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BSMI Lab ID: SL2-IN-E-3008

FCC & IC Report

for the

Starkey Laboratories Inc

CPED

Project Engineer: R. P. St John James

Approval Signatory

Approved signatories: S. M. Connolly ☐ J. A. Jones ☑

The above named are authorised Hursley EMC Services engineers.

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Contents

1.0 DECLARATION

1.1 FCC Part 15 Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with the parts 15.107, 15.109, 15.205, 15.209 and 15.247(d) of the CFR 47:2012 FCC rules in accordance with ANSI C63.4:2003 as well as Industry Canada ICES-003 and IC RSS-210 A8.5. The EUT operates in the frequency bands 902-928MHz and 2400 to 2483.5 MHz and complies with the FCC Part 15 radiated emission requirements.
This report covers the EUT under Part 15B and ICES-003 as a PC peripheral and only the cabinet radiated emission requirements of IC RSS-210 A8.5 and FCC 15.247(d) for Part 15C, other sections of Part 15C and RSS-210 are covered in other documents.

1.2 Modification

To meet the spurious emission requirements the Bluetooth module enclosure was grounded with copper tape.

1.3 EUT Manufacturer

Trade name:	Starkey Laboratories Inc
Company name:	Starkey Laboratories Inc
Company address:	6600 Washington Ave. SO Eden Prairie MN55344 USA
Manufacturing address:	As above.
Company representative:	Mr Kenneth Meyer Tel: (001) 952-947-4734

1.4 Customer Information

Company representative:	Mr Charlie Blackham Telephone Number : +44 (0)7946 624317
Company name:	Sulis Consultants
Company address:	Mead House Longwater Road Eversley RG27 ONW, UK

2.0 EUT DESCRIPTION

2.1 Identity

EUT:	CPED (Cell Phone Entertainment Device)
Model:	CPED
Serial numbers:	N051200034 and N051200104
Sample build:	Production

2.2 Product Operation

The CPED (Cell Phone Entertainment Device) contains 2 transmitters:

"900 MHz band" which is configured in North American variant to operate in the 902-928 MHz band as per 15.247 on channels ranging from 907.644 to 920.993 MHz. The following modulation rates are supported in this mode: GMSK modulation.

"2.4 GHz band" which operates in the 2400 – 2483.5 MHz band using an integrated 3rd party Bluetooth module. Testing will be performed in the following modes:

GFSK (1 Mbps) & 8-DPSK (3 mbps)

The device will enable: Bidirectional wireless audio streaming between Starkey wireless hearing device(s) and a Bluetooth-enabled cell phone.

Wireless stereo audio streaming to Starkey wireless hearing device(s) from a Bluetooth-enabled device (e.g., television, stereo) or via a wired connection to an audio source (e.g., MP3 player).

The device also supports USB connectivity to a PC/laptop for software upgrades and battery charging. The device will therefore need testing as a computer peripheral device.

Radiated Spurious Emissions testing will be performed on channel combination(s) identified as being worst case mode by conducted testing.

The radio transmitters will be activated as required and set to transmit in test mode on maximum power with 100% duty cycle.

Test Channel	"900 MHz radio" Frequencies	Bluetooth Radio Frequencies
Bottom	907.644 MHz	2402 MHz
Middle	911.891 MHz	2441 MHz
Top	920.993 MHz	2480 MHz

2.3 Support Equipment

SUPPORTING EQUIPMENT	PART/MODEL NUMBER	SERIAL NUMBER
Fujitsu Laptop	Esprimo	YKDA651558
Fujitsu Power Supply	ADP-80NB	11336476N
0.5m USB Cable	n/a	na
Salcomp AC Adapter	AC-16X	675493

2.4 Exerciser Program

The EUT was tested in receive mode as a digital device under the FCC Part B/ICES-003 rules and as an intentional transmitter under the part 15C/IC RSS-210 rules. The EUT was connected to a Laptop via a USB cable for Part 15B/ICES-003 and for conducted emissions under Part 15C/RSS-210.

The EUT S/N N051200034 was tested as a battery powered stand alone device with both radios terminated into 50 Ohms and the battery fully charged for IC RSS-210 A8.5, RSS Gen and FCC 15.247(d) spurious emissions. A mains AC Adapter was used to test the EUT to the AC mains conducted emission requirements of FCC 15.207 and RSS Gen 7.2.4 with the both radios transmitting.

The EUT S/N N051200104 was tested connected to a laptop with both radios in receive mode for Part 15B and ICES-003 radiated emission and mains conducted emissions.

For the purposes of measurement the EUT was placed in a mode of continuously transmit at the mid frequency of both radio bands (worst case), all 3 orthogonal positions of the EUT were measured. Under Part 15B/ICES-003 the EUT was tested with its battery charging whilst communicating over the USB interface to proprietary software on the Laptop.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Offices	Hursley EMC Services Ltd Unit 16, Brickfield Lane, Chandlers Ford, Hampshire
EMI Measurement Site	Hursley EMC Services Ltd Hursley Park, Winchester; FCC Registered UK Designation number: UK0006
Test Dates	20th March to 3rd April 2012
HEMCS References:	12R120

3.2 General Operating Conditions

Testing was performed according to the procedures in ANSI C63.4:2003. Final radiated testing was performed at a EUT to antenna distance of three metres above 1GHz and at 10m below 1GHz.

Instrumentation, including receiver and spectrum analyser bandwidth, comply with the requirements of ANSI C63.2:1996.

3.3 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated	20 to 21 degrees Celsius	38 to 42% relative	993 to 1020 millibars
Conducted	21 to 22 degrees Celsius	34 to 35% relative	993 to 1024 millibars

3.4 Radiated Emissions

Initial Scan

A radiated profile scan was taken at a three metre distance on eight azimuths of the system under test in both vertical and horizontal polarities of the antenna in a semi-anechoic chamber. Instrumentation used in the chamber as below:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
008	1	HP	8568B	2517A01791	Spectrum analyser	13/03/2013
011	3	Q-par Angus	QSH20S20S	4350	Horn antenna (18-26.5GHz)	18/06/2012
026	1	Chase	CBL6140	1036	Antenna X-wing (20-2000MHz)	31/12/2012
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	28/04/2012
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	04/04/2012
071a	3	Q-par Angus	WBH218HN	5367	Horn antenna (2-18GHz)	06/05/2013
073	3	Schwarzbeck	BBHA9120B	237	Horn antenna (1-10GHz)	17/06/2013
132	1	HP	8447D	2944A07094	Pre-amplifier (30-1000MHz)	13/03/2013
256	1	HEMCS	PA XVIII	001	Pre-amp, 1-18GHz 55dB	29/04/2012
271	1	Sucoflex	106		Cable SMA (18GHz)	19/01/2013
296	1	RHOPHASE	SPS-23-1	G6966	1-26.5GHz cable	30/06/2012

The EUT was measured in three orthogonal axes to determine which produced the highest emissions.

The data obtained from the profile scan was used as a guide for the final Open Area Test Site (OATS) measurements.

Final Measurements

The system under test was transferred to the OATS from the semi-anechoic chamber. The data obtained from the chamber profile-scan was used to guide the test engineer. Each emission from the EUT was maximised by revolving the system on the turntable and moving the antennae in height and azimuth. The worst-case data is presented in this report. Test instrumentation used in the OAT's measurements was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
021	1	Rohde Schwarz	ESIB	100192	Test receiver (40GHz)	12/04/1012
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	28/04/2012
053	1	HP	8449B	3008A01394	Pre-amplifier (1.0-26.5GHz)	04/04/2012
092	2	Schwarzbeck	VULB 9163	232 (grey)	Trilog antenna (30-3000MHz)	30/09/2013
127	3	Schwarzbeck	BBHA9120B	391	Horn antenna (1-10GHz)	15/12/2012
215	1	Sucoflex	106		Cable SMA (18GHz)	27/07/2012
261	1	Rohde Schwarz	ESVP	892322/015	Test receiver (30-1300MHz)	30/06/2012

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.
'Internal' means internally calibrated using HEMCS procedures

3.5 Conducted Emissions

Test Configuration

A filtered 115V/60Hz supply was fed to the system under test, via a 50Ω/50µH Line Impedance Stabilisation Network (LISN). The LISN was directly bonded to a conductive ground plane.

Test Measurement

The worst-case emissions were identified on both the neutral and phase(s) with a spectrum analyser set to scan from 0.15 MHz to 30 MHz.

The worst-case peaks were then identified and measured using an RF receiver using a quasi-peak detector and compared to the frequency range and limits of CISPR 22 as specified by ANSI C63.4-2003. Quasi-peak values that exceeded the average limit were then re-measured using the average signal detector.

The worst-case results are presented in this report.

Test instrumentation used in the conducted test was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
003	1	Rohde Schwarz	ESH-3	872994/027	Test receiver (9kHz-30MHz)	17/06/2012
006	1	HP	8568B	2841A04350	Spectrum analyser	12/03/2013
162	1	Rohde Schwarz	ESH3 Z5	829996/003	AMN - single phase	11/02/2013
189	1	Rohde Schwarz	ESH3-Z2	-	Pulse limiter N type	17/06/2012

CP = Interval period [year] prescribed for external calibrations

Note: 'Calibration due date' means that the instrument is certified with a UKAS or traceable calibration certificate.

4.0 TEST DATA

4.1 Radiated Emissions (Part 15.109/ICES-003 Digital Equipment)

A search was made of the frequency spectrum from 30.0 MHz to 1.0 GHz and the measurements reported are the highest emissions relative to the limits at a measuring distance of ten metres.

RESULTS - 30 MHz to 1000 MHz

Frequency MHz	Receiver amplitude dBµV	Antenna factor dB	Cable loss dB	Actual quasi-peak value @ 10m dBµV/m	ICE-003 limit @ 10m dBµV/m	FCC 15.109 limit @ 10m dBµV/m
31.2908	2.8	11.0	0.7	14.50	30.0	29.5
206.844	19.4	10.5	1.9	31.8*	30.0	33.0
413.529	8.6	16.0	3.0	27.6	37.0	35.5
555.993	8.8	17.7	3.6	30.1	37.0	35.5
620.116	9.9	19.2	3.9	33.0	37.0	35.5
694.926	9.7	19.5	4.2	33.4	37.0	35.5
764.405	6.3	20.6	4.5	31.4	37.0	35.5

Quasi-peak value= Receiver Amplitude + Antenna Factor + Cable Loss

* Note: This emission exceeds ICES-003 limit, however the emission is unchanged when the EUT is removed from the setup i.e. the emission is from the Laptop and not the EUT.

Uncertainty of measurement: ± 4.7dBµV for a 95% confidence level.

A search was made of the frequency spectrum from 1.0 GHz to 15.0 GHz and the measurements reported are the highest emissions relative to the FCC CFR 47 Part 15 limits at a measuring distance of three metres

RESULTS - 1.0 GHz to 15 GHz

Frequency	Receiver amplitude	Antenna factor	Cable loss	Pre-amp gain	Actual average value @ 3m		Specified average limit @ 3m	
GHz	dBµV	dB	dB	dB	dBµV/m	µV/m	dBµV/m	µV/m
1.062	42.8	24.7	1.6	39.5	29.6	30	54.0	500
2.000	35.8	26.3	2.3	38.4	26.0	20	54.0	500
2.148	36.2	27.7	2.4	38.3	28.0	25	54.0	500
2.681	38.7	26.6	2.7	38.1	29.9	31	54.0	500
4.000	30.8	28.6	3.4	37.0	25.8	20	54.0	500
6.000	30.4	30.5	4.2	37.6	27.5	24	54.0	500

Frequency	Receiver amplitude	Antenna factor	Cable loss	Pre-amp gain	Actual peak value @ 3m		Specified limit @ 3m	
GHz	dBµV	dB	dB	dB	dBµV/m	µV/m	dBµV/m	µV/m
1.062	62.0	24.7	1.6	39.5	48.8	275	74.0	5,000
2.000	62.6	26.3	2.3	38.4	52.8	437	74.0	5,000
2.148	59.2	27.7	2.4	38.3	51.0	355	74.0	5,000
2.681	61.6	26.6	2.7	38.1	52.8	437	74.0	5,000
4.000	55.9	28.6	3.4	37.0	50.9	351	74.0	5,000
6.000	48.5	30.5	4.2	37.6	45.6	191	74.0	5,000

Uncertainty of measurement: ± 5.1dBµV for a 95% confidence level.

Peak/Average value= Receiver Amplitude + Antenna Factor + Cable Loss – Pre-amp gain

Procedure: In accordance with ANSI C63.4:2003.
Measurements below 1.0 GHz performed with a quasi-peak detector (120kHz Bandwidth). Measurements above 1.0 GHz performed with an average and peak detector (1MHz Bandwidth).

TEST ENGINEER: Rob St John James

4.2 Power Line Conducted Emissions – Laptop (15.107 & ICES-003)

A search was made of the frequency spectrum between 0.15 MHz to 30 MHz and the measurements reported here are the highest emissions relative to the CISPR 22 Class B limits. Emissions that meet the average limit on a quasi-peak measurement are deemed to meet both the average and quasi-peak specification.

MAINS – LINE

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.1833	47.5	64.3	-	54.3	Pass
0.6977	41.3	56.0	-	46.0	Pass
15.4810	38.7	60.0	-	50.0	Pass

MAINS – NEUTRAL

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.1835	48.2	64.3	-	54.3	Pass
0.7082	41.2	56.0	-	46.0	Pass
15.8350	39.3	60.0	-	50.0	Pass

Uncertainty of measurement: ± 3.22dBµV for a 95% confidence level.

Measurements made according to the CISPR/FCC rules and Hursley EMC Services test procedure CON-02.

TEST ENGINEER: Rob St John James

4.3 Radiated Emissions (Part 15.247(d) & RSS 210)

A search was made of the frequency spectrum from 30 MHz to 25 GHz and the measurements reported are the highest emissions relative to the Limits at a measuring distance of three metres.

Measurements were carried out with both transmitters set to mid band and the Bluetooth set to GFSK modulation as these conditions were the worst case for power and harmonic emissions.

RESULTS - 30 MHz to 1000 MHz

With the exception of the intentional 912 MHz transmitter the emissions in this band were on the noise floor of the measuring system.

A search was made of the frequency spectrum from 1.0 GHz to 25.0 GHz and the measurements reported are the highest emissions relative to the FCC CFR 47 Part 15 limits at a measuring distance of three metres

RESULTS - 1.0 GHz to 25 GHz

Frequency	Receiver amplitude	Antenna factor	Cable loss	Pre-amp gain	Actual average value @ 3m		Specified average limit @ 3m	
GHz	dBµV	dB	dB	dB	dBµV/m	µV/m	dBµV/m	µV/m
4.88	57.0	28.5	3.7	37.0	52.2	407	54.0	500
7.22	50.0	31.5	4.7	37.4	48.8	275	54.0	500
14.66	40.0	32.9	7.0	32.4	47.5	237	54.0	500
19.54	69.0	4	9.7	34.5	48.2	257	54.0	500
21.99	65.9	2.6	10.2	33.9	44.8	174	54.0	500

Frequency	Receiver amplitude	Antenna factor	Cable loss	Pre-amp gain	Actual peak value @ 3m		Specified limit @ 3m	
GHz	dBµV	dB	dB	dB	dBµV/m	µV/m	dBµV/m	µV/m
4.88	60.0	28.5	3.7	37.0	55.2	575	74.0	5,000
7.22	57.6	31.5	4.7	37.4	56.4	661	74.0	5,000
14.66	48.1	32.9	7.0	32.4	55.6	602	74.0	5,000
19.54	78.3	4	9.7	34.5	57.5	750	74.0	5,000
21.99	75.3	2.6	10.2	33.9	54.2	513	74.0	5,000

Uncertainty of measurement: ± 5.1dB >1GHz for a 95% confidence level.

Procedure: In accordance with ANSI C63.4:2003.

Measurements below 1.0 GHz performed with a quasi-peak detector (120kHz Bandwidth). Measurements above 1.0 GHz performed with an average and peak detector (1MHz Bandwidth).

TEST ENGINEERS: Rob St John James

4.4 Power Line Conducted Emissions – AC Adapter (15.207 & RSS Gen)

A search was made of the frequency spectrum between 0.15 MHz to 30 MHz and the measurements reported here are the highest emissions relative to the CISPR 22 Class B limits. Emissions that meet the average limit on a quasi-peak measurement are deemed to meet both the average and quasi-peak specification.

MAINS – LINE

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.3488	43.7	59.0	-	49.0	Pass
0.5354	48.1	56.0	35.5	46.0	Pass
0.7120	41.5	56.0	-	46.0	Pass

MAINS – NEUTRAL

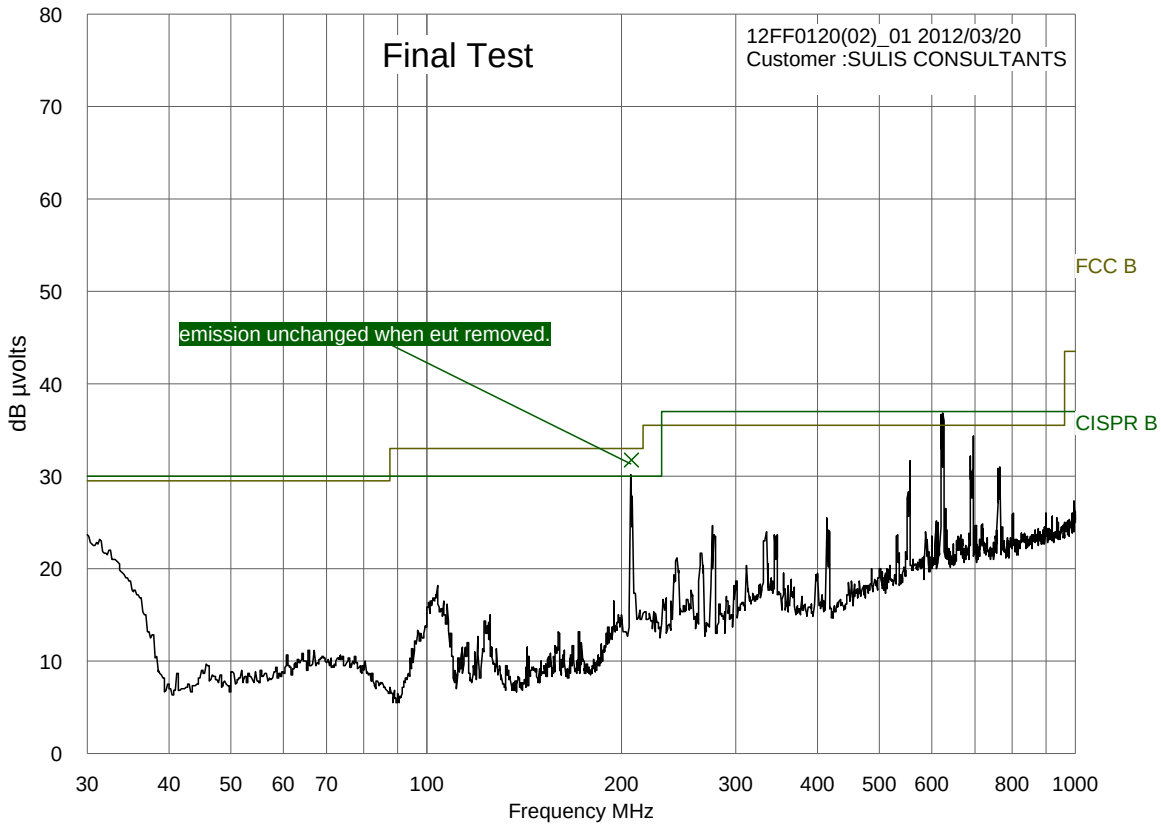
Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.4409	42.1	57.0	-	47.0	Pass
0.5365	42.6	56.0	32.2	46.0	Pass
0.9865	39.2	56.0	-	46.0	Pass

Uncertainty of measurement: ± 3.22dBµV for a 95% confidence level.

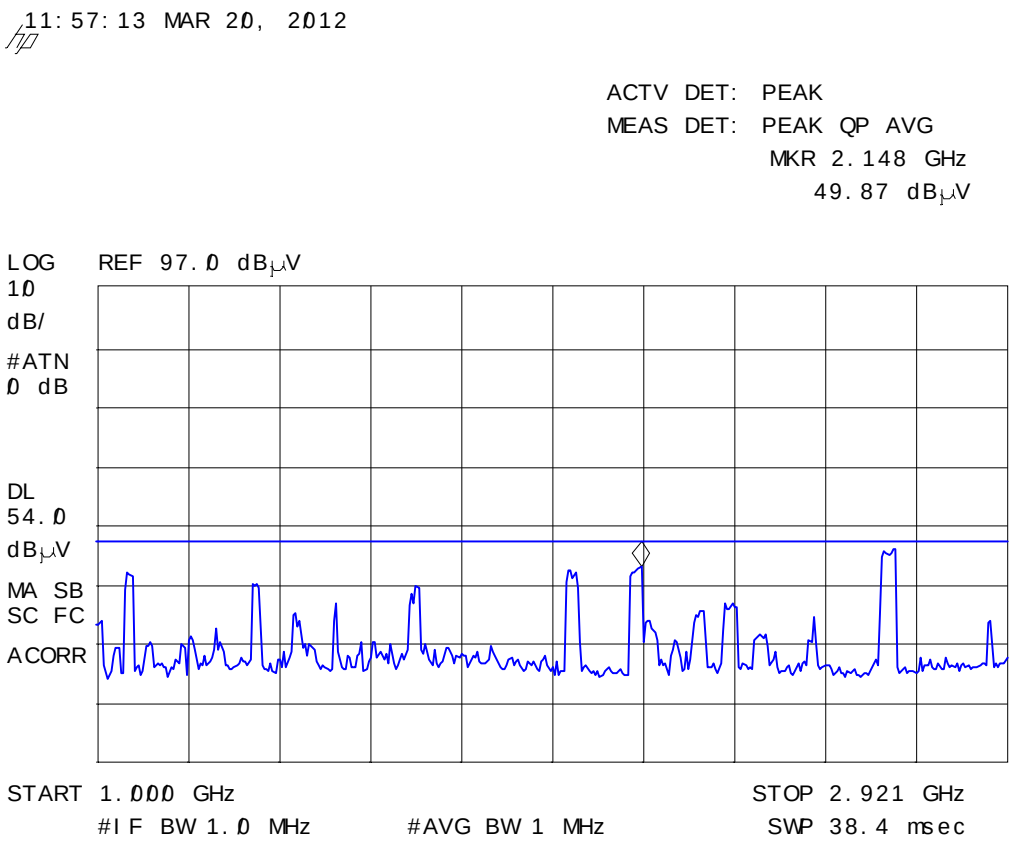
Measurements made according to the CISPR/FCC rules and Hursley EMC Services test procedure CON-02.

TEST ENGINEER: Rob St John James

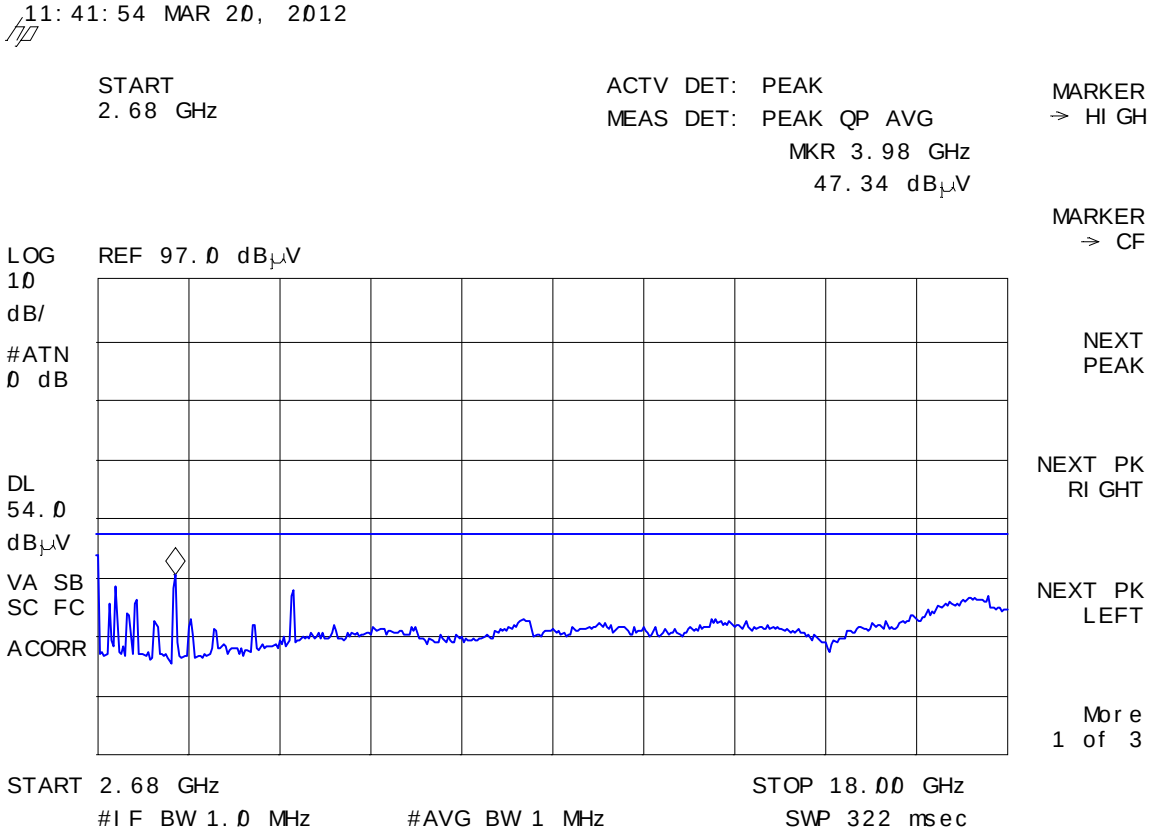
4.4.1 Plot 30 to 1000 MHz (15.109 & ICES-003)



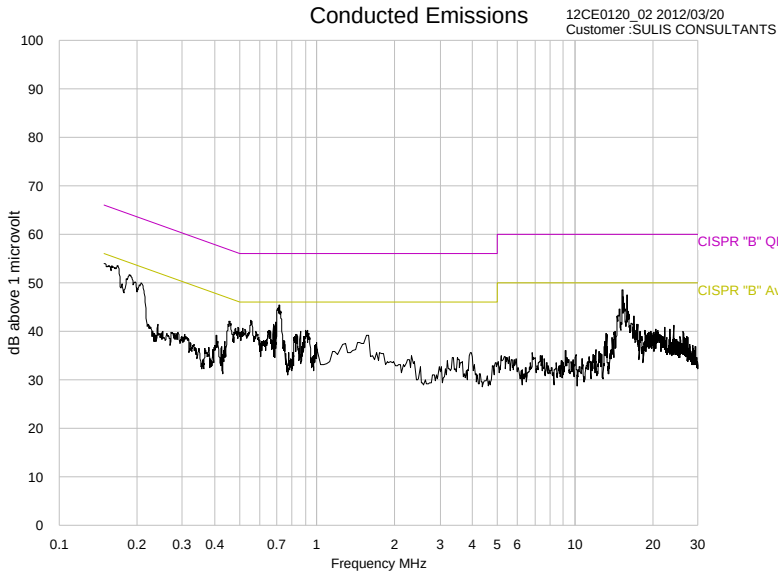
4.4.2 Plot 1 to 2.9 GHz (15.109 & ICES-003)

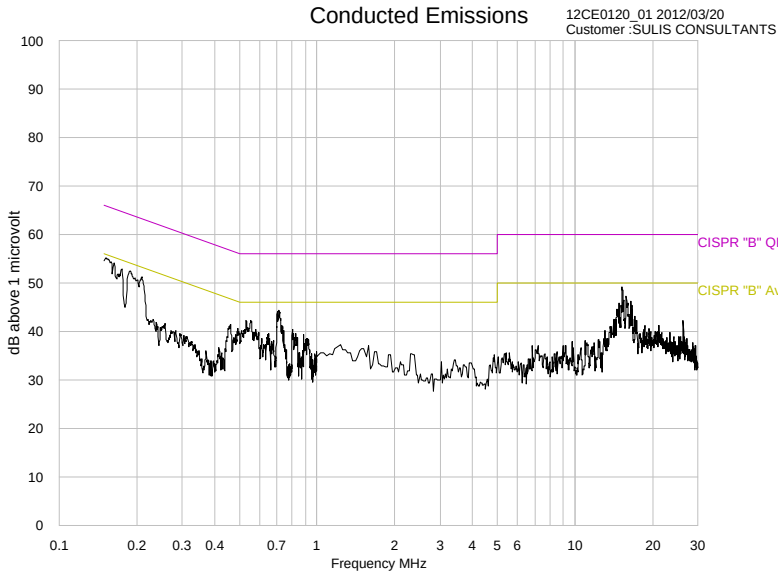


4.4.3 Plot 2.7 to 18 GHz (15.109 & ICES-003)

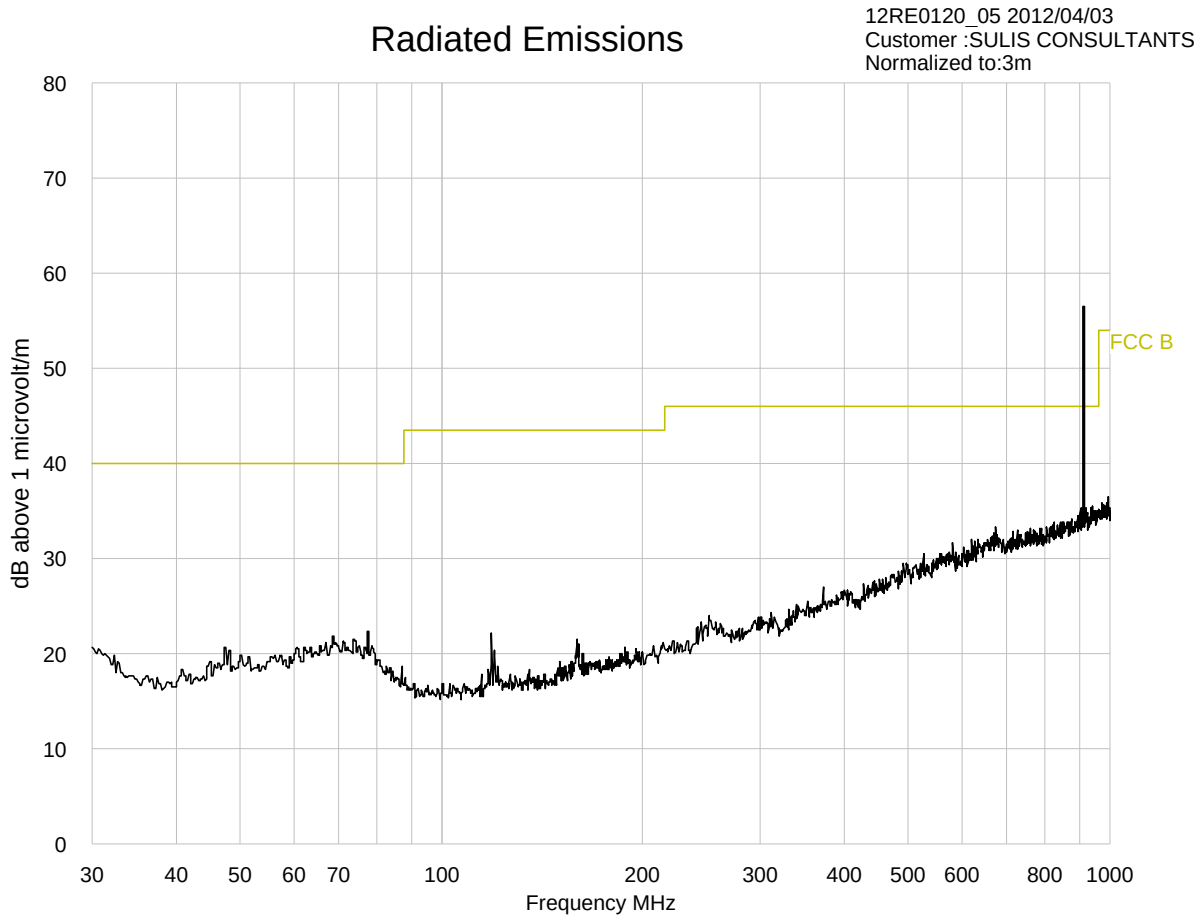


4.4.4 Plot Conducted Emissions (15.107 & ICES-003)

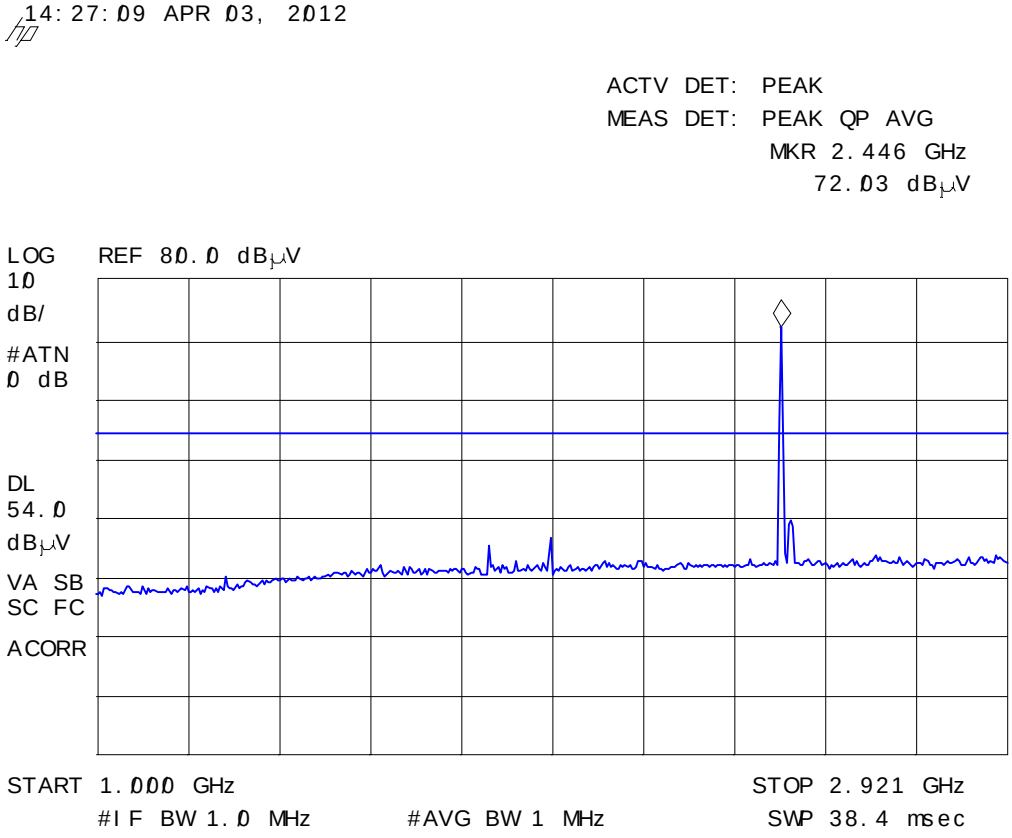




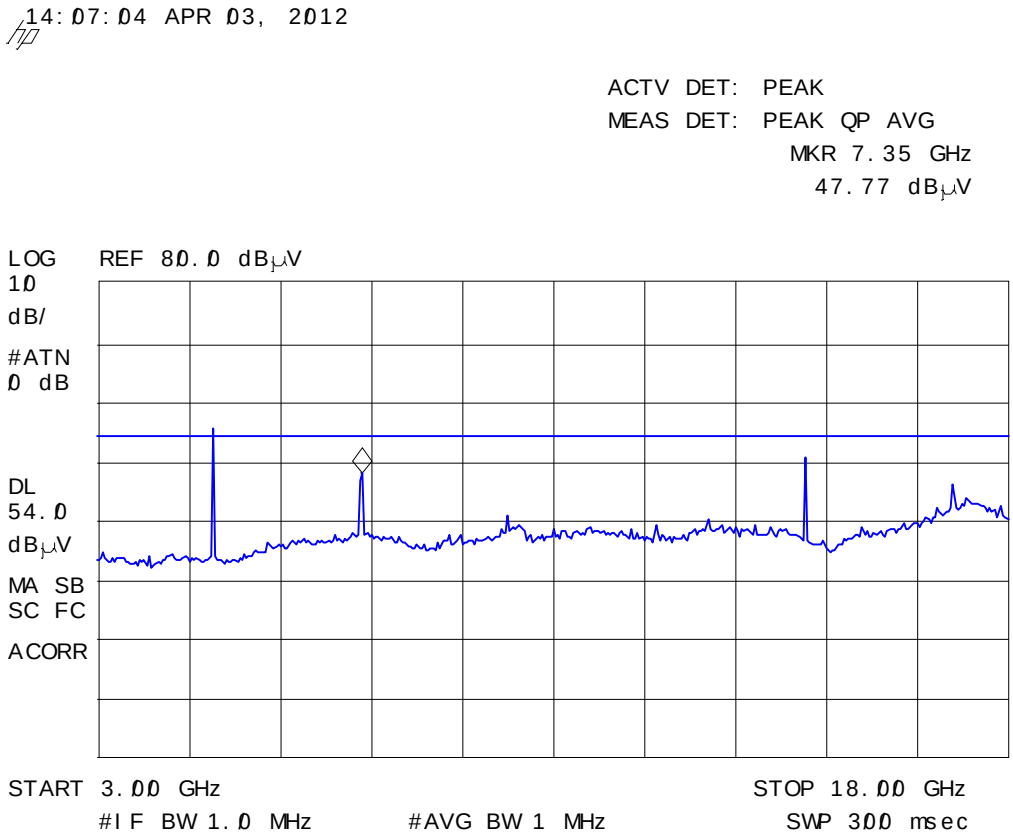
4.4.5 Plot 30 to 1000 MHz (Part 15.247(d) & RSS 210)



4.4.6 Plot 1 to 3 GHz (Part 15.247(d) & RSS 210)



4.4.7 Plot 3 to 18 GHz (Part 15.247(d) & RSS 210)



Note: no emissions were detected between 2.9 and 3GHz

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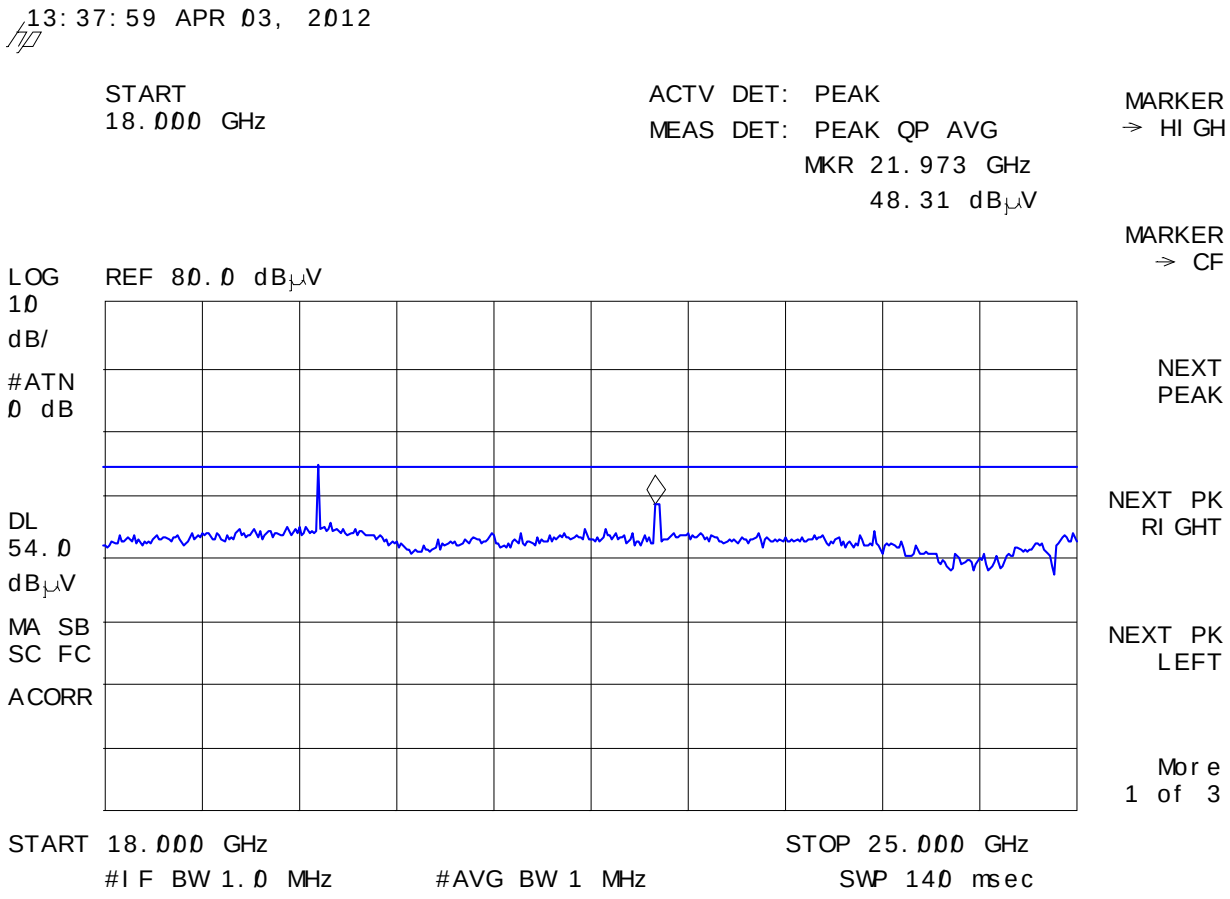
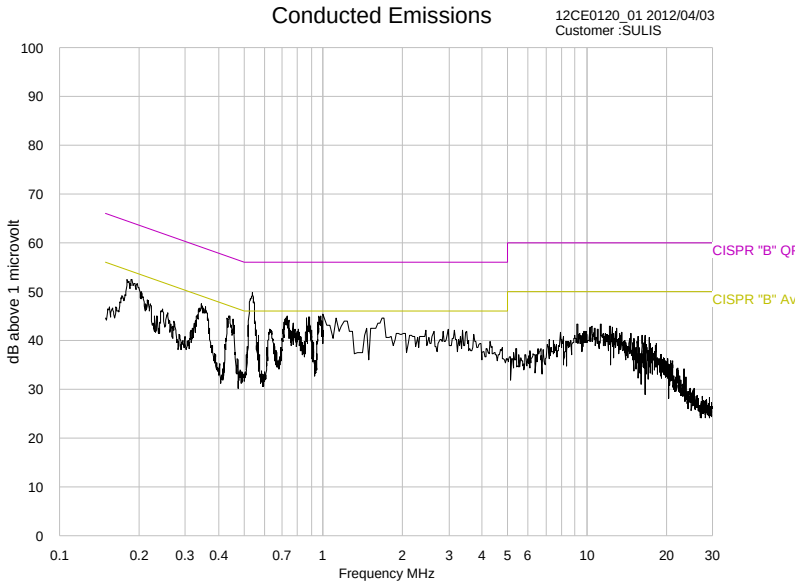
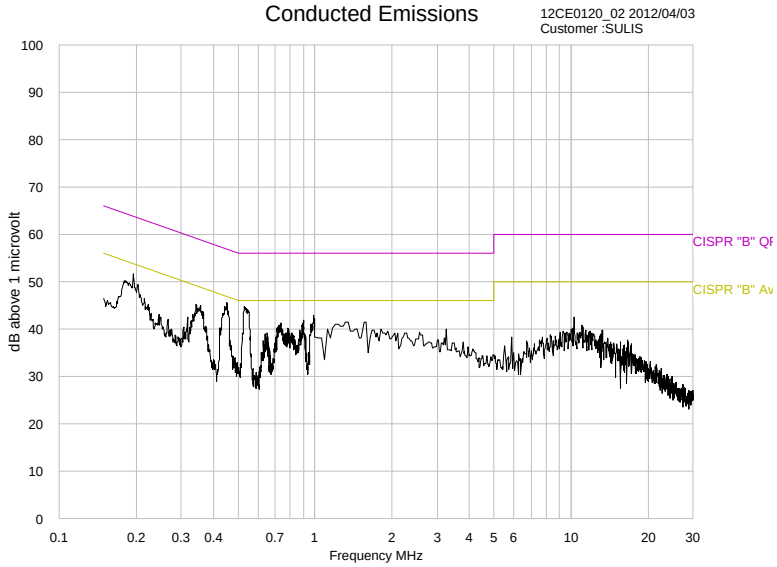
4.4.8 Plot 18 to 25 GHz (Part 15.247(d) & RSS 210)



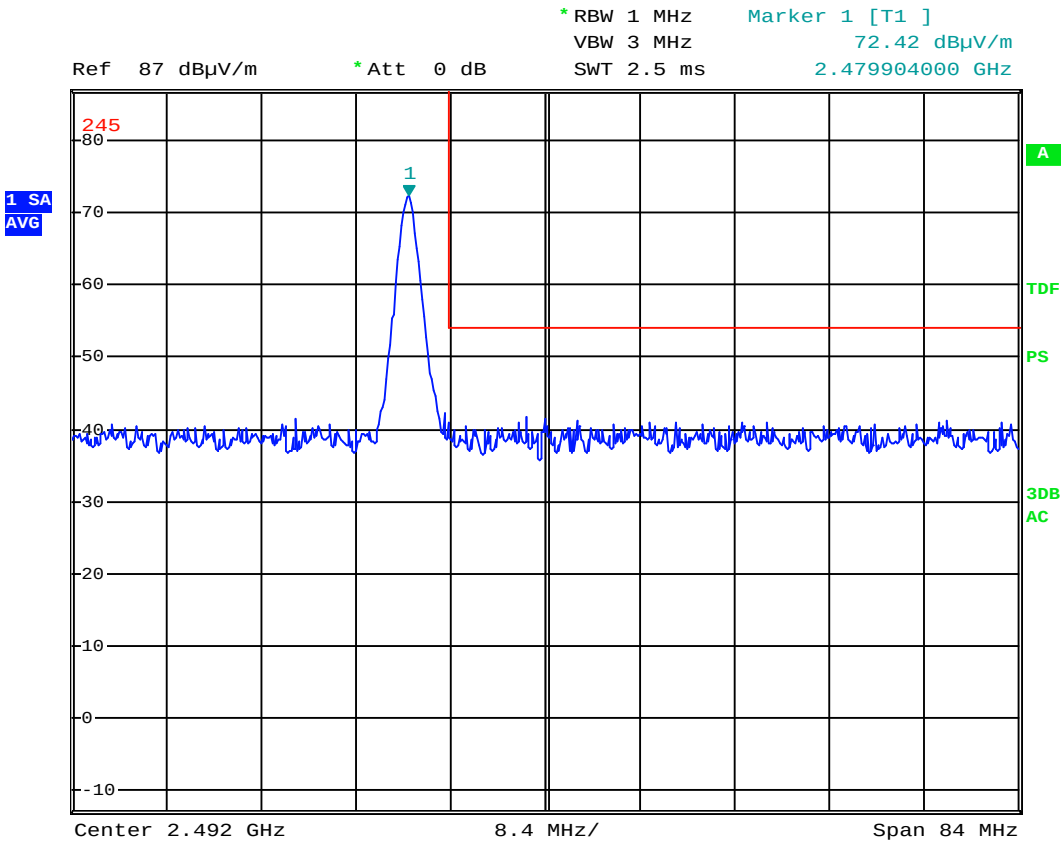
4.4.9 Plot Conducted Emissions (15C & RSS 210)





4.4.10 Plot - Band Edge Emissions 2.4835 GHz

The band edge emissions for all 3 orientations of the EUT and in both Vertical and Horizontal polarity were taken in the OATS at a measuring distance of 3m with the EUT 2.48GHz emission maximised. The worst case emission profile is shown below.



Date: 3.APR.2012 16:56:29

5.0 FCC DETAILS

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

February 13, 2006

Hursley EMC Services Ltd.
Unit 16
Brickfield Lane
Chandlers Ford - Hampshire, SO53 4DB
United Kingdom
Attention: R P St John James

Re: Accreditation of Hursley EMC Services Ltd.
Designation Number: UK0006

Dear Sir or Madam:

We have been notified by Department of Trade and Industry (DTI) that Hursley EMC Services Ltd. has been accredited as a Conformity Assessment Body (CAB).

At this time your organization is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,

Thomas Phillips
Electronics Engineer

6.0 INDUSTRY CANADA DETAILS

Industry Canada Industrie Canada

September 24, 2010

OUR FILE: 46405-7104
Submission No: 142641

Hursley EMC Services Ltd.
Unit 16, Brickfield Lane, Eastleigh
Hampshire, SO53 4DP
Great Britain

Attention: Rob St. John James

Dear Sir/Madame:

The Bureau has received your application for the renewal of a 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought **(7104A-1).** Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

- The company address code associated to the site(s) located at the above address is: **7104A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed two years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;
http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html.

If you have any questions, you may contact the Bureau by e-mail at certification.bureau@ic.gc.ca Please reference our file and submission number above for all correspondence.

Yours sincerely,

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