

TEST REPORT

ACCORDING TO: FCC 47 CFR part 25

FOR:

Alvarion Ltd.

Microbase station

Model: BreezeMAX Micro Outdoor

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1 Applicant information

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E-mail: Moti.Ezra@alvarion.com
Contact name: Mr. Moti Ezra

2 Equipment under test attributes

Product name: Microbase station
Product type: Transciever
Model(s): BreezeMAX Micro Outdoor
Serial number: 90068294
Hardware version: TA0125-01
Software release: 3.0.5.33
Receipt date 4/15/2010

3 Manufacturer information

Manufacturer name: Alvarion Ltd.
Address: 21A Habarzel street, Ramat Hachayal, Tel Aviv 69710, Israel
Telephone: 972 3645 7859
Fax: 972 3645 6222
E-Mail: Moti.Ezra@alvarion.com
Contact name: Mr. Moti Ezra

4 Test details

Project ID: 20709
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 4/15/2010
Test completed: 7/25/2010
Test specification(s): FCC 47 CFR part 25



5 Tests summary

Test	Status
Transmitter characteristics	
Section 25.254(a)(1), Peak output power	Pass
Section 2.1091, RF safety	Pass, exhibit provided in Application for certification
Section 25.254(a)(2), Spurious emissions at RF antenna connector	Pass
Section 25.254(a)(2), Band edge emissions at RF antenna connector	Pass
Section 25.254(a)(4), Spurious emissions in 1559-1610 MHz band	Pass
Section 25.254(d), Radiated spurious emissions	Pass
Section 2.1055, Frequency stability	Pass
Section 2.1049, Occupied bandwidth	Pass

Testing was not completed against all relevant requirements of the test standard. However, 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.

This test report replaces the previously issued test report identified by Doc ID:ALVRAD_FCC.20709_p25_rev1.

	Name and Title	Date	Signature
Tested by:	Mr. L. Markel, test engineer	July 19, 2010	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	July 27, 2010	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	July 28, 2010	



6 EUT description

6.1 General information

The EUT, BreezeMAX Micro Outdoor base station is a high capacity, IP services oriented Broadband Wireless Access system. The BreezeMAX Micro Outdoor is digital modulated TDD system covering 2483.5 MHz up to 2690 MHz range. The system contains a base station unit and a subscriber unit. The basic base station system configuration is an all outdoor-box configuration that contain power supply, modem and the radio.

6.2 Ports and lines

Port type	Port description	Connected from	Connected to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	DC power	EUT	DC power supply	1	Unshielded	3 m	Outdoor
Signal	Ethernet	EUT	Ethernet switch	1	Shielded	10 m	Outdoor
RF*	Antenna	EUT	CPE (subscriber)	2	Coax	10 m	Outdoor

* - connected to external antenna in normal use

6.3 Support and test equipment

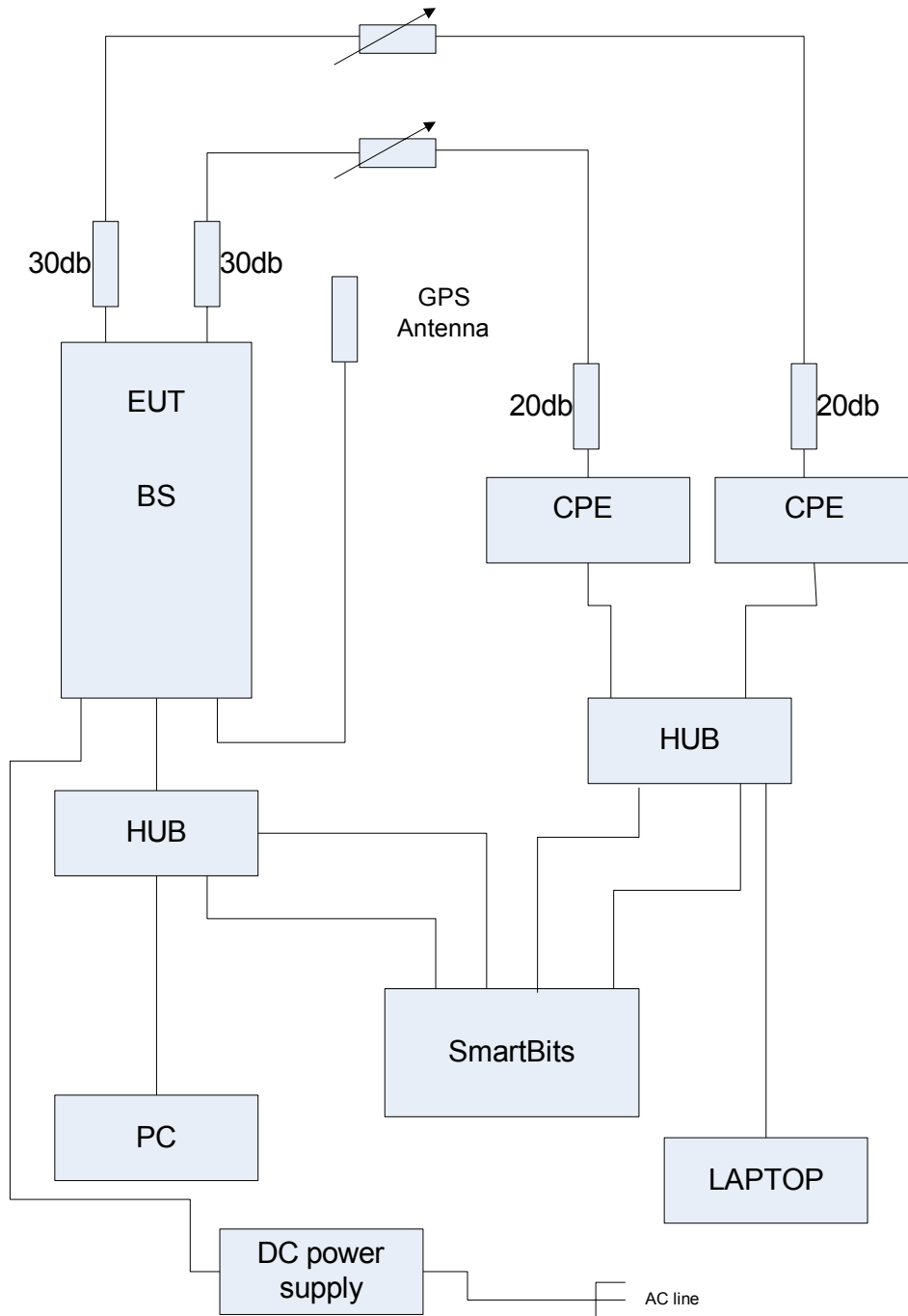
Description	Manufacturer	Model number	Serial number
Smartbits	Spirent Communications	SmartBits 2000	63673610
ETH SWITCH X 2	Dynamode	SW80010-M	NA
CPE X 2	Alvarion	4M-K2-CPE-Si-1D-2.5	NA
PC	Lenovo	NA	9637W1N LMVR4K
Laptop	Lenovo	T60	L3-DZK37-07/01
DC power supply	Horizon	DHR3655D-10	773352 (Alvarion internal)

6.4 Changes made in the EUT

No changes were implemented in the EUT.



6.5 Test configuration





6.6 Transmitter characteristics

Type of equipment						
<input checked="" type="checkbox"/>	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				
<input checked="" type="checkbox"/>	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		2483.5 - 2496.0 MHz				
Operating frequency		2490 MHz				
RF channel spacing		10 MHz				
Maximum rated output power		At transmitter 50 Ω RF output connector	37 dBm			
Is transmitter output power variable?		No				
		<input checked="" type="checkbox"/>	Yes	continuous variable		
			<input checked="" type="checkbox"/>	Yes	stepped variable with stepsize	1 dB
				<input checked="" type="checkbox"/>	Yes	minimum RF power
<input checked="" type="checkbox"/>	Yes	maximum RF power	37.13 dBm			
Antenna connection						
<input type="checkbox"/>	unique coupling	<input checked="" type="checkbox"/>	standard connector			
		<input type="checkbox"/>	Integral			
		<input checked="" type="checkbox"/>	with temporary RF connector			
			without temporary RF connector			
Antenna/s technical characteristics						
Type	Manufacturer	Model number	Gain			
External Omni	MTI	P/N 300650	9 dBi			
External Tilt Panel	Argus	T-085-S4	18 dBi			
Transmitter 99% power bandwidth	Transmitter aggregate data rate/s, MBps	Type of modulation				
10 MHz	3.34	QPSK				
	16.64	64QAM				
Type of multiplexing		TDD				
Modulating test signal (baseband)		PRBS				
Maximum transmitter duty cycle in normal use		66%				
Transmitter power source						
<input checked="" type="checkbox"/>	DC	Nominal rated voltage	Battery type			
	AC mains	Nominal rated voltage	Via 48 VDC power supply from mains			
		Nominal rated voltage	120 V			
		Frequency	60 Hz			
Common power source for transmitter and receiver		<input checked="" type="checkbox"/>	yes			
			no			



Test specification:		Section 2.1049, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2010		
Temperature: 23.8 °C	Air Pressure: 1015 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 25 requirements

7.1 Occupied bandwidth test

7.1.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.1.1.

Table 7.1.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, kHz
2483.5 – 2495.0	26	NA

* - Modulation envelope reference points are provided in terms of attenuation below maximum measured carrier output power.

7.1.2 Test procedure

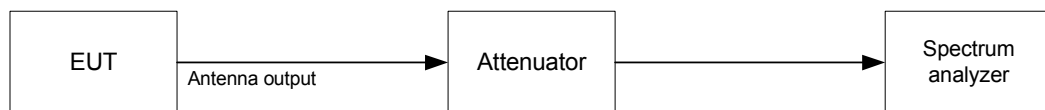
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

7.1.2.2 The EUT was set to transmit the modulated carrier and the output power was measured.

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

7.1.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 Occupied bandwidth test setup





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Test specification:		Section 2.1049, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2010		
Temperature: 23.8 °C	Air Pressure: 1015 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.2 Occupied bandwidth test results

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 110 kHz
VIDEO BANDWIDTH: 1100 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
CHANNEL BW: 10 MHz
MODULATION: QPSK

Carrier frequency, MHz	Occupied bandwidth, MHz	Limit, kHz	Margin, kHz	Verdict
2490.0	9.0719	NA	NA	Pass
MODULATION:		64QAM		
2490.0	9.0888	NA	NA	Pass

Reference numbers of test equipment used

#1	#2	#3				
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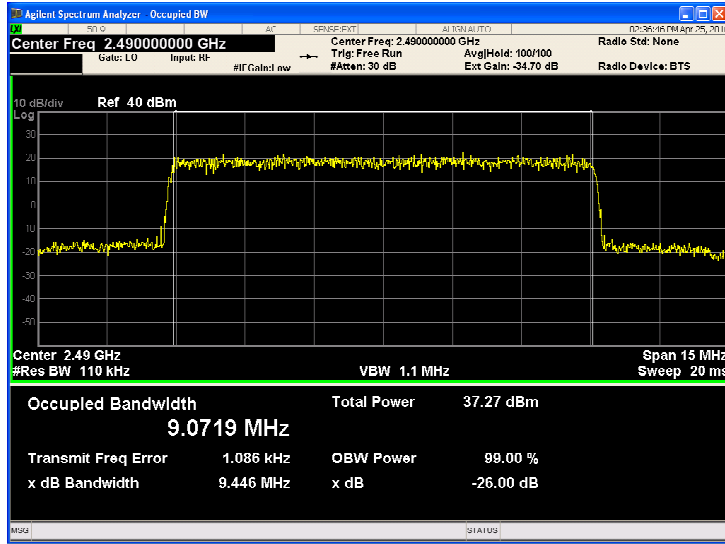
Full description is given in Appendix A.



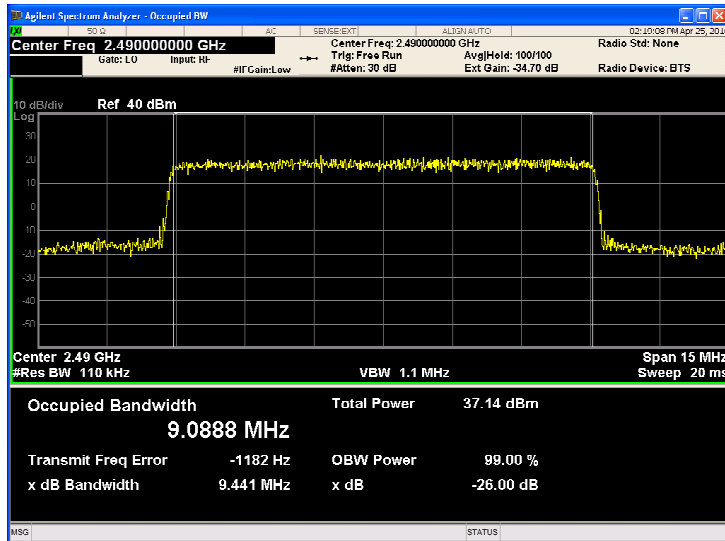
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Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2010		
Temperature: 23.8 °C	Air Pressure: 1015 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Plot 7.1.1 Occupied bandwidth test result, QPSK



Plot 7.1.2 Occupied bandwidth test result, 64QAM





Test specification: Section 25.254(a)(1), Peak output power			
Test procedure: KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 4/14/2010			
Temperature: 24.1 °C	Air Pressure: 1001 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

7.2 Peak output power test

7.2.1 General

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

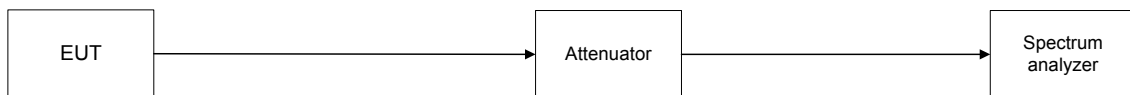
Table 7.2.1 Peak output power limits

Assigned frequency range, MHz	Maximum peak output power dBm / 10 MHz
2483.5 – 2495.0	71.0
	Maximum peak power density dBm/1.25 MHz
	62.0

7.2.2 Test procedure

- 7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.
- 7.2.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.
- 7.2.2.3 The resolution bandwidth of spectrum analyzer was set about 1% of the emission bandwidth and the average power was integrated over EBW with spectrum analyzer as provided in Table 7.2.2.
- 7.2.2.4 The frequency span of spectrum analyzer was set to capture the entire 26 dB band of the transmitter, in average mode to find the maximum emission contained in total emission bandwidth.
- 7.2.2.5 The peak of emission was zoomed and the power was integrated over 1.25 MHz.
- 7.2.2.6 The test results were noticed and reported in Table 7.2.3.

Figure 7.2.1 Peak output power test setup





Test specification: Section 25.254(a)(1), Peak output power	
Test procedure: KDB 237109	
Test mode: Compliance	Verdict: PASS
Date: 4/14/2010	
Temperature: 24.1 °C	Air Pressure: 1001 hPa
Relative Humidity: 43 %	
Power Supply: 48 VDC	
Remarks:	

Table 7.2.2 Peak output power test results per 10 MHz BW

ASSIGNED FREQUENCY RANGE: 2483.5 – 2495.0 MHz
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 110 kHz
VIDEO BANDWIDTH: 1100 kHz
MODULATING SIGNAL: PRBS
MAXIMUM DEDICATED ANTENNA GAIN: 18 dBi

MODULATION: QPSK

Channel MHz	OBW MHz	Pmeas , dBm	Antenna gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB dB	Verdict
2490.00	9.07	37.13	18.00	55.13	71.00	-15.87	Pass

MODULATION: 64QAM

2490.00	9.09	36.90	18.00	54.90	71.00	-16.10	Pass
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Table 7.2.3 Peak output power test results per 1.25 MHz BW

MODULATION: QPSK

Channel MHz	OBW MHz	Pmeas , dBm	Antenna gain, dBi	EIRP, dBm	Limit, dBm	Margin, dB dB	Verdict
2490.00	9.070	29.25	18.00	47.25	62.00	-14.75	Pass

MODULATION: 64QAM

2490.00	9.09	28.63	18.00	46.63	62.00	-15.37	Pass
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Reference numbers of test equipment used

#1	#2	#3					
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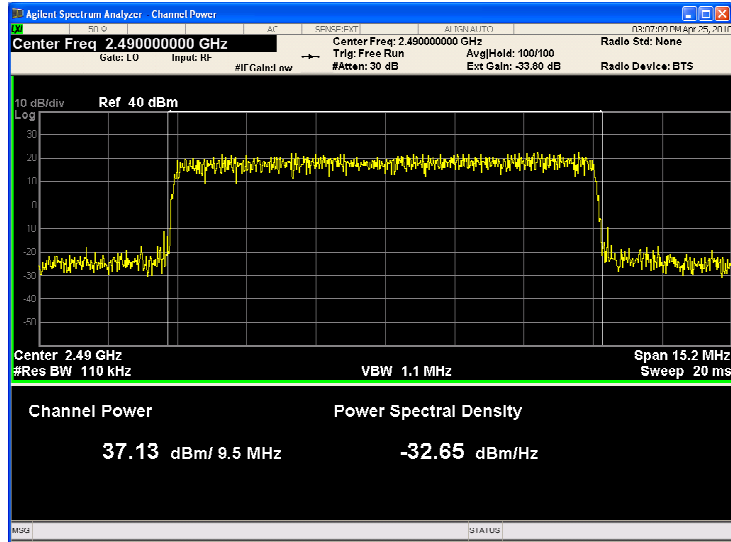
Full description is given in Appendix A.



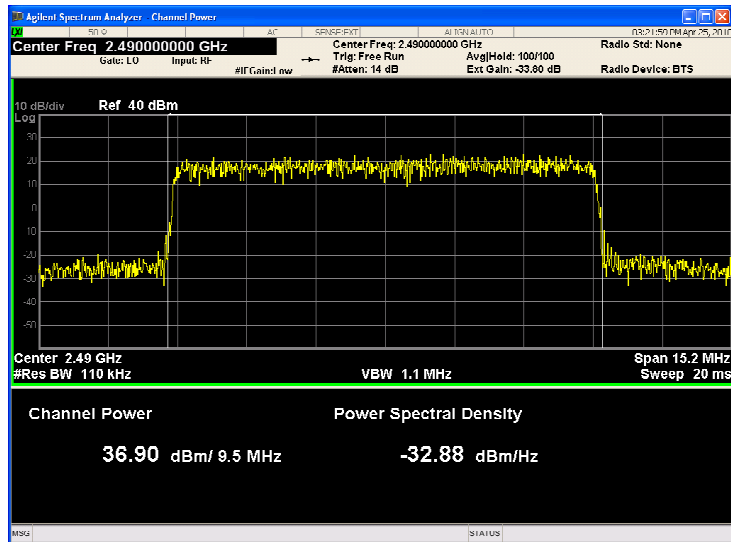
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Test specification: Section 25.254(a)(1), Peak output power			
Test procedure: KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 4/14/2010			
Temperature: 24.1 °C	Air Pressure: 1001 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.1 Peak output power test results, QPSK



Plot 7.2.2 Peak output power test results, 64QAM

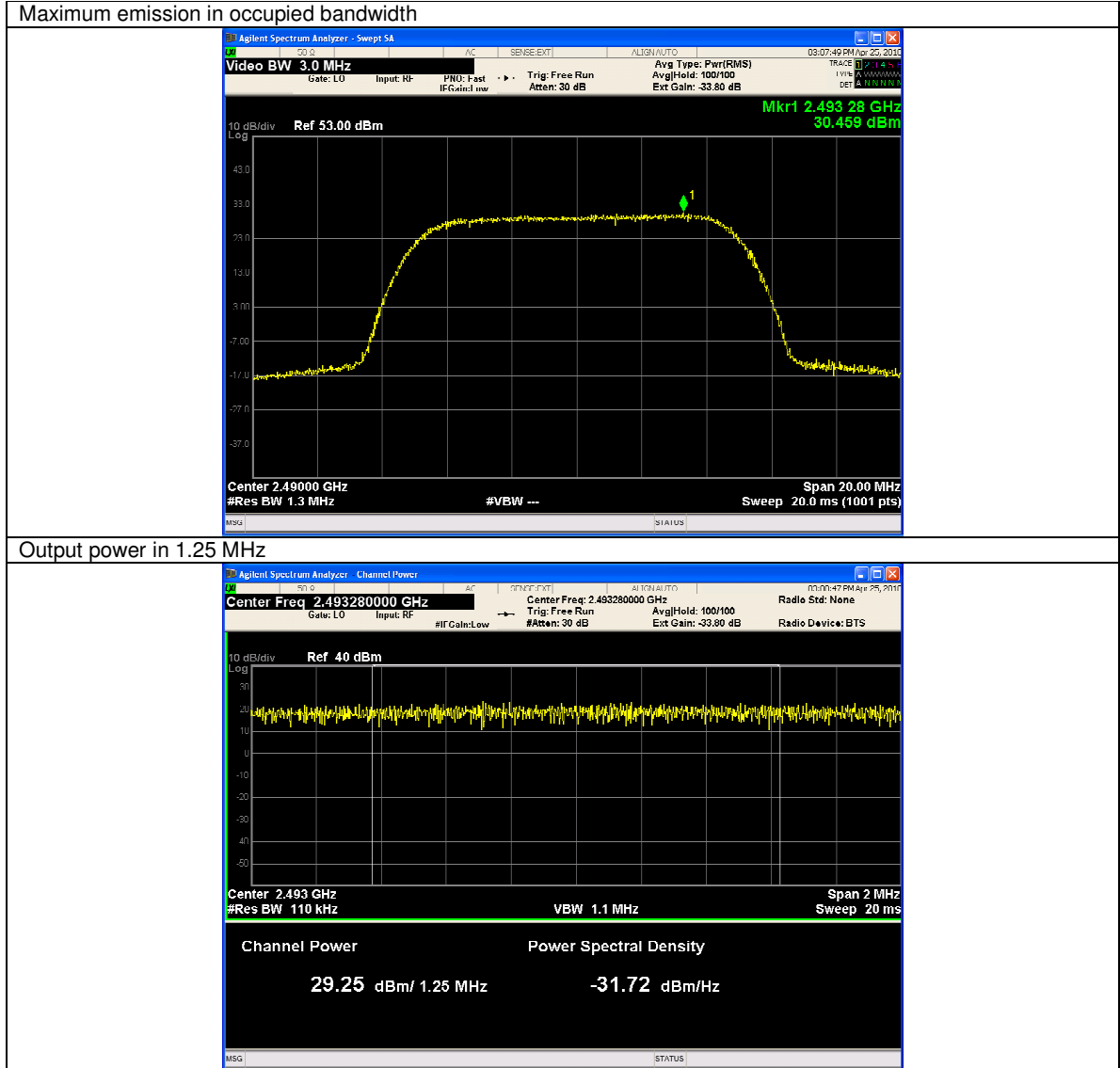




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Test specification: Section 25.254(a)(1), Peak output power			
Test procedure: KDB 237109			
Test mode: Compliance		Verdict: PASS	
Date: 4/14/2010			
Temperature: 24.1 °C	Air Pressure: 1001 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.3 Peak output power density test results, 10 MHz, QPSK

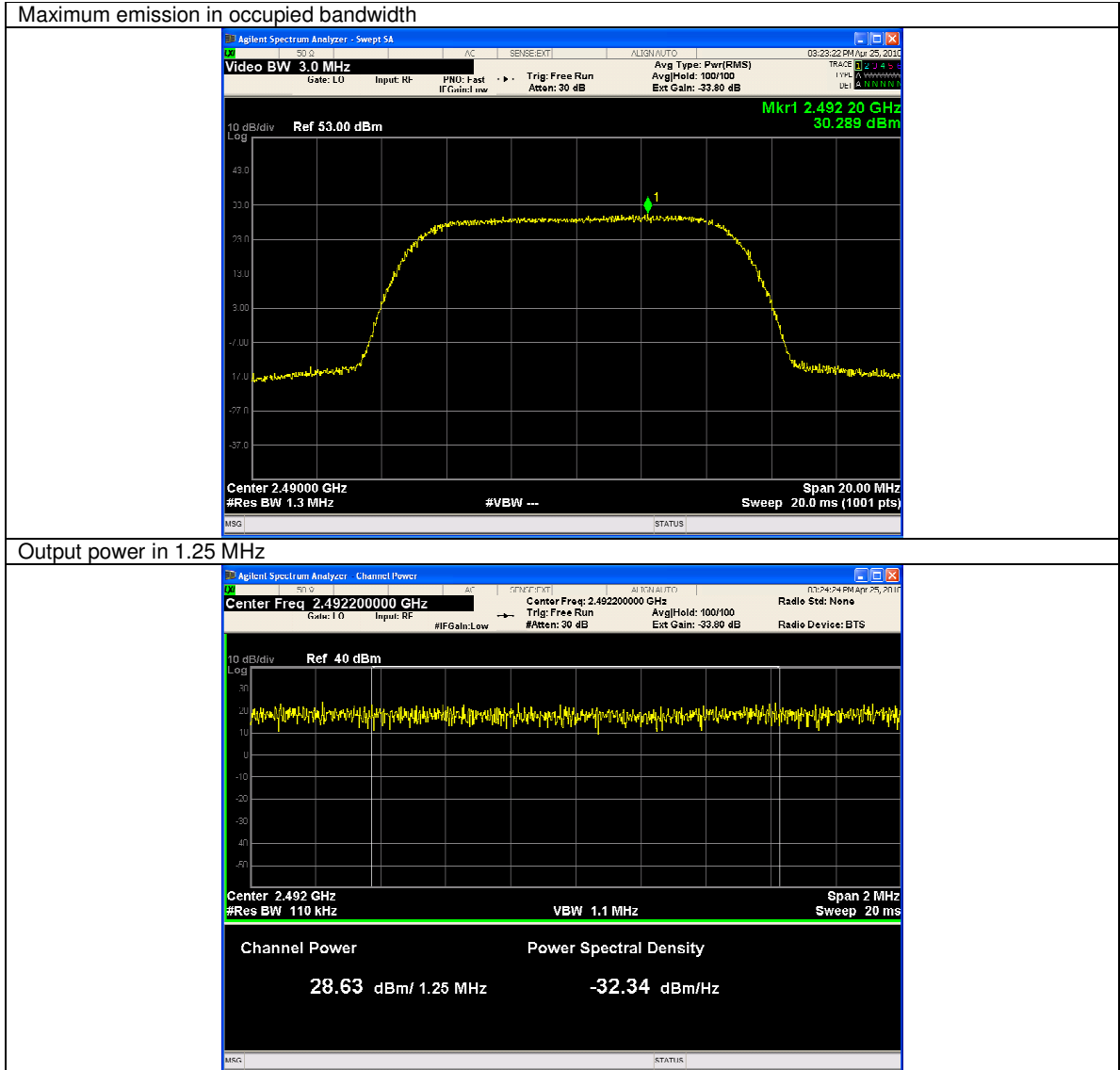




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Test specification: Section 25.254(a)(1), Peak output power			
Test procedure: KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 4/14/2010			
Temperature: 24.1 °C	Air Pressure: 1001 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.4 Peak output power density test results, 10 MHz, 64QAM





Test specification:		Section 25.254(a)(2), Conducted spurious emissions at the band edges	
Test procedure:		KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	4/25/2010		
Temperature: 24.6 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

7.3 Conducted spurious emissions at the band edges

7.3.1 General

This test was performed to measure spurious emissions at RF antenna connector at the band edges. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Spurious emission limits

Operating frequency, MHz	Offset from center frequency, MHz	Spurious emission limit, dBm
2490.00	At the band edges	-14.1 / 30 kHz
	5 – 6 MHz	-13.0 / 100 kHz
	6 – 10 MHz	-13.0 / 1 MHz

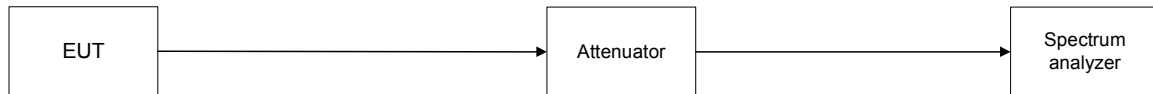
7.3.2 Test procedure

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 spurious emissions were measured with spectrum analyzer as provided in the associated plots.

7.3.2.3 The worst case results are were provided in Table 7.3.2 and in the associated plots.

Figure 7.3.1 Conducted spurious emission test setup





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Test specification:		Section 25.254(a)(2), Conducted spurious emissions at the band edges			
Test procedure:		KDB 237109			
Test mode:	Compliance	Verdict:		PASS	
Date:	4/25/2010				
Temperature: 24.6 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC		
Remarks:					

Table 7.3.2 Spurious emission test results

Frequency offset, ± MHz	SA reading, dBm low range	SA reading, dBm high range	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Channel frequency 2490.0 MHz, QPSK						
At the band edge	-18.60	-19.10	30	NA	-14.10	Pass
5-6	-19.68	-18.66	100	NA	-13.00	
6-7	-15.83	-15.43	110	1000	-13.00	
7-8	-16.71	-16.04				
8-9	-18.26	-16.90				
9-10	-18.85	-17.66				
10-11	-19.73	-18.58				
Channel frequency 2490.0 MHz, 64QAM						
At the band edge	-20.40	-16.65	30	NA	-14.10	Pass
5-6	-20.54	-18.06	100	NA	-13.00	
6-7	-15.67	-15.02	110	1000	-13.00	
7-8	-16.89	-15.88				
8-9	-17.72	-16.84				
9-10	-18.87	-17.72				
10-11	-19.97	-18.71				

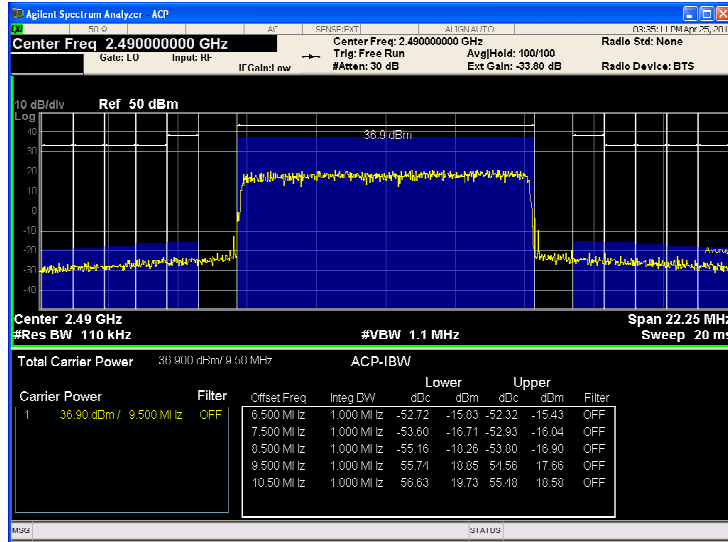
Reference numbers of test equipment used

#1	#2	#3						
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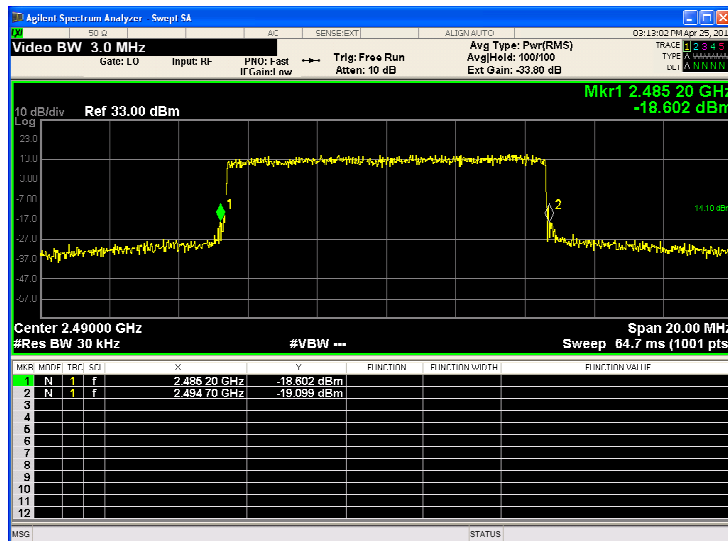
Full description is given in Appendix A.

Test specification:	Section 25.254(a)(2), Conducted spurious emissions at the band edges		
Test procedure:	KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	4/25/2010		
Temperature: 24.6 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.1 Spurious emissions at the band edges, QPSK (6 - 11 MHz offset)

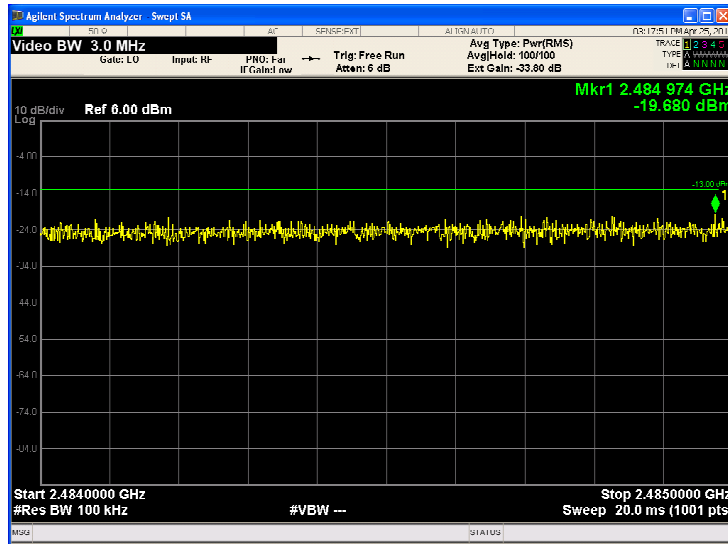


Plot 7.3.2 Spurious emissions at the band edges, QPSK

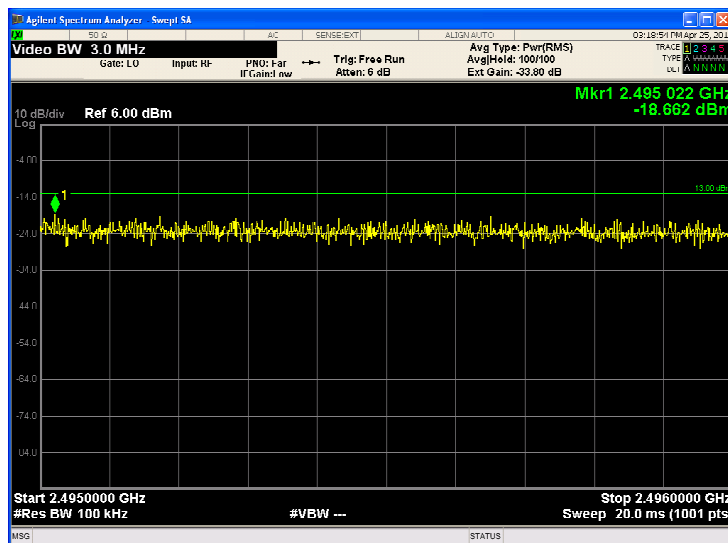


Test specification:	Section 25.254(a)(2), Conducted spurious emissions at the band edges		
Test procedure:	KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	4/25/2010		
Temperature: 24.6 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.3 Spurious emissions in 2484.0 – 2485.0 MHz range, QPSK (-5 - -6 MHz offset)



Plot 7.3.4 Emission mask test results in 2495.0 – 2496.0 MHz range, QPSK (5 - 6 MHz offset)

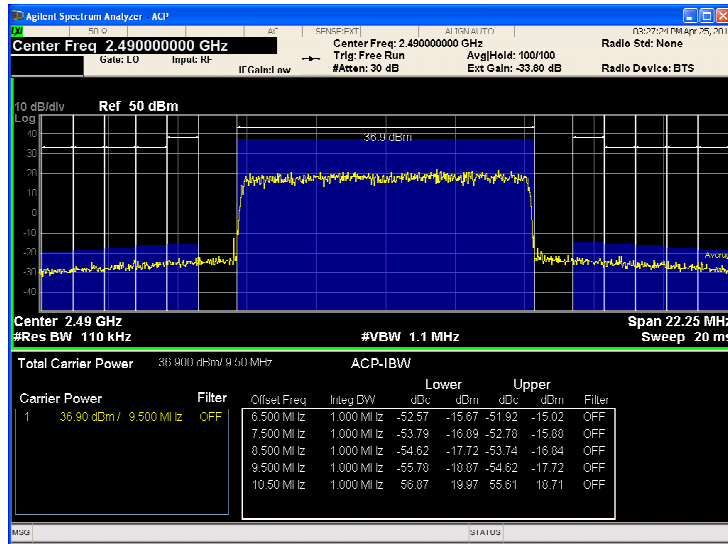




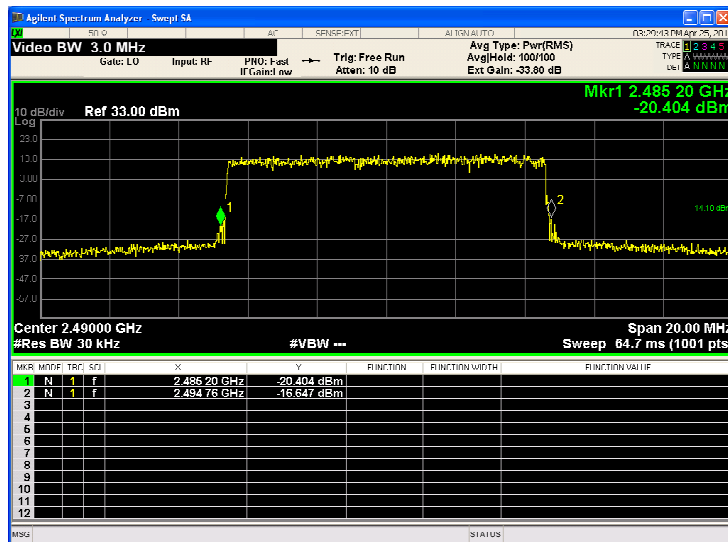
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Test specification: Section 25.254(a)(2), Conducted spurious emissions at the band edges			
Test procedure: KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 4/25/2010			
Temperature: 24.6 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.5 Spurious emissions at the band edges, 64QAM (6 - 11 MHz offset)

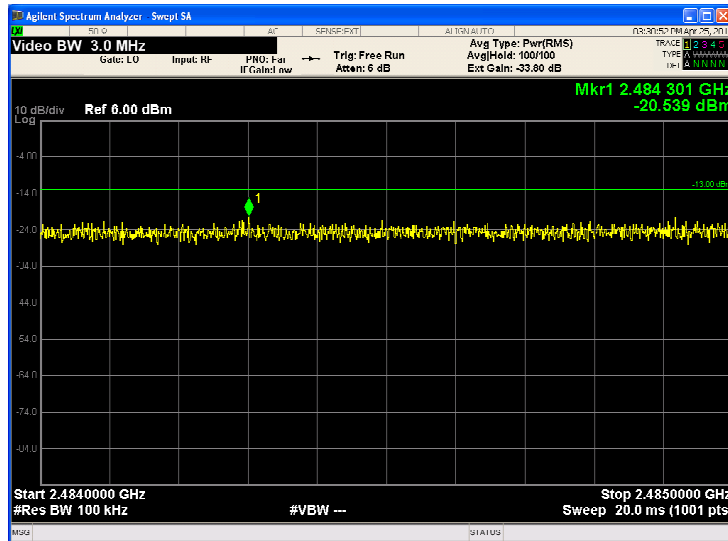


Plot 7.3.6 Spurious emissions at the band edges, 64QAM

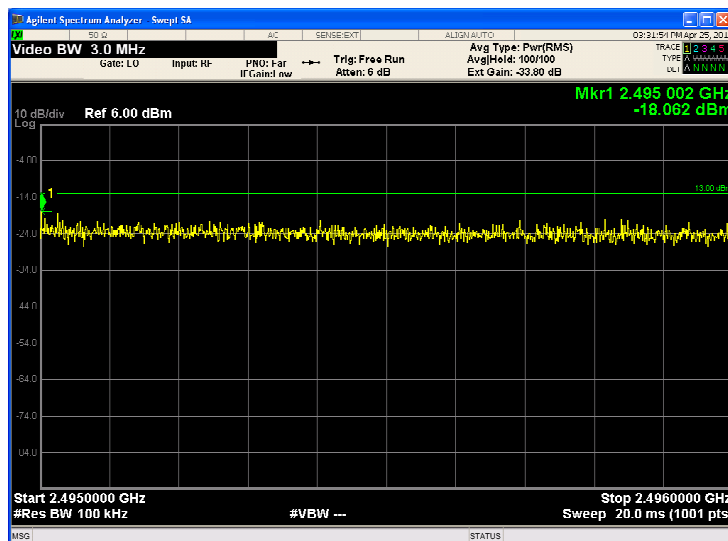


Test specification:	Section 25.254(a)(2), Conducted spurious emissions at the band edges		
Test procedure:	KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	4/25/2010		
Temperature: 24.6 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.7 Spurious emissions in 2484.0 – 2485.0 MHz range, 64QAM (-5 - -6 MHz offset)



Plot 7.3.8 Spurious emissions in 2495.0 – 2496.0 MHz range, 64QAM (5 - 6 MHz offset)





Test specification:		Section 25.254(a)(4), Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
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 7.4.2.

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 – 10 th harmonic*	43+10logP**	-13	84.4

* - 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: $E = \sqrt{30 \times P \times 1.64} / r$, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

Table 7.4.2 Radiated spurious emissions limits in 9 kHz – 30 MHz range

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*		
	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**
0.090 – 0.110	NA	108.5 – 106.8**	NA
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**
0.490 – 1.705	NA	73.8 – 63.0**	NA
1.705 – 30.0*		69.5	

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

$$\text{Lim}_{S_2} = \text{Lim}_{S_1} + 40 \log(S_1/S_2),$$

where S_1 and S_2 – standard defined and test distance respectively in meters.

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

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

7.4.2 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° 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 7.4.3 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° 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 7.4.3 and shown in the associated plots.



Test specification:	Section 25.254(a)(4), Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

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

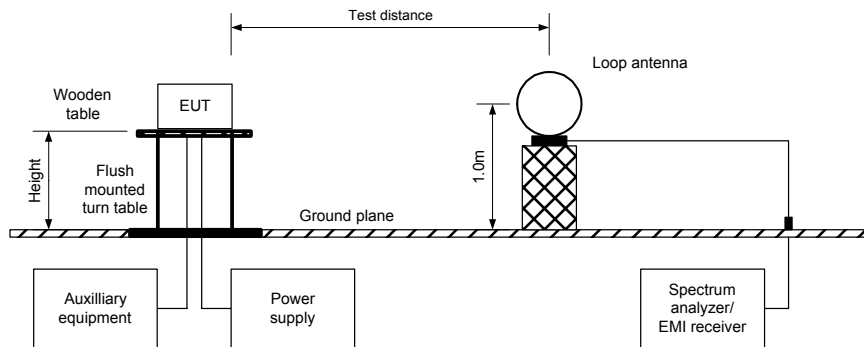
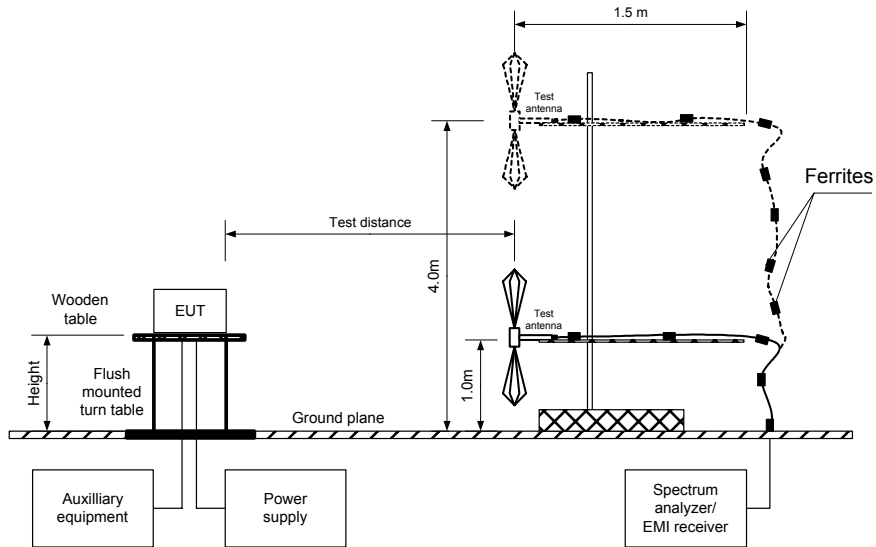


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz





Test specification: Section 25.254(a)(4), Radiated spurious emissions	
Test procedure: 47 CFR, Sections 2.1053 and KDB 237109	
Test mode: Compliance	Verdict: PASS
Date: 5/2/2010	
Temperature: 24.5 °C	Air Pressure: 1011 hPa
Relative Humidity: 38 %	
Power Supply: 48 VDC	
Remarks:	

Table 7.4.3 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 2483.5 - 2495 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber / OATS
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 27000 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: QPSK
MODULATING SIGNAL: PRBS

Frequency, MHz	Field strength, dB(µV/m)	Limit, dB(µV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
All emissions were found at least 20 dB below the specified limit							

*- Margin = Field strength of spurious – calculated field strength limit.

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

Reference numbers of test equipment used

HL 0415	HL 0446	HL 0521	HL 0554	HL 0569	HL 0604	HL 0614	HL 0768
HL 0769	HL 0812	HL 1430	HL 1984	HL 2254	HL 2667	HL 2909	HL 2910
HL 3121	HL 3122	HL 3123	HL 3206	HL 3533	HL 3616		

Full description is given in Appendix A.

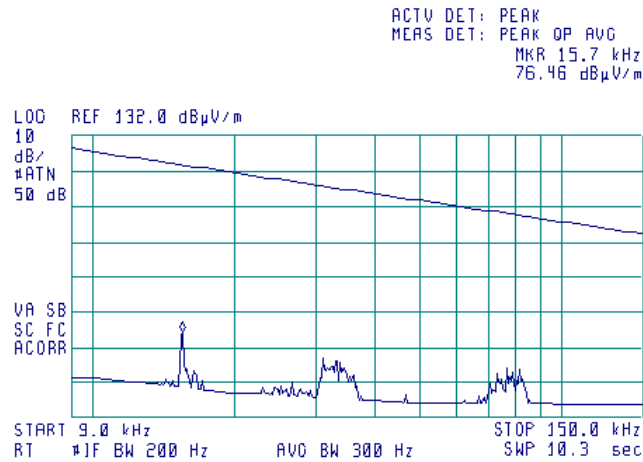


HERMON LABORATORIES

Test specification: Section 25.254(a)(4), Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2010			
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

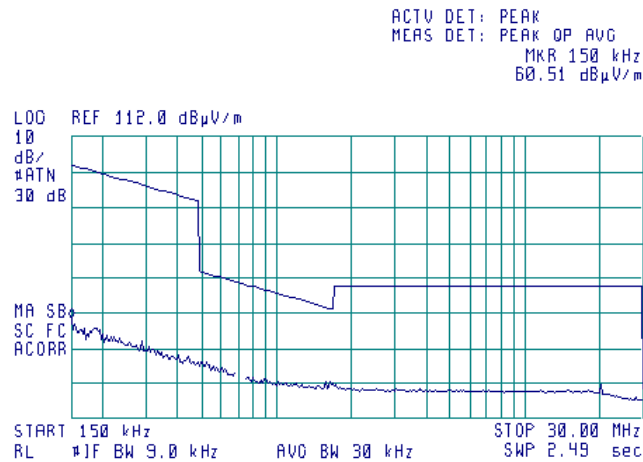
Plot 7.4.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



Plot 7.4.2 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m



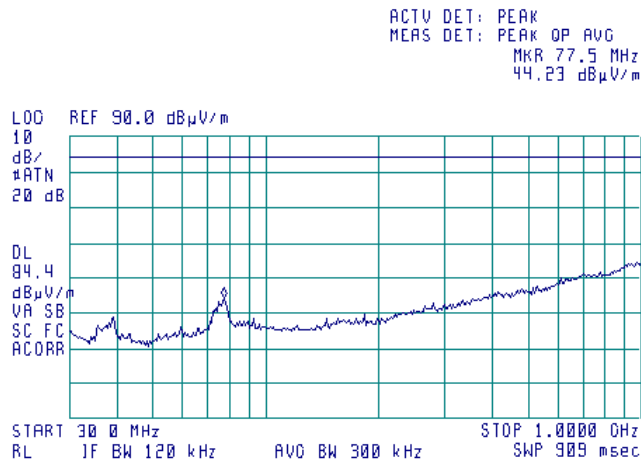


HERMON LABORATORIES

Test specification: Section 25.254(a)(4), Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2010			
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.3 Radiated emission measurements in 30 - 1000 MHz range

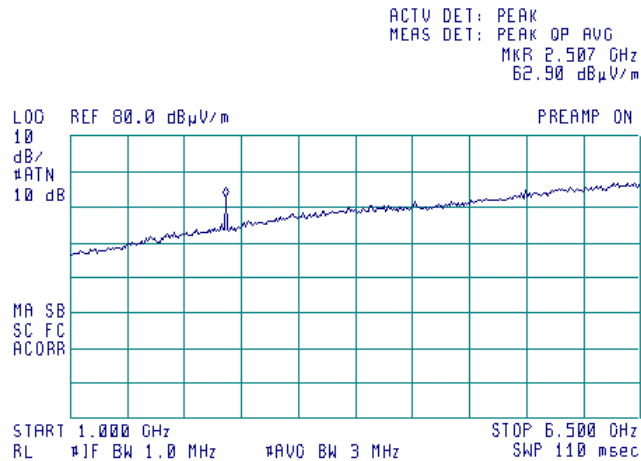
TEST SITE: Semi anechoic chamber
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



All spurious emissions are from digital part of EUT

Plot 7.4.4 Radiated emission measurements in 1000 – 6500 MHz range

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



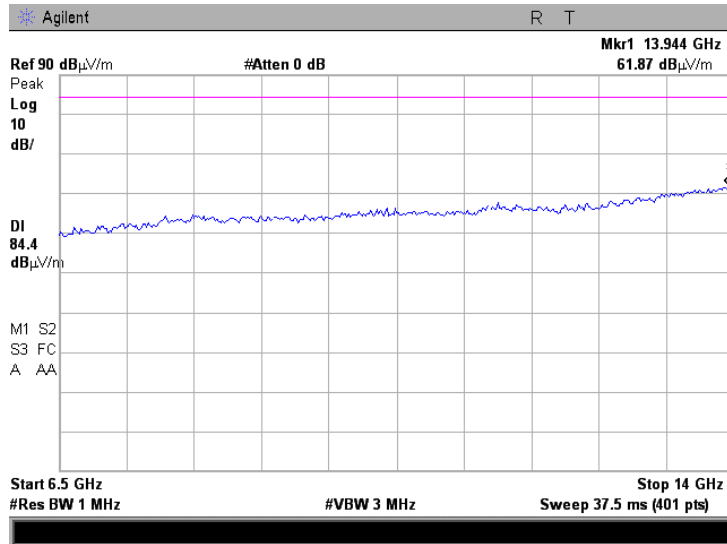


HERMON LABORATORIES

Test specification:	Section 25.254(a)(4), Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

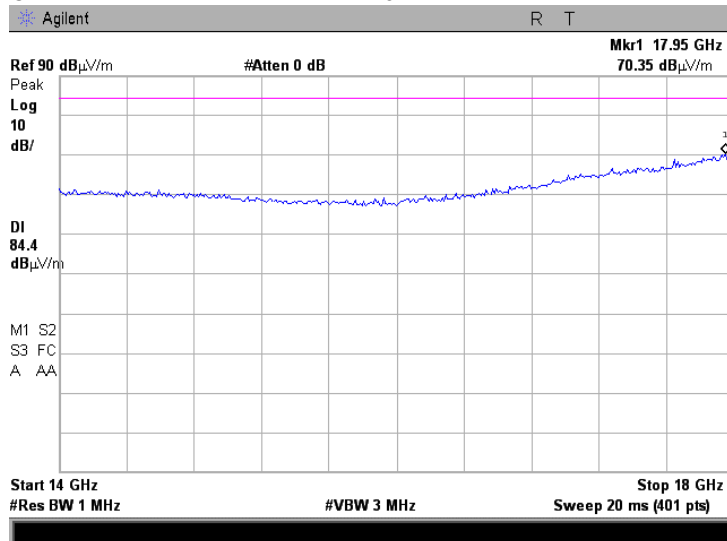
Plot 7.4.5 Radiated emission measurements in 6500 – 14000 MHz range

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



Plot 7.4.6 Radiated emission measurements in 14000 – 18000 MHz range

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



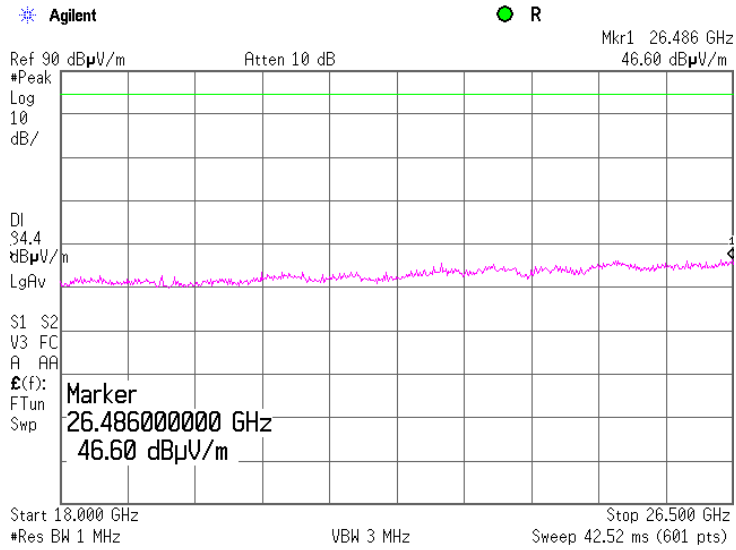


HERMON LABORATORIES

Test specification:	Section 25.254(a)(4), Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.7 Radiated emission measurements in 18000 – 25000 MHz range

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





Test specification:		Section 25.254(a)(4), Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

7.5 Spurious emissions at RF antenna connector test in 1559-1610 MHz band

7.5.1 General

This test was performed to measure radiated spurious emissions from the EUT enclosure with antenna. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Radiated spurious emission test limits

Frequency, MHz	Type of signal	EIRP of spurious emissions, dBW/MHz	Spurious emissions, dBm/MHz
1559 - 1610	Wideband	-100	-70
	Type of signal	EIRP of spurious emissions, dBW/kHz	Spurious emissions, dBm/kHz
	Discrete or less than 700 Hz BW	-110	-80

7.5.2 Test procedure

7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and the EUT performance 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 shown in the associated plots.

Reference numbers of test equipment used

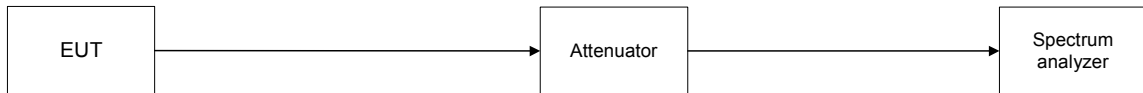
#1	#2	#3					
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Full description is given in Appendix A.



Test specification:	Section 25.254(a)(4), Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

Figure 7.5.1 Spurious emission test setup





Test specification:		Section 25.254(a)(4), Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

Table 7.5.2 3 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 2483.5 – 2500.0 MHz
 INVESTIGATED FREQUENCY RANGE: 1559.0 – 1610.0 MHz
 DETECTOR USED: Average (RMS)
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 ANTENNA GAIN: 18 dBi (worst case)

Frequency, MHz	SA reading, dBm	Type of emission	RBW, kHz	Antenna gain, dBi	Spurious emission EIRP, dBm*	Limit EIRP, dBm	Margin, dB**	Verdict
1572.464	-88.44	Wideband	1000	18	-70.44	-70.0	-0.44	Pass
1572.566	-93.57	Wideband	300	18	-70.34***	-70.0	-0.34	Pass
1601.180	-111.82	Narrowband	1	18	-93.82	-80.0	-13.82	Pass

* - Spurious emission EIRP, dBm = SA reading, dBm + Antenna gain, dBi

** - Margin = Spurious emission – specification limit.

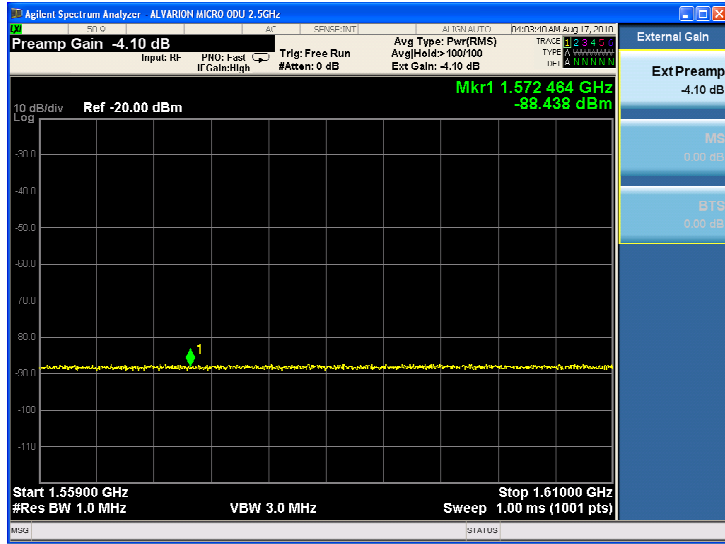
*** - The spurious emission level was calculated as: SA reading, dBm + Antenna gain, dBi + 10*log(1000/300) dB

NOTE: All the measurements reported in the table above are internal spectrum analyzer noise floor. No emissions from EUT were found.



Test specification:	Section 25.254(a)(4), Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2010		
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.1 Spurious emission measurements in 1559.0 – 1610.0 MHz range, wideband, RBW = 1000 kHz



Plot 7.5.2 Spurious emission measurements in 1559.0 – 1610.0 MHz range, wideband, RBW = 300 kHz

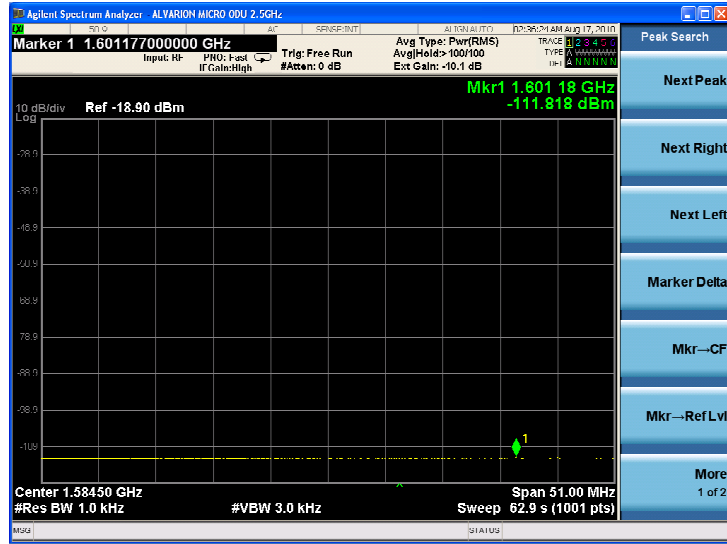




HERMON LABORATORIES

Test specification: Section 25.254(a)(4), Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2010			
Temperature: 24.5 °C	Air Pressure: 1011 hPa	Relative Humidity: 38 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.3 Spurious emission measurements in 1559.0 – 1610.0 MHz range, narrowband, RBW = 1kHz





Test specification:		Section 25.254(a)(2), Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/3/2010		
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

7.6 Spurious emissions at RF antenna connector test

7.6.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Spurious emission limits

Frequency, MHz	ERP of spurious, dBm
0.009 – 10th harmonic*	-13.0

* - P is transmitter output power in Watts

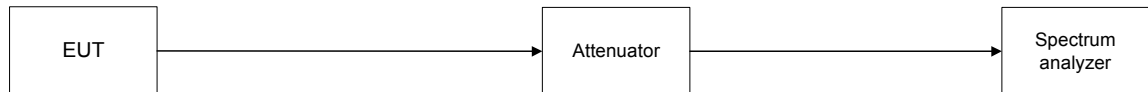
7.6.2 Test procedure

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

7.6.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.6.2 and associated plots.

Figure 7.6.1 Spurious emission test setup





HERMON LABORATORIES

Test specification:		Section 25.254(a)(2), Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/3/2010		
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Table 7.6.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 2483.5 – 2495.0 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 26500 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 CHANNEL BW: 10 MHz
 TRANSMITTER OUTPUT POWER: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Mid carrier frequency								
0.079735	-52.40	Included	Included	0.2	-52.40	-13.00	-39.40	Pass
4.830	-45.21	Included	Included	10.0	-45.21	-13.00	-32.21	Pass
529.600	-41.00	Included	Included	100	-41.00	-13.00	-28.00	Pass
2481.560	-15.28	Included	Included	1000	-15.28	-13.00	-2.28	Pass
2482.583	-14.90	Included	Included	1000	-14.90	-13.00	-1.90	Pass
2483.500	-16.47	Included	Included	1000	-16.47	-13.00	-3.47	Pass
2500.380	-17.66	Included	Included	1000	-17.66	-13.00	-4.66	Pass

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

HL 1424	HL 2254	HL 2909	HL 2953	HL 3321	HL 3386	HL 3455	
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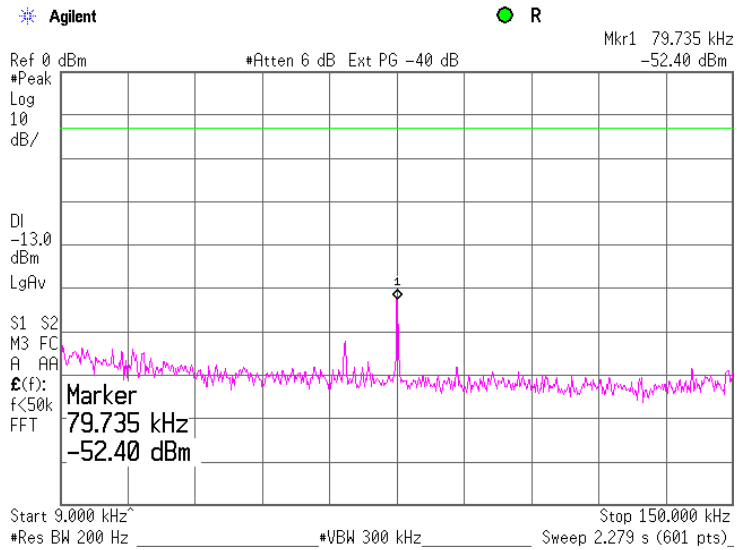
Full description is given in Appendix A.



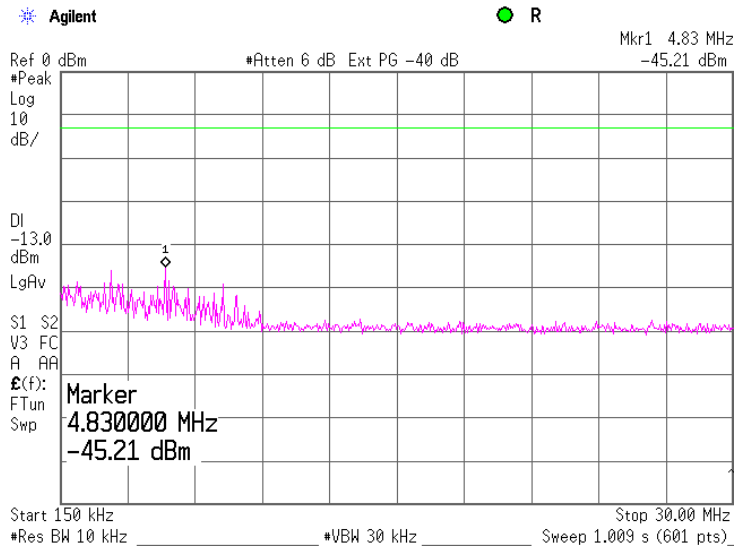
HERMON LABORATORIES

Test specification:	Section 25.254(a)(2), Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/3/2010		
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.1 Spurious emission measurements in 9 - 150 kHz range



Plot 7.6.2 Spurious emission measurements in 0.15 - 30.0 MHz range

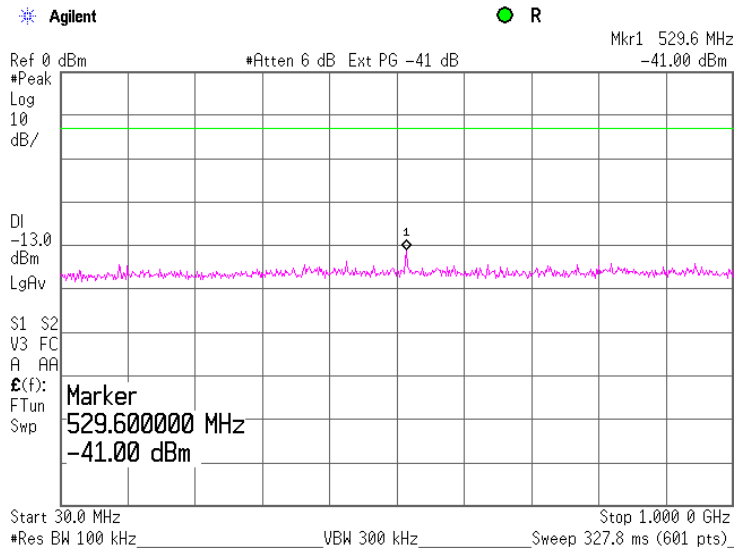




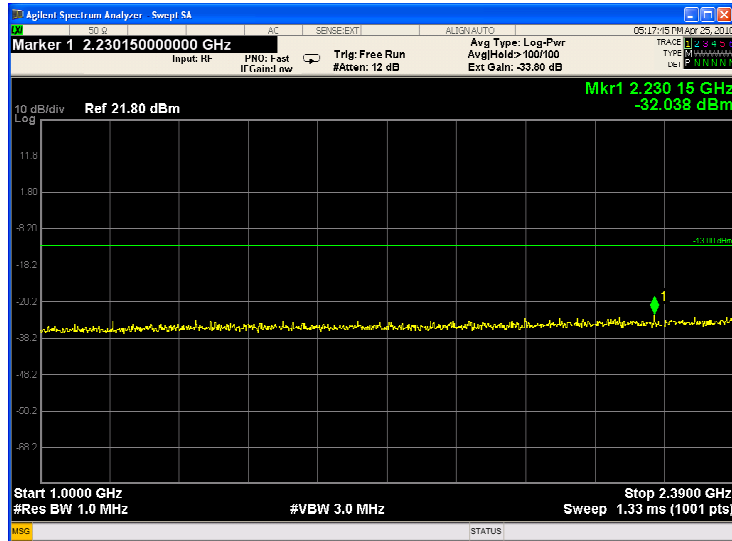
HERMON LABORATORIES

Test specification:		Section 25.254(a)(2), Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/3/2010		
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.3 Spurious emission measurements in 30.0 - 1000 MHz range



Plot 7.6.4 Spurious emission measurements in 1000 - 2390 MHz range (peak)

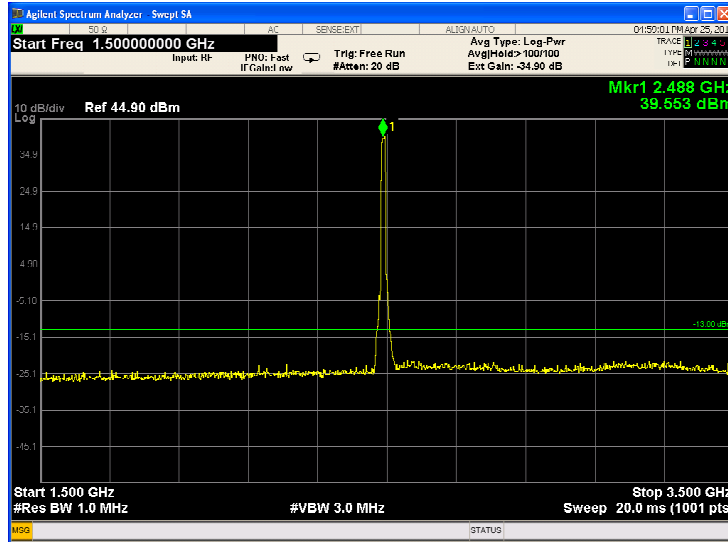




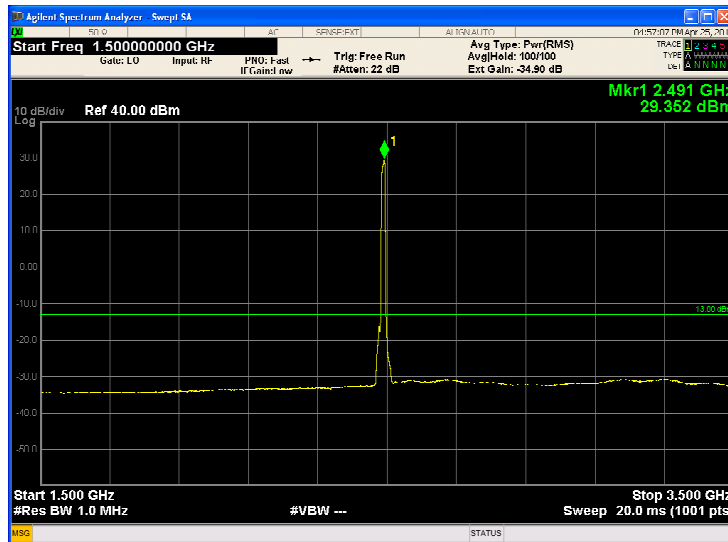
HERMON LABORATORIES

Test specification:		Section 25.254(a)(2), Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and KDB 237109	
Test mode:	Compliance	Verdict:	PASS
Date:	5/3/2010		
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.5 Spurious emission measurements in 1500 - 3500 MHz range (peak)



Plot 7.6.6 Spurious emission measurements in 1500 - 3500 MHz range (average)





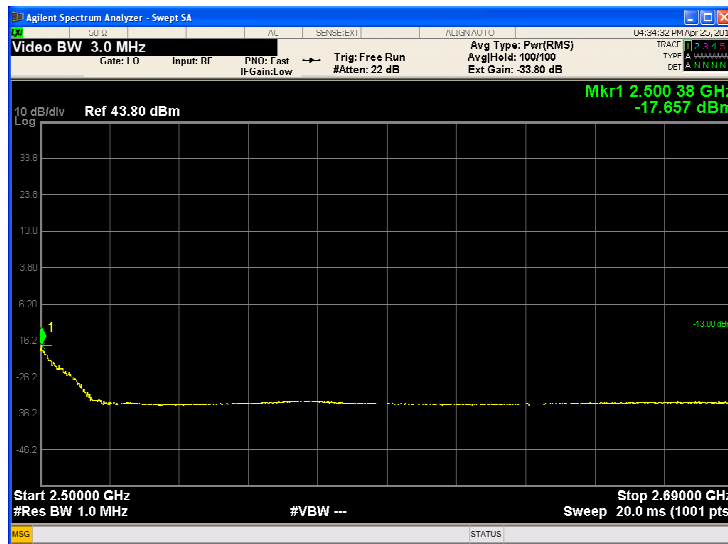
HERMON LABORATORIES

Test specification:		Section 25.254(a)(2), Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and KDB 237109	
Test mode:		Compliance	Verdict: PASS
Date:		5/3/2010	
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.7 Spurious emission measurements in 2390 - 2495 MHz range (average)



Plot 7.6.8 Spurious emission measurements in 2500 - 2690 MHz range (average)

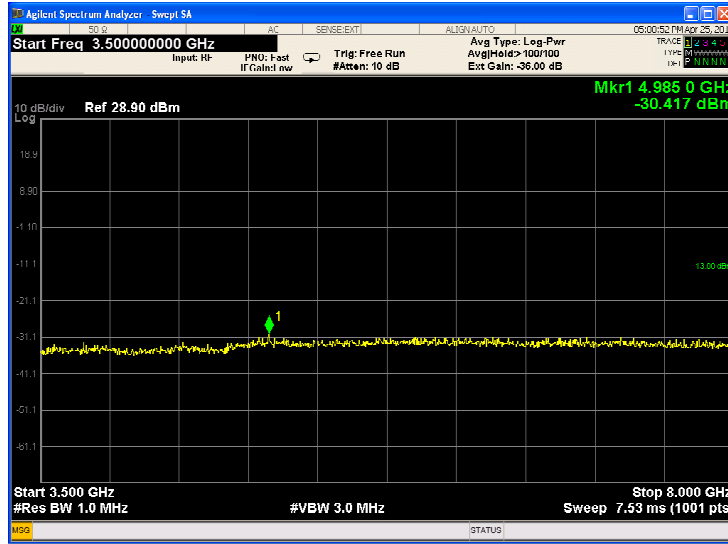




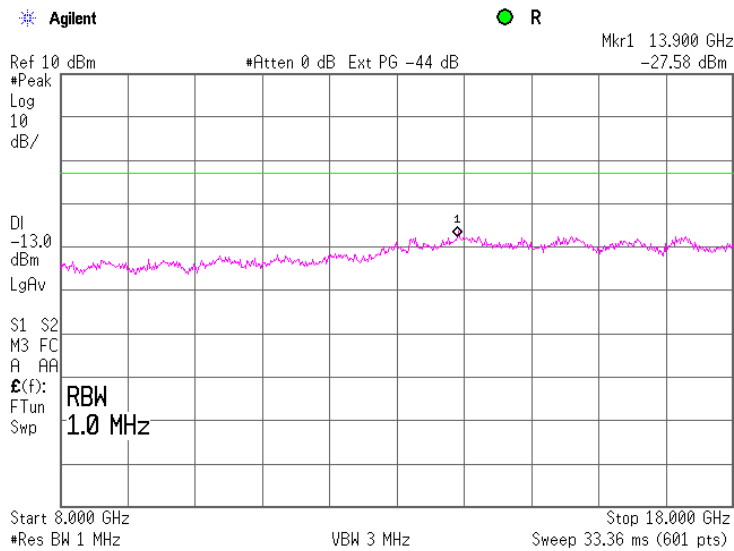
HERMON LABORATORIES

Test specification: Section 25.254(a)(2), Conducted spurious emissions			
Test procedure: 47 CFR, Sections 2.1051 and KDB 237109			
Test mode: Compliance	Verdict: PASS		
Date: 5/3/2010			
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.9 Spurious emission measurements in 3500 - 8000 MHz range



Plot 7.6.10 Spurious emission measurements in 8000 - 18000 MHz range (combined)

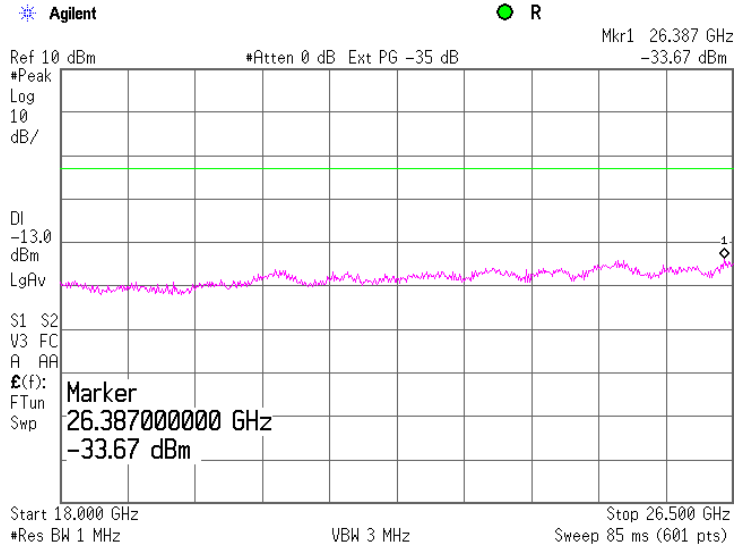




HERMON LABORATORIES

Test specification:	Section 25.254(a)(2), Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and KDB 237109		
Test mode:	Compliance	Verdict:	PASS
Date:	5/3/2010		
Temperature: 24.6 °C	Air Pressure: 1013 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.11 Spurious emission measurements in 18000 - 26500 MHz range





Test specification:		Section 2.1055, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:	Compliance	Verdict:	PASS
Date:	7/19/2010		
Temperature: 22.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 36 %	Power Supply: 48 VDC
Remarks:			

7.7 Frequency stability test

7.7.1 General

This test was performed to measure frequency stability of transmitter RF carrier. Specification test limits are given in Table 7.7.1. The test results are provided in Table 7.7.2.

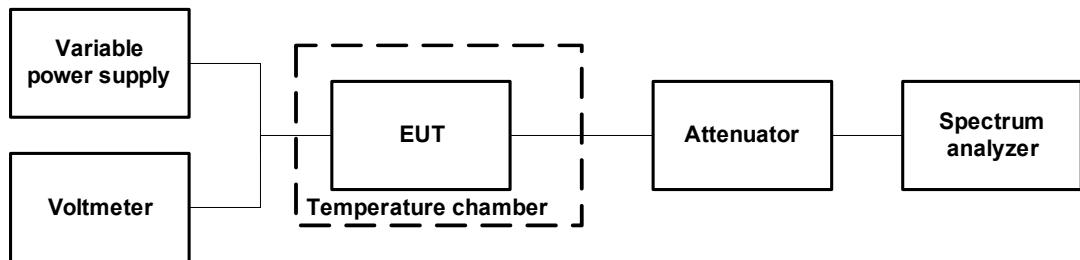
Table 7.7.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement	
	ppm	Hz
2483.5 – 2495.0	NA	NA

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.
- 7.7.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.7.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.7.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.7.2.5 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.
- 7.7.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.7.2.

Figure 7.7.1 Frequency stability test setup





HERMON LABORATORIES

Test specification:		Section 2.1055, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:	Compliance	Verdict:	PASS
Date:	7/19/2010		
Temperature: 22.4 °C	Air Pressure: 1007 hPa	Relative Humidity: 36 %	Power Supply: 48 VDC
Remarks:			

Table 7.7.2 Frequency stability test results

OPERATING FREQUENCY: 2490.0 MHz
 NOMINAL POWER VOLTAGE: 48 VDC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Counter
 RESOLUTION BANDWIDTH: 30 Hz
 VIDEO BANDWIDTH: 100 Hz
 MODULATION: Unmodulated

T, °C	Voltage,								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
2490	nominal	2489.999969	2489.999971	2489.999996	2489.999997	2489.999997	2489.999971	2489.999968	7.00	-22.00	0.00	-0.01
-30	nominal	2489.999981	NA	NA	NA	NA	NA	2489.999978	0.00	-12.00	0.00	0.00
-10	nominal	2489.999990	NA	NA	NA	NA	NA	2489.999980	0.00	-10.00	0.00	0.00
0	nominal	2489.999980	2489.999980	2489.999980	2489.999990	2489.999990	2489.999990	2489.999990	0.00	-10.00	0.00	0.00
10	nominal	2489.999990	NA	NA	NA	NA	NA	2489.999990	0.00	0.00	0.00	0.00
20	15%	2489.999963	NA	NA	NA	NA	NA	2489.999965	0.00	-27.00	0.00	-0.01
20	nominal	2490.000000	NA	NA	NA	NA	NA	2489.999990	10.00	0.00	0.00	0.00
20	-15%	2489.999966	NA	NA	NA	NA	NA	2489.999964	0.00	-26.00	0.00	-0.01
30	nominal	2489.999963	2489.999965	2489.999963	2489.999959	2489.999964	2489.999960	2489.999962	0.00	-31.00	0.00	-0.01
40	nominal	2489.999962	NA	NA	NA	NA	NA	2489.999962	0.00	-28.00	0.00	-0.01
50	nominal	2489.999960	2489.999960	2489.999957	2489.999960	2489.999961	2489.999960	2489.999958	0.00	-33.00	0.00	-0.01

* - Reference frequency

Reference numbers of test equipment used

HL 1424	HL 3286						
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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.
0415	Cable, Coax, RF, RG-214	Hermon Laboratories	CC-3	056	01-Dec-09	01-Dec-10
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	29-Jun-10	29-Jun-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	27-Aug-09	27-Aug-10
0554	Amplifier, 2-18 GHz RF	Miteq	AFD4	104300	28-Feb-10	28-Feb-11
0557	Generator Signal, 9 KHz - 1.2 GHz	Marconi Instruments	2023	112225/08 0	16-Feb-10	16-Feb-11
0569	Antenna, Log Periodic, 200 - 1000 MHz	Electro-Metrics	LPA 25/30	1953	11-Jun-10	11-Jun-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-10	11-Jan-11
0614	Antenna, Dipole, Tunable, 200 - 500 MHz	Electro-Metrics	TDS-30-1	334	31-Jan-10	31-Jan-11
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
0812	Cable Coax, RG-214, 11.5 m, N-type connectors	Hermon Laboratories	C214-11	148	02-Dec-09	02-Dec-10
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-09	28-Aug-10
1430	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1431, HL1432	Agilent Technologies	8542E	3807A002 62,3705A0 0217	31-Aug-09	31-Aug-10
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	11-Jun-10	11-Jun-11
2254	Cable 40 GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	13-Jun-10	13-Jun-11
2667	Signal generator, 9 kHz - 3.3 GHz	Rohde & Schwarz	SML03	101909	30-Dec-09	30-Dec-10
2870	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	2870	17-Sep-09	17-Sep-10
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	15-Sep-09	15-Sep-10
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-10	07-May-11
2910	Cable 18 GHz, 3 m, SMA-SMA	Gore	NA	989370	30-Dec-09	30-Dec-10
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-09	05-Oct-10
3042	Antenna, Horn, 1-18 GHz	Hermon Laboratories	A1-18	3042	29-Jan-10	29-Jan-11
3121	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3121	30-Dec-09	30-Dec-10
3122	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3122	30-Dec-09	30-Dec-10



HL No	Description	Manufacturer	Model	Ser. No.	Last Cal.	Due Cal.
3123	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3123	30-Dec-09	30-Dec-10
3206	Cable 40 GHz, 0.6 m	Gore	GOR245	05118336	13-Jun-10	13-Jun-11
3286	Temperature Chamber, (-40 to +170) °C	Thermotron	EL-8-CH-1-1-CO2	21-9048	09-Sep-09	09-Sep-10
3321	Attenuator DC to 22 GHz, 30 dB, 50 W	Aeroflex / Weinschel	86-30-12	380	30-Dec-09	30-Dec-10
3341	High Pass Filter, 50 Ohm, 1400 to 5000 MHz	Mini-Circuits	VHF-1300+	NA	05-Oct-09	05-Oct-10
3355	Low Pass Filter, 50 Ohm, DC to 1450 MHz	Mini-Circuits	VLF-1450+	NA	05-Oct-09	05-Oct-10
3356	Low Pass Filter, 50 Ohm, DC to 1800 MHz	Mini-Circuits	VLF-1800+	NA	05-Oct-09	05-Oct-10
3386	Microwave Cable Assembly, 26.5 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3386	25-Feb-10	25-Feb-11
3455	Medium Power Fixed Coaxial Attenuator DC to 40 GHz, 20 dB, 5 W	Aeroflex / Weinschel	75A-20-12	1182	25-Mar-10	25-Mar-11
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	11159001001	06-Dec-09	06-Dec-10
3534	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	11159001002	06-Dec-09	06-Dec-10
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	27-May-10	27-May-11
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	25-Sep-09	25-Sep-10
3884	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out.	Agilent Technologies	87405C	MY47010418	13-Jan-10	13-Jan-11

8.1 Alvarion's test equipment and ancillaries used for tests

No.	Description	Manufacturer	Model No.	Serial No.	Due Calibr
1	Signal analyzer, 20 Hz-8.4 GHz	Agilent	MXA N9020A	US46470609	31-July-10
2	Attenuator, DC-8.5GHz, 20 dB	Aeroflex/Weinschel	24-20-34 SN: BV4048	NA	NA
3	Microwave 1.5m cable	Suhner	Sucoflex 104PE	27314/4PE	NA

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, IC 2186A-2 for anechoic chamber, IC 2186A-3 for full-anechoic chamber for RE measurements above 1 GHz), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01).

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11 APPENDIX D Specification references

FCC 47CFR part 25: 2009	Satellite communications
FCC KDB 237109	Equipment Authorization Guidance for Part 25 Transceivers
FCC 47CFR part 1: 2009	Practice and procedure
FCC 47CFR part 2: 2009	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(μ V) to convert it into field intensity in dB(μ A/m).
Antenna factor in dB(1/m) is to be added to receiver meter reading in dB(μ V) to convert it into field intensity in dB(μ V/m).

Antenna factor
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(μ V) to convert it into field intensity in dB(μ V/m).



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

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

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



Antenna factor
Biconilog antenna EMCO Model 3141
Ser.No.1011, HL 0604

Frequency, MHz	Antenna Factor, dB(1/m)	Frequency, MHz	Antenna Factor, dB(1/m)
26	7.8	940	24.0
28	7.8	960	24.1
30	7.8	980	24.5
40	7.2	1000	24.9
60	7.1	1020	25.0
70	8.5	1040	25.2
80	9.4	1060	25.4
90	9.8	1080	25.6
100	9.7	1100	25.7
110	9.3	1120	26.0
120	8.8	1140	26.4
130	8.7	1160	27.0
140	9.2	1180	27.0
150	9.8	1200	26.7
160	10.2	1220	26.5
170	10.4	1240	26.5
180	10.4	1260	26.5
190	10.3	1280	26.6
200	10.6	1300	27.0
220	11.6	1320	27.8
240	12.4	1340	28.3
260	12.8	1360	28.2
280	13.7	1380	27.9
300	14.7	1400	27.9
320	15.2	1420	27.9
340	15.4	1440	27.8
360	16.1	1460	27.8
380	16.4	1480	28.0
400	16.6	1500	28.5
420	16.7	1520	28.9
440	17.0	1540	29.6
460	17.7	1560	29.8
480	18.1	1580	29.6
500	18.5	1600	29.5
520	19.1	1620	29.3
540	19.5	1640	29.2
560	19.8	1660	29.4
580	20.6	1680	29.6
600	21.3	1700	29.8
620	21.5	1720	30.3
640	21.2	1740	30.8
660	21.4	1760	31.1
680	21.9	1780	31.0
700	22.2	1800	30.9
720	22.2	1820	30.7
740	22.1	1840	30.6
760	22.3	1860	30.6
780	22.6	1880	30.6
800	22.7	1900	30.6
820	22.9	1920	30.7
840	23.1	1940	30.9
860	23.4	1960	31.2
880	23.8	1980	31.6
900	24.1	2000	32.0
920	24.1		

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 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(μ V) to convert it into field intensity in dB(μ V/m).



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

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

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

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



Cable loss
Cable coaxial, Huber-Suhner, 18 GHz, 6.4 m, SMA - SMA, model 198-9155-00,
HL 2870

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	5750	2.49	12000	3.71
30	0.17	6000	2.53	12250	3.81
100	0.32	6250	2.58	12500	3.84
250	0.49	6500	2.64	12750	3.88
500	0.70	6750	2.69	13000	3.92
750	0.86	7000	2.75	13250	3.96
1000	1.00	7250	2.80	13500	3.98
1250	1.11	7500	2.87	13750	4.01
1500	1.23	7750	2.93	14000	4.03
1750	1.34	8000	2.94	14250	4.09
2000	1.41	8250	3.00	14500	4.08
2250	1.51	8500	3.04	14750	4.10
2500	1.59	8750	3.08	15000	4.15
2750	1.68	9000	3.14	15250	4.22
3000	1.76	9250	3.16	15500	4.31
3250	1.83	9500	3.22	15750	4.42
3500	1.91	9750	3.26	16000	4.48
3750	1.97	10000	3.36	16250	4.54
4000	2.05	10250	3.41	16500	4.56
4250	2.11	10500	3.46	16750	4.57
4500	2.18	10750	3.50	17000	4.59
4750	2.24	11000	3.54	17250	4.66
5000	2.30	11250	3.58	17500	4.70
5250	2.36	11500	3.63	17750	4.76
5500	2.43	11750	3.66	18000	4.72



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

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



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

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



Cable loss
Cable coaxial, Gore, 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
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3121

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	0.08	3600	2.10	7400	3.08	11200	3.85	15100	4.58
30	0.18	3700	2.14	7500	3.11	11300	3.85	15200	4.60
50	0.26	3800	2.18	7600	3.14	11400	3.86	15300	4.63
100	0.34	3900	2.19	7700	3.16	11500	3.86	15400	4.65
200	0.47	4000	2.25	7800	3.18	11600	3.87	15500	4.71
300	0.59	4100	2.25	7900	3.20	11700	3.85	15600	4.70
400	0.66	4200	2.28	8000	3.22	11800	3.96	15700	4.69
500	0.75	4300	2.35	8100	3.26	11900	3.92	15800	4.71
600	0.83	4400	2.35	8200	3.27	12000	3.92	15900	4.74
700	0.90	4500	2.38	8300	3.29	12100	3.94	16000	4.69
800	0.96	4600	2.43	8400	3.30	12200	3.94	16100	4.72
900	1.02	4700	2.43	8500	3.31	12300	3.99	16200	4.71
1000	1.07	4800	2.45	8600	3.33	12400	4.02	16300	4.74
1100	1.12	4900	2.48	8700	3.35	12500	4.10	16400	4.74
1200	1.15	5000	2.55	8800	3.36	12600	4.09	16500	4.75
1300	1.22	5100	2.54	8900	3.38	12700	4.15	16600	4.78
1400	1.28	5200	2.56	9000	3.40	12800	4.15	16700	4.86
1500	1.29	5300	2.58	9100	3.41	12900	4.08	16800	4.84
1600	1.36	5400	2.61	9200	3.45	13000	4.21	16900	4.83
1700	1.40	5500	2.64	9300	3.48	13100	4.19	17000	4.86
1800	1.45	5600	2.69	9400	3.52	13200	4.29	17100	4.83
1900	1.51	5700	2.67	9500	3.54	13300	4.24	17200	4.90
2000	1.50	5800	2.71	9600	3.59	13400	4.26	17300	4.91
2100	1.56	5900	2.73	9700	3.59	13500	4.26	17400	4.94
2200	1.59	6000	2.75	9800	3.62	13600	4.29	17500	4.93
2300	1.63	6100	2.81	9900	3.70	13700	4.35	17600	4.93
2400	1.73	6200	2.80	10000	3.70	13800	4.31	17700	5.00
2500	1.73	6300	2.82	10100	3.72	13900	4.29	17800	5.01
2600	1.78	6400	2.85	10200	3.73	14000	4.32	17900	5.00
2700	1.84	6500	2.87	10300	3.75	14100	4.33	18000	5.00
2800	1.84	6600	2.90	10400	3.76	14200	4.34		
2900	1.91	6700	2.91	10500	3.77	14300	4.36		
3000	1.91	6800	2.94	10600	3.79	14400	4.38		
3100	1.97	6900	2.96	10700	3.80	14600	4.42		
3200	1.98	7000	2.98	10800	3.81	14700	4.42		
3300	2.04	7100	3.01	10900	3.81	14800	4.55		
3400	2.04	7200	3.02	11000	3.83	14900	4.55		
3500	2.10	7300	3.04	11100	3.84	15000	4.55		



Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3122

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	0.11	3600	2.08	7400	3.07	11200	3.92	15100	4.61
30	0.17	3700	2.12	7500	3.09	11300	3.95	15200	4.58
50	0.23	3800	2.15	7600	3.14	11400	3.93	15300	4.62
100	0.32	3900	2.18	7700	3.15	11500	3.93	15400	4.62
200	0.47	4000	2.21	7800	3.19	11600	3.94	15500	4.65
300	0.58	4100	2.24	7900	3.22	11700	3.97	15600	4.66
400	0.66	4200	2.27	8000	3.20	11800	3.98	15700	4.66
500	0.74	4300	2.31	8100	3.21	11900	4.08	15800	4.72
600	0.81	4400	2.31	8200	3.24	12000	4.03	15900	4.78
700	0.88	4500	2.36	8300	3.27	12100	4.06	16000	4.89
800	0.95	4600	2.37	8400	3.32	12200	4.05	16100	4.95
900	1.00	4700	2.40	8500	3.35	12300	4.16	16200	4.92
1000	1.06	4800	2.43	8600	3.35	12400	4.18	16300	4.95
1100	1.11	4900	2.45	8700	3.33	12500	4.20	16400	5.02
1200	1.16	5000	2.50	8800	3.37	12600	4.22	16500	5.04
1300	1.21	5100	2.51	8900	3.39	12700	4.23	16600	5.06
1400	1.26	5200	2.55	9000	3.45	12800	4.28	16700	5.17
1500	1.31	5300	2.56	9100	3.46	12900	4.26	16800	5.16
1600	1.35	5400	2.59	9200	3.47	13000	4.28	16900	5.19
1700	1.39	5500	2.62	9300	3.46	13100	4.28	17000	5.23
1800	1.44	5600	2.65	9400	3.50	13200	4.28	17100	5.30
1900	1.47	5700	2.67	9500	3.50	13300	4.29	17200	5.26
2000	1.52	5800	2.71	9600	3.53	13400	4.34	17300	5.30
2100	1.55	5900	2.72	9700	3.52	13500	4.31	17400	5.30
2200	1.60	6000	2.73	9800	3.54	13600	4.35	17500	5.36
2300	1.63	6100	2.76	9900	3.56	13700	4.36	17600	5.40
2400	1.67	6200	2.78	10000	3.57	13800	4.37	17700	5.47
2500	1.70	6300	2.81	10100	3.60	13900	4.41	17800	5.56
2600	1.74	6400	2.85	10200	3.69	14000	4.42	17900	5.45
2700	1.78	6500	2.87	10300	3.69	14100	4.45	18000	5.47
2800	1.83	6600	2.87	10400	3.67	14200	4.49		
2900	1.85	6700	2.90	10500	3.70	14300	4.55		
3000	1.89	6800	2.91	10600	3.70	14400	4.62		
3100	1.92	6900	2.96	10700	3.76	14600	4.54		
3200	1.96	7000	2.99	10800	3.88	14700	4.58		
3300	1.99	7100	3.01	10900	3.88	14800	4.57		
3400	2.03	7200	3.04	11000	3.85	14900	4.65		
3500	2.06	7300	3.08	11100	3.85	15000	4.64		



Cable loss
Microwave Cable Assembly, 18 GHz, 6.4 m, SMA – SMA, Huber-Suhner, model 198-9155-00
HL 3123

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	0.11	3600	1.97	7400	3.12	11200	3.90	15100	4.74
30	0.17	3700	1.97	7500	3.13	11300	3.93	15200	4.70
50	0.25	3800	2.03	7600	3.16	11400	3.88	15300	4.73
100	0.32	3900	2.04	7700	3.18	11500	3.87	15400	4.78
200	0.46	4000	2.10	7800	3.20	11600	3.90	15500	4.75
300	0.58	4100	1.97	7900	3.23	11700	3.86	15600	4.76
400	0.65	4200	1.97	8000	3.25	11800	3.88	15700	4.75
500	0.74	4300	2.03	8100	3.26	11900	3.86	15800	4.78
600	0.82	4400	2.04	8200	3.28	12000	3.89	15900	4.79
700	0.89	4500	2.10	8300	3.31	12100	3.94	16000	4.73
800	0.95	4600	1.97	8400	3.31	12200	3.92	16100	4.78
900	1.01	4700	1.97	8500	3.32	12300	3.96	16200	4.84
1000	1.07	4800	2.03	8600	3.34	12400	4.01	16300	4.90
1100	1.11	4900	2.04	8700	3.35	12500	4.07	16400	4.87
1200	1.17	5000	2.10	8800	3.37	12600	4.08	16500	4.90
1300	1.22	5100	2.53	8900	3.39	12700	4.17	16600	4.98
1400	1.27	5200	2.55	9000	3.42	12800	4.26	16700	5.05
1500	1.29	5300	2.60	9100	3.43	12900	4.16	16800	5.04
1600	1.35	5400	2.61	9200	3.51	13000	4.21	16900	5.02
1700	1.40	5500	2.64	9300	3.52	13100	4.24	17000	5.09
1800	1.44	5600	2.70	9400	3.54	13200	4.27	17100	5.07
1900	1.51	5700	2.67	9500	3.63	13300	4.31	17200	5.10
2000	1.49	5800	2.71	9600	3.61	13400	4.33	17300	5.13
2100	1.55	5900	2.74	9700	3.71	13500	4.25	17400	5.23
2200	1.58	6000	2.80	9800	3.66	13600	4.27	17500	5.21
2300	1.62	6100	2.79	9900	3.77	13700	4.33	17600	5.22
2400	1.72	6200	2.81	10000	3.75	13800	4.33	17700	5.36
2500	1.76	6300	2.83	10100	3.77	13900	4.31	17800	5.35
2600	1.78	6400	2.86	10200	3.80	14000	4.30	17900	5.45
2700	1.80	6500	2.88	10300	3.79	14100	4.30	18000	5.43
2800	1.86	6600	2.90	10400	3.87	14200	4.31		
2900	1.90	6700	2.92	10500	3.83	14300	4.37		
3000	1.90	6800	2.98	10600	3.88	14400	4.35		
3100	1.97	6900	2.98	10700	3.86	14600	4.53		
3200	1.97	7000	3.00	10800	3.87	14700	4.50		
3300	2.03	7100	3.02	10900	3.90	14800	4.62		
3400	2.04	7200	3.04	11000	3.84	14900	4.65		
3500	2.10	7300	3.06	11100	3.88	15000	4.79		



HERMON LABORATORIES

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, Microwave Cable Assembly, 104EA, 18 GHz, 1.0 m
Suhner Sucoflex, HL 3386

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.05	5750	1.01	12000	1.29
30	0.07	6000	1.02	12250	1.33
100	0.12	6250	1.02	12500	1.36
250	0.18	6500	0.95	12750	1.35
500	0.26	6750	0.96	13000	1.36
750	0.32	7000	1.01	13250	1.39
1000	0.35	7250	1.04	13500	1.37
1250	0.41	7500	1.09	13750	1.43
1500	0.45	7750	1.12	14000	1.46
1750	0.50	8000	1.13	14250	1.39
2000	0.54	8250	1.15	14500	1.36
2250	0.57	8500	1.15	14750	1.47
2500	0.61	8750	1.15	15000	1.47
2750	0.64	9000	1.16	15250	1.41
3000	0.67	9250	1.14	15500	1.52
3250	0.70	9500	1.14	15750	1.54
3500	0.71	9750	1.19	16000	1.49
3750	0.74	10000	1.20	16250	1.48
4000	0.77	10250	1.22	16500	1.52
4250	0.80	10500	1.23	16750	1.56
4500	0.84	10750	1.22	17000	1.57
4750	0.85	11000	1.21	17250	1.53
5000	0.84	11250	1.24	17500	1.55
5250	0.85	11500	1.26	17750	1.55
5500	0.92	11750	1.28	18000	1.54



Cable loss
Cable coaxial, RG-214/U, N type-N type, 6.5 m
Suhner Switzerland, HL 3616

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.13	1750	2.66	3550	4.44	5350	6.08
30	0.25	1800	2.72	3600	4.46	5400	6.12
50	0.32	1850	2.78	3650	4.59	5450	6.17
100	0.48	1900	2.81	3700	4.60	5500	6.25
150	0.60	1950	2.86	3750	4.72	5550	6.31
200	0.71	2000	2.94	3800	4.72	5600	6.35
250	0.81	2050	2.97	3850	4.86	5650	6.41
300	0.91	2100	3.01	3900	4.85	5700	6.50
350	1.00	2150	3.06	3950	4.99	5750	6.52
400	1.07	2200	3.11	4000	4.90	5800	6.57
450	1.14	2250	3.16	4050	5.04	5850	6.61
500	1.23	2300	3.21	4100	5.01	5900	6.71
550	1.30	2350	3.26	4150	5.10	5950	6.70
600	1.37	2400	3.31	4200	5.08	6000	6.75
650	1.44	2450	3.35	4250	5.18	6050	6.74
700	1.50	2500	3.39	4300	5.14	6100	6.84
750	1.58	2550	3.46	4350	5.22	6150	6.87
800	1.64	2600	3.48	4400	5.21	6200	6.93
850	1.69	2650	3.55	4450	5.29	6250	6.96
900	1.77	2700	3.59	4500	5.31	6300	7.02
950	1.79	2750	3.66	4550	5.39	6350	7.04
1000	1.87	2800	3.68	4600	5.41	6400	7.10
1050	1.92	2850	3.75	4650	5.49	6450	7.11
1100	1.98	2900	3.79	4700	5.52	6500	7.19
1150	2.05	2950	3.86	4750	5.60		
1200	2.09	3000	3.89	4800	5.64		
1250	2.15	3050	3.94	4850	5.73		
1300	2.21	3100	3.98	4900	5.70		
1350	2.27	3150	4.03	4950	5.73		
1400	2.33	3200	4.06	5000	5.75		
1450	2.38	3250	4.12	5050	5.83		
1500	2.44	3300	4.14	5100	5.82		
1550	2.48	3350	4.22	5150	5.91		
1600	2.52	3400	4.24	5200	5.92		
1650	2.56	3450	4.31	5250	5.98		
1700	2.62	3500	4.35	5300	6.01		

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(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
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
μ s	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