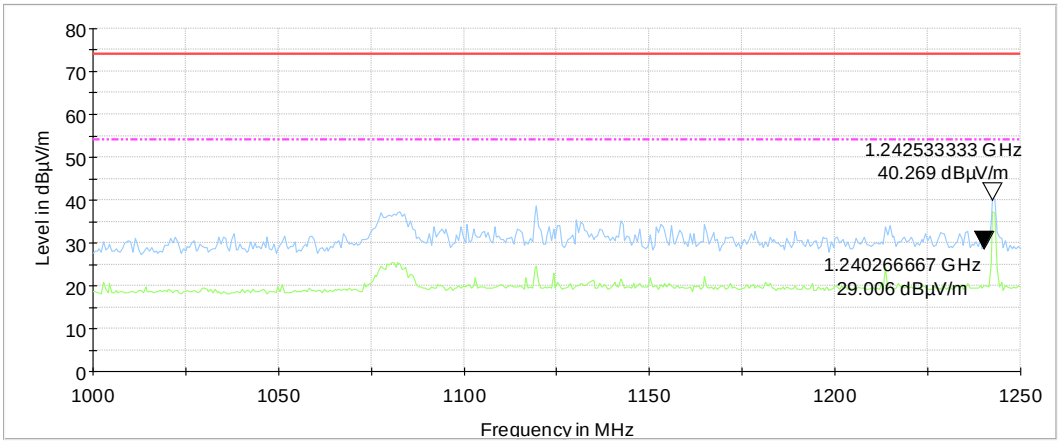
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

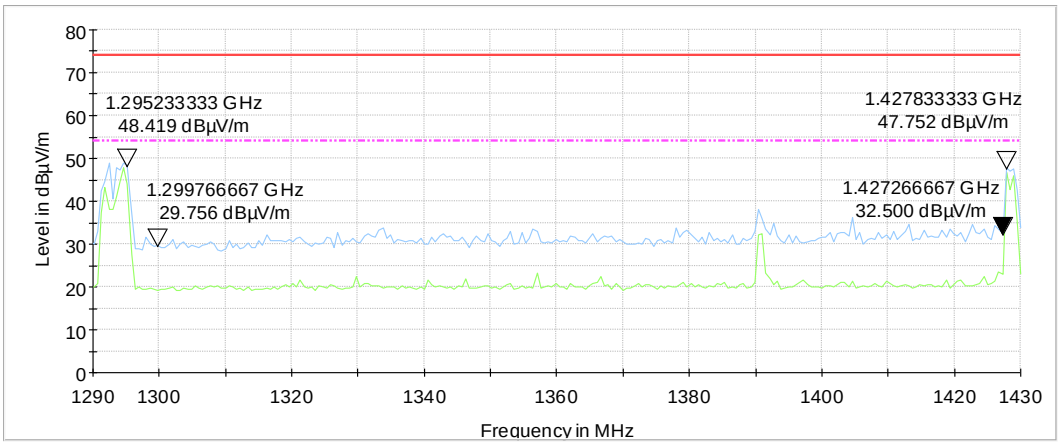
Plot 7.1.28 Radiated emission in restricted band from 1 to 1.25 GHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Plot 7.1.29 Radiated emission in restricted band from 1.29 to 1.43 GHz

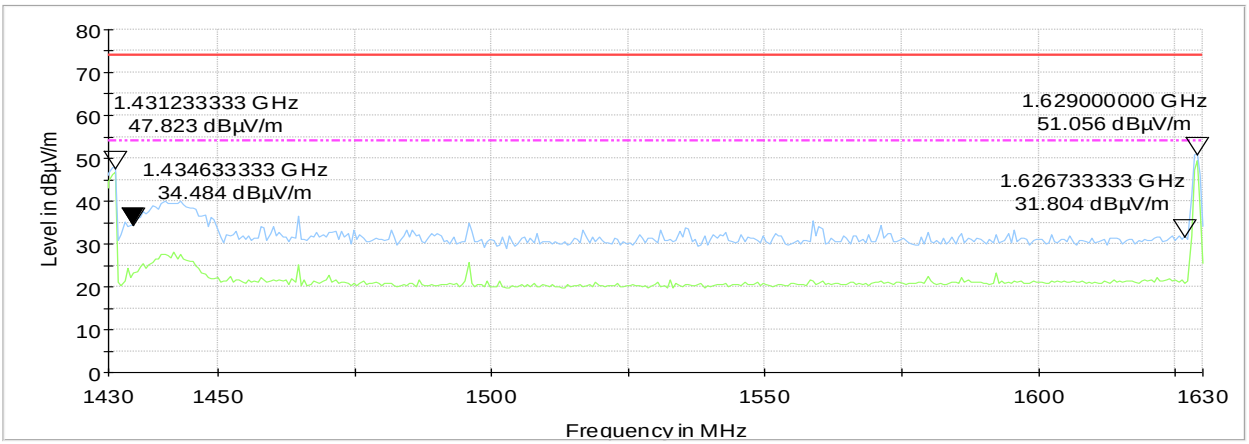
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

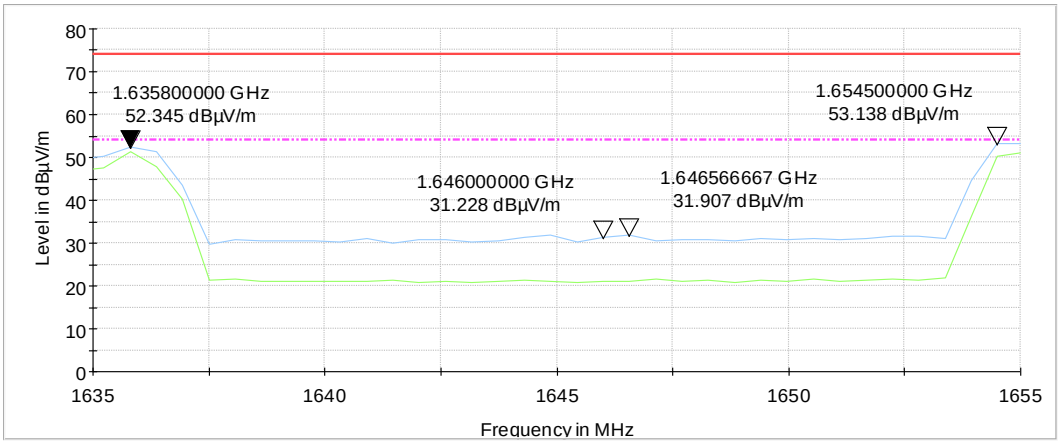
Plot 7.1.30 Radiated emission in restricted band from 1.43 to 1.63 GHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Plot 7.1.31 Radiated emission in restricted band from 1.635 to 1.655 GHz

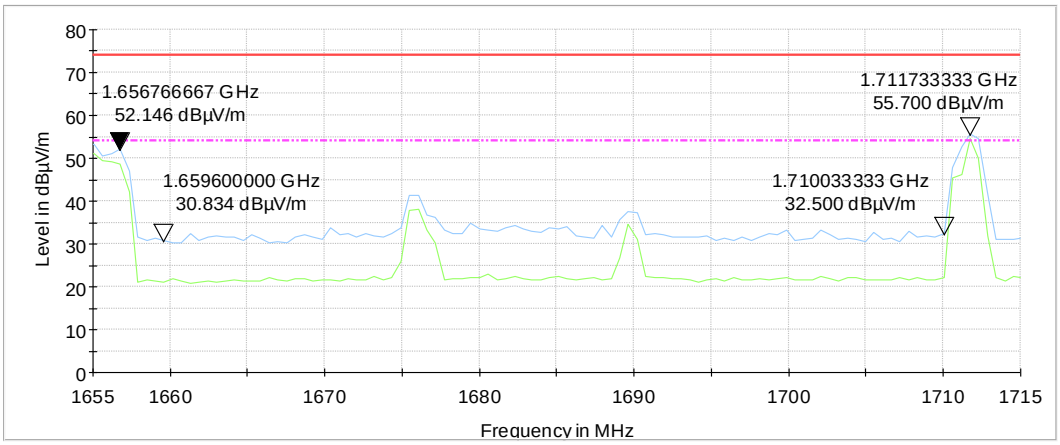
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

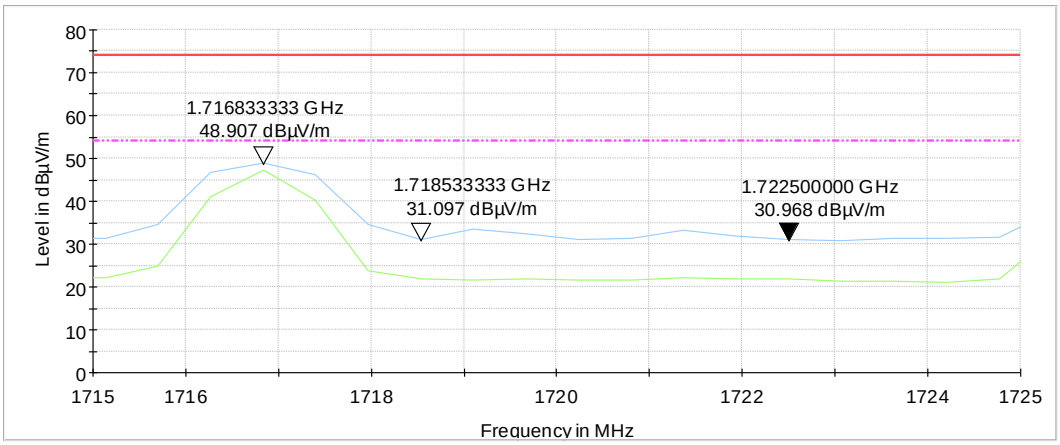
Plot 7.1.32 Radiated emission in restricted band from 1.655 to 1.715 GHz

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



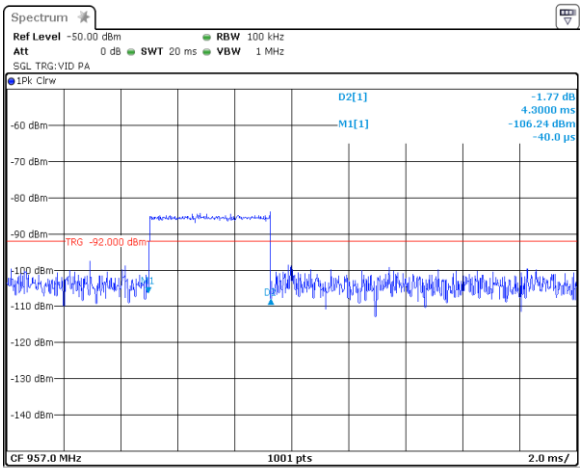
Plot 7.1.33 Radiated emission in restricted band from 1.715 to 1.725 GHz

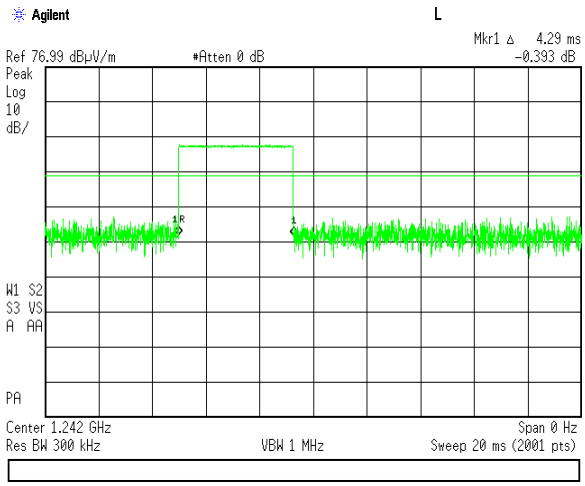
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
OPERATION MODE: CW Stepped



Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

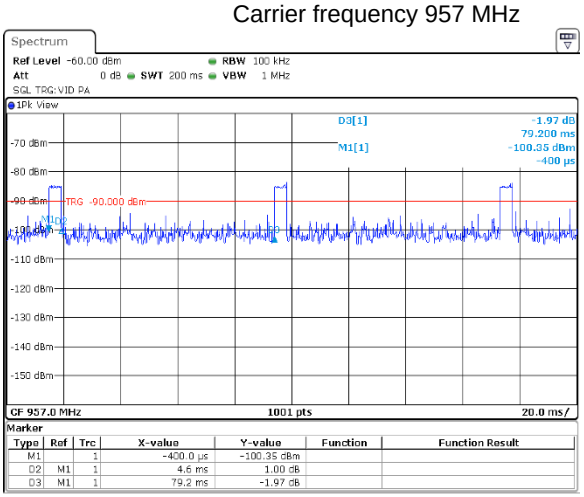
Plot 7.1.34 Transmission burst duration



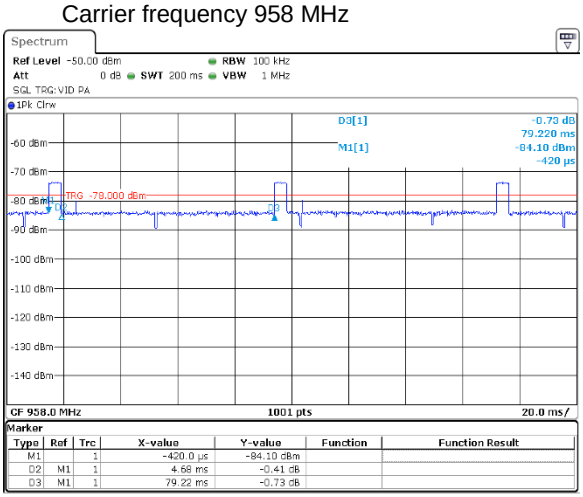


Plot 7.1.35 Number of transmission burst within 100 ms

Carrier frequency 957 MHz



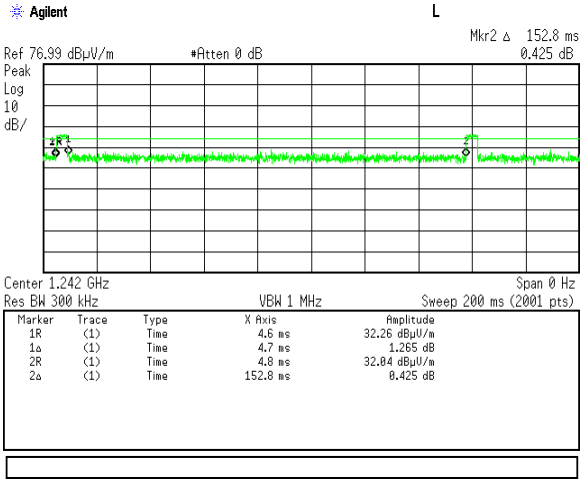
Carrier frequency 958 MHz



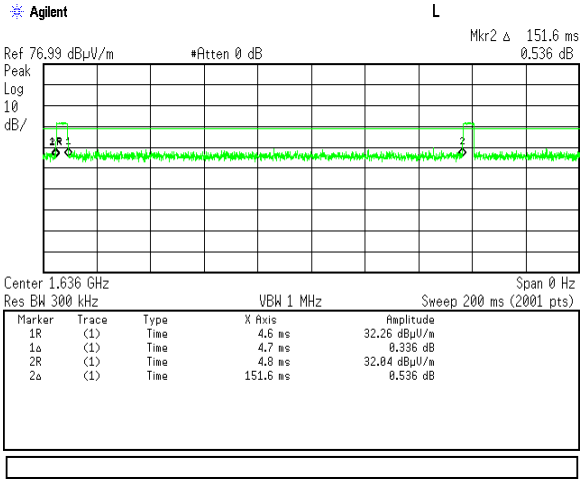
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.1.36 Number of transmission burst within 100 ms

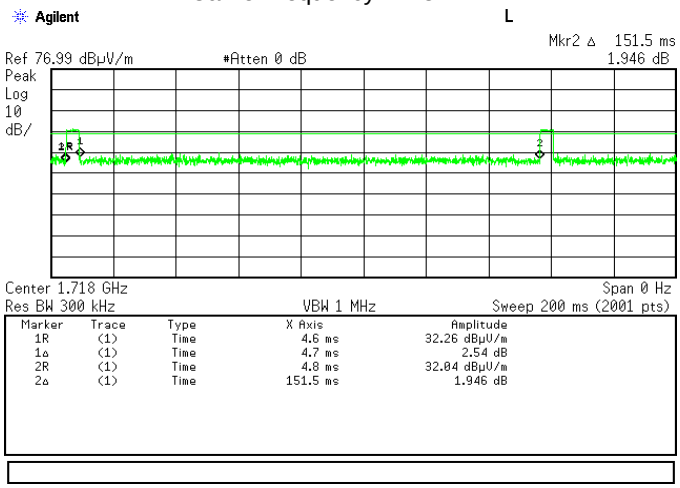
Carrier frequency 1242 MHz



Carrier frequency 1636 MHz



Carrier frequency 1718 MHz



Test specification:	**Section 15.207(a) Conducted emission**		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

7.2 Conducted emissions

7.2.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Limits for conducted emissions according to FCC Part 15

Frequency, MHz	Class B limit, dB(μV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

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

7.2.2 Test procedure

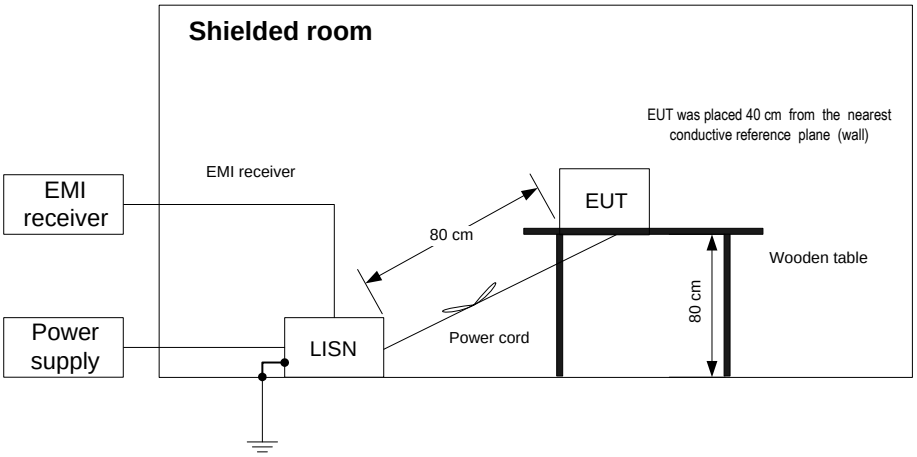
7.2.2.1 The EUT was set up as shown in Figure 7.2.1 and associated photographs, energized and the performance check was conducted.

7.2.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

7.2.2.3 The position of the device cables was varied to determine maximum emission level.

7.2.2.4 The worst test results (the lowest margins) were recorded in Table 7.2.2 and shown in the associated plots.

Figure 7.2.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.207(a) Conducted emission**		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 7.2.2 Conducted emission test results according to FCC Part 15, Section 207

LINE:	AC mains
EUT OPERATING MODE:	Transmit
EUT SET UP:	TABLE-TOP
TEST SITE:	SHIELDED ROOM
FREQUENCY RANGE:	150 kHz - 30 MHz
RESOLUTION BANDWIDTH:	9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.151	56.8	48.9	66.0	-17.1	31.6	56.0	-24.4	L1	Pass
0.325	51.0	48.3	59.6	-11.3	47.4	49.6	-2.2		
0.450	45.7	42.5	57.0	-14.5	34.9	47.0	-12.1		
0.647	44.9	42.8	56.0	-13.2	41.0	46.0	-5.0		
0.970	48.9	47.2	56.0	-8.8	45.5	46.0	-0.5		
1.293	47.5	45.4	56.0	-10.6	43.2	46.0	-2.8		
1.942	46.3	44.3	56.0	-11.7	42.3	46.0	-3.7		
2.588	44.5	42.2	56.0	-13.8	39.3	46.0	-6.7		
4.208	41.8	39.2	56.0	-16.8	34.2	46.0	-11.8		
11.656	40.5	38.3	60.0	-21.7	26.6	50.0	-23.4		
0.154	55.8	48.2	65.8	-17.6	31.1	55.8	-24.7	L2	Pass
0.323	51.1	48.1	59.7	-11.6	47.9	49.7	-1.8		
0.466	45.1	41.7	56.6	-14.9	34.2	46.6	-12.4		
0.648	44.0	41.8	56.0	-14.2	40.8	46.0	-5.2		
0.970	47.1	46.2	56.0	-9.8	45.5	46.0	-0.5		
1.293	46.2	44.9	56.0	-11.1	43.5	46.0	-2.5		
1.941	45.2	43.9	56.0	-12.1	42.4	46.0	-3.6		
2.586	43.5	42.0	56.0	-14.0	39.2	46.0	-6.8		
4.203	40.7	39.3	56.0	-16.7	35.0	46.0	-11.0		
11.650	40.6	37.9	60.0	-22.1	26.4	50.0	-23.6		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

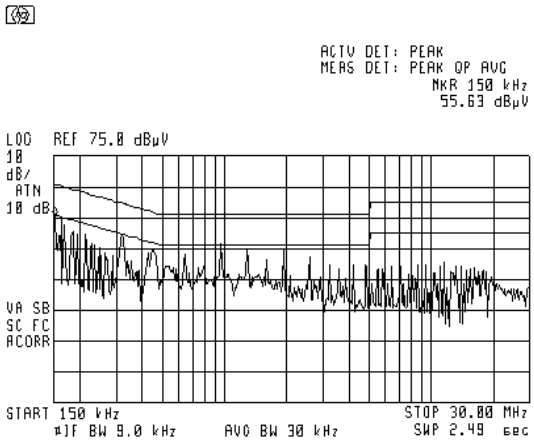
HL 0787	HL 3016	HL 4778	HL 5476				

Full description is given in Appendix A.

Test specification:	**Section 15.207(a) Conducted emission**		
Test procedure:	ANSI C63.10, Section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

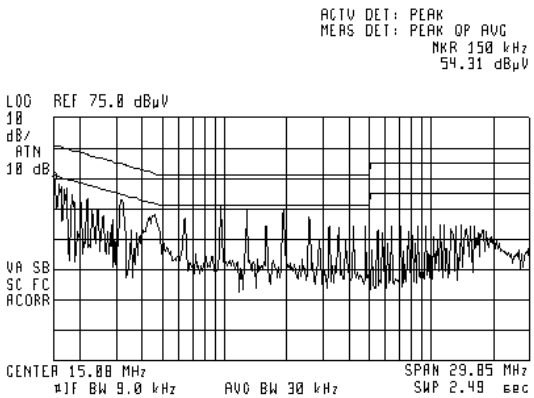
Plot 7.2.1 Conducted emission measurements according to FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2

LINE: L1
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.2.2 Conducted emission measurements according to FCC Part 15, Section 207 / RSS-Gen, Section 7.2.2

LINE: L2
EUT OPERATING MODE: Transmit
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

8 Unintentional emissions according to 47CFR part 15 subpart B

8.1 Radiated emissions

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. During the test Rx module was active, Tx module was disabled.

Table 8.1.1 Radiated emission limits

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*
960 - 5th harmonic**	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:

$Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$,

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

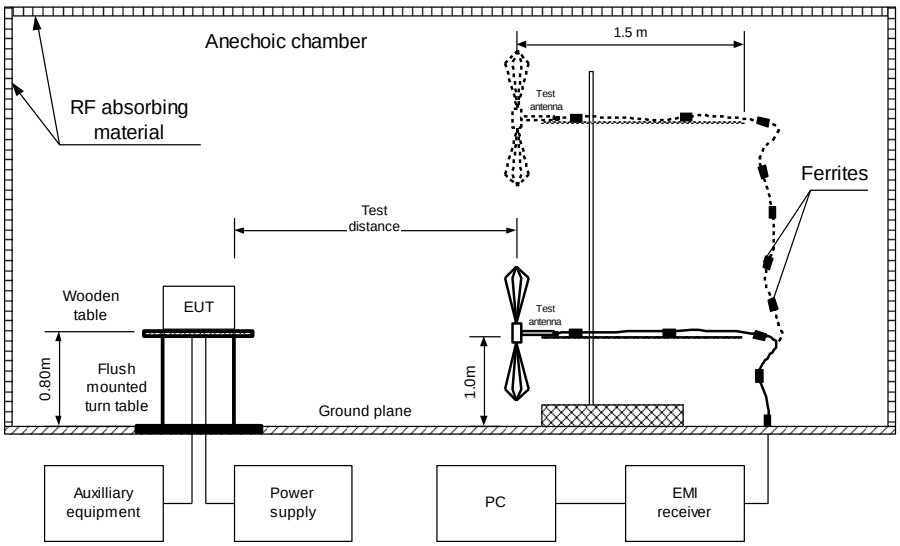
8.1.2 Test procedure for measurements in semi-anechoic chamber

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 provided in the associated tables and plots.

Figure 8.1.1 Setup for radiated emission measurements



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 8.1.2 Field strength of spurious emissions below 1 GHz

TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	CW Stepped
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
VIDEO BANDWIDTH:	≥ Resolution bandwidth
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

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*				
35.961	32.57	30.44	40.0	-9.56	Vertical	1.02	82	Pass
55.633	38.47	36.87	40.0	-3.13	Vertical	1.02	81	
69.118	36.70	35.22	40.0	-4.78	Horizontal	3.21	183	
360.238	43.37	38.49	46.00	-7.51	Hor	1.0	-166	
707.277	53.04	35.79	46.0	-10.21	Horizontal	1.04	24	
733.621	56.87	39.55	46.0	-6.45	Horizontal	1.00	13	
766.348	45.47	33.52	46.00	12.48	Hor	1.0	180	
780.659	53.84	41.06	46.0	-4.94	Horizontal	1.02	360	

Table 8.1.3 Field strength of spurious emissions above 1 GHz

TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT POSITION:	Typical (Vertical)
MODULATING SIGNAL:	CW Stopped
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
VIDEO BANDWIDTH:	≥ Resolution bandwidth
RESOLUTION BANDWIDTH:	1000 kHz
INVESTIGATED FREQUENCY RANGE:	1 – 18 GHz
TEST ANTENNA TYPE:	Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Carrier frequency 1391 MHz											
6955.170	Ver	1.91	151	47.89	74.0	-26.11	47.89	28.66	54.0	-25.34	
Carrier frequency 1392MHz											
6960.195	Hor	1.32	105	50.97	74.0	-23.03	50.97	31.67	54.0	-22.33	
Carrier frequency 1676 MHz											
10056.002	Hor	1.63	112	60.30	74.0	-13.70	60.30	34.86	54.0	-19.14	
Carrier frequency 2070 MHz											
10350.250	Hor	1.72	120	57.59	74.0	-16.41	57.59	32.15	54.0	-21.85	
Carrier frequency 2152 MHz											
10760.120	Hor	1.94	64	58.99	74.0	-22.01	58.99	33.55	54.0	-20.45	Pass

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

Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 8.1.4 Average factor calculation

Frequencies	Number of transmission pulses within 100 ms	Transmission pulse duration, ms	Average factor, dB
1391 MHz	2	5.46	-19.23
1392 MHz	2	5.42	-19.30
1676 MHz	1	5.34	-25.45
2070 MHz	1	5.34	-25.45
2152 MHz	1	5.34	-25.45

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

Average factor = 20xlog ((Number of bursts within 100 ms x Burst duration)/100ms)

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

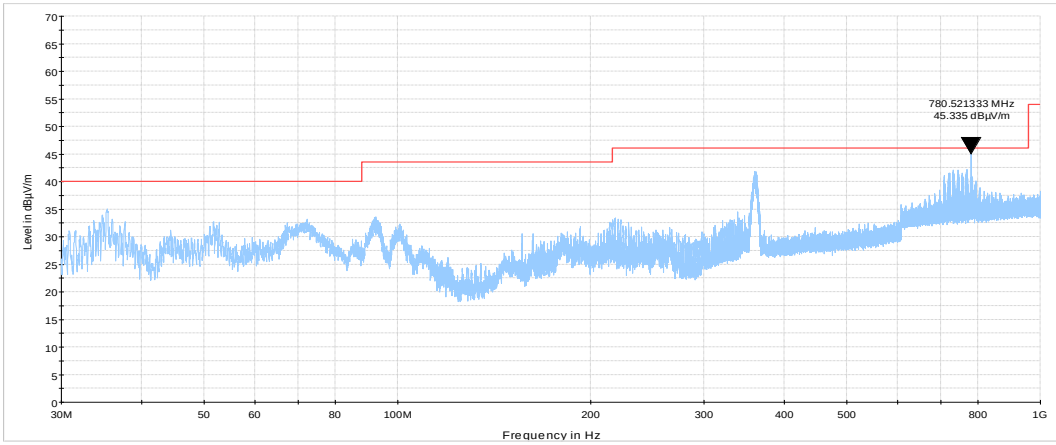
Reference numbers of test equipment used

HL 0604	HL 2909	HL 3818	HL 4276	HL 4353	HL 4933		

Full description is given in Appendix A.

Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range

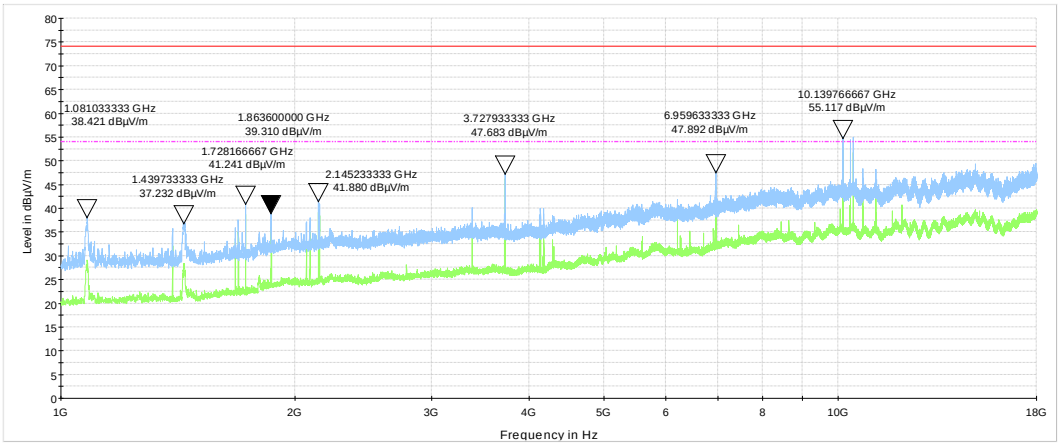
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stepped
TRACE	Peak Hold*
RESOLUTION BANDWIDTH:	120 KHz
VIDEO BANDWIDTH:	300 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	60 KHz
NUMBER OF POINTS:	16200



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Plot 8.1.2 Radiated emission measurements from 1 to 18 GHz,

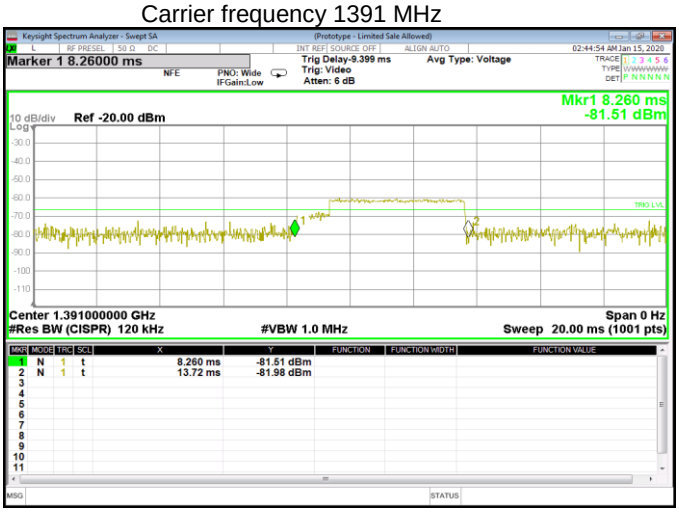
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and horizontal
OPERATION MODE:	CW Stepped
BLUE TRACE:	Peak detector
GREEN TRACE:	Average detector
RESOLUTION BANDWIDTH:	1000 KHz
VIDEO BANDWIDTH:	3000 KHz
MEASUREMENT TIME:	15 Sec
STEP SIZE:	500 KHz
NUMBER OF POINTS:	30001



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

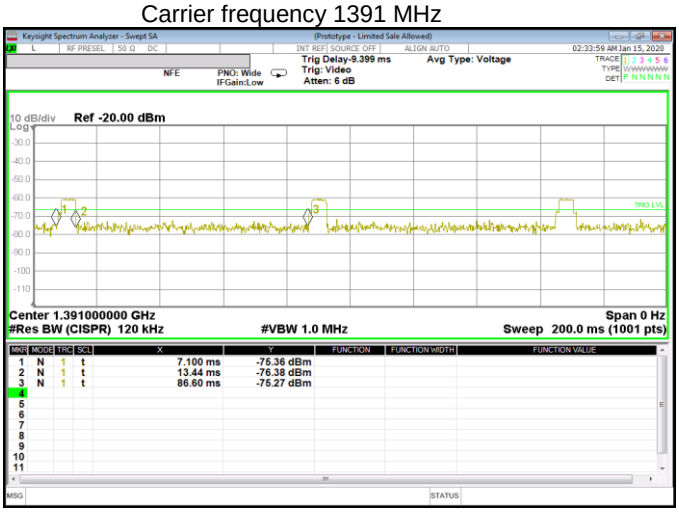
Plot 8.1.3 Transmission pulse duration LO Rx Mode Only

Carrier frequency 1391 MHz



Plot 8.1.4 Number of transmission pulse within 100 ms, LO Rx Mode Only

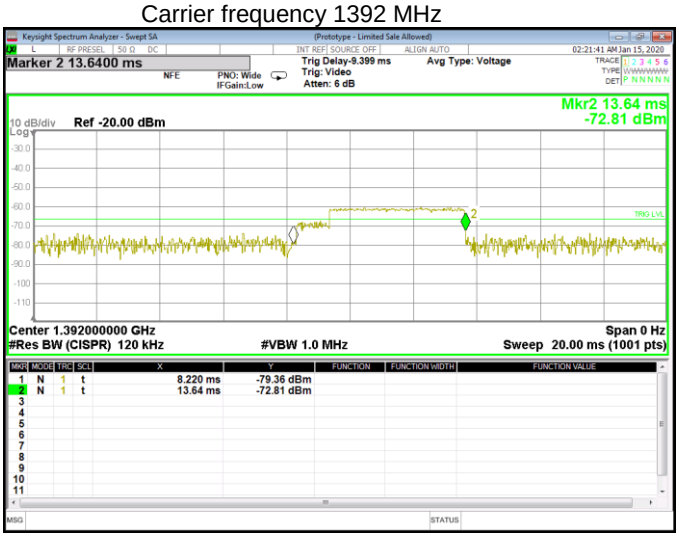
Carrier frequency 1391 MHz



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

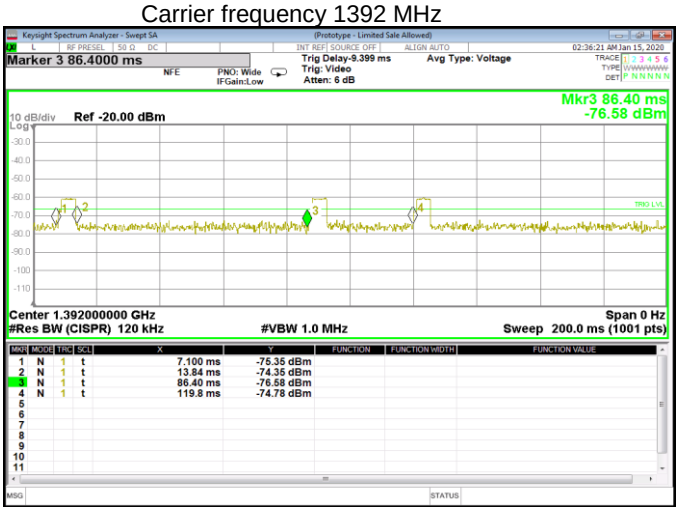
Plot 8.1.5 Transmission pulse duration LO Rx Mode Only

Carrier frequency 1392 MHz



Plot 8.1.6 Number of transmission pulse within 100 ms, LO Rx Mode Only

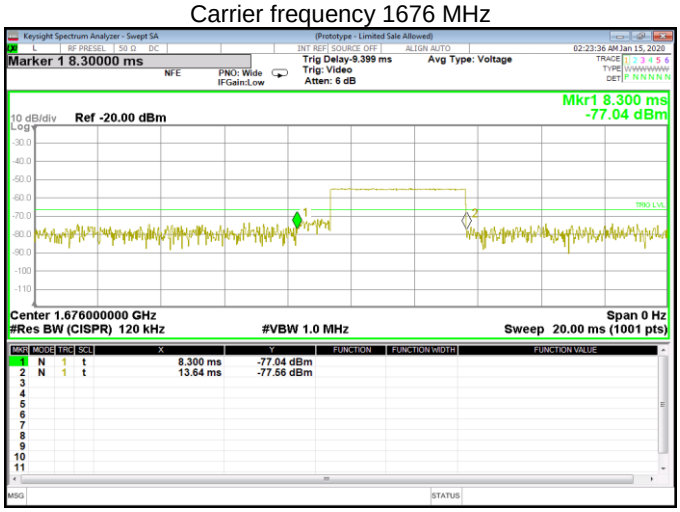
Carrier frequency 1392 MHz



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

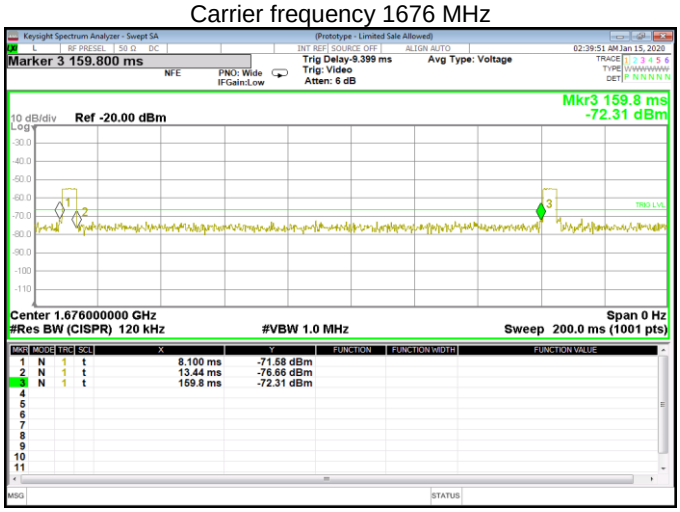
Plot 8.1.7 Transmission pulse duration LO Rx Mode Only

Carrier frequency 1676 MHz



Plot 8.1.8 Number of transmission pulse within 100 ms, LO Rx Mode Only

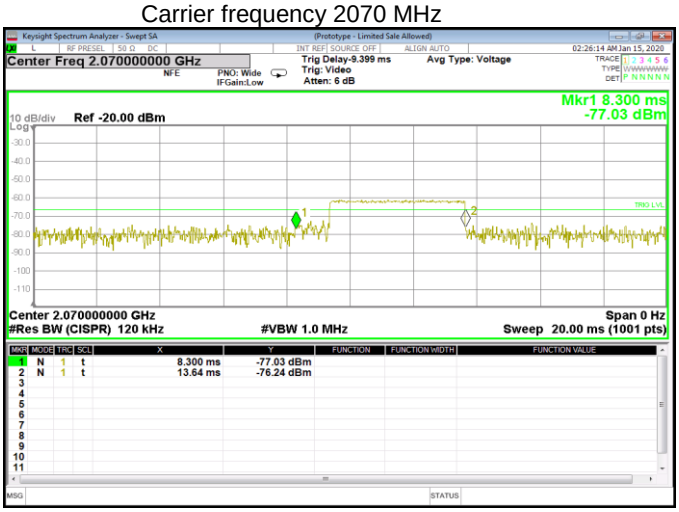
Carrier frequency 1676 MHz



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

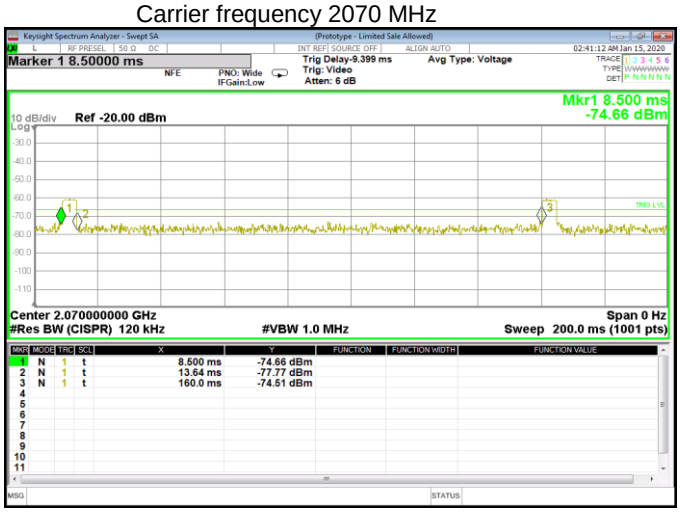
Plot 8.1.9 Transmission pulse duration LO Rx Mode Only

Carrier frequency 2070 MHz



Plot 8.1.10 Number of transmission pulse within 100 ms, LO Rx Mode Only

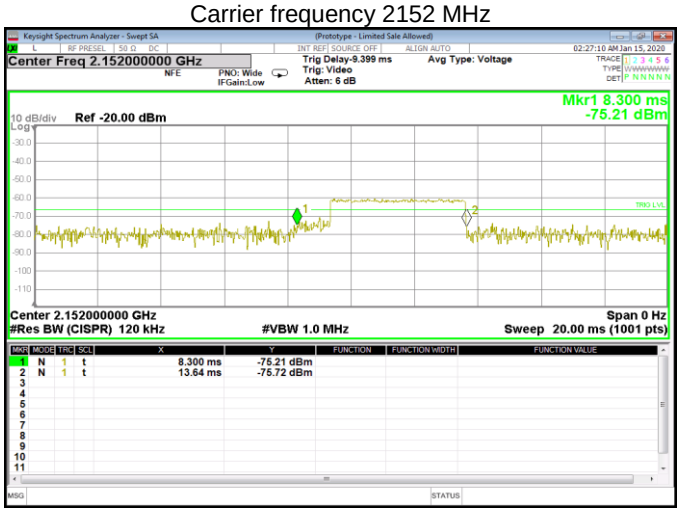
Carrier frequency 2070 MHz



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 8.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

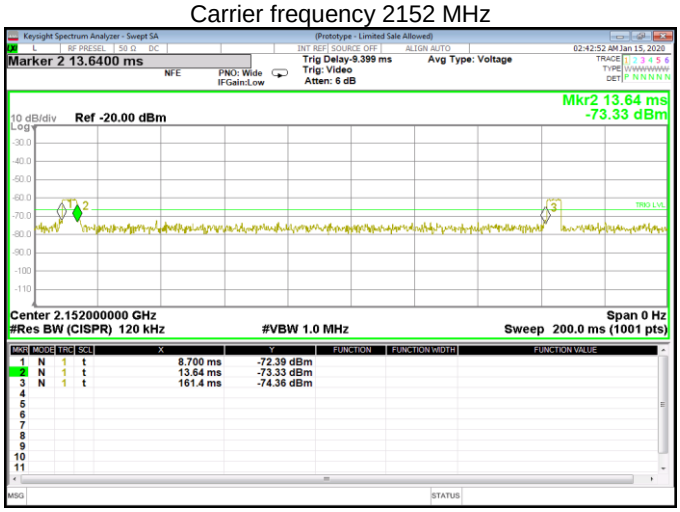
Plot 8.1.11 Transmission pulse duration LO Rx Mode Only

Carrier frequency 2152 MHz



Plot 8.1.12 Number of transmission pulse within 100 ms, LO Rx Mode Only

Carrier frequency 2152 MHz



Test specification:	**Section 15.107, Conducted emission**		
Test procedure:	ANSI C63.4, Section 7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

8.2 Conducted emissions

8.2.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 8.2.1.

Table 8.2.1 Limits for conducted emissions according to FCC Part 15, Section 107

Frequency, MHz	Class B limit, dB(µV)		Class A limit, dB(µV)	
	QP	AVRG	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*	79	66
0.5 - 5.0	56	46	73	60
5.0 - 30	60	50	73	60

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

8.2.2 Test procedure

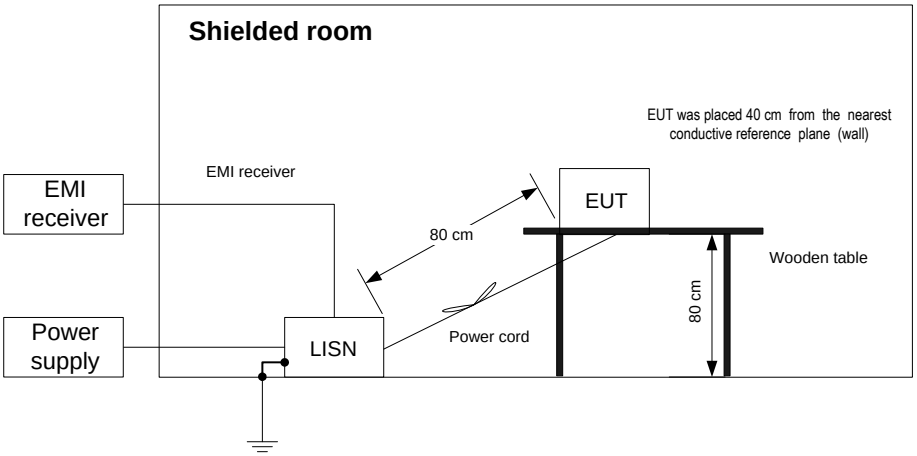
8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and associated photographs, energized and the performance check was conducted.

8.2.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm.

8.2.2.3 The position of the device cables was varied to determine maximum emission level.

8.2.2.4 The worst test results (the lowest margins) were recorded in Table 8.2.2 and shown in the associated plots.

Figure 8.2.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**Section 15.107, Conducted emission**		
Test procedure:	ANSI C63.4, Section 7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

Table 8.2.2 Conducted emission test results according to FCC Part 15, Section 107

LINE: AC mains
EUT OPERATING MODE: Receive
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.152	56.6	48.3	65.9	-17.6	30.7	55.9	-25.2	L1	Pass
0.322	51.2	49.0	59.6	-10.6	47.8	49.6	-1.8		
0.449	45.0	41.8	57.0	-15.2	33.6	47.0	-13.4		
0.646	46.0	43.0	56.0	-13.0	40.8	46.0	-5.2		
0.969	49.8	47.1	56.0	-8.9	45.1	46.0	-0.9		
1.290	48.2	45.5	56.0	-10.5	43.1	46.0	-2.9		
1.932	46.7	44.1	55.9	-11.8	37.5	45.9	-8.4		
2.571	45.1	40.2	56.0	-15.8	27.5	46.0	-18.5		
4.192	42.1	39.5	56.1	-16.6	33.2	46.1	-12.9		
7.111	40.8	38.4	60.0	-21.6	29.0	50.0	-21.0		
0.153	55.9	49.4	65.9	-16.5	33.3	55.9	-22.6	L2	Pass
0.322	51.2	48.0	59.7	-11.7	47.8	49.7	-1.9		
0.462	45.2	41.2	56.8	-15.6	33.4	46.8	-13.4		
0.647	44.4	41.5	56.0	-14.5	40.3	46.0	-5.7		
0.967	47.5	46.1	56.0	-9.9	45.0	46.0	-1.0		
1.292	46.2	4.8	56.0	-51.2	43.6	46.0	-2.4		
1.936	45.5	44.1	56.0	-11.9	42.2	46.0	-3.8		
2.585	43.8	41.9	56.0	-14.1	37.8	46.0	-8.2		
4.192	40.8	39.1	55.9	-16.8	33.5	45.9	-12.4		
11.631	40.7	38.5	60.0	-21.5	27.6	50.0	-22.4		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

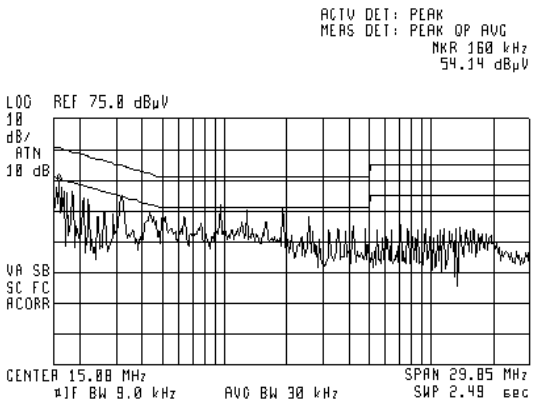
HL 0787	HL 3016	HL 4778	HL 5476				

Full description is given in Appendix A.

Test specification:	**Section 15.107, Conducted emission**		
Test procedure:	ANSI C63.4, Section 7.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	02-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 39 %	**Air Pressure:** 1015 hPa	**Power:** 120 VAC
Remarks:			

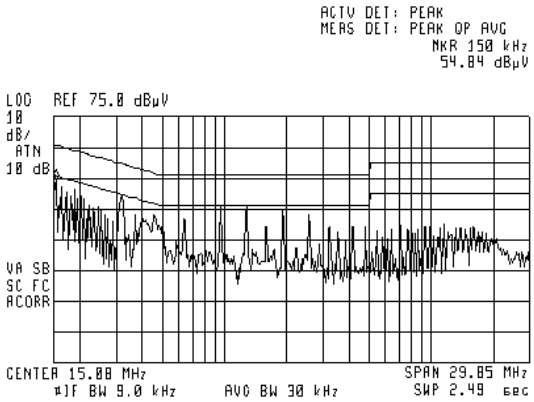
Plot 8.2.1 Conducted emission measurements

LINE: L1
LIMIT: Class B
EUT OPERATING MODE: Receive
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 8.2.2 Conducted emission measurements

LINE: L2
LIMIT: Class B
EUT OPERATING MODE: Receive
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Test specification:	**Section 15.203, Antenna requirements**		
Test procedure:	Visual inspection/supplier declaration		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	05-Dec-19		
Temperature: 24 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1019 hPa	**Power:** 120 VAC
Remarks:			

8.3 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 8.3.1.

Table 8.3.1 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	

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 (9) kHz - 30 MHz	EMCO	6502	2857	24-Feb-19	24-Feb-20
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A01877	08-Oct-19	08-Oct-20
3016	LISN, Two-line V-network, 9 kHz to 30 MHz, (50 uH+5 Ohm), CISPR16-1, MIL-461E	Rohde & Schwarz	ESH 3-Z5	892239/002	27-Jan-19	27-Jan-20
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	07-Apr-19	07-Apr-20
4360	EMI Test Receiver, 20 Hz to 40 GHz.	Rohde & Schwarz	ESU40	100322	31-Dec-18	31-Dec-19
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00262, 3427A00123	04-Nov-19	04-Nov-20
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	06-Jan-19	06-Jan-20
5288	Trilog Antenna, 25 MHz - 8 GHz, 100W	Frankonia	ALX-8000E	00809	08-Feb-19	08-Feb-22
5405	RF cable, 18 GHz, N-N, 6 m	Huber-Suhner	SF118/11N(x2)	500023/118	11-Aug-19	11-Aug-20
5476	Cable, BNC/BNC, 10.5 m	Western wire	MIL-C-17G	NA	30-Jan-19	30-Jan-20

10 APPENDIX B Test equipment correction factors

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

Frequency,	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,	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 5288: Trilog Antenna
Frankonia, model: ALX-8000E, s/n: 00809
30-1000 MHz

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

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

above 1000 MHz

Frequency, MHz	Antenna factor, dB/m	Frequency, MHz	Antenna factor, dB/m
1000	26.9	3600	38.9
1100	28.1	3700	39.4
1200	28.4	3800	39.4
1300	29.6	3900	39.6
1400	29.1	4000	39.7
1500	30.4	4100	39.8
1600	30.7	4200	40.5
1700	31.5	4300	40.9
1800	32.3	4400	41.1
1900	32.6	4500	41.4
2000	32.5	4600	41.3
2100	32.9	4700	41.6
2200	33.5	4800	41.9
2300	33.2	4900	42.3
2400	33.7	5000	42.7
2500	34.6	5100	43.0
2600	34.7	5200	42.9
2700	34.6	5300	43.5
2800	35.0	5400	43.6
2900	35.5	5500	44.3
3000	36.2	5600	44.7
3100	36.8	5700	45.0
3200	36.8	5800	45.0
3300	37.0	5900	45.3
3400	37.5	6000	45.9
3500	38.2		

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

HL 3016: LISN, Two-line V-network, 9 to 30 MHz, (50 uH+5 Ohm)
Rohde & Schwarz, model: ESH 3-Z5, s/n 892239/002, HL 3016

Voltage division factor (insertion loss)

Frequency,	L1, dB	N, dB	Uncertainty, dB
10	0.70	0.72	±0.12
15	0.43	0.42	±0.12
20	0.30	0.28	±0.12
25	0.23	0.21	±0.12
30	0.18	0.17	±0.08
40	0.15	0.12	±0.08
50	0.13	0.11	±0.08
60	0.12	0.10	±0.09
70	0.11	0.09	±0.09
80	0.10	0.08	±0.09
90	0.10	0.08	±0.09
100	0.10	0.08	±0.09
150	0.10	0.08	±0.09
170	0.10	0.08	±0.09
200	0.09	0.08	±0.09
250	0.09	0.08	±0.09
300	0.10	0.08	±0.09
350	0.10	0.09	±0.09
400	0.10	0.08	±0.09
500	0.11	0.08	±0.09
600	0.11	0.09	±0.09
700	0.11	0.09	±0.09
800	0.11	0.09	±0.09
900	0.12	0.10	±0.09
1000	0.12	0.10	±0.09
1200	0.13	0.10	±0.16
1500	0.13	0.12	±0.16
2000	0.15	0.13	±0.16
2500	0.17	0.14	±0.16
3000	0.18	0.15	±0.16
4000	0.21	0.19	±0.16
5000	0.25	0.21	±0.16
7000	0.38	0.32	±0.16
10000	0.49	0.40	±0.16
15000	0.82	0.72	±0.16
20000	1.03	0.87	±0.16
30000	1.34	0.98	±0.32

11 APPENDIX C Test facility description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, 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-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site and T-1606 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, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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12 APPENDIX D 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 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.

13 APPENDIX E Specification references

FCC 47CFR part 15:2018	Radio Frequency Devices.
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

14 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
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

END OF DOCUMENT