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Report On

FCC Testing of the
Sharp CDMA SHX12 Dual Band CDMA (BC0 and BC6) and Tri Band
GSM (900, 1800 and 1900 MHz) Dual Mode Cellular Phone with
Bluetooth, FeliCa, WLAN and GPS
In accordance with FCC CFR 47 Part 15C (Bluetooth)

COMMERCIAL-IN-CONFIDENCE

FCC ID: APYHRO00162

Document 75915934 Report 11 Issue 1

December 2011



Product Service

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COMMERCIAL-IN-CONFIDENCE

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Document 75915934 Report 11 Issue 1

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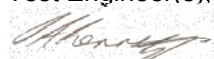
DATED

15 December 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):


S Bennett


G Lawler





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SECTION 1

REPORT SUMMARY

FCC Testing of the
Sharp CDMA SHX12 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and
1900 MHz) Dual Mode Cellular Phone with Bluetooth, FeliCa, WLAN and GPS
In accordance with FCC CFR 47 Part 15C (Bluetooth)



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1.1 INTRODUCTION

The information contained in this report is intended to show verification of the FCC Testing of the Sharp CDMA SHX12 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) Dual Mode Cellular Phone with Bluetooth, FeliCa, WLAN 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 SHX12
Serial Number(s)	IMEI 004401113640193 IMEI 004401113640078
Number of Samples Tested	2
Test Specification/Issue/Date	FCC CFR 47 Part 15C (2010)
Incoming Release Date	Application Form 09 November 2011
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	8873 11 November 2011
Start of Test	26 November 2011
Finish of Test	6 December 2011
Name of Engineer(s)	S Bennett G Lawler
Related Document(s)	ANSI C63.10: 2009



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	



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1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	CDMA SHX12
Part Number	
FCC ID (if applicable)	APYHRO00162
Industry Canada ID (if applicable)	
Technical Description (Please provide a brief description of the intended use of the equipment)	Dual-Band CDMA(800MHz_BC0, 1900MHz_BC6) and Tri-Band GSM (GSM900MHz, DCS1800MHz, PCS1900MHz) Dual Mode 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		



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".			



TRANSMITTER POWER CHARACTERISTICS				
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				



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

(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: T. Taki

Name: Tetsuya Taki

Position held: Manager

Date: 09, Nov., 2011



Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp CDMA SHX12 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and 1900 MHz) Dual Mode Cellular Phone with Bluetooth, FeliCa, WLAN 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.



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SECTION 2

TEST DETAILS

FCC Testing of the
Sharp CDMA SHX12 Dual Band CDMA (BC0 and BC6) and Tri Band GSM (900, 1800 and
1900 MHz) Dual Mode Cellular Phone with Bluetooth, FeliCa, WLAN and GPS
In accordance with FCC CFR 47 Part 15C (Bluetooth)



Product Service

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 SHX12 S/N: IMEI 004401113640193 - Modification State 0

2.1.3 Date of Test

28 November 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	23.4°C
Relative Humidity	30.1%



Product Service

2.1.7 Test Results

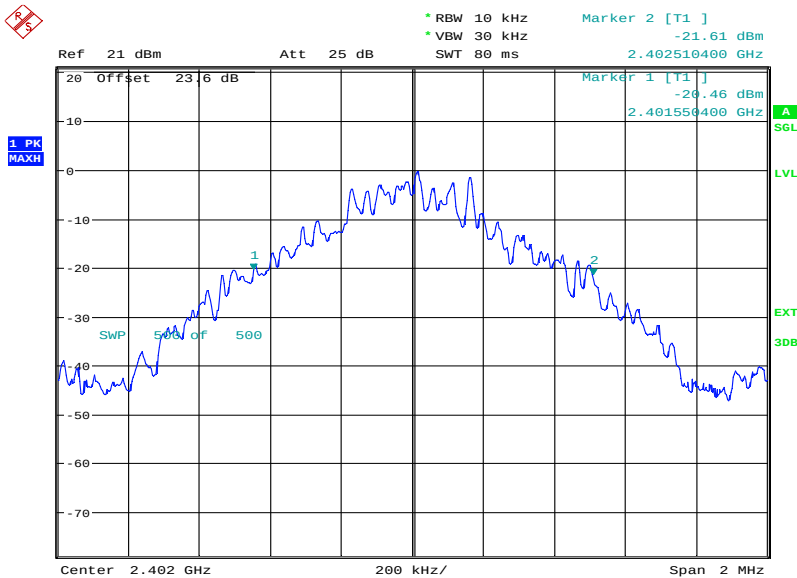
4.0 V DC Supply

20dB Bandwidth

2402 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
DH1	960.0
DH3	963.2
DH5	960.0

DH1

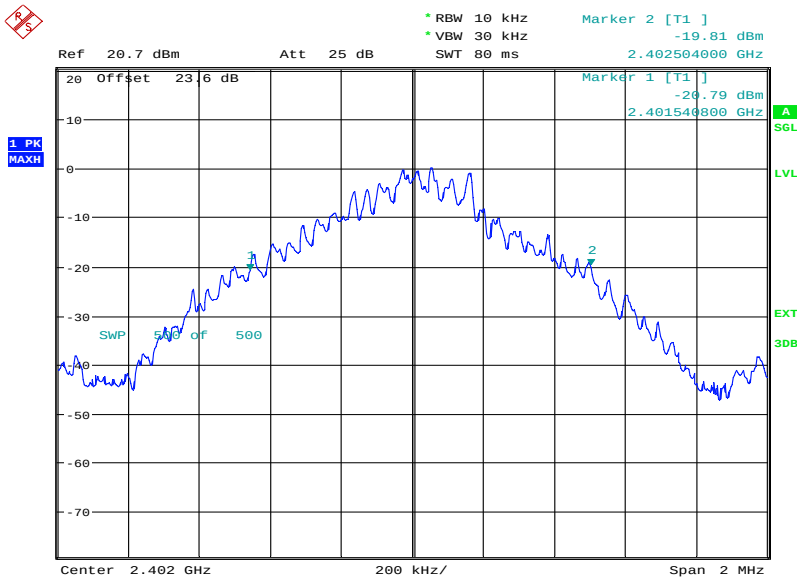


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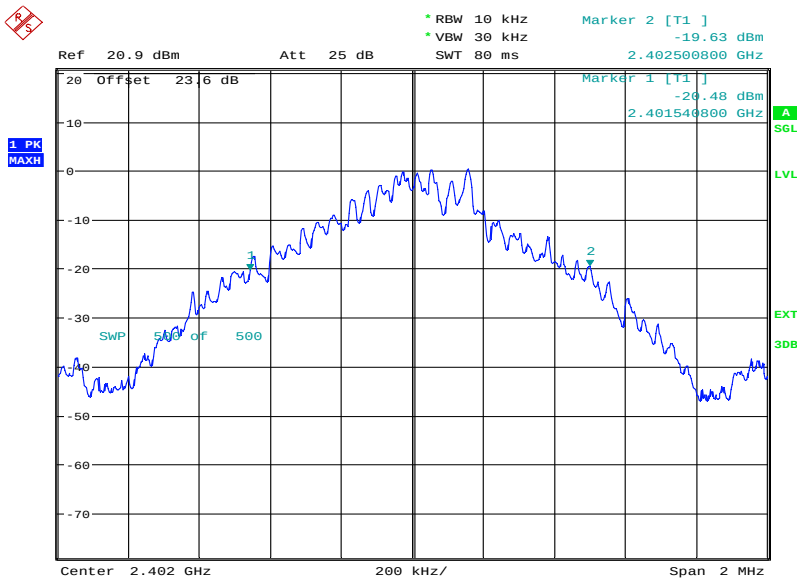
Product Service

DH3



Date: 28.NOV.2011 12:05:04

DH5



Date: 28.NOV.2011 12:25:17

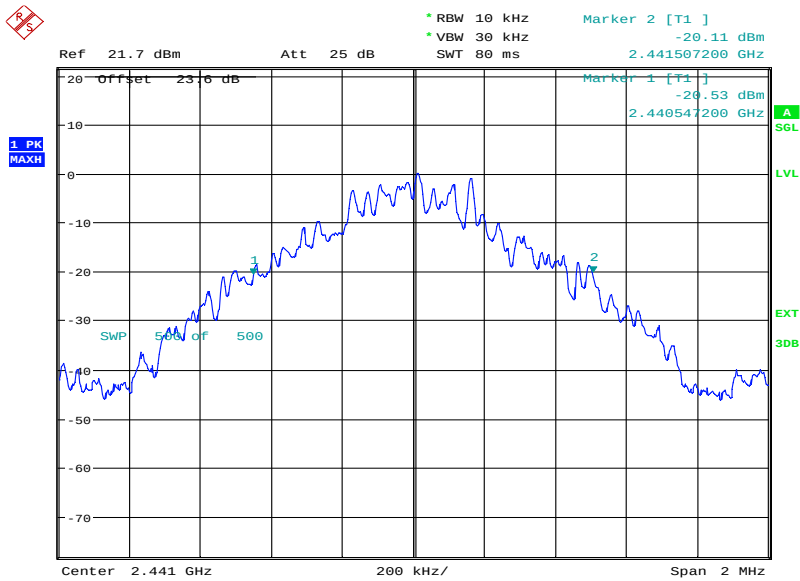


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2441 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
DH1	960.0
DH3	963.2
DH5	960.0

DH1

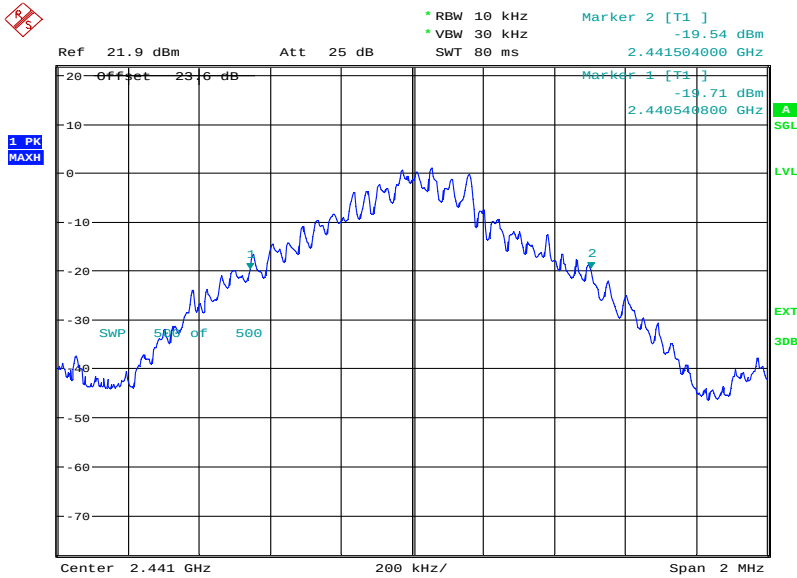


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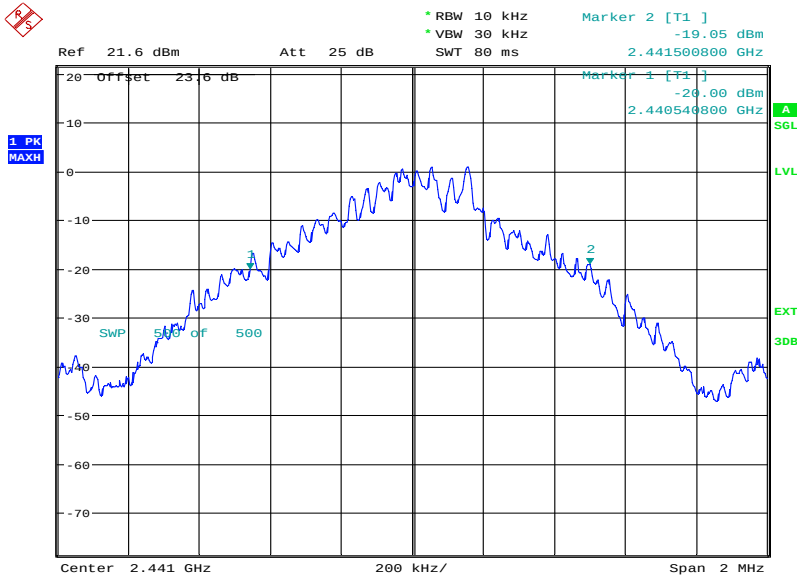
Product Service

DH3



Date: 28.NOV.2011 12:09:53

DH5



Date: 28.NOV.2011 12:27:15

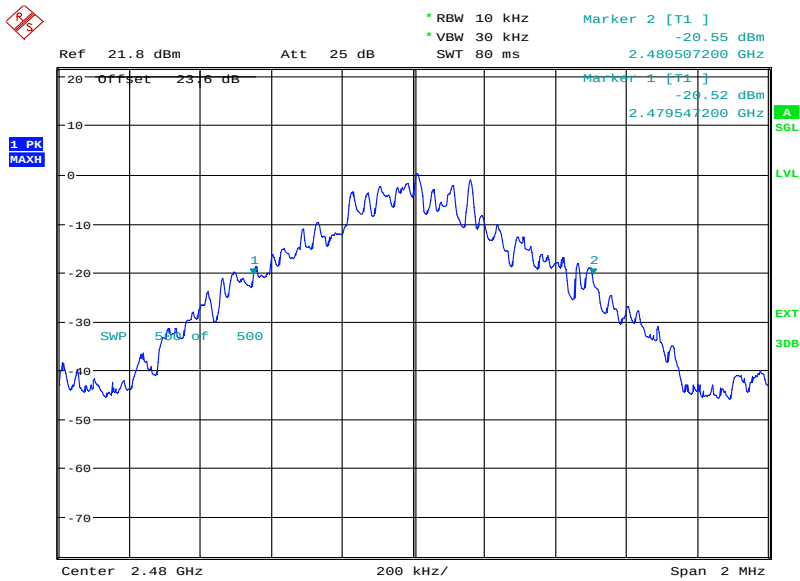


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2480 MHz

Data Rate (Mbps)	20dB Bandwidth (kHz)
DH1	960.0
DH3	963.2
DH5	931.2

DH1

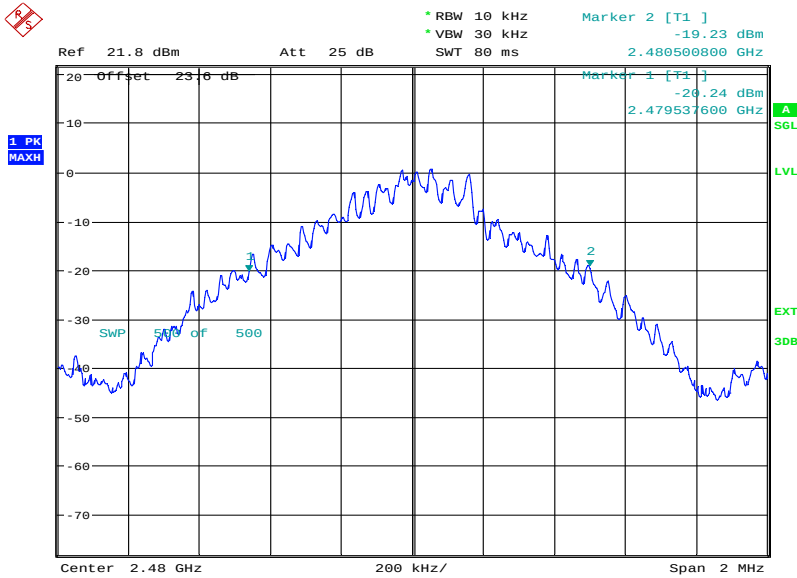


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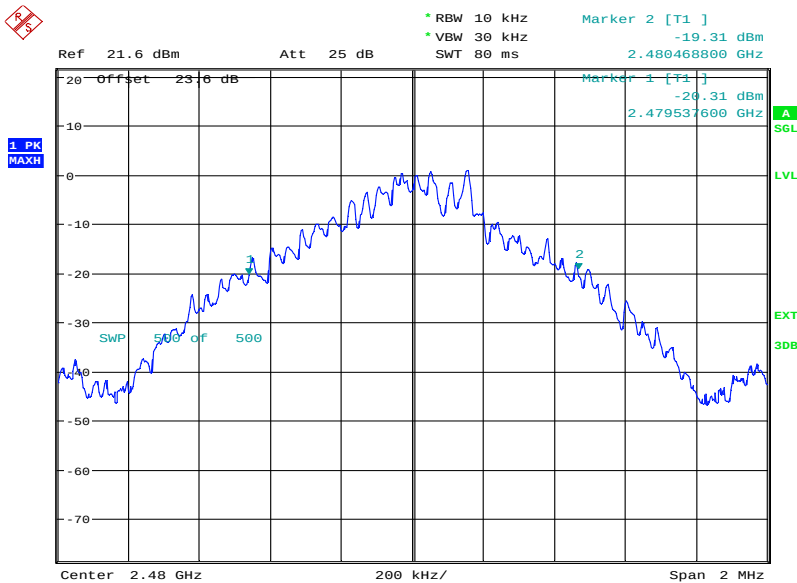
Product Service

DH3



Date: 28.NOV.2011 12:12:17

DH5



Date: 28.NOV.2011 12:29:09

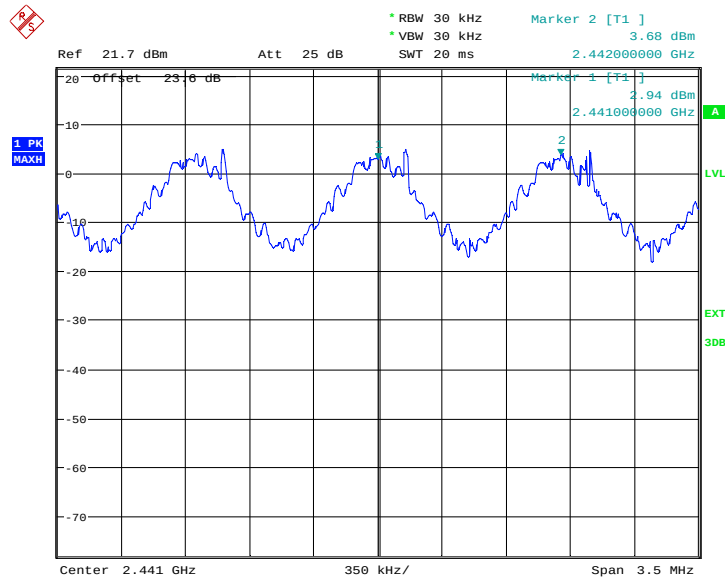
Limit Clause

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.



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Channel Separation



Date: 28.NOV.2011 11:48:44

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 SHX12 S/N: IMEI 004401113640193 - Modification State 0

2.2.3 Date of Test

28 November 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

DH1

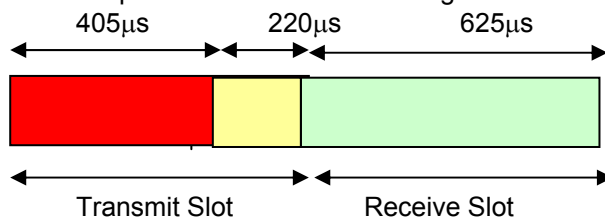
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second.

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:

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

In 1 transmit timeslot, the transmit on time is only 405 μs . 220 μs 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 timeslots, the transmitter is on for $800 \times 405\mu\text{s} = 0.324$ seconds.

$$\therefore \frac{\text{Total Tx Time On}}{\text{No of Channels}} = \frac{0.324}{80} = 4.05\text{ms}$$

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

$$32 \times 4.05\text{ms} = 0.1296 \text{ seconds}$$

DH3

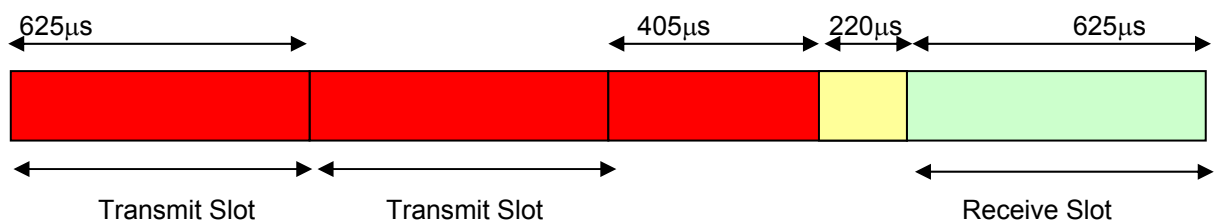
With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots, (ie. no receive slot in-between the 3 transmit slots). The $220\mu\text{s}$ off time for synthesizer re-tuning at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

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 $625\mu\text{s}$. In the third transmit slot, the transmit on time is only $405\mu\text{s}$. $220\mu\text{s}$ 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.





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:

$$\text{Tx} \quad (2 \times 625\mu\text{s}) + (1 \times 405\mu\text{s}) = 1.655\text{ms}$$

So:

$$\begin{aligned} 800 \times 625\mu\text{s} &= 0.5 \text{ seconds} \\ 400 \times 405\mu\text{s} &= 0.162 \text{ seconds} \end{aligned}$$

Thus: $0.5 + 0.162 = 0.662 \text{ seconds}$

$$\therefore \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.662}{80} = 8.275\text{ms}$$

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

$$32 \times 8.275\text{ms} = 0.2648 \text{ seconds}$$

DH5

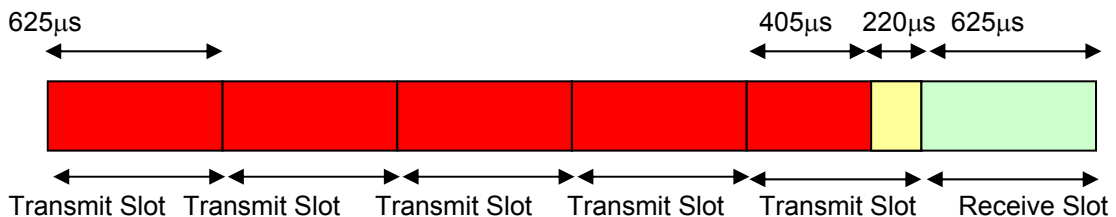
With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots, (ie. no receive slot in-between the 5 transmit slots). The $220\mu\text{s}$ off time for synthesizer re-tuning at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

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 $625\mu\text{s}$. In the fifth transmit slot, the transmit on time is only $405\mu\text{s}$. $220\mu\text{s}$ 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:

$$\text{Tx} \quad (2 \times 625\mu\text{s}) + (1 \times 405\mu\text{s}) = 2.905\text{ms}$$

So:

$$1066.7 \times 625\mu\text{s} = 0.666 \text{ seconds}$$

$$266.7 \times 405\mu\text{s} = 0.108 \text{ seconds}$$

$$\text{Thus:} \quad 0.666 + 0.108 = 0.774 \text{ seconds}$$

$$\therefore \frac{\text{Total Tx Time On}}{\text{No Of Channels}} = \frac{0.774}{80} = 9.675\text{ms}$$

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

$$32 \times 9.675\text{ms} = 0.31 \text{ seconds}$$

2.2.6 Environmental Conditions

Ambient Temperature	23.4°C
Relative Humidity	30.1%



Product Service

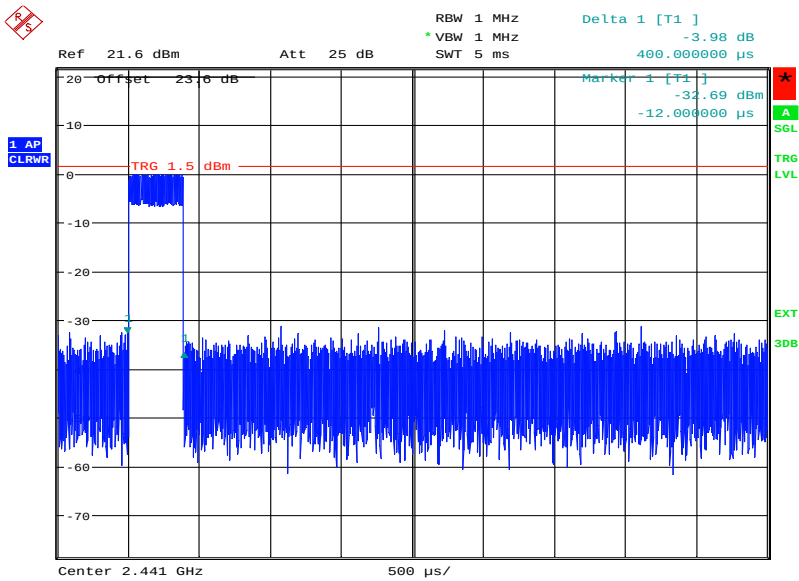
2.2.7 Test Results

4.0 V DC Supply

Channel Dwell Time

DH1

0.000400 ms

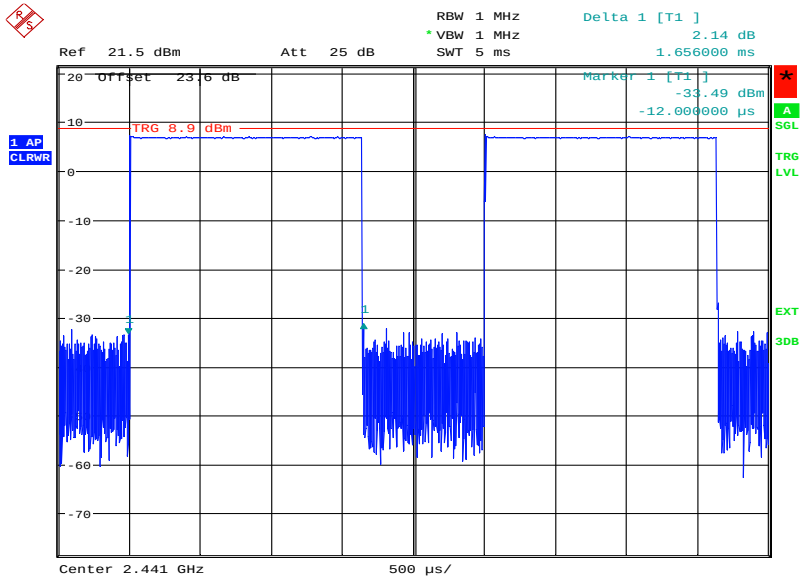




Product Service

DH3

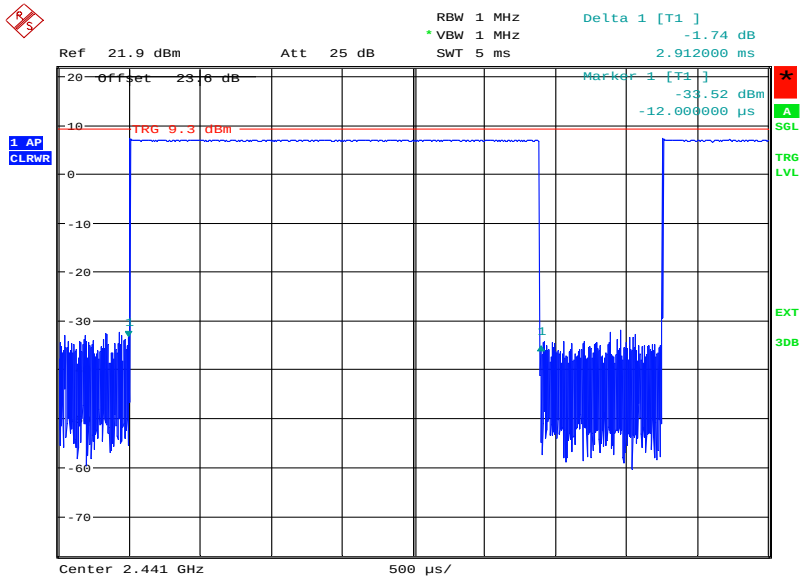
0.000400 ms



Date: 28.NOV.2011 11:37:52

DH5

0.002912 ms



Date: 28.NOV.2011 11:38:23



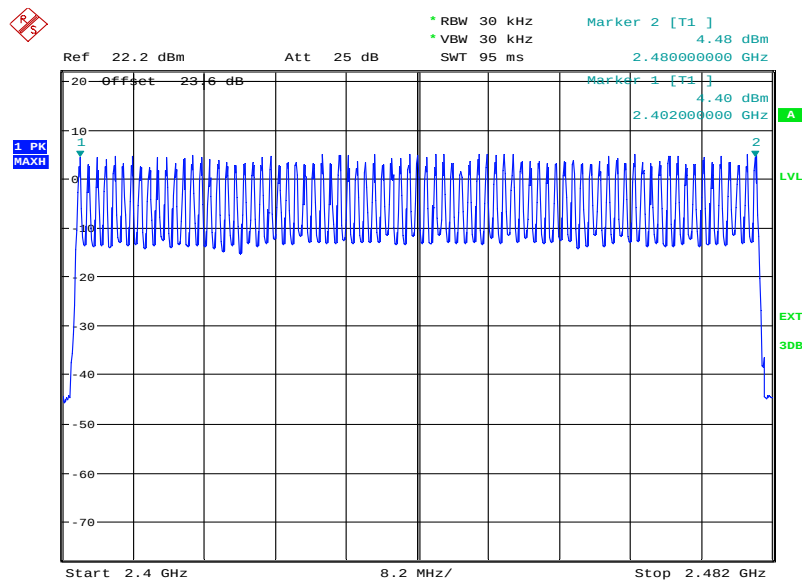
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Limit

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.

Number of Hopping Channels

79



Date: 28.NOV.2011 11:33:13

Limit

≥ 15 channels



Product Service

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 SHX12 S/N: IMEI 004401113640193 - Modification State 0

2.3.3 Date of Test

28 November 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	23.4°C
Relative Humidity	30.1%



2.3.7 Test Results

4.0 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	2.49	3.30	2.78	1.77	2.14	1.98
DH3	2.36	3.06	2.63	1.72	2.02	1.83
DH5	2.26	2.99	2.61	1.68	1.99	1.82

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.



Product Service

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 SHX12 S/N: IMEI 004401113640078 - Modification State 0

2.4.3 Date of Test

26 November 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 Spectrum Analyser. The Analyser settings were adjusted to display the resultant trace on screen and a resolution bandwidth and video bandwidth of 1 MHz were used to perform the measurement. The level on the spectrum analyser was maximised by rotating the EUT 360° and a height search of the measuring antenna. A substitution was then performed using a substitution antenna and signal generator.

This level was maximised by adjusting the height of the measuring antenna once more. The level from the signal generator was then adjusted to achieve the same raw result as with the EUT. This level was then corrected to account for cable loss and antenna factor. If applicable, a peak power analyser was also used to obtain a correction factor for wideband signals such as WLAN.

A calculation was then performed to obtain the final figure.

2.4.6 Environmental Conditions

Ambient Temperature	20.9°C
Relative Humidity	36.0%

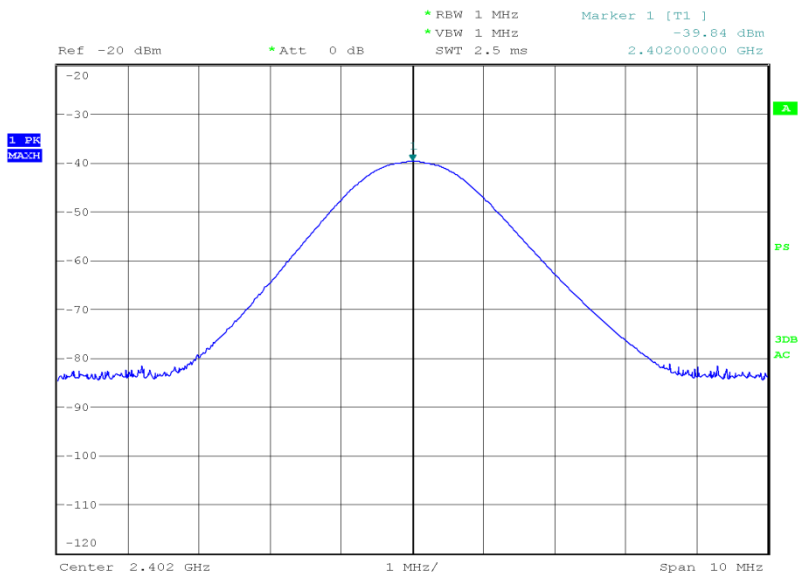


Product Service

2.4.7 Test Results

2402 MHz

EIRP (dBm)	EIRP (mW)
0.41	1.10



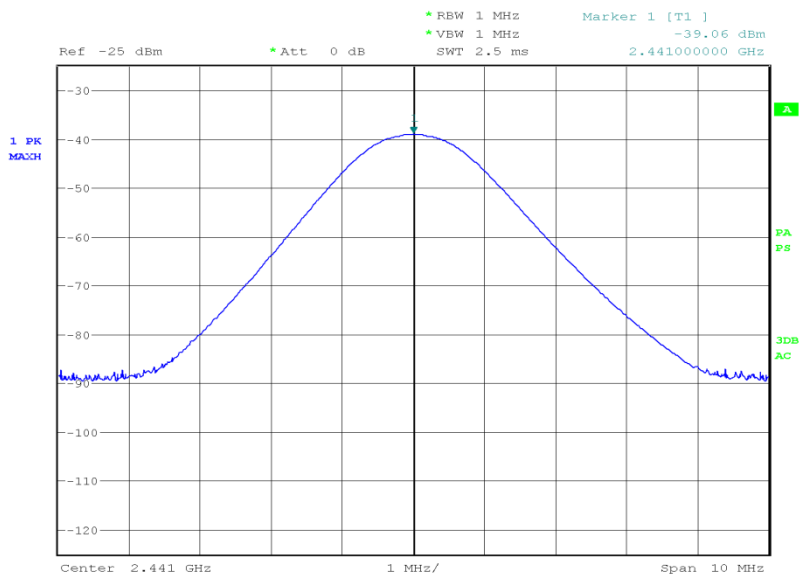
Date: 26.NOV.2011 17:40:48



Product Service

2441 MHz

EIRP (dBm)	EIRP (mW)
1.68	1.47



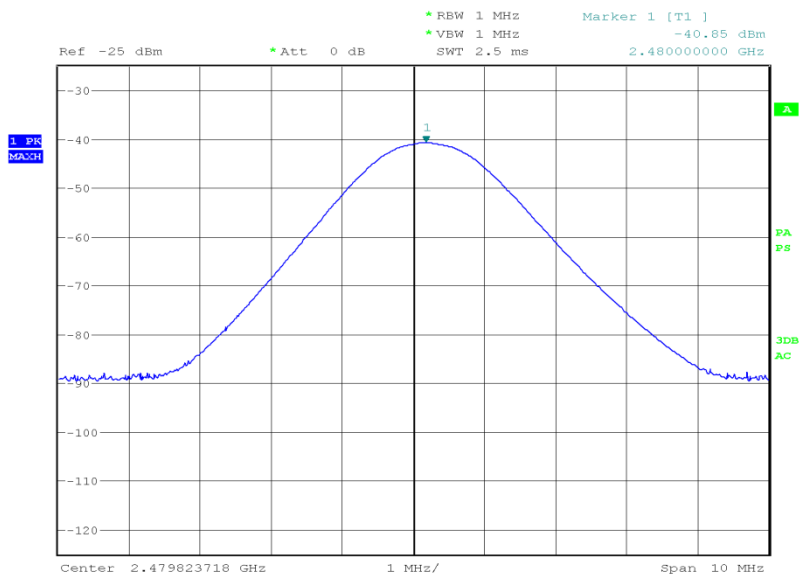
Date: 26.NOV.2011 18:11:51



Product Service

2480 MHz

EIRP (dBm)	EIRP (mW)
0.73	1.18



Date: 26.NOV.2011 18:28:18

Limit

EIRP (dBm)	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 SHX12 S/N: IMEI 004401113640078 - Modification State 0

2.5.3 Date of Test

26 November 2011, 28 November 2011, 29 November 2011 & 6 December 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

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 6.9.3. 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	20.0 - 23.4°C
Relative Humidity	30.1 - 42.0%



Product Service

2.5.7 Test Results

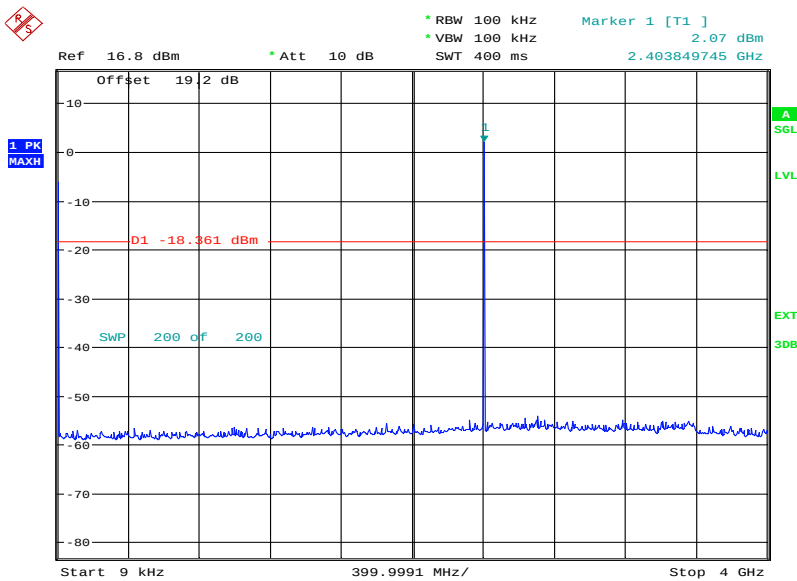
4.0 V DC Supply

Spurious Conducted Emissions

DH1

2402 MHz

9 kHz to 4 GHz

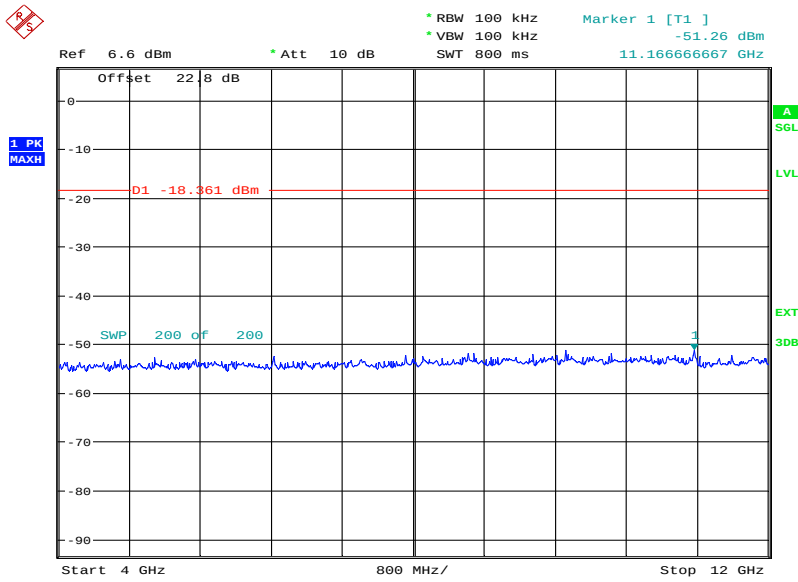


Date: 28.NOV.2011 14:28:52



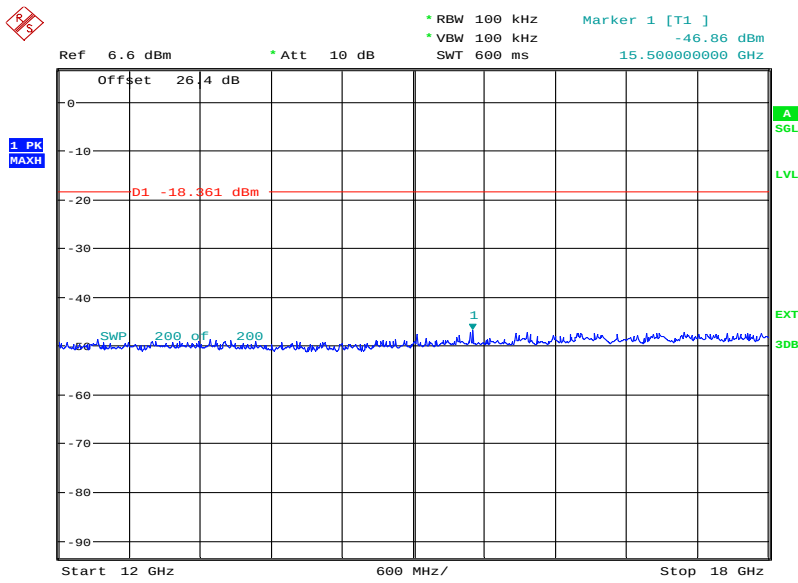
Product Service

4 GHz to 12 GHz



Date: 28.NOV.2011 14:40:16

12 GHz to 18 GHz

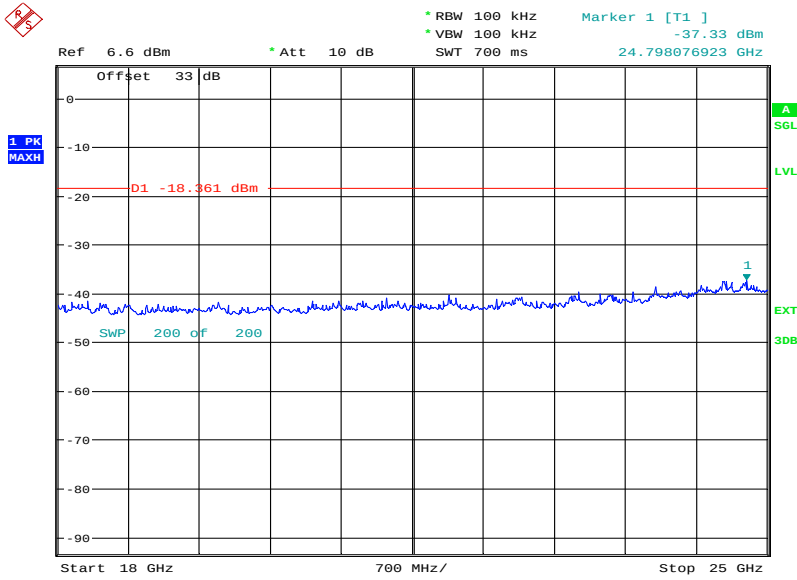


Date: 28.NOV.2011 14:42:42



Product Service

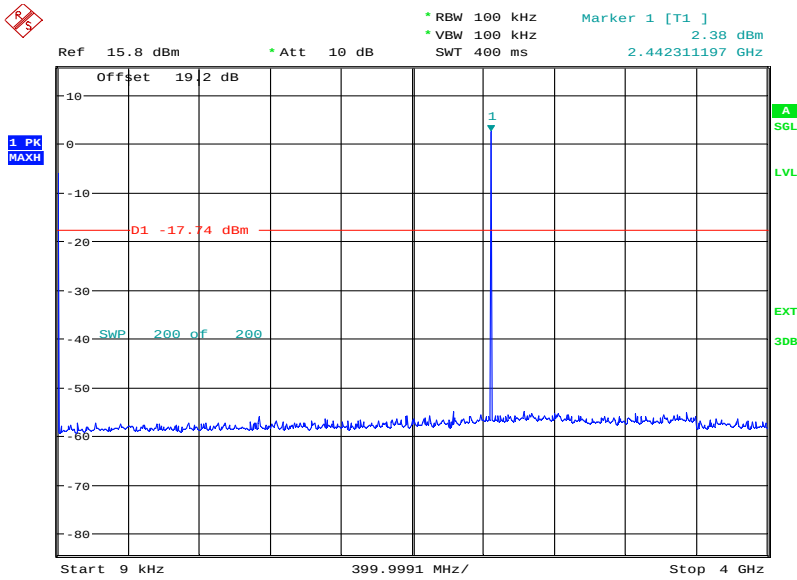
18 GHz to 25 GHz



Date: 28.NOV.2011 15:07:30

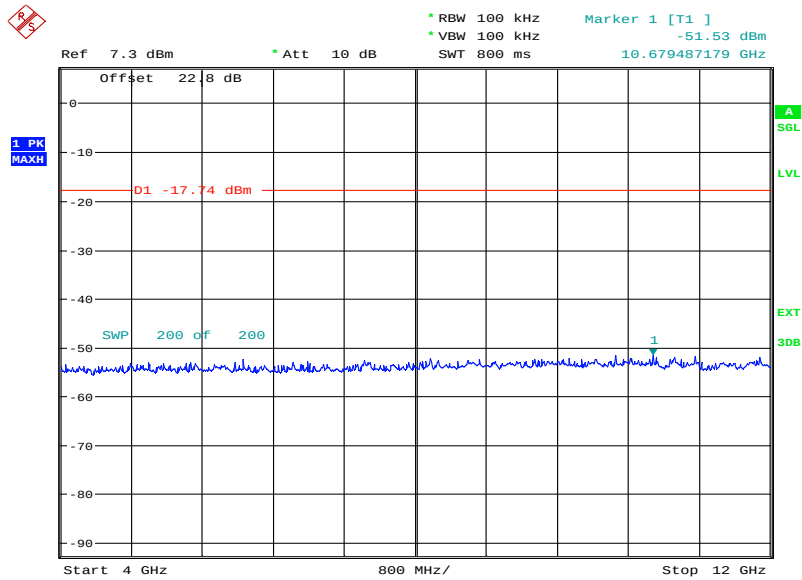
2441 MHz

9 kHz to 4 GHz



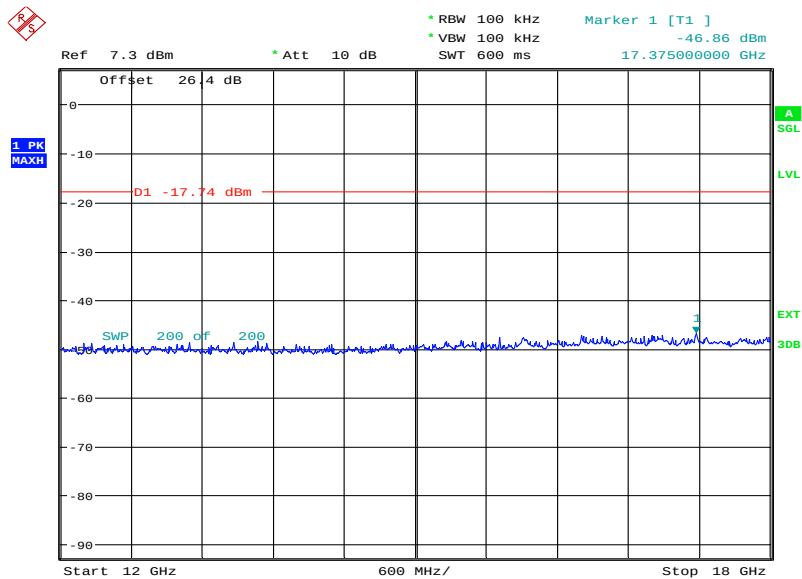
Date: 28.NOV.2011 14:31:58

4 GHz to 12 GHz



Date: 28.NOV.2011 14:46:22

12 GHz to 18 GHz

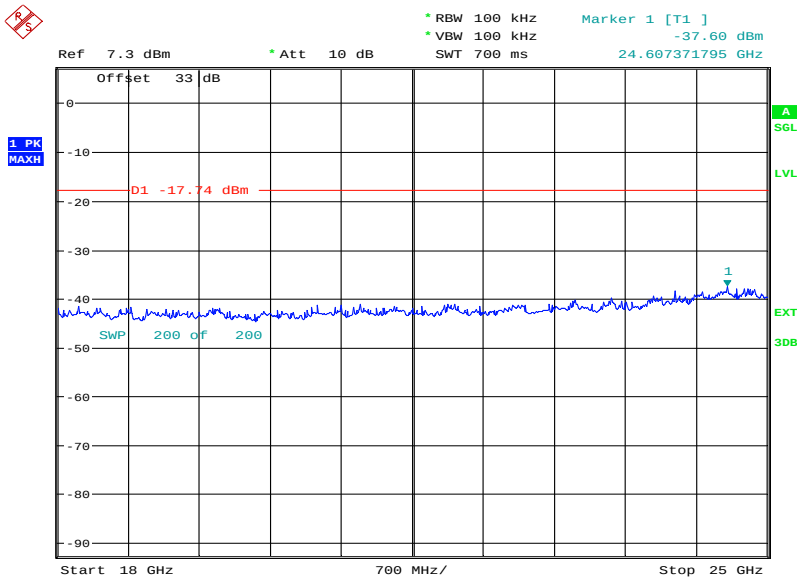


Date: 28.NOV.2011 14:48:49



Product Service

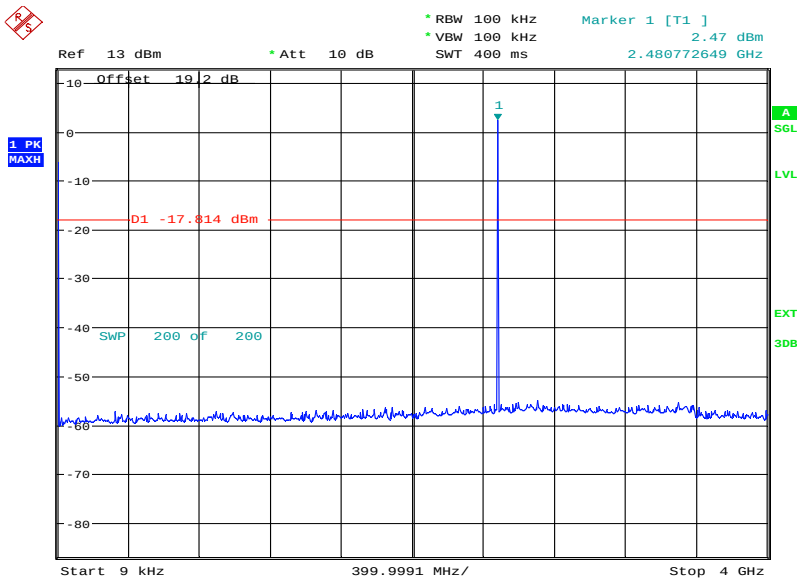
18 GHz to 25 GHz



Date: 28.NOV.2011 15:11:53

2480 MHz

9 kHz to 4 GHz

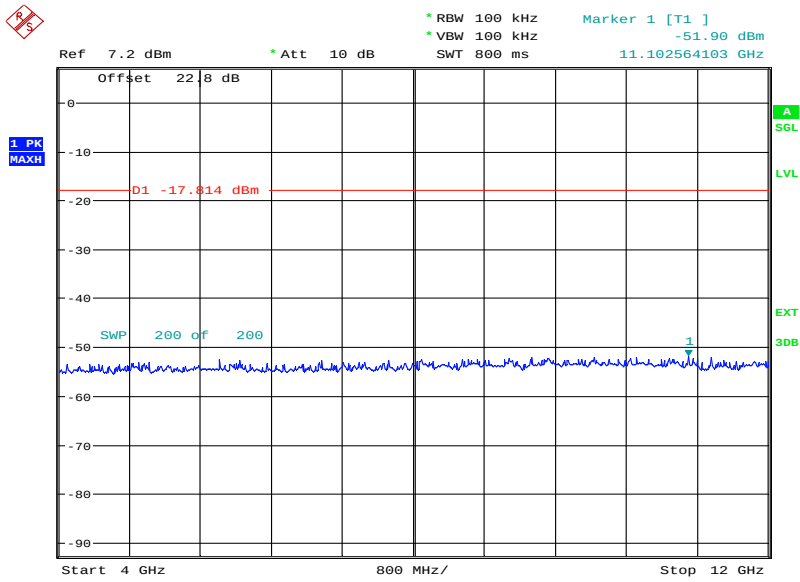


Date: 28.NOV.2011 14:34:26



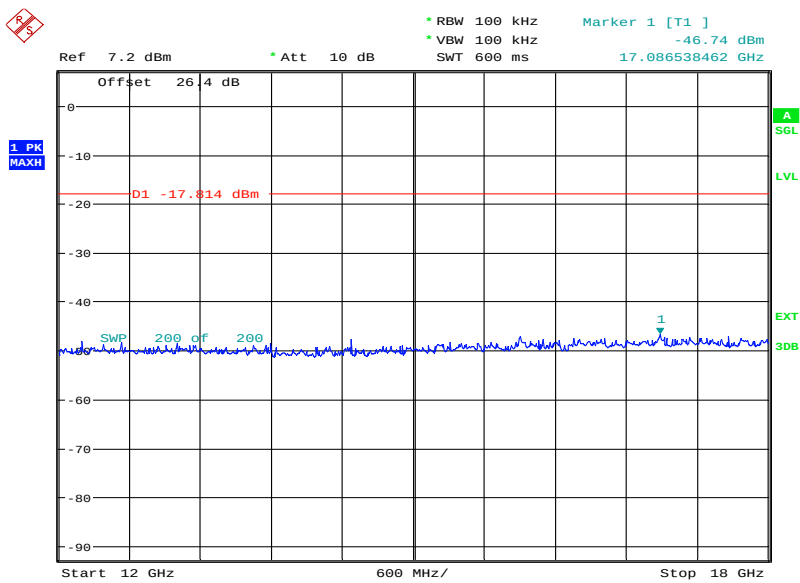
Product Service

4 GHz to 12 GHz



Date: 28.NOV.2011 14:53:30

12 GHz to 18 GHz

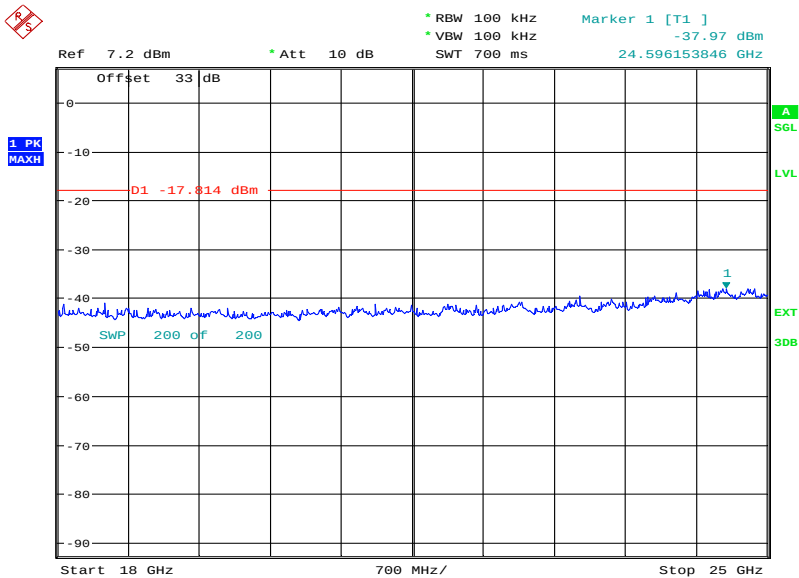


Date: 28.NOV.2011 14:55:59



Product Service

18 GHz to 25 GHz



Date: 28.NOV.2011 15:16:14

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.

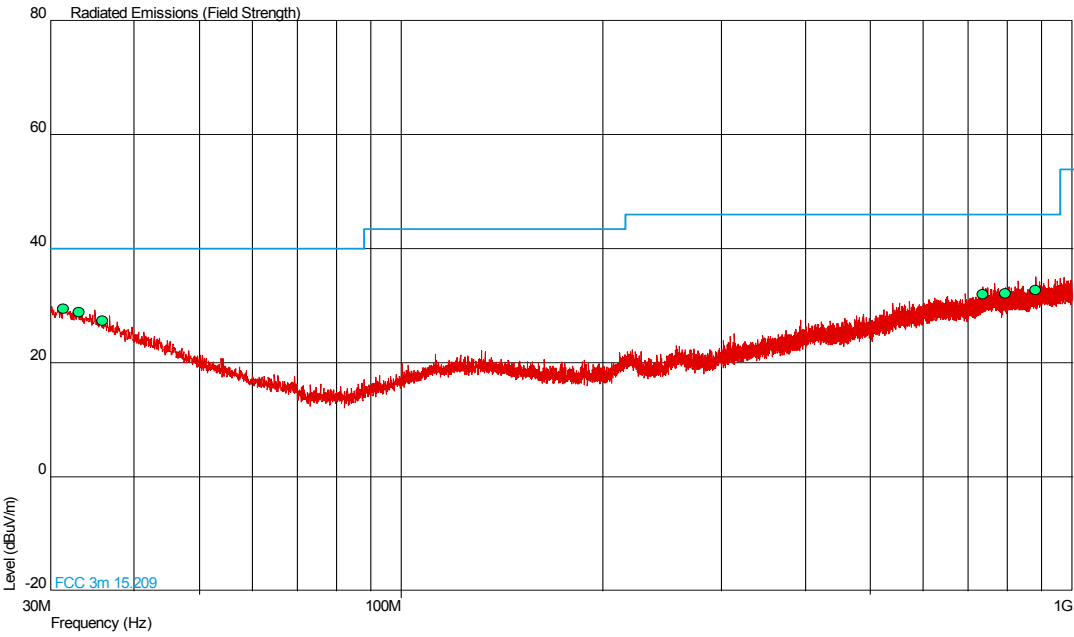


Product Service

Spurious Radiated Emissions

2402 MHz

30 MHz to 1 GHz

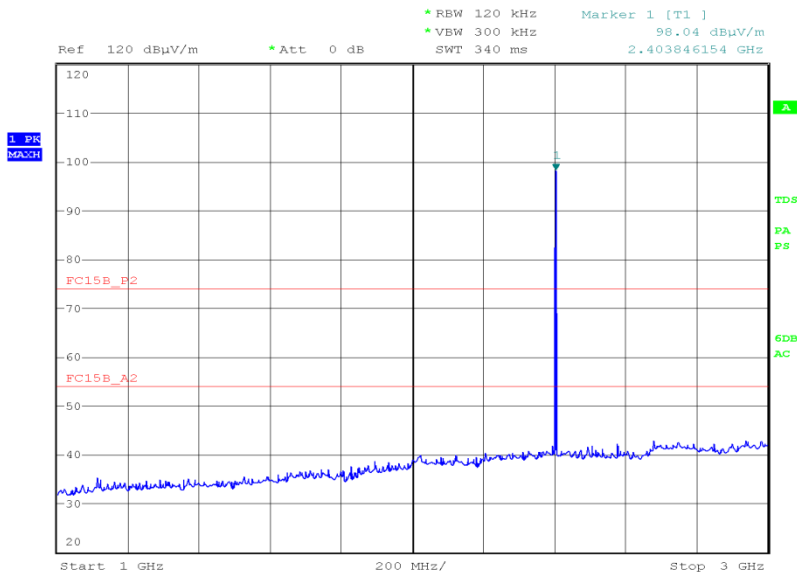


Frequency (MHz)	QP Level (dBuV/m)	QP Level (uV/m)	QP Limit (dBuV/m)	QP Limit (uV/m)	QP Margin (dBuV/m)	QP Margin (uV/m)	Angle (Deg)	Height (m)	Polarity	
31.407	29.5	29.9	40.0	100	-10.5	70.1	0	1.00	Horizontal	
33.104	28.9	27.9	40.0	100	-11.1	72.1	90	1.00	Vertical	
35.917	27.4	23.4	40.0	100	-12.6	76.6	90	1.00	Vertical	
736.500	32.1	40.3	46.0	200	-13.9	159.7	90	1.00	Vertical	
795.282	32.2	40.7	46.0	200	-13.8	159.3	90	1.00	Horizontal	
881.709	32.8	43.7	46.0	200	-13.2	156.3	270	1.00	Vertical	



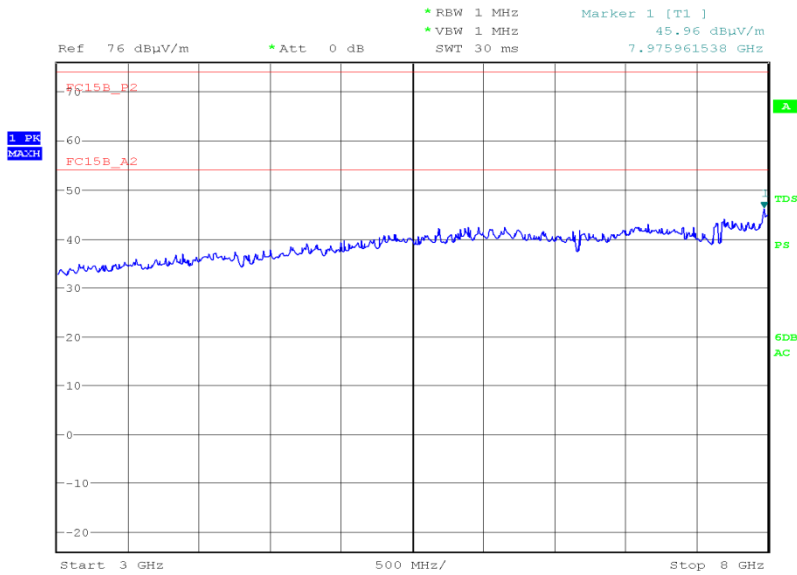
Product Service

1 GHz to 3 GHz



Date: 26.NOV.2011 17:52:38

3 GHz to 8 GHz

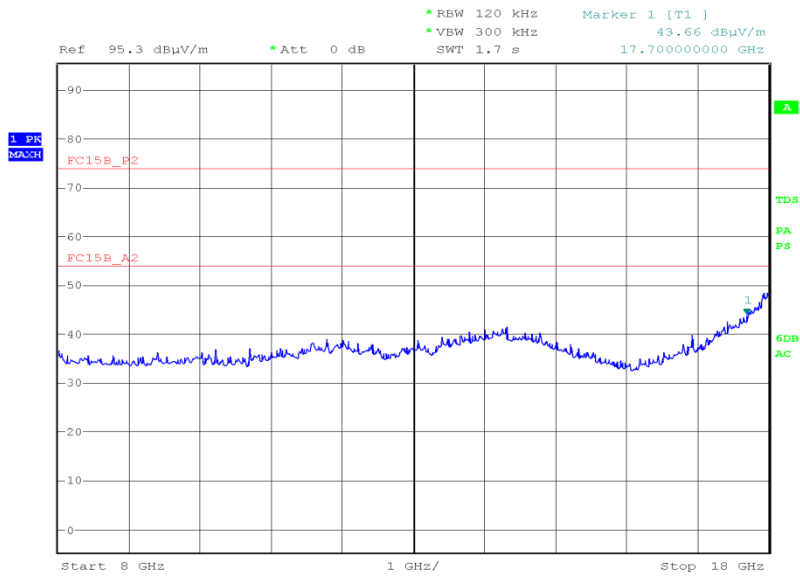


Date: 29.NOV.2011 22:25:58



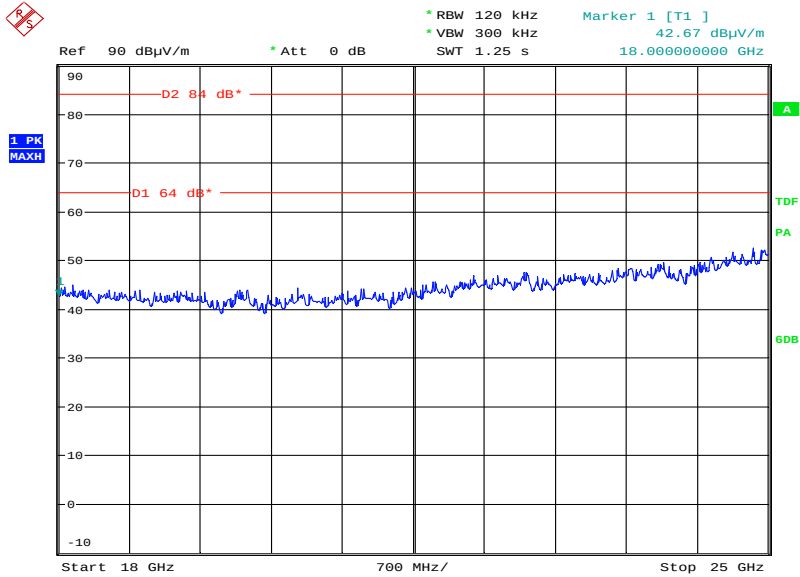
Product Service

8 GHz to 18 GHz



Date: 29.NOV.2011 23:15:51

18 GHz to 25 GHz



Date: 6.DEC.2011 20:58:32

Limit

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

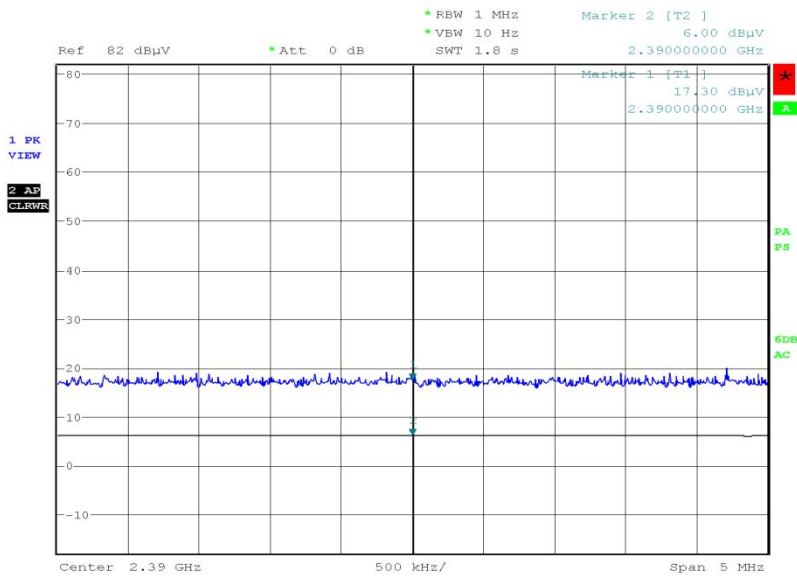


Product Service

Band Edge Emissions

2402 MHz

Polarisation	Final Peak (dBμV/m)	Final Average (dBμV/m)
Horizontal	49.80	38.53



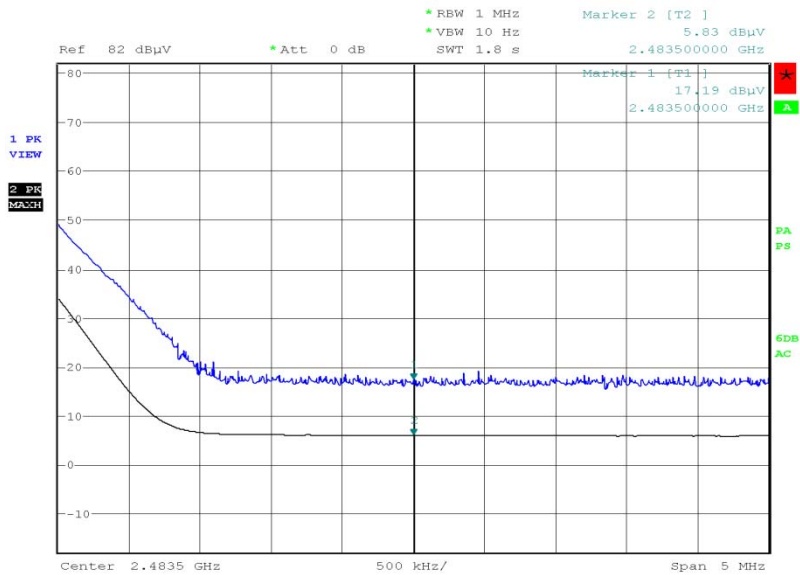
Date: 26.NOV.2011 17:58:47



Product Service

2480 MHz

Polarisation	Final Peak (dBµV/m)	Final Average (dBµV/m)
Horizontal	49.80	38.41



Date: 26.NOV.2011 18:35:59

Limit

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



Product Service

SECTION 3

TEST EQUIPMENT USED



3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1- Frequency Hopping Systems – 20dB Bandwidth and Channel Separation					
RF Coupler	TUV	TUV	415	-	TU
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	24-Mar-2012
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Power Divider	Weinschel	1506A	604	12	17-Mar-2012
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Mar-2012
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	26-May-2012
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	10-Jun-2012
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
Power Supply	Farnell	ET30/2	3423	-	TU
Power Meter	Rohde & Schwarz	NRP	3491	12	19-Apr-2012
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	19-Apr-2012
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	20-Sep-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	11-Jan-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	11-Jan-2012
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	24-Jun-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012
Section 2.2 – Frequency Hopping Systems – Channel Dwell Time and Number of Hopping Channels					
Power Divider	Weinschel	1506A	604	12	17-Mar-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Mar-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	24-Jun-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.3 – Maximum Peak Conducted Output Power					
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	24-Mar-2012
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Power Divider	Weinschel	1506A	604	12	17-Mar-2012
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-2012
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	13-Mar-2012
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	26-May-2012
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	8-Feb-2012
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	24-Jun-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012
Section 2.4- EIRP Peak Power					
Peak Power Analyser	Hewlett Packard	8990A	107	12	11-Feb-2012
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESIB26	2028	12	4-Oct-2012
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	27-Apr-2012
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Feb-2012
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
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



Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 – Spurious and Band Edge Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	14-Nov-2012
Communications Tester	Rohde & Schwarz	CMU 200	442	12	13-Oct-2012
Attenuator (10dB, 10W)	Weinschel	23-10-34	470	12	23-Jun-2012
Attenuator (10dB)	Weinschel	47-10-34	481	12	24-Mar-2012
Attenuator (20dB/ 2W)	Pasternack	PE7004-20	489	12	21-Sep-2012
Power Divider	Weinschel	1506A	604	12	17-Mar-2012
Broadband Resistive Power Divider	Weinschel	1506A	605	12	6-Sep-2012
Spectrum Analyser	Hewlett Packard	E4407B	1154	12	28-Jun-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	20-Sep-2012
Screened Room (5)	Rainford	Rainford	1545	36	3-Feb-2014
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
EMI Test Receiver	Rohde & Schwarz	ESIB26	2028	12	4-Oct-2012
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
4GHz HPF	Sematron	F-100-4000-5-R	2245	-	TU
Multimeter	Iso-tech	IDM101	2421	12	26-Oct-2012
Multimeter	Iso-tech	IDM101	2424	12	5-Sep-2012
Power Supply Unit	Weir	460	2754	-	TU
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	22-Dec-2011
GSM Test Set	Rohde & Schwarz	CMU 200	2809	12	26-May-2012
Antenna (Bilog)	Chase	CBL6143	2904	24	12-May-2013
Test Receiver	Rohde & Schwarz	ESIB40	2941	12	12-May-2012
Comb Generator	Schaffner	RSG1000	3034	-	TU
Antenna (DRG Horn)	ETS-LINDGREN	3115	3125	12	27-Apr-2012
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	10-Jun-2012
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	22-Aug-2012
Hygrometer	Rotronic	I-1000	3220	12	3-May-2012
Power Divider	Weinschel	1506A	3345	12	4-May-2012
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	20-Dec-2011
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	29-Sep-2012
Power magnetic field Coil (Horizontal 2.1m*2.2m)	TUV	N/A	3522	-	TU
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
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	-	TU
'3.5mm' - '3.5mm' RF Cable (1m)	Rhophase	3PS-1803-1000-3PS	3696	12	28-Jan-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3700	12	11-Jan-2012
'N' - 'N' RF Cable (1m)	Rhophase	NPS-1803-1000-NPS	3701	12	11-Jan-2012
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	-	TU
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	26-Aug-2012
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z81	3492	12	19-Apr-2012
Vector Signal Generator	Rohde & Schwarz	SMU 200A	3493	12	20-Sep-2012
Tilt Antenna Mast	matur GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	matur GmbH	NCD	3917	-	TU
DC - 12.4 GHz 10 dB Attenuator 1 W	Suhner	6810.17.A	3964	12	24-Jun-2012



Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Low Noise Amplifier	Wright Technologies	APS04-0085	3969	12	8-Jul-2012
P-Series Power Meter	Agilent	N1911A	3981	12	12-Sep-2012
50 MHz-18 GHz Wideband Power Sensor	Agilent	N1921A	3983	12	12-Sep-2012

TU – Traceability Unscheduled

O/P MON – Output Monitored with Calibrated Equipment



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



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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