

TEST REPORT

ACCORDING TO: FCC 47 CFR PART 15 subpart C, section 15.249; subpart B and
RSS-210 issue 8 Annex 2; ICES-003 Issue 6:2016

FOR:

Afimilk Agricultural Cooperative Ltd.

Wireless Reader

Model: AfiAct II Reader 2

Part number: 4256204

FCC ID:JER4256204

This report is in conformity with ISO/IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested.
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1 Applicant information

Client name: Afimilk Agricultural Cooperative Ltd.
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Telephone: +972 4675 4256
Fax: +972 4675 1862
E-mail: eran@afimilk.co.il
Contact name: Mr. Eran Levin

2 Equipment under test attributes

Product name: Wireless Reader
Product type: Transceiver
Model(s): AfiAct II Reader 2
Part number: 4256204
Hardware version: 2.6
Software release: 1.9
Receipt date 02-Mar-16

3 Manufacturer information

Manufacturer name: Afimilk Agricultural Cooperative Ltd.
Address: Kibbutz Afikim 1514800, Israel
Telephone: +972 4675 4827
Fax: +972 4675 1862
E-Mail: eli_s@afimilk.co.il
Contact name: Mr. Elie Shimshon

4 Test details




Project ID: 28077
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 02-Mar-16
Test completed: 21-Mar-16
Test specification(s): FCC 47 CFR Part 15, subpart C, §15.249; subpart B
RSS-210 issue 8 Annex 2; RSS-Gen issue 4, ICES-003 issue 6:2016

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	Pass
Section 15.249(d)/RSS-210, section A2.9, Band edge emissions	Pass
Section 15.207(a) / RSS-Gen, section 8.8, Conducted emission	Pass
Section 15.203 / RSS-Gen, Section 8.3, Antenna requirement	Pass
Section 15.215(c) / RSS-Gen, Section 6.6, Occupied bandwidth	Pass
Unintentional emissions	
FCC Part 15, Section 107 / ICES-003, Section 6.1 class B, Conducted emission at AC power port	Pass
FCC Part 15, Section 109 / RSS-Gen, Section 7.1.2, ICES-003, Section 6.2 class B, Radiated emission	Pass

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

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

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	March 21, 2016	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	April 14, 2016	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	August 18, 2016	

6 EUT description

6.1 General information

The EUT is a reader operating in 906-927.5 MHz. It contains:

- 1) the sub-gigahertz transceiver board with the following circuits
 - a power supply circuit for converting the supply voltage, 24VAC, to lower DC voltages;
 - a microprocessor circuit to execute the reader functions;
 - two radio transceivers for communicating with the RFID tags worn by the dairy cows;
 - a circuit for driving the display board.
- 2) a display board with the following circuits
 - 6 LEDs for displaying the units functional operation status.
- 3) a small single board computer with the following functions
 - an Ethernet interface used for installation setup and diagnostic servicing;
 - a micro SD card interface for storing all reader transactions;
 - a 2.4 gigahertz WIFI interface card for communicating with the main management computer;
 - a power connector for receiving power from the sub-gigahertz transceiver board;
- 4) two antennas connected to the 2 transceivers;
- 5) two antennas connected to the WIFI interface.

6.2 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length, m
Power	AC	AC mains	Transformer	1	Unshielded	2
Power	AC	Transformer	EUT	1	Unshielded	5

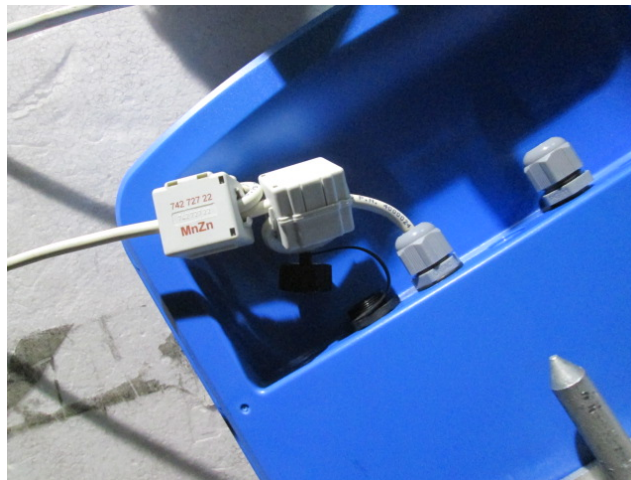
6.3 Changes made in EUT

To withstand the standard requirements the following changes were performed in the EUT:

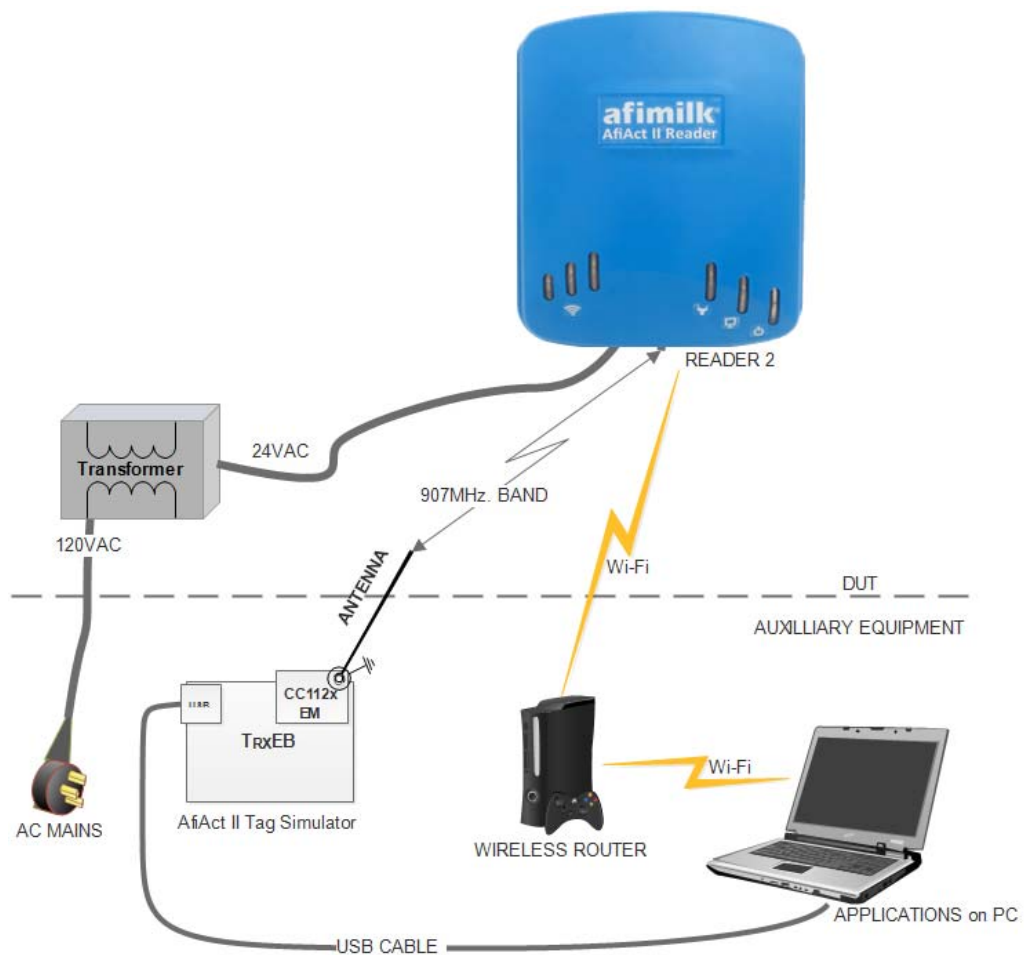
Two ferrite beads manufactured by Wurth Electronics, part numbers 742 727 22 and 742 717 22 (each one with one turn) were installed at the 24 VAC cable as shown in Photograph 6.3.1.

It is manufacturer responsibility to implement the change in the production version of the EUT. In any case the test report applies to the tested item only.

Photograph 6.3.1 Changes made in the EUT



6.4 Test configuration



6.5 Transmitter characteristics

Type of equipment					
V	Stand-alone (Equipment with or without its own control provisions)				
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)				
	Plug-in card (Equipment intended for a variety of host systems)				
Assigned frequency range		902 - 928 MHz			
Operating frequency range		906.0 – 927.5 MHz			
Maximum field strength		91.73 dB(μV/m) at 3 m test distance			
Is transmitter output power variable?		V	No		
			Yes	continuous variable	
				stepped variable with stepsize, software controlled	dB
				Maximum field strength	91.73 dB(μV/m) at 3 m test distance
Antenna connection					
V	unique coupling	standard connector	Integral	V	with temporary RF connector without temporary RF connector
Antenna/s technical characteristics					
Type	Manufacturer		Model number		Gain
WI-FI SMA-RP (two items)	Kunshan Wavelink Electronics Co., Ltd.		RL-437		2 dBi
Rod SMA RP (two items)	LINX TECHNOLOGIES		ANT-916-CW-HW		1 dBi
Transmitter aggregate data rate/s		80 kbps			
Type of modulation		2GFSK			
Transmitter duty cycle supplied for test		100%			
Transmitter power source					
	Battery	Nominal rated voltage	Battery type		
	DC	Nominal rated voltage			
V	AC mains	Nominal rated voltage	24 VAC from transformer	Frequency	50 Hz
Common power source for transmitter and receiver			V	yes	no

Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Mar-16		
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart C and RSS-210 Annex 2 requirements

7.1 Field strength of emissions

7.1.1 General

This test was performed to measure field strength of fundamental and spurious emissions from the EUT. Specification test limits are given in Table 7.1.1, Table 7.1.2, Table 7.1.3.

Table 7.1.1 Radiated fundamental emission limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)		
	Peak	Average	Quasi-Peak
902 – 928	NA	NA	94

Table 7.1.2 Harmonics limits

Fundamental frequency, MHz	Field strength at 3 m, dB(μV/m)	
	Peak	Average
902 – 928	74.0	54.0

Table 7.1.3 Radiated spurious emissions limits (other than harmonics)

Frequency, MHz	Field strength at 3 m, dB(μV/m)*			
	Peak	Quasi Peak	Average	Attenuation below carrier
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	50 dBc (whichever is the less stringent)
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		
Above 1000	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.

Note: The above 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 but not exceeding 40 GHz for intentional radiators operated below 10 GHz and up to the fifth harmonic of the highest fundamental frequency but not exceeding 100 GHz for intentional radiators operated above 10 GHz.

Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

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

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and the performance check was conducted.

7.1.2.2 The specified frequency range was investigated with 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.

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

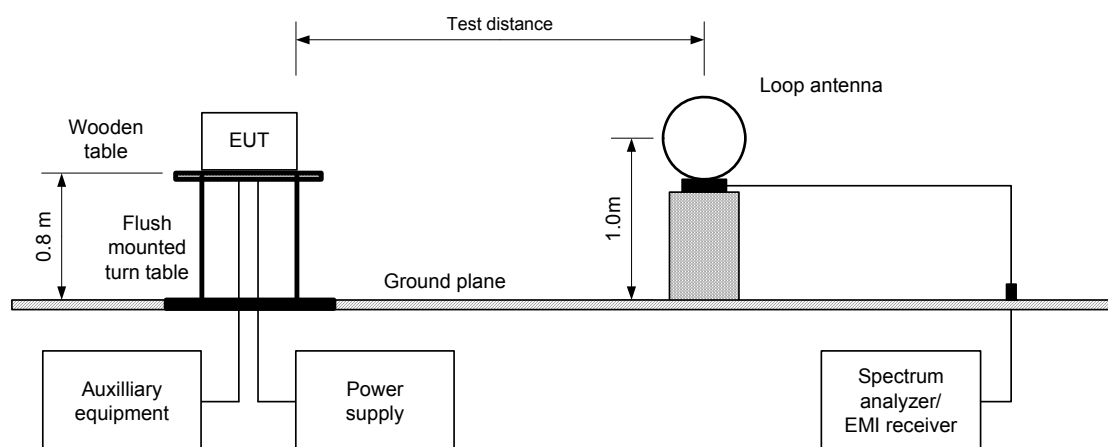
7.1.3 Test procedure for spurious emission field strength measurements above 30 MHz

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

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

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

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

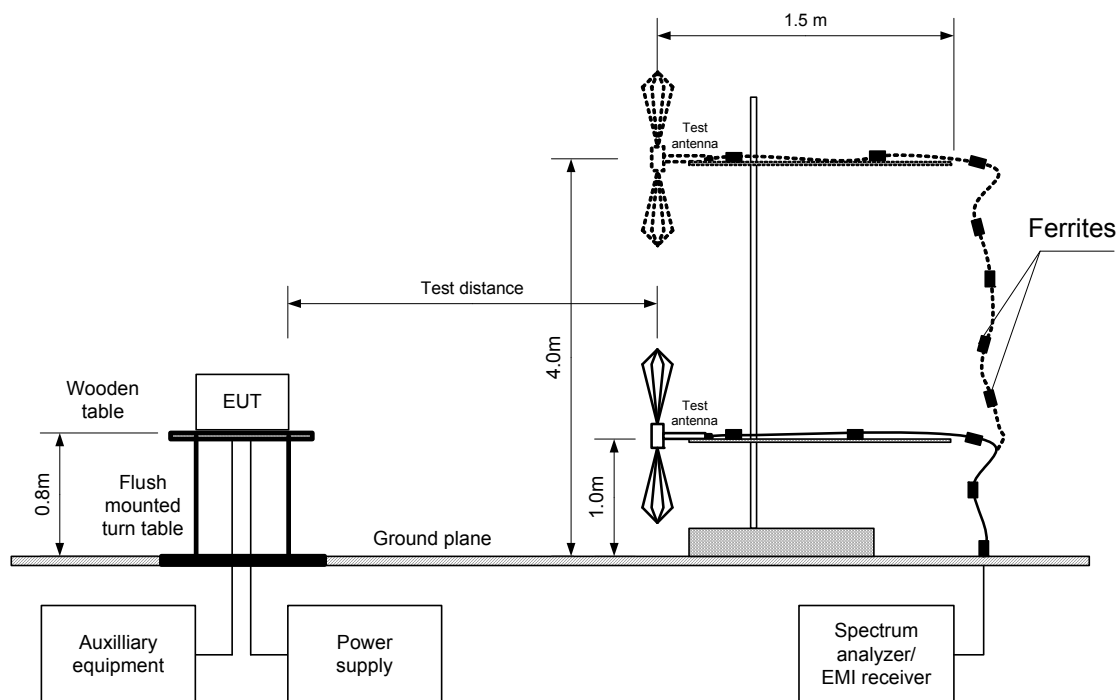




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Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Figure 7.1.2 Setup for spurious emission field strength measurements above 30 MHz





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Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Mar-16		
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.4 Field strength of fundamental emission and spurious emissions

TEST DISTANCE:	3 m
EUT POSITION:	Typical
MODULATION:	GFSK
MODULATING SIGNAL:	ID code
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 9300 MHz
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1.0 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz) 1.0 MHz (above 1000 MHz)
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

Fundamental emission

Frequency, MHz	Antenna		Azimuth, degrees*	Peak emission, dB(μV/m)	Quasi-peak			Verdict
	Pol.	Height, m			Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
905.947	Vert	1.4	200	94.69	90.43	94.0	-3.57	Pass
916.053	Vert	1.3	90	96.17	91.68	94.0	-2.32	Pass
927.488	Vert	1.4	190	95.33	91.73	94.0	-2.17	Pass

Spurious emission

Frequency, MHz	Antenna		Azimuth, degrees*	Peak emission, dB(μV/m)	Quasi-peak			Verdict
	Pol.	Height, m			Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Low frequency								
67.719	Vert	1.6	275	42.40	39.60	40.0	-0.40	Pass
147.809	Vert	1.2	100	42.10	38.40	40.0	-1.60	Pass
375.007	Vert	1.4	80	43.75	42.95	43.5	-0.55	Pass
600.017	Vert	1.4	70	47.60	45.70	46.0	-0.30	Pass
Mid frequency								
30.001	Vert	1.0	0	35.90	31.70	40.0	-8.30	Pass
67.719	Vert	1.6	275	42.60	39.90	40.0	-0.10	Pass
68.719	Hor	1.8	220	33.49	31.20	40.0	-8.80	Pass
152.303	Vert	1.2	100	39.70	35.70	40.0	-4.30	Pass
375.007	Vert	1.4	80	44.40	43.00	43.5	-0.50	Pass
600.013	Vert	1.4	70	46.50	44.50	46.0	-1.50	Pass
625.008	Vert	1.2	90	42.70	40.60	46.0	-5.40	Pass
High frequency								
30.096	Vert	1.0	0	34.7	30.7	40.0	-9.30	Pass
67.719	Vert	1.6	275	42.3	39.4	40.0	-0.60	Pass
147.263	Vert	1.2	100	43.3	39.4	40.0	-0.60	Pass
375.006	Vert	1.4	80	44.5	42.9	43.5	-0.60	Pass
600.015	Vert	1.4	70	47.5	45.8	46.0	-0.20	Pass
600.015	Hor	1.3	225	45.4	43.7	46.0	-2.30	Pass



Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.5 Field strength of fundamental emission and spurious emissions (continued)

F, MHz	Antenna		Azimuth, degrees*	Peak field strength			Average field strength				Verdict
	Pol.	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	
Spurious emissions											
Low frequency											
1811.96	Vert	1.3	220	49.06	74.0	-24.94	49.06	11.80	54.0	-42.20	Pass
Mid frequency											
1832.20	Vert	1.3	220	48.50	74.0	-25.50	48.50	11.24	54.0	-43.76	Pass
High frequency											
1854.93	Vert	1.3	220	45.56	74.0	-28.44	45.56	8.30	54.0	-47.70	Pass

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

**- Margin, dB = Measured (calculated) value, dB(μV/m) - Limit, dB(μV/m).

Table 7.1.6 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
1.37	154	NA	NA	NA	-37.26

*- 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:

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

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 1984	HL 2780	HL 3346	HL 3780	HL 4278
HL 4339	HL 4353	HL 4933					

Full description is given in Appendix A.



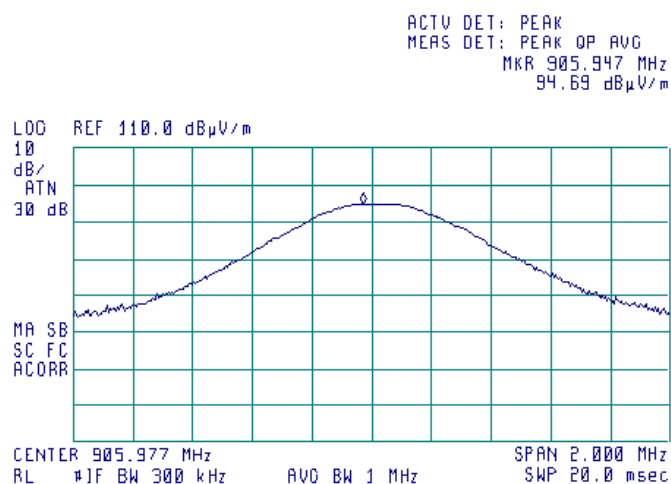
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Date of Issue: 18-Aug-16

Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

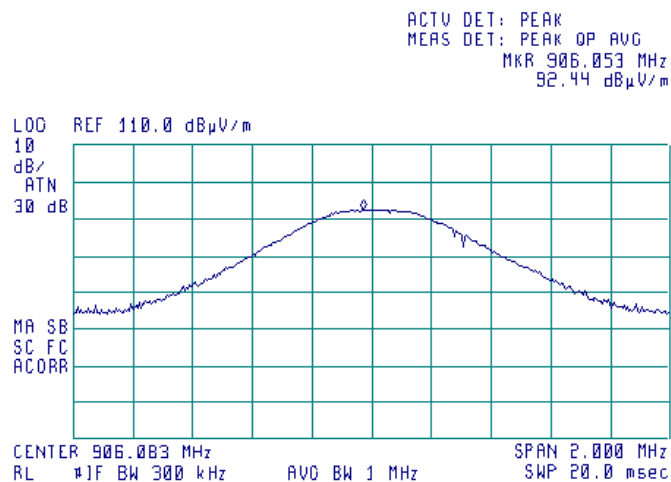
Plot 7.1.1 Radiated emission measurements at the low fundamental frequency

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



Plot 7.1.2 Radiated emission measurements at the low fundamental frequency

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





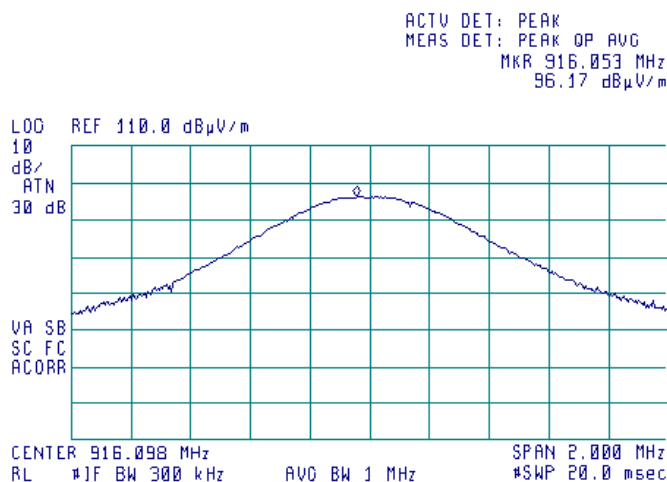
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Report ID: AFIRAD_FCC.28077.docx
Date of Issue: 18-Aug-16

Test specification:	Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions		
Test procedure:	ANSI C63.10 sections 6.5, 6.6		
Test mode:	Compliance	Verdict: PASS	
Date(s):	02-Mar-16		
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

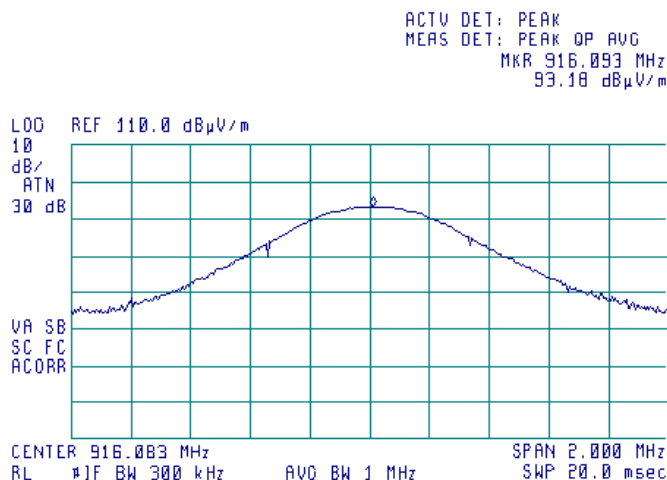
Plot 7.1.3 Radiated emission measurements at the mid fundamental frequency

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



Plot 7.1.4 Radiated emission measurements at the mid fundamental frequency

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





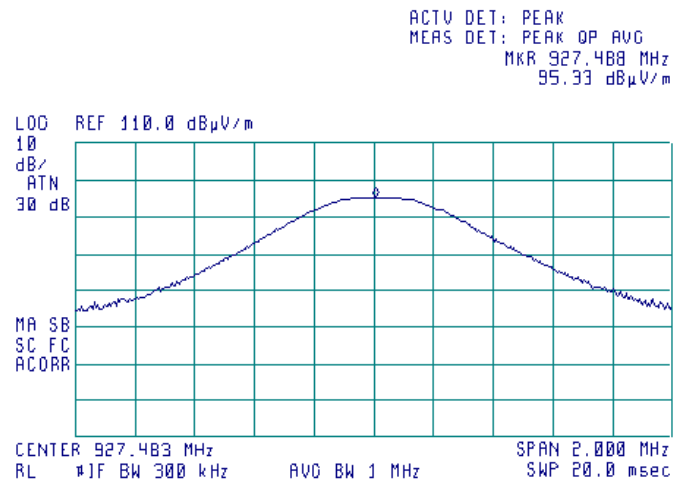
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Report ID: AFIRAD_FCC.28077.docx
Date of Issue: 18-Aug-16

Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

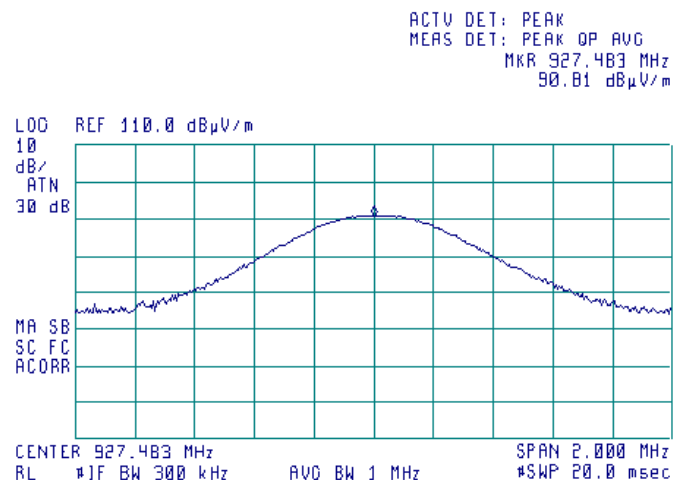
Plot 7.1.5 Radiated emission measurements at the high fundamental frequency

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



Plot 7.1.6 Radiated emission measurements at the high fundamental frequency

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



Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

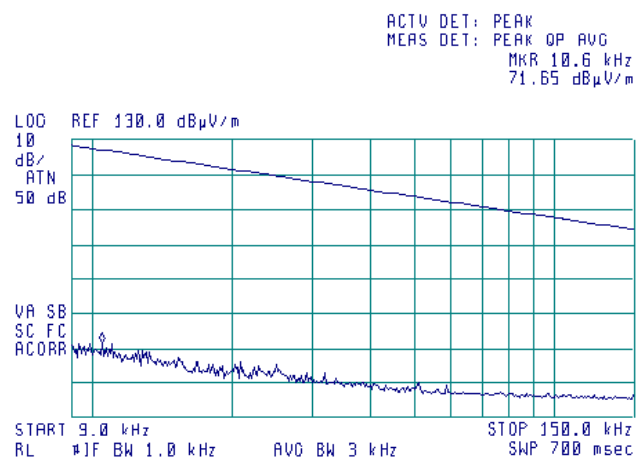
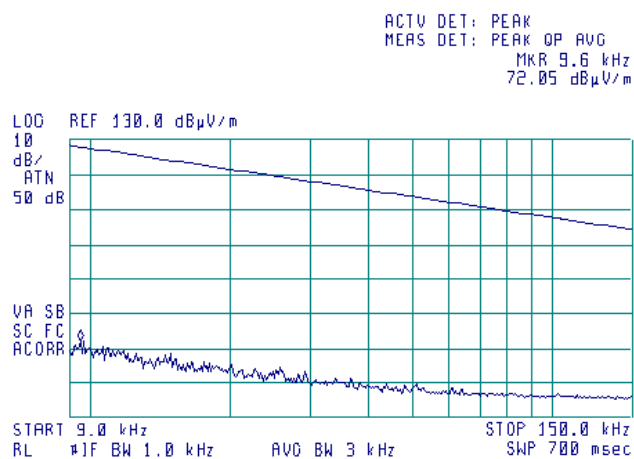
Plot 7.1.7 Radiated emission measurements from 9 to 150 kHz

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

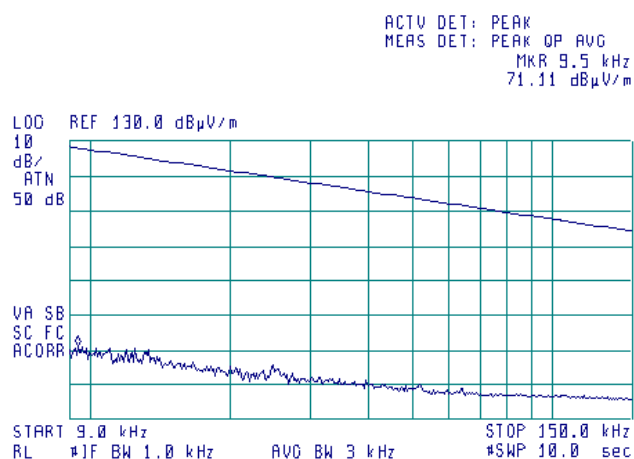
Semi anechoic chamber
3 m
Vertical
Typical (Vertical)

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.8 Radiated emission measurements from 0.15 to 30 MHz

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

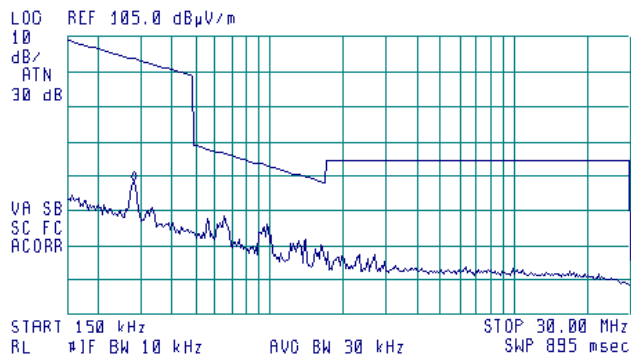
Semi anechoic chamber
3 m
Vertical
Typical (Vertical)

CARRIER FREQUENCY: Low

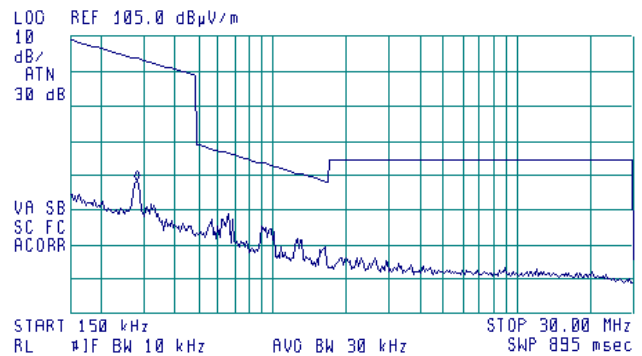
CARRIER FREQUENCY: Mid



ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 280 kHz
63.41 dBμV/m



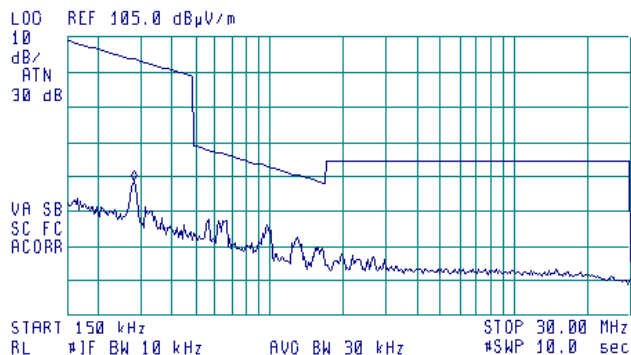
ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 280 kHz
63.53 dBμV/m



CARRIER FREQUENCY: High



ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 280 kHz
63.69 dBμV/m



Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

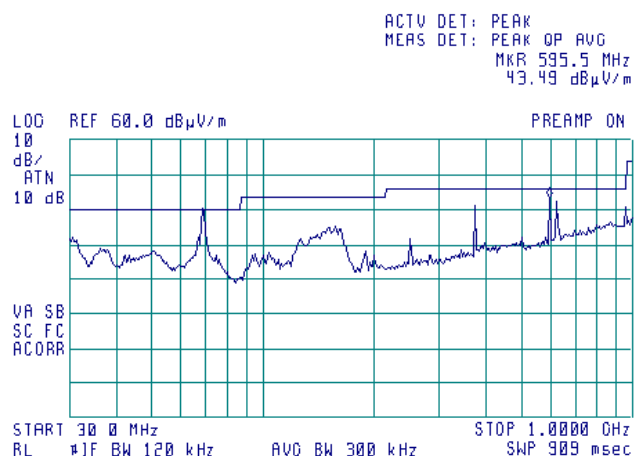
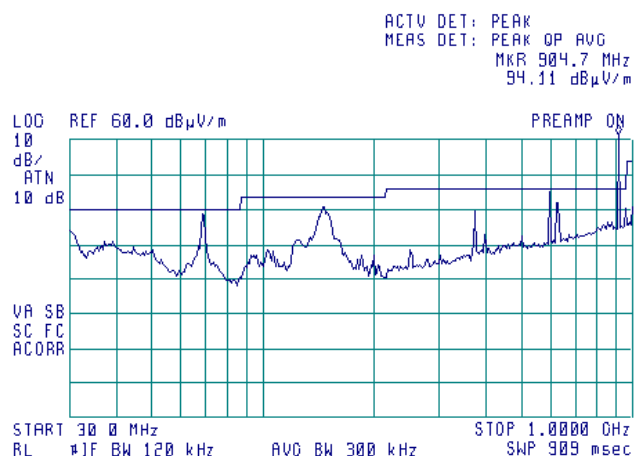
Plot 7.1.9 Radiated emission measurements from 30 to 1000 MHz

TEST SITE:
TEST DISTANCE:
ANTENNA POLARIZATION:
EUT POSITION:

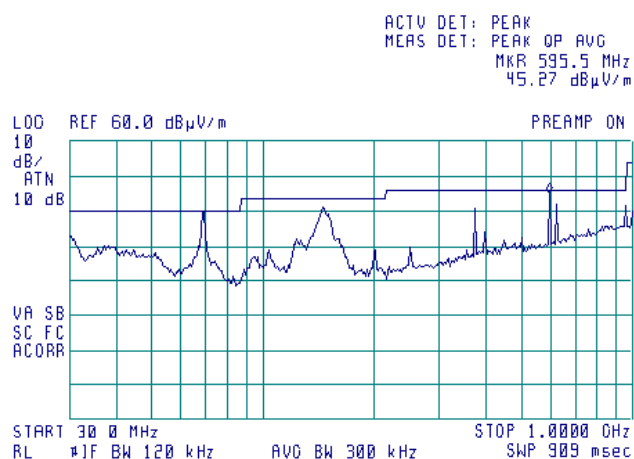
Semi anechoic chamber
3 m
Vertical
Typical (Vertical)

CARRIER FREQUENCY: Low

CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



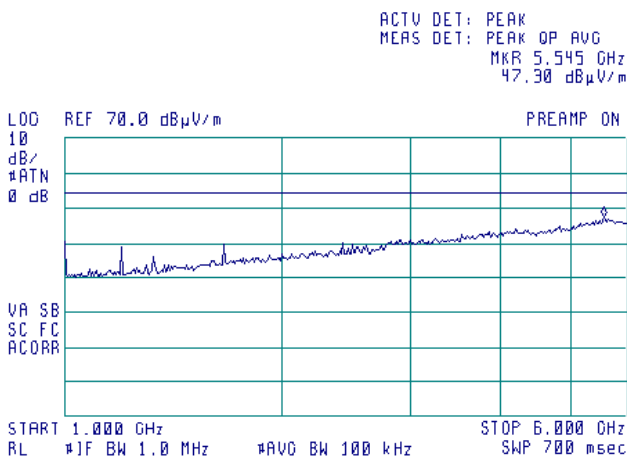
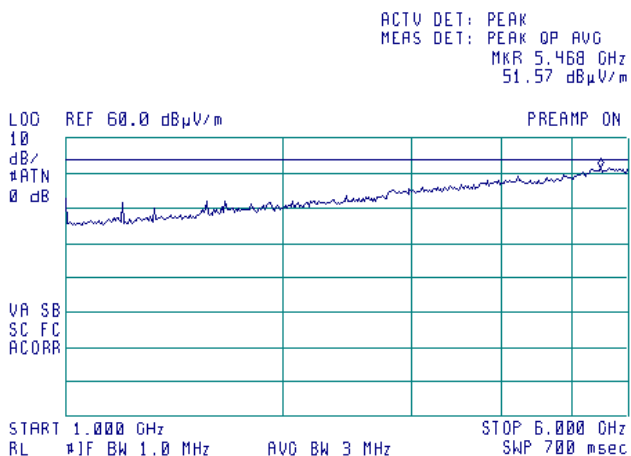
Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.10 Radiated emission measurements from 1.0 to 6.0 GHz

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

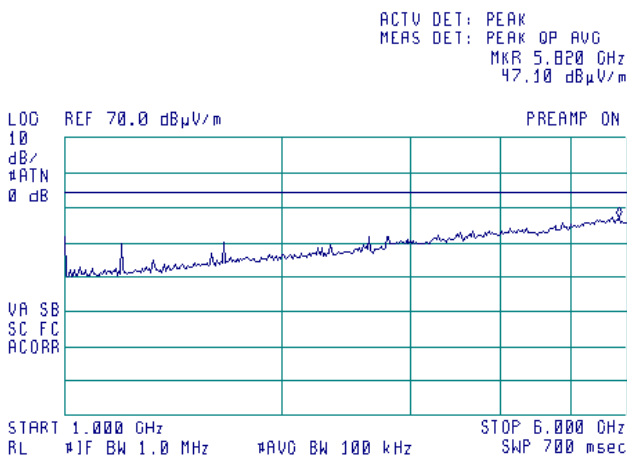
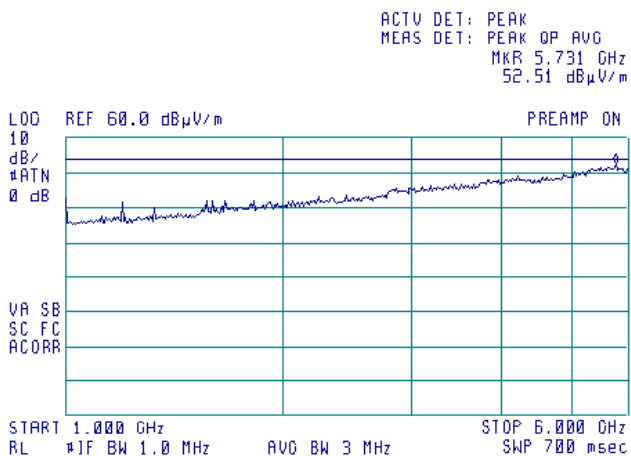
CARRIER FREQUENCY: Low
RBW = 1 MHz; VBW = 3 MHz

RBW = 1 MHz; VBW = 100 kHz



CARRIER FREQUENCY: Mid
RBW = 1 MHz; VBW = 3 MHz

RBW = 1 MHz; VBW = 100 kHz





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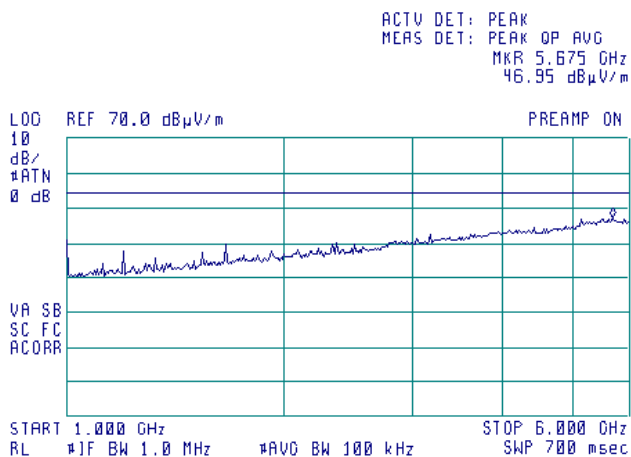
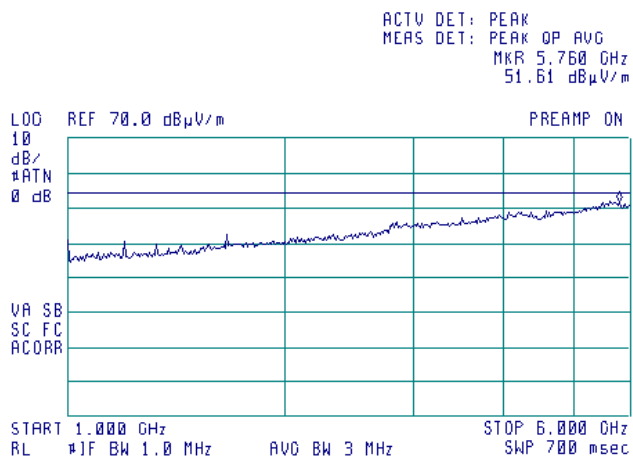
Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.11 Radiated emission measurements from 1.0 to 6.0 GHz

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

CARRIER FREQUENCY: High
RBW = 1 MHz; VBW = 3 MHz

RBW = 1 MHz; VBW = 100 kHz



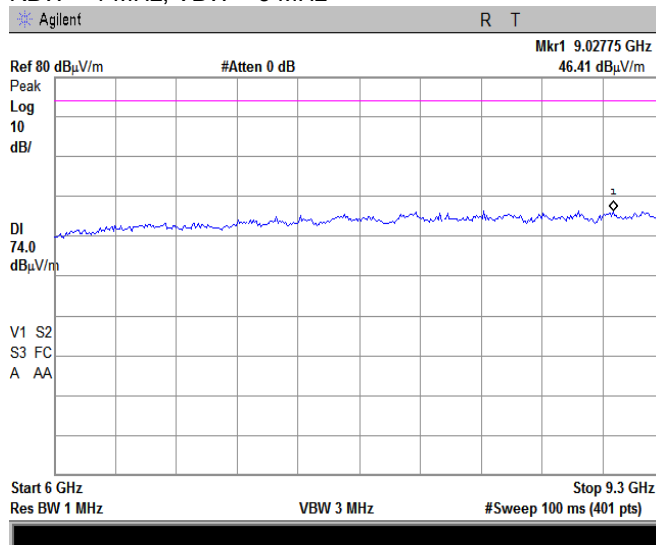
Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.12 Radiated emission measurements from 6.0 to 9.3 GHz

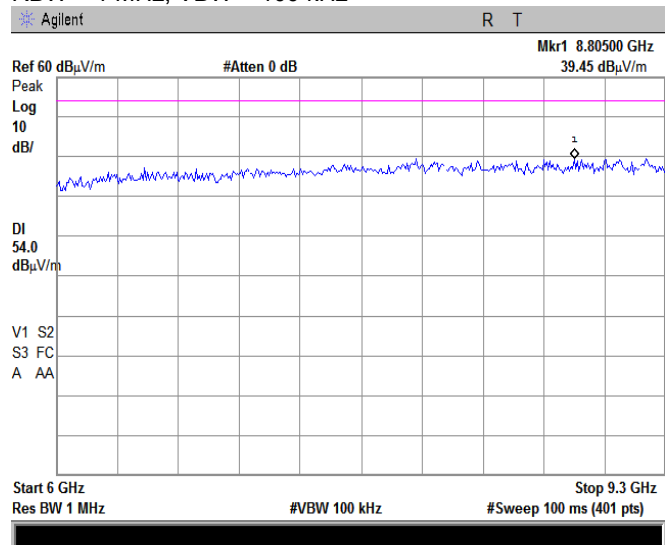
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Typical (Vertical)

CARRIER FREQUENCY: Low

RBW = 1 MHz; VBW = 3 MHz

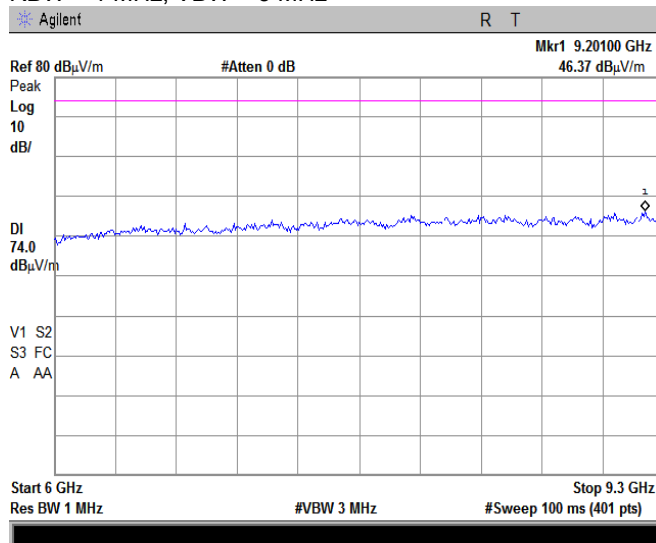


RBW = 1 MHz; VBW = 100 kHz

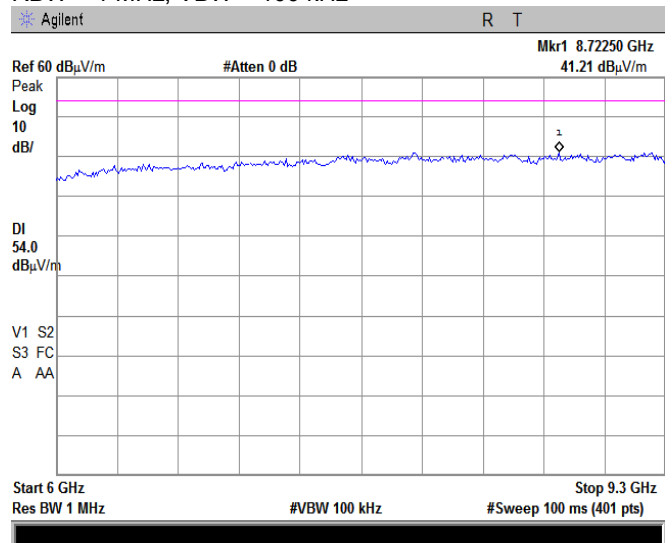


CARRIER FREQUENCY: Mid

RBW = 1 MHz; VBW = 3 MHz



RBW = 1 MHz; VBW = 100 kHz





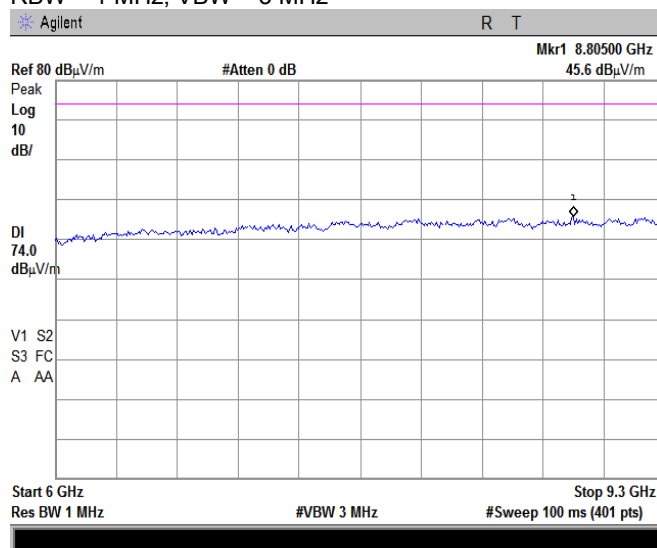
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Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

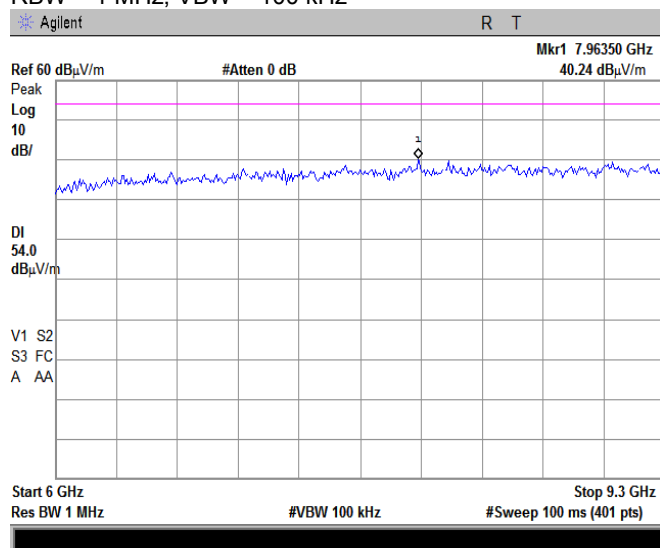
Plot 7.1.13 Radiated emission measurements from 6.0 to 9.3 GHz

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

CARRIER FREQUENCY: High
RBW = 1 MHz; VBW = 3 MHz



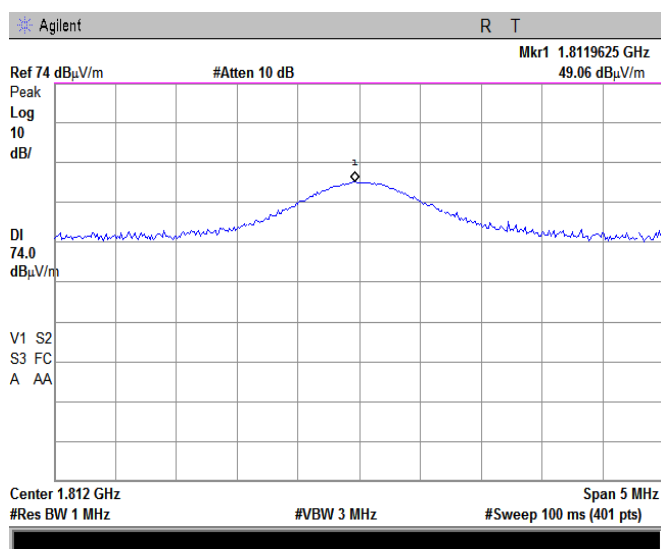
RBW = 1 MHz; VBW = 100 kHz



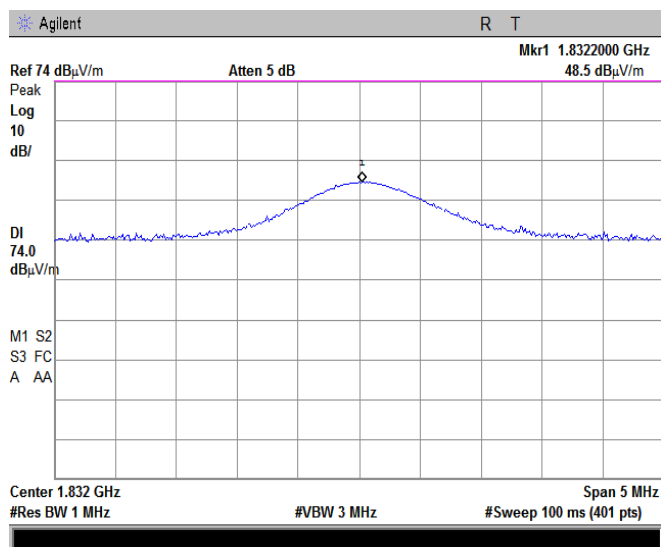
Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.14 Radiated emission measurements at the second harmonic frequency

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



CARRIER FREQUENCY: Mid





HERMON LABORATORIES

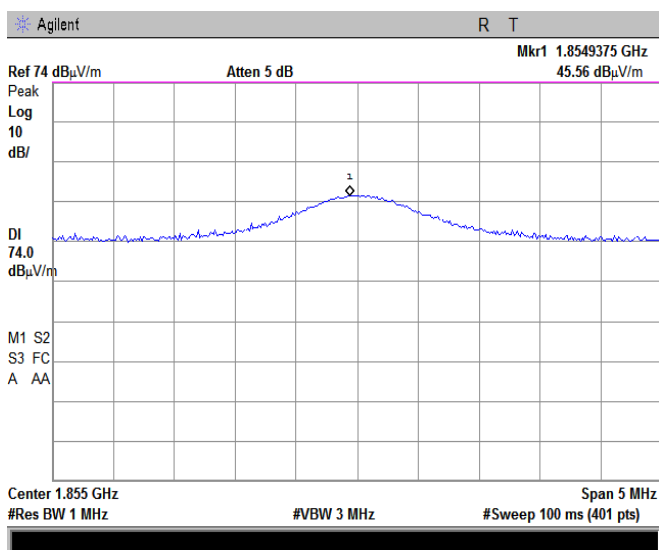
Report ID: AFIRAD_FCC.28077.docx
Date of Issue: 18-Aug-16

Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.15 Radiated emission measurements at the second harmonic frequency

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

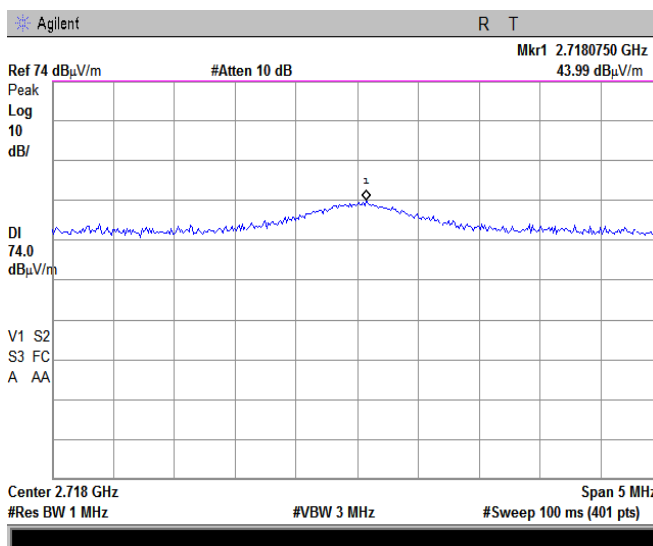
CARRIER FREQUENCY: High



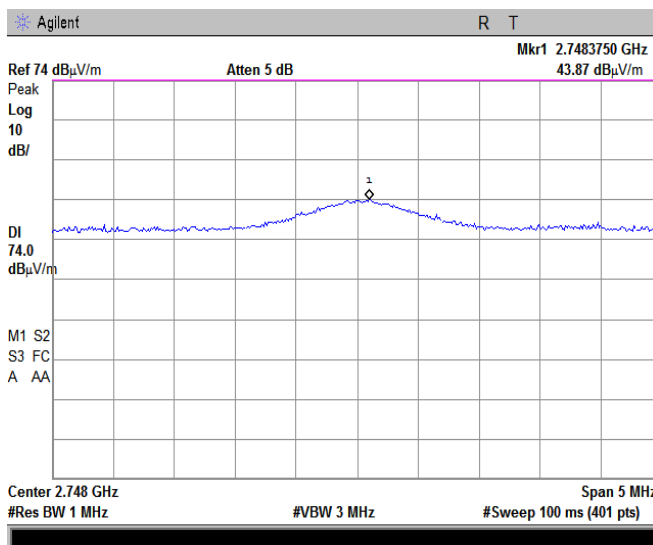
Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.16 Radiated emission measurements at the third harmonic frequency

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



CARRIER FREQUENCY: Mid





HERMON LABORATORIES

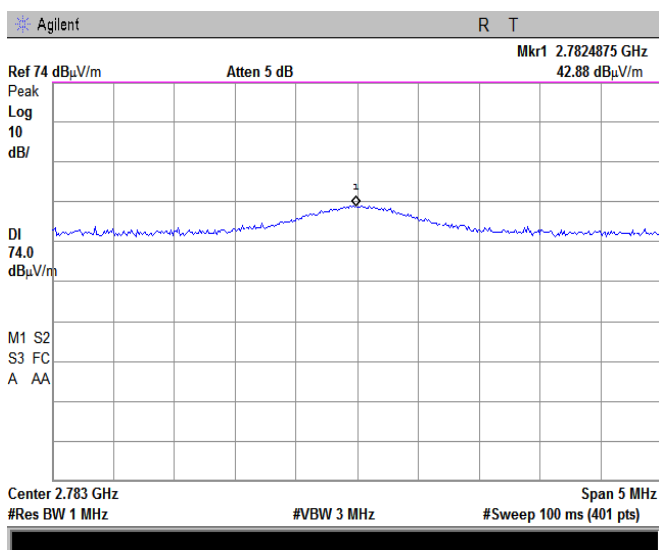
Report ID: AFIRAD_FCC.28077.docx
Date of Issue: 18-Aug-16

Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.17 Radiated emission measurements at the third harmonic frequency

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

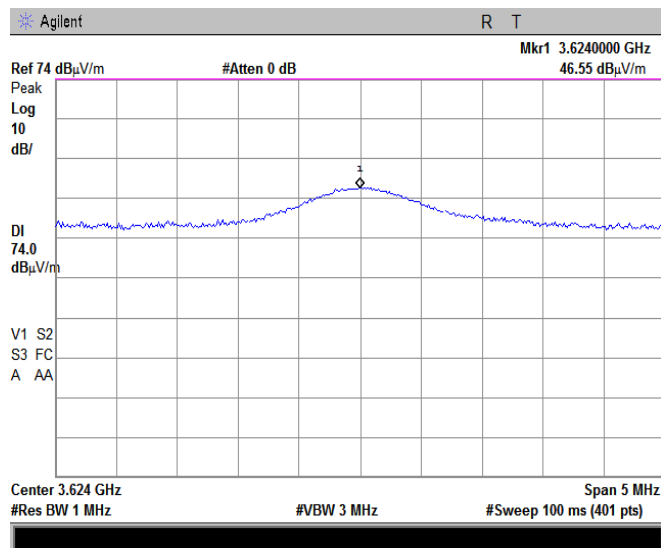
CARRIER FREQUENCY: High



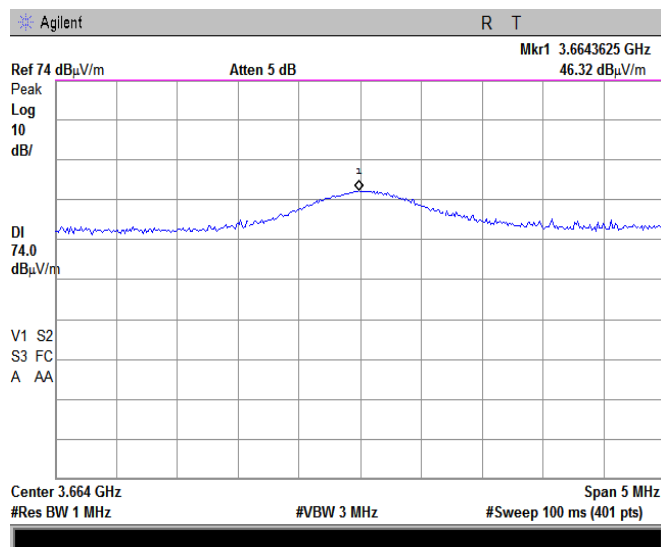
Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.18 Radiated emission measurements at the fourth harmonic frequency

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



CARRIER FREQUENCY: Mid

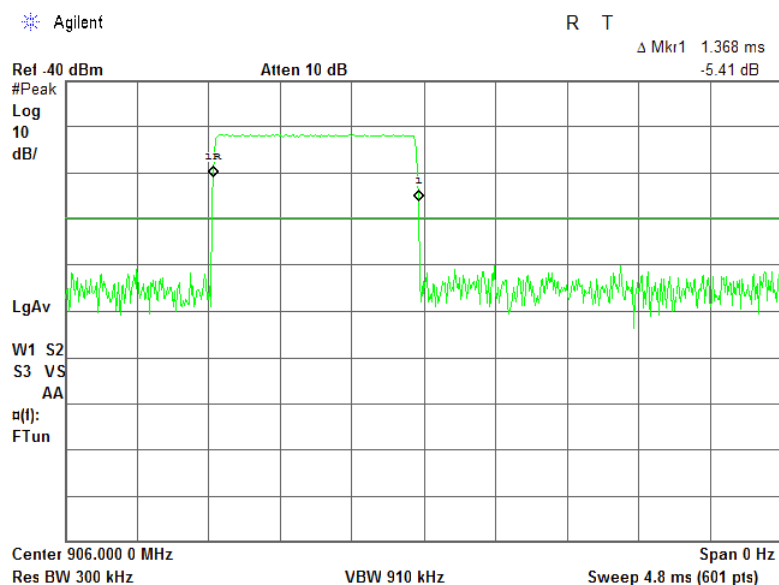




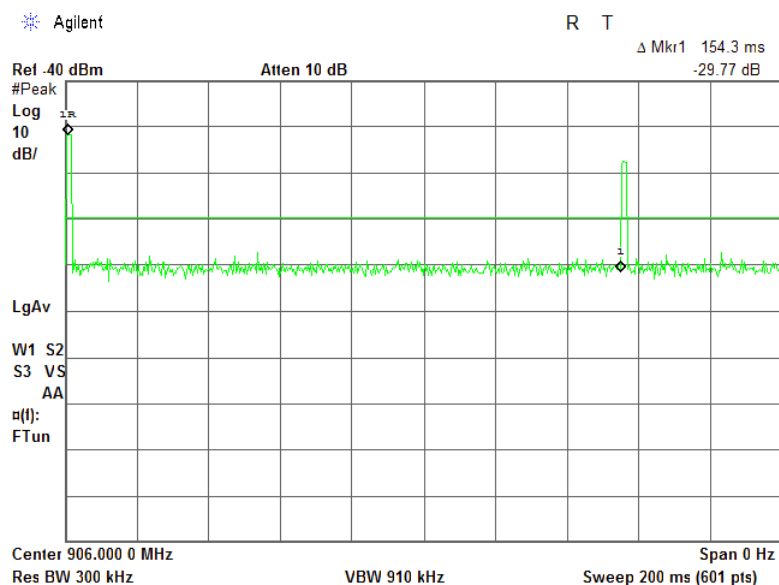
HERMON LABORATORIES

Test specification:		Section 15.249(a)(d)/RSS-210, section A2.9, Field strength of emissions	
Test procedure:		ANSI C63.10 sections 6.5, 6.6	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.19 Transmission pulse duration



Plot 7.1.20 Transmission pulse period





Test specification:		Section 15.215(c) / RSS-Gen, section 6.6, Occupied bandwidth	
Test procedure:		ANSI C63.10 section 6.9.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		03-Mar-16	
Temperature: 23.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to verify that the 20 dB bandwidth of the emissions was contained within the standard specified frequency band according to FCC §15.215 requirements. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
902 - 928	20.0
2400 – 2483.5	
5725 – 5875	
24000 – 24250	

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

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 spectrum analyzer sweep time and bandwidth were set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.2.2.3 The peak of emission was measured. The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.2.2 and associated plot.

Figure 7.2.1 Occupied bandwidth test setup





Test specification:		Section 15.215(c) / RSS-Gen, section 6.6, Occupied bandwidth	
Test procedure:		ANSI C63.10 section 6.9.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		03-Mar-16	
Temperature: 23.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

ASSIGNED FREQUENCY BAND: 902 -928 MHz
 DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 10 kHz
 VIDEO BANDWIDTH: 30 kHz
 MODULATION: 2GFSK
 MODULATING SIGNAL: enable

MODULATION ENVELOPE REFERENCE POINTS: 20 dBc

Channel	Frequency, MHz	OBW, kHz	Limit, kHz	Verdict
Low	906.0	171.9	NA	Pass
Mid	916.1	171.0	NA	Pass
High	927.5	171.1	NA	Pass

MODULATION ENVELOPE REFERENCE POINTS: 99%

Channel	Frequency, MHz	OBW, kHz	Limit, kHz	Verdict
Low	906.0	176.1	NA	Pass
Mid	916.1	175.2	NA	Pass
High	927.5	176.2	NA	Pass

Reference numbers of test equipment used

HL 3810	HL 3818	HL 4273						
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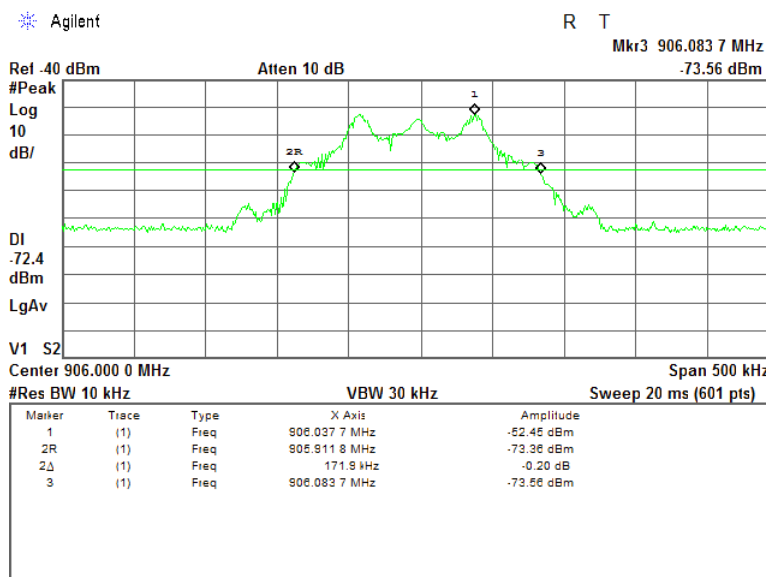
Full description is given in Appendix A.



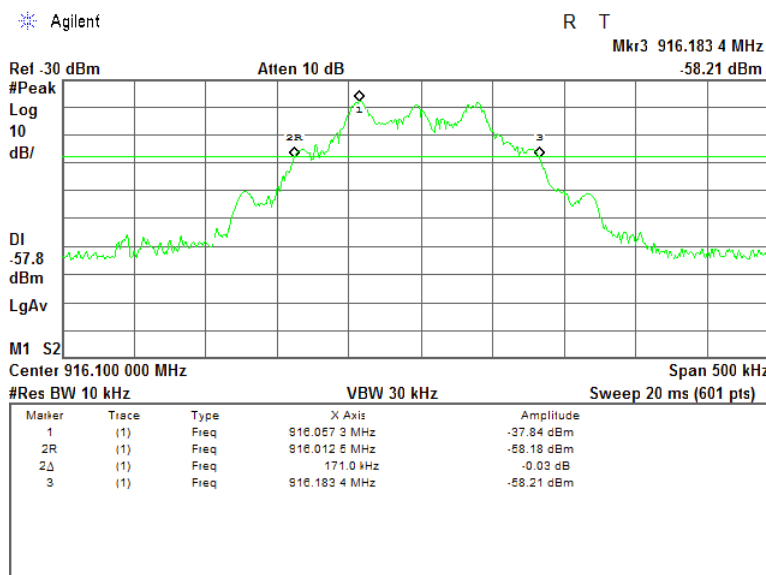
HERMON LABORATORIES

Test specification:		Section 15.215(c) / RSS-Gen, section 6.6, Occupied bandwidth	
Test procedure:		ANSI C63.10 section 6.9.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		03-Mar-16	
Temperature: 23.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.1 Occupied bandwidth 20 dBc test result at low frequency

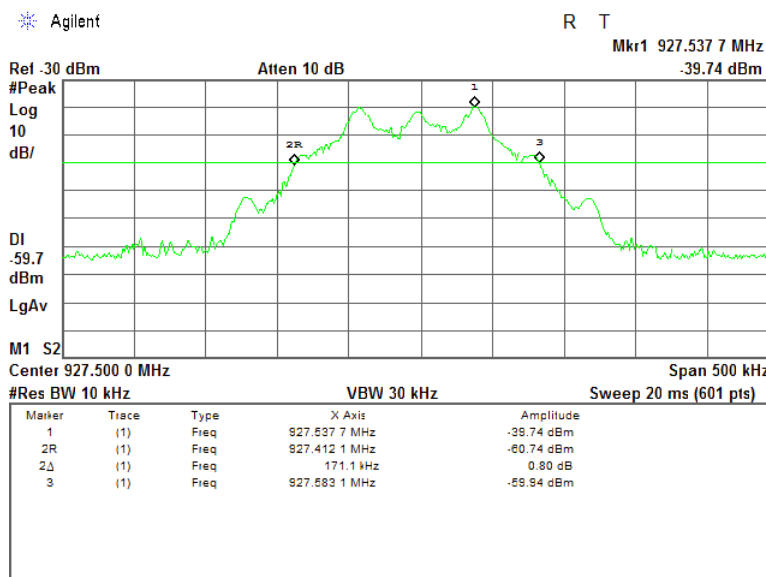


Plot 7.2.2 Occupied bandwidth 20 dBc test result at mid frequency

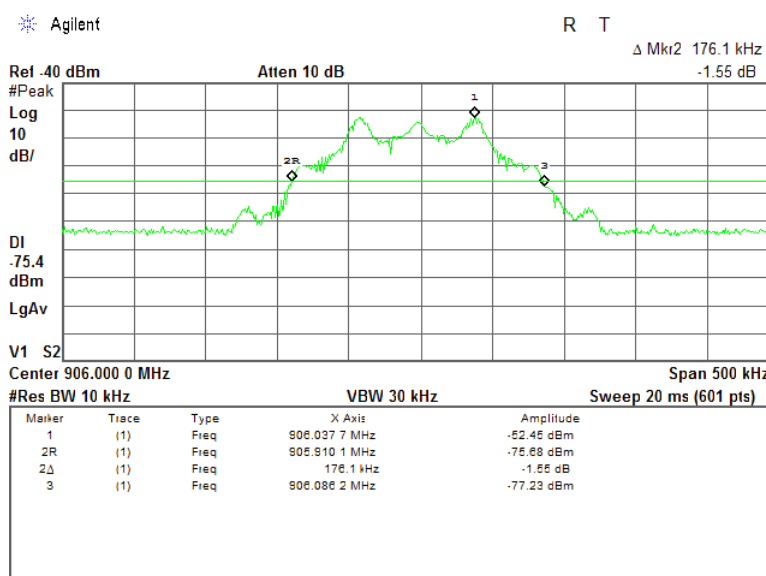


Test specification:		Section 15.215(c) / RSS-Gen, section 6.6, Occupied bandwidth	
Test procedure:		ANSI C63.10 section 6.9.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		03-Mar-16	
Temperature: 23.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.3 Occupied bandwidth 20 dBc test result at high frequency



Plot 7.2.4 Occupied bandwidth 99% test result at low frequency

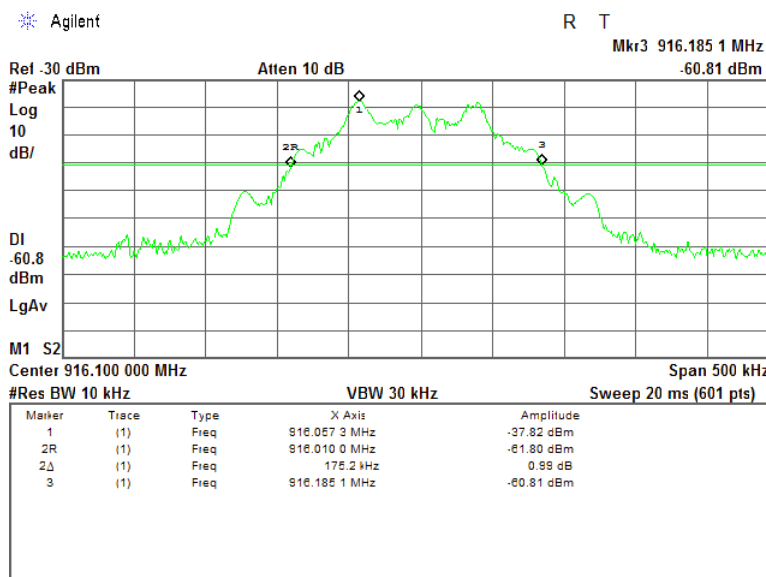




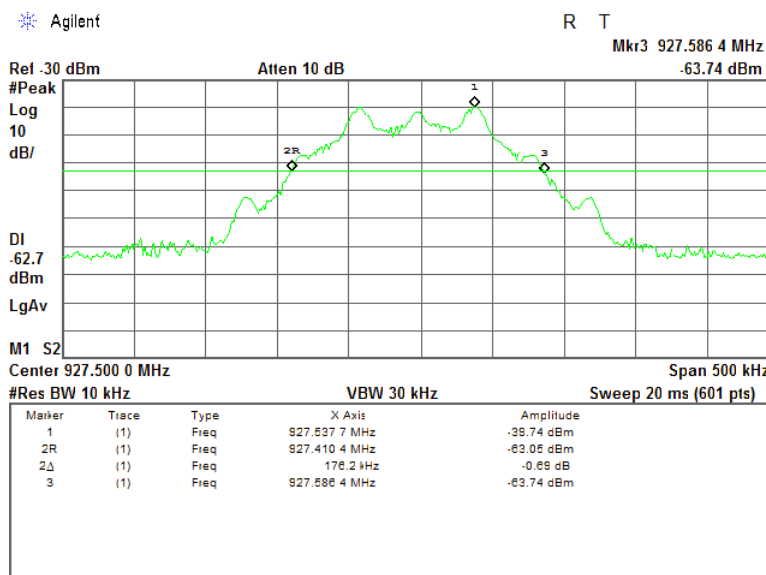
HERMON LABORATORIES

Test specification:		Section 15.215(c) / RSS-Gen, section 6.6, Occupied bandwidth	
Test procedure:		ANSI C63.10 section 6.9.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		03-Mar-16	
Temperature: 23.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.5 Occupied bandwidth 99% test result at mid frequency



Plot 7.2.6 Occupied bandwidth 99% test result at high frequency





Test specification:		Section 15.249(d) / RSS-210, section A2.9, Band edge emissions	
Test procedure:		ANSI C63.10 section 6.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

7.3 Band edge emission

7.3.1 General

This test was performed to verify the EUT band edge emission including all associated side bands was attenuated at least 50 dB below the unmodulated carrier level or below the general spurious emission limit. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Band edge emission limits

Frequency band, MHz	Field strength limit at 3 m, dBμV/m		Attenuation below carrier, dBc
	Peak	QP	
902.000 - 928.000	NA	46.0	50

7.3.2 Test procedure

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

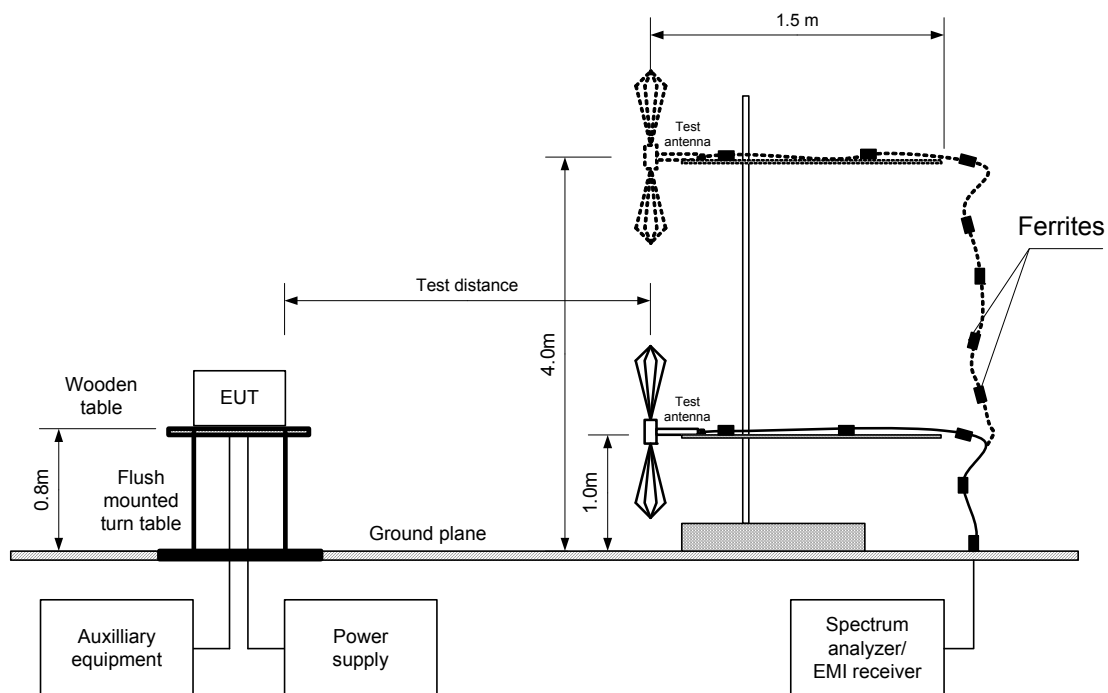
7.3.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.3.2.3 The frequency of modulation envelope points beyond which power level drops below the band edge emission limit was measured.

7.3.2.4 The test results were recorded in Table 7.3.2 and shown in the associated plots.

Test specification:		Section 15.249(d) / RSS-210, section A2.9, Band edge emissions	
Test procedure:		ANSI C63.10 section 6.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Figure 7.3.1 Band edge emission measurement set up





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Test specification:		Section 15.249(d) / RSS-210, section A2.9, Band edge emissions	
Test procedure:		ANSI C63.10 section 6.10	
Test mode:		Compliance	Verdict: PASS
Date(s):		02-Mar-16	
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.2 Band edge emission test results

OPERATING FREQUENCY RANGE: 902-928 MHz
 DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 120 kHz
 VIDEO BANDWIDTH: 300 kHz
 MODULATION: 2GFSK
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Modulation envelope		Measured peak emission, dBµV/m	Measured QP emission, dBµV/m	QP limit, dBµV/m	Margin, dB **	Verdict
Edge	Frequency, MHz					
Low	902.170	40.24	40.24*	46.0	-5.76	Pass
High	928.128	49.02	44.47	46.0	-1.53	Pass

* - QP emission was not measured because the Peak value complies with QP limit.

** - Margin = measured value – limit

Reference numbers of test equipment used

HL 1984	HL 2780	HL 4278	HL 4353				
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Full description is given in Appendix A.

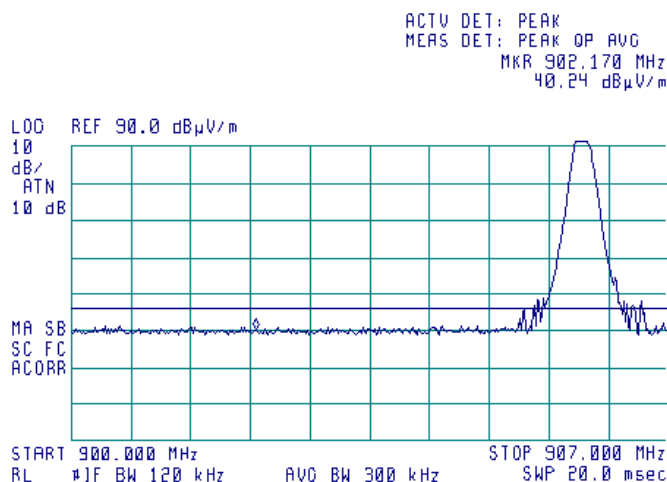


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Test specification:	Section 15.249(d) / RSS-210, section A2.9, Band edge emissions		
Test procedure:	ANSI C63.10 section 6.10		
Test mode:	Compliance	Verdict:	PASS
Date(s):	02-Mar-16		
Temperature: 23.3 °C	Air Pressure: 1010 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

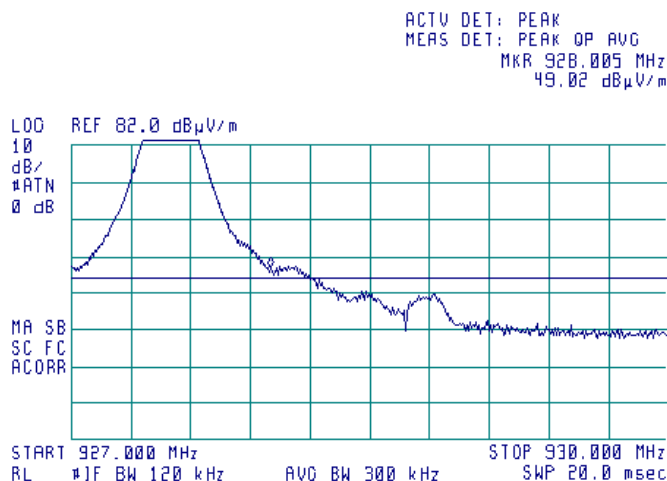
Plot 7.3.1 Low band edge emission test result

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical



Plot 7.3.2 High band edge emission test result

TEST SITE: OATS
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
EUT POSITION: Vertical





Test specification:		Section 15.207(a)/RSS-Gen, section 8.8, Conducted emission	
Test procedure:		ANSI C63.10 section 6.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-Mar-16	
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.4 Conducted emissions

7.4.1 General

This test was performed to measure common mode conducted emissions at the power port. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Limits for conducted emissions

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

* The limit decreases linearly with the logarithm of frequency.

7.4.2 Test procedure

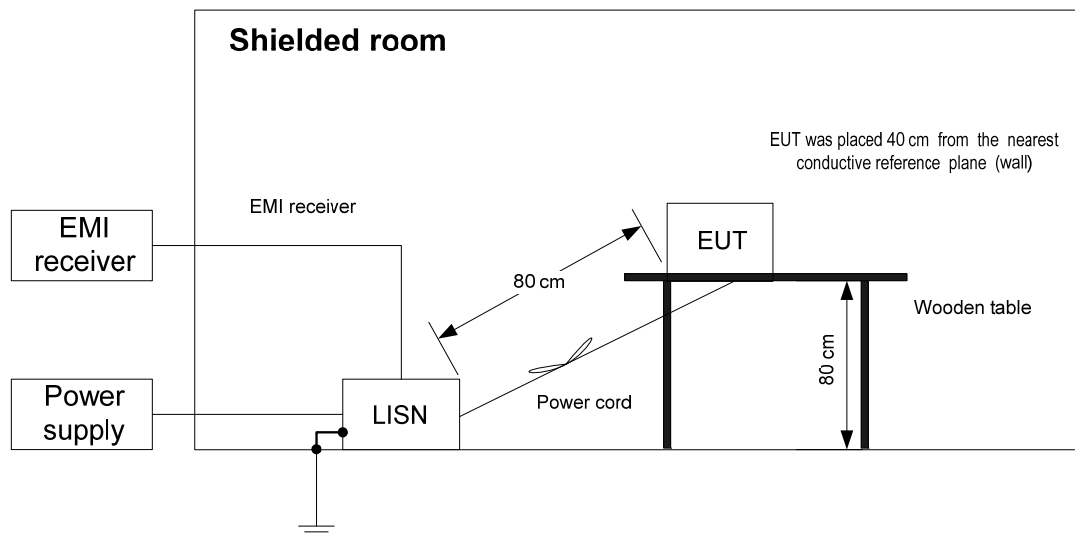
7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

7.4.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.4.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

7.4.2.4 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Setup for conducted emission measurements, table-top equipment





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Test specification:		Section 15.207(a)/RSS-Gen, section 8.8, Conducted emission	
Test procedure:		ANSI C63.10 section 6.2	
Test mode:	Compliance	Verdict:	PASS
Date(s):	15-Mar-16		
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Conducted emission test results

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

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.177988	47.07	39.80	64.63	-24.83	10.26	54.63	-44.37	L1	Pass
0.281900	43.61	41.97	60.82	-18.85	30.75	50.82	-20.07		
0.569613	31.68	27.02	56.00	-28.98	12.69	46.00	-33.31		
1.510240	33.14	31.19	56.00	-24.81	23.59	46.00	-22.41		
14.593845	36.84	32.37	60.00	-27.63	25.04	50.00	-24.96		
22.432500	34.91	29.53	60.00	-30.47	22.93	50.00	-27.07		
0.174125	46.43	39.96	64.82	-24.86	10.16	54.82	-44.66	L2	Pass
0.284940	43.22	39.84	60.73	-20.89	22.81	50.73	-27.92		
15.886250	35.25	29.66	60.00	-30.34	22.47	50.00	-27.53		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0447	HL 1513	HL 3612	HL 3780	HL 4527	HL 4778		
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Full description is given in Appendix A.

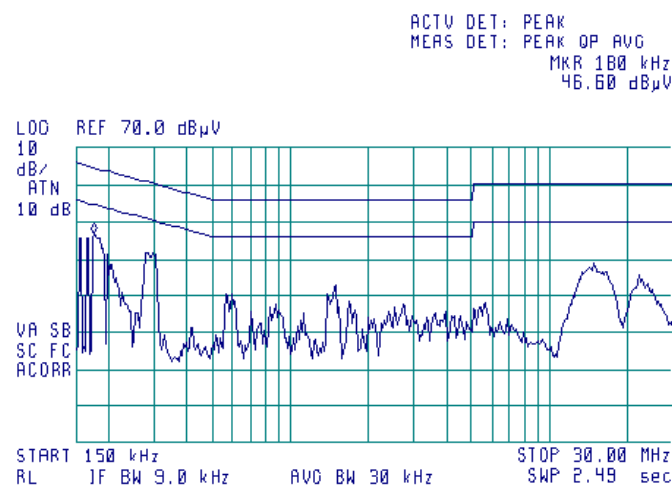


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Test specification:		Section 15.207(a)/RSS-Gen, section 8.8, Conducted emission	
Test procedure:		ANSI C63.10 section 6.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-Mar-16	
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

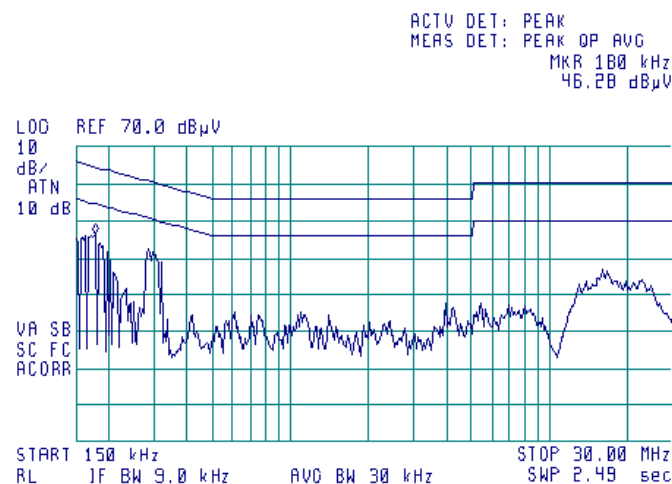
Plot 7.4.1 Conducted emission measurements

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



Plot 7.4.2 Conducted emission measurements

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



Test specification:	Section 15.203 / RSS-Gen, section 8.3, Antenna requirement		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date(s):	20-Mar-16		
Temperature: 23.4 °C	Air Pressure: 1017 hPa	Relative Humidity: 47 %	Power Supply: 120 VAC
Remarks:			

7.5 Antenna requirements

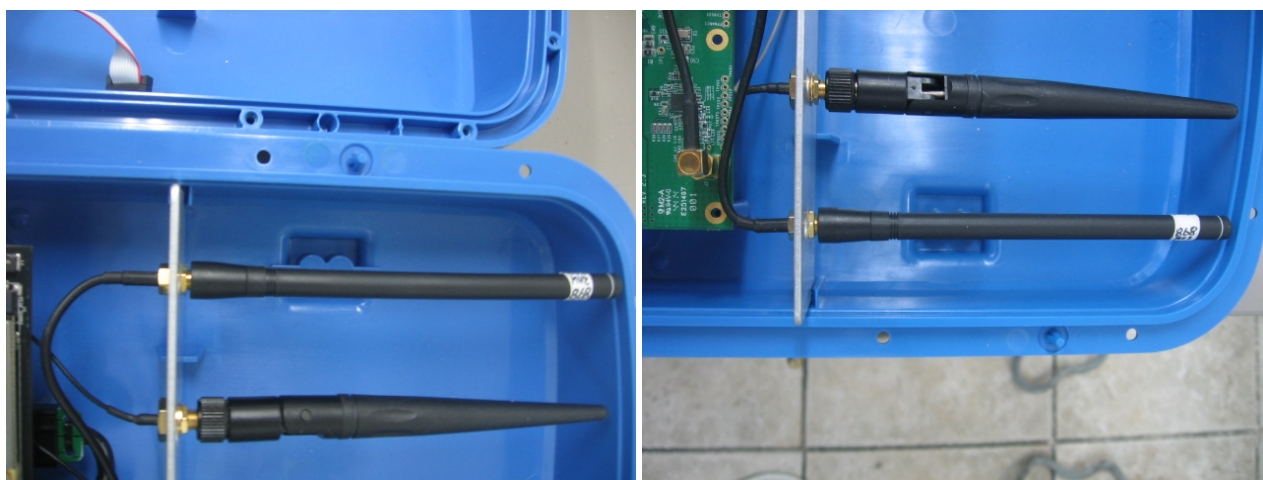
The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed 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 7.5.1.

Table 7.5.1 Antenna requirements

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

Photograph 7.5.1 Antenna assembly





Test specification:	Section 15.107 / ICES-003, Conducted emission at AC power port		
Test procedure:	ANSI C63.4, Sections 11.5 and 12.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	15-Mar-16		
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

8 Emission tests according to 47CFR part 15 subpart B requirements

8.1 Conducted emissions

8.1.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 8.1.1.

Table 8.1.1 Limits for conducted emissions

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

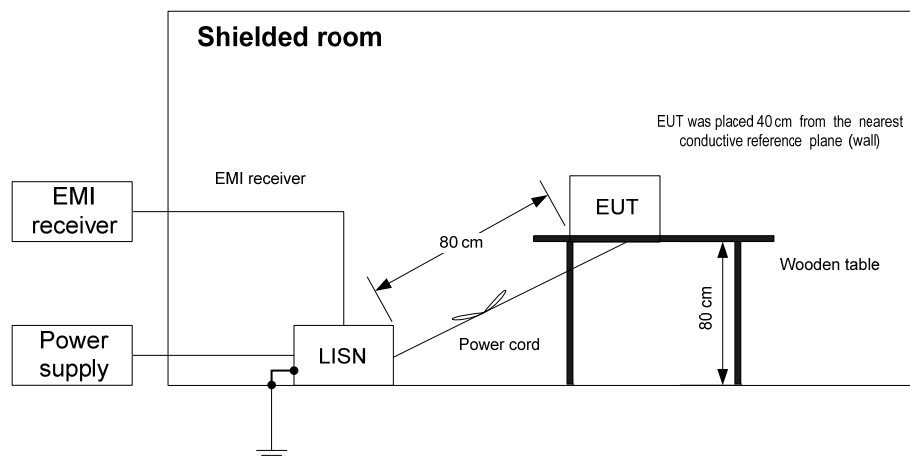
* The limit decreases linearly with the logarithm of frequency.

8.1.2 Test procedure

- 8.1.2.1 The EUT was set up as shown in Figure 8.1.1 and associated photographs, energized and the performance check was conducted.
- 8.1.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 8.1.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.
- 8.1.2.3 The position of the device cables was varied to determine maximum emission level.
- 8.1.2.4 The worst test results (the lowest margins) were recorded in Table 8.1.2 and shown in the associated plots.

Test specification:		Section 15.107 / ICES-003, Conducted emission at AC power port	
Test procedure:		ANSI C63.4, Sections 11.5 and 12.1.3	
Test mode:	Compliance	Verdict:	PASS
Date(s):	15-Mar-16		
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Figure 8.1.1 Setup for conducted emission measurements, table-top equipment



Photograph 8.1.1 Setup for conducted emission measurements





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Test specification:		Section 15.107 / ICES-003, Conducted emission at AC power port	
Test procedure:		ANSI C63.4, Sections 11.5 and 12.1.3	
Test mode:	Compliance	Verdict:	PASS
Date(s):	15-Mar-16		
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 8.1.2 Conducted emission test results

LINE: AC mains
 LIMIT: Class B
 EUT OPERATING MODE: Receive / Stand-by
 EUT SET UP: TABLE-TOP
 TEST SITE: SHIELDED ROOM
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
 FREQUENCY RANGE: 150 kHz - 30 MHz
 RESOLUTION BANDWIDTH: 9 kHz

Frequency, MHz	Peak emission, dB(μV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*	Measured emission, dB(μV)	Limit, dB(μV)	Margin, dB*		
0.177988	47.07	39.80	64.63	-24.83	10.26	54.63	-44.37	L1	Pass
0.281900	43.61	41.97	60.82	-18.85	30.75	50.82	-20.07		
0.569613	31.68	27.02	56.00	-28.98	12.69	46.00	-33.31		
1.510240	33.14	31.19	56.00	-24.81	23.59	46.00	-22.41		
14.593845	36.84	32.37	60.00	-27.63	25.04	50.00	-24.96		
22.432500	34.91	29.53	60.00	-30.47	22.93	50.00	-27.07		
0.174125	46.43	39.96	64.82	-24.86	10.16	54.82	-44.66	L2	Pass
0.284940	43.22	39.84	60.73	-20.89	22.81	50.73	-27.92		
15.886250	35.25	29.66	60.00	-30.34	22.47	50.00	-27.53		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0447	HL 1513	HL 3612	HL 3780	HL 4527	HL 4778		
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Full description is given in Appendix A.

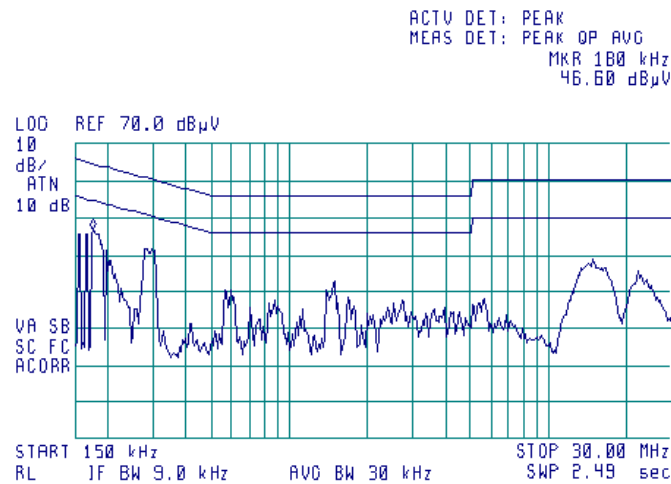


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Test specification:		Section 15.107 / ICES-003, Conducted emission at AC power port	
Test procedure:		ANSI C63.4, Sections 11.5 and 12.1.3	
Test mode:		Compliance	Verdict: PASS
Date(s):		15-Mar-16	
Temperature: 23 °C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

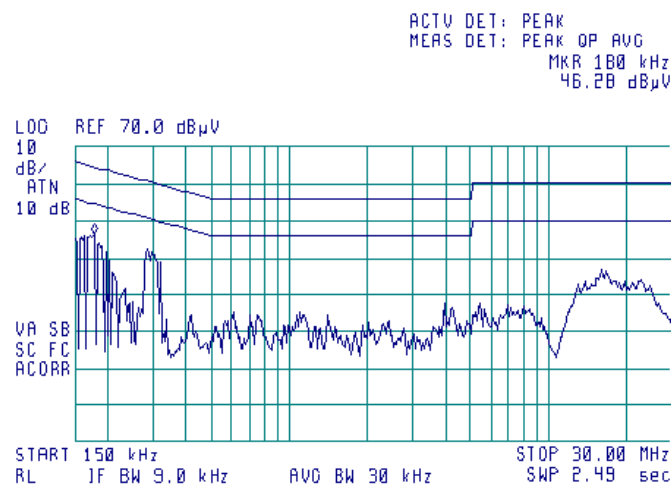
Plot 8.1.1 Conducted emission measurements

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



Plot 8.1.2 Conducted emission measurements

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



Test specification:		Section 15.109 / RSS-Gen, section 7.1.2, ICES-003, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		21-Mar-16	
Temperature: 22 °C	Air Pressure: 1011 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

8.2 Radiated emission measurements

8.2.1 General

This test was performed to measure radiated emissions from the EUT enclosure. Specification test limits are given in Table 8.2.1, Table 8.2.2.

Table 8.2.1 Radiated emission test limits according to FCC Part 15, Section 109 and ICES-003, Section 6.2

Frequency, MHz	Class B limit, dB(μV/m)		Class A limit, dB(μV/m)	
	10 m distance	3 m distance	10 m distance	3 m distance
30 - 88	29.5*	40.0	39.0	49.5*
88 - 216	33.0*	43.5	43.5	54.0*
216 - 960	35.5*	46.0	46.4	56.9*
960 - 5 th harmonic**	43.5*	54.0	49.5	60.0*

* The limit for test distance other than specified was calculated using the inverse linear distance extrapolation factor as follows: $\text{Lim}_{S_2} = \text{Lim}_{S_1} + 20 \log(S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

Table 8.2.2 Radiated emission limits according to RSS-Gen, Section 7.1.2

Frequency, MHz	Field strength limit at 3 m test distance, dB(μV/m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
960 - 5 th harmonic**	54.0

** - harmonic of the highest frequency the EUT generates, uses, operates or tunes to.

8.2.2 Test procedure

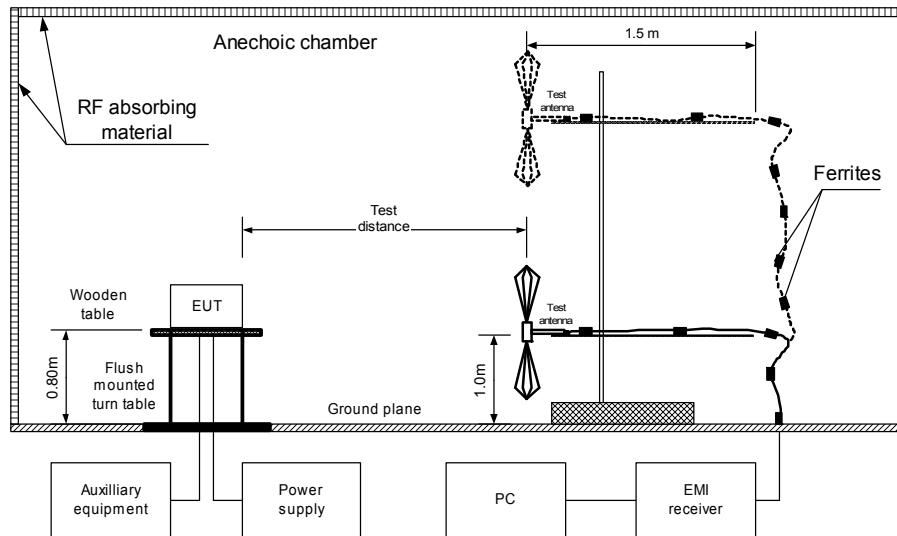
8.2.2.1 The EUT was set up as shown in Figure 8.2.1 and associated photograph/s, energized and the performance check was conducted.

8.2.2.2 The specified frequency range was investigated with biconilog antenna connected to EMI receiver. To find maximum radiation the turntable was rotated 360°, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal and the EUT cables position was varied.

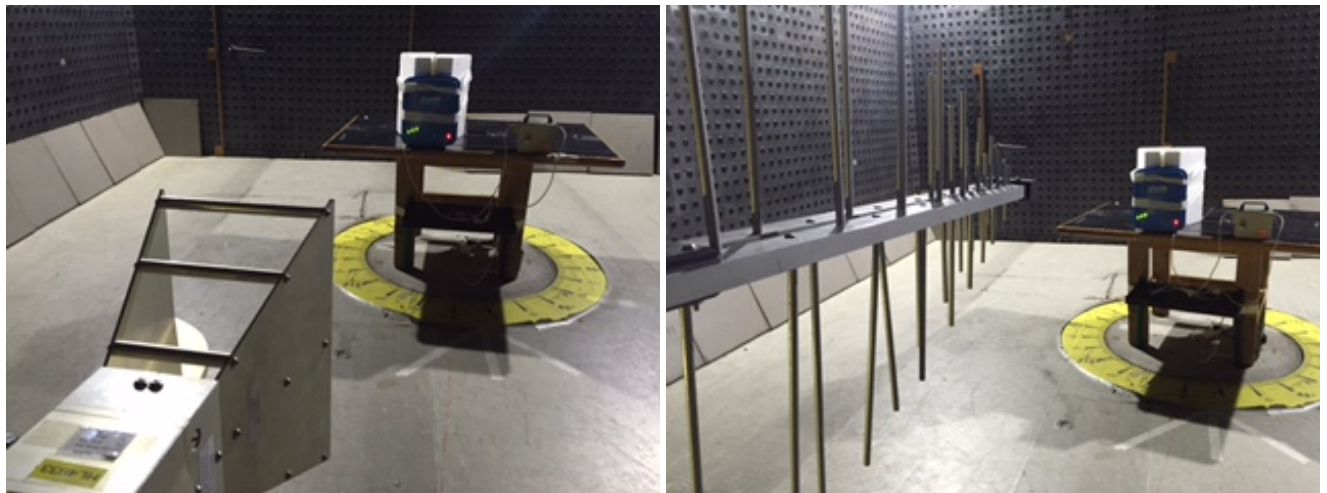
8.2.2.3 The worst test results (the lowest margins) were recorded in Table 8.2.3 and shown in the associated plots.

Test specification:		Section 15.109 / RSS-Gen, section 7.1.2, ICES-003, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		21-Mar-16	
Temperature: 22 °C	Air Pressure: 1011 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

Figure 8.2.1 Setup for radiated emission measurements in anechoic chamber, table-top equipment



Photograph 8.2.1 Setup for radiated emission measurements



Test specification:		Section 15.109 / RSS-Gen, section 7.1.2, ICES-003, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		21-Mar-16	
Temperature: 22 °C	Air Pressure: 1011 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

Photograph 8.2.2 Setup for radiated emission measurements, EUT cabling





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Test specification:		Section 15.109 / RSS-Gen, section 7.1.2, ICES-003, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		21-Mar-16	
Temperature: 22 °C	Air Pressure: 1011 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

Table 8.2.3 Radiated emission test results

EUT SET UP: TABLE-TOP
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / QUASI-PEAK
FREQUENCY RANGE: 30 MHz – 1000 MHz
RESOLUTION BANDWIDTH: 120 kHz

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
50.480	26.57	21.13	40.0	-18.87	V	1.2	0	Pass
131.500	39.87	34.96	43.5	-8.54	V	1.3	355	
333.700	29.71	25.34	47.0	-21.66	V	1.0	340	
550.012	32.73	30.48	46.0	-15.52	H	1.3	10	
600.020	37.07	35.72	46.0	-10.28	V	1.2	10	
650.010	37.36	35.33	46.0	-10.67	V	1.1	5	

TEST SITE: SEMI ANECHOIC CHAMBER
TEST DISTANCE: 3 m
FREQUENCY RANGE: 1000 MHz - 6000 MHz
DETECTORS USED: PEAK / AVERAGE
RESOLUTION BANDWIDTH: 1 MHz

Frequency, MHz	Peak			Average			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
No radiated emission was found										Pass

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

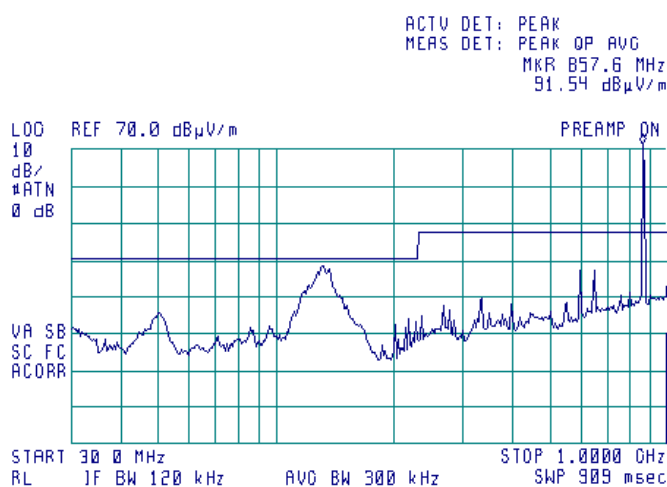
HL 0521	HL 0604	HL 4278	HL 4353	HL 4933			
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Full description is given in Appendix A.

Test specification:		Section 15.109 / RSS-Gen, section 7.1.2, ICES-003, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		21-Mar-16	
Temperature: 22 °C	Air Pressure: 1011 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

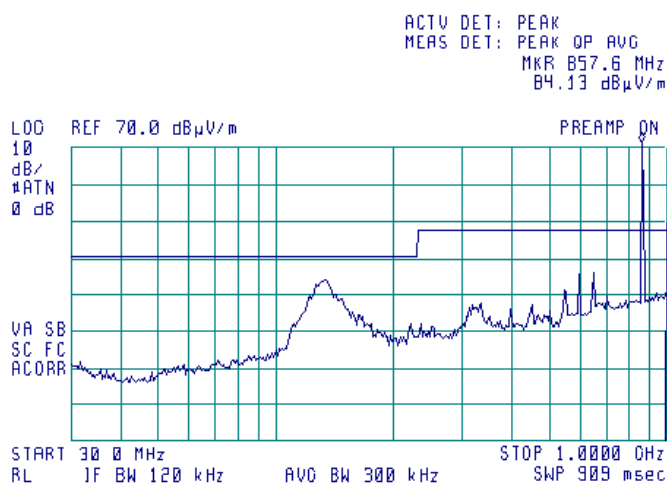
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Plot 8.2.2 Radiated emission measurements in 30 - 1000 MHz range, horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m





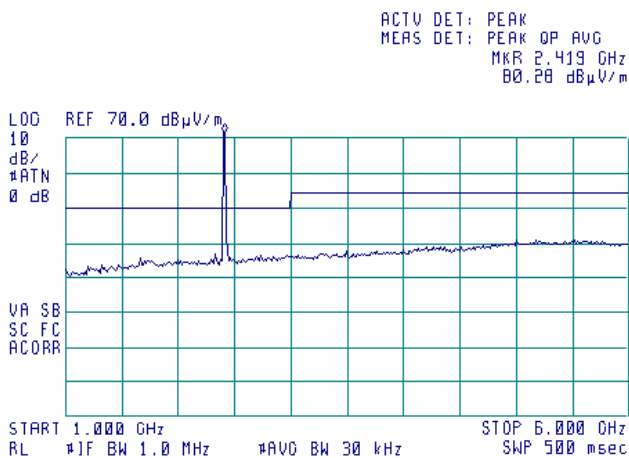
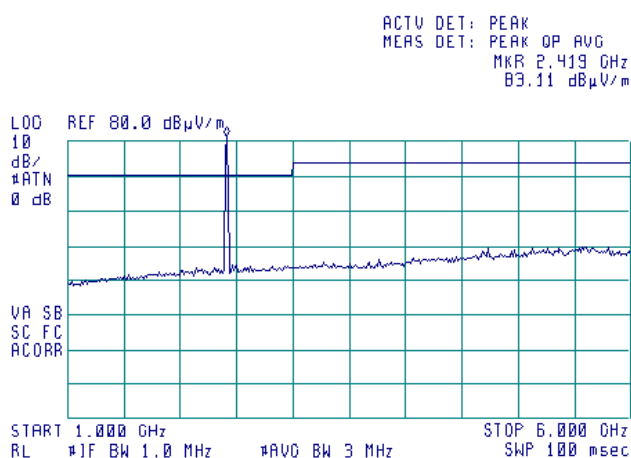
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Test specification:		Section 15.109 / RSS-Gen, section 7.1.2, ICES-003, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:		Compliance	Verdict: PASS
Date(s):		21-Mar-16	
Temperature: 22 °C	Air Pressure: 1011 hPa	Relative Humidity: 54 %	Power Supply: 120 VAC
Remarks:			

Plot 8.2.3 Radiated emission measurements in 1000 – 6000 MHz range, vertical antenna polarization

TEST SITE:
TEST DISTANCE:

Anechoic chamber
3 m

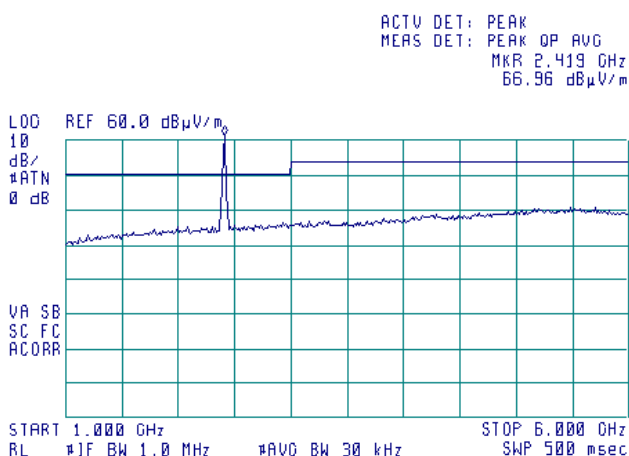
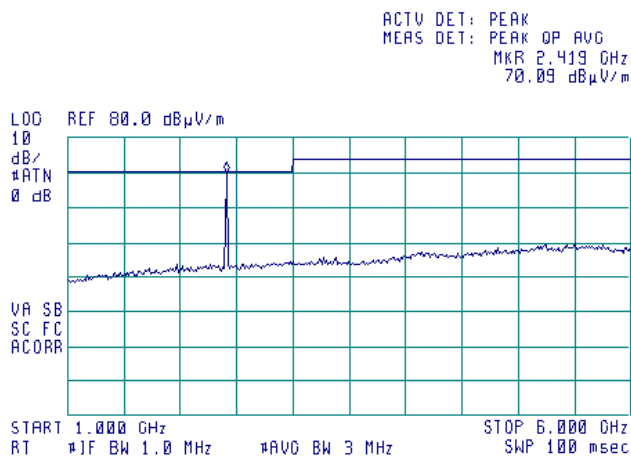


Note : Frequency 2.419 MHz is Wi Fi carrier

Plot 8.2.4 Radiated emission measurements in 1000 – 6000 MHz range, horizontal antenna polarization

TEST SITE:
TEST DISTANCE:

Anechoic chamber
3 m



Note :Frequency 2.419 MHz is Wi Fi carrier

9 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	13-Jan-15	13-Jan-16
0447	LISN, 16/2, 300V RMS, 50 Ohm/50 uH + 5 Ohm, STD CISPR 16-1	Hermon Laboratories	LISN 16 - 1	066	13-Oct-15	13-Oct-16
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	15-May-15	15-May-16
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	08-Sep-15	08-Sep-16
1984	Antenna, Double-Ridged Waveguide Horn, 1 to 18 GHz, 300 W	EMC Test Systems	3115	9911-5964	28-Mar-16	28-Mar-17
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	08-Sep-15	08-Sep-16
3346	High Pass Filter, 50 Ohm, 5000 to 11000 MHz	Mini-Circuits	VHF-4600+	NA	01-Oct-15	01-Oct-17
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	07-Dec-15	07-Dec-16
3780	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	18-Aug-15	18-Aug-16
3810	Near-Field Probe Set, Hand held, 6 probes	EMC Test Systems	7405	9706-3927	30-Dec-15	30-Dec-16
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	29-Apr-15	29-Apr-16
4273	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70045	28-May-15	28-May-16
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
4339	High pass Filter, 50 Ohm, 1000 to 18000 MHz, SMA-FM / SMA-M	Micro-Tronics	HPM5011 5-02	001	06-May-15	06-May-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
4527	DC block , 50 Ohm, 10 MHz to 6 GHz	Mini-Circuits	BLK-6-N+	NA	13-Jan-15	13-Jan-17
4778	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL4777	Hewlett Packard	8542E	30807A00 262, 3427A001 23	05-Nov-15	05-Nov-16
4933	Active Horn Antenna, 1 GHz to 18 GHz	Com-Power Corporation	AHA-118	701046	04-Sep-15	04-Sep-16

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 10 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.0 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.1 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 5.5 dB Biconical antenna: ± 5.5 dB Log periodic antenna: ± 5.6 dB Double ridged horn antenna: ± 5.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Occupied bandwidth	± 8.0 %

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.

Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.

In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

11 APPENDIX C Test 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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Person for contact: Mr. Alex Usoskin, CEO.

12 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-210 Issue 8: 2010	Low Power Licence- Exempt Radiocommunication Devices
RSS-Gen Issue 4: 2014	General Requirements and Information for the Certification of Radiocommunication Equipment
ICES-003 Issue 6: 2016	Information Technology Equipment (Including Digital Apparatus) – Limits and methods of measurement

13 APPENDIX E Test equipment correction factors

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

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

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

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

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

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



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 coaxial, RG-214/U, N type-N type, 17 m
Teldor, HL 3612

Frequency, MHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79

Cable loss
Test cable, Mini-Circuits, S/N 70045, 18 GHz, 1.8 m, SMA/M - N/M
CBL-6FT-SMNM+, HL 4273

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	4800	1.76	9800	2.70	14800	3.59
30	0.11	4900	1.78	9900	2.71	14900	3.59
50	0.14	5000	1.81	10000	2.73	15000	3.60
100	0.20	5100	1.82	10100	2.75	15100	3.63
200	0.30	5200	1.86	10200	2.76	15200	3.67
300	0.38	5300	1.89	10300	2.79	15300	3.70
400	0.45	5400	1.92	10400	2.81	15400	3.68
500	0.50	5500	1.96	10500	2.82	15500	3.70
600	0.55	5600	2.00	10600	2.83	15600	3.71
700	0.60	5700	2.03	10700	2.87	15700	3.77
800	0.65	5800	2.04	10800	2.87	15800	3.75
900	0.69	5900	2.07	10900	2.88	15900	3.77
1000	0.73	6000	2.10	11000	2.89	16000	3.79
1100	0.77	6100	2.10	11100	2.91	16100	3.85
1200	0.80	6200	2.11	11200	2.92	16200	3.82
1300	0.84	6300	2.11	11300	2.94	16300	3.83
1400	0.88	6400	2.14	11400	2.95	16400	3.88
1500	0.92	6500	2.15	11500	2.98	16500	3.89
1600	0.95	6600	2.15	11600	3.00	16600	3.92
1700	0.98	6700	2.16	11700	3.02	16700	3.88
1800	1.01	6800	2.19	11800	3.04	16800	3.95
1900	1.04	6900	2.22	11900	3.08	16900	3.91
2000	1.07	7000	2.24	12000	3.09	17000	3.97
2100	1.09	7100	2.26	12100	3.12	17100	3.92
2200	1.13	7200	2.29	12200	3.13	17200	3.94
2300	1.15	7300	2.32	12300	3.16	17300	3.94
2400	1.18	7400	2.36	12400	3.17	17400	3.98
2500	1.21	7500	2.39	12500	3.19	17500	3.93
2600	1.24	7600	2.41	12600	3.20	17600	3.95
2700	1.27	7700	2.43	12700	3.21	17700	3.96
2800	1.30	7800	2.46	12800	3.21	17800	3.97
2900	1.34	7900	2.49	12900	3.22	17900	3.96
3000	1.36	8000	2.52	13000	3.22	18000	3.97
3100	1.38	8100	2.52	13100	3.24		
3200	1.41	8200	2.54	13200	3.24		
3300	1.45	8300	2.59	13300	3.27		
3400	1.46	8400	2.61	13400	3.28		
3500	1.49	8500	2.60	13500	3.31		
3600	1.51	8600	2.63	13600	3.31		
3700	1.55	8700	2.65	13700	3.35		
3800	1.34	8800	2.65	13800	3.37		
3900	1.36	8900	2.65	13900	3.40		
4000	1.38	9000	2.66	14000	3.43		
4100	1.41	9100	2.66	14100	3.45		
4200	1.45	9200	2.67	14200	3.46		
4300	1.46	9300	2.67	14300	3.46		
4400	1.49	9400	2.67	14400	3.49		
4500	1.51	9500	2.68	14500	3.50		
4600	1.55	9600	2.69	14600	3.50		
4700	1.34	9700	2.69	14700	3.52		

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

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

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

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

14 APPENDIX F Abbreviations and acronyms

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

END OF DOCUMENT