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ELECTRICAL TESTING
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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (DTS),
RSS-247 issue 2

FOR:

On Track Innovations Ltd.

Ultra-compact, multi-purpose NFC reader

Models: SATURN 8700 USB
SATURN 8700 Plus USB

FCC ID:JNX-OTI-SAT8700P

IC:10533A-OTISAT8700P

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

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Telephone:	+972 4686 8003
Fax:	+972 4693 8887
E-mail:	h_itay@otiglobal.com
Contact name:	Mr. Hemy Itay

2 Equipment under test attributes

Product name:	Ultra-compact, multi-purpose NFC reader
Product type:	BLE transceiver
Model(s):	SATURN 8700 Plus USB
Hardware version:	Main Board: V1.1.2 Antenna board: V1.1.0 Display: V4.0
Software release:	S8_V05
Receipt date	09-Jul-17

3 Manufacturer information

Manufacturer name:	On Track Innovations Ltd.
Address:	Z.H.R. Industrial zone, P.O. Box 32, Rosh Pina, 12000, Israel
Telephone:	+972 4686 8003
Fax:	+972 4693 8887
E-Mail:	h_itay@otiglobal.com
Contact name:	Mr. Hemy Itay

4 Test details

Project ID:	29404
Location:	Hermon Laboratories Ltd. P.O. Box 23, Binyamina 3055001, Israel
Test started:	06-Jul-17
Test completed:	10-Aug-17
Test specification(s):	FCC 47CFR part 15 subpart C § 15.247 (DTS); RSS-247 issue 2

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.247(a)2/ RSS-247 section 5.2(a), 6 dB bandwidth	Pass
FCC section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power	Pass
FCC section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	Pass
FCC section 15.247(d) / RSS-247 section 5.5, Band edge emissions	Pass
FCC section 15.247(e) / RSS-247 section 5.2(b), Peak power density	Pass
FCC section 15.247(i), / RSS-102 section 2.5.2, RF exposure	Pass, the exhibit to the application of certification is provided
FCC section 15.207(a) / RSS-Gen section 8.8, Conducted emission	Pass
FCC section 15.203 / RSS-Gen section 8.3, Antenna requirement	Pass

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

This test report supersedes the previously issued test report identified by Doc ID:OTIRAD_FCC.29404_DTS.

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer Mr. A. Morozov, test engineer	August 10, 2017	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	September 13 , 2017	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	November 7, 2017	

6 EUT description

6.1 General information

The EUT is an ultra-compact, multi-purpose NFC reader with a proximity transceiver operating at 13.56 MHz and with a Bluetooth module operating in 2400 - 2483.5 MHz range. The EUT is powered from 5 VDC obtained from auxiliary laptop via USB and supports USB communication.

According to manufacturer's declaration provided in Appendix G of the test report, both EUT models, SATURN 8700 USB and SATURN 8700 Plus USB, have the same PCB and RF part; the only difference is that SATURN 8700 Plus is equipped with LCD display. That is why only SATURN 8700 Plus was tested.

This test report provided for RF operation in 2400 - 2483.5 MHz range.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power + signal	USB	EUT	Laptop	1	Shielded	1.5 m*	Indoor

* Always shorter than 3 m

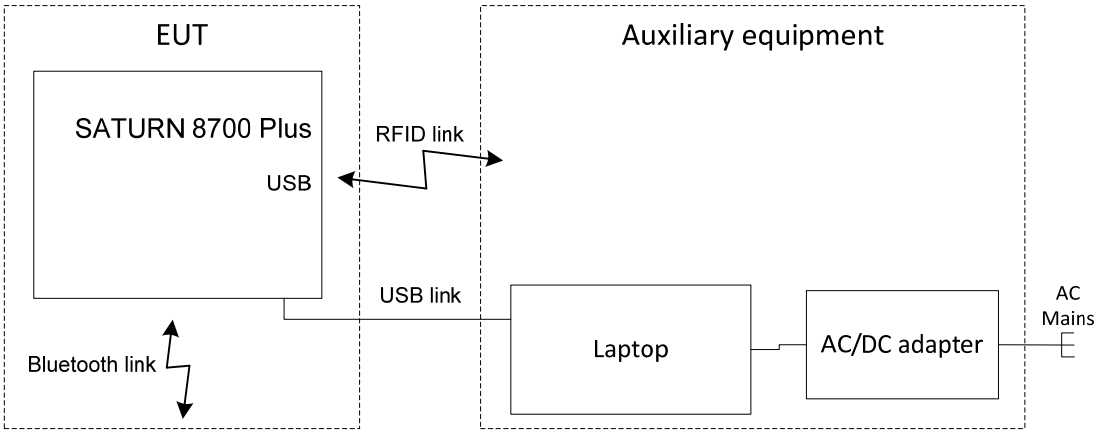
6.3 Auxiliary equipment

Description	Manufacturer	Model number	Serial number
Laptop	Lenovo	T420	R8-Y7NMP 11/08
AC/DC adapter for laptop	Lenovo	92P1103	11S92P1103Z1ZBEF6CB1LK
NFC tag	NXP	NA	NA
NFC tag	AUSTRIACARD	NA	NA

6.4 Changes made in EUT

No changes were implemented in the EUT during testing.

6.5 EUT test configuration



6.6 Transmitter characteristics

Type of equipment	
	Stand-alone (Equipment with or without its own control provisions)
X	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)

Intended use		**Condition of use**
	fixed	Always at a distance more than 2 m from all people
X	mobile	Always at a distance more than 20 cm from all people
	portable	May operate at a distance closer than 20 cm to human body

Assigned frequency range	2400-2483.5 MHz
Operating frequency range	2402 – 2480 MHz
Maximum rated output power	At transmitter 50 Ω RF output connector: NA
	Peak output power: -3.49 dBm

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

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

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Internal	On Track Innovations	Printed	0 dBi

Transmitter aggregate data rate/s	1 Mbps
Type of modulation	BLE(GFSK)
Modulating test signal (baseband)	PRBS

Transmitter power source					
	Battery	**Nominal rated voltage**	V	Battery type	
X	DC	**Nominal rated voltage**	5 VDC		
	AC mains	**Nominal rated voltage**		Frequency	

Test specification:	**Section 15.247(a)2/ RSS-247 section 5.2(a), 6 dB bandwidth**		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1006 hPa	**Power:** 5 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-247 requirements

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	6.0	500.0
2400.0 – 2483.5		
5725.0 – 5850.0		

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

7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and associated plot.

Figure 7.1.1 The 6 dB bandwidth test setup

Test specification:	**Section 15.247(a)2/ RSS-247 section 5.2(a), 6 dB bandwidth**		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1006 hPa	**Power:** 5 VDC
Remarks:			

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND:	2400 – 2483.5 MHz
DETECTOR USED:	Peak
SWEEP MODE:	Single
SWEEP TIME:	Auto
RESOLUTION BANDWIDTH:	10 kHz
VIDEO BANDWIDTH:	30 kHz
MODULATION ENVELOPE REFERENCE POINTS:	6.0 dBc
MODULATION:	GFSK
BIT RATE:	1 Mbps

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
Low frequency				
2402	733.2	500	233.2	Pass
Mid frequency				
2442	733.2	500	233.2	Pass
High frequency				
2480	736.9	500	236.9	Pass

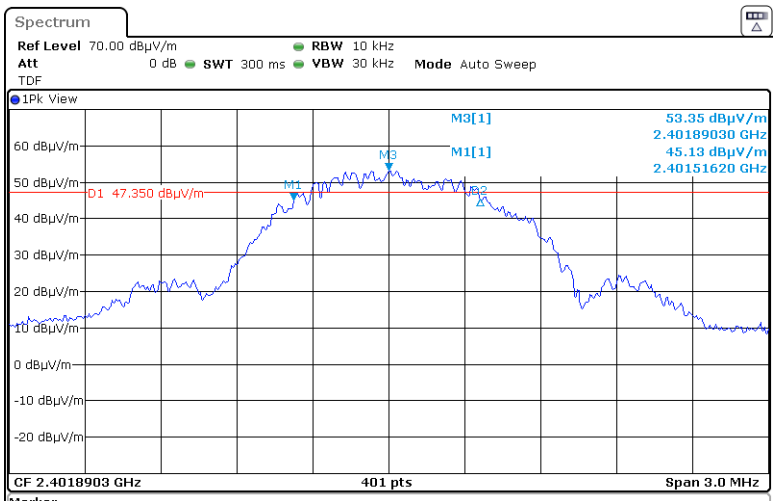
Reference numbers of test equipment used

HL 3901	HL 4135	HL 4355						

Full description is given in Appendix A.

Test specification:	**Section 15.247(a)2/ RSS-247 section 5.2(a), 6 dB bandwidth**		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1006 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.1.1 The 6 dB bandwidth test result at low frequency

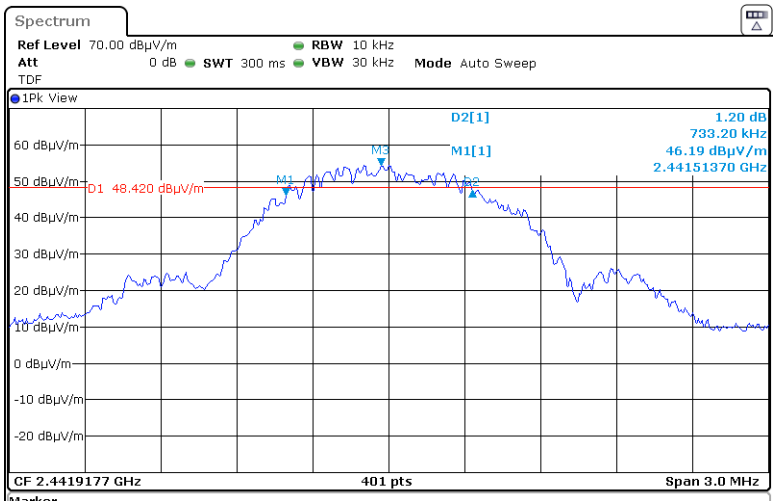


Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4015162 GHz	45.13 dBµV/m		
D2	M1	1	733.2 kHz	0.21 dB		
M3		1	2.4018903 GHz	53.35 dBµV/m		

Date: 9.JUL.2017 15:33:21

Plot 7.1.2 The 6 dB bandwidth test result at mid frequency



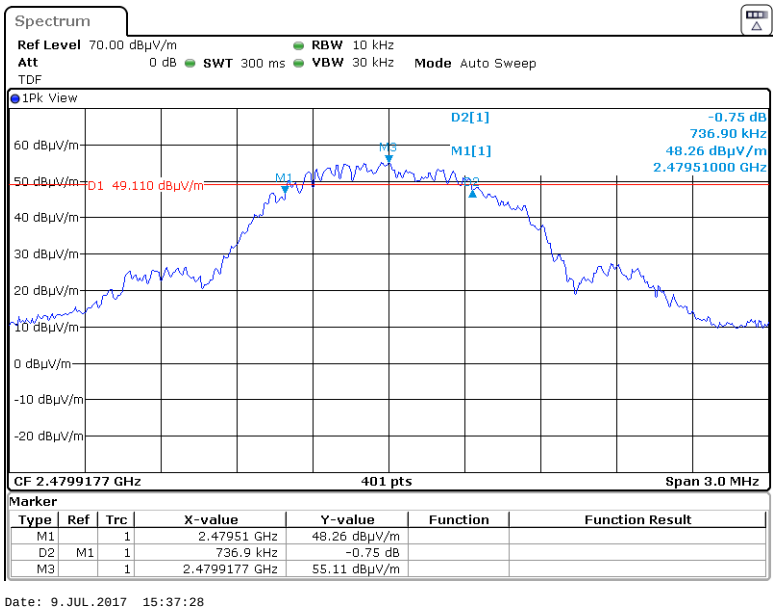
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.4415137 GHz	46.19 dBµV/m		
D2	M1	1	733.2 kHz	1.20 dB		
M3		1	2.4418878 GHz	54.42 dBµV/m		

Date: 9.JUL.2017 15:42:04

Test specification:	**Section 15.247(a)2/ RSS-247 section 5.2(a), 6 dB bandwidth**		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	09-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 48 %	**Air Pressure:** 1006 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.1.3 The 6 dB bandwidth test result at high frequency



Test specification:	**Section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power**		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 5 VDC
Remarks:			

7.2 Peak output power

7.2.1 General

This test was performed to measure the maximum peak output power radiated by transmitter. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Peak output power*		Equivalent field strength limit @ 3m, dB(μV/m)**
		W	dBm	
902.0 – 928.0	6.0	1.0	30.0	131.2
2400.0 – 2483.5				
5725.0 – 5850.0				

*- The limit is provided in terms of conducted RF power at the antenna connector. If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;
without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;
by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

**- Equivalent field strength limit was calculated from the peak output power as follows: E=sqrt(30×P×G)/r, where P is peak output power in Watts, r is antenna to EUT distance in meters and G is transmitter antenna gain in dBi.

7.2.2 Test procedure

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

7.2.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.2.2.3 The resolution bandwidth of spectrum analyzer was set wider than 6 dB bandwidth of the EUT and the field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.2.2.4 The maximum field strength of the EUT carrier frequency was measured as provided in Table 7.2.2 and associated plots.

7.2.2.5 The maximum peak output power was calculated from the field strength of carrier as follows:

$$P = (E \times d)^2 / (30 \times G),$$

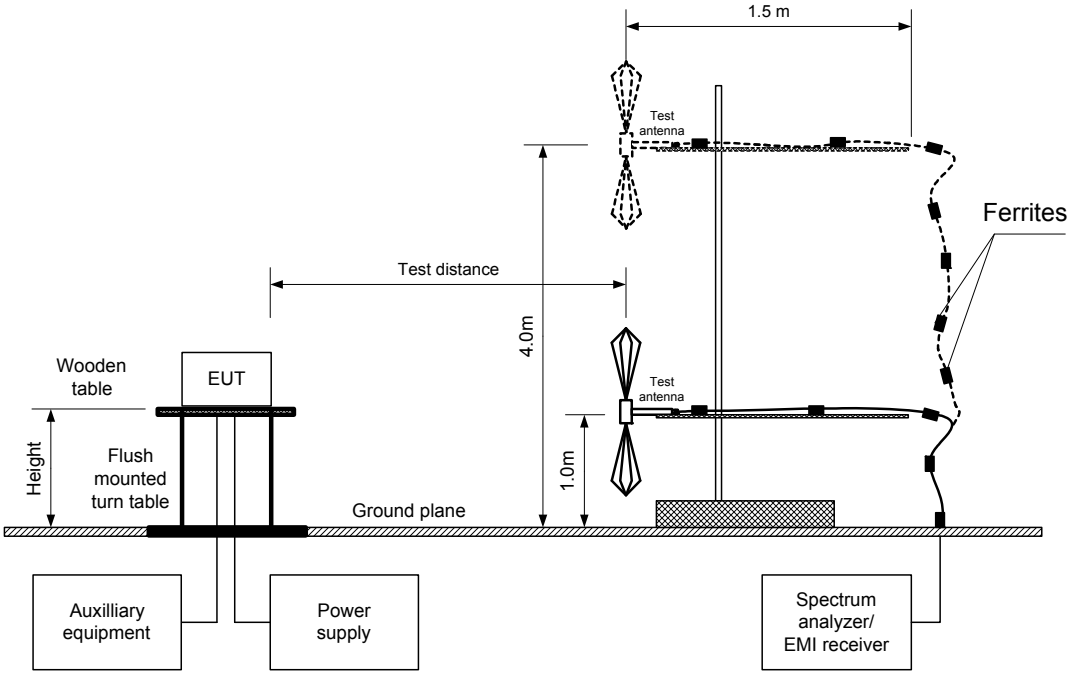
where P is the peak output power in W, E is the field strength in V/m, d is the test distance and G is the transmitter numeric antenna gain over an isotropic radiator.
The above equation was converted in logarithmic units for 3 m test distance:

Peak output power in dBm = Field strength in dB(μV/m) - Transmitter antenna gain in dBi – 95.2 dB

7.2.2.6 The worst test results (the lowest margins) were recorded in Table 7.2.2.

Test specification:	**Section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power**		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 5 VDC
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power**		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 5 VDC
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY:	2400-2483.5 MHz
TEST DISTANCE:	3 m
TEST SITE:	Semi anechoic chamber
EUT HEIGHT:	0.8 m
DETECTOR USED:	Peak
TEST ANTENNA TYPE:	Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
EUT 6 dB BANDWIDTH:	0.735 MHz
RESOLUTION BANDWIDTH:	1 MHz
VIDEO BANDWIDTH:	3 MHz

Frequency, MHz	Field strength, dB(µV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB***	Verdict
2402	91.74	Horizontal	1.20	188	0	-3.49	30.0	-33.49	Pass
2440	90.75	Horizontal	1.19	193	0	-4.48	30.0	-34.48	Pass
2480.138	90.56	Horizontal	1.18	190	0	-4.67	30.0	-34.67	Pass

*****- EUT front panel refer to 0 degrees position of turntable.
******- Peak output power was calculated from the field strength of carrier as follows: $P = (E \times d)^2 / (30 \times G)$,
where P is the peak output power in W, E is the field strength in V/m, d is the test distance in meters and G is the transmitter numeric antenna gain over an isotropic radiator. The above equation was converted in logarithmic units for 3 m test distance: *Peak output power in dBm = Field strength in dB(µV/m) - Transmitter antenna gain in dBi – 95.2 dB*
***- Margin = Peak output power – specification limit.

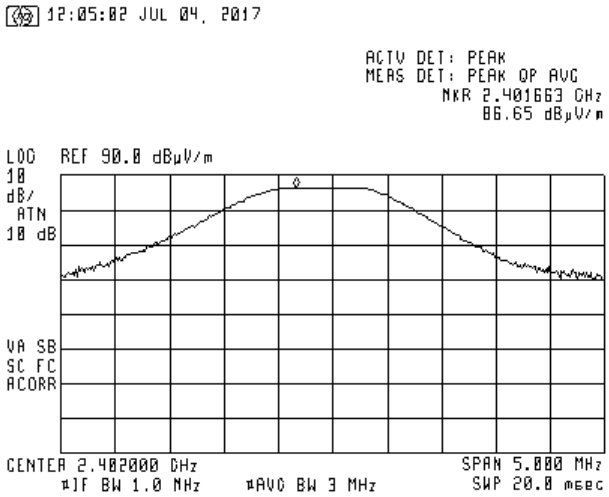
Reference numbers of test equipment used

HL 0521	HL 1984	HL 4278	HL 4353				

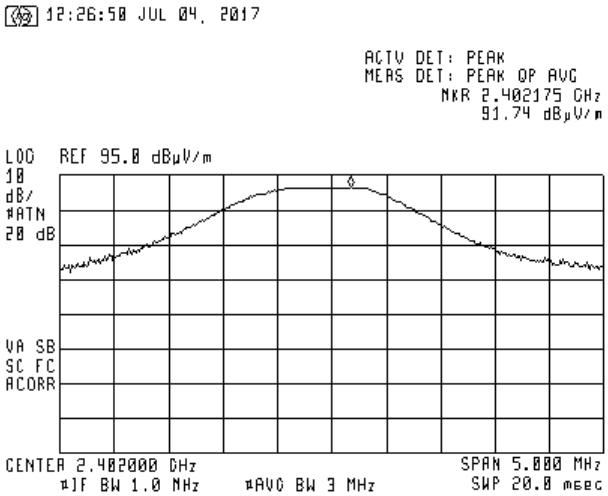
Full description is given in Appendix A.

Test specification:	**Section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power**		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.2.1 Field strength of carrier at low frequency, vertical antenna polarization

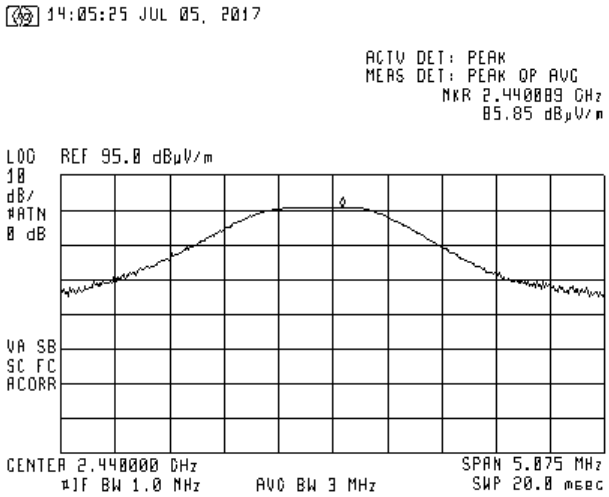


Plot 7.2.2 Field strength of carrier at low frequency, horizontal antenna polarization

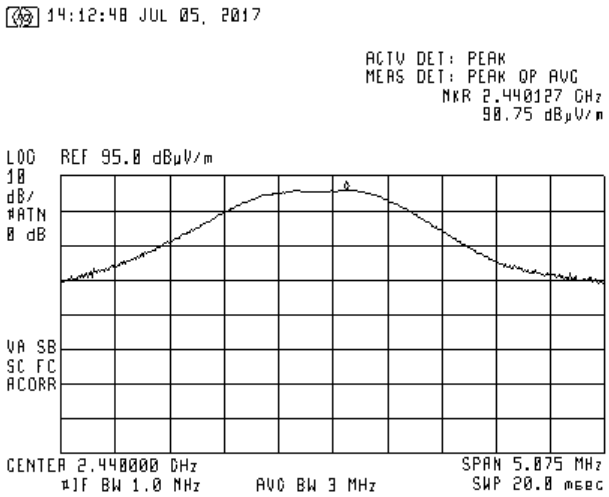


Test specification:	Section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	Relative Humidity: 55 %	Air Pressure: 1010 hPa	Power: 5 VDC
Remarks:			

Plot 7.2.3 Field strength of carrier at mid frequency, vertical antenna polarization

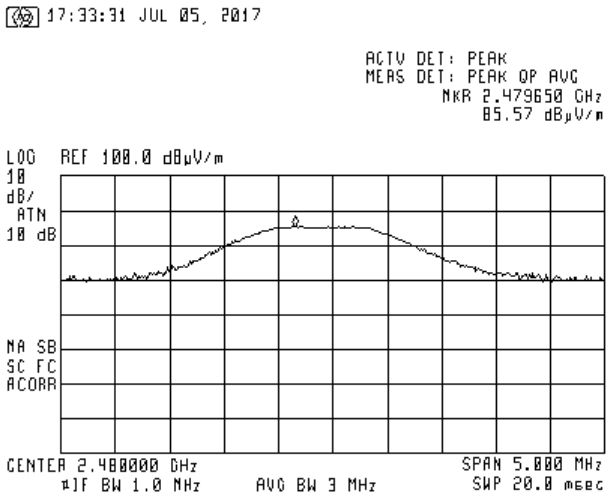


Plot 7.2.4 Field strength of carrier at mid frequency, horizontal antenna polarization

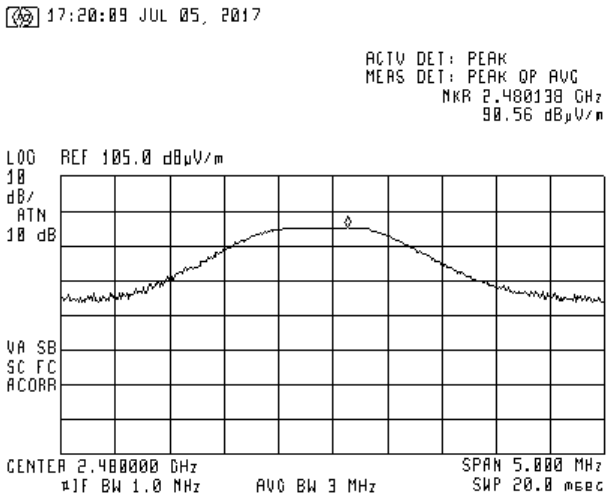


Test specification:	**Section 15.247(b)3/ RSS-247 section 5.4(d), Peak output power**		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.2.5 Field strength of carrier at high frequency, vertical antenna polarization



Plot 7.2.6 Field strength of carrier at high frequency, horizontal antenna polarization



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

7.3 Field strength of spurious emissions

7.3.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
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.

*** - The field strength limits applied from the lowest radio frequency generated in the device, without going below 9 kHz up to the tenth harmonic of the highest fundamental frequency.

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

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

7.3.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

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

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

7.3.3.1 The EUT was set up as shown in Figure 7.3.2, Figure 7.3.3, energized and the performance check was conducted.

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

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

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Figure 7.3.1 Setup for spurious emission field strength measurements below 30 MHz

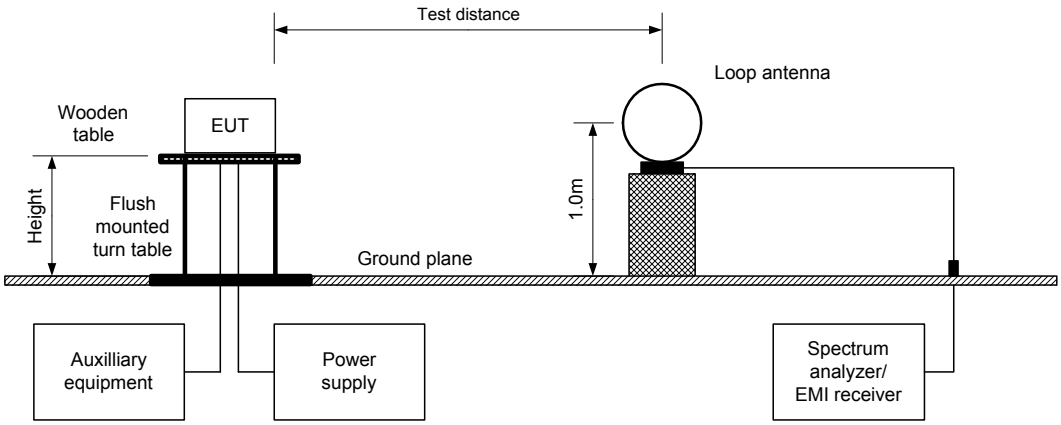
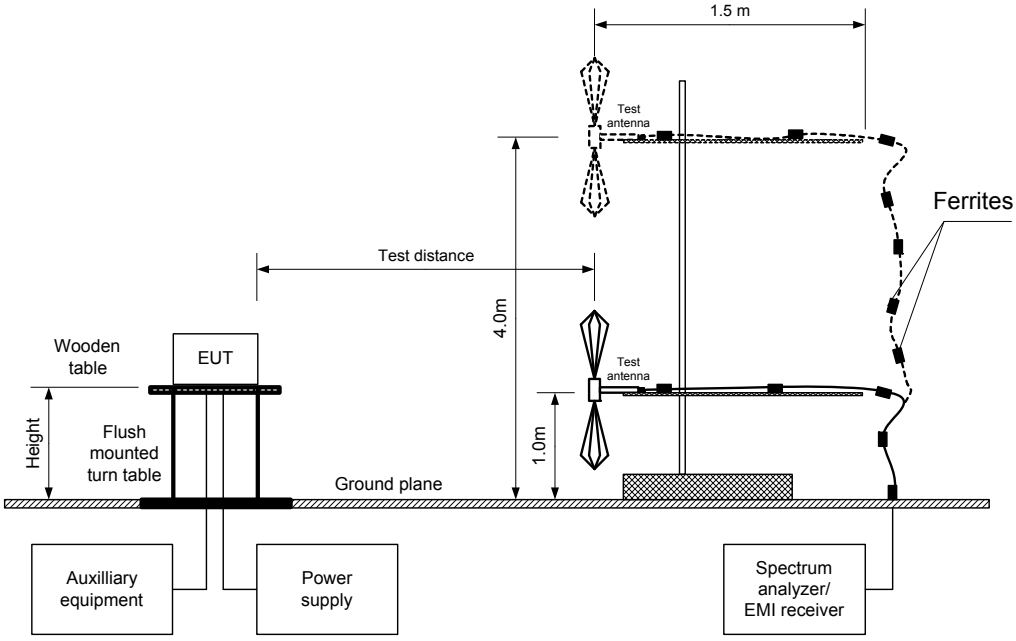
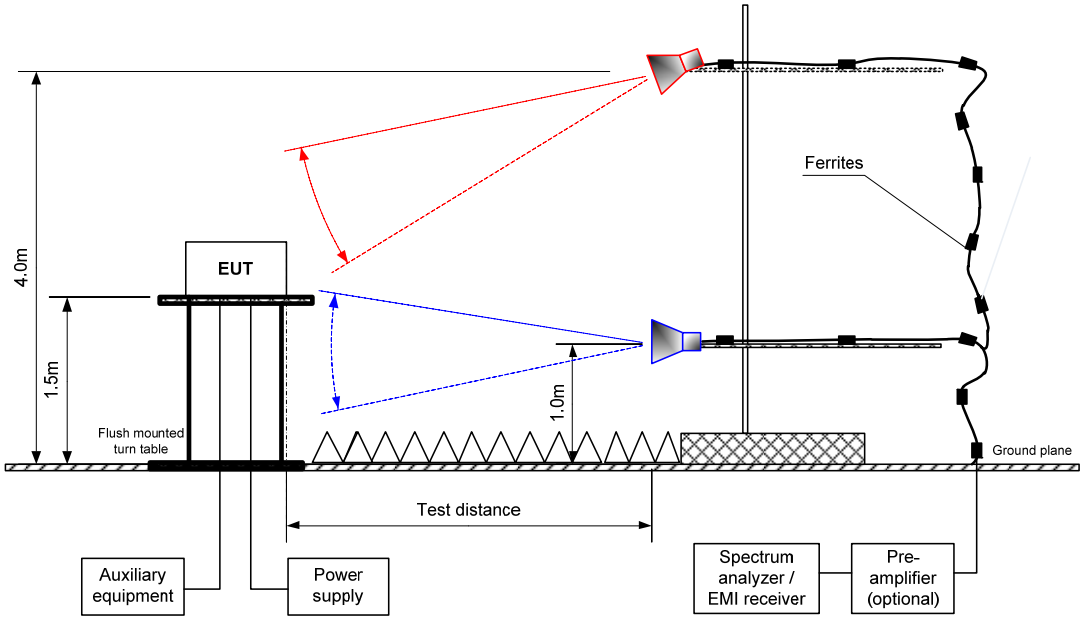


Figure 7.3.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Figure 7.3.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY:	2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 25000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
BIT RATE:	1 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
7206	55.54	Horizontal	1.6	15	90.63	35.09	20.0	15.09	Pass
9608	42.73	Horizontal	1.3	0		47.90		27.90	
14412	47.16	Horizontal	1.3	330		43.47		23.47	
16814	50.93	Horizontal	1.7	270		39.70		19.70	
21618	50.79	Horizontal	1.7	10		39.84		19.84	
24020	48.20	Horizontal	1.8	345		42.43		22.43	
Mid carrier frequency									
9768	47.23	Horizontal	1.2	0	90.37	43.14	20.0	23.14	Pass
17094	52.81	Horizontal	1.6	110		37.56		17.56	
21978	48.37	Horizontal	1.7	175		42.00		22.00	
24420	49.33	Horizontal	1.7	320		41.04		21.04	
High carrier frequency									
9920	48.85	Horizontal	1.3	345	89.60	40.75	20.0	20.75	Pass
17360	56.55	Horizontal	1.6	320		33.05		13.05	
24800	49.52	Horizontal	1.6	60		40.08		20.08	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Attenuation below carrier – specification limit.

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Table 7.3.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY: 2400-2483.5 MHz
INVESTIGATED FREQUENCY RANGE: 1000 - 25000 MHz
TEST DISTANCE: 3 m
MODULATION: GFSK
BIT RATE: 1 Mbps
DUTY CYCLE: 100 %
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
TEST ANTENNA TYPE: Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
4804	Horizontal	1.6	0	47.29	74	-26.71	47.29	43.29	54	-10.71	Pass
12010	Horizontal	1.3	0	45.43	74	-28.57	45.43	41.43	54	-12.57	
19216	Horizontal	1.6	10	51.24	74	-22.76	51.24	47.24	54	-6.76	
Mid carrier frequency											
4884	Horizontal	1.3	30	42.58	74	-31.42	42.58	38.58	54.0	-15.42	Pass
7326	Horizontal	1.5	120	57.09	74	-16.91	57.09	53.09	54.0	-0.91	
12210	Horizontal	1.7	330	47.71	74	-26.29	47.71	43.71	54.0	-10.29	
14652	Horizontal	1.7	320	53.53	74	-20.47	53.53	49.53	54.0	-4.47	
19536	Horizontal	1.6	180	48.99	74	-25.01	48.99	44.99	54.0	-9.01	
High carrier frequency											
4952	Horizontal	1.1	0	44.89	74	-29.11	44.89	40.89	54.0	-13.11	Pass
7440	Horizontal	1.2	150	56.37	74	-17.63	56.37	52.37	54.0	-1.63	
12400	Horizontal	1.6	120	51.94	74	-22.06	51.94	47.94	54.0	-6.06	
14880	Horizontal	1.5	0	53.10	74	-20.90	53.1	49.1	54.0	-4.9	
19840	Horizontal	1.7	0	49.39	74	-24.61	49.39	45.39	54.0	-8.61	
22320	Horizontal	1.7	340	48.75	74	-25.25	48.75	44.75	54.0	-9.25	

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Measured field strength - specification limit.
***- Margin = Calculated field strength - specification limit,
where Calculated field strength = Measured field strength + average factor.

Table 7.3.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
0.3944	0.6256	NA	NA	NA	-4.0

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

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

for pulse train longer than 100 ms:

$$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Table 7.3.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY:	2400 – 2483.5 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
TEST DISTANCE:	3 m
MODULATION:	GFSK
MODULATING SIGNAL:	PRBS
BIT RATE:	1 Mbps
DUTY CYCLE:	100 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	1.0 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*				
Low carrier frequency								
120.0	34.3	33.1	43.5	-10.4	Vertical	1.0	140	Pass
240.0	43.4	42.1	46.0	-3.9	Horizontal	1.0	330	
Mid carrier frequency								
240.0	40.0	38.9	46.0	-7.1	Horizontal	1.0	153	Pass
High carrier frequency								
120.0	31.9	30.2	43.5	-13.3	Vertical	1.0	100	Pass
240.0	33.3	32.1	46.0	-13.9	Horizontal	1.0	237	

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

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 4353	HL 4933	HL 4956	HL 5102	HL 5112

Full description is given in Appendix A.

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Table 7.3.6 Restricted bands according to FCC section 15.205

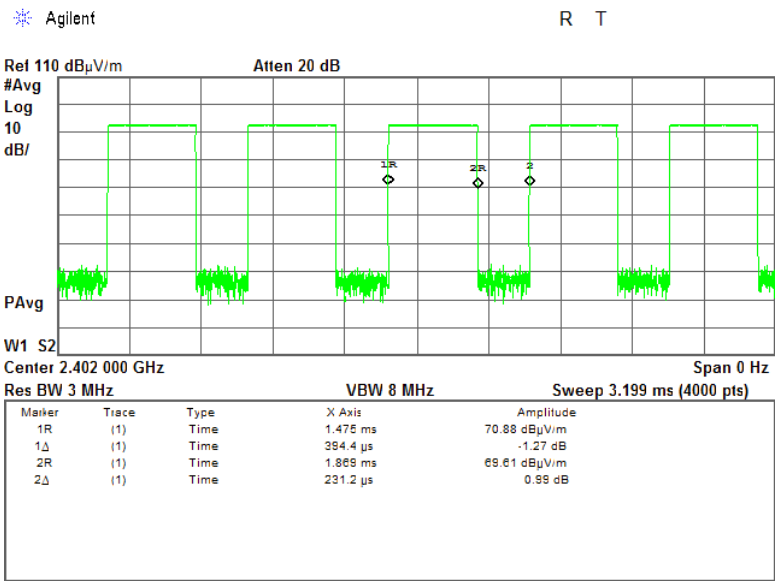
MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.37625 - 8.38675	73 - 74.6	399.9 - 410	2690 - 2900	10.6 - 12.7
0.495 - 0.505	8.41425 - 8.41475	74.8 - 75.2	608 - 614	3260 - 3267	13.25 - 13.4
2.1735 - 2.1905	12.29 - 12.293	108 - 121.94	960 - 1240	3332 - 3339	14.47 - 14.5
4.125 - 4.128	12.51975 - 12.52025	123 - 138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

Table 7.3.7 Restricted bands according to RSS-Gen

MHz	MHz	MHz	MHz	MHz	GHz
0.09 - 0.11	8.291 - 8.294	16.80425 - 16.80475	399.9 - 410	3260 - 3267	10.6 - 12.7
2.1735 - 2.1905	8.362 - 8.366	25.5 - 25.67	608 - 614	3332 – 3339	13.25 - 13.4
3.020 – 3.026	8.37625 - 8.38675	37.5 - 38.25	960 – 1427	3345.8 – 3358	14.47 – 14.5
4.125 – 4.128	8.41425 - 8.41475	73 - 74.6	1435 – 1626.5	3500 – 4400	15.35 – 16.2
4.17725 – 4.17775	12.29 – 12.293	74.8 - 75.2	1645.5 – 1646.5	4500 – 5150	17.7 – 21.4
4.20725 – 4.20775	12.51975 – 12.52025	108 – 138	1660 - 1710	5350 – 5460	22.01 – 23.12
5.677 – 5.683	12.57675 – 12.57725	156.52475 – 156.52525	1718.8 - 1722.2	7250 - 7750	23.6 - 24
6.215 - 6.218	13.36 – 13.41	156.7 - 156.9	2200 - 2300	8025 – 8500	31.2 - 31.8
6.26775 - 6.26825	16.42 - 16.423	240 - 285	2310 - 2390	9000 - 9200	36.43 - 36.5
6.31175 - 6.31225	16.69475 - 16.69525	322 - 335.4	2655 - 2900	9300 - 9500	Above 38.6

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

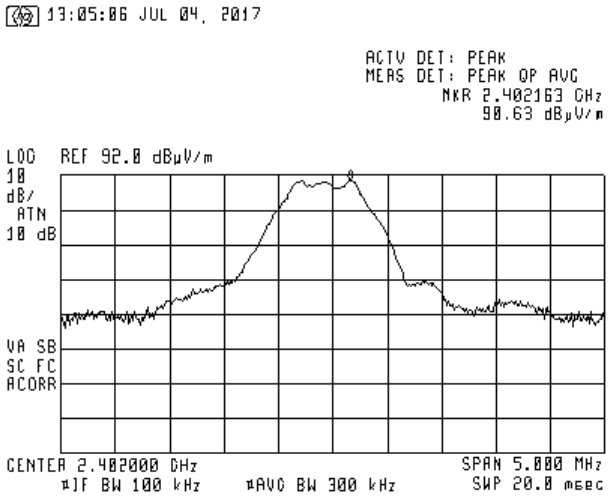
Plot 7.3.1 Duty cycle



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

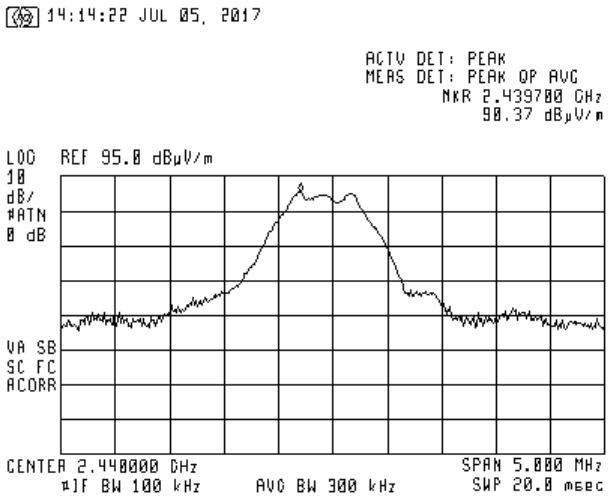
Plot 7.3.2 Radiated emission measurements at the low carrier frequency

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



Plot 7.3.3 Radiated emission measurements at the mid carrier frequency

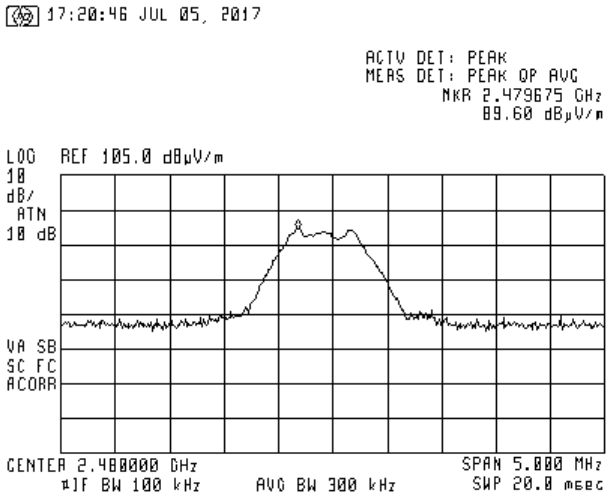
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.4 Radiated emission measurements at the high carrier frequency

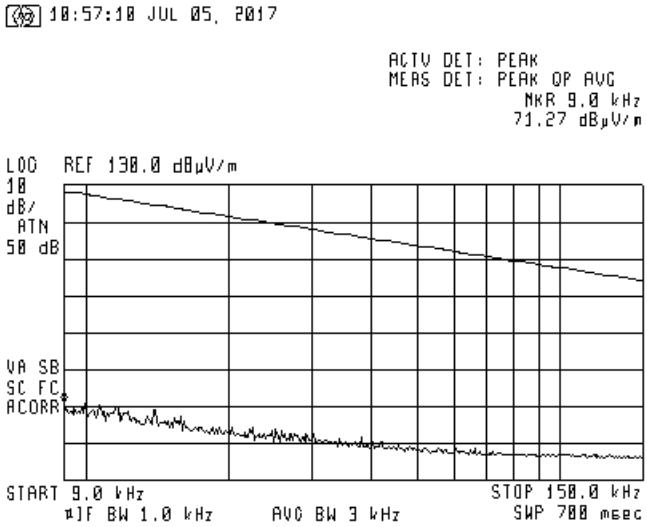
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Horizontal



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

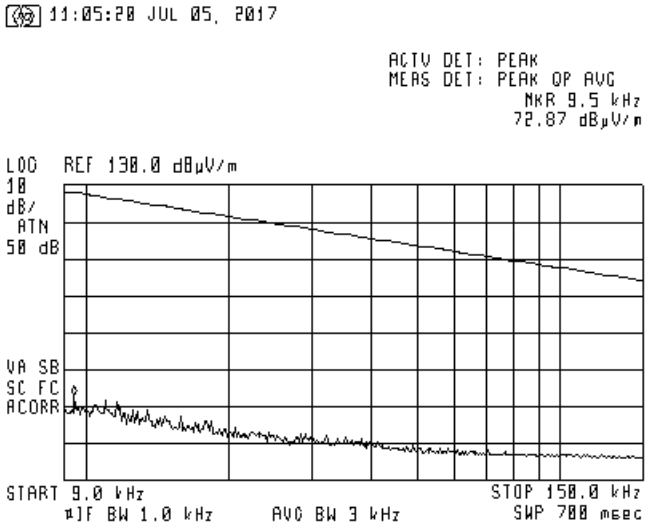
Plot 7.3.5 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

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



Plot 7.3.6 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

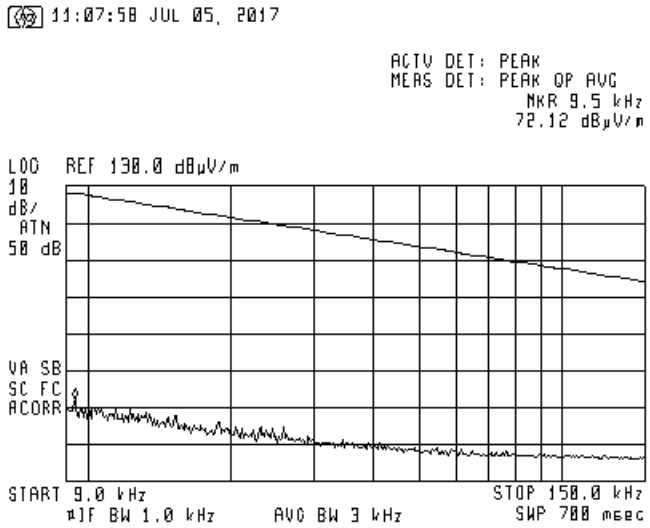
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

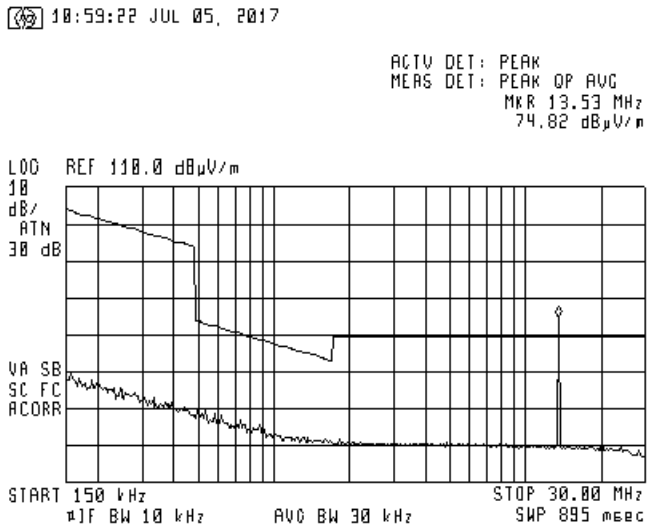
Plot 7.3.7 Radiated emission measurements from 9 to 150 kHz at the high carrier frequency

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



Plot 7.3.8 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

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

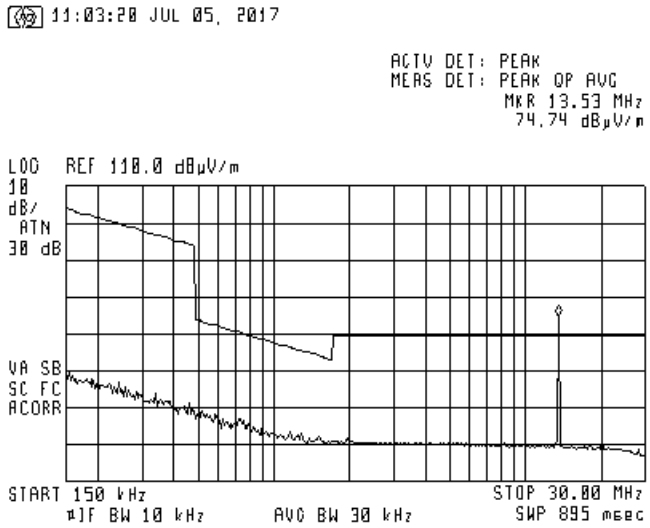


Note: 13.56 MHz – Tx frequency of RFID

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.9 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

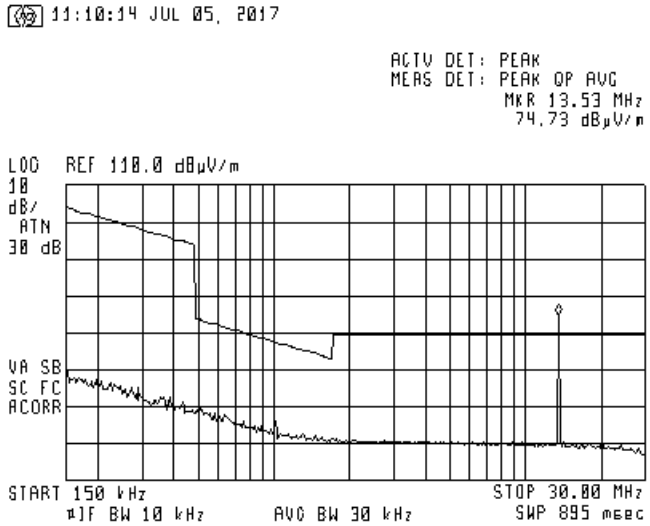
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Note: 13.56 MHz – Tx frequency of RFID

Plot 7.3.10 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

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

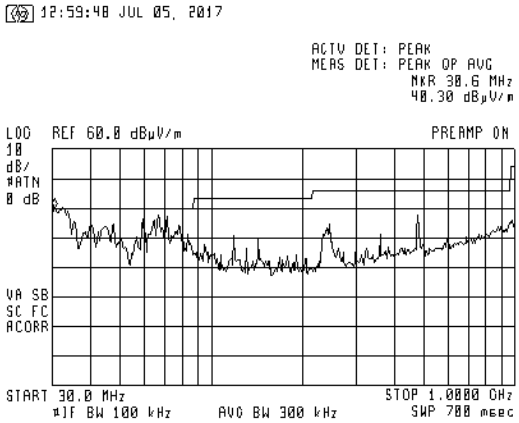


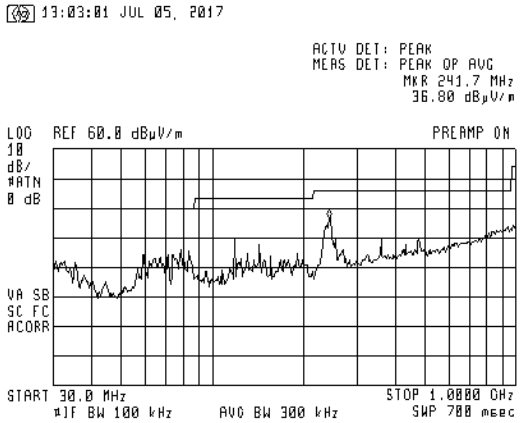
Note: 13.56 MHz – Tx frequency of RFID

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.11 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

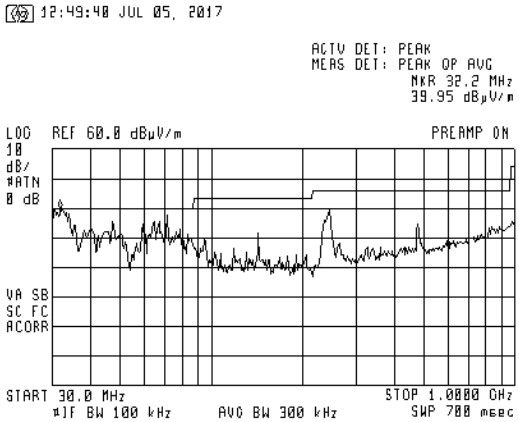
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

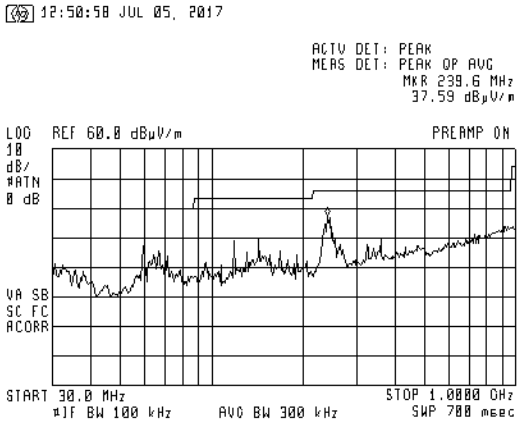




Plot 7.3.12 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

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

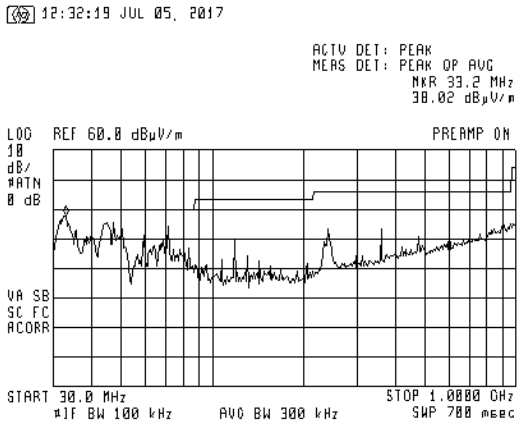


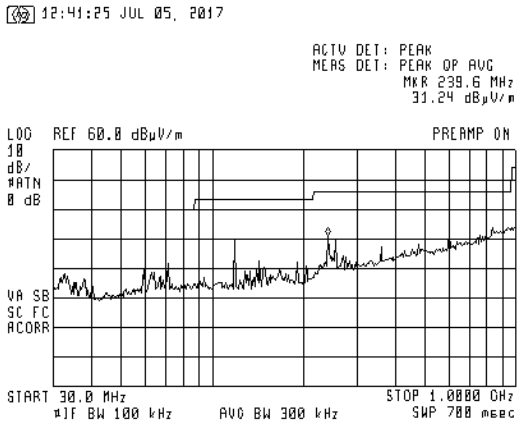


Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.13 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

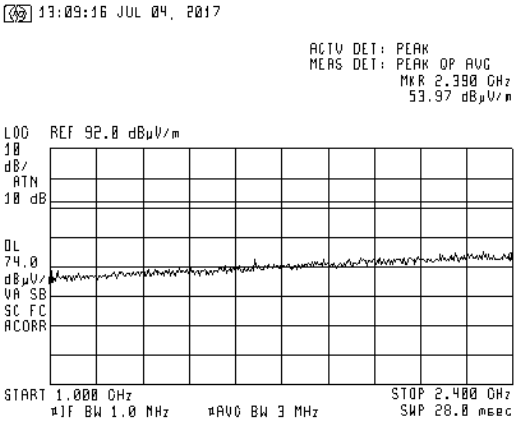
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

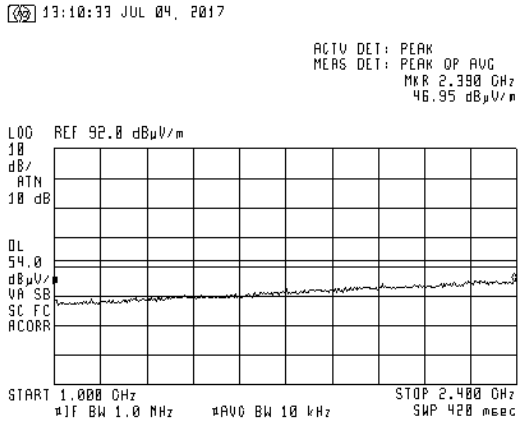




Plot 7.3.14 Radiated emission measurements from 1000 to 2400 MHz at the low carrier frequency

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

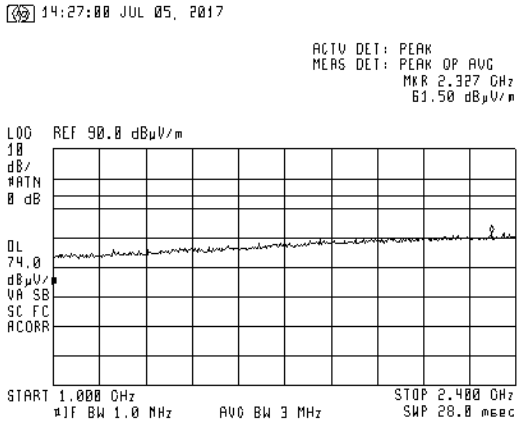


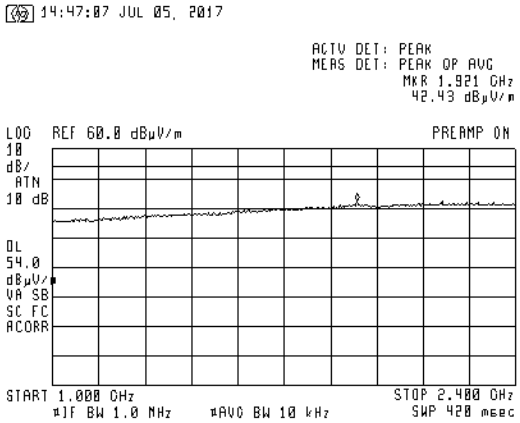


Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.15 Radiated emission measurements from 1000 to 2400 MHz at the mid carrier frequency

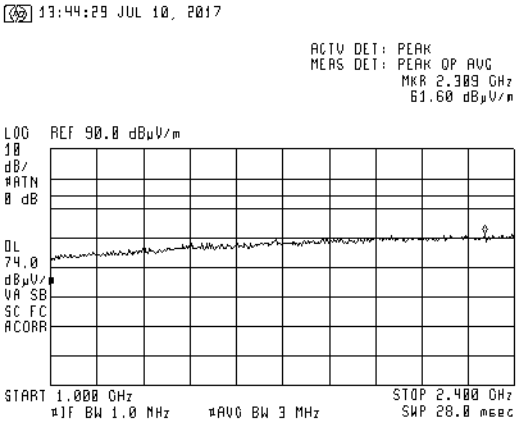
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

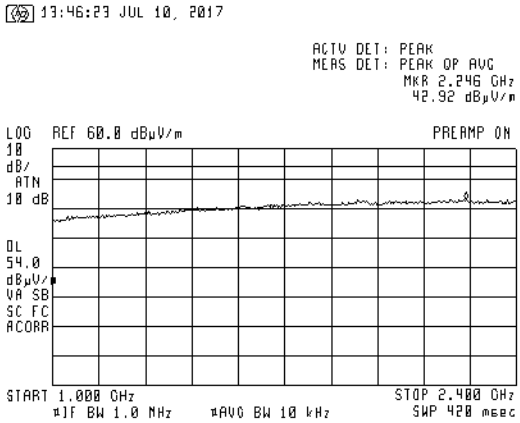




Plot 7.3.16 Radiated emission measurements from 1000 to 2400 MHz at the high carrier frequency

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

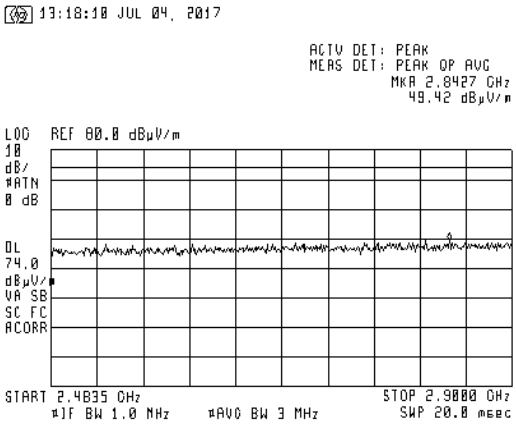


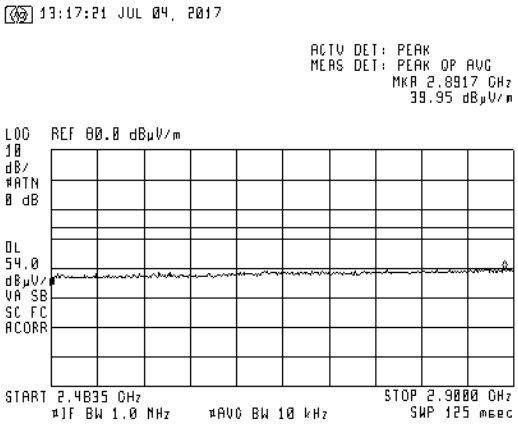


Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.17 Radiated emission measurements from 2483.5 to 2900 MHz at the low carrier frequency

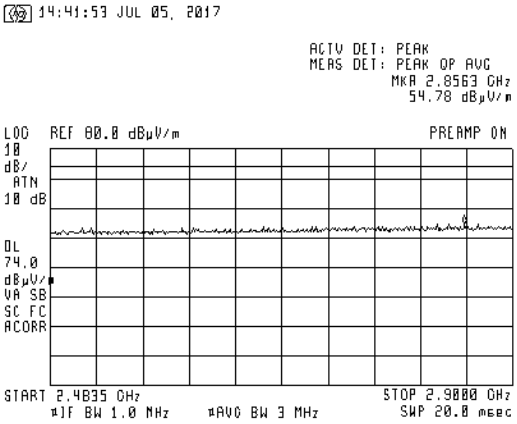
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

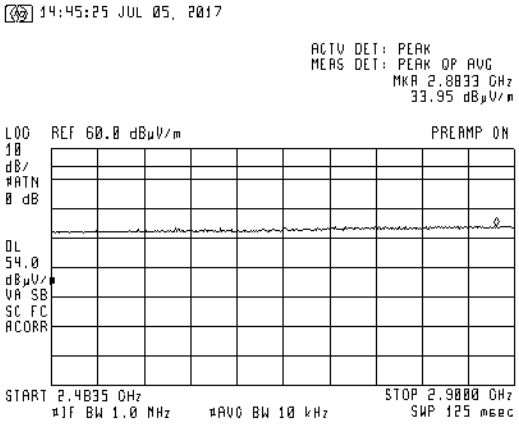




Plot 7.3.18 Radiated emission measurements from 2483.5 to 2900 MHz at the mid carrier frequency

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

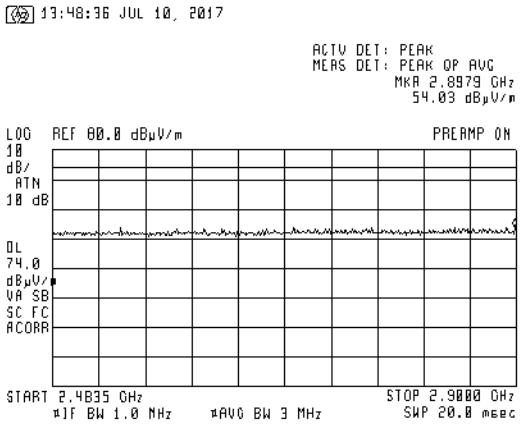


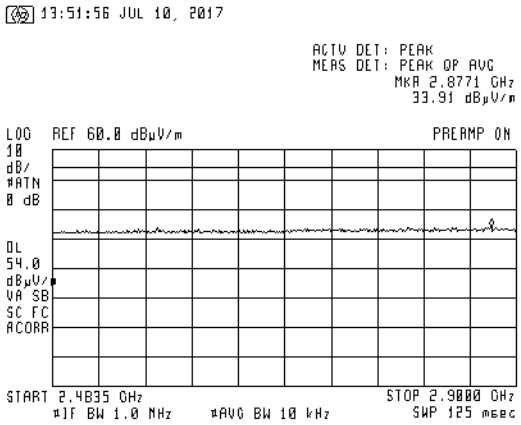


Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.19 Radiated emission measurements from 2483.5 to 2900 MHz at the high carrier frequency

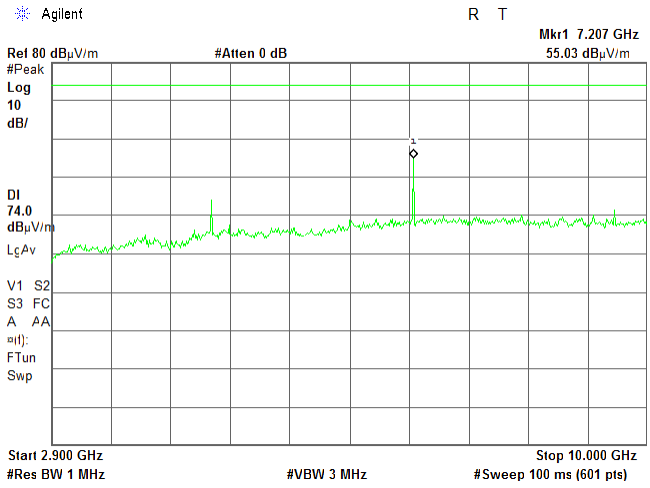
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

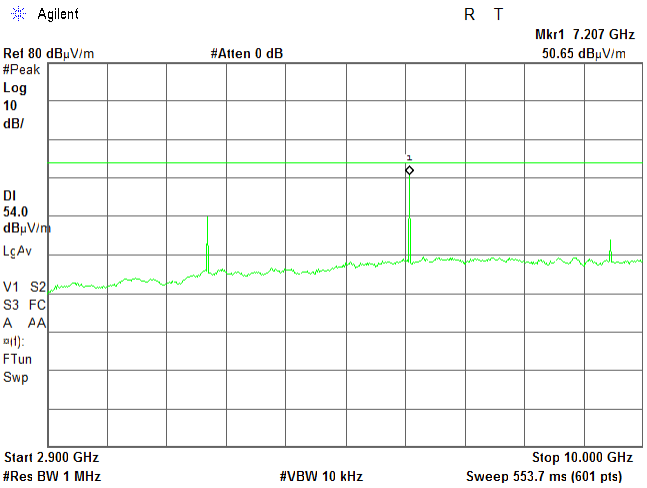




Plot 7.3.20 Radiated emission measurements from 2900 to 10000 MHz at the low carrier frequency

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

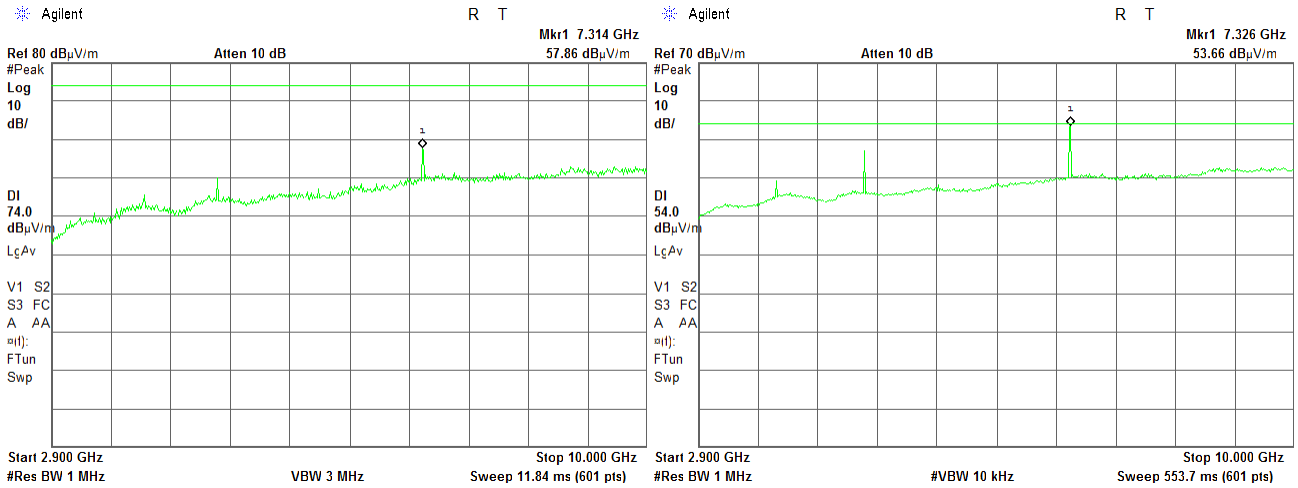




Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

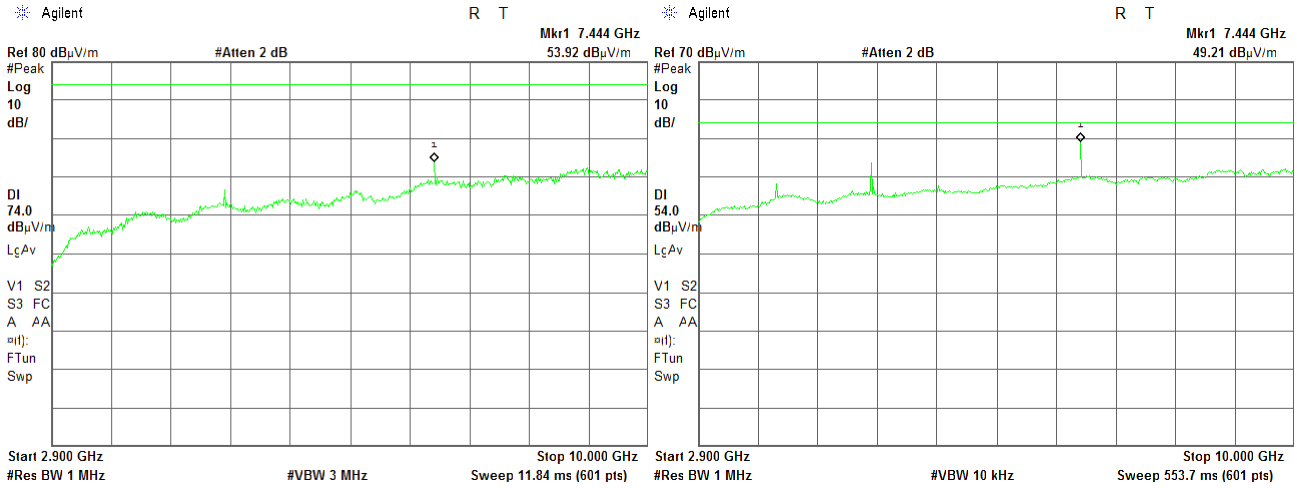
Plot 7.3.21 Radiated emission measurements from 2900 to 10000 MHz at the mid carrier frequency

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



Plot 7.3.22 Radiated emission measurements from 2900 to 10000 MHz at the high carrier frequency

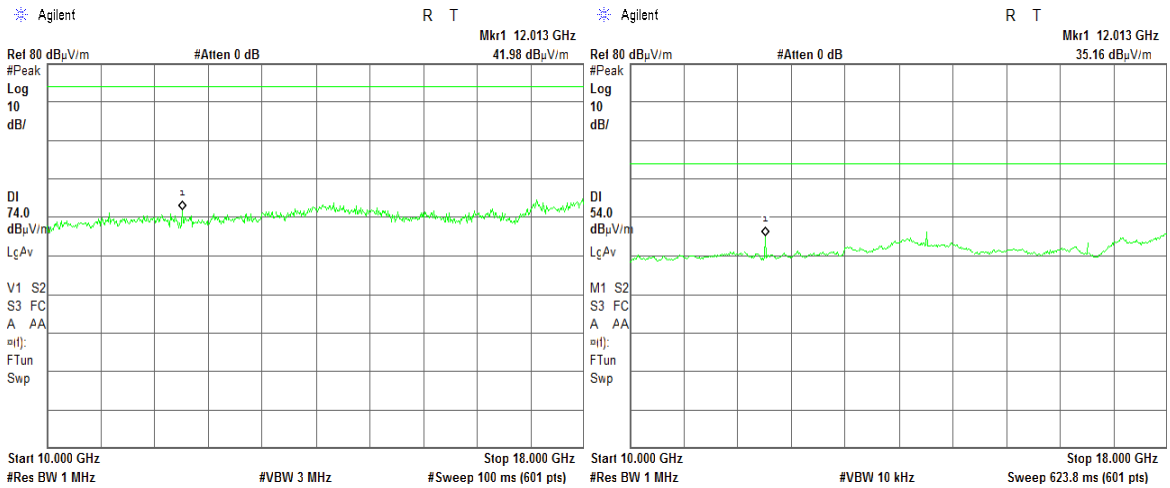
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

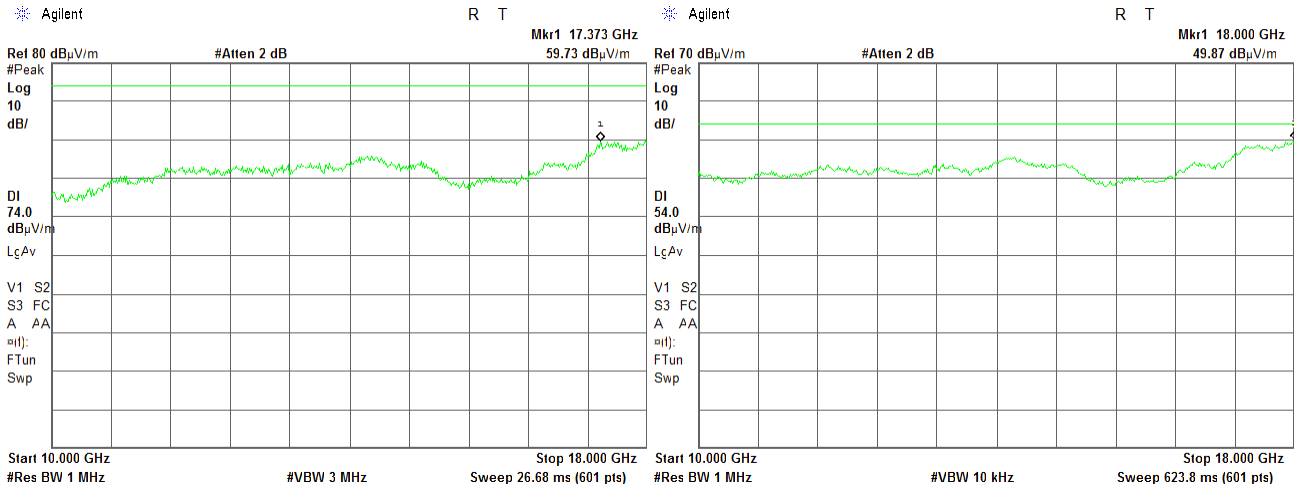
Plot 7.3.23 Radiated emission measurements from 10000 to 18000 MHz at the low carrier frequency

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



Plot 7.3.24 Radiated emission measurements from 10000 to 18000 MHz at the mid carrier frequency

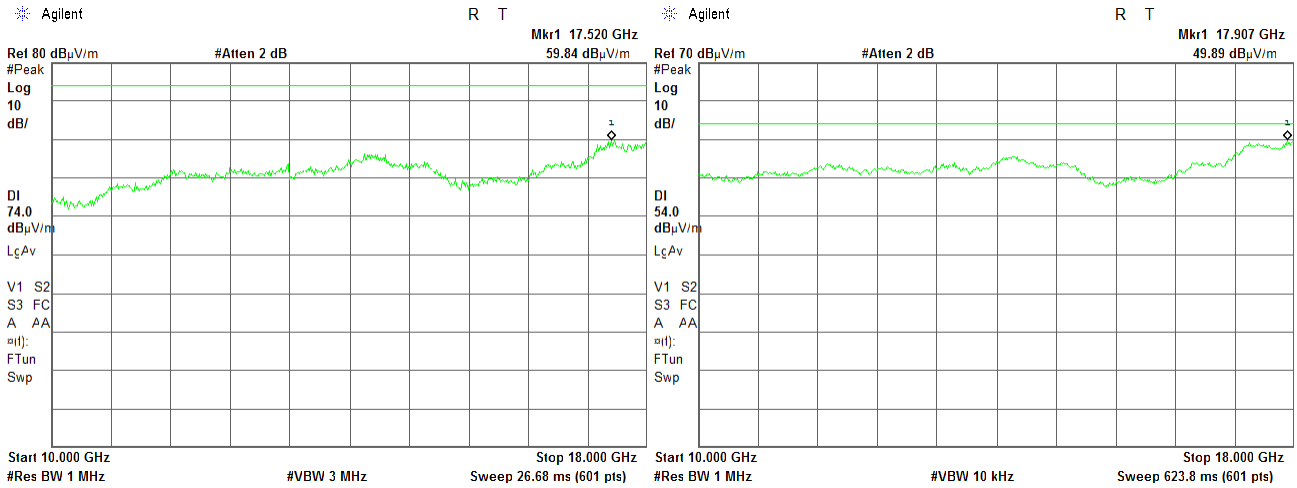
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

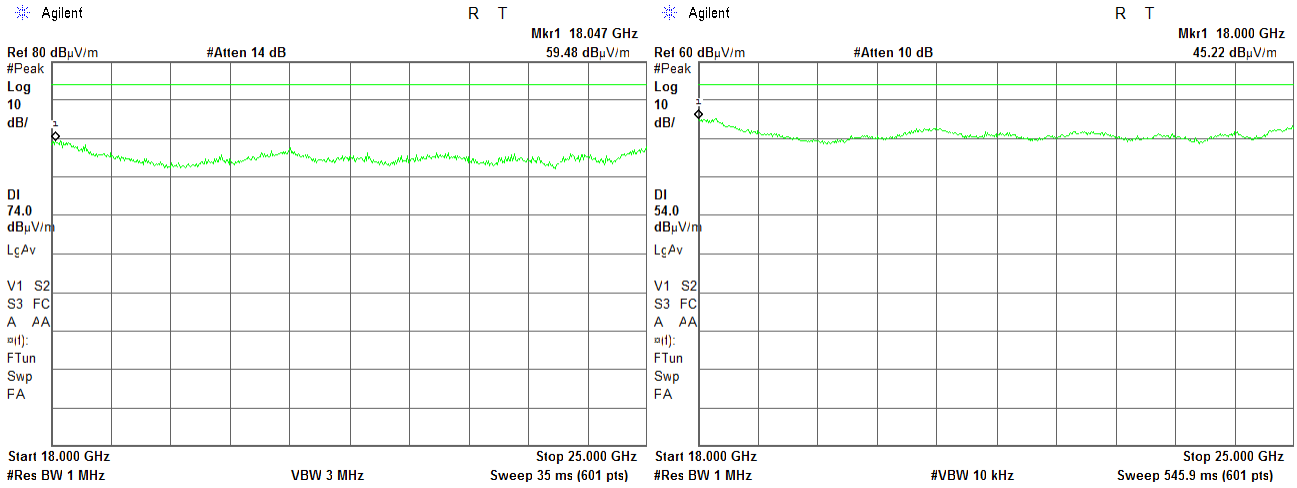
Plot 7.3.25 Radiated emission measurements from 10000 to 18000 MHz at the high carrier frequency

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



Plot 7.3.26 Radiated emission measurements from 18000 to 25000 MHz at the low carrier frequency

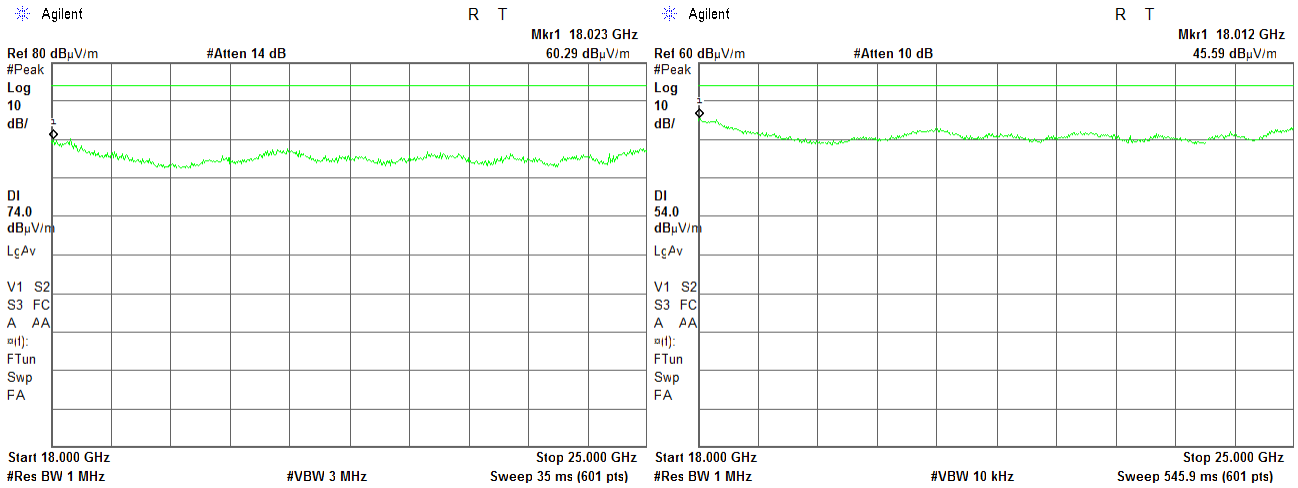
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

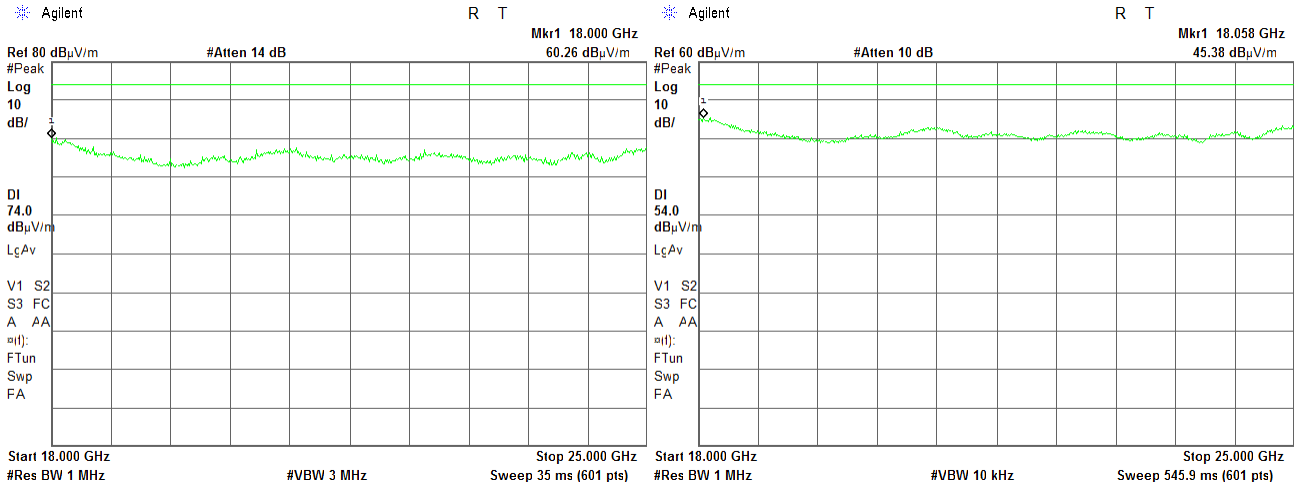
Plot 7.3.27 Radiated emission measurements from 18000 to 25000 MHz at the mid carrier frequency

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



Plot 7.3.28 Radiated emission measurements from 18000 to 25000 MHz at the high carrier frequency

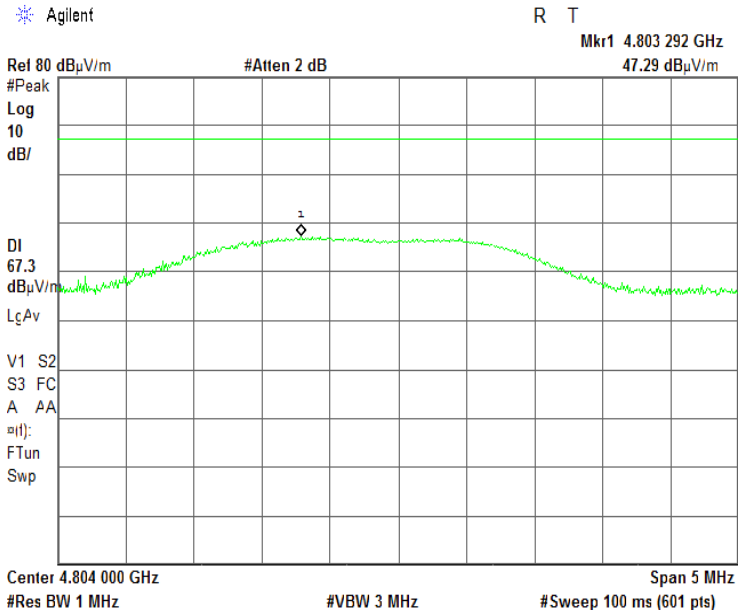
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

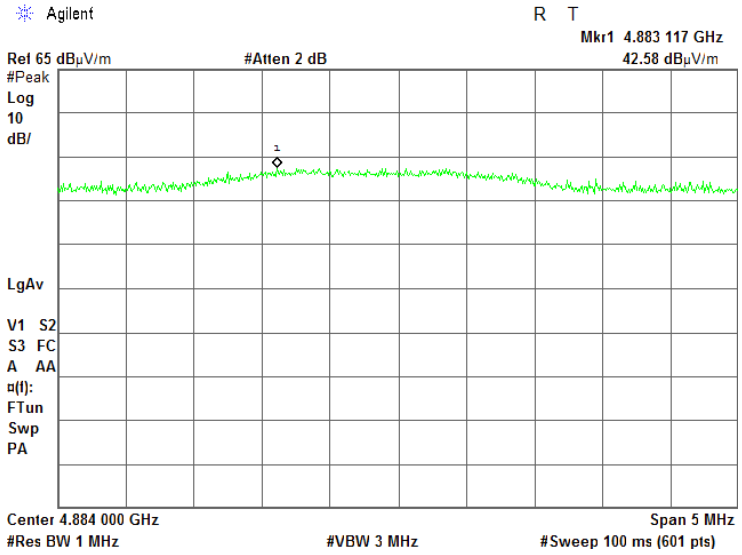
Plot 7.3.29 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.30 Radiated emission measurements at the second harmonic of mid carrier frequency

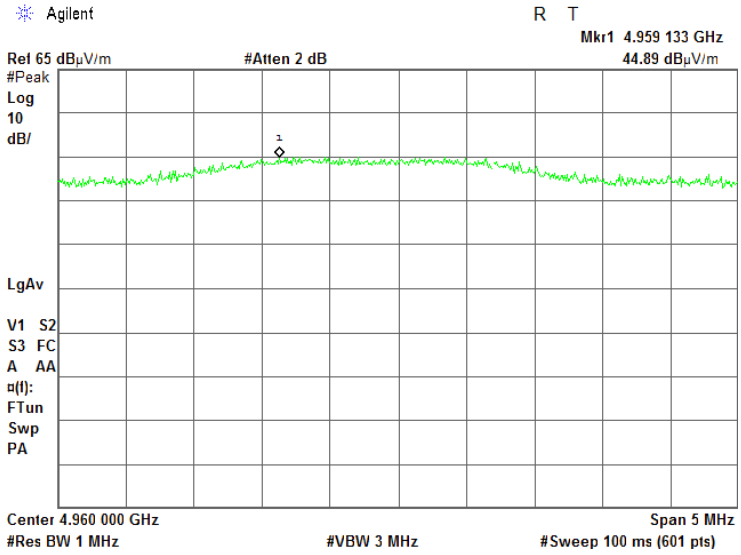
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

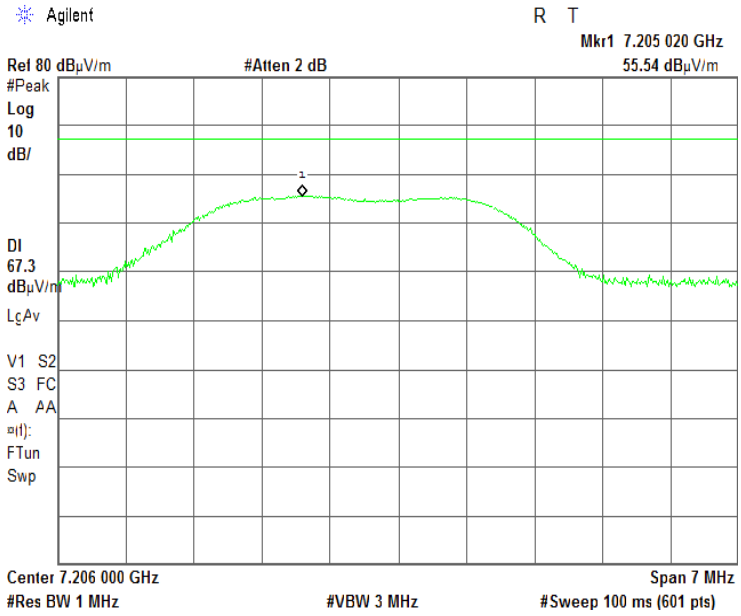
Plot 7.3.31 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.32 Radiated emission measurements at the third harmonic of low carrier frequency

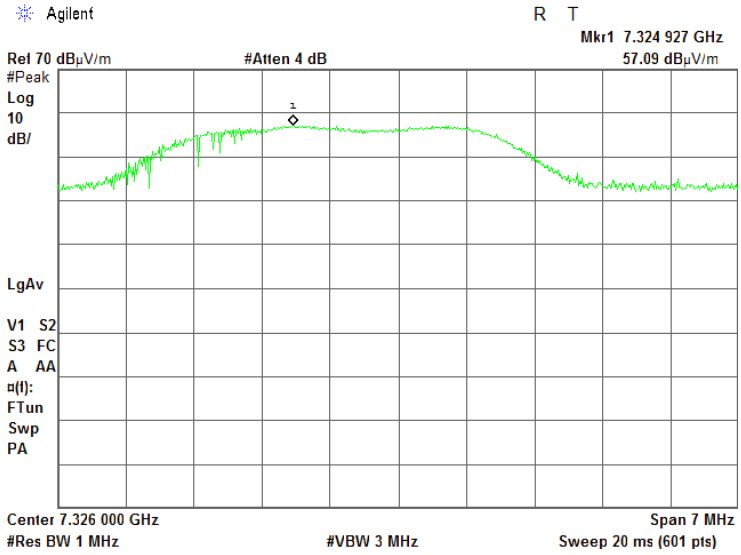
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

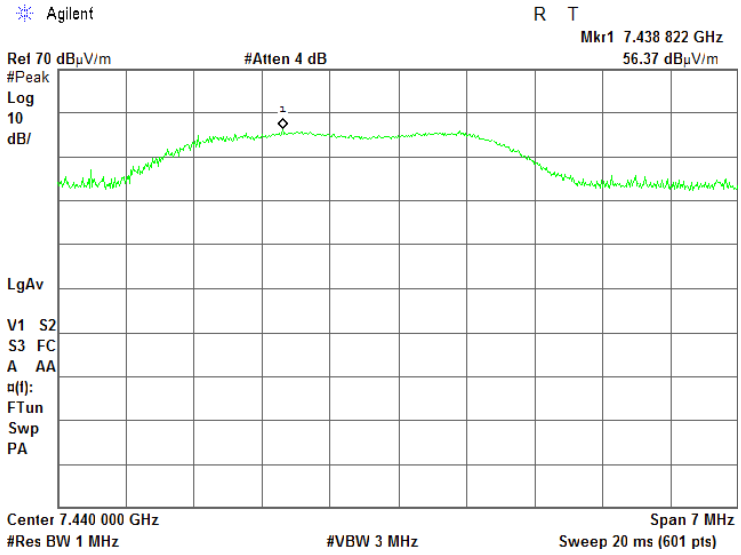
Plot 7.3.33 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.34 Radiated emission measurements at the third harmonic of high carrier frequency

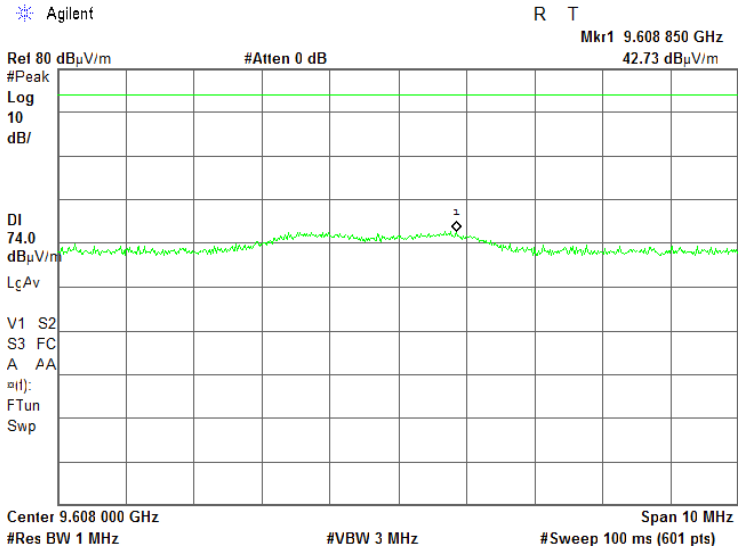
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

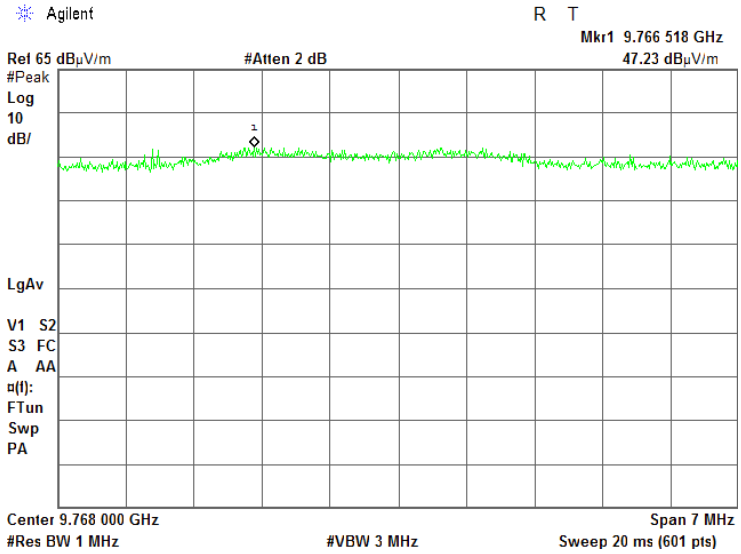
Plot 7.3.35 Radiated emission measurements at the fourth harmonic of low carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.36 Radiated emission measurements at the fourth harmonic of mid carrier frequency

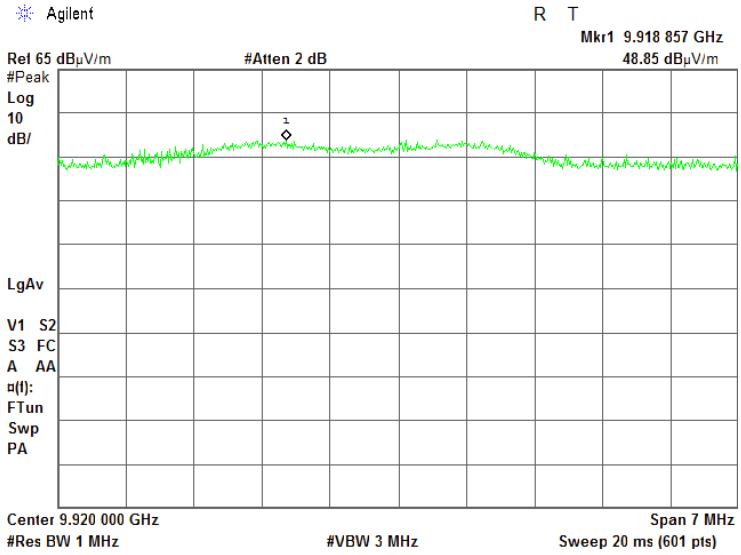
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

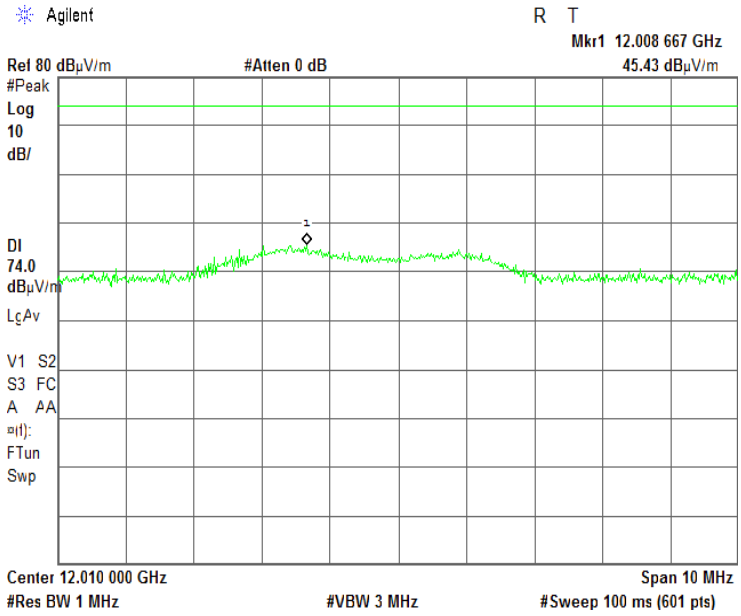
Plot 7.3.37 Radiated emission measurements at the fourth harmonic of high carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.3.38 Radiated emission measurements at the fifth harmonic of low carrier frequency

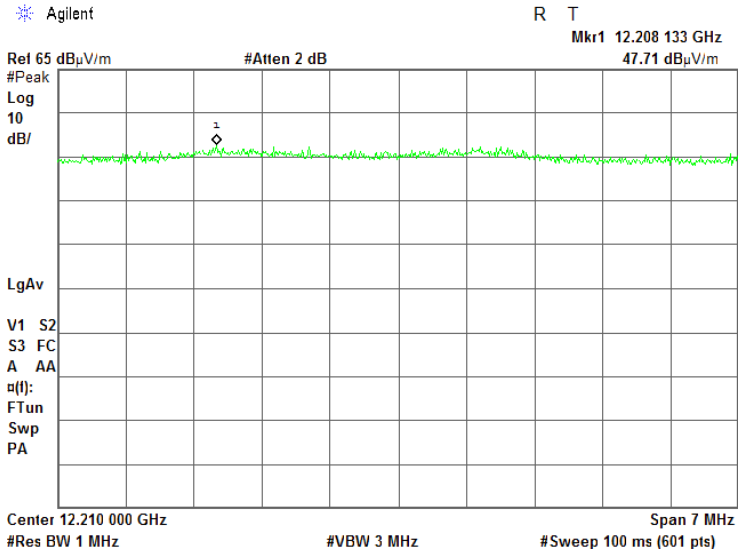
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

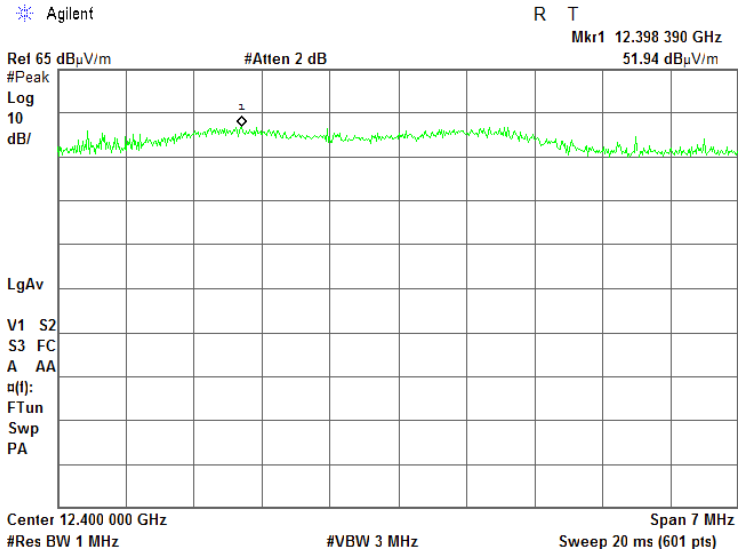
Plot 7.3.39 Radiated emission measurements at the fifth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.40 Radiated emission measurements at the fifth harmonic of high carrier frequency

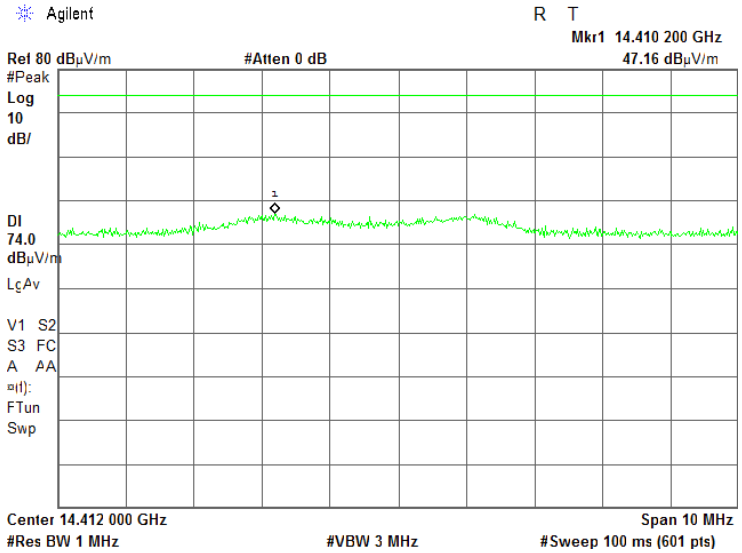
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

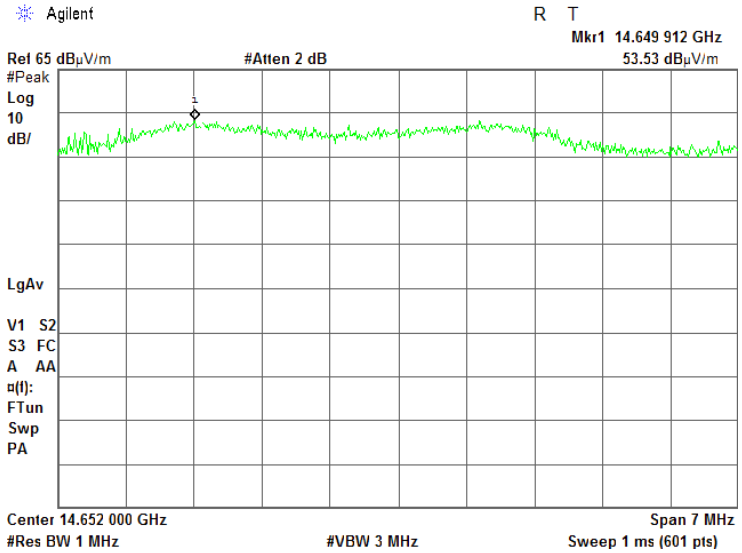
Plot 7.3.41 Radiated emission measurements at the sixth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.42 Radiated emission measurements at the sixth harmonic of mid carrier frequency

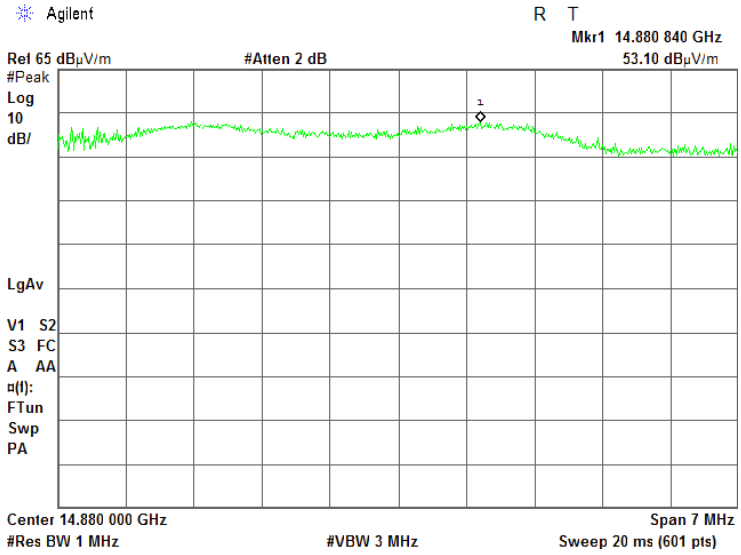
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

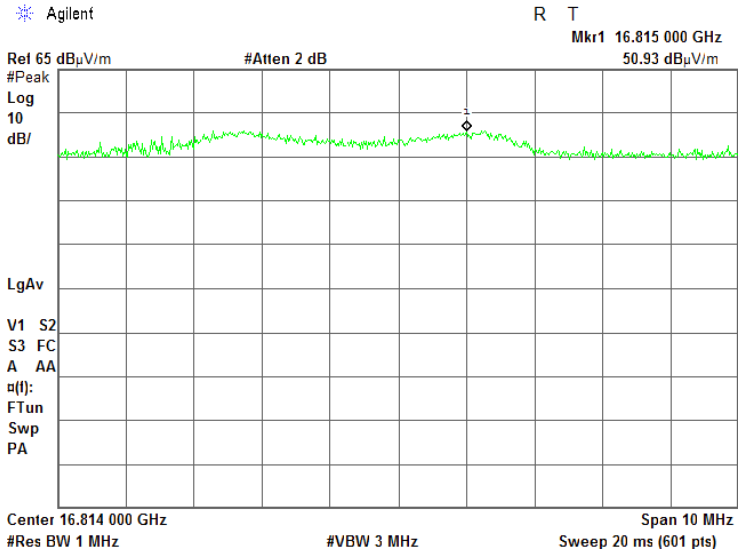
Plot 7.3.43 Radiated emission measurements at the sixth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.44 Radiated emission measurements at the seventh harmonic of low carrier frequency

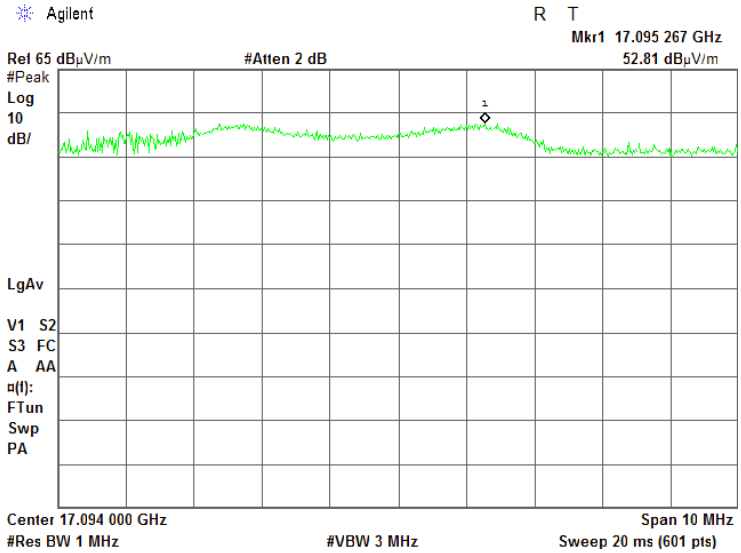
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

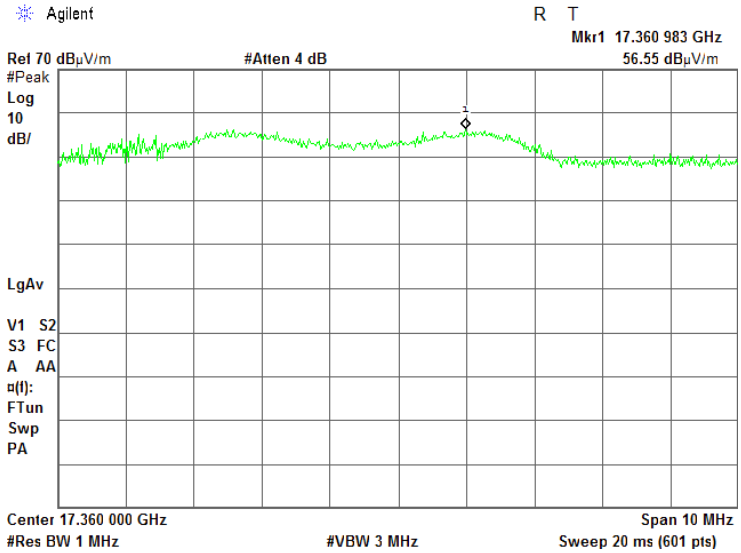
Plot 7.3.45 Radiated emission measurements at the seventh harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.46 Radiated emission measurements at the seventh harmonic of high carrier frequency

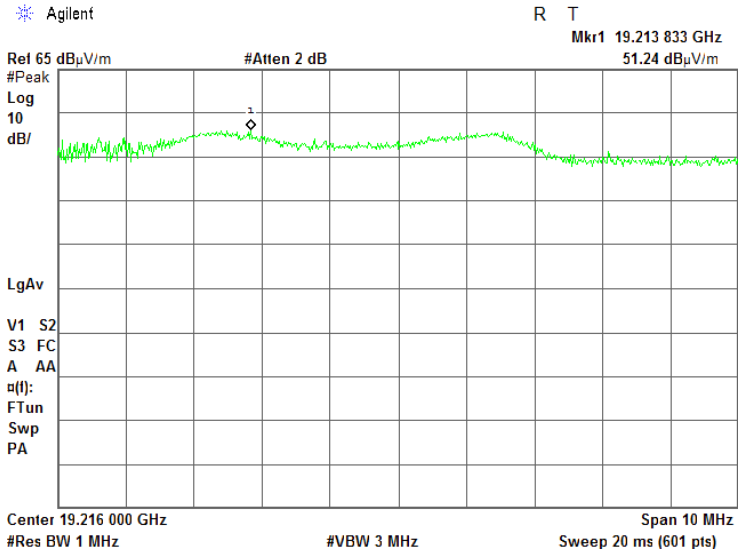
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

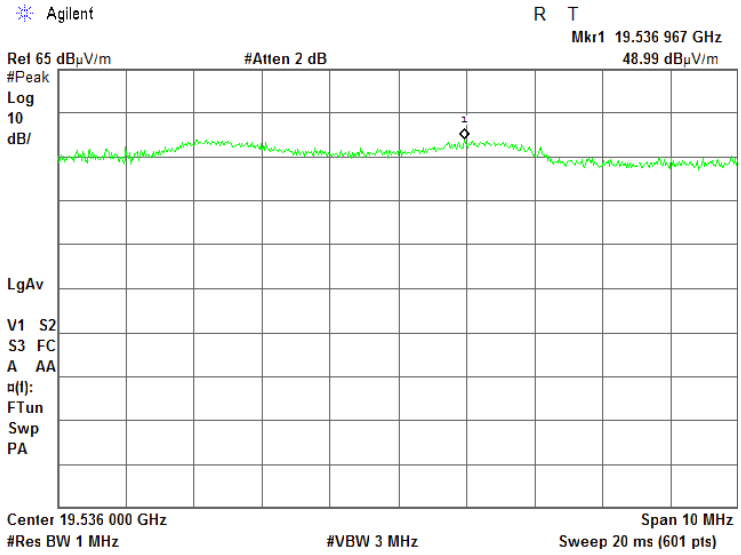
Plot 7.3.47 Radiated emission measurements at the eighth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.48 Radiated emission measurements at the eighth harmonic of mid carrier frequency

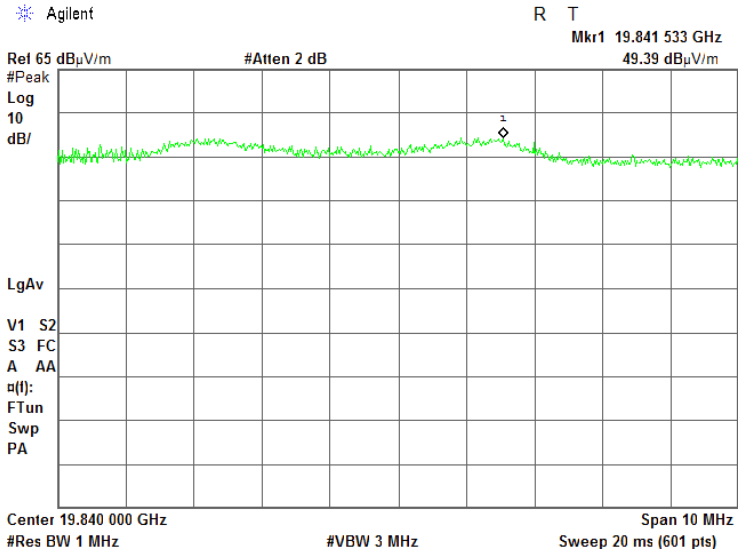
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

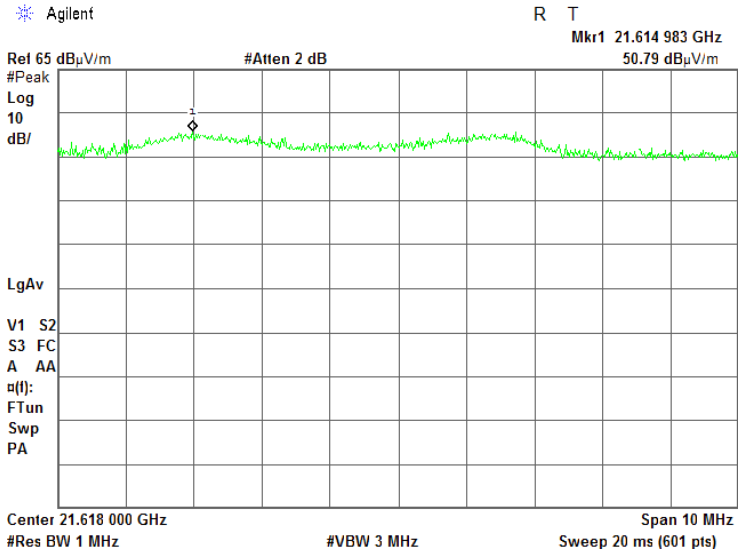
Plot 7.3.49 Radiated emission measurements at the eighth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.50 Radiated emission measurements at the ninth harmonic of low carrier frequency

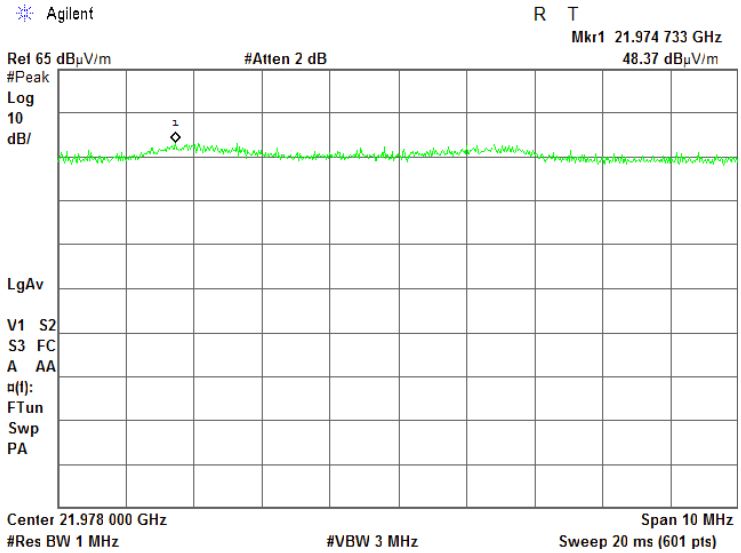
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

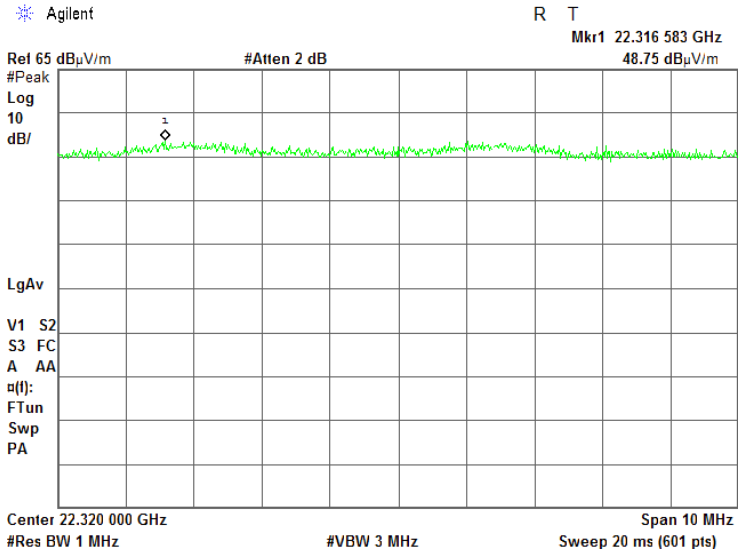
Plot 7.3.51 Radiated emission measurements at the ninth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.52 Radiated emission measurements at the ninth harmonic of high carrier frequency

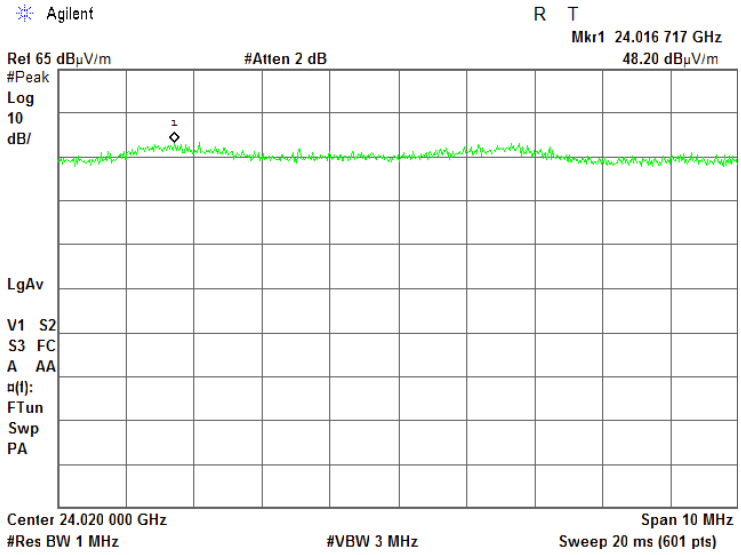
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

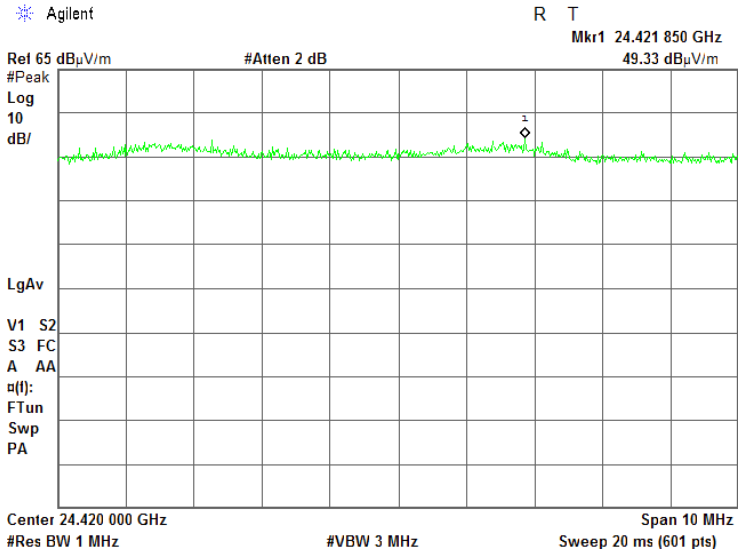
Plot 7.3.53 Radiated emission measurements at the tenth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.3.54 Radiated emission measurements at the tenth harmonic of mid carrier frequency

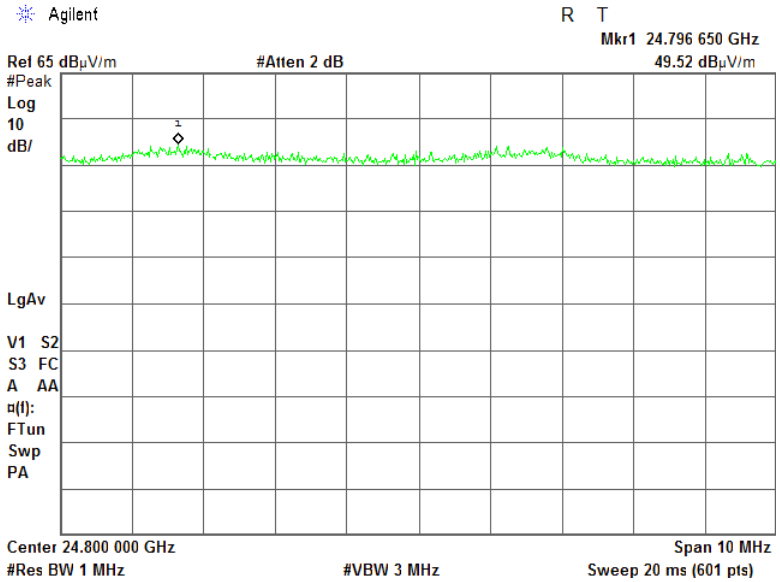
TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17 - 12-Jul-17		
Temperature: 27 ºC	**Relative Humidity:** 47 %	**Air Pressure:** 1007 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.3.55 Radiated emission measurements at the tenth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Band edge emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1005 hPa	**Power:** 5 VDC
Remarks:			

7.4 Band edge radiated emissions

7.4.1 General

This test was performed to measure emissions, radiated from the EUT at the assigned frequency band edges. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Band edge emission limits

Output power	Assigned frequency, MHz	Attenuation below carrier*, dBc	Field strength at 3 m within restricted bands, dB(μV/m)	
			Peak	Average
Peak	902.0 – 928.0	20.0	74.0	54.0
	2400.0 – 2483.5			
	5725.0 – 5850.0			
Averaged over a time interval	902.0 – 928.0	30.0	74.0	54.0
	2400.0 – 2483.5			
	5725.0 – 5850.0			

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized normally modulated at the maximum data rate and its proper operation was checked.

7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

7.4.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

7.4.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.4.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.4.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.4.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

Figure 7.4.1 Band edge emission test setup

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Band edge emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1005 hPa	**Power:** 5 VDC
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 2400 – 2483.5 MHz
DETECTOR USED: Peak
MODULATION: GFSK
BIT RATE: 1 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: ≥ 1% of the span
VIDEO BANDWIDTH: ≥ RBW

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
2400	51.00	90.66	38.66	20	18.66	Pass

*****- Margin = Attenuation below carrier – specification limit.

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(µV/m)	Limit, dB(µV/m)	Margin, dB**	Measured, dB(µV/m)	Calculated, dB(µV/m)	Limit, dB(µV/m)	Margin, dB***	
2483.7	Horizontal	1.6	0	57.19	74.0	-12.61	57.19	53.19	54.0	-0.81	Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Measured field strength - specification limit.
***- Margin = Calculated field strength - specification limit,
where Calculated field strength = Measured field strength + average factor

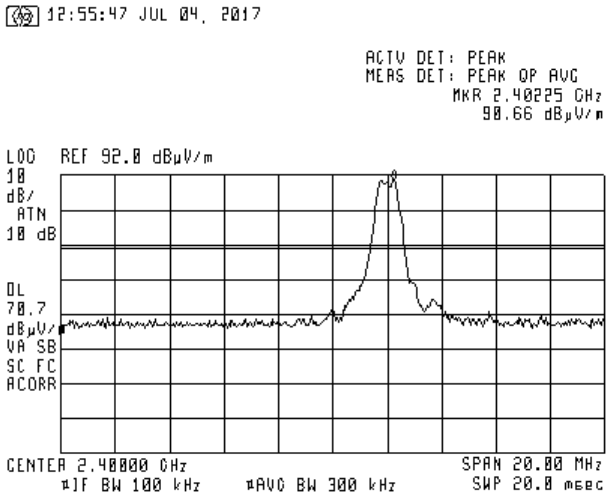
Reference numbers of test equipment used

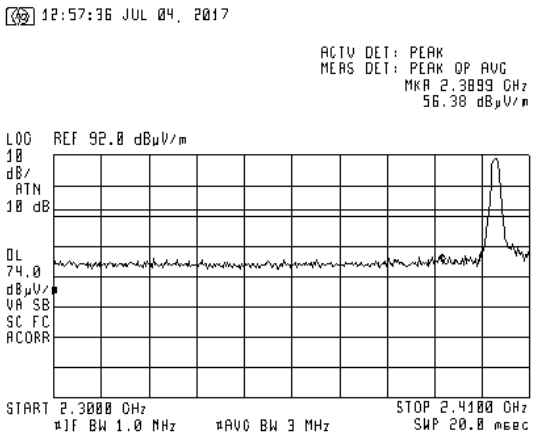
HL 0521	HL 4278	HL 4353	HL 4933	HL 5721			

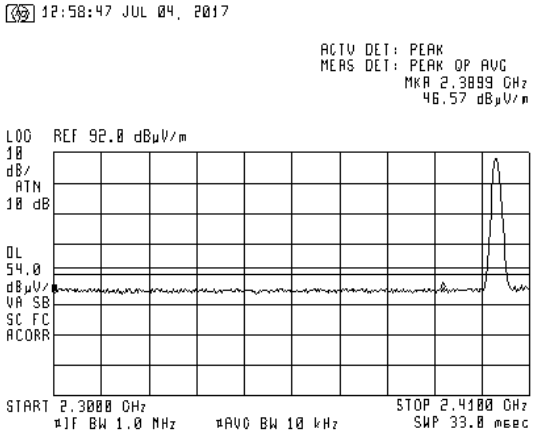
Full description is given in Appendix A.

Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Band edge emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1005 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.4.1 The highest band edge emission at low carrier frequency

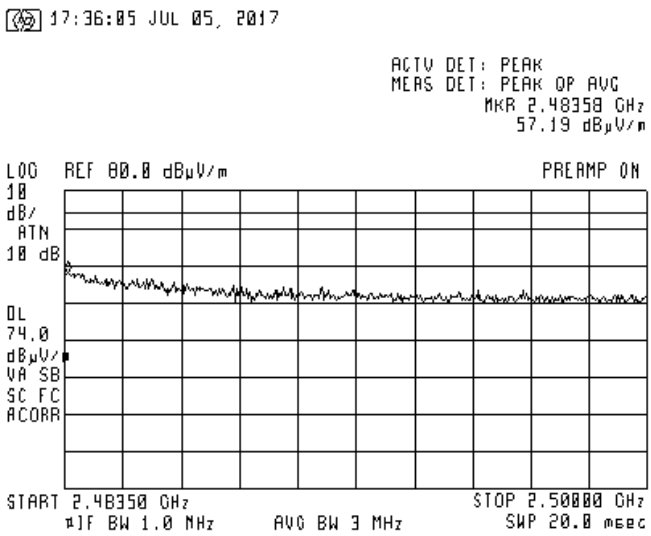






Test specification:	**Section 15.247(d) / RSS-247 section 5.5, Band edge emissions**		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	06-Jul-17		
Temperature: 28 ºC	**Relative Humidity:** 52 %	**Air Pressure:** 1005 hPa	**Power:** 5 VDC
Remarks:			

Plot 7.4.2 The highest band edge emission at high carrier frequency



Test specification:	**Section 15.247(e) / RSS-247 section 5.2(b), Peak power density**		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC
Remarks:			

7.5 Maximum power spectral density (PSD)

7.5.1 General

This test was performed to measure the peak spectral power density radiated by the transmitter RF antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm	Equivalent field strength limit @ 3m, dB(μV/m)*
902.0 – 928.0	3.0	8.0	103.2
2400.0 – 2483.5			
5725.0 – 5850.0			

* - Equivalent field strength limit was calculated from the peak spectral power density as follows: E=sqrt(30×P)/r, where P is peak spectral power density and r is antenna to EUT distance in meters.

7.5.2 Test procedure for field strength measurements

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

7.5.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.5.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept in both vertical and horizontal polarizations.

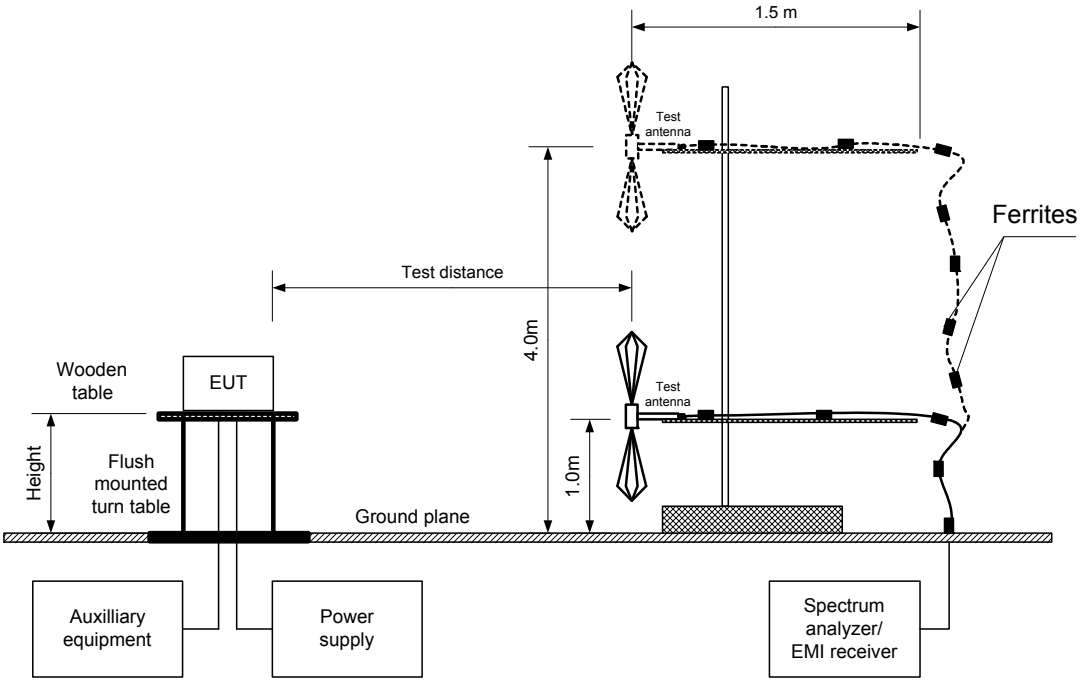
7.5.2.4 The maximum power spectral density was measured using a peak detector with resolution bandwidth set to 100 kHz, VBW≥300 kHz, sweep time = auto couple, trace mode=max hold.

7.5.2.5 The maximum power level was determined in any 100 kHz band within the fundamental EBW. The measured value did not exceed the limit.

7.5.2.6 The test results provided in Table 7.5.2 and associated plots.

Test specification:	**Section 15.247(e) / RSS-247 section 5.2(b), Peak power density**		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(e) / RSS-247 section 5.2(b), Peak power density**		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC
Remarks:			

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 2400-2483.5 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 1.5 m
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
TEST ANTENNA TYPE: Double ridged guide (above 1000 MHz)
MODULATION: BLE
BIT RATE: 1 Mbps

Frequency, MHz	Field strength, dB(μV/m)	EUT antenna gain, dBi	Limit, dB(μV/m)	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position**, degrees
2401	90.63	0	103.2	-12.57	Horizontal	1.20	188
2441	90.37	0	103.2	-12.83	Horizontal	1.19	193
2480	89.60	0	103.2	-13.60	Horizontal	1.18	190

*****- Margin = Field strength - EUT antenna gain - calculated field strength limit.
******- EUT front panel refer to 0 degrees position of turntable.

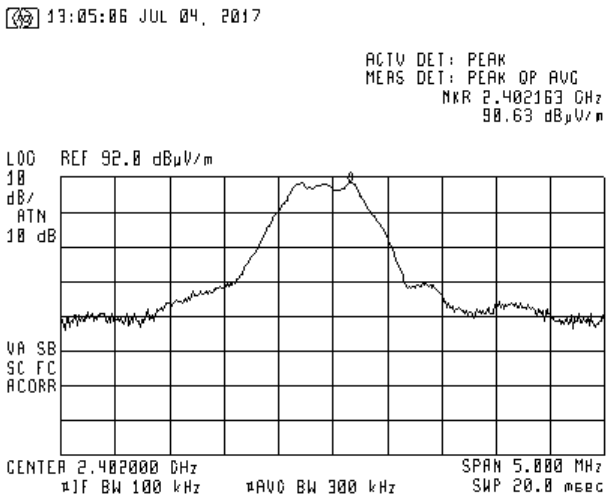
Reference numbers of test equipment used

HL 0521	HL 1984	HL 4278	HL 4353				

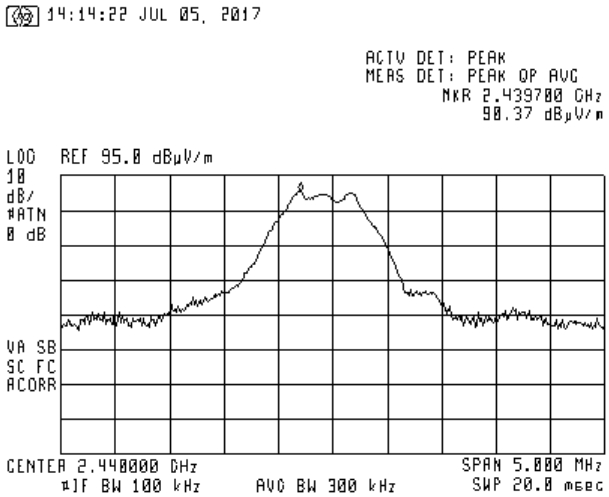
Full description is given in Appendix A.

Test specification:	**Section 15.247(e) / RSS-247 section 5.2(b), Peak power density**		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.5.1 Peak spectral power density at low frequency

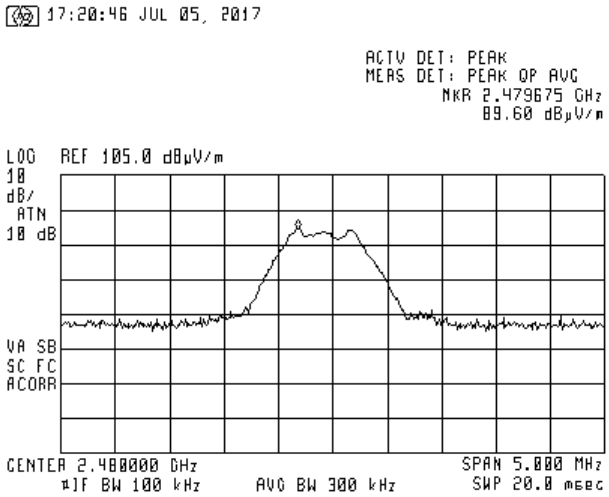


Plot 7.5.2 Peak spectral power density at mid frequency



Test specification:	**Section 15.247(e) / RSS-247 section 5.2(b), Peak power density**		
Test procedure:	ANSI C63.10 section 11.10.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 23 ºC	**Relative Humidity:** 55 %	**Air Pressure:** 1010 hPa	**Power:** 120 VAC
Remarks:			

Plot 7.5.3 Peak spectral power density at high frequency



Test specification:	**Section 15.203, RSS-Gen section 8.3, Antenna requirements**		
Test procedure:	Visual inspection		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	25-Oct-16		
Temperature: 23 ºC	**Relative Humidity:** 44 %	**Air Pressure:** 1013 hPa	**Power:** 120 VAC
Remarks:			

7.6 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.6.1.

Table 7.6.1 Antenna requirements

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

Test specification:	**FCC section 15.207(a), RSS-Gen section 8.8, Conducted emission**		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 25 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1007 hPa	**Power:** 120 VAC
Remarks:			

7.7 Conducted emissions

7.7.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

7.7.2 Test procedure

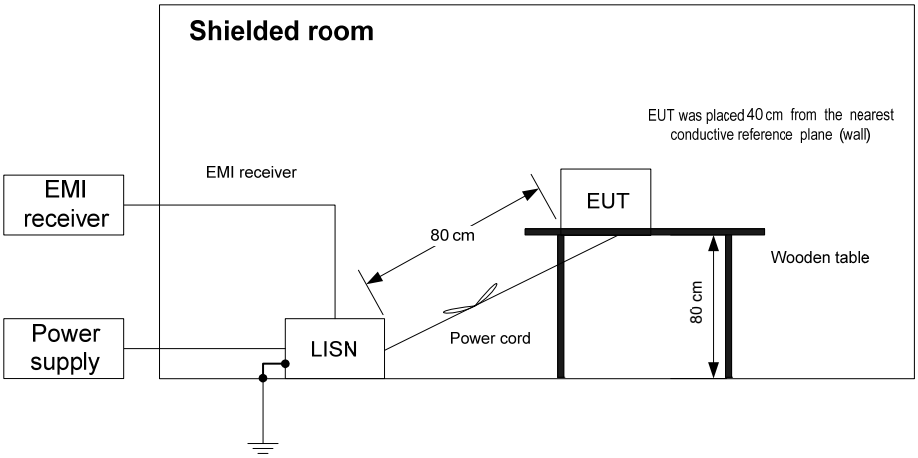
7.7.2.1 The EUT was set up as shown in Figure 7.7.1 and associated photographs, energized and the performance check was conducted.

7.7.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer while unused coaxial connector of the LISN was terminated with 50 Ohm. The Quasi-peak and average detectors were used throughout the testing.

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

7.7.2.4 The worst test results (the lowest margins) were recorded in Table 7.7.2 and shown in the associated plots.

Figure 7.7.1 Setup for conducted emission measurements, table-top equipment



Test specification:	**FCC section 15.207(a), RSS-Gen section 8.8, Conducted emission**		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 25 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1007 hPa	**Power:** 120 VAC
Remarks:			

Table 7.7.2 Conducted emission test results

LINE: AC mains
EUT SET UP: TABLE-TOP
TEST SITE: SHIELDED ROOM
DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
FREQUENCY RANGE: 150 kHz - 30 MHz
RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.189286	42.01	35.25	64.08	-28.83	25.09	54.08	-28.99	L1	Pass
0.392700	49.51	47.25	58.01	-10.76	32.19	48.01	-15.82		
0.477000	41.38	37.15	56.43	-19.28	24.78	46.43	-21.65		
0.602238	41.86	35.04	56.00	-20.96	22.89	46.00	-23.11		
23.299130	40.89	35.81	60.00	-24.19	29.03	50.00	-20.97		
0.189286	42.02	40.46	64.08	-23.62	31.02	54.08	-23.06	L2	Pass
0.302360	41.92	36.42	60.20	-23.78	25.17	50.20	-25.03		
0.408730	48.90	46.03	57.71	-11.68	30.83	47.71	-16.88		
0.502500	42.16	37.35	56.00	-18.65	26.65	46.00	-19.35		
0.713240	39.52	35.10	56.00	-20.90	19.38	46.00	-26.62		
24.400790	36.91	30.87	60.00	-29.13	23.78	50.00	-26.22		

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

Reference numbers of test equipment used

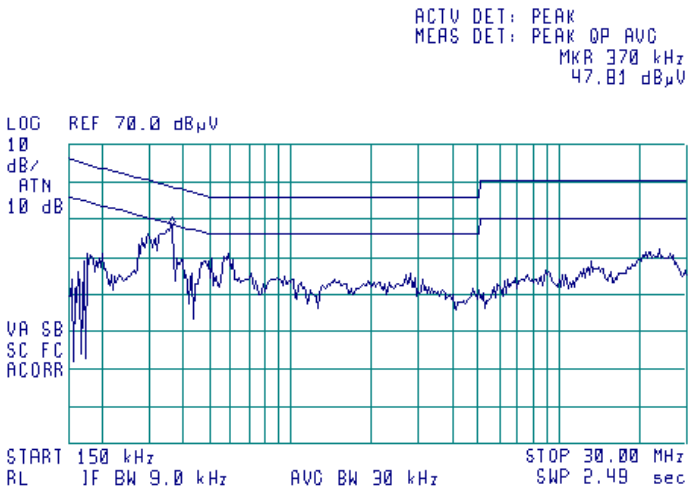
HL 0447	HL 0495	HL 0813	HL 1513	HL 4527			

Full description is given in Appendix A.

Test specification:	**FCC section 15.207(a), RSS-Gen section 8.8, Conducted emission**		
Test procedure:	ANSI C63.10 section 6.2		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	12-Jul-17		
Temperature: 25 ºC	**Relative Humidity:** 49 %	**Air Pressure:** 1007 hPa	**Power:** 120 VAC
Remarks:			

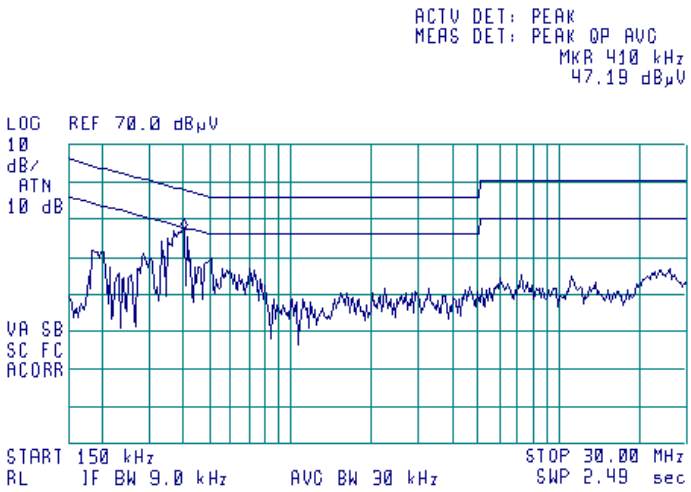
Plot 7.7.1 Conducted emission measurements

LINE: L1
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



Plot 7.7.2 Conducted emission measurements

LINE: L2
LIMIT: QUASI-PEAK, AVERAGE
DETECTOR: PEAK



8 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	19-Jan-17	19-Jan-18
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	01-Nov-16	01-Nov-17
0495	Autotransformer 0-255V, 10A	Variac	EMPL01	495	01-Jun-17	01-Jun-18
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	27-Oct-16	27-Oct-17
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	12-May-17	12-May-18
0813	Cable Coax, 12 m, N-type, up to 3.0 GHz	Hermon Laboratories	C214-12	149	18-Dec-16	18-Dec-17
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	07-Sep-17	07-Sep-18
1984	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz, 300 W	EMC Test Systems	3115	9911-5964	16-Aug-17	16-Aug-18
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	20-Feb-17	20-Feb-18
4135	Shield Box	TESCOM CO., LTD	TC-5916A	5916A000 136	06-Apr-17	06-Apr-18
4278	Test Cable , DC-18 GHz, 4.6 m, N/M - N/M	Mini-Circuits	APC-15FT-NMNM+	0755A	24-Aug-17	24-Aug-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
4355	Signal and Spectrum Analyzer, 9 kHz to 7 GHz	Rohde & Schwarz	FSV 7	191000086 881	20-Apr-17	20-Apr-18
4527	DC block , 50 Ohm, 10 MHz to 6 GHz	Mini-Circuits	BLK-6-N+	NA	16-Jan-17	16-Jan-18
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	14-Oct-16	14-Oct-17
4956	Active horn antenna, 18 to 40 GHz	Com-Power Corporation	AHA-840	105004	17-Jan-17	17-Jan-18
5102	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/11N/11N/6000MM	500848/6A	27-Jul-17	27-Jul-18
5112	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502494/2EA	27-Jul-17	27-Jul-18

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 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
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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.

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, Radio, Safety, Environmental and Telecommunication testing facility.
Hermon Laboratories is recognized and accredited by the Federal Communications Commission (USA) for 1, 2, 15, 18 parts of Code of Federal Regulations 47 (CFR 47), Test Firm Registration Number is 927748, Designation Number is IL1001; registered by Industry Canada for electromagnetic emissions, file number IC 2186A-1 for OATS, certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-869 for RE measurements above 1 GHz, C-845 for conducted emissions site and T-1606 for conducted emissions at telecommunication ports).
The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing, environmental simulation and calibration (for exact scope please refer to Certificate No. 839.01, 839.03 and 839.04).

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

Person for contact: Mr. Michael Nikishin, EMC&Radio group manager

11 APPENDIX D Specification references

FCC 47CFR part 15: 2016	Radio Frequency Devices
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
ANSI C63.2: 1996	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
RSS-247 Issue 2: 2017	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence- Exempt Local Area Network (LE-LAN) Devices
RSS-Gen Issue 4: 2014	General Requirements for Compliance of Radio Apparatus

12 APPENDIX E Test equipment correction factors

Correction factor
Line impedance stabilization network
Model LISN 16 - 1
Hermon Laboratories, HL 0447

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).

Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)	Frequency, MHz	Antenna factor, dB(1/m)
26	7.8	580	20.6	1320	27.8
28	7.8	600	21.3	1340	28.3
30	7.8	620	21.5	1360	28.2
40	7.2	640	21.2	1380	27.9
60	7.1	660	21.4	1400	27.9
70	8.5	680	21.9	1420	27.9
80	9.4	700	22.2	1440	27.8
90	9.8	720	22.2	1460	27.8
100	9.7	740	22.1	1480	28.0
110	9.3	760	22.3	1500	28.5
120	8.8	780	22.6	1520	28.9
130	8.7	800	22.7	1540	29.6
140	9.2	820	22.9	1560	29.8
150	9.8	840	23.1	1580	29.6
160	10.2	860	23.4	1600	29.5
170	10.4	880	23.8	1620	29.3
180	10.4	900	24.1	1640	29.2
190	10.3	920	24.1	1660	29.4
200	10.6	940	24.0	1680	29.6
220	11.6	960	24.1	1700	29.8
240	12.4	980	24.5	1720	30.3
260	12.8	1000	24.9	1740	30.8
280	13.7	1020	25.0	1760	31.1
300	14.7	1040	25.2	1780	31.0
320	15.2	1060	25.4	1800	30.9
340	15.4	1080	25.6	1820	30.7
360	16.1	1100	25.7	1840	30.6
380	16.4	1120	26.0	1860	30.6
400	16.6	1140	26.4	1880	30.6
420	16.7	1160	27.0	1900	30.6
440	17.0	1180	27.0	1920	30.7
460	17.7	1200	26.7	1940	30.9
480	18.1	1220	26.5	1960	31.2
500	18.5	1240	26.5	1980	31.6
520	19.1	1260	26.5	2000	32.0
540	19.5	1280	26.6		
560	19.8	1300	27.0		

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field strength in dB(μV/m).

Antenna factor, HL 4933

COM-POWER CORPORATION

Active Horn Antenna Factor Calibration

1 GHz to 18 GHz

Equipment:	**ACTIVE HORN ANTENNA**
Model:	**AHA-118**
Serial Number:	**701046**
Calibration Distance:	**3 Meter**
Polarization:	**Horizontal**
Calibration Date:	**11/12/2014**

Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)	Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)
1	40.96	-16.47	10	40.94	-1.97
1.5	41.21	-14.53	10.5	40.63	-1.06
2	41.44	-13.30	11	40.74	-1.50
2.5	41.71	-12.87	11.5	40.65	-0.52
3	41.96	-12.26	12	40.76	-0.15
3.5	42.14	-11.77	12.5	41.03	-0.85
4	42.13	-10.91	13	41.37	-0.81
4.5	41.79	-9.41	13.5	41.18	0.05
5	41.44	-7.54	14	40.98	0.36
5.5	40.91	-6.47	14.5	40.81	1.26
6	40.69	-5.48	15	40.65	0.25
6.5	40.64	-5.53	15.5	40.93	-1.05
7	40.76	-4.12	16	41.31	-1.44
7.5	40.94	-3.12	16.5	40.96	-0.80
8	40.68	-1.69	17	40.64	-0.02
8.5	40.08	-1.71	17.5	40.57	1.81
9	40.41	-1.86	18	40.08	3.63
9.5	41.21	-2.73			

Calibration according to ARP 958

Antenna Factor to be added to receiver reading:

Meter Reading (dBuV) + Antenna Factor (dB/m) = Corrected Reading (dBuV/m)

Antenna factor, HL 4956

COM-POWER CORPORATION

Active Horn Antenna Factor Calibration

18 GHz to 40 GHz

Equipment:	ACTIVE HORN ANTENNA
Model:	AHA-840
Serial Number:	105004
Calibration Distance:	3 meter
Polarization:	Horizontal
Calibration Date:	1/26/2015

Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)	Frequency (GHz)	Preamplifier Gain (dB)	Antenna Factor with pre-amp (dB/m)
18	38.83	-1.06	29.5	42.47	-5.33
18.5	39.34	-2.65	30	41.91	-4.86
19	39.71	-3.88	30.5	41.60	-4.64
19.5	39.87	-4.35	31	41.52	-4.60
20	39.98	-3.97	31.5	41.56	-4.79
20.5	40.42	-3.68	32	41.80	-5.21
21	41.12	-4.06	32.5	42.29	-5.54
21.5	41.74	-5.46	33	42.79	-5.63
22	42.14	-6.22	33.5	42.88	-5.38
22.5	42.35	-6.42	34	42.62	-4.76
23	42.50	-6.59	34.5	42.63	-4.84
23.5	42.65	-6.82	35	43.15	-5.13
24	42.81	-7.01	35.5	43.91	-5.83
24.5	42.86	-7.37	36	44.59	-6.39
25	42.73	-7.53	36.5	45.04	-6.64
25.5	42.77	-7.45	37	45.08	-6.40
26	42.85	-7.21	37.5	44.82	-5.75
26.5	42.98	-7.17	38	44.16	-4.58
27	43.14	-7.22	38.5	42.90	-2.66
27.5	43.18	-7.32	39	42.39	-1.71
28	43.04	-7.10	39.5	43.76	-2.49
28.5	43.01	-6.73	40	45.98	-5.21

Calibration per ANSI C63.5: 2006

Standard Site Method, Equations 1-6 (3-antenna)

Corrected Reading (dBμV/m) = Meter Reading (dBμV) + AFE(dB/m)

Cable loss
Cable coax, RG-214, 12 m, s/n 149, HL 0813

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	10	0.27	±0.12
2	30	0.51	±0.12
3	50	0.70	±0.12
4	100	1.05	±0.12
5	150	1.30	±0.13
6	200	1.52	±0.13
7	250	1.71	±0.13
8	300	1.91	±0.13
9	400	2.27	±0.13
10	500	2.56	±0.13
11	600	2.85	±0.14
12	700	3.11	±0.14
13	800	3.37	±0.14
14	900	3.64	±0.14
15	1000	3.90	±0.14

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A
HL 3901

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52

Cable loss
Test cable, Mini-Circuits, S/N 0755A, 18 GHz, 4.6 m, N/M - N/M
APC-15FT-NMNM+, HL 4278

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.24	4900	4.19	10000	6.47	15100	8.33
30	0.26	5000	4.25	10100	6.50	15200	8.35
50	0.34	5100	4.29	10200	6.52	15300	8.37
100	0.50	5200	4.32	10300	6.57	15400	8.40
200	0.72	5300	4.38	10400	6.59	15500	8.42
300	0.90	5400	4.41	10500	6.61	15600	8.46
400	1.06	5500	4.46	10600	6.64	15700	8.50
500	1.20	5600	4.51	10700	6.64	15800	8.52
600	1.32	5700	4.56	10800	6.65	15900	8.56
700	1.44	5800	4.59	10900	6.68	16000	8.61
800	1.54	5900	4.64	11000	6.68	16100	8.64
900	1.64	6000	4.69	11100	6.69	16200	8.66
1000	1.74	6100	4.72	11200	6.70	16300	8.70
1100	1.83	6200	4.77	11300	6.74	16400	8.73
1200	1.92	6300	4.80	11400	6.78	16500	8.74
1300	2.01	6400	4.83	11500	6.81	16600	8.75
1400	2.09	6500	4.89	11600	6.84	16700	8.78
1500	2.18	6600	4.90	11700	6.87	16800	8.79
1600	2.25	6700	4.95	11800	6.92	16900	8.81
1700	2.33	6800	5.01	11900	6.98	17000	8.85
1800	2.39	6900	4.99	12000	7.02	17100	8.90
1900	2.47	7000	5.04	12100	7.08	17200	8.95
2000	2.53	7100	5.11	12200	7.15	17300	8.99
2100	2.60	7200	5.14	12300	7.20	17400	9.03
2200	2.67	7300	5.21	12400	7.26	17500	9.07
2300	2.73	7400	5.29	12500	7.31	17600	9.11
2400	2.80	7500	5.33	12600	7.36	17700	9.15
2500	2.87	7600	5.38	12700	7.41	17800	9.19
2600	2.93	7700	5.46	12800	7.46	17900	9.24
2700	3.00	7800	5.52	12900	7.51	18000	9.28
2800	3.06	7900	5.58	13000	7.55		
2900	3.12	8000	5.64	13100	7.59		
3000	3.18	8100	5.69	13200	7.65		
3100	3.24	8200	5.75	13300	7.69		
3200	3.30	8300	5.80	13400	7.72		
3300	3.35	8400	5.84	13500	7.78		
3400	3.42	8500	5.90	13600	7.82		
3500	3.46	8600	5.97	13700	7.86		
3600	3.52	8700	5.99	13800	7.91		
3700	3.57	8800	6.04	13900	7.96		
3800	3.61	8900	6.10	14000	8.01		
3900	3.67	9000	6.13	14100	8.06		
4000	3.71	9100	6.17	14200	8.10		
4100	3.77	9200	6.23	14300	8.13		
4200	3.83	9300	6.27	14400	8.16		
4300	3.89	9400	6.30	14500	8.19		
4400	3.94	9500	6.35	14600	8.21		
4500	4.00	9600	6.37	14700	8.23		
4600	4.05	9700	6.40	14800	8.26		
4700	4.10	9800	6.44	14900	8.28		
4800	4.16	9900	6.45	15000	8.30		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 003,
HL 4353

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.71
100	0.27	9500	2.81
300	0.47	10000	2.90
500	0.61	10500	2.97
1000	0.87	11000	3.06
1500	1.07	11500	3.13
2000	1.24	12000	3.20
2500	1.39	12500	3.26
3000	1.53	13000	3.34
3500	1.65	13500	3.39
4000	1.77	14000	3.47
4500	1.89	14500	3.54
5000	1.99	15000	3.62
5500	2.07	15500	3.69
6000	2.20	16000	3.76
6500	2.30	16500	3.83
7000	2.39	17000	3.86
7500	2.51	17500	3.94
8000	2.58	18000	4.02
8500	2.65		

Cable loss
RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,
SF106A/11N/11N/6000MM, S/N 500848/6A
HL 5102

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.00	5500	2.43
50	0.23	6000	2.54
100	0.31	6500	2.65
200	0.44	7000	2.76
300	0.54	7500	2.87
400	0.62	8000	2.98
500	0.69	8500	3.06
600	0.76	9000	3.16
700	0.82	9500	3.27
800	0.87	10000	3.36
900	0.94	10500	3.45
1000	0.98	11000	3.55
1100	1.03	11500	3.63
1200	1.08	12000	3.72
1300	1.13	12500	3.82
1400	1.17	13000	3.90
1500	1.21	13500	3.99
1600	1.25	14000	4.06
1700	1.30	14500	4.15
1800	1.33	15000	4.24
1900	1.37	15500	4.30
2000	1.41	16000	4.37
2500	1.59	16500	4.45
3000	1.75	17000	4.53
3500	1.90	17500	4.62
4000	2.04	18000	4.67
4500	2.17		
5000	2.30		

Cable loss
RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,
SF102EA/11SK/11SK/5500MM, S/N 502494/2EA
HL 5112

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
100	0.69	20500	10.18
200	0.97	21000	10.32
300	1.18	21500	10.47
500	1.52	22000	10.60
1000	2.14	22500	10.75
1500	2.62	23000	10.87
2000	3.03	23500	11.00
2500	3.40	24000	11.12
3000	3.73	24500	11.23
3500	4.04	25000	11.35
4000	4.33	25500	11.52
4500	4.60	26000	11.64
5000	4.86	26500	11.73
5500	5.10	27000	11.84
6000	5.34	27500	11.93
6500	5.57	28000	12.05
7000	5.79	28500	12.19
7500	6.00	29000	12.33
8000	6.21	29500	12.44
8500	6.43	30000	12.53
9000	6.62	30500	12.58
9500	6.82	31000	12.71
10000	7.01	31500	12.86
10500	7.17	32000	13.00
11000	7.34	32500	13.11
11500	7.51	33000	13.24
12000	7.68	33500	13.33
12500	7.84	34000	13.44
13000	8.00	34500	13.58
13500	8.16	35000	13.69
14000	8.32	35500	13.81
14500	8.48	36000	13.93
15000	8.63	36500	14.05
15500	8.77	37000	14.24
16000	8.92	37500	14.28
16500	9.08	38000	14.38
17000	9.23	38500	14.50
17500	9.37	39000	14.61
18000	9.51	39500	14.70
18500	9.66	40000	14.83
19000	9.78		
19500	9.92		
20000	10.07		

13 APPENDIX F Abbreviations and acronyms

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

END OF TEST REPORT

14 APPENDIX G Manufacturer's declaration

oti	**Confidential**	**OTI Ltd.** Z.H.R. Industrial zone, POB 32 Rosh Pina 12000, Israel Tel. 972-4-6868000, Fax.972-4-6938887

SATURN8700 Plus USB versus SATURN8700 USB
Declaration of Differences

I hereby declare that the SATURN8700 Plus USB hardware is the same as the SATURN8700 USB hardware except for the following:

- Addition of a display and its interconnecting flat cable.
- Larger box to accommodate also the display.

Notes:

- The SATURN8700 USB contains two boards, main board and antenna board, which are sandwiched one above the other by means two connectors.
- The SATURN8700 Plus USB uses identical two boards sandwich with the addition of a display which is physically mounted outside the perimeter of the rest of the HW. This way it does not affect the RFID and BLE transmission characteristics.
- All the HW associated with the display is assembled on the main board regardless of it uses – SATURN8700 USB and SATURN8700 Plus USB.
- The section of the housing which holds the two bards sandwich is the same as the SATURN8700 USB housing.
- The display power consumption is very low compared with the overall power consumption so no side effects in this regard.

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VP HW Eng.
OTI

ON TRACK INNOVATIONS LTD

END OF DOCUMENT