Report On

FCC Part 15.247 (Bluetooth) Testing of the Sharp SH011 CDMA2000(US850MHz) Cellular Phone with Bluetooth

COMMERCIAL-IN-CONFIDENCE

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REPORT ON FCC Part 15.247 (Bluetooth) Testing of the Sharp SH011 CDMA2000(US850MHz) Cellular Phone with Bluetooth

Document 75911236 Report 02 Issue 1

November 2010

PREPARED FOR

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Authorised Signatory

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DATED 16 November 2010

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47: Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

Test Engineer(s);

M Russell G Lawler

UKAS TESTING 0141

Product Service

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SECTION 1

REPORT SUMMARY

FCC Part 15.247 (Bluetooth) Testing of the Sharp SH011
CDMA2000(US850MHz) Cellular Phone with Bluetooth

Product Service

1.1 INTRODUCTION

The information contained in this report is intended to show verification of Sharp SH011 CDMA2000(US850MHz) Cellular Phone with Bluetooth 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, Communication Systems Group
Manufacturing Description	CDMA2000(US850MHz) Cellular Phone with Bluetooth
Model Number(s)	SH011
Serial Number(s)	000901 000904
Software Version	A9170
Hardware Version	PP1
Number of Samples Tested	Two
Test Specification/Issue/Date	FCC CFR 47 Part 15C: 2009
Incoming Release Date	Application Form 12 November 2010
Disposal Reference Number Date	Held Pending Disposal Not Applicable Not Applicable
Order Number Date	8147 19 October 2010
Start of Test	21 October 2010
Finish of Test	08 November 2010
Name of Engineer(s)	M Russell
Related Document(s)	ANSI C63.4: 2003

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1.2 BRIEF SUMMARY OF RESULTS

A brief summary of results for each configuration, in accordance with FCC CFR 47 Part 15C is shown below.

Configuration 1: SH011 with AC Adaptor						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.1	15.207	Conducted Emissions (AC Power Port)	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	

N/A – Not Applicable

Configuration 2: SH011 with battery						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.7	15.247 (b)(4)	EIRP Peak Power	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	
2.8	15.247(d)	Radiated Emissions (Enclosure Port)	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	
2.9	15.247(d)	Spurious Emissions	2402MHz Tx		N/A	ANSI C63.4
			2441MHz Tx		N/A	
			2480MHz Tx		N/A	
			Hopping on all channels	0	Pass	
2.10	15.247 (d)	Band Edge Measurements	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx		N/A	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	

N/A – Not Applicable

Product Service

Configuration 3: SH011 with dummy battery						
Section	Spec Clause	Test Description	Mode	Mod State	Result	Base Standard
2.2	15.247 (a)(1)	20dB Bandwidth	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	
2.3	15.247 (a)(1)	Channel Separation	2402MHz Tx		N/A	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx		N/A	
			Hopping on all channels		N/A	
2.4	15.247 (a)(1)(iii)	Channel Dwell Time	2402MHz Tx		N/A	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx		N/A	
			Hopping on all channels		N/A	
2.5	15.247 (a)(1)(iii)	Number of Hopping Channels	2402MHz Tx		N/A	ANSI C63.4
			2441MHz Tx		N/A	
			2480MHz Tx		N/A	
			Hopping on all channels	0	Pass	
2.6	15.247 (b)(3)	Maximum Peak Conducted Output Power	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	
2.8	15.247(d)	Radiated Emissions (Enclosure Port)	2402MHz Tx	0	Pass	ANSI C63.4
			2441MHz Tx	0	Pass	
			2480MHz Tx	0	Pass	
			Hopping on all channels		N/A	

N/A – Not Applicable

Product Service

1.3 APPLICATION FORM

EQUIPMENT DESCRIPTION	
Model Name/Number	CDMA SH011
Part Number	N/A
Technical Description (Please provide a brief description of the intended use of the equipment)	CDMA2000 (US850MHz) Cellular Phone with Bluetooth

POWER SOURCE

☐ AC mains — State voltage

AC supply frequency (Hz)

VAC

Max Current

Hz

☐ Single phase ☐ Three phase

And / Or

☐ External DC supply

Nominal voltage V Max Current A

Extreme upper voltage V

Extreme lower voltage V

Battery

☐ Nickel Cadmium ☐ Lead acid (Vehicle regulated)

☐ Alkaline ☐ Leclanche

☒ Lithium ☐ Other Details :

4.0 Volts nominal.

End point voltage as quoted by equipment manufacturer 3.7 V

FREQUENCY INFORMATION

Frequency Range	824.7 to848.31	MHz			
Channel Spacing (where applicable)	30kHz				
Test Frequencies*	Bottom	814.7	MHz	Channel Number (if applicable)	1013
	Middle	836.52	MHz	Channel Number (if applicable)	384
	Top	848.31	MHz	Channel Number (if applicable)	777

If alternate test modes are available resulting in different test frequencies please specify which mode is applicable:

POWER CHARACTERISTICS

Maximum TX power	25dBm	W		
Minimum TX power	-50dBm	W (if variable)		
Is transmitter intended for :				
Continuous duty			☒ Yes	☐ No
Intermittent duty			☐ Yes	☒ No
If intermittent state DUTY CYCLE				
Transmitter ON	seconds			
Transmitter OFF	seconds			

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ANTENNA CHARACTERISTICS				
☐	Antenna connector	State impedance		Ohm
☐	Temporary antenna connector	State impedance		Ohm
☒	Integral antenna	Gain	3.0	dBi

MODULATION CHARACTERISTICS			
☐	Amplitude	☐	Frequency
☐	Phase	☒	Other (please provide details): BPSK,HPSK,QPSK
Can the transmitter operate un-modulated?		☐ Yes	☒ No

CLASS OF EMISSION USED	
ITU designation or Class of Emission:	
1	1M28F9W
(if applicable) 2	
(if applicable) 3	
If more than three classes of emission, list separately:	

EXTREME CONDITIONS					
Extreme test voltages (Max)	4.0	V	Extreme test voltages (Min)	3.7	V
Nominal DC Voltage	4.0	V	DC Maximum Current	600m	A
Maximum temperature	60	°C	Minimum temperature	-20	°C

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: 12th, November 2010

Product Service

1.4 PRODUCT INFORMATION

1.4.1 Technical Description

The Equipment Under Test (EUT) was a Sharp SH011 CDMA2000(US850MHz) Cellular Phone with Bluetooth. A full technical description can be found in the manufacturer's documentation.

1.4.2 Test Configuration

Configuration 1: SH011 with AC Adaptor

The EUT was configured in accordance with FCC CFR 47 Part 15C.

Configuration 2: SH011 with battery

The EUT was configured in accordance with FCC CFR 47 Part 15C.

Configuration 3: SH011 with dummy battery

The EUT was configured in accordance with FCC CFR 47 Part 15C.

1.4.3 EUT Cable / Port Identification

Port	Max Cable Length specified	Usage	Type	Screened
DC Power	80cm	Power Lead	2 core	No

1.4.4 Modes of Operation

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

Mode 1 - 2402MHz Tx

Mode 2 - 2441MHz Tx

Mode 3 - 2480MHz Tx

Mode 4 – Hopping on all channels

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

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 or test laboratories as appropriate.

The EUT was powered from an internal battery and a DC Bench Power Supply, or an AC adaptor as detailed in each test result section.

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

1.6 DEVIATIONS FROM THE STANDARD

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

1.7 MODIFICATION RECORD

No modifications were made to the EUT during testing.

Product Service

SECTION 2

TEST DETAILS

FCC Part 15.247 (Bluetooth) Testing of the Sharp SH011
CDMA2000(US850MHz) Cellular Phone with Bluetooth

2.1 CONDUCTED EMISSIONS (AC POWER PORT)

2.1.1 Specification Reference

FCC CFR 47 Part 15C, Clause 15.207

2.1.2 Equipment Under Test

SH011, S/N: 000904

2.1.3 Date of Test and Modification State

08 November 2010 - Modification State 0

2.1.4 Test Equipment Used

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

2.1.5 Environmental Conditions

	08 November 2010
Ambient Temperature	23.3°C
Relative Humidity	26%
Atmospheric Pressure	963mbar

2.1.6 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI C63.4.

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

Configuration 1 - Mode 1
- Mode 2
- Mode 3

Product Service

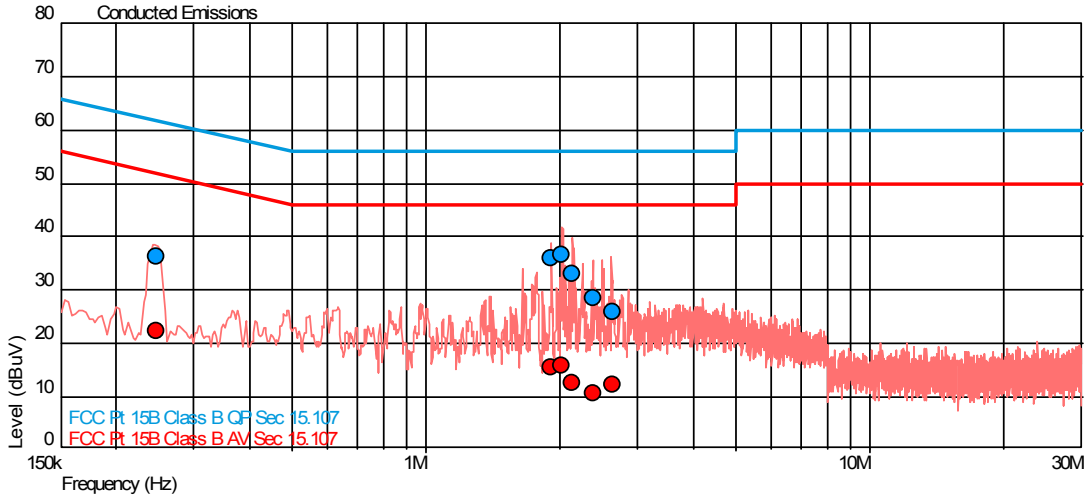
2.1.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Conducted Emission (AC Power Port).

The test results are shown below.

Configuration 1 - Mode 1

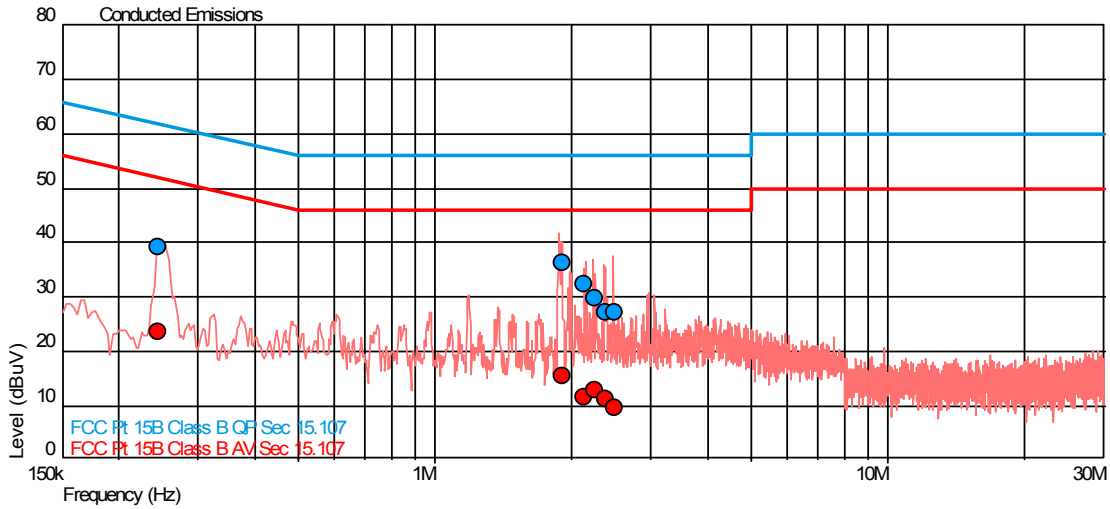
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.247	36.3	61.8	-25.6	22.4	51.8	-29.5
1.907	36.1	56.0	-19.9	15.3	46.0	-30.7
2.022	36.7	56.0	-19.3	15.8	46.0	-30.2
2.131	32.9	56.0	-23.1	12.7	46.0	-33.3
2.371	28.3	56.0	-27.7	10.7	46.0	-35.3
2.618	25.7	56.0	-30.3	12.1	46.0	-33.9

Product Service

Neutral Line

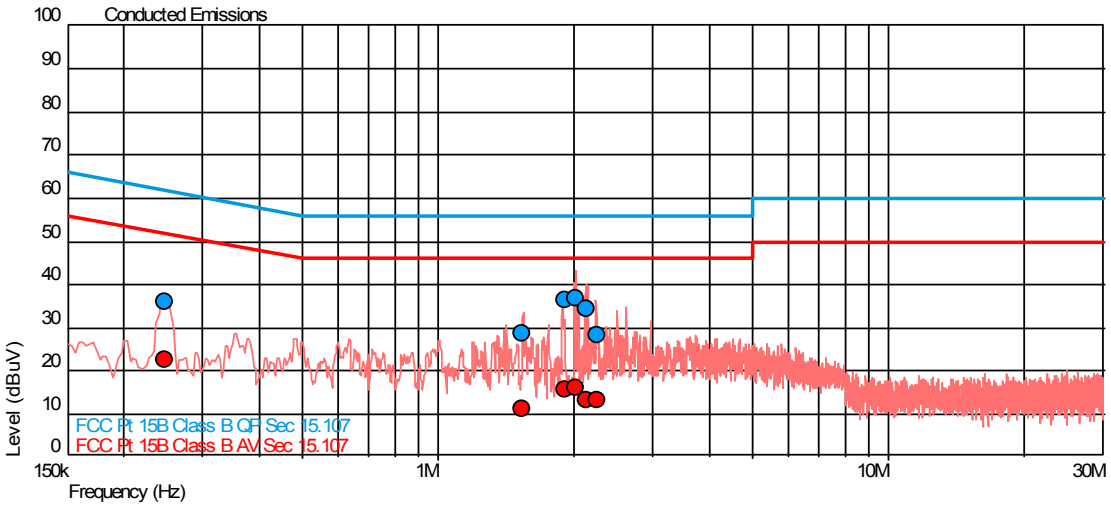


Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.245	39.3	61.9	-22.6	23.5	51.9	-28.4
1.901	36.3	56.0	-19.7	15.6	46.0	-30.4
2.130	32.4	56.0	-23.6	11.7	46.0	-34.3
2.257	29.6	56.0	-26.4	12.8	46.0	-33.2
2.373	27.0	56.0	-29.0	11.2	46.0	-34.8
2.497	27.0	56.0	-29.0	9.7	46.0	-36.3

Product Service

Configuration 1 - Mode 2

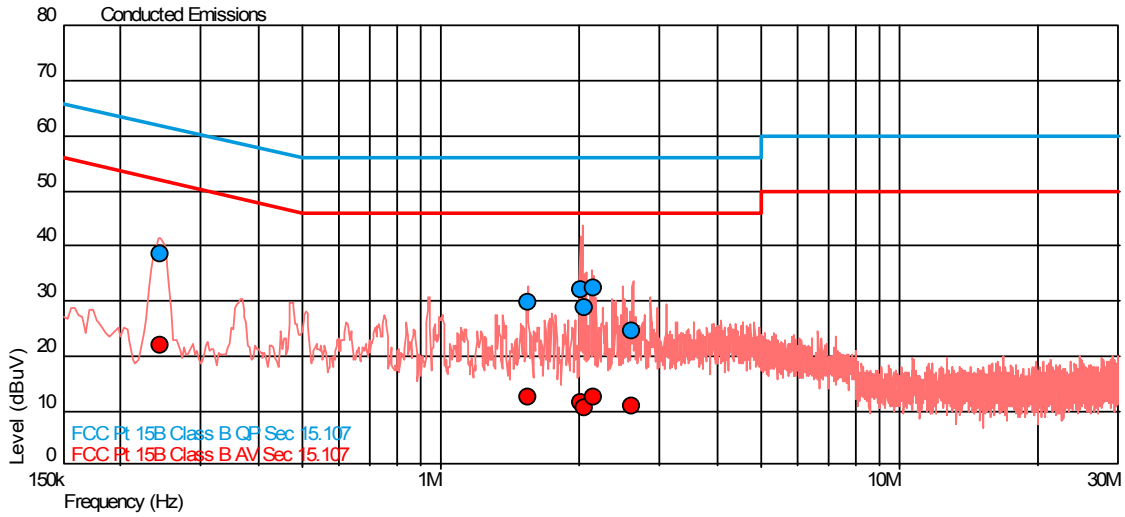
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.247	36.0	61.9	-25.8	22.6	51.9	-29.3
1.538	28.7	56.0	-27.3	11.3	46.0	-34.7
1.909	36.2	56.0	-19.8	15.4	46.0	-30.6
2.025	36.6	56.0	-19.4	15.9	46.0	-30.1
2.140	34.4	56.0	-21.6	13.4	46.0	-32.6
2.258	28.5	56.0	-27.5	13.2	46.0	-32.8

Product Service

Neutral Line

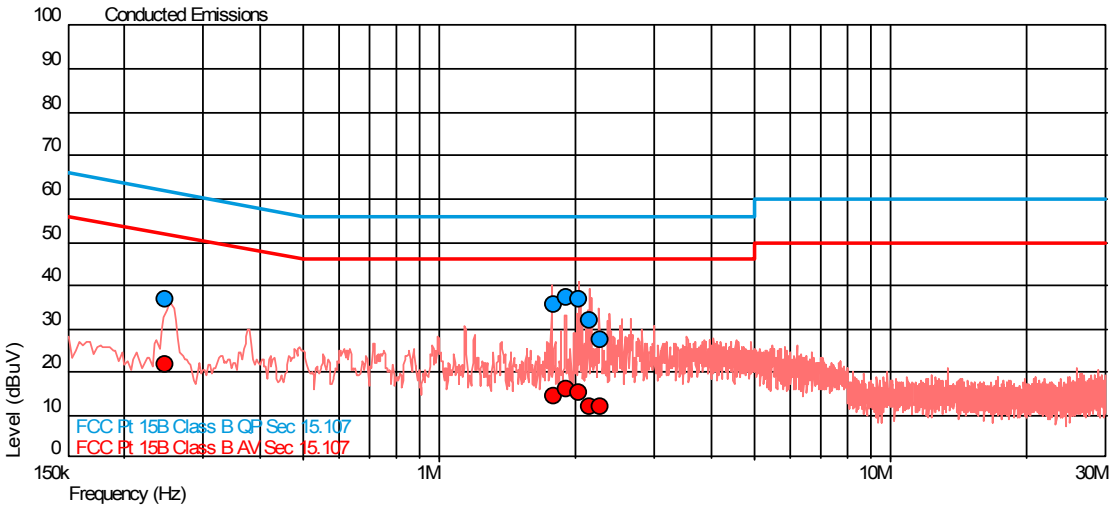


Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.243	38.4	62.0	-23.6	22.0	52.0	-29.9
1.544	29.6	56.0	-26.4	12.6	46.0	-33.4
2.008	32.0	56.0	-24.0	11.5	46.0	-34.5
2.049	28.9	56.0	-27.1	10.6	46.0	-35.4
2.146	32.3	56.0	-23.7	12.5	46.0	-33.5
2.608	24.5	56.0	-31.5	10.8	46.0	-35.2

Product Service

Configuration 1 - Mode 3

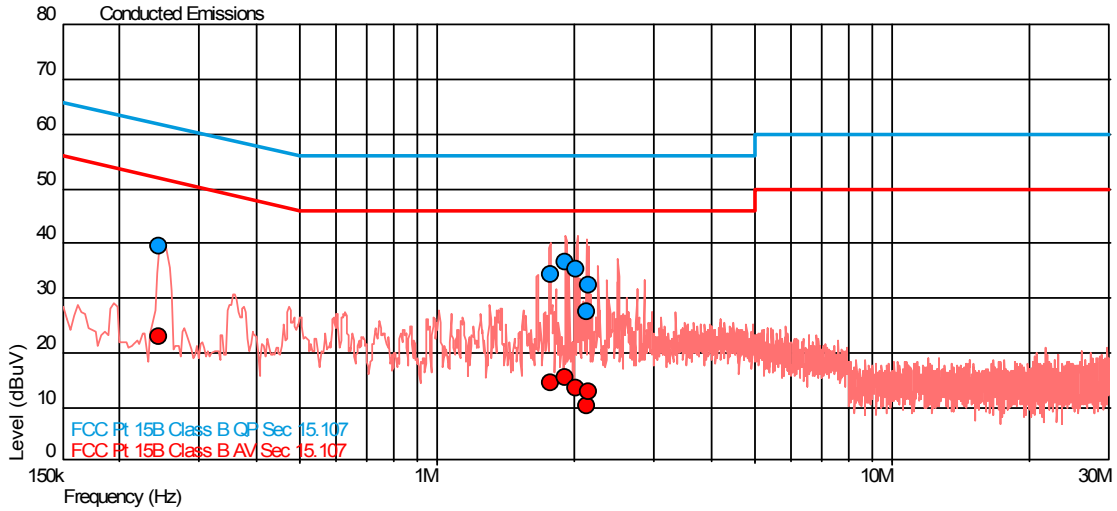
Live Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.247	36.8	61.9	-25.1	21.7	51.9	-30.2
1.797	35.7	56.0	-20.3	14.6	46.0	-31.4
1.915	37.4	56.0	-18.6	15.9	46.0	-30.1
2.028	36.6	56.0	-19.4	15.4	46.0	-30.6
2.142	31.7	56.0	-24.3	12.1	46.0	-33.9
2.263	27.2	56.0	-28.8	12.0	46.0	-34.0

Product Service

Neutral Line



Frequency (MHz)	QP Level (dBµV)	QP Limit (dBµV)	QP Margin (dBµV)	AV Level (dBµV)	AV Limit (dBµV)	AV Margin (dBµV)
0.245	39.5	61.9	-22.4	22.8	51.9	-29.1
1.781	34.3	56.0	-21.7	14.4	46.0	-31.6
1.904	36.6	56.0	-19.4	15.5	46.0	-30.5
2.018	35.3	56.0	-20.7	13.4	46.0	-32.6
2.123	27.6	56.0	-28.4	10.3	46.0	-35.7
2.143	32.5	56.0	-23.5	12.7	46.0	-33.3

Product Service

2.2 20dB BANDWIDTH

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test

SH011, S/N: 000904

2.2.3 Date of Test and Modification State

22 October 2010 - Modification State 0

2.2.4 Test Equipment Used

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

2.2.5 Test Method and Operating Modes

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

The EUT was transmitted at maximum power at all data rates 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 test was performed with the EUT in the following configurations and modes of operation:

Configuration 3 - Mode 1
- Mode 2
- Mode 3

2.2.6 Environmental Conditions

	22 October 2010
Ambient Temperature	23.5°C
Relative Humidity	30.5%

Product Service

2.2.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for 20dB Bandwidth.

The test results are shown below.

Configuration 1 – Modes 1, 2 and 3

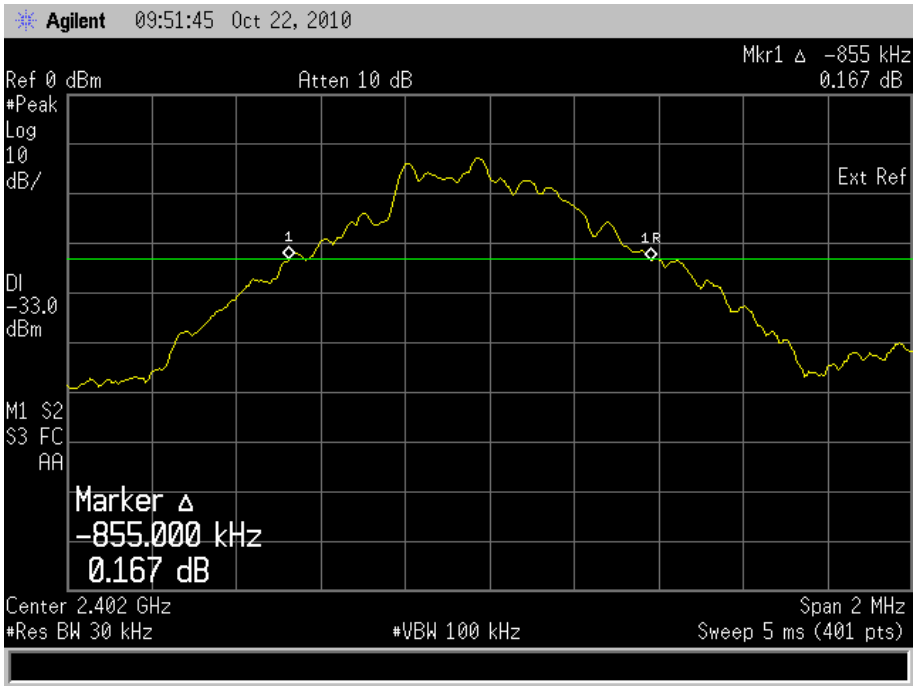
4.0 V DC Supply

Frequency (MHz)	Data Rate (Mbps)	20dB Bandwidth (kHz)
2402	DH1	855
	DH3	940
	DH5	945
2441	DH1	860
	DH3	945
	DH5	945
2480	DH1	855
	DH3	945
	DH5	945

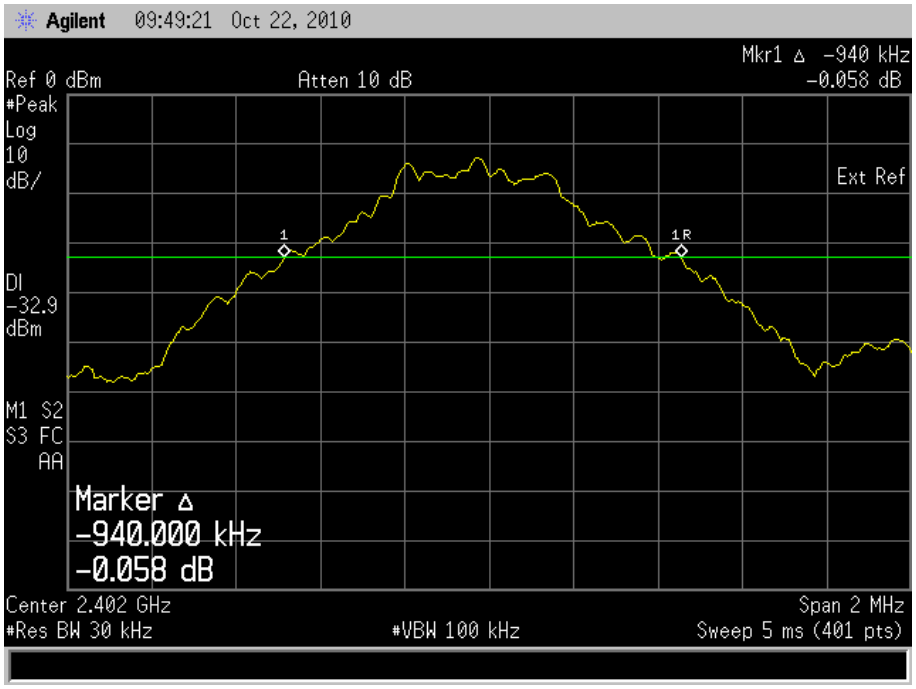
Product Service

Mode 1 - 2402 MHz

DH1

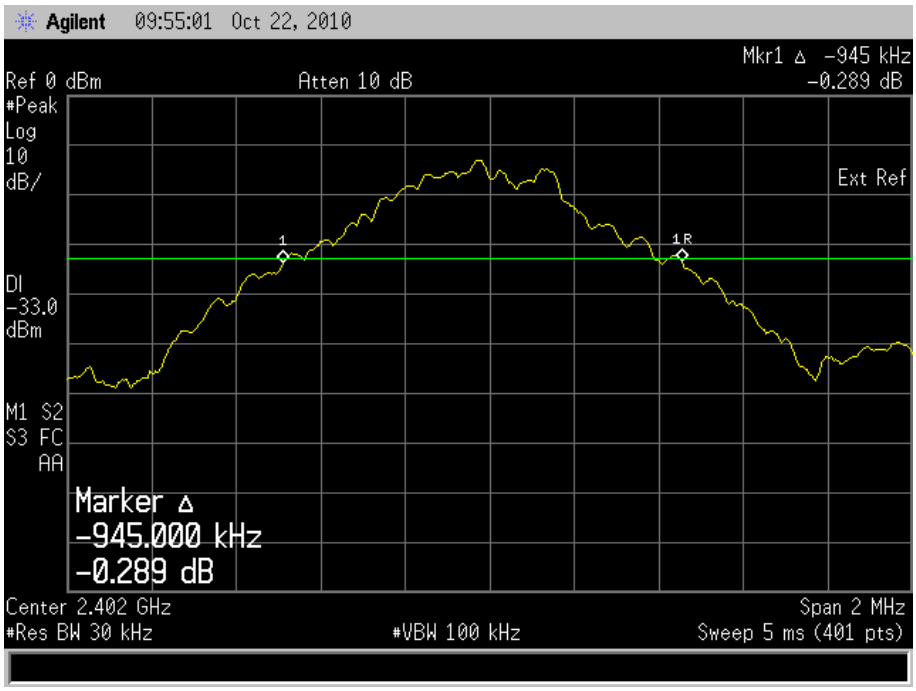


DH3



Product Service

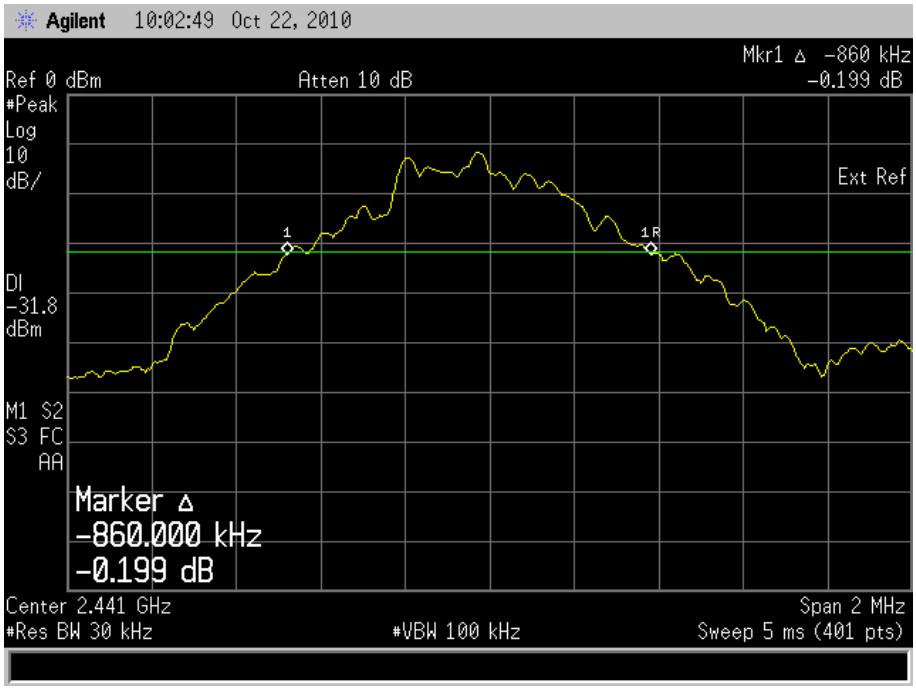
DH5



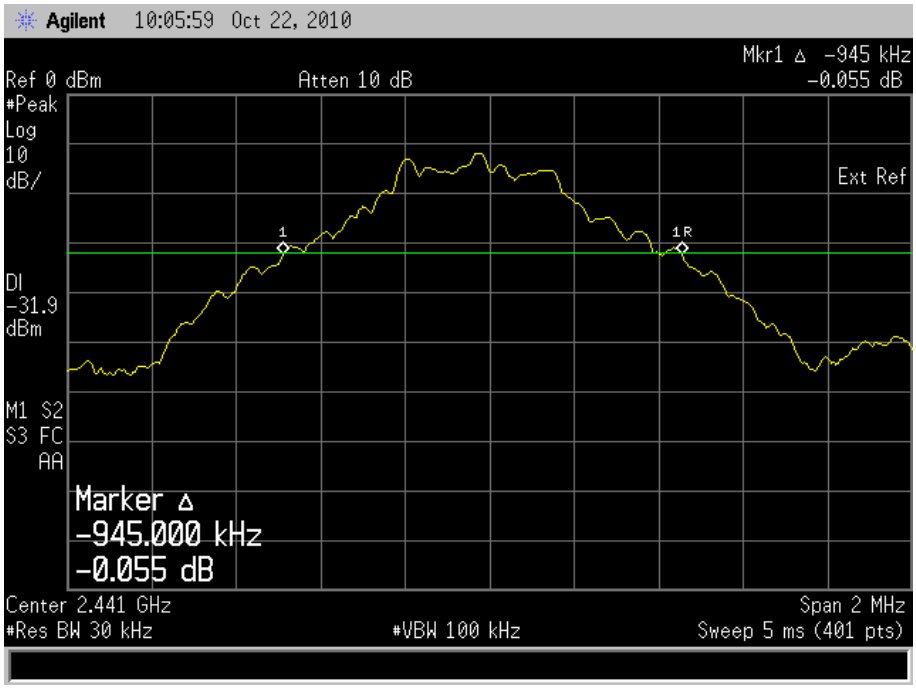
Product Service

Mode 2 - 2441 MHz

DH1

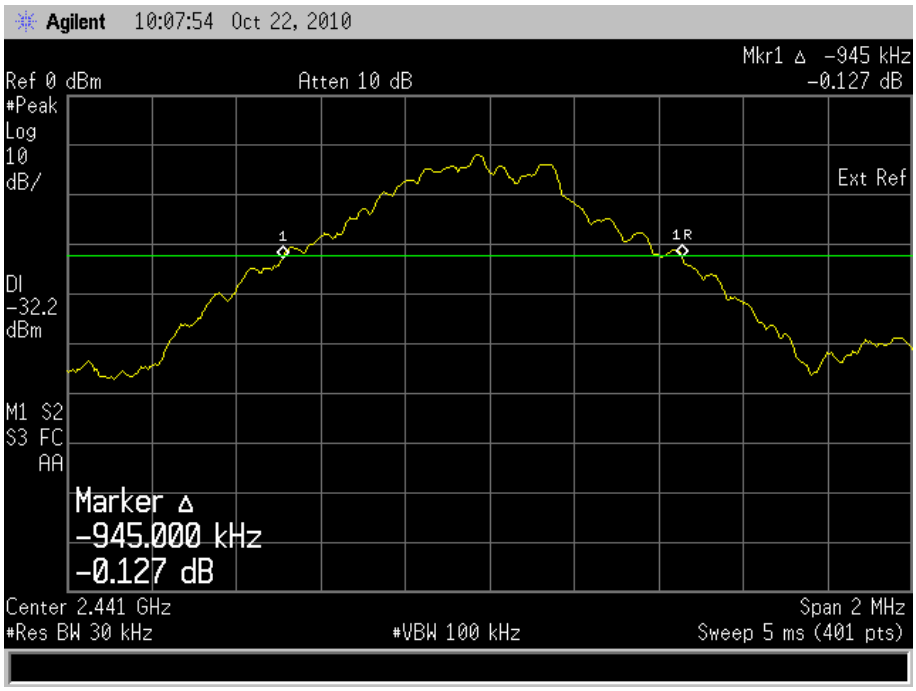


DH3



Product Service

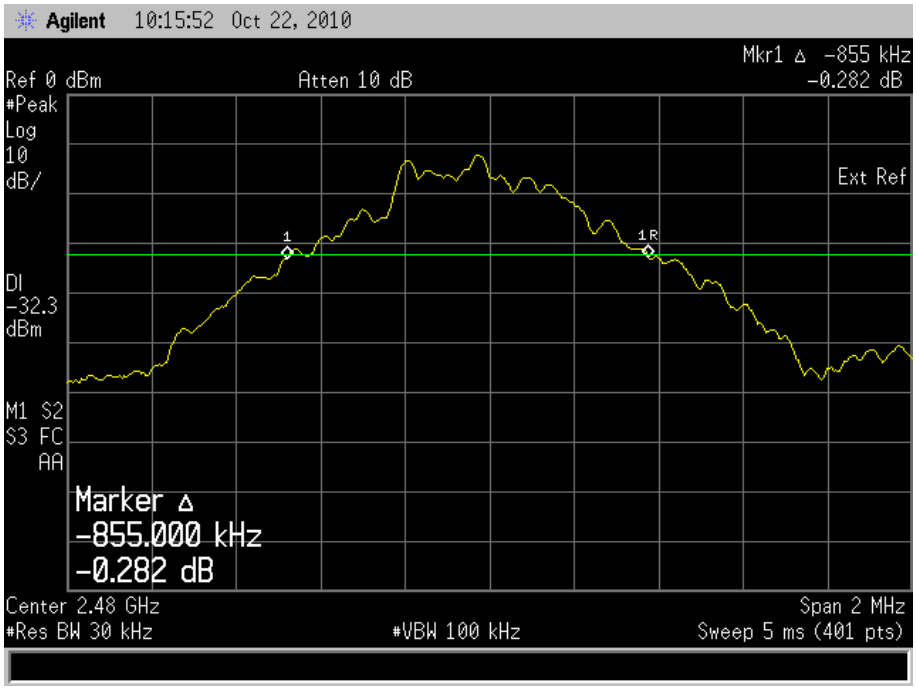
DH5



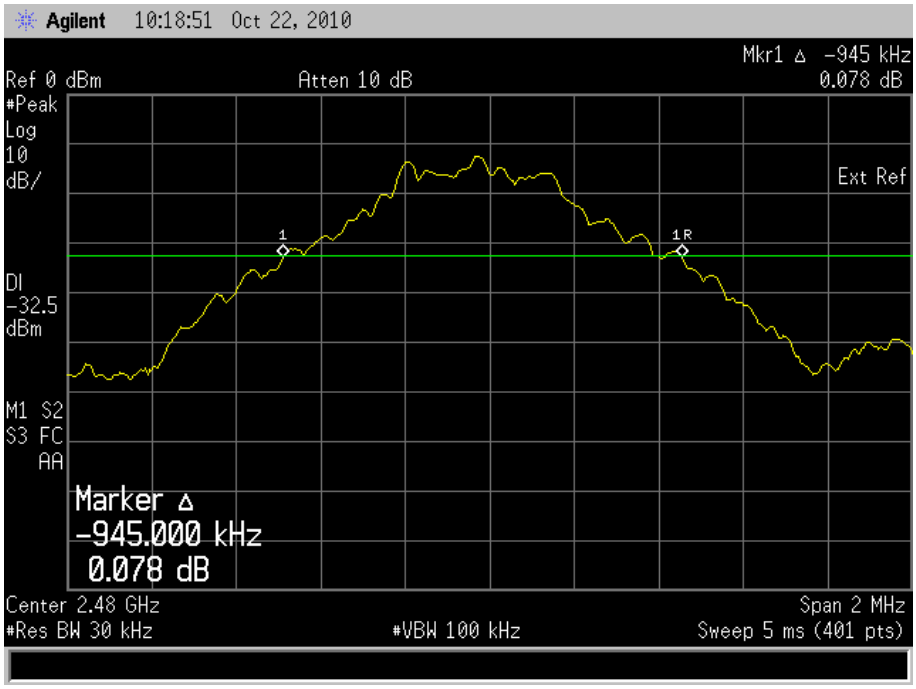
Product Service

Mode 3 - 2480 MHz

DH1

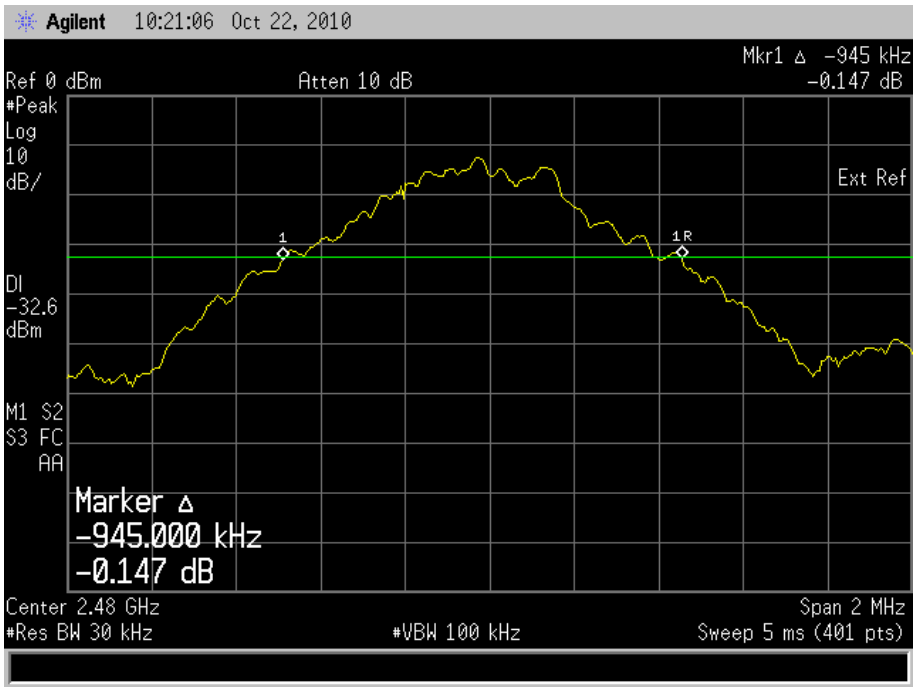


DH3



Product Service

DH5



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

2.3 CHANNEL SEPARATION

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test

SH011, S/N: 000904

2.3.3 Date of Test and Modification State

21 October 2010 - Modification State 0

2.3.4 Test Equipment Used

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

2.3.5 Test Method and Operating Modes

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

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.

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

Configuration 3 - Mode 2

2.3.6 Environmental Conditions

	21 October 2010
Ambient Temperature	24.7°C
Relative Humidity	25.8%

Product Service

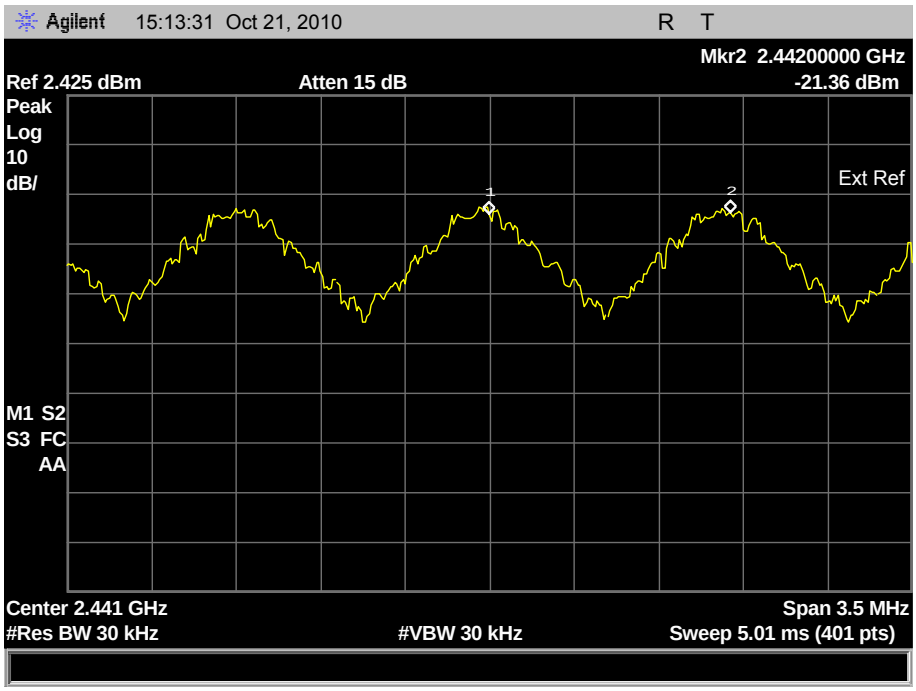
2.3.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Channel Separation.

The test results are shown below.

Configuration 4 - Mode 2

4.0 V DC Supply



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.

Product Service

2.4 CHANNEL DWELL TIME

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test

SH011, S/N: 000904

2.4.3 Date of Test and Modification State

21 October 2010 - Modification State 0

2.4.4 Test Equipment Used

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

2.4.5 Test Method and Operating Modes

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

DH1

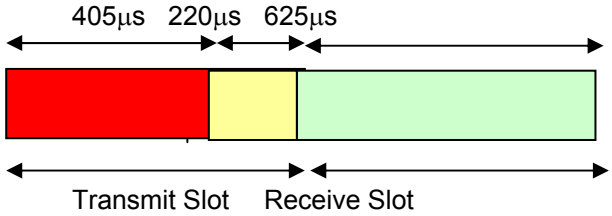
The Bluetooth system hops at a rate of 1600 times per second. Thus, this equates to 1600 timeslots in 1 second.

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.

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

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

32 x 4.05ms = 0.1296 seconds

DH3

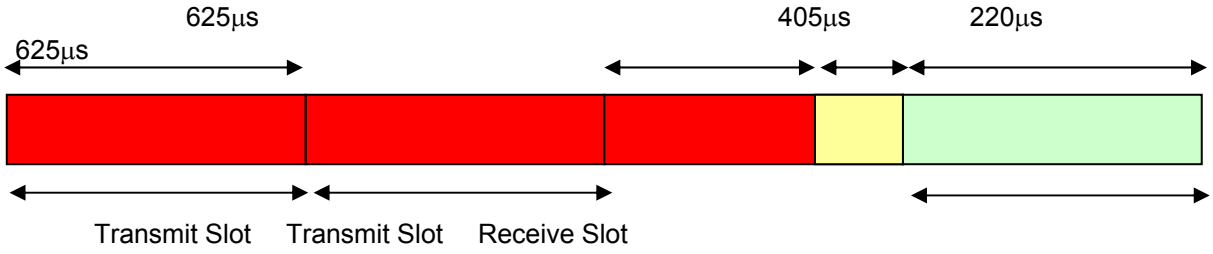
With data rate DH3, the data payload is higher and can use up to 3 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 3 slots, (ie. no receive slot in-between the 3 transmit slots). The 220μs off time for synthesizer re-tuning at the end of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

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

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

32 x 8.275ms = 0.2648 seconds

DH5

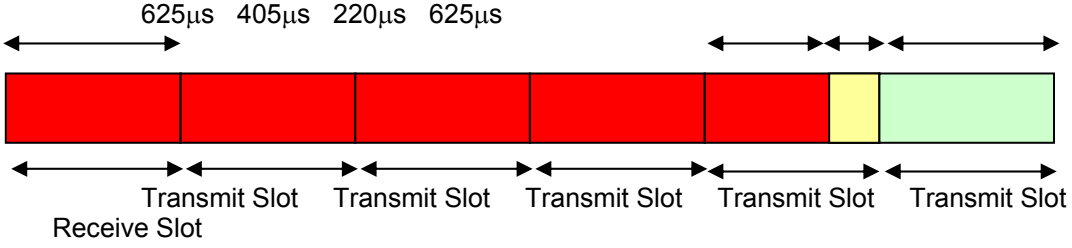
With data rate DH5, the data payload is higher and can use up to 5 timeslots. When more than one timeslot is used, the frequency does not hop and transmission is continuous on all 5 slots, (ie. no receive slot in-between the 5 transmit slots). The 220μs off time for synthesizer re-tuning at the end of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

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

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

32 x 9.675ms = 0.31 seconds

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

Configuration 1 - Mode 2

2.4.6 Environmental Conditions

	21 October 2010
Ambient Temperature	24.7°C
Relative Humidity	25.8%

Product Service

2.4.7 Test Results

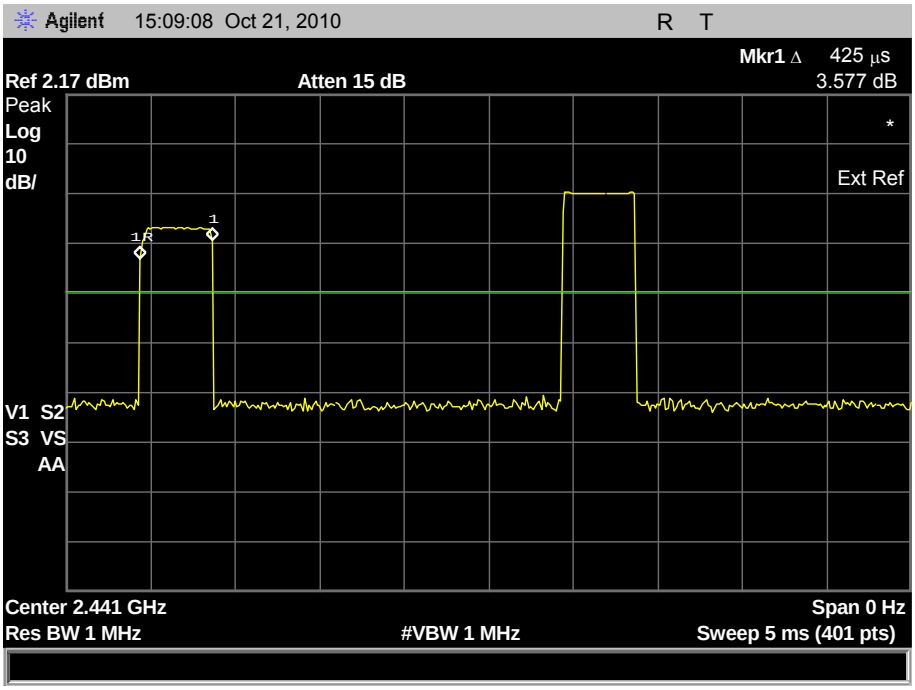
For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Channel Dwell Time.

The test results are shown below.

Configuration 3 - Mode 2

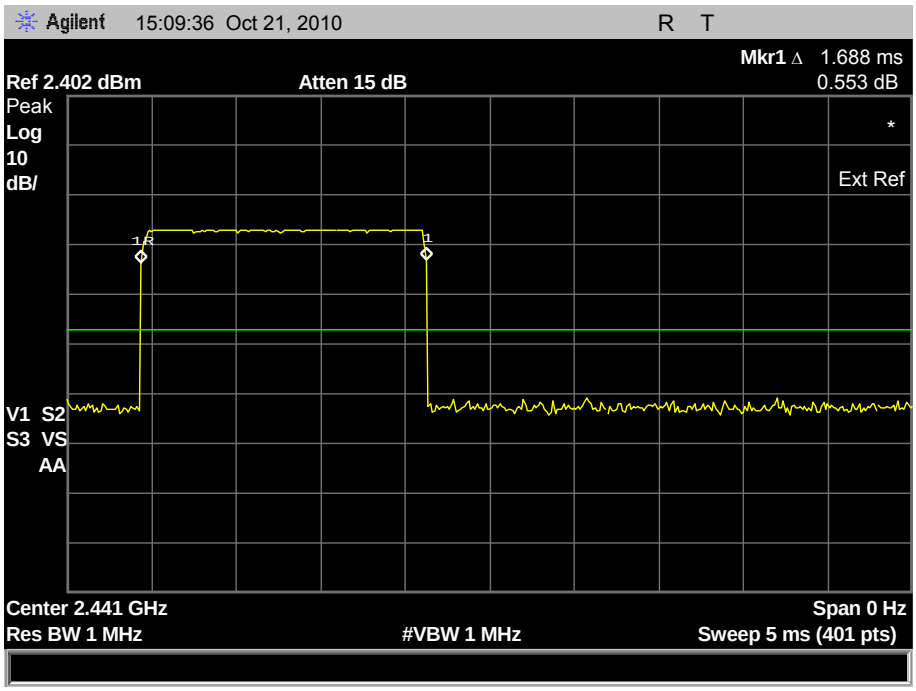
4.0 V DC Supply

DH1

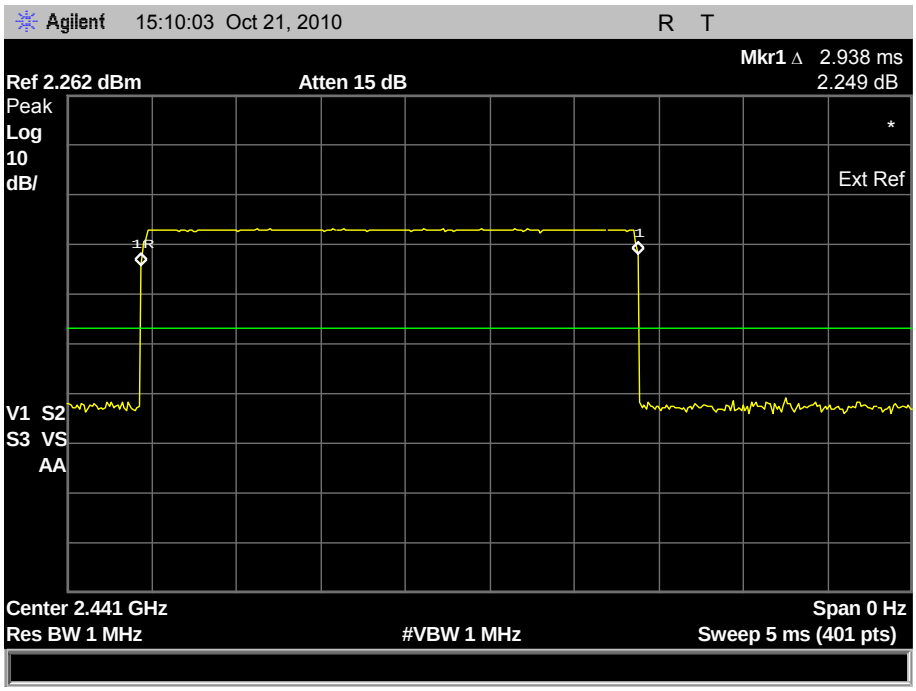


Product Service

DH3



DH5



Limit Clause

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

2.5 NUMBER OF HOPPING CHANNELS

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test

SH011, S/N: 000904

2.5.3 Date of Test and Modification State

21 October 2010 - Modification State 0

2.5.4 Test Equipment Used

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

2.5.5 Test Method and Operating Modes

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

The EUT was connected to a Spectrum Analyser via a cable. 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 plots recorded.

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

Configuration 3 - Mode 4

2.5.6 Environmental Conditions

	21 October 2010
Ambient Temperature	24.7°C
Relative Humidity	25.8%

Product Service

2.5.7 Test Results

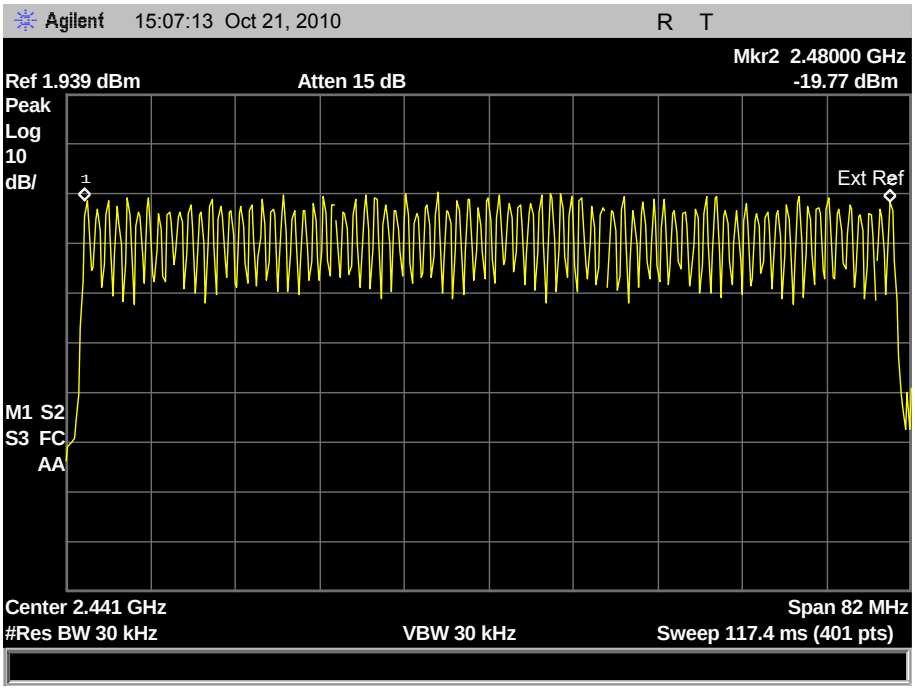
For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Number of Hopping Channels.

The test results are shown below.

Configuration 3 – Mode 4

4.0V DC Supply

0 to 79



Limit

≥ 15 channels

2.6 MAXIMUM PEAK CONDUCTED OUTPUT POWER

2.6.1 Specification Reference

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

2.6.2 Equipment Under Test

SH011, S/N: 000904

2.6.3 Date of Test and Modification State

21 October 2010 - Modification State 0

2.6.4 Test Equipment Used

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

2.6.5 Test Method and Operating Modes

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

The EUT was transmitted at maximum power at all data rates 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.

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

Configuration 3 - Mode 1
- Mode 2
- Mode 3

2.6.6 Environmental Conditions

	21 October 2010
Ambient Temperature	24.7°C
Relative Humidity	25.8%

Product Service

2.6.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Maximum Peak Conducted Output Power.

The test results are shown below.

Configuration 1 - Modes 1, 2 & 3

4.0 V DC Supply

Modulation Data Rate	Maximum Peak Conducted Output Power					
	dBm			mW		
	2402 MHz	2441 MHz	2480 MHz	2402 MHz	2441 MHz	2480 MHz
DH1	-0.55	0.65	0.09	0.88	1.16	1.02
DH3	-0.36	0.95	0.24	0.92	1.24	1.06
DH5	-0.35	0.69	0.16	0.92	1.17	1.04

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.

Product Service

2.7 EIRP PEAK POWER

2.7.1 Specification Reference

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

2.7.2 Equipment Under Test

SH011, S/N: 000901

2.7.3 Date of Test and Modification State

31 October 2010 - Modification State 0

2.7.4 Test Equipment Used

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

2.7.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI C63.4.

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

Configuration 2 - Mode 1
- Mode 2
- Mode 3

2.7.6 Environmental Conditions

	31 October 2010
Ambient Temperature	26.4°C
Relative Humidity	30.0%

Product Service

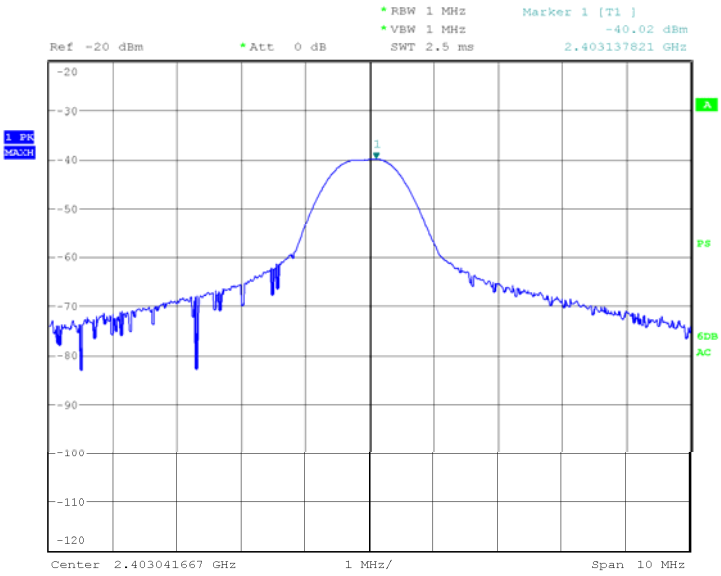
2.7.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for EIRP Peak Power.

The test results are shown below.

Configuration 1 - Mode 1

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.402	1.60	30.0	1.445	1000

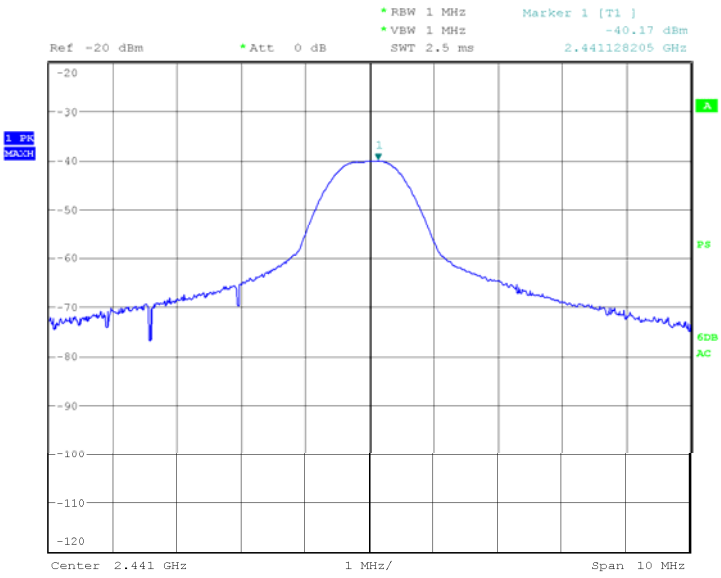


Date: 31.OCT.2010 07:46:45

Product Service

Configuration 1 - Mode 2

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.441	1.30	30.0	1.349	1000

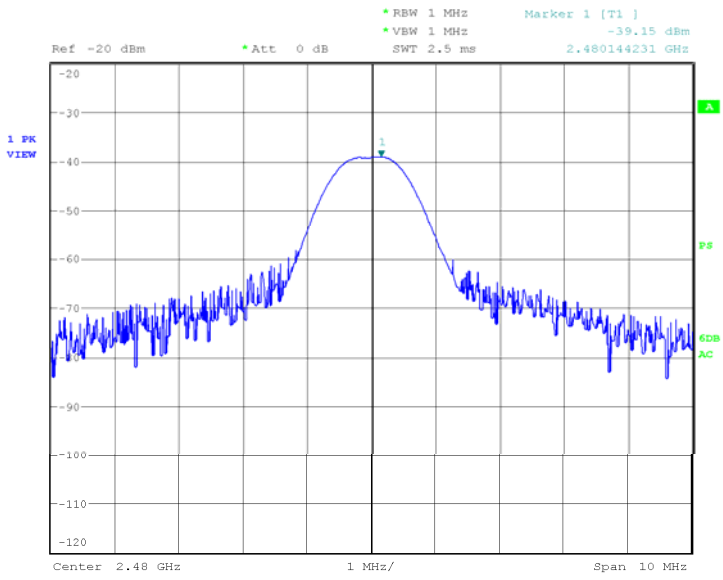


Date: 31.OCT.2010 08:34:16

Product Service

Configuration 1 - Mode 3

Freq GHz	Result EIRP dBm	Limit EIRP dBm	Result EIRP mW	Limit EIRP mW
2.480	1.50	30.0	1.413	1000



Date: 31.OCT.2010 08:37:56

2.8 RADIATED EMISSIONS (ENCLOSURE PORT)

2.8.1 Specification Reference

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

2.8.2 Equipment Under Test

SH011, S/N: 000901

2.8.3 Date of Test and Modification State

31 October 2010 - Modification State 0

2.8.4 Test Equipment Used

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

2.8.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI C63.4.

A preliminary profile of the Spurious Radiated Emissions was obtained by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, the list of emissions was then confirmed or updated under Alternative Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth.

Emissions within the restricted bands defined in 15.205 were measured in accordance with 15.209. Emissions measured below 1GHz employed a quasi peak detector, in accordance with 15.35(a). Emissions measured above 1GHz employed an average detector as defined in 15.35(b). The peak level of the emission was also measured to ensure that a difference of 20dB from the average level was not exceeded, as defined in 15.35(b). Emissions identified within the range 30MHz – 1GHz were then formally measured using a CISPR Quasi-Peak detector. Other emissions from 30MHz to 25GHz excluding the restricted bands were measured using a peak detector.

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

Configuration 2 - Mode 1
- Mode 2
- Mode 3

Product Service

2.8.6 Environmental Conditions

	31 October 2010
Ambient Temperature	26.4°C
Relative Humidity	30.0%

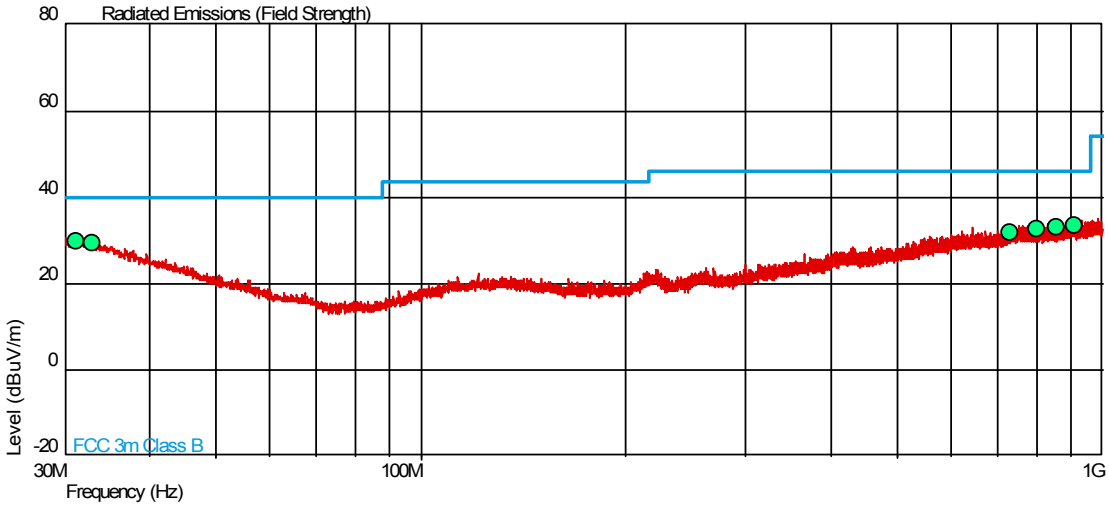
2.8.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Radiated Emissions (Enclosure Port).

The test results are shown below.

Configuration 2 - Mode 1

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (uV/m)	QP Limit (dBµV/m)	QP Limit (uV/m)	QP Margin (dBµV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
31.130	29.7	30.6	40.0	100	-10.3	69.4	360	1.00	Horizontal
32.851	29.3	29.2	40.0	100	-10.7	70.8	75	1.00	Vertical
731.316	32.0	39.8	46.0	200	-14.0	160.2	223	1.00	Horizontal
802.036	32.5	42.2	46.0	200	-13.5	157.8	344	1.00	Vertical
859.489	33.0	44.7	46.0	200	-13.0	155.3	0	1.00	Horizontal
911.546	33.4	46.8	46.0	200	-12.6	153.2	360	1.00	Vertical

Product Service

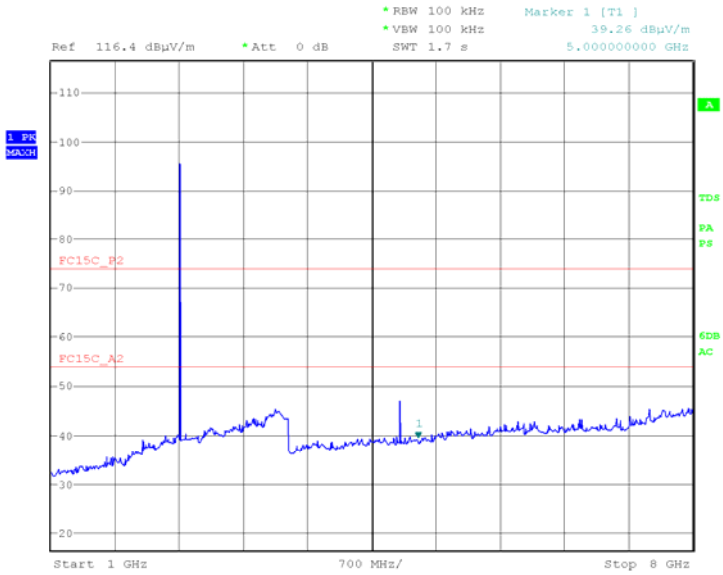
1GHz to 25GHz

No emissions were detected in either polarity therefore reciever sensitivity values are presented in table and plot form.

Freq. GHz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Final Peak dBµV/m	Final Average dBµV/m	Peak Limit dBµV/m	Average Limit dBµV/m
4.806	Vertical	125	98	58.0	51.0	74.0	54.0

1GHz to 8GHz

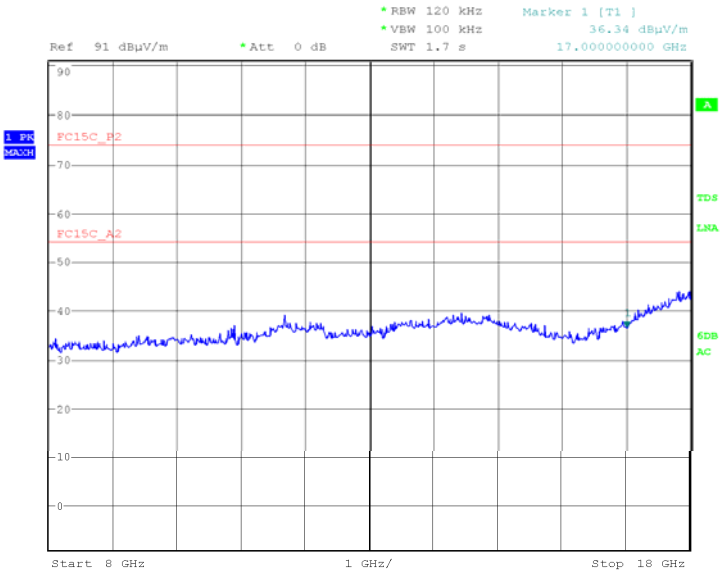
Combined Plot



Product Service

8GHz to 18GHz

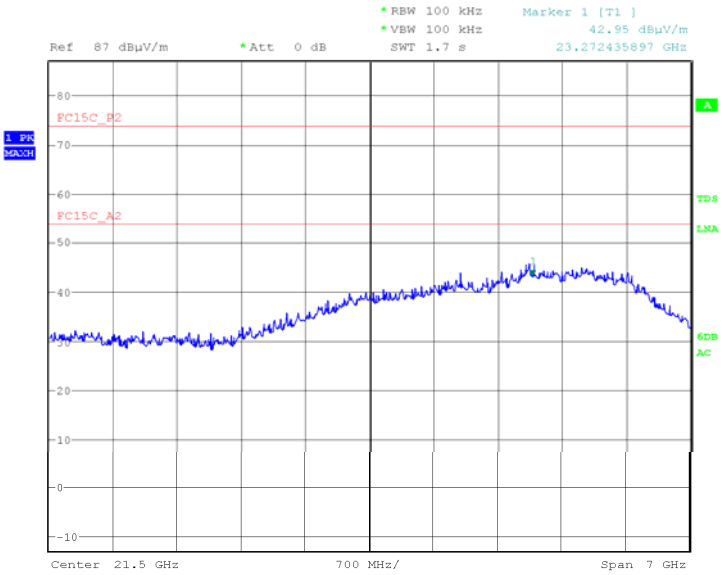
Combined Plot



Date: 31.OCT.2010 15:07:59

18GHz to 25GHz

Combined Plot

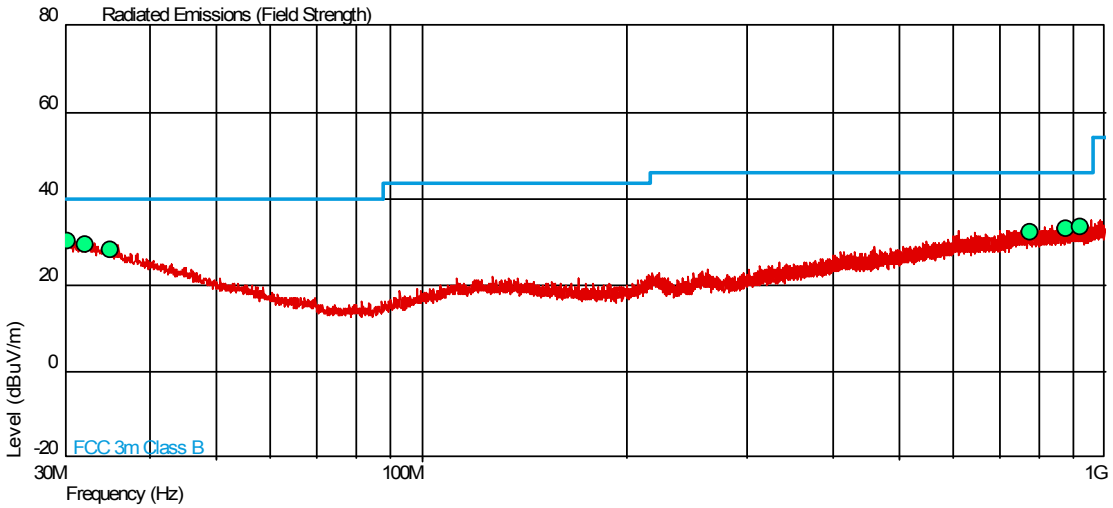


Date: 31.OCT.2010 15:41:24

Product Service

Configuration 2 - Mode 2

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (uV/m)	QP Limit (dBµV/m)	QP Limit (uV/m)	QP Margin (dBµV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
30.243	30.2	32.4	40.0	100	-9.8	67.6	270	1.00	Vertical
32.134	29.5	29.9	40.0	100	-10.5	70.1	270	1.00	Horizontal
34.899	28.3	26.0	40.0	100	-11.7	74.0	90	1.00	Vertical
779.180	32.4	41.7	46.0	200	-13.6	158.3	270	1.00	Horizontal
878.411	33.2	45.7	46.0	200	-12.8	154.3	180	1.00	Vertical
921.915	33.5	47.3	46.0	200	-12.5	152.7	270	1.00	Vertical

Product Service

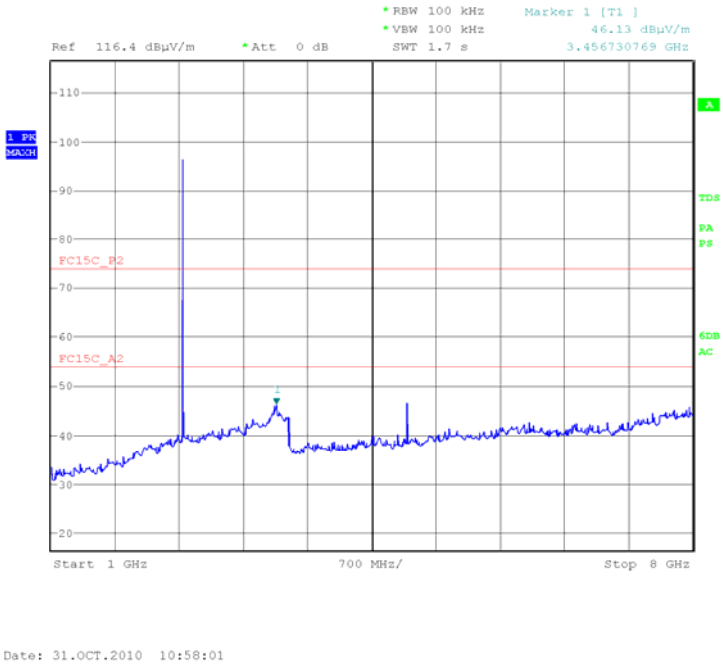
1GHz to 25GHz

No emissions were detected in either polarity therefore reciever sensitivity values are presented in table an plot form.

Freq. GHz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Final Peak dBµV/m	Final Average dBµV/m	Peak Limit dBµV/m	Average Limit dBµV/m
4.884	Vertical	100	114	55.3	47.6	74.0	54.0

1GHz to 8GHz

Combined Plot

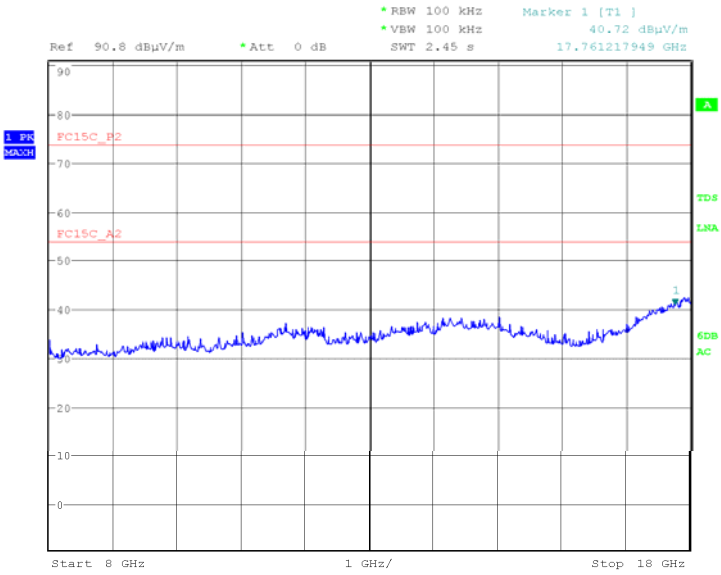


Date: 31.OCT.2010 10:58:01

Product Service

8GHz to 18GHz

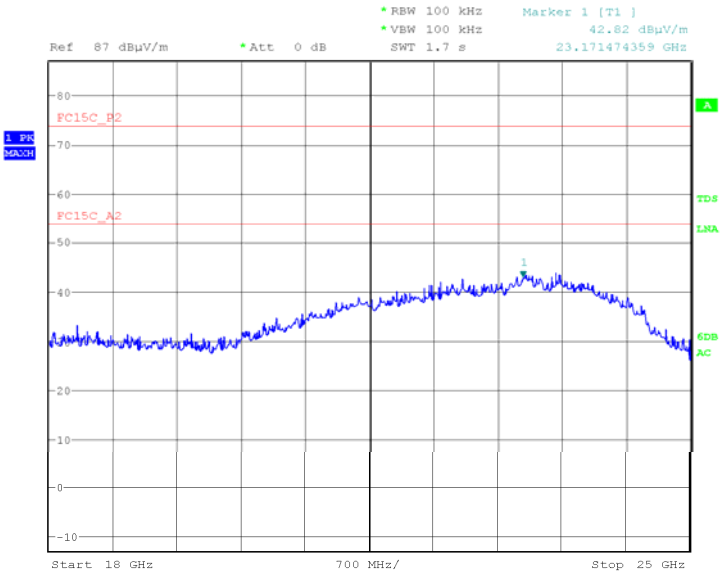
Combined Plot



Date: 31.OCT.2010 14:39:57

18GHz to 25GHz

Combined Plot

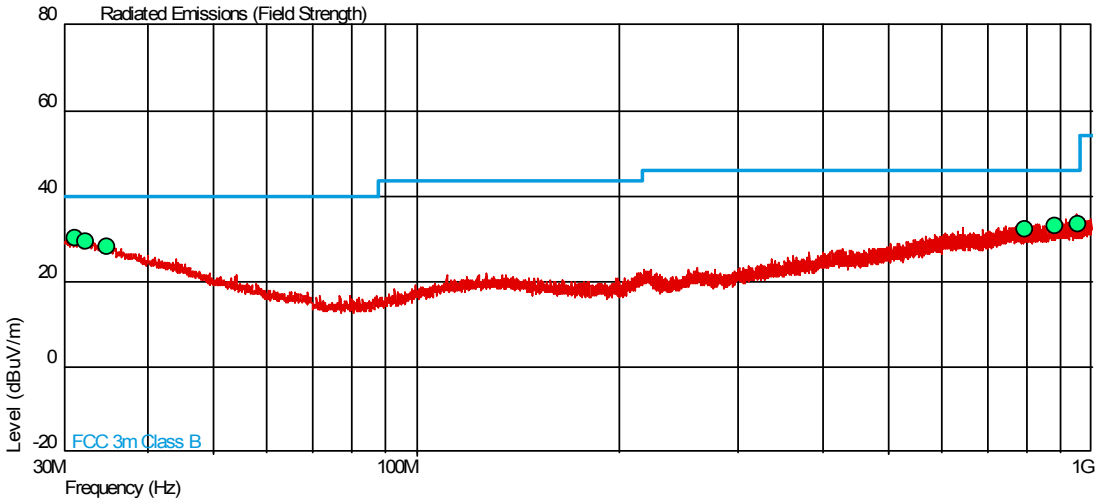


Date: 31.OCT.2010 16:01:17

Product Service

Configuration 2 - Mode 3

30 MHz to 1 GHz



Frequency (MHz)	QP Level (dBµV/m)	QP Level (uV/m)	QP Limit (dBµV/m)	QP Limit (uV/m)	QP Margin (dBµV/m)	QP Margin (uV/m)	Angle (deg)	Height (m)	Polarity
31.200	30.3	32.7	40.0	100	-9.7	67.3	130	1.00	Horizontal
32.381	29.4	29.5	40.0	100	-10.6	70.5	285	1.00	Vertical
34.741	28.4	26.3	40.0	100	-11.6	73.7	273	1.00	Vertical
797.167	32.3	41.2	46.0	200	-13.7	158.8	0	1.00	Vertical
883.154	33.1	45.2	46.0	200	-12.9	154.8	177	1.00	Vertical
954.562	33.6	47.9	46.0	200	-12.4	152.1	225	1.00	Vertical

Product Service

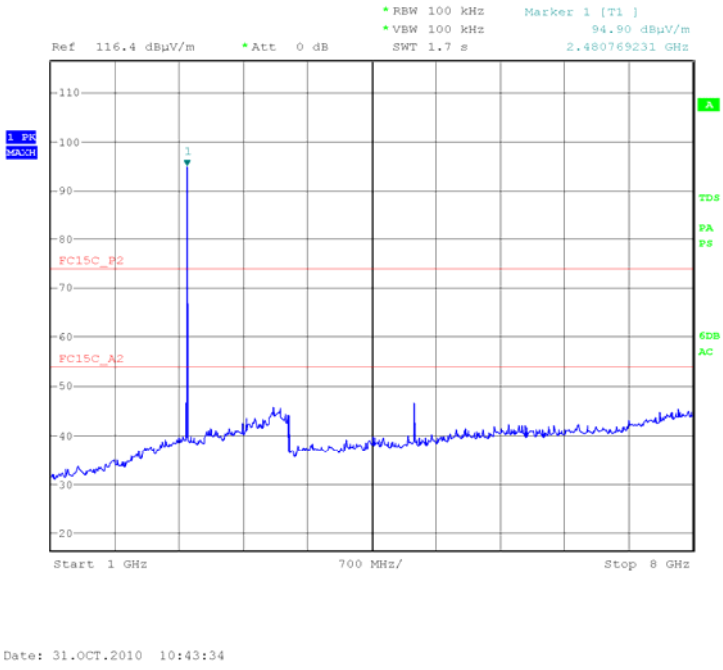
1GHz to 25GHz

No emissions were detected in either polarity therefore reciever sensitivity values are presented in table an plot form.

Freq. GHz	Ant Pol V/H	Ant Hgt cm	EUT Arc Deg	Final Peak dBµV/m	Final Average dBµV/m	Peak Limit dBµV/m	Average Limit dBµV/m
4.961	Vertical	136	132	55.9	48.1	74.0	54.0

1GHz to 8GHz

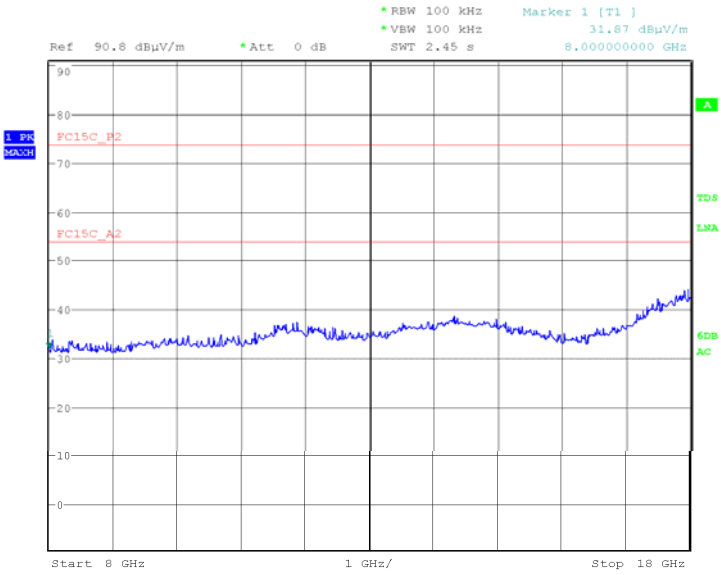
Combined Plot



Product Service

8GHz to 18GHz

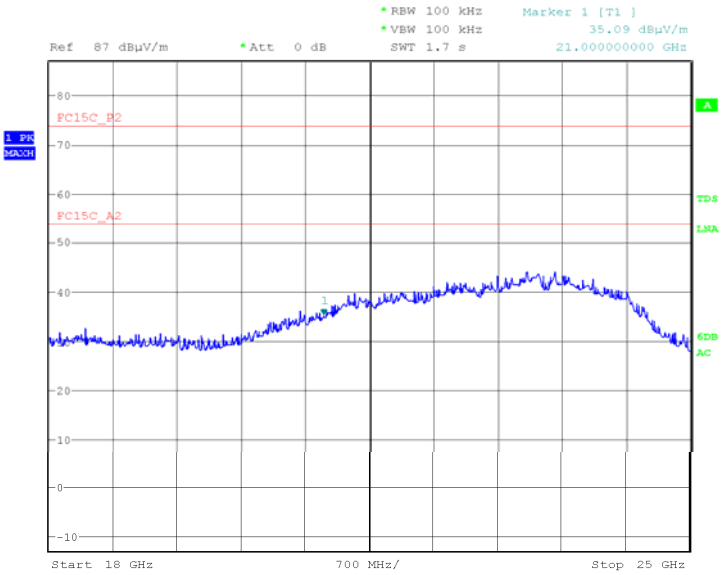
Combined Plot



Date: 31.OCT.2010 14:30:15

18GHz to 25GHz

Combined Plot



Date: 31.OCT.2010 15:56:33

Product Service

2.9 SPURIOUS EMISSIONS

2.9.1 Specification Reference

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

2.9.2 Equipment Under Test

SH011, S/N: 000904

2.9.3 Date of Test and Modification State

22 October 2010 - Modification State 0

2.9.4 Test Equipment Used

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

2.9.5 Test Method and Operating Modes

The test was applied in accordance with FCC CFR 47 Part 15.

In accordance with Part 15.247(d), the Spurious Conducted Emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 9 kHz to 25 GHz. The EUT was set to transmit on full power. The resolution and video bandwidths were set to 100 kHz in accordance with Part 15.247. The spectrum analyser detector was set to Max Hold.

With the EUT transmitting at maximum power, the Spectrum Analyser was set to Max Hold and the fundamental peak measured in a RBW and VBW of 100 kHz. This level was used to determine the limit line as displayed on the plots of -20dBc.

The maximum path loss across each measurement band was used as the reference level offset to ensure worst case results.

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

Configuration 2 - Mode 4

2.9.6 Environmental Conditions

	22 October 2010
Ambient Temperature	22.6°C
Relative Humidity	33.1%

Product Service

2.9.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Spurious Emissions.

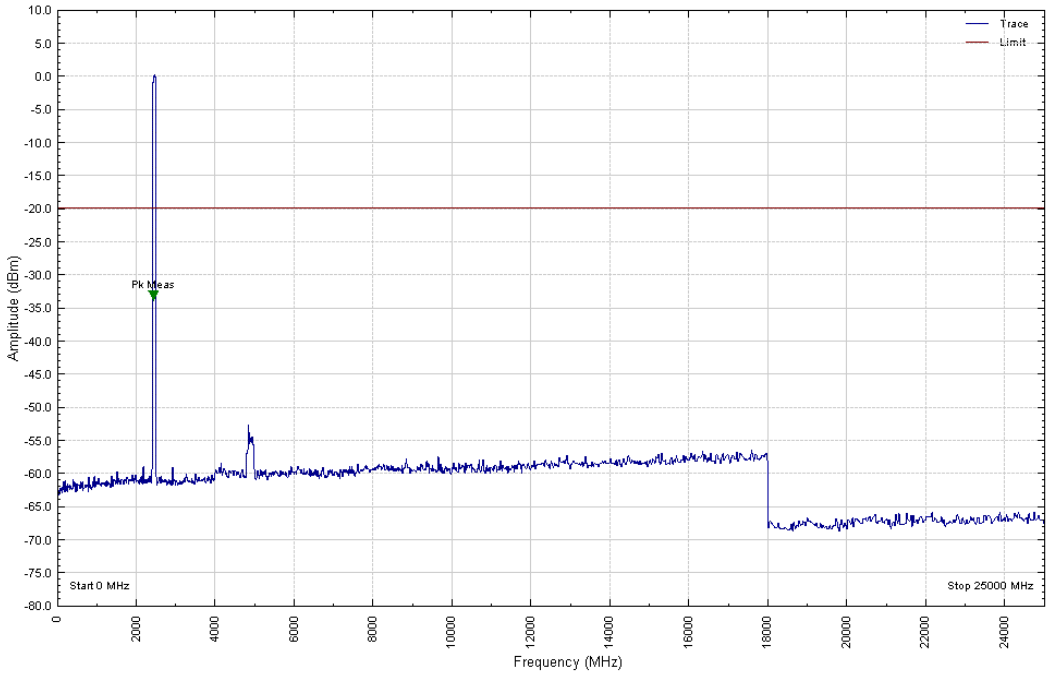
The test results are shown below.

Configuration 2 – Mode 4

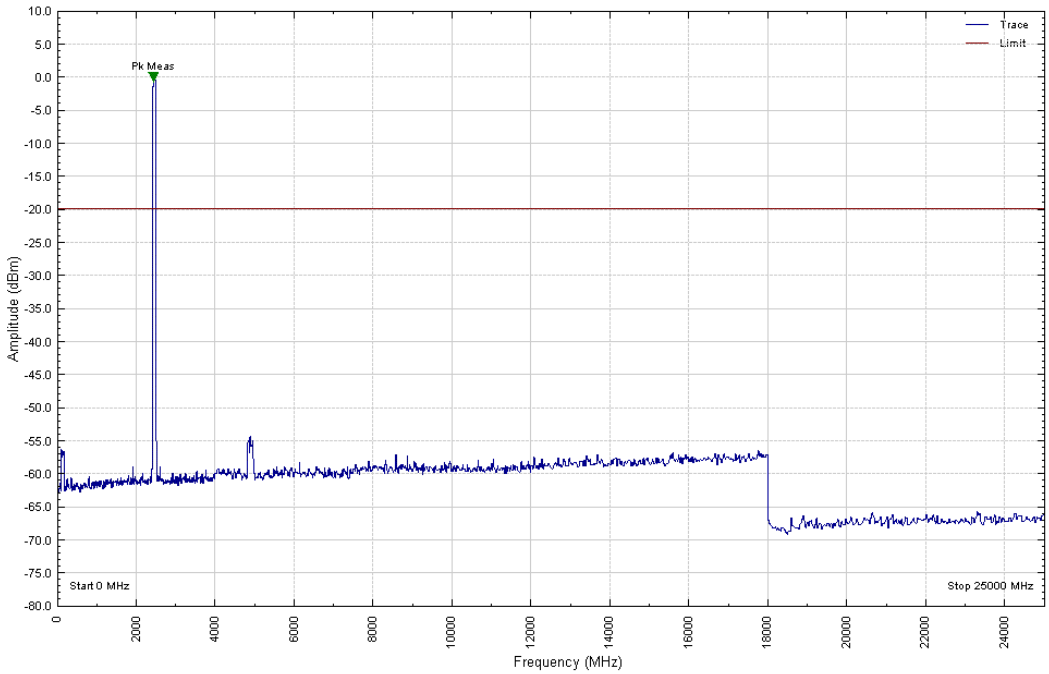
4.0 V DC Supply

9kHz to 25GHz

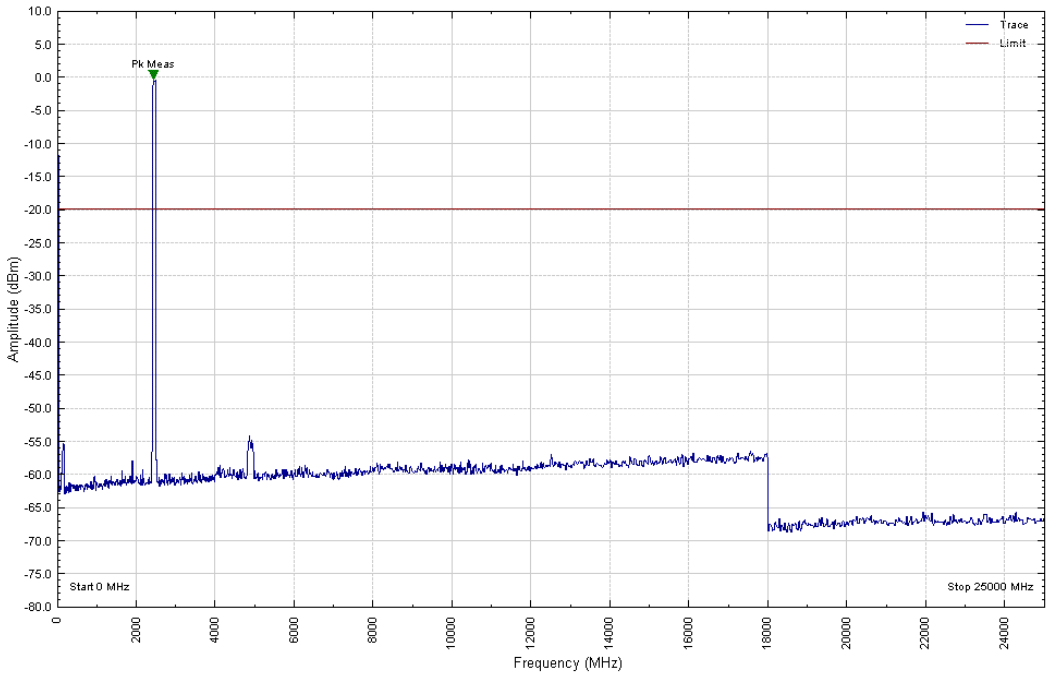
DH1



DH3


Trace
Limit
Pk Meas
Amplitude (dBm)
Start 0 MHz
Stop 25000 MHz
Frequency (MHz)

DH5


Trace
Limit
Pk Meas
Amplitude (dBm)
Start 0 MHz
Stop 25000 MHz
Frequency (MHz)

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

2.10 BAND EDGE EMISSIONS

2.10.1 Specification Reference

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

2.10.2 Equipment Under Test

SH011, S/N: 000901

2.10.3 Date of Test and Modification State

31 October 2010 - Modification State 0

2.10.4 Test Equipment Used7

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

2.10.5 Test Method and Operating Modes

The test was applied in accordance with the test method requirements of ANSI C63.4.

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

Configuration 2 - Mode 1
- Mode 3

2.10.6 Environmental Conditions

	31 October 2010
Ambient Temperature	26.4°C
Relative Humidity	30.0%

Product Service

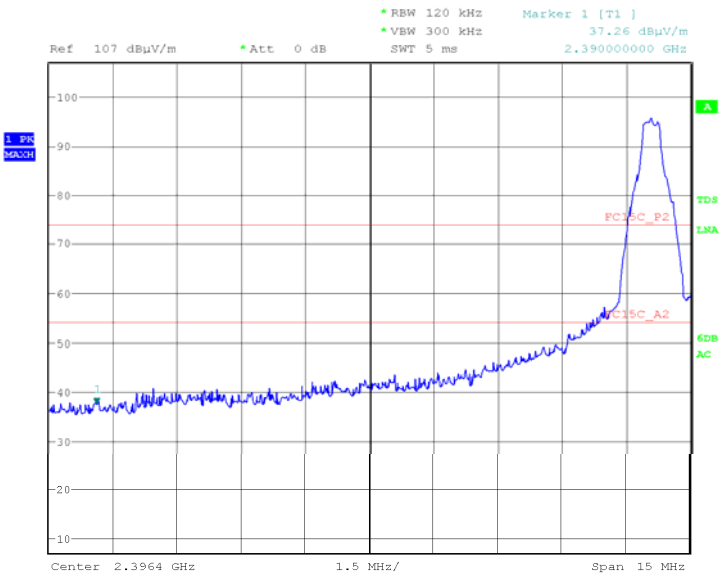
2.10.7 Test Results

For the period of test the EUT met the requirements of FCC CFR 47 Part 15C for Band Edge Emissions.

The test results are shown below.

Configuration 1 - Mode 1

Freq in GHz	Polarisation	Final Peak dBµV/m	Final Peak Limit dBµV/m	Final Average dBµV/m
2.402	Horizontal	53.8	74.0	40.0



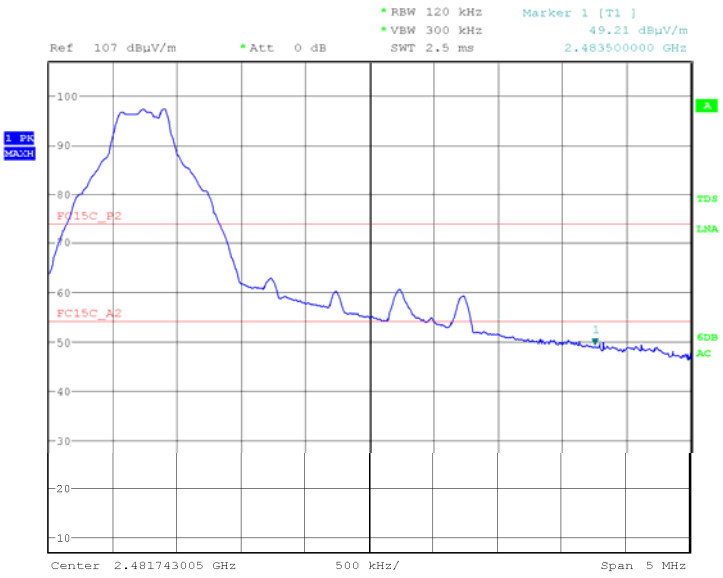
Date: 10.NOV.2010 18:09:22

The plot shows the marker at the band edge frequency with a resolution and video bandwidth of 120 kHz and 300 kHz respectively. This is purely for illustration purposes. The measurement at the band edge was performed peak and average in a much narrower span for better accuracy. The peak was measured with a resolution and video bandwidth of 1 MHz and 1 MHz respectively and the average was measured with a resolution and video bandwidth 1 MHz and 10 Hz respectively in accordance with the specification.

Product Service

Configuration 1 - Mode 3

Freq in GHz	Polarisation	Final Peak dBµV/m	Final Peak Limit dBµV/m	Final Average dBµV/m
2.480	Vertical	71.8	74.0	50.2



The plot shows the marker at the band edge frequency with a resolution and video bandwidth of 120 kHz and 300 kHz respectively. This is purely for illustration purposes. The measurement at the band edge was performed peak and average in a much narrower span for better accuracy. The peak was measured with a resolution and video bandwidth of 1 MHz and 1 MHz respectively and the average was measured with a resolution and video bandwidth 1 MHz and 10 Hz respectively in accordance with the specification.

Product Service

SECTION 3

TEST EQUIPMENT USED

Product Service

3.1 TEST EQUIPMENT USED

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

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.1 and 2.9 - Conducted Emissions (AC Power Port) and Spurious Emissions					
Multimeter	White Gold	WG022	190	12	26-Oct-2010
LISN (1 Phase)	Chase	MN 2050	336	12	25-Mar-2011
True RMS Multimeter	Fluke	79 Series III	411	12	26-Jul-2011
Transient Limiter	Hewlett Packard	11947A	1032	12	22-Jun-2011
GPS Frequency Standard	Rapco	GPS-804/3	1312	6	9-Mar-2011
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	2-Nov-2010
High Pass Filter (4GHz)	RLC Electronics	F-100-4000-5-R	2773	12	6-Sep-2011
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	30-Nov-2010
Hygrometer	Rotronic	I-1000	2891	12	27-Apr-2011
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	28-Nov-2010
Attenuator (10dB, 50W)	Aeroflex / Weinschel	47-10-34	3166	12	10-Jun-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	12	27-Nov-2009
Section 2.2 – 20dB Bandwidth					
True RMS Multimeter	Fluke	79 Series III	411	12	26-Jul-2011
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Section2.3 – Channel Separation					
True RMS Multimeter	Fluke	79 Series III	411	12	26-Jul-2011
Power Divider	Weinschel	1506A	603	12	18-Mar-2011
Attenuator (10dB, 10W)	Trilithic	HFP-50N	1377	12	13-Oct-2011
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Power Meter	Rohde & Schwarz	NRP	3491	-	TU
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z51	3492	12	15-Apr-2011
Section 2.4 - Channel Dwell Time					
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Power Meter	Rohde & Schwarz	NRP	3491	-	TU
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z51	3492	12	15-Apr-2011

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.5 - Number of Hopping Channels					
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
Power Divider	Weinschel	1506A	3345	12	29-Apr-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Power Meter	Rohde & Schwarz	NRP	3491	-	TU
Wideband Power Sensor, 50MHz - 18GHz	Rohde & Schwarz	NRP-Z51	3492	12	15-Apr-2011
Section 2.6 and 2.7 – Maximum Peak Conducted Output Power and EIRP Peak Power					
Peak Power Analyser	Hewlett Packard	8990A	107	12	10-Feb-2011
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	11-Nov-2010
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	11-Nov-2010
Antenna (Bilog)	Schaffner	CBL6143	287	24	19-Jan-2012
True RMS Multimeter	Fluke	79 Series III	411	12	26-Jul-2011
Power Divider	Weinschel	1506A	603	12	18-Mar-2011
Attenuator (10dB, 10W)	Trilithic	HFP-50N	1377	12	13-Oct-2011
Screened Room (5)	Rainford	Rainford	1545	36	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Programmable Power Supply	Iso-tech	IPS 2010	2436	-	O/P Mon
Power Sensor	Hewlett Packard	84812A	2743	-	TU
Antenna (Bilog)	Chase	CBL6143	2904	24	4-Dec-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Hygrometer	Rotronic	I-1000	3220	12	27-Apr-2011
Attenuator (10dB, 20W)	Lucas Weinschel	1	3225	12	13-Oct-2011
ESA-E Series Spectrum Analyser	Agilent	E4402B	3348	12	2-Jun-2011
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	12	27-Nov-2009
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	12	26-Jan-2011
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	10-Aug-2011

Product Service

Instrument	Manufacturer	Type No.	TE No.	Calibration Period (months)	Calibration Due
Section 2.8 and 2.10 Radiated Spurious Emissions and Band Edge Emissions					
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	234	12	11-Nov-2010
Antenna (Double Ridge Guide, 1GHz-18GHz)	EMCO	3115	235	12	11-Nov-2010
Antenna (Bilog)	Schaffner	CBL6143	287	24	19-Jan-2012
Power Splitter	Weinschel	1506A	607	-	TU
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	11-Feb-2011
Mast Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Turntable/Mast Controller	EMCO	2090	1607	-	TU
Filter	Daden Anthony Ass	MH-1500-7SS	2778	12	30-Nov-2010
Antenna (Bilog)	Chase	CBL6143	2904	24	4-Dec-2011
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	3171	12	12-Aug-2011
Amplifier (1 - 8GHz)	Phase One	PS06-0060	3175	12	2-Jul-2011
1m RF Cable sma(m)-sma(m)	Reynolds	262-0248-1000	3453	12	14-Oct-2009
Signal Generator: 10MHz to 20GHz	Rohde & Schwarz	SMR20	3475	12	4-Dec-2010
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	9-Sep-2011
7m Armoured RF Cable	SSI Cable Corp.	1501-13-13-7m WA(-)	3600	12	27-Nov-2009
'3.5mm' - '3.5mm' RF Cable (2m)	Rhophase	3PS-1803-2000-3PS	3703	12	26-Jan-2011
9m RF Cable (N Type)	Rhophase	NPS-2303-9000-NPS	3791	12	10-Aug-2011

TU – Traceability Unscheduled
O/P Mon – Output monitored using calibrated equipment.

Product Service

3.2 MEASUREMENT UNCERTAINTY

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

Test Discipline	Frequency / Parameter	MU
Radiated Emissions, Bilog Antenna, AOATS	30MHz to 1GHz Amplitude	5.1dB*
Radiated Emissions, Horn Antenna, AOATS	1GHz to 40GHz Amplitude	6.3dB*
Conducted Emissions, LISN	150kHz to 30MHz Amplitude	3.2dB*
Conducted Emissions, ISN	150kHz to 30MHz Amplitude	2.1dB
Substitution Antenna, Radiated Field	30MHz to 18GHz Amplitude	2.6dB
Discontinuous Interference	150kHz to 30MHz Amplitude	3.0dB*
Interference Power	30MHz to 300MHz Amplitude	3.0dB*
Radiated E-Field Susceptibility	10MHz to 6GHz Test Amplitude	2.0dB†
Conducted Susceptibility RF	50kHz to 1000MHz Amplitude EM Clamp Method of Test CDN Method of Test BCI Clamp Method of Test Direct Injection Method of Test	 3.1dB• 1.2dB• 1.1dB• 1.2dB•
Conducted Susceptibility LF	DC to 150kHz	1.0%†
Power Frequency Magnetic Field	50Hz/60Hz Amplitude	0.45%
Magnetic Emissions	9kHz to 30MHz Amplitude	3.4dB*
Magnetic Field/Flux iaw EN 50366	10Hz to 400kHz	2.64%
Harmonics and Flicker	The test was applied using proprietary equipment that meets the requirements of EN 61000-3-2 and EN 61000-3-3	—
Mains Voltage Variations and Interrupts	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-11	—
Fast Transient Burst	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-4	—
Electrostatic Discharge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-2	—
Surge	The test was applied using proprietary equipment that meets the requirements of EN 61000-4-5	—
Vehicle Transients	The test was applied using proprietary equipment that meets the requirements of ISO 7637-1 and 2	—
Compass Safe Distance	Azimuth Accuracy	0.10°
Channel Occupancy/Separation	19.1kHz	N/A
Maximum Output Power	Not Applicable	±0.5dB
Number of Channels	Not Applicable	N/A
20dB Bandwidth	19.1kHz	±0.5dB

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

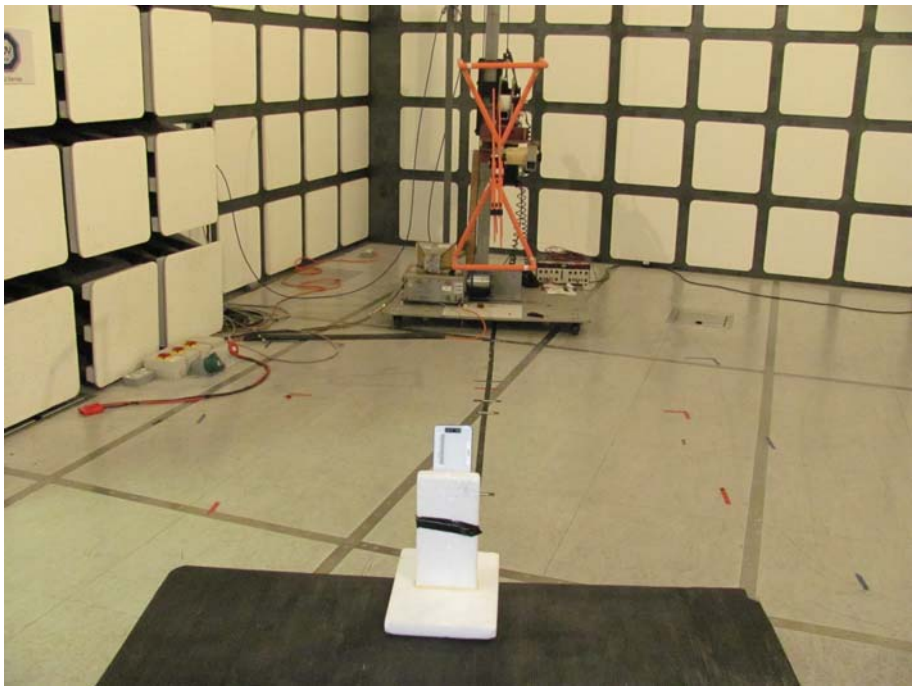
* In accordance with CISPR 16-4-2
† In accordance with UKAS Lab 34
• In accordance with EN61000-4-6

Product Service

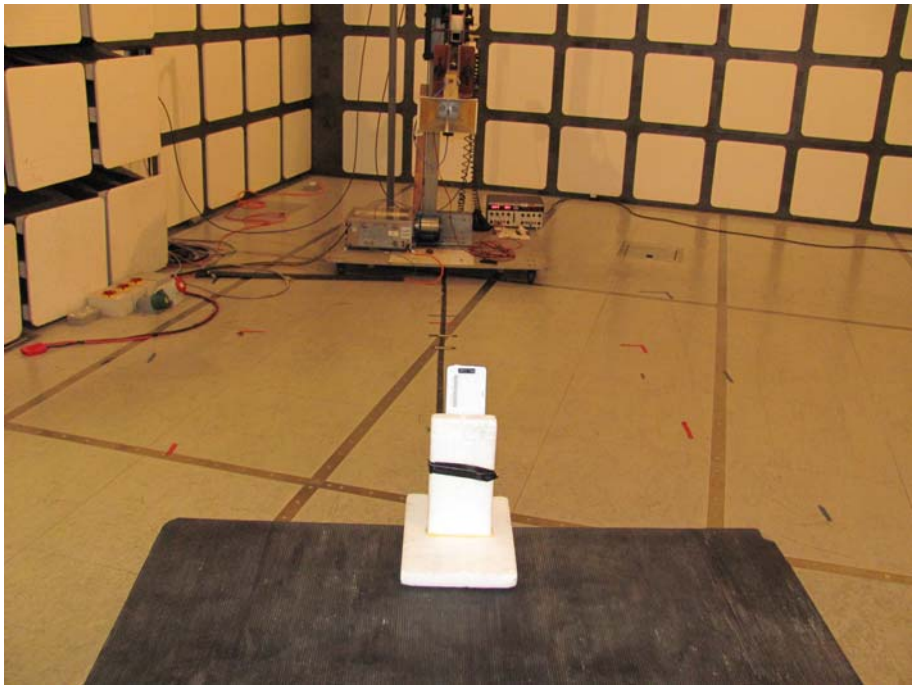
SECTION 4

PHOTOGRAPHS

4.1 TEST SET-UP PHOTOGRAPHS



Radiated Emissions – Vertical Polarisation



Radiated Emissions – Horizontal Polarisation

Conducted Emissions

Product Service

SECTION 5

ACCREDITATION, DISCLAIMERS AND COPYRIGHT

5.1 ACCREDITATION, DISCLAIMERS AND COPYRIGHT

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

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

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