HERMON LABORATORIES

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 System

Type designation: V2.6

FCC ID:2AONF-26U01

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.
Address:	P.O.Box 8702, Meir Ariel 6, intergama Building 1, Netanya, 4059300, Israel
Telephone:	+972 9865 4402
Fax:	+972 9865 4472
E-mail:	nadav.m@sensible-medical.com
Contact name:	Mr. Nadav Mizrahi

2 Equipment under test attributes

Product name:	ReDS System
Product type:	Medical
Type designation:	V2.6
Part number:	GAS0045
Serial number:	1215YVQXZ7
Hardware version:	V2.6 SAS0145 rev G
Software release:	1.6
Receipt date	23-Jan-18

3 Manufacturer information

Manufacturer name:	Sensible Medical Innovations Ltd.
Address:	P.O.Box 8702, Meir Ariel 6, intergama Building 1, Netanya, 4059300, Israel
Telephone:	+972 9865 4402
Fax:	+972 9865 4472
E-Mail:	nadav.m@sensible-medical.com
Contact name:	Mr. Nadav Mizrahi

4 Test details

Project ID:	30597
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	25-Jan-18
Test completed:	08-Feb-18
Test specification:	FCC 47CFR part 15, subpart C, §15.209

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.209, Field strength of emissions	Pass
Section 15.207(a), Conducted emission	Pass *
Section 15.203, Antenna requirements	Pass *
Unintentional emissions	
Section 15.109, Radiated emission	Pass

* The testing was performed earlier by Hermon Laboratories in the framework of HL project 30018. Test results are provided in the appropriate sections of the test report SENRAD_FCC.30018_rev5.

The tested product is approved under FCC ID:2AONF-26U01. The relevant tests to submit Application for Class II permissive changes certification were performed. The purpose of permissive changes is to approve the very same unit without RF shielding implemented on RF portion of the device for cost reduction.

The test results relate only to the items tested. Pass/fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt , test engineer	25-Jan-18 – 08-Feb-18	
Reviewed by:	Mrs. Y. Rapin, technical writer	01-Mar-18	
Approved by:	Mr. M. Nikishin, EMC and Radio group leader	30-Apr-18	

6 EUT description

6.1 General information

The EUT, ReDS System, is a non-invasive bedside monitor connected to a Sensor Unit and used for the measurement of lung fluid. The ReDS™ System V2.6 is comprised of a Sensor Unit and a Bedside Console. The Sensor Unit is patient wearable and consists of two sensors. The Sensor Unit is designed to be adjusted to enable correct fit to an individual patient. The Sensor Unit is controlled by, and passes the data to the Bedside Console via a cable.
In the ReDS system, the tissue being examined is subjected to RF signals generated from a body coupled sensor. It accomplishes 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 a Sensor Unit and attached during measurement to the patient's 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 Powerbox, part number EXM 80 5120, serial number 123800042 was used during the testing.

The EUT is approved under FCC ID:2AONF-26U01. Test results are provided in the test report issued by Hermon Laboratories SENRAD_FCC.30018_rev5. Additional testing was required to apply for Class II permissive changes approval for the very same unit without RF shielding implemented on RF portion of the device for cost reduction.

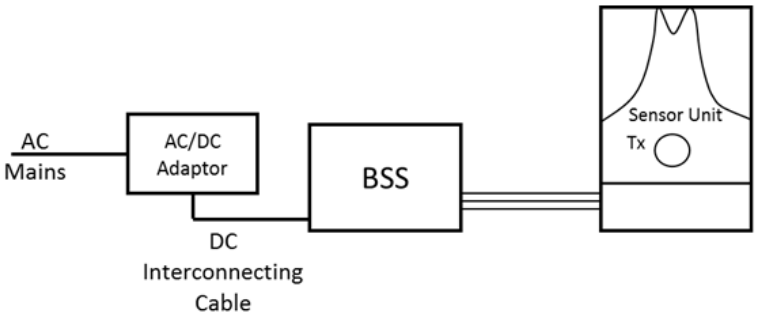
6.2 EUT modules and sub-assemblies

Description	Manufacturer	Part number	Serial number
AC/DC adapter	PowerBox Systems GmbH	EXM805120	123800042
ReDS system	Sensible Medical Innovations Ltd.	GAS0045	1215YVQXZ7
Sensor Unit	Sensible Medical Innovations Ltd.	NA	V2.6.2-0109

6.3 Operating frequencies

Source	Frequency, MHz				
900 MHz band	957	958	NA	NA	NA
1200-1400 MHz band	1242	1243	NA	NA	NA
	1256	1257	NA	NA	NA
	1292	1293	1294	1295	NA
	1428	1429	1430	1431	NA
1600 MHz band	1629	1635	1636	NA	NA
	1655	1656	1657	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	59.45 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	Front sensor (Rx sensor): EAS0034 Rev C, Back Sensor (Tx sensor): EAS0035 Rev D	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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
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 in 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°; 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

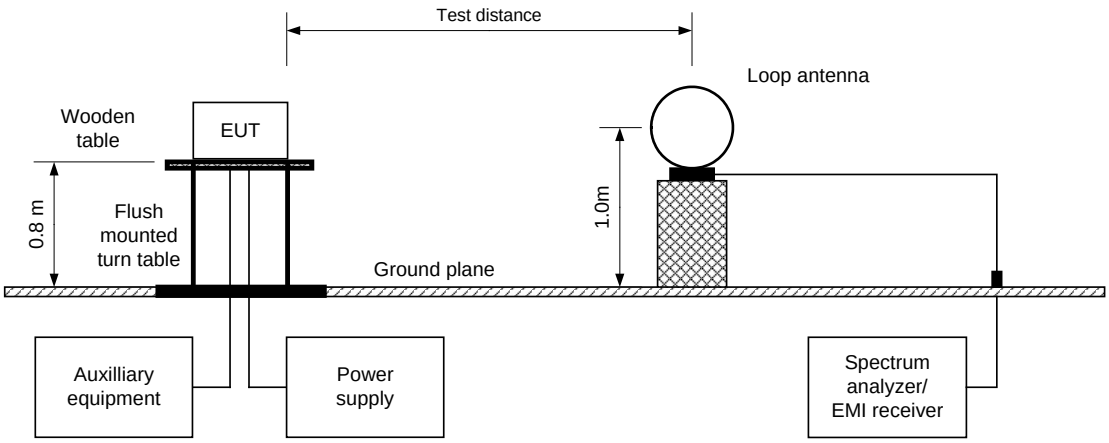
7.1.3.1 The EUT was set up as shown in Figure 7.1.2, energized and the performance check was conducted.

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°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

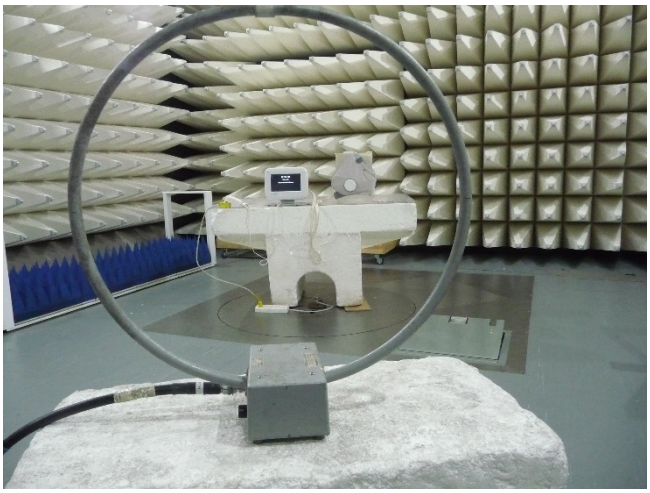
7.1.3.3 The worst test results (the lowest margins) were recorded in Table 7.1.4 and shown in the associated plots.

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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

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

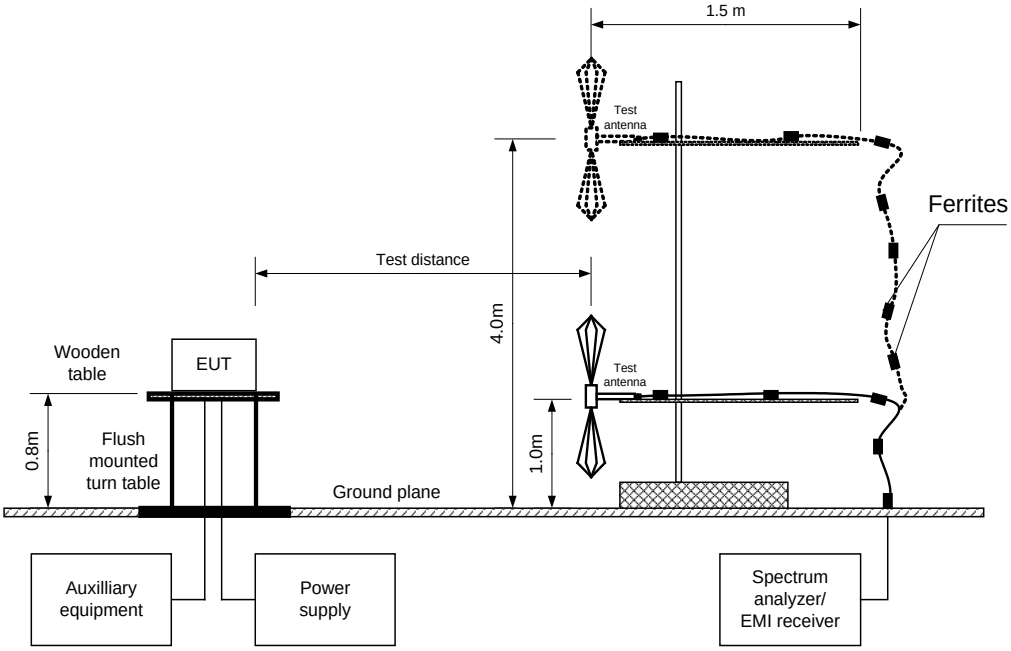


Photograph 7.1.1 Setup for spurious emission field strength measurements below 30 MHz



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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

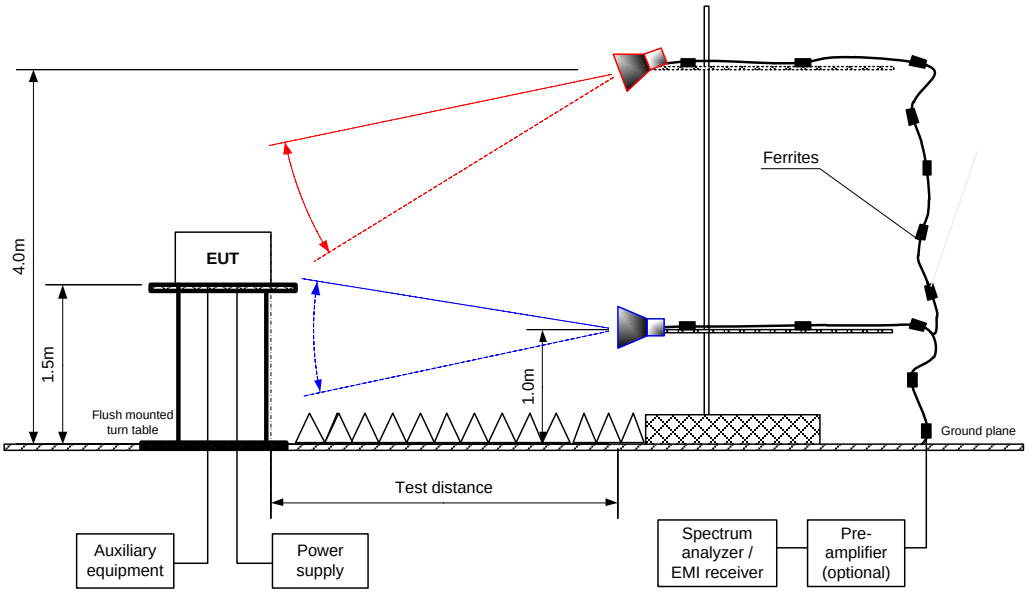
Figure 7.1.2 Setup for spurious emission field strength measurements from 30 to 1000 MHz



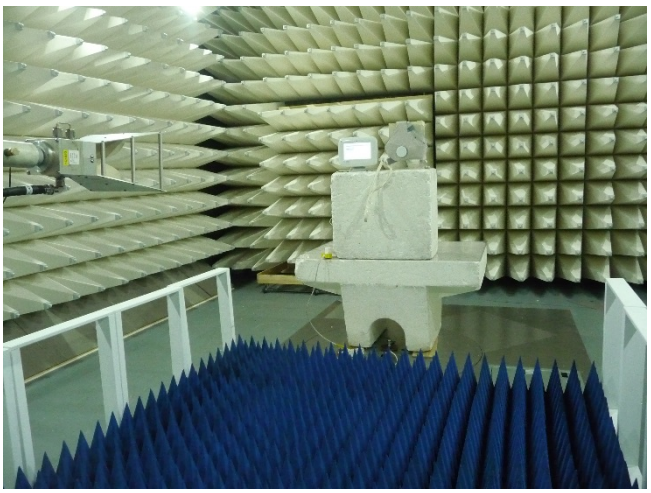
Photograph 7.1.2 Setup for spurious emission field strength measurements from 30 to 1000 MHz

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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Figure 7.1.3 Setup for spurious emission field strength measurements above1000 MHz



Photograph 7.1.3 Setup for spurious emission field strength measurements above 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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Table 7.1.2 Field strength of fundamental emission

TEST DISTANCE: 3 m
TEST SITE: Anechoic chamber
EUT POSITION: Typical (Vertical)
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Quasi-peak
RESOLUTION BANDWIDTH: 120 kHz (30 MHz – 1000 MHz)
1000 kHz above 1 GHz
VIDEO BANDWIDTH: ≥ Resolution bandwidth
TEST ANTENNA TYPE: Biconilog
CARRIER FREQUENCY: Below 1 GHz
OPERATION MODE: Stepping function 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*				
957.0625	45.07	44.24	46.0	-1.76	Horizontal	1.3	15	Pass
958.0625	45.01	43.95	46.0	-2.05	Horizontal	1.3	15	

OPERATION MODE: Stepped CW signal
CARRIER FREQUENCY: Below 1 GHz

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*				
957.0625	45.11	44.27	46.0	-1.73	Horizontal	1.3	15	Pass
958.0625	45.07	44.01	46.0	-1.99	Horizontal	1.3	15	

TEST ANTENNA TYPE: Double Rigged Horn
DETECTOR USED: Peak
OPERATION MODE: Stepping function stopped
CARRIER FREQUENCY: Above 1 GHz

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength			Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
1242.1125	Hor	1.2	28	55.80	74.0	-18.20	28.59	54.0	-25.41	Pass
1636.1000	Hor	1.8	0	59.45	74.0	-14.55	32.20	54.0	-21.80	Pass
1718.0617	Vert	1.35	0	58.79	74.0	-15.21	31.44	54.0	-22.56	Pass

OPERATION MODE: Stepped CW signal
CARRIER FREQUENCY: Above 1 GHz

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			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**	
1242.0625	Hor.	1.9	0	54.91	74.0	-19.09	27.70	54.0	-26.30	Pass
1636.0625	Vert.	1.8	0	57.81	74.0	-16.19	30.56	54.0	-23.44	Pass
1718.0625	Vert.	1.5	0	55.47	74.0	-18.53	28.12	54.0	-25.88	Pass

*****- 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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Table 7.1.3 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
Carrier frequency 1242 MHz					
4.36	166	NA	NA	NA	-27.21
Carrier frequency 1636 MHz					
4.34	161	NA	NA	NA	-27.25
Carrier frequency 1718 MHz					
4.29	161	NA	NA	NA	-27.35

*- 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 0604	HL 3615	HL 3818	HL 3901	HL 4277	HL 4933		

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):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

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)
MODULATION: Stepped CW
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

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)
VIDEO BANDWIDTH: ≥ Resolution bandwidth
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***				
145.00	33.6	24.7	43.5	-18.8	Vertical	1.1	-10	Pass
205.00	44.3	35.1	43.5	-8.4	Horizontal	1.3	0	
225.00	37.3	28.4	43.5	-15.1	Vertical	1.1	-30	
366.73	39.3	37.4	43.5	-6.1	Vertical	1.1	-20	
640.88	46.4	38.7	46.0	-7.3	Vertical	1.0	0	
663.86	46.4	40.1	46.0	-5.9	Vertical	1.1	10	

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

INVESTIGATED FREQUENCY RANGE: 1000 MHz – 18000 MHz
DETECTORS USED: PEAK / AVERAGE
RESOLUTION BANDWIDTH: 1000 kHz
TEST ANTENNA TYPE: Horn

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***				
Carrier frequency 957 MHz										
No spurious emissions were found										Pass
Carrier frequency 958 MHz										
No spurious emissions were found										Pass

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

Table 7.1.5 Average factor calculation for 958 MHz

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Number pulse during 100 ms	Duration, ms	Period, ms		
4.3	2	NA	NA	NA	-21.3

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

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

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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

Table 7.1.6 Field strength of spurious emissions at second harmonic as worst case

Frequency, MHz	Peak			Average			Antenna polariz.	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Calculated emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
2484.127	41.38	74.00	-32.62	14.05	54.00	-39.95	Vertical	1.4	170	Pass
2486.128	42.60	74.00	-31.40	15.27	54.00	-38.73	Vertical	1.4	175	Pass
3270.143	45.76	74.00	-28.24	18.43	54.00	-35.57	Vertical	1.4	160	Pass
3272.107	46.87	74.00	-27.13	19.54	54.00	-34.46	Vertical	1.4	170	Pass
3436.183	46.88	74.00	-27.12	19.55	54.00	-34.45	Vertical	1.4	170	Pass

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

Table 7.1.7 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
Carrier frequency 1242 MHz					
4.32	160	NA	NA	NA	-27.29
Carrier frequency 1636 MHz					
4.29	160	NA	NA	NA	-27.35
Carrier frequency 1718 MHz					
4.29	148.5	NA	NA	NA	-27.35

*- 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 0521	HL 0604	HL 2909	HL 3615	HL 3818	HL 3901	HL 4277
HL 4933							

Full description is given in Appendix A.

Table 7.1.8 Restricted bands according to FCC 47CFR, 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	12.290 - 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	16.420 - 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	

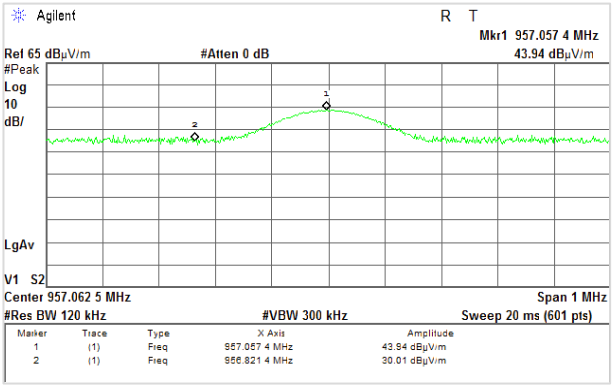
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.1 Radiated emission measurements at the fundamental frequency below 1000 MHz, vertical antenna polarization

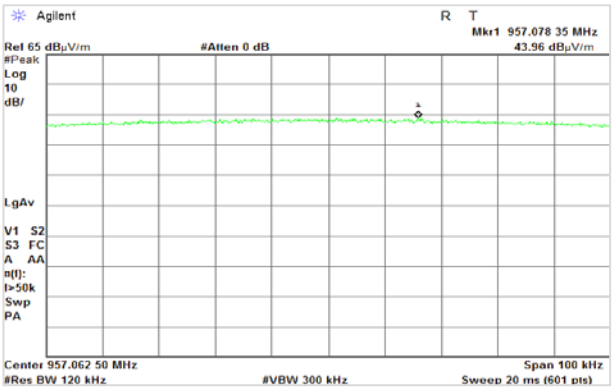
TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	Stepping function stopped

CARRIER FREQUENCY: 957 MHz

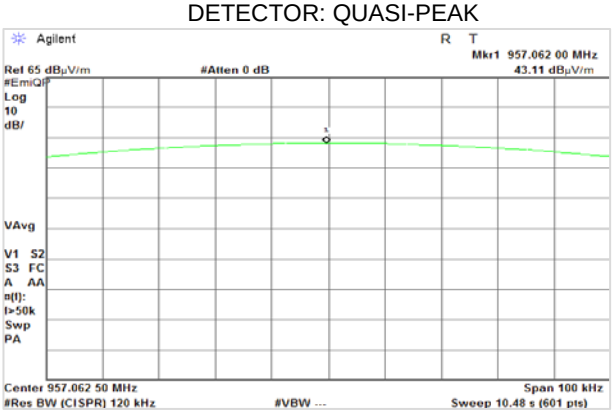
DETECTOR: PEAK



DETECTOR: PEAK

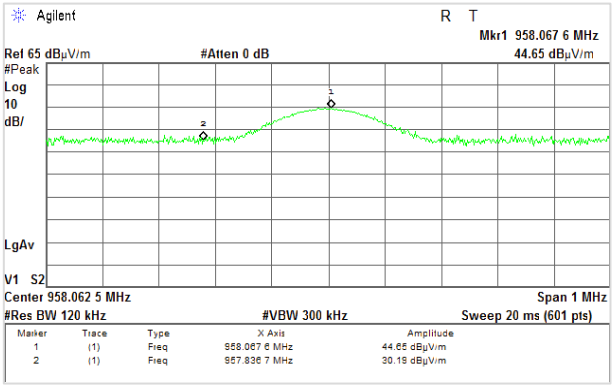


DETECTOR: QUASI-PEAK

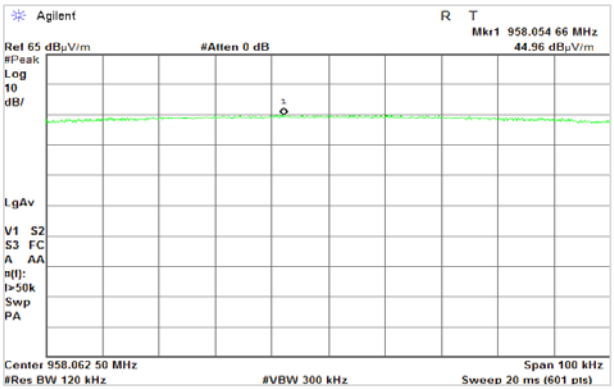


CARRIER FREQUENCY: 958 MHz

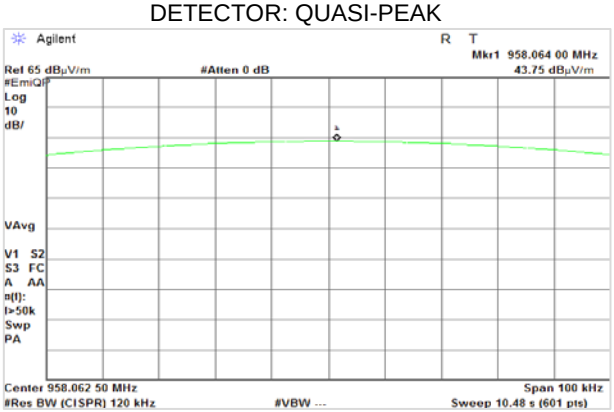
DETECTOR: PEAK



DETECTOR: PEAK



DETECTOR: QUASI-PEAK



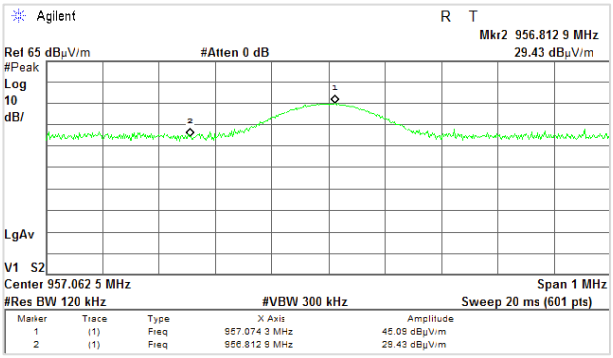
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.2 Radiated emission measurements at the fundamental frequency below 1000 MHz, horizontal antenna polarization

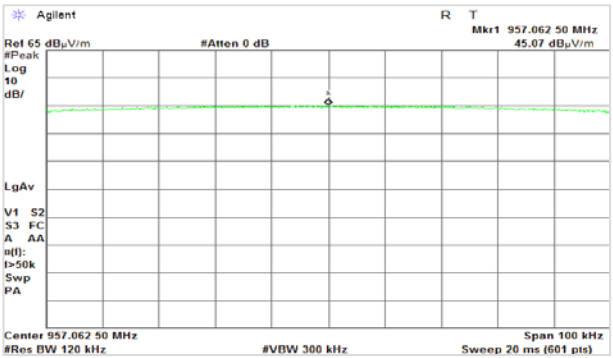
TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	Stepping function stopped

CARRIER FREQUENCY: 957 MHz

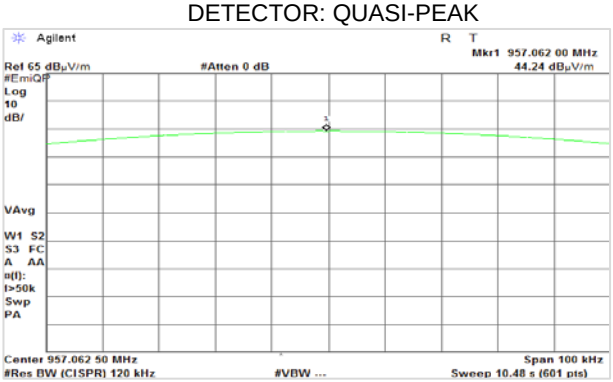
DETECTOR: PEAK



DETECTOR: PEAK

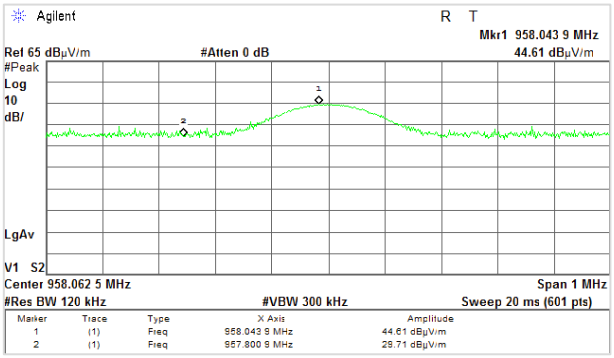


DETECTOR: QUASI-PEAK

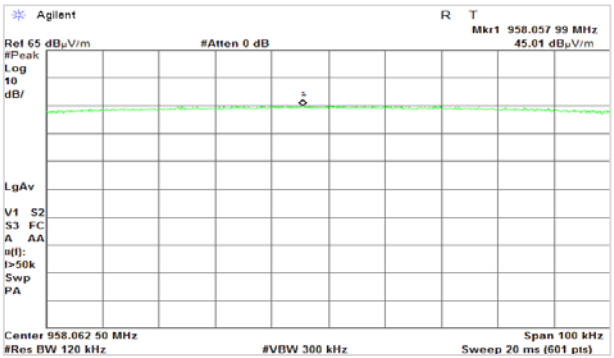


CARRIER FREQUENCY: 958 MHz

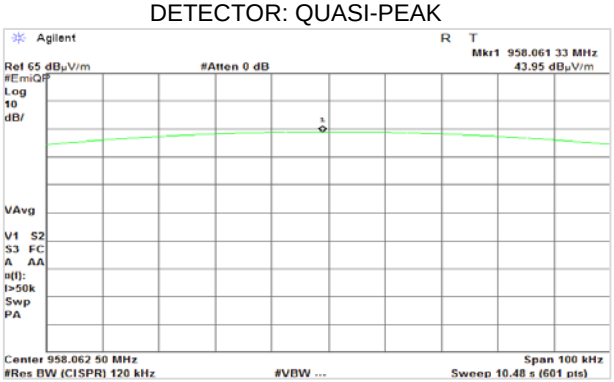
DETECTOR: PEAK



DETECTOR: PEAK



DETECTOR: QUASI-PEAK



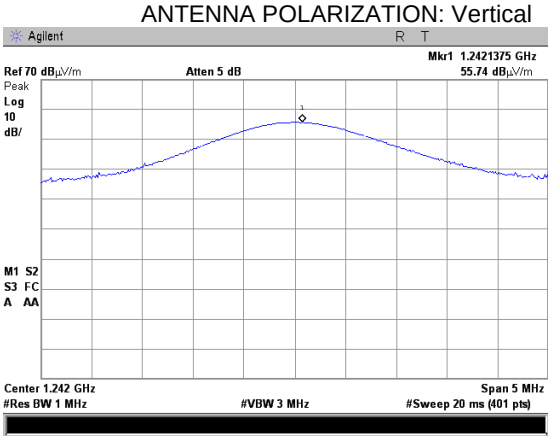
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.3 Radiated emission measurements at the fundamental frequency above 1000 MHz

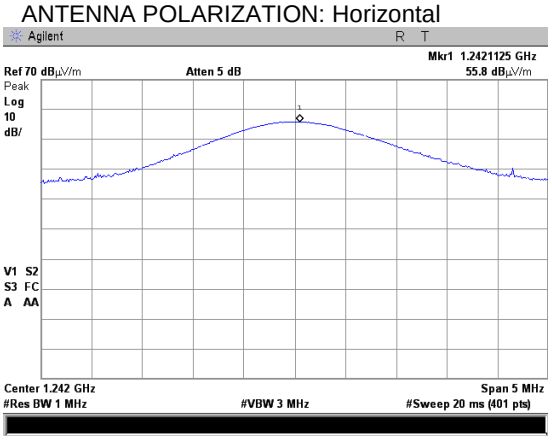
TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
OPERATION MODE: Stepping function stopped

CARRIER FREQUENCY: 1242 MHz

ANTENNA POLARIZATION: Vertical

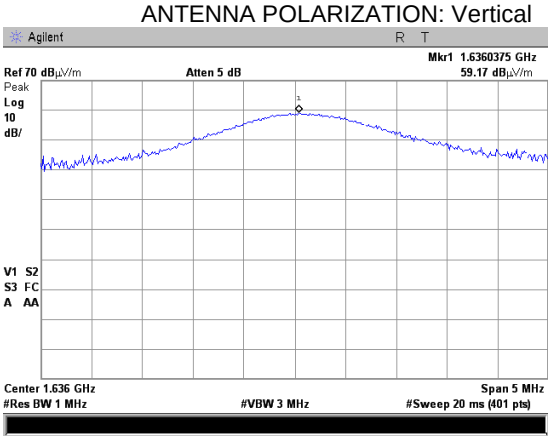


ANTENNA POLARIZATION: Horizontal

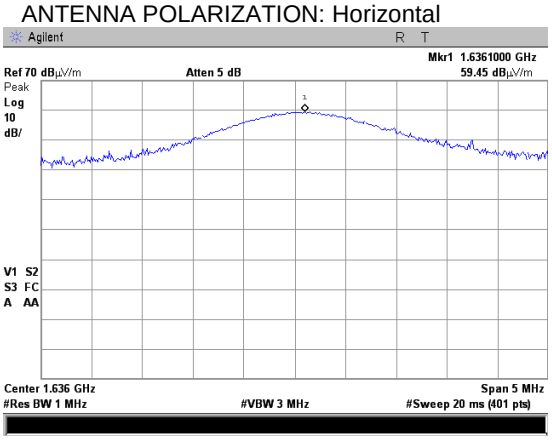


CARRIER FREQUENCY: 1636 MHz

ANTENNA POLARIZATION: Vertical

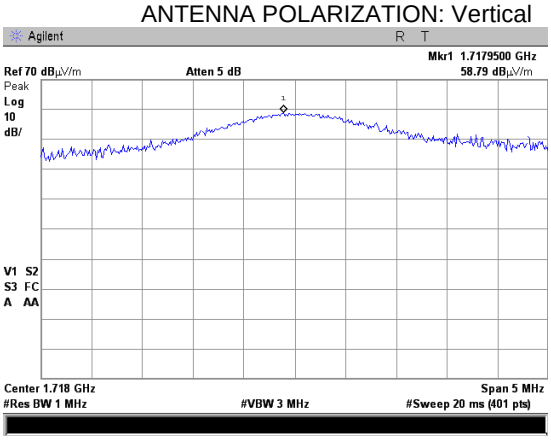


ANTENNA POLARIZATION: Horizontal

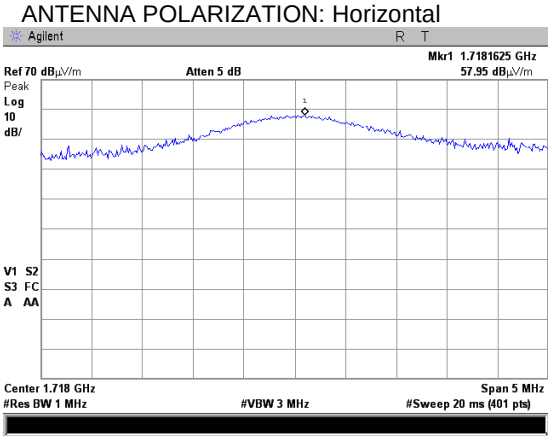


CARRIER FREQUENCY: 1718 MHz

ANTENNA POLARIZATION: Vertical



ANTENNA POLARIZATION: Horizontal



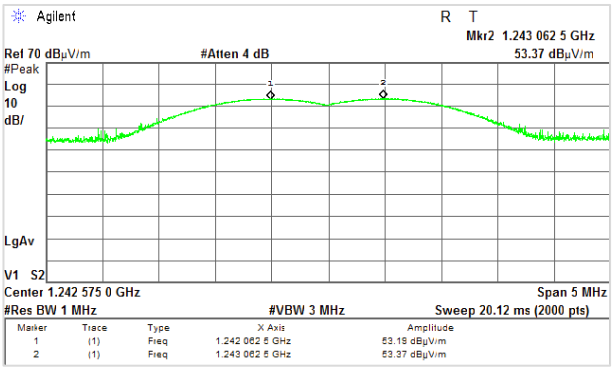
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.4 Radiated emission measurements at the fundamental frequency above 1000 MHz

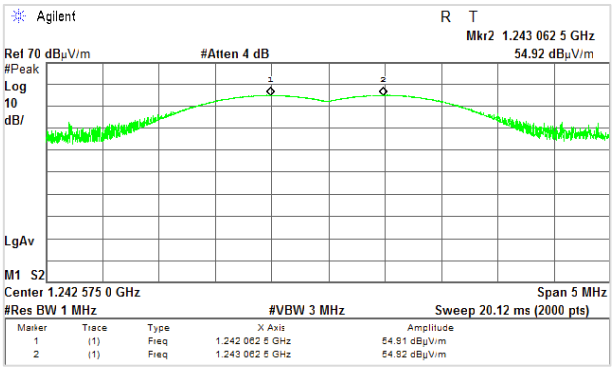
TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
OPERATION MODE: Stepped CW signal

CARRIER FREQUENCY: 1242 MHz

ANTENNA POLARIZATION: Vertical

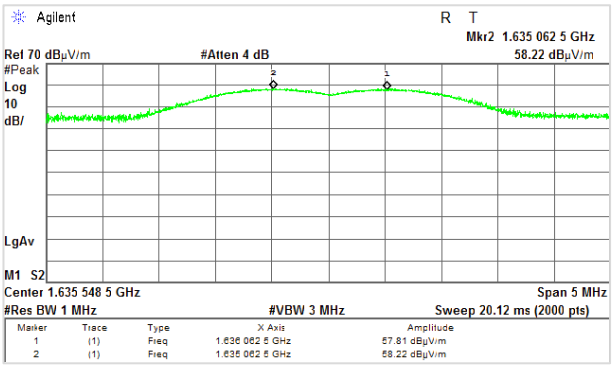


ANTENNA POLARIZATION: Horizontal

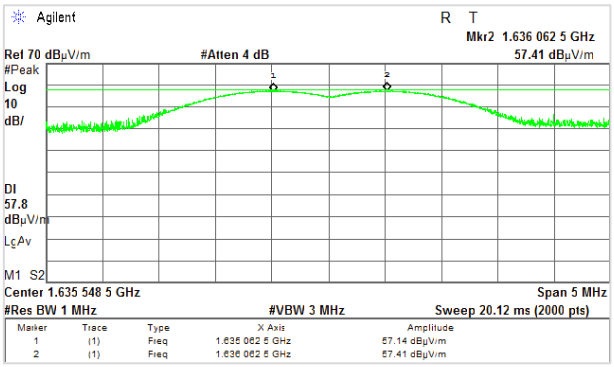


CARRIER FREQUENCY: 1636 MHz

ANTENNA POLARIZATION: Vertical

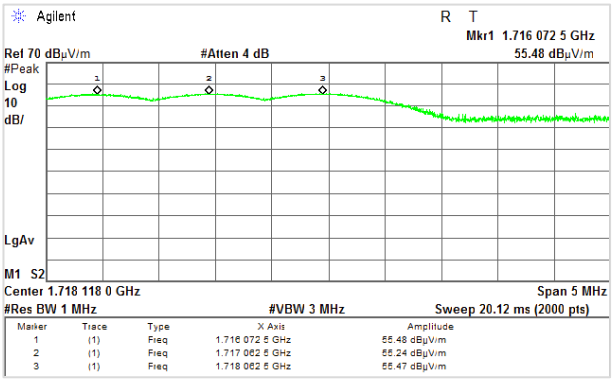


ANTENNA POLARIZATION: Horizontal

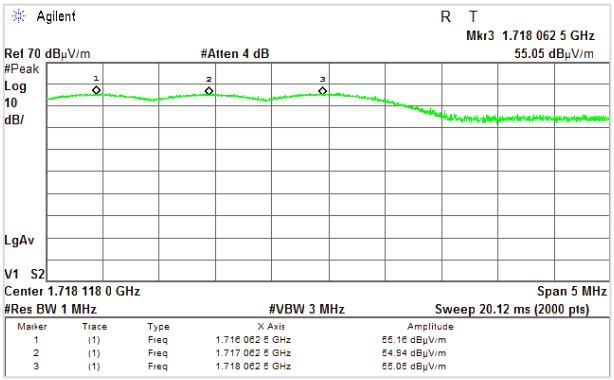


CARRIER FREQUENCY: 1718 MHz

ANTENNA POLARIZATION: Vertical



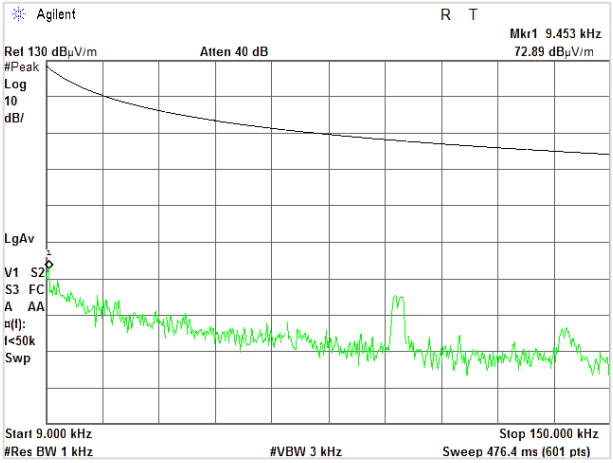
ANTENNA POLARIZATION: Horizontal



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):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

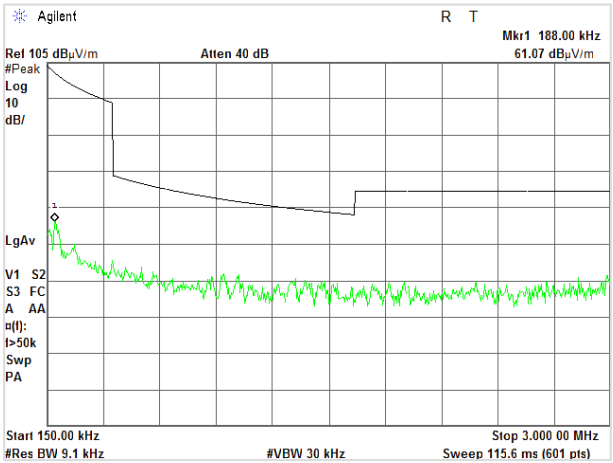
Plot 7.1.5 Radiated emission measurements from 9 to 150 kHz

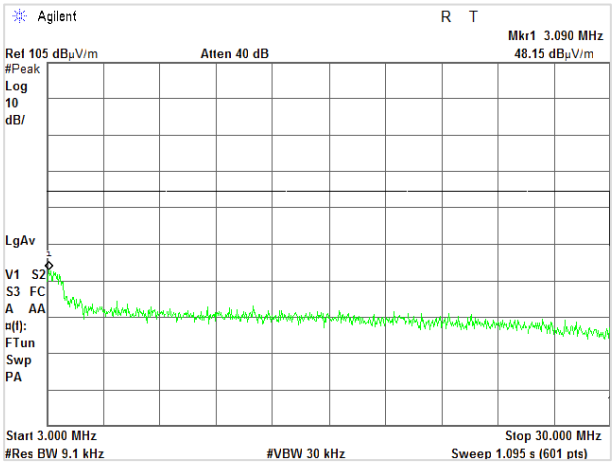
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)



Plot 7.1.6 Radiated emission measurements from 0.15 to 30 MHz

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

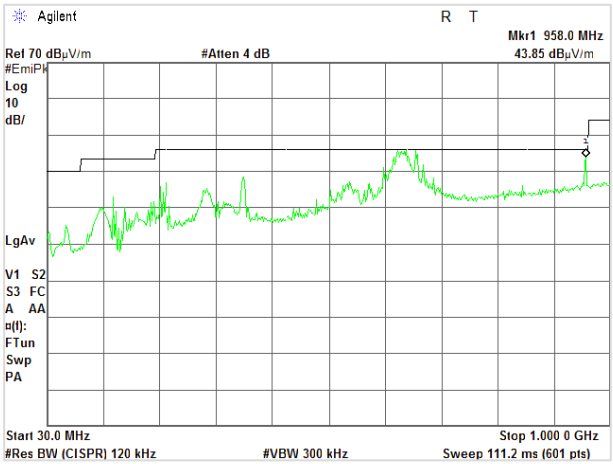


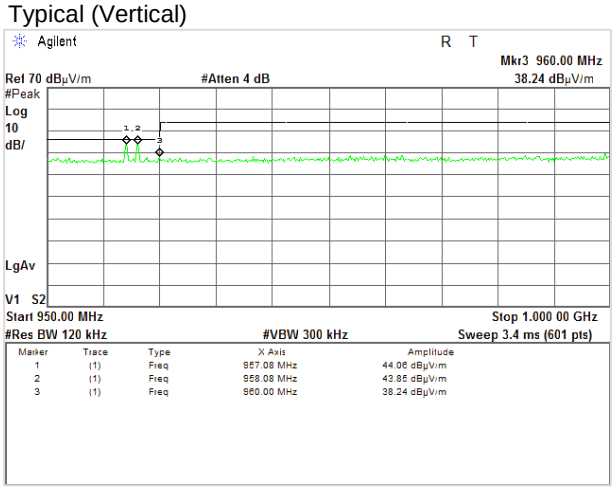


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.7 Radiated emission measurements from 30 to 1000 MHz

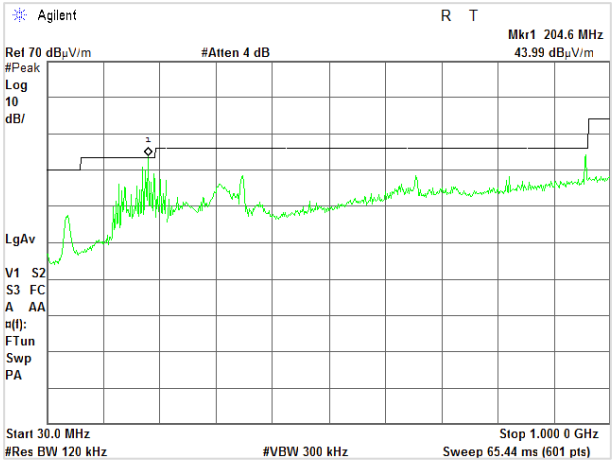
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical
EUT POSITION: Typical (Vertical)

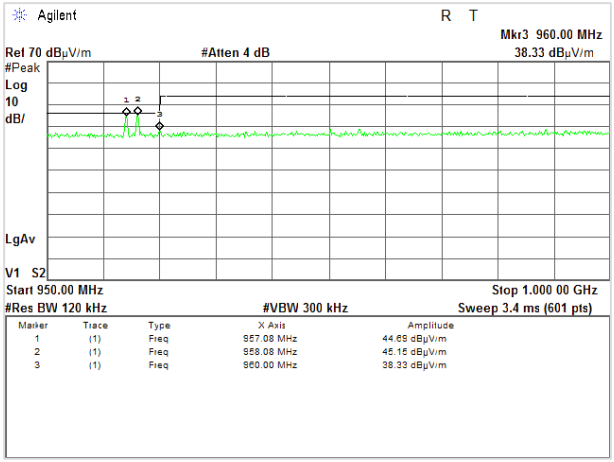




Plot 7.1.8 Radiated emission measurements from 30 to 1000 MHz

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





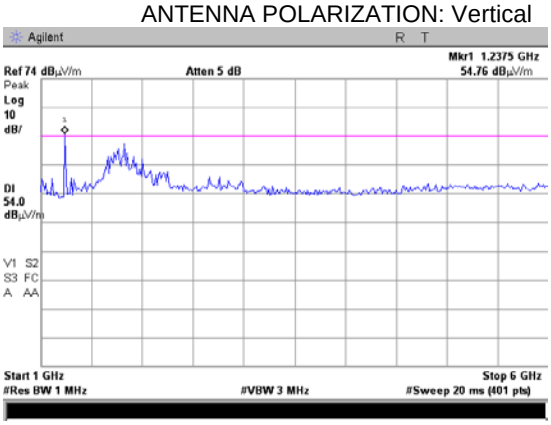
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.9 Radiated emission measurements from 1 to 6 GHz

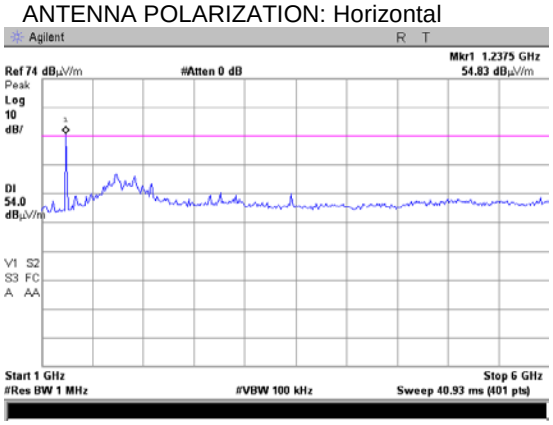
TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	Stepping function stopped
DETECTOR PEAK: RBW = 1 MHz; VBW = 3 MHz	DETECTOR AVERAGE: RBW = 1 MHz; VBW = 30 kHz

CARRIER FREQUENCY: 1242 MHz

ANTENNA POLARIZATION: Vertical

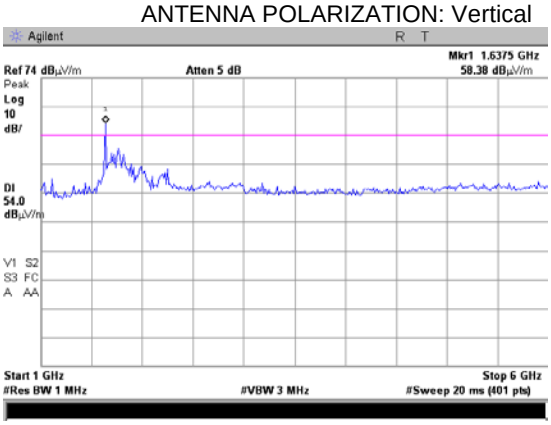


ANTENNA POLARIZATION: Horizontal

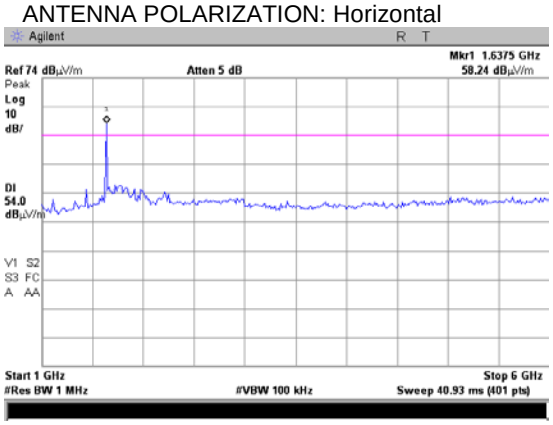


CARRIER FREQUENCY: 1636 MHz

ANTENNA POLARIZATION: Vertical

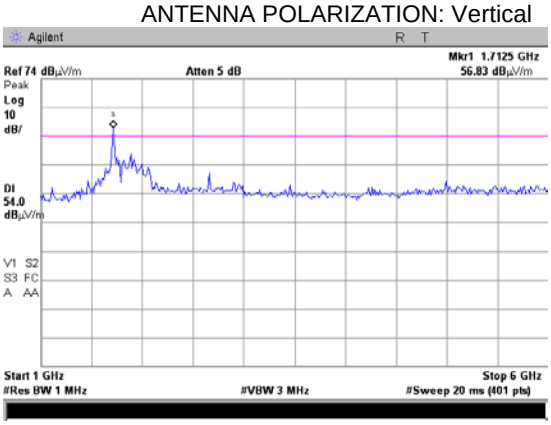


ANTENNA POLARIZATION: Horizontal

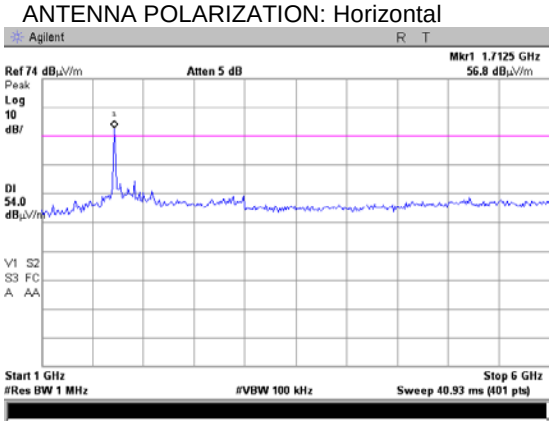


CARRIER FREQUENCY: 1718 MHz

ANTENNA POLARIZATION: Vertical



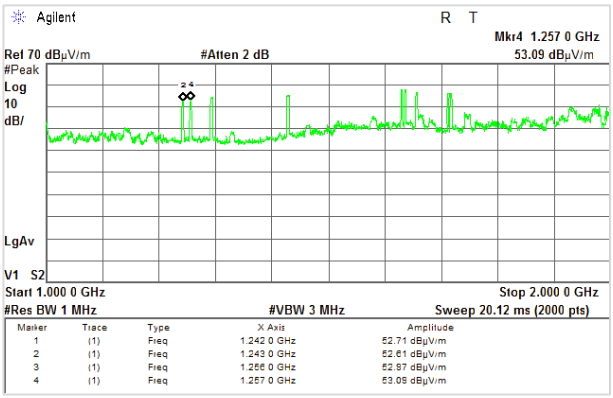
ANTENNA POLARIZATION: Horizontal

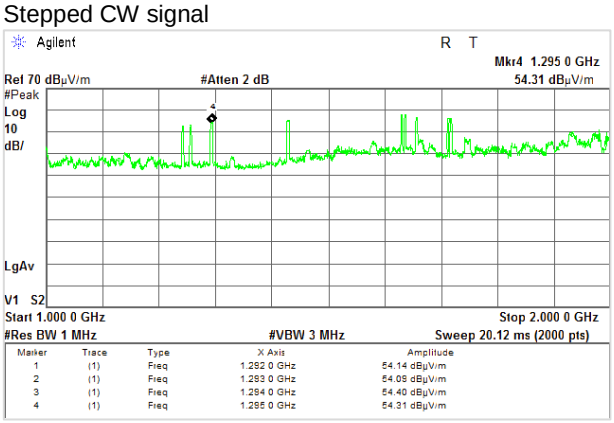


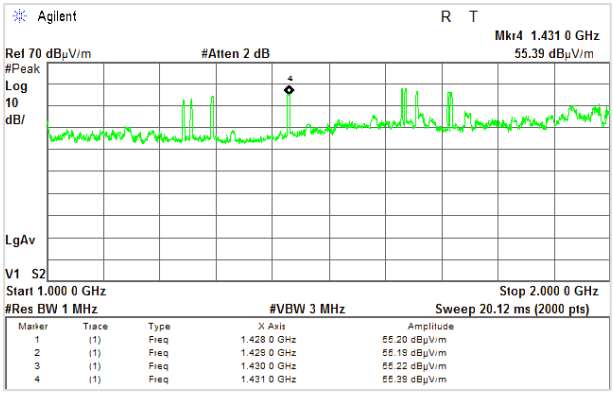
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

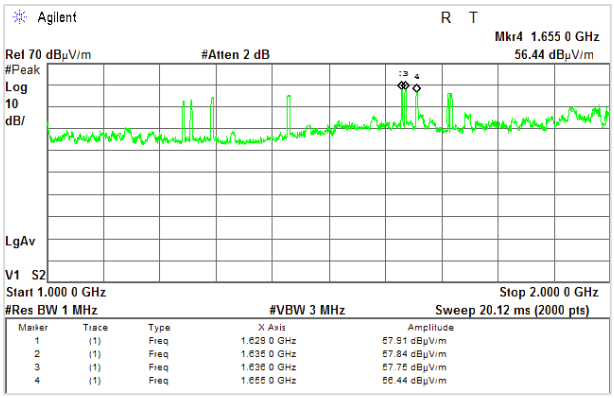
Plot 7.1.10 Radiated emission measurements from 1 to 2 GHz

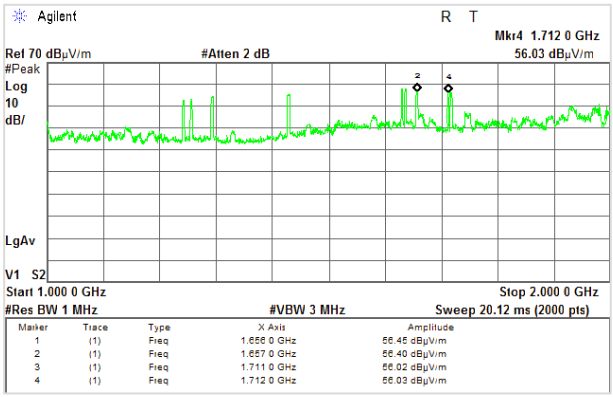
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	Stepped CW signal

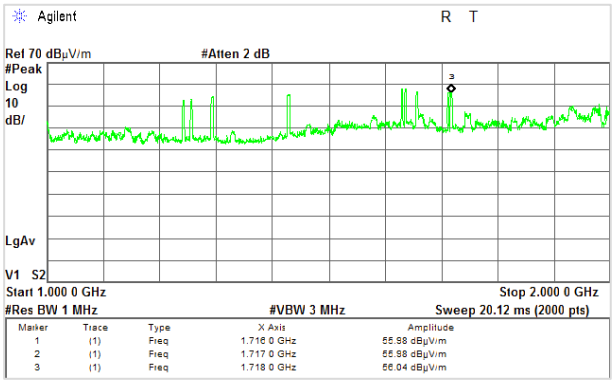








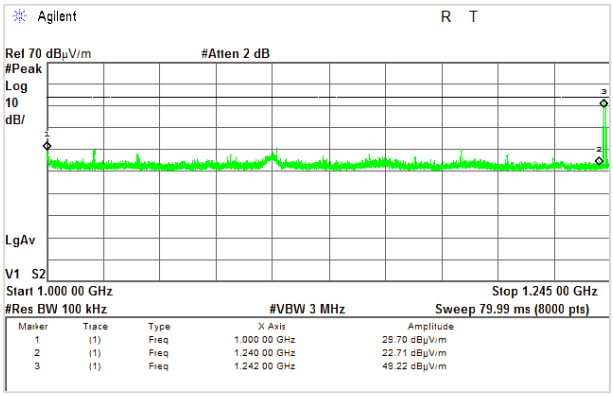


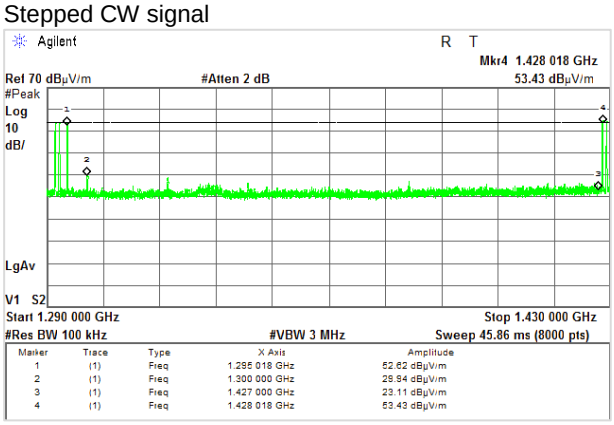


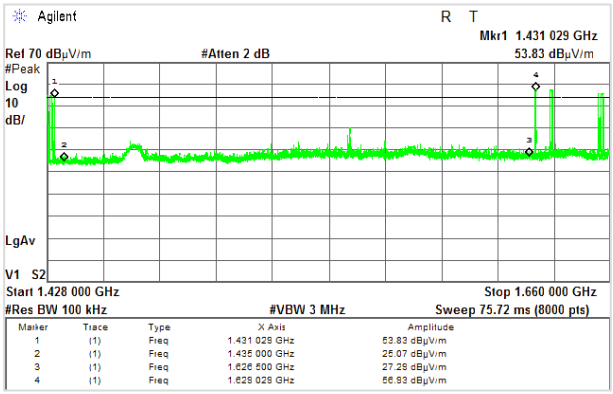
Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

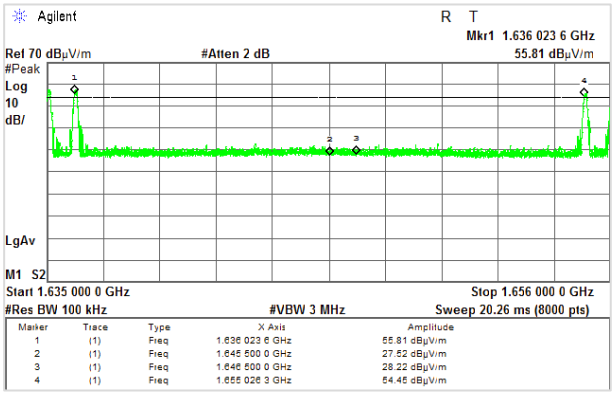
Plot 7.1.11 Field strength in restricted bands

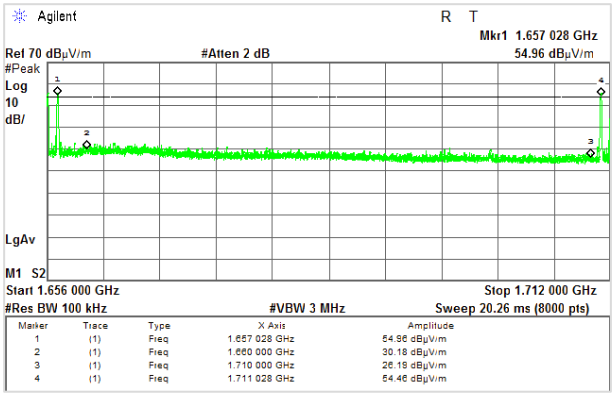
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
OPERATION MODE: Stepped CW signal

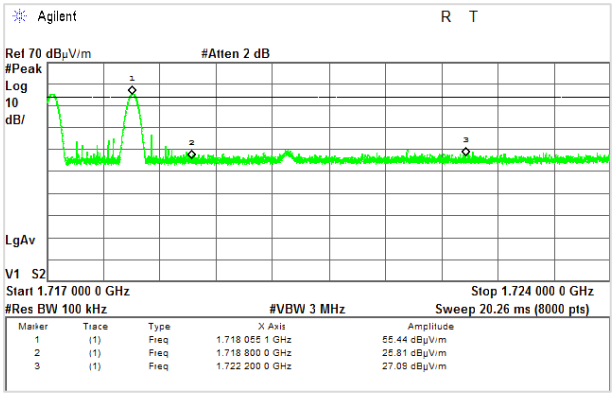








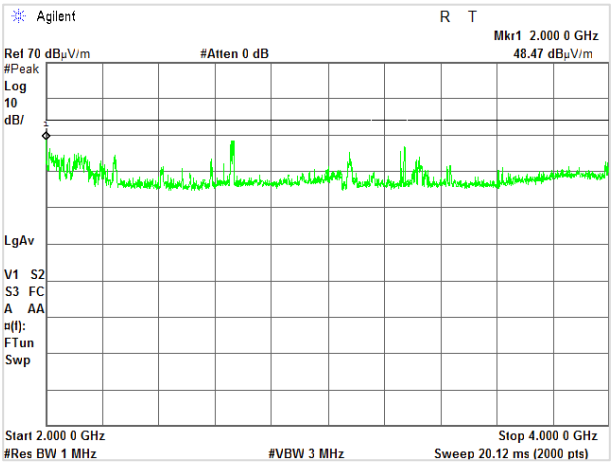


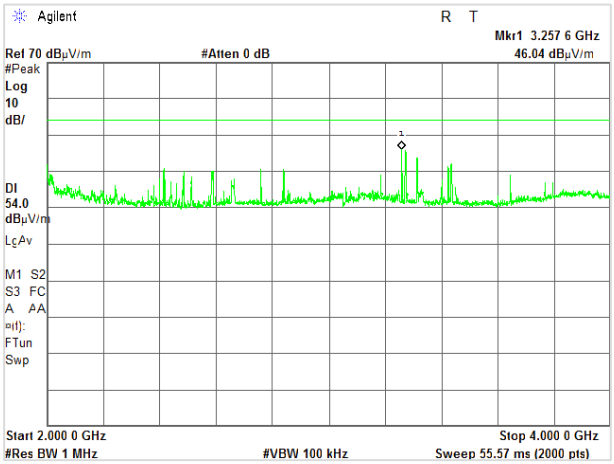


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

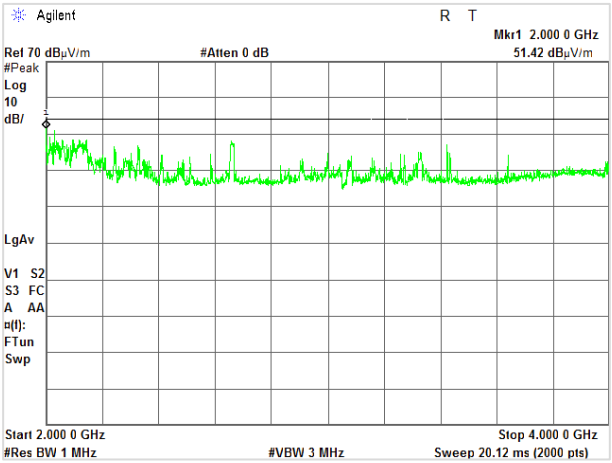
Plot 7.1.12 Radiated emission measurements from 2 to 4 GHz
(Rx module disabled)

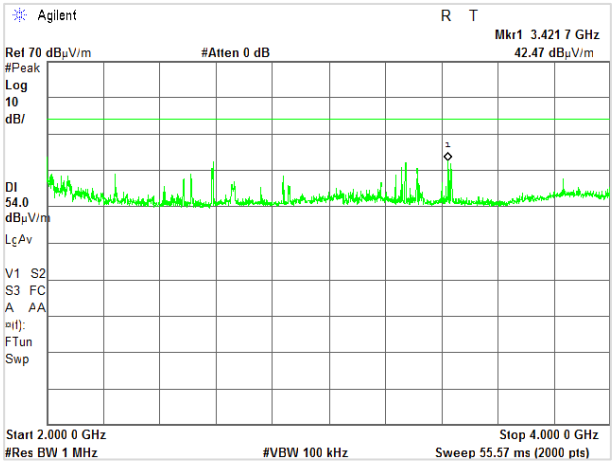
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
ANTENNA POLARIZATION: Vertical
OPERATION MODE: Stepped CW signal
ANTENNA POLARIZATION: Vertical





ANTENNA POLARIZATION: Horizontal

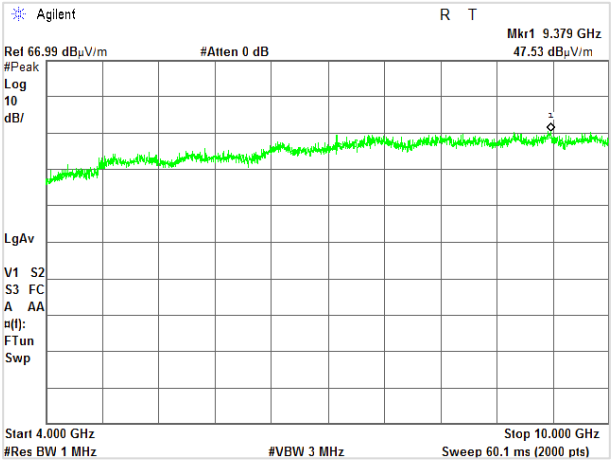


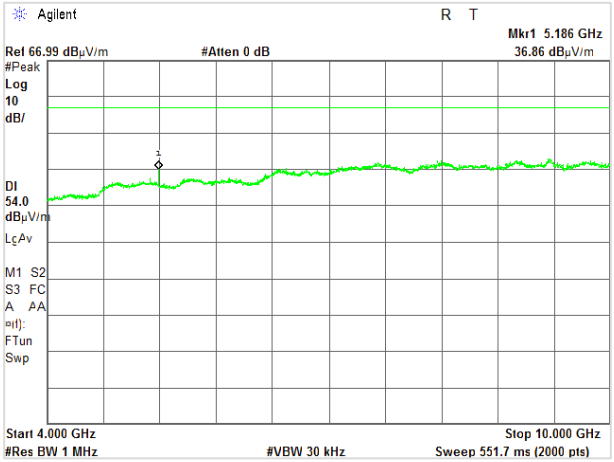


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

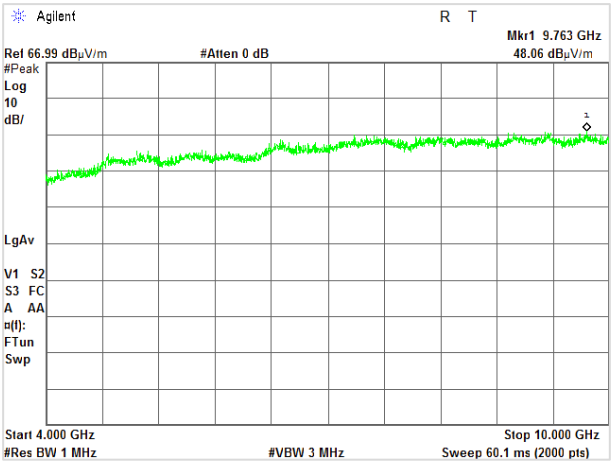
Plot 7.1.13 Radiated emission measurements from 4 to 10 GHz

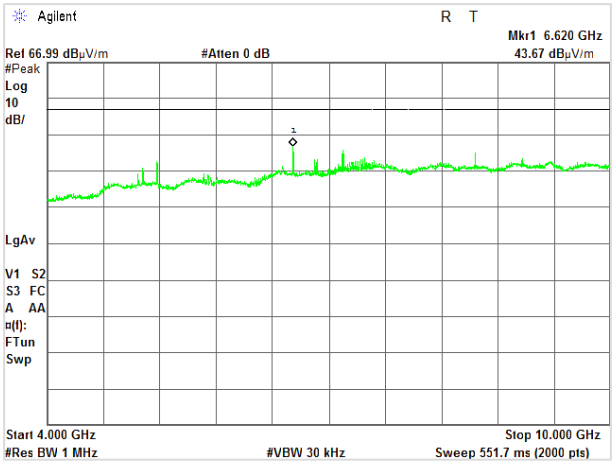
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)
ANTENNA POLARIZATION: Vertical





ANTENNA POLARIZATION: Horizontal

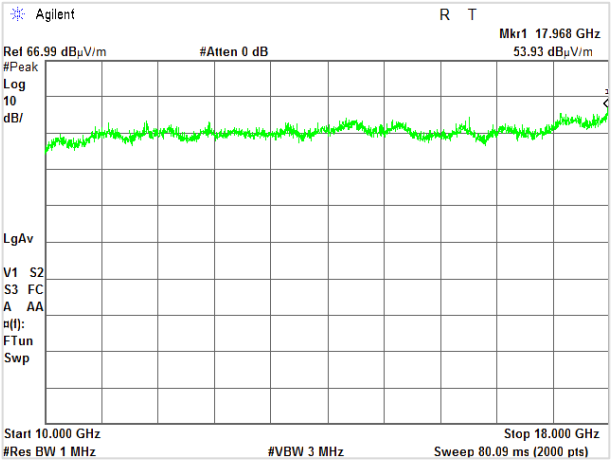


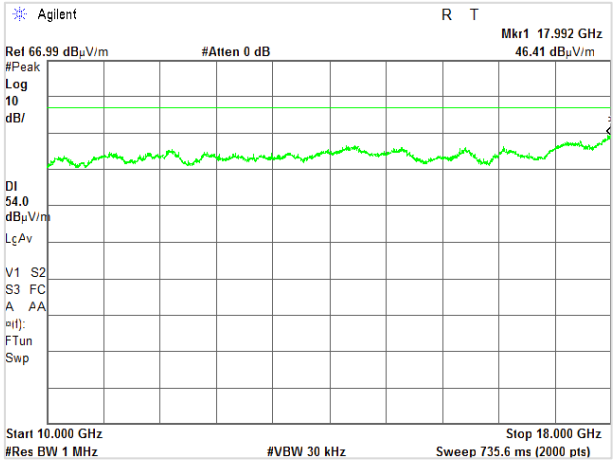


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

Plot 7.1.14 Radiated emission measurements from 10 to 18 GHz

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



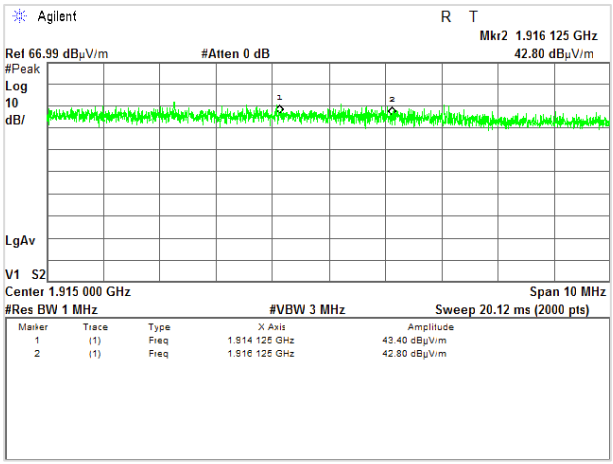


Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

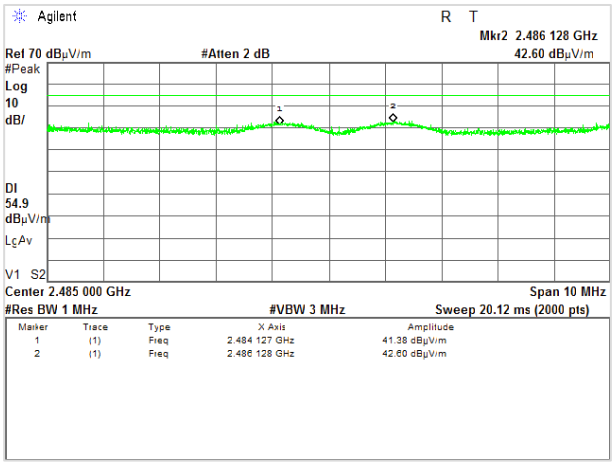
Plot 7.1.15 Radiated emission measurements at the 2nd harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	Stepped CW signal

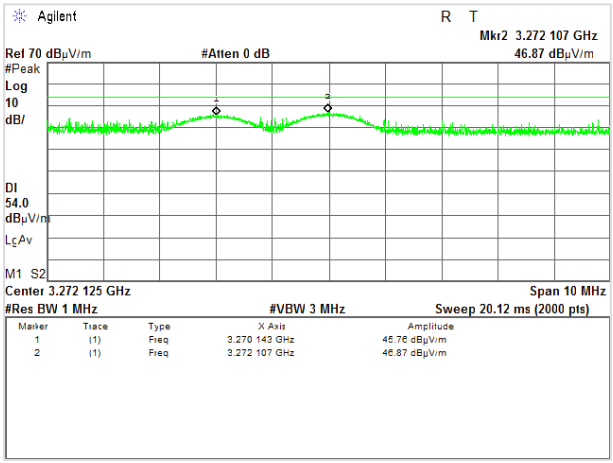
CARRIER FREQUENCY: 957 and 958 MHz



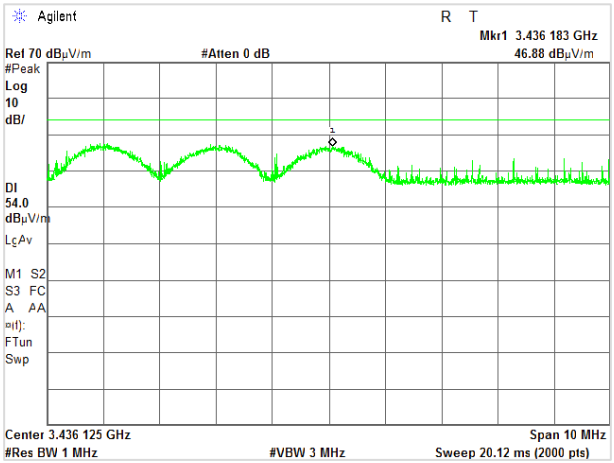
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz

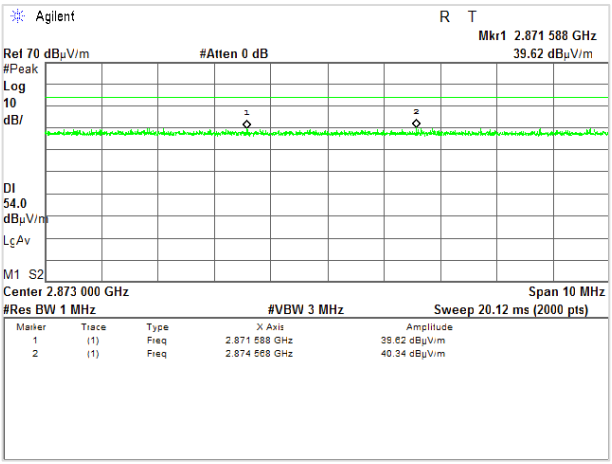


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

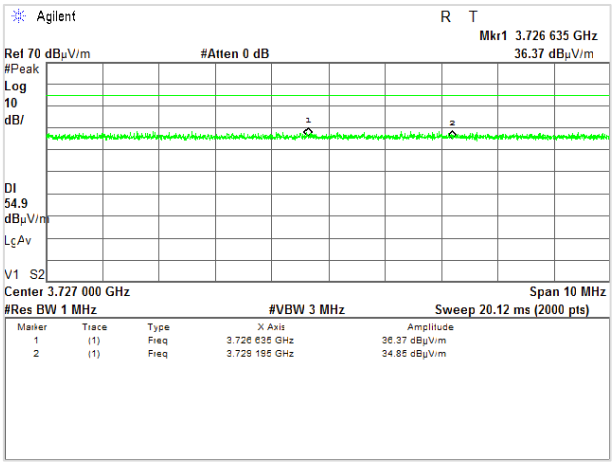
Plot 7.1.16 Radiated emission measurements at the 3rd harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)
OPERATION MODE:	Stepped CW signal

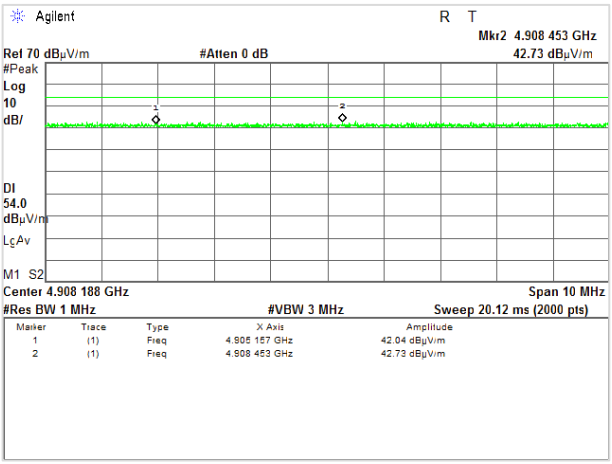
CARRIER FREQUENCY: 957 and 958 MHz



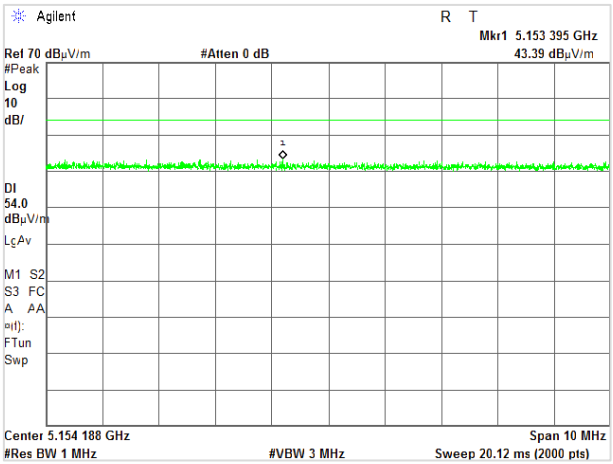
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz

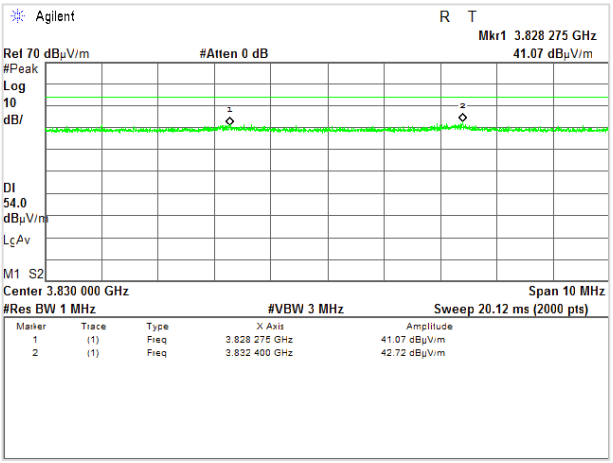


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

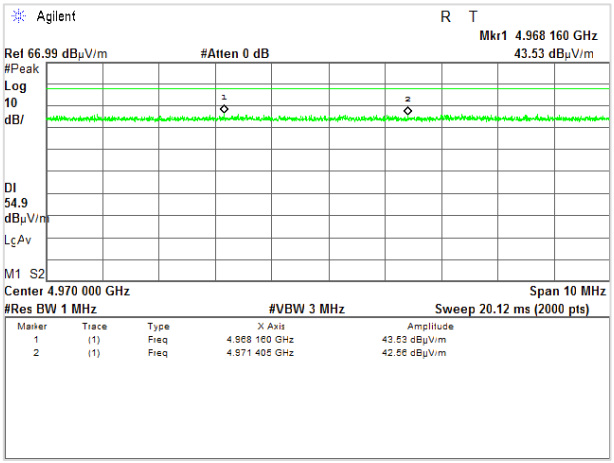
Plot 7.1.17 Radiated emission measurements at the 4th harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

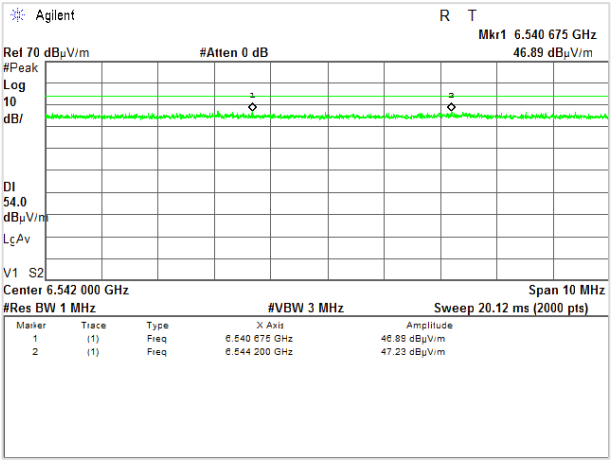
CARRIER FREQUENCY: 957 and 958 MHz



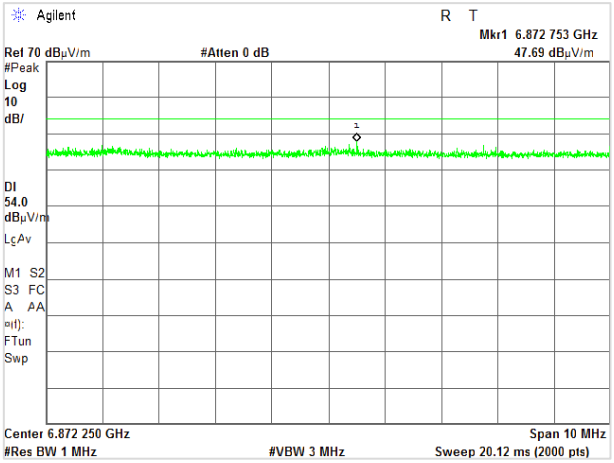
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz

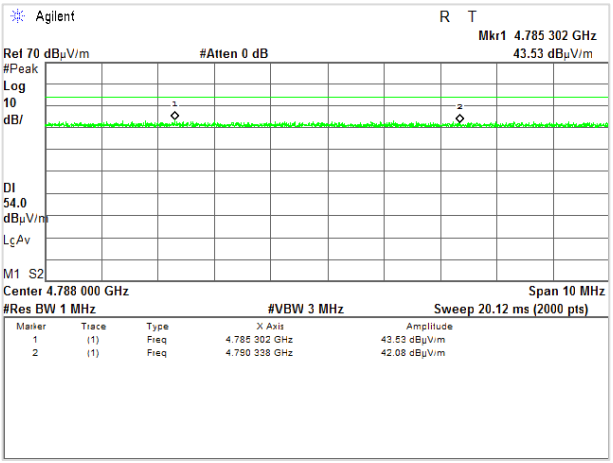


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

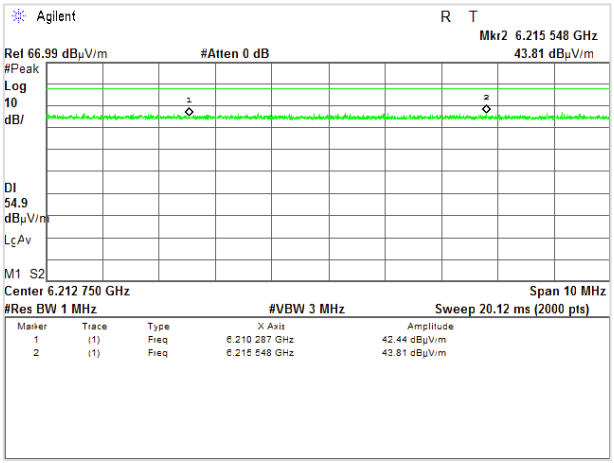
Plot 7.1.18 Radiated emission measurements at the 5th harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

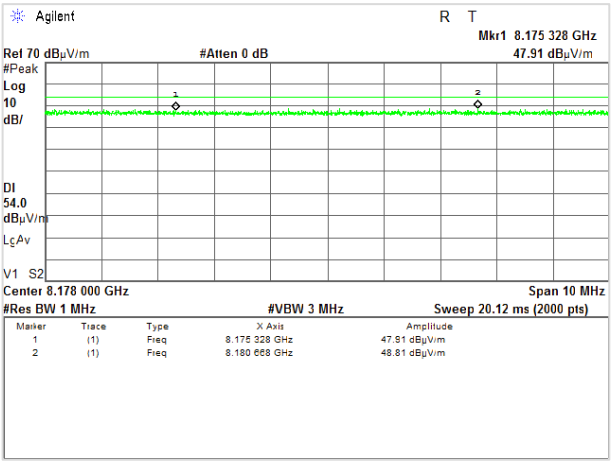
CARRIER FREQUENCY: 957 and 958 MHz



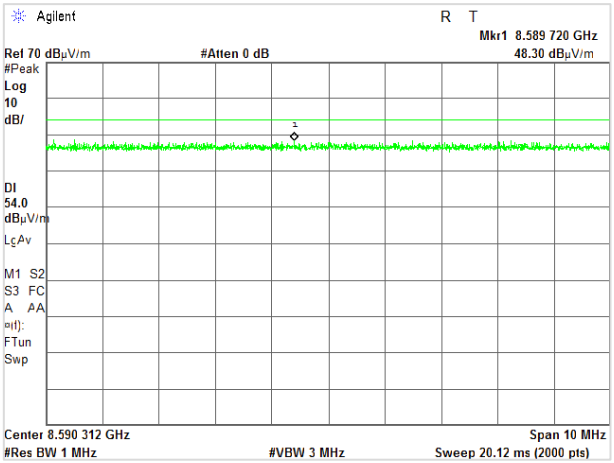
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz

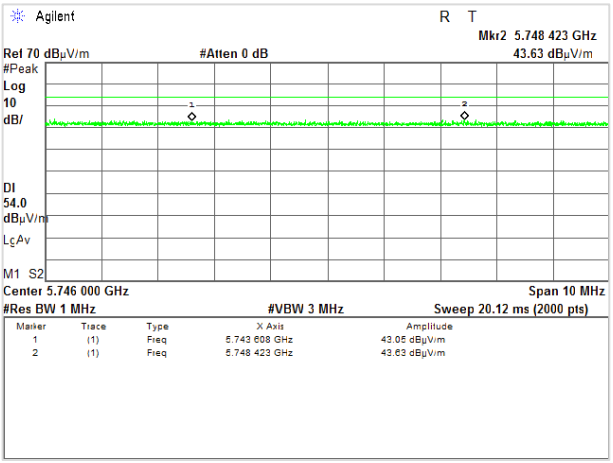


Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

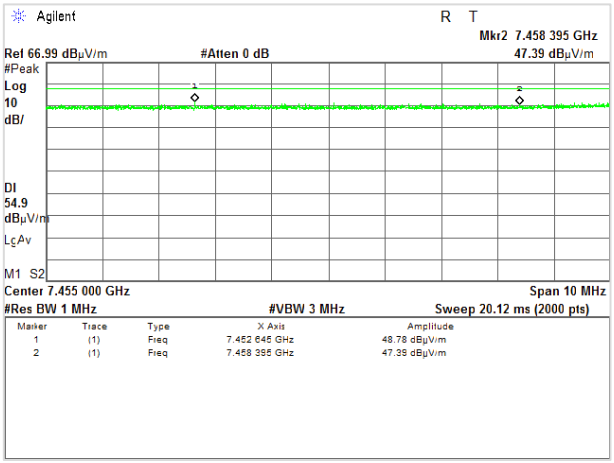
Plot 7.1.19 Radiated emission measurements at the 6th harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

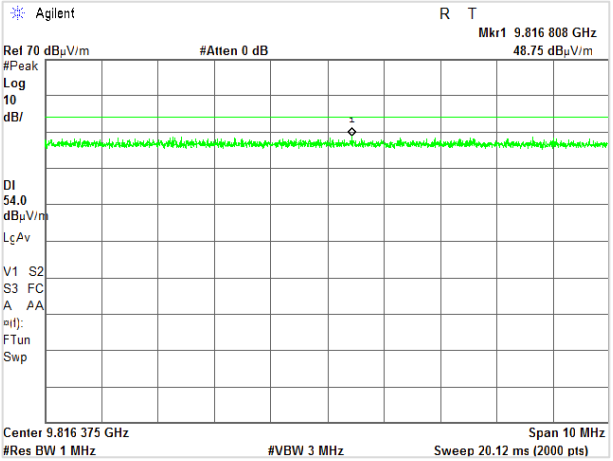
CARRIER FREQUENCY: 957 and 958 MHz



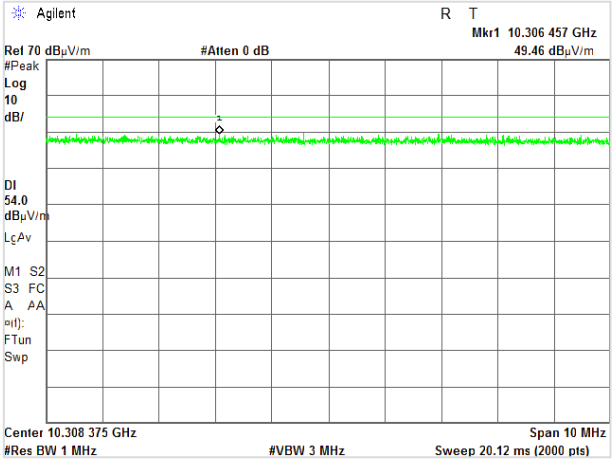
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz

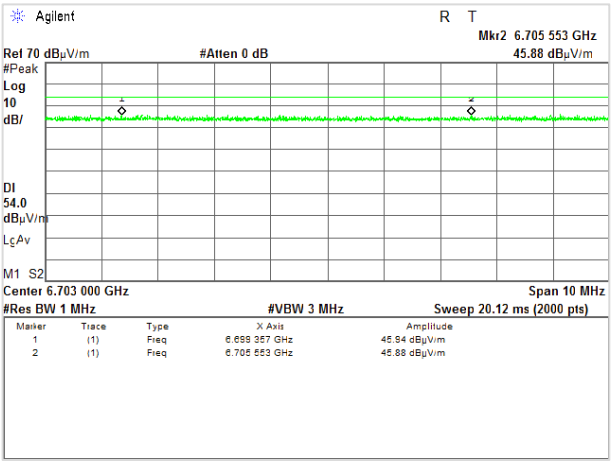


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

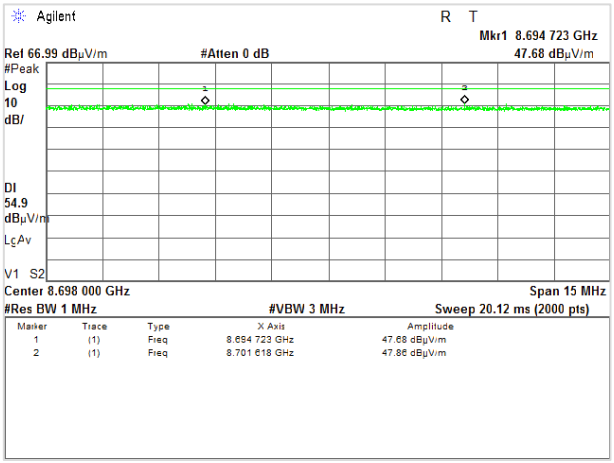
Plot 7.1.20 Radiated emission measurements at the 7th harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

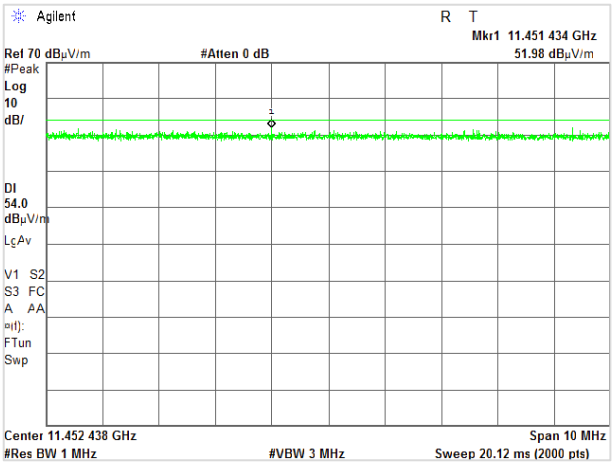
CARRIER FREQUENCY: 957 and 958 MHz



CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz

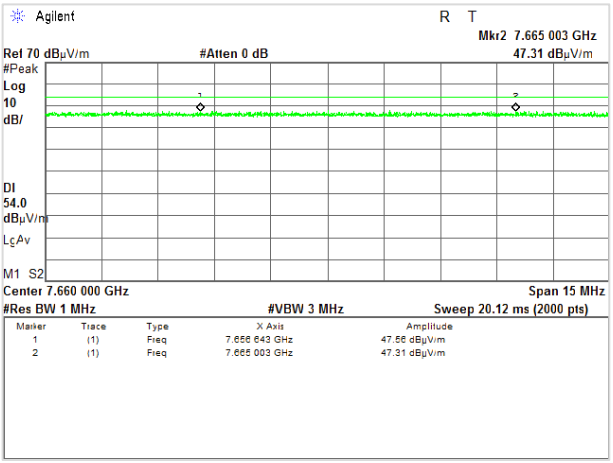


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

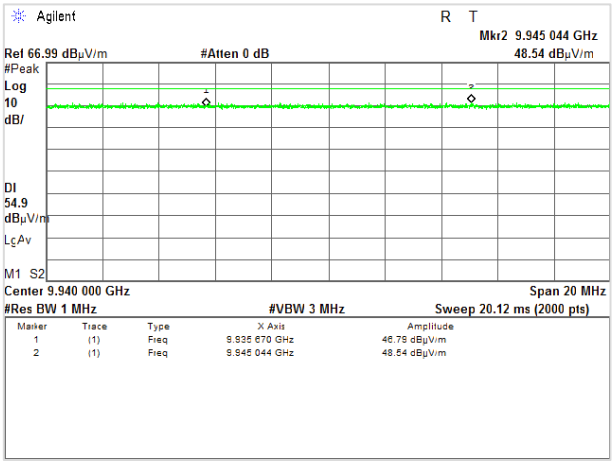
Plot 7.1.21 Radiated emission measurements at the 8th harmonic frequency

TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal
EUT POSITION: Typical (Vertical)

CARRIER FREQUENCY: 957 and 958 MHz



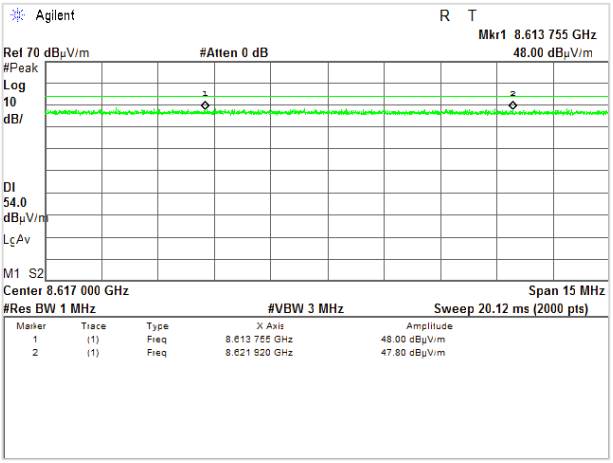
CARRIER FREQUENCY: 1242 MHz



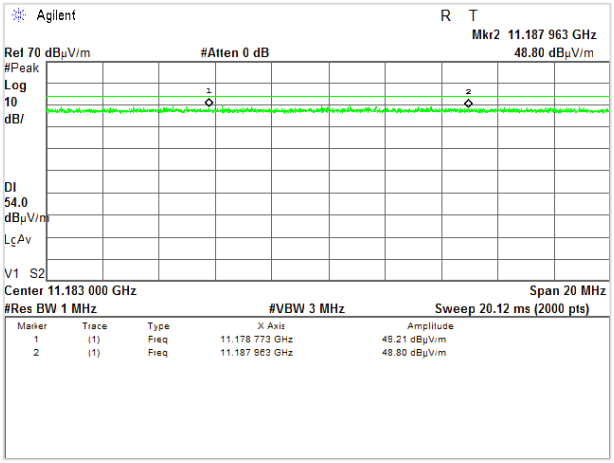
Plot 7.1.22 Radiated emission measurements at the 9th harmonic frequency

TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal
EUT POSITION: Typical (Vertical)

CARRIER FREQUENCY: 957 and 958 MHz



CARRIER FREQUENCY: 1242 MHz

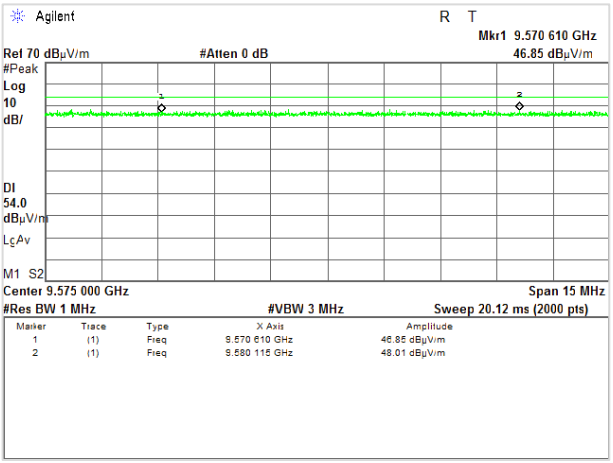


Test specification:	Section 15.209, Field strength of emissions		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1012 hPa	Power: 120 VAC, 50 Hz
Remarks:			

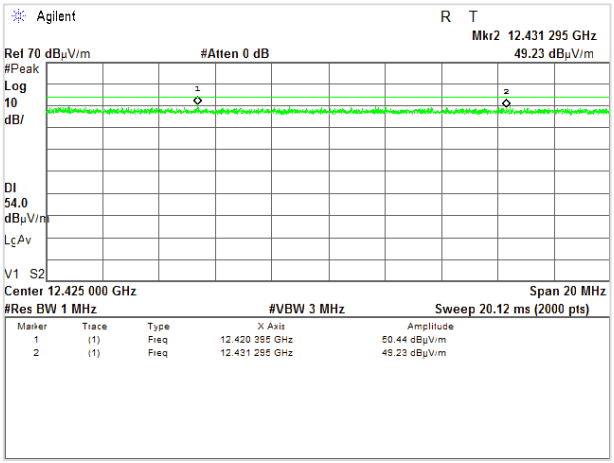
Plot 7.1.23 Radiated emission measurements at the 10th harmonic frequency

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

CARRIER FREQUENCY: 957 and 958 MHz



CARRIER FREQUENCY: 1242 MHz

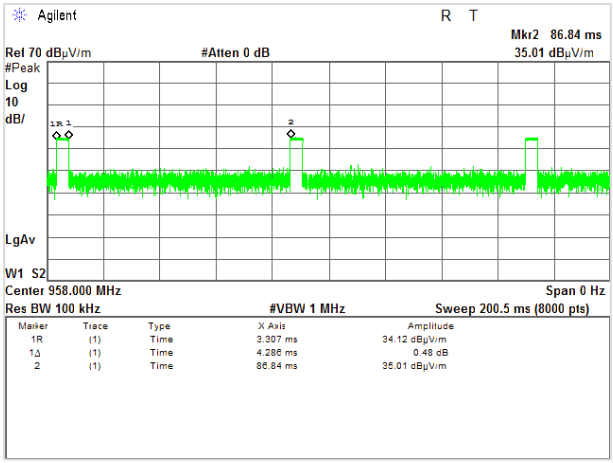


Test specification:	**Section 15.209, Field strength of emissions**		
Test procedure:	ANSI C63.10, Sections 6.4, 6.5		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	08-Feb-18		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1012 hPa	**Power:** 120 VAC, 50 Hz
Remarks:			

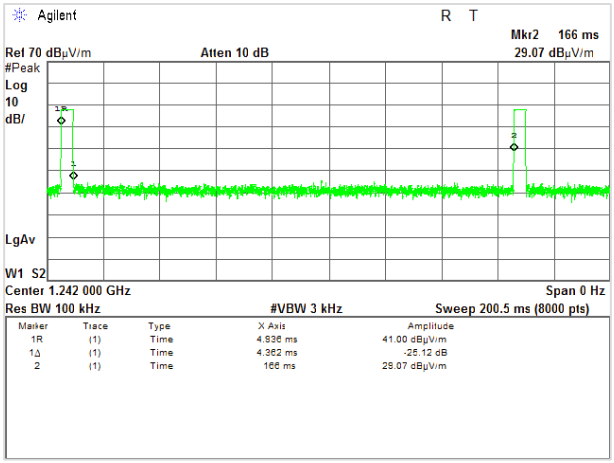
Plot 7.1.24 Transmission pulse duration and pulse period

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical
EUT POSITION:	Typical (Vertical)

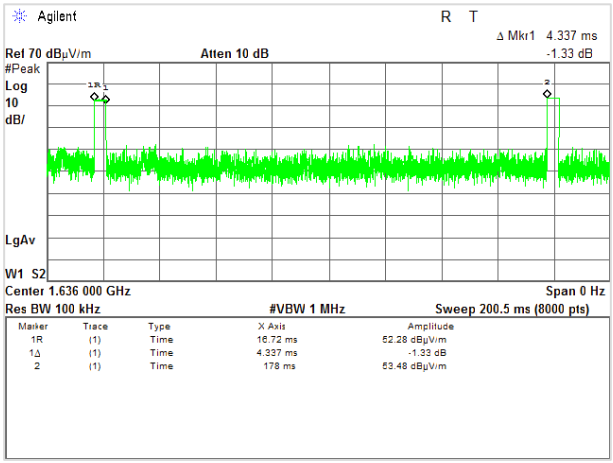
CARRIER FREQUENCY: 958 MHz



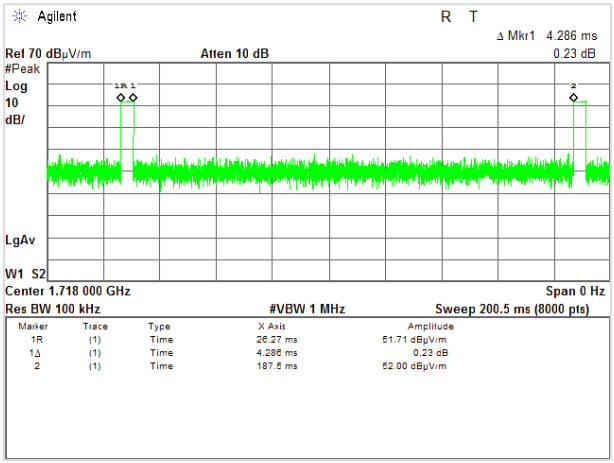
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz



Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	Relative Humidity: 70 %	Air Pressure: 1012 hPa	Power: 230 VAC, 50 Hz
Remarks:			

8 Unintentional emissions according to 47CFR part 15 subpart B

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. 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.

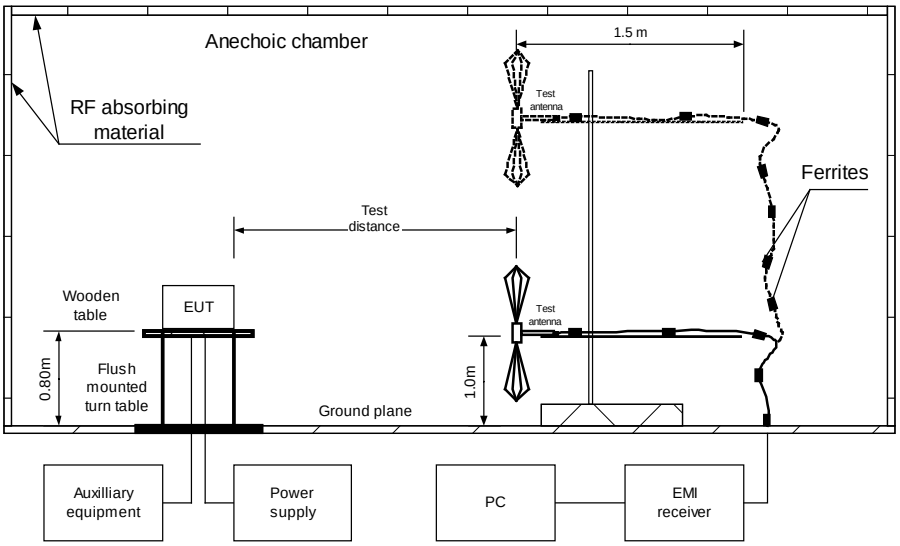
8.1.2 Test procedure for measurements in semi-anechoic chamber

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.

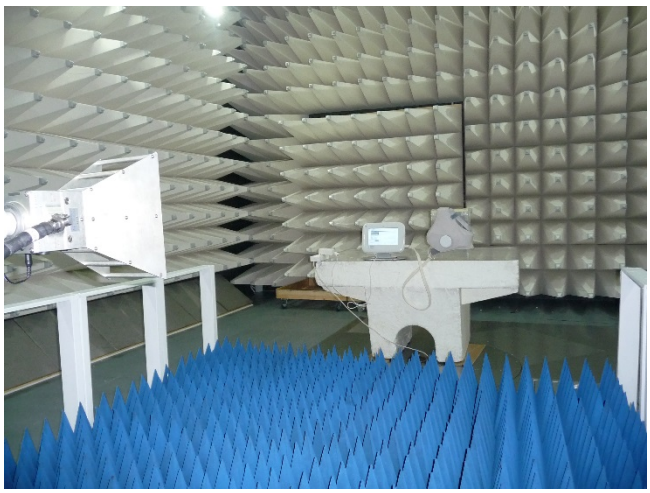
8.1.2.3 The worst test results (the lowest margins) were provided in the associated tables and plots.

Figure 8.1.1 Setup for radiated emission measurements

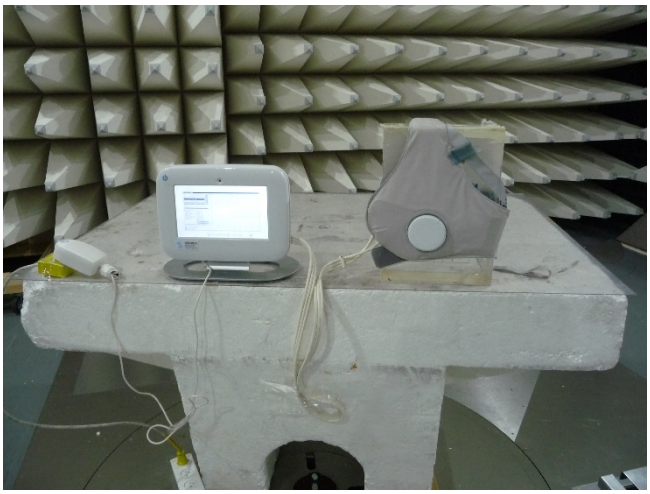


Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	Relative Humidity: 70 %	Air Pressure: 1012 hPa	Power: 230 VAC, 50 Hz
Remarks:			

Photograph 8.1.1 Setup for radiated emission measurements



Photograph 8.1.2 Setup for final radiated emission measurements, EUT cabling



Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	**Relative Humidity:** 70 %	**Air Pressure:** 1012 hPa	**Power:** 230 VAC, 50 Hz
Remarks:			

Table 8.1.2 Radiated emission test results

EUT SET UP: TABLE-TOP
TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive (Tx module disabled)
LIMIT: Class B
DETECTORS USED: QP
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*				
145.0	33.6	24.7	43.5	-18.8	Vertical	1.1	-10	Pass
205.00	44.3	35.1	43.5	-8.4	Horizontal	1.3	0	
235.30	37.5	28.6	43.5	-14.9	Vertical	1.1	-30	
366.73	40.6	36.9	43.5	-6.6	Vertical	1.1	-20	
640.88	46.4	38.7	46.0	-7.3	Vertical	1.0	0	
663.86	46.4	40.1	46.0	-5.9	Vertical	1.1	10	

DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 MHz – 18000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

Frequency, MHz	Peak			Average (VBW 10Hz)			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*				
3258.22	62.6	74.0	-11.4	32.30	54.0	-21.70	Vertical	1.2	-160	Pass
3422.25	57.4	74.0	-16.6	27.18	54.0	-26.82	Vertical	1.1	-160	
3436.25	57.4	74.0	-16.6	28.50	54.0	-25.50	Vertical	1.1	-160	
3642.00	57.3	74.0	-16.7	23.00	54.0	-31.00	Vertical	1.2	-170	
5024.43	63.5	74.0	-10.5	29.80	54.0	-24.20	Horizontal	1.2	-170	
5742.60	60.8	74.0	-13.2	33.17	54.0	-20.83	Vertical	1.3	-150	

Reference numbers of test equipment used

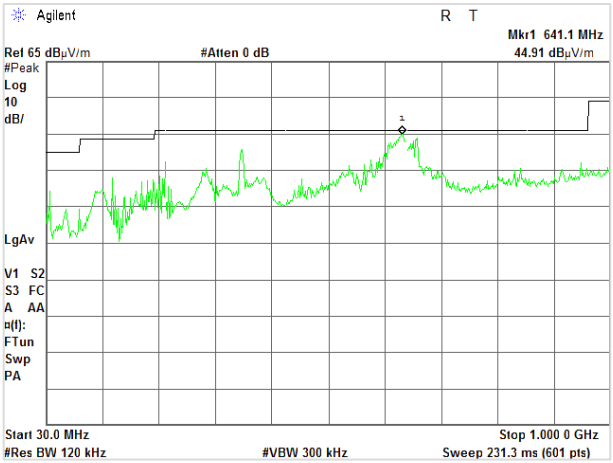
HL 0604	HL 2909	HL 3818	HL 4276	HL 4353	HL 4933		

Full description is given in Appendix A.

Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	Relative Humidity: 70 %	Air Pressure: 1012 hPa	Power: 230 VAC, 50 Hz
Remarks:			

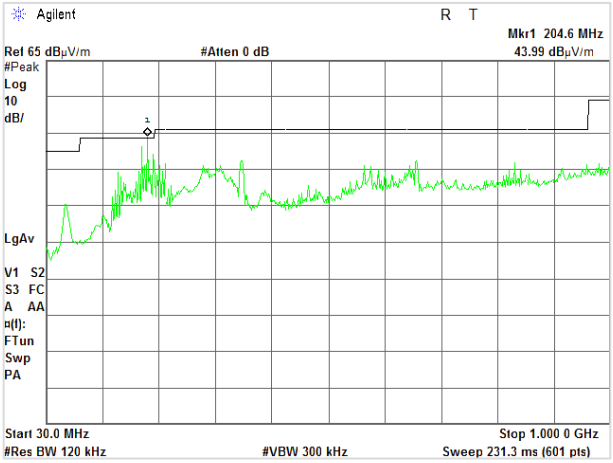
Plot 8.1.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

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



Plot 8.1.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

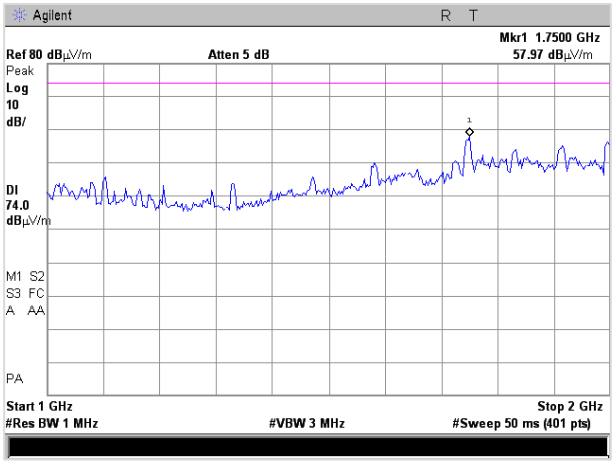
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

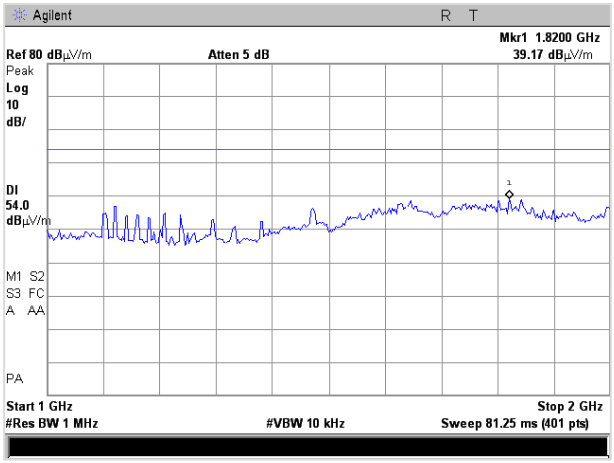


Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	Relative Humidity: 70 %	Air Pressure: 1012 hPa	Power: 230 VAC, 50 Hz
Remarks:			

Plot 8.1.3 Radiated emission measurements from 1 to 2 GHz, vertical antenna polarization

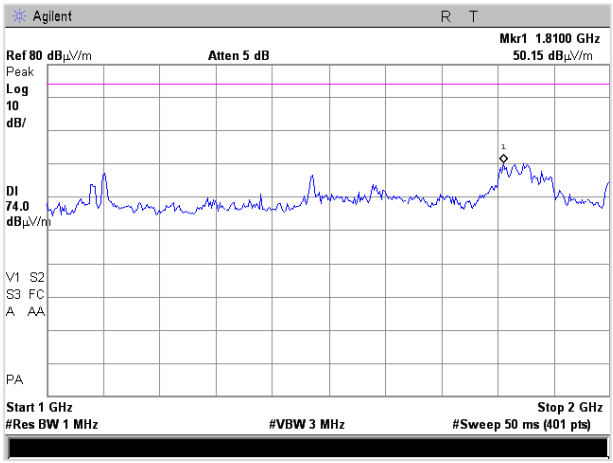
TEST SITE:	Semi anechoic chamber
LIMIT:	Class B
TEST DISTANCE:	3 m
EUT OPERATING MODE:	Receive / Standby

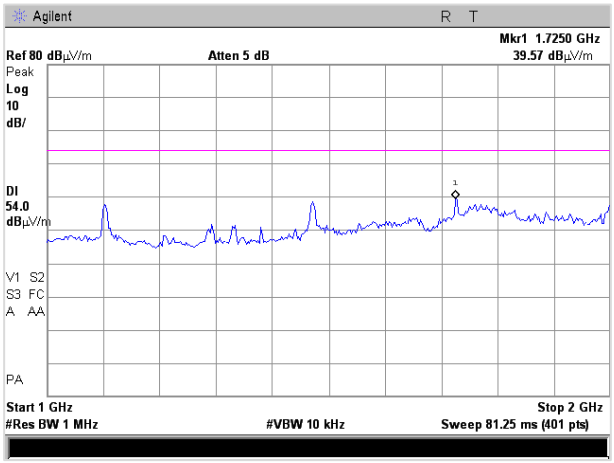




Plot 8.1.4 Radiated emission measurements from 1 to 2 GHz, horizontal antenna polarization

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

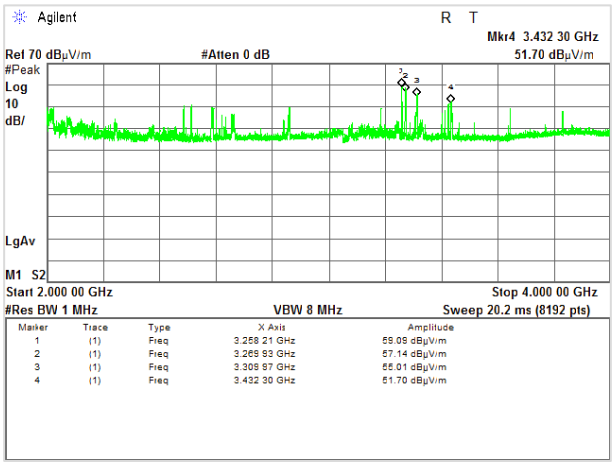


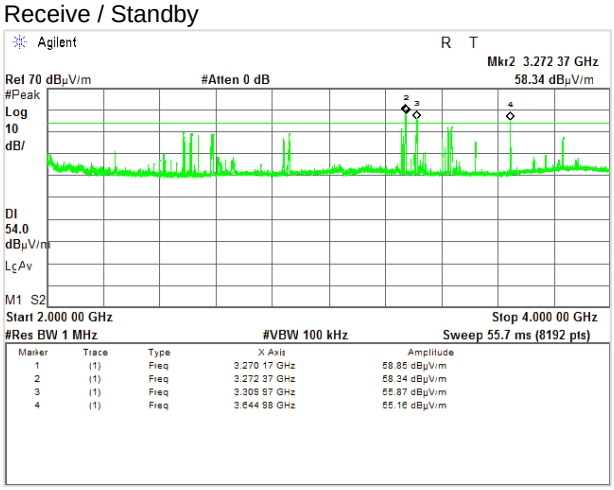


Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	**Relative Humidity:** 70 %	**Air Pressure:** 1012 hPa	**Power:** 230 VAC, 50 Hz
Remarks:			

Plot 8.1.5 Radiated emission measurements from 2 to 4 GHz, vertical antenna polarization

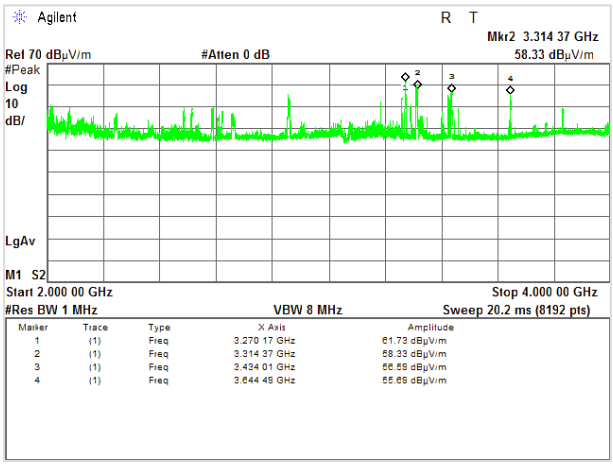
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

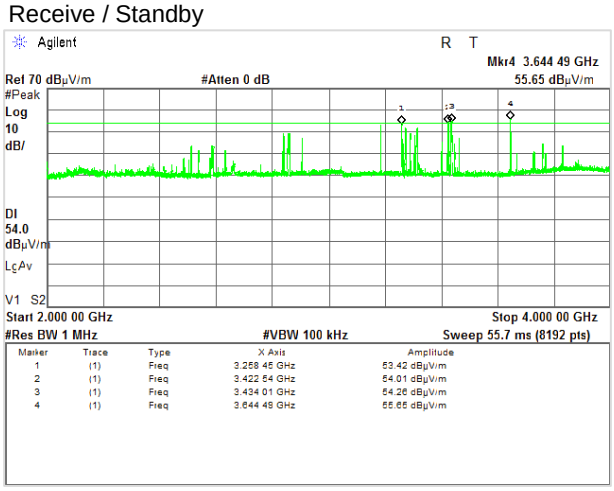




Plot 8.1.6 Radiated emission measurements from 2 to 4 GHz, horizontal antenna polarization

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

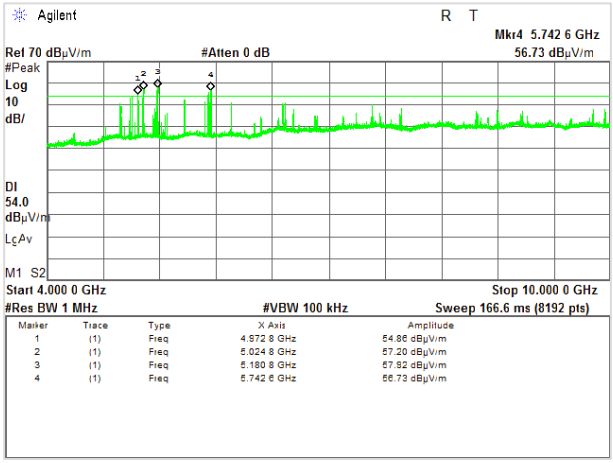


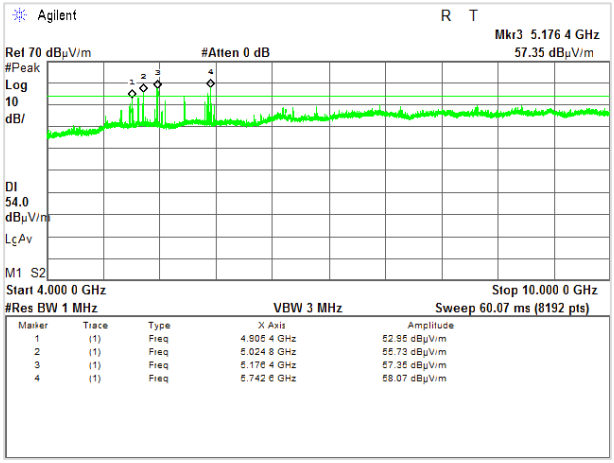


Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	**Relative Humidity:** 70 %	**Air Pressure:** 1012 hPa	**Power:** 230 VAC, 50 Hz
Remarks:			

Plot 8.1.7 Radiated emission measurements from 4 to 10 GHz, vertical antenna polarization

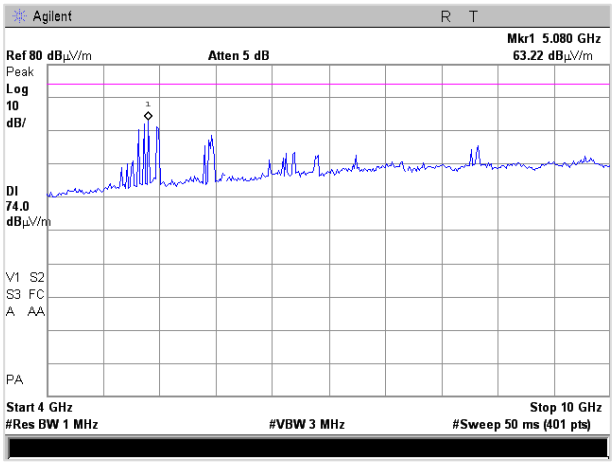
TEST SITE: Semi anechoic chamber
LIMIT: Class B
TEST DISTANCE: 3 m
EUT OPERATING MODE: Receive / Standby

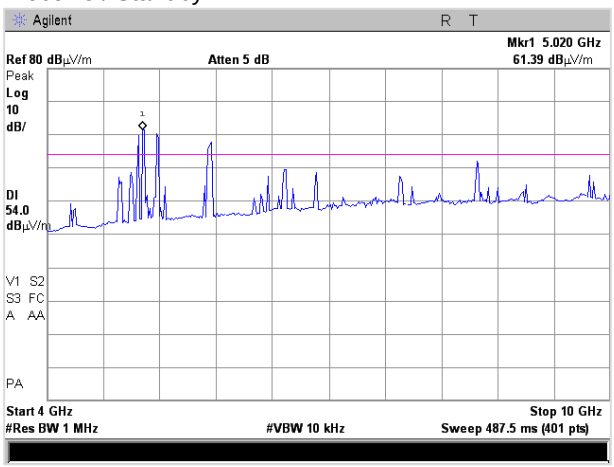




Plot 8.1.8 Radiated emission measurements from 4 to 10 GHz, horizontal antenna polarization

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

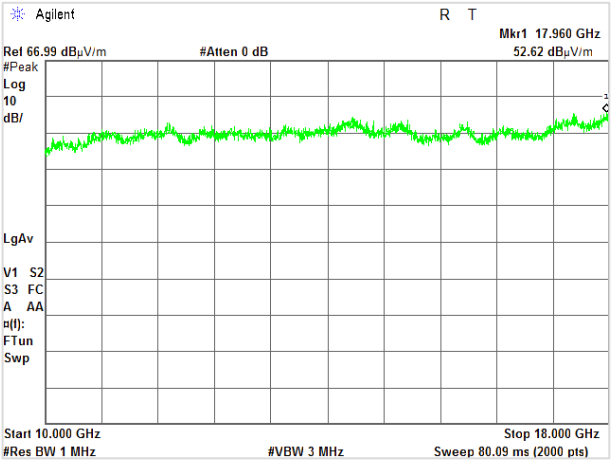


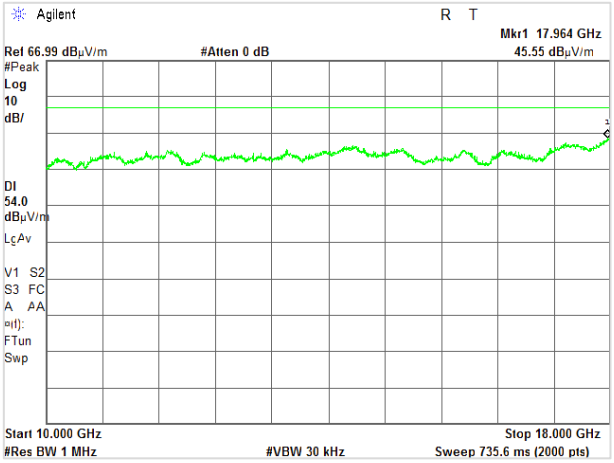


Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	Relative Humidity: 70 %	Air Pressure: 1012 hPa	Power: 230 VAC, 50 Hz
Remarks:			

Plot 8.1.9 Radiated emission measurements from 10 to 18 GHz, vertical antenna polarization

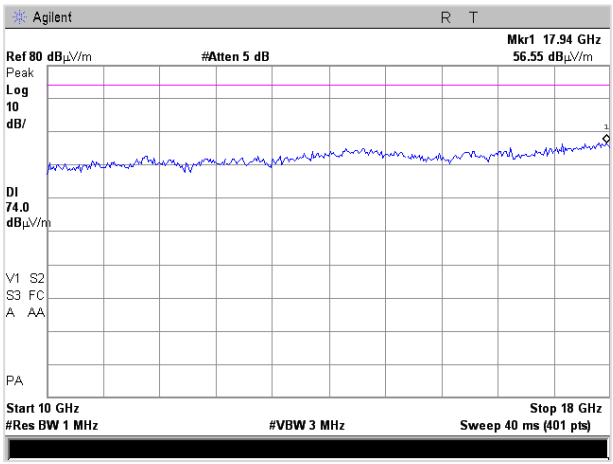
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
EUT POSITION: Typical (Vertical)

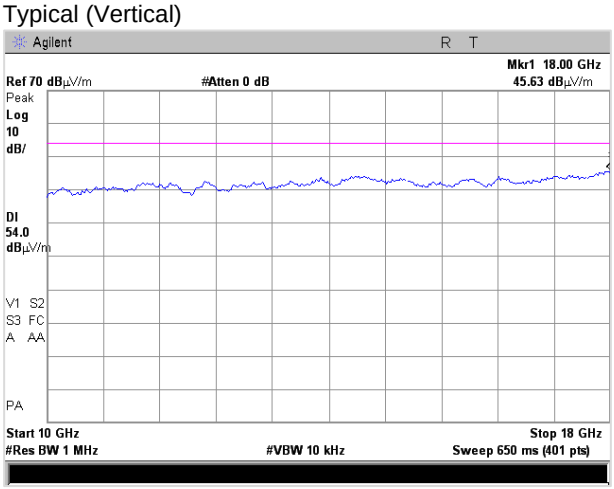




Plot 8.1.10 Radiated emission measurements from 10 to 18 GHz, horizontal antenna polarization

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



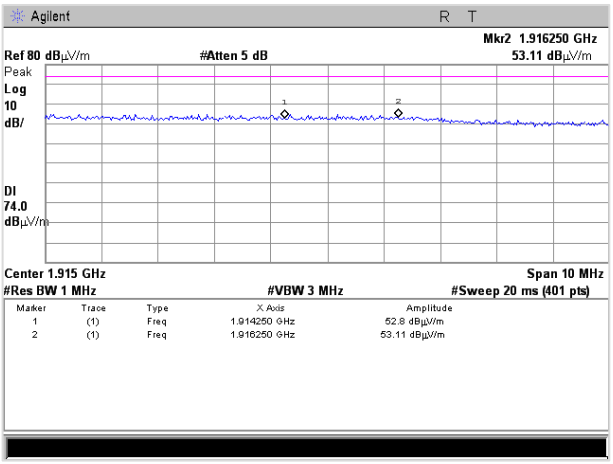


Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	Relative Humidity: 70 %	Air Pressure: 1012 hPa	Power: 230 VAC, 50 Hz
Remarks:			

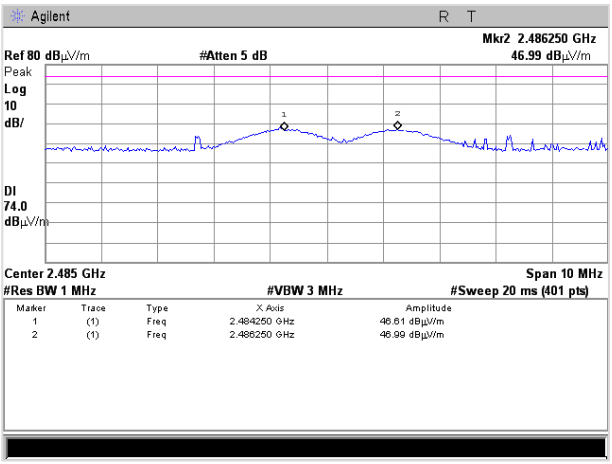
Plot 8.1.11 Radiated emission measurements at the 2nd harmonic LO

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

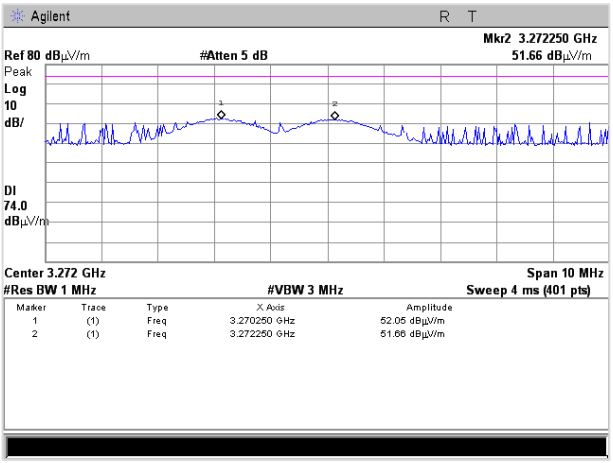
CARRIER FREQUENCY: 957 and 958 MHz



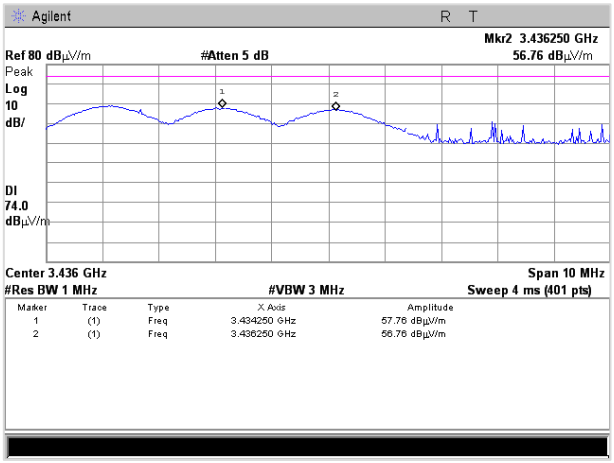
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz

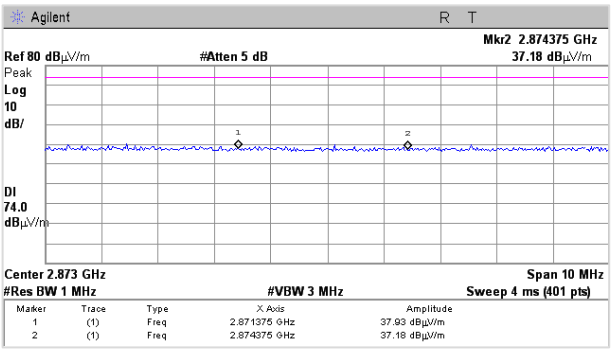


Test specification:	**Section 15.109, Radiated emission**		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	25-Jan-18		
Temperature: 23 ºC	**Relative Humidity:** 70 %	**Air Pressure:** 1012 hPa	**Power:** 230 VAC, 50 Hz
Remarks:			

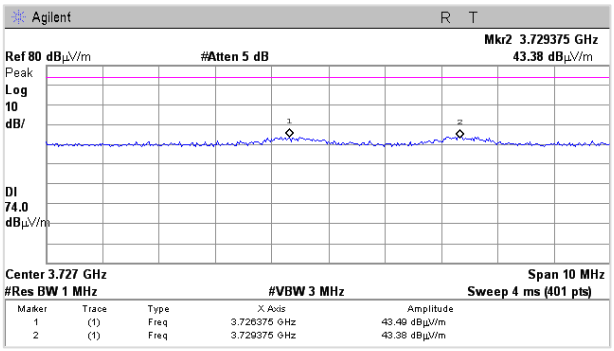
Plot 8.1.12 Radiated emission measurements at the 3rd harmonic LO

TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical & Horizontal
EUT POSITION:	Typical (Vertical)

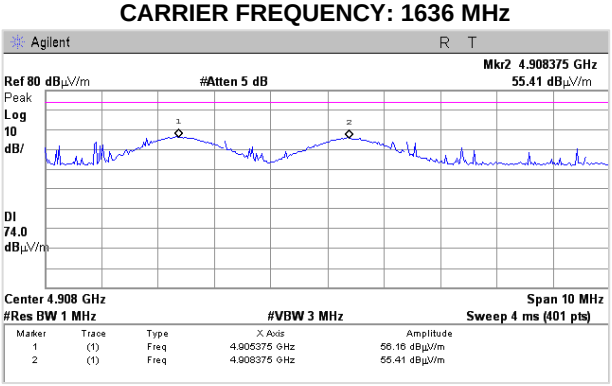
CARRIER FREQUENCY: 957 and 958 MHz



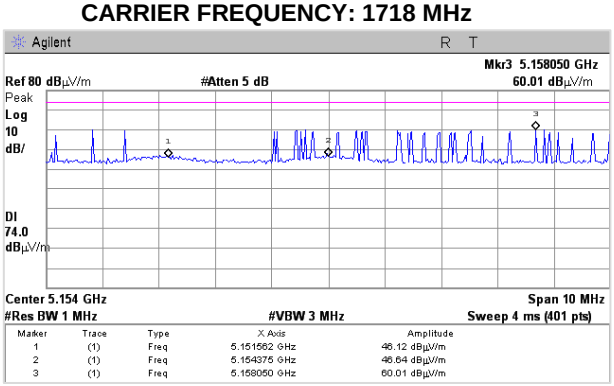
CARRIER FREQUENCY: 1242 MHz



CARRIER FREQUENCY: 1636 MHz



CARRIER FREQUENCY: 1718 MHz



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
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A00253	31-Oct-17	31-Oct-18
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	12-May-17	12-May-18
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	09-Mar-17	09-Mar-18
3615	Cable RF, 6.5 m, N type-N type, DC-6 GHz	Suhner Switzerland	RG 214/U	NA	04-Jun-17	04-Jun-18
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	07-May-17	07-May-18
3901	Microwave Cable Assembly, 40 GHz, 3.5m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	07-Feb-18	07-Feb-19
4276	Test Cable , DC-18 GHz, 3.05 m, N/M - N/M	Mini-Circuits	APC-10FT-NMNM+	0747A	24-Aug-17	24-Aug-18
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
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	15-Mar-17	15-Mar-18
4933	Active Horn Antenna, 1 GHz to 18 GHz	COM-POWER CORPORATION	AHA-118	701046	04-Jan-18	04-Jan-19

10 APPENDIX B 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.

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).

Address: P.O. Box 23, Binyamina 3055001, Israel
Telephone: +972 4628 8001
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e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

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

12 APPENDIX D Test equipment correction factors

Antenna, Loop, Active, 10 kHz - 30 MHz
EMCO, model: 6502, s/n 2857

HL 0446: Antenna factor

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.

Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz
EMCO, model 3141, serial number 9611-1011

HL 0604: Antenna factor

Frequency, MHz	Antenna factor, dB/m
30	12.1
35	9.1
40	8.0
45	8.3
50	9.0
60	10.5
70	11.4
80	12.3
90	13.4
100	13.0
120	11.4
140	12.5

Frequency, MHz	Antenna factor, dB/m
160	14.9
180	14.4
200	13.7
250	16.3
300	17.2
400	19.8
500	22.0
600	24.3
700	25.8
800	26.9
900	27.3
1000	28.5

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

Active Horn Antenna, 1 GHz to 18 GHz
COM-POWER CORPORATION, model: AHA-118, s/n 701046

HL 4933: Antenna factor

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.

Cable RF, 6.5 m, N type-N type, DC-6 GHz
Suhner Switzerland, model: RG 214/U, s/n: NA

HL 3615: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
50	0.31	+0.08 / -0.08
100	0.45	+0.08 / -0.08
200	0.66	+0.08 / -0.08
300	0.83	+0.09 / -0.09
400	0.98	+0.09 / -0.09
500	1.12	+0.09 / -0.09
600	1.26	+0.09 / -0.09
700	1.38	+0.09 / -0.09
800	1.50	+0.09 / -0.09
900	1.63	+0.09 / -0.09
1000	1.74	+0.09 / -0.09
1100	1.85	+0.09 / -0.09
1200	1.97	+0.09 / -0.09
1300	2.08	+0.09 / -0.09
1400	2.19	+0.09 / -0.09
1500	2.30	+0.09 / -0.09
1600	2.41	+0.09 / -0.09
1700	2.53	+0.09 / -0.09
1800	2.63	+0.09 / -0.09
1900	2.74	+0.09 / -0.09
2000	2.83	+0.09 / -0.09
2100	2.93	+0.11 / -0.11
2200	3.00	+0.11 / -0.11
2300	3.07	+0.11 / -0.11
2400	3.13	+0.11 / -0.11
2500	3.19	+0.15 / -0.15
2600	3.25	+0.15 / -0.15
2700	3.33	+0.15 / -0.15
2800	3.40	+0.15 / -0.15
2900	3.48	+0.15 / -0.15
3000	3.57	+0.15 / -0.15
3100	3.63	+0.17 / -0.17
3200	3.71	+0.17 / -0.17

Set / Applied, MHz	Measured, dB	Uncertainty, dB
3300	3.78	+0.17 / -0.17
3400	3.88	+0.17 / -0.17
3500	3.96	+0.17 / -0.17
3600	4.06	+0.17 / -0.17
3700	4.15	+0.17 / -0.17
3800	4.26	+0.17 / -0.17
3900	4.36	+0.17 / -0.17
4000	4.48	+0.17 / -0.17
4100	4.58	+0.22 / -0.23
4200	4.72	+0.22 / -0.23
4300	4.80	+0.22 / -0.23
4400	4.93	+0.22 / -0.23
4500	5.00	+0.22 / -0.23
4600	5.10	+0.22 / -0.23
4700	5.20	+0.22 / -0.23
4800	5.30	+0.22 / -0.23
4900	5.43	+0.22 / -0.23
5000	5.54	+0.22 / -0.23
5100	5.65	+0.22 / -0.23
5200	5.73	+0.22 / -0.23
5300	5.86	+0.22 / -0.23
5400	5.95	+0.22 / -0.23
5500	6.05	+0.22 / -0.23
5600	6.16	+0.22 / -0.23
5700	6.28	+0.22 / -0.23
5800	6.38	+0.22 / -0.23
5900	6.53	+0.22 / -0.23
6000	6.63	+0.22 / -0.23
6100	6.75	+0.22 / -0.23
6200	6.82	+0.22 / -0.23
6300	6.93	+0.22 / -0.23
6400	7.00	+0.22 / -0.23
6500	7.05	+0.22 / -0.23

Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA
Huber-Suhner, model: SUCOFLEX 102A, s/n: 1225/2A

HL 3901: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
50	0.34	±0.06
100	0.47	±0.06
150	0.58	±0.07
200	0.67	±0.07
300	0.82	±0.07
400	0.94	±0.07
500	1.05	±0.07
600	1.15	±0.07
700	1.24	±0.07
800	1.33	±0.07
900	1.41	±0.07
1000	1.49	±0.07
1100	1.56	±0.07
1200	1.62	±0.07
1300	1.69	±0.07
1400	1.76	±0.07
1500	1.82	±0.07
1600	1.88	±0.07
1700	1.94	±0.07
1800	2.00	±0.07
1900	2.05	±0.07
2000	2.11	±0.07
2100	2.16	±0.07
2200	2.21	±0.07
2300	2.26	±0.07
2400	2.32	±0.07
2500	2.36	±0.09
2600	2.42	±0.09
2700	2.47	±0.09
2800	2.52	±0.09
2800	2.52	±0.09
2900	2.57	±0.09
3000	2.62	±0.09
3100	2.67	±0.09
3200	2.72	±0.09
3300	2.76	±0.09
3400	2.80	±0.09
3500	2.84	±0.09
3600	2.88	±0.09
3700	2.93	±0.09
3800	2.96	±0.09
3900	3.00	±0.09
4000	3.04	±0.09
4100	3.08	±0.13
4200	3.11	±0.13
4300	3.15	±0.13
4400	3.19	±0.13
4500	3.22	±0.13
4600	3.26	±0.13

Set / Applied, MHz	Measured, dB	Uncertainty, dB
4700	3.29	±0.13
4800	3.33	±0.13
4900	3.36	±0.13
5000	3.40	±0.13
5100	3.43	±0.13
5200	3.46	±0.13
5300	3.50	±0.13
5400	3.53	±0.13
5500	3.56	±0.13
5600	3.59	±0.13
5700	3.62	±0.13
5800	3.65	±0.13
5900	3.68	±0.13
6000	3.71	±0.13
6100	3.74	±0.13
6200	3.78	±0.13
6300	3.81	±0.13
6400	3.84	±0.13
6500	3.88	±0.13
6600	3.91	±0.13
6700	3.95	±0.13
6800	3.99	±0.13
6900	4.02	±0.13
7000	4.05	±0.13
7100	4.09	±0.13
7200	4.12	±0.13
7300	4.16	±0.13
7400	4.19	±0.13
7500	4.23	±0.13
7600	4.26	±0.13
7700	4.30	±0.13
7800	4.33	±0.13
7900	4.36	±0.13
8000	4.39	±0.13
8100	4.42	±0.13
8200	4.45	±0.13
8300	4.48	±0.13
8400	4.50	±0.13
8500	4.53	±0.13
8600	4.56	±0.13
8700	4.58	±0.13
8800	4.61	±0.13
8900	4.63	±0.13
9000	4.66	±0.13
9100	4.67	±0.13
9200	4.69	±0.13
9300	4.72	±0.13
9400	4.75	±0.13
9500	4.77	±0.13

HL 3901: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
9600	4.79	±0.13
9700	4.81	±0.13
9800	4.84	±0.13
9900	4.87	±0.13
10000	4.89	±0.13
10100	4.92	±0.13
10200	4.94	±0.13
10300	4.96	±0.13
10400	4.98	±0.13
10500	5.01	±0.13
10600	5.02	±0.13
10700	5.05	±0.13
10800	5.07	±0.13
10900	5.10	±0.13
11000	5.12	±0.13
11100	5.15	±0.13
11200	5.18	±0.13
11300	5.21	±0.13
11400	5.23	±0.13
11500	5.26	±0.13
11600	5.30	±0.13
11700	5.33	±0.13
11800	5.36	±0.13
11900	5.39	±0.13
12000	5.42	±0.13
12100	5.45	±0.16
12200	5.48	±0.16
12300	5.52	±0.16
12400	5.56	±0.16
12500	5.59	±0.22
12600	5.61	±0.22
12700	5.65	±0.22
12800	5.69	±0.22
12900	5.72	±0.22
13000	5.74	±0.22
13100	5.78	±0.22
13200	5.80	±0.22
13300	5.83	±0.22
13400	5.85	±0.22
13500	5.87	±0.22
13600	5.89	±0.22
13700	5.91	±0.22
13800	5.94	±0.22
13900	5.95	±0.22
14000	5.97	±0.22
14100	5.99	±0.22
14200	6.02	±0.22
14300	6.02	±0.22
14400	6.04	±0.22
14500	6.06	±0.22

Set / Applied, MHz	Measured, dB	Uncertainty, dB
14600	6.08	±0.22
14700	6.09	±0.22
14800	6.12	±0.22
14900	6.14	±0.22
15000	6.15	±0.22
15100	6.18	±0.22
15200	6.21	±0.22
15300	6.23	±0.22
15400	6.25	±0.22
15500	6.28	±0.22
15600	6.31	±0.22
15700	6.33	±0.22
15800	6.36	±0.22
15900	6.39	±0.22
16000	6.40	±0.22
16100	6.43	±0.22
16200	6.47	±0.22
16300	6.50	±0.22
16400	6.52	±0.22
16500	6.55	±0.22
16600	6.58	±0.22
16700	6.62	±0.22
16800	6.63	±0.22
16900	6.67	±0.22
17000	6.69	±0.22
17100	6.72	±0.22
17200	6.74	±0.22
17300	6.74	±0.22
17400	6.76	±0.22
17500	6.79	±0.22
17600	6.82	±0.22
17700	6.80	±0.22
17800	6.81	±0.22
17900	6.82	±0.22
17200	6.74	±0.22
17300	6.74	±0.22
17400	6.76	±0.22
17500	6.79	±0.22
17600	6.82	±0.22
17700	6.80	±0.22
17800	6.81	±0.22
17900	6.82	±0.22
18000	6.85	±0.22
18500	6.95	±0.42
19000	7.08	±0.42
19500	7.15	±0.42
20000	7.19	±0.42
20500	7.24	±0.42
21000	7.32	±0.42
21500	7.42	±0.42

HL 3901: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
22000	7.57	±0.42
22500	7.70	±0.42
23000	7.81	±0.42
23500	7.85	±0.42
24000	7.86	±0.42
24500	7.94	±0.42
25000	8.02	±0.42
25500	8.12	±0.42
26000	8.23	±0.42
26500	8.33	±0.42
27000	8.39	±0.57
27500	8.42	±0.57
28000	8.43	±0.57
28500	8.48	±0.57
29000	8.57	±0.57
29500	8.65	±0.57
30000	8.70	±0.57
30500	8.77	±0.57

Set / Applied, MHz	Measured, dB	Uncertainty, dB
31000	8.84	±0.57
31500	8.93	±0.57
32000	9.07	±0.57
33500	9.25	±0.57
34000	9.32	±0.57
34500	9.39	±0.57
35000	9.49	±0.57
35500	9.59	±0.57
36000	9.68	±0.57
36500	9.76	±0.57
37000	9.85	±0.57
37500	9.98	±0.57
38000	10.07	±0.57
38500	10.12	±0.57
39000	10.19	±0.57
39500	10.29	±0.57
40000	10.36	±0.57

Test Cable, DC-18 GHz, 3.05 m, N/M - N/M
Mini-Circuits, model: APC-10FT-NMNM+, s/n 0747A

HL 4276: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
0.1	0.02	+0.07 / -0.07
50	0.26	+0.07 / -0.07
100	0.38	+0.07 / -0.07
200	0.55	+0.07 / -0.07
300	0.68	+0.08 / -0.09
400	0.79	+0.08 / -0.09
500	0.89	+0.08 / -0.09
600	0.98	+0.08 / -0.09
700	1.07	+0.08 / -0.09
800	1.15	+0.08 / -0.09
900	1.23	+0.08 / -0.09
1000	1.30	+0.08 / -0.09
1100	1.37	+0.12 / -0.13
1200	1.43	+0.12 / -0.13
1300	1.49	+0.12 / -0.13
1400	1.56	+0.12 / -0.13
1500	1.62	+0.12 / -0.13
1600	1.68	+0.12 / -0.13
1700	1.73	+0.12 / -0.13
1800	1.79	+0.12 / -0.13
1900	1.84	+0.12 / -0.13
2000	1.90	+0.12 / -0.13
2100	1.96	+0.12 / -0.13
2200	2.01	+0.12 / -0.13
2300	2.06	+0.12 / -0.13
2400	2.12	+0.12 / -0.13
2500	2.17	+0.17 / -0.18
2600	2.24	+0.17 / -0.18
2700	2.30	+0.17 / -0.18
2800	2.37	+0.17 / -0.18
2900	2.44	+0.17 / -0.18
3000	2.53	+0.17 / -0.18
3100	2.59	+0.19 / -0.2
3200	2.62	+0.19 / -0.2
3300	2.64	+0.19 / -0.2
3400	2.66	+0.19 / -0.2
3500	2.68	+0.19 / -0.2
3600	2.71	+0.19 / -0.2
3700	2.74	+0.19 / -0.2
3800	2.78	+0.19 / -0.2
3900	2.81	+0.19 / -0.2
4000	2.85	+0.19 / -0.2

Set / Applied, MHz	Measured, dB	Uncertainty, dB
4100	2.89	+0.3 / -0.33
4200	2.94	+0.3 / -0.33
4300	2.97	+0.3 / -0.33
4400	3.01	+0.3 / -0.33
4500	3.05	+0.3 / -0.33
4600	3.09	+0.3 / -0.33
4700	3.12	+0.3 / -0.33
4800	3.16	+0.3 / -0.33
4900	3.20	+0.3 / -0.33
5000	3.24	+0.3 / -0.33
5100	3.28	+0.3 / -0.33
5200	3.32	+0.3 / -0.33
5300	3.35	+0.3 / -0.33
5400	3.39	+0.3 / -0.33
5500	3.42	+0.3 / -0.33
5600	3.46	+0.3 / -0.33
5700	3.50	+0.3 / -0.33
5800	3.54	+0.3 / -0.33
5900	3.59	+0.3 / -0.33
6000	3.62	+0.3 / -0.33
6100	3.66	+0.3 / -0.33
6200	3.70	+0.3 / -0.33
6300	3.73	+0.3 / -0.33
6400	3.77	+0.3 / -0.33
6500	3.80	+0.3 / -0.33
6600	3.85	+0.3 / -0.33
6700	3.88	+0.3 / -0.33
6800	3.92	+0.3 / -0.33
6900	3.95	+0.3 / -0.33
7000	4.00	+0.3 / -0.33
7100	4.04	+0.3 / -0.33
7200	4.07	+0.3 / -0.33
7300	4.12	+0.3 / -0.33
7400	4.15	+0.3 / -0.33
7500	4.19	+0.3 / -0.33
7600	4.23	+0.3 / -0.33
7700	4.26	+0.3 / -0.33
7800	4.29	+0.3 / -0.33
7900	4.33	+0.3 / -0.33
8000	4.36	+0.3 / -0.33
8100	4.40	+0.34 / -0.36
8200	4.42	+0.34 / -0.36

HL 4276: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
8300	4.45	+0.34 / -0.36
8400	4.48	+0.34 / -0.36
8500	4.52	+0.34 / -0.36
8600	4.54	+0.34 / -0.36
8700	4.56	+0.34 / -0.36
8800	4.59	+0.34 / -0.36
8900	4.62	+0.34 / -0.36
9000	4.65	+0.34 / -0.36
9100	4.68	+0.34 / -0.36
9200	4.69	+0.34 / -0.36
9300	4.71	+0.34 / -0.36
9400	4.73	+0.34 / -0.36
9500	4.75	+0.34 / -0.36
9600	4.79	+0.34 / -0.36
9700	4.81	+0.34 / -0.36
9800	4.85	+0.34 / -0.36
9900	4.88	+0.34 / -0.36
10000	4.91	+0.34 / -0.36
10100	4.93	+0.4 / -0.44
10200	4.97	+0.4 / -0.44
10300	5.00	+0.4 / -0.44
10400	5.04	+0.4 / -0.44
10500	5.07	+0.4 / -0.44
10600	5.12	+0.4 / -0.44
10700	5.14	+0.4 / -0.44
10800	5.15	+0.4 / -0.44
10900	5.18	+0.4 / -0.44
11000	5.19	+0.4 / -0.44
11100	5.21	+0.4 / -0.44
11200	5.24	+0.4 / -0.44
11300	5.28	+0.4 / -0.44
11400	5.32	+0.4 / -0.44
11500	5.35	+0.4 / -0.44
11600	5.39	+0.4 / -0.44
11700	5.42	+0.4 / -0.44
11800	5.45	+0.4 / -0.44
11900	5.47	+0.4 / -0.44
12000	5.50	+0.4 / -0.44
12100	5.54	+0.4 / -0.44
12200	5.57	+0.4 / -0.44
12300	5.60	+0.4 / -0.44
12400	5.63	+0.4 / -0.44
12500	5.64	+0.47 / -0.52
12600	5.67	+0.47 / -0.52
12700	5.68	+0.47 / -0.52
12800	5.70	+0.47 / -0.52
12900	5.72	+0.47 / -0.52
13000	5.75	+0.47 / -0.52
13100	5.47	+0.4 / -0.44
13200	5.50	+0.4 / -0.44
13300	5.54	+0.4 / -0.44

Set / Applied, MHz	Measured, dB	Uncertainty, dB
13100	5.77	+0.47 / -0.52
13200	5.82	+0.47 / -0.52
13300	5.84	+0.47 / -0.52
13400	5.88	+0.47 / -0.52
13500	5.90	+0.47 / -0.52
13600	5.93	+0.47 / -0.52
13700	5.95	+0.47 / -0.52
13800	6.00	+0.47 / -0.52
13900	6.02	+0.47 / -0.52
14000	6.05	+0.47 / -0.52
14100	6.08	+0.47 / -0.52
14200	6.11	+0.47 / -0.52
14300	6.12	+0.47 / -0.52
14400	6.15	+0.47 / -0.52
14500	6.18	+0.47 / -0.52
14600	6.22	+0.47 / -0.52
14700	6.25	+0.47 / -0.52
14800	6.29	+0.47 / -0.52
14900	6.33	+0.47 / -0.52
15000	6.35	+0.47 / -0.52
15100	6.38	+0.47 / -0.52
15200	6.40	+0.47 / -0.52
15300	6.44	+0.47 / -0.52
15400	6.48	+0.47 / -0.52
15500	6.52	+0.47 / -0.52
15600	6.54	+0.47 / -0.52
15700	6.59	+0.47 / -0.52
15800	6.60	+0.47 / -0.52
15900	6.64	+0.47 / -0.52
16000	6.62	+0.47 / -0.52
16100	6.67	+0.47 / -0.52
16200	6.71	+0.47 / -0.52
16300	6.75	+0.47 / -0.52
16400	6.79	+0.47 / -0.52
16500	6.81	+0.47 / -0.52
16600	6.85	+0.47 / -0.52
16700	6.85	+0.47 / -0.52
16800	6.89	+0.47 / -0.52
16900	6.89	+0.47 / -0.52
17000	6.93	+0.47 / -0.52
17100	6.93	+0.47 / -0.52
17200	6.99	+0.47 / -0.52
17300	7.00	+0.47 / -0.52
17400	7.01	+0.47 / -0.52
17500	7.01	+0.47 / -0.52
17600	7.02	+0.47 / -0.52
17700	7.05	+0.47 / -0.52
17800	7.06	+0.47 / -0.52
17900	7.08	+0.47 / -0.52
18000	7.09	+0.47 / -0.52

Test Cable , DC-18 GHz, 3.05 m, N/M - N/M
Mini-Circuits, model: APC-10FT-NMNM+, s/n 0748A

HL 4277: Insertion loss

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

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

Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M
MegaPhase, model: NC29-N1N1-244, s/n: 12025101 003

HL 4353: Insertion loss

Set / Applied, MHz	Measured, dB	Uncertainty, dB
50	0.23	+0.06 / -0.06
100	0.31	+0.06 / -0.06
300	0.52	+0.07 / -0.07
500	0.66	+0.07 / -0.07
1000	0.93	+0.07 / -0.07
1500	1.14	+0.07 / -0.07
2000	1.32	+0.07 / -0.07
2500	1.48	+0.09 / -0.1
3000	1.62	+0.09 / -0.1
3500	1.76	+0.12 / -0.12
4000	1.89	+0.16 / -0.17
4500	2.02	+0.21 / -0.22
5000	2.12	+0.21 / -0.22
5500	2.25	+0.21 / -0.22
6000	2.38	+0.21 / -0.22
6500	2.47	+0.21 / -0.22
7000	2.57	+0.21 / -0.22
7500	2.67	+0.21 / -0.22
8000	2.76	+0.24 / -0.26
8500	2.83	+0.27 / -0.29

Set / Applied, MHz	Measured, dB	Uncertainty, dB
9000	2.94	+0.27 / -0.29
9500	3.04	+0.27 / -0.29
10000	3.13	+0.27 / -0.29
10500	3.21	+0.27 / -0.29
11000	3.29	+0.27 / -0.29
11500	3.37	+0.27 / -0.29
12000	3.42	+0.27 / -0.29
12500	3.50	+0.36 / -0.4
13000	3.60	+0.36 / -0.4
13500	3.72	+0.36 / -0.4
14000	3.75	+0.36 / -0.4
14500	3.81	+0.36 / -0.4
15000	3.91	+0.36 / -0.4
15500	3.92	+0.36 / -0.4
16000	4.01	+0.36 / -0.4
16500	4.13	+0.36 / -0.4
17000	4.16	+0.36 / -0.4
17500	4.26	+0.36 / -0.4
18000	4.33	+0.36 / -0.4

13 APPENDIX E Specification references

47CFR part 15: 2017	Radio Frequency Devices.
ANSI C63.2: 2016	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

14 APPENDIX F Abbreviations and acronyms

A	ampere	kV	kilovolt
AC	alternating current	L	length
A/m	ampere per meter	LISN	line impedance stabilization network
AM	amplitude modulation	m	meter
AVRG	average (detector)	MHz	megahertz
BB	broad band	min	minute
cm	centimeter	mm	millimeter
CDN	coupling/ decoupling network	ms	millisecond
CR	continuous phenomena applied to receivers	µs	microsecond
CT	continuous phenomena applied to transmitters	NA	not applicable
dB(µV)	decibel referred to one microvolt	NB	narrow band
dB(µV/m)	decibel referred to one microvolt per meter	NP	normal performance
dB(µA)	decibel referred to one microampere	NT	not tested
EMC	electromagnetic compatibility	Ω	Ohm
EMI	electromagnetic interference	QP	quasi-peak
EUT	equipment under test	PS	power supply
GHz	gigahertz	RE	radiated emission
GND	ground	RF	radio frequency
HCP	horizontal coupling plane	rms	root mean square
HL	Hermon laboratories	s	second
Hz	hertz	V	volt
k	kilo	VCP	vertical coupling plane
kHz	kilohertz	W	width

END OF DOCUMENT