HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

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

FOR:

Telematics Wireless Ltd.
Water meter
Model: Interpreter2
FCC ID:NTA3GINTRP2
IC:4732A-INTRP2

Table of contents

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@telematics-wireless.com
Contact name:	Mr. Itsik Kanner

2 Equipment under test attributes

Product name:	Water meter
Product type:	Transceiver
Model(s):	Interpreter2
Serial number:	5855
Hardware version:	B
Software release:	1.07
Receipt date	22-Mar-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@telematics-wireless.com
Contact name:	Mr. Itsik Kanner

4 Test details

Project ID:	28135
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	18-Apr-16
Test completed:	18-Apr-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	April 18, 2016	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	May 23, 2016	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	August 18, 2016	

6 EUT description

6.1 General information

he EUT is a Interpreter2 water meter, powered from two 3.6 VDC lithium internal batteries.

The EUT supports the following modes of operation:

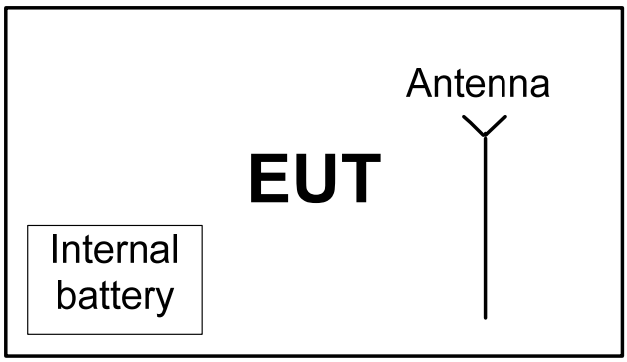
1) DTS- BPSK in 905.43 – 923.546 MHz
2) DTS- FSK at 916.3 MHz
3) FHSS- Wide channel in 902.3-927.8 MHz
4) FHSS- Narrow channel in 904-927.9 MHz

This test report represents the DTS mode test results. The Master DMMR-BT1 unit, S/N 721622 manufactured by Telematics, was used during the testing to change the EUT mode of operation.

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)
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	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	17.03 dBm –BPSK 20.54 dBm - FSK

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
Integral loop	Telematics Wireless Ltd.	NA	3 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						
X	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	X	yes		no

Spread spectrum parameters for transmitters tested per FCC 15.247 only		
DSSS	Chip rate	900 kbps for BPSK
	Spectrum width	6 dB BW

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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 53 %	Power Supply: 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 as provided in Table 7.1.3, Table 7.1.4 and the associated plots.

Figure 7.1.1 The 6 dB bandwidth test setup

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):	18-Apr-16		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 53 %	**Power Supply:** 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	967.881	500	467.881	Pass
916.30	958.314	500	458.314	Pass
923.54	966.736	500	466.736	Pass

MODULATION: FSK
BIT RATE: 60 kbps

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
916.3	734.393	500	734.393	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	1431.2	500	931.2	Pass
916.30	1456.8	500	956.8	Pass
923.54	1428.6	500	928.6	Pass

MODULATION: FSK
BIT RATE: 60 kbps

Carrier frequency, MHz	99% bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
916.3	1165.0	500	665.0	Pass

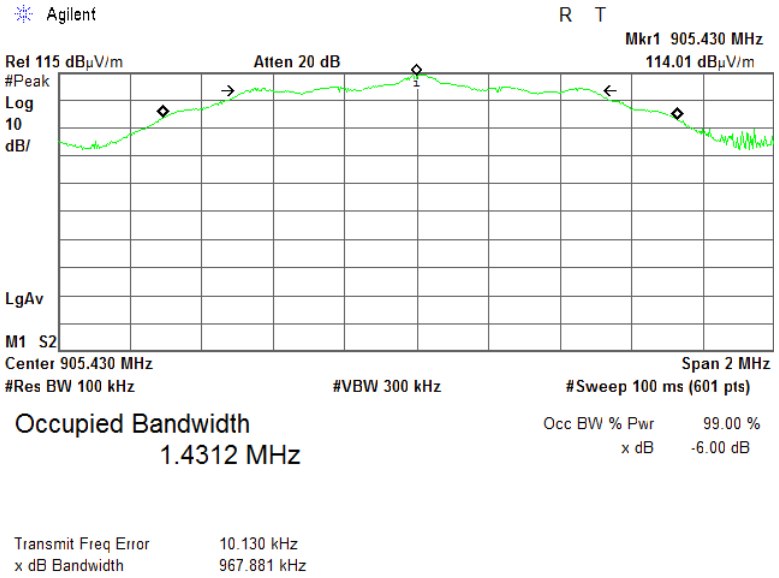
Reference numbers of test equipment used

HL 0521	HL 0604	HL 4278	HL 4353					

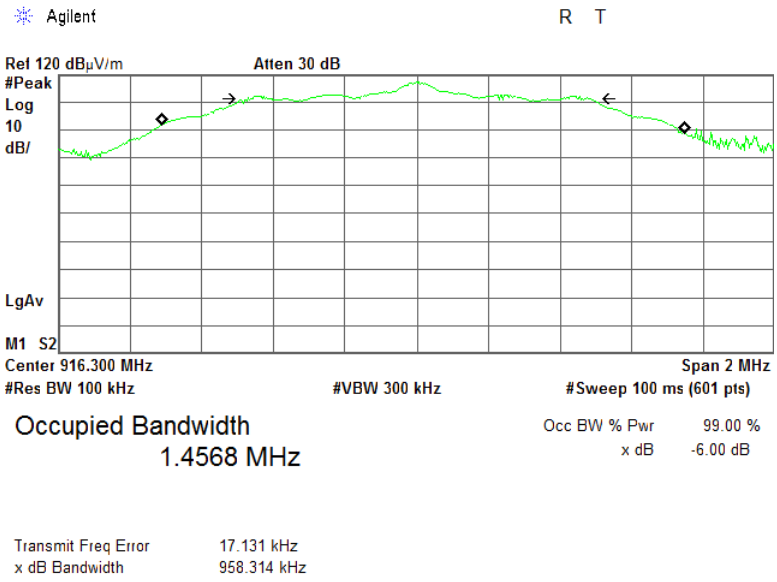
Full description is given in Appendix A.

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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 53 %	Power Supply: Battery
Remarks:			

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

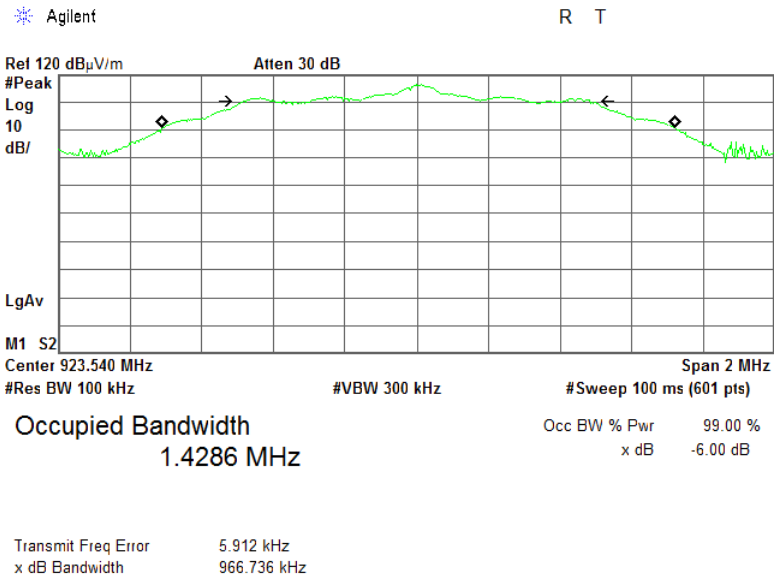


Plot 7.1.2 The occupied bandwidth test result at mid frequency, BPSK modulation

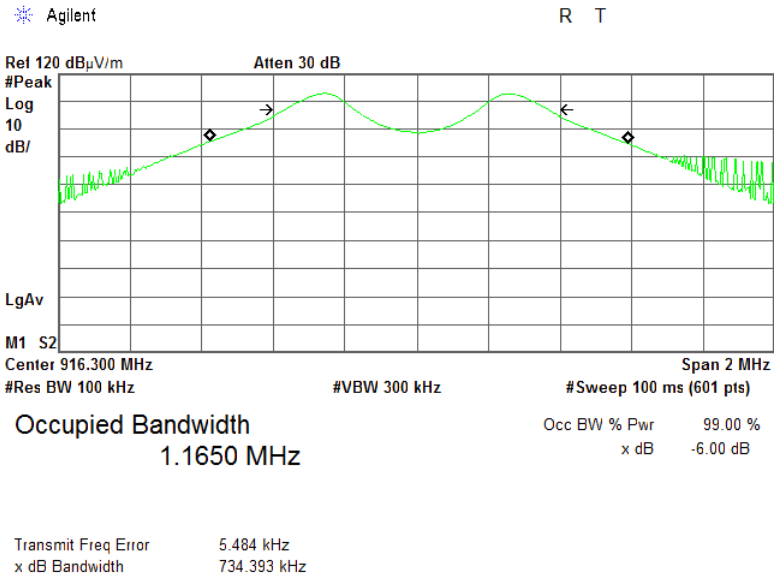


Test specification:	Section 15.247(a)2 / RSS-247 section 5.2(1), 6 dB bandwidth		
Test procedure:	ANSI C63.10 section 11.8.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 53 %	Power Supply: Battery
Remarks:			

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 sections 11.9.2.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

7.2 Maximum output power

7.2.1 General

This test was performed to measure the maximum 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 to 1% - 5% of the EUT occupied bandwidth, VBW ≥ 3 RBW, and the power of the EUT carrier frequency was measured with antenna connected to spectrum analyzer.

7.2.2.4 The average power was measured using the instrument's band power measurement function and the trace average was at least 100 traces in power averaging mode as recorded in Table 7.2.2 and associated plots. The power was computed by integrating the spectrum across the OBW of the signal.

7.2.2.5 To compute the average power during the actual transmission time the duty cycle correction factor was added to the measured power.

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

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

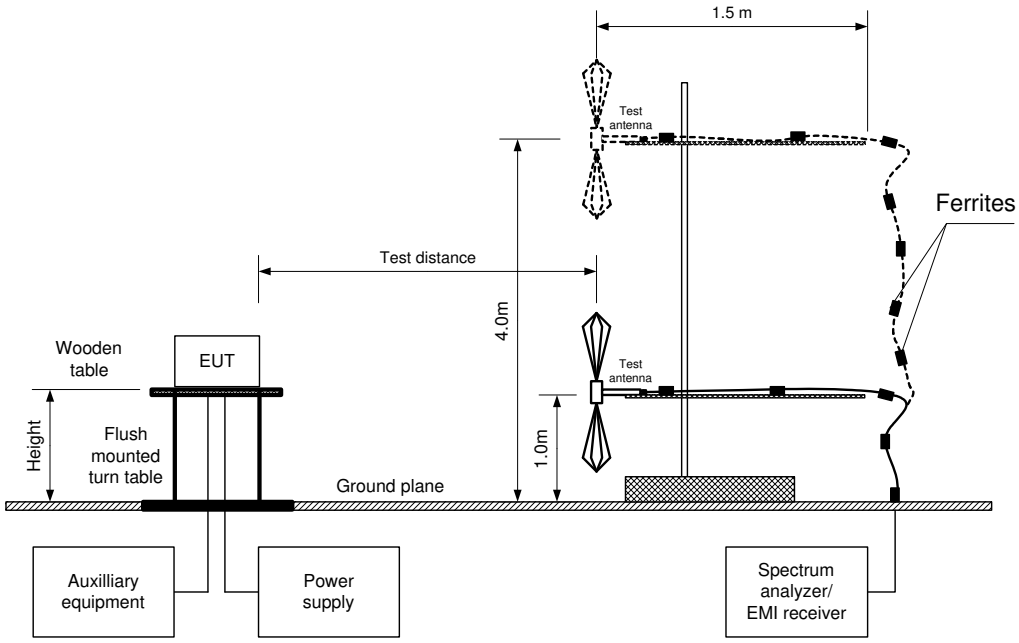
P= SA reading, dBm +107 dB + AF, dB/m + CL, dB - Transmitter antenna gain, dBi -95.2 dB +10 log(1/D) dB, where 107 dB is a SA conversion factor

AF – measuring antenna factor
CL – cable loss
D is a duty cycle.

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

Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Figure 7.2.1 Setup for carrier field strength measurements



Test specification:	**Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power**		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 54 %	**Power Supply:** Battery
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY BAND: 902 - 928 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
DETECTOR USED: AVR
TEST ANTENNA TYPE: Biconilog (30 MHz – 1000 MHz)
MODULATION: BPSK
CHIP RATE: 900 kbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
EUT 6 dB BANDWIDTH: 0.968 MHz

Frequency, MHz	SA reading, dBm	Antenna factor, dB	Cable loss, dB	EUT antenna gain, dBi	Average output power, dBm*	Limit, dBm	Margin, dB**	Verdict
905.43	-36.57	24.3	2.5	3	17.03	30.0	-12.97	Pass
916.30	-38.46	24.4	2.5	3	15.24	30.0	-14.76	Pass
923.55	-39.87	24.5	2.5	3	13.93	30.0	-16.07	Pass

MODULATION: FSK
BIT RATE: 60 kbps
EUT 6 dB BANDWIDTH: 0.734 MHz
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 3 MHz

Frequency, MHz	SA reading, dBm	Antenna factor, dB	Cable loss, dB	EUT antenna gain, dBi	Average output power, dBm*	Limit, dBm	Margin, dB**	Verdict
916.3	-33.16	24.4	2.5	3	12	30.0	-9.46	Pass

*- Average output power was calculated as follows:
SA reading, dBm + 107 dB + AF, dB/m + CL, dB -Transmitter antenna gain, dBi -95.2 dB +10 log(1/D), dB.
**- Margin = Output power – specification limit.

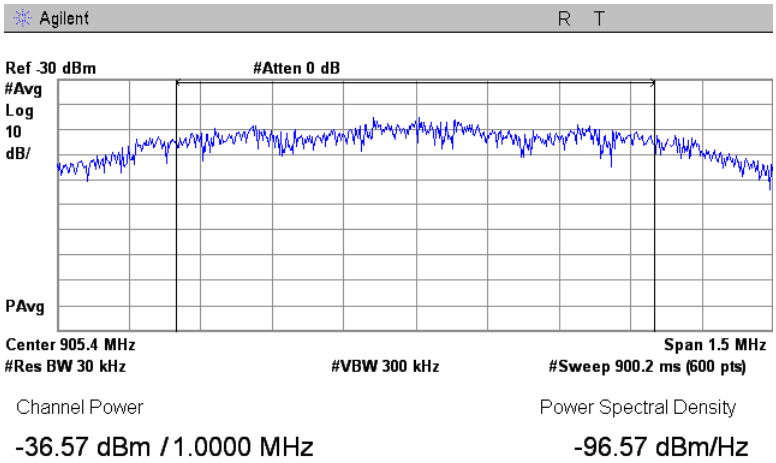
Reference numbers of test equipment used

HL 0521	HL 0604	HL 2909	HL 4278	HL 4353			

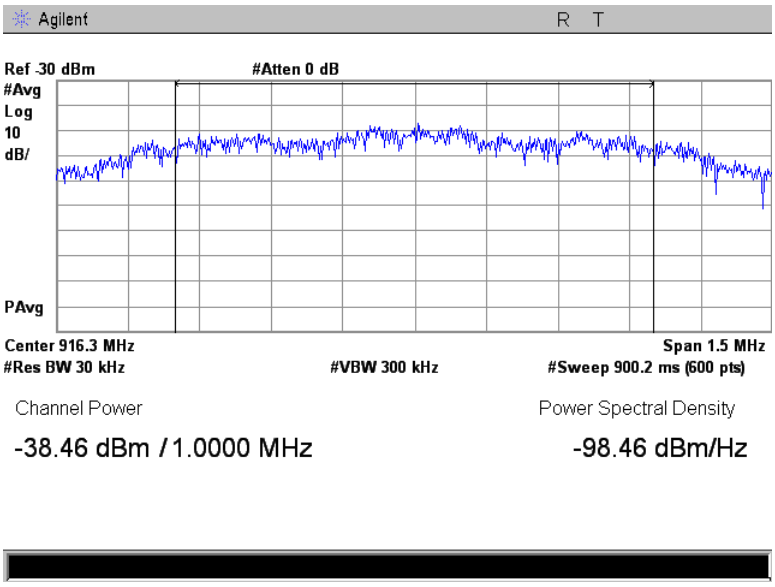
Full description is given in Appendix A.

Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Plot 7.2.1 Field strength of carrier at low frequency, BPSK modulation

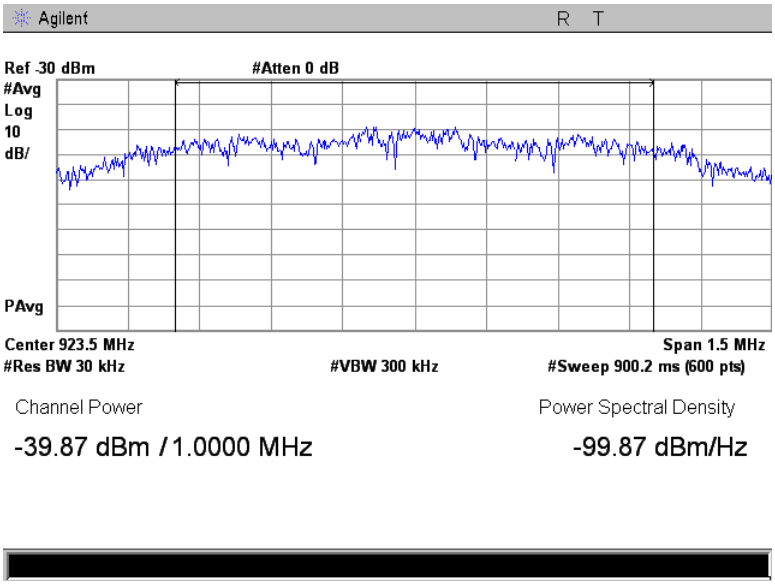


Plot 7.2.2 Field strength of carrier at mid frequency, BPSK modulation

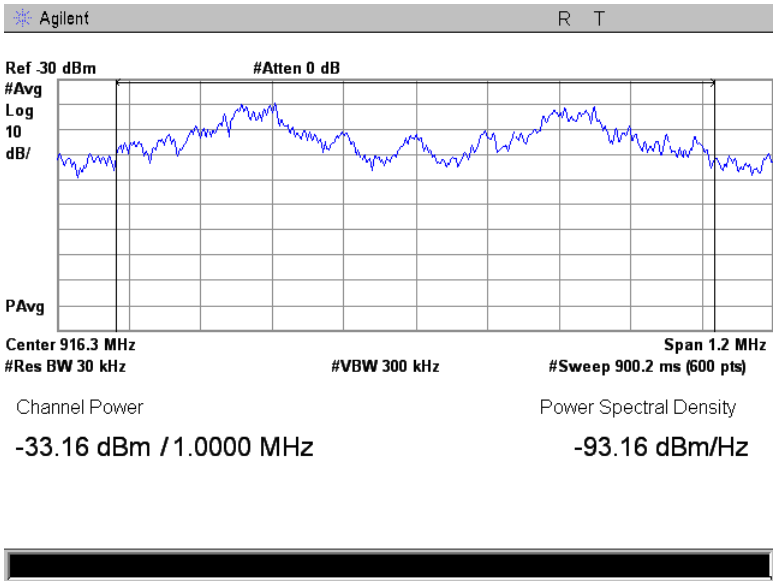


Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Plot 7.2.3 Field strength of carrier at high frequency, BPSK modulation

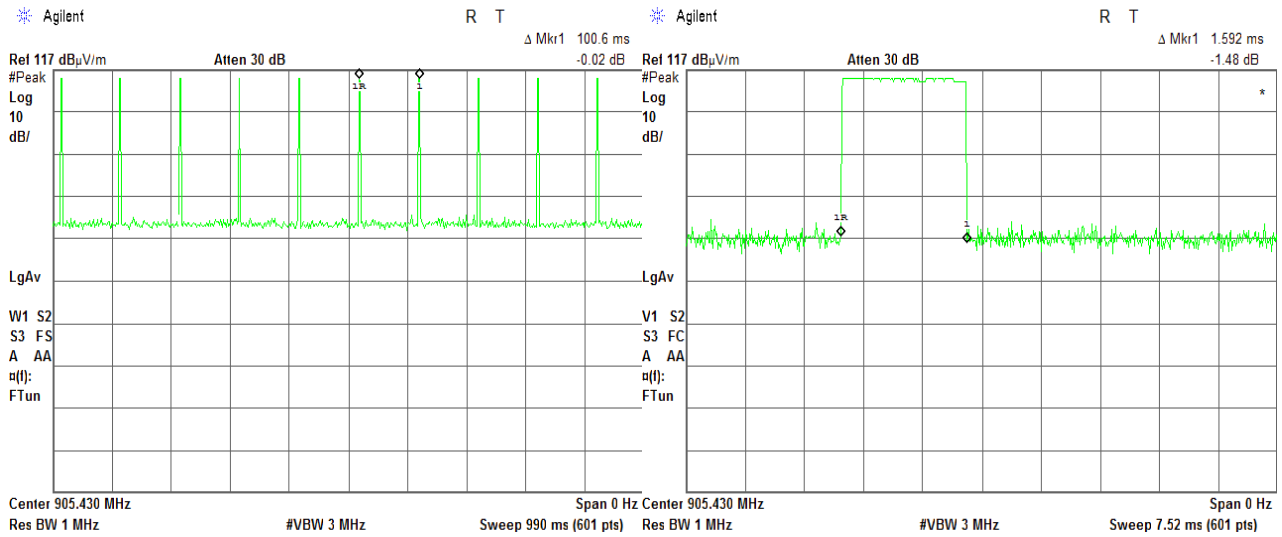


Plot 7.2.4 Field strength of carrier, FSK modulation



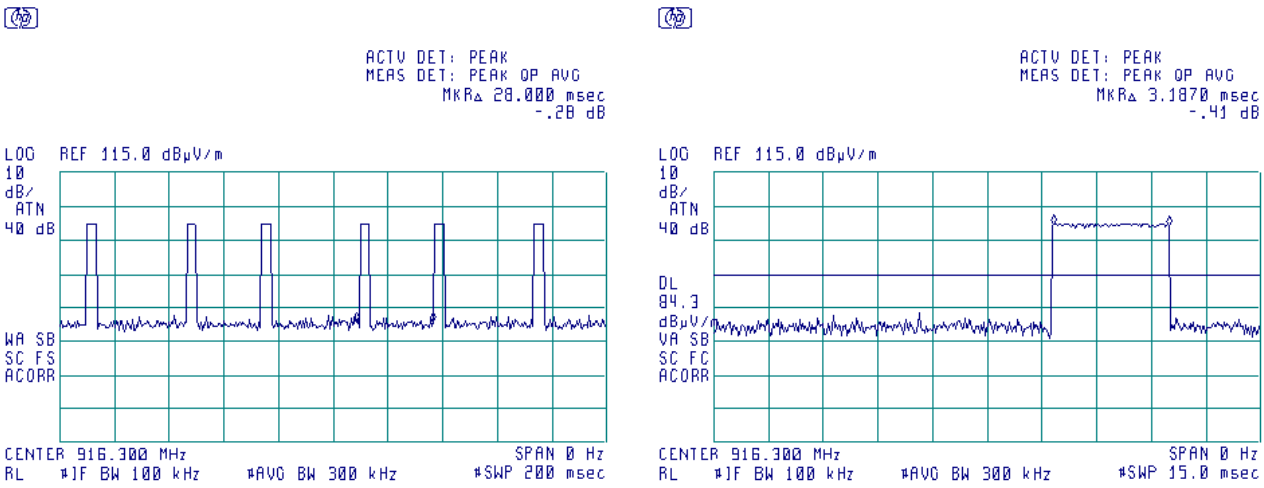
Test specification:	Section 15.247(b)3 / RSS-247 section 5.4(4), Maximum output power		
Test procedure:	ANSI C63.10 sections 11.9.2.2.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Plot 7.2.5 Pulse duration and period measurements for duty cycle calculation, BPSK modulation



Duty cycle=1.6/100.6=0.0159 10Log 1/DC=18 dB

Plot 7.2.6 Pulse duration and period measurements for duty cycle calculation, FSK modulation



Duty cycle =3.2/28=0.114 10Log 1/DC=9.43 dB

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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: 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 – 10thharmonic	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, 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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

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

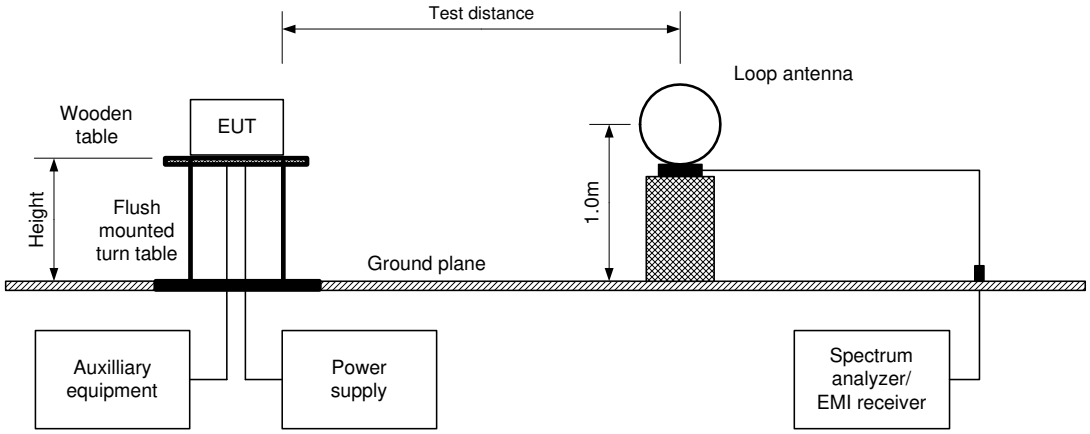
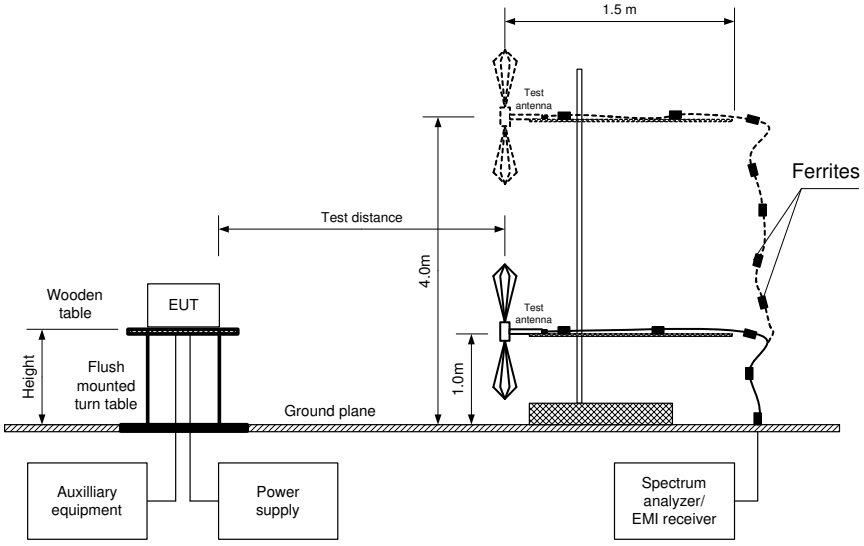


Figure 7.3.2 Setup for spurious emission field strength measurements above 30 MHz



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):	18-Apr-16		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 55 %	**Power Supply:** 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
DUTY CYCLE:	1.5 %
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
456.20	47.10	Vertical	1.0	80	114.93	-67.83	30.0	-37.83	Pass
1810.86	59.29	Vertical	1.4	20		-55.64		-25.64	
457.90	50.70	Vertical	1.0	80	113.30	-62.60	30.0	-32.60	Pass
1832.61	55.51	Vertical	1.5	15		-57.79		-27.79	
458.50	49.60	Vertical	1.0	80	113.15	-63.55	30.0	-33.55	Pass
1839.85	55.54	Vertical	1.5	0		-57.61		-27.61	
462.10	48.60	Vertical	1.0	80	112.93	-64.33	30.0	-34.33	Pass
1847.12	55.03	Vertical	1.5	15		-57.90		-27.90	

*- 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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

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
DUTY CYCLE:	1.5 %
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*				
613.4	56.6	45.4	46.0	-0.6	Vert	1.0	330	Pass
610.7	57.0	45.8	46.0	-0.2	Vert	1.0	330	
609.0	56.1	45.3	46.0	-0.7	Vert	1.0	330	
614.0	53.9	42.4	46.0	-3.6	Vert	1.0	320	
974.4	63.6	53.8	54.0	-0.2	Vert	1.0	330	
961.3	63.3	53.6	54.0	-0.4	Vert	1.0	330	
963.5	63.1	53.4	54.0	-0.6	Vert	1.0	320	
966.5	61.3	52.5	54.0	-1.5	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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: 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
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
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***	
Carrier frequency 905.43 MHz											
1000.00	Vertical	1.5	20	70.34	74.0	-3.66	70.34	34.34	54.0	-19.66	Pass
2716.29	Vertical	1.5	60	58.93	74.0	-15.07	58.93	22.93	54.0	-31.07	
3621.72	Vertical	1.4	60	47.62	74.0	-26.38	47.62	11.62	54.0	-42.38	
4527.15	Vertical	1.4	70	51.46	74.0	-22.54	51.46	15.46	54.0	-38.54	
Carrier frequency 916.30 MHz											
1000.00	Vertical	1.5	0	69.20	74.0	-4.80	69.20	33.20	54.0	-20.80	Pass
2748.90	Vertical	1.4	90	59.99	74.0	-14.01	59.99	23.99	54.0	-30.01	
3665.20	Vertical	1.5	100	48.85	74.0	-25.15	48.85	12.85	54.0	-41.15	
4581.50	Vertical	1.5	120	51.81	74.0	-22.19	51.81	15.81	54.0	-38.19	
Carrier frequency 919.92 MHz											
1000.00	Vertical	1.5	15	68.40	74.0	-5.60	68.40	32.40	54.0	-21.60	Pass
2759.76	Vertical	1.5	90	59.77	74.0	-14.23	59.77	23.77	54.0	-30.23	
3679.68	Vertical	1.3	90	47.55	74.0	-26.45	47.55	11.55	54.0	-42.45	
4599.60	Vertical	1.4	230	50.62	74.0	-23.38	50.62	14.62	54.0	-39.38	
Carrier frequency 923.55 MHz											
1030.00	Vertical	1.5	0	66.30	74.0	-7.70	66.30	30.30	54.0	-23.70	Pass
2770.65	Vertical	1.6	100	60.91	74.0	-13.09	60.91	24.91	54.0	-29.09	
3694.20	Vertical	1.5	60	50.24	74.0	-23.76	50.24	14.24	54.0	-39.76	
4617.75	Vertical	1.4	80	53.14	74.0	-20.86	53.14	17.14	54.0	-36.86	

*- 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		
1.6	100	NA	NA	NA	-36

*- 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):	18-Apr-16		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 55 %	**Power Supply:** 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

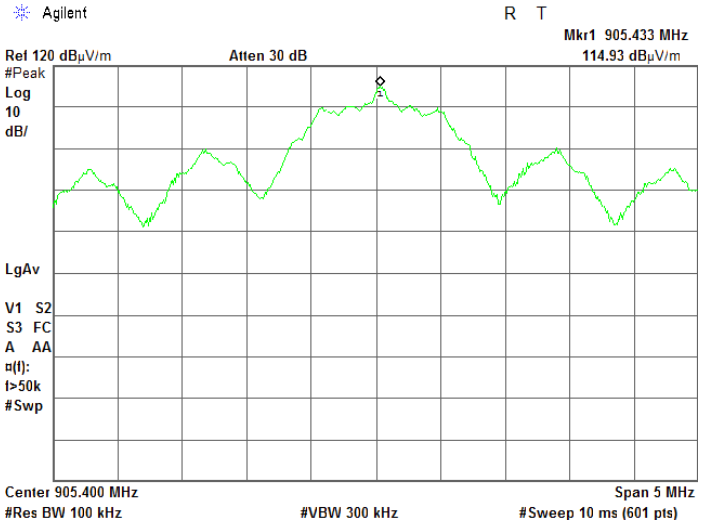
HL 0446	HL 0521	HL 0604	HL 1984	HL 2909	HL 3340	HL 3343	HL 3818
HL 3901	HL 4278	HL 4353					

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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

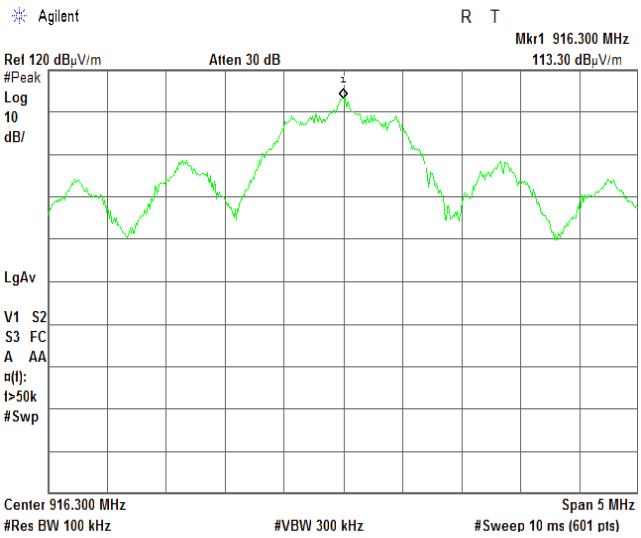
Plot 7.3.1 Radiated emission measurements at the low carrier frequency

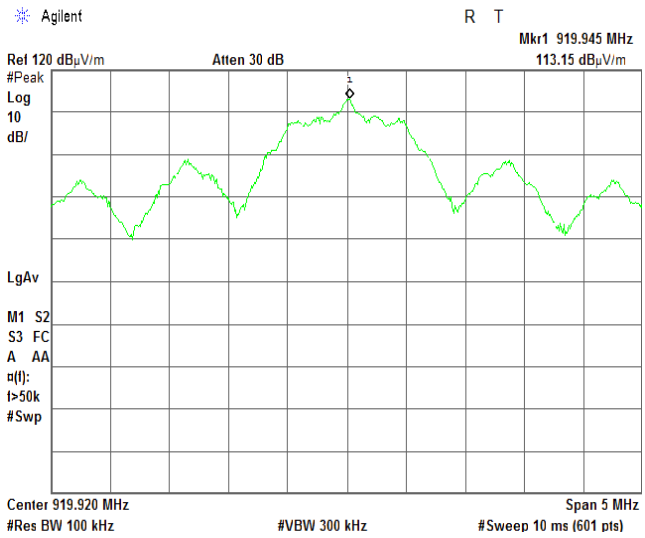
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
MODULATION: BPSK



Plot 7.3.2 Radiated emission measurements at the mid carrier frequency

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
MODULATION: BPSK

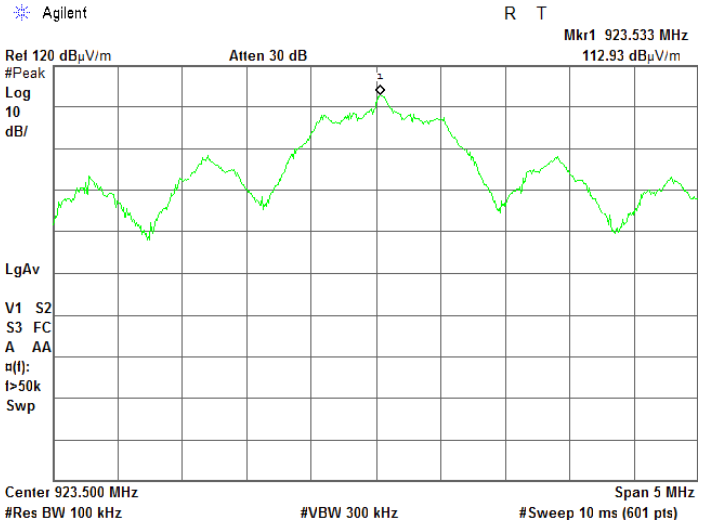




Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

Plot 7.3.3 Radiated emission measurements at the high carrier frequency

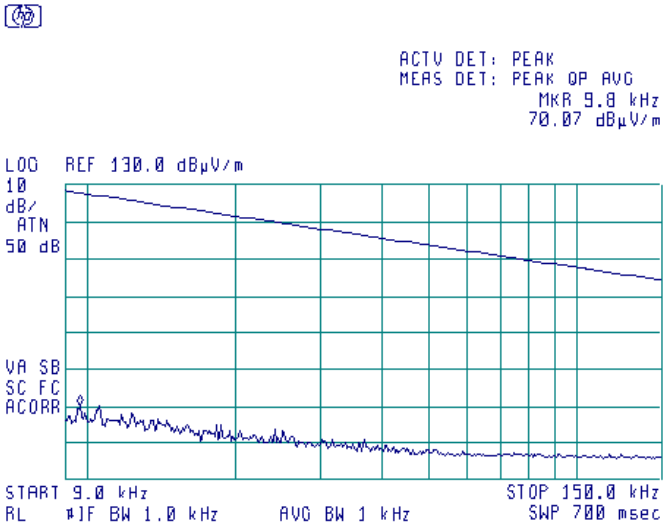
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and horizontal
MODULATION: BPSK



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

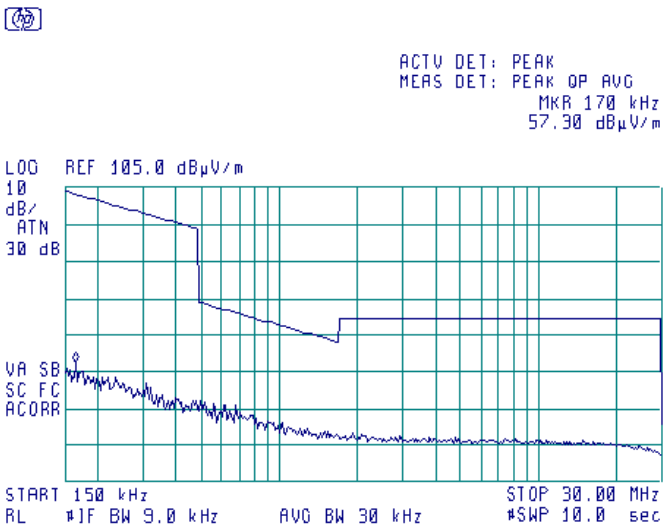
Plot 7.3.4 Radiated emission measurements from 9 to 150 kHz at low, mid and high frequency

TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m



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

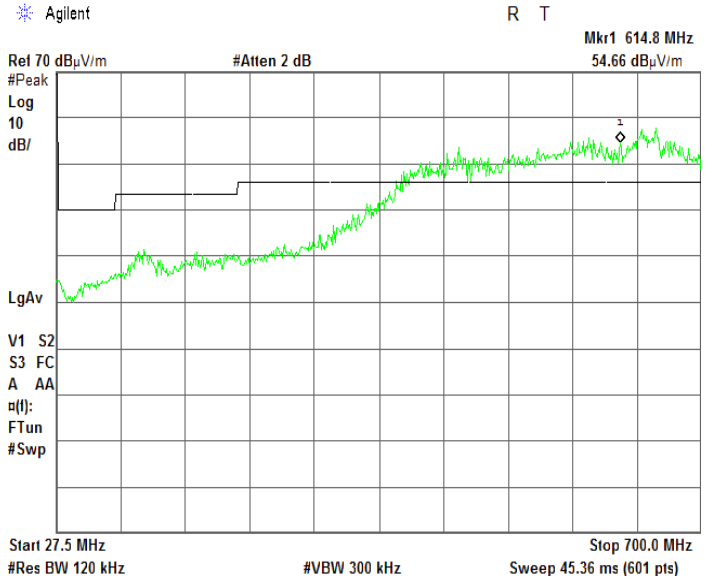
TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

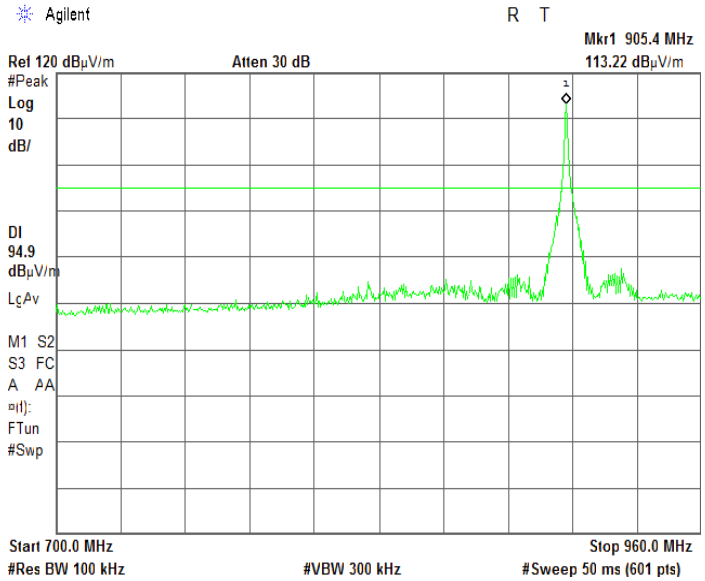
Plot 7.3.6 Radiated emission measurements from 30 to 700 MHz at the low carrier frequency

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



Plot 7.3.7 Radiated emission measurements from 700 to 960 MHz at the low carrier frequency

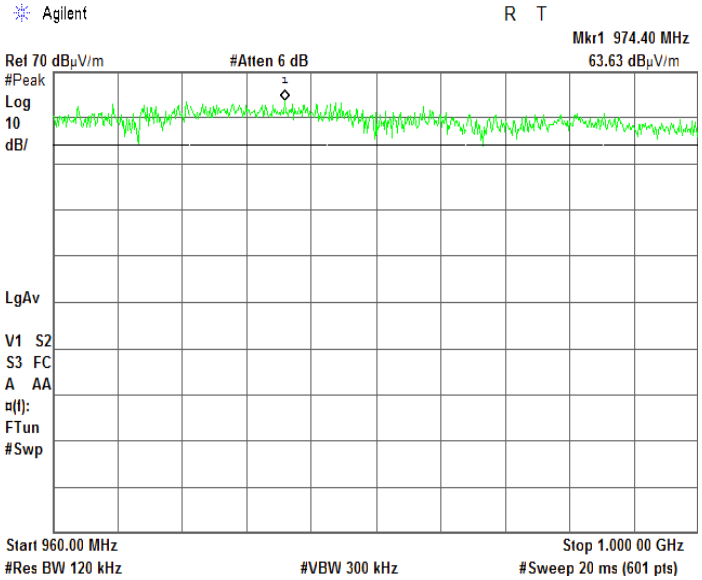
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

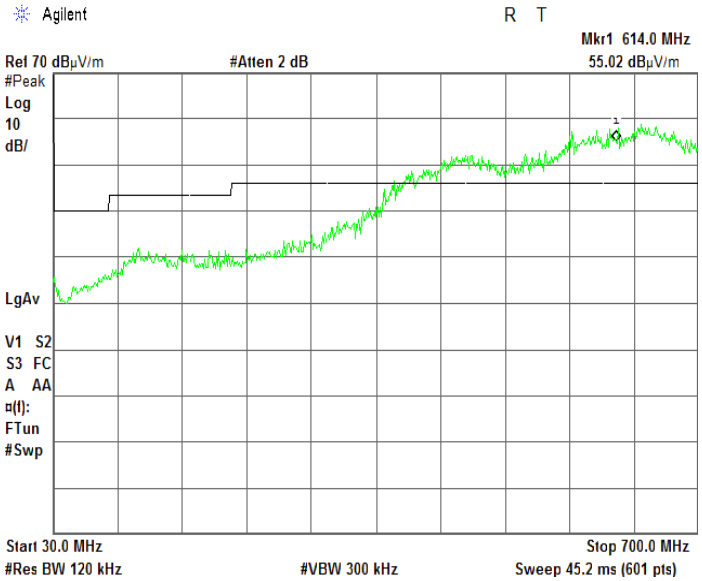
Plot 7.3.8 Radiated emission measurements from 960 to 1000 MHz at the low carrier frequency

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



Plot 7.3.9 Radiated emission measurements from 30 to 700 MHz at the mid carrier frequency 916.3 MHz

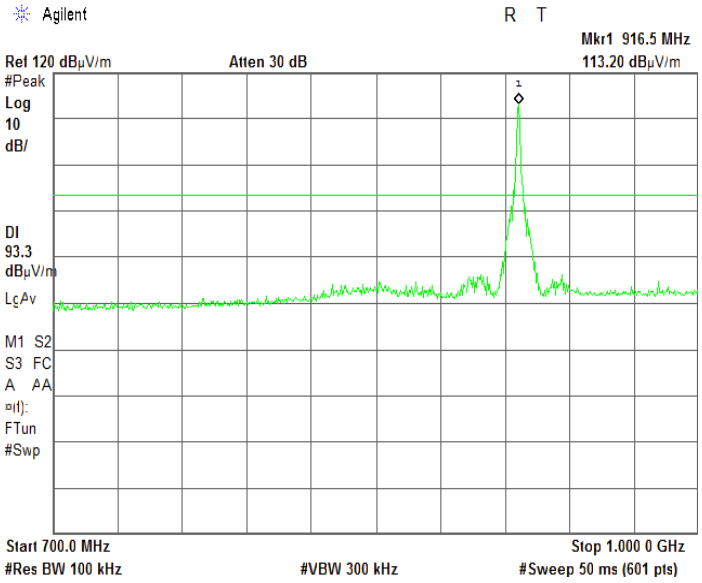
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

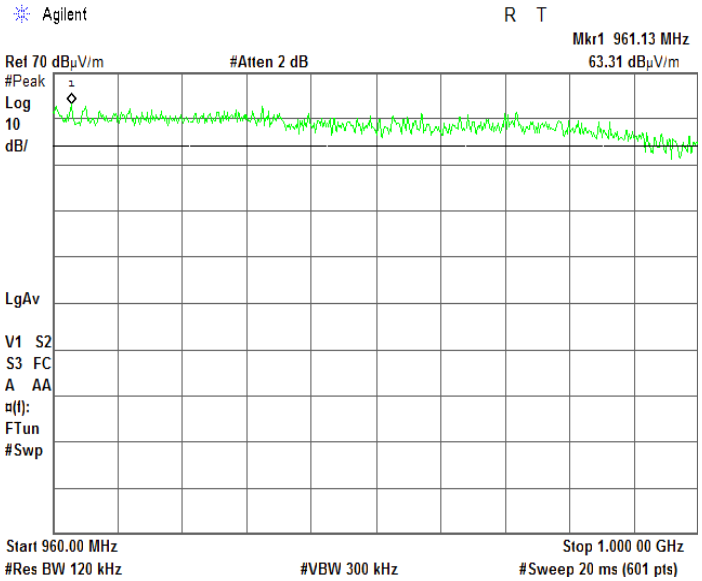
Plot 7.3.10 Radiated emission measurements from 700 to 1000 MHz at the mid carrier frequency 916.3 MHz

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



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

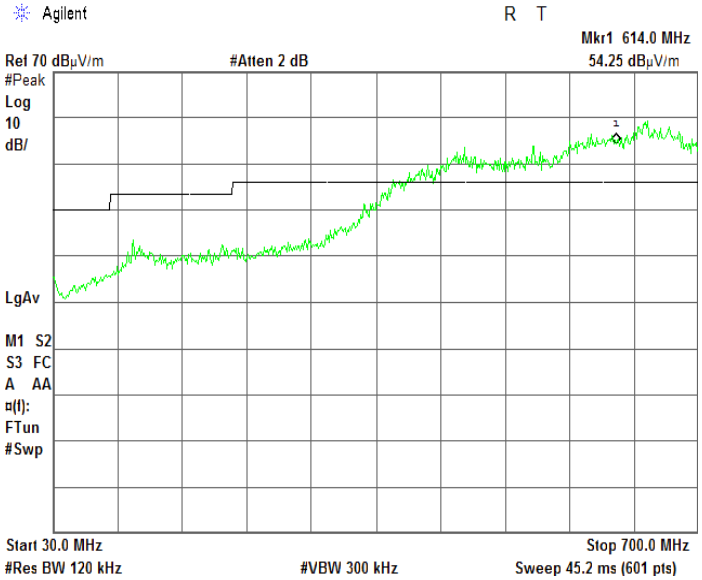
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

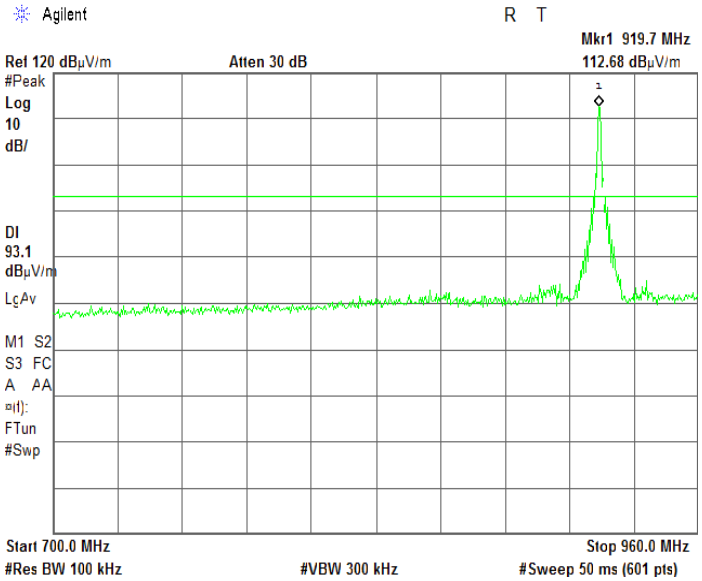
Plot 7.3.12 Radiated emission measurements from 30 to 700 MHz at the mid carrier frequency 919.92 MHz

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



Plot 7.3.13 Radiated emission measurements from 700 to 960 MHz at the mid carrier frequency 919.92 MHz

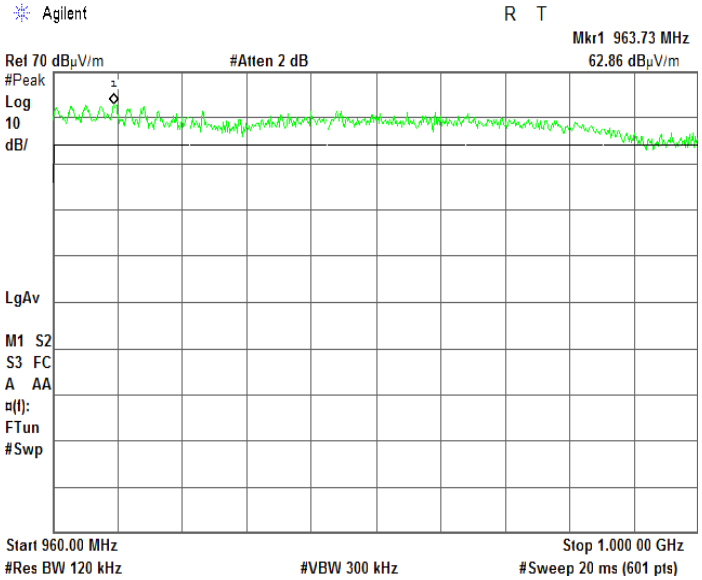
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

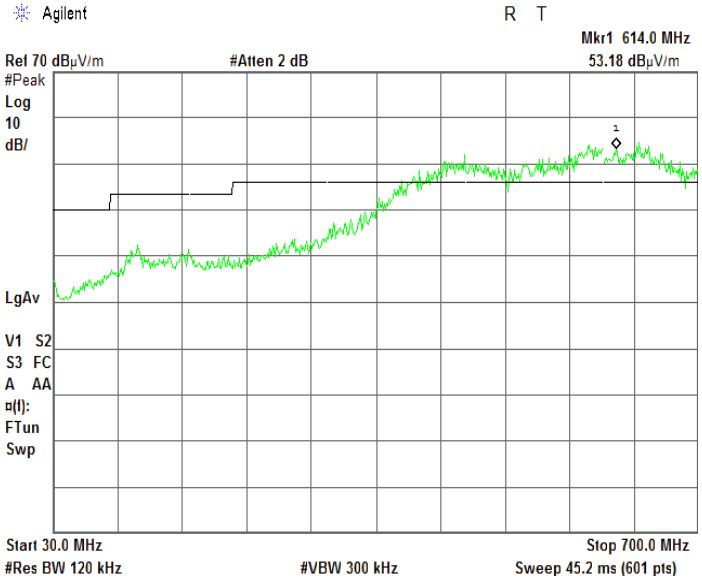
Plot 7.3.14 Radiated emission measurements from 960 to 1000 MHz at the mid carrier frequency 919.92 MHz

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



Plot 7.3.15 Radiated emission measurements from 30 to 700 MHz at the high carrier frequency

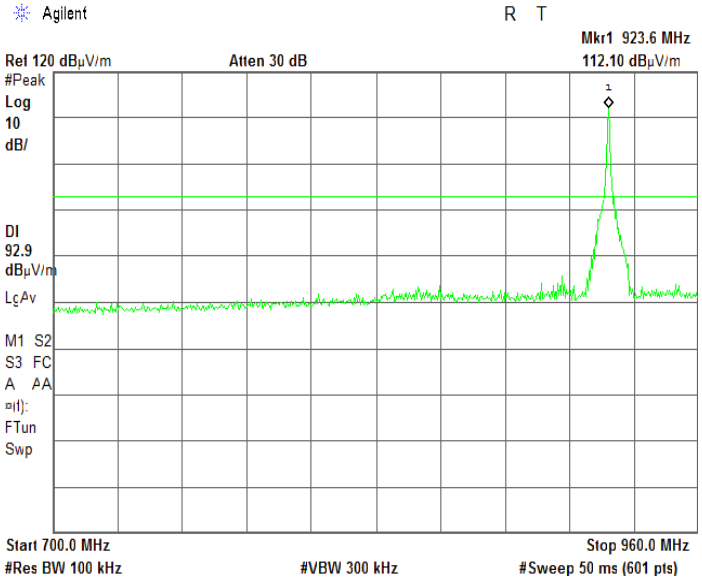
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 55 %	**Power Supply:** Battery
Remarks:			

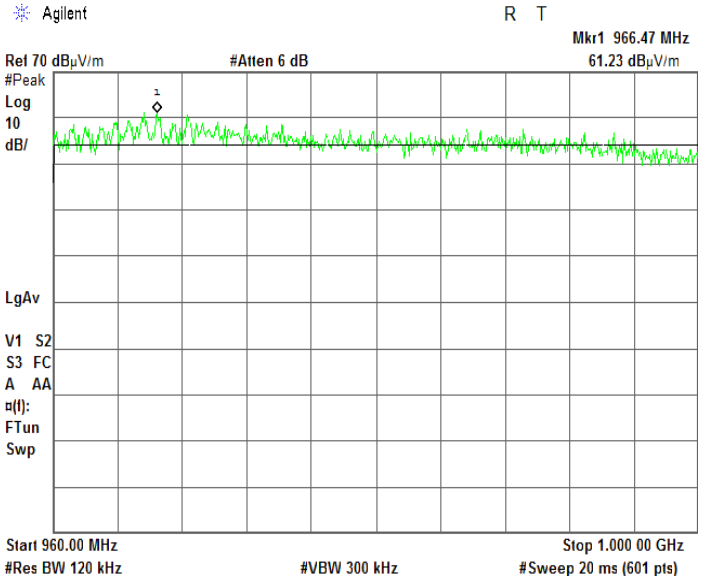
Plot 7.3.16 Radiated emission measurements from 700 to 960 MHz at the high carrier frequency

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

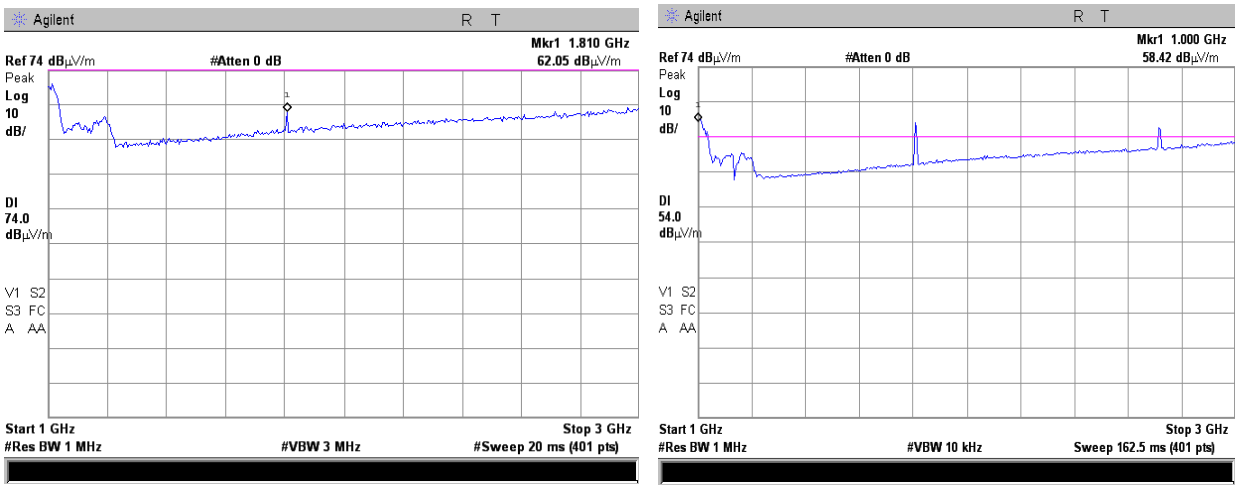
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

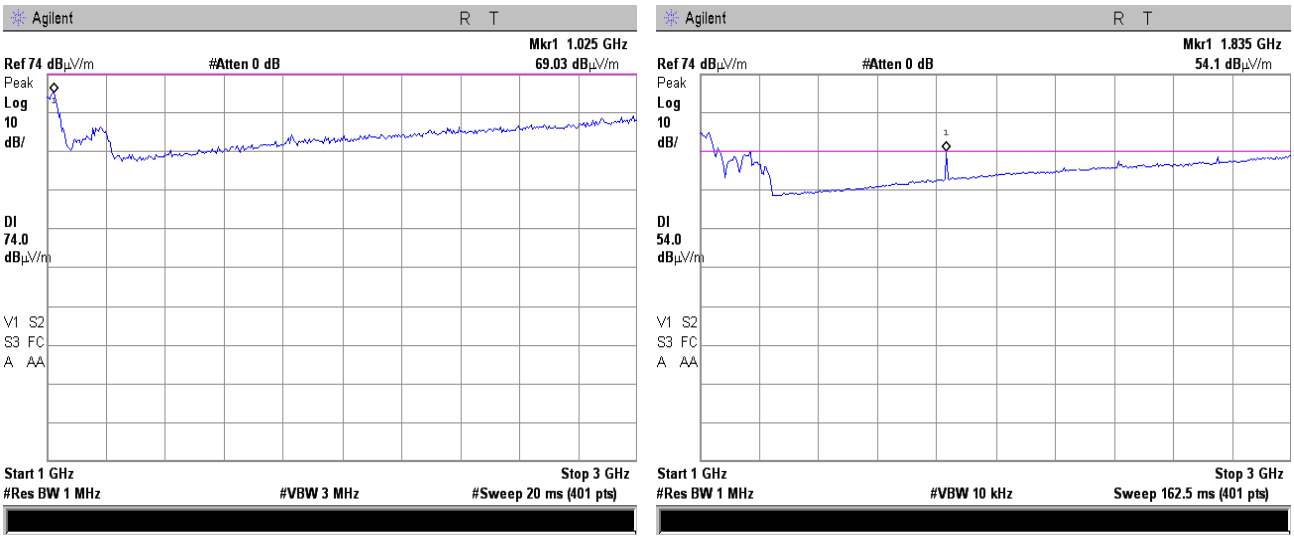
Plot 7.3.18 Radiated emission measurements from 1000 to 3000 MHz at the low carrier frequency

TEST SITE: Semi 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

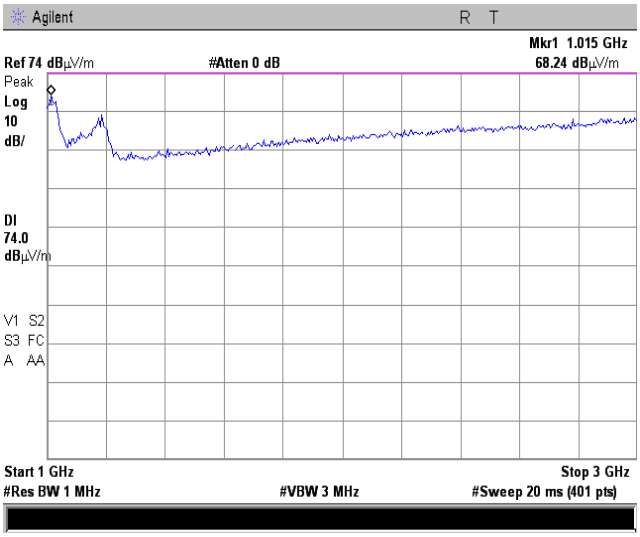
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

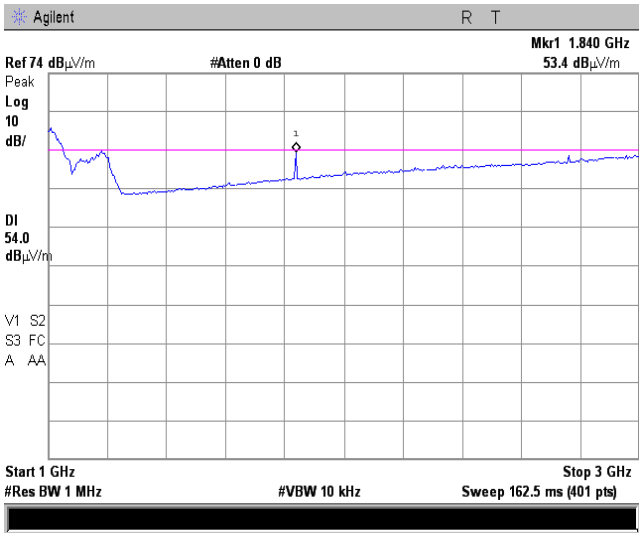


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

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

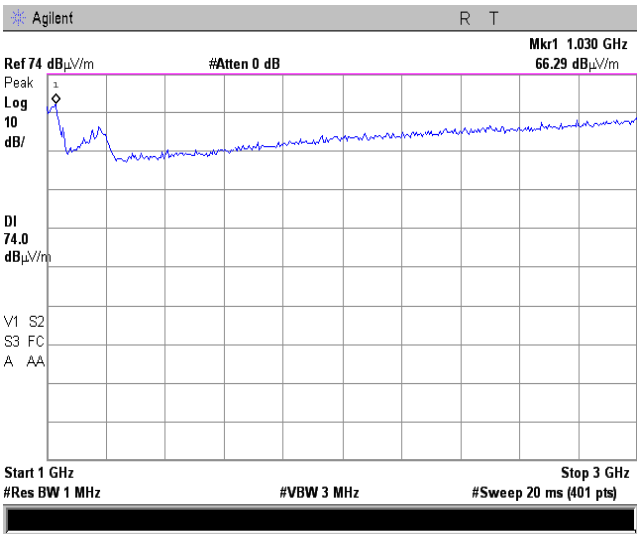
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

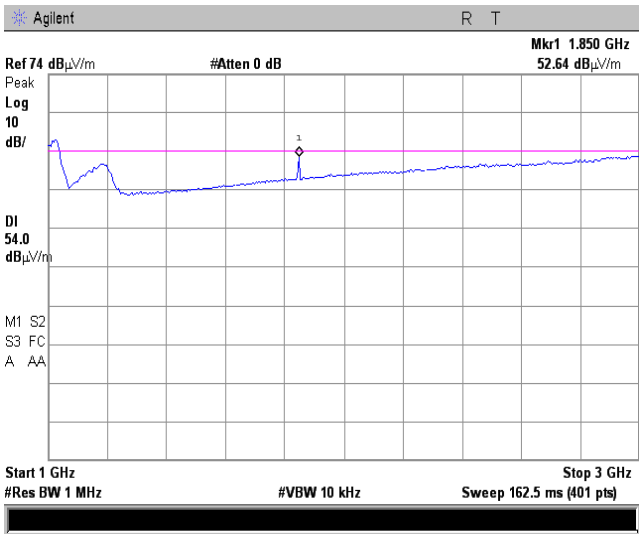




Plot 7.3.21 Radiated emission measurements from 1000 to 3000 MHz at the high carrier frequency

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

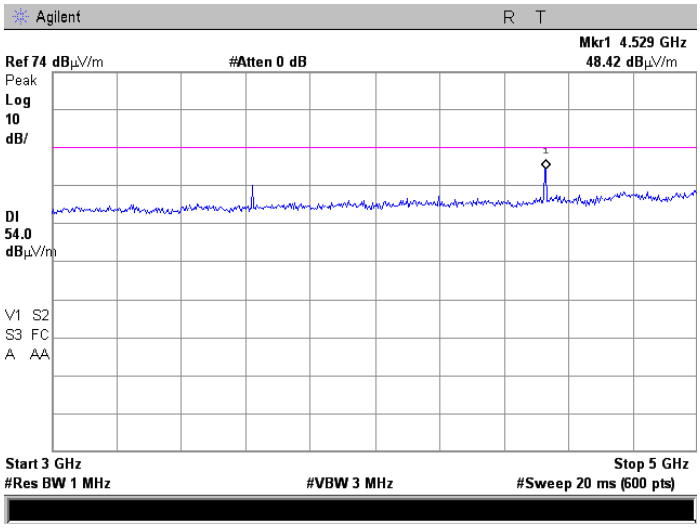




Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

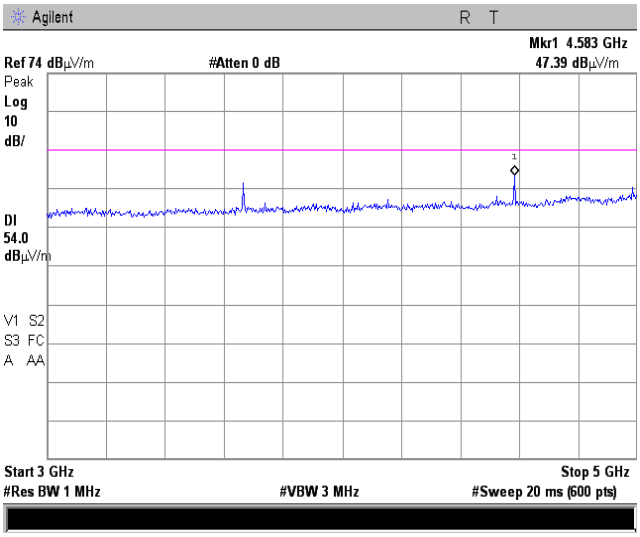
Plot 7.3.22 Radiated emission measurements from 3000 to 5000 MHz at the low carrier frequency

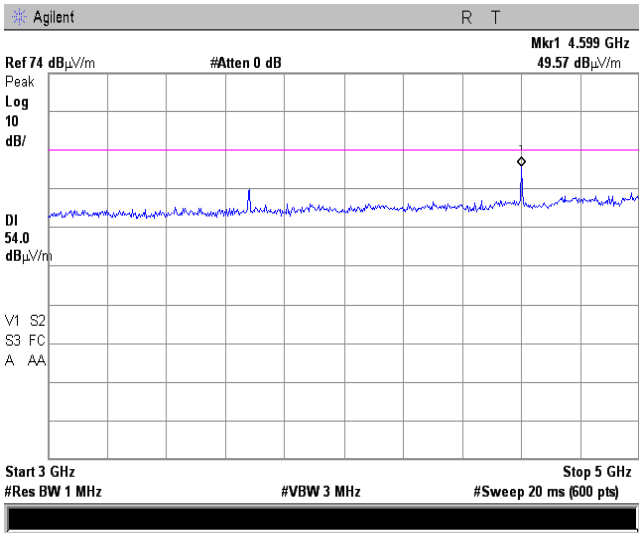
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.3.23 Radiated emission measurements from 3000 to 5000 MHz at the mid carrier frequency

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

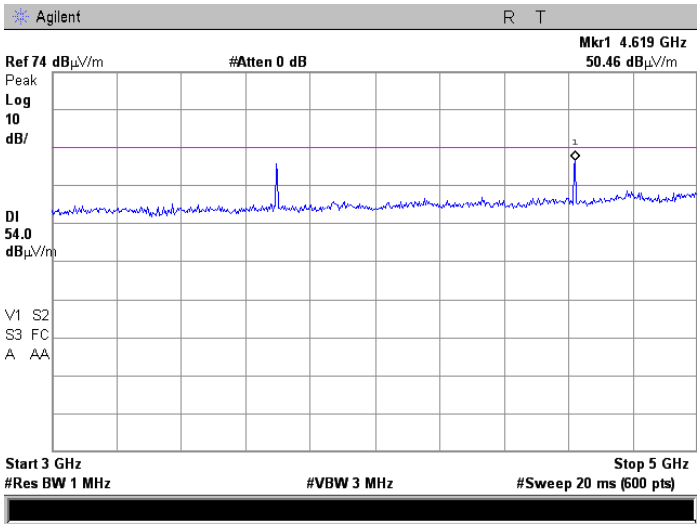




Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

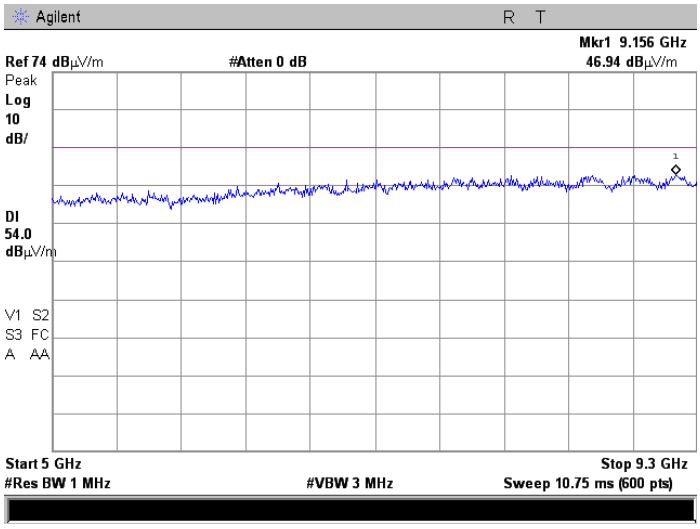
Plot 7.3.24 Radiated emission measurements from 3000 to 5000 MHz at the high carrier frequency

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



Plot 7.3.25 Radiated emission measurements from 5000 to 9300 MHz at the low, mid and high carrier frequency

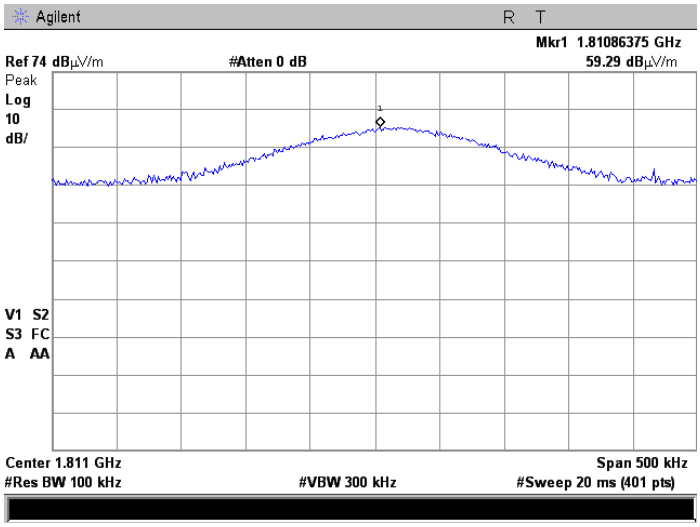
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

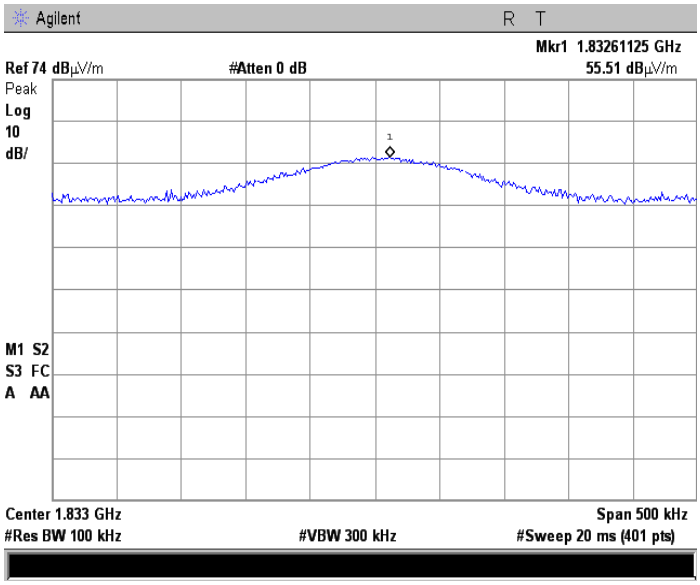
Plot 7.3.26 Radiated emission measurements at the second harmonic of low carrier frequency

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



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

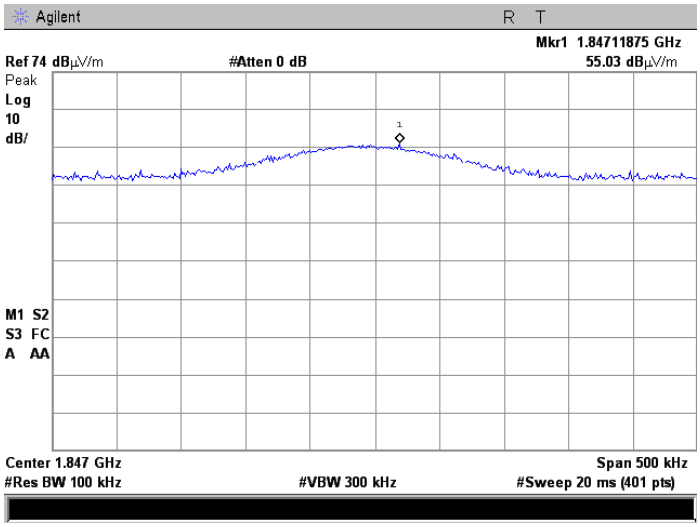
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION Vertical & Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

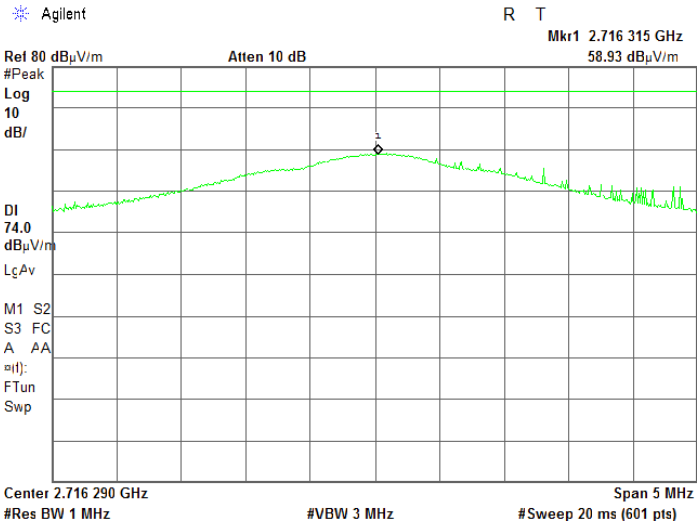
Plot 7.3.28 Radiated emission measurements at the second harmonic of high carrier frequency

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

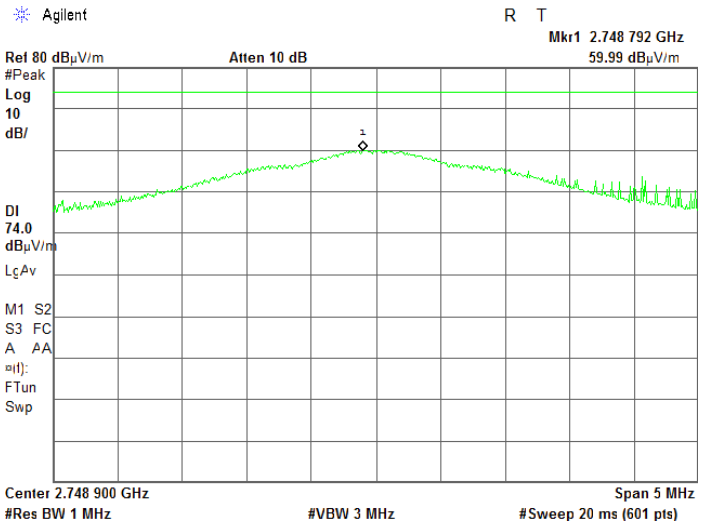
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

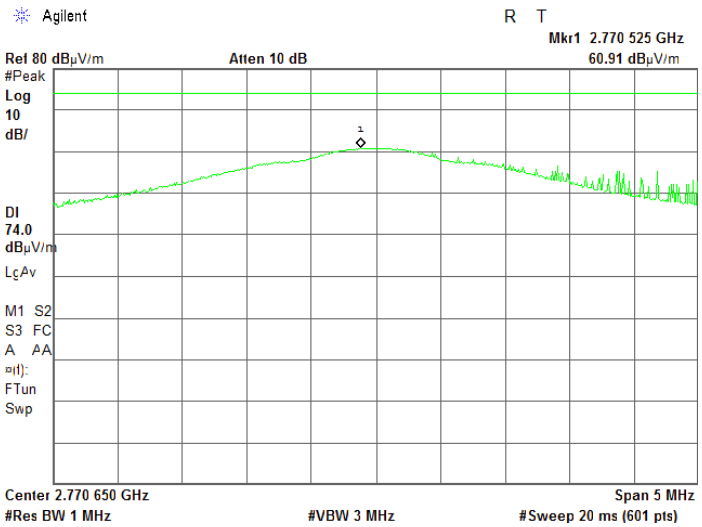
Plot 7.3.30 Radiated emission measurements at the third harmonic of mid carrier frequency

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



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

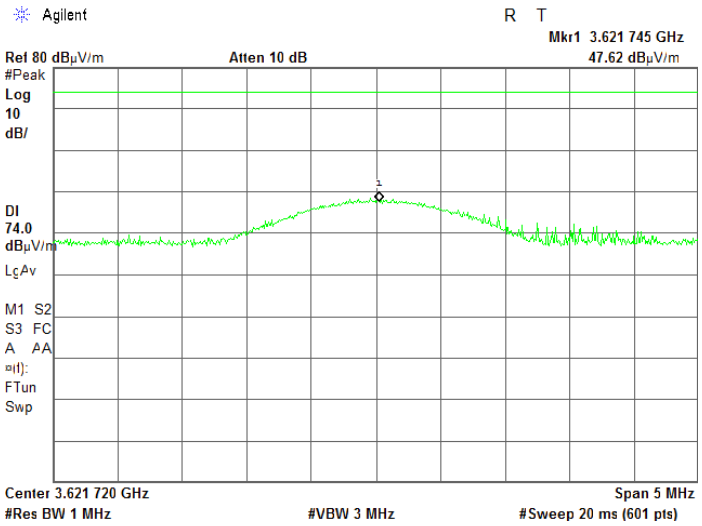
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

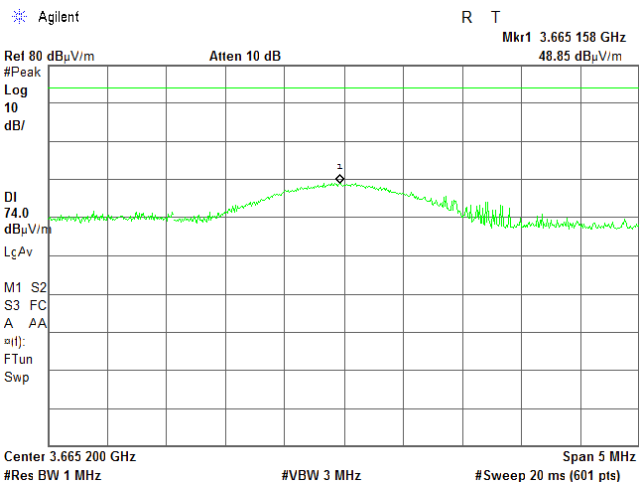
Plot 7.3.32 Radiated emission measurements at the fourth harmonic of low carrier frequency

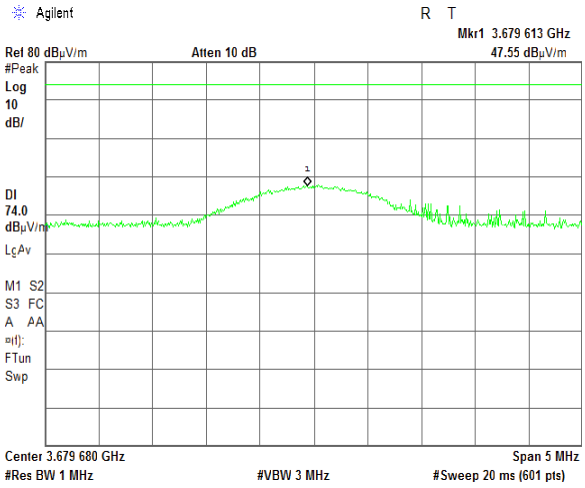
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal



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

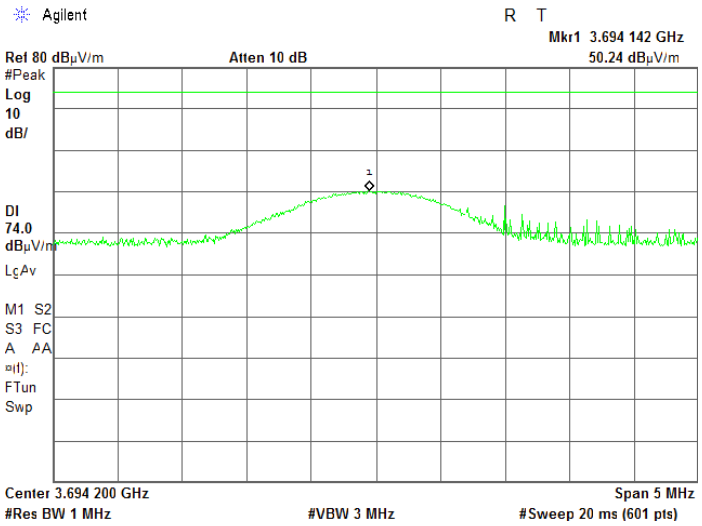




Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

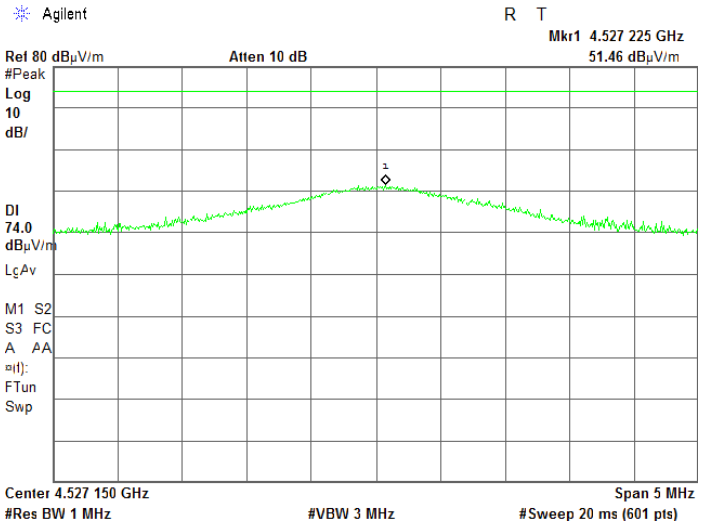
Plot 7.3.34 Radiated emission measurements at the fourth harmonic of high carrier frequency

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

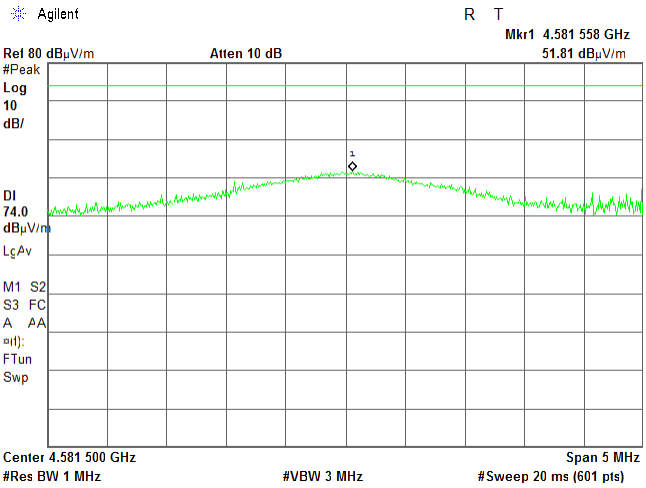
TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal

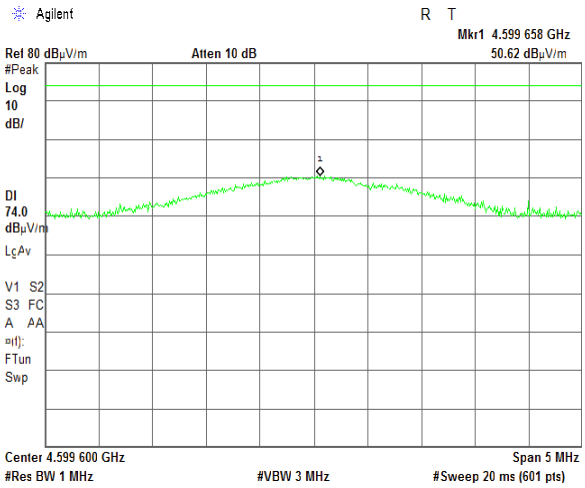


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

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

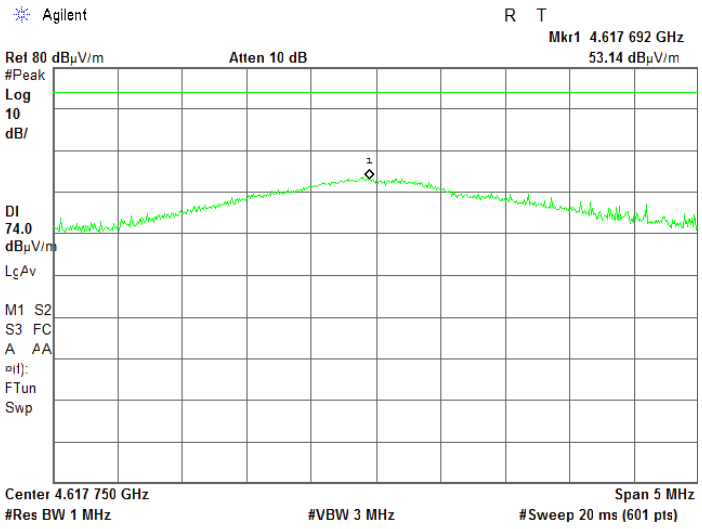
TEST SITE: Semi Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical & Horizontal





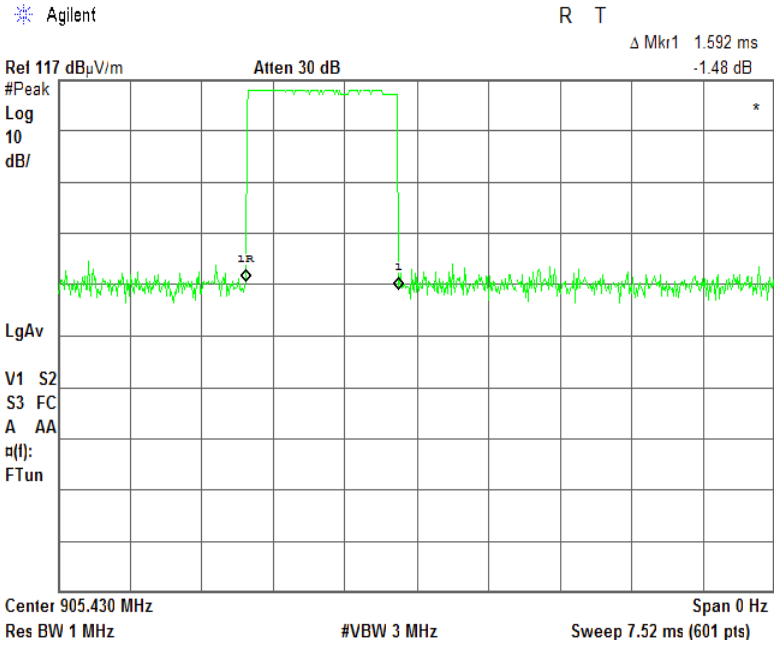
Plot 7.3.37 Radiated emission measurements at the fifth harmonic of high carrier frequency

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

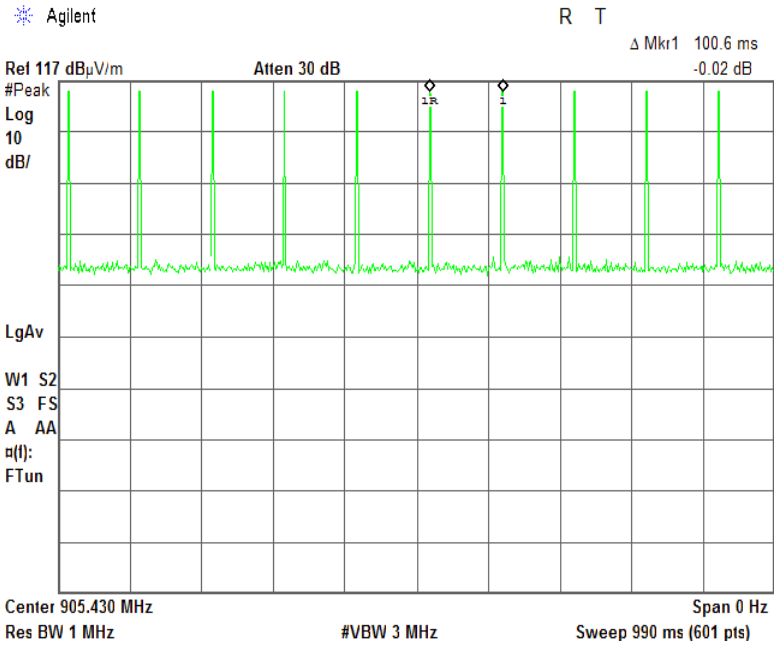


Test specification:	Section 15.247(d) / RSS-247 section 5.5, Radiated spurious emissions		
Test procedure:	ANSI C63.10 section 11.12.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 55 %	Power Supply: Battery
Remarks:			

Plot 7.3.38 Transmission pulse duration



Plot 7.3.39 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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1010 hPa	Relative Humidity: 56 %	Power Supply: 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
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):	18-Apr-16		
Temperature: 23 ºC	**Air Pressure:** 1010 hPa	**Relative Humidity:** 56 %	**Power Supply:** Battery
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 902-928 MHz
DETECTOR USED: Peak
MODULATION: BPSK
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz

Frequency, MHz	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
901.392	-73.77	-43.45	30.32	30.0	0.32	Pass
928.586	-83.85	-53.60	30.25		0.25	

*- Margin = Attenuation below carrier – specification limit.

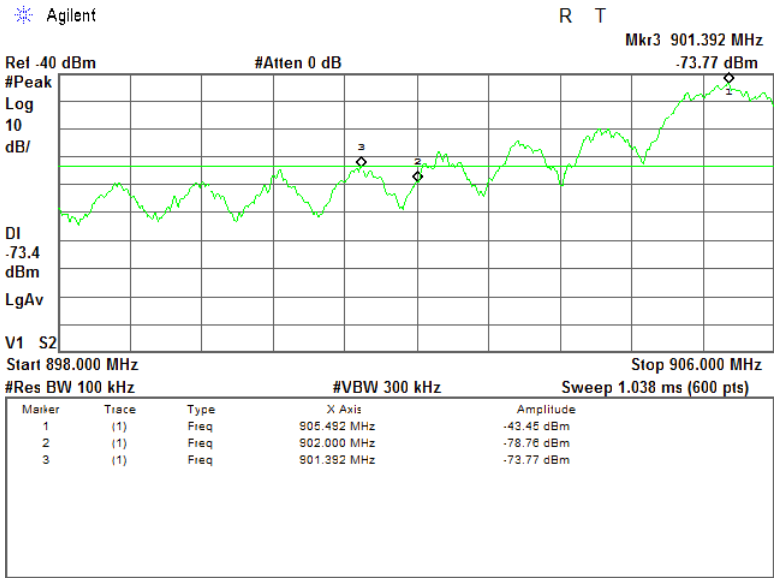
Reference numbers of test equipment used

HL 3818							

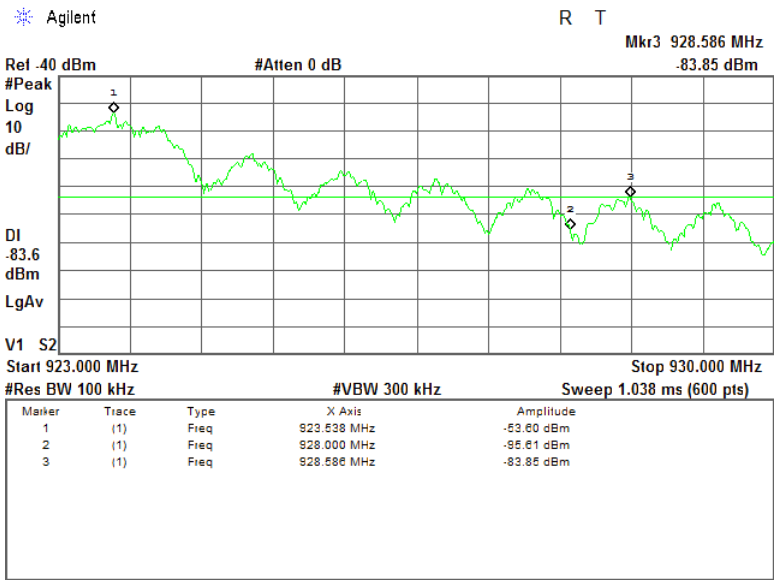
Full description is given in Appendix A.

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):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: 1010 hPa	Relative Humidity: 56 %	Power Supply: Battery
Remarks:			

Plot 7.4.1 The highest band edge emission at low carrier frequency



Plot 7.4.2 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 11.10.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

7.5 Maximum power spectral density (PSD)

7.5.1 General

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

Table 7.5.1 Power spectral 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.

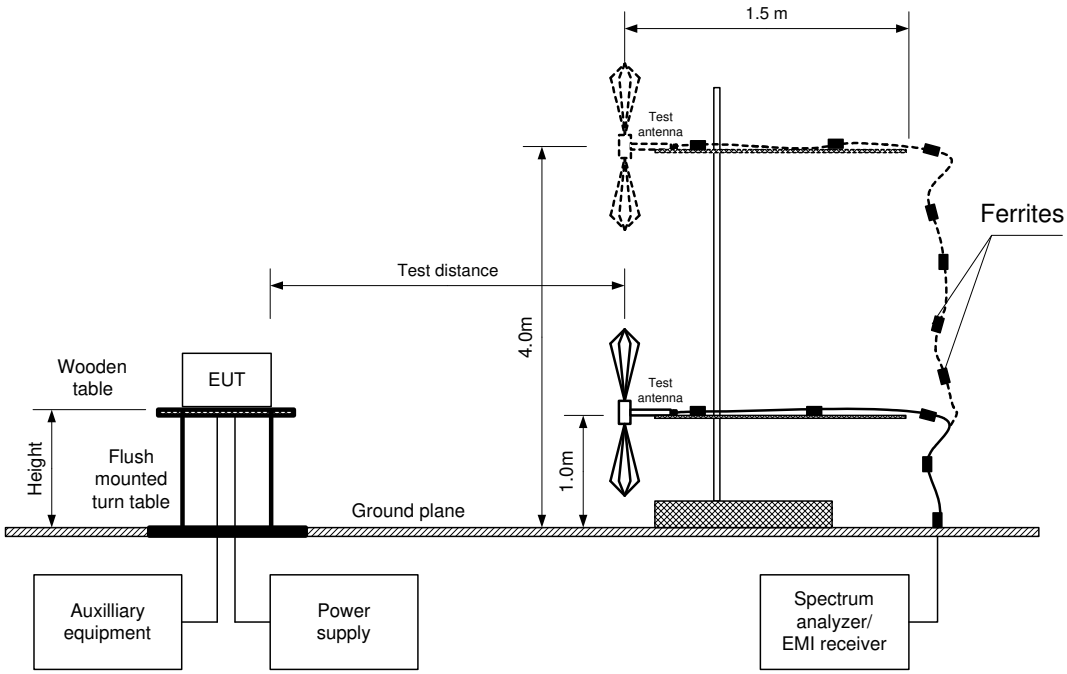
7.5.2.4 The average power spectral density was measured in power averaging mode with resolution bandwidth set to 3 kHz, video bandwidth VBW $\geq$ 3 RBW over a minimum of 100 traces to find the highest level.

7.5.2.5 To compute the average power spectral density during the actual transmission time the duty cycle correction factor was added to the measured PSD.

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

Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Figure 7.5.1 Setup for carrier field strength measurements



Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Table 7.5.2 Field strength measurement of peak spectral power density

ASSIGNED FREQUENCY: 902 - 928 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
DETECTOR USED: Peak
TEST ANTENNA TYPE: Biconilog
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	87.385	7.185	8	-0.815	Vertical	1.0	30	Pass
916.30	85.275	5.075	8	-2.925	Vertical	1.0	30	Pass
923.55	86.920	6.720	8	-1.280	Vertical	1.0	10	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	90.7	1.93	8	-6.07	Vertical	1	45	Pass

* - Calculated PSD = Field strength, dB(μV/m) – EUT antenna gain, dBi – 95.2 dB +10log(1/DC) dB.

**- Margin = Calculated PSD - Limit

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

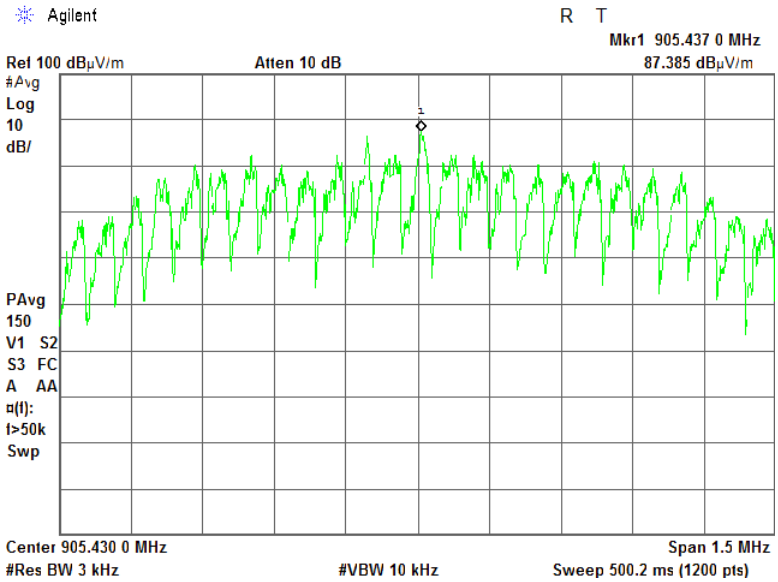
Reference numbers of test equipment used

HL 0521	HL 0604	HL 2871	HL 2909	HL 3818	HL 4280		

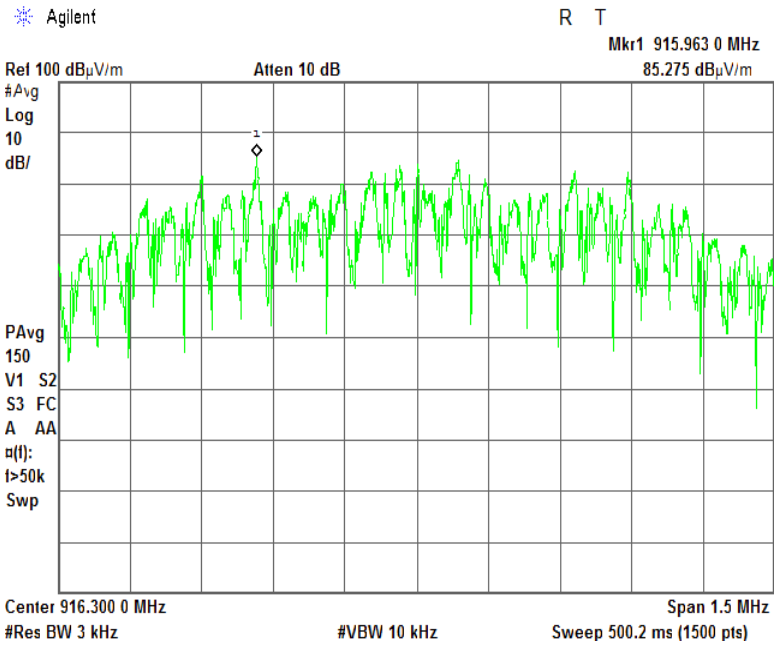
Full description is given in Appendix A.

Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Plot 7.5.1 Peak spectral power density at 905.43 MHz, BPSK modulation

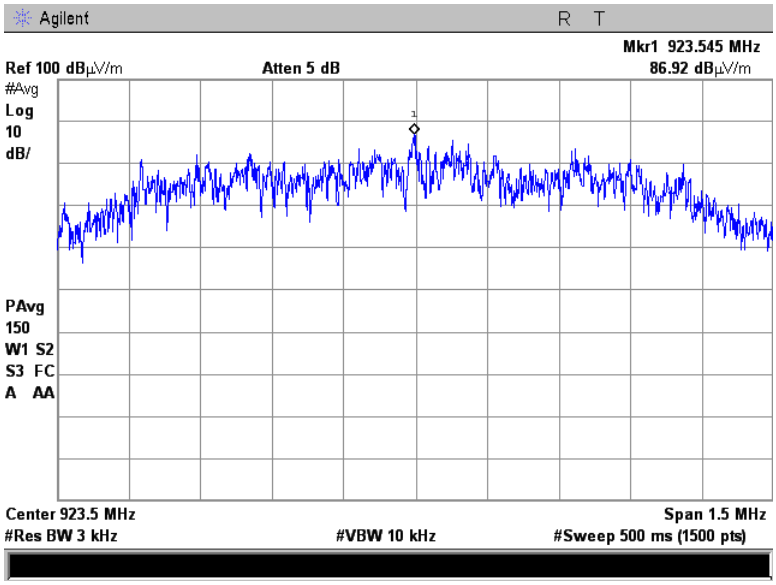


Plot 7.5.2 Peak spectral power density at 916.3 MHz, BPSK modulation

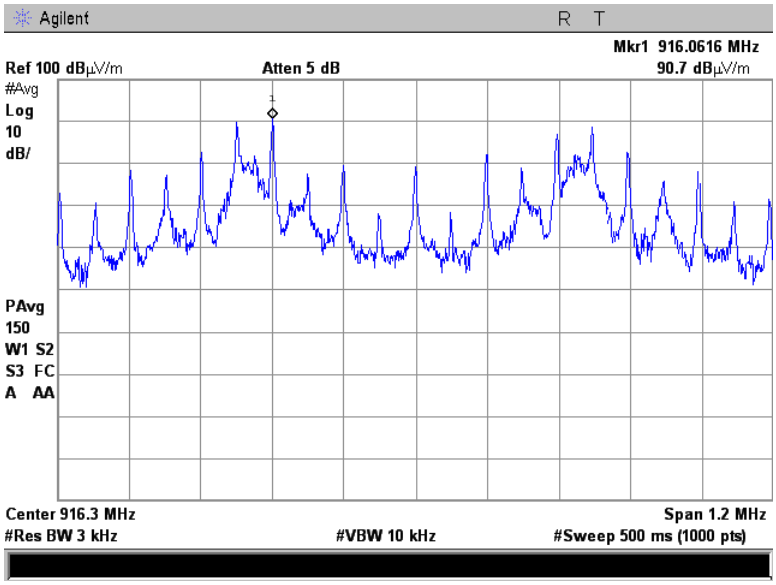


Test specification:	Section 15.247(e) / RSS-247 section 5.2(2), Maximum power spectral density		
Test procedure:	ANSI C63.10 section 11.10.5		
Test mode:	Compliance	Verdict:	PASS
Date(s):	18-Apr-16		
Temperature: 23 ºC	Air Pressure: hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

Plot 7.5.3 Peak spectral power density at 923.55 MHz, 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 / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	17-Apr-16		
Temperature: 22 ºC	Air Pressure: 1007 hPa	Relative Humidity: 54 %	Power Supply: Battery
Remarks:			

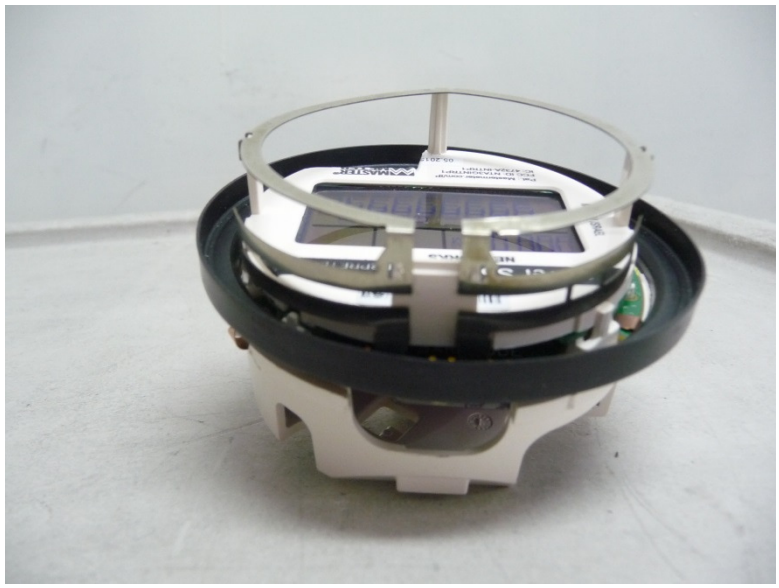
7.6 Antenna requirements

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
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-15	27-Oct-16
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-May-16	10-May-17
1984	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz, 300 W	EMC Test Systems	3115	9911-5964	28-Mar-16	28-Mar-17
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	15-Dec-15	15-Dec-16
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	21-Feb-16	21-Feb-17
3340	High Pass Filter, 50 Ohm, 1000 to 3000 MHz	Mini-Circuits	SHP-1000+	NA	01-Oct-15	01-Oct-17
3343	High Pass Filter, 50 Ohm, 2650 to 6500 MHz	Mini-Circuits	VHF-2700+	NA	01-Jan-16	01-Jan-17
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	03-May-16	03-May-17
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	15-Feb-16	15-Feb-17
4278	Test Cable , DC-18 GHz, 4.6 m, N/M - N/M	Mini-Circuits	APC-15FT-NMNM+	0755A	22-Nov-15	22-Nov-16
4280	Test Cable , DC-18 GHz, 4.6 m, N/M - N/M	Mini-Circuits	APC-15FT-NMNM+	0763A	22-Nov-15	22-Nov-16
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

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 listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; 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, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. 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). The FCC Designation Number is IL1001.

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website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

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: 2009	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(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).

Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-8155-00, HL 2871

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.12	5750	2.34	12000	3.55
30	0.14	6000	2.39	12250	3.61
100	0.27	6250	2.46	12500	3.67
250	0.45	6500	2.52	12750	3.74
500	0.63	6750	2.58	13000	3.79
750	0.76	7000	2.64	13250	3.82
1000	0.89	7250	2.68	13500	3.83
1250	1.01	7500	2.73	13750	3.83
1500	1.12	7750	2.78	14000	3.88
1750	1.23	8000	2.83	14250	3.93
2000	1.32	8250	2.88	14500	3.96
2250	1.41	8500	2.94	14750	4.01
2500	1.49	8750	2.97	15000	4.00
2750	1.58	9000	3.02	15250	4.01
3000	1.66	9250	3.07	15500	4.00
3250	1.73	9500	3.13	15750	4.13
3500	1.80	9750	3.18	16000	4.22
3750	1.87	10000	3.21	16250	4.29
4000	1.93	10250	3.26	16500	4.29
4250	2.01	10500	3.30	16750	4.32
4500	2.06	10750	3.36	17000	4.37
4750	2.12	11000	3.39	17250	4.45
5000	2.17	11250	3.44	17500	4.49
5250	2.24	11500	3.48	17750	4.53
5500	2.29	11750	3.52	18000	4.55

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
Test cable, Mini-Circuits, S/N 0763A, 18 GHz, 4.6 m, N/M - N/M
APC-15FT-NMNM+, HL 4280

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.21	5000	4.27	10200	6.50	15400	8.49
30	0.26	5100	4.32	10300	6.55	15500	8.50
50	0.34	5200	4.35	10400	6.59	15600	8.55
100	0.51	5300	4.41	10500	6.62	15700	8.58
200	0.63	5400	4.43	10600	6.65	15800	8.61
300	0.73	5500	4.49	10700	6.66	15900	8.64
400	0.91	5600	4.54	10800	6.68	16000	8.68
500	1.07	5700	4.58	10900	6.70	16100	8.72
600	1.21	5800	4.63	11000	6.71	16200	8.73
700	1.33	5900	4.67	11100	6.72	16300	8.75
800	1.45	6000	4.73	11200	6.74	16400	8.77
900	1.55	6100	4.76	11300	6.77	16500	8.80
1000	1.65	6200	4.81	11400	6.81	16600	8.80
1100	1.75	6300	4.86	11500	6.84	16700	8.82
1200	1.85	6400	4.89	11600	6.87	16800	8.83
1300	1.94	6500	4.94	11700	6.89	16900	8.87
1400	2.03	6600	4.95	11800	6.94	17000	8.92
1500	2.11	6700	4.99	11900	7.00	17100	8.96
1600	2.19	6800	5.04	12000	7.05	17200	9.01
1700	2.27	6900	5.04	12100	7.10	17300	9.07
1800	2.34	7000	5.09	12200	7.17	17400	9.09
1900	2.42	7100	5.15	12300	7.23	17500	9.14
2000	2.49	7200	5.19	12400	7.29	17600	9.17
2100	2.56	7300	5.25	12500	7.34	17700	9.21
2200	2.63	7400	5.33	12600	7.38	17800	9.24
2300	2.69	7500	5.39	12700	7.44	17900	9.28
2400	2.76	7600	5.42	12800	7.48	18000	9.31
2500	2.83	7700	5.51	12900	7.55		
2600	2.89	7800	5.58	13000	7.58		
2700	2.95	7900	5.62	13100	7.63		
2800	3.02	8000	5.68	13200	7.67		
2900	3.08	8100	5.73	13300	7.72		
3000	3.15	8200	5.78	13400	7.76		
3100	3.21	8300	5.83	13500	7.81		
3200	3.27	8400	5.87	13600	7.85		
3300	3.33	8500	5.92	13700	7.88		
3400	3.38	8600	5.96	13800	7.93		
3500	3.44	8700	6.00	13900	7.97		
3600	3.49	8800	6.04	14000	8.01		
3700	3.55	8900	6.10	14100	8.05		
3800	3.60	9000	6.13	14200	8.09		
3900	3.65	9100	6.17	14300	8.12		
4000	3.71	9200	6.22	14400	8.15		
4100	3.75	9300	6.25	14500	8.19		
4200	3.81	9400	6.28	14600	8.22		
4300	3.86	9500	6.32	14700	8.26		
4400	3.93	9600	6.36	14800	8.29		
4500	3.98	9700	6.37	14900	8.32		
4600	4.03	9800	6.41	15000	8.36		
4700	4.08	9900	6.42	15100	8.40		
4800	4.13	10000	6.45	15200	8.43		
4900	4.18	10100	6.48	15300	8.44		

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		

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

END OF DOCUMENT