

TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247 (DTS),
RSS-247 issue 1

FOR:

Telematics Wireless Ltd.
Water meter
Model:SONATA
FCC ID:NTASONATA1
IC:4732A-SONATA1

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1 Applicant information

Client name: Telematics Wireless Ltd.
Address: 26 Hamelaha street, POB 1911, Holon, 58117, Israel
Telephone: +972 3557 5767
Fax: +972 3557 5753
E-mail: itsikk@tlmw.com
Contact name: Mr. Itsik Kanner

2 Equipment under test attributes

Product name: Water meter
Product type: Transceiver
Model(s): SONATA
Serial number: 14192479
Hardware version: Rev D
Software release: AB01
Receipt date 31-Aug-16

3 Manufacturer information

Manufacturer name: Telematics Wireless Ltd.
Address: 26 Hamelaha street, POB 1911, Holon, 58117, Israel
Telephone: +972 3557 5767
Fax: +972 3557 5753
E-Mail: itsikk@tlmw.com
Contact name: Mr. Itsik Kanner

4 Test details

Project ID: 28785
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 31-Aug-16
Test completed: 15-Sep-16
Test specification(s): FCC 47CFR part 15 subpart C § 15.247 (DTS);
RSS-247 issue 1

5 Tests summary

Test	Status
Transmitter characteristics	
FCC section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth	Pass
FCC section 15.247(b)3/ RSS-247 section 5.4(4), Peak output power	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 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	Pass
FCC section 15.247(d)/ RSS-247 section 5.5, Emissions at band edges	Pass
FCC section 15.247(e) / RSS-247 section 5.2(2), Peak power density	Pass
FCC section 15.203 / RSS-Gen section 8.3, Antenna requirement	Pass
FCC section 15.207(a) / RSS-Gen section 8.8, Conducted emission	Not required

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.

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

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	September 15, 2016	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	November 1, 2016	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	December 6, 2016	

6 EUT description

6.1 General information

The EUT is a SONATA water meter, powered from two 3.6 VDC lithium internal batteries.

The EUT supports the following modes of operation:

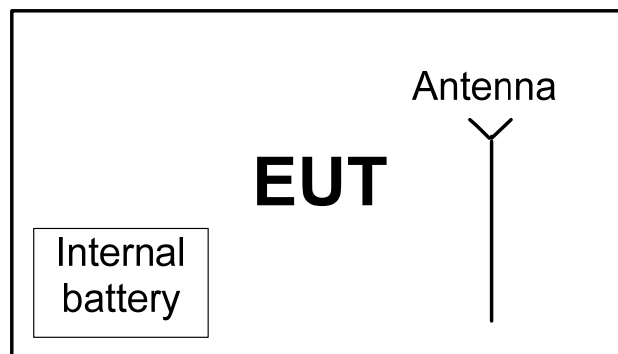
- 1) DTS- BPSK in 905.43 – 923.546 MHz
- 2) DTS- FSK at 916.3 MHz
- 3) FHSS- Wide channel in 902.3-927.8 MHz
- 4) FHSS- Narrow channel in 904-927.9 MHz

This test report represents the DTS mode test results.

6.2 Changes made in EUT

No changes were implemented in the EUT during the testing.

6.3 Test configuration



6.4 Transmitter characteristics

Type of equipment					
☐ Stand-alone (Equipment with or without its own control provisions)					
☒ Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)					
☐ Plug-in card (Equipment intended for a variety of host systems)					
Intended use		Condition of use			
☐ fixed		Always at a distance more than 2 m from all people			
☒ 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		902-928 MHz			
Operating frequency range		905.43 - 923.546 MHz (BPSK modulation) 916.3 MHz (FSK modulation)			
Maximum rated output power		At transmitter 50 Ω RF output connector		NA	
		Peak output power		21.40 dBm –BPSK 19.86 dBm - FSK	
Is transmitter output power variable?		☒	No		
		☐	Yes	☐ continuous variable	
				☐ stepped variable with stepsize dB	
				minimum RF power dBm	
				maximum RF power dBm	
Antenna connection					
☐ unique coupling		☐ standard connector		☒ integral	☐ with temporary RF connector ☒ without temporary RF connector
Antenna/s technical characteristics					
Type		Manufacturer		Model number	
Integral		Telematics Wireless Ltd.		Printed	
				Gain	
				0 dBi	
Transmitter aggregate data rate/s		900 kbps (BPSK), 60 kbps (FSK)			
Type of modulation		BPSK; FSK			
Modulating test signal (baseband)		PRBS			
Transmitter power source					
☒	Battery	Nominal rated voltage	3.6 VDC	Battery type	Lithium
	DC	Nominal rated voltage	VDC		
	AC mains	Nominal rated voltage	VAC	Frequency	Hz
Common power source for transmitter and receiver				☒	yes
				☐	no



Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure: ANSI C63.10 section 11.8.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 31-Aug-16			
Temperature: 23 °C	Relative Humidity: 56 %	Air Pressure: 1008 hPa	Power: Battery
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 7.1.2.

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.

Table 7.1.2 The 99% bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points	Limit, kHz
902.0 – 928.0	99%	NA
2400.0 – 2483.5		
5725.0 – 5850.0		

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 7.1.3 and associated plot.

Figure 7.1.1 The 6 dB bandwidth test setup





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Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure: ANSI C63.10 section 11.8.1			
Test mode: Compliance	Verdict: PASS		
Date(s): 31-Aug-16			
Temperature: 23 °C	Relative Humidity: 56 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Table 7.1.3 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 902 – 928 MHz
 DETECTOR USED: Peak
 SWEEP MODE: Max hold
 SWEEP TIME: Auto
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 6.0 dBc
 MODULATION: BPSK
 CHIP RATE: 900 kbps

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
905.43	640.429	500	140.429	Pass
916.30	581.745	500	81.745	Pass
923.54	543.585	500	43.585	Pass

MODULATION: FSK
 BIT RATE: 60 kbps

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
916.3	753.771	500	253.771	Pass

Table 7.1.4 The 99% bandwidth test results

ASSIGNED FREQUENCY BAND: 902 – 928 MHz
 DETECTOR USED: Peak
 SWEEP MODE: Max hold
 SWEEP TIME: Auto
 RESOLUTION BANDWIDTH: 100 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 99% BW
 MODULATION: BPSK
 CHIP RATE: 900 kbps

Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
905.43	1417.1	500	917.1	Pass
916.30	1408.4	500	908.4	Pass
923.54	1404.3	500	904.3	Pass

MODULATION: FSK
 BIT RATE: 60 kbps

Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
916.3	1177.3	500	677.3	Pass

Reference numbers of test equipment used

HL 3818								
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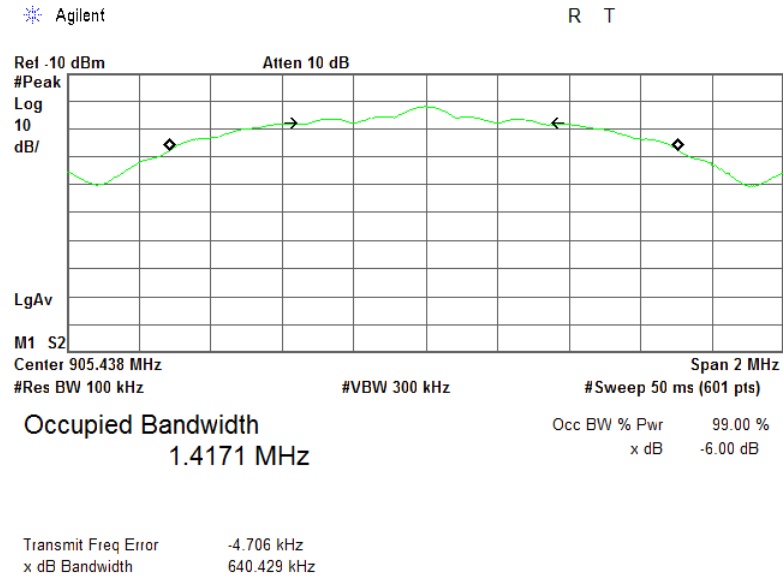
Full description is given in Appendix A.



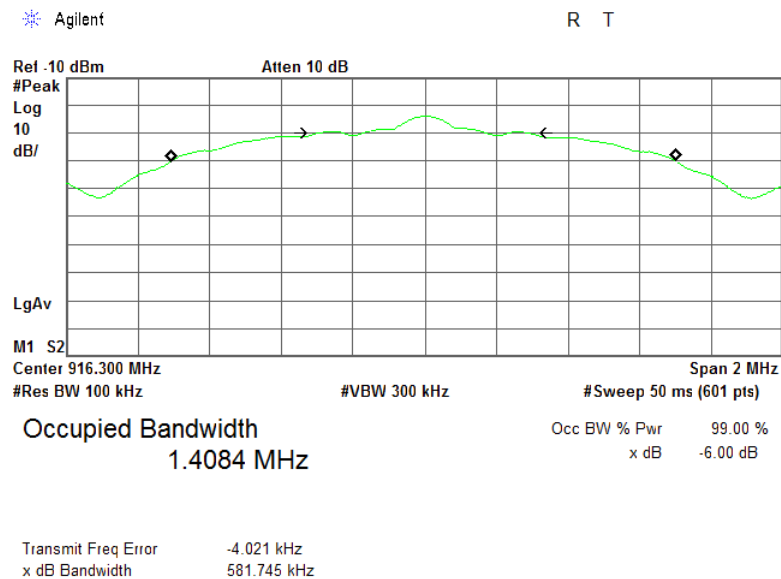
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Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure: ANSI C63.10 section 11.8.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 31-Aug-16			
Temperature: 23 °C	Relative Humidity: 56 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.1.1 The occupied bandwidth test result at low frequency BPSK modulation



Plot 7.1.2 The occupied bandwidth test result at mid frequency BPSK modulation

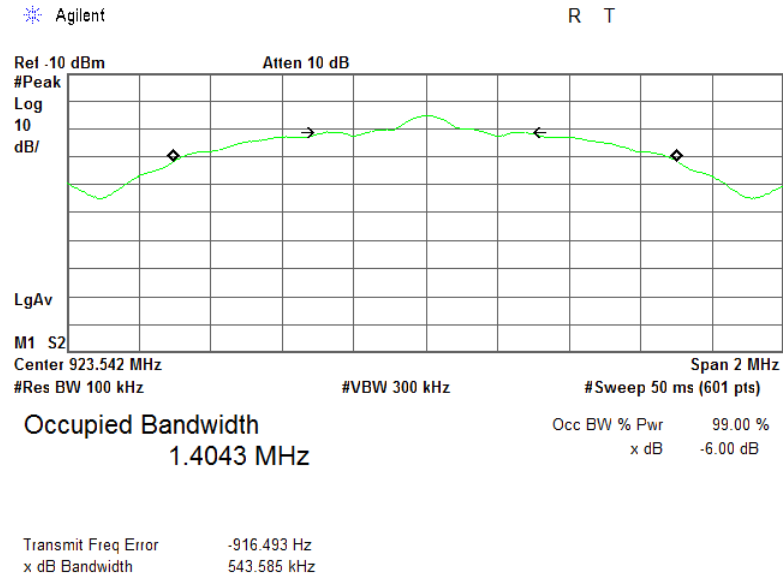




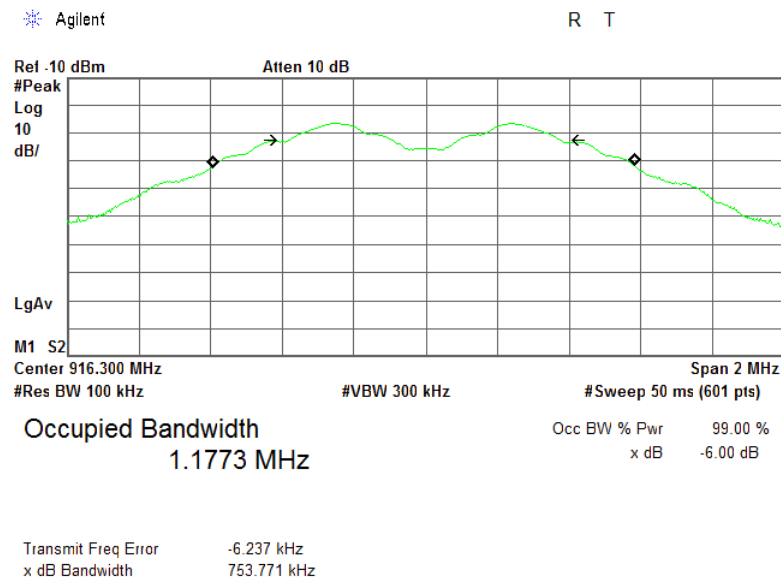
HERMON LABORATORIES

Test specification: Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth			
Test procedure: ANSI C63.10 section 11.8.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 31-Aug-16			
Temperature: 23 °C	Relative Humidity: 56 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.1.3 The occupied bandwidth test result at high frequency BPSK modulation



Plot 7.1.4 The occupied bandwidth test result at carrier frequency, FSK modulation





Test specification: Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power			
Test procedure: ANSI C63.10 section 11.9.1.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

7.2 Maximum 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: $E = \sqrt{30 \times P \times G} / r$, 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 power of the EUT carrier frequency was measured with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

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

7.2.2.5 The maximum output power was calculated using the equation for field strength of carrier as follows:

$$\text{Peak output power in dBm} = \text{Field strength in dB}(\mu\text{V/m}) - \text{Transmitter antenna gain in dBi} - 95.2 \text{ dB}$$

$$P = \text{SA reading, dBm} + 107 \text{ dB} + \text{AF, dB/m} + \text{CL, dB} - \text{Transmitter antenna gain, dBi} - 95.2 \text{ dB},$$

where 107 dB is a SA conversion factor

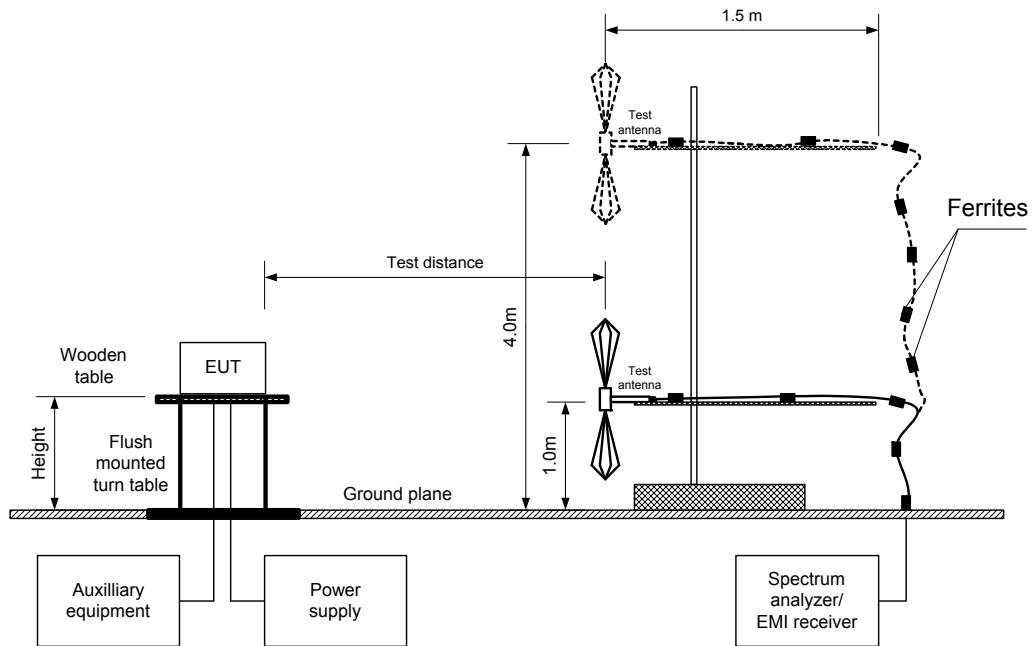
AF – measuring antenna factor

CL – cable loss.

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(4), Maximum output power			
Test procedure: ANSI C63.10 section 11.9.1.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements





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Test specification: Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power			
Test procedure: ANSI C63.10 section 11.9.1.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY: 902 - 928 MHz
 TEST DISTANCE: 3 m
 TEST SITE: OATS
 EUT HEIGHT: 0.8 m
 DETECTOR USED: Peak
 TEST ANTENNA TYPE: Log periodic
 MODULATION: BPSK
 CHIP RATE: 900 kbps
 EUT 6 dB BANDWIDTH: 640 kHz

Frequency, MHz	SA reading, dBm	Antenna factor, dB/m	Cable loss, dB	EUT antenna gain, dBi	Peak output power, dBm*	Limit, dBm	Margin, dB**	Verdict
905.43	-18.74	22.6	4.5	0	20.16	30.0	-9.84	Pass
916.30	-17.60	22.7	4.5	0	21.40	30.0	-8.60	Pass
919.92	-17.66	22.7	4.5	0	21.34	30.0	-8.66	Pass
923.55	-17.83	22.8	4.5	0	21.27	30.0	-8.73	Pass

MODULATION: FSK
 BIT RATE: 60 kbps
 EUT 6 dB BANDWIDTH: 754 kHz

Frequency, MHz	SA reading, dBm	Antenna factor, dB/m	Cable loss, dB	EUT antenna gain, dBi	Peak output power, dBm**	Limit, dBm	Margin, dB**	Verdict
916.3	-19.04	22.7	4.5	0	19.86	30.0	-10.14	Pass

*- Peak output power was calculated as follows:

SA reading, dBm + 107 dB + AF, dB/m + CL, dB - Transmitter antenna gain, dBi - 95.2 dB.

** - Margin = Output power – specification limit.

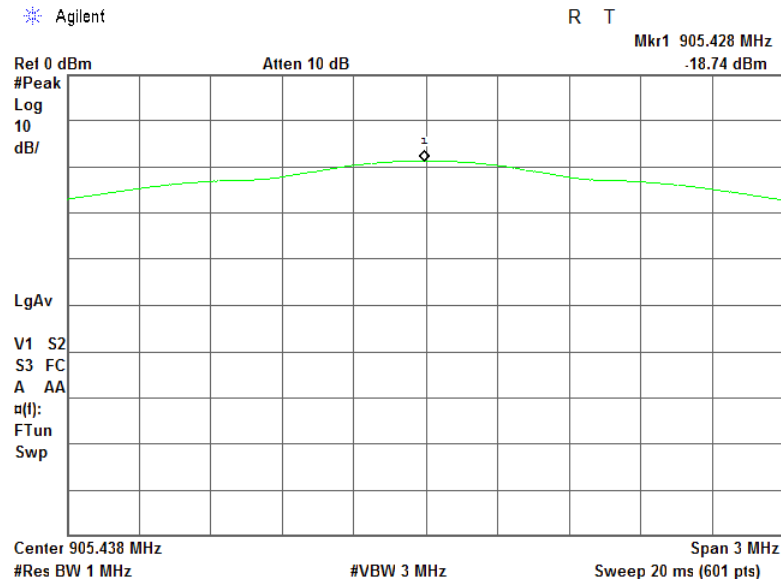
Reference numbers of test equipment used

HL 0415	HL 0569	HL 3818	HL 4294				
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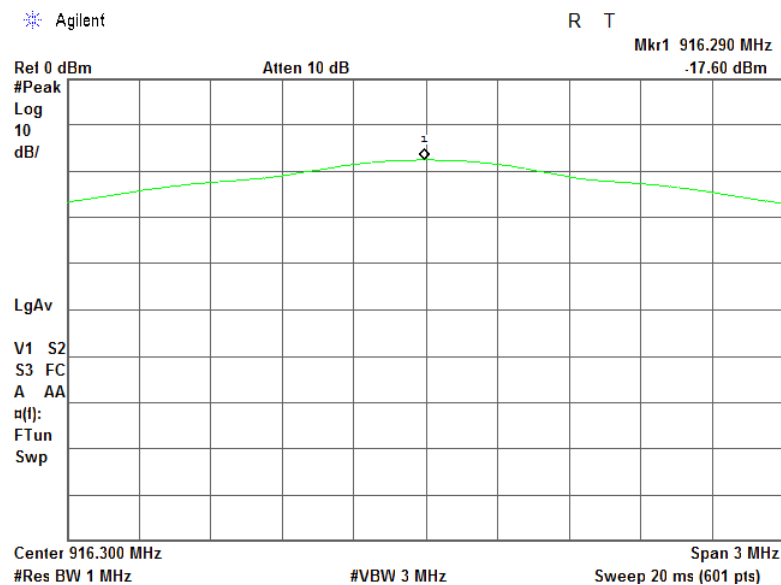
Full description is given in Appendix A.

Test specification: Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power			
Test procedure: ANSI C63.10 section 11.9.1.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.2.1 Field strength of carrier at low frequency BPSK modulation

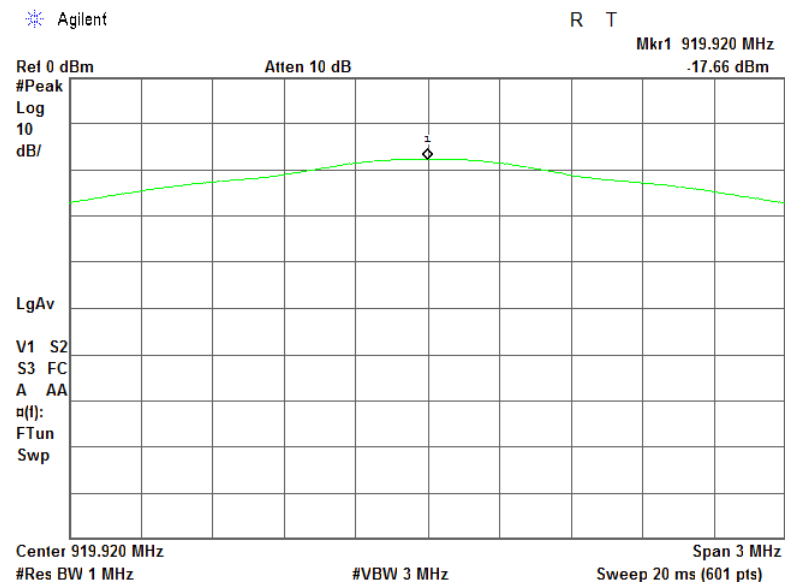


Plot 7.2.2 Field strength of carrier at mid frequency BPSK modulation

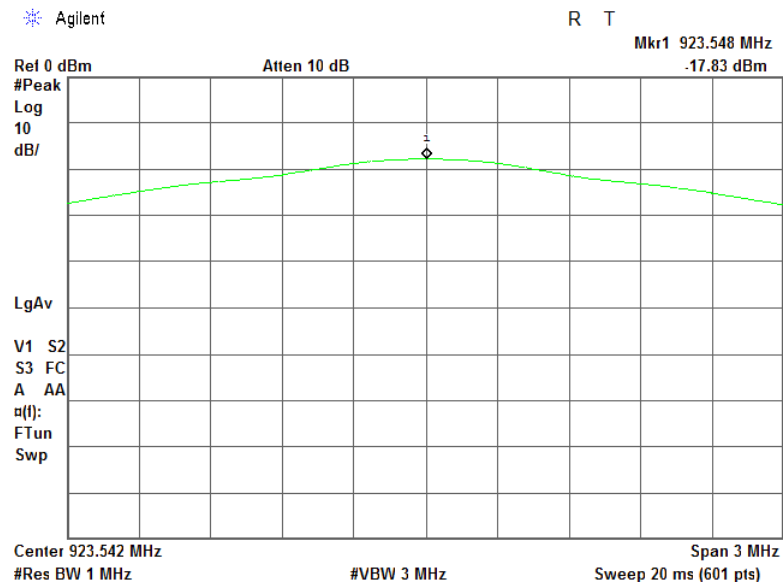


Test specification: Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power			
Test procedure: ANSI C63.10 section 11.9.1.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.2.3 Field strength of carrier at mid frequency BPSK modulation



Plot 7.2.4 Field strength of carrier at high frequency BPSK modulation

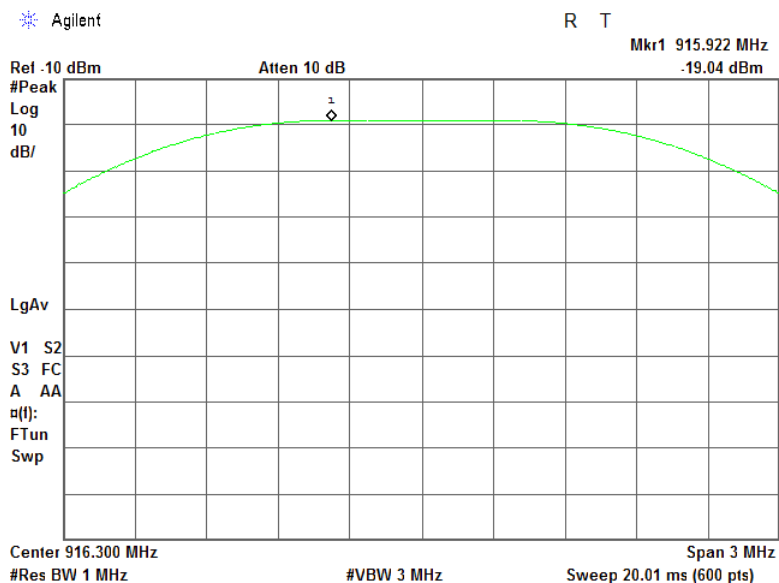




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Test specification: Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power			
Test procedure: ANSI C63.10 section 11.9.1.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.2.5 Field strength of carrier FSK modulation



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
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**	30.0
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 – 10 th harmonic	74.0	NA	54.0	

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

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log (S_1/S_2),$$

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° 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°, 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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

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

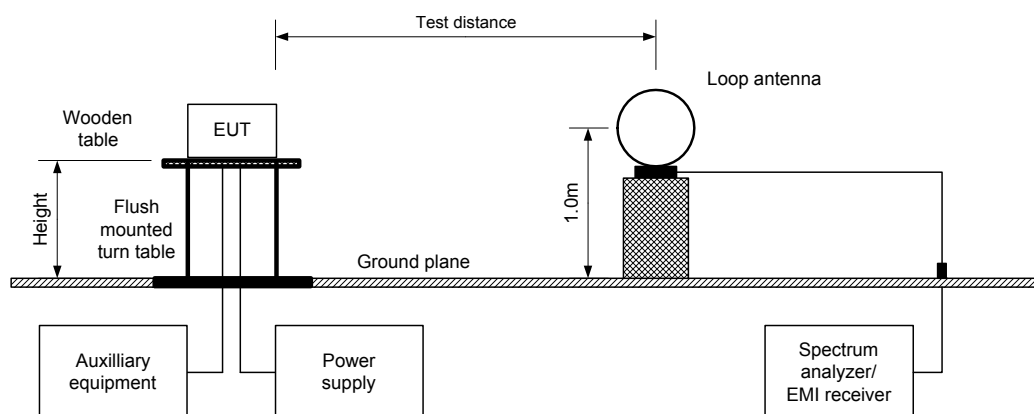
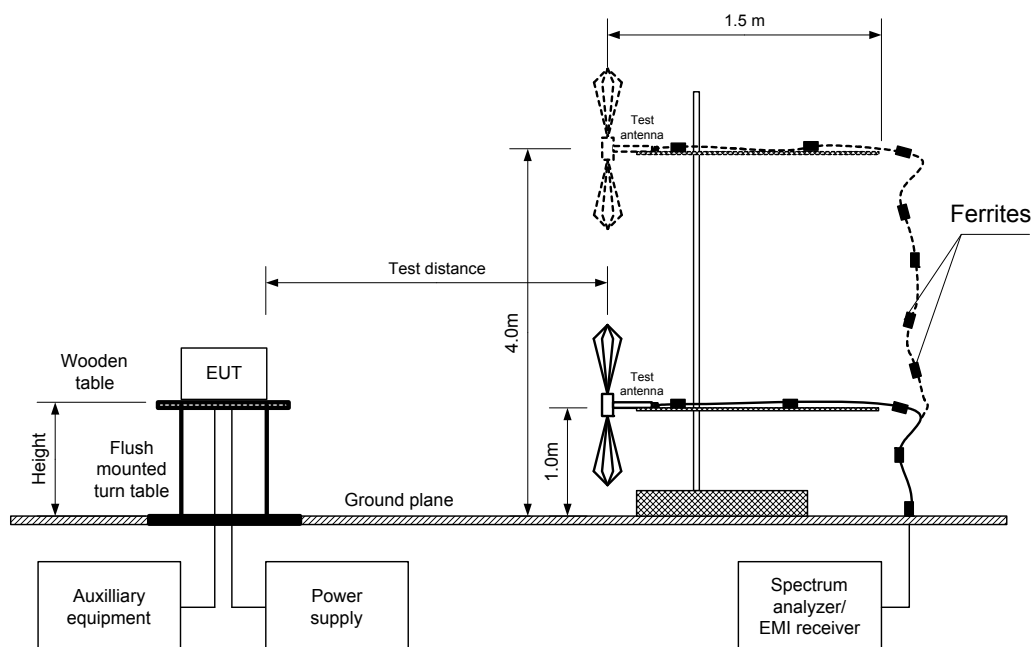
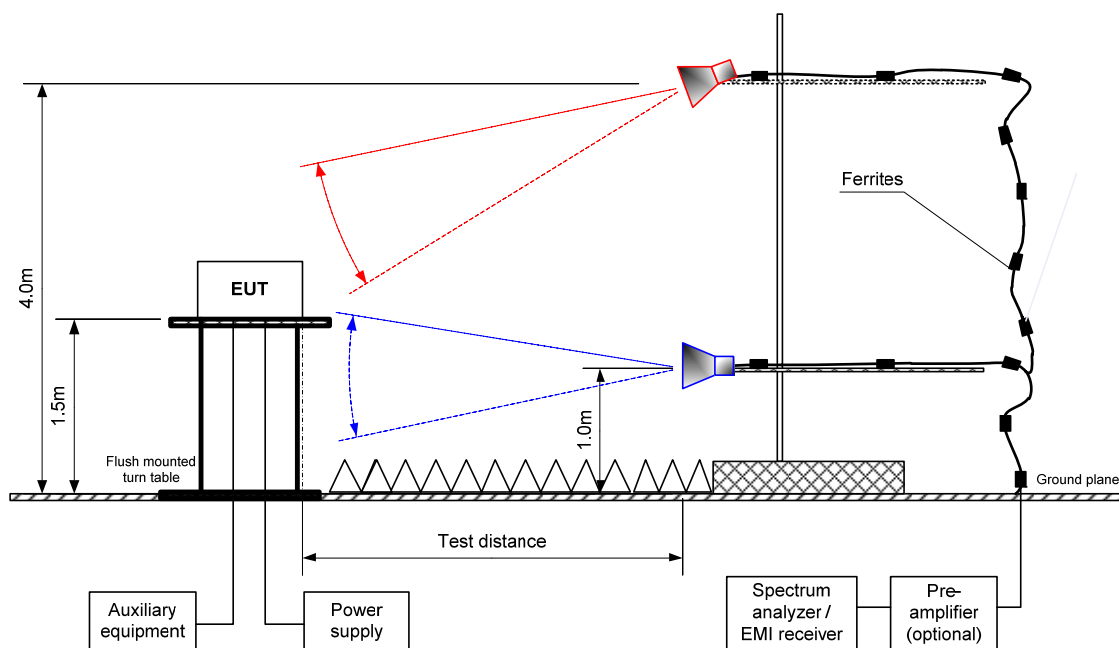


Figure 7.3.2 Setup for spurious emission field strength measurements in 30 – 1000 MHz



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Figure 7.3.3 Setup for spurious emission field strength measurements above 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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Table 7.3.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY: 902 - 928 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 - 9300 MHz
 TEST DISTANCE: 3 m
 MODULATION: BPSK
 CHIPRATE: 900 kbps
 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)

Double Haged gauge (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
Carrier frequency 905.43 MHz									
1810.86	53.53	V	1.4	60	114.72	61.19	20	41.19	Pass
6337.87	43.49	V	1.5	230		71.23		51.23	Pass
7243.50	40.96	V	1.5	272		73.76		53.76	Pass
Carrier frequency 916.3 MHz									
1832.61	54.17	V	1.4	60	113.08	58.91	20	38.91	Pass
5497.8	40.84	V	1.4	230		72.24		52.24	Pass
Carrier frequency 919.92 MHz									
1839.85	59.84	V	1.4	60	113.39	53.55	20	33.55	Pass
Carrier frequency 923.54 MHz									
1847.12	60.47	V	1.4	60	113.72	53.25	20	33.25	Pass

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

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

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

ASSIGNED FREQUENCY: 902 – 928 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 1000 MHz
 TEST DISTANCE: 3 m
 MODULATION: BPSK
 BIT RATE: 900 kbps
 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*				
963.8	58.7	51.0	54.0	-3.0	Vert	1.0	330	Pass
961.2	59.4	51.4	54.0	-2.6	Vert	1.0	330	
963.9	58.9	51.1	54.0	-2.9	Vert	1.0	320	
961.2	59.2	50.4	54.0	-3.6	Vert	1.0	330	

*- Margin = Measured emission - specification limit.

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

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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Table 7.3.4 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY: 902 – 928 MHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 9300 MHz
 TEST DISTANCE: 3 m
 MODULATION: BPSK
 CHIP RATE: 900 kbps
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide

TEST ANTENNA TYPE: Double ridge guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Carrier frequency 905.43 MHz											
1000.00	Vertical	1.5	20	51.80	74.0	-22.20	51.80	23.60	54.0	-30.40	Pass
2716.29	Vertical	1.5	60	43.12	74.0	-30.88	43.12	14.92	54.0	-39.08	
3621.76	Vertical	1.4	68	48.10	74.0	-25.90	48.10	19.90	54.0	-34.10	
4527.2	Vertical	1.4	70	49.40	74.0	-24.60	49.40	21.20	54.0	-32.80	
5432.60	Vertical	1	52	49.40	74.0	-24.60	49.40	21.20	54.0	-32.80	
9054.43	Vertical	1.4	0	57.92	74.0	-16.08	57.92	29.72	54.0	-24.28	
Carrier frequency 916.30 MHz											
1000.00	Vertical	1.5	0	48.50	74.0	-25.50	48.50	20.30	54.0	-33.70	Pass
2748.90	Vertical	1.4	90	42.39	74.0	-31.61	42.39	14.19	54.0	-39.81	
3665.30	Vertical	1.5	100	48.40	74.0	-25.60	48.40	20.20	54.0	-33.80	
4581.50	Vertical	1.5	120	46.47	74.0	-27.53	46.47	18.27	54.0	-35.73	
Carrier frequency 919.92 MHz											
1000.00	Vertical	1.5	15	48.10	74.0	-25.90	48.10	19.90	54.0	-34.10	Pass
2759.76	Vertical	1.4	80	44.61	74.0	-29.39	44.61	16.41	54.0	-37.59	
3679.68	Vertical	1.3	90	47.92	74.0	-26.08	47.92	19.72	54.0	-34.28	
4599.60	Vertical	1.4	230	44.44	74.0	-29.56	44.44	16.24	54.0	-37.76	
Carrier frequency 923.55 MHz											
1030.00	Vertical	1.5	0	48.30	74.0	-25.70	48.30	20.10	54.0	-33.90	Pass
2770.65	Vertical	1.6	100	45.20	74.0	-28.80	45.20	17.00	54.0	-37.00	
3694.20	Vertical	1.5	60	48.10	74.0	-25.90	48.10	19.90	54.0	-34.10	
4617.75	Vertical	1.4	80	41.48	74.0	-32.52	41.48	13.28	54.0	-40.72	

*- 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 7.3.5 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
3.9	100	NA	NA	NA	-28.2

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:

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

for pulse train longer than 100 ms:

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



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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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Table 7.3.5 Restricted bands

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	

Harmonic distribution:

Harmonic #	Low carrier, MHz	Mid carrier, MHz	High carrier, MHz
1	905.4375	916.3020	923.5463
2	1,810.8750	1,832.6040	1,847.0925
3	2,716.3125	2,748.9060	2,770.6388
4	3,621.7500	3,665.2080	3,694.1850
5	4,527.1875	4,581.5100	4,617.7313
6	5,432.6250	5,497.8120	5,541.2775
7	6,338.0625	6,414.1140	6,464.8238
8	7,243.5000	7,330.4160	7,388.3700
9	8,148.9375	8,246.7180	8,311.9163
10	9,054.3750	9,163.0200	9,235.4625

Legend:

Outside restricted band harmonic
Within restricted band harmonic

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0583	HL 0604	HL 2697	HL 3342	HL 3818	HL 4222
HL 4339	HL 4933	HL 5107	HL 5110				

Full description is given in Appendix A.

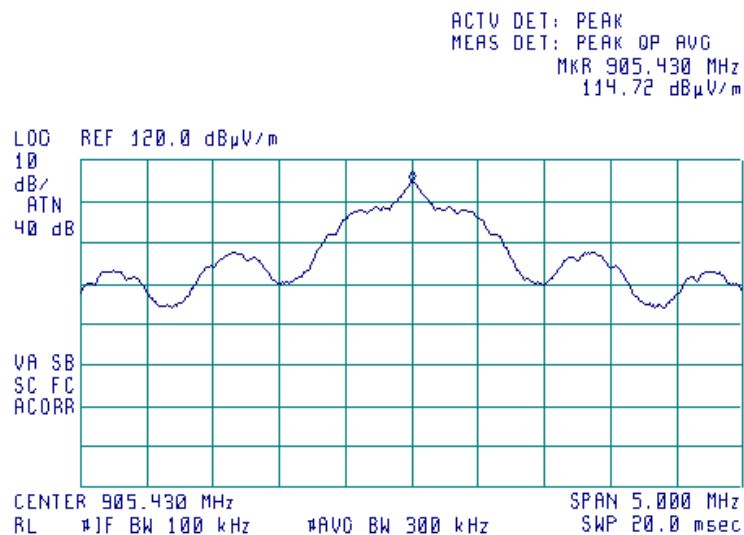


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Test specification: Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

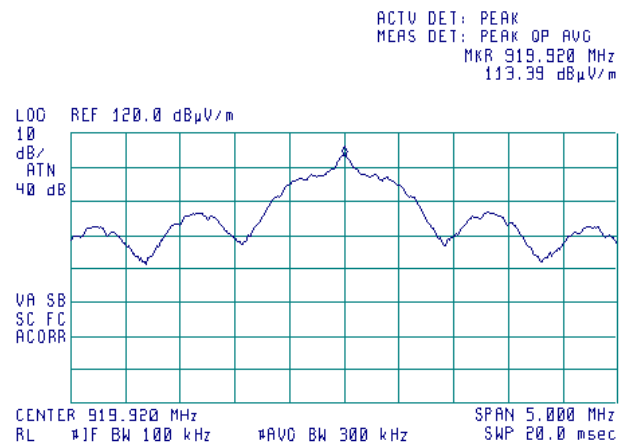
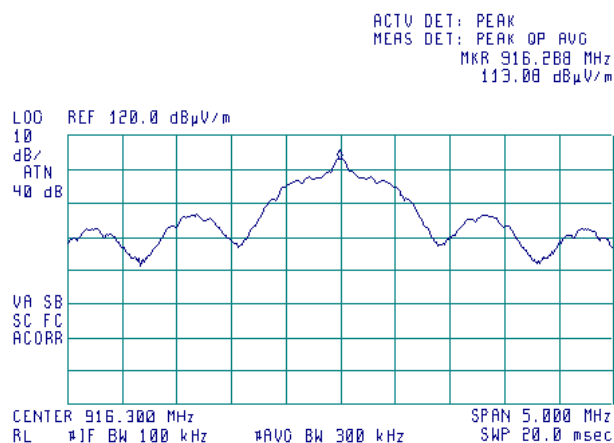
Plot 7.3.1 Radiated emission measurements at the low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
MODULATION: BPSK



Plot 7.3.2 Radiated emission measurements at the mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
MODULATION: BPSK





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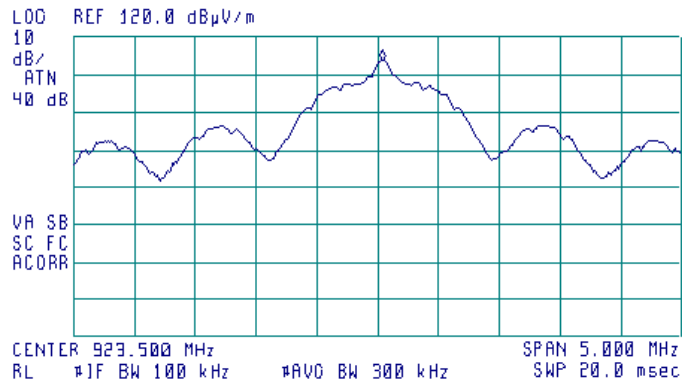
Test specification: Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Plot 7.3.3 Radiated emission measurements at the high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
MODULATION: BPSK



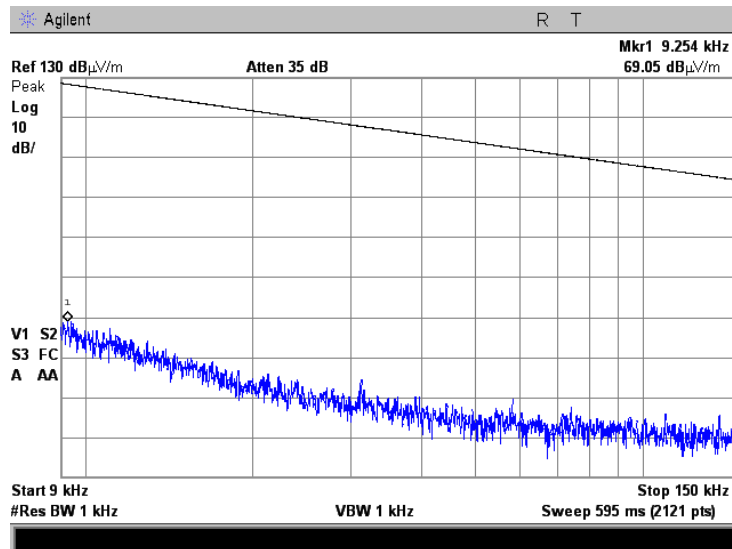
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 923.538 MHz
113.72 dBμV/m



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

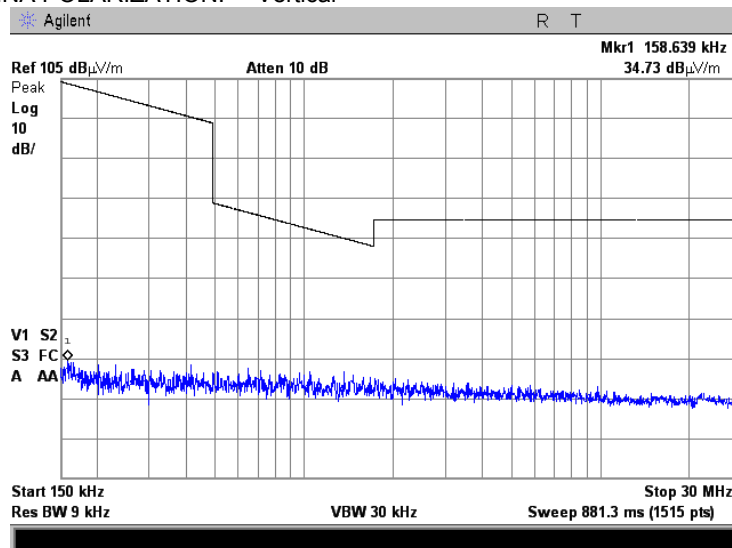
Plot 7.3.4 Radiated emission measurements from 9 to 150 kHz at the low, mid and high carrier frequency

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Plot 7.3.5 Radiated emission measurements from 0.15 to 30 MHz at the low, mid and high carrier frequency

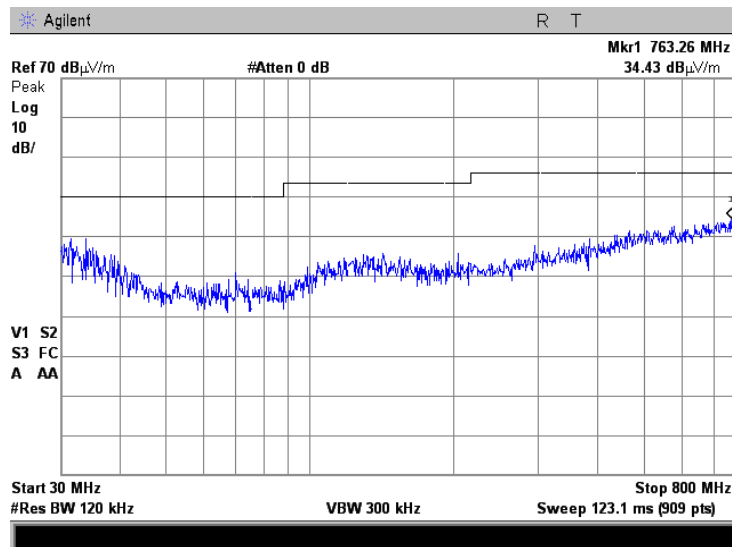
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

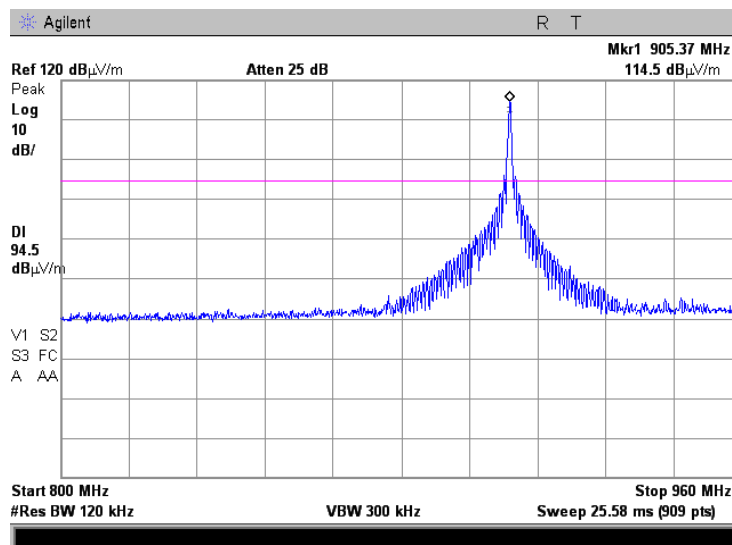
Plot 7.3.6 Radiated emission measurements from 30 to 800 MHz at the low carrier frequency

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



Plot 7.3.7 Radiated emission measurements from 800 to 960 MHz at the low carrier frequency

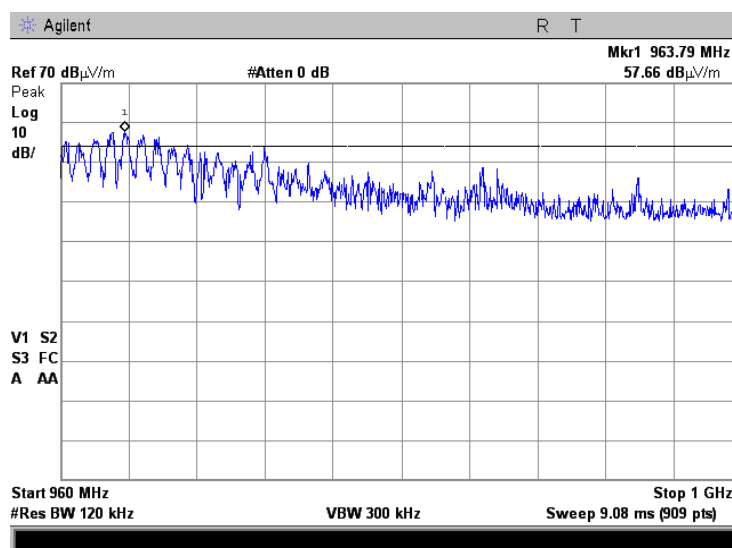
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

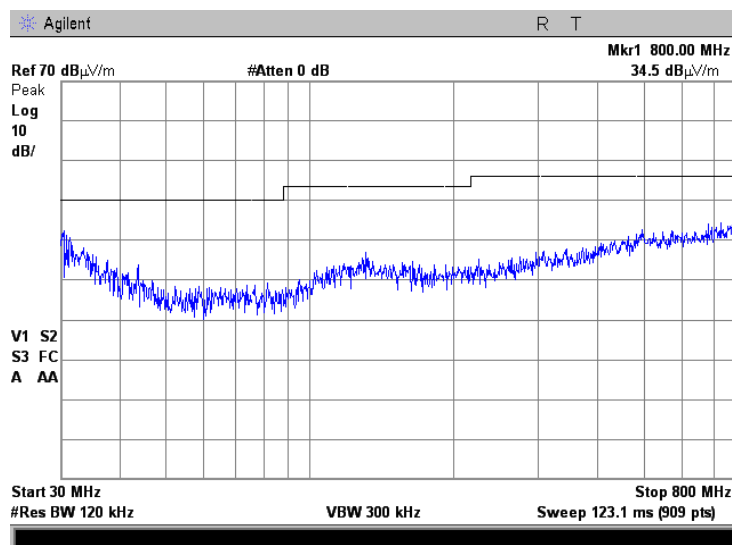
Plot 7.3.8 Radiated emission measurements from 960 to 1000 MHz at the low carrier frequency

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



Plot 7.3.9 Radiated emission measurements from 30 to 800 MHz at the mid carrier frequency 916.3 MHz

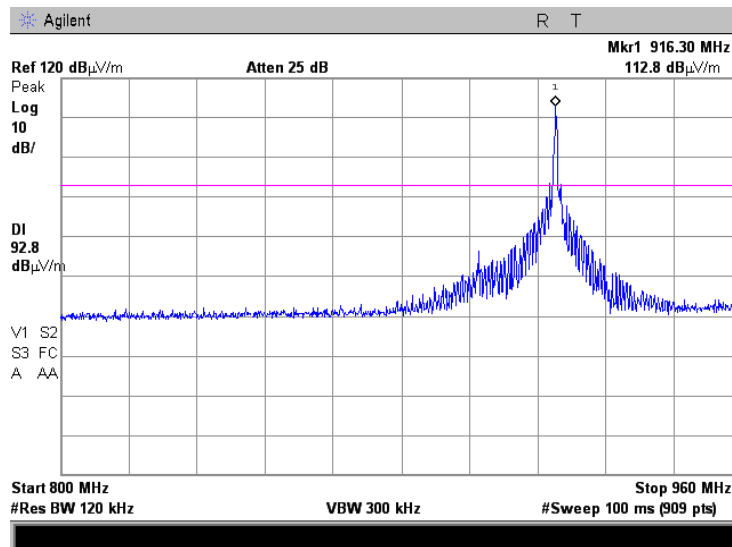
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

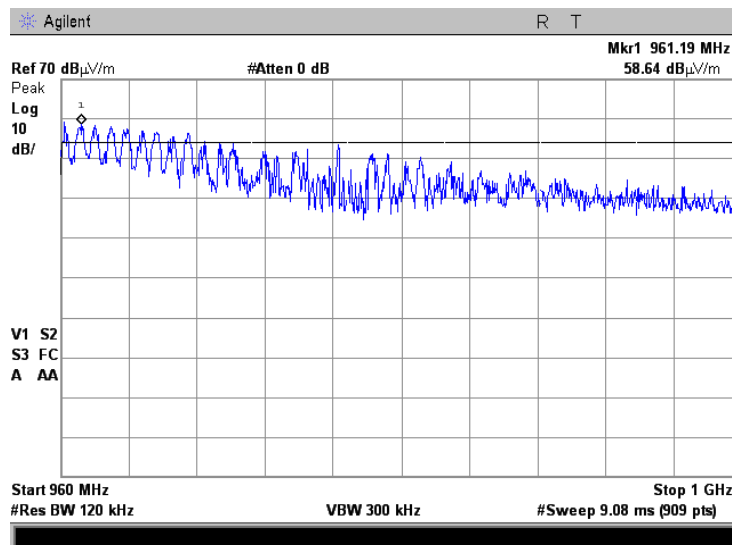
Plot 7.3.10 Radiated emission measurements from 800 to 960 MHz at the mid carrier frequency 916.3 MHz

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



Plot 7.3.11 Radiated emission measurements from 960 to 1000 MHz at the mid carrier frequency 916.3 MHz

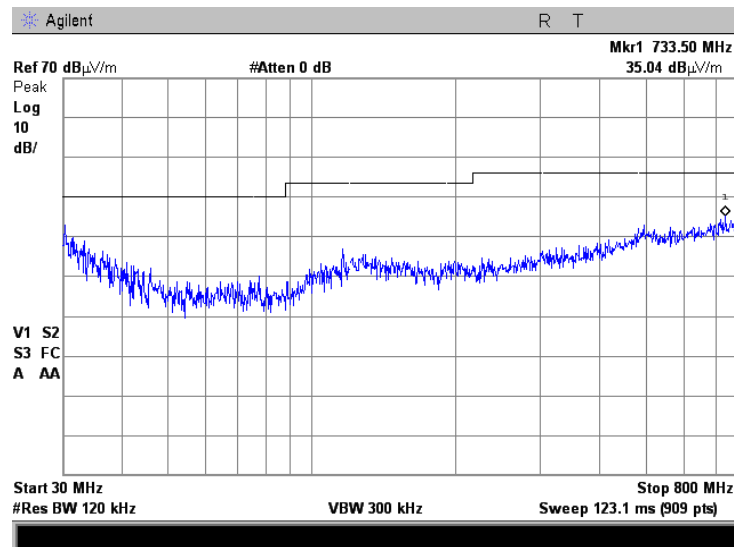
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

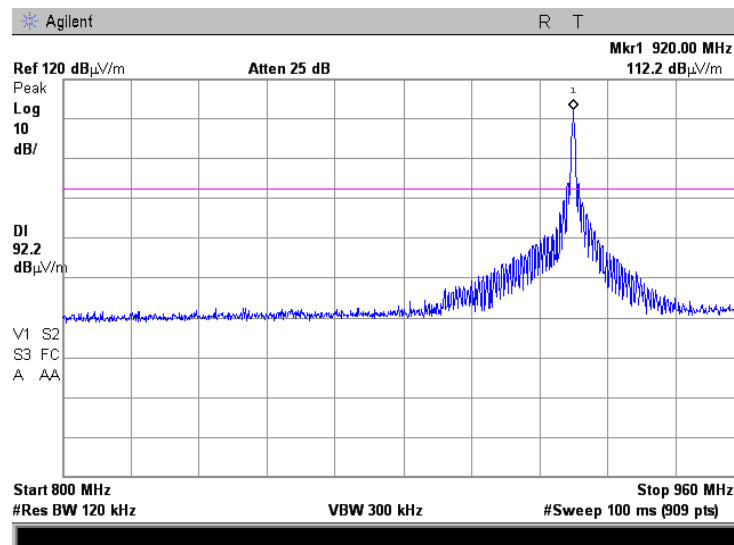
Plot 7.3.12 Radiated emission measurements from 30 to 800 MHz at the mid carrier frequency 919.92 MHz

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



Plot 7.3.13 Radiated emission measurements from 800 to 960 MHz at the mid carrier frequency 919.92 MHz

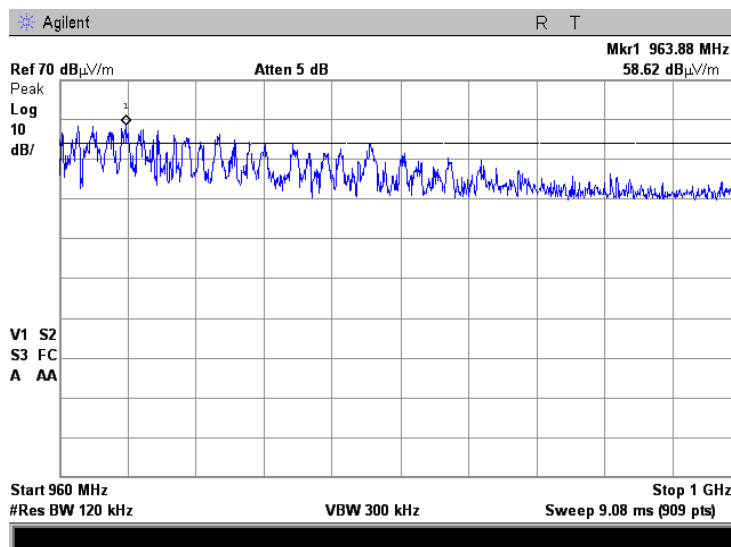
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

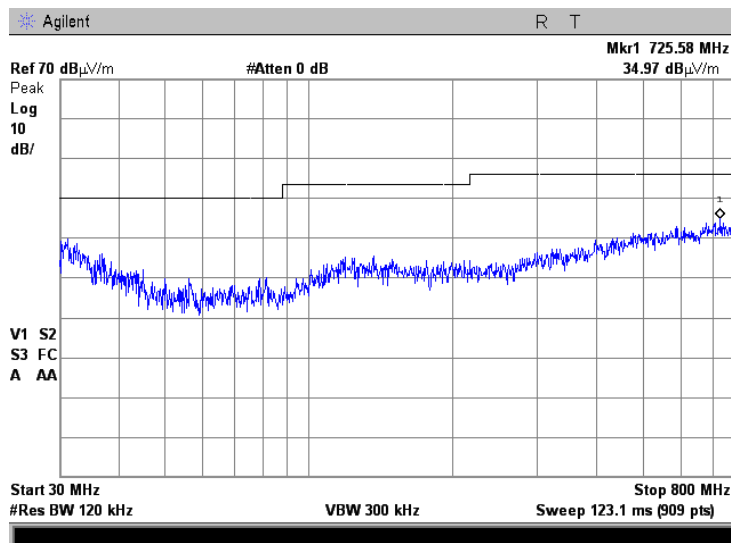
Plot 7.3.14 Radiated emission measurements from 960 to 1000 MHz at the mid carrier frequency 919.92 MHz

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



Plot 7.3.15 Radiated emission measurements from 30 to 800 MHz at the high carrier frequency

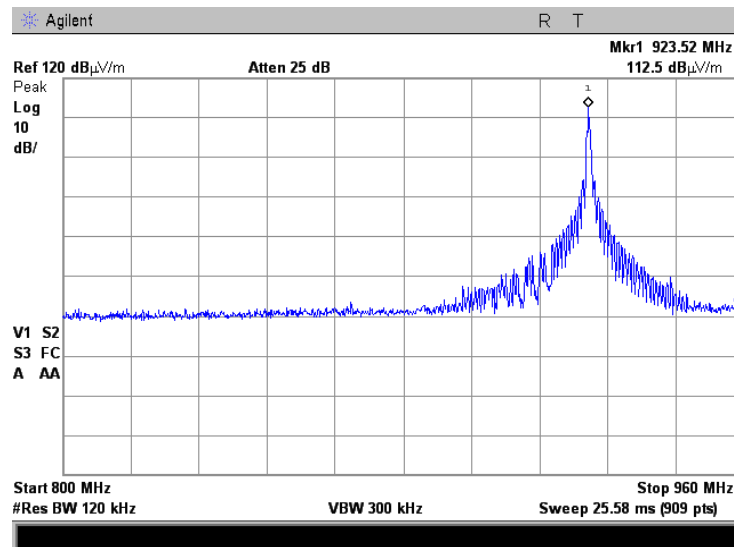
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

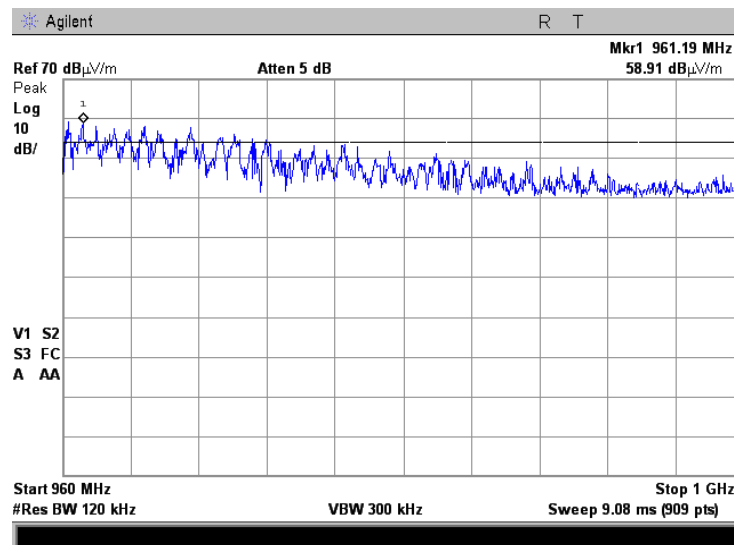
Plot 7.3.16 Radiated emission measurements from 800 to 960 MHz at the high carrier frequency

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



Plot 7.3.17 Radiated emission measurements from 960 to 1000 MHz at the high carrier frequency

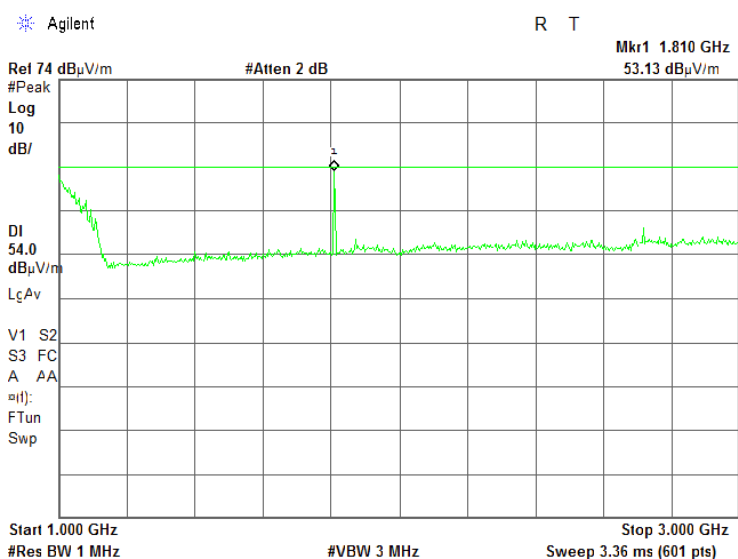
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

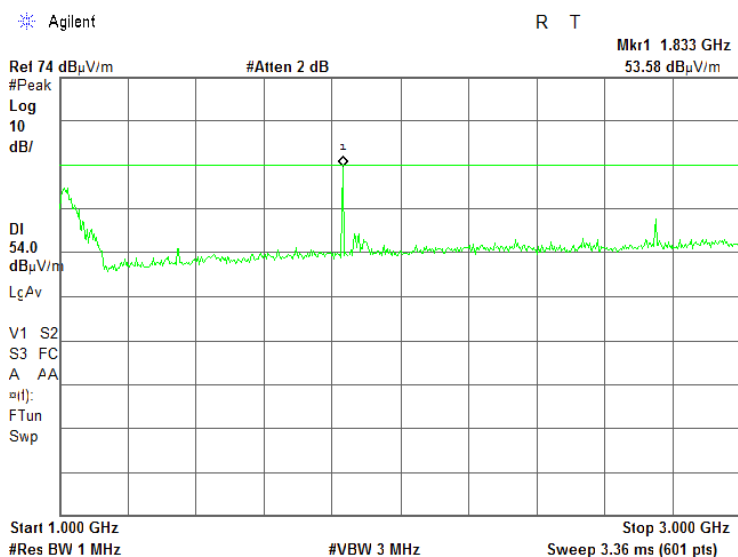
Plot 7.3.18 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency

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



Plot 7.3.19 Radiated emission measurements from 1000 to 3000 MHz at the mid carrier frequency 916.3 MHz

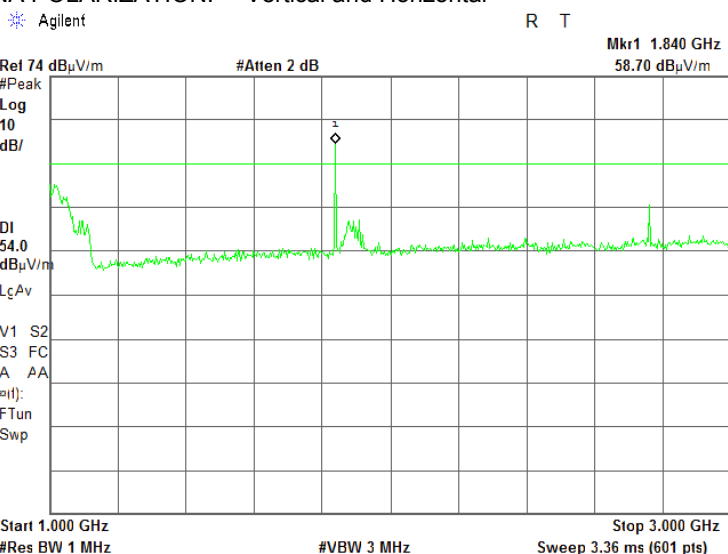
TEST SITE: Full anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

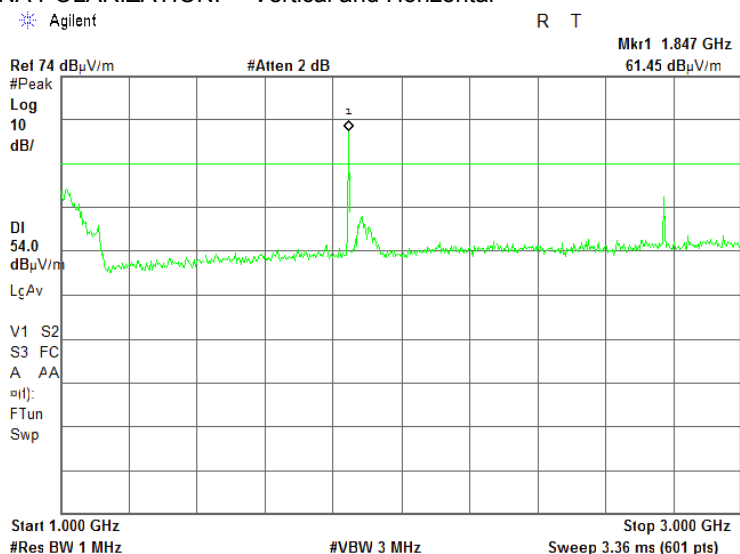
Plot 7.3.20 Radiated emission measurements from 1000 to 3000 MHz at the mid (919.92 MHz) carrier frequency

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



Plot 7.3.21 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency

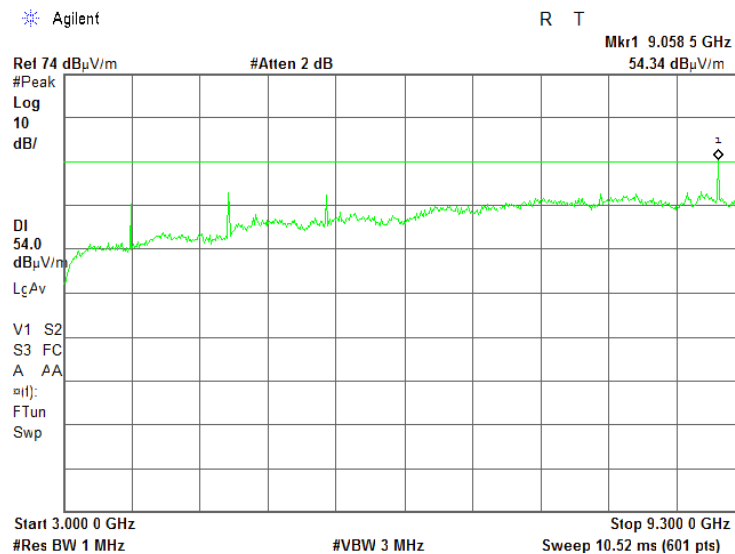
TEST SITE: Full anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

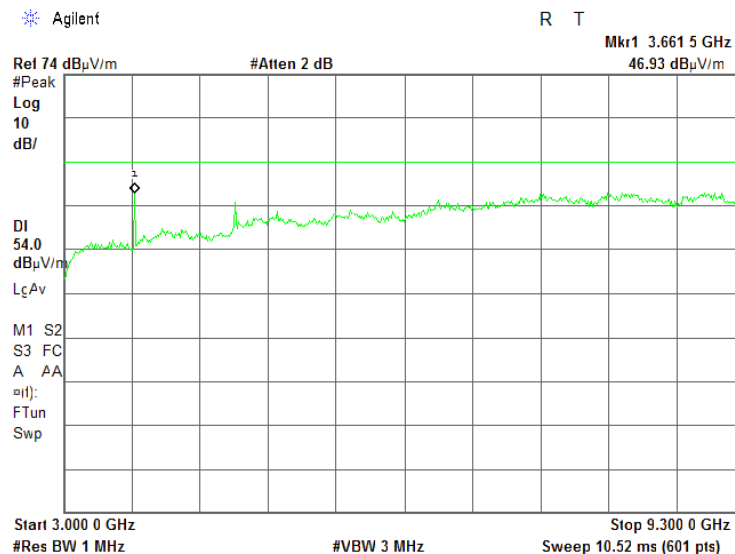
Plot 7.3.22 Radiated emission measurements from 3000 to 9300 MHz at the low carrier frequency

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



Plot 7.3.23 Radiated emission measurements from 3000 to 9300 MHz at the mid (916.3 MHz) carrier frequency

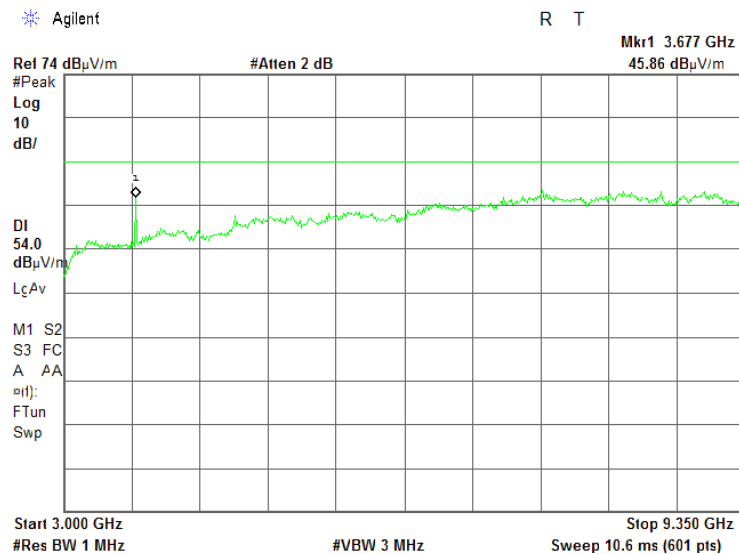
TEST SITE: Full anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

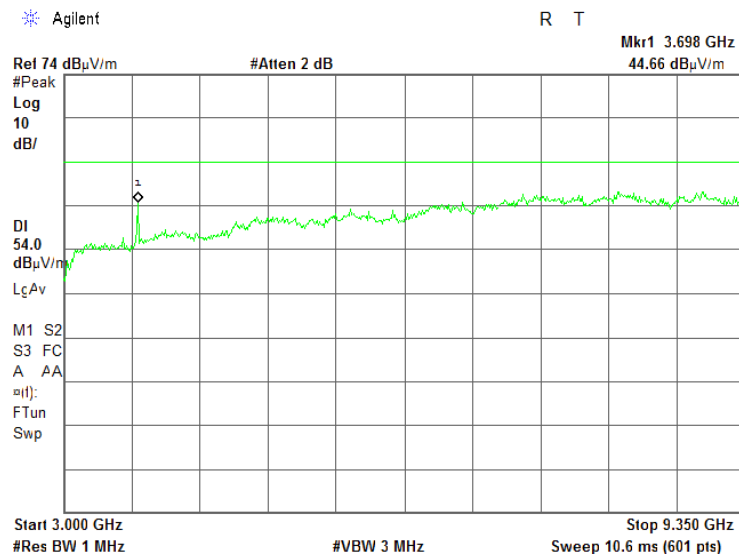
Plot 7.3.24 Radiated emission measurements from 3000 to 9300 MHz at the mid (919.92 MHz) carrier frequency

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



Plot 7.3.25 Radiated emission measurements from 3000 to 9300 MHz at the high carrier frequency

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





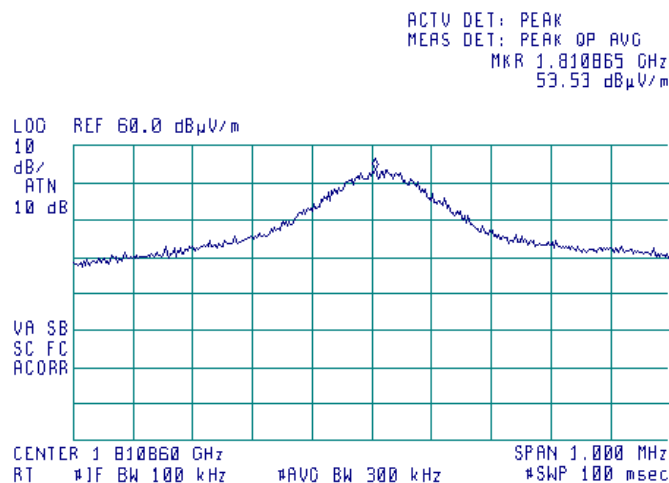
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Test specification: Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Plot 7.3.26 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION

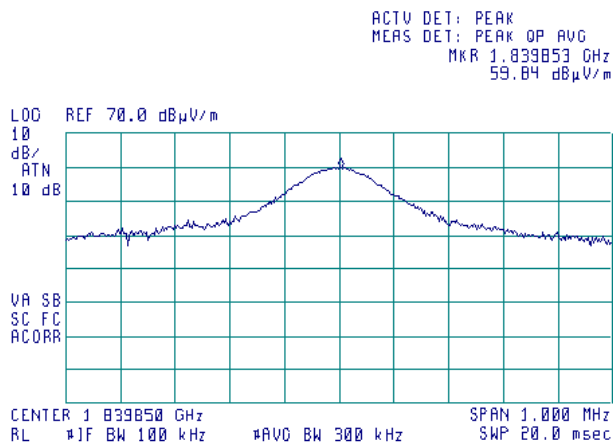
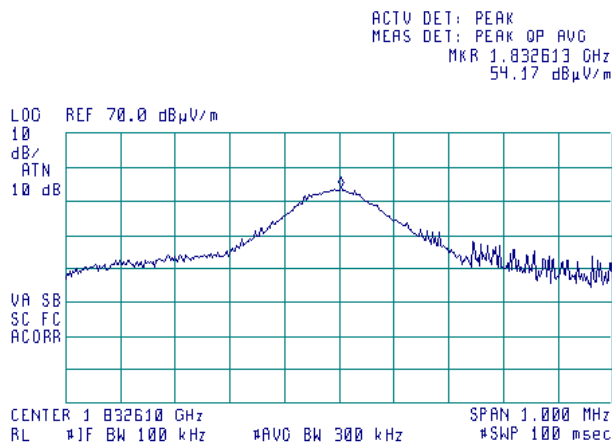
Semi anechoic chamber
3 m
Vertical & Horizontal



Plot 7.3.27 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION

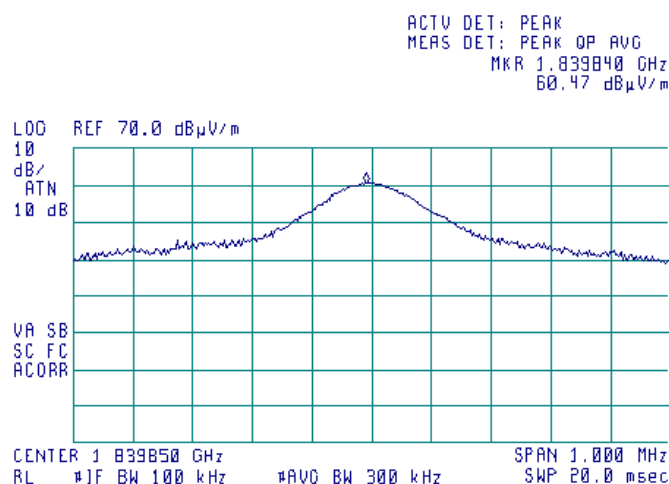
Semi anechoic chamber
3 m
Vertical & Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

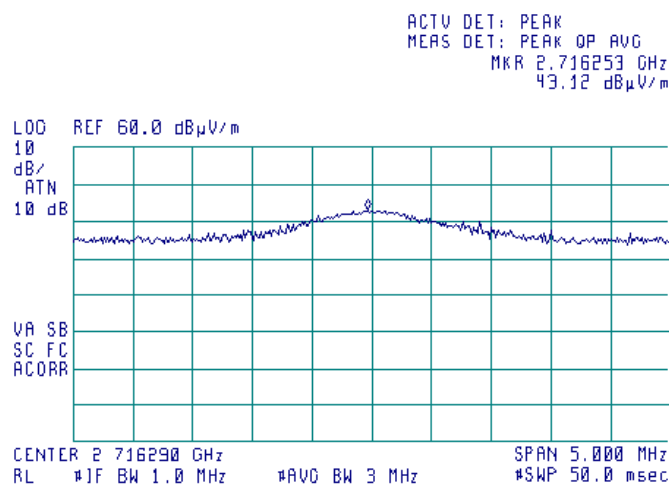
Plot 7.3.28 Radiated emission measurements at the second harmonic of high carrier frequency

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



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

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





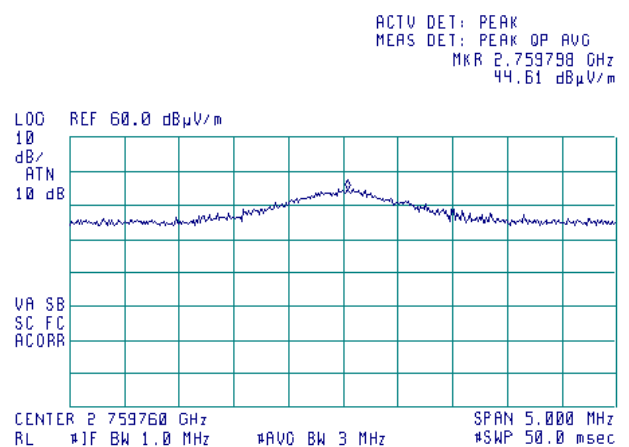
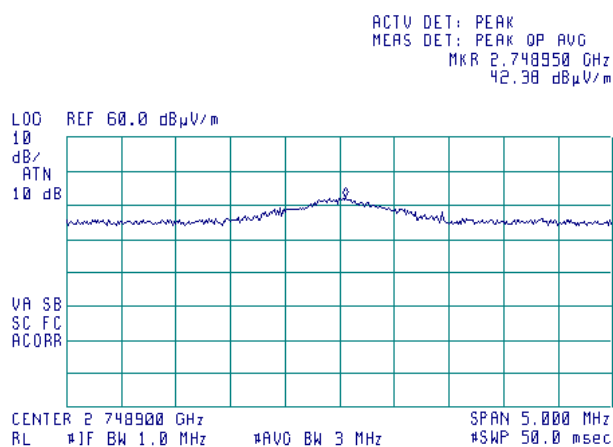
HERMION LABORATORIES

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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

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

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

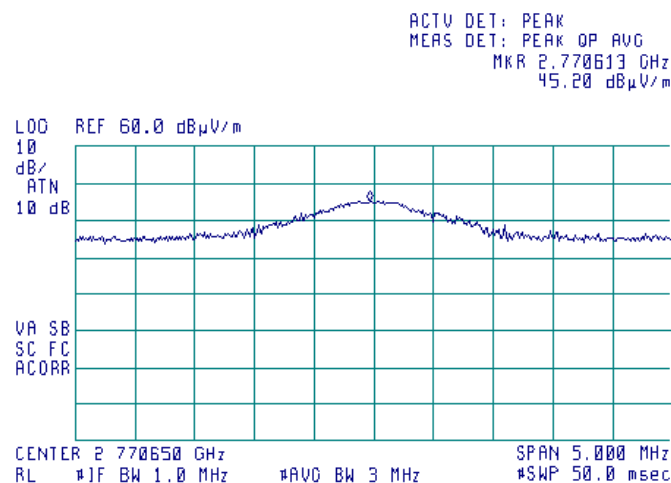
Semi anechoic chamber
3 m
Vertical & Horizontal



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

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

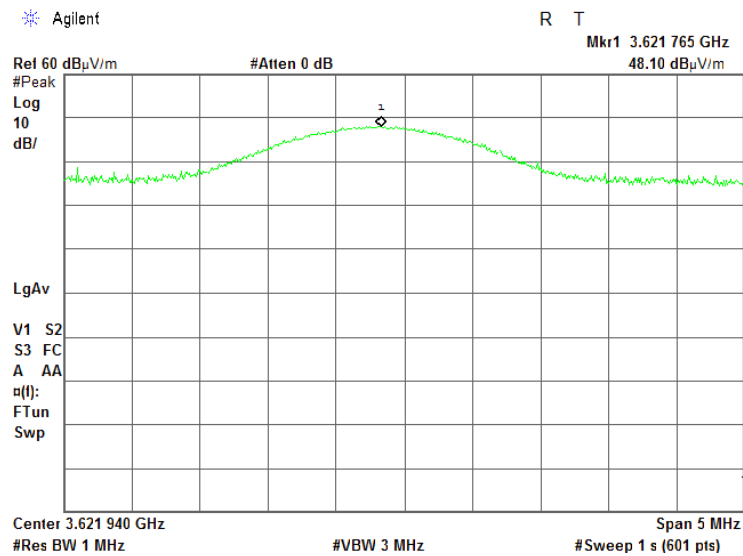
Semi anechoic chamber
3 m
Vertical & Horizontal



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

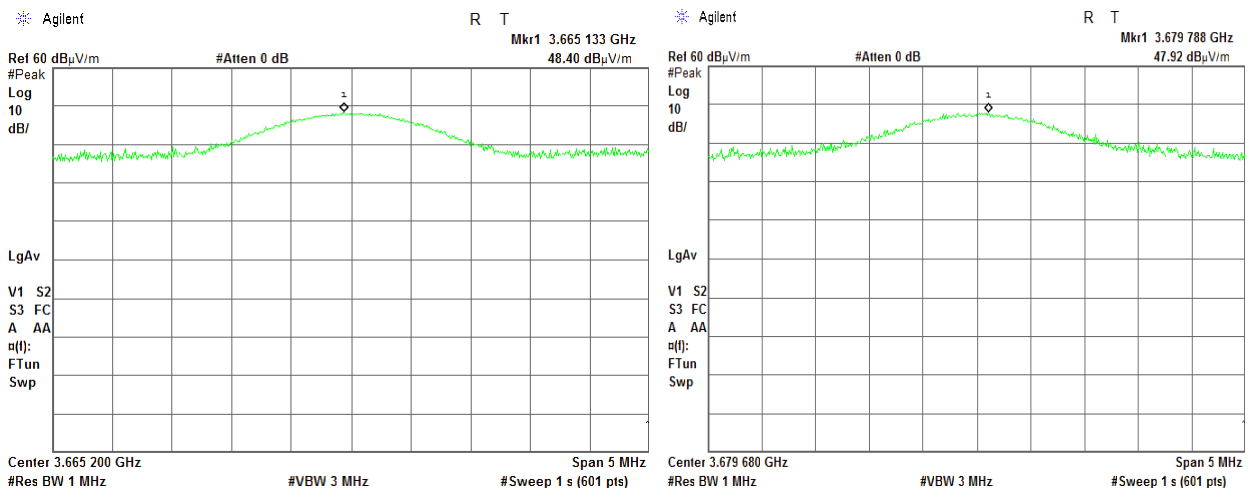
Plot 7.3.32 Radiated emission measurements at the fourth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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

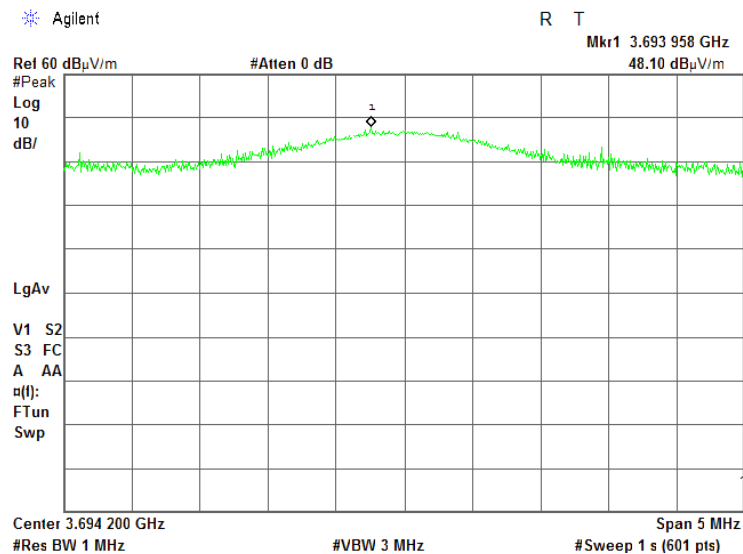
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

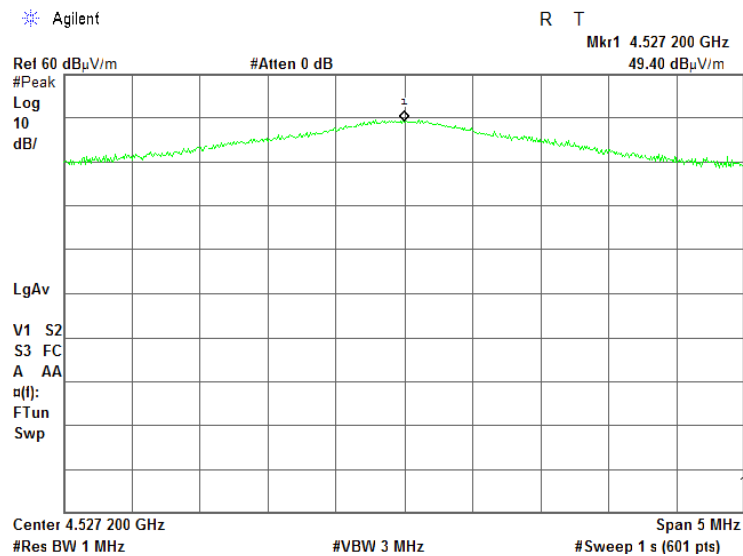
Plot 7.3.34 Radiated emission measurements at the fourth harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal

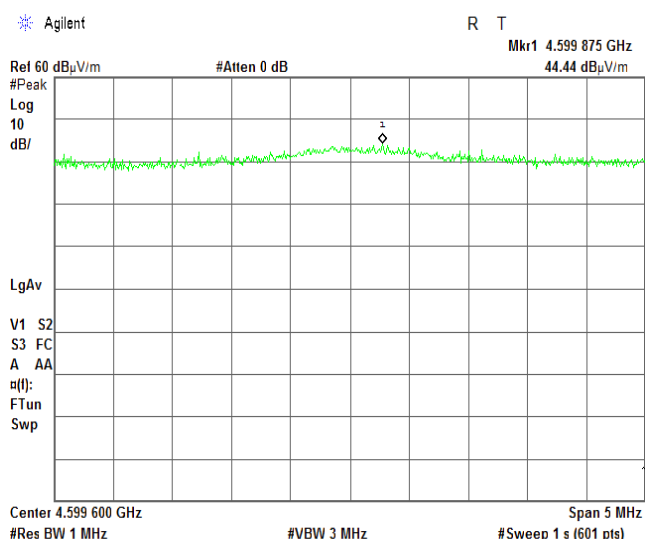
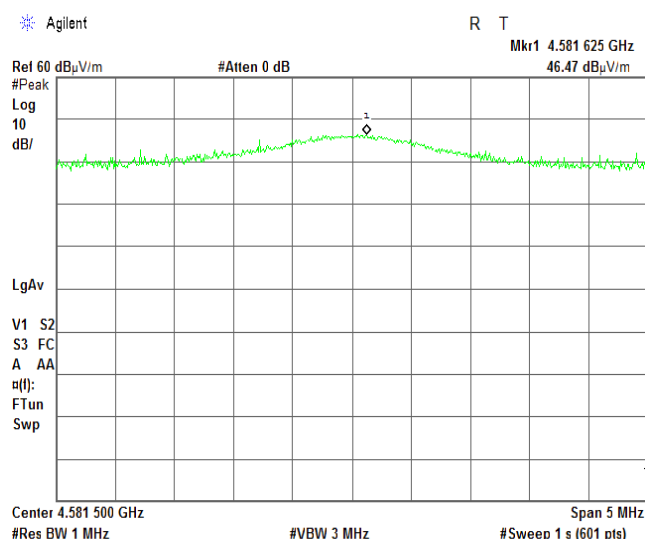


Test specification: Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

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

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

OATS
3 m
Vertical & Horizontal



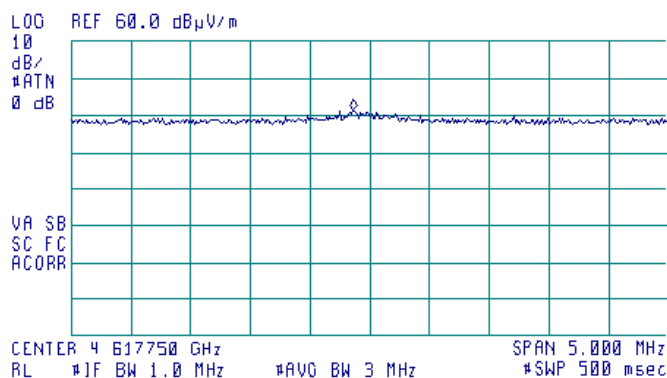
Plot 7.3.37 Radiated emission measurements at the fifth harmonic of high carrier frequency

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:

Semi Anechoic chamber
3 m
Vertical & Horizontal



ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 4.617613 GHz
41.48 dBμV/m



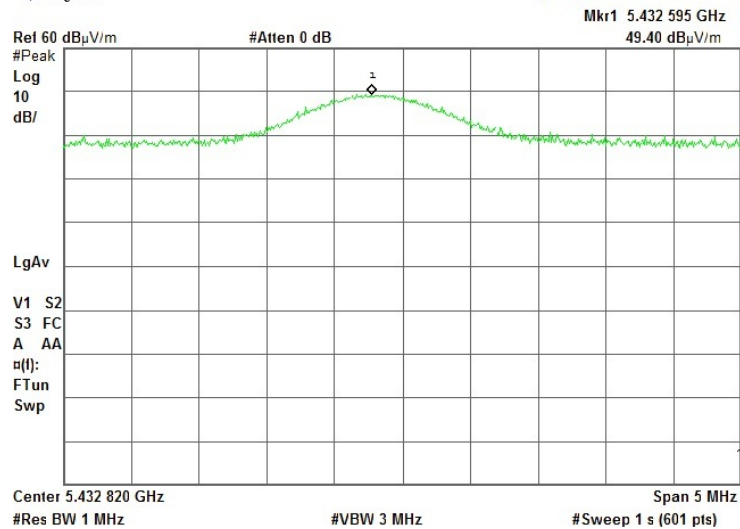
Test specification:		Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions	
Test procedure:		ANSI C63.10 section 11.12.1	
Test mode:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

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

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal

Agilent

R T

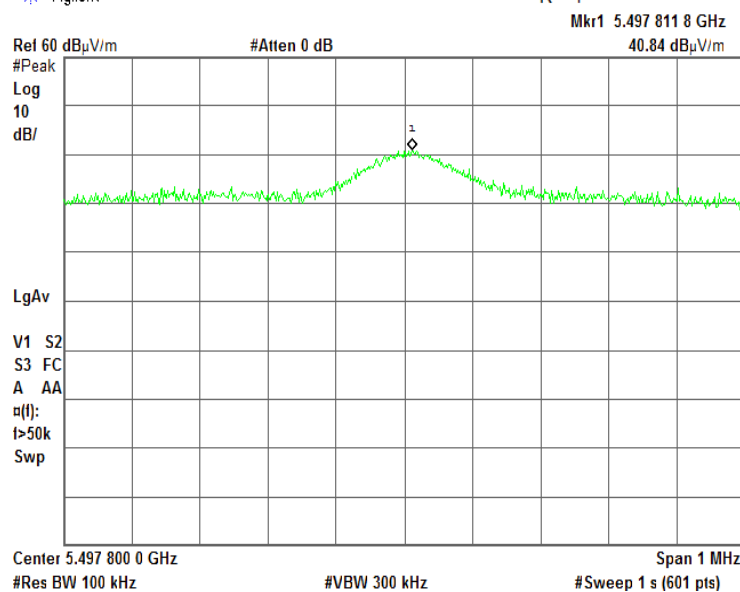


Plot 7.3.39 Radiated emission measurements at the sixth harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal

Agilent

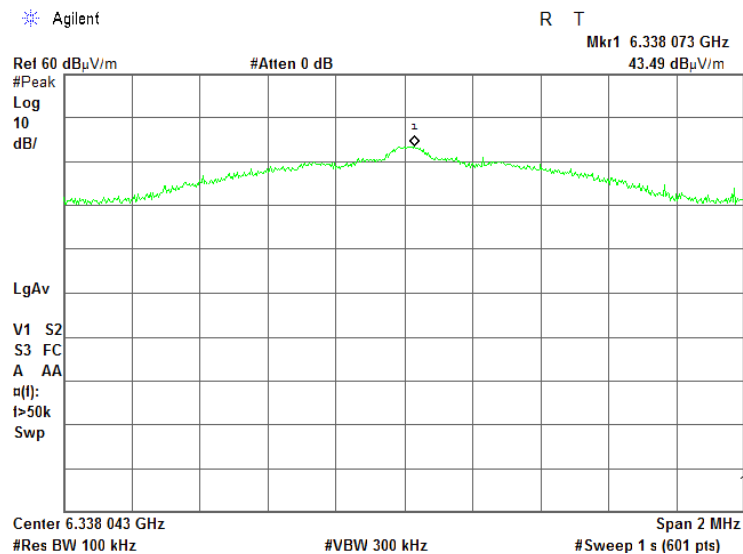
R T



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:		Verdict: PASS	
Date(s):			
07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

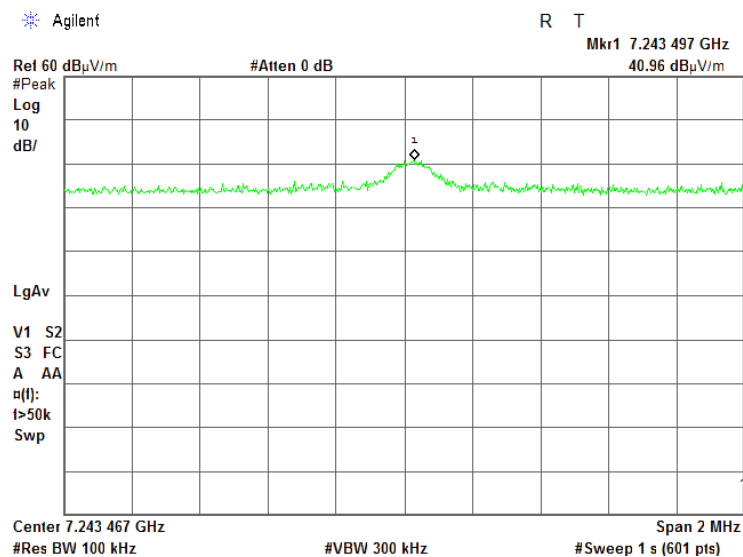
Plot 7.3.40 Radiated emission measurements at the seventh harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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

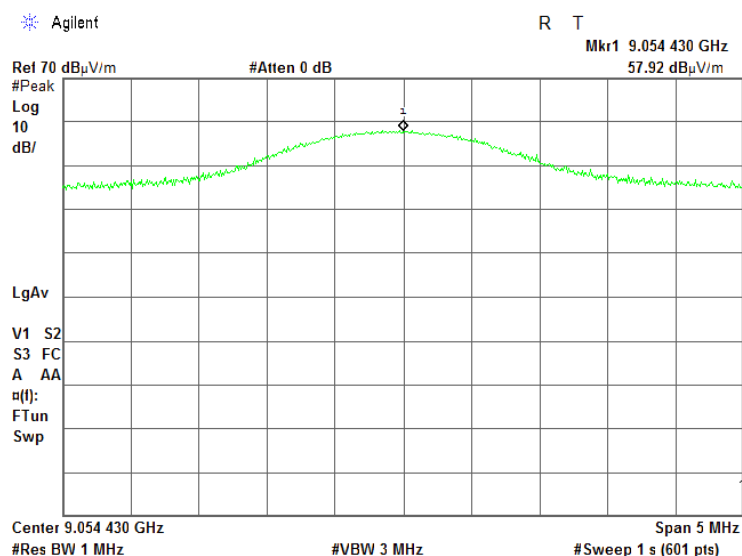
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

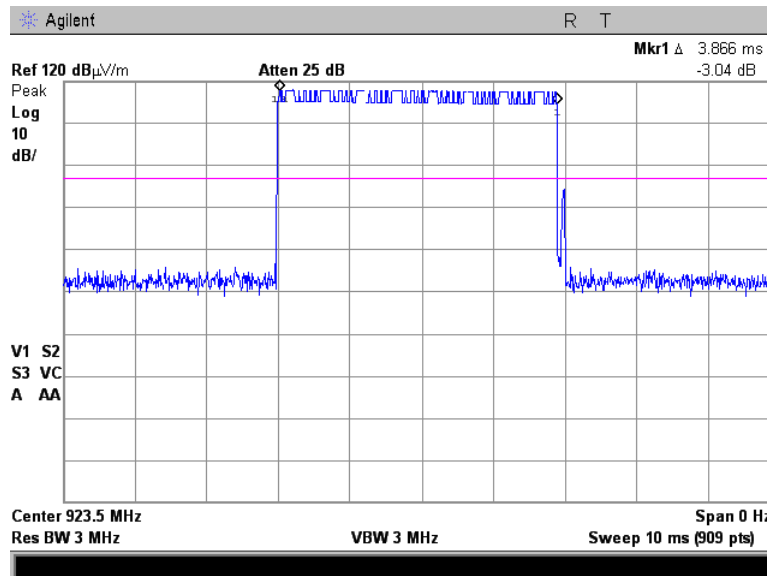
Plot 7.3.42 Radiated emission measurements at the tenth harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal

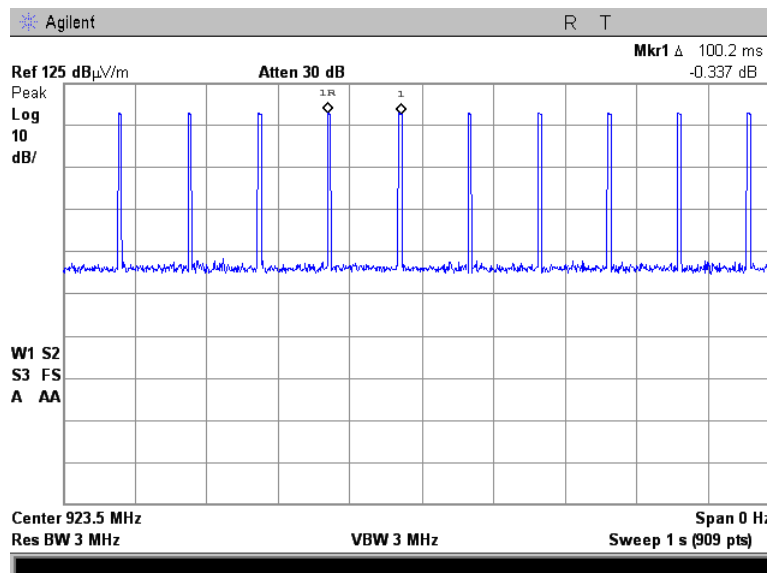


Test specification: Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 07-Sep-16 - 15-Sep-16			
Temperature: 26 °C	Relative Humidity: 41 %	Air Pressure: 1005 hPa	Power: Battery
Remarks:			

Plot 7.3.43 Transmission pulse duration



Plot 7.3.44 Transmission pulse period



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): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 58 %	Air Pressure: 1008 hPa	Power: Battery
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			

* - 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





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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): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 58 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY BAND: 902-928 MHz
 DETECTOR USED: Peak
 MODULATION: BPSK
 BIT RATE: 900 kps
 RESOLUTION BANDWIDTH: $\geq 1\%$ of the span
 VIDEO BANDWIDTH: $\geq$ RBW

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
905.4375	-49.97	-20.30	29.67	20.0	9.67	Pass
923.5425	-49.73	-19.40	30.33		10.33	

*- Margin = Attenuation below carrier – specification limit.

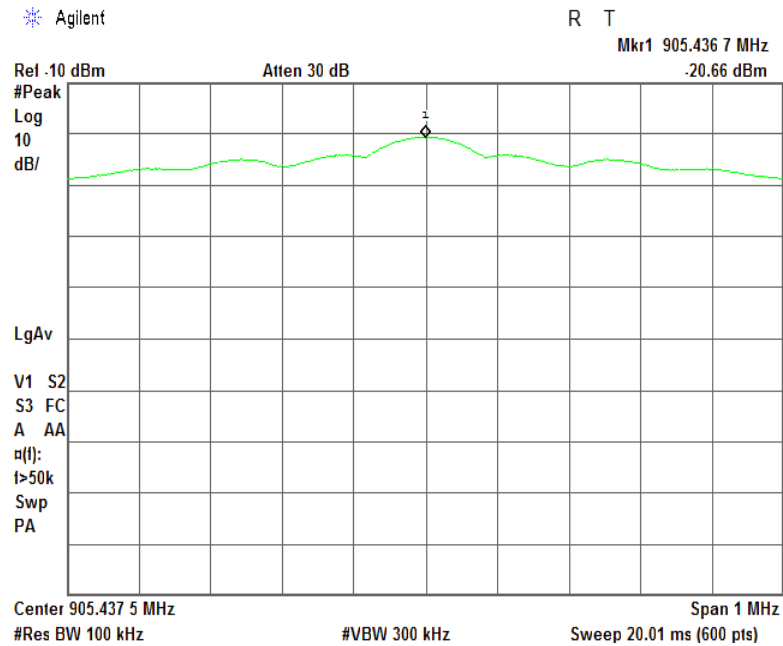
Reference numbers of test equipment used

HL 0415	HL 0569	HL 3818	HL 4294				
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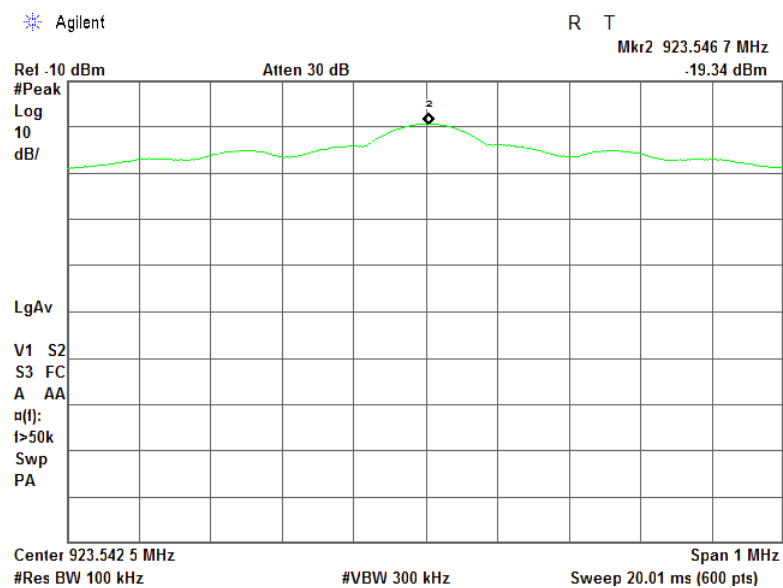
Full description is given in Appendix A.

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): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 58 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.4.1 The highest emission level within the assigned band at low carrier frequency

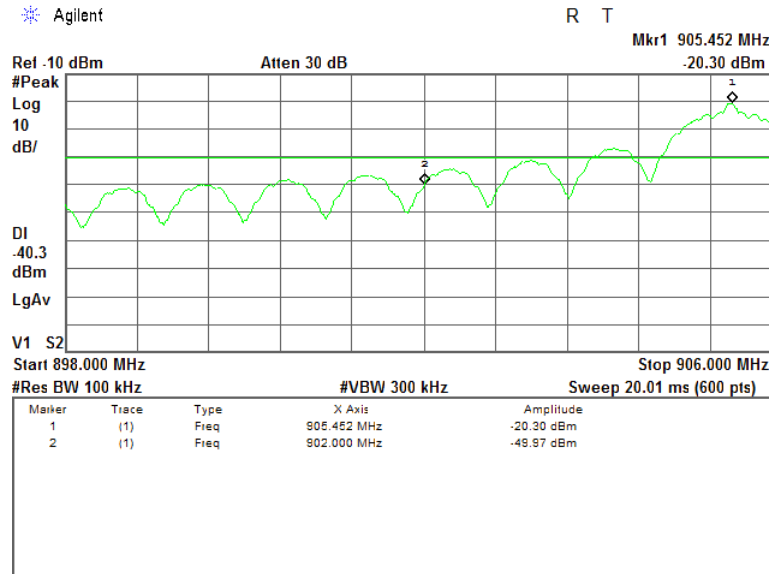


Plot 7.4.2 The highest emission level within the assigned band at high carrier frequency

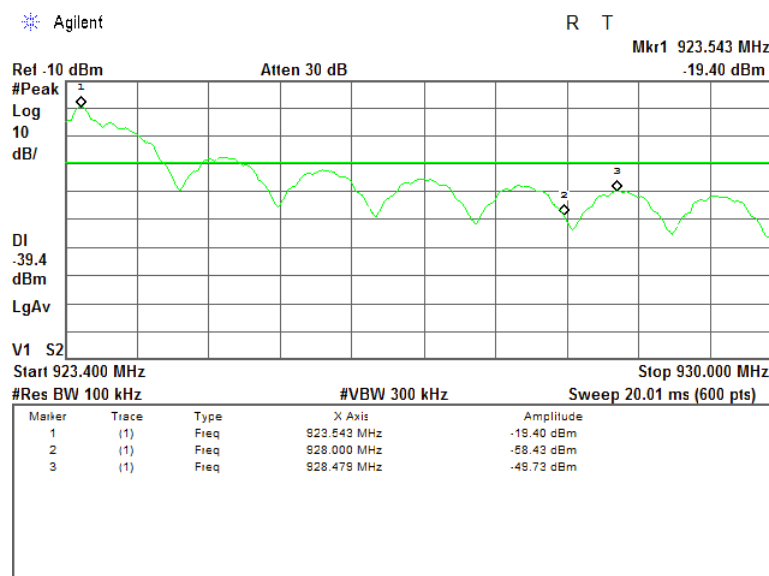


Test specification: Section 15.247(d) / RSS-247 section 5.5, Band edge emissions			
Test procedure: ANSI C63.10 section 11.12.1			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 58 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.4.3 The highest band edge emission at low carrier frequency



Plot 7.4.4 The highest band edge emission at high carrier frequency



Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
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: $E = \sqrt{30 \times P} / r$, 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.

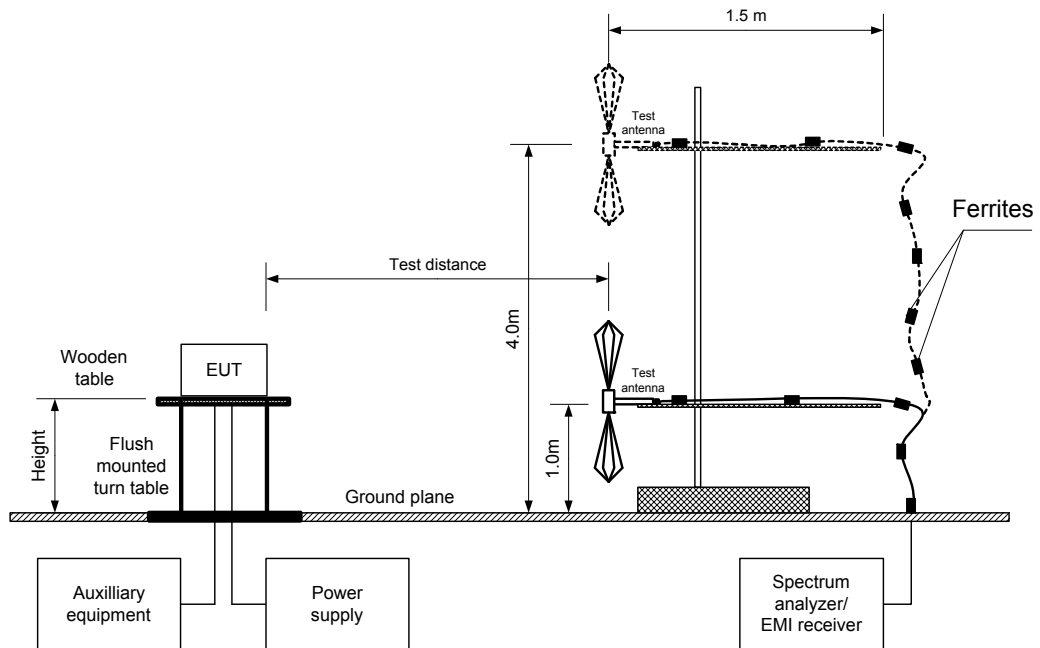
7.5.2.3 The field strength of the EUT carrier frequency was measured with antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360° and the measuring antenna height was swept in both vertical and horizontal polarizations.

7.5.2.4 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth ≥ 3 RBW, auto sweep time and sufficient number of sweeps was allowed for trace stabilization.

7.5.2.5 The peak spectral power density was measured as provided in Table 7.5.2 and associated plots.

Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements





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Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY BAND: 902 - 928 MHz
 TEST DISTANCE: 3 m
 TEST SITE: OATS
 EUT HEIGHT: 0.8 m
 DETECTOR USED: Peak
 TEST ANTENNA TYPE: Log periodic
 MODULATION: BPSK
 CHIP RATE: 900k bps

Frequency, MHz	Field strength, dB(μV/m)	Calculated PSD*, dBm	Limit, dBm	Margin, dB**	Antenna polarization	Antenna height, m	Turn-table position***, degrees	Verdict
905.43	99.81	4.61	8	-3.39	Vertical	1.3	0	Pass
916.30	100.11	4.91	8	-3.09	Vertical	1.3	0	Pass
919.92	101.44	6.24	8	-1.76	Vertical	1.3	0	Pass
923.55	102.07	6.87	8	-1.13	Vertical	1.3	0	Pass

MODULATION: FSK
 BIT RATE: 60 kbps

Frequency, MHz	Field strength, dB(μV/m)	Calculated PSD* dBm	Limit, dBm	Margin, dB*	Antenna polarization	Antenna height, m	Turn-table position***, degrees	Verdict
916.3	102.63	7.43	8	-0.57	Vertical	1.3	0	Pass

* - Calculated PSD = Field strength, dB(μV/m) – EUT antenna gain, dBi – 95.2 dB.

** - Margin = Calculated PSD - Limit

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

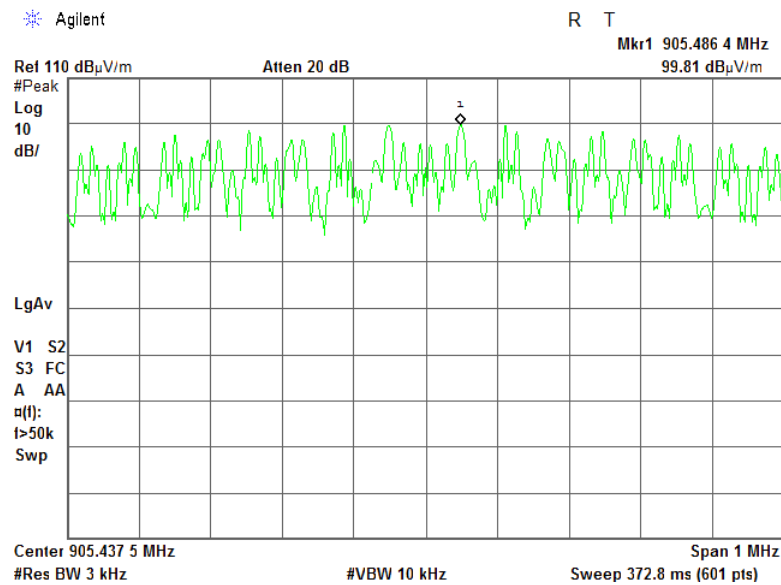
Reference numbers of test equipment used

HL 0415	HL 0569	HL 3818	HL 4294				
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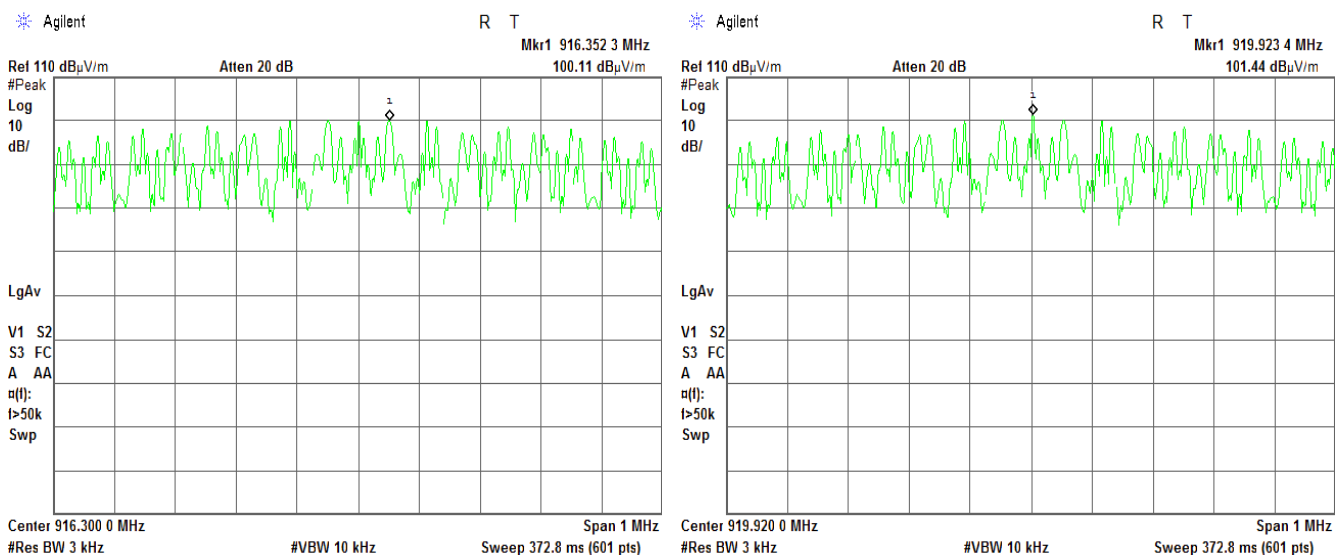
Full description is given in Appendix A.

Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.5.1 Peak spectral power density at low frequency, BPSK modulation

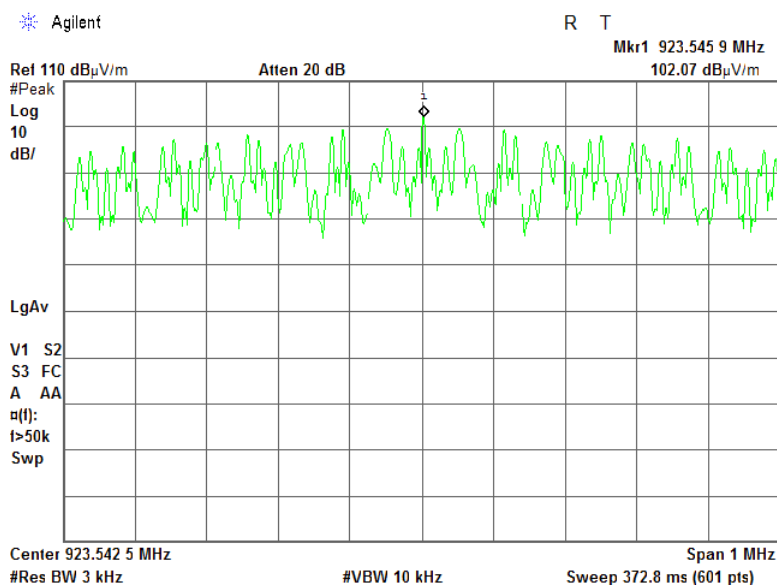


Plot 7.5.2 Peak spectral power density at mid frequency, BPSK modulation

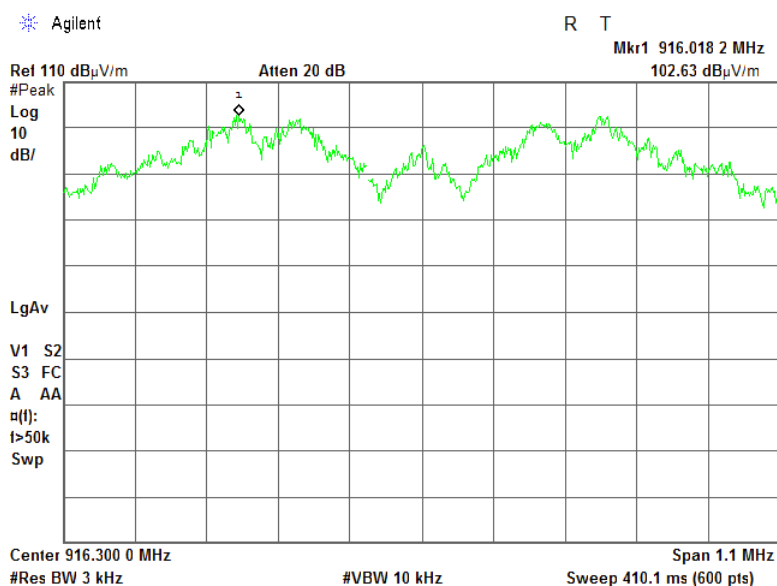


Test specification: Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density			
Test procedure: ANSI C63.10 section 11.10.2			
Test mode: Compliance		Verdict: PASS	
Date(s): 04-Sep-16			
Temperature: 25 °C	Relative Humidity: 57 %	Air Pressure: 1008 hPa	Power: Battery
Remarks:			

Plot 7.5.3 Peak spectral power density at high frequency, BPSK modulation



Plot 7.5.4 Peak spectral power density, FSK modulation



Test specification:		FCC Part 15, Section 203 / RSS-Gen, Section 7.1.4, Antenna requirements	
Test procedure:		Visual inspection	
Test mode:		Verdict: PASS	
Date(s):		15-Sep-16	
Temperature: 26 °C	Relative Humidity: 40 %	Air Pressure: 1005 hPa	Power Supply: Battery
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	

Photograph 7.6.1 Antenna assembly



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0415	Cable, Coax, RF, RG-214, 12.3 m	Hermon Laboratories	CC-3	056	07-Dec-15	07-Dec-16
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	18-Jan-16	18-Jan-17
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
0569	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1953	30-Sep-16	30-Sep-17
0583	Antenna, Log Periodic, 200 - 1000 MHz	Hermon Laboratories	LP 200/1000	035	30-Sep-16	30-Sep-18
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-May-16	10-May-17
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	10-May-16	10-May-17
3342	High Pass Filter, 50 Ohm, 2000 to 5200 MHz.	Mini-Circuits	VHF-1910+	NA	01-Oct-15	01-Oct-17
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	03-May-16	03-May-17
4222	High Pass Filter, 50 Ohm, 3150 to 6500 MHz	Mini-Circuits	VHF-2700+	NA	01-Oct-15	01-Oct-17
4294	Microwave Cable Assembly, 18.0 GHz, 3.4 m, SMA/SMA	Huber-Suhner	Sucoflex P103	NA	07-Dec-15	07-Dec-16
4339	High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M	Micro-Tronics	HPM5011 5-02	001	08-May-16	08-May-17
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-16	15-Mar-17
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	14-Oct-16	14-Oct-17
5101	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/1 1N/11N/6 000MM	500847/6A	26-Jul-16	26-Jul-17
5107	RF cable, 18 GHz, 4.5 m, N-type	Huber-Suhner	SF106A/1 1N/11N/4 500MM	500845/6A	26-Jul-16	26-Jul-17
5110	RF cable, 18 GHz, 3 m, N-type	Huber-Suhner	ST18A/N m/Nm/300 0	600818/18 A	26-Jul-16	26-Jul-17

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, 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, 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 and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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11 APPENDIX D Specification references

FCC 47CFR part 15: 2015	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 1: 2015	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

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(μ V) to convert it into field strength in dB(μ V/m).

Antenna factor
Log periodic antenna
Electro-Metrics, model LPA-25/30
Ser.No.1953, HL 0569

Frequency MHz	Antenna Factor dB(1/m)	Frequency MHz	Antenna Factor dB(1/m)
200	15.2	625	25.2
225	15.1	650	25.8
250	16.3	675	27.2
275	17.2	700	27.6
300	19.6	725	27.6
325	18.4	750	27.6
350	19.0	775	28.0
375	20.0	800	28.2
400	20.9	825	29.4
425	21.3	850	29.9
450	22.1	875	30.0
475	22.7	900	30.4
500	23.2	925	30.6
525	23.9	950	30.8
550	24.2	975	31.6
575	24.6	1000	32.1
600	24.7		

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

Antenna factor
Log periodic antenna
Hermon Laboratories, model LP 200/1000
Ser.No.035, HL 0583

Frequency, MHz	Antenna factor, dB(1/m)
200	12.0
250	12.5
300	14.5
350	15.7
400	16.0
450	16.7
500	18.1
550	18.2
600	18.8
650	20.1
700	21.8
750	21.4
800	21.4
850	22.4
900	22.8
950	23.4
1000	24.6

The antenna factor shall be added to receiver reading in dB μ V to obtain field strength in dB μ V/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(μ V) to convert it into field strength in dB(μ V/m).

Antenna calibration
Sunol Sciences Inc., model JB3, serial number A022805, HL 2697

Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain
30	22.2	-22.5	0.01	620	19.7	6.3	4.27	1215	24.9	7.0	5.05	1810	28.3	7.1	5.08	2405	30.9	6.9	4.93
35	18.5	-17.4	0.02	625	19.7	6.5	4.42	1220	24.9	7.0	4.99	1815	28.5	6.9	4.91	2410	30.9	6.9	4.89
40	14.7	-12.5	0.06	630	19.6	6.6	4.57	1225	25.1	6.9	4.91	1820	28.6	6.8	4.74	2415	31.0	6.9	4.85
45	11.3	-8.1	0.16	635	19.7	6.5	4.48	1230	25.2	6.8	4.82	1825	28.7	6.8	4.75	2420	31.0	6.8	4.82
45	11.3	-8.1	0.16	640	19.9	6.4	4.40	1235	25.1	7.0	4.96	1830	28.7	6.8	4.76	2425	31.1	6.8	4.81
50	8.9	-4.7	0.34	645	19.9	6.5	4.45	1240	25.0	7.1	5.09	1835	28.7	6.7	4.72	2430	31.0	6.9	4.87
55	7.9	-2.8	0.52	650	19.9	6.5	4.51	1245	25.0	7.1	5.12	1840	28.8	6.7	4.69	2435	31.0	6.9	4.86
60	7.5	-2.1	0.62	655	19.9	6.6	4.50	1250	25.0	7.1	5.15	1845	28.6	6.9	4.90	2440	31.2	6.8	4.74
65	8.5	-2.0	0.63	660	19.9	6.7	4.69	1255	25.0	7.2	5.25	1850	28.4	7.1	5.12	2445	31.1	6.9	4.91
70	9.0	-1.9	0.64	665	19.9	6.7	4.70	1260	24.9	7.3	5.36	1855	28.5	7.0	5.07	2450	31.0	7.0	4.96
75	8.8	-1.1	0.78	670	20.0	6.7	4.71	1265	25.0	7.3	5.31	1860	28.6	7.0	5.01	2455	31.0	7.0	5.01
80	8.4	-0.2	0.97	675	20.1	6.7	4.71	1270	25.1	7.2	5.26	1865	28.5	7.1	5.17	2460	30.9	7.2	5.19
85	8.0	0.6	1.20	680	20.1	6.7	4.71	1275	25.3	7.0	5.05	1870	28.4	7.3	5.33	2465	31.1	6.9	4.95
90	8.2	1.1	1.29	685	20.1	6.8	4.79	1280	25.5	6.8	4.94	1875	28.4	7.2	5.28	2470	31.3	6.8	4.76
95	9.2	0.5	1.13	690	20.1	6.9	4.88	1285	25.4	7.0	4.97	1880	28.5	7.2	5.22	2475	31.4	6.7	4.69
100	10.6	-0.4	0.92	695	20.2	6.8	4.82	1290	25.3	7.1	5.10	1885	28.5	7.2	5.22	2480	31.3	6.8	4.79
110	12.6	-1.6	0.70	705	20.4	6.8	4.75	1300	25.2	7.3	5.33	1895	28.6	7.2	5.24	2490	31.1	7.0	4.99
120	13.9	-2.1	0.62	715	20.5	6.8	4.80	1310	25.5	7.1	5.09	1905	28.5	7.3	5.36	2500	30.9	7.2	5.27
125	14.2	-2.0	0.63	720	20.5	6.9	4.85	1315	25.4	7.2	5.23	1910	28.5	7.4	5.45	2505	31.1	7.1	5.15
130	14.2	-1.7	0.68	725	20.6	6.8	4.81	1320	25.3	7.3	5.36	1915	28.5	7.3	5.38	2510	31.0	7.2	5.22
140	13.4	0.3	0.94	735	20.9	6.7	4.55	1330	25.6	7.0	5.06	1925	28.5	7.3	5.39	2520	31.2	7.0	5.05
150	12.9	0.8	1.21	745	21.0	6.6	4.59	1340	25.7	7.1	5.09	1935	28.5	7.4	5.54	2530	31.0	7.3	5.37
160	12.7	1.6	1.44	755	21.0	6.8	4.74	1350	25.7	7.1	5.17	1945	28.5	7.5	5.59	2540	31.2	7.1	5.09
165	12.5	2.0	1.59	760	21.0	6.8	4.83	1355	25.8	7.0	5.06	1950	28.6	7.4	5.48	2545	31.0	7.3	5.43
170	12.2	2.6	1.83	765	21.1	6.8	4.73	1360	25.9	6.9	4.95	1955	28.6	7.5	5.57	2550	31.0	7.3	5.39
175	11.8	3.3	2.13	770	21.3	6.7	4.64	1365	26.0	6.9	4.95	1960	28.6	7.5	5.65	2555	31.1	7.2	5.30
180	11.6	3.7	2.36	775	21.3	6.7	4.68	1370	26.0	7.0	4.98	1965	28.7	7.4	5.47	2560	31.0	7.4	5.47
185	11.5	4.0	2.54	780	21.3	6.7	4.72	1375	26.0	7.0	5.01	1970	28.5	7.2	5.29	2565	30.8	7.6	5.70
190	11.6	4.2	2.61	785	21.3	6.8	4.77	1380	26.0	7.0	5.06	1975	28.9	7.2	5.22	2570	31.1	7.3	5.37
200	13.1	3.2	2.07	795	21.4	6.8	4.79	1390	26.1	6.9	4.92	1985	29.1	7.1	5.11	2580	31.6	6.9	4.87
205	12.0	4.4	2.76	800	21.5	6.8	4.77	1395	26.2	6.9	4.94	1990	29.1	7.0	5.06	2585	31.6	6.8	4.79
210	11.0	5.6	3.66	805	21.6	6.7	4.71	1400	26.2	7.0	4.96	1995	29.1	7.1	5.09	2590	31.6	6.9	4.88
215	11.3	5.6	3.59	810	21.7	6.7	4.65	1405	26.1	7.0	5.02	2000	29.1	7.1	5.11	2595	31.5	7.0	4.97
220	11.6	5.5	3.52	815	21.7	6.7	4.72	1410	26.1	7.1	5.09	2005	29.1	7.1	5.16	2600	31.6	6.9	4.86
225	11.7	5.5	3.45	820	21.7	6.8	4.80	1415	26.2	7.0	5.02	2010	29.1	7.1	5.15	2605	31.3	7.2	5.30
230	11.9	5.5	3.57	825	21.7	6.8	4.82	1420	26.3	7.0	5.06	2015	29.2	7.1	5.13	2610	31.4	7.1	5.15
235	12.1	5.5	3.56	830	21.7	6.9	4.85	1425	26.2	7.1	5.10	2020	29.2	7.1	5.18	2615	31.7	6.9	4.88
240	12.3	5.5	3.54	835	21.8	6.8	4.82	1430	26.1	7.2	5.25	2025	29.3	7.1	5.08	2620	31.6	7.0	4.97
245	12.3	5.7	3.71	840	21.9	6.8	4.80	1435	26.1	7.2	5.24	2030	29.3	7.0	5.05	2625	31.4	7.1	5.17
250	12.3	5.9	3.88	845	21.9	6.8	4.83	1440	26.2	7.2	5.24	2035	29.3	7.1	5.07	2630	31.6	7.0	5.00
255	12.5	5.9	3.85	850	21.9	6.9	4.86	1445	26.3	1	5.11	2040	29.3	7.1	5.13	2635	31.8	6.8	4.82
260	12.7	5.8	3.83	855	22.0	6.8	4.80	1450	26.5	7.0	4.98	2045	29.2	7.2	5.23	2640	31.7	7.0	4.98
265	13.2	5.5	3.54	860	22.1	6.8	4.74	1455	26.4	7.1	5.07	2050	29.2	7.2	5.27	2645	31.7	6.9	4.93
270	13.7	5.2	3.27	865	22.1	6.9	4.82	1460	26.4	7.1	5.17	2055	29.3	7.2	5.21	2650	31.8	6.9	4.85
275	13.7	5.3	3.39	870	21.9	7.1	5.11	1465	26.4	7.2	5.19	2060	29.5	7.0	5.02	2655	31.8	6.9	4.85
280	13.7	5.4	3.50	875	22.0	7.1	5.08	1470	26.4	7.2	5.22	2065	29.4	7.1	5.08	2660	31.7	7.0	5.02
285	13.7	5.6	3.61	880	22.1	7.0	5.05	1475	26.4	7.1	5.17	2070	29.4	7.1	5.01	2665	32.0	6.7	4.71
290	13.7	5.7	3.72	885	22.1	7.0	5.06	1480	26.5	7.1	5.12	2075	29.5	7.0	5.01	2670	32.0	6.7	4.67
295	13.8	5.8	3.77	890	22.1	7.0	5.06	1485	26.5	7.1	5.14	2080	29.8	6.8	4.76	2675	31.9	6.8	4.81
300	13.9	5.8	3.81	895	22.2	7.1	5.09	1490	26.5	7.1	5.17	2085	29.7	6.9	4.89	2680	31.7	7.0	5.04
305	14.0	5.9	3.85	900	22.2	7.1	5.12	1495	26.5	7.2	5.24	2090	29.7	6.9	4.86	2685	31.9	6.8	4.83
310	14.1	5.9	3.88	905	22.3	7.1	5.09	1500	26.5	7.2	5.31	2095	29.8	6.8	4.78	2690	32.1	6.7	4.72
315	14.3	5.8	3.88	910	22.3	7.0	5.05	1505	26.5	7.2	5.27	2100	29.8	6.8	4.75	2695	32.1	6.7	4.71
320	14.4	5.9	3.90	915	22.4	7.0	5.05	1510	26.5	7.2	5.30	2105	29.8	6.8	4.81	2700	32.0	6.8	4.81
325	14.5	5.9	3.92	920	22.6	6.9	4.92	1515	26.6	7.2	5.37	2110	29.9	6.8	4.78	2705	32.0	6.8	4.80
330	14.6	5.9	3.93	925	22.7	6.9	4.85	1520	26.5	7.3	5.38	2115	29.9	6.8	4.76	2710	32.1	6.8	4.79
335	14.7	6.0	4.02	930	22.8	6.8	4.77	1525	26.6	7.3	5.37	2120	29.9	6.8	4.84	2715	32.1	6.7	4.71
340	14.7	6.2	4.12	935	22.8	6.8	4.83	1530	26.6	7.3	5.36	2125	29.9	6.9	4.89	2720	32.4	6.5	4.47
345	14.9	6.1	4.06	940	22.8	6.9	4.89	1535	26.6	7.4	5.44	2130	29.9	6.9	4.90	2725	32.2	6.7	4.63
350	15.1	6.0	3.99	945	22.8	6.9	4.87	1540	26.5	7.4	5.53	2135	29.8	6.9	4.94	2730	31.9	7.0	5.05
355	15.3	5.9	3.88	950	22.9	6.9	4.85	1545	26.5	7.5	5.58	2140	29.8	7.1	5.08	2735	31.6	7.4	5.44
360	15.8	5.8	3.78	955	23.0	6.8	4.81	1550	26.6	7.5	5.63	2145	29.8	6.9	4.92	2740	31.8	7.1	5.40
365	15.5	5.9	3.89	960	23.1	6.8	4.77	1555	26.7	7.3	5.59	2150	29.9	7.0	4.98	2745	31.9	7.0	5.06
370	15.5	6.0	4.01	965	23.1	6.7	4.73	1560	26.9	7.1	5.18	2155	29.8	7.1	5.10	2750	32.0	6.9	4.94
375	15.6	6.1	4.03	970	23.2	6.7	4.69	1565	26.9	7.2	5.23	2160	29.8	7.1	5.09	2755	32.0	7.0	4.98
380	15.7	6.1	4.05	975	23.3	6.6	4.62	1570	26.9	7.2	5.30	2165	29.9	7.0	5.00	2760	32.0	7.0	5.06
385	15.7	6.2	4.15	980	23.5	6.6	4.54	1575	27.0	7.2	5.23	2170	29.9	7.1	5.07	2765	32.2	6.8	4.80
390	15.7	6.3	4.25	985	23.5	6.6	4.52	1580	27.0	7.1	5.17	2175	29.8	7.2	5.20	2770			



HERMON LABORATORIES

Antenna factor, HL 4933

**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)					

Cable loss
Cable coax, RG-214, 12.3 m, s/n 056, HL 0415

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	10	0.23	±0.12
2	30	0.44	±0.12
3	50	0.60	±0.12
4	100	0.89	±0.12
5	150	1.11	±0.13
6	200	1.30	±0.13
7	250	1.45	±0.13
8	300	1.61	±0.13
9	400	1.94	±0.13
10	500	2.18	±0.13
11	600	2.45	±0.14
12	700	2.67	±0.14
13	800	2.94	±0.14
14	900	3.16	±0.14
15	1000	3.38	±0.14

Cable loss
Microwave Cable Assembly, 18.0 GHz, 3.4 m, SMA/SMA, Huber-Suhner,
Sucoflex P103, HL 4294

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	4900	2.09	10000	2.90	15100	3.61
30	0.17	5000	2.10	10100	2.92	15200	3.67
50	0.22	5100	2.14	10200	2.95	15300	3.63
100	0.30	5200	2.16	10300	2.96	15400	3.64
200	0.42	5300	2.17	10400	2.99	15500	3.68
300	0.51	5400	2.19	10500	2.99	15600	3.71
400	0.59	5500	2.19	10600	3.03	15700	3.74
500	0.66	5600	2.22	10700	3.03	15800	3.71
600	0.72	5700	2.24	10800	3.04	15900	3.74
700	0.77	5800	2.23	10900	3.05	16000	3.71
800	0.82	5900	2.26	11000	3.09	16100	3.73
900	0.88	6000	2.27	11100	3.07	16200	3.76
1000	0.93	6100	2.26	11200	3.08	16300	3.82
1100	0.98	6200	2.29	11300	3.11	16400	3.90
1200	1.02	6300	2.30	11400	3.12	16500	3.81
1300	1.06	6400	2.34	11500	3.11	16600	3.88
1400	1.10	6500	2.34	11600	3.15	16700	3.87
1500	1.14	6600	2.36	11700	3.16	16800	3.89
1600	1.19	6700	2.36	11800	3.18	16900	3.95
1700	1.23	6800	2.39	11900	3.19	17000	4.02
1800	1.27	6900	2.39	12000	3.23	17100	4.04
1900	1.30	7000	2.44	12100	3.25	17200	3.99
2000	1.35	7100	2.46	12200	3.22	17300	4.03
2100	1.38	7200	2.44	12300	3.25	17400	4.03
2200	1.42	7300	2.48	12400	3.25	17500	4.06
2300	1.45	7400	2.47	12500	3.28	17600	4.05
2400	1.48	7500	2.48	12600	3.27	17700	4.12
2500	1.51	7600	2.50	12700	3.27	17800	4.14
2600	1.55	7700	2.53	12800	3.30	17900	4.18
2700	1.59	7800	2.56	12900	3.30	18000	4.14
2800	1.62	7900	2.55	13000	3.27		
2900	1.65	8000	2.56	13100	3.32		
3000	1.66	8100	2.56	13200	3.32		
3100	1.69	8200	2.57	13300	3.32		
3200	1.71	8300	2.59	13400	3.35		
3300	1.74	8400	2.62	13500	3.38		
3400	1.76	8500	2.67	13600	3.39		
3500	1.78	8600	2.65	13700	3.42		
3600	1.80	8700	2.68	13800	3.47		
3700	1.85	8800	2.68	13900	3.45		
3800	1.88	8900	2.68	14000	3.49		
3900	1.90	9000	2.74	14100	3.50		
4000	1.91	9100	2.74	14200	3.55		
4100	1.93	9200	2.76	14300	3.59		
4200	1.96	9300	2.78	14400	3.58		
4300	1.97	9400	2.79	14500	3.56		
4400	1.99	9500	2.80	14600	3.57		
4500	2.02	9600	2.83	14700	3.57		
4600	2.02	9700	2.84	14800	3.57		
4700	2.04	9800	2.86	14900	3.64		
4800	2.05	9900	2.92	15000	3.64		

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 500847/6A
HL 5101

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	2.42
50	0.22	6000	2.53
100	0.31	6500	2.65
200	0.43	7000	2.76
300	0.53	7500	2.86
400	0.62	8000	2.96
500	0.69	8500	3.06
600	0.76	9000	3.16
700	0.82	9500	3.26
800	0.87	10000	3.35
900	0.93	10500	3.44
1000	0.98	11000	3.54
1100	1.03	11500	3.62
1200	1.08	12000	3.70
1300	1.12	12500	3.80
1400	1.17	13000	3.88
1500	1.21	13500	3.97
1600	1.25	14000	4.04
1700	1.29	14500	4.13
1800	1.33	15000	4.22
1900	1.37	15500	4.31
2000	1.41	16000	4.39
2500	1.59	16500	4.47
3000	1.75	17000	4.54
3500	1.90	17500	4.61
4000	2.04	18000	4.68
4500	2.17		
5000	2.30		

Cable loss
RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,
SF106A/11N/11N/4500MM, S/N 500845/6A
HL 5107

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	1.75
50	0.16	6000	1.84
100	0.22	6500	1.92
200	0.31	7000	2.00
300	0.38	7500	2.07
400	0.44	8000	2.15
500	0.49	8500	2.23
600	0.54	9000	2.29
700	0.58	9500	2.38
800	0.63	10000	2.43
900	0.67	10500	2.50
1000	0.71	11000	2.57
1100	0.74	11500	2.63
1200	0.77	12000	2.69
1300	0.81	12500	2.76
1400	0.84	13000	2.82
1500	0.87	13500	2.87
1600	0.91	14000	2.93
1700	0.93	14500	3.00
1800	0.96	15000	3.06
1900	0.99	15500	3.12
2000	1.01	16000	3.18
2500	1.14	16500	3.22
3000	1.26	17000	3.28
3500	1.37	17500	3.36
4000	1.47	18000	3.43
4500	1.57		
5000	1.66		

Cable loss
RF Cable, Huber-Suhner, 18 GHz, 3 m, N- type,
ST18A/Nm/Nm/3000, S/N 600818/18A
HL 5110

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
0.1	0.01	5500	1.99
50	0.17	6000	2.10
100	0.24	6500	2.20
200	0.34	7000	2.29
300	0.42	7500	2.38
400	0.48	8000	2.47
500	0.54	8500	2.57
600	0.59	9000	2.65
700	0.64	9500	2.74
800	0.69	10000	2.83
900	0.73	10500	2.91
1000	0.77	11000	2.99
1100	0.82	11500	3.07
1200	0.86	12000	3.14
1300	0.89	12500	3.22
1400	0.93	13000	3.29
1500	0.96	13500	3.37
1600	1.00	14000	3.45
1700	1.03	14500	3.52
1800	1.06	15000	3.59
1900	1.10	15500	3.66
2000	1.13	16000	3.74
2500	1.28	16500	3.80
3000	1.41	17000	3.88
3500	1.54	17500	4.00
4000	1.66	18000	4.02
4500	1.78		
5000	1.89		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	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
μ s	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

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