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Report On

FCC and Industry Canada Testing of the
e2v Technologies (UK) Ltd
Argus® Long Range Telemetry System

FCC ID: PW9DTX2400
IC ID: 5644A-DTX2400

Document 75909400 Report 01 Issue 1

July 2010



Product Service

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REPORT ON

FCC and Industry Canada Testing of the
e2v Technologies (UK) Ltd
Argus® Long Range Telemetry System

Document 75909400 Report 01 Issue 1

July 2010

PREPARED FOR

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PREPARED BY

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Senior Administrator

APPROVED BY

M Jenkins
Authorised Signatory

DATED

26 July 2010

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 2 and 90 and Industry Canada RSS-119 and RSS-210. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

S Bennett





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SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
e2v Technologies (UK) Ltd
Argus® Long Range Telemetry System



Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC and Industry Canada Testing of the e2v Technologies (UK) Ltd Argus® Long Range Telemetry System to the requirements of FCC CFR 47 Part 2 and 90 and Industry Canada RSS-119 and RSS-210.

Objective	To perform Radio Approval Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	e2v Technologies (UK) Ltd
Model Number(s)	DTX2400
Serial Number(s)	0019
Software Version	N/A
Hardware Version	Tx Version 1 Camera fitted with Mod Kit DAS768831AA
Number of Samples Tested	One
Test Specification/Issue/Date	FCC CFR 47 Part 2: 2009 FCC CFR 47 Part 90: 2009 Industry Canada RSS-119: 2007 Industry Canada RSS-210: 2007
Incoming Release Date	Declaration of Build Status 08 June 2010
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	4500122452 30 September 2009
Start of Test	19 May 2010
Finish of Test	24 May 2010
Name of Engineer(s)	S Bennett
Related Document(s)	ANSI C63.4 : 2003



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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 2 and 90 and Industry Canada RSS-119 and RSS-210 is shown below.

Configuration 1 - As supplied									
Section	Spec Clause				Test Description	Mode	Mod State	Result	Comments
	FCC		IC						
	Part 2	Part 90	RSS-119	RSS-210					
2.1	2.1046	90.205	-	A8.4	Radiated Emissions (Enclosure Port)	Tx	0	Pass	
2.2	2.1046	90.205	-	A8.4	Power and Antenna Height Limits / Transmitter Output Power	Tx	0	Pass	
2.3	2.1047	90.207	5.2	-	Types of Emission / Modulation	Tx	0	-	Customer declared
2.4	2.1049	90.209	-	-	Bandwidth Limitations	Tx	0	Pass	
2.5	2.1051	90.210	-	-	ERP Peak Power	Tx	0	Pass	
2.6	2.1051	90.210	-	-	Emission Mask	Tx	0	Pass	
2.7	2.1051	90.210	-	-	Emission Mask	Tx	0	Pass	
2.8	-	-	-	A8.5	Emission Mask	Tx	0	Pass	
2.9	2.1055	90.213	-	-	Transmitter Frequency Stability	Tx	0	Pass	
2.10	-	-	-	A8.2(a)	6dB Bandwidth	Tx	0	Pass	
2.11	-	-	-	A8.2(b)	Power Spectral Density	Tx	0	Pass	



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1.3 DECLARATION OF BUILD STATUS

MAIN EUT	
MANUFACTURING DESCRIPTION	LRT Transmitter
MANUFACTURER	e2v technologies (uk) Ltd
TYPE	
PART NUMBER	DTX2400
SERIAL NUMBER	Camera : 004 Tx : 0019
HARDWARE VERSION	Tx DAS767692BA Version 1 Tx tested in camera P7250 Camera fitted with Mod Kit DAS768831AA
SOFTWARE VERSION	
TRANSMITTER OPERATING RANGE	2450 to 2483.5 MHz
RECEIVER OPERATING RANGE	
COUNTRY OF ORIGIN	UK
INTERMEDIATE FREQUENCIES	750 to 783.5 MHz
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	2M5G2D , 1M25G2D, 2M5W2D, 1M25W2D
MODULATION TYPES: (i.e. GMSK, QPSK)	QPSK or 16QAM FEC 2/3 or 1/3
HIGHEST INTERNALLY GENERATED FREQUENCY	2483.5 MHz
OUTPUT POWER (W or dBm)	100mW 200mW EIRP
FCC ID	PW9DTX2400
INDUSTRY CANADA ID	5644A-DTX2400
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	Transmission of a thermal image from a portable thermal image camera to a remote receiver
BATTERY/POWER SUPPLY	
MANUFACTURING DESCRIPTION	Internal rechargeable battery
MANUFACTURER	e2v technologies (uk) Ltd
TYPE	
PART NUMBER	
VOLTAGE	Tx 7.2 V
COUNTRY OF ORIGIN	UK

Signature

P L Newby

Date

8th June 2010

Declaration of Build Status Serial Number

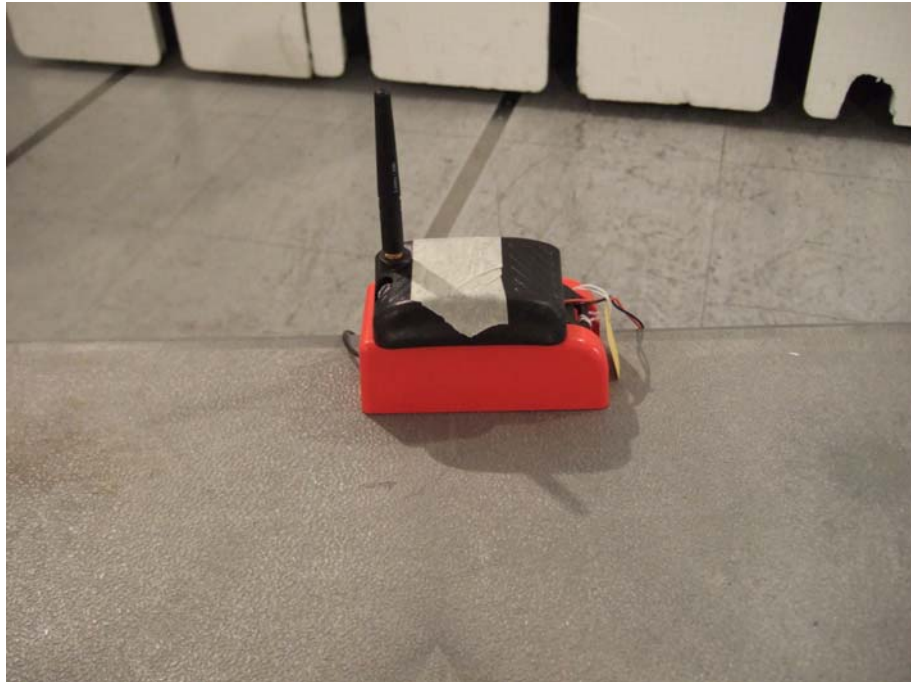
Note: This document has been prepared to enable manufacturers with no mechanism for producing their own Declaration of Build Status, to declare the build state of the equipment submitted for test.

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

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a e2v Technologies (UK) Ltd Argus® Long Range Telemetry System as shown in the photograph below. A full technical description can be found in the manufacturer's documentation.



Equipment Under Test



Product Service

1.4.2 Test Configuration

Configuration 1: As supplied

The EUT was configured in accordance with FCC CFR 47 Part 2 and 90 and Industry Canada RSS-119 and RSS-210.

1.4.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
Transmitter Antenna	-	Transmit	SMA Connector	N/A

1.4.4 Modes of Operation

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

Mode 1 - TX

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



Product Service

1.5 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 power is described on each test page.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

Industry Canada Accreditation
IC2932B-1 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.



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SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
e2v Technologies (UK) Ltd
Argus® Long Range Telemetry System



Product Service

2.1 RADIATED EMISSIONS (ENCLOSURE PORT)

2.1.1 Specification Reference

FCC Part 2, Clause 2.1046
FCC Part 90, Clause 90.205
RSS-210, Clause A8.4

2.1.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.1.3 Date of Test and Modification State

08 and 20 May 2010 – 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

2.1.6 Environmental Conditions

	08 May 2010	20 May 2010
Ambient Temperature	18.2°C	22.6°C
Relative Humidity	29%	26%
Atmospheric Pressure	1004mbar	1028mbar



Product Service

2.1.7 Test Results

For the period of test the EUT met the requirements of FCC Part 2 and 90 and RSS-210 for Radiated Emissions (Enclosure Port).

The test results are shown below.

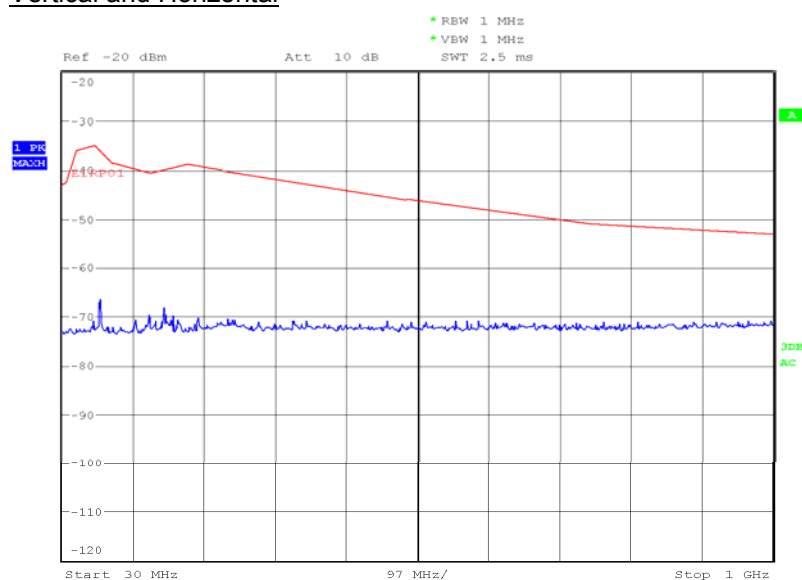
Configuration 1 - Mode 1

Bottom Channel 2452MHz

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
80.961	V	100	167	-45.70	-13.0	-32.70	Pass
4904	V	100	54	-41.96	-13.0	-28.96	Pass
7356	V	172	230	-34.00	-13.0	-21.00	Pass
4904	H	100	151	-44.07	-13.0	-31.07	Pass
7356	H	163	75	-35.61	-13.0	-22.61	Pass
9808	H	100	206	-39.60	-13.0	-26.60	Pass
9808	V	112	16	-39.60	-13.0	-26.60	Pass
12262	V	100	89	-28.75	-13.0	-15.75	Pass

30MHz to 1GHz

Vertical and Horizontal



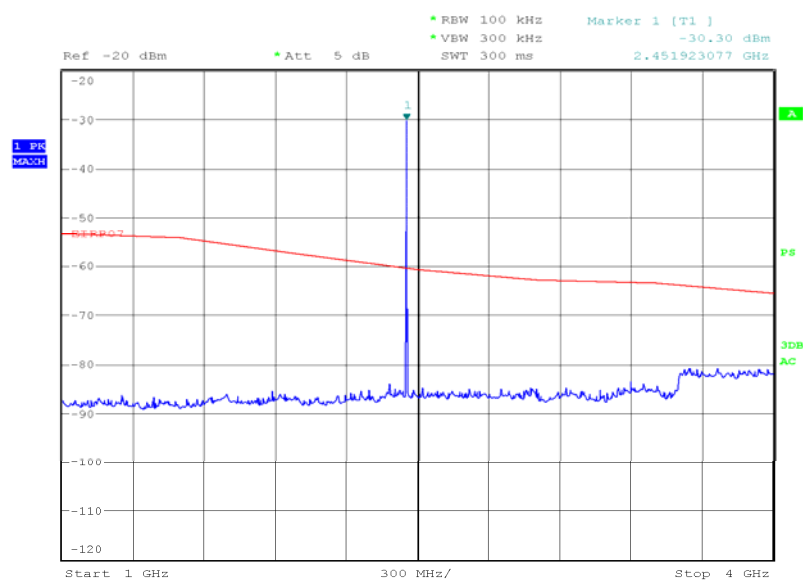
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Product Service

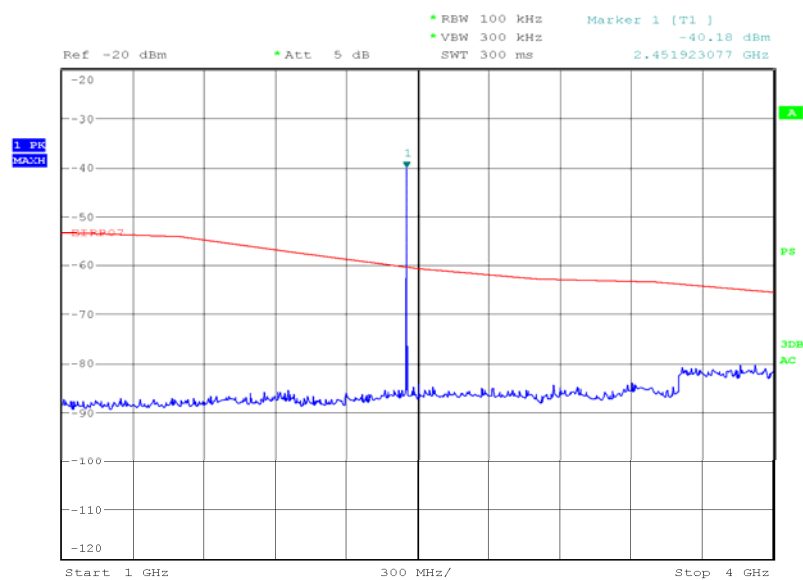
1GHz to 4GHz

Vertical



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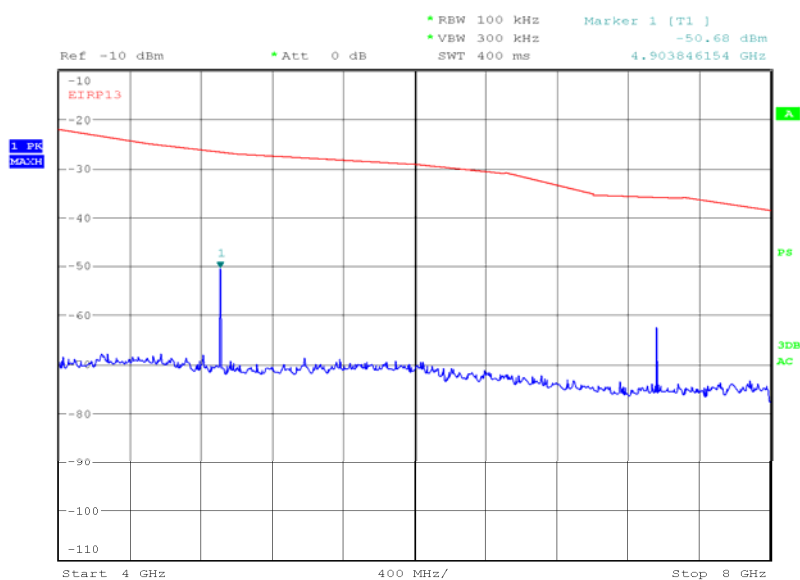
Horizontal



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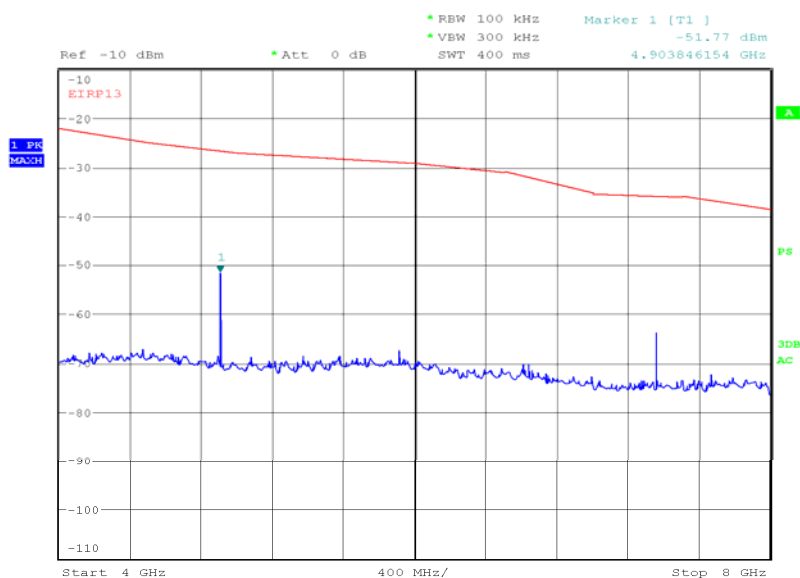
4GHz to 8GHz

Vertical



Date: 9.MAY.2010 02:05:01

Horizontal



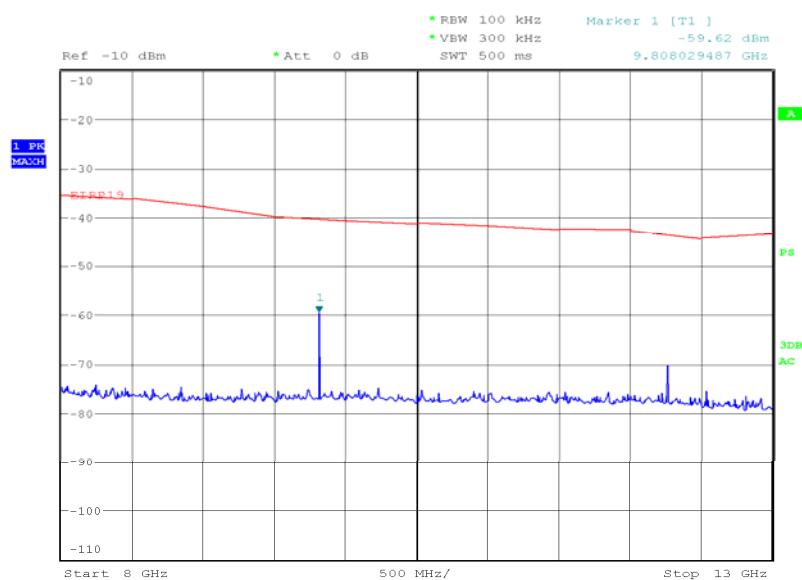
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Product Service

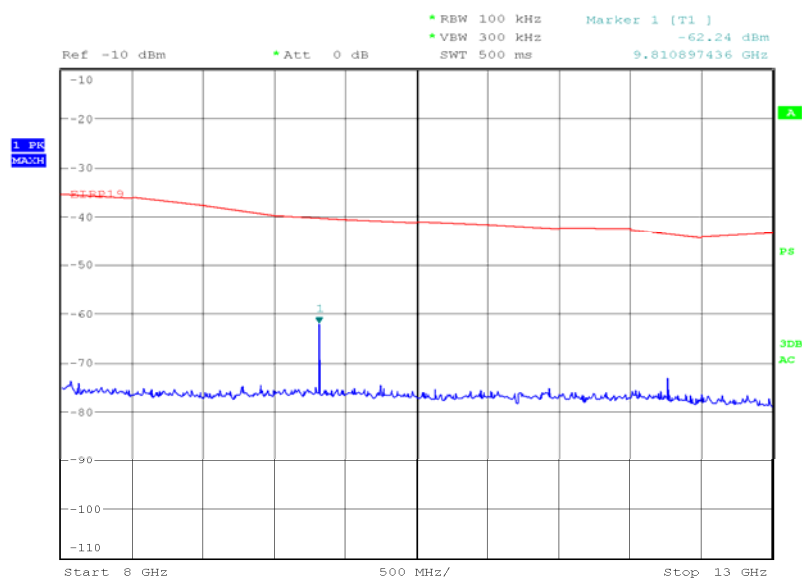
8GHz to 13GHz

Vertical



Date: 9.MAY.2010 03:20:10

Horizontal



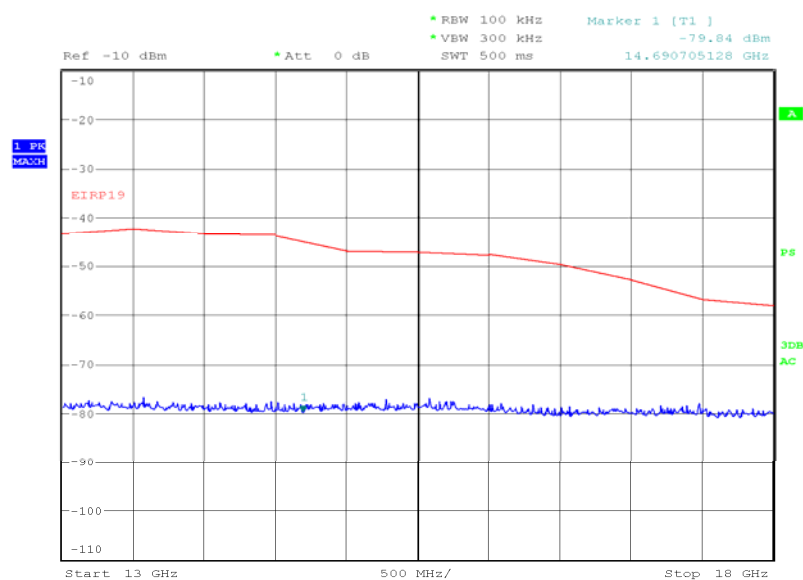
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Product Service

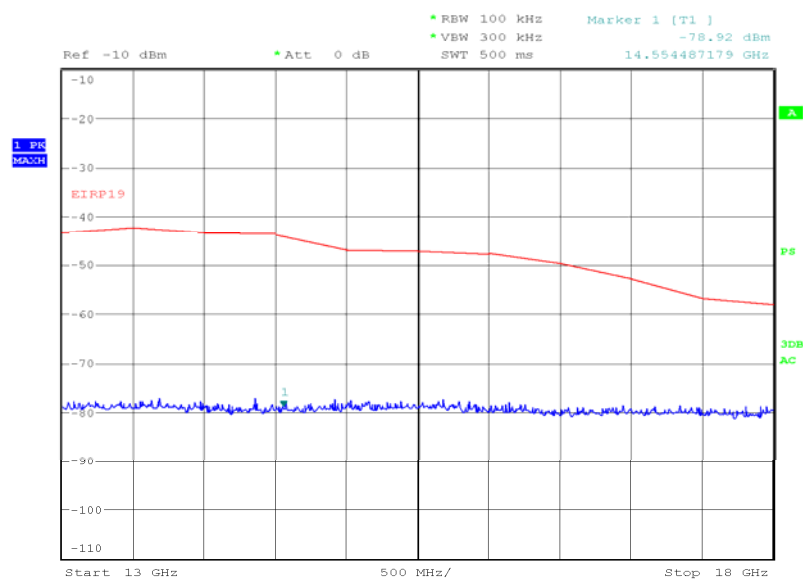
13GHz to 18GHz

Vertical



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Horizontal



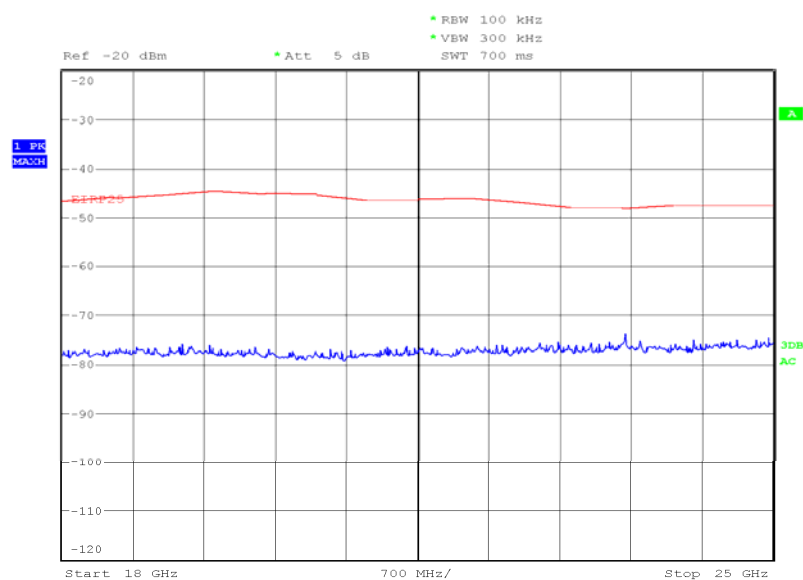
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Product Service

18GHz to 25GHz

Vertical and Horizontal



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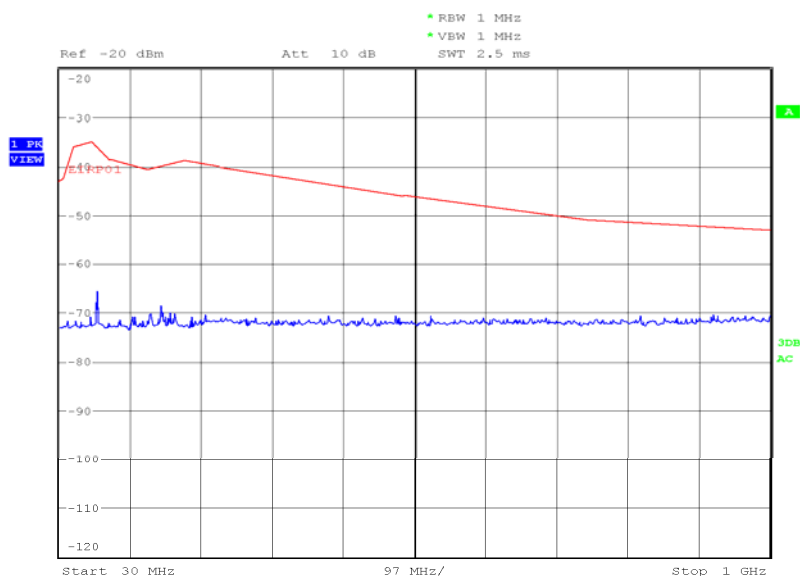
Product Service

Middle Channel 2452MHz

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
80.83	V	100	158	-45.10	-13.0	-32.1	Pass
4924	H	126	150	-37.20	-13.0	-24.2	Pass
7386	H	165	36	-31.90	-13.0	-18.9	Pass
4924	V	149	58	-37.67	-13.0	-24.67	Pass
7386	V	110	267	-37.23	-13.0	-24.23	Pass
9848	H	100	221	-41.58	-13.0	-28.58	Pass
9848	V	118	5	-41.04	-13.0	-28.04	Pass
12310	V	100	95	-30.16	-13.0	-17.16	Pass

30MHz to 1GHz

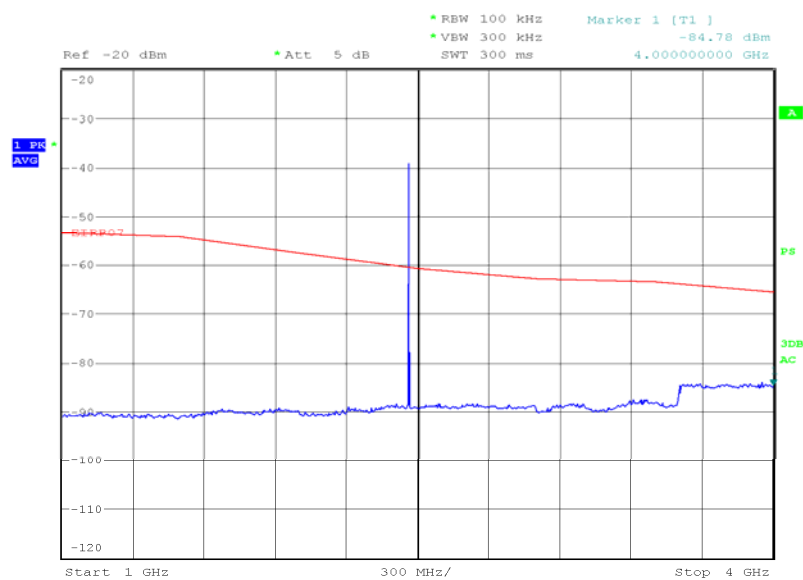
Vertical and Horizontal



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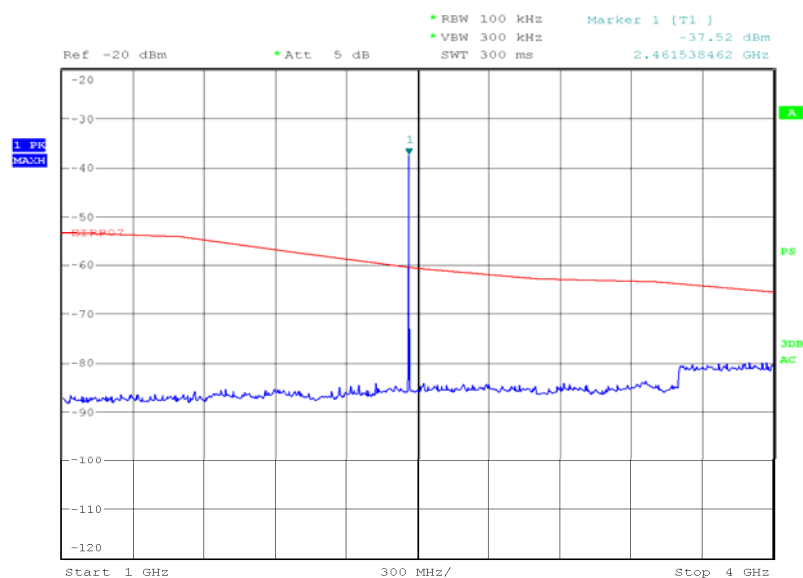
1GHz to 4GHz

Vertical



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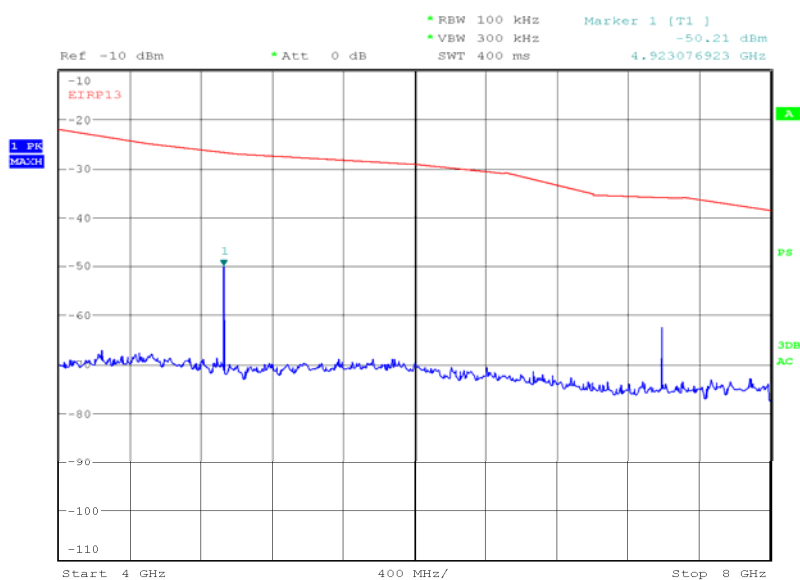
Horizontal



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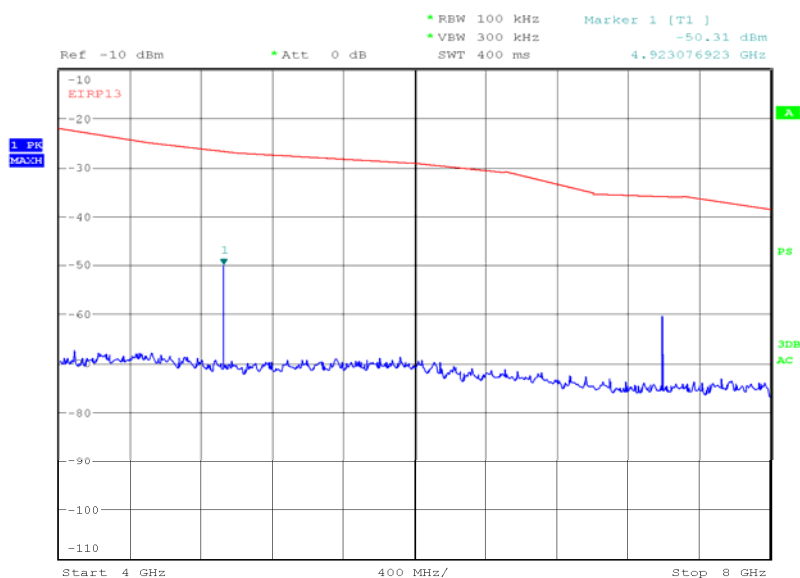
4GHz to 8GHz

Vertical



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Horizontal



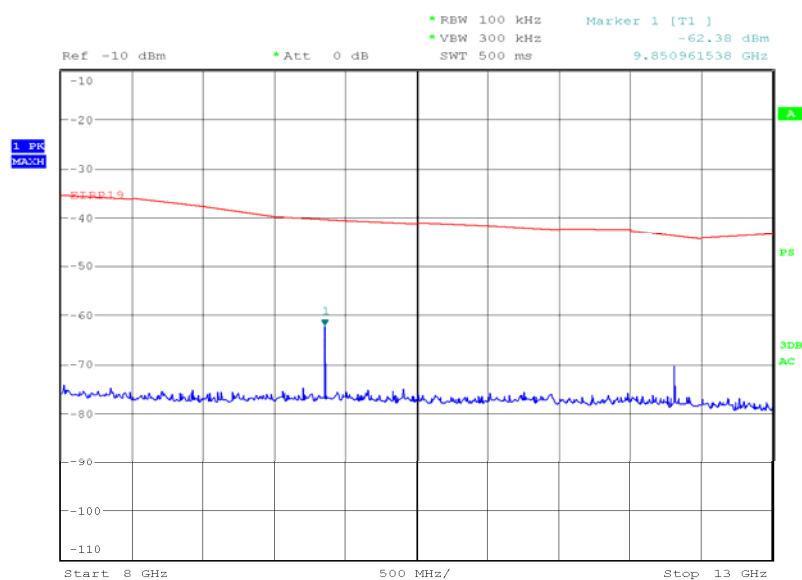
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Product Service

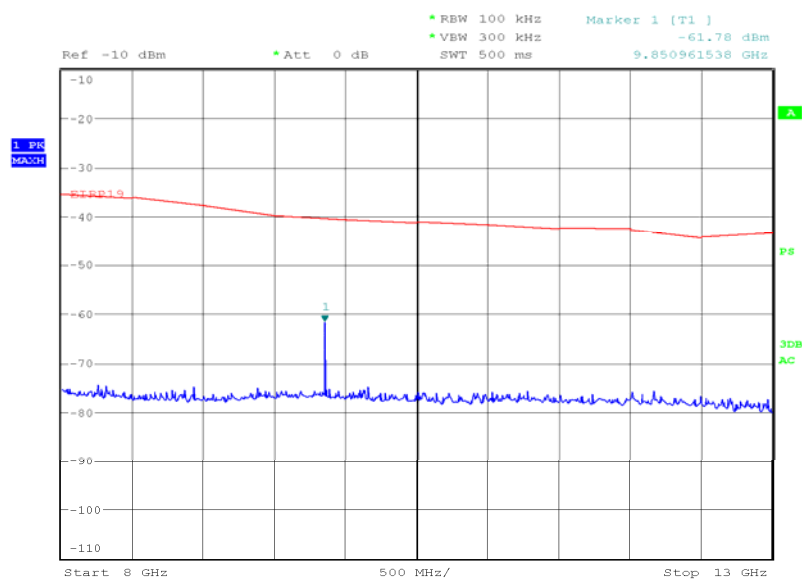
8GHz to 13GHz

Vertical



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Horizontal



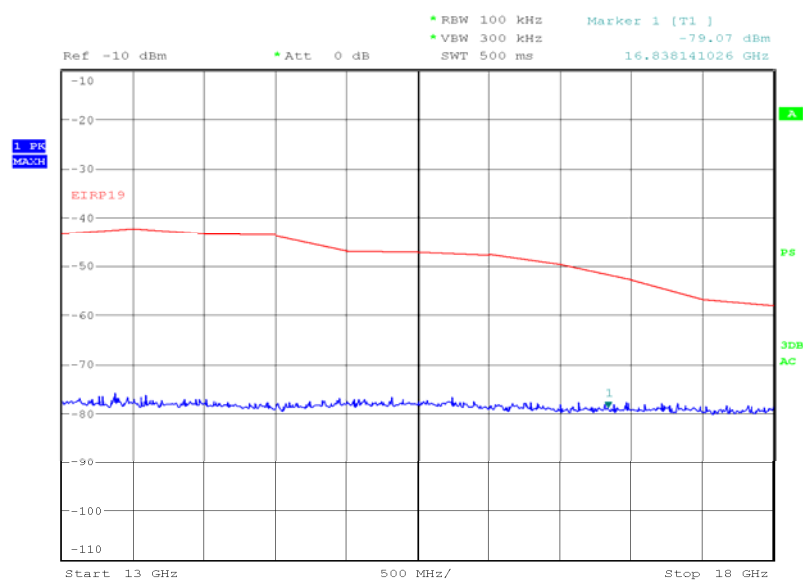
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Product Service

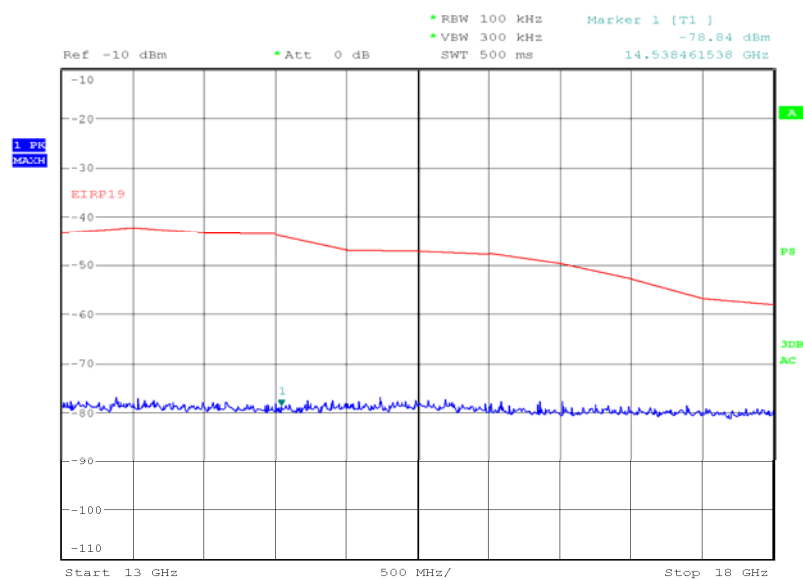
13GHz to 18GHz

Vertical



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Horizontal



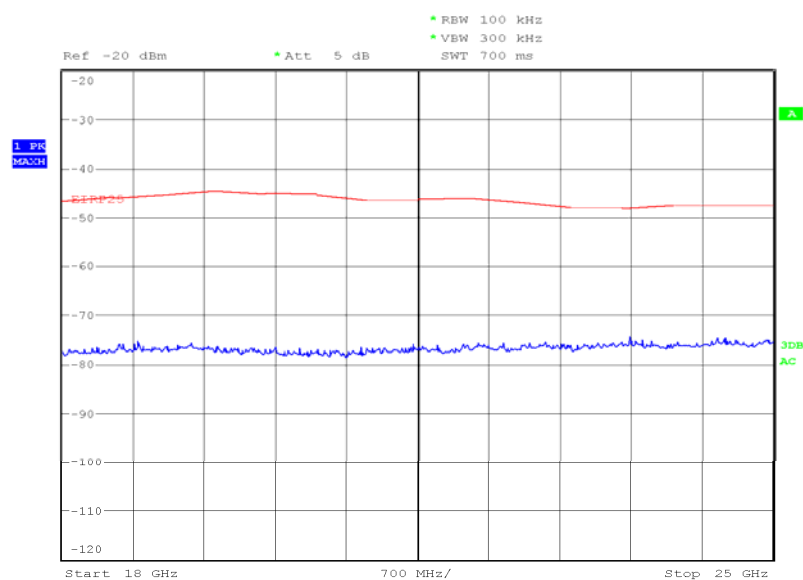
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Product Service

18GHz to 25GHz

Vertical and Horizontal



Date: 20.MAY.2010 17:04:41



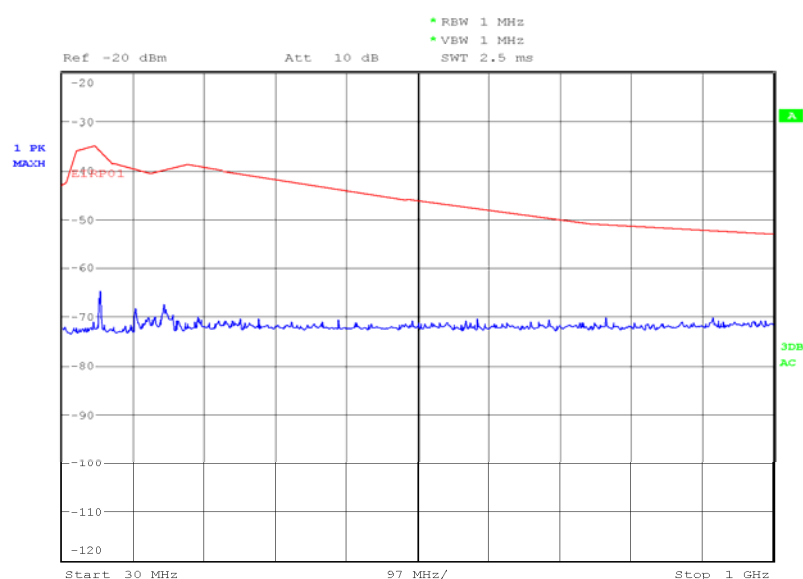
Product Service

Top Channel 2452MHz

Frequency MHz	Antenna Polarisation	Ant Height cm	EUT Arc degrees	Result Peak dBm	Limit dBm	Margin dB	Result
80.93	V	100	148	-45.81	-13.0	-32.81	Pass
4961	V	128	58	-34.70	-13.0	-21.70	Pass
7448	V	128	314	-30.51	-13.0	-17.51	Pass
4964	H	100	138	-34.57	-13.0	-21.57	Pass
7446	H	170	96	-31.64	-13.0	-18.64	Pass
9928	V	122	6	-39.83	-13.0	-26.83	Pass
12410	V	100	87	-32.80	-13.0	-19.80	Pass

30MHz to 1GHz

Vertical and Horizontal



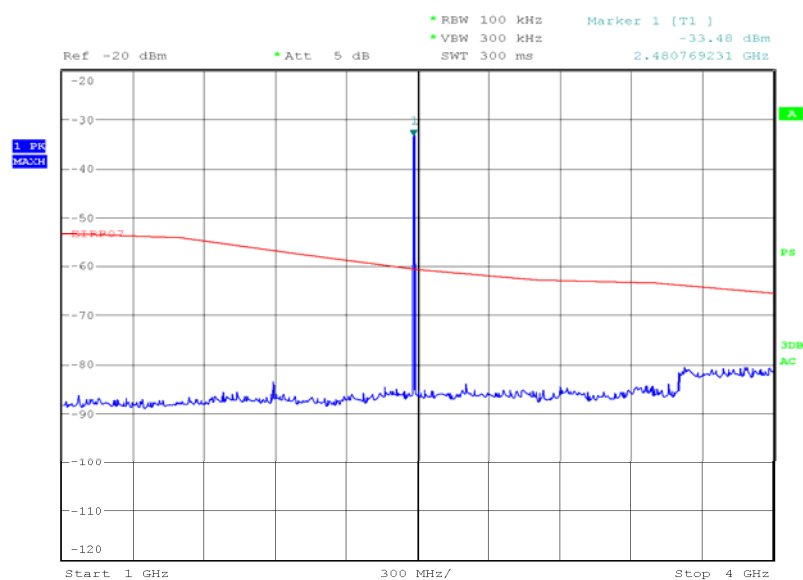
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Product Service

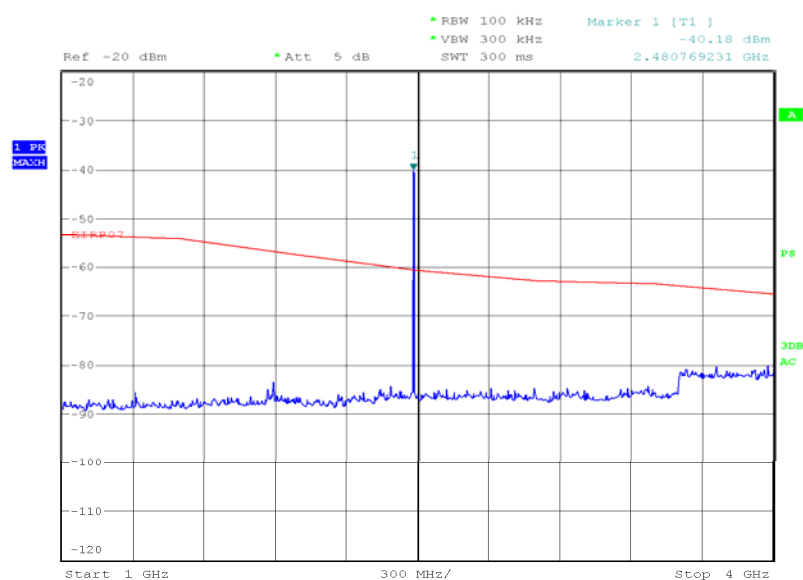
1GHz to 4GHz

Vertical



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Horizontal



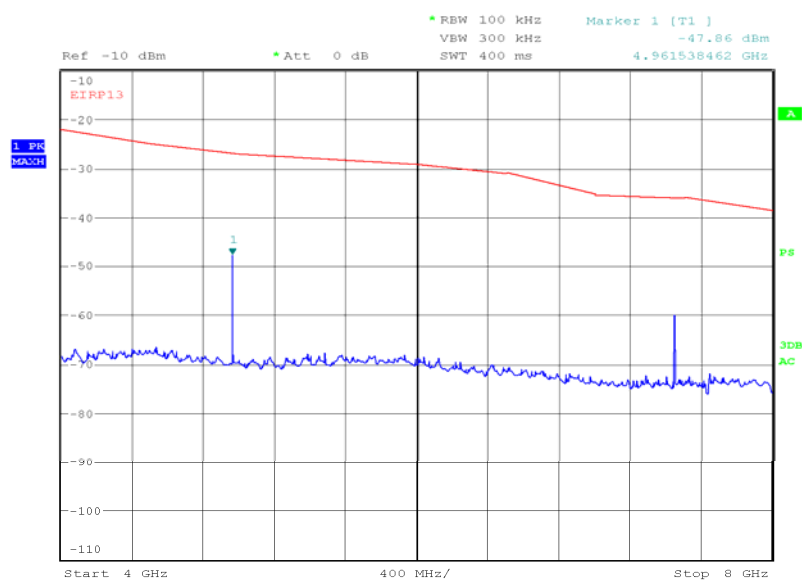
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Product Service

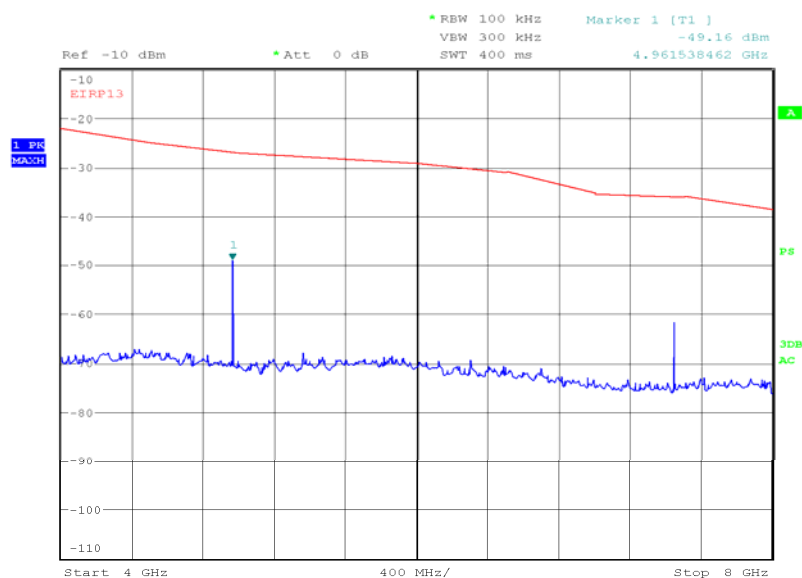
4GHz to 8GHz

Vertical



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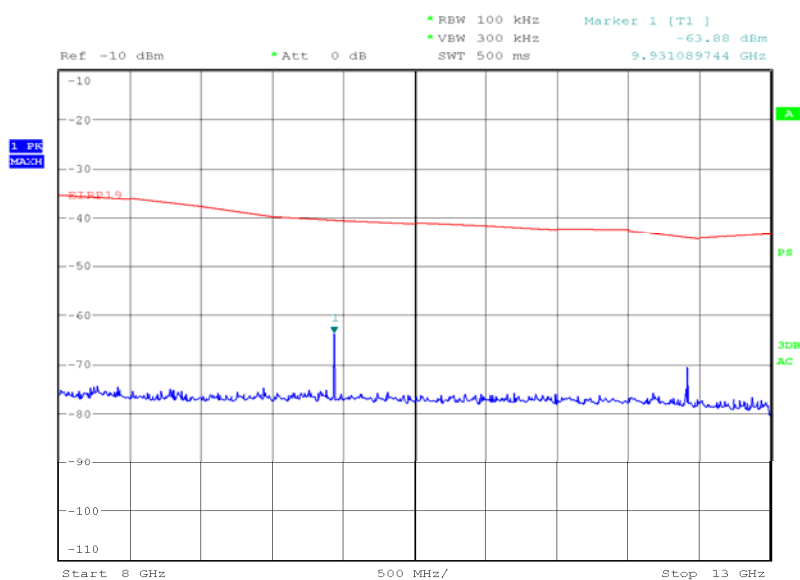
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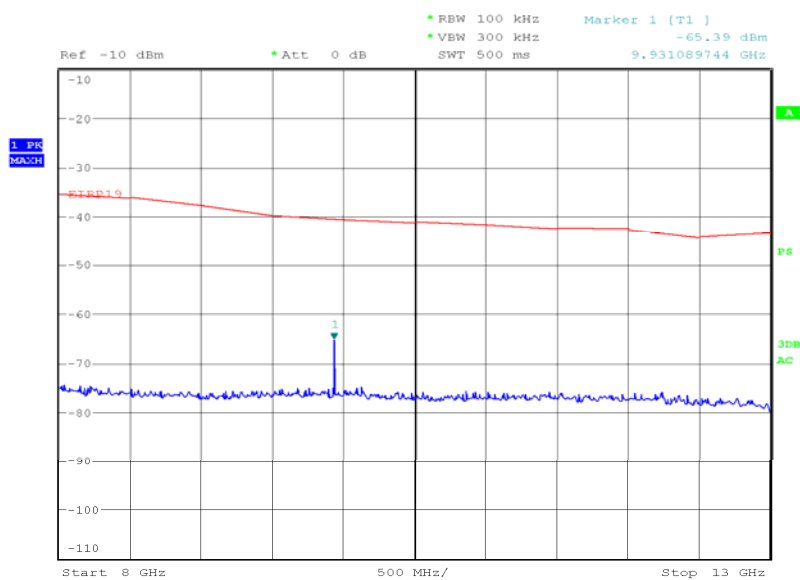
8GHz to 13GHz

Vertical



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Horizontal



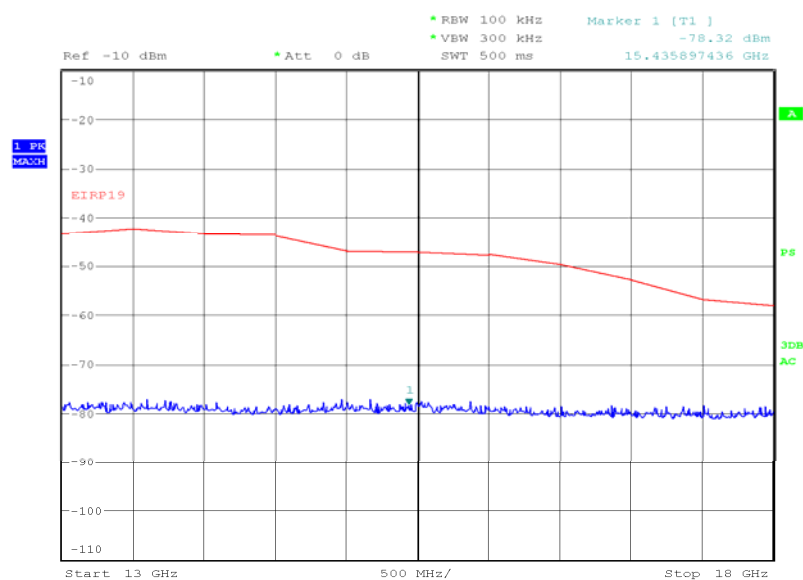
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Product Service

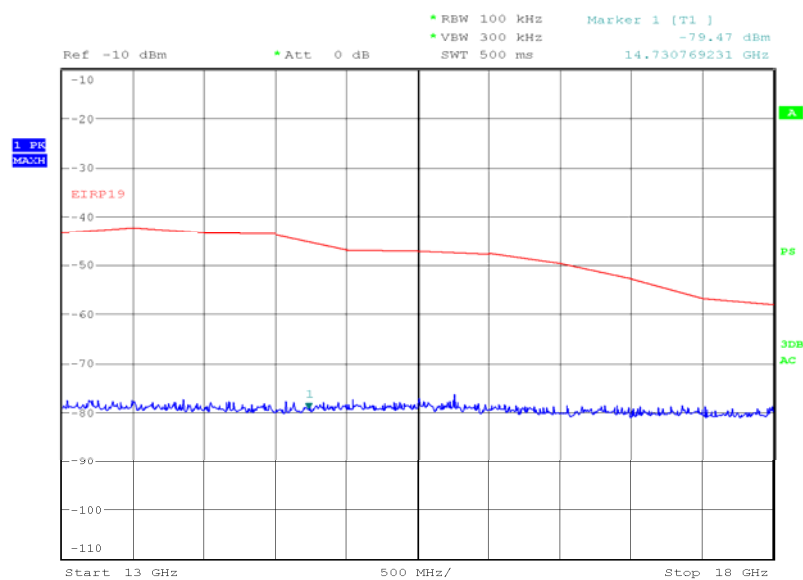
13GHz to 18GHz

Vertical



Date: 9.MAY.2010 04:12:56

Horizontal



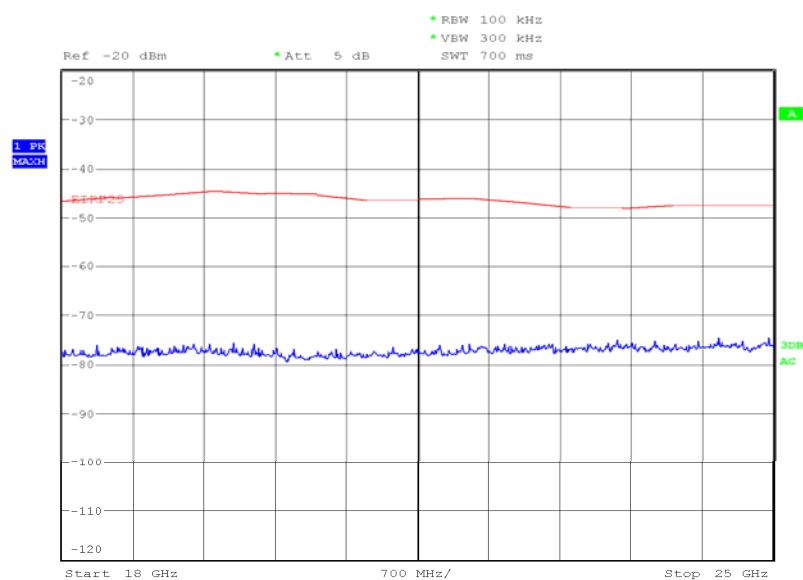
Date: 9.MAY.2010 04:11:20



Product Service

18GHz to 25GHz

Vertical and Horizontal



Date: 20.MAY.2010 16:31:30



Product Service

2.2 POWER AND ANTENNA HEIGHT LIMITS / TRANSMITTER OUTPUT POWER

2.2.1 Specification Reference

FCC Part 2, Clause 2.1046
FCC Part 90, Clause 90.205
RSS-210, Clause A8.4

2.2.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.2.3 Date of Test and Modification State

24 May 2010 - 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 Environmental Conditions

	24 May 2010
Ambient Temperature	20°C
Relative Humidity	38%

2.2.6 Test Procedure

The EUT was connected to a Peak Power Analyser via a 20dB attenuator and a 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 were measured at maximum power and QPSK modulation schemes. This was used 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)



Product Service

2.2.7 Test Results

7.2 V DC Supply

Manufacturer's rated output power: 20dBm

Frequency (MHz)	QPSK Modulation			
	Average Power		Peak Power	
	dBm	mW	dBm	mW
2452	20.36	108.64	26.92	492.04
2467	20.46	111.17	26.91	490.91
2482	20.32	107.64	26.86	485.29

Limit Clause

90.205(s) – The output power shall not exceed 20% of the manufacturers rated output power.

RSS-210 A8.4 – For Systems employing digital modulation techniques operating in the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz, the maximum peak conducted output power shall not exceed 1W.



Product Service

2.3 TYPE OF EMISSIONS / MODULATION

2.3.1 Specification Reference

FCC Part 2, Clause 2.1047
FCC Part 90, Clause 90.207
RSS-119, Clause 5.2

2.3.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.3.3 Test Results

Customer declaration:

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.



Product Service

2.4 BANDWIDTH LIMITATIONS

2.4.1 Specification Reference

FCC Part 2, Clause 2.1049
FCC Part 90, Clause 90.209

2.4.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.4.3 Date of Test and Modification State

24 May 2010 - Modification State 0

2.4.4 Test Equipment Used

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

2.4.5 Environmental Conditions

	24 May 2010
Ambient Temperature	19°C
Relative Humidity	37%

2.4.6 Test Procedure

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

2.4.7 Test Results

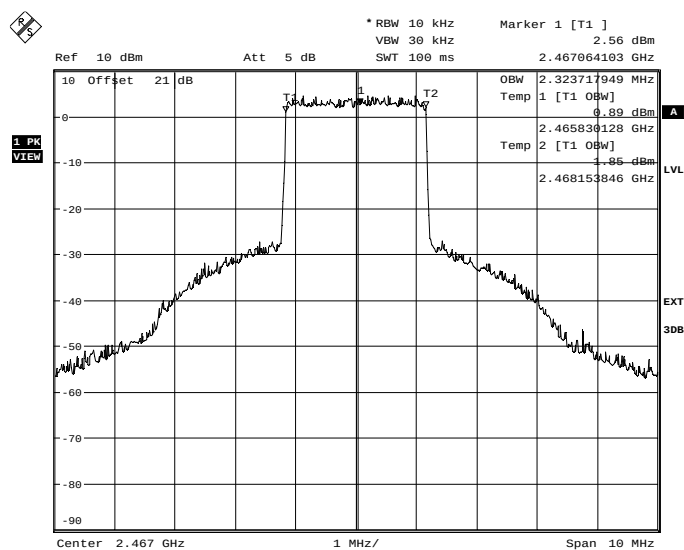
7.2 V DC Supply

Frequency (MHz)	Occupied Bandwidth (99%)
	QPSK Modulation (MHz)
2467	2.323717



Product Service

2467 MHz



OBW1
Date: 24.MAY.2010 10:12:44

Limit Clause

The maximum authorised single channel bandwidth of emission is corresponding to the type of emission specified.



Product Service

2.5 ERP PEAK POWER

2.5.1 Specification Reference

FCC CFR 47 Part 90, Clause 90.210

2.5.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.5.3 Date of Test and Modification State

25 May 2010 - 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 Method and Operating Modes

The test was applied in accordance with the test method requirements of .

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

Configuration 1 - Mode 1

2.5.6 Environmental Conditions

	25 May 2010
Ambient Temperature	20.5°C
Relative Humidity	37%
Atmospheric Pressure	1025mbar



Product Service

2.5.7 Test Results

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

The test results are shown below.

Configuration 1 - Mode 1

Frequency (GHz)	ERP Result (dBm)	ERP Limit (dBm)	ERP Result (W)	ERP Limit (W)
2.452	22.87	37	0.194	5
2.467	22.90	37	0.195	5
2.482	23.65	37	0.232	5



Product Service

2.6 EMISSION MASK

2.6.1 Specification Reference

FCC Part 2, Clause 2.1051
FCC Part 90, Clause 90.210

2.6.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.6.3 Date of Test and Modification State

24 May 2010 - 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 Environmental Conditions

	24 May 2010
Ambient Temperature	21°C
Relative Humidity	41%

2.6.6 Test Procedure

In clause 90.210, the frequency band 2450 -2483.5 MHz 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 un-modulated 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.

The spectrum analyser was chosen so as the signal shape was not influenced by the RBW filter. The VBW was set to 3 times the RBW. The detector was set to RMS and trace averaging applied as the reference power was an average measurement.

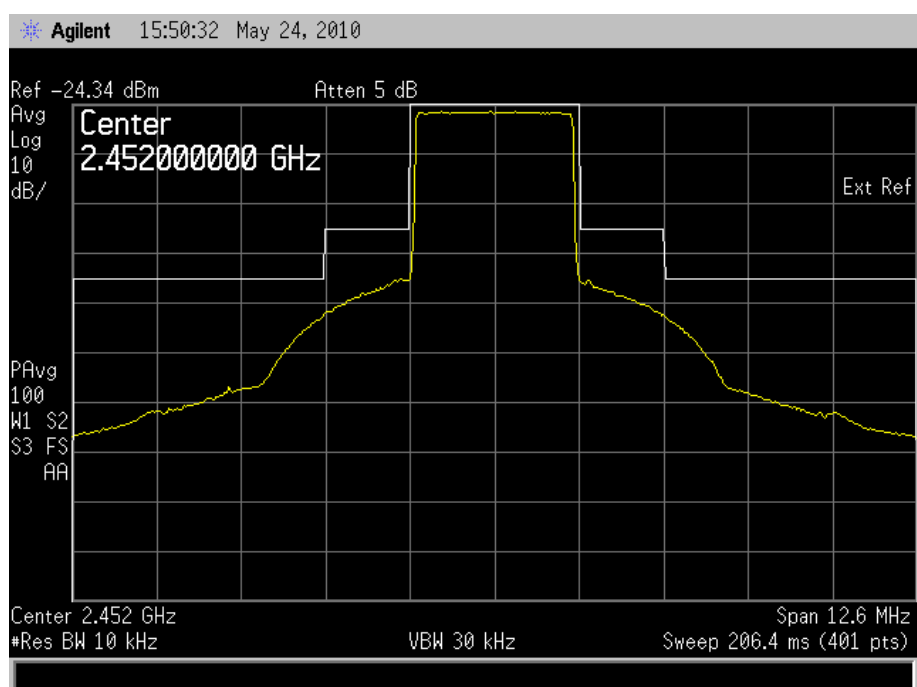


Product Service

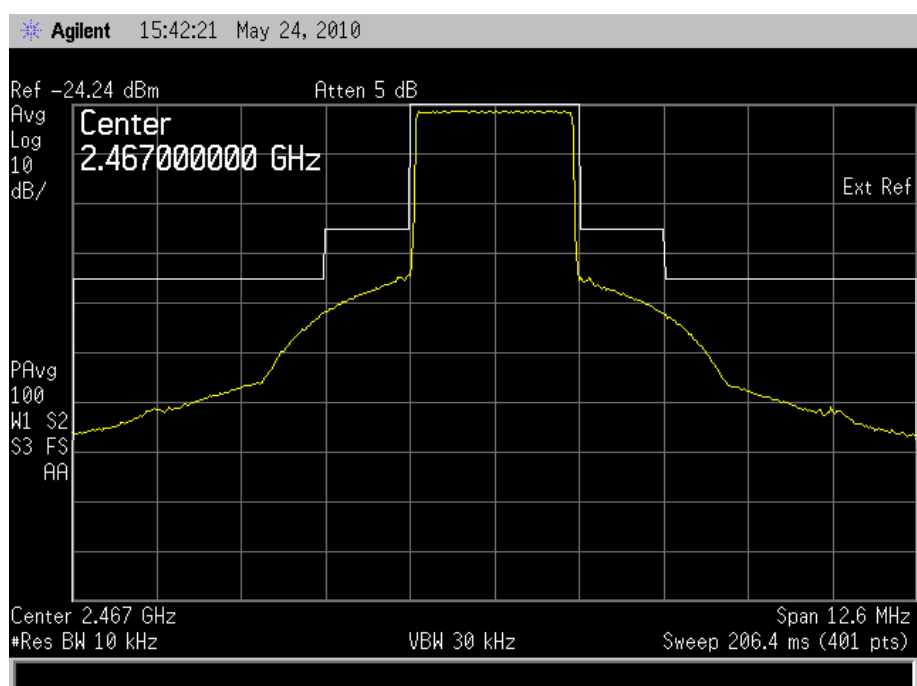
2.6.7 Test Results

7.2 V DC Supply

2452 MHz



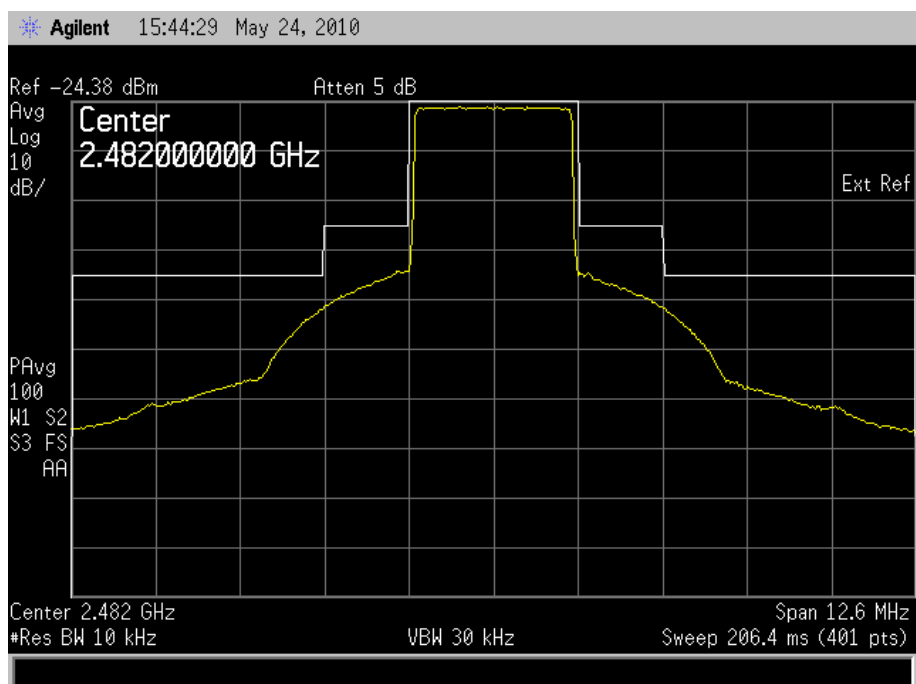
2467 MHz





Product Service

2482 MHz



Limit Clause

Emission Mask B



Product Service

2.7 EMISSION MASK

2.7.1 Specification Reference

FCC Part 2, Clause 2.1051
FCC Part 90, Clause 90.210(b)(3)

2.7.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.7.3 Date of Test and Modification State

24 May 2010 - 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 Environmental Conditions

	24 May 2010
Ambient Temperature	21°C
Relative Humidity	41%

2.7.6 Test Procedure

In accordance with 2.1051 and clause 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 filters and attenuator with the frequency spectrum being investigated between 9 kHz and 25 GHz. The EUT was set to transmit on full power with QPSK modulation. The EUT was tested on bottom, middle and top channels. The RBW below 1000MHz was set to 100 kHz and 1 MHz for measurements above 1000 MHz as defined in 90.210(o). The detector was set to peak with the trace set to max hold.

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



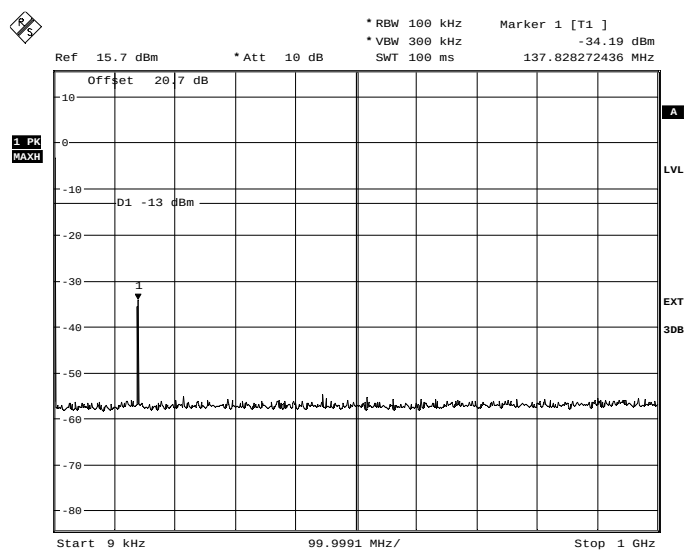
Product Service

2.7.7 Test Results

7.2 V DC Supply

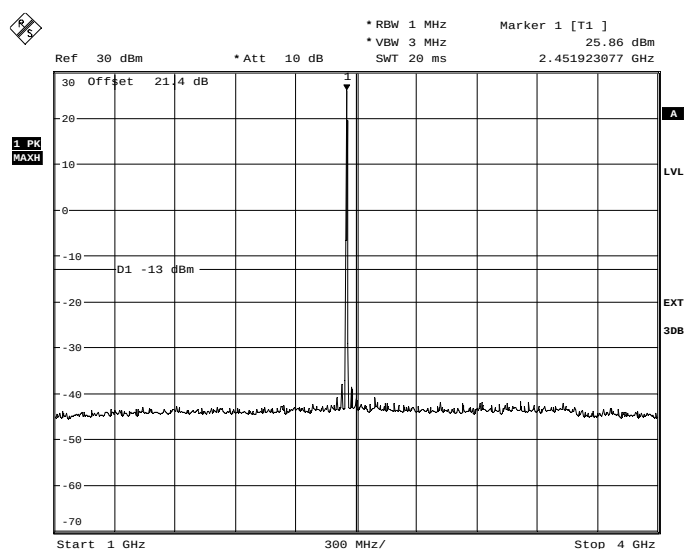
2452 MHz

9 kHz to 1 GHz



OBW1
Date: 24.MAY.2010 12:32:17

1 GHz to 4 GHz

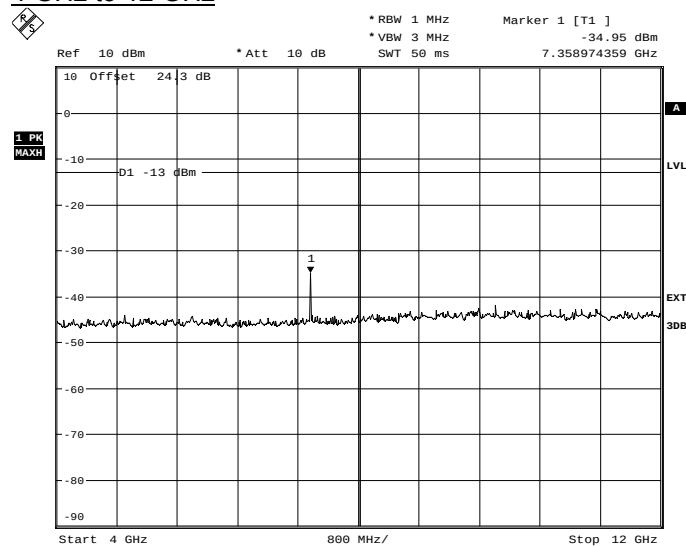


OBW1
Date: 24.MAY.2010 12:35:57



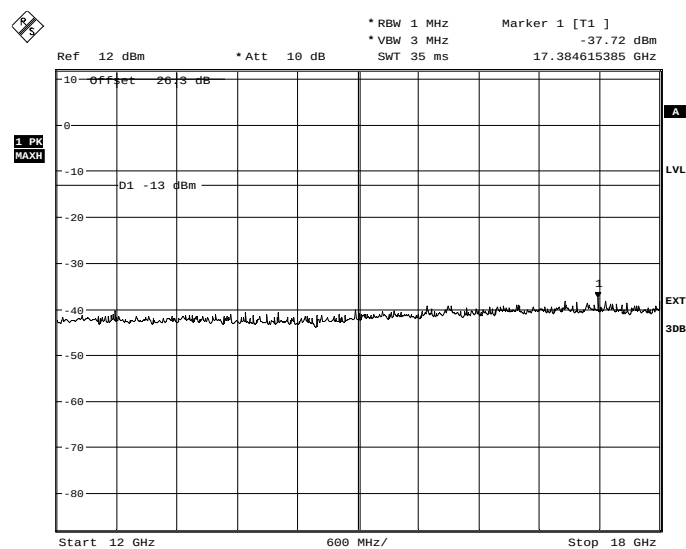
Product Service

4 GHz to 12 GHz



OBW1
Date: 24.MAY.2010 12:47:58

12 GHz to 18 GHz

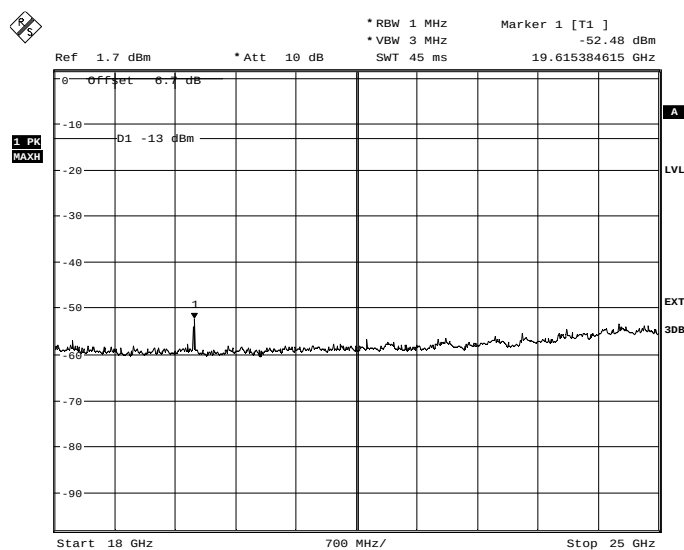


OBW1
Date: 24.MAY.2010 12:52:13



Product Service

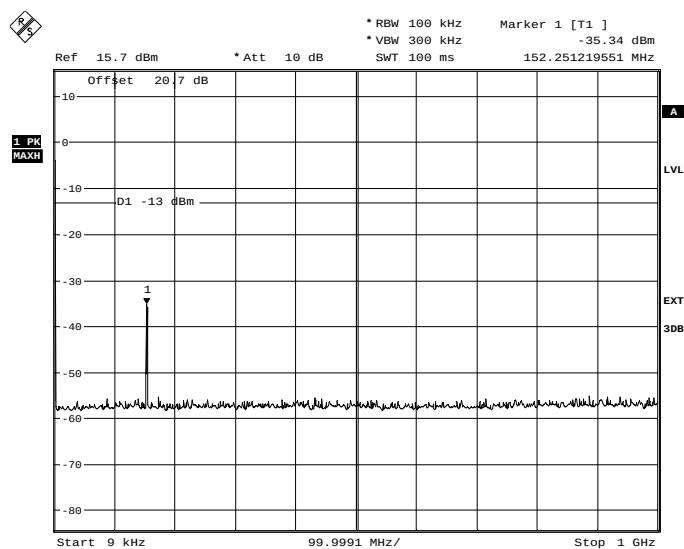
18 GHz to 25 GHz



OBW1
Date: 24.MAY.2010 12:12:13

2467 MHz

9 kHz to 1 GHz

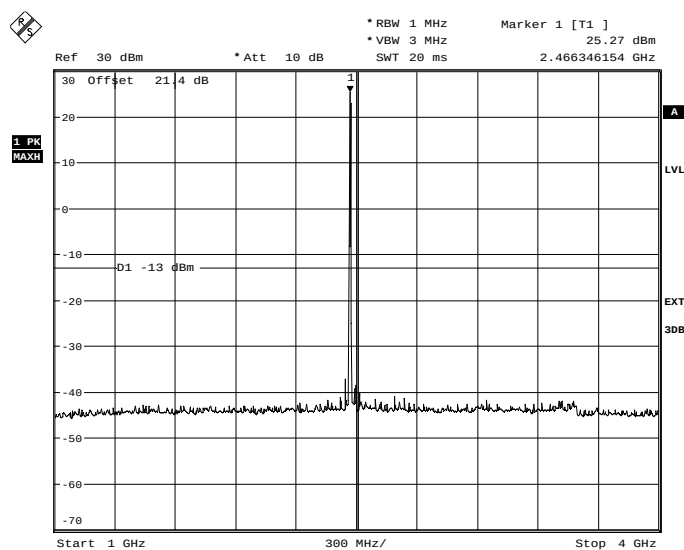


OBW1
Date: 24.MAY.2010 12:29:37



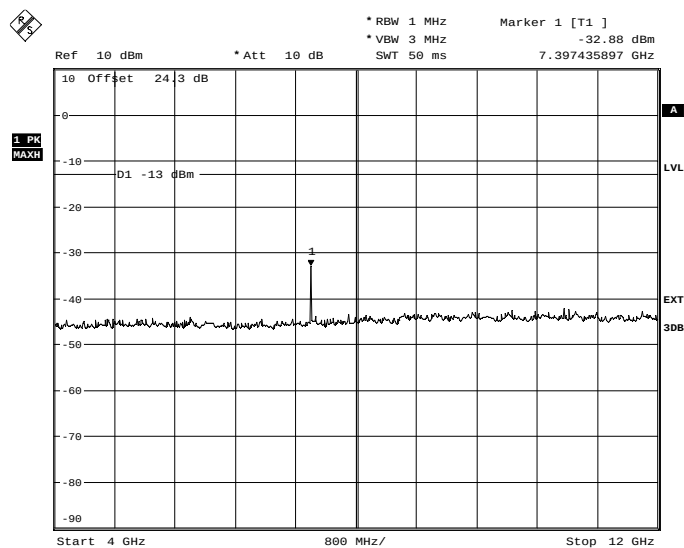
Product Service

1 GHz to 4 GHz



OBW1
Date: 24.MAY.2010 12:37:18

4 GHz to 12 GHz

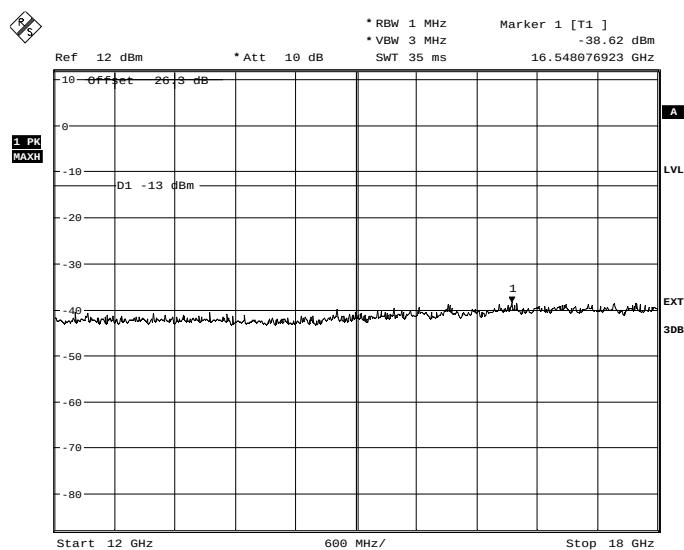


OBW1
Date: 24.MAY.2010 12:45:50



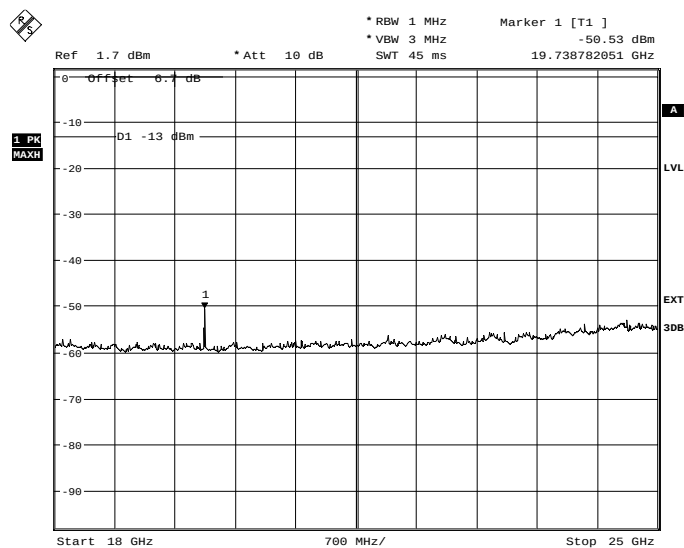
Product Service

12 GHz to 18 GHz



OBW1
Date: 24.MAY.2010 12:53:30

18 GHz to 25 GHz



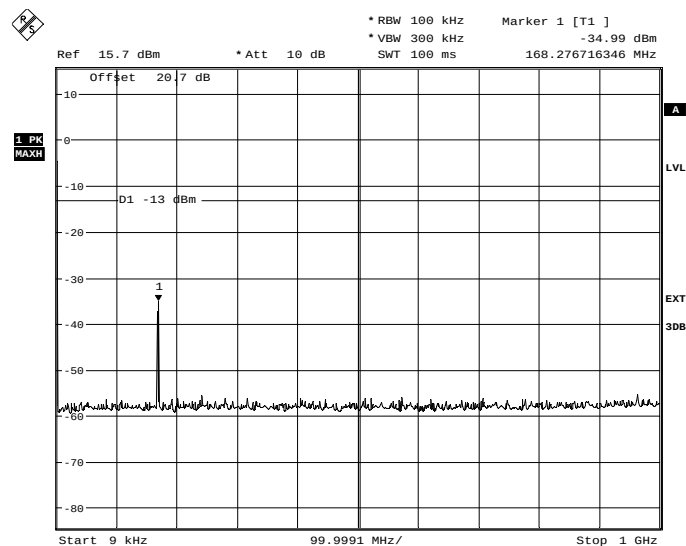
OBW1
Date: 24.MAY.2010 12:21:00



Product Service

2482 MHz

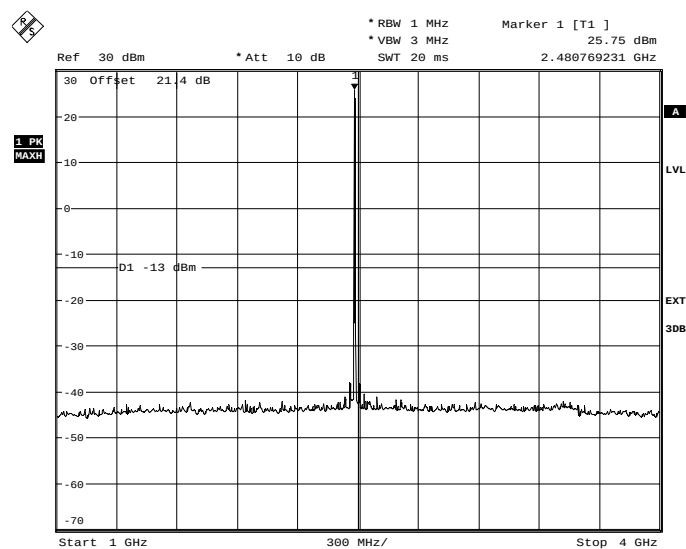
9 kHz to 1 GHz



OBW1

Date: 24.MAY.2010 12:27:25

1 GHz to 4 GHz



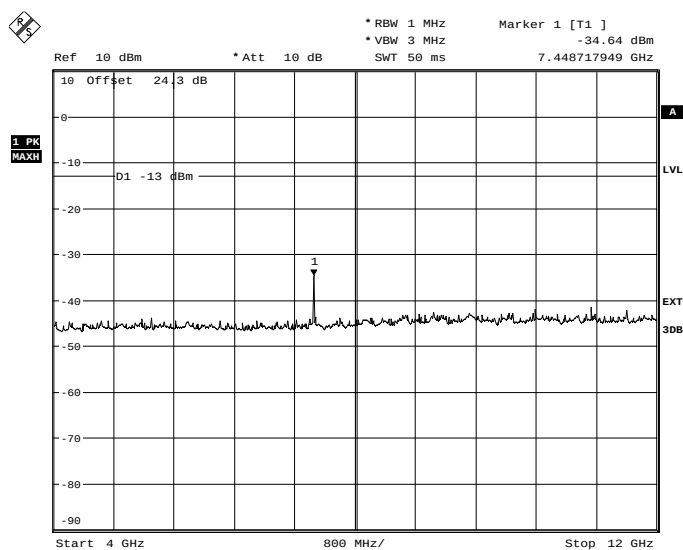
OBW1

Date: 24.MAY.2010 12:38:52



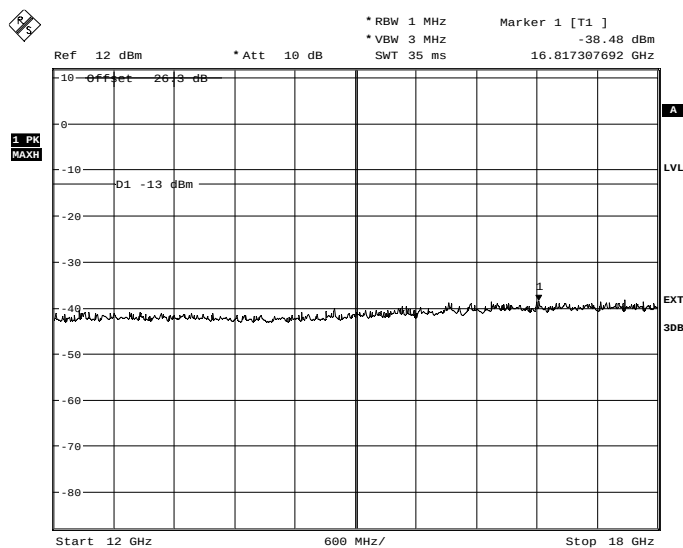
Product Service

4 GHz to 12 GHz



OBW1
Date: 24.MAY.2010 12:43:06

12 GHz to 18 GHz

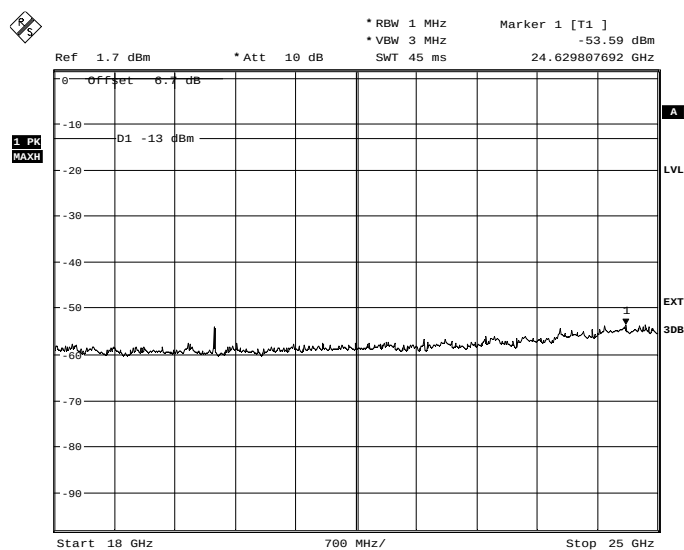


OBW1
Date: 24.MAY.2010 12:55:22



Product Service

18 GHz to 25 GHz



OBW1
Date: 24.MAY.2010 12:24:17

Limit Clause

90.210(b)(3)

Frequency Range	Attenuation (dB)
> $\pm 250\%$ Authorised Bandwidth	$43 + 10 \log P$



Product Service

2.8 EMISSION MASK

2.8.1 Specification Reference

RSS-210, Clause A8.5

2.8.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.8.3 Date of Test and Modification State

24 May 2010 - Modification State 0

2.8.4 Test Equipment Used

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

2.8.5 Environmental Conditions

	24 May 2010
Ambient Temperature	21°C
Relative Humidity	41%

2.8.6 Test Procedure

The spurious emissions from the antenna terminal were measured. The transmitter output power going into the spectrum analyser was attenuated using a combination of filters and attenuator with the frequency spectrum being investigated between 9 kHz and 25 GHz. The EUT was set to transmit on full power with QPSK modulation. The EUT was tested on bottom, middle and top channels. The RBW was set to 100 kHz as defined in clause A8.5. The detector was set to peak with the trace set to max hold.

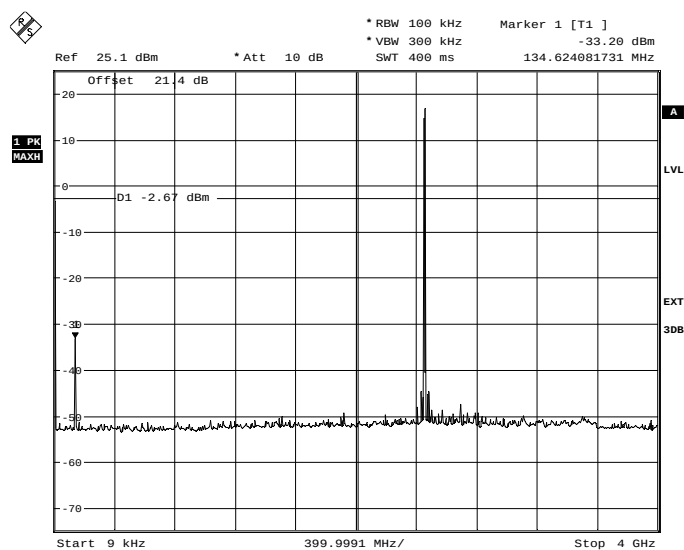
From 9 kHz to 4 GHz a 20 dB attenuator was used. From 4 GHz to 18 GHz a high pass filter and a 20 dB attenuator was used. From 18 GHz to 25 GHz a waveguide was used.

2.8.7 Test Results

7.2 V DC Supply

2452 MHz

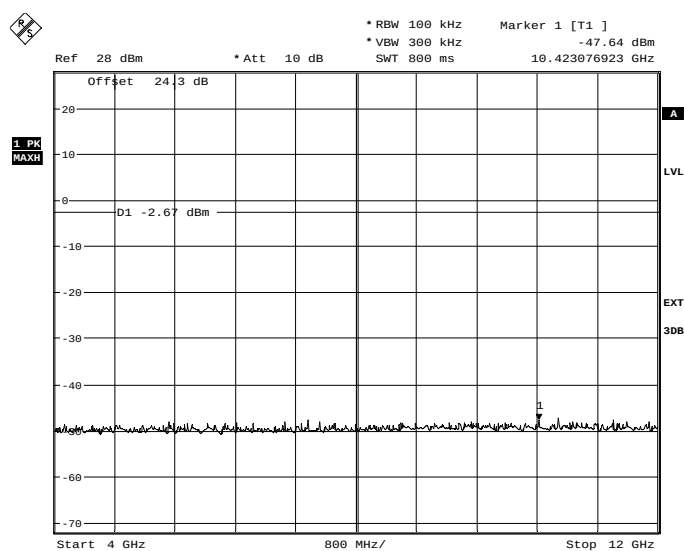
9 kHz to 4 GHz



OBW1

Date: 24.MAY.2010 14:25:05

4 GHz to 12 GHz



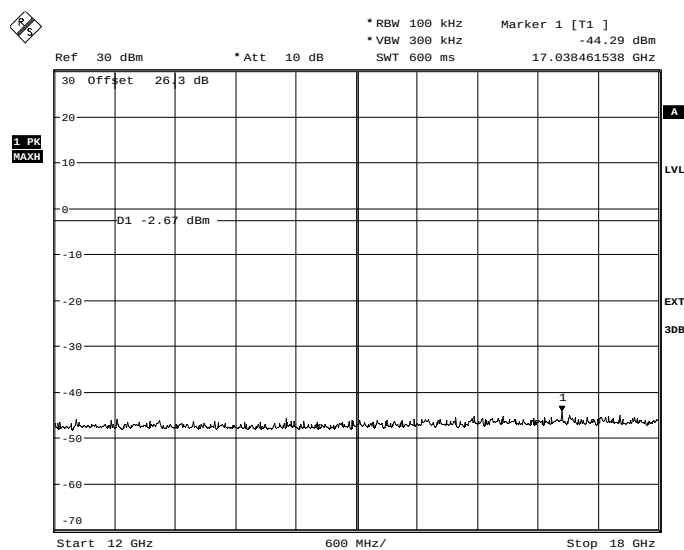
OBW1

Date: 24.MAY.2010 14:35:56



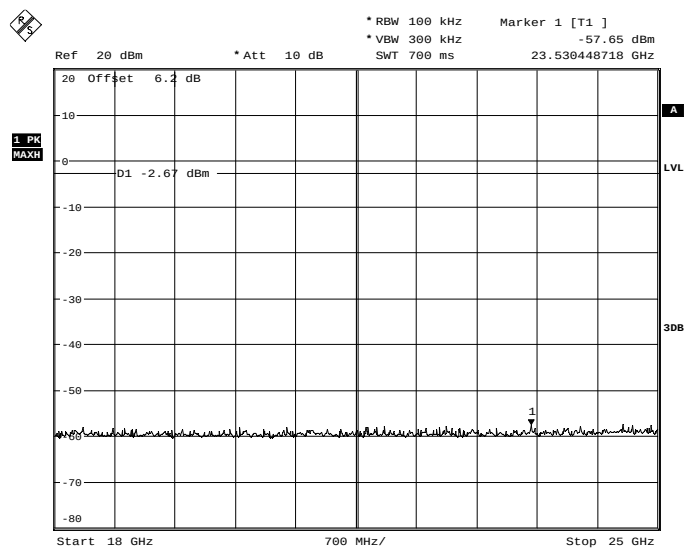
Product Service

12 GHz to 18 GHz



OBW1
Date: 24.MAY.2010 14:38:58

18 GHz to 25 GHz



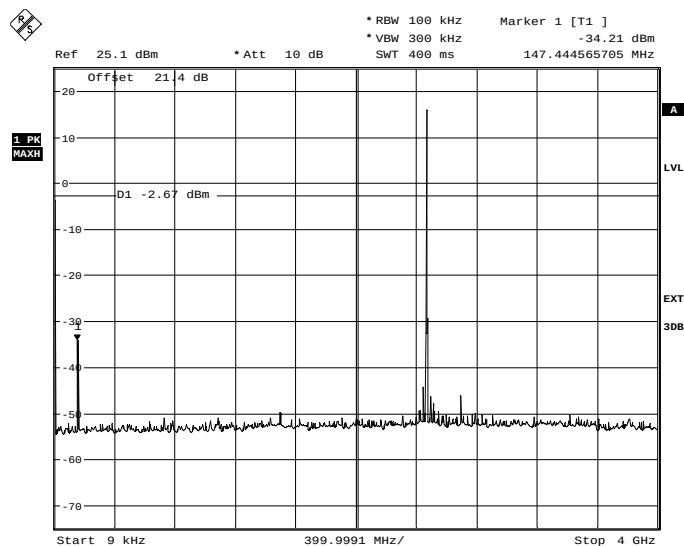
OBW1
Date: 22.JUN.2010 10:35:35



Product Service

2467 MHz

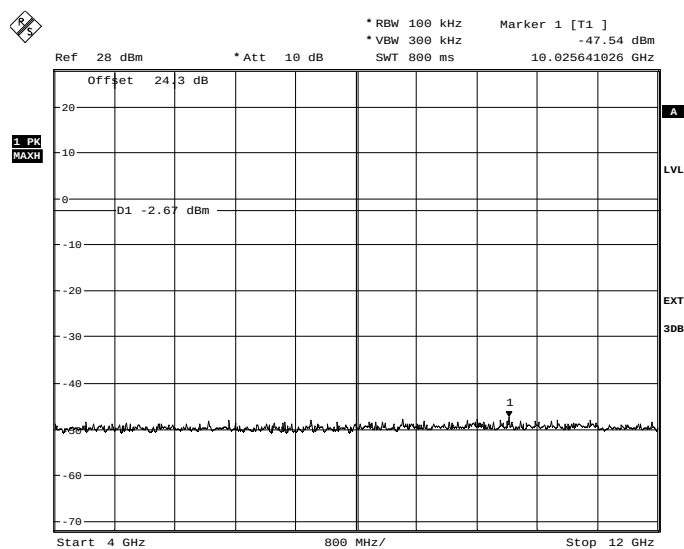
9 kHz to 4 GHz



OBW1

Date: 24.MAY.2010 14:26:25

4 GHz to 12 GHz



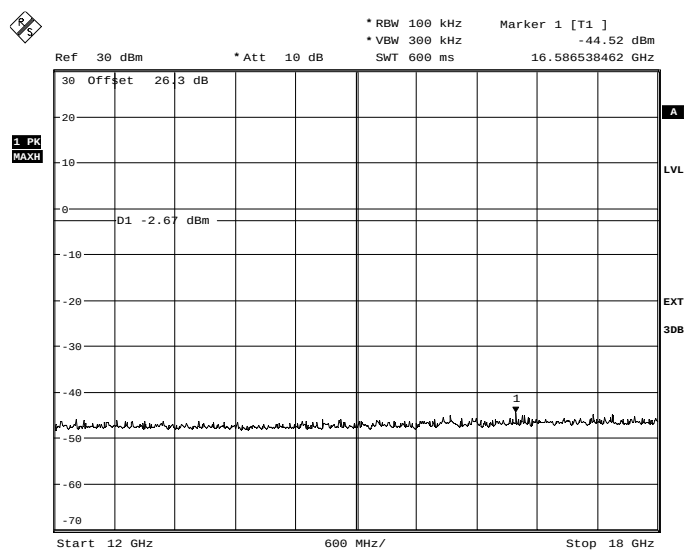
OBW1

Date: 24.MAY.2010 14:33:39



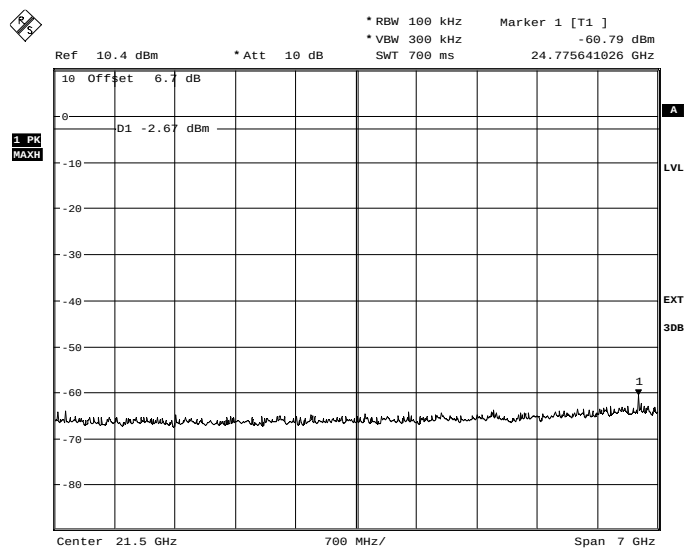
Product Service

12 GHz to 18 GHz



OBW1
Date: 24.MAY.2010 14:41:27

18 GHz to 25 GHz



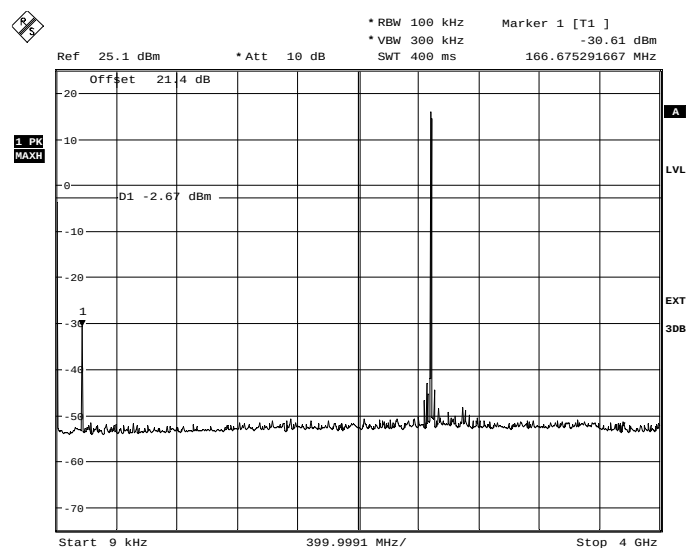
OBW1
Date: 24.MAY.2010 14:51:49



Product Service

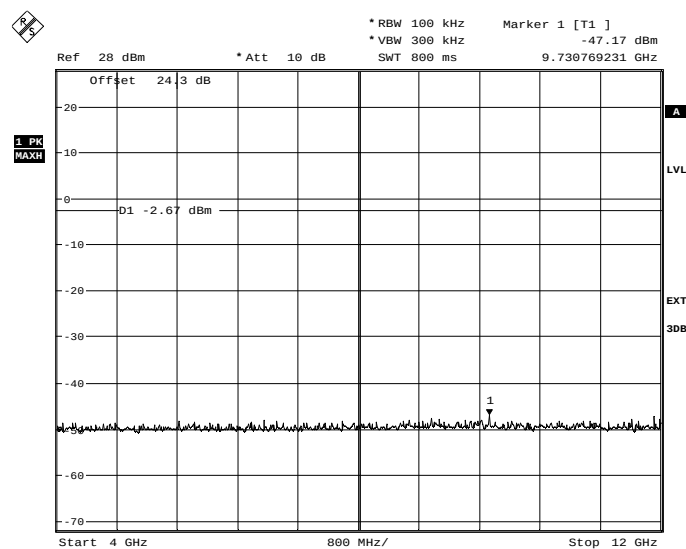
2482 MHz

9 kHz to 4 GHz



OBW1
Date: 24.MAY.2010 14:28:00

4 GHz to 12 GHz

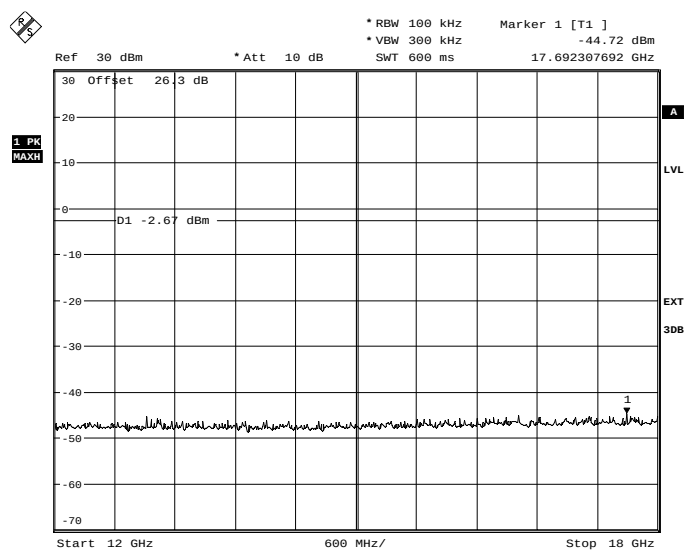


OBW1
Date: 24.MAY.2010 14:31:51



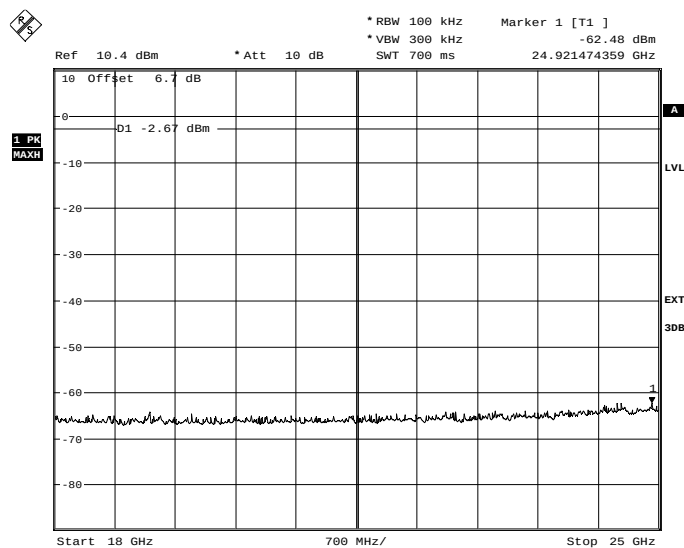
Product Service

12 GHz to 18 GHz



OBW1
Date: 24.MAY.2010 14:43:29

18 GHz to 25 GHz



OBW1
Date: 24.MAY.2010 14:50:23

Limit Clause

Frequency Range	Limit
9 kHz to 25 GHz	-20 dBc



Product Service

2.9 TRANSMITTER FREQUENCY STABILITY

2.9.1 Specification Reference

FCC Part 2, Clause 2.1055
FCC Part 90, Clause 90.213

2.9.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.9.3 Date of Test and Modification State

19 May 2010 - 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 Environmental Conditions

	19 May 2010
Ambient Temperature	24°C
Relative Humidity	37%

2.9.6 Test Procedure

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 for the measurement. The -6 dB points at the upper and lower part of the spectrum were recorded. The centre frequency was calculated by $f_1 + (f_2 - f_1 / 2)$, where f_1 was the lower -6 dB frequency and f_2 was the upper -6 dB frequency. The temperature was varied between -30°C and +50°C as defined in 2.1055. At 20°C the voltage was varied by $\pm 15\%$ as defined in 2.1055 (d)(1).



Product Service

2.9.7 Test Results

7.2 V DC Supply

2467 MHz

Temperature Interval (°C)	Voltage (V)	Frequency Error (Hz)	Frequency Error (ppm)
-30	7.2	-6442	-2.61
-20	7.2	-2083	-0.85
-10	7.2	-5833	-2.36
0	7.2	-6250	-2.53
+10	7.2	-2084	-0.84
+20	8.28	-2083	-0.84
+20	7.2	-2083	-0.84
+20	6.12	-2083	-0.84
+30	7.2	+2083	+0.84
+40	7.2	-2083	-0.84
+50	7.2	+10417	+4.22
Maximum Frequency Error (Hz)		+10417 / -6442	+4.22 / -2.61
Measurement Uncertainty (Hz)		± 11	

Limit Clause

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



Product Service

2.10 6dB BANDWIDTH

2.10.1 Specification Reference

RSS-210, Clause A8.2(a)

2.10.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.10.3 Date of Test and Modification State

24 May 2010 - Modification State 0

2.10.4 Test Equipment Used

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

2.10.5 Environmental Conditions

	24 May 2010
Ambient Temperature	21°C
Relative Humidity	48%

2.10.6 Test Procedure

The EUT was connected to a spectrum analyser via a 10dB attenuator. The path loss was measured between the EUT and the spectrum analyser and entered as a reference level offset. The peak response of the signal was established and the 6dB points determined using the markers. A resolution bandwidth of 10kHz and a video bandwidth of 30kHz were used with the trace sets to max hold.

2.10.7 Test Results

7.2 V DC Supply

Frequency (MHz)	Modulation	6dB Bandwidth (MHz)
2452	QPSK	2.338461
2467	QPSK	2.338461
2482	QPSK	2.343028

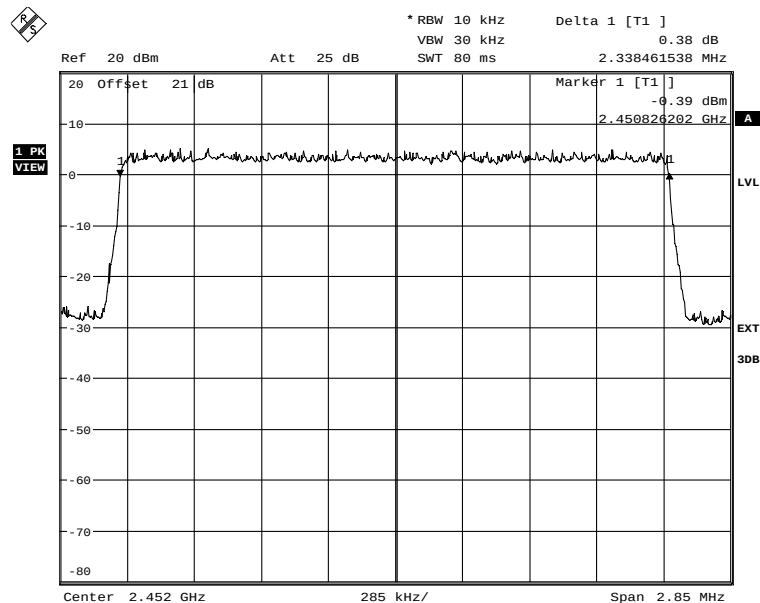
Limit Clause

≥ 500 kHz



Product Service

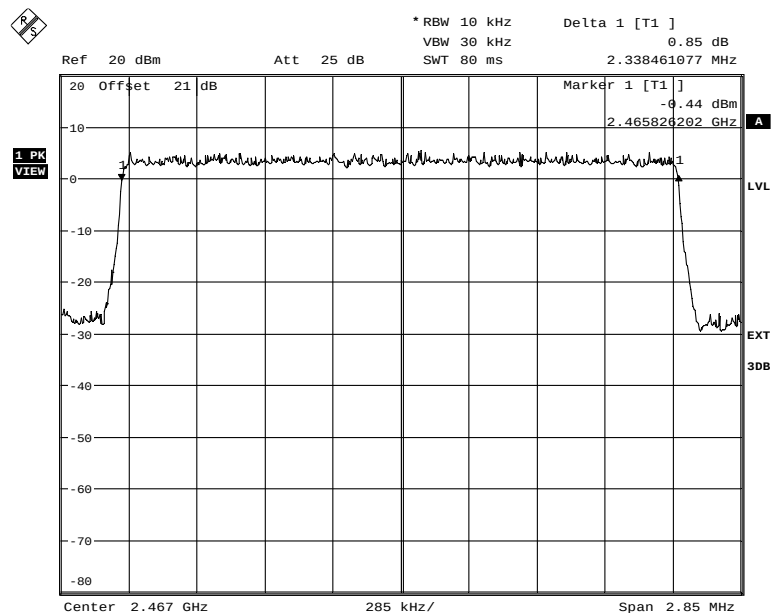
2452MHz



OBW1

Date: 24.MAY.2010 10:25:05

2467MHz



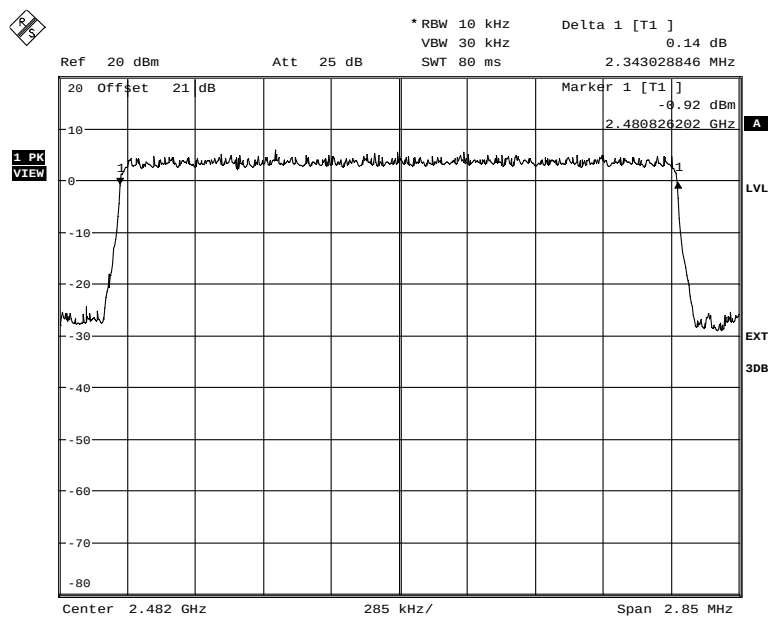
OBW1

Date: 24.MAY.2010 10:21:56



Product Service

2482MHz



OBW1

Date: 24.MAY.2010 10:28:56



Product Service

2.11 POWER SPECTRAL DENSITY

2.11.1 Specification Reference

RSS-210, Clause A8.2(b)

2.11.2 Equipment Under Test

Argus® Long Range Telemetry System, S/N: 0019

2.11.3 Date of Test and Modification State

24 May 2010 - Modification State 0

2.11.4 Test Equipment Used

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

2.11.5 Environmental Conditions

	24 May 2010
Ambient Temperature	22°C
Relative Humidity	36%

2.11.6 Test Procedure

The EUT was connected to a spectrum analyser via a 10dB attenuator. The path loss was measured between the EUT and the spectrum analyser and entered as a reference level offset. The trace was set to max hold and using a peak detector the maximum response was established. With the spectrum analyser RBW at 3kHz and VBW at 10KHz, the power spectral density in a 3kHz bandwidth was measured.

2.11.7 Test Results

7.2 V DC Supply

Frequency (MHz)	Modulation	Power Spectral Density in 3kHz band (dBm)
2452	QPSK	-1.67
2467	QPSK	-1.39
2482	QPSK	-1.31

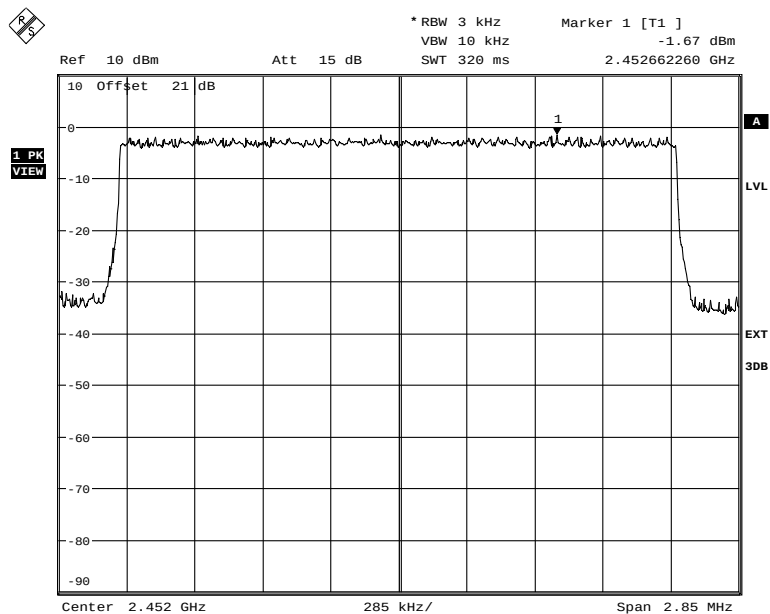
Limit Clause

$\leq +8$ dBm / 3 kHz



Product Service

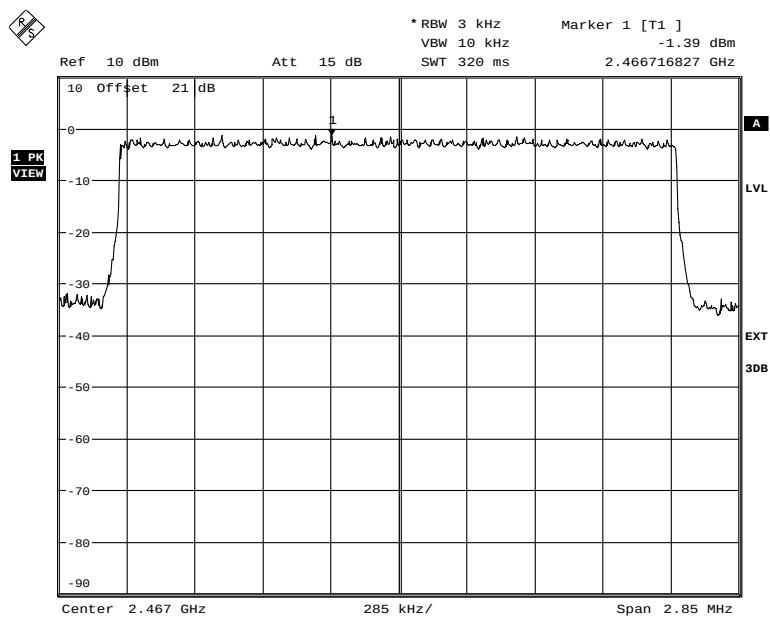
2452MHz



OBW1

Date: 24.MAY.2010 10:45:57

2467MHz



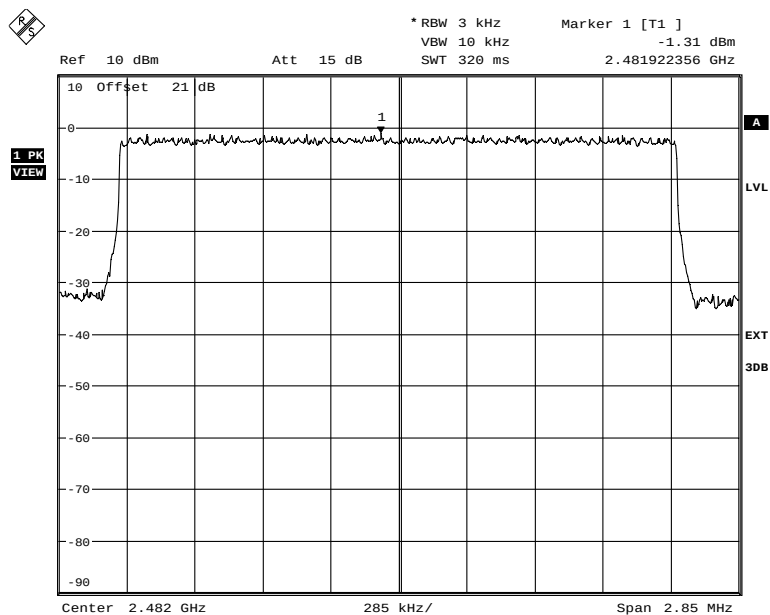
OBW1

Date: 24.MAY.2010 10:42:44



Product Service

2482MHz



OBW1

Date: 24.MAY.2010 10:39:53



Product Service

SECTION 3

TEST EQUIPMENT USED



Product Service

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 2.1 and 2.5 - Radiated Emissions (Enclosure Port) and ERP Peak Power					
Peak Power Analyser	Hewlett Packard	8990A	107	12	10-Feb-2011
Antenna (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	TU
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	12-Oct-2010
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	12-Oct-2010
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Attenuator 20dB 5W	Marconi	56534-904H	377	12	30-Apr-2011
Pre-Amplifier	Phase One	PS04-0085	1532	12	16-Sep-2010
Pre-Amplifier	Phase One	PS04-0086	1533	12	17-Sep-2010
Pre-Amplifier	Phase One	PS04-0087	1534	12	22-Sep-2010
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
4GHz HPF	Sematron	F-100-4000-5-R	2245	-	TU
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	4-Dec-2011
Antenna (Biconnical)	Schaffner	VBA6106A	3106	12	27-Mar-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	4-Aug-2010
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	1-Sep-2010
Section 2.2 - Power and Antenna Height Limits / Transmitter Output Power					
Peak Power Analyser	Hewlett Packard	8990A	107	12	10-Feb-2011
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Temperature Chamber	Montford	2F3	467	-	O/P Mon
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011
Section 2.4 - Bandwidth Limitations					
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	8-Sep-2010
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	3-Jun-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.6 - Emission Mask					
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	19-Jun-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	8-Sep-2010
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011
Section 2.7 and 2.8- Emission Mask					
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	8-Sep-2010
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	8-Sep-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	3-Jun-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3696	12	26-Jan-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011
Waveguide	Flann Microwave	18-26.5GHz)	-	-	-
Section 2.9 - Transmitter Frequency Stability					
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
Temperature Chamber	Montford	2F3	467	-	O/P Mon
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	8-Sep-2010
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Thermocouple Thermometer	Fluke	51	3172	12	3-Jul-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
3 Phase Contact Adaptor	TUV	UKN	3458	-	TU
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	3-Jun-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.10 – 6dB Bandwidth					
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	8-Sep-2010
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	3-Jun-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011
Section 2.11 - Power Spectral Density					
Multimeter	Fluke	75 Mk3	455	12	15-Dec-2010
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	8-Sep-2010
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Attenuator (20dB, 50W)	Aeroflex / Weinschel	47-20-34	3165	12	9-Jun-2010
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	3-Jun-2010
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	25-Feb-2011
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3702	12	26-Jan-2011

TU – Traceability Unscheduled

OP MON – Output Monitored with Calibrated Equipment

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	5.2dB*
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	10MHz to 6GHz Test Amplitude	2.0dB†
Conducted Susceptibility RF	50kHz to 1000MHz Amplitude	3.1dB•
	EM Clamp Method of Test	1.2dB•
	CDN Method of Test	1.1dB•
	BCI Clamp Method of Test	1.2dB•
Conducted Susceptibility LF	DC to 150kHz	1.0%†
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 10⁶.

* In accordance with CISPR 16-4-2

† In accordance with UKAS Lab 34

• In accordance with EN61000-4-6: 2009



Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT



Product Service

4.1 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
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