

TEST REPORT

ACCORDING TO: FCC part 15 subpart E and subpart B

FOR:

Airspan Networks (Israel) Ltd.

Base station

Model: MicroMax 5.6 GHz TDD Int.

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

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Telephone: +972 3977 7444
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E-mail: zlevi@Airspan.com
Contact name: Mr. Zion Levi

2 Equipment under test attributes

Product name: Base station
Product type: Transceiver
Model(s): MicroMax 5.6 GHz TDD Int.
Serial number: 809F6C101188
Software release: 6.0.17.0
Hardware version: C7
Receipt date: 9/4/2007

3 Manufacturer information

Manufacturer name: Airspan Networks (Israel) Ltd.
Address: 1, Harava street, "Unitronics" building, POB 199, Airport City, 70100, Israel
Telephone: +972 3977 7444
Fax: +972 3977 7400
E-Mail: zlevi@Airspan.com
Contact name: Mr. Zion Levi




4 Test details

Project ID: 18175
Location: Hermon Laboratories Ltd. P.O.Box 23, Binyamina 30500, Israel
Test started: 9/4/2007
Test completed: 10/11/2007
Test specification(s): FCC part 15 subpart E and subpart B

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.407(a)(3), Occupied 26 dB bandwidth	Pass
Section 15.407(a)(3), Maximum peak output power	Pass
Section 15.407(a)(3), Peak power spectral density	Pass
Section 15.407(a)(6), Ratio of the peak excursion of the modulation envelope to the peak transmit power	Pass
Section 15.407(b), Unwanted radiated emission	Pass
Section 15.407(b)(6), 15.207, Conducted emission	Pass
Section 15.407(f), RF exposure	Provided in documentation for Application
Section 15.407(g), Frequency stability	Pass
Unintentional emissions	
Section 15.107 Class B, AC power lines conducted emissions	Pass
Section 15.109 Class B, Radiated emissions	Pass
Section 15.111, Spurious emissions at RF antenna connector	Not required

Testing was completed against all relevant requirements of the test standard. 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. A. Lane, test engineer	October 11, 2007	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	October 15, 2007	
Approved by:	Mr. M. Nikishin, EMC and radio group leader	October 16, 2007	

6 EUT description

6.1 General information

The EUT, base station radio, MicroMAX 5.6GHz TDD Int., is part of a WiMAX broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network to give high-speed data access. The MicroMAX's transceiver/receiver (up to 64QAM modulation, data rate up to 37 Mbps) uses OFDM and operates in TDD duplexing mode.

6.2 Ports and lines

Port type	Port description	Connected		Connector type	Qty.	Cable type	Cable length
		From	To				
Signal	48 V DC & Ethernet	EUT	SDA	D-type 15 pin	1	unshielded	4 m
Signal	RS232	EUT	Laptop	D-type 9 pin	1	unshielded	3 m
RF	Antenna	EUT	50 Ohm termination	N-type	1	NA	NA

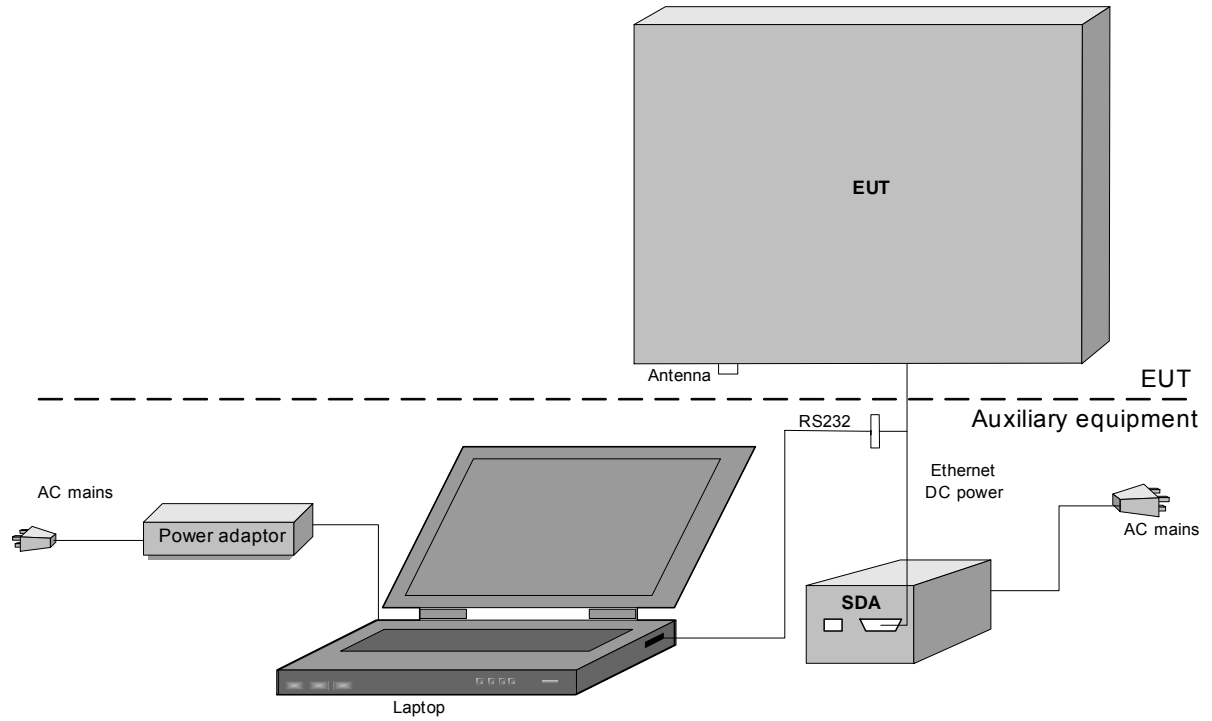
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
SDA	Airspan	SDA-1	045D3C0199
Laptop	Dell	Ppx	48985
Adapter to laptop	Dell	AA20031	93640
Mouse	Microsoft	PS/2	X04-72169

6.4 Changes made in the EUT

No changes were implemented.

6.5 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		5470 - 5725 MHz				
Operating frequency range		5480 – 5717.5 MHz				
RF channel spacing		10 MHz				
Rated output power		At transmitter 50 Ω RF output connector	12.3 dBm			
Is transmitter output power variable?		No				
		V	Yes	continuous variable		
			Yes	V	stepped variable with stepsize	1 dB
					minimum RF power	-30 dBm
	maximum RF power	12.3 dBm				
Antenna connection						
unique coupling	standard connector	V Integral	V with temporary RF connector without temporary RF connector			
Antenna/s technical characteristics						
Type	Manufacturer	Model number	Gain			
Integral	Airspan	NA	14.5 dBi			
Transmitter 99% power bandwidth		10 MHz				
Type of modulation		BPSK, 64QAM				
Type of multiplexing		TDMA				
Modulating test signal (baseband)		WiMAX				
Maximum transmitter duty cycle in normal use		100%				
Transmitter power source						
	Nominal rated voltage		Battery type			
V	DC	Nominal rated voltage	48 VDC from SDA unit powered by 120 VAC			
	AC mains	Nominal rated voltage	Frequency Hz			
Common power source for transmitter and receiver		V	yes no			



Test specification: Section 15.407(a)(3), 26 dB bandwidth			
Test procedure: FCC Public Notice DA 02-2138, Appendix A			
Test mode: Compliance	Verdict: PASS		
Date: 9/24/2007			
Temperature: 26 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 15 subpart E requirements

7.1 Occupied 26 dB bandwidth

7.1.1 General

This test was performed to measure the 26 dB bandwidth of the device.

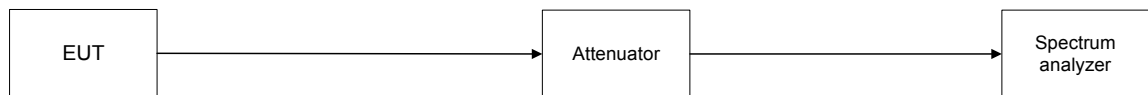
7.1.2 Test procedure

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

7.1.2.2 The EUT was set to transmit modulated carrier at maximum data rate.

7.1.2.3 The measurements were performed in continuous transmission mode of operation for carrier (channel) frequencies at low and high edges and at the middle of the frequency range shown in Table 7.1.1. The transmitter bandwidth was measured with spectrum analyzer as frequency delta between reference points on modulation envelope and provided in Table 7.1.1 and associated plots.

Figure 7.1.1 The 26 dB bandwidth test setup





Test specification: Section 15.407(a)(3), 26 dB bandwidth	
Test procedure: FCC Public Notice DA 02-2138, Appendix A	
Test mode: Compliance	Verdict: PASS
Date: 9/24/2007	
Temperature: 26 °C	Air Pressure: 1010 hPa
Relative Humidity: 46 %	
Power Supply: 120 VAC	
Remarks:	

Table 7.1.1 The 26 dB bandwidth test results

ASSIGNED FREQUENCY RANGE: 5470- 5725 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: ≥ RBW
MODULATION SIGNAL: Digital

Carrier Frequency, GHz	26 dB bandwidth, MHz
Modulation: BPSK	
5480.0	9.77
5600.0	9.90
5717.5	9.97
Modulation: 64QAM	
5480.0	9.87
5600.0	9.93
5717.5	9.83

Reference numbers of test equipment used

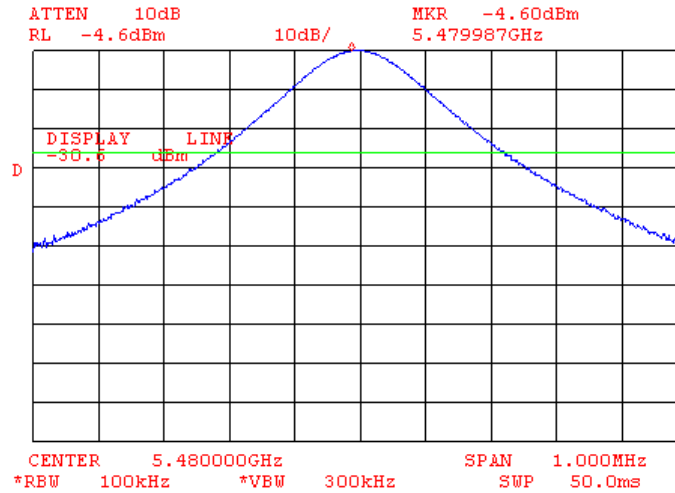
HL 1424	HL 2524	HL 2952						
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Full description is given in Appendix A.

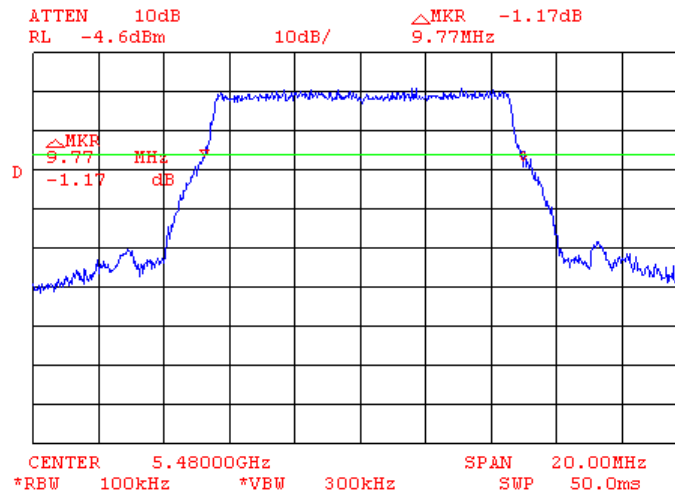


Test specification:	Section 15.407(a)(3), 26 dB bandwidth		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/24/2007		
Temperature: 26 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.1 Reference power level measurement at the low frequency carrier



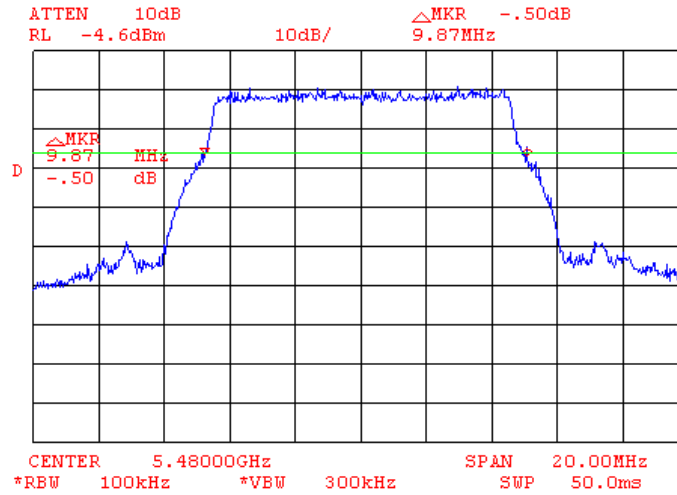
Plot 7.1.2 The 26 dB bandwidth test result at low frequency carrier, BPSK



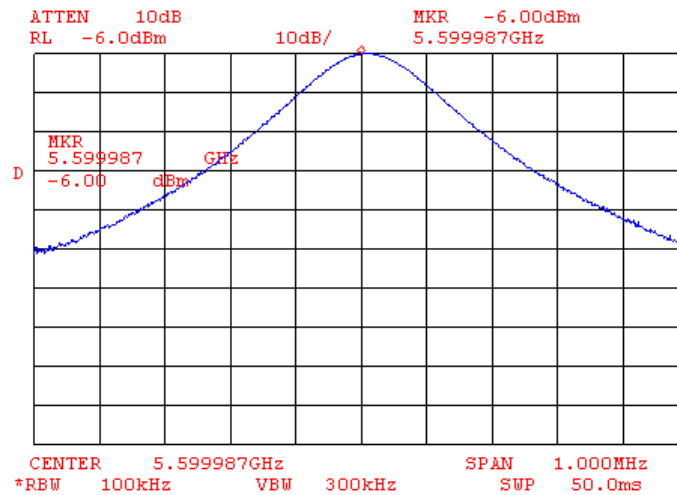


Test specification:	Section 15.407(a)(3), 26 dB bandwidth		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/24/2007		
Temperature: 26 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.3 The 26 dB bandwidth test result at low frequency carrier, 64QAM



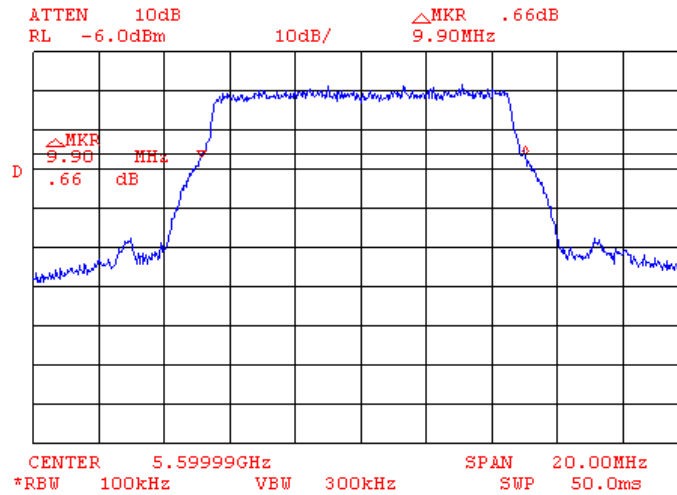
Plot 7.1.4 Reference power level measurement at mid frequency carrier



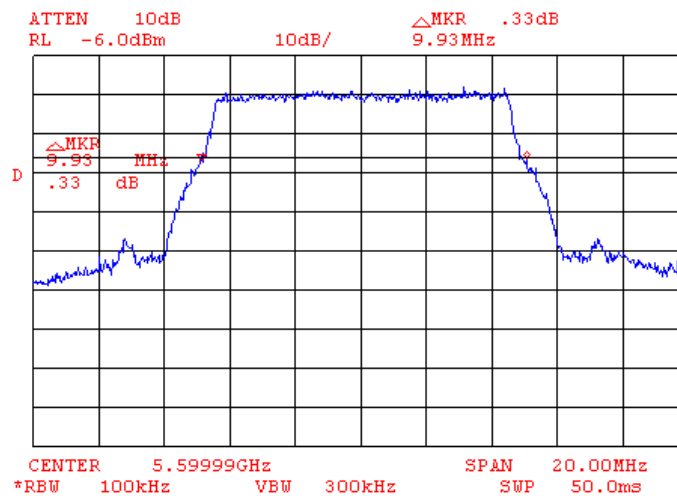


Test specification:	Section 15.407(a)(3), 26 dB bandwidth		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/24/2007		
Temperature: 26 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.5 The 26 dB bandwidth test result at mid frequency carrier, BPSK



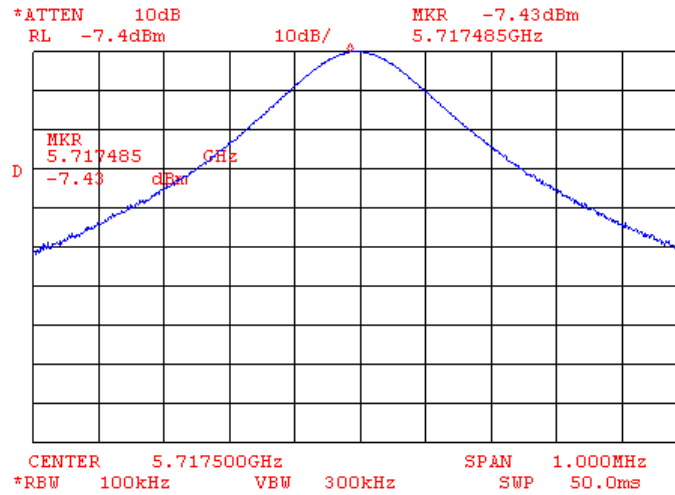
Plot 7.1.6 The 26 dB bandwidth test result at mid frequency carrier, 64QAM



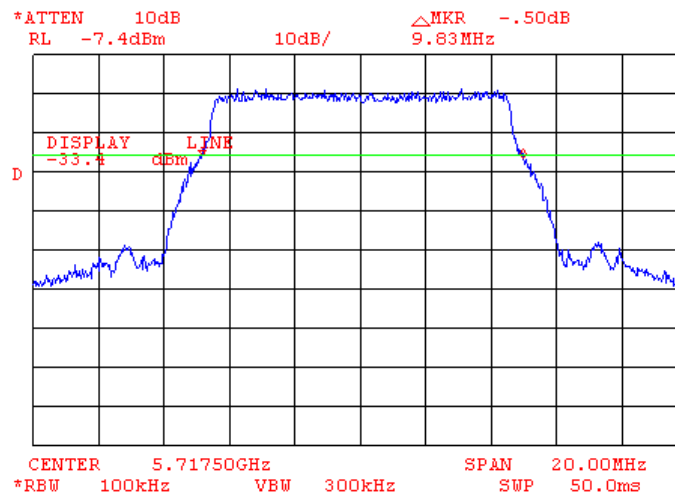


Test specification:	Section 15.407(a)(3), 26 dB bandwidth		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/24/2007		
Temperature: 26 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.7 Reference power level measurement at high frequency carrier



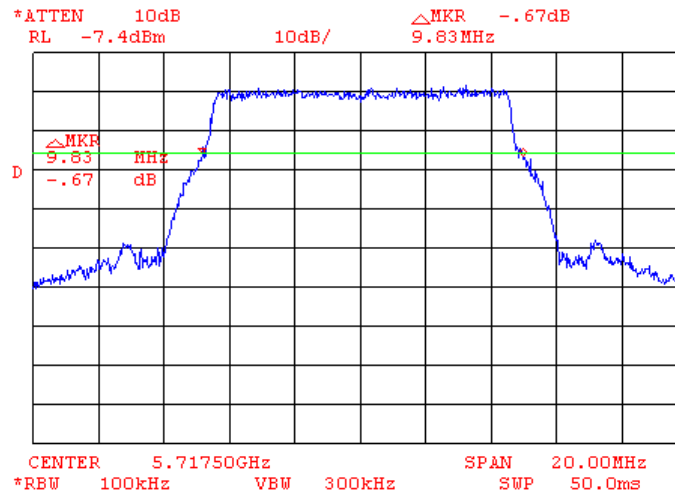
Plot 7.1.8 The 26 dB bandwidth test result at high frequency carrier, BPSK





Test specification:	Section 15.407(a)(3), 26 dB bandwidth		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/24/2007		
Temperature: 26 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.9 The 26 dB bandwidth test result at high frequency carrier, 64QAM





Test specification: Section 15.407(a)(1-3), Peak output power			
Test procedure: FCC Public Notice DA 02-2138, Appendix A			
Test mode: Compliance	Verdict: PASS		
Date: 9/25/2007			
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

7.2 Peak output power

7.2.1 General

This test was performed to measure the maximum peak output power at the transmitter RF antenna connector. Specification test limits are given in Table 7.2.1.

Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum peak transmit power*	Used limit*, dBm
5470 - 5725	The lesser of 250 mW or 11 dBm +10 log B (B is the 26-dB emission bandwidth in MHz)	20.98 dBm

The maximum 26-dB emission bandwidth is 9.97 MHz, the limit is equal to:

11 dBm + 10 log 9.97 = **20.98 dBm** (less than 250 mW = 24 dBm);

* Note 1: due to 14.5 dBi antenna gain the limits of peak output power shall be reduced by 8.5 dB.

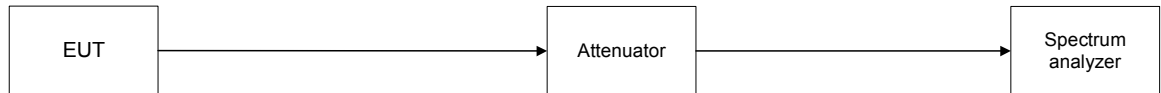
7.2.2 Test procedure

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

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

7.2.2.3 The measurements were performed in continuous transmission mode of operation for carrier (channel) frequency at low, mid and high edges.

Figure 7.2.1 Peak output power test setup





Test specification: Section 15.407(a)(1-3), Peak output power	
Test procedure: FCC Public Notice DA 02-2138, Appendix A	
Test mode: Compliance	Verdict: PASS
Date: 9/25/2007	
Temperature: 26 °C	Air Pressure: 1012 hPa
Relative Humidity: 46 %	
Power Supply: 120 VAC	
Remarks:	

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 5470- 5725 MHz
 DETECTOR USED: Sample
 POWER WORD: 1900
 RBW: 1 MHz
 VBW: 3 MHz

Frequency, GHz	Total power, dBm	Limit*, dBm	Margin, dB	Verdict
Modulation: BPSK				
5480.0	12.30	12.48	-0.18	Pass
5600.0	12.10	12.48	-0.38	Pass
5717.5	11.80	12.48	-0.68	Pass
Modulation: 64QAM				
5480.0	12.30	12.48	-0.18	Pass
5600.0	12.20	12.48	-0.28	Pass
5717.5	11.90	12.48	-0.58	Pass

* Note: due to 14.5 dBi antenna gain the limits of peak output power were reduced by 8.5 dB

Reference numbers of test equipment used

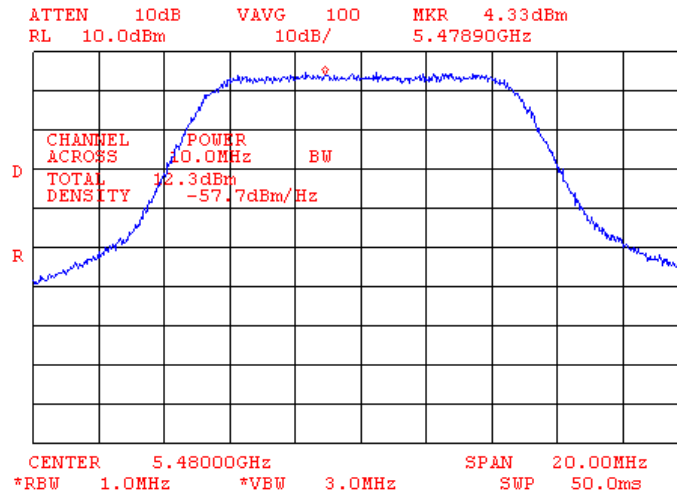
HL 1424	HL 2524	HL 2925					
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Full description is given in Appendix A.

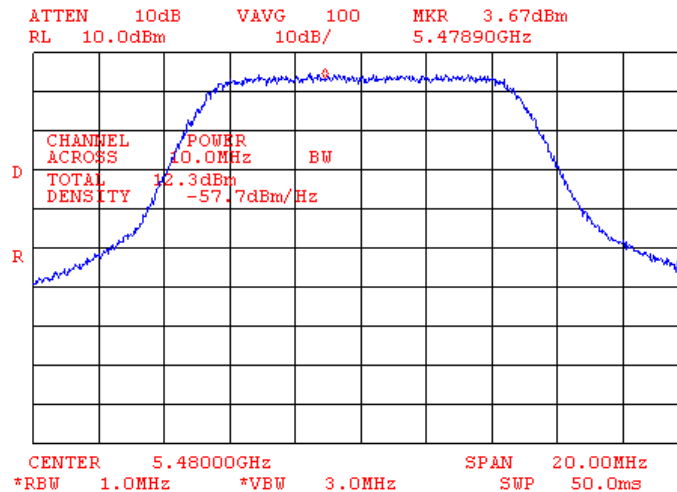


Test specification:	Section 15.407(a)(1-3), Peak output power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.1 Peak output power at the low frequency, BPSK



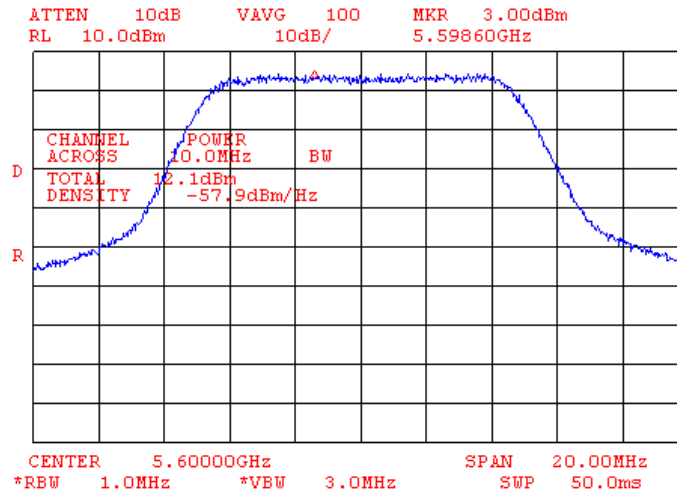
Plot 7.2.2 Peak output power at low frequency, 64QAM



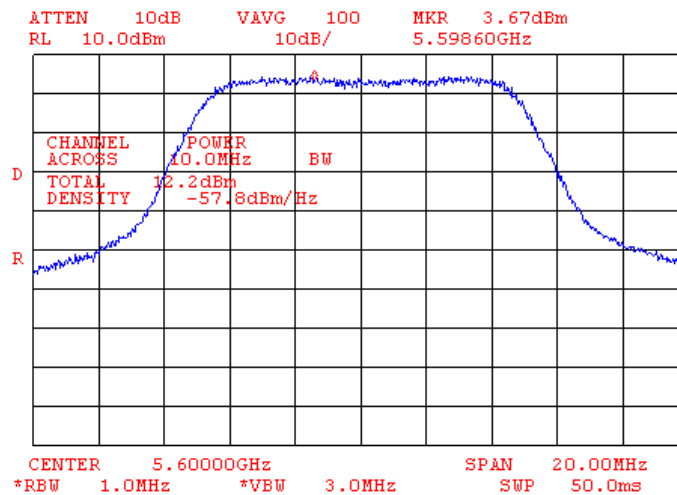


Test specification:	Section 15.407(a)(1-3), Peak output power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.3 Peak power density at the mid frequency, BPSK



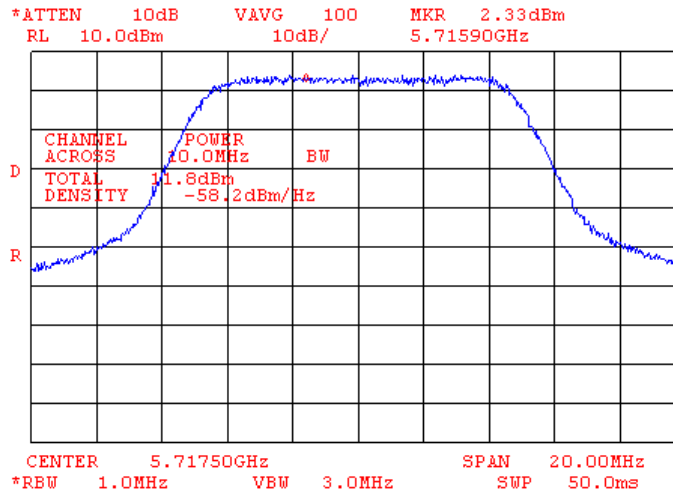
Plot 7.2.4 Peak power density at mid frequency, 64QAM



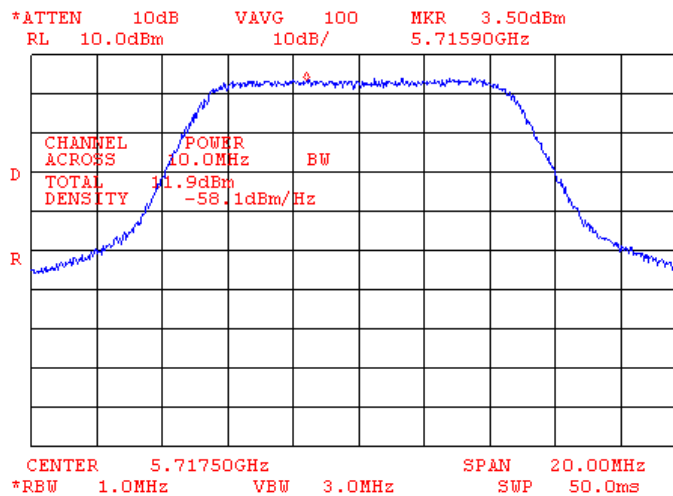


Test specification:	Section 15.407(a)(1-3), Peak output power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.5 Peak power density at the high frequency, BPSK



Plot 7.2.6 Peak power density at high frequency, 64QAM



Test specification:		Section 15. 407(a)(1-3), Peak power spectral density	
Test procedure:		FCC Public Notice DA 02-2138, Appendix A	
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

7.3 Peak spectral power density

7.3.1 General

This test was performed to measure the peak spectral power density at the transmitter RF antenna connector. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Peak spectral power density limits

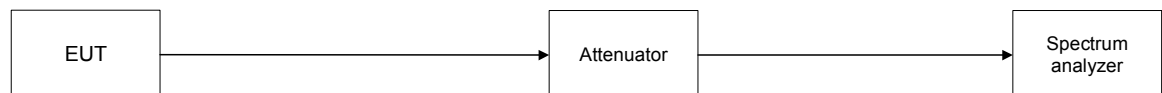
Assigned frequency range, MHz	Measurement bandwidth, MHz	Peak spectral power density*, dBm
5470 - 5725	1.0	11.0

* Note 1: due to 14.5 dBi antenna gain the limits of peak power spectral density shall be reduced by 8.5 dB.

7.3.2 Test procedure

- 7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.
- 7.3.2.2 The EUT was adjusted to produce maximum available to end user RF output power.
- 7.3.2.3 The measurements were performed in continuous transmission mode of operation for carrier (channel) frequency at low and high edges and at the middle of the frequency range.
- 7.3.2.4 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.3.2 and associated plots.

Figure 7.3.1 Peak spectral power density test setup





Test specification:		Section 15. 407(a)(1-3), Peak power spectral density	
Test procedure:		FCC Public Notice DA 02-2138, Appendix A	
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Table 7.3.2 Peak spectral power density test results

ASSIGNED FREQUENCY RANGE: 5470 - 5725 MHz
DETECTOR USED: Sample
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: 3 MHz

Carrier frequency, MHz	Measured peak power spectral density, dBm/MHz**	Calculated limit*, dBm/MHz	Margin***, dB	Verdict
Modulation: BPSK				
5480.0	2.3	2.5	-0.2	Pass
5600.0	2.1	2.5	-0.4	Pass
5717.5	1.8	2.5	-0.7	Pass
Modulation: 64QAM				
5480.0	2.3	2.5	-0.2	Pass
5600.0	2.2	2.5	-0.3	Pass
5717.5	1.9	2.5	-0.6	Pass

* due to 14.5 dBi antenna gain the limits of peak power spectral density were reduced by 8.5 dB;

** Measurement plots are in dBm/Hz, in order to convert to dBm/MHz a 60 dB factor was added.

*** Margin = Peak power density – calculated limit.

Reference numbers of test equipment used

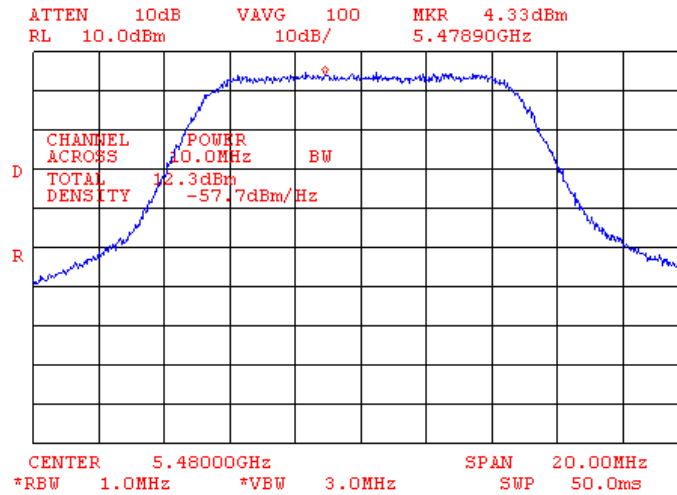
HL 1424	HL 2524	HL 2952					
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Full description is given in Appendix A.

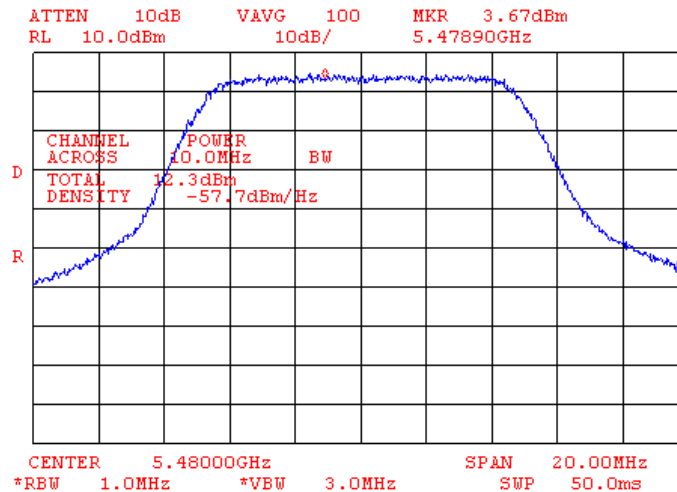


Test specification:	Section 15. 407(a)(1-3), Peak power spectral density		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.1 Peak spectral power density at the low frequency, BPSK



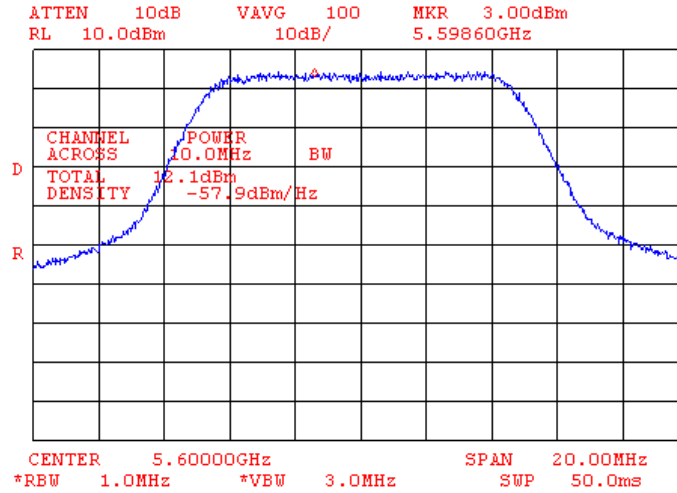
Plot 7.3.2 Peak spectral power density at low frequency, 64QAM



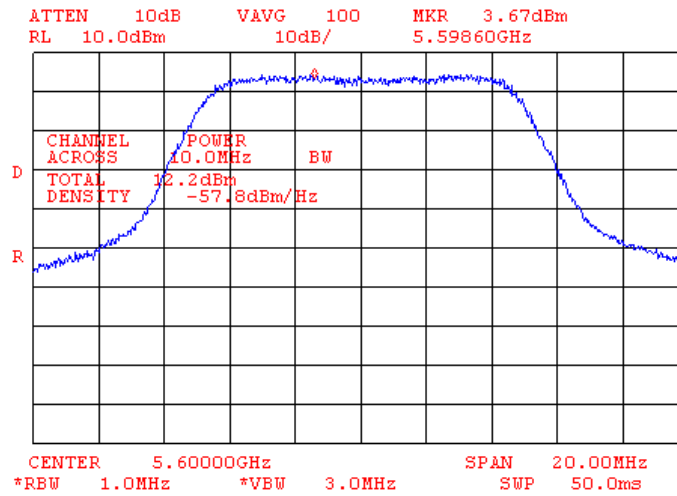


Test specification:	Section 15. 407(a)(1-3), Peak power spectral density		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.3 Peak spectral power density at the mid frequency, BPSK



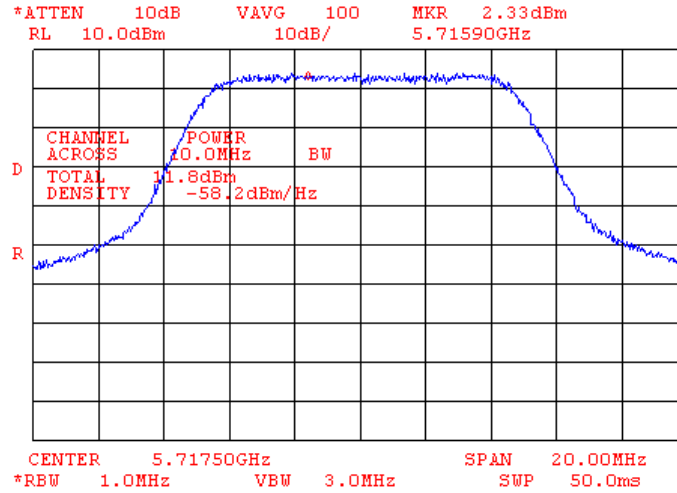
Plot 7.3.4 Peak spectral power density at mid frequency, 64QAM



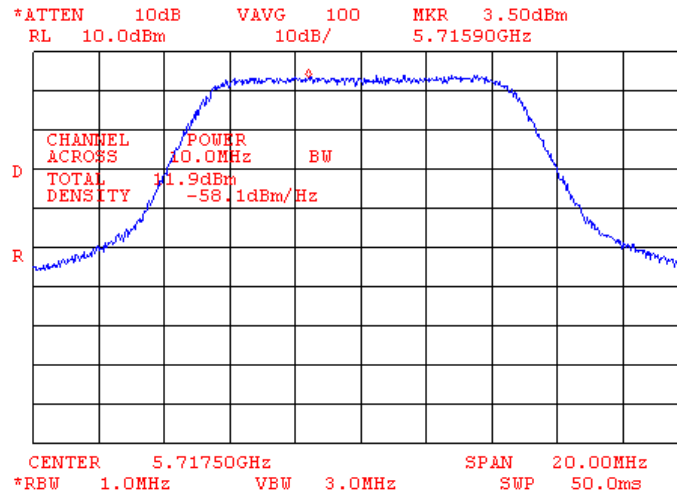


Test specification:	Section 15. 407(a)(1-3), Peak power spectral density		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.3.5 Peak spectral power density at the high frequency, BPSK



Plot 7.3.6 Peak spectral power density at high frequency, 64QAM





Test specification:	Section 15.407(a)(6), Ratio of the peak excursion of the modulation envelope to the peak transmit power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

7.4 Ratio of the peak excursion of the modulation envelope to the peak transmit power

7.4.1 General

This test was performed to measure the ratio of the peak excursion of the modulation envelope to the peak transmit power at RF antenna connector. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Peak excursion limits

Assigned frequency, MHz	Maximum peak excursion, dB/MHz
5470 - 5750	13.0

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and its proper operation was checked.

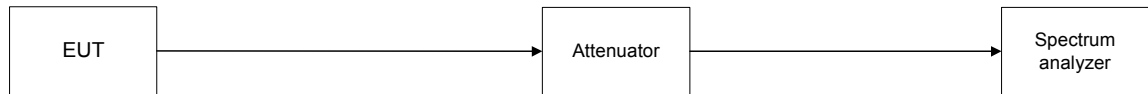
7.4.2.2 The EUT was adjusted to produce maximum available to end user RF output power.

7.4.2.3 The measurements were performed in continuous transmission mode of operation for carrier (channel) frequency at low and high edges and at the middle of the frequency range.

The maximum peak excursion of modulation envelope was measured as a difference between 2 traces.

7.4.2.4 The test results were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Band edge emission test setup





Test specification:	Section 15.407(a)(6), Ratio of the peak excursion of the modulation envelope to the peak transmit power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Peak excursion test results

ASSIGNED FREQUENCY RANGE: 5470 – 5725 MHz
DETECTOR USED: Peak hold/Sample
MODULATION TECHNIQUE:: Digital
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: 1 MHz

Carrier frequency, MHz	Measured maximum peak excursion, dB	Limit, dB/MHz	Margin, dB	Verdict
Modulation: BPSK				
5480.0	11.84	13.0	-1.16	Pass
5600.0	12.17	13.0	-0.83	Pass
5717.5	11.50	13.0	-1.50	Pass
Modulation: 64QAM				
5480.0	11.84	13.0	-1.16	Pass
5600.0	11.67	13.0	-1.33	Pass
5717.5	12.17	13.0	-0.83	Pass

*- Margin = Attenuation below carrier – specification limit.

Reference numbers of test equipment used

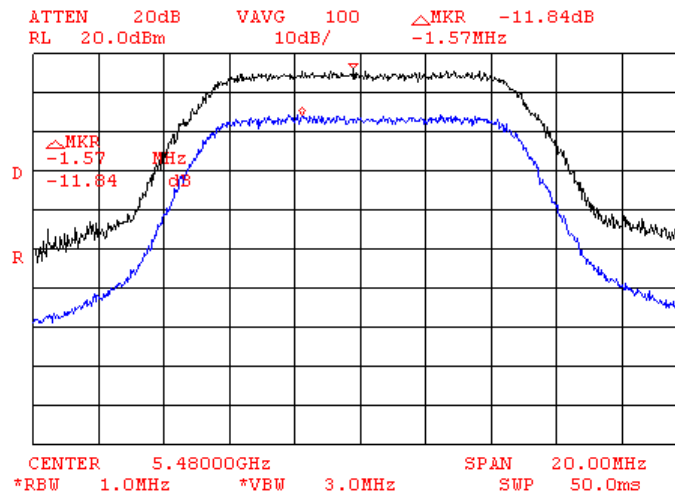
HL 1424	HL 2524	HL 2925					
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Full description is given in Appendix A.

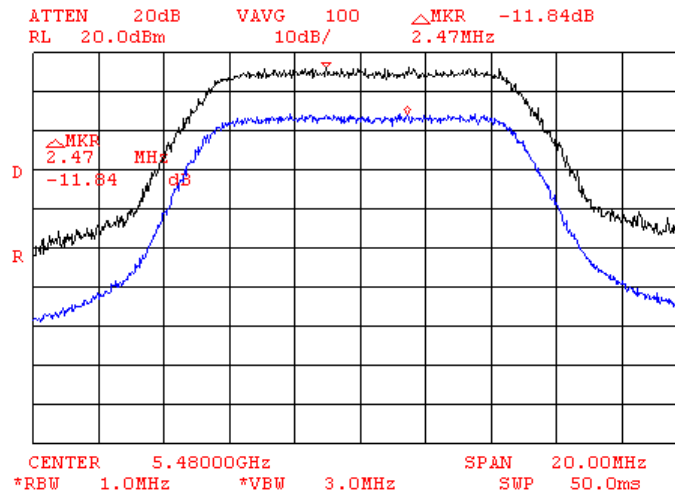


Test specification:	Section 15.407(a)(6), Ratio of the peak excursion of the modulation envelope to the peak transmit power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.1 Peak excursion measurements at low frequency, BPSK



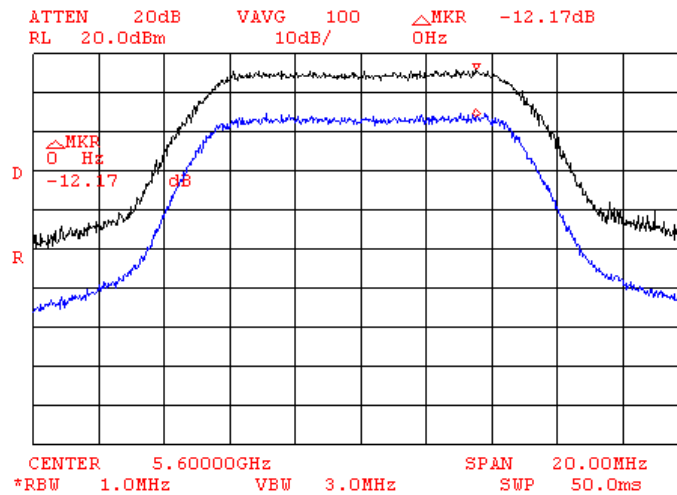
Plot 7.4.2 Peak excursion measurements at low frequency, 64QAM



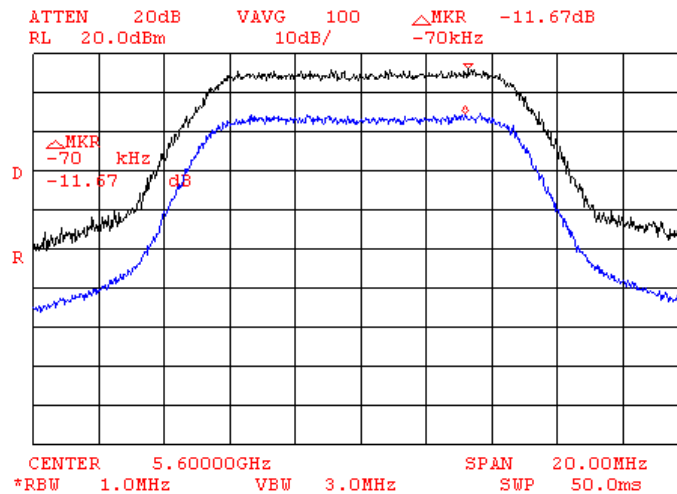


Test specification:	Section 15.407(a)(6), Ratio of the peak excursion of the modulation envelope to the peak transmit power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.3 Peak excursion measurements at mid frequency, BPSK

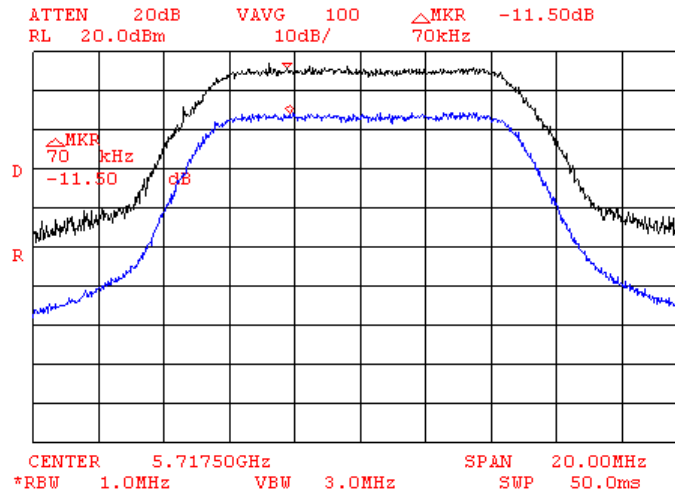


Plot 7.4.4 Peak excursion measurements at mid frequency, 64QAM

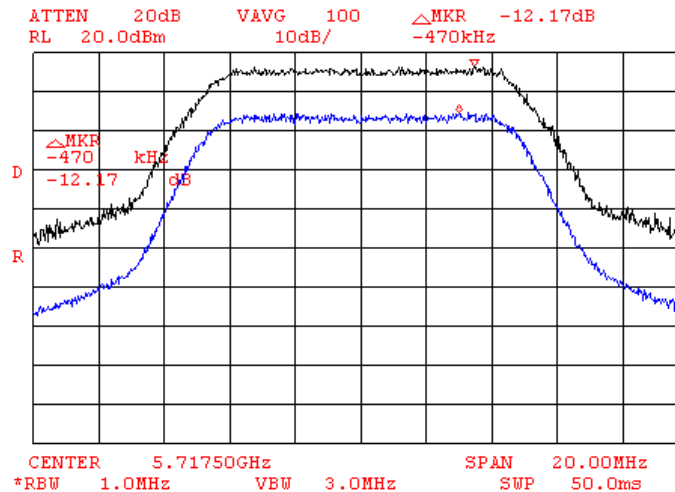


Test specification:	Section 15.407(a)(6), Ratio of the peak excursion of the modulation envelope to the peak transmit power		
Test procedure:	FCC Public Notice DA 02-2138, Appendix A		
Test mode:	Compliance	Verdict:	PASS
Date:	9/25/2007		
Temperature: 26 °C	Air Pressure: 1012 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.5 Peak excursion measurements at high frequency, BPSK



Plot 7.4.6 Peak excursion measurements at high frequency, 64QAM





Test specification:		Section 15.407(b), Out of band undesirable emissions	
Test procedure:		Public notice DA02-2138	
Test mode:	Compliance	Verdict:	PASS
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.5 Spurious emissions at RF antenna connector test

7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 EIRP of undesirable emissions limits outside restricted bands

Frequency band, GHz	Out of band EIRP, dBm/MHz
5.470 – 5.725	-27

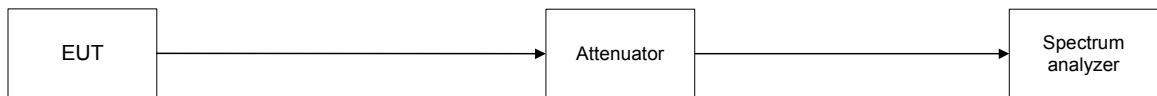
7.5.2 Test procedure for conducted spurious emission

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

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

7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and associated plots.

Figure 7.5.1 Setup for conducted spurious emission measurements





Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict:	PASS
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Conducted spurious emissions test results

ASSIGNED FREQUENCY BAND: 5.470 - 5.725 GHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
 MODULATION: QAM
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 RESOLUTION BANDWIDTH: 1 MHz

Frequency, MHz	Peak emission, dBm	Limit, dBm/MHz**	Margin, dB*	Verdict
Low carrier frequency 5480 MHz				
5470.00	-44.67	-41.5	-3.17	Pass
Mid carrier frequency 5600 MHz				
5443.0	-47.50	-41.5	-6.00	Pass
High carrier frequency 5717.5 MHz				
5725.3	-42.00	-41.5	-0.5	Pass

*- Margin = Peak emission – limit.

**- The limit was reduced by the gain of antenna (14.5 dBi), because the limit is EIRP limit.

Reference numbers of test equipment used

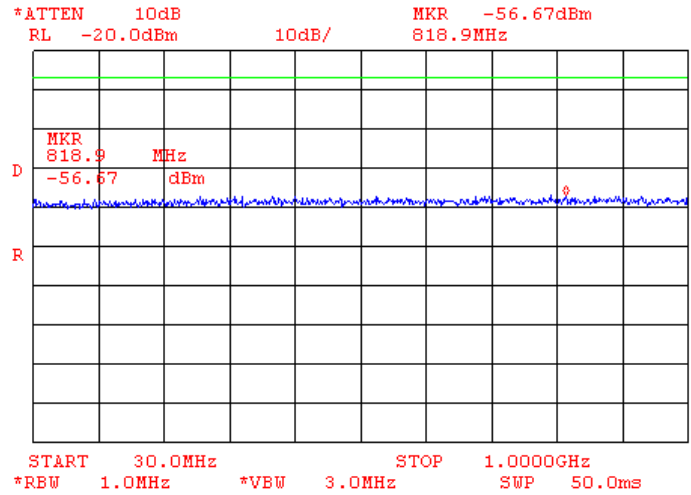
HL 1424	HL 2524	HL 2925					
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Full description is given in Appendix A.

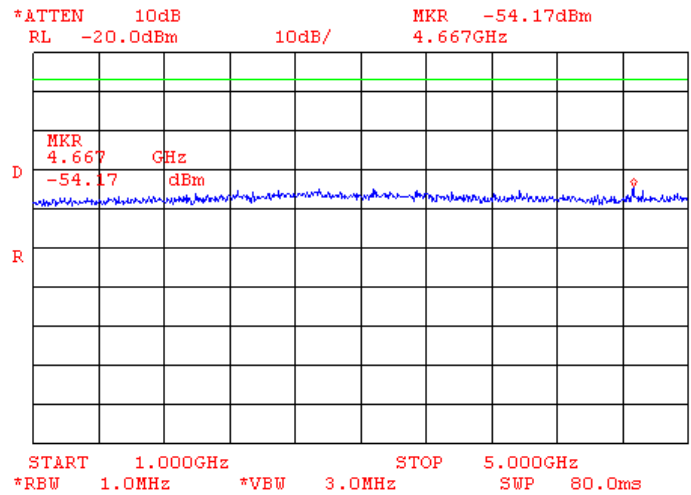


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.3 Conducted emission measurements from 30 to 1000 MHz at the low carrier frequency



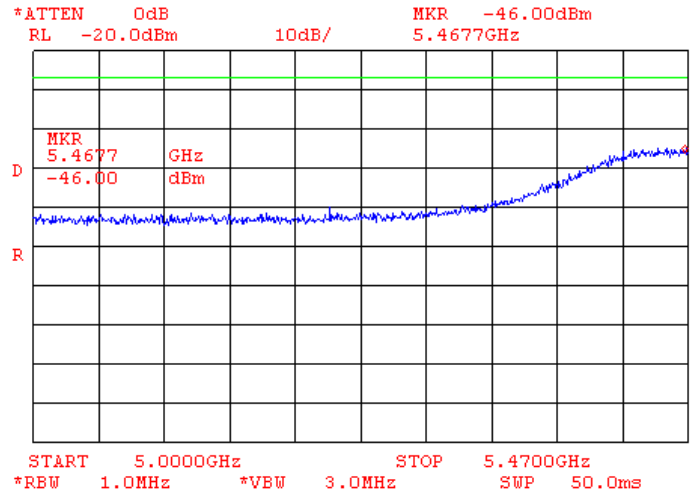
Plot 7.5.4 Conducted emission measurements from 1.0 to 5.0 GHz at the low carrier frequency



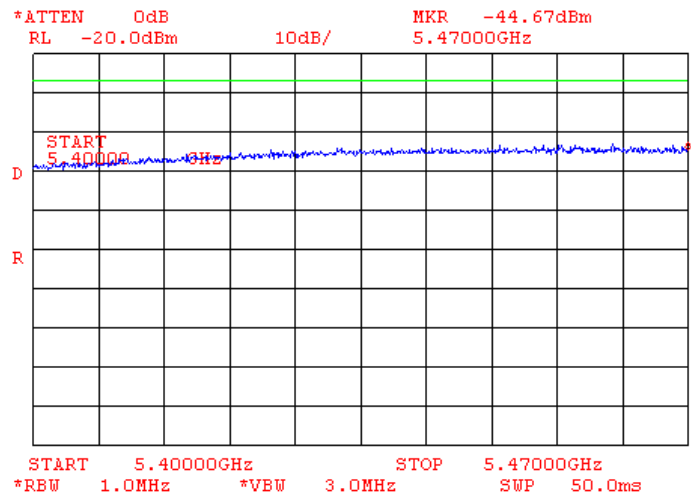


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.5 Conducted emission measurements from 5.0 to 5.470 GHz at the low carrier frequency



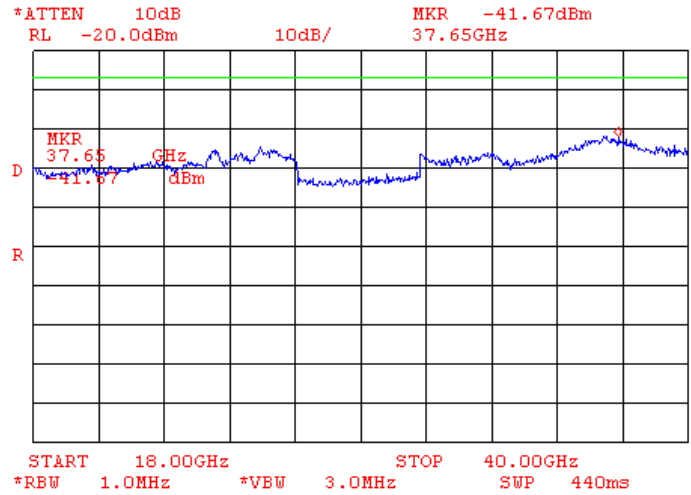
Plot 7.5.6 Conducted emission measurements from 5.4 to 5.470 GHz at the low carrier frequency





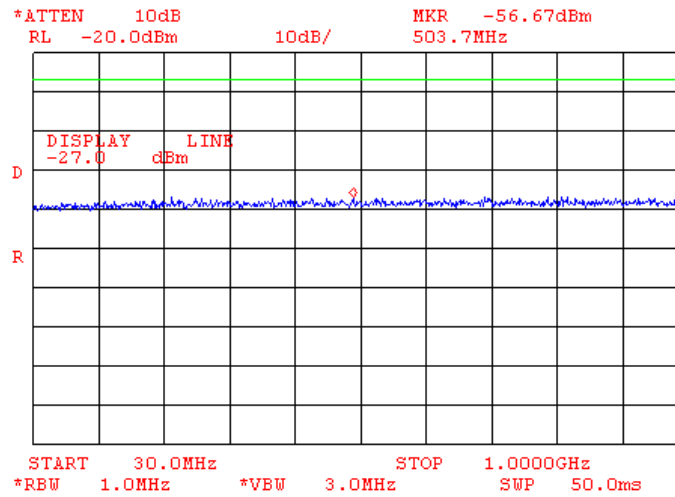
Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.9 Conducted emission measurements from 18 to 40 GHz at the low carrier frequency

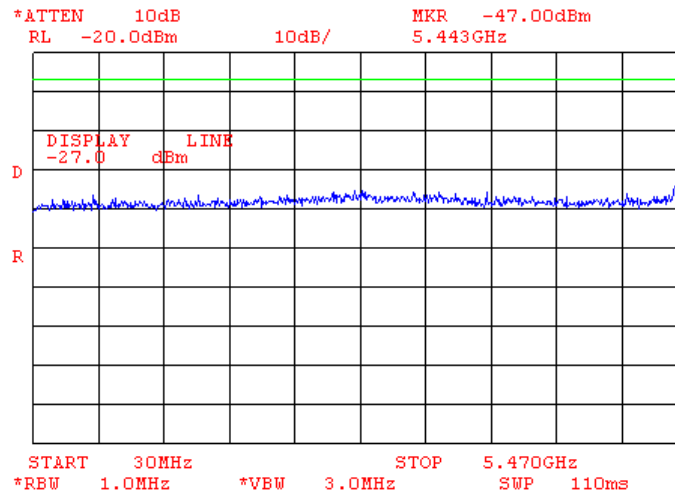


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.12 Conducted emission measurements from 30 to 1000 MHz at the mid carrier frequency



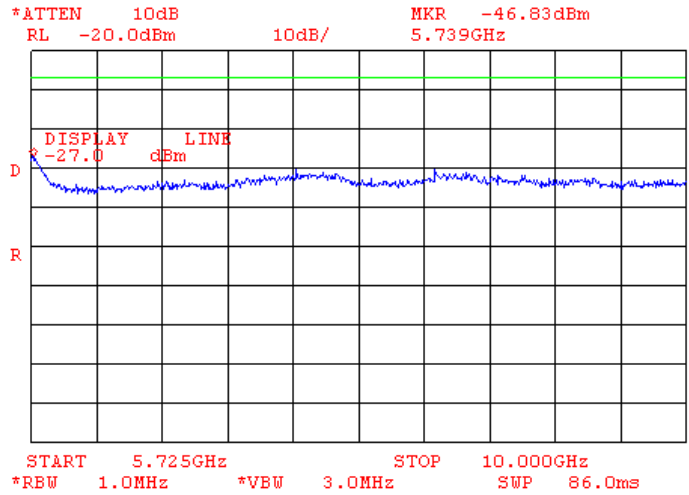
Plot 7.5.13 Conducted emission measurements from 1.0 to 5.47 GHz at the mid carrier frequency



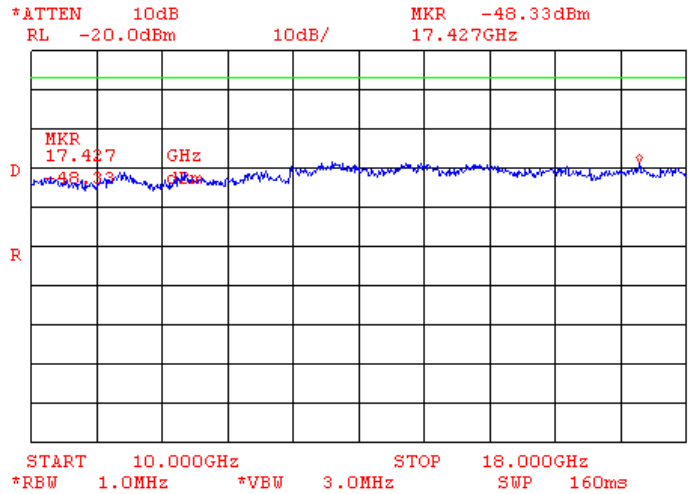


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.14 Conducted emission measurements from 5.725 to 10 GHz at the mid carrier frequency



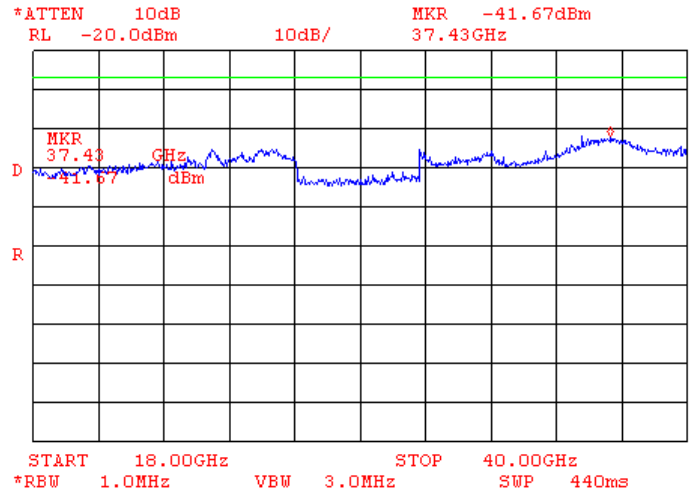
Plot 7.5.15 Conducted emission measurements from 10 to 18 GHz at the mid carrier frequency





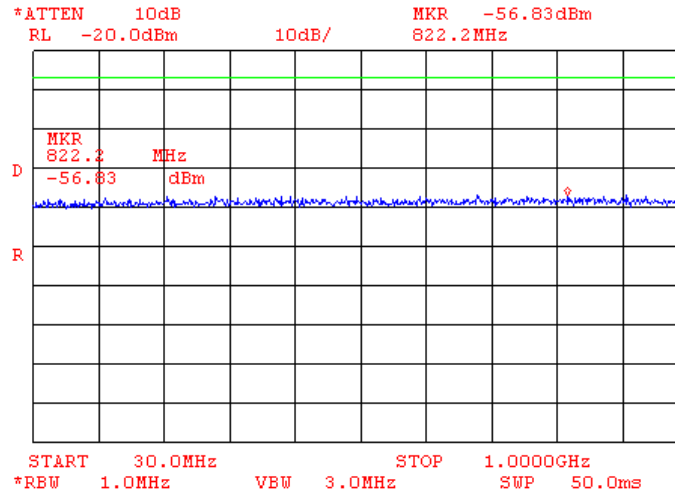
Test specification:		Section 15.407(b), Out of band undesirable emissions	
Test procedure:		Public notice DA02-2138	
Test mode:	Compliance	Verdict:	PASS
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.16 Conducted emission measurements from 18 to 40 GHz at the mid carrier frequency

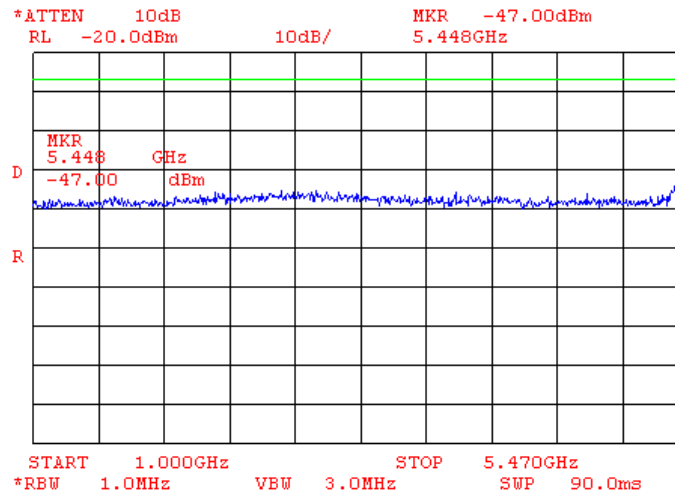


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.19 Conducted emission measurements from 30 to 1000 MHz at the high carrier frequency



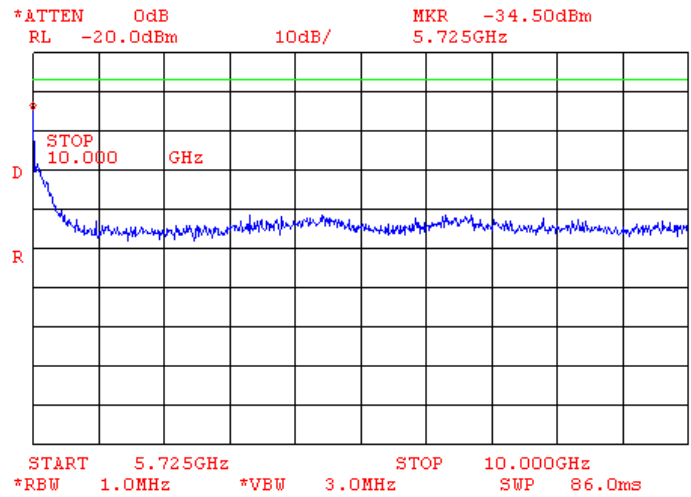
Plot 7.5.20 Conducted emission measurements from 1.0 to 5.47 GHz at the high carrier frequency



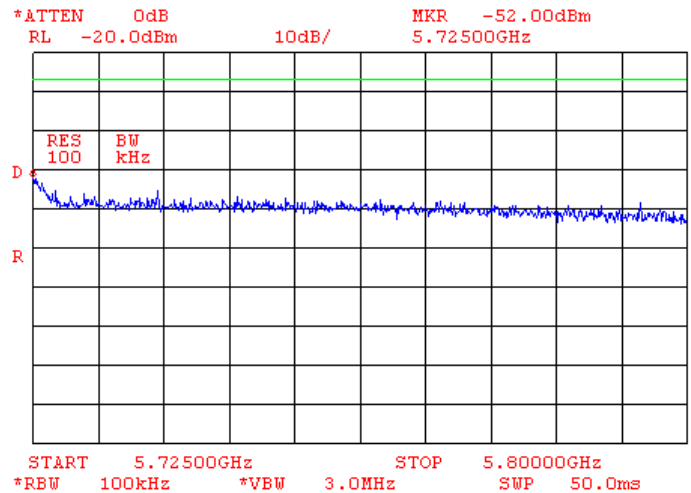


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict:	PASS
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.21 Conducted emission measurements from 5.725 to 10 GHz at the high carrier frequency



Plot 7.5.22 Conducted emission measurements from 5.725 to 5.8 GHz at the high carrier frequency

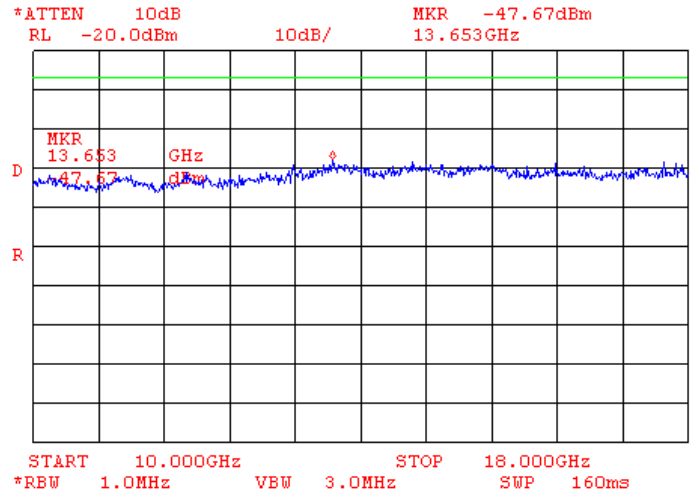


Note: a 10 dB factor should be added to the measurement due to lower RBW.

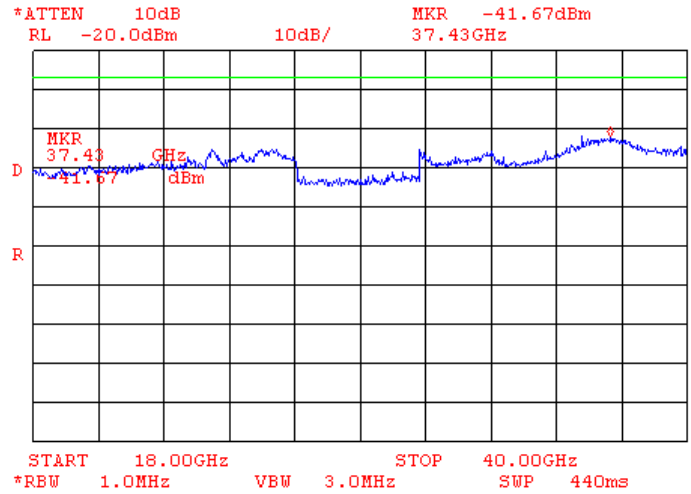


Test specification:	Section 15.407(b), Out of band undesirable emissions		
Test procedure:	Public notice DA02-2138		
Test mode:	Compliance	Verdict: PASS	
Date:	10/01/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.23 Conducted emission measurements from 10 to 18 GHz at the high carrier frequency



Plot 7.5.24 Conducted emission measurements from 18 to 40 GHz at the high carrier frequency





Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.6 Field strength of spurious emissions

7.6.1 General

This test was performed to measure field strength of spurious emissions from the EUT. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Radiated spurious emissions limits below 1 GHz and within restricted bands above 1 GHz

Frequency, MHz	Field strength at 3 m, dB(μV/m) ^{***}		
	Peak	Quasi Peak	Average
0.009 – 0.490*	NA	128.5 – 93.8**	NA
0.490 – 1.705*		73.8 – 63.0**	
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:

$$\text{LimS2} = \text{LimS1} + 40 \log (S1/S2),$$

where S1 and S2 – standard defined and test distance respectively in meters.

** - The limit decreases linearly with the logarithm of frequency.

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

Table 7.6.2 EIRP of undesirable emissions limits outside restricted bands (above 1 GHz)

Frequency band, GHz	Out of band EIRP, dBm/MHz	Field strength at 3 m, dB(μV/m)
5.47 – 5.725	-27	68.23

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

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and the performance check was conducted.

7.6.2.2 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.

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

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

7.6.3.1 The EUT was set up as shown in Figure 7.6.2, energized and the performance check was conducted.

7.6.3.2 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.

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



Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Figure 7.6.1 Setup for spurious emission field strength measurements below 30 MHz

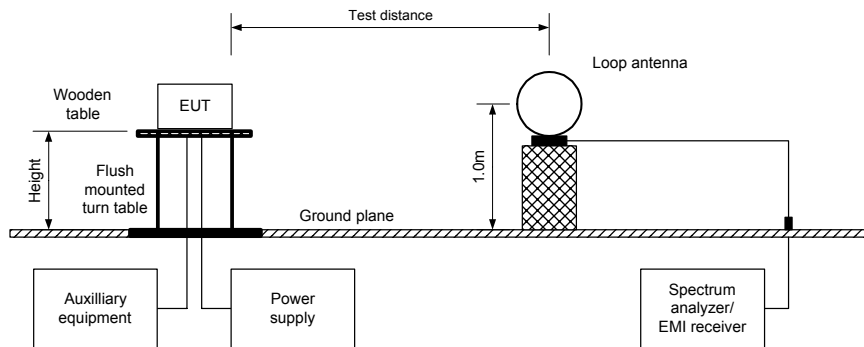
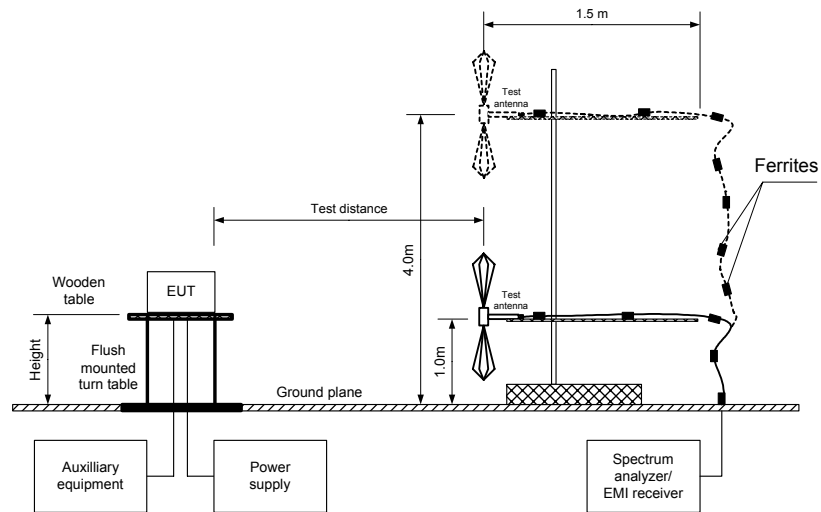


Figure 7.6.2 Setup for spurious emission field strength measurements above 30 MHz





Test specification:		Section 15.407(b), Unwanted radiated emissions			
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode:	Compliance	Verdict:		PASS	
Date:	10/06/2007				
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC		
Remarks:					

Table 7.6.3 Field strength of spurious emissions within restricted bands

ASSIGNED FREQUENCY BAND: 5.470 - 5.725 GHz
 INVESTIGATED FREQUENCY RANGE: 1000 - 40000 MHz
 TEST DISTANCE: 3 m
 MODULATION: QAM
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 DETECTOR USED: Peak
 RESOLUTION BANDWIDTH: 1000 kHz
 TEST ANTENNA TYPE: Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength (VBW=3 MHz)			Average field strength (VBW=10Hz)			Verdict
	Polarization	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										
4670.0	V	1.2	120	54.92	74.00	-19.08	52.36	54.00	-1.64	Pass
Mid carrier frequency										
4790.15	V	1.2	120	53.11	74.00	-20.89	51.25	54.00	-2.75	Pass

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

Table 7.6.4 Restricted bands

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



Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.6.5 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY BAND:	5.470 - 5.725 GHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 40 GHz
TEST DISTANCE:	3 m
MODULATION:	QAM
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
DETECTOR: USED:	Peak
RESOLUTION BANDWIDTH:	1000 kHz
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz) Double ridged guide (above 1000 MHz)

Frequency, MHz	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of spurious, dB(μV/m)	Limit, dBμV/m	Margin, dB**	Verdict
All carrier frequencies							
No spurious were found							Pass

Note: Band edge emissions measurements are given in section 7.5.

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

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



Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.6.6 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY BAND:	5.470 - 5.725GHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
TEST DISTANCE:	3 m
MODULATION:	QAM
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
RESOLUTION BANDWIDTH:	1 kHz (9 kHz – 150 kHz)
	9.0 kHz (150 kHz – 30 MHz)
	120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz)
	Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(µV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*				
All carrier frequencies								
300.0000	35.81	35.19	46.00	-10.81	V	1.5	120	Pass
600.0062	41.28	40.26	46.00	-5.74	H	1.5	130	
624.9800	35.63	33.47	46.00	-12.53	H	1.2	120	
700.0000	43.82	42.79	46.00	-3.21	V	1.4	302	
724.9950	38.38	36.24	46.00	-9.76	V	1.2	100	
800.0062	35.31	32.78	46.00	-13.22	V	1.2	90	

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0589	HL 0604	HL 1425	HL 1556	HL 1947	HL 1984
HL 2009	HL 2909						

Full description is given in Appendix A.



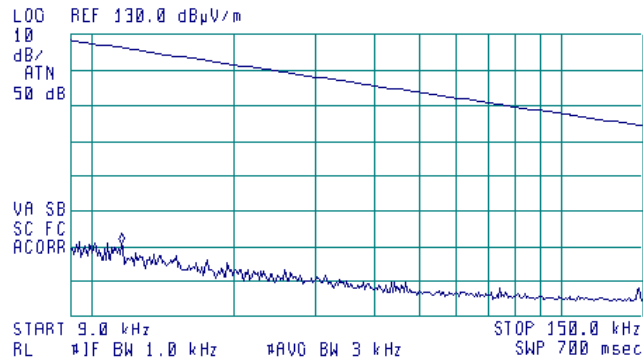
Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.1 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

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

19:07:18 OCT 08, 2007

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 11.5 kHz
70.72 dBµV/m

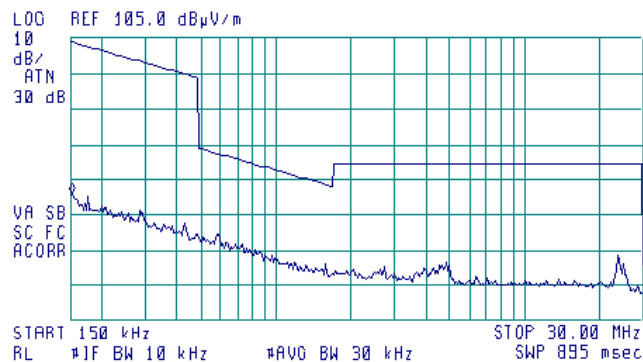


Plot 7.6.2 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

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

19:05:32 OCT 08, 2007

ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 150 kHz
60.90 dBµV/m

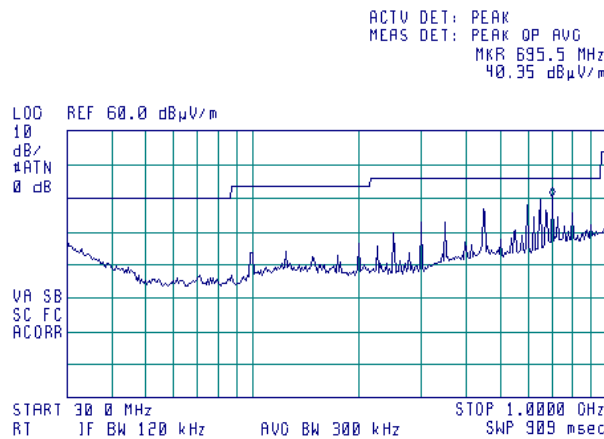




Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.3 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

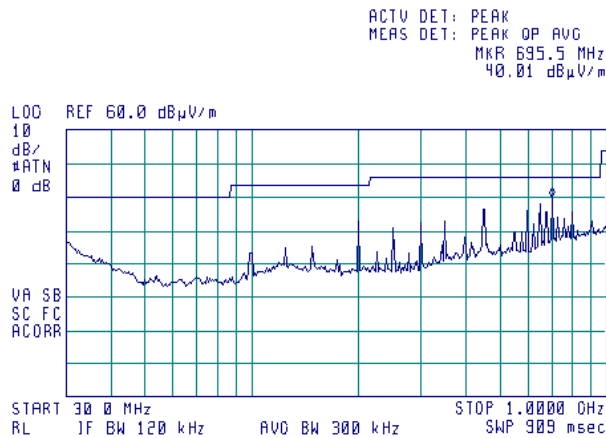
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Note: all spurious from digital part of EUT.

Plot 7.6.4 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

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



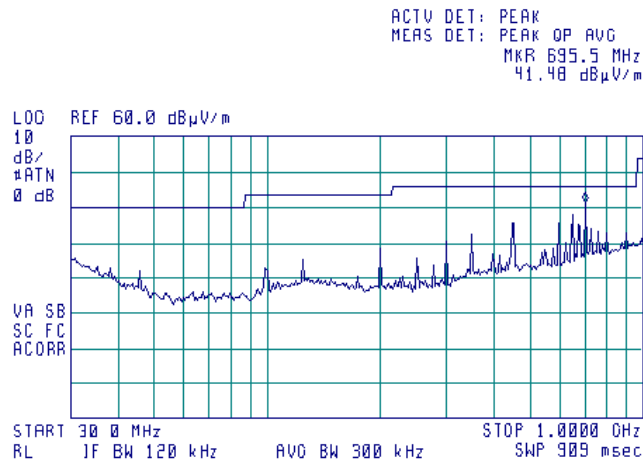
Note: all spurious from digital part of EUT.



Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.5 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

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

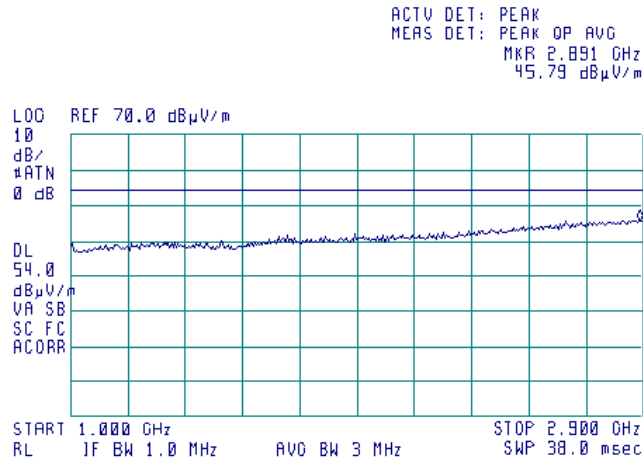


Note: all spurious from digital part of EUT.

Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

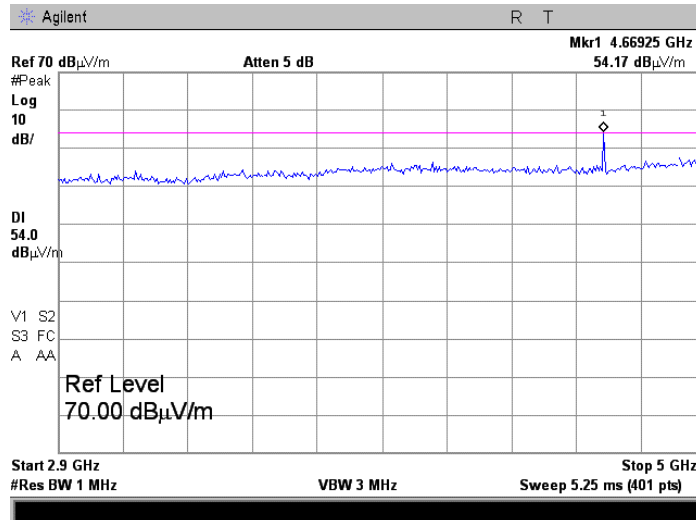
Plot 7.6.6 Radiated emission measurements from 1.0 to 2.9 GHz at the low carrier frequency

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



Plot 7.6.7 Radiated emission measurements from 2.9 to 5.0 GHz at the low carrier frequency

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

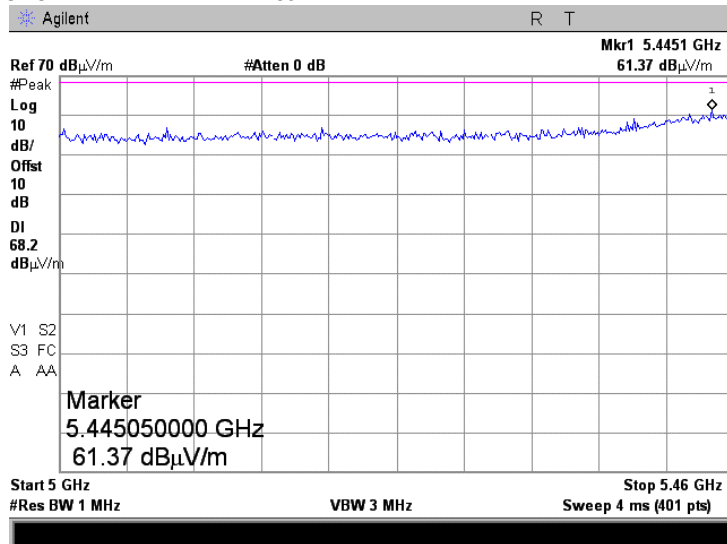




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

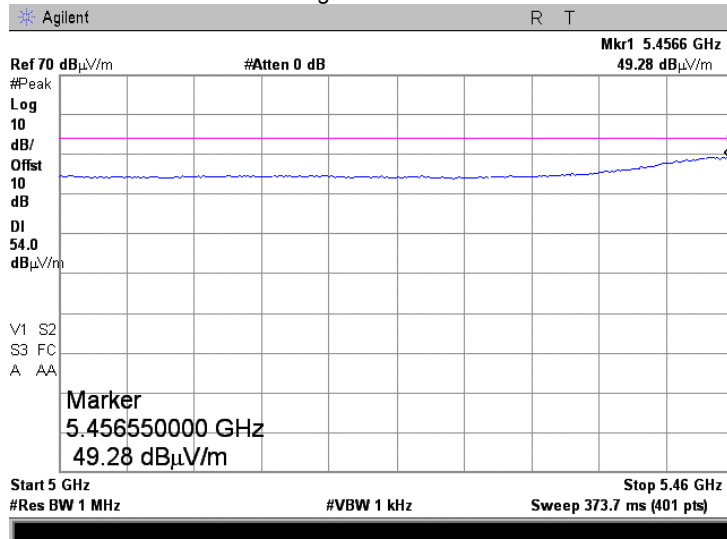
Plot 7.6.8 Radiated emission measurements from 5.0 to 5.46 GHz at the low carrier frequency

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



Plot 7.6.9 Radiated emission measurements from 5.0 to 5.46 GHz at the low carrier frequency

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

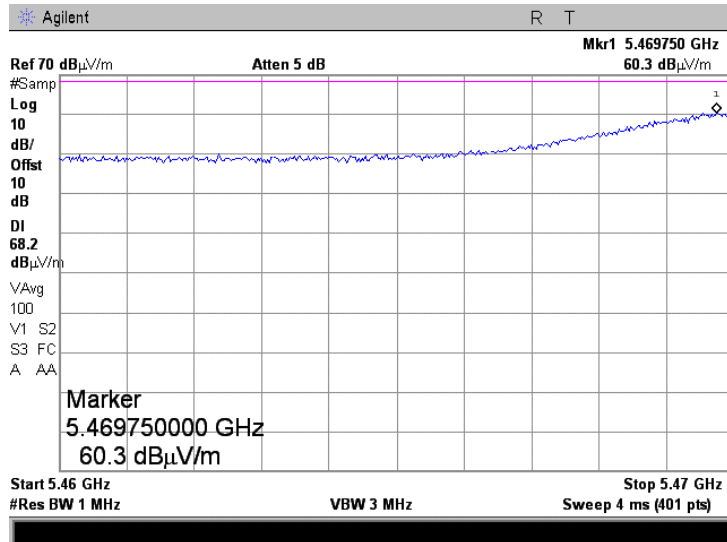




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.10 Radiated emission measurements from 5.46 to 5.47 GHz at the low carrier frequency

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

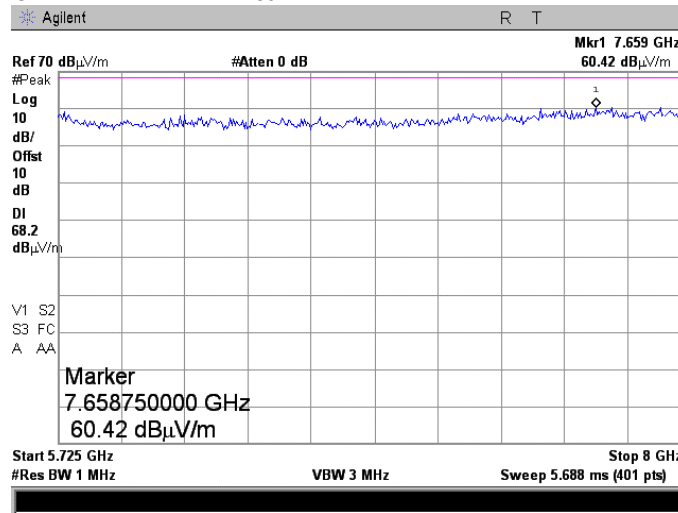




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

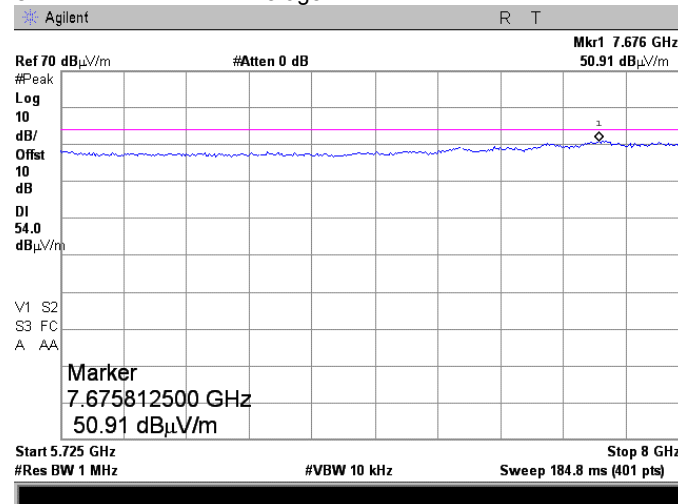
Plot 7.6.11 Radiated emission measurements from 5.725 to 8.0 GHz at the low carrier frequency

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



Plot 7.6.12 Radiated emission measurements from 5.725 to 8.0 GHz at the low carrier frequency

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

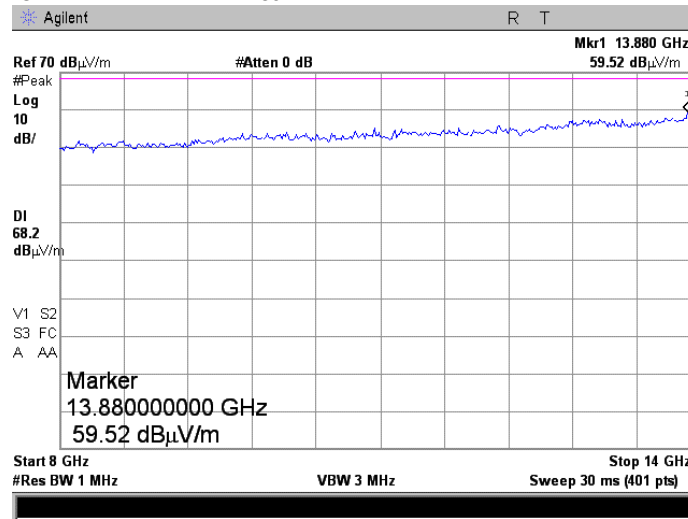




Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

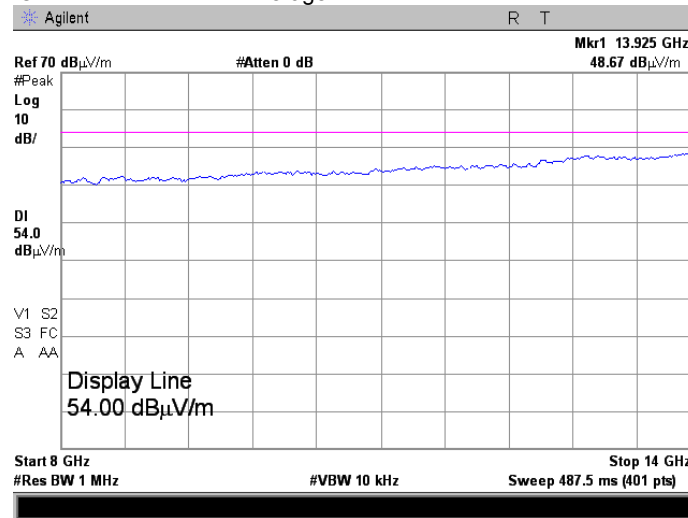
Plot 7.6.13 Radiated emission measurements from 8.0 to 14.0 GHz at the low carrier frequency

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



Plot 7.6.14 Radiated emission measurements from 8.0 to 14.0 GHz at the low carrier frequency

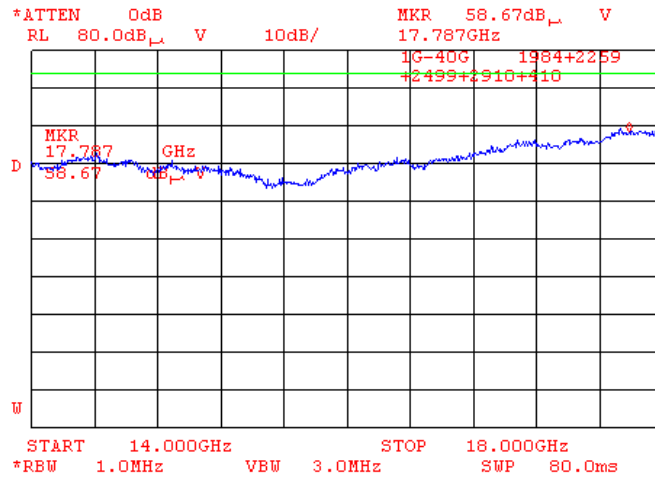
TEST SITE: Anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Average



Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

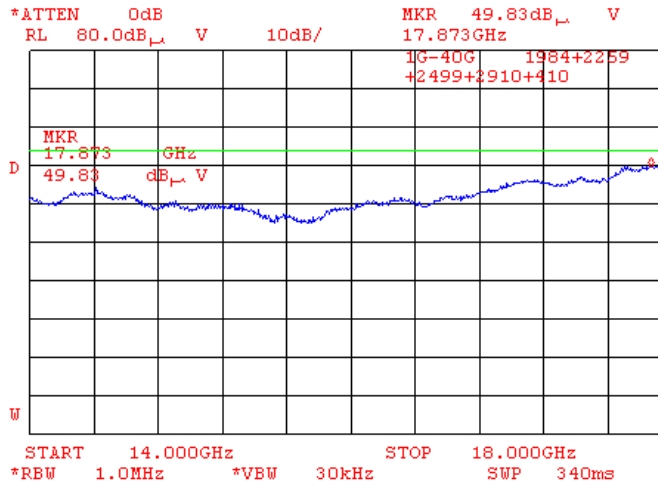
Plot 7.6.15 Radiated emission measurements from 14 to 18 GHz at the low carrier frequency

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



Plot 7.6.16 Radiated emission measurements from 14 to 18 GHz at the low carrier frequency

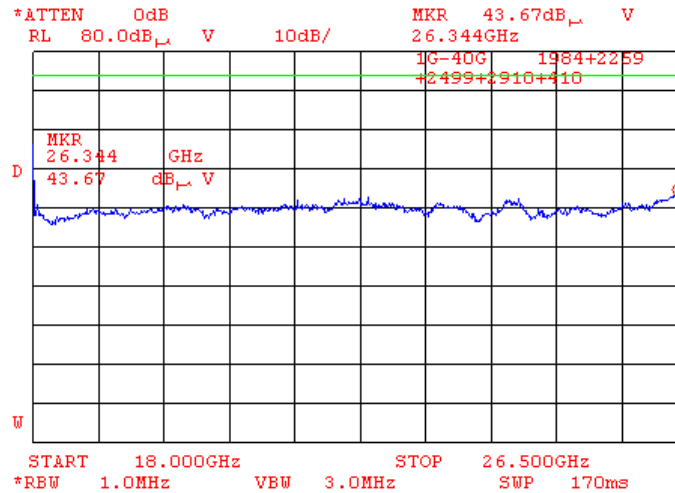
TEST SITE: OATS
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Average



Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

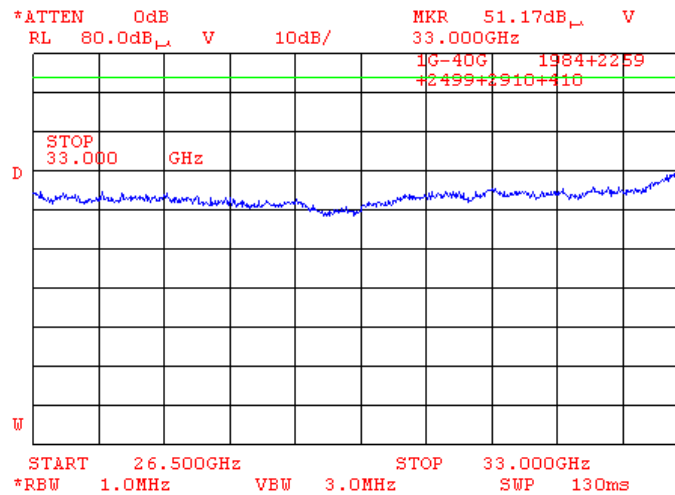
Plot 7.6.17 Radiated emission measurements from 18 to 26.5 GHz at the low carrier frequency

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



Plot 7.6.18 Radiated emission measurements from 26.5 to 33 GHz at the low carrier frequency

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

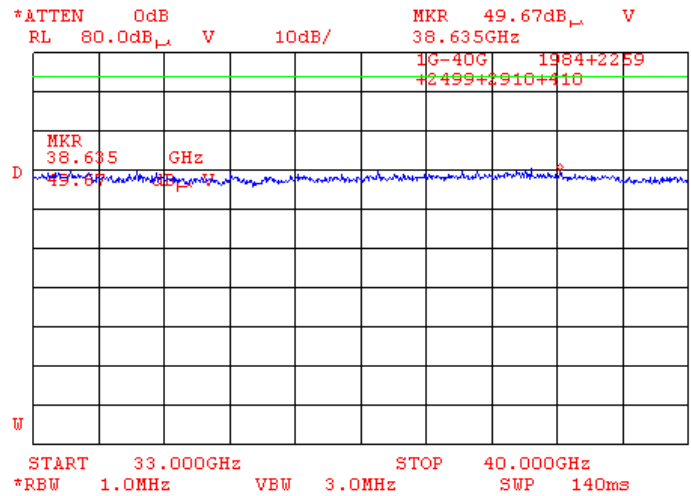




Test specification:		Section 15.407(b), Unwanted radiated emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.19 Radiated emission measurements from 33 to 40 GHz at the low carrier frequency

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





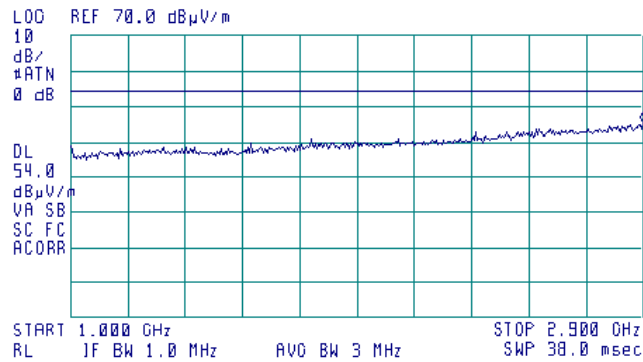
Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.20 Radiated emission measurements from 1.0 to 2.9 GHz at the mid carrier frequency

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

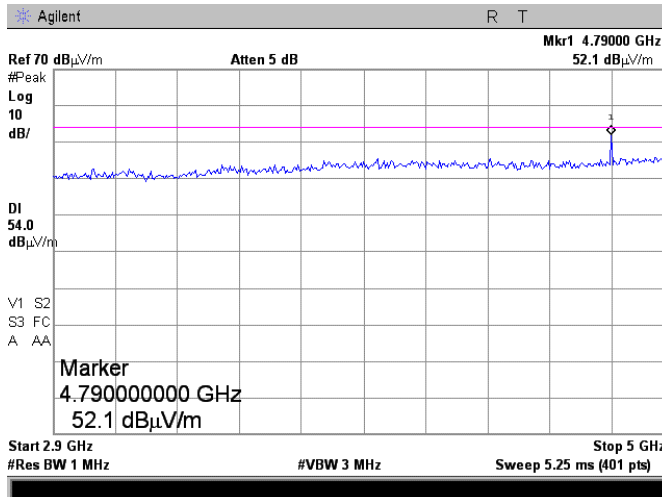


ACTV DET: PEAK
MERS DET: PEAK QP AVG
Mkr 2.900 GHz
45.31 dBµV/m



Plot 7.6.21 Radiated emission measurements from 2.9 to 5.0 GHz at the mid carrier frequency

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

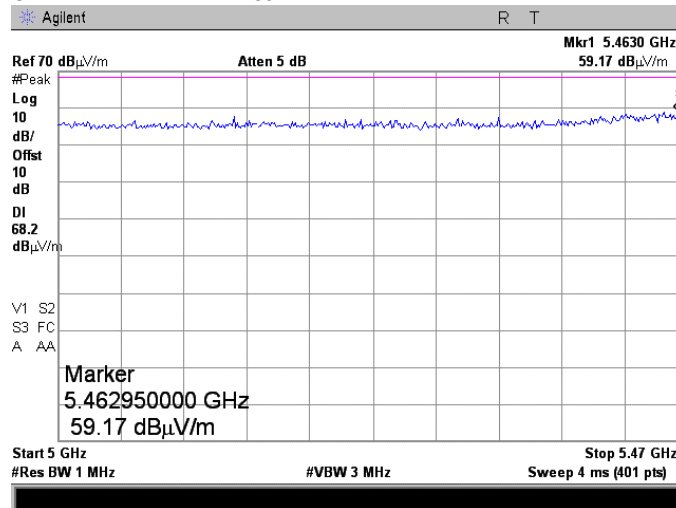




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

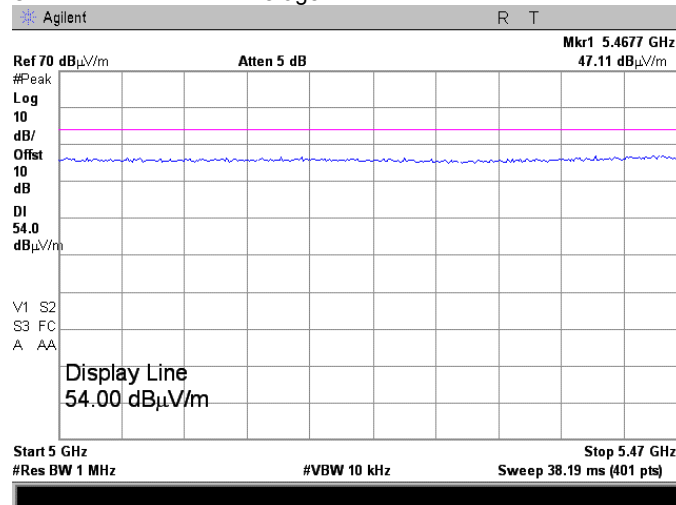
Plot 7.6.22 Radiated emission measurements from 5.00 to 5.47 GHz at the mid carrier frequency

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



Plot 7.6.23 Radiated emission measurements from 5.00 to 5.47 GHz at the mid carrier frequency

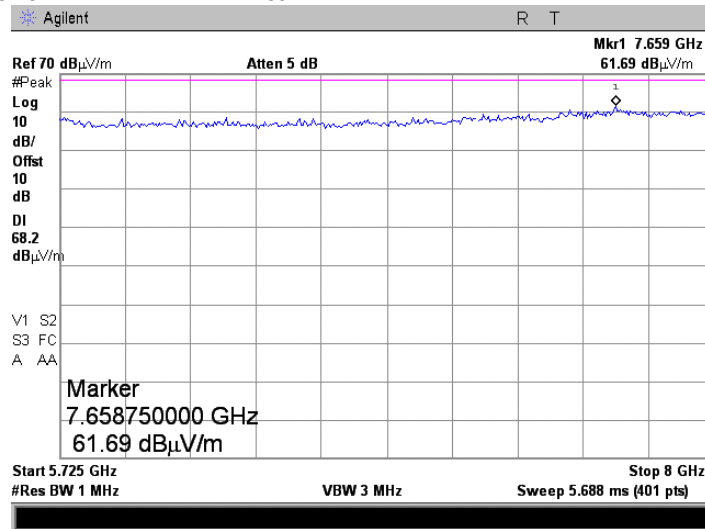
TEST SITE: Anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Average



Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

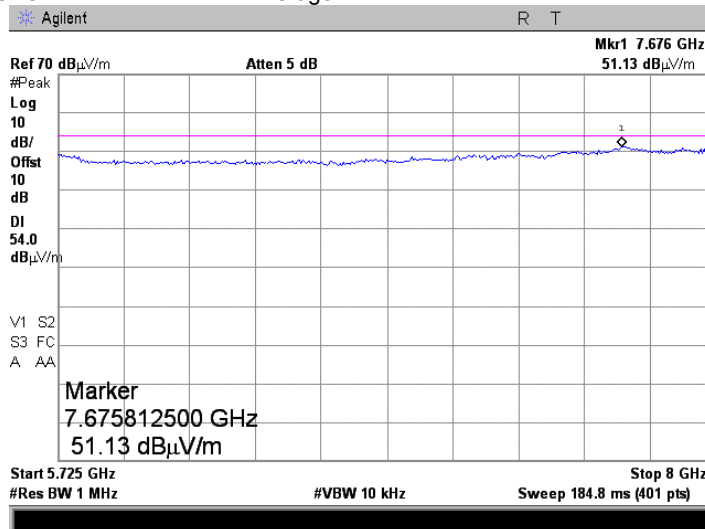
Plot 7.6.24 Radiated emission measurements from 5.725 to 8.0 GHz at the mid carrier frequency

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



Plot 7.6.25 Radiated emission measurements from 5.725 to 8.0 GHz at the mid carrier frequency

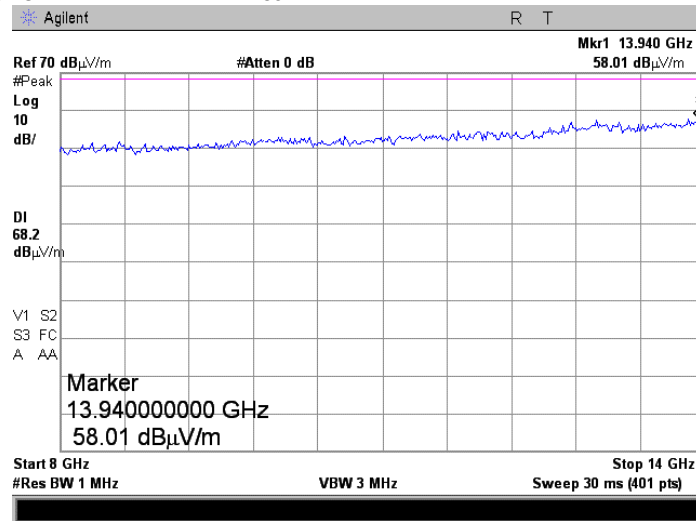
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Average



Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

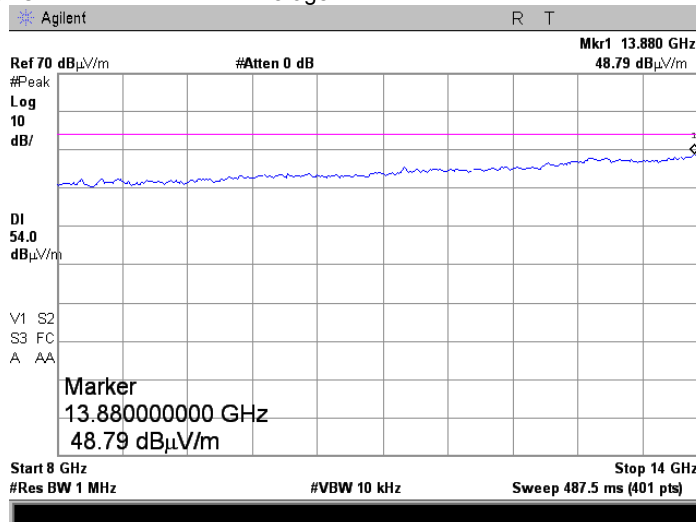
Plot 7.6.26 Radiated emission measurements from 8 to 14 GHz at the mid carrier frequency

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



Plot 7.6.27 Radiated emission measurements from 8 to 14 GHz at the mid carrier frequency

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

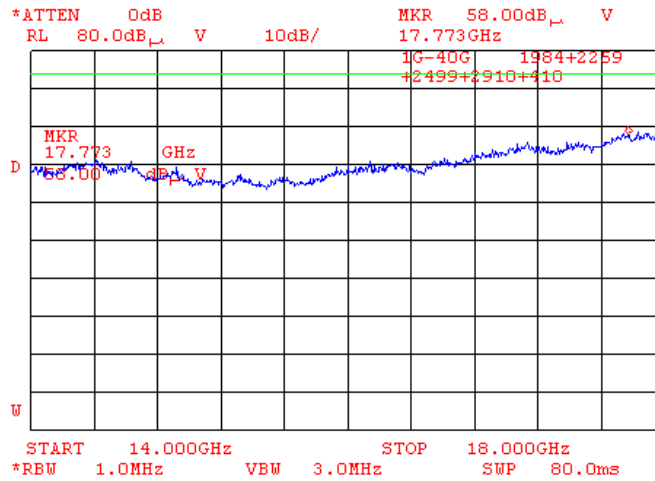




Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

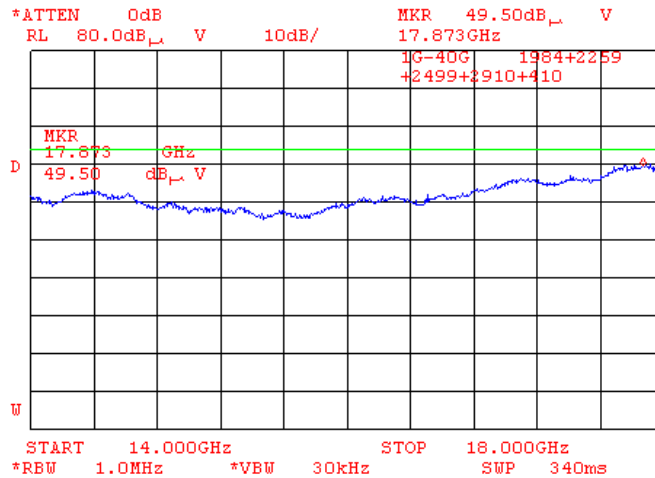
Plot 7.6.28 Radiated emission measurements from 14 to 18 GHz at the mid carrier frequency

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



Plot 7.6.29 Radiated emission measurements from 14 to 18 GHz at the mid carrier frequency

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

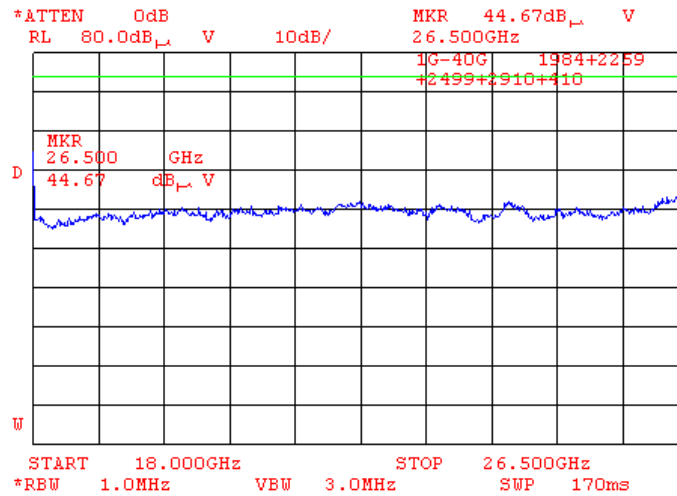




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

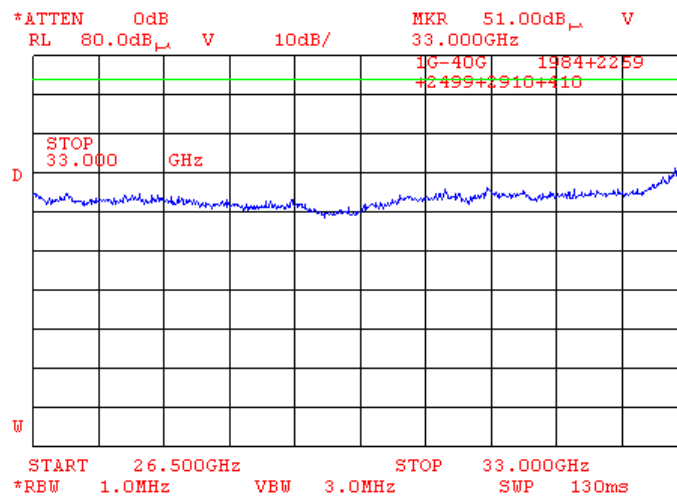
Plot 7.6.30 Radiated emission measurements from 18 to 26.5 GHz at the mid carrier frequency

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



Plot 7.6.31 Radiated emission measurements from 26.5 to 33 GHz at the mid carrier frequency

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

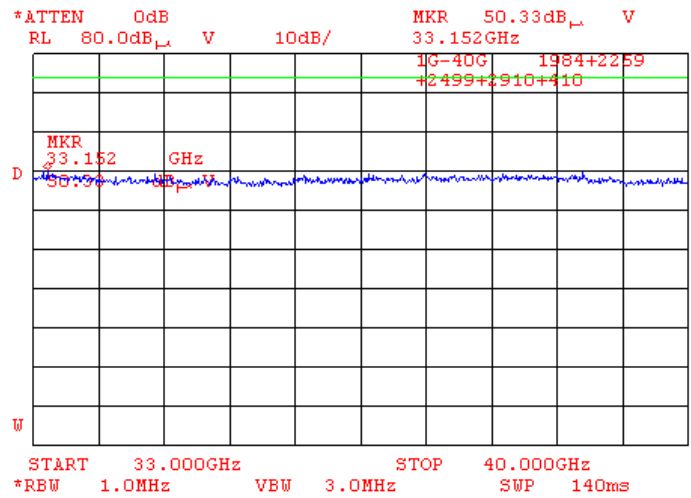




Test specification:		Section 15.407(b), Unwanted radiated emissions	
Test procedure:		Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.32 Radiated emission measurements from 33 to 40 GHz at the mid carrier frequency

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

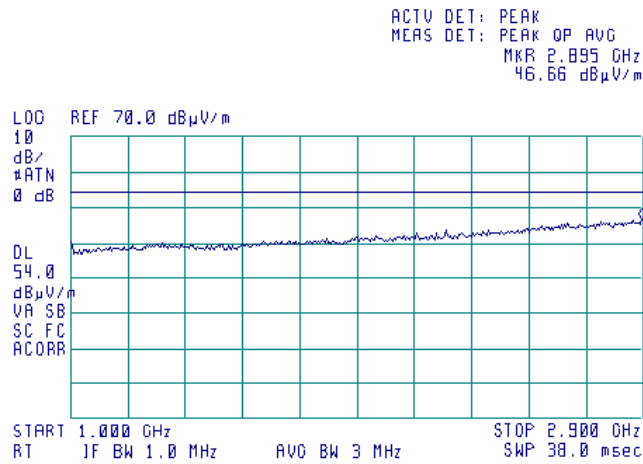




Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

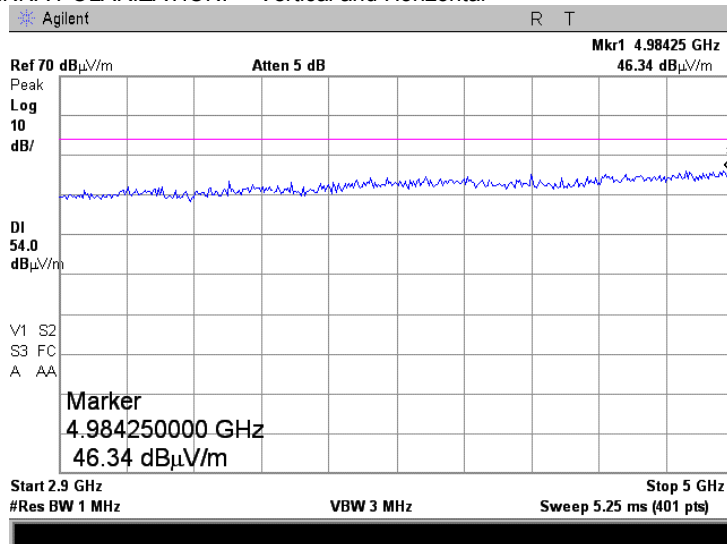
Plot 7.6.33 Radiated emission measurements from 1.0 to 2.9 GHz at the high carrier frequency

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



Plot 7.6.34 Radiated emission measurements from 2.9 to 5.0 GHz at the high carrier frequency

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

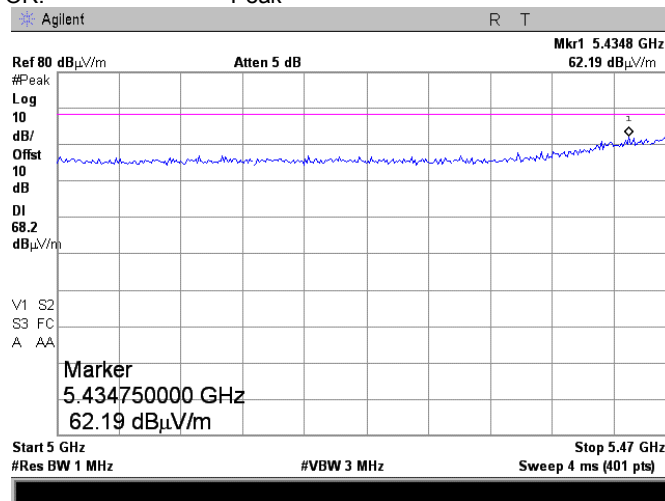




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

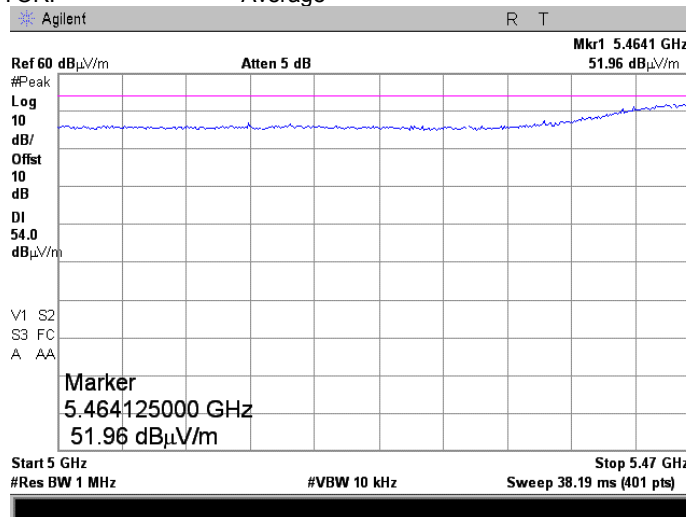
Plot 7.6.35 Radiated emission measurements from 5.0 to 5.47 GHz at the high carrier frequency

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



Plot 7.6.36 Radiated emission measurements from 5.0 to 5.47 GHz at the high carrier frequency

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

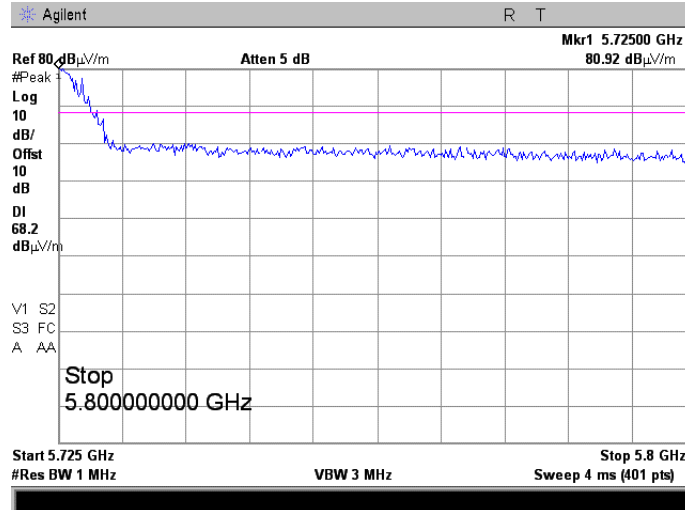




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.37 Radiated emission measurements from 5.725 to 5.8 GHz at the high carrier frequency

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



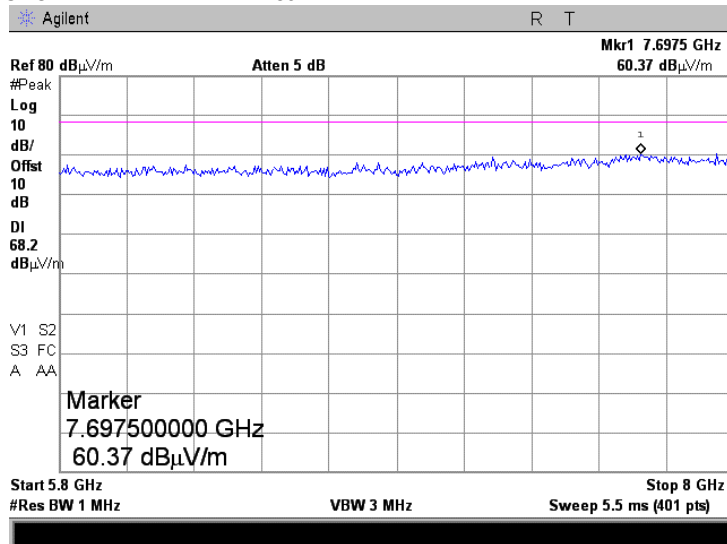
Note: Band edge emission measurement is given in section 7.5 of this test report (band edge is outside the restricted bands).



Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

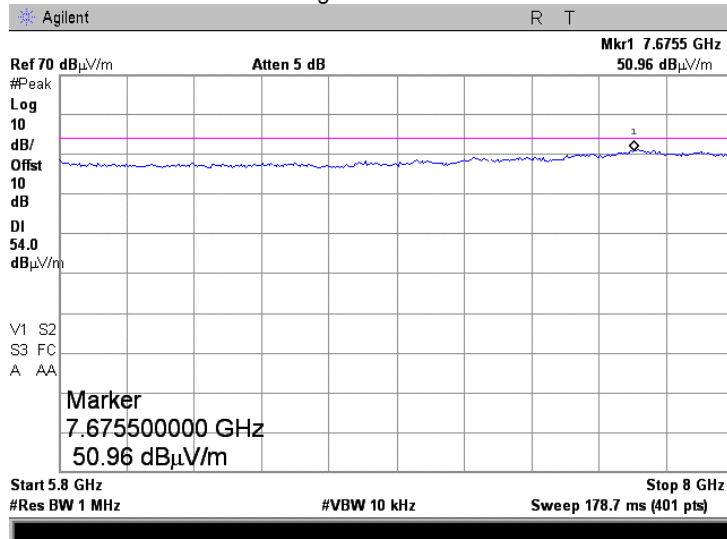
Plot 7.6.38 Radiated emission measurements from 5.8 to 8.0 GHz at the high carrier frequency

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



Plot 7.6.39 Radiated emission measurements from 5.8 to 8.0 GHz at the high carrier frequency

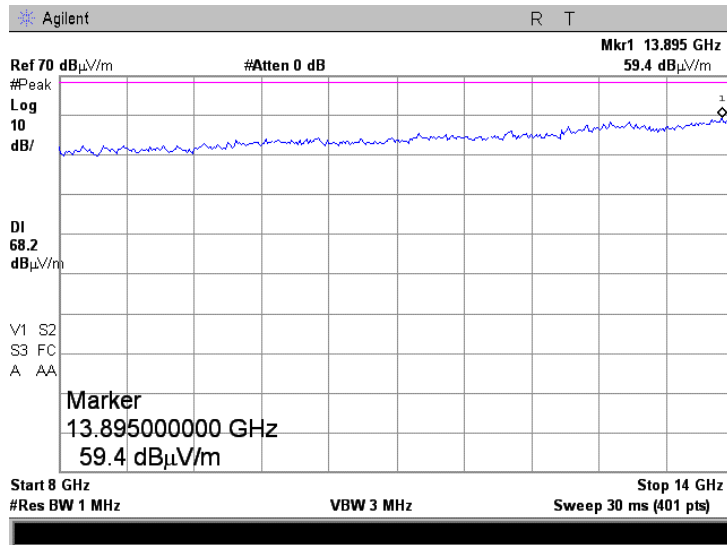
TEST SITE: Anechoic chamber
 TEST DISTANCE: 3 m
 ANTENNA POLARIZATION: Vertical and Horizontal
 DETECTOR: Average



Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

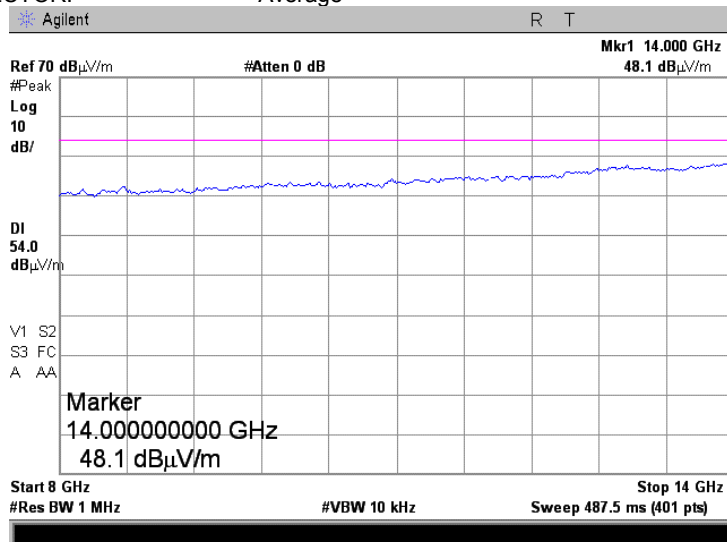
Plot 7.6.40 Radiated emission measurements from 8 to 14 GHz at the high carrier frequency

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



Plot 7.6.41 Radiated emission measurements from 8 to 14 GHz at the high carrier frequency

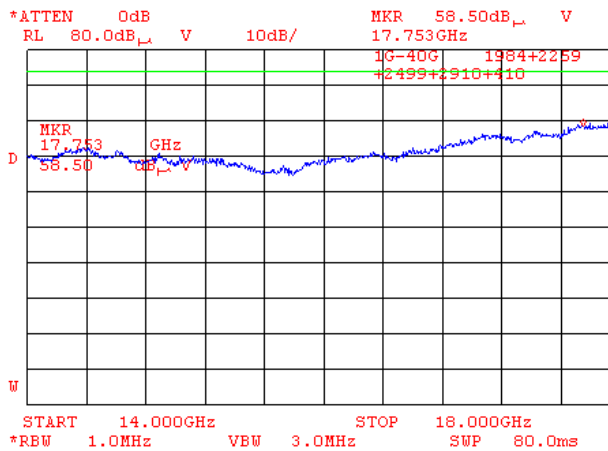
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Average



Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

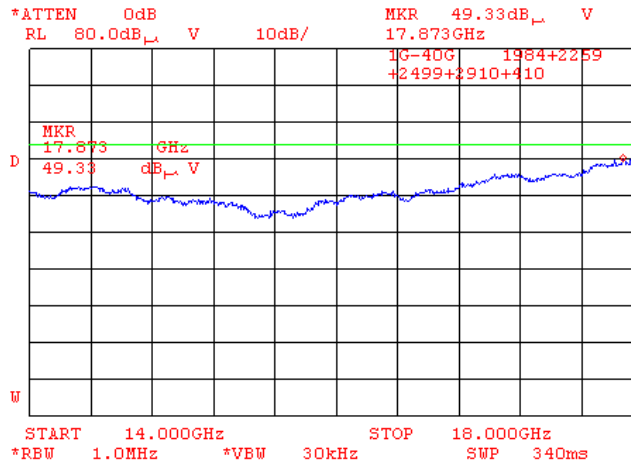
Plot 7.6.42 Radiated emission measurements from 14 to 18 GHz at the high carrier frequency

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



Plot 7.6.43 Radiated emission measurements from 14 to 18 GHz at the high carrier frequency

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

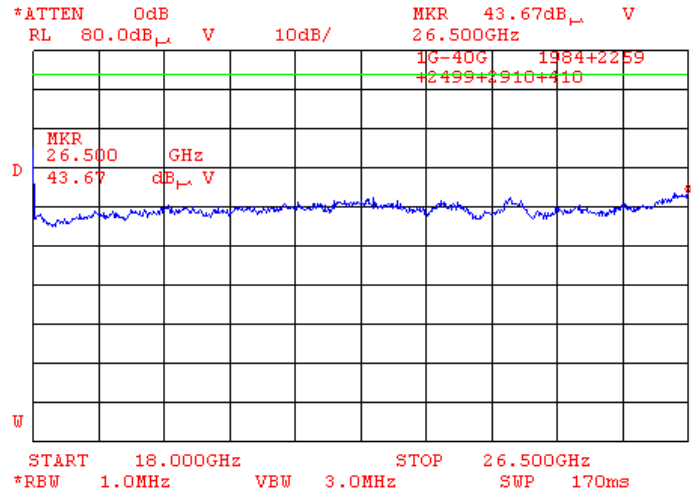




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

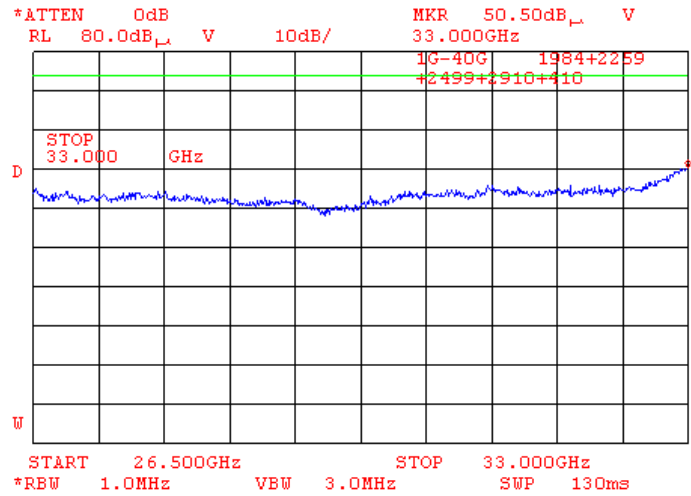
Plot 7.6.44 Radiated emission measurements from 18 to 26.5 GHz at the high carrier frequency

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



Plot 7.6.45 Radiated emission measurements from 26.5 to 33 GHz at the high carrier frequency

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

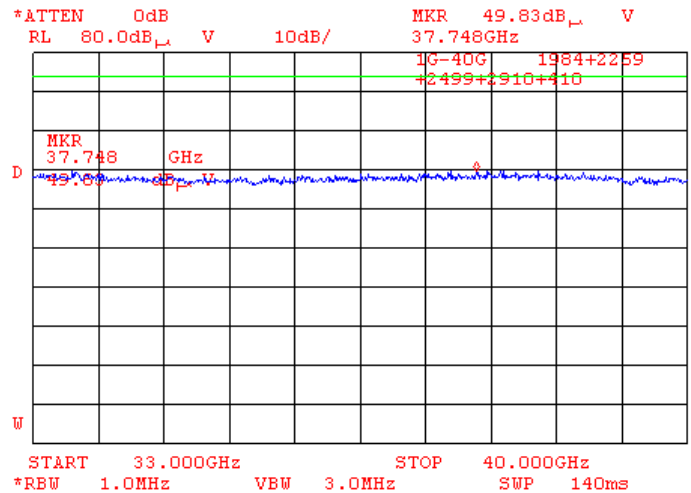




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.46 Radiated emission measurements from 33 to 40 GHz at the high carrier frequency

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

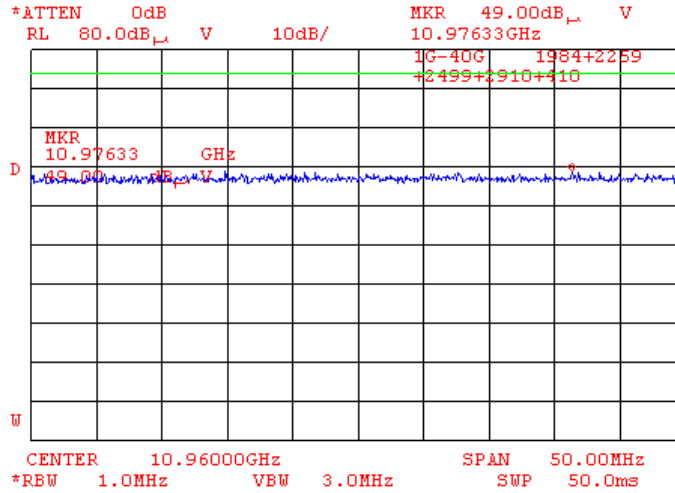




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

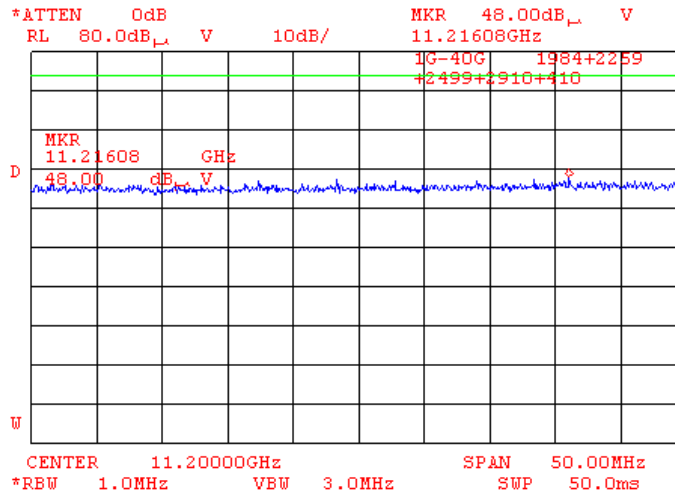
Plot 7.6.47 Radiated emission measurements at the second harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.6.48 Radiated emission measurements at the second harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

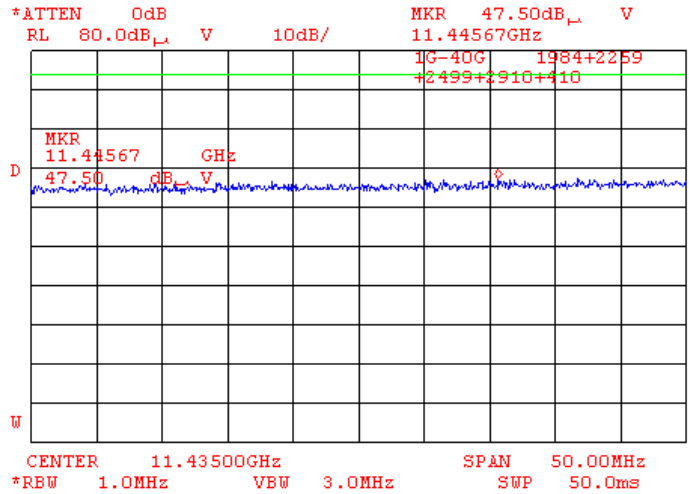




Test specification:	Section 15.407(b), Unwanted radiated emissions		
Test procedure:	Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict: PASS	
Date:	10/06/2007		
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

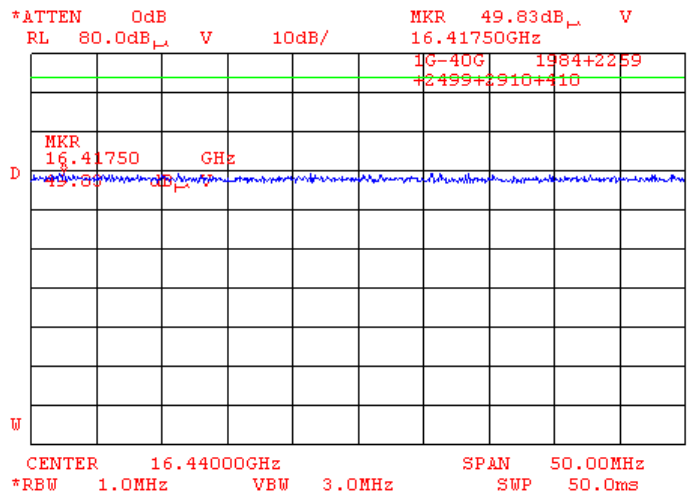
Plot 7.6.49 Radiated emission measurements at the second harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.6.50 Radiated emission measurements at the third harmonic of low carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m

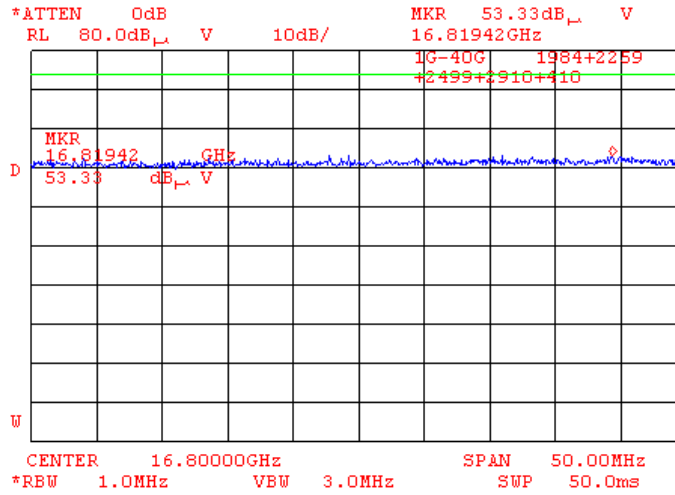




Test specification: Section 15.407(b), Unwanted radiated emissions			
Test procedure: Public notice DA 00-705/ 47 CFR, Section 15.247(c) / ANSI C63.4, Section 13.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/06/2007			
Temperature: 27°C	Air Pressure: 1009 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

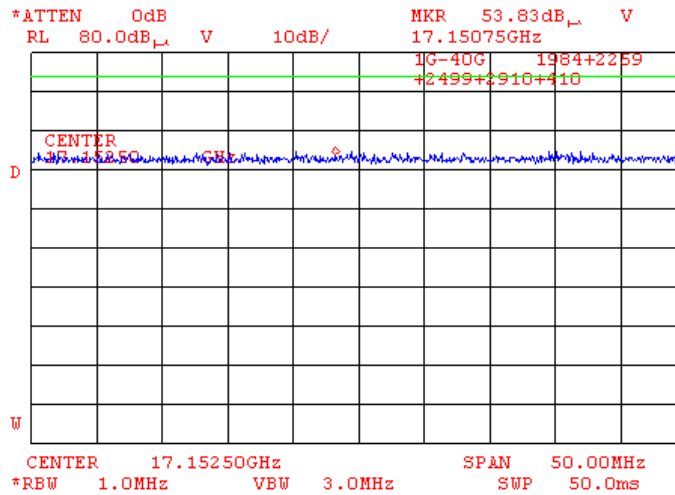
Plot 7.6.51 Radiated emission measurements at the third harmonic of mid carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 7.6.52 Radiated emission measurements at the third harmonic of high carrier frequency

TEST SITE: OATS
TEST DISTANCE: 3 m





Test specification: Section 15.407(g), Frequency stability			
Test procedure: Section 2.1055			
Test mode: Compliance	Verdict: PASS		
Date: 10/02/2007			
Temperature: 25°C	Air Pressure: 1013 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

7.7 Frequency stability test

7.7.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.7.1.

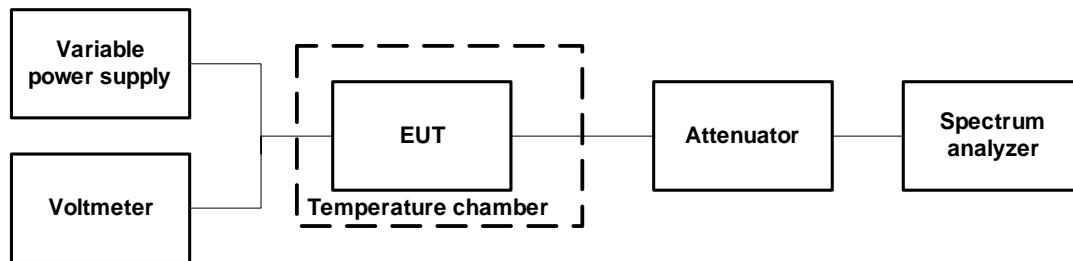
Table 7.7.1 Frequency stability limits

Assigned frequency band, MHz	Maximum allowed frequency displacement
5470 - 5725	Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.
- 7.7.2.2 The EUT power was turned off. Temperature within test chamber was set to the required one and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.7.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then after 2, 5 and 10 minutes. The EUT was powered off.
- 7.7.2.4 The above procedure was repeated at the rest of the test temperatures and voltages as provided in Table 7.7.2.
- 7.7.2.5 Frequency displacement was calculated and compared with the limit as provided in Table 7.7.2.

Figure 7.7.1 Frequency stability test setup





Test specification:		Section 15.407(g), Frequency stability	
Test procedure:		Section 2.1055	
Test mode:	Compliance	Verdict: PASS	
Date:	10/02/2007		
Temperature: 25°C	Air Pressure: 1013 hPa	Relative Humidity: 45 %	Power Supply: 120 VAC
Remarks:			

Table 7.7.2 Frequency stability test results

OPERATING FREQUENCY: 5470 - 5725 MHz
 NOMINAL POWER VOLTAGE: 120 VAC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Counter
 RESOLUTION BANDWIDTH: 10 kHz
 VIDEO BANDWIDTH: 30 kHz
 MODULATION: Unmodulated

Temperature °C	Voltage, V	Frequency, MHz				Max frequency drift, Hz		Verdict
		Start up	2 nd min	5 th min	10 th min	Positive	Negative	
Low frequency:								
-40	Nominal	5479.997516	5479.997688	5479.997707	5479.997743	3240	0	Pass
20	Nominal +15%	5479.994495	5479.994452	5479.994421	5479.994370	0	-133	
20	Nominal	5479.994830	5479.994734	5479.994580	5479.994503*	327	0	
20	Nominal -15%	5479.994357	5479.994344	5479.994330	5479.9943302	0	-173	
55	Nominal	5479.992605	5479.992622	5479.992665	5479.992790	0	-1898	
Mid frequency:								
-40	Nominal	5599.997681	5599.997715	5599.997713	5599.997710	2525	0	Pass
20	Nominal +15%	5599.995175	5599.995132	5599.995075	5599.995000	0	-190	
20	Nominal	5599.995396	5599.995368	5599.995279	5599.995190*	206	0	
20	Nominal -15%	5599.994981	5599.994923	5599.994891	5599.994764	0	-426	
55	Nominal	5599.992560	5599.992495	5599.992469	5599.992445	0	-2745	
High frequency:								
-40	Nominal	5717.497654	5717.497652	5717.497642	5717.497648	3656	0	Pass
20	Nominal +15%	5717.493985	5717.493976	5717.493965	5717.493956	0	-42	
20	Nominal	5717.494066	5717.494025	5717.494014	5717.493998*	68	0	
20	Nominal -15%	5717.493954	5717.493946	5717.493944	5717.493935	0	-63	
55	Nominal	5717.493730	5717.493291	5717.492932	5717.492450	0	-1548	

The maximum frequency drift is 3.6 kHz. The band edges of the channel is at least 2.5 MHz from either side of the band, the 3.6 kHz drift is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the EUT.

Reference numbers of test equipment used

HL 2882	HL 2909	HL 3286					
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Full description is given in Appendix A.

Test specification: Section 15.207, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance	Verdict: PASS		
Date: 10/11/2007			
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

7.8 Conducted emissions

7.8.1 General

This test was performed to measure common mode conducted emissions at the mains power port. Specification test limits are given in Table 7.8.1.

Table 7.8.1 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.

7.8.2 Test procedure

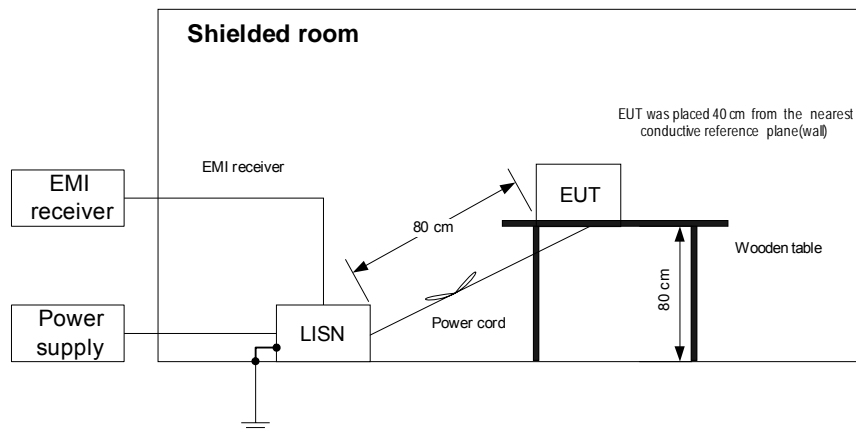
7.8.2.1 The EUT was set up as shown in Figure 7.8.1, energized and the performance check was conducted.

7.8.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.8.1. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

7.8.2.4 The worst test results (the lowest margins) were recorded in Table 7.8.2 and shown in the associated plots.

Figure 7.8.1 Setup for conducted emission measurements, table-top equipment





Test specification:		Section 15.207, Conducted emission at AC power port	
Test procedure:		ANSI C63.4, Sections 11.5 and 12.1.3	
Test mode:	Compliance	Verdict:	PASS
Date:	10/11/2007		
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

Table 7.8.2 Conducted emission test results

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

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*		
0.245243	46.52	45.55	61.93	-16.38	45.37	51.93	-6.56	L1	Pass
0.343819	45.23	44.89	59.17	-14.28	44.85	49.17	-4.32		
0.589317	44.83	44.16	56.00	-11.84	43.48	46.00	-2.52		
0.737016	44.15	43.55	56.00	-12.45	42.76	46.00	-3.24		
0.982425	43.93	43.51	56.00	-12.49	43.10	46.00	-2.90		
1.228275	43.74	43.17	56.00	-12.83	42.93	46.00	-3.07		
0.245743	46.80	46.26	61.92	-15.66	46.20	51.92	-5.72	L2	Pass
0.343806	46.90	46.48	59.17	-12.69	46.46	49.17	-2.71		
0.540070	45.95	45.67	56.00	-10.33	45.62	46.00	-0.38		
0.589805	46.23	45.53	56.00	-10.47	44.89	46.00	-1.11		
0.786275	46.30	45.91	56.00	-10.09	45.71	46.00	-0.29		
0.982617	45.36	45.03	56.00	-10.97	44.86	46.00	-1.14		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0672	HL 0787	HL 1430	HL 1503	HL 1510	HL 2888		
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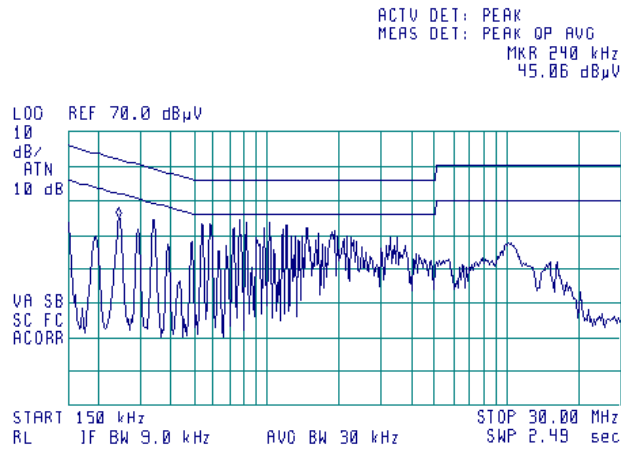
Full description is given in Appendix A.



Test specification: Section 15.207, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance	Verdict: PASS		
Date: 10/11/2007			
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

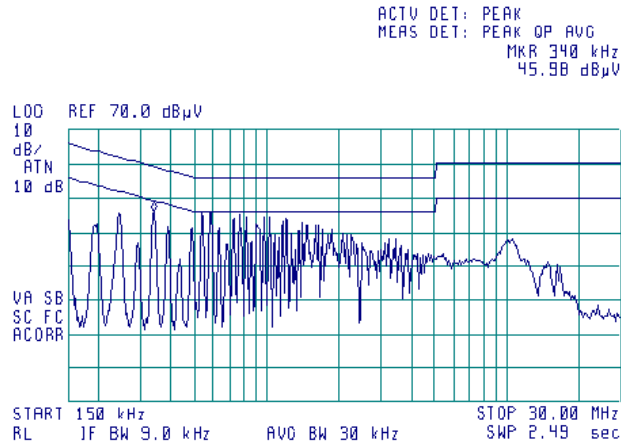
Plot 7.8.1 Conducted emission measurements

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



Plot 7.8.2 Conducted emission measurements

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





Test specification:	FCC Part 15, Section 203, Antenna requirements		
Test procedure:	Visual inspection / supplier declaration		
Test mode:	Compliance	Verdict:	PASS
Date:	10/08/2007		
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

7.9 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 7.9.1.

Table 7.9.1 Antenna requirements

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

Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance	Verdict: PASS		
Date: 10/11/2007			
Temperature: 25°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

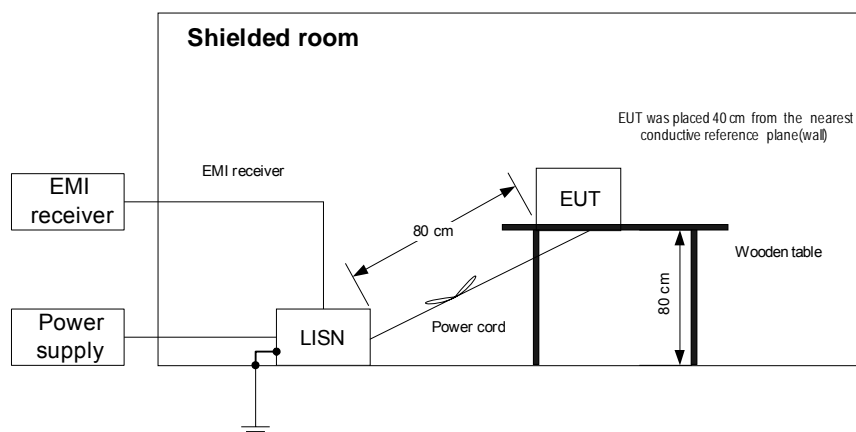
8.1.2.1 The EUT was set up as shown in Figure 8.1.1, energized and the performance check was conducted.

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.

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





Test specification:		Section 15.107, Conducted emission at AC power port	
Test procedure:		ANSI C63.4, Sections 11.5 and 12.1.3	
Test mode:	Compliance	Verdict:	PASS
Date:	10/11/2007		
Temperature: 25°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 SET UP: TABLE-TOP
 TEST SITE: SHIELDED ROOM
 DETECTORS USED: PEAK / QUASI-PEAK / AVERAGE
 FREQUENCY RANGE: 150 kHz - 30 MHz
 RESOLUTION BANDWIDTH: 9 kHz
 EUT MODE: Receive

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*		
0.245243	46.52	45.55	61.93	-16.38	45.37	51.93	-6.56	L1	Pass
0.343819	45.23	44.89	59.17	-14.28	44.85	49.17	-4.32		
0.589317	44.83	44.16	56.00	-11.84	43.48	46.00	-2.52		
0.737016	44.15	43.55	56.00	-12.45	42.76	46.00	-3.24		
0.982425	43.93	43.51	56.00	-12.49	43.10	46.00	-2.90		
1.228275	43.74	43.17	56.00	-12.83	42.93	46.00	-3.07		
0.245743	46.80	46.26	61.92	-15.66	46.20	51.92	-5.72	L2	Pass
0.343806	46.90	46.48	59.17	-12.69	46.46	49.17	-2.71		
0.540070	45.95	45.67	56.00	-10.33	45.62	46.00	-0.38		
0.589805	46.23	45.53	56.00	-10.47	44.89	46.00	-1.11		
0.786275	46.30	45.91	56.00	-10.09	45.71	46.00	-0.29		
0.982617	45.36	45.03	56.00	-10.97	44.86	46.00	-1.14		

*- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

HL 0672	HL 0787	HL 1430	HL 1503	HL 1510	HL 2888		
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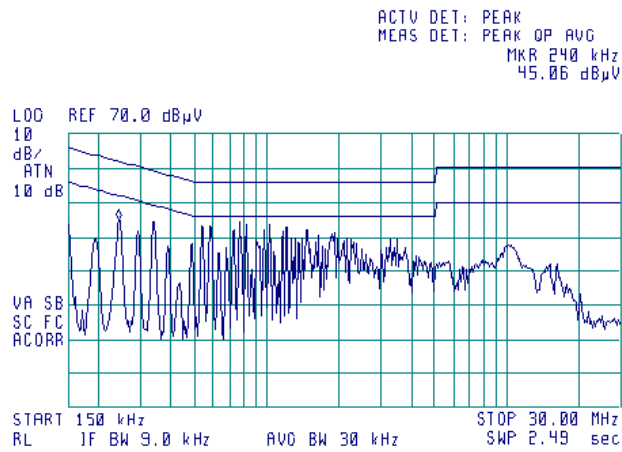
Full description is given in Appendix A.



Test specification: Section 15.107, Conducted emission at AC power port			
Test procedure: ANSI C63.4, Sections 11.5 and 12.1.3			
Test mode: Compliance	Verdict: PASS		
Date: 10/11/2007			
Temperature: 25°C	Air Pressure: 1012 hPa	Relative Humidity: 48 %	Power Supply: 120 VAC
Remarks:			

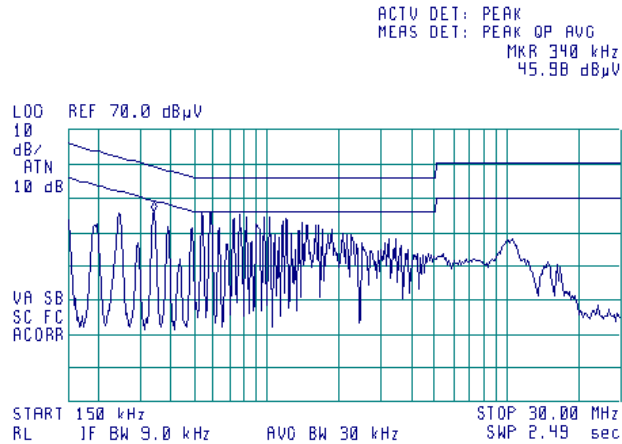
Plot 8.1.1 Conducted emission measurements

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



Plot 8.1.2 Conducted emission measurements

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





Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance		Verdict: PASS	
Date: 10/08/2007			
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	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 8.2.1 Radiated emission test limits

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*
Above 960	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: $Lim_{S_2} = Lim_{S_1} + 20 \log(S_1/S_2)$, where S_1 and S_2 – standard defined and test distance respectively in meters.

8.2.2 Test procedure

- 8.2.2.1** The EUT was set up as shown in Figure 8.2.1, energized and the EUT performance was checked.
- 8.2.2.2** The preliminary measurements were performed in the anechoic chamber at 3 m test distance. The specified frequency range was investigated with the antenna connected to the EMI receiver. To find the highest emission the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations. The EUT cables position was varied to maximize emission.
- 8.2.2.3** The EUT was set up as shown in Figure 8.2.2, energized and the EUT performance was checked.
- 8.2.2.4** The final measurements were performed at the open area test site at 3 m test distance with the antenna connected to the EMI receiver. The EUT wires and cables were arranged to produce the highest emission as it was found during the preliminary measurements. The frequencies, produced the highest emissions with respect to the limits during the preliminary test were investigated. To find the highest emission the turntable was rotated 360° and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal polarizations.
- 8.2.2.5** The worst test results with respect to the limits were recorded in Table 8.2.2 and shown in the associated plots.

Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance		Verdict: PASS	
Date: 10/08/2007			
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

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

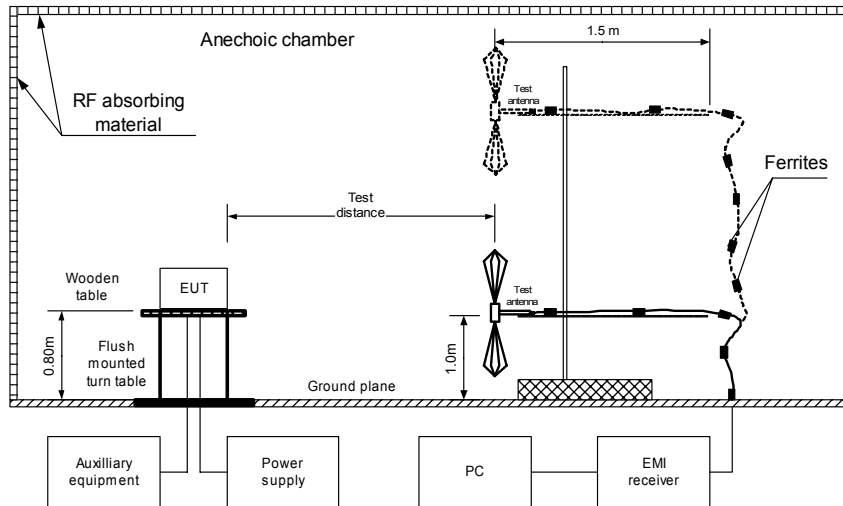
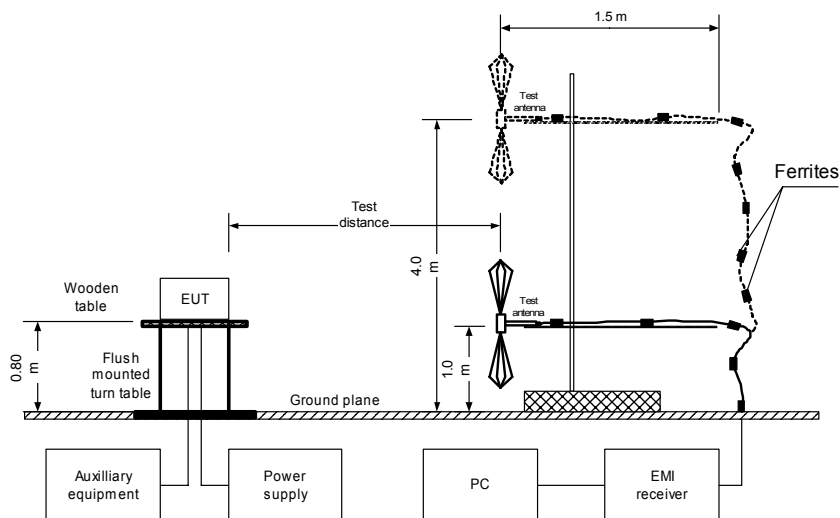


Figure 8.2.2 Setup for radiated emission measurements at OATS, table-top equipment





Test specification:		Section 15.109, Radiated emission	
Test procedure:		ANSI C63.4, Sections 11.6 and 12.1.4	
Test mode:	Compliance	Verdict:	PASS
Date:	10/08/2007		
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Table 8.2.2 Radiated emission test results

EUT SET UP: TABLE-TOP
TEST SITE: OATS
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*				
300.000000	35.81	35.19	46.00	-10.81	V	1.5	120	Pass
600.006250	41.28	40.26	46.00	-5.74	H	1.5	130	
624.980000	35.63	33.47	46.00	-12.53	H	1.2	120	
700.000000	43.82	42.79	46.00	-3.21	V	1.4	302	
724.995000	38.38	36.24	46.00	-9.76	V	1.2	100	
800.006250	35.31	32.78	46.00	-13.22	V	1.2	90	

TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTORS USED: PEAK / AVERAGE
FREQUENCY RANGE: 1000 – 33000 MHz
RESOLUTION BANDWIDTH: 1000 kHz

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

*- Margin = Measured emission - specification limit.

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

Reference numbers of test equipment used

HL 0415	HL 0813	HL 0569	HL 1200	HL 1424	HL 1430	HL 1553	HL 1566
HL 1947	HL 1984	HL 2254	HL 2259	HL 2260	HL 2399	HL 2387	HL 2697
HL 2909	HL 2910						

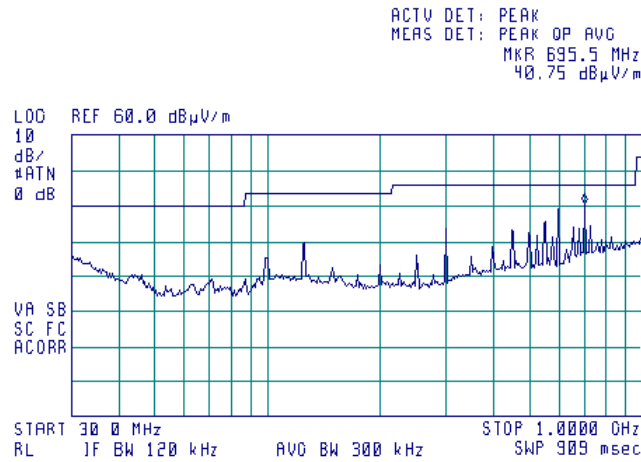
Full description is given in Appendix A.



Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/08/2007			
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

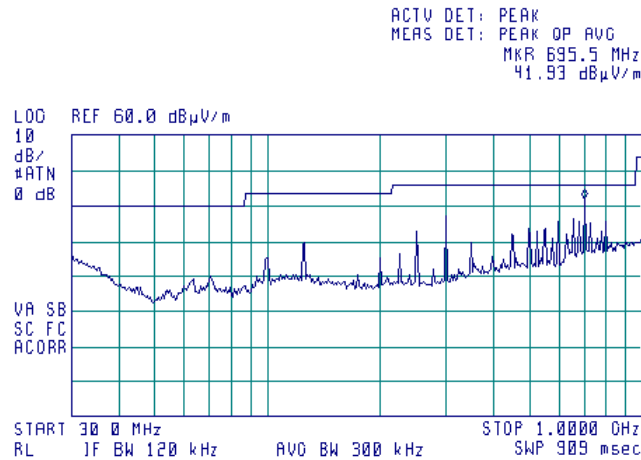
Plot 8.2.1 Radiated emission measurements in 30 - 1000 MHz range, vertical antenna polarization

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





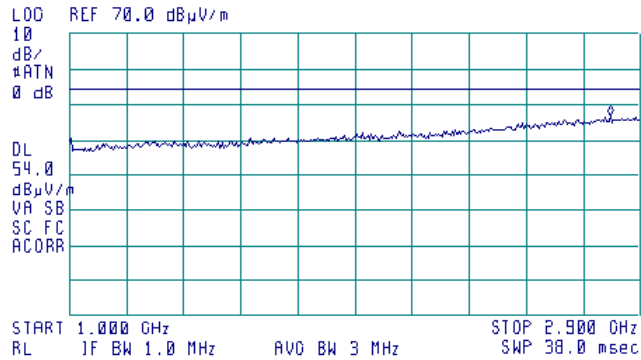
Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/08/2007			
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

Plot 8.2.3 Radiated emission measurements 1.0 – 2.9 GHz, vertical & horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m

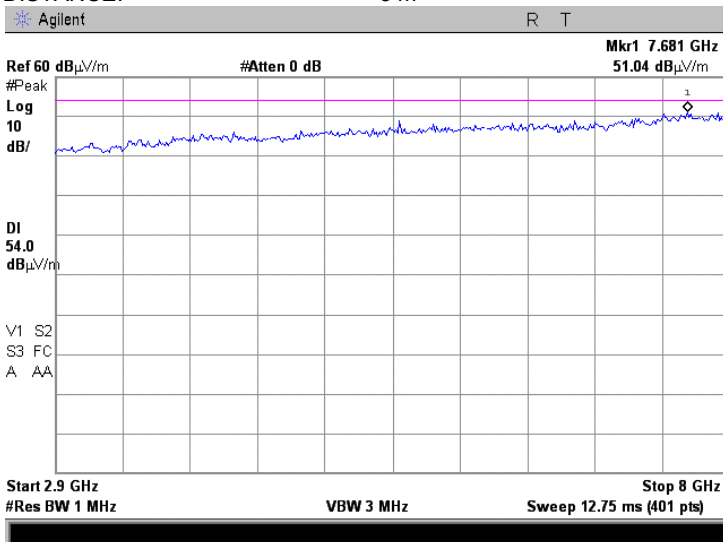


ACTV DET: PEAK
MEAS DET: PEAK OP AVG
MKR 2.800 GHz
46.60 dBµV/m



Plot 8.2.4 Radiated emission measurements 2.9 – 8.0 GHz, vertical & horizontal antenna polarization

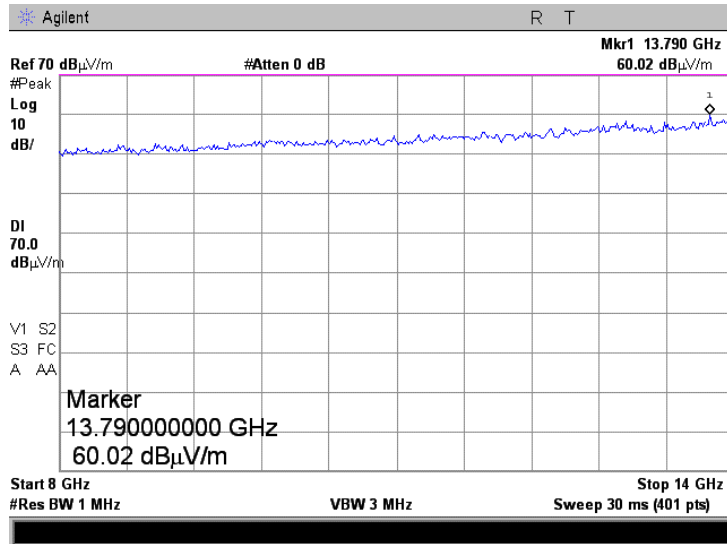
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m



Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance	Verdict: PASS		
Date: 10/08/2007			
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

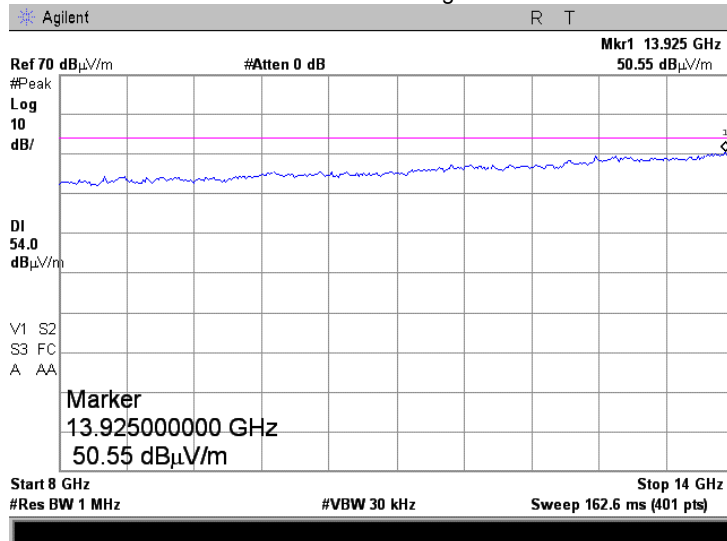
Plot 8.2.5 Radiated emission measurements 8.0 – 14 GHz, vertical & horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
DETECTOR: Peak



Plot 8.2.6 Radiated emission measurements 8.0 – 14 GHz, vertical & horizontal antenna polarization

TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
DETECTOR: Average

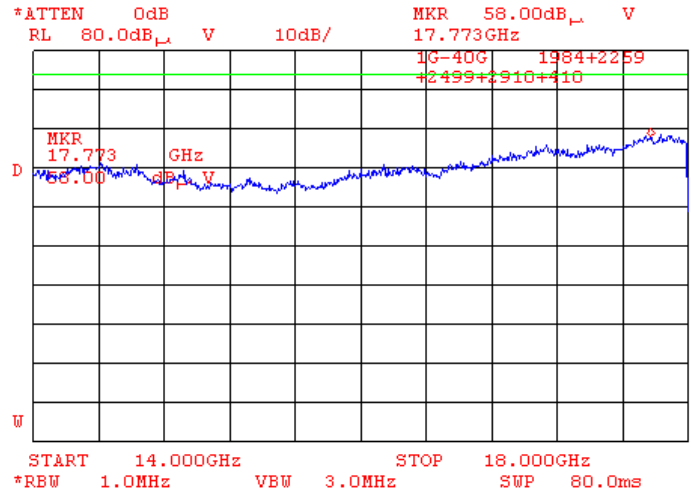




Test specification: Section 15.109, Radiated emission			
Test procedure: ANSI C63.4, Sections 11.6 and 12.1.4			
Test mode: Compliance			Verdict: PASS
Date: 10/08/2007			
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

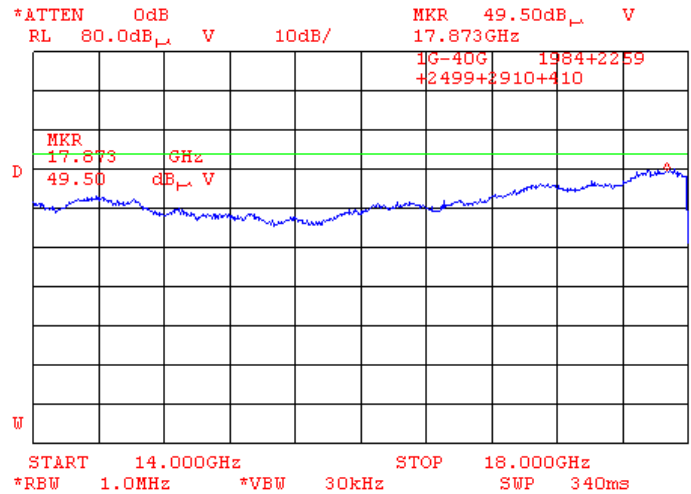
Plot 8.2.7 Radiated emission measurements from 14.0 to 18 GHz, vertical & horizontal antenna polarization

TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTOR: Peak



Plot 8.2.8 Radiated emission measurements from 14.0 to 18 GHz, vertical & horizontal antenna polarization

TEST SITE: OATS
TEST DISTANCE: 3 m
DETECTOR: Average

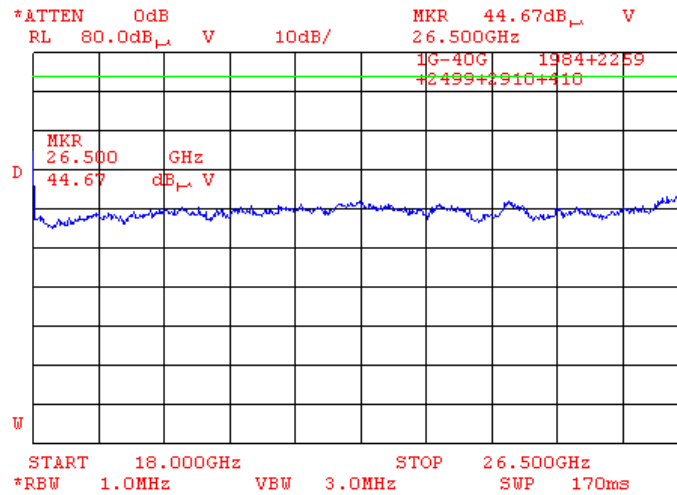




Test specification:	Section 15.109, Radiated emission		
Test procedure:	ANSI C63.4, Sections 11.6 and 12.1.4		
Test mode:	Compliance	Verdict:	PASS
Date:	10/08/2007		
Temperature: 24°C	Air Pressure: 1012 hPa	Relative Humidity: 44 %	Power Supply: 120 VAC
Remarks:			

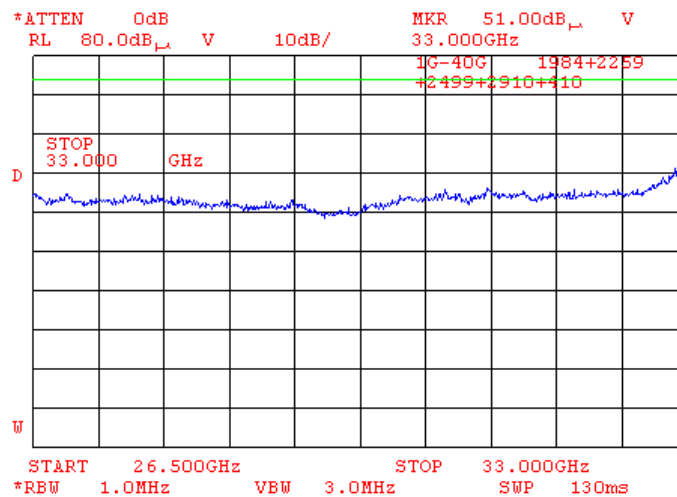
Plot 8.2.9 Radiated emission measurements from 18 to 26.5 GHz, vertical & horizontal antenna polarization

TEST SITE: OATS
TEST DISTANCE: 3 m



Plot 8.2.10 Radiated emission measurements from 26.5 to 33 GHz, vertical & horizontal antenna polarization

TEST SITE: OATS
TEST DISTANCE: 3 m



**9 APPENDIX A Test equipment and ancillaries used for tests**

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0415	Cable, Coax, RF, RG-214	HL	CC-3	056	02-Dec-06	02-Dec-07
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	28-Jun-07	28-Jun-08
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard Co	8546A	3617A 00319, 3448A002 53	28-Aug-07	28-Aug-08
0569	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1953	10-Jan-07	10-Jan-08
0589	Cable Coaxial, GORE A2P01POL118, 2.3 m	HL	GORE-3	176	02-Dec-06	02-Dec-07
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	10-Jan-07	10-Jan-08
0672	Shielded Room 4.6(L) x 4.2(W) x 2.4(H) m	HL	SR - 3	027	11-Nov-06	11-Nov-07
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard Co	11947A	3107A018 77	21-Nov-06	21-Nov-07
0813	Cable Coax, RG-214, 12 m, N-type connectors	HL	C214-12	149	02-Dec-06	02-Dec-07
1200	Quadruplexer 1-12 GHz (1-2 GHz; 2-4GHz;4-8 GHz; 8-12GHz)	Elettronica S.p.A. - Roma	UE 84	D/00240	08-Feb-07	08-Feb-09
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-07	28-Aug-08
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	31-Aug-07	31-Aug-08
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	31-Aug-07	31-Aug-08
1503	Cable RF, 6 m, BNC/BNC	Belden	M17/167 MIL-C-17	1503	11-Sep-07	11-Sep-08
1510	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1510	01-Jan-07	01-Jan-08
1553	Cable RF, 3.5 m	Alpha Wire	RG-214	1553	22-May-07	22-May-08
1556	Cable RF, 0.5 m	Telequis	MIL-C-17F-RG 058 CU	1556	12-Sep-07	12-Sep-08
1566	Cable RF, 2 m	Huber-Suhner	Sucoflex 104PE	13094/4PE	02-Dec-06	02-Dec-07
1947	Cable 18GHz, 6.5 m, blue	Rhophase Microwave Limited	NPS-1803A-6500-NPS	T4974	05-Oct-07	05-Oct-08
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	03-Mar-07	03-Mar-08
2009	Cable RF, 8 m	Alpha Wire	RG-214	C-56	20-May-07	20-May-08
2254	Cable 40GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	17-Jun-07	17-Jun-08
2259	Amplifier Low Noise 2-20 GHz	Sophia Wireless	LNA0220-C	0223	05-Nov-06	05-Nov-07
2260	Amplifier Low Noise 14-33 GHz	Sophia Wireless	LNA28-B	0233	05-Nov-06	05-Nov-07
2387	Filter Bandpass, 8-14 GHz	HL	FBP8-14	2387	05-Jun-07	05-Jun-09
2399	Cable 40 GHz, 1.5 m, blue	Rhophase Microwave Limited	KPS-1503A-1500-KPS	X2945	01-Jan-07	01-Jan-08



HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
2524	Attenuator, 10 dB, DC-18 GHz	Midwest Microwave	263-10	2524	03-Jan-07	03-Jan-08
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	10-Jan-07	10-Jan-08
2882	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539001	11-Feb-07	11-Feb-08
2888	LISN Two-line V-Network 50 Ohm / 50 uH + 5 Ohm, 16A, MIL STD 461E, CISPR 16-1	Rolf Heine	NNB-2/16Z	02/10018	29-Mar-07	29-Mar-08
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	07-May-07	07-May-08
2910	Cable 18 GHz, 3 m, SMA-SMA	Gore	NA	989370	05-Oct-07	05-Oct-08
2925	Directional coupler 80 MHz to 2400 MHz, 50 dB	RLC Electronics	M-3341	9648	25-May-07	25-May-08
2952	Cable, RF, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-07	05-Oct-08
3286	Temperature chamber, (-40 to +170) °C	Thermotron	EL-8-CH-1-1-CO2	21-9048	16-Aug-07	16-Aug-08

10 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Conducted carrier power at RF antenna connector	Below 12.4 GHz: ± 1.7 dB 12.4 GHz to 40 GHz: ± 2.3 dB
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Occupied bandwidth	± 8.0 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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

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

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

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) and by Industry Canada for electromagnetic emissions (file numbers IC 2186-1 for OATS and IC 2186-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), assessed by TNO Certification EP&S (Netherlands) for a number of EMC, telecommunications, environmental, safety standards, and by AMTAC (UK) for safety of medical devices. 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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Person for contact: Mr. Alex Usoskin, CEO.

12 APPENDIX D Specification references

47CFR part 15: 2006	Radio Frequency Devices.
FCC Public Notice DA 02-2138 August 30, 2002	Measurement procedure updated for peak transmit power in U-NII bands
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	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.

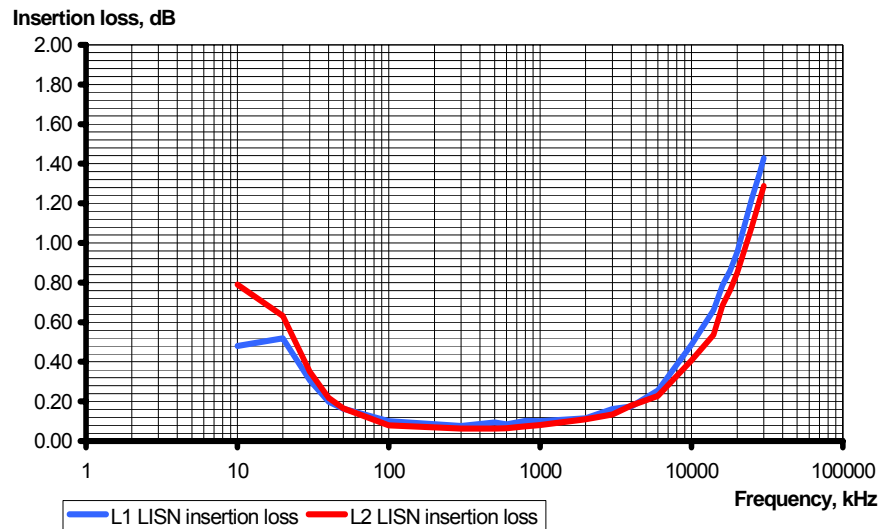
13 APPENDIX E Abbreviations and acronyms

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
dB Ω	decibel referred to one Ohm
DC	direct current
DTS	digital transmission system
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
FHSS	frequency hopping spread spectrum
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LISN	line impedance stabilization network
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NT	not tested
OATS	open area test site
Ω	Ohm
PCB	printed circuit board
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
VA	volt-ampere

14 APPENDIX F Test equipment correction factors

**Correction factor
Line impedance stabilization network
Model NNB-2/16Z, Rolf Heine, HL 2888**

Frequency, kHz	Insertion loss, dB		Measurement Uncertainty, dB
	L1	N	
10	0.48	0.79	±0.6
20	0.52	0.63	
30	0.31	0.35	
40	0.20	0.22	
50	0.16	0.17	
100	0.10	0.08	
300	0.08	0.06	
500	0.10	0.06	
600	0.09	0.07	
800	0.10	0.07	
1000	0.10	0.08	
2000	0.12	0.11	
3000	0.16	0.14	
4000	0.17	0.18	
6000	0.26	0.23	
10000	0.49	0.41	
14000	0.66	0.54	
16000	0.79	0.69	
18000	0.86	0.76	
20000	0.96	0.85	
25000	1.22	1.08	
28000	1.35	1.21	
30000	1.43	1.29	



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).

Antenna factor
Biconilog antenna EMCO, model 3141, serial number 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	560	19.8	1300	27.0
28	7.8	580	20.6	1320	27.8
30	7.8	600	21.3	1340	28.3
40	7.2	620	21.5	1360	28.2
60	7.1	640	21.2	1380	27.9
70	8.5	660	21.4	1400	27.9
80	9.4	680	21.9	1420	27.9
90	9.8	700	22.2	1440	27.8
100	9.7	720	22.2	1460	27.8
110	9.3	740	22.1	1480	28.0
120	8.8	760	22.3	1500	28.5
130	8.7	780	22.6	1520	28.9
140	9.2	800	22.7	1540	29.6
150	9.8	820	22.9	1560	29.8
160	10.2	840	23.1	1580	29.6
170	10.4	860	23.4	1600	29.5
180	10.4	880	23.8	1620	29.3
190	10.3	900	24.1	1640	29.2
200	10.6	920	24.1	1660	29.4
220	11.6	940	24.0	1680	29.6
240	12.4	960	24.1	1700	29.8
260	12.8	980	24.5	1720	30.3
280	13.7	1000	24.9	1740	30.8
300	14.7	1020	25.0	1760	31.1
320	15.2	1040	25.2	1780	31.0
340	15.4	1060	25.4	1800	30.9
360	16.1	1080	25.6	1820	30.7
380	16.4	1100	25.7	1840	30.6
400	16.6	1120	26.0	1860	30.6
420	16.7	1140	26.4	1880	30.6
440	17.0	1160	27.0	1900	30.6
460	17.7	1180	27.0	1920	30.7
480	18.1	1200	26.7	1940	30.9
500	18.5	1220	26.5	1960	31.2
520	19.1	1240	26.5	1980	31.6
540	19.5	1260	26.5	2000	32.0
		1280	26.6		

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).



Antenna factor
Double-ridged wave guide horn antenna
EMC Test Systems, model 3115, serial no: 9911-5964, HL 1984

Frequency, MHz	Antenna gain, dBi	Antenna factor. dB(1/m)
1000.0	5.8	24.5
1500.0	9.0	24.8
2000.0	8.6	27.7
2500.0	9.5	28.7
3000.0	8.9	30.8
3500.0	8.2	32.9
4000.0	9.6	32.7
4500.0	11.2	32.1
5000.0	10.6	33.6
5500.0	9.8	35.3
6000.0	10.1	35.7
6500.0	10.7	35.8
7000.0	10.9	36.2
7500.0	10.5	37.2
8000.0	11.1	37.2
8500.0	10.8	38.1
9000.0	10.7	38.6
9500.0	11.5	38.3
10000.0	11.8	38.4
10500.0	12.3	38.3
11000.0	12.3	38.8
11500.0	11.5	39.9
12000.0	12.2	39.6
12500.0	12.6	39.5
13000.0	12.0	40.5
13500.0	11.7	41.1
14000.0	11.7	41.5
14500.0	12.7	40.8
15000.0	14.2	39.5
15500.0	16.0	38.1
16000.0	16.2	38.1
16500.0	14.5	40.1
17000.0	12.2	42.6
17500.0	9.7	45.4
18000.0	6.6	48.7

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

Antenna Factor
Active Loop Antenna
EMC Test Systems, model 6502, serial number 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(μ V) to convert it into field intensity in dB(μ A/m).

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

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

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

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

Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain
30	22.2	-22.5	0.01	620	19.7	6.3	4.27	1215	24.9	7.0	5.05	1810	28.3	7.1	5.08	2405	30.9	6.9	4.93
35	18.5	-17.4	0.02	625	19.7	6.5	4.42	1220	24.9	7.0	4.99	1815	28.5	6.9	4.91	2410	30.9	6.9	4.89
40	14.7	-12.5	0.06	630	19.6	6.6	4.57	1225	25.1	6.9	4.91	1820	28.6	6.8	4.74	2415	31.0	6.9	4.85
45	11.3	-8.1	0.16	635	19.6	6.5	4.48	1230	25.2	6.8	4.82	1825	28.7	6.8	4.76	2420	31.0	6.8	4.82
45	11.3	-8.1	0.16	640	19.9	6.4	4.40	1235	25.1	7.0	4.96	1830	28.7	6.8	4.76	2425	31.1	6.8	4.81
50	8.9	-4.7	0.34	645	19.9	6.5	4.45	1240	25.0	7.1	5.09	1835	28.7	6.7	4.72	2430	31.0	6.9	4.87
55	7.9	-2.8	0.62	650	19.9	6.5	4.51	1245	25.0	7.1	5.12	1840	28.8	6.7	4.69	2435	31.0	6.9	4.88
60	7.8	-2.1	0.82	655	19.9	6.6	4.60	1250	25.0	7.1	5.15	1845	28.6	6.9	4.90	2440	31.2	6.8	4.74
65	2.0	8.5	2.0	660	19.9	6.7	4.69	1255	25.0	7.2	5.25	1850	28.4	7.1	5.12	2445	31.1	6.9	4.91
70	9.0	-1.9	0.64	665	19.9	6.7	4.70	1260	24.9	7.3	5.36	1855	28.5	7.0	5.07	2450	31.0	7.0	4.96
75	8.8	-1.1	0.78	670	20.0	6.7	4.71	1265	25.0	7.3	5.31	1860	28.6	7.0	5.01	2455	31.0	7.0	5.01
80	8.4	-0.2	0.97	675	20.1	6.7	4.71	1270	25.1	7.2	5.26	1865	28.5	7.1	5.17	2460	30.9	7.2	5.19
85	8.0	0.8	1.20	680	20.1	6.7	4.71	1275	25.3	7.0	5.05	1870	28.4	7.3	5.33	2465	31.1	6.9	4.95
90	9.2	1.1	1.29	685	20.1	6.8	4.79	1280	25.5	6.8	4.94	1875	28.4	7.2	5.28	2470	31.3	6.8	4.76
95	9.2	0.5	1.13	690	20.1	6.9	4.88	1285	25.4	7.0	4.97	1880	28.5	7.2	5.22	2475	31.4	6.7	4.69
100	10.6	-0.4	0.92	695	20.2	6.8	4.82	1290	25.3	7.1	5.10	1885	28.5	7.2	5.22	2480	31.3	6.8	4.79
110	12.6	-1.6	0.70	705	20.4	6.8	4.75	1300	25.2	7.3	5.33	1895	28.6	7.2	5.24	2490	31.1	7.0	4.99
120	13.9	-2.1	0.62	715	20.5	6.8	4.80	1310	25.5	7.1	5.09	1905	28.5	7.3	5.36	2500	30.9	7.2	5.27
125	14.2	-2.0	0.63	720	20.5	6.9	4.85	1315	25.6	7.2	5.23	1910	28.5	7.4	5.45	2505	31.1	7.1	5.15
130	14.2	-1.7	0.68	725	20.6	6.8	4.81	1320	25.3	7.3	5.36	1915	28.5	7.3	5.38	2510	31.0	7.2	5.22
140	13.4	-0.3	0.94	735	20.9	6.7	4.65	1330	25.6	7.0	5.06	1925	28.6	7.3	5.35	2520	31.2	7.0	5.05
150	12.9	0.8	1.21	745	21.0	6.6	4.59	1340	25.7	7.1	5.09	1935	28.5	7.4	5.54	2530	31.0	7.3	5.37
160	12.7	1.6	1.44	755	21.0	6.8	4.74	1350	25.7	7.1	5.09	1945	28.5	7.5	5.59	2540	31.2	7.1	5.08
165	2.0	2.0	1.59	760	21.0	6.8	4.73	1355	25.8	7.2	5.06	1950	28.5	7.4	5.48	2545	31.0	7.3	4.43
170	12.2	2.6	1.83	765	21.1	6.8	4.73	1360	25.9	6.9	4.95	1955	28.6	7.5	5.57	2550	31.0	7.3	5.39
175	11.8	3.3	2.13	770	21.3	6.7	4.64	1365	26.0	6.9	4.95	1960	28.6	7.5	5.65	2555	31.1	7.2	5.30
180	11.6	3.7	2.36	775	21.3	6.7	4.68	1370	26.0	7.0	4.96	1965	28.7	7.4	5.47	2560	31.0	7.4	5.47
185	11.5	4.0	2.54	780	21.3	6.7	4.72	1375	26.0	7.0	5.01	1970	28.9	7.2	5.29	2565	30.8	7.6	5.70
190	11.2	4.2	2.81	785	21.2	6.8	4.77	1380	26.1	7.2	5.27	1975	28.9	7.4	5.22	2570	31.0	7.3	5.22
200	13.1	3.2	2.07	795	21.4	6.8	4.79	1390	26.1	6.9	4.92	1985	29.1	7.1	5.11	2580	31.6	6.9	4.87
205	12.0	4.4	2.76	800	21.5	6.8	4.77	1395	26.2	6.9	4.94	1990	29.1	7.0	5.06	2585	31.6	6.8	4.79
210	11.0	5.6	3.66	805	21.6	6.7	4.71	1400	26.2	7.0	4.96	1995	29.1	7.1	5.09	2590	31.6	6.9	4.88
215	11.3	5.6	3.69	810	21.7	6.7	4.65	1405	26.1	7.0	4.92	2000	29.1	7.1	5.11	2595	31.5	7.0	4.97
220	11.6	5.5	3.52	815	21.7	6.7	4.72	1410	26.1	7.1	5.09	2005	29.5	7.1	5.16	2600	31.6	6.9	4.86
225	11.7	5.5	3.55	820	21.7	6.8	4.80	1415	26.2	7.0	5.02	2010	29.1	7.1	5.15	2605	31.3	7.2	5.30
230	11.9	5.5	3.57	825	21.7	6.8	4.82	1420	26.3	7.0	4.96	2015	29.2	7.1	5.13	2610	31.4	7.1	5.15
235	12.1	5.5	3.56	830	21.7	6.9	4.85	1425	26.2	7.1	5.10	2020	29.2	7.1	5.18	2615	31.7	6.9	4.88
240	12.3	5.5	3.54	835	21.8	6.8	4.82	1430	26.1	7.2	5.25	2025	29.3	7.1	5.08	2620	31.8	7.0	4.97
245	12.3	5.7	3.71	840	21.9	6.8	4.80	1435	26.1	7.2	5.24	2030	29.3	7.0	5.05	2625	31.4	7.1	5.17
250	12.3	5.9	3.88	845	21.9	6.8	4.83	1440	26.2	7.2	5.24	2035	29.3	7.1	5.07	2630	31.6	7.0	5.00
255	12.5	5.9	3.85	850	22.0	6.8	4.86	1445	26.3	7.1	5.11	2040	29.3	7.1	5.13	2635	31.6	6.8	4.82
260	12.7	5.8	3.83	855	22.0	6.8	4.80	1450	26.5	7.0	4.98	2045	29.2	7.2	5.23	2640	31.7	7.0	4.98
265	13.2	5.5	3.54	860	22.1	6.8	4.74	1455	26.4	7.1	5.07	2050	29.2	7.2	5.27	2645	31.7	6.9	4.93
270	13.7	5.2	3.27	865	22.0	6.9	4.92	1460	26.4	7.1	5.17	2055	29.3	7.2	5.21	2650	31.8	6.9	4.85
275	13.7	5.3	3.39	870	21.9	7.1	5.11	1465	26.4	7.2	5.19	2060	29.5	7.0	5.02	2655	31.8	6.9	4.85
280	13.7	5.4	3.50	875	22.0	7.1	5.08	1470	26.4	7.2	5.22	2065	29.4	7.1	5.08	2660	31.7	7.0	5.02
285	13.6	5.6	3.71	880	22.0	7.0	5.05	1475	26.4	7.1	5.12	2070	29.4	7.1	5.10	2665	31.6	6.7	4.71
290	13.7	5.7	3.72	885	22.1	7.0	5.06	1480	26.5	7.1	5.12	2075	29.5	7.0	5.10	2670	32.0	6.7	4.67
295	13.8	5.8	3.77	890	22.1	7.0	5.06	1485	26.5	7.1	5.14	2080	29.8	6.8	4.76	2675	31.9	6.8	4.81
300	13.9	5.8	3.81	895	22.2	7.1	5.09	1490	26.5	7.1	5.17	2085	29.7	6.9	4.89	2680	31.7	7.0	5.04
305	14.0	5.9	3.85	900	22.2	7.1	5.12	1495	26.5	7.2	5.24	2090	29.7	6.9	4.86	2685	31.9	6.8	4.83
310	14.1	5.9	3.88	905	22.3	7.1	5.09	1500	26.5	7.2	5.31	2095	29.8	6.8	4.78	2690	32.1	6.7	4.72
315	14.3	5.9	3.89	910	22.3	7.0	5.05	1505	26.5	7.2	5.27	2100	29.9	6.8	4.75	2695	32.1	6.7	4.71
320	14.4	5.9	3.90	915	22.4	7.0	4.99	1510	26.6	7.2	5.23	2105	29.8	6.8	4.81	2700	32.0	6.8	4.81
325	14.5	5.9	3.92	920	22.6	6.9	4.92	1515	26.6	7.2	5.20	2110	29.9	6.8	4.76	2705	32.0	6.8	4.80
330	14.6	5.9	3.93	925	22.7	6.9	4.85	1520	26.5	7.3	5.38	2115	29.9	6.8	4.76	2710	32.1	6.8	4.79
335	14.7	6.0	4.02	930	22.8	6.8	4.77	1525	26.6	7.3	5.37	2120	29.9	6.8	4.84	2715	32.1	6.7	4.71
340	14.7	6.2	4.12	935	22.8	6.8	4.83	1530	26.6	7.3	5.38	2125	29.9	6.9	4.89	2720	32.4	6.5	4.47
345	14.8	6.1	4.06	940	22.9	6.8	4.89	1535	26.8	7.3	5.44	2130	29.9	6.8	4.90	2725	32.2	6.7	4.83
350	15.1	6.0	3.99	945	22.8	6.9	4.87	1540	26.5	7.4	5.53	2135	29.8	6.9	4.94	2730	31.9	7.0	5.05
355	15.3	5.9	3.88	950	22.9	6.9	4.85	1545	26.5	7.5	5.58	2140	29.8	7.1	5.08	2735	31.6	7.4	5.44
360	15.6	5.8	3.78	955	23.0	6.8	4.81	1550	26.5	7.5	5.63	2145	29.9	6.9	4.92	2740	31.6	7.1	5.46
365	15.5	5.9	3.89	960	23.1	6.8	4.77	1555	26.7	7.3	5.39	2150	29.9	7.0	4.98	2745	31.9	7.0	5.06
370	15.5	6.0	4.01	965	23.1	6.7	4.73	1560	26.9	7.1	5.16	2155	29.8	7.1	5.10	2750	32.0	6.9	4.94
375	15.6	6.1	4.03	970	23.2	6.7	4.69	1565	26.9	7.2	5.23	2160	29.8	7.1	5.09	2755	32.0	7.0	4.98
380	15.7	6.1	4.05	975	23.2	6.8	4.82	1570	26.9	7.2	5.30	2165	29.9	7.0	5.00	2760	32.0	7.0	5.06
385	15.7	6.2	4.15	980	23.5	6.6	4.54	1575	27.0	7.2	5.23	2170	29.9	7.1	5.07	2765	32.2	6.8	4.80
390	15.7	6.3	4.25																



Cable loss
Cable Coaxial, RG-58/RG-214, s/n 056, HL 0415
+ Cable Coaxial, RG-214, 11.5m, s/n 148, HL 0812

No.	Frequency, MHz	Cable loss, dB	Measured uncertainty, dB
1	20	0.73	±0.12
2	30	0.91	
3	50	1.2	
4	80	1.56	
5	100	1.76	
6	200	2.59	
7	300	3.26	
8	400	3.93	
9	500	4.42	
10	600	4.92	
11	700	5.36	
12	800	5.88	
13	900	6.41	
14	1000	6.71	
15	1500	8.63	
16	2000	10.39	

Cable loss
Cable Coaxial, GORE A2P01POL118, 2.3 m, model:GORE-3, HL 0589
+ Cable Coaxial, ANDREW PSWJ4, 6m, model: ANDREW-6, HL 1004

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	30	0.33	≤ 6.5	±0.12
2	50	0.40		
3	100	0.57		
4	300	0.97		
5	500	1.25		
6	800	1.59		
7	1000	1.81		
8	1200	1.97		
9	1400	2.15		
10	1600	2.28		
11	1800	2.43		
12	2000	2.61		
13	2200	2.75		
14	2400	2.89		
15	2600	2.97		
16	2800	3.21	≤ 6.5	±0.12
17	3000	3.32		
18	3300	3.47		
19	3600	3.62		
20	3900	3.84		
21	4200	3.92		
22	4500	4.07		
23	4800	4.36		±0.17
24	5100	4.62		
25	5400	4.78		
26	5700	5.16		
27	6000	5.67		
28	6500	5.99		



Cable loss
Cable RG-214, HL 0813

No.	Frequency, MHz	Cable loss, dB
1	10	0.15
2	20	0.40
3	30	0.51
4	40	0.61
5	50	0.68
6	60	0.76
7	70	0.80
8	80	0.92
9	90	0.96
10	100	0.99
11	200	1.60
12	300	1.85
13	400	2.25
14	500	2.43
15	600	2.80
16	700	3.14
17	800	3.34
18	900	3.75
19	1000	4.05
20	1200	4.41
21	1400	4.81
22	1600	5.18
23	1800	5.58
24	2000	6.09
25	2500	7.27
26	2900	8.01



Cable loss
Cable coaxial, 6 m, model: M17/167 MIL-C-17, HL 1503

Frequency, MHz	Cable loss, dB
0.15	0.043
1	0.077
3	0.139
5	0.169
10	0.248
30	0.430
50	0.561
75	0.697
100	0.822
300	1.446
500	1.901
800	2.663
1000	2.829
1500	3.569
2000	4.179

Cable loss
Cable M17/167 MIL-C-17, HL 1510

No.	Frequency, MHz	Cable loss, dB
1	0.1	0.05
2	1	0.09
3	3	0.16
4	5	0.18
5	10	0.27
6	30	0.44
7	50	0.58
8	80	0.69
9	100	0.82
10	300	1.48
11	500	2.01
12	800	2.65
13	1000	3.12



Cable loss
RF cable 3.5 m, Alpha Wire, model RG-214, S/N 149, HL 1553

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB
1	1	0.01	±0.05
2	10	0.07	
3	30	0.12	
4	50	0.22	
5	100	0.26	
6	200	0.40	
7	300	0.52	
8	400	0.60	
9	500	0.70	
10	600	0.77	
11	700	0.84	
12	800	1.00	
13	900	1.00	
14	1000	1.05	
15	2000	1.70	



Cable loss
Cable RF, 2m, model: Sucoflex 104PE, S/N 13094/4PE, HL 1566

No.	Frequency, MHz	Cable loss, dB	Tolerance, dB	Measurement uncertainty, dB
1	30	0.10	≤ 5.0	±0.12
2	50	0.13		
3	100	0.20		
4	300	0.33		
5	500	0.45		
6	800	0.60		
7	1000	0.65		
8	1500	0.91		
9	2000	1.08		
10	2500	1.19		
11	3000	1.28		
12	3500	1.49		
13	4000	1.63		
14	4500	1.63	≤ 5.0	±0.17
15	5000	1.66		
16	5500	1.88		
17	6000	1.96		
18	6500	1.93		
19	7000	2.07		
20	7500	2.37		
21	8000	2.34		
22	8500	2.64		
23	9000	2.68		
24	9500	2.64		
25	10000	2.70		
26	10500	2.84		
27	11000	2.88		
28	11500	3.19		
29	12000	3.15		
30	12500	3.20	≤ 5.0	±0.26
31	13000	3.22		
32	13500	3.47		
33	14000	3.41		
34	14500	3.59		
35	15000	3.79		
36	15500	4.24		
37	16000	4.12		
38	16500	4.46		
39	17000	4.50		
40	17500	4.49		
41	18000	4.45		

Cable loss
Cable 18 GHz, 6.5 m, blue, model: NPS-1803A-6500-NPS, S/N T4974, HL 1947

Frequency, GHz	Cable loss, dB
0.03	0.30
0.05	0.38
0.10	0.53
0.20	0.74
0.30	0.91
0.40	1.05
0.50	1.18
0.60	1.29
0.70	1.40
0.80	1.50
0.90	1.59
1.00	1.68
1.10	1.77
1.20	1.86
1.30	1.94
1.40	2.01
1.50	2.08
1.60	2.16
1.70	2.22
1.80	2.29
1.90	2.36
2.00	2.42
2.10	2.48
2.20	2.54
2.30	2.60
2.40	2.66
2.50	2.71
2.60	2.77
2.70	2.83
2.80	2.89
2.90	2.95
3.10	3.06
3.30	3.17
3.50	3.28
3.70	3.39
3.90	3.51
4.10	3.62
4.30	3.76
4.50	3.87
4.70	4.01
4.90	4.10
5.10	4.21
5.30	4.31
5.50	4.43
5.70	4.56
5.90	4.71

Frequency, GHz	Cable loss, dB
6.10	4.87
6.30	4.95
6.50	4.94
6.70	4.88
6.90	4.87
7.10	4.83
7.30	4.85
7.50	4.86
7.70	4.91
7.90	4.96
8.10	5.03
8.30	5.08
8.50	5.13
8.70	5.21
8.90	5.22
9.10	5.34
9.30	5.35
9.50	5.52
9.70	5.51
9.90	5.66
10.10	5.70
10.30	5.78
10.50	5.79
10.70	5.82
10.90	5.86
11.10	5.94
11.30	6.06
11.50	6.21
11.70	6.44
11.90	6.61
12.10	6.76
12.40	6.68
13.00	6.66
13.50	6.81
14.00	6.90
14.50	6.90
15.00	6.97
15.50	7.17
16.00	7.28
16.50	7.27
17.00	7.38
17.50	7.68
18.00	7.92



Cable loss
RF cable 8 m, model RG-214, HL 2009

No.	Frequency, MHz	Cable loss, dB	Tolerance (Specification), dB	Measurement uncertainty, dB
1	1	0.10	NA	±0.12
2	10	0.14		
3	30	0.25		
4	50	0.34		
5	100	0.53		
6	300	0.99		
7	500	1.31		
8	800	1.73		
9	1000	1.98		
10	1100	2.11		
11	1200	2.21		
12	1300	2.35		
13	1400	2.46		
14	1500	2.55		
15	1600	2.68		
16	1700	2.78		
17	1800	2.88		
18	1900	2.98		
19	2000	3.09		

Cable loss
Cable 40 GHz, 0.8 m, blue, model: KPS-1503A-800-KPS, S/N W4907, HL 2254

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.04	5.10	0.80	15.00	1.49
0.05	0.07	5.30	0.83	15.50	1.49
0.10	0.09	5.50	0.83	16.00	1.46
0.20	0.15	5.70	0.84	16.50	1.47
0.30	0.19	5.90	0.87	17.00	1.50
0.40	0.25	6.10	0.86	17.50	1.57
0.50	0.29	6.30	0.89	18.00	1.63
0.60	0.33	6.50	0.90	18.50	1.57
0.70	0.37	6.70	0.89	19.00	1.63
0.80	0.41	6.90	0.93	19.50	1.65
0.90	0.44	7.10	0.92	20.00	1.64
1.00	0.45	7.30	0.95	20.50	1.75
1.10	0.48	7.50	0.96	21.00	1.72
1.20	0.51	7.70	0.97	21.50	1.78
1.30	0.53	7.90	1.01	22.00	1.76
1.40	0.54	8.10	1.00	22.50	1.72
1.50	0.57	8.30	1.05	23.00	1.83
1.60	0.59	8.50	1.04	23.50	1.80
1.70	0.04	8.70	1.07	24.00	1.90
1.80	0.07	8.90	1.11	24.50	1.81
1.90	0.09	9.10	1.09	25.00	1.98
2.00	0.15	9.30	1.14	25.50	1.91
2.10	0.19	9.50	1.12	26.00	2.02
2.20	0.25	9.70	1.15	26.50	1.92
2.30	0.29	9.90	1.16	27.00	1.97
2.40	0.33	10.10	1.16	28.00	2.02
2.50	0.37	10.30	1.19	29.00	1.95
2.60	0.41	10.50	1.14	30.00	1.94
2.70	0.44	10.70	1.19	31.00	2.11
2.80	0.45	10.90	1.17	32.00	2.17
2.90	0.48	11.10	1.13	33.00	2.27
3.10	0.61	11.30	1.20	34.00	2.27
3.30	0.64	11.50	1.13	35.00	2.29
3.50	0.65	11.70	1.20	36.00	2.35
3.70	0.68	11.90	1.18	37.00	2.37
3.90	0.69	12.10	1.14	38.00	2.40
4.10	0.71	12.40	1.19	39.00	2.57
4.30	0.73	13.00	1.34	40.00	2.36
4.50	0.75	13.50	1.33		
4.70	0.77	14.00	1.48		
4.90	0.79	14.50	1.45		



Cable loss

Cable coaxial, 40GHz, 1.5 m, Blue, Rhophase Microwave Limited, model: KPS-1503A-1500-KPS, HL 2399

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
0.03	0.07	6.5	1.57	15.50	2.50
0.05	0.10	6.7	1.60	16.00	2.51
0.1	0.16	6.9	1.55	16.50	2.58
0.2	0.26	7.1	1.65	17.00	2.65
0.3	0.33	7.3	1.65	17.50	2.73
0.5	0.38	7.5	1.70	18.00	2.74
0.7	0.41	7.7	1.71	18.50	2.67
0.9	0.58	7.9	1.73	19.00	2.67
1.1	0.64	8.1	1.79	19.50	2.74
1.3	0.70	8.3	1.81	20.00	2.69
1.5	0.75	8.5	1.84	20.50	2.80
1.7	0.79	8.7	1.85	21.00	2.82
1.9	0.83	8.9	1.90	21.50	2.87
2.1	0.88	9.1	1.95	22.00	2.87
2.3	0.93	9.3	1.93	22.50	2.92
2.5	0.97	9.5	1.98	23.50	3.04
2.7	1.01	9.7	1.96	24.00	3.05
2.9	1.04	9.9	2.03	24.50	3.03
3.1	1.08	10.1	1.99	25.00	3.11
3.3	1.14	10.30	2.02	25.50	3.10
3.5	1.17	10.50	2.02	26.00	3.17
3.7	1.21	10.70	2.02	26.50	3.11
3.9	1.24	10.90	2.08	27.00	3.16
4.1	1.26	11.10	2.02	28.00	3.19
4.3	1.26	11.30	2.09	29.00	3.19
4.5	1.29	11.50	2.05	30.00	3.30
4.7	1.34	11.70	2.11	31.00	3.31
4.9	1.34	11.90	2.11	32.00	3.35
5.1	1.40	12.10	2.12	33.00	3.46
5.3	1.43	12.40	2.17	34.00	3.45
5.5	1.45	13.00	2.29	35.00	3.49
5.7	1.47	13.50	2.31	36.00	3.54
5.9	1.40	14.00	2.43	37.00	3.62
6.1	1.53	14.50	2.43	39.00	3.69
6.3	1.55	15.00	2.46	40.00	3.75



Cable loss
Cable coaxial, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 001
HL 2882

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
10	0.08	5750	1.78	12000	2.57
30	0.12	6000	1.84	12250	2.62
100	0.22	6250	1.87	12500	2.66
250	0.35	6500	1.92	12750	2.68
500	0.49	6750	1.96	13000	2.67
750	0.60	7000	2.01	13250	2.75
1000	0.68	7250	2.08	13500	2.77
1250	0.78	7500	2.12	13750	2.90
1500	0.85	7750	2.19	14000	3.00
1750	0.92	8000	2.22	14250	3.12
2000	0.98	8250	2.28	14500	2.98
2250	1.06	8500	2.29	14750	3.03
2500	1.11	8750	2.27	15000	2.99
2750	1.19	9000	2.28	15250	2.99
3000	1.25	9250	2.26	15500	2.98
3250	1.30	9500	2.29	15750	2.98
3500	1.34	9750	2.33	16000	2.99
3750	1.40	10000	2.34	16250	3.05
4000	1.45	10250	2.41	16500	3.11
4250	1.51	10500	2.46	16750	3.18
4500	1.54	10750	2.48	17000	3.23
4750	1.59	11000	2.48	17250	3.21
5000	1.63	11250	2.52	17500	3.22
5250	1.68	11500	2.53	17750	3.22
5500	1.72	11750	2.56	18000	3.25



Cable loss
Cable coaxial, Gore, 18 GHz, 3m, SMA-SMA, S/N 989370
HL 2910

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
10	0.07	5750	2.97	12000	5.05
30	0.19	6000	2.91	12250	4.44
100	0.36	6250	3.23	12500	4.82
250	0.53	6500	3.42	12750	5.22
500	0.77	6750	3.17	13000	5.02
750	0.94	7000	3.56	13250	5.00
1000	1.10	7250	3.77	13500	5.09
1250	1.19	7500	3.48	13750	4.70
1500	1.35	7750	3.81	14000	5.03
1750	1.51	8000	3.82	14250	5.17
2000	1.57	8250	3.62	14500	4.92
2250	1.69	8500	3.95	14750	4.91
2500	1.76	8750	4.00	15000	5.03
2750	1.83	9000	3.80	15250	4.93
3000	2.02	9250	4.09	15500	5.28
3250	2.17	9500	4.12	15750	5.60
3500	2.13	9750	4.11	16000	5.16
3750	2.23	10000	4.36	16250	5.45
4000	2.40	10250	4.75	16500	5.78
4250	2.31	10500	4.61	16750	5.47
4500	2.52	10750	4.26	17000	5.21
4750	2.77	11000	4.62	17250	5.53
5000	2.82	11250	4.55	17500	5.53
5250	2.77	11500	4.59	17750	5.71
5500	3.04	11750	5.20	18000	5.77



Cable loss
Cable coaxial, Gore, 18 GHz, 1.2 m, SMA-SMA, S/N 10020014
HL 2952

Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB	Frequency, GHz	Cable loss, dB
10	0.03	5750	0.97	12000	1.50
30	0.05	6000	1.01	12250	1.45
100	0.11	6250	1.03	12500	1.48
250	0.19	6500	1.06	12750	1.57
500	0.26	6750	1.08	13000	1.51
750	0.32	7000	1.10	13250	1.64
1000	0.38	7250	1.13	13500	1.60
1250	0.43	7500	1.13	13750	1.63
1500	0.47	7750	1.21	14000	1.59
1750	0.53	8000	1.20	14250	1.66
2000	0.55	8250	1.24	14500	1.60
2250	0.59	8500	1.29	14750	1.65
2500	0.63	8750	1.23	15000	1.72
2750	0.66	9000	1.27	15250	1.68
3000	0.69	9250	1.27	15500	1.73
3250	0.72	9500	1.29	15750	1.70
3500	0.75	9750	1.30	16000	1.82
3750	0.78	10000	1.38	16250	1.79
4000	0.82	10250	1.44	16500	1.81
4250	0.84	10500	1.47	16750	1.91
4500	0.86	10750	1.45	17000	1.92
4750	0.90	11000	1.50	17250	1.98
5000	0.91	11250	1.46	17500	2.05
5250	0.94	11500	1.47	17750	2.04
5500	0.96	11750	1.44	18000	2.05