HERMON LABORATORIES

839.01
Electrical

Hermon Laboratories Ltd.
Harakevet Industrial Zone, Binyamina 30500,
Israel
Tel. +972-4-6288001
Fax. +972-4-6288277
E-mail: mail@hermonlabs.com

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 subpart Z

FOR:

Airspan Networks (Israel) Ltd.

Subscriber unit

Model: ProST 3.65G TDD

Table of contents

1 Applicant information

Client name:	Airspan Networks Inc.
Address:	777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA
Telephone:	+1 561 893 8686
Fax:	+1 561 893 8671
E-mail:	zlevi@airspan.com
Contact name:	Mr. Zion Levi

2 Equipment under test attributes

Product name:	Subscriber unit
Model(s):	ProST 3.65GHz TDD
Serial number:	P/N 90802014; S/N 874F72C24AZ74
Hardware version:	A0
Software release:	22.17.3t1
Receipt date	11/08/2009

3 Manufacturer information

Manufacturer name:	Airspan Networks Inc.
Address:	777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA
Telephone:	+1 561 893 8686
Fax:	+1 561 893 8671
E-Mail:	zlevi@airspan.com
Contact name:	Mr. Zion Levi

4 Test details

Project ID:	20100
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	11/08/2009
Test completed:	11/10/2009
Test specification(s):	47CFR part 90 subpart Z

5 Tests summary

Test	Status
Transmitter characteristics	
Section 90.205, 90.1321 Maximum output power and peak power spectral density	Pass
Section 90.209, Occupied bandwidth	Pass
Section 90.210 (b), Emission mask	Pass
Section 90.1323, Conducted spurious emissions	Pass
Section 90.1323, Radiated spurious emissions	Pass
Section 90.213, Frequency stability	Pass
Section 2.1091, 90.1335, RF radiation exposure evaluation	Pass, exhibit attached to the Application for certification

Testing was completed against all relevant requirements of the test standard. The results obtained indicate that the product under test complies in full with the requirements tested.
The test results relate only to the items tested. Pass/ fail decision was based on nominal values.

	Name and Title	Date	Signature
Tested by:	Mr. L. Markel, test engineer	November 10, 2009	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	November 25, 2009	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	November 26, 2009	

6 EUT description

6.1 General information

A subscriber premises radio, ProST 3.65GHz 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 ProST's transceiver/receiver (Up to 64 QAM modulation, data rate up to 37Mbps) uses OFDM and operating in TDD duplexing mode, equipped with a 16 dBi internal antenna. The maximum RF output power (not including antenna gain) is 19.73 dBm and it can be reduced by software.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC Power	EUT	SDA (+ DATA)	1	UTP	10	Outdoor
Signal	RS-232	EUT (Maintance only)	Laptop	1	UTP	0.2	Outdoor
RF	Antenna	EUT	50 Ohm termination	1	Shielded	NA	NA

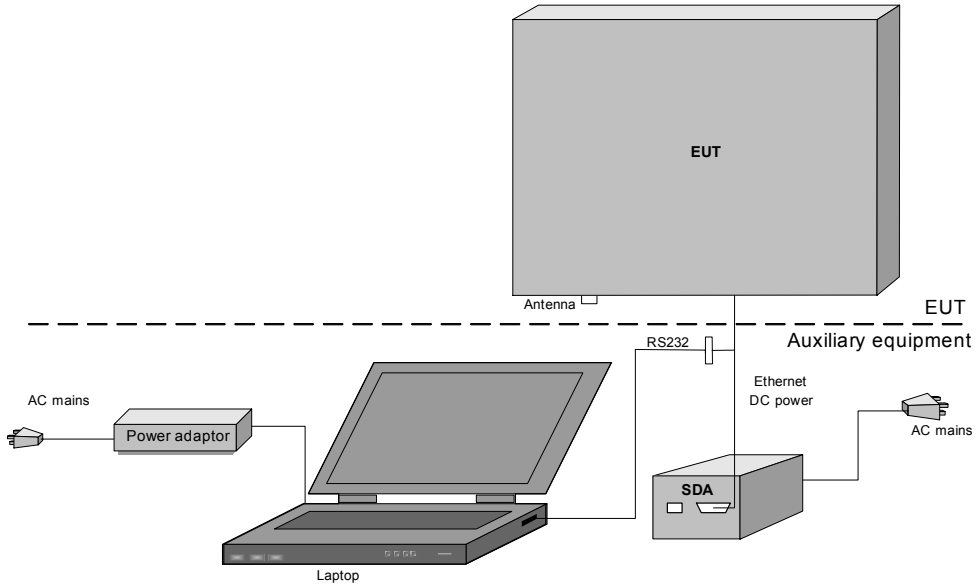
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
Laptop	IBM	X31	99-TXWYC
Laptop adaptor	IBM	NA	11S92P1014Z1 ZD2N74T2LS
SDA	Airspan	SDA-4S/VL type 2	752D6C0444
Mouse	Microsoft	NA	X802382-004

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		3650.0 – 3675.0 MHz						
Operating frequency range		3652.5 – 3672.5 MHz						
RF channel spacing		5 MHz						
Maximum rated output power		At transmitter 50 Ω RF output connector					19.73 dBm	
Is transmitter output power variable?			No					
		V	Yes		continuous variable			
				V	stepped variable with stepsize		1 dB	
				minimum RF power			-30 dBm	
				maximum RF power			19.73 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
Internal	MARS	MA-WA36-AS16	16 dBi

Transmitter 99% power bandwidth		5 MHz						
Transmitter aggregate data rate/s		BPSK – 2.095 MBps, QPSK - 4.19 MBps, 16QAM – 12.565 MBps, 64QAM – 18.85 MBps						
Type of modulation		BPSK, QPSK, 16QAM, 64QAM						
Type of multiplexing		OFDM						
Modulating test signal (baseband)		PRBS						
Maximum transmitter duty cycle in normal use		90%						
Transmitter power source								
		Nominal rated voltage		Battery type				
	DC	**Nominal rated voltage**	48 VDC via SDA connected to mains					
V	AC mains	**Nominal rated voltage**	120 V	Frequency	60 Hz			
Common power source for transmitter and receiver			**V**	yes		no		

Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

7 Transmitter tests according to 47CFR part 90 requirements

7.1 Peak output power test

7.1.1 General

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

Table 7.1.1 Peak output power and spectral density limits

Assigned frequency range, MHz	Channel bandwidth, MHz	Maximum peak output power, EIRP		Power spectral density EIRP, dBm/MHz
		W	dBm	
3650.0 – 3675.0	5	5	37.0	30.0

7.1.2 Test procedure

7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.
7.1.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
7.1.2.3 The peak output power was measured with power meter as provided in Table 7.1.2.
7.1.2.4 The EUT was set up as shown in Figure 7.1.2, energized and its proper operation was checked.
7.1.2.5 The peak output power density was measured with spectrum analyzer as provided in Table 7.1.3 and the associated plots.

Figure 7.1.1 Peak output power test setup

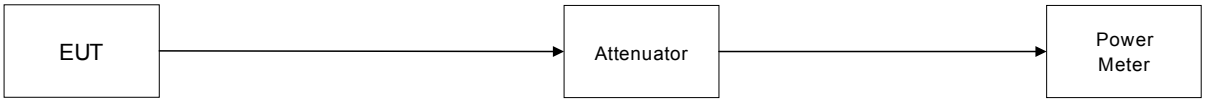
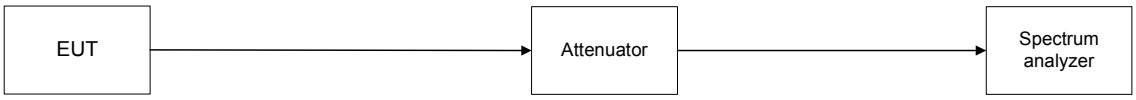


Figure 7.1.2 Peak power spectral density test setup



Test specification:	**Section 90.1321, Maximum output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 41 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.2 Peak output power test results

OPERATING FREQUENCY RANGE: 3650.0 – 3675.0 MHz
DETECTOR USED: Average (Power Meter)
RESOLUTION BANDWIDTH: NA
VIDEO BANDWIDTH: NA
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Power meter reading, dBm	External attenuation, dB	Cable loss dB	RF output power*, dBm	Limit, dBm	Margin, dB	Verdict
64QAM, Bit Rate: 18.85 Mbps							
3652.5	19.73	included	included	35.73	37.00	-1.27	Pass
3665.0	19.40	included	included	35.40	37.00	-1.60	Pass
3672.5	19.36	included	included	35.36	37.00	-1.64	Pass
16QAM, Bit Rate :12.565Mbps							
3652.5	19.69	included	included	35.69	37.00	-1.31	Pass
3665.0	19.32	included	included	35.32	37.00	-1.68	Pass
3672.5	19.05	included	included	35.05	37.00	-1.95	Pass
QPSK, Bit Rate: 4.19 Mbps							
3652.5	19.60	included	included	35.60	37.00	-1.40	Pass
3665.0	19.20	included	included	35.20	37.00	-1.80	Pass
3672.5	19.28	included	included	35.28	37.00	-1.72	Pass
BPSK, Bit Rate: 2.095Mbps							
3652.5	19.71	included	included	35.71	37.00	-1.29	Pass
3665.0	19.39	included	included	35.39	37.00	-1.61	Pass
3672.5	19.23	included	included	35.23	37.00	-1.77	Pass

***** - RF Output Power = Power Meter Reading + Antenna Gain (16 dBi)

Test specification:	**Section 90.1321, Maximum output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 41 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.1.3 Power spectral density test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Carrier frequency, MHz	Spectrum analyzer reading, dBm/Hz	Attenuation, dB	Cable loss dB	Power density*, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
64QAM,Bit Rate: 18.85 Mbps							
3652.5	13.68	included	included	29.68	30.00	-0.32	Pass
3665.0	13.78	included	included	29.78	30.00	-0.22	Pass
3672.5	13.87	included	included	29.87	30.00	-0.13	Pass
16QAM, Bit Rate: 12.565 Mbps							
3652.5	13.51	included	included	29.51	30.00	-0.49	Pass
3665.0	13.56	included	included	29.56	30.00	-0.44	Pass
3672.5	13.82	included	included	29.82	30.00	-0.18	Pass
QPSK,Bit Rate: 4.19 Mbps							
3652.5	13.35	included	included	29.35	30.00	-0.65	Pass
3665.0	13.92	included	included	29.92	30.00	-0.08	Pass
3672.5	13.86	included	included	29.86	30.00	-0.14	Pass
BPSK, Bit Rate: 2.095 Mbps							
3652.5	13.22	included	included	29.22	30.00	-0.78	Pass
3665.0	13.83	included	included	29.83	30.00	-0.17	Pass
3672.5	13.90	included	included	29.90	30.00	-0.10	Pass

* - Power density = Spectrum analyzer reading + Antenna Gain (16 dBi)

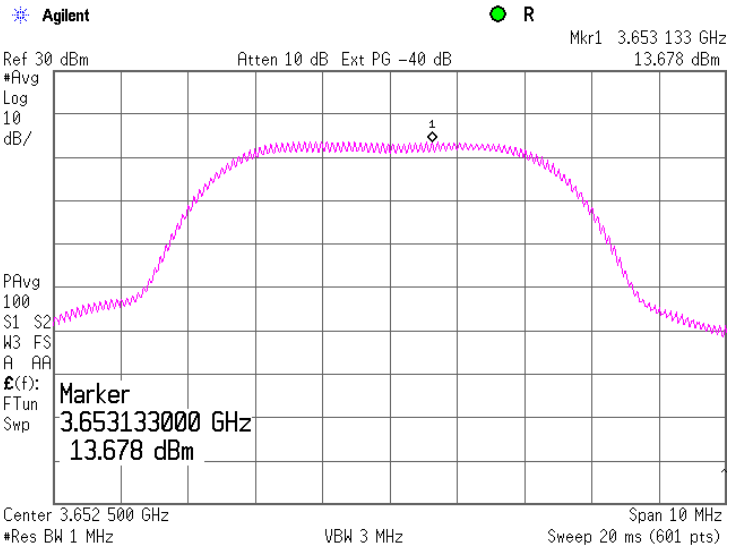
Reference numbers of test equipment used

HL 2953	HL 3301	HL 3302	HL 3439	HL 3442	HL 3818		

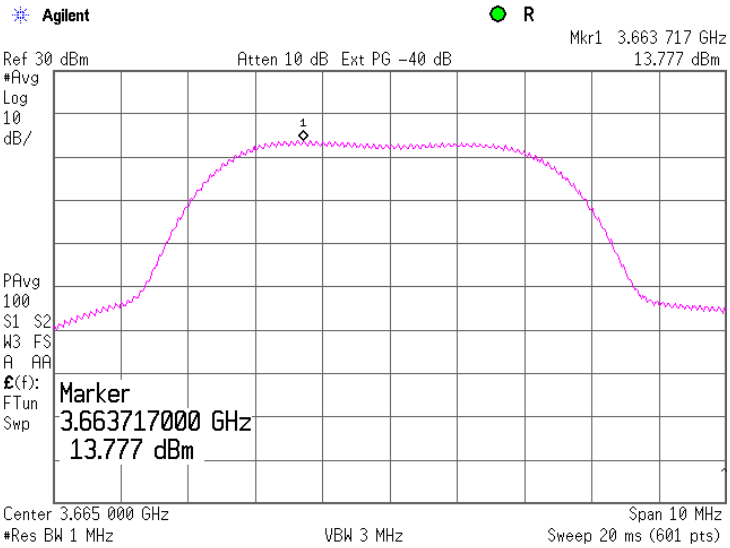
Full description is given in Appendix A.

Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.1 Peak output power density test results at low frequency, 64QAM, Bit Rate: 18.85 Mbps

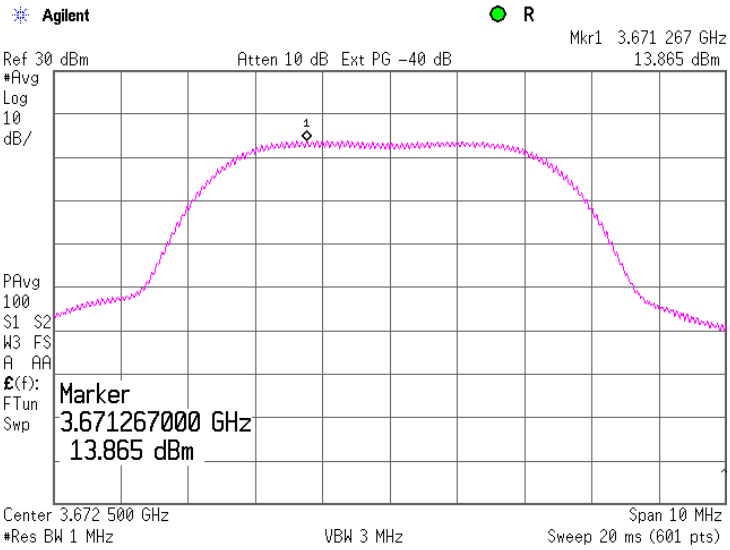


Plot 7.1.2 Peak output power density test results at mid frequency, 64QAM, Bit Rate: 18.85 Mbps

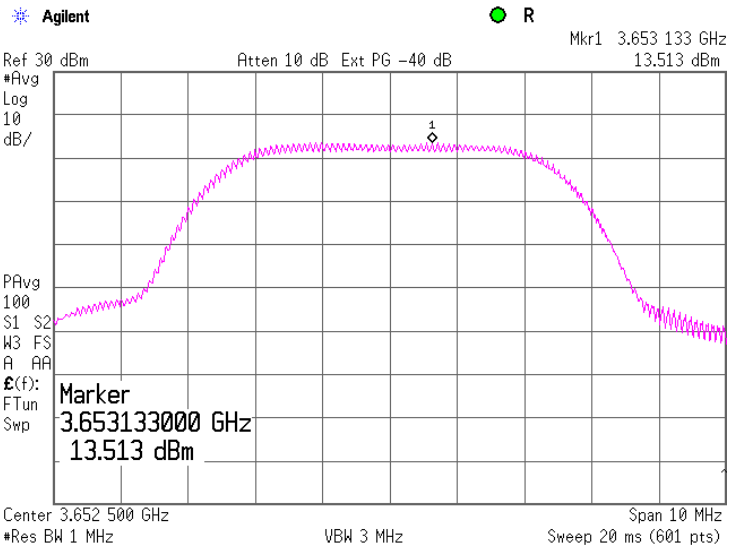


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.3 Peak output power density test results at high frequency, 64QAM, Bit Rate: 18.85 Mbps

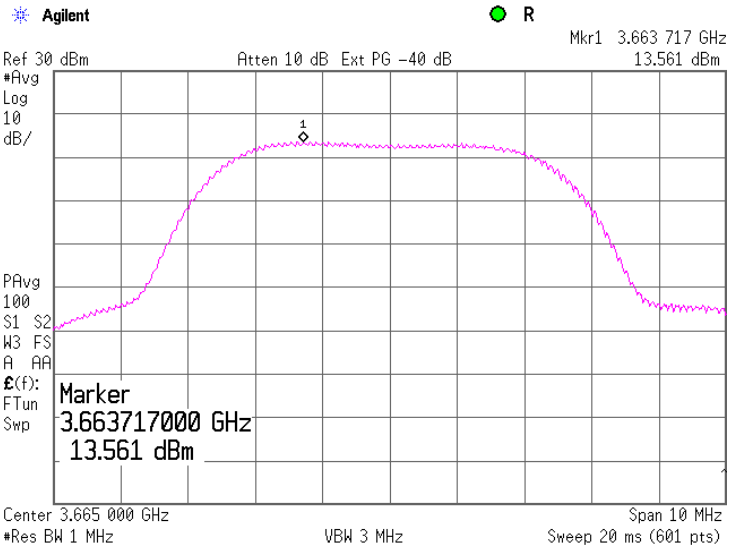


Plot 7.1.4 Peak output power density test results at low frequency, 16QAM, Bit Rate: 12.565 Mbps

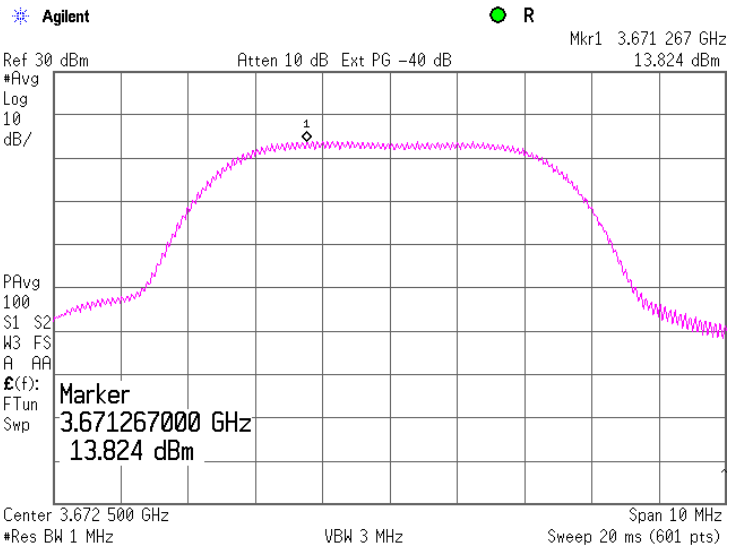


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.5 Peak output power density test results at mid frequency, 16QAM, Bit Rate: 12.565 Mbps

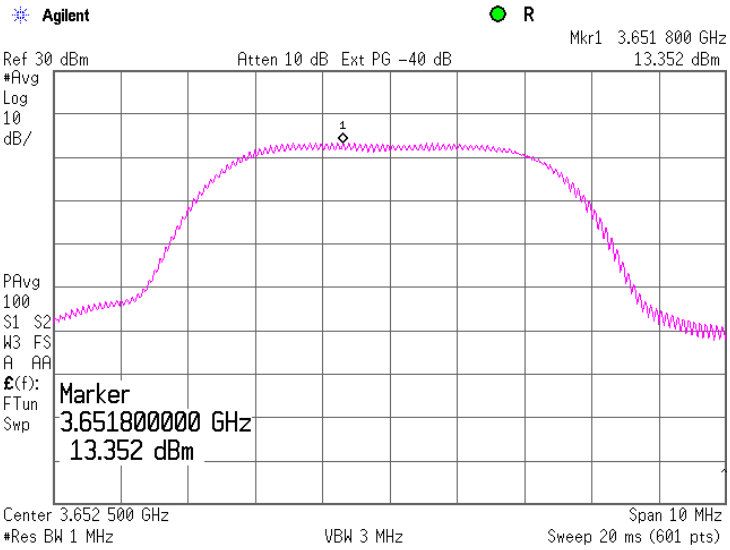


Plot 7.1.6 Peak output power density test results at high frequency, 16QAM, Bit Rate: 12.565 Mbps

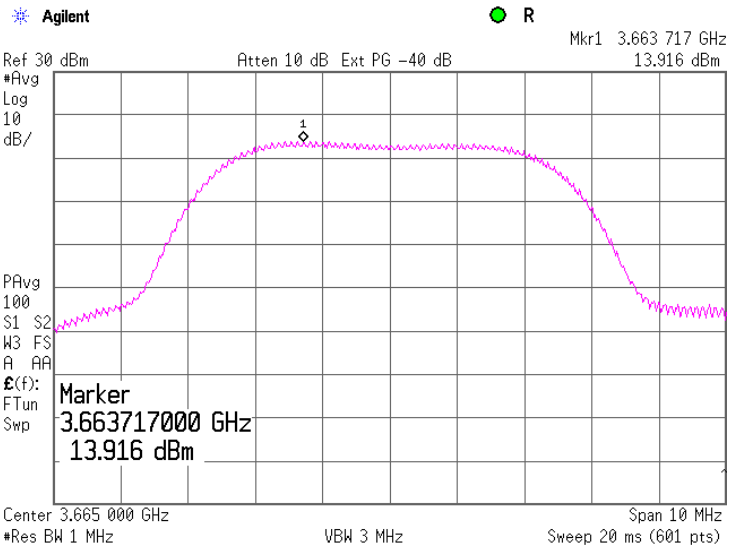


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.7 Peak output power density test results at low frequency, QPSK, Bit Rate: 4.19 Mbps

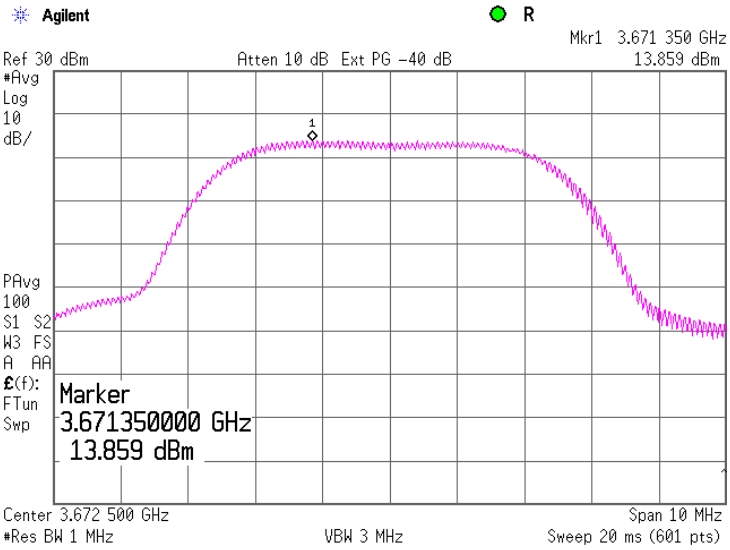


Plot 7.1.8 Peak output power density test results at mid frequency, QPSK, Bit Rate: 4.19 Mbps

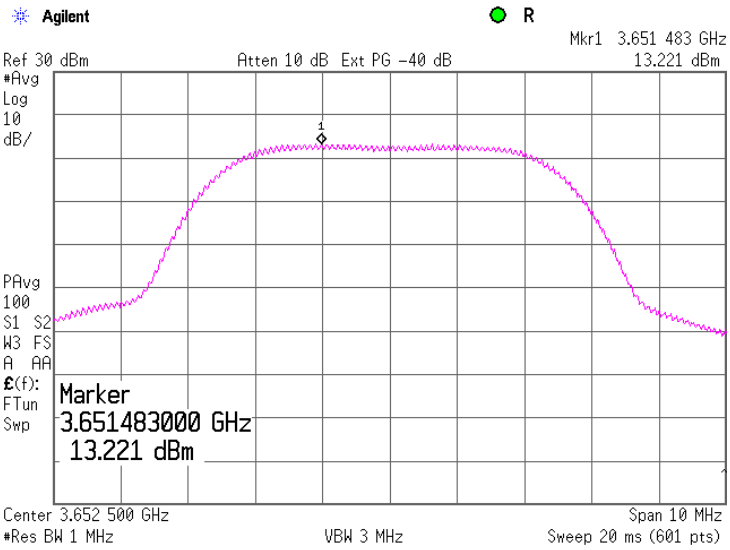


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.9 Peak output power density test results at high frequency, QPSK, Bit Rate: 4.19 Mbps

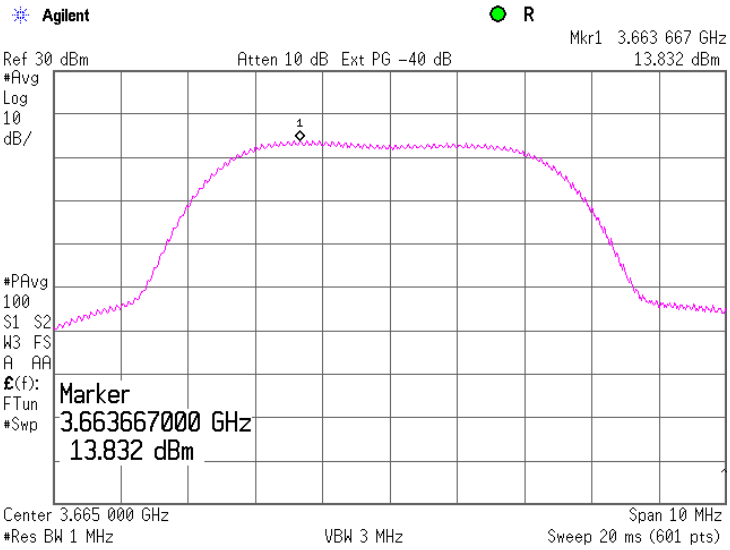


Plot 7.1.10 Peak output power density test results at low frequency, BPSK, Bit Rate: 2.095 Mbps

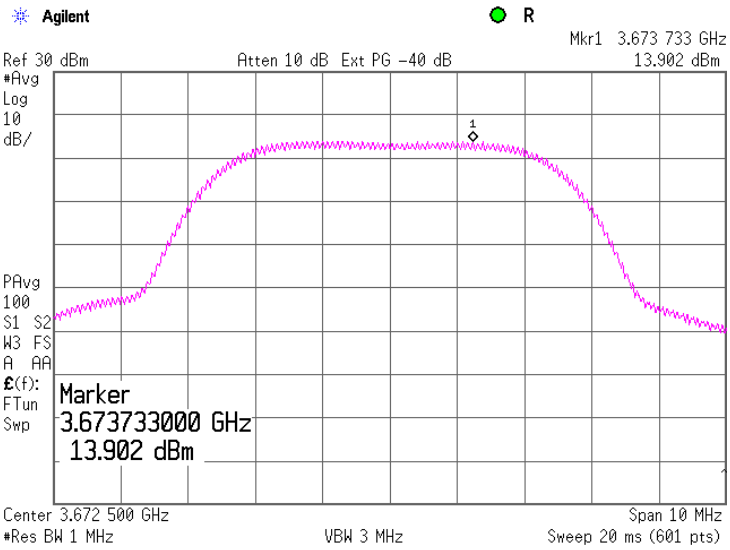


Test specification:	Section 90.1321, Maximum output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 5:09:05 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.1.11 Peak output power density test results at mid frequency, BPSK, Bit Rate: 2.095 Mbps



Plot 7.1.12 Peak output power density test results at high frequency, BPSK, Bit Rate: 2.095 Mbps



Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:22:52 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

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

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Channel bandwidth, MHz	Maximum allowed bandwidth, MHz
3650.0 - 3675.0	26	5	5

* - Modulation envelope reference points are provided in terms of attenuation below the total average power.

7.2.2 Test procedure

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

7.2.2.2 The EUT was set to transmit the normally modulated carrier.

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

Figure 7.2.1 Occupied bandwidth test setup

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:22:52 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Sample
RESOLUTION BANDWIDTH: 50 kHz
VIDEO BANDWIDTH: 500 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: PRBS

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, MHz	Margin, MHz	Verdict
64QAM,Bit Rate 18.85Mbps				
3652.5	4.575	5.0	-0.425	Pass
3665.0	4.592	5.0	-0.408	Pass
3672.5	4.575	5.0	-0.425	Pass
BPSK ,Bit Rate 2.095Mbps				
3652.5	4.575	5.0	-0.425	Pass
3665.0	4.575	5.0	-0.425	Pass
3672.5	4.575	5.0	-0.425	Pass

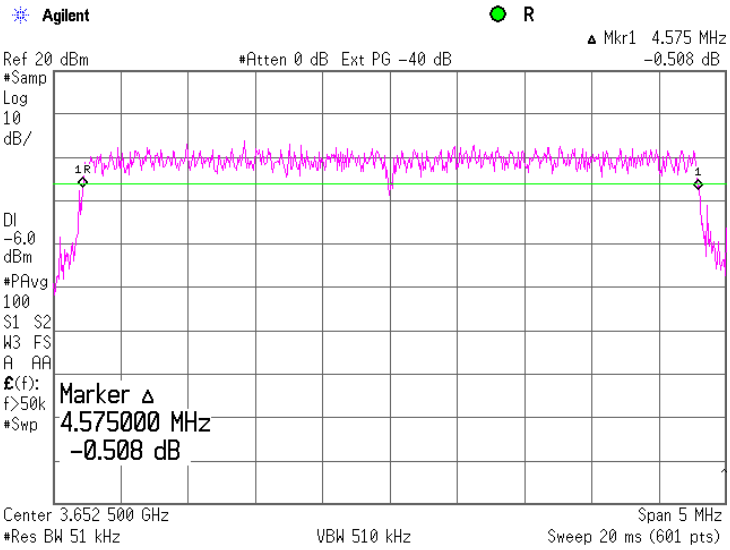
Reference numbers of test equipment used

HL 2953	HL 3439	HL 3442	HL 3818				

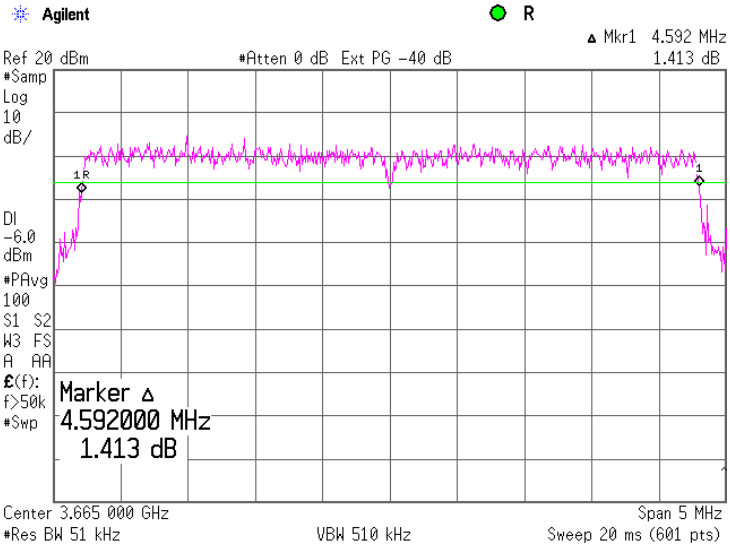
Full description is given in Appendix A.

Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:22:52 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at low frequency, 64QAM, Bit Rate: 18.85 Mbps

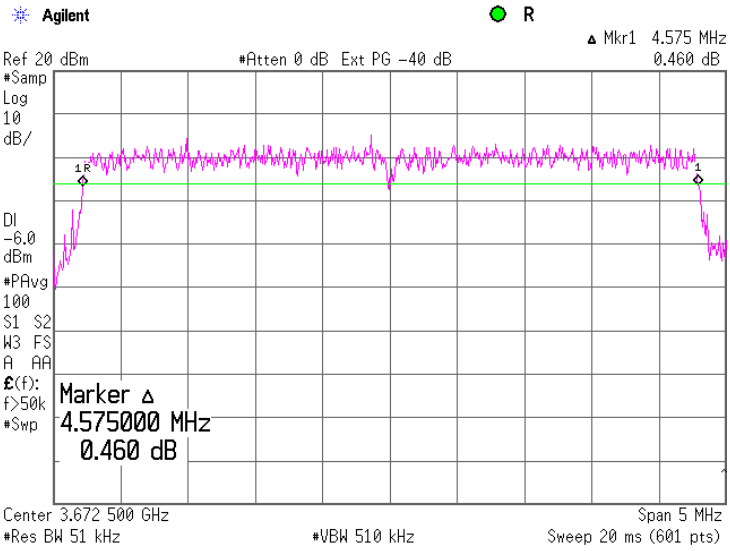


Plot 7.2.2 Occupied bandwidth test result at mid frequency, 64QAM, Bit Rate: 18.85 Mbps

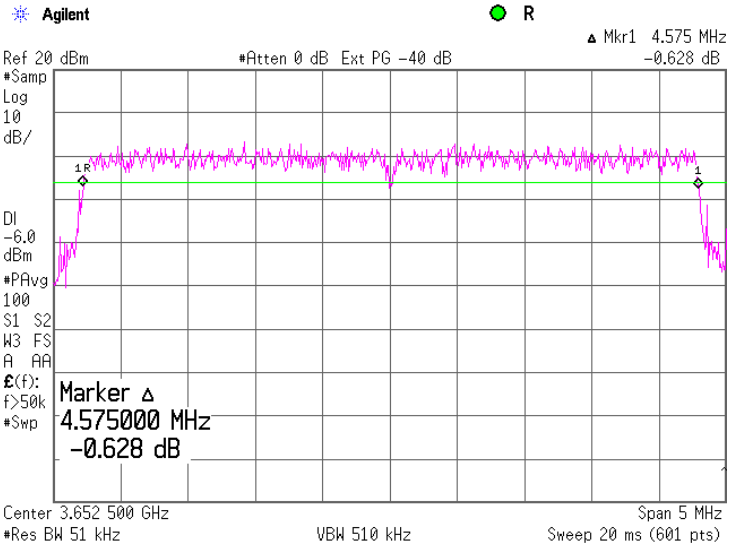


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:22:52 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at high frequency, 64QAM, Bit Rate: 18.85 Mbps

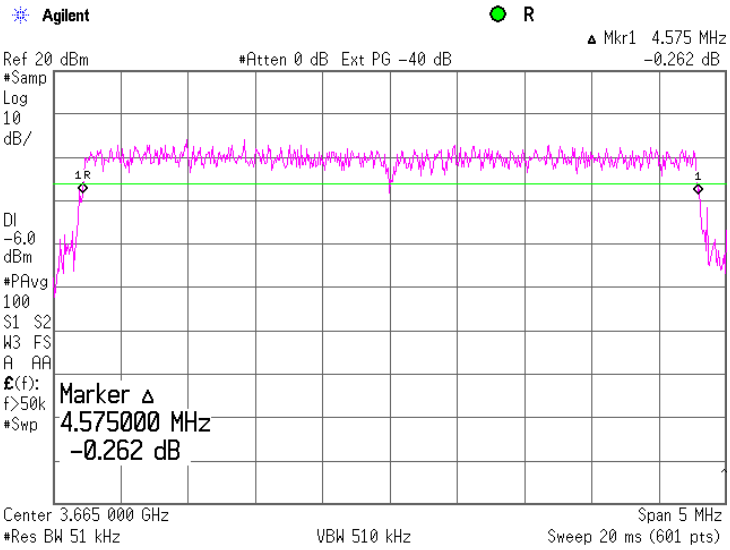


Plot 7.2.4 Occupied bandwidth test result at low frequency, BPSK, Bit Rate: 2.095Mbps

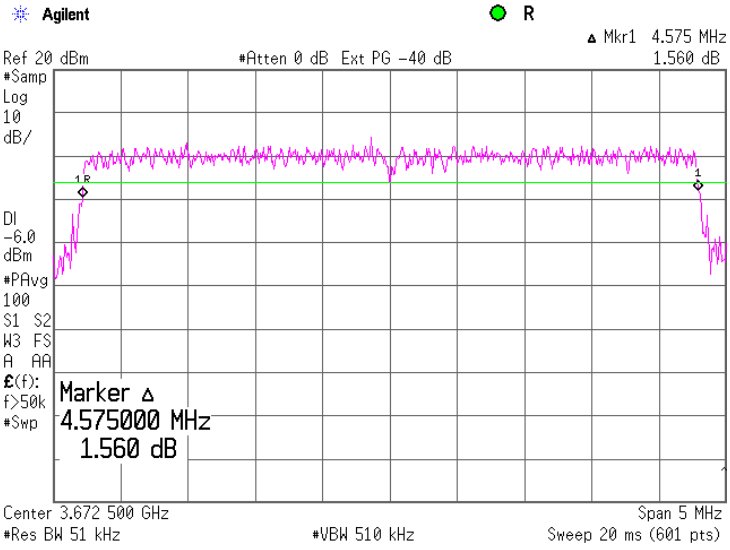


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:22:52 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 41 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.5 Occupied bandwidth test result at mid frequency, BPSK, Bit Rate: 2.095Mbps



Plot 7.2.6 Occupied bandwidth test result at high frequency, BPSK, Bit Rate: 2.095Mbps



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

7.3 Emission mask test

7.3.1 General

This test was performed to measure emission mask at RF antenna connector. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Emission mask limits

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask B (Channel bandwidth 5 MHz)	
0 – 2.5 MHz	0
2.5 – 5.0 MHz	25
5.0 – 12.5 MHz	35
More than** 12.5 MHz	43 + 10 log(P)

** - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

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 emission mask was measured with spectrum analyzer as provided in Table 7.3.2 and the associated plots.

Figure 7.3.1 Emission mask test setup

Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.3.2 Emission mask test results

Carrier frequency, MHz	Limit	Verdict
3652.5	Emission mask B	Pass
3665.0		
3672.5		

Reference numbers of test equipment used

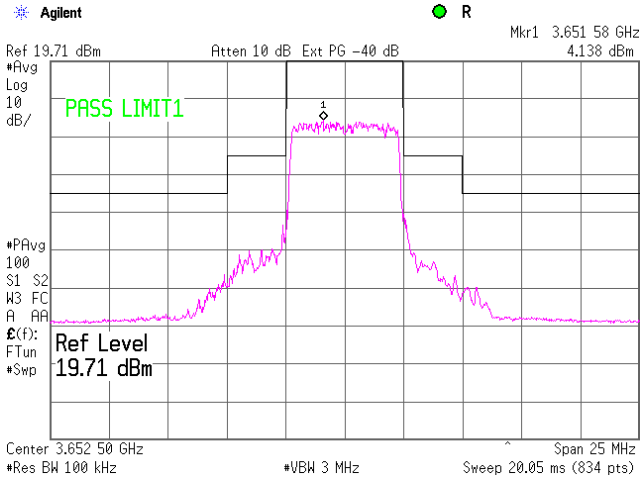
HL 2953	HL 3439	HL 3442	HL 3818				

Full description is given in Appendix A.

Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

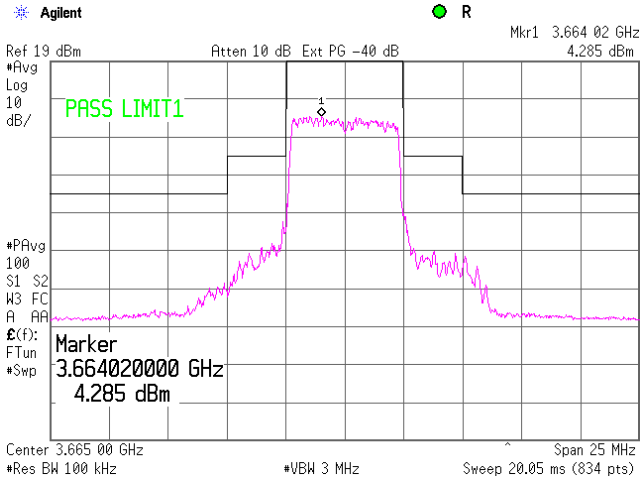
Plot 7.3.1 Emission mask test results at low carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
BIT RATE:	18.85 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.3.2 Emission mask test results at mid carrier frequency

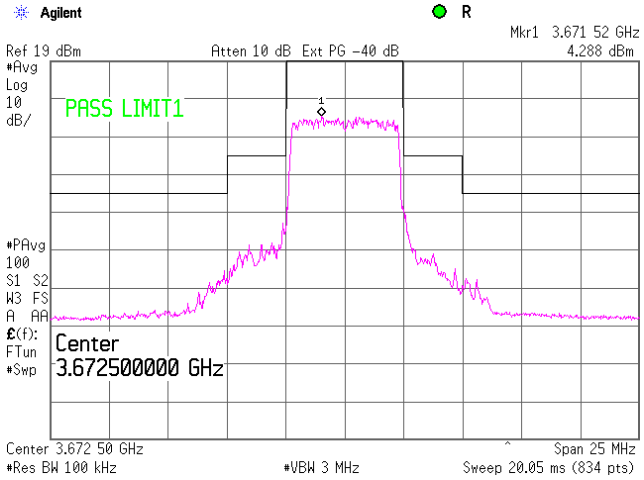
ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
BIT RATE:	18.85 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

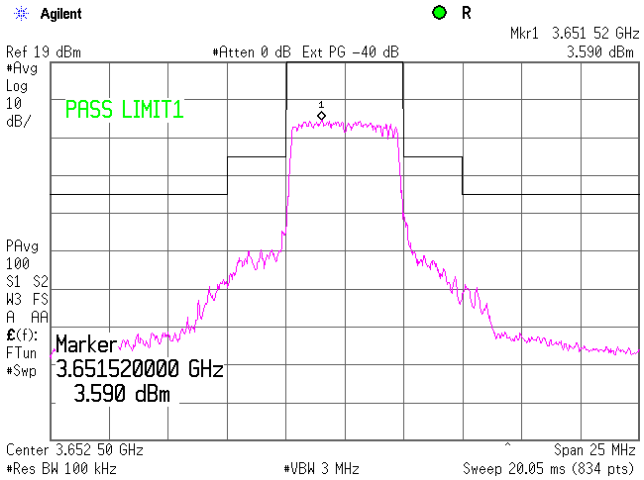
Plot 7.3.3 Emission mask test results at high carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
BIT RATE:	18.85 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.3.4 Emission mask test results at low carrier frequency

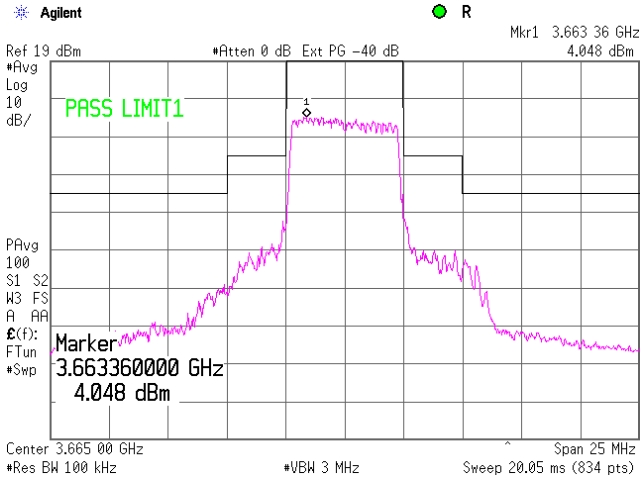
ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	16QAM
BIT RATE:	12.565 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

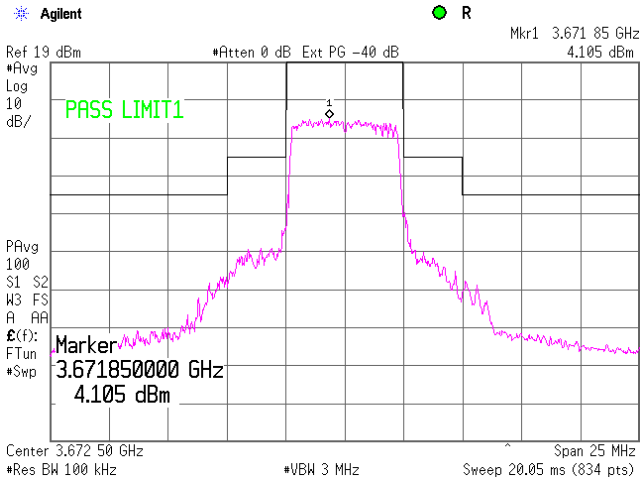
Plot 7.3.5 Emission mask test results at mid carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	16QAM
BIT RATE:	12.565 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.3.6 Emission mask test results at high carrier frequency

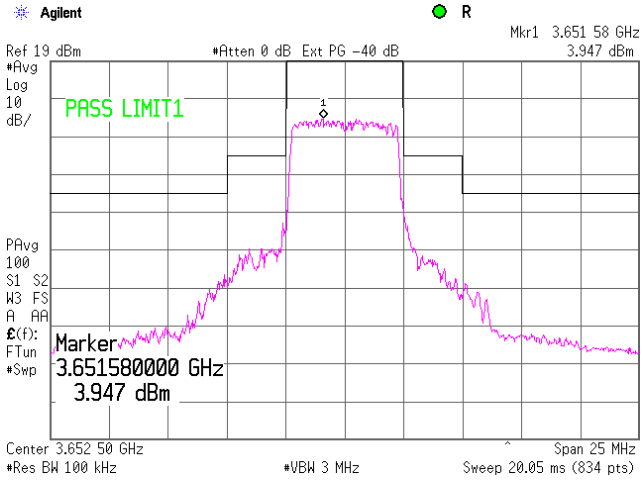
ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	16QAM
BIT RATE:	12.565 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

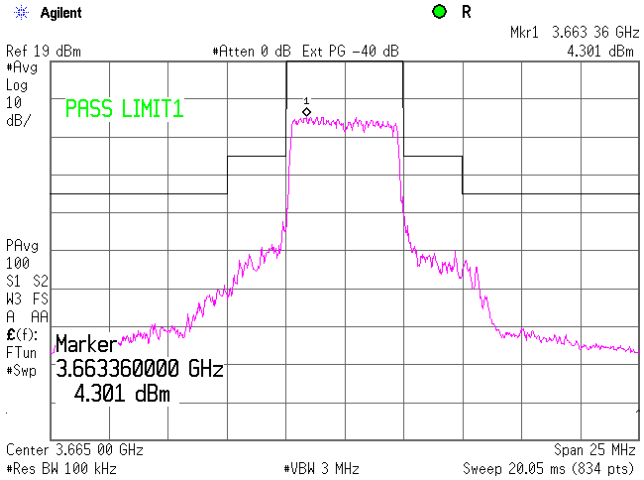
Plot 7.3.7 Emission mask test results at low carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
BIT RATE:	4.19 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.3.8 Emission mask test results at mid carrier frequency

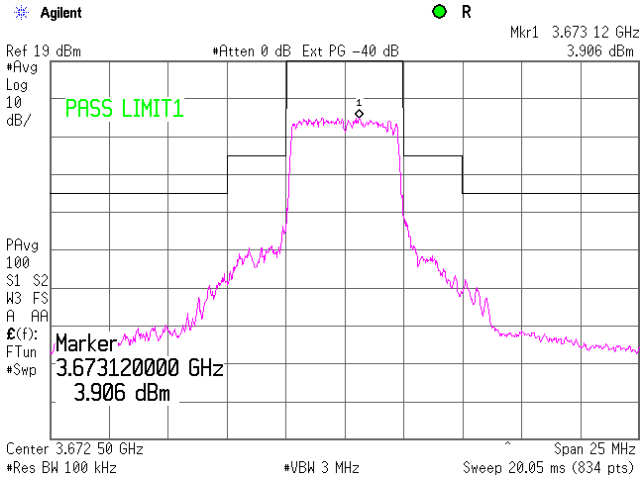
ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
BIT RATE:	4.19 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	Section 90.210, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

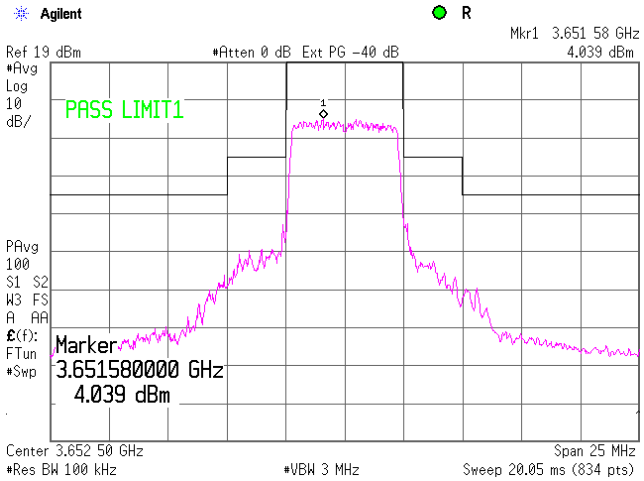
Plot 7.3.9 Emission mask test results at high carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
BIT RATE:	4.19 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.3.10 Emission mask test results at low carrier frequency

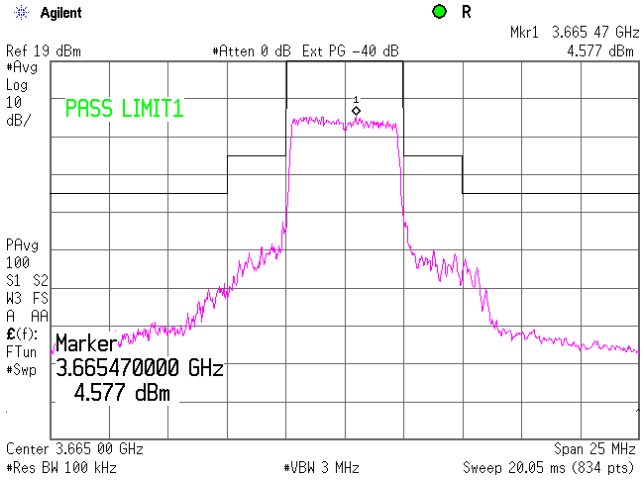
ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	BPSK
BIT RATE:	2.095 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	**Section 90.210, Emission mask**		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.210(m); TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/8/2009 4:24:44 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

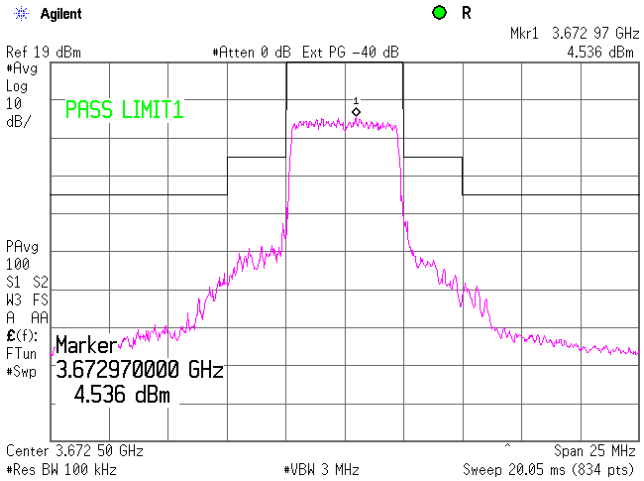
Plot 7.3.11 Emission mask test results at mid carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	BPSK
BIT RATE:	2.095 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.3.12 Emission mask test results at high carrier frequency

ASSIGNED FREQUENCY RANGE:	3650 – 3675 MHz
DETECTOR USED:	Average
MODULATION:	BPSK
BIT RATE:	2.095 Mbps
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

7.4 Radiated spurious emission measurements

7.4.1 General

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

Table 7.4.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μV/m)***
0.009 – 10th harmonic*	43+10logP**	-13	84.38

* - Excluding the in band emission within ± 250 % of the authorized bandwidth from the carrier
** - P is transmitter output power in Watts
*** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows: E=sqrt(30×P×1.64)/r, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.
7.4.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.
7.4.2.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

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

7.4.3.1 The EUT was set up as shown in Figure 7.4.2, energized and the performance check was conducted.
7.4.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.
7.4.3.3 The worst test results (the lowest margins) were recorded in Table 7.4.2 and shown in the associated plots.

7.4.4 Test procedure for substitution ERP measurements of spurious

7.4.4.1 The test equipment was set up as shown in Figure 7.4.3 and energized.
7.4.4.2 RF signal generator was set to the frequency of investigated spurious emission and the RF output level was preliminary adjusted to produce the same field strength as it was measured from the EUT.
7.4.4.3 The test antenna height was swept from 1 to 4 m to find maximum emission from substitution antenna and RF signal generator output was fine adjusted to produce the same field strength as it was measured from the EUT.
7.4.4.4 The above procedure was performed in both, horizontal and vertical, polarizations of the test and substitution antennas.
7.4.4.5 The ERP of spurious emissions was calculated as a sum of signal generator output power in dBm and antenna gain in dBd reduced by cable loss in dB.
7.4.4.6 The above procedure was repeated at the rest of investigated frequencies.
7.4.4.7 The worst test results (the lowest margins) were recorded in Table 7.4.3 and shown in the associated plots.

Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Figure 7.4.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

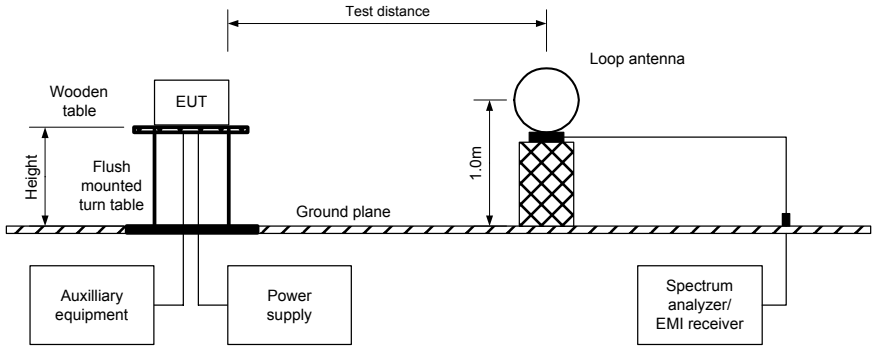
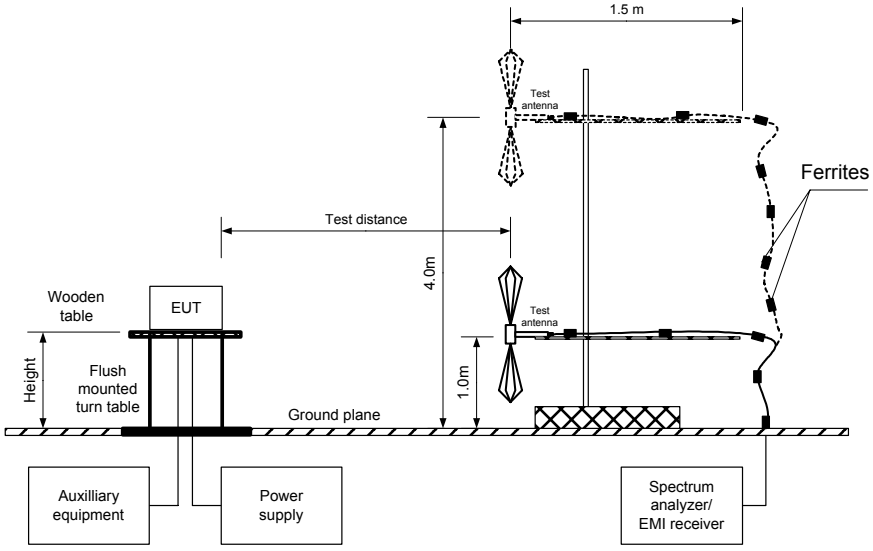
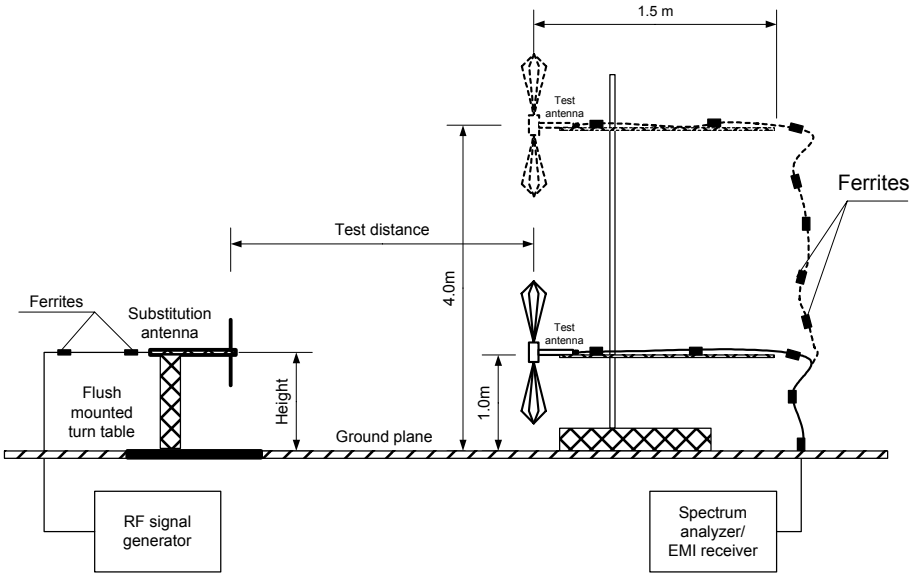


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Figure 7.4.3 Setup for substitution ERP measurements of spurious



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

Table 7.4.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
TEST DISTANCE: 3 m
TEST SITE: Fully anechoic chamber / OATS
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: 64QAM (maximum output power)
MODULATING SIGNAL: PRBS
BIT RATE: 18.85 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Low carrier frequency 3652.5 MHz							
10995.33	69.39	84.38	-14.99	1000	V	1.3	010
10995.03	60.64	84.38	-23.74	1000	H	1.1	000
Mid carrier frequency 3665.0 MHz							
10992.50	70.28	84.38	-14.10	1000	V	1.3	010
10992.77	60.05	84.38	-24.33	1000	H	1.1	000
High carrier frequency 3672.5 MHz							
11015.33	69.21	84.38	-15.17	1000	V	1.3	010
11014.97	59.35	84.38	-25.03	1000	H	1.1	000

*- Margin = Field strength of spurious – calculated field strength limit.
**- EUT front panel refers to 0 degrees position of turntable.

Test specification:	**Section 90.1323, Radiated spurious emissions**		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 50 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.4.3 Substitution ERP of spurious test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
TEST SITE: OATS
TEST DISTANCE: 3 m
SUBSTITUTION ANTENNA HEIGHT: 0.8 m
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
SUBSTITUTION ANTENNA TYPE: Tunable dipole (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength, dB(µV/m)	RBW, kHz	Antenna polarization	RF generator output, dBm	Ant gain, dBd	Cable loss, dB	ERP, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency										
10995.33	69.39	1000	V	-36.46	10.45	2.50	-28.51	-13.00	-15.51	Pass
10995.03	60.64	1000	H	-43.70	10.45	2.50	-35.75	-13.00	-22.75	Pass
Mid carrier frequency										
10992.50	70.28	1000	V	-35.13	10.45	2.50	-27.15	-13.00	-14.15	Pass
10992.77	60.05	1000	H	-43.95	10.45	2.50	-35.97	-13.00	-22.97	Pass
High carrier frequency										
11015.33	69.21	1000	V	-36.28	10.45	2.50	-28.28	-13.00	-15.28	Pass
11014.97	59.35	1000	H	-44.85	10.45	2.50	-36.85	-13.00	-23.85	Pass

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

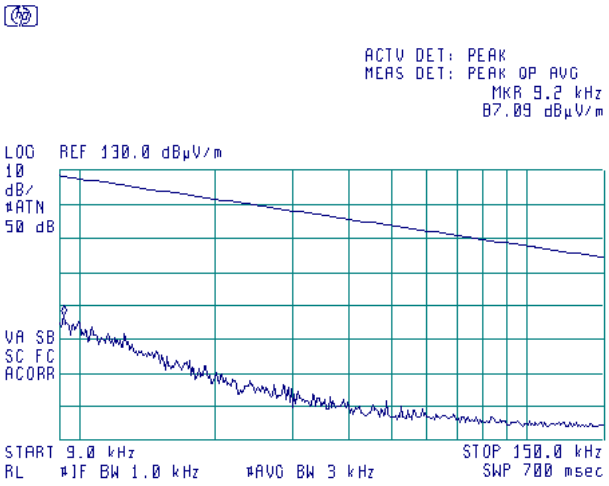
HL 0446	HL 0661	HL 0768	HL 0769	HL 1430	HL 1984	HL 2432	HL 2697
HL 2780	HL 2882	HL 2883	HL 3207	HL 3531	HL 3533	HL 3535	HL 3559
HL 3624							

Full description is given in Appendix A.

Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

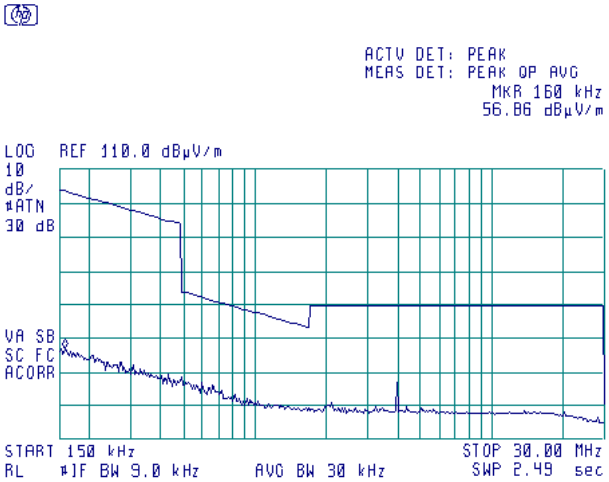
Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Low, Mid, High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.4.2 Radiated emission measurements in 0.15 - 30 MHz range

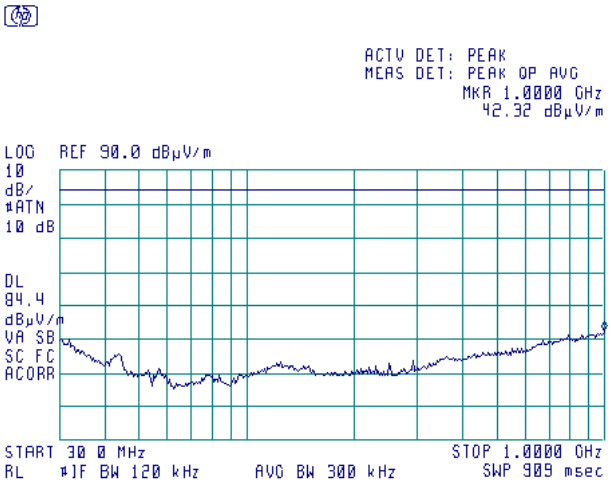
TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Low, Mid, High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

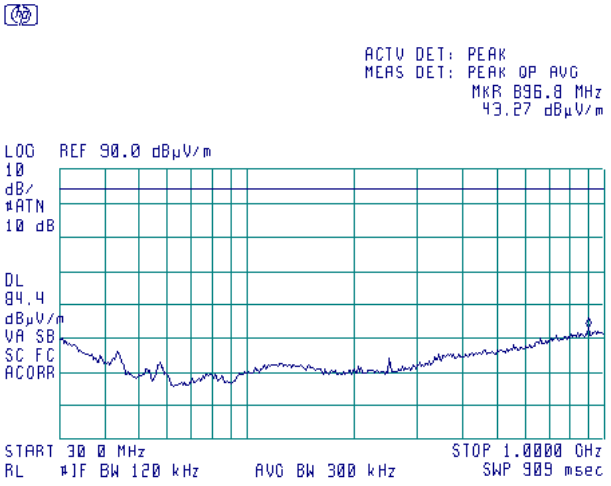
Plot 7.4.3 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.4.4 Radiated emission measurements in 30 - 1000 MHz range

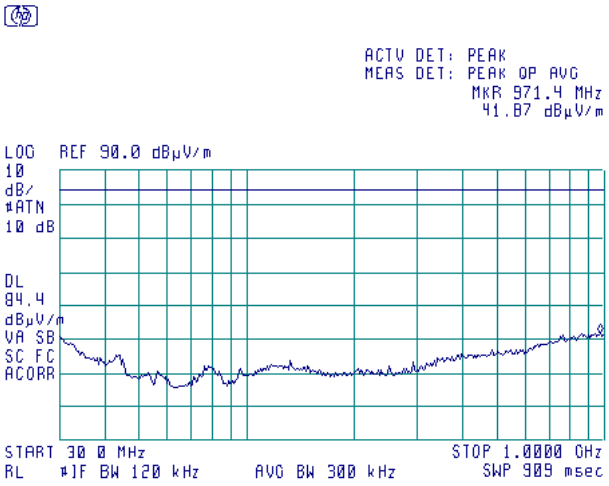
TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

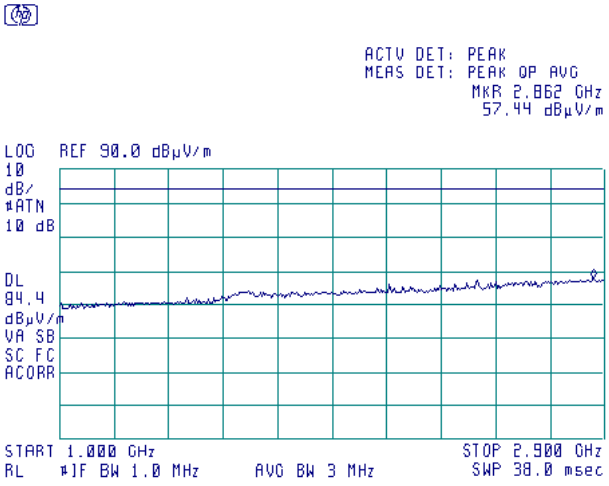
Plot 7.4.5 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.4.6 Radiated emission measurements in 1000 – 2900 MHz range

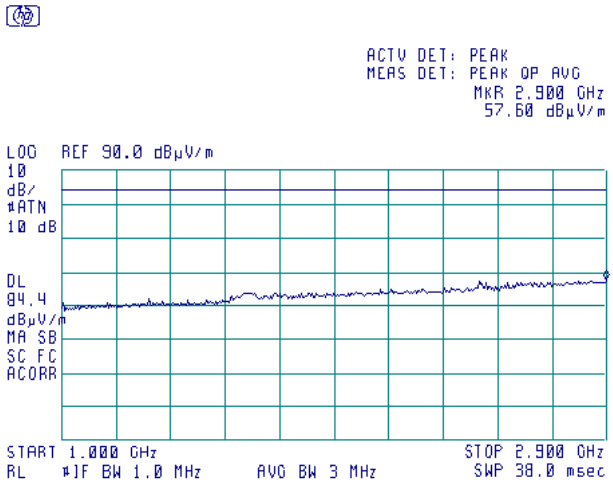
TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

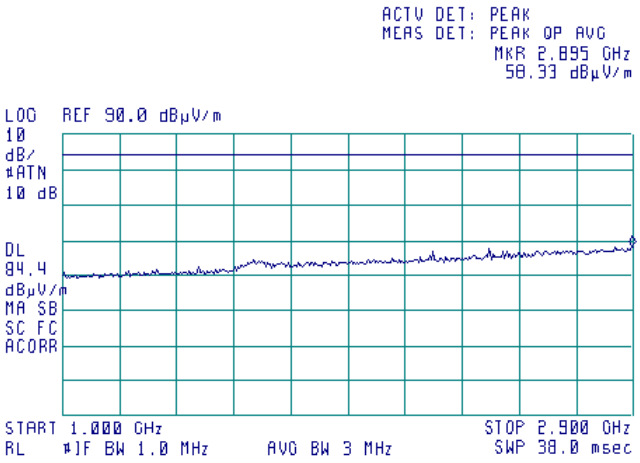
Plot 7.4.7 Radiated emission measurements in 1000 – 2900 MHz range

TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.4.8 Radiated emission measurements in 1000 – 2900 MHz range

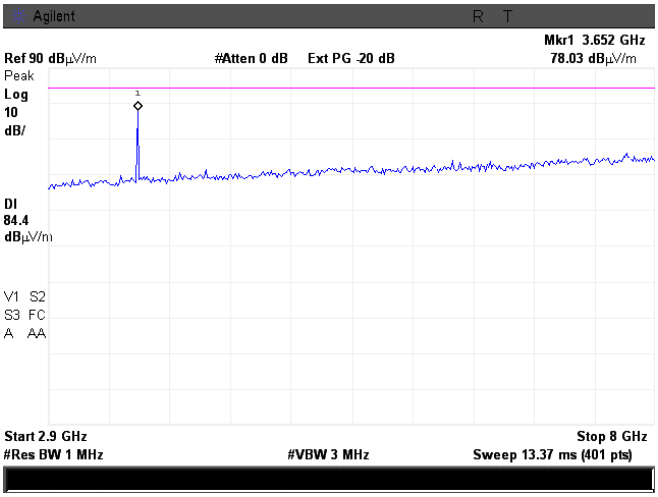
TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

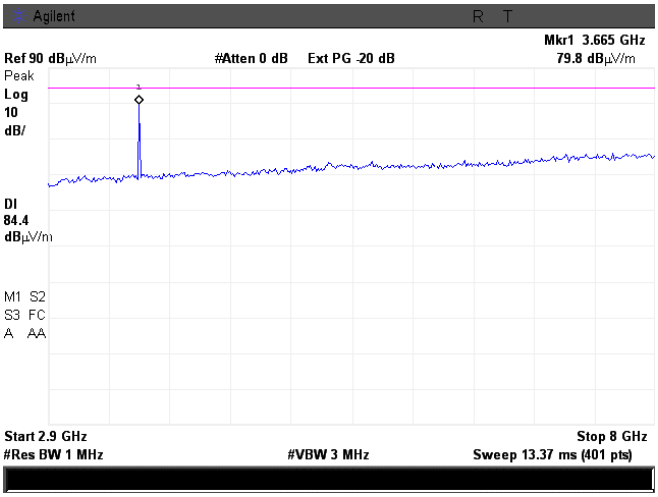
Plot 7.4.9 Radiated emission measurements in 2900 – 8000 MHz range

TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Plot 7.4.10 Radiated emission measurements in 2900 – 8000 MHz range

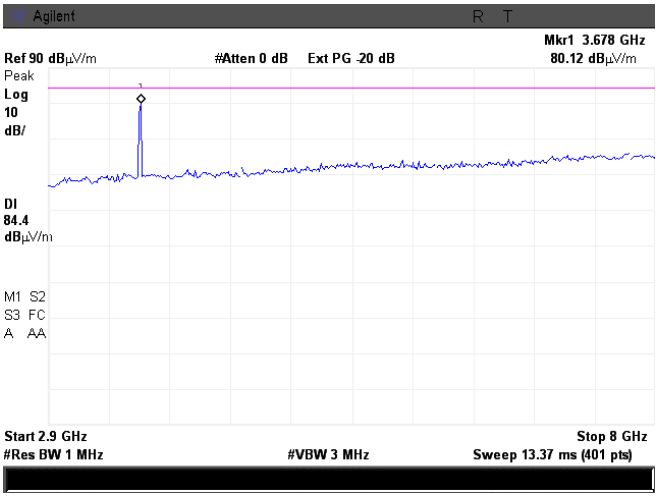
TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

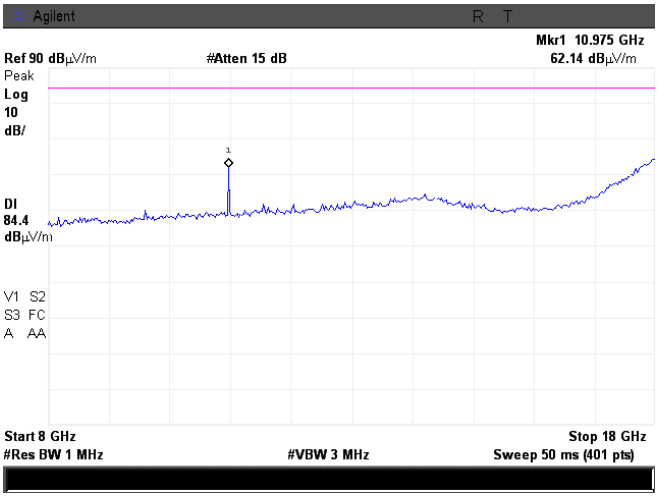
Plot 7.4.11 Radiated emission measurements in 2900 – 8000 MHz range

TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Plot 7.4.12 Radiated emission measurements in 8000 – 18000 MHz range

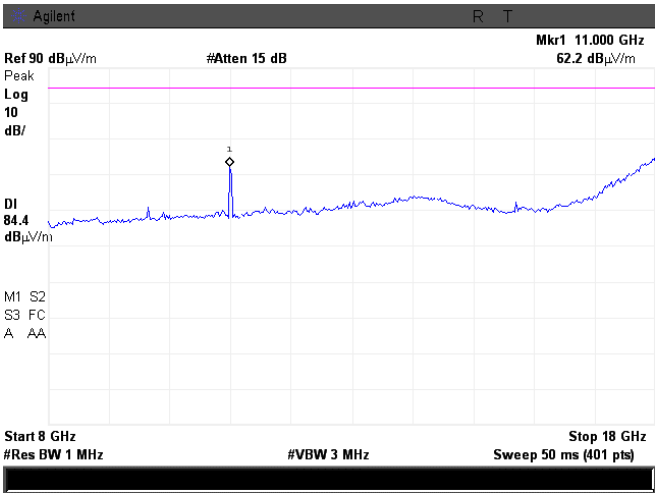
TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

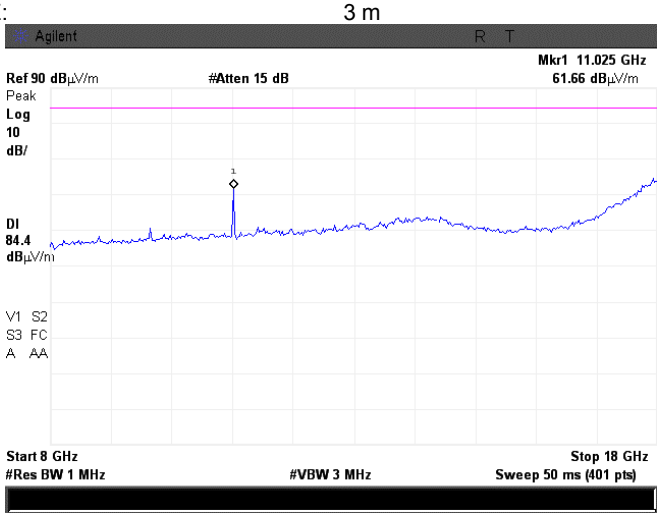
Plot 7.4.13 Radiated emission measurements in 8000 – 18000 MHz range

TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.4.14 Radiated emission measurements in 8000 – 18000 MHz range

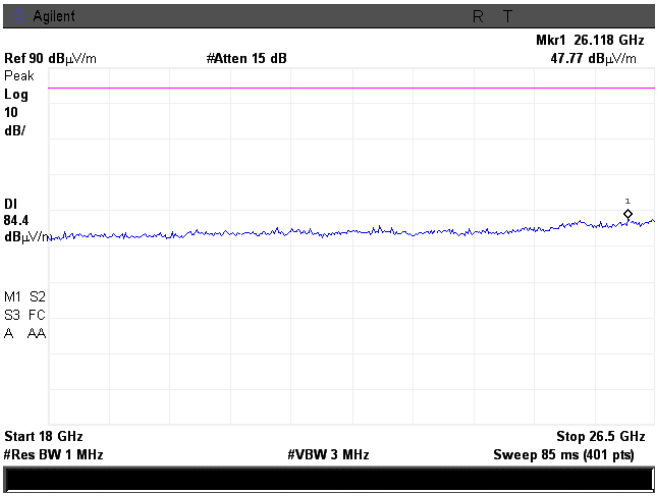
TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

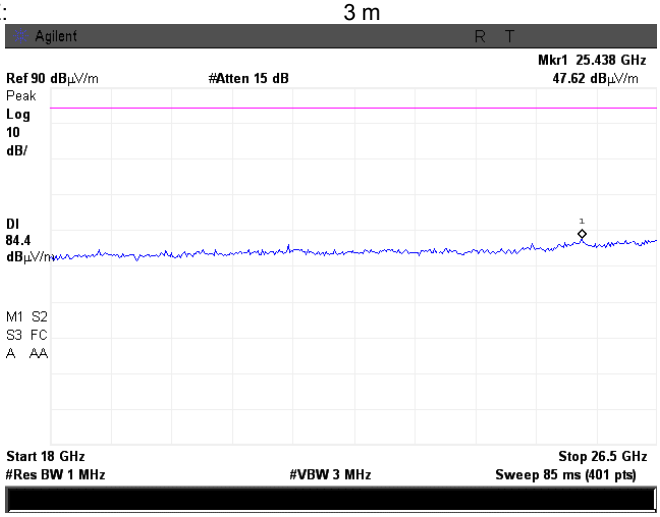
Plot 7.4.15 Radiated emission measurements in 18000 – 26500 MHz range

TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Low
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Plot 7.4.16 Radiated emission measurements in 18000 – 26500 MHz range

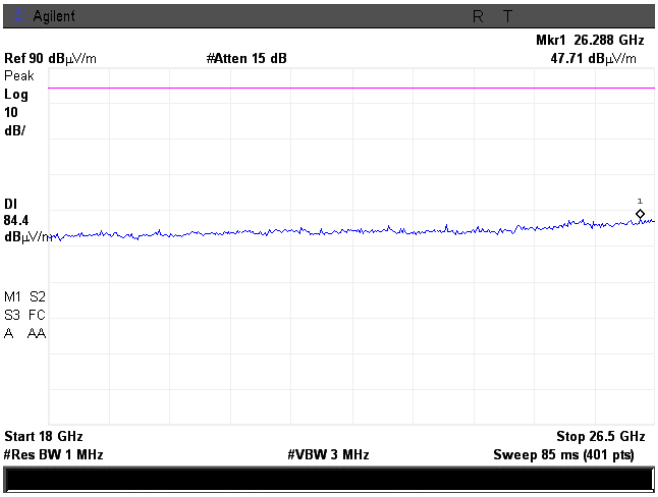
TEST SITE:	Fully anechoic chamber
CARRIER FREQUENCY:	Mid
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

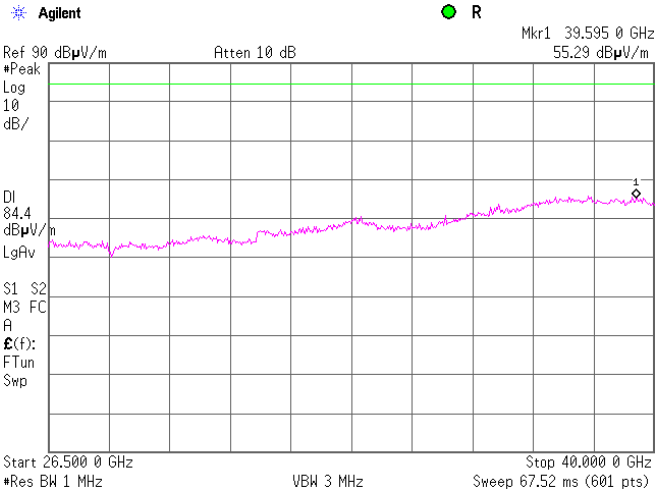
Plot 7.4.17 Radiated emission measurements in 18000 – 26500 MHz range

TEST SITE: Fully anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Plot 7.4.18 Radiated emission measurements in 26500 – 40000 MHz range

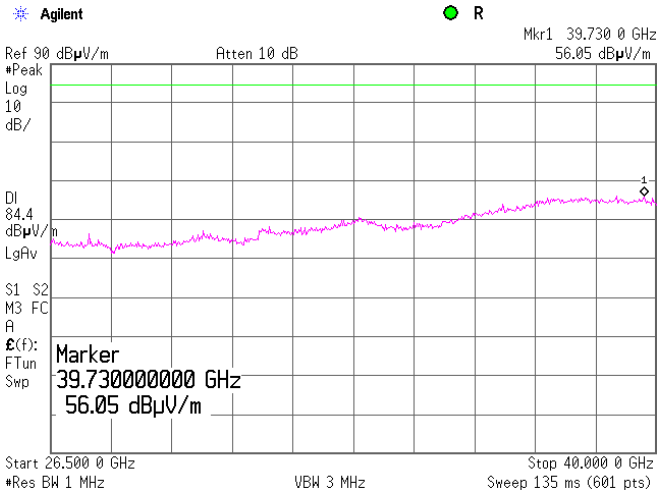
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

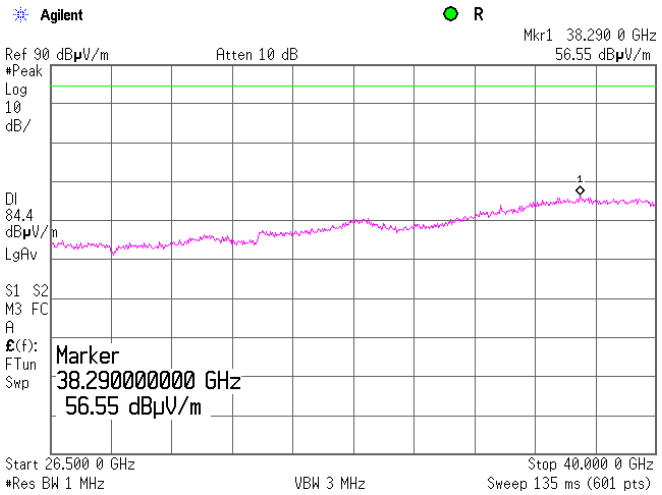
Plot 7.4.19 Radiated emission measurements in 26500 – 40000 MHz range

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



Plot 7.4.20 Radiated emission measurements in 26500 – 40000 MHz range

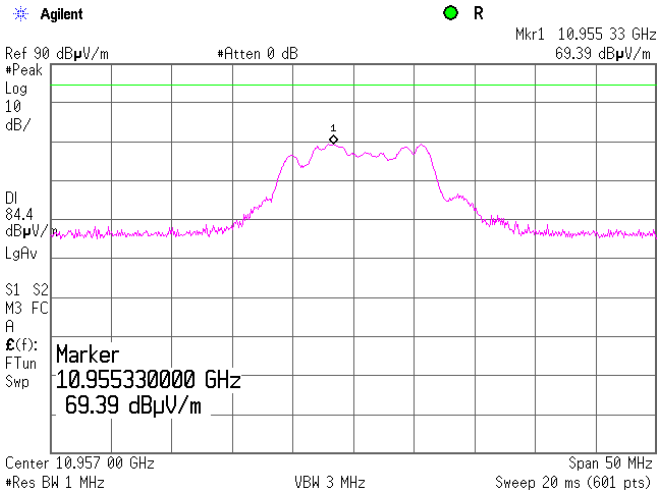
TEST SITE:	OATS
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

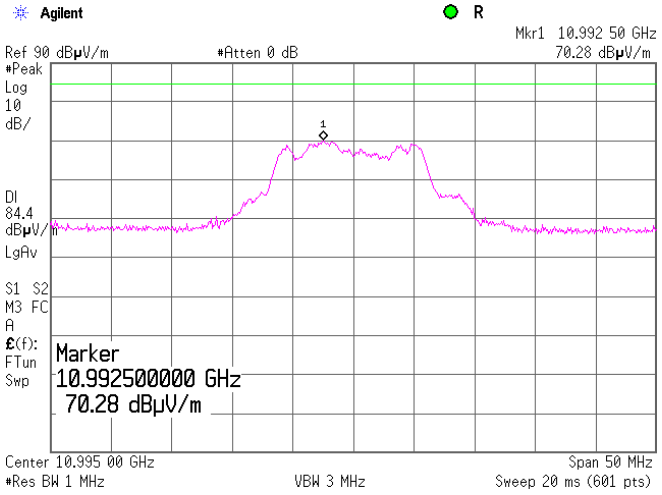
Plot 7.4.21 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.22 Radiated emission measurements at the 3rd harmonic

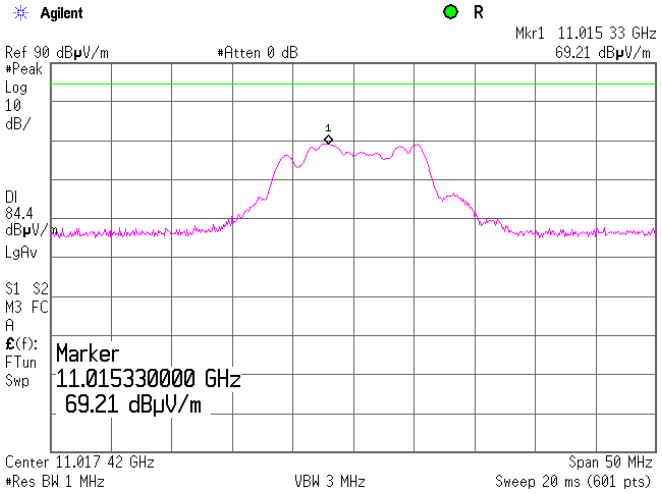
TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

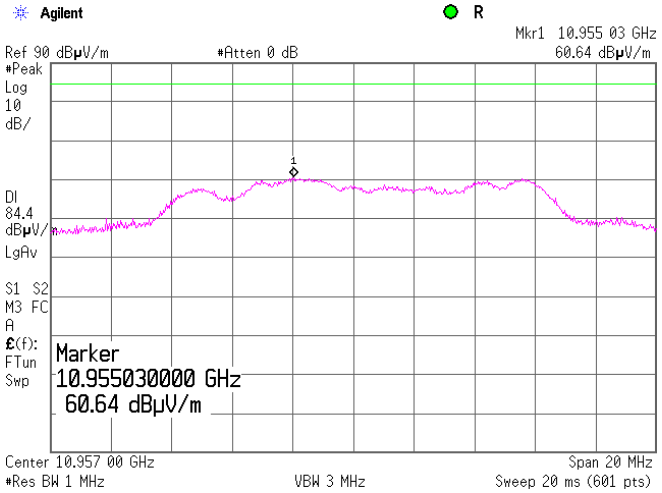
Plot 7.4.23 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical
TEST DISTANCE: 3 m



Plot 7.4.24 Radiated emission measurements at the 3rd harmonic

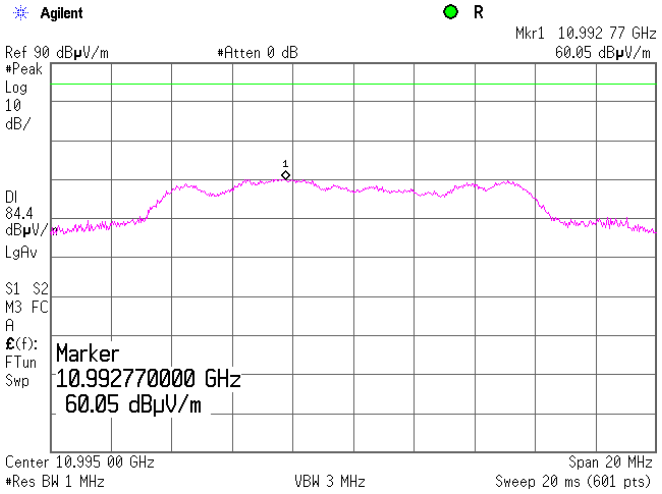
TEST SITE: OATS
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.1323, Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90. 1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 3:49:57 PM		
Temperature: 26.1 ºC	Air Pressure: 1015 hPa	Relative Humidity: 50 %	Power Supply: 120 VAC
Remarks:			

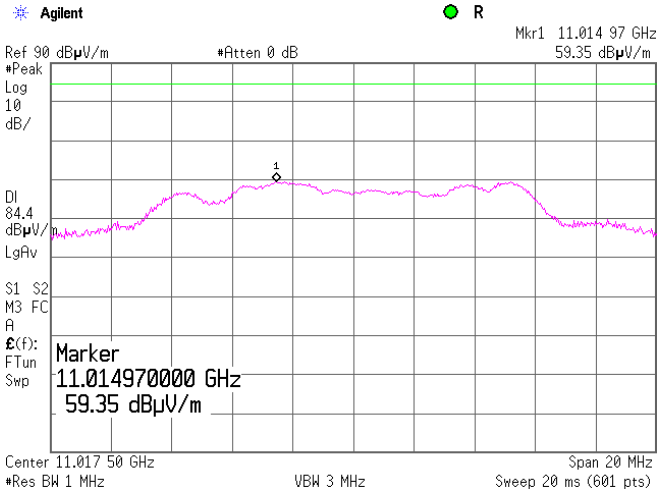
Plot 7.4.25 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Plot 7.4.26 Radiated emission measurements at the 3rd harmonic

TEST SITE: OATS
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	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 Spurious emission limits

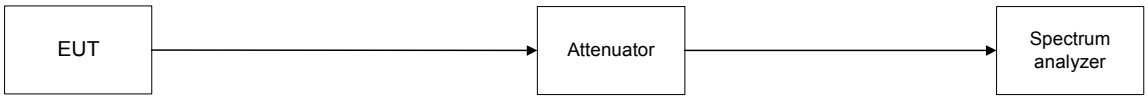
Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm
0.009 – 10th harmonic*	43+10logP** (mask B)	-13.0

* - spurious emission limits do not apply to the in band emission within ± 250 % of the authorized bandwidth from the carrier; investigated in course of emission mask testing
** - P is transmitter output power in Watts

7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.
7.5.2.2 The EUT 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 Spurious emission test setup



Test specification:	**Section 90.1323, Conducted spurious emissions**		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	**Air Pressure:** 1011 hPa	**Relative Humidity:** 40 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION: 64QAM
MODULATING SIGNAL: PRBS
BIT RATE: 18.85 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
TRANSMITTER OUTPUT POWER: 19.71 dBm at low frequency
19.40 dBm at mid frequency
19.36 dBm at high frequency

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
3196.030	-29.93	Included	Included	1000	-29.93	-13.00	-16.93	Pass
Mid carrier frequency								
3210.042	-29.73	Included	Included	1000	-29.73	-13.00	-16.73	Pass
High carrier frequency								
3216.100	-28.98	Included	Included	1000	-28.98	-13.00	-15.98	Pass

*- Margin = Spurious emission – specification limit.

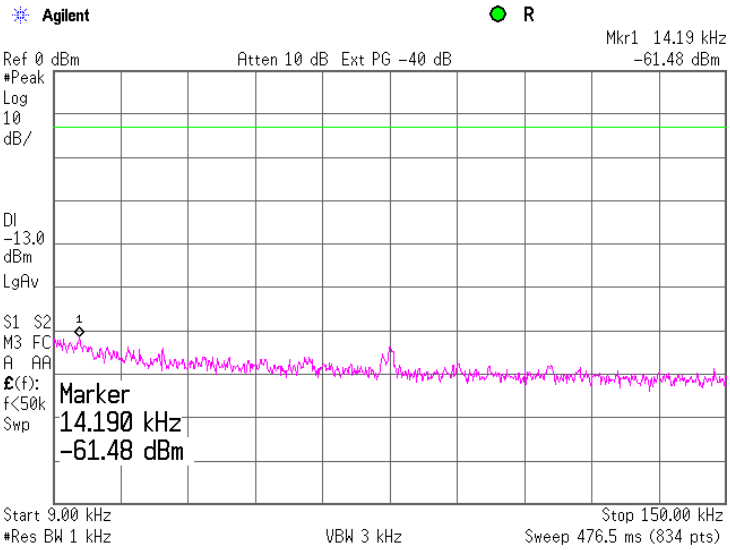
Reference numbers of test equipment used

HL 2953	HL 3206	HL 3439	HL 3442	HL 3455	HL 3818		

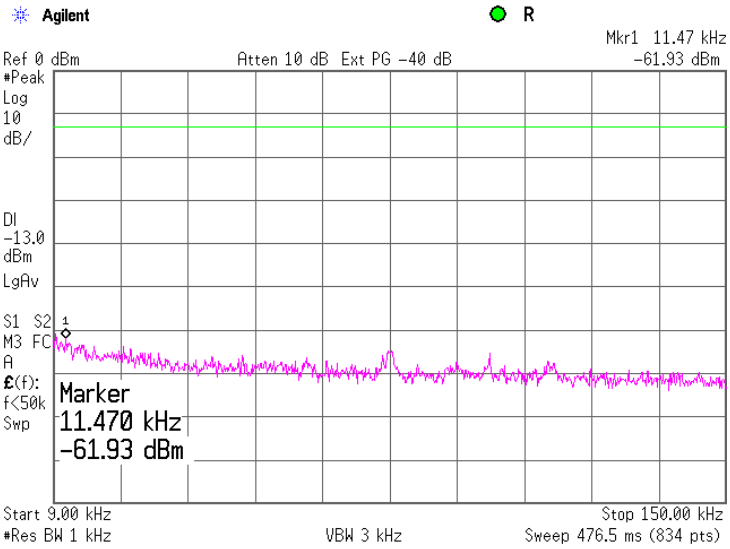
Full description is given in Appendix A.

Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

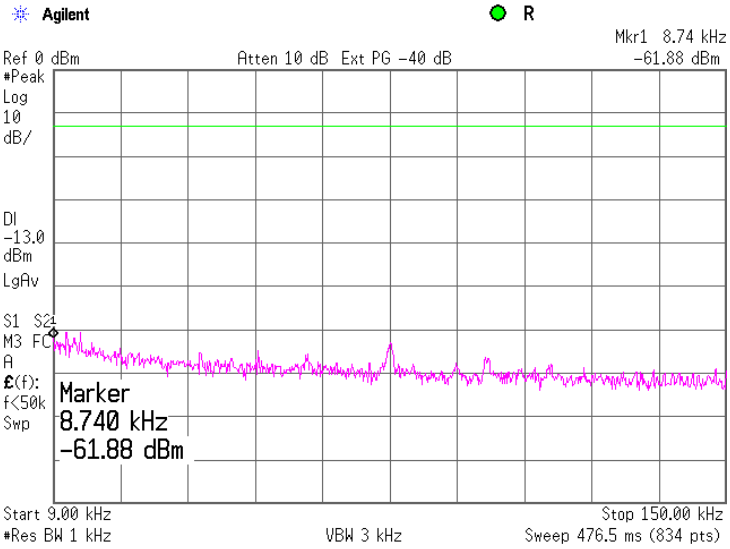


Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

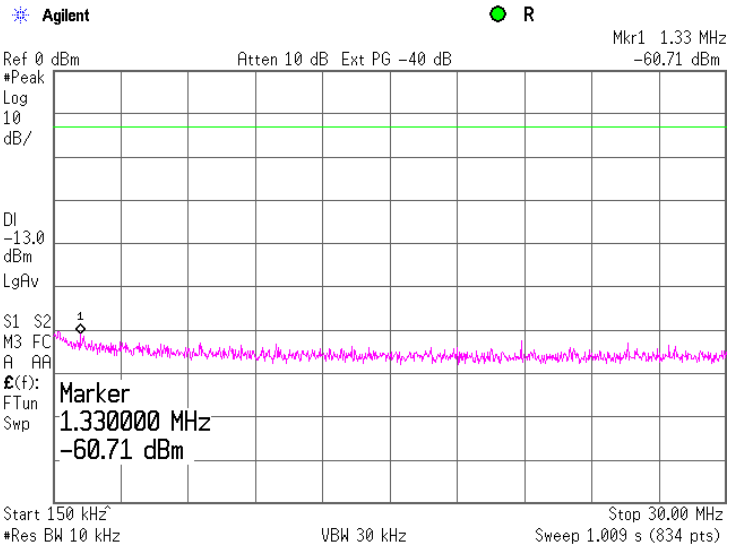


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

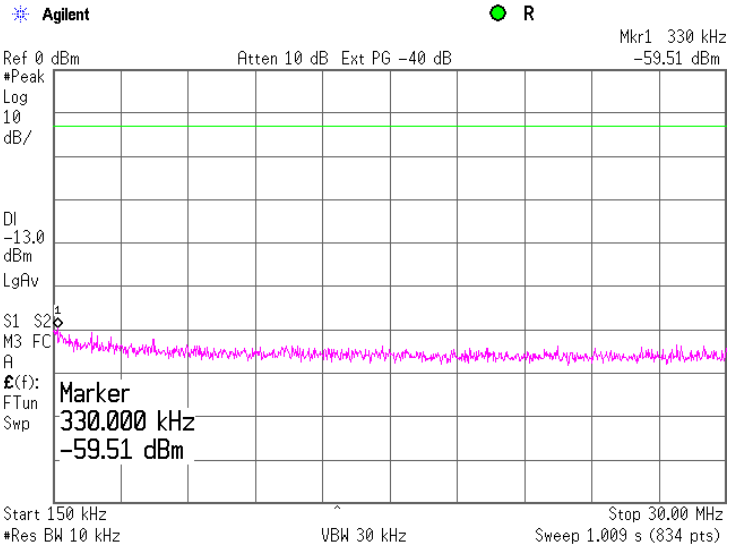


Plot 7.5.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

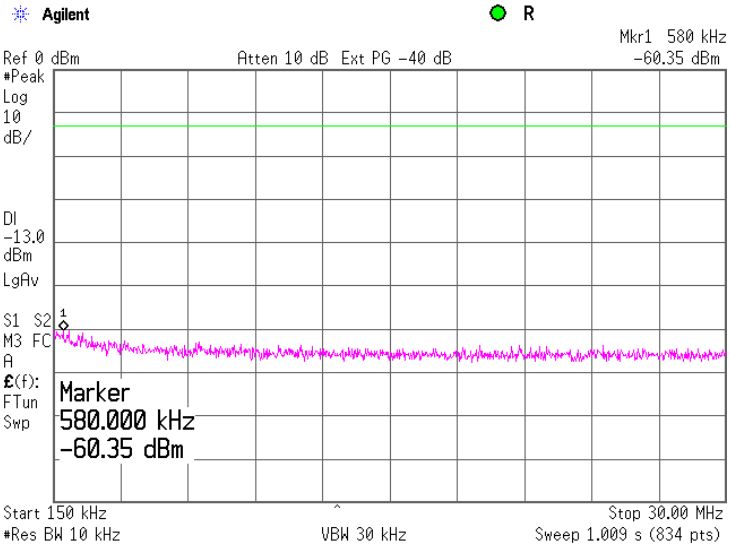


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency

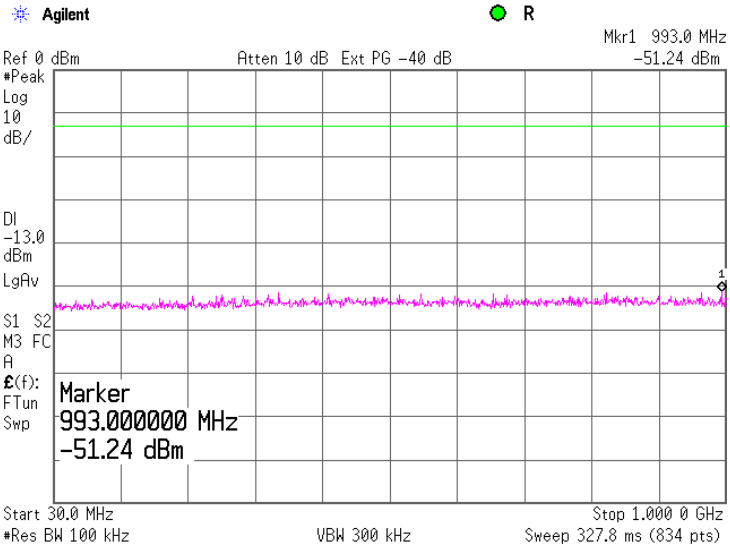


Plot 7.5.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency

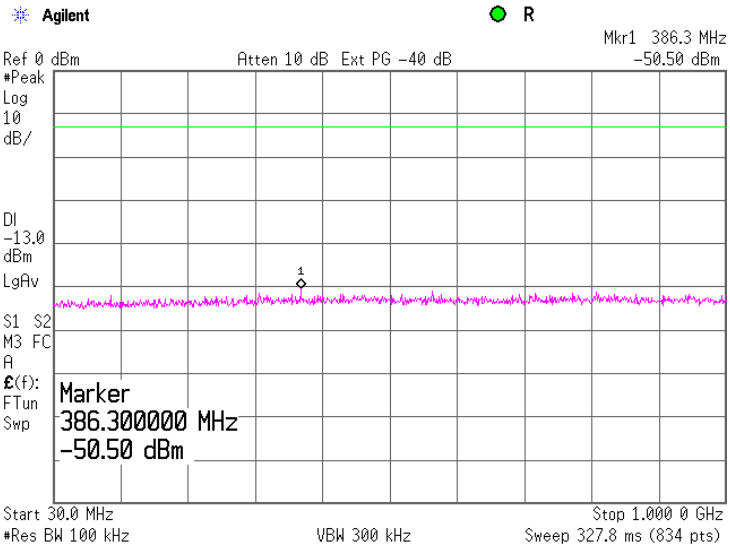


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.7 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency

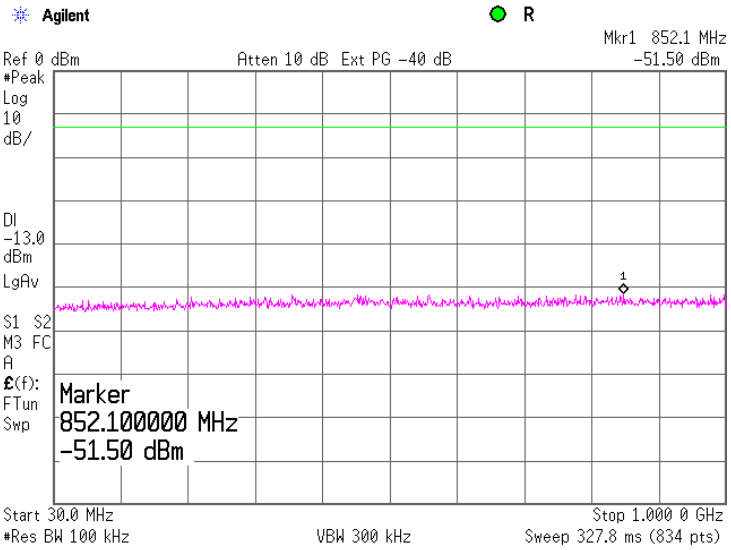


Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency

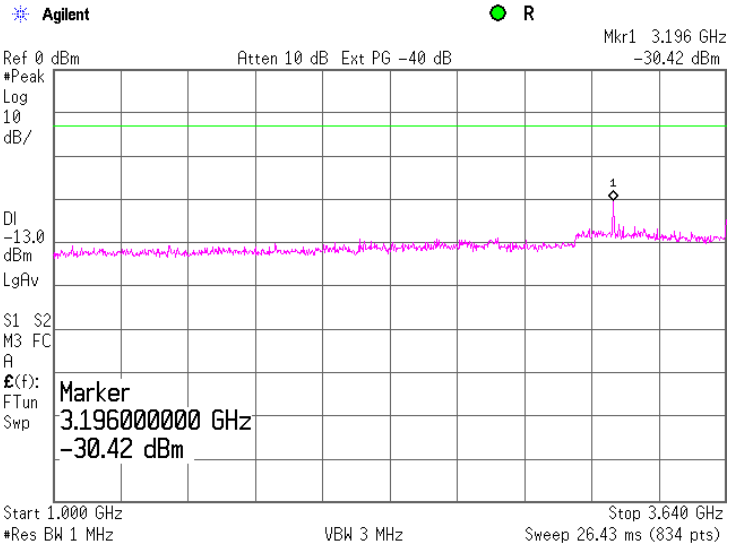


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.9 Spurious emission measurements in 30.0 - 1000 MHz range at high carrier frequency

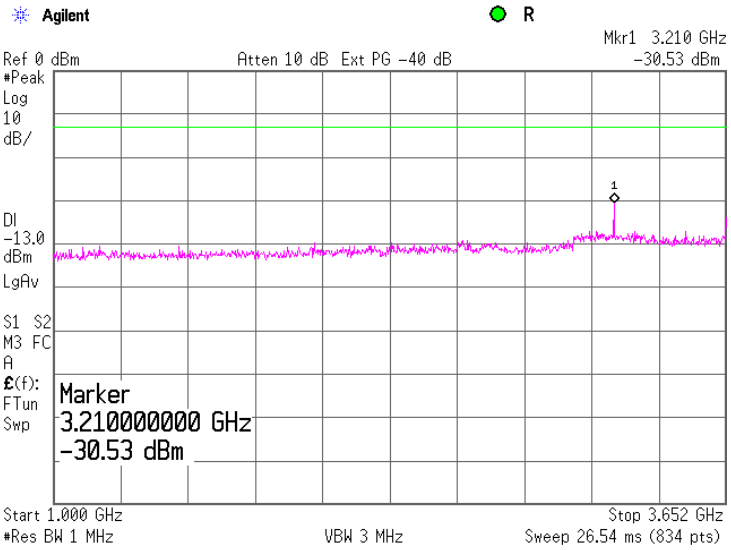


Plot 7.5.10 Spurious emission measurements in 1000 - 3640 MHz range at low carrier frequency

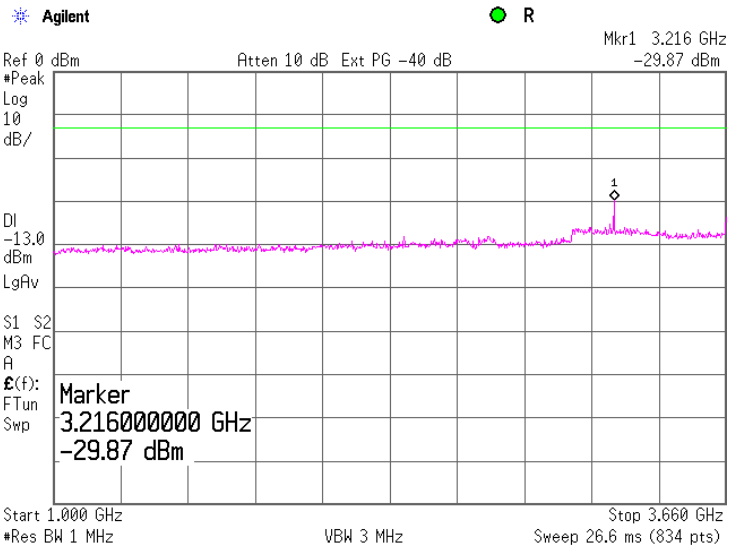


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.11 Spurious emission measurements in 1000 – 3652.5 MHz at mid carrier frequency

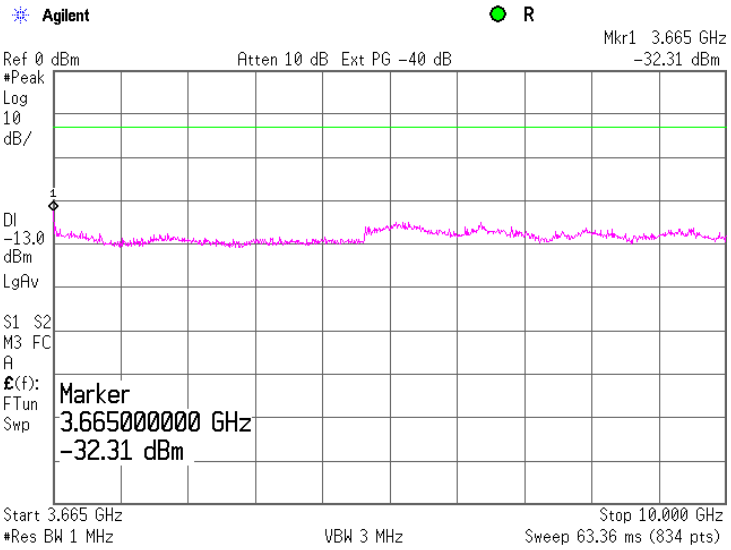


Plot 7.5.12 Spurious emission measurements in 1000 - 3660 MHz at high carrier frequency

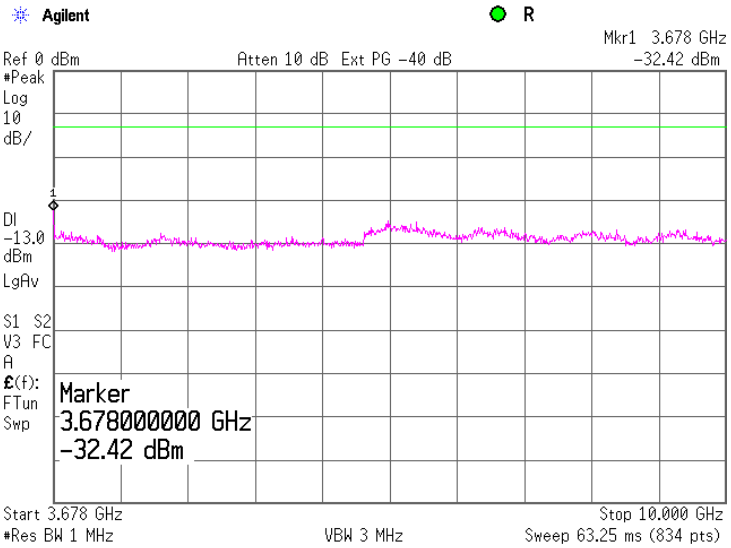


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.13 Spurious emission measurements in 3665 - 10000 MHz range at low carrier frequency

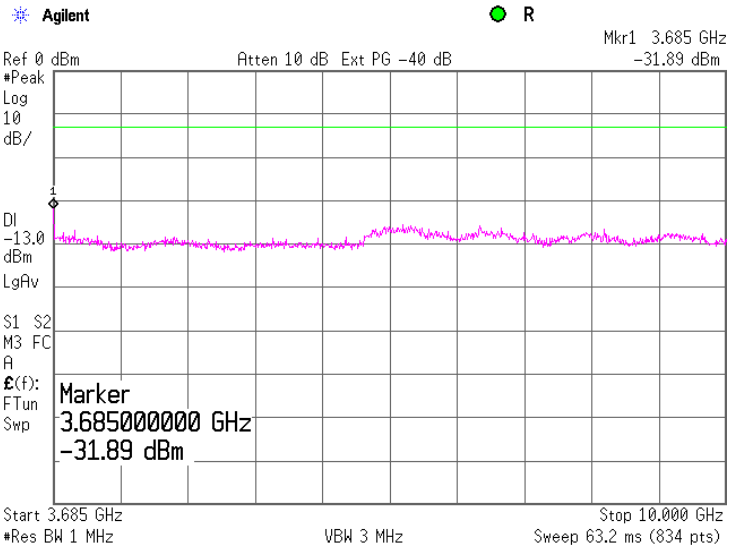


Plot 7.5.14 Spurious emission measurements in 3677.5 - 10000 MHz at mid carrier frequency

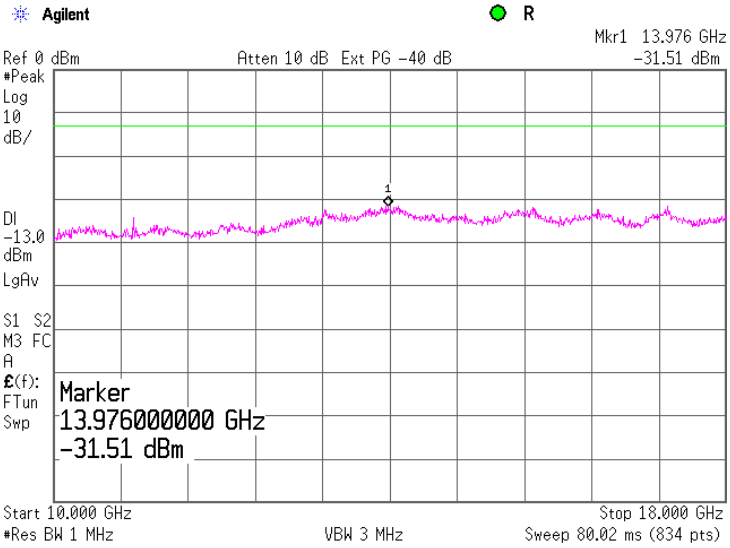


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.15 Spurious emission measurements in 3685 - 10000 MHz at high carrier frequency

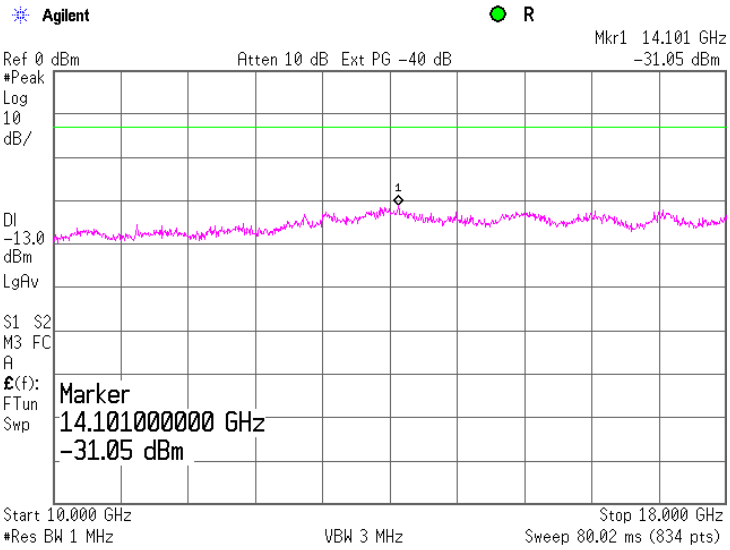


Plot 7.5.16 Spurious emission measurements in 10000 - 18000 MHz range at low carrier frequency

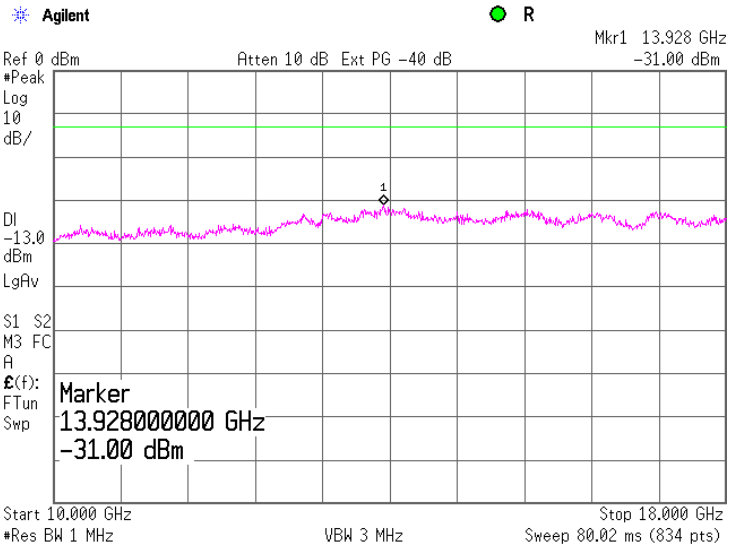


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.17 Spurious emission measurements in 10000 - 18000 MHz at mid carrier frequency

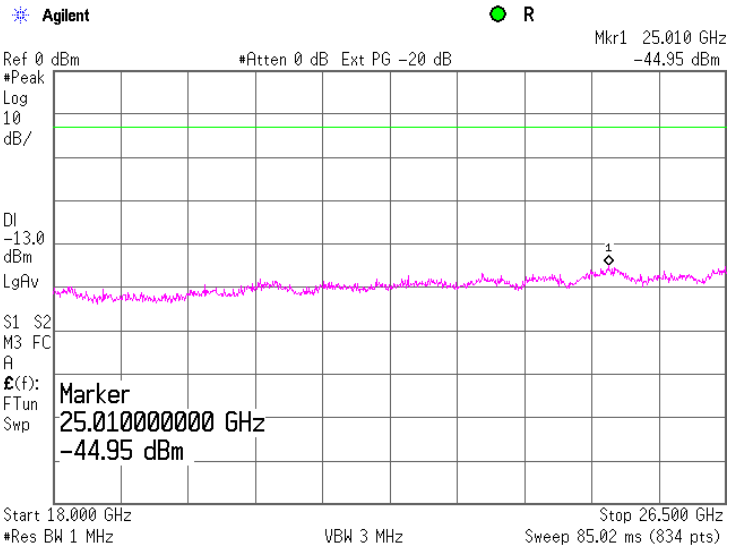


Plot 7.5.18 Spurious emission measurements in 10000 - 18000 MHz at high carrier frequency

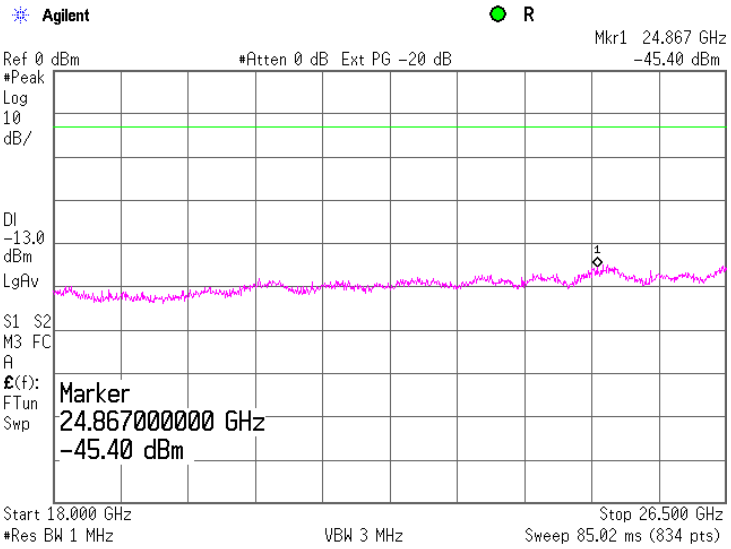


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.19 Spurious emission measurements in 18000 - 26500 MHz range at low carrier frequency

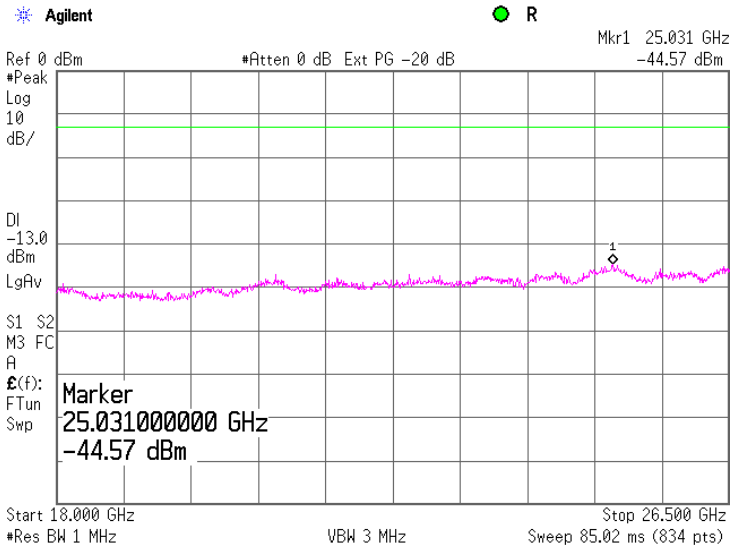


Plot 7.5.20 Spurious emission measurements in 18000 - 26500 MHz at mid carrier frequency

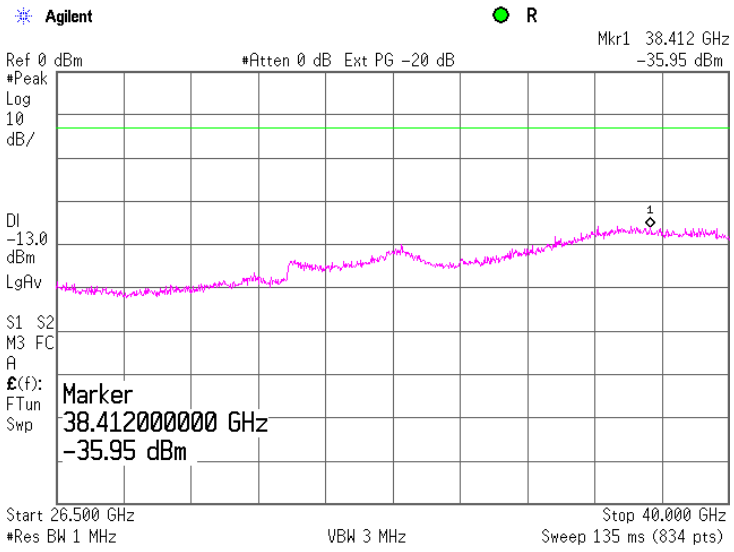


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.21 Spurious emission measurements in 18000 - 26500 MHz at high carrier frequency

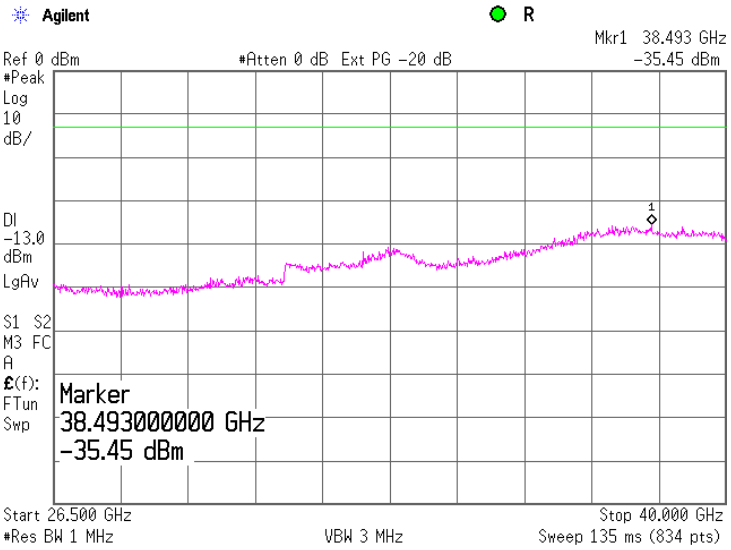


Plot 7.5.22 Spurious emission measurements in 26500 - 40000 MHz range at low carrier frequency

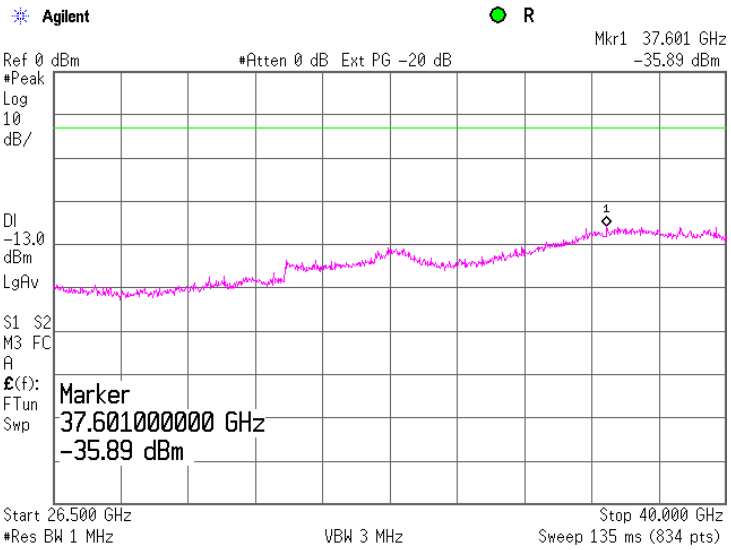


Test specification:	Section 90.1323, Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.1323		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/9/2009 12:22:20 PM		
Temperature: 25.2 ºC	Air Pressure: 1011 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.5.23 Spurious emission measurements in 26500 – 40000 MHz at mid carrier frequency



Plot 7.5.24 Spurious emission measurements in 26500 – 40000 MHz at high carrier frequency



Test specification:	Section 90.213, Frequency stability		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	11/10/2009 4:44:16 PM		
Temperature: 25.4 ºC	Air Pressure: 1015 hPa	Relative Humidity: 43 %	Power Supply: 120 VAC
Remarks:			

7.6 Frequency stability test

7.6.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
3650.0 – 3675.0	NA	NA

7.6.2 Test procedure

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and its proper operation was checked.

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

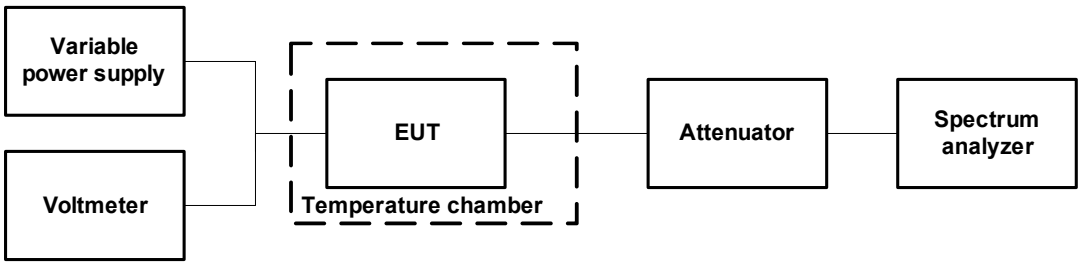
7.6.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

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

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

7.6.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.6.2.

Figure 7.6.1 Frequency stability test setup



Test specification:	**Section 90.213, Frequency stability**		
Test procedure:	47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2		
Test mode:	Compliance	**Verdict:**	PASS
Date & Time:	11/10/2009 4:44:16 PM		
Temperature: 25.4 ºC	**Air Pressure:** 1015 hPa	**Relative Humidity:** 43 %	**Power Supply:** 120 VAC
Remarks:			

Table 7.6.2 Frequency stability test results

ASSIGNED FREQUENCY RANGE: 3650.0 – 3675.0 MHz
NOMINAL POWER VOLTAGE: 120 VAC
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 1000 Hz
VIDEO BANDWIDTH: 3000 Hz
MODULATION: Unmodulated

T, ºC	Voltage,	Time period							Max frequency drift, Hz		Max frequency drift,ppm	
	V	Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative	Positive	Negative
Low carrier 3652.5 MHz												
-30	nominal	3652.517688	3652.517874	3652.517929	3652.518002	3652.518247	3652.518457	3652.518545	20632.00	0.00	5.65	0.00
-20	nominal	3652.527979	NA	NA	NA	NA	NA	3652.528325	30412.00	0.00	8.33	0.00
-10	nominal	3652.529096	NA	NA	NA	NA	NA	3652.528616	31183.00	0.00	8.54	0.00
0	nominal	3652.525736	3652.524500	3652.524050	3652.523700	3652.523450	3652.523236	3652.522560	27823.00	0.00	7.62	0.00
10	nominal	3652.510060	NA	NA	NA	NA	NA	3652.510626	12713.00	0.00	3.48	0.00
20	15%	3652.498649	NA	NA	NA	NA	NA	3652.497037	736.00	-876.00	0.20	-0.24
20	nominal	3652.491002	NA	NA	NA	NA	NA	3652.497913	0.00	-6911.00	0.00	-1.89
20	-15%	3652.497871	NA	NA	NA	NA	NA	3652.497053	0.00	-860.00	0.00	-0.24
30	nominal	3652.492644	3652.489664	3652.488652	3652.487922	3652.487403	3652.486906	3652.485756	0.00	-12157.00	0.00	-3.33
40	nominal	3652.476542	NA	NA	NA	NA	NA	3652.473105	0.00	-24808.00	0.00	-6.79
50	nominal	3652.463988	3652.463850	3652.463740	3652.463717	3652.463695	3652.463672	3652.463641	0.00	-34272.00	0.00	-9.38
Mid carrier 3665/0 MHz												
-30	nominal	3665.012776	3665.015880	3665.016900	3665.017273	3665.017697	3665.018027	3665.018500	21619.00	0.00	5.90	0.00
-20	nominal	3665.027987	NA	NA	NA	NA	NA	3665.028550	31669.00	0.00	8.64	0.00
-10	nominal	3665.029370	NA	NA	NA	NA	NA	3665.028798	32489.00	0.00	8.86	0.00
0	nominal	3665.023167	3665.022886	3665.022770	3665.022700	3665.022680	3665.022644	3665.022620	26286.00	0.00	7.17	0.00
10	nominal	3665.009500	NA	NA	NA	NA	NA	3665.010635	13754.00	0.00	3.75	0.00
20	15%	3664.998362	NA	NA	NA	NA	NA	3664.997088	1481.00	0.00	0.40	0.00
20	nominal	3664.987666	NA	NA	NA	NA	NA	3664.996881	0.00	-9215.00	0.00	-2.51
20	-15%	3664.997077	NA	NA	NA	NA	NA	3664.997079	198.00	0.00	0.05	0.00
30	nominal	3664.991454	3664.989241	3664.988700	3664.988000	3664.987596	3664.987277	3664.986177	0.00	-10704.00	0.00	-2.92
40	nominal	3664.977594	NA	NA	NA	NA	NA	3664.972940	0.00	-23941.00	0.00	-6.53
50	nominal	3664.964042	3664.963650	3664.963622	3664.963529	3664.963536	3664.963480	3664.963444	0.00	-33437.00	0.00	-9.12
High carrier 3672.5 MHz												
-30	nominal	3672.514025	3672.516850	3672.517670	3672.517914	3672.517988	3672.518545	3672.518939	21999.00	0.00	5.99	0.00
-20	nominal	3672.527041	NA	NA	NA	NA	NA	3672.528659	31719.00	0.00	8.64	0.00
-10	nominal	3672.529559	NA	NA	NA	NA	NA	3672.528600	32619.00	0.00	8.88	0.00
0	nominal	3672.525876	3672.524800	3672.524330	3672.523920	3672.523700	3672.523450	3672.522900	28936.00	0.00	7.88	0.00
10	nominal	3672.509484	NA	NA	NA	NA	NA	3672.510689	13749.00	0.00	3.74	0.00
20	15%	3672.498012	NA	NA	NA	NA	NA	3672.497035	1072.00	0.00	0.29	0.00
20	nominal	3672.497012	NA	NA	NA	NA	NA	3672.496940	72.00	0.00	0.02	0.00
20	-15%	3672.499339	NA	NA	NA	NA	NA	3672.497080	2399.00	0.00	0.65	0.00
30	nominal	3672.486832	3672.486300	3672.486137	3672.486043	3672.485964	3672.485917	3672.485644	0.00	-11296.00	0.00	-3.08
40	nominal	3672.479927	NA	NA	NA	NA	NA	3672.472957	0.00	-23983.00	0.00	-6.53
50	nominal	3672.465437	3672.464700	3672.464375	3672.464224	3672.463952	3672.463852	3672.463458	0.00	-33482.00	0.00	-9.12

* - Reference frequency

Reference numbers of test equipment used

HL 0493	HL 1424	HL 2869					

Full description is given in Appendix A.

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	28-Jun-09	28-Jun-10
0493	Temperature Chamber -45…175 deg C	Thermotron	S-1.2 Mini-Max	14016	20-May-09	20-May-10
0661	Generator Swept Signal, 10 MHz to 40 GHz, + 10 dBm	HP	83640B	3614A00266	17-Sep-08	17-Dec-09
0768	Antenna Standard Gain Horn,18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	23-Dec-08	23-Dec-11
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	23-Dec-08	23-Dec-11
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A00219	28-Aug-09	28-Aug-10
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A00262,3705A00217	31-Aug-09	31-Aug-10
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	24-Aug-09	24-Aug-10
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	24-Aug-09	24-Aug-10
2697	Antenna, 30 MHz - 3.0 GHz	Sunol Sciences. Corp. Pleasanton, California USA	JB3	A022805	11-Jan-09	11-Jan-10
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY45102406	05-Jul-09	05-Jul-10
2869	Cable, 18 GHz, 1.2 m, SMA - SMA, Right Angle	Gore	NA	91P72073	04-Feb-09	04-Feb-10
2882	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539001	30-Dec-08	30-Dec-09
2883	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539003	07-Dec-08	07-Dec-09
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-09	05-Oct-10
3206	Cable 40 GHz, 0.6 m	Gore	GOR245	05118336	11-Jun-09	11-Jun-10
3207	Cable 40 GHz, 1.2 m	Gore	GOR245	05118337	11-Jun-09	11-Jun-10
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY45101057	03-Dec-08	03-Dec-09
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY45240586	05-Dec-08	05-Dec-09
3439	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	08-Mar-09	08-Mar-10
3455	Medium Power Fixed Coaxial Attenuator DC to 40 GHz, 20 dB, 5 W	Aeroflex / Weinschel	75A-20-12	1182	17-Mar-09	17-Mar-10
3531	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ-02084040-J0	11159002002	07-Dec-08	07-Dec-09

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	11159001001	07-Dec-08	07-Dec-09
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537-J0	11159003001	07-Dec-08	07-Dec-09
3559	Cable 40 GHz, SMA-SMA, 0.95 m, Blue	Gore	PHASEFLEX	03771245	10-Aug-09	10-Aug-10
3624	Cable RF, 3.5 m, N type-N type, DC-6.5 GHz	Belden	MIL C-17	NA	17-Dec-08	17-Dec-09
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	25-Sep-09	25-Sep-10

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

Test description	Expanded uncertainty
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
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
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %

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

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

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

10 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.
Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS and IC 2186A-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), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

Address: P.O. Box 23, Binyamina 30500, Israel.
Telephone: +972 4628 8001
Fax: +972 4628 8277
e-mail: mail@hermonlabs.com
website: www.hermonlabs.com

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

FCC 47CFR part 90: 2008	Private land mobile radio services
FCC 47CFR part 1: 2008	Practice and procedure
FCC 47CFR part 2: 2008	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 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.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

12 APPENDIX E Test equipment correction factors

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

Frequency, MHz	Magnetic Antenna Factor, dB(S/m)	Electric Antenna Factor, dB(1/m)
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.7
0.750	-41.9	9.6
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.1
4.000	-41.4	10.1
5.000	-41.5	10.0
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

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

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

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

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

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL 1984

Frequency, MHz	Antenna factor, dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.6
2500.0	28.9
3000.0	31.2
3500.0	32.0
4000.0	32.5
4500.0	32.7
5000.0	33.6
5500.0	35.1
6000.0	35.4
6500.0	34.9
7000.0	36.1
7500.0	37.8
8000.0	38.0
8500.0	38.1
9000.0	39.1
9500.0	38.3
10000.0	38.6
10500.0	38.2
11000.0	38.7
11500.0	39.5
12000.0	40.0
12500.0	40.4
13000.0	40.5
13500.0	41.1
14000.0	41.6
14500.0	41.7
15000.0	38.7
15500.0	38.2
16000.0	38.8
16500.0	40.5
17000.0	42.5
17500.0	45.9
18000.0	49.4

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

Antenna factor
Double-ridged guide horn antenna
Model 3115, serial number: 00027177, HL 2432

Frequency, MHz	Antenna factor. dB(1/m)
1000.0	24.7
1500.0	25.7
2000.0	27.8
2500.0	28.9
3000.0	30.7
3500.0	31.8
4000.0	33.0
4500.0	32.8
5000.0	34.2
5500.0	34.9
6000.0	35.2
6500.0	35.4
7000.0	36.3
7500.0	37.3
8000.0	37.5
8500.0	38.0
9000.0	38.3
9500.0	38.3
10000.0	38.7
10500.0	38.7
11000.0	38.9
11500.0	39.5
12000.0	39.5
12500.0	39.4
13000.0	40.5
13500.0	40.8
14000.0	41.5
14500.0	41.3
15000.0	40.2
15500.0	38.7
16000.0	38.5
16500.0	39.8
17000.0	41.9
17500.0	45.8
18000.0	49.1

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

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

Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain	Frequency, MHz	ACF, dB	Gain, dBi	Num gain
30	22.2	-22.5	0.01	620	19.7	6.3	4.27	1215	24.9	7.0	5.05	1810	28.3	7.1	5.08	2405	30.9	6.9	4.93
35	18.5	-17.4	0.02	625	19.7	6.5	4.42	1220	24.9	7.0	4.99	1815	28.5	6.9	4.91	2410	30.9	6.9	4.89
40	14.7	-12.5	0.06	630	19.6	6.6	4.57	1225	25.1	6.9	4.91	1820	28.6	6.8	4.74	2415	31.0	6.9	4.85
45	11.3	-8.1	0.16	635	19.7	6.5	4.48	1230	25.2	6.8	4.82	1825	28.7	6.8	4.75	2420	31.0	6.8	4.82
45	11.3	-8.1	0.16	640	19.9	6.4	4.40	1235	25.1	7.0	4.96	1830	28.7	6.8	4.76	2425	31.1	6.8	4.81
50	8.9	-4.7	0.34	645	19.9	6.5	4.45	1240	25.0	7.1	5.09	1835	28.7	6.7	4.72	2430	31.0	6.9	4.87
55	7.9	-2.8	0.52	650	19.9	6.5	4.51	1245	25.0	7.1	5.12	1840	28.8	6.7	4.69	2435	31.0	6.9	4.88
60	7.8	-2.1	0.62	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	8.5	-2.0	0.63	660	19.9	6.7	4.69	1255	25.0	7.2	5.25	1850	28.4	7.1	5.12	2445	31.1	6.9	4.91
70	9.0	-1.9	0.64	665	19.9	6.7	4.70	1260	24.9	7.3	5.36	1855	28.5	7.0	5.07	2450	31.0	7.0	4.96
75	8.8	-1.1	0.78	670	20.0	6.7	4.71	1265	25.0	7.3	5.31	1860	28.6	7.0	5.01	2455	31.0	7.0	5.01
80	8.4	-0.2	0.97	675	20.1	6.7	4.71	1270	25.1	7.2	5.26	1865	28.5	7.1	5.17	2460	30.9	7.2	5.19
85	8.0	0.8	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	8.2	1.1	1.29	685	20.1	6.8	4.79	1280	25.5	6.8	4.84	1875	28.4	7.2	5.28	2470	31.3	6.8	4.76
95	9.2	0.5	1.13	690	20.1	6.9	4.88	1285	25.4	7.0	4.97	1880	28.5	7.2	5.22	2475	31.4	6.7	4.69
100	10.6	-0.4	0.92	695	20.2	6.8	4.82	1290	25.3	7.1	5.10	1885	28.5	7.2	5.22	2480	31.3	6.8	4.79
110	12.6	-1.6	0.70	705	20.4	6.8	4.75	1300	25.2	7.3	5.33	1895	28.6	7.2	5.24	2490	31.1	7.0	4.99
120	13.9	-2.1	0.62	715	20.5	6.8	4.80	1310	25.5	7.1	5.09	1905	28.5	7.3	5.36	2500	30.9	7.2	5.27
125	14.2	-2.0	0.63	720	20.5	6.9	4.85	1315	25.4	7.2	5.23	1910	28.5	7.4	5.45	2505	31.1	7.1	5.15
130	14.2	-1.7	0.68	725	20.6	6.8	4.81	1320	25.3	7.3	5.36	1915	28.5	7.3	5.38	2510	31.0	7.2	5.22
140	13.4	-0.3	0.94	735	20.9	6.7	4.65	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	5.17	1945	28.5	7.5	5.59	2540	31.2	7.1	5.09
165	12.5	2.0	1.59	760	21.0	6.8	4.83	1355	25.8	7.0	5.06	1950	28.6	7.4	5.48	2545	31.0	7.3	5.43
170	12.2	2.6	1.83	765	21.1	6.8	4.73	1360	25.9	6.9	4.95	1955	28.6	7.5	5.57	2550	31.0	7.3	5.39
175	11.8	3.3	2.13	770	21.3	6.7	4.64	1365	26.0	6.9	4.95	1960	28.6	7.5	5.65	2555	31.1	7.2	5.30
180	11.6	3.7	2.36	775	21.3	6.7	4.68	1370	26.0	7.0	4.96	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	11.6	4.2	2.61	785	21.3	6.8	4.77	1380	26.0	7.0	5.06	1975	28.9	7.2	5.22	2570	31.1	7.3	5.37
200	13.1	3.2	2.07	795	21.4	6.8	4.79	1390	26.1	6.9	4.92	1985	29.1	7.1	5.11	2580	31.6	6.9	4.87
205	12.0	4.4	2.76	800	21.5	6.8	4.77	1395	26.2	6.9	4.94	1990	29.1	7.0	5.06	2585	31.6	6.8	4.79
210	11.0	5.6	3.66	805	21.6	6.7	4.71	1400	26.2	7.0	4.96	1995	29.1	7.1	5.09	2590	31.6	6.9	4.88
215	11.3	5.6	3.59	810	21.7	6.7	4.65	1405	26.1	7.0	5.02	2000	29.1	7.1	5.11	2595	31.5	7.0	4.97
220	11.6	5.5	3.52	815	21.7	6.7	4.72	1410	26.1	7.1	5.09	2005	29.1	7.1	5.16	2600	31.6	6.9	4.86
225	11.7	5.5	3.55	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	31.6	7.0	4.97
245	12.3	5.7	3.71	840	21.9	6.8	4.80	1435	26.1	7.2	5.24	2030	29.3	7.0	5.05	2625	31.4	7.1	5.17
250	12.3	5.9	3.88	845	21.9	6.8	4.83	1440	26.2	7.2	5.24	2035	29.3	7.1	5.07	2630	31.6	7.0	5.00
255	12.5	5.9	3.85	850	21.9	6.9	4.86	1445	26.3	1	5.11	2040	29.3	7.1	5.13	2635	31.8	6.8	4.82
260	12.7	5.8	3.83	855	22.0	6.8	4.80	1450	26.5	7.0	4.98	2045	29.2	7.2	5.23	2640	31.7	7.0	4.98
265	13.2	5.5	3.54	860	22.1	6.8	4.74	1455	26.4	7.1	5.07	2050	29.2	7.2	5.27	2645	31.7	6.9	4.93
270	13.7	5.2	3.27	865	22.0	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	13.7	5.6	3.61	880	22.1	7.0	5.05	1475	26.4	7.1	5.17	2070	29.4	7.1	5.10	2665	32.0	6.7	4.71
290	13.7	5.7	3.72	885	22.1	7.0	5.06	1480	26.5	7.1	5.12	2075	29.5	7.0	5.01	2670	32.0	6.7	4.67
295	13.8	5.8	3.77	890	22.1	7.0	5.06	1485	26.5	7.1	5.14	2080	29.8	6.8	4.76	2675	31.9	6.8	4.81
300	13.9	5.8	3.81	895	22.2	7.1	5.09	1490	26.5	7.1	5.17	2085	29.7	6.9	4.89	2680	31.7	7.0	5.04
305	14.0	5.9	3.85	900	22.2	7.1	5.12	1495	26.5	7.2	5.24	2090	29.7	6.9	4.86	2685	31.9	6.8	4.83
310	14.1	5.9	3.88	905	22.3	7.1	5.09	1500	26.5	7.2	5.31	2095	29.8	6.8	4.78	2690	32.1	6.7	4.72
315	14.3	5.9	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	5.30	2110	29.9	6.8	4.78	2705	32.0	6.8	4.80
330	14.6	5.9	3.93	925	22.7	6.9	4.85	1520	26.5	7.3	5.38	2115	29.9	6.8	4.76	2710	32.1	6.8	4.79
335	14.7	6.0	4.02	930	22.8	6.8	4.77	1525	26.6	7.3	5.37	2120	29.9	6.8	4.84	2715	32.1	6.7	4.71
340	14.7	6.2	4.12	935	22.8	6.8	4.83	1530	26.6	7.3	5.36	2125	29.9	6.9	4.89	2720	32.4	6.5	4.47
345	14.9	6.1	4.06	940	22.8	6.9	4.89	1535	26.6	7.4	5.44	2130	29.9	6.9	4.90	2725	32.2	6.7	4.63
350	15.1	6.0	3.99	945	22.8	6.9	4.87	1540	26.5	7.4	5.53	2135	29.8	6.9	4.94	2730	31.9	7.0	5.05
355	15.3	5.9	3.88	950	22.9	6.9	4.85	1545	26.5	7.5	5.58	2140	29.8	7.1	5.08	2735	31.6	7.4	5.44
360	15.6	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	23.3	6.6	4.62	1570	26.9	7.2	5.30	2165	29.9	7.0	5.00	2760	32.0	7.0	5.06
385	15.7	6.2	4.15	980	23.5	6.6	4.54	1575	27.0	7.2	5.23	2170	29.9	7.1	5.07	2765	32.2	6.8	4.80
390	15.7	6.3	4.25	985	23.5	6.6	4.52	1580	27.0	7.1	5.17	2175	29.8	7.2	5.20	2770	32.3	6.8	4.73
395	15.9	6.3	4.22	990	23.6	6.5	4.50	1585	27.0	7.2	5.20	2180	29.8	7.2	5.27	2775	32.3	6.8	4.77
400	16.0	6.2	4.18	995	23.6	6.5	4.48	1590	27.0	7.2	5.22	2185	29.8	7.2	5.27	2780	32.3	6.8	4.82
405	16.3	6.1	4.07	1000	23.7	6.5	4.46	1595	27.0	7.2	5.29	2190	29.8	7.2	5.28	2785	32.7	6.4	4.41
410	16.5	6.0	3.96	1005	23.7	6.5	4.51	1600	27.0	7.3	5.36	2195	29.8	7.2	5.30	2790	32.8	6.3	4.25
415	16.5	6.0	4.00	1010	23.7	6.6	4.57	1605	27.0	7.3	5.38	2200	29.7	7.3	5.38	2795	32.8	6.4	4.33
420	16.6	6.1	4.03	1015	23.7	6.6	4.55	1610	27.0	7.3	5.41	2205	29.7	7.3	5.41	2800	32.5	6.7	4.66
425	16.6	6.1	4.10	1020	23.8	6.6	4.54	1615	27.1	7.3	5.33	2210	29.7	7.4	5.47	2805	32.5	6.6	4.62
430	16.7	6.2	4.16	1025	23.8	6.6	4.62	1620	27.2	7.2	5.27	2215	29.7	7.4	5.54	2810	32.5	6.7	4.70
435	16.9	6.1	4.05	1030	23.7	6.7	4.70	1625	27.2	7.2	5.30	2220	29.7	7.5	5.57	2815	32.3	6.9	4.85
440	17.1	5.9	3.93	1035	23.7	6.8	4.81	1630	27.2	7.3	5.33	2225	29.8	7.3	5.43	2820	32.2	7.0	5.01
445	17.2	6.0	3.97	1040	23.6	6.9	4.92	1635	27.2	7.3	5.35	2230	29.8	7.4	5.45	2825	32.3	7.0	4.96
450	17.2	6.0	4.00	1045	23.7	6.9	4.91	1640	27.2	7.3	5.36	2235	29.7	7.5	5.61	2830	32.4	6.8	4.80
455	17.3	6.1	4.04	1050	23.7	6.9	4.91	1645	27.3	7.2	5.22	2240	29.5	7.7	5.86	2835	32.5	6.7	4.68
460	17.4	6.1	4.07	1055	23.7	7.0	5.01	1650	27.5	7.1	5.09	2245	29.8	7.4	5.53	2840	32.5	6.8	4.78
465	17.5	6.1	4.05	1060	23.6	7.1	5.11	1655	27.5	7.1	5.11	2250	30.0	7.3	5.35	2845	32.6	6.6	4.62
470	17.6	6.1	4.04	1065	23.7	7.0	5.06	1660	27.5	7.1	5.13	2255	30.0	7.2	5.28	2850	32.6	6.7	4.70
475	17.7	6.0	3.99	1070	23.8	7.0	5.01	1665	27.6	7.0	5.06	2260	30.1	7.2	5.24	2855	32.4	6.9	4.88
480	17.9	5.9	3.93	1075	23.8	7.0	5.01	1670	27.7	7.0	4.99	2265	30.1	7.2	5.20	2860	32.4	7.0	4.98
485	18.0	5.9	3.88	1080	23.9	7.0	5.01	1675	27.7	7.0	5.02	2270	30.2	7.1	5.12	2865	32.8	6.5	4.52
490	18.2	5.8	3.82	1085	24.0	7.0	4.96	1680	27.7	7.0	5.05	2275	30.3	7.0	5.05	2870	33.0	6.3	4.30
495	18.0	6.0	4.02	1090	24.0	6.9	4.91	1685	27.7	7.0	5.01	2280	30.0	7.0	5.06	2875	33.0	6.4	4.38
500	17.9	6.3	4.23	1095	24.1	6.9	4.86	1690	27.8	7.0	4.98	2285	30.3	7.0	5.05	2880	32.5	6.9	4.87
505	17.9	6.3	4.29	1100	24.2	6.8	4.82	1695	27.8	7.0	5.01	2290	30.3	7.1	5.07	2885	33.0	6.4	4.40
510	18.0	6.4	4.36	1105	24.3	6.8	4.80	1700	27.8	7.0	5.03	2295	30.3	7.1	5.13	2890	33.1	6.3	4.28
515	18.1	6.4	4.34	1110	24.3	6.8	4.78	1705	27.8	7.1	5.09	2300	30.2	7.2	5.23	2895	33.1	6.4	4.34
520	18.2	6.4	4.32	1115	24.3	6.8	4.79	1710	27.7	7.1	5.16	2305	30.3	7.2	5.20	2900	33.0	6.4	4.41
525	18.2	6.4	4.36	1120	24.4	6.8	4.80	1715	27.8	7.1	5.08	2310	30.2	7.3	5.35	2905	32.9	6.6	4.58
530	18.3	6.4	4.39	1125	24.3	6.9	4.90	1720	27.9	7.0	5.00	2315	30.1	7.4	5.45	2910	32.9	6.5	4.51
535	18.3	6.4	4.41	1130	24.3	7.0	5.00	1725	28.0	7.0	4.99	2320	30.3	7.2	5.27	2915	33.1	6.4	4.33
540	18.4	6.4	4.41	1135	24.4	6.9	4.90	1730	28.0	7.0	4.98	2325	30.4	7.2	5.22	2920	33.3	6.2	4.16
545	18.4	6.5	4.47	1140	24.5	6.8	4.81	1735	28.0	7.0	5.02	2330	30.4	7.1	5.13	2925	33.0	6.5	4.45
550	18.4	6.6	4.53	1145	24.6	6.8	4.76	1740	28.0	7.1	5.07	2335	30.5	7.0	5.07	2930	33.0	6.5	4.51
555	18.6	6.5	4.45	1150	24.7	6.7	4.71	1745	28.0	7.0	5.04	2340	30.5	7.1	5.11	2935	33.0	6.5	4.48
560	18.8	6.4	4.37	1155	24.7	6.8	4.76	1750	28.1	7.0	5.01	2345	30.6	7.0	5.07	2940	33.0	6.5	4.52
565	18.9	6.4	4.33	1160	24.7	6.8	4.80	1755	27.9	7.1	5.17	2350	30.5	7.1	5.12	2945	33.1	6.5	4.42
570	19.0	6.3	4.28	1165	24.7	6.8	4.81	1760	27.8	7.3	5.34	2355	30.6	7.1	5.08	2950	33.2	6.4	4.32
575	19.1	6.3	4.31	1170	24.7	6.8	4.81	1765	27.9	7.3	5.31	2360	30.9	6.8	4.79	2955	33.3	6.3	4.27
580	19.1	6.4	4.33	1175	24.8	6.8	4.84	1770	27.9	7.2	5.28	2365	31.0	6.7	4.66	2960	33.3	6.3	4.30
590	19.1	6.6	4.52	1185	24.8	6.9	4.92	1780	27.9	7.3	5.35	2375	31.1	6.6	4.60	2970	33.3	6.4	4.36
595	19.0	6.6	4.62	1190	24.7	7.0	4.99	1785	28.1	7.2	5.21	2380	31.1	6.6	4.61	2975	33.0	6.6	4.60
600	19.0	6.7	4.72	1195	24.7	7.0	5.02	1790	28.2	7.0	5.07	2385	31.1	6.7	4.62	2980	32.9	6.8	4.74
610	19.1	6.8	4.76	1205	24.08	7.1	5.08	1800	28.3	7.0	5.06	2395	31.2	6.6	4.60	2990	32.9	6.8	4.82
615	19.4	6.5	4.51	1210	24.8	7.1	5.11	1805	28.3	7.1	5.07	2400	30.9	6.9	4.93	3000	33.4	6.4	4.33

Cable loss
Cable coaxial, Gore, 18 GHz, 1.1 m, SMA - SMA, model Right Angle, S/N 91P72071
HL 2869

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	0.87	12000	1.30
30	0.06	6000	0.87	12250	1.33
100	0.10	6250	0.89	12500	1.35
250	0.18	6500	0.92	12750	1.36
500	0.25	6750	0.94	13000	1.38
750	0.27	7000	0.98	13250	1.41
1000	0.34	7250	0.99	13500	1.39
1250	0.35	7500	1.02	13750	1.41
1500	0.42	7750	1.03	14000	1.42
1750	0.44	8000	1.04	14250	1.46
2000	0.49	8250	1.04	14500	1.39
2250	0.52	8500	1.08	14750	1.46
2500	0.55	8750	1.08	15000	1.40
2750	0.59	9000	1.12	15250	1.47
3000	0.61	9250	1.12	15500	1.36
3250	0.64	9500	1.15	15750	1.49
3500	0.67	9750	1.14	16000	1.51
3750	0.69	10000	1.19	16250	1.60
4000	0.70	10250	1.20	16500	1.56
4250	0.74	10500	1.23	16750	1.66
4500	0.76	10750	1.24	17000	1.71
4750	0.77	11000	1.24	17250	1.78
5000	0.79	11250	1.25	17500	1.75
5250	0.82	11500	1.28	17750	1.77
5500	0.84	11750	1.29	18000	1.86

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

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	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, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 003
HL 2883

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.70	12000	2.46
30	0.12	6000	1.75	12250	2.48
100	0.21	6250	1.80	12500	2.52
250	0.34	6500	1.81	12750	2.50
500	0.47	6750	1.86	13000	2.54
750	0.59	7000	1.86	13250	2.48
1000	0.67	7250	1.92	13500	2.63
1250	0.76	7500	1.96	13750	2.65
1500	0.84	7750	1.98	14000	2.72
1750	0.92	8000	2.02	14250	2.67
2000	0.98	8250	2.03	14500	2.70
2250	1.05	8500	2.05	14750	2.72
2500	1.12	8750	2.11	15000	2.79
2750	1.17	9000	2.17	15250	2.80
3000	1.22	9250	2.17	15500	2.83
3250	1.27	9500	2.20	15750	2.75
3500	1.33	9750	2.19	16000	2.82
3750	1.38	10000	2.22	16250	2.85
4000	1.42	10250	2.25	16500	2.90
4250	1.46	10500	2.30	16750	2.89
4500	1.51	10750	2.28	17000	2.88
4750	1.54	11000	2.32	17250	2.85
5000	1.59	11250	2.34	17500	2.96
5250	1.62	11500	2.39	17750	3.04
5500	1.65	11750	2.42	18000	3.04

Cable loss
Cable coaxial, Gore, 25.5 GHz, 1.2 m, SMA-SMA, S/N 10020014
HL 2953

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	8750	1.28	18000	1.84
30	0.06	9000	1.30	18250	1.91
100	0.12	9250	1.35	18500	1.94
250	0.19	9500	1.34	18750	1.92
500	0.27	9750	1.36	19000	1.95
750	0.34	10000	1.33	19250	2.00
1000	0.40	10250	1.38	19500	1.96
1250	0.45	10500	1.39	19750	2.02
1500	0.50	10750	1.39	20000	1.92
1750	0.54	11000	1.43	20250	2.04
2000	0.57	11250	1.42	20500	2.00
2250	0.60	11500	1.48	20750	2.09
2500	0.64	11750	1.49	21000	2.01
2750	0.67	12000	1.59	21250	2.07
3000	0.70	12250	1.50	21500	2.20
3250	0.74	12500	1.55	21750	2.10
3500	0.76	12750	1.55	22000	2.24
3750	0.80	13000	1.61	22250	2.25
4000	0.83	13250	1.62	22500	2.12
4250	0.85	13500	1.56	22750	2.05
4500	0.87	13750	1.61	23000	2.10
4750	0.91	14000	1.57	23250	2.03
5000	0.92	14250	1.66	23500	2.08
5250	0.96	14500	1.58	23750	2.14
5500	0.99	14750	1.69	24000	2.16
5750	0.99	15000	1.71	24250	2.25
6000	1.03	15250	1.74	24500	2.17
6250	1.05	15500	1.75	24750	2.32
6500	1.07	15750	1.72	25000	2.32
6750	1.08	16000	1.89	25250	2.32
7000	1.12	16250	1.79	25500	2.41
7250	1.13	16500	1.84	25750	2.31
7500	1.15	16750	1.82	26000	2.28
7750	1.20	17000	1.79	26250	2.32
8000	1.20	17250	1.78	26500	2.29
8250	1.23	17500	1.85		
8500	1.27	17750	1.83		

Cable loss
Cable coaxial, GORE-TEX, GOR245, 40 GHz, 0.6 m, SMA-SMA, S/N 05118336
HL 3206

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss,dB	Frequency, MHz	Cable loss,dB
10	0.09	5000	0.85	10200	1.24	15500	1.55	31500	2.24
30	0.09	5100	0.86	10300	1.25	15600	1.50	32000	2.21
50	0.10	5200	0.87	10400	1.24	15700	1.56	32500	2.19
100	0.14	5300	0.88	10500	1.20	15800	1.50	33000	2.24
200	0.18	5400	0.89	10600	1.23	15900	1.58	33500	2.26
300	0.22	5500	0.90	10700	1.25	16000	1.56	34000	2.25
400	0.26	5600	0.92	10800	1.28	16100	1.59	34500	2.28
500	0.29	5700	0.93	10900	1.35	16200	1.57	35000	2.27
600	0.31	5800	0.93	11000	1.30	16300	1.59	35500	2.31
700	0.33	5900	0.95	11100	1.31	16400	1.57	36000	2.36
800	0.35	6000	0.93	11200	1.31	16500	1.60	36500	2.39
900	0.38	6100	0.97	11300	1.35	16600	1.60	37000	2.39
1000	0.39	6200	0.95	11400	1.32	16700	1.63	37500	2.41
1100	0.41	6300	0.99	11500	1.38	16800	1.66	38000	2.40
1200	0.42	6400	0.98	11600	1.33	16900	1.64	38500	2.40
1300	0.45	6500	0.99	11700	1.37	17000	1.66	39000	2.54
1400	0.46	6600	0.99	11800	1.36	17100	1.65	39500	2.39
1500	0.48	6700	0.99	11900	1.42	17200	1.67	40000	2.48
1600	0.49	6800	0.99	12000	1.34	17300	1.66		
1700	0.50	6900	1.02	12100	1.41	17400	1.69		
1800	0.52	7000	1.02	12200	1.36	17500	1.66		
1900	0.53	7100	1.06	12300	1.40	17600	1.69		
2000	0.53	7200	1.05	12400	1.34	17700	1.70		
2100	0.54	7300	1.02	12500	1.39	17800	1.74		
2200	0.55	7400	1.03	12600	1.40	17900	1.67		
2300	0.56	7500	1.04	12700	1.42	18000	1.72		
2400	0.57	7600	1.05	12800	1.37	18500	1.72		
2500	0.59	7700	1.10	12900	1.39	19000	1.78		
2600	0.60	7800	1.11	13000	1.40	19500	1.77		
2700	0.62	7900	1.10	13100	1.42	20000	1.82		
2800	0.62	8000	1.10	13200	1.41	20500	1.82		
2900	0.65	8100	1.10	13300	1.43	21000	1.94		
3000	0.65	8200	1.10	13400	1.45	21500	1.92		
3100	0.66	8300	1.16	13500	1.45	22000	2.07		
3200	0.67	8400	1.15	13600	1.54	22500	1.90		
3300	0.69	8500	1.20	13700	1.54	23000	1.96		
3400	0.70	8600	1.19	13800	1.49	23500	1.88		
3500	0.71	8700	1.15	13900	1.50	24000	1.96		
3600	0.71	8800	1.16	14000	1.50	24500	1.96		
3700	0.73	8900	1.19	14100	1.52	25000	2.10		
3800	0.74	9000	1.18	14200	1.60	25500	2.05		
3900	0.75	9100	1.23	14300	1.57	26000	2.05		
4000	0.76	9200	1.20	14400	1.57	26500	2.05		
4100	0.76	9300	1.20	14600	1.50	27000	1.97		
4200	0.78	9400	1.19	14700	1.54	27500	2.09		
4300	0.79	9500	1.23	14800	1.51	28000	2.10		
4400	0.80	9600	1.21	14900	1.54	28500	2.05		
4500	0.80	9700	1.22	15000	1.57	29000	2.08		
4600	0.82	9800	1.20	15100	1.56	29500	1.94		
4700	0.82	9900	1.18	15200	1.51	30000	2.11		
4800	0.83	10000	1.20	15300	1.56	30500	2.25		
4900	0.85	10100	1.23	15400	1.54	31000	2.23		

Cable loss
Cable coaxial, GORE-TEX, GOR245, 40 GHz, 1.2 m, SMA-SMA, S/N 05118337
HL 3207

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss,dB	Frequency, MHz	Cable loss,dB
10	0.17	5000	1.54	10200	2.26	15500	2.77	31500	4.07
30	0.14	5100	1.54	10300	2.26	15600	2.78	32000	4.03
50	0.16	5200	1.56	10400	2.24	15700	2.81	32500	3.93
100	0.22	5300	1.59	10500	2.23	15800	2.81	33000	4.00
200	0.30	5400	1.60	10600	2.25	15900	2.84	33500	4.09
300	0.38	5500	1.61	10700	2.31	16000	2.91	34000	4.08
400	0.44	5600	1.63	10800	2.34	16100	2.92	34500	4.13
500	0.48	5700	1.66	10900	2.38	16200	2.88	35000	4.15
600	0.54	5800	1.68	11000	2.38	16300	2.90	35500	4.18
700	0.58	5900	1.68	11100	2.38	16400	2.93	36000	4.22
800	0.62	6000	1.71	11200	2.37	16500	2.92	36500	4.25
900	0.65	6100	1.71	11300	2.38	16600	2.97	37000	4.26
1000	0.69	6200	1.73	11400	2.40	16700	3.02	37500	4.40
1100	0.73	6300	1.75	11500	2.41	16800	3.02	38000	4.40
1200	0.76	6400	1.76	11600	2.44	16900	3.01	38500	4.52
1300	0.78	6500	1.78	11700	2.44	17000	3.04	39000	4.54
1400	0.81	6600	1.77	11800	2.44	17100	3.08	39500	4.36
1500	0.85	6700	1.79	11900	2.45	17200	3.05	40000	4.48
1600	0.87	6800	1.80	12000	2.46	17300	3.06		
1700	0.90	6900	1.83	12100	2.45	17400	3.06		
1800	0.93	7000	1.84	12200	2.45	17500	3.07		
1900	0.96	7100	1.86	12300	2.48	17600	3.08		
2000	0.95	7200	1.88	12400	2.49	17700	3.09		
2100	0.98	7300	1.86	12500	2.51	17800	3.12		
2200	1.00	7400	1.87	12600	2.53	17900	3.09		
2300	1.02	7500	1.90	12700	2.51	18000	3.08		
2400	1.04	7600	1.91	12800	2.52	18500	3.11		
2500	1.06	7700	1.95	12900	2.54	19000	3.14		
2600	1.08	7800	1.98	13000	2.56	19500	3.20		
2700	1.11	7900	1.99	13100	2.56	20000	3.24		
2800	1.14	8000	1.98	13200	2.59	20500	3.31		
2900	1.15	8100	1.98	13300	2.59	21000	3.38		
3000	1.17	8200	2.00	13400	2.60	21500	3.44		
3100	1.19	8300	2.01	13500	2.65	22000	3.45		
3200	1.20	8400	2.05	13600	2.71	22500	3.45		
3300	1.24	8500	2.07	13700	2.71	23000	3.47		
3400	1.26	8600	2.08	13800	2.69	23500	3.47		
3500	1.27	8700	2.09	13900	2.67	24000	3.54		
3600	1.28	8800	2.09	14000	2.68	24500	3.62		
3700	1.32	8900	2.10	14100	2.68	25000	3.73		
3800	1.32	9000	2.12	14200	2.74	25500	3.77		
3900	1.35	9100	2.12	14300	2.77	26000	3.71		
4000	1.36	9200	2.15	14400	2.80	26500	3.73		
4100	1.39	9300	2.13	14600	2.74	27000	3.73		
4200	1.40	9400	2.16	14700	2.73	27500	3.78		
4300	1.41	9500	2.17	14800	2.75	28000	3.81		
4400	1.43	9600	2.17	14900	2.75	28500	3.81		
4500	1.47	9700	2.18	15000	2.77	29000	3.80		
4600	1.46	9800	2.16	15100	2.76	29500	3.81		
4700	1.49	9900	2.17	15200	2.76	30000	3.89		
4800	1.50	10000	2.20	15300	2.77	30500	4.03		
4900	1.52	10100	2.22	15400	2.79	31000	4.01		

Cable loss
Cable coaxial, GORE, PHASEFLEX, 40 GHz, 0.95 m, SMA-SMA, S/N 03771245
HL 3559

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss,dB
30	0.08	10000	0.96	20500	1.59	31000	2.24
100	0.10	10500	0.99	21000	1.63	31500	2.71
500	0.22	11000	1.02	21500	1.70	32000	2.47
1000	0.32	11500	1.07	22000	1.71	32500	2.37
1500	0.40	12000	1.13	22500	1.60	33000	2.35
2000	0.41	12500	1.16	23000	1.58	33500	2.34
2500	0.44	13000	1.26	23500	1.64	34000	2.31
3000	0.53	13500	1.26	24000	1.68	34500	2.43
3500	0.54	14000	1.22	24500	1.79	35000	2.45
4000	0.62	14500	1.26	25000	1.86	35500	2.48
4500	0.62	15000	1.27	25500	1.77	36000	3.60
5000	0.67	15500	1.29	26000	1.78	36500	2.62
5500	0.70	16000	1.39	26500	1.83	37000	2.45
6000	0.72	16500	1.50	27000	1.87	37500	2.47
6500	0.76	17000	1.49	27500	1.97	38000	2.38
7000	0.83	17500	1.37	28000	2.69	38500	2.41
7500	0.85	18000	1.40	28500	1.94	39000	2.56
8000	0.89	18500	1.41	29000	2.02	39500	2.71
8500	0.91	19000	1.48	29500	2.05	40000	2.69
9000	0.95	19500	1.61	30000	2.11		
9500	0.96	20000	1.59	30500	2.11		

Cable loss
Cable coaxial, MIL C-17, N type-N type, 2.7 m
Belden, HL 3624

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.08	1750	1.79	3550	3.02	5350	4.19
30	0.13	1800	1.83	3600	3.10	5400	4.13
50	0.18	1850	1.88	3650	3.12	5450	4.22
100	0.27	1900	1.90	3700	3.10	5500	4.32
150	0.35	1950	1.94	3750	3.18	5550	4.32
200	0.42	2000	1.96	3800	3.24	5600	4.27
250	0.47	2050	2.02	3850	3.26	5650	4.40
300	0.54	2100	2.04	3900	3.24	5700	4.42
350	0.60	2150	2.08	3950	3.35	5750	4.42
400	0.66	2200	2.10	4000	3.39	5800	4.45
450	0.71	2250	2.15	4050	3.40	5850	4.54
500	0.75	2300	2.19	4100	3.36	5900	4.61
550	0.81	2350	2.22	4150	3.49	5950	4.62
600	0.86	2400	2.24	4200	3.54	6000	4.53
650	0.90	2450	2.28	4250	3.46	6050	4.63
700	0.94	2500	2.32	4300	3.53	6100	4.71
750	1.01	2550	2.34	4350	3.70	6150	4.68
800	1.06	2600	2.39	4400	3.67	6200	4.65
850	1.10	2650	2.42	4450	3.58	6250	4.77
900	1.13	2700	2.44	4500	3.66	6300	4.76
950	1.20	2750	2.47	4550	3.78	6350	4.77
1000	1.23	2800	2.50	4600	3.75	6400	4.77
1050	1.26	2850	2.54	4650	3.70	6450	4.89
1100	1.31	2900	2.59	4700	3.80	6500	4.91
1150	1.38	2950	2.61	4750	3.86		
1200	1.51	3000	2.63	4800	3.89		
1250	1.45	3050	2.71	4850	3.80		
1300	1.47	3100	2.72	4900	3.92		
1350	1.49	3150	2.73	4950	3.97		
1400	1.55	3200	2.80	5000	3.98		
1450	1.59	3250	2.84	5050	3.94		
1500	1.62	3300	2.85	5100	4.08		
1550	1.64	3350	2.87	5150	4.12		
1600	1.70	3400	2.94	5200	4.04		
1650	1.74	3450	2.98	5250	4.05		
1700	1.75	3500	2.98	5300	4.26		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
CBW	channel bandwidth
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EBW	emission bandwidth
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

END OF DOCUMENT