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TEST REPORT

ACCORDING TO: FCC CFR 47 PART 90 subpart Z and RSS-197 Issue 1:2010

FOR:

Alvarion Ltd.

WiMAX base station

Model:BreezeMAX Extreme 3.65

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

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1 Applicant information

Client name: Alvarion Ltd.
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Telephone: 972 3645 7859
Fax: 972 3645 6222
E-mail: Moti.Ezra@alvarion.com
Contact name: Mr. Moti Ezra

2 Equipment under test attributes

Product name: WiMAX base station
Product type: Transceiver
Trademark: BreezeMAX Extreme 3.65
Model(s): XTRM-BS-2SIS-3.7-EXT-SP
Serial number: S123456
Software release: [1.7.1.37](#)
Receipt date: 4/12/2011

3 Manufacturer information

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

4 Test details




Project ID: 21940
Location: Hermon Laboratories Ltd. Harakevet Industrial Zone, Binyamina 30500, Israel
Test started: 4/12/2011
Test completed: 5/17/2011
Test specification(s): 47CFR part 90 subpart Z; RSS-197 issue 1:2010

5 Tests summary

Test	Status
Transmitter characteristics	
FCC Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power	Pass
FCC Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	Pass
FCC Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth	Pass
FCC Section 90.210(b), Emission mask	Pass
FCC Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector	Pass
FCC Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions	Pass
FCC Section 90.213 / RSS-197, Section 5.7, Frequency stability	Pass
FCC Section 90.203 (o) / RSS-197 Section 5.4, Contention based protocol	Pass
FCC Section 90.1335 / RSS-Gen, Section 5.5, RF exposure	Pass, Exhibit attached to Application for certification
Receiver characteristics	
RSS-197, Section 5.8, Receiver spurious emissions	Pass

All the tests were performed for upper 25 MHz band of 3650 – 3700 MHz range. The lower 25 MHz band was approved under FCC ID:LKT-EXTR-36 and IC:2514A-EXTR36.

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	May 17, 2011	
Reviewed by:	Mrs. M. Cherniavsky, certification engineer	May 22, 2011	
Approved by:	Mr. M. Nikishin, EMC and Radio group manager	May 23, 2011	



6 EUT description

6.1 General information

The EUT, base station, is a part of BreezeMAX Extreme 3.65 high capacity, IP services oriented Broadband Wireless Access system. The BreezeMAX Extreme 3.65 is digital modulated TDD system covering 3650 MHz up to 3700 MHz range. The system contains a base station unit and a subscriber unit.

The basic base station system configuration is all outdoor-box configurations that contain a power supply, a MODEM and the radio part.

6.2 EUT modules and sub-assemblies

Description	Manufacturer	Model or P/N	Hardware rev.	Serial number
AC power adaptor	PS1082	0525B5555	A	A30737095990

6.3 EUT options/configurations

Mode or Number	Operating mode description
Transmit	MIMO transmit mode via both Tx chains/SISO transmit mode via each chain
Option 1	EUT powered via AC power adaptor 120 VAC to 52 VDC
Option 2	EUT powered via external 48 VDC PS

6.4 Ports and lines

Port type	Port description	Conn. from	Conn. to	Qty.	Cable type	Cable length	Indoor / outdoor
RF	Antenna	Base station	Termination	2	Coax	NA	Outdoor
RF GPS	Antenna GPS	Base station	Antenna external	1	Coax	15	Outdoor
Signal	GPS In/Out	Base station (GPS Out)	Base station (GPS In)	1	Shielded	2	Outdoor
Option 1							
Power	AC power	AC mains	Power adaptor	1	Unshielded	1.5	Indoor
Signal	DATA/DC	Power adaptor	Base station	1	Shielded	3	Outdoor
Power	DC power	Base station (DC in)	Open circuit	1	Shielded	20	Outdoor
Signal	Ethernet	Power adaptor	Laptop	1	Unshielded	10	Indoor
Option 2							
Power	DC power	48 VDC supply	Base station (DC in)	1	Shielded	20	Outdoor
Signal	Ethernet	Base station	Laptop PC	1	Shielded	10	Outdoor

6.5 Support and test equipment

Description	Manufacturer	Model number	Serial number
PC laptop	IBM (lenovo)	T61	L3-CP819 08/05

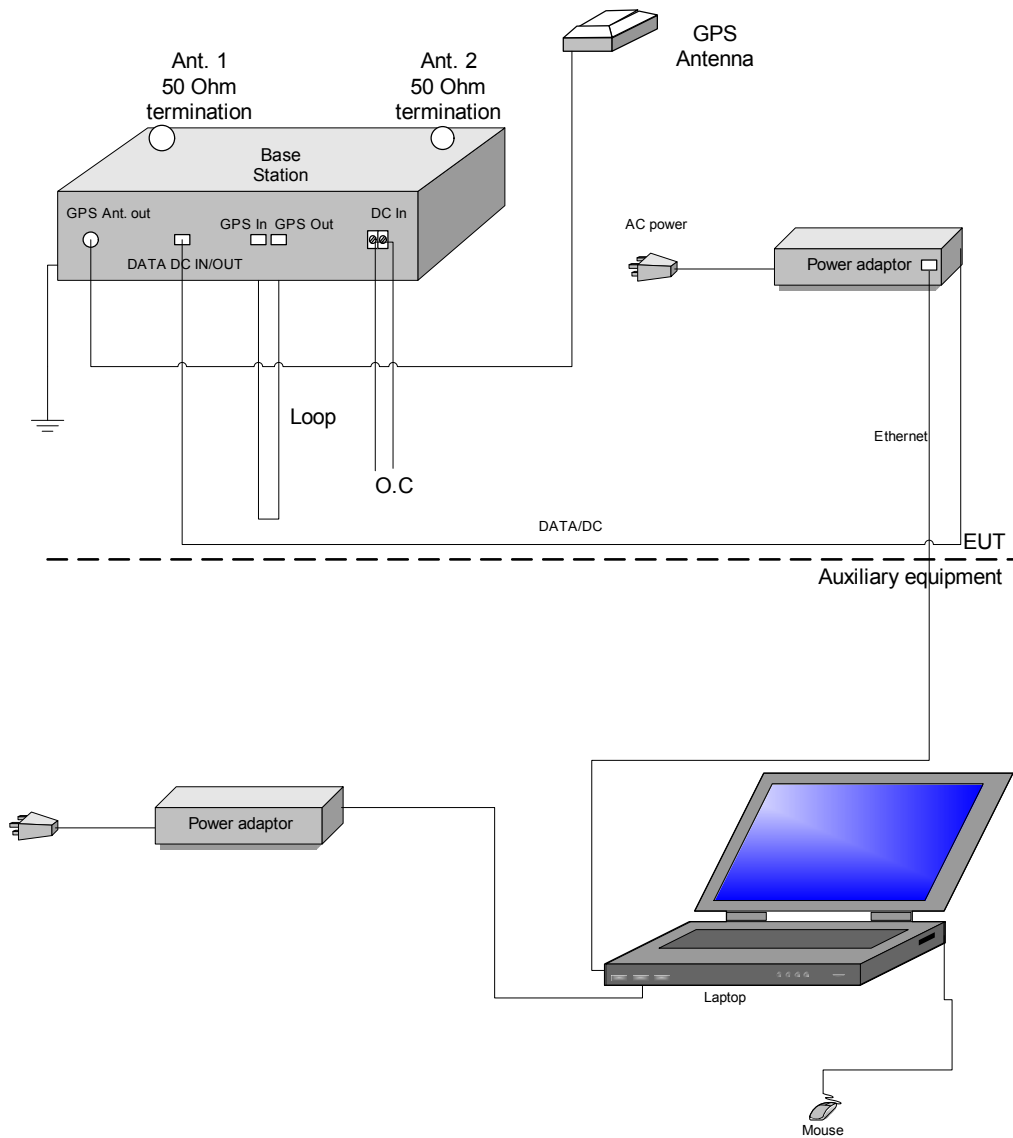
6.6 Operating frequencies

Source	Frequency, MHz
Tx/Rx	3675 - 3700
LO	3155 - 3180



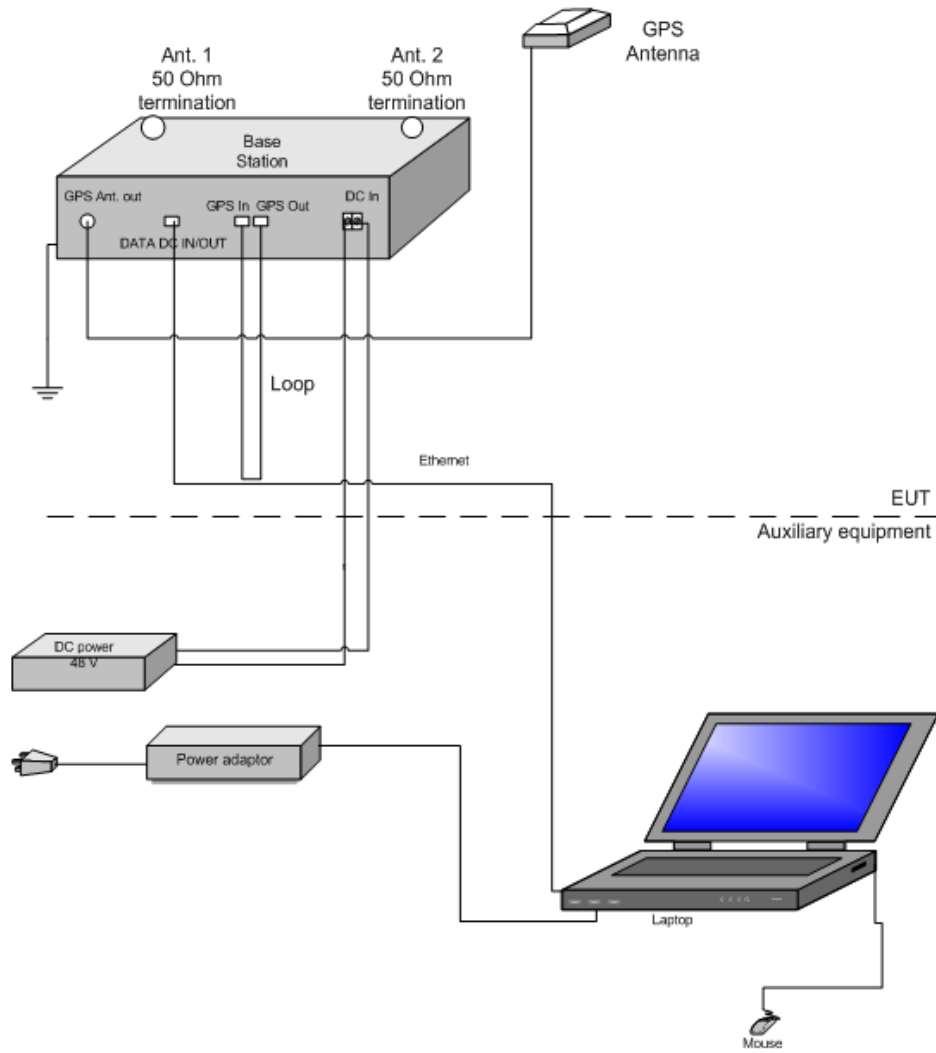
6.7 Test configuration

Option 1





Option 2





6.8 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		3650 – 3700 MHz				
Operating frequency range		3677.5 – 3697.5 MHz				
RF channel spacing		5 MHz, 7 MHz, 10 MHz, 14 MHz, 20 MHz				
Maximum rated output power		EIRP, total: 34.58 dBm for 5 MHz CBW 35.30 dBm for 7 MHz CS 37.12 dBm for 10 MHz CBW 39.00 dBm for 14 MHz CS 39.97 dBm for 20 MHz CS				
Is transmitter output power variable?		No				
		V	Yes	continuous variable		
				V	stepped variable with stepsize	1 dB
				minimum RF power		17 dBm
maximum RF power, total		25.26 dBm for 5 MHz CBW 25.73 dBm for 7 MHz CBW 27.17 dBm for 10 MHz CBW 29.42 dBm for 14 MHz CBW 29.72 dBm for 20 MHz CBW				
Antenna connection						
unique coupling	V	standard connector	V	Integral	V with temporary RF connector without temporary RF connector	
Antenna/s technical characteristics						
Type	Manufacturer	Model number	Gain	Feeder loss	Assembly gain	
Integral dual slant	PCTEL	P/N AN1429-01 Rev.A	13 dBi	NA	13.0 dBi	
External omni-directional	Alvarion	P/N 300609 Rev.A	10 dBi	0.7 dB	9.3 dBi	
External dual slant	Alvarion	P/N 300644 Rev.A	16.5 dBi	0.7 dB	15.8 dBi	
Transmitter 99% power bandwidth, MHz		5 MHz, 7 MHz, 10 MHz, 14 MHz, 20 MHz				
Type of modulation		QPSK1/2, QPSK3/4, 16QAM1/2, 16QAM3/4, 64QAM5/6				
Modulating test signal (baseband)		PRBS				
Maximum transmitter duty cycle in normal use		60%				
Transmitter power source						
		Nominal rated voltage		Battery type		
V	DC	Nominal rated voltage	48 V (option 2)			
V	AC mains	Nominal rated voltage	120 V (option 1)	Frequency	60 Hz	
Common power source for transmitter and receiver			V	yes	no	

Test specification:		Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

7 Transmitter tests according to 47CFR part 90 and RSS-197 requirements

7.1 Maximum output power

7.1.1 General

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

Table 7.1.1 Maximum output power limits

Assigned frequency range, MHz	Occupied bandwidth, MHz	Maximum peak output power, EIRP	
		W	dBm
Base and fixed stations			
3675.0 – 3700.0	5	5	37.00
	7	7	38.45
	10	10	40.00
	14	10	41.46
	20	10	43.00

7.1.2 Test procedure

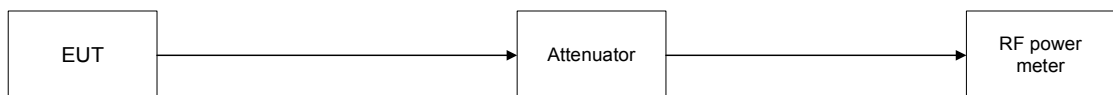
7.1.2.1 The EUT was set up as shown in Figure 7.1.1, energized and its proper operation was checked.

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

7.1.2.3 The peak output power was measured with a power meter as provided in Table 7.1.2.

7.1.2.4 All test results are provided in the associated tables.

Figure 7.1.1 Transmitter output power test setup



Test specification:	Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.2 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3677.5	22.45	21.73	25.12	9.3	34.42	37.0	-2.58	Pass
3687.5	22.42	21.72	25.09	9.3	34.39	37.0	-2.61	Pass
3697.5	22.52	21.55	25.07	9.3	34.37	37.0	-2.63	Pass
64QAM								
3677.5	22.65	21.81	25.26	9.3	34.58	37.0	-2.42	Pass
3687.5	22.61	21.79	25.23	9.3	34.53	37.0	-2.47	Pass
3697.5	22.55	21.63	25.12	9.3	34.44	37.0	-2.56	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$

*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.3 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated*, dBm	Antenna gain, dBi	EIRP total**, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3677.5	18.46	17.96	21.23	13.0	34.23	37.0	-2.77	Pass
3687.5	18.65	17.87	21.29	13.0	34.29	37.0	-2.71	Pass
3697.5	18.60	18.35	21.49	13.0	34.49	37.0	-2.51	Pass
64QAM								
3677.5	18.74	18.07	21.43	13.0	34.44	37.0	-2.56	Pass
3687.5	18.78	18.02	21.43	13.0	34.43	37.0	-2.57	Pass
3697.5	18.72	17.91	21.34	13.0	34.36	37.0	-2.64	Pass

* - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$

** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Test specification:	Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.4 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3677.5	15.71	14.82	18.30	15.8	34.10	37.0	-2.90	Pass
3687.5	15.71	14.83	18.30	15.8	34.10	37.0	-2.90	Pass
3697.5	15.68	14.75	18.25	15.8	34.05	37.0	-2.95	Pass
64QAM								
3677.5	15.82	14.87	18.38	15.8	34.20	37.0	-2.80	Pass
3687.5	15.83	14.86	18.38	15.8	34.18	37.0	-2.82	Pass
3697.5	15.76	14.76	18.30	15.8	34.11	37.0	-2.89	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)
** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$
*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.5 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3678.5	22.54	21.81	25.20	9.3	34.50	38.45	-3.95	Pass
3687.5	22.67	22.76	25.73	9.3	35.04	38.45	-3.41	Pass
3696.5	22.64	21.99	25.34	9.3	34.64	38.45	-3.81	Pass
64QAM								
3678.5	22.95	22.17	25.59	9.3	34.90	38.45	-3.55	Pass
3687.5	22.04	22.17	25.12	9.3	34.42	38.45	-4.03	Pass
3696.5	22.80	22.03	25.44	9.3	34.76	38.45	-3.69	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)
** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$
*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Test specification:		Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.6 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated*, dBm	Antenna gain, dBi	EIRP total**, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3678.5	18.75	18.01	21.41	13.0	34.41	38.45	-4.04	Pass
3687.5	18.62	17.97	21.32	13.0	34.33	38.45	-4.12	Pass
3696.5	18.64	18.10	21.39	13.0	34.39	38.45	-4.06	Pass
64QAM								
3678.5	18.93	18.31	21.64	13.0	34.66	38.45	-3.79	Pass
3687.5	18.85	18.34	21.61	13.0	34.61	38.45	-3.84	Pass
3696.5	18.80	18.19	21.52	13.0	34.53	38.45	-3.92	Pass

* - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz,Ant1})/10)} + 10^{(P(\text{dBm/MHz,Ant2})/10)})$

** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.7 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3678.5	16.62	15.97	19.32	15.8	35.12	38.45	-3.33	Pass
3687.5	16.60	15.91	19.28	15.8	35.09	38.45	-3.36	Pass
3696.5	16.67	16.03	19.37	15.8	35.17	38.45	-3.28	Pass
64QAM								
3678.5	16.87	16.03	19.48	15.8	35.30	38.45	-3.15	Pass
3687.5	16.78	16.10	19.46	15.8	35.26	38.45	-3.19	Pass
3696.5	16.75	15.92	19.37	15.8	35.18	38.45	-3.27	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz,Ant1})/10)} + 10^{(P(\text{dBm/MHz,Ant2})/10)})$

*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Test specification:		Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.8 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3680.0	24.47	23.70	27.11	9.3	36.41	40.0	-3.59	Pass
3687.5	24.41	23.74	27.10	9.3	36.41	40.0	-3.59	Pass
3695.0	24.53	23.75	27.17	9.3	36.47	40.0	-3.53	Pass
64QAM								
3680.0	24.25	23.53	26.92	9.3	36.23	40.0	-3.77	Pass
3687.5	24.30	23.65	27.00	9.3	36.30	40.0	-3.70	Pass
3695.0	24.16	23.65	26.92	9.3	36.24	40.0	-3.76	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$

*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.9 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated*, dBm	Antenna gain, dBi	EIRP total**, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3680.0	20.74	19.80	23.31	13.0	36.31	40.0	-3.69	Pass
3687.5	20.72	19.75	23.27	13.0	36.29	40.0	-3.71	Pass
3695.0	20.21	19.78	23.01	13.0	36.01	40.0	-3.99	Pass
64QAM								
3680.0	20.48	19.43	23.00	13.0	36.01	40.0	-3.99	Pass
3687.5	20.28	19.42	22.88	13.0	35.88	40.0	-4.12	Pass
3695.0	20.27	19.38	22.86	13.0	35.87	40.0	-4.13	Pass

* - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$

** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Test specification:	Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.10 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3680.0	18.47	17.92	21.21	15.80	37.01	40.0	-2.99	Pass
3687.5	18.67	17.89	21.31	15.80	37.12	40.0	-2.88	Pass
3695.0	18.57	17.84	21.23	15.80	37.03	40.0	-2.97	Pass
64QAM								
3680.0	18.42	17.64	21.06	15.80	36.87	40.0	-3.13	Pass
3687.5	18.34	17.51	20.96	15.80	36.76	40.0	-3.24	Pass
3695.0	18.41	17.56	21.02	15.80	36.83	40.0	-3.17	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)
** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$
*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.11 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3682.0	26.15	25.50	28.85	9.3	38.15	41.46	-3.31	Pass
3687.5	26.43	25.86	29.16	9.3	38.48	41.46	-2.98	Pass
3693.0	26.37	25.58	29.00	9.3	38.30	41.46	-3.16	Pass
64QAM								
3682.0	26.60	25.78	29.22	9.3	38.54	41.46	-2.92	Pass
3687.5	26.88	25.88	29.42	9.3	38.72	41.46	-2.74	Pass
3693.0	26.29	25.71	29.02	9.3	38.34	41.46	-3.12	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)
** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz, Ant1})/10)} + 10^{(P(\text{dBm/MHz, Ant2})/10)})$
*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Test specification:	Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.12 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi	EIRP total**, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3682.0	23.12	22.21	25.70	13.0	38.70	41.46	-2.76	Pass
3687.5	23.11	22.38	25.77	13.0	38.79	41.46	-2.67	Pass
3693.0	23.30	22.58	25.97	13.0	38.97	41.46	-2.49	Pass
64QAM								
3682.0	23.34	22.58	25.99	13.0	39.00	41.46	-2.46	Pass
3687.5	23.28	22.50	25.92	13.0	38.92	41.46	-2.54	Pass
3693.0	23.12	22.48	25.82	13.0	38.84	41.46	-2.62	Pass

* - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz,Ant1})/10)} + 10^{(P(\text{dBm/MHz,Ant2})/10)})$

** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.13 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3682.0	20.48	19.61	23.08	15.80	38.88	41.46	-2.58	Pass
3687.5	20.20	19.48	22.87	15.80	38.68	41.46	-2.78	Pass
3693.0	20.38	19.44	22.95	15.80	38.75	41.46	-2.71	Pass
64QAM								
3682.0	20.53	19.57	23.09	15.80	38.90	41.46	-2.56	Pass
3687.5	20.48	19.58	23.06	15.80	38.86	41.46	-2.60	Pass
3693.0	20.47	19.68	23.10	15.80	38.92	41.46	-2.54	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz,Ant1})/10)} + 10^{(P(\text{dBm/MHz,Ant2})/10)})$

*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Test specification:	Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power		
Test procedure:	47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict: PASS	
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.14 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3685.0	27.77	25.31	29.72	9.3	39.02	43.0	-3.98	Pass
3687.5	26.16	25.56	28.88	9.3	38.20	43.0	-4.80	Pass
3690.0	26.42	25.73	29.10	9.3	38.40	43.0	-4.60	Pass
64QAM								
3685.0	26.13	25.57	28.87	9.3	38.18	43.0	-4.82	Pass
3687.5	26.15	25.30	28.76	9.3	38.06	43.0	-4.94	Pass
3690.0	26.20	25.44	28.85	9.3	38.16	43.0	-4.84	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz}, \text{Ant1})/10)} + 10^{(P(\text{dBm/MHz}, \text{Ant2})/10)})$

*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Table 7.1.15 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi	EIRP total**, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3685.0	23.98	23.41	26.71	13.0	39.71	43.0	-3.29	Pass
3687.5	24.14	23.58	26.88	13.0	39.89	43.0	-3.11	Pass
3690.0	24.08	23.46	26.79	13.0	39.79	43.0	-3.21	Pass
64QAM								
3685.0	24.31	23.41	26.89	13.0	39.91	43.0	-3.09	Pass
3687.5	24.28	23.61	26.97	13.0	39.97	43.0	-3.03	Pass
3690.0	24.12	23.49	26.83	13.0	39.84	43.0	-3.16	Pass

** - RF output power calculated, dBm/MHz = $10 \log(10^{(P(\text{dBm/MHz}, \text{Ant1})/10)} + 10^{(P(\text{dBm/MHz}, \text{Ant2})/10)})$

*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi



Test specification:		Section 90.1321 / RSS-197, Section 5.6, Maximum conducted output power	
Test procedure:		47 CFR, Section 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/17/2011 - 4/28/2011		
Temperature: 24.2 °C	Air Pressure: 1005 hPa	Relative Humidity: 42 %	Power Supply: 48 VDC
Remarks:			

Table 7.1.16 EIRP test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Average (Power Meter)
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	RF output power, dBm		Total RF output power calculated**, dBm	Antenna gain, dBi*	EIRP total***, dBm	Limit, dBm	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3685.0	20.97	20.22	23.62	15.80	39.42	43.0	-3.58	Pass
3687.5	21.08	20.18	23.66	15.80	39.48	43.0	-3.52	Pass
3690.0	21.28	20.38	23.86	15.80	39.66	43.0	-3.34	Pass
64QAM								
3685.0	21.04	20.38	23.73	15.80	39.55	43.0	-3.45	Pass
3687.5	21.30	20.40	23.88	15.80	39.68	43.0	-3.32	Pass
3690.0	21.32	20.42	23.90	15.80	39.72	43.0	-3.28	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)
** - RF output power calculated, dBm/MHz = 10 log(10^((P(dBm/MHz,Ant1)/10)+ 10^((P(dBm/MHz,Ant2)/10)))
*** - EIRP total, dBm/MHz = RF output power calculated, dBm/MHz + Antenna Assembly Gain, dBi

Reference numbers of test equipment used

HL 2952	HL 3301	HL 3302					
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Full description is given in Appendix A.

Test specification:		Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure:		47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2011 - 4/28/2011		
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

7.2 EIRP power density

7.2.1 General

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

Table 7.2.1 Power density limits

Assigned frequency range, MHz	Occupied bandwidth, MHz	Maximum power spectral density, EIRP	
		W/MHz	dBm/MHz
Base and fixed stations			
3675.0 – 3700.0	5	1	30
	7		
	10		
	14		
	20		

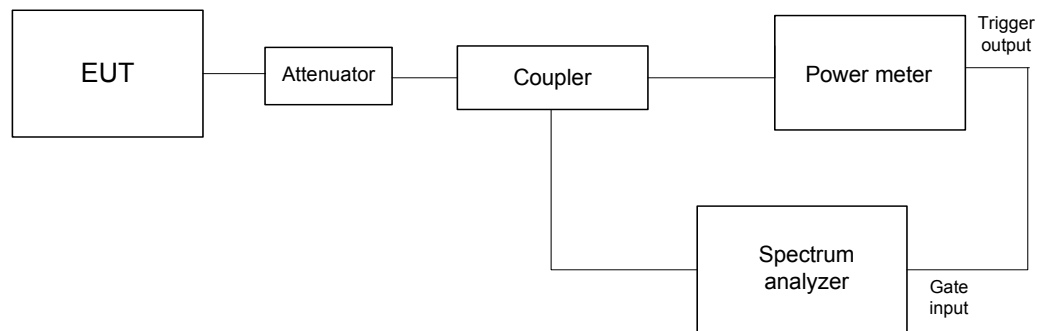
7.2.2 Test procedure

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

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

7.2.2.3 The peak output power density was measured with spectrum analyzer as provided in the associated tables and plots.

Figure 7.2.1 Peak power density test setup



Test specification:	Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density		
Test procedure:	47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1		
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2011 - 4/28/2011		
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.2 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3677.5	17.19	16.54	19.91	9.3	29.19	30.0	-0.81	Pass
3687.5	17.33	16.59	19.99	9.3	29.29	30.0	-0.71	Pass
3697.5	17.44	16.48	20.00	9.3	29.30	30.0	-0.70	Pass
64QAM								
3677.5	17.69	16.77	20.26	9.3	29.58	30.0	-0.42	Pass
3687.5	17.48	16.69	20.11	9.3	29.41	30.0	-0.59	Pass
3697.5	17.44	16.63	20.06	9.3	29.38	30.0	-0.62	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.3 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated*, dBm/MHz	Antenna assembly gain, dBi	Peak power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3677.5	13.49	13.44	16.48	13.0	29.48	30.00	-0.52	Pass
3687.5	13.58	12.73	16.19	13.0	29.19	30.00	-0.81	Pass
3697.5	13.49	12.72	16.13	13.0	29.13	30.00	-0.87	Pass
64QAM								
3677.5	13.81	13.01	16.44	13.0	29.45	30.00	-0.55	Pass
3687.5	13.79	12.96	16.41	13.0	29.41	30.00	-0.59	Pass
3697.5	13.68	12.84	16.29	13.0	29.31	30.00	-0.69	Pass

* - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.4 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3677.5	10.55	9.65	13.13	15.8	28.93	30.00	-1.07	Pass
3687.5	10.63	9.81	13.25	15.8	29.05	30.00	-0.95	Pass
3697.5	10.53	9.65	13.12	15.8	28.92	30.00	-1.08	Pass
64QAM								
3677.5	10.84	9.78	13.35	15.8	29.17	30.00	-0.83	Pass
3687.5	10.83	9.77	13.34	15.8	29.14	30.00	-0.86	Pass
3697.5	10.69	9.78	13.27	15.8	29.08	30.00	-0.92	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{\frac{P(\text{dBm/MHz, Ant. 1})}{10}} + 10^{\frac{P(\text{dBm/MHz, Ant. 2})}{10}}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.5 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3678.5	17.14	16.12	19.67	9.3	28.97	30.0	-1.03	Pass
3687.5	17.25	16.26	19.79	9.3	29.11	30.0	-0.89	Pass
3696.5	17.21	16.81	20.02	9.3	29.32	30.0	-0.68	Pass
64QAM								
3678.5	17.81	17.26	20.55	9.3	29.87	30.0	-0.13	Pass
3687.5	17.40	16.99	20.21	9.3	29.51	30.0	-0.49	Pass
3696.5	17.30	17.06	20.19	9.3	29.51	30.0	-0.49	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{\frac{P(\text{dBm/MHz, Ant. 1})}{10}} + 10^{\frac{P(\text{dBm/MHz, Ant. 2})}{10}}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.6 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated*, dBm/MHz	Antenna assembly gain, dBi	Peak power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3678.5	13.31	12.24	15.82	13.00	28.82	30.00	-1.18	Pass
3687.5	13.11	12.21	15.69	13.00	28.71	30.00	-1.29	Pass
3696.5	13.07	12.54	15.82	13.00	28.82	30.00	-1.18	Pass
64QAM								
3678.5	13.69	13.51	16.61	13.00	29.63	30.00	-0.37	Pass
3687.5	13.36	13.60	16.49	13.00	29.49	30.00	-0.51	Pass
3696.5	13.19	13.15	16.18	13.00	29.20	30.00	-0.80	Pass

* - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.7 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3678.5	11.35	10.39	13.91	15.8	29.71	30.00	-0.29	Pass
3687.5	10.29	9.53	12.94	15.8	28.75	30.00	-1.25	Pass
3696.5	10.97	10.01	13.53	15.8	29.33	30.00	-0.67	Pass
64QAM								
3678.5	10.49	9.62	13.09	15.8	28.90	30.00	-1.10	Pass
3687.5	10.36	9.64	13.03	15.8	28.83	30.00	-1.17	Pass
3696.5	10.30	11.04	13.70	15.8	29.51	30.00	-0.49	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.8 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3680.0	16.70	15.86	19.31	9.3	28.61	30.0	-1.39	Pass
3687.5	16.84	16.02	19.46	9.3	28.78	30.0	-1.22	Pass
3695.0	16.83	16.03	19.46	9.3	28.76	30.0	-1.24	Pass
64QAM								
3680.0	16.86	15.98	19.45	9.3	28.77	30.0	-1.23	Pass
3687.5	16.70	15.98	19.37	9.3	28.67	30.0	-1.33	Pass
3695.0	16.71	15.98	19.37	9.3	28.69	30.0	-1.31	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{\wedge}[P(\text{dBm/MHz, Ant.1})/10] + 10^{\wedge}[P(\text{dBm/MHz, Ant.2})/10]\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.9 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated*, dBm/MHz	Antenna assembly gain, dBi	Peak power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3680.0	13.08	11.97	15.57	13.00	28.57	30.00	-1.43	Pass
3687.5	12.99	11.87	15.48	13.00	28.49	30.00	-1.51	Pass
3695.0	12.49	11.96	15.24	13.00	28.24	30.00	-1.76	Pass
64QAM								
3680.0	13.07	11.90	15.53	13.00	28.55	30.00	-1.45	Pass
3687.5	12.93	12.01	15.50	13.00	28.50	30.00	-1.50	Pass
3695.0	12.95	11.95	15.49	13.00	28.50	30.00	-1.50	Pass

* - Total power density, dBm/MHz = $10 \log\{10^{\wedge}[P(\text{dBm/MHz, Ant.1})/10] + 10^{\wedge}[P(\text{dBm/MHz, Ant.2})/10]\}$

** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification:		Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure:		47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2011 - 4/28/2011		
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.10 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3680.0	10.85	10.07	13.49	15.80	29.29	30.00	-0.71	Pass
3687.5	10.96	10.05	13.54	15.80	29.35	30.00	-0.65	Pass
3695.0	11.08	9.97	13.57	15.80	29.37	30.00	-0.63	Pass
64QAM								
3680.0	11.03	10.14	13.62	15.80	29.43	30.00	-0.57	Pass
3687.5	10.97	9.93	13.49	15.80	29.29	30.00	-0.71	Pass
3695.0	10.98	10.08	13.56	15.80	29.38	30.00	-0.62	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.11 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3682.0	16.64	15.89	19.29	9.3	28.59	30.0	-1.41	Pass
3687.5	17.06	16.68	19.88	9.3	29.20	30.0	-0.80	Pass
3693.0	17.04	16.27	19.68	9.3	28.98	30.0	-1.02	Pass
64QAM								
3682.0	17.23	16.31	19.80	9.3	29.12	30.0	-0.88	Pass
3687.5	17.51	16.66	20.12	9.3	29.42	30.0	-0.58	Pass
3693.0	17.14	16.57	19.87	9.3	29.19	30.0	-0.81	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance		Verdict: PASS	
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.12 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated*, dBm/MHz	Antenna assembly gain, dBi	Peak power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3682.0	13.82	13.06	16.47	13.00	29.47	30.00	-0.53	Pass
3687.5	13.75	13.17	16.48	13.00	29.50	30.00	-0.50	Pass
3693.0	14.03	13.19	16.64	13.00	29.64	30.00	-0.36	Pass
64QAM								
3682.0	14.24	13.25	16.78	13.00	29.80	30.00	-0.20	Pass
3687.5	14.26	13.53	16.92	13.00	29.92	30.00	-0.08	Pass
3693.0	13.94	13.32	16.65	13.00	29.67	30.00	-0.33	Pass

* - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant.1})/10]} + 10^{[P(\text{dBm/MHz, Ant.2})/10]}\}$

** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.13 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3682.0	11.18	10.32	13.78	15.80	29.58	30.00	-0.42	Pass
3687.5	10.97	10.31	13.66	15.80	29.48	30.00	-0.52	Pass
3693.0	11.16	10.30	13.76	15.80	29.56	30.00	-0.44	Pass
64QAM								
3682.0	11.47	10.35	13.96	15.80	29.77	30.00	-0.23	Pass
3687.5	11.40	10.40	13.94	15.80	29.74	30.00	-0.26	Pass
3693.0	11.41	10.63	14.05	15.80	29.86	30.00	-0.14	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant.1})/10]} + 10^{[P(\text{dBm/MHz, Ant.2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification:		Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure:		47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode:	Compliance	Verdict:	PASS
Date:	4/18/2011 - 4/28/2011		
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.14 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 9.3 dBi
CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3685.0	15.18	14.79	18.00	9.30	27.30	30.00	-2.70	Pass
3687.5	15.70	14.99	18.37	9.30	27.69	30.00	-2.31	Pass
3690.0	15.86	15.20	18.55	9.30	27.85	30.00	-2.15	Pass
64QAM								
3685.0	15.81	15.36	18.60	9.30	27.92	30.00	-2.08	Pass
3687.5	15.89	15.09	18.52	9.30	27.82	30.00	-2.18	Pass
3690.0	15.83	15.19	18.53	9.30	27.85	30.00	-2.15	Pass

* - Antenna assembly gain = Antenna gain (10 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Table 7.2.15 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 13 dBi
CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated*, dBm/MHz	Antenna assembly gain, dBi	Peak power density**, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3685.0	13.39	12.86	16.14	13.00	29.14	30.00	-0.86	Pass
3687.5	13.44	13.03	16.25	13.00	29.27	30.00	-0.73	Pass
3690.0	13.48	12.89	16.21	13.00	29.21	30.00	-0.79	Pass
64QAM								
3685.0	13.92	12.97	16.48	13.00	29.50	30.00	-0.50	Pass
3687.5	13.84	13.19	16.54	13.00	29.54	30.00	-0.46	Pass
3690.0	13.85	13.04	16.47	13.00	29.49	30.00	-0.51	Pass

* - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Table 7.2.16 EIRP power density test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
DETECTOR USED: Peak
RESOLUTION BANDWIDTH: 1000 kHz
VIDEO BANDWIDTH: 3000 kHz
MODULATION: QPSK/64QAM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
ANTENNA ASSEMBLY GAIN*: 15.8 dBi
CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	SA reading, dBm/MHz		Total power density calculated**, dBm/MHz	Antenna assembly gain, dBi*	Peak power density***, dBm/MHz	Limit, dBm/MHz	Margin, dB	Verdict
	Ant. 1	Ant. 2						
QPSK								
3685.0	10.38	9.71	13.07	15.80	28.87	30.00	-1.13	Pass
3687.5	10.40	9.57	13.02	15.80	28.83	30.00	-1.17	Pass
3690.0	10.66	9.78	13.25	15.80	29.05	30.00	-0.95	Pass
64QAM								
3685.0	10.68	10.01	13.37	15.80	29.18	30.00	-0.82	Pass
3687.5	10.75	10.01	13.41	15.80	29.21	30.00	-0.79	Pass
3690.0	10.83	10.01	13.45	15.80	29.27	30.00	-0.73	Pass

* - Antenna assembly gain = Antenna gain (16.5 dBi) – minimum declared feeder loss (0.7 dB)

** - Total power density, dBm/MHz = $10 \log\{10^{[P(\text{dBm/MHz, Ant. 1})/10]} + 10^{[P(\text{dBm/MHz, Ant. 2})/10]}\}$

*** - Peak power density, dBm/MHz = Total power density*, dBm/MHz + Antenna Gain, dBi

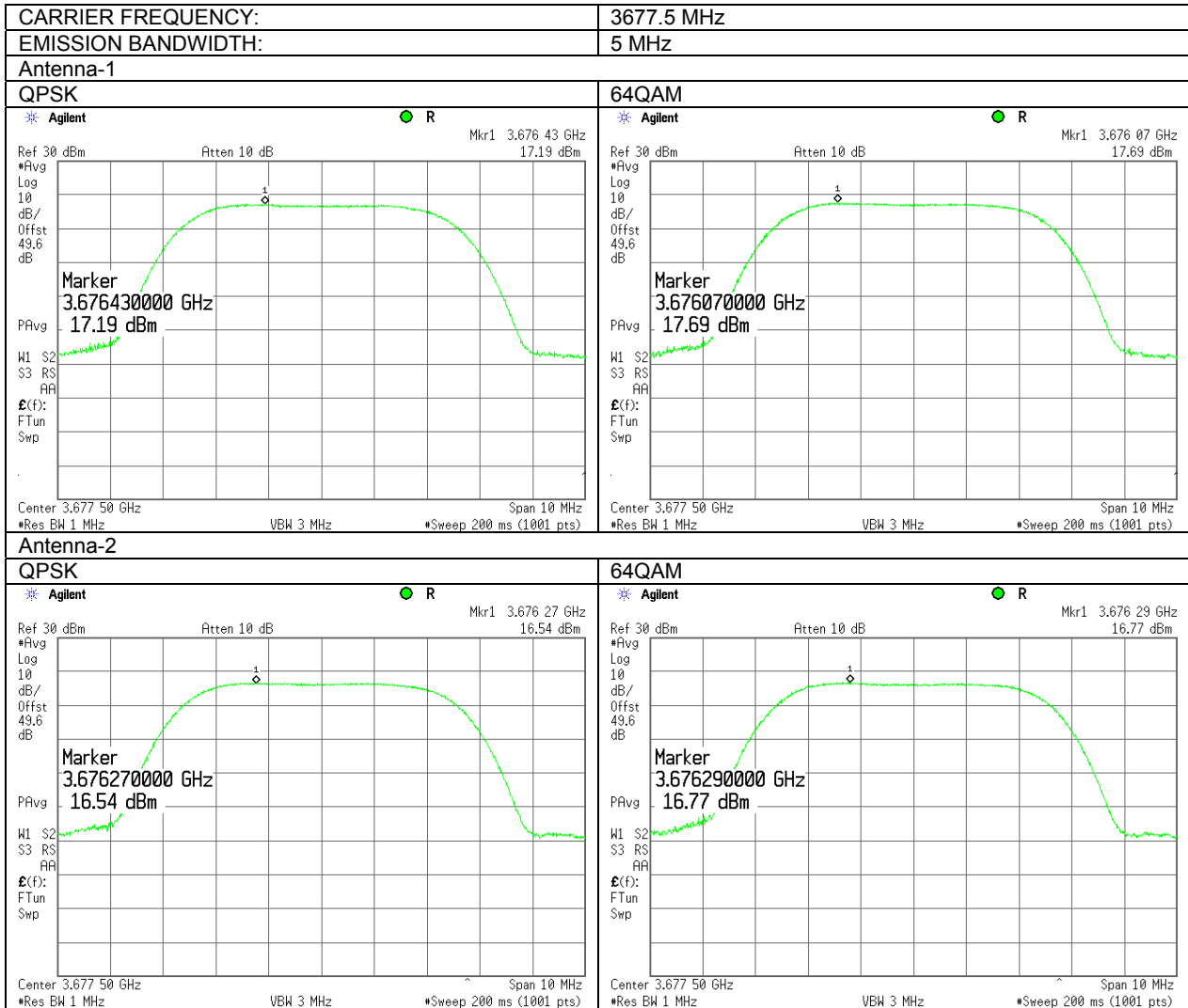
Reference numbers of test equipment used

HL 2818	HL 2952	HL 3301	HL 3302	HL 3763	HL 3818	HL 3868	
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Full description is given in Appendix A.

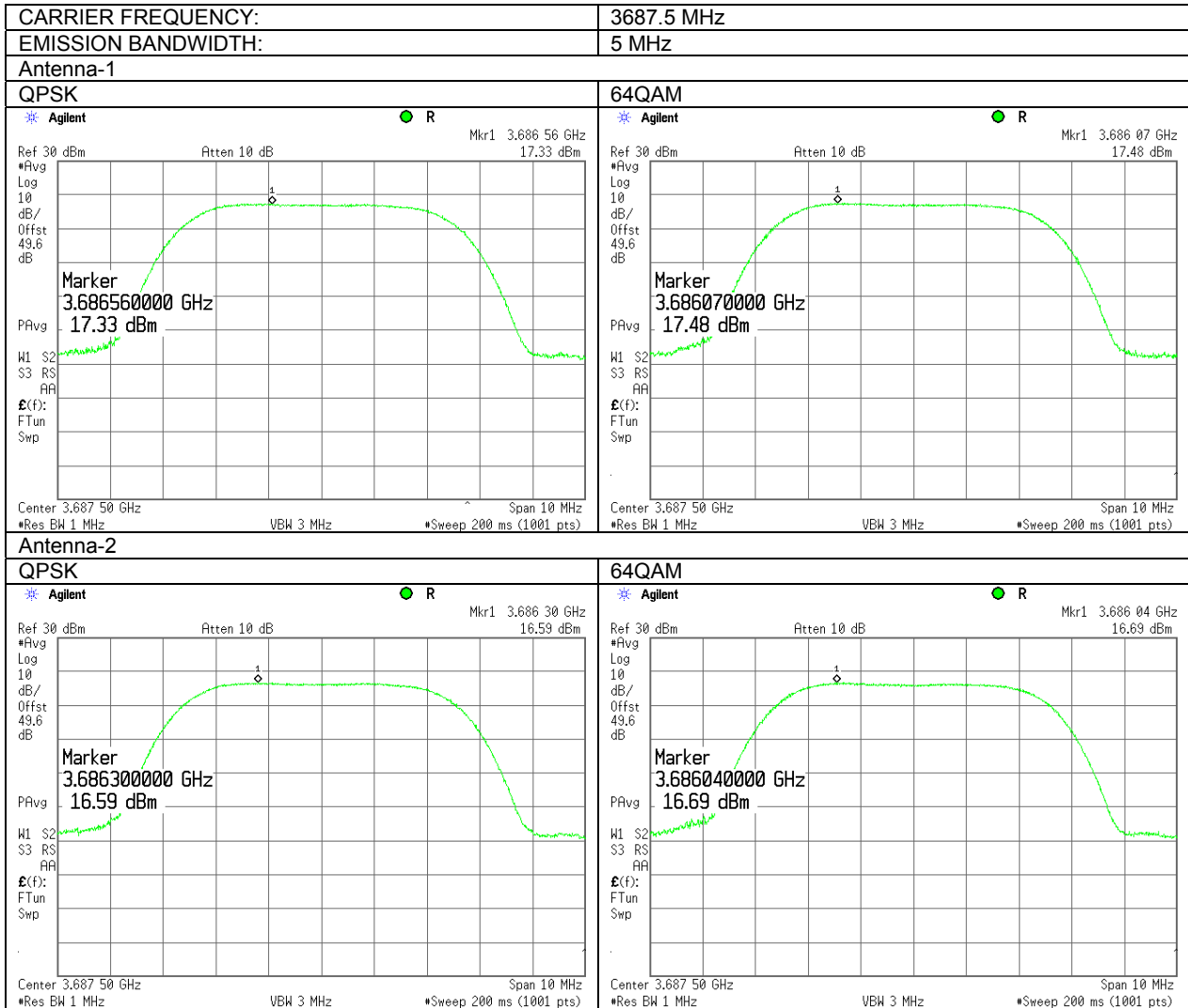
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.1 EIRP spectral density test results at low frequency with 9.3 dBi antenna



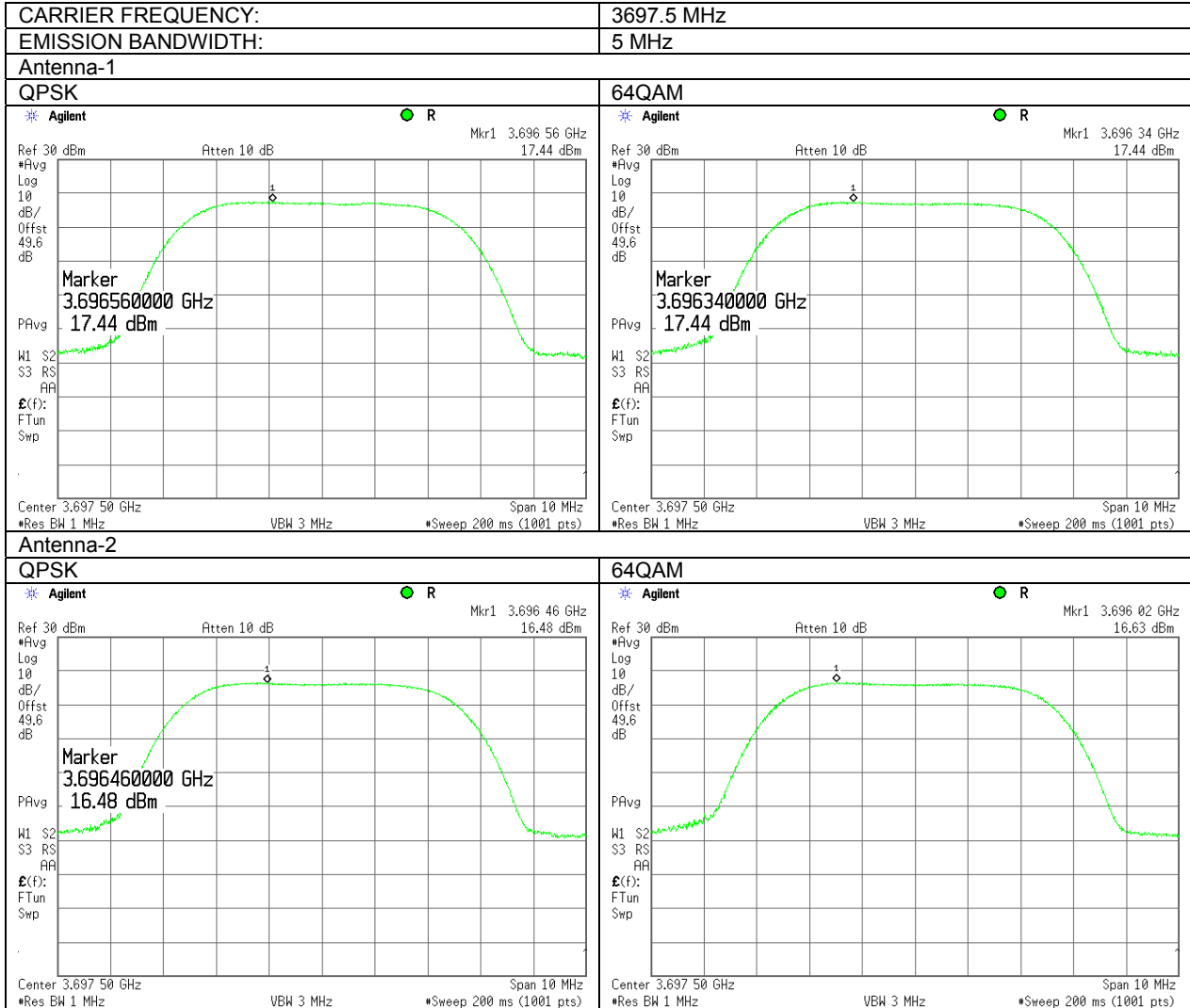
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.2 EIRP spectral density test results at mid frequency with 9.3 dBi antenna



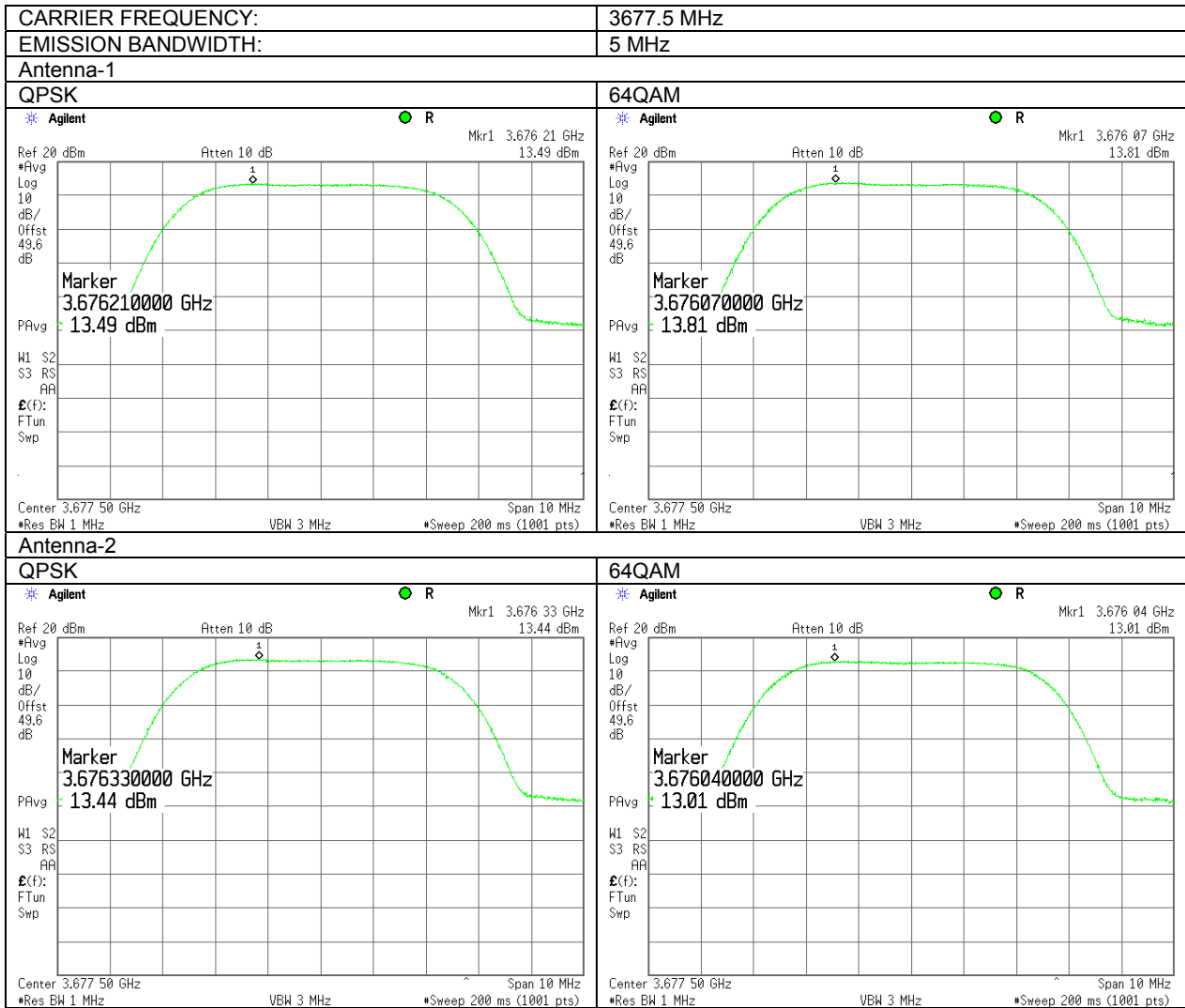
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.3 EIRP spectral density test results at high frequency with 9.3 dBi antenna



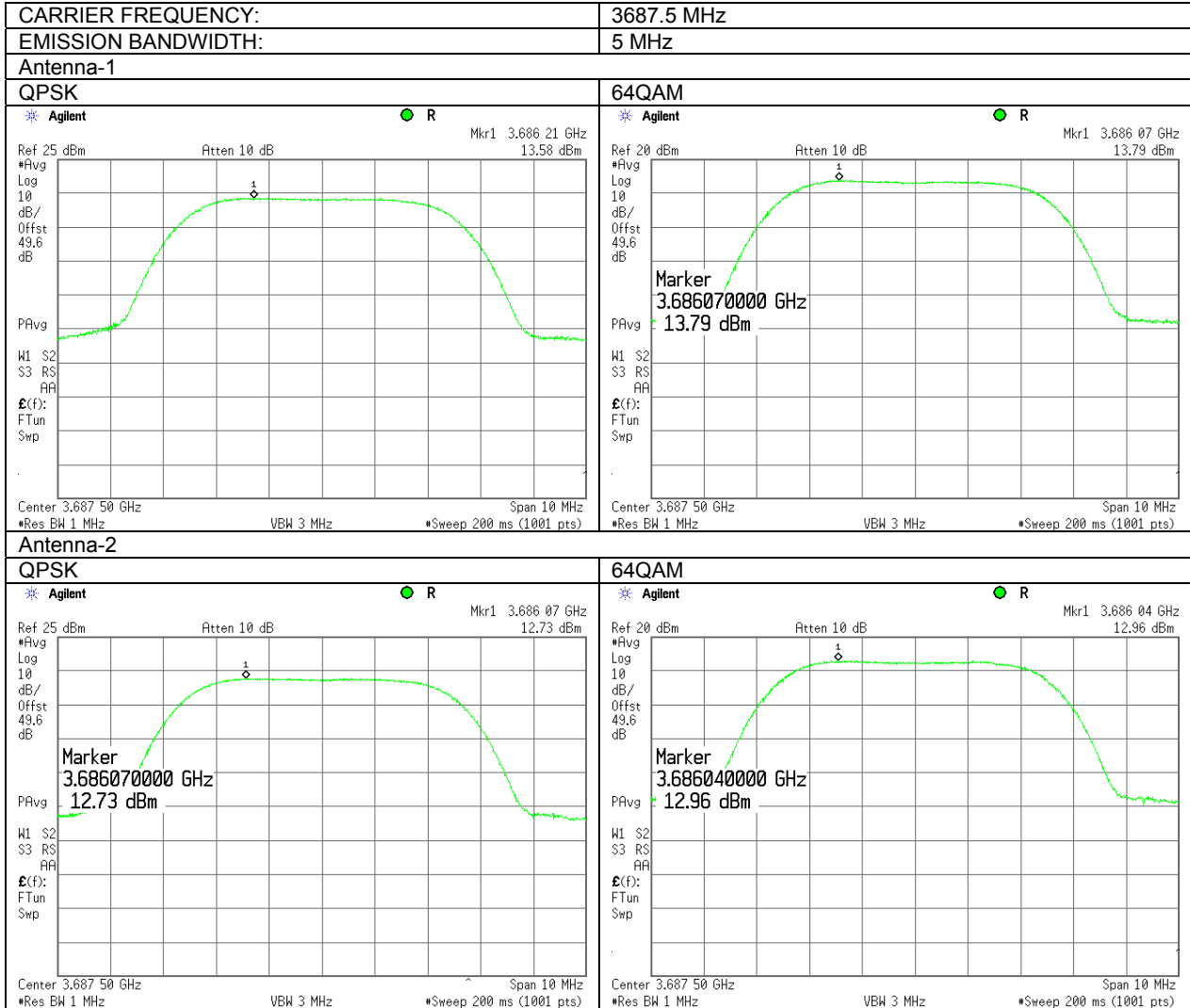
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.4 EIRP spectral density test results at low frequency with 13 dBi antenna



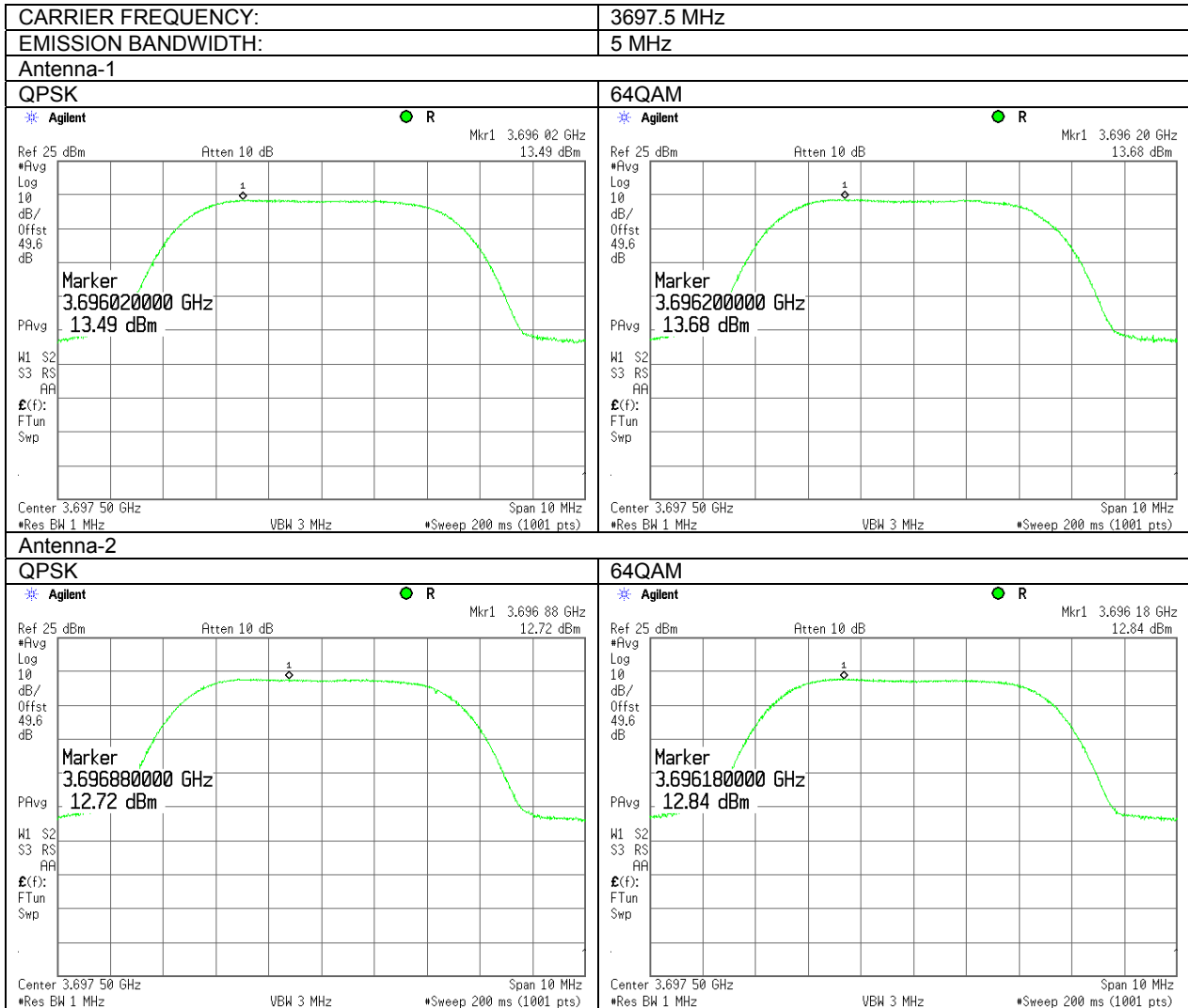
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.5 EIRP spectral density test results at mid frequency with 13 dBi antenna



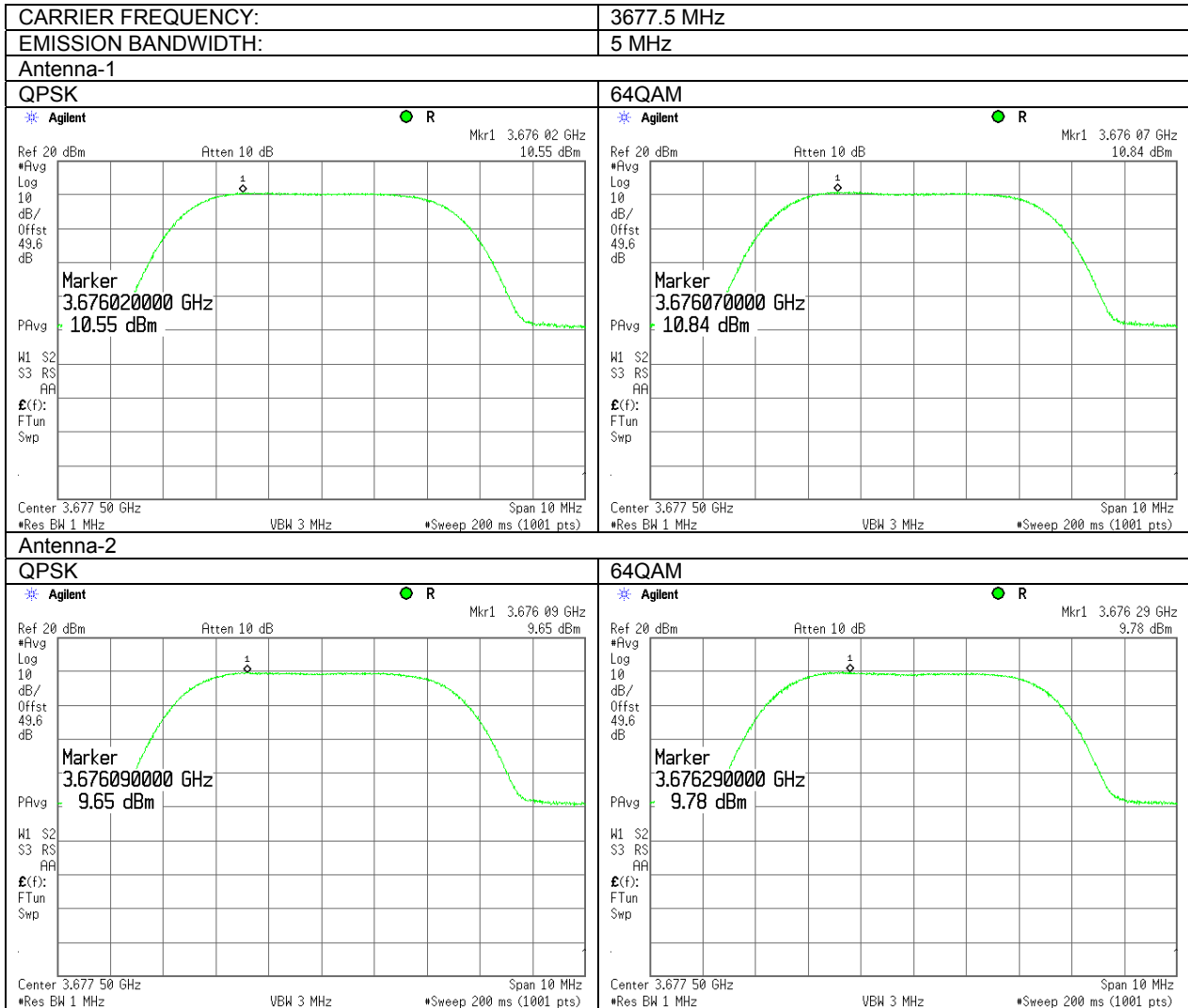
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.6 EIRP spectral density test results at high frequency with 13 dBi antenna



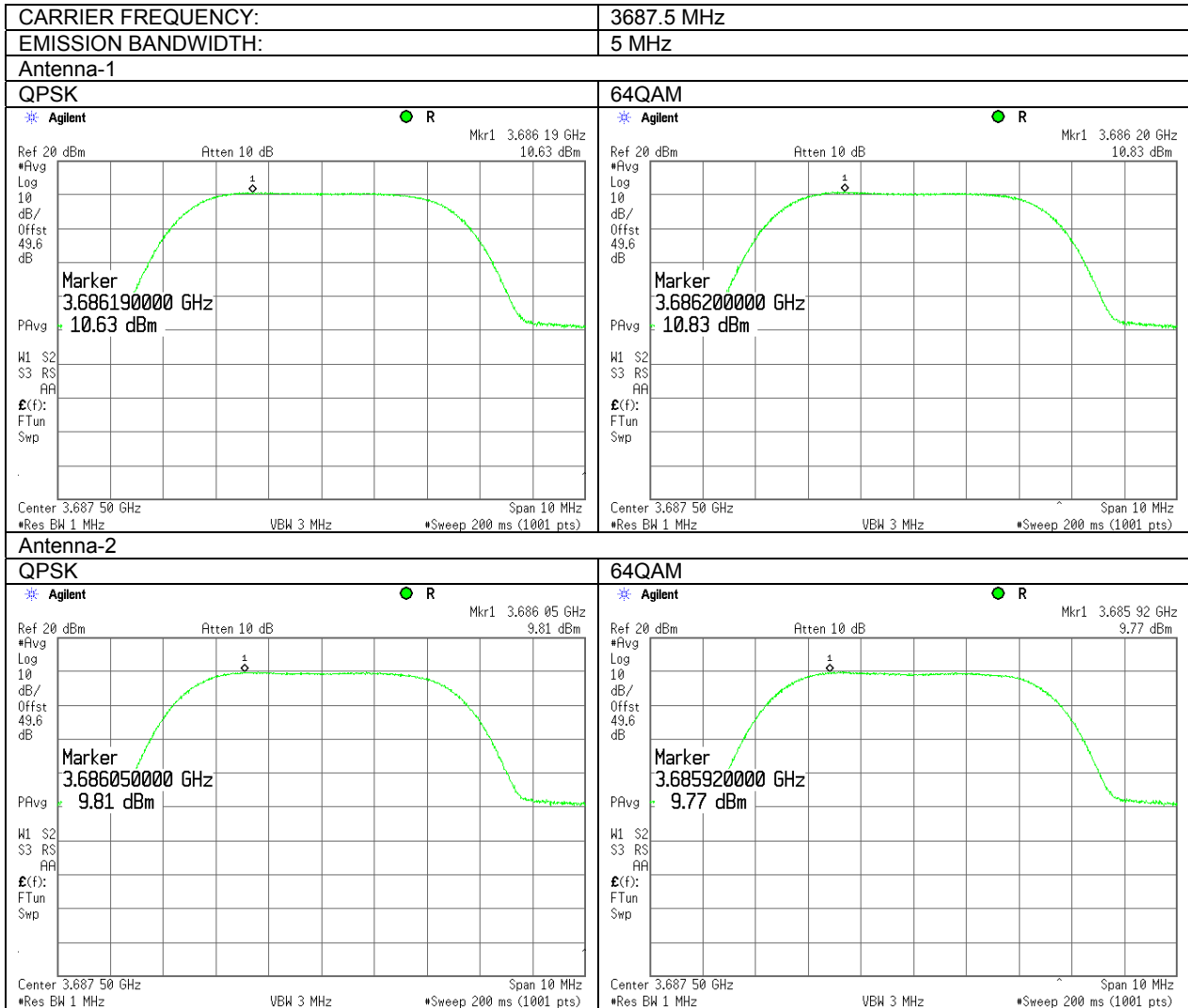
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.7 EIRP spectral density test results at low frequency with 15.8 dBi antenna



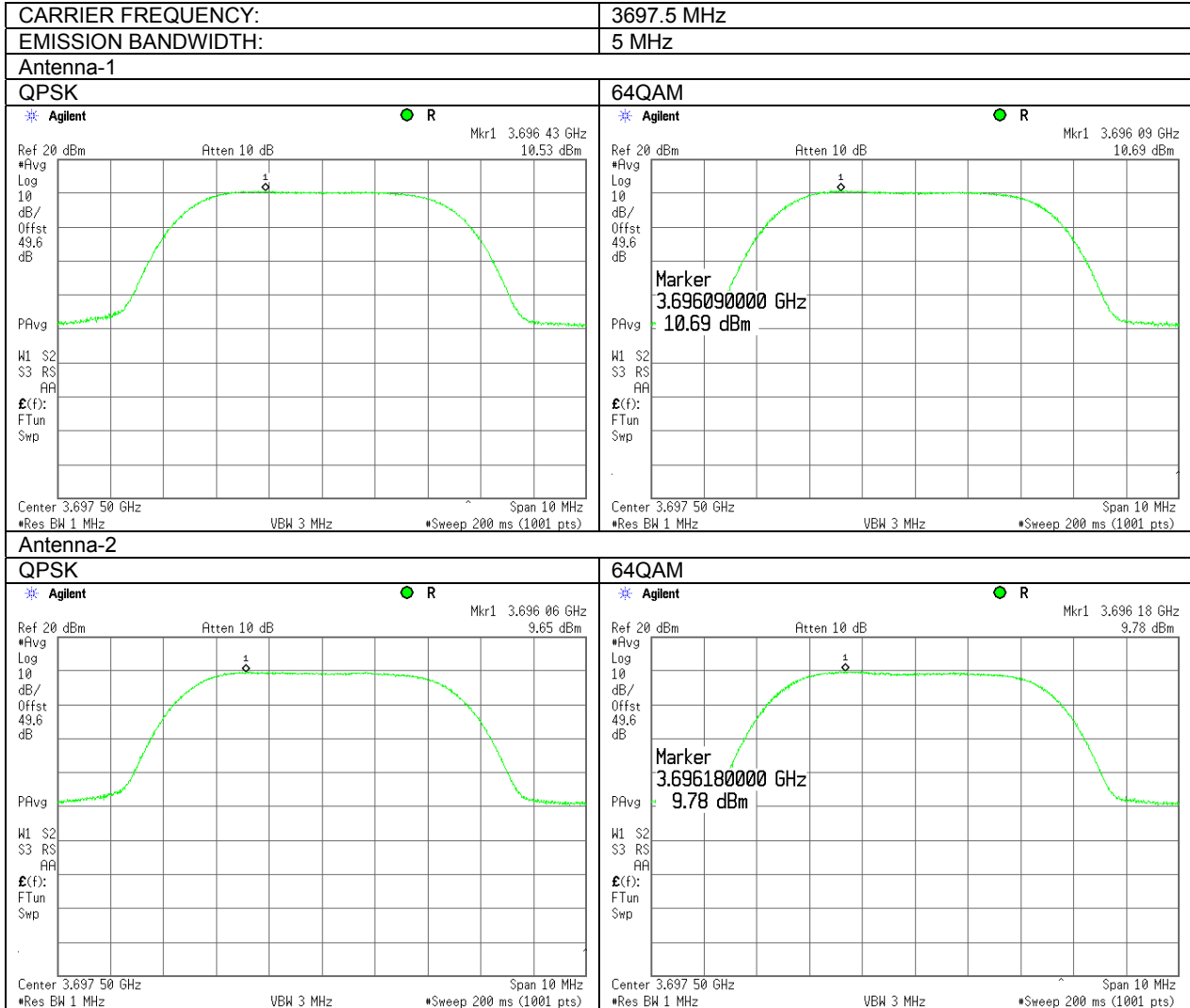
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.8 EIRP spectral density test results at mid frequency with 15.8 dBi antenna



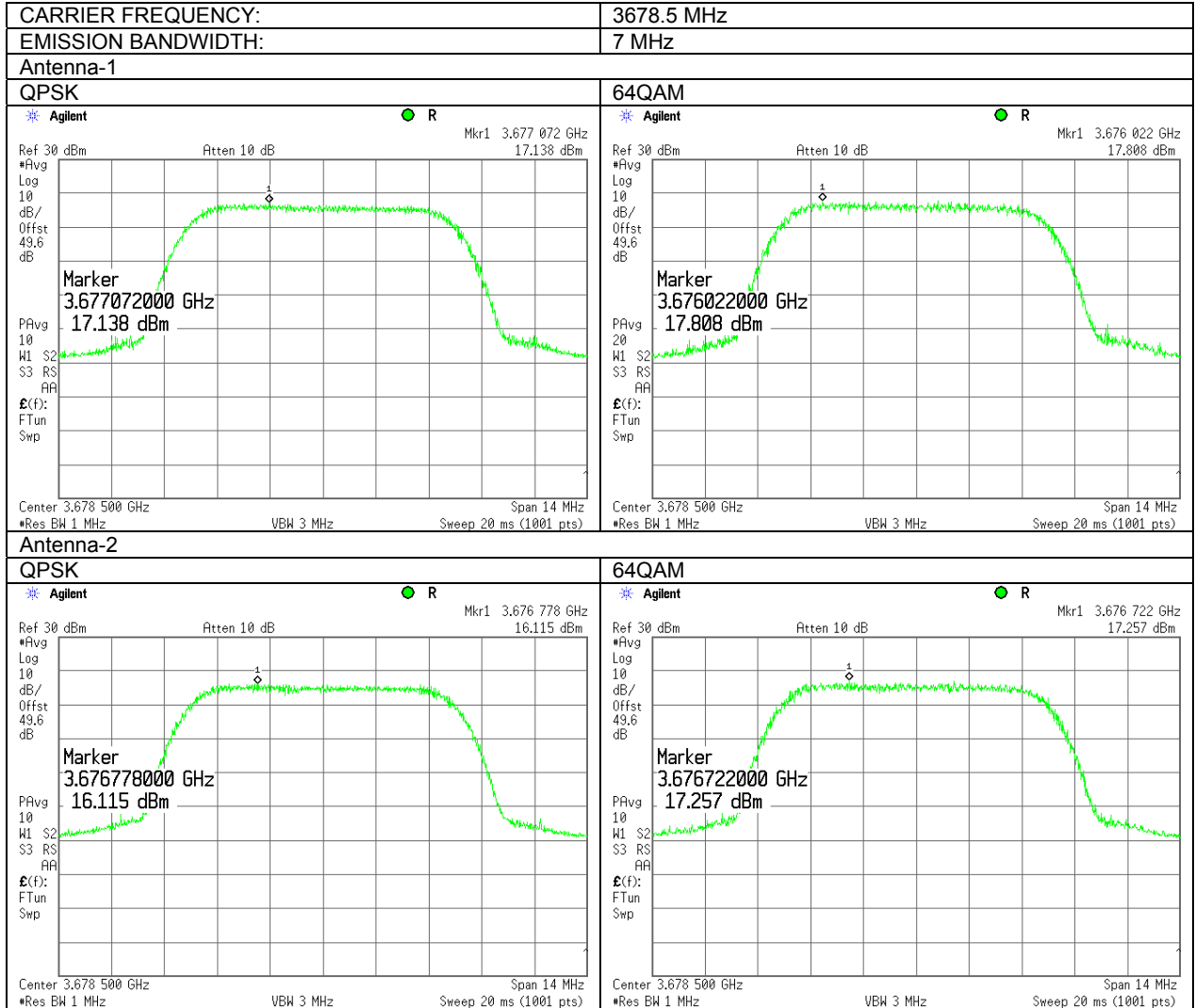
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.9 EIRP spectral density test results at high frequency with 15.8 dBi antenna



Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.10 EIRP spectral density test results at low frequency with 9.3 dBi antenna

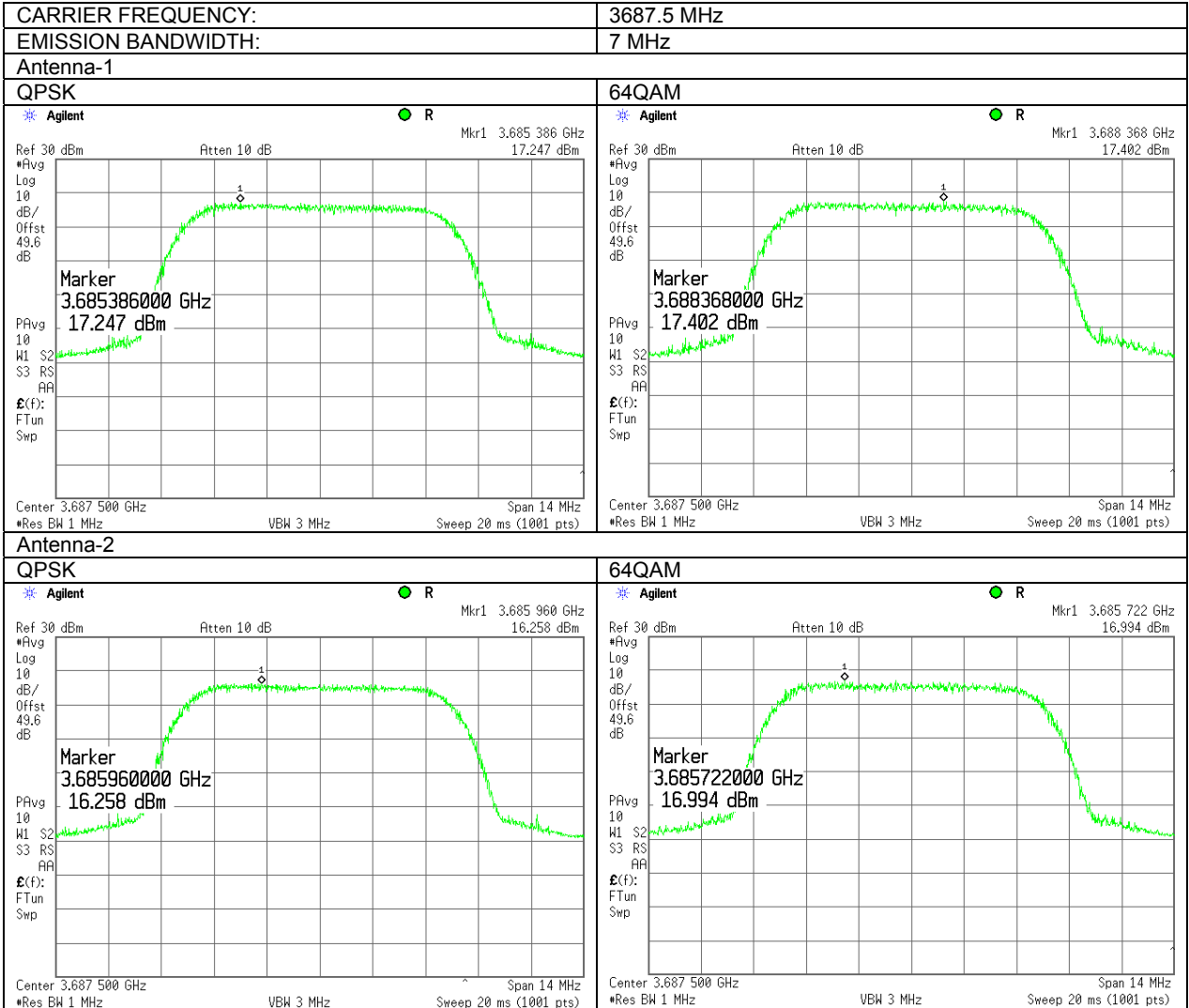




HERMON LABORATORIES

Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.11 EIRP spectral density test results at mid frequency with 9.3 dBi antenna

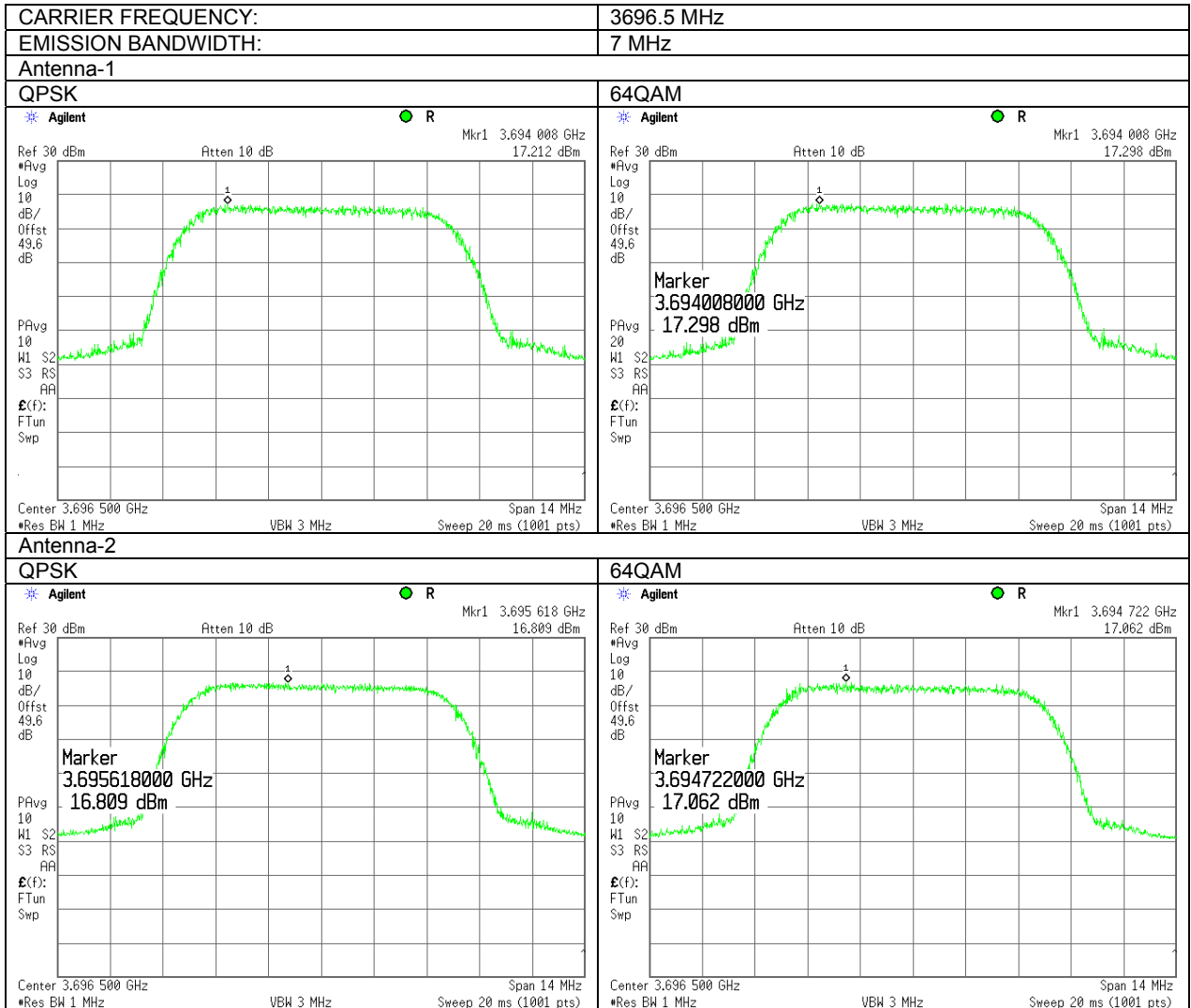




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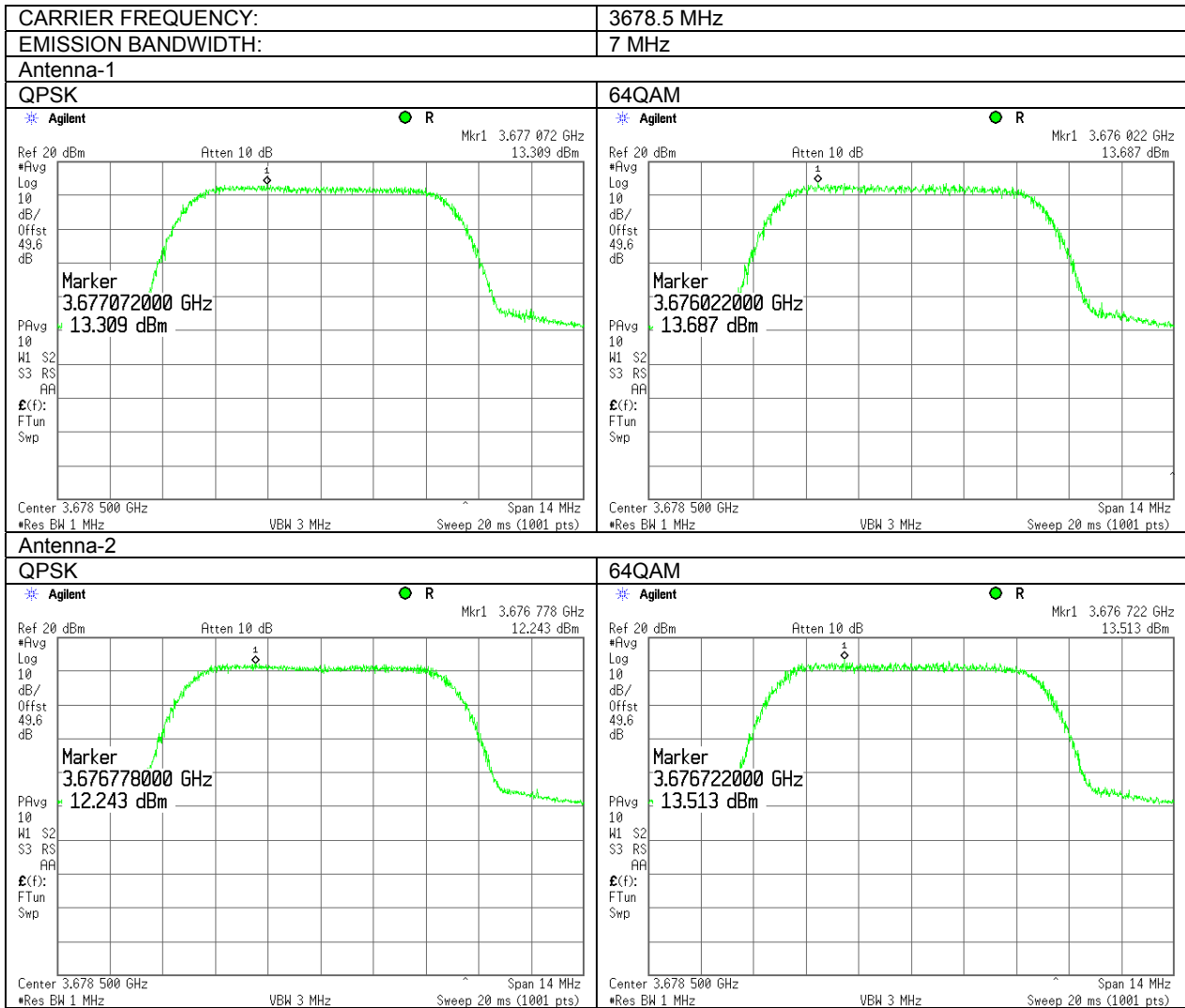
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.12 EIRP spectral density test results at high frequency with 9.3 dBi antenna



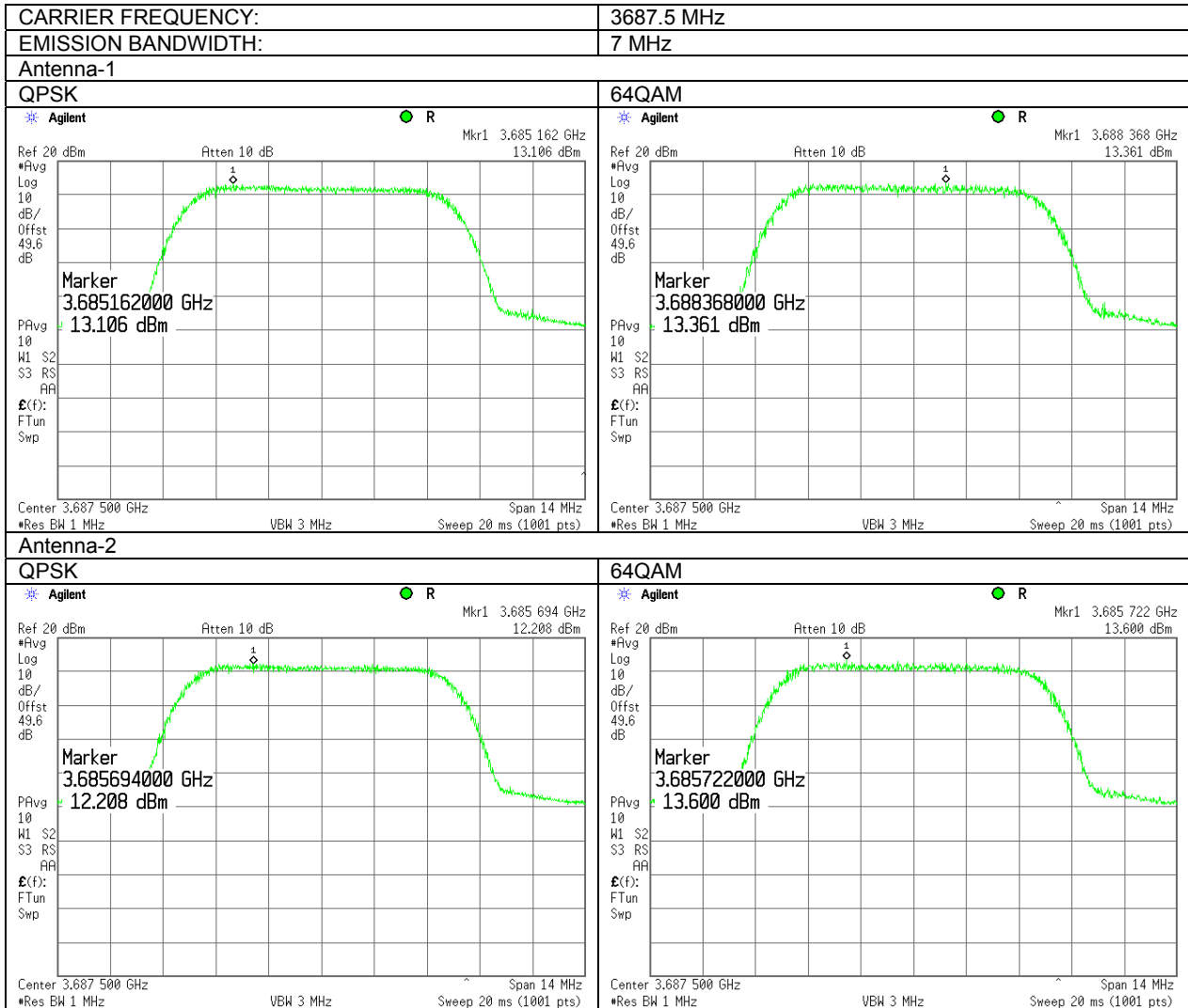
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.13 EIRP spectral density test results at low frequency with 13 dBi antenna



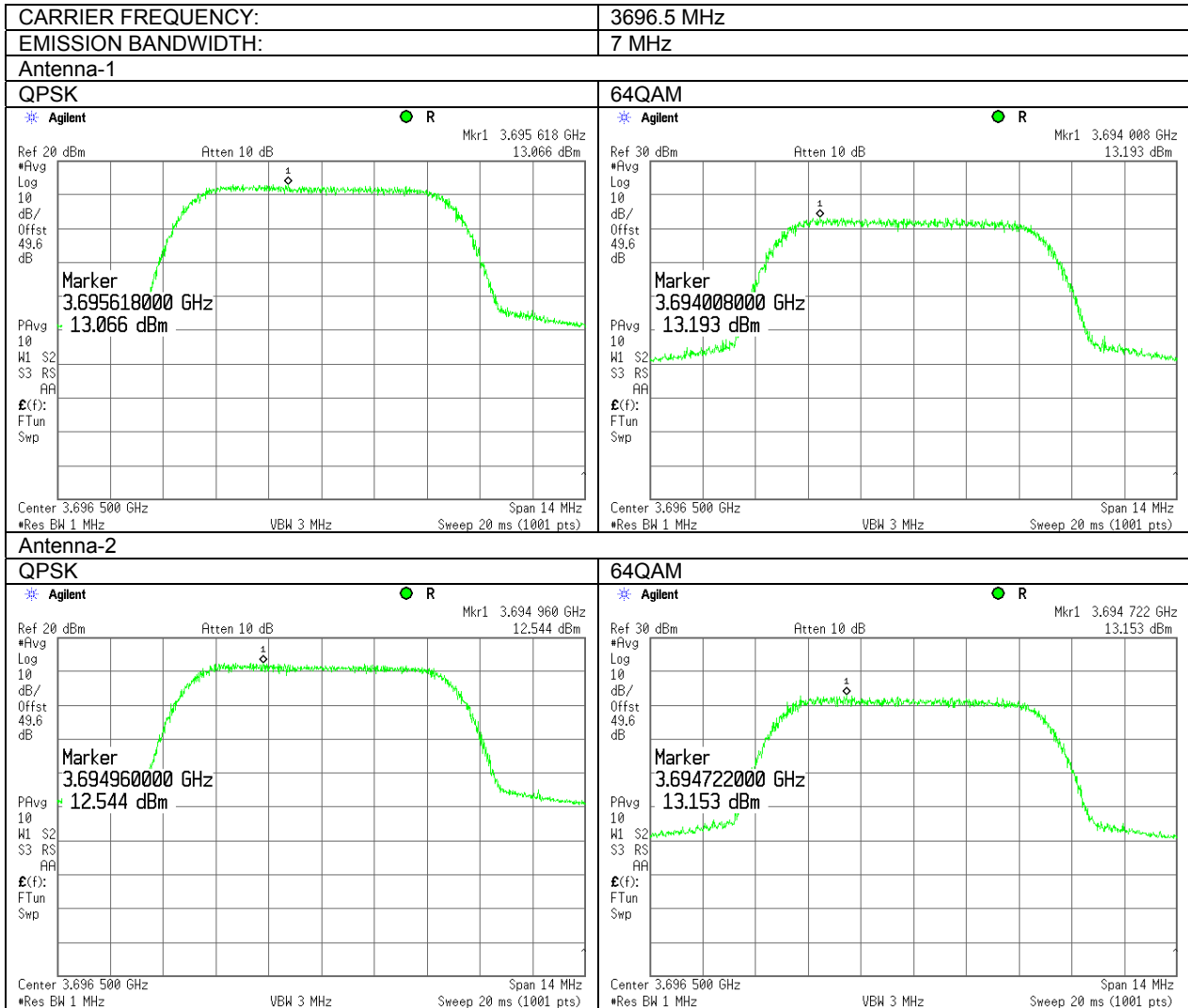
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.14 EIRP spectral density test results at mid frequency with 13 dBi antenna



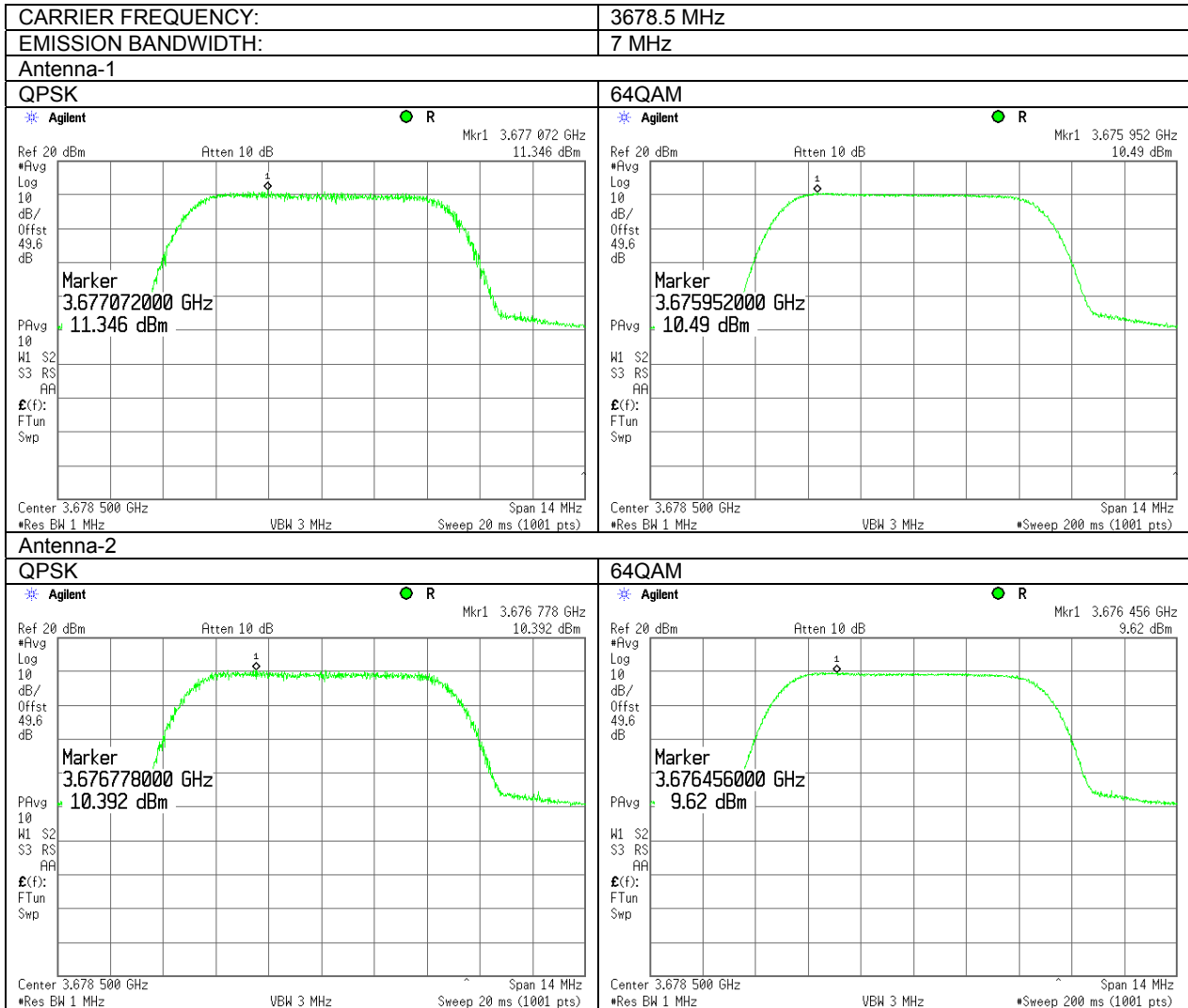
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.15 EIRP spectral density test results at high frequency with 13 dBi antenna



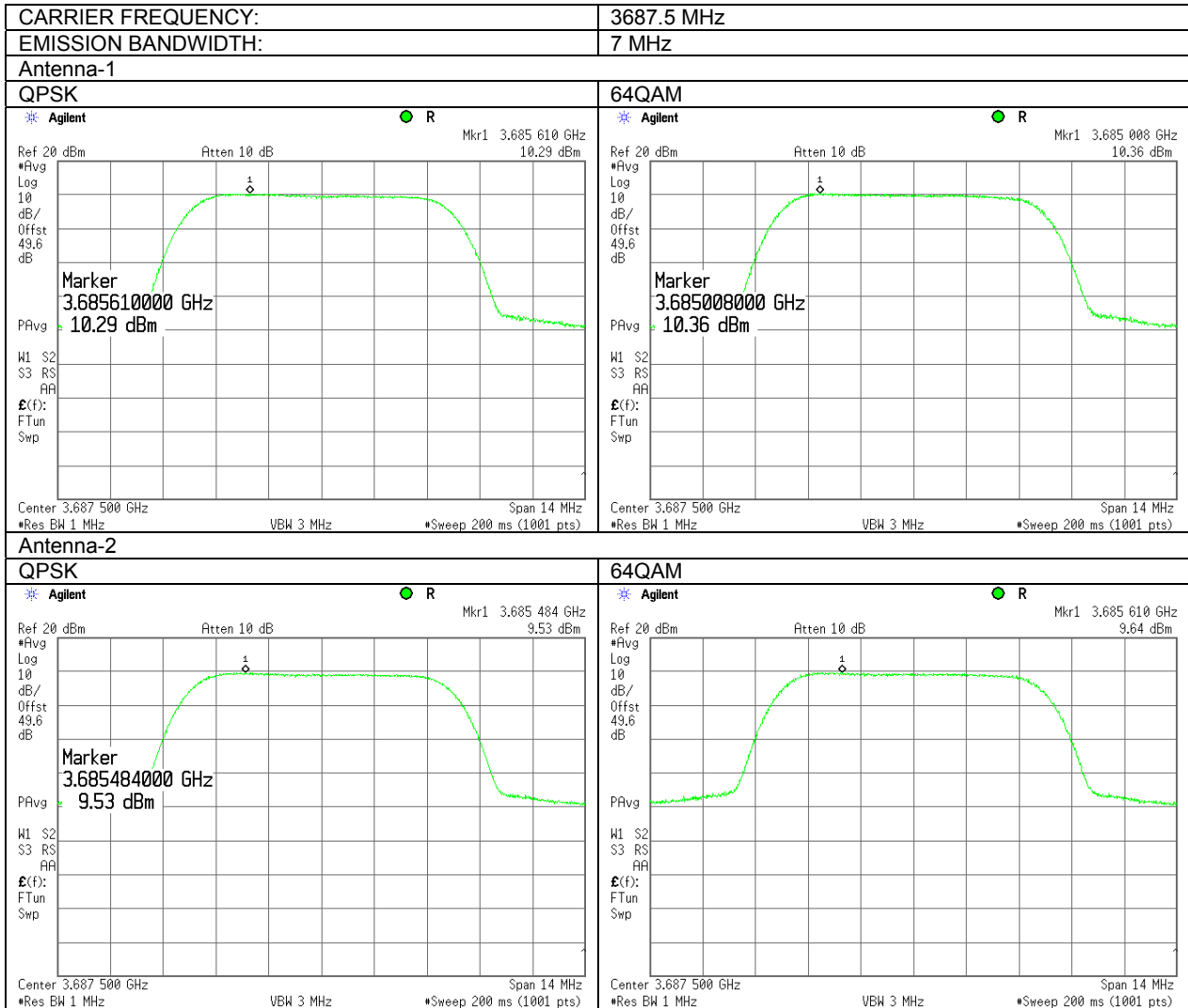
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.16 EIRP spectral density test results at low frequency with 15.8 dBi antenna



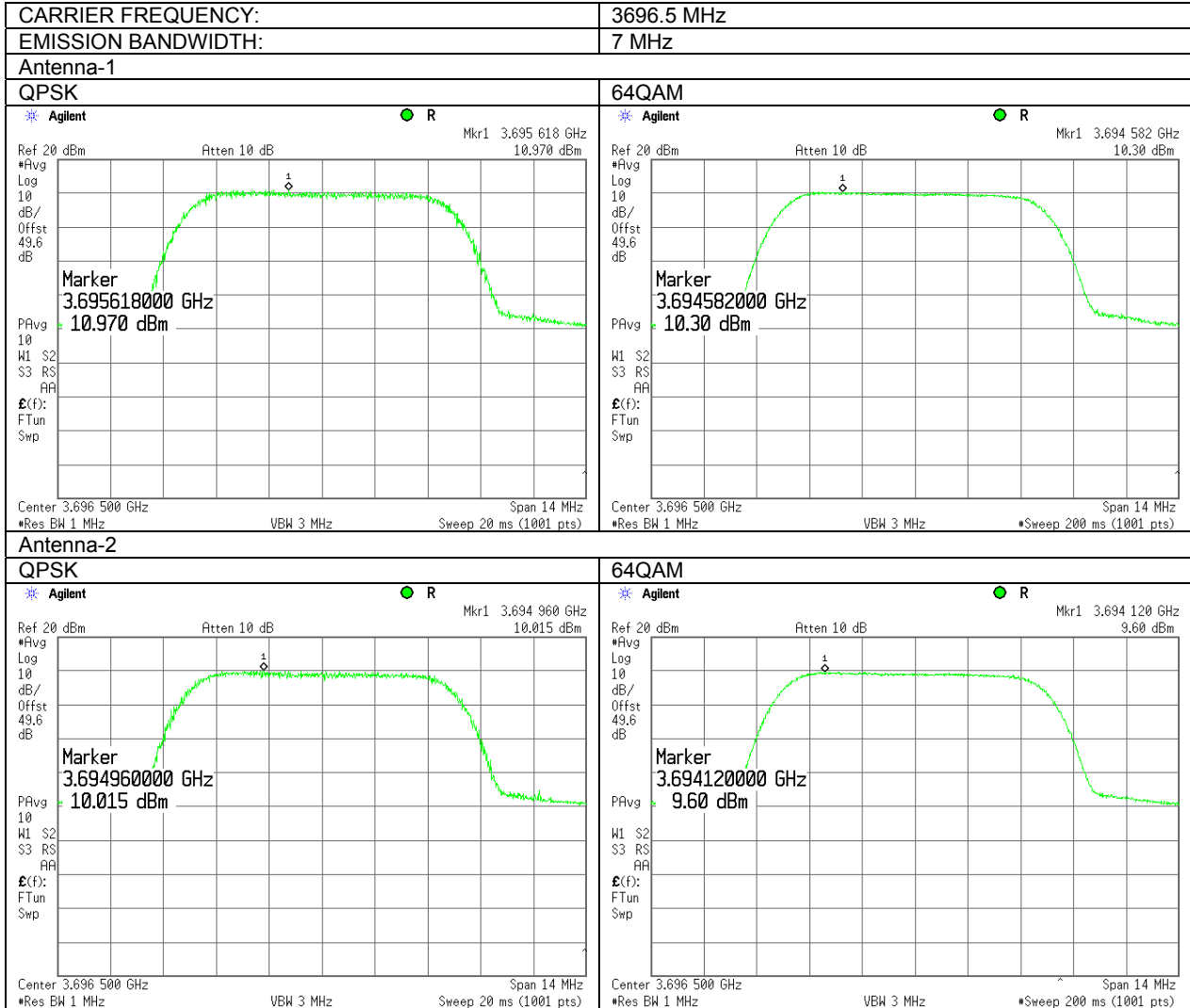
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.17 EIRP spectral density test results at mid frequency with 15.8 dBi antenna



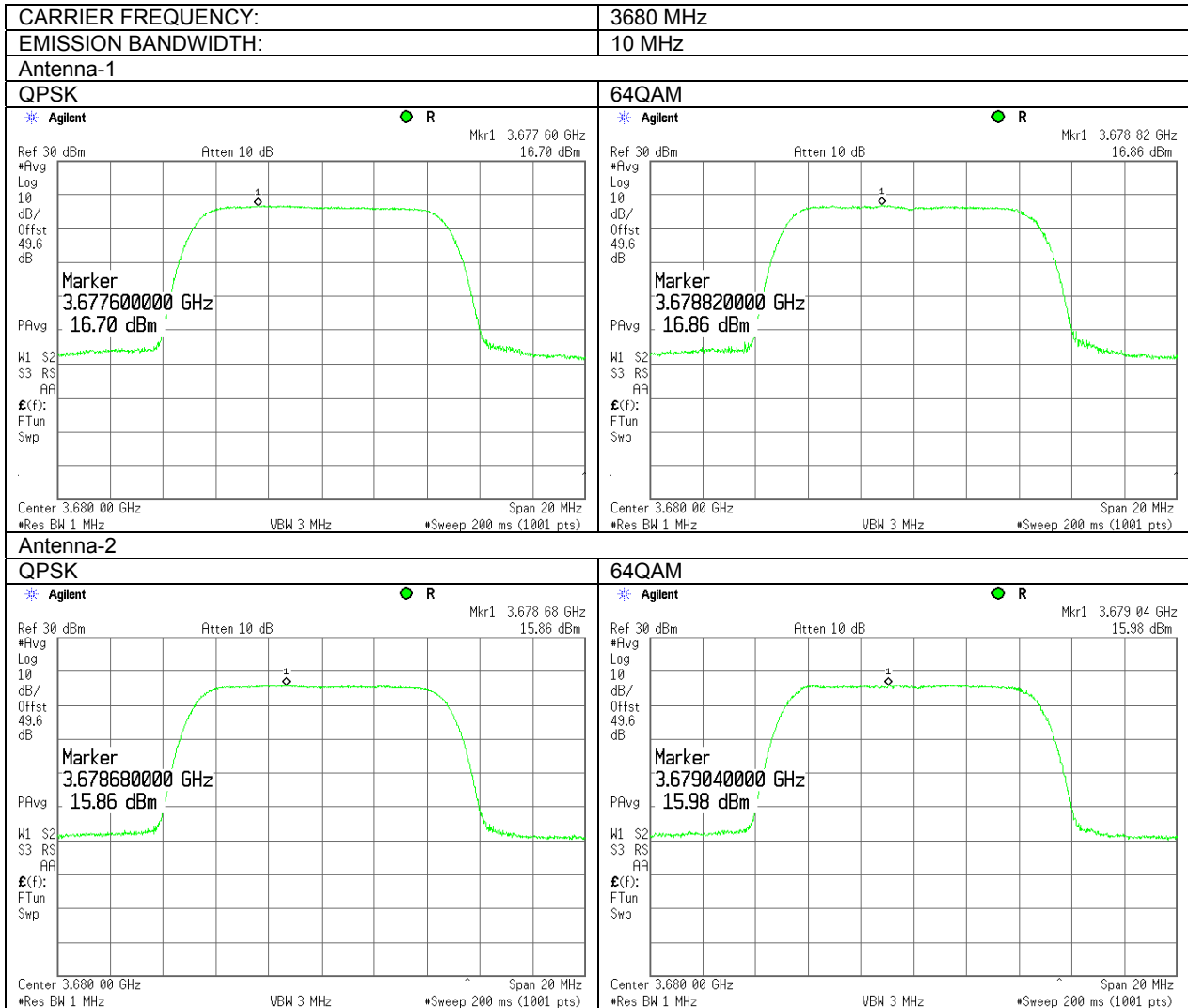
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.18 EIRP spectral density test results at high frequency with 15.8 dBi antenna



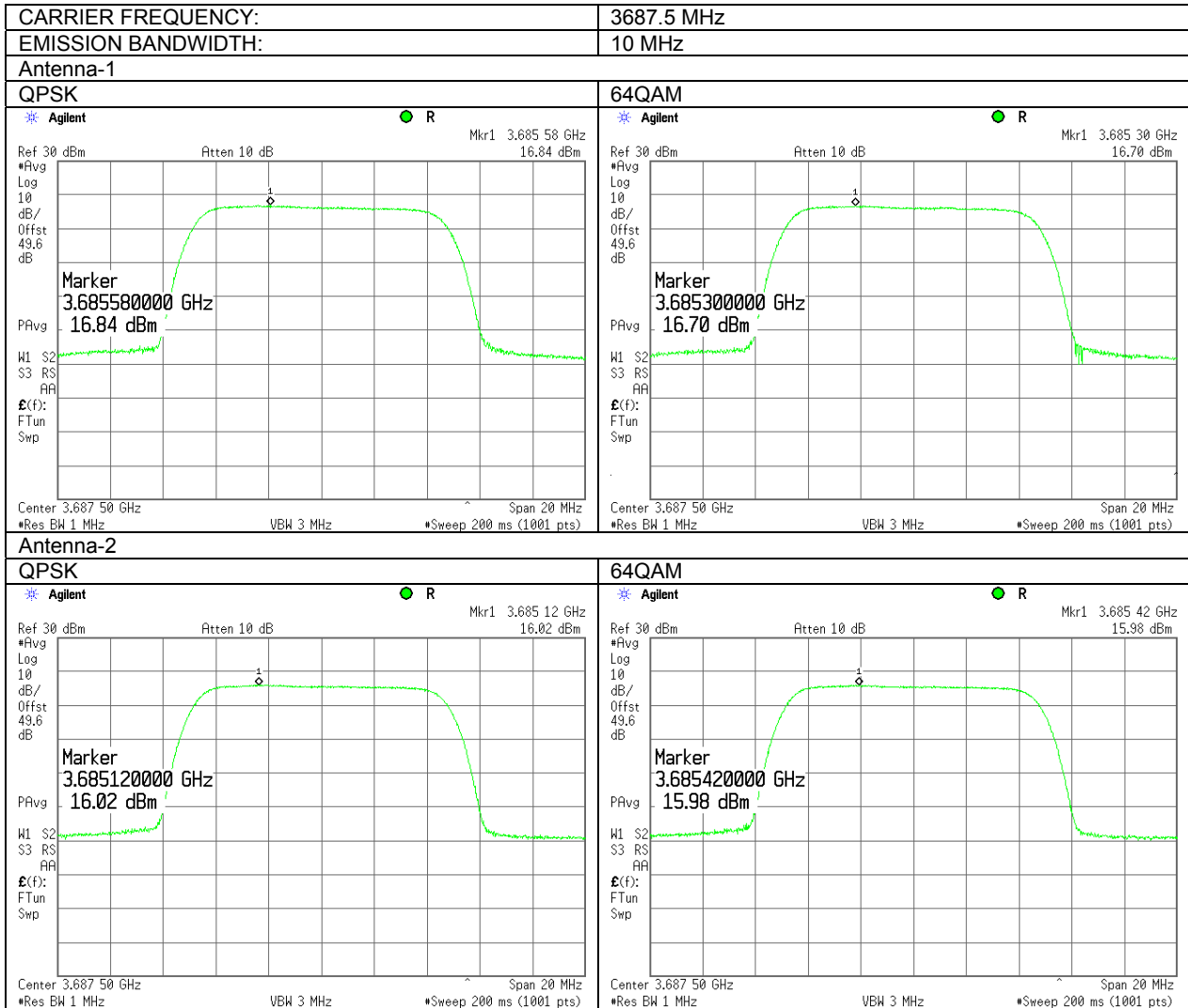
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.19 EIRP spectral density test results at low frequency with 9.3 dBi antenna



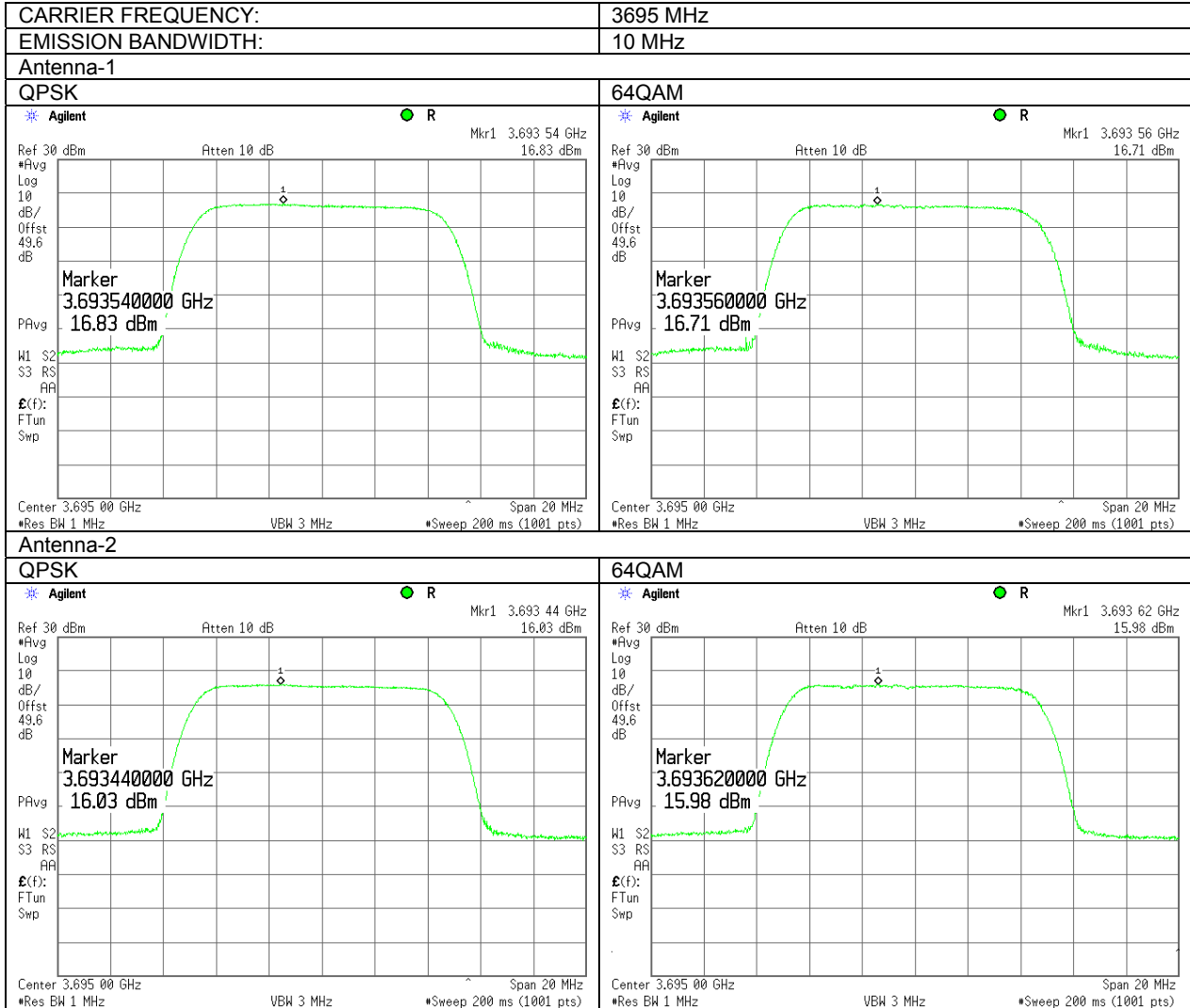
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.20 EIRP spectral density test results at mid frequency with 9.3 dBi antenna



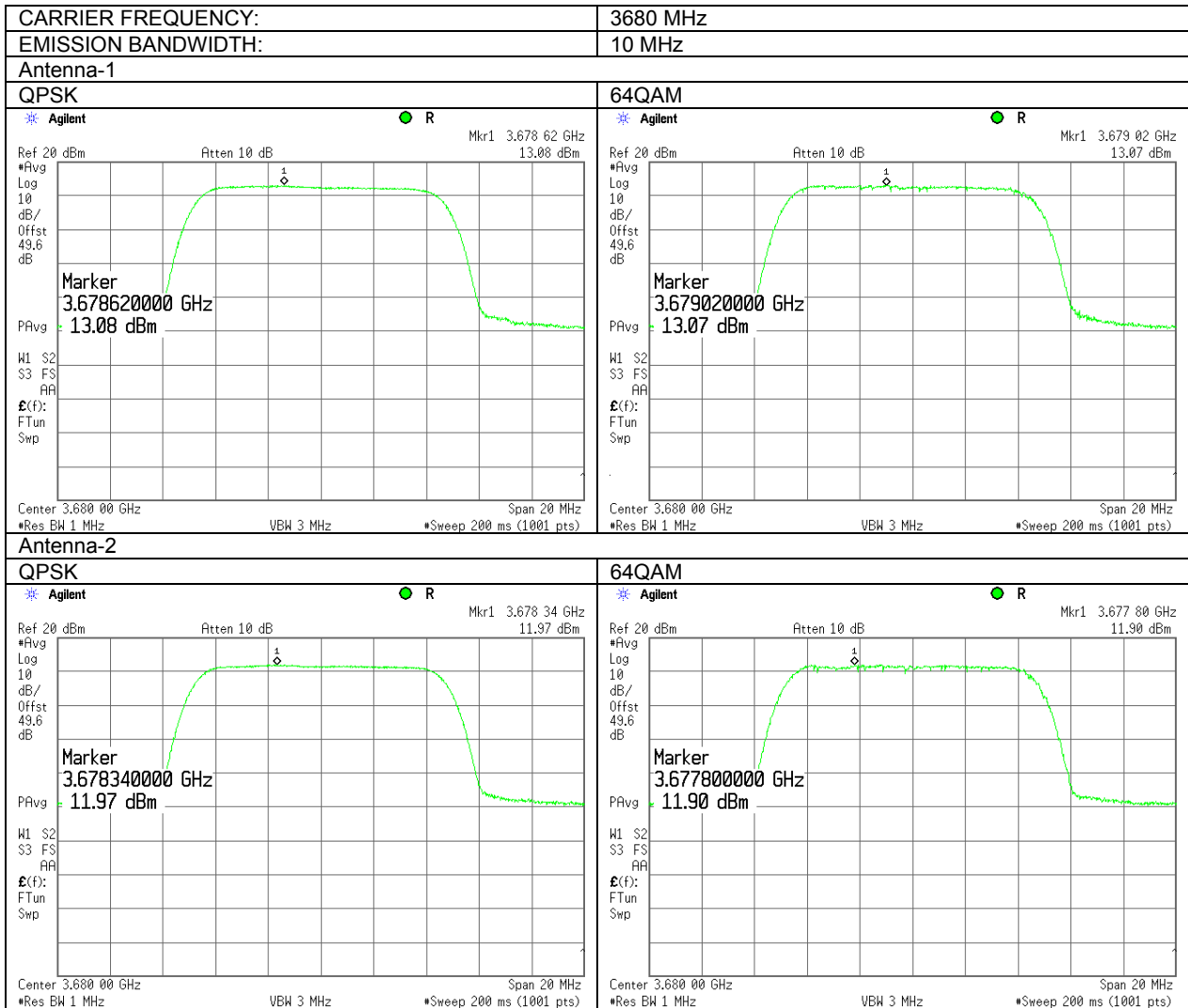
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.21 EIRP spectral density test results at high frequency with 9.3 dBi antenna



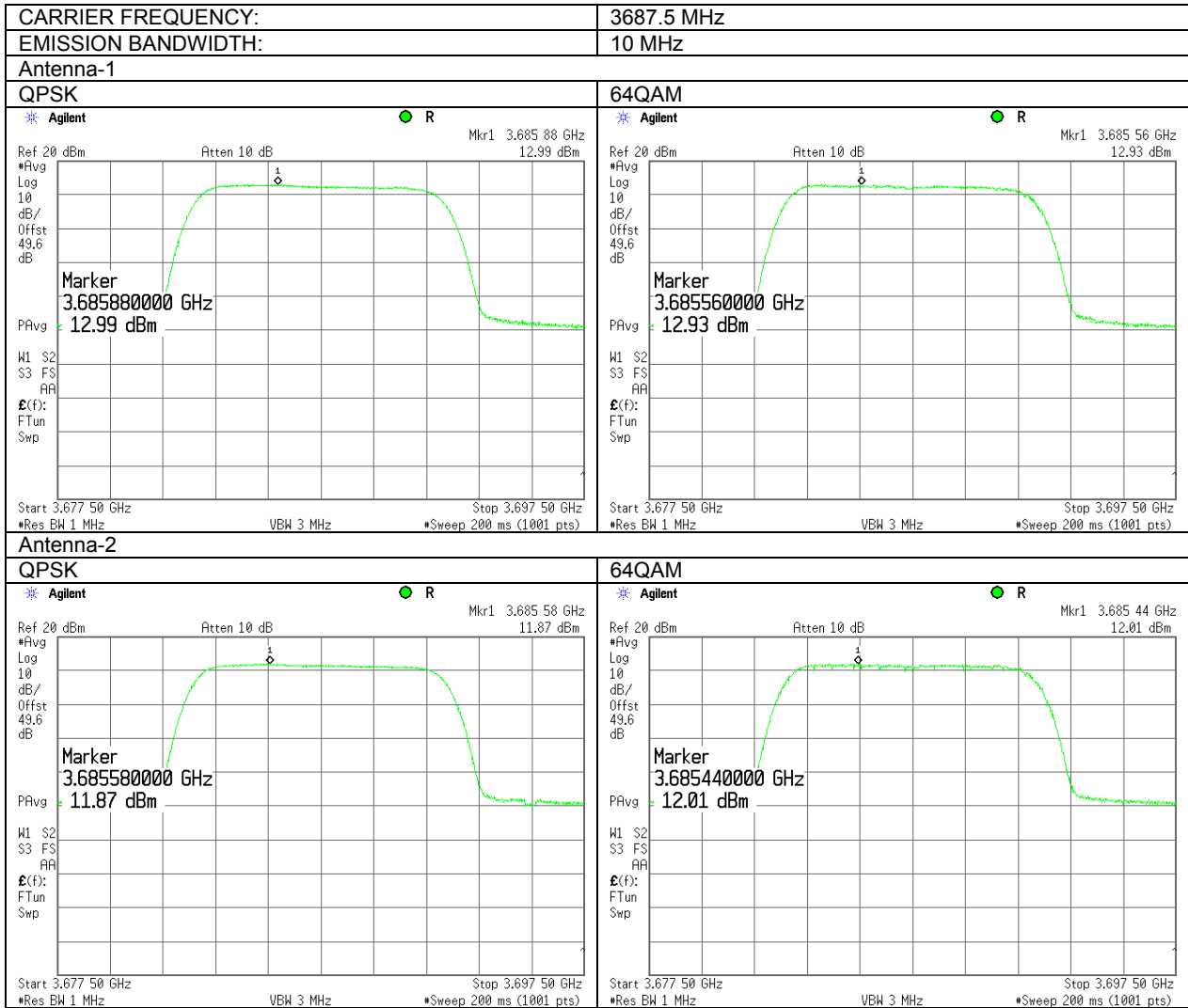
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.22 EIRP spectral density test results at low frequency with 13 dBi antenna



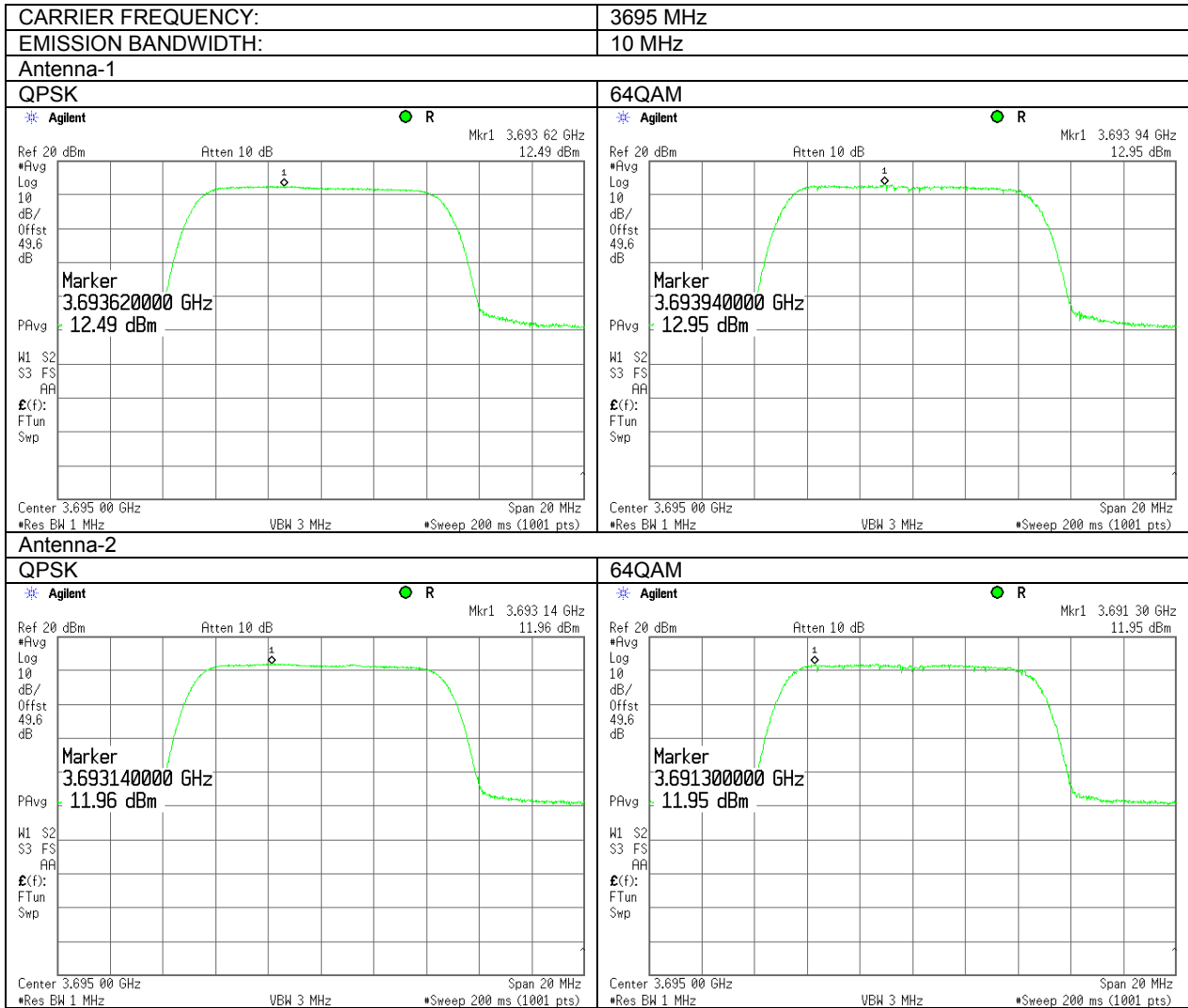
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.23 EIRP spectral density test results at mid frequency with 13 dBi antenna



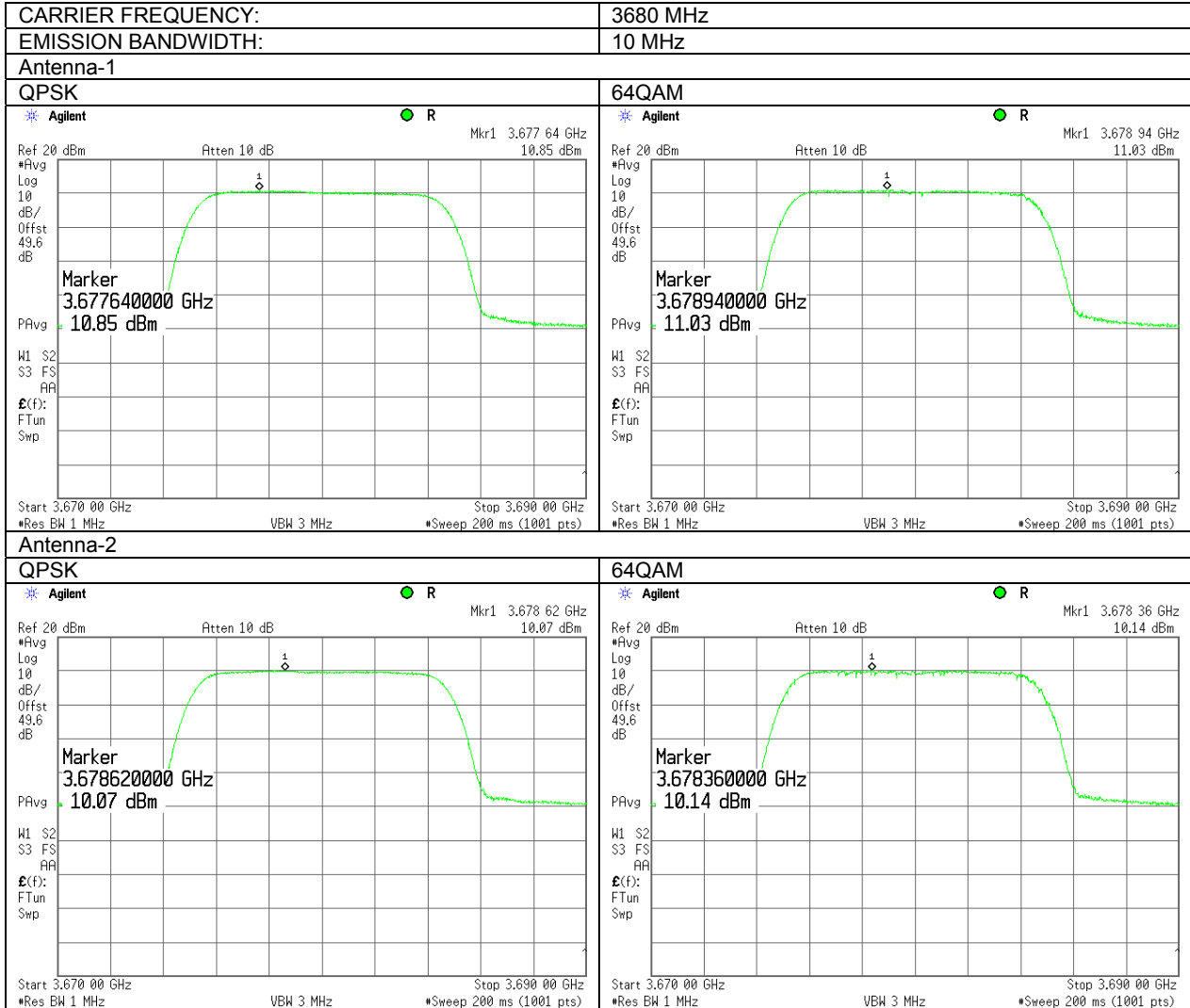
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.24 EIRP spectral density test results at high frequency with 13 dBi antenna



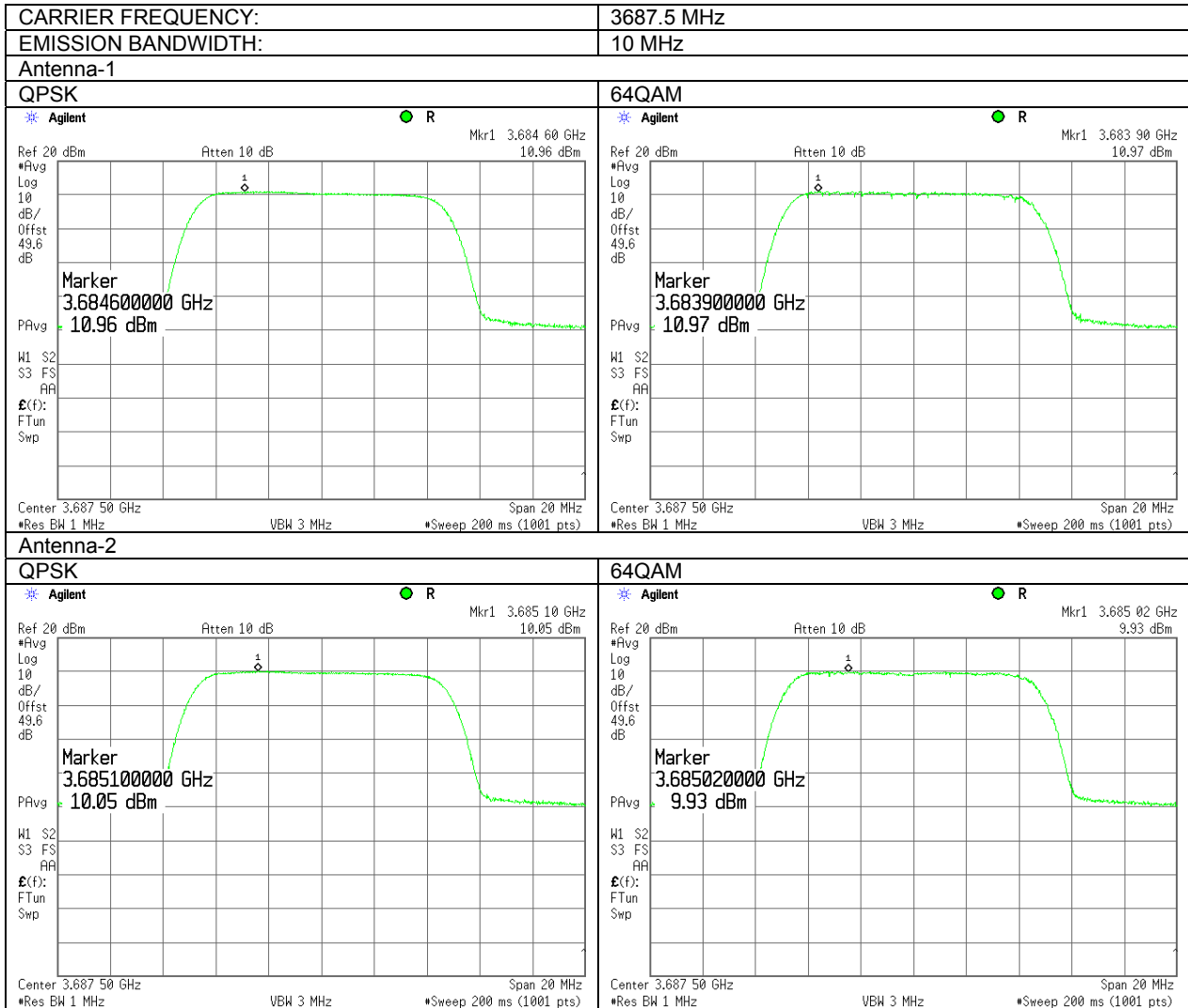
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.25 EIRP spectral density test results at low frequency with 15.8 dBi antenna



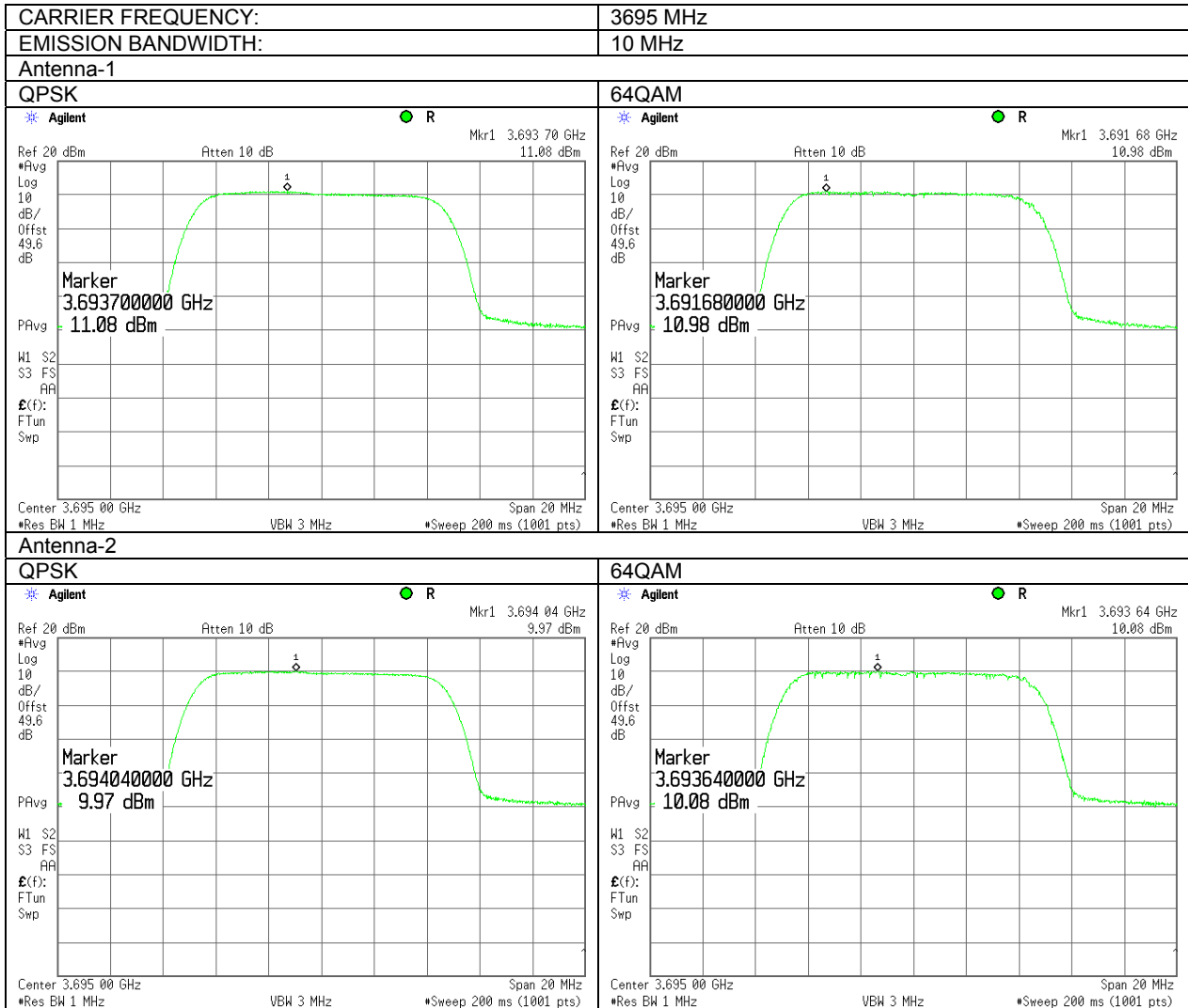
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.26 EIRP spectral density test results at mid frequency with 15.8 dBi antenna



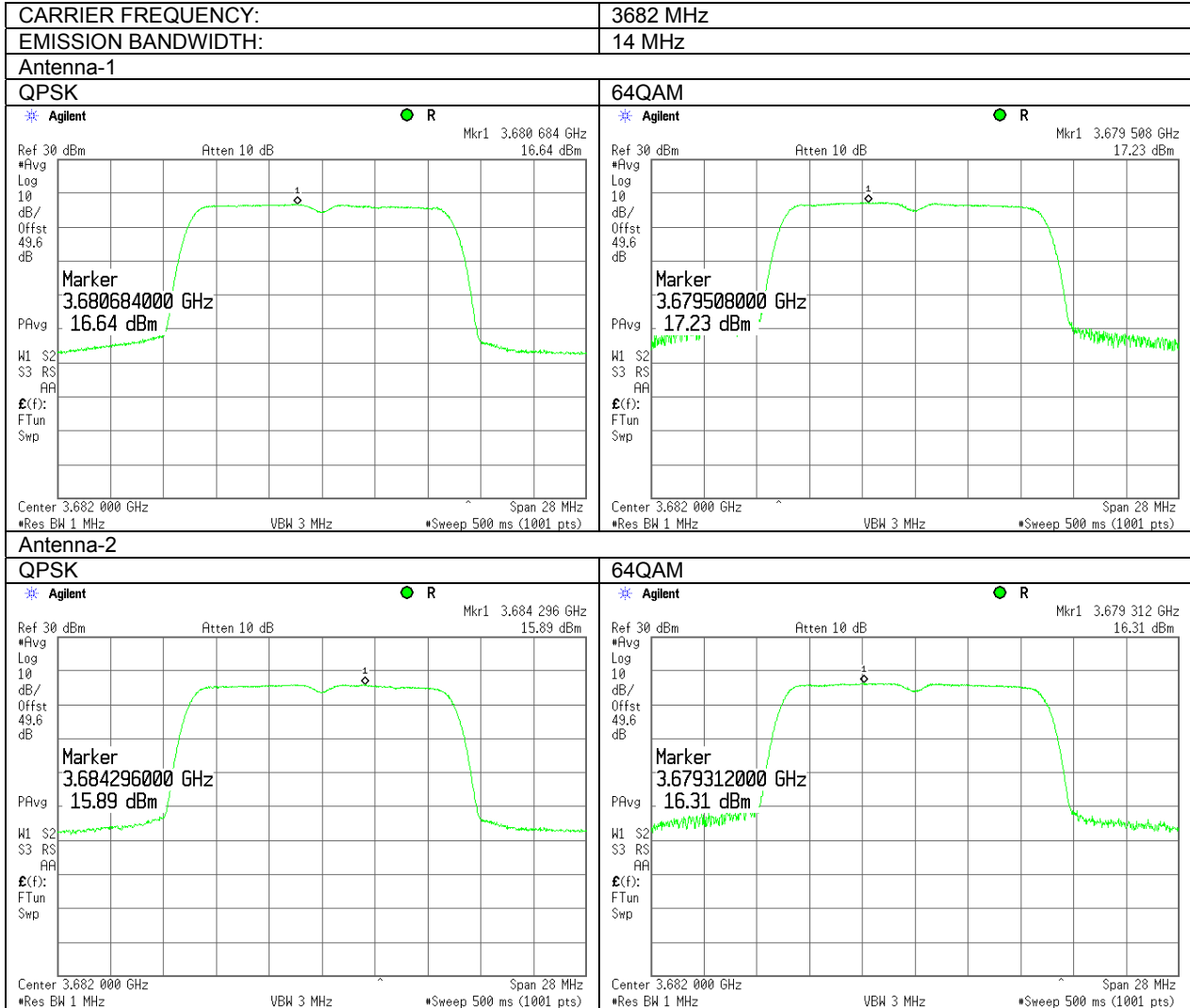
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.27 EIRP spectral density test results at high frequency with 15.8 dBi antenna



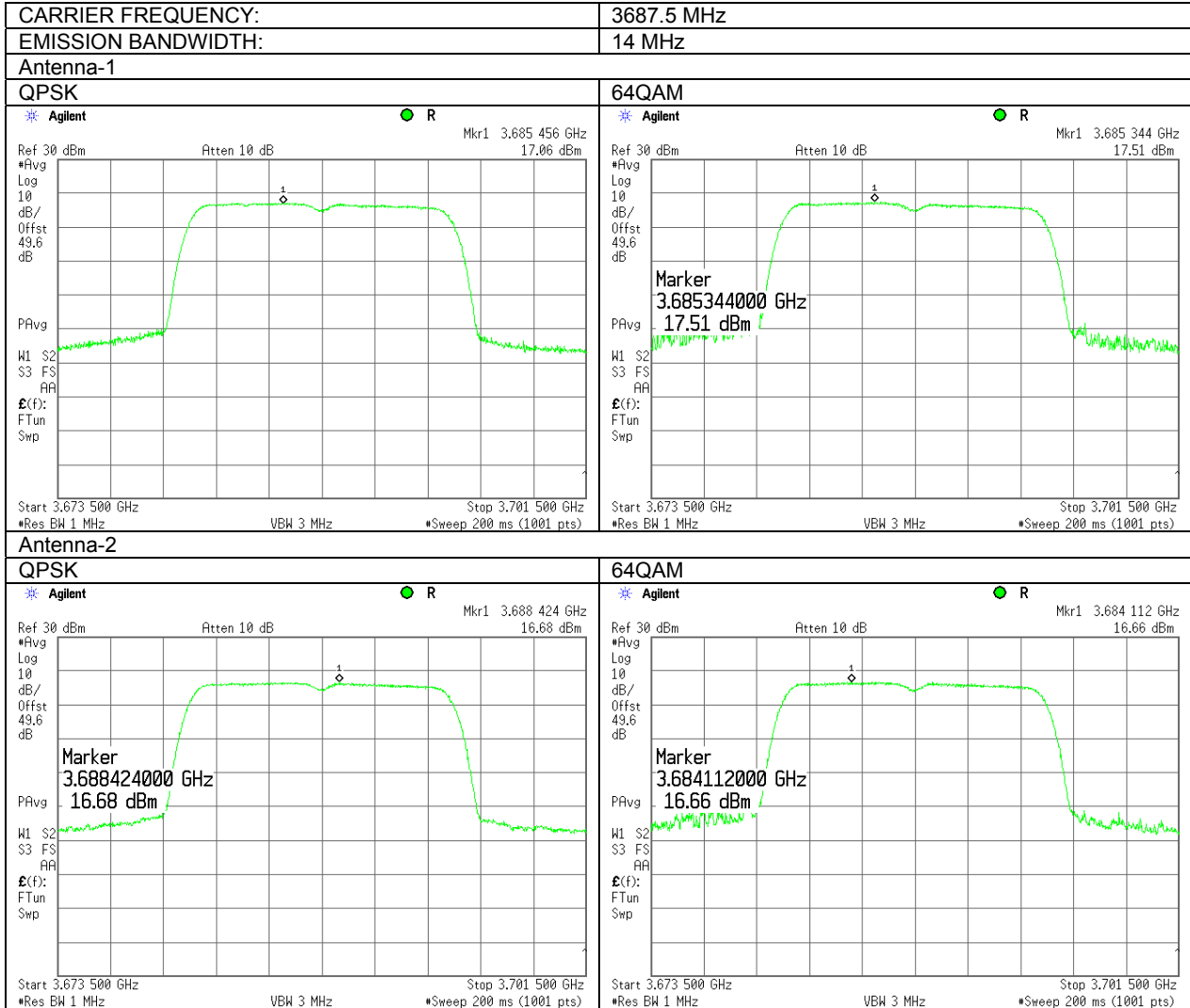
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.28 EIRP spectral density test results at low frequency with 9.3 dBi antenna



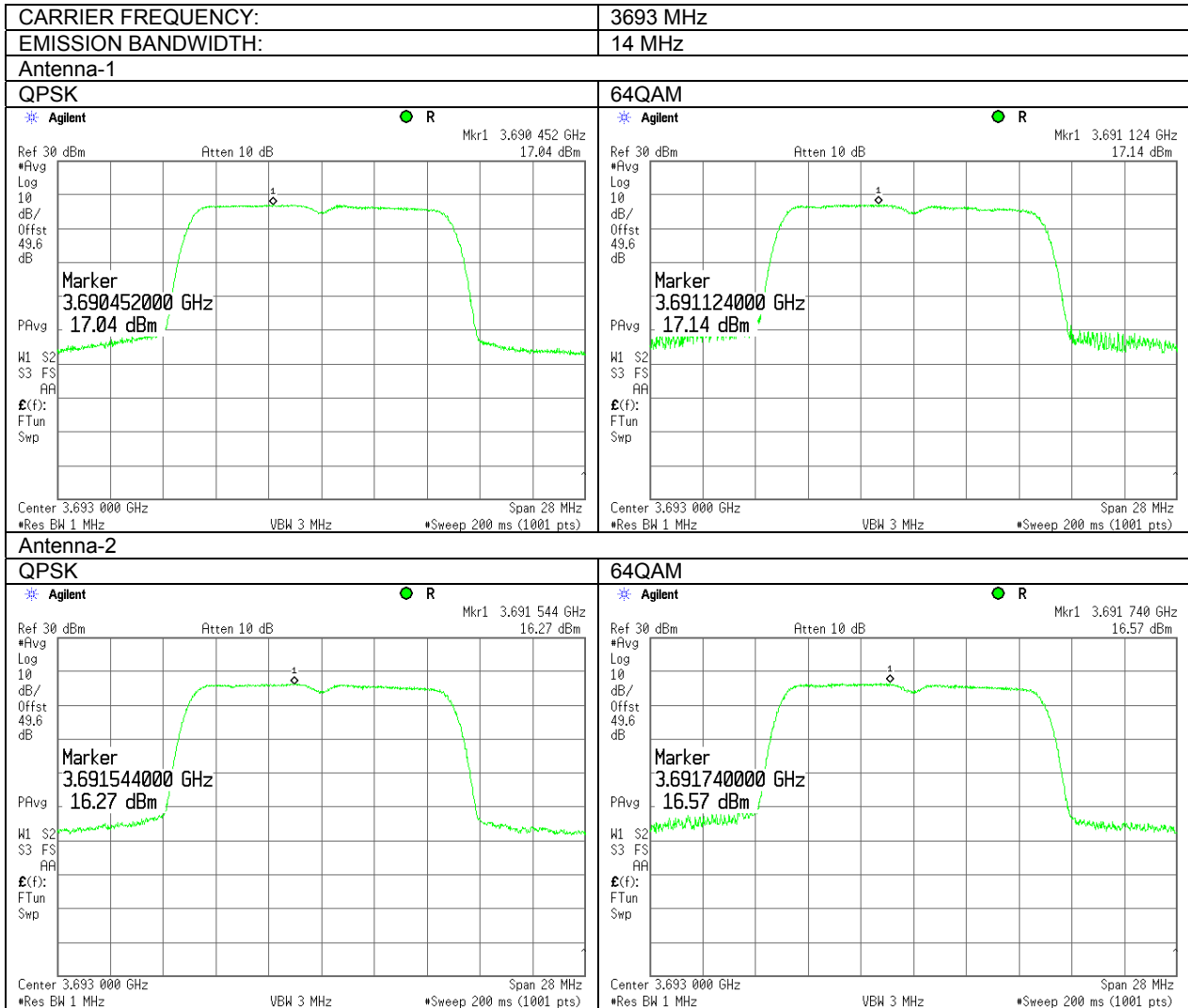
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.29 EIRP spectral density test results at mid frequency with 9.3 dBi antenna



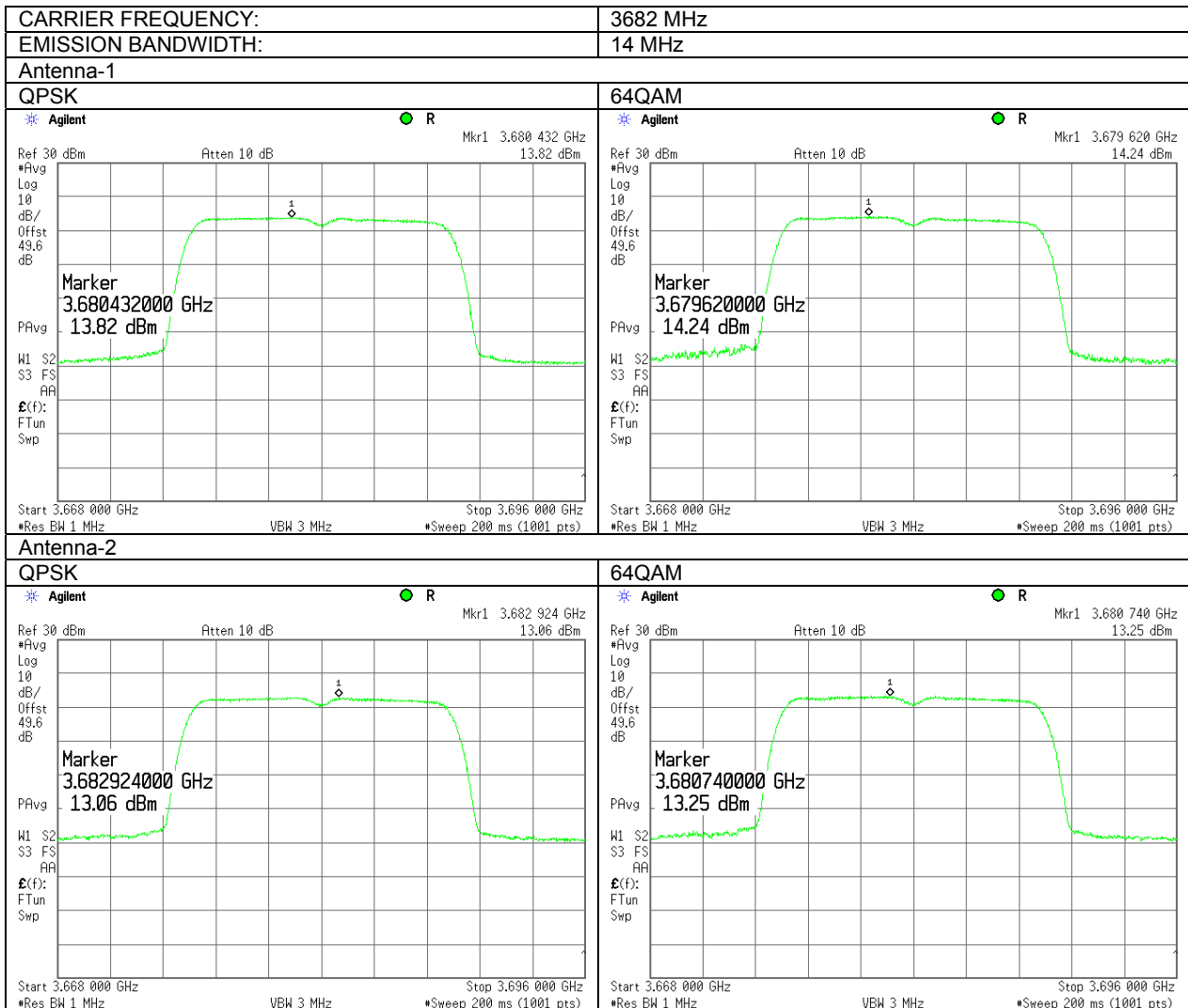
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.30 EIRP spectral density test results at high frequency with 9.3 dBi antenna



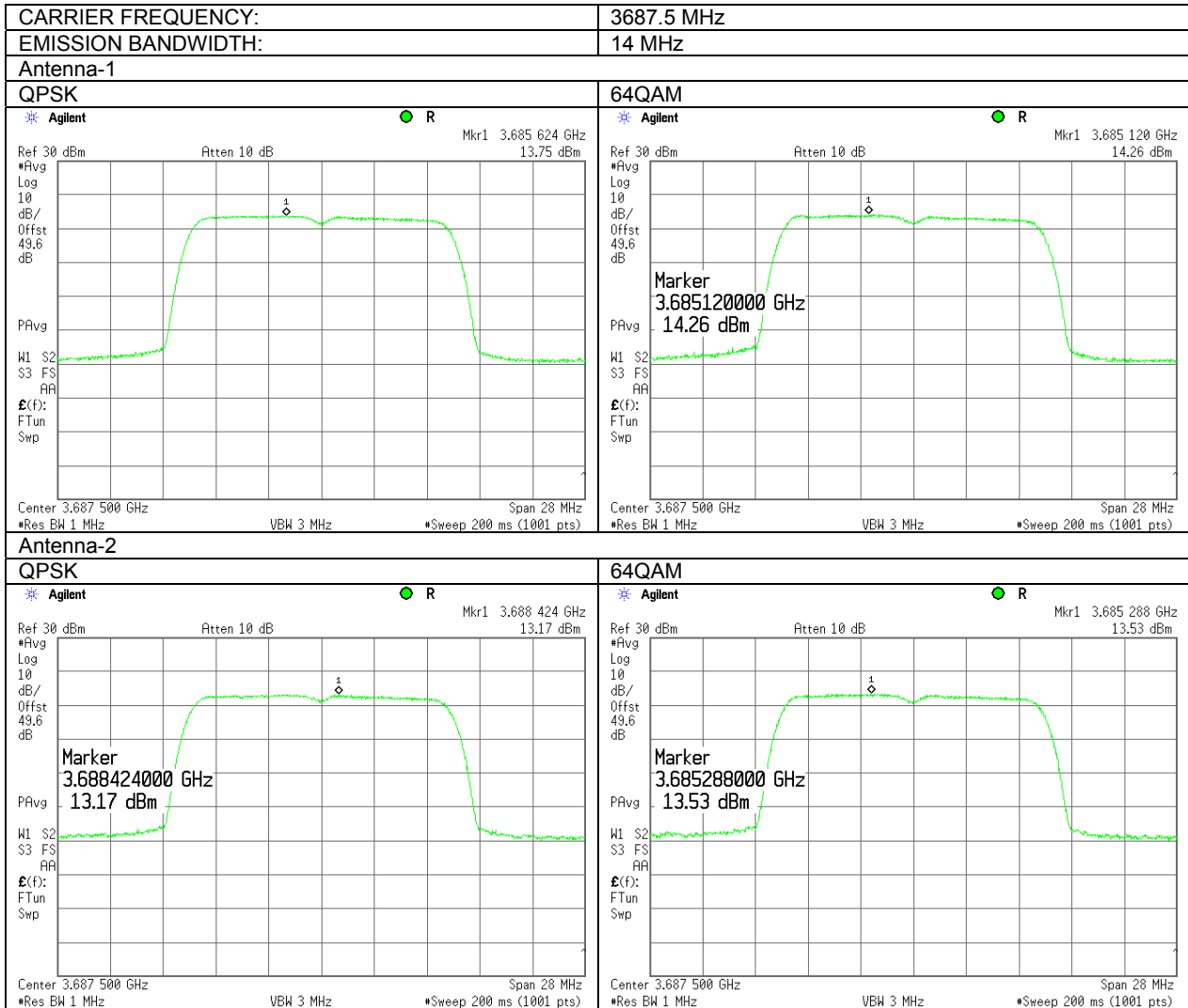
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.31 EIRP spectral density test results at low frequency with 13 dBi antenna



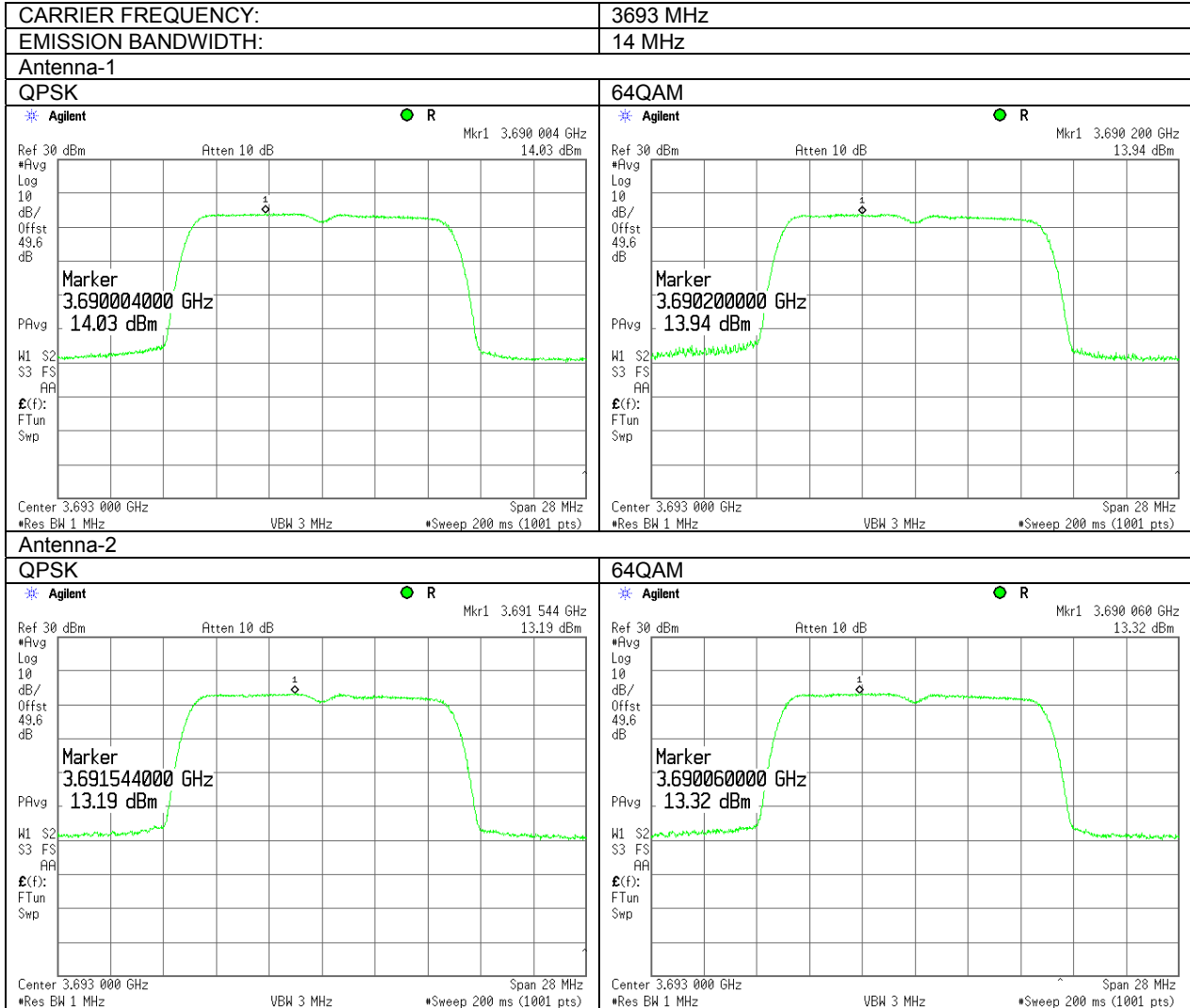
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.32 EIRP spectral density test results at mid frequency with 13 dBi antenna



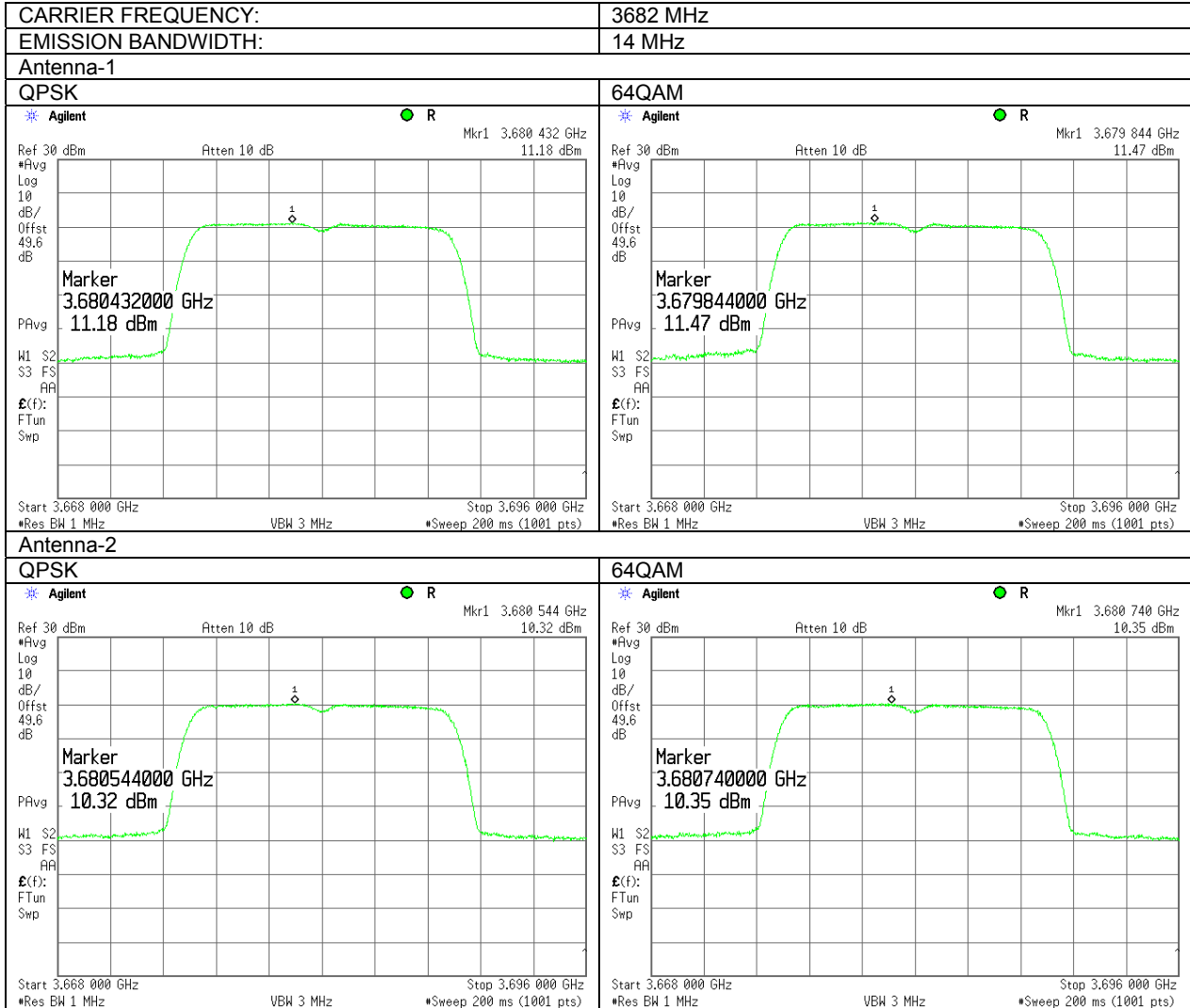
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.33 EIRP spectral density test results at high frequency with 13 dBi antenna



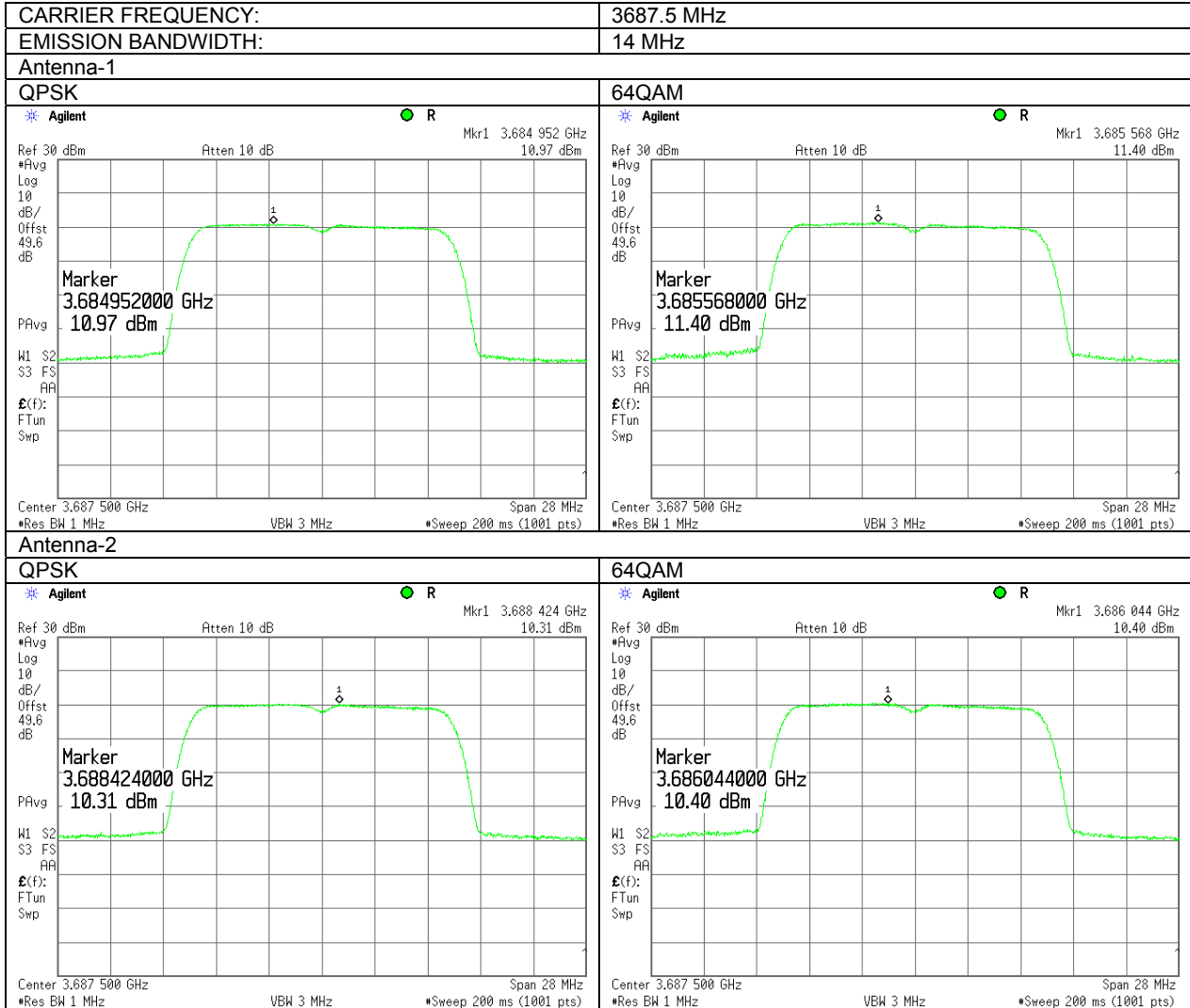
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.34 EIRP spectral density test results at low frequency with 15.8 dBi antenna



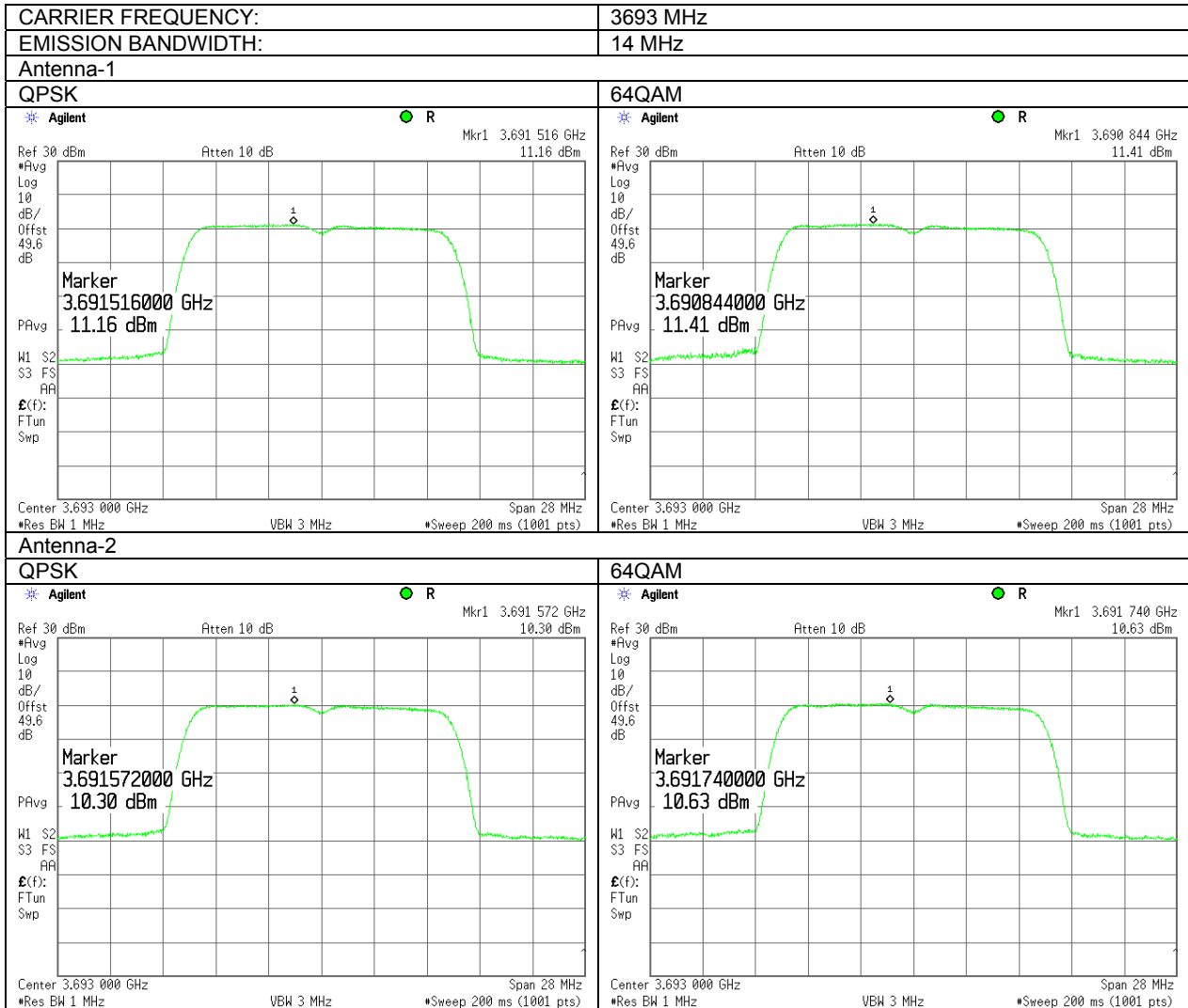
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.35 EIRP spectral density test results at mid frequency with 15.8 dBi antenna



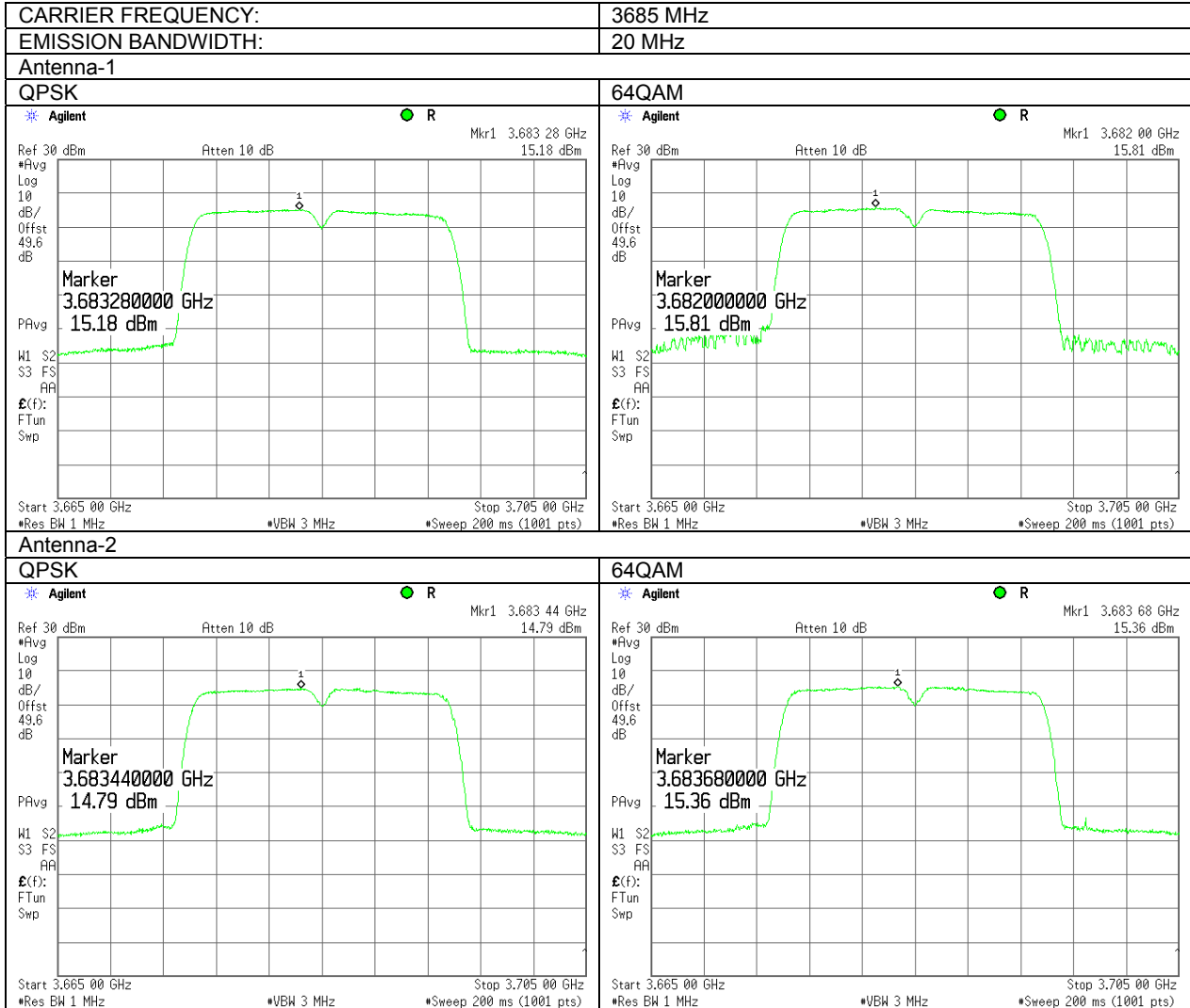
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.36 EIRP spectral density test results at high frequency with 15.8 dBi antenna



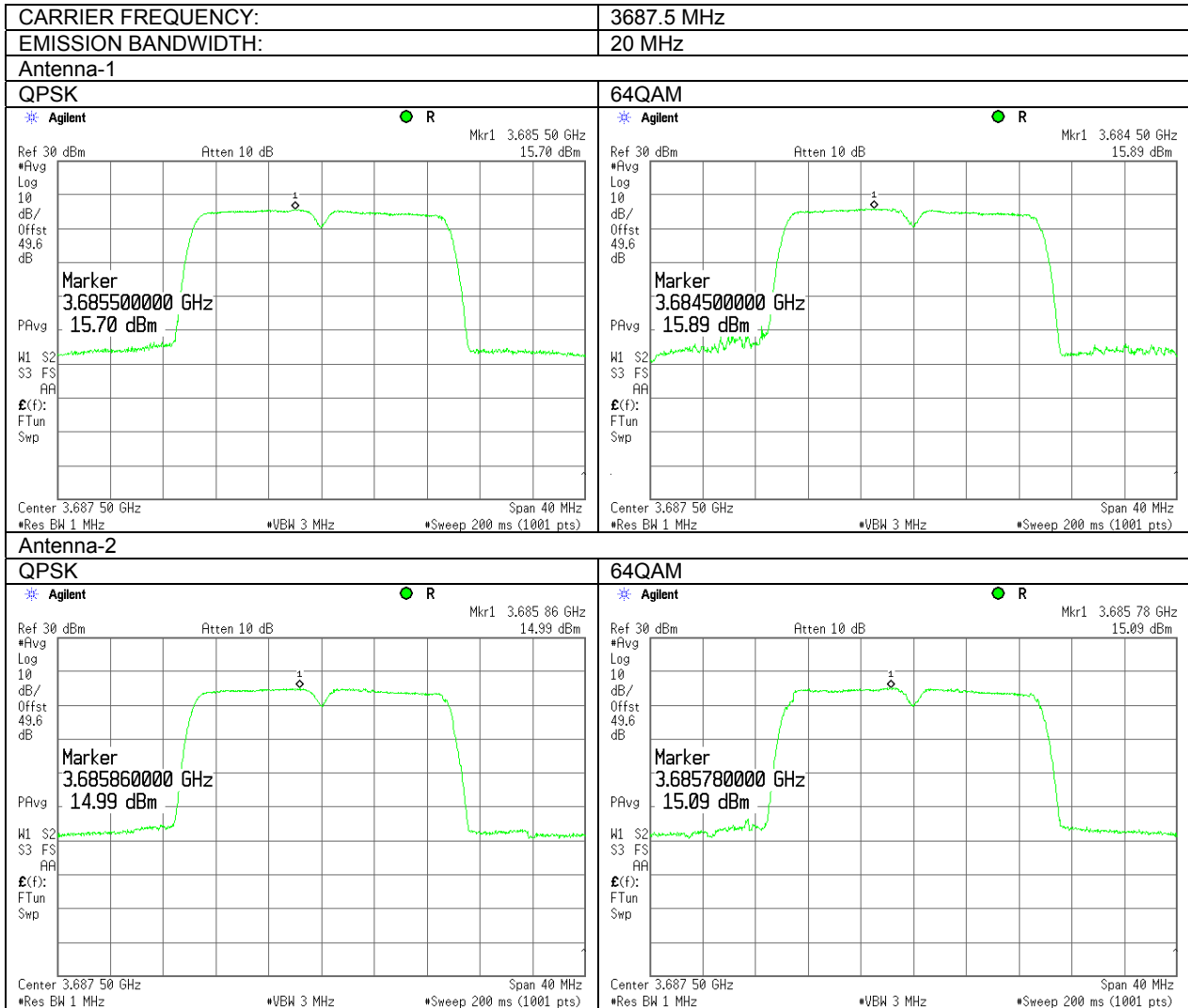
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.37 EIRP spectral density test results at low frequency with 9.3 dBi antenna



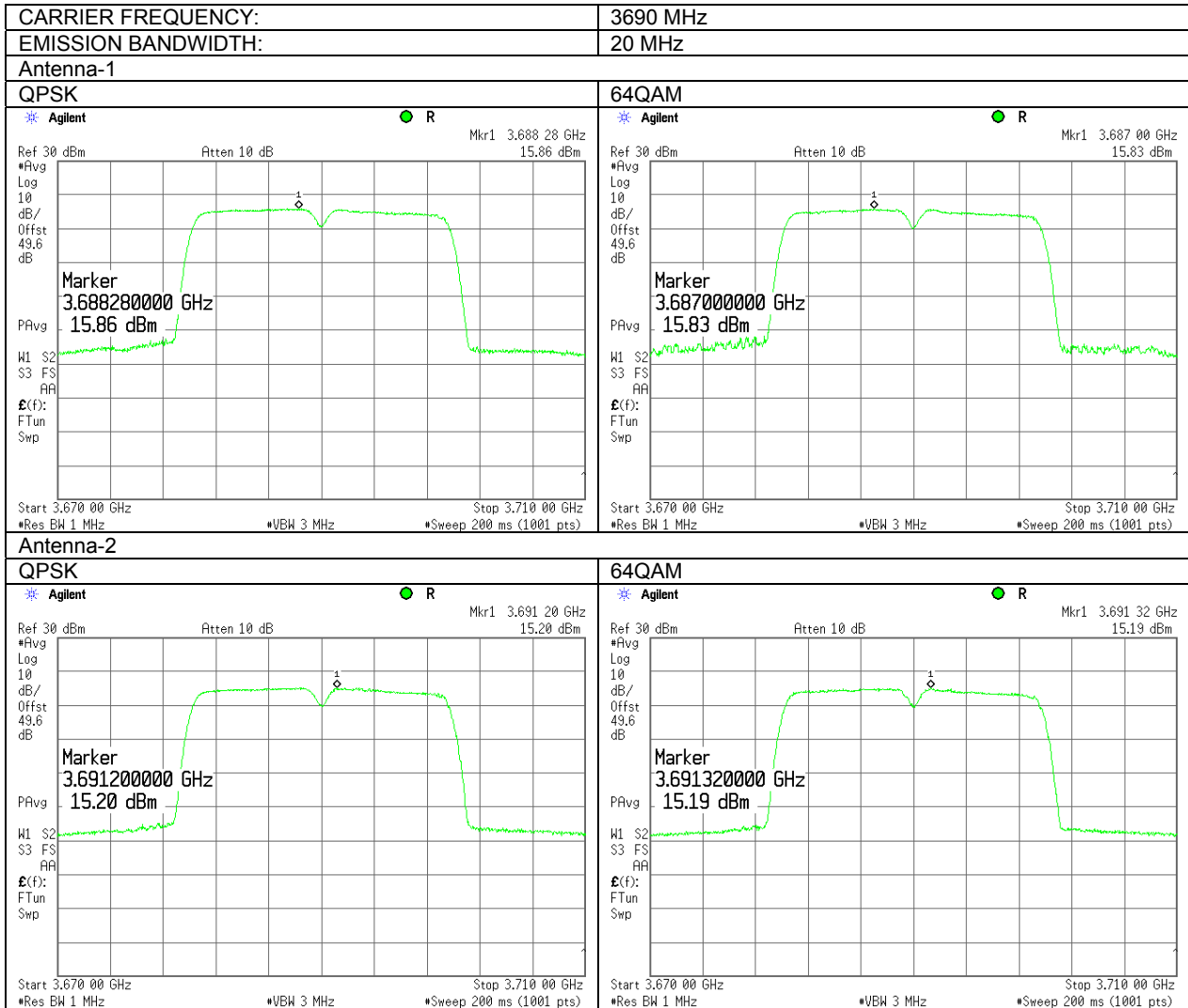
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.38 EIRP spectral density test results at mid frequency with 9.3 dBi antenna



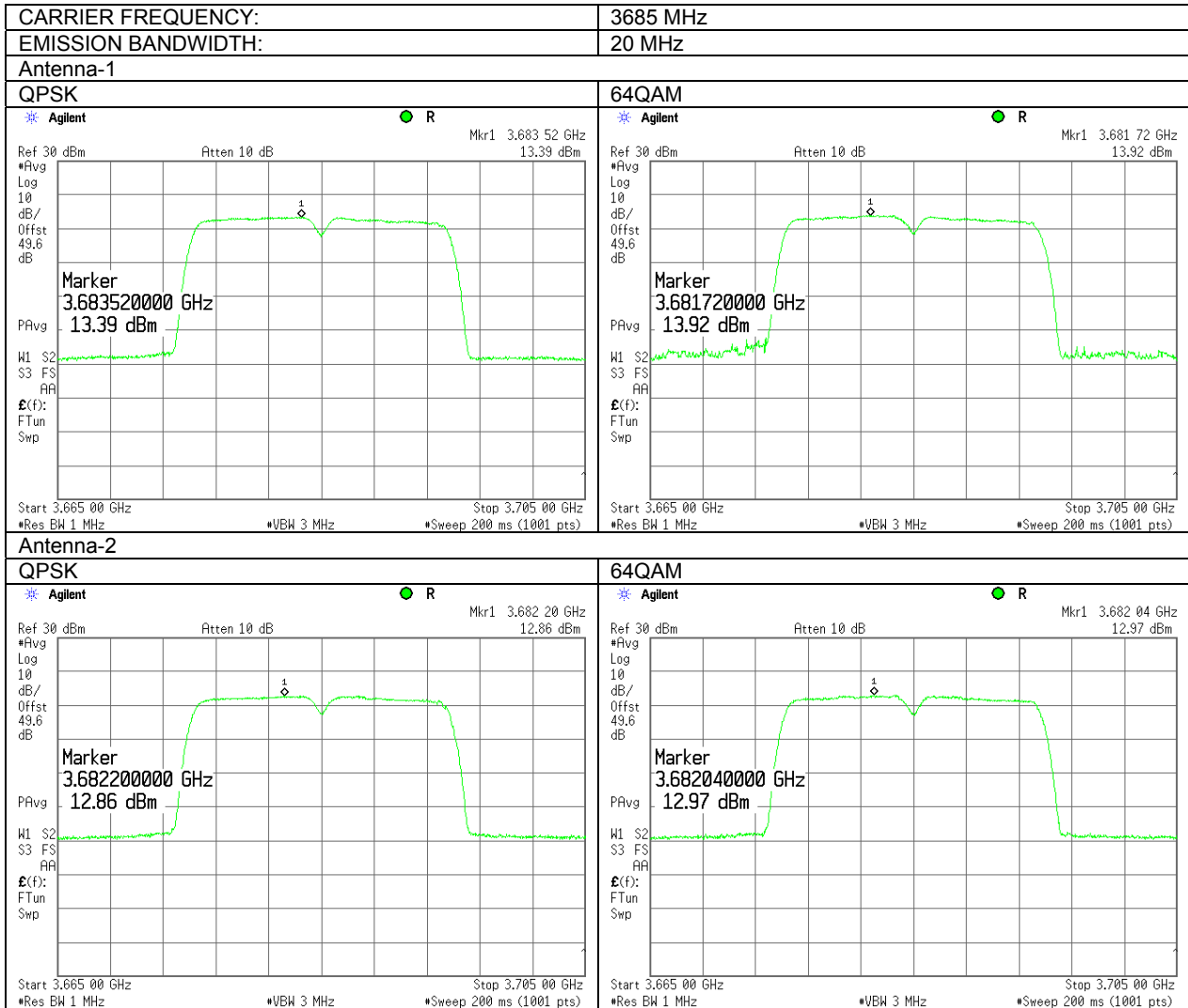
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.39 EIRP spectral density test results at high frequency with 9.3 dBi antenna



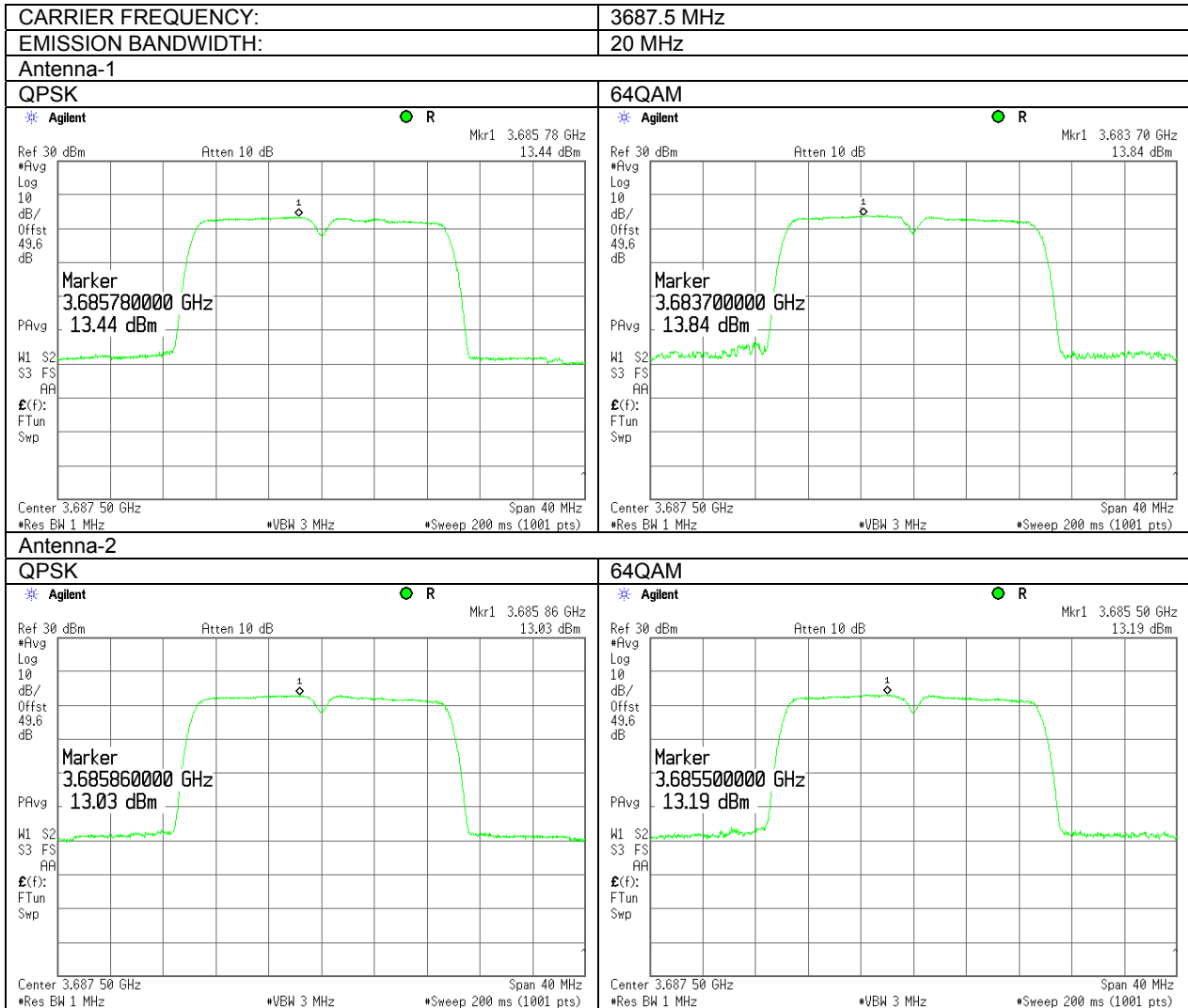
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
	Relative Humidity: 45 %
	Power Supply: 48 VDC
Remarks:	

Plot 7.2.40 EIRP spectral density test results at low frequency with 13 dBi antenna



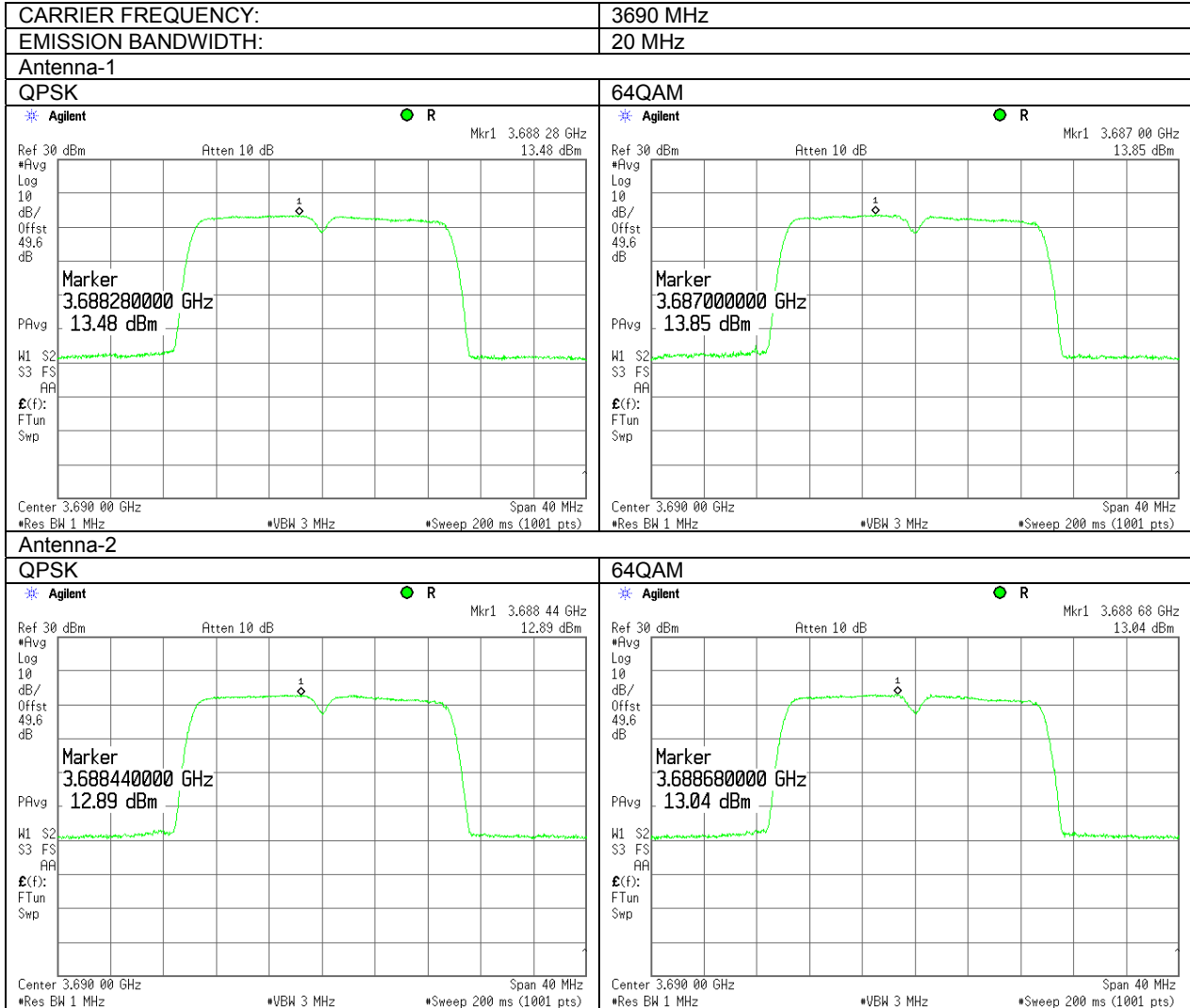
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.41 EIRP spectral density test results at mid frequency with 13 dBi antenna



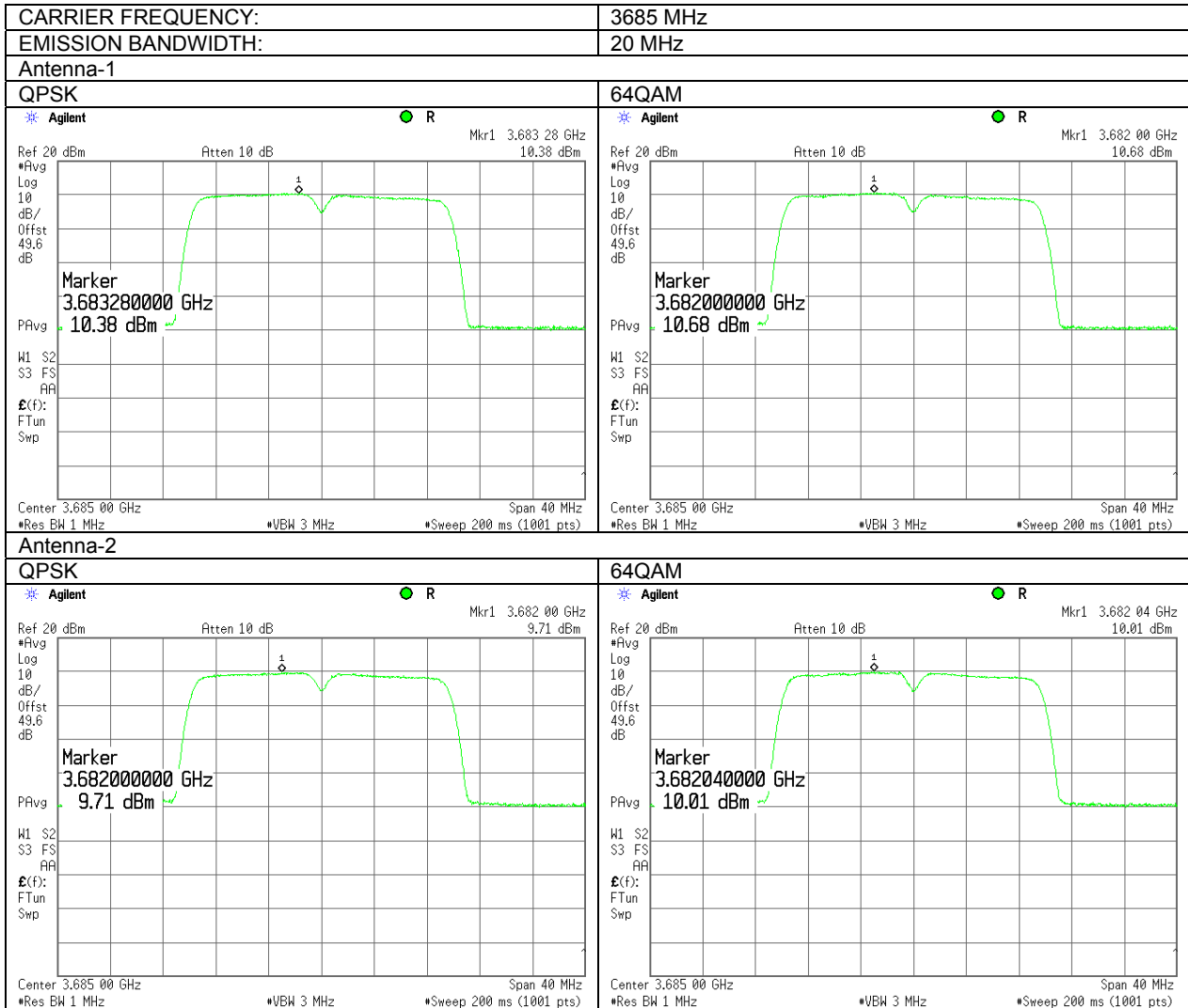
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.42 EIRP spectral density test results at high frequency with 13 dBi antenna



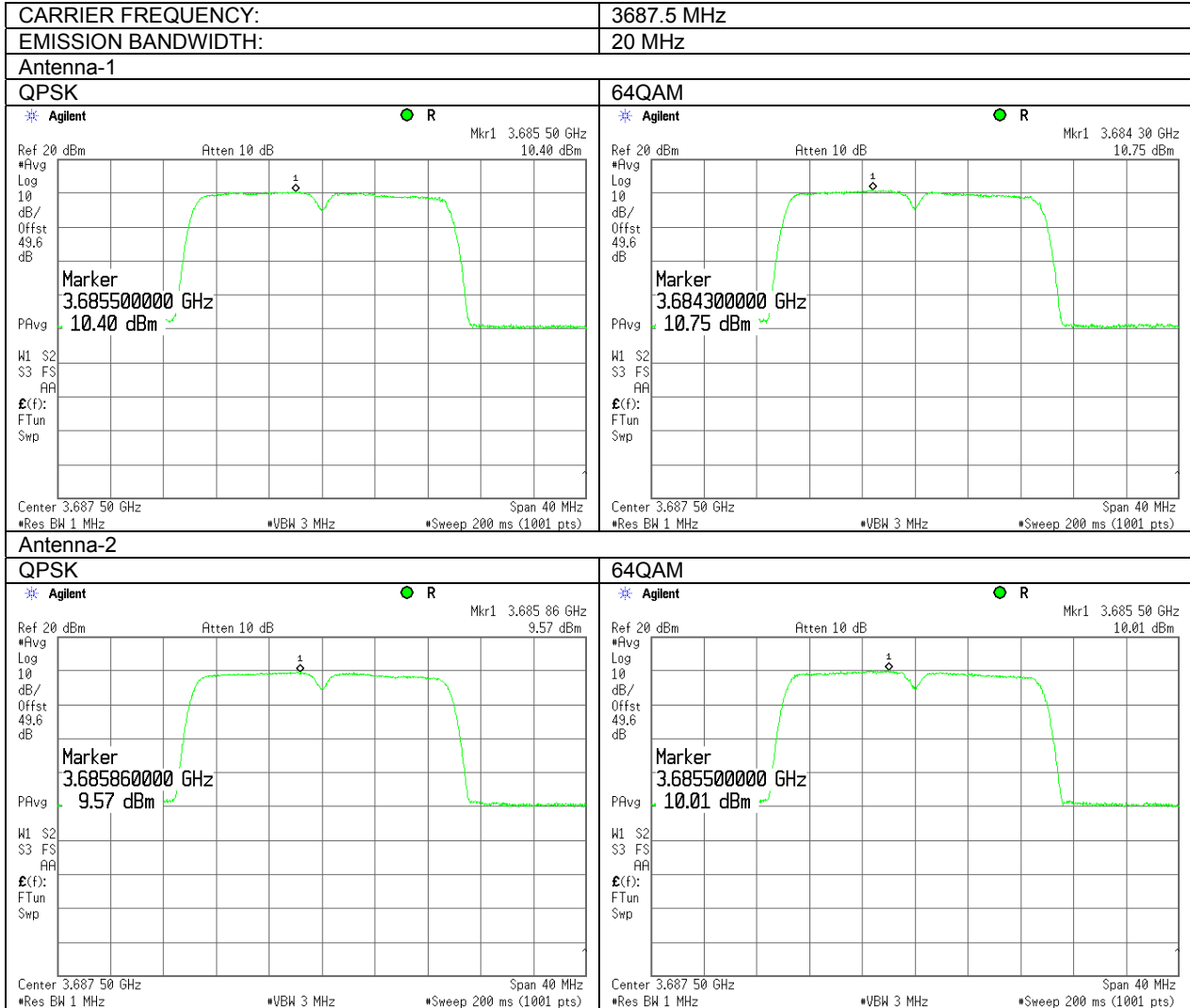
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.43 EIRP spectral density test results at low frequency with 15.8 dBi antenna



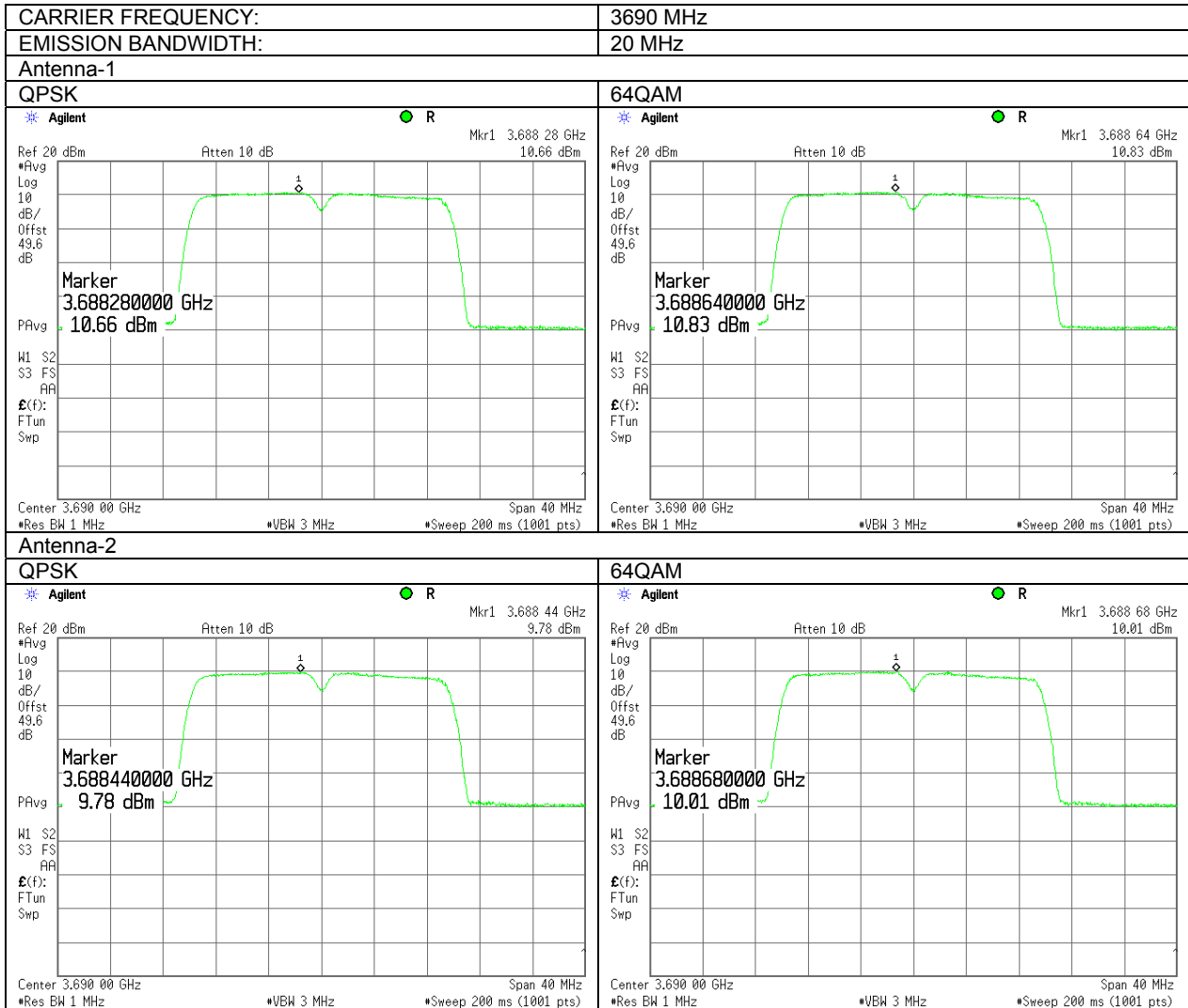
Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density			
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1			
Test mode: Compliance	Verdict: PASS		
Date: 4/18/2011 - 4/28/2011			
Temperature: 23.4 °C	Air Pressure: 1005 hPa	Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:			

Plot 7.2.44 EIRP spectral density test results at mid frequency with 15.8 dBi antenna



Test specification: Section 90.1321 / RSS-197, Section 5.6, Peak EIRP power density	
Test procedure: 47 CFR, Sections 2.1046; TIA/EIA-603-C, Section 2.2.1	
Test mode: Compliance	Verdict: PASS
Date: 4/18/2011 - 4/28/2011	
Temperature: 23.4 °C	Air Pressure: 1005 hPa
Relative Humidity: 45 %	Power Supply: 48 VDC
Remarks:	

Plot 7.2.45 EIRP spectral density test results at high frequency with 15.8 dBi antenna



Test specification:		Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

7.3 Occupied bandwidth test

7.3.1 General

This test was performed to measure transmitter occupied bandwidth. Specification test limits are given in Table 7.3.1.

Table 7.3.1 Occupied bandwidth limits

Assigned frequency, MHz	Modulation envelope reference points*, dBc	Maximum allowed bandwidth, MHz
3675.0 – 3700.0	26	NA

* - Modulation envelope reference points are provided in terms of attenuation below the total average power.

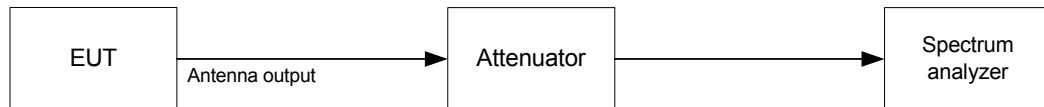
7.3.2 Test procedure

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 set to transmit the normally modulated carrier.

7.3.2.3 The transmitter occupied bandwidth was measured with spectrum analyzer as a frequency delta between the reference points on modulation envelope and provided in Table 7.3.2 and the associated plots.

Figure 7.3.1 Occupied bandwidth test setup



Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Table 7.3.2 Occupied bandwidth test results

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 51 kHz
VIDEO BANDWIDTH: 150 kHz
MODULATION: OFDM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
CHANNEL BANDWIDTH: 5 MHz

Carrier frequency, MHz	Occupied bandwidth 99%, kHz	Occupied bandwidth 26 dBc, kHz
QPSK		
3677.5	4446.7	4950.0
3687.5	4564.8	4918.0
3697.5	4570.0	4886.0
64QAM		
3677.5	4557.3	4957.0
3687.5	4557.7	4850.0
3697.5	4556.6	4851.0

Table 7.3.3 Occupied bandwidth test results

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 75 kHz
VIDEO BANDWIDTH: 225 kHz
MODULATION: OFDM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
CHANNEL BANDWIDTH: 7 MHz

Carrier frequency, MHz	Occupied bandwidth 99%, kHz	Occupied bandwidth 26 dBc, kHz
QPSK		
3678.5	6505.1	6762.0
3687.5	6493.8	6897.0
3696.5	6508.0	6961.0
64QAM		
3677.5	6490.4	6843.0
3687.5	6491.9	6758.0
3697.5	6494.8	6940.0

Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Table 7.3.4 Occupied bandwidth test results

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 100 kHz
VIDEO BANDWIDTH: 300 kHz
MODULATION: OFDM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
CHANNEL BANDWIDTH: 10 MHz

Carrier frequency, MHz	Occupied bandwidth 99%, kHz	Occupied bandwidth 26 dBc, kHz
QPSK		
3680.0	9056.8	9588.0
3687.5	9057.7	9833.0
3695.0	9057.0	9644.0
64QAM		
3680.0	9076.0	9387.0
3687.5	9095.3	9617.0
3695.0	9084.1	9432.0

Table 7.3.5 Occupied bandwidth test results

DETECTOR USED: Average
RESOLUTION BANDWIDTH: 150 kHz
VIDEO BANDWIDTH: 450 kHz
MODULATION: OFDM
MODULATING SIGNAL: PRBS
BIT RATE: Maximum
CHANNEL BANDWIDTH: 14 MHz

Carrier frequency, MHz	Occupied bandwidth 99%, kHz	Occupied bandwidth 26 dBc, kHz
QPSK		
3682.0	13426.5	13878.0
3687.5	13423.7	13888.0
3693.0	13419.1	13871.0
64QAM		
3682.0	13421.5	13880.0
3687.5	13379.6	13873.0
3693.0	13419.9	13888.0

Test specification:		Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth	
Test procedure:		47 CFR, Section 2.1049	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Table 7.3.6 Occupied bandwidth test results

DETECTOR USED: Average
 RESOLUTION BANDWIDTH: 220 kHz
 VIDEO BANDWIDTH: 680 kHz
 MODULATION: OFDM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum
 CHANNEL BANDWIDTH: 20 MHz

Carrier frequency, MHz	Occupied bandwidth 99%, kHz	Occupied bandwidth 26 dBc, kHz
QPSK		
3685.0	18967.0	19896.0
3687.5	18983.4	19647.0
3690.0	18949.9	19723.0
64QAM		
3685.0	18990.1	19738.0
3687.5	18922.9	19815.0
3690.0	18989.9	19809.0

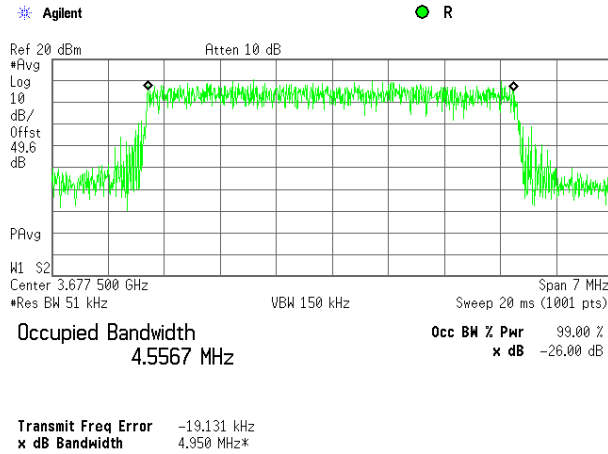
Reference numbers of test equipment used

HL 2818	HL 2952	HL 3301	HL 3302	HL 3763	HL 3818	HL 3868	
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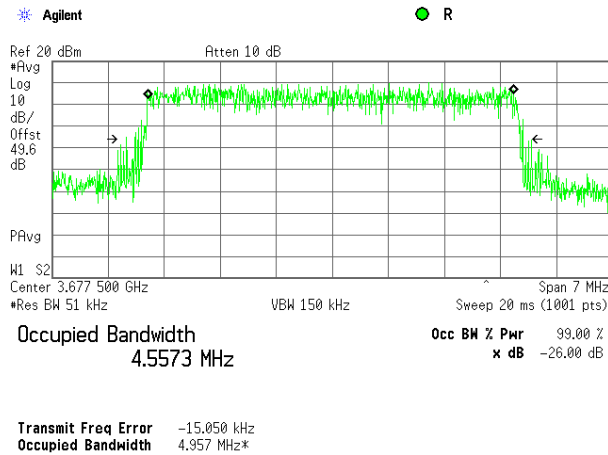
Full description is given in Appendix A.

Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.1 Occupied bandwidth test result at low frequency, 5 MHz channel bandwidth, QPSK

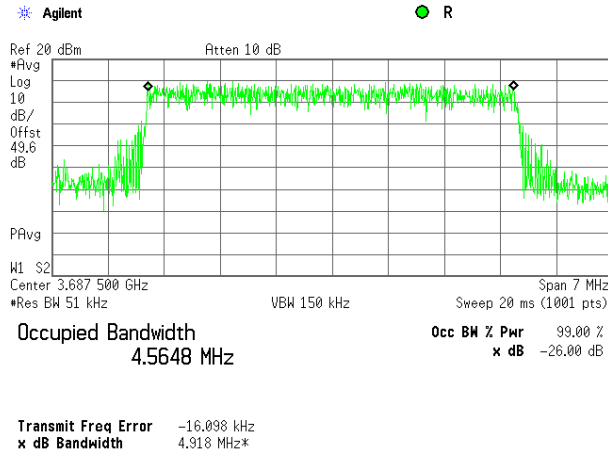


Plot 7.3.2 Occupied bandwidth test result at low frequency, 5 MHz channel bandwidth, 64QAM

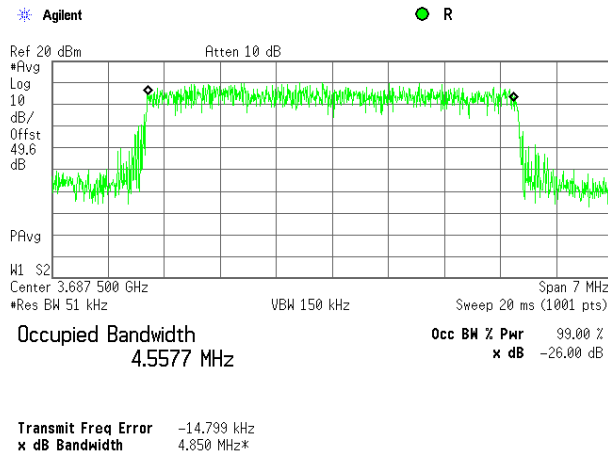


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.3 Occupied bandwidth test result at mid frequency, 5 MHz channel bandwidth, QPSK

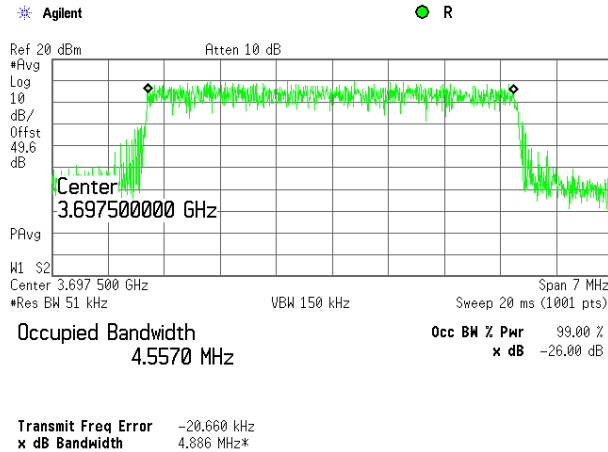


Plot 7.3.4 Occupied bandwidth test result at mid frequency, 5 MHz channel bandwidth, 64QAM

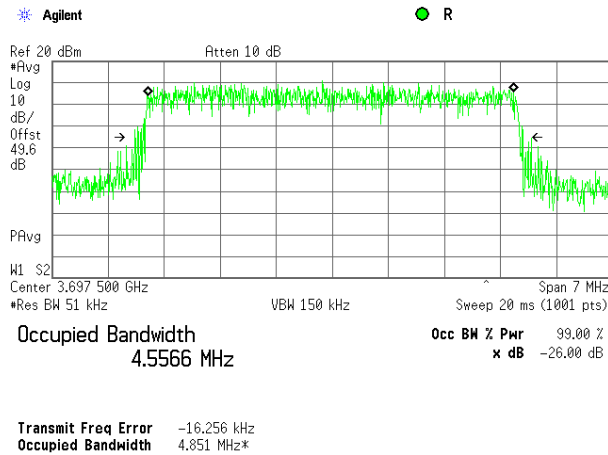


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.5 Occupied bandwidth test result at high frequency, 5 MHz channel bandwidth, QPSK

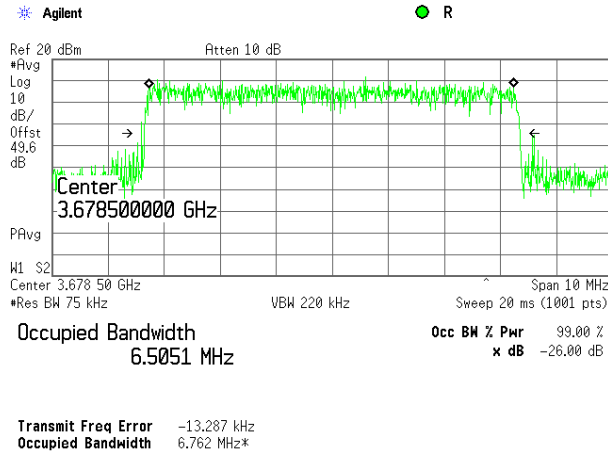


Plot 7.3.6 Occupied bandwidth test result at high frequency, 5 MHz channel bandwidth, 64QAM

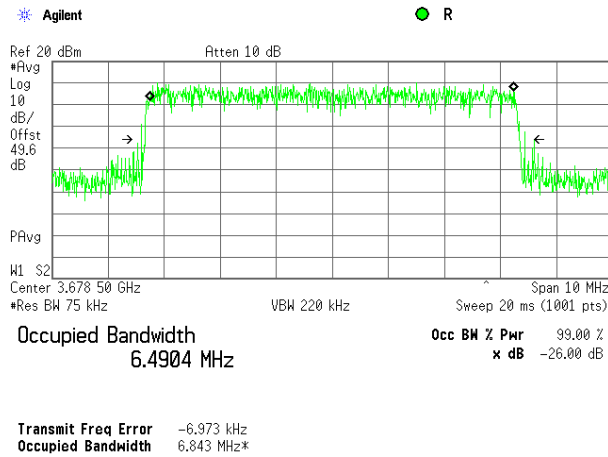


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.7 Occupied bandwidth test result at low frequency, 7 MHz channel bandwidth, QPSK

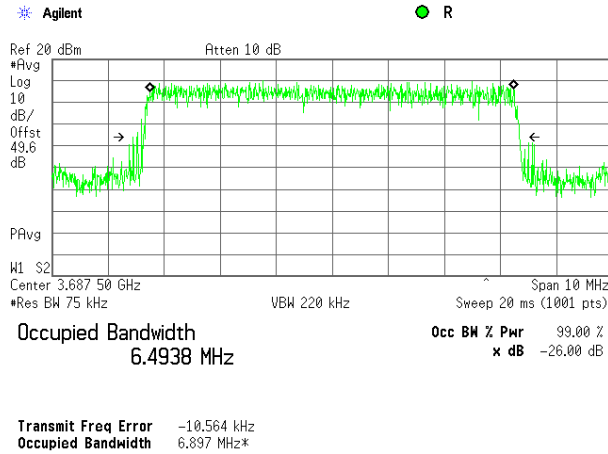


Plot 7.3.8 Occupied bandwidth test result at low frequency, 7 MHz channel bandwidth, 64QAM

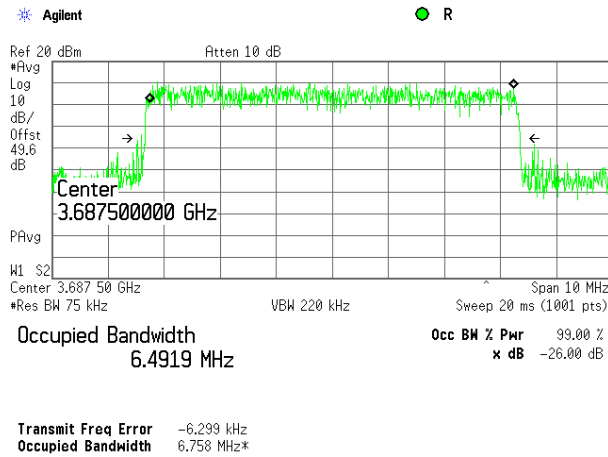


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.9 Occupied bandwidth test result at mid frequency, 7 MHz channel bandwidth, QPSK

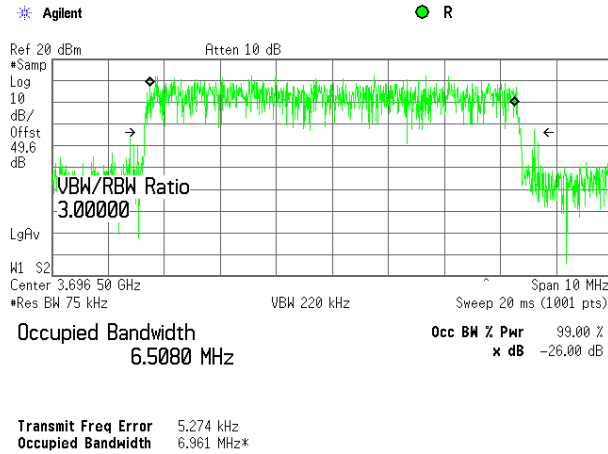


Plot 7.3.10 Occupied bandwidth test result at mid frequency, 7 MHz channel bandwidth, 64QAM

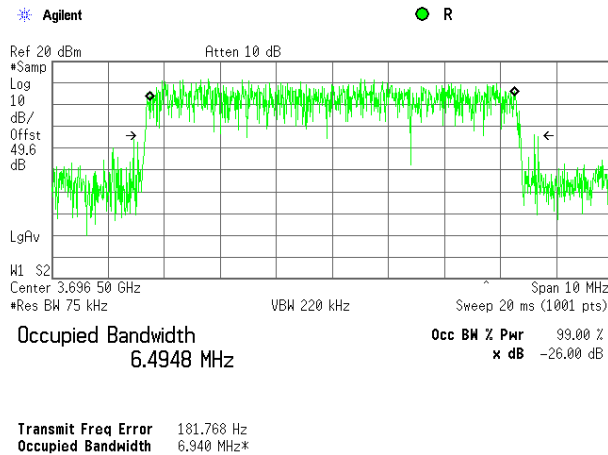


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.11 Occupied bandwidth test result at high frequency, 7 MHz channel bandwidth, QPSK

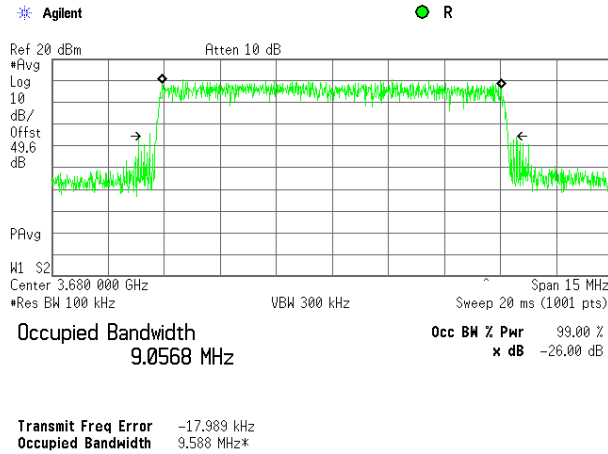


Plot 7.3.12 Occupied bandwidth test result at high frequency, 7 MHz channel bandwidth, 64QAM

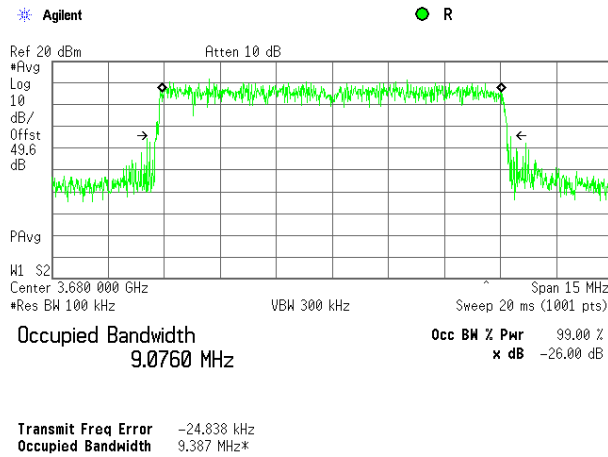


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.13 Occupied bandwidth test result at low frequency, 10 MHz channel bandwidth, QPSK

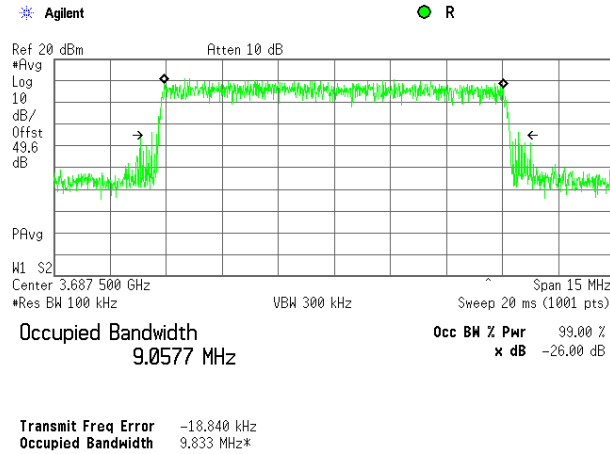


Plot 7.3.14 Occupied bandwidth test result at low frequency, 10 MHz channel bandwidth, 64QAM

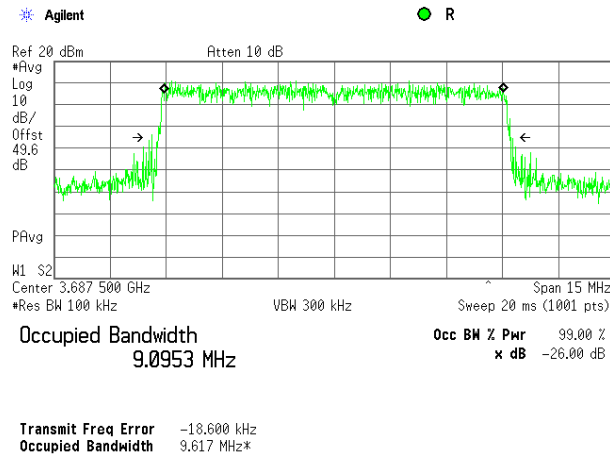


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.15 Occupied bandwidth test result at mid frequency, 10 MHz channel bandwidth, QPSK

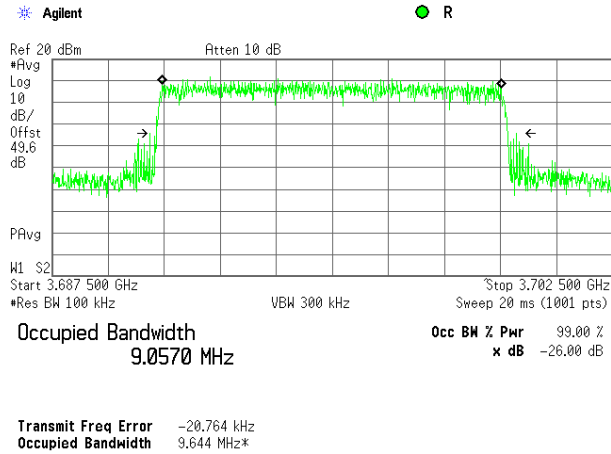


Plot 7.3.16 Occupied bandwidth test result at mid frequency, 10 MHz channel bandwidth, 64QAM

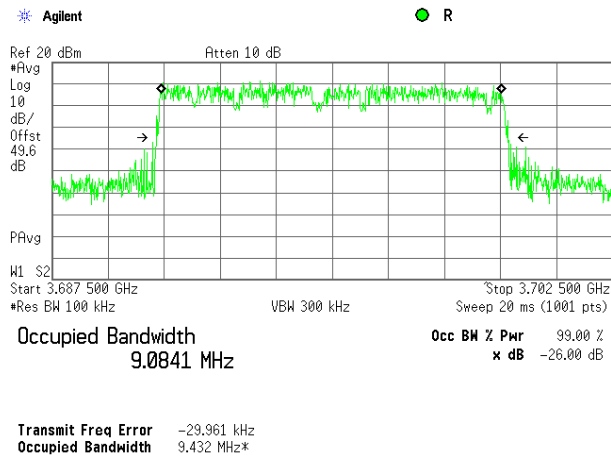


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.17 Occupied bandwidth test result at high frequency, 10 MHz channel bandwidth, QPSK

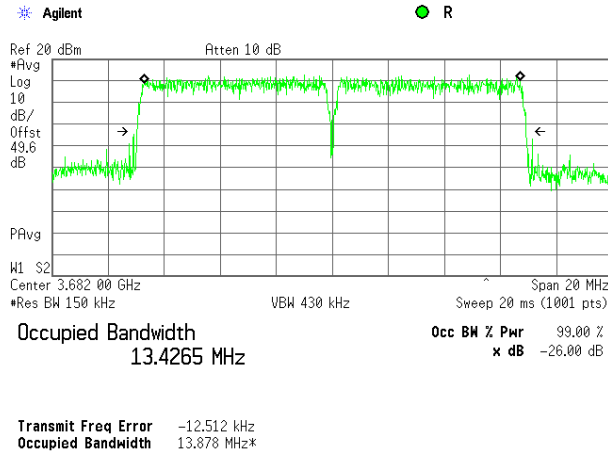


Plot 7.3.18 Occupied bandwidth test result at high frequency, 10 MHz channel bandwidth, 64QAM

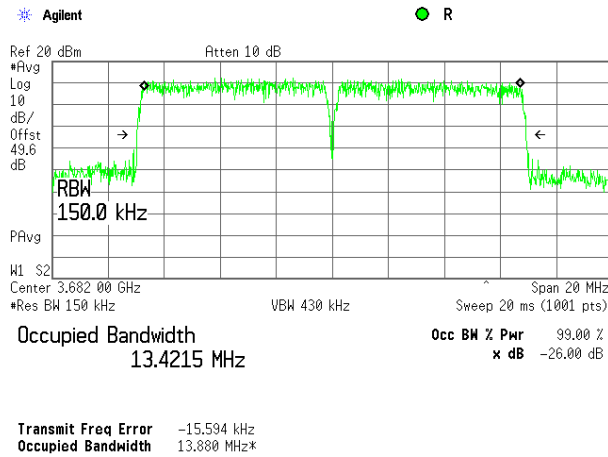


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.19 Occupied bandwidth test result at low frequency, 14 MHz channel bandwidth, QPSK

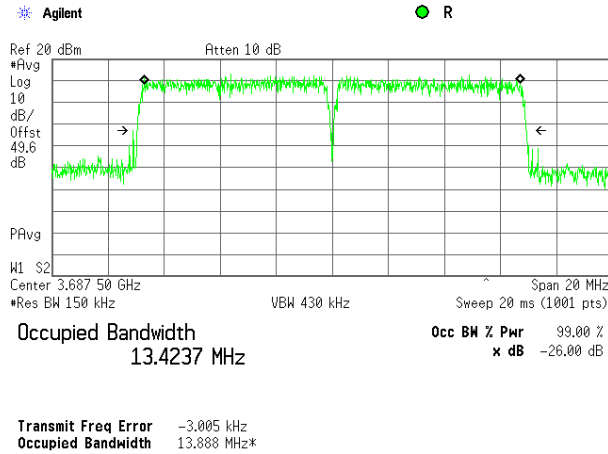


Plot 7.3.20 Occupied bandwidth test result at low frequency, 14 MHz channel bandwidth, 64QAM

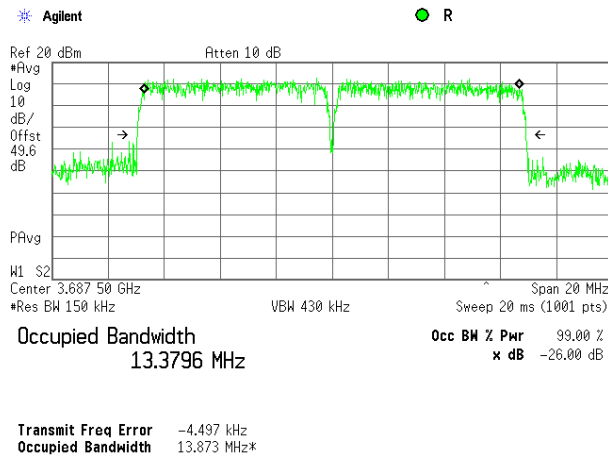


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.21 Occupied bandwidth test result at mid frequency, 14 MHz channel bandwidth, QPSK

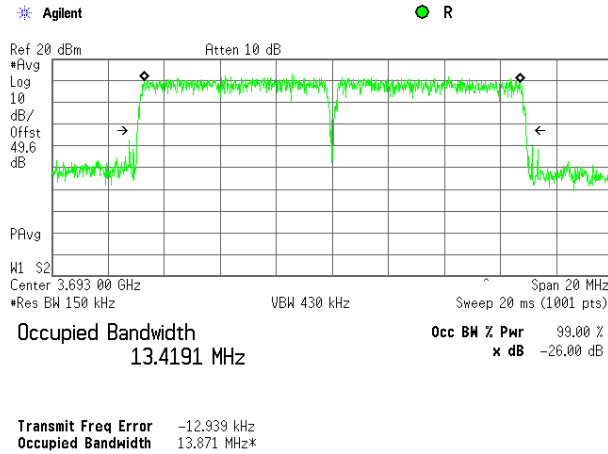


Plot 7.3.22 Occupied bandwidth test result at mid frequency, 14 MHz channel bandwidth, 64QAM

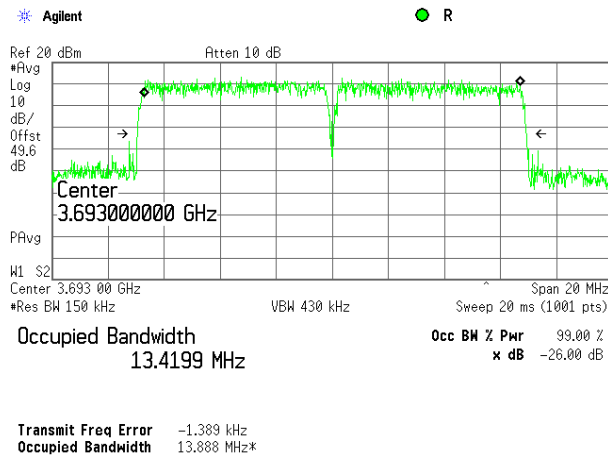


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.23 Occupied bandwidth test result at high frequency, 14 MHz channel bandwidth, QPSK

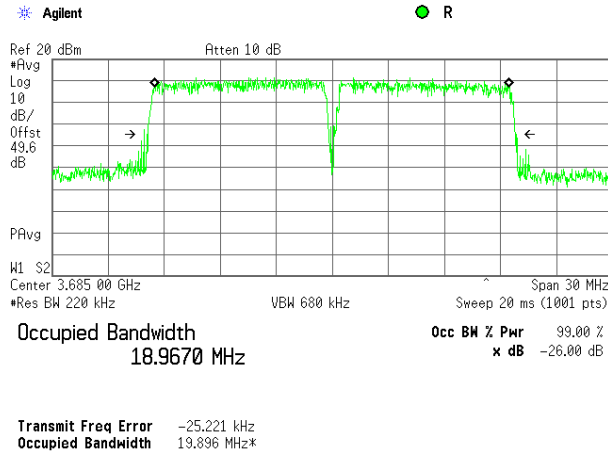


Plot 7.3.24 Occupied bandwidth test result at high frequency, 14 MHz channel bandwidth, 64QAM

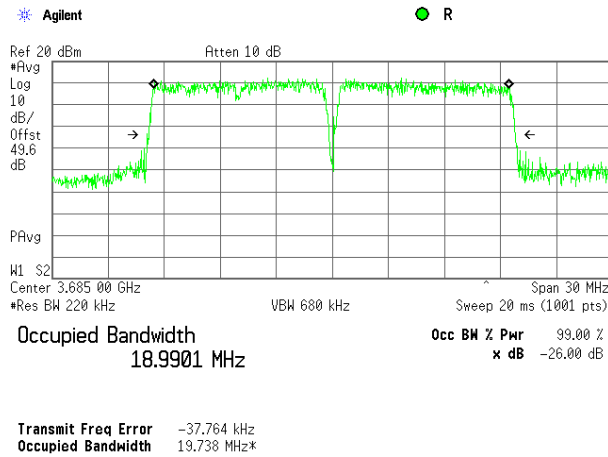


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.25 Occupied bandwidth test result at low frequency, 20 MHz channel bandwidth, QPSK

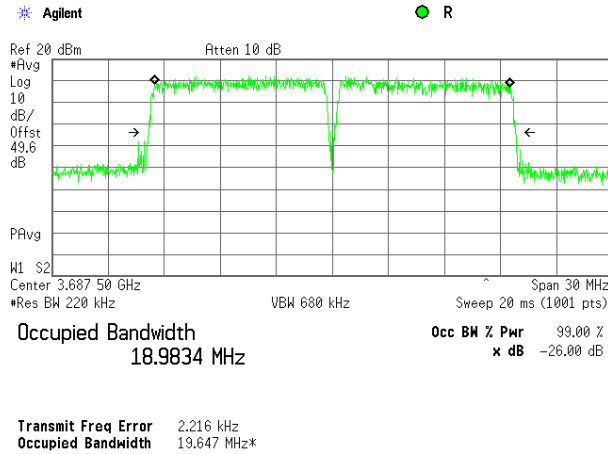


Plot 7.3.26 Occupied bandwidth test result at low frequency, 20 MHz channel bandwidth, 64QAM

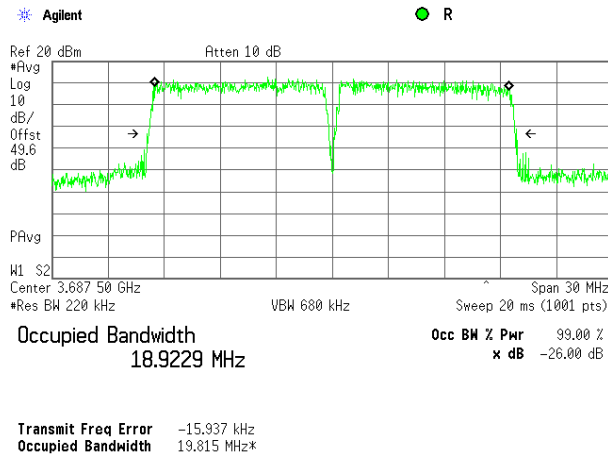


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.27 Occupied bandwidth test result at mid frequency, 20 MHz channel bandwidth, QPSK

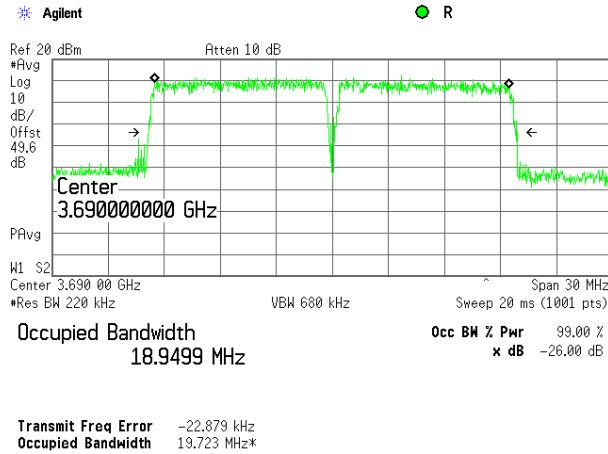


Plot 7.3.28 Occupied bandwidth test result at mid frequency, 20 MHz channel bandwidth, 64QAM

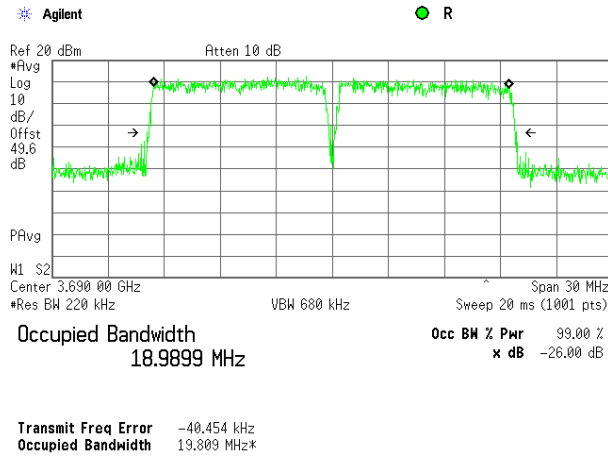


Test specification: Section 90.209 / RSS-197, Section 5.2, Occupied bandwidth			
Test procedure: 47 CFR, Section 2.1049			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 23.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.3.29 Occupied bandwidth test result at high frequency, 20 MHz channel bandwidth, QPSK



Plot 7.3.30 Occupied bandwidth test result at high frequency, 20 MHz channel bandwidth, 64QAM



Test specification:		Section 90.210(b), Emission mask	
Test procedure:		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

7.4 Emission mask test

7.4.1 General

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

Table 7.4.1 Emission mask limits

Frequency displacement from carrier	Attenuation below carrier, dBc
Emission mask B (Emission bandwidth 5 MHz)	
0 – 2.5 MHz	0
2.5 – 5.0 MHz	25
5.0 – 12.5 MHz	35
More than* 12.5 MHz	43 + 10 log(P)
Emission mask B (Emission bandwidth 7 MHz)	
0 – 3.5 MHz	0
3.5 – 7.0 MHz	25
7.0 – 17.5 MHz	35
More than* 17.5 MHz	43 + 10 log(P)
Emission mask B (Emission bandwidth 10 MHz)	
0 – 5 MHz	0
5 – 10.0 MHz	25
10.0 – 25.0 MHz	35
More than* 25.0 MHz	43 + 10 log(P)
Emission mask B (Emission bandwidth 14 MHz)	
0 – 7.0 MHz	0
7.0 – 14.0 MHz	25
14.0 – 35.0 MHz	35
More than* 35.0 MHz	43 + 10 log(P)
Emission mask B (Emission bandwidth 20 MHz)	
0 – 10.0 MHz	0
10.0 – 20.0 MHz	25
20.0 – 50.0 MHz	35
More than* 50.0 MHz	43 + 10 log(P)

* - emission mask includes carrier modulation envelope within ± 250 % of the authorized bandwidth; the frequency range removed beyond ± 250 % of the authorized bandwidth from carrier was investigated as spurious emission

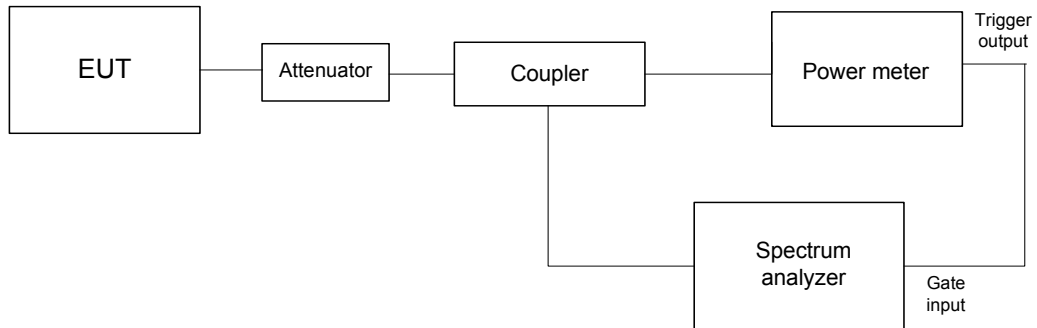
7.4.2 Test procedure

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 emission mask was measured with spectrum analyzer as provided in the associated plots. The test results are provided in Table 7.4.2 and the associated plots.

Test specification:		Section 90.210(b), Emission mask	
Test procedure:		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Figure 7.4.1 Emission mask test setup



Test specification:		Section 90.210(b), Emission mask	
Test procedure: 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Table 7.4.2 Emission mask test results

Carrier frequency, MHz	Limit	Reference to Plot	Verdict
5 MHz			
3677.5	Emission mask B	Plot 7.4.1, Plot 7.4.2	Pass
3687.5		Plot 7.4.3, Plot 7.4.4	
3697.5		Plot 7.4.5, Plot 7.4.6	
7 MHz			
3678.5	Emission mask B	Plot 7.4.7, Plot 7.4.8	Pass
3687.5		Plot 7.4.9, Plot 7.4.10	
3696.5		Plot 7.4.11, Plot 7.4.12	
10 MHz			
3680.0	Emission mask B	Plot 7.4.13, Plot 7.4.14	Pass
3687.5		Plot 7.4.15, Plot 7.4.16	
3695.0		Plot 7.4.17, Plot 7.4.18	
14 MHz			
3682.0	Emission mask B	Plot 7.4.19, Plot 7.4.20	Pass
3687.5		Plot 7.4.21, Plot 7.4.22	
3693.0		Plot 7.4.23, Plot 7.4.24	
20 MHz			
3685.0	Emission mask B	Plot 7.4.25, Plot 7.4.26	Pass
3687.5		Plot 7.4.27, Plot 7.4.28	
3690.0		Plot 7.4.29, Plot 7.4.30	

NOTE1: Attenuation below carrier provided in terms of attenuation below total average power within occupied bandwidth. Measurement was performed with RBW set to 100 kHz and the limit mask was reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Reference numbers of test equipment used

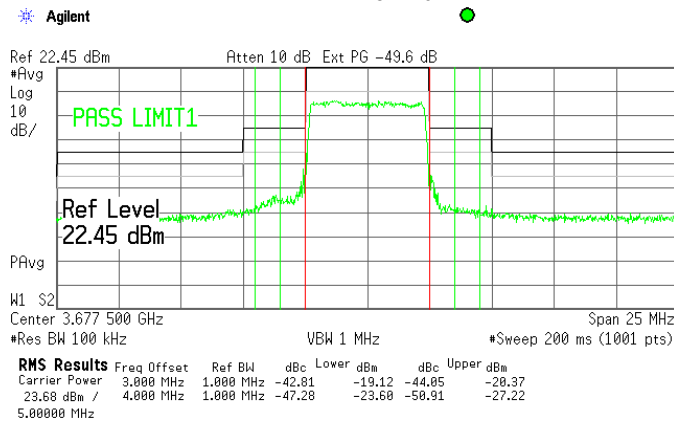
HL 2818	HL 2952	HL 3301	HL 3302	HL 3763	HL 3818	HL 3868	
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Full description is given in Appendix A.

Test specification: Section 90.210(b), Emission mask			
Test procedure: 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
Test mode: Compliance	Verdict: PASS		
Date: 4/24/2011 - 5/1/2011			
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.1 Emission mask test results at low carrier frequency, 5 MHz CBW

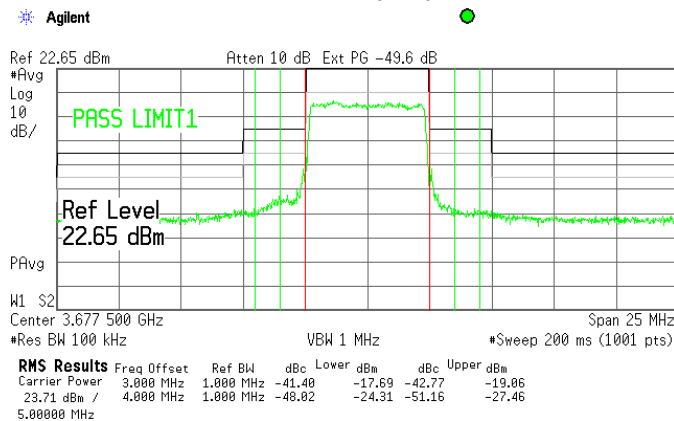
ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.2 Emission mask test results at low carrier frequency, 5 MHz CBW

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

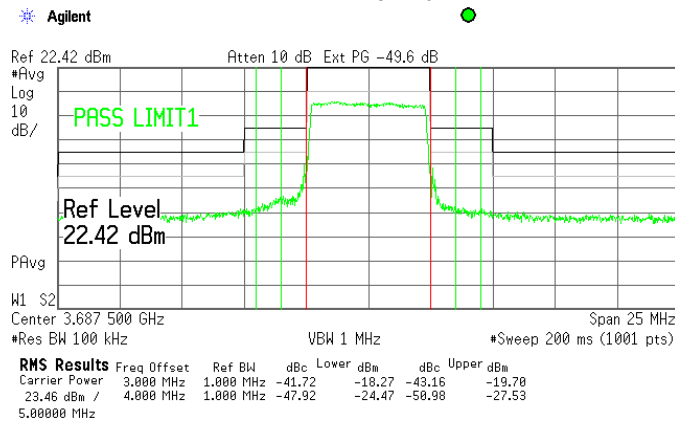


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.3 Emission mask test results at mid carrier frequency, 5 MHz CBW

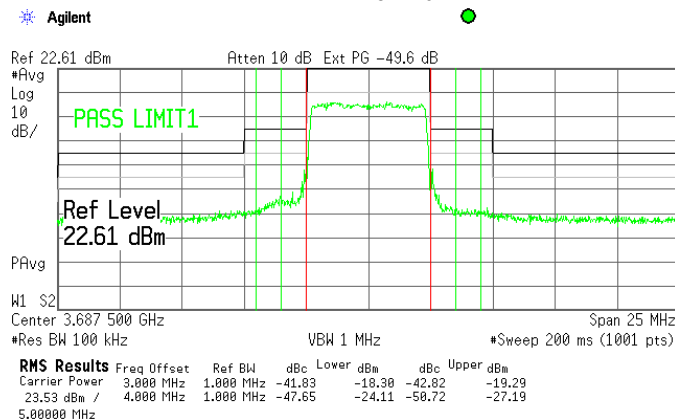
ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.4 Emission mask test results at mid carrier frequency, 5 MHz CBW

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

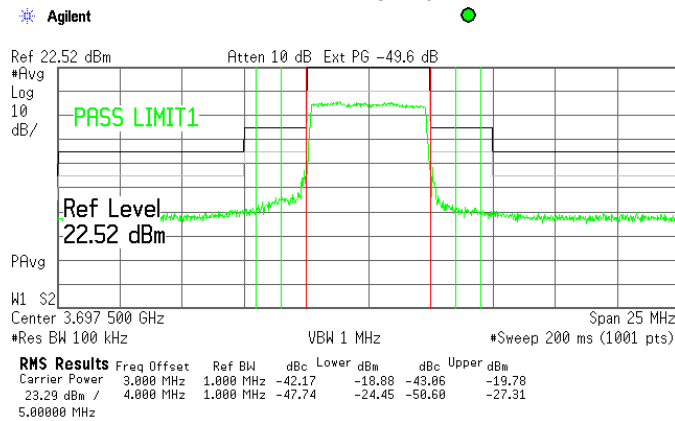


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.5 Emission mask test results at high carrier frequency, 5 MHz CBW

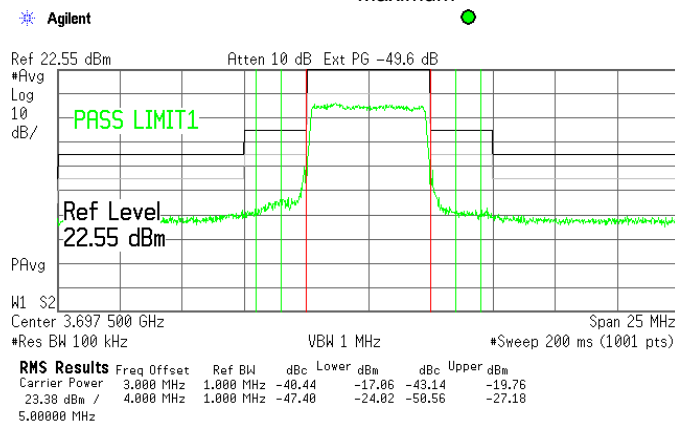
ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.6 Emission mask test results at high carrier frequency, 5 MHz CBW

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

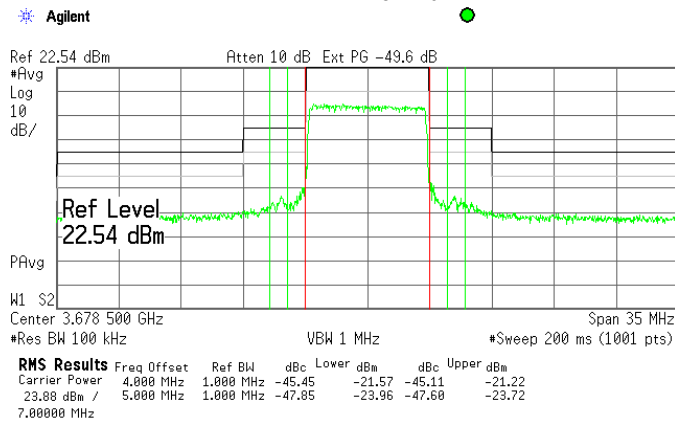


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.7 Emission mask test results at low carrier frequency, 7 MHz CBW

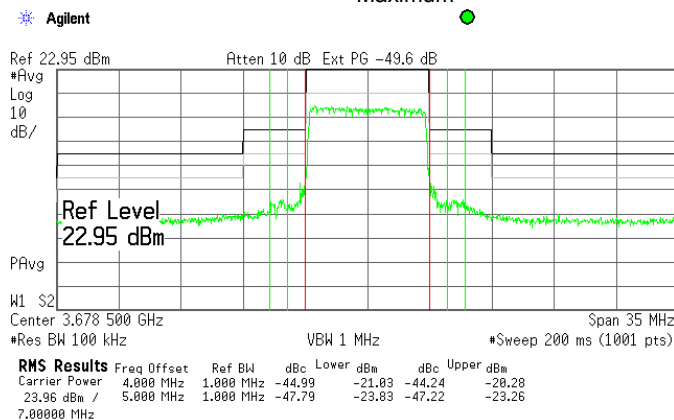
ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.8 Emission mask test results at low carrier frequency, 7 MHz CBW

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

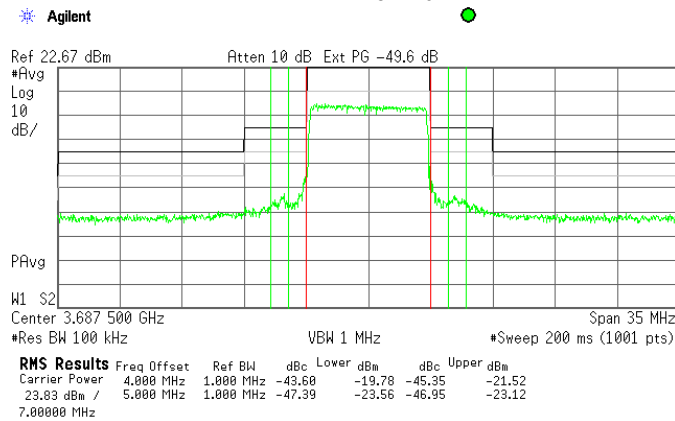


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.9 Emission mask test results at mid carrier frequency, 7 MHz CBW

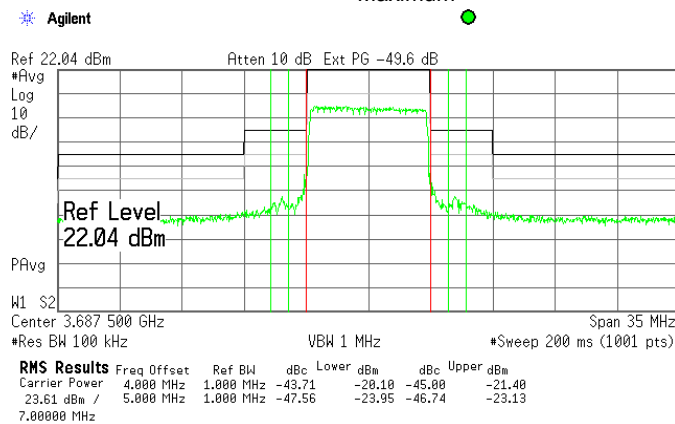
ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.10 Emission mask test results at mid carrier frequency, 7 MHz CBW

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

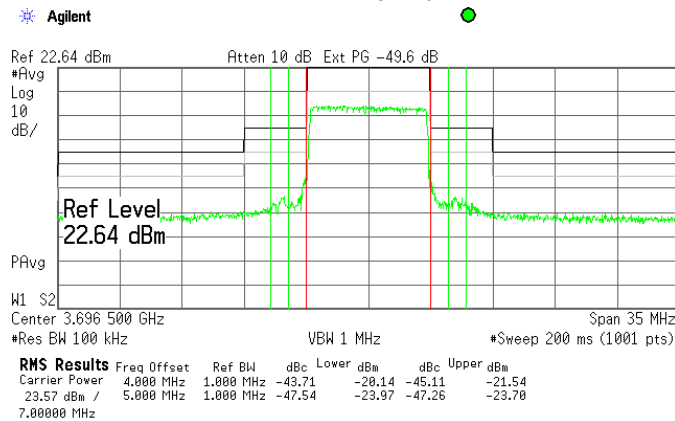


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.11 Emission mask test results at high carrier frequency, 7 MHz CBW

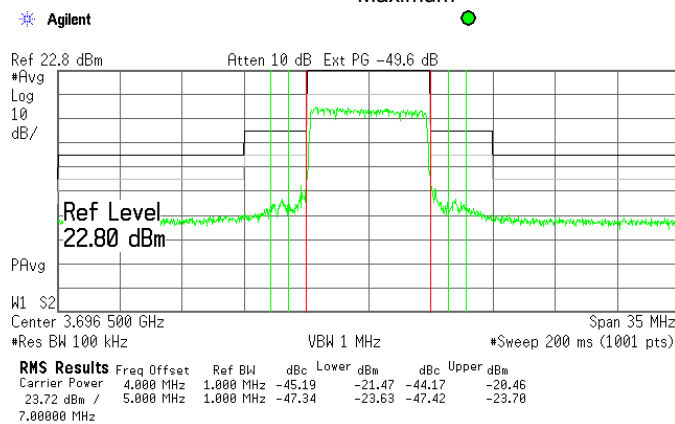
ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.12 Emission mask test results at high carrier frequency, 7 MHz CBW

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

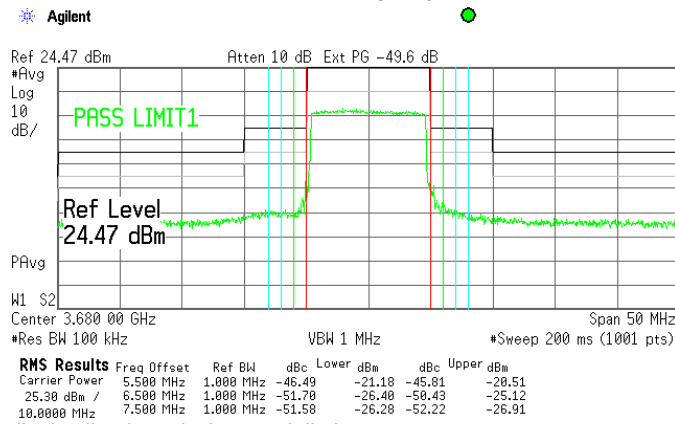


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification: Section 90.210(b), Emission mask			
Test procedure: 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
Test mode: Compliance	Verdict: PASS		
Date: 4/24/2011 - 5/1/2011			
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.13 Emission mask test results at low carrier frequency, 10 MHz CBW

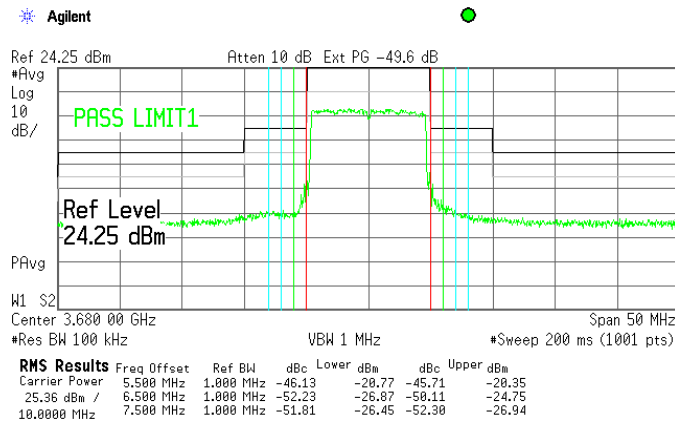
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.14 Emission mask test results at low carrier frequency, 10 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

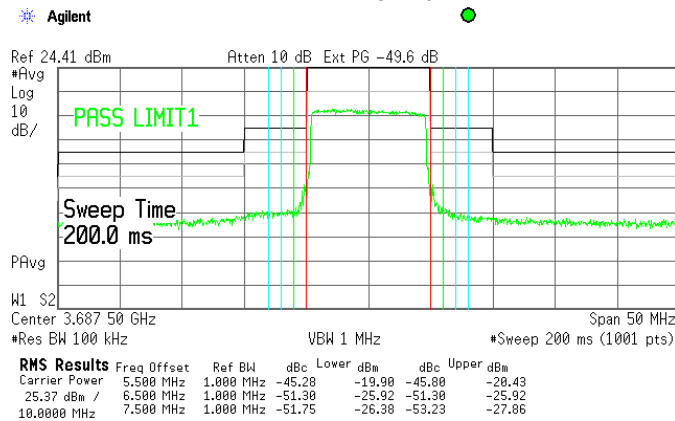


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification: Section 90.210(b), Emission mask			
Test procedure: 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
Test mode: Compliance	Verdict: PASS		
Date: 4/24/2011 - 5/1/2011			
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.15 Emission mask test results at mid carrier frequency, 10 MHz CBW

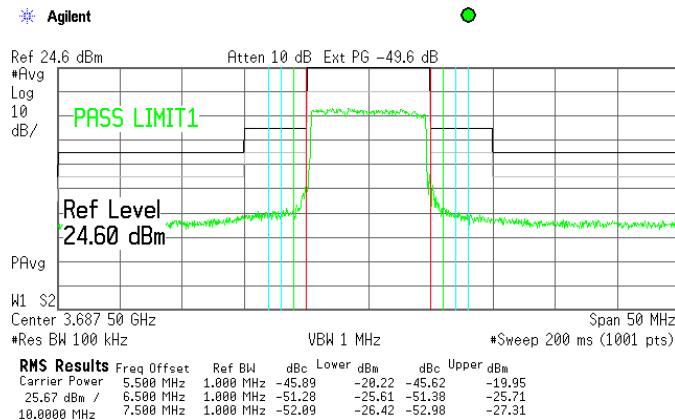
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.16 Emission mask test results at mid carrier frequency, 10 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

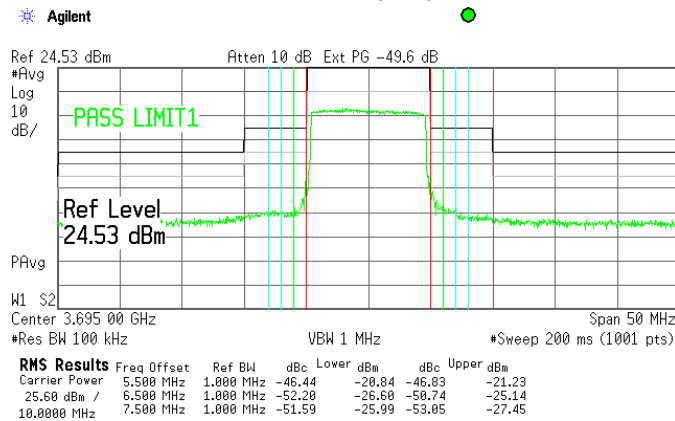


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification: Section 90.210(b), Emission mask			
Test procedure: 47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13			
Test mode: Compliance	Verdict: PASS		
Date: 4/24/2011 - 5/1/2011			
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.17 Emission mask test results at high carrier frequency, 10 MHz CBW

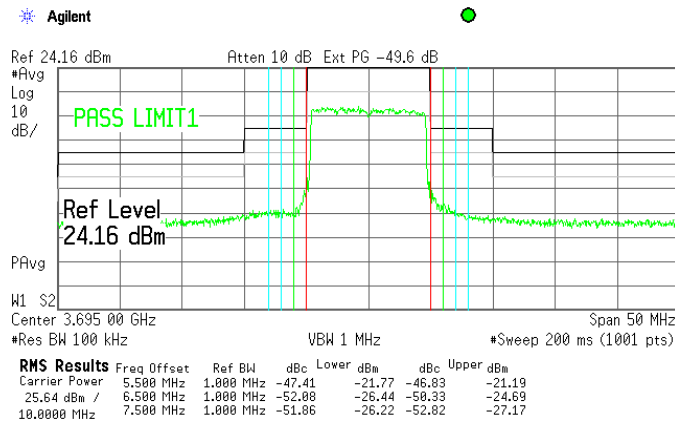
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.18 Emission mask test results at high carrier frequency, 10 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

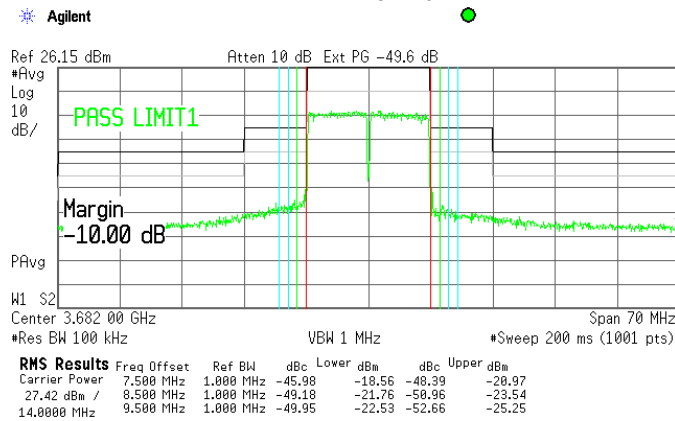


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.19 Emission mask test results at low carrier frequency, 14 MHz CBW

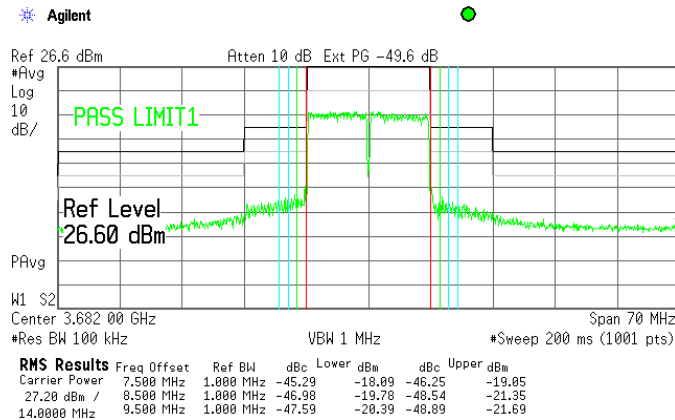
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.20 Emission mask test results at low carrier frequency, 14 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

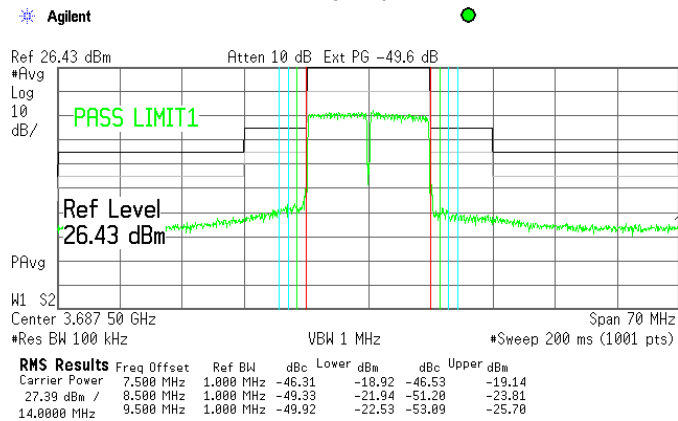


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.21 Emission mask test results at mid carrier frequency, 14 MHz CBW

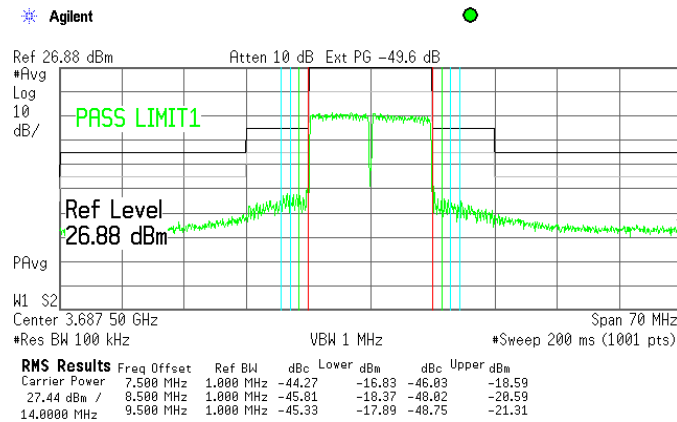
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.22 Emission mask test results at mid carrier frequency, 14 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

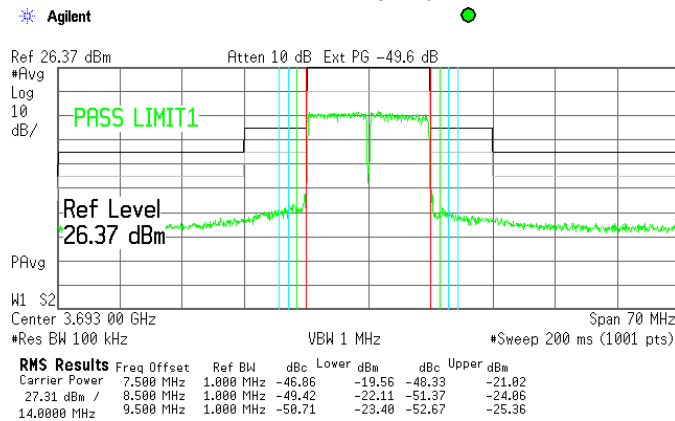


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.23 Emission mask test results at high carrier frequency, 14 MHz CBW

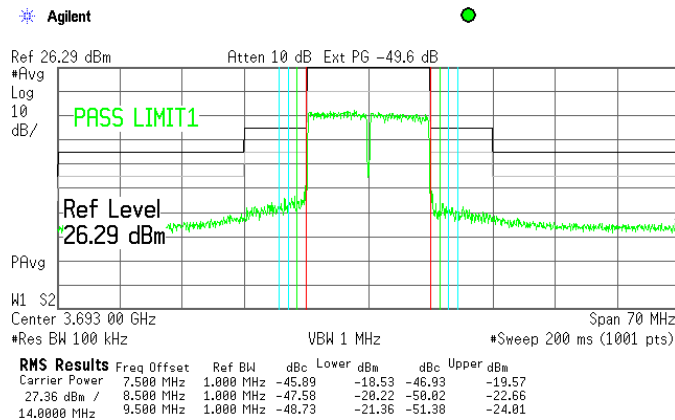
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.24 Emission mask test results at high carrier frequency, 14 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

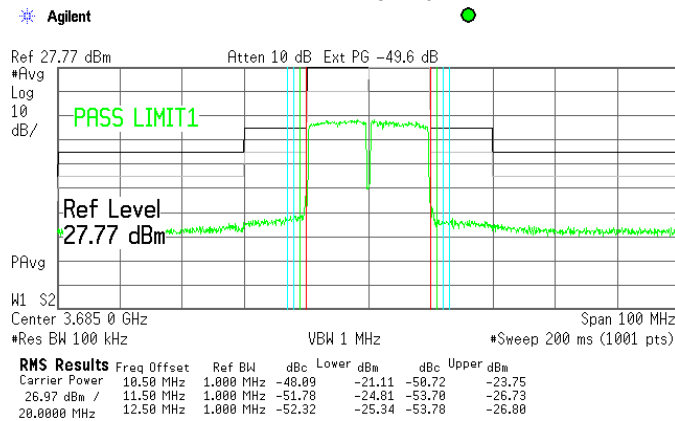


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.25 Emission mask test results at low carrier frequency, 20 MHz CBW

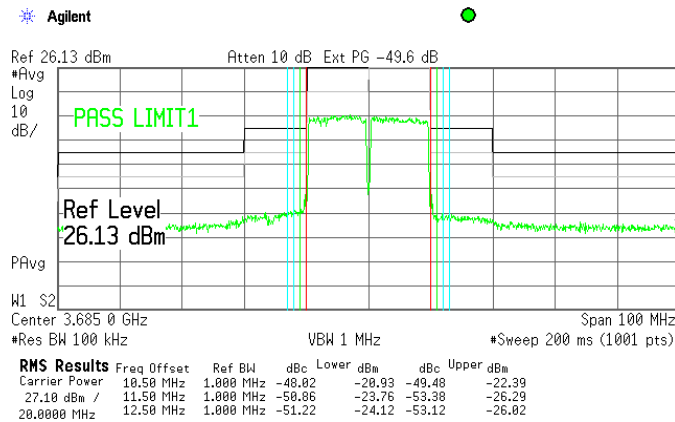
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.26 Emission mask test results at low carrier frequency, 20 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

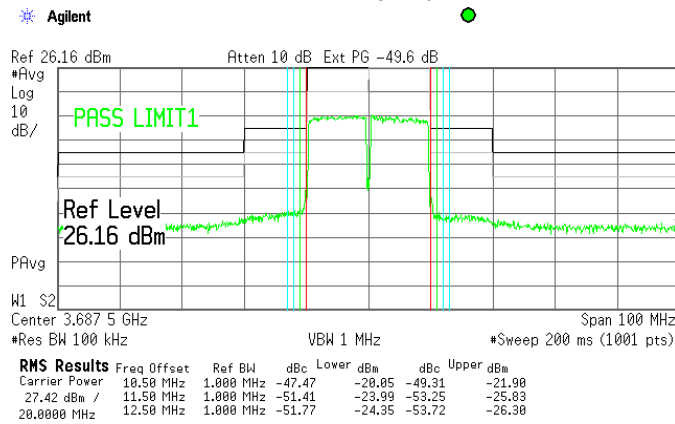


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:		Section 90.210(b), Emission mask	
Test procedure:		47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13	
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.27 Emission mask test results at mid carrier frequency, 20 MHz CBW

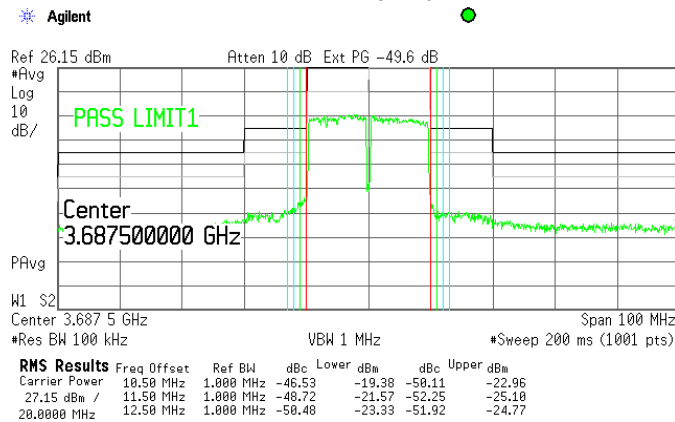
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.28 Emission mask test results at mid carrier frequency, 20 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum

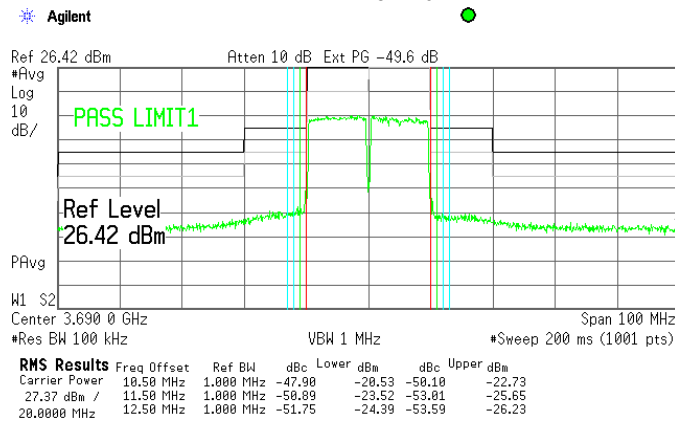


Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.210(b), Emission mask		
Test procedure:	47 CFR, Sections 2.1051, 2.1047, 90.210; TIA/EIA-603-C, Section 2.2.13		
Test mode:	Compliance	Verdict:	PASS
Date:	4/24/2011 - 5/1/2011		
Temperature: 24.2 °C	Air Pressure: 1013 hPa	Relative Humidity: 44 %	Power Supply: 48 VDC
Remarks:			

Plot 7.4.29 Emission mask test results at high carrier frequency, 20 MHz CBW

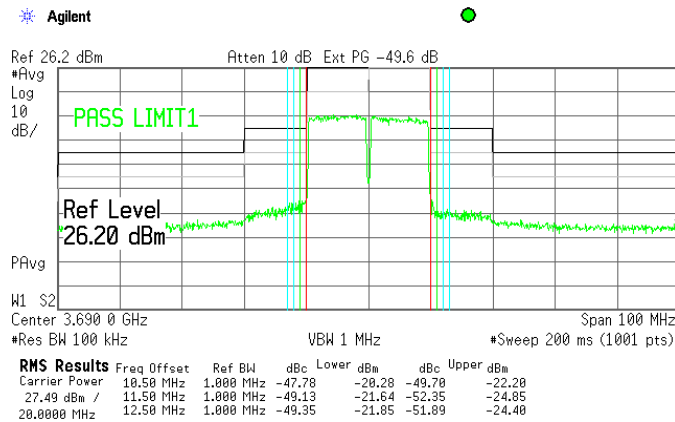
ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: QPSK
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Plot 7.4.30 Emission mask test results at high carrier frequency, 20 MHz CBW

ASSIGNED FREQUENCY RANGE: 3650 – 3675 MHz
 DETECTOR USED: Average
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 BIT RATE: Maximum



Note: Upper display line is emission mask limit.
 Lower display line is emission mask limit reduced by 10 dB to compensate the lower RBW [$10 \cdot \log(1 \text{ MHz} / 100 \text{ kHz}) = 10 \text{ dB}$].

Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

7.5 Spurious emissions at RF antenna connector test

7.5.1 General

This test was performed to measure spurious emissions at RF antenna connector. Specification test limits are given in Table 7.5.1.

Table 7.5.1 Spurious emission limits

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

* - spurious emission limits do not apply to the in band emission within ± 250 % of the authorized bandwidth from the carrier; investigated in course of emission mask testing

** - P is transmitter output power in Watts

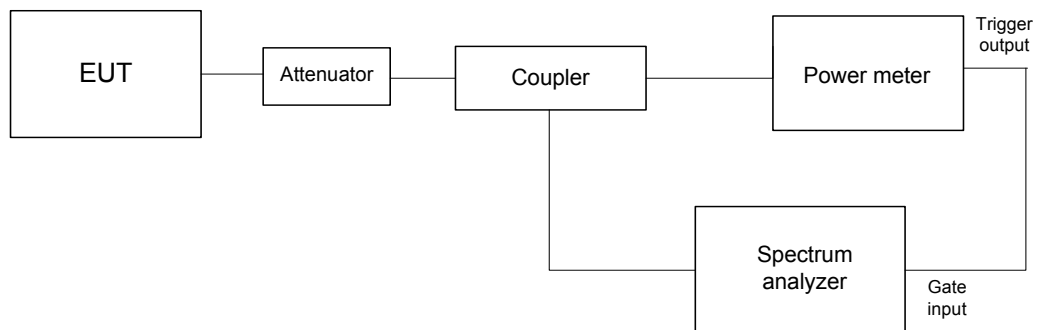
7.5.2 Test procedure

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

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

7.5.2.3 The spurious emission was measured with spectrum analyzer as provided in Table 7.5.2 and the associated plots.

Figure 7.5.1 Spurious emission test setup for single antenna mode



Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Table 7.5.2 Spurious emission test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
 INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 MHz
 DETECTOR USED: Peak
 VIDEO BANDWIDTH: ≥ Resolution bandwidth
 MODULATION: 64QAM
 MODULATING SIGNAL: PRBS
 EMISSION BANDWIDTH: 14 MHz (worst case)
 TRANSMITTER OUTPUT POWER: Maximum

Frequency, MHz	SA reading, dBm	Attenuator, dB	Cable loss, dB	RBW, kHz	Spurious emission, dBm	Limit, dBm	Margin, dB*	Verdict
Low carrier frequency								
No emissions were found								Pass
Mid carrier frequency								
No emissions were found								Pass
High carrier frequency								
No emissions were found								Pass

*- Margin = Spurious emission – specification limit.

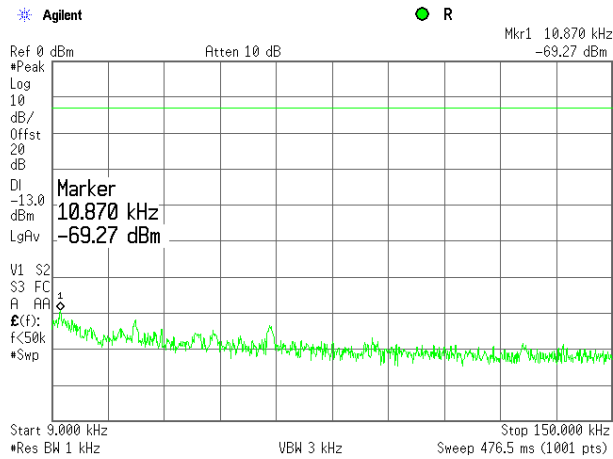
Reference numbers of test equipment used

HL 2818	HL 2952	HL 3301	HL 3302	HL 3763	HL 3818	HL 3868	
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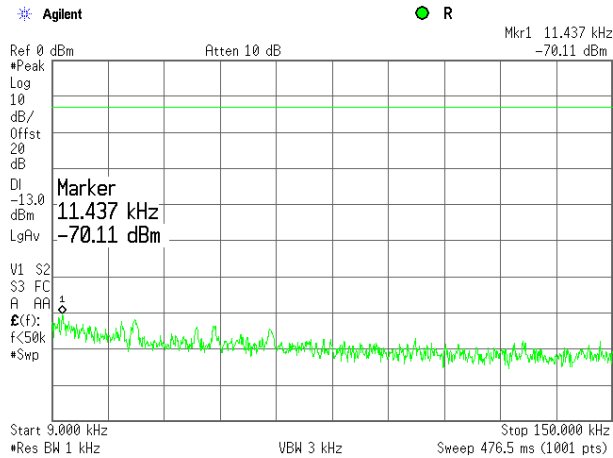
Full description is given in Appendix A.

Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.1 Spurious emission measurements in 9 - 150 kHz range at low carrier frequency (Ant.1)

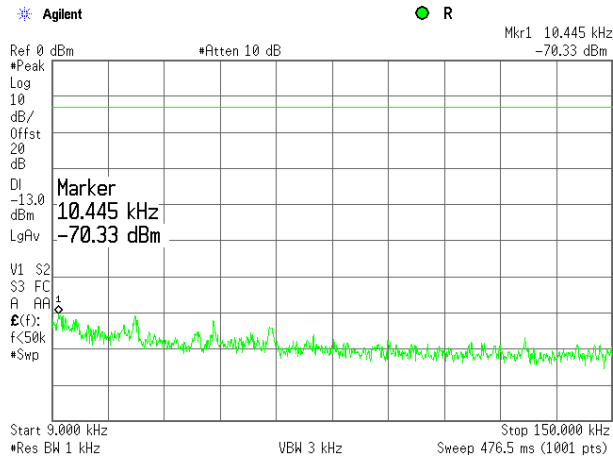


Plot 7.5.2 Spurious emission measurements in 9 - 150 kHz range at mid carrier frequency (Ant.1)

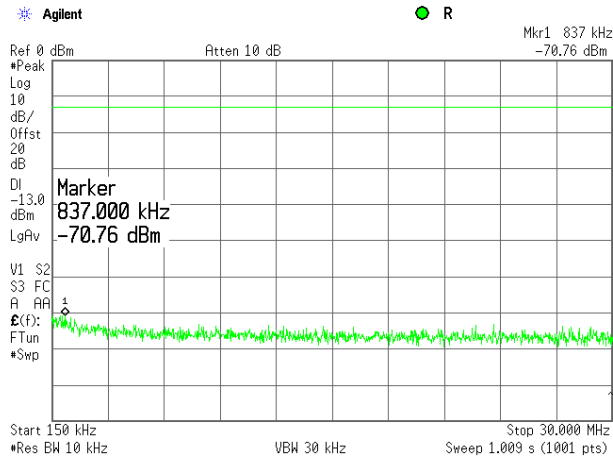


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.3 Spurious emission measurements in 9 - 150 kHz range at high carrier frequency (Ant.1)

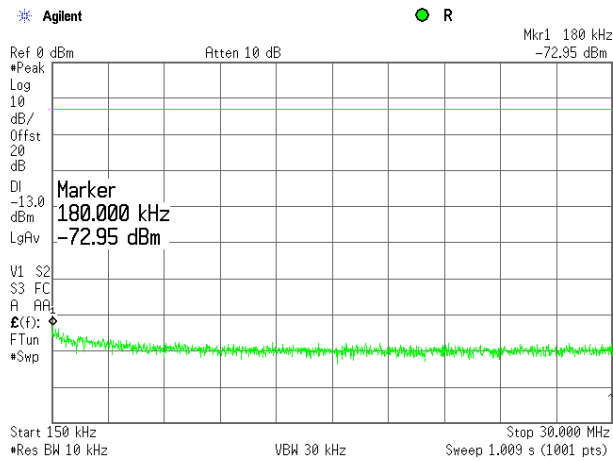


Plot 7.5.4 Spurious emission measurements in 0.15 - 30.0 MHz range at low carrier frequency (Ant.1)

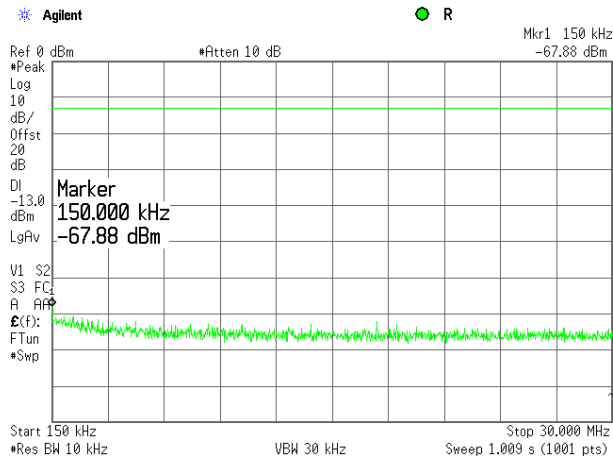


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.5 Spurious emission measurements in 0.15 - 30.0 MHz range at mid carrier frequency (Ant.1)

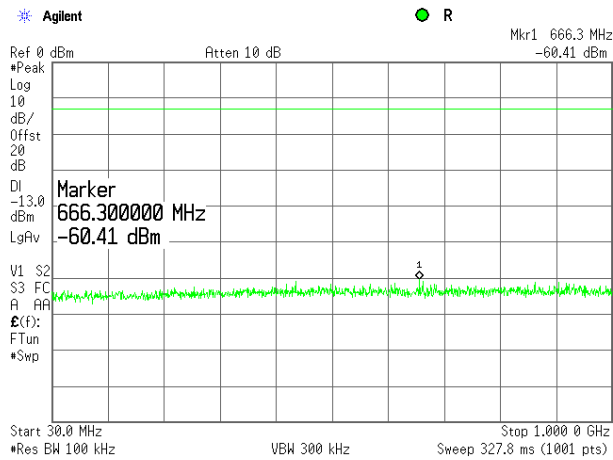


Plot 7.5.6 Spurious emission measurements in 0.15 – 30.0 MHz range at high carrier frequency (Ant.1)

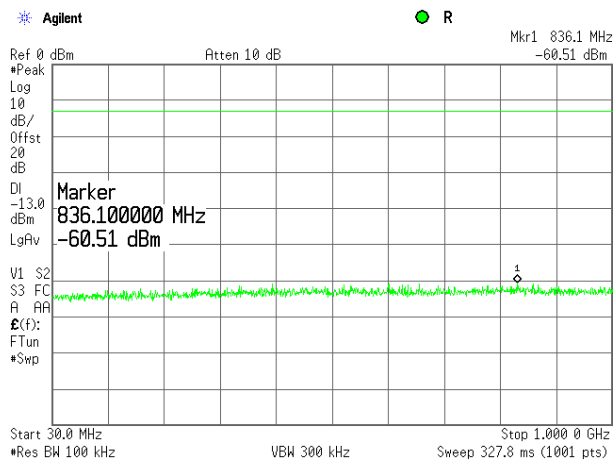


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.7 Spurious emission measurements in 30.0 - 1000 MHz range at low carrier frequency (Ant.1)

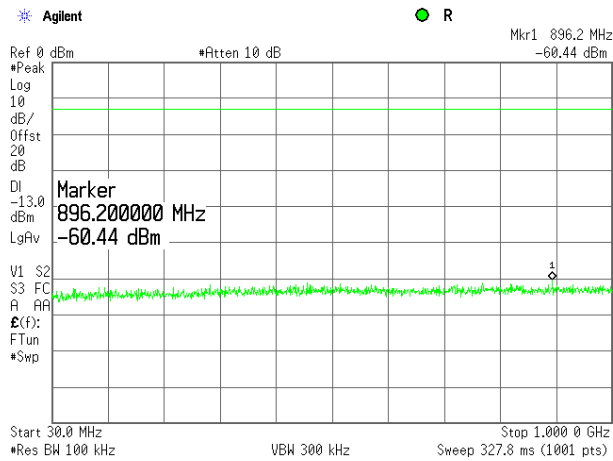


Plot 7.5.8 Spurious emission measurements in 30.0 - 1000 MHz range at mid carrier frequency (Ant.1)

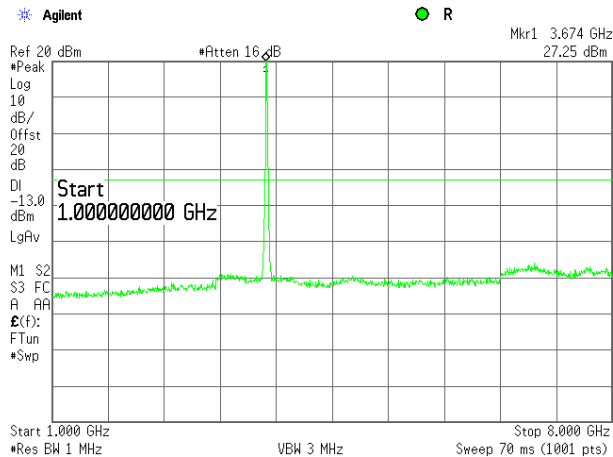


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.9 Spurious emission measurements in 30.0 - 1000 MHz range at high carrier frequency (Ant.1)

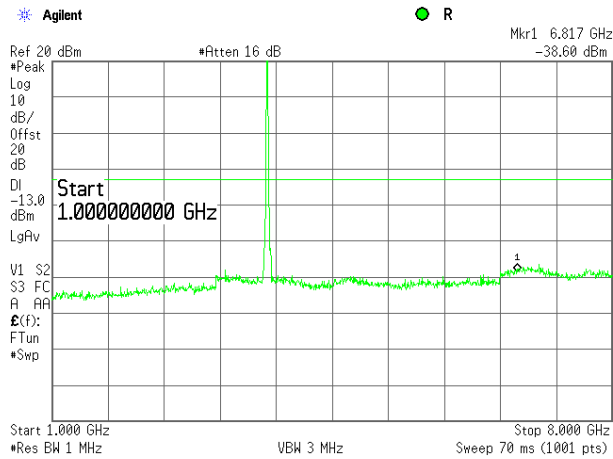


Plot 7.5.10 Spurious emission measurements in 1000 - 8000 MHz range at low carrier frequency (Ant.1)

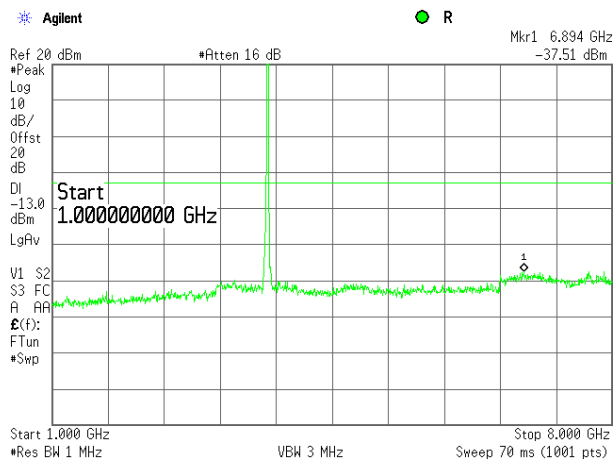


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.11 Spurious emission measurements in 1000 - 8000 MHz at mid carrier frequency (Ant.1)

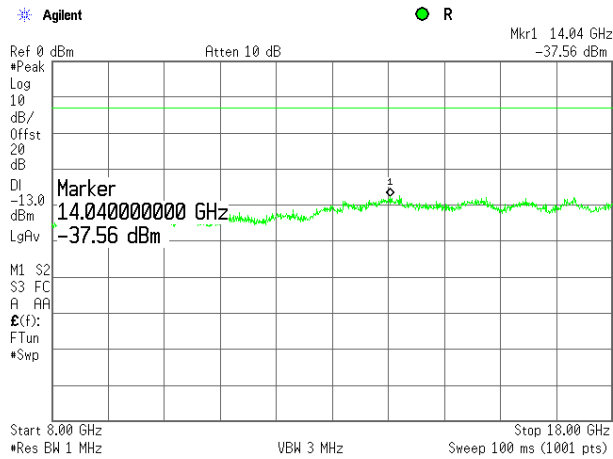


Plot 7.5.12 Spurious emission measurements in 1000 - 8000 MHz at high carrier frequency (Ant.1)

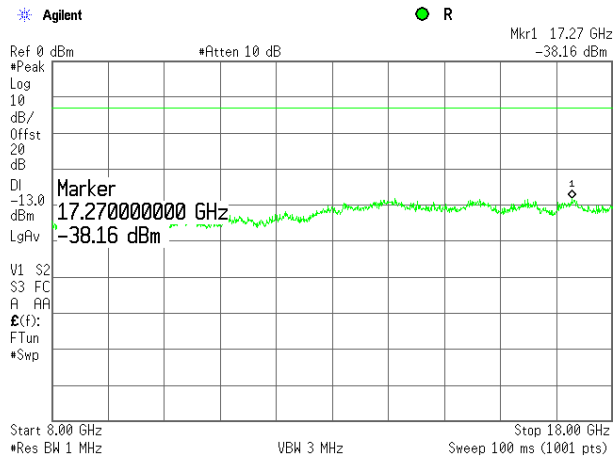


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.13 Spurious emission measurements in 8000 – 18000 MHz range at low carrier frequency (Ant.1)

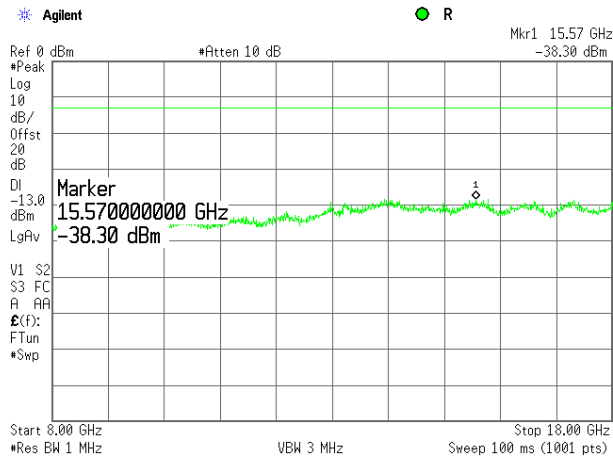


Plot 7.5.14 Spurious emission measurements in 8000 – 18000 MHz at mid carrier frequency (Ant.1)

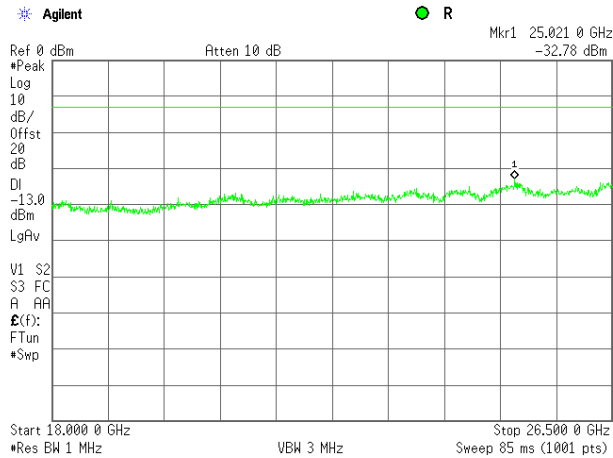


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.15 Spurious emission measurements in 8000 – 18000 MHz at high carrier frequency (Ant.1)

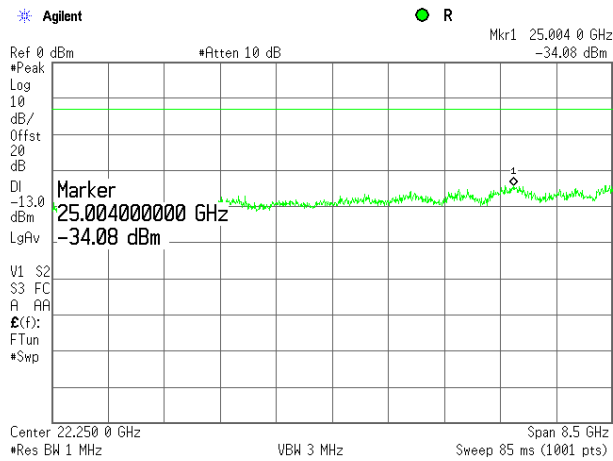


Plot 7.5.16 Spurious emission measurements in 18000 – 26500 MHz range at low carrier frequency (Ant. 1)

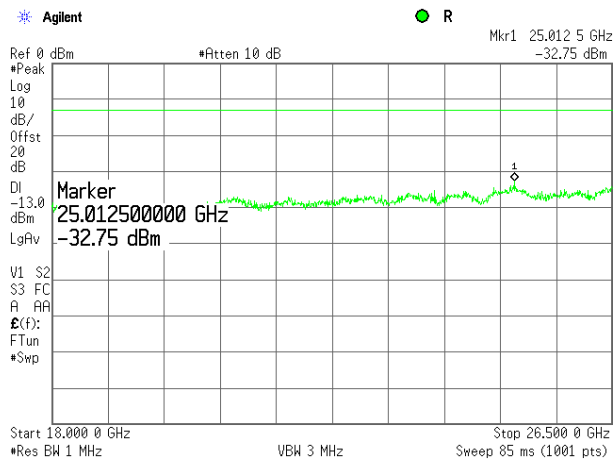


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.17 Spurious emission measurements in 18000 – 26500 MHz at mid carrier frequency (Ant. 1)

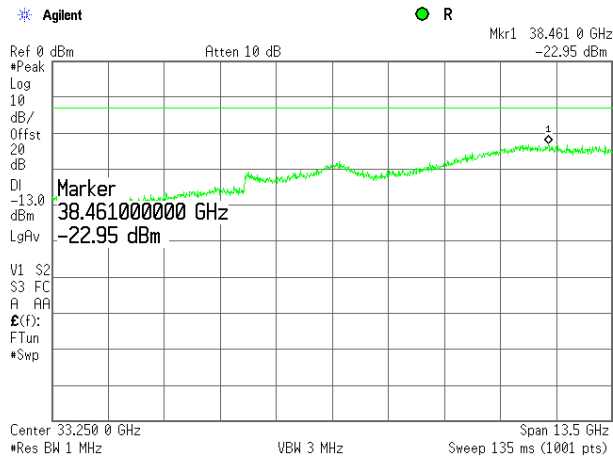


Plot 7.5.18 Spurious emission measurements in 18000 – 26500 MHz at high carrier frequency (Ant. 1)

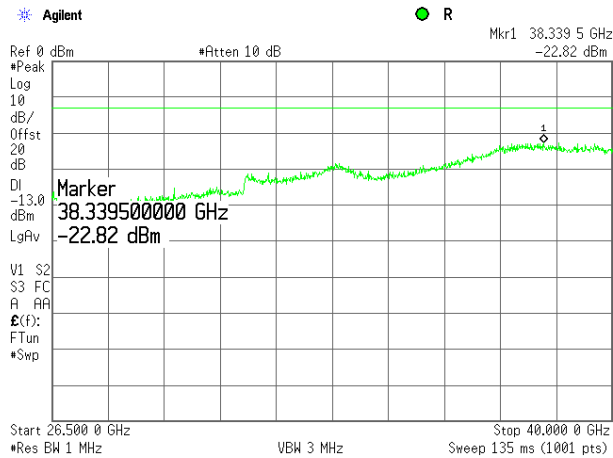


Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.19 Spurious emission measurements in 26500 - 40000 MHz range at low carrier frequency (Ant. 1)

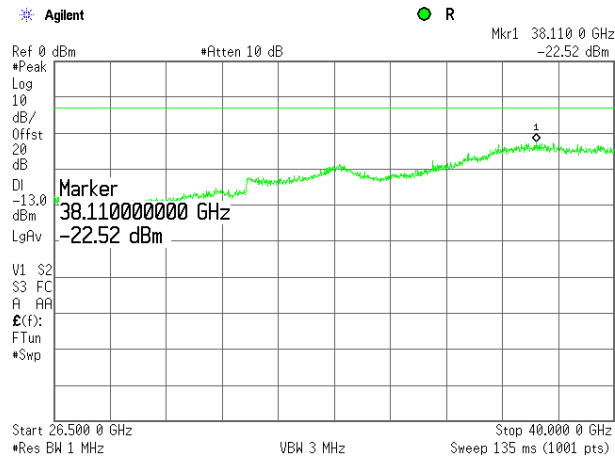


Plot 7.5.20 Spurious emission measurements in 26500 - 40000 MHz at mid carrier frequency (Ant. 1)



Test specification:	Section 90.1323 / RSS-197, Section 5.7, Spurious emissions at RF antenna connector		
Test procedure:	47 CFR, Sections 2.1051, 90.1323; FCC guidance 662911 D01		
Test mode:	Compliance	Verdict: PASS	
Date:	5/2/2011		
Temperature: 23.5 °C	Air Pressure: 101 hPa	Relative Humidity: 43 %	Power Supply: 48 VDC
Remarks:			

Plot 7.5.21 Spurious emission measurements in 26500 - 40000 MHz at high carrier frequency (Ant. 1)



Test specification:		Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

7.6 Radiated spurious emission measurements

7.6.1 General

This test was performed to measure radiated spurious emissions from the EUT. Specification test limits are given in Table 7.6.1.

Table 7.6.1 Radiated spurious emission test limits

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

* - Excluding the in band emission within \pm 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

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

7.6.2.1 The EUT was set up as shown in Figure 7.6.1, energized and the performance check was conducted.

7.6.2.2 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.

7.6.2.3 The worst test results (the lowest margins) were recorded in Table 7.6.2 and shown in the associated plots.

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

7.6.3.1 The EUT was set up as shown in Figure 7.6.2, energized and the performance check was conducted.

7.6.3.2 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.

7.6.3.3 The worst test results (the lowest margins) were recorded in Table 7.6.2 and shown in the associated plots.

Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Figure 7.6.1 Setup for spurious emission field strength measurements in 9 kHz to 30 MHz band

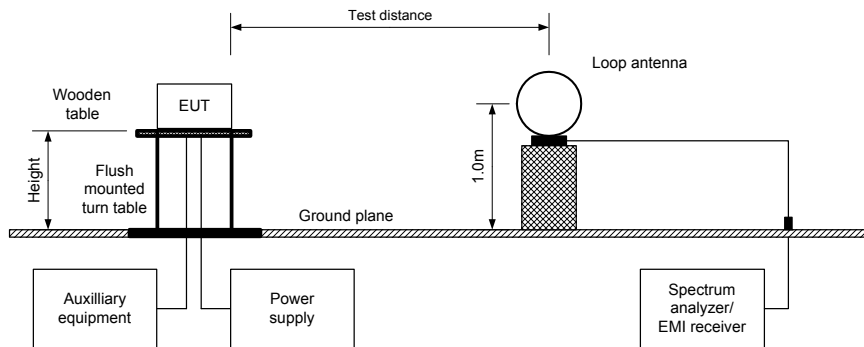
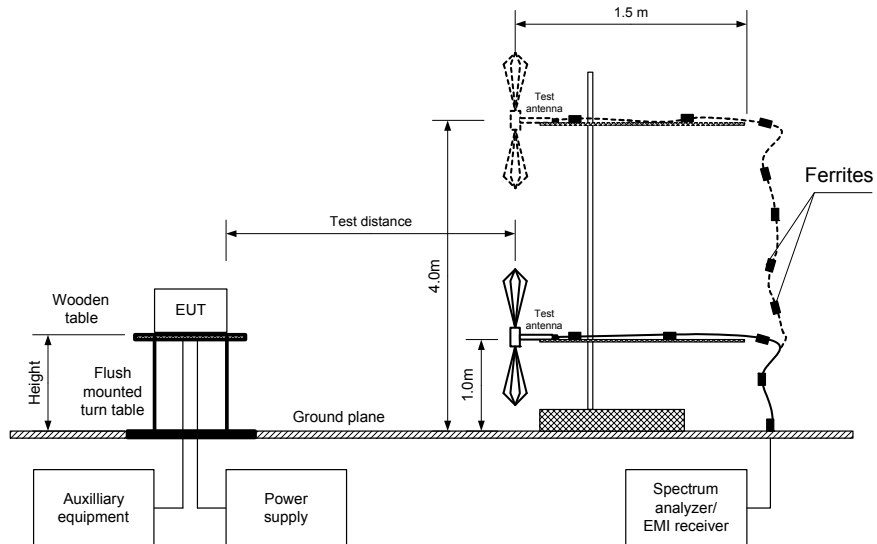


Figure 7.6.2 Setup for spurious emission field strength measurements above 30 MHz



Test specification:		Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Table 7.6.2 Spurious emission field strength test results

ASSIGNED FREQUENCY RANGE: 3675 – 3700 MHz
TEST DISTANCE: 3 m
TEST SITE: Semi anechoic chamber
EUT HEIGHT: 0.8 m
INVESTIGATED FREQUENCY RANGE: 0.009 – 40000 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)
64QAM
MODULATION: 64QAM
MODULATING SIGNAL: PRBS
EMISSION BANDWIDTH: 14 MHz (worst case)
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	Verdict
Low carrier frequency								
All emission were found more than 20 dB below the limit								Pass
Mid carrier frequency								
All emission were found more than 20 dB below the limit								Pass
High carrier frequency								
All emission were found more than 20 dB below the limit								Pass

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

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

Reference numbers of test equipment used

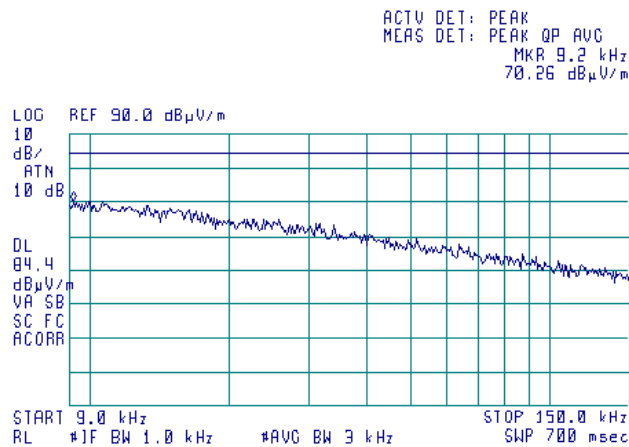
HL 0446	HL 0521	HL 0604	HL 1424	HL 1425	HL 1553	HL 1984	HL 2871
HL 2883	HL 3123	HL 3531	HL 3616	HL 3884			

Full description is given in Appendix A.

Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

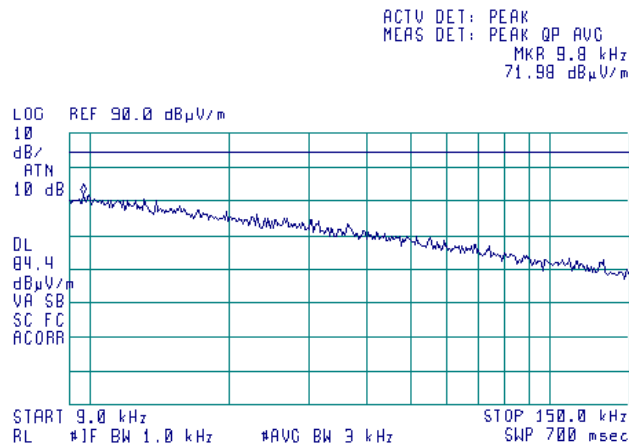
Plot 7.6.1 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.6.2 Radiated emission measurements in 9 - 150 kHz range

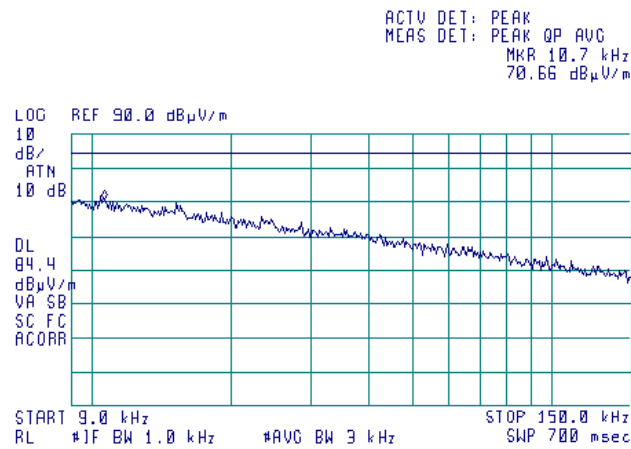
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:		Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

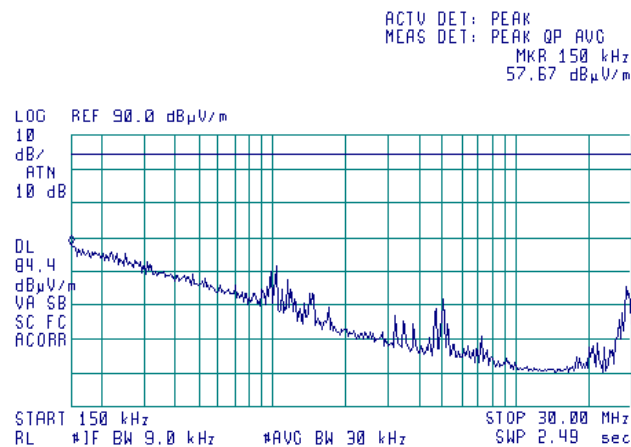
Plot 7.6.3 Radiated emission measurements in 9 - 150 kHz range

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



Plot 7.6.4 Radiated emission measurements in 0.15 - 30 MHz range

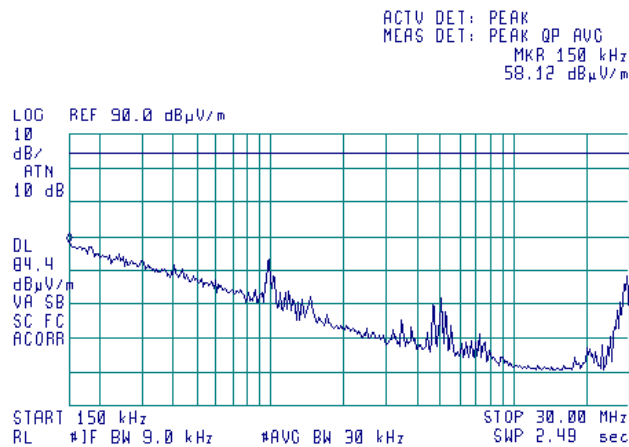
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Low
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

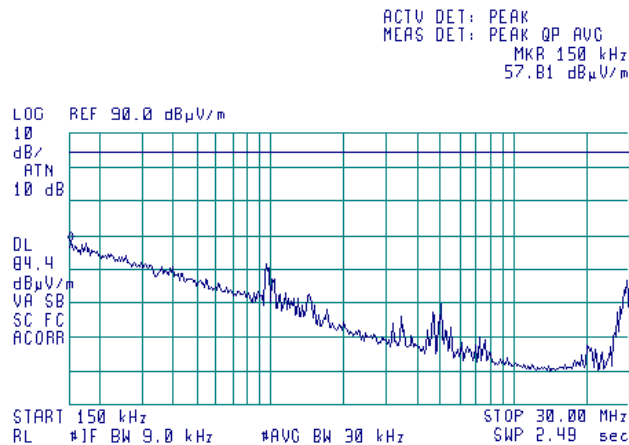
Plot 7.6.5 Radiated emission measurements in 0.15 - 30 MHz range

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



Plot 7.6.6 Radiated emission measurements in 0.15 - 30 MHz range

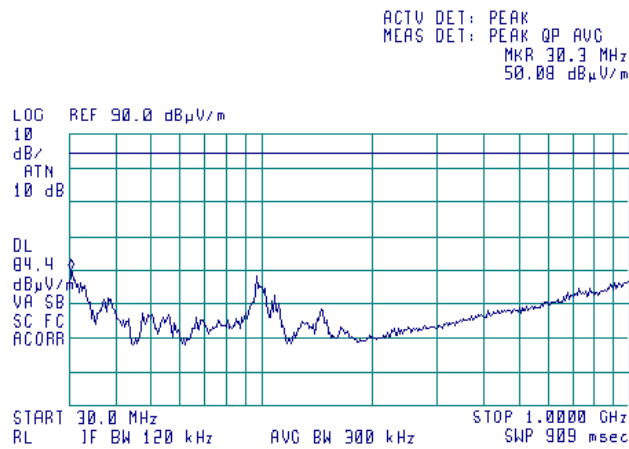
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: High
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

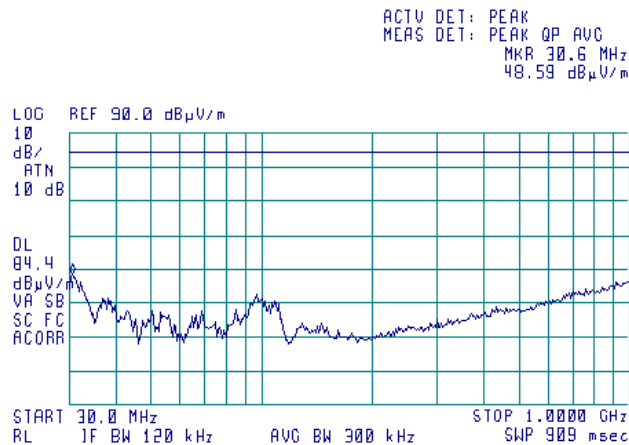
Plot 7.6.7 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.6.8 Radiated emission measurements in 30 - 1000 MHz range

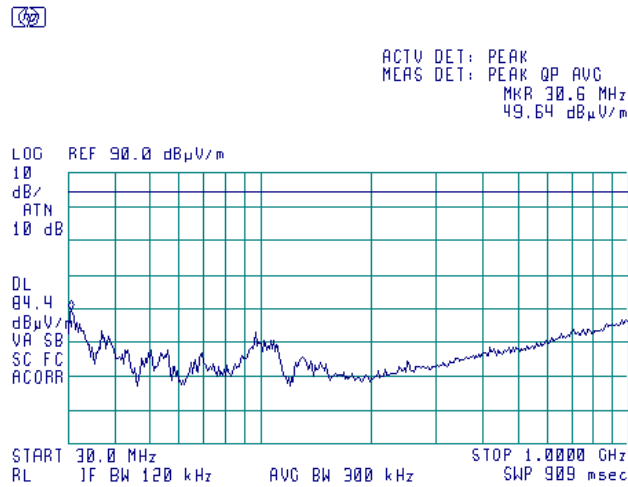
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

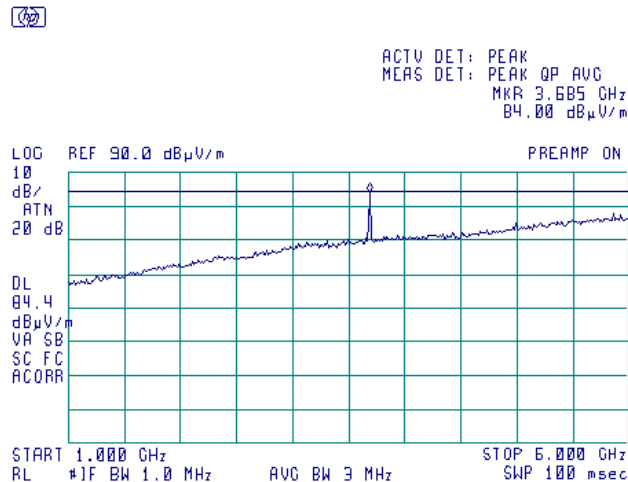
Plot 7.6.9 Radiated emission measurements in 30 - 1000 MHz range

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



Plot 7.6.10 Radiated emission measurements in 1000 – 6000 MHz range

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

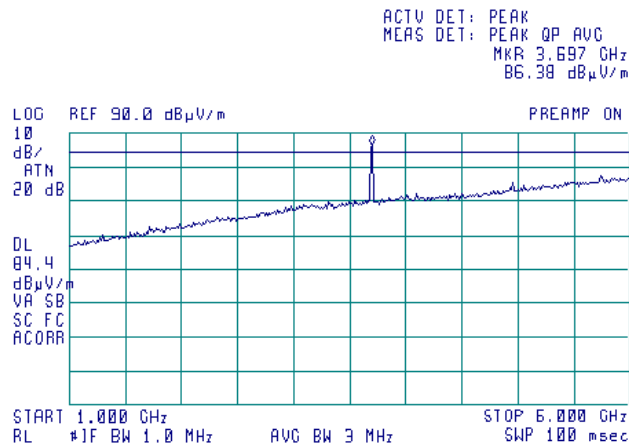


NOTE: 3685 MHz – low fundamental frequency.

Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.11 Radiated emission measurements in 1000 – 6000 MHz range

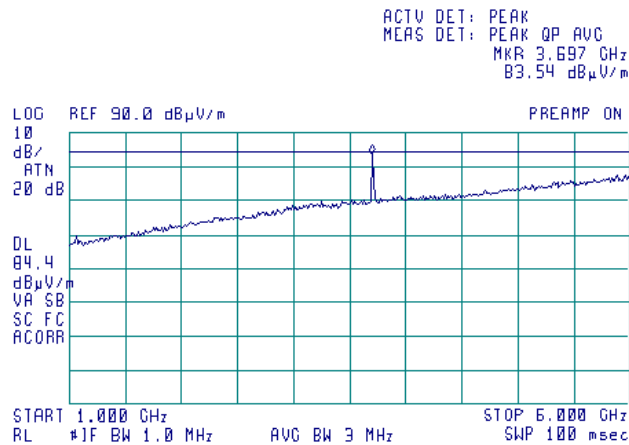
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



NOTE: 3697 MHz – mid fundamental frequency

Plot 7.6.12 Radiated emission measurements in 1000 – 6000 MHz range

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

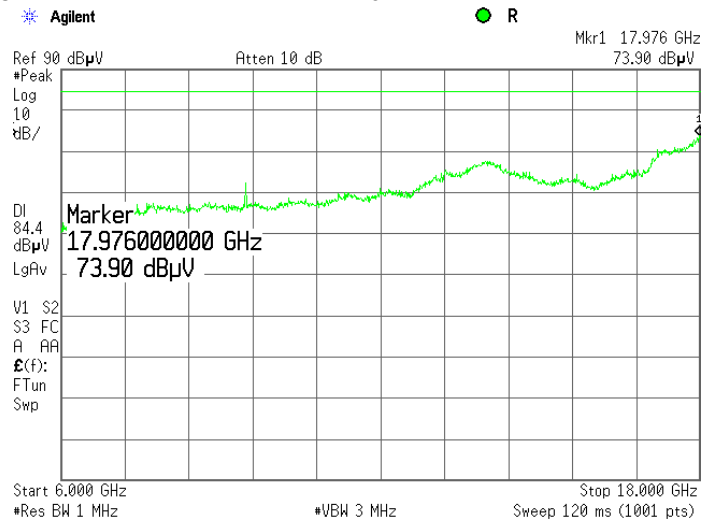


NOTE: 3697 MHz – high fundamental frequency

Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

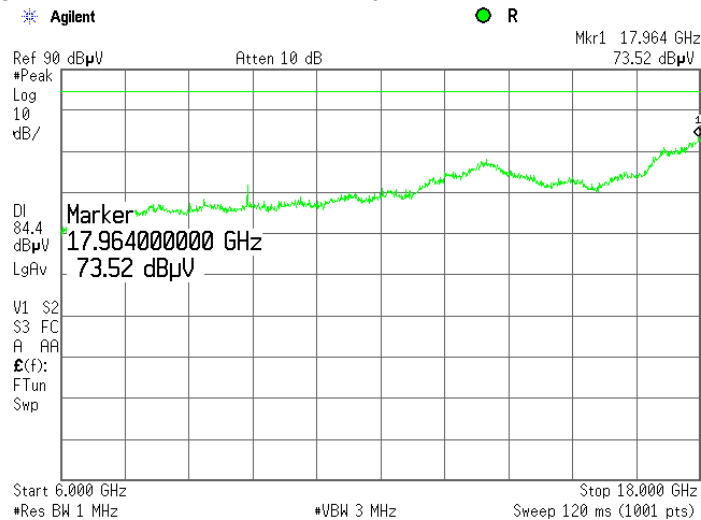
Plot 7.6.13 Radiated emission measurements in 6000 – 18000 MHz range

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



Plot 7.6.14 Radiated emission measurements in 6000 – 18000 MHz range

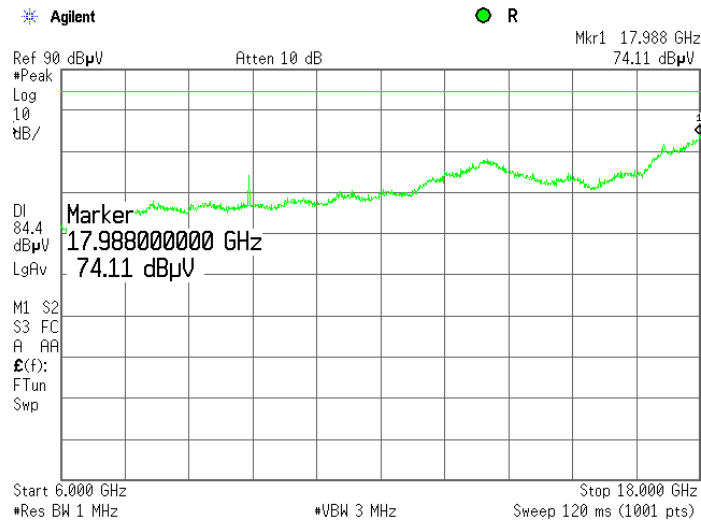
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical
 TEST DISTANCE: 3 m



Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

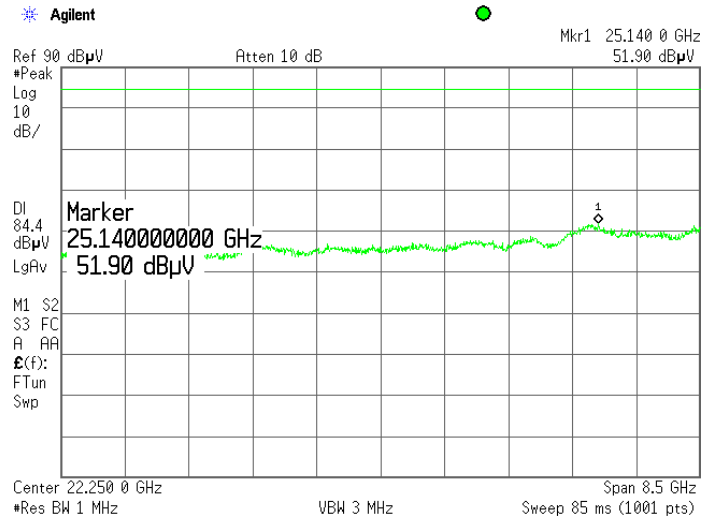
Plot 7.6.15 Radiated emission measurements in 6000 – 18000 MHz range

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



Plot 7.6.16 Radiated emission measurements in 18000 – 26500 MHz range

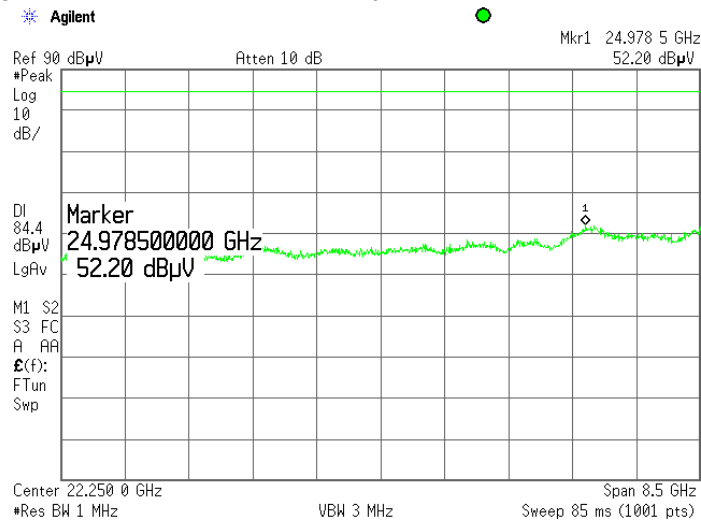
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Low
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

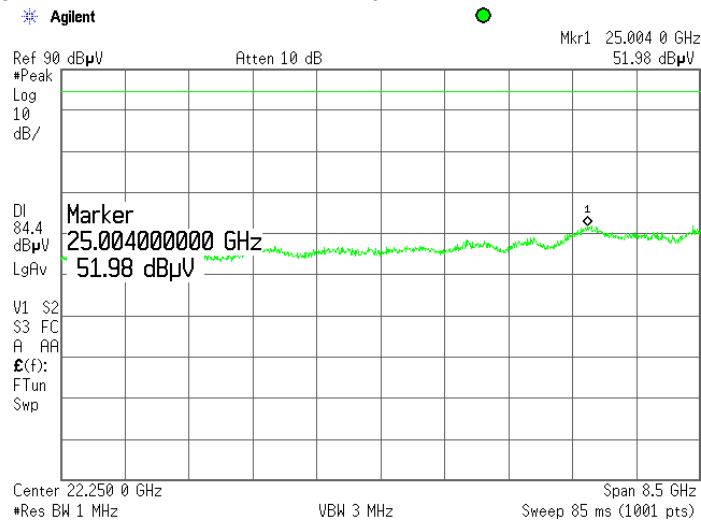
Plot 7.6.17 Radiated emission measurements in 18000 – 26500 MHz range

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



Plot 7.6.18 Radiated emission measurements in 18000 – 26500 MHz range

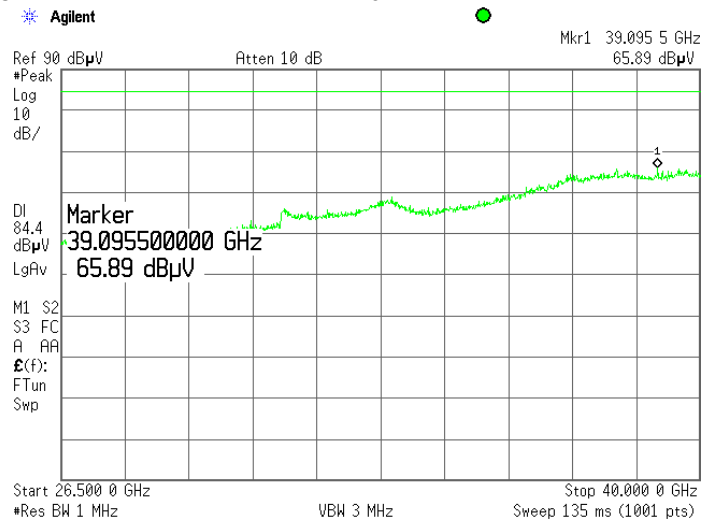
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: High
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification: Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions			
Test procedure: 47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12			
Test mode: Compliance	Verdict: PASS		
Date: 5/2/2011			
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

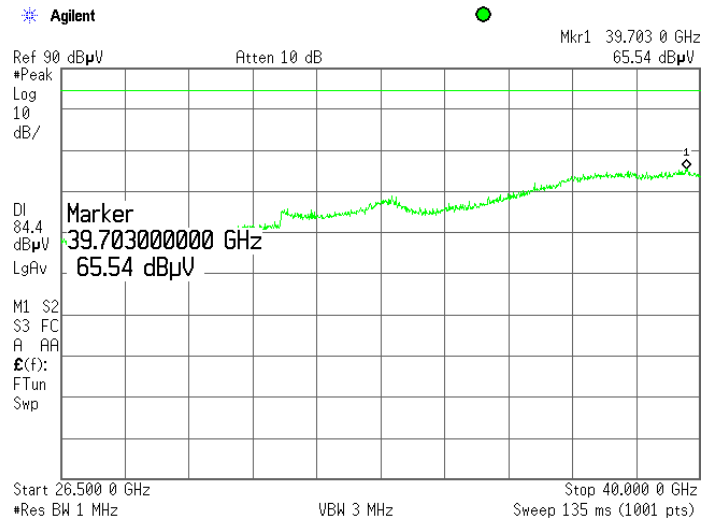
Plot 7.6.19 Radiated emission measurements in 26500 – 40000 MHz range

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



Plot 7.6.20 Radiated emission measurements in 26500 – 40000 MHz range

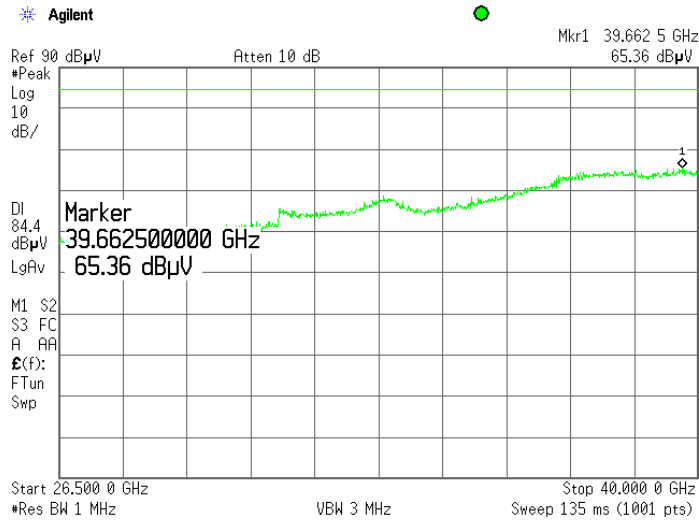
TEST SITE: Semi anechoic chamber
 CARRIER FREQUENCY: Mid
 ANTENNA POLARIZATION: Vertical and Horizontal
 TEST DISTANCE: 3 m



Test specification:		Section 90.1323 / RSS-197, Section 5.7, Radiated spurious emissions	
Test procedure:		47 CFR, Sections 2.1053, 90.1323; TIA/EIA-603-C, Section 2.2.12	
Test mode:	Compliance	Verdict:	PASS
Date:	5/2/2011		
Temperature: 24.2 °C	Air Pressure: 1014 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 7.6.21 Radiated emission measurements in 26500 – 40000 MHz range

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



Test specification: Section 90.213 / RSS-197, Section 5.7, Frequency stability	
Test procedure: 47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode: Compliance	Verdict: PASS
Date: 5/1/2011 - 5/12/2011	
Temperature: 23.2 °C	Air Pressure: 1007 hPa
Relative Humidity: 46 %	
Power Supply: 48 VDC	
Remarks:	

7.7 Frequency stability test

7.7.1 General

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

Table 7.7.1 Frequency stability limits according to FCC part 2

Assigned frequency, MHz	Maximum allowed frequency displacement
3675.00 – 3700.00	The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

Table 7.7.2 Frequency stability limits according to RSS-197

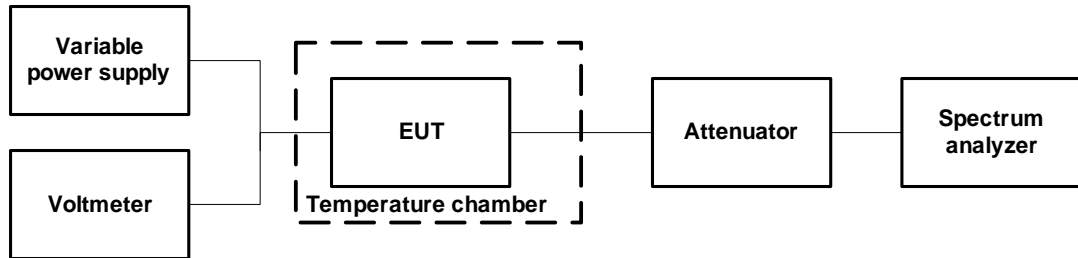
Assigned frequency, MHz	Maximum allowed frequency displacement
3675.0 – 3700.0	The frequency stability shall be sufficient to ensure that f_1 minus the frequency offset and f_1 plus the frequency offset shall be within the authorized band of operation

7.7.2 Test procedure

- 7.7.2.1 The EUT was set up as shown in Figure 7.7.1, energized and its proper operation was checked.
- 7.7.2.2 The EUT power was turned off. Temperature within test chamber was set to +30°C and a period of time sufficient to stabilize all of the oscillator circuit components was allowed.
- 7.7.2.3 The EUT was powered on and carrier frequency was measured at start up moment and then every minute until frequency had been stabilized or 10 minutes elapsed whichever reached the last. The EUT was powered off.
- 7.7.2.4 The above procedure was repeated at 0°C and at the lowest test temperature.
- 7.7.2.5 The EUT was powered on and carrier frequency was measured at start up moment and at the end of stabilization period at the rest of test temperatures and voltages. The EUT was powered off.
- 7.7.2.6 Frequency displacement was calculated and compared with the limit as provided in Table 7.7.3.

Test specification:		Section 90.213 / RSS-197, Section 5.7, Frequency stability	
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2	
Test mode:	Compliance	Verdict:	PASS
Date:	5/1/2011 - 5/12/2011		
Temperature: 23.2 °C	Air Pressure: 1007 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Figure 7.7.1 Frequency stability test setup



Test specification:		Section 90.213 / RSS-197, Section 5.7, Frequency stability			
Test procedure:		47 CFR, Section 2.1055; TIA/EIA-603-C Section 2.2.2			
Test mode:		Compliance		Verdict: PASS	
Date:		5/1/2011 - 5/12/2011			
Temperature: 23.2 °C		Air Pressure: 1007 hPa		Relative Humidity: 46 %	
Remarks:		Power Supply: 48 VDC			

Table 7.7.3 Frequency stability test results

ASSIGNED FREQUENCY RANGE: 3675.0 – 3700.0 MHz
 NOMINAL POWER VOLTAGE: 48 VDC
 TEMPERATURE STABILIZATION PERIOD: 20 min
 POWER DURING TEMPERATURE TRANSITION: Off
 SPECTRUM ANALYZER MODE: Peak
 RESOLUTION BANDWIDTH: 51 kHz
 VIDEO BANDWIDTH: 150kHz
 MODULATION: 64QAM

T, °C	Voltage, VDC	Frequency, MHz							Max frequency drift, Hz		Max frequency drift, ppm	
		Start up	1st min	2nd min	3rd min	4th min	5th min	10th min	Positive	Negative	Positive	Negative
Low channel MHz												
-30	nominal	3.677490	3.677486	3.677486	3.677486	3.677486	3.677490	3.677486	-4	-8	-0.001	-0.002
-20	nominal	3.677483	NA	NA	NA	NA	NA	3.677483	-11	-11	-0.003	-0.003
-10	nominal	3.677486	NA	NA	NA	NA	NA	3.677486	-8	-8	-0.002	-0.002
0	nominal	3.677532	3.677494	3.677488	3.677500	3.677488	3.677506	3.677500	39	-6	0.011	-0.002
10	nominal	3.677488	NA	NA	NA	NA	NA	3.677494	0	-6	0.000	-0.002
20	+15%	3.677494	NA	NA	NA	NA	NA	3.677494	0	0	0.000	0.000
20	nominal	3.677506	NA	NA	NA	NA	NA	3.677494*	12	0	0.003	0.000
20	-15%	3.677494	NA	NA	NA	NA	NA	3.677500	6	0	0.002	0.000
30	nominal	3.677494	3.677500	3.677488	3.677481	3.677488	3.677494	3.677500	6	-12	0.002	-0.003
40	nominal	3.677500	NA	NA	NA	NA	NA	3.677500	6	6	0.002	0.002
50	nominal	3.677494	NA	NA	NA	NA	NA	3.677500	6	0	0.002	0.000
Mid channel MHz												
-30	nominal	3.687486	3.687490	3.687486	3.687483	3.687483	3.687483	3.687486	8	1	0.002	0.000
-20	nominal	3.687486	NA	NA	NA	NA	NA	3.687486	5	5	0.001	0.001
-10	nominal	3.687494	NA	NA	NA	NA	NA	3.687494	12	12	0.003	0.003
0	nominal	3.687500	3.687500	3.687500	3.687494	3.687500	3.687494	3.687500	19	12	0.005	0.003
10	nominal	3.687500	NA	NA	NA	NA	NA	3.687488	19	6	0.005	0.002
20	+15%	3.687494	NA	NA	NA	NA	NA	3.687481	12	0	0.003	0.000
20	nominal	3.687500	NA	NA	NA	NA	NA	3.687481*	19	0	0.005	0.000
20	-15%	3.687513	NA	NA	NA	NA	NA	3.687500	31	19	0.008	0.005
30	nominal	3.687500	3.687494	3.687494	3.687500	3.687494	3.687494	3.687506	25	12	0.007	0.003
40	nominal	3.687494	NA	NA	NA	NA	NA	3.687494	12	12	0.003	0.003
50	nominal	3.687500	NA	NA	NA	NA	NA	3.687494	19	12	0.005	0.003
High channel MHz												
-30	nominal	3.697483	3.697486	3.697486	3.697486	3.697483	3.697483	3.697486	-2	-5	-0.001	-0.001
-20	nominal	3.697494	NA	NA	NA	NA	NA	3.697481	6	-6	0.002	-0.002
-10	nominal	3.697475	NA	NA	NA	NA	NA	3.697490	2	-13	0.001	-0.004
0	nominal	3.697494	3.697500	3.697500	3.697481	3.697494	3.697506	3.697481	19	-6	0.005	-0.002
10	nominal	3.697494	NA	NA	NA	NA	NA	3.697484	6	-4	0.002	-0.001
20	+15%	3.697494	NA	NA	NA	NA	NA	3.697494	6	6	0.002	0.002
20	nominal	3.697494	NA	NA	NA	NA	NA	3.697488*	6	0	0.002	0.000
20	-15%	3.697494	NA	NA	NA	NA	NA	3.697494	6	6	0.002	0.002
30	nominal	3.697506	3.697481	3.697500	3.697506	3.697506	3.697500	3.697500	19	-6	0.005	-0.002
40	nominal	3.697500	NA	NA	NA	NA	NA	3.697500	12	12	0.003	0.003
50	nominal	3.697494	NA	NA	NA	NA	NA	3.697500	12	6	0.003	0.002

* - Reference frequency

Note1: As no limit is specified by the standard for 3675.0 – 3700.0 MHz band the worst case test results are given for information purpose only.

Reference numbers of test equipment used

HL 2952	HL 3286	HL 3818				
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Full description is given in Appendix A.



Test specification:		Section 90.203 (o)/RSS-197 Section 5.4, Contention based protocol	
Test procedure:			
Test mode:	Compliance	Verdict:	PASS
Date:	5/01/2011 – 5/13/2011		
Temperature: 23.2°C	Air Pressure: 1007 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

8 Contention Based Protocol

8.1 General

This test was performed to verify the EUT contention-based protocol function. Contention-based protocol is defined as:

A protocol that allows multiple users to share the same spectrum by defining the events that must occur when two or more transmitters attempt to simultaneously access the same channel and establishing rules by which a transmitter provides reasonable opportunities for other transmitters to operate. Such a protocol may consist of procedures for initiating new transmissions, procedures for determining the state of the channel (available or unavailable), and procedures for managing retransmissions in the event of a busy channel. Contention-based protocols shall fall into one of two categories:

- (1) An unrestricted contention-based protocol is one which can avoid co-frequency interference with devices using all other types of contention-based protocols.
- (2) A restricted contention-based protocol is one that does not qualify as unrestricted.

The EUT is WiMax Base station capable to operate in TDD mode in the full 3650.0 – 3700.0 MHz band and using unrestricted Contention Based Protocol. The EUT equipped with "listen before transmit" function that performs channel measurements across transmission bandwidth at the beginning of each downlink frame prior to transmission.

In case a signal level measured is above the RSL Turn-off level the EUT will not transmit for the next timeslot (defined by Backoff frame parameter).

The EUT RSL turn-off level and Backoff frame are operator/user defined.

8.2 Test procedure

The EUT is equipped with two Tx/Rx chains. As both transmit chains operate simultaneously and only Tx1/Rx1 chain is equipped with contention-based protocol function the test was performed while interferer signal is injected in Tx₁/Rx₁ port, the EUT operation monitored by a spectrum analyzer connected to the Tx₁/Rx₁ port.

The EUT was set to transmit as shown in Figure 8.2.1 and the transmission was verified by the spectrum analyzer.

The signal generator was connected as shown in Figure 8.1.1, an interferer signal was generated. The EUT response was monitored and reported in Table 8.2.1 and Plot 8.2.2 shows an example of the EUT transmission operation while detecting an interferer signal at its RSL turn-off level.

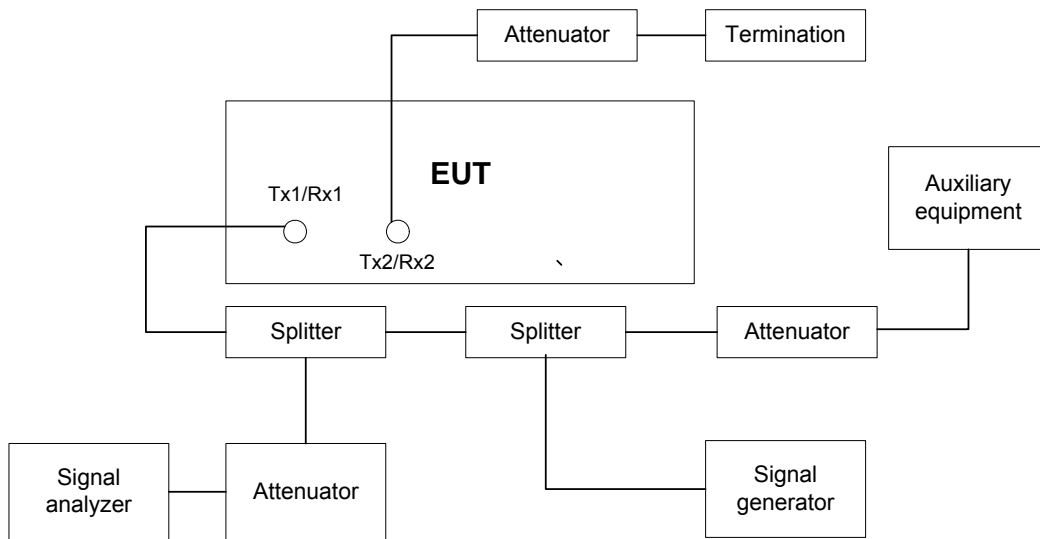
The combination of EUT transmission bandwidth, channel, interferer signal type and level was chosen according to Table 8.2.1.

The CW interferer signal was continuously injected to the receiver input.



Test specification: Section 90.203 (o)/RSS-197 Section 5.4, Contention based protocol			
Test procedure:			
Test mode: Compliance	Verdict: PASS		
Date: 5/01/2011 – 5/13/2011			
Temperature: 23.2°C	Air Pressure: 1007 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Figure 8.2.1 Set-up for contention-based protocol verification test





Test specification: Section 90.203 (o)/RSS-197 Section 5.4, Contention based protocol	
Test procedure:	
Test mode: Compliance	Verdict: PASS
Date: 5/01/2011 – 5/13/2011	
Temperature: 23.2°C	Air Pressure: 1007 hPa
Relative Humidity: 46 %	
Power Supply: 48 VDC	
Remarks:	

Table 8.2.1 Contention based protocol test results

INTERFERER SIGNAL INJECTION: To port Tx₁/Rx₁
EUT TRANSMISSION MONITORING: At port Tx₁/Rx₁

Test number	Wanted signal characteristics			Interferer signal characteristics			Results		
	Channel frequency, MHz	Channel bandwidth, MHz	RSL turn-off level settings, dBm	Frequency, MHz	Modulation	Level, dBm	Interference detection	Tx OFF time, ms**	Verdict
1	3677.5	5	-65	3675.0	CW	-65	Yes	7.0	Pass
2	3677.5		-65	3675.0	CW	-70	No	NA	Pass
3	3677.5		-91	3675.5	CW	-91	Yes	13.1	Pass
4	3677.5		-65	3677.5	CW	-65	Yes	14.9	Pass
5	3677.5		-65	3677.5	CW	-70	No	NA	Pass
6	3677.5		-91	3677.5	CW	-91	Yes	13	Pass
7	3677.5		-65	3680.0	CW	-65	Yes	11.7	Pass
8	3677.5		-65	3680.0	CW	-70	No	NA	Pass
9	3677.5		-91	3679.5	CW	-91	Yes	14	Pass
10	3687.5		-65	3687.5	CW	-65	Yes	9.4	Pass
11	3687.5		-65	3687.5	CW	-70	No	NA	Pass
12	3687.5		-65	3687.5	OFDMA	-65	Yes	NA	Pass
13	3687.5		-65	3687.5	OFDMA	-70	No	NA	Pass
14	3687.5		-91	3687.5	CW	-91	Yes	11.3	Pass
15	3687.5		-65	3685.0	CW	-65	Yes	14.5	Pass
16	3687.5		-65	3685.5	CW	-70	No	NA	Pass
17	3687.5		-91	3685.5	CW	-91	Yes	16.5	Pass
18	3687.5		-65	3690.0	CW	-65	Yes	14.1	Pass
19	3687.5		-65	3690.0	CW	-70	No	NA	Pass
20	3687.5		-91	3689.5	CW	-91	Yes	16.5	Pass
21	3697.5		-65	3695.0	CW	-65	Yes	12.1	Pass
22	3697.5		-65	3695.0	CW	-70	No	NA	Pass
23	3697.5		-91	3695.0	CW	-91	Yes	14.5	Pass
24	3697.5		-65	3697.5	CW	-65	Yes	7.1	Pass
25	3697.5		-65	3697.5	CW	-70	No	NA	Pass
26	3697.5		-91	3697.5	CW	-91	Yes	15.8	Pass
27	3697.5		-65	3699.5	CW	-65	Yes	12.0	Pass
28	3697.5		-65	3699.5	CW	-70	No	NA	Pass
29	3697.5		-91	3699.5	CW	-91	Yes	14.1	Pass

* - Interference and wanted signal durations are measured in ms and each frame duration is 5 ms

** - Tx OFF time is measured as a time period from the start of interference signal (interference signal exceeds the threshold level) and till the EUT ceases to transmit

*** - Interference detection without stopping of the transmission monitored on the auxiliary PC



Test specification:		Section 90.203 (o)/RSS-197 Section 5.4, Contention based protocol			
Test procedure:					
Test mode:	Compliance	Verdict:		PASS	
Date:	5/01/2011 – 5/13/2011				
Temperature: 23.2°C	Air Pressure: 1007 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC		
Remarks:					

Table 8.2.2 Contention Base Protocol test results

INTERFERER SIGNAL INJECTION:				To port Tx ₁ /Rx ₁					
EUT TRANSMISSION MONITORING:				At port Tx ₁ /Rx ₁					
Test number	Wanted signal characteristics			Interferer signal characteristics			Results		
	Channel frequency, MHz	Channel Bandwidth, MHz	RSL turn-off level settings, dBm	Frequency, MHz	Modulation	Level, dBm	Interference detection	Tx OFF time, ms**	Verdict
30	3678.5	7	-91	3678.5	CW	-91	Yes	5.3	Pass
31	3687.5		-91	3684.5	CW	-91	Yes	10.4	Pass
32	3687.5		-91	3687.5	CW	-91	Yes	8.5	Pass
33	3687.5		-91	3687.5	OFDMA	-91	Yes	11.0	Pass
34	3687.5		-91	3690.5	CW	-91	Yes	11.3	Pass
35	3696.5		-91	3696.5	CW	-91	Yes	11.5	Pass
36	3680.0	10	-91	3680.0	CW	-91	Yes	8.3	Pass
37	3687.5		-91	3691.5	CW	-91	Yes	9.4	Pass
38	3687.5		-91	3687.5	CW	-91	Yes	8.1	Pass
39	3687.5		-91	3687.5	OFDMA	-91	Yes	9.3	Pass
40	3687.5		-91	3683.5	CW	-91	Yes	10.3	Pass
41	3695.0		-91	3695.0	CW	-91	Yes	10.1	Pass
42	3682	14	-91	3682.0	CW	-91	Yes	9.1	Pass
43	3687.5		-91	3694.0	CW	-91	Yes	8.4	Pass
44	3687.5		-91	3687.5	CW	-91	Yes	7.6	Pass
45	3687.5		-91	3687.5	OFDMA	-91	Yes	7.9	Pass
46	3687.5		-91	3681.0	CW	-91	Yes	6.4	Pass
47	3693.0		-91	3693.0	CW	-91	Yes	5.8	Pass
48	3685	20	-91	3685.0	CW	-91	Yes	11.2	Pass
49	3685		-91	3685.0	OFDMA	-91	Yes	12.1	Pass
50	3690		-91	3690.0	CW	-91	Yes	9.6	Pass

* - Interference and wanted signal durations are measured in ms and each frame duration is 5 ms.

** - Tx OFF time is measured as a time period from the start of interference signal (interference signal exceeds the threshold level) and till the EUT ceases to transmit.

*** - Interference detection without stopping of the transmission monitored on the auxiliary PC.

Reference numbers of test equipment used

HL 1424	HL 2016	HL 2017	HL 2952	HL 3301	HL 3559	HL 3667	HL 3868
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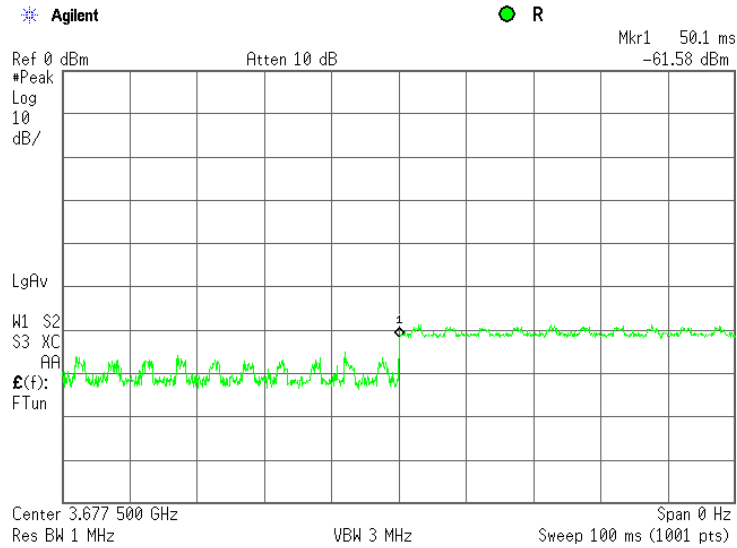
Full description is given in Appendix A.



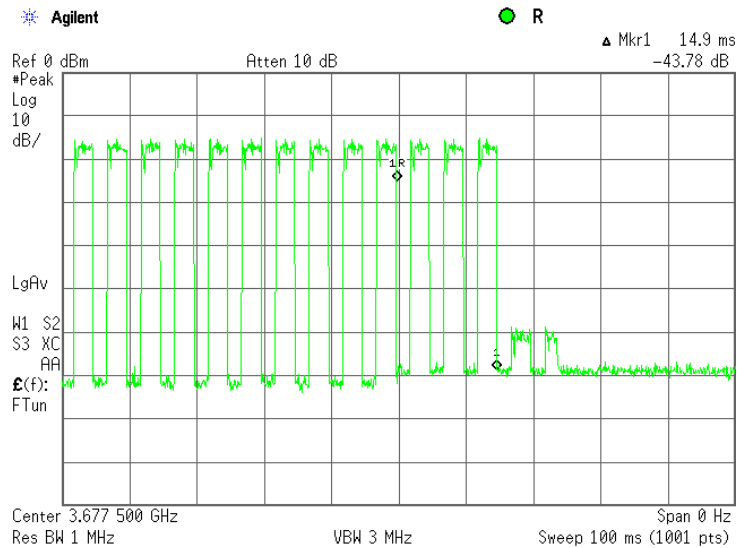
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Test specification:		Section 90.203 (o)/RSS-197 Section 5.4, Contention based protocol	
Test procedure:			
Test mode:	Compliance	Verdict:	PASS
Date:	5/01/2011 – 5/13/2011		
Temperature: 23.2°C	Air Pressure: 1007 hPa	Relative Humidity: 46 %	Power Supply: 48 VDC
Remarks:			

Plot 8.2.1 Tx off example, observation time



Plot 8.2.2 Tx off example, shut-off time



Test specification: RSS-197, Section 5.8, Receiver spurious emissions			
Test procedure: ANSI C63.4, Sections 12.1.4, 12.1.5			
Test mode: Compliance	Verdict: PASS		
Date: 5/4/2011			
Temperature: 24.2 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %	Power Supply: 48 VDC
Remarks:			

9 Tests according to RSS-Gen requirements

9.1 Receiver spurious emissions

9.1.1 General

This test was performed to measure spurious emissions at RF antenna connector of receiver or a receiver which was tested for compliance with radiated emission limits with the antenna port connected to resistive termination. Specification test limits at antenna connector measurement are given in Table 9.1.1 (RSS-Gen section 6.2).

Table 9.1.1 Antenna conducted measurement spurious emission limits

Frequency range, MHz	Power of spurious		Measurement bandwidth, (min) kHz
	nW	dBm	
30 – 1000	2	-57	4
1000 – 3 rd harmonic	5	-53	4

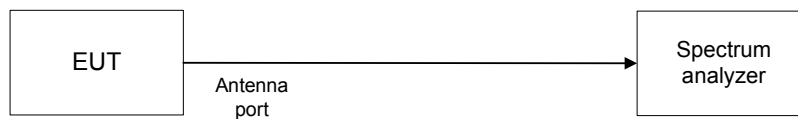
* - harmonic of the highest frequency the EUT generates, uses, operates or tunes to (without exceeding 40 GHz).

9.1.2 Test procedure for conducted measurement

9.1.2.1 The EUT was set up as shown in Figure 9.1.1, energized and its proper operation was checked.

9.1.2.2 The spurious emission was measured with spectrum analyzer as provided in Table 9.1.2 and the associated plots.

Figure 9.1.1 Spurious emission test setup



Test specification: RSS-197, Section 5.8, Receiver spurious emissions	
Test procedure: ANSI C63.4, Sections 12.1.4, 12.1.5	
Test mode: Compliance	Verdict: PASS
Date: 5/4/2011	
Temperature: 24.2 °C	Air Pressure: 1010 hPa
Relative Humidity: 56 %	
Power Supply: 48 VDC	
Remarks:	

Table 9.1.2 Spurious emission test results according to RSS-Gen, Section 6.2

INVESTIGATED FREQUENCY RANGE: 3675 – 3700 MHz
 RECEIVER OPERATING FREQUENCY: 30-11100 MHz
 EUT OPERATING MODE: Receive
 DETECTOR USED: Peak/ (below 1000 MHz)
 Average (above 1000 MHz)
 RESOLUTION BANDWIDTH: 100 kHz (below 1000 MHz)
 1000 kHz (above 1000 MHz)
 VIDEO BANDWIDTH: 300 kHz (below 1000 MHz)
 3000 kHz (above 1000 MHz)

Frequency, MHz	Spurious emission, dBm	Limit, dBm	Margin, dB	Verdict
No emissions were found				Pass

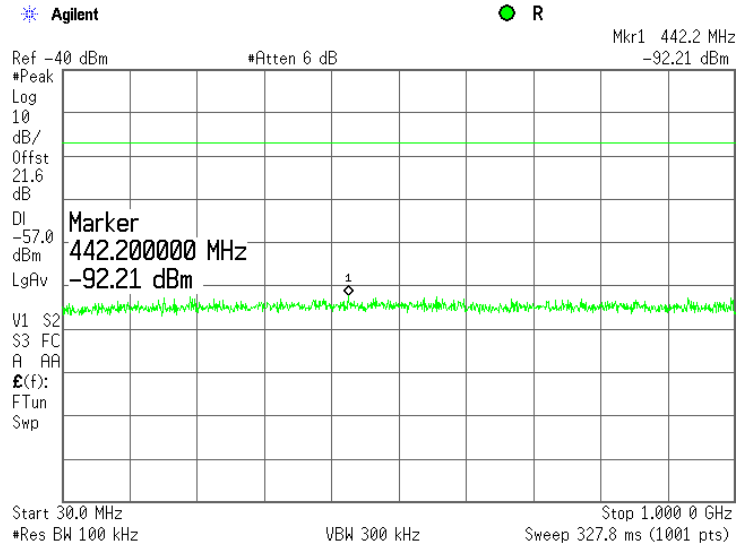
Reference numbers of test equipment used

HL 2952	HL 3287	HL 3345	HL 3347	HL 3773	HL 3818		
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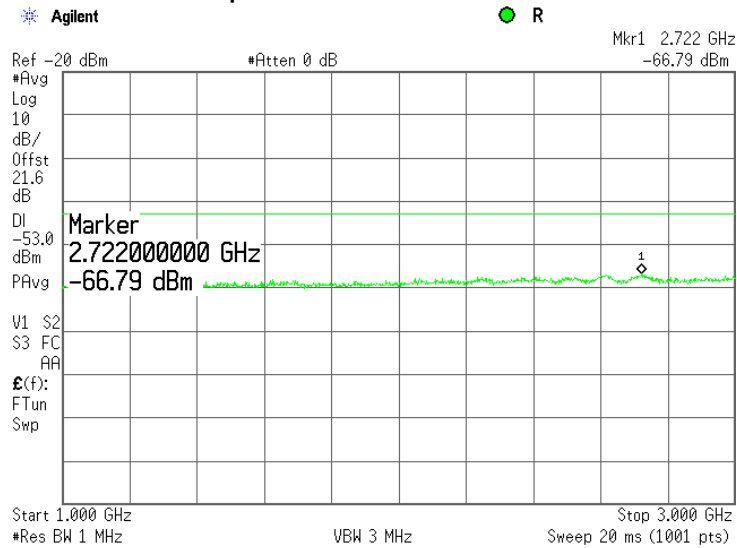
Full description is given in Appendix A.

Test specification: RSS-197, Section 5.8, Receiver spurious emissions			
Test procedure: ANSI C63.4, Sections 12.1.4, 12.1.5			
Test mode: Compliance	Verdict: PASS		
Date: 5/4/2011			
Temperature: 24.2 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %	Power Supply: 48 VDC
Remarks:			

Plot 9.1.1 Conducted spurious emission measurements in 30 - 1000 MHz range

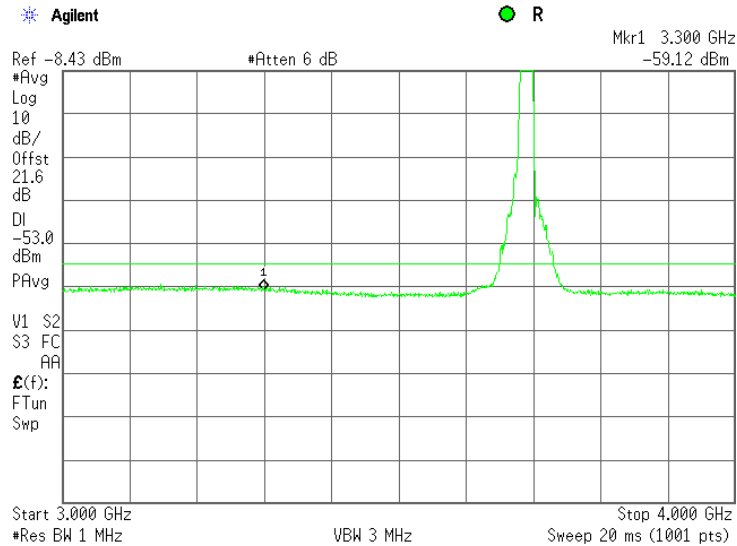


Plot 9.1.2 Conducted spurious emission measurements 1000 - 3000 MHz



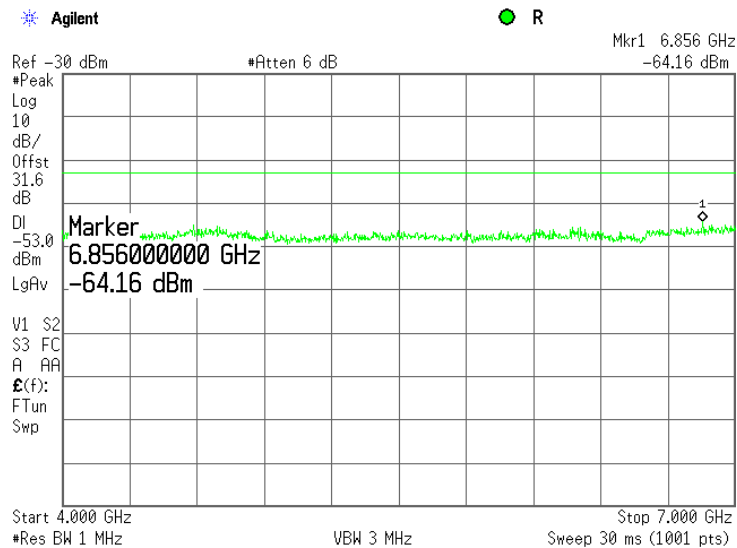
Test specification: RSS-197, Section 5.8, Receiver spurious emissions			
Test procedure: ANSI C63.4, Sections 12.1.4, 12.1.5			
Test mode: Compliance	Verdict: PASS		
Date: 5/4/2011			
Temperature: 24.2 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %	Power Supply: 48 VDC
Remarks:			

Plot 9.1.3 Conducted spurious emission measurements 3000 - 4000 MHz



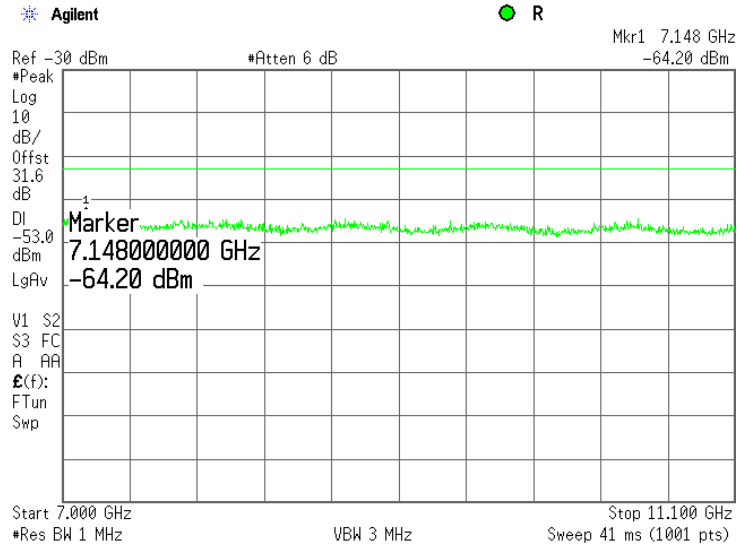
NOTE: 3687.5MHz – fundamental frequency

Plot 9.1.4 Conducted spurious emission measurements 4000-8000 MHz



Test specification: RSS-197, Section 5.8, Receiver spurious emissions			
Test procedure: ANSI C63.4, Sections 12.1.4, 12.1.5			
Test mode: Compliance	Verdict: PASS		
Date: 5/4/2011			
Temperature: 24.2 °C	Air Pressure: 1010 hPa	Relative Humidity: 56 %	Power Supply: 48 VDC
Remarks:			

Plot 9.1.5 Conducted spurious emission measurements 8000-11100 MHz



10 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	29-Jun-10	29-Jun-11
0521	EMI Receiver (Spectrum Analyzer) with RF filter section 9 kHz-6.5 GHz	Hewlett Packard	8546A	3617A 00319, 3448A002 53	25-Aug-10	25-Aug-11
0604	Antenna BiconiLog Log-Periodic/T Bow-TIE, 26 - 2000 MHz	EMCO	3141	9611-1011	11-Jan-11	11-Jan-12
0768	Antenna Standard Gain Horn, 18-26.5 GHz, WR-42, 25 dB gain	Quinstar Technology	QWH-4200-BA	110	26-Jan-11	26-Jan-14
0769	Antenna Standard Gain Horn, 26.5-40 GHz, WR28, 25 dB gain	Quinstar Technology	QWH-2800-BA	112	26-Jan-11	26-Jan-14
1424	Spectrum Analyzer, 30 Hz- 40 GHz	Agilent Technologies	8564EC	3946A002 19	01-Jan-11	01-Jan-12
1425	EMI Receiver, 9 kHz - 2.9 GHz, System: HL1426, HL1427	Agilent Technologies	8542E	3710A002 22, 3705A002 04	24-Aug-10	24-Aug-11
1553	Cable RF, 3.5 m, N/N-type	Alpha Wire	RG-214	1553	01-Sep-10	01-Sep-11
1984	Antenna, Double-Ridged Waveguide Horn, 1-18 GHz, 300 W	EMC Test Systems	3115	9911-5964	11-Jun-10	11-Jun-11
2016	Attenuator, Manual Step, 0-9/1 dB, 0-8 GHz, 2 W	Midwest Microwave	1072	1315	7-Feb-11	7-Feb-12
2017	Attenuator, Manual Step, 0-60/10 dB, 0-8.0 GHz	Midwest Microwave	1071	2017	7-Feb-11	7-Feb-12
2818	Cable TELEQUIS RG 58 C/U SMA/SMA	Belden	TELEQUI S	2818	04-May-11	04-May-12
2871	Microwave Cable Assembly, 18 GHz, 6.4 m, SMA - SMA	Huber-Suhner	198-8155- 00	2871	14-Sep-10	14-Sep-11
2883	Cable, 18 GHz N-type, M-F, 3 m	Bird Electronic Corp.	TC- MNFN-3.0	211539 003	01-Dec-10	01-Dec-11
2952	Cable, RF, 18 GHz, 1.2 m, SMA-SMA	Gore	10020014	NA	04-Oct-10	04-Oct-11
3123	Microwave Cable Assembly, 18 GHz, 5.0 m, SMA - SMA	Huber-Suhner	198-9155- 00	3123	03-Oct-10	03-Oct-11
3286	Temperature Chamber, (-50 to +170) °C	Thermotron	EL-8-CH- 1-1-CO2	21-9048	12-Sep-10	12-Sep-11
3287	Filter, low pass, DC-3.0 GHz	Unknown	NA	3287	04-Oct-10	04-Oct-11
3301	Power Meter, P-series, 50 MHz to 40 GHz	Agilent Technologies	N1911A	MY451010 57	13-Dec-10	13-Dec-11
3302	Power sensor, P-Series, 50 MHz to 40 GHz, -35/30 to 20 dBm	Agilent Technologies	N1922A	MY452405 86	13-Dec-10	13-Dec-11
3345	High Pass Filter, 50 Ohm, 4250 to 10000 MHz	Mini-Circuits	VHF- 3800+	NA	04-Oct-10	04-Oct-11
3347	High Pass Filter, 50 Ohm, 6000 to 11500 MHz	Mini-Circuits	VHF- 5500+	NA	04-Oct-10	04-Oct-11
3531	Amplifier, low noise, 2 to 8 GHz	Quinstar Technology	QLJ- 02084040 -J0	111590020 02	23-Dec-10	23-Dec-11
3559	Cable 40 GHz, SMA-SMA, 0.95 m, Blue	Gore	PHASEFL EX	03771245	13-Jun-10	13-Jun-11
3616	Cable RF, 6.5 m, N type-N type, DC-6.5 GHz	Suhner Switzerland	Rg 214/U	NA	27-May-10	27-May-11
3667	Directional coupler, 2 GHz to 8 GHz, 10 dB	ELISRA	MW10162	1011	30-Jan-11	30-Jan-12



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Date of Issue: 5/18/2011

HL No	Description	Manufacturer	Model	Ser. No.	Last Cal./ Check	Due Cal./ Check
3763	Precision Fixed Attenuator, 50 Ohm, 5 W, 20 dB, DC to 18 GHz	Mini-Circuits	BW-S20W5+	NA	07-Dec-10	07-Dec-11
3773	Attenuator, N-type, 10 dB, DC to 18 GHz, 5 W	Mini-Circuits	BW-N10W5+	NA	31-Aug-10	31-Aug-11
3818	PSA Series Spectrum Analyzer, 3 Hz- 44 GHz	Agilent Technologies	E4446A	MY48250288	25-Sep-09	25-Sep-11
3868	Directional coupler, 2 GHz to 8 GHz, 10 dB, SMA Female	Narda	4203-10	06978	13-Dec-10	13-Dec-12
3884	Preamplifier, 0.1 to 18 GHz, Gain 25 dB, N-type(f) in, N-type(m) out	Agilent Technologies	87405C	MY47010418	13-Jan-11	13-Jan-12

11 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.

12 APPENDIX C Test laboratory description

Tests were performed at Hermon Laboratories Ltd., which is a fully independent, private, EMC, safety, environmental and telecommunication testing facility.

Hermon Laboratories is listed by the Federal Communications Commission (USA) for all parts of Code of Federal Regulations 47 (CFR 47), Registration Numbers 90624 for OATS and 90623 for the anechoic chamber; by Industry Canada for electromagnetic emissions (file numbers IC 2186A-1 for OATS and IC 2186A-2 for anechoic chamber), certified by VCCI, Japan (the registration numbers are R-808 for OATS, R-1082 for anechoic chamber, C-845 for conducted emissions site), has a status of a Telefication - Listed Testing Laboratory, Certificate No. L138/00. The laboratory is accredited by American Association for Laboratory Accreditation (USA) according to ISO/IEC 17025 for electromagnetic compatibility, product safety, telecommunications testing and environmental simulation (for exact scope please refer to Certificate No. 839.01). The FCC Designation Number is US1003.

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13 APPENDIX D Specification references

FCC 47CFR part 90: 2010	Private land mobile radio services
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
RSS-197 Issue 1:2010	Wireless Broadband Access Equipment Operating in the Band 3650-3700 MHz
SRSP-303.65 Issue 1:2010	Technical Requirements for Wireless Broadband Services (WBS) in the Band 3650-3700 MHz
RSS-Gen Issue 3:2010	General Requirements and Information for Certification of Radiocommunication Equipment
662911 D01: 4/04/2011	FCC Guidance for Multiple Transmitter Output v01

14 APPENDIX E Test equipment correction factors

Antenna Factor
Active Loop Antenna
EMC Test Systems, model 6502, S/N 2857, HL 0446

Frequency, MHz	Magnetic Antenna Factor, dB(S/m)	Electric Antenna Factor, dB(1/m)
0.009	-32.8	18.7
0.010	-33.8	17.7
0.020	-38.3	13.2
0.050	-41.1	10.4
0.075	-41.3	10.2
0.100	-41.6	9.9
0.150	-41.7	9.8
0.250	-41.6	9.9
0.500	-41.8	9.7
0.750	-41.9	9.6
1.000	-41.4	10.1
2.000	-41.5	10.0
3.000	-41.4	10.1
4.000	-41.4	10.1
5.000	-41.5	10.0
10.000	-41.9	9.6
15.000	-41.9	9.6
20.000	-42.2	9.3
25.000	-42.8	8.7
30.000	-44.0	7.5

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

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

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

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

Antenna factor

Biconilog antenna EMCO, model 3141, serial number 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	560	19.8	1300	27.0
28	7.8	580	20.6	1320	27.8
30	7.8	600	21.3	1340	28.3
40	7.2	620	21.5	1360	28.2
60	7.1	640	21.2	1380	27.9
70	8.5	660	21.4	1400	27.9
80	9.4	680	21.9	1420	27.9
90	9.8	700	22.2	1440	27.8
100	9.7	720	22.2	1460	27.8
110	9.3	740	22.1	1480	28.0
120	8.8	760	22.3	1500	28.5
130	8.7	780	22.6	1520	28.9
140	9.2	800	22.7	1540	29.6
150	9.8	820	22.9	1560	29.8
160	10.2	840	23.1	1580	29.6
170	10.4	860	23.4	1600	29.5
180	10.4	880	23.8	1620	29.3
190	10.3	900	24.1	1640	29.2
200	10.6	920	24.1	1660	29.4
220	11.6	940	24.0	1680	29.6
240	12.4	960	24.1	1700	29.8
260	12.8	980	24.5	1720	30.3
280	13.7	1000	24.9	1740	30.8
300	14.7	1020	25.0	1760	31.1
320	15.2	1040	25.2	1780	31.0
340	15.4	1060	25.4	1800	30.9
360	16.1	1080	25.6	1820	30.7
380	16.4	1100	25.7	1840	30.6
400	16.6	1120	26.0	1860	30.6
420	16.7	1140	26.4	1880	30.6
440	17.0	1160	27.0	1900	30.6
460	17.7	1180	27.0	1920	30.7
480	18.1	1200	26.7	1940	30.9
500	18.5	1220	26.5	1960	31.2
520	19.1	1240	26.5	1980	31.6
540	19.5	1260	26.5	2000	32.0
		1280	26.6		

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

Antenna factor
Double-ridged wave guide horn antenna
Model 3115, S/N 9911-5964, HL1984

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

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

Cable loss
RF cable 3.5 m, Alpha Wire, model RG-214, S/N 149, HL 1553

No.	Frequency, MHz	Cable loss, dB	Measurement uncertainty, dB
1	1	0.01	±0.05
2	10	0.07	
3	30	0.12	
4	50	0.22	
5	100	0.26	
6	200	0.40	
7	300	0.52	
8	400	0.60	
9	500	0.70	
10	600	0.77	
11	700	0.84	
12	800	1.00	
13	900	1.00	
14	1000	1.05	
15	2000	1.70	

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

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



Cable loss
Cable coaxial, Bird, 18 GHz, N-type, M-F, model TC-MNFN-3.0, S/N 211539 003
HL 2883

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.06	5750	1.70	12000	2.46
30	0.12	6000	1.75	12250	2.48
100	0.21	6250	1.80	12500	2.52
250	0.34	6500	1.81	12750	2.50
500	0.47	6750	1.86	13000	2.54
750	0.59	7000	1.86	13250	2.48
1000	0.67	7250	1.92	13500	2.63
1250	0.76	7500	1.96	13750	2.65
1500	0.84	7750	1.98	14000	2.72
1750	0.92	8000	2.02	14250	2.67
2000	0.98	8250	2.03	14500	2.70
2250	1.05	8500	2.05	14750	2.72
2500	1.12	8750	2.11	15000	2.79
2750	1.17	9000	2.17	15250	2.80
3000	1.22	9250	2.17	15500	2.83
3250	1.27	9500	2.20	15750	2.75
3500	1.33	9750	2.19	16000	2.82
3750	1.38	10000	2.22	16250	2.85
4000	1.42	10250	2.25	16500	2.90
4250	1.46	10500	2.30	16750	2.89
4500	1.51	10750	2.28	17000	2.88
4750	1.54	11000	2.32	17250	2.85
5000	1.59	11250	2.34	17500	2.96
5250	1.62	11500	2.39	17750	3.04
5500	1.65	11750	2.42	18000	3.04



Cable loss
Cable coaxial, Gore, 18 GHz, 1.2 m, SMA-SMA, S/N 10020014
HL 2952

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.03	5750	0.97	12000	1.50
30	0.05	6000	1.01	12250	1.45
100	0.11	6250	1.03	12500	1.48
250	0.19	6500	1.06	12750	1.57
500	0.26	6750	1.08	13000	1.51
750	0.32	7000	1.10	13250	1.64
1000	0.38	7250	1.13	13500	1.60
1250	0.43	7500	1.13	13750	1.63
1500	0.47	7750	1.21	14000	1.59
1750	0.53	8000	1.20	14250	1.66
2000	0.55	8250	1.24	14500	1.60
2250	0.59	8500	1.29	14750	1.65
2500	0.63	8750	1.23	15000	1.72
2750	0.66	9000	1.27	15250	1.68
3000	0.69	9250	1.27	15500	1.73
3250	0.72	9500	1.29	15750	1.70
3500	0.75	9750	1.30	16000	1.82
3750	0.78	10000	1.38	16250	1.79
4000	0.82	10250	1.44	16500	1.81
4250	0.84	10500	1.47	16750	1.91
4500	0.86	10750	1.45	17000	1.92
4750	0.90	11000	1.50	17250	1.98
5000	0.91	11250	1.46	17500	2.05
5250	0.94	11500	1.47	17750	2.04
5500	0.96	11750	1.44	18000	2.05

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

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
10	0.11	3600	1.97	7400	3.12	11200	3.90	15100	4.74
30	0.17	3700	1.97	7500	3.13	11300	3.93	15200	4.70
50	0.25	3800	2.03	7600	3.16	11400	3.88	15300	4.73
100	0.32	3900	2.04	7700	3.18	11500	3.87	15400	4.78
200	0.46	4000	2.10	7800	3.20	11600	3.90	15500	4.75
300	0.58	4100	1.97	7900	3.23	11700	3.86	15600	4.76
400	0.65	4200	1.97	8000	3.25	11800	3.88	15700	4.75
500	0.74	4300	2.03	8100	3.26	11900	3.86	15800	4.78
600	0.82	4400	2.04	8200	3.28	12000	3.89	15900	4.79
700	0.89	4500	2.10	8300	3.31	12100	3.94	16000	4.73
800	0.95	4600	1.97	8400	3.31	12200	3.92	16100	4.78
900	1.01	4700	1.97	8500	3.32	12300	3.96	16200	4.84
1000	1.07	4800	2.03	8600	3.34	12400	4.01	16300	4.90
1100	1.11	4900	2.04	8700	3.35	12500	4.07	16400	4.87
1200	1.17	5000	2.10	8800	3.37	12600	4.08	16500	4.90
1300	1.22	5100	2.53	8900	3.39	12700	4.17	16600	4.98
1400	1.27	5200	2.55	9000	3.42	12800	4.26	16700	5.05
1500	1.29	5300	2.60	9100	3.43	12900	4.16	16800	5.04
1600	1.35	5400	2.61	9200	3.51	13000	4.21	16900	5.02
1700	1.40	5500	2.64	9300	3.52	13100	4.24	17000	5.09
1800	1.44	5600	2.70	9400	3.54	13200	4.27	17100	5.07
1900	1.51	5700	2.67	9500	3.63	13300	4.31	17200	5.10
2000	1.49	5800	2.71	9600	3.61	13400	4.33	17300	5.13
2100	1.55	5900	2.74	9700	3.71	13500	4.25	17400	5.23
2200	1.58	6000	2.80	9800	3.66	13600	4.27	17500	5.21
2300	1.62	6100	2.79	9900	3.77	13700	4.33	17600	5.22
2400	1.72	6200	2.81	10000	3.75	13800	4.33	17700	5.36
2500	1.76	6300	2.83	10100	3.77	13900	4.31	17800	5.35
2600	1.78	6400	2.86	10200	3.80	14000	4.30	17900	5.45
2700	1.80	6500	2.88	10300	3.79	14100	4.30	18000	5.43
2800	1.86	6600	2.90	10400	3.87	14200	4.31		
2900	1.90	6700	2.92	10500	3.83	14300	4.37		
3000	1.90	6800	2.98	10600	3.88	14400	4.35		
3100	1.97	6900	2.98	10700	3.86	14600	4.53		
3200	1.97	7000	3.00	10800	3.87	14700	4.50		
3300	2.03	7100	3.02	10900	3.90	14800	4.62		
3400	2.04	7200	3.04	11000	3.84	14900	4.65		
3500	2.10	7300	3.06	11100	3.88	15000	4.79		

Cable loss
Cable coaxial, GORE, PHASEFLEX, 40 GHz, 0.95 m, SMA-SMA, S/N 03771245
HL 3559

Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB	Frequency, MHz	Cable loss, dB
30	0.08	10000	0.96	20500	1.59	31000	2.24
100	0.10	10500	0.99	21000	1.63	31500	2.71
500	0.22	11000	1.02	21500	1.70	32000	2.47
1000	0.32	11500	1.07	22000	1.71	32500	2.37
1500	0.40	12000	1.13	22500	1.60	33000	2.35
2000	0.41	12500	1.16	23000	1.58	33500	2.34
2500	0.44	13000	1.26	23500	1.64	34000	2.31
3000	0.53	13500	1.26	24000	1.68	34500	2.43
3500	0.54	14000	1.22	24500	1.79	35000	2.45
4000	0.62	14500	1.26	25000	1.86	35500	2.48
4500	0.62	15000	1.27	25500	1.77	36000	3.60
5000	0.67	15500	1.29	26000	1.78	36500	2.62
5500	0.70	16000	1.39	26500	1.83	37000	2.45
6000	0.72	16500	1.50	27000	1.87	37500	2.47
6500	0.76	17000	1.49	27500	1.97	38000	2.38
7000	0.83	17500	1.37	28000	2.69	38500	2.41
7500	0.85	18000	1.40	28500	1.94	39000	2.56
8000	0.89	18500	1.41	29000	2.02	39500	2.71
8500	0.91	19000	1.48	29500	2.05	40000	2.69
9000	0.95	19500	1.61	30000	2.11		
9500	0.96	20000	1.59	30500	2.11		

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

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

15 APPENDIX F Abbreviations and acronyms

A	ampere
AC	alternating current
A/m	ampere per meter
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
dB Ω	decibel referred to one Ohm
DC	direct current
EIRP	equivalent isotropically radiated power
ERP	effective radiated power
EUT	equipment under test
F	frequency
GHz	gigahertz
GND	ground
H	height
HL	Hermon laboratories
Hz	hertz
ITE	information technology equipment
k	kilo
kHz	kilohertz
LO	local oscillator
m	meter
MHz	megahertz
min	minute
mm	millimeter
ms	millisecond
μ s	microsecond
NA	not applicable
NB	narrow band
NT	not tested
OATS	open area test site
Ω	Ohm
QP	quasi-peak
PCB	printed circuit board
PM	pulse modulation
PS	power supply
RE	radiated emission
RF	radio frequency
rms	root mean square
Rx	receive
s	second
T	temperature
Tx	transmit
V	volt
VA	volt-ampere

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