TEST REPORT
FROM
RFI GLOBAL SERVICES LTD

Test of: Orthogon Systems.
PTP54400

To: FCC Part 15.407: 2006

Test Report Serial No:
RFI/RPTE2/RP49282JD01A

Supersedes Test Report Serial No:
RFI/RPTE1/RP49282JD01A

This Test Report Is Issued Under The Authority Of Michael Derby, Radio Performance Service Leader: 	
Checked By: Michael Derby 	**Report Copy No: PDF01**
Issue Date: 20 September 2007	**Test Dates: 21 August 2007 to 28 August 2007**

This report is issued in Adobe Acrobat portable document format (PDF). It is only a valid copy of the report if it is being viewed in PDF format with the following security options not allowed: Changing the document, Selecting text and graphics, Adding or changing notes and form fields. Furthermore, the date of creation must match the issue date stated above. This report may be copied in full. The results in this report apply only to the sample(s) tested.

RFI Global Services Ltd
Pavilion A, Ashwood Park, Ashwood Way, Basingstoke, Hampshire RG23 8BG
Telephone: +44 (0)1256 312000 Facsimile: +44 (0)1256 312001
Email: info@rfi-global.com Website: www.rfi-global.com

Registered in England and Wales. Company number:2117901

This page has been left intentionally blank.

Table of Contents

1. Client Information

Company Name:	Orthogon Systems.
Address:	Unit A1 Linhay Business Park Eastern Road Ashburton Devon TQ13 7UP UK
Contact Name:	Mr C Fisher

2. Equipment Under Test (EUT)

The following information (with the exception of the Date of Receipt) has been supplied by the client:

2.1. Identification of Equipment Under Test (EUT)

Brand Name:	Motorola
Model Name or Number:	PTP54400
Serial Number:	000456005CD1
Hardware Version Number:	D05-R02-C
Software Version Number:	54400-09-01
FCC ID Number:	QWP54XX
Country of Manufacture:	UK
Date of Receipt:	21 August 2007

Brand Name:	Motorola Power Supply
Model Name or Number:	Power IDU
Serial Number:	0628238987
Date of Receipt:	21 August 2007

2.2. Description of EUT

The equipment under test is a point to point wireless Ethernet bridge.

2.3. Modifications Incorporated in EUT

During the course of testing the EUT was not modified.

2.4. Additional Information Related to Testing

Power Supply Requirement:	110 VAC		
Intended Operating Environment:	Commercial		
Equipment Category:	Broadband Radio Access Network, Fixed Link.		
Type of Unit:	Base Station (Fixed Use)		
Transmit Frequency Range:	5479 MHz to 5717 MHz		
Transmit Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	5479
	Middle	10	5593
	Top	19	5717
Receive Frequency Range:	5479 MHz to 5717 MHz		
Receive Channels Tested:	**Channel ID**	**Channel Number**	**Channel Frequency (MHz)**
	Bottom	1	5479
	Middle	10	5593
	Top	19	5717
Maximum Power Output	-6.7dBm		

2.5. Port Identification

Port	Description
1	Horizontal and Vertical Antenna Port
2	RJ45 P1DU

2.6. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Slave ODU
Brand Name:	Motorola
Model Name or Number:	PTP54400
Serial Number:	0004 56005AD4
Cable Length and Type:	0.8m, 50 Coax
Connected to Port:	Horizontal Antenna Port

Description:	Computer
Brand Name:	ACER
Model Name or Number:	Travelmate 4021lmi
Serial Number:	LXTAH 0508353100905EM00
Cable Length and Type:	4m, CAT5
Connected to Port:	RJ45 P1DU

3. Test Results

Reference:	FCC Part 15 Subpart C: 2006 (Section 15.407)
Title:	Code of Federal Regulations, Part 15 (47CFR15) Radio Frequency Devices
Purpose of Test:	To determine whether the equipment complied with the requirements of the specification for the purposes of certification.

3.1. Methods and Procedures

The methods and procedures used were as detailed in:

ANSI/TIA-603-B-2003
Land Mobile Communications Equipment, Measurements and performance Standards

ANSI C63.2 (1987)
Title: American National Standard for Instrumentation - Electromagnetic noise and field strength.

ANSI C63.4 (2003)
Title: American National Standard Methods of Measurement of Electromagnetic Emissions from Low Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

ANSI C63.5 (1988)
Title: American National Standard for the Calibration of antennas used for Radiated Emission measurements in Electromagnetic Interference (EMI) control.

ANSI C63.7 (1988)
Title: American National Standard Guide for Construction of Open Area Test Sites for performing Radiated Emission Measurements.

CISPR 16-1: (1999)
Title: Specification For Radio Disturbance and Immunity Measuring Apparatus and Methods. Part 1: Radio Disturbance and Immunity Measuring Apparatus.

3.2. Definition of Measurement Equipment

The measurement equipment used complied with the requirements of the standards referenced in the Methods & Procedures section above. Appendix 1 contains a list of the test equipment used.

4. Deviations from the Test Specification

At the client's request, the dynamic frequency selection (DFS) test was not performed.

5. Operation of the EUT During Testing

5.1. Operating Modes

The EUT was tested in the following operating modes, unless otherwise stated:

As a master device, transmitting ACQ, BPSK, QPSK, 16QAM and 64QAM, unless otherwise stated in this report.

Operating on the bottom, middle or top channel, as per each test case requirement.

5.2. Configuration and Peripherals

The EUT was tested in the following configuration:

For AC conducted emissions the EUT was connected to the PIDU.

For conducted antenna port measurements the EUT was connected to a slave ODU and a communications link was maintained.

For cabinet radiation testing:
The initial pre-scans were performed with the EUT mounted on a pole, with the PIDU located close to the ODU.
The final measurements were performed with an antenna fitted to the EUT. The antenna was a dish antenna, of 6 foot (182 cm) diameter.

6. Summary of Test Results

Range of Measurements	Specification Reference	Port Type	Compliancy Status
Transmitter AC Conducted Emissions (150 kHz to 30 MHz)	Section 15.207	AC Mains	Complied
Transmitter Peak Transmit Power	Section 15.407(a)	Antenna Terminals	Complied
Transmitter Peak Power Spectral Density	Section 15.407(a)	Antenna Terminals	Complied
Transmitter Modulation Envelope Peak Excursion Ratio	Section 15.407(a)(6)	Antenna Terminals	Complied
Transmitter Emission Bandwidth	Section 15.403(i)	Antenna Terminals	Complied
Transmitter Radiated Emissions	Sections 15.407(b) & 15.209(a)	Antenna	Complied
Transmitter Band Edge Radiated Emissions	Section 15.407(b)	Antenna	Complied

6.1. Location of Tests

All the measurements described in this report were performed at the premises of
RFI Global Services Ltd, Ewhurst Park, Ramsdell, Basingstoke, Hampshire, RG26 5RQ, UK.

7. Measurements, Examinations and Derived Results

7.1. General Comments

This section contains test results only.

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%.
Please refer to Section 8 for details of measurement uncertainties.

As per FCC part 15.407 section (h)(1); Transmit Power Control (TPC) testing is not required for a device with an e.i.r.p. of less than 500 mW (27 dBm). As stated by the manufacturer and confirmed by our measurements, this EUT has an e.i.r.p. of less than 27 dBm.

It is the responsibility of the manufacturer to ensure EUT frequency stability, such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user manual.

7.2. Test Results

7.2.1. Transmitter AC Conducted Spurious Emissions

Results:

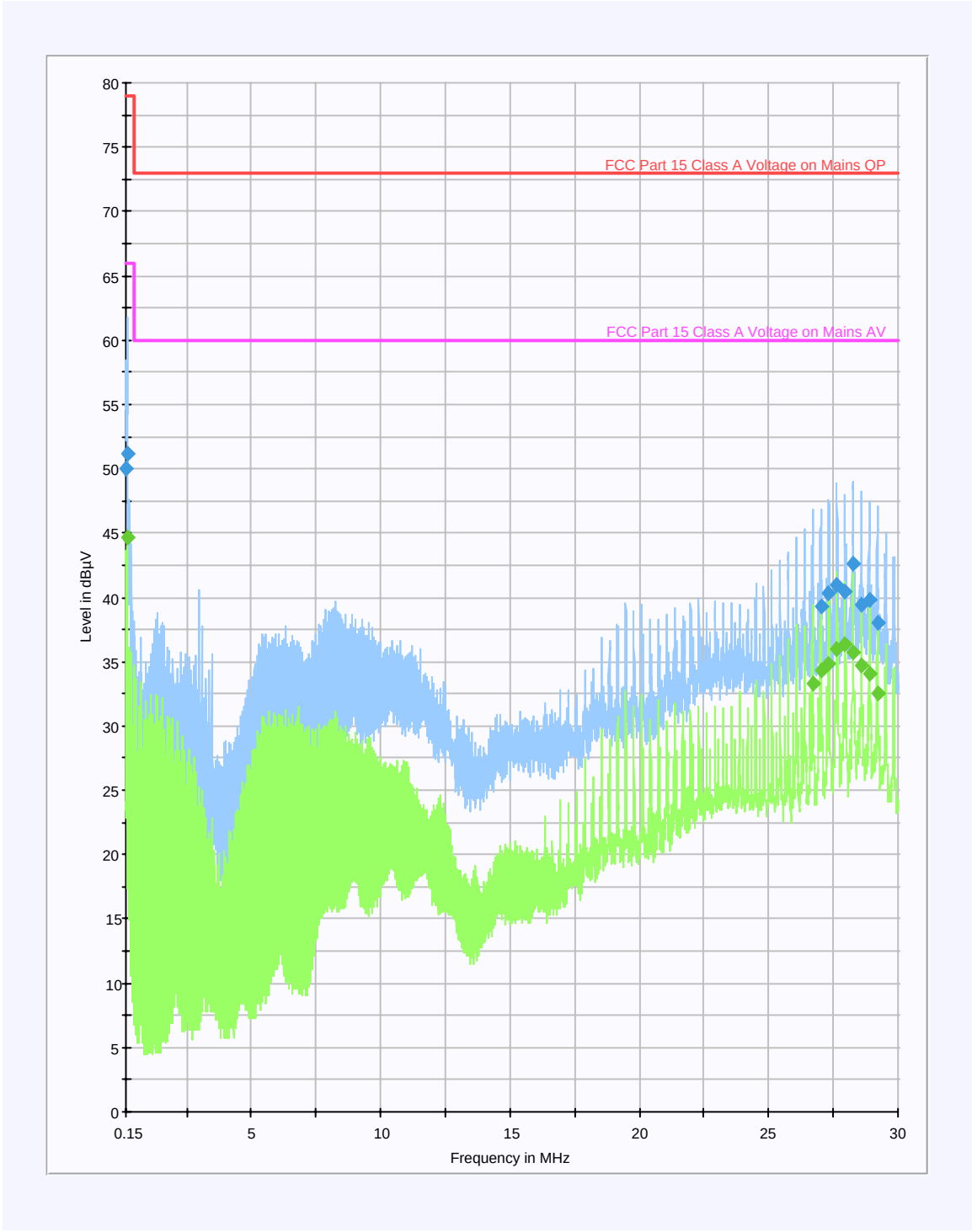
Top Channel: Quasi-Peak Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.170000	Neutral	50.1	64.9	14.8	Complied
0.190000	Neutral	51.1	63.9	12.8	Complied
27.014000	Live	39.3	60.0	20.7	Complied
27.330000	Live	40.4	60.0	19.6	Complied
27.642000	Live	41.0	60.0	19.0	Complied
27.958000	Live	40.4	60.0	19.6	Complied
28.266000	Live	42.6	60.0	17.4	Complied
28.586000	Live	39.5	60.0	20.5	Complied
28.898000	Live	39.8	60.0	20.2	Complied
29.214000	Live	38.1	60.0	21.9	Complied

Top Channel: Average Detector Measurements on Live and Neutral Lines

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.186000	Neutral	44.6	54.9	10.3	Complied
26.698000	Neutral	33.3	53.9	20.6	Complied
27.014000	Live	34.4	50.0	15.6	Complied
27.330000	Live	34.8	50.0	15.2	Complied
27.642000	Live	36.0	50.0	14.0	Complied
27.954000	Live	36.3	50.0	13.7	Complied
28.270000	Live	35.7	50.0	14.3	Complied
28.582000	Live	34.7	50.0	15.3	Complied
28.898000	Live	34.1	50.0	15.9	Complied
29.210000	Live	32.5	50.0	17.5	Complied

Transmitter AC Conducted Spurious Emissions (Continued)



Note: Although the limits shown on this plot are of FCC Part 15 Class A, the limits on the results table shown on the previous page are of FCC Part 15 Class B

7.2.2. Transmitter Peak Transmit Power

Results: Complied

Antenna Details:	
Gain (dBi):	33.4
Antenna Cable Loss (dB):	1.2

No variation in output power was observed, over voltage extremes of 85% and 115% of nominal voltage.

The limit was calculated as:

11 + 10.Log(B) – Antenna Gain + Allowed 6dBi + Antenna Cable loss.

Example: 21.4 dBm – 33.4 dBi + 6 dBi + 1.2 dB = -4.8 dBm

For PSD: 11 dBm – 33.4 dBi + 6 dBi + 1.2 dB = -4.8 dBm

Results: Bottom Channel 5479 MHz

Conducted Output Power (dBm)				**Limit**	**Margin**
Mode	**Port H**	**Port V**	**Aggregate**	**(dBm)**	**(dB)**
ACQ	-12.1	-11.0	-8.5	-4.8	3.7
BPSK	-11.2	-10.1	-7.6	-4.7	2.9
QPSK	-11.2	-10.2	-7.7	-4.7	2.9
16QAM	-11.2	-10.1	-7.6	-4.6	3.0
64QAM	-11.2	-10.1	-7.6	-4.8	2.8

Results: Middle Channel 5593 MHz

Conducted Output Power (dBm)				**Limit**	**Margin**
Mode	**Port H**	**Port V**	**Aggregate**	**(dBm)**	**(dB)**
ACQ	-10.6	-10.0	-7.3	-4.9	2.4
BPSK	-10.0	-9.5	-6.7	-4.8	1.9
QPSK	-10.0	-9.6	-6.7	-4.6	2.2
16QAM	-10.0	-9.5	-6.8	-4.7	2.0
64QAM	-10.1	-9.6	-6.9	-4.7	2.2

Results: Top Channel 5717 MHz

Conducted Output Power (dBm)				**Limit**	**Margin**
Mode	**Port H**	**Port V**	**Aggregate**	**(dBm)**	**(dB)**
ACQ	-11.5	-11.4	-8.5	-4.9	3.5
BPSK	-10.9	-10.4	-7.6	-4.9	2.7
QPSK	-10.9	-10.4	-7.6	-4.7	2.9
16QAM	-10.8	-10.5	-7.6	-4.7	2.9
64QAM	-10.8	-10.4	-7.6	-4.7	2.9

7.2.3. Transmitter Peak Power Spectral Density

Results: Bottom Channel 5479 MHz

Conducted Output (dBm/MHz)				Limit	Margin
Mode	Port H	Port V	Aggregate	(dBm/MHz)	(dB)
ACQ	-23.0	-22.0	-19.5	-15.2	4.3
BPSK	-19.7	-18.7	-16.1	-15.2	0.9
QPSK	-20.0	-19.1	-16.5	-15.2	1.3
16QAM	-20.0	-19.1	-16.5	-15.2	1.3
64QAM	-20.1	-19.0	-16.5	-15.2	1.3

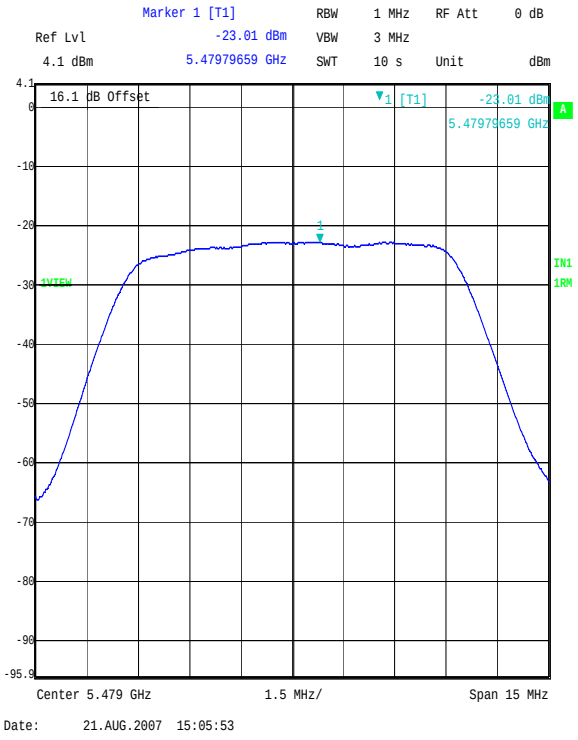
Results: Middle Channel 5593 MHz

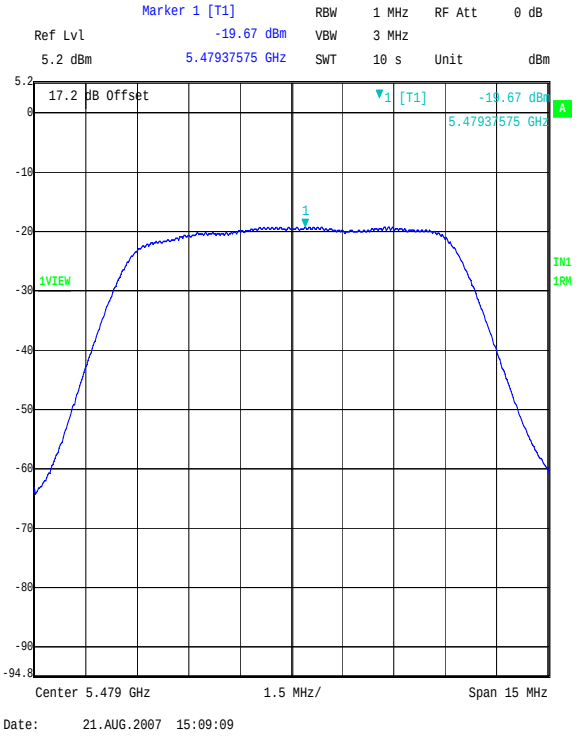
Conducted Output (dBm/MHz)				Limit	Margin
Mode	Port H	Port V	Aggregate	(dBm/MHz)	(dB)
ACQ	-22.7	-22.1	-19.4	-15.2	4.2
BPSK	-19.2	-18.6	-15.9	-15.2	0.7
QPSK	-19.6	-19.2	-16.4	-15.2	1.2
16QAM	-19.6	-19.1	-16.3	-15.2	1.1
64QAM	-19.6	-19.0	-16.3	-15.2	1.1

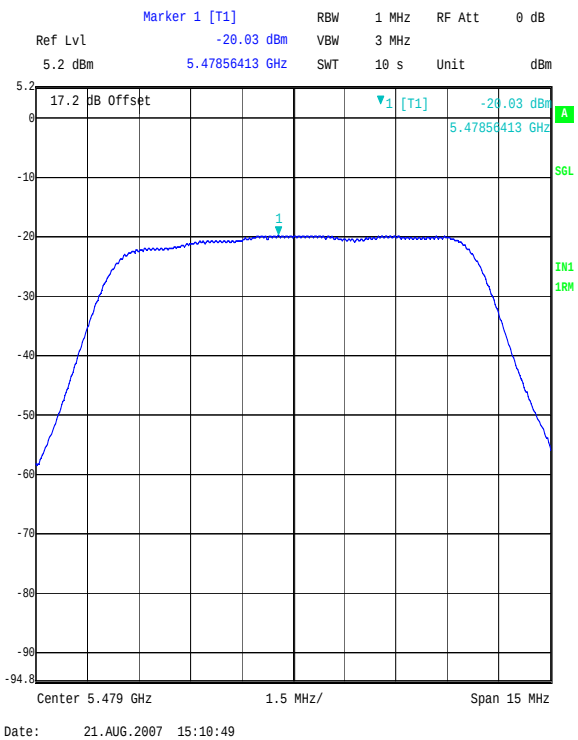
Results: Top Channel 5717 MHz

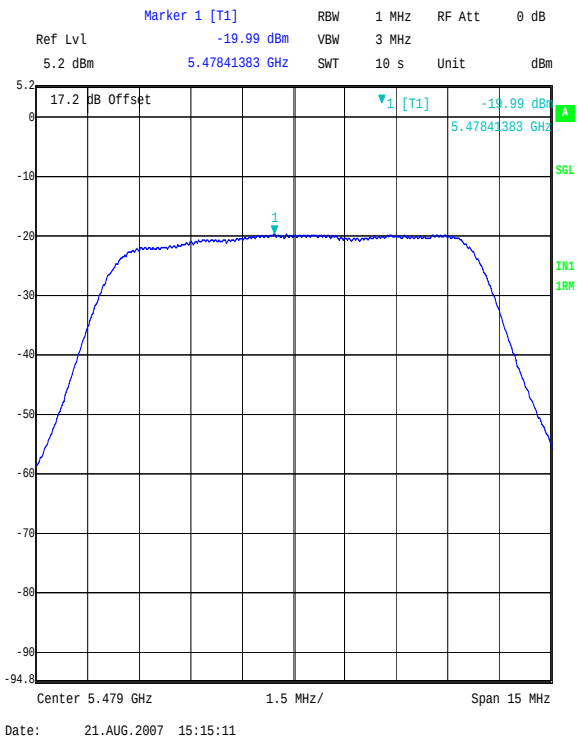
Conducted Output (dBm/MHz)				Limit	Margin
Mode	Port H	Port V	Aggregate	(dBm/MHz)	(dB)
ACQ	-23.6	-22.8	-20.1	-15.2	4.9
BPSK	-20.2	-19.5	-16.8	-15.2	1.6
QPSK	-20.9	-19.9	-17.4	-15.2	2.2
16QAM	-20.4	-20.0	-17.2	-15.2	2.0
64QAM	-20.4	-19.9	-17.1	-15.2	1.9

Transmitter Peak Power Spectral Density (Continued)

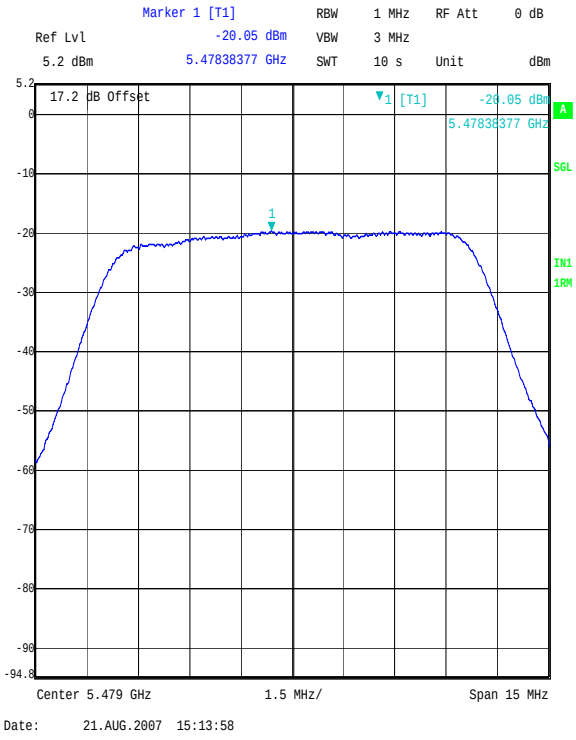


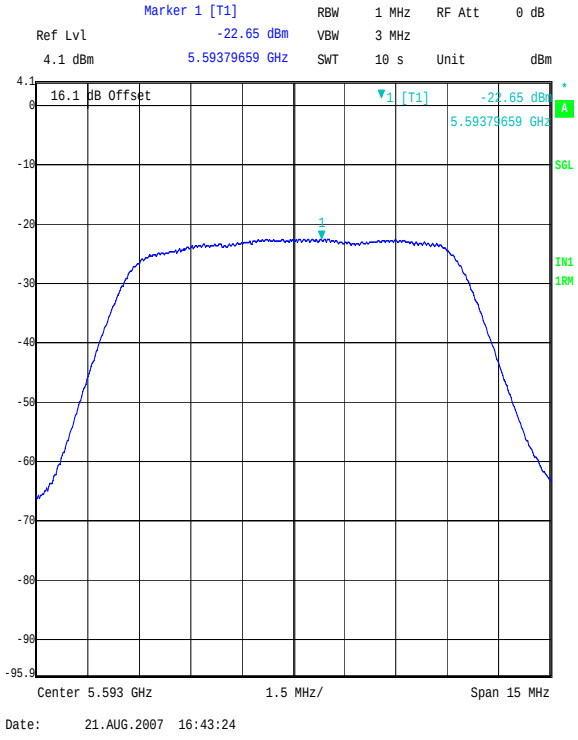


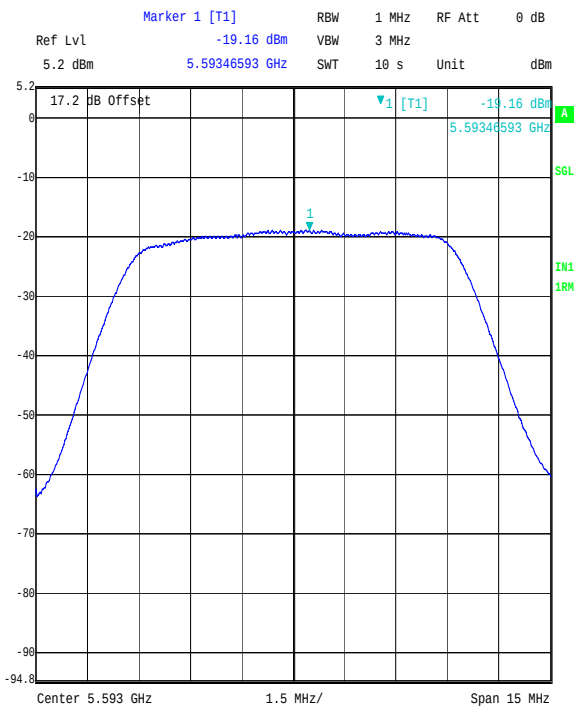


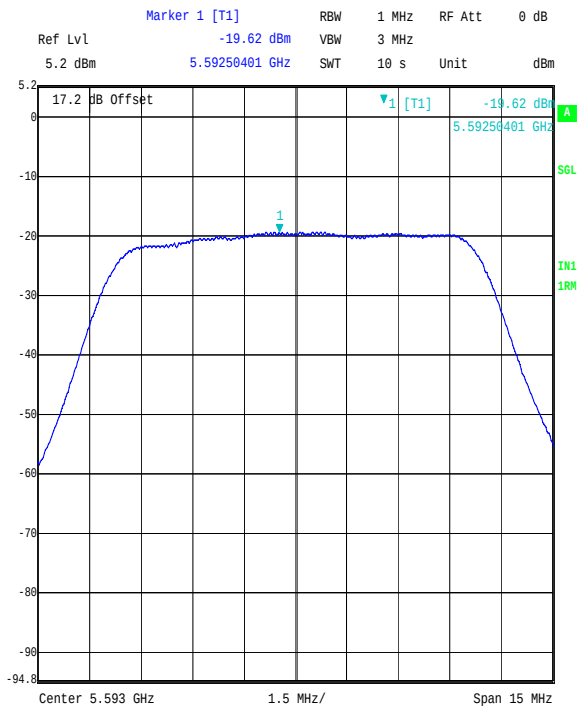


Transmitter Peak Power Spectral Density (Continued)

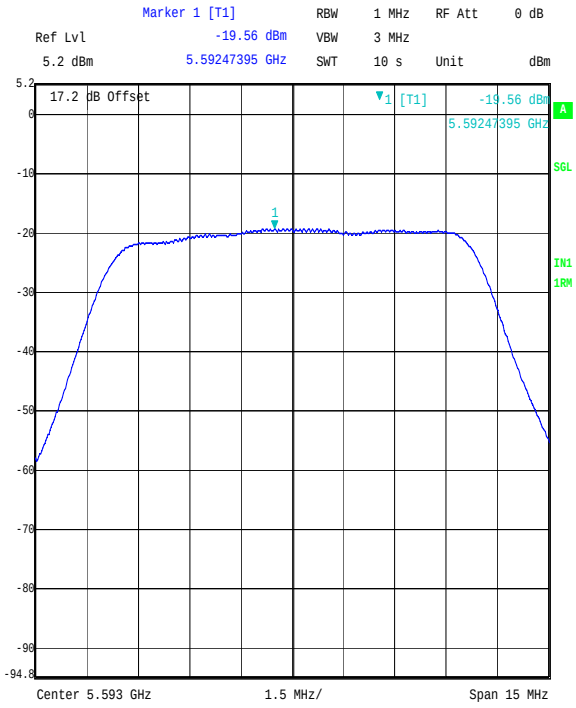


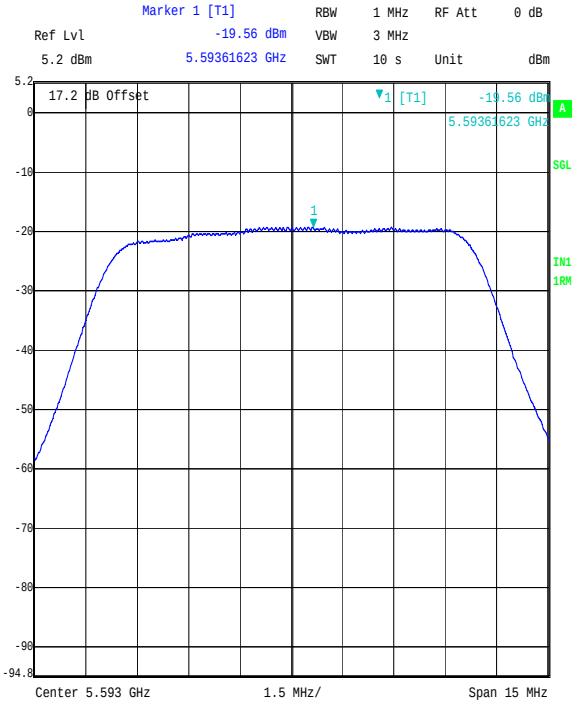


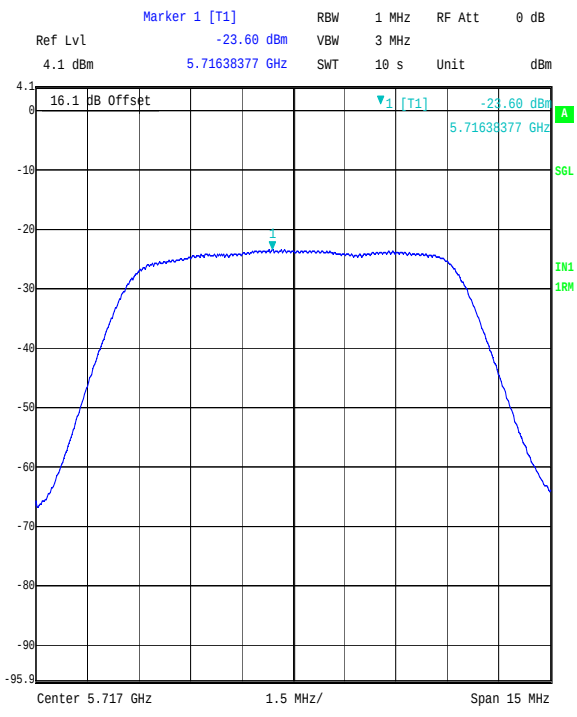


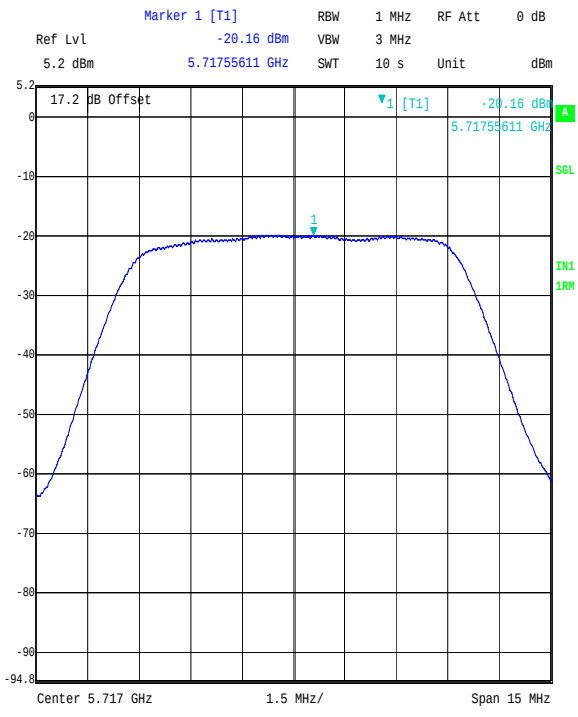


Transmitter Peak Power Spectral Density (Continued)

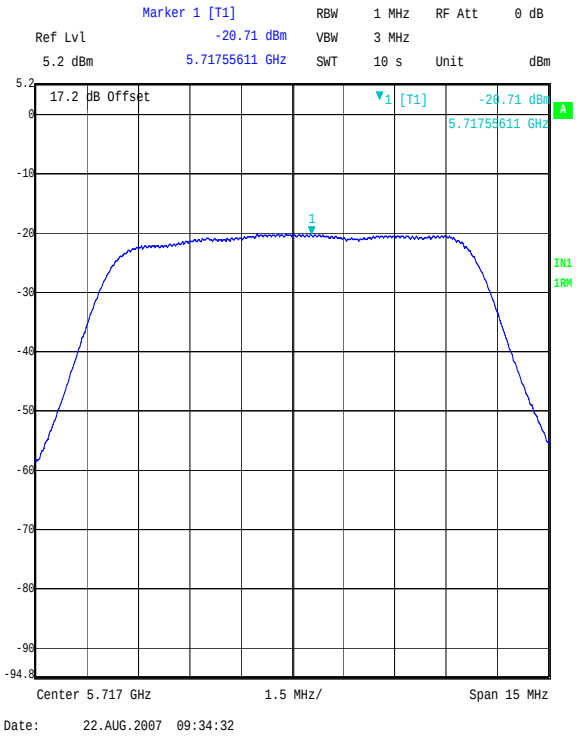


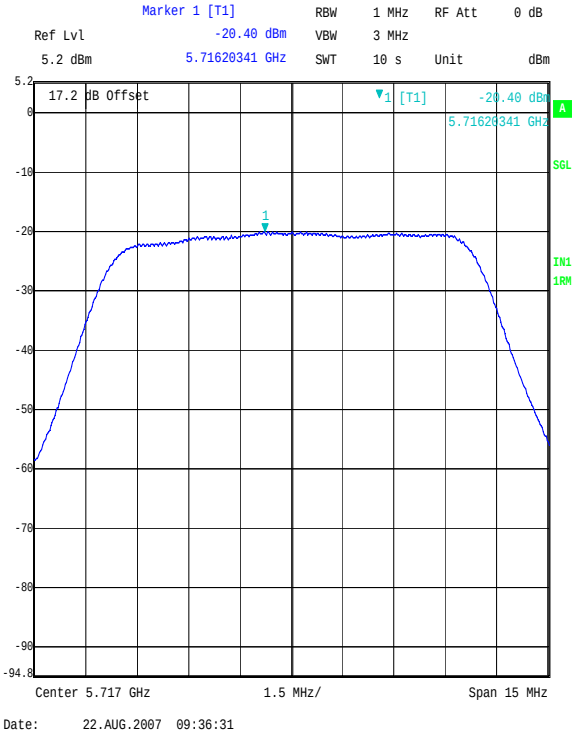


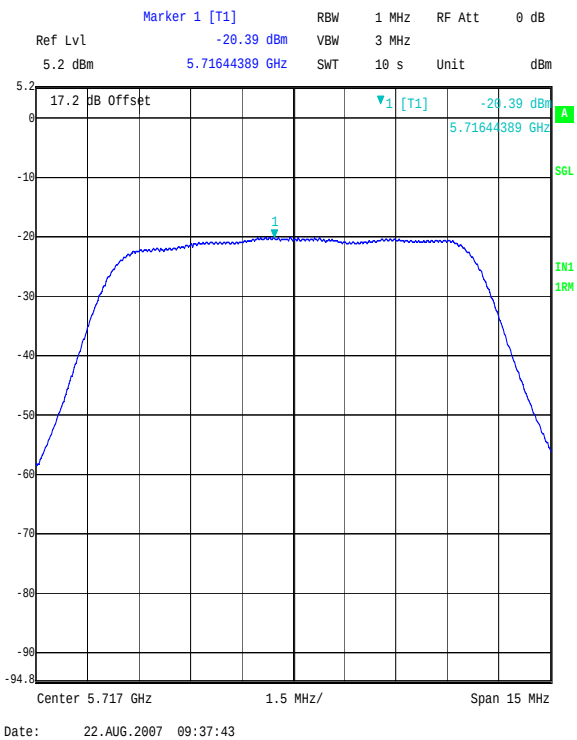




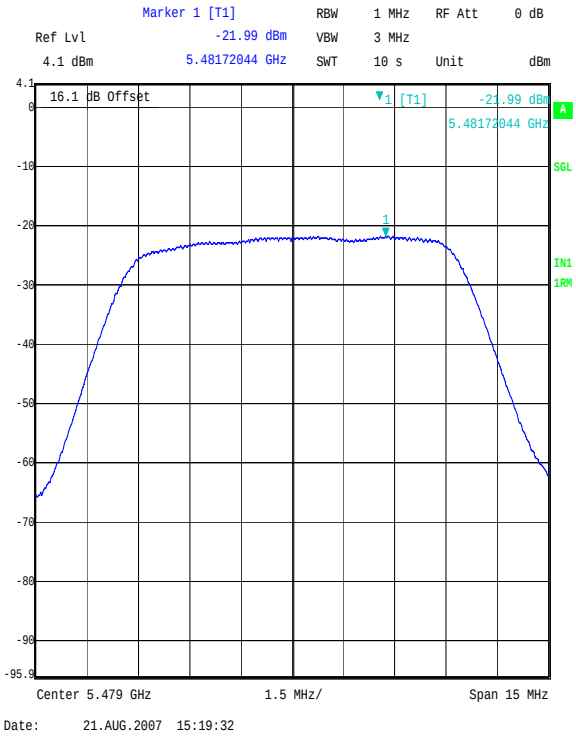
Transmitter Peak Power Spectral Density (Continued)

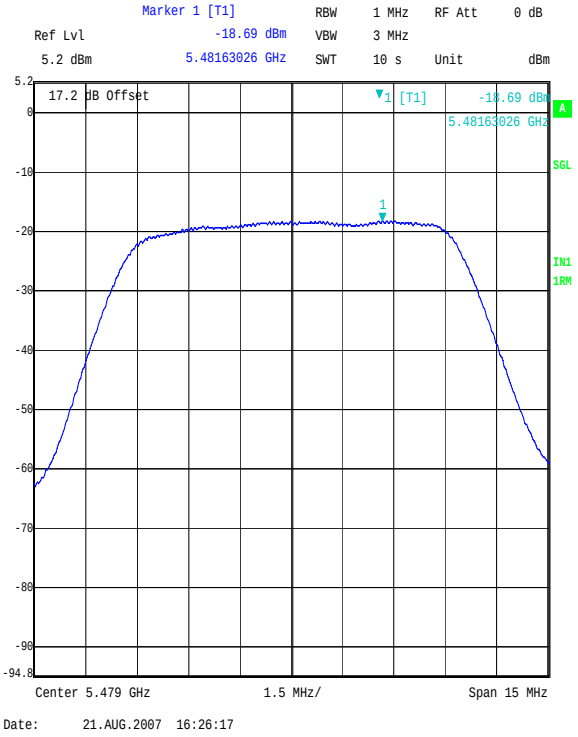


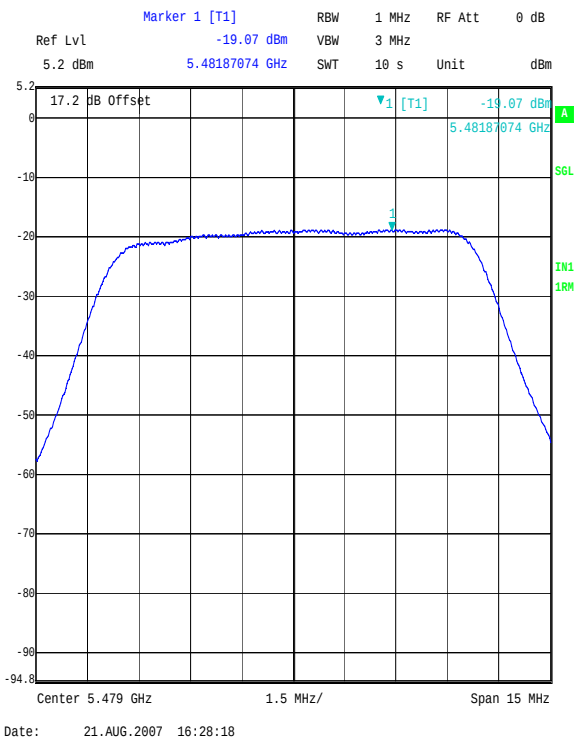


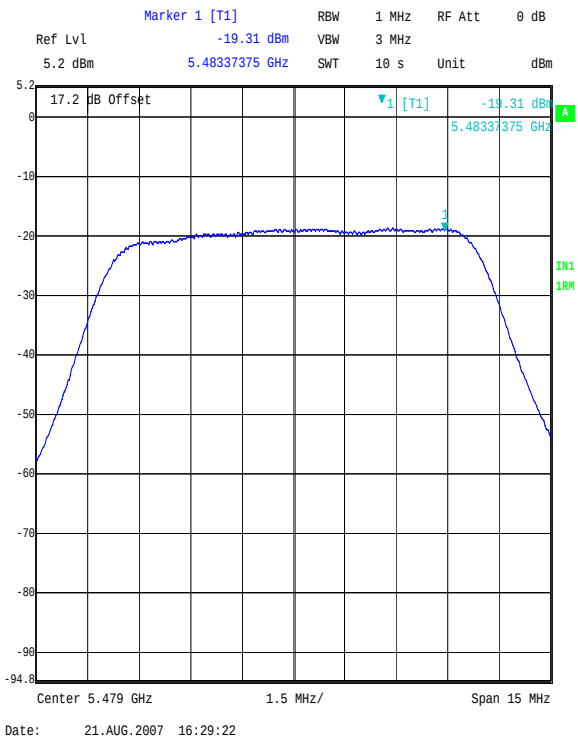


Transmitter Peak Power Spectral Density (Continued)

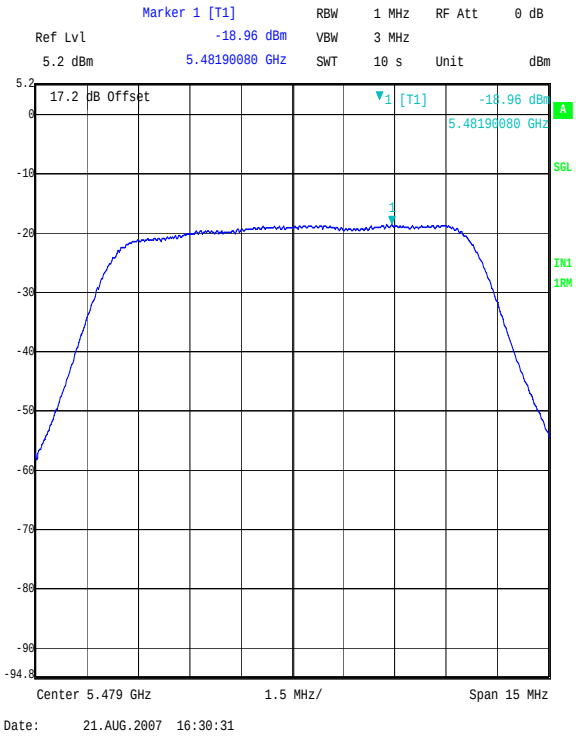


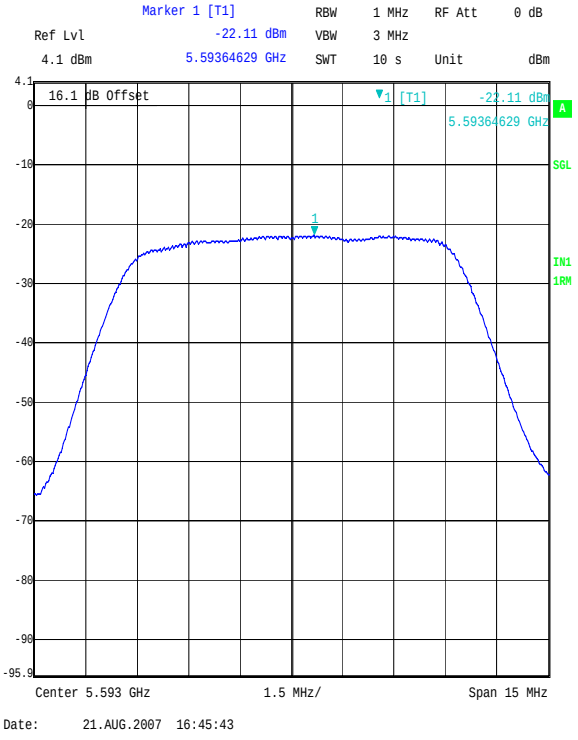


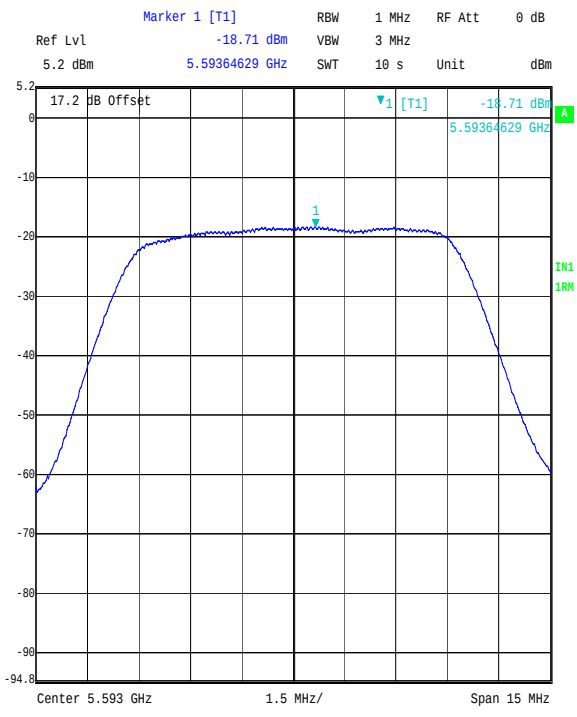


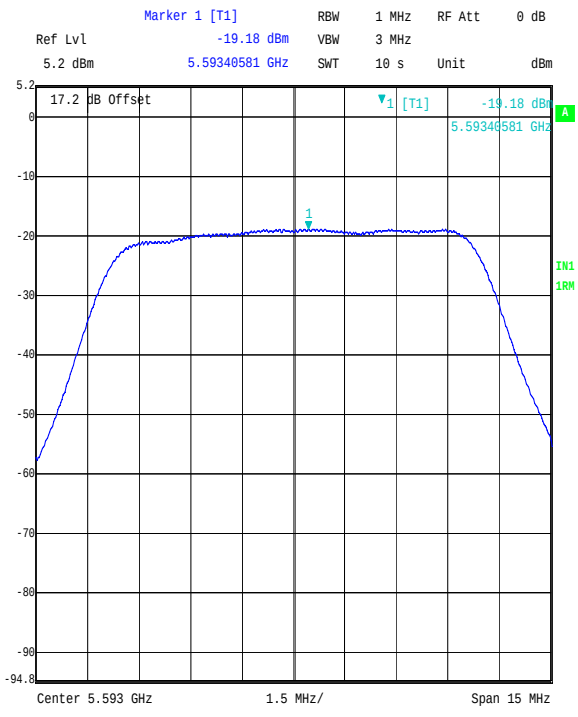


Transmitter Peak Power Spectral Density (Continued)

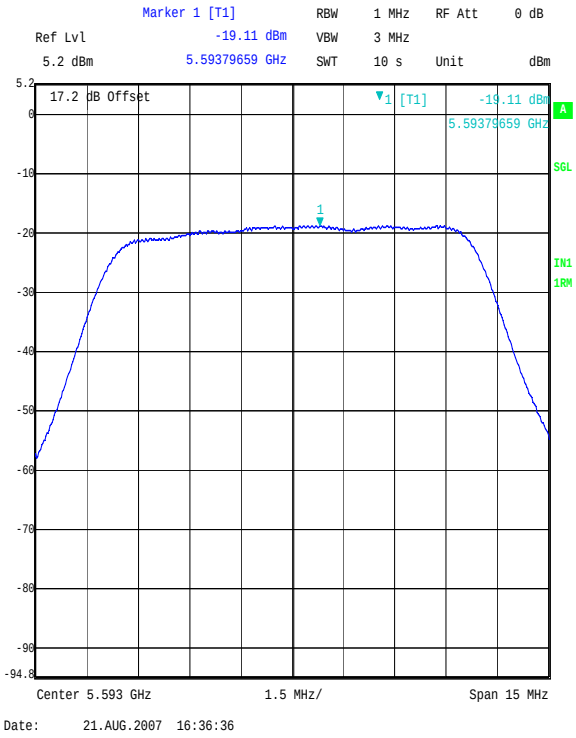


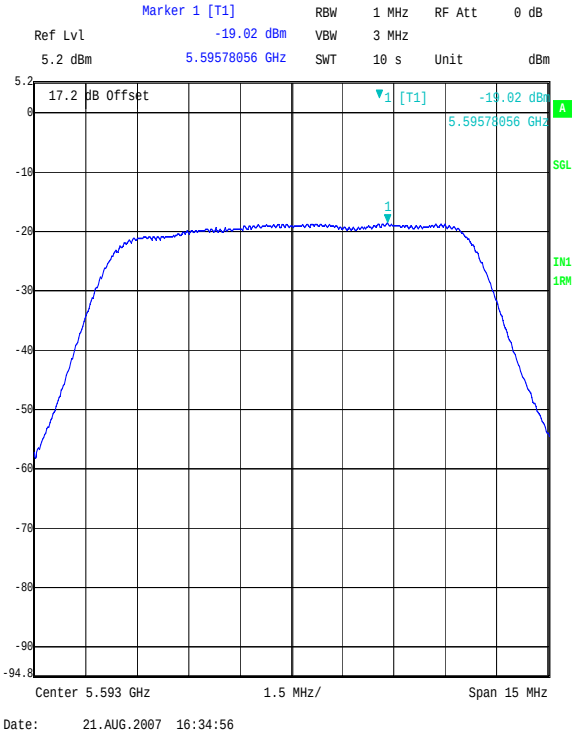


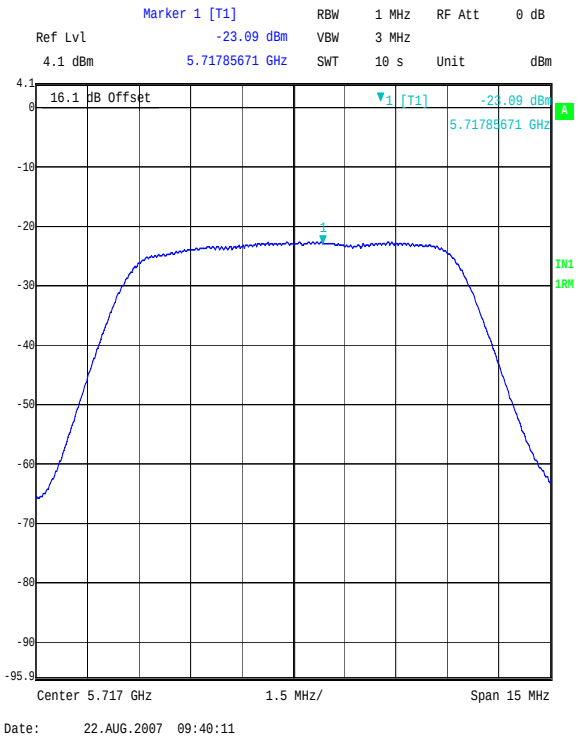


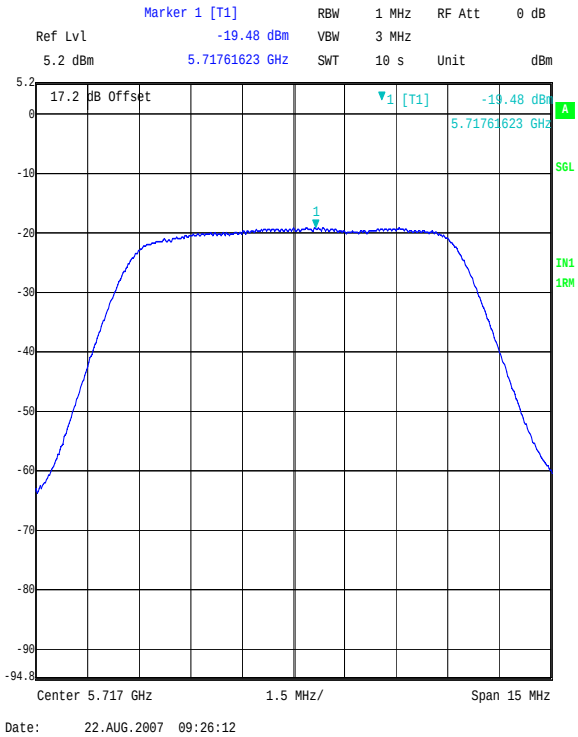


Transmitter Peak Power Spectral Density (Continued)

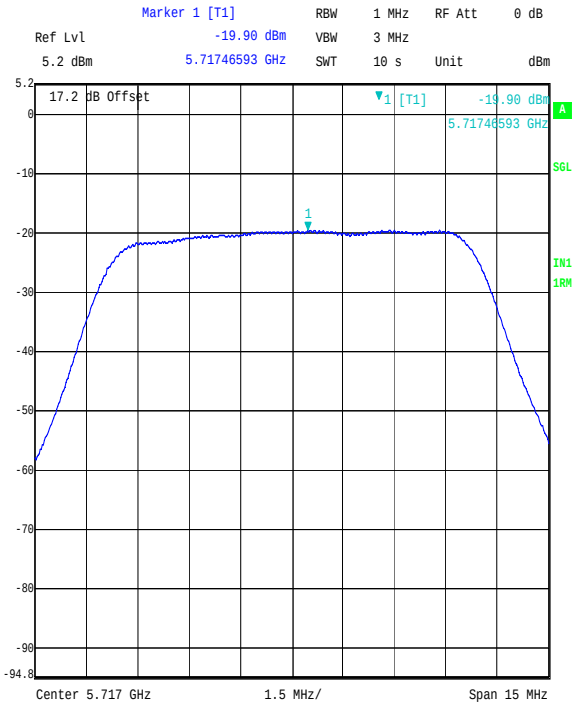




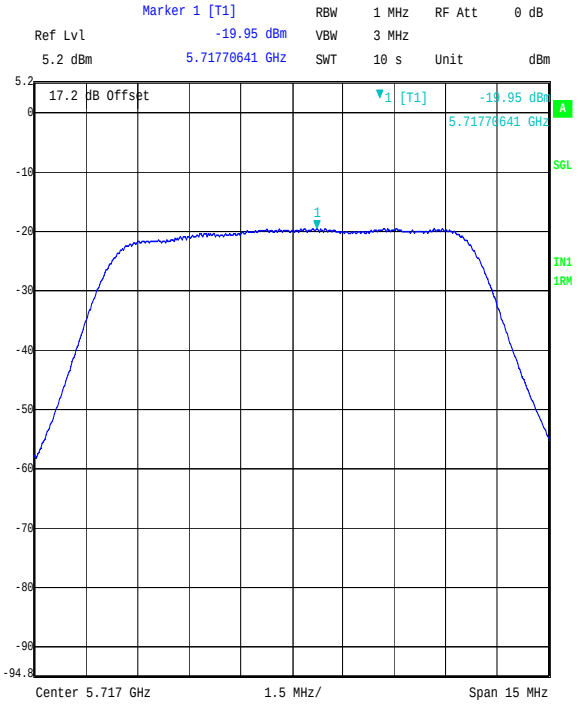




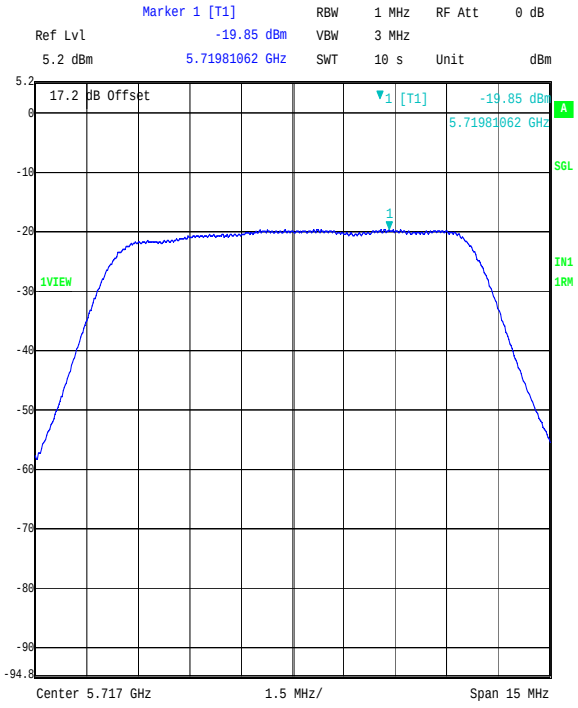
Transmitter Peak Power Spectral Density (Continued)



Date: 22.AUG.2007 09:24:51



Date: 22.AUG.2007 09:23:37



Date: 22.AUG.2007 09:20:42

7.2.4. Transmitter Modulation Envelope Peak Excursion Ratio

Results: ACQ Port V

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	9.9	13.0	3.1	Complied
Middle	9.1	13.0	3.9	Complied
Top	9.4	13.0	3.6	Complied

Results: BPSK Port V

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.5	13.0	4.5	Complied
Middle	9.1	13.0	3.9	Complied
Top	9.0	13.0	4.0	Complied

Results: QPSK Port V

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	7.5	13.0	5.5	Complied
Middle	8.6	13.0	4.4	Complied
Top	9.1	13.0	3.9	Complied

Results: 16QAM Port V

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.7	13.0	4.3	Complied
Middle	8.6	13.0	4.4	Complied
Top	9.4	13.0	3.6	Complied

Results: 64QAM Port V

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.7	13.0	4.3	Complied
Middle	8.6	13.0	4.4	Complied
Top	9.4	13.0	3.6	Complied

Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

Results: ACQ Port H

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.4	13.0	4.6	Complied
Middle	8.8	13.0	4.2	Complied
Top	8.5	13.0	4.5	Complied

Results: BPSK Port H

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.4	13.0	4.6	Complied
Middle	9.0	13.0	4.0	Complied
Top	9.7	13.0	3.3	Complied

Results: QPSK Port H

Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.0	13.0	5.0	Complied
Middle	8.7	13.0	4.3	Complied
Top	9.1	13.0	3.9	Complied

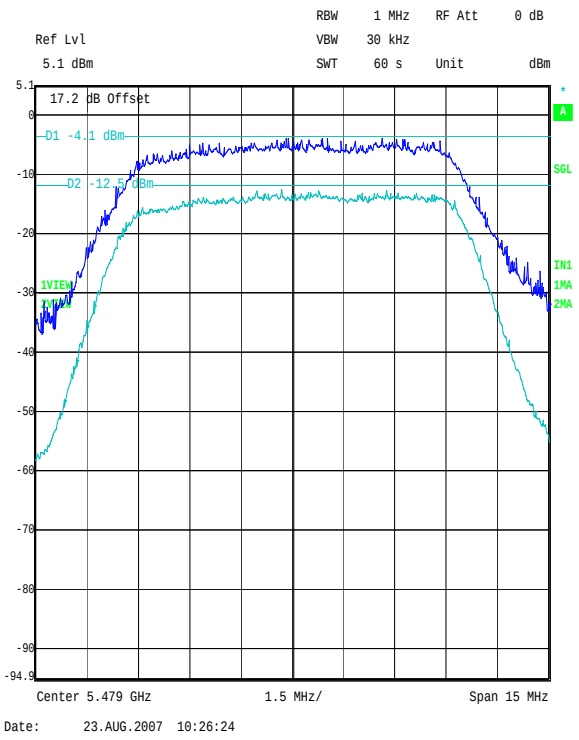
Results: 16QAM Port H

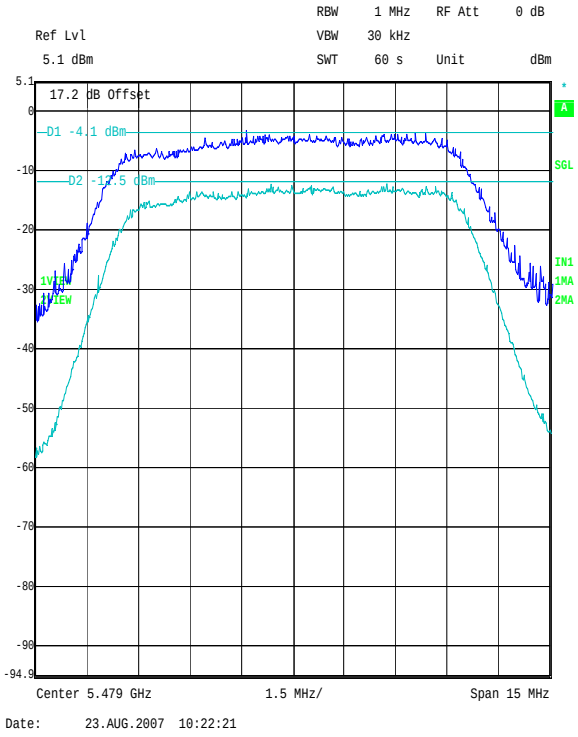
Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.0	13.0	5.0	Complied
Middle	8.5	13.0	4.5	Complied
Top	8.7	13.0	4.3	Complied

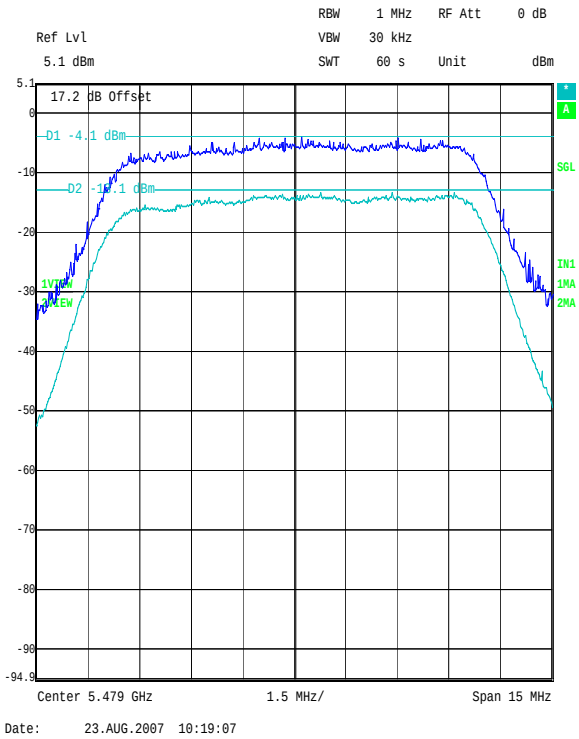
Results: 64QAM Port H

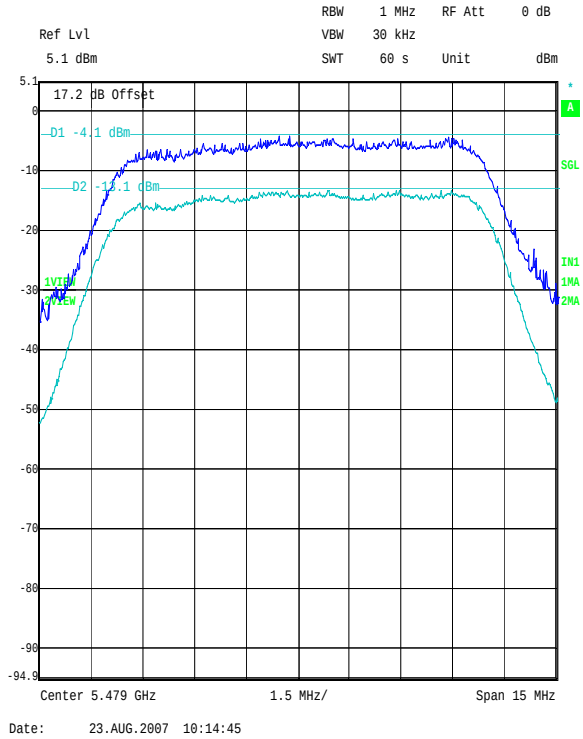
Channel	Ratio (dB)	Limit (dB)	Margin (dB)	Result
Bottom	8.1	13.0	4.9	Complied
Middle	8.4	13.0	4.6	Complied
Top	8.7	13.0	4.3	Complied

Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

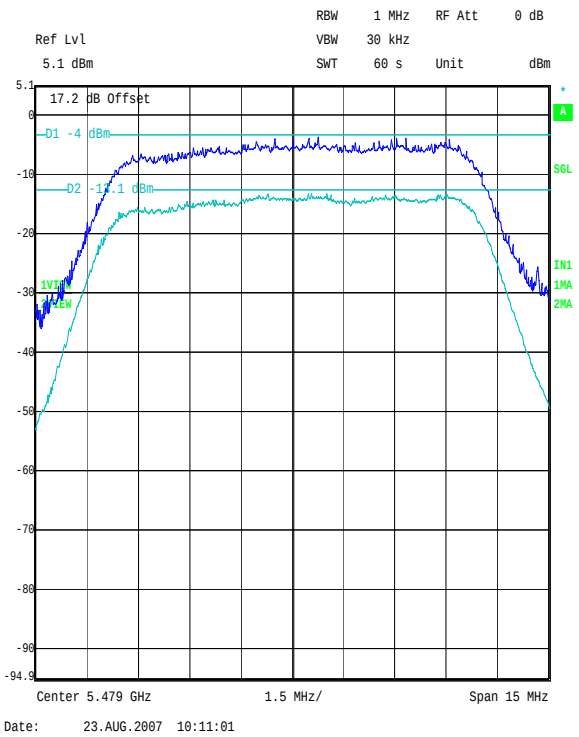


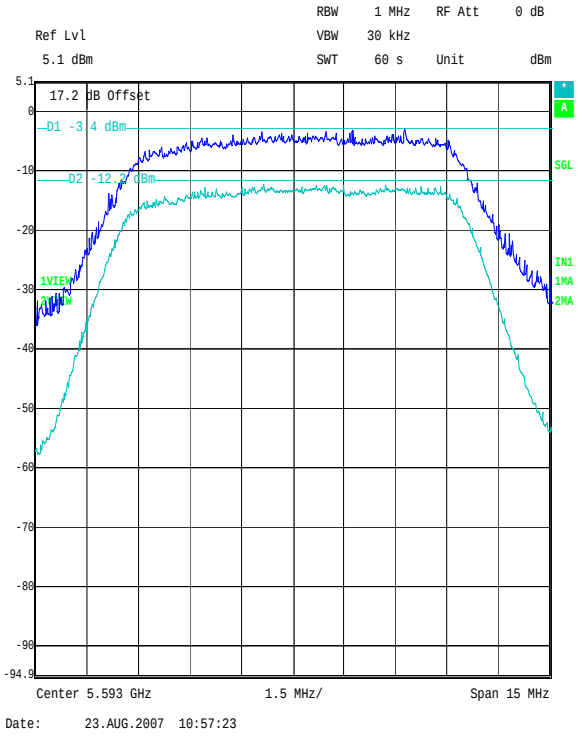


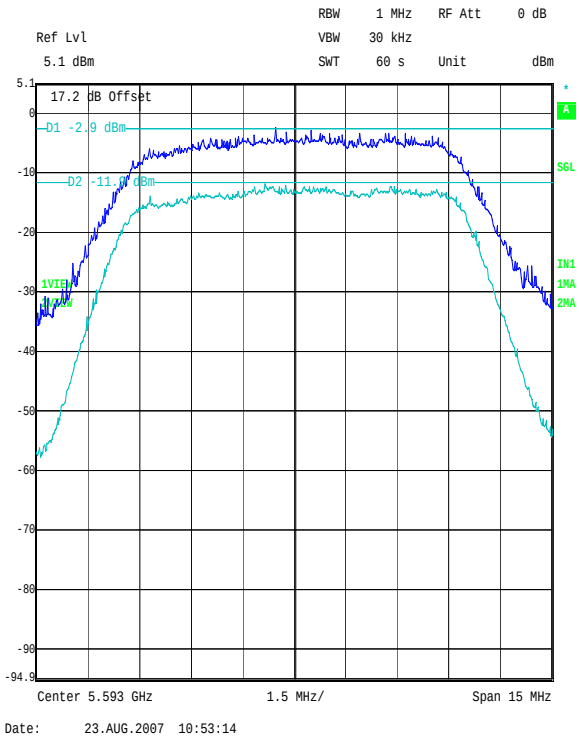


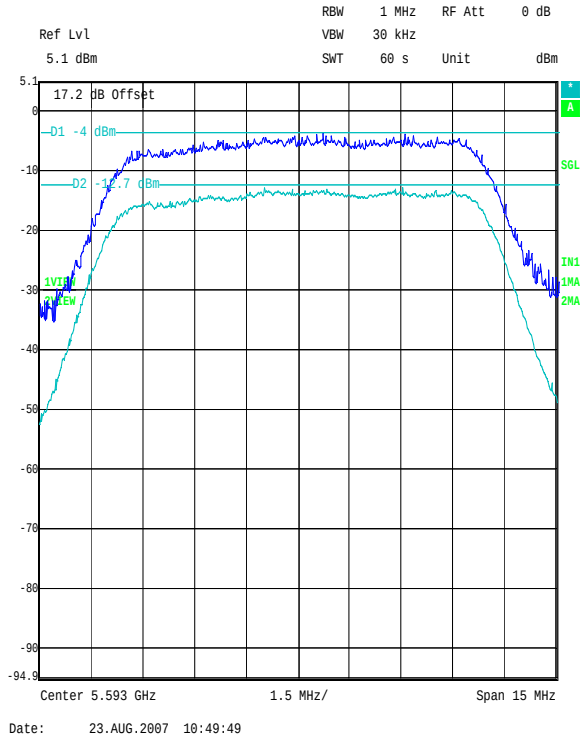


Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

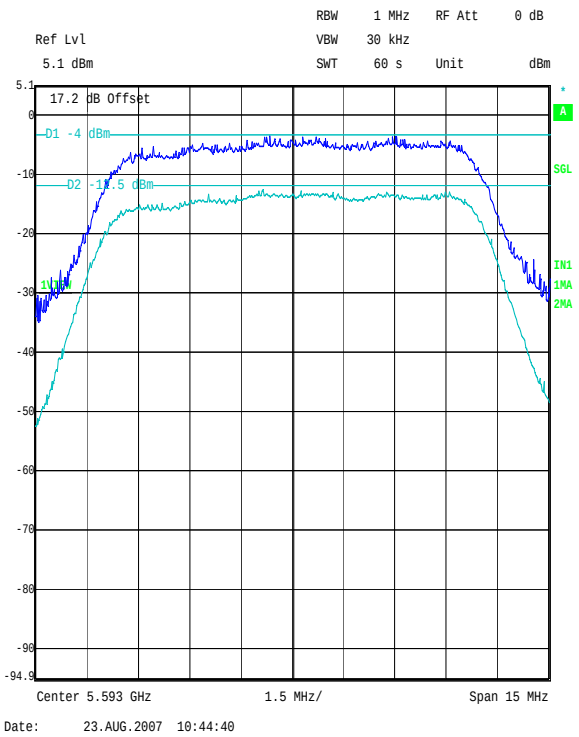


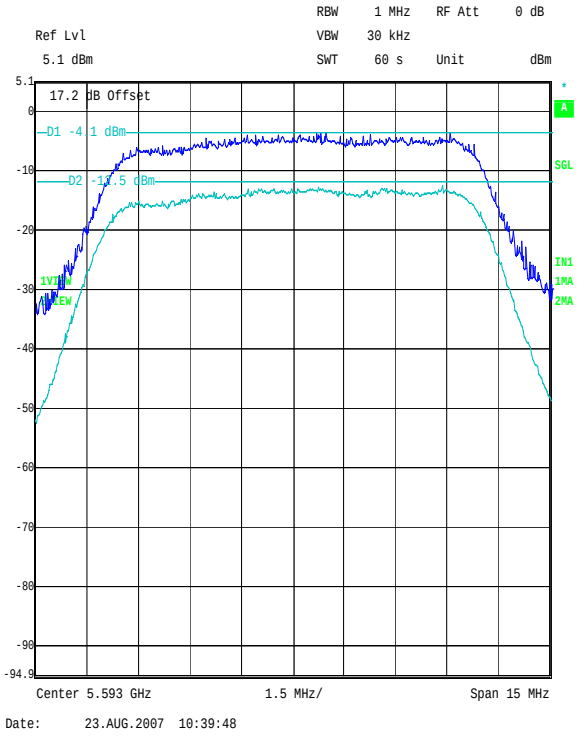


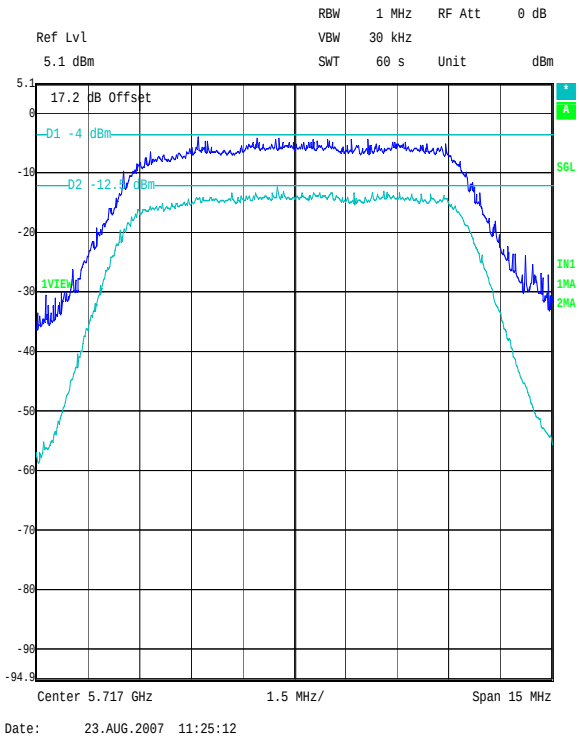


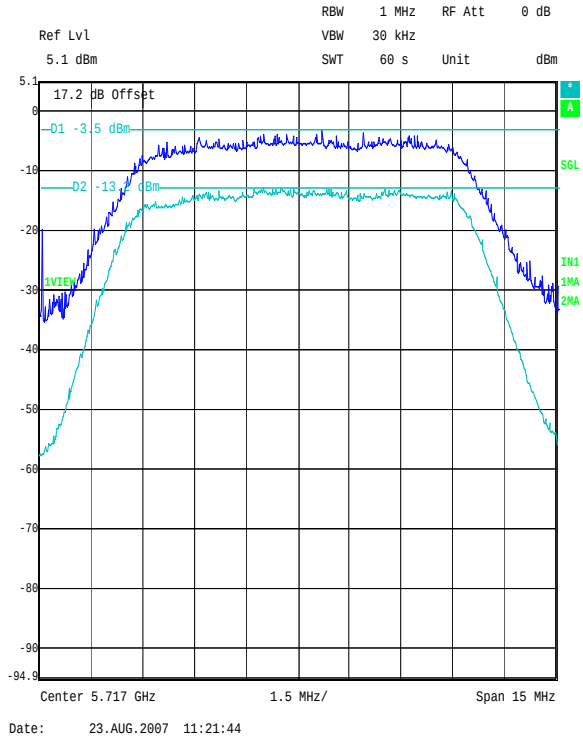


Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

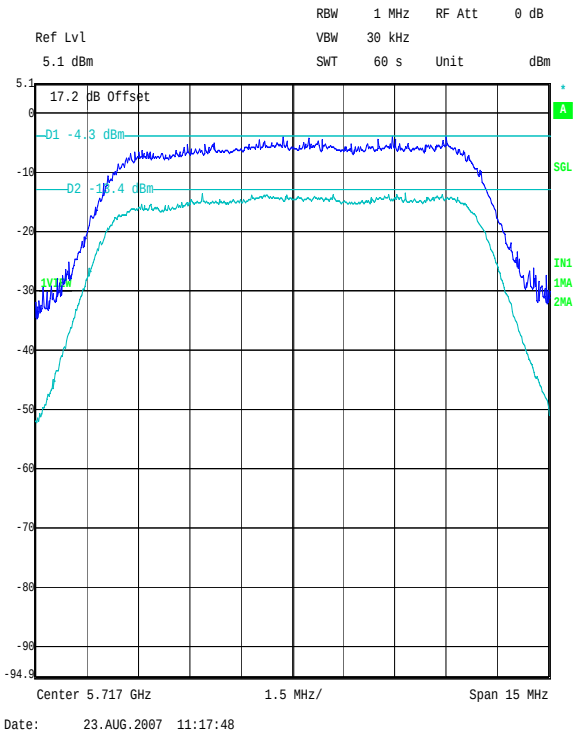


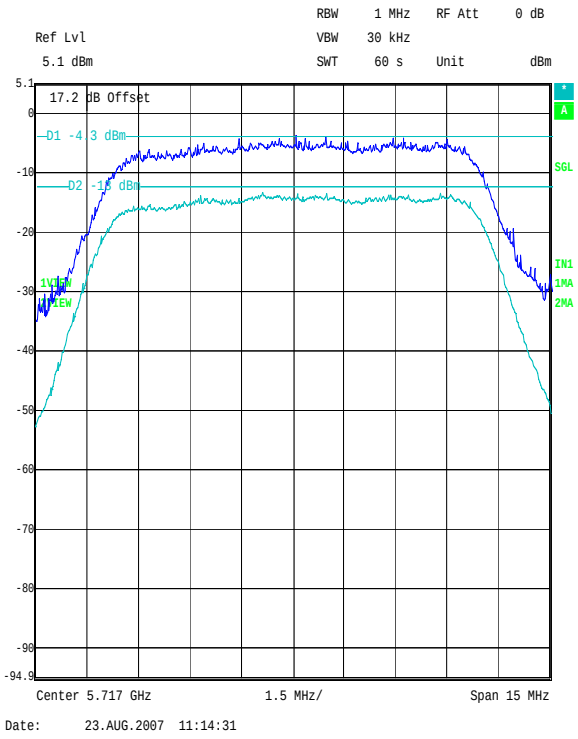


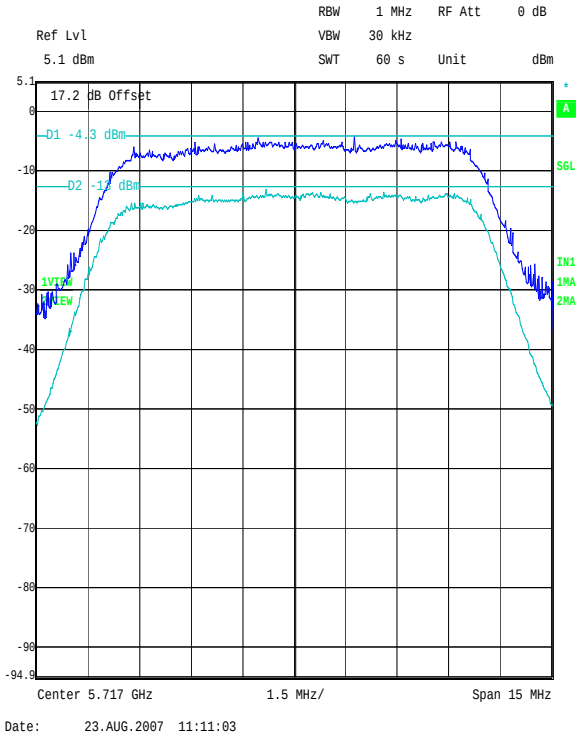




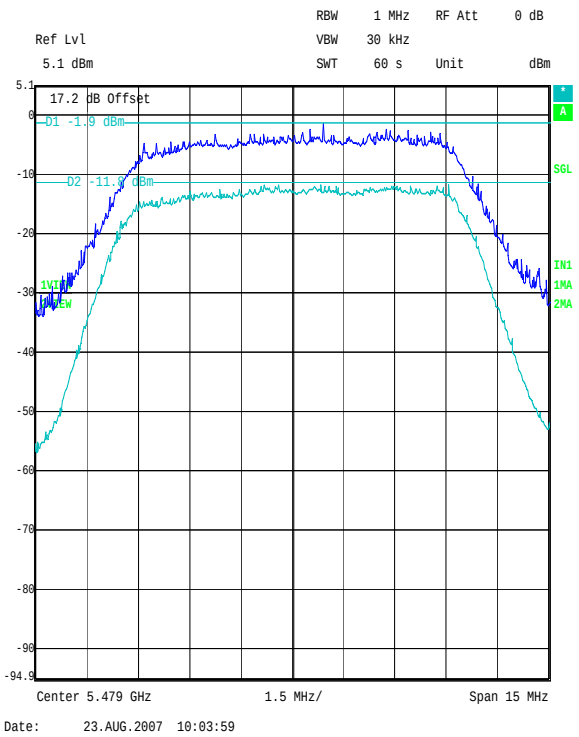
Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

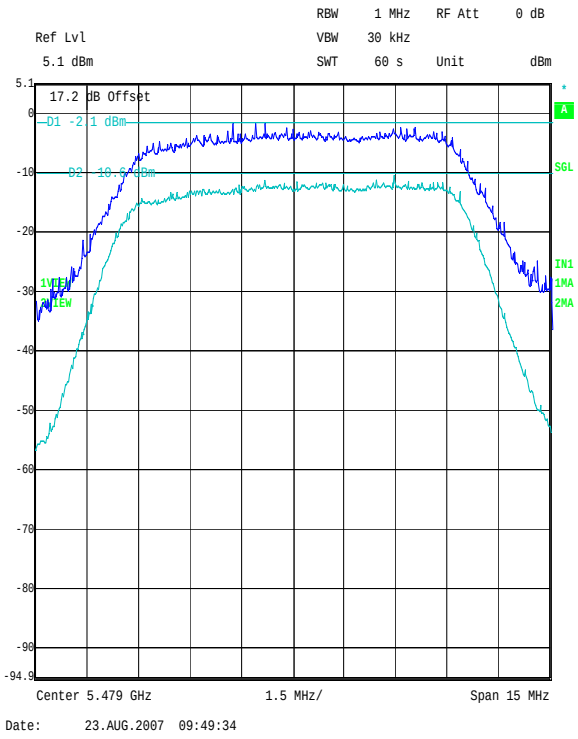


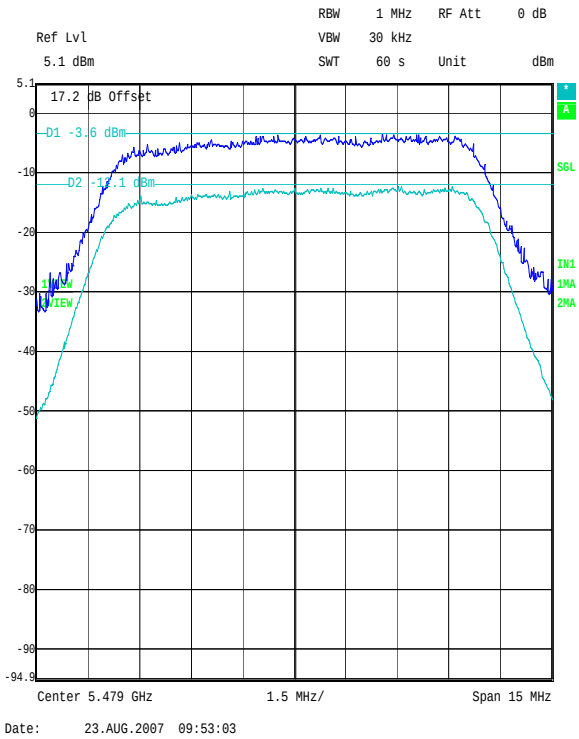


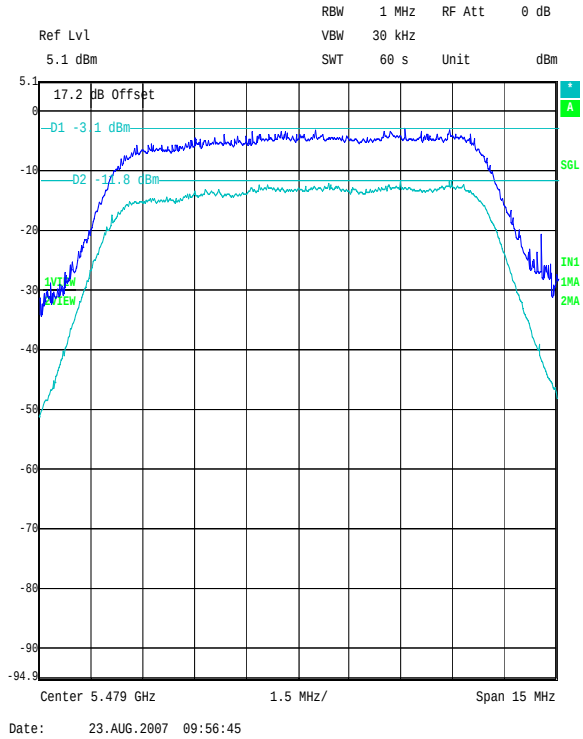


Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

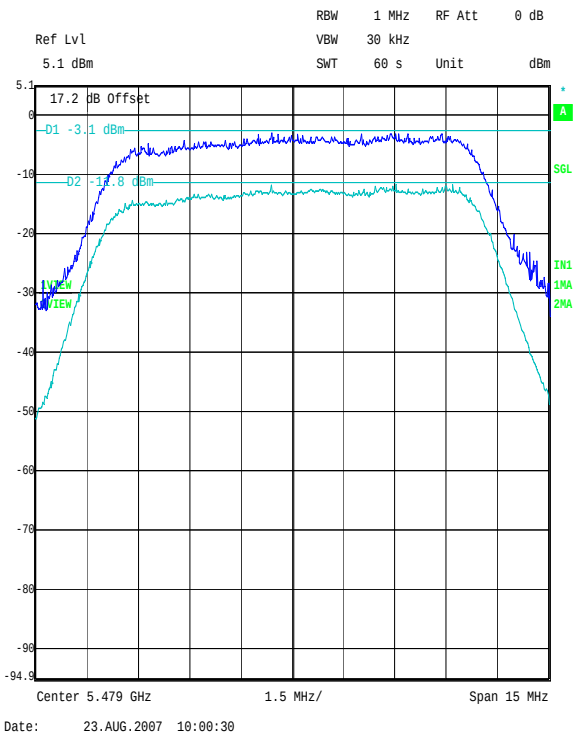


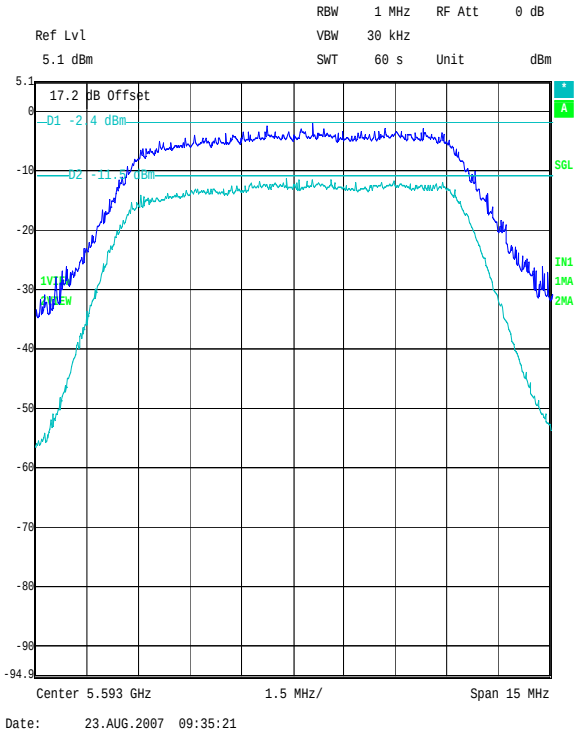


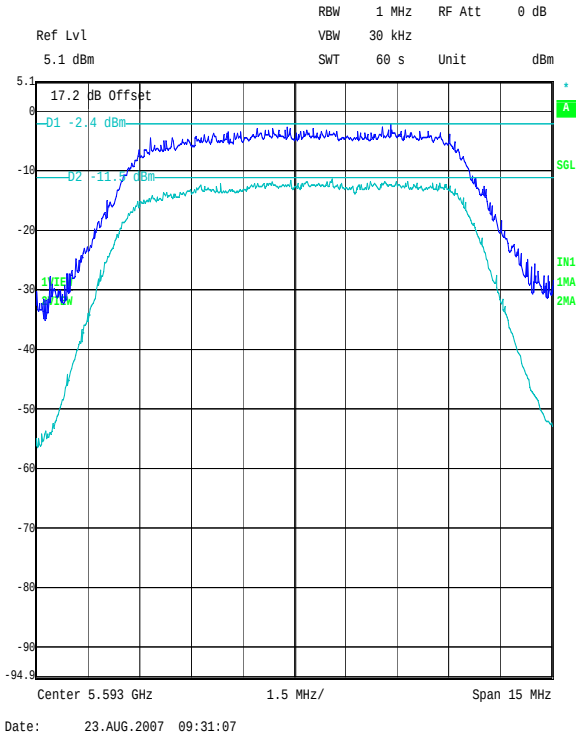


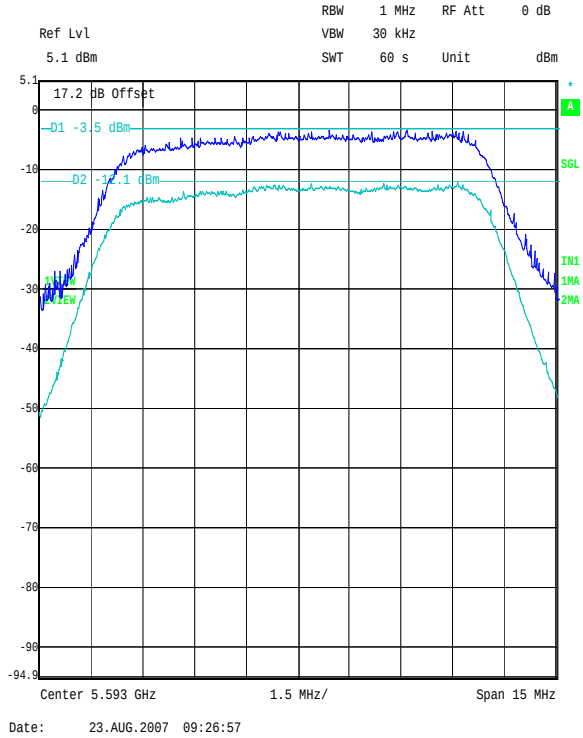


Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

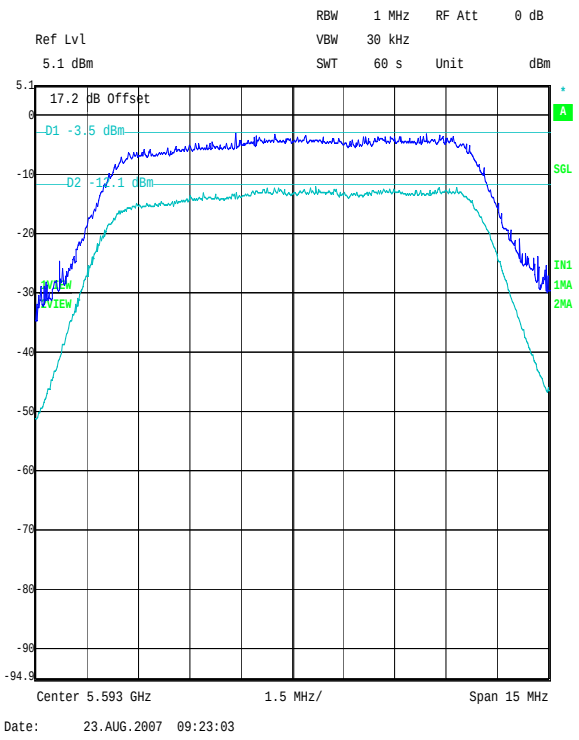


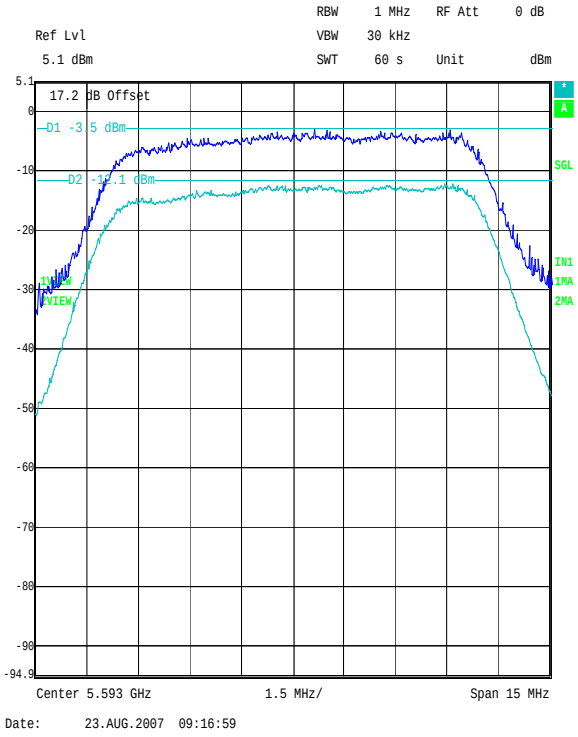


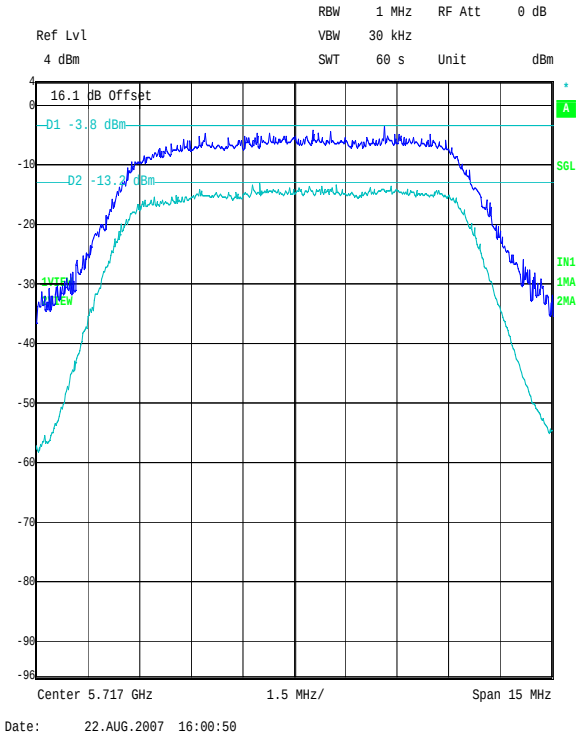


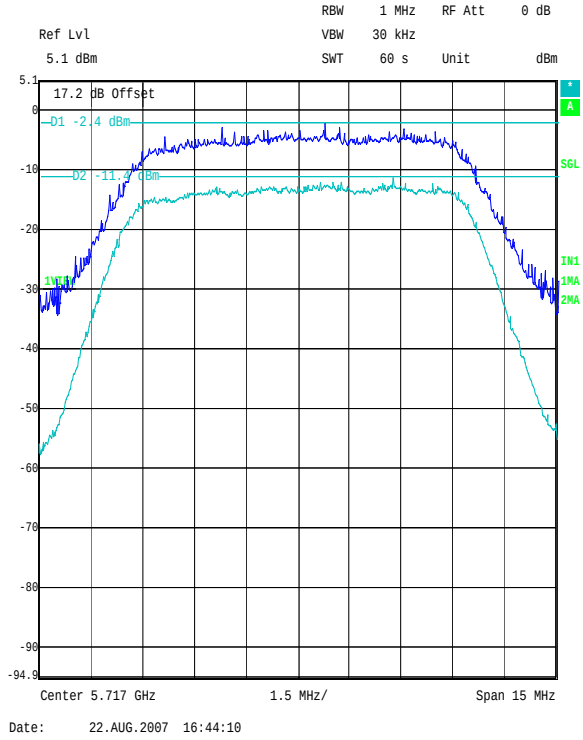


Transmitter Modulation Envelope Peak Excursion Ratio (Continued)

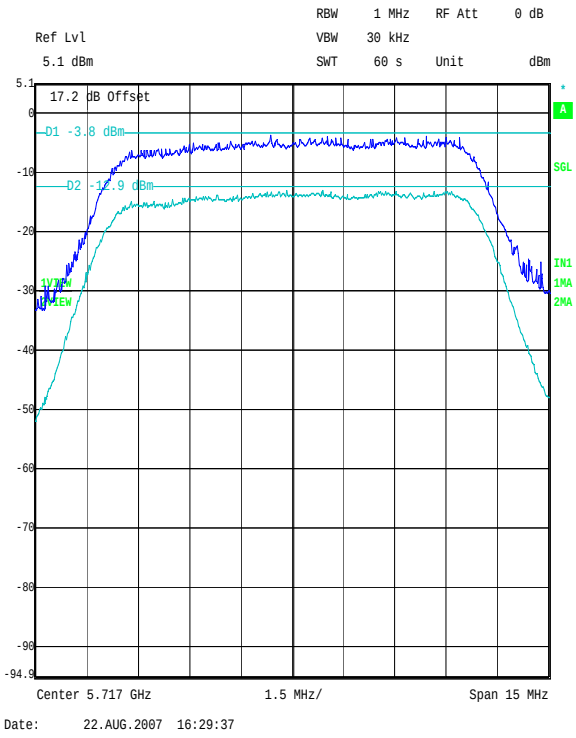


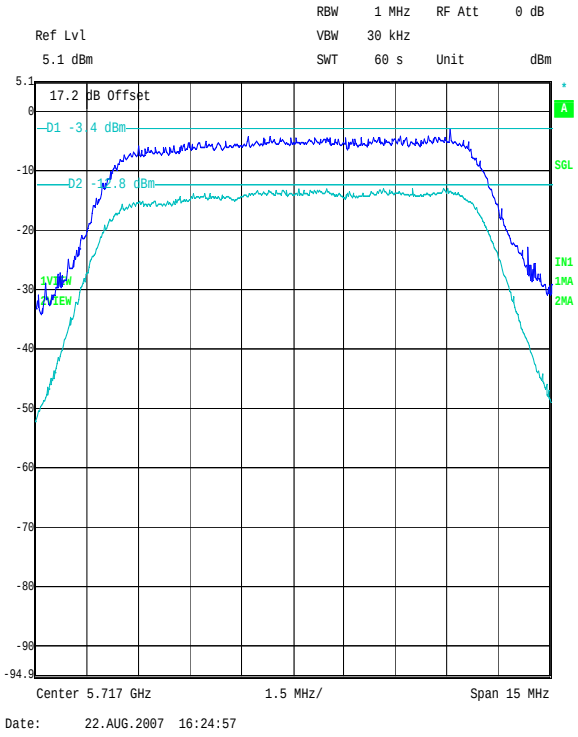


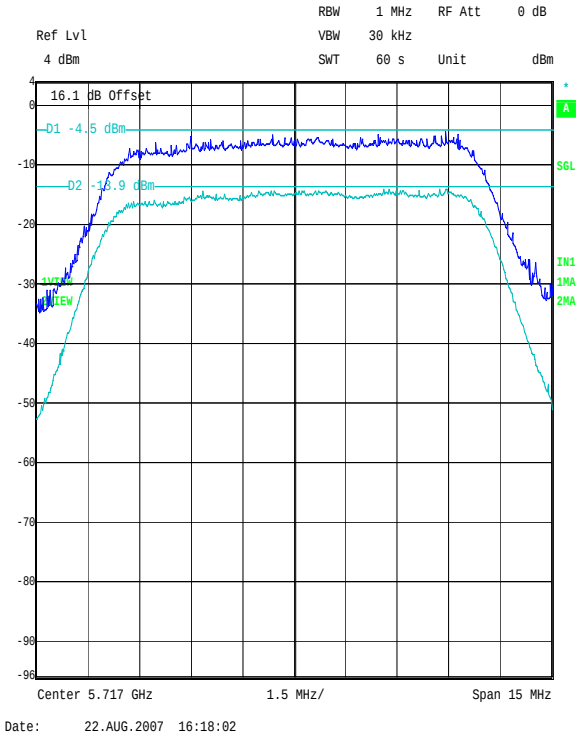




Transmitter Modulation Envelope Peak Excursion Ratio (Continued)







7.2.5. Transmitter Emission Bandwidth

Port H exhibited similar results to Port V; therefore Port V only was tested.

Results: ACQ Port V

Channel	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	20 dB Bandwidth (MHz)	26 dB Bandwidth (MHz)
Bottom	100	100	10.5	10.9
Middle	100	100	10.6	10.8
Top	100	100	10.5	10.7

Results: BPSK Port V

Channel	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	20 dB Bandwidth (MHz)	26 dB Bandwidth (MHz)
Bottom	100	100	10.1	11.1
Middle	100	100	10.2	10.9
Top	100	100	10.2	10.7

Results: QPSK Port V

Channel	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	20 dB Bandwidth (MHz)	26 dB Bandwidth (MHz)
Bottom	100	100	10.7	11.1
Middle	100	100	10.8	11.4
Top	100	100	10.8	11.2

Transmitter Emission Bandwidth (Continued)

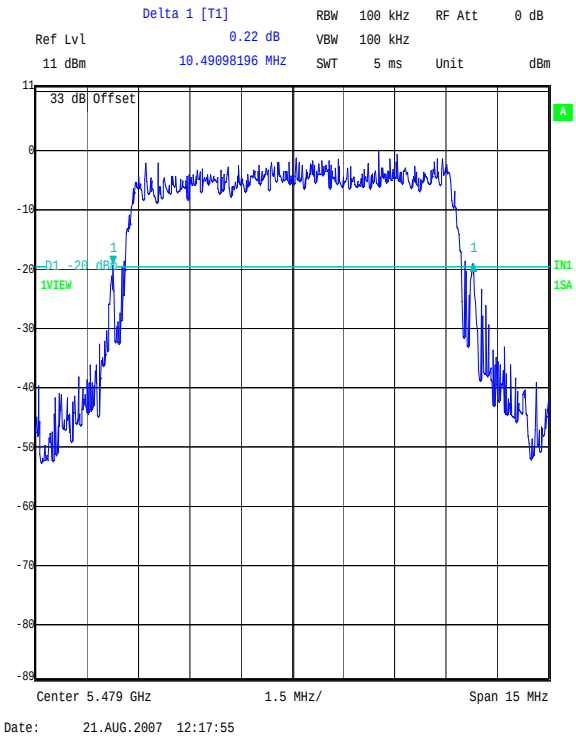
Results: 16QAM Port V

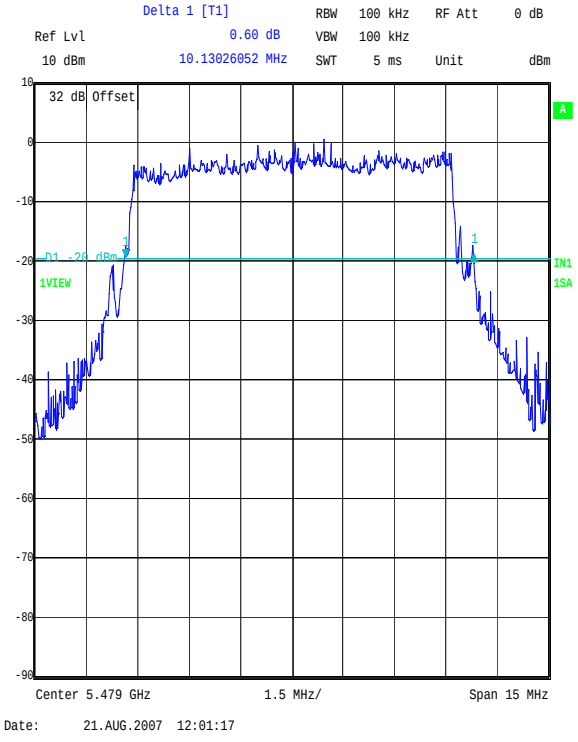
Channel	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	20 dB Bandwidth (MHz)	26 dB Bandwidth (MHz)
Bottom	100	100	10.7	11.4
Middle	100	100	10.7	11.2
Top	100	100	10.8	11.2

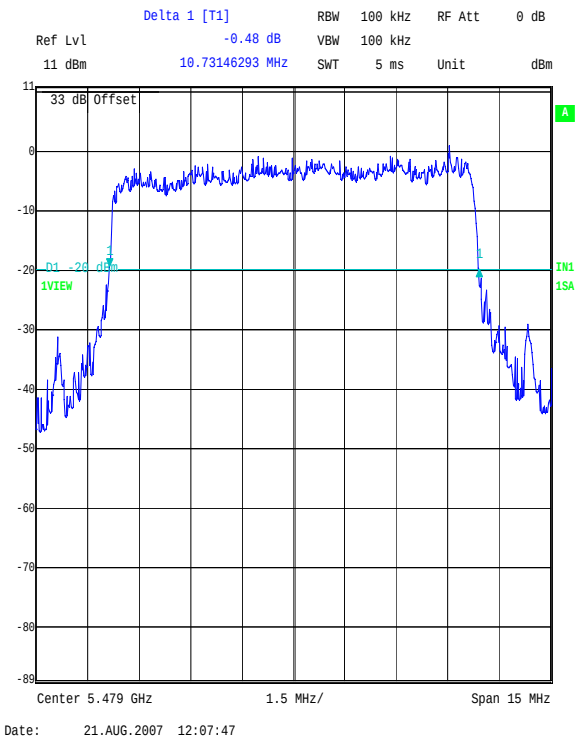
Results: 64QAM Port V

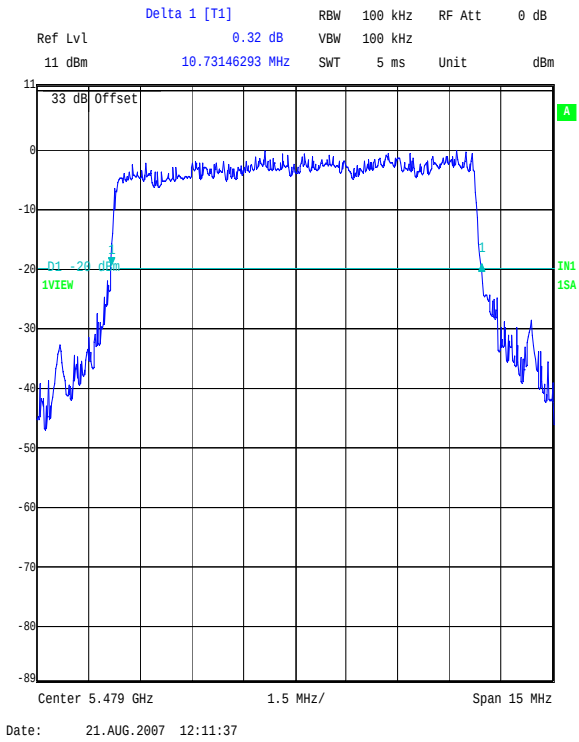
Channel	Resolution Bandwidth (kHz)	Video Bandwidth (kHz)	20 dB Bandwidth (MHz)	26 dB Bandwidth (MHz)
Bottom	100	100	10.7	10.9
Middle	100	100	10.7	11.3
Top	100	100	10.7	11.2

Transmitter Emission Bandwidth (Continued)

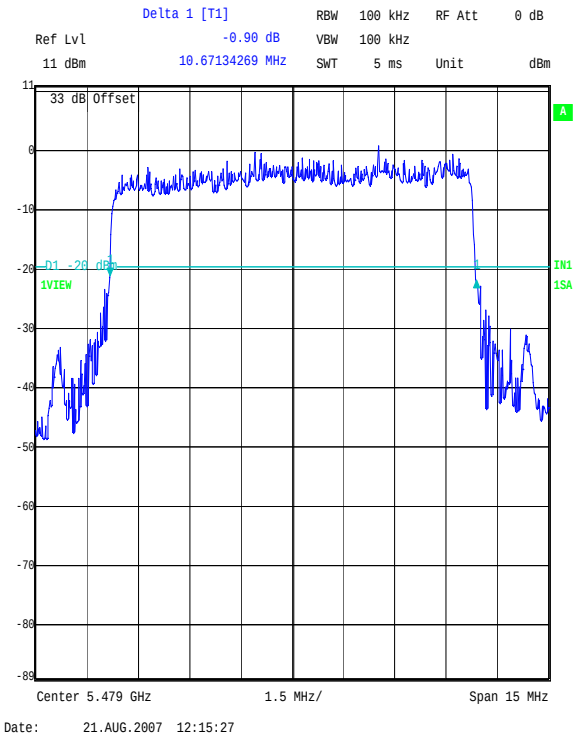


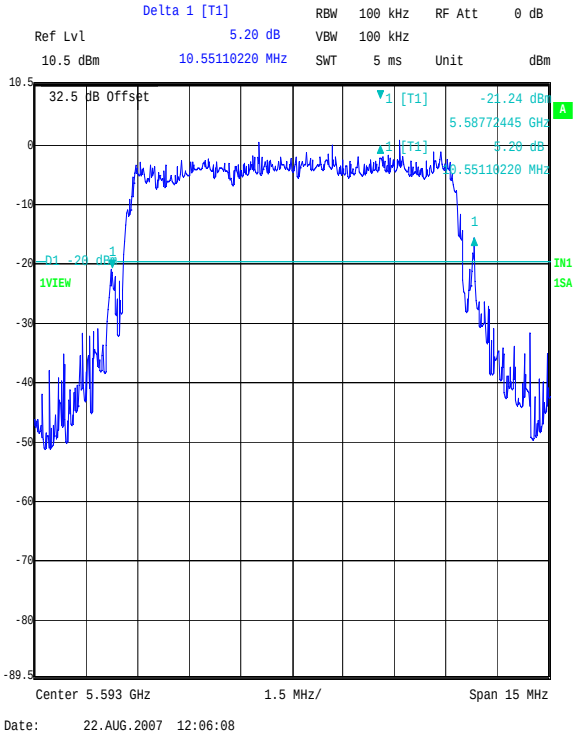


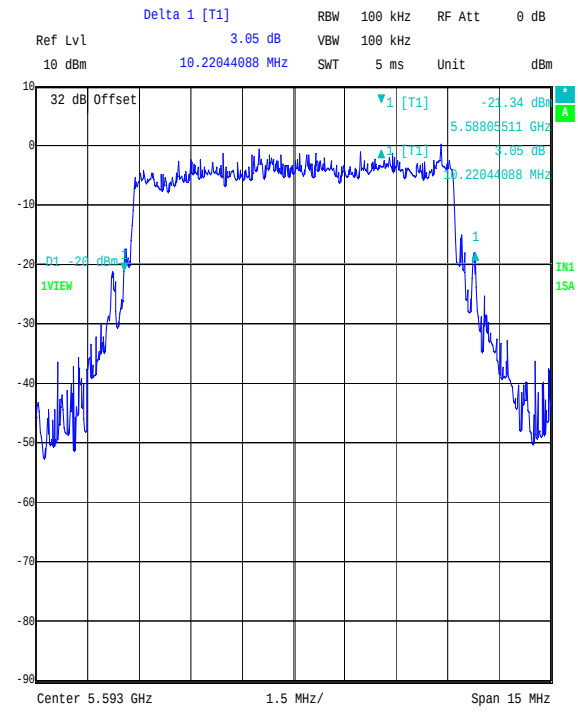


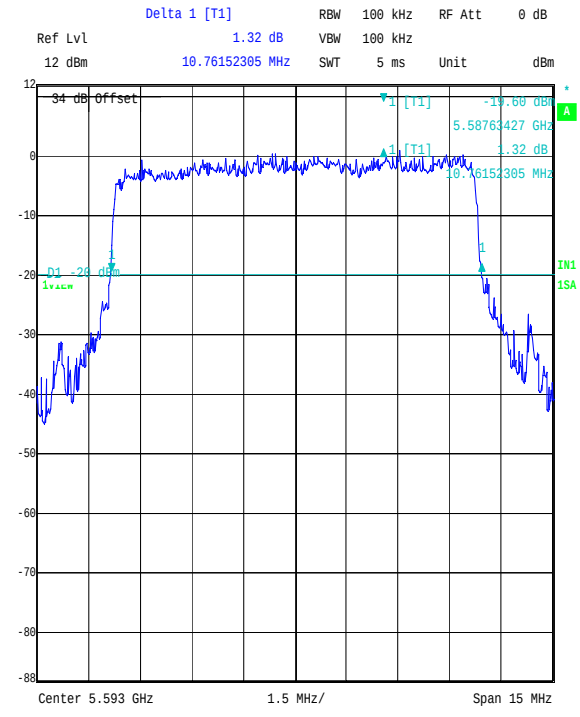


Transmitter Emission Bandwidth (Continued)

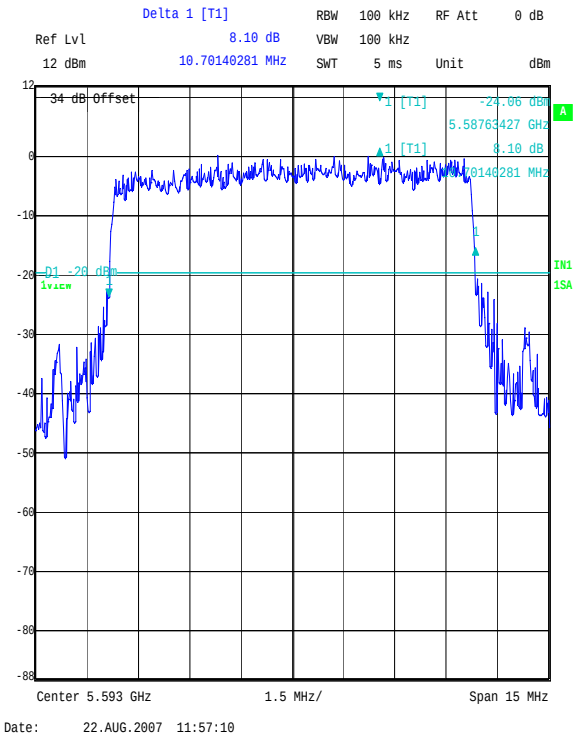


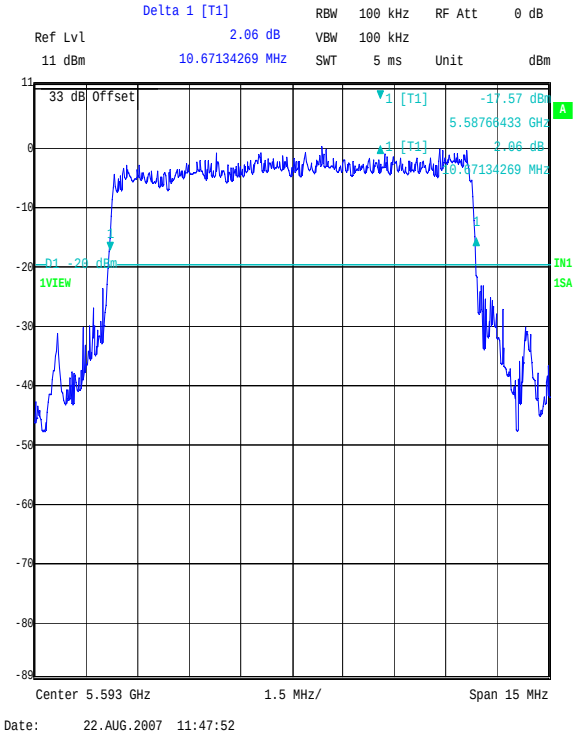


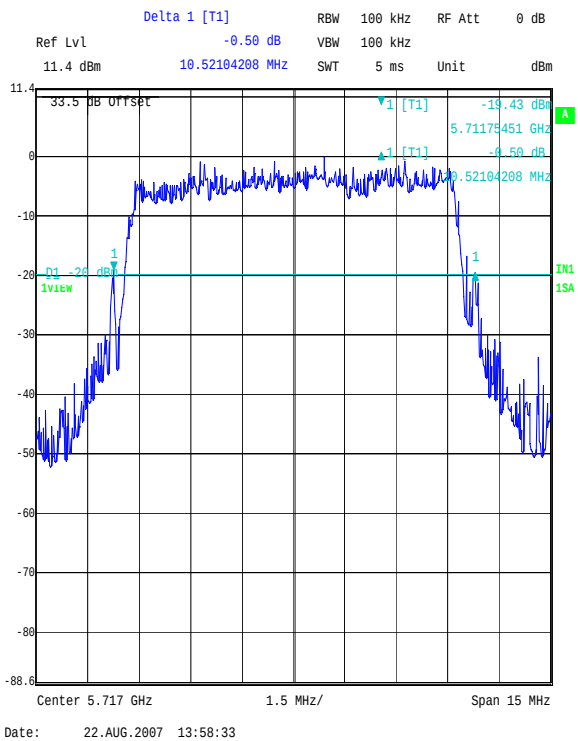


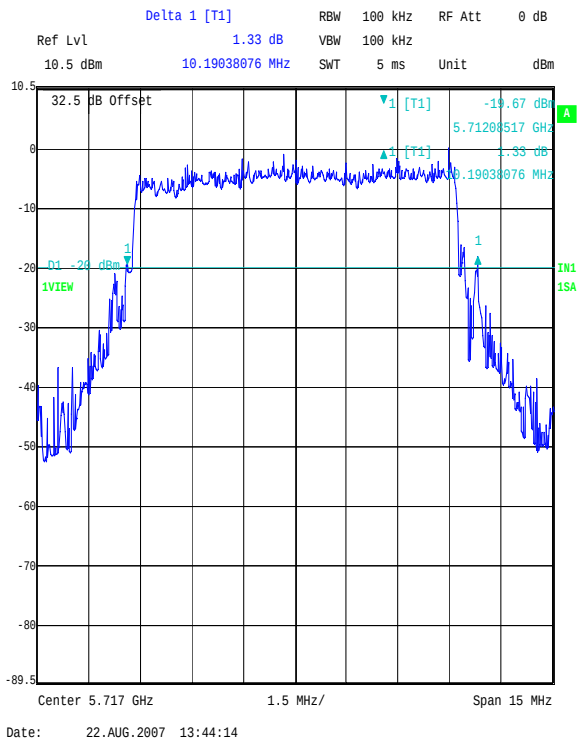


Transmitter Emission Bandwidth (Continued)

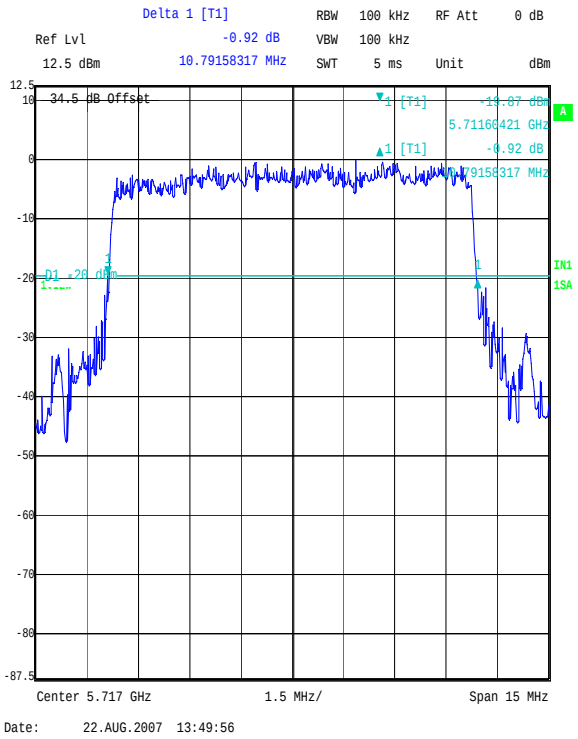


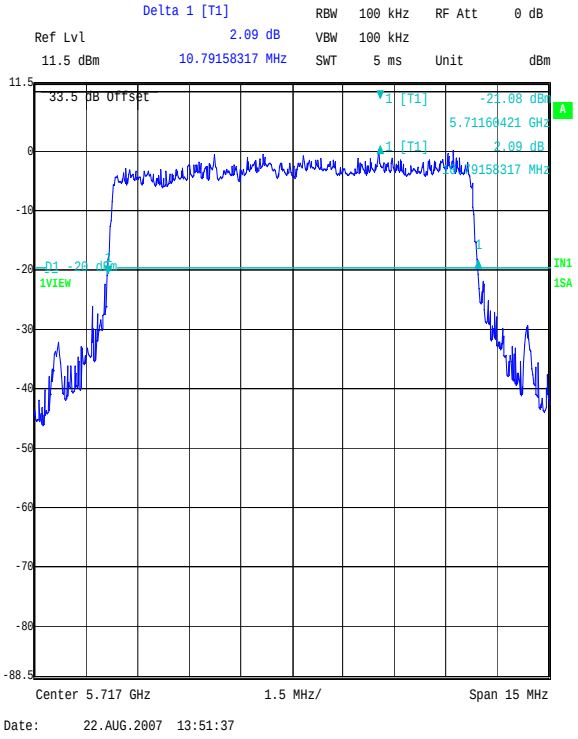


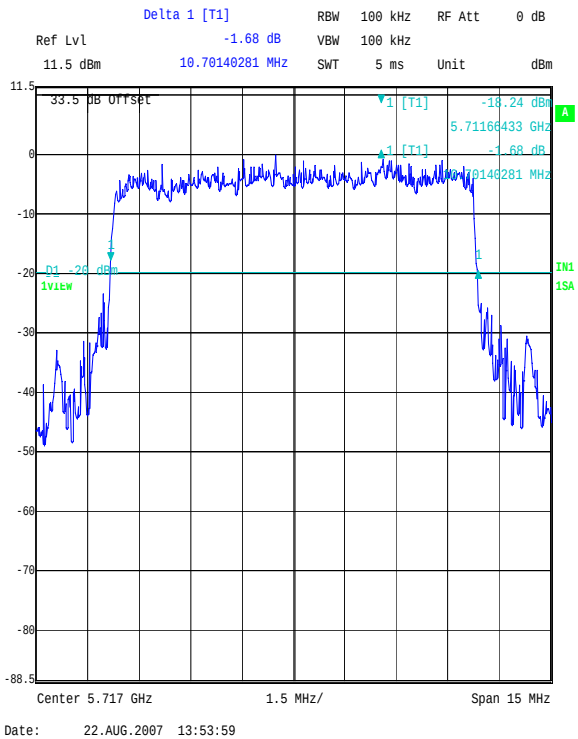




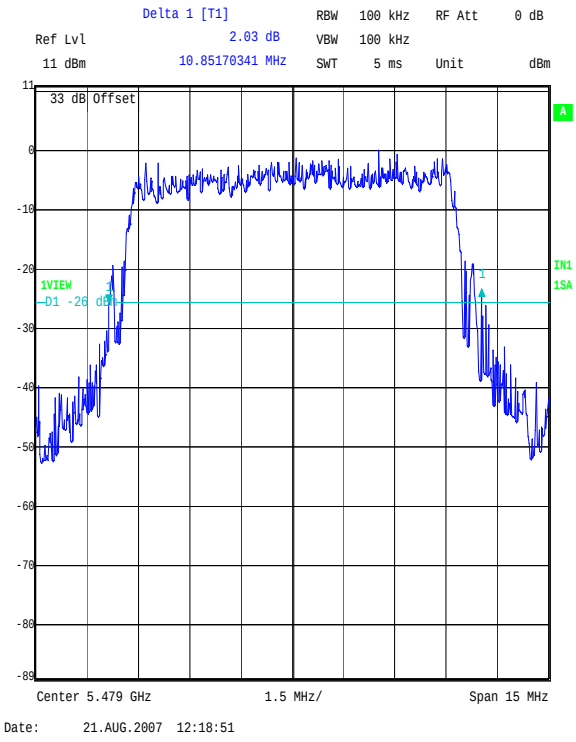
Transmitter Emission Bandwidth (Continued)

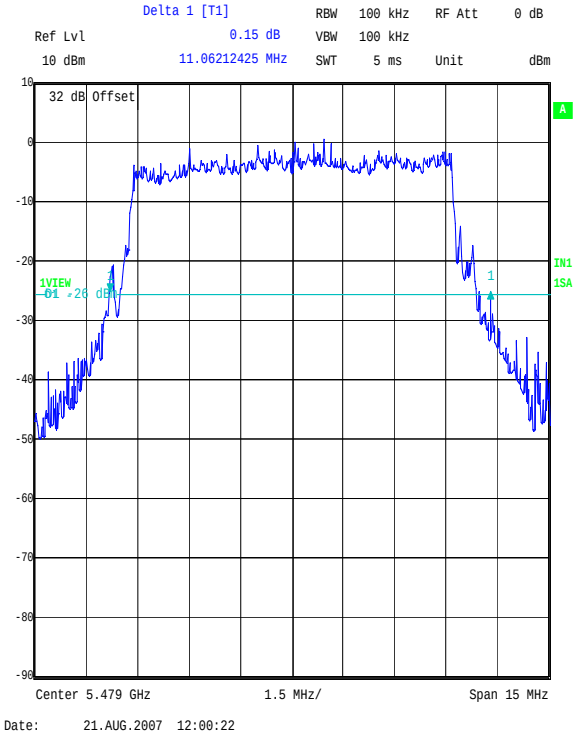


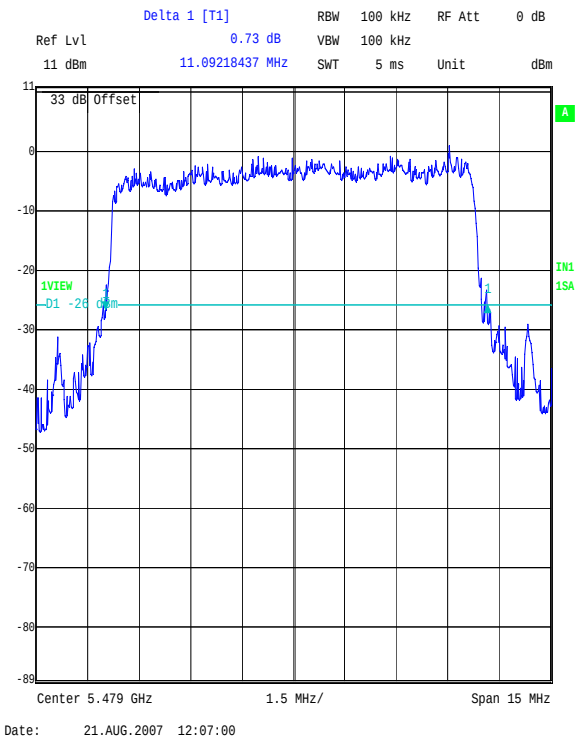


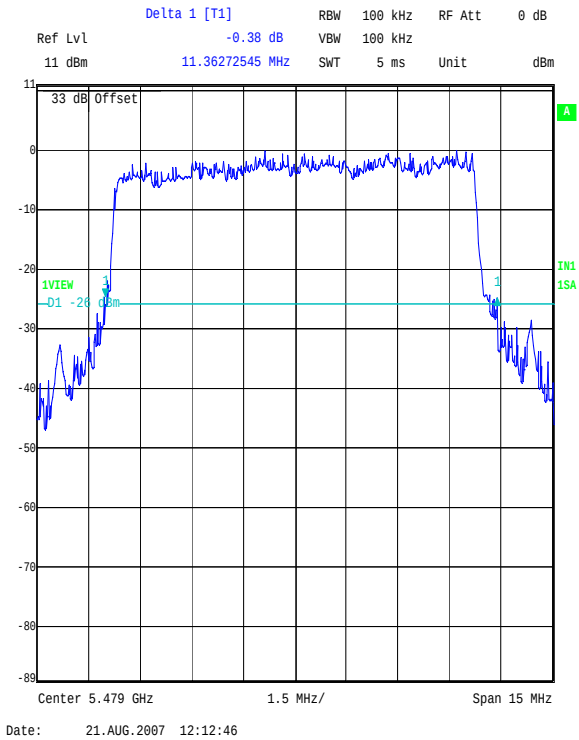


Transmitter Emission Bandwidth (Continued)

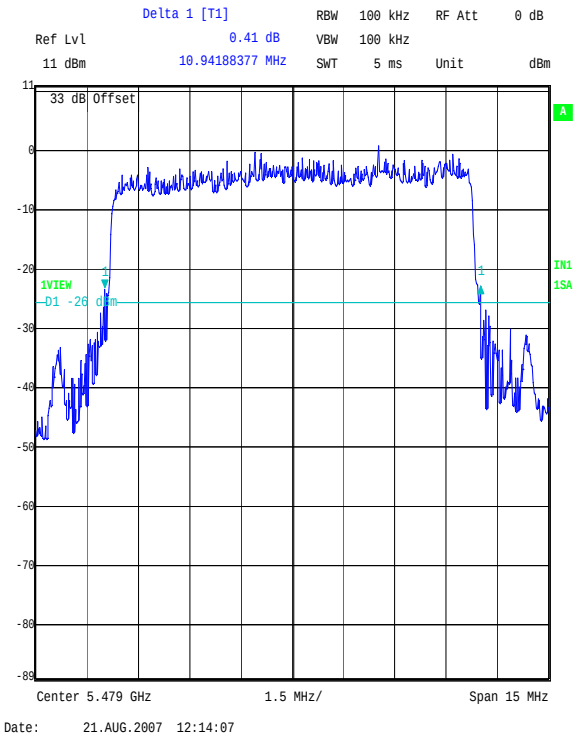


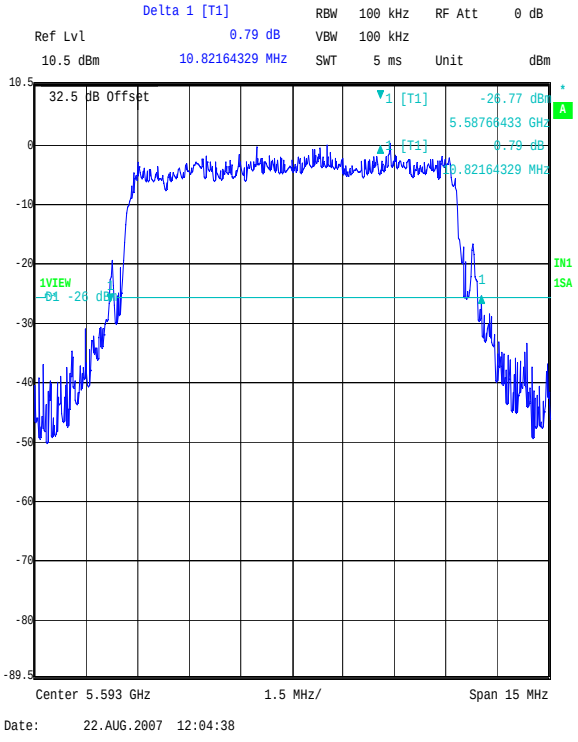


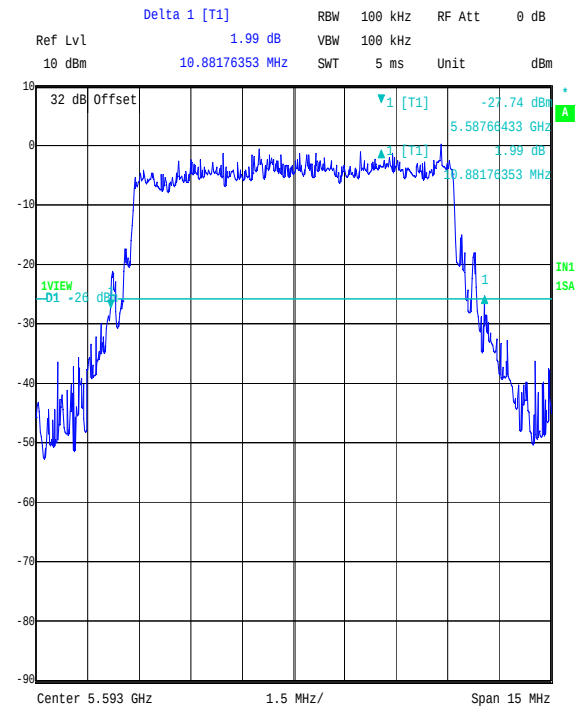


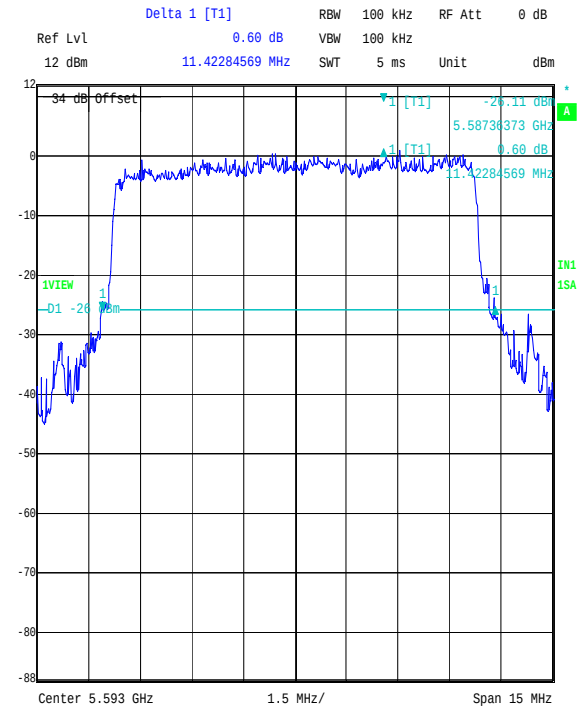


Transmitter Emission Bandwidth (Continued)

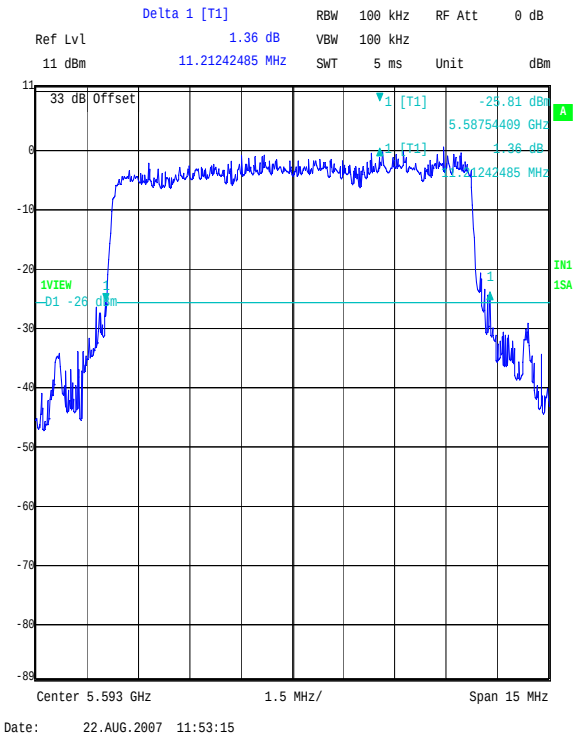


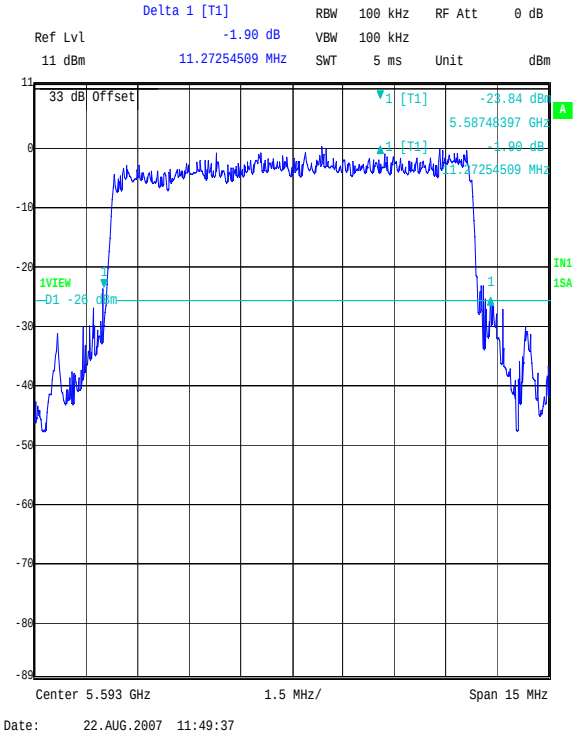


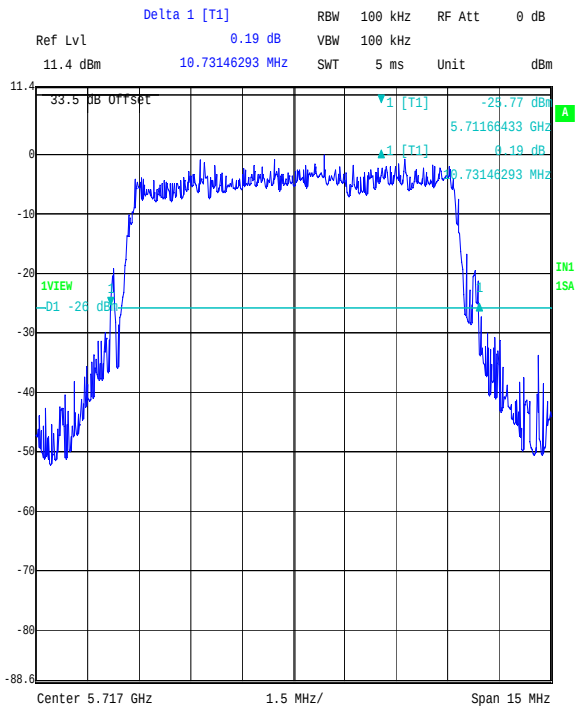


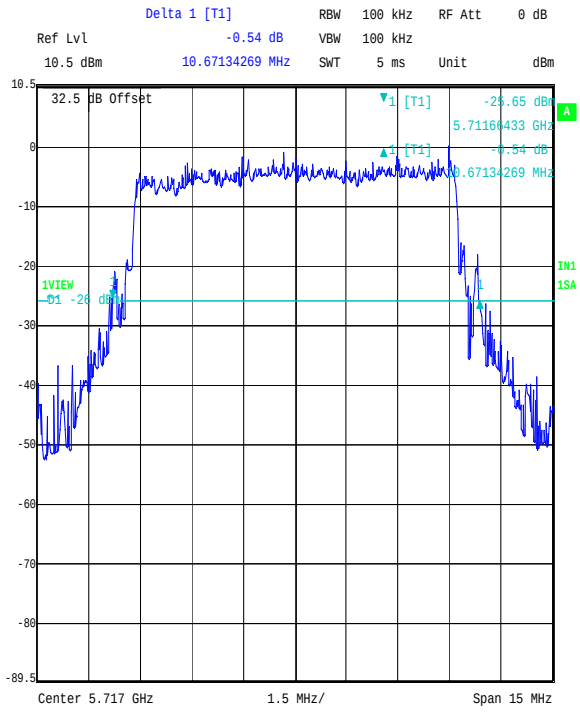


Transmitter Emission Bandwidth (Continued)

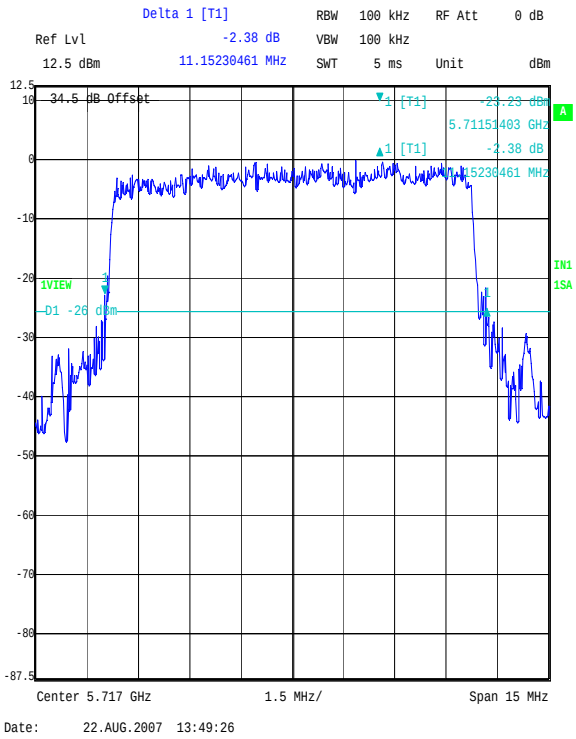


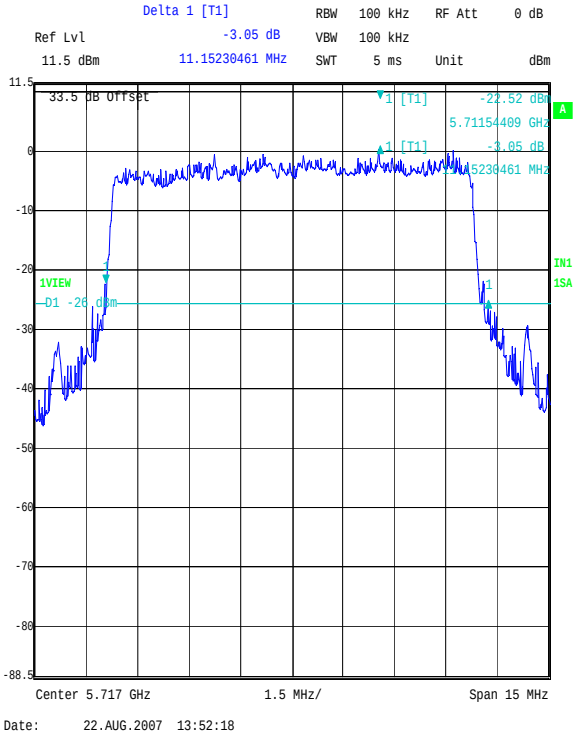


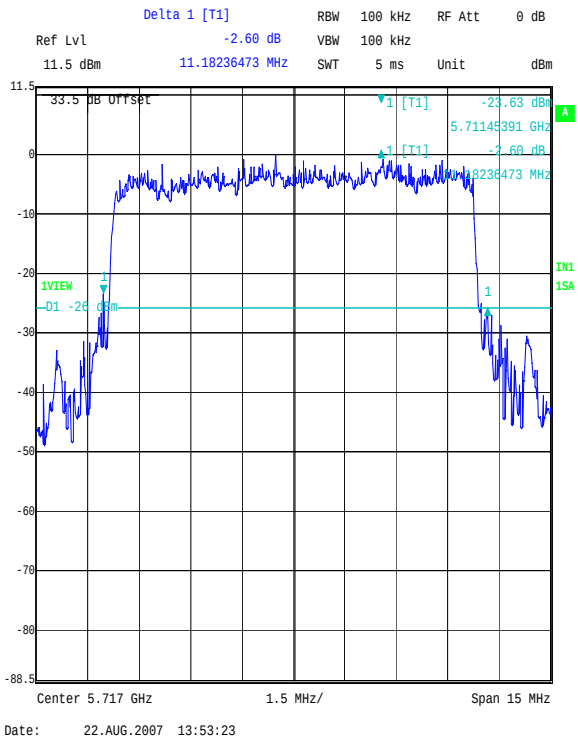




Transmitter Emission Bandwidth (Continued)







7.2.6. Conducted Transmitter Spurious Emissions

For transmitters operating in the 5.47 GHz to 5.725 GHz band; all emissions outside of the 5.47 GHz to 5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz**.**

Only spurious emissions within 20 dB of the limit need be reported.

The limit shown in the table below is calculated as:

Limit – Antenna gain + allowed 6dBi gain + antenna cable loss – aggregate correction factor.

Example: -27 dBm/MHz – 33.4 dBi + 6 dBi + 1.2 dB – 3 dB = -56.2 dBm/MHz

Note: BPSK mode was found to be worst case with regards to output power and as such, all emissions measurements were performed in the BPSK mode of operation.

Results: Bottom Channel

Frequency (MHz)	Modulation Scheme	Peak Emission Level (dBm)	Limit (dBm/MHz)	Margin (dB)
0.060	BPSK	-74.5	-56.2	18.3
0.063	BPSK	-77.6	-56.2	21.4
25549.098	BPSK	-67.0	-56.2	10.8

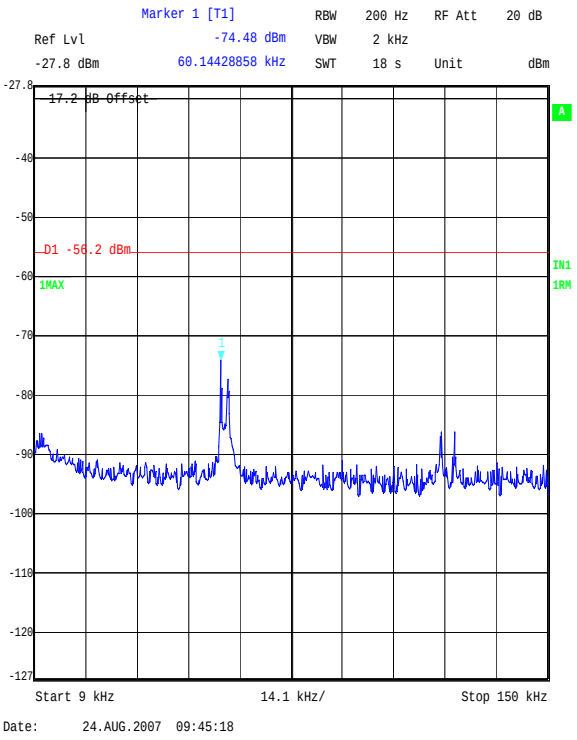
Results: Middle Channel

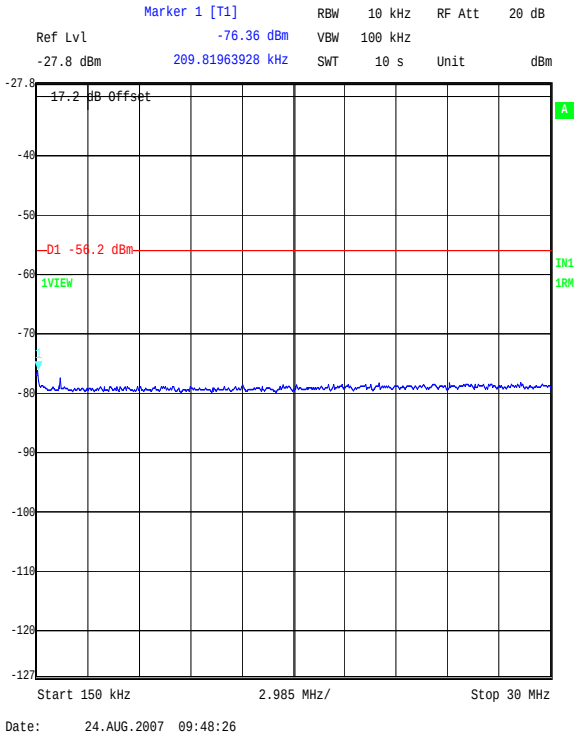
Frequency (MHz)	Modulation Scheme	Peak Emission Level (dBm)	Limit (dBm/MHz)	Margin (dB)
0.060	BPSK	-75.7	-56.2	-19.5
0.062	BPSK	-79.4	-56.2	-23.2
25549.098	BPSK	-67.0	-56.2	-10.8

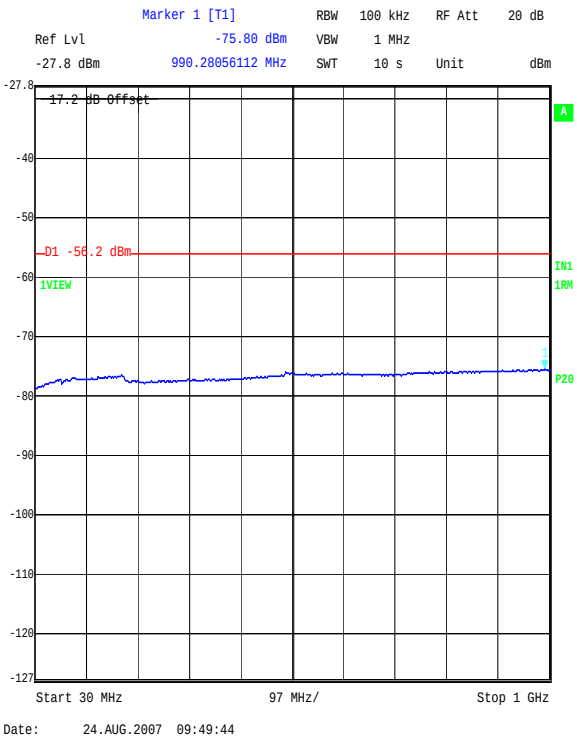
Results: Top Channel

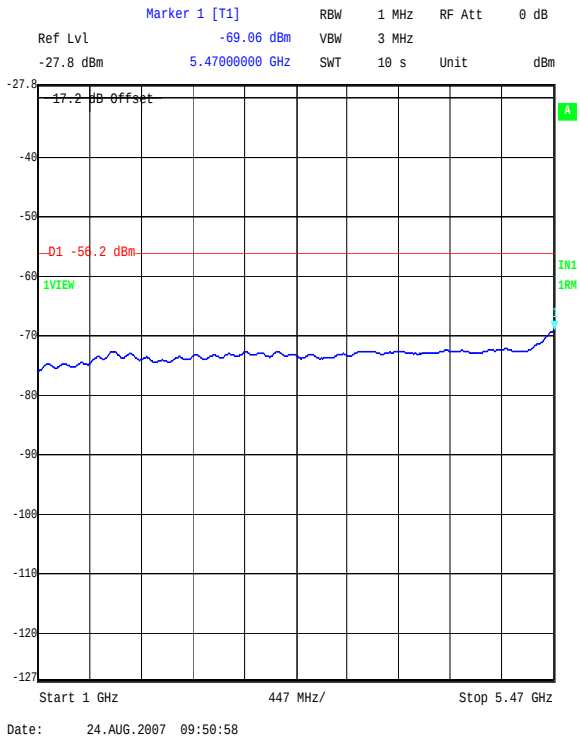
Frequency (MHz)	Modulation Scheme	Peak Emission Level (dBm)	Limit (dBm/MHz)	Margin (dB)
0.060	BPSK	-74.6	-56.2	-18.4
0.063	BPSK	-77.9	-56.2	-21.7
25549.098	BPSK	-67.0	-56.2	-10.8

Conducted Transmitter Spurious Emissions (Continued)

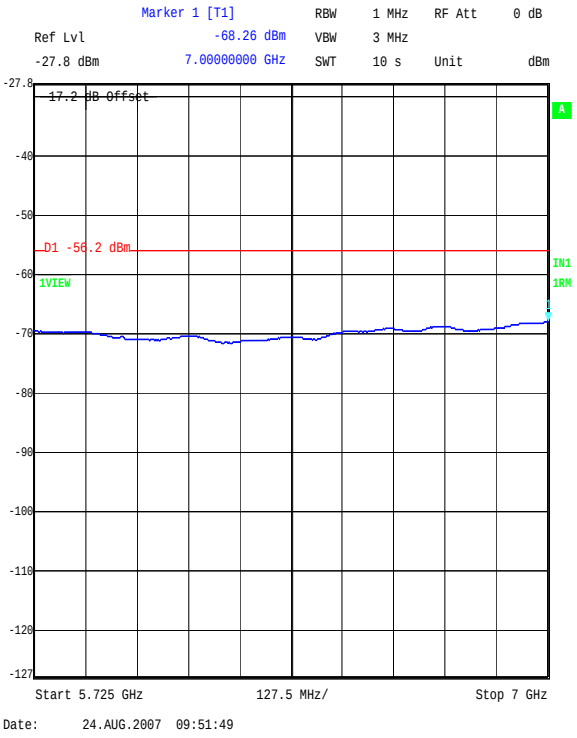


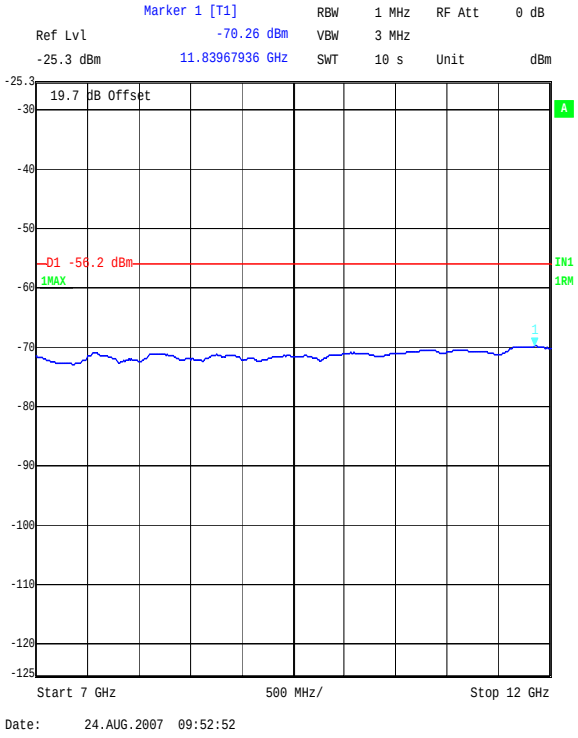


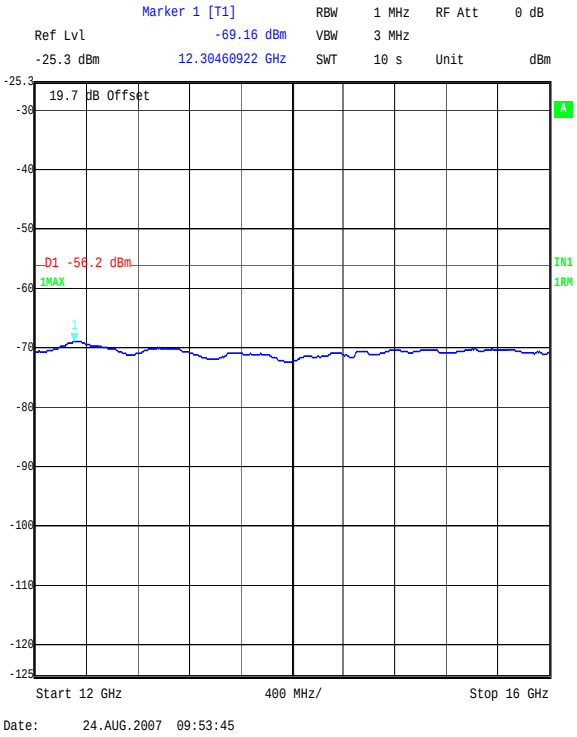


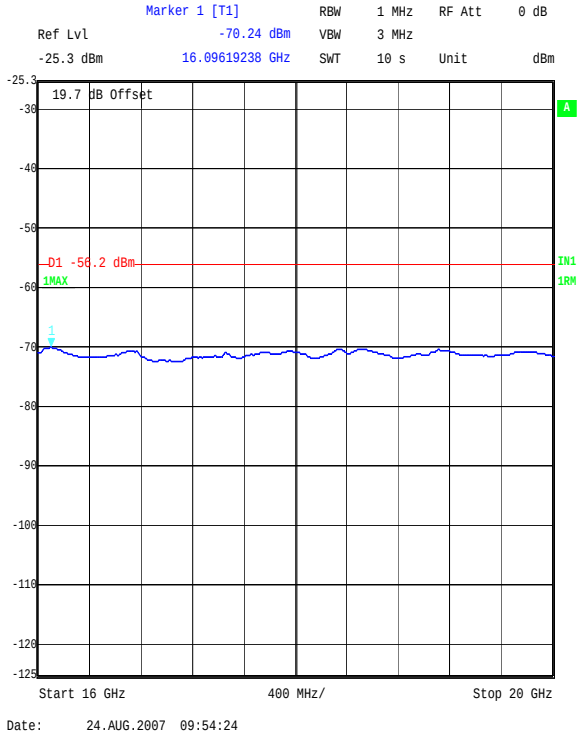


Conducted Transmitter Spurious Emissions (Continued)

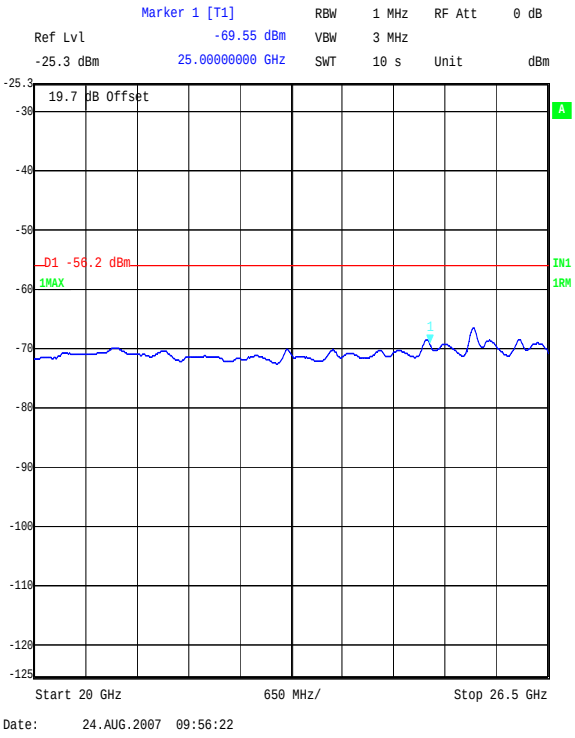


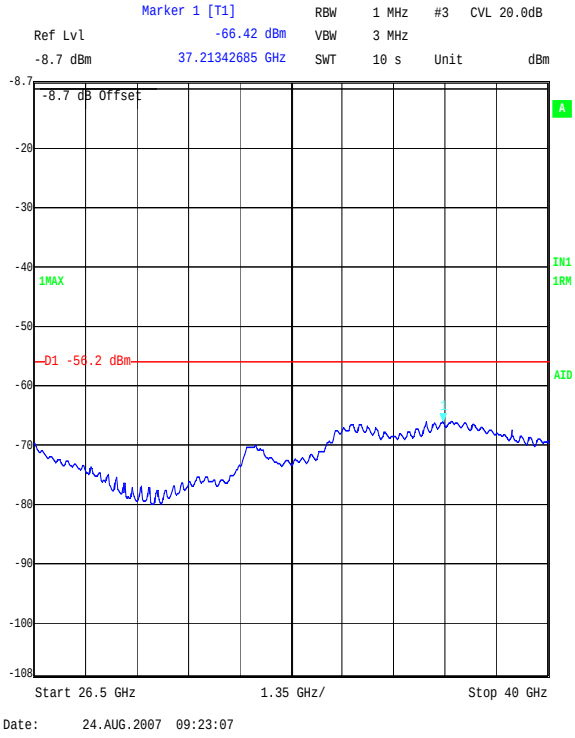




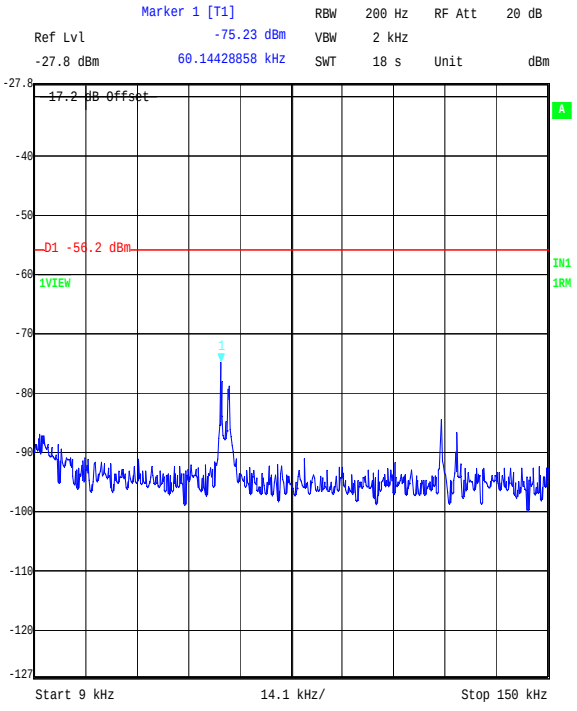


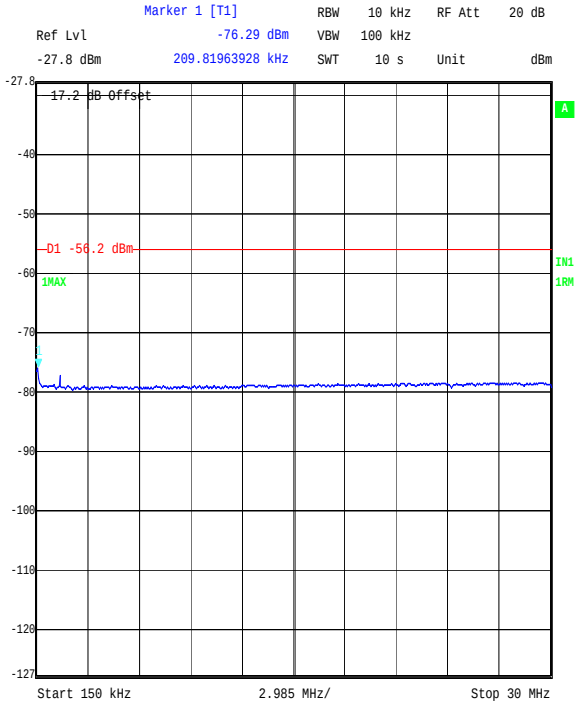
Conducted Transmitter Spurious Emissions (Continued)

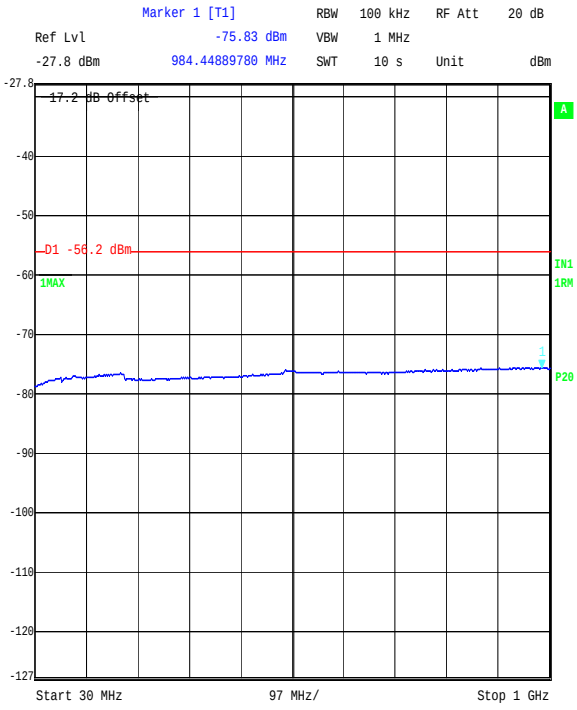


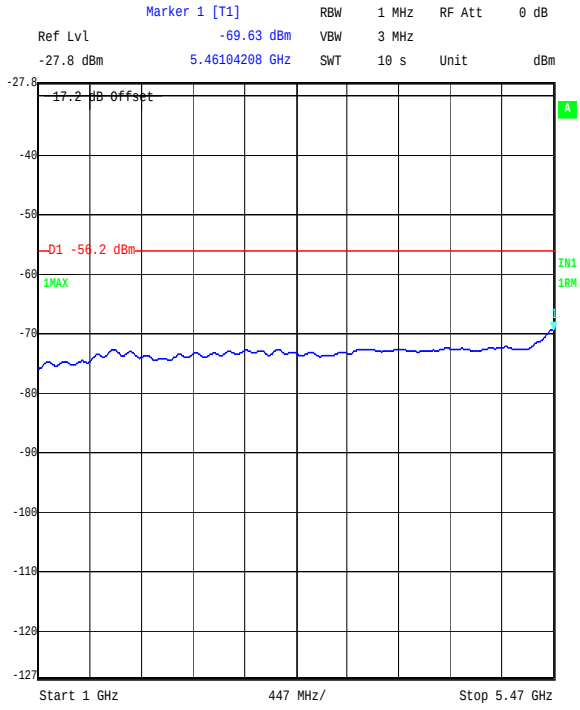


Conducted Transmitter Spurious Emissions (Continued)

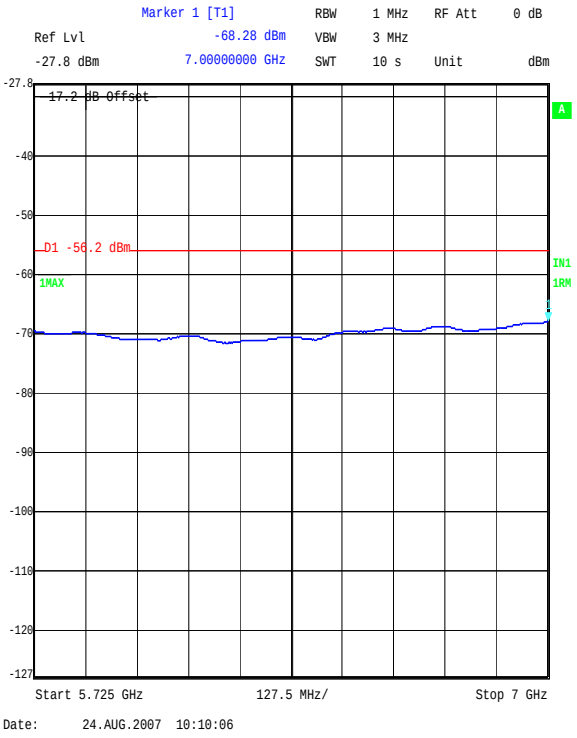


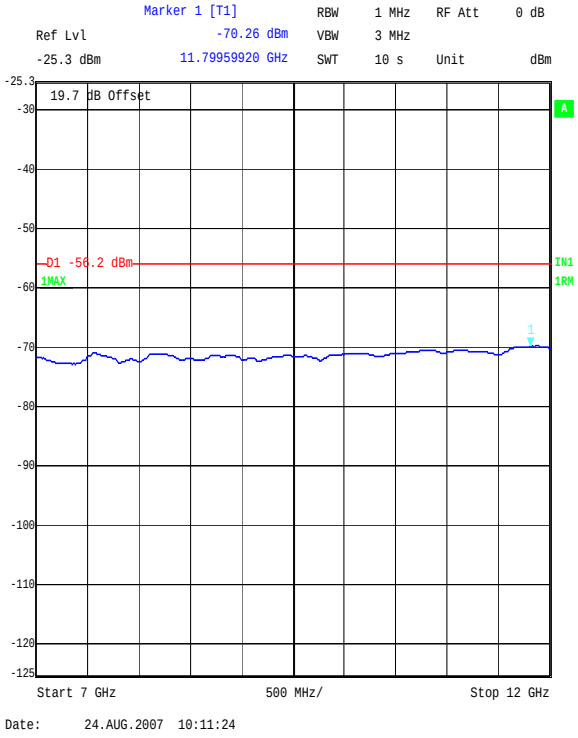


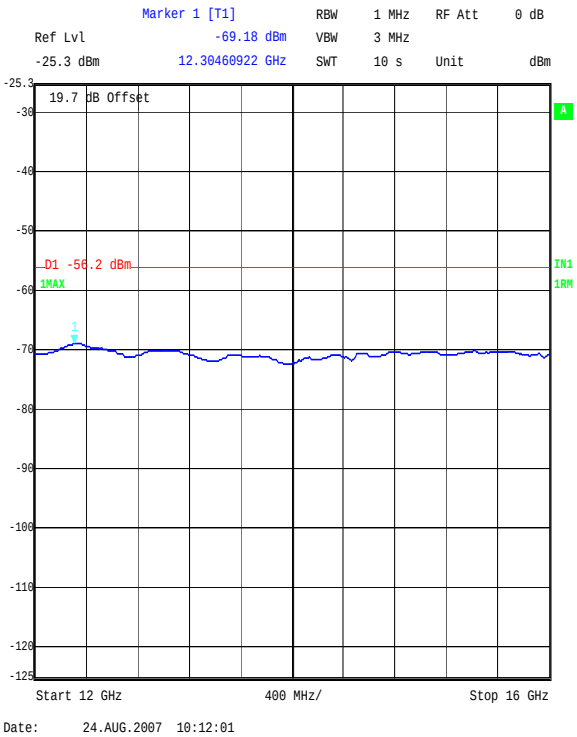


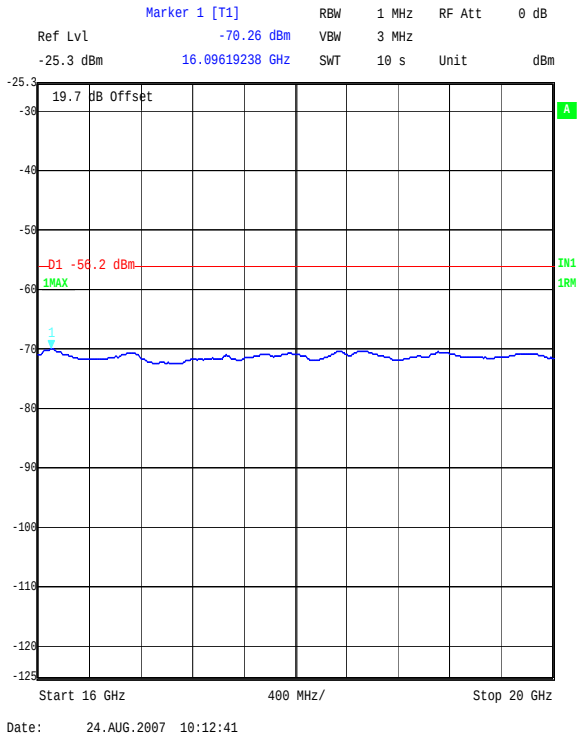


Conducted Transmitter Spurious Emissions (Continued)

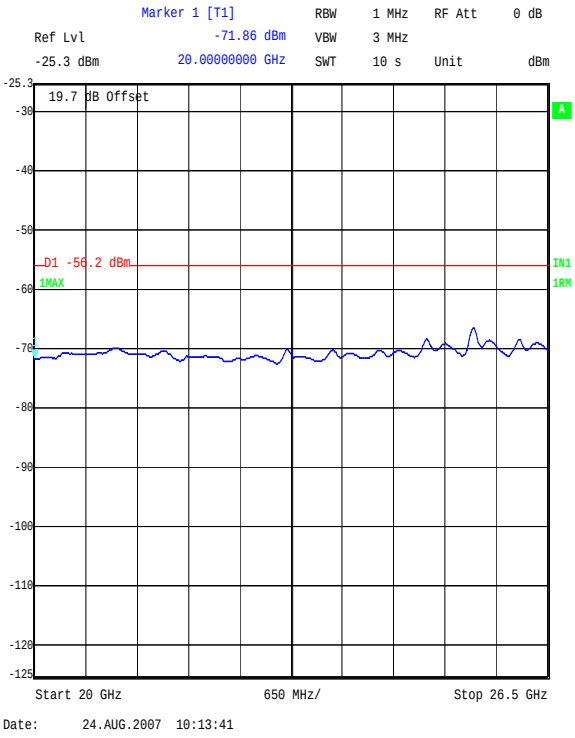


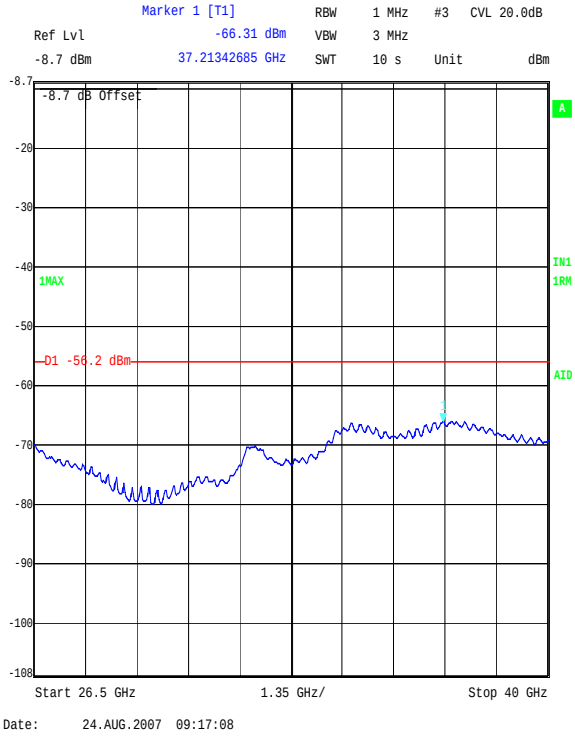




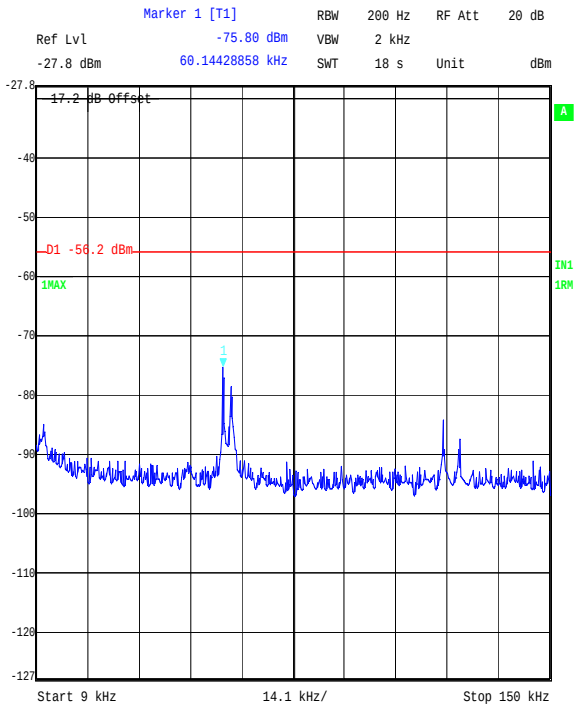


Conducted Transmitter Spurious Emissions (Continued)

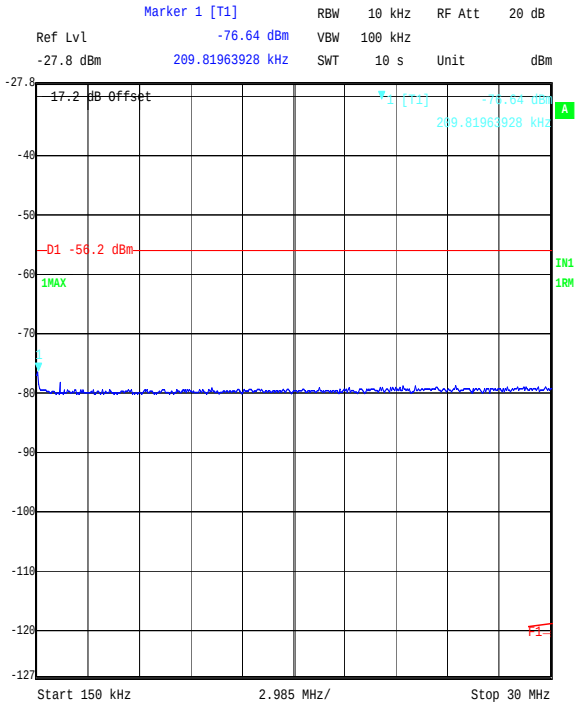




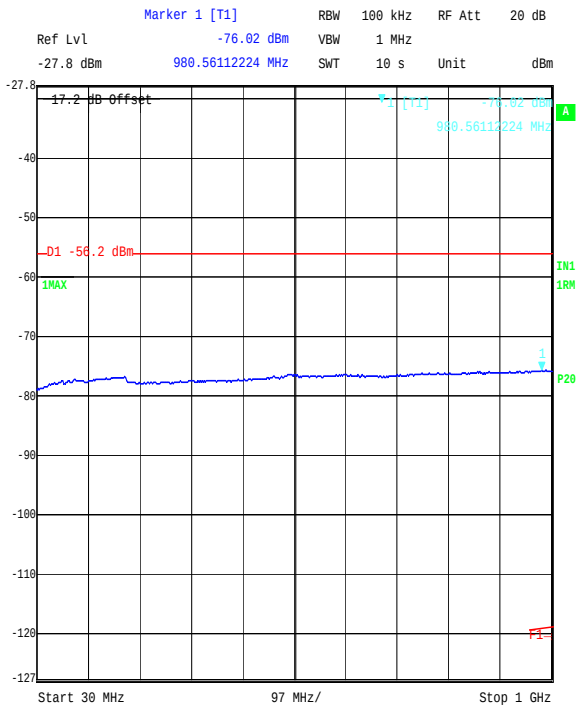
Conducted Transmitter Spurious Emissions (Continued)



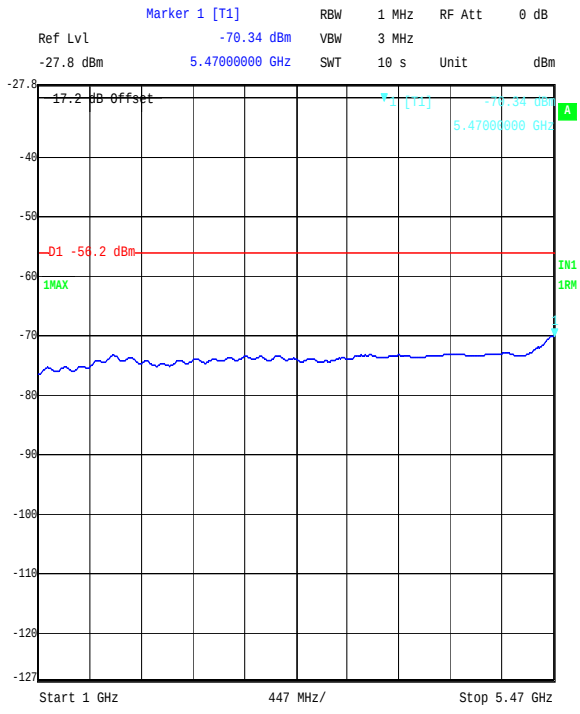
Date: 24.AUG.2007 10:20:17



Date: 23.AUG.2007 14:40:14

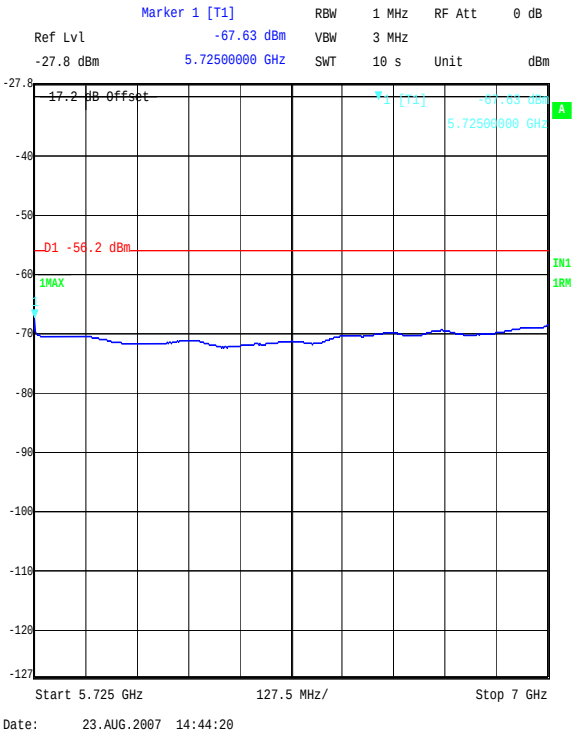


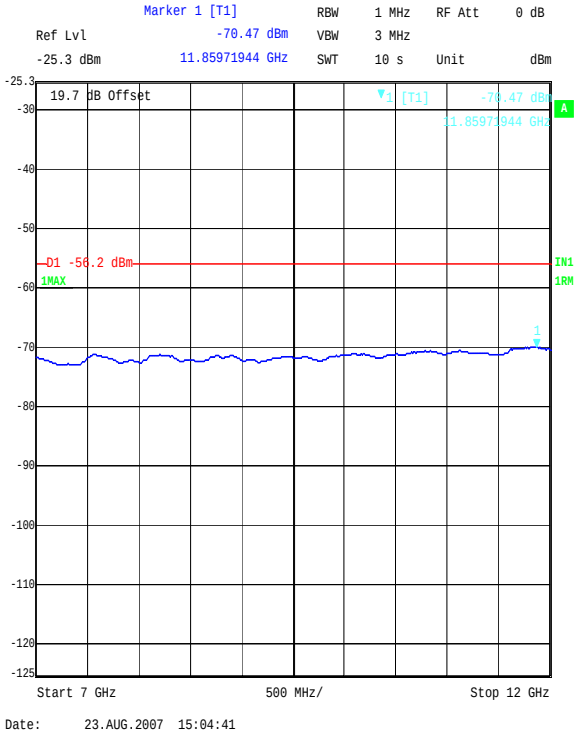
Date: 23.AUG.2007 14:41:01

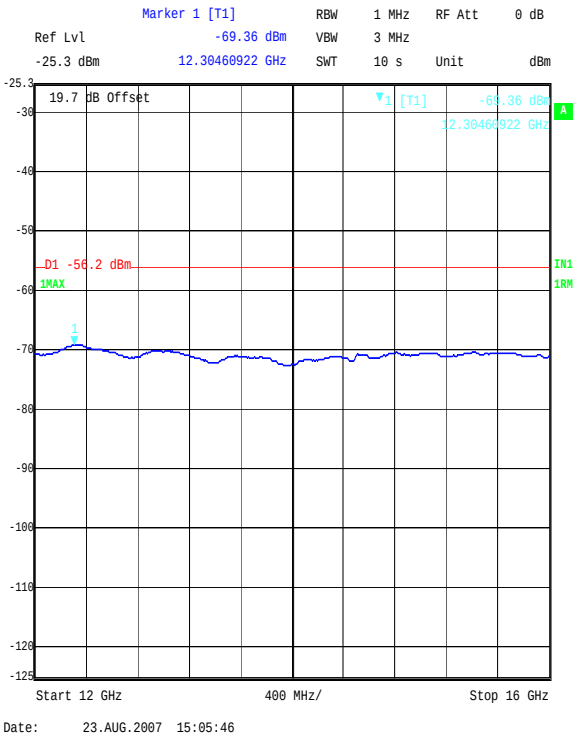


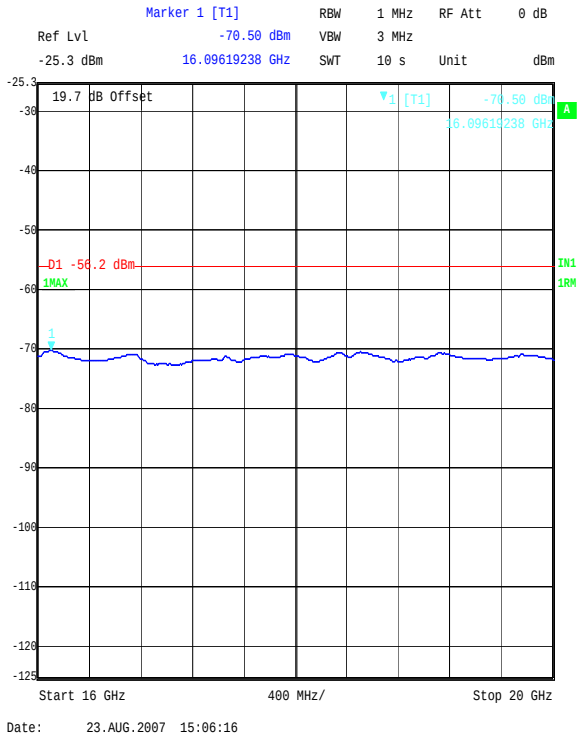
Date: 23.AUG.2007 14:45:17

Conducted Transmitter Spurious Emissions (Continued)

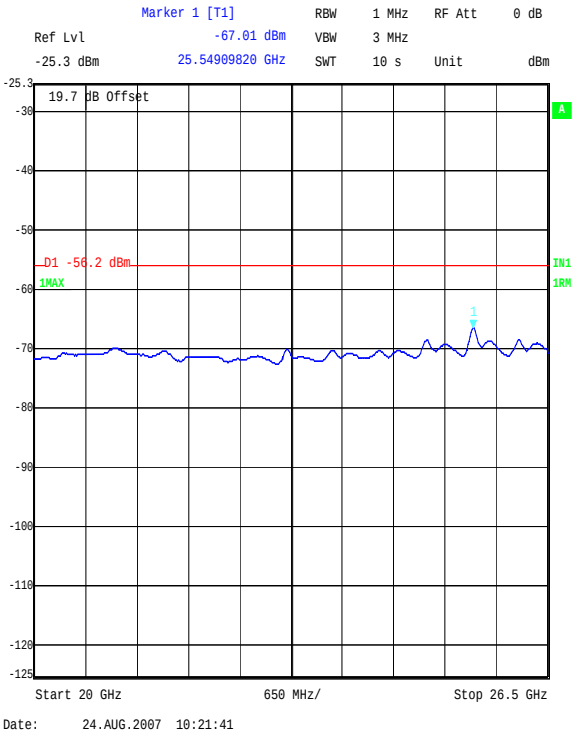


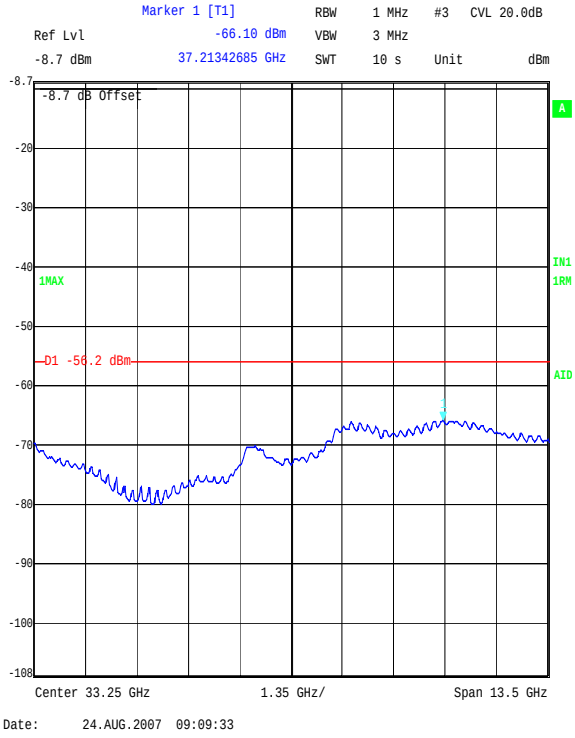






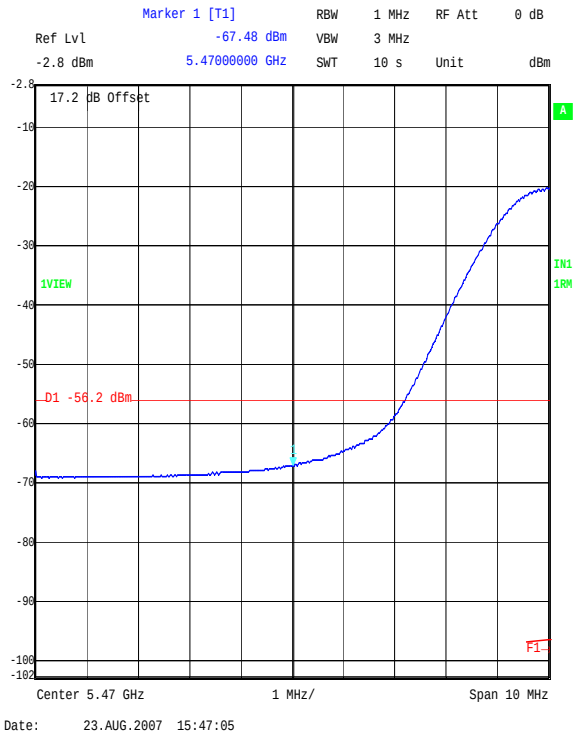
Conducted Transmitter Spurious Emissions (Continued)

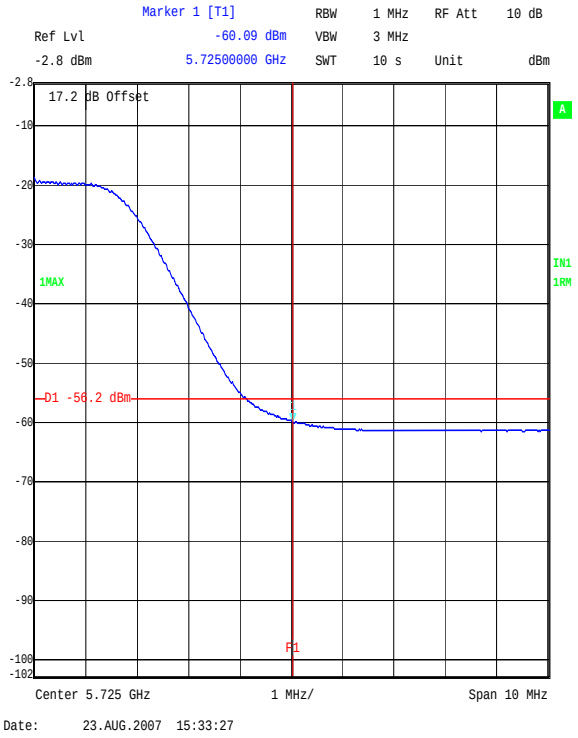




7.2.7. Conducted Transmitter Spurious Emissions Band Edge

Frequency (MHz)	Modulation Scheme	Peak Emission Level (dBm)	Limit (dBm/MHz)	Margin (dB)
5470.000	BPSK	-67.5	-56.2	11.3
5725.000	BPSK	-61.5	-56.2	5.3





7.2.8. Transmitter Radiated Emissions

Results:

Electric Field Strength Measurements: 30 MHz to 1000 MHz

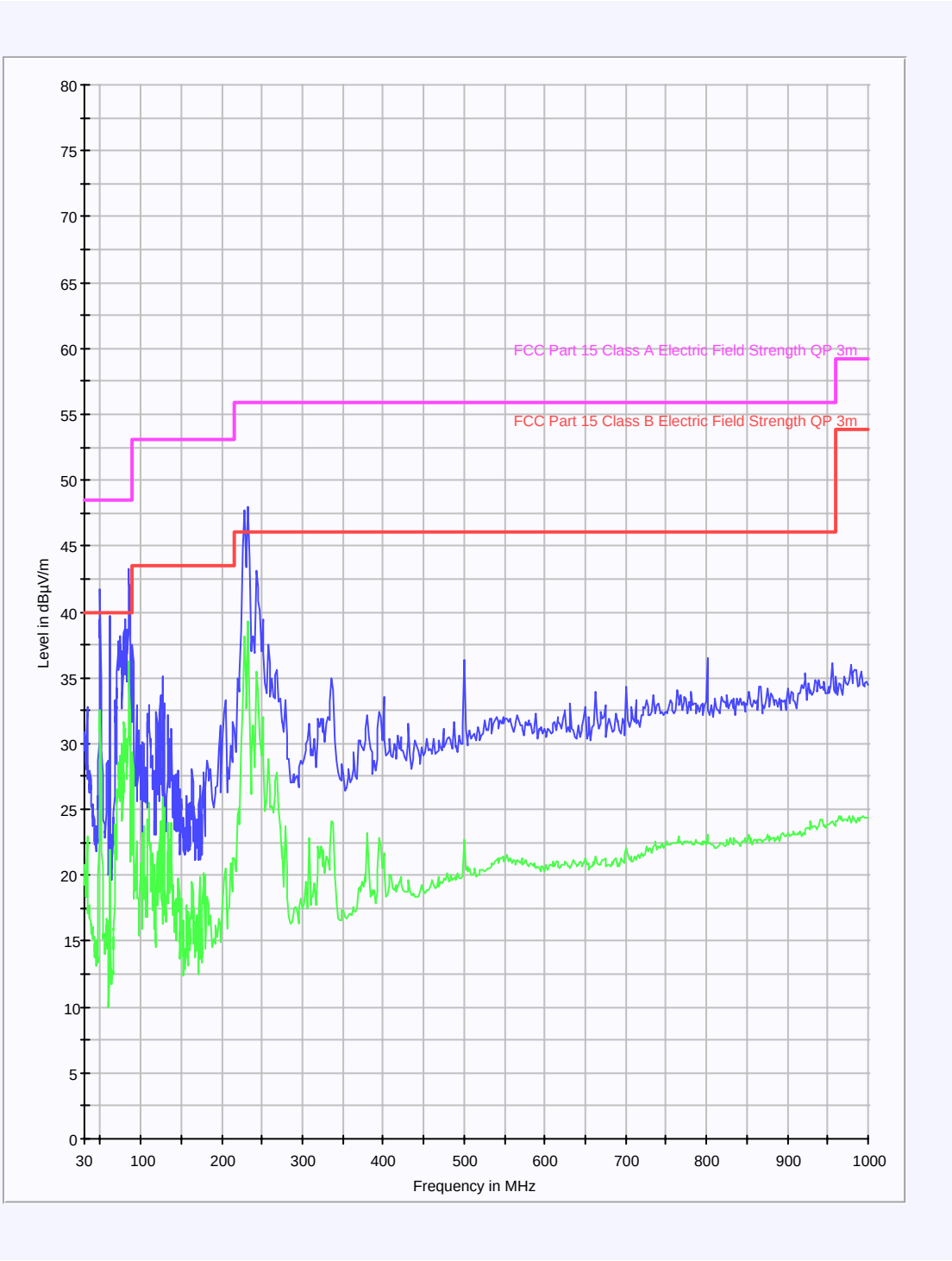
Top Channel

Frequency (MHz)	Antenna Polarity	Q-P Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
49.288	Vertical	20.0	40.0	20.0	Complied
61.563	Vertical	16.9	40.0	23.1	Complied
85.049	Vertical	20.9	40.0	19.1	Complied
227.876	Vertical	17.3	46.0	28.7	Complied

Note(s):

1. *The preliminary scans showed similar emission levels for each mode below 1 GHz, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.*

Transmitter Radiated Emissions (Continued)



Transmitter Radiated Emissions (Continued)

Results:

Electric Field Strength Measurements (Frequency Range: 1 GHz to 40 GHz)

Top Channel

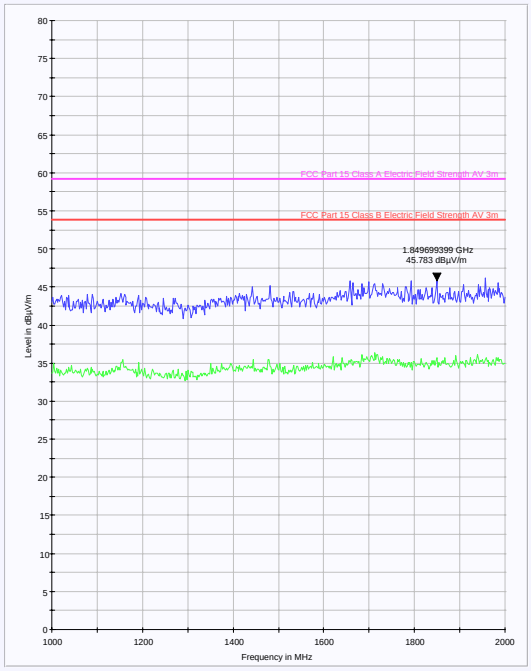
Frequency (MHz)	Peak Emission Level (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Result
1849.699	-49.4	-27.0	22.4	Complied
3914.839	-49.0	-27.0	22.0	Complied
5378.758	-55.6	-27.0	28.6	Complied
7851.631	-56.5	-27.0	29.5	Complied

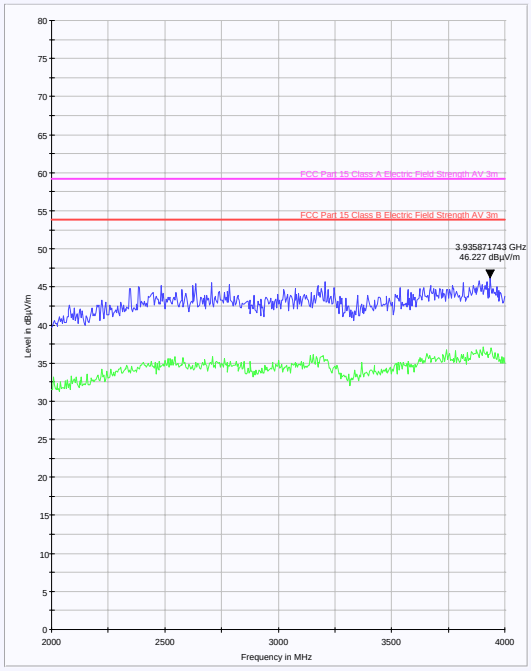
Note(s):

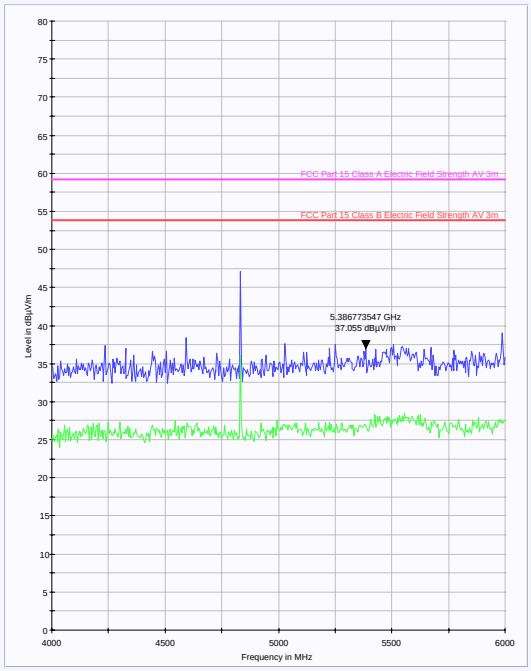
1. *The preliminary scans showed similar emission levels for each mode below 1 GHz, therefore final radiated emissions measurements were performed with the EUT set to the top channel only.*

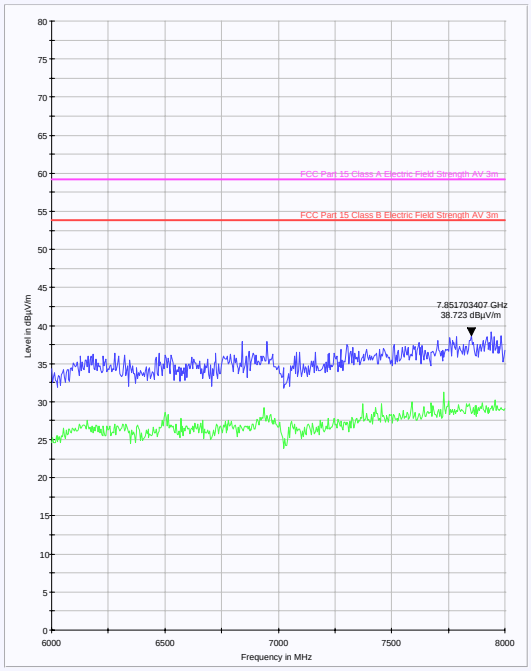
Test of: Orthogon Systems.
PTP54400
To: FCC Part 15.407: 2006

Transmitter Radiated Emissions (Continued)



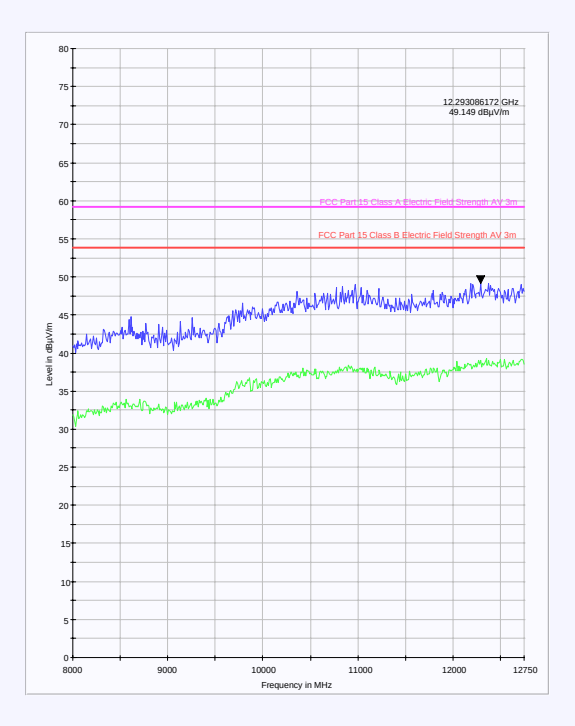


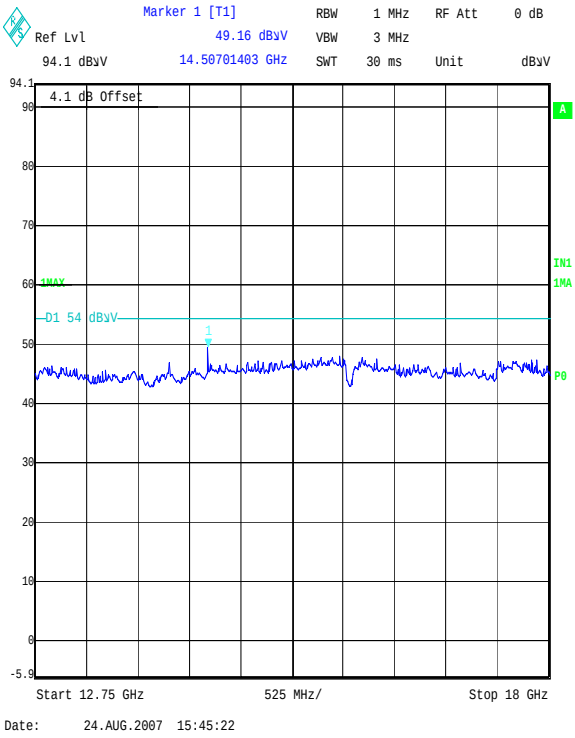




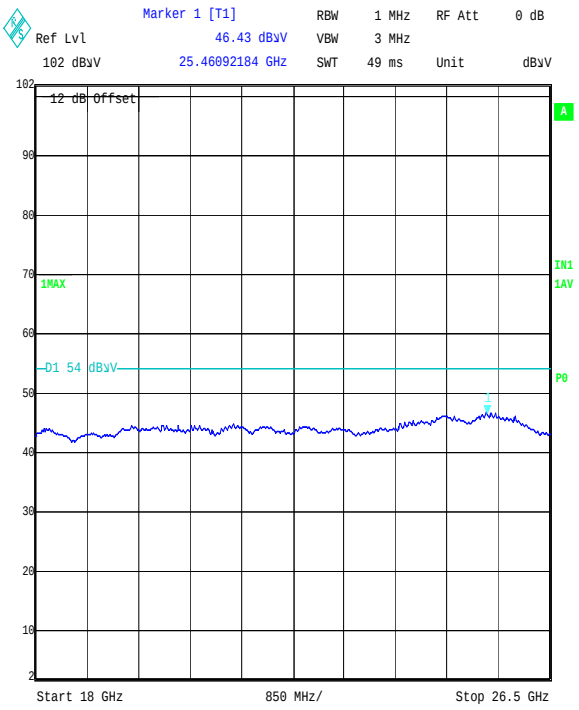
Test of: Orthogon Systems.
PTP54400
To: FCC Part 15.407: 2006

Transmitter Radiated Emissions (Continued)

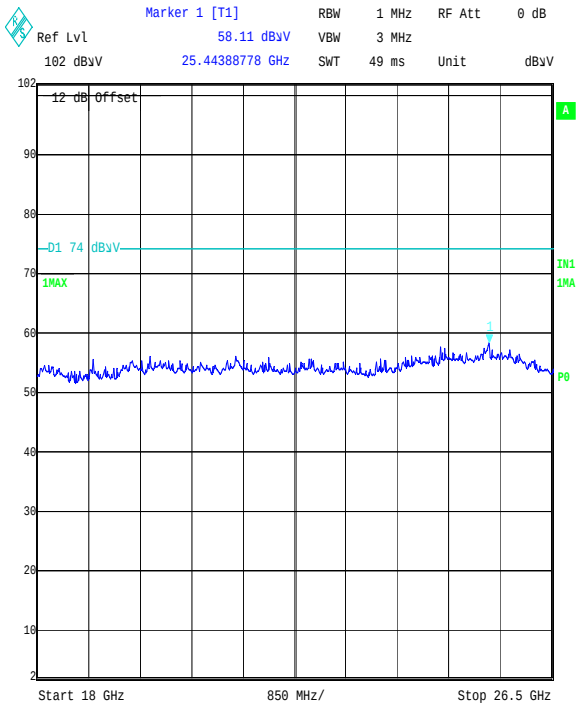




Date: 24.AUG.2007 15:45:22

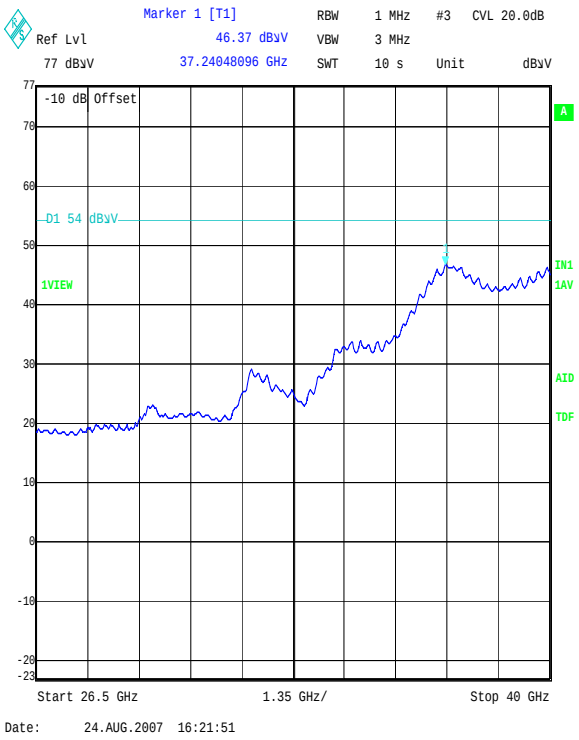


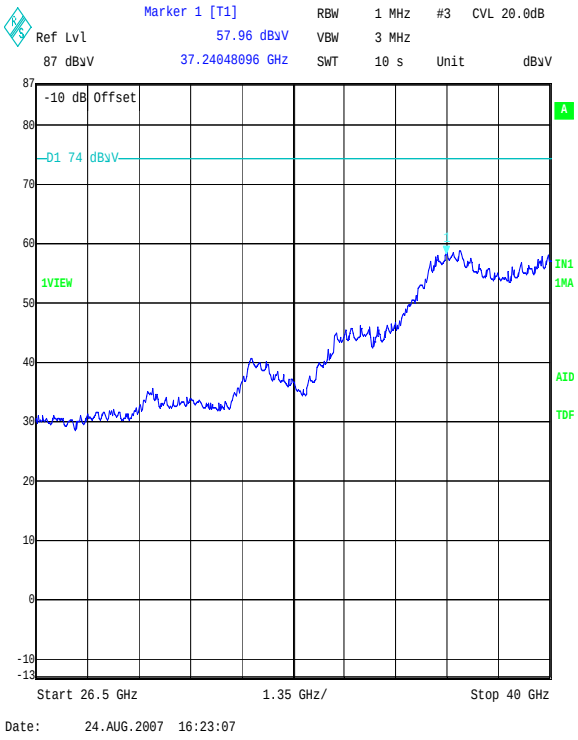
Date: 24.AUG.2007 15:47:12



Date: 24.AUG.2007 15:47:45

Transmitter Radiated Emissions (Continued)





7.2.9. Transmitter Band Edge Radiated Emissions

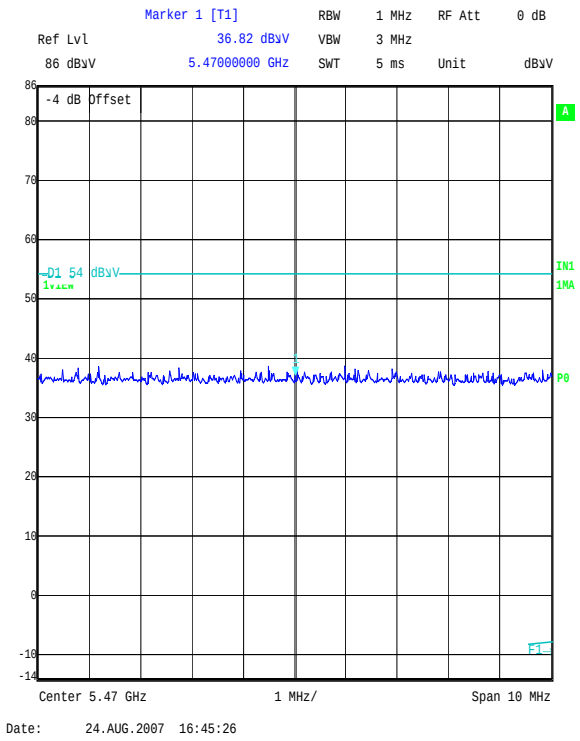
Results:

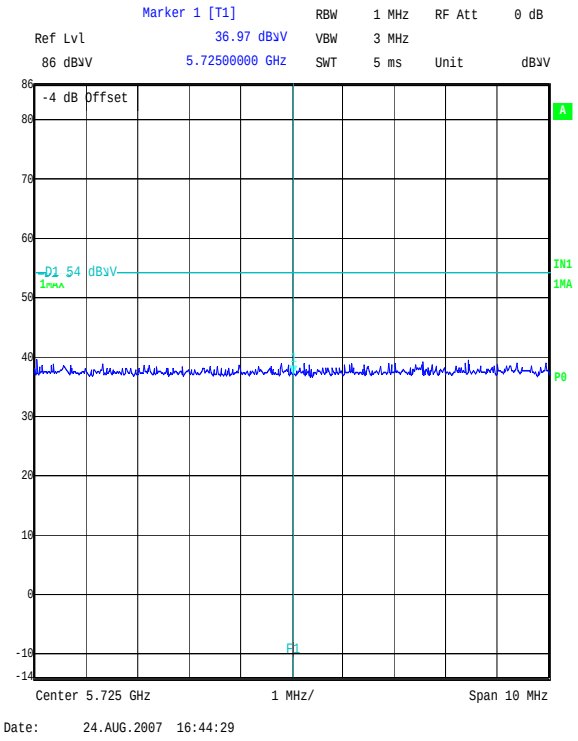
Bottom Band Edge

Frequency (MHz)	Peak Emission Level (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Result
5470.0	-58.4	-27.0	31.4	Complied

Top Band Edge

Frequency (MHz)	Peak Emission Level (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)	Result
5725.0	-59.2	-27.0	32.2	Complied





8. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently, the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor, such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	+/- 3.25 dB
Peak Transmit Power	Not applicable	95%	+/- 0.46 dB
Peak Power Spectral Density	Not applicable	95%	+/- 1.2 dB
Emission Bandwidth	Not applicable	95%	+/- 0.12 %
Radiated Spurious Emissions	30 MHz to 1000 MHz	95%	+/- 5.26 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	+/- 2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty, the published guidance of the appropriate accreditation body is followed.

Appendix 1. Test Equipment Used

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
A028	Horn Antenna	Eaton	91888-2	304	08 Jun 2006	36
A031	Horn Antenna	Eaton	91889-2	557	08 Jun 2006	36
A1037	Bilog Antenna	Chase EMC Ltd	CBL6112B	2413	20 Sep 2006	12
A1069	LISN	Rohde & Schwarz	ESH3-Z5	837469/012	09 Feb 2007	12
A1368	Directional Coupler	Pasternack Enterprises.	PE2214-10	None	Calibrated before use	-
A1534	Preamplifier	Hewlett Packard	8449B OPT H02	3008A00405	Calibrated before use	-
A253	Horn Antenna	Flann Microwave	12240-20	128	17 Nov 2006	36
A254	Horn Antenna	Flann Microwave	14240-20	139	17 Nov 2006	36
A255	Horn Antenna	Flann Microwave	16240-20	519	17 Nov 2006	36
A256	Horn Antenna	Flann Microwave	18240-20	400	17 Nov 2006	36
A425	Horn Antenna	EMCO	3116	9611-2330	10 Apr 2006	36
A436	Horn Antenna	Flann	20240-20	330	24 Apr 2006	36
C1198	Cable	Utiflex	FA147A1015 M2020	3502 27138-4	04 Jun 2007	12
M1124	Spectrum Analyser	Rohde & Schwarz	ESIB26	100046K	20 Dec 2006	12
M1175	Power Sensor	HP	8485A	2942A10299	03 Nov 2006	12
M1242	Spectrum Analyser	Rohde & Schwarz	FSEM30	845986/022	08 Sep 2006	12
M1252	Signal Generator	HP	83640A	3119A00489	10 Aug 2006	12
M1253	Spectrum Analyser	HP	8564E	3442A00262	30 Oct 2006	12
M1263	EMI Test Receiver	Rohde & Schwarz	ESIB7	100265	25 Jan 2007	12

Test Equipment Used (Continued)

RFI No.	Instrument	Manufacturer	Type No.	Serial No.	Date Last Calibrated	Cal. Interval (Months)
M1269	Multimeter	Fluke	179	90250210	05 Mar 2007	12
M166	Environment Meter	EuroCom	None	None	19 Apr 2007	12
M281	Power Meter	Hewlett Packard	E4418A (EPM441A)	GB37170210-01	06 Jun 2007	12
S0539	Power Supply	Kikusui	PCR 1000L	13010170	Calibrated before use	-
S202	3m OATS	RFI	2	S202-15011990	17 Nov 2006	12
S212	Screened Room	RFI	12		Calibrated before use	-

NB In accordance with UKAS requirements, all the measurement equipment is on a calibration schedule. All equipment was within calibration at the time of the test.

Appendix 2. Measurement Methods

A2.1. AC Mains Conducted Emissions

AC mains conducted emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

The test was performed in a shielded enclosure with the equipment arranged as detailed in the standard on a wooden bench using the floor of the screened enclosure as the ground reference plane. The EUT was powered with 115V 60 Hz AC mains supplied via a Line Impedance Stabilisation Network (LISN).

Initial measurements in the form of swept scans covering the entire measurement band were performed in order to identify frequencies on which the EUT was generating interference. In order to minimise the time taken for these swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidths (see table below). Repetitive scans were performed to allow for emissions with low repetition rates, and the duty cycle of the EUT. The test configuration was the same for the initial scans as for the final measurements.

Following the initial scans, a graph was produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. A tolerance line was set 6 dB below the specification limit and levels above the tolerance line were re-tested (at individual frequencies) using the appropriate detector function.

The test equipment settings for conducted emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements**
Detector Type:	Peak	Quasi-Peak (CISPR)/Average
Mode:	Max Hold	Not applicable
Bandwidth:	10 kHz*	9 kHz*
Amplitude Range:	60 dB	20 dB
Measurement Time:	Not applicable	> 1 s
Observation Time:	Not applicable	> 15 s
Step Size:	Continuous sweep	Not applicable
Sweep Time:	Coupled	Not applicable

A2.2. Idle Mode Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial measurements covering the entire measurement band in the form of swept scans in a shielded enclosure were performed in order to identify frequencies on which the EUT was generating interference. This determined the frequencies on which the EUT should be re-measured in full on the open area test site. In order to minimise the time taken for the swept measurements, a Peak detector was used in conjunction with the appropriate detector IF measuring bandwidth (see table below). Repetitive scans were performed to allow for emissions with low repetition rates.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. Following the initial scans, graphs were produced giving an overview of the emissions from the EUT plotted against the appropriate specification limit. Any emission within 20 dB of the limit were then measured on the open area test site, except in cases where the noise floor was within 20 dB of the limit, in these cases the highest point of the noise floor was measured.

Where an emission fell inside a restricted band, measurements were made at the appropriate test distance using a measuring receiver with a Quasi-Peak detector for measurements below 1000 MHz and an Average and Peak detector for measurements above 1000 MHz. A peak detector was used for all other measurements.

For the final measurements the EUT was arranged on a non-conducting turn table on a standard test site compliant with ANSI C63.4 – 2003 Clause 5.4.

All measurements on the open area test site were performed using broadband antennas.

On the open area test site, at each frequency where a signal was to be measured, the trace was maximised by rotating a turntable through 360°. The angle at which the maximum signal was observed was locked out. For frequencies below 1000 MHz the test antenna was varied in height between 1 m and 4 m in order to further maximise the target emission.

For frequencies above 1000 MHz where a horn antenna was used, height searching was performed to locate the optimal height of the horn with respect to the EUT. At this point the horn was locked off and the turntable was again rotated through 360° to maximise the target signal. It should be noted that the received signal from the EUT would diminish very quickly after it exits the beam width of the horn antenna, for this reason it may not be necessary to fully height search with the horns.

At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT.

Scans were performed to the upper frequency limits as stated in Section 15.33

The final field strength was determined as the indicated level in dBμV plus cable loss and antenna factor.

The test equipment settings for radiated emissions measurements were as follows:

Receiver Function	**Initial Scan**	**Final Measurements Below 1 GHz**	**Final Measurements Above 1 GHz**
Detector Type:	Peak	Quasi-Peak (CISPR)	Peak / Average
Mode:	Max Hold	Not applicable	Max Hold
Bandwidth:	(120 kHz < 1 GHz) (1 MHz > 1 GHz)	120 kHz	1 MHz
Amplitude Range:	100 dB	100 dB	100 dB
Step Size:	Continuous sweep	Not applicable	Not applicable
Sweep Time:	Coupled	Not applicable	Not applicable

A2.3. Transmitter Peak Transmit Power

Prior to testing being performed, a suitable RF attenuator and cable were calibrated for the required frequencies. For each frequency to be measured, the EUT was set to its maximum transmit power and the output power on both H and V ports was measured with a power meter. The power meter was corrected for both cable/attenuator loss and duty cycle correction factor.

The aggregate power was then calculated by adding the measured H and V port power levels. The stated limit was compared with the measured aggregate level, to show compliance. The Radiated port powers were calculated by subtracting the interconnecting cable loss and adding the proposed antenna gain. This value was then compared to the radiated limit. The result for both methods can be seen in the output power section of this report.

A2.4. Transmitter Peak Power Spectral Density

Prior to testing being performed, a suitable RF attenuator and cable were calibrated for the required frequencies. The calibrated level of the attenuator and cable were entered as an offset into the spectrum analyser to compensate for the losses in the measurement set up.

The analyzer bandwidth was set to 1 MHz and the peak value of the fundamental signal was recorded.

A2.5. Transmitter Modulation Envelope Peak Excursion Ratio

The test method use was that shown in the FCC procedure for UNII part 15 subpart E devices. The spectrum analyser frequency span was set to show the entire fundamental emission.

Trace 1 was set with a RBW = VBW = 1 MHz and the detector set to Max Hold.

Trace 2 was set with a RBW = 1 MHz and a VBW = 30 kHz.

The detector was set to Max Peak hold. The difference between the traces was reported.

A2.6. Transmitter Emission (20 dB / 26 dB) Bandwidth

To determine the occupied bandwidth, a resolution bandwidth of greater than 1% of the emission bandwidth was used. A video bandwidth of a least the same value or greater was used. The analyser was set for a maximum hold scan to capture the profile of the signal. The peak level was then determined, and a reference line was drawn 26 dB below the peak level. The bandwidth was determined at the points where the 26 dB reference crossed the profile of the emission.

The same process was used for the 20 dB bandwidth measurement, except the limit line was set to -20 dB relative to the carrier.

A2.7. Transmitter Radiated Emissions

Radiated emissions measurements were performed in accordance with the standard, against appropriate limits for each detector function.

Initial pre-scans covering the entire measurement band from the lowest generated frequency declared up to 40 GHz. The scans were performed within a screened chamber in order to identify frequencies on which the EUT was generating spurious. This procedure identified the frequencies from the EUT which required further examination. Repetitive scans were performed to allow for emissions with low repetition rates, and for the duty cycle of the EUT.

The initial scans were performed using an antenna height of 1.5 m and a measurement distance of 3 m. A limit line was set to the specification limit by characterising the screen room using a known signal source set at exactly the same location as the EUT. The signal source was derived from either a horn antenna or a dipole dependant on the frequency band under investigation. Any levels within 20 dB of this limit were measured where possible, on occasion; the receiver noise floor came within the 20 dB boundary. On these occasions, the system noise floor may have been recorded.

An open area test site using the appropriate test distance and measuring receiver with a Peak detector was used for final measurements at each frequency recorded in the screen room.

The levels were maximised by initially rotating the turntable through 360° and then varying the antenna height between 1 m and 4 m in the vertical polarisation. At this point, any signals found to be between the limit and a level 6 dB below it were further maximised by changing the configuration of the EUT, e.g. re-routing cables to peripherals and moving peripherals with respect to the EUT. The procedure was repeated for the horizontal polarisation.

Once the final amplitude (maximised) had been obtained, the EUT was substituted with a substitution antenna. For EIRP measurements a Horn antenna whose gain was based on an isotropic antenna was used, ERP measurements were done using a dipole. The centre of the substitution antenna was set to approximately the same centre location as the EUT. The substitution antenna was set to the horizontal polarity. The substitution antenna was matched into a signal generator using a 6 dB or greater attenuator. The signal generator was tuned to the EUT's frequency under test.

The test antenna was then raised and lowered to obtain a maximum reading on the spectrum analyser. The level of the signal generator output was then adjusted until the maximum recorded EUT level was observed. The signal generator level was noted. This procedure was repeated with both test antenna and substitution antenna vertically polarised. The EIRP was calculated as:-

EIRP = Signal Generator Level - Cable Loss + Antenna Gain

Note that the measurements in the 1st, 2nd and 3rd 1 MHz blocks away from band edge were performed using an analyser span of 1 MHz and a 100 kHz receiver resolution bandwidth (RBW). 10 linear readings were taken for each 100 kHz strip across the 1 MHz band. These readings were integrated to give the emission level in an equivalent 1 MHz bandwidth.

Note measurements below 1 GHz were performed according to the method of measurement detailed for idle mode radiated emissions.

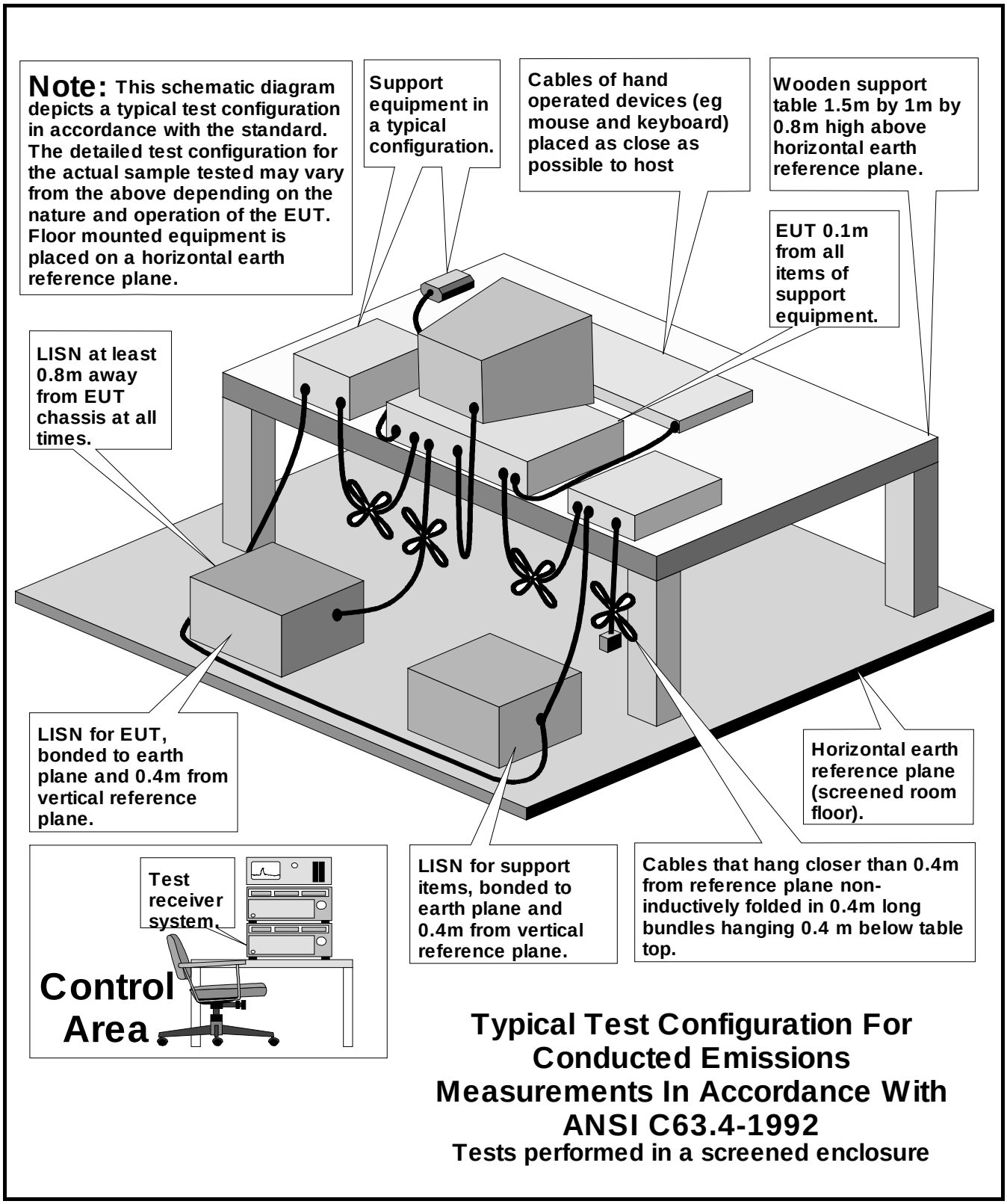
Appendix 3. Test Configuration Drawings

This appendix contains the following drawings:

Drawing Reference Number	Title
DRG\491282JD01\EMICON	Test configuration for measurement of conducted emissions.
DRG\491282JD01\EMIRAD	Test configuration for measurement of radiated emissions.

Test of: Orthogon Systems.
PTP54400
To: FCC Part 15.407: 2006

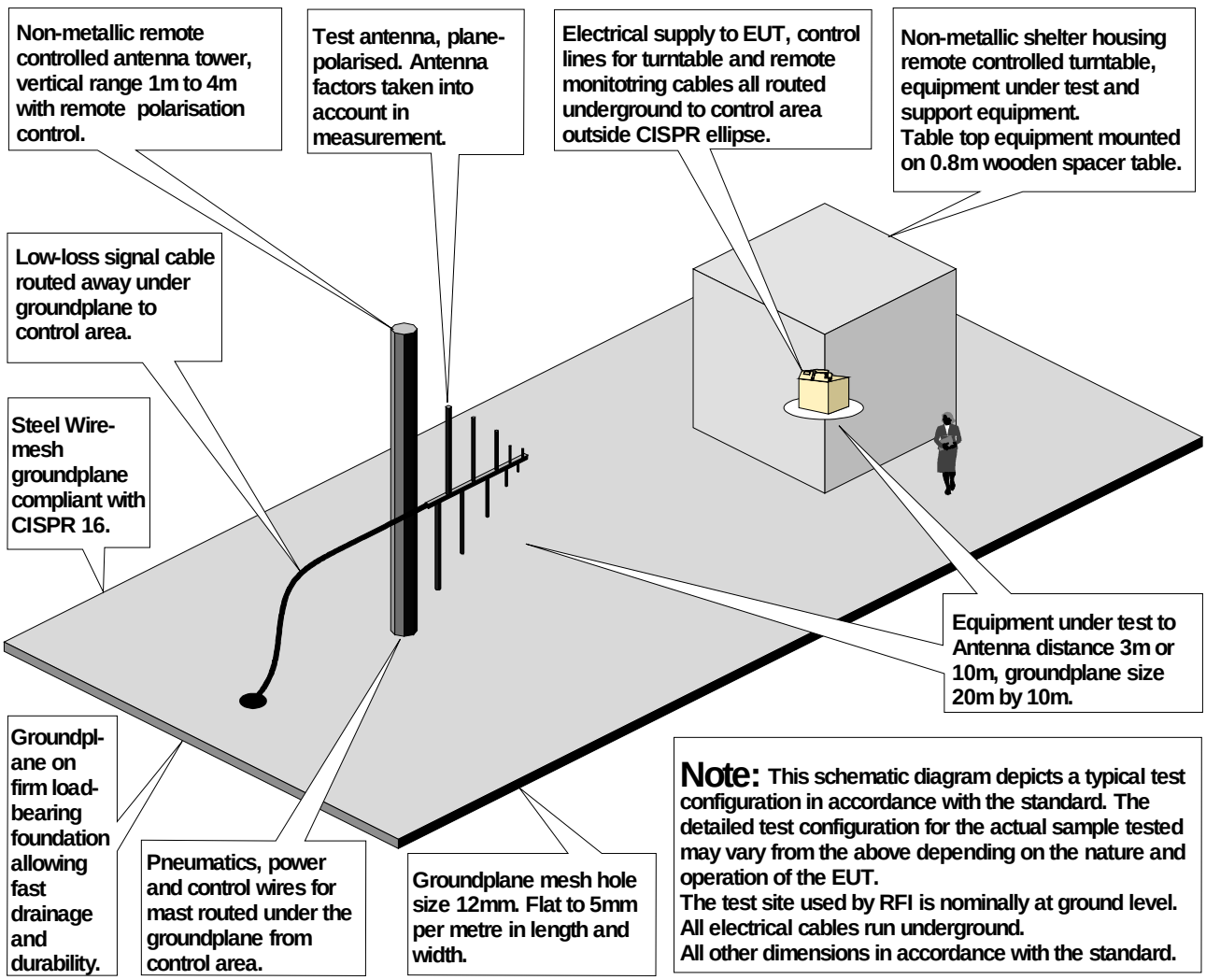
DRG\491282JD01\EMICON



Typical Test Configuration For Conducted Emissions Measurements In Accordance With ANSI C63.4-1992
Tests performed in a screened enclosure

Note: This diagram is also applicable for the latest version of ANSI C63.4-2003

DRG\491282JD01\EMIRAD



Note: This schematic diagram depicts a typical test configuration in accordance with the standard. The detailed test configuration for the actual sample tested may vary from the above depending on the nature and operation of the EUT.
The test site used by RFI is nominally at ground level.
All electrical cables run underground.
All other dimensions in accordance with the standard.

Test Configuration For Radiated Emissions Measurements

Reflection-free area: >60m by 52m (CISPR ellipse)
Groundplane Earthed
Control room outside CISPR ellipse