

TEST REPORT

ACCORDING TO: FCC CFR 47 PART 24 subpart E

FOR:

Airspan Networks Inc.

LTE Base Station

Model: Synergy 2000, 1.9 GHz (B2, B25)

FCC ID:PIDSYN1900

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1 Applicant information

Client name: Airspan Networks Inc.
Address: 777 Yamato Rd, Suite 310, Boca Raton 33431, Florida, USA
Telephone: +1 561 893 8670
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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, 1.9 GHz (B2, B25)
Serial number: 74DFF6CC5318
Hardware version: D7
Software release: 13.152
Receipt date 09-Aug-15

3 Manufacturer information

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

4 Test details

Project ID: 27362
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 09-Aug-15
Test completed: 11-Aug-15
Test specification(s): FCC 47CFR part 24 subpart E

5 Tests summary

Test	Status
Transmitter characteristics	
Section 24.232, RF power output	Pass
Section 2.1091, RF exposure	Pass
Section 24.238(b), Occupied bandwidth	Pass
Section 24.238, Spurious emissions at antenna terminal	Pass
Section 24.238, Band edge emissions at antenna terminal	Pass
Section 24.238, Radiated spurious emissions	Pass
Section 24.235, Frequency stability	Pass

The product was approved by FCC under FCC ID:PIDSYN1900 for operation in 1935 – 1985 MHz band with 10 MHz and 20 MHz channel bandwidth. The relevant tests to support the 5 MHz channel bandwidth in 1932.5 – 1987.5 MHz band were performed to support Application for Class II permissive changes certification.

The bandwidth change was implemented by software, no hardware changes were made.

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 9, 2015	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	September 6, 2015	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	October 11, 2015	

6 EUT description

6.1 General information

A Base station radio, Synergy 2000 - Band 2&25 TDD LTE, is a part of 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 17 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	ETH port	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 maintenance only

6.3 Support and test equipment

Description	Manufacturer	Model number	Serial number
DC power supply	Mean Well	PSP-600-48	RB29063683
GPS antenna	Tallysman Wireless	32-3030-0	20110606
Laptop	DELL	E6410	PO1038624
4 Port USB to RS-232 hub	ATEN INTERNATIONAL	UC2324	Z3CA2180AB40199

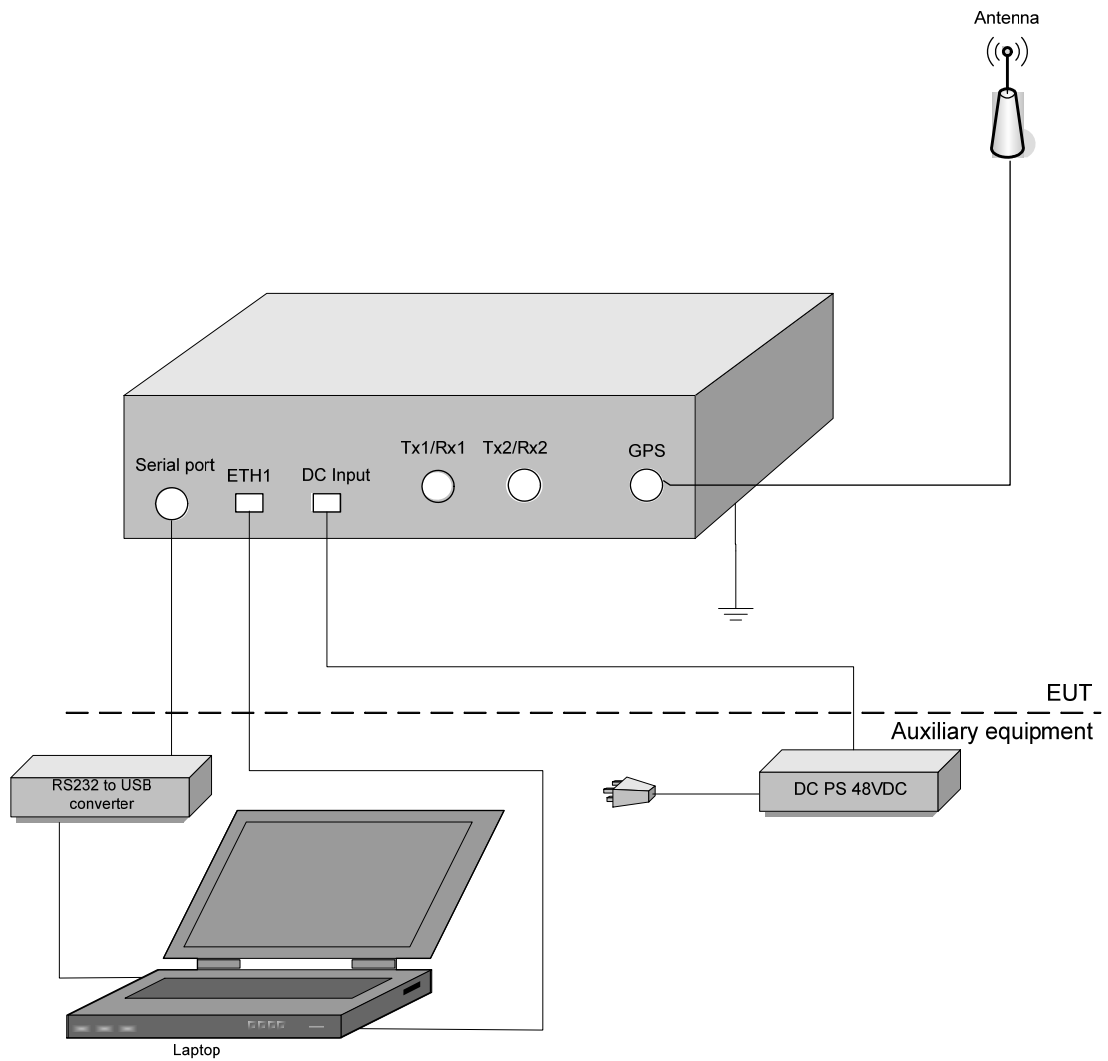
6.4 Operating frequencies

Source	Frequency, MHz
Tx	1930-1990
Rx	1850-1915

6.5 Changes made in the EUT

No changes were implemented in the EUT during testing.

6.6 Test configuration



6.7 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		1930.0 – 1990.0 MHz			
Operating frequency range		1932.5 – 1987.5 MHz			
RF channel spacing		5 MHz			
Maximum rated output power		At transmitter 50 Ω RF output connector (aggregate power of both RF chains)		33.42 dBm	
Is transmitter output power variable?		No			
		V	Yes	continuous variable	
				V stepped variable with stepsize	0.25 dB
				minimum RF power	0 dBm
				maximum RF power	33.42 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 Sector antenna	Alpha Wireless	AW3083	17.0 dBi		
External Sector antenna	Alpha Wireless	AW3314	16.0 dBi		
Transmitter aggregate data rate/s, Mbps					
Transmitter 99% power bandwidth		Type of modulation			
5 MHz		QPSK	16QAM	64QAM	
		7	15	37	
Type of multiplexing		OFDMA/TDD			
Modulating test signal (baseband)		PRBS			
Maximum transmitter duty cycle in normal use		100 %			
Transmitter power source					
V	DC	Nominal rated voltage	48 VDC		
Common power source for transmitter and receiver			V	yes no	

Test specification:		Section 24.232, RF power output	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 24 requirements

7.1 RF power output

7.1.1 General

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

Table 7.1.1 RF power output limits

Assigned frequency range, MHz	Maximum peak power spectral density, EIRP	
	W	dBm
1930 - 1990	1640 Watts/MHz	62 dBm/MHz

7.1.2 Test procedure

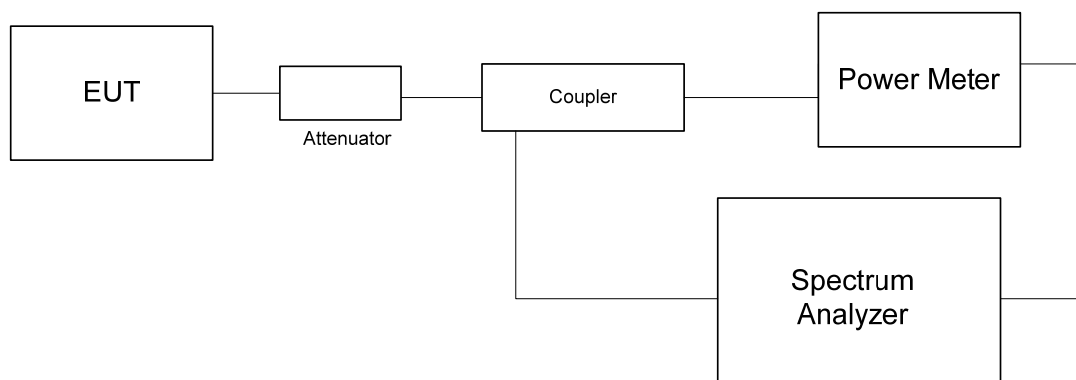
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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

7.1.2.3 The peak output power was measured with spectrum analyzer as provided in Table 7.1.2 and associated plots.

7.1.2.4 The peak-to-average ratio was measured with power meter as provided in Table 7.1.3 and associated plots.

Figure 7.1.1 RF power output test setup





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Test specification:	Section 24.232, RF power output		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date(s):	09-Aug-15		
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.2 RF power output test results

OPERATING FREQUENCY RANGE: 1930 - 1990MHz
 DETECTOR USED: Average (RMS)
 RESOLUTION BANDWIDTH: 1 MHz
 VIDEO BANDWIDTH: 3 MHz
 MODULATION: QPSK / 64QAM
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 EBW: 5 MHz

Carrier frequency, MHz	Modulation	Pmeas (RF#1), dBm/MHz	Pmeas (RF#2), dBm/MHz	P _{meas} *, dBm/MHz	Antenna gain, dBi	EIRP total**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
1932.5	QPSK	23.77	22.33	26.12	17.0	43.12	62.0	-18.88	Pass
1962.5	QPSK	23.43	22.65	26.07	17.0	43.07	62.0	-18.93	Pass
1987.5	QPSK	24.04	22.15	26.21	17.0	43.21	62.0	-18.79	Pass
1932.5	64QAM	24.11	22.41	26.35	17.0	43.37	62.0	-18.63	Pass
1962.5	64QAM	23.92	22.83	26.42	17.0	43.42	62.0	-18.58	Pass
1987.5	64QAM	24.07	22.35	26.30	17.0	43.32	62.0	-18.68	Pass

* - $P_{meas}, dBm = 10 \log(10^{((P(dBm/MHz, RF\#1)/10)} + 10^{((P(dBm/MHz, RF\#2)/10)})$

** - $EIRP \text{ total, dBm/MHz} = P_{meas}, dBm/MHz + \text{Antenna Gain, dBi}$

Peak output power, dBm = Peak output power, dBm/MHz + 10log(BW occupied / BW receiver)

Max RF power is 26.42 dBm/MHz + 10 log (5 MHz/1 MHz) = 26.42 dBm/MHz + 7 dB = **33.42 dBm**

Table 7.1.3 Peak to Average ratio test results

EBW	Frequency	PAR in RF Chain 1, dB		Limit, dB	Verdict
		QPSK	64QAM		
5 MHz	Low	7.44	7.41	13	Pass
	Mid	7.39	7.47		
	High	7.41	7.15		

Reference numbers of test equipment used

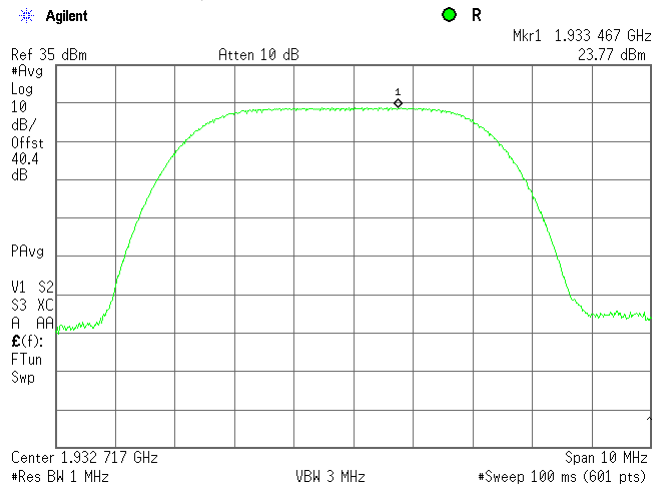
HL 2909	HL 3301	HL 3302	HL 3390	HL 3770	HL 4273	HL 4366	
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Full description is given in Appendix A.

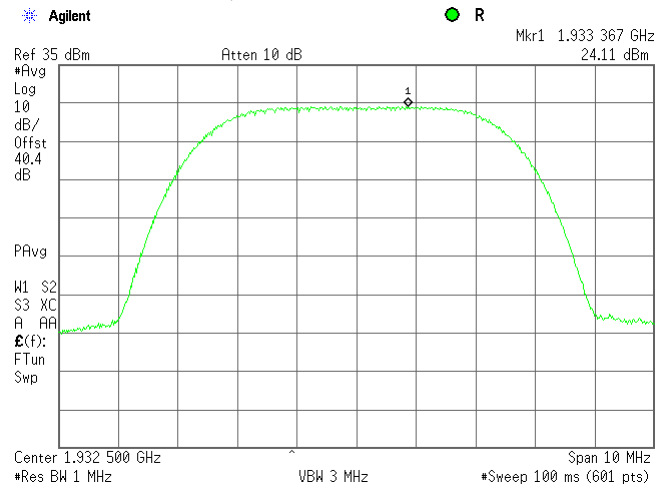
Test specification:		Section 24.232, RF power output	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.1.1 RF power output test results at low frequency, RF Chain1

CHANNEL SPACING:
MODULATION: QPSK

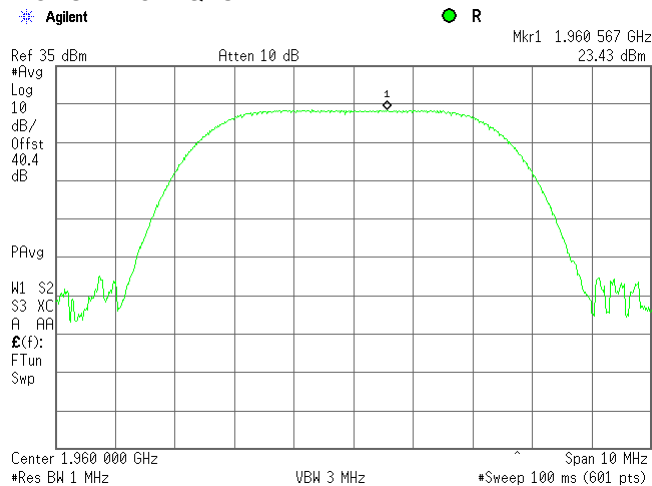


5 MHz
MODULATION: 64QAM

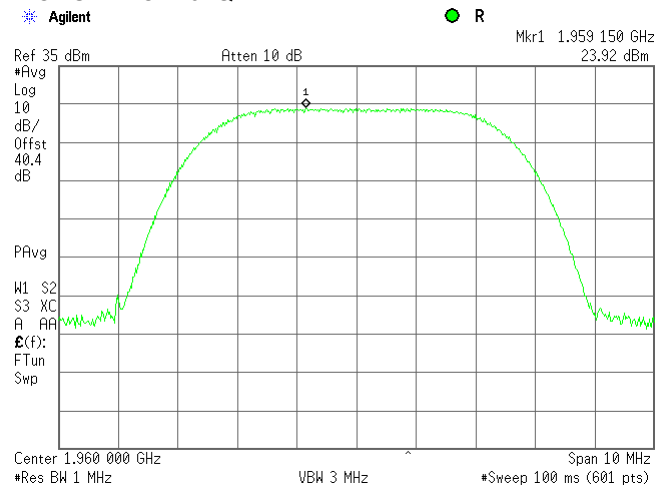


Plot 7.1.2 RF power output test results at mid frequency, RF Chain1

CHANNEL SPACING:
MODULATION: QPSK



5 MHz
MODULATION: 64QAM



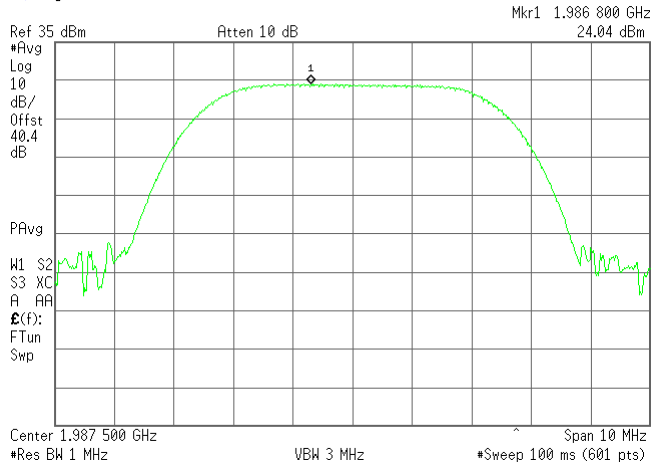
Test specification:		Section 24.232, RF power output	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.1.3 RF power output test results at high frequency, RF Chain1

CHANNEL SPACING:
MODULATION: QPSK

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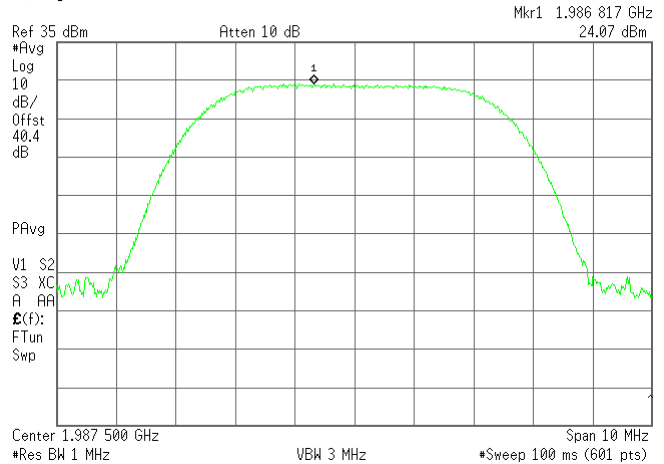
R



5 MHz
MODULATION: 64QAM

Agilent

R

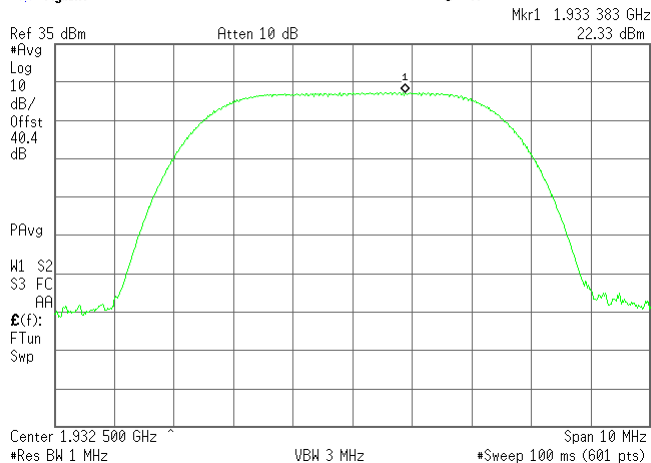


Plot 7.1.4 RF power output test results at low frequency, RF Chain2

CHANNEL SPACING:
MODULATION: QPSK

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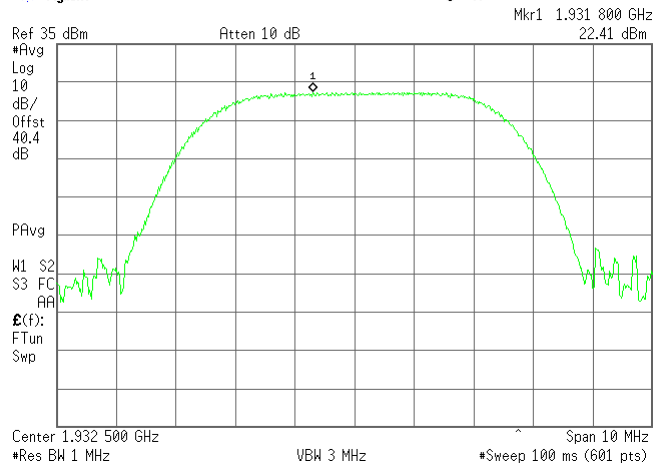
R



5 MHz
MODULATION: 64QAM

Agilent

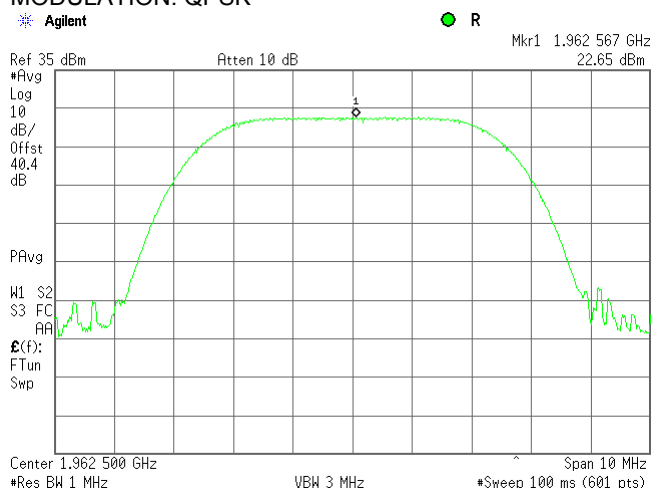
R



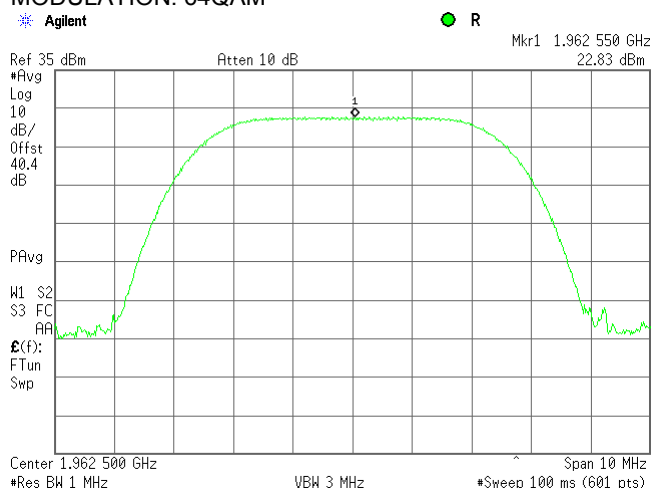
Test specification:		Section 24.232, RF power output	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.1.5 RF power output test results at mid frequency, RF Chain2

CHANNEL SPACING:
MODULATION: QPSK

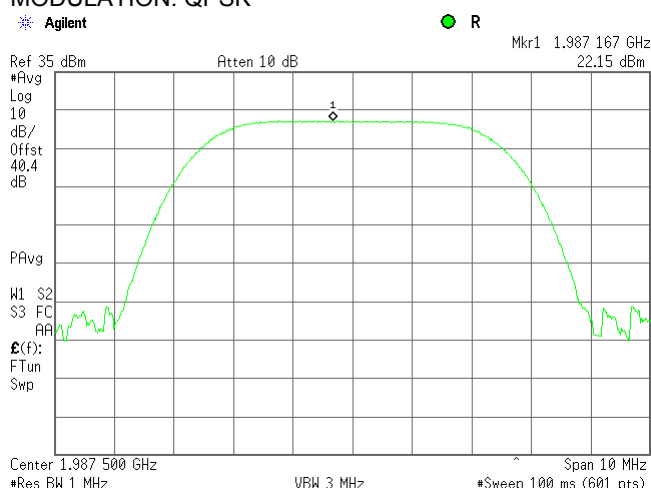


5 MHz
MODULATION: 64QAM

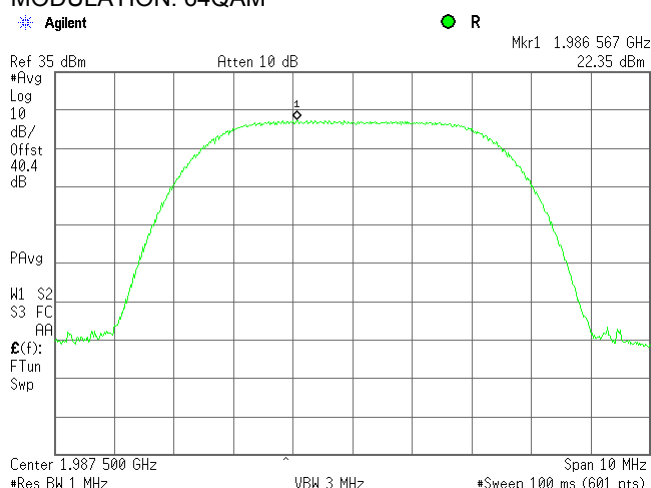


Plot 7.1.6 RF power output test results at high frequency, RF Chain2

CHANNEL SPACING:
MODULATION: QPSK



5 MHz
MODULATION: 64QAM

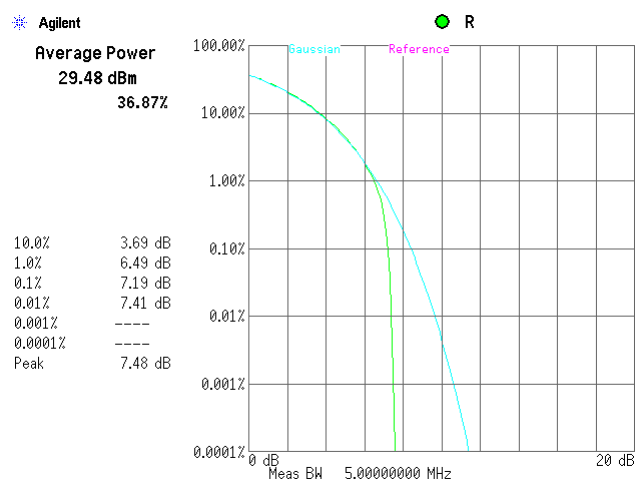
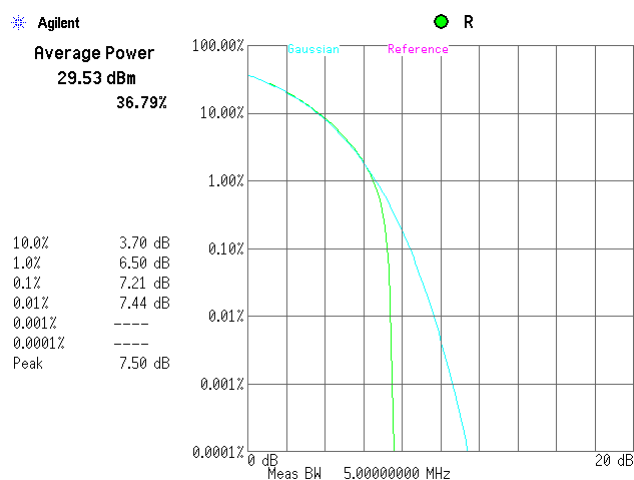


Test specification:		Section 24.232, RF power output	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.1.7 PAR test results at low frequency, RF Chain1

CHANNEL SPACING:
MODULATION: QPSK

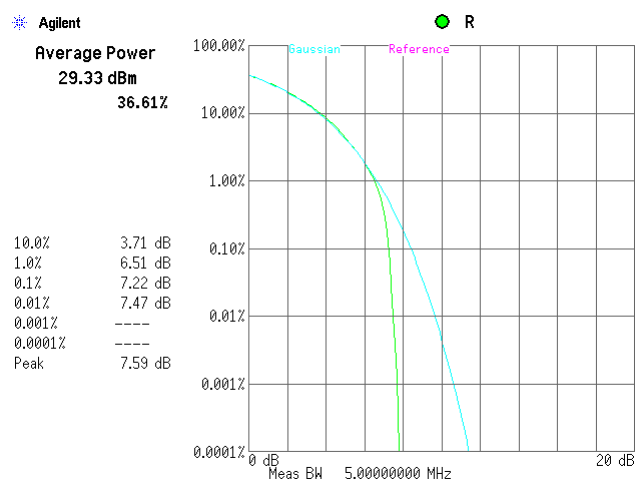
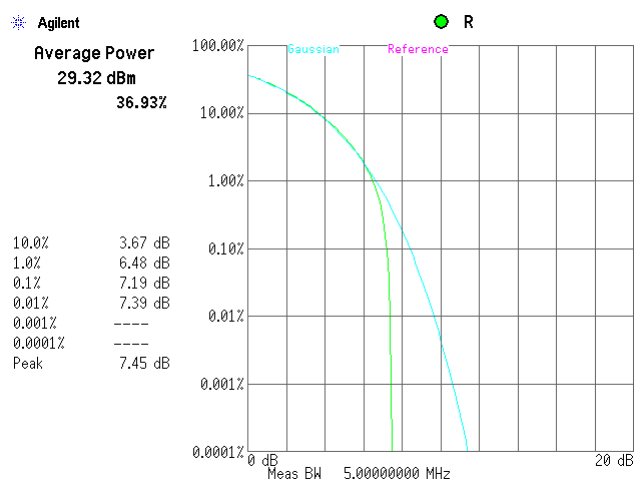
5 MHz
MODULATION: 64QAM



Plot 7.1.8 PAR test results at mid frequency, RF Chain1

CHANNEL SPACING:
MODULATION: QPSK

5 MHz
MODULATION: 64QAM

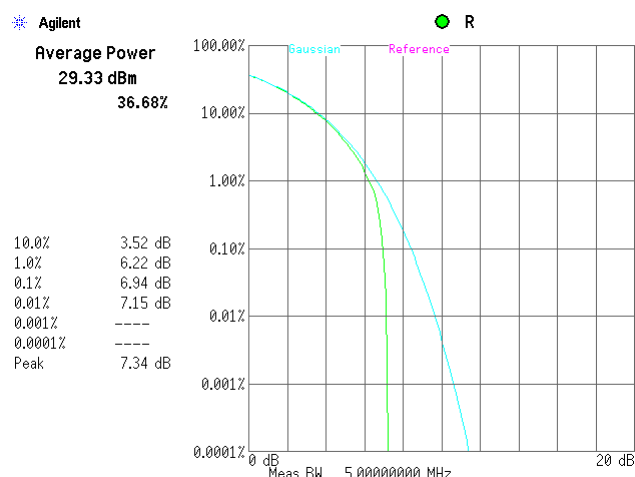
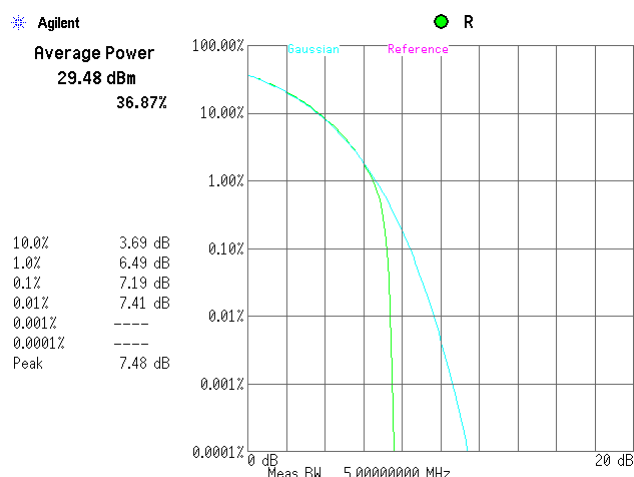


Test specification:		Section 24.232, RF power output	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-A, Section 2.2.1	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.1.9 PAR test results at high frequency ,RF Chain1

CHANNEL SPACING:
MODULATION: QPSK

5 MHz
MODULATION: 64QAM



Test specification:		Section 24.238(b), Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

7.2 Occupied bandwidth test

7.2.1 General

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

Table 7.2.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc
1930 - 1990	26

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

7.2.2 Test procedure

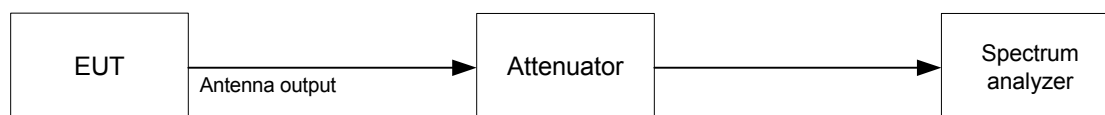
7.2.2.1 The EUT was set up as shown in Figure 7.2.1, energized and its proper operation was checked.

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

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

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

Figure 7.2.1 Occupied bandwidth test setup





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Report ID: AIRRAD_FCC.27362.docx

Date of Issue: 6-Sep-15

Test specification:		Section 24.238(b), Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Aug-15		
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.2 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: 5 MHz

Carrier frequency, MHz	Occupied bandwidth, kHz	Limit, kHz	Margin, kHz	Verdict
QPSK 7 Mbps				
1932.5	4.913	NA	NA	Pass
1962.5	4.960	NA	NA	Pass
1987.5	4.921	NA	NA	Pass
64QAM 37 Mbps				
1932.5	4.829	NA	NA	Pass
1962.5	4.885	NA	NA	Pass
1987.5	4.823	NA	NA	Pass

Reference numbers of test equipment used

HL 3301	HL 3302	HL 3818	HL 3901	HL 4068		
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Full description is given in Appendix A.

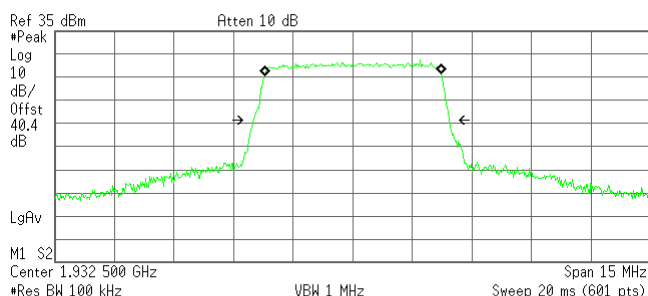
Test specification:		Section 24.238(b), Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.1 Occupied bandwidth test result at low frequency

CHANNEL SPACING:
MODULATION: QPSK

Agilent

R



Occupied Bandwidth
4.4277 MHz

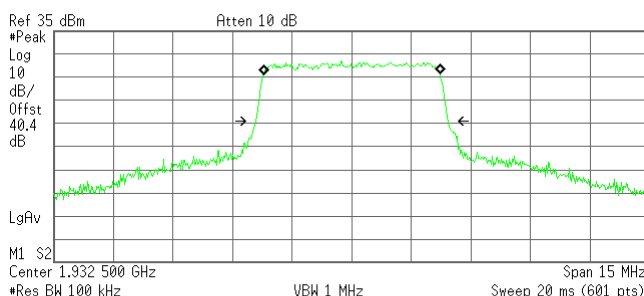
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 6.109 kHz
x dB Bandwidth 4.913 MHz

5 MHz
MODULATION: 64 QAM

Agilent

R



Occupied Bandwidth
4.4251 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

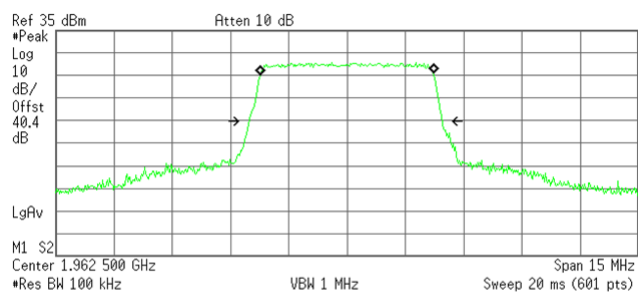
Transmit Freq Error 2.229 kHz
x dB Bandwidth 4.829 MHz

Plot 7.2.2 Occupied bandwidth test result at mid frequency

CHANNEL SPACING:
MODULATION: QPSK

Agilent

R



Occupied Bandwidth
4.4394 MHz

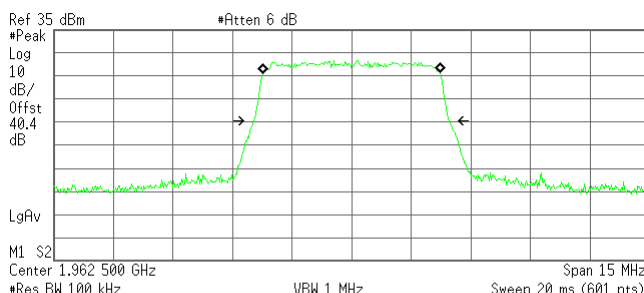
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -2.866 kHz
x dB Bandwidth 4.960 MHz

5 MHz
MODULATION: 64 QAM

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R



Occupied Bandwidth
4.4447 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error -457.351 Hz
x dB Bandwidth 4.885 MHz

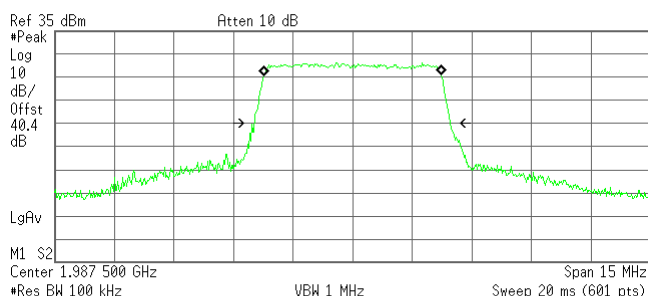
Test specification:		Section 24.238(b), Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.3 Occupied bandwidth test result at high frequency

CHANNEL SPACING:
MODULATION: QPSK

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R



Occupied Bandwidth
4.4472 MHz

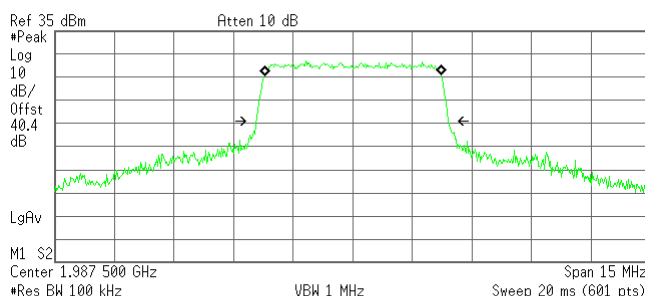
Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 187.111 Hz
Occupied Bandwidth 4.921 MHz

5 MHz
MODULATION: 64 QAM

Agilent

R



Occupied Bandwidth
4.4259 MHz

Occ BW % Pwr 99.00 %
x dB -26.00 dB

Transmit Freq Error 711.419 Hz
x dB Bandwidth 4.823 MHz

Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date(s):	10-Aug-15		
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

7.3 Spurious emissions at antenna terminal test

7.3.1 General

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

Table 7.3.1 Spurious emission limits

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

7.3.2 Test procedure

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

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

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

Figure 7.3.1 Spurious emission test setup





Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

Table 7.3.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 1930-1990 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009-19900 MHz
 VIDEO BANDWIDTH: $\geq$ Resolution bandwidth
 MODULATION: 64 QAM*
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 EBW: 5 MHz
 NUMBER OF RF OUTPUTS: N = 2
 TESTED RF CHAIN: #2

Frequency, MHz	SA reading, dBm	Attenuation, dB	Detector Used	RBW, kHz	Spurious emission, dBm**	Limit, dBm	Margin, dB***	Verdict
Low carrier frequency								
1926.784	-20.59	included	RMS	1000	-17.59	-13.0	-4.59	Pass
1938.279	-19.34	included	RMS	1000	-16.34	-13.0	-3.34	Pass
Mid carrier frequency								
1956.330	-17.49	included	RMS	1000	-14.49	-13.0	-1.49	Pass
1960.724	-17.31	included	RMS	1000	-14.31	-13.0	-1.31	Pass
High carrier frequency								
1981.539	-18.91	included	RMS	1000	-15.91	-13.0	-2.91	Pass
1993.067	-18.00	included	RMS	1000	-15.00	-13.0	-2.00	Pass

* - Tested at the worst case according to Max Power Density test.

** - Spurious emission result = SA reading + 10log(N)

*** - Margin = Limit – Spurious emission result

Reference numbers of test equipment used

HL 3787	HL 3901	HL 3818	HL 4068			
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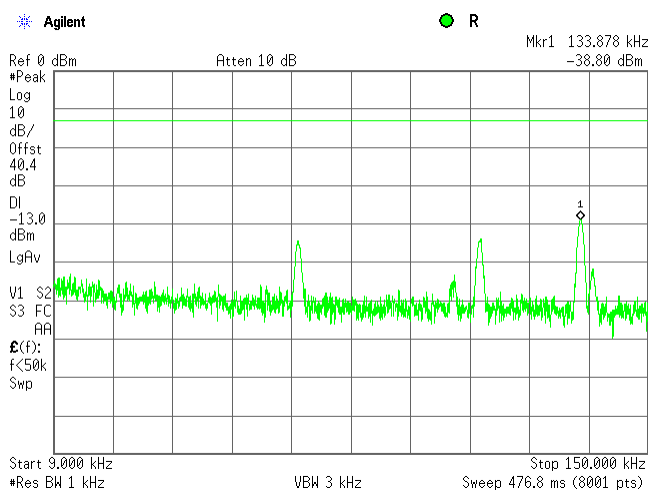
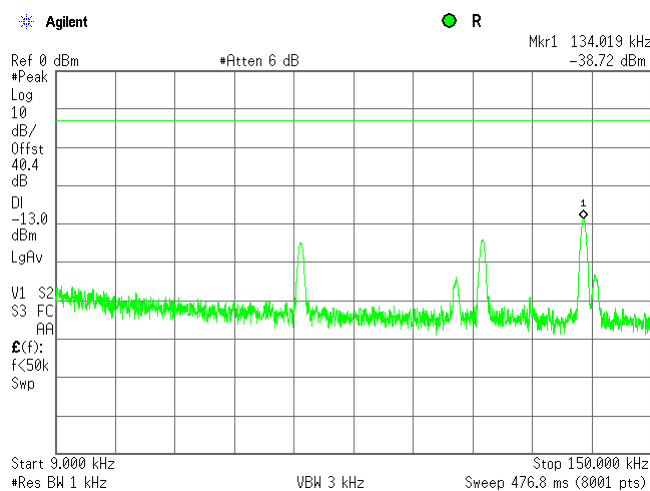
Full description is given in Appendix A.

Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

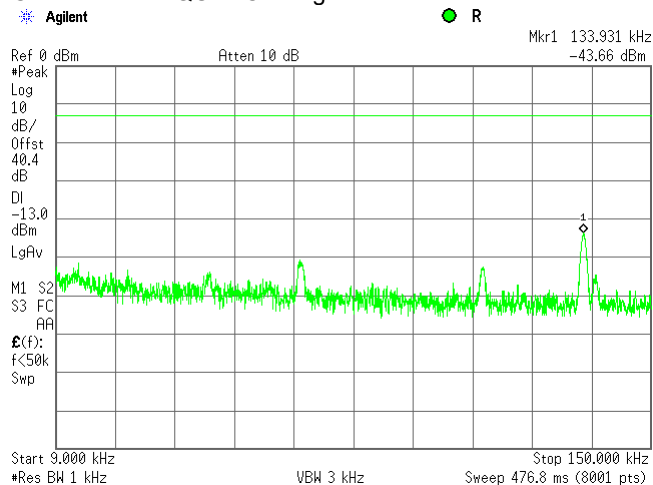
Plot 7.3.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency

MODULATION:
TESTED RF CHAIN:
CARRIER FREQUENCY: Low

64 QAM
#2
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

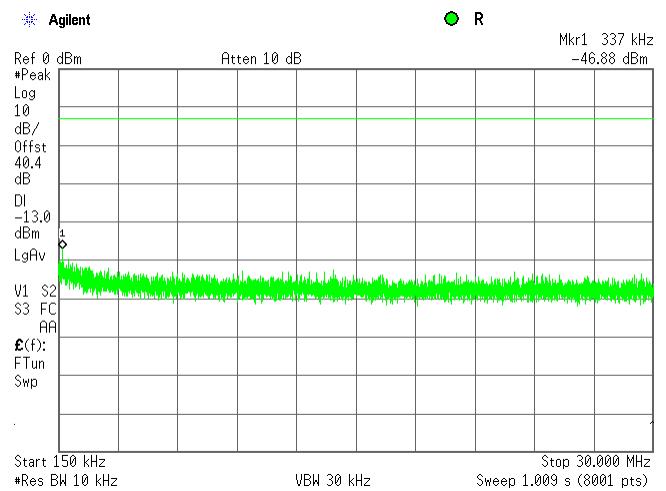
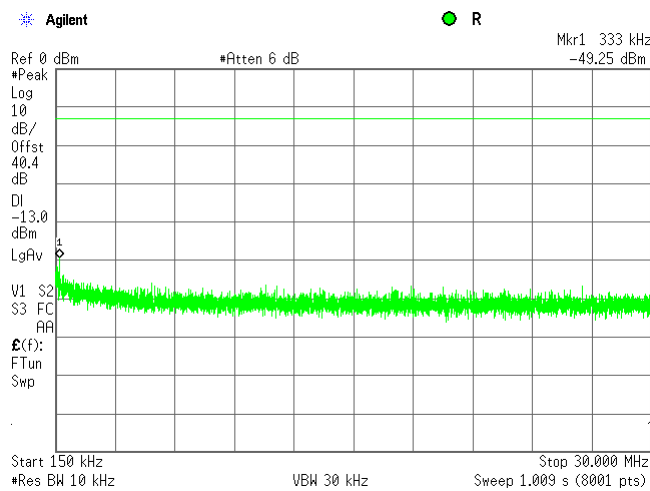


Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

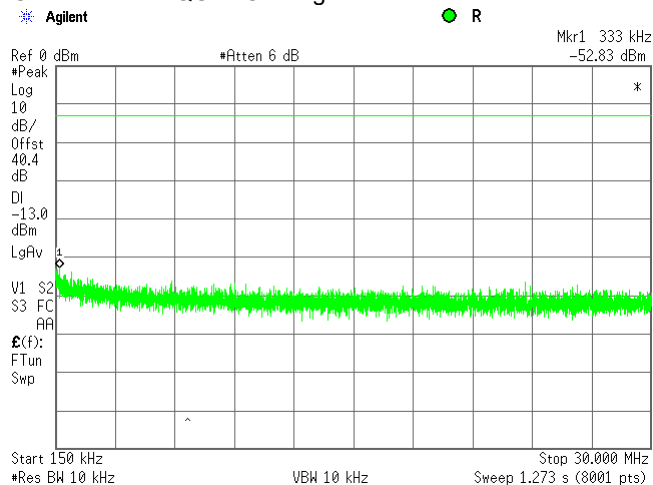
Plot 7.3.2 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency

MODULATION:
TESTED RF CHAIN:
CARRIER FREQUENCY: Low

64 QAM
#2
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

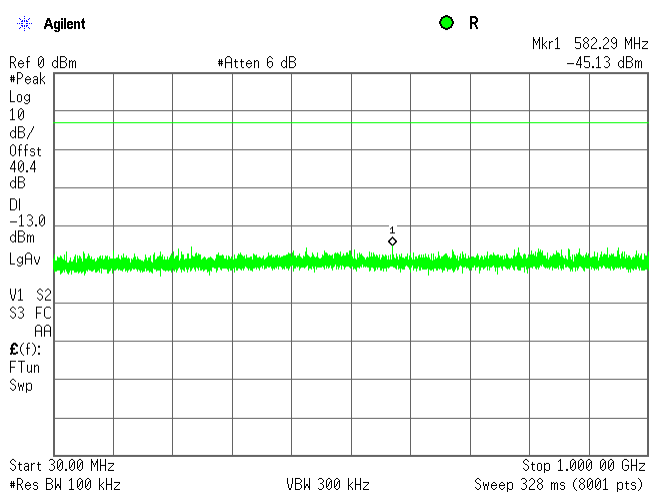
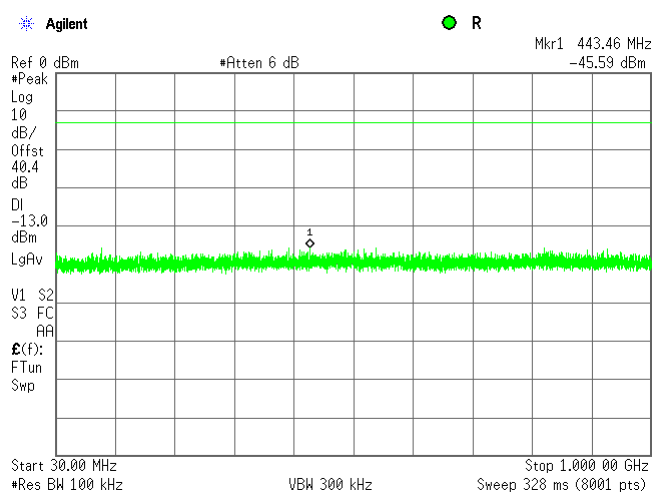


Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

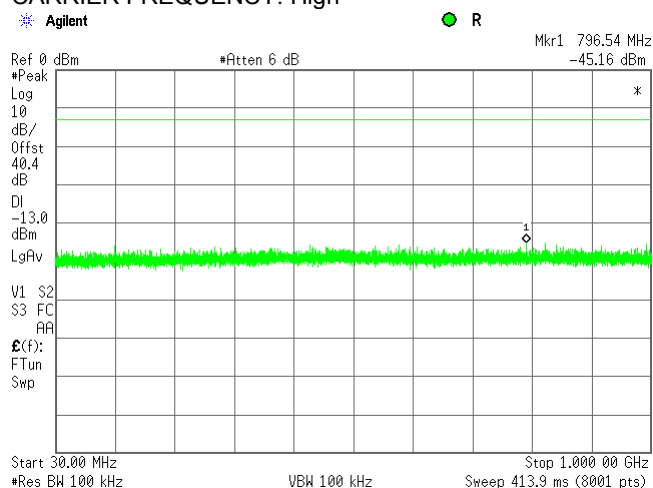
Plot 7.3.3 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency

MODULATION:
TESTED RF CHAIN:
CARRIER FREQUENCY: Low

64 QAM
#2
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

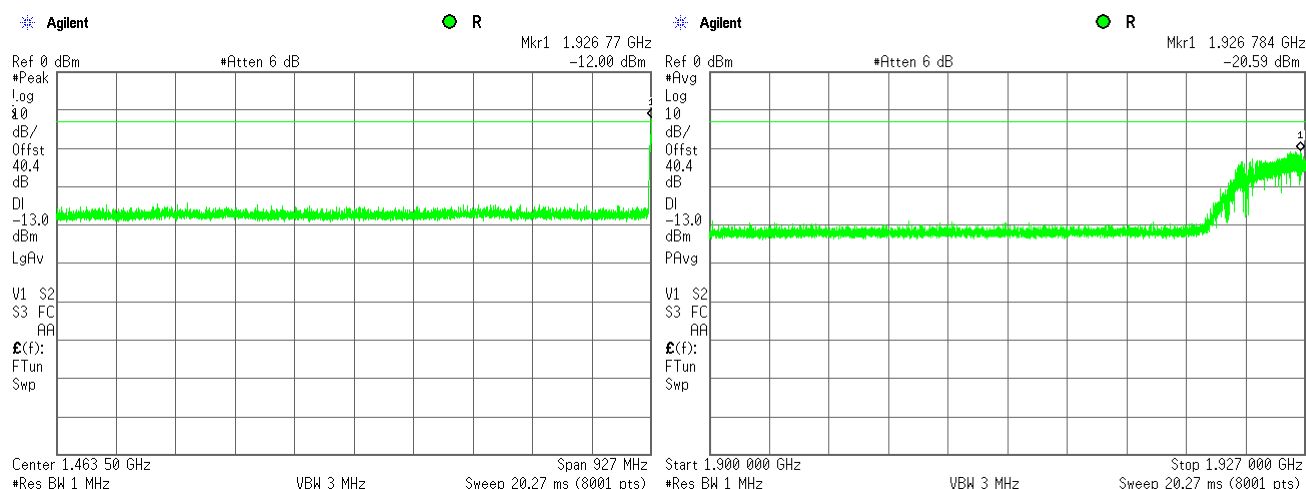


Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.4 Spurious emission measurements in 1000 – 1927 MHz range at low carrier frequency

MODULATION:
TESTED RF CHAIN:

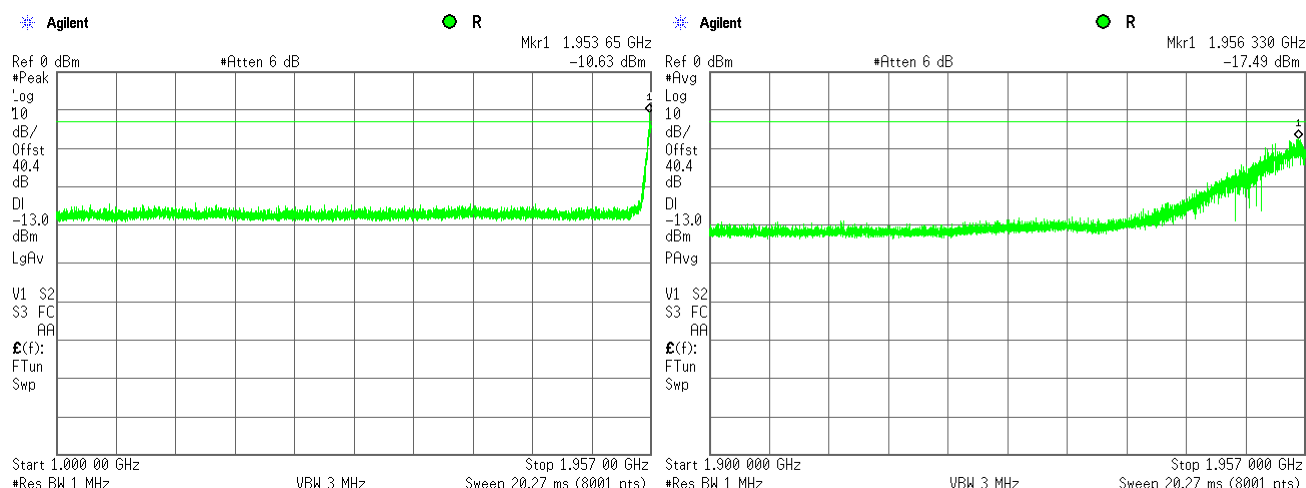
64 QAM
#2



Plot 7.3.5 Spurious emission measurements in 1000 – 1957 MHz range at mid carrier frequency

MODULATION:
TESTED RF CHAIN:

64 QAM
#2

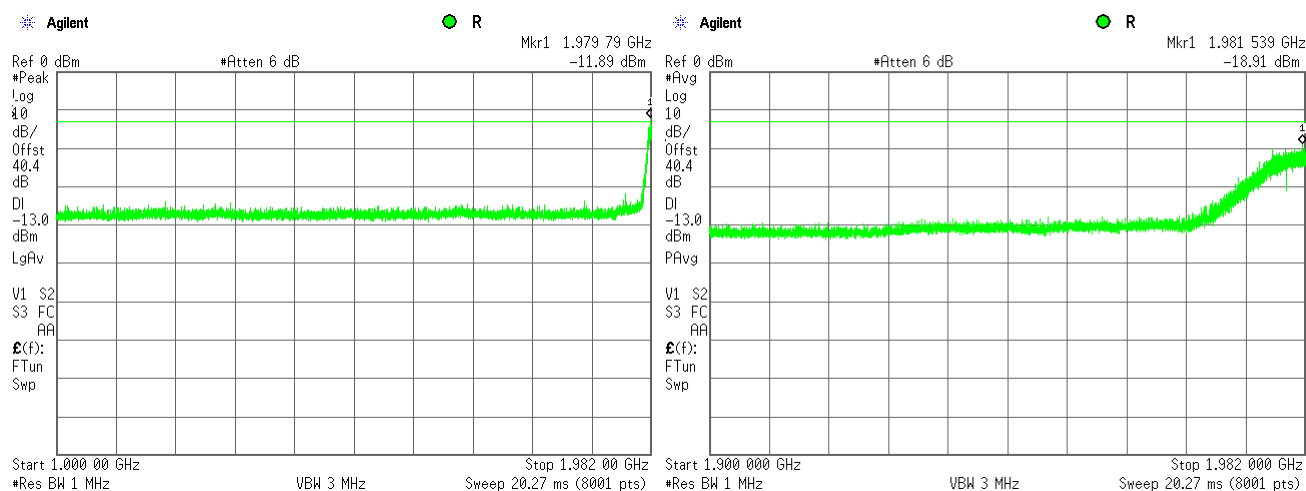


Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.6 Spurious emission measurements in 1000 – 1982 MHz range at high carrier frequency

MODULATION:
TESTED RF CHAIN:

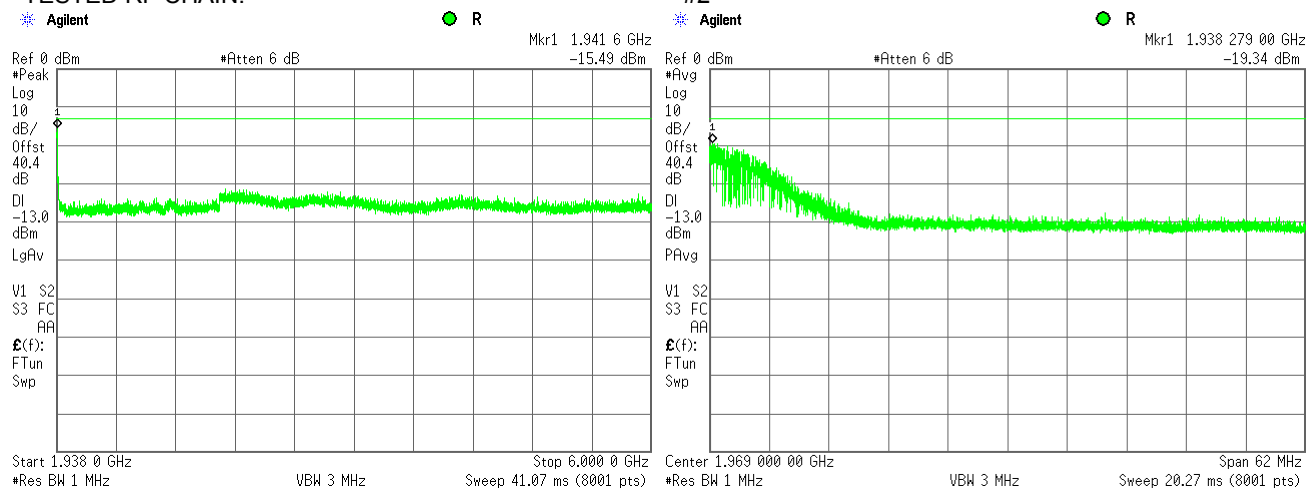
64 QAM
#2



Plot 7.3.7 Spurious emission measurements in 1938 – 6000 MHz range at low carrier frequency

MODULATION:
TESTED RF CHAIN:

64 QAM
#2

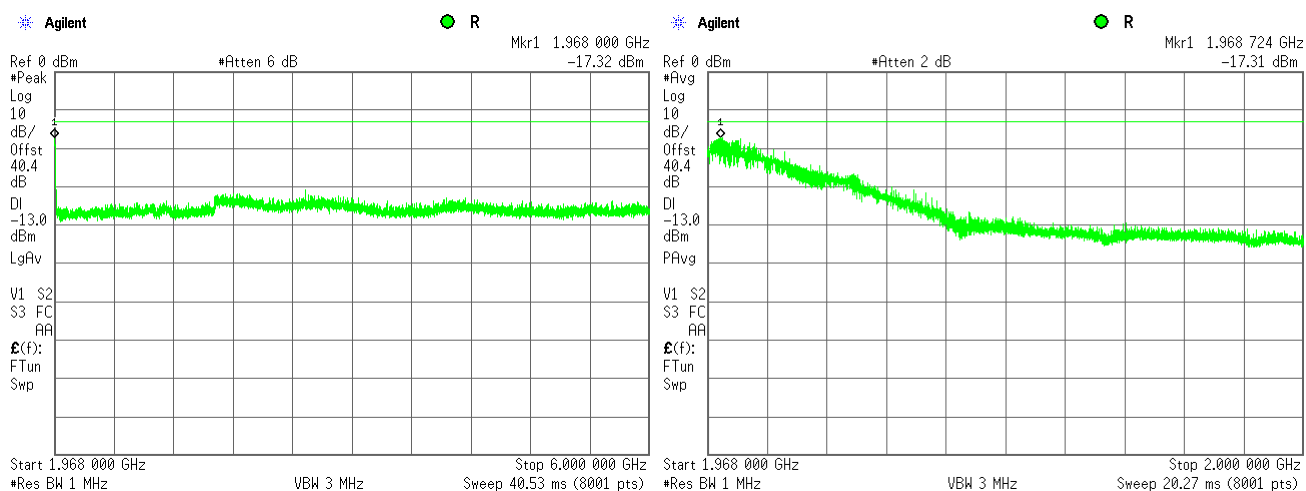


Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.8 Spurious emission measurements in 1968 - 6000 MHz range at mid carrier frequency

MODULATION:
TESTED RF CHAIN:

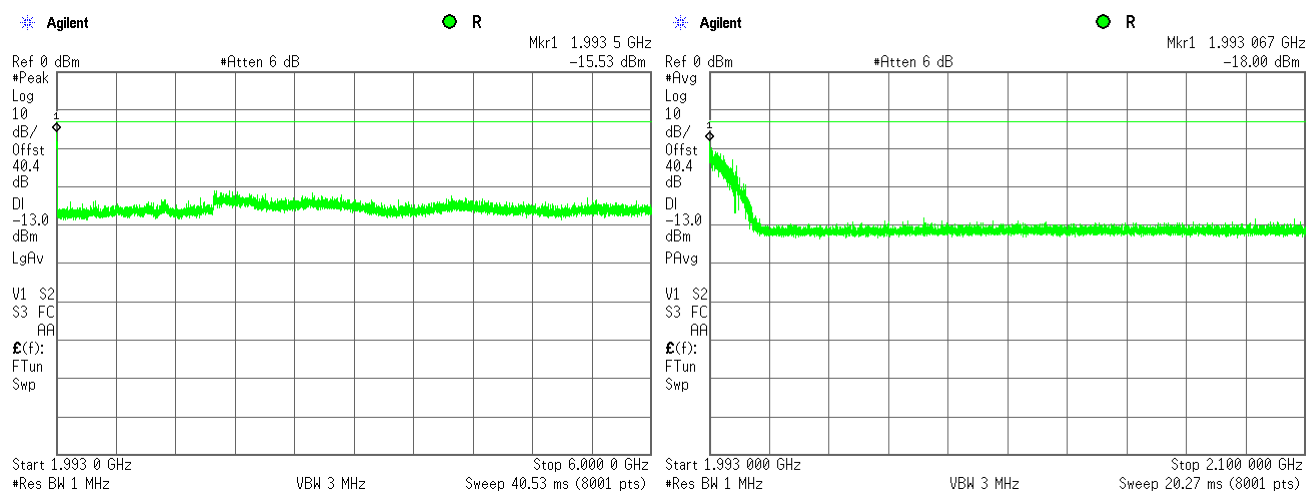
64 QAM
#2



Plot 7.3.9 Spurious emission measurements in 1993 - 6000 MHz range at high carrier frequency

MODULATION:
TESTED RF CHAIN:

64 QAM
#2



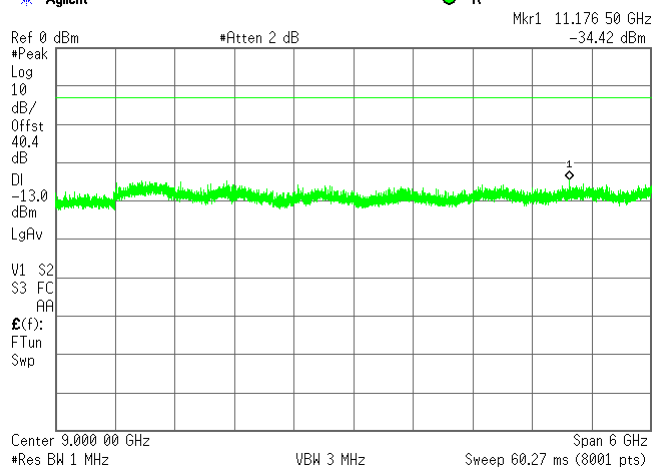
Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.10 Spurious emission measurements in 6000 – 12000 MHz range

MODULATION:
TESTED RF CHAIN:
CARRIER FREQUENCY: Low

Agilent

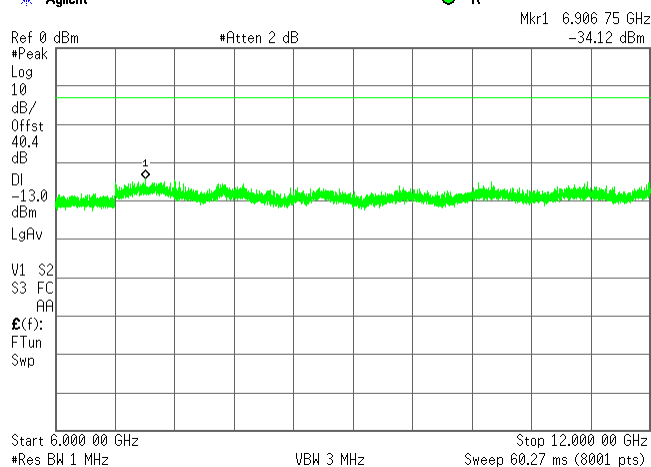
R



64 QAM
#2
CARRIER FREQUENCY: Mid

Agilent

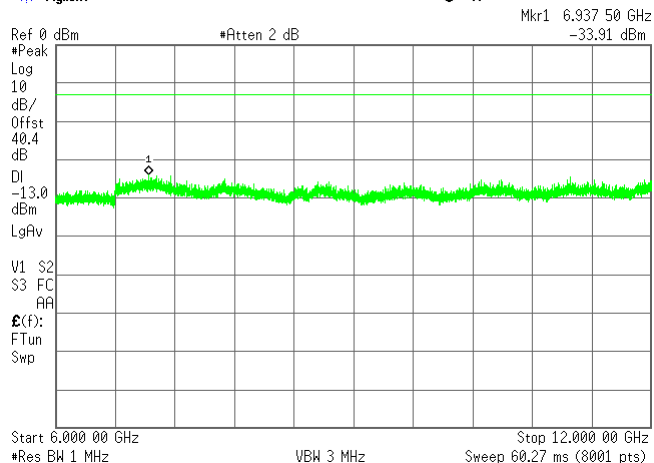
R



CARRIER FREQUENCY: High

Agilent

R



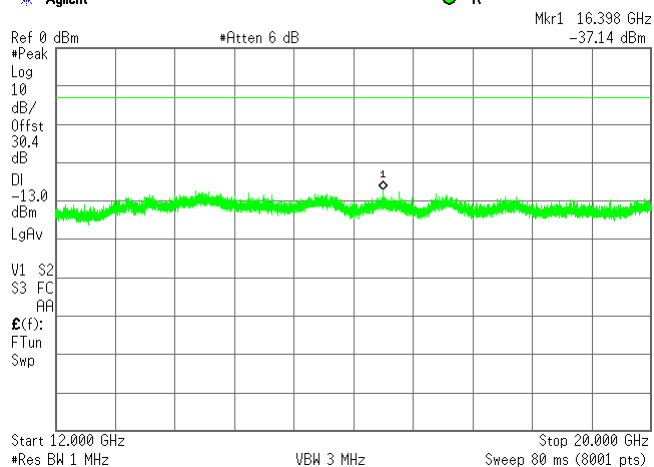
Test specification:		Section 24.238, Spurious emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		10-Aug-15	
Temperature: 23.7 °C	Air Pressure: 1009 hPa	Relative Humidity: 47 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.11 Spurious emission measurements in 12000 - 20000 MHz range at low carrier frequency

MODULATION:
TESTED RF CHAIN:
CARRIER FREQUENCY: Low

Agilent

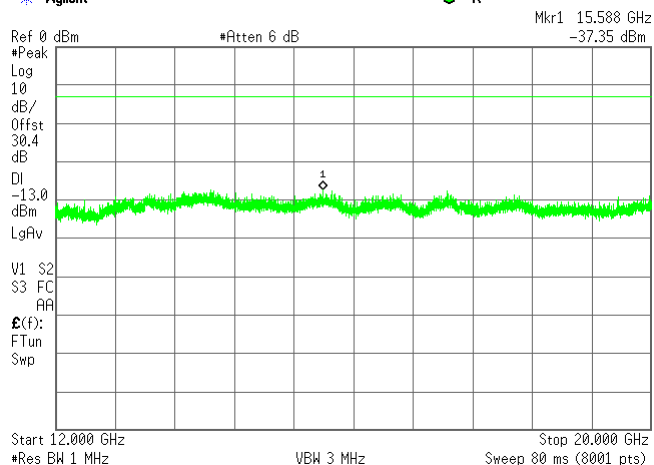
R



CARRIER FREQUENCY: High

Agilent

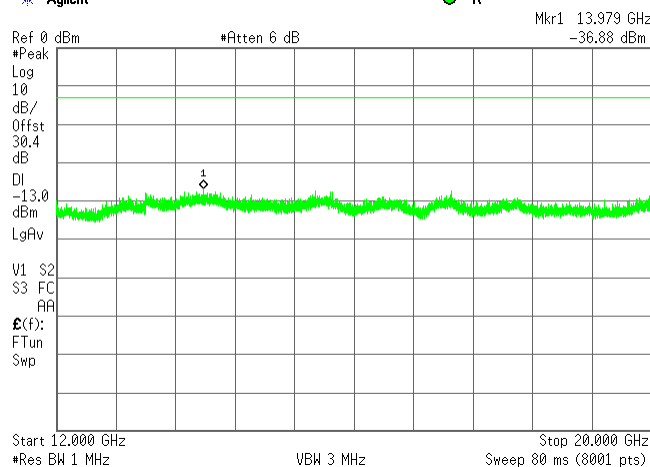
R



64 QAM
#2
CARRIER FREQUENCY: Mid

Agilent

R



Test specification:		Section 24.238, Band edge emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Aug-15		
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

7.4 Band edge emission

7.4.1 General

This test was performed to verify the EUT band edge emission including all associated side bands and was attenuated at least $43+10\log(P)$ below the unmodulated carrier level. Specification test limits are given in Table 7.4.1.

Table 7.4.1 Band edge emission limits

Carrier frequency, MHz	Frequency range	Attenuation below carrier, dBc	Limit, dBm
Channel bandwidth 5 MHz			
1932.5	1925-1930 1940-1945	$43+10*\log(P^*)$	-13.0
1962.5	1955-1960 1965-1970	$43+10*\log(P^*)$	-13.0
1987.5	1980-1985 1990-1995	$43+10*\log(P^*)$	-13.0

7.4.2 Test procedure

7.4.2.1 The EUT was set up as shown in Figure 7.4.1, energized and the performance check was conducted.

7.4.2.2 The spectrum analyzer frequency span was set to capture all major modulation sidebands of emission and sweep time was set sufficiently slow to ensure peak measurements. Spectrum analyzer was set in peak hold mode and time sufficient for trace stabilization was allowed.

7.4.2.3 The frequency of modulation envelope points beyond which power level drops below the band edge emission limit was measured.

7.4.2.4 The test results were recorded in Table 7.4.2 and shown in the associated plots.

Figure 7.4.1 Band edge emission measurement set up





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Test specification:		Section 24.238, Band edge emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date(s):	09-Aug-15		
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.4.2 Band edge emission test results

ASSIGNED FREQUENCY RANGE: 1930 – 1990 MHz
 INVESTIGATED FREQUENCY RANGE: 1925 – 1995 MHz
 RBW: 100 kHz
 DETECTOR USED: Average
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 MODULATING SIGNAL: PRBS
 TRANSMITTER OUTPUT POWER SETTINGS: Maximum
 NUMBER OF RF OUTPUTS: N = 2

EBW: 5 MHz
 MODULATION: QPSK

Frequency offset, ± MHz	Band edge SA reading, dBm	Band edge result, dBm	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Low carrier frequency						
-3.0	-24.60	-21.60	100	1000	-13.0	Pass
3.0	-23.13	-20.13	100	1000	-13.0	Pass
Mid carrier frequency						
-3.0	-23.26	-20.26	100	1000	-13.0	Pass
3.0	-23.28	-20.28	100	1000	-13.0	Pass
High carrier frequency						
-3.0	-19.12	-16.12	100	1000	-13.0	Pass
3.0	-22.44	-19.44	100	1000	-13.0	Pass

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

EBW: 5 MHz
 MODULATION: 64 QAM

Frequency offset, ± MHz	Band edge SA reading, dBm	Band edge result, dBm	RBW, kHz	Integration BW, kHz	Limit, dBm	Verdict
Low carrier frequency						
-3.0	-18.73	-15.73	100	1000	-13.0	Pass
3.0	-19.45	-16.45	100	1000	-13.0	Pass
Mid carrier frequency						
-3.0	-18.48	-15.48	100	1000	-13.0	Pass
3.0	-18.16	-15.16	100	1000	-13.0	Pass
High carrier frequency						
-3.0	-19.15	-16.15	100	1000	-13.0	Pass
3.0	-17.54	-14.54	100	1000	-13.0	Pass

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

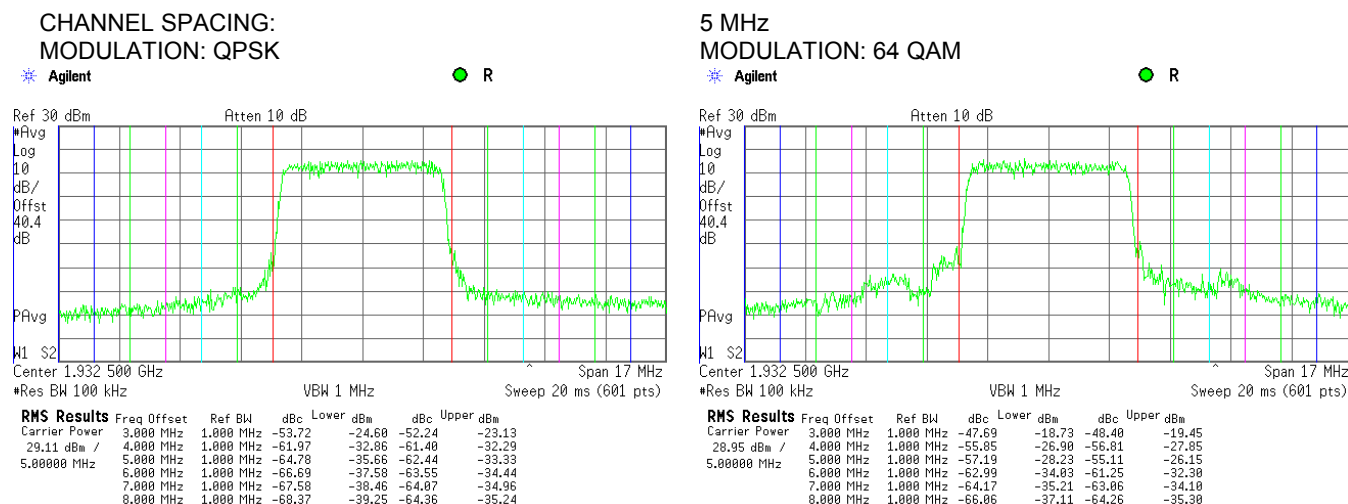
Reference numbers of test equipment used

HL 3818	HL 3901	HL 4068				
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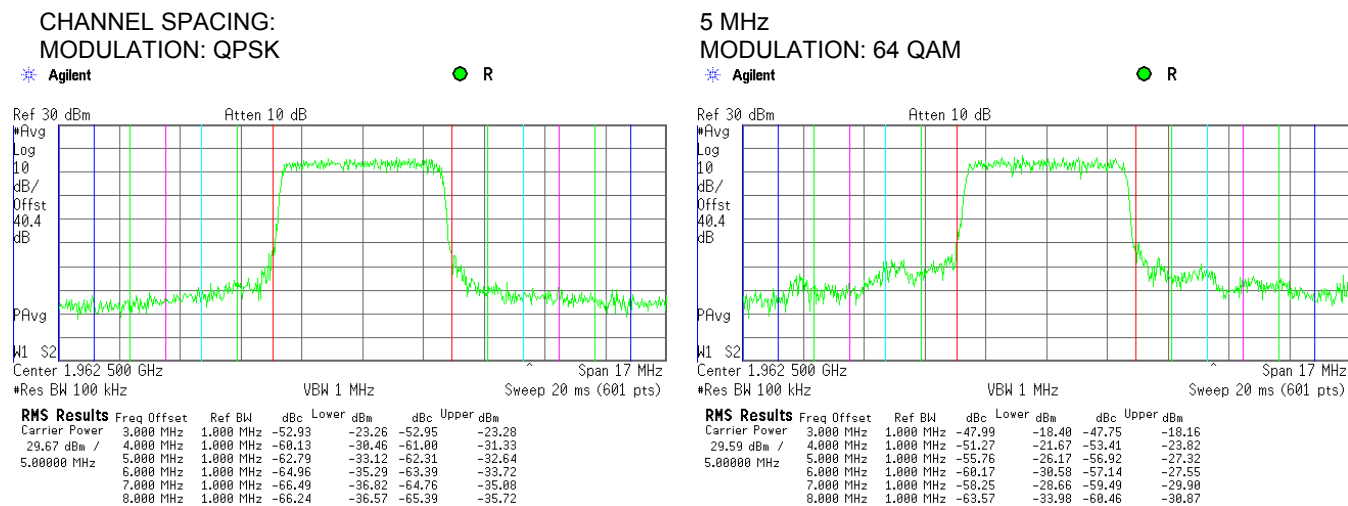
Full description is given in Appendix A.

Test specification:	Section 24.238, Band edge emissions at antenna terminal		
Test procedure:	47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13		
Test mode:	Compliance	Verdict: PASS	
Date(s):	09-Aug-15		
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.1 Band edge emission test result at low frequency, RF Chain1

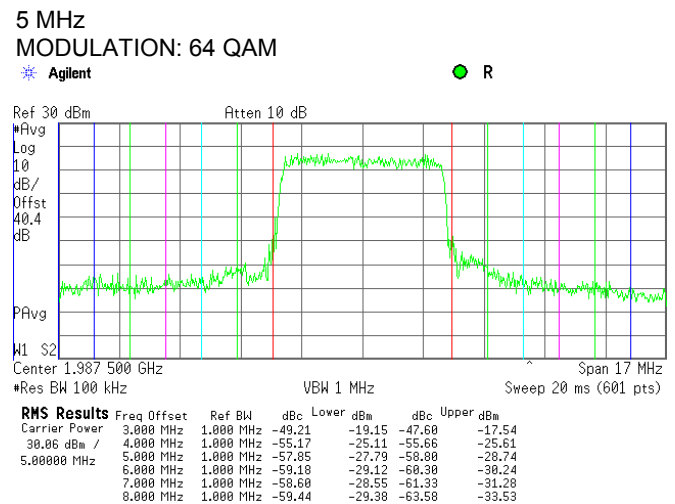
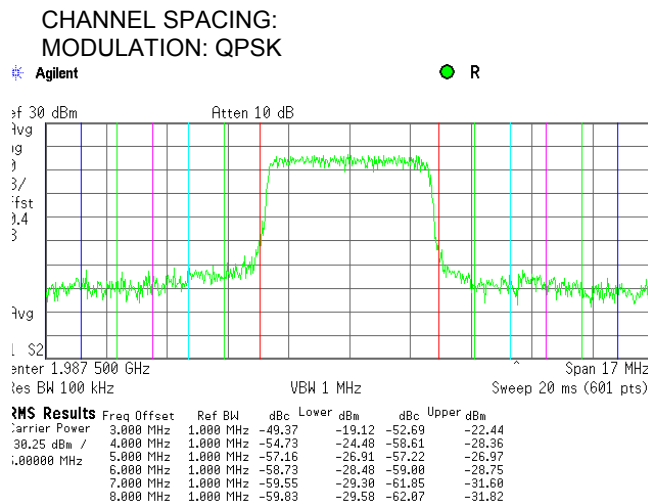


Plot 7.4.2 Band edge emission test result at mid frequency, RF Chain1



Test specification:		Section 24.238, Band edge emissions at antenna terminal	
Test procedure:		47 CFR, Sections 2.1051 and 24.238; TIA/EIA-603-A, Section 2.2.13	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.3 Band edge emission test result at high frequency, RF Chain1





Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

7.5 Radiated spurious emission measurements

7.5.1 General

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

Table 7.5.1 Radiated spurious emission test limits

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

* - Excluding the in band emission within ± 250 % of the authorized bandwidth from the carrier

** - P is transmitter output power in Watts

*** - Equivalent field strength limit was calculated from maximum allowed ERP of spurious as follows:
 $E = \sqrt{30 \times P \times 1.64} / r$, where P is ERP in Watts, 1.64 is numeric gain of ideal dipole and r is antenna to EUT distance in meters

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

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

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

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

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

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

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

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

Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

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

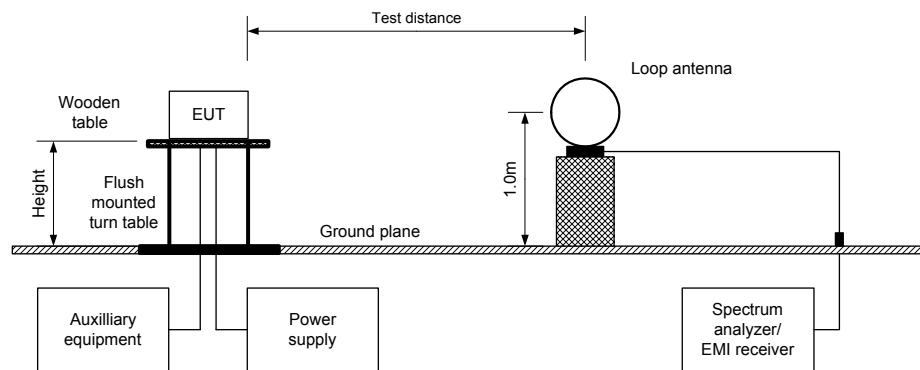
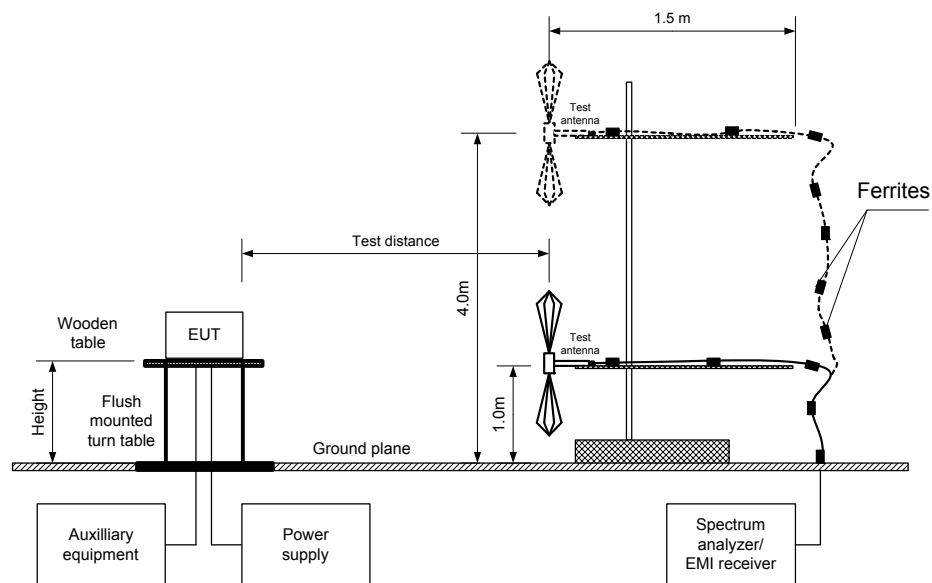


Figure 7.5.2 Setup for spurious emission field strength measurements above 30 MHz





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Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.5.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 1930 – 1990 MHz
 TEST DISTANCE: 3 m
 TEST SITE: Semi anechoic chamber
 EUT HEIGHT: 0.8 m
 INVESTIGATED FREQUENCY RANGE: 0.009 – 20000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: > Resolution bandwidth
 TEST ANTENNA TYPE: Active loop (9 kHz – 30 MHz)
 Biconilog (30 MHz – 1000 MHz)
 Double ridged guide (above 1000 MHz)
 MODULATION: QPSK/64 QAM
 MODULATING SIGNAL: PRBS
 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							
All emissions were found more than 20 dB below the limit							
Mid carrier frequency							
All emissions were found more than 20 dB below the limit							
High carrier frequency							
All emissions were found more than 20 dB below the limit							

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

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

Reference numbers of test equipment used

HL 0446	HL 0521	HL 0604	HL 0768	HL 2432	HL 2780	HL 4353	HL 4720
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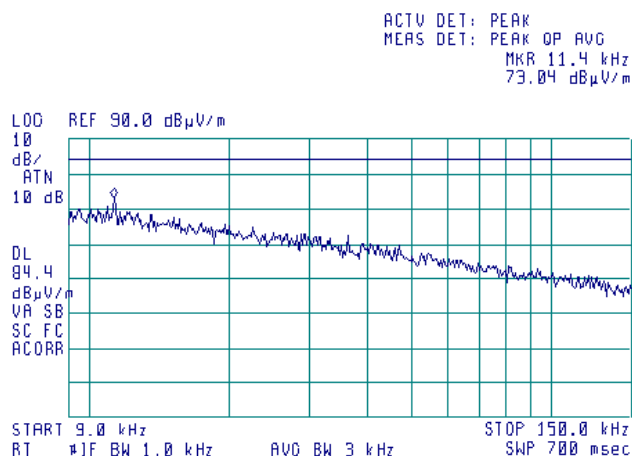
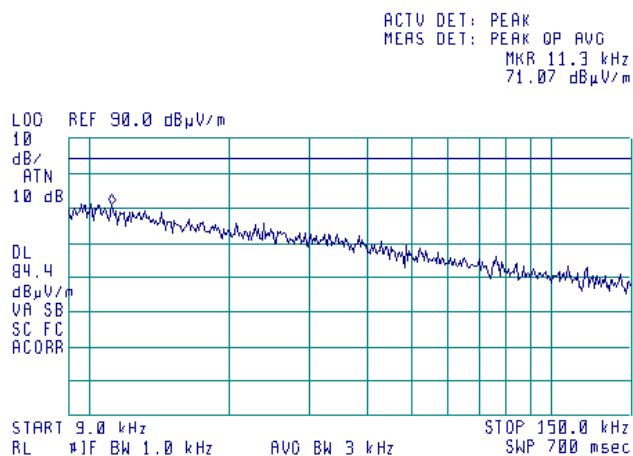
Full description is given in Appendix A.

Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

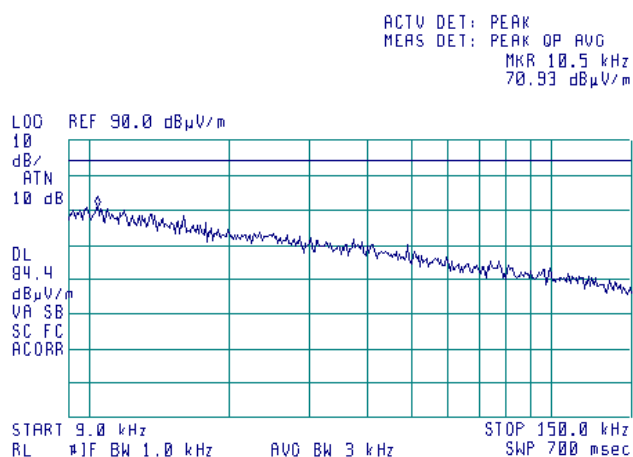
Plot 7.5.1 Radiated emission measurements in 9 - 150 kHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:
CARRIER FREQUENCY: Low

Semi anechoic chamber
Vertical and Horizontal
3 m
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

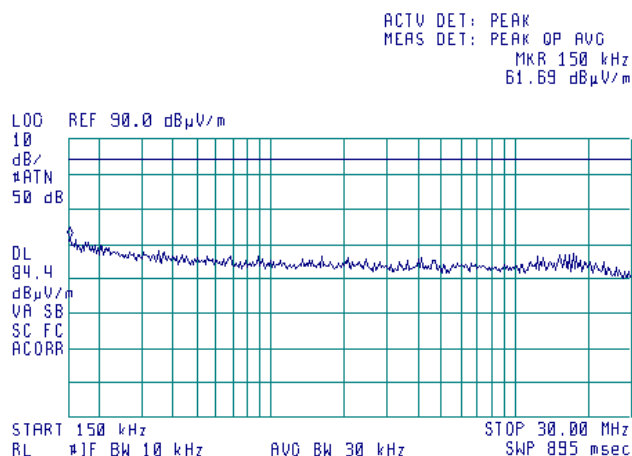
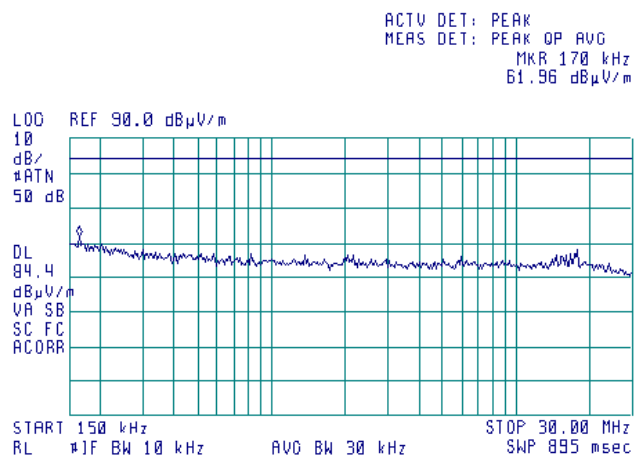


Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

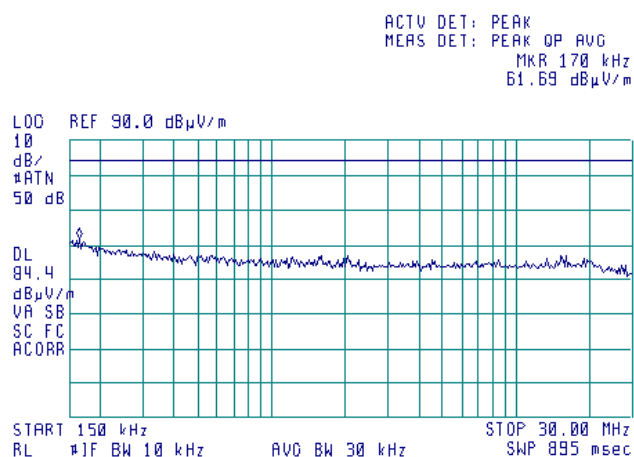
Plot 7.5.2 Radiated emission measurements in 0.15 - 30 MHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:
CARRIER FREQUENCY: Low

Semi anechoic chamber
Vertical and Horizontal
3 m
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High





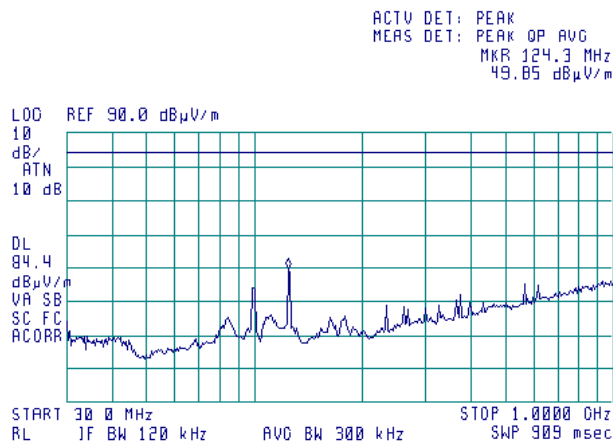
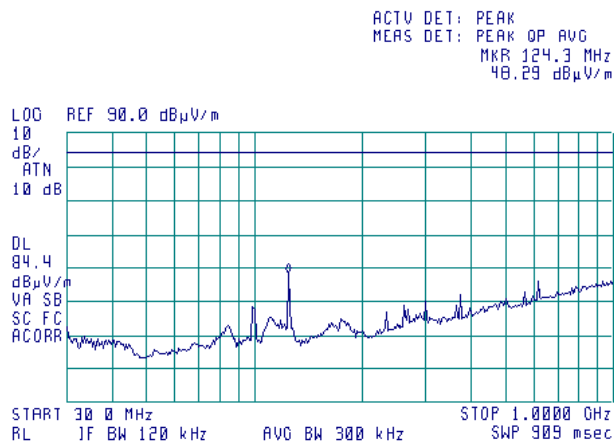
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Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

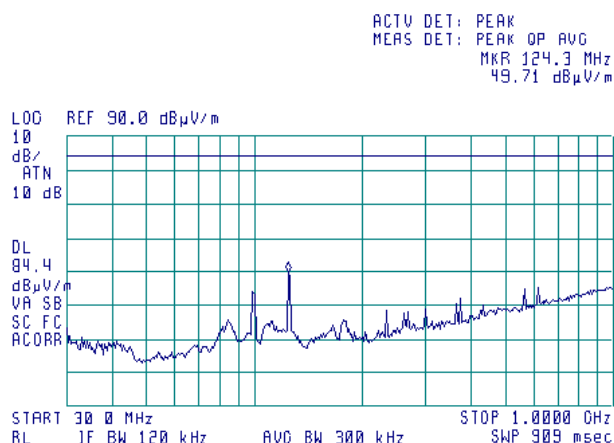
Plot 7.5.3 Radiated emission measurements in 30 - 1000 MHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:
CARRIER FREQUENCY: Low

Semi anechoic chamber
Vertical and Horizontal
3 m
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High





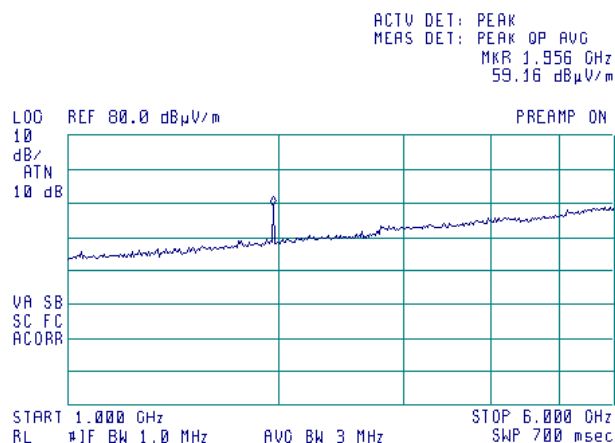
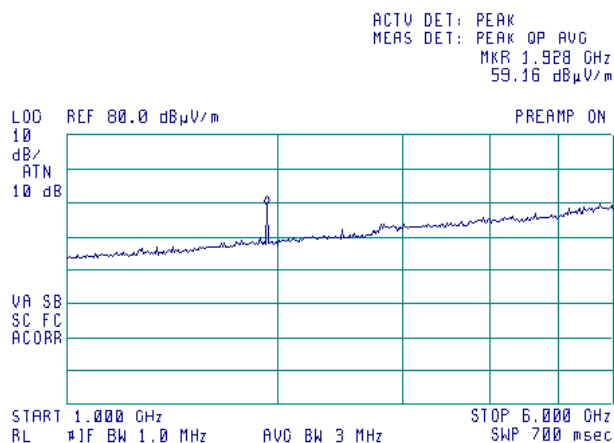
HERMON LABORATORIES

Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C		Air Pressure: 1006 hPa	Relative Humidity: 48 %
Remarks:		Power Supply: 48 VDC	

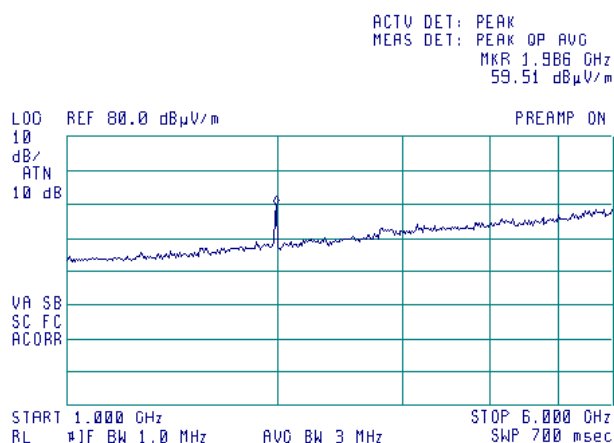
Plot 7.5.4 Radiated emission measurements in 1000 – 6000 MHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:
CARRIER FREQUENCY: Low

Semi anechoic chamber
Vertical and Horizontal
3 m
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High



Limit 84.4 dB μ V/m was applied



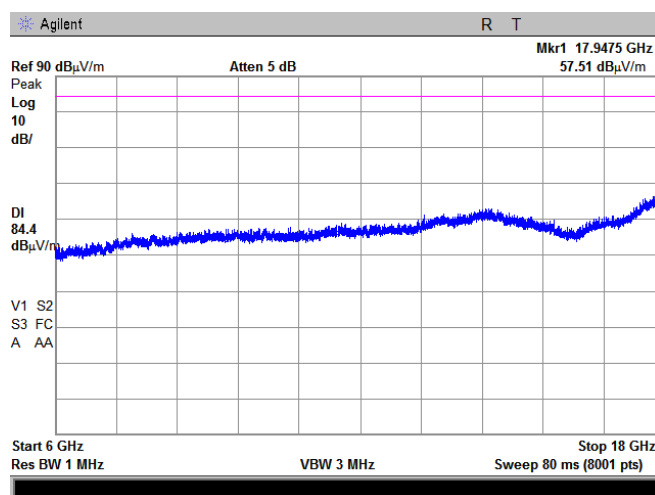
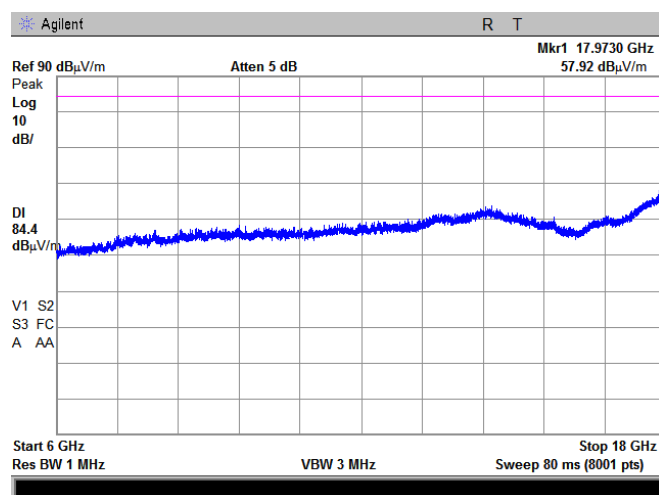
HERMON LABORATORIES

Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

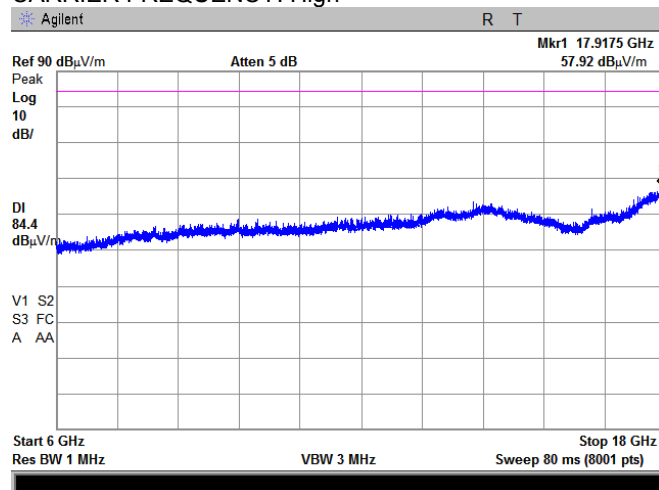
Plot 7.5.5 Radiated emission measurements in 3000 – 12000 MHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:
CARRIER FREQUENCY: Low

Semi anechoic chamber
Vertical and Horizontal
3 m
CARRIER FREQUENCY: Mid



CARRIER FREQUENCY: High

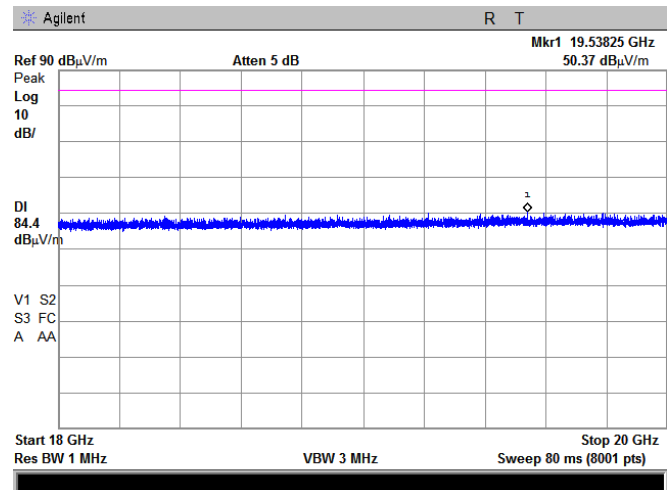
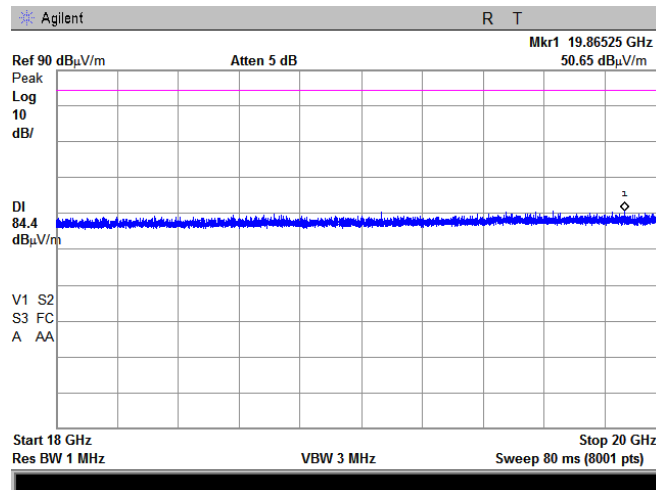
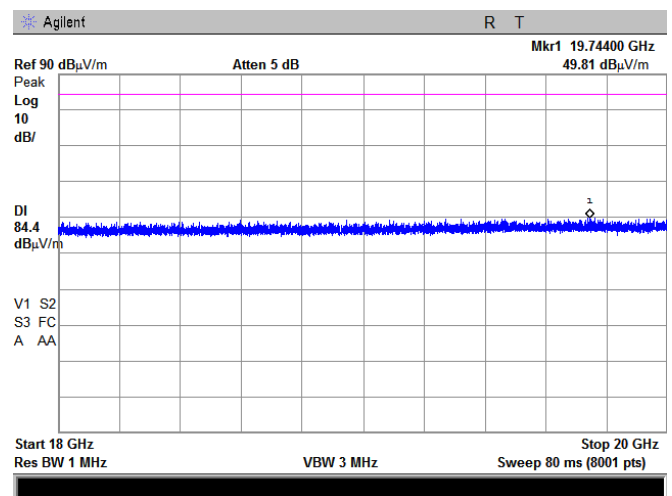
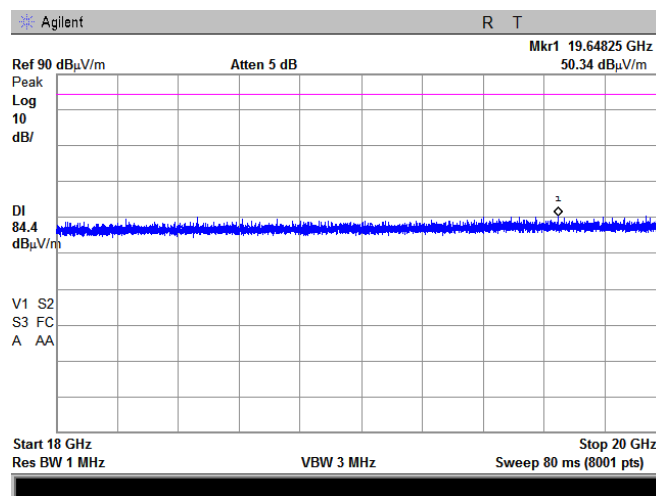


Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.6 Radiated emission measurements in 18000 – 20000 MHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:
CARRIER FREQUENCY: Low

Semi anechoic chamber
Vertical and Horizontal
3 m
CARRIER FREQUENCY: Mid



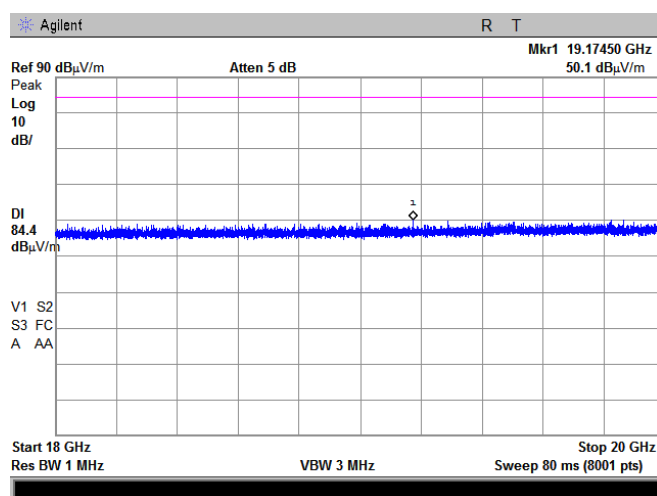
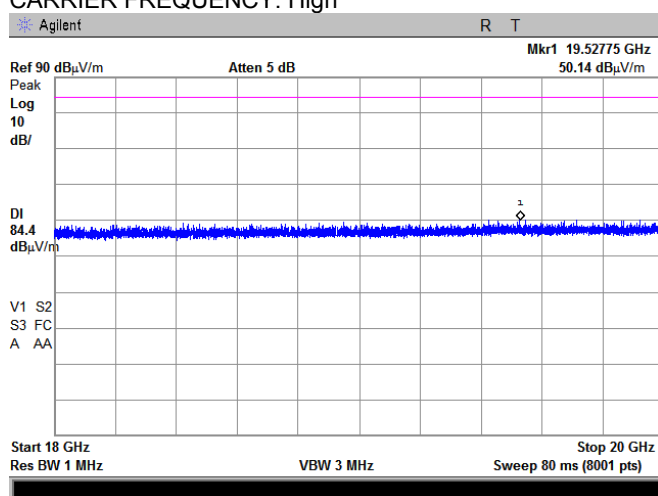
Test specification:		Section 24.238, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053 and 24.238; TIA/EIA-603-A, Section 2.2.12	
Test mode:		Compliance	Verdict: PASS
Date(s):		11-Aug-15	
Temperature: 23.8 °C	Air Pressure: 1006 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.7 Radiated emission measurements in 18000 – 20000 MHz range

TEST SITE:
ANTENNA POLARIZATION:
TEST DISTANCE:

Semi anechoic chamber
Vertical and Horizontal
3 m

CARRIER FREQUENCY: High



Test specification:		Section 24.235, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
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.

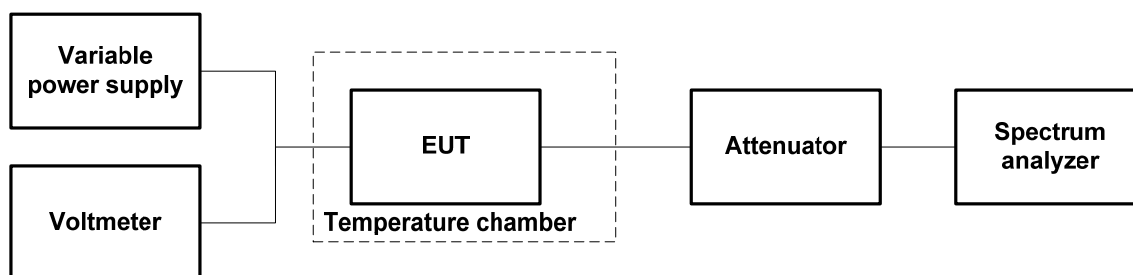
Table 7.6.1 Frequency stability limits

Assigned frequency, MHz	Limits
1930-1990	26 dBc points including frequency tolerance shall remain within the authorized frequency block

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, Table 7.6.3.

Figure 7.6.1 Frequency stability test setup



Test specification:		Section 24.235, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.6.2 Frequency stability test results

OPERATING FREQUENCY: 1930 1990 MHz
 NOMINAL POWER VOLTAGE: 48 VDC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Max Hold
 RESOLUTION BANDWIDTH: 10 Hz
 VIDEO BANDWIDTH: 30 Hz
 MODULATION: Unmodulated

MODULATION: _____												
T, °C	Voltage V	Frequency, MHz							Max frequency drift, Hz		Limit, Hz	Verdict
		Start up	1 st min	2 nd min	3 rd min	4 th min	5 th min	10 th min	Posit.	Negat.		
Low frequency												
-30	nominal	1935.00007	1935.000065	1935.000065	1935.000065	1935.000063	1935.000063	1935.00006	0	30	NA	Pass
-20	nominal	1935.000078	NA	NA	NA	NA	NA	1935.000068	0	22		
-10	nominal	1935.00008	NA	NA	NA	NA	NA	1935.00008	0	10		
0	nominal	1935.000084	1935.000084	1935.000084	1935.000083	1935.000083	1935.000083	1935.000083	0	7		
10	nominal	1935.000086	NA	NA	NA	NA	NA	1935.000086	0	4		
20	15%	1935.000092	NA	NA	NA	NA	NA	1935.00009	0	0		
20	nominal	1935.000092	NA	NA	NA	NA	NA	1935.00009	0	0		
20	-15%	1935.000092	NA	NA	NA	NA	NA	1935.00009	0	0		
30	nominal	1935.000091	1935.000091	1935.000091	1935.000091	1935.000091	1935.000091	1935.00009	1	0		
40	nominal	1935.000097	NA	NA	NA	NA	NA	1935.000094	4	0		
50	nominal	1935.00009	NA	NA	NA	NA	NA	1935.000094	4	0		
Mid frequency												
-30	nominal	1960.000099	1960.000087	1960.000092	1960.000089	1960.000092	1960.000094	1960.000092	2	5	NA	Pass
-20	nominal	1960.000107	NA	NA	NA	NA	NA	1960.000092	0	0		
-10	nominal	1960.000082	NA	NA	NA	NA	NA	1960.000081	0	11		
0	nominal	1960.000084	1960.000084	1960.000084	1960.000084	1960.000084	1960.000084	1960.000084	0	8		
10	nominal	1960.000088	NA	NA	NA	NA	NA	1960.000087	0	5		
20	15%	1960.960092	NA	NA	NA	NA	NA	1960.000092	0	0		
20	nominal	1960.960092	NA	NA	NA	NA	NA	1960.000092	0	0		
20	-15%	1960.960092	NA	NA	NA	NA	NA	1960.000092	0	0		
30	nominal	1960.000092	1960.000092	1960.000092	1960.000092	1960.000092	1960.000092	1960.000091	0	1		
40	nominal	1985.000098	NA	NA	NA	NA	NA	1960.000096	4	0		
50	nominal	1985.000096	NA	NA	NA	NA	NA	1960.000094	2	0		
High frequency												
-30	nominal	1985.000069	1985.000069	1985.000071	1985.000071	1985.000066	1985.000069	1985.000069	0	30	NA	Pass
-20	nominal	1985.000079						1985.000079	0	17		
-10	nominal	1985.000084	NA	NA	NA	NA	NA	1985.000084	0	12		
0	nominal	1985.000087	1985.000087	1985.000087	1985.000087	1985.000087	1985.000087	1985.000086	0	10		
10	nominal	1985.000091	NA	NA	NA	NA	NA	1985.00009	0	6		
20	15%	1985.000096	NA	NA	NA	NA	NA	1985.000096	0	0		
20	nominal	1985.000096	NA	NA	NA	NA	NA	1985.000096	0	0		
20	-15%	1985.000096	NA	NA	NA	NA	NA	1985.000096	0	0		
30	nominal	1985.000094	1985.000094	1985.000094	1985.000094	1985.000094	1985.000094	1985.000094	0	2		
40	nominal	1985.000101	NA	NA	NA	NA	NA	1985.000099	3	0		
50	nominal	1985.000098	NA	NA	NA	NA	NA	1985.000098	2	0		

* - Reference frequency

** - Battery operating end point specified by the manufacturer.



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Report ID: AIRRAD_FCC.27362.docx
Date of Issue: 6-Sep-15

Test specification:		Section 24.235, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-A Section 2.2.2	
Test mode:		Compliance	Verdict: PASS
Date(s):		09-Aug-15	
Temperature: 24.8 °C	Air Pressure: 1010 hPa	Relative Humidity: 48 %	Power Supply: 48 VDC
Remarks:			

Table 7.6.3 Frequency displacement

Channel	Maximum frequency displacement			
	ppm		Hz	
	Positive	Negative	Positive	Negative
Low	0.01	0.06	4.00	30.00
Mid	0.01	0.02	4.00	11.00
High	0.01	0.06	3.00	30.00

Reference numbers of test equipment used

HL 2909	HL 3210						
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Full description is given in Appendix A.

8 APPENDIX A Test equipment and ancillaries used for tests

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
0446	Antenna, Loop, Active, 10 kHz - 30 MHz	EMCO	6502	2857	13-Jan-15	13-Jan-16
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	22-Oct-14	22-Oct-15
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	15-May-15	15-May-16
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	25-Dec-14	25-Dec-15
2432	Antenna, Double-Ridged Waveguide Horn 1-18 GHz	EMC Test Systems	3115	00027177	17-Apr-15	17-Apr-16
2780	EMC analyzer, 100 Hz to 26.5 GHz	Agilent Technologies	E7405A	MY451024 62	02-Sep-15	02-Sep-16
2909	Spectrum analyzer, ESA-E, 100 Hz to 26.5 GHz	Agilent Technologies	E4407B	MY414447 62	22-Feb-15	22-Feb-16
3174	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	05-Apr-15	05-Apr-16
3210	Temperature Chamber, (-50...+100) °C	Associated Environmental Systems	NA	NA	16-Sep-14	16-Sep-15
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	30-Jan-15	30-Jan-16
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	30-Jan-15	30-Jan-16
3390	Microwave Cable Assembly, 26.5 GHz, 1.0 m, N type/N type	Suhner Sucoflex	104EA	3390	04-Feb-15	04-Feb-16
3770	Attenuator, N-type, 20 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N20W5+	NA	18-Aug-15	18-Aug-16
3787	Precision Fixed Attenuator, 50 Ohm, 5 W, 10 dB, DC to 18 GHz	Mini-Circuits	BW-S10W5+	NA	02-Dec-14	02-Dec-15
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY482502 88	29-Apr-15	29-Apr-16
3901	Microwave Cable Assembly, 40.0 GHz, 3.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1225/2A	10-Feb-15	10-Feb-16
3903	Microwave Cable Assembly, 40.0 GHz, 1.5 m, SMA/SMA	Huber-Suhner	SUCOFLE X 102A	1226/2A	10-Feb-15	10-Feb-16
4068	Attenuator, SMA, 30 dB, DC to 12.4 GHz	Midwest Microwave	ATT-0527-30-SMA-07	NA	13-Jul-15	13-Jul-16
4273	Test Cable , DC-18 GHz, 1.8 m, SMA/M - N/M	Mini-Circuits	CBL-6FT-SMNM+	70045	28-May-15	28-May-16
4353	Low Loss Armored Test Cable, DC - 18 GHz, 6.2 m, N type-M/N type-M	MegaPhase	NC29-N1N1-244	12025101 003	15-Mar-15	15-Mar-16
4366	Directional coupler, 1 GHz to 18 GHz, 10 dB, SMA Female	Tiger Micro-Electronics Institute	TGD-A1101-10	01e-JSDE805-007	18-May-14	18-May-16

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
4720	Low Loss Armored Test Cable, DC - 18 GHz, 4.5 m, N type-M/N type-M	MegaPhase	NC29-N1N1-177	51300101002	12-Jul-15	12-Jul-16

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	$\pm 8\%$
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 stability	30 – 300 MHz: ± 50.5 Hz (1.68 ppm) 300 – 1000 MHz: ± 168 Hz (0.56 ppm)
Unintentional radiator tests	
Conducted emissions with LISN	9 kHz to 150 kHz: ± 3.9 dB 150 kHz to 30 MHz: ± 3.8 dB
Radiated emissions at 3 m measuring distance Horizontal polarization Vertical polarization	Biconilog antenna: ± 5.3 dB Biconical antenna: ± 5.0 dB Log periodic antenna: ± 5.3 dB Double ridged horn antenna: ± 5.3 dB Biconilog antenna: ± 6.0 dB Biconical antenna: ± 5.7 dB Log periodic antenna: ± 6.0 dB Double ridged horn antenna: ± 6.0 dB

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

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

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

10 APPENDIX C Test 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), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, G-27 for full-anechoic chamber for RE measurements above 1 GHz, C-845 for conducted emissions site, T-1606 for conducted emissions at telecommunication ports), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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Person for contact: Mr. Alex Usoskin, CEO.

11 APPENDIX D Specification references

47CFR part 24: 2014	Personal communications services
47CFR part 1: 2014	Practice and procedure
47CFR part 2: 2014	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: 2009	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-D:2010	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(μ V) to convert it into field strength in dB(μ V/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(μ V) to convert it into field strength in dB(μ V/m).

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

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

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

Cable loss
Cable coaxial, Microwave Cable Assembly, 104EA, 18 GHz, 1.0 m
Suhner Sucoflex, HL 3390

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.03	4800	0.55	9800	0.89	14900	1.07
30	0.04	4900	0.56	9900	0.89	15000	1.07
50	0.05	5000	0.57	10000	0.86	15100	1.08
100	0.07	5100	0.58	10100	0.86	15200	1.07
200	0.10	5200	0.58	10200	0.88	15300	1.09
300	0.12	5300	0.59	10300	0.92	15400	1.10
400	0.14	5400	0.59	10400	0.94	15500	1.10
500	0.16	5500	0.60	10500	0.96	15600	1.12
600	0.17	5600	0.61	10600	0.93	15700	1.15
700	0.18	5700	0.61	10700	0.89	15800	1.15
800	0.20	5800	0.63	10800	0.89	15900	1.17
900	0.21	5900	0.63	10900	0.88	16000	1.14
1000	0.23	6000	0.64	11000	0.92	16100	1.14
1100	0.24	6100	0.64	11100	0.91	16200	1.15
1200	0.25	6200	0.64	11200	0.89	16300	1.14
1300	0.27	6300	0.65	11300	0.88	16400	1.13
1400	0.28	6400	0.65	11400	0.88	16500	1.13
1500	0.28	6500	0.66	11500	0.90	16600	1.13
1600	0.30	6600	0.67	11600	0.94	16700	1.14
1700	0.31	6700	0.67	11700	0.96	16800	1.14
1800	0.32	6800	0.67	11800	0.92	16900	1.14
1900	0.33	6900	0.68	11900	0.92	17000	1.14
2000	0.34	7000	0.67	12000	0.91	17100	1.15
2100	0.35	7100	0.68	12100	0.92	17200	1.14
2200	0.35	7200	0.69	12200	0.95	17300	1.15
2300	0.36	7300	0.69	12300	0.98	17400	1.15
2400	0.37	7400	0.68	12400	0.96	17500	1.16
2500	0.39	7500	0.69	12500	0.99	17600	1.16
2600	0.40	7600	0.70	12600	0.96	17700	1.16
2700	0.41	7700	0.71	12700	0.93	17800	1.19
2800	0.42	7800	0.72	12800	0.94	17900	1.21
2900	0.42	7900	0.72	12900	0.98	18000	1.25
3000	0.43	8000	0.72	13000	0.99		
3100	0.44	8100	0.73	13100	0.99		
3200	0.45	8200	0.74	13200	0.99		
3300	0.46	8300	0.75	13300	0.99		
3400	0.46	8400	0.74	13400	1.00		
3500	0.47	8500	0.73	13500	1.02		
3600	0.47	8600	0.73	13600	1.05		
3700	0.47	8700	0.75	13700	1.03		
3800	0.49	8800	0.77	13800	1.02		
3900	0.49	8900	0.77	13900	1.03		
4000	0.50	9000	0.77	14000	1.03		
4100	0.51	9100	0.77	14100	1.05		
4200	0.52	9200	0.78	14200	1.05		
4300	0.52	9300	0.80	14300	1.04		
4400	0.53	9400	0.82	14400	1.03		
4500	0.53	9500	0.82	14600	1.06		
4600	0.54	9600	0.83	14700	1.07		
4700	0.56	9700	0.89	14800	1.08		

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 70045, 18 GHz, 1.8 m, SMA/M - N/M
CBL-6FT-SMNM+, HL 4273

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.09	4800	1.76	9800	2.70	14800	3.59
30	0.11	4900	1.78	9900	2.71	14900	3.59
50	0.14	5000	1.81	10000	2.73	15000	3.60
100	0.20	5100	1.82	10100	2.75	15100	3.63
200	0.30	5200	1.86	10200	2.76	15200	3.67
300	0.38	5300	1.89	10300	2.79	15300	3.70
400	0.45	5400	1.92	10400	2.81	15400	3.68
500	0.50	5500	1.96	10500	2.82	15500	3.70
600	0.55	5600	2.00	10600	2.83	15600	3.71
700	0.60	5700	2.03	10700	2.87	15700	3.77
800	0.65	5800	2.04	10800	2.87	15800	3.75
900	0.69	5900	2.07	10900	2.88	15900	3.77
1000	0.73	6000	2.10	11000	2.89	16000	3.79
1100	0.77	6100	2.10	11100	2.91	16100	3.85
1200	0.80	6200	2.11	11200	2.92	16200	3.82
1300	0.84	6300	2.11	11300	2.94	16300	3.83
1400	0.88	6400	2.14	11400	2.95	16400	3.88
1500	0.92	6500	2.15	11500	2.98	16500	3.89
1600	0.95	6600	2.15	11600	3.00	16600	3.92
1700	0.98	6700	2.16	11700	3.02	16700	3.88
1800	1.01	6800	2.19	11800	3.04	16800	3.95
1900	1.04	6900	2.22	11900	3.08	16900	3.91
2000	1.07	7000	2.24	12000	3.09	17000	3.97
2100	1.09	7100	2.26	12100	3.12	17100	3.92
2200	1.13	7200	2.29	12200	3.13	17200	3.94
2300	1.15	7300	2.32	12300	3.16	17300	3.94
2400	1.18	7400	2.36	12400	3.17	17400	3.98
2500	1.21	7500	2.39	12500	3.19	17500	3.93
2600	1.24	7600	2.41	12600	3.20	17600	3.95
2700	1.27	7700	2.43	12700	3.21	17700	3.96
2800	1.30	7800	2.46	12800	3.21	17800	3.97
2900	1.34	7900	2.49	12900	3.22	17900	3.96
3000	1.36	8000	2.52	13000	3.22	18000	3.97
3100	1.38	8100	2.52	13100	3.24		
3200	1.41	8200	2.54	13200	3.24		
3300	1.45	8300	2.59	13300	3.27		
3400	1.46	8400	2.61	13400	3.28		
3500	1.49	8500	2.60	13500	3.31		
3600	1.51	8600	2.63	13600	3.31		
3700	1.55	8700	2.65	13700	3.35		
3800	1.34	8800	2.65	13800	3.37		
3900	1.36	8900	2.65	13900	3.40		
4000	1.38	9000	2.66	14000	3.43		
4100	1.41	9100	2.66	14100	3.45		
4200	1.45	9200	2.67	14200	3.46		
4300	1.46	9300	2.67	14300	3.46		
4400	1.49	9400	2.67	14400	3.49		
4500	1.51	9500	2.68	14500	3.50		
4600	1.55	9600	2.69	14600	3.50		
4700	1.34	9700	2.69	14700	3.52		

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

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

Cable loss
Low Loss Armored Test Cable, MegaPhase, 18 GHz, 4.5 m, N type-M/N type-M,
NC29-N1N1-177, S/N 51300101 002
HL 4720

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
50	0.14	9000	2.10
100	0.21	9500	2.26
300	0.36	10000	2.39
500	0.46	10500	2.36
1000	0.66	11000	2.36
1500	0.81	11500	2.44
2000	0.93	12000	2.51
2500	1.05	12500	2.71
3000	1.15	13000	2.71
3500	1.25	13500	2.69
4000	1.34	14000	2.78
4500	1.42	14500	2.84
5000	1.52	15000	2.85
5500	1.60	15500	2.98
6000	1.66	16000	3.02
6500	1.78	16500	3.09
7000	1.82	17000	3.11
7500	1.86	17500	3.16
8000	1.95	18000	3.32
8500	2.01		

13 APPENDIX F Abbreviations and acronyms

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

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