Report On

FCC and Industry Canada Testing of the
Inmarsat Global Ltd IsatPhone2
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN

COMMERCIAL-IN-CONFIDENCE

FCC ID: YCT-ISATPHONE2
IC ID: 8944A-ISATPHONE2

Document 75924065 Report 06 Issue 1 November 2013

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REPORT ON

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Document 75924065 Report 06 Issue 1

November 2013

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APPROVED BY

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Authorised Signatory

DATED 15 November 2013

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 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

G Lawler A Galpin

Product Service

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Product Service

SECTION 1

REPORT SUMMARY

FCC and Industry Canada Testing of the
Inmarsat Global Ltd IsatPhone2
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC and Industry Canada Testing of the Inmarsat Global Ltd IsatPhone2 to the requirements of FCC CFR 47 Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN.

Objective	To perform FCC and Industry Canada Testing to determine the Equipment Under Test's (EUT's) compliance with the Test Specification, for the series of tests carried out.
Manufacturer	Inmarsat Global Ltd
Model Number(s)	IsatPhone2
Serial Number(s)	IX40100471
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2012) Industry Canada RSS-210 (2010) Industry Canada RSS-GEN (2010)
Incoming Release Date	Application Form 08 November 2013
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	57-00098-01/1 30 August 2013
Start of Test	30 October 2013
Finish of Test	5 November 2013
Name of Engineer(s)	G Lawler A Galpin
Related Document(s)	ANSI C63.10: 2009

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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 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN is shown below.

Section	Spec Clause			Test Description	Result	Comments/Base Standard
	Pt 15C	RSS-210	RSS-GEN			
Bluetooth						
2.1	15.207	7.2.4	-	AC Line Conducted Emissions	Pass	
2.2	15.247 (b)(3)	A8.4 (2)	-	Maximum Peak Conducted Output Power	Pass	
2.3	15.247 (a)(1)	A8.1 (a)(b)	-	Frequency Hopping Systems - 20 dB Bandwidth and Channel Separation	Pass	
2.4	15.247 (a)(1)(iii)	A8.1 (d)	-	Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels	Pass	
2.5	15.247 (b)(4)	A8.4 (4)	-	EIRP Peak Power	Pass	
2.6	15.247 (d)	A8.5	2.2	Spurious and Band Edge Emissions	Pass	

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1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	IsatPhone2
Part Number	NA
FCC ID (if applicable)	YCT-ISATPHONE2
Industry Canada ID (if applicable)	8944A-ISATPHONE2
Technical Description (Please provide a brief description of the intended use of the equipment)	Satellite phone for Inmarsat GMR2+ satellite network system.

Types of Modulations used by the Equipment
☒ FHSS
☐ Other forms of modulation
In case of FHSS Modulation
In case of non-Adaptive Frequency Hopping equipment:
Number of Hopping Frequencies: 79
In case of Adaptive Frequency Hopping Equipment:
Maximum number of Hopping Frequencies: 79
Minimum number of Hopping Frequencies: 20
Dwell Time: 0.625ms
Minimum Channel Occupation Time: 0.625ms
Adaptive / non-adaptive equipment:
☐ non-adaptive Equipment
☐ adaptive Equipment without the possibility to switch to a non-adaptive mode
☒ adaptive Equipment which can also operate in a non-adaptive mode
In case of adaptive equipment:
The Channel Occupancy Time implemented by the equipment: 2.905 ms
☐ The equipment has implemented an LBT based DAA mechanism
In case of equipment using modulation different from FHSS:
☐ The equipment is Frame Based equipment
☐ The equipment is Load Based equipment
☐ The equipment can switch dynamically between Frame Based and Load Based equipment
The CCA time implemented by the equipment: µs
The value q as referred to in clause 4.3.2.5.2.2.2
☒ The equipment has implemented an non-LBT based DAA mechanism
☐ The equipment can operate in more than one adaptive mode

Product Service

In case of non-adaptive Equipment:		
The maximum RF Output Power (e.i.r.p.): 6.2 dBm		
The maximum (corresponding) Duty Cycle: 77 %		
Equipment with dynamic behaviour, that behaviour is described here. (e.g. the different combinations of duty cycle and corresponding power levels to be declared):		
NA		
The worst case operational mode for each of the following tests:		
RF Output Power:		
Power Spectral Density:		
Duty cycle, Tx-Sequence, Tx-gap:		
Dwell time, Minimum Frequency Occupation & Hopping Sequence (only for FHSS equipment):		
Hopping Frequency Separation (only for FHSS equipment):		
Medium Utilisation:		
Adaptivity & Receiver Blocking:		
Occupied Channel Bandwidth:		
Transmitter unwanted emissions in the OOB domain:		
Transmitter unwanted emissions in the spurious domain:		
Receiver spurious emissions:		
The different transmit operating modes (tick all that apply):		
☒	Operating mode 1: Single Antenna Equipment	
	☒	Equipment with only 1 antenna
	☐	Equipment with 2 diversity antennas but only 1 antenna active at any moment in time
	☐	Smart Antenna Systems with 2 or more antennas, but operating in a (legacy) mode where only 1 antenna is used. (e.g. IEEE 802.11™ [i.3] legacy mode in smart antenna systems)
☐	Operating mode 2: Smart Antenna Systems - Multiple Antennas without beam forming	
	☐	Single spatial stream / Standard throughput / (e.g. IEEE 802.11™ [i.3] legacy mode)
	☐	High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
	☐	High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2
NOTE: Add more lines if more channel bandwidths are supported.		
☐	Operating mode 3: Smart Antenna Systems - Multiple Antennas with beam forming	
	☐	Single spatial stream / Standard throughput (e.g. IEEE 802.11™ [i.3] legacy mode)
	☐	High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 1
	☐	High Throughput (> 1 spatial stream) using Occupied Channel Bandwidth 2
NOTE: Add more lines if more channel bandwidths are supported.		
In case of Smart Antenna Systems:		
The number of Receive chains:		
The number of Transmit chains:		
☐	symmetrical power distribution	
☐	asymmetrical power distribution	
In case of beam forming, the maximum beam forming gain:		
NOTE: Beam forming gain does not include the basic gain of a single antenna.		

Product Service

Operating Frequency Range(s) of the equipment:	
Operating Frequency Range 1: 2402 MHz to 2480 MHz	Bluetooth (e.g Bluetooth for EU)
Operating Frequency Range 2: MHz to MHz	(e.g WLAN for EU)
Operating Frequency Range 3: MHz to MHz	(e.g Bluetooth for FCC and/or Industry Canada)
Operating Frequency Range 4: MHz to MHz	(e.g WLAN for FCC and/or Industry Canada)
NOTE: Add more lines if more Frequency Ranges are supported.	
Occupied Channel Bandwidth(s):	
Occupied Channel Bandwidth1: 1 MHz to MHz	
Occupied Channel Bandwidth2: MHz to MHz	
NOTE: Add more lines if more channel bandwidths are supported.	
Type of Equipment (stand-alone, combined, plug-in radio device, etc.):	
☐ Stand-alone	
☒ Combined Equipment (Equipment where the radio part is fully integrated within another type of equipment)	
☐ Plug-in radio device (Equipment intended for a variety of host systems)	
☐ Other	
The extreme operating conditions that apply to the equipment:	
Operating temperature range: -20 °C to +55 °C	
Operating voltage range: 3.55 V to 4.2 V	☐ AC ☒ DC
Details provided are for the:	
☒ stand-alone equipment	
☐ combined (or host) equipment	
☐ test jig	

Product Service

The intended combination(s) of the radio equipment power settings and one or more antenna assemblies and their corresponding e.i.r.p levels:			
Antenna Type:			
☒ Integral Antenna			
Antenna Gain: 2.2 dBi			
If applicable, additional beamforming gain (excluding basic antenna gain): dB			
☒ Temporary RF connector provided			
☐ No temporary RF connector provided			
☐ Dedicated Antennas (equipment with antenna connector)			
☐ Single power level with corresponding antenna(s)			
☐ Multiple power settings and corresponding antenna(s)			
Number of different Power Levels:			
Power Level 1: dBm			
Power Level 2: dBm			
Power Level 3: dBm			
Power Level 4: dBm			
NOTE 1: Add more lines in case the equipment has more power levels.			
NOTE 2: These power levels are conducted power levels (at antenna connector).			
For each of the Power Levels, provide the intended antenna assemblies, their corresponding gains (G) and the resulting e.i.r.p. levels also taking into account the beamforming gain (Y) if applicable			
Power Level 1: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
3			
4			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			
Power Level 2: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
3			
4			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			
Power Level 3: dBm			
Number of antenna assemblies provided for this power level:			
Assembly #	**Gain (dBi)**	**e.i.r.p (dBm)**	**Part number or model number**
1			
2			
3			
4			
NOTE: Add more rows in case more antenna assemblies are supported for this power level.			

Product Service

The nominal voltages of the stand-alone radio equipment or the nominal voltages of the combined (host) equipment or test jig in case of plug-in devices:	
Details provided are for the: ☒ stand-alone equipment	
☐ combined (or host) equipment	
☐ test jig	
Supply Voltage ☐ AC mains State AC voltage	
☒ State DC voltage 3.7	
In case of DC, indicate the type of power source	
☐ Internal Power Supply	
☐ External Power Supply or AC/DC adapter	
☒ Battery	
☐ Other:	
Describe the test modes available which can facilitate testing:	
BT Testmode to allow tester communication and control. Activated via PC with provided script	
The equipment type (e.g. Bluetooth®, IEEE 802.11™ [i.3], proprietary, etc.):	
Bluetooth	
Combination for testing (see clause 5.1.3.3 of EN 300 328 V1.8.1)	
From all combinations of conducted power settings and intended antenna assembly(ies) specified in clause 3.1 m), specify the combination resulting in the highest e.i.r.p. for the radio equipment. Unless otherwise specified in EN 300 328, this power setting is to be used for testing against the requirements of EN 300 328. In case there is more than one such conducted power setting resulting in the same (highest) e.i.r.p. level, the highest power setting is to be used for testing. See also EN 300 328, clause 5.1.3.3.	
Highest overall e.i.r.p. value: 6.2 dBm	
Corresponding Antenna assembly gain: 2.2 dBi	Antenna Assembly #: Internal antenna
Corresponding conducted power setting: 4 dBm	Listed as Power Setting #:
(also the power level to be used for testing)	
Additional information provided by the applicant	
Modulation	
ITU Class(es) of emission:	
Can the transmitter operate unmodulated? ☐ Yes ☒ No	
Duty Cycle	
The transmitter is intended for:	
☒ Continuous duty	
☐ Intermittent duty	
☐ Continuous operation possible for testing purposes	
About the UUT	
☐ The equipment submitted are representative production models	
☒ If not, the equipment submitted are pre-production models ?	
☒ If pre-production equipment are submitted, the final production equipment will be identical in all respects with the equipment tested	
☐ If not, supply full details	
☐ The equipment submitted is CE marked	
☒ In addition to the CE mark, the Class-II identifier (Alert Sign) is affixed.	

Product Service

	Additional items and/or supporting equipment provided
☒	Spare batteries (e.g. for portable equipment)
☒	Battery charging device
☒	External Power Supply or AC/DC adapter
☒	Test Jig or interface box
☐	RF test fixture (for equipment with integrated antennas)
☐	Host System
	Manufacturer
	Model
	Model Name
☒	Combined equipment
	Manufacturer Inmarsat
	Model IsatPhone2
	Model Name NA
☒	User Manual
☒	Technical documentation (Handbook and circuit diagrams)

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

Signature: Name: Ari Tastula

Position held: R&D HW Senior Architect Date: 08.11.2013

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was an Inmarsat Global Ltd IsatPhone2. A full technical description can be found in the manufacturer's documentation.

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.

The EUT was powered from a 3.7 V DC supply.

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 standard were made during testing.

1.7 MODIFICATION RECORD

Modification 0 - No modifications were made to the test sample during testing.

Product Service

SECTION 2

TEST DETAILS

FCC and Industry Canada Testing of the
Inmarsat Global Ltd IsatPhone2
In accordance with FCC CFR 47 Part 15C, Industry Canada RSS-210 and Industry Canada RSS-GEN

2.1 AC LINE CONDUCTED EMISSIONS

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.207
Industry Canada RSS-210, Clause 7.2.4

2.1.2 Equipment Under Test and Modification State

IsatPhone2 S/N: IX40100471 - Modification State 0

2.1.3 Date of Test

4 November 2013

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 Procedure

The EUT was set up on a test table 800mm above a horizontal ground plane. A vertical ground plane was also required and is placed 400mm from the EUT.

The EUT was powered through a Line Impedance Stabilisation Network (LISN) which was bonded to the ground plane. The EUT was located so that the distance between the EUT and the LISN was no less than 800mm. Where possible the cable between the mains input of the EUT and the LISN was 1m. Where this is not possible the cable is non-inductively bundled with the bundle not exceeding 400mm in length.

A preliminary profile of the Conducted Emissions was obtained over the frequency range 150kHz to 30MHz. Any points of interest are noted for formal measurements.

During formal measurements, the measuring receiver was tuned to the emission of interest where Quasi – Peak and Average measurements are performed in a 9 kHz Video and Resolution Bandwidth.

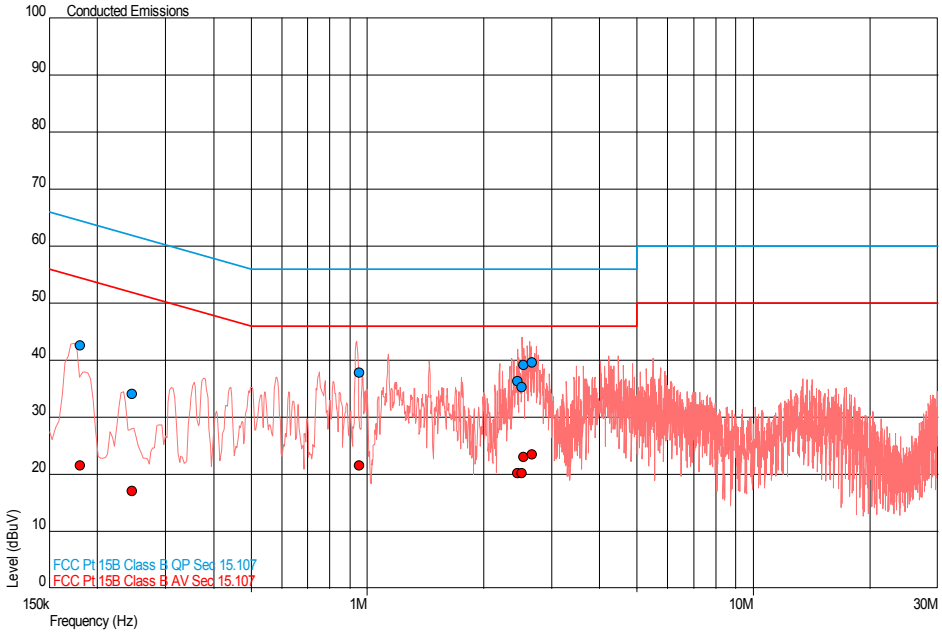
2.1.6 Environmental Conditions

Ambient Temperature	18.6°C
Relative Humidity	36.0%

Product Service

2.1.7 Test Results

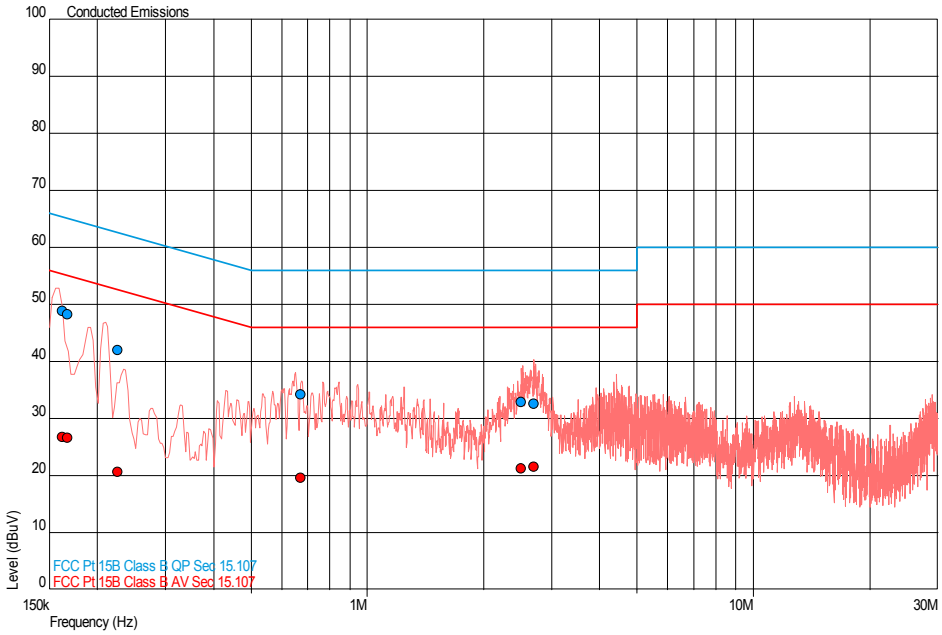
Live Line



Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.181	42.6	64.4	-21.9	21.5	54.4	-32.9
0.246	34.1	61.9	-27.8	17.1	51.9	-34.8
0.955	37.8	56.0	-18.2	21.6	46.0	-24.4
2.457	36.3	56.0	-19.7	20.2	46.0	-25.8
2.519	35.2	56.0	-20.8	20.2	46.0	-25.8
2.539	39.1	56.0	-16.9	23.0	46.0	-23.0
2.667	39.7	56.0	-16.3	23.5	46.0	-22.5

Product Service

Neutral Line



Frequency (MHz)	QP Level (dBuV)	QP Limit (dBuV)	QP Margin (dBuV)	AV Level (dBuV)	AV Limit (dBuV)	AV Margin (dBuV)
0.162	48.9	65.4	-16.5	26.8	55.4	-28.6
0.168	48.3	65.1	-16.8	26.6	55.1	-28.5
0.226	42.1	62.6	-20.5	20.7	52.6	-31.9
0.672	34.2	56.0	-21.8	19.6	46.0	-26.4
2.505	32.9	56.0	-23.1	21.2	46.0	-24.8
2.700	32.6	56.0	-23.4	21.5	46.0	-24.5

2.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(3)
Industry Canada RSS-210, Clause A8.4 (2)

2.2.2 Equipment Under Test and Modification State

IsatPhone2 Pro 2+ S/N: Ant Number IN50000242 - Modification State 0

2.2.3 Date of Test

5 November 2013

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 Procedure

The EUT was configured to transmit at maximum power via a cable to the Peak Power Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a reference level offset was entered to account for the measurement path loss. The measurement bandwidth was set according to the signal being measured and the peak and average levels were recorded.

2.2.6 Environmental Conditions

Ambient Temperature	23.9°C
Relative Humidity	41.1%

Product Service

2.2.7 Test Results

3.7 V DC Supply

Packet Type	Maximum Peak Conducted Output Power					
	dBm			mW		
	2402 MHz	2441 MHz	2480 MHz	2402 MHz	2441 MHz	2480 MHz
DH1	5.10	4.63	3.56	3.23	2.90	2.26
DH3	5.13	4.67	3.88	3.25	2.93	2.44
DH5	5.07	4.66	3.88	3.21	2.92	2.44

Limit Clause

The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725-5850MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands: 1 Watt.

2.3 FREQUENCY HOPPING SYSTEMS - 20 dB BANDWIDTH AND CHANNEL SEPARATION

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)
Industry Canada RSS-210, Clause A8.1 (a)(b)

2.3.2 Equipment Under Test and Modification State

IsatPhone2 Pro 2+ S/N: Ant Number IN50000242 - Modification State 0

2.3.3 Date of Test

4 November 2013

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

For the 20 dB bandwidth measurement, the EUT was configured to transmit at maximum power via a cable to the Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen. The peak point of the trace was measured and the markers positioned to give the -20dBc points of the displayed spectrum.

For the channel separation measurement, the EUT was transmitted at maximum power into a Spectrum Analyser. The trace was set to Max Hold to store several adjacent channels on screen. Using the marker delta function, the markers were positioned to show the separation between adjacent channels.

2.3.6 Environmental Conditions

Ambient Temperature	23.7°C
Relative Humidity	29.6%

Product Service

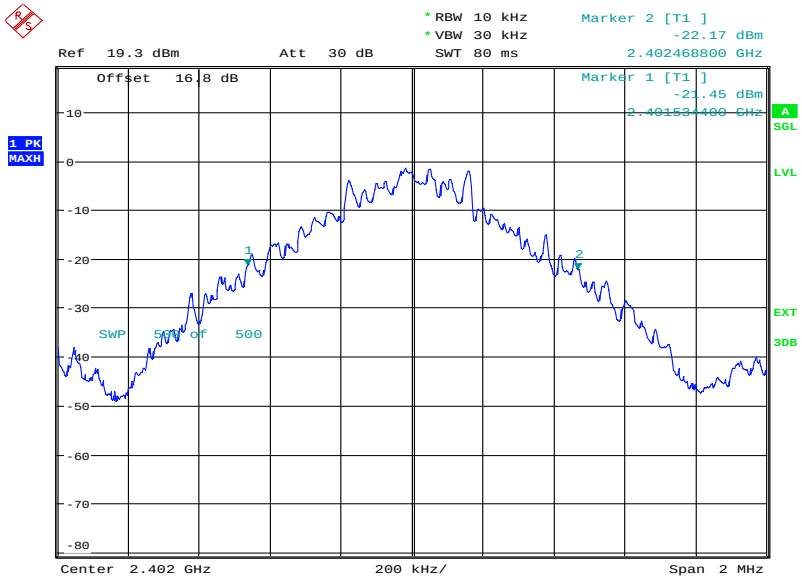
2.3.7 Test Results

3.7 V DC Supply

20dB Bandwidth

2402 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
DH3	934.4



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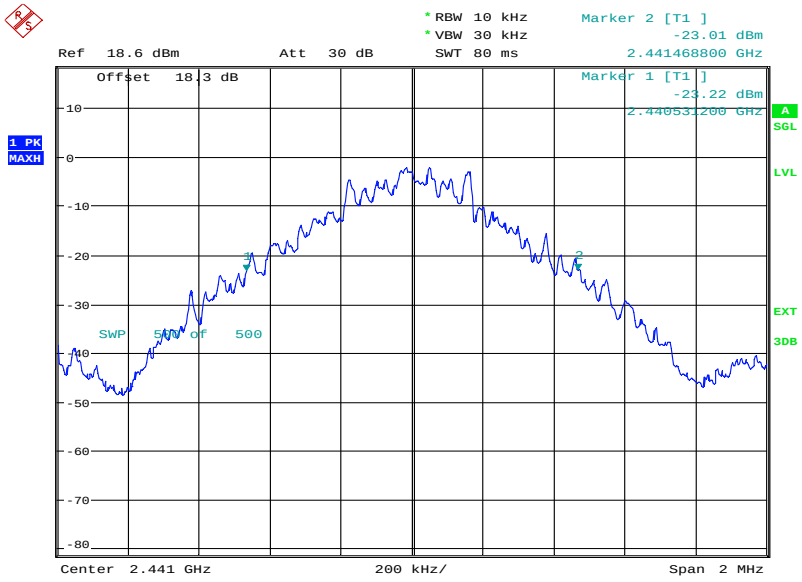
2441 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
DH3	937.6



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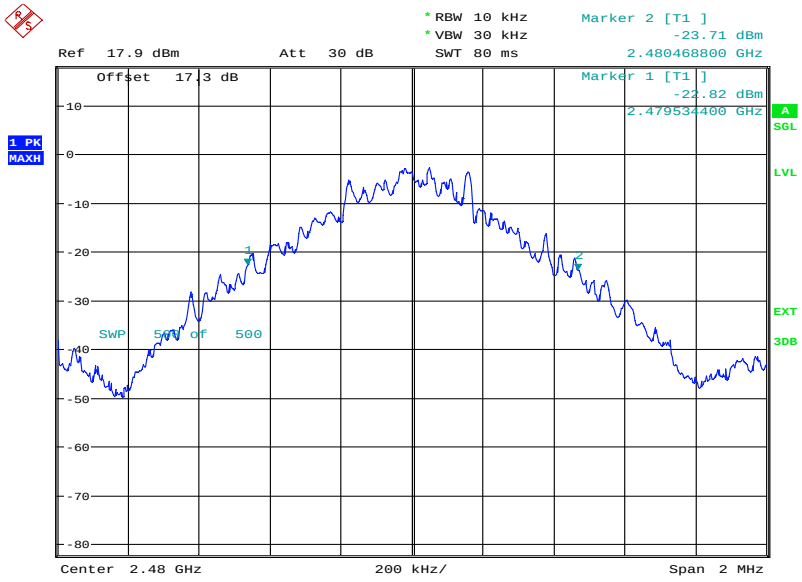
2480 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
DH3	934.4



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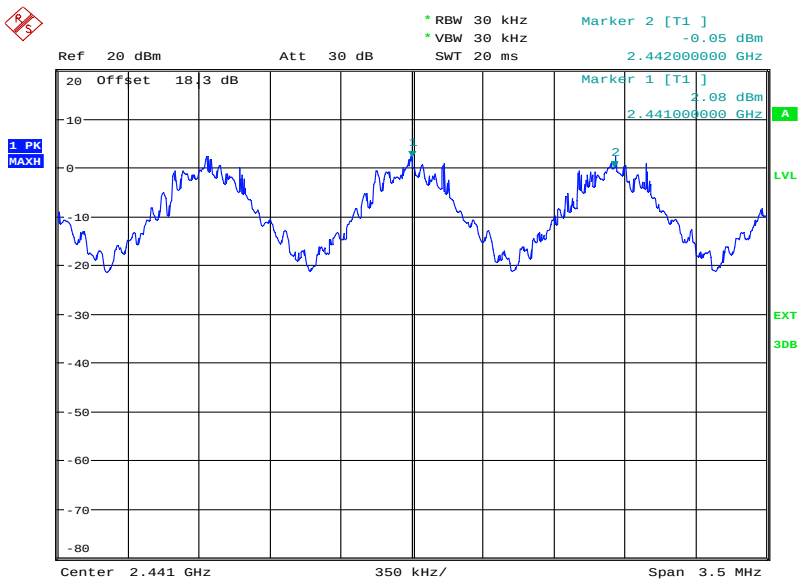
Limit Clause

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

Product Service

Channel Separation

Channel Separation: 1 MHz



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Limit Clause

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 0.125 W.

The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

2.4 FREQUENCY HOPPING SYSTEMS - CHANNEL DWELL TIME AND NUMBER OF HOPPING CHANNELS

2.4.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)(iii)
Industry Canada RSS-210, Clause A8.1 (d)

2.4.2 Equipment Under Test and Modification State

IsatPhone2 Pro 2+ S/N: Ant Number IN50000242 - Modification State 0

2.4.3 Date of Test

4 November 2013

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 Test Procedure

The EUT was connected to a Spectrum Analyser via a cable. The EUT was set to transmit on maximum power on the middle channel. The frequency span was set to 0 Hz and a video trigger was used to measure the dwell time of the transmitted signal. This was performed using DH1, DH3 and DH5 packet types.

In order to measure the number of hopping channels, the EUT was set to transmit on maximum power and hopping on all channels. The span was adjusted to show the individual channels. The display trace was set to Max Hold and the plot recorded.

2.4.6 Environmental Conditions

Ambient Temperature	23.7°C
Relative Humidity	29.6%

Product Service

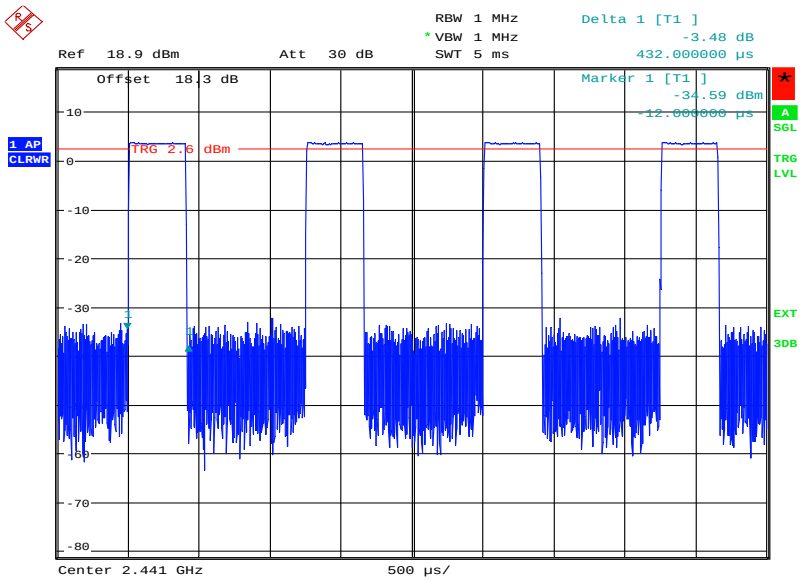
2.4.7 Test Results

3.7 V DC Supply

Channel Dwell Time

DH1

0.000432 ms



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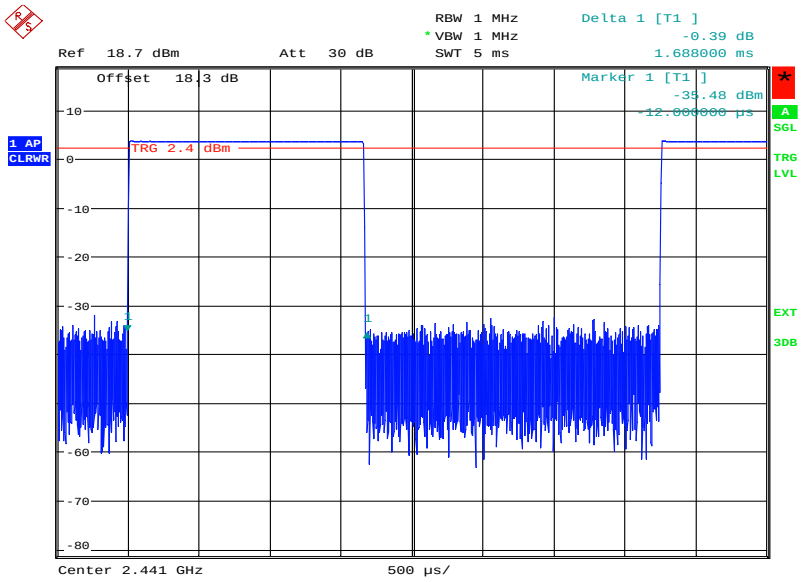
DH3

0.001688 ms



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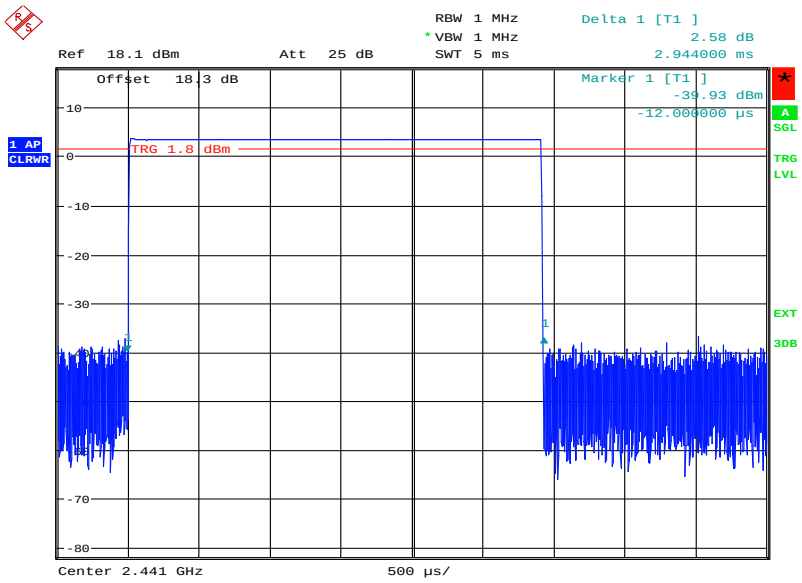
DH5

0.002944 ms



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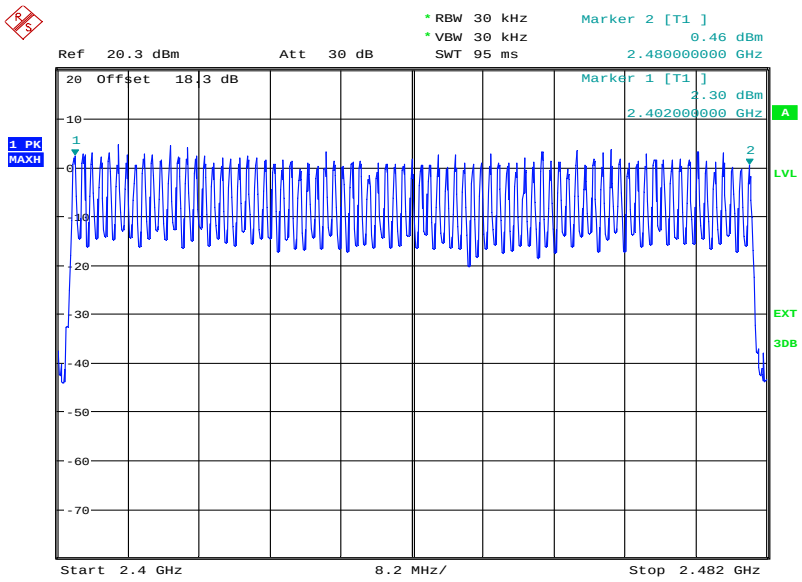
Limit

Frequency hopping systems operating in the band 2400-2483.5 MHz shall use at least 15 hopping channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that a minimum of 15 hopping channels are used.

Product Service

Number of Hopping Channels

79 channels



Date: 4.NOV.2013 15:35:17

Limit

≥ 15 channels

2.5 EIRP PEAK POWER

2.5.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(4)
Industry Canada RSS-210, Clause A8.4 (4)

2.5.2 Equipment Under Test and Modification State

IsatPhone2 S/N: IX40100471 - Modification State 0

2.5.3 Date of Test

30 October 2013

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

The EUT was configured to transmit at maximum power via a cable to the Peak Power Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a reference level offset was entered to account for the measurement path loss. The measurement bandwidth was set according to the signal being measured and the peak and average levels were recorded.

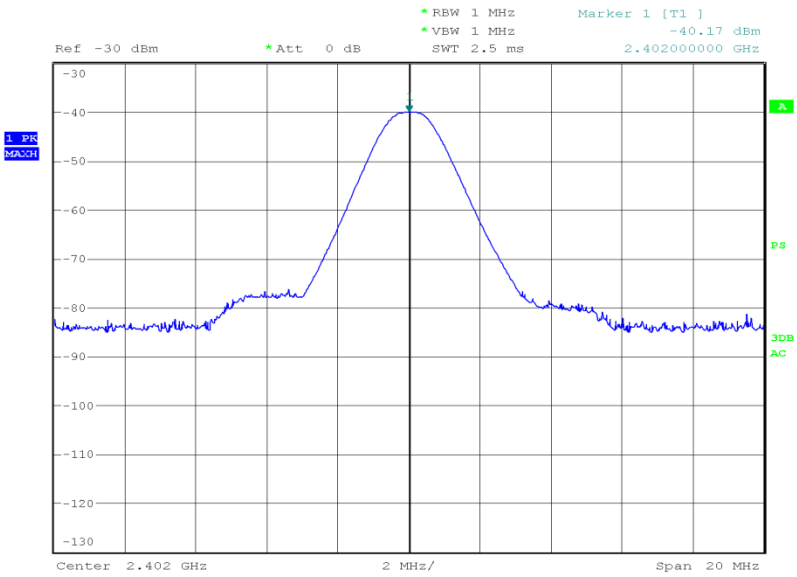
2.5.6 Environmental Conditions

Ambient Temperature	19.8°C
Relative Humidity	43.0%

2.5.7 Test Results

2402 MHz

EIRP (dBm)	EIRP (mW)
1.84	1.528

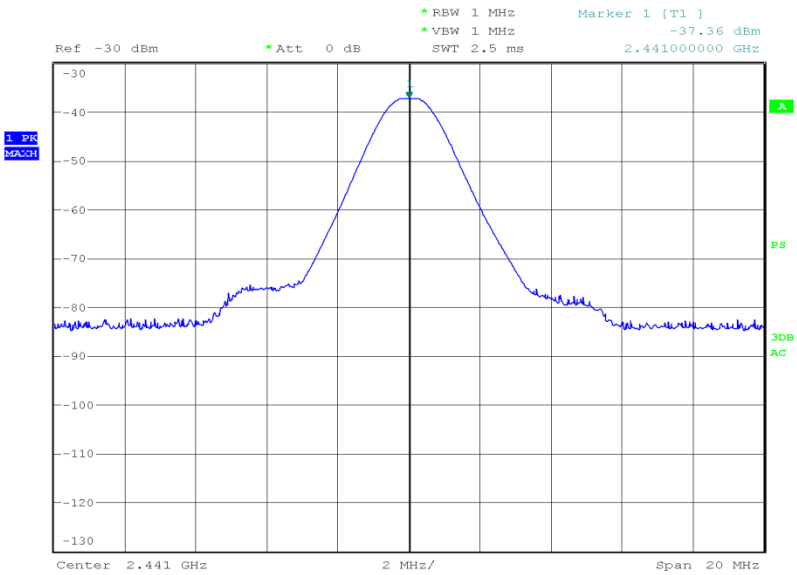


Date: 30.OCT.2013 19:06:02

Product Service

2441 MHz

EIRP (dBm)	EIRP (mW)
5.06	3.206

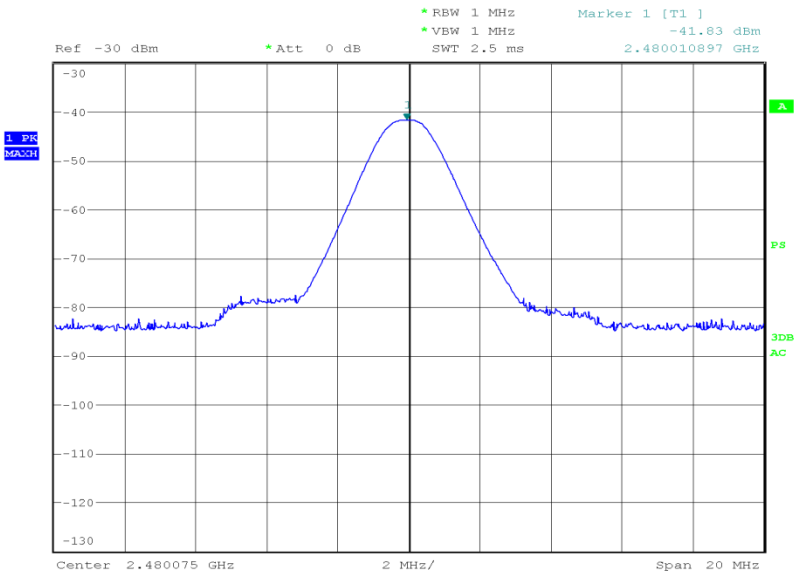


Date: 30.OCT.2013 19:49:06

Product Service

2480 MHz

EIRP (dBm)	EIRP (mW)
0.95	1.245



Date: 30.OCT.2013 19:58:17

Limit

Limit EIRP (dBm)	Limit EIRP(mW)
36.0	4000

2.6 SPURIOUS AND BAND EDGE EMISSIONS

2.6.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (d)
Industry Canada RSS-210, Clause A8.5
Industry Canada RSS-GEN, Clause 2.2

2.6.2 Equipment Under Test and Modification State

IsatPhone2 Pro 2+ S/N: Ant Number IN50000242 - Modification State 0

2.6.3 Date of Test

30 October 2013 & 5 November 2013

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

For conducted emissions, the EUT was set to operate at maximum power on the worst case data rate. The test was performed on the bottom, middle and top channels. The test was performed from 9 kHz to 25 GHz. Firstly, the power of each fundamental frequency was measured in 100 kHz bandwidth and this was used to show a -20 dBc limit line on the trace. The measurement path loss in each relevant frequency band was measured and entered as a reference level offset.

For radiated emissions, the test method described above was also used. However, the measurement was performed from 30 MHz to 25 GHz and the path loss is incorporated as a transducer factor and entered into the spectrum analyser.

The band edge measurements were performed in accordance with ANSI C63.10, Clause 6.9.2. The results were analysed to ensure compliance with restricted bands. The EUT was set to the lowest and highest operating frequencies.

2.6.6 Environmental Conditions

Ambient Temperature	19.8 - 24.3°C
Relative Humidity	32.8 - 44.0%

Product Service

2.6.7 Test Results

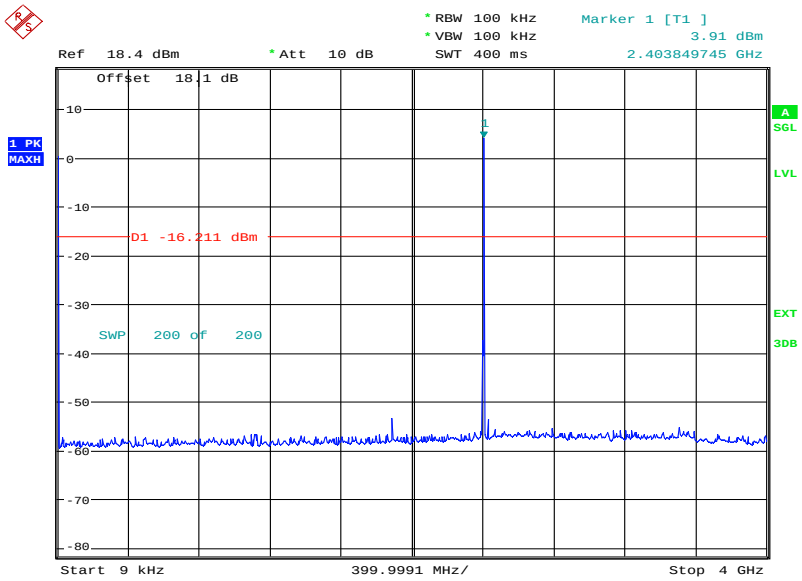
3.7 V DC Supply

Spurious Conducted Emissions

2402 MHz

DH3

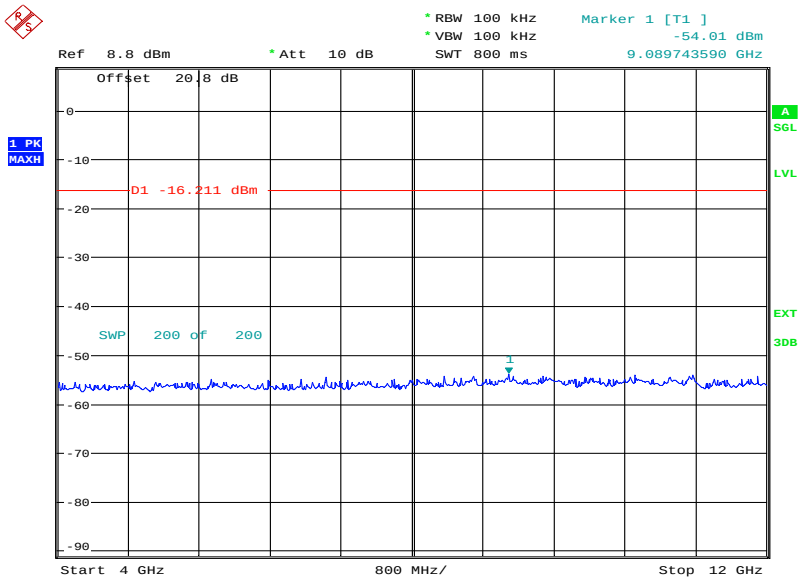
9 kHz to 4 GHz



Date: 5.NOV.2013 13:13:35

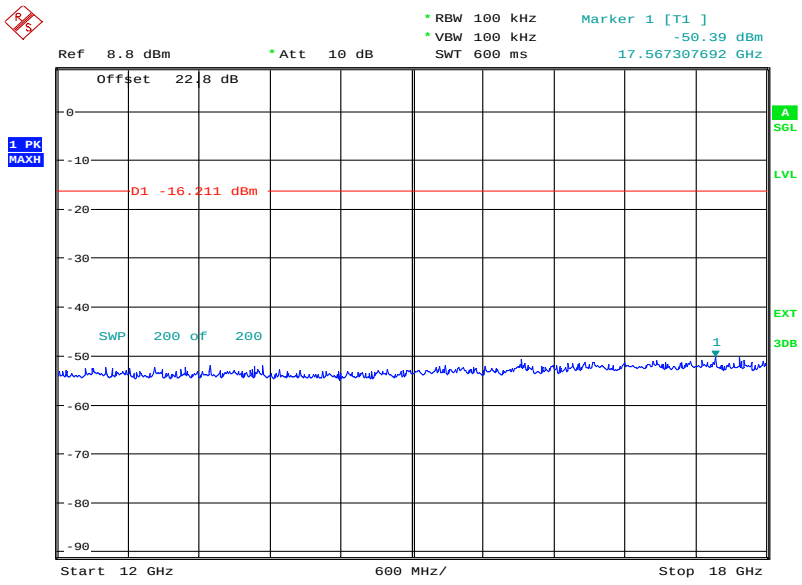
Product Service

4 GHz to 12 GHz



Date: 5.NOV.2013 13:41:57

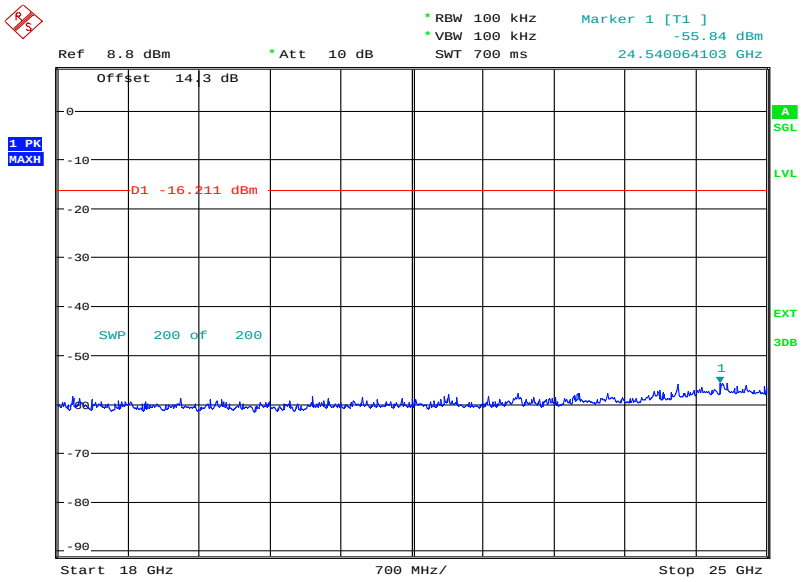
12 GHz to 18 GHz



Date: 5.NOV.2013 13:44:48

Product Service

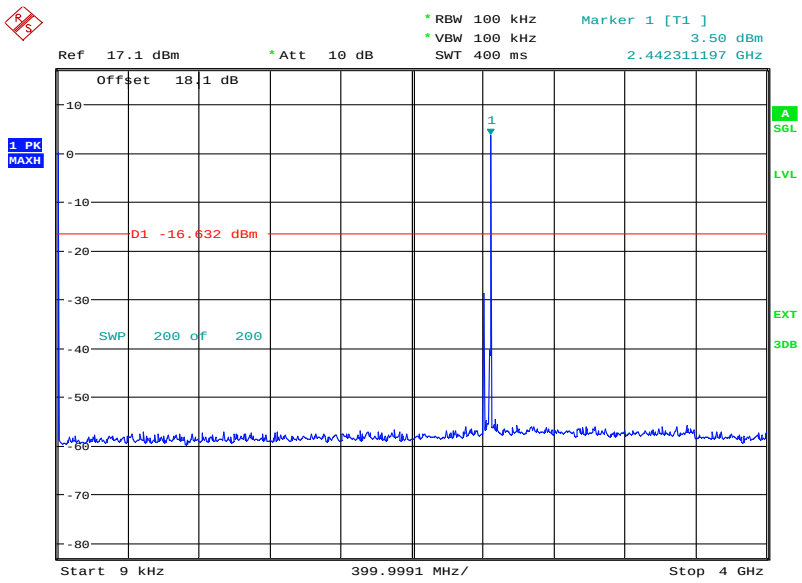
18 GHz to 25 GHz



Date: 5.NOV.2013 14:08:17

2441 MHz

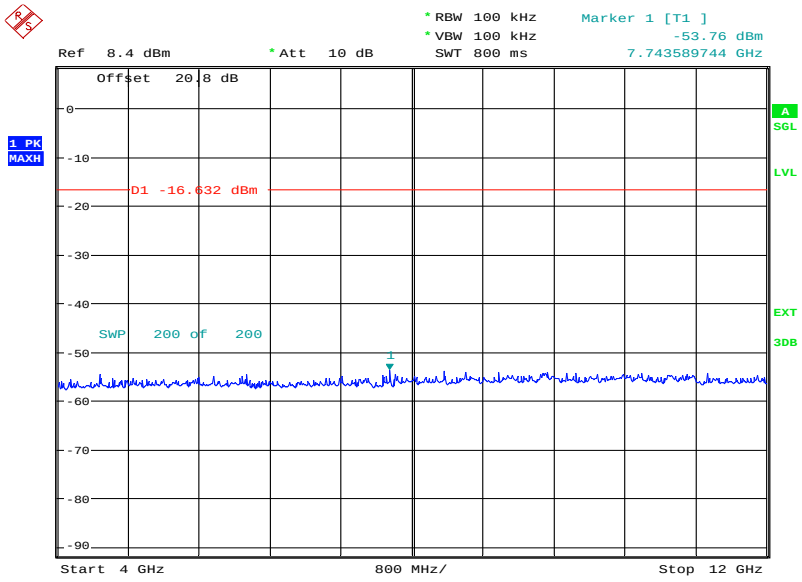
9 kHz to 4 GHz



Date: 5.NOV.2013 13:22:25

The plot above shows a second signal at 2402 MHz which is generated from the Bluetooth Test Set.

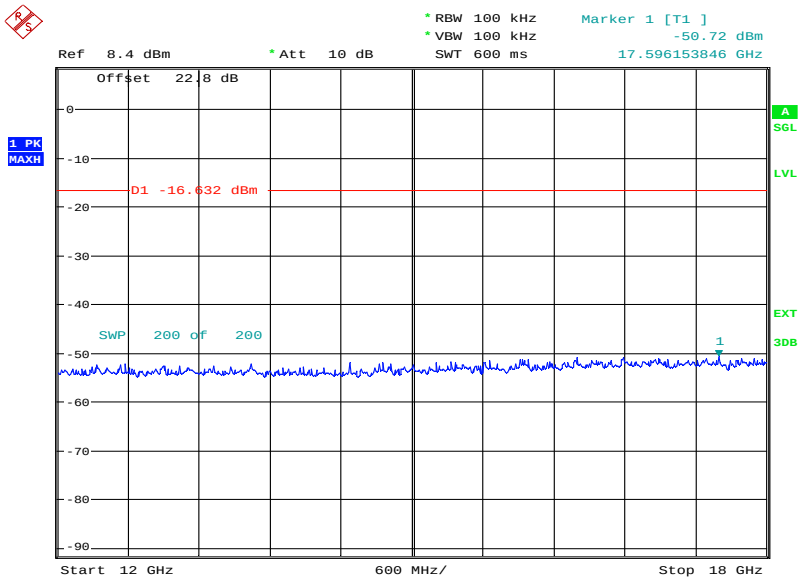
4 GHz to 12 GHz



Date: 5.NOV.2013 13:38:22

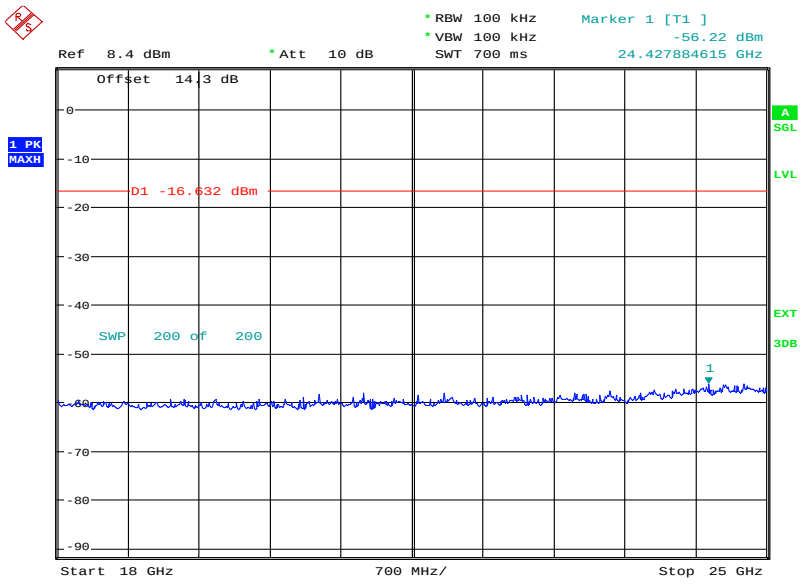
Product Service

12 GHz to 18 GHz



Date: 5.NOV.2013 13:50:25

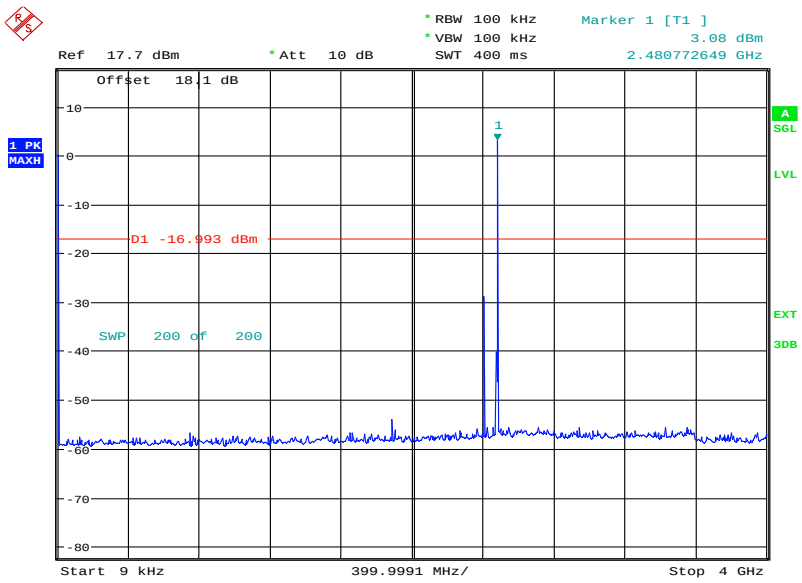
18 GHz to 25 GHz



Date: 5.NOV.2013 14:11:28

2480 MHz

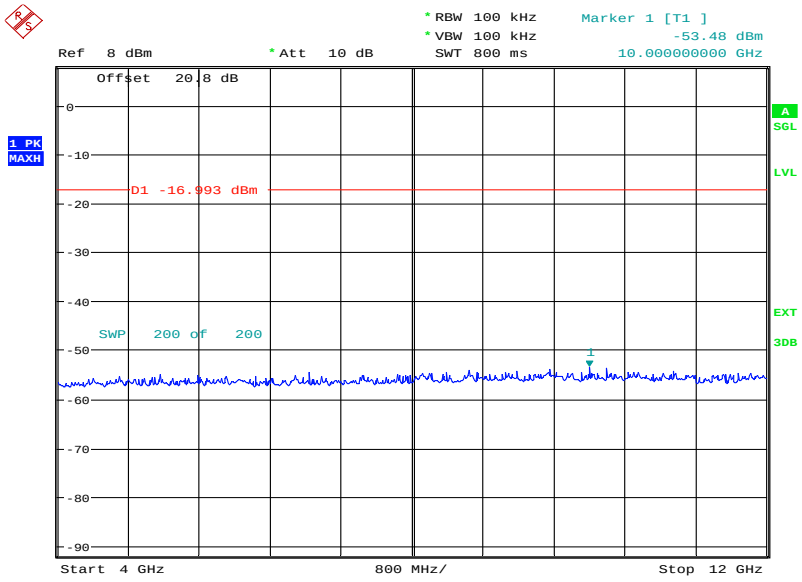
9 kHz to 4 GHz



Date: 5.NOV.2013 13:25:39

The plot above shows a second signal at 2402 MHz which is generated from the Bluetooth Test Set.

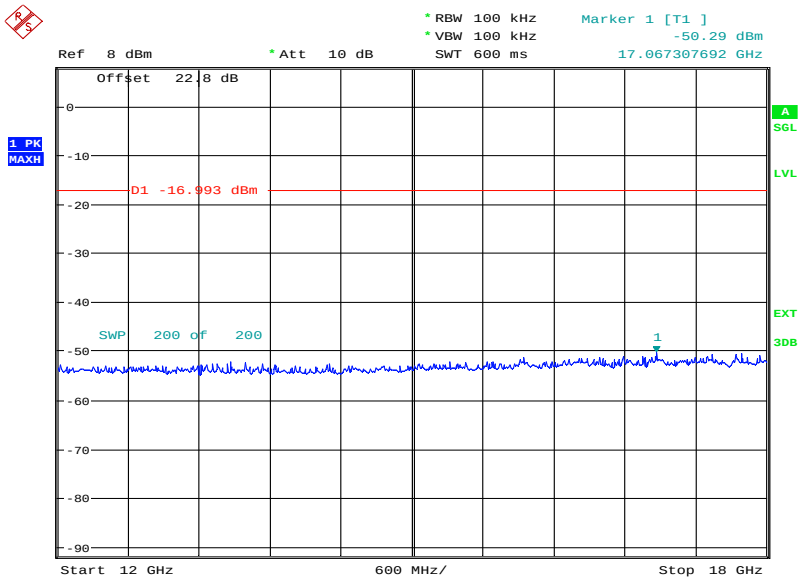
4 GHz to 12 GHz



Date: 5.NOV.2013 13:34:38

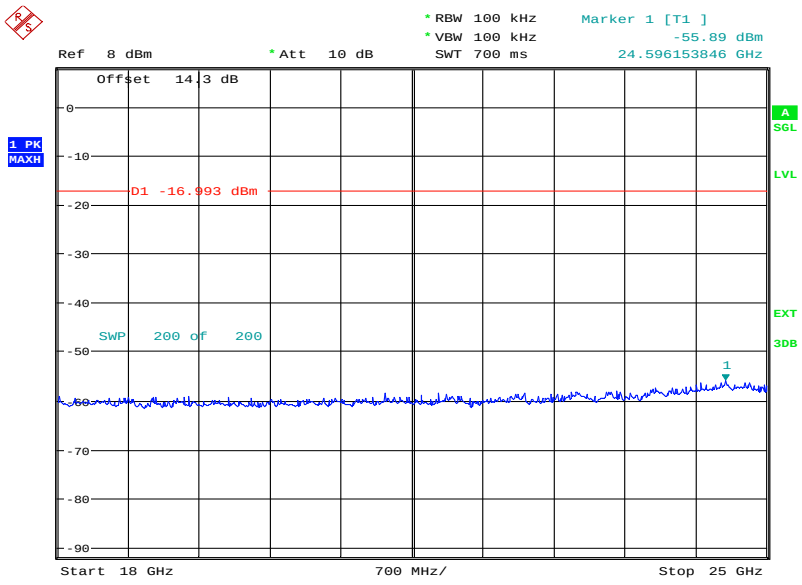
Product Service

12 GHz to 18 GHz



Date: 5.NOV.2013 13:53:26

18 GHz to 25 GHz



Date: 5.NOV.2013 14:14:40

Limit Clause

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

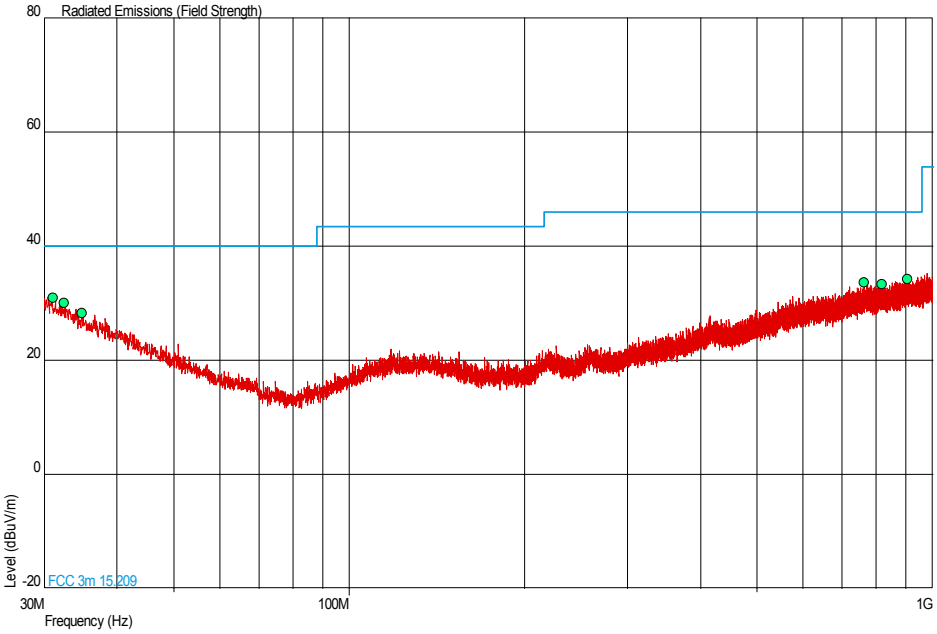
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.

Product Service

Spurious Radiated Emissions

2402 MHz

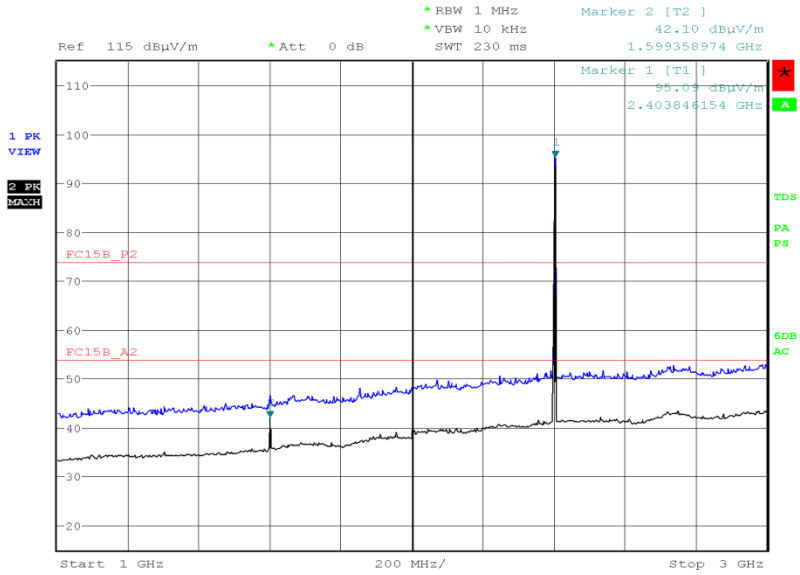
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.067	30.9	35.1	40.0	100	-9.1	64.9	0	1.00	Vertical
32.474	30.1	32.0	40.0	100	-9.9	68.0	0	1.00	Horizontal
34.802	28.4	26.3	40.0	100	-11.6	73.7	0	1.00	Vertical
764.242	33.7	48.4	46.0	200	-12.3	151.6	0	1.00	Vertical
817.931	33.4	46.8	46.0	200	-12.6	153.2	0	1.00	Vertical
906.347	34.2	51.3	46.0	200	-11.8	148.7	0	1.00	Horizontal

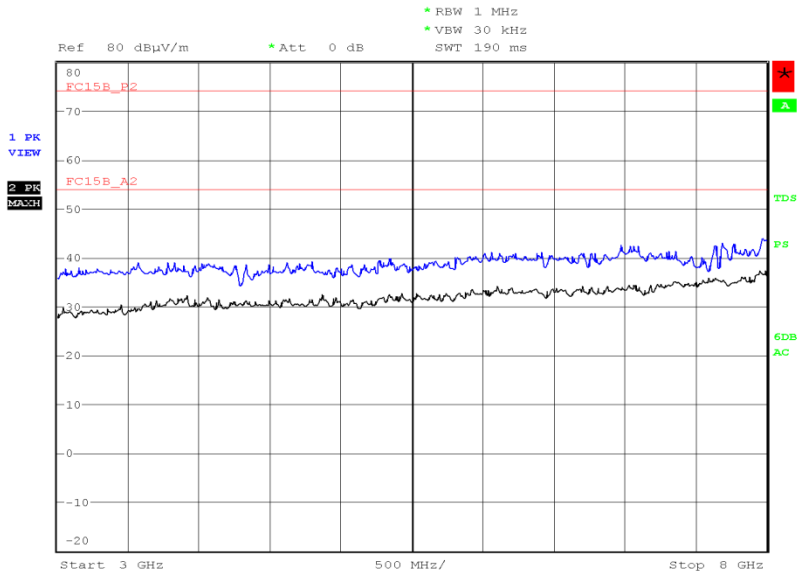
Product Service

1 GHz to 3 GHz



Date: 30.OCT.2013 19:33:44

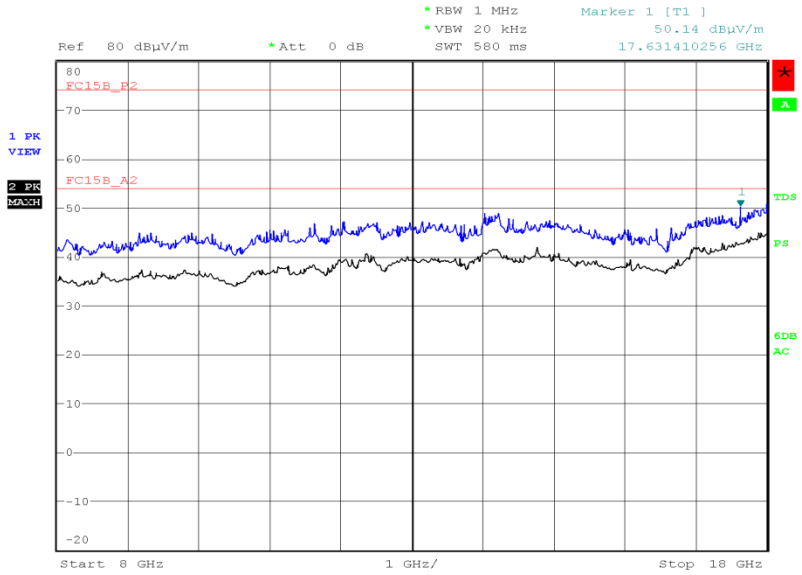
3 GHz to 8 GHz



Date: 30.OCT.2013 21:08:06

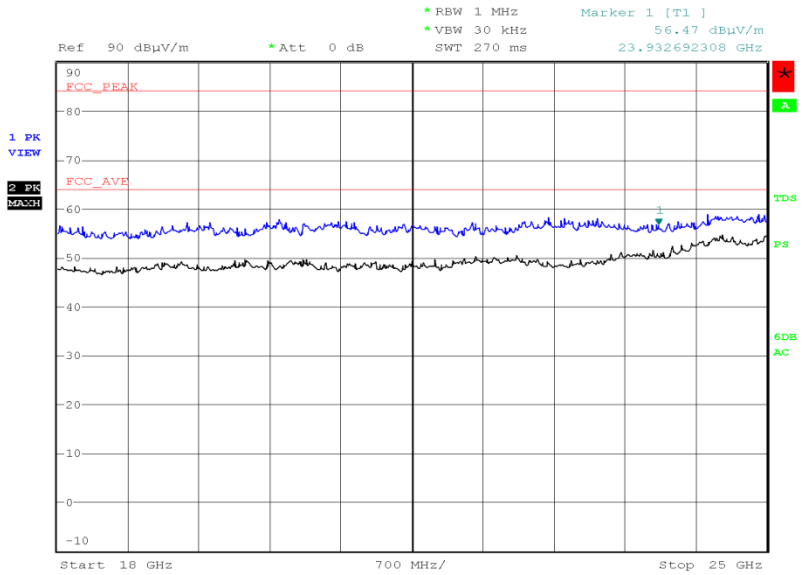
Product Service

8 GHz to 18 GHz



Date: 30.OCT.2013 21:47:30

18 GHz to 25 GHz

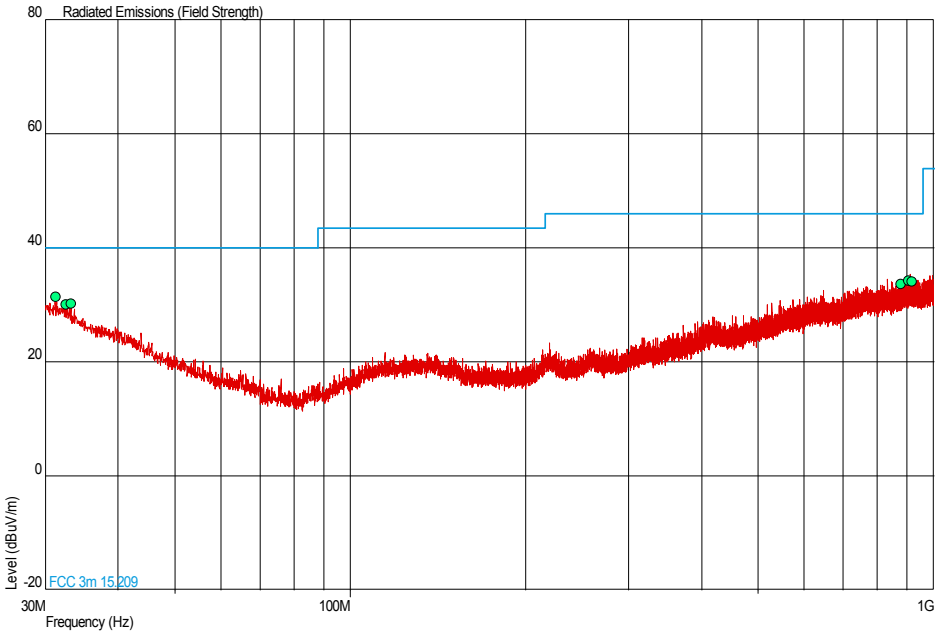


Date: 30.OCT.2013 22:24:20

Product Service

2441 MHz

30 MHz to 1 GHz



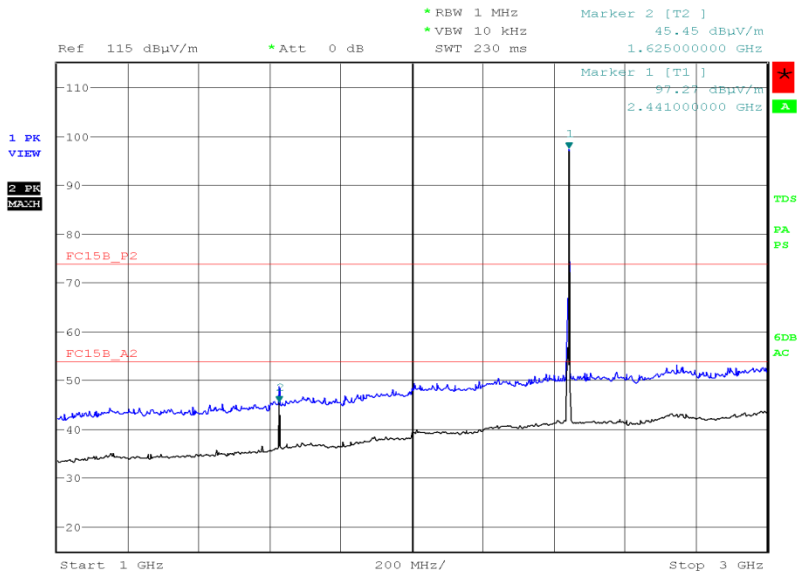
Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.261	31.4	37.2	40.0	100	-8.6	62.8	0	1.00	Horizontal
32.522	30.1	32.0	40.0	100	-9.9	68.0	0	1.00	Horizontal
33.250	30.3	32.7	40.0	100	-9.7	67.3	0	1.00	Vertical
879.235	33.7	48.4	46.0	200	-12.3	151.6	0	1.00	Horizontal
905.668	34.2	51.3	46.0	200	-11.8	148.7	0	1.00	Vertical
917.987	34.2	51.3	46.0	200	-11.8	148.7	0	1.00	Vertical

Product Service

1 GHz to 25 GHz

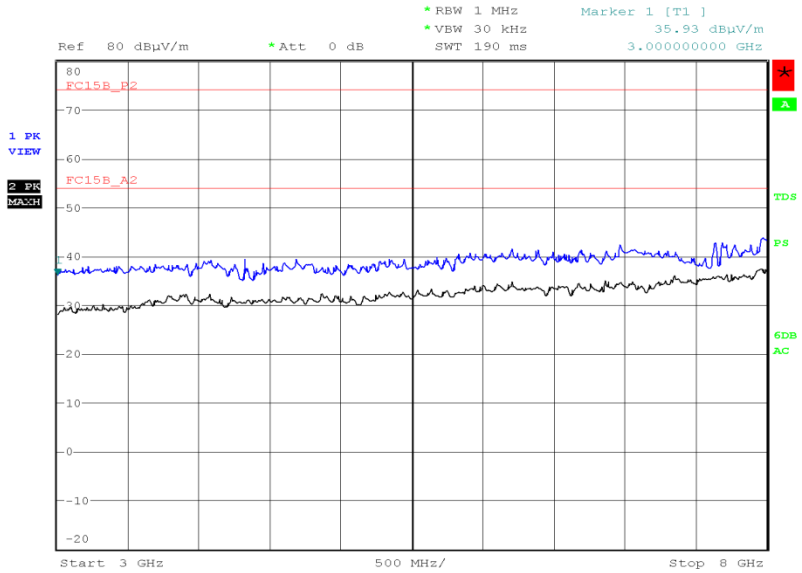
Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
1.6264	Horizontal	100	299	50.76	44.08

1 GHz to 3 GHz



Date: 30.OCT.2013 19:37:19

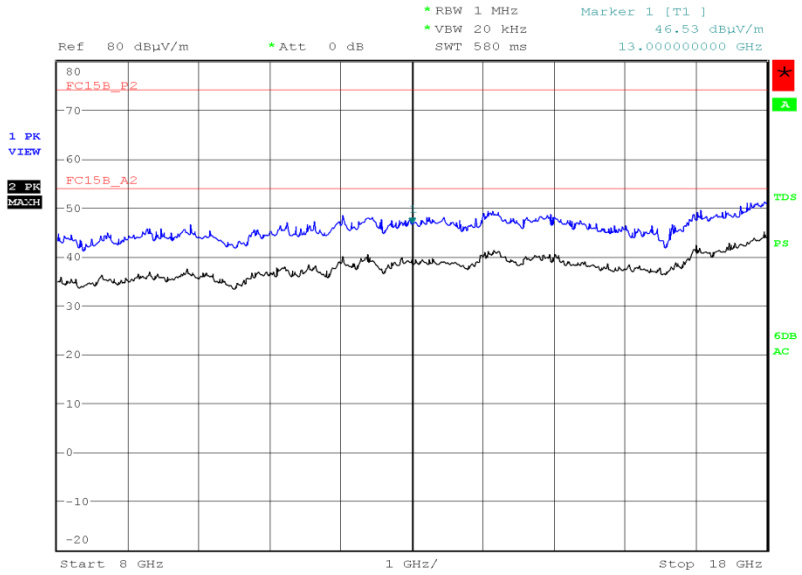
3 GHz to 8 GHz



Date: 30.OCT.2013 21:17:37

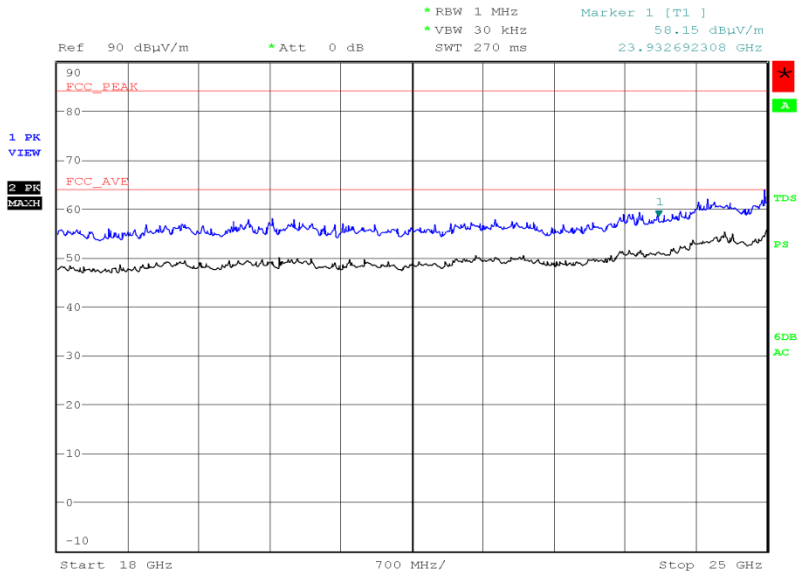
Product Service

8 GHz to 18 GHz



Date: 30.OCT.2013 21:39:32

18 GHz to 25 GHz

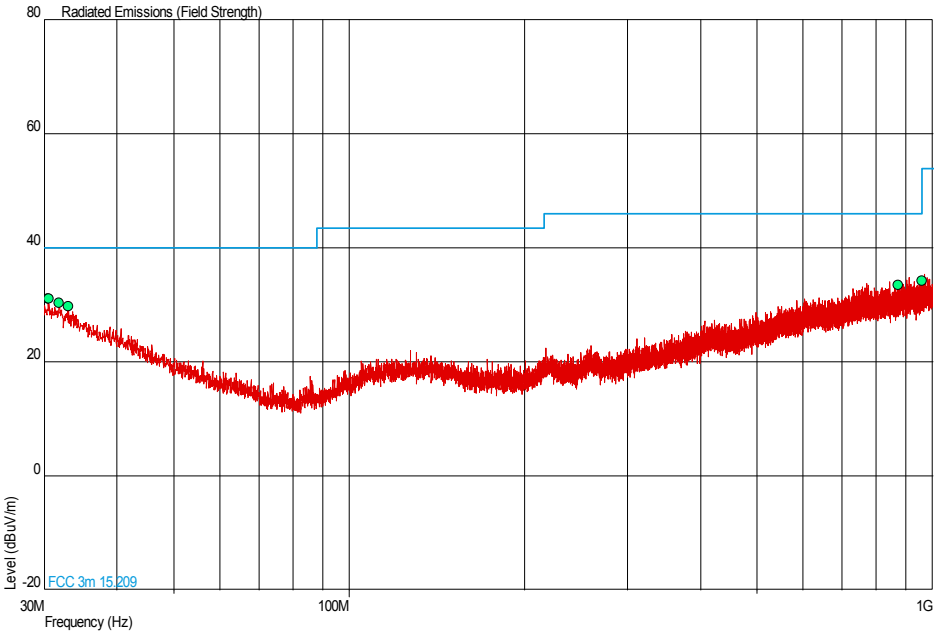


Date: 30.OCT.2013 22:28:23

Product Service

2480 MHz

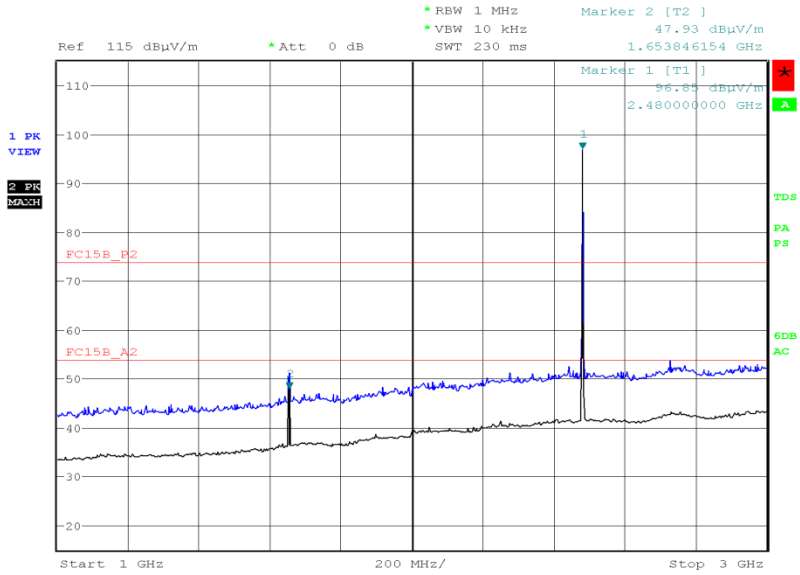
30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
30.485	31.2	36.3	40.0	100	-8.8	63.7	0	1.00	Vertical
30.582	31.1	35.9	40.0	100	-8.9	64.1	0	1.00	Vertical
31.843	30.4	33.1	40.0	100	-9.6	66.9	0	1.00	Vertical
33.007	29.8	30.9	40.0	200	-10.2	169.1	0	1.00	Vertical
871.378	33.5	47.3	46.0	200	-12.5	152.7	0	1.00	Vertical
957.369	34.3	51.9	46.0	200	-11.7	148.1	0	1.00	Vertical

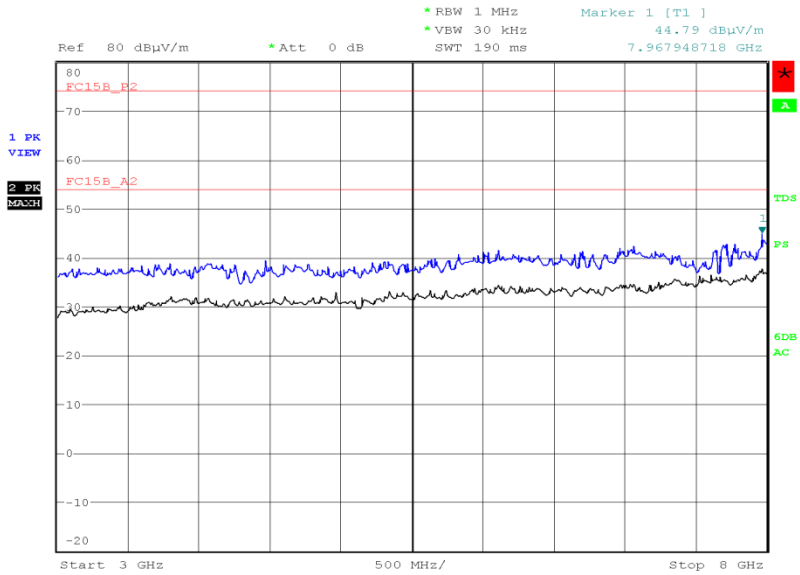
Product Service

1 GHz to 3 GHz



Date: 30.OCT.2013 20:13:08

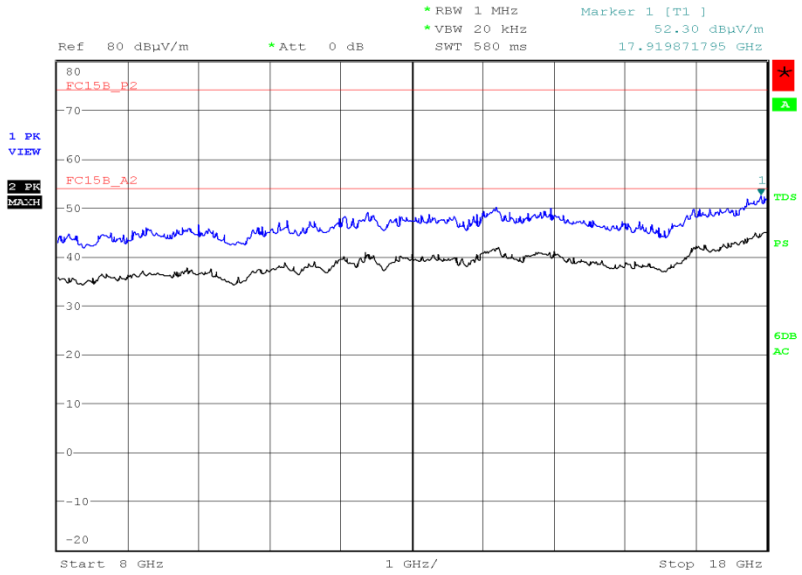
3 GHz to 8 GHz



Date: 30.OCT.2013 21:23:30

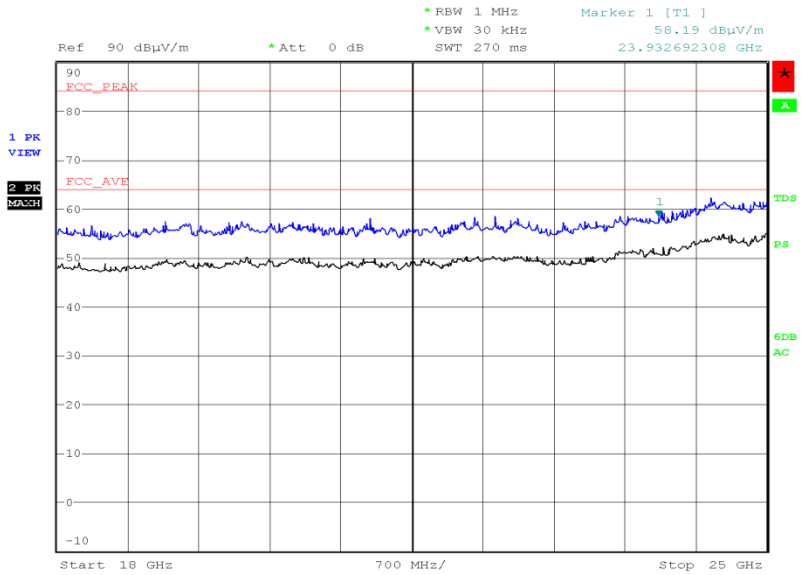
Product Service

8 GHz to 18 GHz



Date: 30.OCT.2013 21:33:49

18 GHz to 25 GHz



Date: 30.OCT.2013 22:32:45

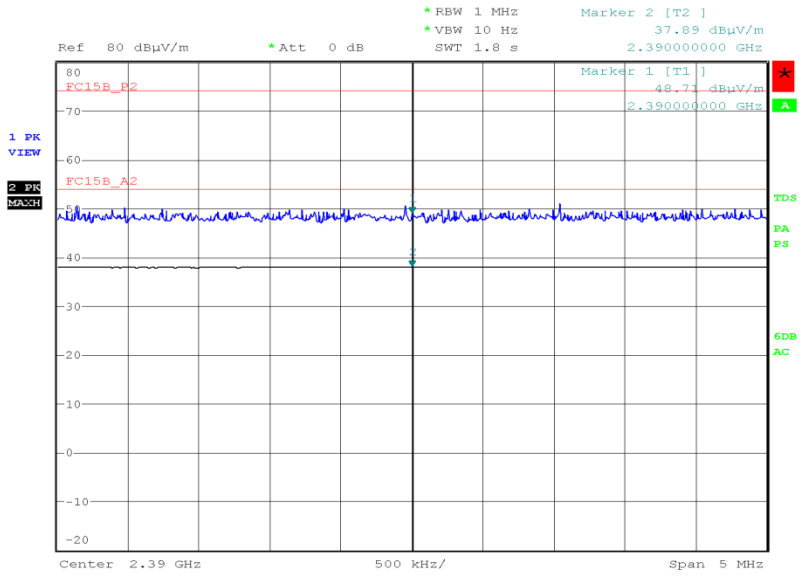
Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

Band Edge Emissions

2402 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	48.71	37.89

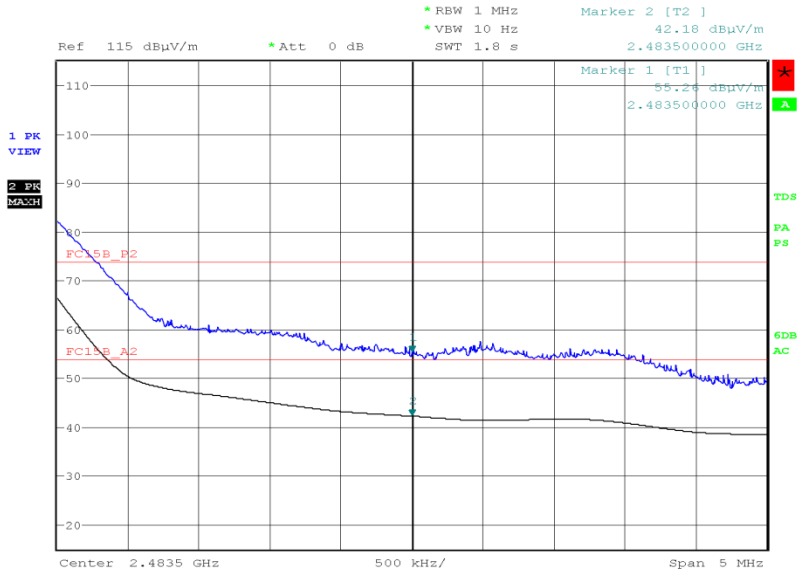


Date: 30.OCT.2013 19:10:48

Product Service

2480 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	55.26	42.18



Date: 30.OCT.2013 20:02:12

Limit

Peak (dBµV/m)	Average (dBµV/m)
74.0	54.0

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– AC Line Conducted Emissions					
LISN (1 Phase)	Chase	MN 2050	336	12	28-Mar-2014
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Transient Limiter	Hewlett Packard	11947A	2377	12	13-Feb-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
Section 2.2- Maximum Peak Conducted Output Power					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2014
Broadband Resistive Power Divider	Weinschel	1506A	605	12	11-Oct-2014
Power Supply	Hewlett Packard	6104A	1948	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
P-Series Power Meter	Agilent Technologies	N1911A	3980	12	18-Sep-2014
50 MHz-18 GHz Wideband Power Sensor	Agilent Technologies	N1921A	3982	12	18-Sep-2014
Section 2.3 - Frequency Hopping Systems - 20dB Bandwidth and Channel Separation					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2014
Broadband Resistive Power Divider	Weinschel	1506A	605	12	11-Oct-2014
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	24-Jan-2014
Power Supply	Hewlett Packard	6104A	1948	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
Section 2.4- Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2014
Broadband Resistive Power Divider	Weinschel	1506A	605	12	11-Oct-2014
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	24-Jan-2014
Power Supply	Hewlett Packard	6104A	1948	-	TU
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5- EIRP Peak Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-Apr-2014
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	9-Nov-2013
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	1-Feb-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Section 2.6- Spurious and Band Edge Emissions					
Multimeter	White Gold	WG022	190	12	28-Oct-2014
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	3-Apr-2014
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Jan-2014
Attenuator (10dB)	Weinschel	47-10-34	481	12	27-Mar-2014
Broadband Resistive Power Divider	Weinschel	1506A	605	12	11-Oct-2014
Splitter	Weinschel	1593	1292	12	10-May-2014
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	24-Jan-2014
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	7-Nov-2014
Pre-Amplifier	Phase One	PSO4-0087	1534	12	30-Sep-2014
Screened Room (5)	Rainford	Rainford	1545	36	25-Dec-2013
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Power Supply	Hewlett Packard	6104A	1948	-	TU
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	1-Feb-2014
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	9-Aug-2014
Amplifier (8 - 18GHz)	Phase One	PS06-0061	3176	12	9-Aug-2014
Hygrometer	Rotronic	I-1000	3220	12	16-Jul-2014
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	1-Feb-2014
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Oct-2014
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	4-Jul-2014
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	13-Sep-2014
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	1-Feb-2014
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	-	TU
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU

TU – Traceability Unscheduled

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	MU
Spurious and Band Edge Emissions	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Frequency Hopping Systems - 20 dB Bandwidth and Channel Separation	± 16.74 kHz
EIRP Peak Power	30MHz to 1GHz: ± 5.1 dB 1GHz to 40GHz: ± 6.3 dB
Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels	-
Maximum Peak Conducted Output Power	± 0.70 dB
AC Line Conducted Emissions	± 3.2 dB

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 (Not UKAS Accredited).