Report On

FCC Testing of the
Domo Ltd SOLO Transmitter
In accordance with FCC CFR 47 Part 90

COMMERCIAL-IN-CONFIDENCE

FCC ID: XRFSOLOTX

Document 75907158 Report 02 Issue 2 November 2009

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FCC Testing of the
Domo Ltd SOLO Transmitter
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Document 75907158 Report 02 Issue 2

November 2009

PREPARED FOR

Cobham Surveillance
Domo Ltd
12 Manor Court
Barnes Wallis Road
Fareham
PO15 5TH

PREPARED BY

N Bennett
Senior Administrator

APPROVED BY

C Gould
Authorised Signatory

M Jenkins
Authorised Signatory

DATED 03 November 2009

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 90. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineers:

S Bennett

G Lawler

This report has been up-issued to Issue 2 to amend the FCC ID.

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Domo Ltd SOLO Transmitter
In accordance with FCC CFR 47 Part 90

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Domo Ltd, SOLO Transmitter to the requirements of FCC CFR 47 Part 90.

Objective	To perform FCC Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Domo Ltd
Model Number(s)	SOLO Transmitter
Serial Number(s)	003018
Number of Samples Tested	One
Test Specification/Issue/Date	FCC CFR 47 Part 90: 2008
Disposal Reference Number Date	Returned with client Not Applicable (TSR Updated) 10 September 2009
Order Number Date	4313 16 July 2009
Start of Test	20 August 2009
Finish of Test	08 September 2009
Name of Engineer(s)	S Bennett G Lawler

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 90 is shown below.

Section	Spec Clause	Test Description	Mode	Result	Comments
2.1	90.210(b)(3)	Spurious Emissions Outside Emissions Mask	Transmit Bottom	Pass	
			Transmit Middle	Pass	
			Transmit Top	Pass	
2.2	90.205, 2.1046	EIRP Peak Power	Transmit Bottom	Pass	
			Transmit Middle	Pass	
			Transmit Top	Pass	
2.3	90.205, 2.1046	Power and Antenna Height Limits	Transmit Bottom	Pass	
			Transmit Middle	Pass	
			Transmit Top	Pass	
2.4	90.207, 2.1049	Types of Emission	Transmit Bottom	Pass	
			Transmit Middle	Pass	
			Transmit Top	Pass	
2.5	90.209, 2.1049	Bandwidth Limitations	Transmit Bottom	N/A	
			Transmit Middle	Pass	
			Transmit Top	N/A	
2.6	90.210, 2.1051	Emission Mask	Transmit Bottom	Pass	
			Transmit Middle	Pass	
			Transmit Top	Pass	
2.7	90.213	Frequency Stability	Transmit Bottom	N/A	
			Transmit Middle	Pass	
			Transmit Top	N/A	
2.8	2.1047	Modulation Characteristics	Transmit Bottom	-	Customer Declared
			Transmit Middle	-	
			Transmit Top	-	
2.9	90.210(b)(3)	Emission Mask	Transmit Bottom	Pass	
			Transmit Middle	Pass	
			Transmit Top	Pass	

1.3 APPLICATION FORM

APPLICANT'S DETAILS
COMPANY NAME : Domo Ltd, Trading as Cobham Surveillance ADDRESS : 11/12 Manor Court, Barnes Wallis Road, Segensworth, Hampshire PO15 5TH NAME FOR CONTACT PURPOSES : Stuart Doe TELEPHONE NO: 01489 566 750 FAX NO: 01489 880 538 E-MAIL: Stuart.doe@cobham.com

EQUIPMENT INFORMATION

Equipment designator:

Model name/number SOLO TRANSMITTER Identification number S/N 003018

Supply Voltage:

[ ] AC mains State AC voltage …… V and AC frequency …… Hz
[12] DC (external) State DC voltage 12V and DC current …… A
[ ] DC (internal) State DC voltage …… V and Battery type ……

Frequency characteristics:

Frequency range 228 MHz to 255 MHz Channel spacing 2.5MHz (if channelized)
Designated test frequencies:
Bottom: …… MHz Middle: …… MHz Top: …… MHz

Power characteristics:

Maximum transmitter power 100mW Minimum transmitter power …… W (if variable)

[X] Continuous transmission
[ ] Intermittent transmission State duty cycle ……
If intermittent, can transmitter be set to continuous transmit test mode? Y/N

Antenna characteristics:

[X] Antenna connector State impedance …… ohm
[ ] Temporary antenna connector State impedance …… ohm
[ ] Integral antenna State gain 4 dBi

Modulation characteristics:

[ ] Amplitude [ ] Other
[ ] Frequency Details: ……..
[ ] Phase
Can the transmitter operate un-modulated? Y/N
ITU Class of emission: 2M 50D7FEF (Video)

Extreme conditions:

Maximum temperature 50 ºC Minimum temperature -10 ºC

Maximum supply voltage	16V	Minimum supply voltage	5.9V

I hereby declare that I am entitled to sign on behalf of the applicant and that the information supplied is correct and complete.

Signature : Held on file at TÜV Product Service Ltd

Name : Stuart Doe

Position held : Programme Manager

Date : 05/08/2009

TÜV Product Service Ltd formally certifies that the manufacturer's declaration as typed out in this report is a true and accurate record of the original received from the applicant.

1.4 DECLARATION OF BUILD STATUS

Manufacturer	Domo Ltd, Trading as Cobham Surveillance
Country of origin	United Kingdom
Technical Description	COFDM OMNI TX
Model No	Solo 2/4 Transmitter
Part No	SOLO TRANSMITTER
Serial No	003018
Drawing Number	-
Build Status	Active
Software Issue	2.5
Hardware Issue	2
FCC ID	XRFSOLOTX
Highest Operating Frequency	255MHz
Signature	Stuart Doe
Date	05/08/2009
D of B S Serial No	75907158

Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

No responsibility will be accepted by TÜV Product Service as to the accuracy of the information declared in this document by the manufacturer.

1.5 PRODUCT INFORMATION

1.5.1 Technical Description

The Equipment Under Test (EUT) was a Domo Ltd, SOLO Transmitter as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.

Equipment Under Test

1.5.2 Test Configuration

Configuration 1: Stand Alone Powered

The EUT was configured as a standalone item and powered via a 12V DC supply.

1.5.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
DC Power	<3m	Power Cable	Mains	No

1.5.4 Modes of Operation

Modes of operation of each EUT during testing were as follows:

Mode 1 - Transmit Bottom

Mode 2 - Transmit Middle

Mode 3 - Transmit Top

Information on the specific test modes utilised are detailed in the test procedure for each individual test.

1.6 TEST CONDITIONS

For all tests the EUT was set up in accordance with the relevant test standard and to represent typical operating conditions. Tests were applied with the EUT situated in a shielded enclosure, test laboratories or an open test area as appropriate.

The EUT was powered from a 12V DC Power supply unit.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

1.7 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standards or test plan were made during testing.

1.8 MODIFICATION RECORD

No modifications were made to the EUT during testing.

SECTION 2

TEST DETAILS

FCC Testing of the
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2.1 SPURIOUS EMISSIONS OUTSIDE EMISSION MASK

2.1.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.210(b)(3)

2.1.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.1.3 Date of Test and Modification State

08 September 2009 - Modification State 0

2.1.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.1.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 90.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2
- Mode 3

2.1.6 Environmental Conditions

	08 September 2009
Ambient Temperature	21.2°C
Relative Humidity	49%
Atmospheric Pressure	1015mbar

2.1.7 Test Results

The EUT meet the requirements of FCC CFR 47 Part 90 for Spurious Emissions Outside Emissions Mask.

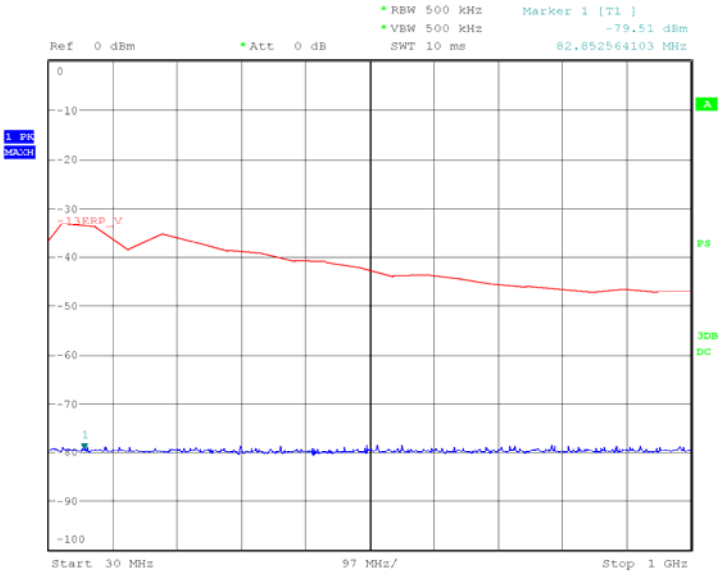
No emissions measured from the EUT were within 10dB of the limit.

The emission plots are shown on the following pages.

Configuration 1 - Mode 1

30MHz to 1GHz

Vertical



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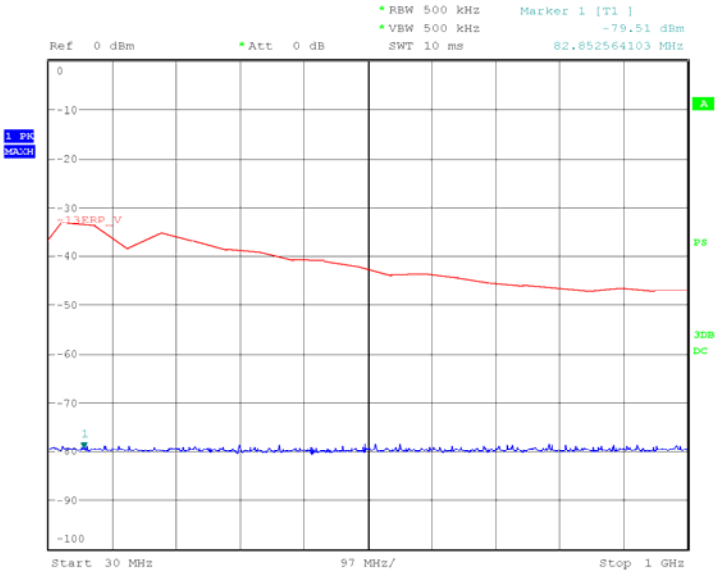

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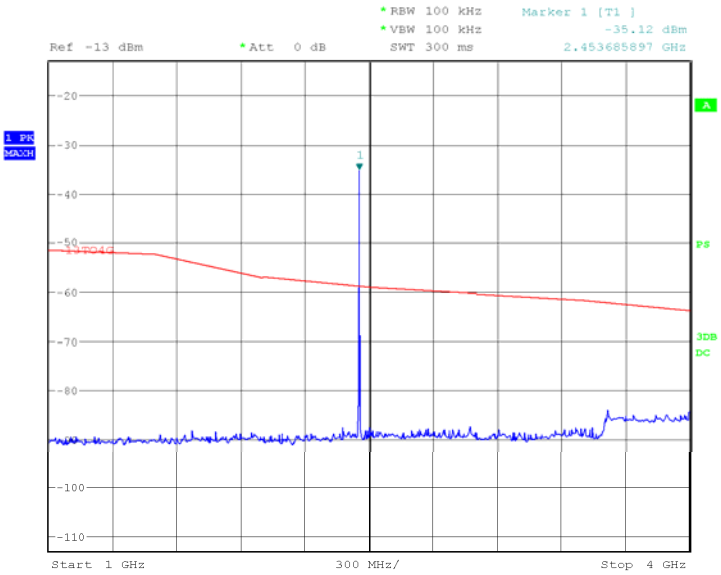
1GHz to 4GHz

Vertical



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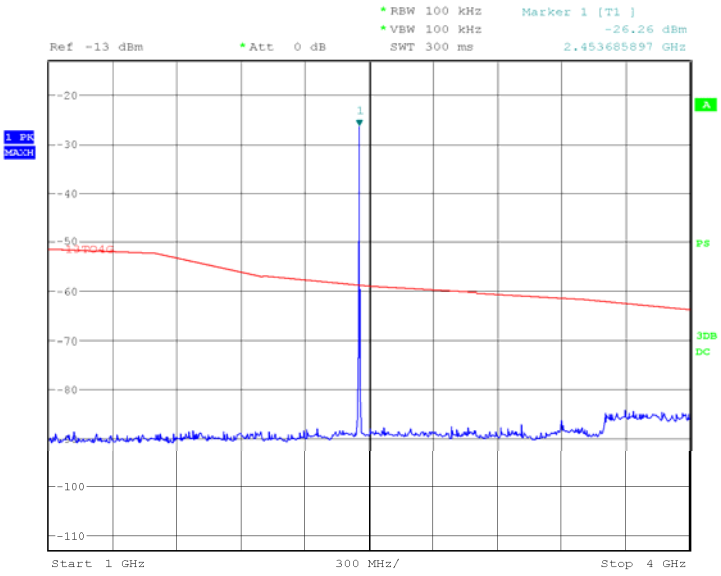

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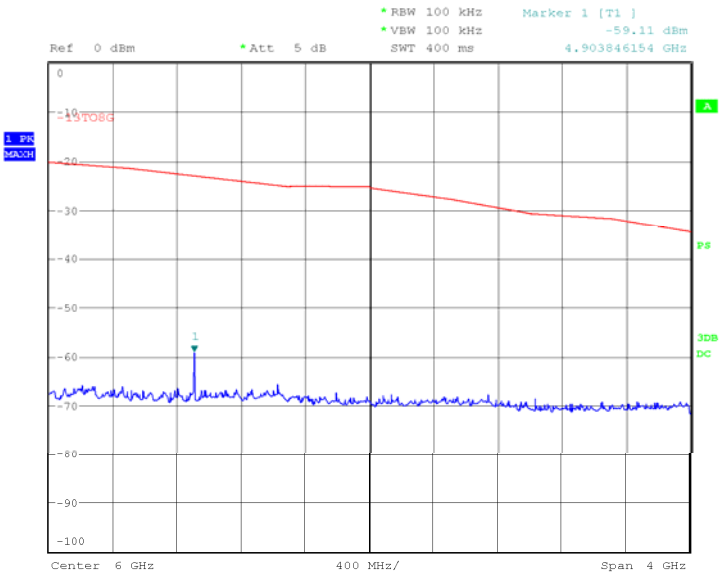
Note: The emissions which are observed to exceed the limit on the plots above are intentional transmissions and therefore are excluded from testing.

4GHz to 8GHz

Vertical



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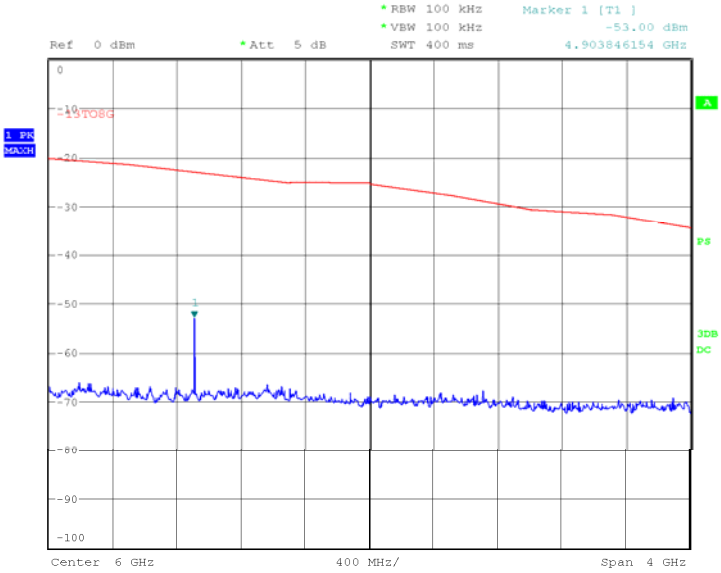

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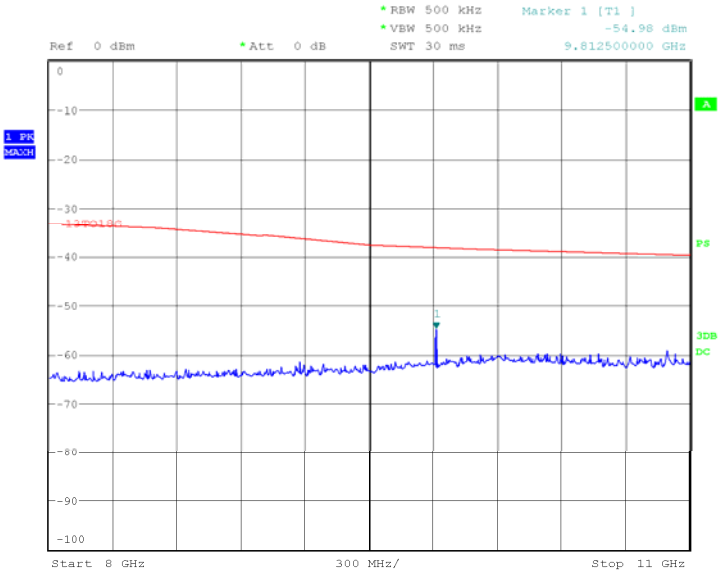
8GHz to 12GHz

Vertical



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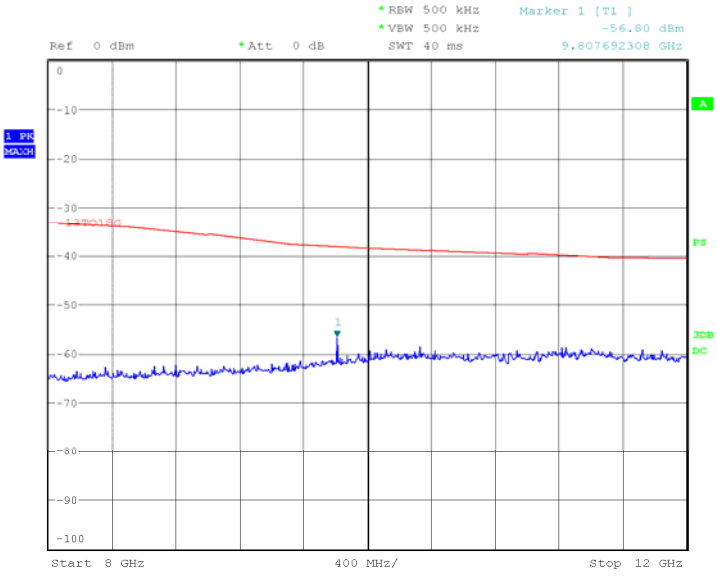

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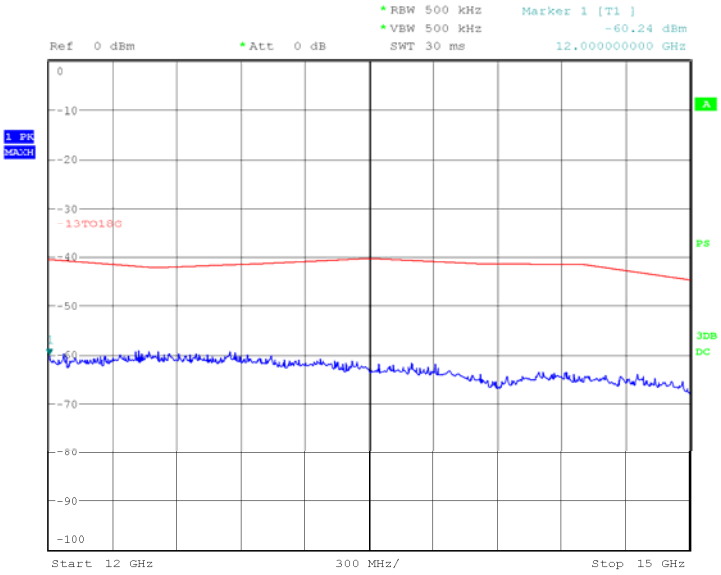
12GHz to 15GHz

Vertical



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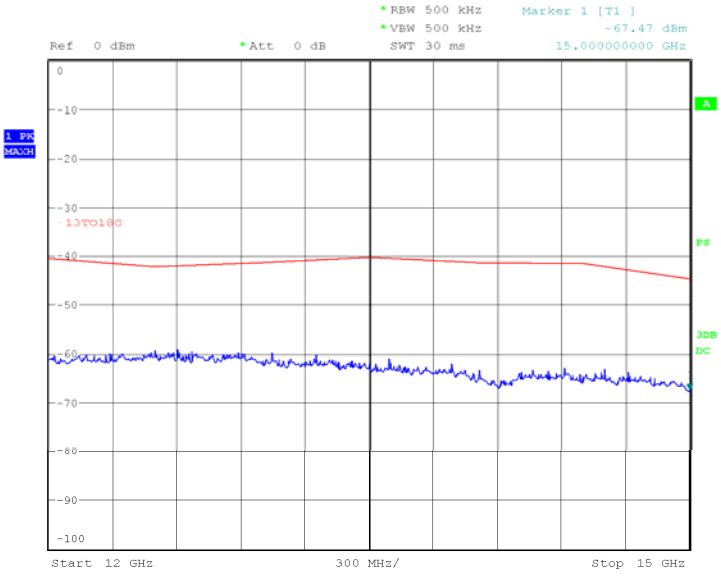

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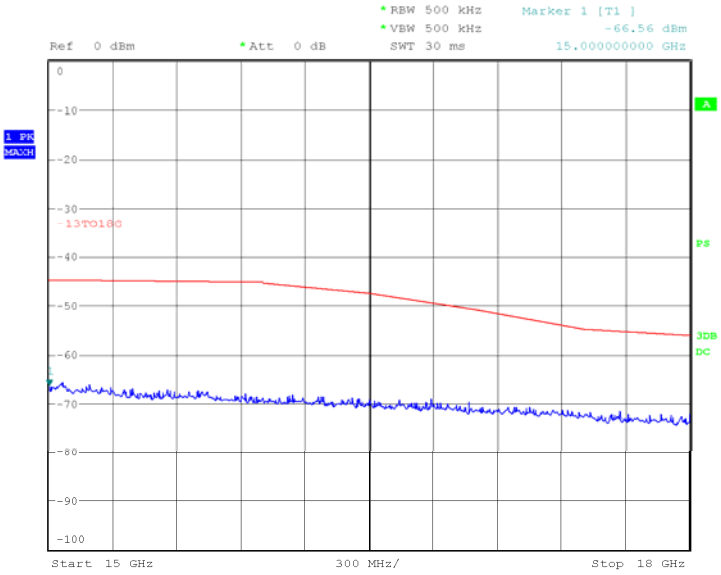
15GHz to 18GHz

Vertical



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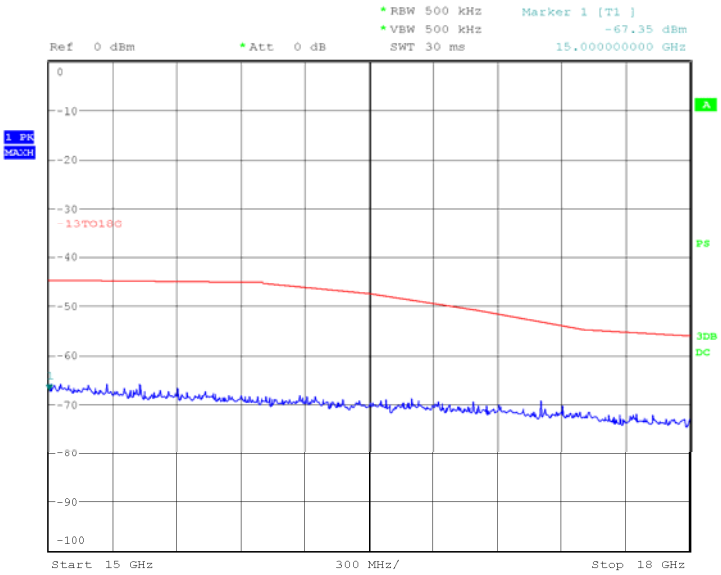

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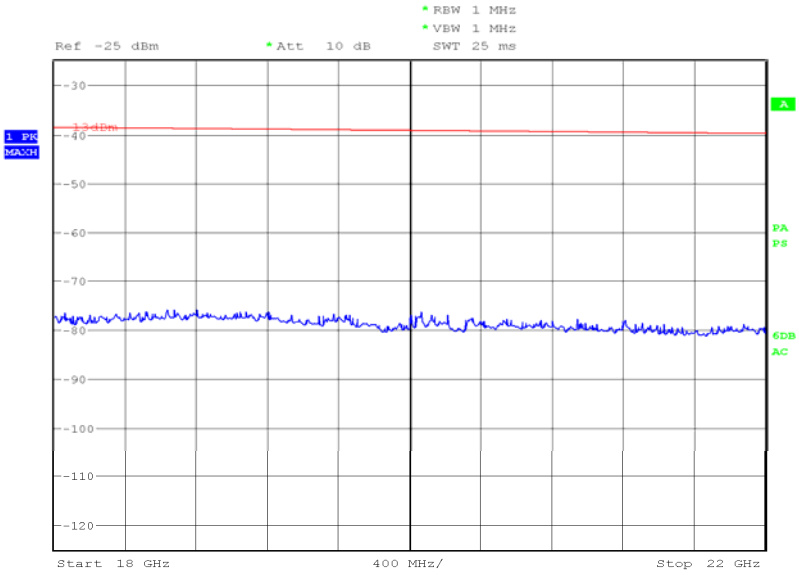
18GHz to 22GHz

Vertical



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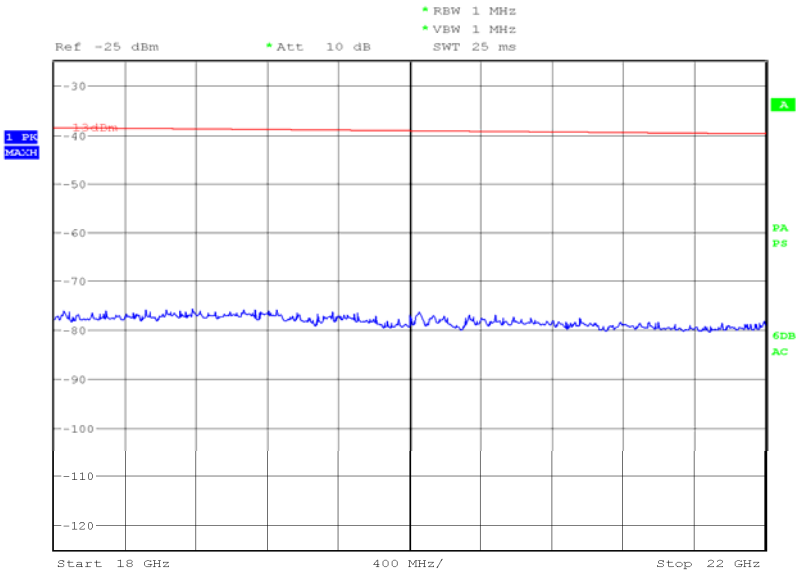

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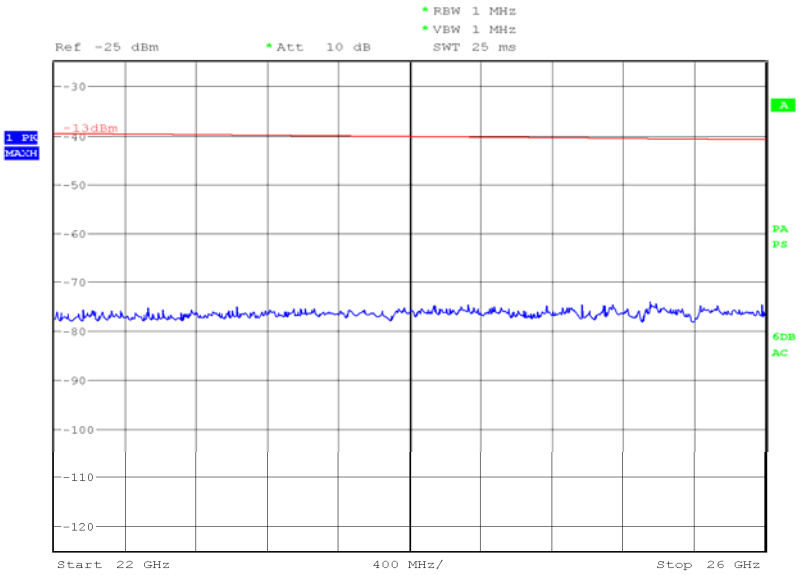
22GHz to 26GHz

Vertical



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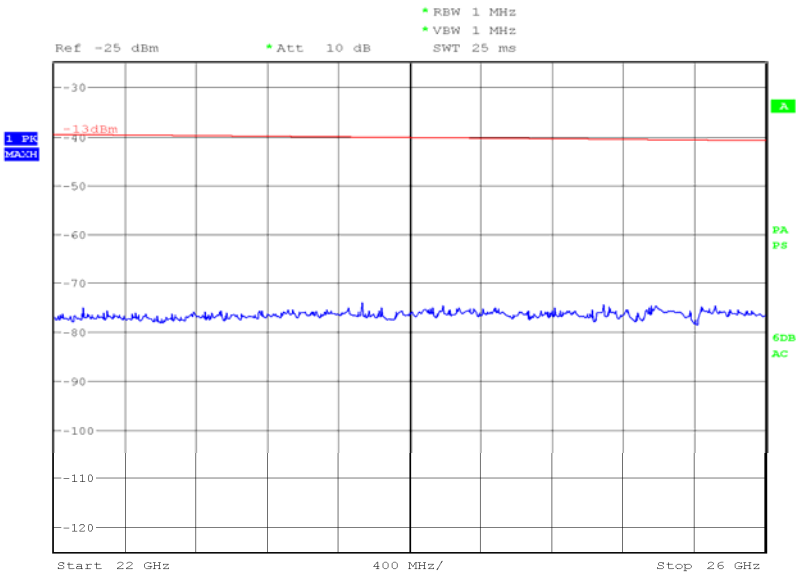

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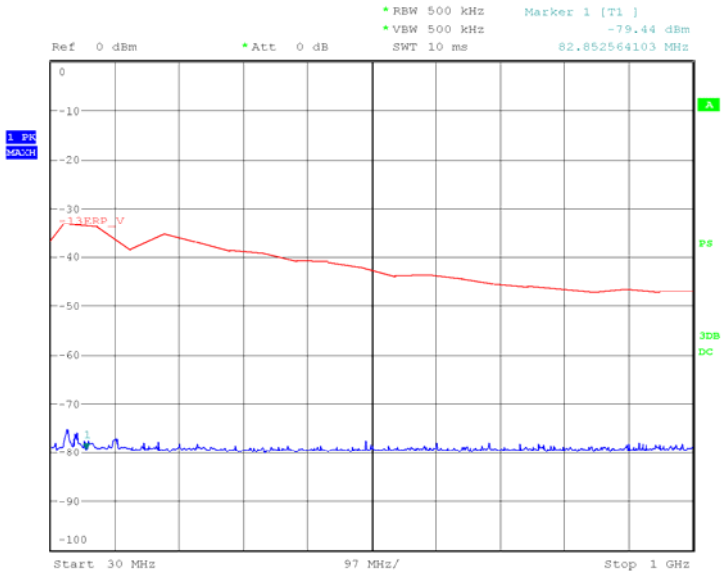
Configuration 1 - Mode 2

30MHz to 1GHz

Vertical



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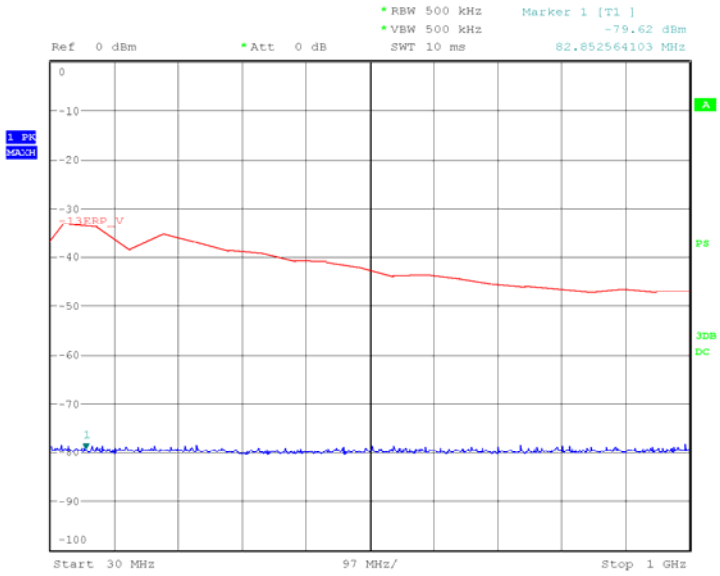

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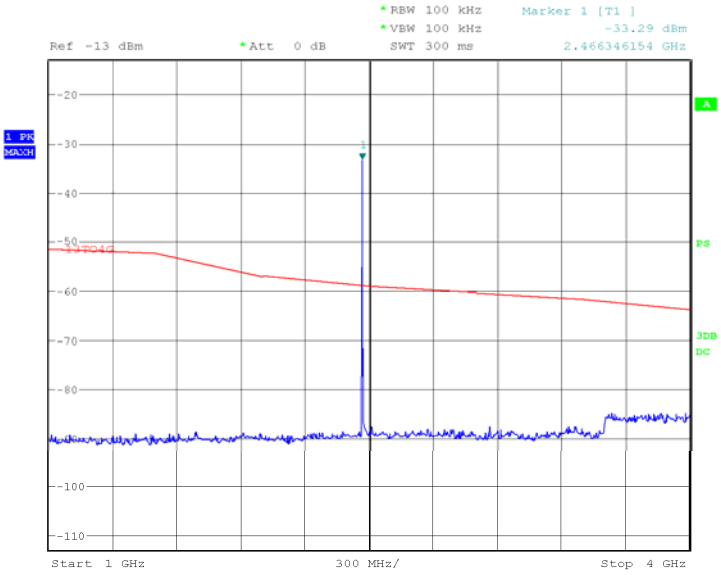
1GHz to 4GHz

Vertical



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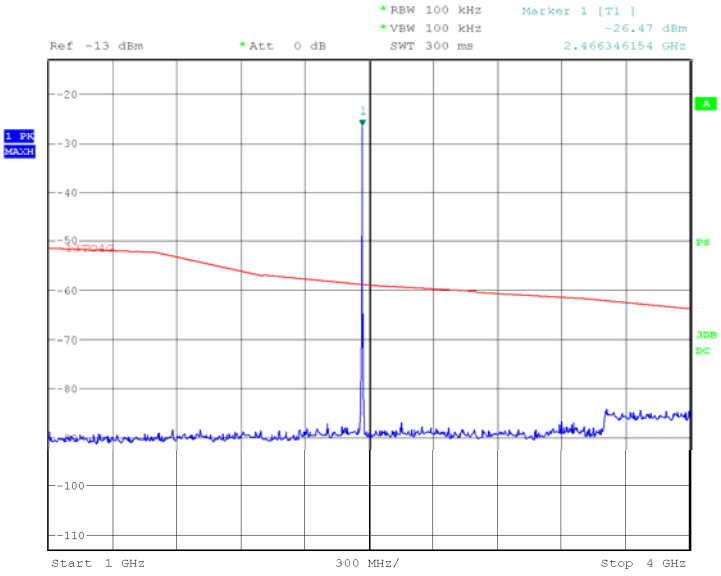

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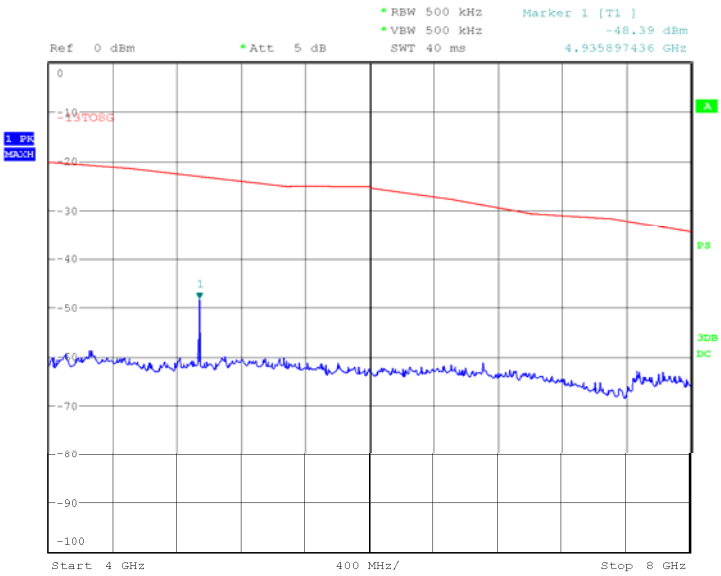
Note: The emissions which are observed to exceed the limit on the plots above are intentional transmissions and therefore are excluded from testing.

4GHz to 8GHz

Vertical



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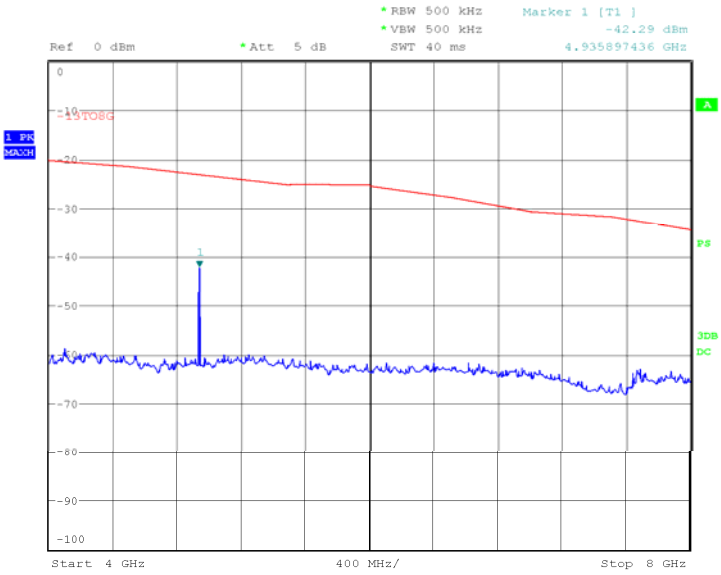

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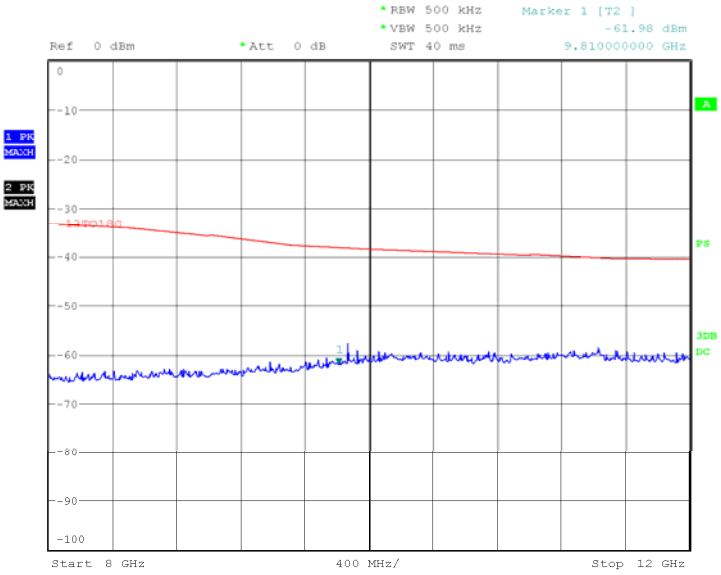
8GHz to 12GHz

Vertical



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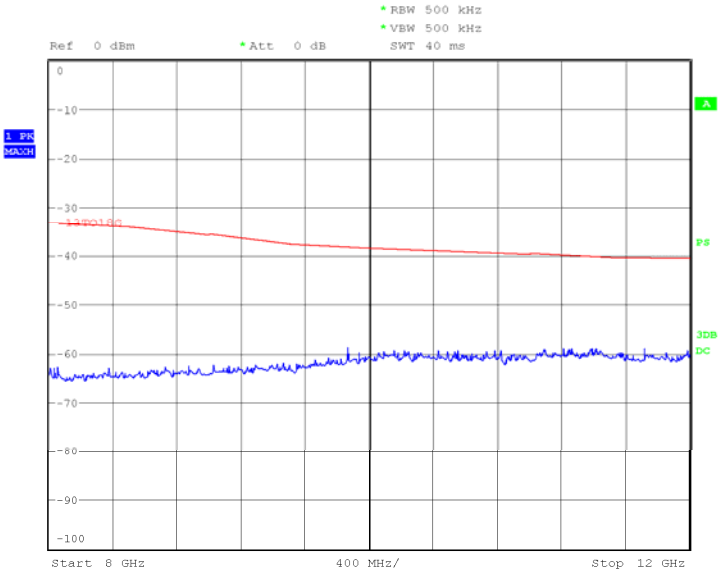

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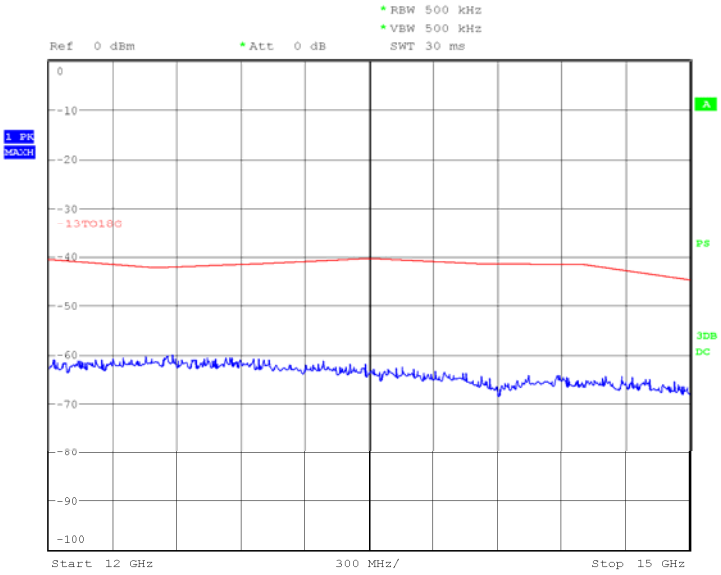
12GHz to 15GHz

Vertical



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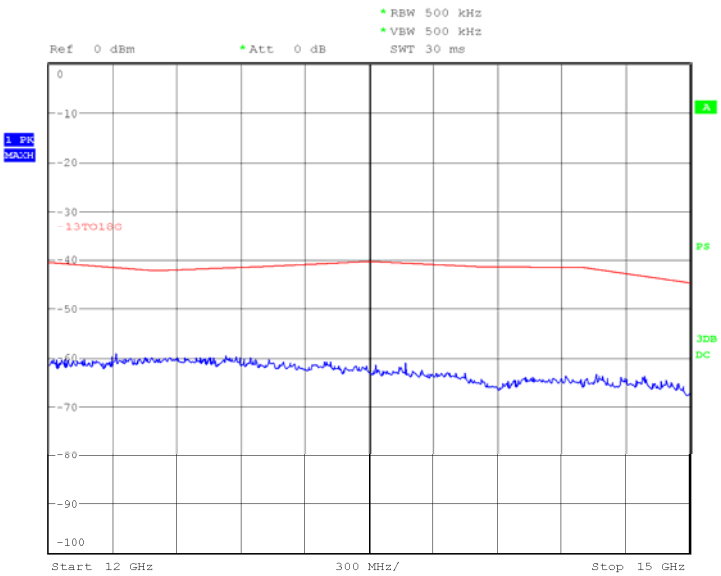

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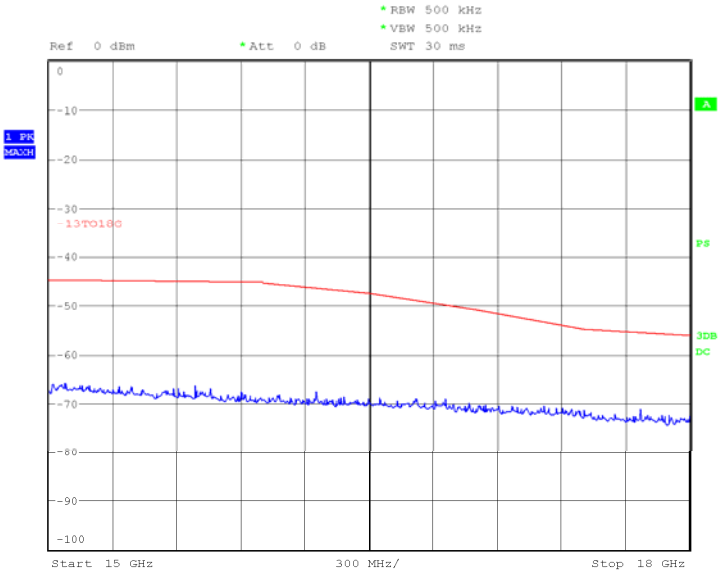
15GHz to 18GHz

Vertical



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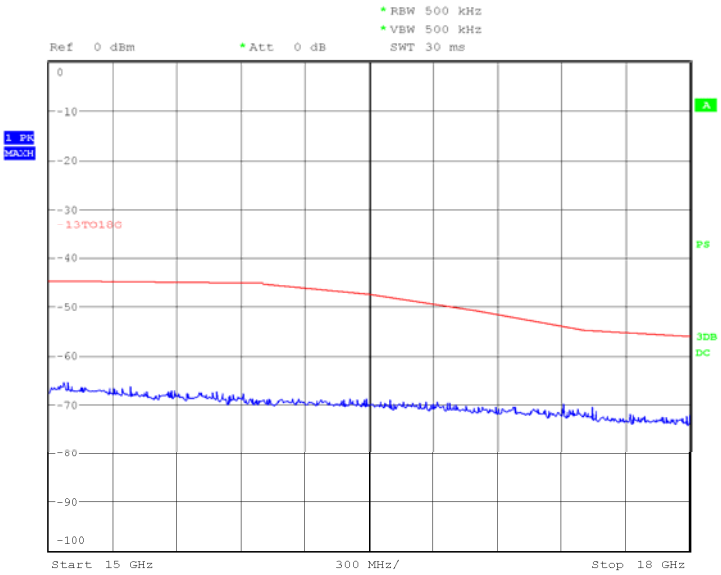

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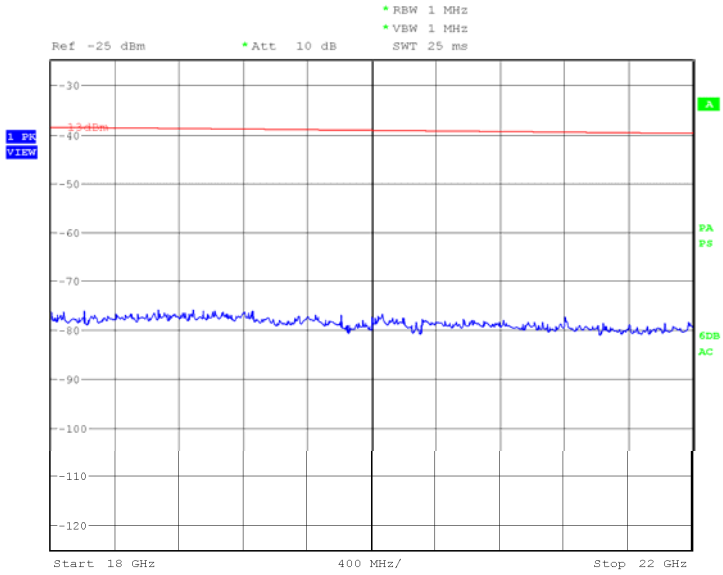
18GHz to 22GHz

Vertical



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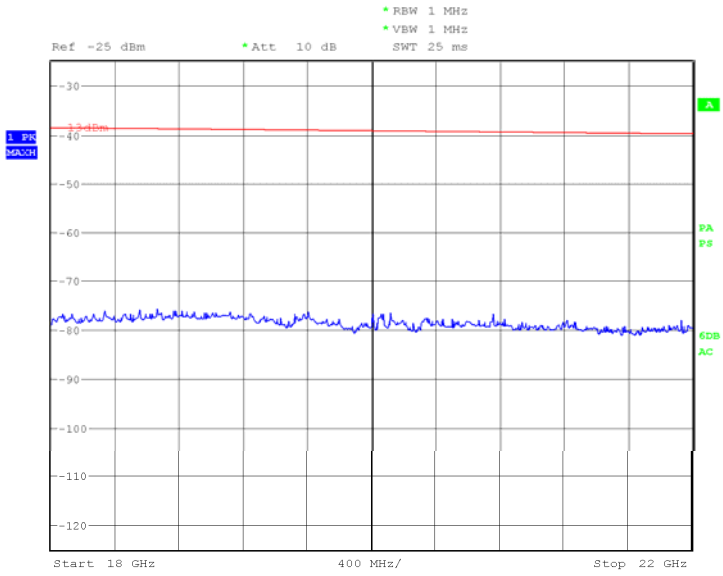

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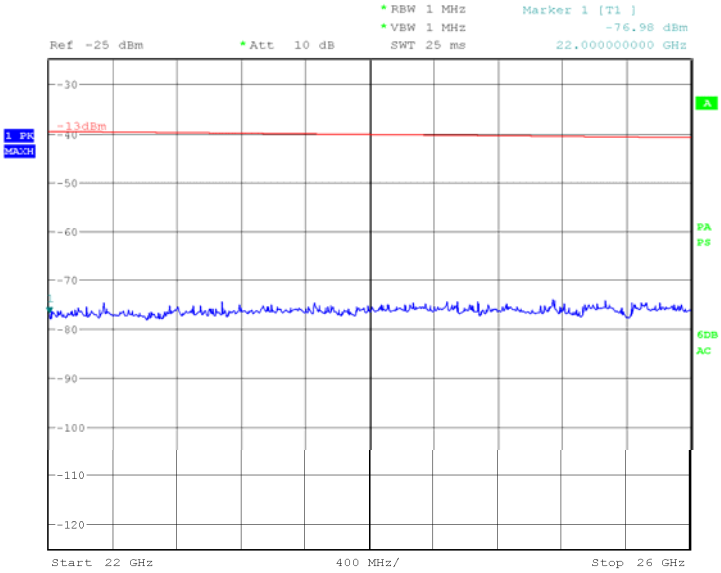
22GHz to 26GHz

Vertical



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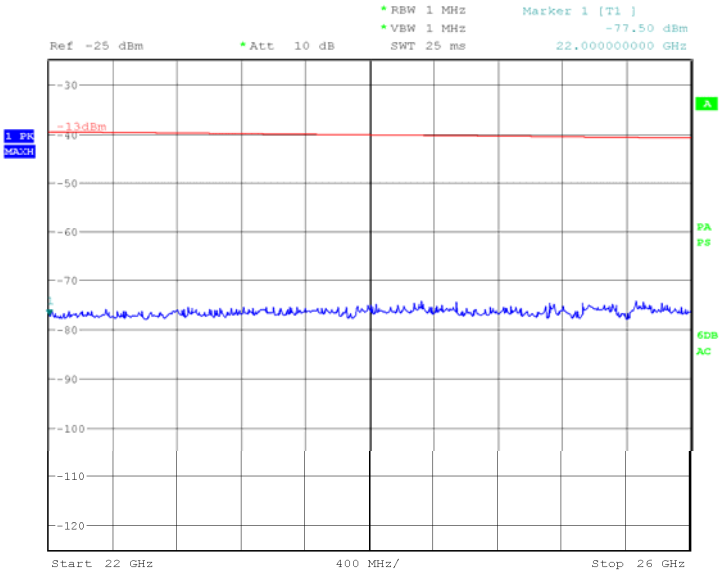

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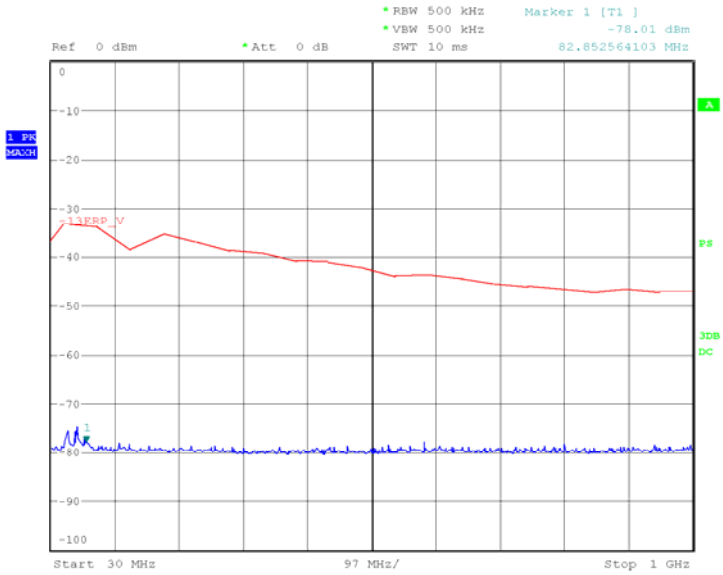
Configuration 1 - Mode 3

30MHz to 1GHz

Vertical



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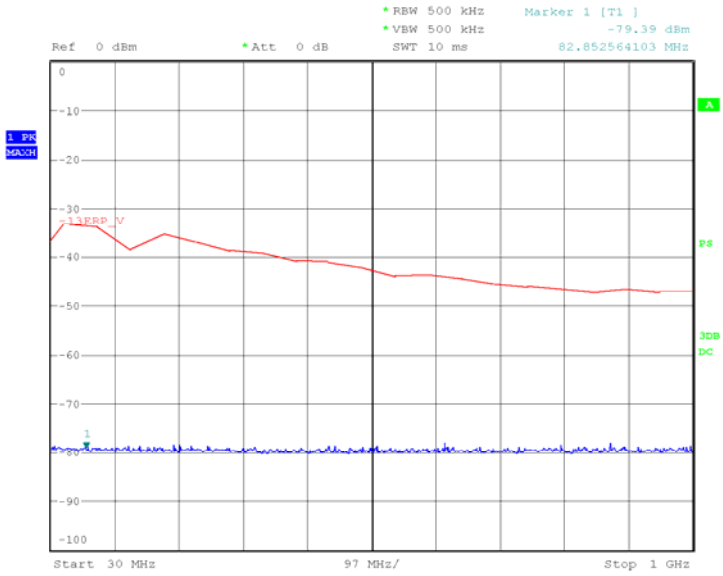

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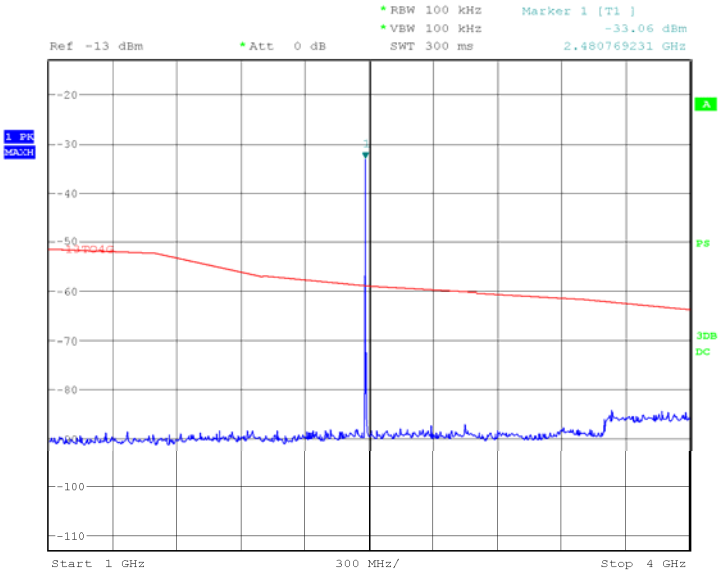
1GHz to 4GHz

Vertical



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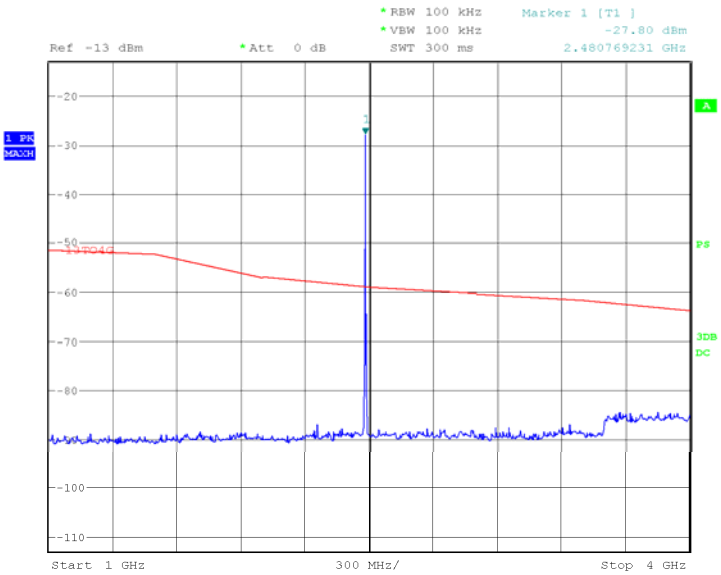
Horizontal

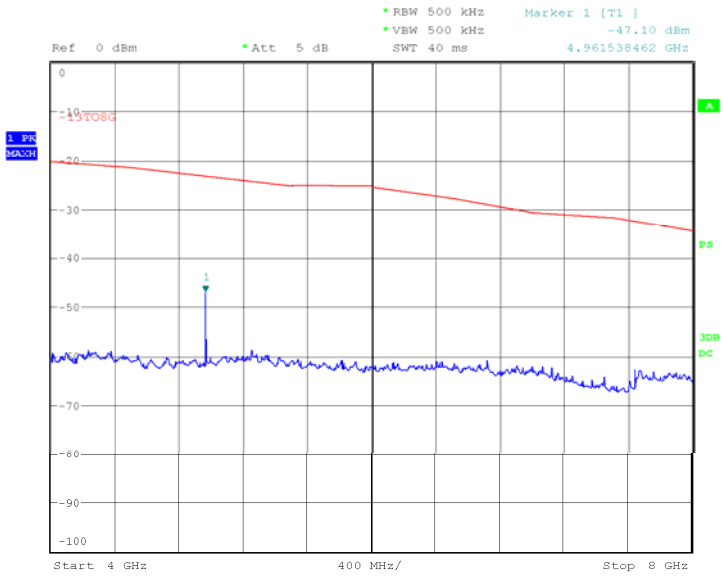


Date: 8.SEP.2009 21:37:52

Note: The emissions which are observed to exceed the limit on the plots above are intentional transmissions and therefore are excluded from testing.

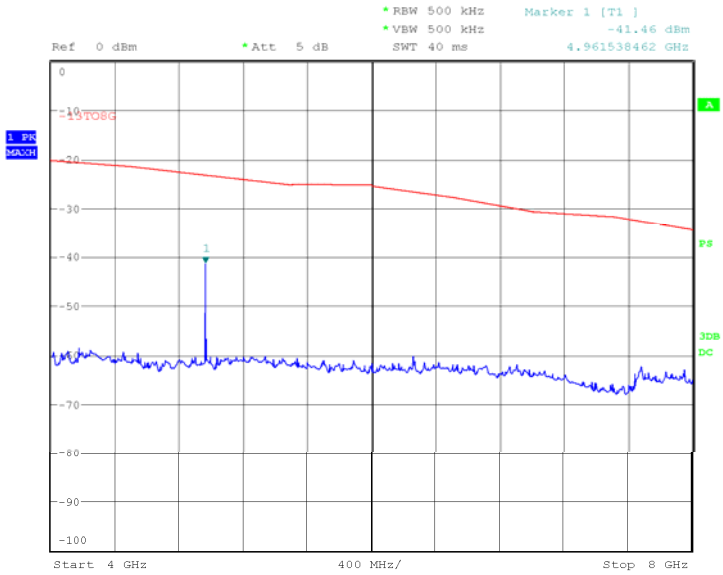
4GHz to 8GHz

Vertical



Date: 8.SEP.2009 23:13:54

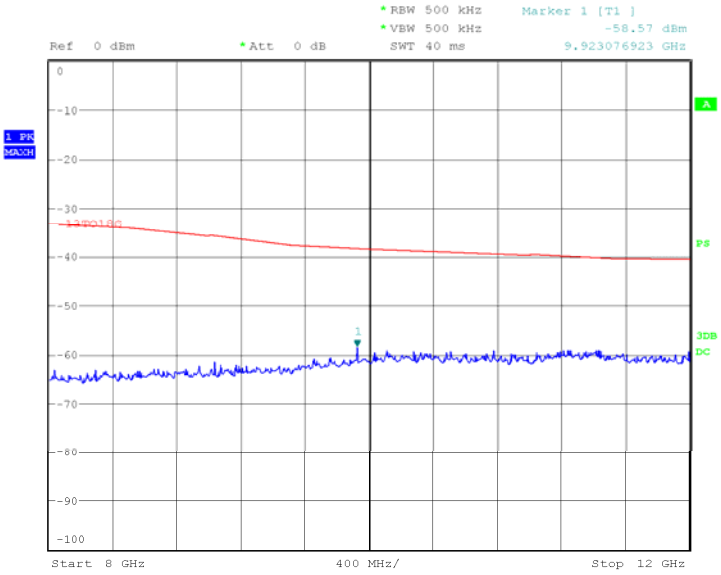
Horizontal



Date: 8.SEP.2009 23:17:28

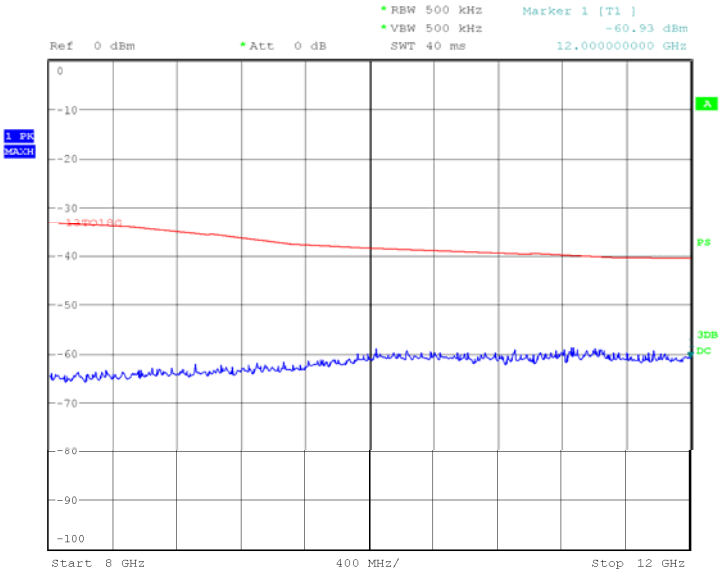
8GHz to 12GHz

Vertical



Date: 9.SEP.2009 01:05:19

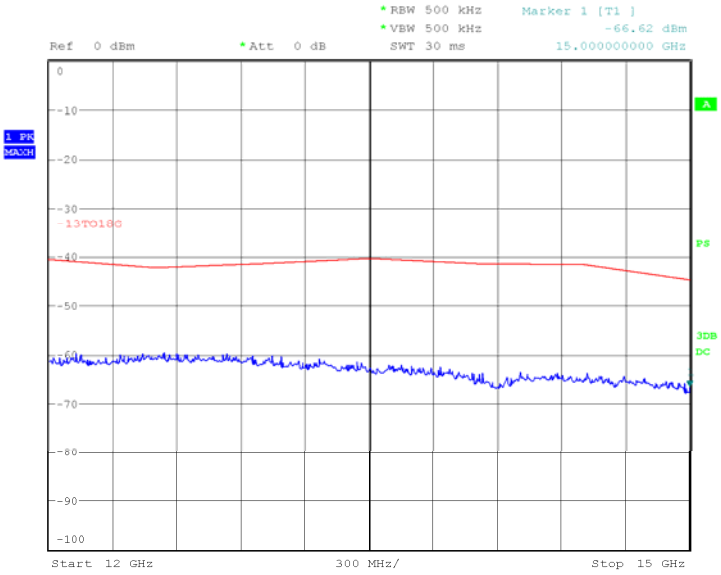
Horizontal



Date: 9.SEP.2009 01:21:42

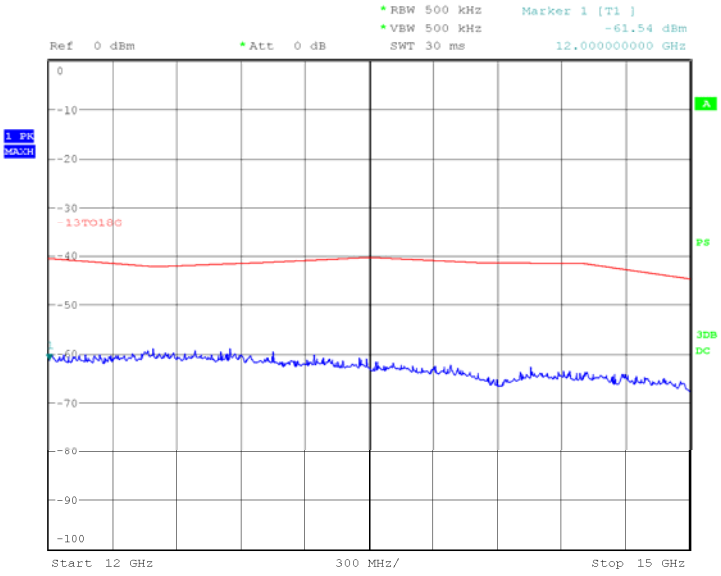
12GHz to 15GHz

Vertical



Date: 9.SEP.2009 01:29:39

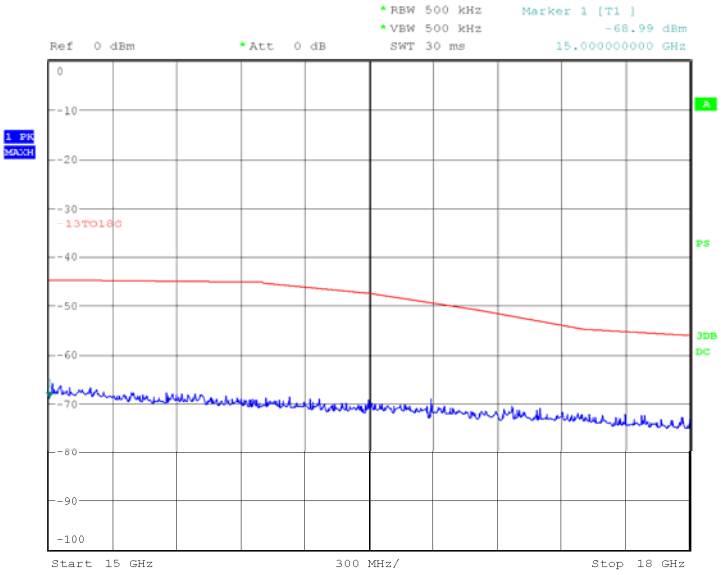
Horizontal



Date: 9.SEP.2009 01:23:59

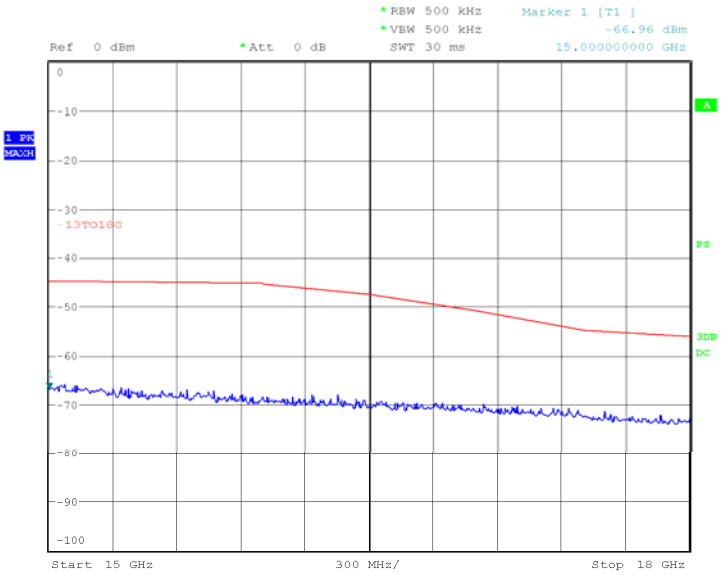
15GHz to 18GHz

Vertical



Date: 9.SEP.2009 01:17:56

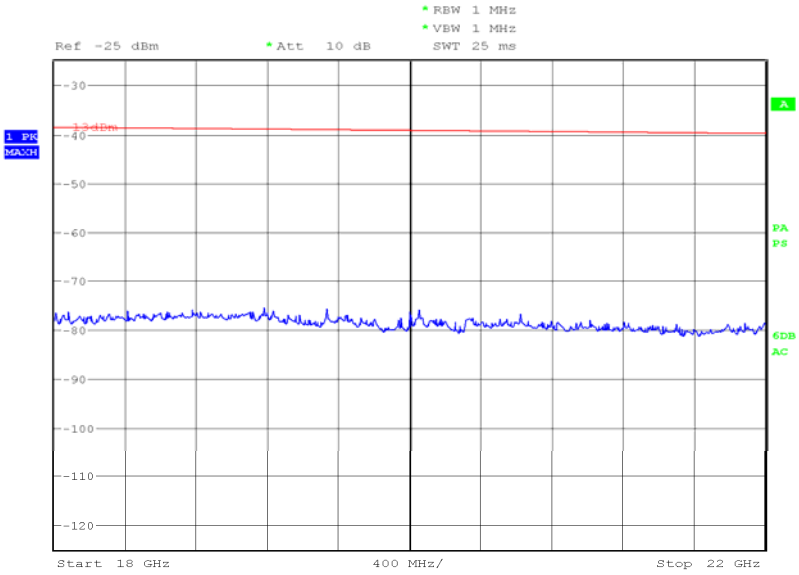
Horizontal



Date: 9.SEP.2009 01:26:22

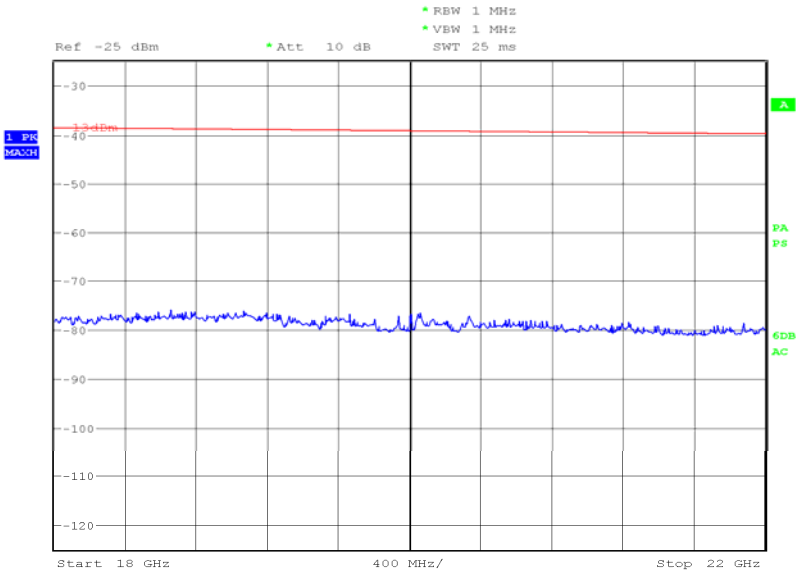
18GHz to 22GHz

Vertical



Date: 10.SEP.2009 12:15:00

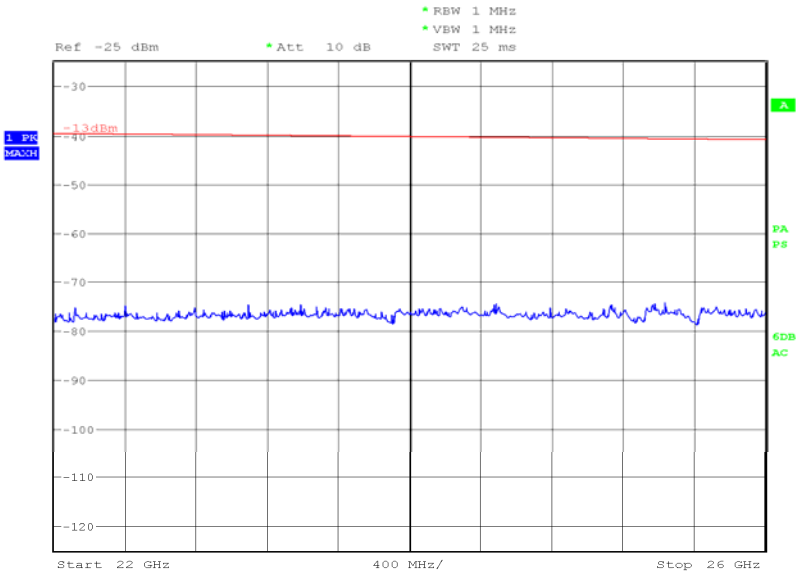
Horizontal



Date: 10.SEP.2009 12:24:38

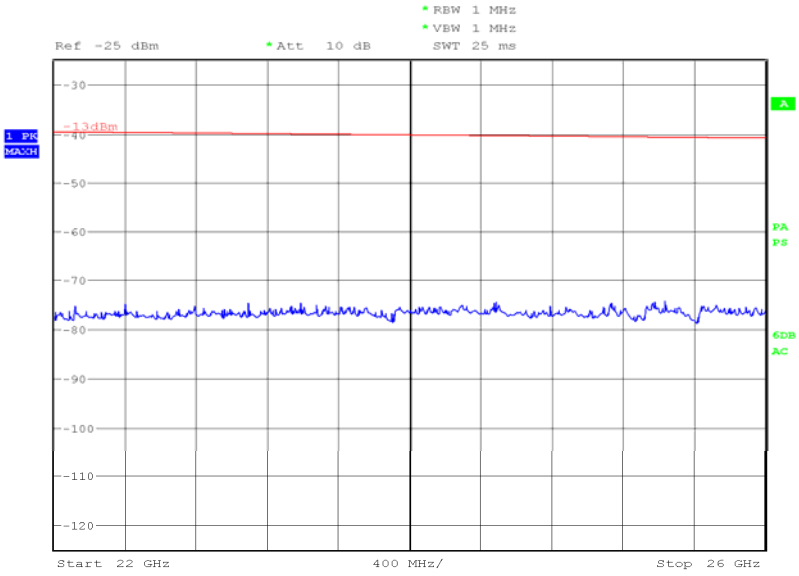
22GHz to 26GHz

Vertical



Date: 10.SEP.2009 12:22:26

Horizontal



Date: 10.SEP.2009 12:22:26

2.2 EIRP PEAK POWER

2.2.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.205, 2.1046

2.2.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.2.3 Date of Test and Modification State

08 September 2009 - Modification State 0

2.2.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.2.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 90.

The test was performed with the EUT in the following configurations and modes of operation:

Configuration 1 - Mode 1
- Mode 2
- Mode 3

2.2.6 Environmental Conditions

	08 September 2009
Ambient Temperature	21.2°C
Relative Humidity	49%
Atmospheric Pressure	1015mbar

2.2.7 Test Results

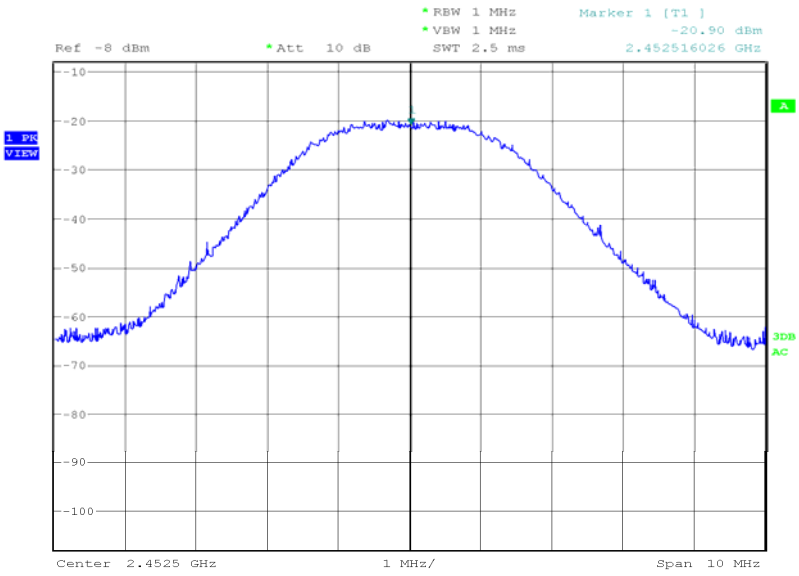
For the period of test the EUT met the requirements of FCC CFR 47 Part 90 for EIRP Peak Power.

The test results are shown below.

Configuration 1 - Mode 1

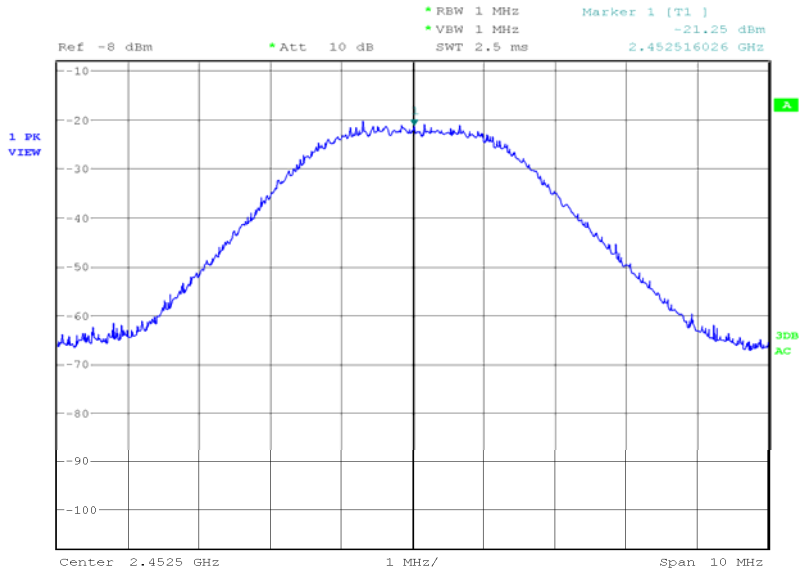
QPSK Modulation

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
2.45250	28.8	37	0.759	5



16QAM Modulation

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
2.45250	29.0	37	0.794	5

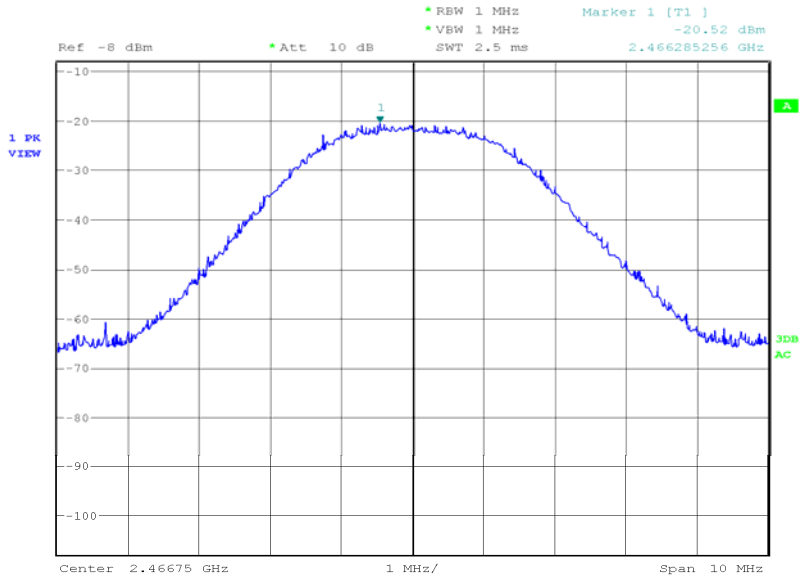


Date: 8.SEP.2009 19:38:51

Configuration 1 - Mode 2

QPSK Modulation

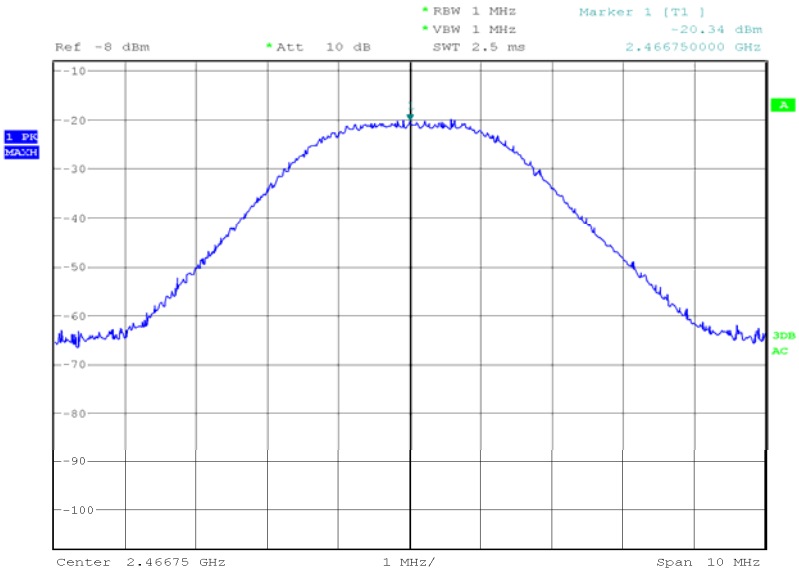
Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
2.46675	29.2	37	0.832	5



Date: 8.SEP.2009 18:19:20

16QAM Modulation

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
2.46675	29.2	37	0.832	5

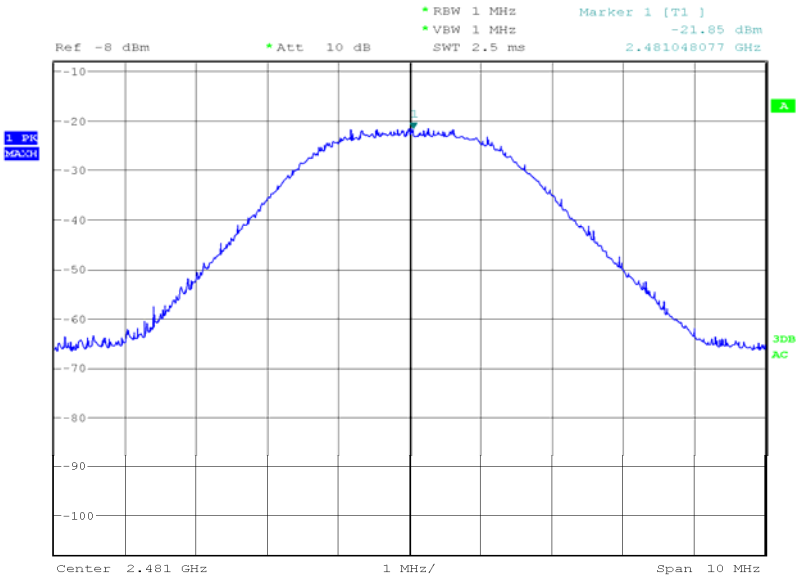


Date: 8.SEP.2009 19:56:28

Configuration 1 - Mode 3

QPSK Modulation

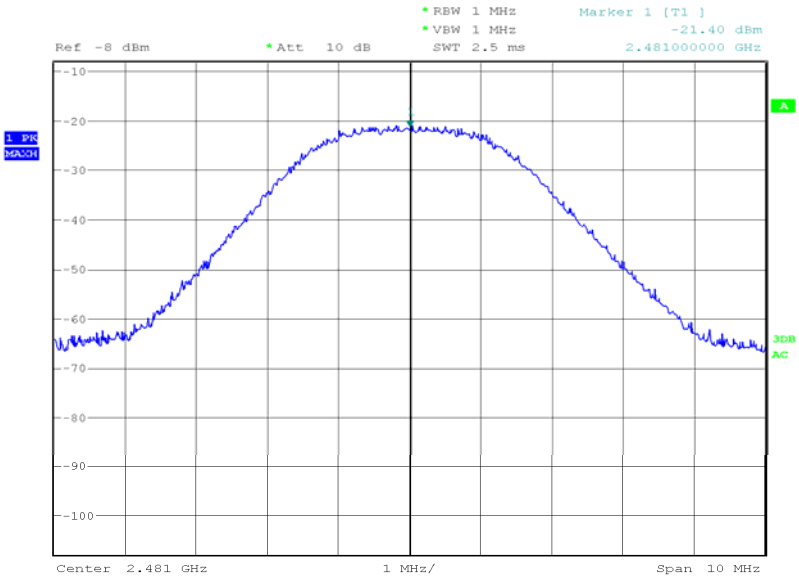
Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
2.48100	27.5	37	0.562	5



Date: 8.SEP.2009 18:34:17

16QAM Modulation

Frequency	Result (dBm)	Limit (dBm)	Result (W)	Limit (W)
2.48100	27.6	37	0.575	5



Date: 8.SEP.2009 20:10:35

2.3 POWER AND ANTENNA HEIGHT LIMITS

2.3.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.205, 2.1046

2.3.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.3.3 Date of Test and Modification State

19 August 2009 – Modification State 0

2.3.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.3.5 Test Procedure

Test Performed in accordance with FCC CFR 47 Part 90.

The EUT was connected to a peak power analyser via a 20dB attenuator and cable. The path loss between the EUT and power sensor was measured and used as an offset in the measuring equipment. Both the peak and average power levels at maximum power and QPSK and QAM modulation schemes were measured. This was to demonstrate compliance with the maximum allowed power of 5W as defined in 90.205(o). Due to the nature of the carrier (COFDM), the signal has a high peak to average ratio. The manufacturer declares their power as average, thus the power has also been measured as an average to demonstrate compliance with 90.205 (s).

2.3.6 Environmental Conditions

	19 August 2009
Ambient Temperature	23°C
Relative Humidity	54%

2.3.7 Test Results

Carrier Power

Frequency (MHz)	QPSK				16QAM			
	Average		Peak		Average		Peak	
	dBm	mW	dBm	mW	dBm	mW	dBm	mW
2452.50	15.60	36.31	22.45	175.79	15.65	36.73	22.35	171.79
2466.75	15.56	35.97	22.33	171.00	15.54	35.81	22.23	167.11
2481.00	15.42	34.83	21.83	152.41	15.44	34.99	22.07	161.06

Limit Clause

90.205(o)

2450 – 2483.5 MHZ	≤ 5W

90.205(s)

The output power shall not exceed 20% of the manufacturers rated output power 100mW	Limit: 120mW or 20.8dBm

2.4 TYPES OF EMISSION

2.4.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.207, 2.1049

2.4.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.4.3 Date of Test and Modification State

20 August 2009 – Modification State 0

2.4.4 Test Procedure

Test Performed in accordance with FCC CFR 47 Part 90.

The EUT operates with a measured channel bandwidth of 2.3MHz and has a declared authorised bandwidth of 2.5MHz. The EUT can operate with 16QAM or QPSK modulation. Therefore, the type of emission can be classified as follows:

QPSK: 2M5G2D
16QAM: 2M5W2D

The measurements in section 2.3 Bandwidth Limitations show compliance with the emission designators described above.

2.4.5 Environmental Conditions

	20 August 2009
Ambient Temperature	23°C
Relative Humidity	52%

2.5 BANDWIDTH LIMITATIONS

2.5.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.209, 2.1049

2.5.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.5.3 Date of Test and Modification State

19 August 2009 – Modification State 0

2.5.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.5.5 Test Procedure

Test Performed in accordance with FCC CFR 47 Part 90.

The EUT was connected to a spectrum analyser using a 20dB attenuator and cable. Using the test software supplied, the EUT was configured to transmit with a 2.5MHz channel spacing with QPSK and QAM modulation schemes at maximum power. A resolution bandwidth of 10kHz was used in conjunction with the spectrum analysers occupied bandwidth function to determine the bandwidth of the transmitted signal.

2.5.6 Environmental Conditions

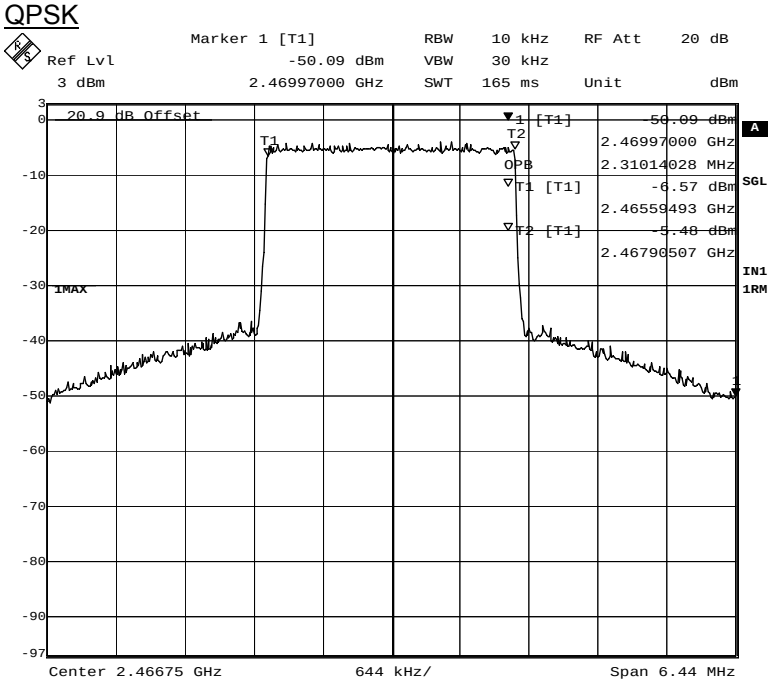
	19 August 2009
Ambient Temperature	22°C
Relative Humidity	55%

2.5.7 Test Results

Carrier Power

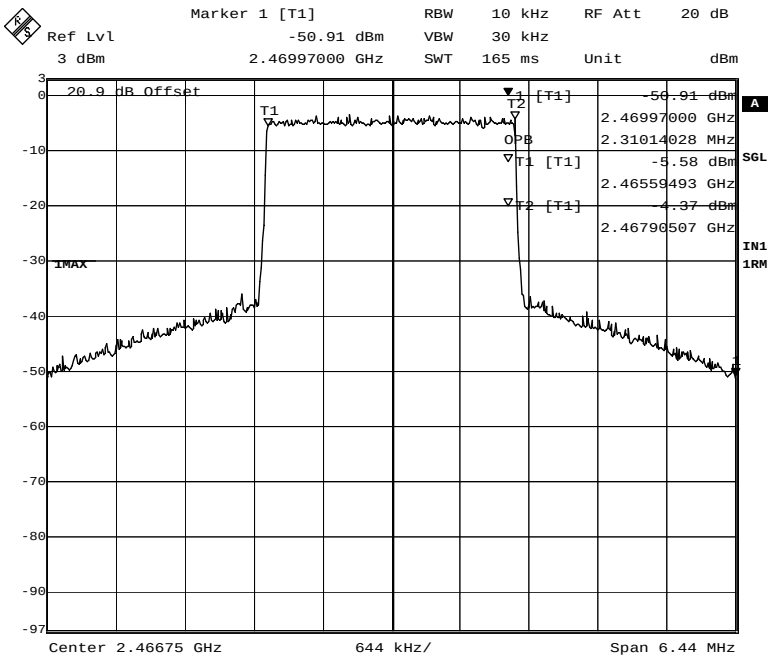
Frequency (MHz)	Occupied Bandwidth (99%)	
	QPSK	16QAM
2466.75	2.3101	2.3101

QPSK



Date: 20.AUG.2009 12:32:24

16QAM



Date: 20.AUG.2009 12:30:40

2.6 EMISSION MASK

2.6.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.210, 2.1051

2.6.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.6.3 Date of Test and Modification State

20 August 2009 – Modification State 0

2.6.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.6.5 Test Procedure

Test Performed in accordance with FCC CFR 47 Part 90.

In clause 90.210, the frequency band 2450 – 2483.5MHz is not listed in the table. Therefore, "All other bands" mask has been used. In accordance with 90.210 (n), mask B has been used to demonstrate compliance. It was not possible to transmit an unmodulated carrier, therefore the wideband power was measured. Due to the wideband nature of the signal, it was not possible to measure the emission mask using a resolution bandwidth which would show the correct power level. Therefore, the difference between the measurement bandwidth and the occupied bandwidth was established.

$$10 \log \frac{2.323\text{MHz}}{10\text{kHz}} = 23.7\text{dB}$$

∴ Taking the worst case, (lowest power) the reference level would normally be 15.4dBm, however, because using a smaller RBW reduces the amplitude of the signal, the reference level is adjusted by 23.7dBm and becomes -8.3dBm.

The spectrum analyser RBW was chosen so the signal shape was not influenced by the RBW filter. The VBW was set to three times the RBW. The detector was set to RMS and trace averaging applied as the reference power was an average measurement. The plots were recorded and are shown on the following pages.

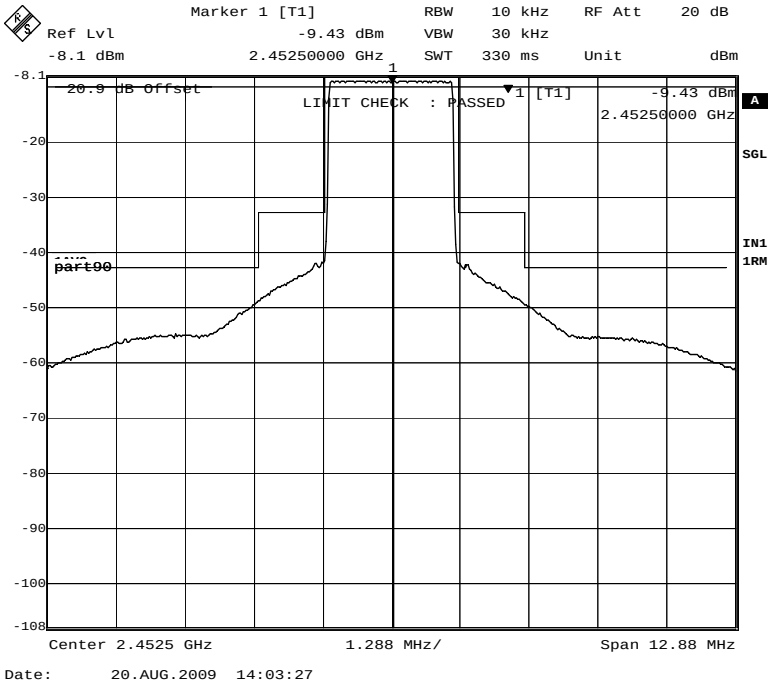
2.6.6 Environmental Conditions

	20 August 2009
Ambient Temperature	22°C
Relative Humidity	59%

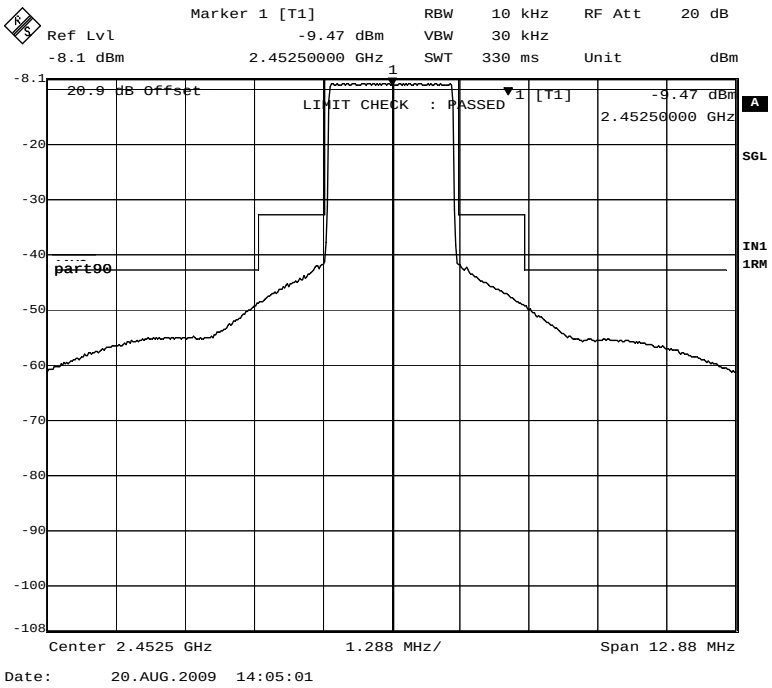
2.6.7 Test Results

2452.50 MHz

QPSK

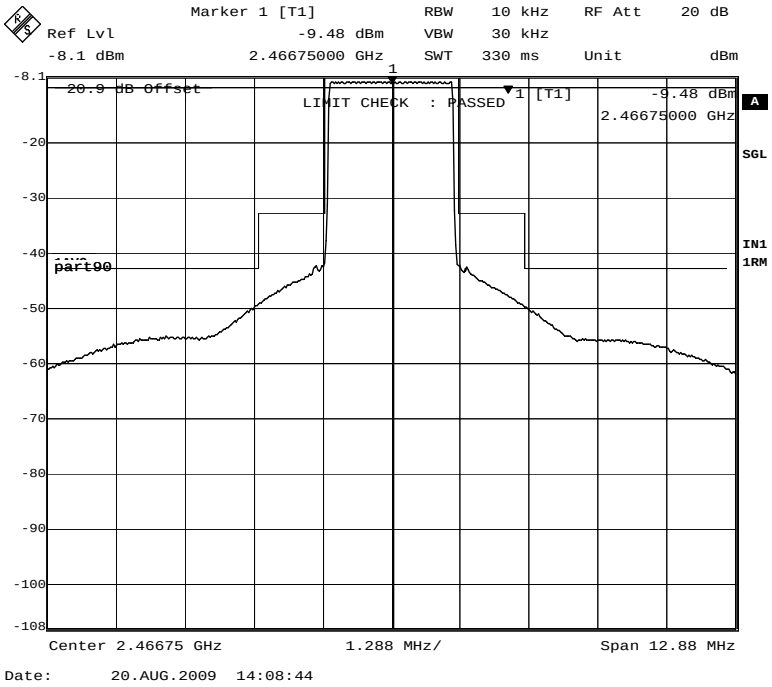


16QAM



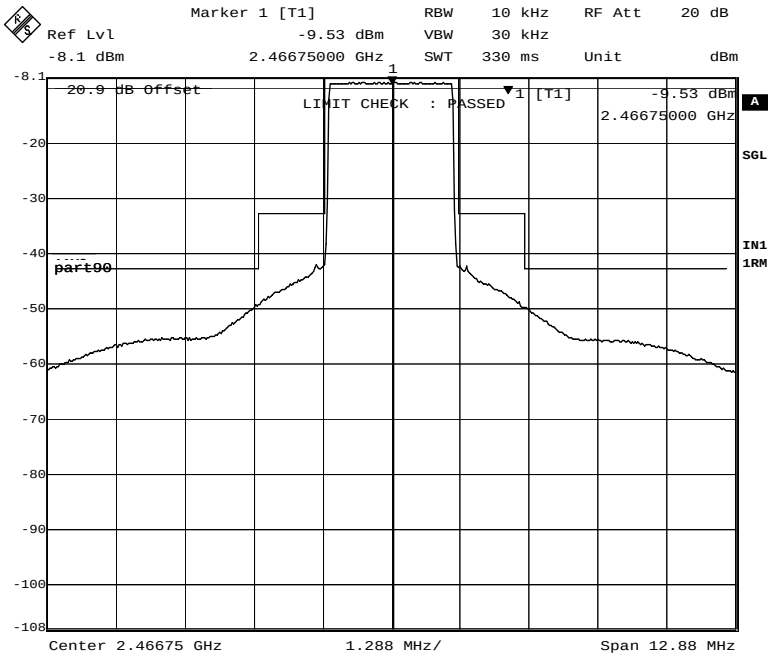
2466.75

QPSK



Date: 20.AUG.2009 14:08:44

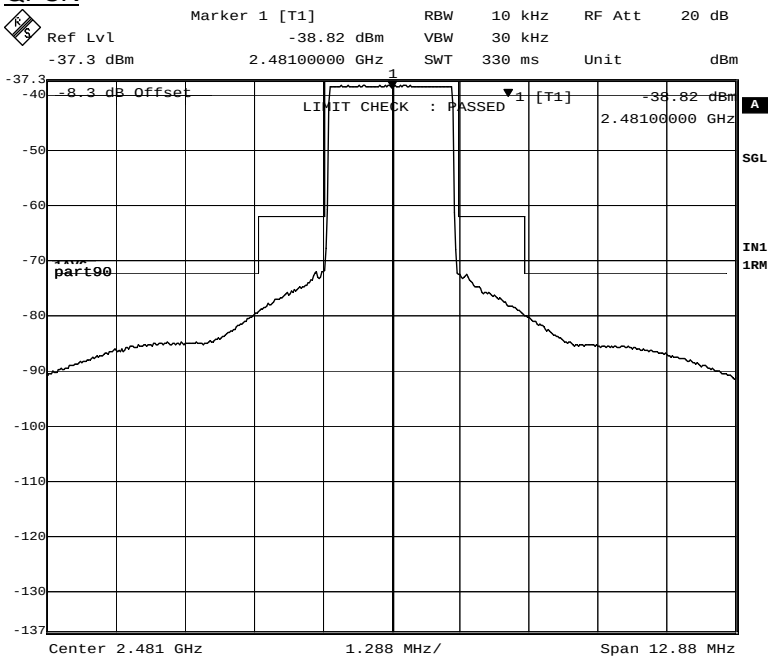
16QAM



Date: 20.AUG.2009 14:07:16

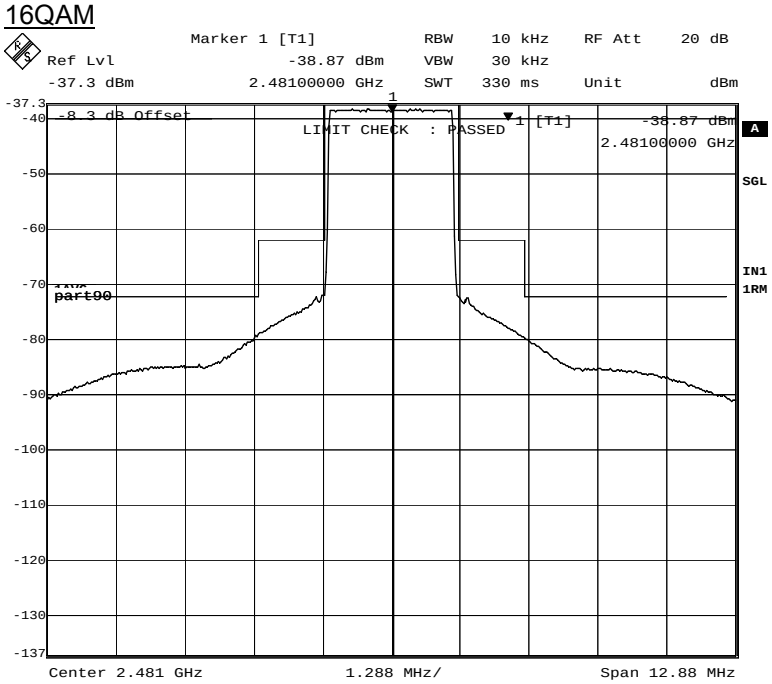
2481.00

QPSK



Date: 20.AUG.2009 14:10:41

16QAM



Date: 20.AUG.2009 14:12:44

2.7 FREQUENCY STABILITY

2.7.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.213

2.7.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.7.3 Date of Test and Modification State

02 September 2009 – Modification State 0

2.7.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.7.5 Test Procedure

Test Performed in accordance with FCC CFR 47 Part 90.

The EUT was placed in a climatic chamber and set to transmit on maximum power on the middle channel. The EUT could not be operated without modulation, hence a spectrum analyser was used. To measure the frequency the -6dB points at the upper and lower part of the spectrum were recorded. The centre frequency was calculated by f1 + (f2 - f1/2), where f_1 was the lower -6dB frequency and f_2 was the upper -6dB frequency, the temperature was varied between -30°C and +50°C as defined in 2.1055. At 20°C the voltage was varied by 15% as defined in 2.1055(d)(1). The results are shown in the table below.

2.7.6 Environmental Conditions

	02 September 2009
Ambient Temperature	24°C
Relative Humidity	48%

2.7.7 Test Results

2466.75 MHz

Temperature	Supply Voltage	Frequency Error (Hz)	Frequency Error (ppm)
+50°C	12 V DC	-3686	-1.49
+40°C	12 V DC	-3612	-1.46
+30°C	12 V DC	-3330	-1.35
+20°C	13.8 V DC	-3682	-1.57
+20°C	12 V DC	-3826	-1.55
+20°C	10.2 V DC	-3858	-1.56
+10°C	12 V DC	-3261	-1.32
0°C	12 V DC	-2584	-1.04
-10°C	12 V DC	-1854	-0.75
-20°C	12 V DC	-895	-0.36
-30°C	12 V DC	-77	-0.03

Limit

The frequency stability is to be determined by the station authorisation.

2.8 MODULATION CHARACTERISTICS

2.8.1 Specification Reference

FCC CFR 47 Part 90, Clause 2.1047

2.8.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.8.3 Test Procedure

As declared by the customer.

Description of Modulation

Orthogonal frequency-division multiplexing (OFDM) – essentially identical to Coded OFDM (COFDM) – is a scheme utilised as a digital multi-carrier modulation method. A large number of closely-spaced orthogonal sub-carriers are used to carry data. The data is divided into several parallel data streams or channels, one for each sub-carrier. Each sub-carrier is modulated with a conventional modulation scheme, such as Quadrature Phase Shift Keying (QPSK) or Quadrature Amplitude Modulation (QAM) at a low symbol rate, maintaining total data rates similar to conventional single-carrier modulation schemes in the same bandwidth.

Phase-shift keying (PSK) is a digital modulation scheme that conveys data by modulating the phase of the carrier wave. Quadrature phase-shift keying (QPSK) uses four points on the constellation diagram, equispaced around a circle. With four phases, QPSK can encode two bits per symbol.

Quadrature amplitude modulation (QAM) conveys two digital bit streams, by changing the amplitudes of two carrier waves, using the amplitude-shift keying (ASK) digital modulation scheme. 16QAM uses sixteen points on the constellation diagram and can encode four bits per symbol, thus carrying twice the amount of data than QPSK.

2.9 EMISSION MASK

2.9.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.210(b)(3)

2.9.2 Equipment Under Test

SOLO Transmitter, S/N: 003018

2.9.3 Date of Test and Modification State

20 August 2009 – Modification State 0

2.9.4 Test Equipment Used

The major items of test equipment used for the above tests are identified in Section 3.1.

2.9.5 Test Procedure

Test Performed in accordance with FCC CFR 47 Part 90.

In accordance with 2.1051 and 90.210(b)(3), the spurious emissions from the antenna terminal were measured. The transmitter output power going into the spectrum analyser was attenuated using a combination of fitters and attenuators with the frequency spectrum being investigated between 9kHz and 25GHz. The EUT was set to transmit on full power with QPSK and 16QAM modulations. The worst case path loss in each measurement range was measured and entered as a reference level offset in the spectrum analyser. The EUT was tested on bottom, middle and top channels. The RBW below 1000MHz was set to 100kHz and 1MHz above 1000MHz as defined in 90.210(o).

The detector was set to peak with the trace set to max hold.

From 9kHz to 4GHz a 20dB attenuator was used
From 4GHz to 18GHz a high pass filter and 10dB attenuator was used
From 18GHz to 25GHz a waveguide was used.

2.9.6 Environmental Conditions

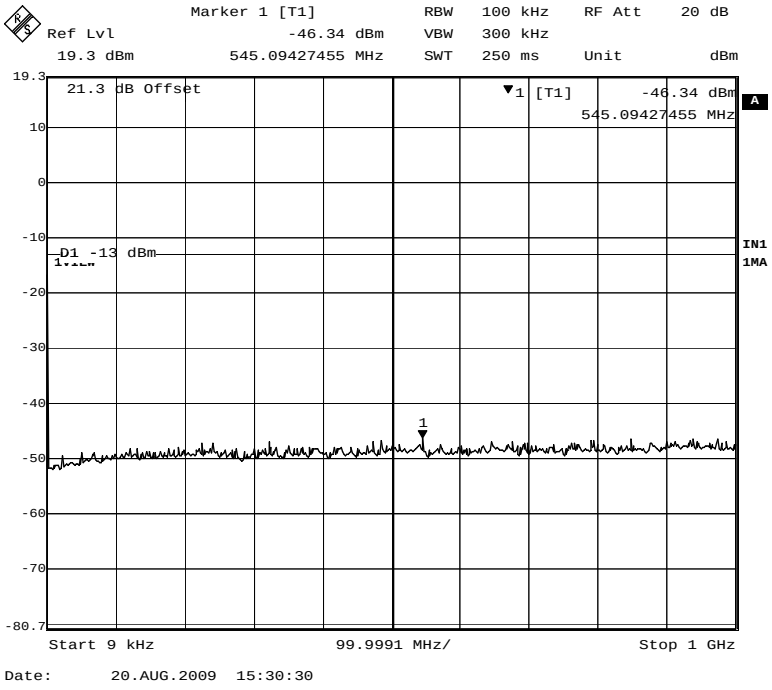
	20 August 2009
Ambient Temperature	23°C
Relative Humidity	53%

2.9.7 Test Results

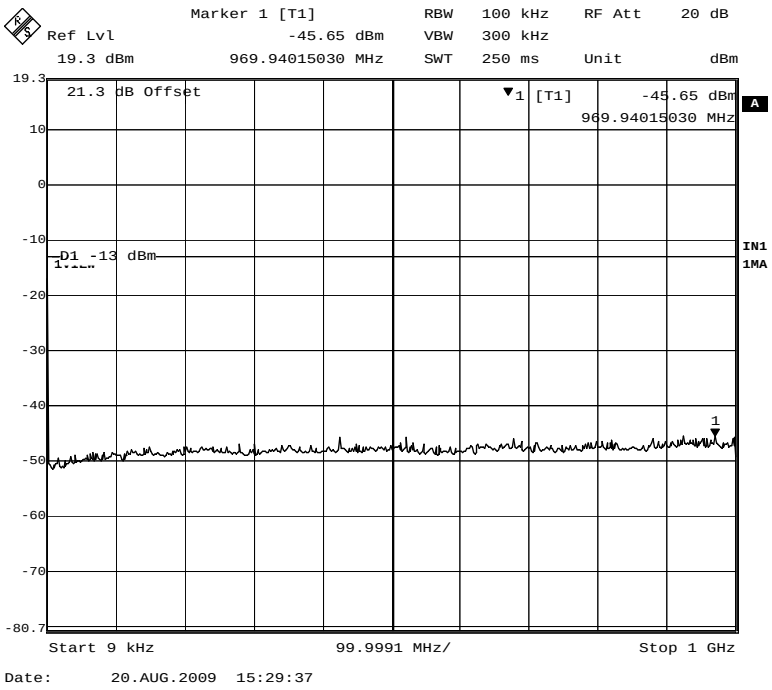
2452.50 MHz

9kHz to 1GHz

QPSK

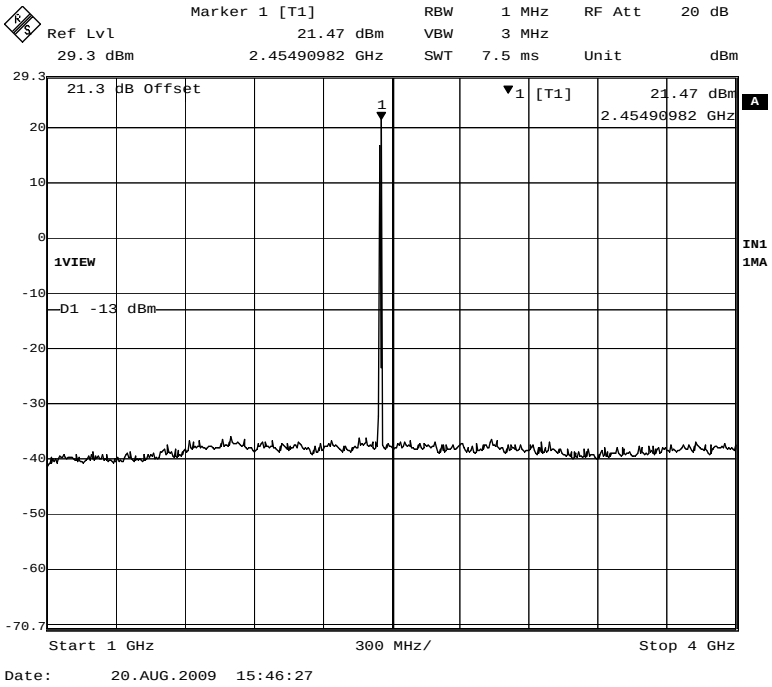


16QAM

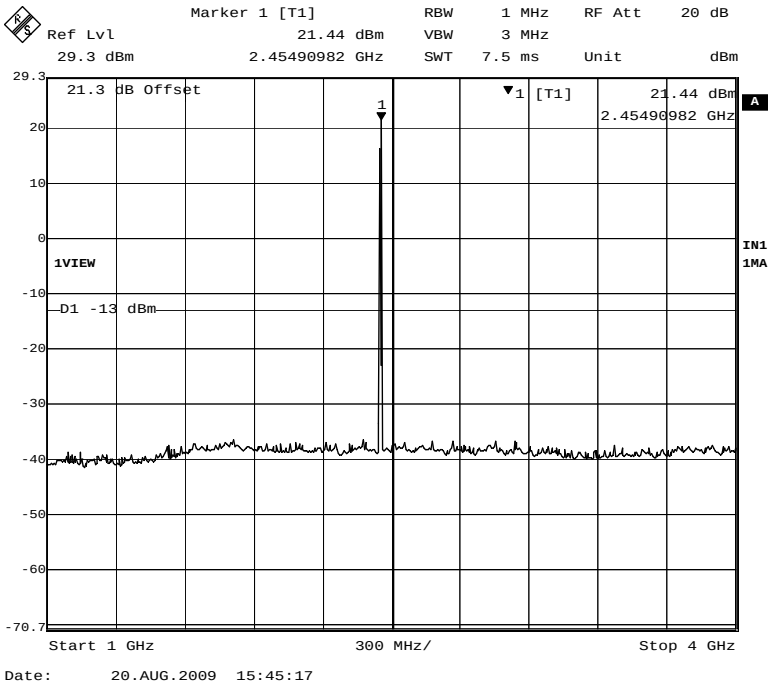


1GHz to 4GHz

QPSK



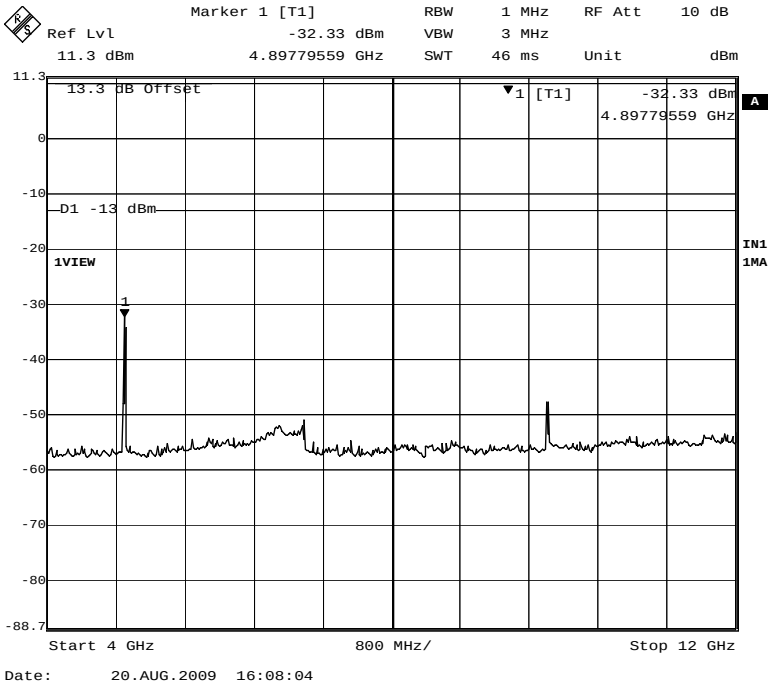
16QAM



Note: The emissions which are observed to exceed the limit on the plots above are intentional transmissions and therefore are excluded from testing.

4GHz to 12GHz

QPSK



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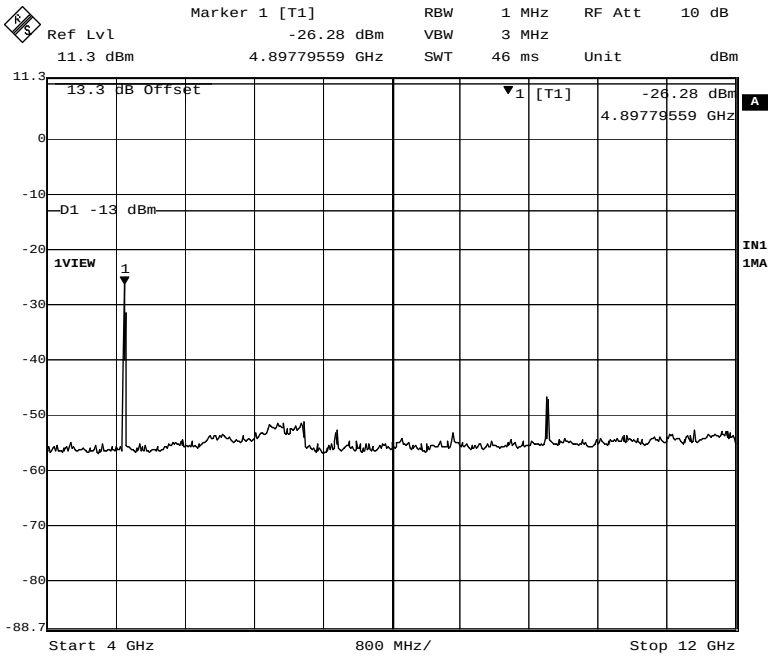
16QAM



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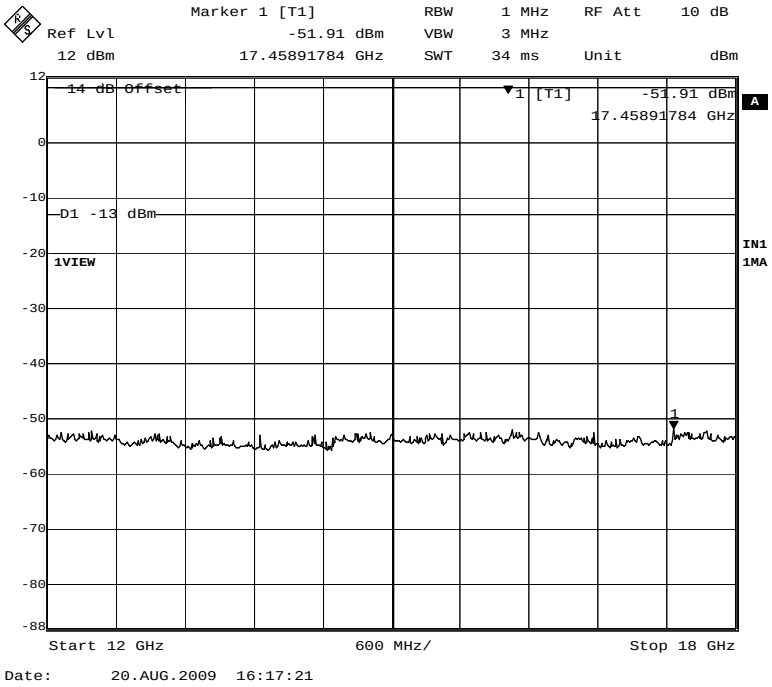
12GHz to 18GHz

QPSK



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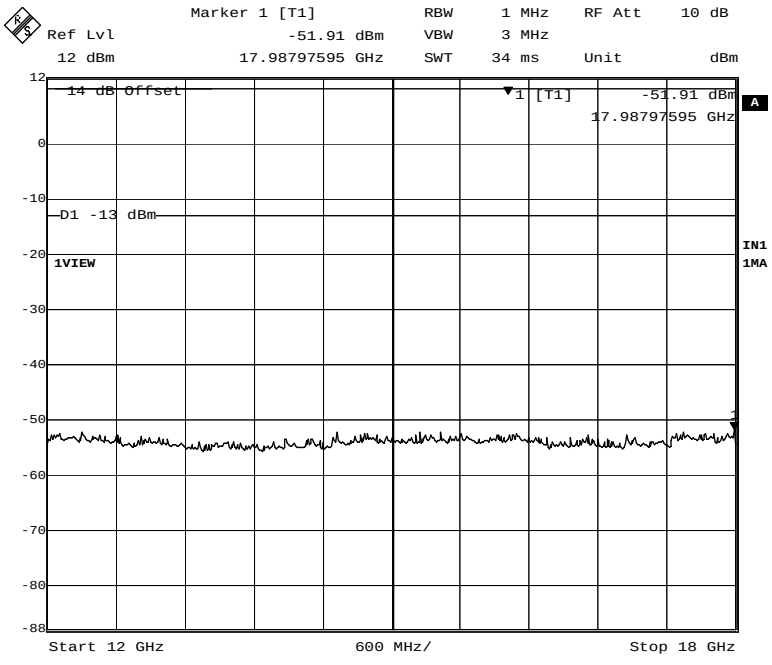

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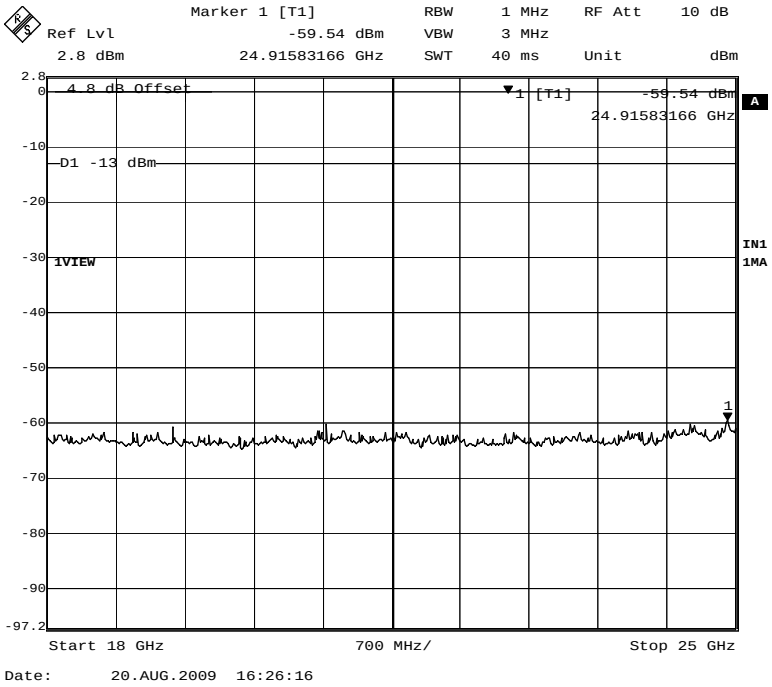
18GHz to 25GHz

QPSK



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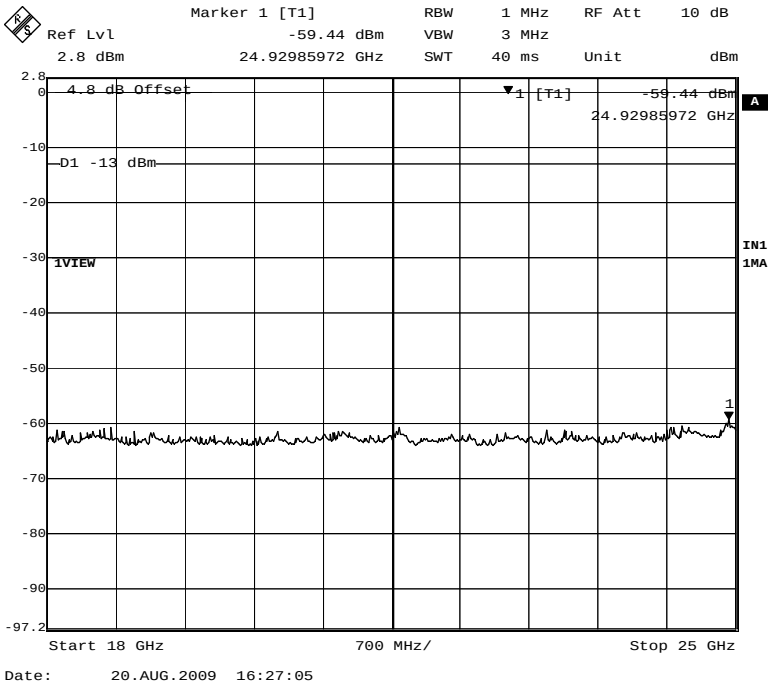
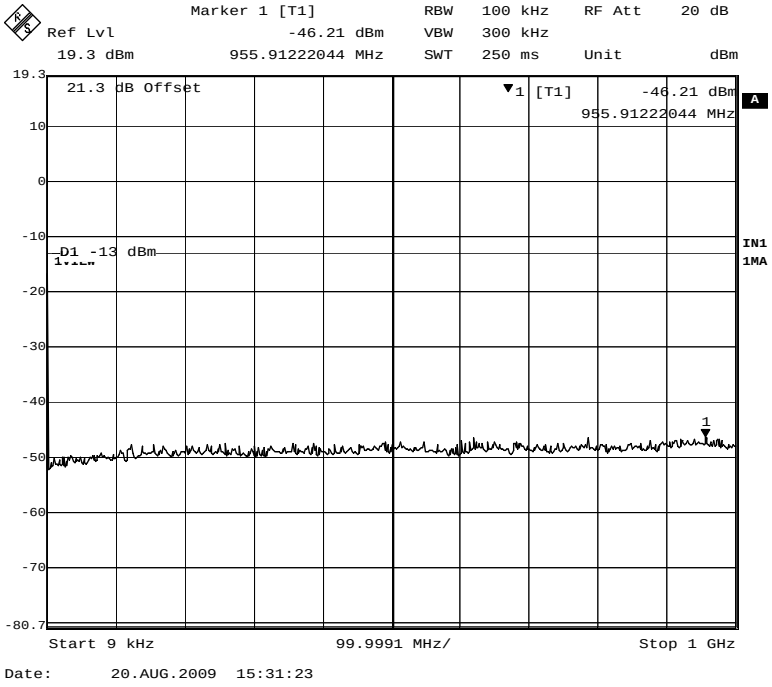


2466.75 MHz

9kHz to 1GHz

QPSK



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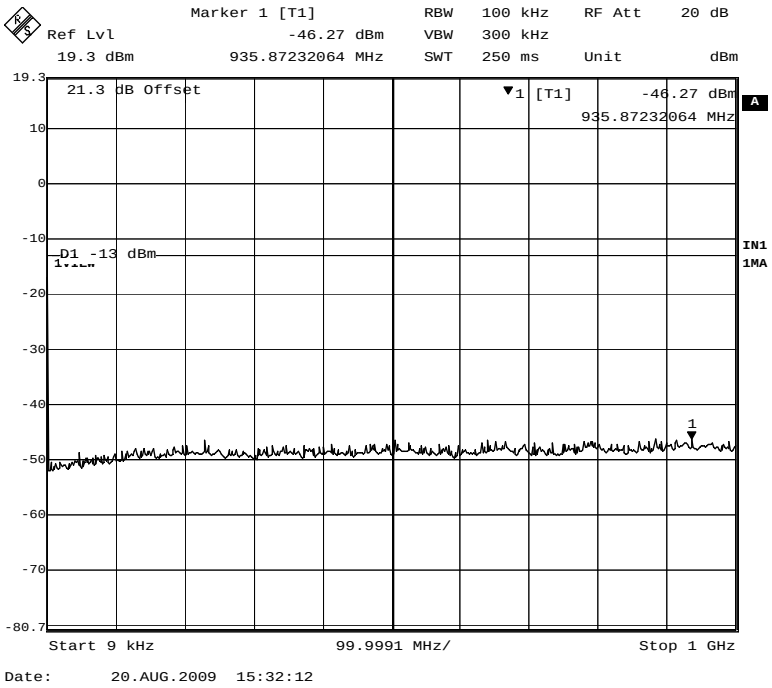
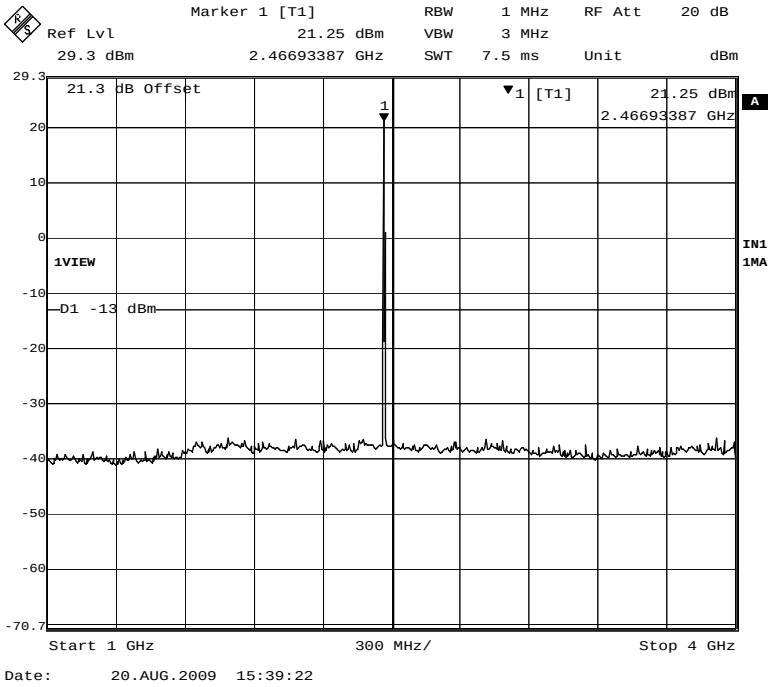


1GHz to 4GHz

QPSK



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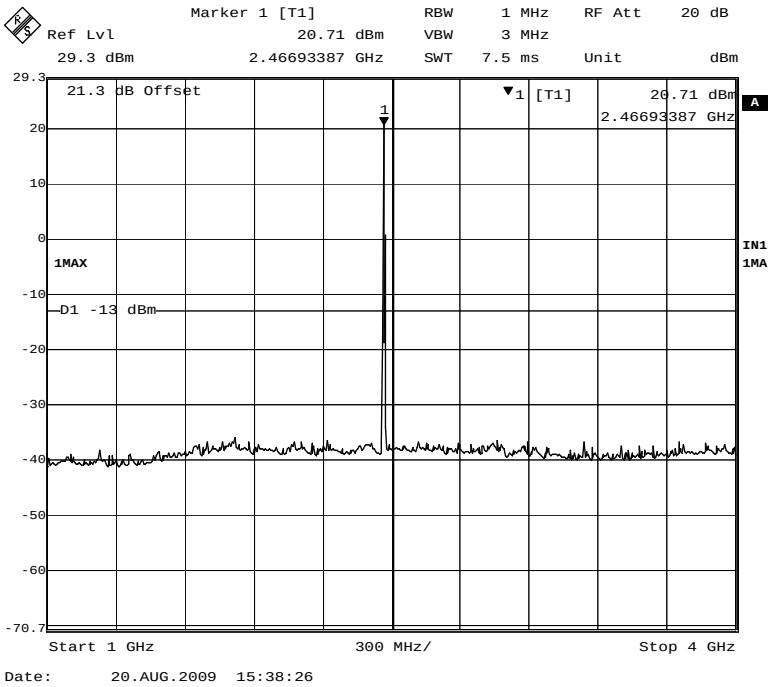
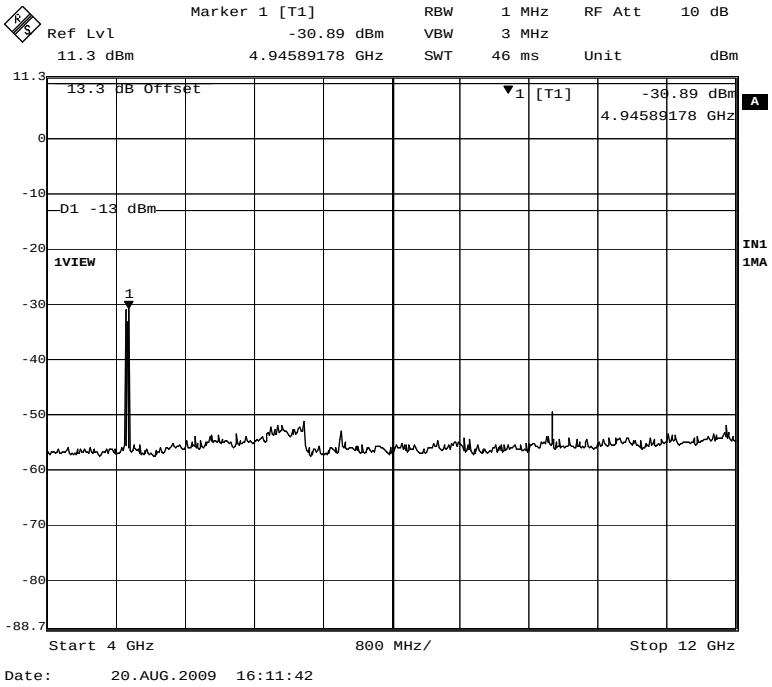


Note: The emissions which are observed to exceed the limit on the plots above are intentional transmissions and therefore are excluded from testing.

4GHz to 12GHz

QPSK



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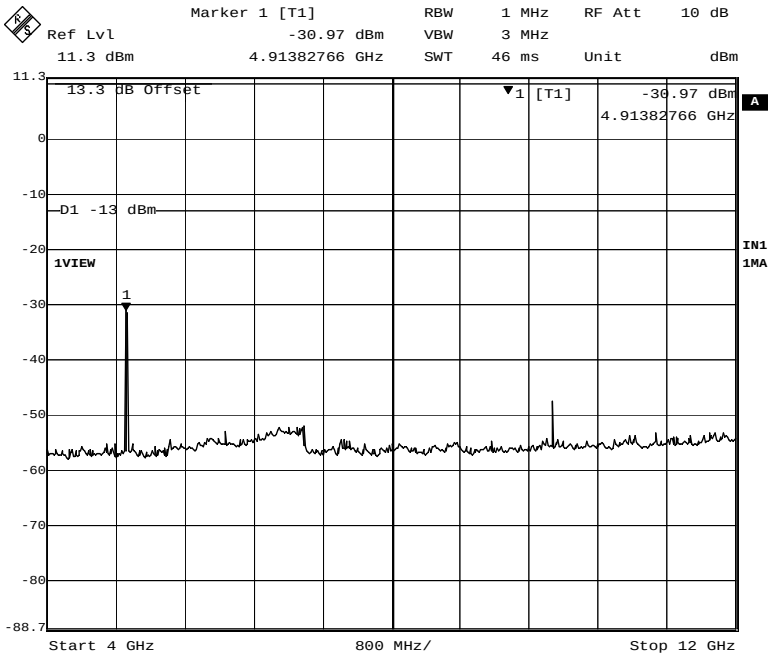

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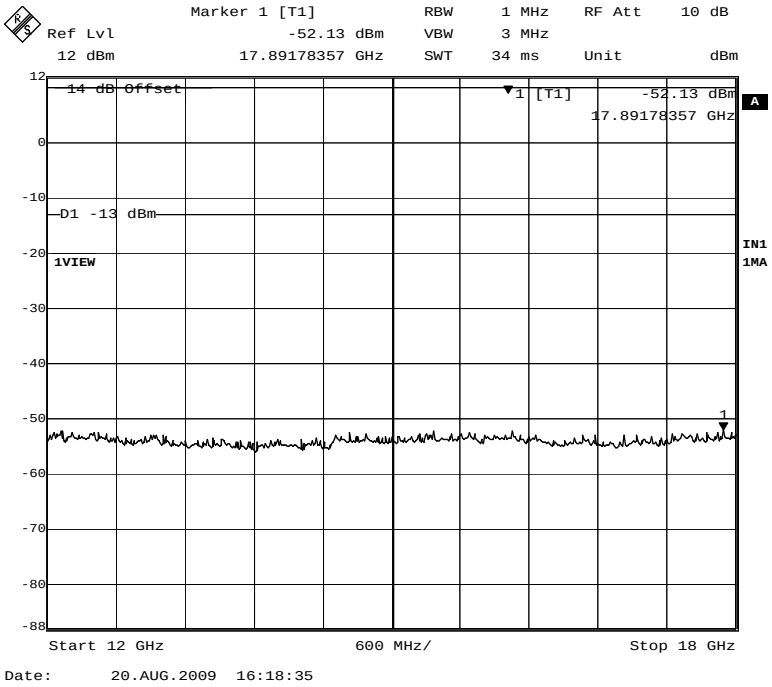
12GHz to 18GHz

QPSK



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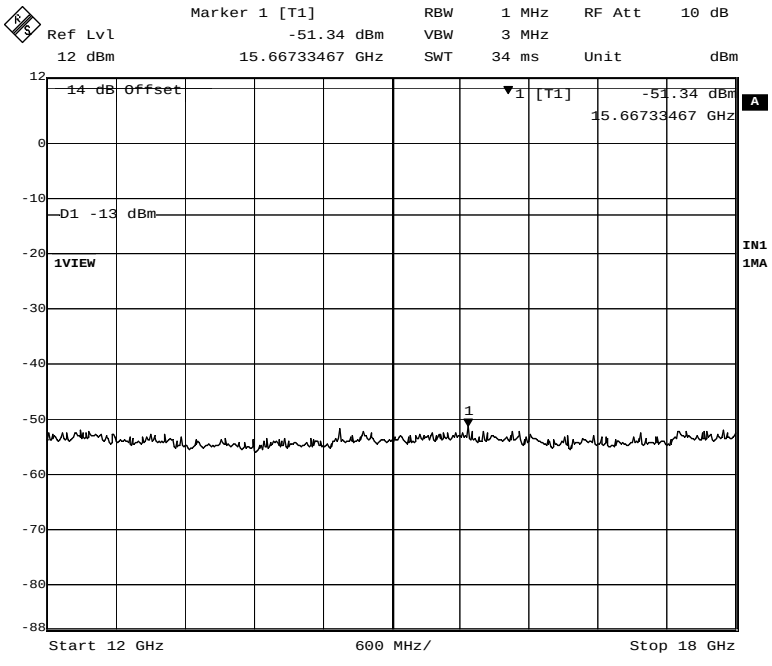
16QAM



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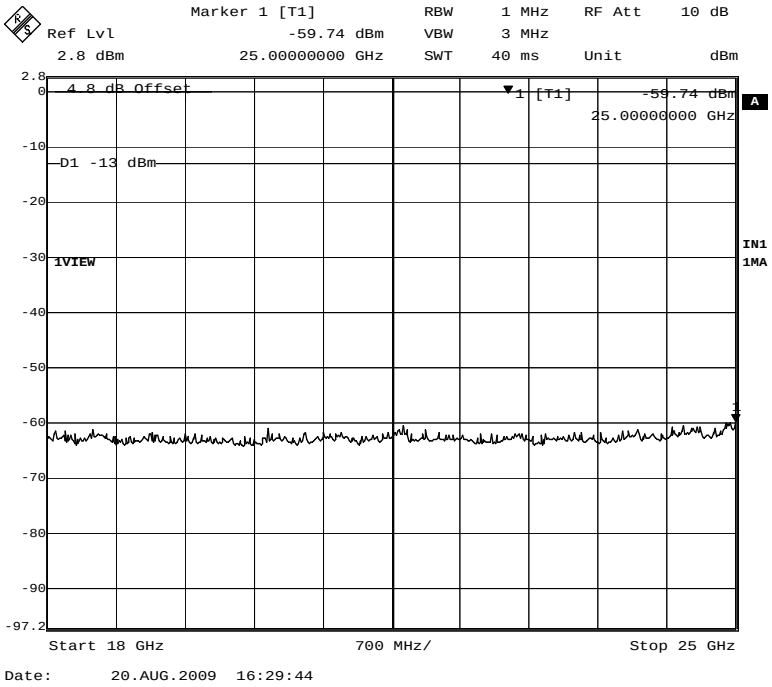
18GHz to 25GHz

QPSK



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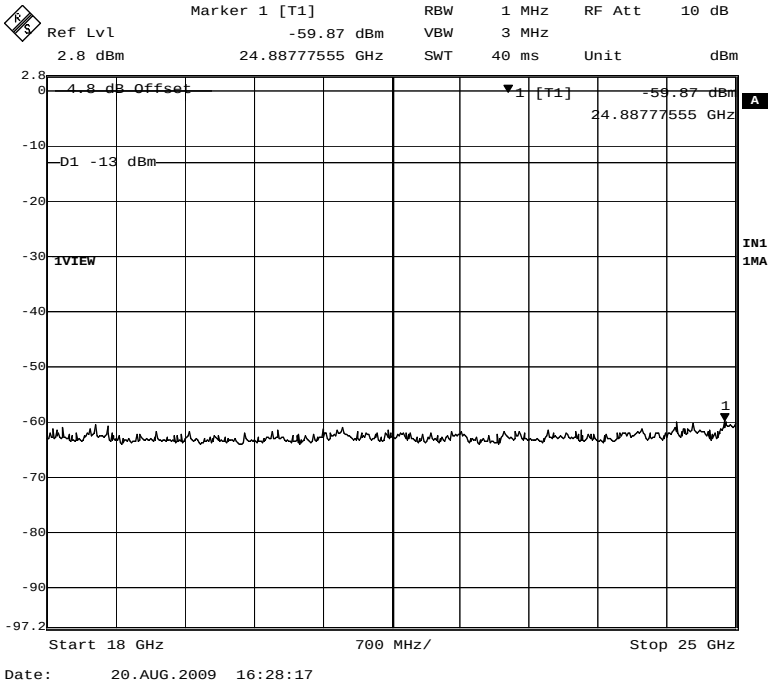
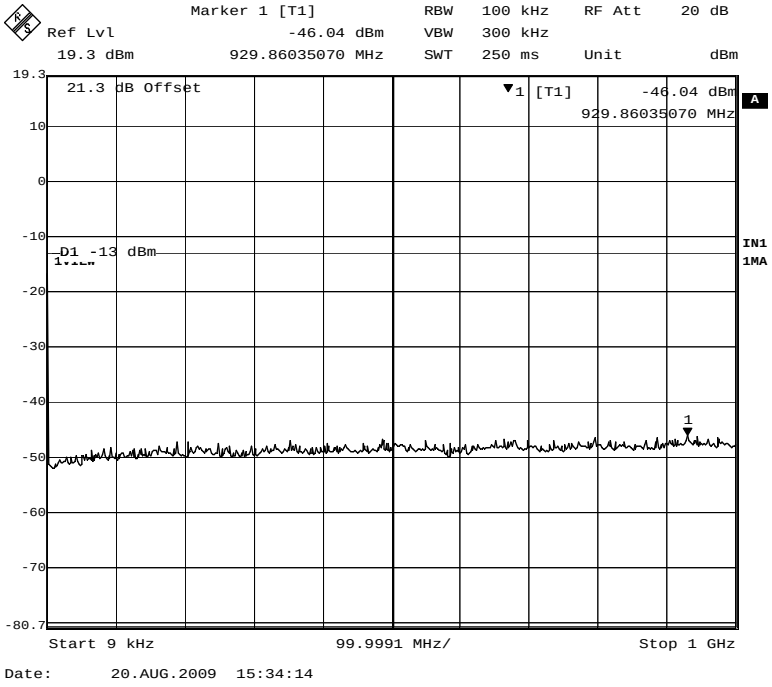


2481.00 MHz

9kHz to 1GHz

QPSK



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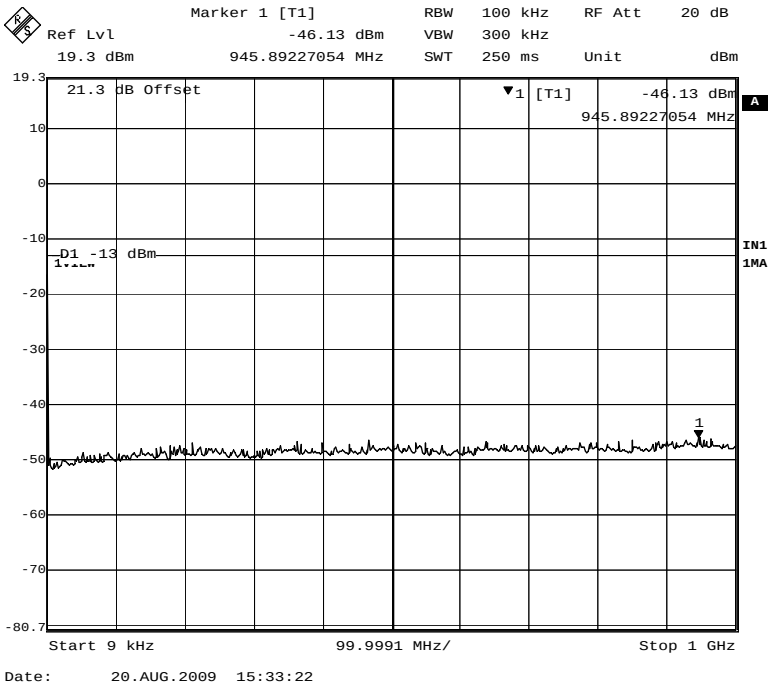
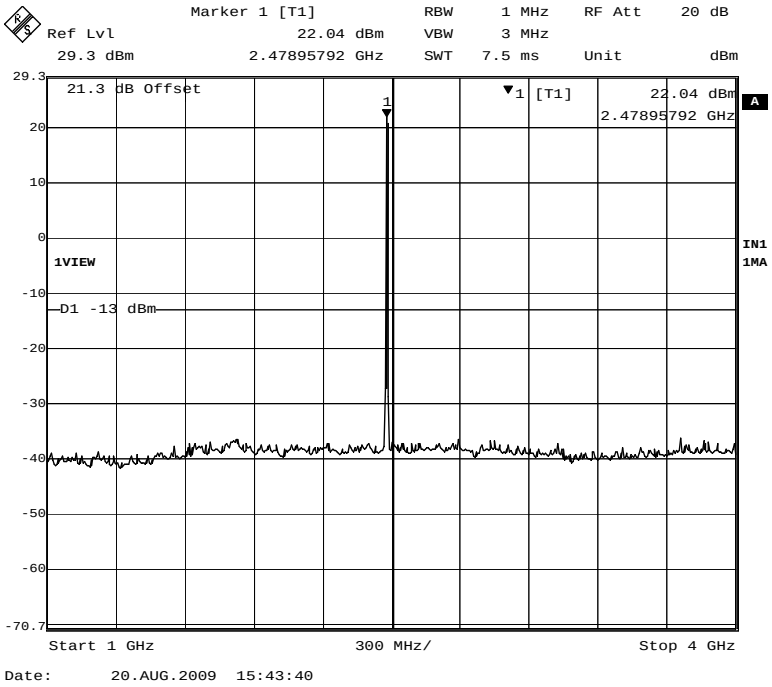
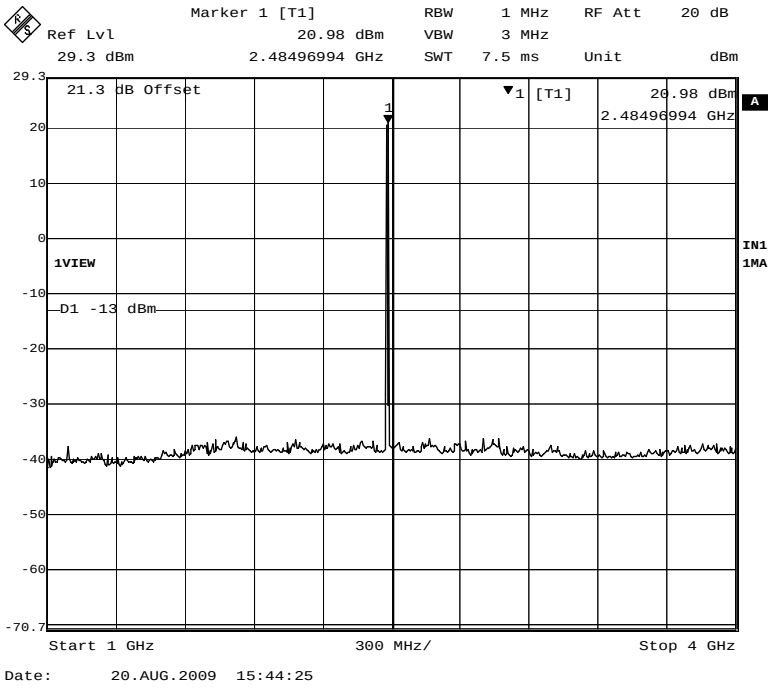


1GHz to 4GHz

QPSK



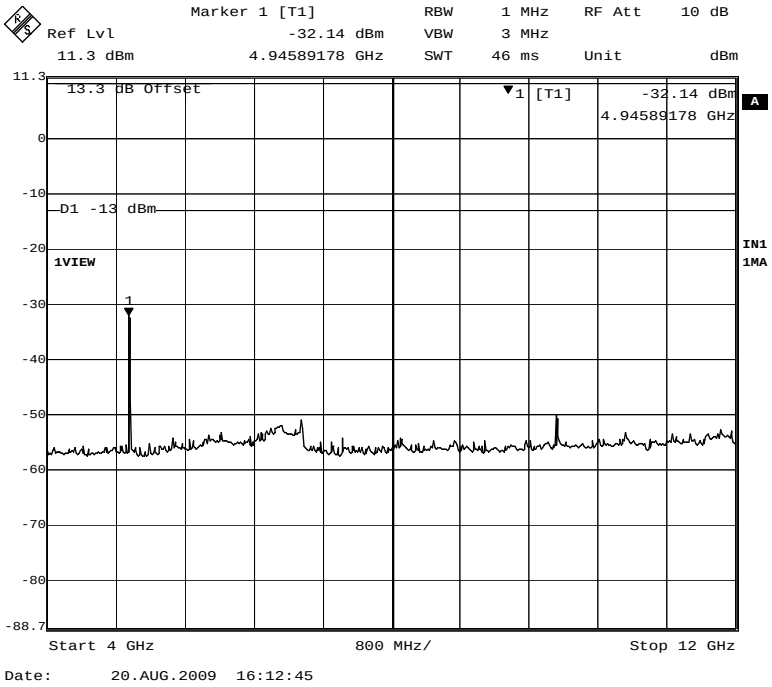
16QAM



Note: The emissions which are observed to exceed the limit on the plots above are intentional transmissions and therefore are excluded from testing.

4GHz to 12GHz

QPSK



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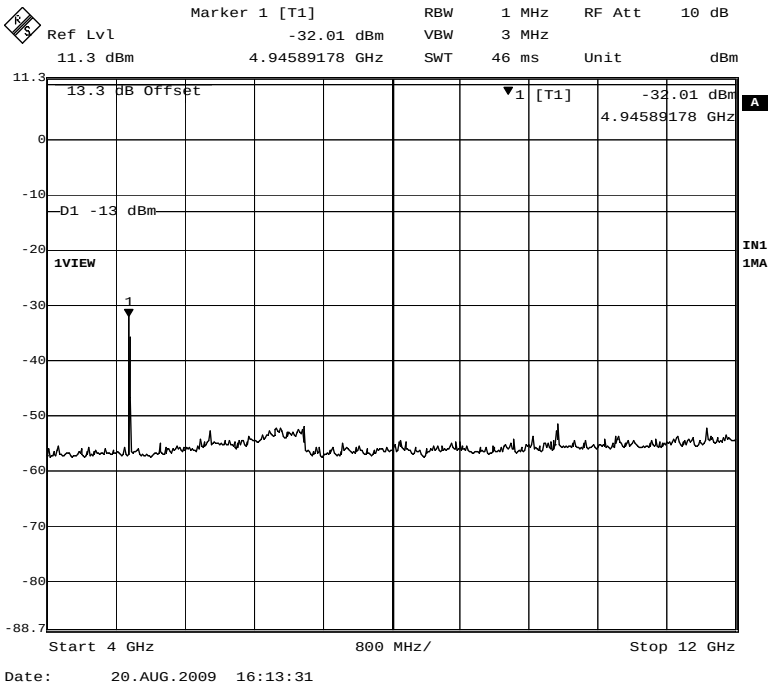
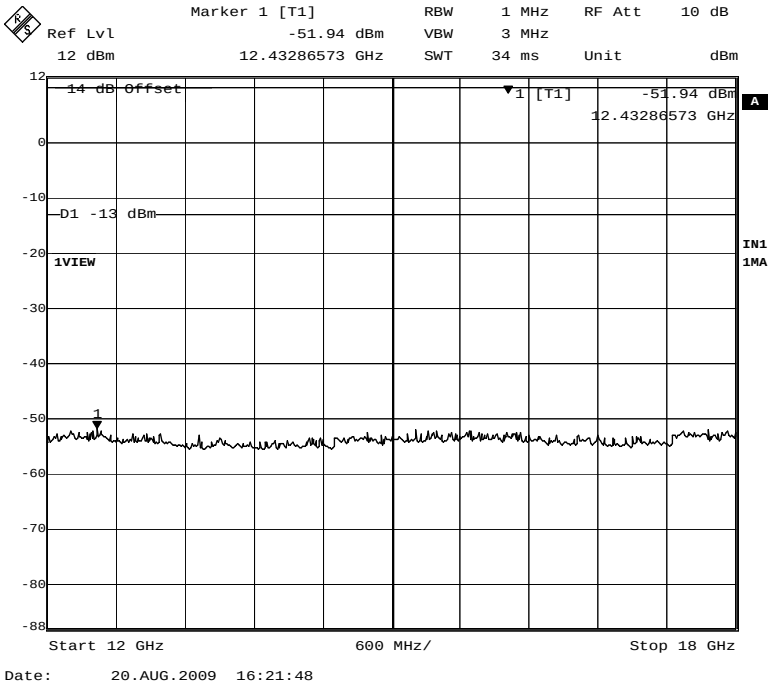


12GHz to 18GHz

QPSK



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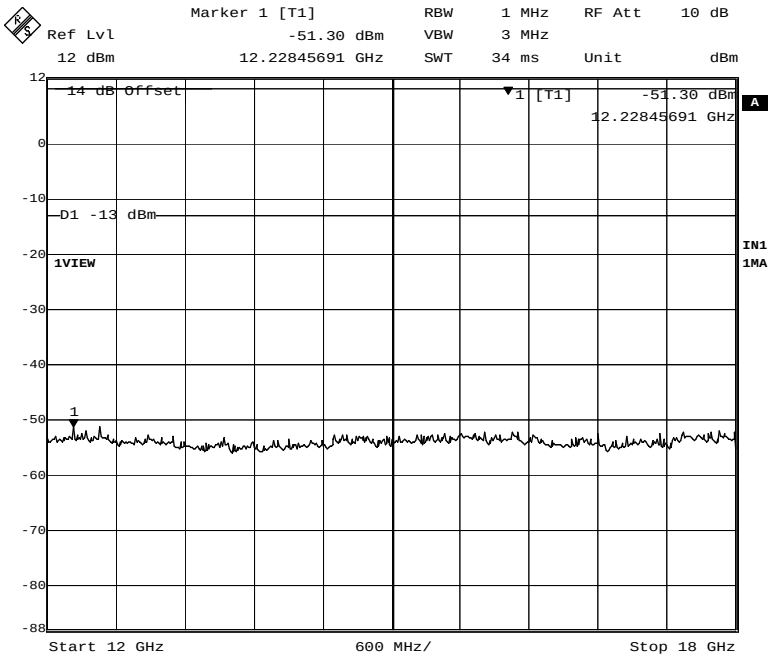
16QAM



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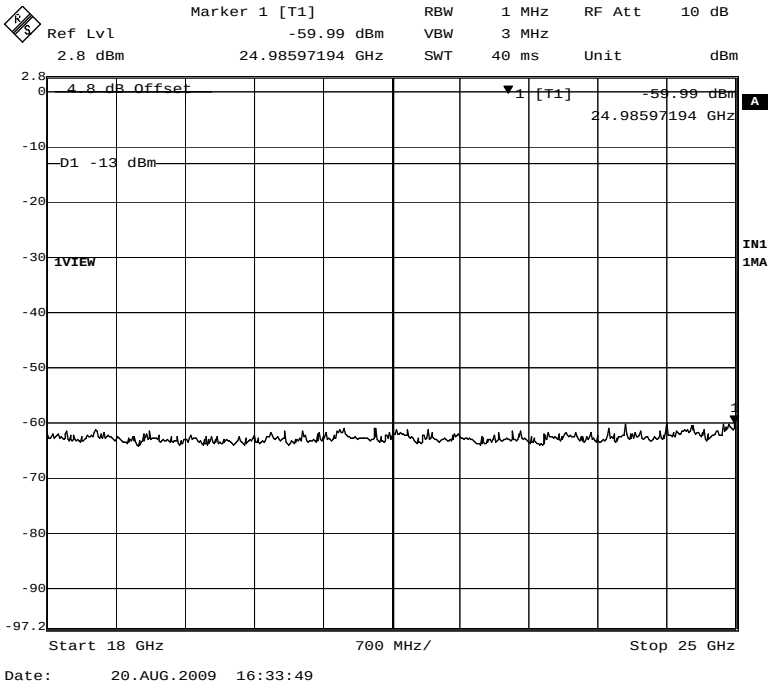
18GHz to 25GHz

QPSK



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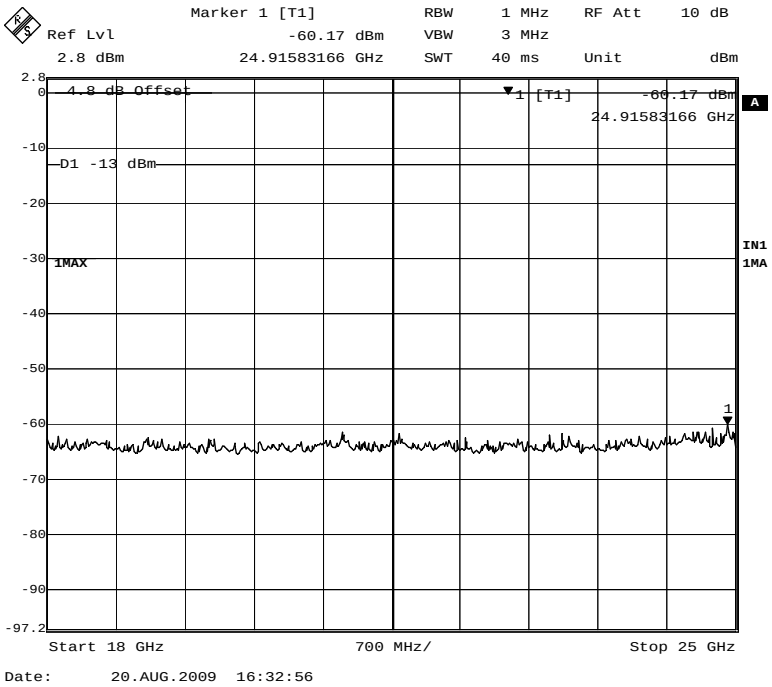


Product Service

SECTION 3

TEST EQUIPMENT USED

3.1 TEST EQUIPMENT USED

List of absolute measuring and other principal items of test equipment.

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.2 EMC - Maximum Output Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	13-Sep-2009
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	11-Sep-2009
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Signal Generator	Rohde & Schwarz	SMR40	1589	12	30-Oct-2009
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1610	-	TU
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	1-Sep-2010
Section 2.1 EMC - Radiated Emissions					
Spectrum Analyser	Hewlett Packard	8562A	14	12	15-Jul-2010
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	30-Aug-2008
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	13-Sep-2009
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	11-Sep-2009
Amplifier (Low Noise, 18GHz-40GHz)	Narda	NARDA DB02-0447	237	12	26-Jun-2010
Attenuator 20dB 5W	Marconi	56534-904H	377	12	29-Apr-2010
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	17-Jul-2010
Pre-Amplifier	Phase One	PS04-0085	1532	12	15-Sep-2009
Pre-Amplifier	Phase One	PS04-0086	1533	12	15-Sep-2009
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Signal Generator	Rohde & Schwarz	SMR40	1589	12	30-Oct-2009
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1610	-	TU
4GHz HPF	Sematron	F-100-4000-5-R	2245	-	TU
Cable (2m, SMA(m) - SMA(m))	Reynolds	262-0248-2000	2401	-	TU
Cable (3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2403	12	27-Nov-2009
Signal Generator (250kHz to 4GHz)	Agilent	E4433B	2893	12	19-Feb-2010
Antenna (Bilog)	Chase	CBL6143	2904	24	28-Nov-2009
Comb Generator	Schaffner	RSG1000	3034	-	TU
Compliance 3 Emissions	Schaffner	C3e Software V.4.00.00	3274	-	N/A - Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	1-Sep-2010

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 Radio (Tx) - Power Characteristics					
Peak Power Analyser	Hewlett Packard	8990A	107	12	2-Feb-2010
Multimeter	White Gold	WG022	190	12	11-Sep-2009
Power Supply	Hewlett Packard	6104A	1948	-	TU
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Hygrometer	Rotronic	I-1000	2891	12	17-Apr-2010
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	12	22-Apr-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
Section 2.5 Radio (Tx) - Occupied Bandwidth					
Multimeter	White Gold	WG022	190	12	11-Sep-2009
Power Supply	Hewlett Packard	6104A	1948	-	TU
Test Receiver	Rohde & Schwarz	ESIB26	2085	12	5-Dec-2009
Hygrometer	Rotronic	I-1000	2891	12	17-Apr-2010
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	12	22-Apr-2010
Section 2.6 Radio (Tx) - Emission Mask					
Multimeter	White Gold	WG022	190	12	11-Sep-2009
Power Supply	Hewlett Packard	6104A	1948	-	TU
Test Receiver	Rohde & Schwarz	ESIB26	2085	12	5-Dec-2009
Hygrometer	Rotronic	I-1000	2891	12	17-Apr-2010
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	12	22-Apr-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010
Section 2.7 Radio (Tx) - Frequency Tolerance under Temperature and Voltage Variations					
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Multimeter	White Gold	WG022	190	12	11-Sep-2009
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	3-Sep-2009
Power Supply	Hewlett Packard	6104A	1948	-	TU
Hygrometer	Rotronic	I-1000	2891	12	17-Apr-2010
Thermocouple Thermometer	Fluke	51	3174	12	3-Jul-2010
Attenuator (30dB, 150W)	Narda	769-30	3369	12	19-May-2010
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-May-2010

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.9 Radio (Tx) - Conducted Spurious Emissions					
Multimeter	White Gold	WG022	190	12	11-Sep-2009
Attenuator 10dB 25W	Weinschel	46-10-43	400	12	5-May-2010
Power Supply	Hewlett Packard	6104A	1948	-	TU
Test Receiver	Rohde & Schwarz	ESIB26	2085	12	5-Dec-2009
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	5-Sep-2009
Hygrometer	Rotronic	I-1000	2891	12	17-Apr-2010
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Cable (1m, N Type)	Rhophase	NPS-1601-1000-NPS	3351	12	22-Apr-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Feb-2010

TU – Traceability Unscheduled

3.2 MEASUREMENT UNCERTAINTY

For a 95% confidence level, the measurement uncertainties for defined systems are:-

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Conducted Emissions, LISN	150kHz to 30MHz Amplitude	3.2dB*
Conducted Emissions, ISN	150kHz to 30MHz Amplitude	2.1dB
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB
Discontinuous Interference	150kHz to 30MHz Amplitude	3.0dB*
Interference Power	30MHz to 300MHz Amplitude	3.0dB*
Radiated E-Field Susceptibility	26MHz to 2.5GHz Test Amplitude	1.4dB†
Conducted Susceptibility	100kHz to 250MHz Amplitude	1.8dB†
DC Input Ripple Immunity	Current Voltage	0.45% 0.91%
Power Frequency Magnetic Field	50Hz/60Hz Amplitude	0.45%
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Magnetic Field/Flux iaw EN 50366	10Hz to 400kHz	2.64%
Harmonics and Flicker	The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3	—
Mains Voltage Variations and Interrupts	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11	—
Fast Transient Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4	—
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5	—
Vehicle Transients	The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2	—
Compass Safe Distance	Azimuth Accuracy	0.10°

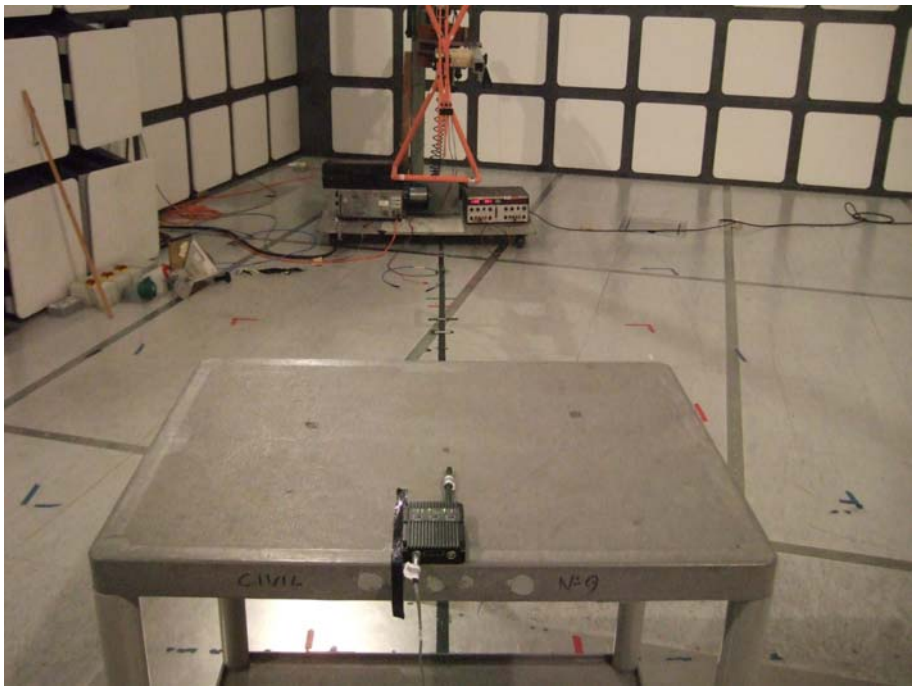
Worst case error for both Time and Frequency measurement 12 parts in 10^6.

* In accordance with CISPR 16-4
† In accordance with UKAS Lab 34

SECTION 4

PHOTOGRAPHS

4.1 TEST SET UP PHOTOGRAPH



Spurious Emissions Outside Emission Band

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

This report relates only to the actual item/items tested.

Our UKAS Accreditation does not cover opinions and interpretations and any expressed are outside the scope of our UKAS Accreditation.

Results of tests not covered by our UKAS Accreditation Schedule are marked NUA (Not UKAS Accredited).