HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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TEST REPORT

ACCORDING TO: FCC 47CFR part 15 subpart C § 15.247

FOR:

Airspan Networks Inc.
WIMAX base station radio
Model: Air4Gp-WL44 5.8 GHz
FCC ID:PIDMMAX5725

Table of contents

1 Applicant information

Client name:	Airspan Networks Inc.
Address:	777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA
Telephone:	+1 561 893 8670
Fax:	+1 561 893 8671
E-mail:	zlevi@airspan.com
Contact name:	Mr. Zion Levi

2 Equipment under test attributes

Product name:	WIMAX base station radio
Product type:	Transceiver
Model(s):	Air4Gp-WL44 5.8 GHz
Serial number:	61B1C716D4CC
Hardware version:	A6
Software release:	13.10.50.019
Receipt date	8/9/2012

3 Manufacturer information

Manufacturer name:	Airspan Networks Inc.
Address:	777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA
Telephone:	+1 561 893 8670
Fax:	+1 561 893 8671
E-Mail:	zlevi@airspan.com
Contact name:	Mr. Zion Levi

4 Test details

Project ID:	23604
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	8/9/2012
Test completed:	8/30/2012
Test specification(s):	FCC 47CFR part 15, subpart C §15.247

5 Tests summary

Test	Status
Transmitter characteristics	
Section 15.247(a)(2), 6 dB bandwidth	Pass
Section 15.247(b)(3), Peak output power	Pass
Section 15.247(b)5, RF exposure	Pass
Section 15.247(d), Conducted spurious emissions	Pass
Section 15.247(d), Radiated spurious emissions	Pass
Section 15.247(d), Band edge emissions	Pass
Section 15.247(e), Peak power density	Pass
Section 15.207(a), Conducted emission	Pass
Section 15.203, Antenna requirement	Pass

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

	Name and Title	Date	Signature
Tested by:	Mr. S. Samokha, test engineer	August 30, 2012	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	September 24, 2012	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	September 27, 2012	

6 EUT description

6.1 General information

A base station radio, Air4Gp-WL44 5.8 GHz TDD Int., is part of a WiMAX broadband fixed cellular wireless access system. The system provides a radio link between an end-user (a subscriber) and a network to give high-speed data access. The Air4Gp-WL44's transceiver/receiver (up to 64QAM modulation, data rate up to 46 Mbps) uses OFDM and operating in TDD duplexing mode, equipped with a 16.5 dBi integral antenna.
The Air4Gp-WL44 is installed outdoors and typically is mounted on a pole. The ProST transmits and receives traffic to and from the base station respectively. The transceiver provides subscribers with "always-on" Internet, high speed data only, or data and voice (VoIP) services and is configured with a unique base station reference number, preventing the ProST from relocating to another subscriber premises without authorization.

6.2 Ports and lines

Port type	Port description	Conn. from	Connected to	Qty.	Cable type	Cable length, m
Power	DC power	DC power supply	EUT	1	Unshielded	10
Signal	Ethernet	ETH1 port	PC laptop	1	Shielded	10
Signal	Antenna	EUT	GPS external antenna	1	Coax	5
RF	Antenna (external)	EUT	Termination 50 Ohm	2	Coax	NA
RF	Antenna (internal)	EUT	Termination 50 Ohm	2	Coax	0.2
Signal*	RS-232	EUT	Laptop	1	Unshielded	2

*For maintenance only

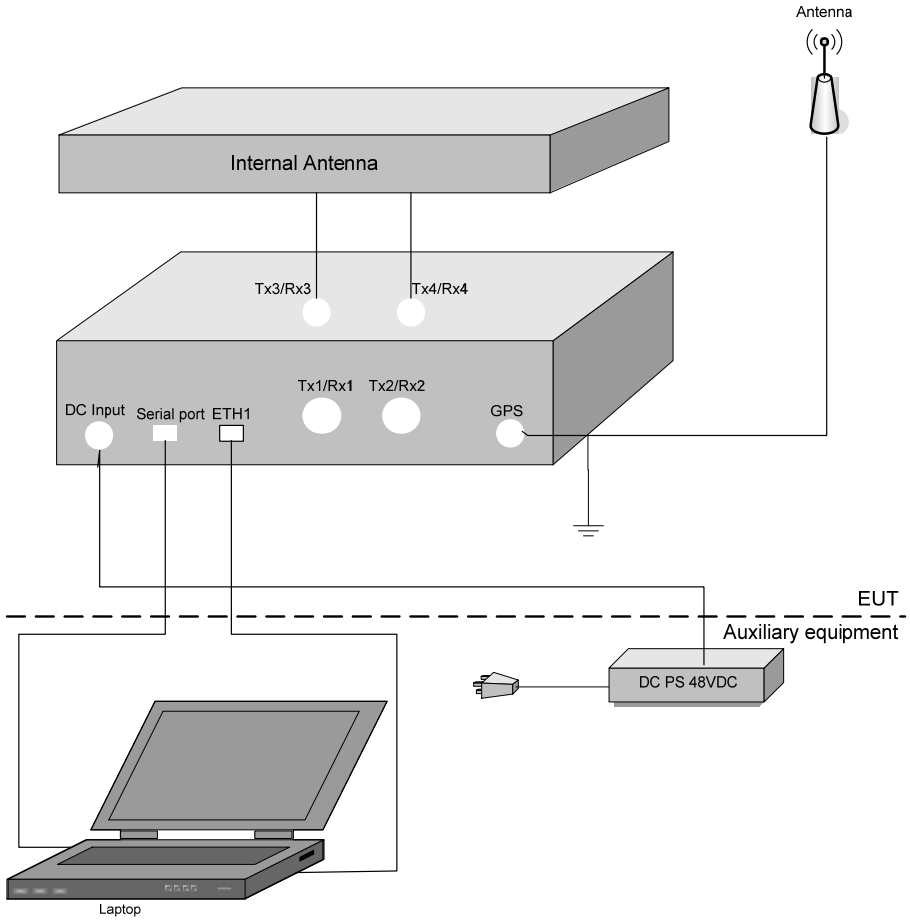
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
DC power supply	Horizon Electronics	DHR3655D	767469
Laptop	IBM	X31	99-TXWYC
GPS antenna	Trimble	P/N 57861-00	01880177

6.4 Changes made in the EUT

No changes were implemented.

6.5 Test configuration



6.6 Transmitter characteristics

Type of equipment		
V	Stand-alone (Equipment with or without its own control provisions)	
	Combined equipment (Equipment where the radio part is fully integrated within another type of equipment)	
	Plug-in card (Equipment intended for a variety of host systems)	

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

Assigned frequency range	5725 - 5850 MHz		
Operating frequency range	EBW 3.5 MHz: 5726.75 – 5848.25 MHz; EBW 5 MHz: 5727.5 – 5847.5 MHz; EBW 7 MHz: 5728.5 – 5846.5 MHz; EBW 10 MHz: 5730 - 5845 MHz		
RF channel bandwidth	3.5 MHz, 5 MHz, 7 MHz, 10 MHz		
Maximum rated output power	At transmitter 50 Ω RF output connector (total conducted power for 4 chains)		19.48 dBm
Antenna output:	Without beamforming		4
Is transmitter output power variable?	V	No	
		Yes	continuous variable
			stepped variable with stepsize
			minimum RF power
			maximum RF power

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

Antenna/s technical characteristics			
Type	Manufacturer	Model number	Antenna assembly gain
Dual Slant Base Station Antenna Integral	MARS ANTENNAS & RF SYSTEMS Ltd.	MA-WD55-DS16AS	16.5 dBi (max)

Transmitter 99% power bandwidth	Transmitter aggregate data rate/s, MBps	Type of modulation (OFDM)
3.5 MHz	4	QPSK
	14	64QAM
5 MHz	7	QPSK
	23	64QAM
7 MHz	8	QPSK
	28	64QAM
10 MHz	13	QPSK
	46	64QAM

Modulating test signal (baseband)	OFDM				
Maximum transmitter duty cycle in normal use	75%				
Maximum transmitter duty cycle for test purposes	62%				

Transmitter power source					
		Nominal rated voltage		Battery type	
V	DC (PoE)	**Nominal rated voltage**	48 VDC from PS		
	AC mains	**Nominal rated voltage**		Frequency	Hz

Common power source for transmitter and receiver	V	yes	no

Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

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

7.1 Minimum 6 dB bandwidth

7.1.1 General

This test was performed to measure 6 dB bandwidth of the EUT carrier frequency. Specification test limits are given in Table 7.1.1.

Table 7.1.1 The 6 dB bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Minimum bandwidth, kHz
902.0 – 928.0	**6.0**	**500.0**
2400.0 – 2483.5		
5725.0 – 5850.0		

* - Modulation envelope reference points provided in terms of attenuation below the peak of modulated carrier.

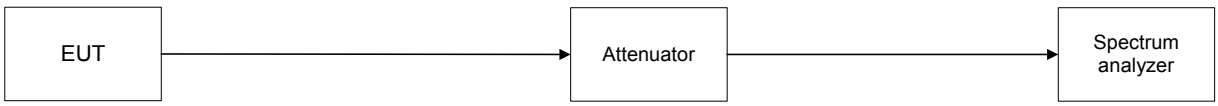
7.1.2 Test procedure

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

7.1.2.2 The EUT was set to transmit modulated carrier.

7.1.2.3 The transmitter minimum 6 dB bandwidth was measured with spectrum analyzer RBW set to1-5% of EBW and VBW ≥3 x RBW as frequency delta between reference points on modulation envelope and provided in Table 7.1.2 and the associated plots.

Figure 7.1.1 The 6 dB bandwidth test setup



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Table 7.1.2 The 6 dB bandwidth test results

ASSIGNED FREQUENCY BAND: 5725 – 5850 MHz
DETECTOR USED: Sample
SWEEP MODE: Single
RESOLUTION BANDWIDTH: 1-5% of EBW
VIDEO BANDWIDTH: ≥3 x RBW
SWEEP TIME: Auto
MODULATION ENVELOPE REFERENCE POINTS: 20.0 dBc
MODULATING SIGNAL: PRBS

Carrier frequency, MHz	6 dB bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
3.5 MHz channel spacing:				
QPSK:				
5726.75	3297.0	500	2797.0	Pass
5800.00	3267.0	500	2767.0	Pass
5848.25	3310.0	500	2810.0	Pass
64QAM:				
5726.75	3270.0	500	2770.0	Pass
5800.00	3321.0	500	2821.0	Pass
5848.25	3339.0	500	2839.0	Pass
5 MHz channel spacing:				
QPSK:				
5727.5	4656.0	500	4156.0	Pass
5800.0	4608.0	500	4108.0	Pass
5847.5	4577.5	500	4077.5	Pass
64QAM:				
5727.5	4563.0	500	4063.0	Pass
5800.0	4600.0	500	4100.0	Pass
5847.5	4583.5	500	4083.5	Pass
7 MHz channel spacing:				
QPSK:				
5728.5	6546.0	500	6046.0	Pass
5800.0	6426.0	500	5926.0	Pass
5846.5	6534.0	500	6034.0	Pass
64QAM:				
5728.5	6546.0	500	6046.0	Pass
5800.0	6434.0	500	5934.0	Pass
5846.5	6508.0	500	6008.0	Pass
10 MHz channel spacing:				
QPSK:				
5730	9059.7	500	8559.7	Pass
5800	9120.2	500	8620.2	Pass
5845	9167.0	500	8667.0	Pass
64QAM:				
5730	9178.5	500	9178.5	Pass
5800	9142.2	500	9142.2	Pass
5845	9158.7	500	9158.7	Pass

Reference numbers of test equipment used

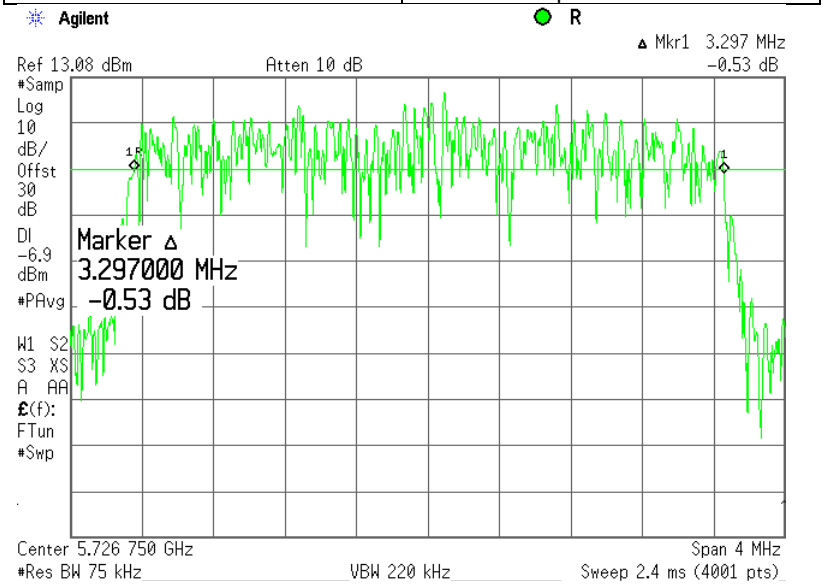
HL 3787	HL 3818	HL 3903						

Full description is given in Appendix A.

Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

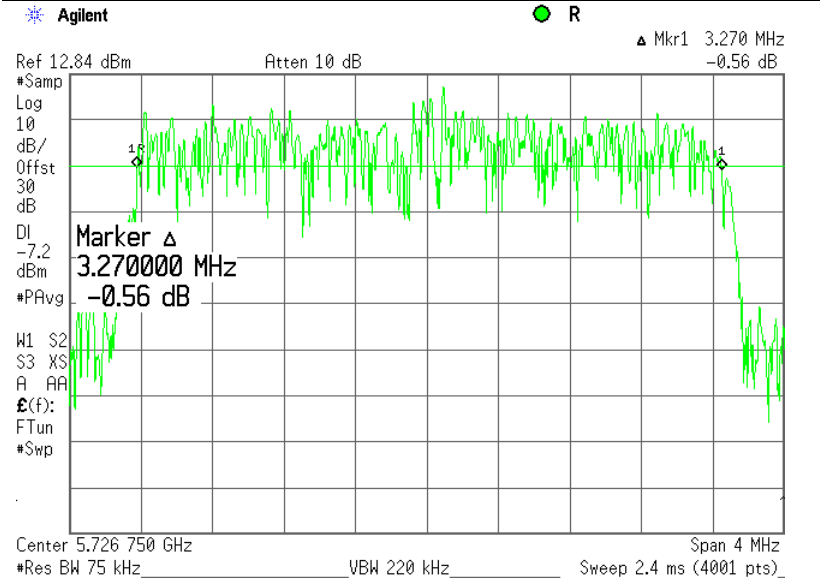
Plot 7.1.1 The 6 dB bandwidth test result at low frequency

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.1.2 The 6 dB bandwidth test result at low frequency

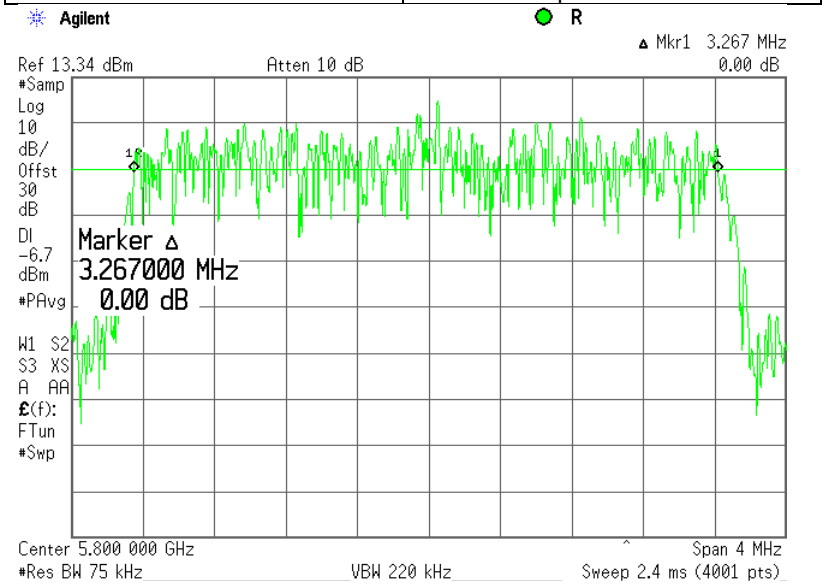
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

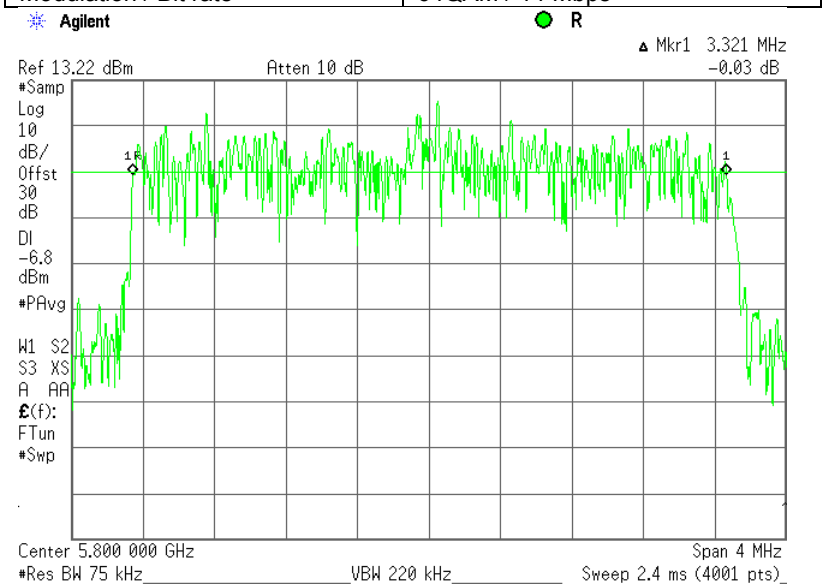
Plot 7.1.3 The 6 dB bandwidth test result at mid frequency

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.1.4 The 6 dB bandwidth test result at mid frequency

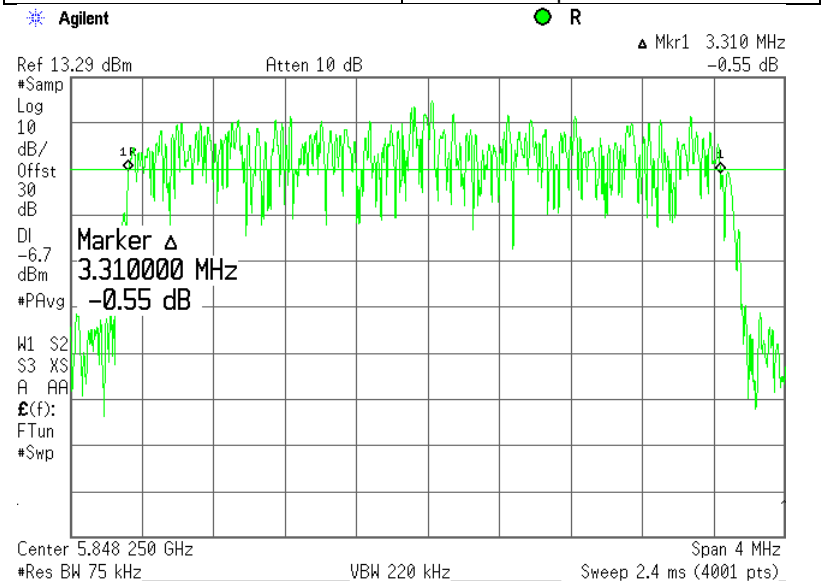
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

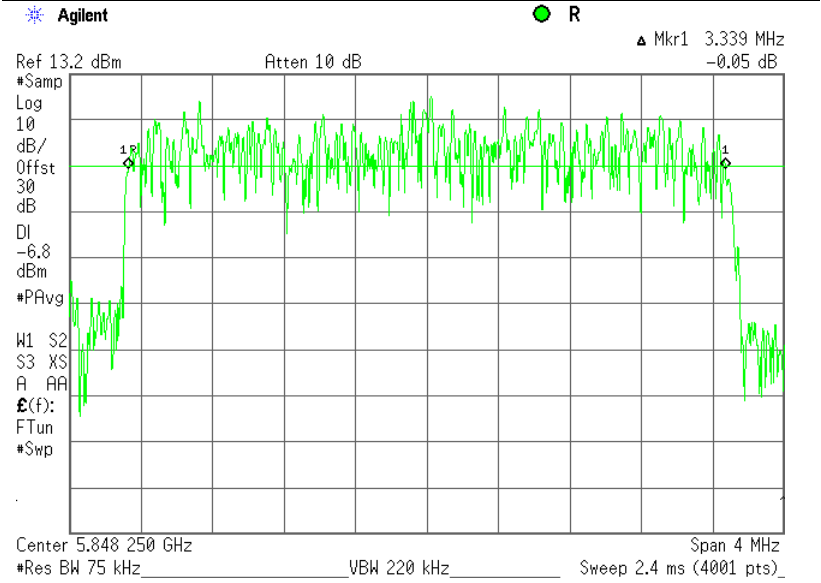
Plot 7.1.5 The 6 dB bandwidth test result at high frequency

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.1.6 The 6 dB bandwidth test result at high frequency

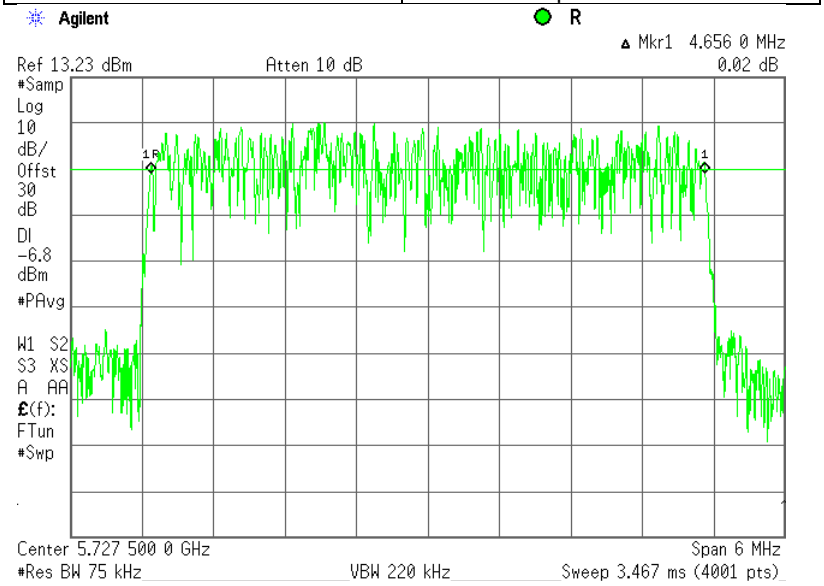
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

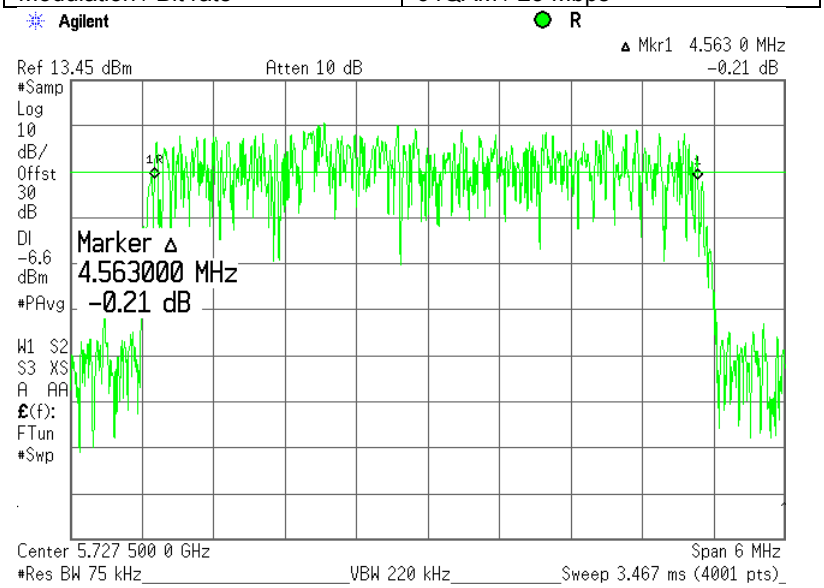
Plot 7.1.7 The 6 dB bandwidth test result at low frequency

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.1.8 The 6 dB bandwidth test result at low frequency

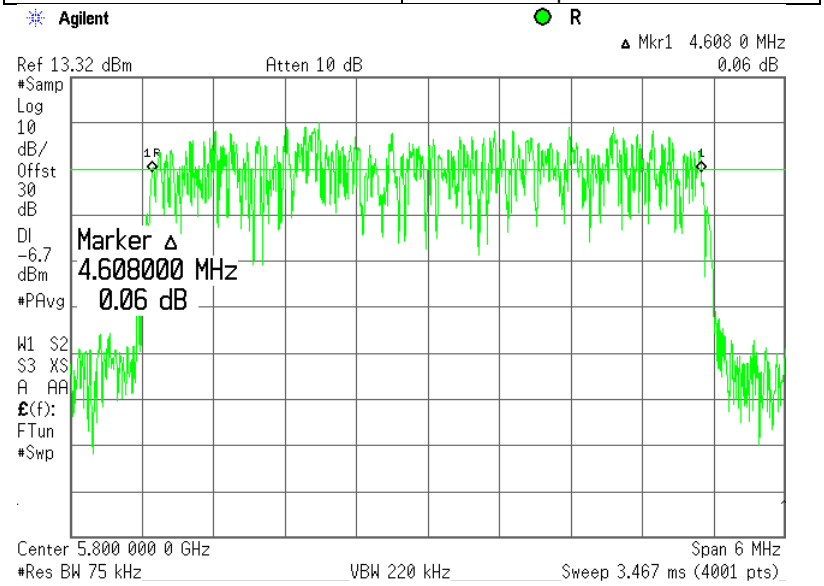
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

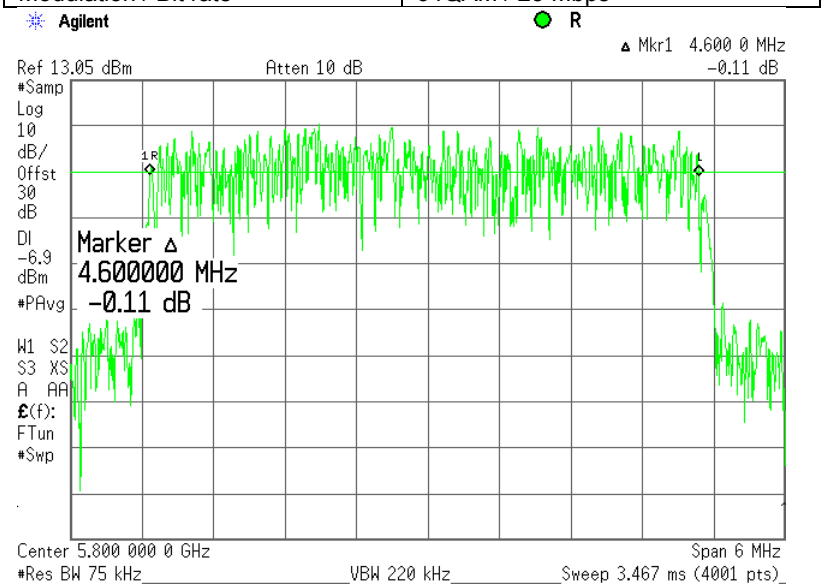
Plot 7.1.9 The 6 dB bandwidth test result at mid frequency

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.1.10 The 6 dB bandwidth test result at mid frequency

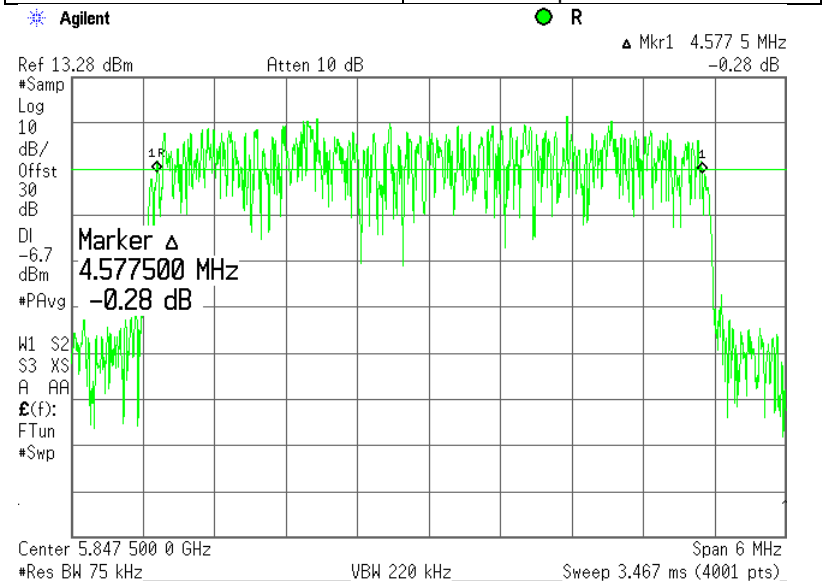
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

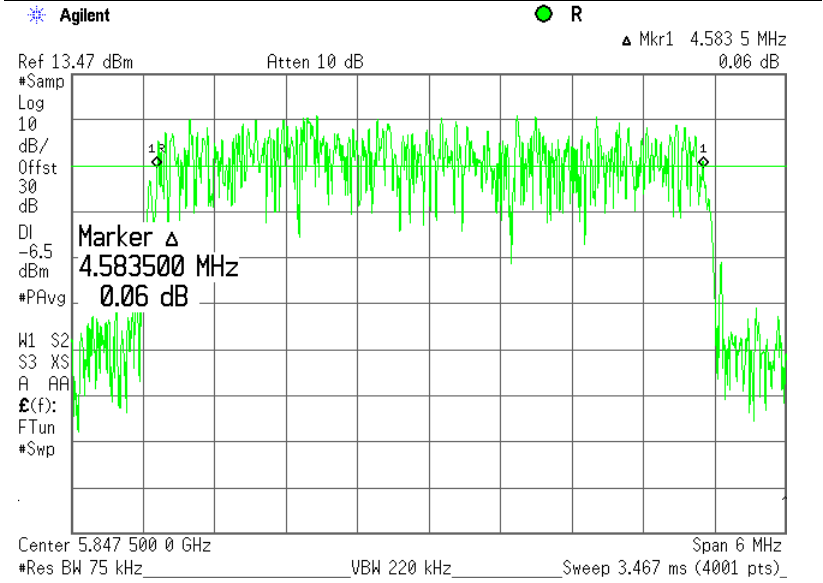
Plot 7.1.11 The 6 dB bandwidth test result at high frequency

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.1.12 The 6 dB bandwidth test result at high frequency

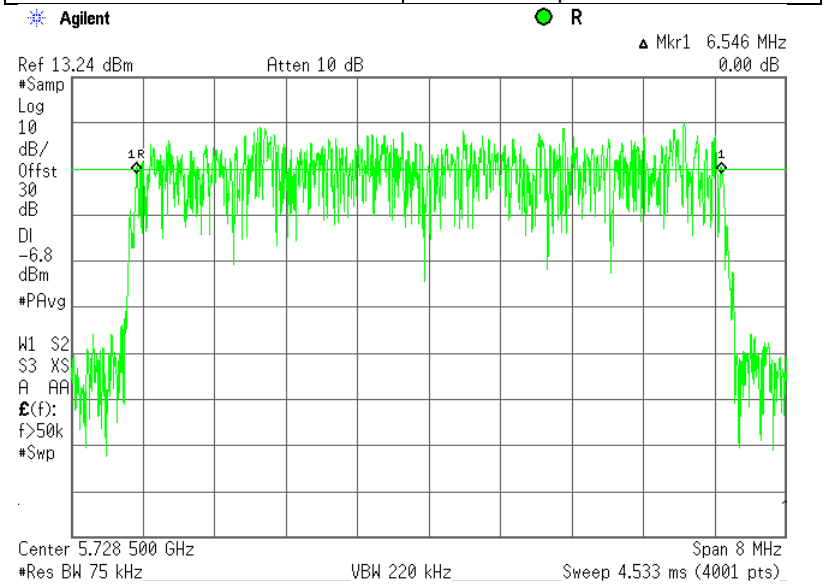
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

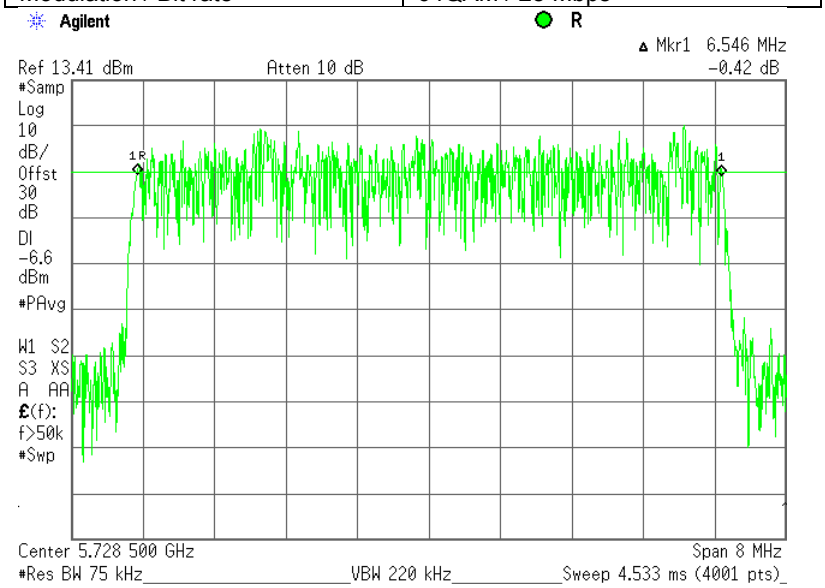
Plot 7.1.13 The 6 dB bandwidth test result at low frequency

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.1.14 The 6 dB bandwidth test result at low frequency

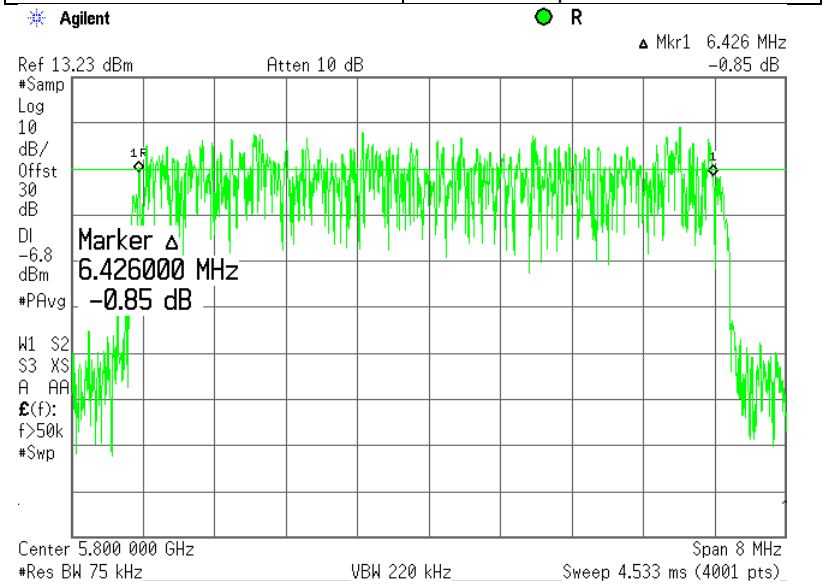
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

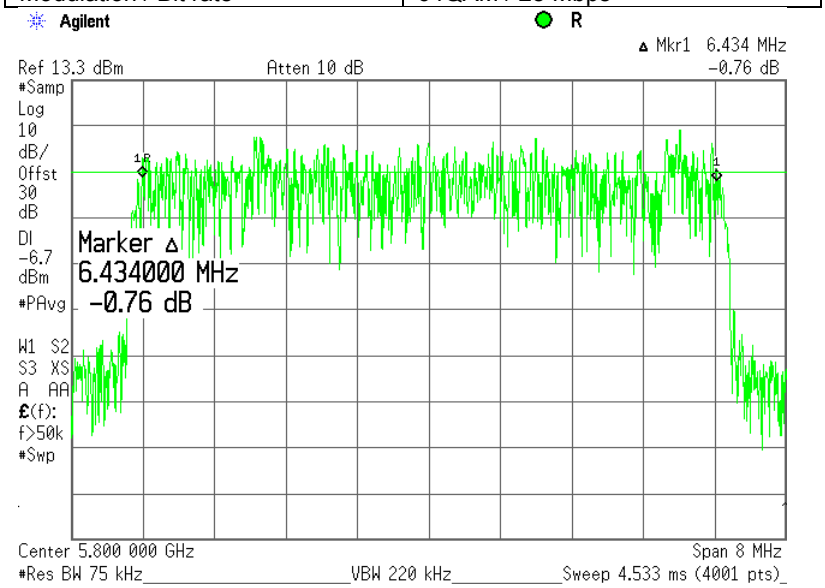
Plot 7.1.15 The 6 dB bandwidth test result at mid frequency

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.1.16 The 6 dB bandwidth test result at mid frequency

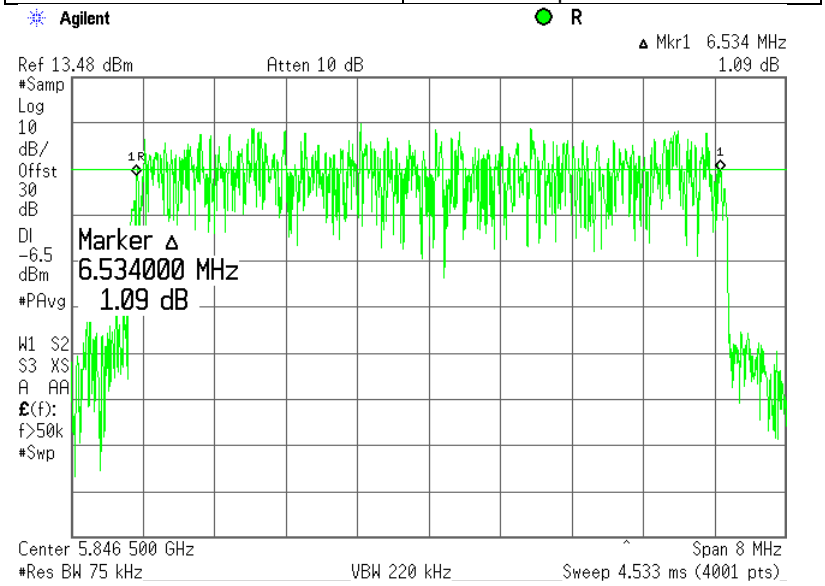
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

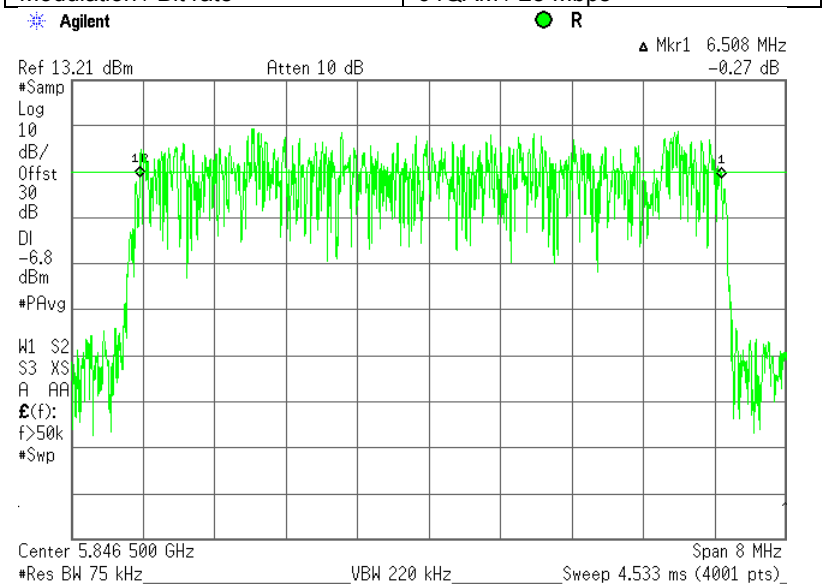
Plot 7.1.17 The 6 dB bandwidth test result at high frequency

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.1.18 The 6 dB bandwidth test result at high frequency

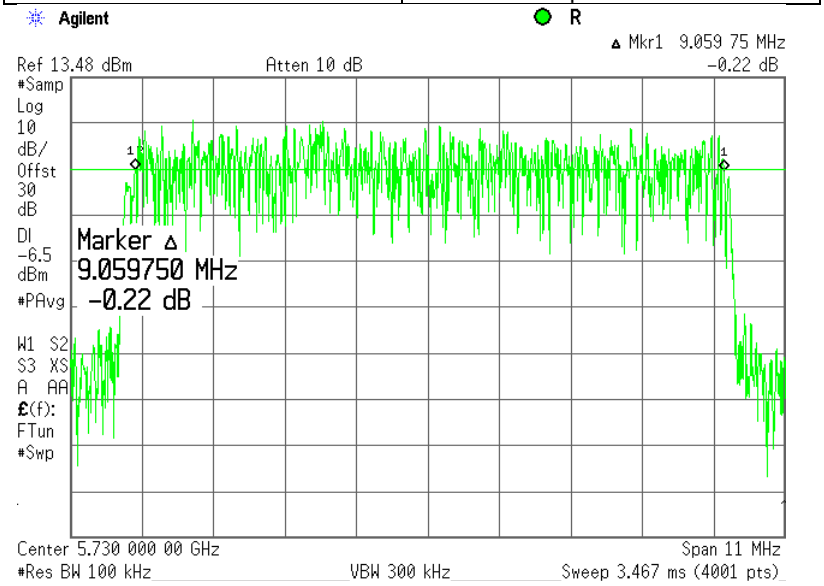
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

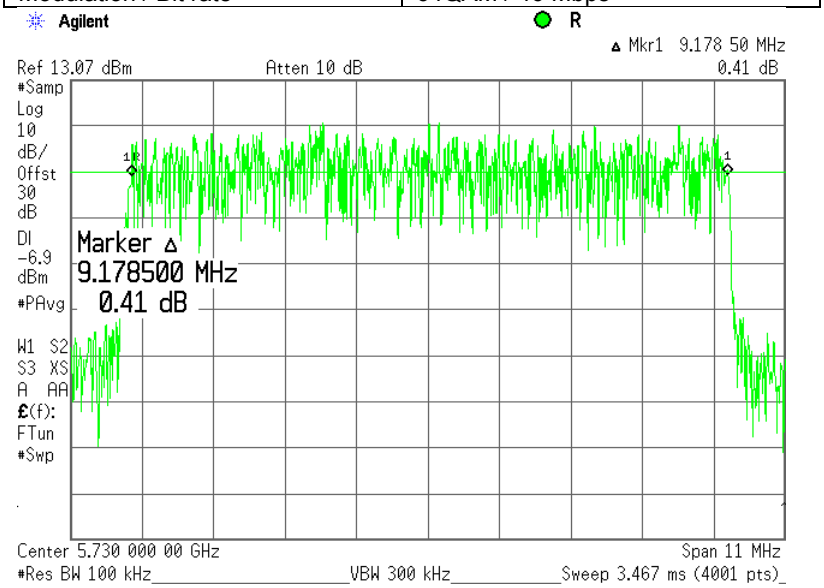
Plot 7.1.19 The 6 dB bandwidth test result at low frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.1.20 The 6 dB bandwidth test result at low frequency

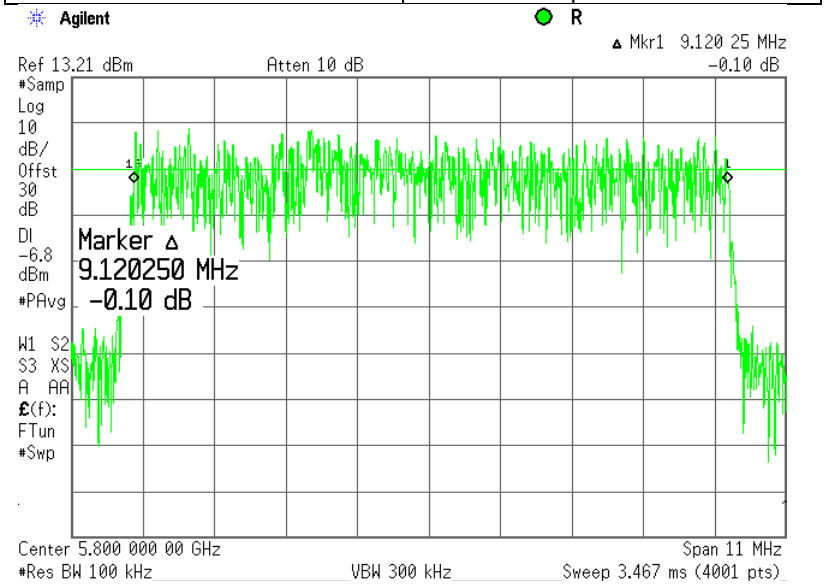
Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

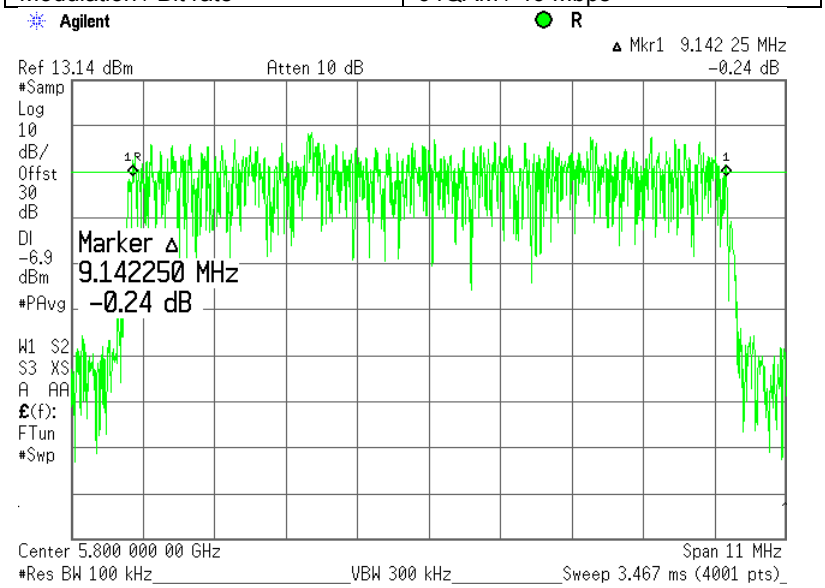
Plot 7.1.21 The 6 dB bandwidth test result at mid frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.1.22 The 6 dB bandwidth test result at mid frequency

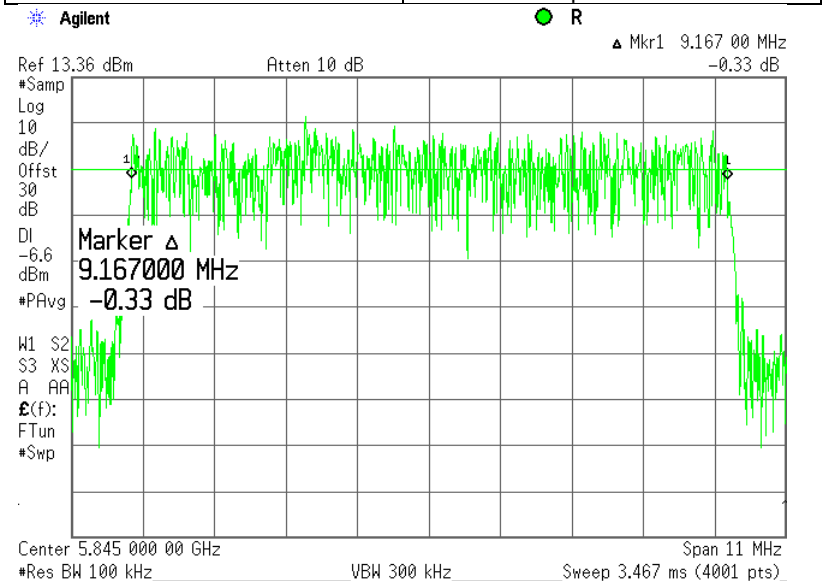
Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(a)(2), 6 dB bandwidth		
Test procedure:	ANSI C63.10-2009 section 6.9.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

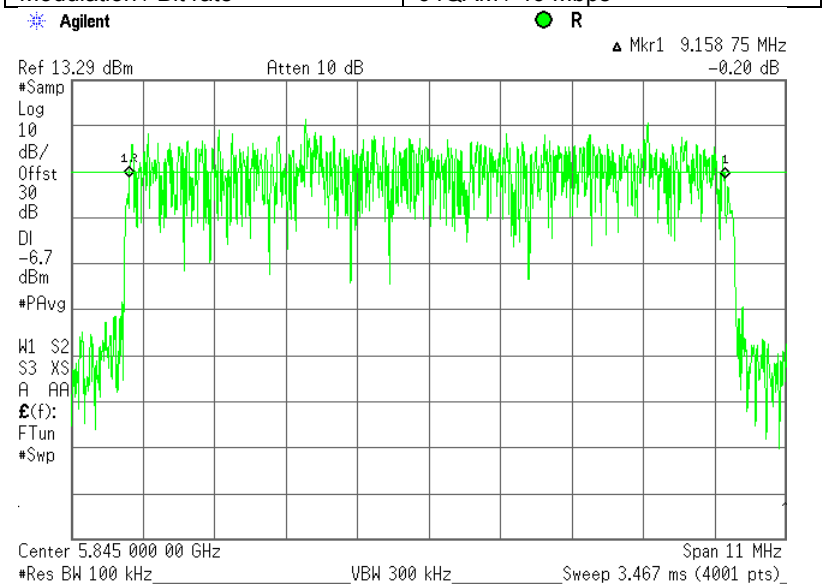
Plot 7.1.23 The 6 dB bandwidth test result at high frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.1.24 The 6 dB bandwidth test result at high frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

7.2 Output power

7.2.1 General

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

Table 7.2.1 Output power limits

Assigned frequency range, MHz	Maximum antenna gain, dBi	Output power*	
		W	dBm
902.0 – 928.0	6.0	1.0	30.0
2400.0 – 2483.5			
5725.0 – 5850.0			

*- If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power limit shall be reduced below the stated value as follows:

by 1 dB for every 3 dB that the directional gain of antenna exceeds 6 dBi for fixed point-to-point transmitters operate in 2400-2483.5 MHz band;

without any corresponding reduction for fixed point-to-point transmitters operate in 5725-5850 MHz band;

by the amount in dB that the directional gain of antenna exceeds 6 dBi for the rest of transmitters.

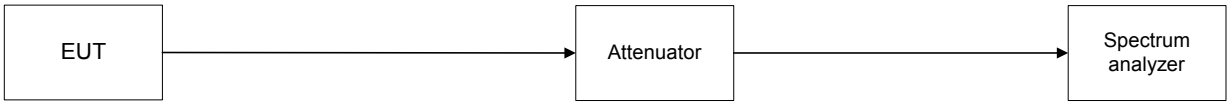
7.2.2 Test procedure

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

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

7.2.2.3 The resolution bandwidth of spectrum analyzer was set to 1 MHz, video bandwidth was set > 3xRBW and the maximum average output power was measured as provided in Table 7.2.2 and the associated plots.

Figure 7.2.1 Peak output power test setup



Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Table 7.2.2 Output power test results

ASSIGNED FREQUENCY: 5725 – 5850 MHz
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 1 MHz
VIDEO BANDWIDTH: > 3xRBW
ANTENNA GAIN: 16.5 dBi
NUMBER OF RF OUTPUTS: 4

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	Tx power, dBm		Limit**, dBm	Margin***, dB	Verdict
				Measured	Total*			
3.5 MHz channel spacing								
QPSK								
5726.75	13.08	included	included	13.08	19.08	19.5	-0.42	Pass
5800.00	13.34	included	included	13.34	19.34	19.5	-0.16	Pass
5848.25	13.29	included	included	13.29	19.29	19.5	-0.21	Pass
64QAM								
5726.75	12.84	included	included	12.84	18.84	19.5	-0.66	Pass
5800.00	13.22	included	included	13.22	19.22	19.5	-0.28	Pass
5848.25	13.20	included	included	13.20	19.20	19.5	-0.30	Pass
5 MHz channel spacing								
QPSK								
5727.5	13.23	included	included	13.23	19.23	19.5	-0.27	Pass
5800.0	13.32	included	included	13.32	19.32	19.5	-0.18	Pass
5847.5	13.28	included	included	13.28	19.28	19.5	-0.22	Pass
64QAM								
5727.5	13.45	included	included	13.45	19.45	19.5	-0.05	Pass
5800.0	13.05	included	included	13.05	19.05	19.5	-0.45	Pass
5847.5	13.47	included	included	13.47	19.47	19.5	-0.03	Pass
7 MHz channel spacing								
QPSK								
5728.5	13.19	included	included	13.19	19.19	19.5	-0.31	Pass
5800.0	13.40	included	included	13.40	19.40	19.5	-0.10	Pass
5846.5	13.24	included	included	13.24	19.24	19.5	-0.26	Pass
64QAM								
5728.5	13.41	included	included	13.41	19.41	19.5	-0.09	Pass
5800.0	13.23	included	included	13.23	19.23	19.5	-0.27	Pass
5846.5	13.30	included	included	13.30	19.30	19.5	-0.20	Pass
10 MHz channel spacing								
QPSK								
5730	13.48	included	included	13.48	19.48	19.5	-0.02	Pass
5800	13.21	included	included	13.21	19.21	19.5	-0.29	Pass
5845	13.36	included	included	13.36	19.36	19.5	-0.14	Pass
64QAM								
5730	13.07	included	included	13.07	19.07	19.5	-0.43	Pass
5800	13.14	included	included	13.14	19.14	19.5	-0.36	Pass
5845	13.29	included	included	13.29	19.29	19.5	-0.21	Pass

* - Total power, dBm = Measured power, dBm + 10*log(N) dB = Measured power, dBm + 6 dB
where N=4 is a number of RF outputs
** - Limit, dBm = Output power limit– (Antenna gain – 6) = 30 – 10.5 = 19.5 dBm
*** - Margin = Total output power – calculated limit.
Note: Maximum output power was obtained at U_{nom} input power voltage.

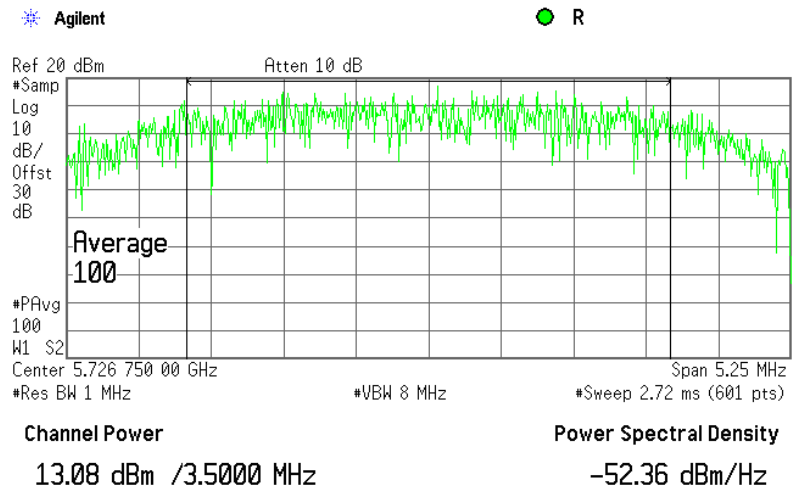
Reference numbers of test equipment used

HL 3787	HL 3818	HL 3903					

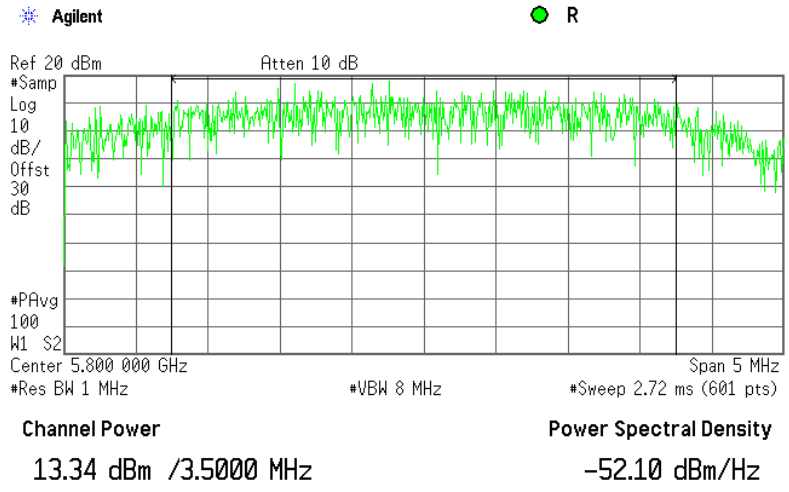
Full description is given in Appendix A.

Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.1 Output power at low frequency, 3.5 MHz channel spacing, QPSK

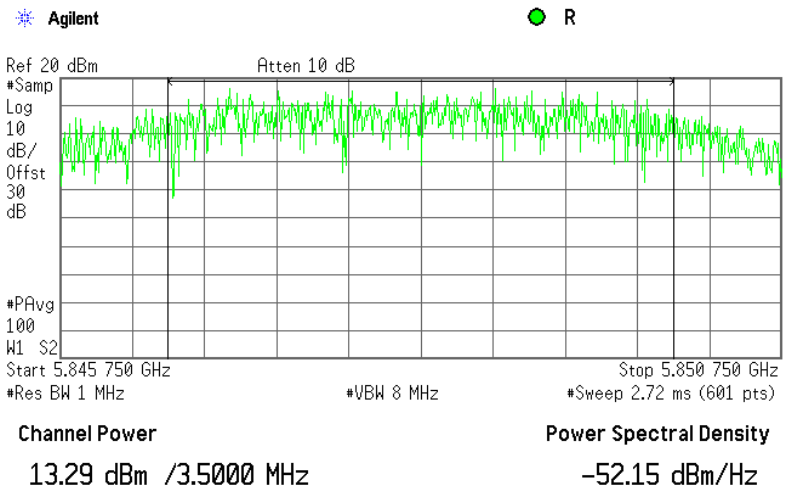


Plot 7.2.2 Output power at mid frequency, 3.5 MHz channel spacing, QPSK

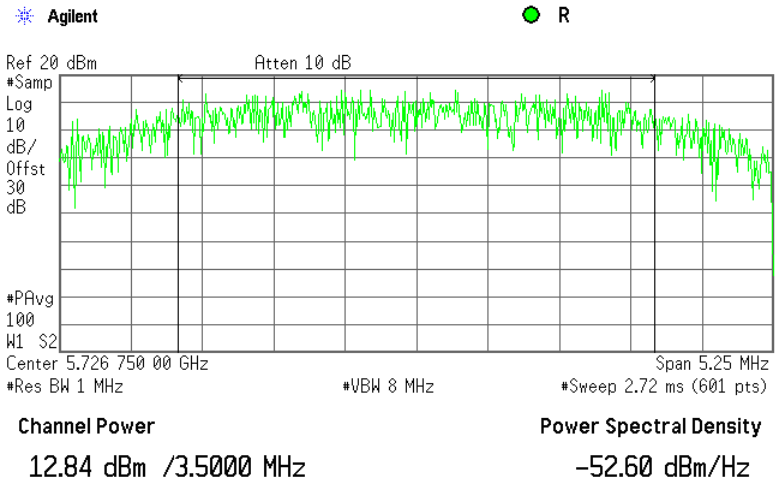


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.3 Output power at high frequency, 3.5 MHz channel spacing, QPSK

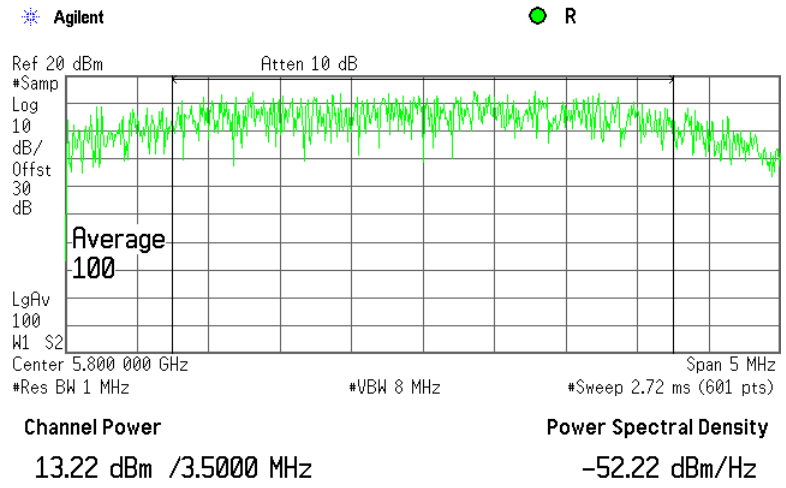


Plot 7.2.4 Output power at low frequency, 3.5 MHz channel spacing, 64QAM

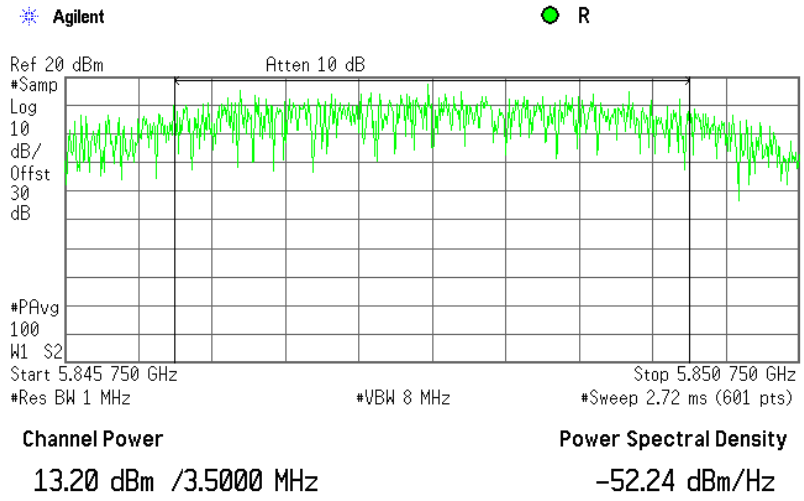


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.5 Output power at mid frequency, 3.5 MHz channel spacing, 64QAM

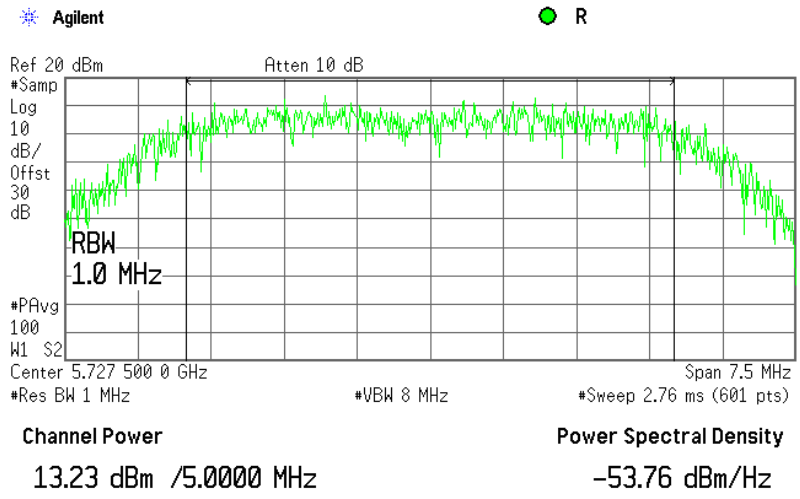


Plot 7.2.6 Output power at high frequency, 3.5 MHz channel spacing, 64QAM

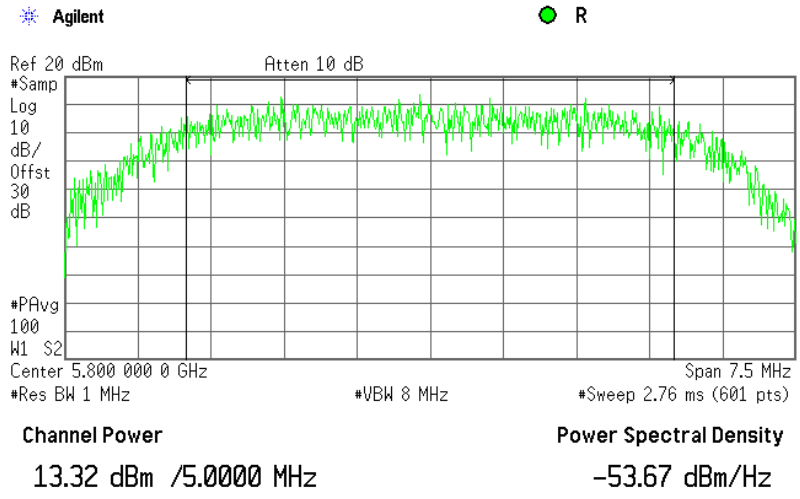


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.7 Output power at low frequency, 5 MHz channel spacing, QPSK

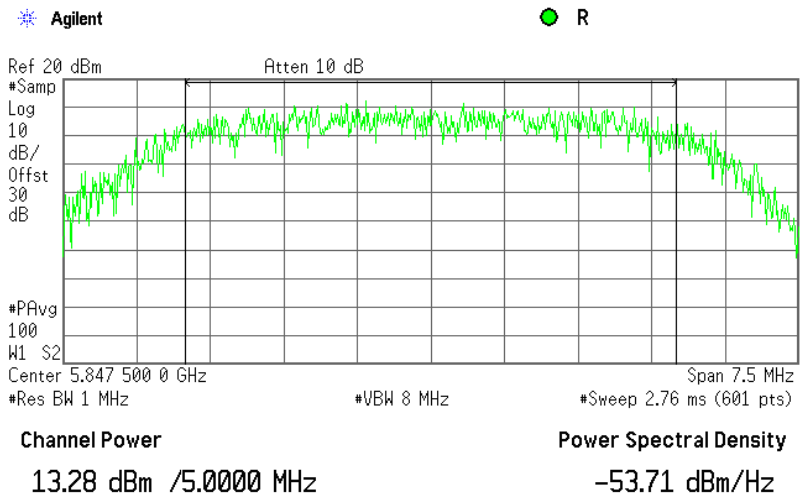


Plot 7.2.8 Output power at mid frequency, 5 MHz channel spacing, QPSK

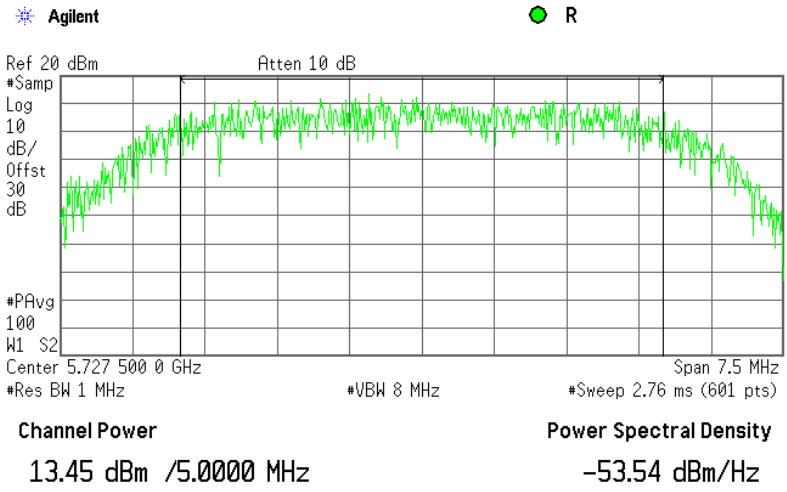


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.9 Output power at high frequency, 5 MHz channel spacing, QPSK

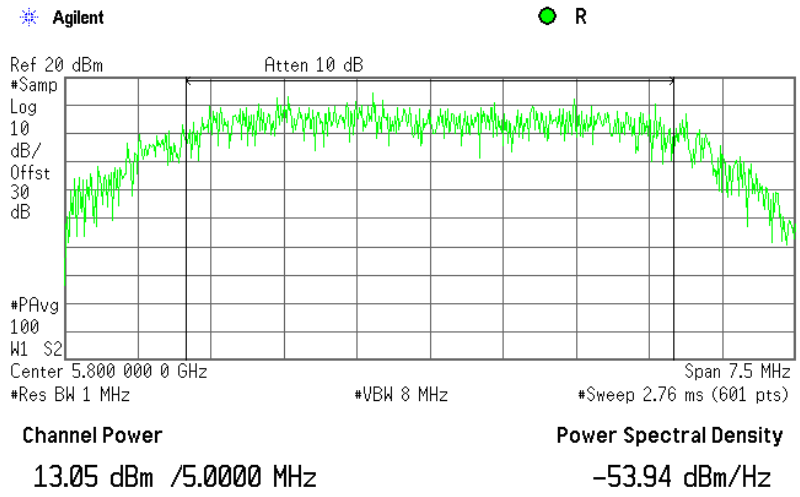


Plot 7.2.10 Output power at low frequency, 5 MHz channel spacing, 64QAM

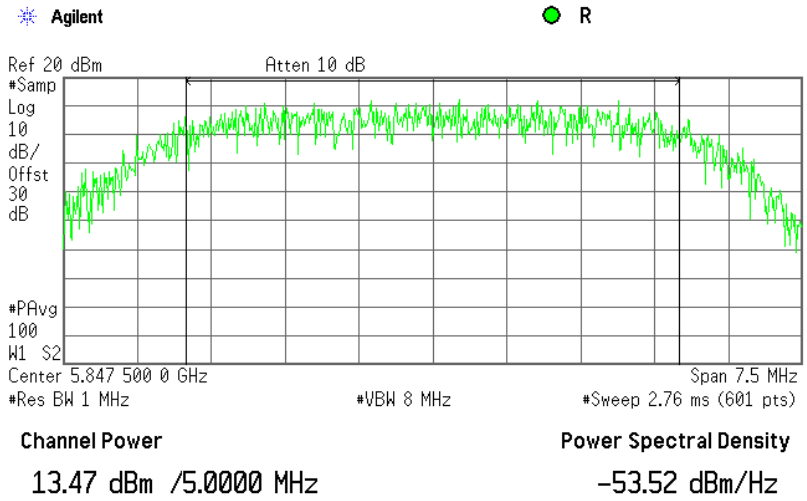


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.11 Output power at mid frequency, 5 MHz channel spacing, 64QAM

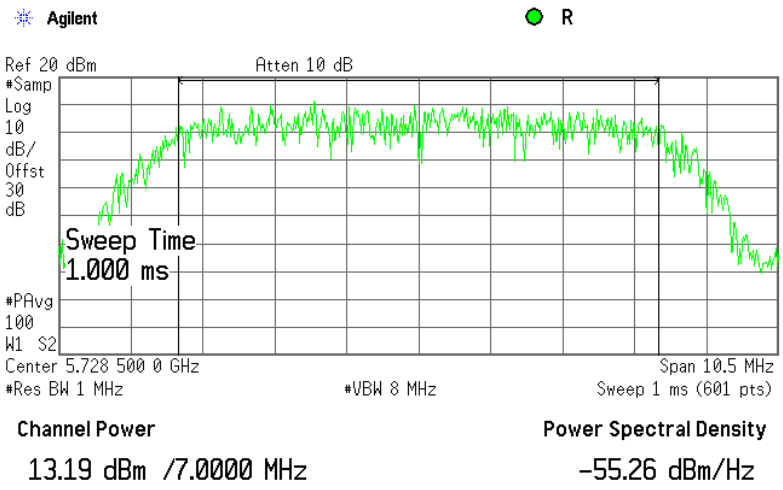


Plot 7.2.12 Output power at high frequency, 5 MHz channel spacing, 64QAM

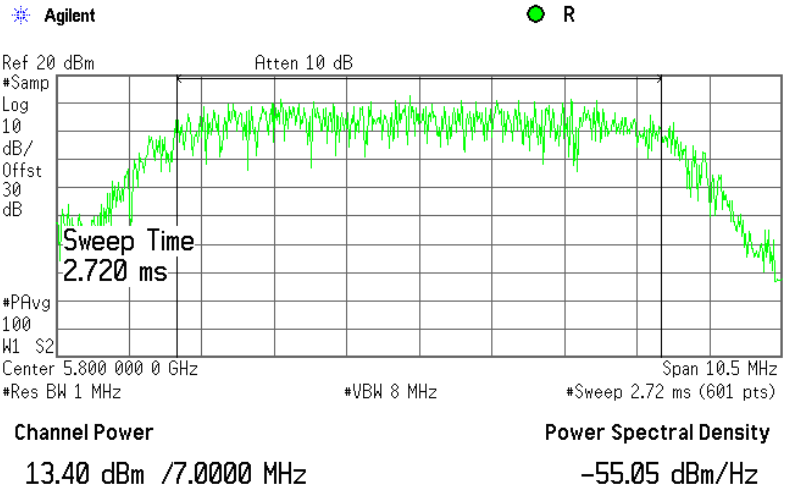


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.13 Output power at low frequency, 7 MHz channel spacing, QPSK

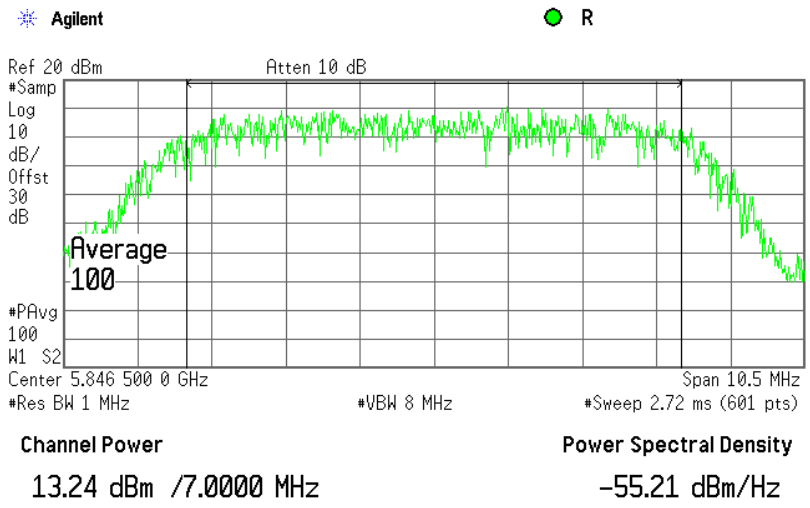


Plot 7.2.14 Output power at mid frequency, 7 MHz channel spacing, QPSK

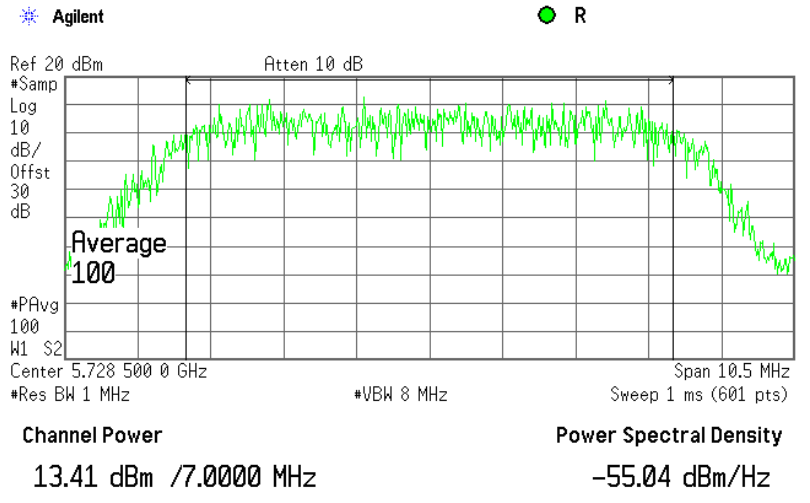


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.15 Output power at high frequency, 7 MHz channel spacing, BPSK

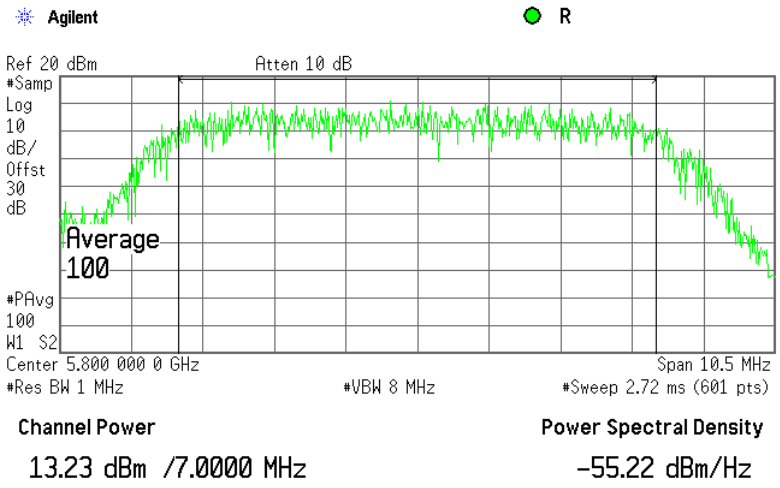


Plot 7.2.16 Output power at low frequency, 7 MHz channel spacing, 64QAM

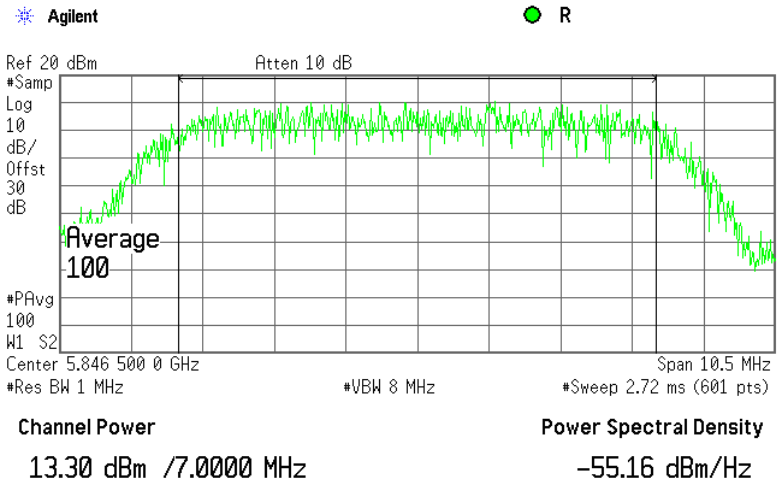


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.17 Output power at mid frequency, 7 MHz channel spacing, 64QAM

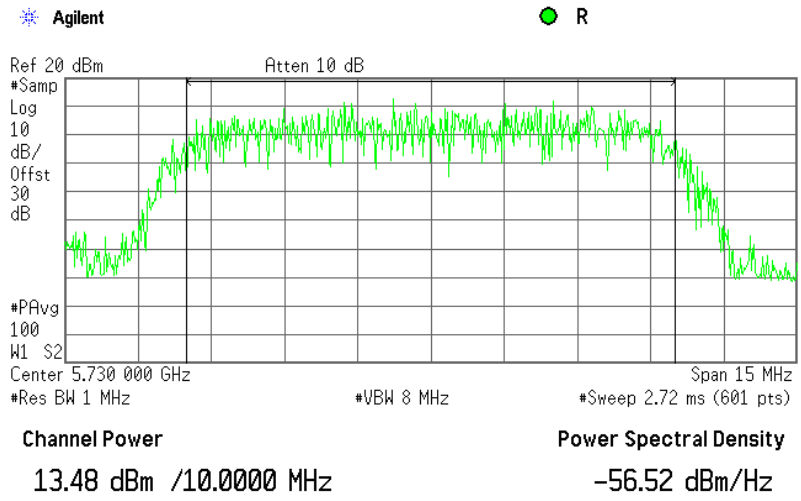


Plot 7.2.18 Output power at high frequency, 7 MHz channel spacing, 64QAM

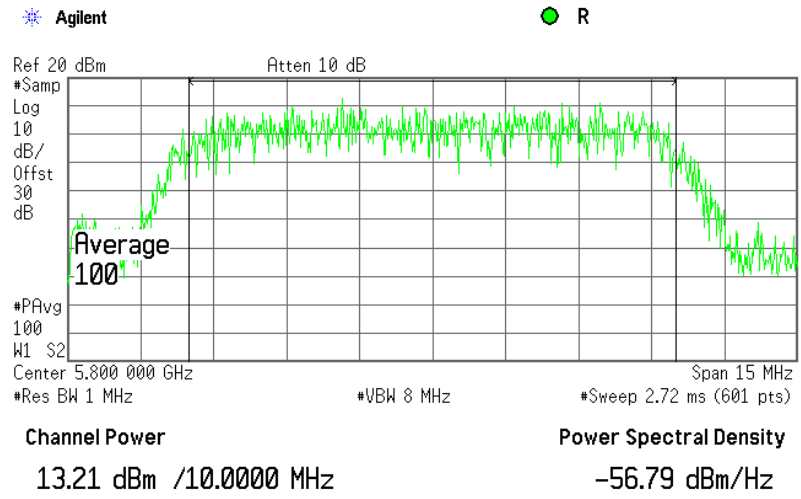


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.19 Output power at low frequency, 10 MHz channel spacing, QPSK

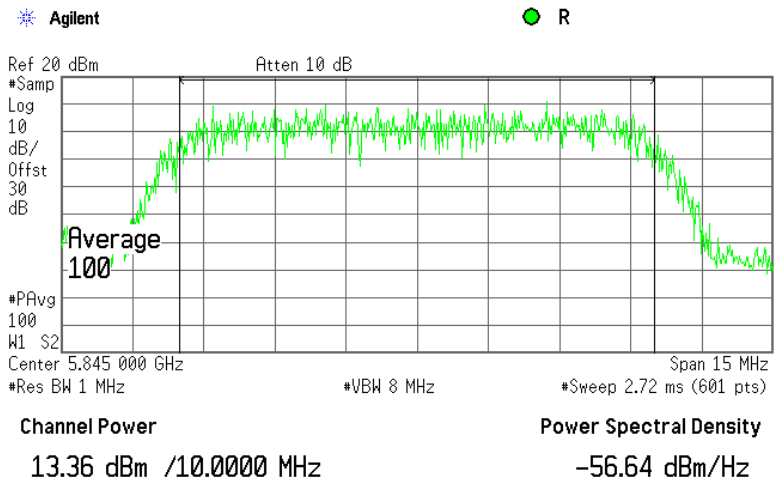


Plot 7.2.20 Output power at mid frequency, 10 MHz channel spacing, QPSK

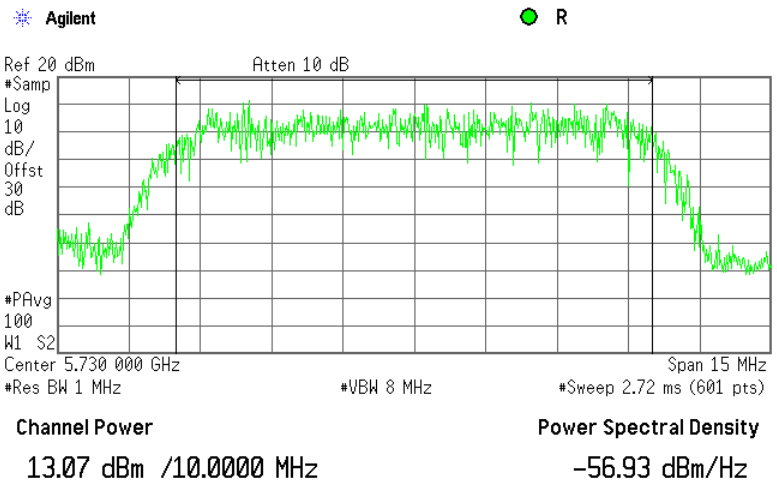


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.21 Output power at high frequency, 10 MHz channel spacing, QPSK

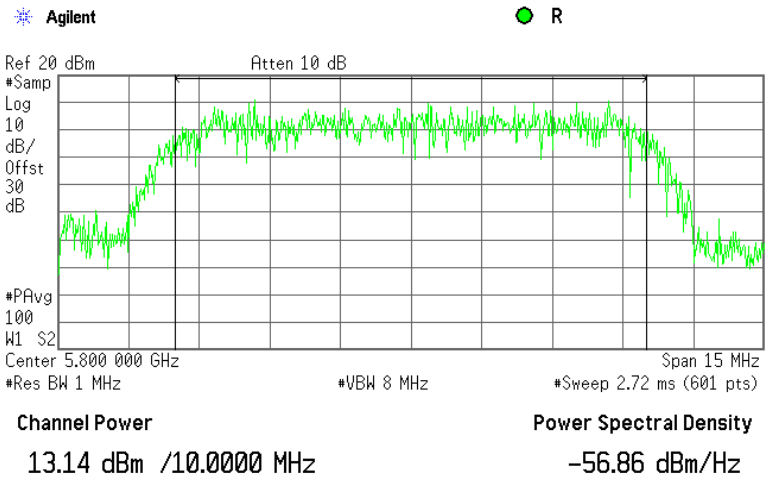


Plot 7.2.22 Output power at low frequency, 10 MHz channel spacing, 64QAM

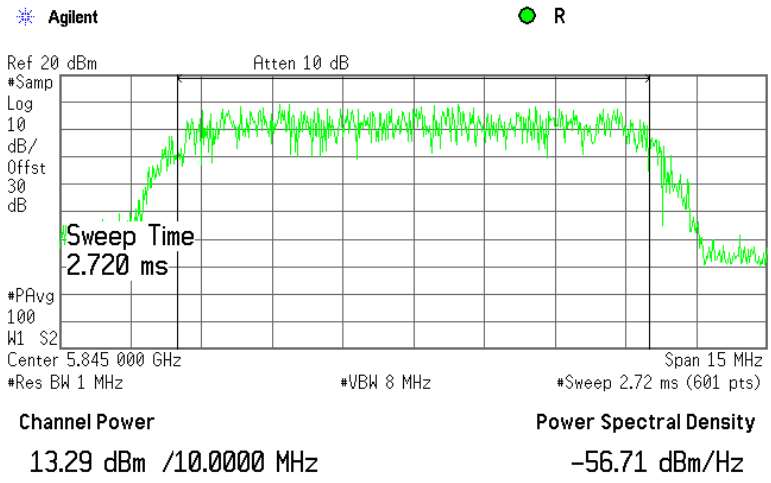


Test specification:	Section 15.247(b)(3), Output power		
Test procedure:	ANSI C63.10-2009 section 6.10.3.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.23 Output power at mid frequency, 10 MHz channel spacing, 64QAM



Plot 7.2.24 Output power at high frequency, 10 MHz channel spacing, 64QAM



Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

7.3 Spurious emissions at RF antenna connector

7.3.1 General

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

Table 7.3.1 Spurious emission limits

Frequency*, MHz	Attenuation below carrier**, dBc
0.009 – 10th harmonic	20.0 (30.0)

* - The above 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.
** - Spurious emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.3.2 Test procedure

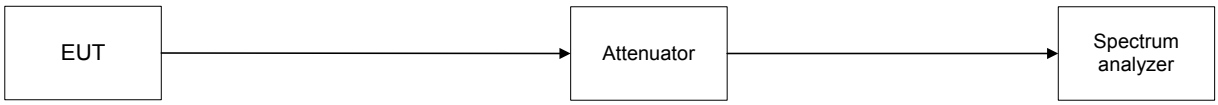
7.3.2.1 The EUT was set up as shown in Figure 7.3.1, energized and its proper operation was checked.

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

7.3.2.3 The highest emission level within the authorized band was measured.

7.3.2.4 The spurious emission was measured with spectrum analyzer as provided in Table 7.3.2, the ssociated plots and referenced to the highest emission level measured within the authorized band.

Figure 7.3.1 Spurious emission test setup



Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 ºC	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Table 7.3.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 5725 – 5850 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION: QPSK (worst case)
MODULATING SIGNAL: PRBS
BIT RATE: 4.0 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Spurious emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Low carrier frequency						
No emissions were found						Pass
Mid carrier frequency						
No emissions were found						Pass
High carrier frequency						
No emissions were found						Pass

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

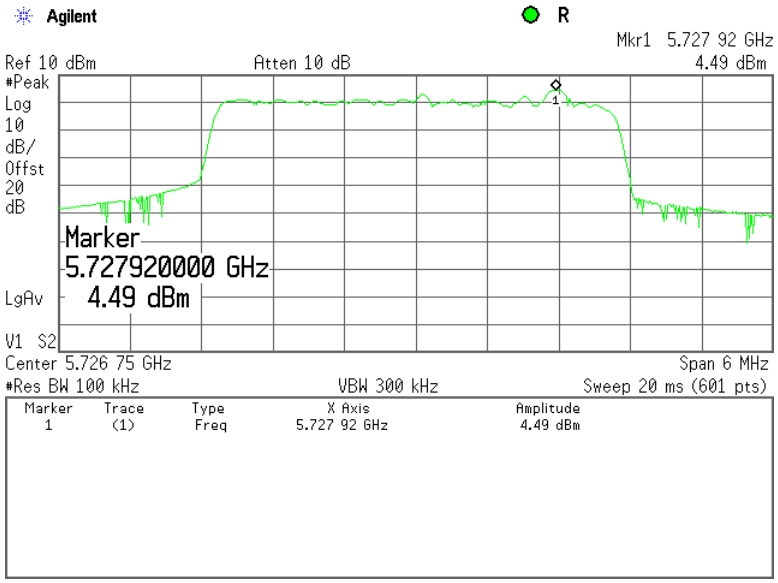
Reference numbers of test equipment used

HL 3787	HL 3818	HL 3903					

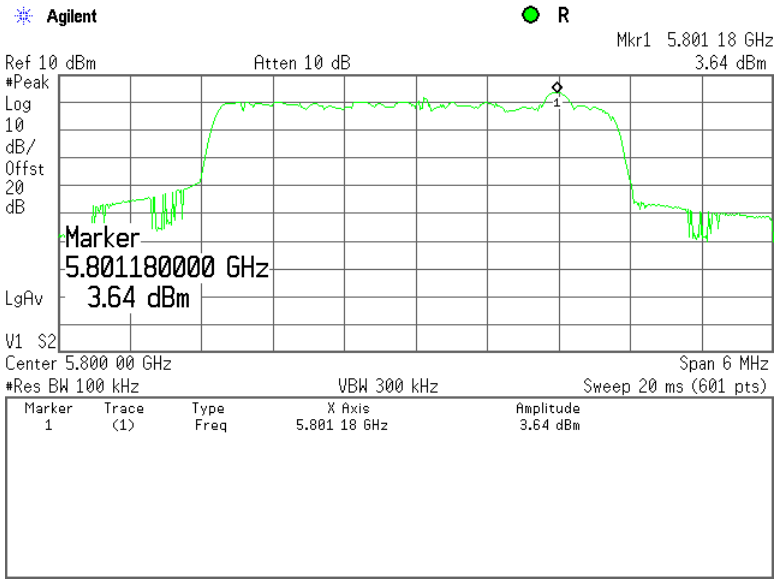
Full description is given in Appendix A.

Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.1 The highest emission level within the assigned band at low carrier frequency

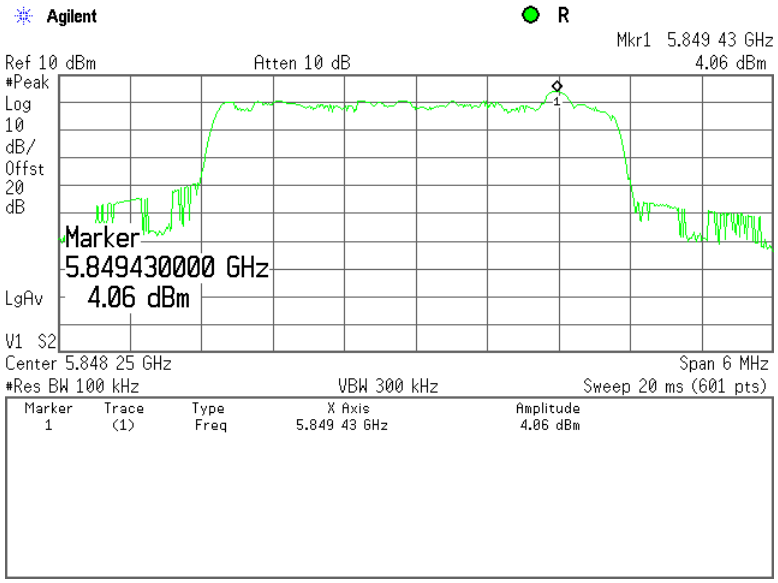


Plot 7.3.2 The highest emission level within the assigned band at mid carrier frequency

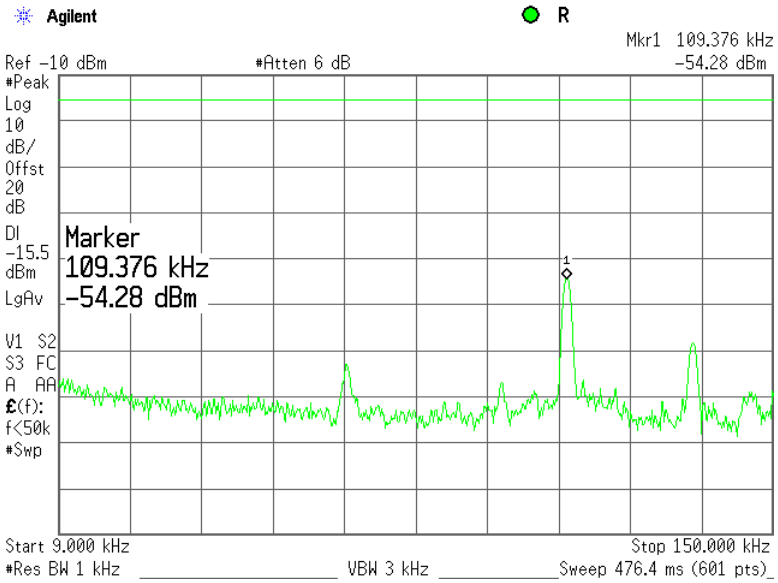


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.3 The highest emission level within the assigned band at high carrier frequency

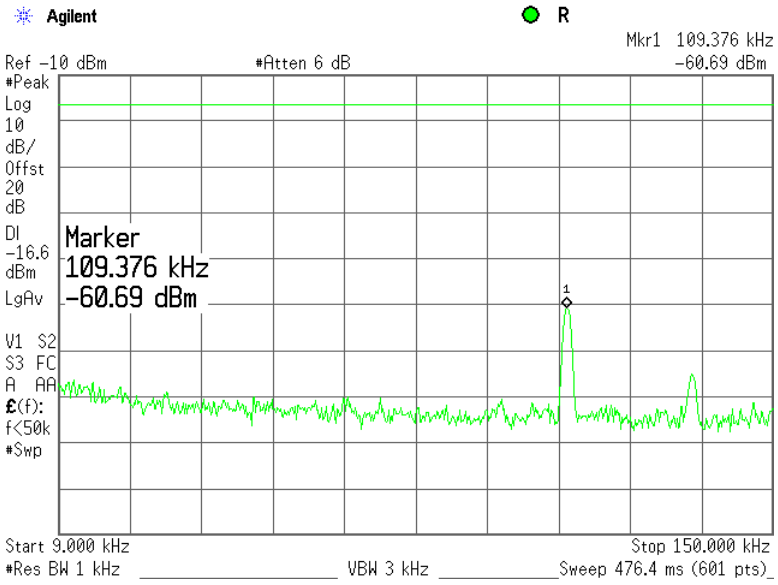


Plot 7.3.4 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

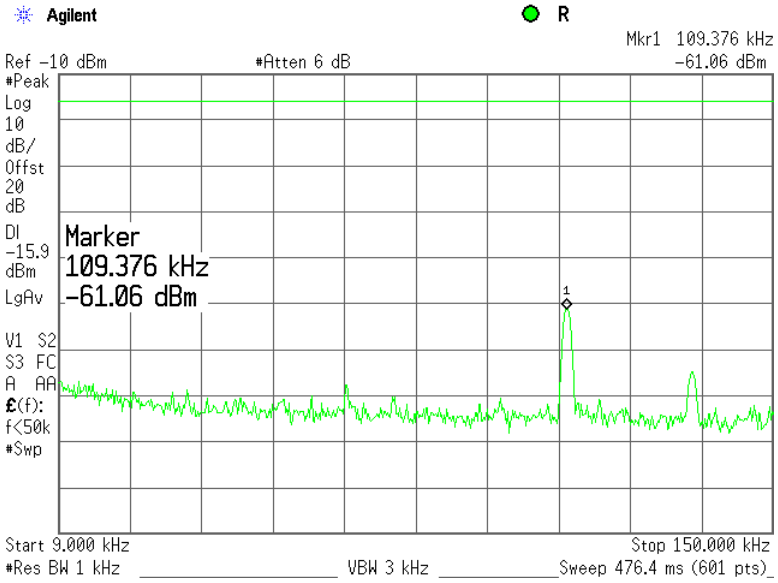


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.5 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

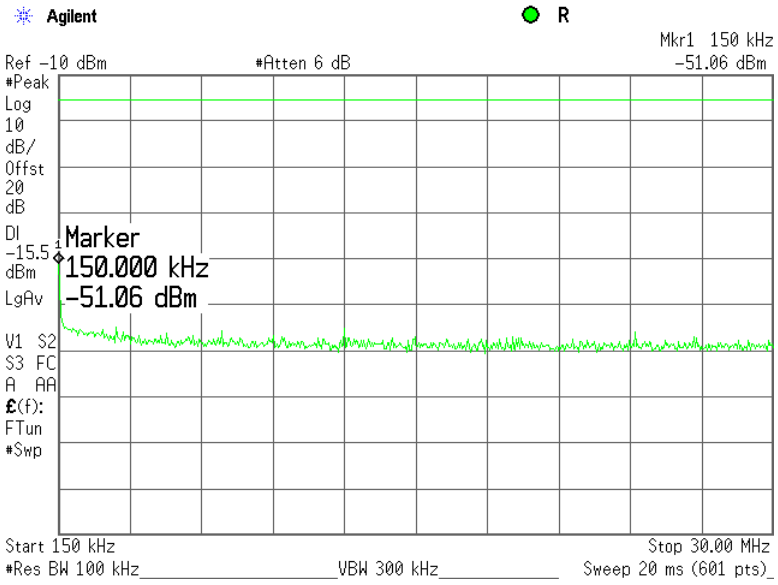


Plot 7.3.6 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

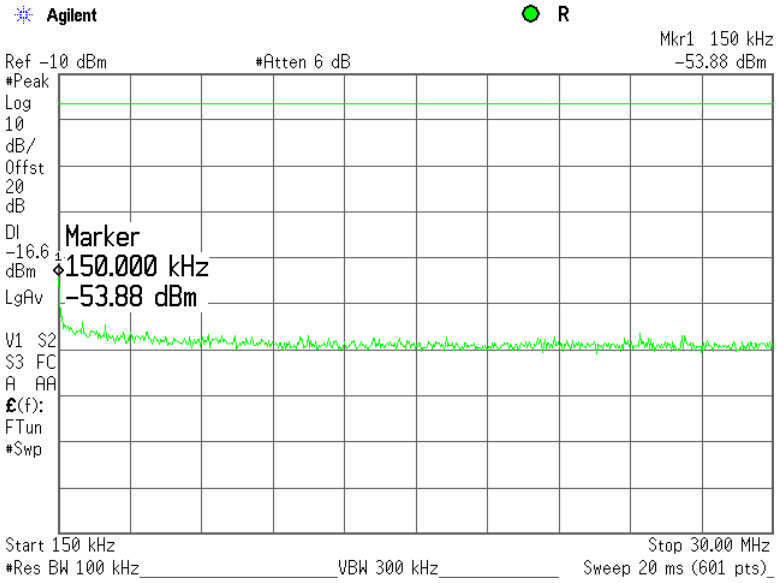


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.7 Spurious emission measurements in 0.15 - 30 MHz range at low carrier frequency

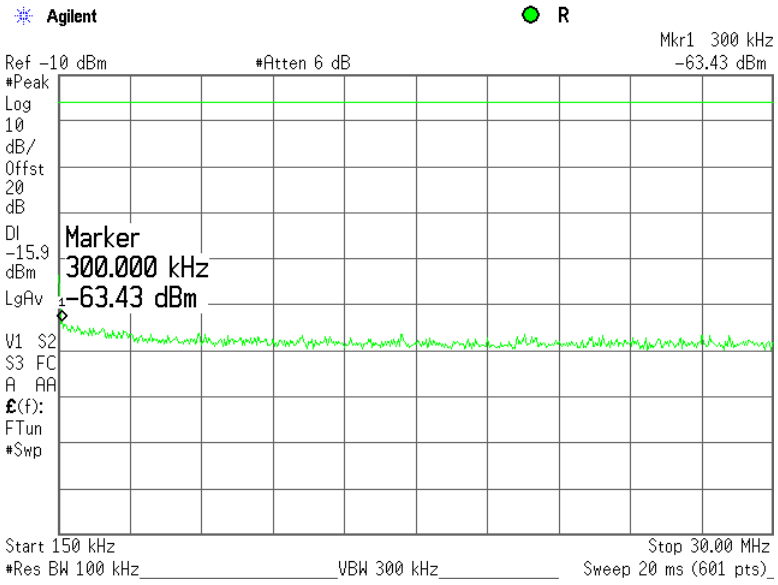


Plot 7.3.8 Spurious emission measurements in 0.15 - 30 MHz range at mid carrier frequency

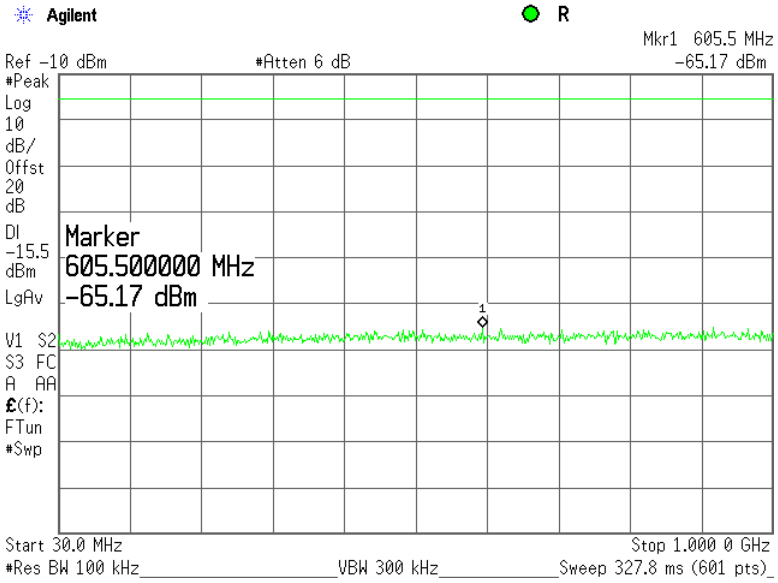


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.9 Spurious emission measurements in 0.15 - 30 MHz range at high carrier frequency

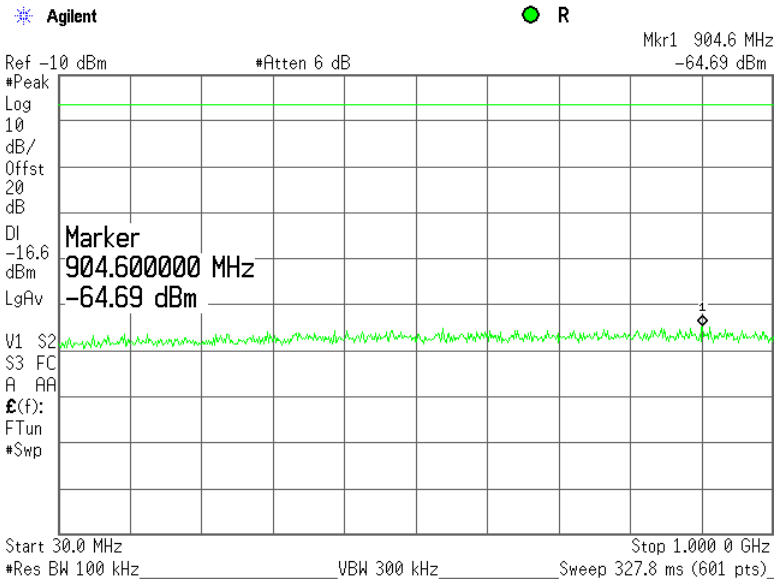


Plot 7.3.10 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency

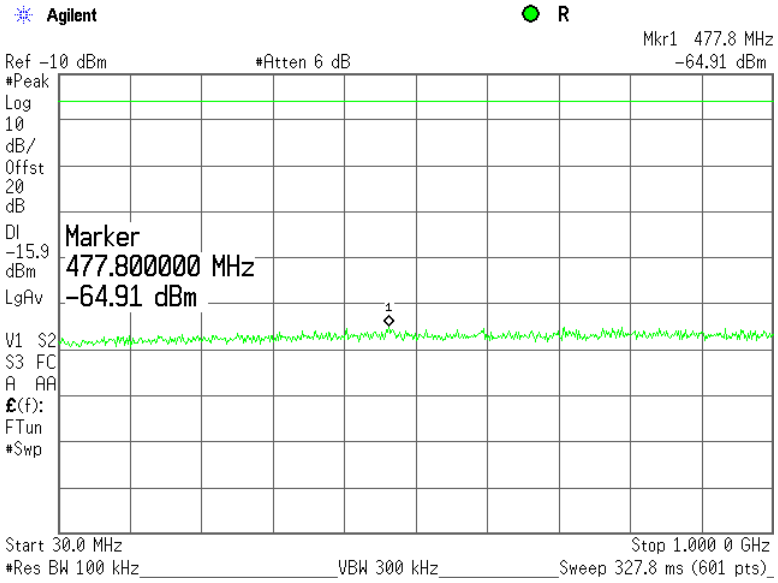


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.11 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency

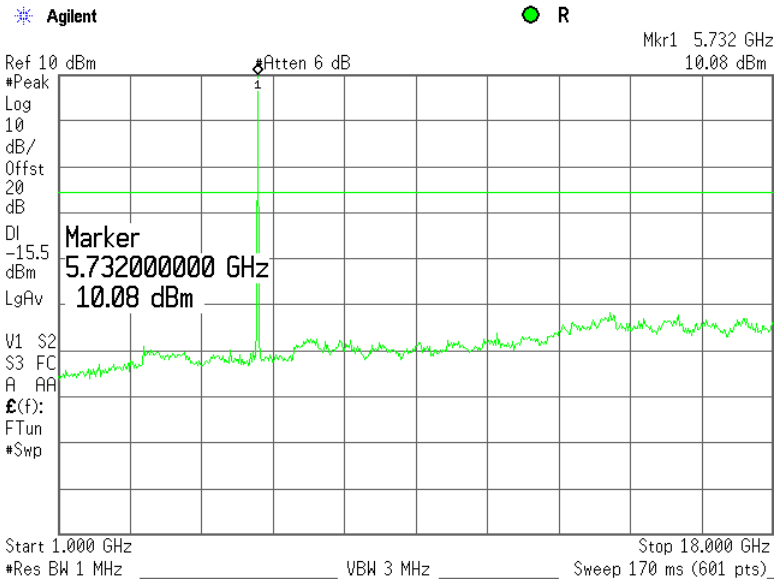


Plot 7.3.12 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency

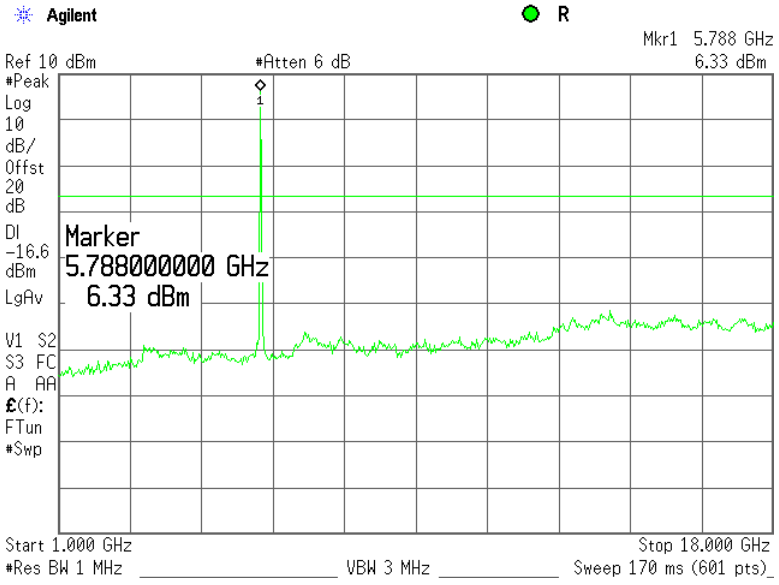


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.13 Spurious emission measurements in 1000 - 18000 MHz range at low carrier frequency

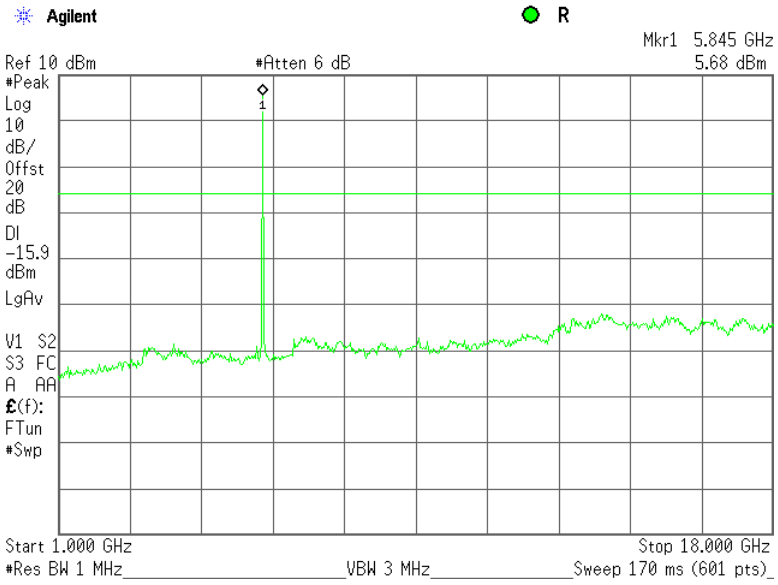


Plot 7.3.14 Spurious emission measurements in 1000 - 18000 MHz range at mid carrier frequency

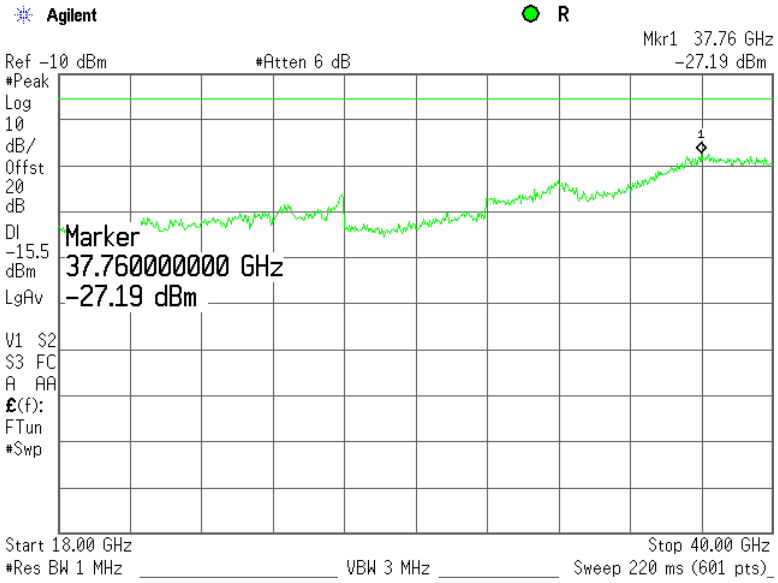


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.15 Spurious emission measurements in 1000 - 18000 MHz range at high carrier frequency

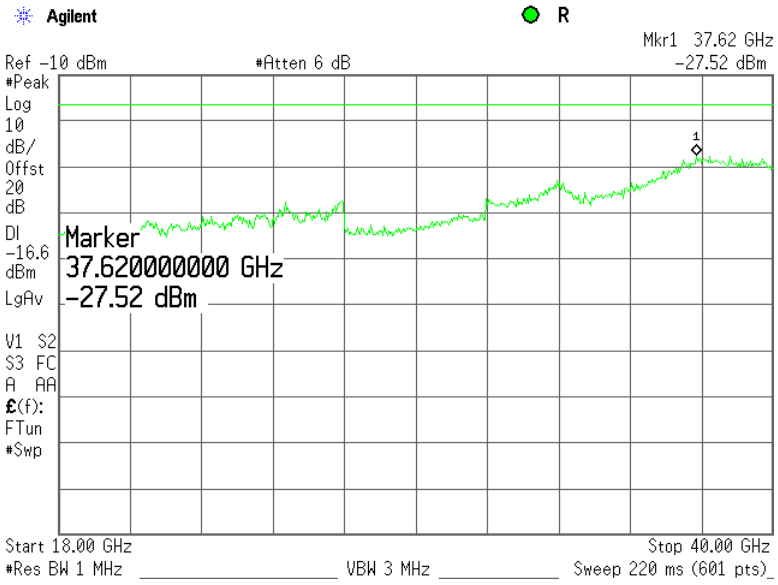


Plot 7.3.16 Spurious emission measurements in 18000 - 40000 MHz range at low carrier frequency

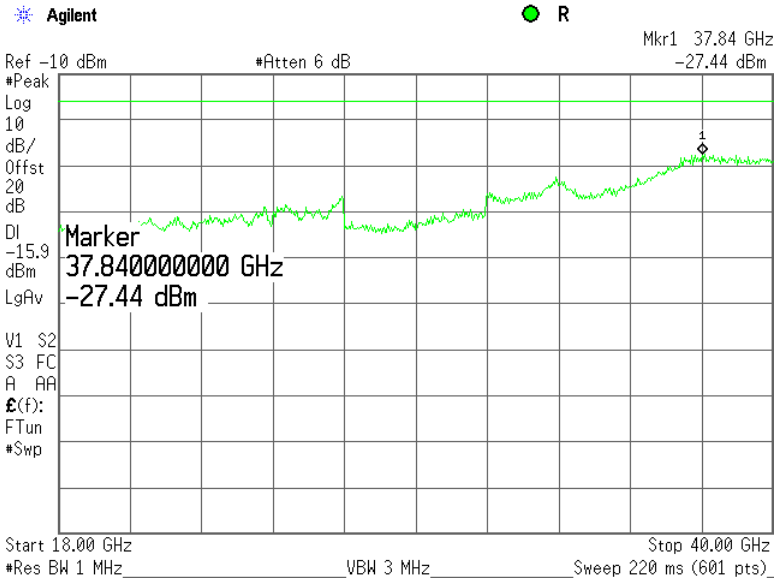


Test specification:	Section 15.247(d), Conducted spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.3 °C	Air Pressure: 1007 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.17 Spurious emission measurements in 18000 - 40000 MHz range at mid carrier frequency



Plot 7.3.18 Spurious emission measurements in 18000 - 40000 MHz range at high carrier frequency



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

7.4 Field strength of spurious emissions

7.4.1 General

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

Table 7.4.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Attenuation of field strength of spurious versus carrier outside restricted bands, dBc***
	Peak	Quasi Peak	Average	
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	20.0
0.090 – 0.110	NA	108.5 – 106.8**	NA	
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	
0.490 – 1.705	NA	73.8 – 63.0**	NA	
1.705 – 30.0*		69.5		
30 – 88		40.0		
88 – 216		43.5		
216 – 960		46.0		
960 - 1000		54.0		
1000 – 10th harmonic	74.0	NA	54.0	

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

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

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

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

*** - 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/ EMI receiver. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

7.4.2.3 The worst test results (the lowest margins) were recorded 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/ EMI receiver. To find maximum radiation the turntable was rotated 360^0, the measuring antenna height was changed from 1 to 4 m, its polarization was switched from vertical to horizontal.

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

Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Figure 7.4.1 Setup for spurious emission field strength measurements below 30 MHz

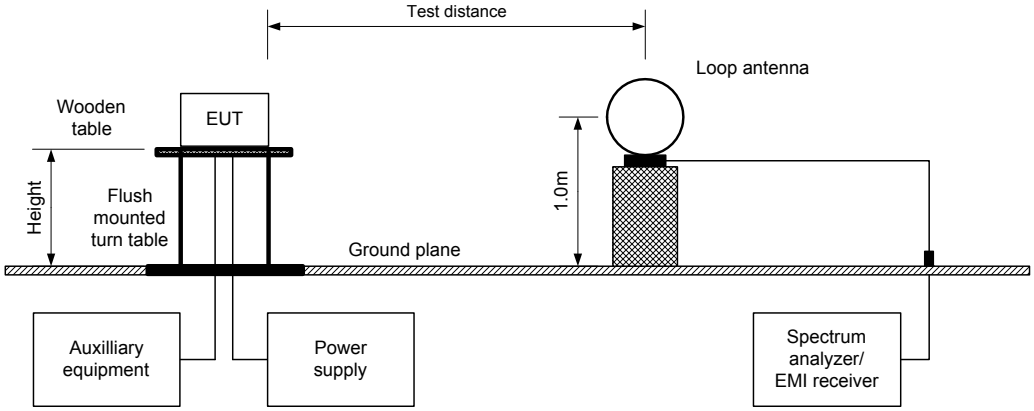
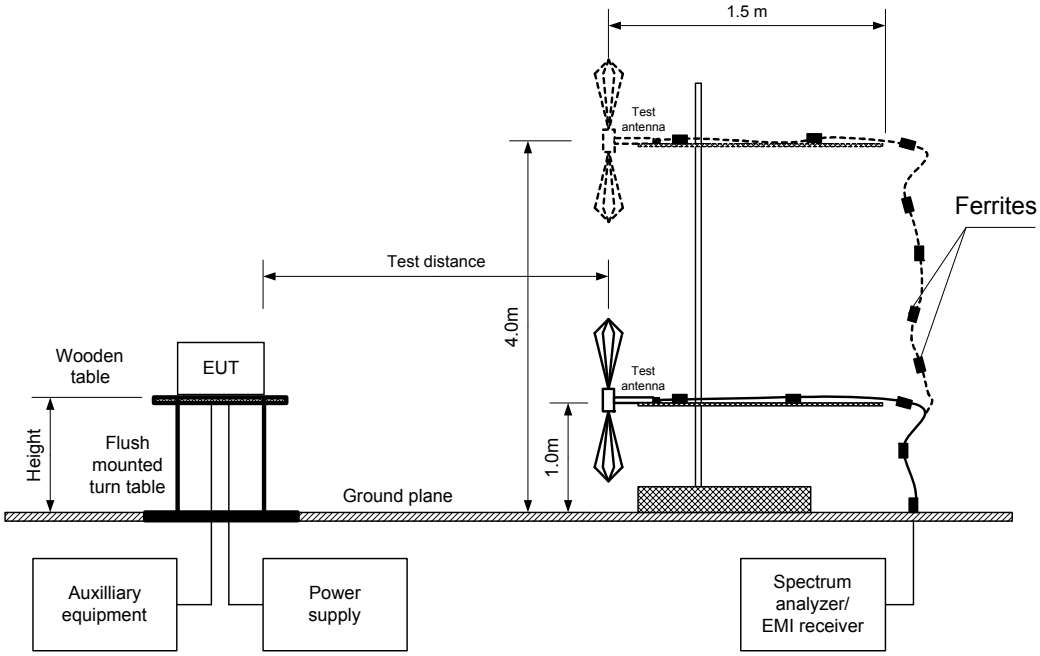


Figure 7.4.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Table 7.4.2 Field strength of emissions outside restricted bands

ASSIGNED FREQUENCY RANGE:	5725 – 5850 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 40000 MHz
TEST DISTANCE:	3 m
MODULATION:	QPSK (worst case)
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
DUTY CYCLE:	62 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
EUT ANTENNA:	Terminated 50 Ohm
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	100 kHz
VIDEO BANDWIDTH:	300 kHz
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Double ridged guide (above 1000 MHz)

Frequency, MHz	Field strength of spurious, dB(μV/m)	Antenna polarization	Antenna height, m	Azimuth, degrees*	Field strength of carrier, dB(μV/m)	Attenuation below carrier, dBc	Limit, dBc	Margin, dB**	Verdict
Low carrier frequency									
No emissions were foumd									Pass
Mid carrier frequency									
No emissions were foumd									Pass
High carrier frequency									
No emissions were foumd									Pass

*- EUT front panel refers to 0 degrees position of turntable.
**- Margin = Attenuation below carrier – specification limit.

Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Table 7.4.3 Field strength of spurious emissions above 1 GHz within restricted bands

ASSIGNED FREQUENCY:	5725 - 5850 MHz
INVESTIGATED FREQUENCY RANGE:	1000 - 40000 MHz
TEST DISTANCE:	3 m
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
DUTY CYCLE:	62 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
EUT ANTENNA:	Terminated 50 Ohm
DETECTOR USED:	Peak
RESOLUTION BANDWIDTH:	1000 kHz
TEST ANTENNA TYPE:	Double ridged guide

Frequency, MHz	Antenna		Azimuth, degrees*	Peak field strength(VBW=3 MHz)			Average field strength(VBW=10 Hz)				Verdict
	Polarization	Height, m		Measured, dB(μV/m)	Limit, dB(μV/m)	Margin, dB**	Measured, dB(μV/m)	Calculated, dB(μV/m)	Limit, dB(μV/m)	Margin, dB***	
Low carrier frequency											
No emissions were foumd											Pass
Mid carrier frequency											
No emissions were foumd											Pass
High carrier frequency											
No emissions were foumd											Pass

*****- EUT front panel refers to 0 degrees position of turntable.
******- Margin = Measured field strength - specification limit.
***- Margin = Calculated field strength - specification limit,
where Calculated field strength = Measured field strength + average factor.

Table 7.4.4 Average factor calculation

Transmission pulse		Transmission burst		Transmission train duration, ms	Average factor, dB
Duration, ms	Period, ms	Duration, ms	Period, ms		
2.78	4.98	NA	NA	NA	-5.06

*- Average factor was calculated as follows

for pulse train shorter than 100 ms:
$$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{Train\ duration} \times Number\ of\ bursts\ within\ pulse\ train\right)$$

for pulse train longer than 100 ms:
$$Average\ factor = 20 \times \log_{10}\left(\frac{Pulse\ duration}{Pulse\ period} \times \frac{Burst\ duration}{100\,ms} \times Number\ of\ bursts\ within\ 100\,ms\right)$$

Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Table 7.4.5 Field strength of spurious emissions below 1 GHz within restricted bands

ASSIGNED FREQUENCY:	5725 - 5850 MHz
INVESTIGATED FREQUENCY RANGE:	0.009 – 1000 MHz
TEST DISTANCE:	3 m
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	4 Mbps
DUTY CYCLE:	62 %
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
EUT ANTENNA:	Terminated 50 Ohm
RESOLUTION BANDWIDTH:	1.0 kHz (9 kHz – 150 kHz) 9.0 kHz (150 kHz – 30 MHz) 120 kHz (30 MHz – 1000 MHz)
VIDEO BANDWIDTH:	> Resolution bandwidth
TEST ANTENNA TYPE:	Active loop (9 kHz – 30 MHz) Biconilog (30 MHz – 1000 MHz)

Frequency, MHz	Peak emission, dB(μV/m)	Quasi-peak			Antenna polarization	Antenna height, m	Turn-table position**, degrees	Verdict
		Measured emission, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*				
Low carrier frequency								
149.9000	29.0	23.8	43.5	-19.7	Hor	1.0	279	Pass
150.4800	39.0	36.2	43.5	-7.3	Hor	1.0	279	
280.0094	45.2	42.0	46.0	-4.0	Vert	1.2	179	
285.0000	47.9	44.5	46.0	-1.5	Vert	1.2	179	
Mid carrier frequency								
149.9000	28.0	21.9	43.5	-21.6	Hor	1.0	300	Pass
150.6200	39.0	37.3	43.5	-6.2	Hor	1.0	300	
280.0094	43.2	40.1	46.0	-5.9	Vert	1.2	30	
285.0000	48.8	45.7	46.0	-0.3	Vert	1.2	20	
High carrier frequency								
149.9000	29.1	22.4	43.5	-21.1	Hor	1.0	266	Pass
150.7550	39.5	37.7	43.5	-5.8	Hor	1.0	266	
279.8893	44.0	40.8	46.0	-5.2	Vert	1.2	10	
285.0000	45.4	41.1	46.0	-4.9	Vert	1.2	20	

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

Table 7.4.6 Restricted bands

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

Reference numbers of test equipment used

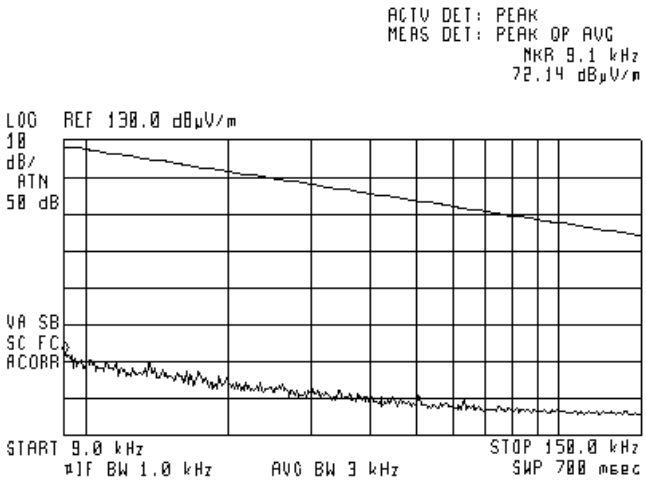
HL 0446	HL 0521	HL 0604	HL 0768	HL 0769	HL 3533	HL 3535	HL 3818
HL 3901	HL 4352	HL 4353					

Full description is given in Appendix A.

Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

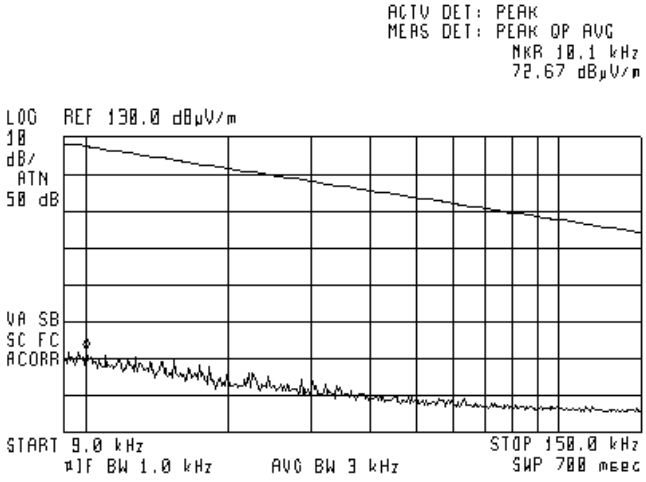
Plot 7.4.1 Radiated emission measurements from 9 to 150 kHz at the low carrier frequency

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



Plot 7.4.2 Radiated emission measurements from 9 to 150 kHz at the mid carrier frequency

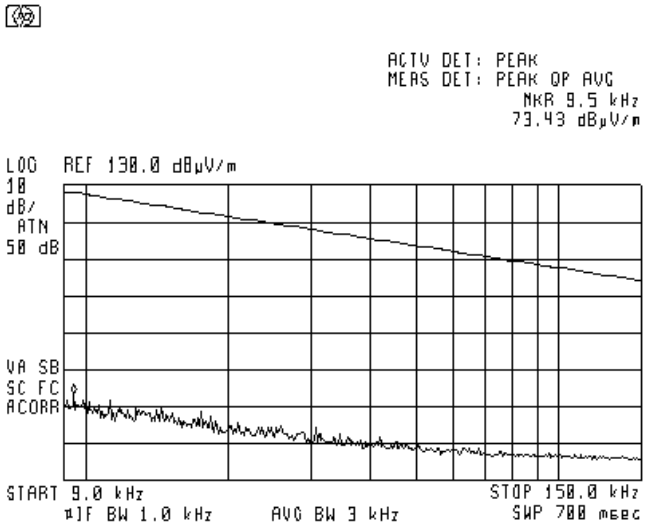
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

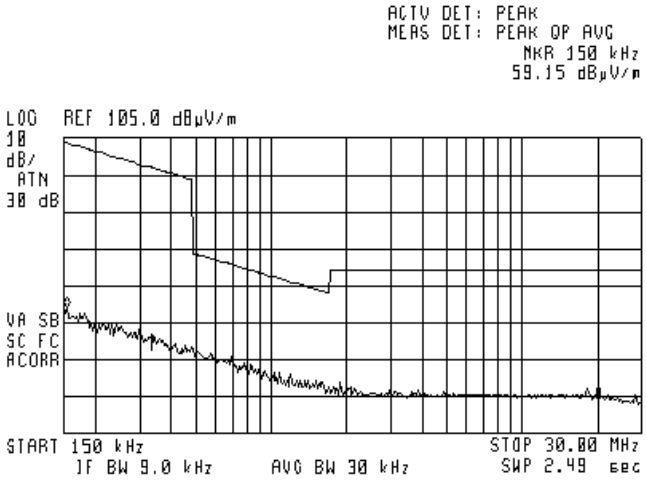
Plot 7.4.3 Radiated emission measurements from 9 to 150 kHz at the high carrier frequency

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



Plot 7.4.4 Radiated emission measurements from 0.15 to 30 MHz at the low carrier frequency

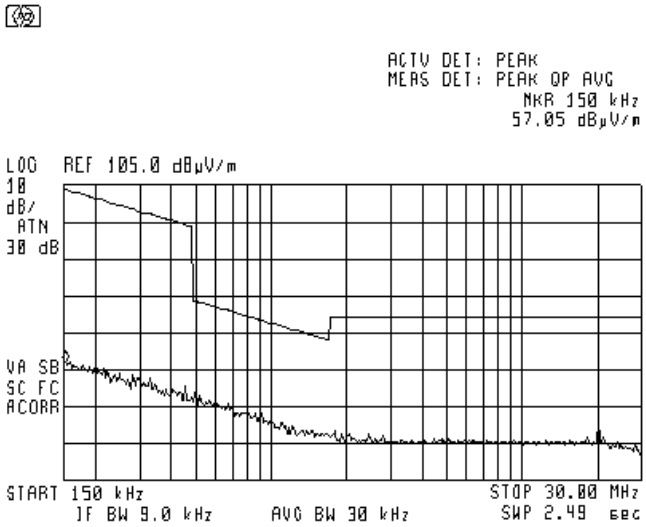
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	**Section 15.247(d), Radiated spurious emissions**		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48VDC
Remarks:			

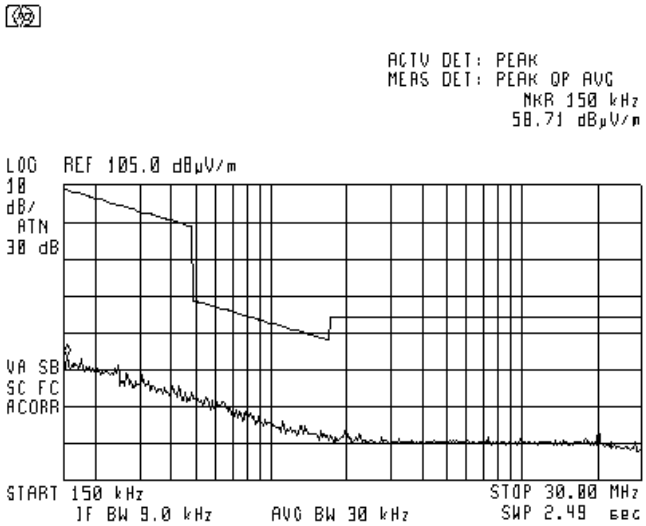
Plot 7.4.5 Radiated emission measurements from 0.15 to 30 MHz at the mid carrier frequency

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



Plot 7.4.6 Radiated emission measurements from 0.15 to 30 MHz at the high carrier frequency

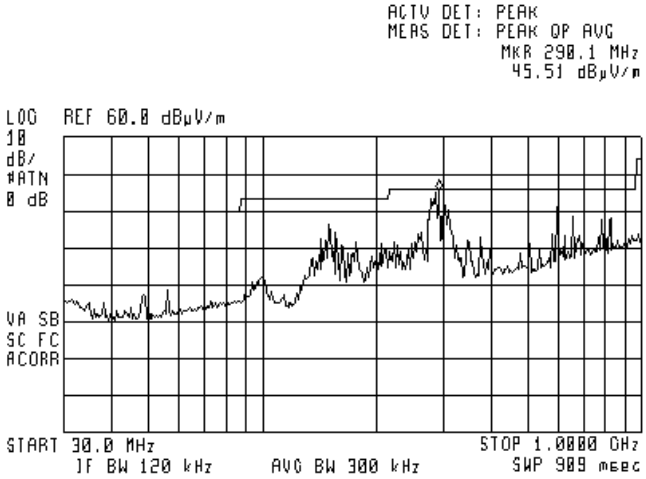
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

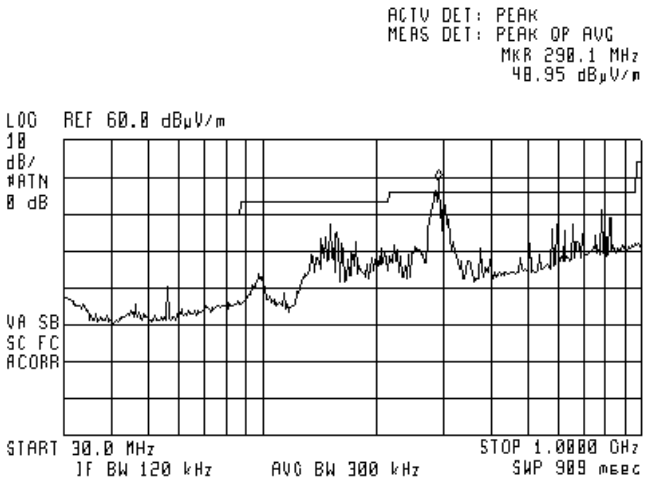
Plot 7.4.7 Radiated emission measurements from 30 to 1000 MHz at the low carrier frequency

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



Plot 7.4.8 Radiated emission measurements from 30 to 1000 MHz at the mid carrier frequency

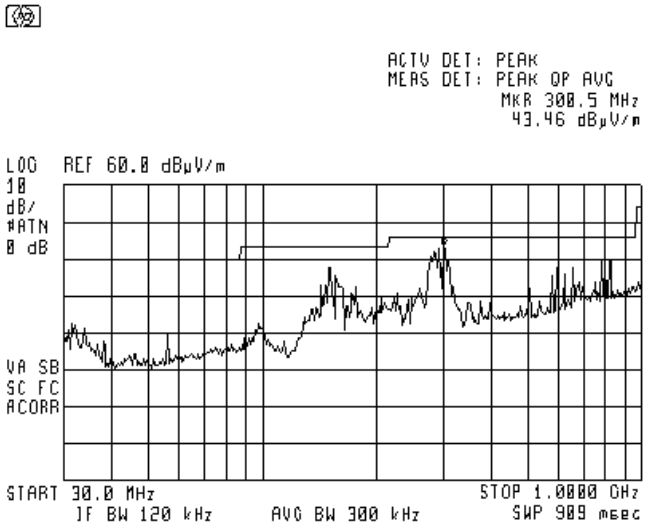
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Test specification:	**Section 15.247(d), Radiated spurious emissions**		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48VDC
Remarks:			

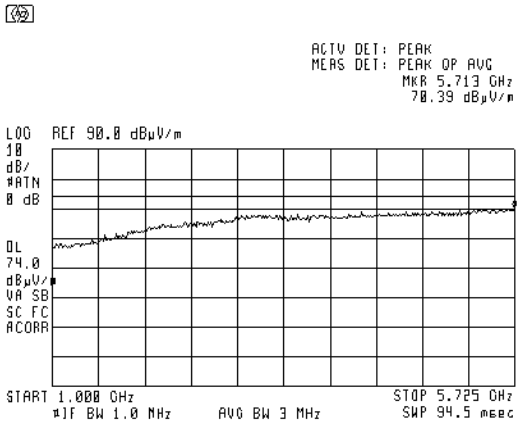
Plot 7.4.9 Radiated emission measurements from 30 to 1000 MHz at the high carrier frequency

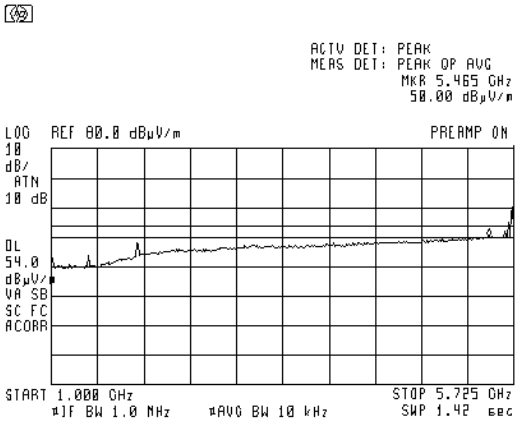
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal



Plot 7.4.10 Radiated emission measurements from 1000 to 5725 MHz at the low carrier frequency

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

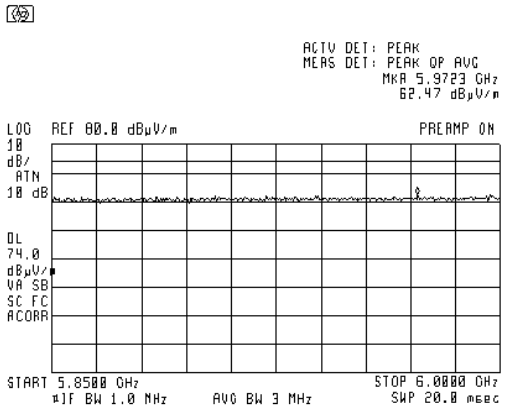


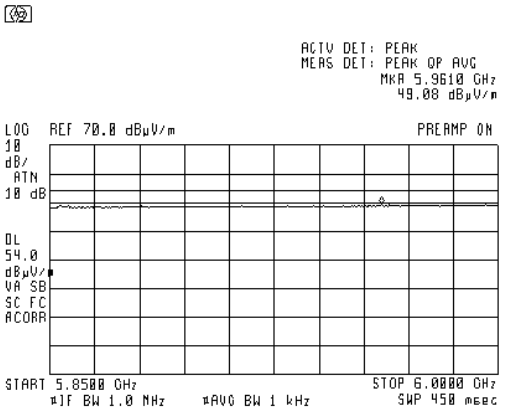


Test specification:	**Section 15.247(d), Radiated spurious emissions**		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48VDC
Remarks:			

Plot 7.4.11 Radiated emission measurements from 5850 to 6000 MHz at the low carrier frequency

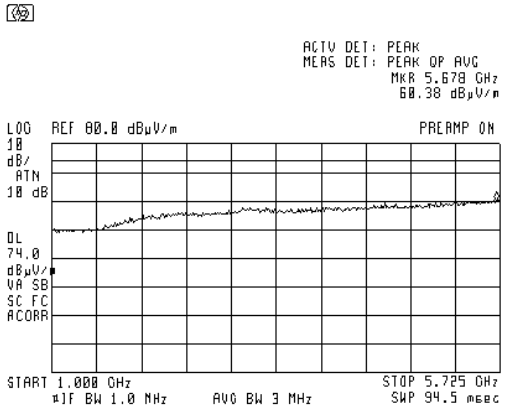
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Peak DETECTOR: Average

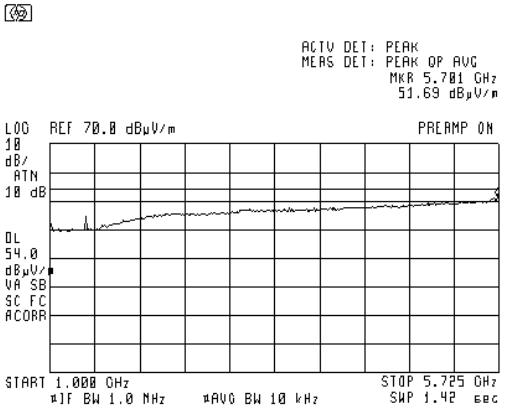




Plot 7.4.12 Radiated emission measurements from 1000 to 5725 MHz at the mid carrier frequency

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

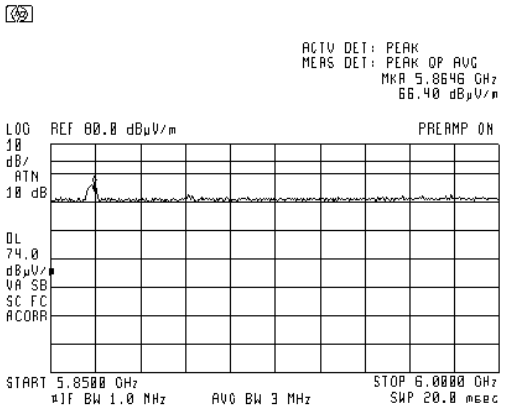


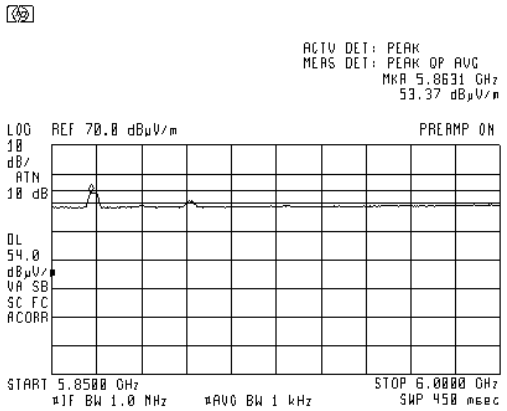


Test specification:	**Section 15.247(d), Radiated spurious emissions**		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48VDC
Remarks:			

Plot 7.4.13 Radiated emission measurements from 5850 to 6000 MHz at the mid carrier frequency

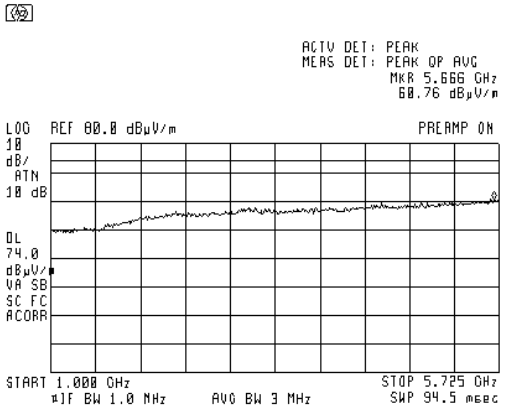
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Peak DETECTOR: Average

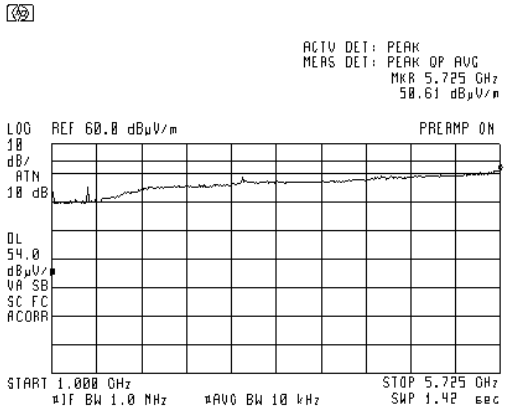




Plot 7.4.14 Radiated emission measurements from 1000 to 6000 MHz at the high carrier frequency

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

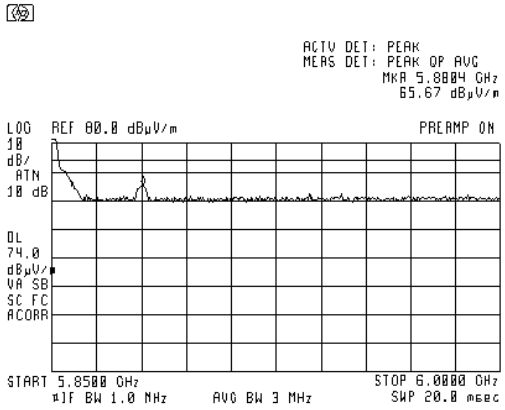




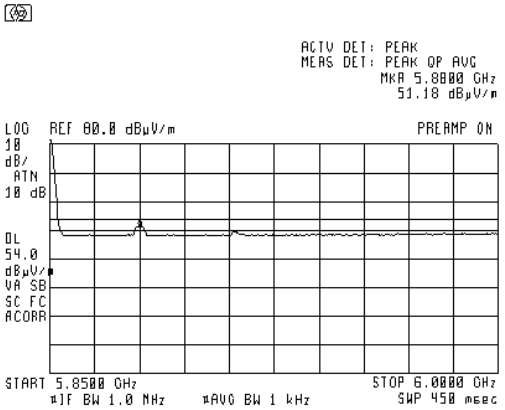
Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.15 Radiated emission measurements from 5850 to 6000 MHz at the high carrier frequency

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

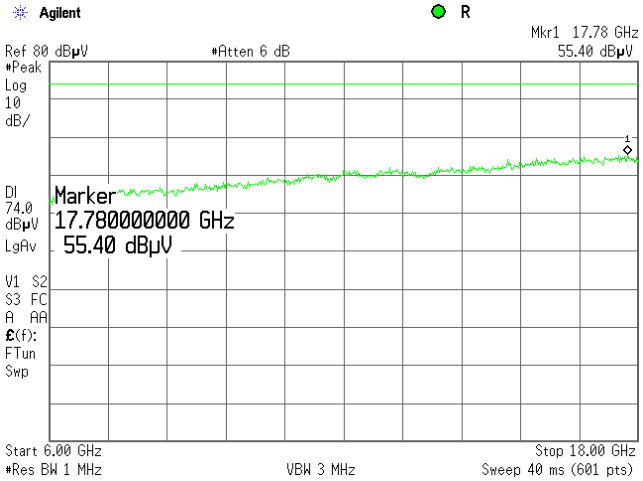


DETECTOR: Average

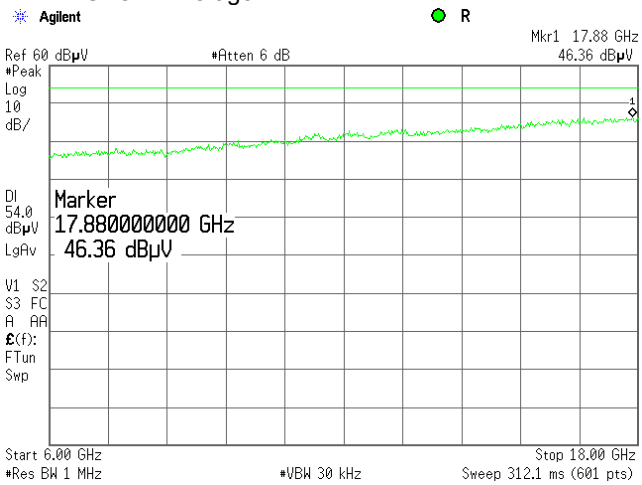


Plot 7.4.16 Radiated emission measurements from 6000 to 18000 MHz at the low carrier frequency

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



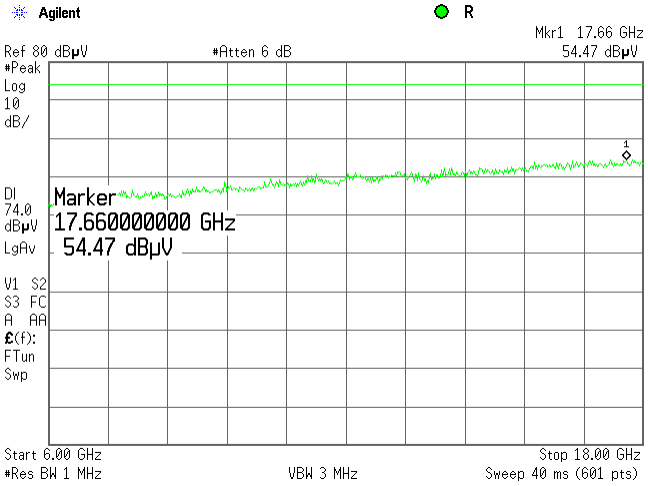
DETECTOR: Average



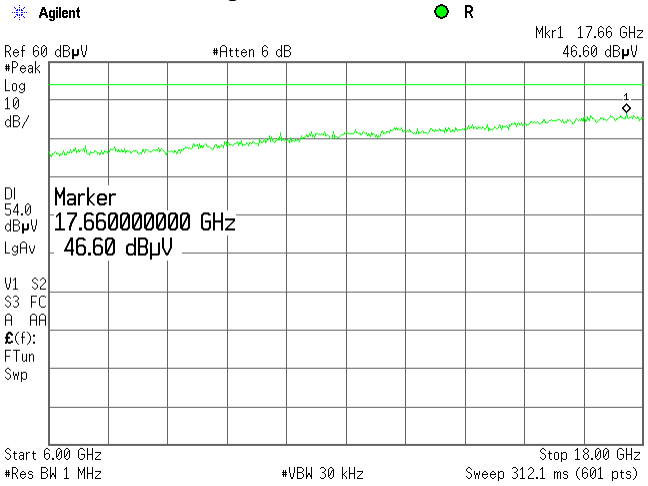
Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.17 Radiated emission measurements from 6000 to 18000 MHz at the mid carrier frequency

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

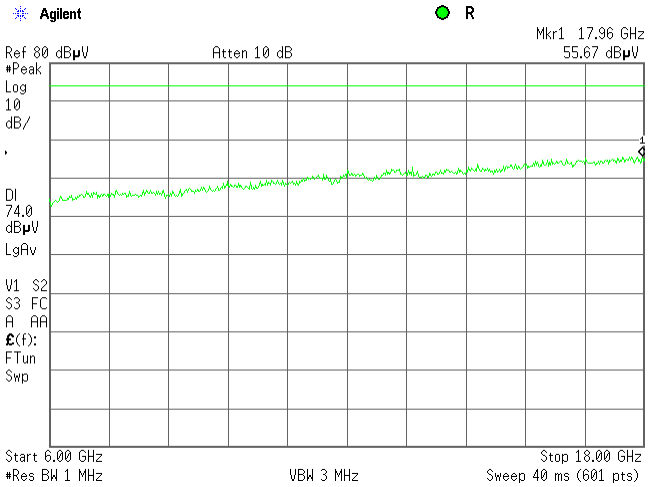


DETECTOR: Average

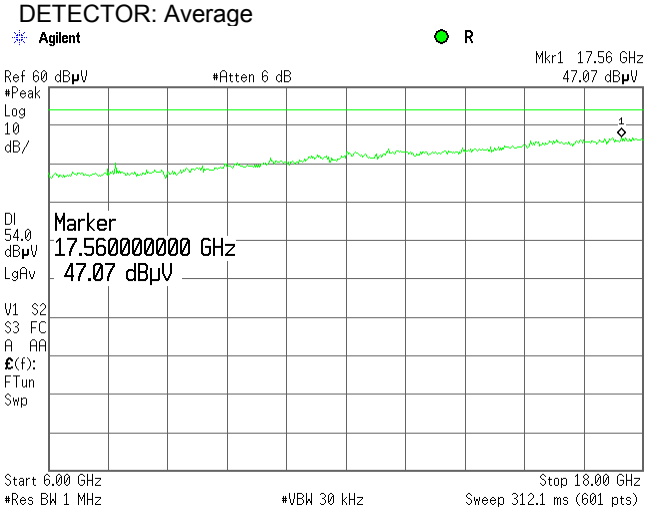


Plot 7.4.18 Radiated emission measurements from 6000 to 18000 MHz at the high carrier frequency

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



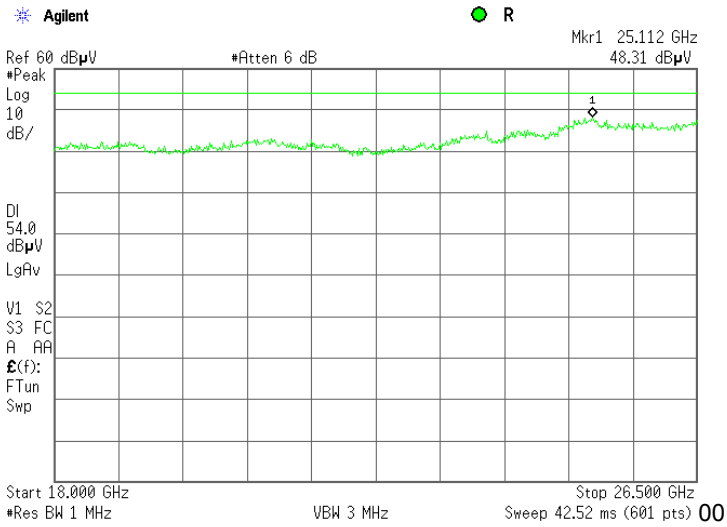
DETECTOR: Average



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

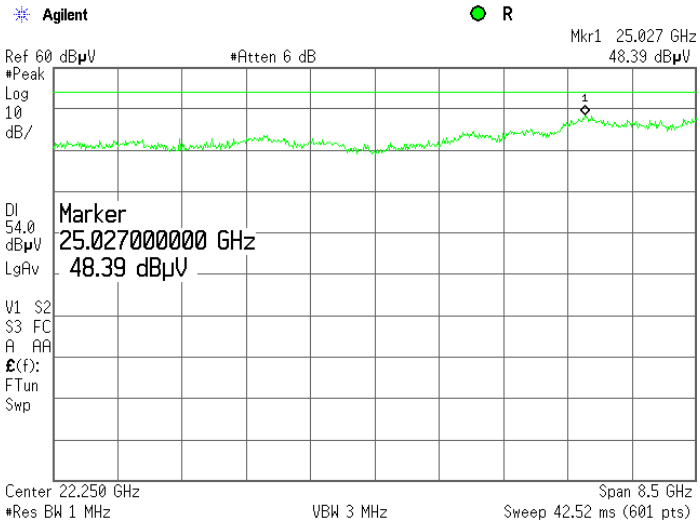
Plot 7.4.19 Radiated emission measurements from 18000 to 26500 MHz at the low carrier frequency

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



Plot 7.4.20 Radiated emission measurements from 18000 to 26500 MHz at the mid carrier frequency

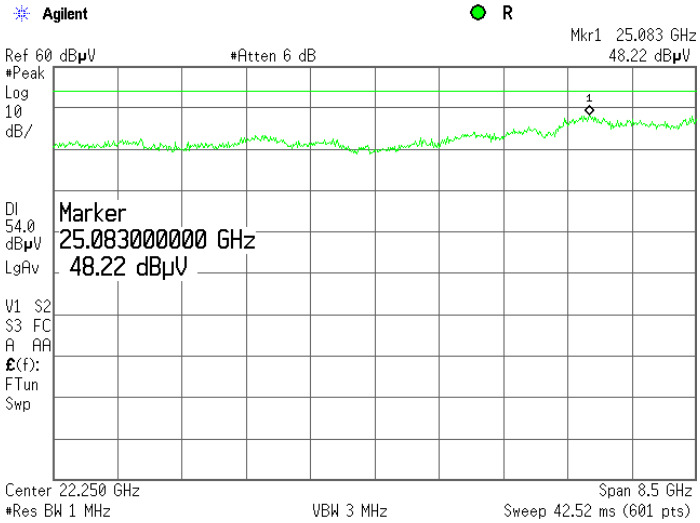
TEST SITE: Anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Peak



Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 ºC	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

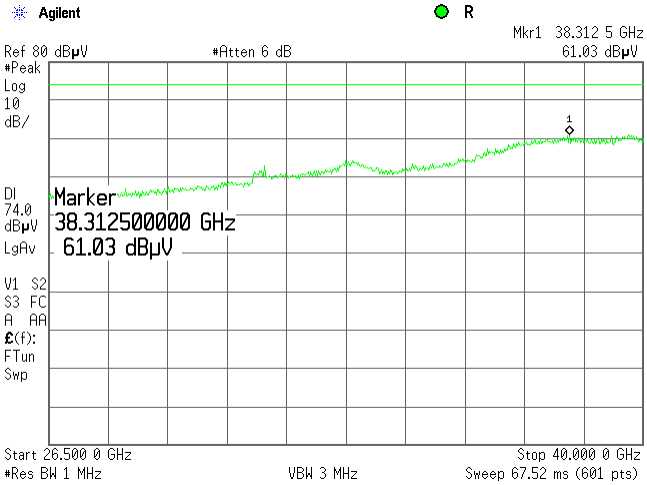
Plot 7.4.21 Radiated emission measurements from 18000 to 26500 MHz at the high carrier frequency

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

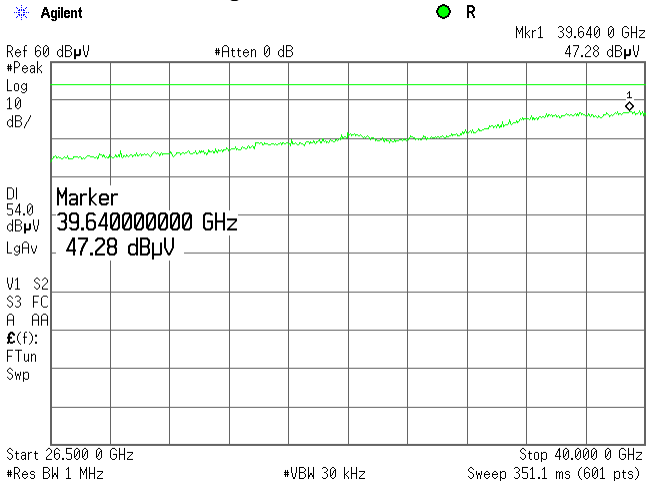


Plot 7.4.22 Radiated emission measurements from 26500 to 40000 MHz at the low carrier frequency

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



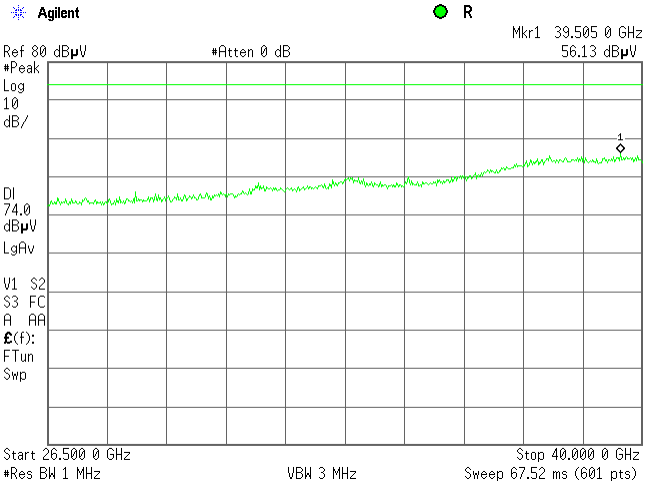
DETECTOR: Average

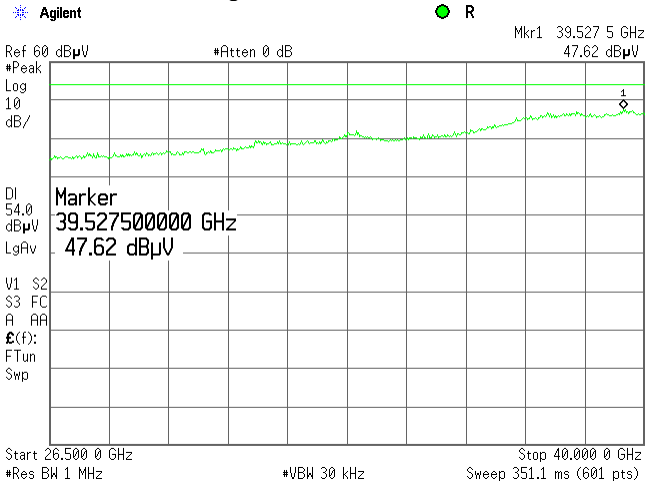


Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.23 Radiated emission measurements from 26500 to 40000 MHz at the mid carrier frequency

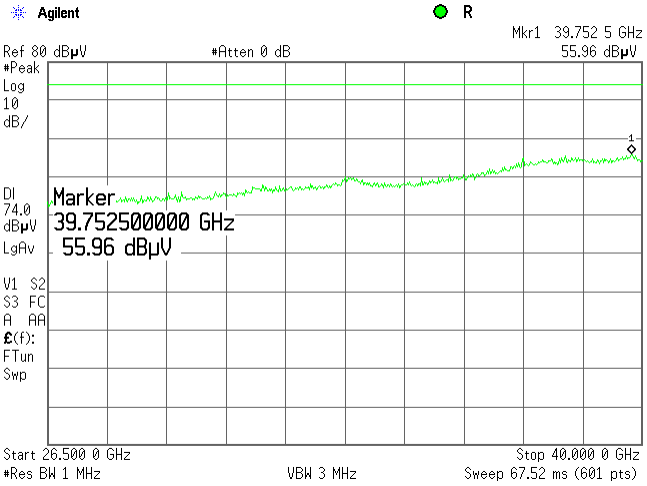
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Peak / DETECTOR: Average

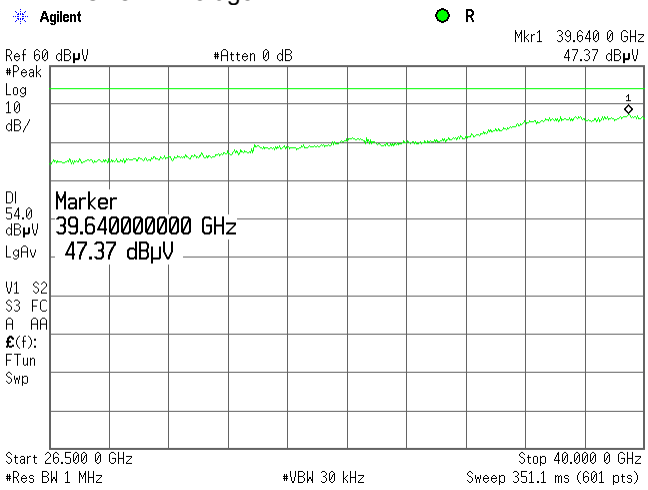




Plot 7.4.24 Radiated emission measurements from 26500 to 40000 MHz at the high carrier frequency

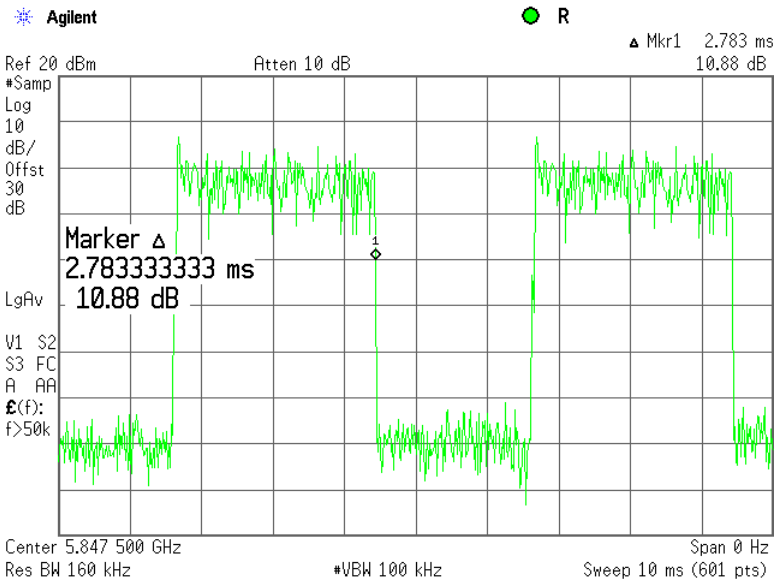
TEST SITE: Semi anechoic chamber
TEST DISTANCE: 3 m
ANTENNA POLARIZATION: Vertical and Horizontal
DETECTOR: Peak / DETECTOR: Average



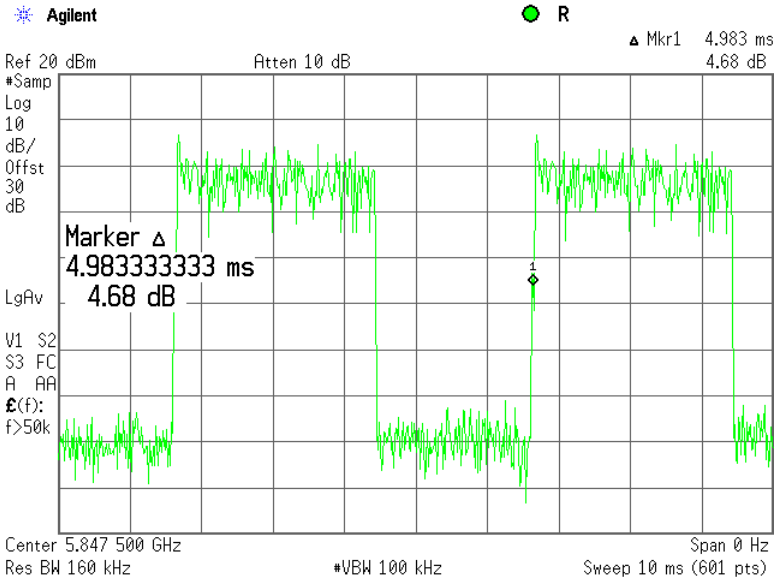


Test specification:	Section 15.247(d), Radiated spurious emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01/ANSI C63.4, Section 13.1.4		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.3 °C	Air Pressure: 1006 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.25 Transmission pulse duration



Plot 7.4.26 Transmission pulse period



Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 ºC	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

7.5 Radiated versus conducted measurements

7.5.1 General

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

Table 7.5.1 Radiated spurious emissions limits

Frequency, MHz	Field strength at 3 m within restricted bands, dB(μV/m)*			Conducted limit within restricted bands***, dBm*		
	Peak	Quasi Peak	Average	Peak	Quasi Peak	Average
0.009 – 0.090	148.5 – 128.5	NA	128.5 – 108.5**	24.75 – 4.75	NA	4.75 – -15.35
0.090 – 0.110	NA	108.5 – 106.8**	NA		-15.75 – -16.95	NA
0.110 – 0.490	126.8 – 113.8	NA	106.8 – 93.8**	3.05 – -9.95	NA	-17.05 – -29.95
0.490 – 1.705	NA	73.8 – 63.0**	NA	NA	-49.95 – -60.75	NA
1.705 – 30.0*		69.5			-54.25	
30 – 88		40.0			-82.45	
88 – 216		43.5			-78.45	
216 – 960		46.0			-76.45	
960 - 1000		54.0			-68.45	
1000 – 10th harmonic	74.0	NA	54.0	-43.75	NA	-63.75

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

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

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

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

*** - Conducted limit within restricted bands was determined from the follow relationship:

$$EIRP = E + 20 \log (d) - 104.8 – AG – 10*\log(N) – \text{Ground reflection factor}$$

where EIRP = the equivalent isotropic radiated power in dBm,

E = electric field strength in dBuV/m,

D = measurement distance in meters,

AG = Antenna Gain in dBi (AG = 16.5dBi),

N = number of RF outputs (N = 4)

Ground reflection factor = 6 dB for frequencies below 30 MHz and 4.7 dB in frequency range 30-1000 MHz.

7.5.2 Test procedure

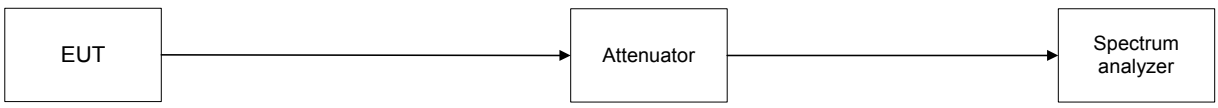
7.5.2.1 The EUT was set up as shown in Figure 7.5.1, energized and its proper operation was checked.

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

7.5.2.3 The highest emission level within the authorized band was measured.

7.5.2.4 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and the associated plots and referenced to the emission level determined using the electric field strength limit and measurememnt distances for unwanted emissions into the restricted frequency bands.

Figure 7.5.1 Spurious emission test setup



Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 ºC	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Table 7.5.2 Spurious emission within restricted bands test results

ASSIGNED FREQUENCY RANGE: 5725 – 5850 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1 kHz (9 kHz – 150 kHz)
10 kHz (150 kHz – 30 MHz)
100 kHz (30 MHz – 1000 MHz)
1000 kHz (above 1000 MHz)
VIDEO BANDWIDTH: >3 x RBW
MODULATION: QPSK (Worst case)
MODULATING SIGNAL: PRBS
BIT RATE: 4.0 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
NUMBER OF RF OUTPUTS : 4

Frequency, MHz	Spurious emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin, dB*	Verdict
Low carrier frequency						
No emissions were found						Pass
Mid carrier frequency						
No emissions were found						Pass
High carrier frequency						
No emissions were found						Pass

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

Table 7.5.3 Restricted bands

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

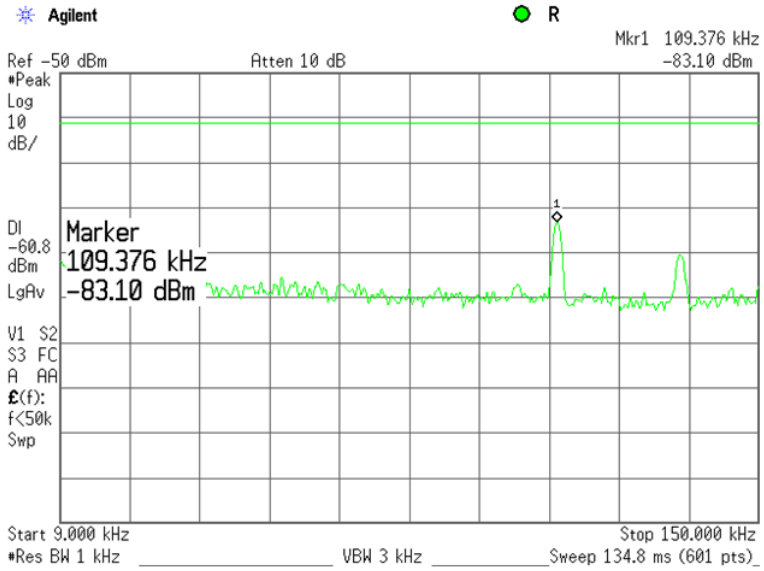
Reference numbers of test equipment used

HL 3787	HL 3818	HL 3903					

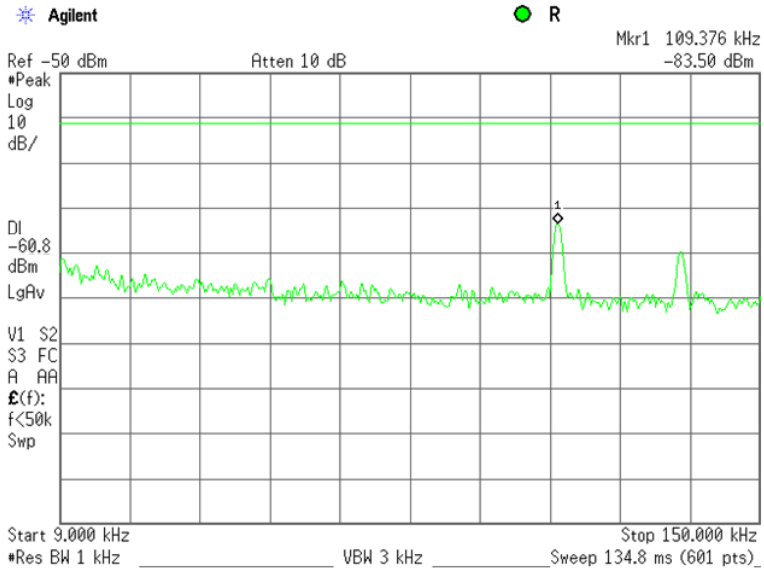
Full description is given in Appendix A.

Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

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

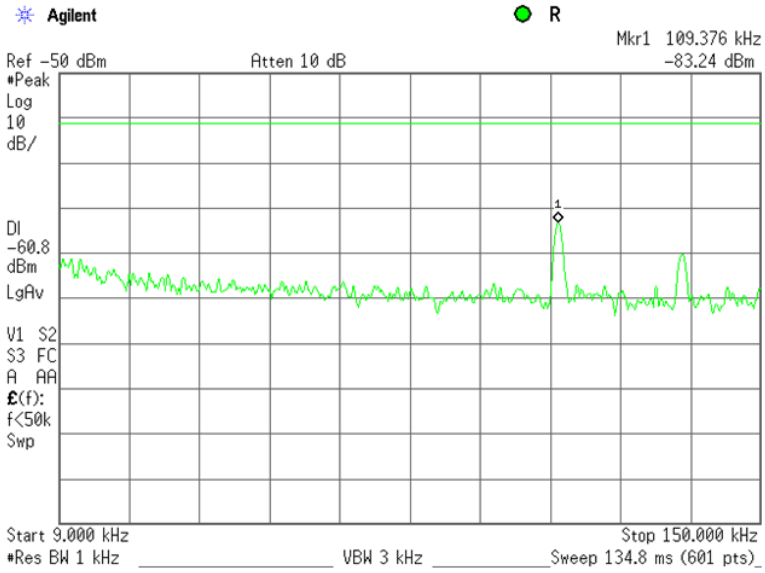


Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

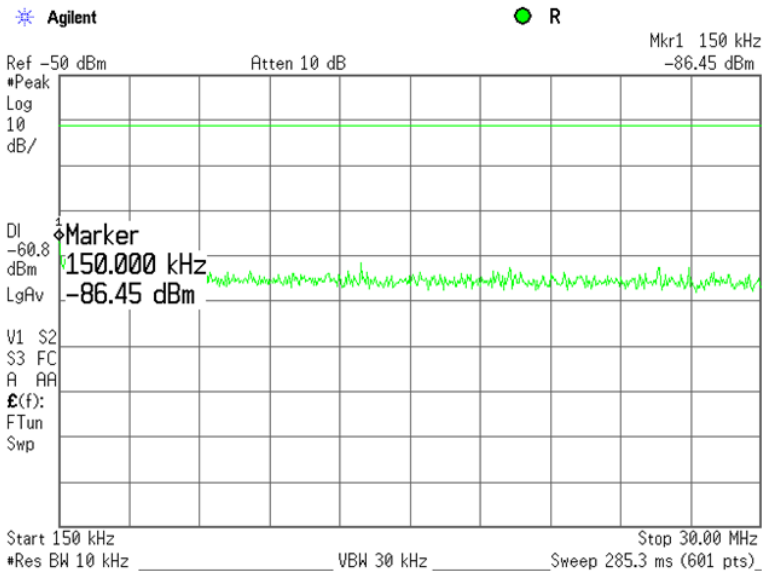


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

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

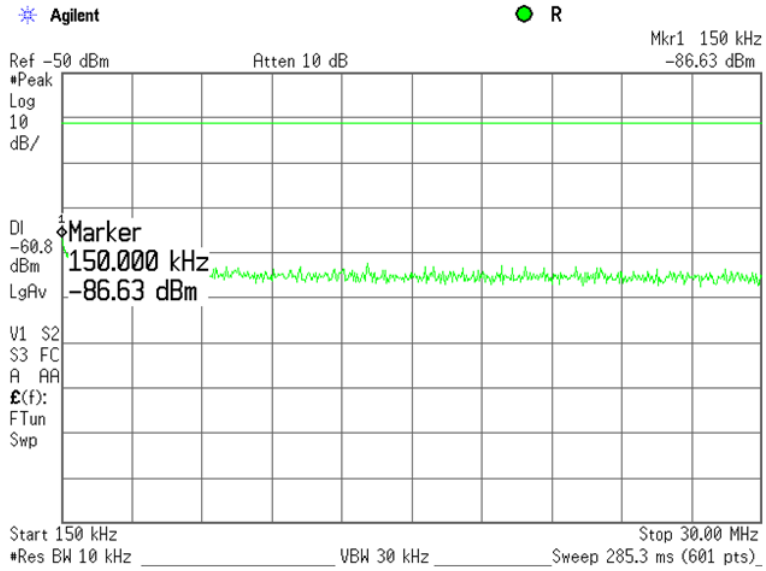


Plot 7.5.4 Spurious emission measurements in 0.15 - 30 MHz range at low carrier frequency

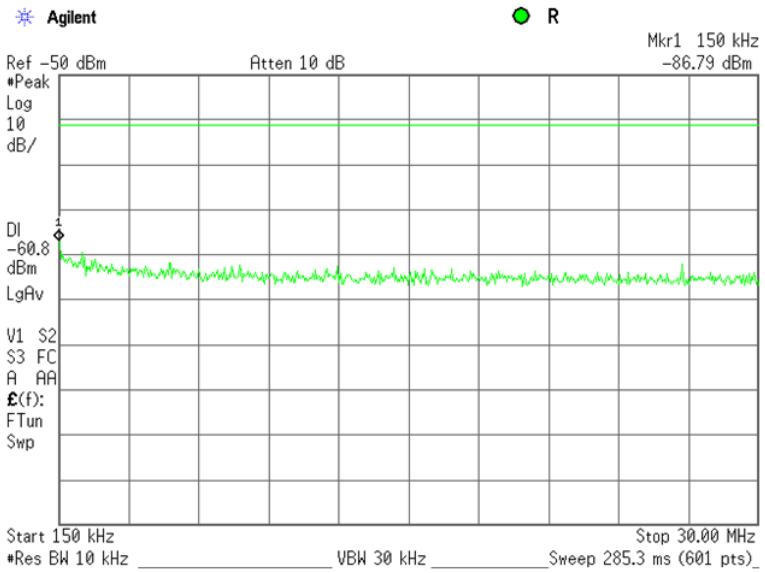


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.5 Spurious emission measurements in 0.15 - 30 MHz range at mid carrier frequency

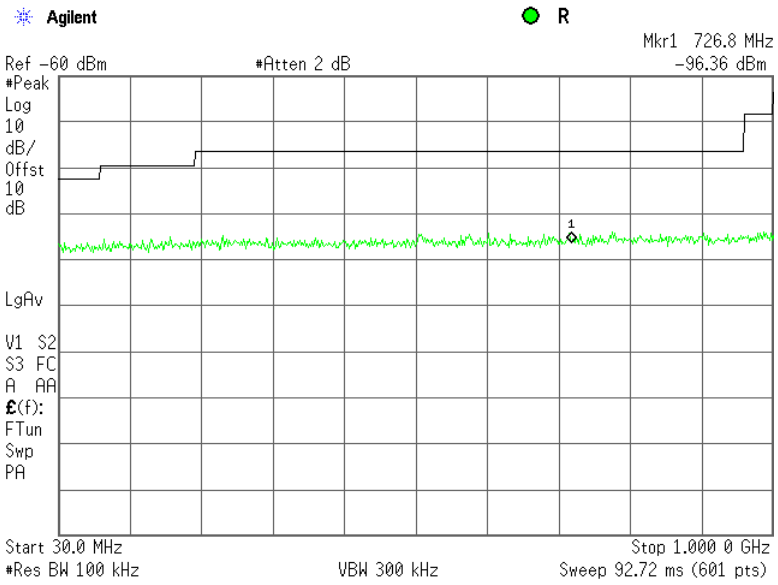


Plot 7.5.6 Spurious emission measurements in 0.15 - 30 MHz range at high carrier frequency

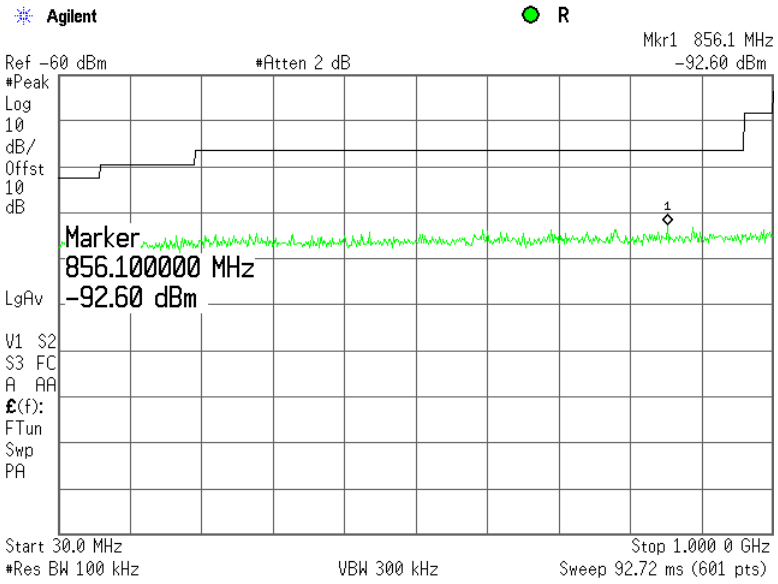


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.7 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency

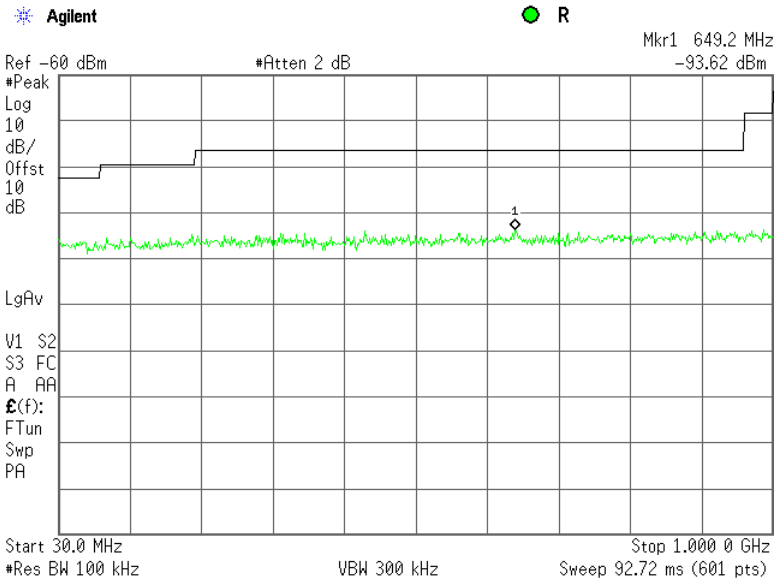


Plot 7.5.8 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency



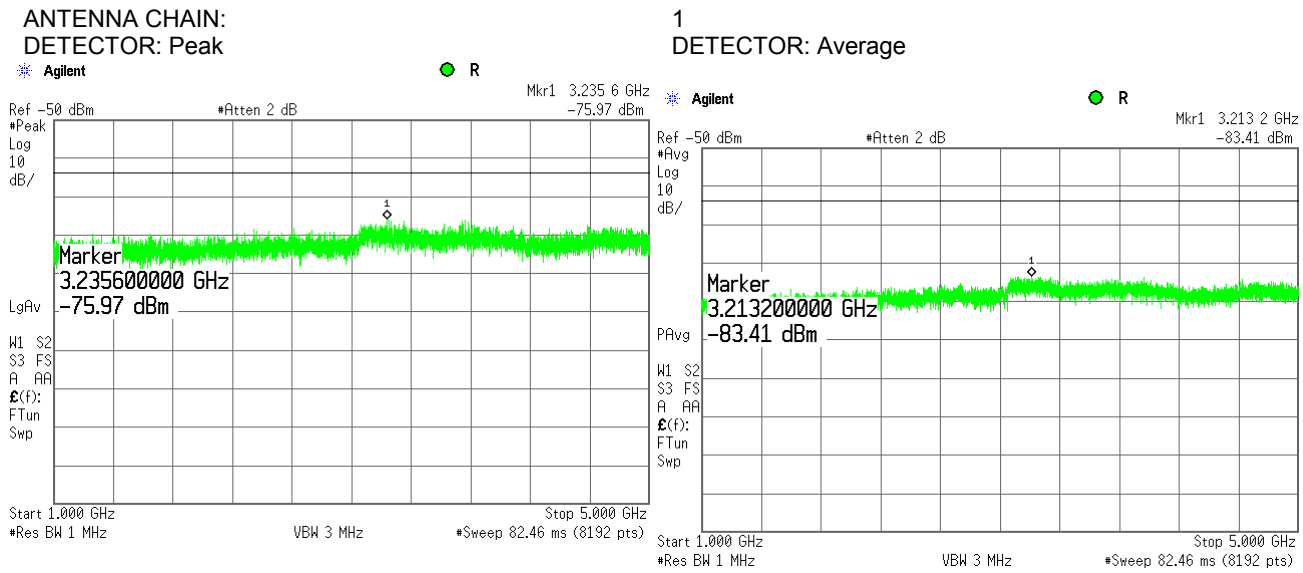
Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.9 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency

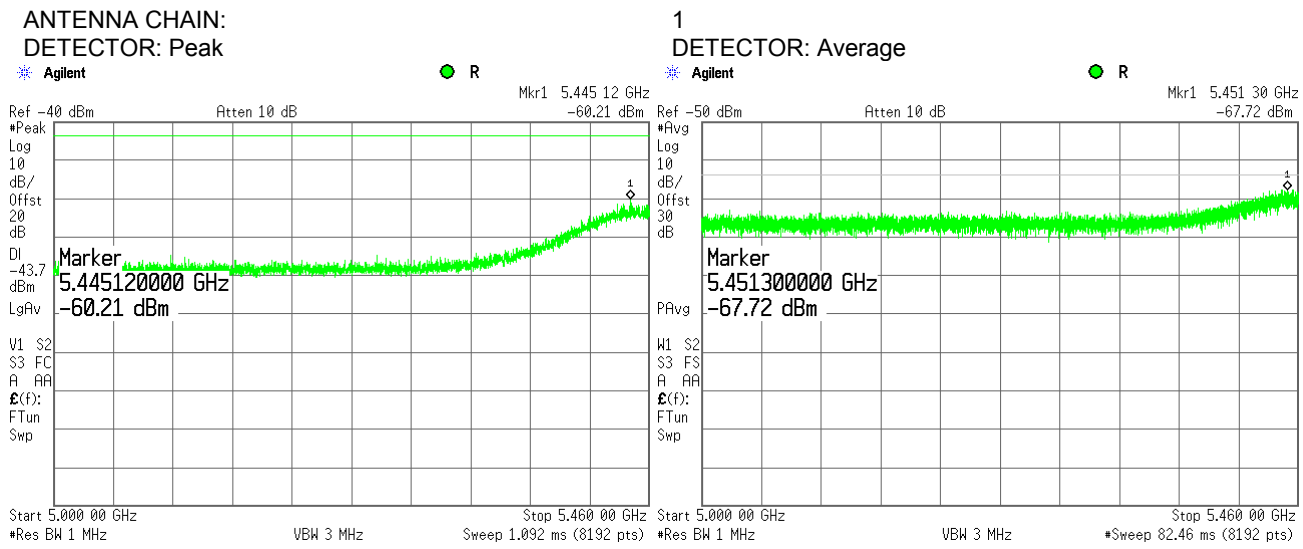


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.10 Spurious emission measurements in 1000 - 5000 MHz range at low carrier frequency

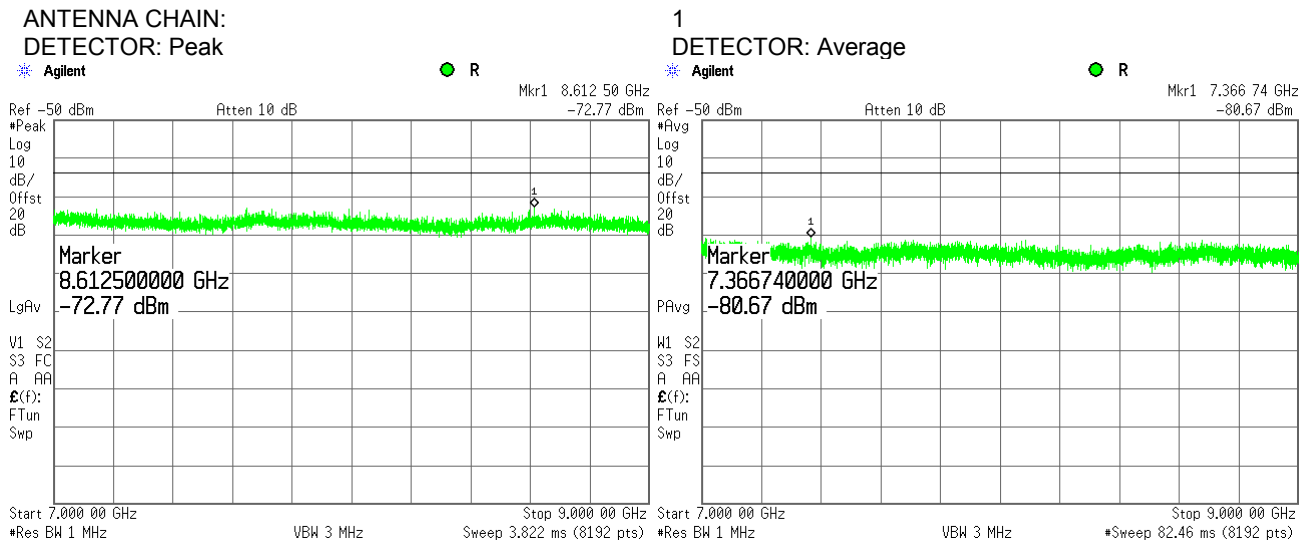


Plot 7.5.11 Spurious emission measurements in 5000 - 5460 MHz range at low carrier frequency

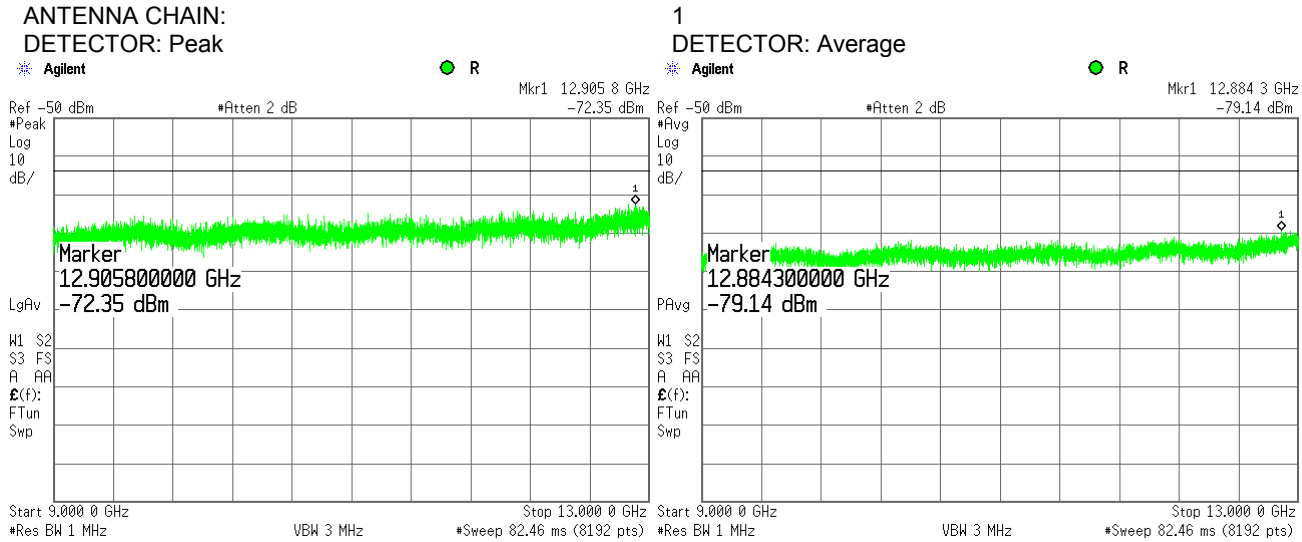


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.12 Spurious emission measurements in 7000 - 9000 MHz range at low carrier frequency

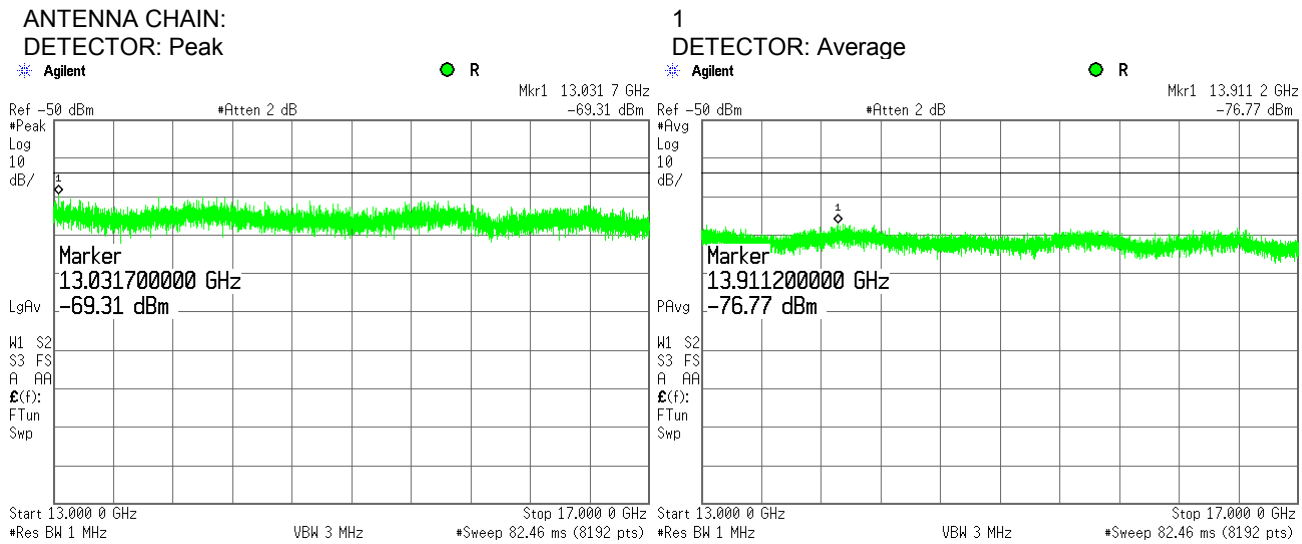


Plot 7.5.13 Spurious emission measurements in 9000 - 13000 MHz range at low carrier frequency

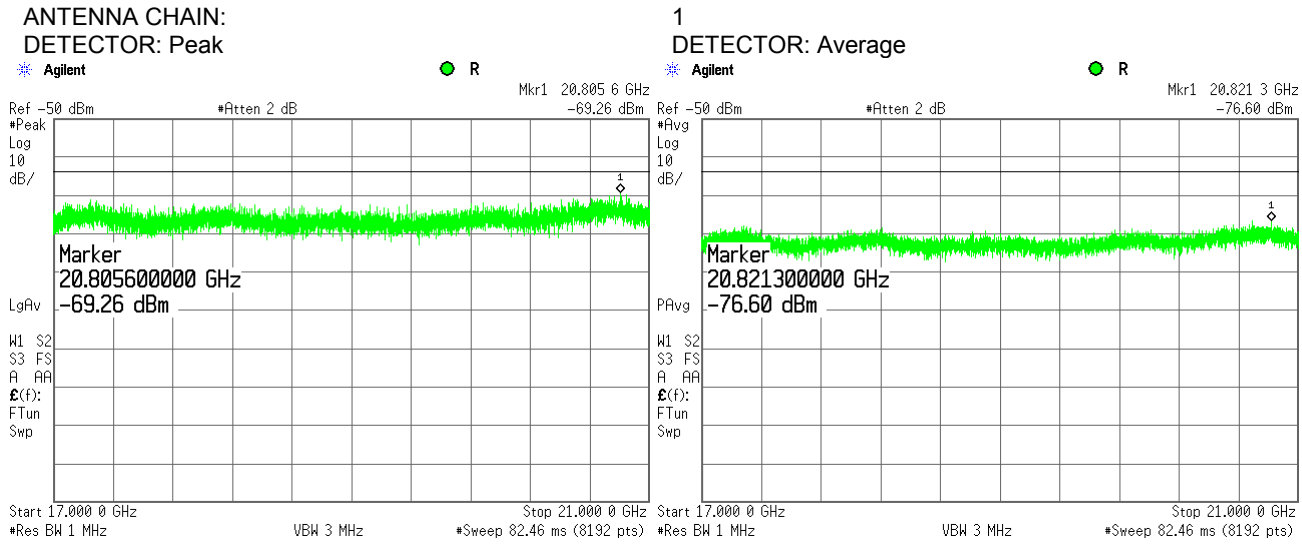


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.14 Spurious emission measurements in 13000 - 17000 MHz range at low carrier frequency

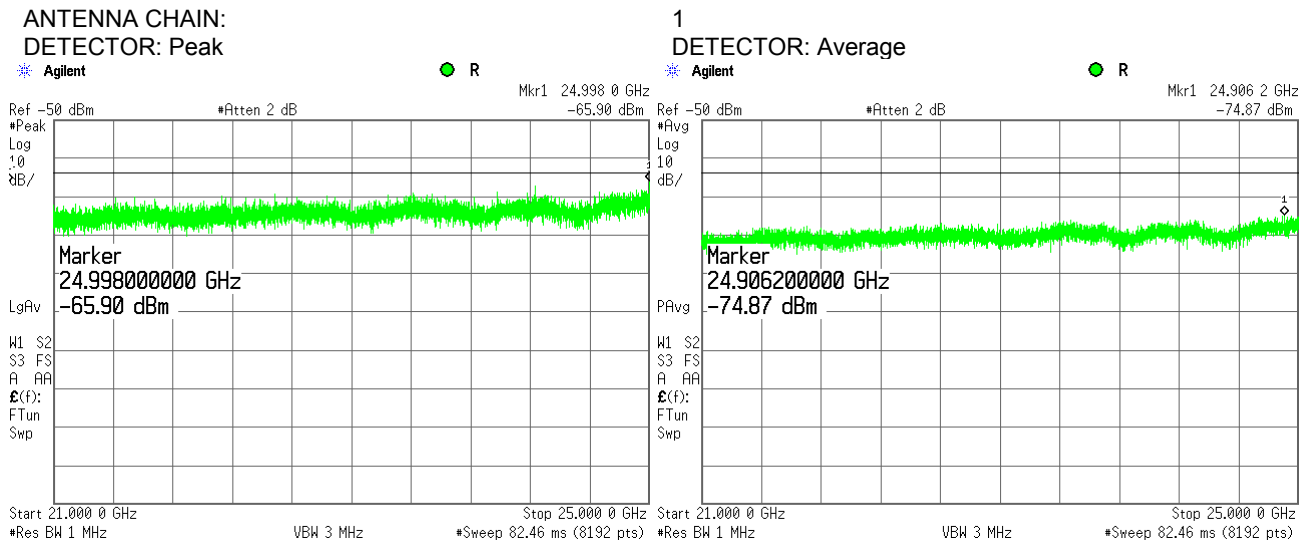


Plot 7.5.15 Spurious emission measurements in 17000 - 21000 MHz range at low carrier frequency

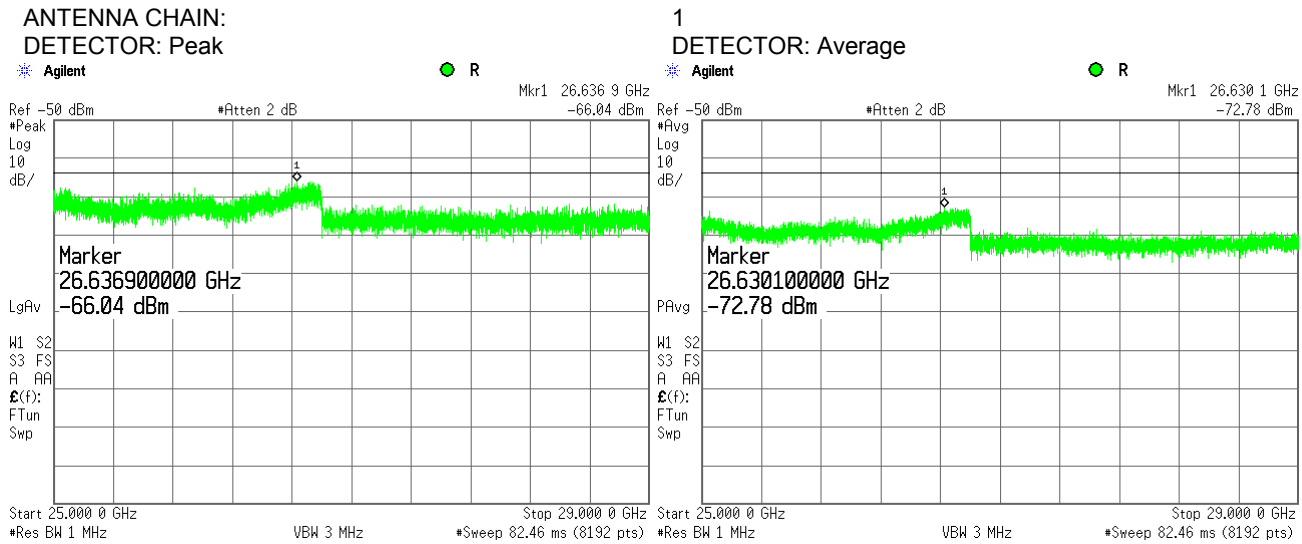


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.16 Spurious emission measurements in 21000 - 25000 MHz range at low carrier frequency

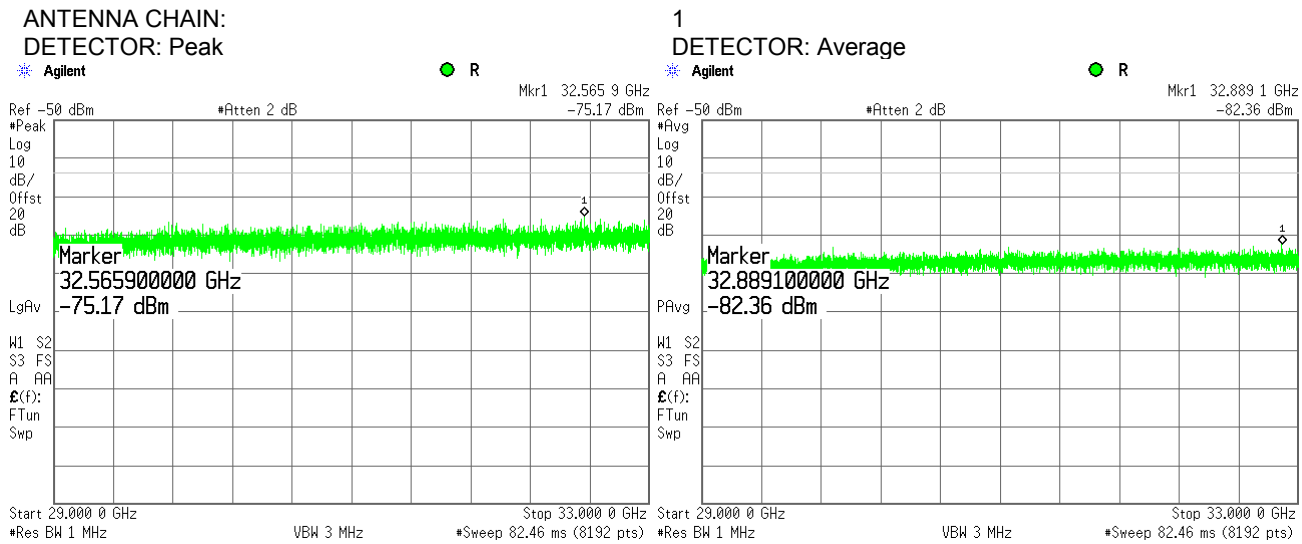


Plot 7.5.17 Spurious emission measurements in 25000 - 29000 MHz range at low carrier frequency

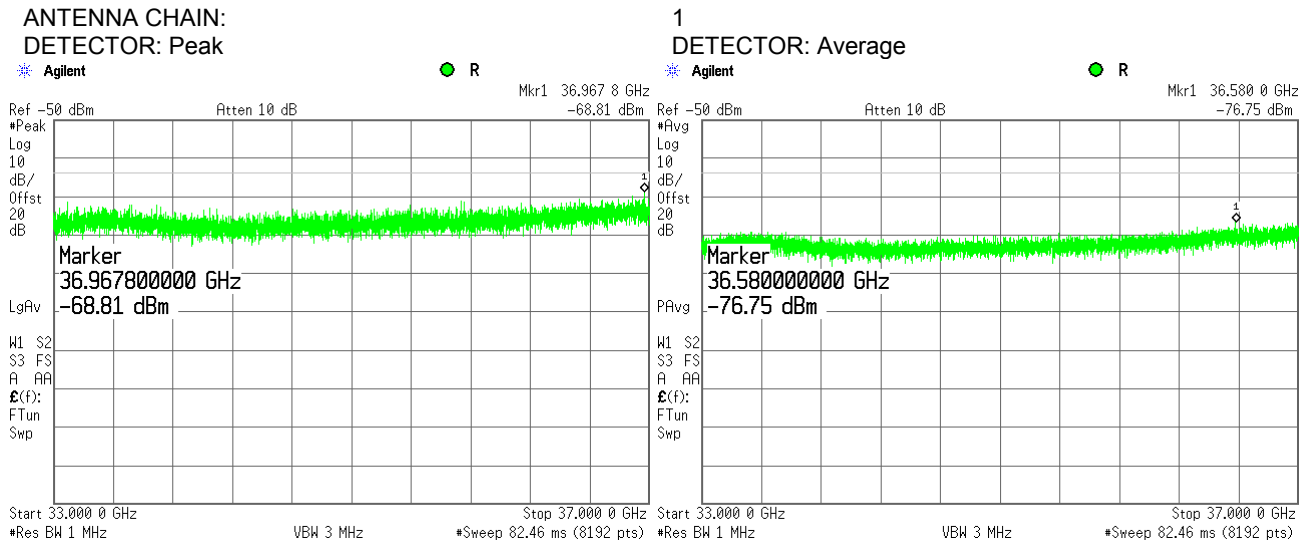


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.18 Spurious emission measurements in 29000 - 33000 MHz range at low carrier frequency

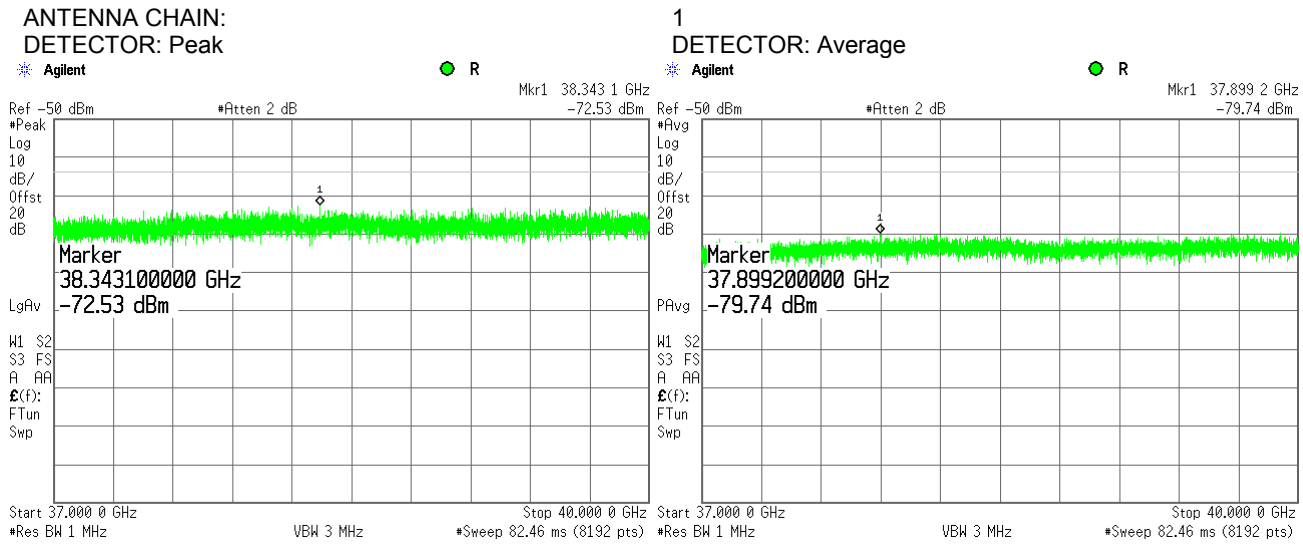


Plot 7.5.19 Spurious emission measurements in 33000 - 37000 MHz range at low carrier frequency



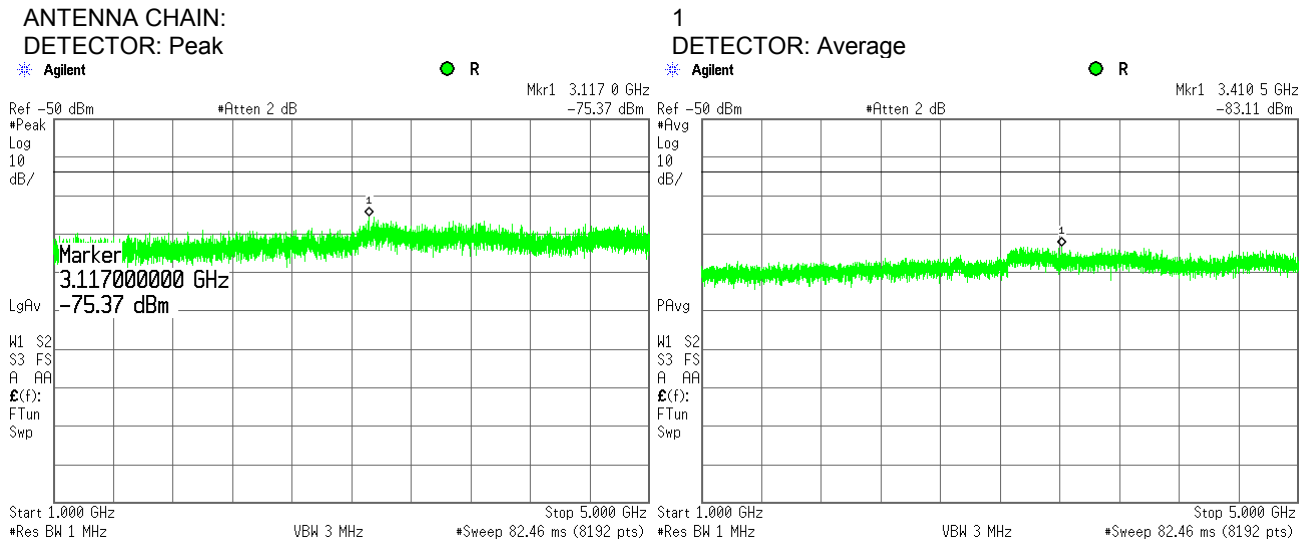
Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.20 Spurious emission measurements in 37000 - 40000 MHz range at low carrier frequency

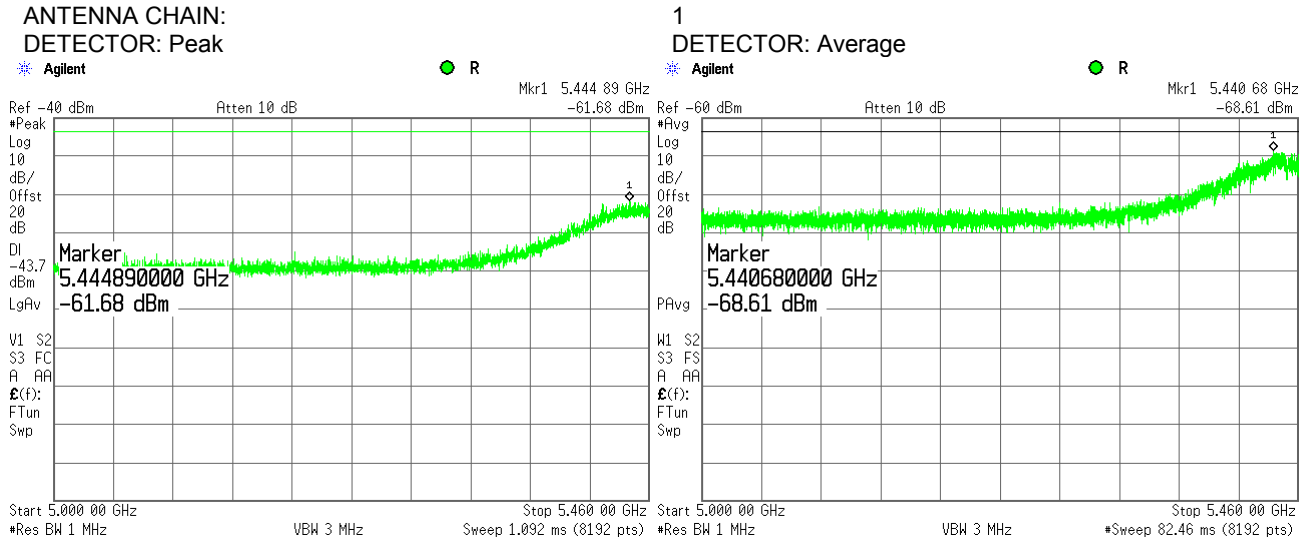


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.21 Spurious emission measurements in 1000 - 5000 MHz range at mid carrier frequency

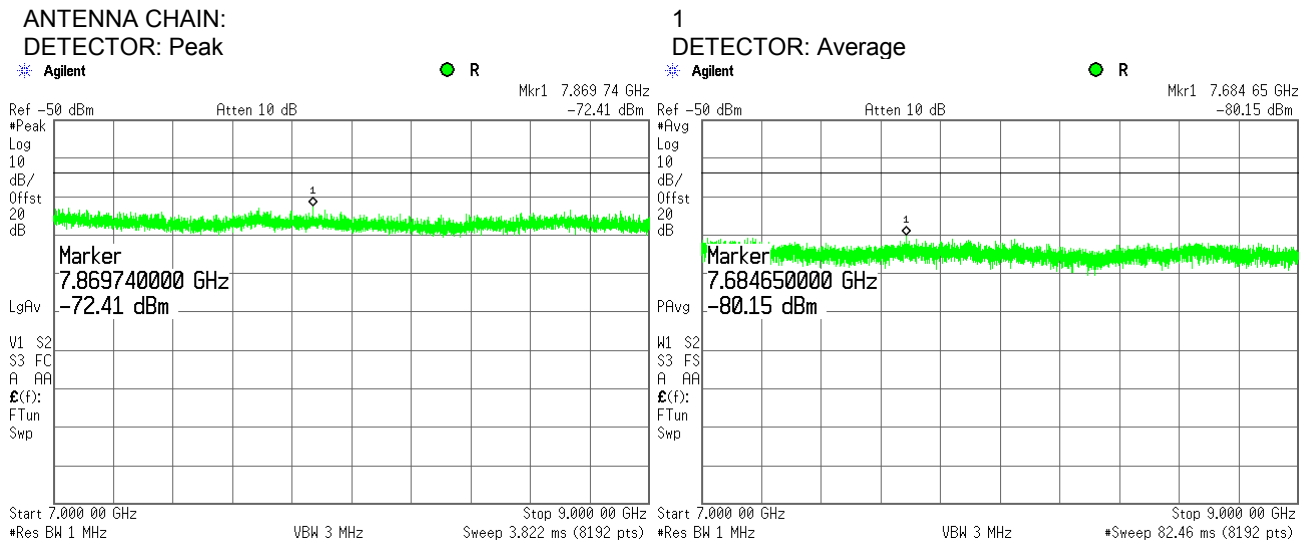


Plot 7.5.22 Spurious emission measurements in 5000 - 5460 MHz range at mid carrier frequency

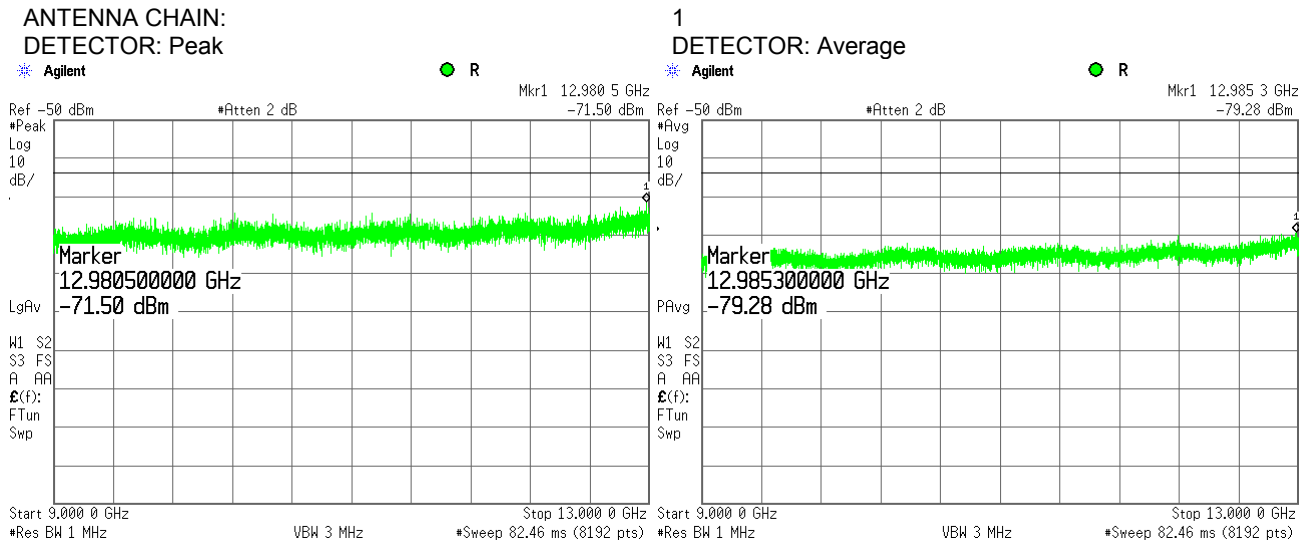


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.23 Spurious emission measurements in 7000 - 9000 MHz range at mid carrier frequency

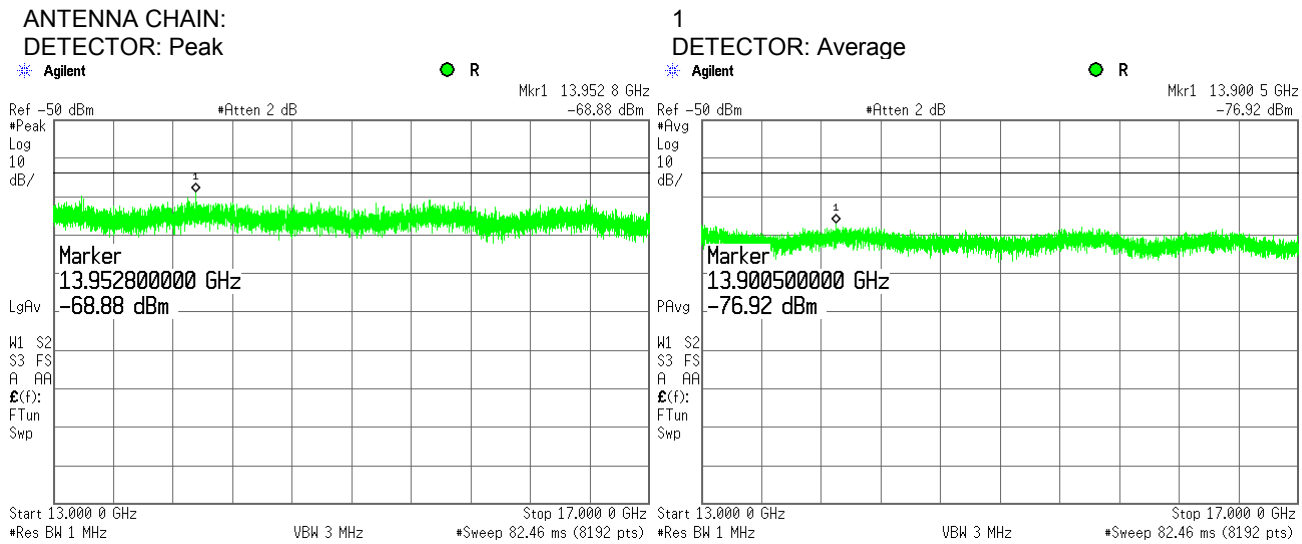


Plot 7.5.24 Spurious emission measurements in 9000 - 13000 MHz range at mid carrier frequency

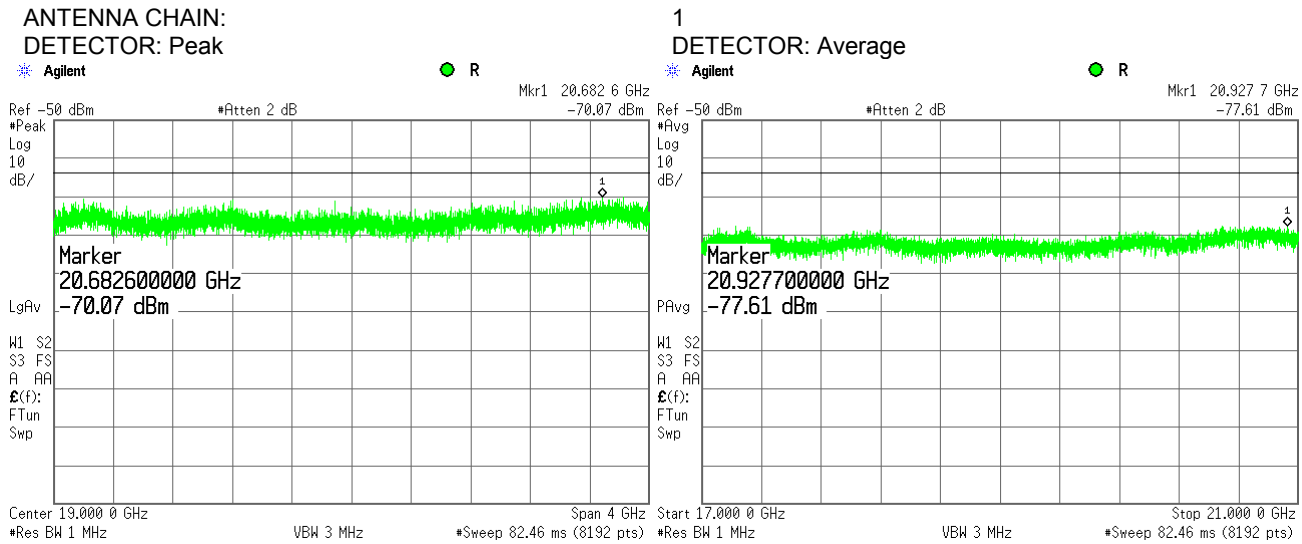


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.25 Spurious emission measurements in 13000 - 17000 MHz range at mid carrier frequency

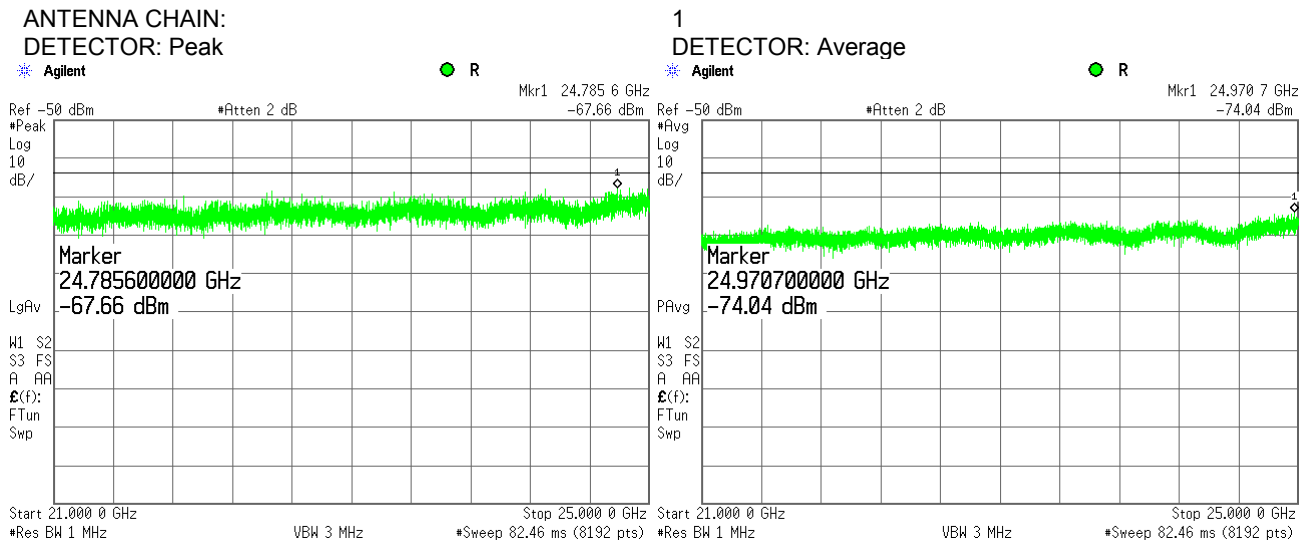


Plot 7.5.26 Spurious emission measurements in 17000 - 21000 MHz range at mid carrier frequency

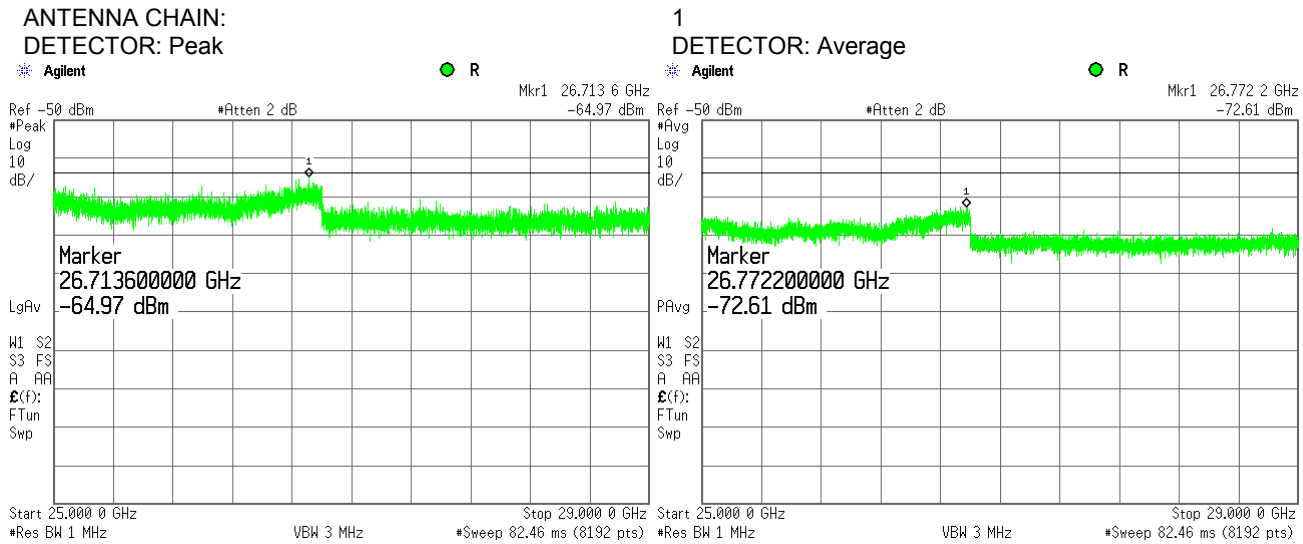


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.27 Spurious emission measurements in 21000 - 25000 MHz range at mid carrier frequency

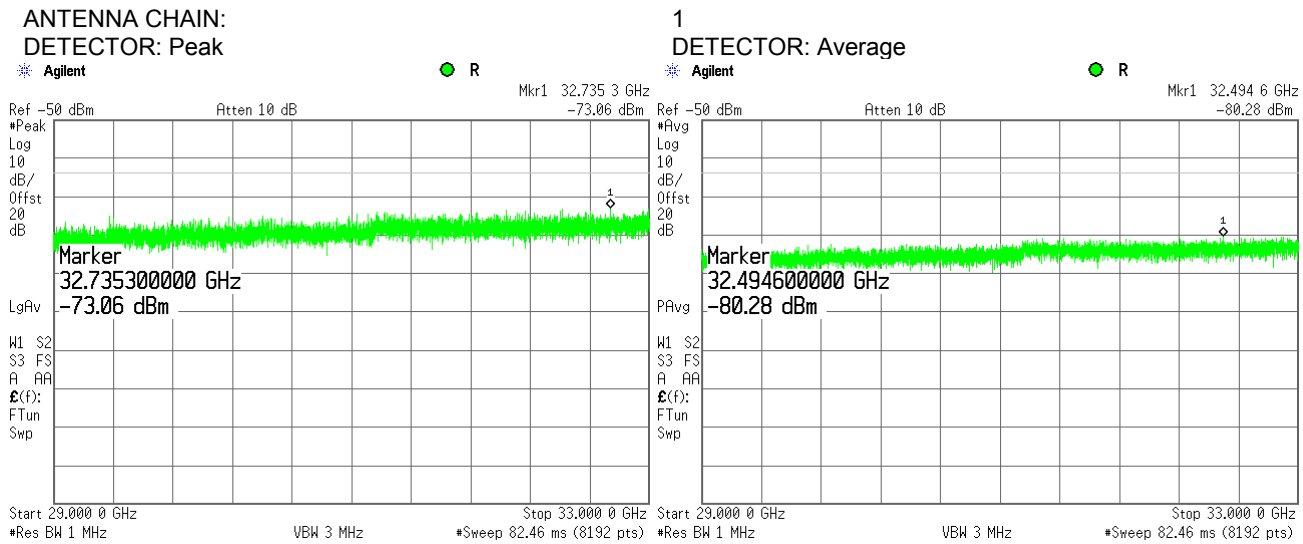


Plot 7.5.28 Spurious emission measurements in 25000 - 29000 MHz range at mid carrier frequency

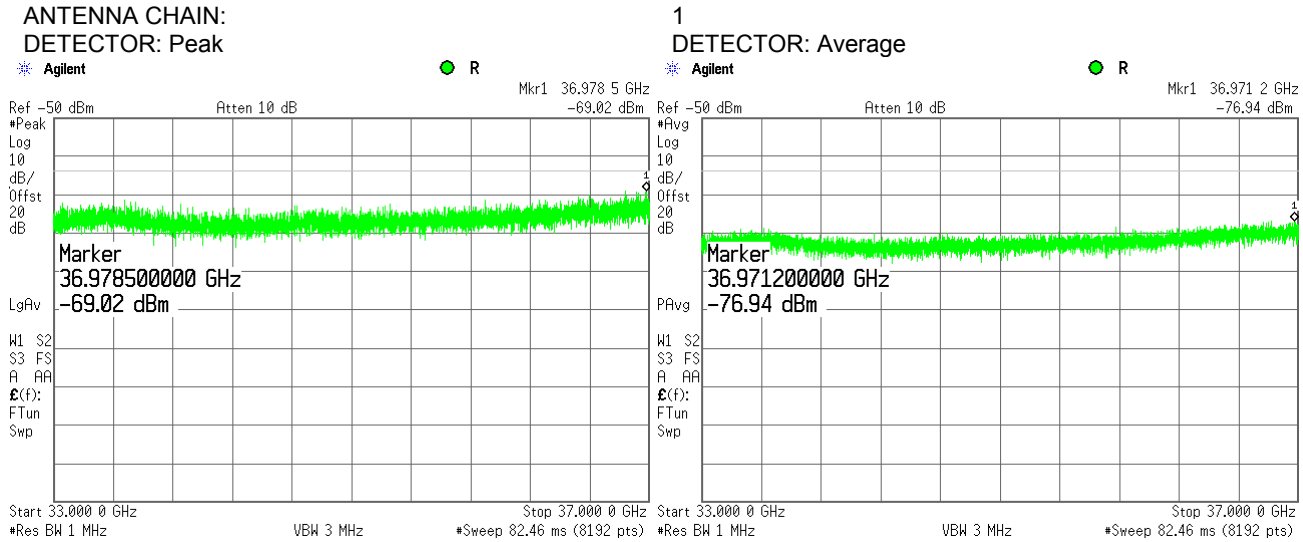


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.29 Spurious emission measurements in 29000 - 33000 MHz range at mid carrier frequency

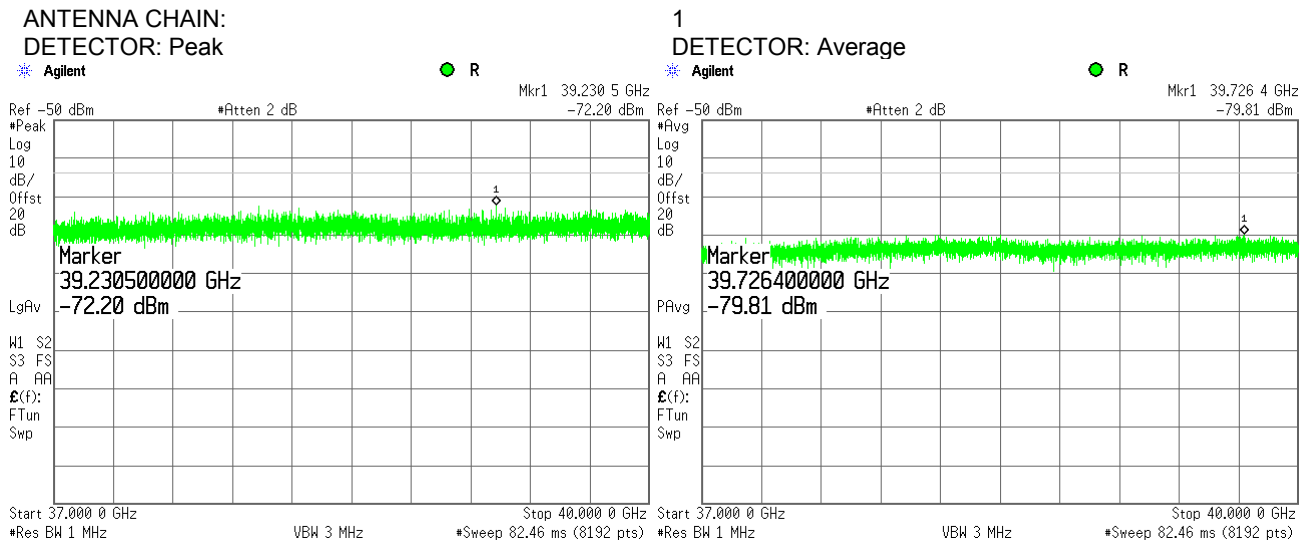


Plot 7.5.30 Spurious emission measurements in 33000 - 37000 MHz range at mid carrier frequency



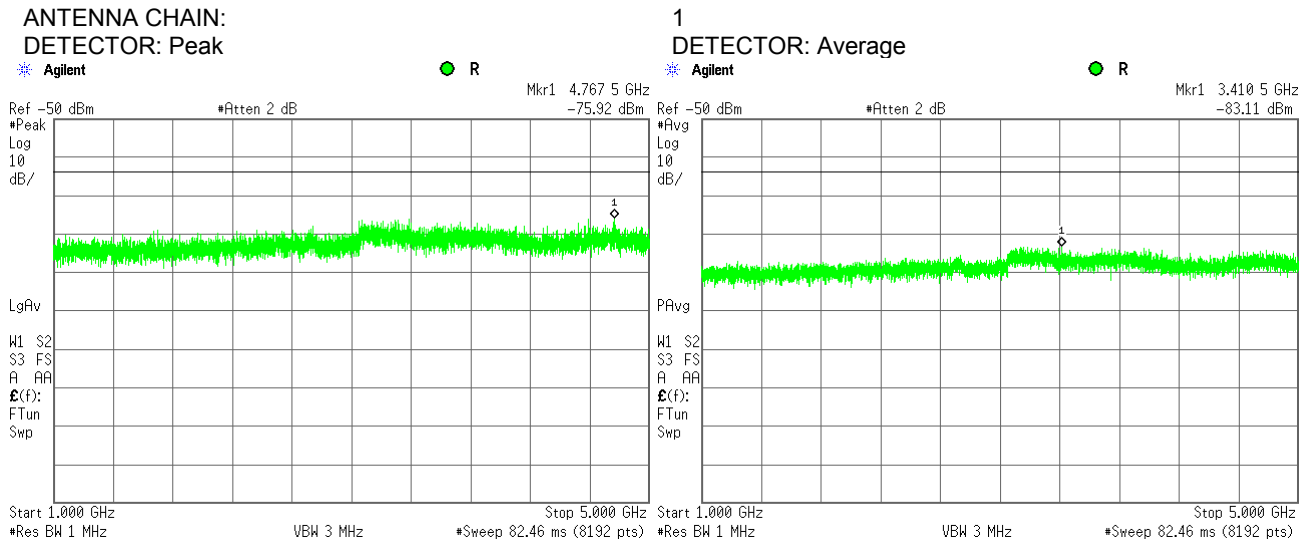
Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.31 Spurious emission measurements in 37000 - 40000 MHz range at mid carrier frequency

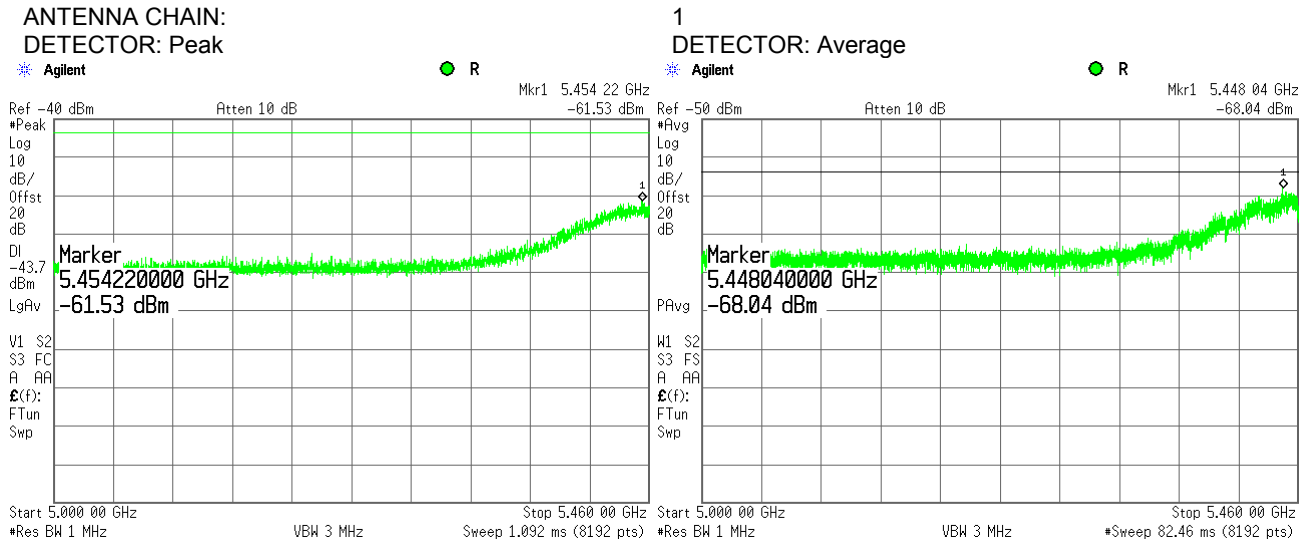


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.32 Spurious emission measurements in 1000 - 5000 MHz range at high carrier frequency

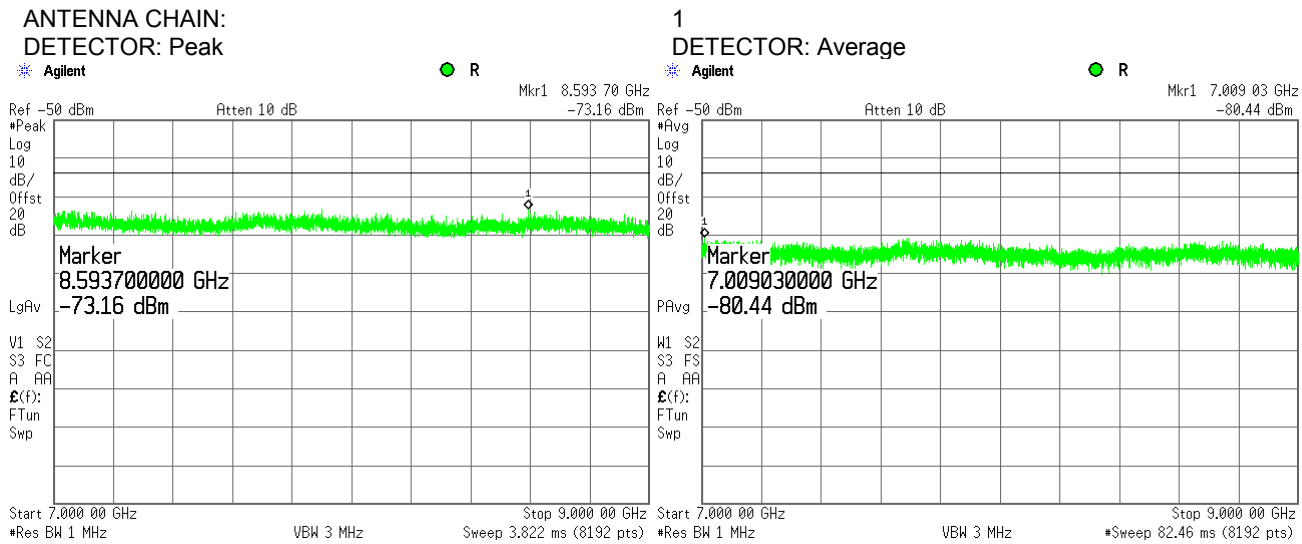


Plot 7.5.33 Spurious emission measurements in 5000 - 5460 MHz range at high carrier frequency

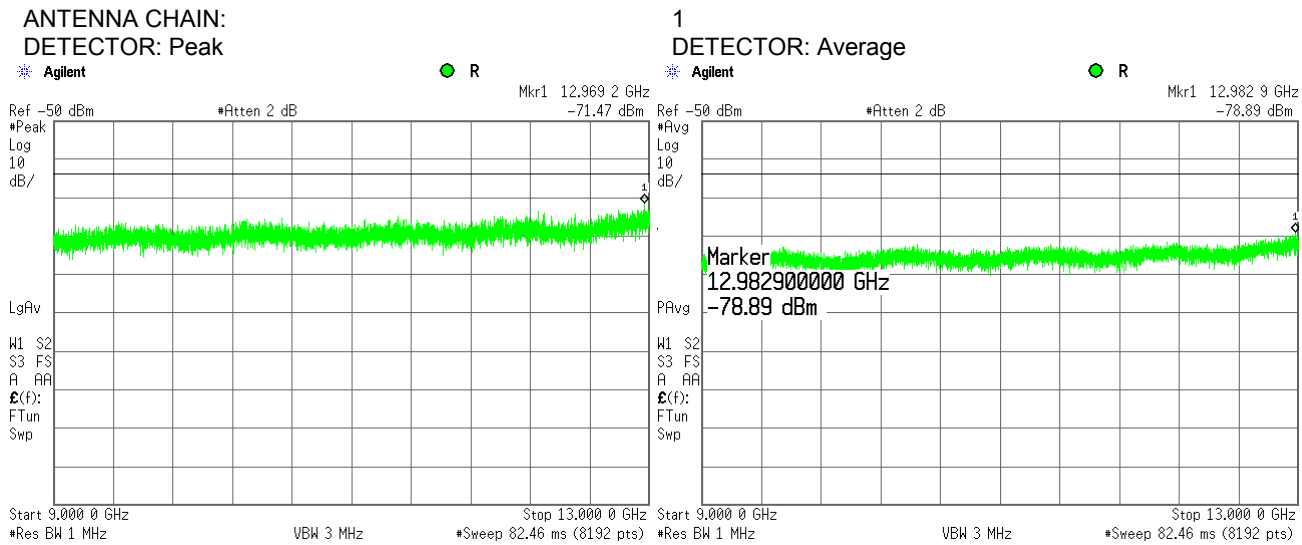


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.34 Spurious emission measurements in 7000 - 9000 MHz range at high carrier frequency

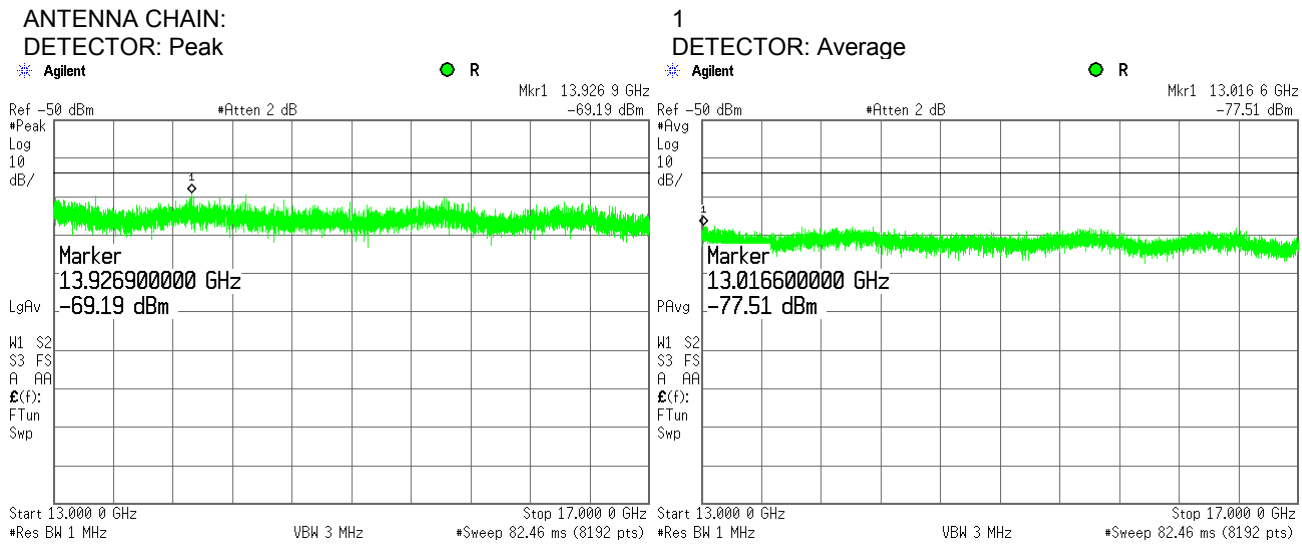


Plot 7.5.35 Spurious emission measurements in 9000 - 13000 MHz range at high carrier frequency

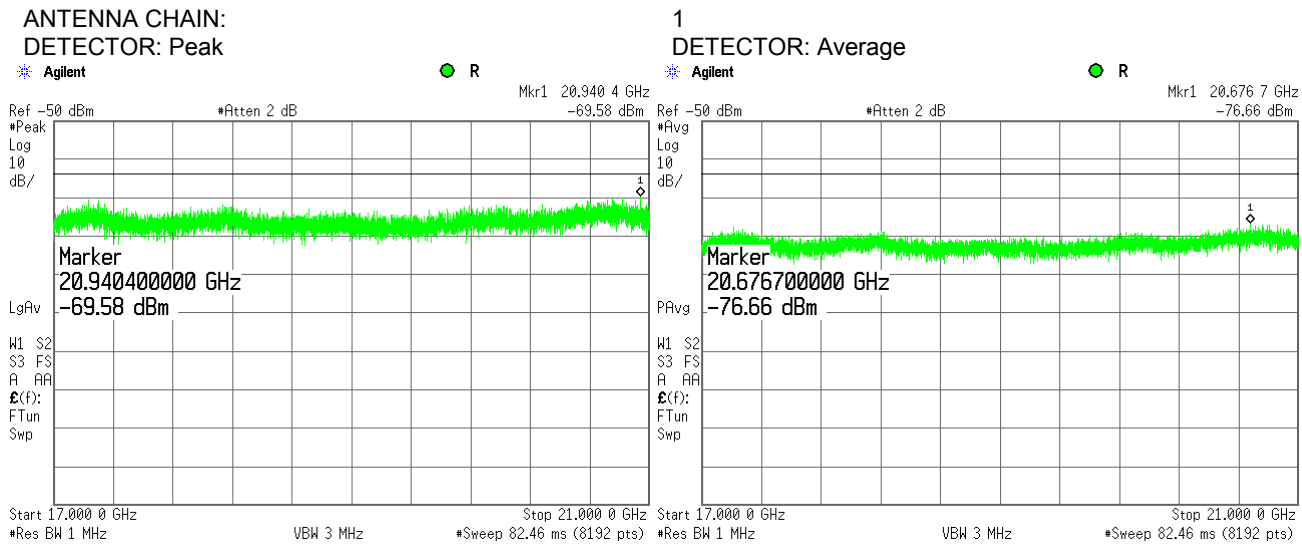


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.36 Spurious emission measurements in 13000 - 17000 MHz range at high carrier frequency

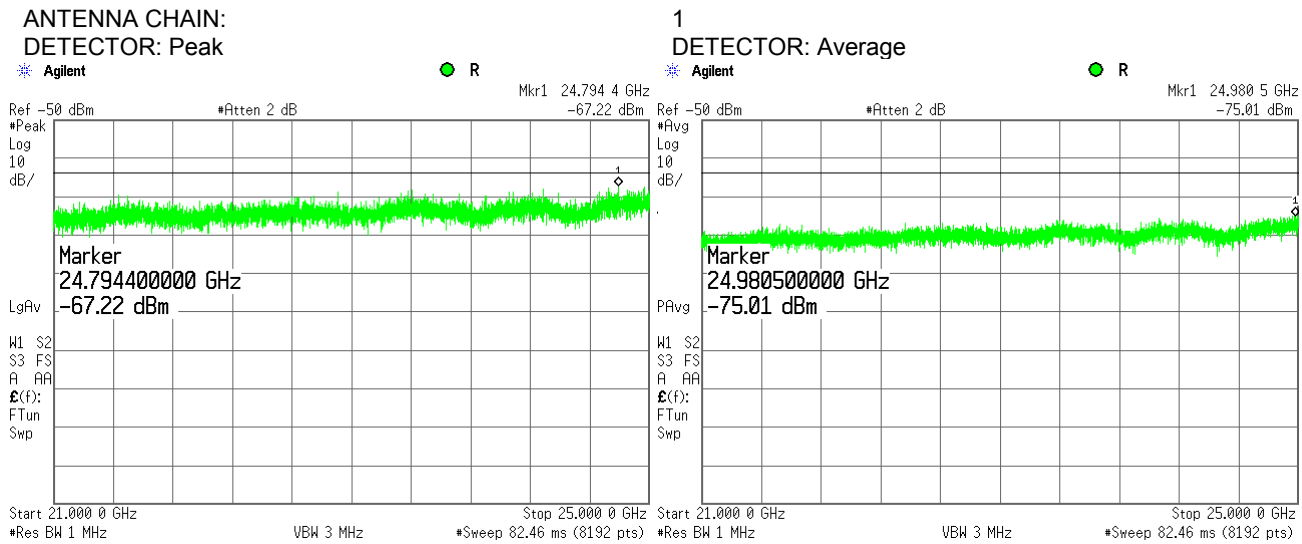


Plot 7.5.37 Spurious emission measurements in 17000 - 21000 MHz range at high carrier frequency

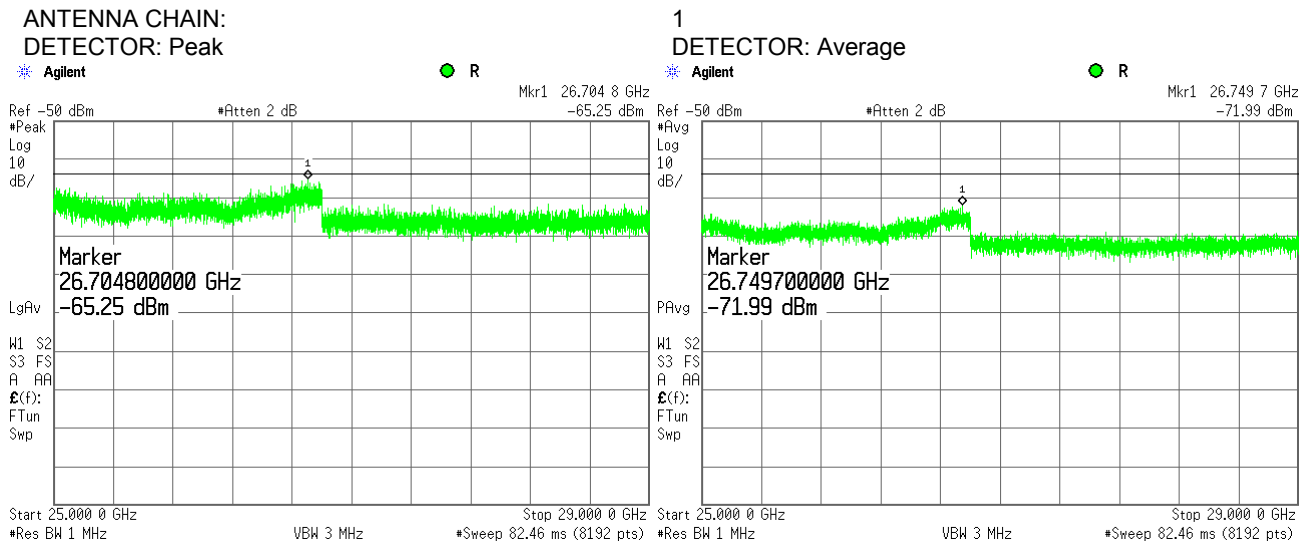


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.38 Spurious emission measurements in 21000 - 25000 MHz range at high carrier frequency

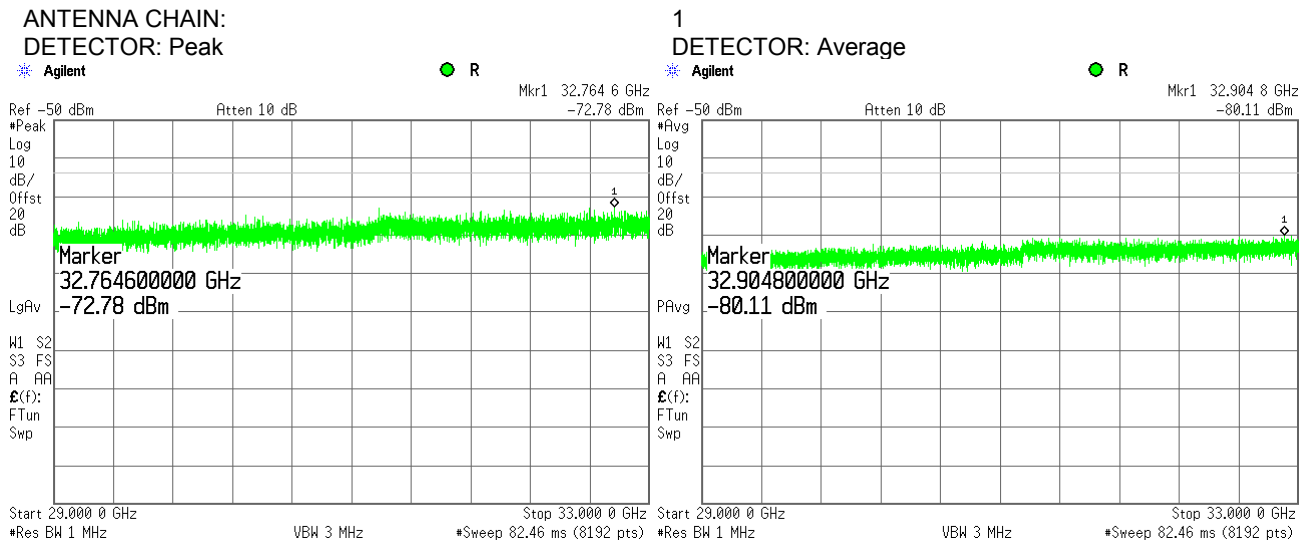


Plot 7.5.39 Spurious emission measurements in 25000 - 29000 MHz range at high carrier frequency

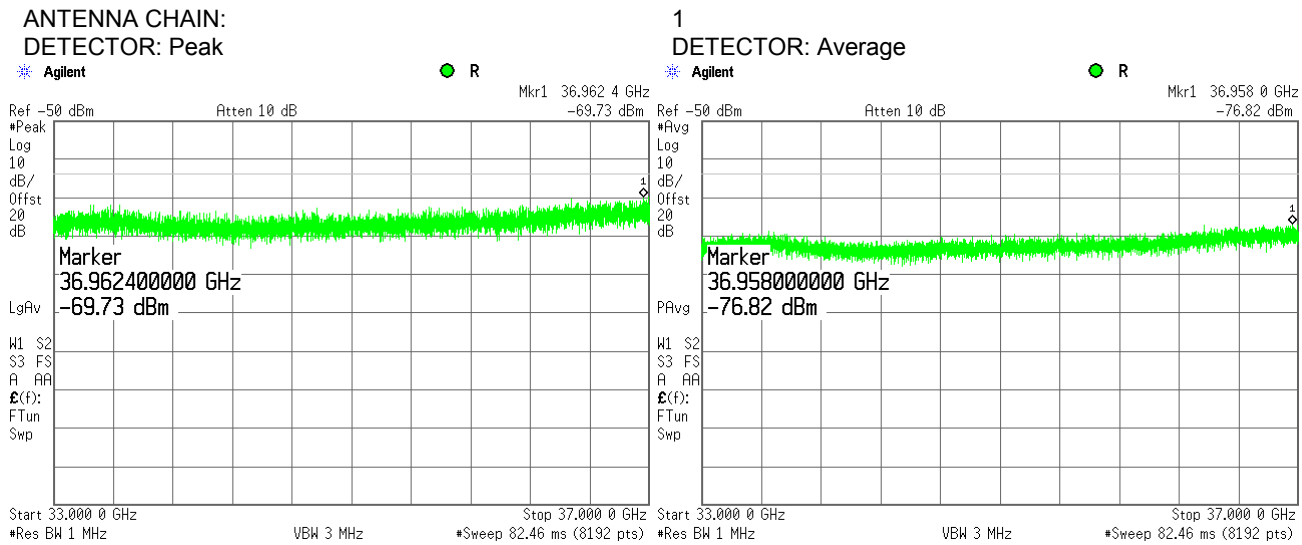


Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.40 Spurious emission measurements in 29000 - 33000 MHz range at high carrier frequency

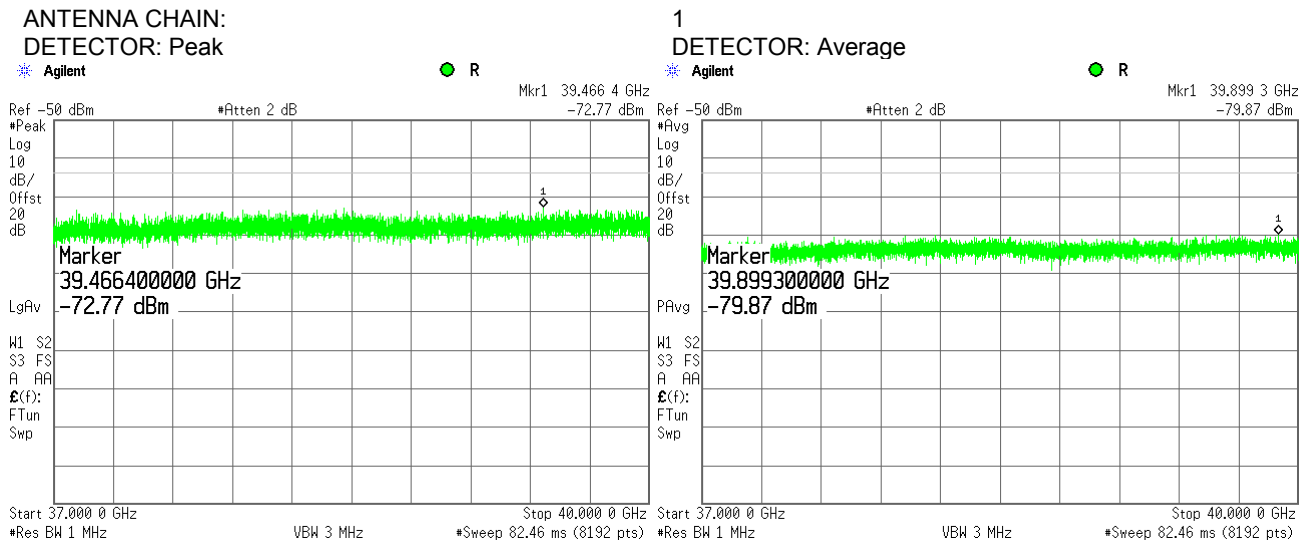


Plot 7.5.41 Spurious emission measurements in 33000 - 37000 MHz range at high carrier frequency



Test specification:	Section 15.247(d), Radiated versus Conducted emissions measurements		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.42 Spurious emission measurements in 37000 - 40000 MHz range at high carrier frequency



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 ºC	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

7.6 Band edge emissions at RF antenna connector

7.6.1 General

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

Table 7.6.1 Band edge emission limits

Output power	Assigned frequency, MHz	Attenuation below carrier*, dBc
Peak	902.0 – 928.0	20.0
	2400.0 – 2483.5	
	5725.0 – 5850.0	
Averaged over a time interval	902.0 – 928.0	30.0
	2400.0 – 2483.5	
	5725.0 – 5850.0	

* - Band edge emission limit is provided in terms of attenuation below the peak of modulated carrier measured with the same resolution bandwidth.

7.6.2 Test procedure

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized normally modulated at the maximum data rate and its proper operation was checked.

7.6.2.2 The EUT was adjusted to produce maximum available to end user RF output power at the lowest carrier frequency.

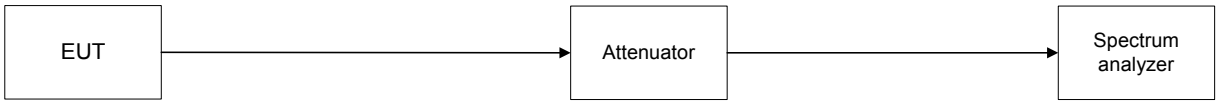
7.6.2.3 The spectrum analyzer span was set to capture the carrier frequency and associated modulation products. The resolution bandwidth was set wider than 1 % of the frequency span.

7.6.2.4 The spectrum analyzer was set in max hold mode and allowed trace to stabilize. The highest emission level within the authorized band was measured.

7.6.2.5 The maximum band edge emission and modulation product outside of the band were measured as provided in Table 7.6.2 and associated plots and referenced to the highest emission level measured within the authorized band.

7.6.2.6 The above procedure was repeated with the EUT adjusted to produce maximum RF output power at the highest carrier frequency.

Figure 7.6.1 Band edge emission test setup



Test specification:	**Section 15.247(d), Band edge emissions**		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 37 %	**Power Supply:** 48VDC
Remarks:			

Table 7.6.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 5725.0 – 5850.0 MHz
DETECTOR USED: Peak
MODULATION: QPSK / 64QAM
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz

Frequency, MHz	Modulation/ Bit rate, Mbps	Band edge emission, dBm	Emission at carrier, dBm	Attenuation below carrier, dBc	Limit, dBc	Margin*, dB	Verdict
3.5 MHz BW, Low channel							
5725.000	QPSK/4	-17.95	12.03	29.98	20.0	9.98	Pass
5725.000	64QAM/14	-17.10	12.41	29.52	20.0	9.52	Pass
3.5 MHz BW, High channel							
5850.000	QPSK/4	-20.22	11.68	31.90	20.0	11.90	Pass
5850.000	64QAM/14	-19.79	11.96	31.75	20.0	11.75	Pass
5 MHz BW, Low channel							
5725.000	QPSK/7	-21.54	9.05	30.59	20.0	10.59	Pass
5725.000	64QAM/23	-21.48	9.26	30.73	20.0	10.73	Pass
5 MHz BW, High channel							
5850.000	QPSK/7	-20.70	8.98	29.68	20.0	9.68	Pass
5850.000	64QAM/23	-24.73	9.07	33.80	20.0	13.80	Pass
7 MHz BW, Low channel							
5725.000	QPSK/8	-28.60	8.84	37.44	20.0	17.44	Pass
5725.000	64QAM/28	-20.53	8.86	29.39	20.0	9.39	Pass
7 MHz BW, High channel							
5850.000	QPSK/8	-26.13	8.49	34.62	20.0	14.62	Pass
5850.000	64QAM/28	-29.62	8.71	38.33	20.0	18.33	Pass
10 MHz BW, Low channel							
5725.000	QPSK/13	-36.23	6.41	42.64	20.0	22.64	Pass
5725.000	64QAM/46	-29.84	6.10	35.94	20.0	15.94	Pass
10 MHz BW, High channel							
5850.000	QPSK/13	-38.63	5.93	44.56	20.0	24.56	Pass
5850.000	64QAM/46	-30.13	5.82	35.95	20.0	15.95	Pass

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

Reference numbers of test equipment used

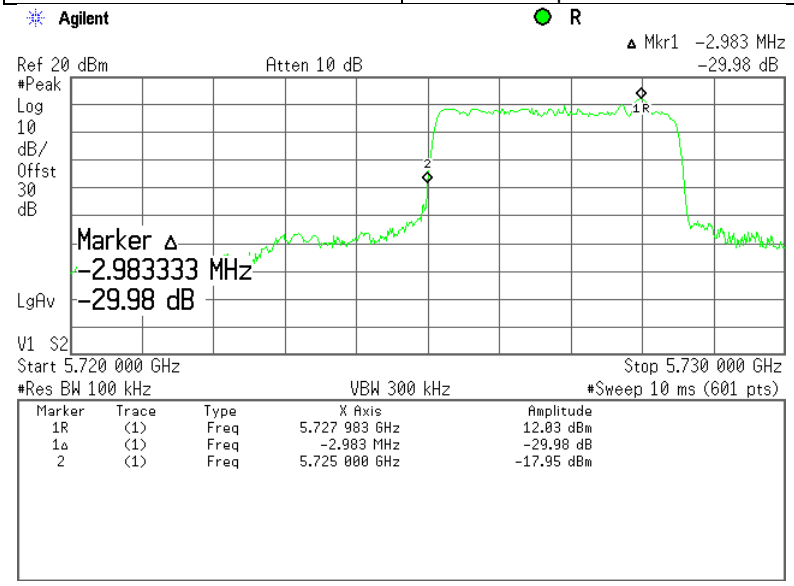
HL 3818	HL 3901	HL 4367					

Full description is given in Appendix A.

Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

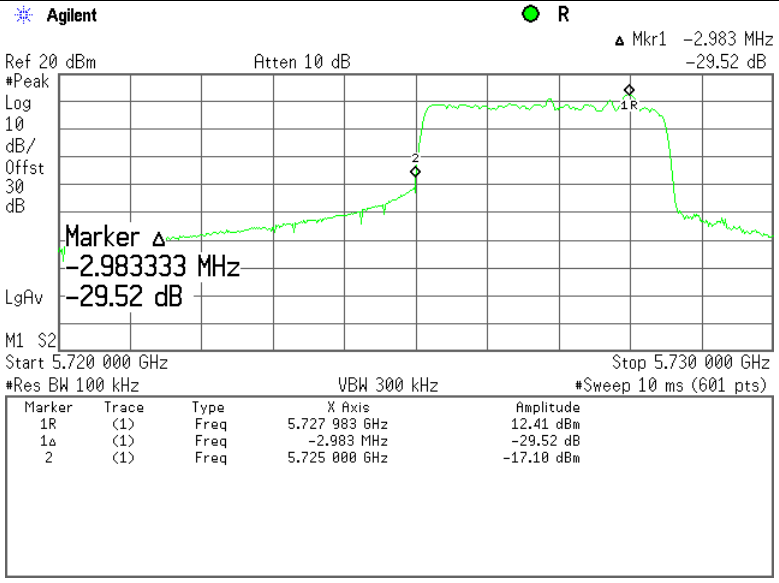
Plot 7.6.1 The highest band edge emission at low carrier frequency

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.6.2 The highest band edge emission at low carrier frequency

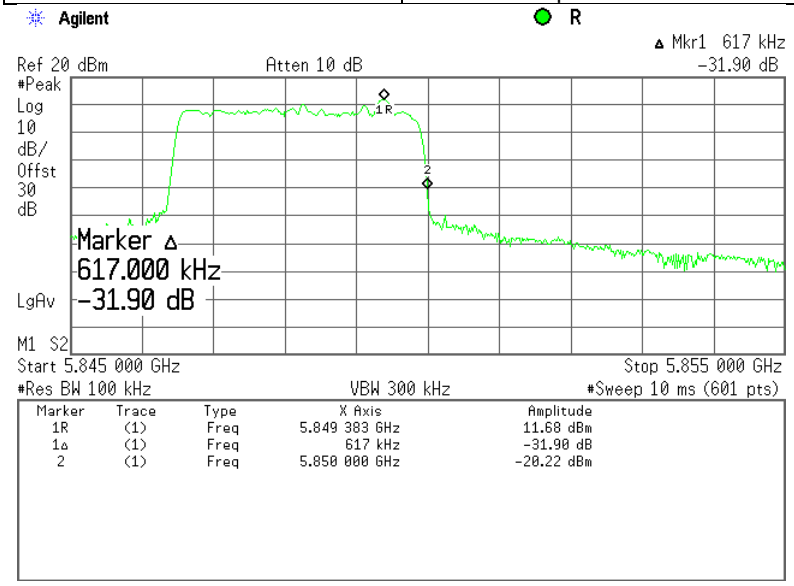
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

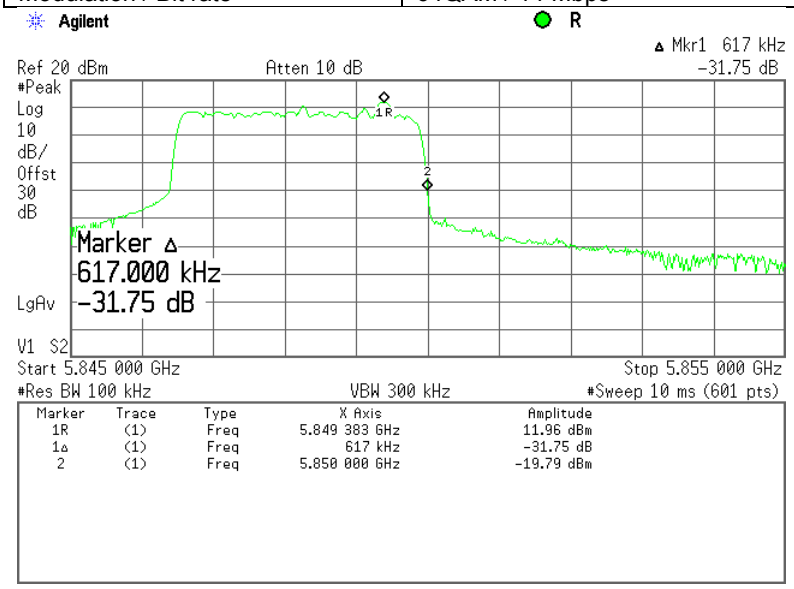
Plot 7.6.3 The highest band edge emission at high carrier frequency

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.6.4 The highest band edge emission at high carrier frequency

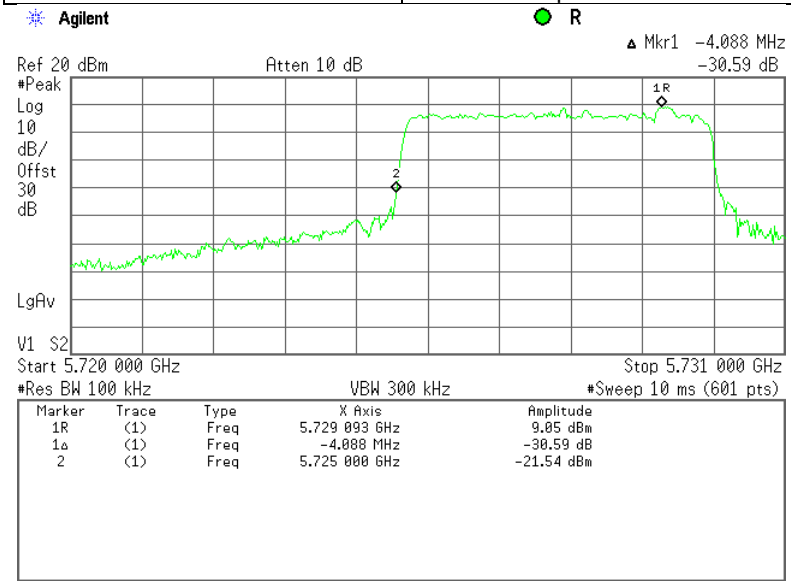
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

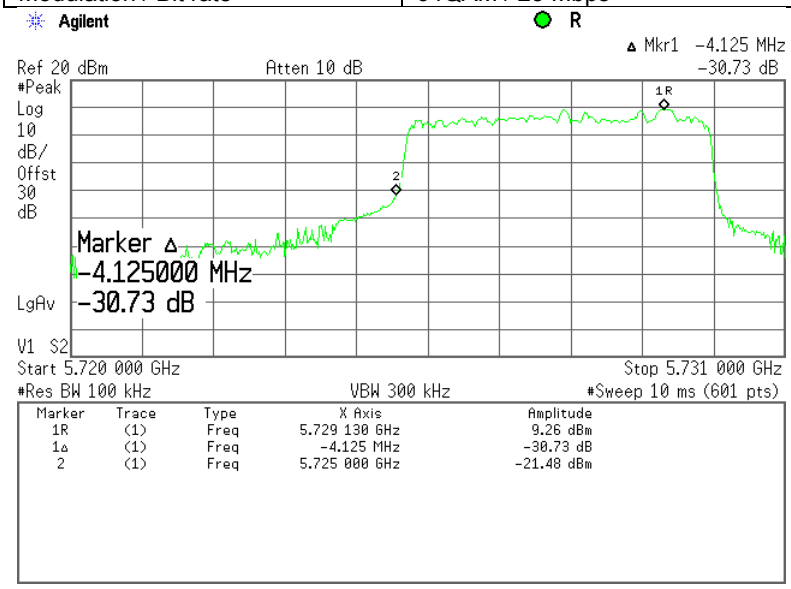
Plot 7.6.5 The highest band edge emission at low carrier frequency

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.6.6 The highest band edge emission at low carrier frequency

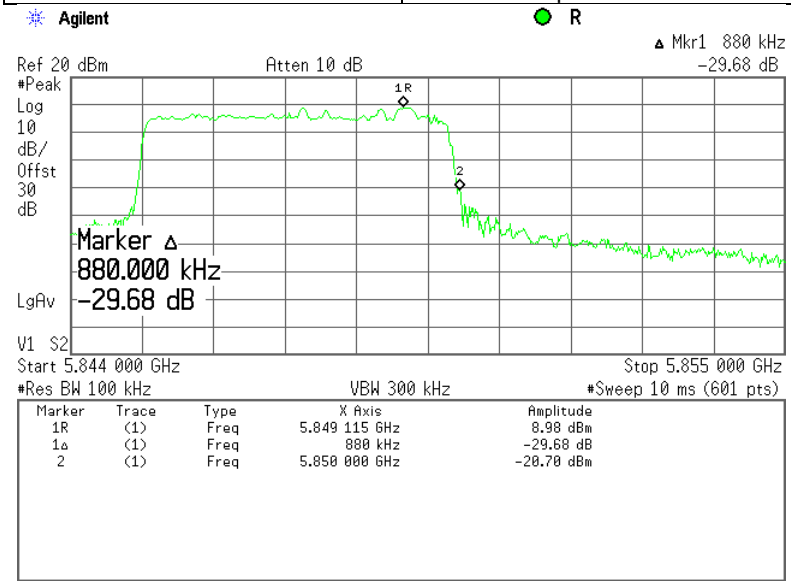
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

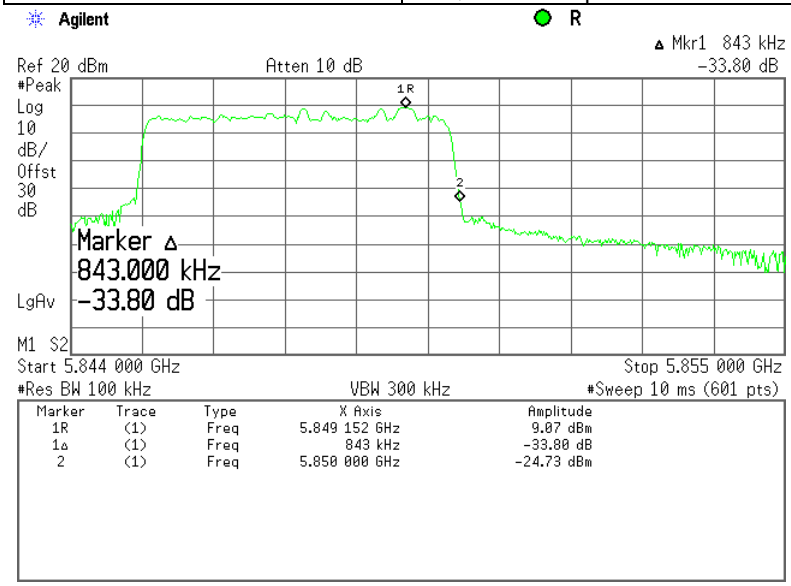
Plot 7.6.7 The highest band edge emission at high carrier frequency

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.6.8 The highest band edge emission at high carrier frequency

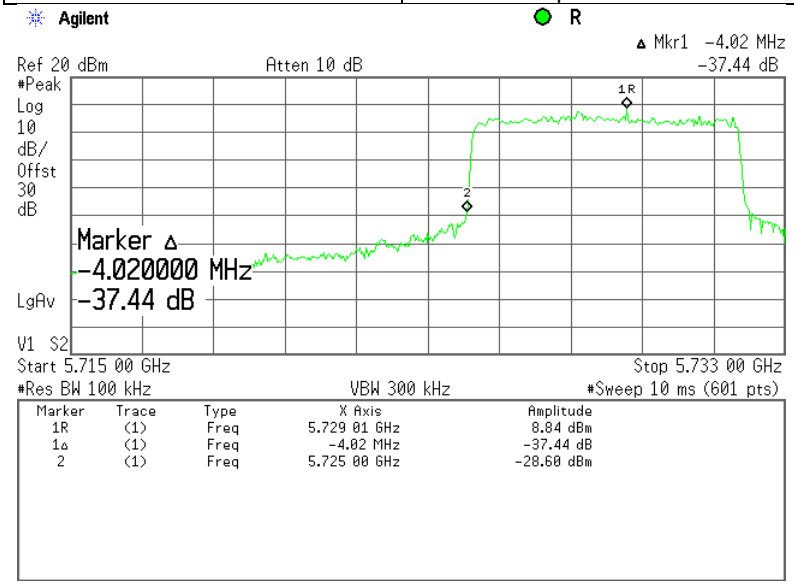
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

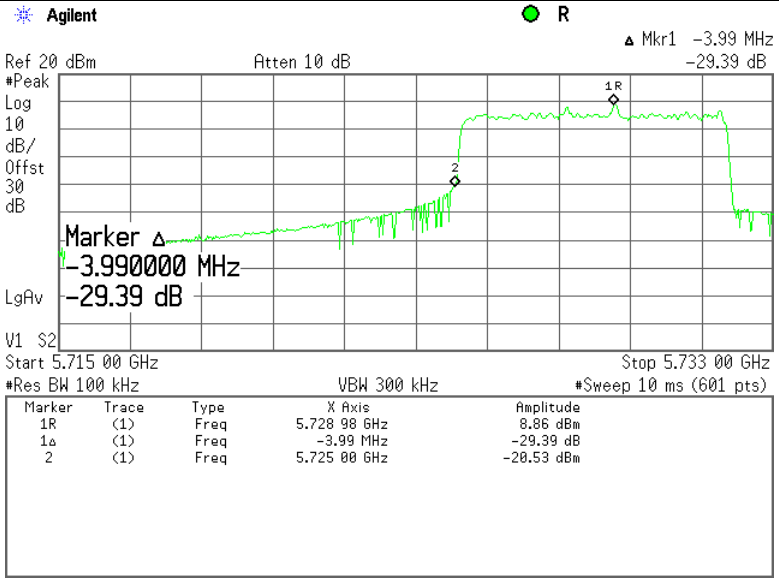
Plot 7.6.9 The highest band edge emission at low carrier frequency

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.6.10 The highest band edge emission at low carrier frequency

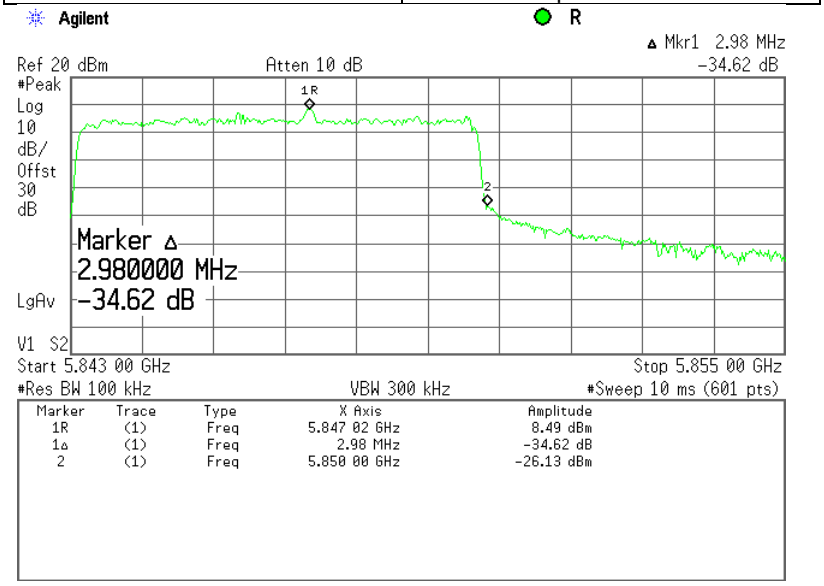
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

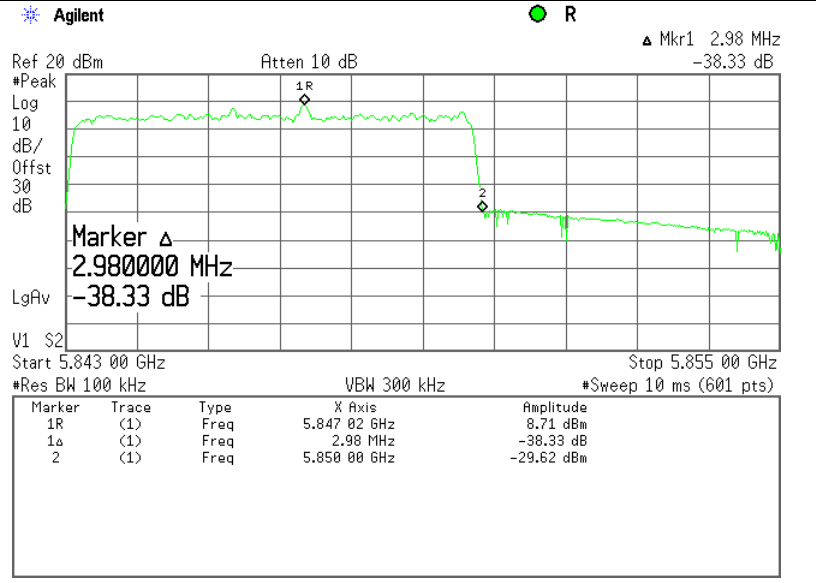
Plot 7.6.11 The highest band edge emission at high carrier frequency

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.6.12 The highest band edge emission at high carrier frequency

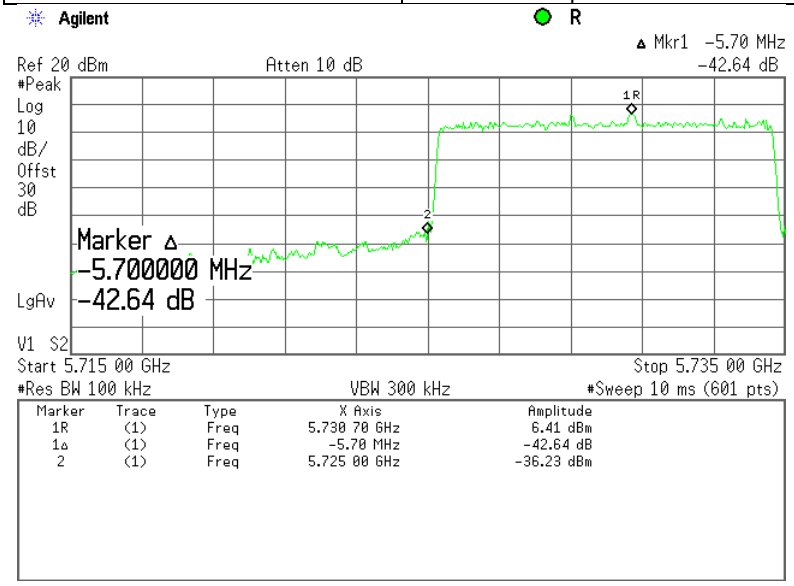
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

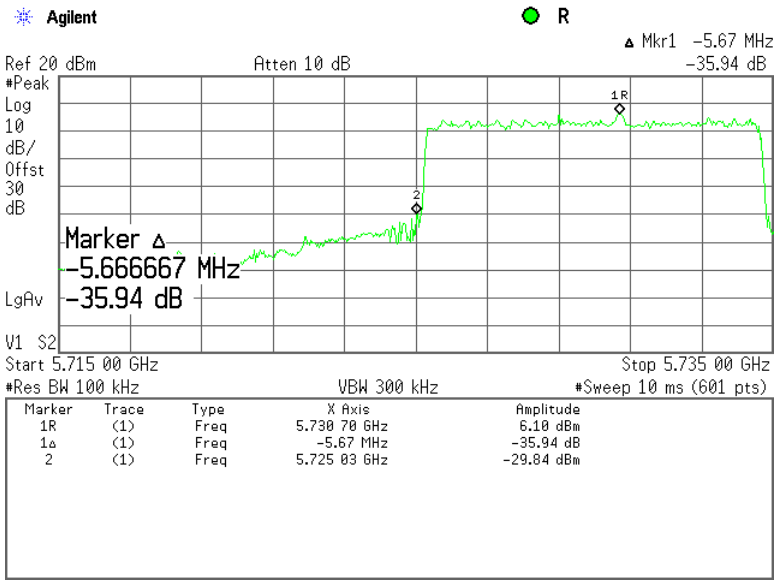
Plot 7.6.13 The highest band edge emission at low carrier frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.6.14 The highest band edge emission at low carrier frequency

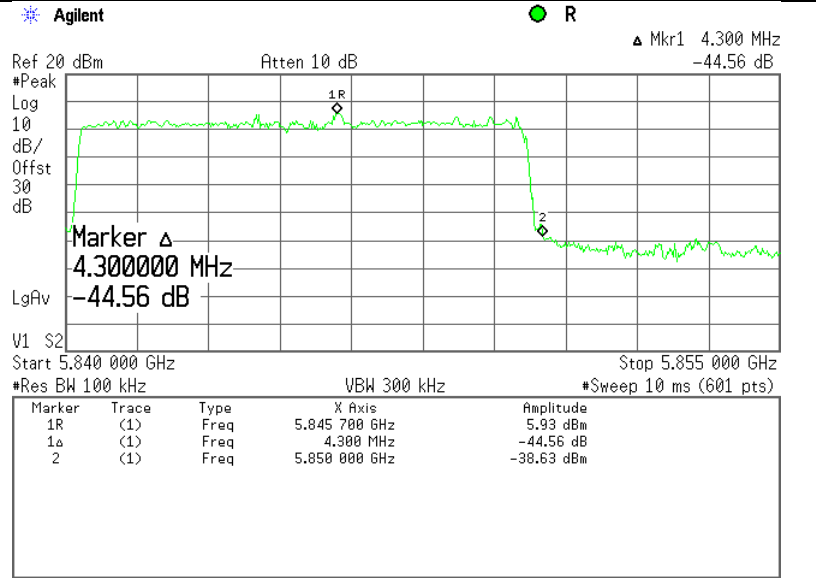
Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(d), Band edge emissions		
Test procedure:	558074 D01 DTS Meas Guidance v01		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1006 hPa	Relative Humidity: 37 %	Power Supply: 48VDC
Remarks:			

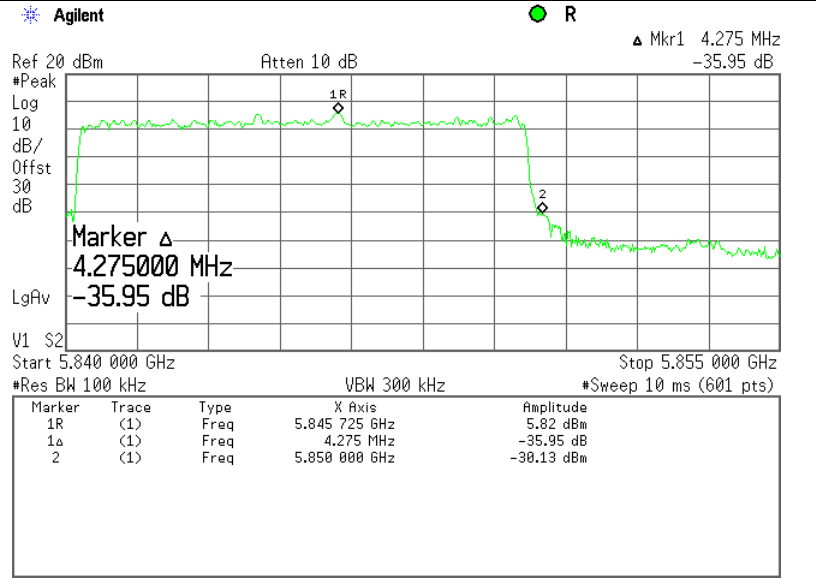
Plot 7.6.15 The highest band edge emission at high carrier frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.6.16 The highest band edge emission at high carrier frequency

Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 ºC	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

7.7 Peak spectral power density

7.7.1 General

This test was performed to measure the peak spectral power density at the transmitter RF antenna connector. Specification test limits are given in Table 7.7.1.

Table 7.7.1 Peak spectral power density limits

Assigned frequency range, MHz	Measurement bandwidth, kHz	Peak spectral power density, dBm
5725 – 5850	3.0	8.0

7.7.2 Test procedure

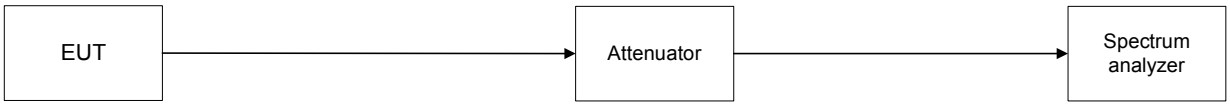
7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.

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

7.7.2.3 The frequency span of spectrum analyzer was set to capture the entire 6 dB band of the transmitter, in peak hold mode with resolution bandwidth set to 3.0 kHz, video bandwidth wider than resolution bandwidth, auto sweep time and sufficient number of sweeps was allowed for trace stabilization. The spectrum lines spacing was verified to be wider than 3 kHz. Otherwise the resolution bandwidth was reduced until individual spectrum lines were resolved and the power of individual spectrum lines was integrated over 3 kHz band.

7.7.2.4 The peak of emission was zoomed with span set just wide enough to capture the emission peak area and sweep time was set equal to span width divided by resolution bandwidth. Spectrum analyzer was set in peak hold mode, sufficient number of sweeps was allowed for trace stabilization and peak spectral power density was measured as provided in Table 7.7.2 and the associated plots.

Figure 7.7.1 Peak spectral power density test setup



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 ºC	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

Table 7.7.2 Peak spectral power density test results

ASSIGNED FREQUENCY: 5725 – 5850 MHz
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 10 kHz
ANTENNA GAIN: 16.5 dBi
NUMBER OF RF OUTPUTS: 4

Carrier frequency, MHz	Spectrum analyzer reading, dBm	External attenuation, dB	Cable loss, dB	Peak spectral power dencity, dBm/3kHz	Limit*, dBm/3kHz	Margin**, dB	Verdict
3.5 MHz channel spacing							
BPSK							
5726.75	-12.08	included	included	-12.08	-8.5	-3.58	Pass
5800.00	-11.80	included	included	-11.80	-8.5	-3.30	Pass
5848.25	-11.55	included	included	-11.55	-8.5	-3.05	Pass
64QAM							
5726.75	-11.79	included	included	-11.79	-8.5	-3.29	Pass
5800.00	-12.59	included	included	-12.59	-8.5	-4.09	Pass
5848.25	-11.02	included	included	-11.02	-8.5	-2.52	Pass
5 MHz channel spacing							
BPSK							
5727.5	-11.77	included	included	-11.77	-8.5	-3.27	Pass
5800.0	-13.58	included	included	-13.58	-8.5	-5.08	Pass
5847.5	-13.74	included	included	-13.74	-8.5	-5.24	Pass
64QAM							
5727.5	-11.72	included	included	-11.72	-8.5	-3.22	Pass
5800.0	-12.15	included	included	-12.15	-8.5	-3.65	Pass
5847.5	-13.76	included	included	-13.76	-8.5	-5.26	Pass
7 MHz channel spacing							
BPSK							
5726.5	-13.81	included	included	-13.81	-8.5	-5.31	Pass
5800.0	-15.08	included	included	-15.08	-8.5	-6.58	Pass
5846.5	-14.50	included	included	-14.50	-8.5	-6.00	Pass
64QAM							
5726.5	-14.16	included	included	-14.16	-8.5	-5.66	Pass
5800.0	-14.20	included	included	-14.20	-8.5	-5.70	Pass
5846.5	-14.39	included	included	-14.39	-8.5	-5.89	Pass
10 MHz channel spacing							
BPSK							
5730	-14.38	included	included	-14.38	-8.5	-5.88	Pass
5800	-15.21	included	included	-15.21	-8.5	-6.71	Pass
5845	-14.71	included	included	-14.71	-8.5	-6.21	Pass
64QAM							
5730	-13.65	included	included	-13.65	-8.5	-5.15	Pass
5800	-14.39	included	included	-14.39	-8.5	-5.89	Pass
5845	-13.83	included	included	-13.83	-8.5	-5.33	Pass

* - Limit = Peak spectral power density limit (dBm/3kHz) – (Antenna gain – 6) – 10*log(N) = 8 – 10.5 – 6 = -8.5 dBm, where N=4 is number of outputs

** - Margin = Peak spectral power density – specification limit.

Reference numbers of test equipment used

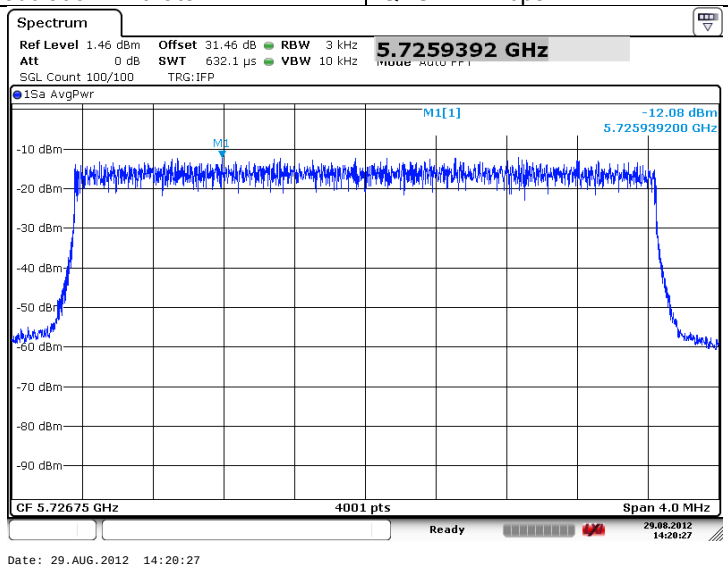
HL 3787	HL 3818	HL 3903					

Full description is given in Appendix A.

Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

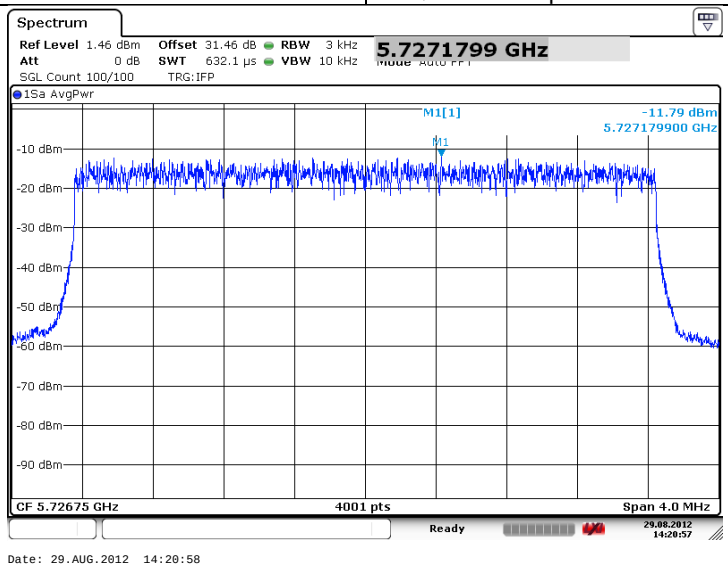
Plot 7.7.1 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



lot 7.7.2 Peak spectral power density at low frequency within 6 dB band

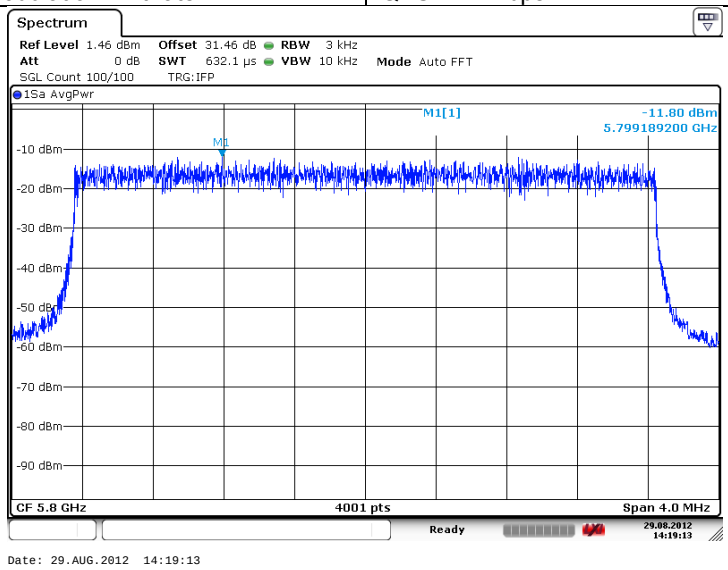
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

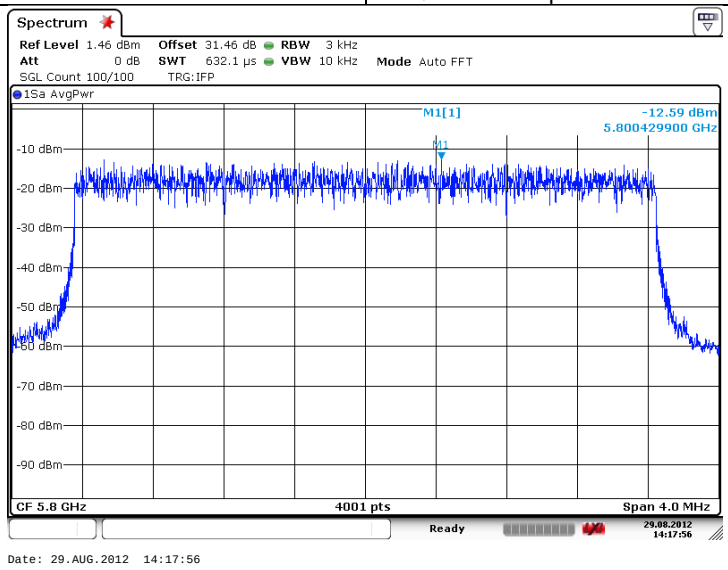
Plot 7.7.3 Peak spectral power density at mid frequency within 6 dB band

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.7.4 Peak spectral power density at mid frequency within 6 dB band

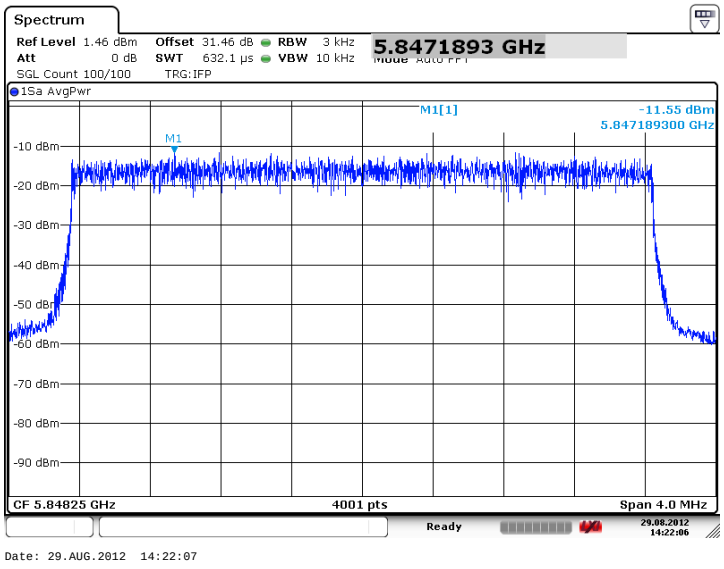
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

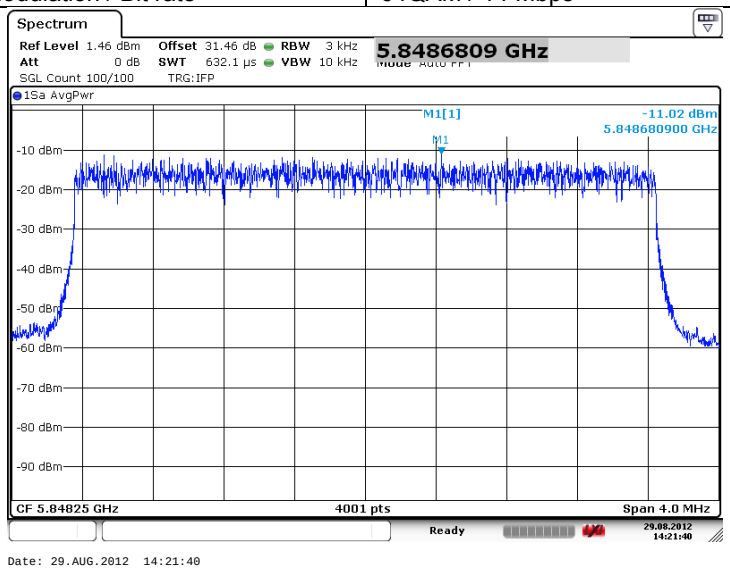
Plot 7.7.5 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	3.5 MHz
Modulation / Bit rate	QPSK / 4 Mbps



Plot 7.7.6 Peak spectral power density at high frequency within 6 dB band

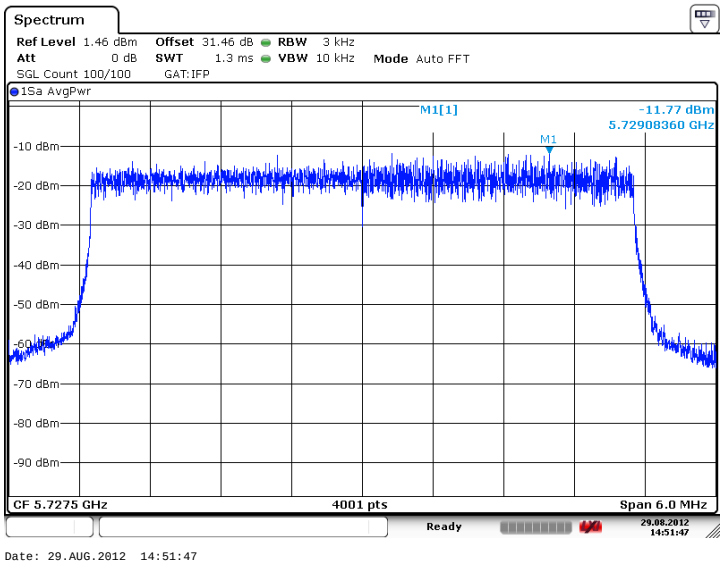
Emission Bandwidth	3.5 MHz
Modulation / Bit rate	64QAM / 14 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

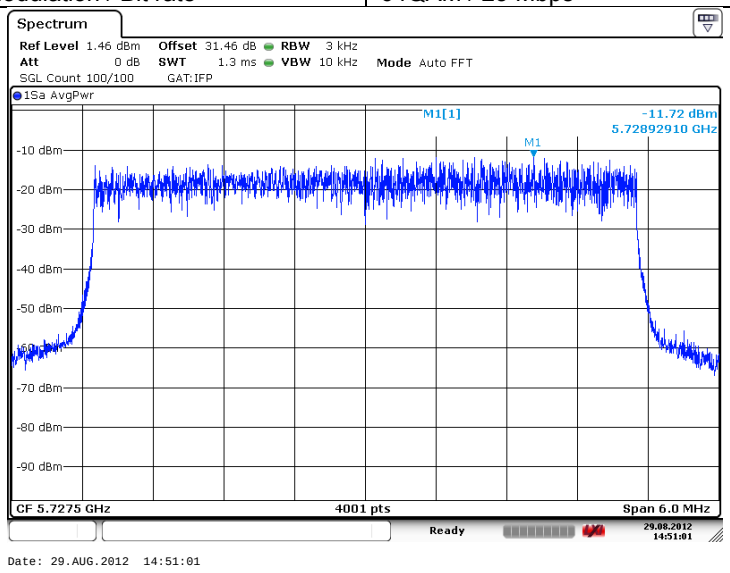
Plot 7.7.7 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.7.8 Peak spectral power density at low frequency within 6 dB band

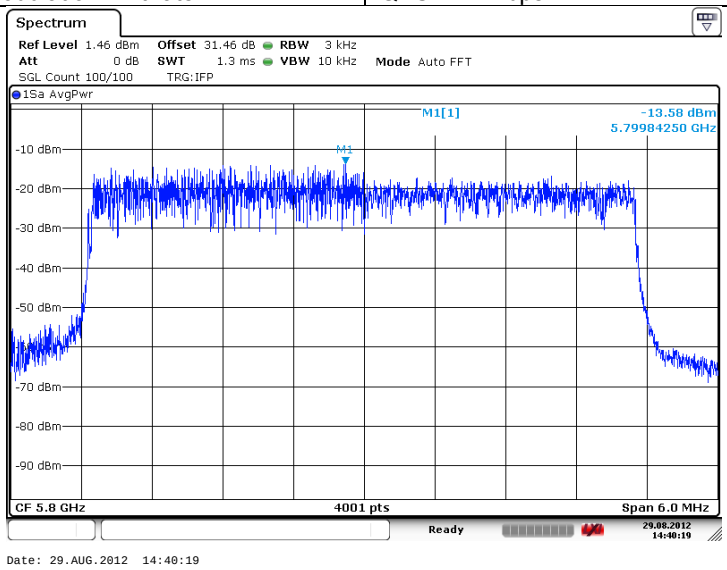
Emission Bandwidth	20 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

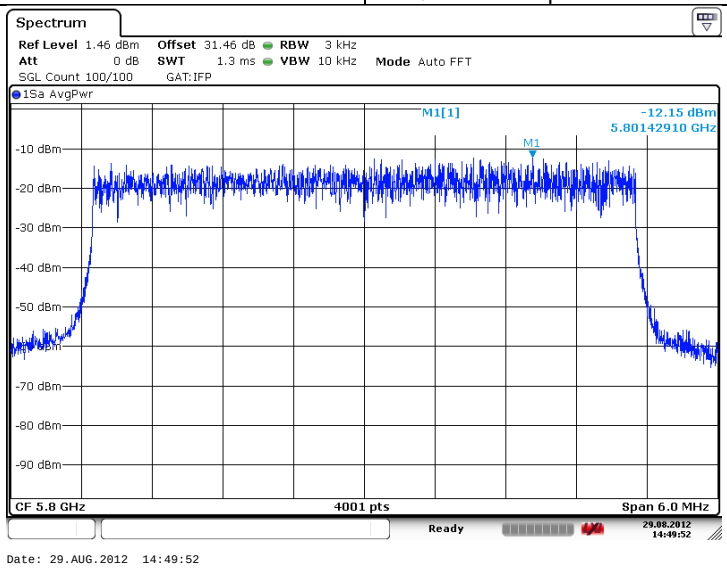
Plot 7.7.9 Peak spectral power density at mid frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.7.10 Peak spectral power density at mid frequency within 6 dB band

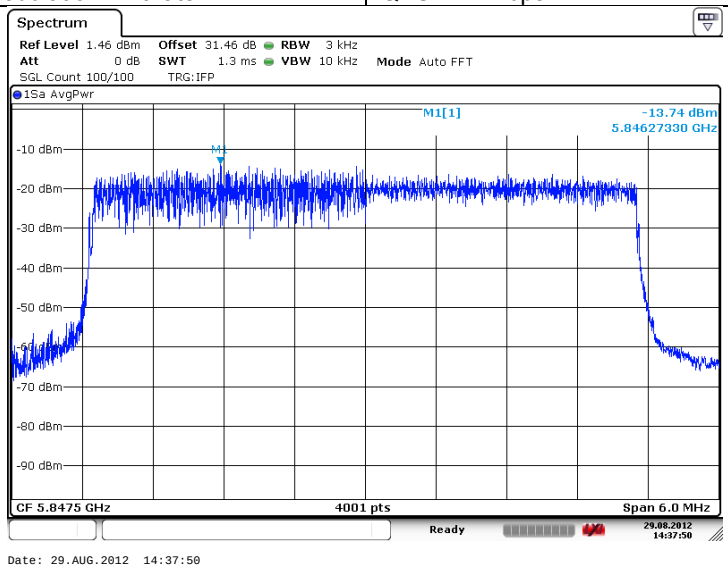
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

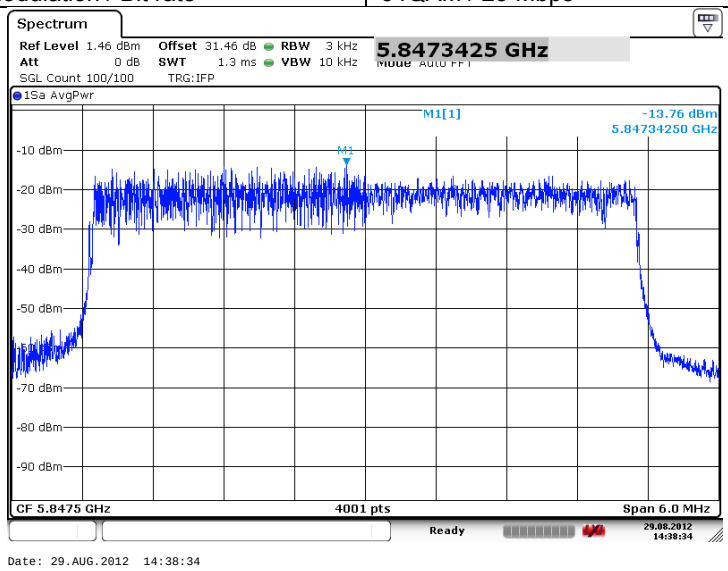
Plot 7.7.11 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	5 MHz
Modulation / Bit rate	QPSK / 7 Mbps



Plot 7.7.12 Peak spectral power density at high frequency within 6 dB band

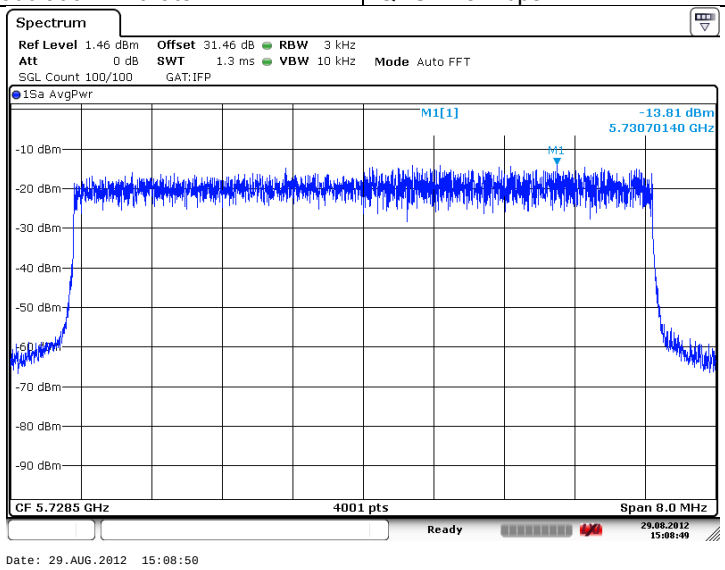
Emission Bandwidth	5 MHz
Modulation / Bit rate	64QAM / 23 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

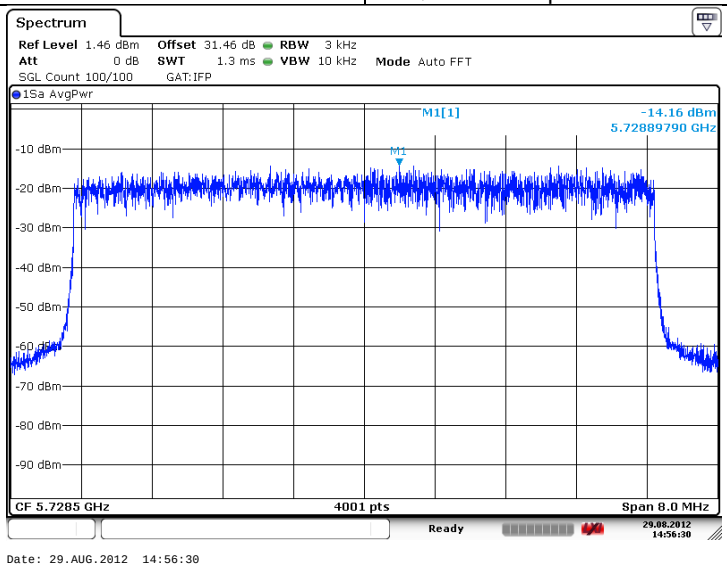
Plot 7.7.13 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.7.14 Peak spectral power density at low frequency within 6 dB band

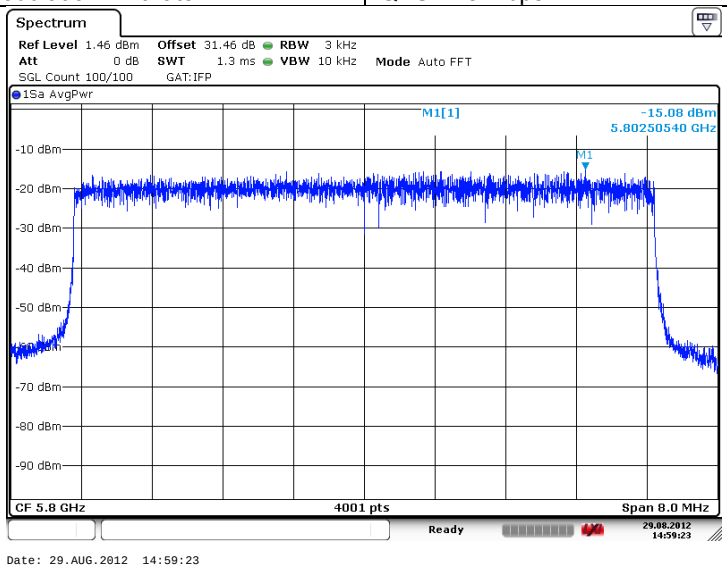
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

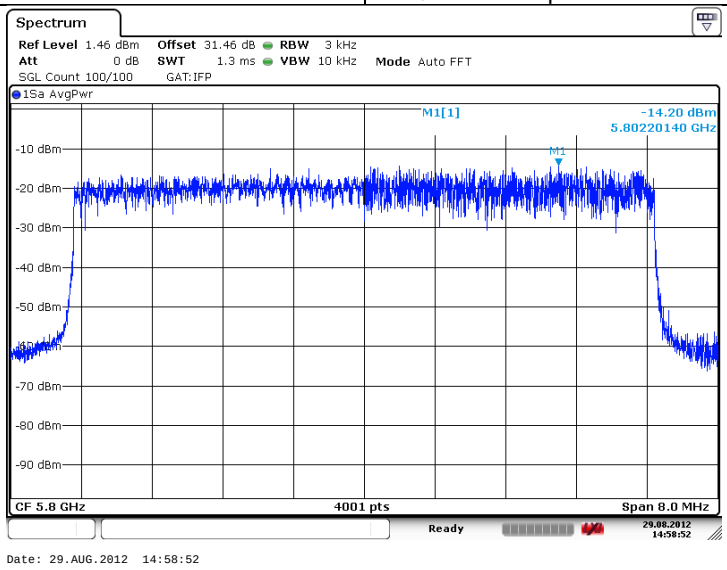
Plot 7.7.15 Peak spectral power density at mid frequency within 6 dB band

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.7.16 Peak spectral power density at mid frequency within 6 dB band

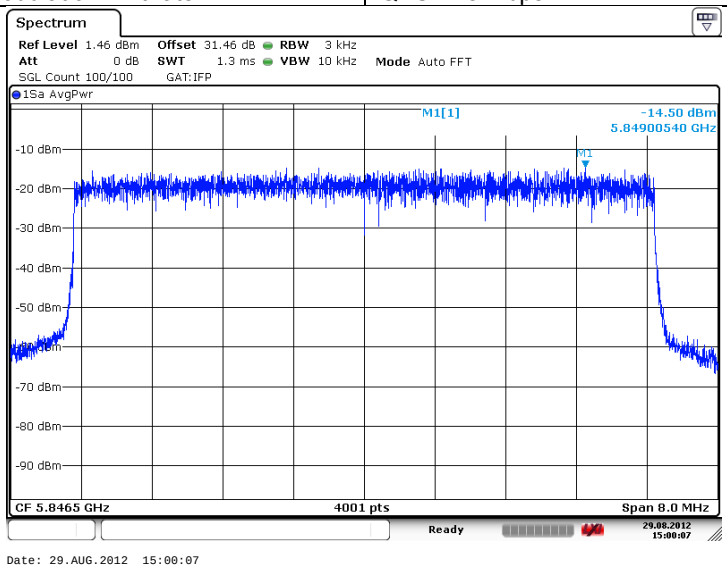
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

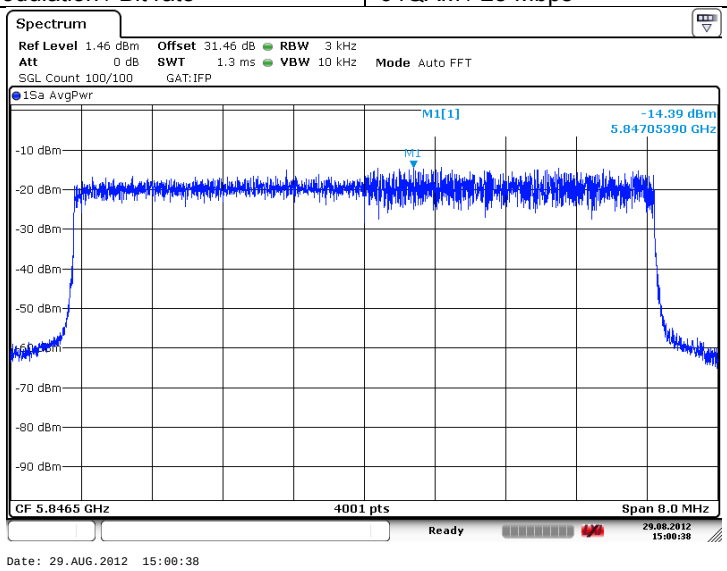
Plot 7.7.17 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	7 MHz
Modulation / Bit rate	QPSK / 8 Mbps



Plot 7.7.18 Peak spectral power density at high frequency within 6 dB band

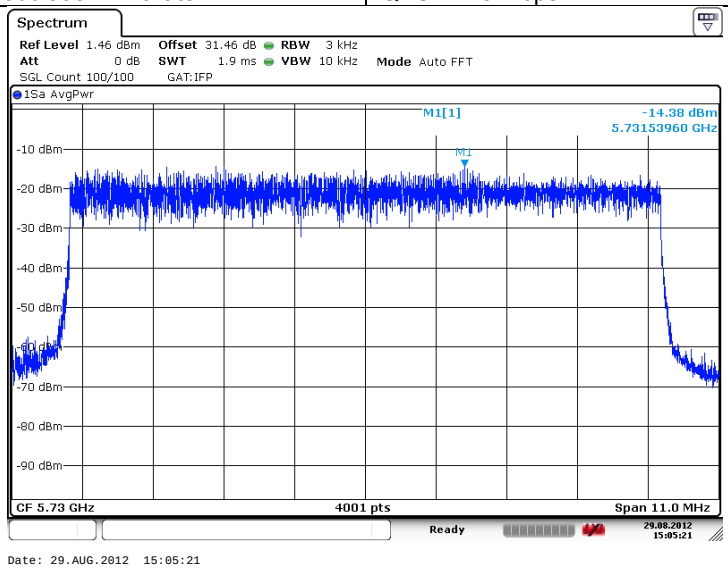
Emission Bandwidth	7 MHz
Modulation / Bit rate	64QAM / 28 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

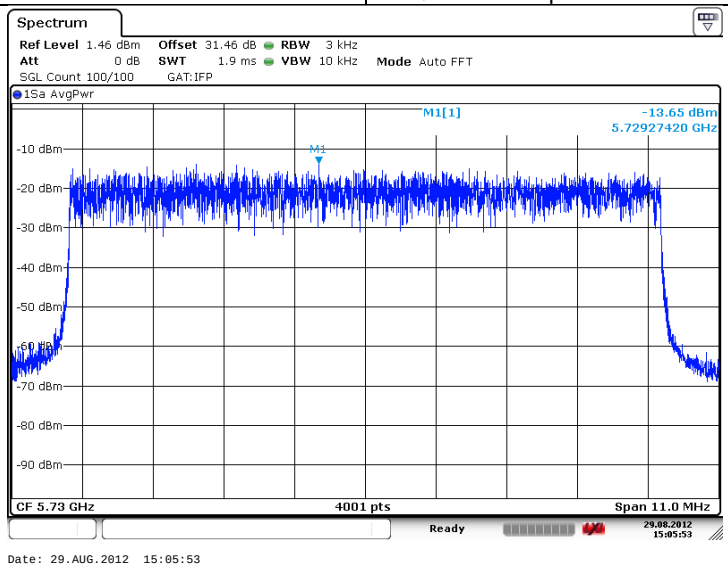
Plot 7.7.19 Peak spectral power density at low frequency within 6 dB band

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.7.20 Peak spectral power density at low frequency within 6 dB band

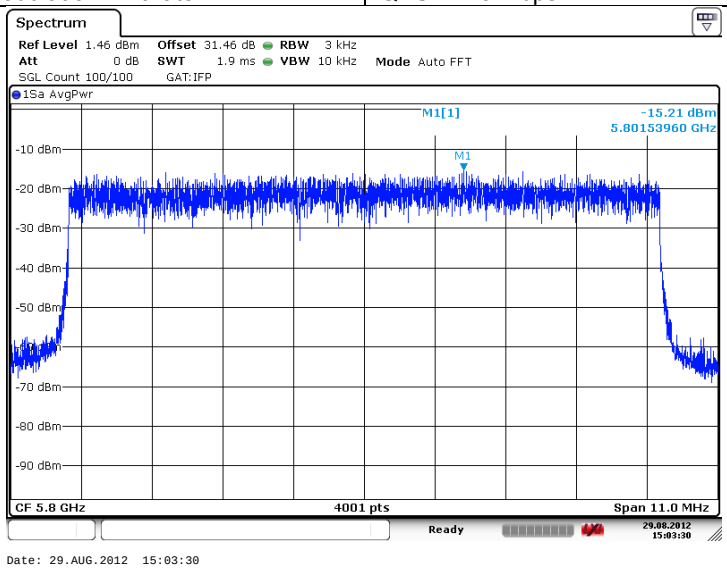
Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

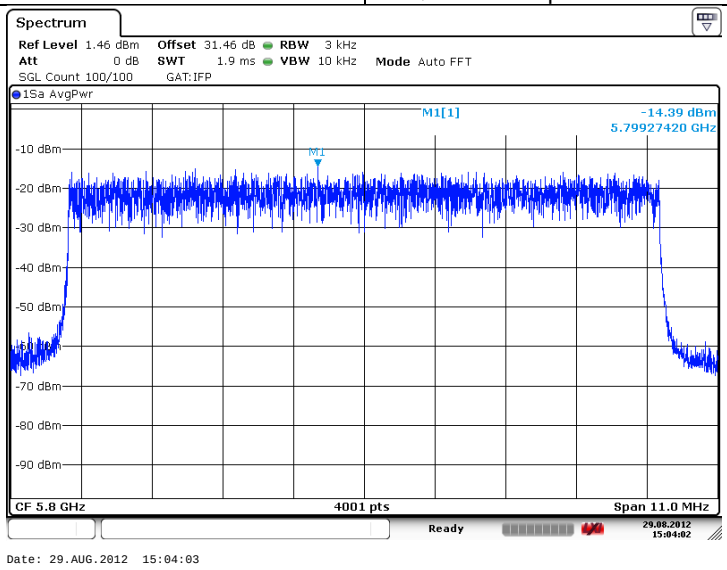
Plot 7.7.21 Peak spectral power density at mid frequency within 6 dB band

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.7.22 Peak spectral power density at mid frequency within 6 dB band

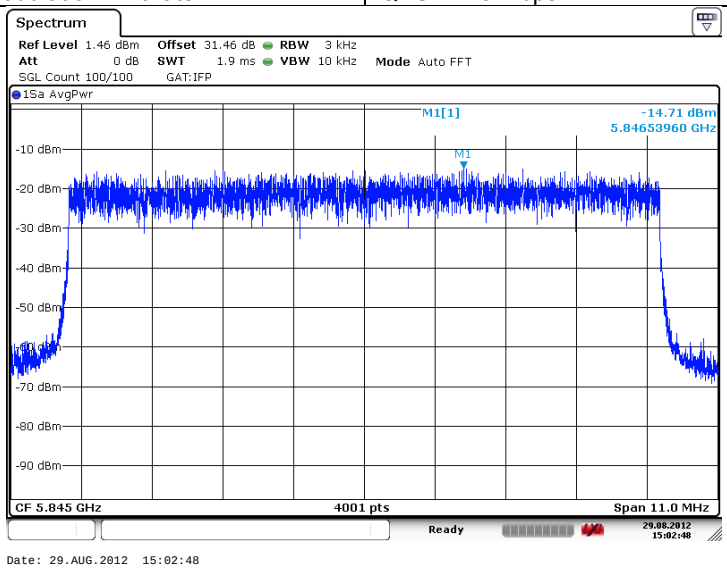
Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.247(e), Peak power density		
Test procedure:	ANSI C63.10-2009 section 6.11.2		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/28/2012 - 8/29/2012		
Temperature: 24.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 47 %	Power Supply: 48VDC
Remarks:			

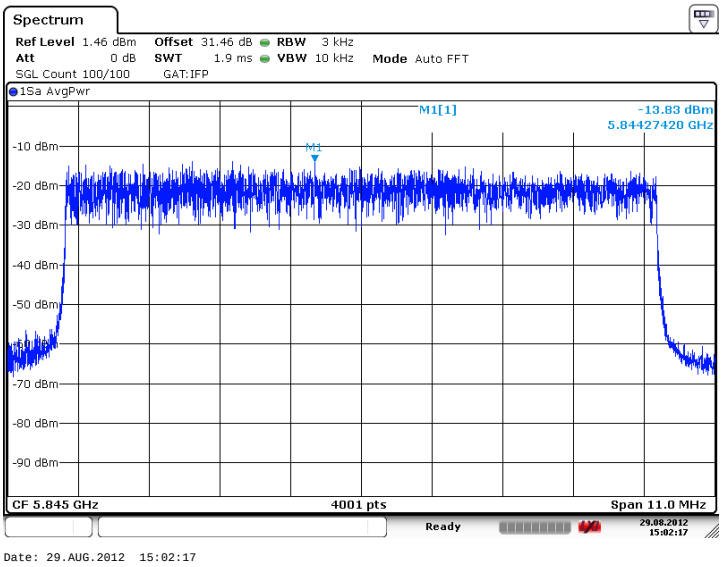
Plot 7.7.23 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	10 MHz
Modulation / Bit rate	QPSK / 13 Mbps



Plot 7.7.24 Peak spectral power density at high frequency within 6 dB band

Emission Bandwidth	10 MHz
Modulation / Bit rate	64QAM / 46 Mbps



Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.1 ºC	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

7.8 Conducted emissions

7.8.1 General

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

Table 7.8.1 Limits for conducted emissions

Frequency, MHz	Class B limit, dB(μV)	
	QP	AVRG
0.15 - 0.5	66 - 56*	56 - 46*
0.5 - 5.0	56	46
5.0 - 30	60	50

* The limit decreases linearly with the logarithm of frequency.

7.8.2 Test procedure

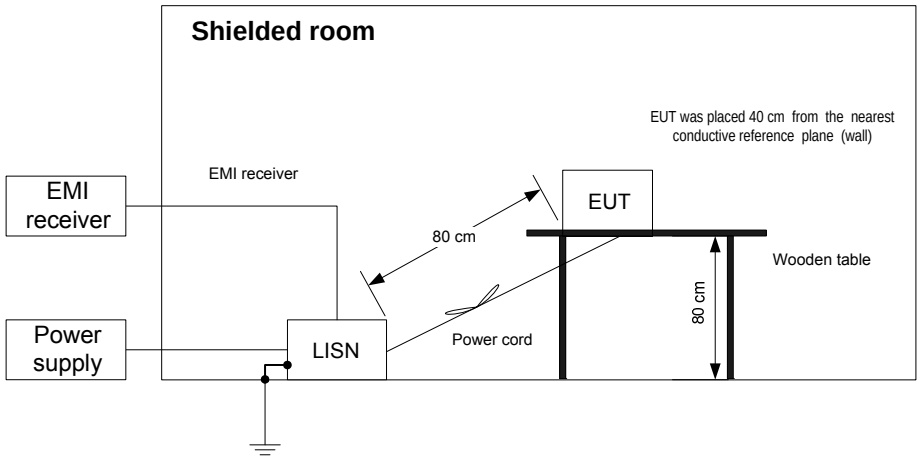
7.8.2.1 The EUT was set up as shown in Figure 7.8.1 and associated photographs, energized and the performance check was conducted.

7.8.2.2 The measurements were performed at power terminals with the LISN, connected to a spectrum analyzer in the frequency range referred to in Table 7.8.2. Unused coaxial connector of the LISN was terminated with 50 Ohm. Quasi-peak and average detectors were used throughout the testing.

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

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

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



Test specification:	**Section 15.207(a), Conducted emission**		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	8/30/2012		
Temperature: 24.1 ºC	**Air Pressure:** 1007 hPa	**Relative Humidity:** 39 %	**Power Supply:** 48VDC
Remarks:			

Table 7.8.2 Conducted emission test results

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

Frequency, MHz	Peak emission, dB(µV)	Quasi-peak			Average			Line ID	Verdict
		Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*	Measured emission, dB(µV)	Limit, dB(µV)	Margin, dB*		
0.208430	47.72	45.53	63.33	-17.80	32.13	53.33	-21.20	L1	Pass
0.595776	41.64	39.56	56.00	-16.44	31.30	46.00	-14.70		
0.683110	42.33	39.79	56.00	-16.21	28.33	46.00	-17.67		
0.946754	43.21	41.27	56.00	-14.73	35.45	46.00	-10.55		
1.216080	45.30	41.29	56.00	-14.71	31.09	46.00	-14.91		
1.461648	41.71	39.67	56.00	-16.33	28.15	46.00	-17.85		
0.209120	50.14	48.05	63.30	-15.25	32.70	53.30	-20.60	L2	Pass
0.595466	41.38	39.21	56.00	-16.79	30.92	46.00	-15.08		
0.664589	42.27	40.23	56.00	-15.77	30.94	46.00	-15.06		
0.664744	41.84	39.30	56.00	-16.70	31.09	46.00	-14.91		
0.946666	42.03	39.61	56.00	-16.39	29.02	46.00	-16.98		
1.205465	45.96	40.83	56.00	-15.17	29.29	46.00	-16.71		

*****- Margin = Measured emission - specification limit.

Reference numbers of test equipment used

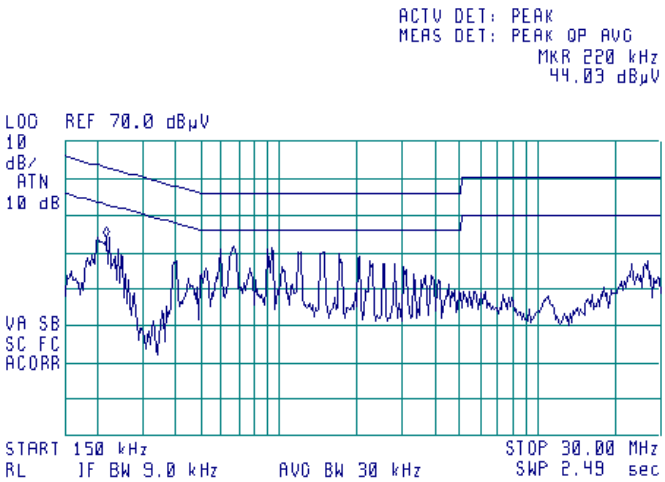
HL 0163	HL 0787	HL 1425	HL 1513	HL 3612			

Full description is given in Appendix A.

Test specification:	Section 15.207(a), Conducted emission		
Test procedure:	ANSI C63.4, Section 13.1.3		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012		
Temperature: 24.1 ºC	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

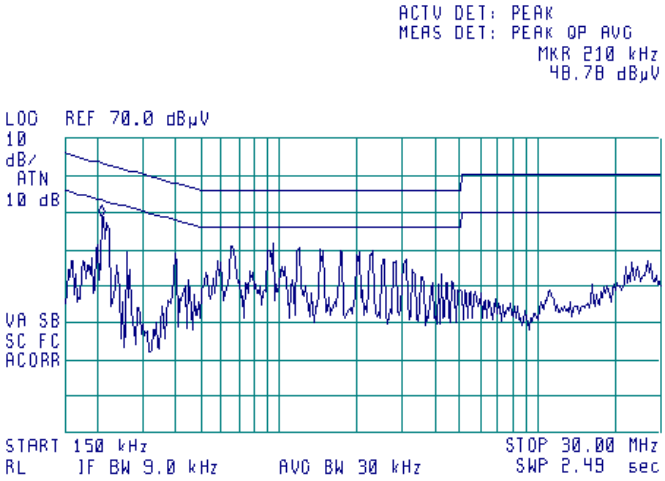
Plot 7.8.1 Conducted emission measurements

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



Plot 7.8.2 Conducted emission measurements

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



Test specification:	Section 15.203, Antenna requirement		
Test procedure:	Visual inspection		
Test mode:	Compliance	Verdict:	PASS
Date(s):	8/30/2012 - 8/30/2012		
Temperature: 24.2 ºC	Air Pressure: 1007 hPa	Relative Humidity: 39 %	Power Supply: 48VDC
Remarks:			

7.9 Antenna requirements

The EUT was verified for compliance with antenna requirements. A transmitter shall be designed to ensure that no antenna other than that furnished by the responsible party will be used with the device. It may be either permanently attached or employs a unique antenna connector for every antenna proposed for use with the EUT. This requirement does not apply to professionally installed transmitters.
The rationale for compliance with the above requirements was either visual inspection results or supplier declaration. The summary of results is provided in Table 7.9.1.

Table 7.9.1 Antenna requirements

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

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0163	LISN FCC/VDE/50 Ohm/50 uH + 5 Ohm, MIL-STD-461E, CISPR 16-1	Electro-Metrics	ANS 25/2	1314	01-Jul-12	01-Jul-13
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-12	03-Jul-13
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	29-Aug-11	29-Sep-12
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	20-May-12	20-May-14
0768	Antenna Standard Gain Horn,18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	03-Feb-12	03-Feb-15
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	03-Feb-12	03-Feb-15
0787	Transient Limiter 9 kHz-200 MHz	Hewlett Packard	11947A	3107A018 77	18-Oct-11	18-Oct-12
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	25-Sep-11	25-Sep-12
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	26-Aug-12	26-Aug-13
1513	Cable RF, 8 m, BNC/BNC	Belden	M17/167 MIL-C-17	1513	02-Sep-12	02-Sep-13
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	25-Nov-11	25-Nov-12
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	09-Jul-12	09-Jul-13
3533	Amplifier, low noise, 6 to 18 GHz	Quinstar Technology	QLJ-06184040 -J0	111590010 01	25-Dec-11	25-Dec-12
3535	Amplifier, low noise, 18 to 40 GHz	Quinstar Technology	QLJ-18404537 -J0	111590030 01	10-Jul-12	10-Jul-13
3612	Cable RF, 17.5 m, N type-N type	Teldor	RG-214/U	NA	01-Dec-11	01-Dec-12
3787	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	19-Dec-11	19-Dec-12
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	16-Feb-12	16-Feb-13
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	08-Feb-12	08-Feb-13
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	08-Feb-12	08-Feb-13
4160	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out	Agilent Technologies	87405C	MY470105 94	08-Aug-12	08-Aug-13

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
4352	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 002	06-Jun-12	06-Mar-13
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	06-Jun-12	06-Mar-13
4367	Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female	Tiger Micro-Electronics Institute	TGD-A1101-10	01e-JSDE805-006	17-Apr-12	17-Apr-14

9 APPENDIX B Measurement uncertainties

Expanded uncertainty at 95% confidence in Hermon Labs EMC measurements

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

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

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). The FCC Designation Number is US1003.

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11 APPENDIX D Specification references

FCC 47CFR part 15: 2011	Radio Frequency Devices
558074 D01 DTS Meas Guidance v01, 1/18/2012	FCC Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247
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 C63.10: 2009	American National Standard for Testing Unlicensed Wireless Devices

12 APPENDIX E Test equipment correction factors

Correction factor
Line impedance stabilization network
Model ANS-25/2, Electro-Metrics, HL 0163

Frequency, kHz	Correction factor, dB
10	4.9
15	2.86
20	1.83
25	1.25
30	0.91
35	0.69
40	0.53
50	0.35
60	0.25
70	0.18
80	0.14
90	0.11
100	0.09
125	0.06
150	0.04

The correction factor in dB is to be added to meter readings of an interference analyzer or a spectrum analyzer.

Antenna factor
Active loop antenna
Model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic antenna factor, dB	Electric antenna factor, dB
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	9.8
0.750	-41.9	9.7
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.2
4.000	-41.4	10.1
5.000	-41.5	10.1
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(1/m) is to be added to receiver meter reading in dB(μV) to convert it into field intensity in dB(μV/m).

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

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

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

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

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

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

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

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

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

Cable loss
Cable coaxial, RG-214/U, N type-N type, 17 m
Teldor, HL 3612

Frequency, MHz	Cable loss, dB
0.1	0.05
0.5	0.07
1	0.10
3	0.22
5	0.29
10	0.39
30	0.68
50	0.90
100	1.27
150	1.58
200	1.80
250	2.12
300	2.36
350	2.60
400	2.82
450	2.99
500	3.23
550	3.40
600	3.56
650	3.71
700	3.90
750	4.04
800	4.23
850	4.39
900	4.55
950	4.65
1000	4.79

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 3.5 m, SMA-SMA, S/N 1225/2A
HL 3901

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	9500	4.29	21000	6.67
100	0.41	10000	4.40	22000	6.92
500	0.93	10500	4.52	23000	7.00
1000	1.33	11000	4.64	24000	7.18
1500	1.63	11500	4.76	25000	7.29
2000	1.90	12000	4.87	26000	7.55
2500	2.12	12500	4.99	27000	7.70
3000	2.33	13000	5.11	28000	7.88
3500	2.50	13500	5.20	29000	8.02
4000	2.67	14000	5.31	30000	8.15
4500	2.82	14500	5.42	31000	8.35
5000	2.99	15000	5.51	32000	8.40
5500	3.16	15500	5.58	33000	8.62
6000	3.32	16000	5.68	34000	8.73
6500	3.51	16500	5.78	35000	8.78
7000	3.65	17000	5.91	36000	8.94
7500	3.79	17500	5.99	37000	9.21
8000	3.92	18000	6.07	38000	9.37
8500	4.04	19000	6.36	39000	9.45
9000	4.18	20000	6.49	40000	9.52

Cable loss
Microwave Cable Assembly, Huber-Suhner, 40 GHz, 1.5 m, SMA-SMA, S/N 1226/2A
HL 3903

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	-0.02	9500	1.84	21000	2.98
100	0.15	10000	1.86	22000	3.07
500	0.38	10500	1.93	23000	3.13
1000	0.56	11000	1.99	24000	3.21
1500	0.69	11500	2.04	25000	3.26
2000	0.82	12000	2.10	26000	3.48
2500	0.90	12500	2.15	27000	3.44
3000	0.98	13000	2.21	28000	3.53
3500	1.06	13500	2.25	29000	3.59
4000	1.11	14000	2.29	30000	3.66
4500	1.17	14500	2.34	31000	3.70
5000	1.24	15000	2.36	32000	3.79
5500	1.32	15500	2.40	33000	3.88
6000	1.40	16000	2.45	34000	3.94
6500	1.50	16500	2.48	35000	3.91
7000	1.56	17000	2.56	36000	4.05
7500	1.62	17500	2.58	37000	4.22
8000	1.68	18000	2.60	38000	4.25
8500	1.74	19000	2.84	39000	4.27
9000	1.78	20000	2.88	40000	4.33

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-244S/N 12025101 002,
HL 4352

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.20	9000	2.81
100	0.28	9500	2.89
300	0.49	10000	3.00
500	0.63	10500	3.07
1000	0.90	11000	3.15
1500	1.10	11500	3.23
2000	1.28	12000	3.30
2500	1.44	12500	3.38
3000	1.57	13000	3.47
3500	1.71	13500	3.55
4000	1.85	14000	3.61
4500	1.95	14500	3.68
5000	2.05	15000	3.76
5500	2.14	15500	3.86
6000	2.27	16000	3.92
6500	2.38	16500	3.97
7000	2.47	17000	4.03
7500	2.58	17500	4.10
8000	2.65	18000	4.18
8500	2.74		

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

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

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
AM	amplitude modulation
AVRG	average (detector)
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(μV)	decibel referred to one microvolt
dB(μV/m)	decibel referred to one microvolt per meter
dB(μA)	decibel referred to one microampere
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μs	microsecond
NA	not applicable
NB	narrow band
OATS	open area test site
Ω	Ohm
PM	pulse modulation
PS	power supply
ppm	part per million (10^{-6})
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
WB	wideband

END OF DOCUMENT