HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47 CFR part 15 section 15.255

FOR:

Siklu Communication Ltd.

Point-to-Multipoint Wireless V-band link operating in 57-64 GHz

Models: MH-B100-CCS-PoE-MWB
MH-T200-CNN-PoE-MWB
MH-T200-CCC-PoE-MWB

FCC ID:2ACYESK-MH60GE-A1

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1 Applicant information

Client name:	Siklu Communication Ltd.
Address:	43 Hasivim street, Petach-Tikva 49517, Israel
Telephone:	+972 3921 4015
Fax:	+972 3921 4162
E-mail:	baruch@siklu.com
Contact name:	Mr. Baruch Schwarz

2 Equipment under test attributes

Product name:	Point-to-Multipoint wireless V-band link operating in 57-64 GHz
Product type:	Transceiver
Model(s):	MH-B100-CCS-PoE-MWB
Brand name:	MultiHaul
Serial number:	S704000100
Hardware version:	A0
Software release:	1.0
Receipt date	12/08/2016

3 Manufacturer information

Manufacturer name:	Siklu Communication Ltd.
Address:	43 Hasivim street, Petach-Tikva 49517, Israel
Telephone:	+972 3921 4015
Fax:	+972 3921 4162
E-Mail:	baruch@siklu.com
Contact name:	Mr. Baruch Schwarz

4 Test details

Project ID:	29038
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	12/08/2016
Test completed:	1/12/2017
Test specification(s):	FCC 47 CFR part 15 section 15.255

5 Tests summary

Test	Status
FCC Section 15.255(b)(ii), Transmitter power and power spectral density	Pass
FCC Section 15.215(c), Occupied bandwidth	Pass
FCC Section 15.255(c), Conducted spurious emissions	Not required
FCC Section 15.255(c)(2), Radiated spurious emissions below 40 GHz	Pass
FCC Section 15. 255(c)(3), Radiated emissions outside assigned band and above 40 GHz up to 200 GHz	Pass
FCC Section 15.255(f), Frequency tolerance	Tested without limit
FCC Section 15.255(g), RF exposure	Pass, exhibit included in Application for certification

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. K. Zushchyk, test engineer	January 12, 2017	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	January 19, 2017	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	February 6, 2017	

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6 EUT description

6.1 General information

The EUT is an outdoor unit of point-to-multipoint high BW system, based on WiGi technology, operating in the 57-64 GHz regulated V-Band. The EUT radio supports up to 2.5 Gbps.
There are two options for this system. Functionally, a system can serve as a base unit (BU) or as an end point ("Terminal Unit" – TU). In terms of HW, both types have identical Architecture, HW, and Low-Level SW drivers. The difference is only in the application layer.
Several combinations are possible for system assembly. Some of them are more P2P like, while others benefit from P2MP capability.
During the testing the EUT system was powered by POE+.

6.2 Ports and lines

Port type	Port description	Conected from	Connected to	Qty.	Cable type	Cable length, m
Telecom	Ethernet-POE	EUT ETH1	POE+	1	Shielded	2
Telecom	Ethernet-PSE	EUT ETH2	Open circuit	1	Shielded	2
Telecom	Ethernet-PSE/SFP	EUT ETH3	Open circuit	1	Shielded/fiber optic	2

6.3 Support and test equipment

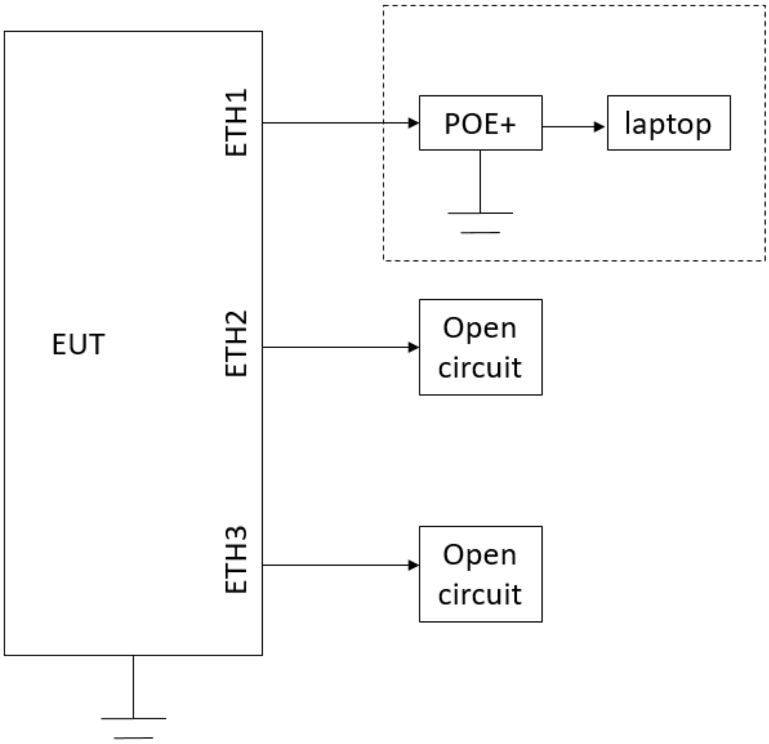
Description	Manufacturer	Model number	Serial number
Laptop	Dell	E7440	35868926774
POE	Power Dsine Microsemi	9001G-40/SP rev b	11226519000962A01

6.4 Changes made in the EUT

No changes were performed in the EUT during testing.

6.5 Test configuration

6.5.1 EUT test configuration



6.6 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)				

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

Assigned frequency range	57.0 GHz – 64.0 GHz	
Operating frequencies (tested)	60480 MHz, 62640 MHz	
Maximum rated output power	EIRP	39.50 dBm

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

Antenna connection					
unique coupling	standard connector	V	Integral		with temporary RF connector
					without temporary RF connector

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Gain
Integrated array of 32 dipole antenna	Siklu Ltd.	CCB001	24 dBi

Transmitter 99% power bandwidth, MHz	**Transmitter aggregate data rate/s, Mbps**	**Type of modulation**
2160	2500	QPSK

Type of multiplexing	TDD

Transmitter power source					
		Nominal rated voltage		Battery type	
V	DC	**Nominal rated voltage**	48 V		
		Voltage range	POE 42-57 V		
	AC mains	**Nominal rated voltage**		Frequency	

Common power source for transmitter and receiver	V	yes	no

Test specification:	**Section 15.255(b)(ii), Transmitter power and power spectral density**		
Test procedure:	47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Section 9.11		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 ºC	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

7 Transmitter tests

7.1 Transmitter power test

7.1.1 General

This test was performed to measure the peak output power. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Output power limits

Assigned frequency range, MHz	Maximum output power			
	Peak conducted output power		EIRP, dBm*	
	mW	dBm	Peak	Average
57000 – 64000	500	27.0	43	40

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 adjusted to produce maximum available for end user RF output power.

7.1.2.3 The average and peak voltage was measured at the low and high frequency channels with oscilloscope connected to RF detectorand provided in the associated plots.

7.1.2.4 The unmodulated signal was applied to Zero-Biased Detector via variable attenuator as shown in Figure 7.1.2.

7.1.2.5 The variable attenuator was adjusted such that the oscilloscope indicated a voltage equal to the peak voltage recorded in the step 7.1.2.3.

7.1.2.6 The variable attenuator was disconnected from the Zero-Biased Detector.

7.1.2.7 Without changing any settings, the variable attenuator was connected to a power meter as shown in Figure 7.1.3.

7.1.2.8 The power was measured and result was recorded in Table 7.1.2 and Table 7.1.3.

7.1.2.9 The steps 7.1.2.4 through 7.1.2.8 were repeated for the average voltage recorded in the step 7.1.2.3 and 7.1.2.4.

Test specification:	**Section 15.255(b)(ii), Transmitter power and power spectral density**		
Test procedure:	47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Section 9.11		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 ºC	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Figure 7.1.1 Peak output power test setup

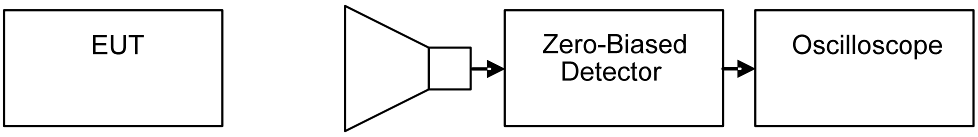


Figure 7.1.2 Peak output power test setup

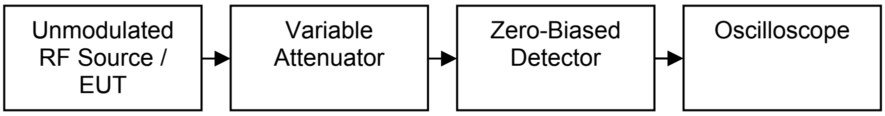
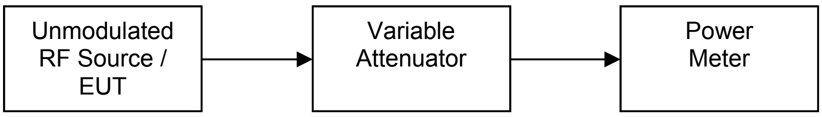


Figure 7.1.3 Peak output power test setup



Test specification:	Section 15.255(b)(ii), Transmitter power and power spectral density		
Test procedure:	47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Section 9.11		
Test mode:	Compliance	Verdict:	PASS
Date:	12/21/2016		
Temperature: 22 ºC	Air Pressure: 1007 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

Table 7.1.2 Peak output power test results

OPERATING FREQUENCY RANGE: 57.0 – 64.0 GHz
DETECTOR USED: Peak
MEASUREMENTS DISTANCE: 0.6 m
VIDEO BANDWIDTH: >10 MHz
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
MODULATION: QPSK

Frequency, MHz	λ*, m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	E_{meas}**, dBuV/m	EIRP***, dBm	Limit, dBm	Margin****, dB	Verdict
60480	0.00496	-7.02	-0.25	24.00	149.64	39.50	43.00	-3.50	Pass
62640	0.00479	-7.09	-0.65	24.00	148.55	39.41	43.00	-3.59	Pass

* - λ = 300/Frequency(MHz)
** - E_{meas}= 126.8 – 20log(λ) + Power measured – Measurement Antenna Gain
*** - EIRP= E_{meas} + 20log(Measurements distance) – 104.7
**** - Margin = EIRP – Limit

Table 7.1.3 Average output power test results

OPERATING FREQUENCY RANGE: 57.0 – 64.0 GHz
DETECTOR USED: Average
MEASUREMENTS DISTANCE: 0.6 m
VIDEO BANDWIDTH: >10 MHz
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
MODULATION: QPSK

Frequency, MHz	λ*, m	DSO, mV	Power measured, dBm	Antenna Gain, dBi	E_{meas}**, dBuV/m	EIRP***, dBm	Limit, dBm	Margin****, dB	Verdict
60480	0.00496	4.597	-0.95	24.00	147.94	38.80	40.00	-1.20	Pass
62640	0.00479	4.939	-1.30	24.00	147.89	38.78	40.00	-1.22	Pass

* - λ = 300/Frequency(MHz)
** - E_{meas}= 126.8 – 20log(λ) + Power measured – Measurement Antenna Gain
*** - EIRP= E_{meas} + 20log(Measurements distance) – 104.7
**** - Margin = EIRP – Limit

Reference numbers of test equipment used

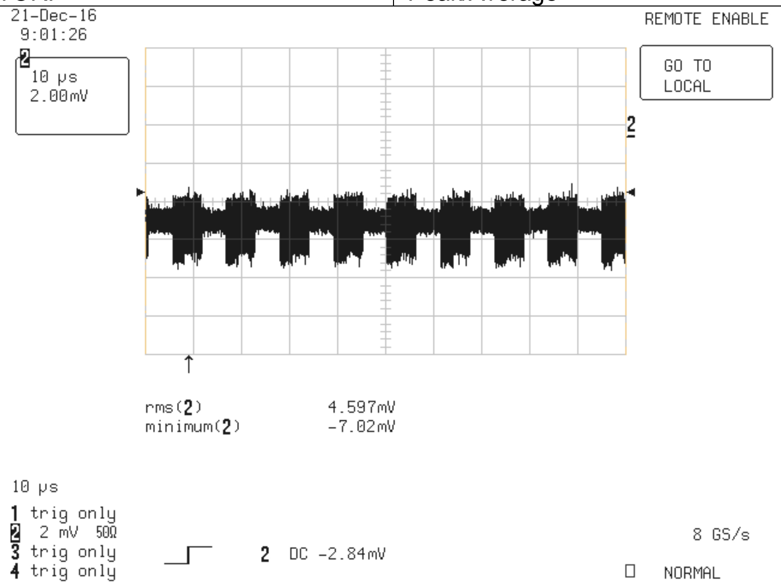
HL 0661	HL 0771	HL 3291	HL 3333	HL 3293	HL 3901	HL 4856	

Full description is given in Appendix A.

Test specification:	**Section 15.255(b)(ii), Transmitter power and power spectral density**		
Test procedure:	47 CFR, Section 2.1046; Section 15.255(b); ANSI C63.10, Section 9.11		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

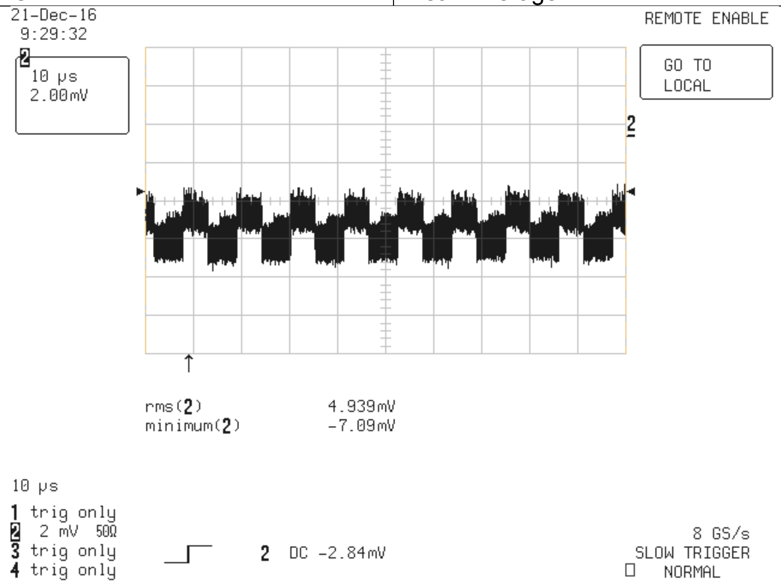
Plot 7.1.1 Output power test result at the low frequency

DETECTOR:	Peak/Average



Plot 7.1.2 Output power test result at the high frequency

DETECTOR:	Peak/Average



Test specification:	Section 15.215(c), Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	Verdict:	PASS
Date:	1/12/2017		
Temperature: 23 ºC	Air Pressure: 1008 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Occupied bandwidth limits

Assigned frequency range, MHz	Modulation envelope reference points
57000 - 64000	20 dBc

NOTE: Modulation envelope reference points provided in terms of attenuation below unmodulated 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 EUT was set to transmit modulated carrier as provided in Table 7.2.2.

7.2.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope. The test results are provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Occupied bandwidth test setup

Test specification:	**Section 15.215(c), Occupied bandwidth**		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	**Verdict:**	PASS
Date:	1/12/2017		
Temperature: 23 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

OPERATING FREQUENCY RANGE: 57000 –64000 MHz
DETECTOR USED: Peak

Frequency, MHz	Modulation	Occupied bandwidth 99%, MHz	Occupied bandwidth 20 dBc MHz	Verdict
60480	QPSK	2104.8	2308.0	Pass
62640		2009.8	2243.0	Pass

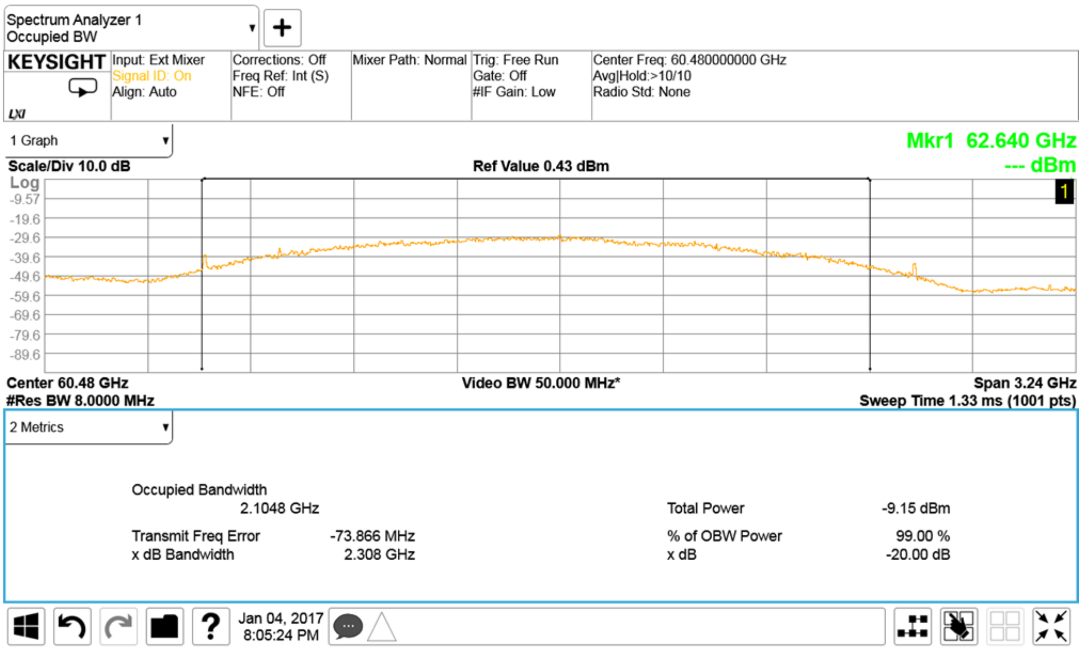
Reference numbers of test equipment used

HL 0771	HL 3433	HL 3434					

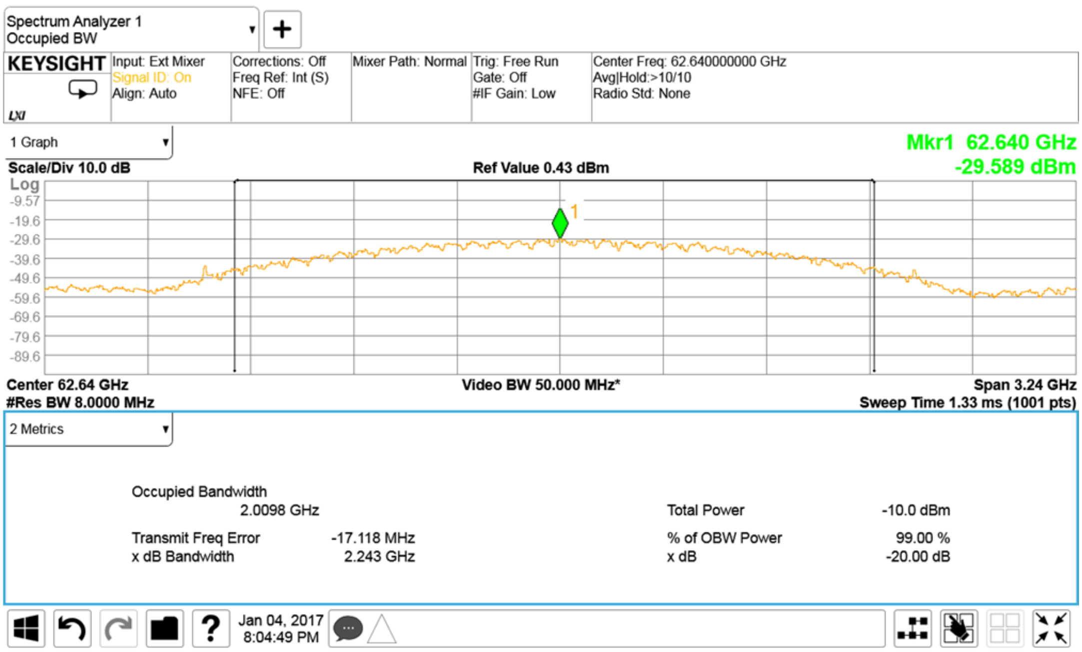
Full description is given in Appendix A.

Test specification:	**Section 15.215(c), Occupied bandwidth**		
Test procedure:	47 CFR, Section 2.1049, ANSI C63.10, Section 9.3		
Test mode:	Compliance	**Verdict:**	PASS
Date:	1/12/2017		
Temperature: 23 °C	**Air Pressure:** 1008 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.2.1 Occupied bandwidth at low frequency



Plot 7.2.2 Occupied bandwidth at the high frequency



Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

7.3 Out of band radiated emissions below 40 GHz

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 emission limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)***		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
0.090 – 0.110	NA	108.5 – 106.8**	NA
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**
0.490 – 1.705	NA	73.8 – 63.0**	NA
1.705 – 30.0*		69.5**	
30 – 88		40.0	
88 – 216		43.5	
216 – 960		46.0	
960 - 40000	74.0	NA	54.0

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

$$Lim_{S2} = Lim_{S1} + 40 \log (S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.
***- The limit decreases linearly with the logarithm of frequency.

7.3.2 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 loop antenna connected to spectrum analyzer/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna was rotated around its vertical axis and the measuring antenna polarization was switched from vertical to horizontal.

7.3.2.3 The worst test results (the lowest margins) were recorded in Table 7.3.2 and shown in the associated plots.

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

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

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

7.3.3.3 The worst test results (the lowest margins) were recorded in Table 7.3.2, Table 7.3.3 and shown in the associated plots.

Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 ºC	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Figure 7.3.1 Radiated emissions below 30 MHz test set up

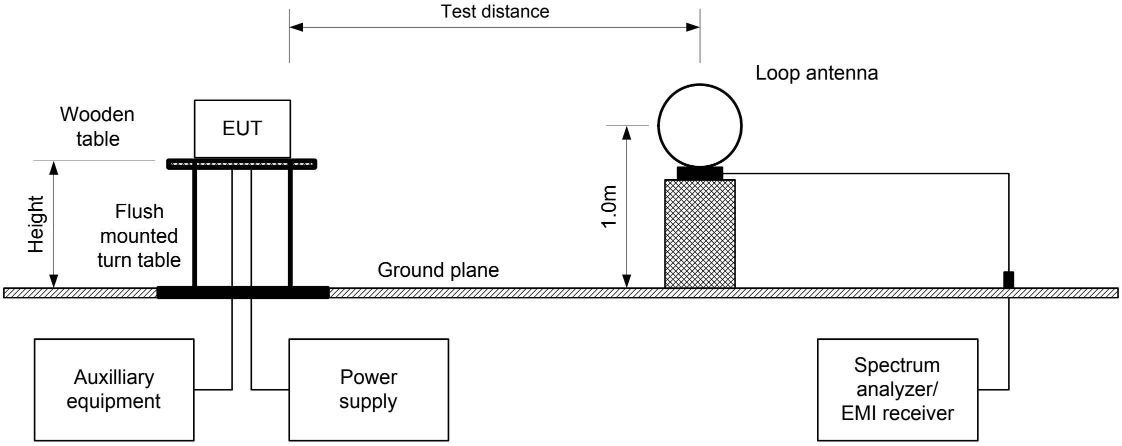
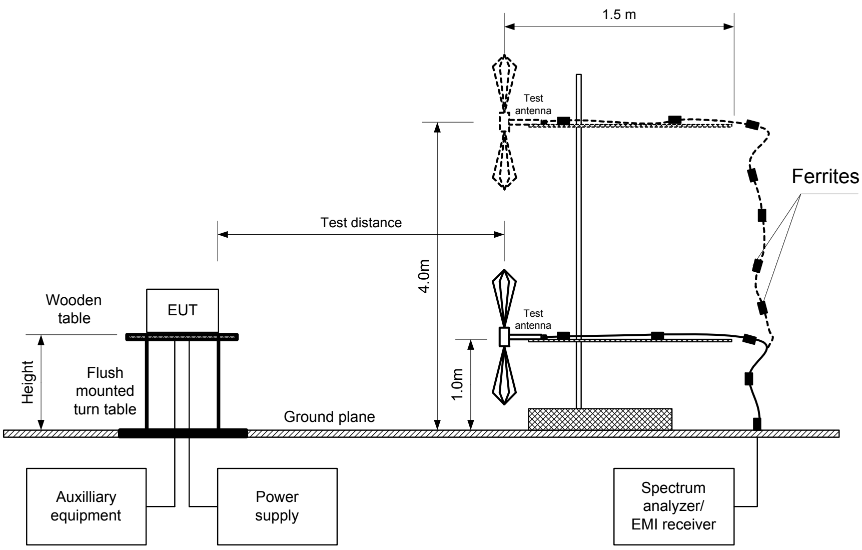
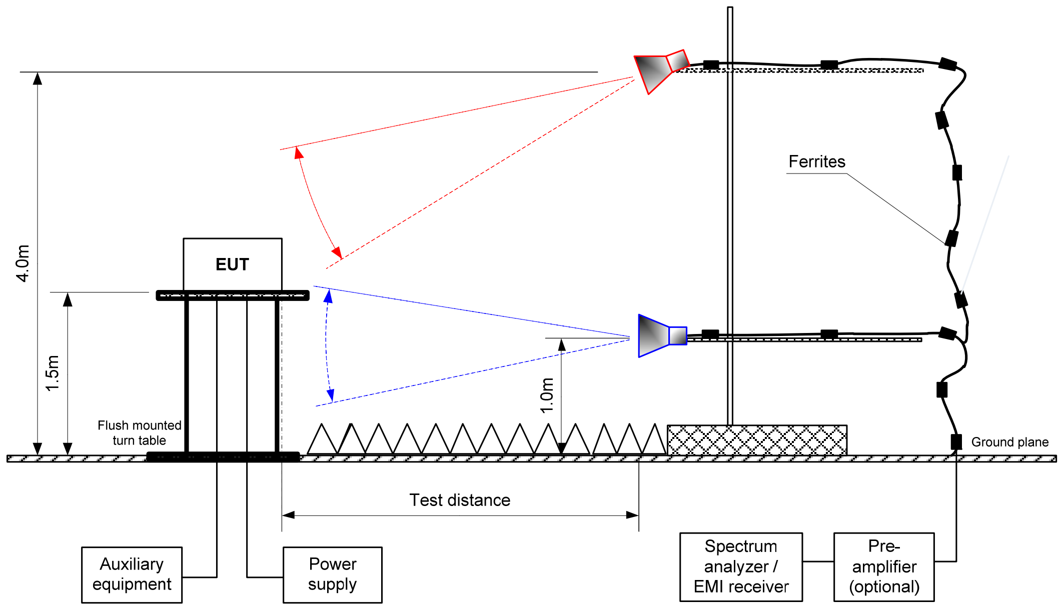


Figure 7.3.2 Radiated emissions in 30 MHz-1000 MHz test set up



Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Figure 7.3.3 Setup for spurious emission field strength measurements above1000 MHz



Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Table 7.3.2 Radiated emissions test results below 1000 MHz

TEST SITE:	Semi Anechoic Chamber
TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	QPSK
EMISSION BANDWIDTH:	2160 MHz
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	0.009 – 40000 MHz
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(uV/m)	Margin, dB*				
Low frequency 60480 MHz								
41.85	36.1	34.6	40.0	-5.4	Vertical	1.0	53	Pass
75.46	36.7	35.8	40.0	-4.2	Vertical	1.1	105	Pass
650.00	45.7	44.0	46.0	-2.0	Horizontal	1.3	90	Pass
750.00	44.8	43.4	46.0	-2.6	Horizontal	1.5	60	Pass
875.00	45.2	43.9	46.0	-2.1	Vertical	1.5	356	Pass
High frequency 62640 MHz								
41.85	36.3	34.8	40.0	-5.2	Vertical	1.1	60	Pass
75.46	36.4	35.3	40.0	-4.7	Vertical	1.1	110	Pass
650.00	45.7	43.5	46.0	-2.5	Horizontal	1.3	97	Pass
750.00	45.2	43.9	46.0	-2.1	Horizontal	14	100	Pass
875.00	45.7	43.5	46.0	-2.5	Vertical	1.5	356	Pass

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

Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 ºC	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Table 7.3.3 Radiated emissions test results in 1000 – 40000 MHz range

TEST SITE:	OATS
TEST DISTANCE:	3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	QPSK
EMISSION BANDWIDTH:	2160 MHz
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
INVESTIGATED FREQUENCY RANGE:	1000 – 40000 MHz
RESOLUTION BANDWIDTH:	1000 kHz
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Double-Ridged Waveguide Horn

Frequency, MHz	**Antenna**		**Azimuth, degrees***	**Peak field strength (VBW=3 MHz)**			**Average field strength (VBW=30 Hz)**			**Verdict**
	Polariz.	**Height, m**		**Measured, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB****	**Measured, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB****	
Low frequency 60480 MHz										
1000.025	H	2.1	310	52.69	74.0	-21.31	41.33	54.0	-12.67	Pass
2031.275	V	1.3	350	56.03	74.0	-17.97	43.02	54.0	-10.98	
2666.670	H	2.1	45	62.45	74.0	-11.55	41.75	54.0	-12.25	
5312.550	V	1.7	340	48.24	74.0	-25.76	40.70	54.0	-13.30	
5625.050	V	1.7	340	51.24	74.0	-22.76	46.00	54.0	-8.00	
7560.054	H	1.6	330	56.43	74.0	-17.57	51.94	54.0	-2.06	
High frequency 62640 MHz										
1000.000	H	1.8	325	53.79	74.0	-20.21	40.70	54.0	-13.30	Pass
2031.275	V	1.3	0	57.20	74.0	-16.80	42.86	54.0	-11.14	
2666.613	H	2.0	45	61.05	74.0	-12.95	42.05	54.0	-11.95	
5312.563	V	1.8	325	47.81	74.0	-26.19	40.17	54.0	-13.83	
5625.140	V	1.8	350	51.04	74.0	-22.96	44.93	54.0	-9.07	
7560.050	H	1.5	330	56.48	74.0	-17.52	51.91	54.0	-2.09	

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

Reference numbers of test equipment used

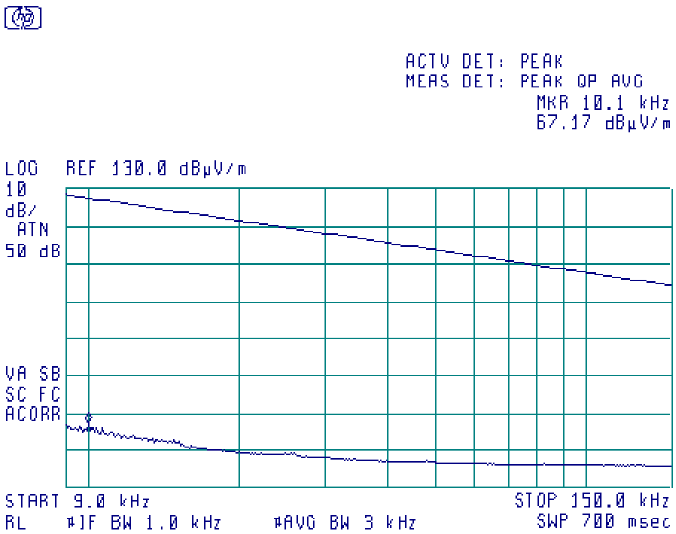
HL 0446	HL 0521	HL 0604	HL 3818	HL 4353	HL 4956	HL 5101	HL 5111

Full description is given in Appendix A.

Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

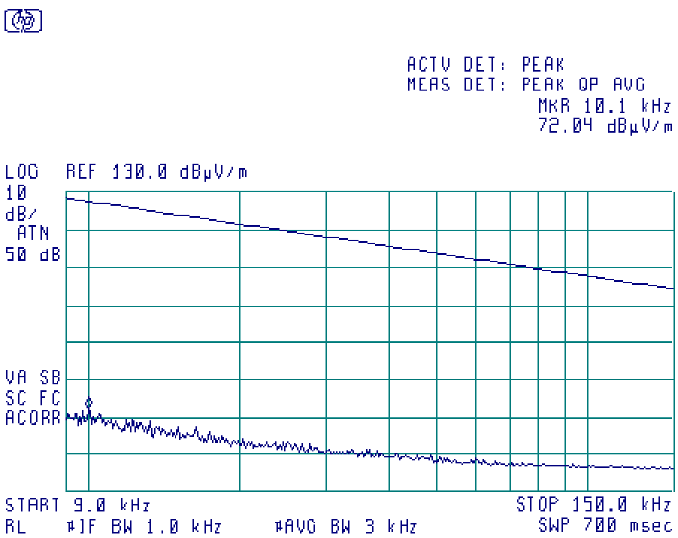
Plot 7.3.1 Radiated emission measurements from 9 to 150 kHz

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



Plot 7.3.2 Radiated emission measurements from 9 to 150 kHz at high frequency

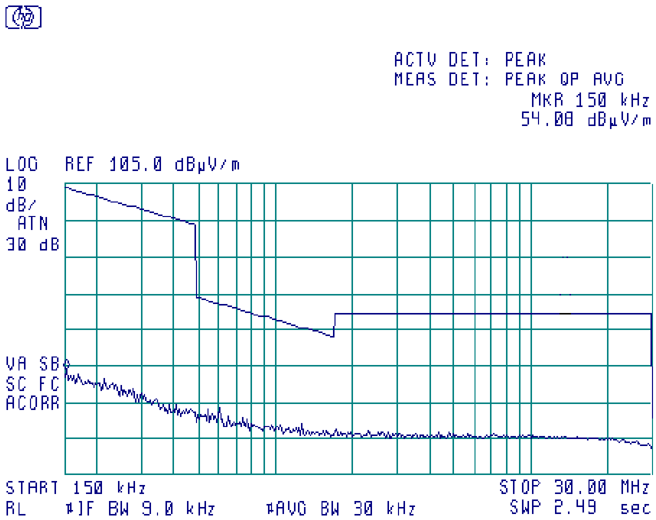
TEST SITE:	Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical



Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

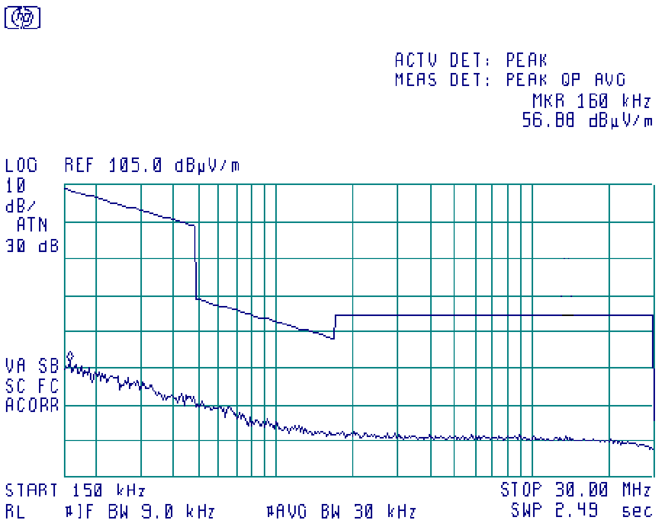
Plot 7.3.3 Radiated emission measurements from 0.15 to 30 MHz at low frequency

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



Plot 7.3.4 Radiated emission measurements from 0.15 to 30 MHz at high frequency

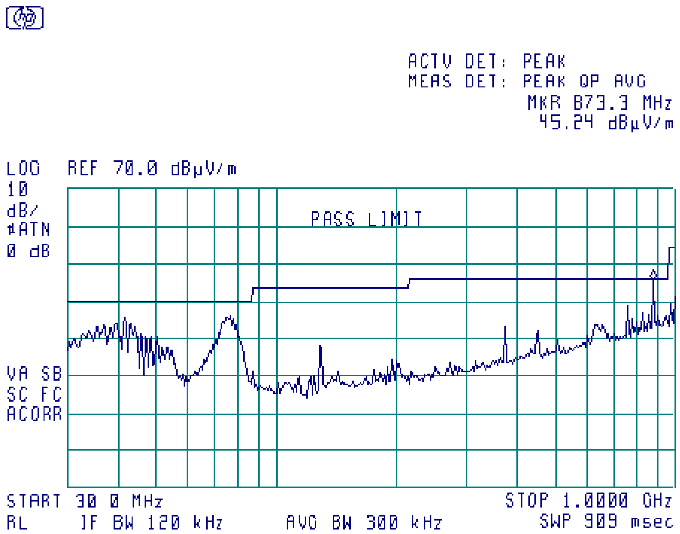
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

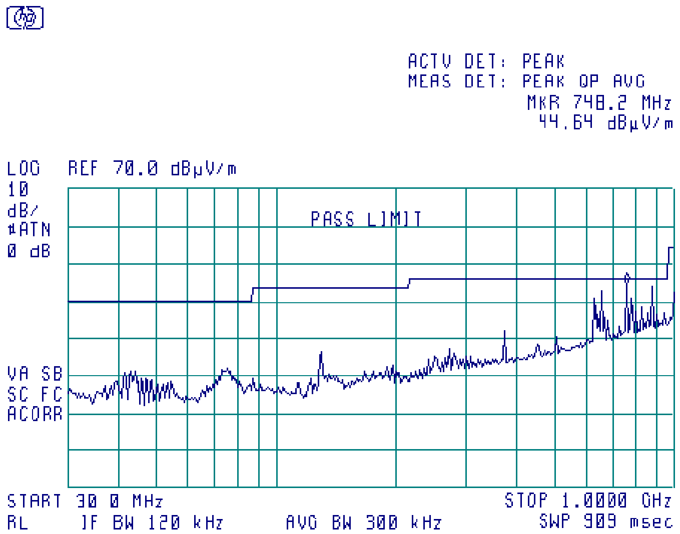
Plot 7.3.5 Radiated emission measurements from 30 to 1000 MHz at low frequency

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



Plot 7.3.6 Radiated emission measurements from 30 to 1000 MHz at low frequency

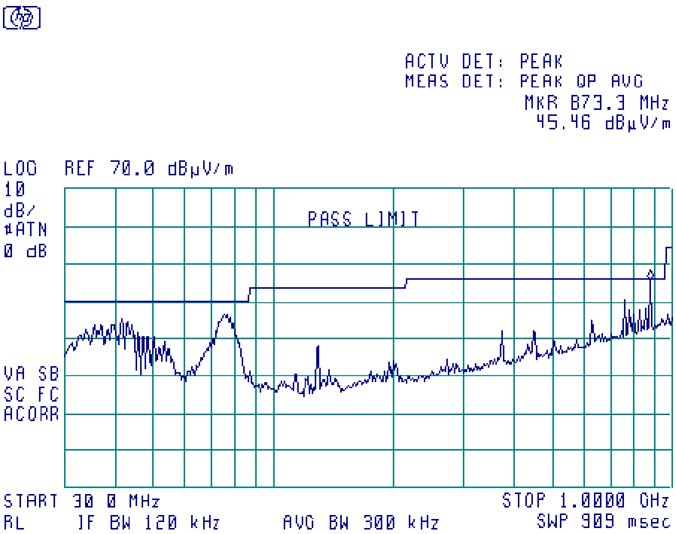
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal



Test specification:	Section 15.255(c)(2), Out of band radiated emissions below 40 GHz		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	Verdict:	PASS
Date:	12/21/2016		
Temperature: 22 °C	Air Pressure: 1007 hPa	Relative Humidity: 42%	Power Supply: 48 VDC
Remarks:			

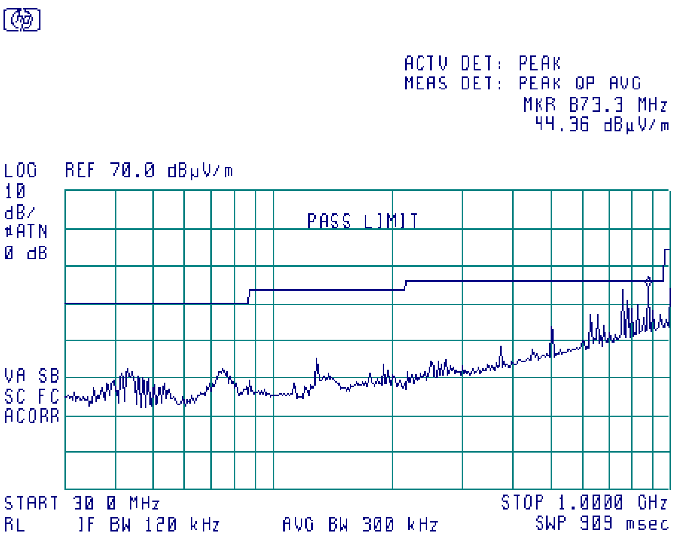
Plot 7.3.7 Radiated emission measurements from 30 to 1000 MHz at high frequency

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



Plot 7.3.8 Radiated emission measurements from 30 to 1000 MHz at high frequency

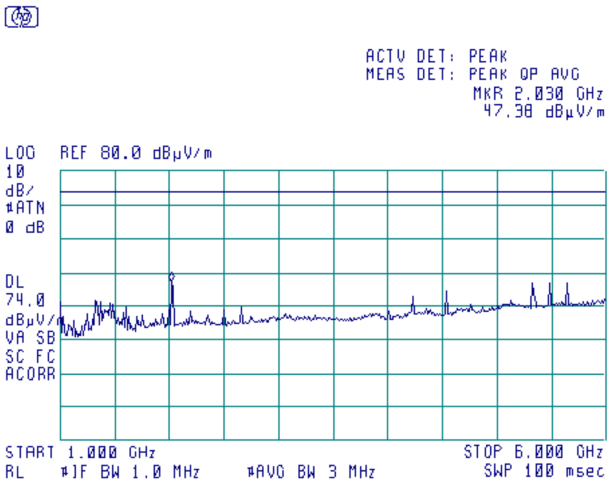
TEST SITE:	Semi anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Horizontal

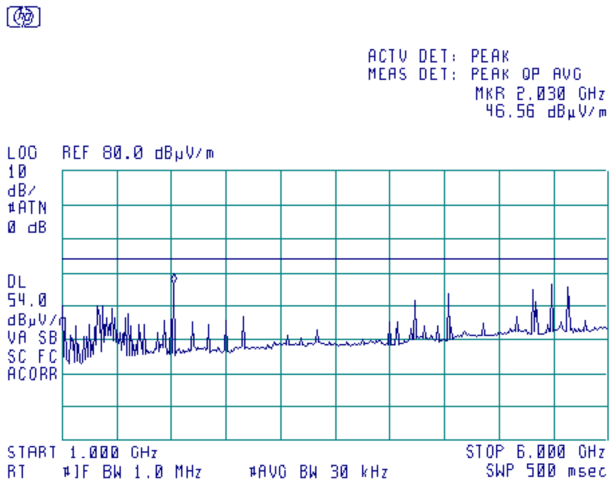


Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.3.9 Radiated emission measurements from 1000 to 6000 MHz at low frequency

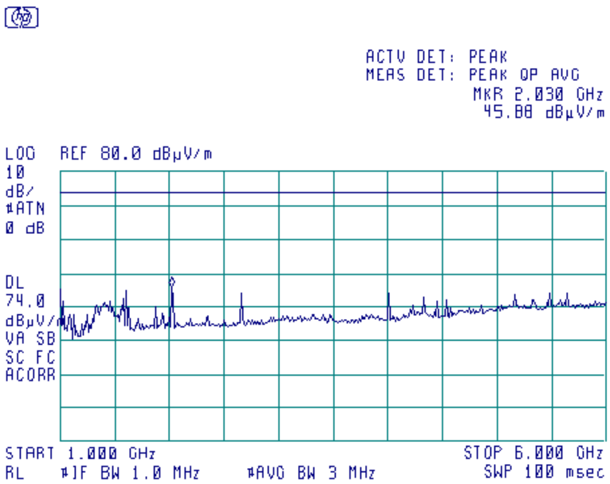
TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical

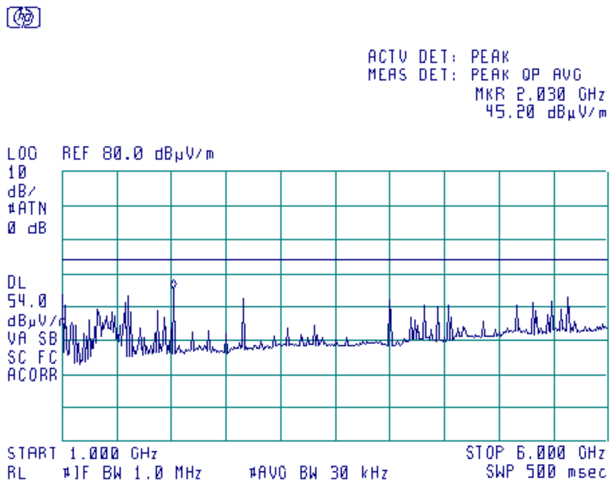




Plot 7.3.10 Radiated emission measurements from 1000 to 6000 MHz at low frequency

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

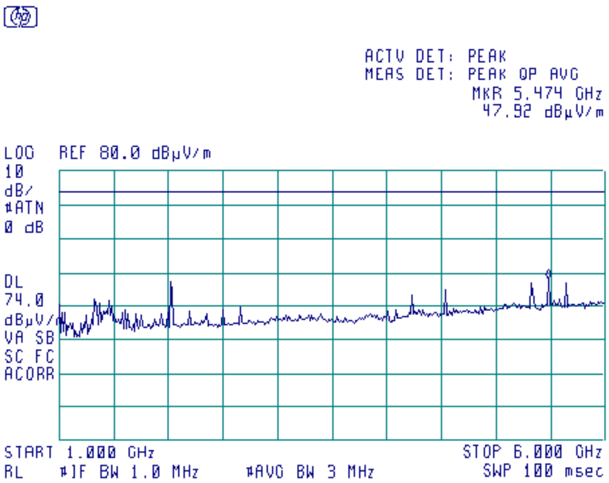


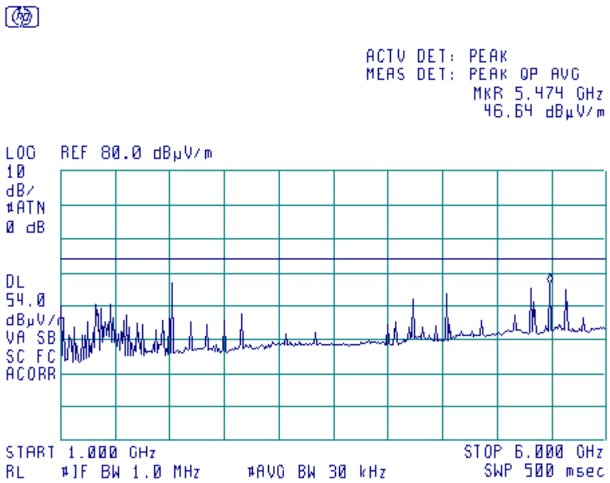


Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.3.11 Radiated emission measurements from 1000 to 6000 MHz at high frequency

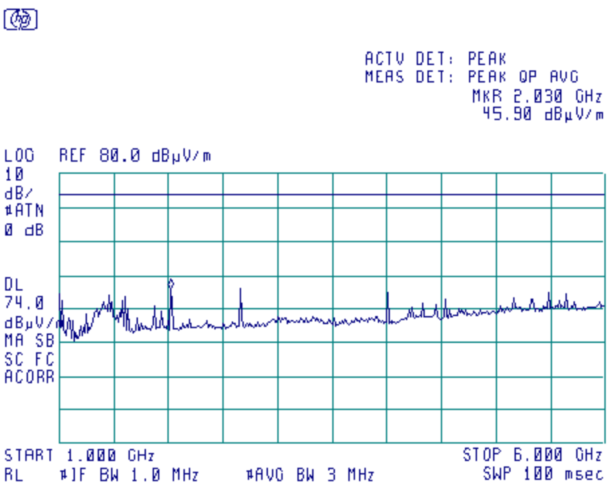
TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical

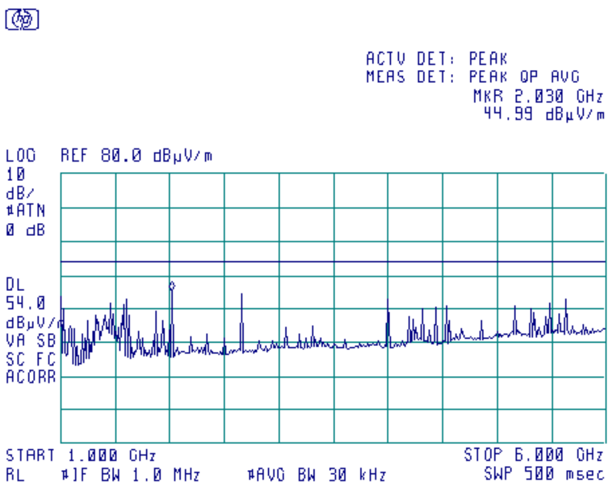




Plot 7.3.12 Radiated emission measurements from 1000 to 6000 MHz at high frequency

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

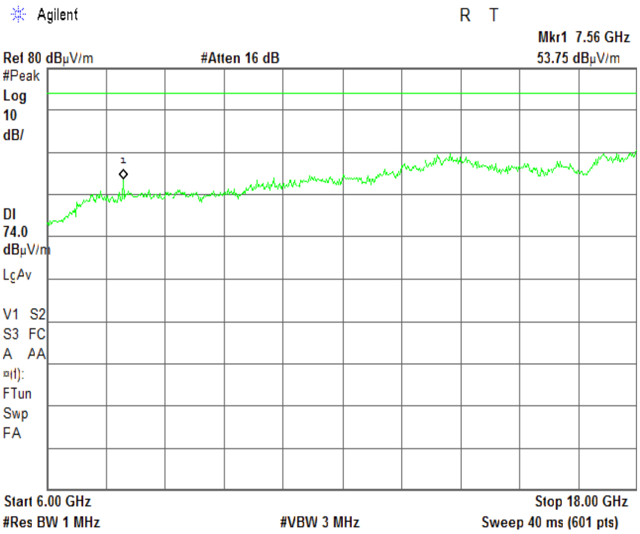


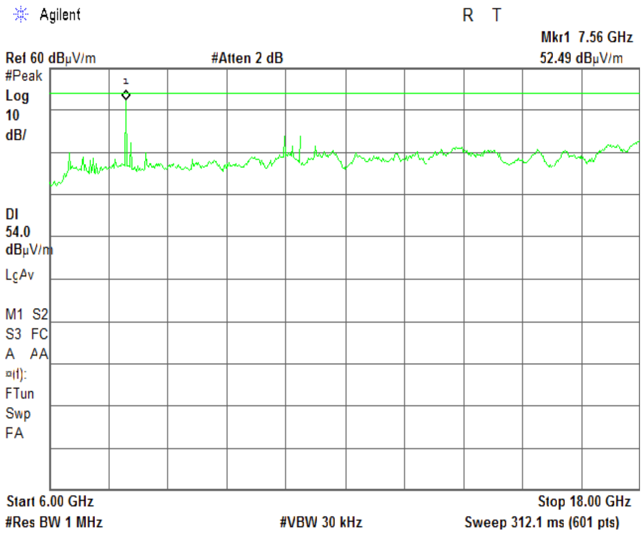


Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.3.13 Radiated emission measurements from 6000 – 18000 MHz at low frequency

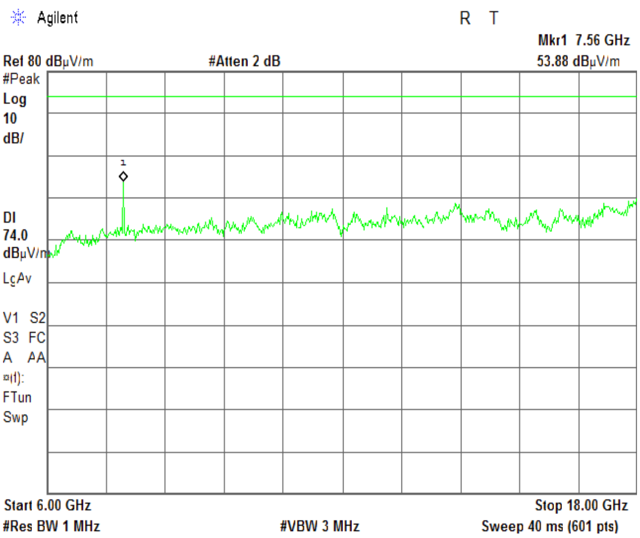
TEST SITE:	Semi Anechoic chamber
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal

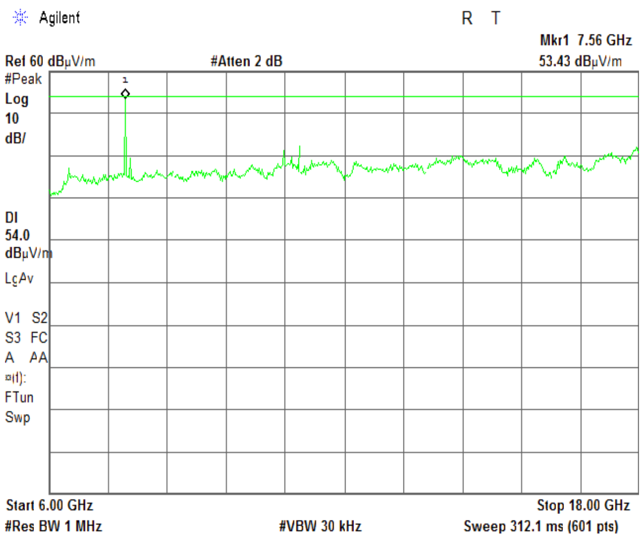




Plot 7.3.14 Radiated emission measurements from 6000 – 18000 MHz at high frequency

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

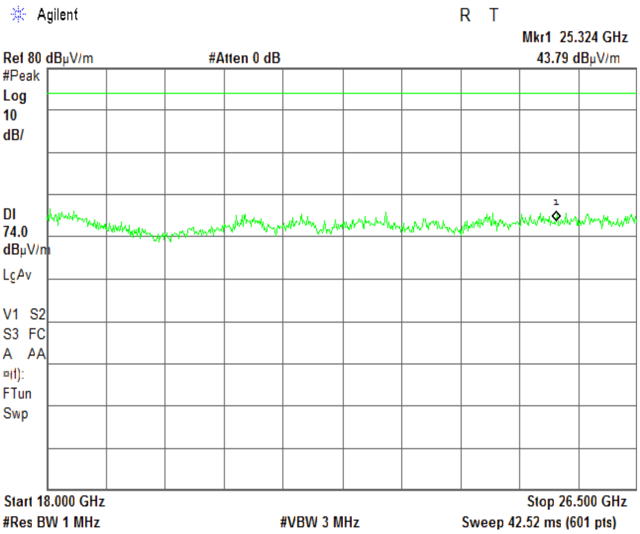


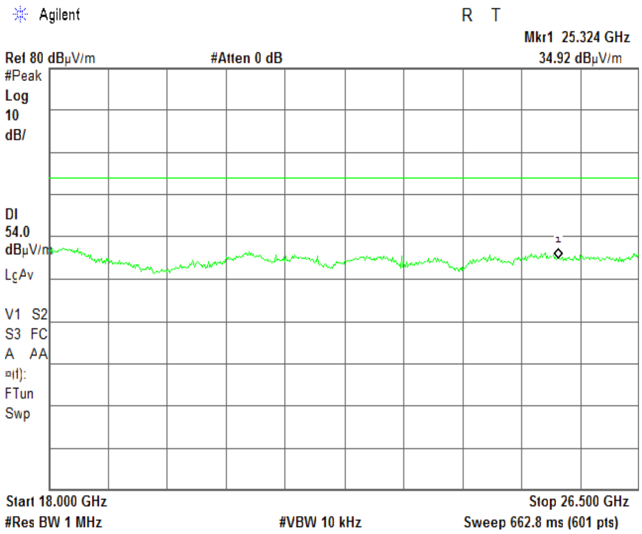


Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.3.15 Radiated emission measurements from 18000 to 26500 MHz at low frequency

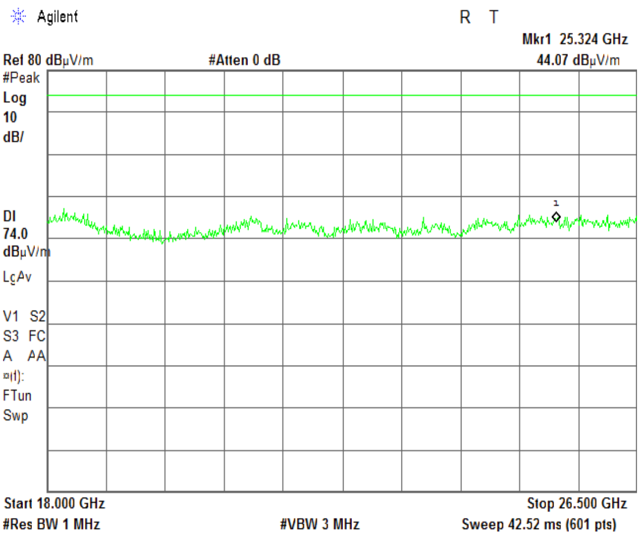
TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal

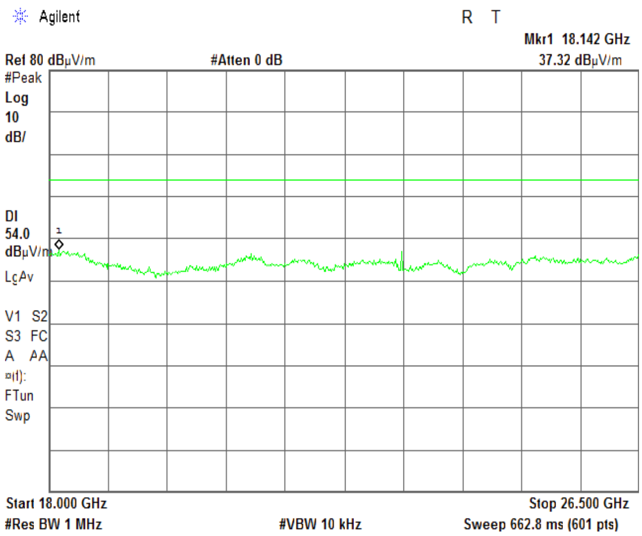




Plot 7.3.16 Radiated emission measurements from 18000 to 26500 MHz at high frequency

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

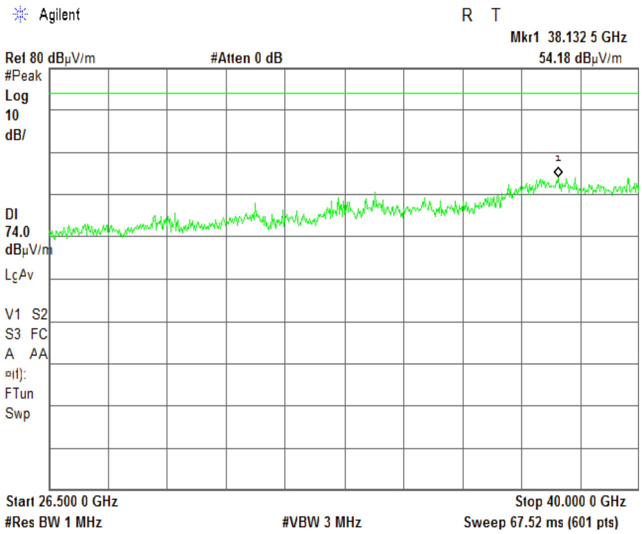


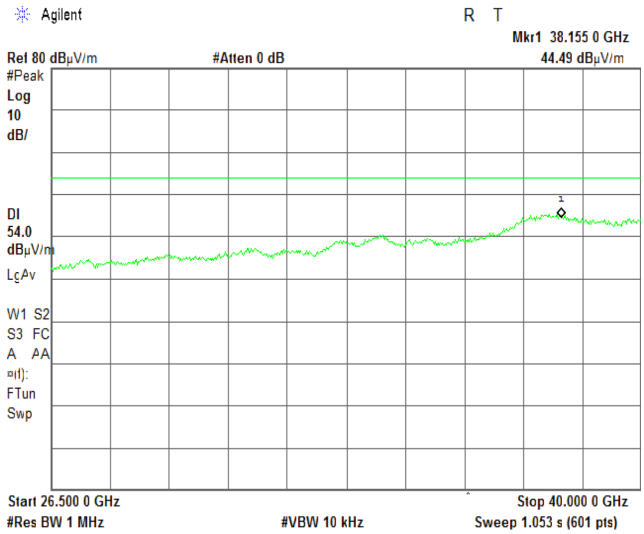


Test specification:	**Section 15.255(c)(2), Out of band radiated emissions below 40 GHz**		
Test procedure:	47 CFR, Section 2.1053; ANSI C63.10, Section 9.13		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/21/2016		
Temperature: 22 °C	**Air Pressure:** 1007 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.3.17 Radiated emission measurements from 26500 to 40000 MHz at low frequency

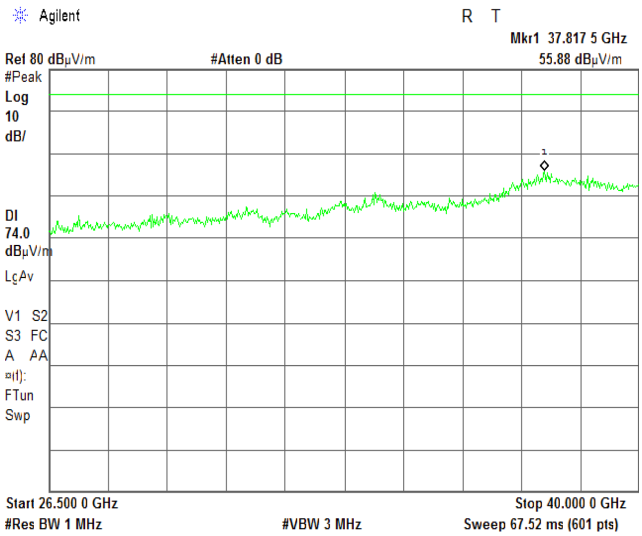
TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal

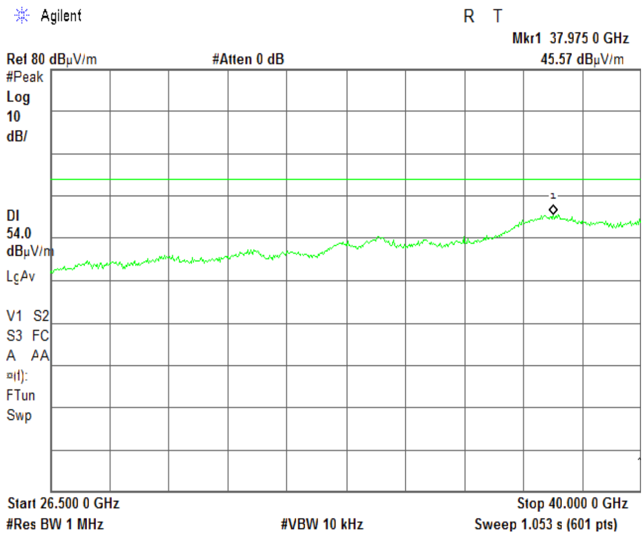




Plot 7.3.18 Radiated emission measurements from 26500 to 40000 MHz at high frequency

TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR:	Peak





Test specification:	Section 15.255(c)(3), Out of band radiated emissions above 40 GHz		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	Verdict:	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	Air Pressure: 1011 hPa	Relative Humidity: 51%	Power Supply: 48 VDC
Remarks:			

7.4 Out of band radiated emissions above 40 GHz up to 200 GHz

7.4.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Radiated spurious emission test limits

Frequency, GHz	Power density at 3 m distance pW/cm^2	Distance, m	Field strength dB(μV/m)*, peak	Field strength dB(μV/m)*, average
40 – 220	90.0	3.0	105.30	85.30
75 - 110	90.0	0.70	120.90**	100.90**
110 - 140	90.0	0.05	140.90**	120.90**
140 - 200	90.0	0.01	154.80**	134.80**

* - Field strength was calculated per equation (26) of ANSI C63.10-2013 section 9 as follows: E=sqrt(PD×377), where PD is the power density at the distance specified by the limit in W/m^2, E- field strength in V/m.
**- The limit for other test distance was calculated using the inverse distance extrapolation factor as follows:
$Lim_{S2} = Lim_{S1} + 20 \log (S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

7.4.2 Test procedure for spurious emission field strength measurements

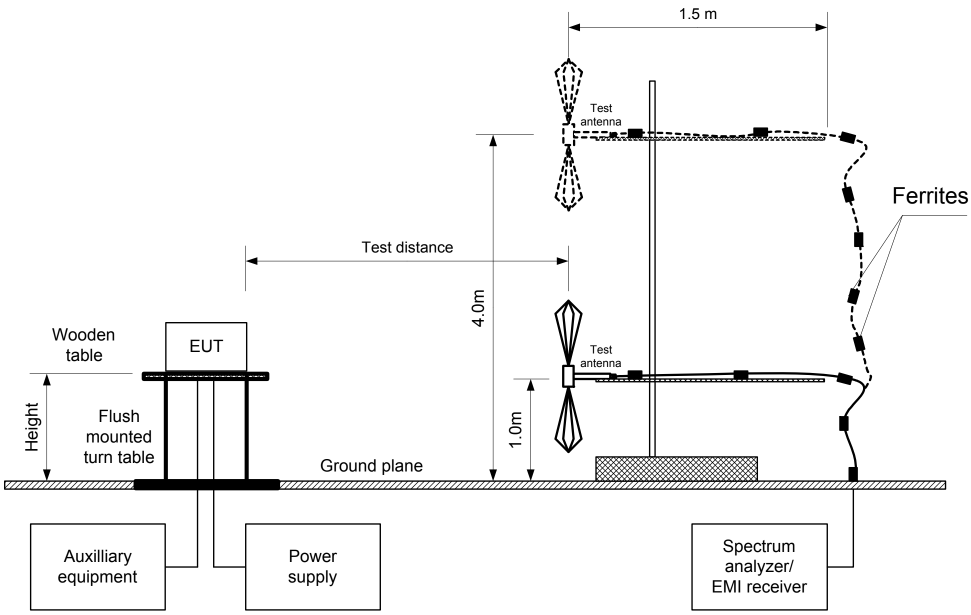
7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

7.4.2.2 The 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.

7.4.2.3 The test results are given in Table 7.4.2 and shown in the associated plots.

Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Figure 7.4.1 Radiated emissions above 40 GHz test set up



Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Table 7.4.2 Out of band radiated emissions test results

TEST DISTANCE:	0.05 - 3 m
EUT POSITION:	Typical (Vertical)
MODULATION:	QPSK
CHANNEL BANDWIDTH:	2160 MHz
TRANSMITTER OUTPUT POWER:	Maximum
INVESTIGATED FREQUENCY RANGE:	40 – 200 GHz
RESOLUTION BANDWIDTH:	1000 kHz
VIDEO BANDWIDTH:	≥ Resolution bandwidth
TEST ANTENNA TYPE:	Standard Gain Horn 24dB (40-60 GHz) Standard Gain Horn 24dB (50-75 GHz) Standard Gain Horn 24dB (75-110 GHz) Standard Gain Horn 24dB (90-140 GHz) Standard Gain Horn 24dB (140-220 GHz)

Frequency, MHz	**Antenna**		**Azimuth, degrees***	**Peak field strength(VBW=3 MHz)**			**Average field strength(VBW=1 kHz)**			**Verdict**
	Polariz.	**Height, m**		**Measured, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB****	**Measured, dB(μV/m)**	**Limit, dB(μV/m)**	**Margin, dB****	
Low carrier frequency										
No emissions were found										Pass
High carrier frequency										
No emissions were found										Pass

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

Reference numbers of test equipment used

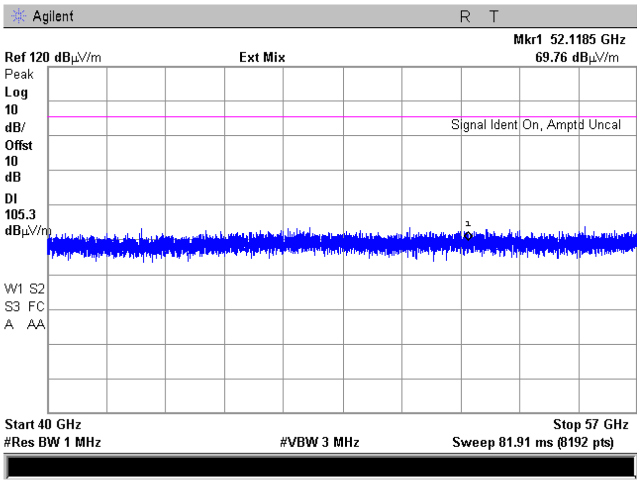
HL 0747	HL 0748	HL 0770	HL 0771	HL 0772	HL 1295	HL 1299	HL 1303
HL 1304	HL 1306	HL 1312	HL 2909	HL 3235	HL 3290	HL 3291	HL 3294
HL 3297	HL 3305	HL 3329	HL 3433	HL 3434	HL 3536	HL 3901	HL 4023

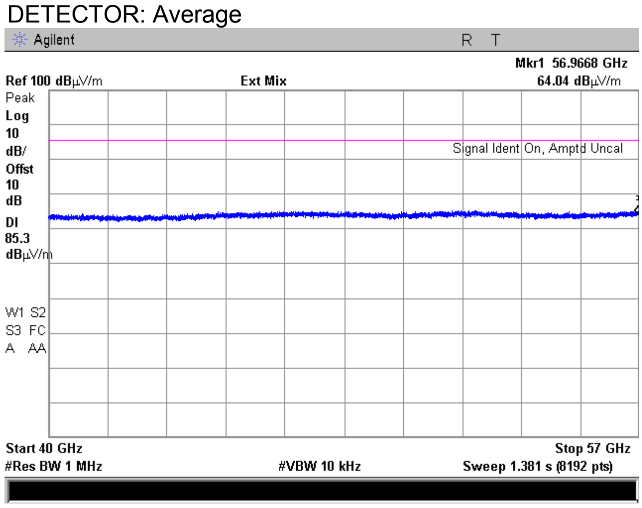
Full description is given in Appendix A.

Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.4.1 Radiated emission measurements from from 40 to 57 GHz at the low frequency

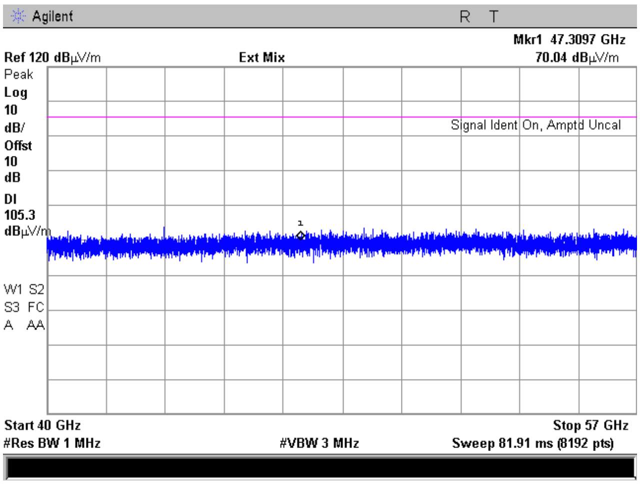
TEST SITE:	OATS
TEST DISTANCE:	3 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

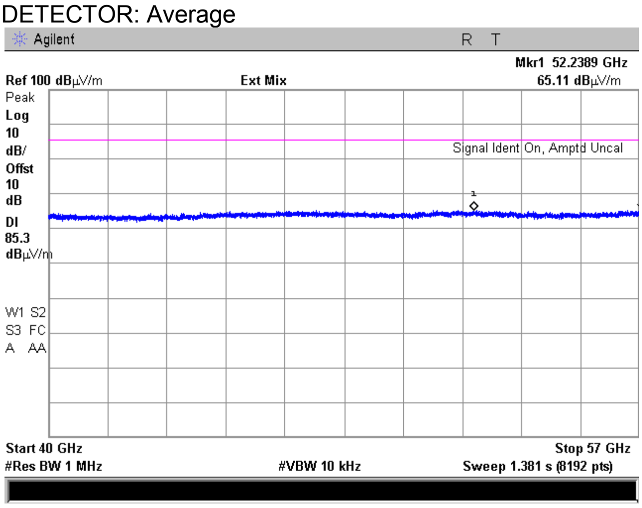




Plot 7.4.2 Radiated emission measurements from 40 to 57 GHz at the high frequency

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



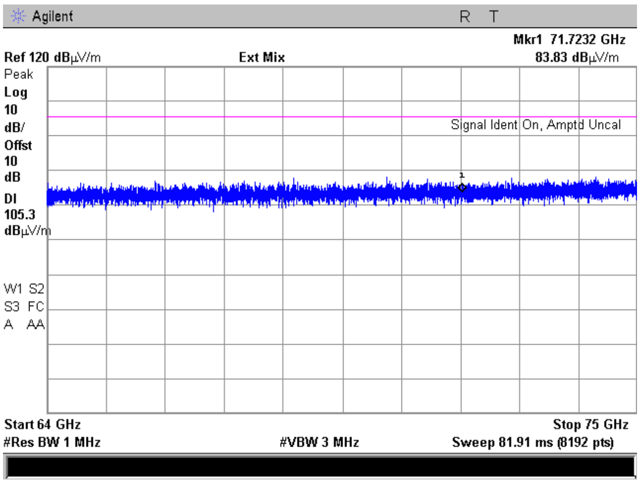


Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

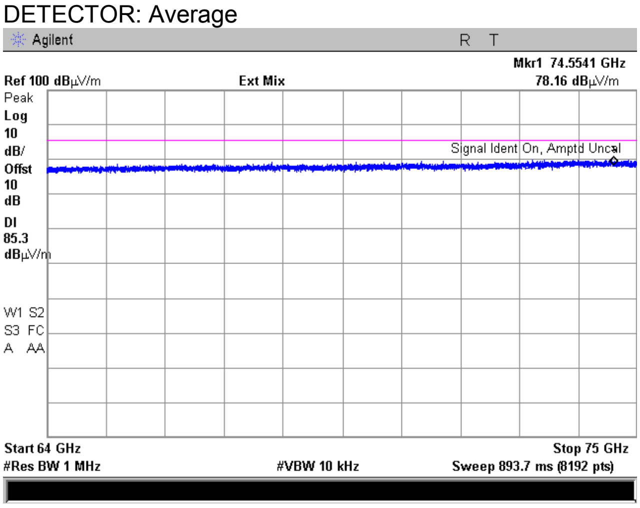
Plot 7.4.3 Radiated emission measurements from 64 to 75 GHz at the low frequency

TEST SITE: Semi Anechoic Chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal

DETECTOR: Peak



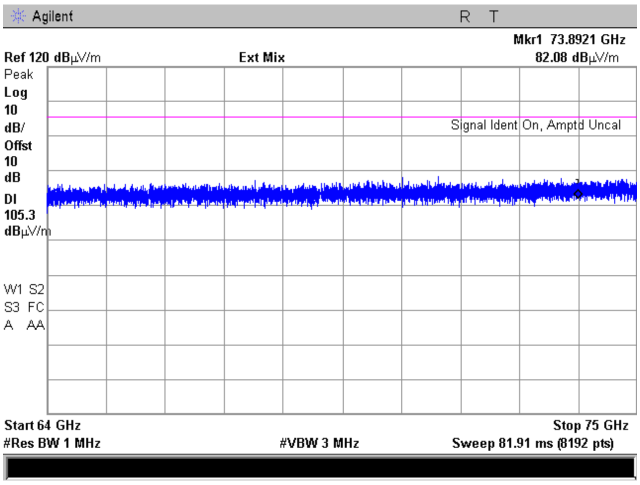
DETECTOR: Average



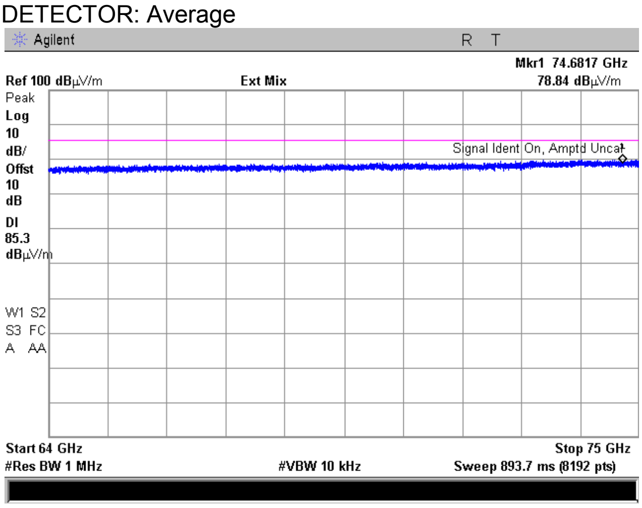
Plot 7.4.4 Radiated emission measurements from 64 to 75 GHz at the high frequency

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

DETECTOR: Peak



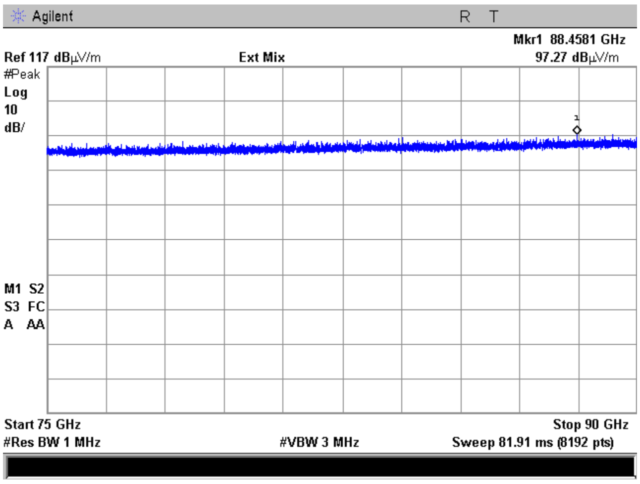
DETECTOR: Average

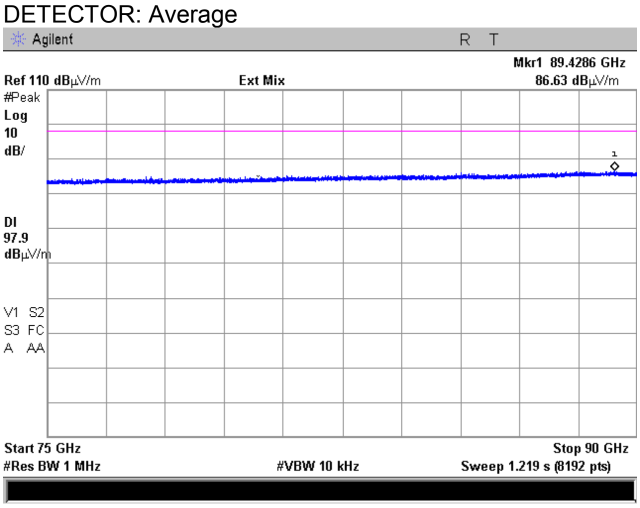


Test specification:	Section 15.255(c)(3), Out of band radiated emissions above 40 GHz		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	Verdict:	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	Air Pressure: 1011 hPa	Relative Humidity: 51%	Power Supply: 48 VDC
Remarks:			

Plot 7.4.5 Radiated emission measurements from 75 to 90 GHz at the low frequency

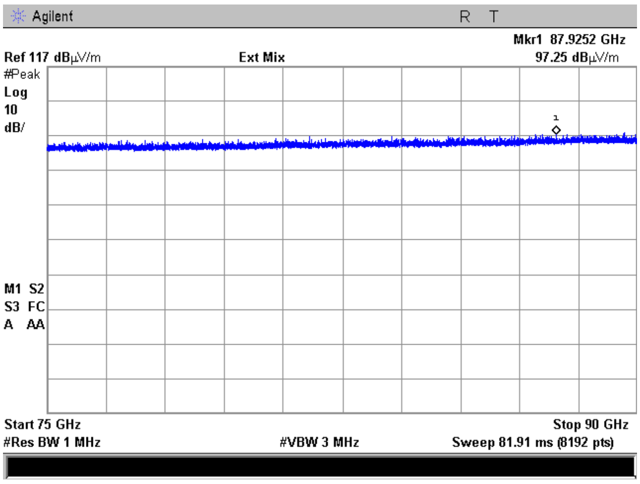
TEST SITE:	OATS
TEST DISTANCE:	0.7 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

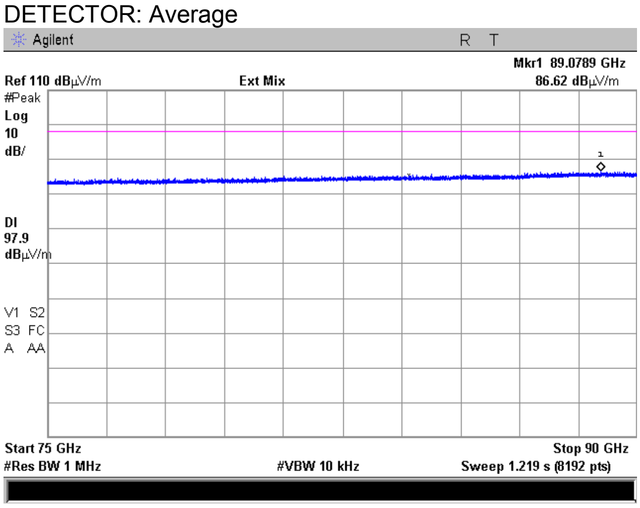




Plot 7.4.6 Radiated emission measurements from 75 to 90 GHz at the high frequency

TEST SITE:	OATS
TEST DISTANCE:	0.7 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

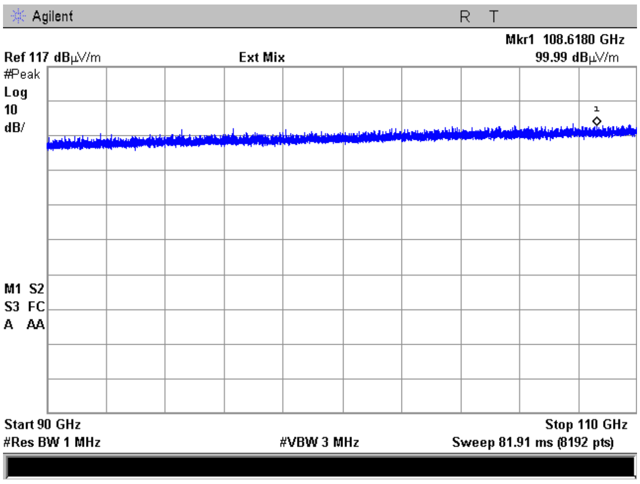


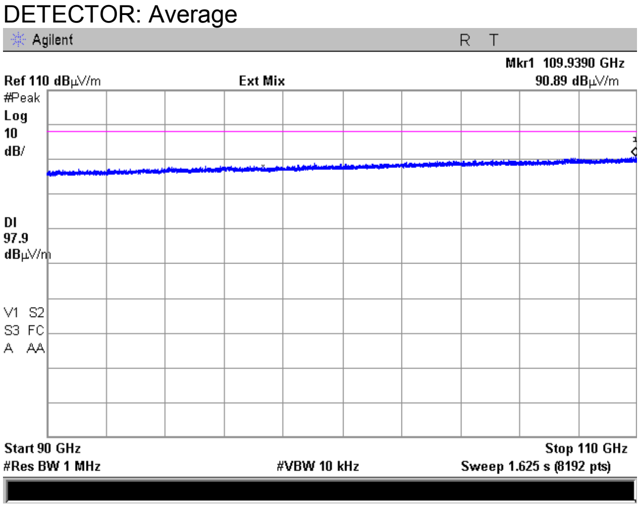


Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.4.7 Radiated emission measurements from 90 to 110 GHz at the low frequency

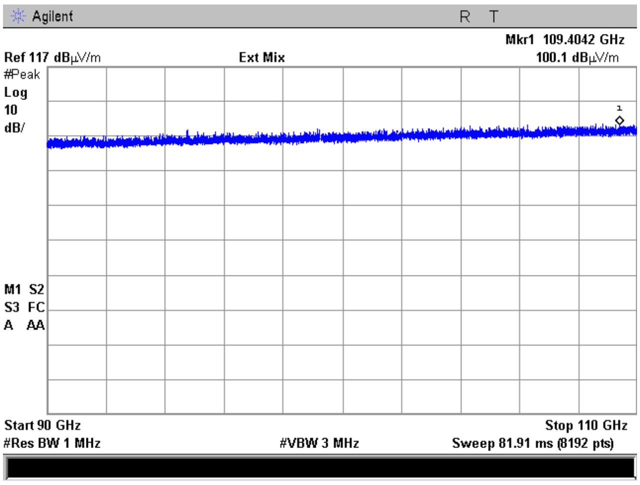
TEST SITE:	OATS
TEST DISTANCE:	0.7 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

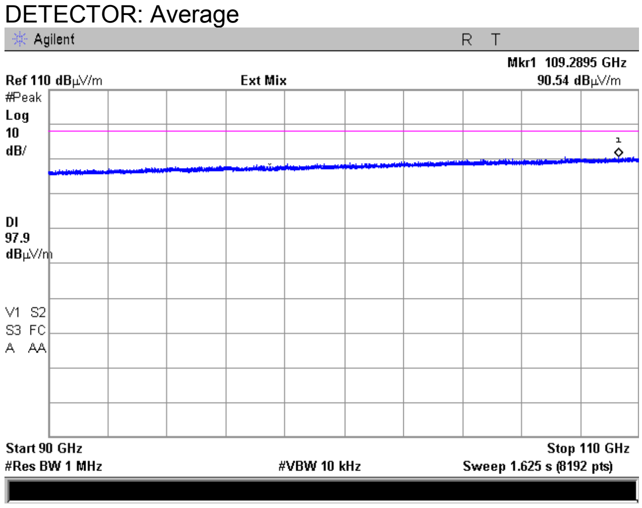




Plot 7.4.8 Radiated emission measurements from 90 to 110 GHz at the high frequency

TEST SITE:	OATS
TEST DISTANCE:	0.7 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

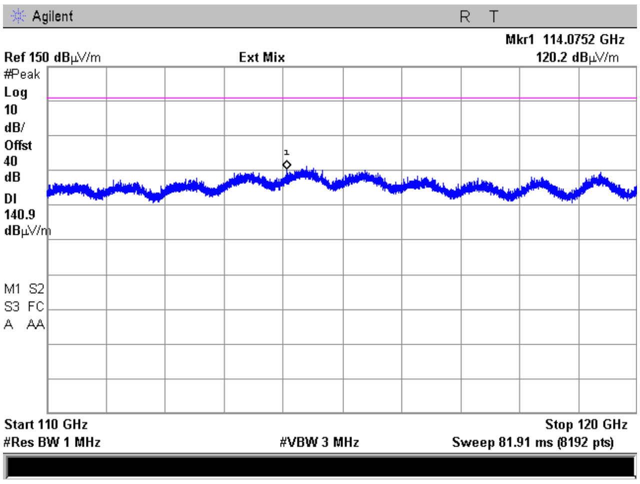


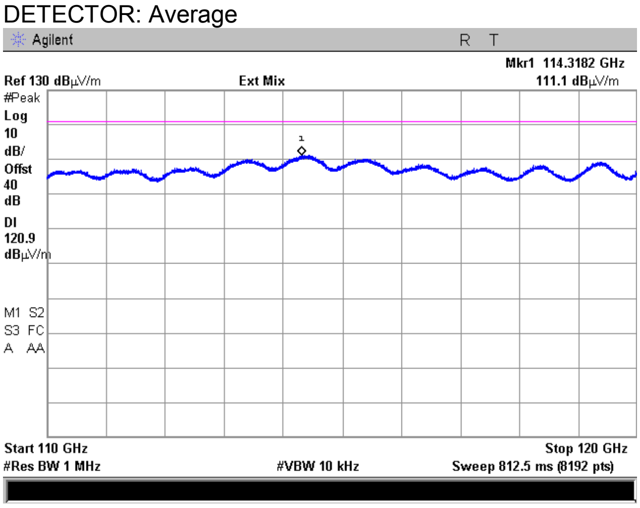


Test specification:	Section 15.255(c)(3), Out of band radiated emissions above 40 GHz		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	Verdict:	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	Air Pressure: 1011 hPa	Relative Humidity: 51%	Power Supply: 48 VDC
Remarks:			

Plot 7.4.9 Radiated emission measurements from 110 to 120 GHz at the low frequency

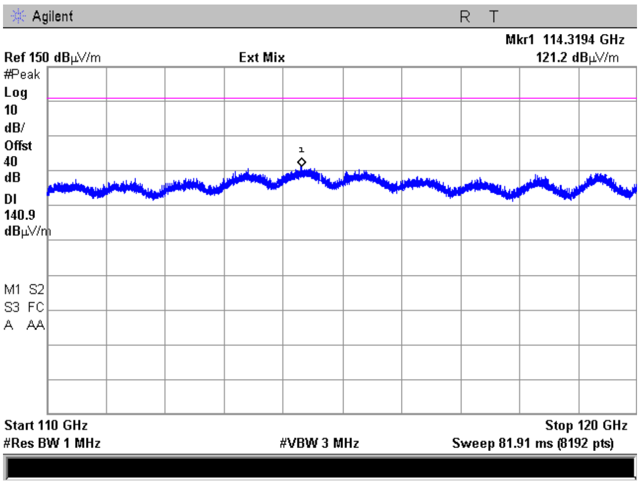
TEST SITE:	OATS
TEST DISTANCE:	0.05 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

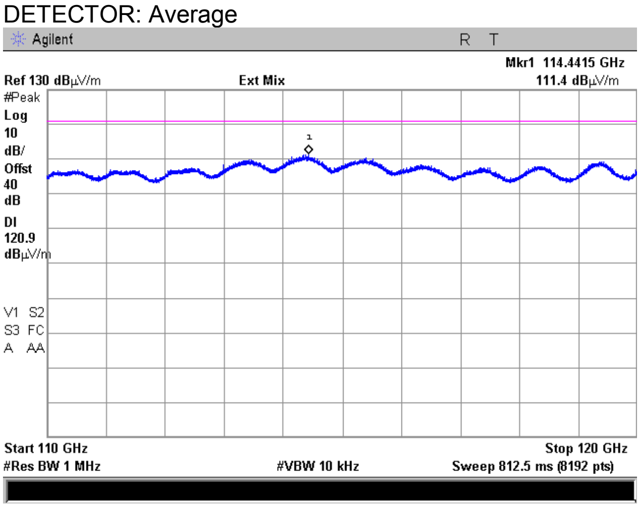




Plot 7.4.10 Radiated emission measurements from 110 to 120 GHz at the high frequency

TEST SITE:	OATS
TEST DISTANCE:	0.05 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

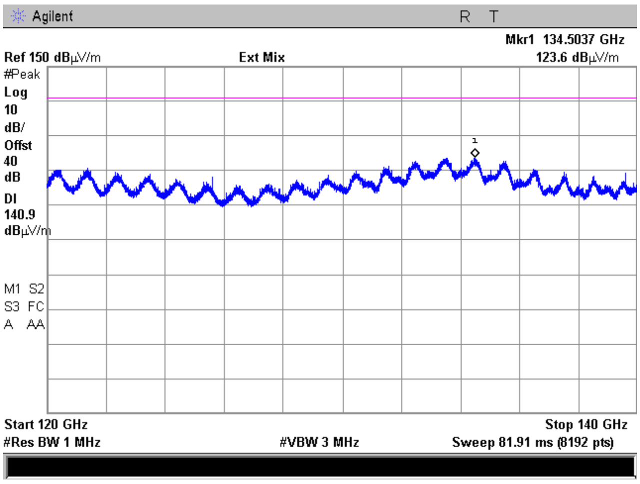


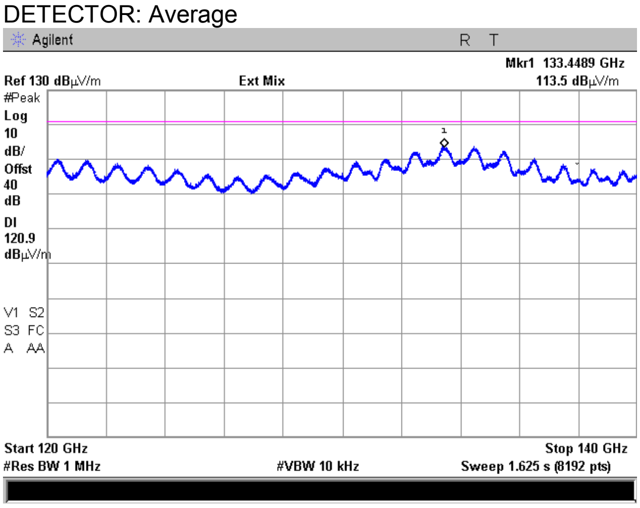


Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.4.11 Radiated emission measurements from 120 to 140 GHz at the low frequency

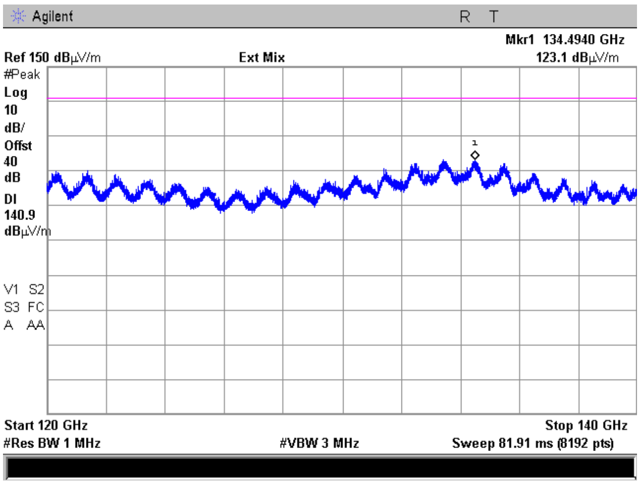
TEST SITE:	OATS
TEST DISTANCE:	0.05 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

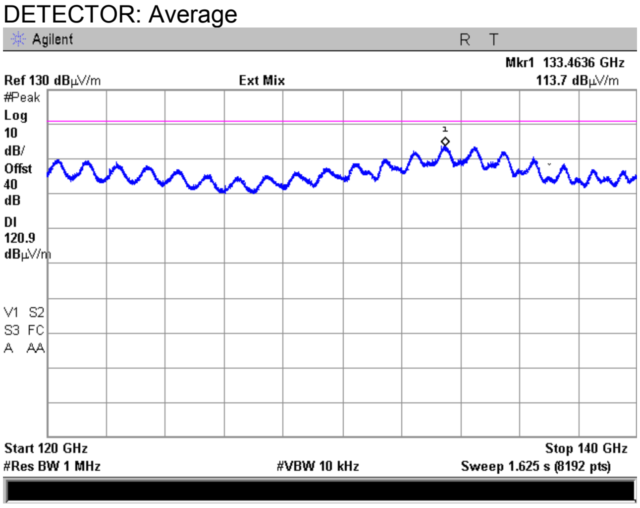




Plot 7.4.12 Radiated emission measurements from 120 to 140 GHz at the high frequency

TEST SITE:	OATS
TEST DISTANCE:	0.05 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average



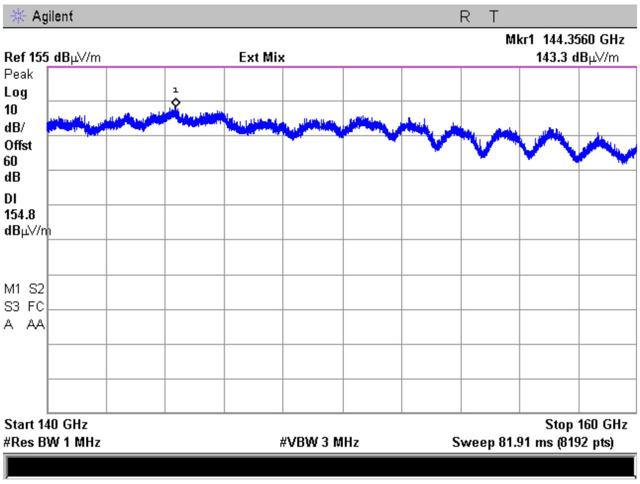


Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

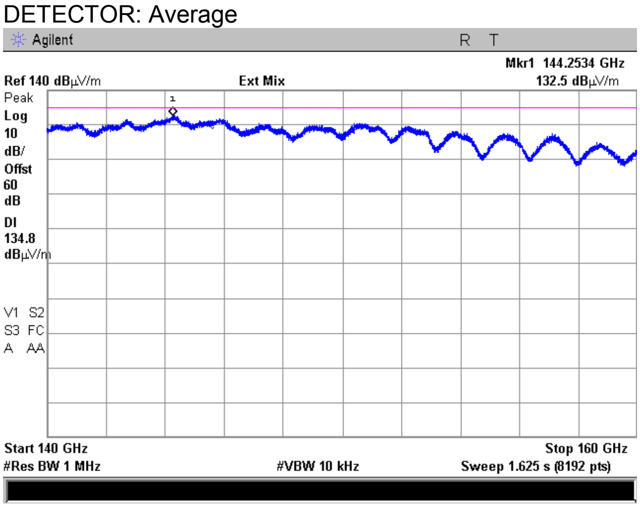
Plot 7.4.13 Radiated emission measurements from 140 to 160 GHz at the low frequency

TEST SITE: OATS
TEST DISTANCE: 0.01 m
ANTENNA POLARIZATION: Vertical and Horizontal

DETECTOR: Peak



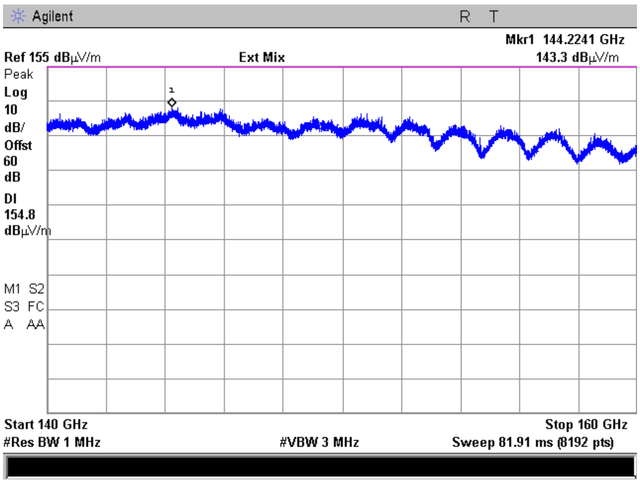
DETECTOR: Average



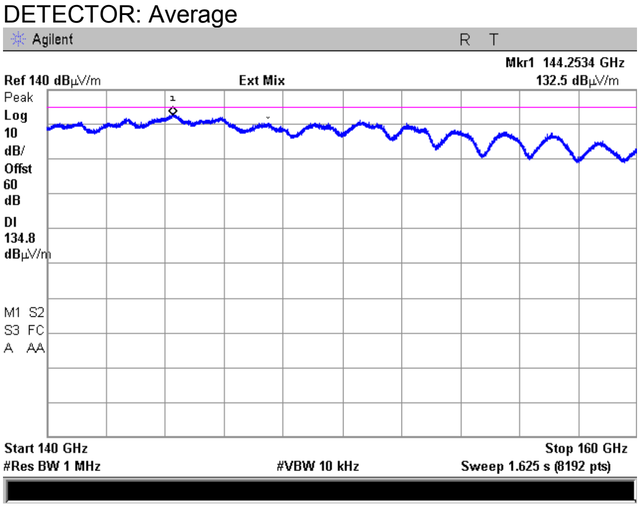
Plot 7.4.14 Radiated emission measurements from 140 to 160 GHz at the high frequency

TEST SITE: OATS
TEST DISTANCE: 0.01 m
ANTENNA POLARIZATION: Vertical and Horizontal

DETECTOR: Peak



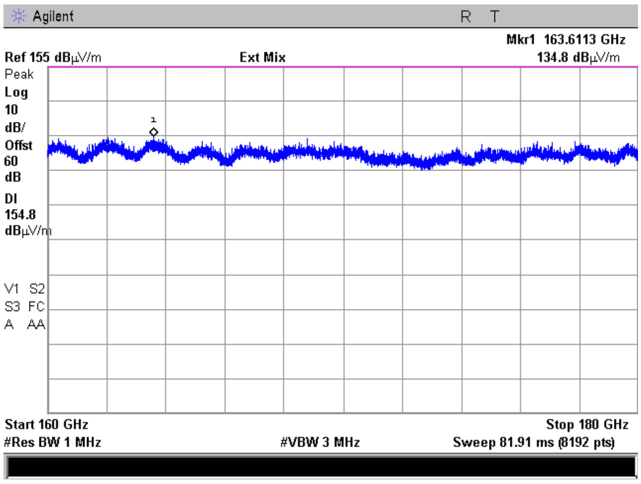
DETECTOR: Average

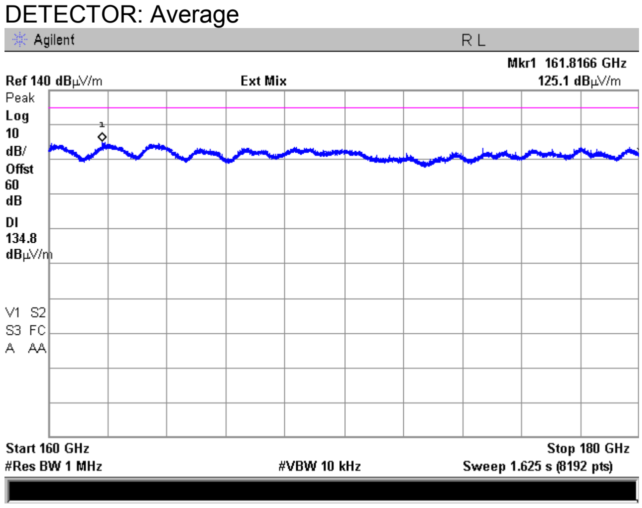


Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22°C	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.4.15 Radiated emission measurements from 160 to 180 GHz at the low frequency

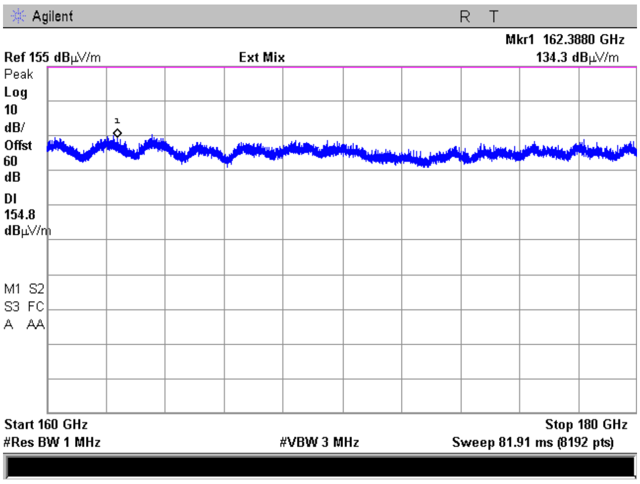
TEST SITE:	OATS
TEST DISTANCE:	0.01 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

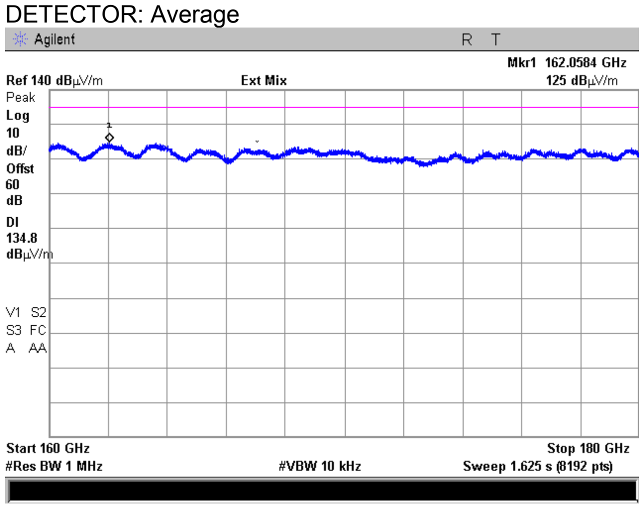




Plot 7.4.16 Radiated emission measurements from 160 to 180 GHz at the high frequency

TEST SITE:	OATS
TEST DISTANCE:	0.01 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

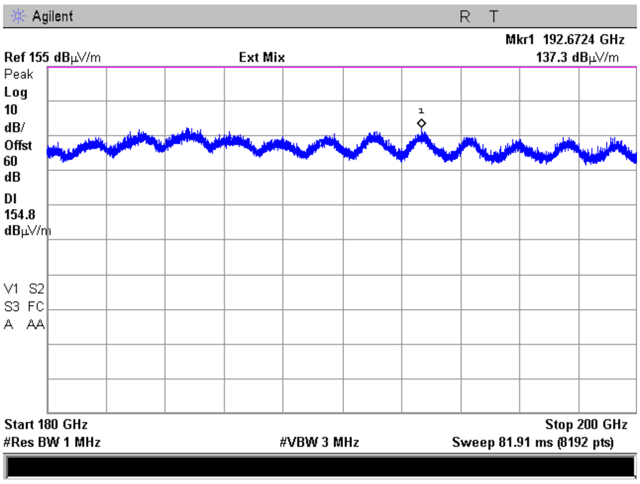


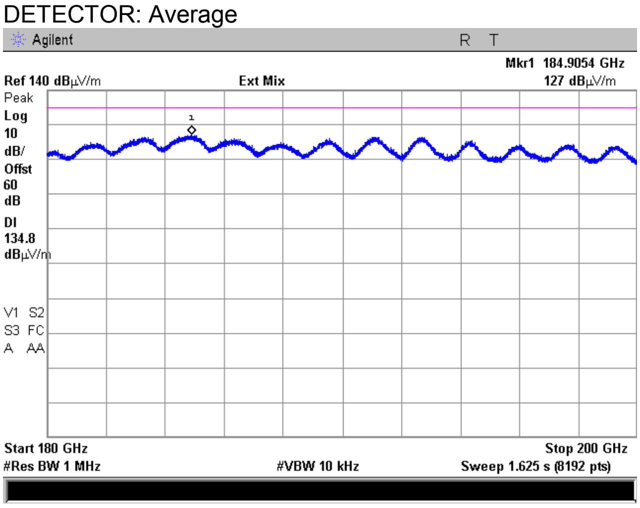


Test specification:	**Section 15.255(c)(3), Out of band radiated emissions above 40 GHz**		
Test procedure:	ANSI C63.10, Sections 9.9, 9.12		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/20/2016-12/21/2016		
Temperature: 22ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 51%	**Power Supply:** 48 VDC
Remarks:			

Plot 7.4.17 Radiated emission measurements from 180 to 200 GHz at the low frequency

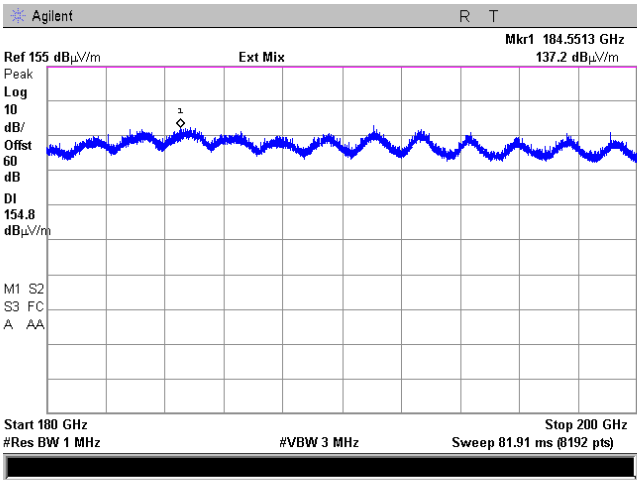
TEST SITE:	OATS
TEST DISTANCE:	0.03 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average

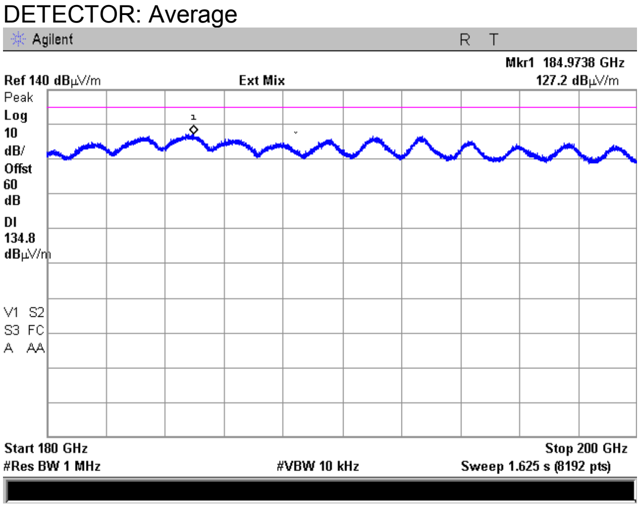




Plot 7.4.18 Radiated emission measurements from 180 to 200 GHz at the high frequency

TEST SITE:	OATS
TEST DISTANCE:	0.01 m
ANTENNA POLARIZATION:	Vertical and Horizontal
DETECTOR: Peak	DETECTOR: Average





Test specification:	**Section 15.255(f), Frequency tolerance**		
Test procedure:	47 CFR, Section 2.1055; ANSI C63.10, Section 9.14		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/08/2016		
Temperature: 24.3ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

7.5 Frequency stability test

7.5.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement
60480	NA
62640	

7.5.2 Test procedure

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 power was turned off. Temperature within test chamber was set to +30˚C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.

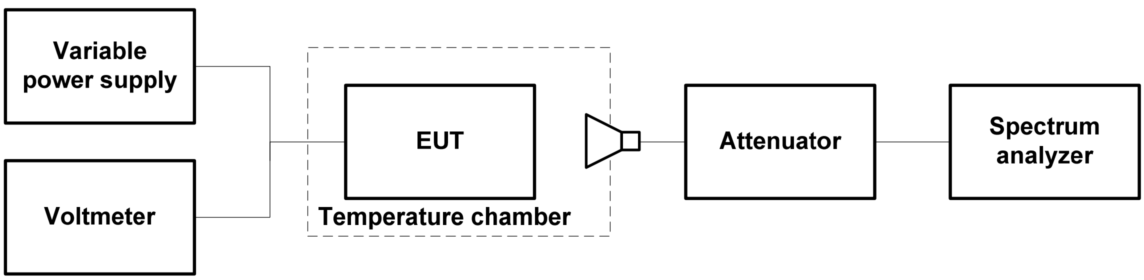
7.5.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

7.5.2.4 The above procedure was repeated at 0˚C and at the lowest test temperature.

7.5.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.

7.5.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.5.2.

Figure 7.5.1 Frequency stability test setup



Test specification:	**Section 15.255(f), Frequency tolerance**		
Test procedure:	47 CFR, Section 2.1055; ANSI C63.10, Section 9.14		
Test mode:	Compliance	**Verdict:**	PASS
Date:	12/08/2016		
Temperature: 24.3ºC	**Air Pressure:** 1012 hPa	**Relative Humidity:** 42%	**Power Supply:** 48 VDC
Remarks:			

Table 7.5.2 Frequency stability test results

OPERATING FREQUENCY:	57000 – 64000 MHz
NOMINAL POWER VOLTAGE:	48 V output of AC/DC adapter (V input=120 VAC)
TEMPERATURE STABILIZATION PERIOD:	20 min
POWER DURING TEMPERATURE TRANSITION:	Off
SPECTRUM ANALYZER MODE:	Counter
RESOLUTION BANDWIDTH:	3 kHz
VIDEO BANDWIDTH:	10 kHz
MODULATION:	Unmodulated

T, ºC	Voltage, V	Frequency, MHz							Max frequency drift, kHz	
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Posit	Negative
Low frequency										
-20	nominal	60578.3325	60578.3200	60578.3575	60578.3125	60578.3325	60578.3325	60578.3325	0	-1570.00
-10	nominal	60578.2900	NA	NA	NA	NA	NA	60578.2950	0	-1592.50
0	nominal	60578.1700	60578.1700	60578.1575	60578.1725	60578.1750	60578.1725	60578.1700	0	-1725.00
10	nominal	60579.9875	NA	NA	NA	NA	NA	60580.0025	120.00	0
20	+15%(126.5V)	60579.9000	NA	NA	NA	NA	NA	60579.9050	22.50	0
20	nominal	60579.8825	NA	NA	NA	NA	NA	60579.9250	42.50	0
20	-15%(93.5V)	60579.8875	NA	NA	NA	NA	NA	60579.9000	17.50	0
30	nominal	60579.8225	60579.8175	60579.8200	60579.8150	60579.8100	60579.8100	60579.8050	0	-77.50
40	nominal	60579.7450	NA	NA	NA	NA	NA	60579.7425	0	-140.00
50	nominal	60579.8000	NA	NA	NA	NA	NA	60579.8025	0	-82.50
High frequency										
-20	nominal	62740.3450	62740.3475	62740.3325	62740.3450	62740.3450	62740.3475	62740.3450	455.00	0
-10	nominal	62740.3000	NA	NA	NA	NA	NA	62740.3075	415.00	0
0	nominal	62740.1700	62740.1725	62740.1725	62740.1720	62740.1750	62740.1775	62740.1800	287.50	0
10	nominal	62739.9825	NA	NA	NA	NA	NA	62740.0075	115.00	0
20	+15%(126.5V)	62739.8912	NA	NA	NA	NA	NA	62739.9015	9.00	-1.30
20	nominal	62739.8925	NA	NA	NA	NA	NA	62739.9002	7.70	0
20	-15%(93.5V)	62739.8912	NA	NA	NA	NA	NA	62739.9005	8.00	-1.30
30	nominal	62739.7975	62739.7950	62739.7975	62739.7925	62739.7925	62739.7900	62739.7925	0	-102.50
40	nominal	62739.7350	NA	NA	NA	NA	NA	62739.7325	0	-160.00
50	nominal	62739.7900	NA	NA	NA	NA	NA	62739.7975	0	-102.50

* - Reference frequency

Reference numbers of test equipment used

HL 1303	HL 2358	HL 2909	HL 3291	HL 3295	HL 3305	HL 3433	HL 3434

Full description is given in Appendix A.

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-16	27-Oct-17
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-May-16	10-May-17
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	Hewlett Packard	83640B	3614A002 66	10-May-16	10-May-17
0747	Mixer, Millimeter Wave Harmonic 90 - 140 GHZ	Oleson Microwave Labs	M08HW	F80429-1	30-Nov-16	30-Nov-17
0748	Mixer Millimeter Wave Harmonic 60 - 90 GHz	Oleson Microwave Labs	M12 HW	E 804 29-1	30-Nov-16	30-Nov-17
0770	Antenna Standard Gain Horn, 40-60 GHz WR-19, U-band, 24 dB mid-band gain	Quinstar Technology	QWH-1900-AA	118	17-Jul-16	17-Jul-17
0771	Antenna Standard Gain Horn, 60-90 GHz, WR-12, 24 dB mid-band gain	Quinstar Technology	QWH-1200-AA	111	14-Jul-16	14-Jul-17
0772	Antenna Standard Gain Horn, 75-110 GHz, WR-10, 24 dB mid-band gain	Quinstar Technology	QWH-0800-AA	110	14-Jul-16	14-Jul-17
1295	Adapter 35WR28Kf, 26.5-40 GHz	Wiltron	35WR28K F	1295	17-Sep-15	17-Sep-17
1299	Transition waveguide ET28S -19R	Custom Microwave	ET28S - 19R	1299	30-Jul-15	30-Jul-18
1303	Transition waveguide ET28S -12R	Custom Microwave	ET28S - 12R	S0951	30-Jul-15	30-Jul-18
1304	Transition waveguide ET28S - 8R	Custom Microwave	ET28S - 8R	1304	30-Jul-15	30-Jul-18
1306	Transition waveguide ET28S - 5R	Custom Microwave	ET28S - 5R	1306	30-Jul-15	30-Jul-18
1312	Mixer Millimeter Wave Harmonic 140-220 GHz	Oleson Microwave Labs	M05HWD	G91112-1	30-Nov-16	30-Nov-17
2358	Power Supply, 2 X 0-36VDC / 5A, 5VDC / 5A	Horizon Electronics	DHR3655 D	767469	02-Jun-16	02-Jun-17
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	21-Feb-16	21-Feb-17
3235	Harmonic mixer 40 to 60 GHz	Agilent Technologies	11970U	MY300301 82	16-Aug-16	16-Aug-19
3290	Attenuator, direct reading, 40 to 60 GHz, 0.4 W	Quinstar Technology	QAD-U00000	10381008	30-Nov-16	30-Nov-17
3291	Attenuator, direct reading, 60 to 90 GHz, 0.2 W	Quinstar Technology	QAD-E00000	10381009	30-Nov-16	30-Nov-17
3293	Frequency multiplier, input 20-30 GHz, output 60-90 GHz	Quinstar Technology	QPM-75003E	10381003	30-Nov-16	30-Nov-17
3294	Tapered transition, WR-28, UG-599 to WR-15, UG-385 (26.5-40 GHz to 50-75 GHz)	Quinstar Technology	QWP-AV0000	10381004	30-Jul-15	30-Jul-18
3295	Tapered transition, WR-28, UG-599 to WR-15, UG-385 (26.5-40 GHz to 50-75 GHz)	Quinstar Technology	QWP-AV0000	10381005	30-Jul-15	30-Jul-18
3297	Tapered, WR-28, UG-599 to WR-10, UG-387 (26.5-40 GHz to 75-100 GHz)	Quinstar Technology	QWP-AW0000	10381007	30-Jul-15	30-Jul-18
3305	Harmonic mixer 50 to 75 GHz	Agilent Technologies	11970V	MY300301 49	16-Aug-16	16-Aug-19

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
3329	Antenna Standard Gain Horn, 140-220 GHz, WR-5, 24 dB mid-band gain	Quinstar Technology	NA	3329	20-Jul-16	20-Jul-17
3333	Oscilloscope, 1 GHz, 4 channels	LeCroy Corporation	LC584AL	10239	18-Jan-17	18-Jan-18
3433	Test Cable , DC-18 GHz, 1.5 m, SMA - SMA	Mini-Circuits	CBL-5FT-SMSM+	25679	20-Mar-16	20-Mar-17
3434	Test Cable , DC-18 GHz, 1.5 m, SMA - SMA	Mini-Circuits	CBL-5FT-SMSM+	25683	20-Mar-16	20-Mar-17
3536	Antenna Standard Gain Horn, 90-140 GHz, WR-8, 24 dB mid-band gain	Quinstar Technology	QWH-FPRR00	11159004001	13-Jun-16	13-Jun-17
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	03-May-16	03-May-17
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	15-Feb-16	15-Feb-17
4023	Diplexer for use OML mixers with Agilent spectrum analyzer	Oleson Microwave Labs	DPL.26	NA	30-Nov-16	30-Nov-17
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101003	15-Mar-16	15-Mar-17
4856	Amplifier, solid state, 18 GHz to 40 GHz, 20 dBm output power	Quinstar Technology	QGW-18402023-JO	16779001001	14-Apr-16	14-Apr-17
4956	Active horn antenna, 18 to 40 GHz	Com-Power Corporation	AHA-840	105004	17-Jan-17	17-Jan-18
5101	RF cable, 18 GHz, 6 m, N-type	Huber-Suhner	SF106A/11N/11N/6000MM	500847/6A	26-Jul-16	26-Jul-17
5111	RF cable, 40 GHz, 5.5 m, K-type	Huber-Suhner	SF102EA/11SK/11SK/5500MM	502493/2EA	26-Jul-16	26-Jul-17

8.1 Test equipment and ancillaries used for tests

HL No.	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
NA	Signal Analyzer	Keysight	MXA N9020B	MY56080134	21-Apr-16	21-Apr-18
NA	Waveguide Harmonic Mixer	Keysight	M1971E OPT 003	MY55270136	29-Nov-16	29-Nov-17
NA	RF detector	Pacific	VDH	NA	NA	NA
NA	PM-Sensor	Keysight	E8486A	MY55050012	15-Nov-16	15-Nov-17
NA	Power meter	Keysight	E4419B	GB39290617	10-Mar-16	11-Mar-17

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Frequency error	± 0.56 ppm
Carrier power conducted	± 1.7 dB
Spurious emissions conducted at RF antenna connector	30 MHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 12.75 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
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	 Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

Hermon Laboratories is accredited by A2LA for calibration according to present requirements of ISO/IEC 17025 and NCSL Z540-1. The accreditation is granted to perform calibration of parameters that are listed in the Scope of Hermon Laboratories Accreditation.
Hermon Laboratories calibrates its reference and transfer standards by calibration laboratories accredited to ISO/IEC 17025 by a mutually recognized Accreditation Body or by a recognized national metrology institute. All reference and transfer standards used in the calibration system are traceable to national or international standards.
In-house calibration of all test and measurement equipment is performed on a regular basis according to Hermon Laboratories calibration procedures, manufacturer calibration/verification procedures or procedures defined in the relevant standards. The Hermon Laboratories test and measurement equipment is calibrated within the tolerances specified by the manufacturers and/or by the relevant standards.

10 APPENDIX C Test laboratory description

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

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11 APPENDIX D Specification references

47CFR part 15: 2015	Radio Frequency Devices.
FCC 47CFR part 2: 2015	Frequency allocations and radio treaty matters; general rules and regulations
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.
ANSI C63.10: 2013	American National Standard of Procedures for Compliance Testing of Unlicemsed Wireless Devices

12 APPENDIX E Test equipment correction factors

Antenna Factor
Active Loop Antenna
EMC Test Systems, model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic Antenna Factor, dB(S/m)	Electric Antenna Factor, dB(1/m)
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	9.7
0.750	-41.9	9.6
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.1
4.000	-41.4	10.1
5.000	-41.5	10.0
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(S/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μA/m).
Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

Antenna factor
Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.112, HL 0768, 0769, 0770, 0771, 0772

Frequency min, GHz	Frequency max, GHz	Antenna factor, dB(1/m)
18.000	26.500	32.01
26.500	40.000	35.48
40.000	60.000	39.03
60.000	90.000	42.55
90.000	140.000	46.23
140.000	220.000	50.11

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

Antenna factor, HL 4956

COM-POWER CORPORATION

Active Horn Antenna Factor Calibration

18 GHz to 40 GHz

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

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

Calibration per ANSI C63.5: 2006

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

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

Cable loss
Test Cable, Mini-Circuits, CBL-5FT-SMSM+, SMA-SMA, 18 GHz, 1.5 m
Mini-Circuits, HL 3433

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10.0	0.06	9000	2.01
100	0.17	9500	2.06
500	0.41	10000	2.05
1000	0.58	10500	2.18
1500	0.72	11000	2.26
2000	0.86	11500	2.28
2500	0.96	12000	2.43
3000	1.04	12500	2.53
3500	1.13	13000	2.52
4000	1.23	13500	2.56
4500	1.31	14000	2.60
5000	1.41	14500	2.59
5500	1.49	15000	2.67
6000	1.55	15500	2.76
6500	1.63	16000	2.86
7000	1.71	16500	2.91
7500	1.78	17000	2.95
8000	1.86	17500	3.02
8500	1.92	18000	3.07

Cable loss
Test Cable, Mini-Circuits, CBL-5FT-SMSM+, SMA-SMA, 18 GHz, 1.5 m, S/N 25683
Mini-Circuits, HL 3434

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10.0	0.06	9000	1.96
100	0.16	9500	2.01
500	0.40	10000	2.01
1000	0.57	10500	2.14
1500	0.72	11000	2.21
2000	0.85	11500	2.24
2500	0.95	12000	2.36
3000	1.03	12500	2.47
3500	1.11	13000	2.46
4000	1.21	13500	2.50
4500	1.29	14000	2.53
5000	1.39	14500	2.53
5500	1.46	15000	2.62
6000	1.52	15500	2.70
6500	1.60	16000	2.80
7000	1.68	16500	2.86
7500	1.75	17000	2.88
8000	1.83	17500	2.94
8500	1.88	18000	3.00

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

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

Cable loss
RF Cable, Huber-Suhner, 18 GHz, 6 m, N- type,
SF106A/11N/11N/6000MM, S/N 500847/6A
HL 5101

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

Cable loss
RF Cable, Huber-Suhner, 40 GHz, 5.5 m, K type,
SF102EA/11SK/11SK/5500MM, S/N 502493/2EA
HL 5111

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
100	0.68	20500	10.17
200	0.97	21000	10.30
300	1.18	21500	10.43
500	1.52	22000	10.58
1000	2.14	22500	10.73
1500	2.62	23000	10.85
2000	3.03	23500	10.98
2500	3.39	24000	11.11
3000	3.72	24500	11.20
3500	4.03	25000	11.32
4000	4.32	25500	11.47
4500	4.59	26000	11.59
5000	4.84	26500	11.72
5500	5.09	27000	11.83
6000	5.32	27500	11.94
6500	5.55	28000	12.04
7000	5.77	28500	12.16
7500	5.99	29000	12.28
8000	6.19	29500	12.40
8500	6.40	30000	12.50
9000	6.60	30500	12.59
9500	6.79	31000	12.68
10000	6.98	31500	12.80
10500	7.16	32000	12.94
11000	7.34	32500	13.09
11500	7.51	33000	13.23
12000	7.68	33500	13.32
12500	7.84	34000	13.44
13000	8.00	34500	13.54
13500	8.15	35000	13.68
14000	8.31	35500	13.81
14500	8.46	36000	13.90
15000	8.62	36500	13.99
15500	8.76	37000	14.12
16000	8.91	37500	14.22
16500	9.06	38000	14.33
17000	9.21	38500	14.47
17500	9.35	39000	14.54
18000	9.49	39500	14.62
18500	9.62	40000	14.75
19000	9.76		
19500	9.90		
20000	10.05		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
CBW	channel bandwidth
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
EBW	emission bandwidth
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
QP	quasi-peak
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

END OF DOCUMENT