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TEST REPORT

ACCORDING TO: FCC CFR 47 Part 90 subparts R&S

FOR:

MobileAccess Networks
Distributed antenna system
Model: 700/800 Public Safety
Remote Hub Unit

This report is in conformity with ISO/ IEC 17025. The "A2LA Accredited" symbol endorsement applies only to the tests and calibrations that are listed in the scope of Hermon Laboratories accreditation. The test results relate only to the items tested. This test report shall not be reproduced in any form except in full with the written approval of Hermon Laboratories Ltd.



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1 Applicant information

Client name: MobileAccess Networks Inc.
Address: 8391 Old Courthouse Rd., suite 300, Vienna, Virginia 22182, USA
Telephone: 001 703 848 0200
Fax: 001 703 848 0280
E-mail: Sblum@mobileaccess.com
Contact name: Mr. Steve Blum

2 Equipment under test attributes

Product name: Distributed Antenna System
Product type: Booster
Model(s): 700/800 Public Safety Remote Hub Unit (RHU)
RHU Serial number: 094215C
RHU Hardware version: 01
BU Serial number: 0936046 with a module WB-B4U
BU Hardware version: A03
Software release: 3.18
Receipt date: 12/7/2009

3 Manufacturer information

Manufacturer name: MobileAccess Networks Inc.
Address: 8391 Old Courthouse Rd., suite 300, Vienna, Virginia 22182, USA
Telephone: 001 703 848 0200
Fax: 001 703 848 0280
E-Mail: Sblum@mobileaccess.com
Contact name: Mr. Steve Blum

4 Test details

Project ID: 20278
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 12/7/2009
Test completed: 12/23/2009
Test specification(s): FCC 47CFR Part 90 subparts R, S



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5 Tests summary

Test	Status
Transmitter characteristics	
Section 90.219, Maximum output power	Pass
Section 90.209, Occupied bandwidth	Pass
Section 90.210, 90.691, Emission mask	Pass
Section 90.210, 90.543, Radiated spurious emissions	Pass
Section 90.210, 90.543, Conducted spurious emissions	Pass
Section 90.543, Adjacent channel power	Pass
Section 90.210, 90.543, Intermodulation	Pass
Section 90.213, 90.539, Frequency stability	Not required, the EUT does not convert RF frequency
Section 2.1091, RF radiation exposure evaluation	Pass, Exhibit to Application for certification attached

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.

This test report replaces the previously issued test report identified by Doc ID:MOBRAD_FCC.20278.

	Name and Title	Date	Signature
Tested by:	Mrs. E. Pitt, test engineer	December 23, 2009	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	December 29, 2009	
Approved by:	Mr. M. Nikishin, EMC and radio group manager	January 5, 2010	



6 EUT description

6.1 General information

The EUT, Remote Hub Unit, is a part of the MobileAccess system providing in-building coverage by routing RF signals from base transmit station (BTS) through optic fibers to remote areas where the signals are converted back to RF and interfaced to antennas covering the remote area.

The RHU converts the optic signal to an RF signal and feeds it to the antennas in the remote areas in order to provide the required coverage. The RHU filters and amplifies the optic signal received from the base unit (BU) according to the service it supports. The base unit (BU) is a non-transmitting host unit, not connected to antenna or amplifier.

Each RHU supports two different services (one high-band and one low-band) and provides coax connections to up to four antennas.

6.2 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length	Indoor / outdoor
Power	AC power	RHU	AC main	1	Unshielded	1.5	Indoor
RF	Antenna	RHU	Termination	4	NA	NA	NA
Signal	Signal	RHU	Base unit	2	Fiber optic	20	Outdoor
Power	DC power	Base unit	AC/DC power supply	1	Unshielded	1.5	Indoor

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
ESG-D series signal generator	Agilent	E4433B	GB40051033
ESG-D series signal generator	Agilent	E4432B	GB38450502
Power supply	Mean Well	PSU40A-8	863953

6.4 Operating frequencies

Source	Frequency, MHz
DL low band	763-775
DL high band	851-869
CPU	11.059

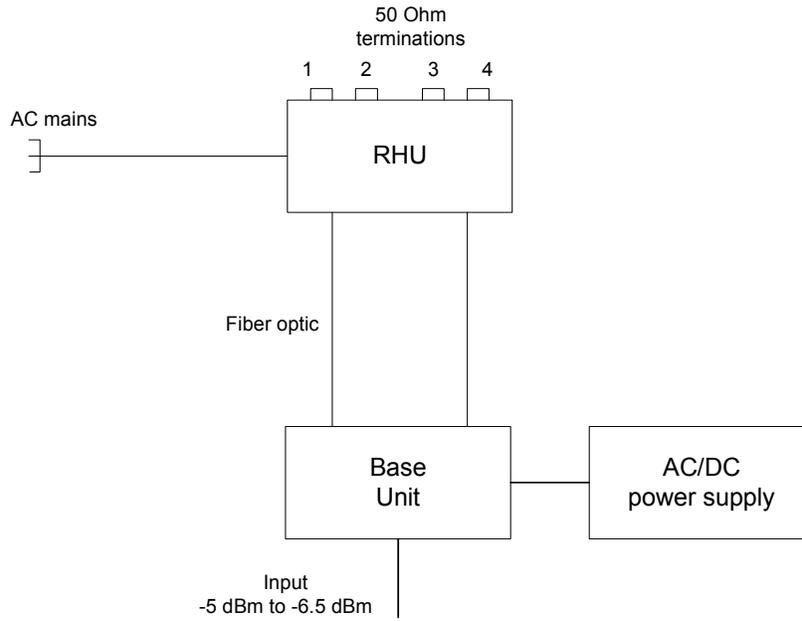
6.5 Changes made in the EUT

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

- 1) The 10 dB attenuator was added after the fiber in the RHU;
- 2) The 15 dB attenuator was added before the PRE AMP in the RHU;
- 3) Calibration (DCA change) of the RHU was performed due to the new attenuation in the RF path;
- 4) Calibration (DCA change) of the BU was performed.



6.6 Test configuration





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6.7 Transmitter characteristics

Type of equipment														
	Stand-alone (Equipment with or without its own control provisions)													
X	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									
	fixed				Always at a distance more than 2 m from all people									
X	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 (Downlink)					763 – 775 MHz / 851 – 869 MHz									
Operating frequency range (Downlink)					763.025 – 774.975 MHz/851.025 – 868.975 MHz									
Maximum rated output power					At transmitter 50 Ω RF output connector									
					Effective radiated power (for equipment with no RF connector)									
Is transmitter output power variable?					No									
					continuous variable									
					X	Yes				stepped variable with stepsize				1 dB
					minimum RF power					NA				
					maximum RF power					15.84 dBm				
Antenna connection														
unique coupling			X	standard connector			integral		with temporary RF connector					
								without temporary RF connector						
Channel spacing					25 kHz									
Transmitter aggregate data rate/s					7.5 kbps									
Type of modulation					16QAM									
Transmitter power source														
X	AC			Nominal rated voltage			120 V, 50-60 Hz		Battery type					
Frequency conversion		Uplink		X	No		Yes		Different LO for up and down conversion					
		Downlink		X	No		Yes							
Automatic gain control (AGC)		Uplink		X	No		Yes		Input range					
		Downlink			No		X Yes							
								-5 ÷ -6.5 dBm		Output level				
								16 dBm		16 dBm				



Test specification:		Section 90.219, 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:	12/22/2009 11:38:01 AM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	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 limits

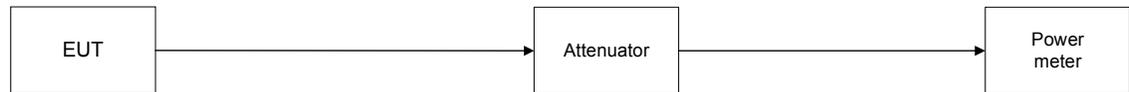
Assigned frequency range, MHz	ERP limit		Maximum peak output power at one antenna connector, dBm*
	W	dBm	
763-775	5	37	21
851-869			

- Maximum peak output power at one antenna connector was calculated for 10 dBi antenna gain and 4 antenna connectors:
37 dBm – 10 dBi – 6 dB = 21 dBm.

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.

Figure 7.1.1 Peak output power test setup





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Test specification:		Section 90.219, 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:	12/22/2009 11:38:01 AM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Table 7.1.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 763-775 MHz/851-869 MHz

Base Unit input power, dBm	Carrier frequency, MHz	Power meter reading, dBm	Limit, dBm	Margin, dB	Verdict
-6.5	763.025	13.31	21	-7.69	Pass
	770.000	14.23		-6.77	
	774.975	12.28		-8.72	
-5.0	763.025	14.84	21	-6.16	Pass
	770.000	15.77		-5.23	
	774.975	13.81		-7.19	
-6.5	851.025	12.24	21	-8.76	Pass
	860.000	14.46		-6.54	
	868.975	12.96		-8.04	
-5.0	851.025	13.64	21	-7.36	Pass
	860.000	15.84		-5.16	
	868.975	14.35		-6.65	

Reference numbers of test equipment used

HL 3301	HL 3302						
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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:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	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	Maximum allowed bandwidth, kHz
763 - 775	26	20
851 - 869		20

* - Modulation envelope reference points are provided in terms of attenuation below the unmodulated carrier.

7.2.2 Test procedure

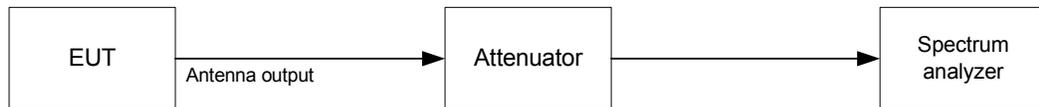
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

7.2.2.2 The EUT was set to transmit the unmodulated carrier and the reference peak power level was measured.

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

7.2.2.4 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.2.2 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:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Table 7.2.2 Occupied bandwidth test results

DETECTOR USED: Peak hold
 RESOLUTION BANDWIDTH: 300 Hz
 VIDEO BANDWIDTH: 30 kHz
 MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
 MODULATION: 16 QAM
 BIT RATE: 7.5 kbps

Carrier frequency, MHz	Occupied bandwidth, kHz		Limit, kHz	Margin, kHz	Verdict
	input	output			
763.025	10.13	10.13	20	-9.87	Pass
770.000	10.03	10.10	20	-9.90	Pass
774.975	10.10	10.20	20	-9.80	Pass
851.025	10.13	10.03	20	-9.97	Pass
860.000	10.07	10.13	20	-9.87	Pass
868.975	10.10	10.20	20	-9.80	Pass

Reference numbers of test equipment used

HL 1424	HL 3385	HL 3761					
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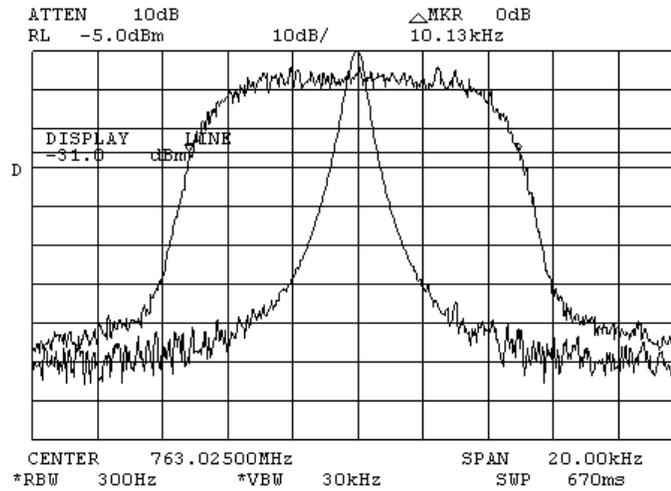
Full description is given in Appendix A.



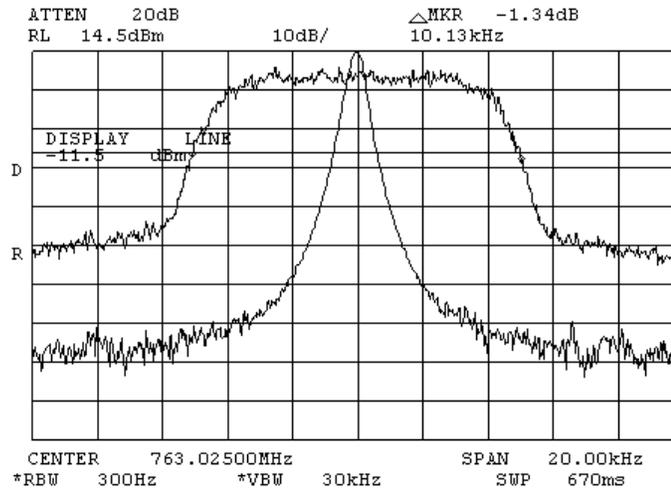
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Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at low frequency in 763-775 MHz band, EUT input



Plot 7.2.2 Occupied bandwidth test result at low frequency in 763-775 MHz band, EUT output

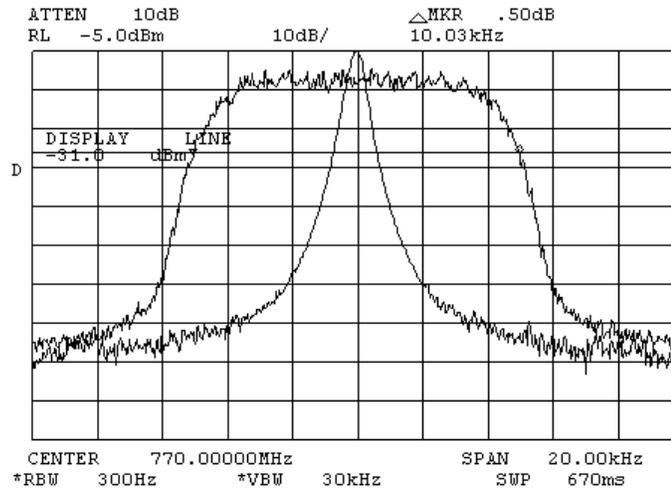




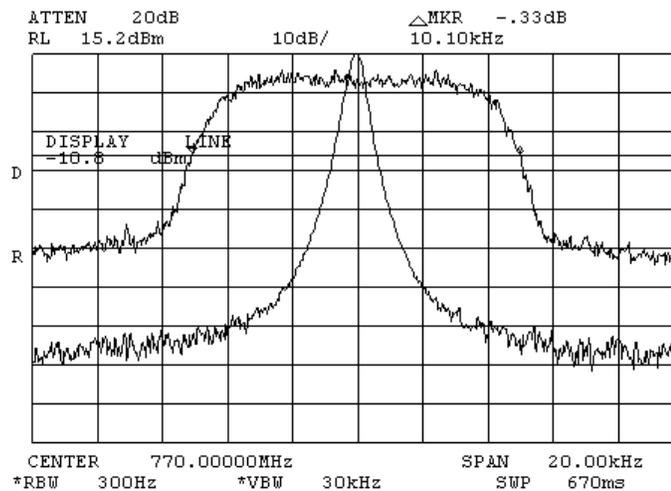
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Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at mid frequency in 763-775 MHz band, EUT input



Plot 7.2.4 Occupied bandwidth test result at mid frequency in 763-775 MHz band, EUT output

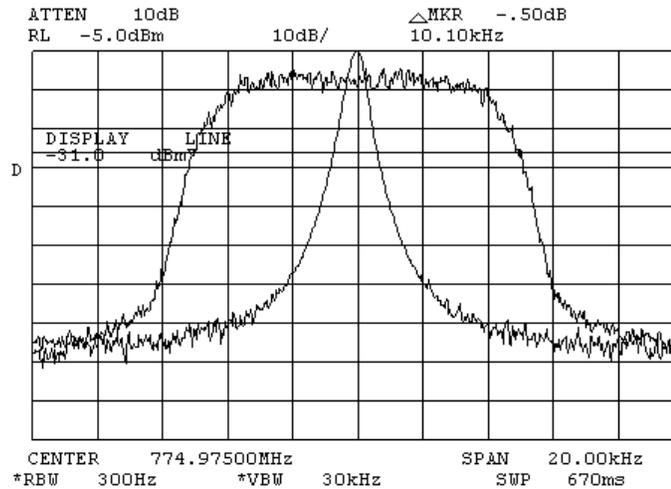




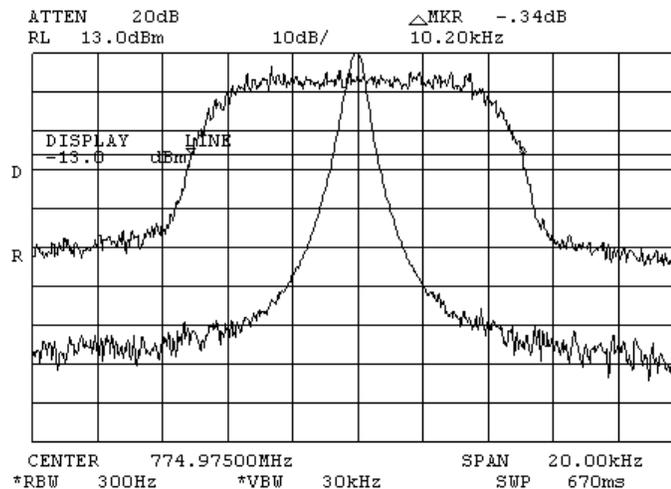
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Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.5 Occupied bandwidth test result at high frequency in 763-775 MHz band, EUT input



Plot 7.2.6 Occupied bandwidth test result at high frequency in 763-775 MHz band, EUT output

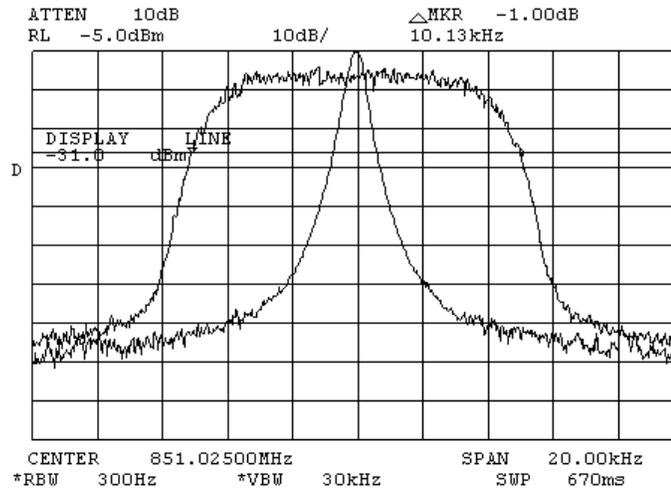




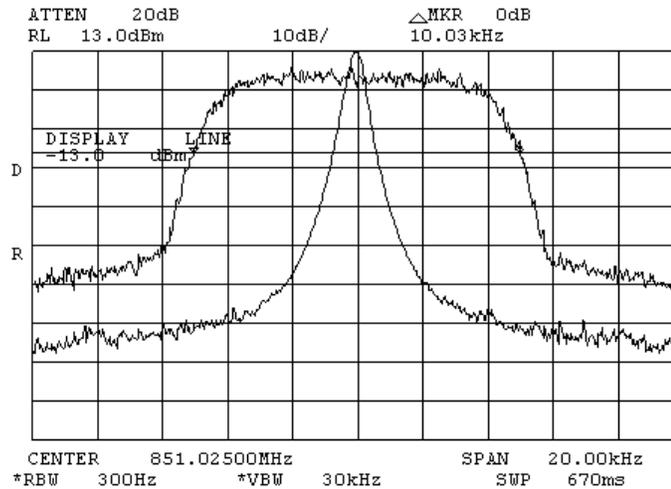
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Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.7 Occupied bandwidth test result at low frequency in 851-869 MHz band, EUT input



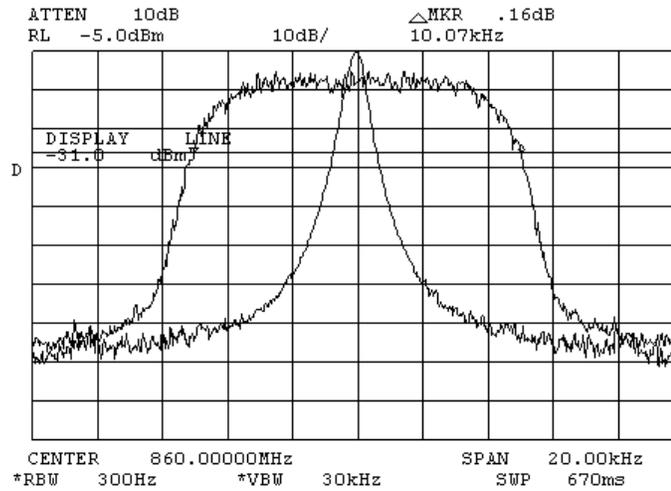
Plot 7.2.8 Occupied bandwidth test result at low frequency in 851-869 MHz band, EUT output



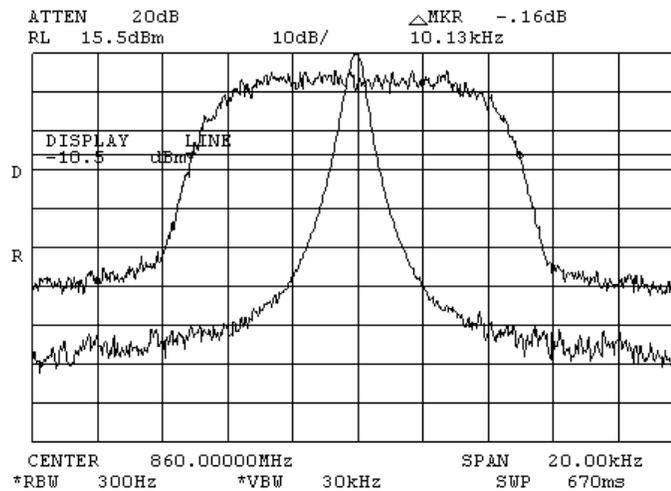


Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.9 Occupied bandwidth test result at mid frequency in 851-869 MHz band, EUT input



Plot 7.2.10 Occupied bandwidth test result at mid frequency in 851-869 MHz band, EUT output

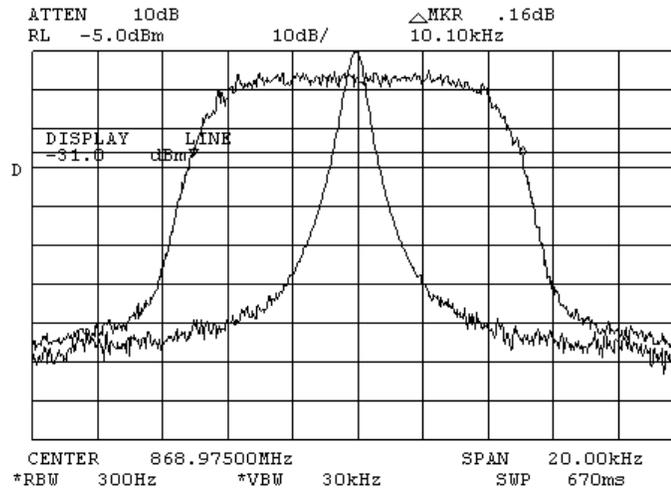




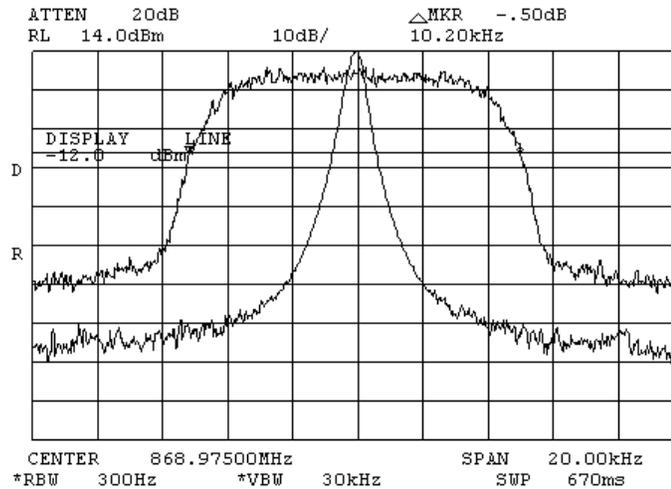
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Test specification:	Section 90.209, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/22/2009 2:21:20 PM		
Temperature: 23.1 °C	Air Pressure: 1019 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Plot 7.2.11 Occupied bandwidth test result at high frequency in 851-869 MHz band, EUT input



Plot 7.2.12 Occupied bandwidth test result at high frequency in 851-869 MHz band, EUT output





Test specification:	Section 90.210, 90.691, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2009 1:31:05 PM		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	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 25 kHz, authorized bandwidth 20 kHz)	
0 – 10.0 kHz	0
10.0 – 20.0 kHz	25.0
20.0 – 50.0 kHz	35.0
More than 50.0 kHz	43+10logP(W)
Emission mask H (Channel bandwidth 25.0 kHz, authorized bandwidth 20.0 kHz)	
0 – 4.0 kHz	0
4.0 – 8.5 kHz	0 – 35.0*
8.5 – 15 kHz	35 – 45.0*
15 – 25 kHz	45-71.1
More than 25.0 kHz	43+10logP(W)
Emission mask G (Channel bandwidth 25.0 kHz, authorized bandwidth 20.0 kHz)	
0 – 10 kHz	0
10 – 50 kHz	116log(f/6.1) or 50+10logP(W) or 70.0 whichever is the lesser
More than 50 kHz	43+10logP(W)
Emission mask 90.691 (Channel bandwidth 25.0 kHz, authorized bandwidth 20.0 kHz)	
0 – 12.5 kHz	0
12.5-up to 869.0375 MHz	116log(f/6.1) or 50+10logP(W) or 80.0 whichever is the lesser
12.5-up to 853.9625 MHz	
More than 37.5 kHz from the frequency block	43+10logP(W) or 80.0 whichever is the lesser

* - linearly increase with frequency

** - 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 the associated plots. The test results were recorded in Table 7.3.2.



Test specification:	Section 90.210, 90.691, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2009 1:31:05 PM		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

Figure 7.3.1 Emission mask test setup



Table 7.3.2 Emission mask test results

Carrier frequency, MHz	Limit	Verdict
763-775	Emission mask B	Pass
851-854	Emission mask H	
854-869	Emission mask G Emission mask 90.691	

Reference numbers of test equipment used

HL 1424	HL 3385	HL 3761						
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Full description is given in Appendix A.

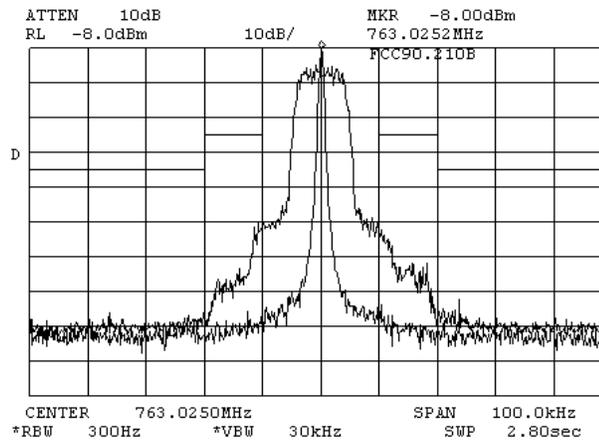


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Test specification:	Section 90.210, 90.691, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2009 1:31:05 PM		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

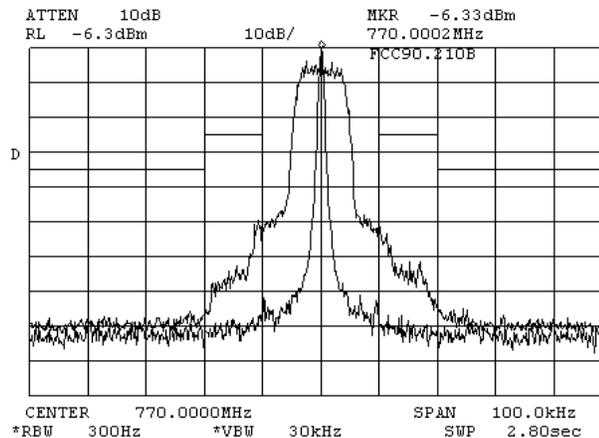
Plot 7.3.1 Emission mask test results at low carrier frequency

Operating frequency range: 763-775 MHz
 Applicable emission mask: B
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



Plot 7.3.2 Emission mask test results at mid carrier frequency

Operating frequency range: 763-775 MHz
 Applicable Emission mask: B
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



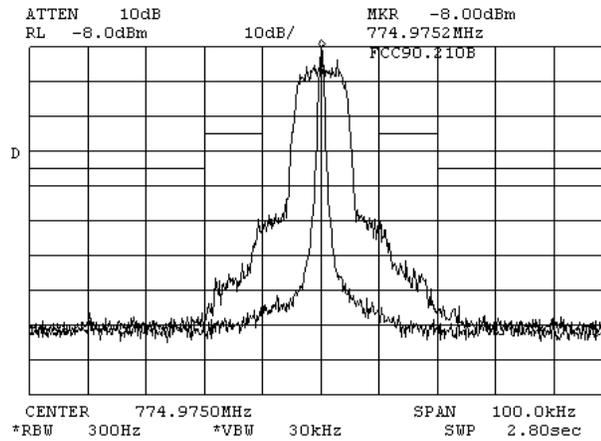


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Test specification:	Section 90.210, 90.691, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2009 1:31:05 PM		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

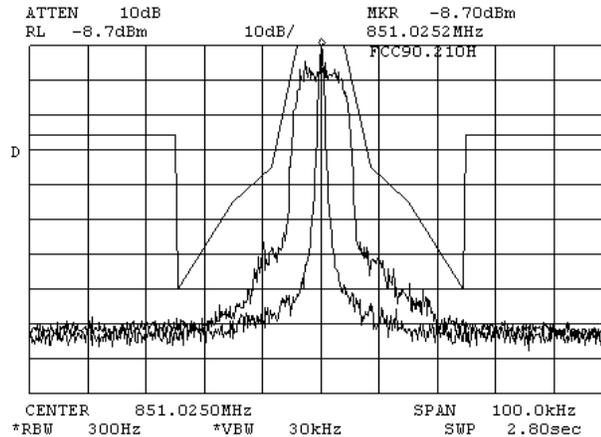
Plot 7.3.3 Emission mask test results at high carrier frequency

Operating frequency range: 763-775 MHz
 Applicable Emission mask: B
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



Plot 7.3.4 Emission mask test results at low carrier frequency

Operating frequency range: 851-854 MHz
 Applicable Emission mask: H
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



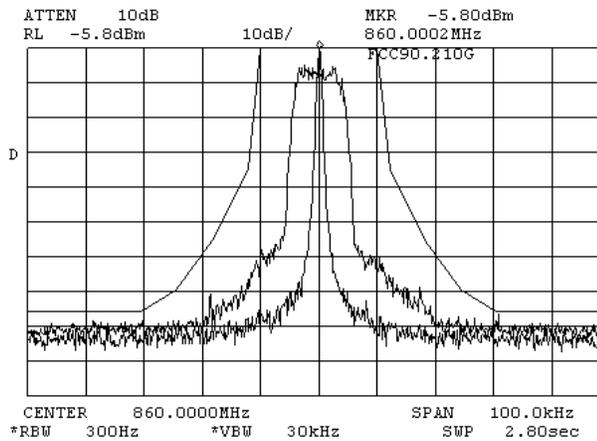


HERMON LABORATORIES

Test specification:	Section 90.210, 90.691, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2009 1:31:05 PM		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

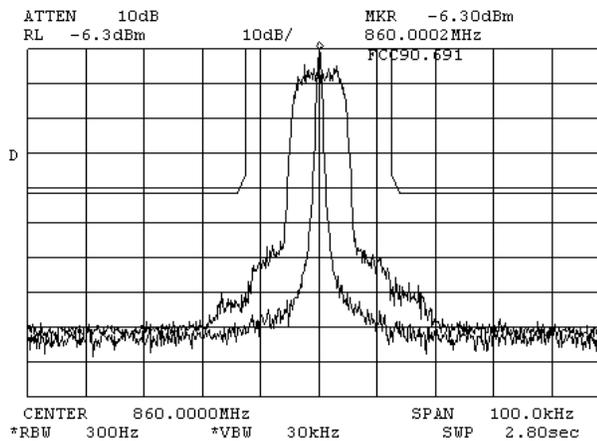
Plot 7.3.5 Emission mask test results at mid carrier frequency

Operating frequency range: 854-869 MHz
 Applicable Emission mask: G
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



Plot 7.3.6 Emission mask test results at mid carrier frequency

Operating frequency range: 854-869 MHz
 Applicable Emission mask: Section 90.691
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



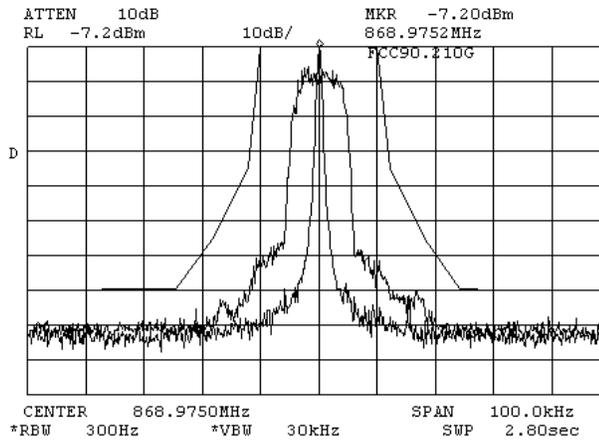


HERMON LABORATORIES

Test specification:	Section 90.210, 90.691, Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/15/2009 1:31:05 PM		
Temperature: 23 °C	Air Pressure: 1010 hPa	Relative Humidity: 46 %	Power Supply: 120 VAC
Remarks:			

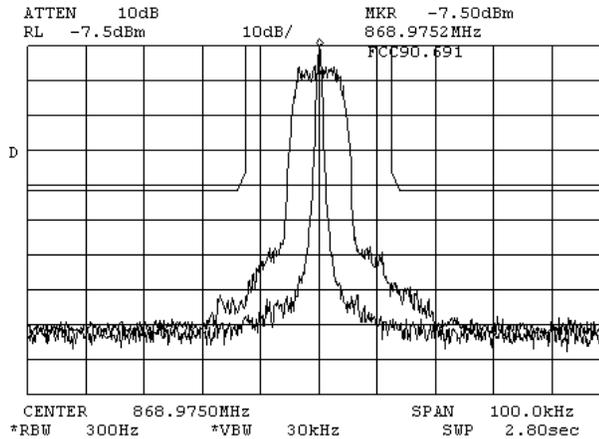
Plot 7.3.7 Emission mask test results at high carrier frequency

Operating frequency range: 854-869 MHz
 Applicable Emission mask: G
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum



Plot 7.3.8 Emission mask test results at high carrier frequency

Operating frequency range: 854-869 MHz
 Applicable Emission mask: Section 90.691
 Modulation: 16QAM
 Bit rate: 7.5 Kbps
 Transmitter output power setting: Maximum





Test specification:		Section 90.210, 90.543, Adjacent channel power	
Test procedure:		47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

7.4 Adjacent channel power (ACP) test

7.4.1 General

This test was performed to measure ACP at RF antenna connector. Specification test limits are given in Table 7.4.1.

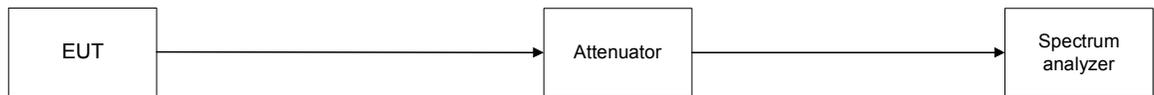
7.4.2 Test procedure

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

7.4.2.2 The transmitter was normally modulated as for operating conditions.

7.4.2.3 The ACP was measured with spectrum analyzer capable of making direct ACP measurements. The test results are recorded in Table 7.4.1 and provided in the associated plots.

Figure 7.4.1 ACP test setup





HERMON LABORATORIES

Test specification:		Section 90.210, 90.543, Adjacent channel power			
Test procedure:		47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13			
Test mode:	Compliance	Verdict:		PASS	
Date & Time:	12/23/2009 2:36:25 PM				
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC		
Remarks:					

Table 7.4.1 ACP test results

Carrier frequency, MHz	Offset from center frequency, kHz	Measurement – bandwidth, kHz	ACP, dBc	Limit, dBc	Margin, dB	Verdict
763.025	5.975 to 11.975	6.25	-71.33	-60.8*	-10.43	Pass
770.00	15.625	6.25	-58.36	-40	-18.36	Pass
	21.875	6.25	-72.29	-60	-12.29	Pass
	37.5	25	-69.25	-60	-9.25	Pass
	62.5	25	-71.81	-65	-6.81	Pass
	87.5	25	-69.79	-65	-4.79	Pass
	150	100	-71.71	-65	-6.71	Pass
	250	100	-73.42	-65	-8.42	Pass
	350	100	-72.74	-65	-7.74	Pass
	>400 to 12000	30	-89.63	-80	-9.63	Pass
	12000-793000	30	-107.03	-80	-27.03	Pass
793000-805000	30	-110.10	-100	-10.1	Pass	
774.975	15.625	6.25	-58.02	-40	-18.02	Pass
	21.875	6.25	-69.98	-60	-9.98	Pass
	37.5	25	-69.84	-60	-9.84	Pass
	62.5	25	-72.81	-65	-7.81	Pass
	87.5	25	-72.50	-65	-7.5	Pass
	150	100	-70.67	-65	-5.67	Pass
	250	100	-71.85	-65	-6.85	Pass
	350	100	-72.09	-65	-7.09	Pass
	>400 to 12000	30	-87.72	-80	-7.72	Pass
	12000-793000	30	-103.84	-80	-23.84	Pass
793000-805000	30	-107.92	-100	-7.92	Pass	

*Limit was calculated according to §90.543(e)(1).

Reference numbers of test equipment used

HL 1424	HL 2909	HL 3119	HL 3775				
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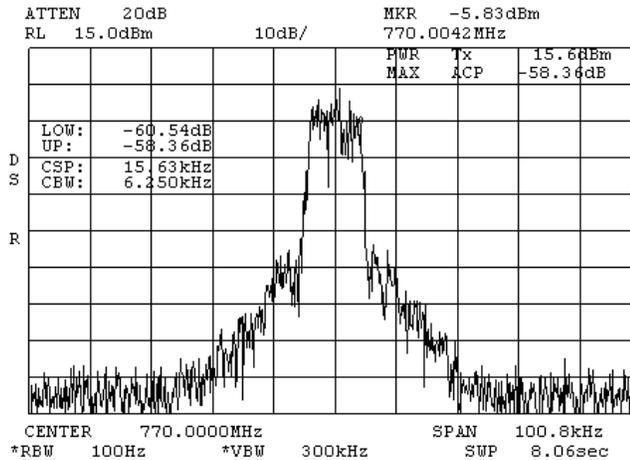
Full description is given in Appendix A.



Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

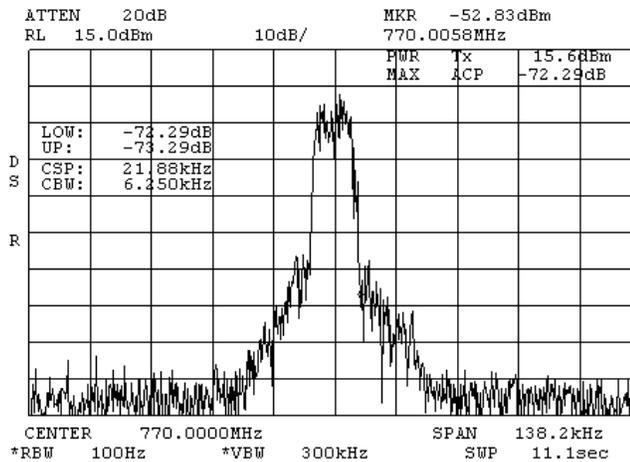
Plot 7.4.2 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Offset from center frequency: 15.625 kHz
 Measurement bandwidth: 6.25 kHz



Plot 7.4.3 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Offset from center frequency: 21.875 kHz
 Measurement bandwidth: 6.25 kHz

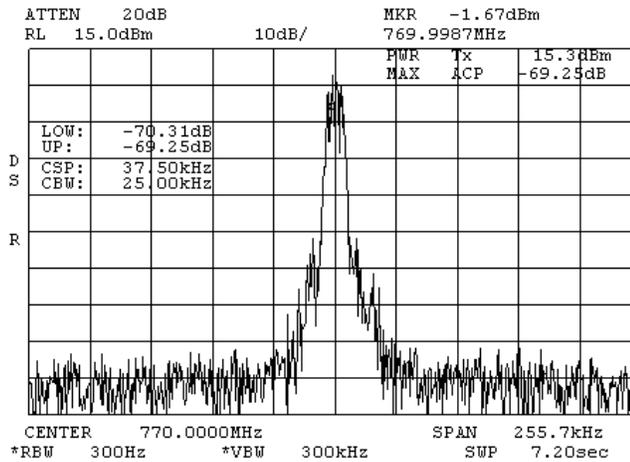




Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

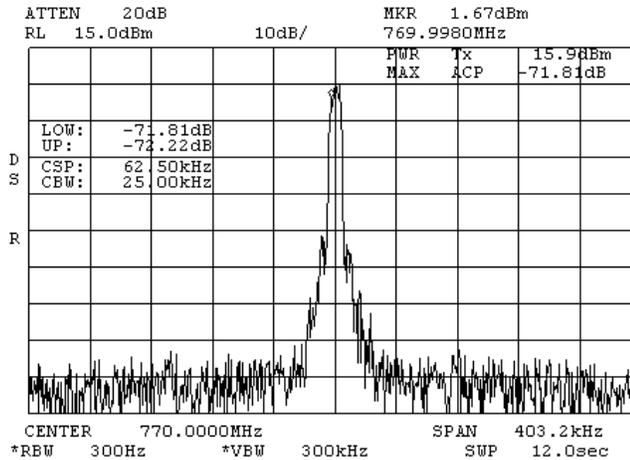
Plot 7.4.4 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
Offset from center frequency: 37.5 kHz
Measurement bandwidth: 25 kHz



Plot 7.4.5 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
Offset from center frequency: 62.5 kHz
Measurement bandwidth: 25 kHz



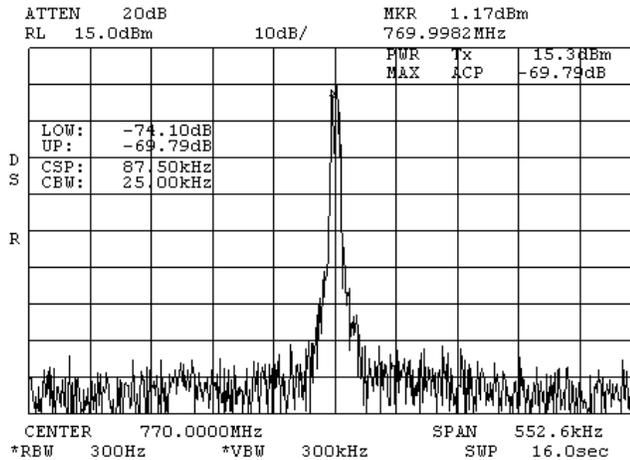


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

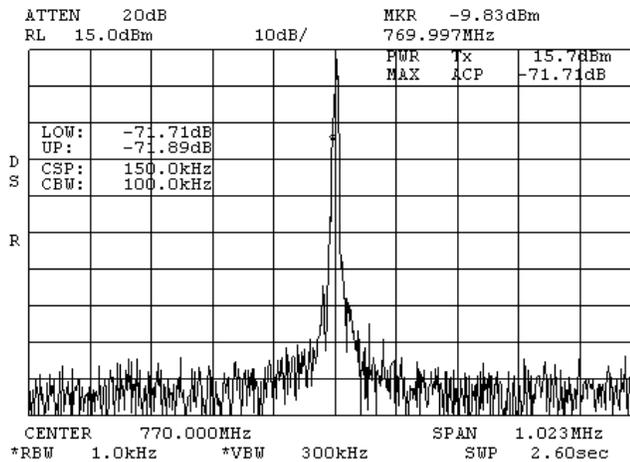
Plot 7.4.6 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
Offset from center frequency: 87.5 kHz
Measurement bandwidth: 25 kHz



Plot 7.4.7 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
Offset from center frequency: 150 kHz
Measurement bandwidth: 100 kHz



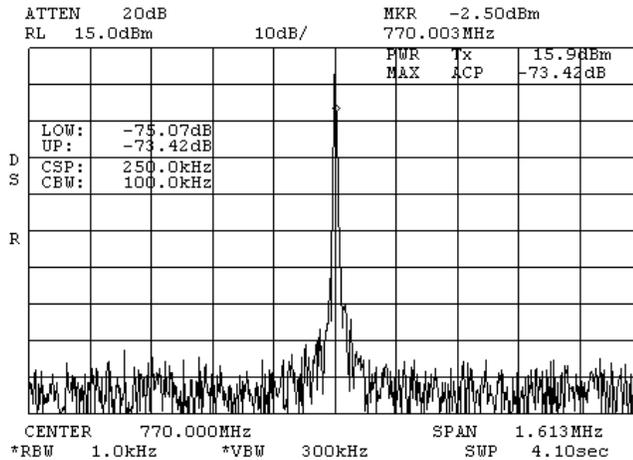


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

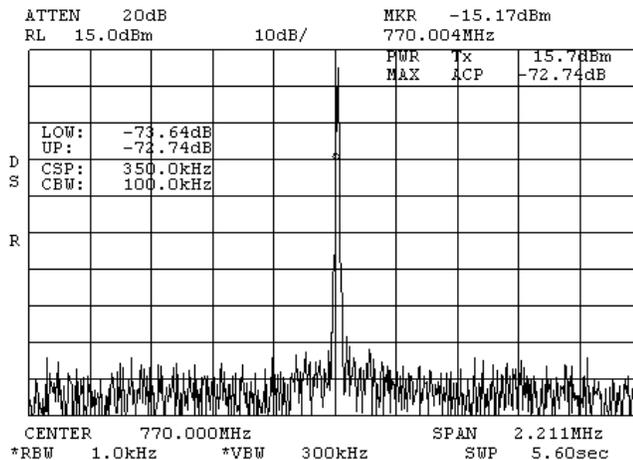
Plot 7.4.8 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Offset from center frequency: 250 kHz
 Measurement bandwidth: 100 kHz



Plot 7.4.9 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Offset from center frequency: 350 kHz
 Measurement bandwidth: 100 kHz



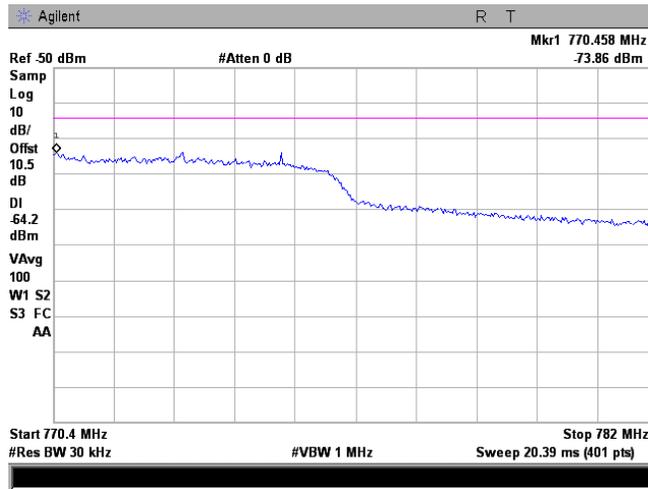


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

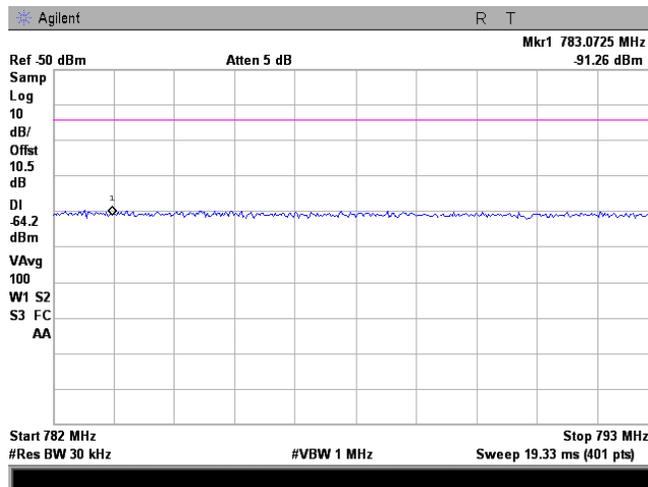
Plot 7.4.10 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Offset from center frequency: 400 kHz to 12 MHz
 Measurement bandwidth: 30 kHz



Plot 7.4.11 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Offset from center frequency: 12 MHz to 793 MHz
 Measurement bandwidth: 30 kHz



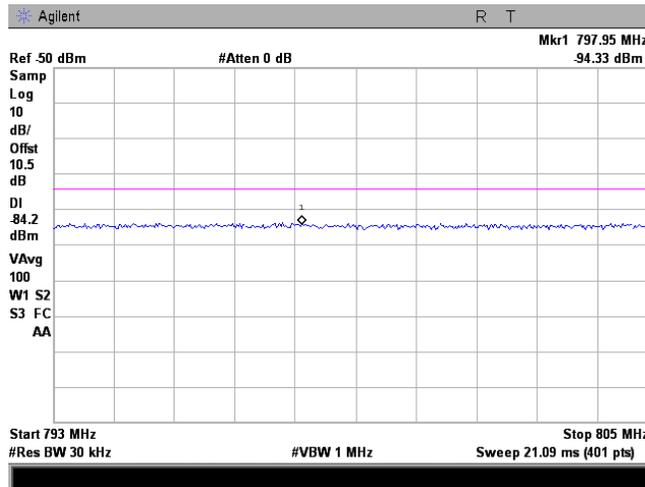


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.12 ACP test results at mid carrier frequency

Operating frequency: 770 MHz
 Paired receive band: 793-805 MHz
 Measurement bandwidth: 30 kHz



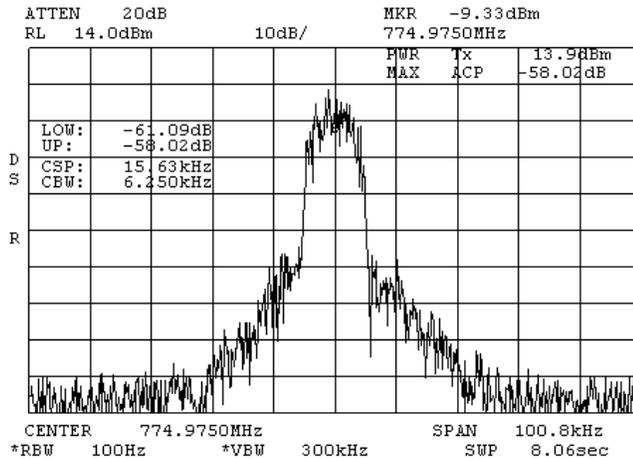


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

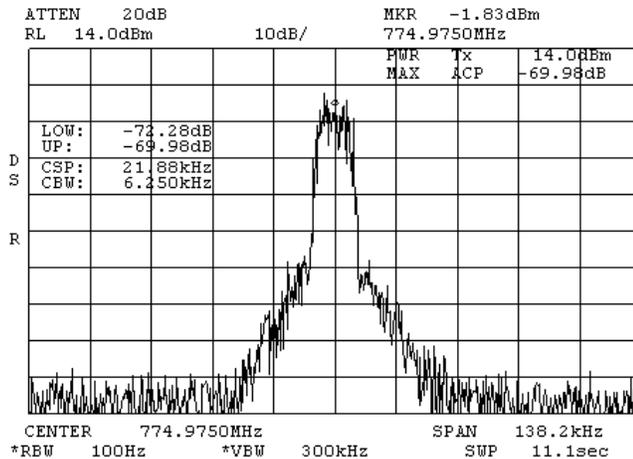
Plot 7.4.13 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Offset from center frequency: 15.625 kHz
 Measurement bandwidth: 6.25 kHz



Plot 7.4.14 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Offset from center frequency: 21.875 kHz
 Measurement bandwidth: 6.25 kHz

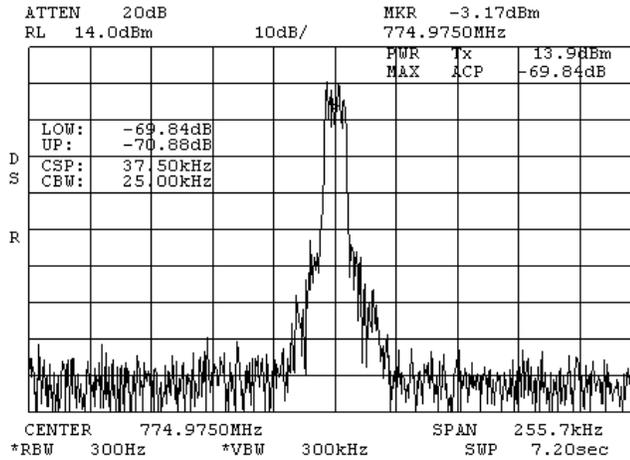




Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

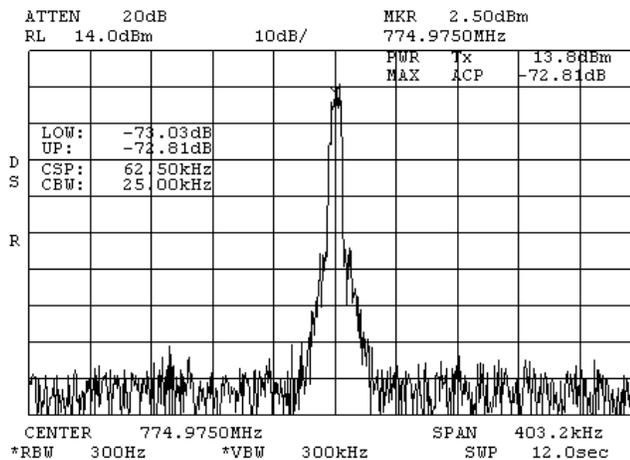
Plot 7.4.15 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
Offset from center frequency: 37.5 kHz
Measurement bandwidth: 25 kHz



Plot 7.4.16 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
Offset from center frequency: 62.5 kHz
Measurement bandwidth: 25 kHz

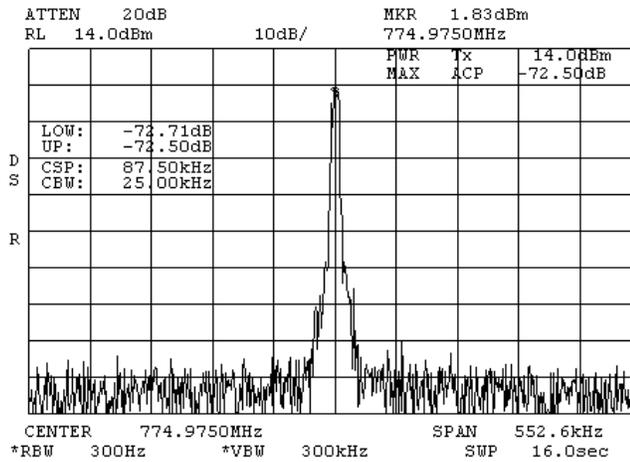




Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

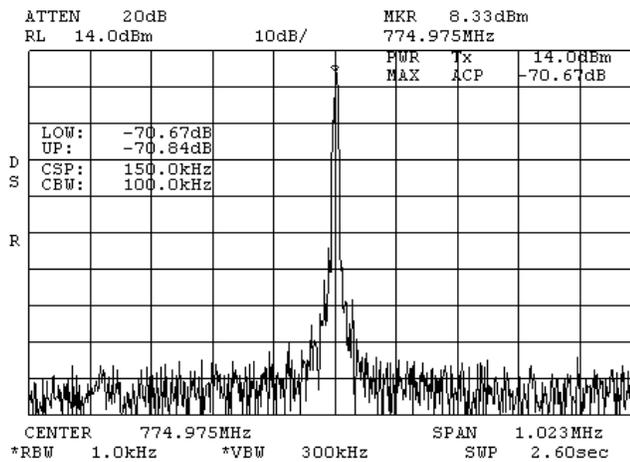
Plot 7.4.17 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Offset from center frequency: 87.5 kHz
 Measurement bandwidth: 25 kHz



Plot 7.4.18 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Offset from center frequency: 150 kHz
 Measurement bandwidth: 100 kHz



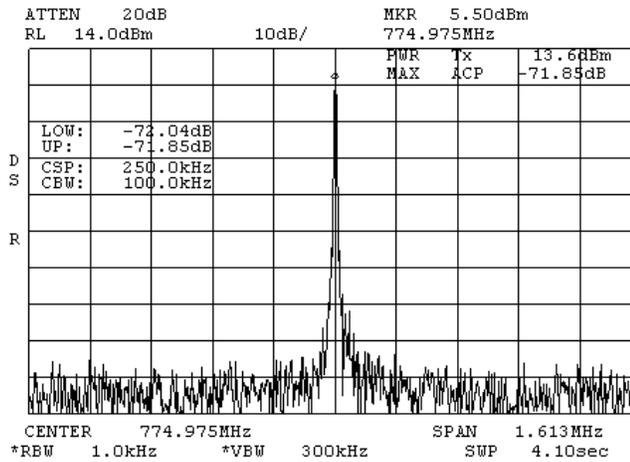


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

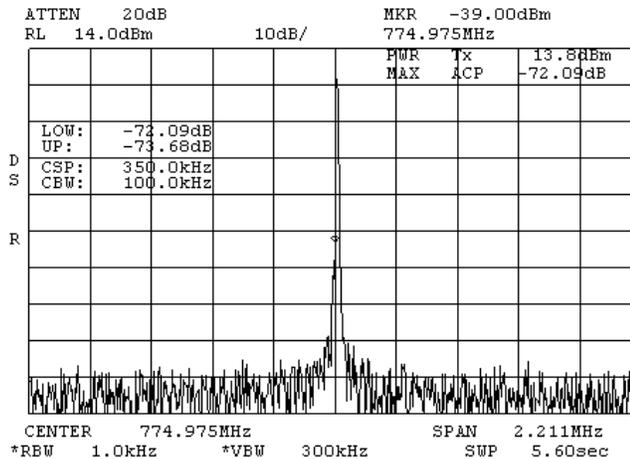
Plot 7.4.19 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
Offset from center frequency: 250 kHz
Measurement bandwidth: 100 kHz



Plot 7.4.20 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
Offset from center frequency: 350 kHz
Measurement bandwidth: 100 kHz



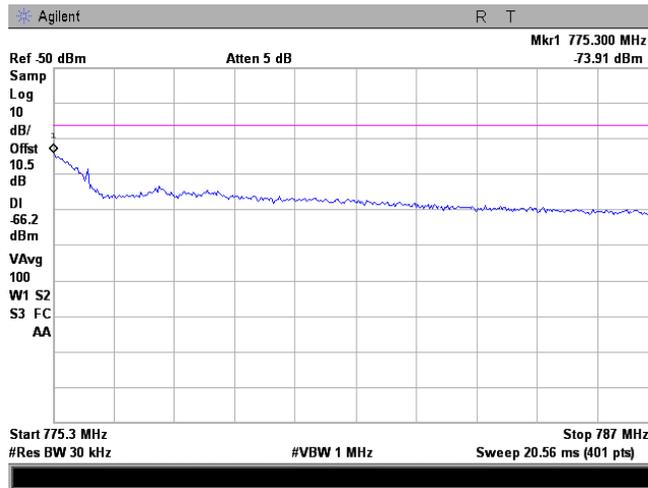


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

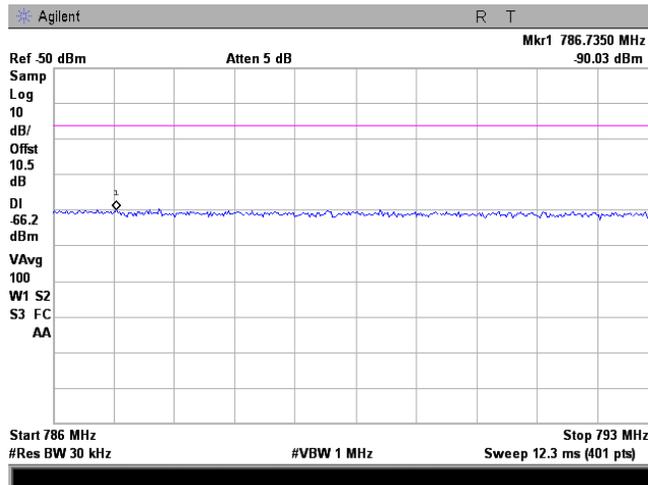
Plot 7.4.21 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Offset from center frequency: 400 kHz to 12 MHz
 Measurement bandwidth: 30 kHz



Plot 7.4.22 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Offset from center frequency: 12 MHz to 793 MHz
 Measurement bandwidth: 30 kHz



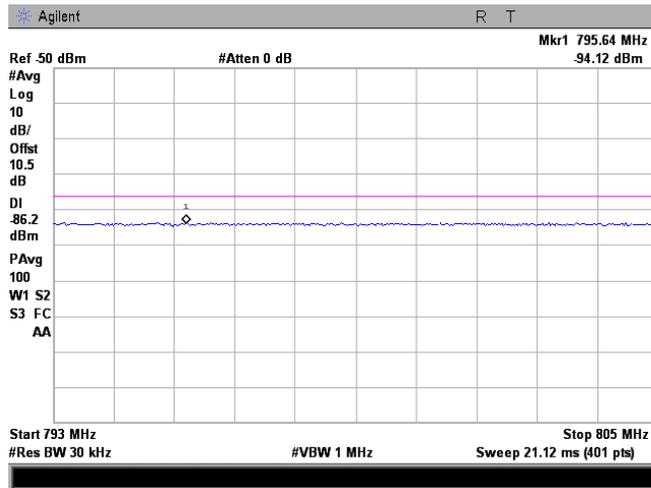


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543, Adjacent channel power		
Test procedure:	47 CFR, Sections 2.1051, 2.1047 and 90.543(b); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict: PASS	
Date & Time:	12/23/2009 2:36:25 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.4.23 ACP test results at high carrier frequency

Operating frequency: 774.975 MHz
 Paired receive band: 793-805 MHz
 Measurement bandwidth: 30 kHz





Test specification:		Section 90.210, 90.543(c); Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/16/2009 2:33:55 PM		
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

7.5 Radiated spurious emission measurements

7.5.1 General

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

Table 7.5.1 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

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

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

7.5.2.2 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.

7.5.2.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.

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

7.5.3.1 The EUT was set up as shown in Figure 7.5.2, energized and the performance check was conducted.

7.5.3.2 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.

7.5.3.3 The worst test results (the lowest margins) were recorded in Table 7.5.2 and shown in the associated plots.



Test specification:	Section 90.210, 90.543(c); Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/16/2009 2:33:55 PM		
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Figure 7.5.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

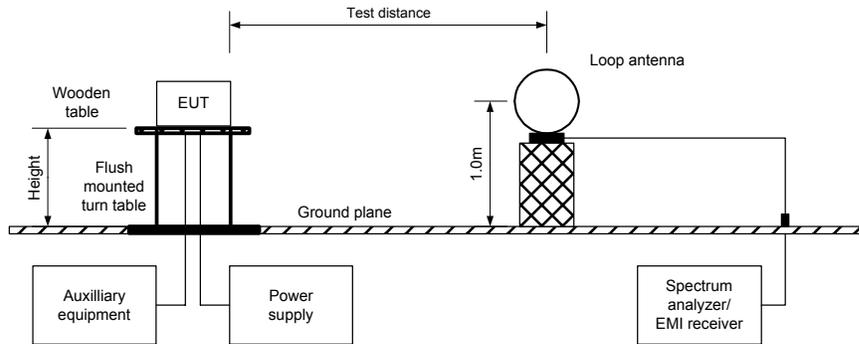
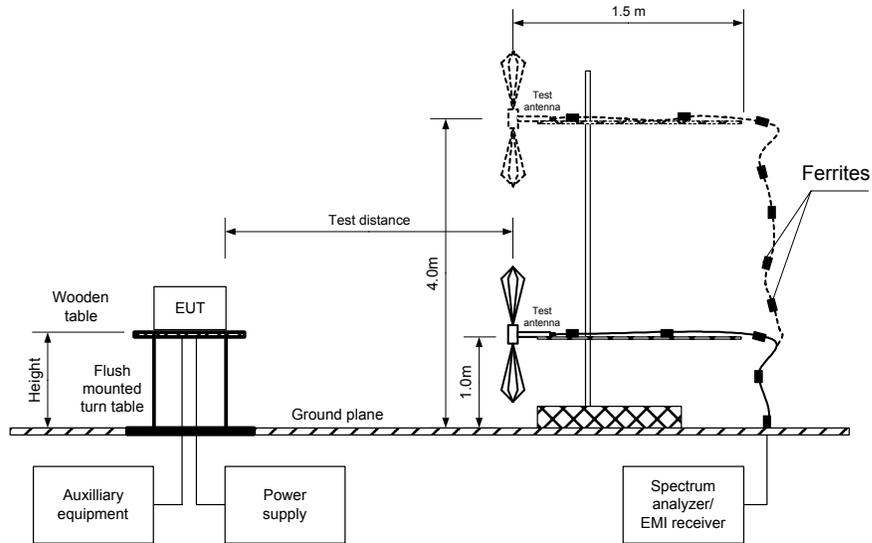


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz





Test specification:		Section 90.210, 90.543(c); Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/16/2009 2:33:55 PM		
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 763-775 MHz; 851-869 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 9000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconical (30 MHz – 200 MHz)
Log periodic (200 MHz – 1000 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)

MODULATION: 16QAM
BIT RATE: 7.5 kbps
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
All emissions were found at least 20 dB below the specified limit							

Verdict: Pass

*- 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 0446	HL 0521	HL 0604	HL 1424	HL 1984	HL 2254	HL 2870	HL 3121
HL 3531	HL 3533	HL 3616					

Full description is given in Appendix A.



HERMON LABORATORIES

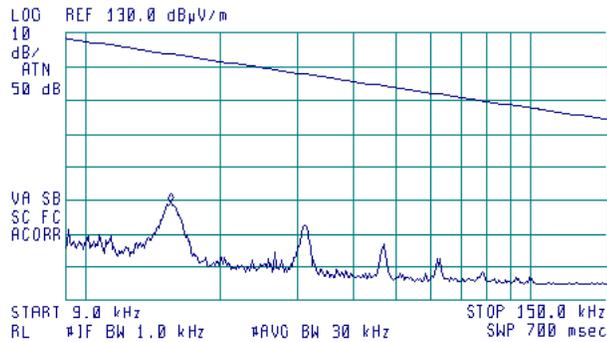
Test specification:		Section 90.210, 90.543(c); Radiated spurious emissions	
Test procedure: 47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance		Verdict: PASS	
Date & Time: 12/16/2009 2:33:55 PM			
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 763.025; 770; 774.975; 851.025; 860; 868.975 MHz
 TEST DISTANCE: 3 m

14:02:58 DEC 11, 2009

ACTV DET: PEAK
 MEAS DET: PEAK OP AVG
 MKR 15.7 kHz
 79.38 dBµV/m

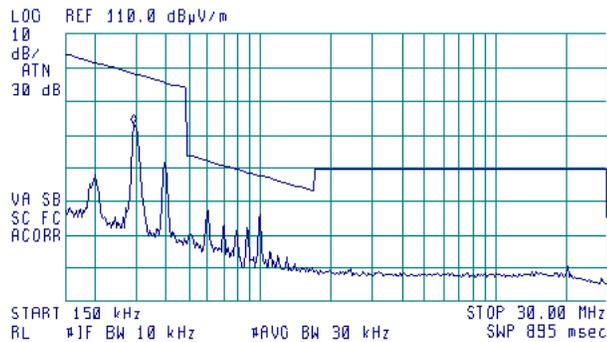


Plot 7.5.2 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 763.025; 770; 774.975; 851.025; 860; 868.975 MHz
 TEST DISTANCE: 3 m

14:01:28 DEC 11, 2009

ACTV DET: PEAK
 MEAS DET: PEAK OP AVG
 MKR 250 kHz
 83.39 dBµV/m





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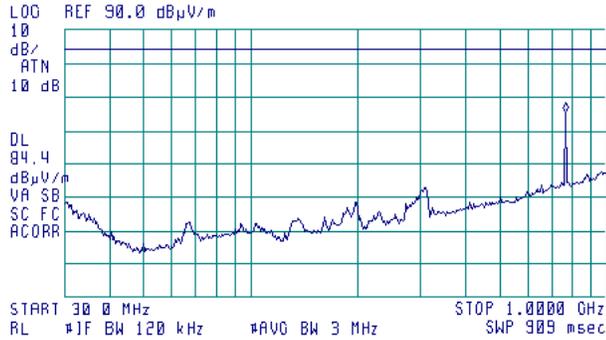
Test specification: Section 90.210, 90.543(c); Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date & Time: 12/16/2009 2:33:55 PM			
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Plot 7.5.3 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 763.025 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

15:13:20 DEC 10, 2009

ACTV DET: PEAK
 MEAS DET: PEAK AVG
 MKR 756.0 MHz
 65.21 dBµV/m

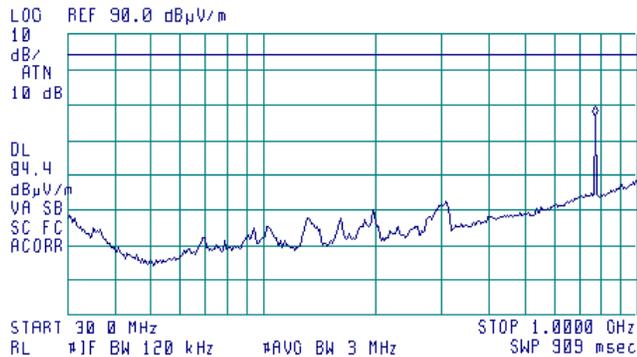


Plot 7.5.4 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 770 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

15:07:26 DEC 10, 2009

ACTV DET: PEAK
 MEAS DET: PEAK AVG
 MKR 763.8 MHz
 66.84 dBµV/m





HERMON LABORATORIES

Test specification: Section 90.210, 90.543(c); Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date & Time: 12/16/2009 2:33:55 PM			
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Plot 7.5.5 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 774.975 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

15:20:49 DEC 10, 2009

ACTV DET: PEAK
 MEAS DET: PEAK AVG
 MKR 771.6 MHz
 67.10 dBµV/m



Plot 7.5.6 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 851.025 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

15:31:07 DEC 10, 2009

ACTV DET: PEAK
 MEAS DET: PEAK AVG
 MKR 849.8 MHz
 64.36 dBµV/m





HERMON LABORATORIES

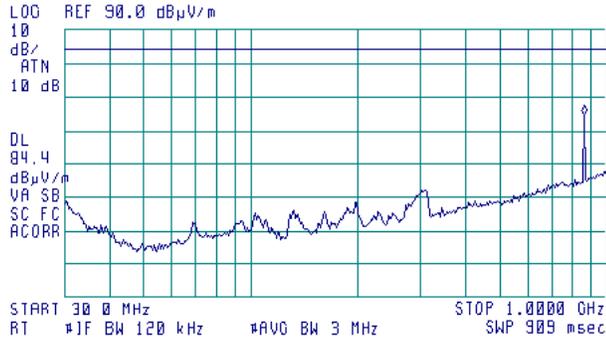
Test specification: Section 90.210, 90.543(c); Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date & Time: 12/16/2009 2:33:55 PM			
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Plot 7.5.7 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 860 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

15:36:34 DEC 10, 2009

ACTV DET: PEAK
 MEAS DET: PEAK AVG
 MKR 857.6 MHz
 64.50 dBµV/m

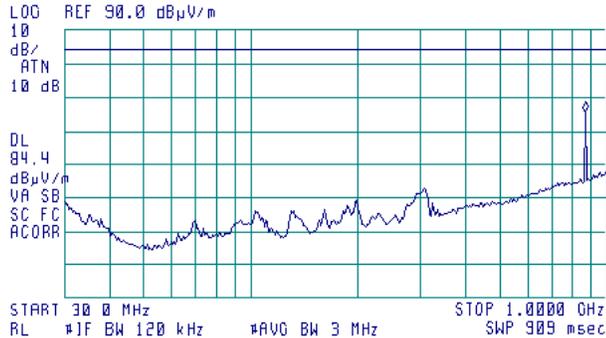


Plot 7.5.8 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 868.975 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

15:43:35 DEC 10, 2009

ACTV DET: PEAK
 MEAS DET: PEAK AVG
 MKR 865.5 MHz
 65.55 dBµV/m





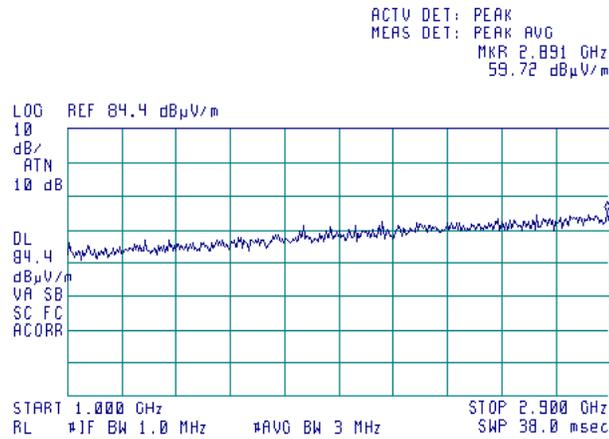
HERMON LABORATORIES

Test specification: Section 90.210, 90.543(c); Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date & Time: 12/16/2009 2:33:55 PM			
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

Plot 7.5.9 Radiated emission measurements in 1000 – 2900 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 763.025; 770; 774.975; 851.025; 860; 868.975 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

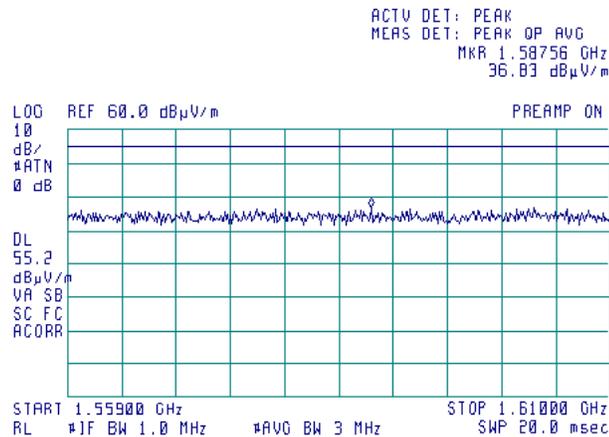
16:51:14 DEC 10, 2009



Plot 7.5.10 Radiated emission measurements in 1559 – 1610 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 763.025; 770; 774.975 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m

18:38:38 DEC 15, 2009



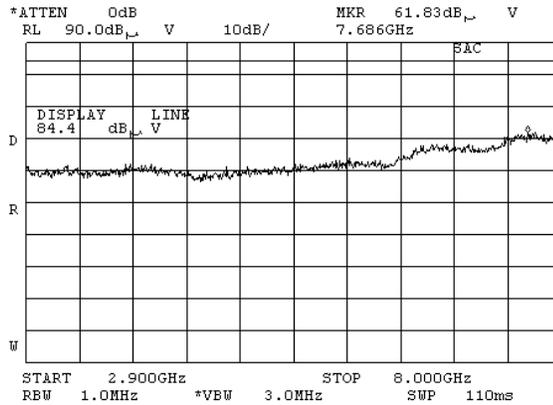


HERMON LABORATORIES

Test specification:	Section 90.210, 90.543(c); Radiated spurious emissions		
Test procedure:	47 CFR, Sections 2.1053 and 90.543(c); TIA/EIA-603-C, Section 2.2.12		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/16/2009 2:33:55 PM		
Temperature: 23 °C	Air Pressure: 1011 hPa	Relative Humidity: 48%	Power Supply: 120 VAC
Remarks:			

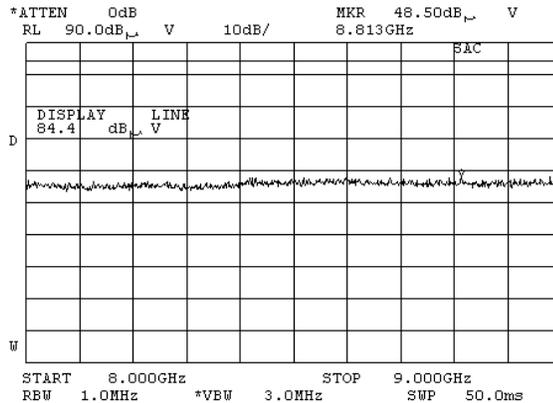
Plot 7.5.11 Radiated emission measurements in 2900-8000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 763.025; 770; 774.975; 851.025; 860; 868.975 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Plot 7.5.12 Radiated emission measurements in 8000 – 9000 MHz range

TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: 851.025; 860; 868.975 MHz
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m





Test specification:		Section 90.543(c), 90.691; Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.543(c); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:20:05 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
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	Attenuation below carrier, dBc	ERP of spurious, dBm
0.009 – 10th harmonic*	43+10logP** (mask B, H, G)	-13.0
853.9625-854	50+10logP** (mask 90.691)	-20.0
869-869.0375	50+10logP** (mask 90.691)	-20.0

* - 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

7.6.2 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 the associated plots.

Figure 7.6.1 Spurious emission test setup





Test specification:		Section 90.543(c), 90.691; Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.543(c); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:20:05 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Table 7.6.2 Spurious emission test results

INVESTIGATED FREQUENCY RANGE: 0.009 – 8700 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 MODULATION: 16QAM
 BIT RATE: 7.5 kbps
 TRANSMITTER OUTPUT POWER: Maximum

ASSIGNED FREQUENCY RANGE: 763-775 MHz

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
762.975	-40.33	included	included	10	-40.33	-23	-17.33	Pass
763.075	-40.00	included	included	10	-40.00	-23	-17.00	Pass
765.000	-54.67	included	included	100	-54.67	-13	-41.67	Pass
Mid carrier frequency								
769.950	-38.83	included	included	10	-38.83	-23	-16.83	Pass
770.050	-39.17	included	included	10	-39.17	-23	-16.17	Pass
771.000	-55.50	included	included	100	-55.50	-13	-42.50	Pass
High carrier frequency								
774.925	-41.17	included	included	10	-41.17	-23	-18.17	Pass
775.025	-41.00	included	included	10	-41.00	-23	-18.00	Pass
776.000	-57.50	included	included	100	-57.50	-13	-44.50	Pass

ASSIGNED FREQUENCY RANGE: 851-869 MHz

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
763.700	-57.67	included	included	100	-45.67	-13	-32.67	Pass
850.975	-39.50	included	included	10	-39.50	-23	-16.50	Pass
851.075	-41.00	included	included	10	-41.00	-13	-28.00	Pass
852.000	-55.83	included	included	100	-43.50	-13	-30.50	Pass
Mid carrier frequency								
764.500	-58.17	included	included	100	-58.17	-13	-45.17	Pass
859.500	-37.50	included	included	100	-37.50	-20	-17.50	Pass
859.950	-40.17	included	included	10	-40.17	-30	-10.17	Pass
860.050	-40.83	included	included	10	-40.83	-30	-10.83	Pass
863.800	-53.83	included	included	100	-53.83	-20	-33.83	Pass
High carrier frequency								
868.9250	-40.67	included	included	10	-40.67	-30	-10.67	Pass
869.02538	-40.00	included	included	10	-40.00	-30	-10.00	Pass
869.0375	-47.67	included	included	10	-47.67	-30	-17.67	Pass

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

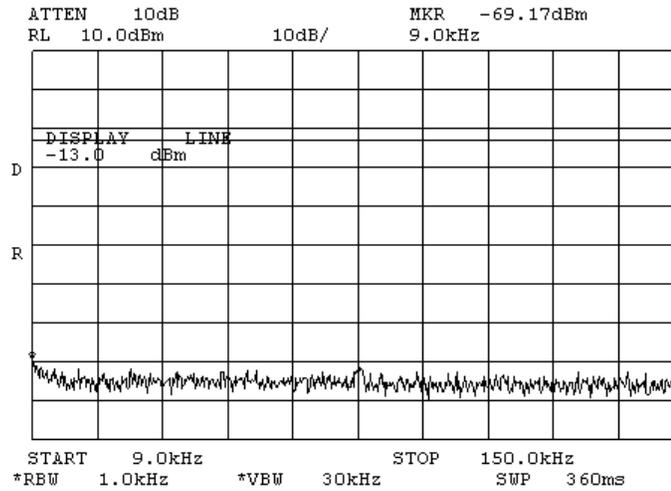
HL 1424	HL 3385	HL 3761					
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Full description is given in Appendix A.

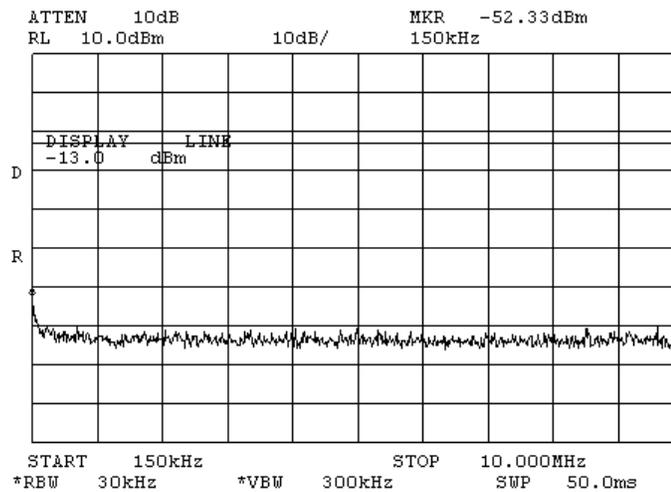


Test specification:		Section 90.543(c), 90.691; Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.543(c); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:20:05 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.1 Spurious emission measurements in 9 - 150 kHz range at low, mid and high carrier frequency, operating frequency range 763-775 MHz and 851-869 MHz



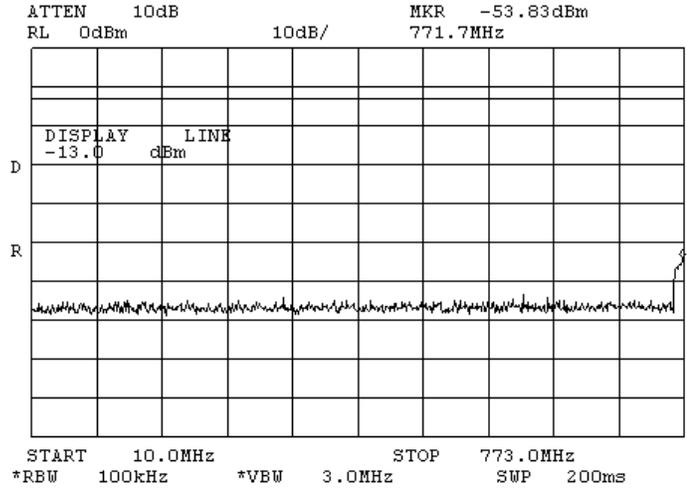
Plot 7.6.2 Spurious emission measurements in 0.15 - 10 MHz range at low, mid and high carrier frequency, operating frequency range 763-775 MHz and 851-869 MHz



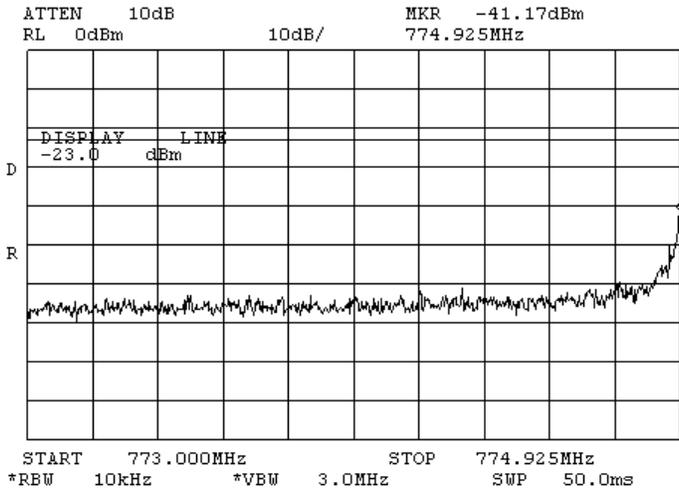


Test specification:	Section 90.543(c), 90.691; Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.543(c); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:20:05 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.15 Spurious emission measurements in 10 -773 MHz at high carrier frequency, operating frequency range 763-775 MHz



Plot 7.6.16 Spurious emission measurements in 773- 774.925 MHz at high carrier frequency, operating frequency range 763-775 MHz



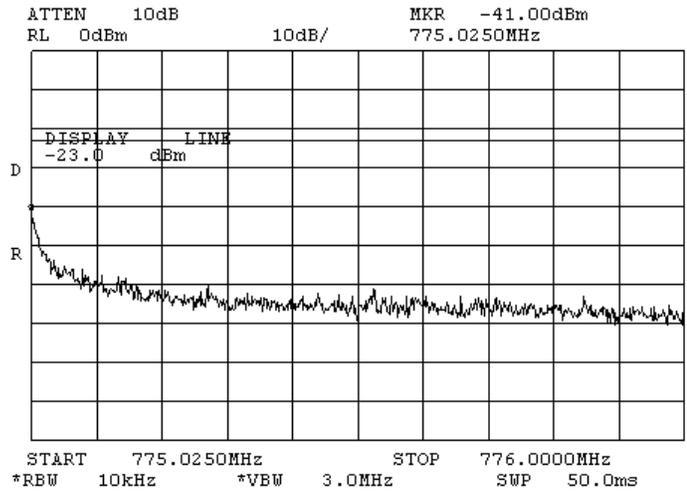
Limit=-13+10log(10kHz/100kHz)=-23 dBm



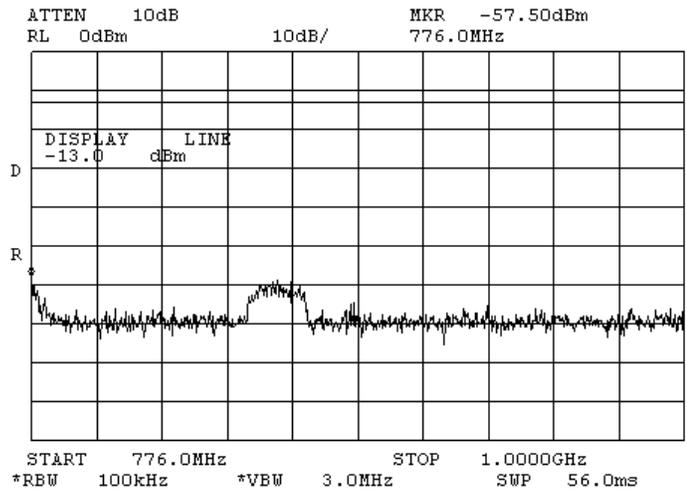
HERMON LABORATORIES

Test specification:	Section 90.543(c), 90.691; Conducted spurious emissions		
Test procedure:	47 CFR, Sections 2.1051 and 90.543(c); TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:20:05 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.17 Spurious emission measurements in 775.025 -776 MHz at high carrier frequency, operating frequency range 763-775 MHz



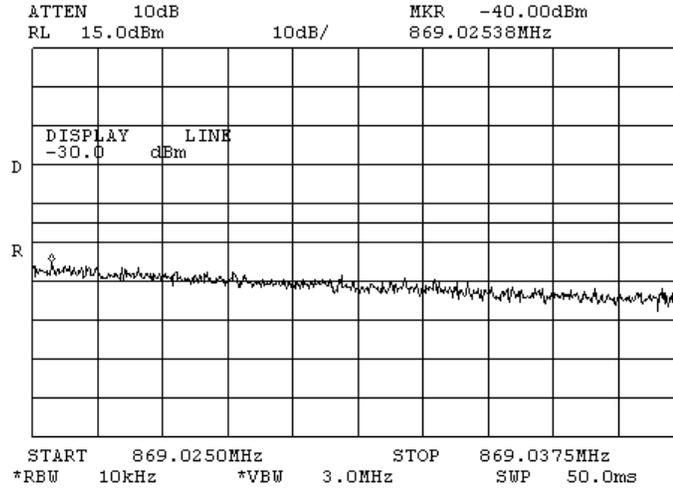
Plot 7.6.18 Spurious emission measurements in 776- 1000 MHz at high carrier frequency, operating frequency range 763-775 MHz





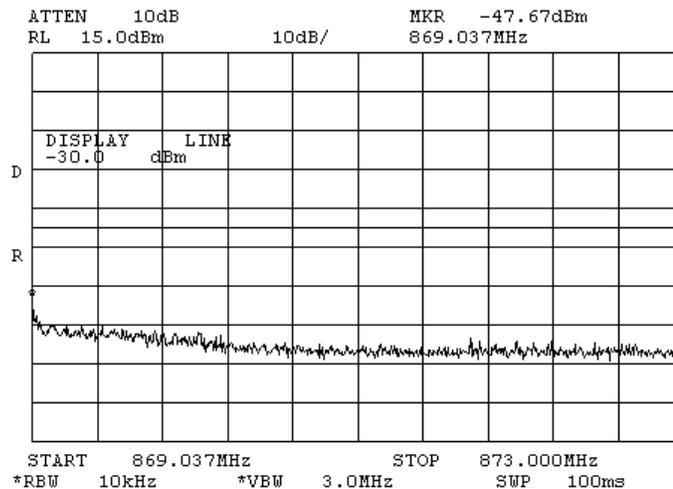
Test specification:		Section 90.543(c), 90.691; Conducted spurious emissions	
Test procedure:		47 CFR, Sections 2.1051 and 90.543(c); TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:20:05 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Plot 7.6.35 Spurious emission measurements in 869.025-869.0375 MHz at high carrier frequency, operating frequency range 851-869 MHz



Limit=-20+10log(10kHz/100kHz)=-30 dBm

Plot 7.6.36 Spurious emission measurements in 869.0375-873 MHz at high carrier frequency, operating frequency range 851-869 MHz



Limit=-20+10log(10kHz/100kHz)=-30 dBm



Test specification:		Section 90.543, Intermodulation	
Test procedure:		47 CFR, Sections 2.1051; TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:45:31 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

7.7 Intermodulation

7.7.1 General

This test was performed to measure intermodulation at RF antenna connector. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc
Intermodulation	$43 + 10 \log P^* = 28.8$

* - P is transmitter output power in Watts, $P = 15.8 \text{ dBm} = 0.038 \text{ W}$

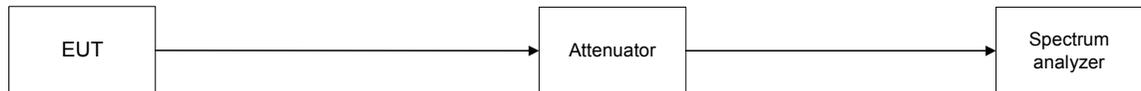
7.7.2 Test procedure

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

7.7.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.7.2 and the associated plots.

Figure 7.7.1 Intermodulation test setup





Test specification:	Section 90.543, Intermodulation		
Test procedure:	47 CFR, Sections 2.1051; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:45:31 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

Table 7.7.2 Intermodulation test results

ASSIGNED FREQUENCY RANGES: 763-775 MHz
851-869 MHz

DETECTOR USED: Peak

VIDEO BANDWIDTH: ≥ Resolution bandwidth

MODULATION: 16QAM

BIT RATE: 7.5 kbps

TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Attenuation below carrier dBc	Limit, dBc	Margin, dB*	Verdict
ASSIGNED FREQUENCY RANGE: 763-775 MHz									
762.9992	-32.33	included	included	1	-32.33	42.33	28.8	-13.53	Pass
775.0042	-37.17	included	included	1	-37.17	48.17	28.8	-19.37	Pass
ASSIGNED FREQUENCY RANGE: 851-869 MHz									
850.9967	-41.00	included	included	1	-41.00	51.00	28.8	-22.20	Pass
869.0033	-39.83	included	included	1	-39.83	49.83	28.8	-21.03	Pass

*- Margin = Spurious emission – specification limit.

Reference numbers of test equipment used

HL 1424	HL 2953	HL 3761					
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Full description is given in Appendix A.

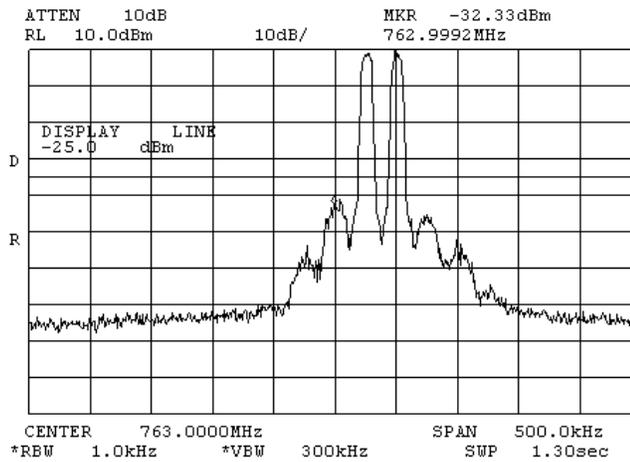


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Test specification:	Section 90.543, Intermodulation		
Test procedure:	47 CFR, Sections 2.1051; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:45:31 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

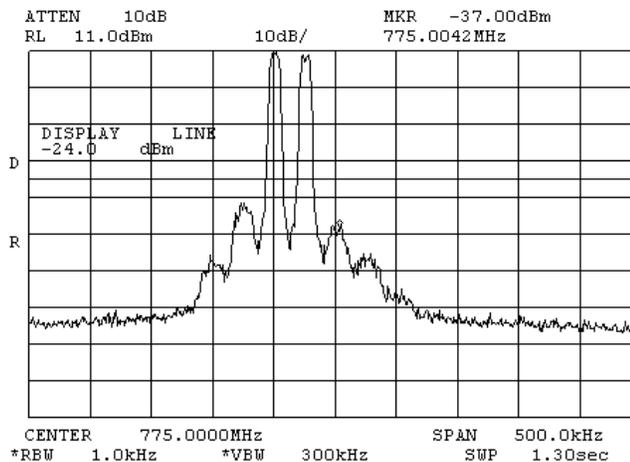
Plot 7.7.1 Intermodulation test results at low-band low edge

Frequency range	763-775 MHz
Input signals	F1=763.025 MHz F2=763.050 MHz



Plot 7.7.2 Intermodulation test results at low-band high edge

Frequency range	763-775 MHz
Input signals	F1=774.975 MHz F2=774.950 MHz



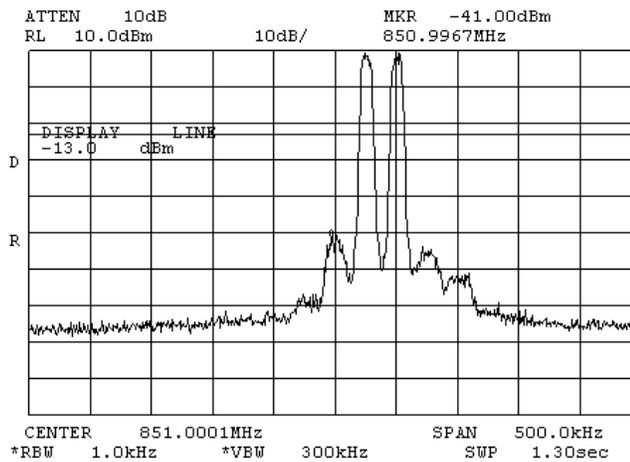


HERMON LABORATORIES

Test specification:	Section 90.543, Intermodulation		
Test procedure:	47 CFR, Sections 2.1051; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date & Time:	12/23/2009 4:45:31 PM		
Temperature: 24.4 °C	Air Pressure: 1022 hPa	Relative Humidity: 40 %	Power Supply: 120 VAC
Remarks:			

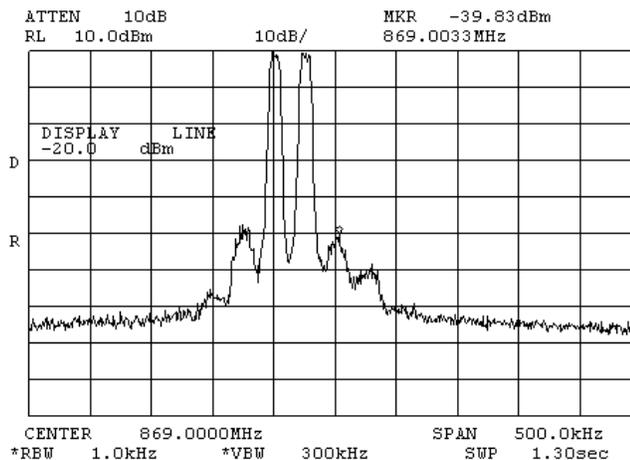
Plot 7.7.3 Intermodulation test results at high-band low edge

Frequency range	851-869 MHz
Input signals	F1=851.025 MHz F2=851.050 MHz



Plot 7.7.4 Intermodulation test results at high-band high edge

Frequency range	851-869 MHz
Input signals	F1=868.975 MHz F2=868.950 MHz



**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	29-Jun-09	29-Jun-10
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
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-09	11-Jan-10
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	28-Aug-09	28-Aug-10
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	28-Aug-09	28-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
2254	Cable 40 GHz, 0.8 m, blue	Rhophase Microwave Limited	KPS-1503A-800-KPS	W4907	11-Jun-09	11-Jun-10
2870	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	2870	17-Sep-09	17-Sep-10
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	07-May-09	07-May-10
2953	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	05-Oct-09	05-Oct-10
3119	Cable, 18 GHz N-type, M-F, 3 m	Bird	TC-MNFN-3.0	211539004	29-Nov-09	29-Nov-10
3121	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-9155-00	3121	30-Dec-08	30-Dec-09
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	14-Dec-09	14-Dec-10
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	14-Dec-09	14-Dec-10
3385	Microwave Cable Assembly, 18.0 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3385	01-Dec-09	01-Dec-10
3531	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ-02084040-J0	111590020 02	06-Dec-09	06-Dec-10
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040-J0	111590010 01	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	02-Dec-09	02-Dec-10
3761	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	07-Dec-09	07-Dec-10
3775	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	31-Aug-09	31-Aug-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).

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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(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
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, HL1984**

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

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

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, 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 18 GHz, N-type, M-F, 3 m, Bird Electronic Corp., model TC-MNFN-3.0, S/N 211539004
HL 3119

Frequency, MHz	Cable loss, dB								
10	0.06	3600	1.34	7400	2.00	11200	2.48	15100	2.90
30	0.09	3700	1.36	7500	2.01	11300	2.45	15200	2.89
50	0.11	3800	1.37	7600	2.03	11400	2.51	15300	2.91
100	0.23	3900	1.39	7700	2.05	11500	2.45	15400	2.85
200	0.30	4000	1.39	7800	2.07	11600	2.49	15500	2.83
300	0.42	4100	1.42	7900	2.06	11700	2.51	15600	2.89
400	0.39	4200	1.45	8000	2.06	11800	2.50	15700	2.85
500	0.47	4300	1.47	8100	2.09	11900	2.52	15800	2.87
600	0.49	4400	1.49	8200	2.10	12000	2.48	15900	2.91
700	0.63	4500	1.51	8300	2.11	12100	2.53	16000	2.90
800	0.62	4600	1.53	8400	2.15	12200	2.54	16100	2.94
900	0.70	4700	1.55	8500	2.15	12300	2.56	16200	2.91
1000	0.70	4800	1.54	8600	2.17	12400	2.57	16300	2.96
1100	0.77	4900	1.57	8700	2.19	12500	2.57	16400	3.01
1200	0.78	5000	1.60	8800	2.20	12600	2.55	16500	3.01
1300	0.83	5100	1.60	8900	2.21	12700	2.50	16600	2.98
1400	0.86	5200	1.62	9000	2.22	12800	2.57	16700	3.00
1500	0.85	5300	1.65	9100	2.23	12900	2.57	16800	3.01
1600	0.94	5400	1.66	9200	2.25	13000	2.55	16900	3.06
1700	0.90	5500	1.69	9300	2.24	13100	2.62	17000	3.07
1800	0.90	5600	1.70	9400	2.28	13200	2.60	17100	3.09
1900	0.95	5700	1.72	9500	2.28	13300	2.67	17200	3.10
2000	0.97	5800	1.74	9600	2.27	13400	2.66	17300	3.11
2100	1.00	5900	1.75	9700	2.30	13500	2.71	17400	3.16
2200	1.02	6000	1.77	9800	2.30	13600	2.73	17500	3.15
2300	1.05	6100	1.79	9900	2.34	13700	2.73	17600	3.21
2400	1.08	6200	1.82	10000	2.32	13800	2.85	17700	3.21
2500	1.10	6300	1.83	10100	2.31	13900	2.83	17800	3.18
2600	1.13	6400	1.83	10200	2.31	14000	2.83	17900	3.25
2700	1.15	6500	1.87	10300	2.26	14100	2.83	18000	3.14
2800	1.17	6600	1.88	10400	2.32	14200	2.84		
2900	1.21	6700	1.90	10500	2.26	14300	2.90		
3000	1.22	6800	1.93	10600	2.26	14400	2.84		
3100	1.25	6900	1.92	10700	2.31	14600	2.88		
3200	1.27	7000	1.95	10800	2.24	14700	2.85		
3300	1.29	7100	1.96	10900	2.39	14800	2.92		
3400	1.28	7200	1.99	11000	2.41	14900	2.93		
3500	1.31	7300	2.00	11100	2.46	15000	2.83		

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								
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
Cable coaxial, Microwave Cable Assembly, 104EA, 18 GHz, 1.0 m
Suhner Sucoflex, HL 3385

Frequency, MHz	Cable loss, dB						
10	0.04	5000	0.89	10200	1.16	15500	1.54
30	0.07	5100	0.88	10300	1.17	15600	1.50
50	0.07	5200	0.88	10400	1.14	15700	1.49
100	0.11	5300	0.90	10500	1.17	15800	1.51
200	0.15	5400	0.90	10600	1.18	15900	1.49
300	0.20	5500	0.91	10700	1.30	16000	1.58
400	0.23	5600	0.96	10800	1.20	16100	1.58
500	0.25	5700	0.97	10900	1.21	16200	1.57
600	0.28	5800	0.97	11000	1.27	16300	1.55
700	0.30	5900	1.01	11100	1.23	16400	1.61
800	0.32	6000	1.05	11200	1.24	16500	1.66
900	0.34	6100	1.05	11300	1.24	16600	1.66
1000	0.36	6200	1.06	11400	1.27	16700	1.70
1100	0.38	6300	1.09	11500	1.26	16800	1.70
1200	0.40	6400	1.09	11600	1.26	16900	1.61
1300	0.40	6500	1.09	11700	1.21	17000	1.63
1400	0.43	6600	1.15	11800	1.24	17100	1.64
1500	0.44	6700	1.16	11900	1.30	17200	1.65
1600	0.46	6800	1.17	12000	1.28	17300	1.65
1700	0.49	6900	1.18	12100	1.26	17400	1.65
1800	0.51	7000	1.21	12200	1.30	17500	1.65
1900	0.53	7100	1.20	12300	1.31	17600	1.63
2000	0.52	7200	1.24	12400	1.30	17700	1.63
2100	0.53	7300	1.24	12500	1.31	17800	1.61
2200	0.55	7400	1.25	12600	1.32	17900	1.62
2300	0.57	7500	1.25	12700	1.35	18000	1.60
2400	0.58	7600	1.26	12800	1.39		
2500	0.59	7700	1.27	12900	1.36		
2600	0.63	7800	1.30	13000	1.39		
2700	0.63	7900	1.29	13100	1.41		
2800	0.64	8000	1.31	13200	1.38		
2900	0.64	8100	1.30	13300	1.40		
3000	0.66	8200	1.29	13400	1.44		
3100	0.66	8300	1.28	13500	1.43		
3200	0.68	8400	1.22	13600	1.45		
3300	0.69	8500	1.22	13700	1.45		
3400	0.72	8600	1.23	13800	1.52		
3500	0.72	8700	1.24	13900	1.53		
3600	0.72	8800	1.26	14000	1.53		
3700	0.74	8900	1.20	14100	1.51		
3800	0.75	9000	1.21	14200	1.50		
3900	0.78	9100	1.19	14300	1.46		
4000	0.77	9200	1.17	14400	1.47		
4100	0.78	9300	1.17	14600	1.51		
4200	0.81	9400	1.13	14700	1.47		
4300	0.80	9500	1.14	14800	1.45		
4400	0.81	9600	1.17	14900	1.45		
4500	0.82	9700	1.17	15000	1.40		
4600	0.85	9800	1.18	15100	1.44		
4700	0.85	9900	1.14	15200	1.44		
4800	0.91	10000	1.16	15300	1.49		
4900	0.89	10100	1.16	15400	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						
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
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μ V)	decibel referred to one microvolt
dB(μ V/m)	decibel referred to one microvolt per meter
dB(μ A)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
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

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