Report On

FCC Testing of the
Sharp CDMA SHI13, Tri Band CDMA (BC0, BC3 and BC6) Cellular Phone with Bluetooth, WLAN, FeliCa and GPS
In accordance with FCC CFR 47 Part 15C

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00158

Document 75914914 Report 08 Issue 1 October 2011

TÜV SÜD Product Service Ltd, Octagon House, Concorde Way, Segensworth North,
Fareham, Hampshire, United Kingdom, PO15 5RL
Tel: +44 (0) 1489 558100. Website: www.tuvps.co.uk

REPORT ON

FCC Testing of the
Sharp CDMA SHI13, Tri Band CDMA (BC0, BC3 and BC6) Cellular Phone with Bluetooth, WLAN, FeliCa and GPS
In accordance with FCC CFR 47 Part 15C

Document 75914914 Report 08 Issue 1

October 2011

PREPARED FOR

Sharp Communication Compliance Ltd
Azure House
Bagshot Road
Bracknell
Berkshire
RG12 7QY

PREPARED BY

Natalie Bennett
Senior Administrator

APPROVED BY

Mark Jenkins
Authorised Signatory

DATED 18 October 2011

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. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

B Airs G Lawler R Henley

Product Service

CONTENTS

Product Service

SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp CDMA SHI13, Tri Band CDMA (BC0, BC3 and BC6) Cellular Phone with Bluetooth, WLAN, FeliCa and GPS
In accordance with FCC CFR 47 Part 15C

1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Sharp CDMA SHI13, Tri Band CDMA (BC0, BC3 and BC6) Cellular Phone with Bluetooth, WLAN, FeliCa and GPS to the requirements of FCC CFR 47 Part 15C.

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	Sharp Corporation
Model Number(s)	CDMA SHI13
Serial Number(s)	SSHFN000874 SSHFN000869
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2010)
Incoming Release Date	Application Form 09 August 2011
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	8723 05 September 2011
Start of Test	11 September 2011
Finish of Test	16 September 2011
Name of Engineer(s)	B Airs G Lawler R Henley
Related Document(s)	ANSI C63.10: 2009

Product Service

1.2 BRIEF SUMMARY OF RESULTS

A brief summary of the tests carried out in accordance with FCC CFR 47 Part 15C is shown below.

Section	Spec Clause	Test Description	Result	Comments/Base Standard
Bluetooth				
2.1	15.247 (a)(1)	Frequency Hopping Systems - 20dB Bandwidth and Channel Separation	Pass	
2.2	15.247 (a)(1)(iii)	Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels	Pass	
2.3	15.247 (b)(3)	Maximum Peak Conducted Output Power	Pass	
2.4	15.247 (b)(4)	EIRP Peak Power	Pass	
2.5	15.247 (d)	Spurious and Band Edge Emissions	Pass	

Product Service

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION		
Model Name/Number	CDMA SHI13	
Part Number		
FCC ID (if applicable)	APYHRO00158	
Industry Canada ID (if applicable)		
Technical Description (Please provide a brief description of the intended use of the equipment)	Tri-Band CDMA(800MHz_BC0/3, 1900MHz_BC6) Cellular Phone with Bluetooth, W-LAN, FeliCa and GPS receiver enabled.	

EXTREME TEMPERATURE RANGE over which the equipment is to be type tested
☐ -20°C to +55°C
☒ Other (2)
☐ Not applicable (no extreme temperature testing required)
Extreme temperature range for the host(s): -20C to +60C

(2) The equipment shall be tested over the following temperature ranges :

a) 0°C to +35°C for equipment for indoor use only, or intended for used in areas where the temperature is controlled within this range.

b) Over the extremes of the temperature range(s) of the declared host equipment(s) in case of plug-in radio devices.

TYPE OF ANTENNA				
☒ Integral				
Temporary RF connector provided:			☒ Yes	☐ No
☐ Antenna connector				
☐ Number of antenna assembly(ies) submitted				
Gain of the antenna intended for normal use:				
0	dBi	for assembly identified as	Bluetooth	
0	dBi	for assembly identified as	WLAN	
	dBi	for assembly identified as		
	dBi	for assembly identified as		
	dBi	for assembly identified as		

TRANSMITTER TECHNICAL CHARACTERISTICS		
TRANSMITTER OPERATING FREQUENCY RANGE(S)		
	FCC and/or Industry Canada	**EU**
Bluetooth	2402 to 2480 MHz	2402 to 2480 MHz
WLAN	2412 to 2462 MHz	2412 to 2472 MHz
FCC and/or Industry Canada (only)		
Highest Internally Generated Frequency 1401.6 MHz		

Product Service

SPREAD SPECTRUM PARAMETERS

☒ **Bluetooth**

FHSS: Channel ☒ 79 Other	EDR ☒ Yes ☐ No

Medium Access Protocol (Customer Declaration)

"We have implemented Bluetooth protocol which satisfies the medium access protocol requirement of EN 300 328".

☒ **WLAN**

IEEE 802.11(b) – DSSS ☒

IEEE 802.11(g) – OFDM ☒

IEEE 802.11(n) – OFDM ☒

Supported Spatial Streams

	2.4 GHz	5GHz
Transmitter (Tx)	Yes	No
Receiver (Rx)	Yes	No

GI (Guard Interval) ☒ 800 ns ☐ 400 ns

Band Width ☒ 20 MHz ☐ 40 MHz

☐ **Other Technology**

Direct Sequence ☐ Frequency Hopping ☐ Combined ☐ Other

DSSS	Chip Sequence Length	bit
	Spectrum Width	MHz
FHSS	Total Number of Hops	
	Dwell Time	ms
	Bandwidth Per Hop	MHz
	Maximum Separation of Hops	MHz for ETSI EN 300 328
Other		

Medium Access Protocol (Customer Declaration)

"We have implemented IEEE 802.11 (b/g/n) protocol which satisfies the medium access protocol requirement of EN 300 328".

Product Service

TRANSMITTER POWER CHARACTERSITICS							
Bluetooth							
Maximum Rated Transmitter Output							
Effective radiated power (for equipment with antenna connector)	0.0025	W					
Effective radiated power (for equipment with integral antenna)	0.0025	W					
Minimum Rated Transmitter Output							
Effective radiated power (for equipment with antenna connector)	0.00025	W					
Effective radiated power (for equipment with integral antenna)	0.00025	W					
Is transmitter intended for :							
Continuous duty			☒	Yes	☐	No	
Intermittent duty			☐	Yes	☒	No	
If intermittent state DUTY CYCLE							
Transmitter ON	seconds	Transmitter OFF	minutes				
Is continuous operation possible for testing purposes?			☒	Yes	☐	No	
Is transmitter output power variable:			☐	Yes	☒	No	
State during the test:							
Transmitter duty cycle	Tx on	Seconds	Tx Off	Seconds			
Duty cycle (Tx on /(Tx on +Tx off))	%						
☐ Continuously variable		☐ Stepped					
dB per step							
WLAN							
Maximum Rated Transmitter Output							
Effective radiated power (for equipment with antenna connector)	0.065(b/0.025(g.n)	W					
Effective radiated power (for equipment with integral antenna)	0.065(b/0.025(g/n)	W					
Minimum Rated Transmitter Output							
Effective radiated power (for equipment with antenna connector)		W					
Effective radiated power (for equipment with integral antenna)		W					
Is transmitter intended for :							
Continuous duty			☒	Yes	☐	No	
Intermittent duty			☐	Yes	☐	No	
If intermittent state DUTY CYCLE							
Transmitter ON	seconds	Transmitter OFF	minutes				
Is continuous operation possible for testing purposes?			☒	Yes	☐	No	
Is transmitter output power variable:			☐	Yes	☒	No	
State during the test:							
Transmitter duty cycle	Tx on	Seconds	Tx Off	Seconds			
Duty cycle (Tx on /(Tx on +Tx off))	%						
☐ Continuously variable		☐ Stepped					
dB per step							

Product Service

TRANSMITTER POWER SOURCE (3)					
☒ Common power source for transmitter and receiver					
☐ AC mains		State voltage			
AC supply frequency	(Hz)	VAC		Max Current	Hz
☐ Single phase			☐ Three phase		
And / Or					
☐ External DC supply					
Nominal voltage			Max Current		A
Extreme upper voltage			Extreme lower voltage		
Battery					
☐ Nickel Cadmium					
☐ Lead acid (Vehicle regulated)					
☐ Alkaline					
☒ Lithium					
☐ Other Details :					
4.0 Volts nominal.					
End point voltage as quoted by equipment manufacturer			3.7	V	

(3) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF		
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.		
☒ Applies	3.4	V cut-off voltage
☐ Does not apply		

Product Service

RECEIVER POWER SOURCE (4)				
☐ AC mains		State voltage		
AC supply frequency	(Hz)	VAC	Max Current	Hz
☐ Single phase		☐ Three phase		
And / Or				
☐ External DC supply				
Nominal voltage		Max Current	A	
Extreme upper voltage		Extreme lower voltage		
Battery				
☐ Nickel Cadmium				
☐ Lead acid (Vehicle regulated)				
☐ Alkaline				
☐ Lithium				
☐ Other Details :				
Volts nominal.				
End point voltage as quoted by equipment manufacturer		V		

(4) If a transmitter and receiver use the same power source, this should be declared. In such cases only the box for the transmitter power source should be filled in.

AUTOMATIC EQUIPMENT SWITCH OFF	
If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.	
☐ Applies	V cut-off voltage
☐ Does not apply	

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

Signature: Yasuhiro Kawauchi Name: Yasuhiro Kawauchi

Position held: Manager Date: 09, Aug.2011

Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp CDMA SHI13, Tri Band CDMA (BC0, BC3 and BC6) Cellular Phone with Bluetooth, WLAN, FeliCa and GPS. 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 4.0 V DC supply.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

No deviations from the applicable test standard or test plan 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 Testing of the
Sharp CDMA SHI13, Tri Band CDMA (BC0, BC3 and BC6) Cellular Phone with Bluetooth, WLAN, FeliCa and GPS
In accordance with FCC CFR 47 Part 15C

2.1 FREQUENCY HOPPING SYSTEMS - 20dB BANDWIDTH AND CHANNEL SEPARATION

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)

2.1.2 Equipment Under Test and Modification State

CDMA SHI13 S/N: SSHFN000874 - Modification State 0

2.1.3 Date of Test

15 September 2011

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 transmitted 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.

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.

2.1.6 Environmental Conditions

Ambient Temperature	23.6°C
Relative Humidity	40.8%

Product Service

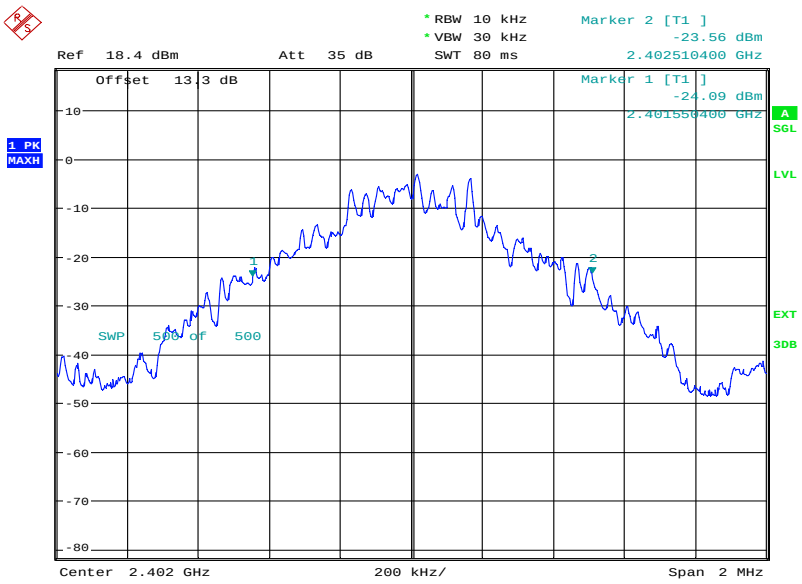
2.1.7 Test Results

4.0 V DC Supply

20dB Bandwidth

2402 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
2DH1	960

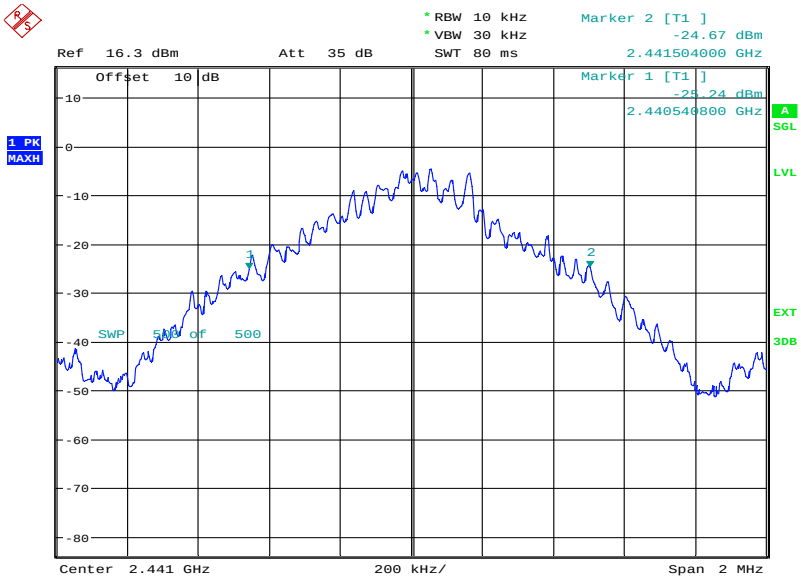


Date: 15.SEP.2011 10:13:14

Product Service

2441 MHz

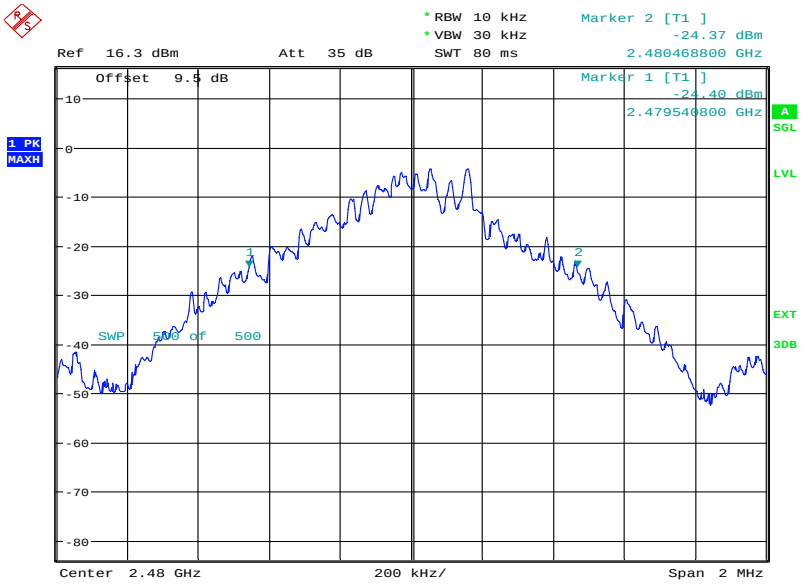
Data Rate (Mbps)	20dB Bandwidth (kHz)
2DH3	963.2



Date: 15.SEP.2011 10:37:21

2480 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
2DH5	931.2



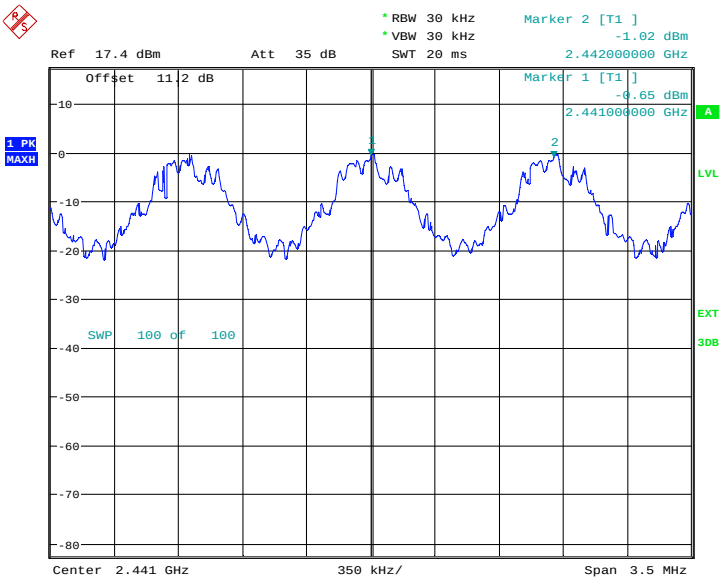
Date: 15.SEP.2011 10:55:12

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



Date: 13.SEP.2011 14:51:17

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.

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

2.2.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (a)(1)(iii)

2.2.2 Equipment Under Test and Modification State

CDMA SHI13 S/N: SSHFN000874 - Modification State 0

2.2.3 Date of Test

15 September 2011

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 test was applied in accordance with the test method requirements of FCC CFR 47 Part 15 .

DH1

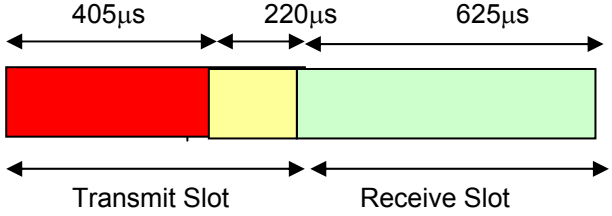
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second.

The DH1 data rate operates on a Transmit on 1 timeslot and Receive on 1 timeslot basis. Thus, in 1 second, there are 800 Transmit timeslots and 800 Receive timeslots.

Thus:

$$1\ \text{Timeslot} = \frac{1}{1600} = 625\mu s$$

In 1 transmit timeslot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH1 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle

So, with 800 Tx and 800 Rx timelsots, the transmitter is on for 800 x 405μs = 0.324 seconds.

$$\therefore \quad \frac{\text{Total Tx Time On}}{\text{No of Channels}} = \frac{0.324}{79} = 4.10\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

32 x 4.05ms = 0.1296 seconds

DH3

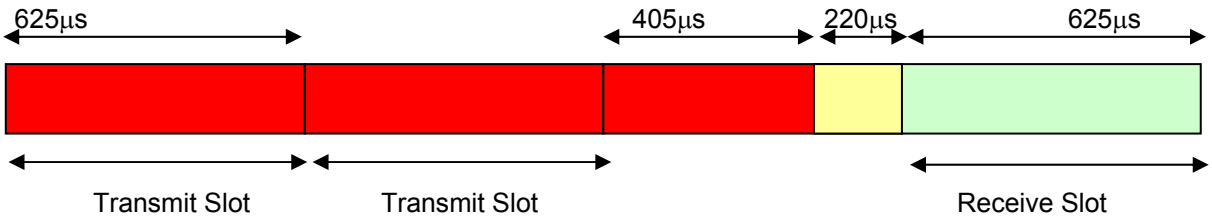
With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots, (ie. no receive slot in-between the 3 transmit slots). The 220μs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 3 transmit timeslots. 2 are 625μs long and the final slot is transmitting for 405μs.

The DH3 data rate operates on a Transmit on 3 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1200 Transmit timeslots and 400 Receive timeslots.

Thus:

$$1\text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

The first 2 Transmit timeslots are transmitting for the complete 625μs. In the third transmit slot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



Product Service

DH3 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle, (Maximum Payload)

Thus, the transmitter for one complete transmit and receive cycle would be on for:

Tx (2 x 625μs) + (1 x 405μs) = 1.655ms

So:

800 x 625μs = 0.5 seconds
400 x 405μs = 0.162 seconds

Thus: 0.5 + 0.162 = 0.662 seconds

$$\therefore \quad \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.662}{79} = 8.379\text{ms}$$

So, in 32 seconds, the transmitter dwell time per channel is:

32 x 8.275ms = 0.2648 seconds

DH5

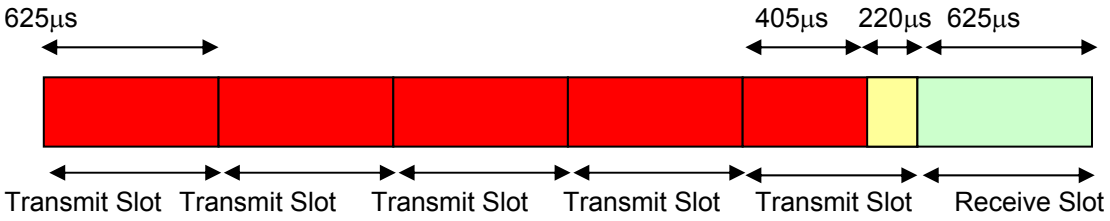
With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots, (ie. no receive slot in-between the 5 transmit slots). The 220μs off time for synthesizer re-tuning at the end of a slot is only used on the final slot. Thus, for one cycle, there are 5 transmit timeslots. 4 are 625μs long and the final slot is transmitting for 405μs.

The DH5 data rate operates on a Transmit on 5 timeslots and Receives on 1 timeslot basis, (assuming maximum data payload). The frequency-hopping rate is the same. Thus, in 1 second, there are 1333.3 Transmit timeslots and 266.7 Receive timeslots.

Thus:

$$1\text{ Timeslot} = \frac{1}{1600} = 625\mu\text{s}$$

The first 4 Transmit timeslots are transmitting for the complete 625μs. In the fifth transmit slot, the transmit on time is only 405μs. 220μs is reserved as off time for the synthesizer to re-tune ready for the next transmit frequency. The following timeslot is a receive slot. This process continues assuming the data rate remains the same.



DH5 Timeslot Arrangement Showing One Complete Transmit and Receive Cycle, (Maximum Payload)

Thus, the transmitter for one complete transmit and receive cycle would be on for:

Tx (2 x 625μs) + (1 x 405μs) = 2.905ms

So:

1066.7 x 625μs = 0.666 seconds
266.7 x 405μs = 0.108 seconds

Thus: 0.666 + 0.108 = 0.774 seconds

$\therefore$ $\frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.774}{79} = 9.797\text{ms}$

So, in 32 seconds, the transmitter dwell time per channel is:

32 x 9.675ms = 0.31 seconds

2.2.6 Environmental Conditions

Ambient Temperature	23.7°C
Relative Humidity	40.4%

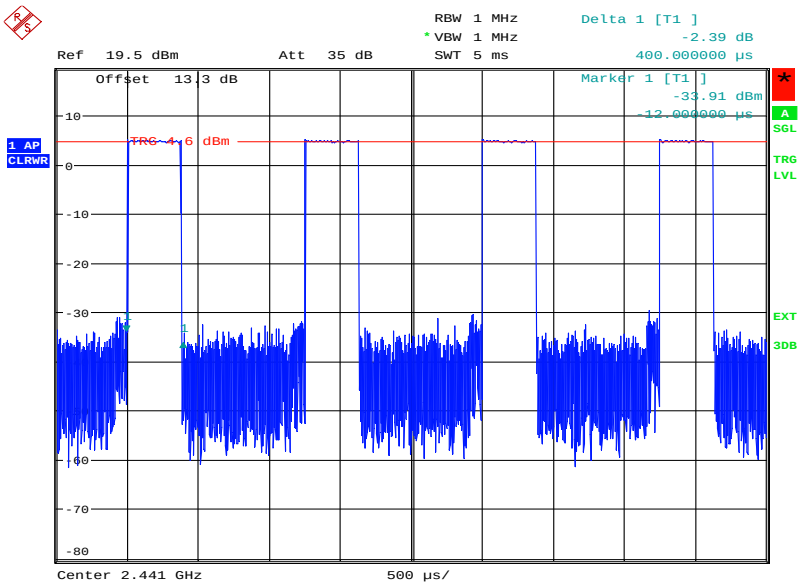
Product Service

2.2.7 Test Results

4.0 V DC Supply

Channel Dwell Time

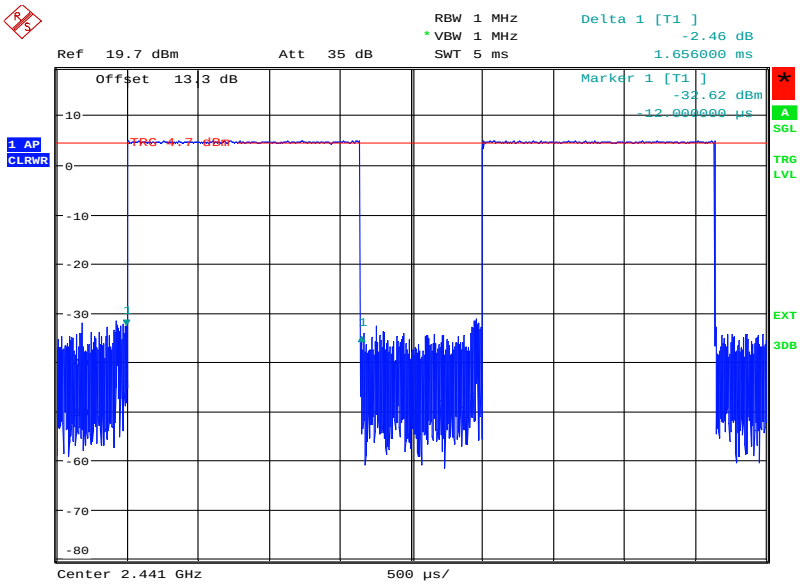
2DH1



Date: 15.SEP.2011 11:28:59

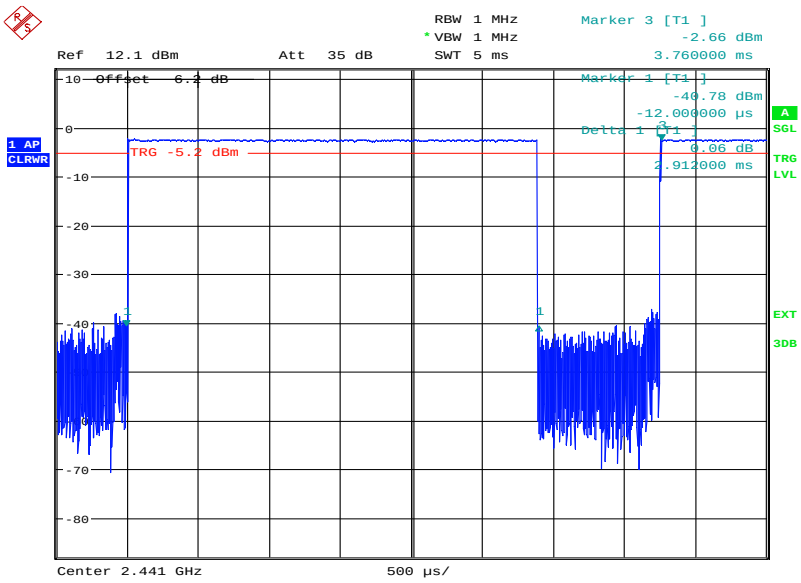
Product Service

2DH3



Date: 15.SEP.2011 10:06:55

2DH5



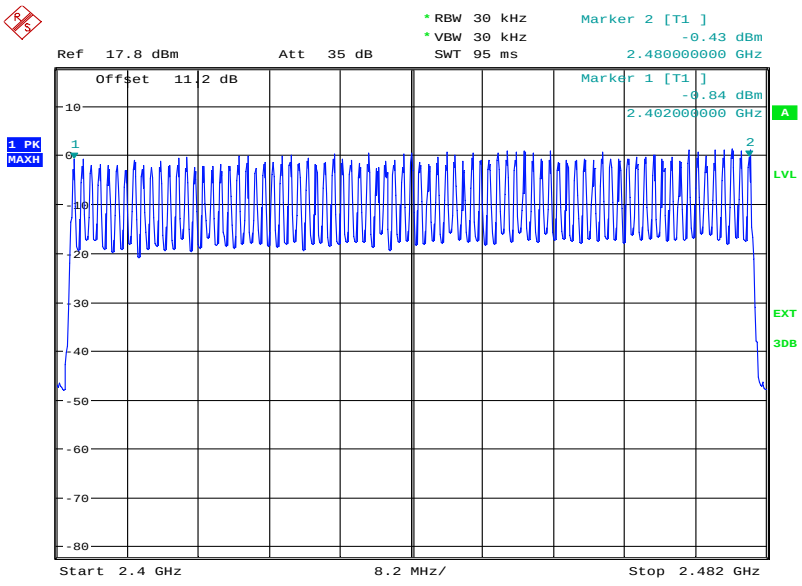
Date: 13.SEP.2011 12:50:44

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.

Number of Hopping Channels

79



Date: 13.SEP.2011 14:38:01

Limit

≥ 15 channels

2.3 MAXIMUM PEAK CONDUCTED OUTPUT POWER

2.3.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(3)

2.3.2 Equipment Under Test and Modification State

CDMA SHI13 S/N: SSHFN000874 - Modification State 0

2.3.3 Date of Test

15 September 2011

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

The EUT was transmitted 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.

2.3.6 Environmental Conditions

Ambient Temperature	23.7°C
Relative Humidity	40.6%

Product Service

2.3.7 Test Results

4.0 V DC Supply

Bluetooth

Packet Type	Maximum Peak Conducted Output Power					
	dBm			mW		
	2402 MHz	2441 MHz	2480 MHz	2402 MHz	2441 MHz	2480 MHz
2DH1	-0.44	0.66	1.23	0.904	1.164	1.327
2DH3	-0.41	0.65	1.17	0.910	1.161	1.309
2DH5	-0.46	0.59	1.11	0.899	1.146	1.291

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.

2.4 EIRP PEAK POWER

2.4.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (b)(4)

2.4.2 Equipment Under Test and Modification State

CDMA SHI13 S/N: SSHFN000869 - Modification State 0

2.4.3 Date of Test

12 September 2011

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 transmitted 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.

2.4.6 Environmental Conditions

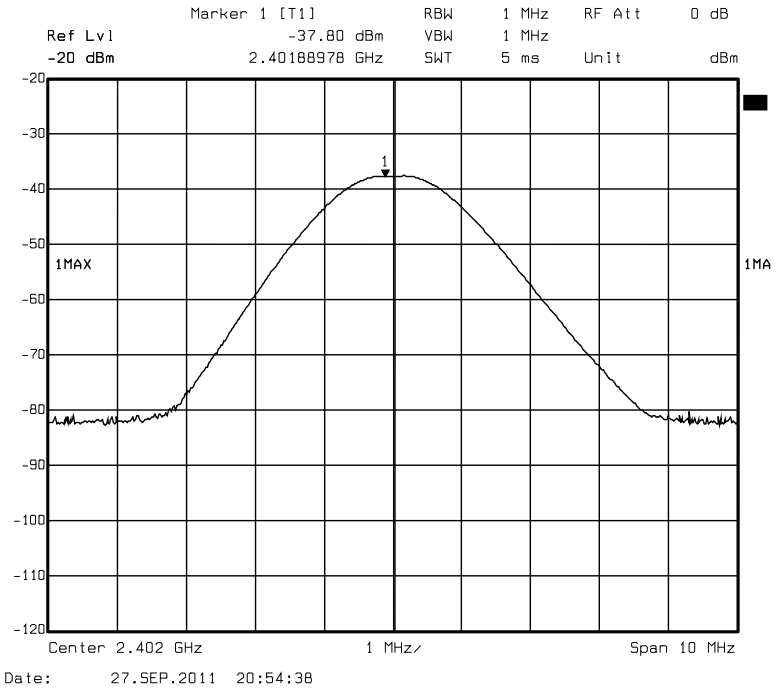
Ambient Temperature	23.0°C
Relative Humidity	54.0%

Product Service

2.4.7 Test Results

2402 MHz

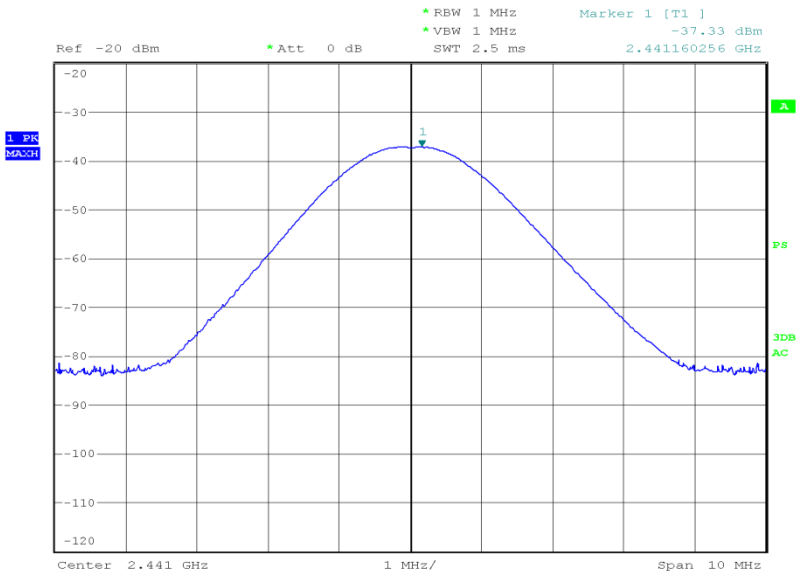
EIRP (dBm)	EIRP (mW)
+4.5	2.82



Product Service

2441 MHz

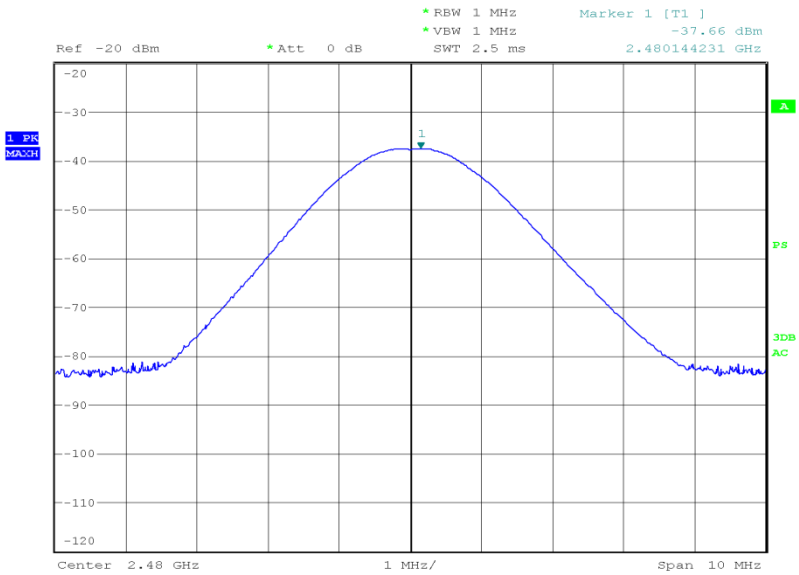
EIRP (dBm)	EIRP (mW)
+4.9	3.09



Date: 12.SEP.2011 21:38:47

2480 MHz

EIRP (dBm)	EIRP (mW)
+4.6	2.88



Date: 12.SEP.2011 21:51:43

Limit

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

2.5 SPURIOUS AND BAND EDGE EMISSIONS

2.5.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.247 (d)

2.5.2 Equipment Under Test and Modification State

CDMA SHI13 S/N: SSHFN000869 - Modification State 0

2.5.3 Date of Test

11 September 2011, 13 September 2011, 14 September 2011 & 16 September 2011

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 band edge measurements were performed in accordance with ANSI C63.10, Clause 6.9.3. The results were analysed to ensure compliance with restricted bands. The EUT was set to the lowest and highest operating frequencies.

2.5.6 Environmental Conditions

Ambient Temperature	22.7 - 25.2°C
Relative Humidity	34.0 - 51.0%

Product Service

2.5.7 Test Results

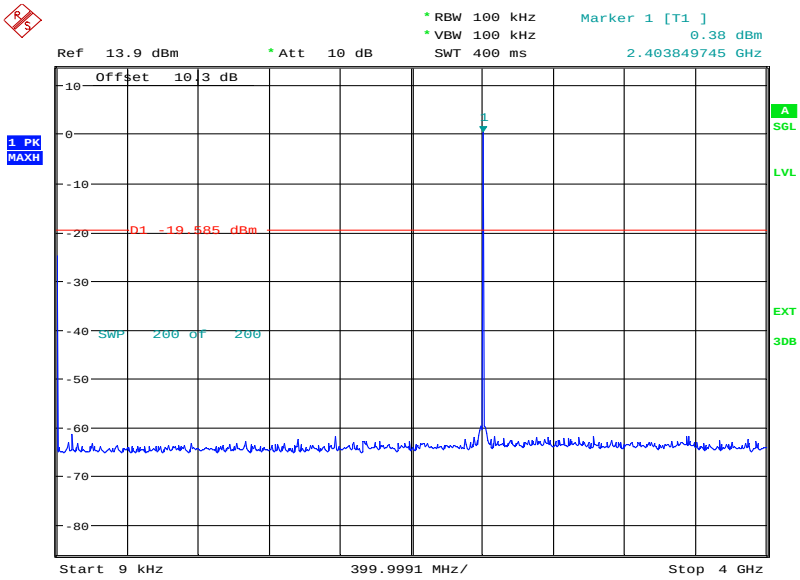
4.0 V DC Supply

Spurious Conducted Emissions

2DH5

2402 MHz

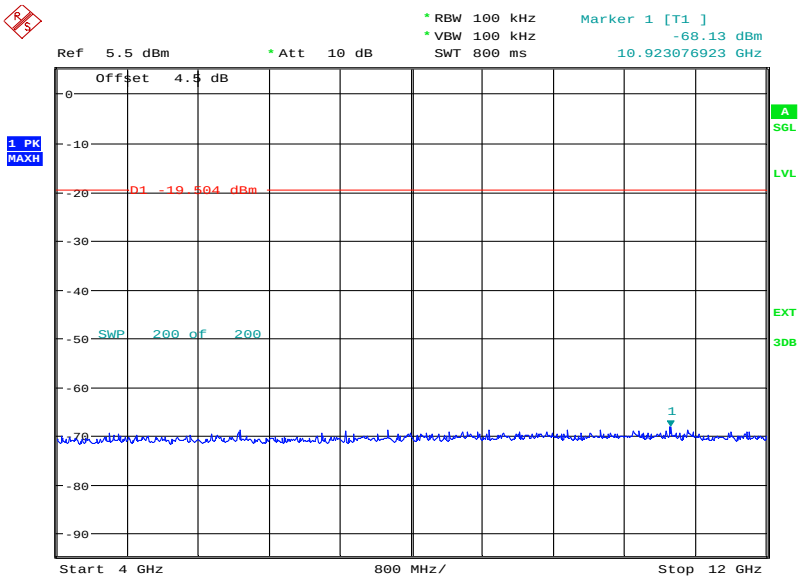
9 kHz to 4 GHz



Date: 16.SEP.2011 14:43:07

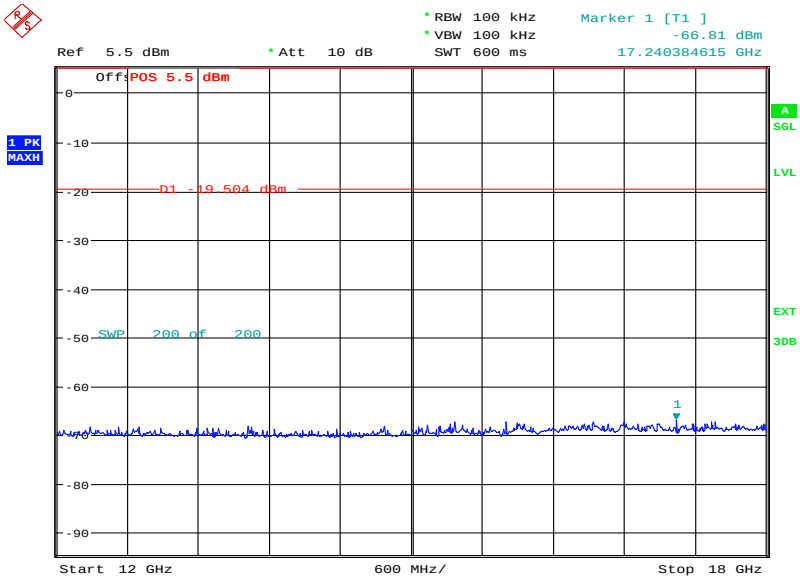
Product Service

4 GHz to 12 GHz



Date: 16.SEP.2011 14:01:19

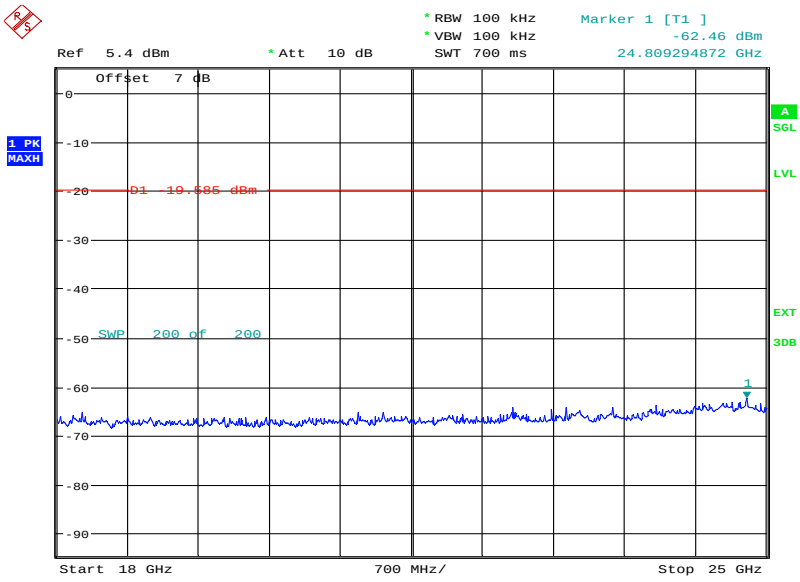
12 GHz to 18 GHz



Date: 16.SEP.2011 14:07:43

Product Service

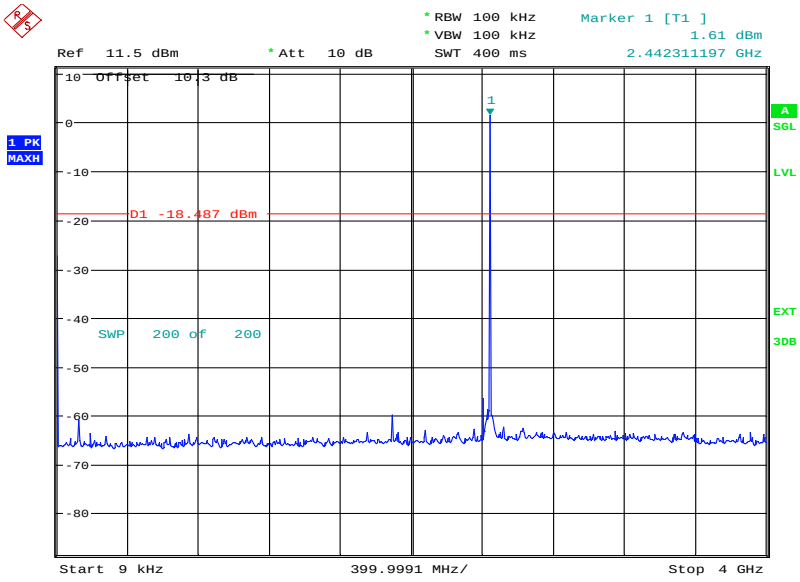
18 GHz to 25 GHz



Date: 16.SEP.2011 15:38:49

2441 MHz

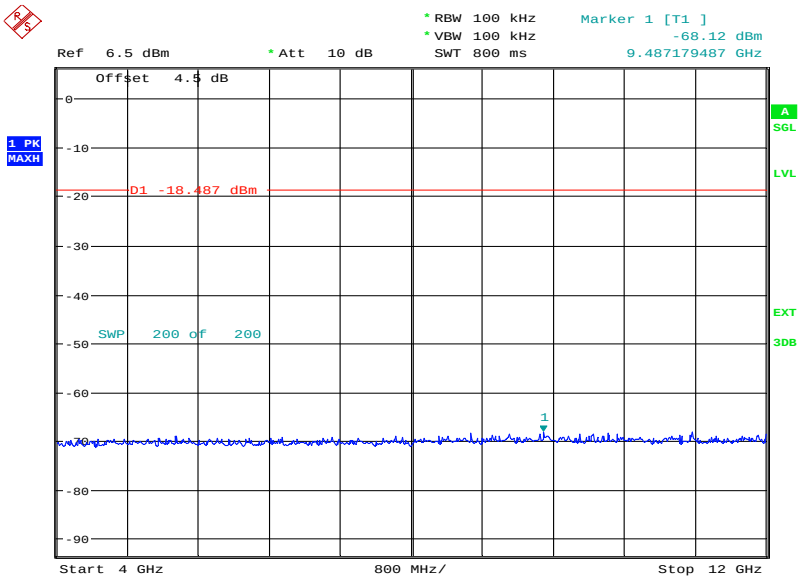
9 kHz to 4 GHz



Date: 16.SEP.2011 14:37:07

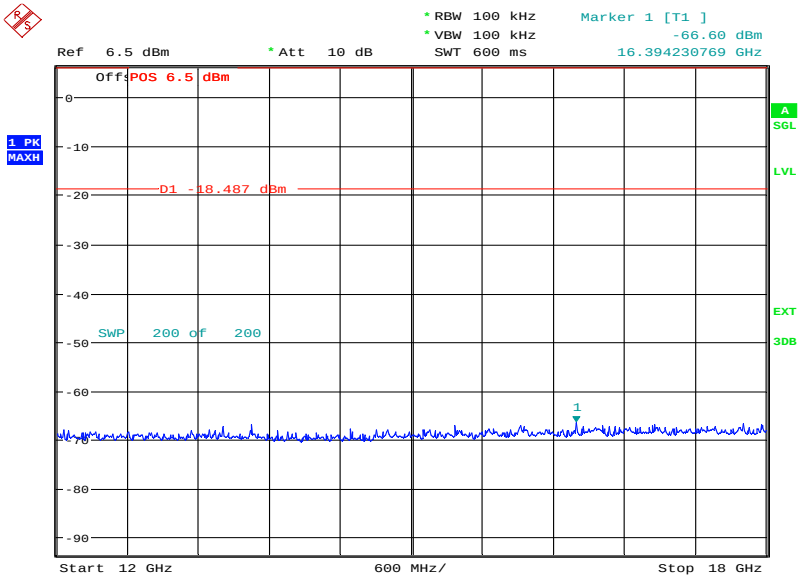
Product Service

4 GHz to 12 GHz



Date: 16.SEP.2011 15:25:58

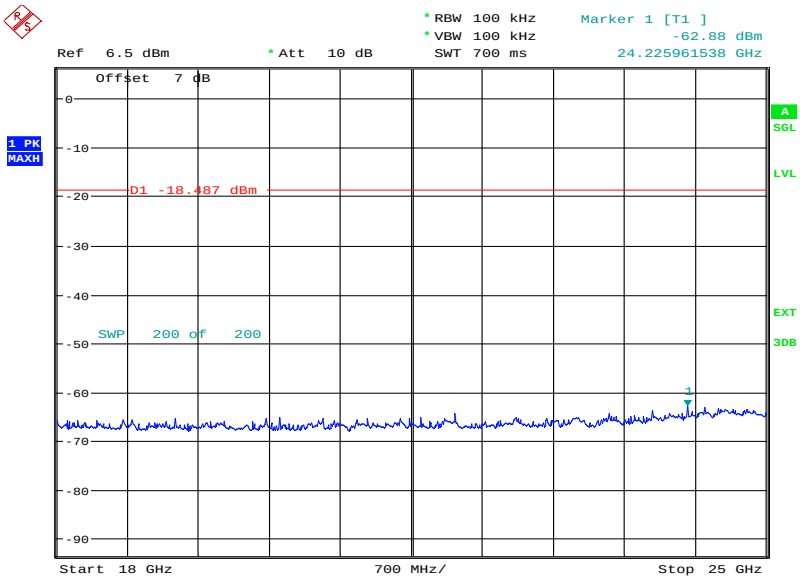
12 GHz to 18 GHz



Date: 16.SEP.2011 15:29:07

Product Service

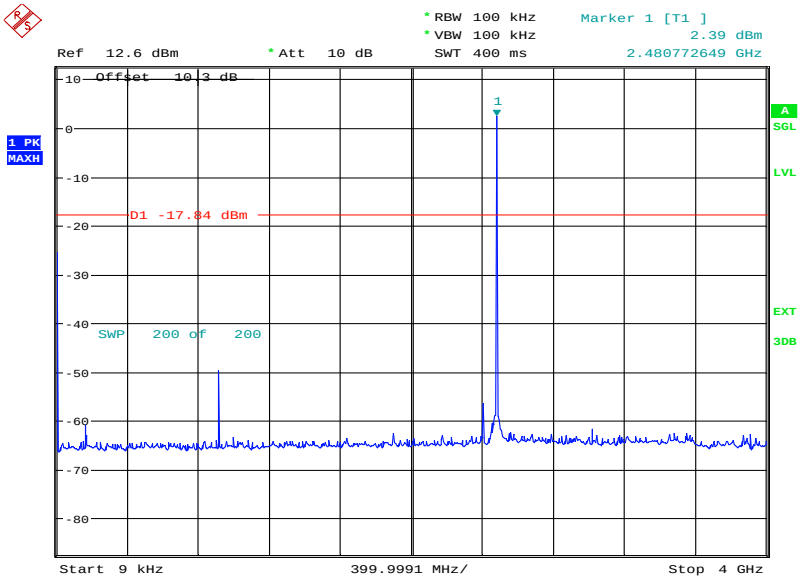
18 GHz to 25 GHz



Date: 16.SEP.2011 15:34:34

2480 MHz

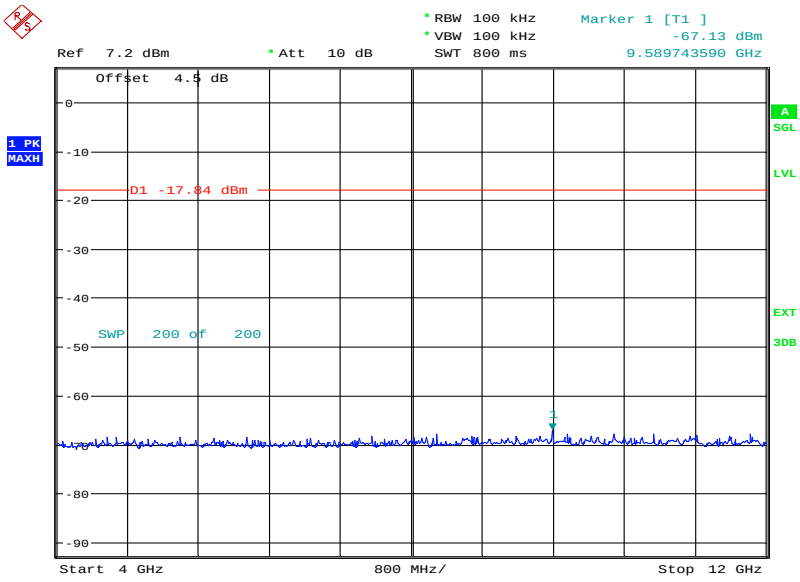
9 kHz to 4 GHz



Date: 16.SEP.2011 14:48:12

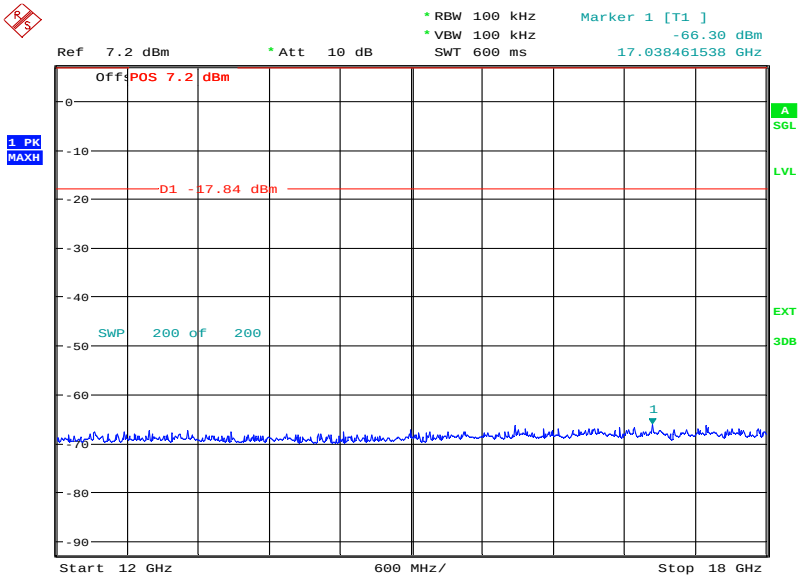
Product Service

4 GHz to 12 GHz



Date: 16.SEP.2011 15:15:28

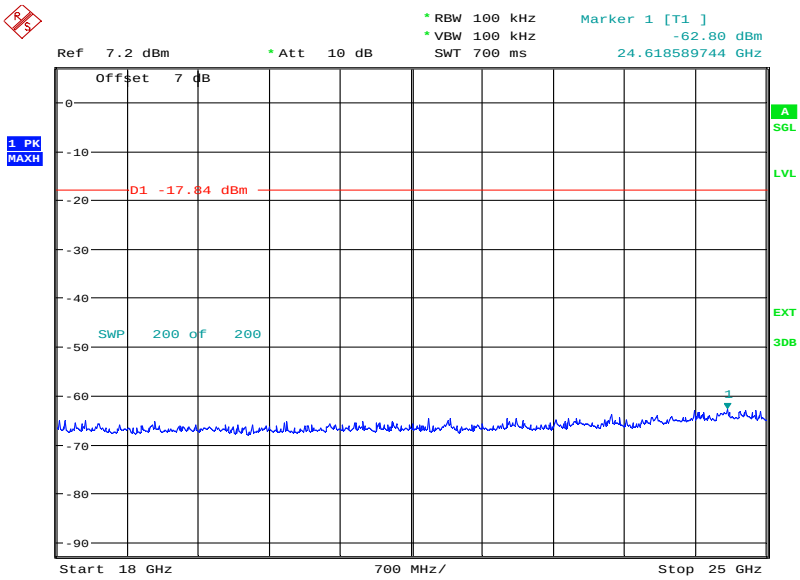
12 GHz to 18 GHz



Date: 16.SEP.2011 15:18:18

Product Service

18 GHz to 25 GHz



Date: 16.SEP.2011 15:43:26

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.

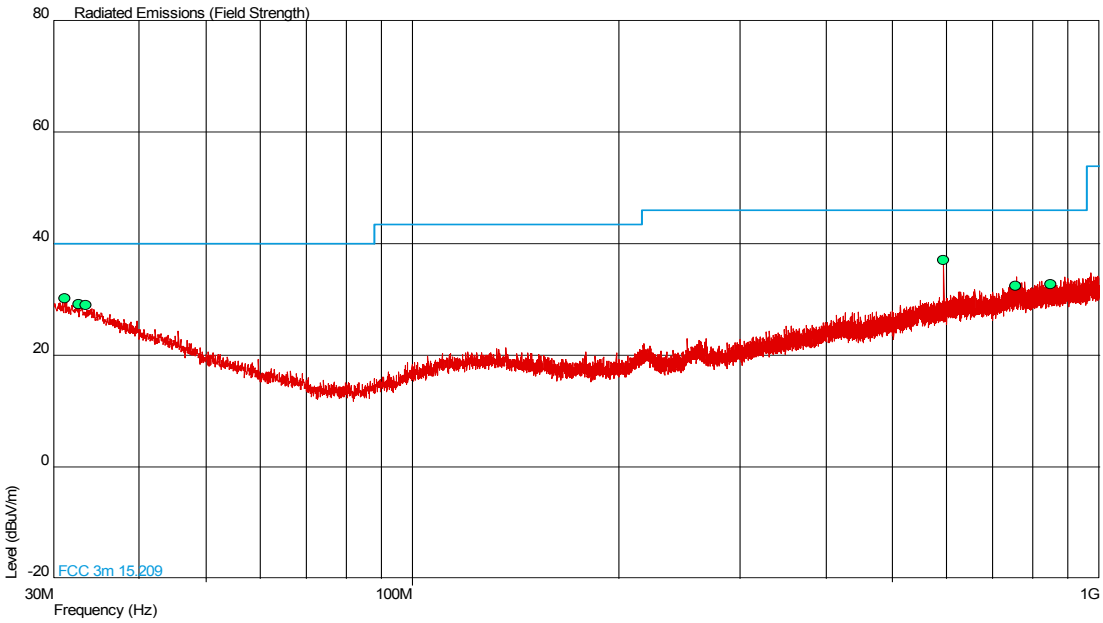
If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval the attenuation required shall be 30 dB instead of 20 dB.

Product Service

Spurious Radiated Emissions

2402 MHz

30 MHz to 1 GHz

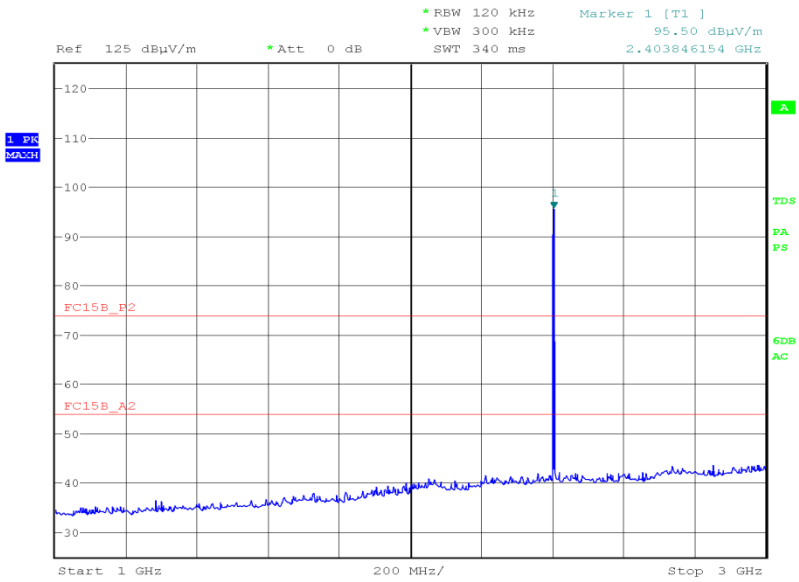


Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity
31.205	30.2	32.4	40.0	100	-9.8	67.6	346	100.00	Vertical
32.713	29.2	28.8	40.0	100	-10.8	71.2	0	100.00	Horizontal
33.509	29.0	28.2	40.0	100	-11.0	71.8	360	100.00	Horizontal
593.105	37.0	70.8	46.0	200	-9.0	129.2	0	100.00	Vertical
754.243	32.5	42.2	46.0	200	-13.5	157.8	357	100.00	Vertical
849.221	32.8	43.7	46.0	200	-13.2	156.3	148	100.00	Vertical

1GHz to 25GHz

Frequency (GHz)	Antenna Polarisation	Antenna Height (cm)	EUT Arc (degrees)	Final Peak (dBµV/m)	Final Average (dBµV/m)
2.390	Horizontal	100	352	47.5	38.2

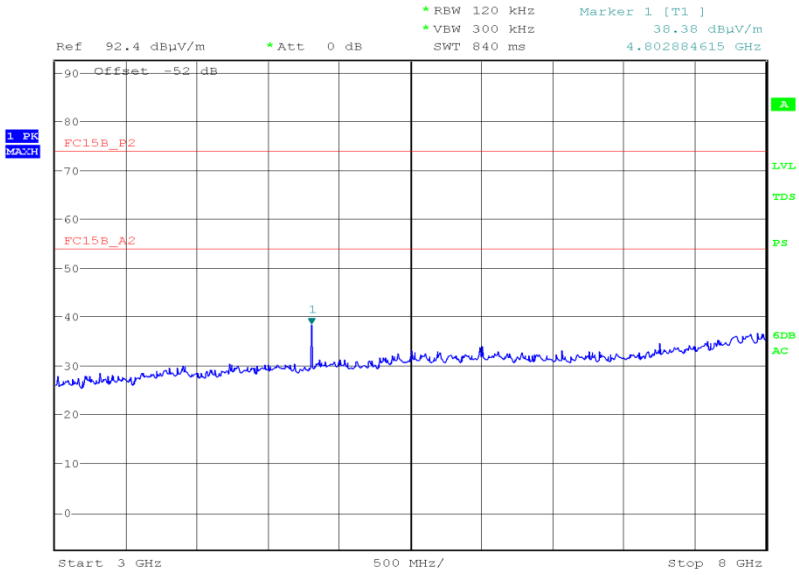
1 GHz to 3 GHz



Date: 13.SEP.2011 21:43:18

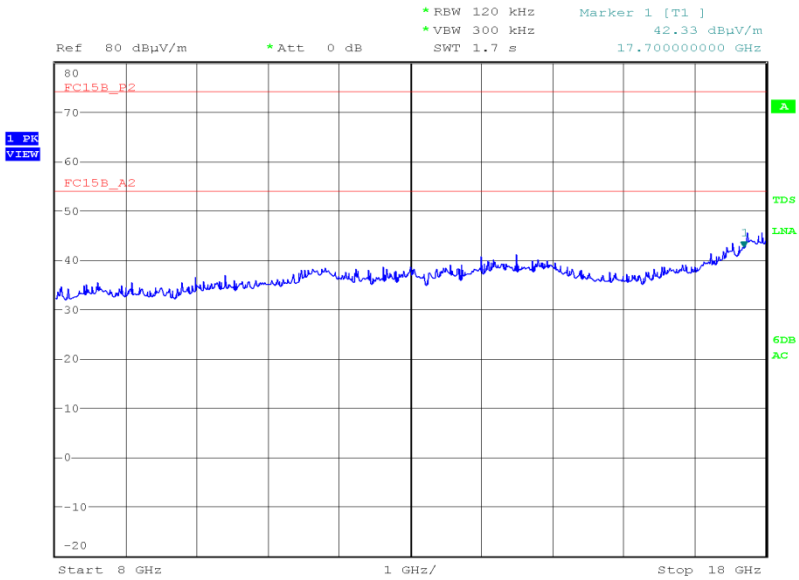
Product Service

3 GHz to 8 GHz



Date: 14.SEP.2011 20:15:31

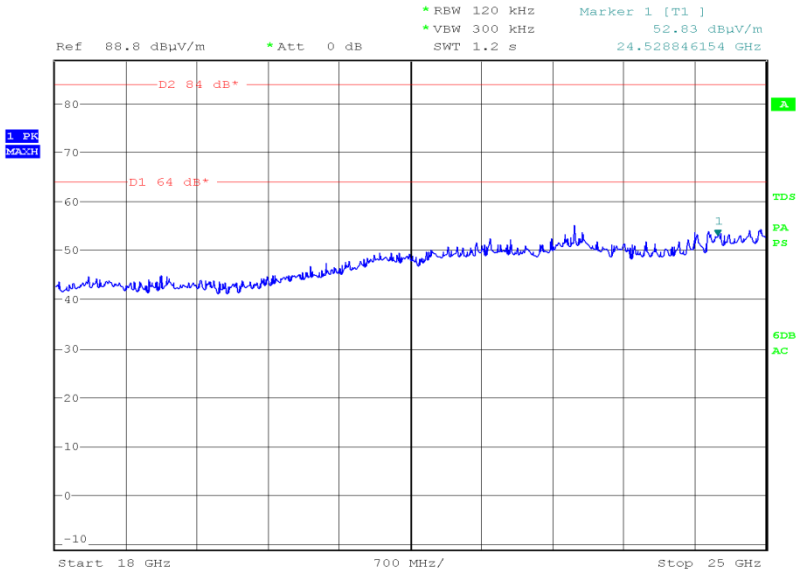
8 GHz to 18 GHz



Date: 14.SEP.2011 21:46:39

Product Service

18 GHz to 25 GHz



Date: 14.SEP.2011 22:01:10

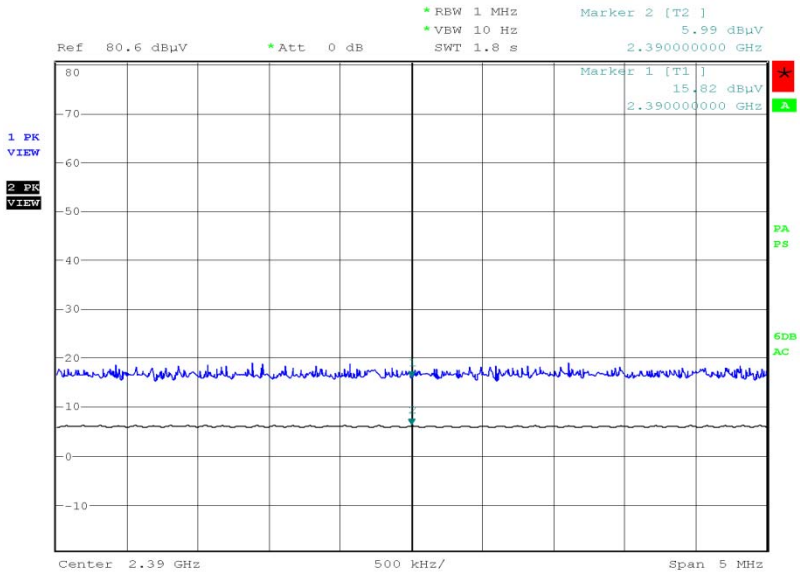
Limit

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

Band Edge Emissions

2402 MHz

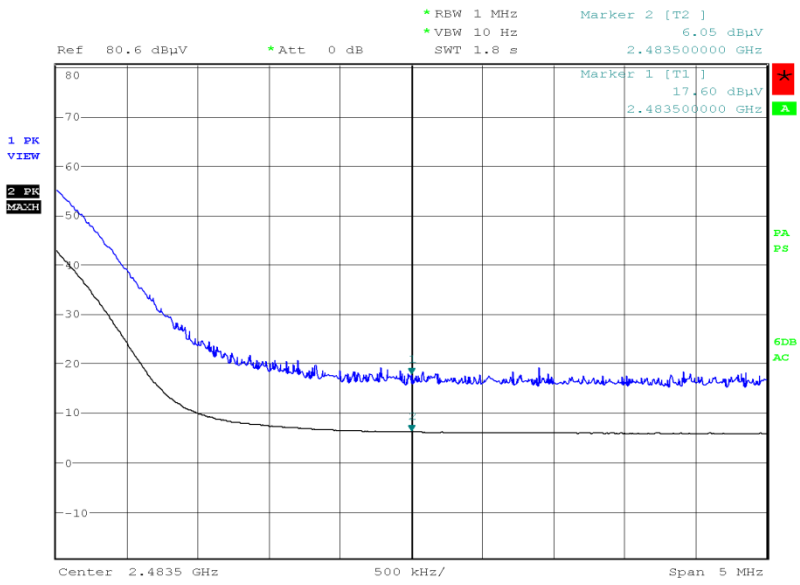
Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	47.5	38.2



Date: 13.SEP.2011 21:47:39

2480 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	50.0	38.5



Date: 13.SEP.2011 22:12:33

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 – Frequency Hopping Systems – 20dB Bandwidth and Channel Bandwidth					
Signal Generator	Hewlett Packard	ESG4000A	61	12	18-May-2012
Multimeter	White Gold	WG022	190	12	26-Oct-2011
30V/5A Power Supply	Farnell	L30-5	191	-	O/P Mon
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Sep-2012
Multimeter	Iso-tech	IDM101	2419	12	14-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Power Divider	Weinschel	1506A	3345	12	4-May-2012
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	6-Jun-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
Power Meter	Rohde & Schwarz	NRP	3491	12	19-Apr-2012
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	19-Apr-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3697	12	28-Jan-2012
DC - 12.4 GHz 10 dB Attenuator	Suhner	6810.17.A	3965	12	24-Jun-2012
Section 2.2 – Frequency Hopping Systems - Channel Dwell Time and Number of Hopping Channels					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 – Maximum Peak Conducted Output Power					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
P-Series Power Meter	Agilent	N1911A	3980	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3982	12	12-Sep-2012
Section 2.4 - EIRP Peak Power					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	12-Nov-2011
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	12-Nov-2011
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
Signal Generator, 9kHz to 3GHz	Rohde & Schwarz	SMA 100A	3494	12	25-Jan-2012
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	19-Sep-2011
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 – Spurious and Band Edge Emissions					
Multimeter	White Gold	WG022	190	12	26-Oct-2011
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	12-Nov-2011
Dual Power Supply Unit	Thurlby	PL320	288	-	TU
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Mar-2012
Antenna (Double Ridge Guide)	Q-Par Angus Ltd	QSH 180K	1511	24	2-Aug-2012
Pre-Amplifier	Phase One	PS04-0086	1533	12	15-Sep-2011 *
Pre-Amplifier	Phase One	PSO4-0087	1534	12	22-Sep-2011
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Test Receiver	Rohde & Schwarz	ESIB26	2085	12	14-Dec-2011
4GHz HPF	Sematron	F-100-4000-5-R	2245	-	TU
Power Supply Unit	Weir	460	2754	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	5-Jul-2012
Amplifier (8 - 18GHz)	Phase One	PS06-0061	3176	12	5-Jul-2012
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Compliance 5 Emissions	Schaffner	C5e Software V.5.00.00	3275	-	N/A - Software
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	19-Sep-2011
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
3 GHz High Pass Filter	K&L Microwave	11SH10-3000/X18000-O/O	3552	12	14-Apr-2012
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Tilt Antenna Mast	maturo Gmbh	TAM 4.0-P	3916	-	TU
Mast Controller	maturo Gmbh	NCD	3917	-	TU
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	12	8-Jul-2012

TU – Traceability Unscheduled
O/P MON – Output Monitored with Calibrated Equipment

* In calibration at the time of testing.

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

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

Product Service

SECTION 4

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

Product Service

4.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

UKAS TESTING 0141

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).