HERMON LABORATORIES

ELECTRICAL TESTING
0839.01

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

TEST REPORT

ACCORDING TO: FCC 47CFR part 27

FOR:

Airspan Networks Inc.
LTE Base Station
Model: Synergy 2000 2.5H GHz (B41H)
FCC ID:PIDSYN2620

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1 Applicant information

Client name:	Airspan Networks Inc.
Address:	777 Yamato, Road Suite 310 Boca Raton, FL 33431, 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:	LTE Base Station
Product type:	Transceiver
Model(s):	Synergy 2000 2.5H GHz (B41H)
Serial number:	6F21D7173080
Hardware version:	C2
Software release:	14.12.00.034
Receipt date	7/28/2013

3 Manufacturer information

Manufacturer name:	Airspan Networks Inc.
Address:	777 Yamato, Road Suite 310 Boca Raton, FL 33431, 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:	24750
Location:	Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started:	7/28/2013
Test completed:	8/1/2013
Test specification(s):	FCC 47CFR part 27

5 Tests summary

Test	Status
Transmitter characteristics	
Section 27.50(h), Peak output power at RF antenna connector	Pass
Section 27.50(h)(4), Spectral power density	Pass
Section 2.1091, 27.52, RF safety	Pass, exhibit provided in Application for certification
Section 27.53(m)(2), Spurious emissions at RF antenna connector	Pass
Section 27.53(m)(2), Band edge emissions at RF antenna connector	Pass
Section 27.53(m)(2), Radiated spurious emissions	Pass
Section 27.54, Frequency stability	Pass
Section 2.1049, Occupied bandwidth	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 1, 2013	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	August 6, 2013	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	August 8, 2013	

6 EUT description

6.1 General information

A base station radio, Synergy 2000-Band 41 TDD LTE, is a part of the LTE 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 Synergy's' transceiver/receiver (Up to 64 QAM modulation, data rate up to 150 Mbps) uses OFDM and operating in TDD mode, equipped with a 18 dBi external antenna.
The Synergy is installed outdoors and typically is mounted on a pole. The Subscriber 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 LTE UE from relocating to another subscriber premises without authorization.

6.2 Ports and lines

Port type	Port description	Connected 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	EUT	Termination 50 Ohm	2	Coax	NA
Signal*	RS-232	EUT	Laptop	1	Unshielded	2

* For maintance only

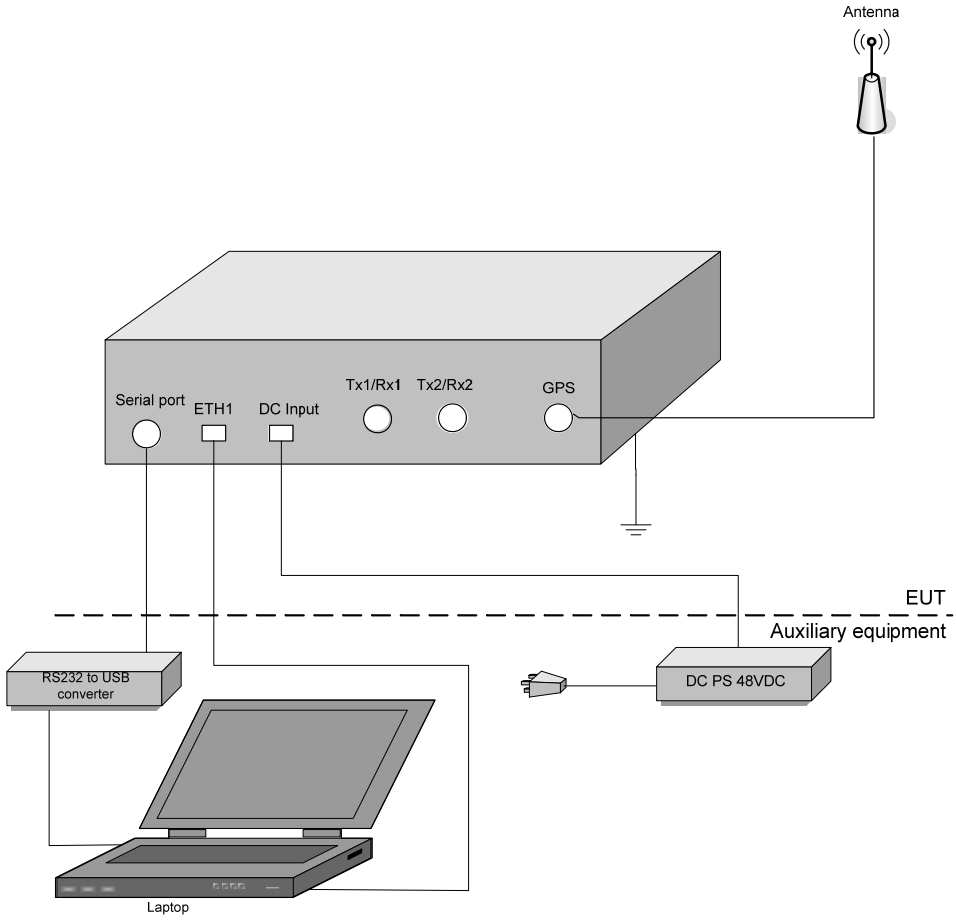
6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
DC power supply	Standig	605D	1AI-G0XE-A02
Laptop	DELL	E6420	HTCNR1
AC/DC adaptor	DELL	MK947	1AI-GOXE-A02
GPS antenna	Tallysman Wireless	32-3030-0	20110606

6.4 Changes made in the EUT

No changes were implemented in the EUT during testing.

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	2620.0 – 2690.0 MHz
Operating frequency	2625.0 - 2685.0 MHz for 10 MHz OBW 2630.0 – 2680.0 MHz for 20 MHz OBW
RF channel spacing	10 MHz, 20MHz
Maximum rated output power	At transmitter 50 Ω RF output connector (aggregate power of both RF chains): 33.36 dBm

Is transmitter output power variable?				
	No			
V	Yes		continuous variable	
		V	stepped variable with stepsize	0.5 dB
			minimum RF power	-30 dBm
			maximum RF power at antenna connector	33.36 dBm

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

Antenna/s technical characteristics

Type	Manufacturer	Model number	Gain
External	ALPHA Wireless Ltd	AW3007	18 dBi
External	ALPHA Wireless Ltd	AW3008	17 dBi
External sector	Cobham Antenna Systems	SA12-2.5-DS/1915	11 dBi

Transmitter aggregate data rate/s, MBps

Transmitter 99% power bandwidth	Type of modulation		
	QPSK	16QAM	64QAM
10 MHz	15.5	30.5	75.0
20 MHz	31.0	61.0	150.0

Type of multiplexing	TDD
Modulating test signal (baseband)	PRBS
Maximum transmitter duty cycle in normal use	75%

Transmitter power source					
		Nominal rated voltage		Battery type	
V	DC	**Nominal rated voltage**	48 VDC via AC/DC adaptor		
	AC mains	**Nominal rated voltage**	120 V	Frequency	60 Hz

Common power source for transmitter and receiver	**V**	yes	no

Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

7 Transmitter tests according to 47CFR part 27

7.1 Occupied bandwidth test

7.1.1 General

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

Table 7.1.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, kHz
2620.0 – 2690.0 MHz	26	NA

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

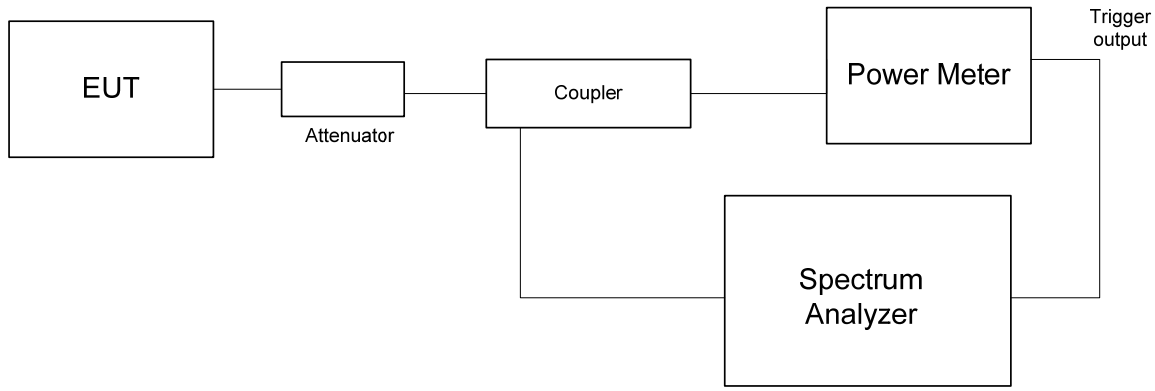
7.1.2 Test procedure

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 the normal modulated signal and actual channel width was measured at the 26 dBc modulation envelope reference points.

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

Figure 7.1.1 Occupied bandwidth test setup



Test specification:	**Section 2.1049, Occupied bandwidth**		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 40 %	**Power Supply:** 48VDC
Remarks:			

Table 7.1.2 Occupied bandwidth test results

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: PRBS
EBW: 10 MHz

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
QPSK 15.5 Mbps				
2625.000	9299.0	NA	NA	Pass
2656.000	9330.0	NA	NA	Pass
2685.000	9443.0	NA	NA	Pass
64QAM 75 Mbps				
2625.000	9309.0	NA	NA	Pass
2656.000	9315.0	NA	NA	Pass
2685.000	9321.0	NA	NA	Pass

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 200 kHz
VIDEO BANDWIDTH: 620 kHz
MODULATION ENVELOPE REFERENCE POINTS: 26 dBc
MODULATING SIGNAL: PRBS
EBW: 20 MHz

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
QPSK 31 Mbps				
2630.000	18453.0	NA	NA	Pass
2656.000	18442.0	NA	NA	Pass
2680.000	18789.0	NA	NA	Pass
64QAM 150 Mbps				
2630.000	18473.0	NA	NA	Pass
2656.000	18706.0	NA	NA	Pass
2680.000	18644.0	NA	NA	Pass

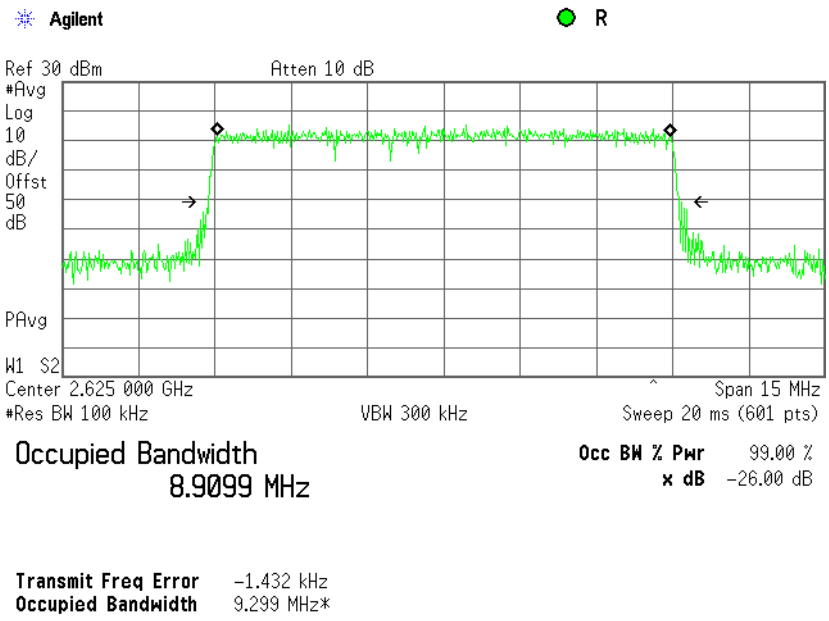
Reference numbers of test equipment used

HL 3442	HL 3455	HL 3818	HL 3901				

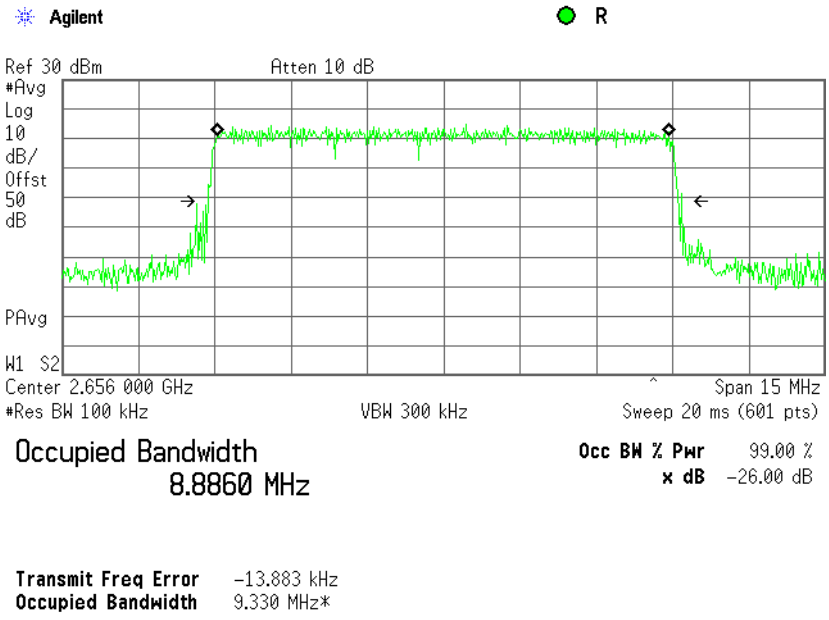
Full description is given in Appendix A.

Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.1 Occupied bandwidth test results at low frequency, 10 MHz EBW, QPSK

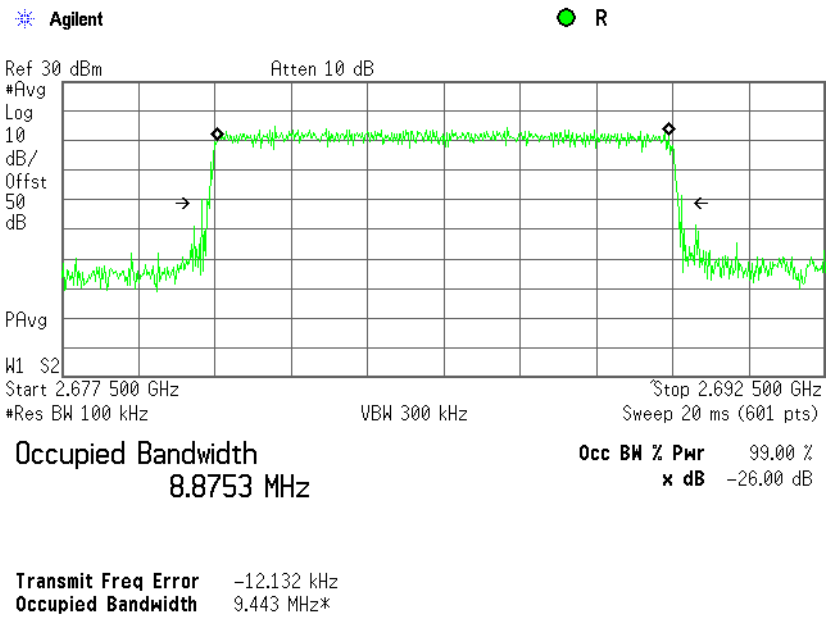


Plot 7.1.2 Occupied bandwidth test results at mid frequency, 10 MHz EBW, QPSK

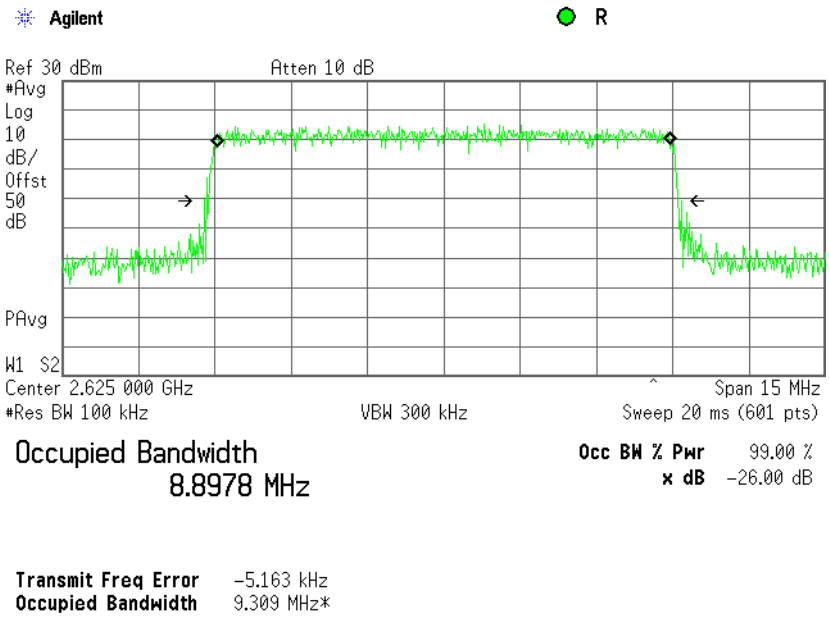


Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.3 Occupied bandwidth test results at high frequency, 10 MHz EBW, QPSK

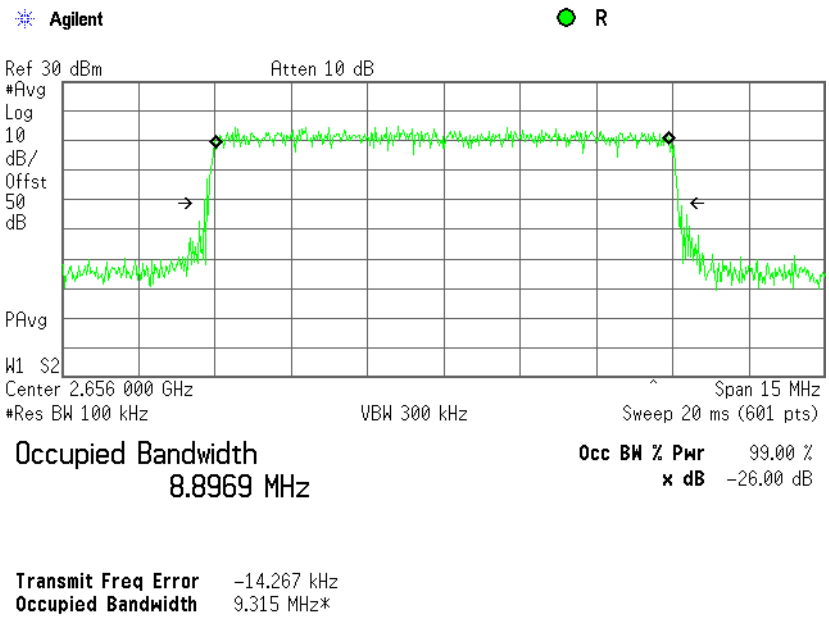


Plot 7.1.4 Occupied bandwidth test results at low frequency, 10 MHz EBW, 64QAM

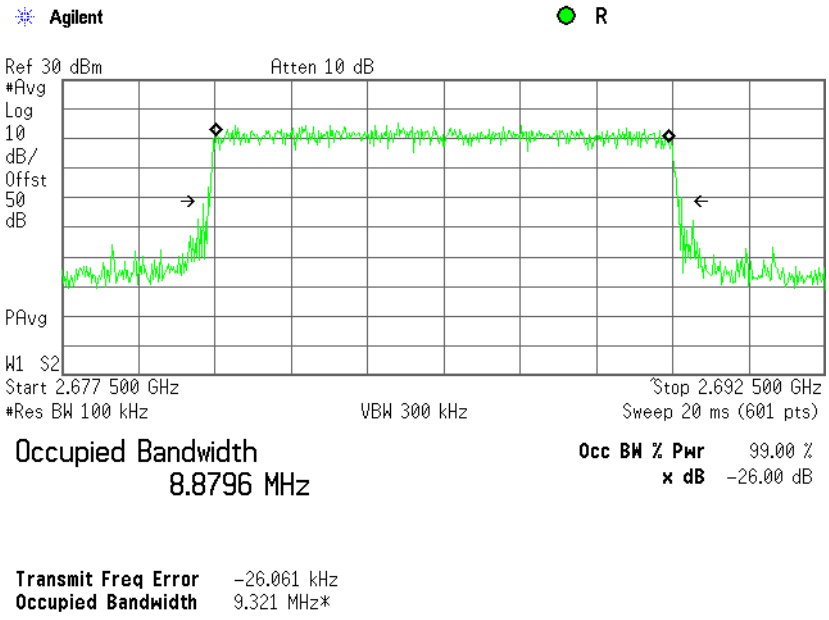


Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.5 Occupied bandwidth test results at mid frequency, 10 MHz EBW, 64QAM

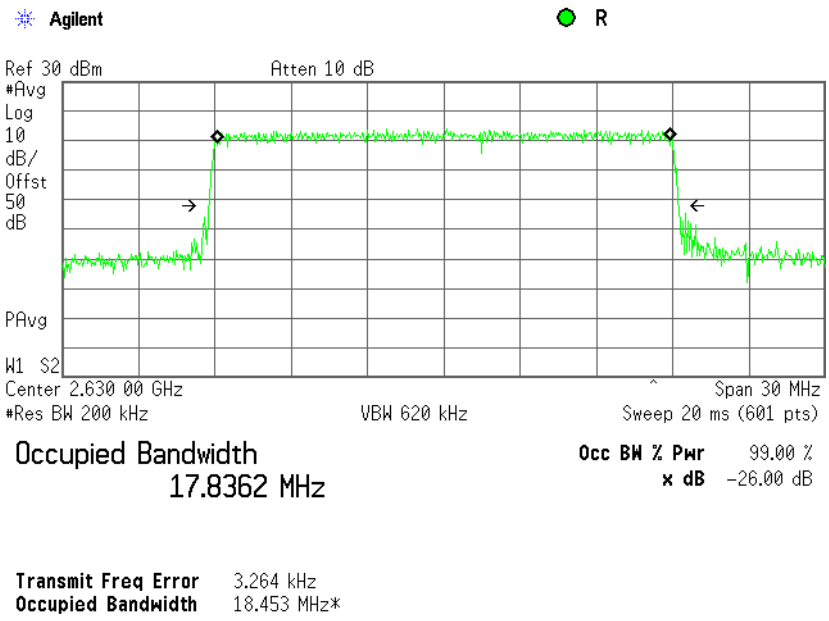


Plot 7.1.6 Occupied bandwidth test results at high frequency, 10 MHz EBW, 64QAM

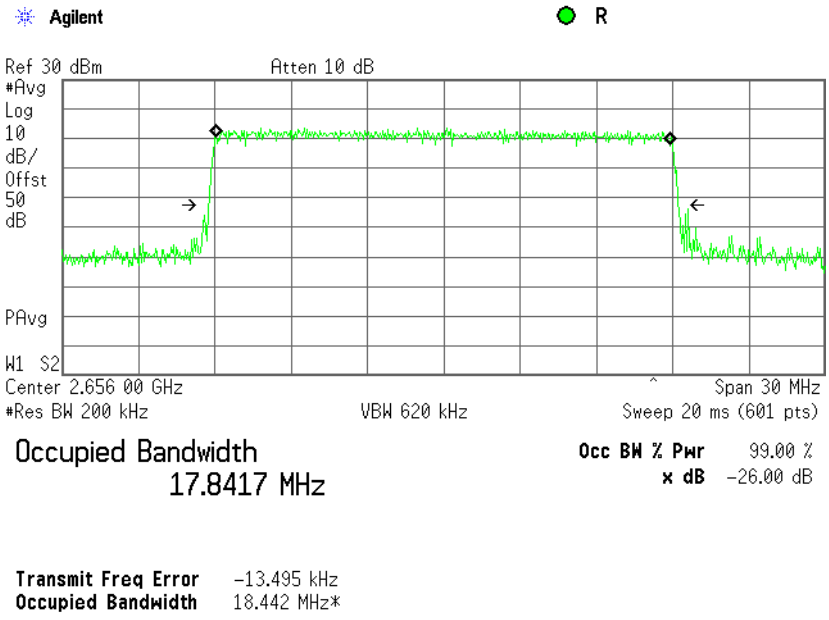


Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.7 Occupied bandwidth test results at low frequency, 20 MHz EBW, QPSK

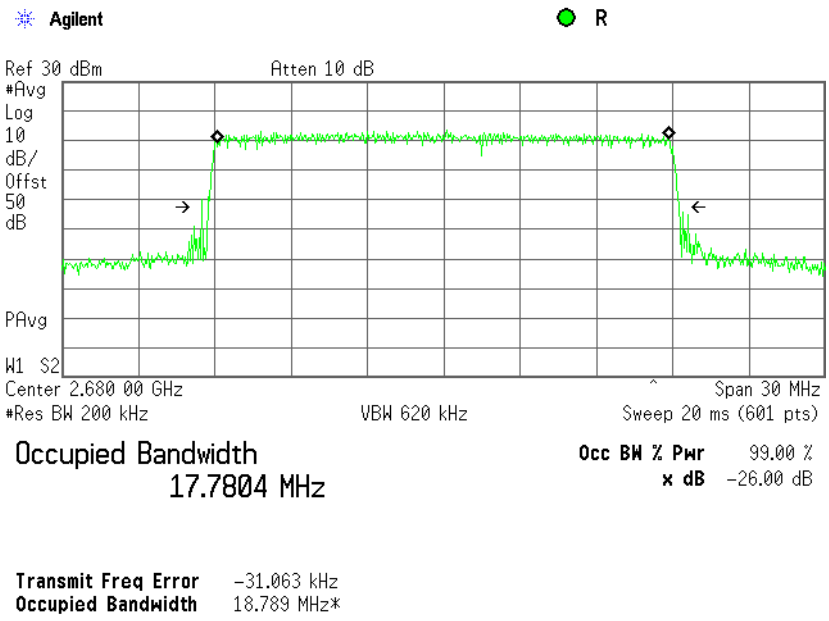


Plot 7.1.8 Occupied bandwidth test results at mid frequency, 20 MHz EBW, QPSK

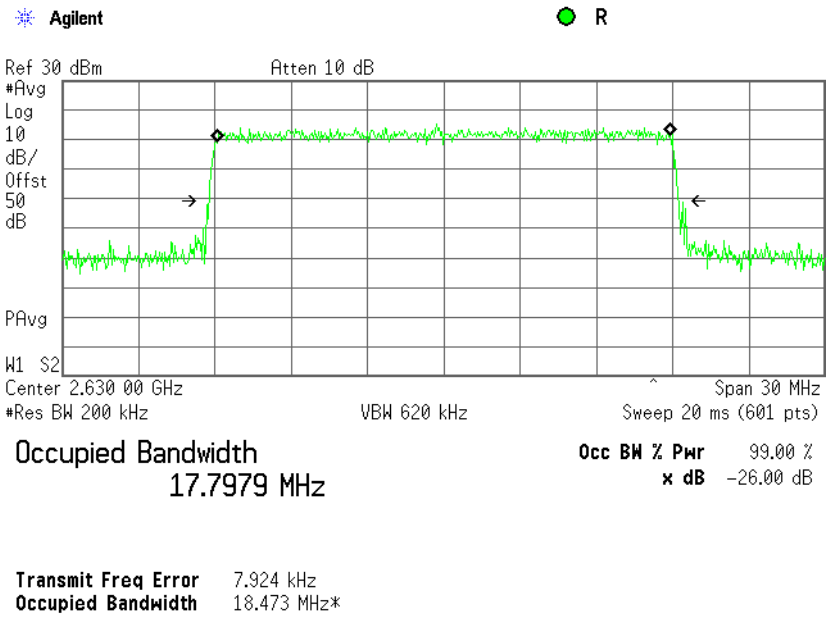


Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.9 Occupied bandwidth test results at high frequency, 20 MHz EBW, QPSK

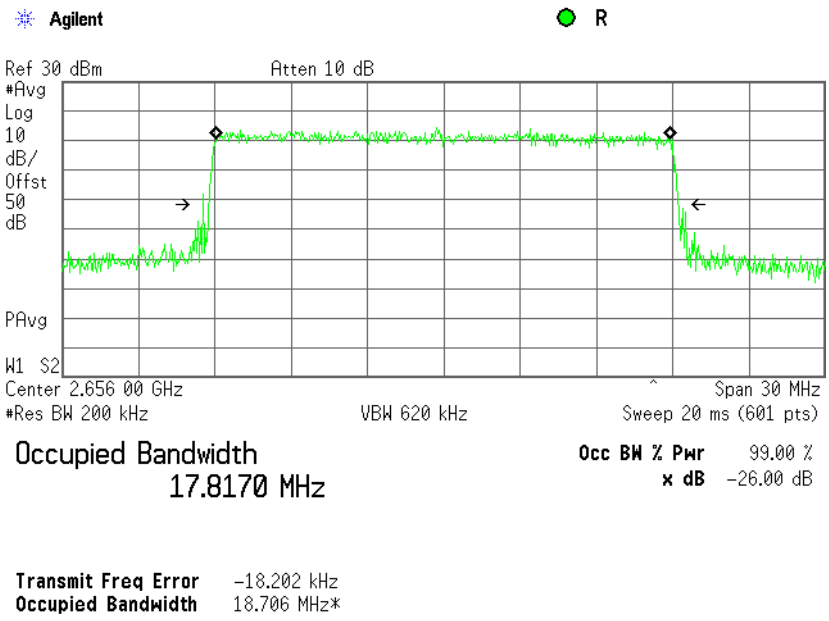


Plot 7.1.10 Occupied bandwidth test results at low frequency, 20 MHz EBW, 64QAM

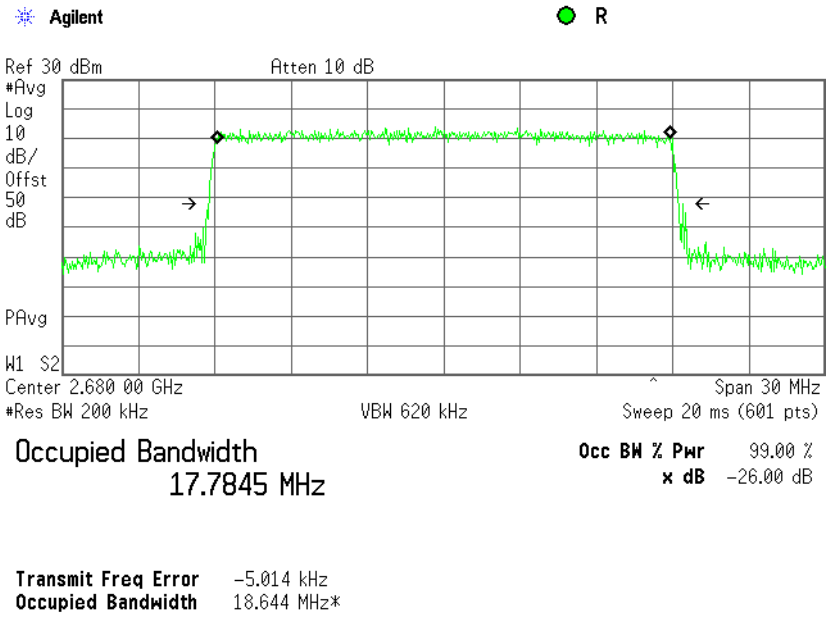


Test specification:	Section 2.1049, Occupied bandwidth		
Test procedure:	47 CFR, Section 2.1049		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.1.11 Occupied bandwidth test results at mid frequency, 20 MHz EBW, 64QAM



Plot 7.1.12 Occupied bandwidth test results at high frequency, 20 MHz EBW, 64QAM



Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

7.2 Peak output power test

7.2.1 General

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

Table 7.2.1 Peak output power limits

Transmitter type	Assigned frequency range, MHz	Maximum EIRP, dBm
Main, booster and base stations	2496 – 2690	63+10log(X/Y)+10log(360/beamwidth)
		Maximum peak power density dBm/100 kHz
		EIRP+10log(0.1/Y)

*- X is the actual channel width in MHz (occupied bandwidth), Y is either

1) 6 MHz if prior to transition or the station is in the MBS following transition or
2) 5.5 MHz if the station is in the LBS and UBS following transition, and
3) beamwidth is the total horizontal plane beam width of the individual transmitting antenna for the station or any sector measured at the half-power points.

7.2.2 Test procedure

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

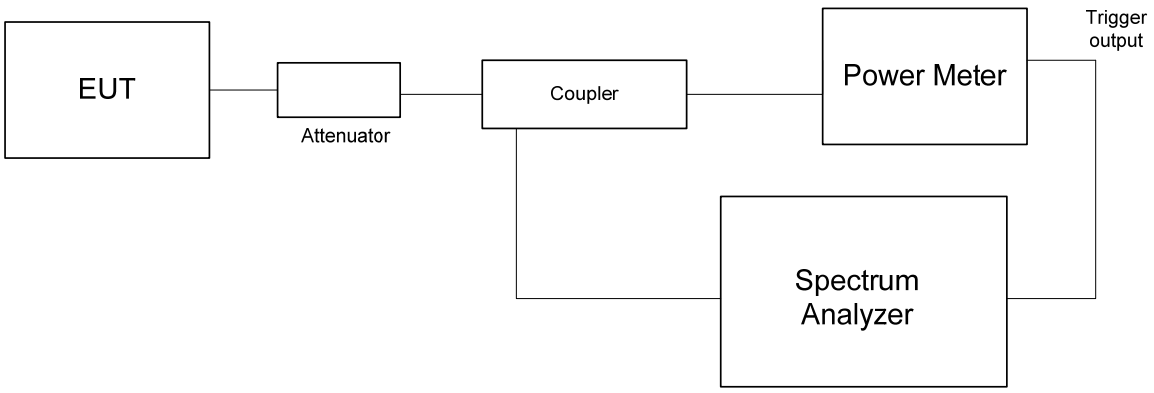
7.2.2.2 The EUT was adjusted to produce maximum available to the end user RF output power.

7.2.2.3 The average output power was measured with power meter as provided in Table 7.2.2 and Table 7.2.3.

7.2.2.4 The power spectral density was measured with spectrum analyzer as provided in Table 7.2.4 to Table 7.2.5 and the associated plots..

7.2.2.5 The test results are provided in the tables below and associated plots.

Figure 7.2.1 Peak output power test setup



Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.2.2 Peak output power test results

ASSIGNED FREQUENCY RANGE: 2620.0 – 2690.0 MHz
DETECTOR USED: Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DUTY CYCLE: 100%
EBW: 10 MHz
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

- Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps								
2625.00	30.30	30.40	33.36	18.0	51.36	69.32	-17.96	Pass
2656.00	29.87	30.21	33.05	18.0	51.07	69.34	-18.27	Pass
2685.00	29.78	29.67	32.74	18.0	50.74	69.39	-18.65	Pass
64QAM 75.0 Mbps								
2625.00	30.05	30.38	33.23	18.0	51.24	69.33	-18.08	Pass
2656.00	29.57	30.88	33.28	18.0	51.28	69.33	-18.05	Pass
2685.00	29.61	29.80	32.72	18.0	50.73	69.33	-18.60	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.7

MAXIMUM ANTENNA GAIN: 17 dBi

Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps								
2625.00	30.30	30.40	33.36	17.0	50.36	67.88	-17.52	Pass
2656.00	29.87	30.21	33.05	17.0	50.07	67.88	-17.81	Pass
2685.00	29.78	29.67	32.74	17.0	49.74	67.96	-18.22	Pass
64QAM 75.0 Mbps								
2625.00	30.05	30.38	33.23	17.0	50.24	67.88	-17.64	Pass
2656.00	29.57	30.88	33.28	17.0	50.28	67.94	-17.65	Pass
2685.00	29.61	29.80	32.72	17.0	49.73	67.92	-18.19	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.7

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3345	HL 3818	HL 3903	HL 4164	HL 4367	

Full description is given in Appendix A.

Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.2.3 Peak output power test results

ASSIGNED FREQUENCY RANGE: 2620.0 – 2690.0 MHz
DETECTOR USED: Average
MODULATING SIGNAL: PRBS
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
DUTY CYCLE: 100%
EBW: 20 MHz
MAXIMUM ANTENNA GAIN: 18 dBi

- Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK 31.0 Mbps								
2630.00	30.20	30.19	33.21	18.0	51.21	69.29	-18.08	Pass
2656.00	29.65	30.60	33.16	18.0	51.18	69.29	-18.11	Pass
2680.00	29.50	29.60	32.56	18.0	50.56	69.37	-18.81	Pass
64QAM 150.0 Mbps								
2630.00	30.28	30.25	33.28	18.0	51.29	69.29	-18.00	Pass
2656.00	29.49	30.68	33.14	18.0	51.14	69.35	-18.21	Pass
2680.00	29.50	29.62	32.57	18.0	50.59	69.33	-18.75	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.7

MAXIMUM ANTENNA GAIN: 17 dBi

- Carrier frequency, MHz	Power Meter reading RF#1, dBm	Power Meter reading RF#2, dBm	Total RF power**, dBm	Antenna gain, dBi	Total EIRP*, dBm	Limit***, dBm	Margin, dB	Verdict
QPSK 31.0 Mbps								
2630.00	30.20	30.19	33.21	17.0	50.21	67.88	-17.67	Pass
2656.00	29.65	30.60	33.16	17.0	50.18	67.88	-17.70	Pass
2680.00	29.50	29.60	32.56	17.0	49.56	67.96	-18.40	Pass
64QAM 150.0 Mbps								
2630.00	30.28	30.25	33.28	17.0	50.29	67.88	-17.59	Pass
2656.00	29.49	30.68	33.14	17.0	50.14	67.94	-17.80	Pass
2680.00	29.50	29.62	32.57	17.0	49.59	67.92	-18.34	Pass

* - EIRP total, dBm = Total RF power**, dBm + Antenna Gain, dBi
** - Total RF power , dBm = 10 log{10^[P(dBm,RF#1)/10]+ 10^([P(dBm, RF#2)/10]}
*** - See Table 7.2.7

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3345	HL 3818	HL 3903	HL 4164	HL 4367	

Full description is given in Appendix A.

Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.2.4 Power spectral density test results

ASSIGNED FREQUENCY RANGE: 2620.0 – 2690.0 MHz
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATING SIGNAL: PRBS
CHANNEL BANDWIDTH: 10 MHz
TRANSMITTER OUTPUT POWER SETTINGS: 30 dBm
DUTY CYCLE: 100%
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

Carrier frequency, MHz	SA reading, RF #1 dBm/100kHz	PSD result**, dBm/100kHz	Antenna gain, dBi	Total PSD*, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps							
2625.00	12.94	15.95	18.0	33.95	45.22	-11.27	Pass
2656.00	12.91	15.92	18.0	33.94	45.22	-11.28	Pass
2685.00	12.95	15.96	18.0	33.96	45.22	-11.26	Pass
64QAM 75.0 Mbps							
2625.00	13.35	16.36	18.0	34.38	45.22	-10.84	Pass
2656.00	12.83	15.84	18.0	33.84	45.22	-11.38	Pass
2685.00	13.16	16.17	18.0	34.19	45.22	-11.03	Pass

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.8

MAXIMUM ANTENNA GAIN: 17 dBi

Carrier frequency, MHz	SA reading, RF #1 dBm/100kHz	PSD result**, dBm/100kHz	Antenna gain, dBi	Total PSD*, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps							
2625.00	12.94	15.95	17.0	32.95	45.22	-12.27	Pass
2656.00	12.91	15.92	17.0	32.94	45.22	-12.28	Pass
2685.00	12.95	15.96	17.0	32.96	45.22	-12.26	Pass
64QAM 75.0 Mbps							
2625.00	13.35	16.36	17.0	33.38	45.22	-11.84	Pass
2656.00	12.83	15.84	17.0	32.84	45.22	-12.38	Pass
2685.00	13.16	16.17	17.0	33.19	45.22	-12.03	Pass

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.8

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3345	HL 3818	HL 3903	HL 4164	HL 4367	

Full description is given in Appendix A.

Test specification:	**Section 27.50(h), Peak output power**		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	**Air Pressure:** 1008 hPa	**Relative Humidity:** 40 %	**Power Supply:** 48VDC
Remarks:			

Table 7.2.5 Power spectral density test results

ASSIGNED FREQUENCY RANGE: 2620.0 – 2690.0 MHz
DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATING SIGNAL: PRBS
CHANNEL BANDWIDTH: 20 MHz
TRANSMITTER OUTPUT POWER SETTINGS: 30 dBm
DUTY CYCLE: 100%
NUMBER OF RF OUTPUTS: N = 2
MAXIMUM ANTENNA GAIN: 18 dBi

Carrier frequency, MHz	SA reading, RF #1 dBm/100kHz	PSD result**, dBm/100kHz	Antenna gain, dBi	Total PSD*, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps							
2630.00	9.97	12.98	18.0	30.98	45.22	-14.24	Pass
2656.00	9.57	12.58	18.0	30.60	45.22	-14.62	Pass
2680.00	9.13	12.14	18.0	30.14	45.22	-15.08	Pass
64QAM 75.0 Mbps							
2630.00	10.19	13.20	18.0	31.22	45.22	-14.00	Pass
2656.00	9.69	12.70	18.0	30.70	45.22	-14.52	Pass
2680.00	9.53	12.54	18.0	30.56	45.22	-14.66	Pass

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.8

MAXIMUM ANTENNA GAIN: 17 dBi

Carrier frequency, MHz	SA reading, RF #1 dBm/100kHz	PSD result**, dBm/100kHz	Antenna gain, dBi	Total PSD*, dBm/100kHz	Limit***, dBm	Margin, dB	Verdict
QPSK 15.5 Mbps							
2630.00	9.97	12.98	17.0	29.98	45.22	-15.24	Pass
2656.00	9.57	12.58	17.0	29.60	45.22	-15.62	Pass
2680.00	9.13	12.14	17.0	29.14	45.22	-16.08	Pass
64QAM 75.0 Mbps							
2630.00	10.19	13.20	17.0	30.22	45.22	-15.00	Pass
2656.00	9.69	12.70	17.0	29.70	45.22	-15.52	Pass
2680.00	9.53	12.54	17.0	29.56	45.22	-15.66	Pass

* - Total PSD, dBm/100kHz = PSD result**,dBm/100kHz + Antenna Gain, dBi
** - PSD result, dBm/100kHz = SA reading + 10*log(N)
*** - See Table 7.2.8

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3345	HL 3818	HL 3903	HL 4164	HL 4367	

Full description is given in Appendix A.

Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.2.6 Pre-transition frequency channels assignment

Channel	Channel BW, MHz	Peak power limit, dBm	Power density limit, dBm/100kHz
10 MHz Dual Channel			
2625.0 MHz BRS Ch.E3 BRS Ch. F3	9.299	63+10log(OBW/12.0)+10log(360/beamwidth)	EIRP+10log(0.1/12.0)
2656.0 MHz BRS Ch.H1+ EBS Ch. G2	9.330	63+10log(OBW/12.0)+10log(360/beamwidth)	EIRP+10log(0.1/12.0)
2685.0 MHz BRS Ch.G4+ I Channels	9.443	63+10log(OBW/10.0)+10log(360/beamwidth)	EIRP+10log(0.1/10.0)
20 MHz 4 Channels			
2630.0 MHz BRS Ch.E3+E4+ BRS Ch. F3+F4	18.453	63+10log(OBW/24.0)+10log(360/beamwidth)	EIRP+10log(0.1/24.0)
2656.0 MHz EBS Ch.G1+G2+ BRS Ch.H1+H2	18.442	63+10log(OBW/24.0)+10log(360/beamwidth)	EIRP+10log(0.1/24.0)
2680.0 MHz EBS Ch. G3+G4+ BRS Ch.H3+ I Channels	18.789	63+10log(OBW/22.0)+10log(360/beamwidth)	EIRP+10log(0.1/22.0)

Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.2.7 EIRP limits

Channel	Channel BW, MHz	Peak power limit, dBm	
		17 dBi, 90º beamwidth	18 dBi, 65ºbeamwidth
10 MHz Dual Channel			
2625.0 MHz BRS Ch.E3+ BRS Ch. F3	12.0	67.91	69.32
2656.0 MHz BRS Ch.H1+ EBS Ch. G2	12.0	67.93	69.34
2685.0 MHz BRS Ch.G4+ I Channels	10.0	67.98	69.39
20 MHz 4 Channels			
2630.0 MHz BRS Ch.E3+E4+ BRS Ch. F3+F4	24.0	67.88	69.29
2656.0 MHz EBS Ch.G1+G2+ BRS Ch.H1+H2	24.0	67.88	69.29
2680.0 MHz EBS Ch. G3+G4+ BRS Ch.H3+ I Channels	22.0	67.96	69.37

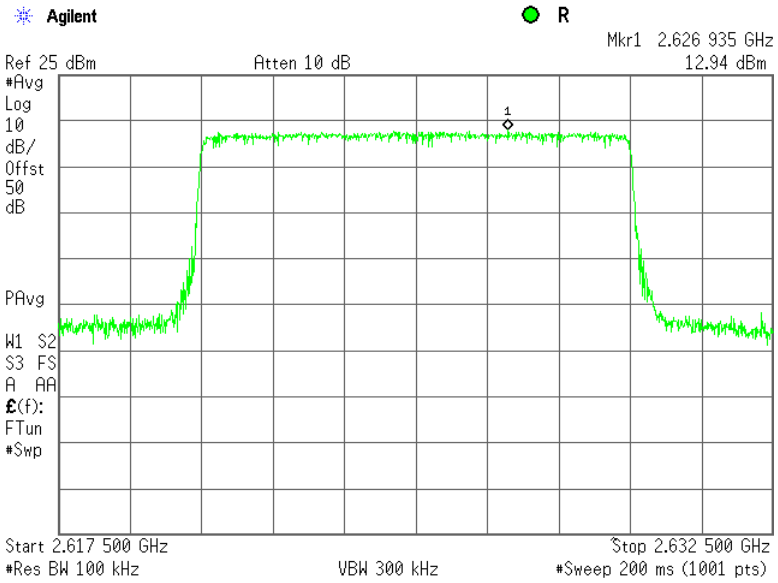
Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.2.8 Peak power density limits

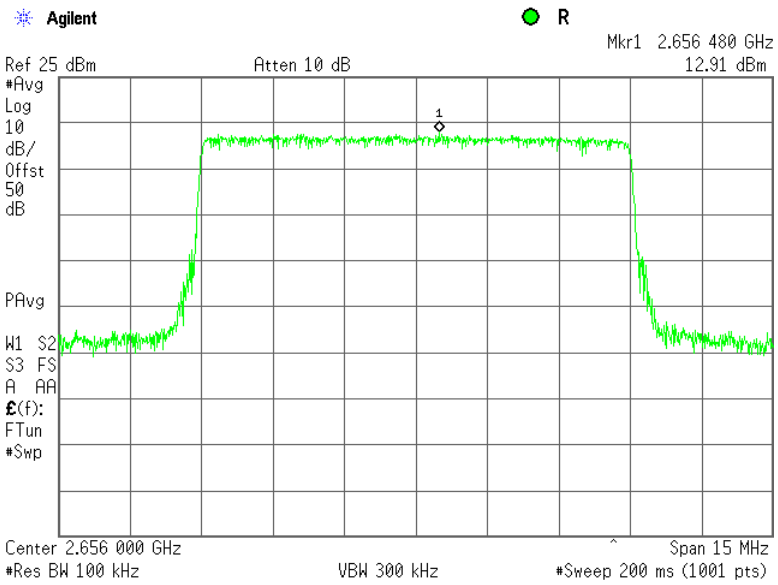
Channel	Channel BW, MHz	Peak power density, dBm/100kHz	
		17 dBi, 90º beamwidth	18 dBi, 65ºbeamwidth
10 MHz Dual Channel			
2625.0 MHz BRS Ch.E3+ BRS Ch. F3	12.0	45.22	45.22
2656.0 MHz BRS Ch.H1+ EBS Ch. G2	12.0	45.22	45.22
2685.0 MHz BRS Ch.G4+ I Channels	10.0	45.22	45.22
20 MHz 4 Channels			
2630.0 MHz BRS Ch.E3+E4+ BRS Ch. F3+F4	24.0	45.22	45.22
2656.0 MHz EBS Ch.G1+G2+ BRS Ch.H1+H2	24.0	45.22	45.22
2680.0 MHz EBS Ch. G3+G4+ BRS Ch.H3+ I Channels	22.0	45.22	45.22

Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.1 Power spectral density test results at low frequency, QPSK, 10 MHz EBW

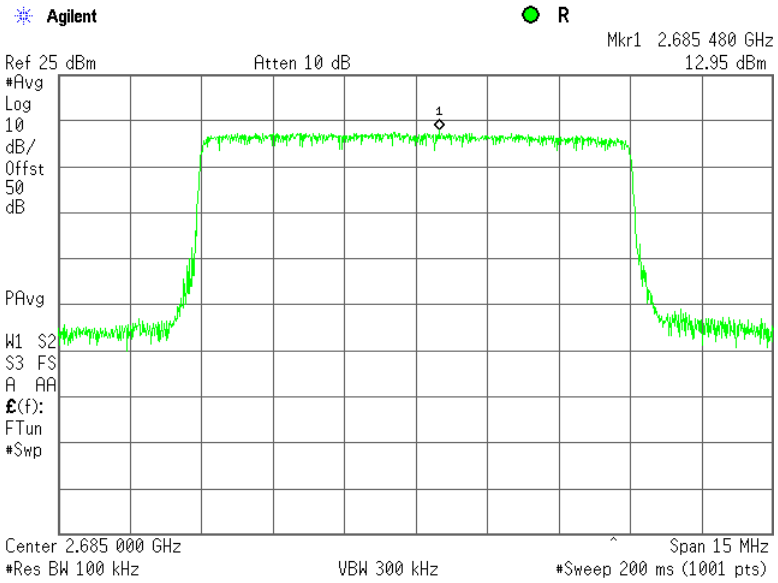


Plot 7.2.2 Power spectral density test results at mid frequency, QPSK, 10 MHz EBW

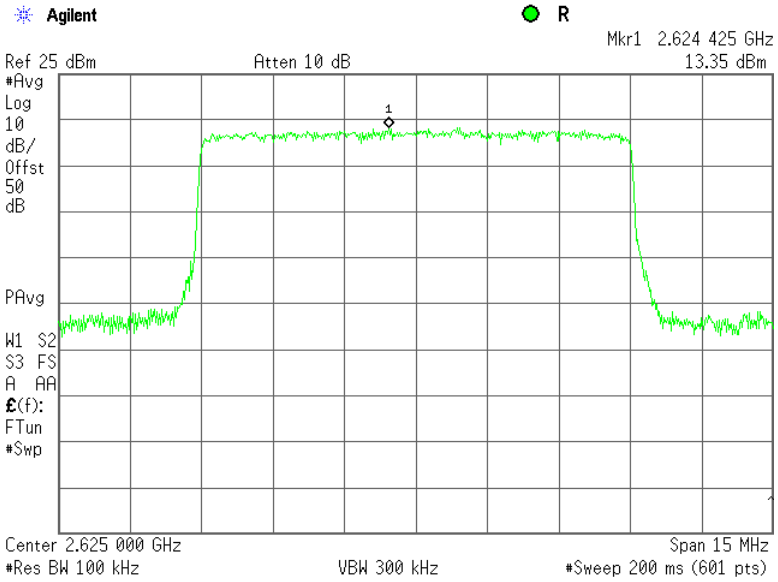


Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.3 Power spectral density test results at high frequency, QPSK, 10 MHz EBW

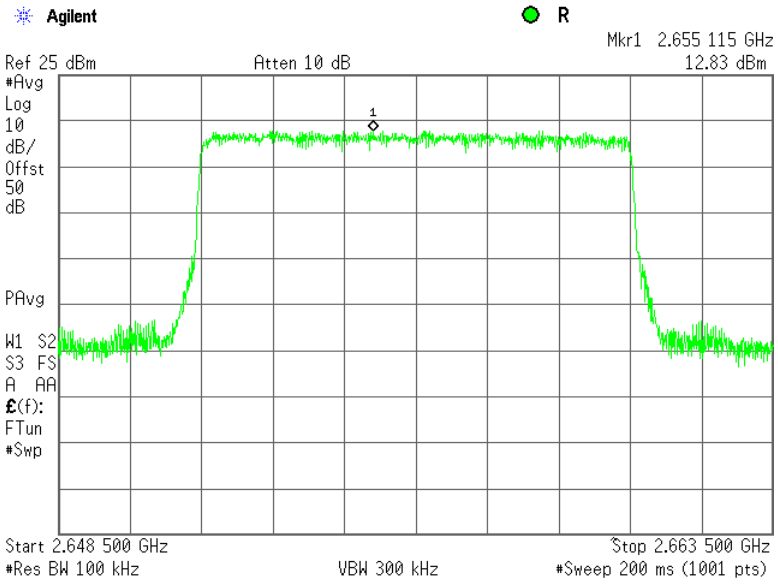


Plot 7.2.4 Power spectral density test results at low frequency, 64QAM, 10 MHz EBW

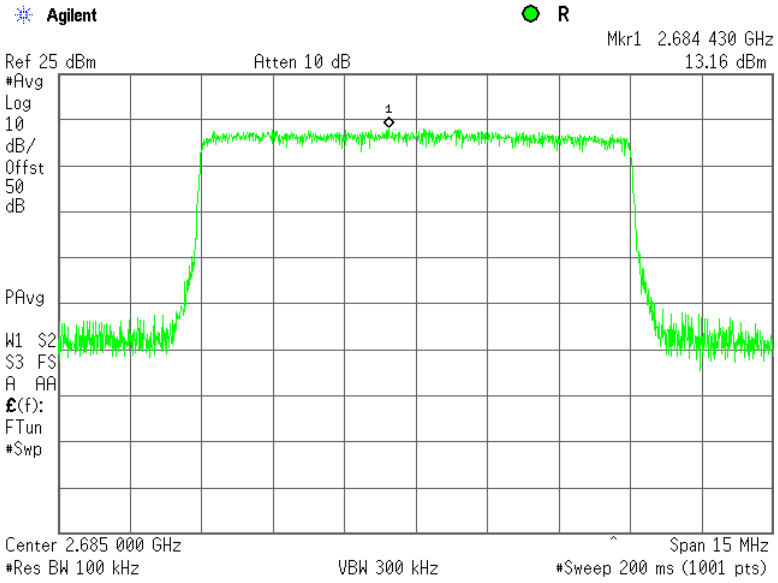


Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.5 Power spectral density test results at mid frequency, 64QAM, 10 MHz EBW

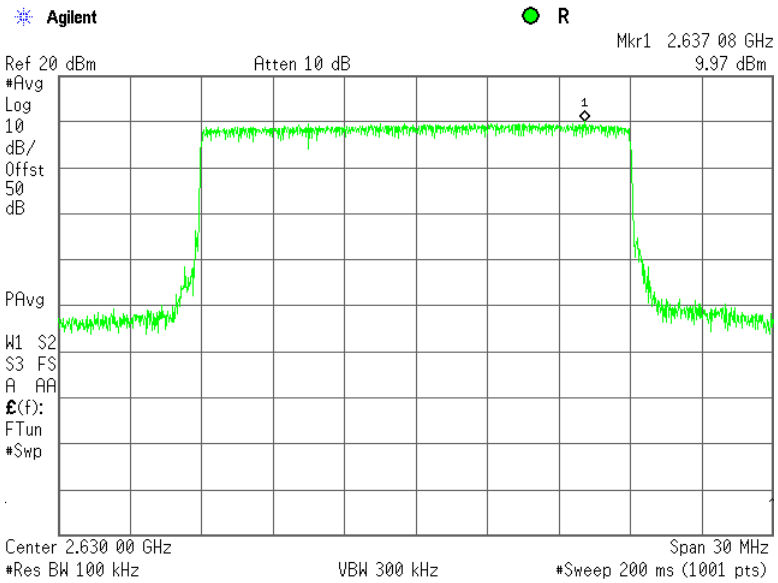


Plot 7.2.6 Power spectral density test results at high frequency, 64QAM, 10 MHz EBW

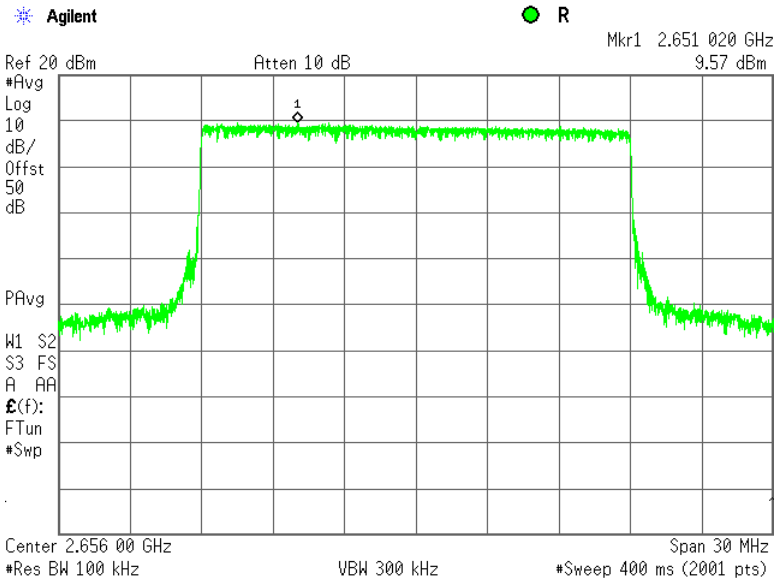


Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.7 Power spectral density test results at low frequency, QPSK, 20 MHz EBW

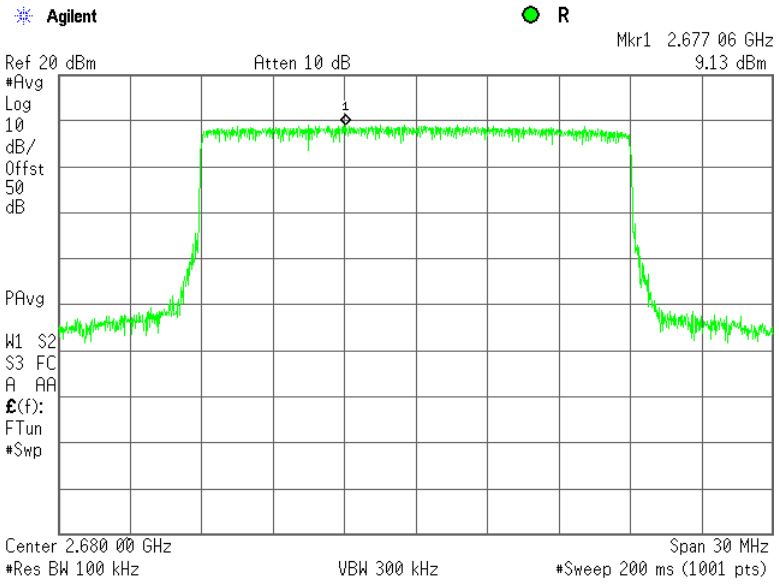


Plot 7.2.8 Power spectral density test results at mid frequency, QPSK, 20 MHz EBW

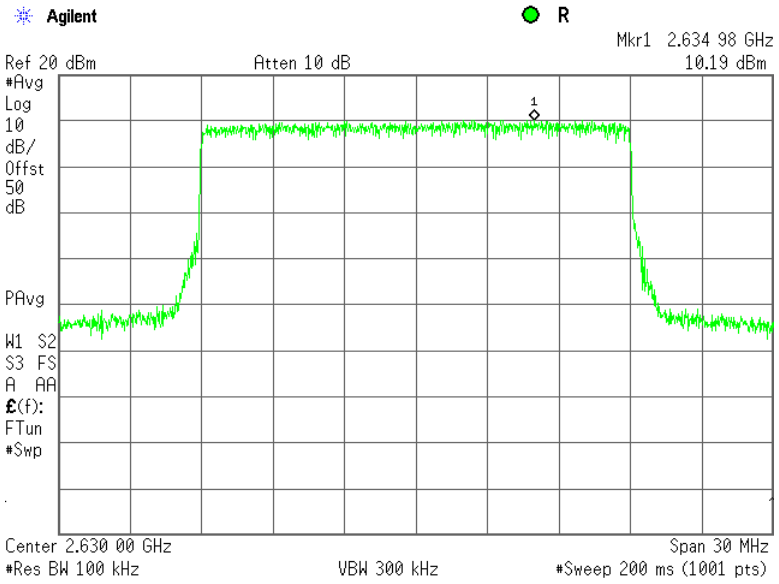


Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.9 Power spectral density test results at high frequency, QPSK, 20 MHz EBW

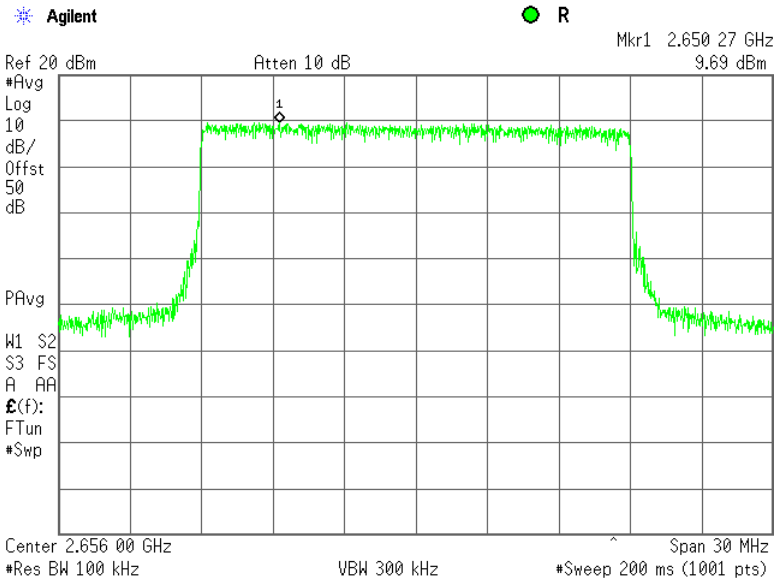


Plot 7.2.10 Power spectral density test results at low frequency, 64QAM, 20 MHz EBW

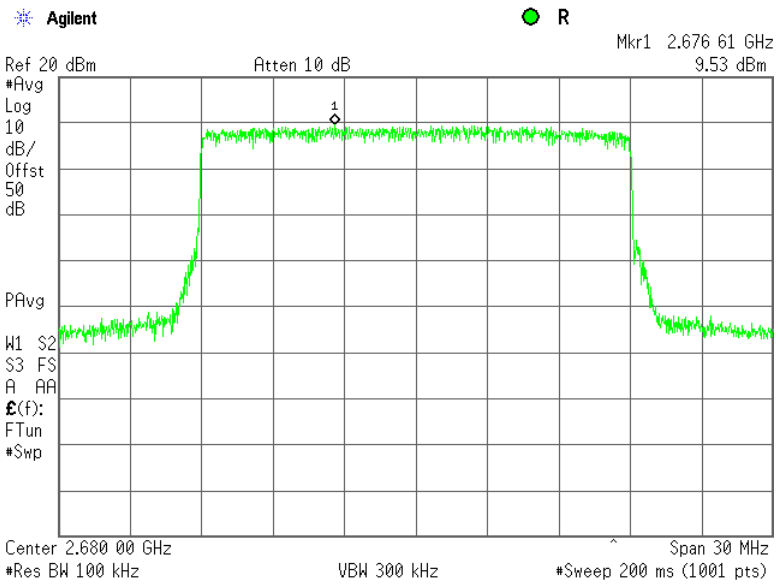


Test specification:	Section 27.50(h), Peak output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.2.11 Power spectral density test results at mid frequency, 64QAM, 20 MHz EBW



Plot 7.2.12 Power spectral density test results at high frequency, 64QAM, 20 MHz EBW



Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

7.3 Band edge emissions at RF connector test

7.3.1 General

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

Table 7.3.1 Spurious emission limits at band edges

Channel	Frequency range	Attenuation below carrier, dBc	Limit, dBm
Channel bandwidth 10 MHz			
2625.0	2614.0 – 2620.0 2632.0 – 2638.0	43+ 10*Log (P*)	-13.0
2656.0	2644.0 – 2650.0 2662.0 – 2668.0	43+ 10*Log (P*)	-13.0
2685.0	2674.0 – 2680.0 2690.0 – 2696.0	43+ 10*Log (P*)	-13.0
Channel bandwidth 20 MHz			
2630.0	2614.0 – 2620.0 2644.0 – 2650.0	43+ 10*Log (P*)	-13.0
2656.0	2638.0 – 2644.0 2668.0 – 2674.0	43+ 10*Log (P*)	-13.0
2680.0	2668.0 – 2674.0 2690.0 – 2696.0	43+ 10*Log (P*)	-13.0

* - P is transmitter output power in Watts

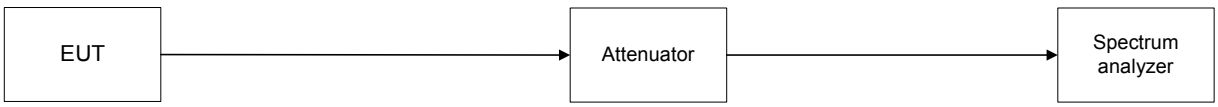
7.3.2 Test procedure

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

7.3.2.2 The spurious emission was measured with spectrum analyzer as provided in the associated plots.

7.3.2.3 The worst case results are provided in the associated tables and shown in the associated plots.

Figure 7.3.1 Spurious emission test setup



Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.3.2 Spurious emission at the low band edge test results

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE:	See Table 7.3.1
RBW:	100 kHz
DETECTOR USED:	Average
VIDEO BANDWIDTH:	≥ Resolution bandwidth
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
MODULATION:	QPSK, 64QAM
EBW:	10 MHz
NUMBER OF RF OUTPUTS:	N = 2

Frequency offset, ± MHz	Low band edge SA reading, dBm	Low band edge result, dBm*	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Low carrier frequency 2625.0 MHz QPSK (Output power = 31.19 dBm)						
5.5	-19.66	-16.66	100	1000	-13.0	Pass
6.5	-20.54	-17.54	100	1000	-13.0	
7.5	-21.77	-18.77	100	1000	-13.0	
8.5	-21.37	-18.37	100	1000	-13.0	
Low carrier frequency 2625.0 MHz 64QAM (Output power = 30.82 dBm)						
6.5	-18.24	-15.24	100	1000	-13.0	Pass
7.5	-19.90	-16.90	100	1000	-13.0	
8.5	-19.27	-16.27	100	1000	-13.0	
9.5	-21.51	-18.51	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz QPSK (Output power = 30.79 dBm)						
6.5	-21.13	-18.13	100	1000	-13.0	Pass
7.5	-23.19	-20.19	100	1000	-13.0	
8.5	-22.97	-19.97	100	1000	-13.0	
9.5	-23.51	-20.51	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz 64QAM (Output power = 30.41 dBm)						
6.5	-20.76	-17.76	100	1000	-13.0	Pass
7.5	-24.17	-21.17	100	1000	-13.0	
8.5	-24.21	-21.21	100	1000	-13.0	
9.5	-25.04	-22.04	100	1000	-13.0	
High carrier frequency 2685.0 MHz QPSK (Output power = 30.70 dBm)						
6.5	-21.42	-18.42	300	1000	-13.0	Pass
7.5	-20.79	-17.79	300	1000	-13.0	
8.5	-21.08	-18.08	300	1000	-13.0	
9.5	-22.89	-19.89	300	1000	-13.0	
High carrier frequency 2685.0 MHz 64QAM (Output power = 30.32 dBm)						
6.5	-22.97	-19.97	100	1000	-13.0	Pass
7.5	-24.29	-21.29	100	1000	-13.0	
8.5	-23.60	-20.60	100	1000	-13.0	
9.5	-26.57	-23.57	100	1000	-13.0	

* - Low band edge result = Low band edge SA Reading + 10log(N)

Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.3.3 Spurious emission at the high band edge test results

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE:	See Table 7.3.1
RBW:	100 kHz
DETECTOR USED:	Average
VIDEO BANDWIDTH:	≥ Resolution bandwidth
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
MODULATION:	QPSK, 64QAM
EBW:	10 MHz
NUMBER OF RF OUTPUTS:	N = 2

Frequency offset, ± MHz	High band edge SA reading, dBm	High band edge result, dBm*	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Low carrier frequency 2625.0 MHz QPSK (Output power = 31.19 dBm)						
5.5	-19.66	-16.66	100	1000	-13.0	Pass
6.5	-19.67	-16.67	100	1000	-13.0	
7.5	-21.43	-18.43	100	1000	-13.0	
8.5	-22.41	-19.41	100	1000	-13.0	
Low carrier frequency 2625.0 MHz 64QAM (Output power = 30.82 dBm)						
6.5	-20.03	-17.03	100	1000	-13.0	Pass
7.5	-22.05	-19.05	100	1000	-13.0	
8.5	-22.74	-19.74	100	1000	-13.0	
9.5	-22.61	-19.61	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz QPSK (Output power = 30.79 dBm)						
6.5	-20.09	-17.09	100	1000	-13.0	Pass
7.5	-22.47	-19.47	100	1000	-13.0	
8.5	-23.88	-20.88	100	1000	-13.0	
9.5	-25.07	-22.07	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz 64QAM (Output power = 30.41 dBm)						
6.5	-20.93	-17.93	100	1000	-13.0	Pass
7.5	-23.01	-20.01	100	1000	-13.0	
8.5	-24.21	-21.21	100	1000	-13.0	
9.5	-25.15	-22.15	100	1000	-13.0	
High carrier frequency 2685.0 MHz QPSK (Output power = 30.70 dBm)						
6.5	-19.33	-16.33	300	1000	-13.0	Pass
7.5	-20.26	-17.26	300	1000	-13.0	
8.5	-22.27	-19.27	300	1000	-13.0	
9.5	-22.61	-19.61	300	1000	-13.0	
High carrier frequency 2685.0 MHz 64QAM (Output power = 30.32 dBm)						
6.5	-22.50	-19.50	100	1000	-13.0	Pass
7.5	-23.24	-20.24	100	1000	-13.0	
8.5	-25.03	-22.03	100	1000	-13.0	
9.5	-25.41	-22.41	100	1000	-13.0	

* - High band edge result = High band edge SA Reading + 10log(N)

Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.3.4 Spurious emission at the low band edge test results

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE:	See Table 7.3.1
RBW:	100 kHz
DETECTOR USED:	Average
VIDEO BANDWIDTH:	≥ Resolution bandwidth
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
MODULATION:	QPSK, 64QAM
EBW:	20 MHz
NUMBER OF RF OUTPUTS:	N = 2

Frequency offset, ± MHz	Low band edge SA reading, dBm	Low band edge result, dBm*	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Low carrier frequency 2625.0 MHz QPSK (Output power = 31.22 dBm)						
10.5	-22.60	-19.60	100	1000	-13.0	Pass
11.5	-22.12	-19.12	100	1000	-13.0	
12.5	-23.61	-20.61	100	1000	-13.0	
13.5	-23.07	-20.07	100	1000	-13.0	
Low carrier frequency 2625.0 MHz 64QAM (Output power = 31.15 dBm)						
10.5	-22.07	-19.07	100	1000	-13.0	Pass
11.5	-23.08	-20.08	100	1000	-13.0	
12.5	-24.99	-21.99	100	1000	-13.0	
13.5	-25.09	-22.09	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz QPSK (Output power = 30.64 dBm)						
10.5	-21.78	-18.78	100	1000	-13.0	Pass
11.5	-20.74	-17.74	100	1000	-13.0	
12.5	-23.20	-20.20	100	1000	-13.0	
13.5	-23.30	-20.30	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz 64QAM (Output power = 30.63 dBm)						
10.5	-20.57	-17.57	100	1000	-13.0	Pass
11.5	-21.85	-18.85	100	1000	-13.0	
12.5	-22.51	-19.51	100	1000	-13.0	
13.5	-23.19	-20.19	100	1000	-13.0	
High carrier frequency 2685.0 MHz QPSK (Output power = 30.39 dBm)						
10.5	-22.70	-19.70	100	1000	-13.0	Pass
11.5	-22.47	-19.47	100	1000	-13.0	
12.5	-24.23	-21.23	100	1000	-13.0	
13.5	-24.10	-21.10	100	1000	-13.0	
High carrier frequency 2685.0 MHz 64QAM (Output power = 30.31 dBm)						
10.5	-22.29	-19.29	100	1000	-13.0	Pass
11.5	-23.50	-20.50	100	1000	-13.0	
12.5	-24.45	-21.45	100	1000	-13.0	
13.5	-25.27	-22.27	100	1000	-13.0	

* - Low band edge result = Low band edge SA Reading + 10log(N)

Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 ºC	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Table 7.3.5 Spurious emission at the high band edge test results

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
INVESTIGATED FREQUENCY RANGE:	See Table 7.3.1
RBW:	100 kHz
DETECTOR USED:	Average
VIDEO BANDWIDTH:	≥ Resolution bandwidth
MODULATING SIGNAL:	PRBS
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum
MODULATION:	QPSK, 64QAM
EBW:	20 MHz
NUMBER OF RF OUTPUTS:	N = 2

Frequency offset, ± MHz	High band edge SA reading, dBm	High band edge result, dBm*	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Low carrier frequency 2625.0 MHz QPSK (Output power = 31.22 dBm)						
10.5	-20.75	-17.75	100	1000	-13.0	Pass
11.5	-21.88	-18.88	100	1000	-13.0	
12.5	-21.66	-18.66	100	1000	-13.0	
13.5	-23.93	-20.93	100	1000	-13.0	
Low carrier frequency 2625.0 MHz 64QAM (Output power = 31.15 dBm)						
10.5	-21.35	-18.35	100	1000	-13.0	Pass
11.5	-22.54	-19.54	100	1000	-13.0	
12.5	-23.27	-20.27	100	1000	-13.0	
13.5	-23.80	-20.80	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz QPSK (Output power = 30.64 dBm)						
10.5	-21.12	-18.12	100	1000	-13.0	Pass
11.5	-22.51	-19.51	100	1000	-13.0	
12.5	-23.30	-20.30	100	1000	-13.0	
13.5	-23.50	-20.50	100	1000	-13.0	
Mid carrier frequency 2656.0 MHz 64QAM (Output power = 30.63 dBm)						
10.5	-20.93	-17.93	100	1000	-13.0	Pass
11.5	-22.01	-19.01	100	1000	-13.0	
12.5	-24.50	-21.50	100	1000	-13.0	
13.5	-25.34	-22.34	100	1000	-13.0	
High carrier frequency 2685.0 MHz QPSK (Output power = 30.39 dBm)						
10.5	-22.46	-19.46	100	1000	-13.0	Pass
11.5	-23.62	-20.62	100	1000	-13.0	
12.5	-24.20	-21.20	100	1000	-13.0	
13.5	-24.84	-21.84	100	1000	-13.0	
High carrier frequency 2685.0 MHz 64QAM (Output power = 30.31 dBm)						
10.5	-23.16	-20.16	100	1000	-13.0	Pass
11.5	-24.67	-21.67	100	1000	-13.0	
12.5	-25.48	-22.48	100	1000	-13.0	
13.5	-26.46	-23.46	100	1000	-13.0	

* - High band edge result = High band edge SA Reading + 10log(N)

Reference numbers of test equipment used

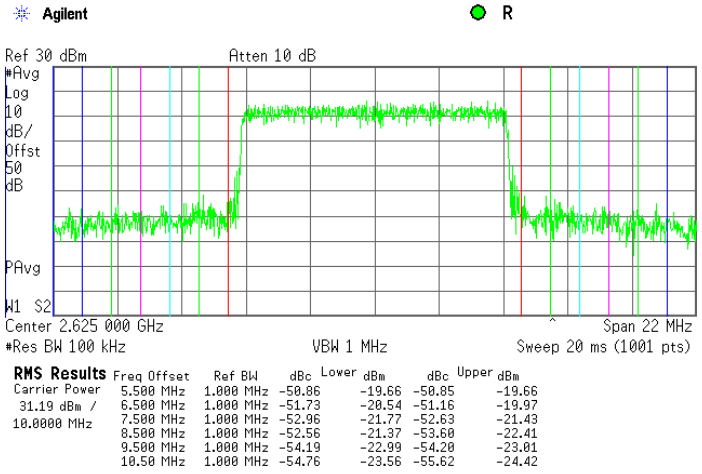
HL 3301	HL 3302	HL 3345	HL 3818	HL 3903	HL 4164	HL 4367	

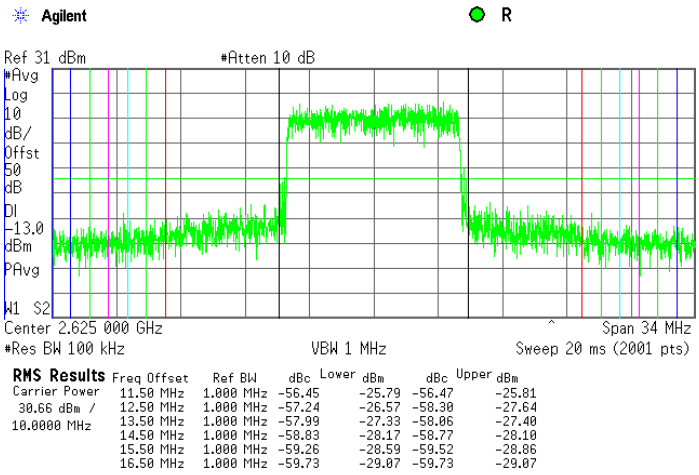
Full description is given in Appendix A.

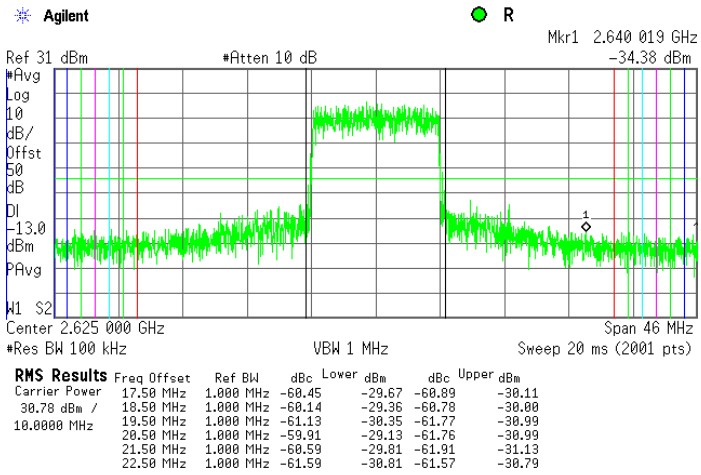
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.1 Spurious emission at band edges test results at low carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	15.5 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



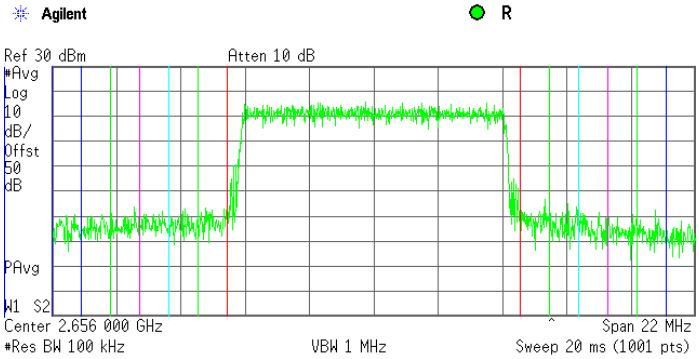




Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

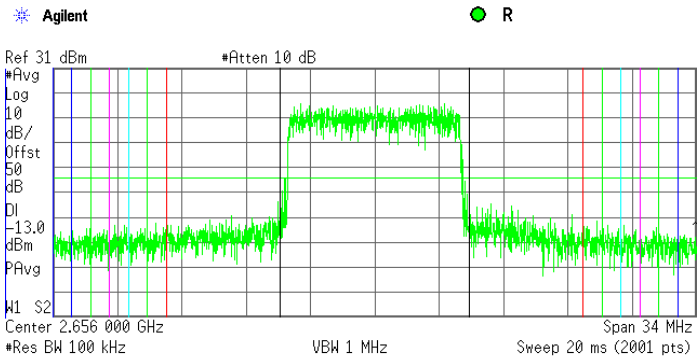
Plot 7.3.2 Spurious emission at band edges test results at mid carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	15.5 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



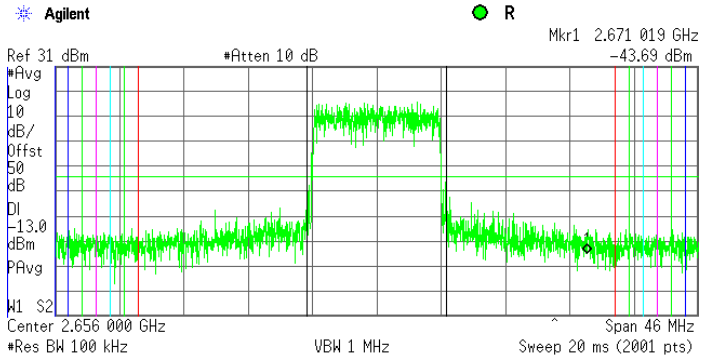
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	5.500 MHz	1.000 MHz	-51.93	-21.13	-50.89	-20.89
30.79 dBm /	6.500 MHz	1.000 MHz	-53.98	-23.19	-53.26	-22.47
10.0000 MHz	7.500 MHz	1.000 MHz	-53.77	-22.97	-54.67	-23.88
	8.500 MHz	1.000 MHz	-54.31	-23.51	-55.86	-25.07
	9.500 MHz	1.000 MHz	-54.93	-24.14	-56.75	-25.95
	10.50 MHz	1.000 MHz	-55.36	-24.57	-58.60	-27.81



RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	11.50 MHz	1.000 MHz	-58.21	-27.94	-57.63	-27.36
30.27 dBm /	12.50 MHz	1.000 MHz	-58.97	-28.70	-59.22	-28.94
10.0000 MHz	13.50 MHz	1.000 MHz	-58.82	-28.55	-59.36	-29.09
	14.50 MHz	1.000 MHz	-59.51	-29.23	-60.52	-30.25
	15.50 MHz	1.000 MHz	-59.57	-29.30	-60.45	-30.18
	16.50 MHz	1.000 MHz	-60.54	-30.27	-60.75	-30.48



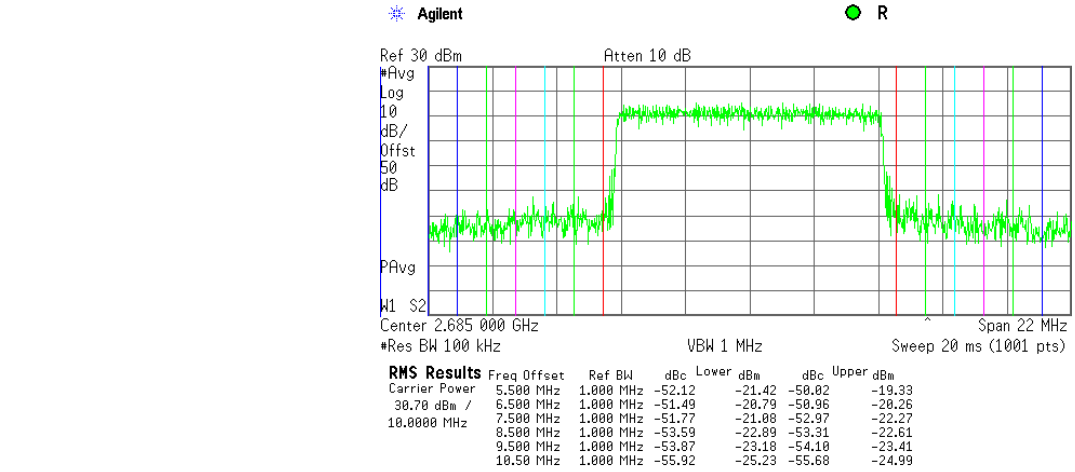
RMS Results

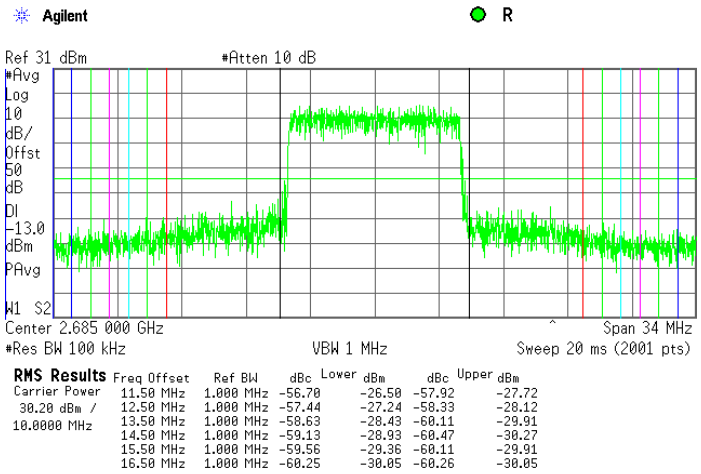
	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power	17.50 MHz	1.000 MHz	-60.63	-30.40	-61.58	-31.35
30.23 dBm /	18.50 MHz	1.000 MHz	-60.77	-30.53	-60.24	-30.01
10.0000 MHz	19.50 MHz	1.000 MHz	-60.82	-30.59	-61.16	-30.93
	20.50 MHz	1.000 MHz	-60.42	-30.19	-61.56	-31.33
	21.50 MHz	1.000 MHz	-60.08	-29.85	-60.40	-30.17
	22.50 MHz	1.000 MHz	-60.70	-30.47	-60.98	-30.75

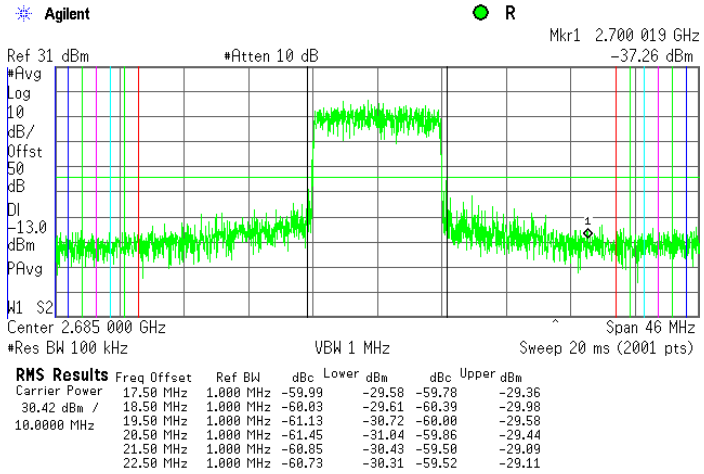
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.3 Spurious emission at band edges test results at high carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	15.5 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



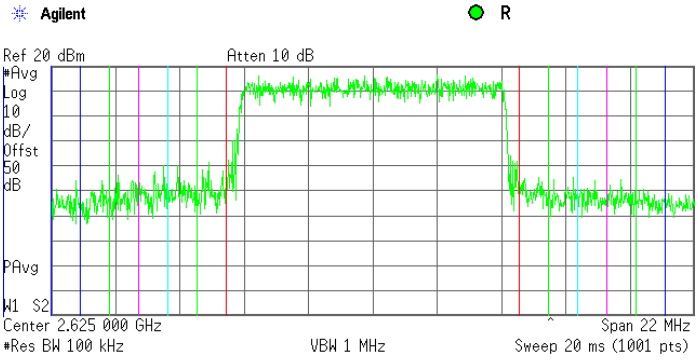




Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

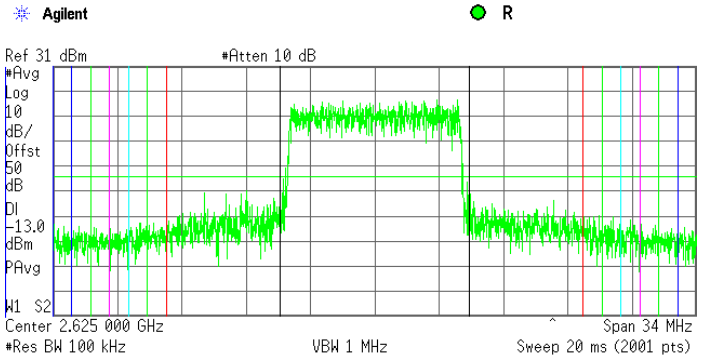
Plot 7.3.4 Spurious emission at band edges test results at low carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
BIT RATE:	75.0 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



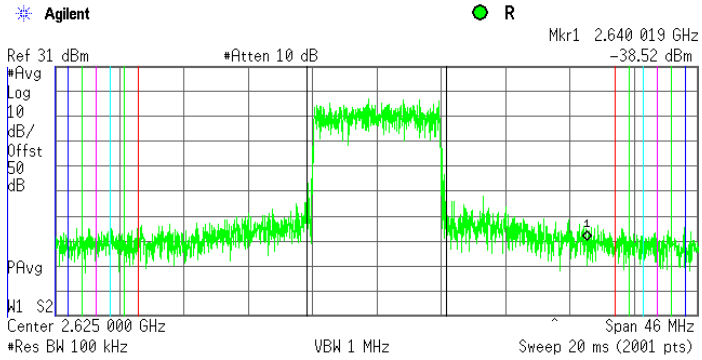
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 30.82 dBm / 10.0000 MHz	5.500 MHz	1.000 MHz	-49.07	-18.24	-50.85	-20.03
	6.500 MHz	1.000 MHz	-50.73	-19.90	-52.88	-22.05
	7.500 MHz	1.000 MHz	-50.10	-19.27	-53.57	-22.74
	8.500 MHz	1.000 MHz	-52.33	-21.51	-53.43	-22.61
	9.500 MHz	1.000 MHz	-54.44	-23.61	-55.24	-24.41
	10.50 MHz	1.000 MHz	-55.12	-24.29	-56.18	-25.35



RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Adj Channel Pow 30.89 dBm / 10.0000 MHz	11.50 MHz	1.000 MHz	-57.89	-27.00	-56.18	-25.29
	12.50 MHz	1.000 MHz	-57.42	-26.53	-57.31	-26.42
	13.50 MHz	1.000 MHz	-59.80	-28.91	-57.88	-26.99
	14.50 MHz	1.000 MHz	-59.84	-28.95	-59.41	-28.52
	15.50 MHz	1.000 MHz	-59.68	-28.79	-59.50	-28.61
	16.50 MHz	1.000 MHz	-59.69	-28.80	-60.64	-29.74



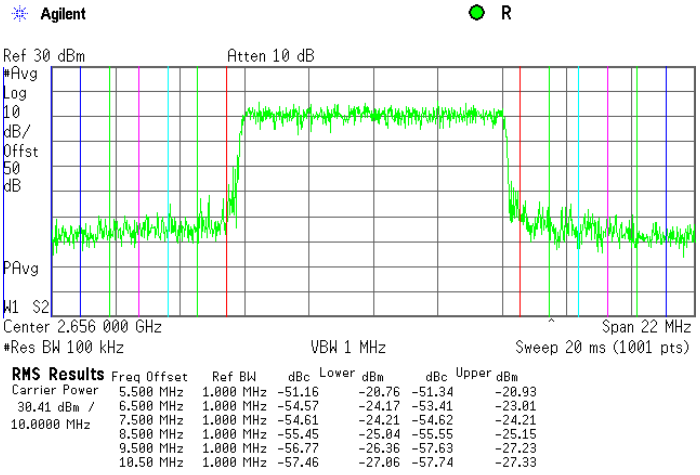
RMS Results

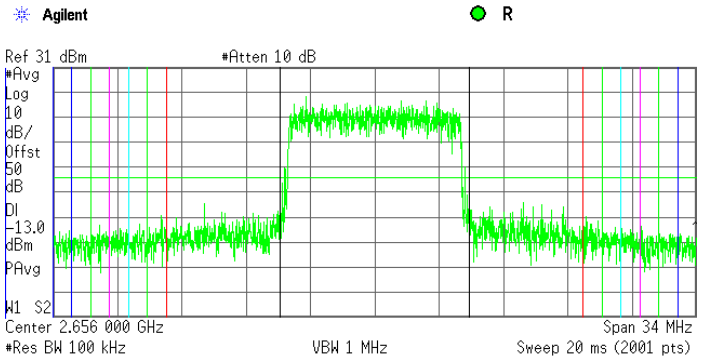
	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 30.84 dBm / 10.0000 MHz	17.50 MHz	1.000 MHz	-60.92	-30.08	-60.53	-29.70
	18.50 MHz	1.000 MHz	-60.02	-29.18	-61.50	-30.67
	19.50 MHz	1.000 MHz	-59.77	-28.93	-60.94	-30.11
	20.50 MHz	1.000 MHz	-60.46	-29.62	-61.84	-31.00
	21.50 MHz	1.000 MHz	-61.43	-30.59	-61.48	-30.65
	22.50 MHz	1.000 MHz	-60.82	-29.98	-62.55	-31.71

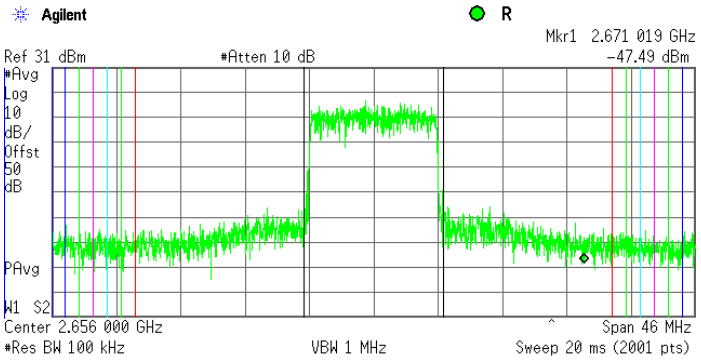
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.5 Spurious emission at band edges test results at mid carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
BIT RATE:	75.0 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



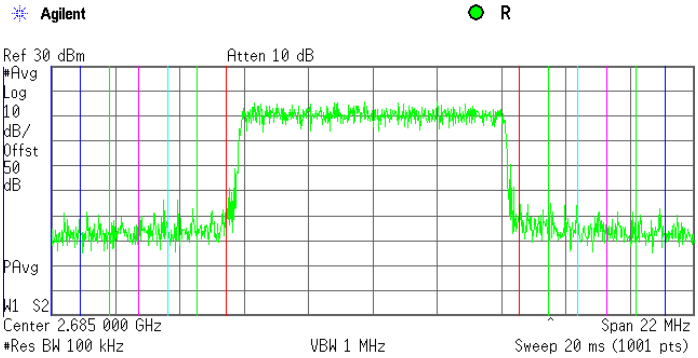




Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

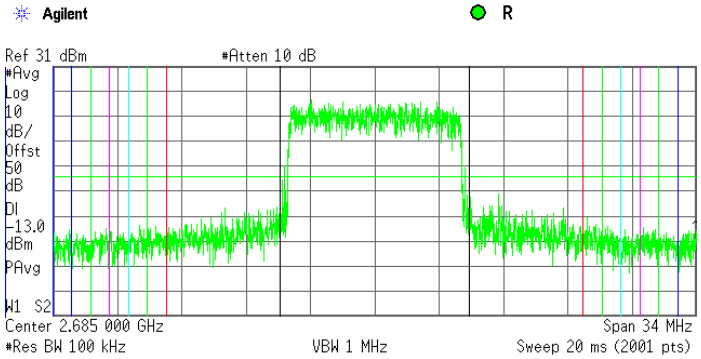
Plot 7.3.6 Spurious emission at band edges test results at high carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
BIT RATE:	75.0 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



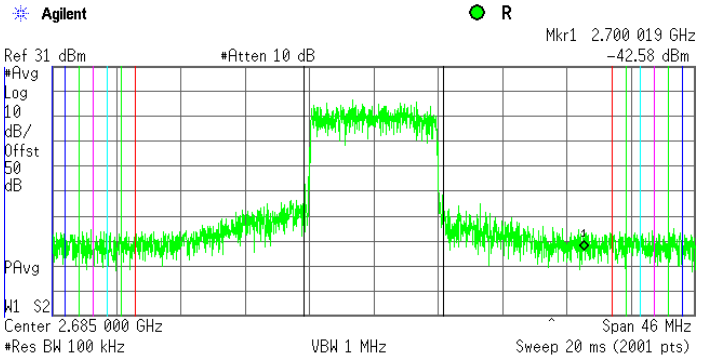
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 30.32 dBm / 10.0000 MHz	5.500 MHz	1.000 MHz	-53.28	-22.97	-52.86	-22.55
	6.500 MHz	1.000 MHz	-54.61	-24.29	-53.55	-23.24
	7.500 MHz	1.000 MHz	-53.92	-23.60	-55.35	-25.03
	8.500 MHz	1.000 MHz	-56.89	-26.57	-55.73	-25.41
	9.500 MHz	1.000 MHz	-56.71	-26.39	-55.82	-25.51
	10.50 MHz	1.000 MHz	-57.09	-26.77	-57.37	-27.05



RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 30.53 dBm / 10.0000 MHz	11.50 MHz	1.000 MHz	-59.25	-28.72	-57.67	-27.14
	12.50 MHz	1.000 MHz	-59.84	-29.32	-59.45	-28.92
	13.50 MHz	1.000 MHz	-60.96	-30.43	-61.03	-30.50
	14.50 MHz	1.000 MHz	-60.01	-29.48	-59.34	-28.81
	15.50 MHz	1.000 MHz	-61.75	-31.22	-60.95	-30.42
	16.50 MHz	1.000 MHz	-61.11	-30.58	-60.97	-30.44



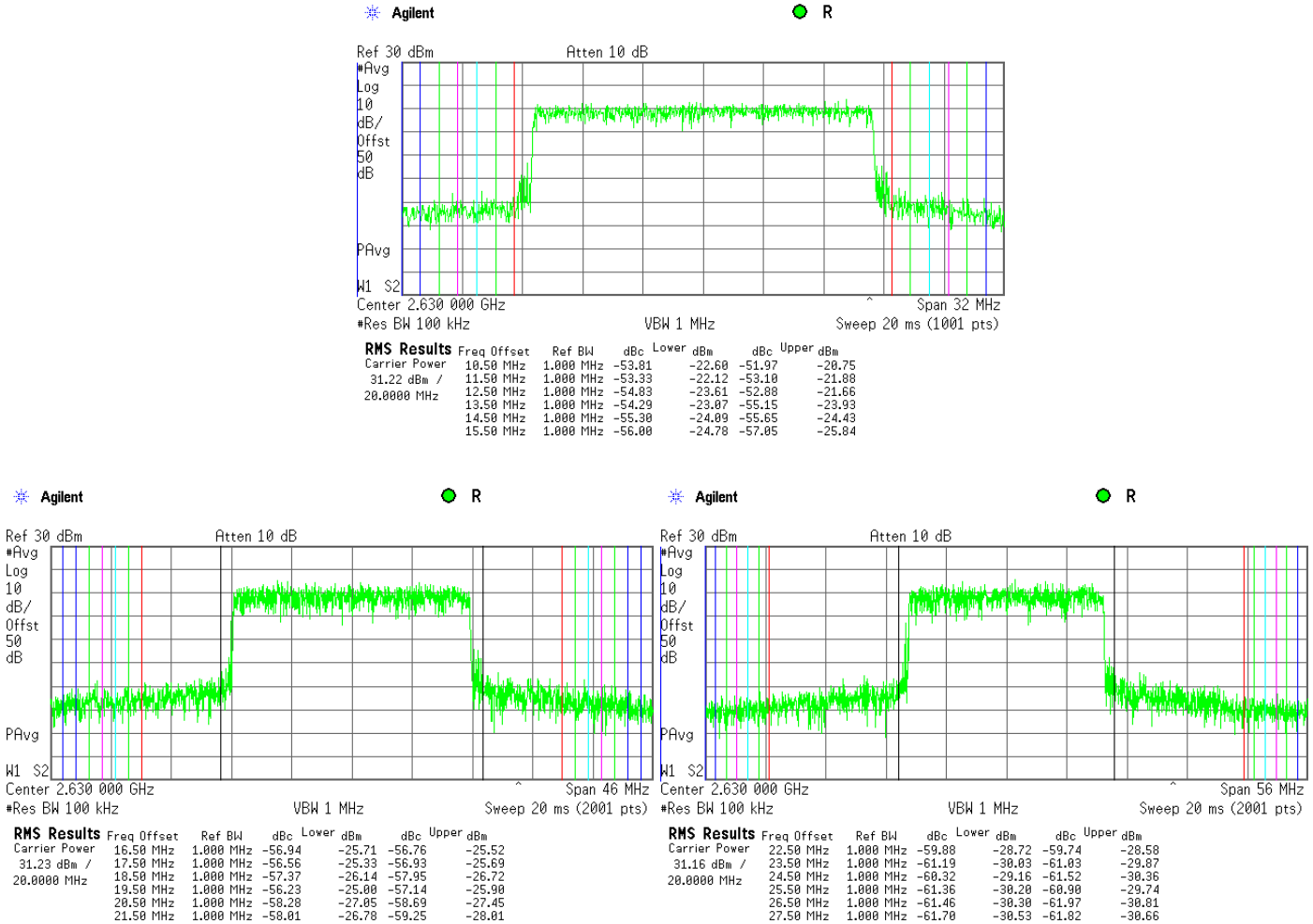
RMS Results

	Freq Offset	Ref BW	dBc	Lower dBm	dBc	Upper dBm
Carrier Power 30.27 dBm / 10.0000 MHz	17.50 MHz	1.000 MHz	-60.67	-30.40	-60.80	-30.53
	18.50 MHz	1.000 MHz	-61.42	-31.15	-60.12	-29.84
	19.50 MHz	1.000 MHz	-61.13	-30.86	-60.92	-30.64
	20.50 MHz	1.000 MHz	-61.11	-30.84	-61.52	-31.25
	21.50 MHz	1.000 MHz	-60.73	-30.45	-59.82	-29.55
	22.50 MHz	1.000 MHz	-60.39	-30.12	-60.87	-30.60

Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.7 Spurious emission at band edges test results at low carrier frequency, 20 MHz EBW

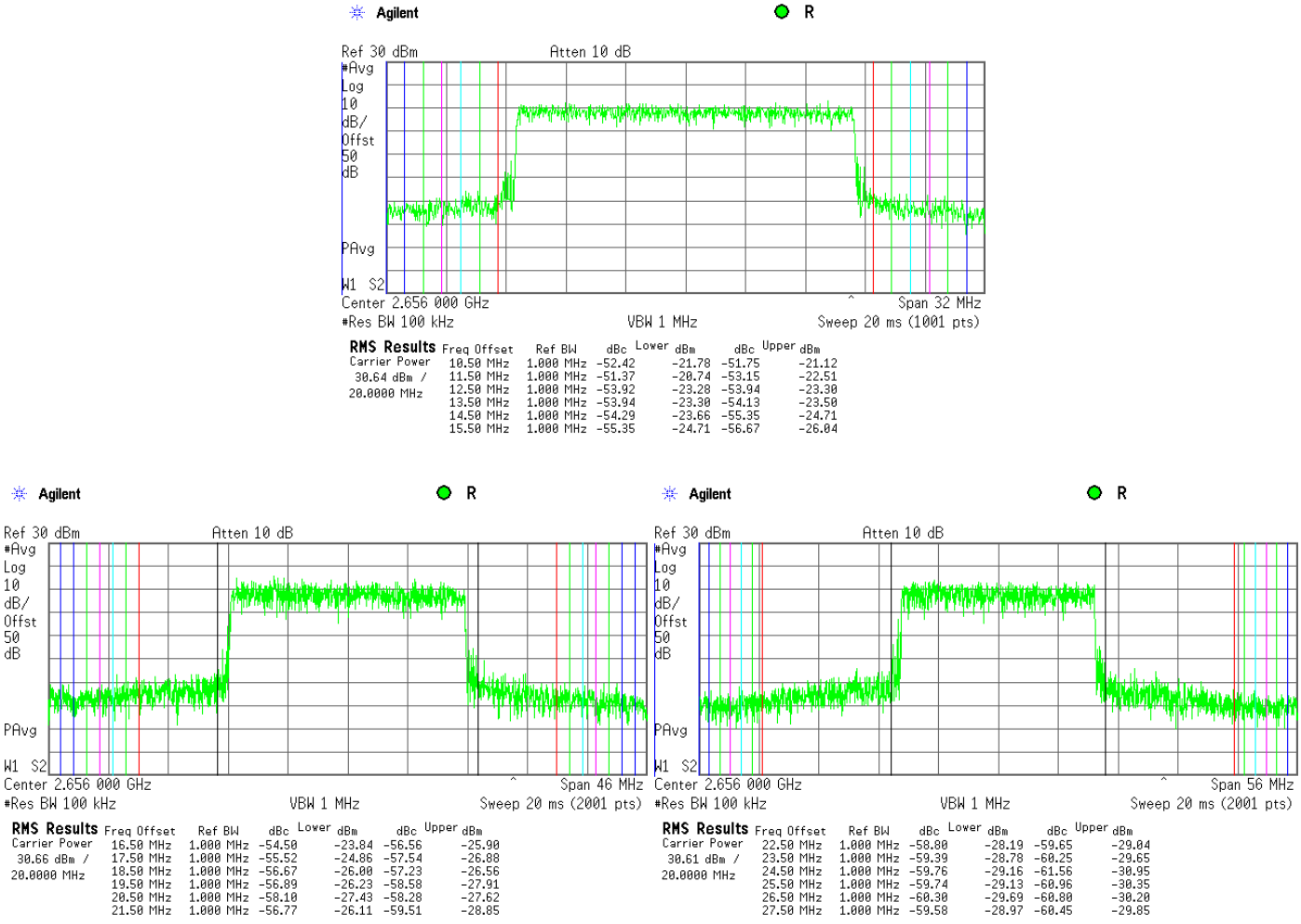
ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	31 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.8 Spurious emission at band edges test results at mid carrier frequency, 20 MHz EBW

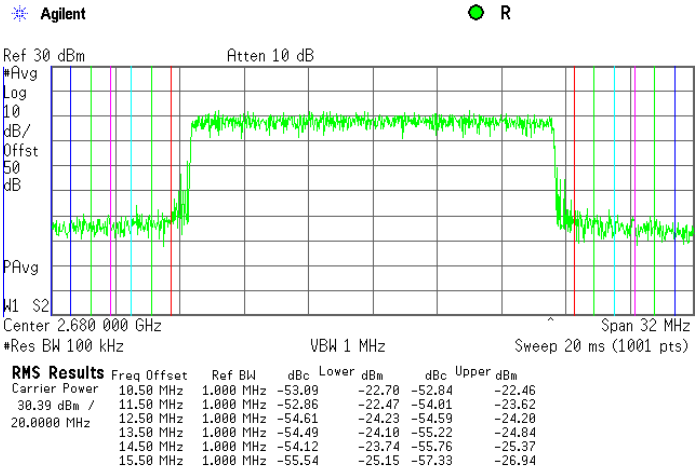
ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	31 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum

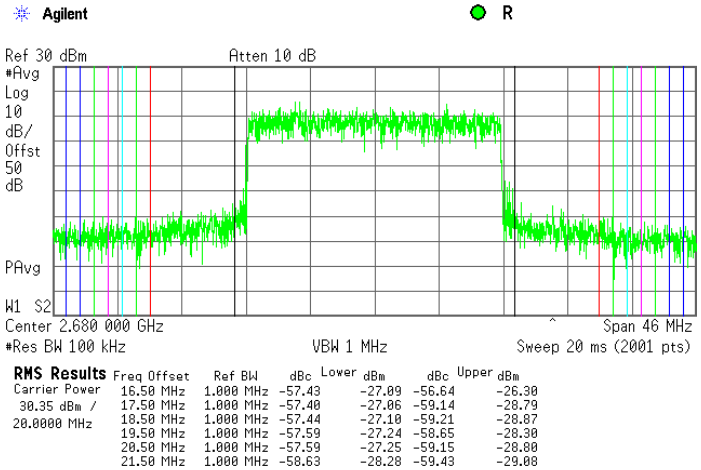


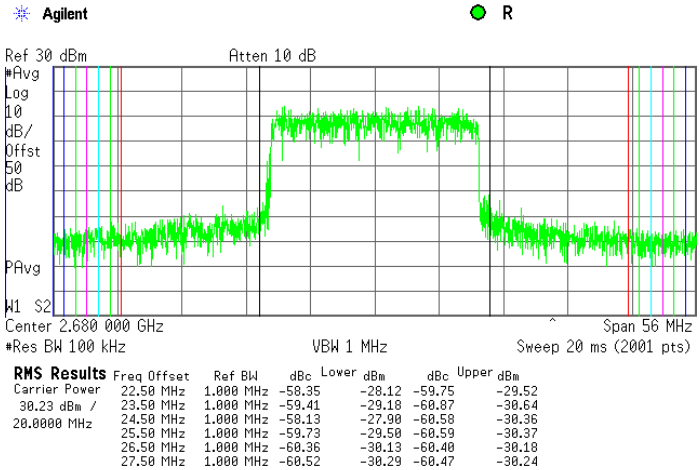
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.9 Spurious emission at band edges test results at high carrier frequency, 20 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	31 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



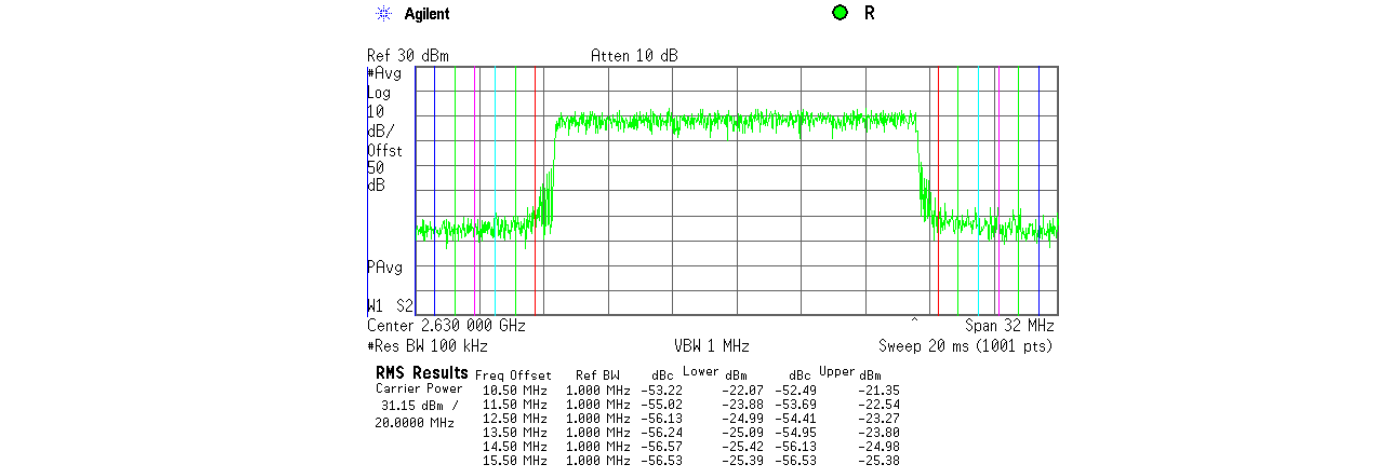


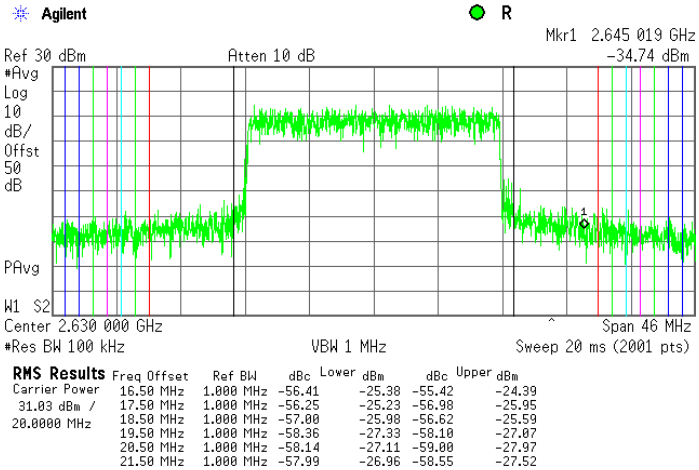


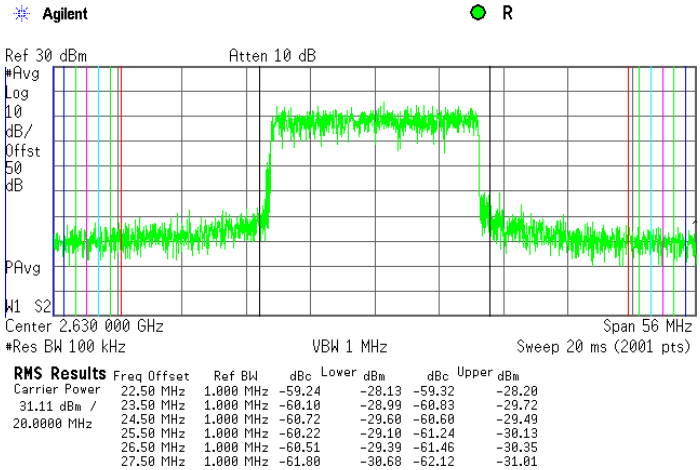
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.10 Spurious emission at band edges test results at low carrier frequency, 20 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
BIT RATE:	150 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



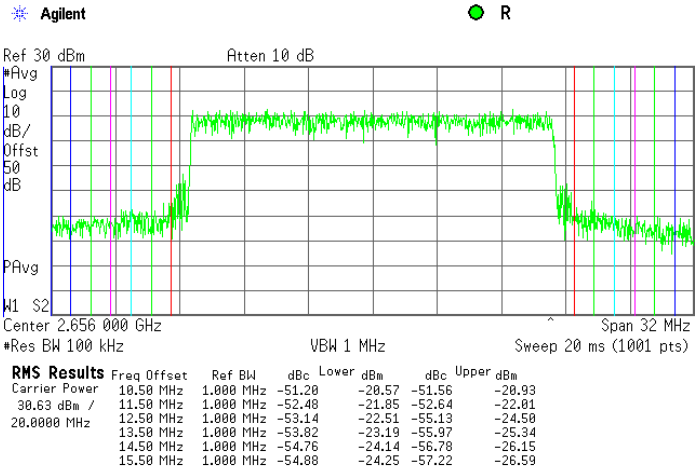


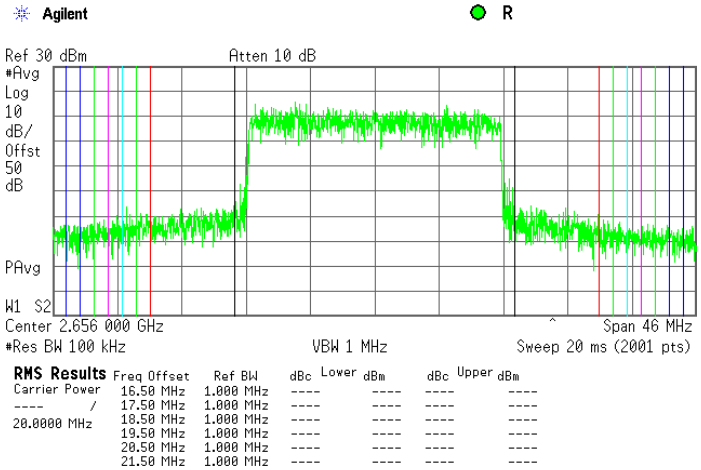


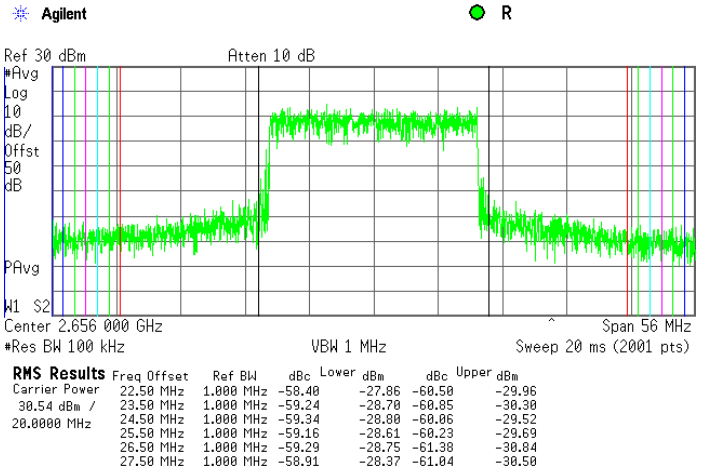
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.11 Spurious emission at band edges test results at mid carrier frequency, 20 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
BIT RATE:	150 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



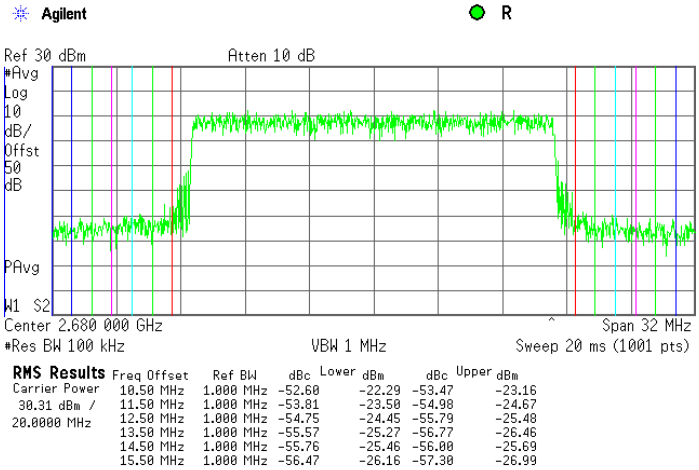


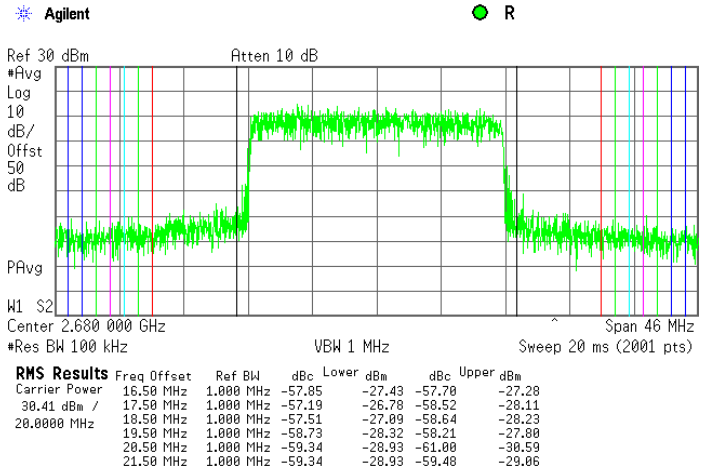


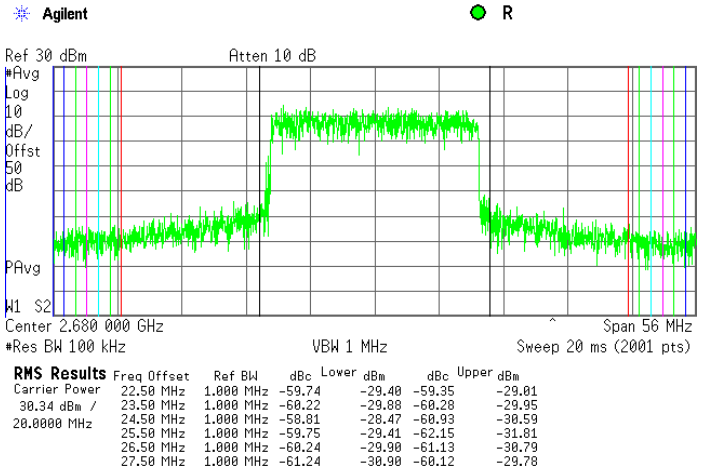
Test specification:	Section 27.53(m)(2), Conducted spurious emissions at the band edges		
Test procedure:	47 CFR, Sections 2.1051, 27.53; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/29/2013		
Temperature: 24.2 °C	Air Pressure: 1008 hPa	Relative Humidity: 40 %	Power Supply: 48VDC
Remarks:			

Plot 7.3.12 Spurious emission at band edges test results at high carrier frequency, 20 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	64QAM
MODULATING SIGNAL:	PRBS
BIT RATE:	150 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum







Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 ºC	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

7.4 Spurious emissions at RF antenna connector test

7.4.1 General

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

Table 7.4.1 Spurious emission limits

Frequency, MHz	Attenuation below carrier, dBc	Spurious emissions, dBm
Base and fixed user stations		
0.009 – 10th harmonic	43+10logP(W)**	-13.0

* - spurious emission limits do not apply to the channel edge emission investigated in course of band edge emission testing
** - P is transmitter output power in watts

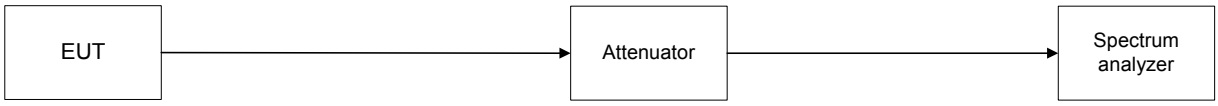
7.4.2 Test procedure

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

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

7.4.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.4.2 and associated plots.

Figure 7.4.1 Spurious emission test setup, single output



Test specification:	**Section 27.53(m)(2), Spurious emissions at RF antenna connector**		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	7/30/2013		
Temperature: 24.0 ºC	**Air Pressure:** 1006 hPa	**Relative Humidity:** 44 %	**Power Supply:** 48VDC
Remarks:			

Table 7.4.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 2620 – 2690 MHz
INVESTIGATED FREQUENCY RANGE: 0.009 – 27000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: ≥ Resolution bandwidth
MODULATION:
MODULATING SIGNAL: PRBS
BIT RATE: 75 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum
NUMBER OF RF OUTPUTS: N = 1

Frequency, MHz	SA reading, dBm	Attenuation, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
All spurious were found at least 20 dB below the specified limit								Pass
Mid carrier frequency								
All spurious were found at least 20 dB below the specified limit								Pass
High carrier frequency								
All spurious were found at least 20 dB below the specified limit								Pass

NUMBER OF RF OUTPUTS: N = 2

Frequency, MHz	SA reading, dBm	Attenuation, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
All spurious were found at least 20 dB below the specified limit								Pass
Mid carrier frequency								
All spurious were found at least 20 dB below the specified limit								Pass
High carrier frequency								
All spurious were found at least 20 dB below the specified limit								Pass

*****- Margin = Spurious emission – specification limit.

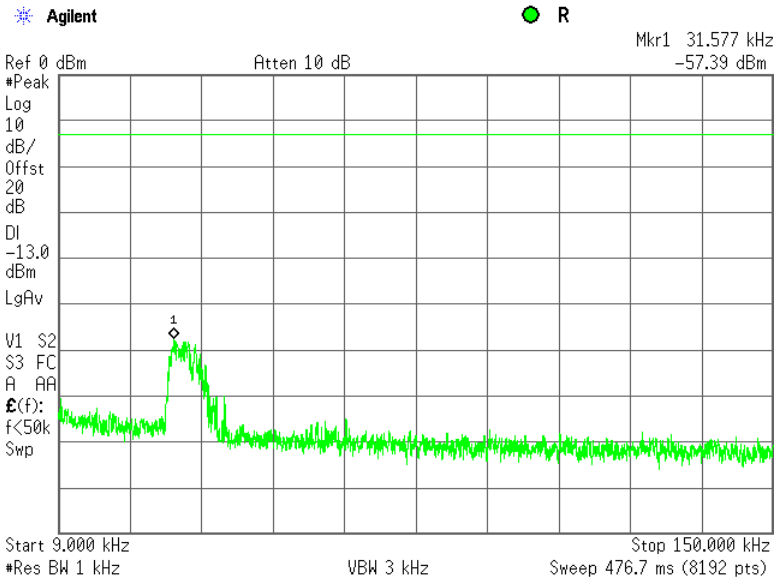
Reference numbers of test equipment used

HL 2455	HL 3442	HL 3787	HL 3818	HL 3901	HL 4367		

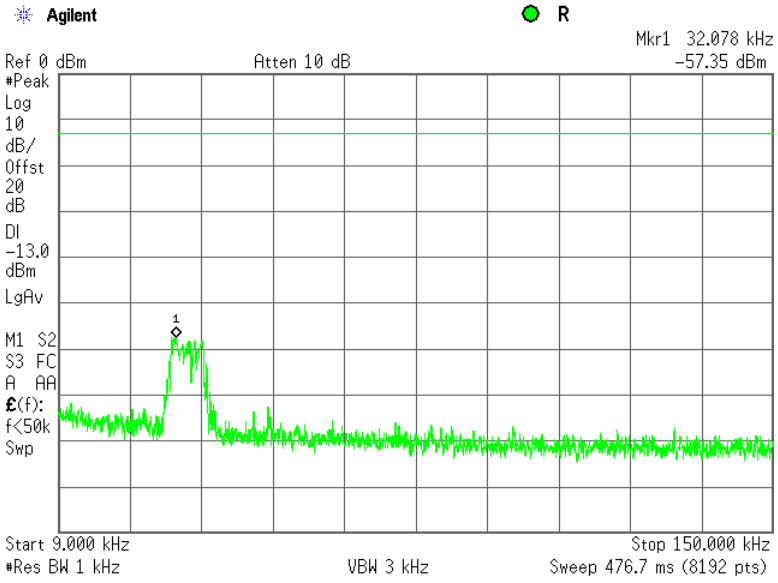
Full description is given in Appendix A.

Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

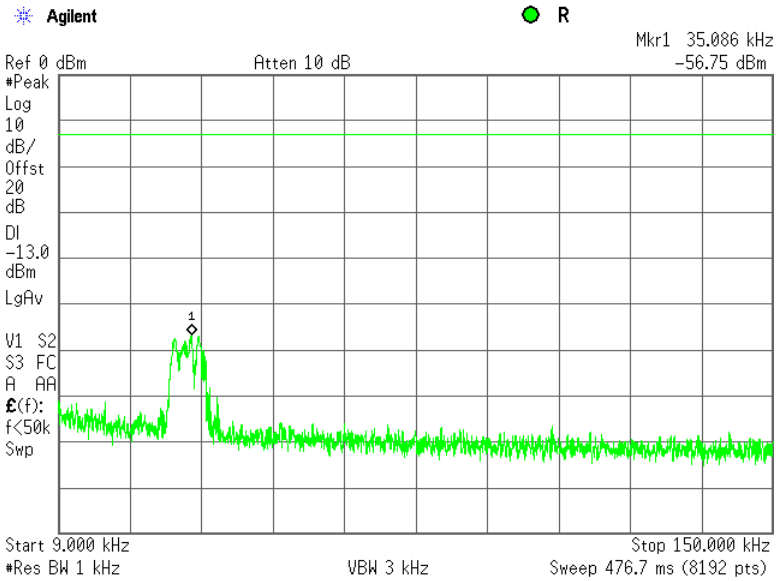


Plot 7.4.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency

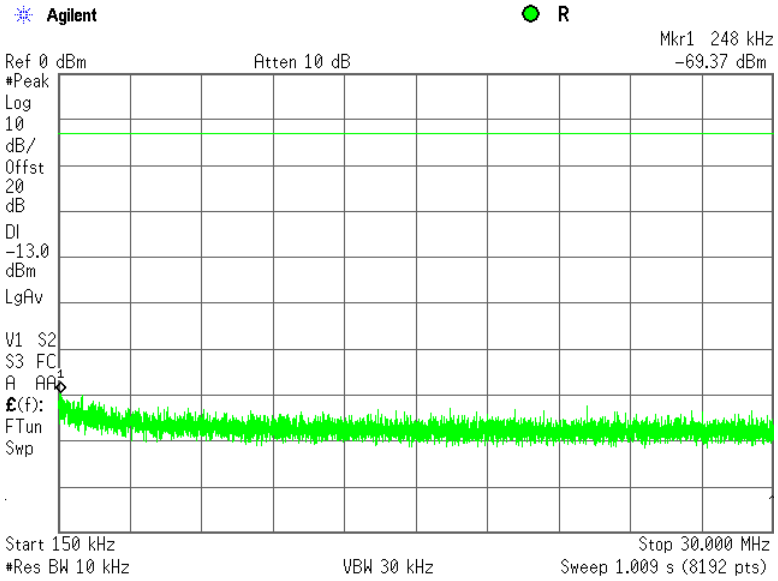


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency

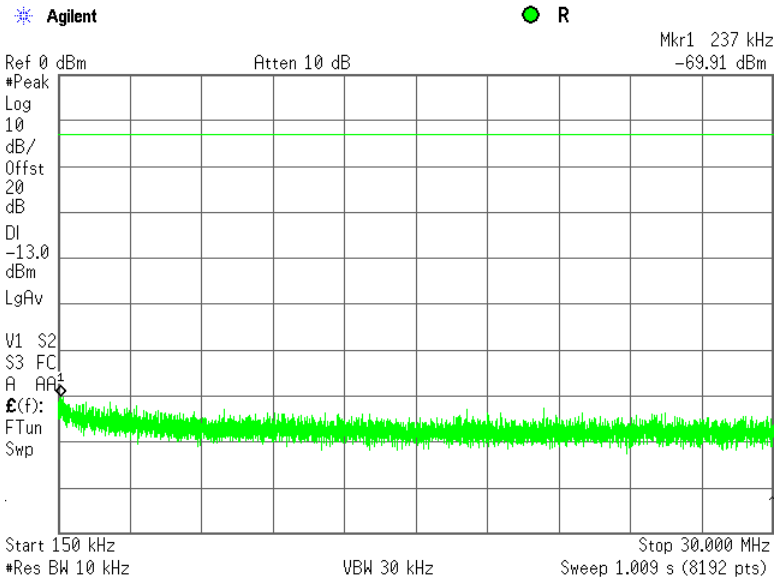


Plot 7.4.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

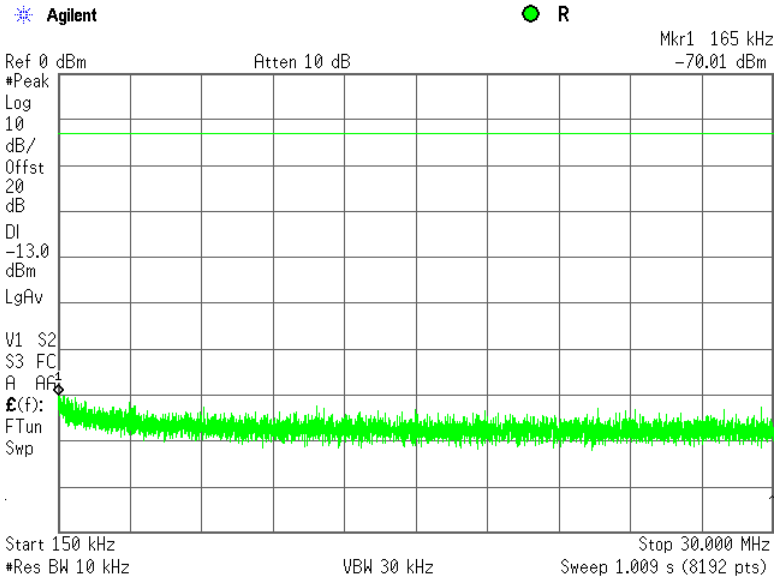


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency

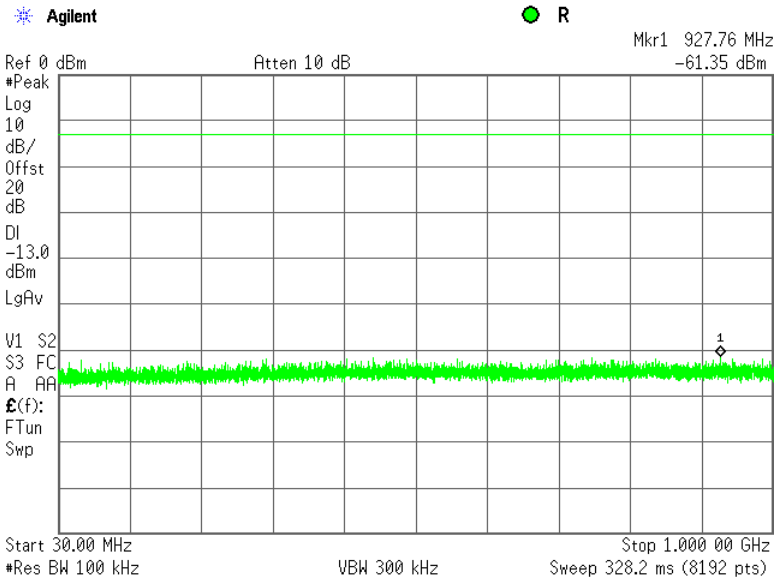


Plot 7.4.6 Spurious emission measurements in 0.15 - 30.0 MHz range at high carrier frequency

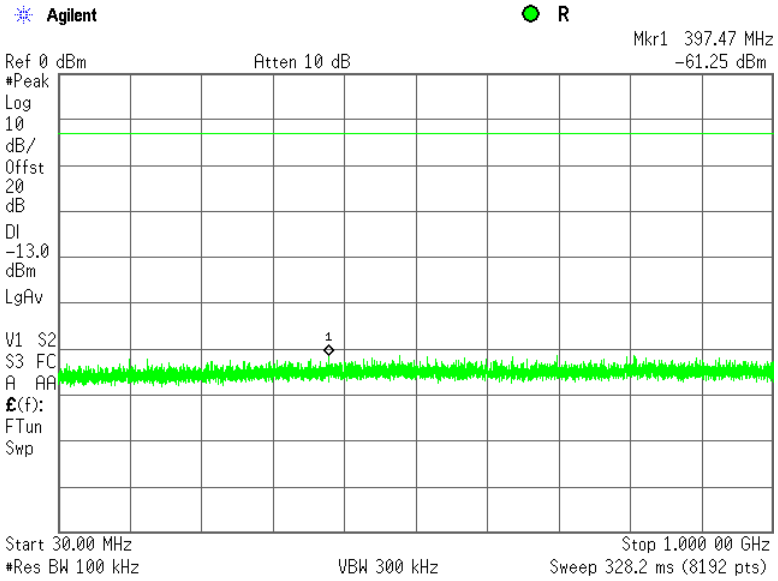


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.7 Spurious emission measurements in 30 - 1000 MHz range at low carrier frequency

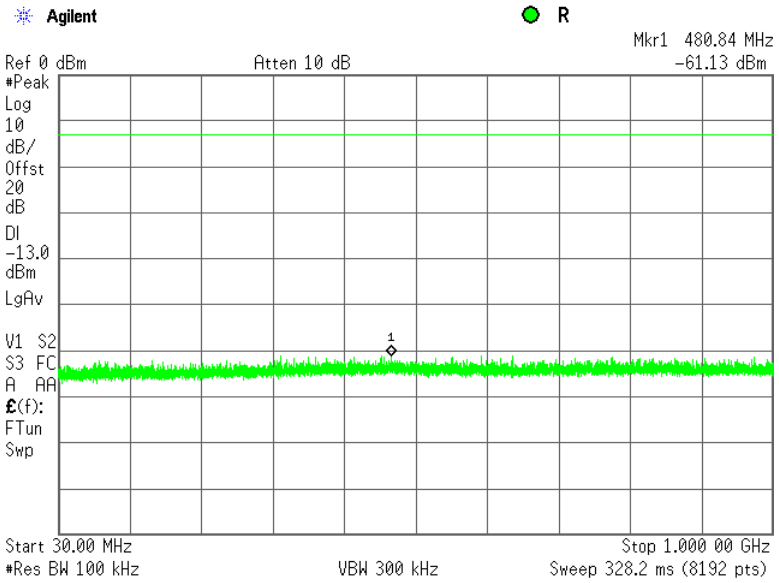


Plot 7.4.8 Spurious emission measurements in 30 - 1000 MHz range at mid carrier frequency

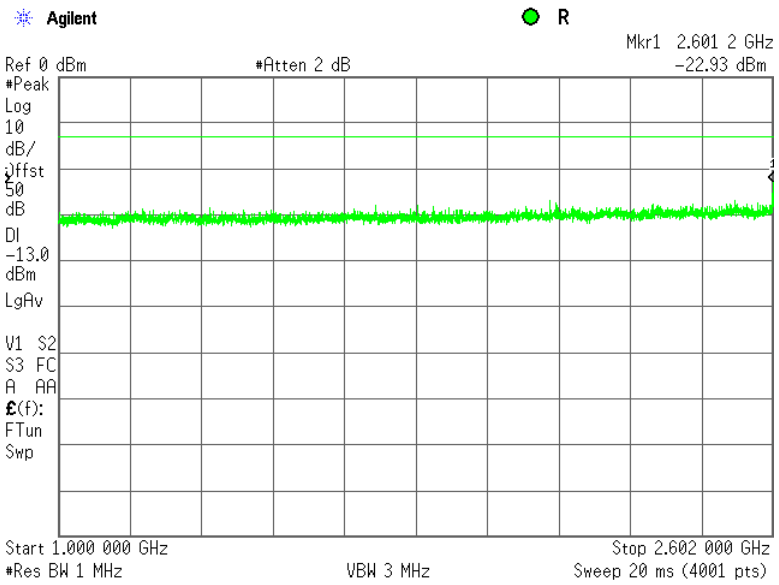


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.9 Spurious emission measurements in 30 - 1000 MHz range at high carrier frequency

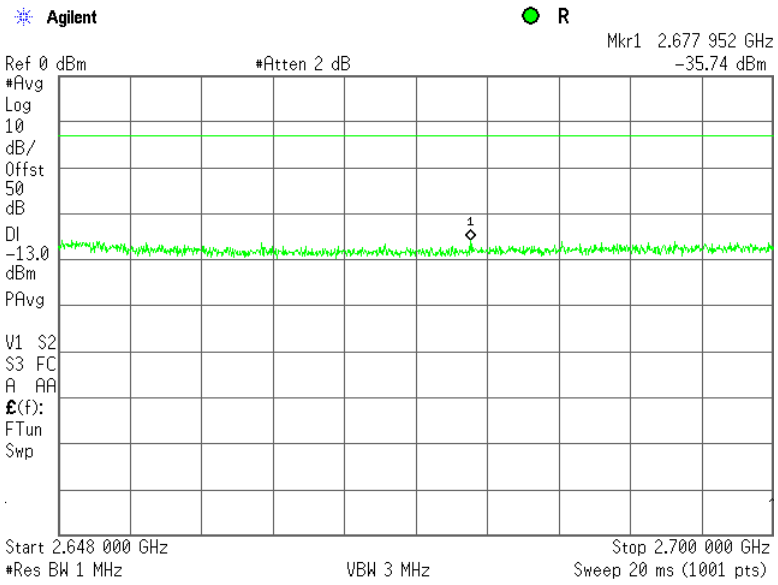


Plot 7.4.10 Spurious emission measurements in 1000 - 2602 MHz range at low carrier frequency



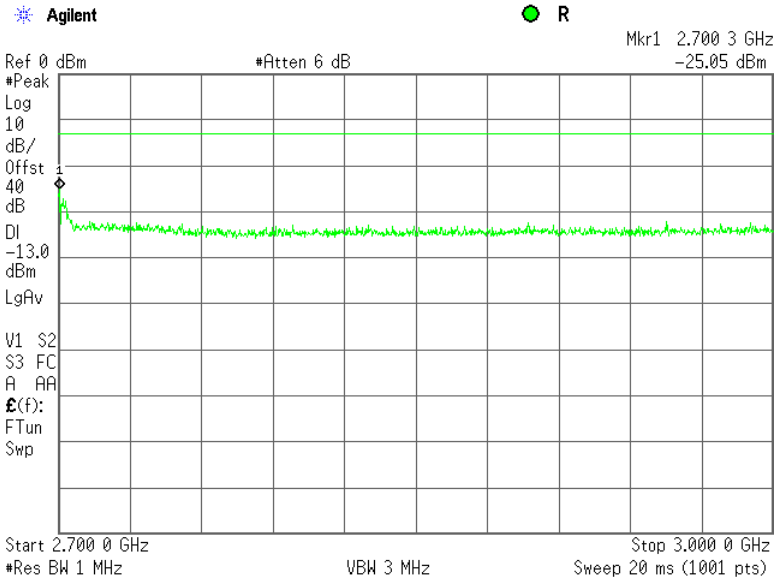
Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.11 Spurious emission measurements in 2648 - 2700 MHz range at low carrier frequency



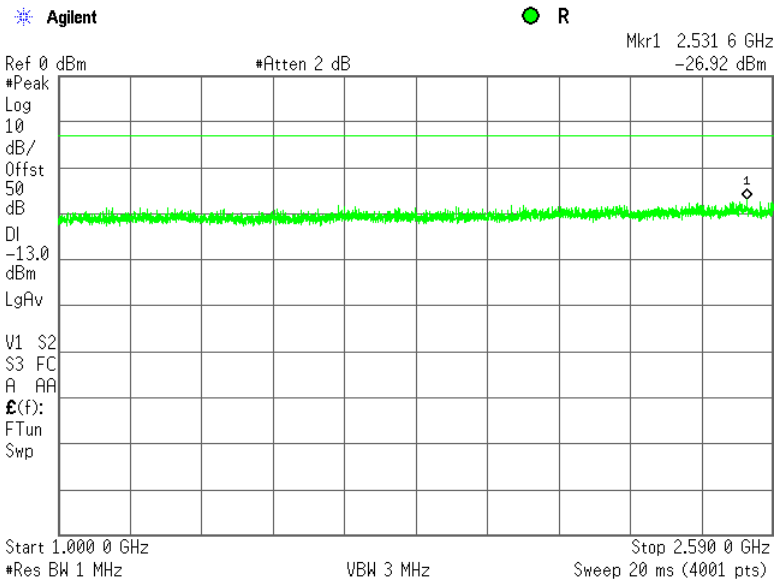
NOTE: Average Detector with Gating was used

Plot 7.4.12 Spurious emission measurements in 2700 - 3000 MHz range at low carrier frequency

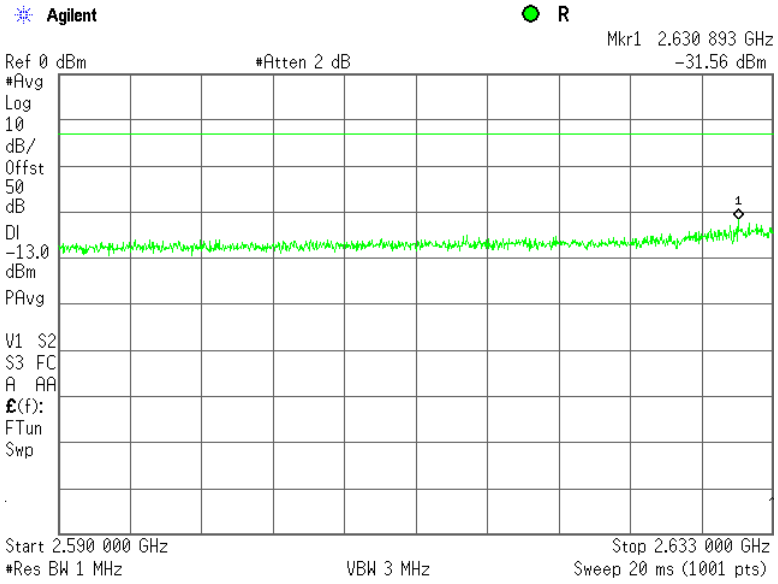


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.13 Spurious emission measurements in 1000 - 2590 MHz at mid carrier frequency



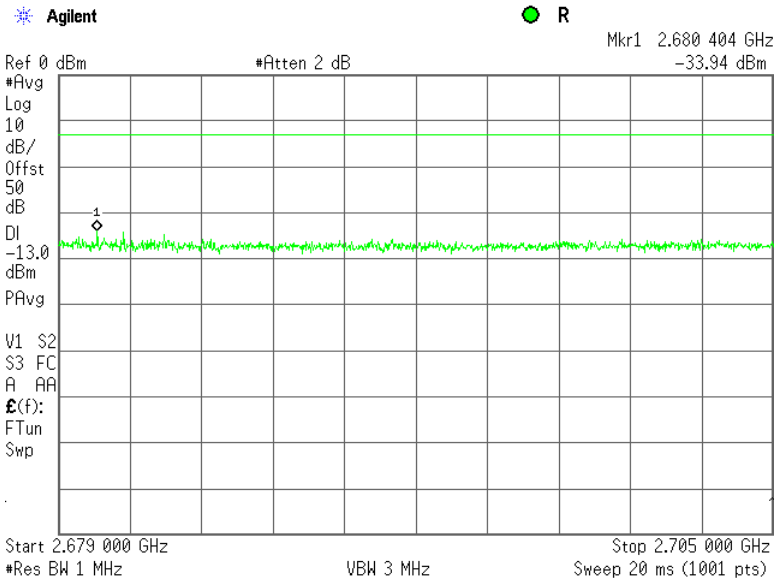
Plot 7.4.14 Spurious emission measurements in 2590 - 2633 MHz range at mid carrier frequency



NOTE: Average Detector with Gating was used

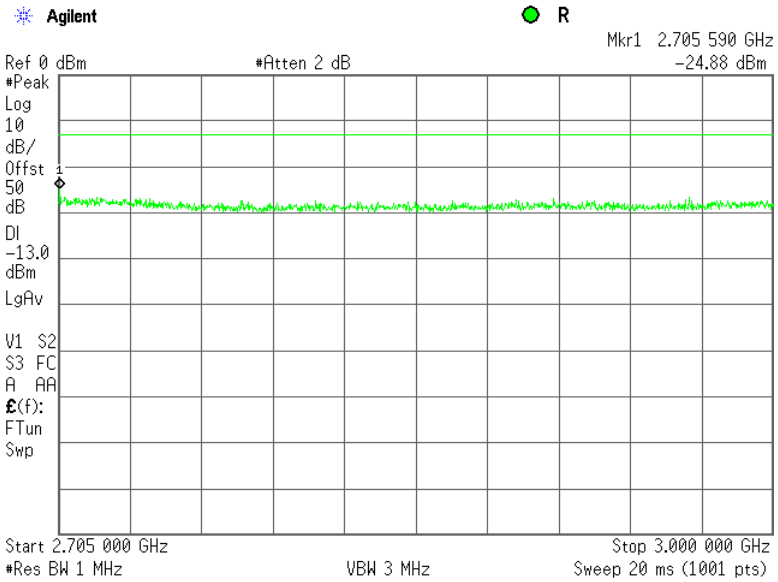
Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.15 Spurious emission measurements in 2679 - 2705 MHz range at mid carrier frequency



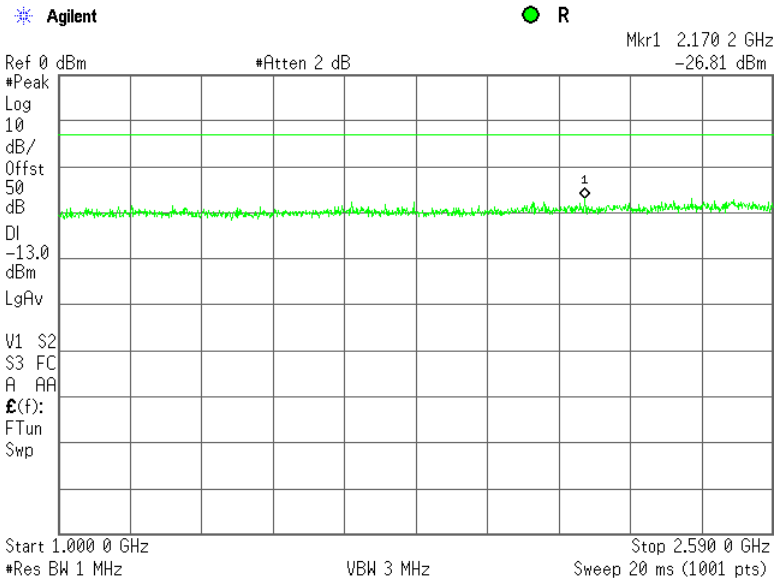
NOTE: Average Detector with Gating was used

Plot 7.4.16 Spurious emission measurements in 2705 - 3000 MHz range at mid carrier frequency

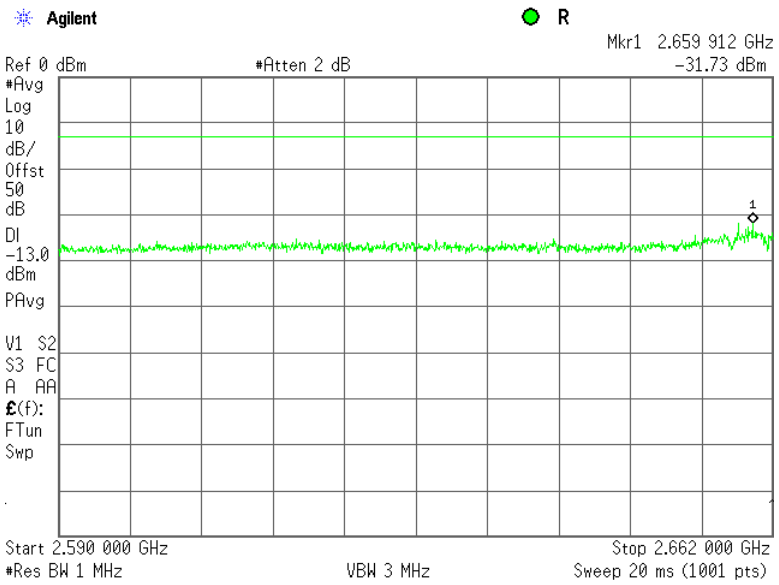


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.17 Spurious emission measurements in 1000 - 2590 MHz at high carrier frequency



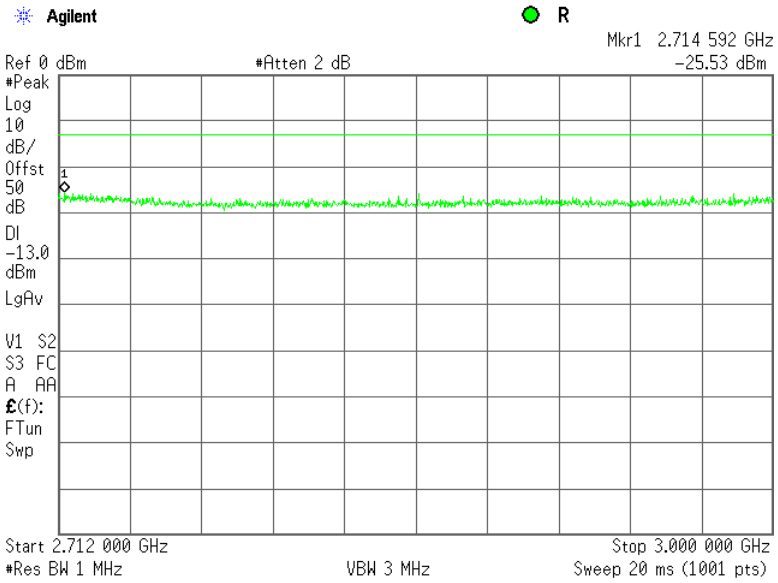
Plot 7.4.18 Spurious emission measurements in 2590 – 2662 MHz range at high carrier frequency



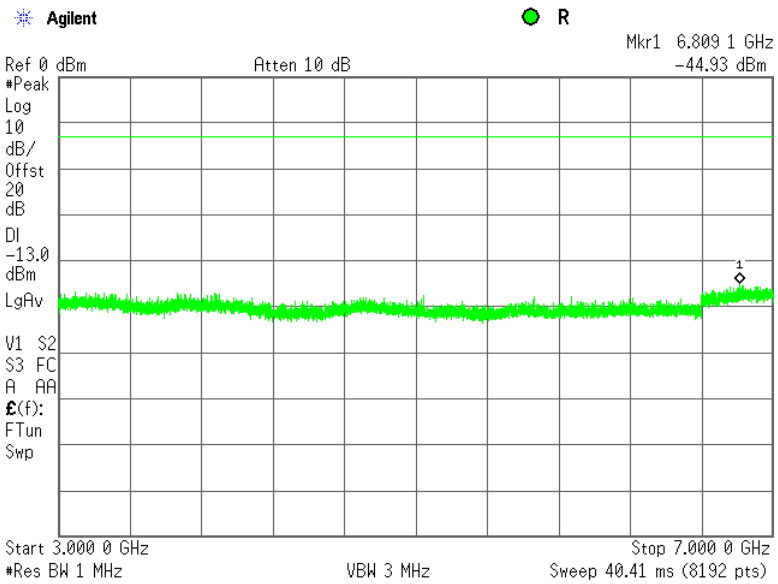
NOTE: Average Detector with Gating was used

Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.19 Spurious emission measurements in 2712 - 3000 MHz range at high carrier frequency

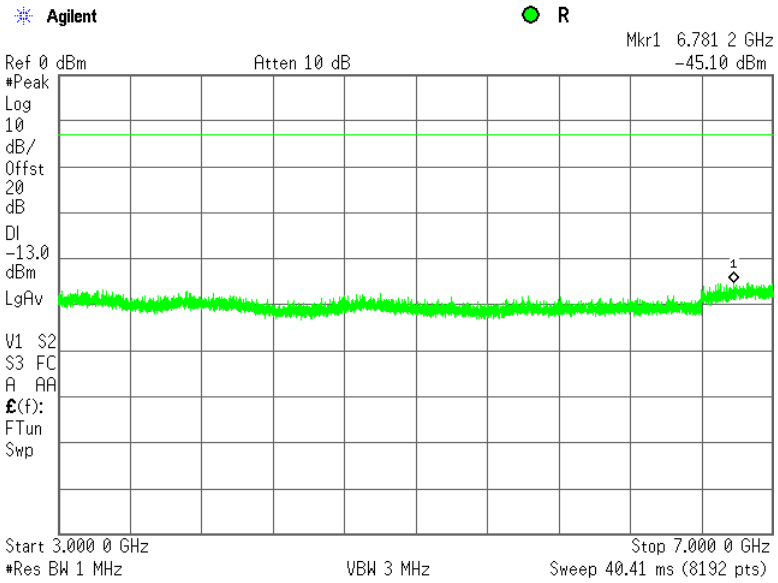


Plot 7.4.20 Spurious emission measurements in 3000 - 7000 MHz range at low carrier frequency

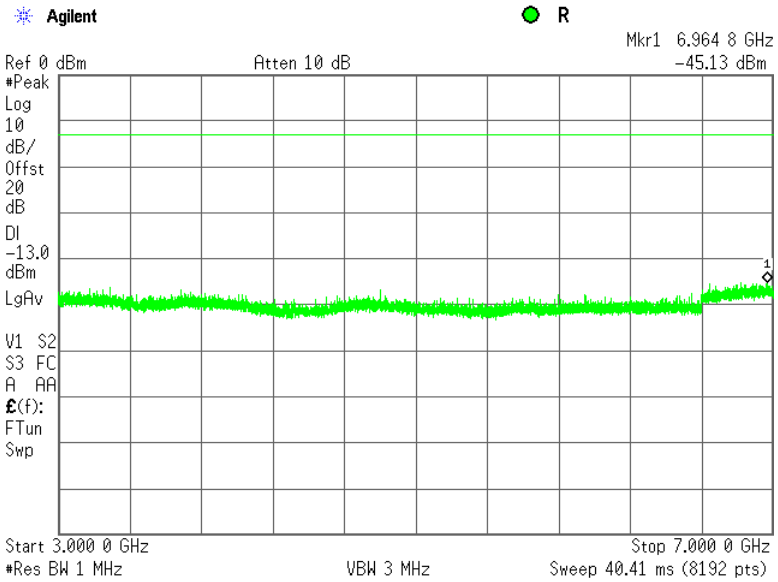


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.21 Spurious emission measurements in 3000 - 7000 MHz at mid carrier frequency

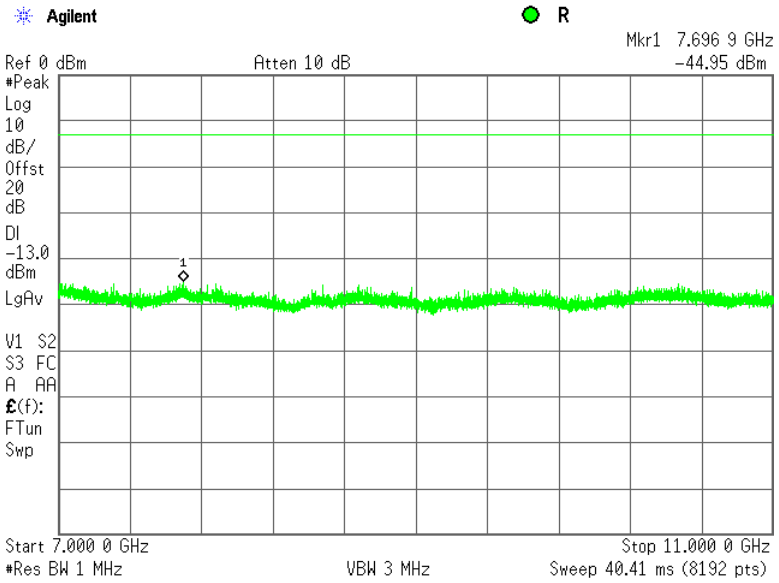


Plot 7.4.22 Spurious emission measurements in 3000 - 7000 MHz at high carrier frequency

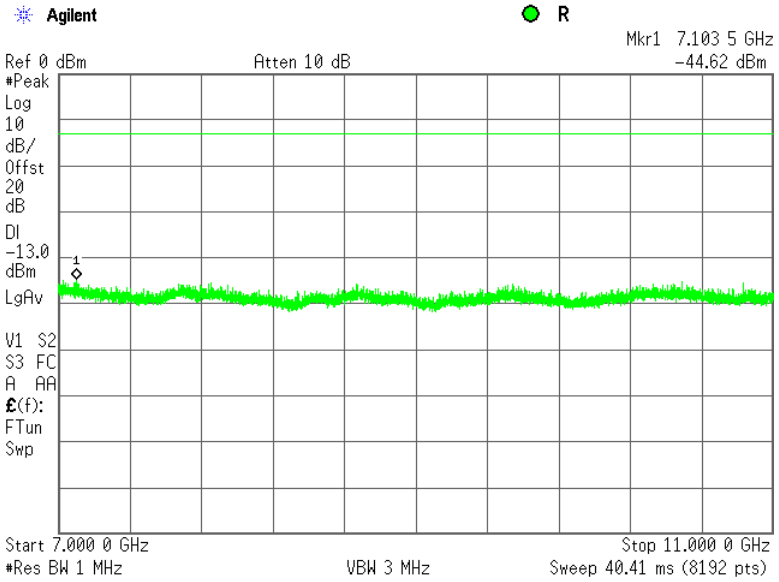


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.23 Spurious emission measurements in 7000 - 11000 MHz range at low carrier frequency

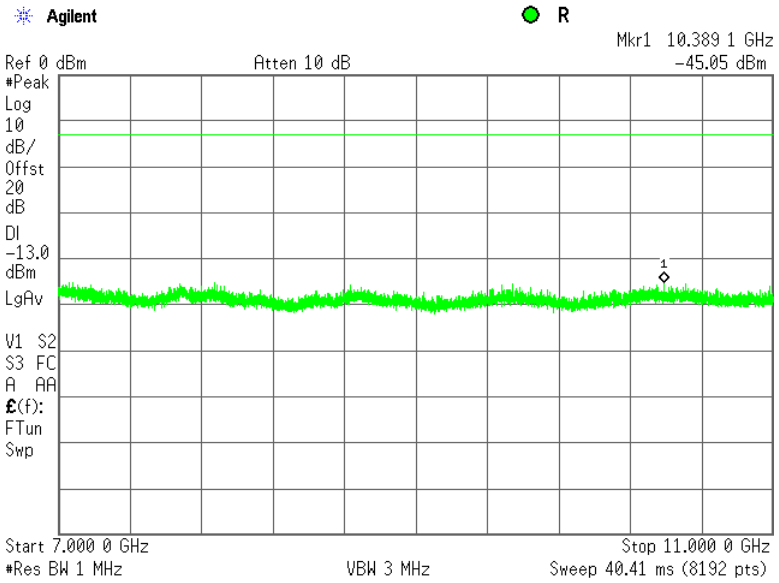


Plot 7.4.24 Spurious emission measurements in 7000 - 11000 MHz at mid carrier frequency

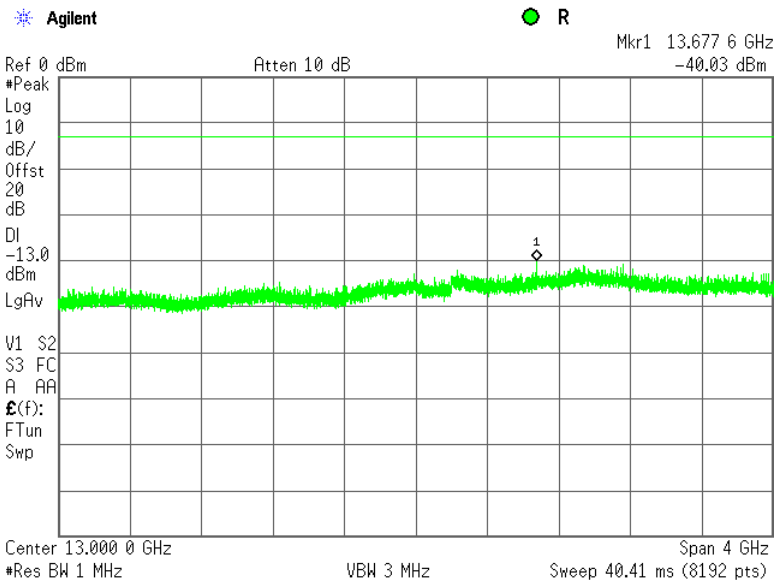


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.25 Spurious emission measurements in 7000 - 11000 MHz at high carrier frequency

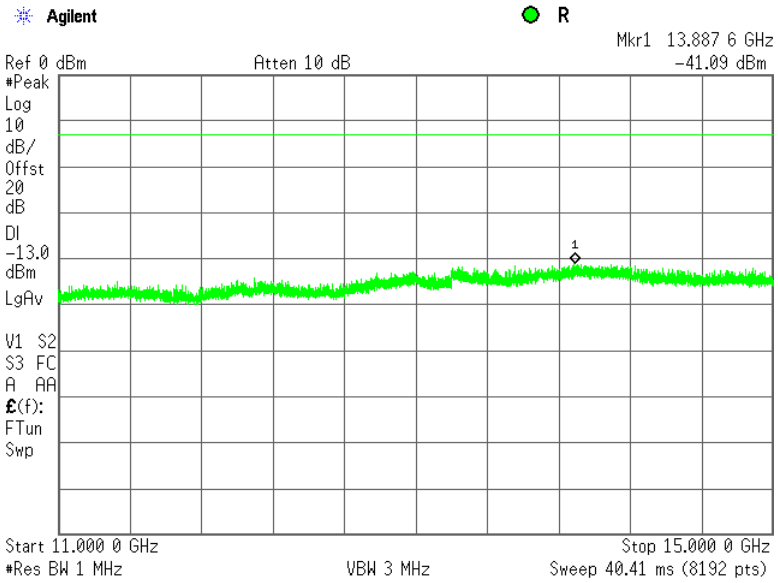


Plot 7.4.26 Spurious emission measurements in 11000 - 15000 MHz range at low carrier frequency

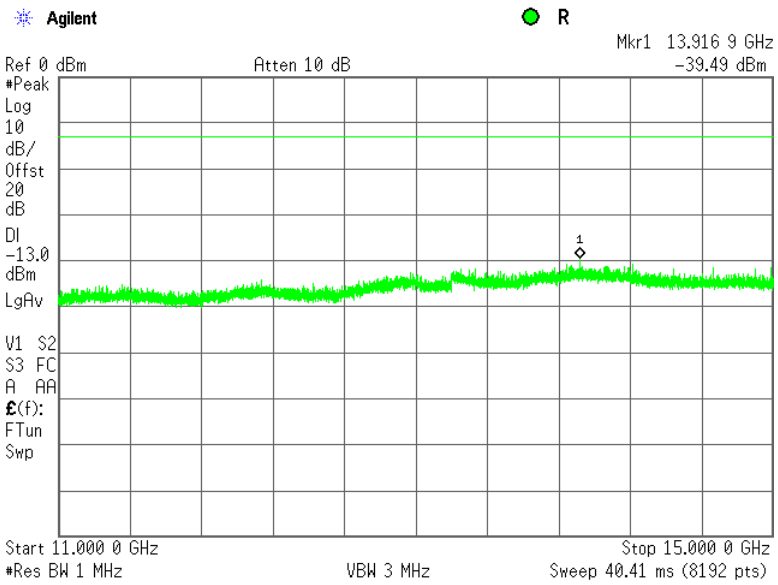


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.27 Spurious emission measurements in 11000 - 15000 MHz at mid carrier frequency

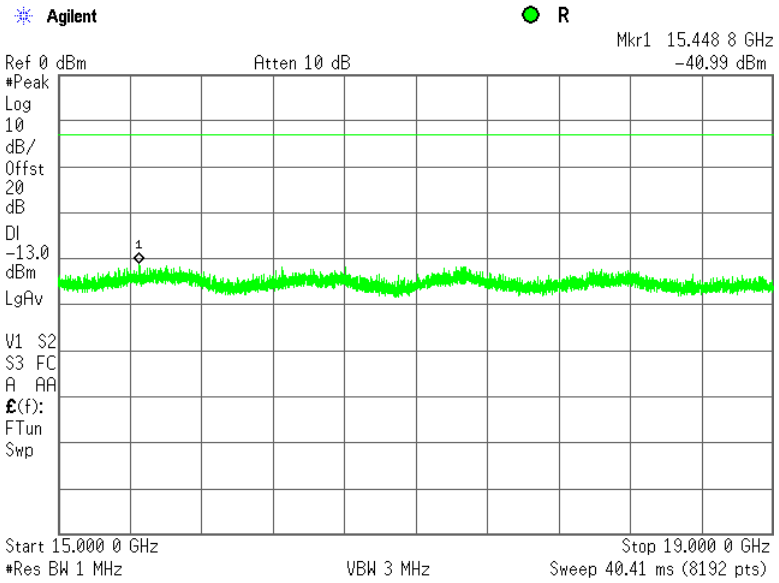


Plot 7.4.28 Spurious emission measurements in 11000 - 15000 MHz at high carrier frequency

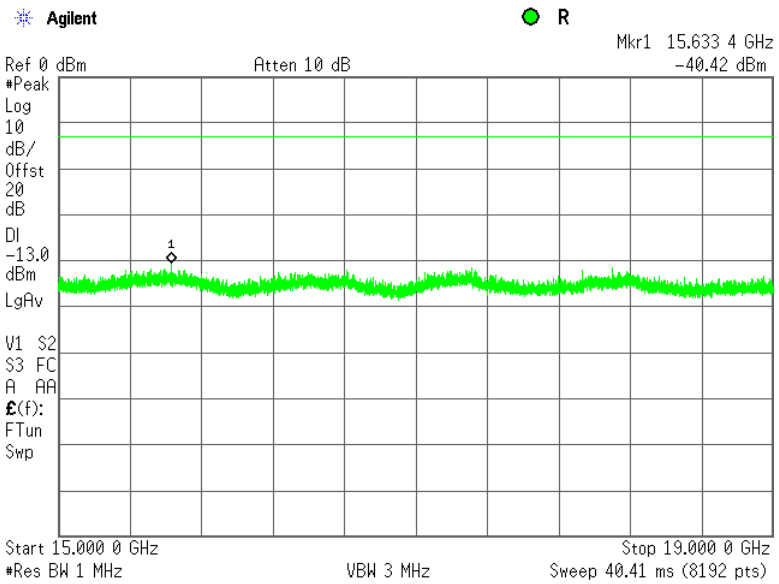


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.29 Spurious emission measurements in 15000 - 19000 MHz range at low carrier frequency

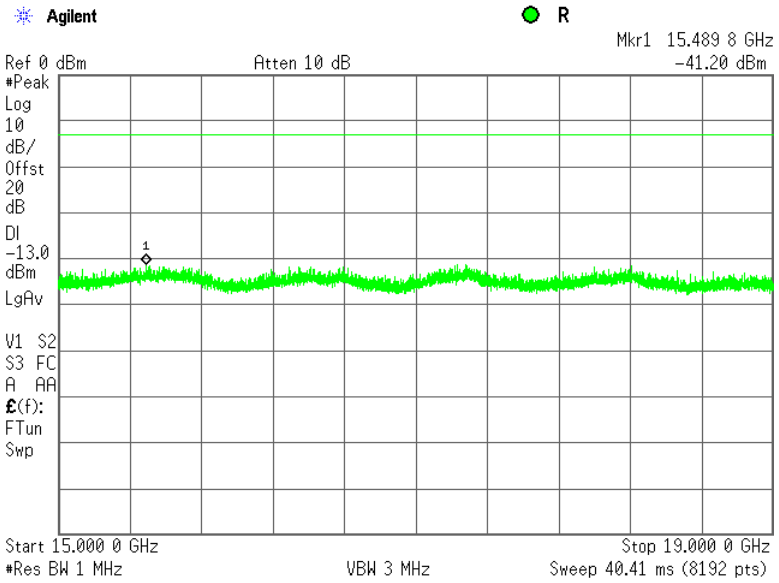


Plot 7.4.30 Spurious emission measurements in 15000 - 19000 MHz at mid carrier frequency

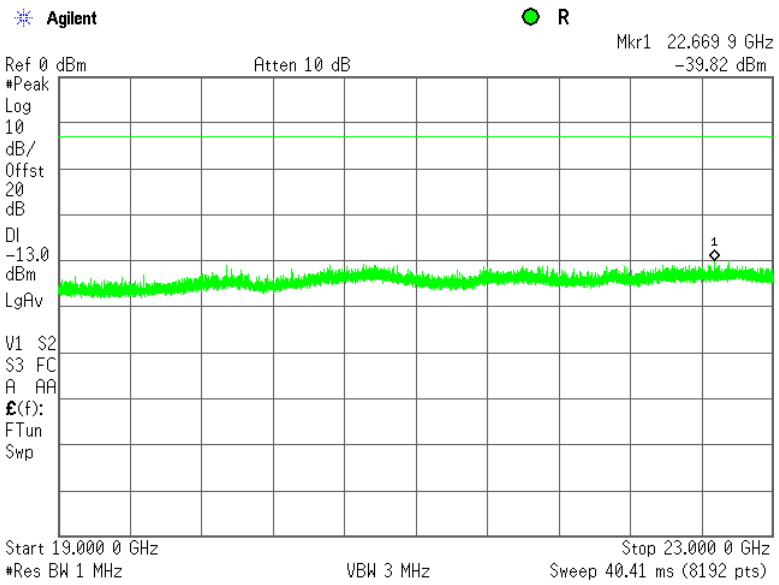


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.31 Spurious emission measurements in 15000 - 19000 MHz at high carrier frequency

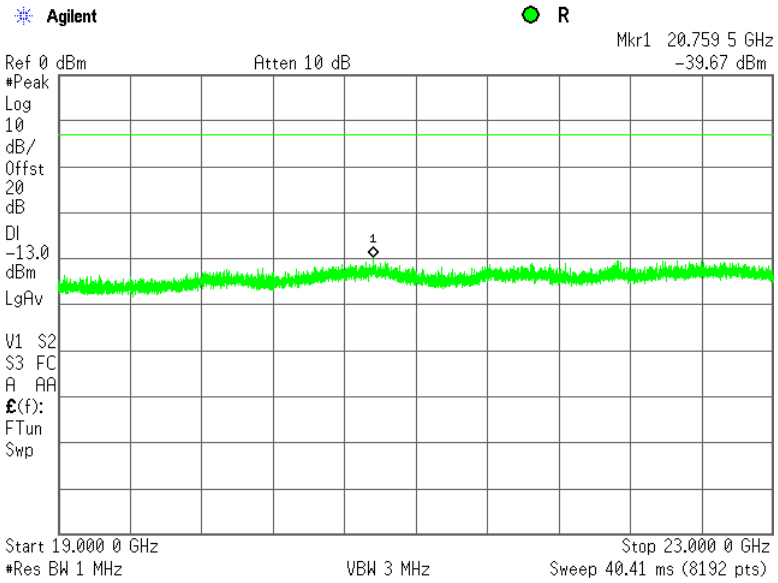


Plot 7.4.32 Spurious emission measurements in 19000 - 23000 MHz range at low carrier frequency

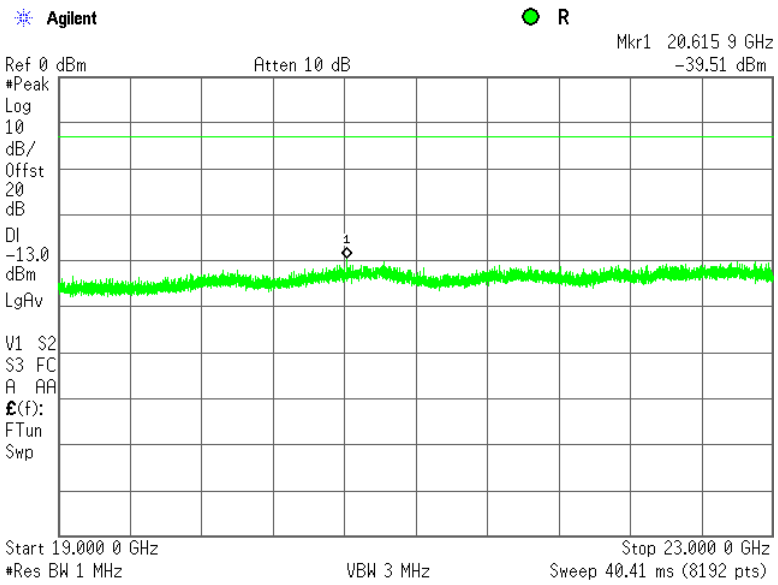


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.33 Spurious emission measurements in 19000 - 23000 MHz at mid carrier frequency

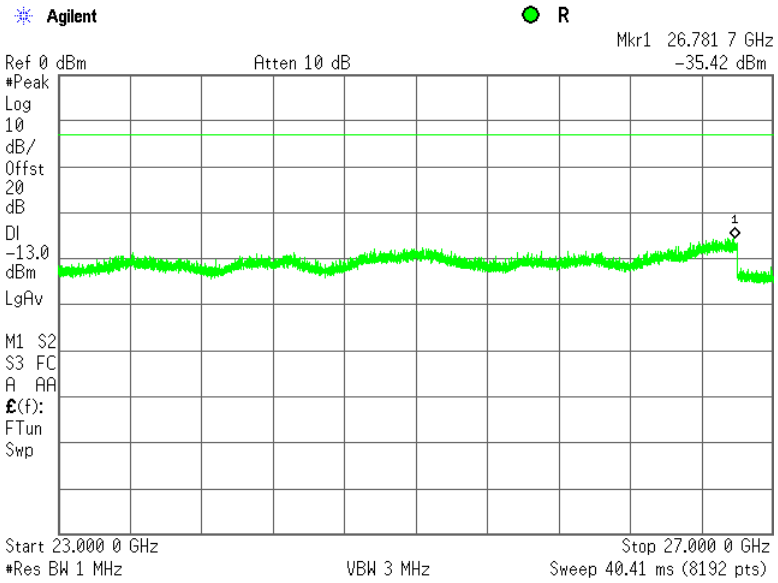


Plot 7.4.34 Spurious emission measurements in 19000 - 23000 MHz at high carrier frequency

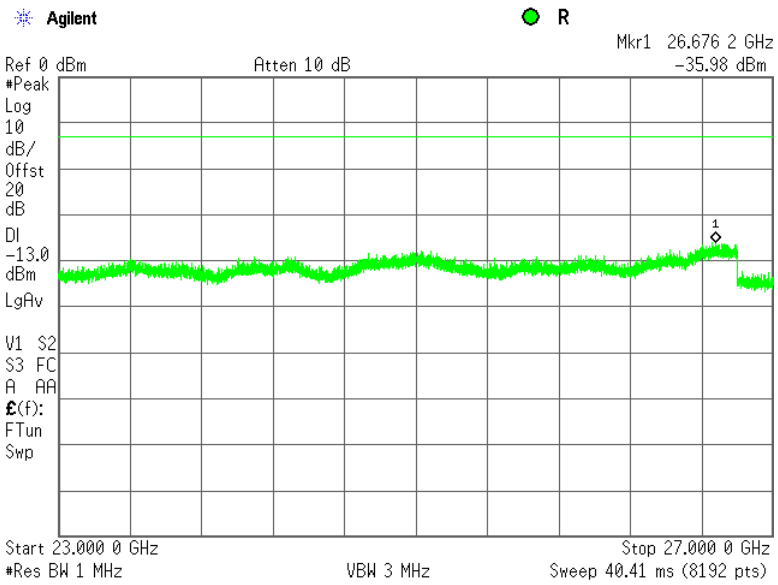


Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.35 Spurious emission measurements in 23000 - 27000 MHz range at low carrier frequency

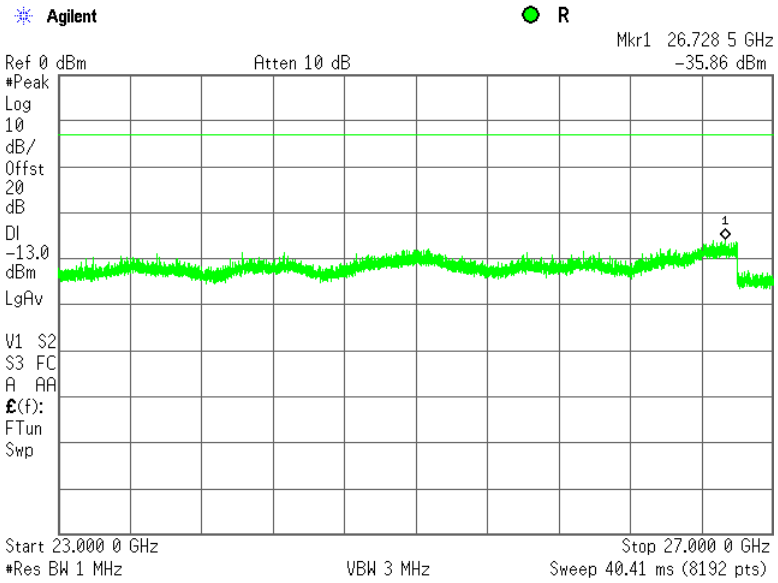


Plot 7.4.36 Spurious emission measurements in 23000 - 27000 MHz at mid carrier frequency



Test specification:	Section 27.53(m)(2), Spurious emissions at RF antenna connector		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013		
Temperature: 24.0 °C	Air Pressure: 1006 hPa	Relative Humidity: 44 %	Power Supply: 48VDC
Remarks:			

Plot 7.4.37 Spurious emission measurements in 23000 - 27000 MHz at high carrier frequency



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

7.5 Radiated spurious emission measurements

7.5.1 General

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

Table 7.5.1 Radiated spurious emission test limits

Frequency, MHz	Attenuation below carrier, dBc	ERP of spurious, dBm	Equivalent field strength limit @ 3m, dB(μV/m)***
0.009 – 10th harmonic*	43+10logP** fixed	-13	84.4

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

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

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

7.5.2.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna was rotated around its vertical axis.

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

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

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

7.5.3.2 The specified frequency range was investigated with antenna connected to spectrum analyzer. To find maximum radiation the turntable was rotated 360^0 and the measuring antenna height was swept from 1 to 4 m in both, vertical and horizontal, polarizations.

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

Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

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

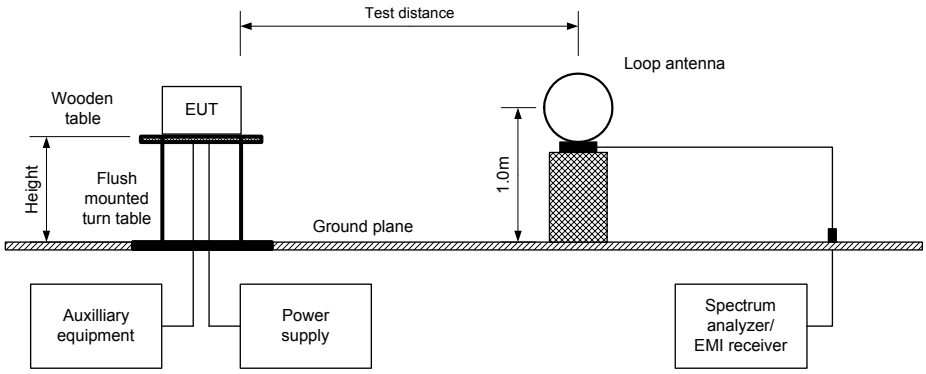
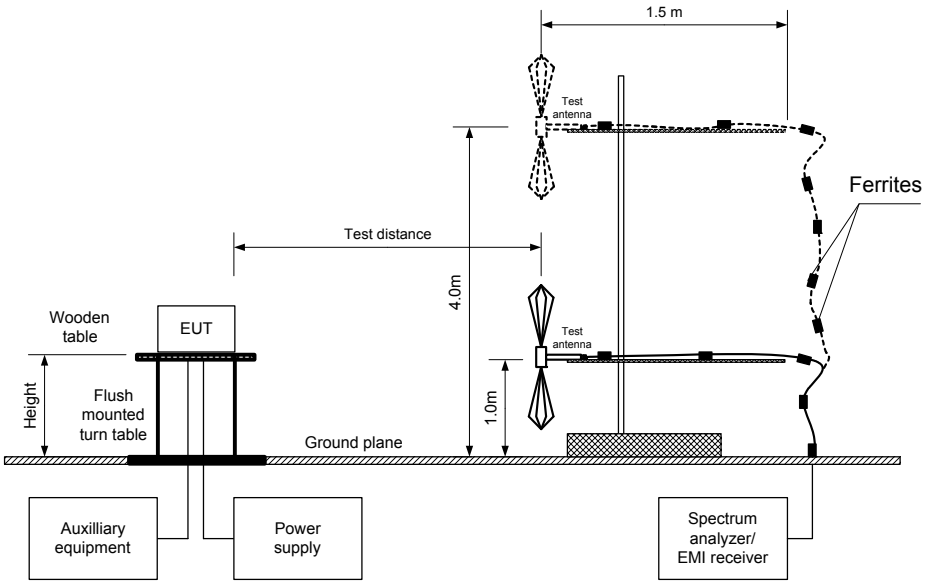


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:	**Section 27.53(m)(2), Radiated spurious emissions**		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	**Air Pressure:** 1005 hPa	**Relative Humidity:** 41 %	**Power Supply:** 48VDC
Remarks:			

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 2620-2690 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 27000 MHz
DETECTOR USED: Peak
VIDEO BANDWIDTH: > Resolution bandwidth
TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
Biconilog (30 MHz – 1000 MHz)
Double ridged guide (above 1000 MHz)
MODULATION: 64 QAM
MODULATING SIGNAL: PRBS
EBW: 10 MHz
BIT RATE: 75 Mbps
TRANSMITTER OUTPUT POWER SETTINGS: Maximum

Frequency, MHz	Field strength, dB(μV/m)	Limit, dB(μV/m)	Margin, dB*	RBW, kHz	Antenna polarization	Antenna height, m	Turn-table position**, degrees
Low carrier frequency MHz							
No emissions were found							
Mid carrier frequency MHz							
No emissions were found							
High carrier frequency MHz							
No emissions were found							

Verdict: Pass

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

Reference numbers of test equipment used

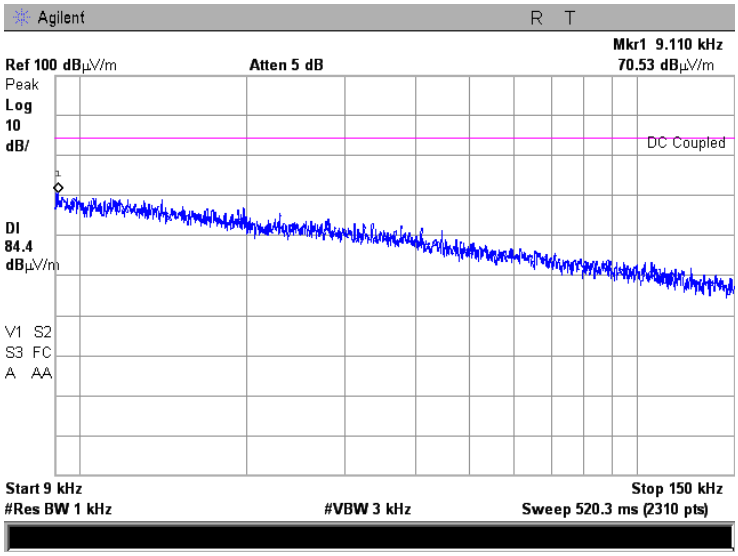
HL 0446	HL 0604	HL 0768	HL 0769	HL 2871	HL 2909	HL 3818	HL 4114
HL 4347							

Full description is given in Appendix A.

Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

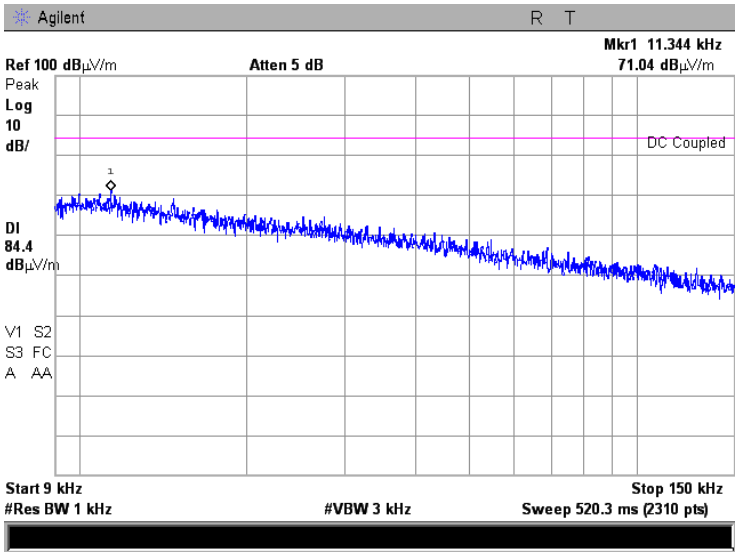
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.2 Radiated emission measurements in 9 - 150 kHz range

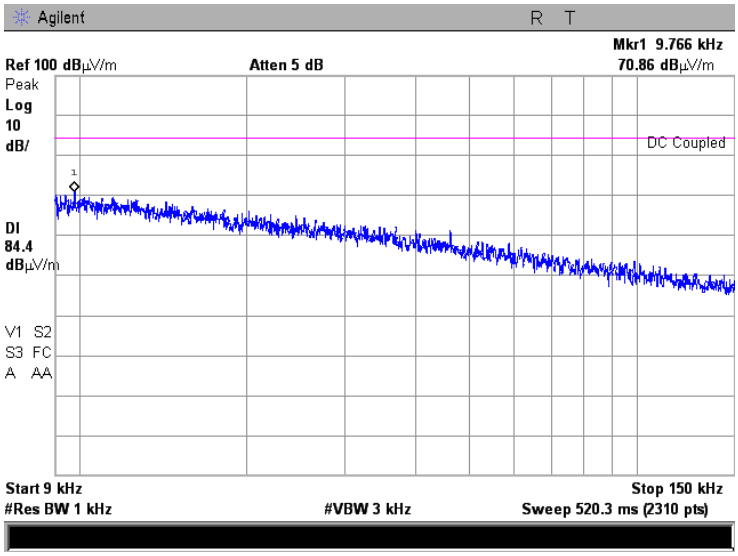
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

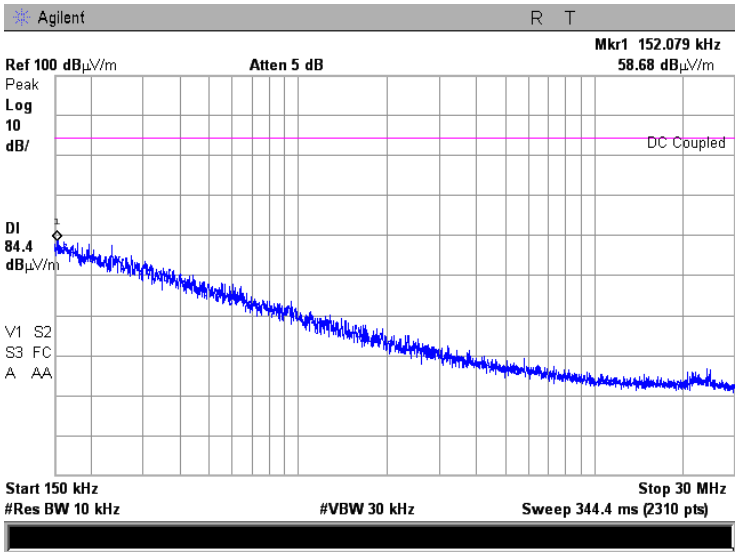
Plot 7.5.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.5.4 Radiated emission measurements in 0.15 - 30 MHz range

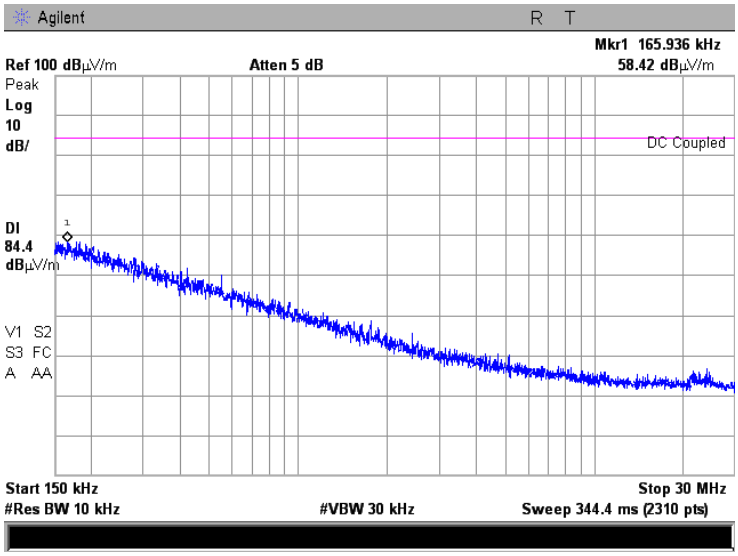
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

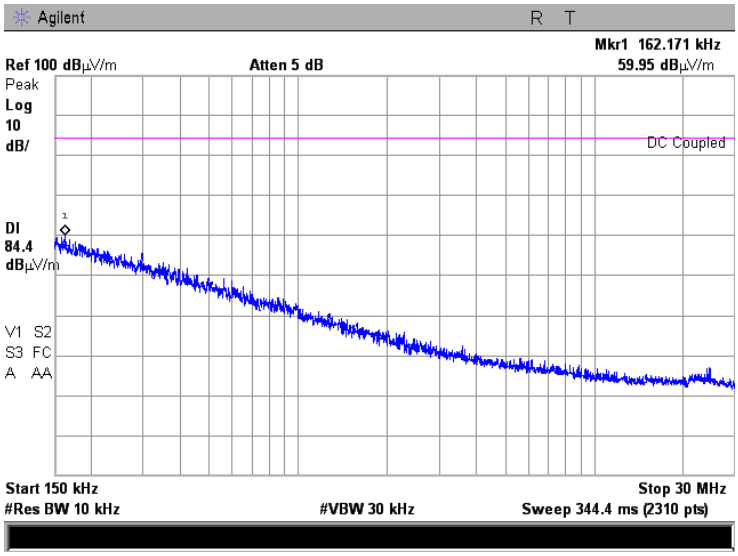
Plot 7.5.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.5.6 Radiated emission measurements in 0.15 - 30 MHz range

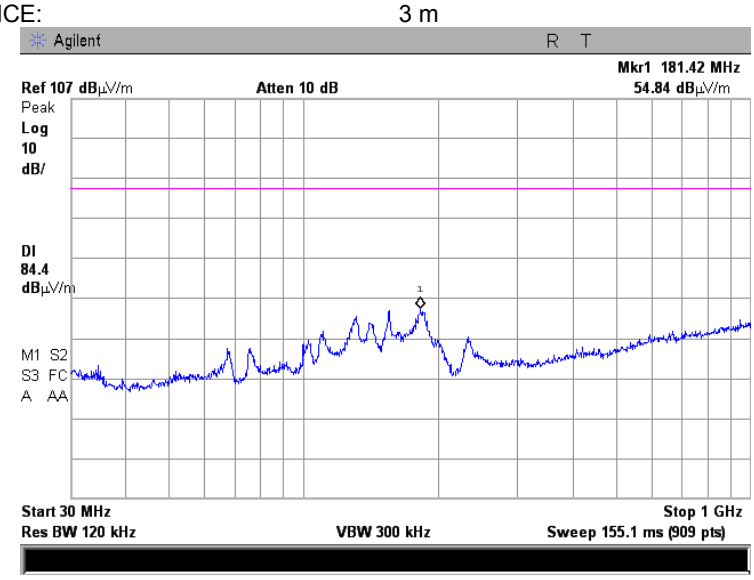
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

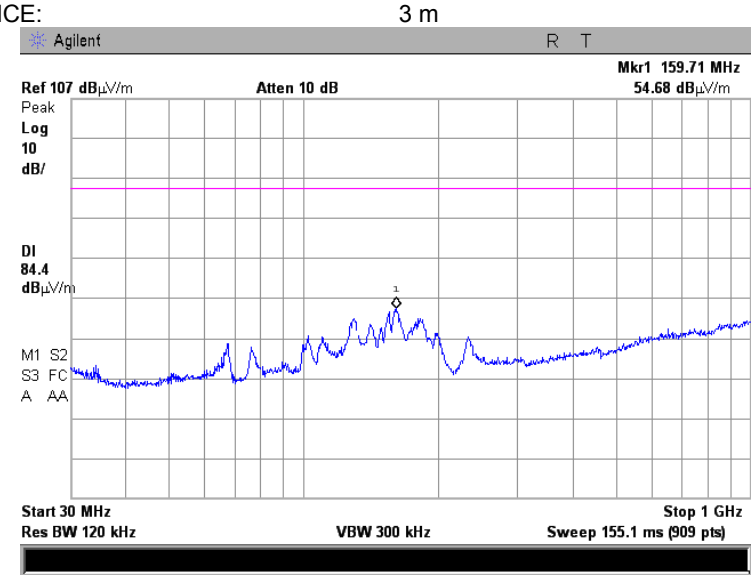
Plot 7.5.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.5.8 Radiated emission measurements in 30 - 1000 MHz range

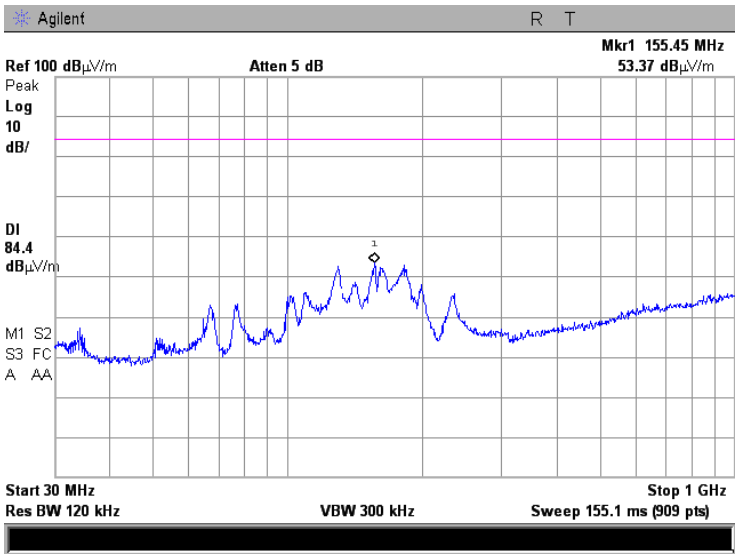
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.9 Radiated emission measurements in 30 - 1000 MHz range

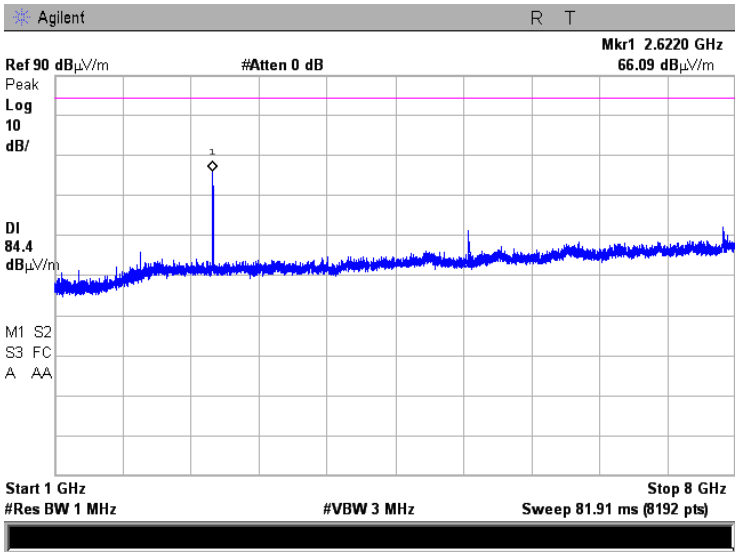
TEST SITE:	Semi anechoic chamber
CARRIER FREQUENCY:	High
ANTENNA POLARIZATION:	Vertical and Horizontal
TEST DISTANCE:	3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.10 Radiated emission measurements in 1000 – 8000 MHz range

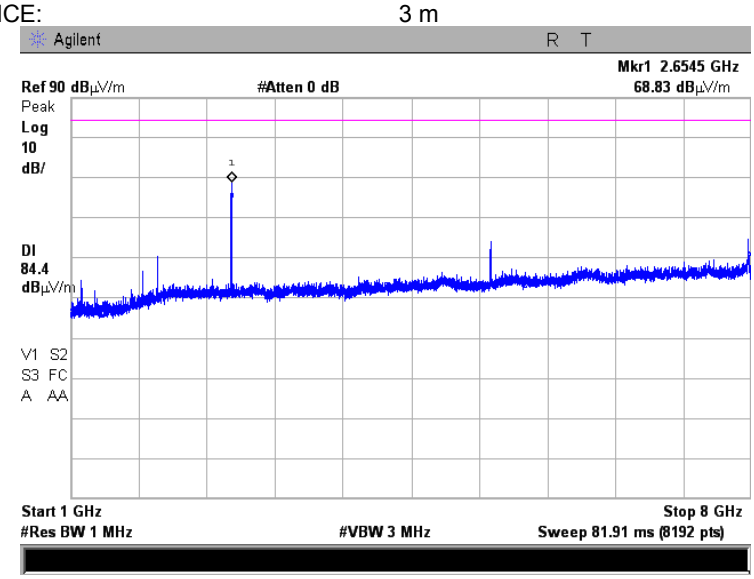
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



NOTE: 2620 MHz - carrier frequency

Plot 7.5.11 Radiated emission measurements in 1000 – 8000 MHz range

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

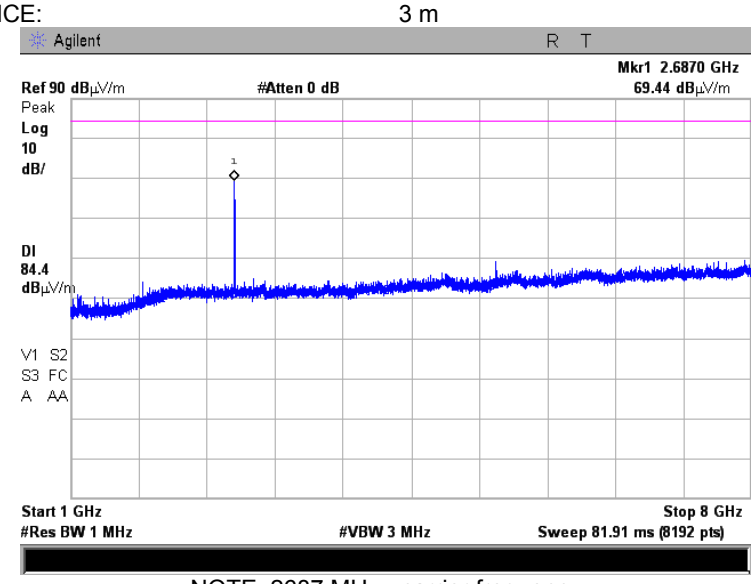


NOTE: 2654 MHz - carrier frequency

Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

Plot 7.5.12 Radiated emission measurements in 1000 – 8000 MHz range

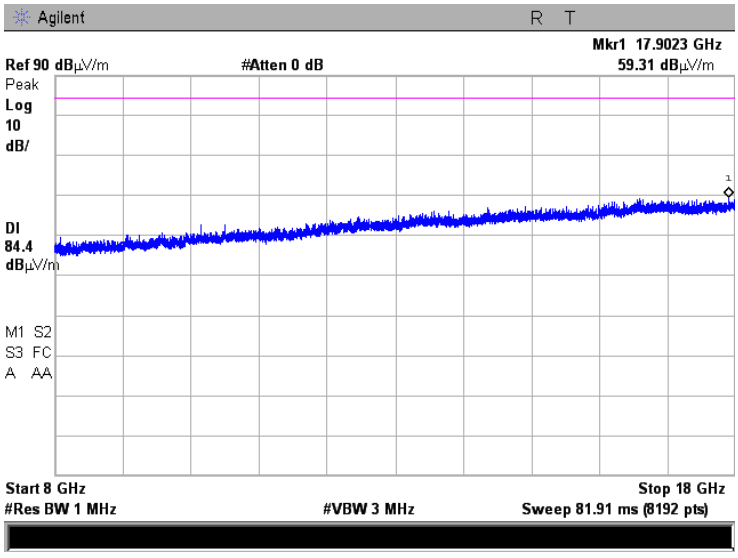
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



NOTE: 2687 MHz - carrier frequency

Plot 7.5.13 Radiated emission measurements in 8000 – 18000 MHz range

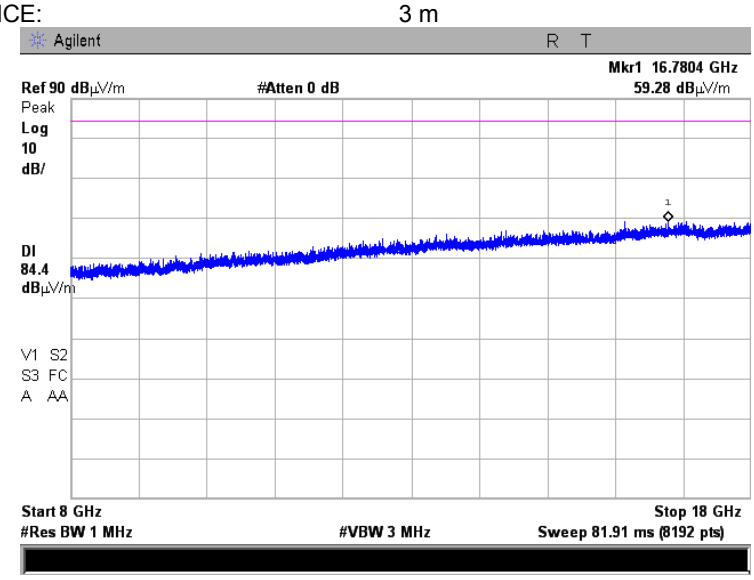
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

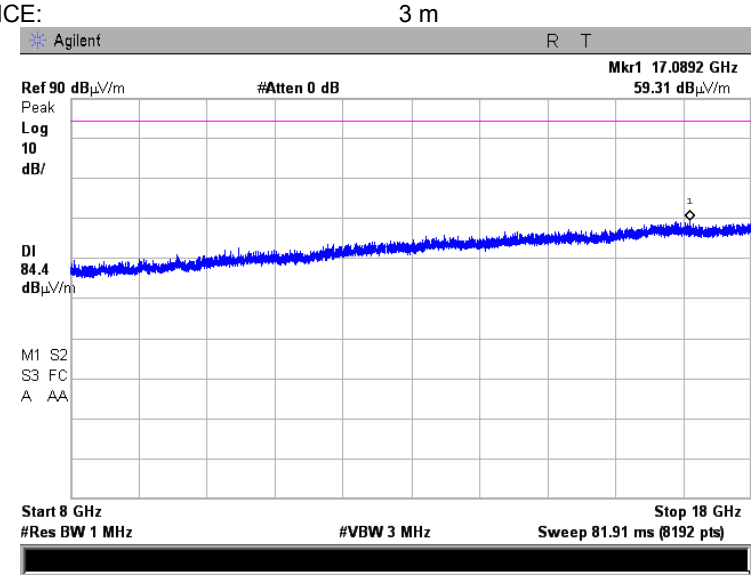
Plot 7.5.14 Radiated emission measurements in 8000 – 18000 MHz range

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



Plot 7.5.15 Radiated emission measurements in 8000 – 18000 MHz range

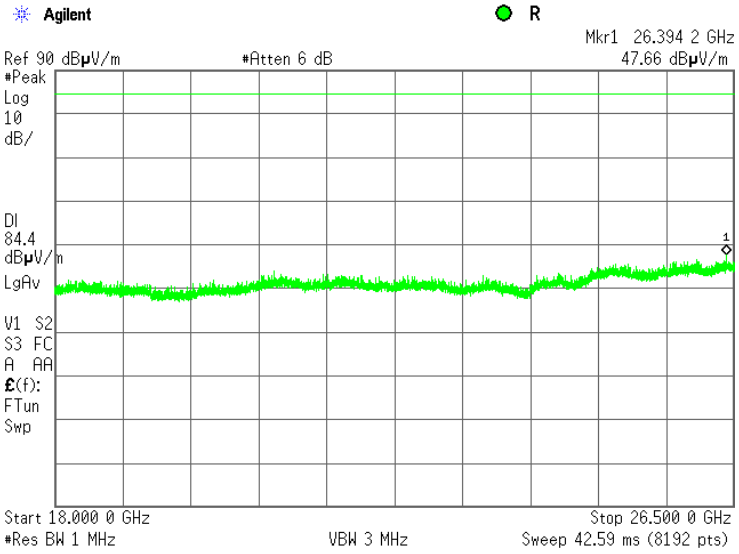
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: High
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

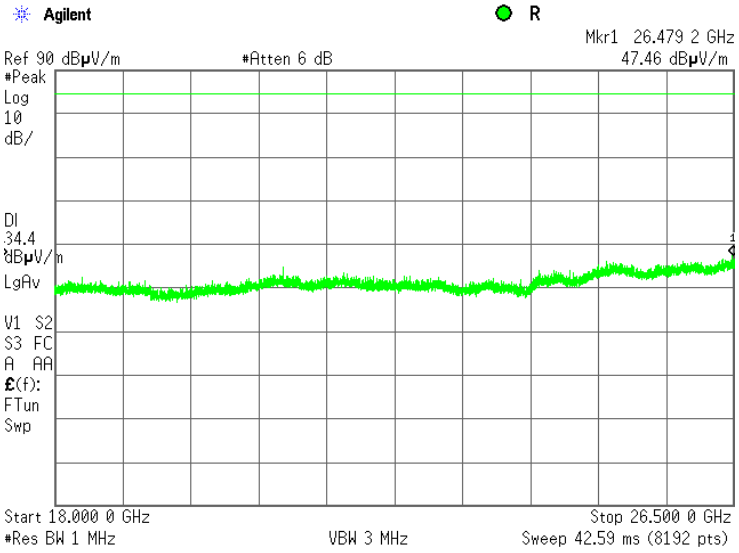
Plot 7.5.16 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.5.17 Radiated emission measurements in 18000 – 26500 MHz range

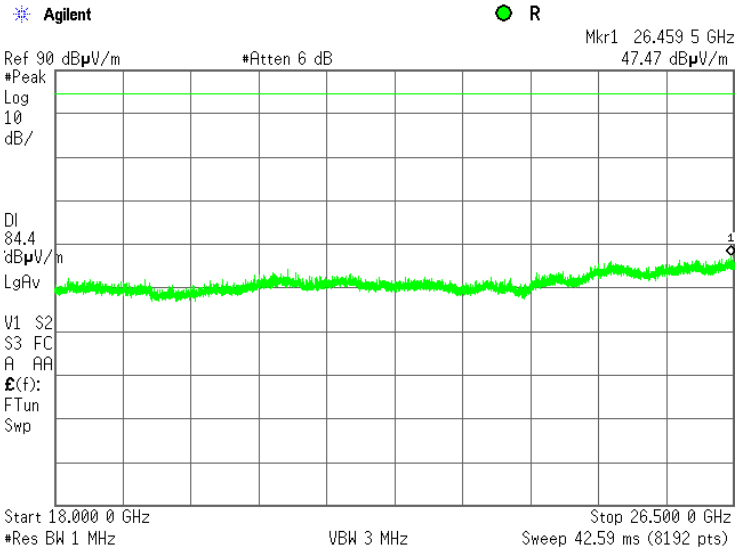
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Mid
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

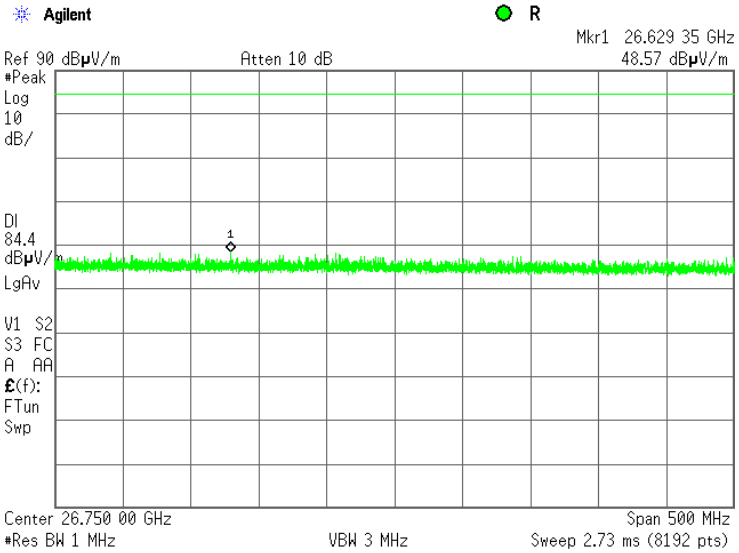
Plot 7.5.18 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.5.19 Radiated emission measurements in 26500 – 27000 MHz range

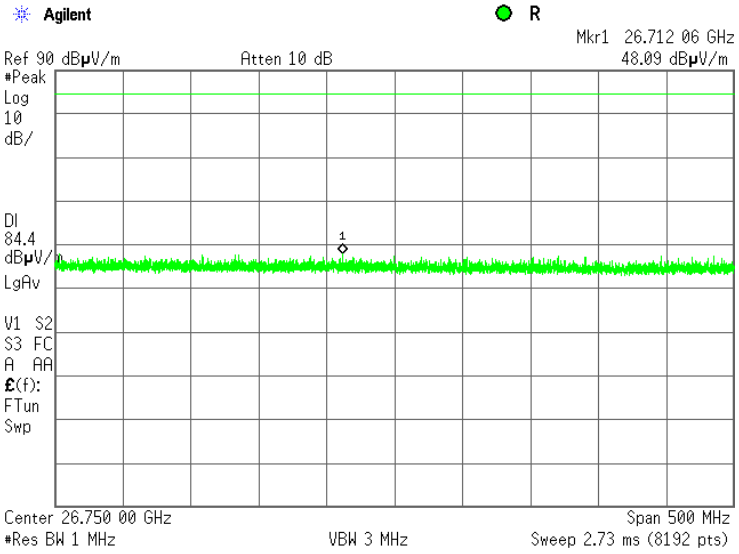
TEST SITE: Semi anechoic chamber
CARRIER FREQUENCY: Low
ANTENNA POLARIZATION: Vertical and Horizontal
TEST DISTANCE: 3 m



Test specification:	Section 27.53(m)(2), Radiated spurious emissions		
Test procedure:	Section 27.53(m)(2)		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/31/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

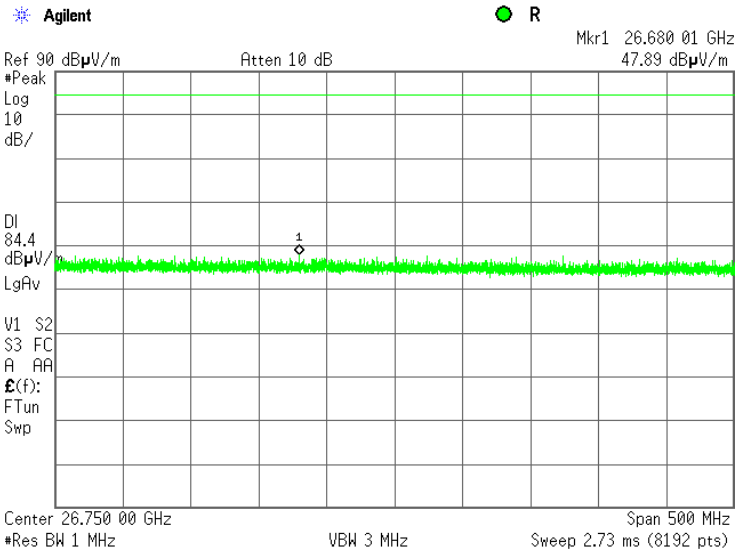
Plot 7.5.20 Radiated emission measurements in 26500 – 27000 MHz range

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



Plot 7.5.21 Radiated emission measurements in 26500 – 27000 MHz range

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



Test specification:	Section 27.54, Frequency stability		
Test procedure:	47 CFR, Section 2.1055		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013 - 8/1/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

7.6 Frequency stability test

7.6.1 General

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

Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Maximum allowed frequency displacement
2620.0 – 2690.0	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

7.6.2 Test procedure

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

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

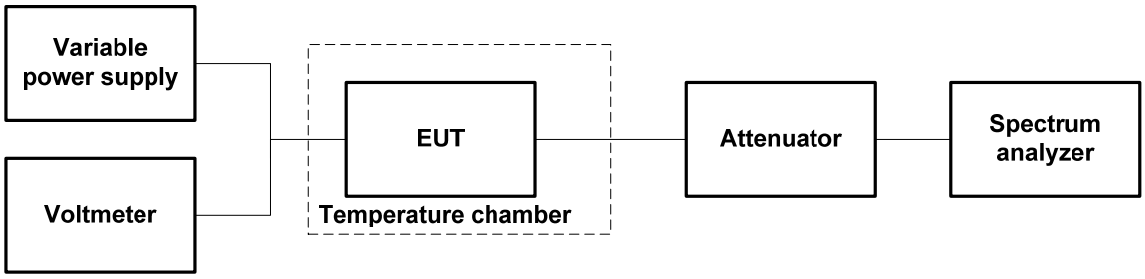
7.6.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.

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

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

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

Figure 7.6.1 Frequency stability test setup



Test specification:	**Section 27.54, Frequency stability**		
Test procedure:	47 CFR, Section 2.1055		
Test mode:	Compliance	**Verdict:**	PASS
Date(s):	7/30/2013 - 8/1/2013		
Temperature: 23.4 ºC	**Air Pressure:** 1005 hPa	**Relative Humidity:** 41 %	**Power Supply:** 48VDC
Remarks:			

Table 7.6.2 Frequency stability test results

ASSIGNED FREQUENCY: 2620.0 – 2690.0 MHz
NOMINAL POWER VOLTAGE: 48 VDC
TEMPERATURE STABILIZATION PERIOD: 20 min
POWER DURING TEMPERATURE TRANSITION: Off
SPECTRUM ANALYZER MODE: Counter
RESOLUTION BANDWIDTH: 3 kHz
VIDEO BANDWIDTH: 9.1 kHz
MODULATION: Unmodulated

T, ºC	Voltage, V	Frequency, MHz							Max frequency drift, Hz	
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative
Low carrier frequency 2625.0 MHz										
-30	nominal	2625.960001	2625.959961	2625.960055	2625.960031	2625.960038	2625.960075	2625.960092	0	-185
-20	nominal	2625.960077	NA	NA	NA	NA	NA	2625.960043	0	-103
-10	nominal	2625.959973	NA	NA	NA	NA	NA	2625.960061	0	-173
0	nominal	2625.960043	2625.960073	2625.960055	2625.960012	2625.960088	2625.960118	2625.960087	0	-134
10	nominal	2625.960150	NA	NA	NA	NA	NA	2625.960063	4	-83
20	15%	2625.960094	NA	NA	NA	NA	NA	2625.960106	0	-52
20	nominal	2625.960064	NA	NA	NA	NA	NA	2625.960146	0	-82
20	-15%	2625.960134	NA	NA	NA	NA	NA	2625.960066	0	-80
30	nominal	2625.960058	2625.960101	2625.960084	2625.960108	2625.960148	2625.960141	2625.960111	2	-88
40	nominal	2625.960020	NA	NA	NA	NA	NA	2625.960120	0	-126
50	nominal	2625.960106	NA	NA	NA	NA	NA	2625.960089	0	-57
Mid carrier frequency 2656.0 MHz										
-30	nominal	2656.959974	2656.960009	2656.960003	2656.960042	2656.960039	2656.960053	2656.960084	28	-82
-20	nominal	2656.960022	NA	NA	NA	NA	NA	2656.960051	0	-34
-10	nominal	2656.960021	NA	NA	NA	NA	NA	2656.960014	0	-42
0	nominal	2656.959988	2656.959935	2656.960025	2656.960029	2656.960021	2656.960018	2656.960001	0	-121
10	nominal	2656.959972	NA	NA	NA	NA	NA	2656.960012	0	-84
20	15%	2656.960011	NA	NA	NA	NA	NA	2656.960066	10	-45
20	nominal	2656.959966	NA	NA	NA	NA	NA	2656.960056	0	-90
20	-15%	2656.960031	NA	NA	NA	NA	NA	2656.960036	0	-25
30	nominal	2656.960041	2656.960061	2656.960071	2656.960086	2656.960101	2656.960089	2656.960131	75	-15
40	nominal	2656.960073	NA	NA	NA	NA	NA	2656.960103	47	0
50	nominal	2656.960116	NA	NA	NA	NA	NA	2656.960046	60	-10
High carrier frequency 2685.0 MHz										
-30	nominal	2685.960018	2685.960073	2685.960018	2685.960086	2685.960058	2685.960075	2685.960094	58	-18
-20	nominal	2685.960016	NA	NA	NA	NA	NA	2685.960068	32	-20
-10	nominal	2685.960014	NA	NA	NA	NA	NA	2685.960034	0	-22
0	nominal	2685.960016	2685.960074	2685.960063	2685.960075	2685.960065	2685.960097	2685.960055	61	-20
10	nominal	2685.960067	NA	NA	NA	NA	NA	2685.960108	72	0
20	15%	2685.960269	NA	NA	NA	NA	NA	2685.960091	233	0
20	nominal	2685.960031	NA	NA	NA	NA	NA	2685.960036	0	-5
20	-15%	2685.960131	NA	NA	NA	NA	NA	2685.960051	95	0
30	nominal	2685.960014	2685.960054	2685.960081	2685.960034	2685.960099	2685.960081	2685.960144	108	-22
40	nominal	2685.960143	NA	NA	NA	NA	NA	2685.960096	107	0
50	nominal	2685.959980	NA	NA	NA	NA	NA	2685.960021	0	-56

* - Reference frequency

Test specification:	Section 27.54, Frequency stability		
Test procedure:	47 CFR, Section 2.1055		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013 - 8/1/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

Table 7.6.3 Maximum frequency displacement

Channel	Maximum frequency displacement			
	ppm		Hz	
	Negative	Positive	Negative	Positive
Low (2625.0 MHz)	-0.49	0.01	185	4
Mid (2656.0 MHz)	-0.32	0.20	-121	73
High (2685.0 MHz)	-0.15	0.61	-56	233

Table 7.6.4 Transmission occupied bandwidth with frequency drift test results

Lower measured* band edge, MHz	Upper measured* band edge, MHz	Lower calculated** band edge, MHz	Upper calculated** band edge, MHz	Lower specified band edge, MHz	Upper specified band edge, MHz	Lower margin***, MHz	Upper margin***, MHz	Verdict
10 MHz BW								
QPSK								
2620.275	2629.675	2620.274815	2629.675004	2620.000000	2632.000000	-0.274815	-2.324996	Pass
2651.275	2660.70	2651.274879	2660.700075	2650.000000	2662.000000	-1.274879	-1.299925	Pass
2680.275	2689.75	2680.274944	2689.750233	2680.000000	2690.000000	-0.274944	-0.249767	Pass
64QAM								
2620.325	2629.70	2620.324815	2629.700004	2620.000000	2632.000000	-0.324815	-2.299996	Pass
2651.350	2660.70	2651.349879	2660.700075	2650.000000	2662.000000	-1.349879	-1.299925	Pass
2680.325	2689.725	2680.324944	2689.725233	2680.000000	2690.000000	-0.324944	-0.274767	Pass
20 MHz BW								
QPSK								
2620.600000	2639.500000	2620.599815	2639.500004	2620.000000	2644.000000	-0.599815	-4.499996	Pass
2646.600000	2665.500000	2646.599879	2665.500075	2644.000000	2668.000000	-2.599879	-2.499925	Pass
2670.600000	2689.400000	2670.599944	2689.400233	2668.000000	2690.000000	-2.599944	-0.599767	Pass
64QAM								
2620.650000	2639.350000	2620.649815	2639.350004	2620.000000	2644.000000	-0.649815	-4.649996	Pass
2646.650000	2665.300000	2646.649879	2665.300075	2644.000000	2668.000000	-2.649879	-2.699925	Pass
2670.650000	2689.300000	2670.649944	2689.300233	2668.000000	2690.000000	-2.649944	-0.699767	Pass

* - Measured under normal test conditions at 26 dBc points
** - Measured band edge with proper drift addition
*** - Margin = Calculated band edge – specified band edge

Reference numbers of test equipment used

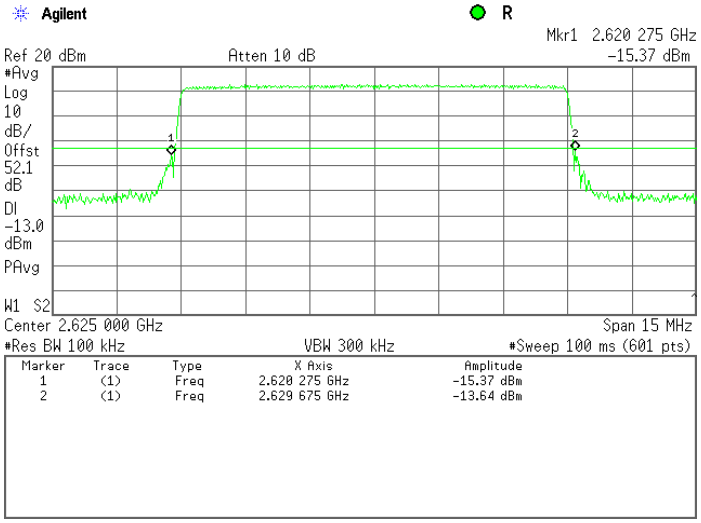
HL 3787	HL 3818	HL 4276					

Full description is given in Appendix A.

Test specification:	Section 27.54, Frequency stability		
Test procedure:	47 CFR, Section 2.1055		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013 - 8/1/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

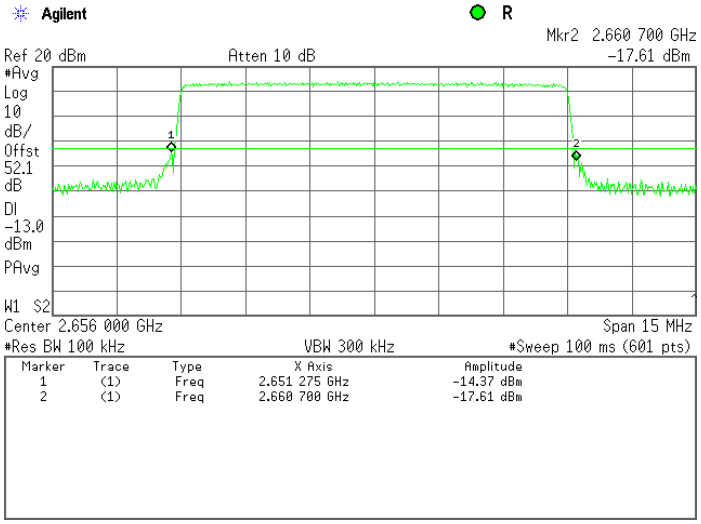
Plot 7.6.1 Emission mask test results at low carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	15.5 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Plot 7.6.2 Emission mask test results at mid carrier frequency, 10 MHz EBW

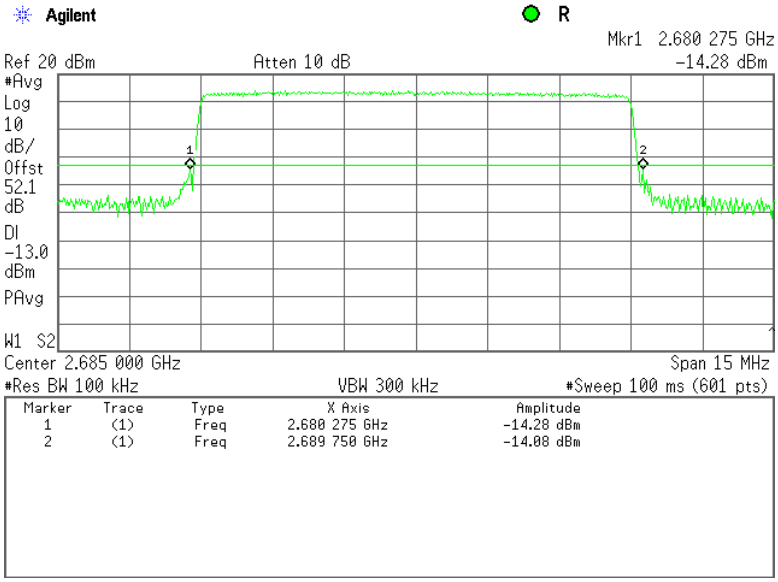
ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	15.5 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



Test specification:	Section 27.54, Frequency stability		
Test procedure:	47 CFR, Section 2.1055		
Test mode:	Compliance	Verdict:	PASS
Date(s):	7/30/2013 - 8/1/2013		
Temperature: 23.4 ºC	Air Pressure: 1005 hPa	Relative Humidity: 41 %	Power Supply: 48VDC
Remarks:			

Plot 7.6.3 Emission mask test results at high carrier frequency, 10 MHz EBW

ASSIGNED FREQUENCY RANGE:	2620.0 – 2690.0 MHz
DETECTOR USED:	Average
MODULATION:	QPSK
MODULATING SIGNAL:	PRBS
BIT RATE:	15.5 Mbps
TRANSMITTER OUTPUT POWER SETTINGS:	Maximum



8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	03-Jul-12	03-Jul-14
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	04-Jun-13	04-Jun-14
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	12-Dec-12	12-Dec-15
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	12-Dec-12	12-Dec-15
2455	Switching Panel for short/open circuit tests according GMW3172	Hermon Laboratories	SP-5	2452	30-Dec-12	30-Dec-13
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155-00	2871	04-Dec-12	04-Dec-13
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY41444762	20-Dec-12	20-Dec-13
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY45101057	19-Dec-12	19-Dec-13
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY45240586	19-Dec-12	19-Dec-13
3345	High Pass Filter, 50 Ohm, 4250 to 10000 MHz	Mini-Circuits	VHF-3800+	NA	30-Dec-12	30-Dec-13
3442	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	07-Mar-13	07-Mar-14
3455	Medium Power Fixed Coaxial Attenuator DC to 40 GHz, 20 dB, 5 W	Aeroflex / Weinschel	75A-20-12	1182	18-Mar-13	18-Mar-14
3787	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	04-Dec-12	04-Dec-13
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	24-Apr-13	24-Apr-14
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1225/2A	06-Feb-13	06-Feb-14
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLEX 102A	1226/2A	06-Feb-13	06-Feb-14
4114	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz	ETS Lindgren	3117	00123515	07-Dec-12	07-Dec-13
4164	DC Power Supply, 60V, 5A	Standig	605D	NA	17-Jan-13	17-Jan-14
4276	Test Cable , DC-18 GHz, 3.05 m, N/M - N/M	Mini-Circuits	APC-10FT-NMNM+	0747A	26-Nov-12	26-Nov-13
4347	Low Loss Armored Test Cable, DC - 18 GHz, 2.0 m, N type-M/N type-M	MegaPhase	NC29-N1N1-79	12025103001	06-Mar-13	06-Mar-14
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
Transmitter tests	
Carrier power conducted at antenna connector	± 1.7 dB
Carrier power radiated (substitution method)	± 4.5 dB
Occupied bandwidth	±8%
Conducted emissions at RF antenna connector	9 kHz to 2.9 GHz: ± 2.6 dB 2.9 GHz to 6.46 GHz: ± 3.5 dB 6.46 GHz to 13.2 GHz: ± 4.3 dB 13.2 GHz to 22.0 GHz: ± 5.0 dB 22.0 GHz to 26.8 GHz: ± 5.5 dB 26.8 GHz to 40.0 GHz: ± 4.8 dB
Spurious emissions radiated 30 MHz – 40 GHz (substitution method)	± 4.5 dB
Frequency error	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Transient frequency behaviour	187 Hz ± 13.9 %
Duty cycle, timing (Tx ON / OFF) and average factor measurements	± 1.0 %

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

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

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

10 APPENDIX C Test facility 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.

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

Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

47CFR part 27: 2012	Private land mobile radio services
47CFR part 1: 2012	Practice and procedure
47CFR part 2: 2012	Frequency allocations and radio treaty matters; general rules and regulations
ANSI C63.2: 1996	American National Standard for Instrumentation-Electromagnetic Noise and Field Strength, 10 kHz to 40 GHz-Specifications.
ANSI C63.4: 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
ANSI/TIA/EIA-603-C:2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

12 APPENDIX E Test equipment correction factors

Antenna factor
Active loop antenna
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 strength in dB(μV/m).

Antenna factor
Standard gain horn antenna
Quinstar Technology
Model QWH
Ser.No.112, HL 0768, 0769, 0770, 0771, 0772

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 waveguide horn antenna
ETS Lindgren, Model 3117, serial number: 00123515, HL 4114

Frequency, MHz	Antenna factor, dB/m		
	Measured	Manufacturer	Deviation
1000	28.0	28.4	-0.4
1500	28.0	27.4	0.6
2000	31.2	30.9	0.3
2500	32.5	33.4	-0.9
3000	32.9	32.6	0.3
3500	32.7	32.8	-0.1
4000	33.1	33.4	-0.3
4500	33.8	33.9	-0.1
5000	33.8	34.1	-0.3
5500	34.4	34.5	-0.1
6000	35.0	35.2	-0.2
6500	35.4	35.5	-0.1
7000	35.7	35.7	0.0
7500	35.9	35.7	0.2
8000	35.8	35.8	0.0
8500	35.9	35.8	0.1
9000	36.3	36.2	0.1
9500	36.6	36.6	0.0
10000	37.1	37.1	0.0
10500	37.6	37.5	0.1
11000	37.9	37.7	0.2
11500	38.5	38.1	0.4
12000	39.2	38.7	0.5
12500	39.0	38.9	0.1
13000	39.1	39.1	0.0
13500	38.9	38.8	0.1
14000	39.0	38.8	0.2
14500	39.6	39.9	-0.3
15000	39.9	39.7	0.2
15500	39.9	40.1	-0.2
16000	40.7	40.8	-0.1
16500	41.3	41.8	-0.5
17000	42.5	42.1	0.4
17500	41.3	41.2	0.1
18000	41.4	40.9	0.5

Antenna factor is to be added to receiver meter reading in dB(μV) to convert to field strength in dB(μV/meter)

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

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

Cable loss
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
Test cable, Mini-Circuits, S/N 0747A, 18 GHz, 3.05 m, N/M - N/M
APC-10FT-NMNM+, HL 4276

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	4500	2.81	9300	4.30	14100	5.59
30	0.19	4600	2.85	9400	4.33	14200	5.61
50	0.25	4700	2.88	9500	4.36	14300	5.63
100	0.36	4800	2.92	9600	4.39	14400	5.66
150	0.44	4900	2.95	9700	4.42	14500	5.68
200	0.52	5000	3.00	9800	4.46	14600	5.70
300	0.64	5100	3.03	9900	4.49	14700	5.72
400	0.75	5200	3.08	10000	4.53	14800	5.75
500	0.84	5300	3.11	10100	4.56	14900	5.77
600	0.93	5400	3.13	10200	4.60	15000	5.80
700	1.01	5500	3.16	10300	4.64	15100	5.82
800	1.08	5600	3.20	10400	4.66	15200	5.85
900	1.15	5700	3.22	10500	4.68	15300	5.88
1000	1.22	5800	3.26	10600	4.70	15400	5.91
1100	1.28	5900	3.30	10700	4.73	15500	5.93
1200	1.34	6000	3.34	10800	4.75	15600	5.97
1300	1.40	6100	3.39	10900	4.77	15700	5.99
1400	1.46	6200	3.42	11000	4.80	15800	6.02
1500	1.51	6300	3.47	11100	4.83	15900	6.07
1600	1.57	6400	3.50	11200	4.86	16000	6.08
1700	1.62	6500	3.52	11300	4.88	16100	6.11
1800	1.68	6600	3.55	11400	4.90	16200	6.12
1900	1.72	6700	3.58	11500	4.92	16300	6.14
2000	1.77	6800	3.60	11600	4.94	16400	6.17
2100	1.82	6900	3.62	11700	4.96	16500	6.19
2200	1.87	7000	3.64	11800	4.98	16600	6.21
2300	1.92	7100	3.66	11900	5.01	16700	6.22
2400	1.96	7200	3.68	12000	5.03	16800	6.24
2500	2.01	7300	3.71	12100	5.06	16900	6.26
2600	2.05	7400	3.74	12200	5.09	17000	6.28
2700	2.10	7500	3.78	12300	5.12	17100	6.31
2800	2.14	7600	3.81	12400	5.15	17200	6.33
2900	2.18	7700	3.84	12500	5.17	17300	6.36
3000	2.23	7800	3.87	12600	5.20	17400	6.39
3100	2.27	7900	3.90	12700	5.22	17500	6.42
3200	2.31	8000	3.93	12800	5.25	17600	6.45
3300	2.35	8100	3.96	12900	5.28	17700	6.48
3400	2.39	8200	4.00	13000	5.32	17800	6.50
3500	2.42	8300	4.03	13100	5.35	17900	6.52
3600	2.46	8400	4.06	13200	5.38	18000	6.55
3700	2.50	8500	4.08	13300	5.40		
3800	2.54	8600	4.11	13400	5.42		
3900	2.58	8700	4.13	13500	5.44		
4000	2.61	8800	4.16	13600	5.46		
4100	2.65	8900	4.18	13700	5.48		
4200	2.69	9000	4.21	13800	5.51		
4300	2.73	9100	4.24	13900	5.53		
4400	2.77	9200	4.27	14000	5.56		

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 6.2 m, N type-M/N type-M,
NC29-N1N1-79 S/N 12025103 001,
HL 4347

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.08	9000	0.92
100	0.11	9500	1.00
300	0.18	10000	1.05
500	0.23	10500	1.04
1000	0.32	11000	1.05
1500	0.39	11500	1.09
2000	0.45	12000	1.13
2500	0.50	12500	1.15
3000	0.54	13000	1.19
3500	0.59	13500	1.19
4000	0.62	14000	1.22
4500	0.65	14500	1.26
5000	0.69	15000	1.32
5500	0.71	15500	1.38
6000	0.77	16000	1.34
6500	0.82	16500	1.36
7000	0.84	17000	1.46
7500	0.85	17500	1.49
8000	0.88	18000	1.46
8500	0.90		

13 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
AM	amplitude modulation
AVRG	average (detector)
BB	broad band
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dB(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
QP	quasi-peak
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt

END OF DOCUMENT