FCC Part 15C & Industry Canada Certification Report

for the

Chroma 60 Display

FCC ID = VC7120-0131
IC = 8910A-1200131

Project Engineer: R. P. St John James

Approval Signatory

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

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ilac-MRA UKAS TESTING 1871

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Document History:

Issue#1: 24th December 2014 was withdrawn and replaced by Issue#2: Note added to plots on pages 11 to 14 with incorrect date.

1.0 DECLARATION

1.1 FCC Part 15C Statement and Industry Canada (IC) Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with IC RSS-Gen 3 Issue 3:2010 and IC RSS-210 Issue 8 and the parts 15.109, 15.209 and 15.249 of the CFR 47:2013 FCC rules in accordance with ANSI C63.4:2003. The EUT operates at frequencies of 902.5 to 927.5 MHz and complies with part 15C emission requirements.

1.2 Related Submittal(s) Grants

This is an application for certification of a Chroma 60 Display (transmitting at 902.5 to 927.5 MHz), described in this report.

The sections of FCC Part 15 that apply to the EUT are:
15.209 General requirements
15.249 Operation within the band 902 to 928 MHz
15.109 applied to the EUT in receive model.

Note: The EUT in receiver mode complies with part 15B of the FCC rules for unintentional radiators.

1.3 EUT Manufacturer

Trade name:	Displaydata Limited
Company name:	Displaydata Limited
Company address:	Century Court Millenium Way Bracknell Berkshire RG12 2XT United Kingdom
Manufacturing address:	As above.
Company representative:	Mr Simon Cox Tel: +44 (0) 1344 887685

2.0 EUT DESCRIPTION

2.1 Identity

EUT:	Electronic Shelf Label
Model:	Chroma 60
Serial numbers:	JD00000003 (38.4kbps data rate) JD00000006 (100kbps data rate)
	The serial numbers of EUTs were allocated by Displaydata specifically for testing purpose identification, and do not reflect serial numbers used in Chroma 60 production.
Sample build:	Production
	FCC ID = VC7120-0131 IC = 8910A-1200131

2.2 Product Operation

The EUT is part of a system for electronic shelf labels to be used within retail outlets such as shops and super markets. The EUT is an electronic shelf edge label that displays product and price information. The EUT is always installed in a vertical position but can be orientated in landscape or portrait. The EUT contains a radio for receiving and transmitting data to a base unit known as a Dynamic Communicator. The EUT transmits infrequently, typically once a day for a few milliseconds.

2.3 Support Equipment

SUPPORTING EQUIPMENT	PART/MODEL NUMBER	SERIAL NUMBER
Dell Laptop	Latitude 1 D620	205-655 644-27
Dell Power Supply	Dell 90W–DL620	N/A
Ethernet hub	NetGear FS108P	2HK1163E007A7
Ethernet hub PSU	NetGear NU60-F480125-1NN	N/A
Displaydata Communicator	Dynamic Communicator	ZC0000035

2.4 Exerciser Program

The EUT was set to transmit continuously at the bottom, middle and top of the 902 to 928MHz radio operating range, this being 902.5, 913.5 and 927.5MHz respectively. The laptop, via the Dynamic Communicator, was used to set the operating frequency of the EUT. Once transmitting the EUT was tested standalone in the semi-anechoic chamber.

The EUT was measured in 100kbps data rate and 38.4kbps data rate, initial tests showed the worst case (highest amplitude) results were with the 100kbps data rate. The 902 and 928MHz band-edge was measured at both data rates. All emissions were maximised and measured in both landscape and portrait orientations.

The EUT was also tested in receive mode, the sample s/n JD00000003 was used for this test.

All the tests were performed with the EUT powered with new batteries.

3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Offices	Hursley EMC Services Ltd Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire
EMI Measurement Site	Hursley EMC Services Ltd Hursley Park, Winchester; FCC Registered UK Designation number: UK0006 Industry Canada Registration Number : **7104A**
Test Dates	22nd & 23rd December 2014
HEMCS References:	14R601

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.

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 & Conducted	20.5 to 21.5 degrees Celsius	40 to 45% relative	1015 to 1015 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
040	1	HP	8593EM	3536A00137	Spectrum analyser (9kHz-26.5GHz)	15/10/2015
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	Internal
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	26/06/2015
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	02/10/2015
466	2	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	29/01/2015
552	1	Rohde & Schwarz	ESCI7	1166595007	7GHz Receiver	17/04/2015

The data obtained from the profile scan was used as a guide for the final measurements. Profiles were measured of the EUT in both orientations and at both data rates.

Final Measurements

The system under test was then measured at three metres in the Open Area Test site (OATS) using a receiver. The data obtained from the chamber profile-scan was used to guide the test engineer. Above 30 MHz, each emission from the transmitter was maximised by revolving the system on the turntable and moving the antennae in height and azimuth. All tests were repeated with the EUT in both landscape and portrait orientations. The worst-case data is presented in this report.

Test instrumentation used was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	02/10/2015
466	2	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	29/01/2015
552	1	Rohde & Schwarz	ESCI7	1166595007	7GHz Receiver	17/04/2015

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

4.0 TEST DATA

4.1 FCC – Radiated Emissions (Transmitting)

A search was made of the frequency spectrum from 30 MHz to 10 GHz and the measurements reported are the highest emissions relative to the 'FCC CFR 47 Section 15.209 and 15.249 Limits' at a measuring distance of three metres.

Testing was performed with the EUT at the top, bottom and middle transmitter operating frequencies. Below 1 GHz a quasi-peak detector was used (bandwidth 120 kHz), above 1 GHz a peak and average detector was used (bandwidth 1 MHz). The worst-case results from all tests are presented here.

The transmitter frequencies show all 4 results from each orientation and both data rates to show spread.

RESULTS - 30 MHz to 1000 MHz

Frequency MHz	Receiver amplitude dBµV	Antenna factor dB	Cable loss dB	Actual quasi-peak value @ 3m dBµV/m	Specified limit @ 3m dBµV/m	Data rate kbps	Channel B,M,T	Orientation Port / Land
901.9500	10.6	21.9	5.0	37.53	46	38.4	B	Landscape
901.9500	12.5	21.9	5.0	39.37	46	38.4	B	Portrait
902.0000	11.6	21.9	5.0	38.48	46	38.4	B	Landscape
902.0000	13.7	21.9	5.0	40.56	46	38.4	B	Portrait
902.5000*	55.1	21.9	5.0	81.99	94	38.4	B	Landscape
902.5000*	57.9	21.9	5.0	84.82	94	38.4	B	Portrait
901.9500	10.6	21.9	5.0	37.47	46	100	B	Landscape
901.9500	11.8	21.9	5.0	38.71	46	100	B	Portrait
902.0000	11.5	21.9	5.0	38.36	46	100	B	Landscape
902.0000	12.9	21.9	5.0	39.77	46	100	B	Portrait
902.5000*	53.0	21.9	5.0	79.9	94	100	B	Landscape
902.5000*	55.2	21.9	5.0	82.14	94	100	B	Portrait
913.5000*	58.3	21.9	5.0	85.19	94	38.4	M	Landscape
913.5000*	53.5	21.9	5.0	80.39	94	38.4	M	Portrait
913.5000*	58.8	21.9	5.0	85.65	94	100	M	Landscape
913.5000*	55.2	21.9	5.0	82.07	94	100	M	Portrait
927.5000*	57.6	22.0	5.1	84.73	94	38.4	T	Landscape
927.5000*	54.6	22.0	5.1	81.71	94	38.4	T	Portrait
928.0000	15.7	22.0	5.1	42.76	46	38.4	T	Landscape
928.0000	13.5	22.0	5.1	40.55	46	38.4	T	Portrait
928.0500	15.1	22.0	5.1	42.21	46	38.4	T	Landscape
928.0500	13.0	22.0	5.1	40.05	46	38.4	T	Portrait

*Transmitter frequency

Uncertainty of measurements: ± 4.2 dBµV for a 95% confidence level.

The table for transmitted frequencies shows test results measured with 38.4kbps and 100kbps data rates, in portrait and landscape product orientations.

Radiated emissions (continued)

RESULTS - 1.0 GHz to 10.0 GHz

Frequency GHz	Receiver amplitude dBµV	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual average value @ 3m dBµV/m	Specified average limit @ 3m dBµV/m	Data Rate kbps	Channel B,M,T	Orientation Port / Land
1.805	40.7	26.7	2.4	39.0	30.84	54.0	38.4	B	Landscape
5.415	35.5	29.5	4.8	37.9	31.88	54.0	38.4	B	Landscape
1.805	38.0	26.7	2.4	39.0	28.12	54.0	100	B	Landscape
5.415	38.1	29.5	4.8	37.9	34.49	54.0	100	B	Landscape
1.805	48.8	26.7	2.4	39.0	38.9	54.0	38.4	B	Portrait
5.415	36.4	29.5	4.8	37.9	32.83	54.0	38.4	B	Portrait
1.805	42.6	26.7	2.4	39.0	32.74	54.0	100	B	Portrait
5.415	36.3	29.5	4.8	37.9	32.71	54.0	100	B	Portrait
1.827	47.2	26.7	2.4	39.0	37.32	54.0	38.4	M	Landscape
5.481	33.9	29.5	4.8	37.9	30.29	54.0	38.4	M	Landscape
1.827	30.4	26.7	2.4	39.0	20.5	54.0	100	M	Landscape
5.481	37.1	29.5	4.8	37.9	33.46	54.0	100	M	Landscape
1.827	46.9	26.7	2.4	39.0	36.97	54.0	38.4	M	Portrait
5.481	34.7	29.5	4.8	37.9	31.09	54.0	38.4	M	Portrait
1.827	46.6	26.7	2.4	39.0	36.73	54.0	100	M	Portrait
5.481	27.6	29.5	4.8	37.9	24.00	54.0	100	M	Portrait
1.855	35.1	26.7	2.4	39.0	25.18	54.0	38.4	T	Landscape
5.565	23.3	30.1	4.8	37.9	20.32	54.0	38.4	T	Landscape
1.855	31.6	26.7	2.4	39.0	21.71	54.0	100	T	Landscape
5.565	24.8	30.1	4.8	37.9	21.77	54.0	100	T	Landscape
1.855	35.5	26.7	2.4	39.0	25.56	54.0	38.4	T	Portrait
5.565	30.8	30.1	4.8	37.9	27.79	54.0	38.4	T	Portrait
1.855	31.5	26.7	2.4	39.0	21.56	54.0	100	T	Portrait
5.565	37.0	30.1	4.8	37.9	34.02	54.0	100	T	Portrait

Frequency GHz	Receiver amplitude dBµV	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual Peak Value @ 3m dBµV/m	Specified Peak limit @ 3m dBµV/m	Data Rate Kbps	Channel B,M,T	Orientation Port / Land
1.805	45.5	26.7	2.4	39.0	35.57	74.0	38.4	B	Landscape
5.415	47.0	29.5	4.8	37.9	43.44	74.0	38.4	B	Landscape
1.805	43.9	26.7	2.4	39.0	34.04	74.0	100	B	Landscape
5.415	47.3	29.5	4.8	37.9	43.74	74.0	100	B	Landscape
1.805	51.8	26.7	2.4	39.0	41.88	74.0	38.4	B	Portrait
5.415	48.1	29.5	4.8	37.9	44.51	74.0	38.4	B	Portrait
1.805	46.6	26.7	2.4	39.0	36.73	74.0	100	B	Portrait
5.415	45.8	29.5	4.8	37.9	42.19	74.0	100	B	Portrait
1.827	50.6	26.7	2.4	39.0	40.68	74.0	38.4	M	Landscape
5.481	46.0	29.5	4.8	37.9	42.42	74.0	38.4	M	Landscape
1.827	40.3	26.7	2.4	39.0	30.36	74.0	100	M	Landscape
5.481	46.5	29.5	4.8	37.9	42.94	74.0	100	M	Landscape
1.827	50.4	26.7	2.4	39.0	40.49	74.0	38.4	M	Portrait
5.481	46.6	29.5	4.8	37.9	42.98	74.0	38.4	M	Portrait
1.827	49.9	26.7	2.4	39.0	39.98	74.0	100	M	Portrait
5.481	39.0	29.5	4.8	37.9	35.38	74.0	100	M	Portrait
1.855	42.6	26.7	2.4	39.0	32.71	74.0	38.4	T	Landscape
5.565	35.3	30.1	4.8	37.9	32.34	74.0	38.4	T	Landscape
1.855	40.6	26.7	2.4	39.0	30.65	74.0	100	T	Landscape
5.565	37.1	30.1	4.8	37.9	34.10	74.0	100	T	Landscape
1.855	42.4	26.7	2.4	39.0	32.45	74.0	38.4	T	Portrait
5.565	43.2	30.1	4.8	37.9	40.24	74.0	38.4	T	Portrait
1.855	41.4	26.7	2.4	39.0	31.54	74.0	100	T	Portrait
5.565	46.4	30.1	4.8	37.9	43.41	74.0	100	T	Portrait

Procedure: In accordance with ANSI C63.4:2003

Measurements below 1.0 GHz performed with a quasi-peak detector. Measurements above 1.0 GHz performed with an average and peak detector.

The tables above 1GHz show the test results for the data rate with the highest emission in both landscape and portrait product orientations. This was found to be with 38.4kbps data rate in all cases.

Note: To meet the limit the transmitter amplitude was turned down to -5dBm.

TEST ENGINEER: Rob St John James

4.2 FCC – Radiated Emissions (Receive Mode)

A search was made of the frequency spectrum from 30 MHz to 10.0 GHz and the measurements reported are the highest emissions relative to the 'FCC CFR 47 Section 15.109 Limits' at a measuring distance of three metres.

RESULTS 30 MHz to 1000 MHz

Frequency MHz	Receiver amplitude dBµV	Antenna factor dB	Cable loss dB	Actual quasi-peak value @ 3m dBµV/m	Specified limit @ 3m dBµV/m
All emissions were at or below the noise floor of the measuring system.					

Procedure: In accordance with ANSI C63.4:2003

Measurements below 1000 MHz performed with a quasi-peak detector. Measurements above 1000 MHz performed with an average and peak detector.

4.3 Occupied Bandwidth

Section 4.6 of RSS-GEN

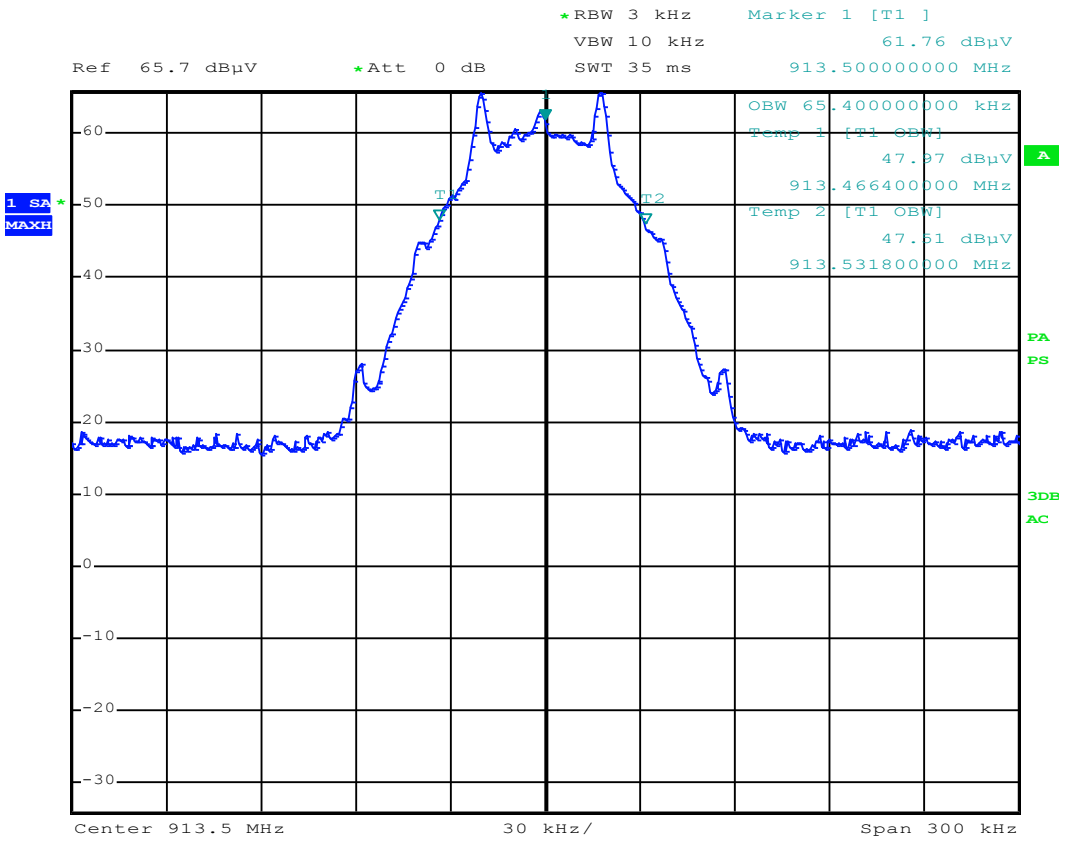
The output from the measuring antenna was fed into the input of the ESCI7 spectrum analyser/receiver. The bandwidth of the transmitter was measured with an ESCI7 analyser set to 99% Occupied Bandwidth with a sampling detector on max hold. The resolution bandwidth, span and video bandwidth are indicated on the occupied bandwidth plot (modulated) included with this report.

The bandwidth of the modulated Transmitter signal was measured as 65.4kHz at the 38.4kbps data rate and 95.4kHz at the 100kbps data rates.

TEST ENGINEER: Rob St John James

4.4 99% Bandwidth Plots

38.4kbps data rate bandwidth measured as 65.4kHz

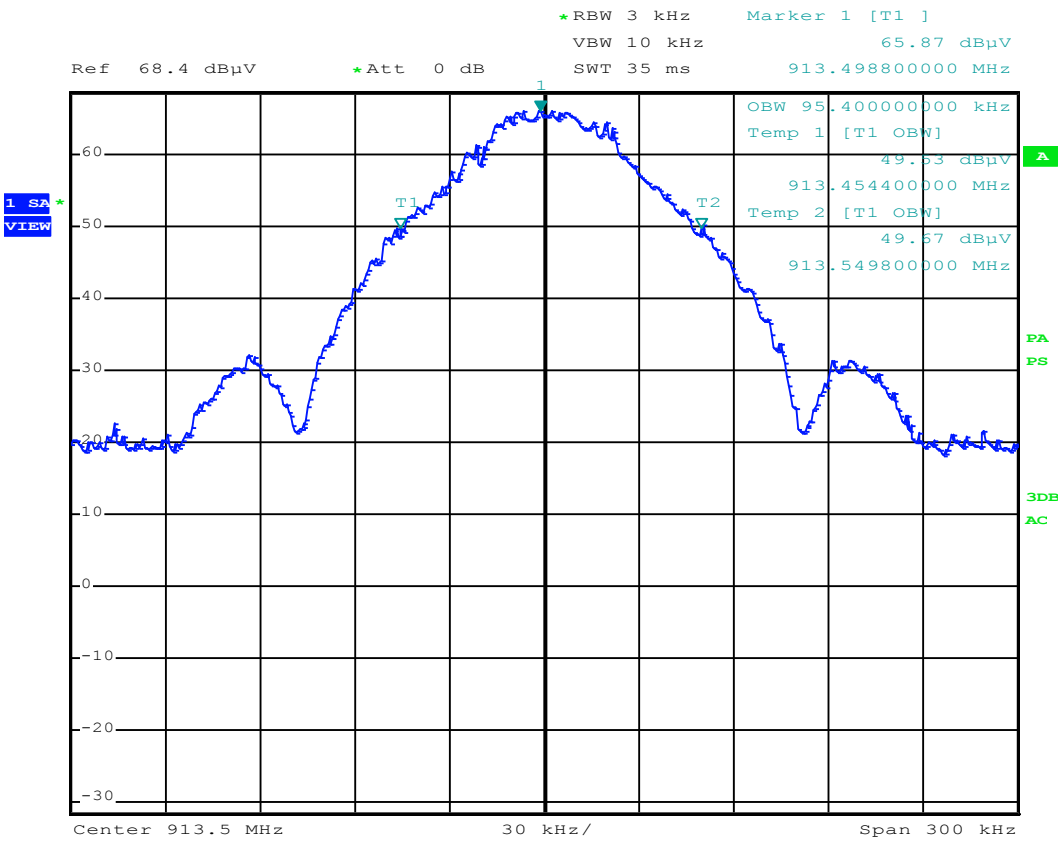


Date: 8.DEC.2014 15:43:42

Note: The spectrum analyser used for the above plot had an incorrect date set , the date of testing for the above plot was the 23d December 2014.

99% Bandwidth Plots (continued)

100kbps data rate bandwidth measured as 95.4kHz.

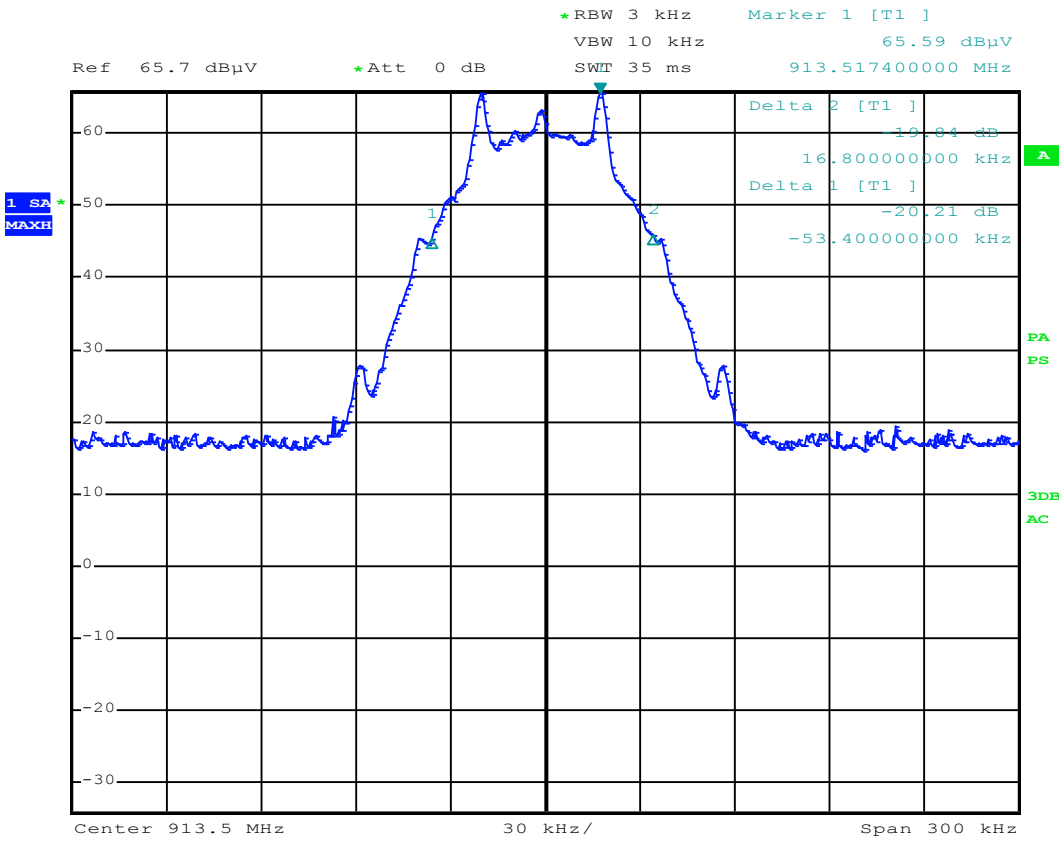


Date: 8.DEC.2014 16:12:46

Note: The spectrum analyser used for the above plot had an incorrect date set , the date of testing for the above plot was the 23d December 2014.

4.5 20dB Bandwidth Plot

38.4kbps data rate 20dB bandwidth measured as 70.2kHz (70.2kHz = 53.4kHz + 16.8kHz from plot below)

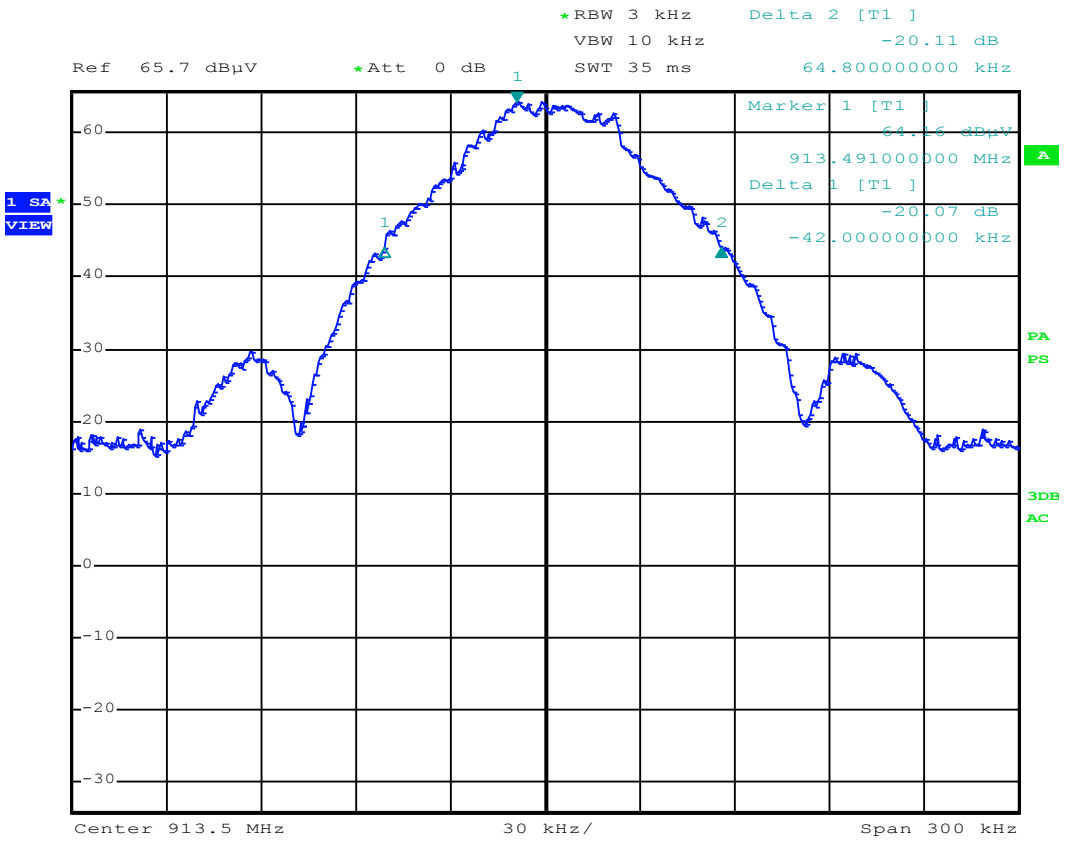


Date: 8.DEC.2014 15:49:12

Note: The spectrum analyser used for the above plot had an incorrect date set , the date of testing for the above plot was the 23d December 2014.

20dB Bandwidth Plot (continued)

100kbps data rate 20dB bandwidth measured as 106.8kHz (106.8kHz = 64.8kHz + 42kHz from plot below)

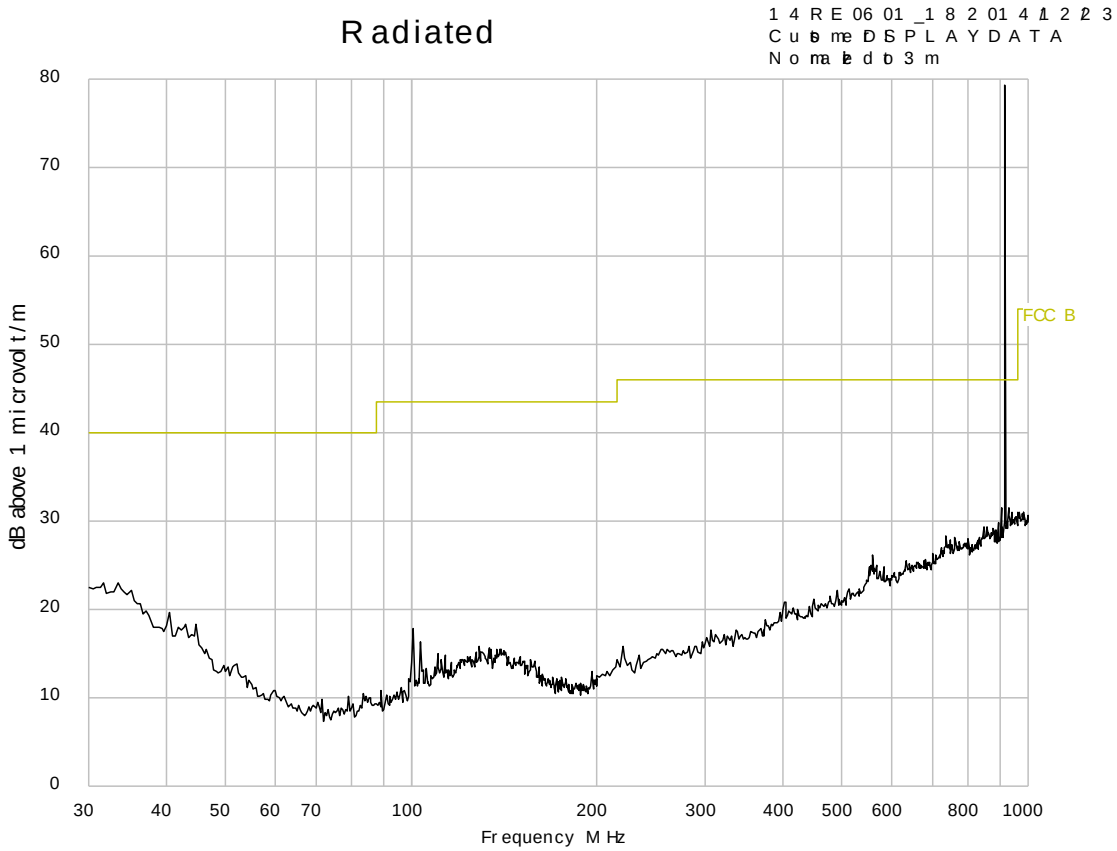


Date: 8.DEC.2014 15:52:34

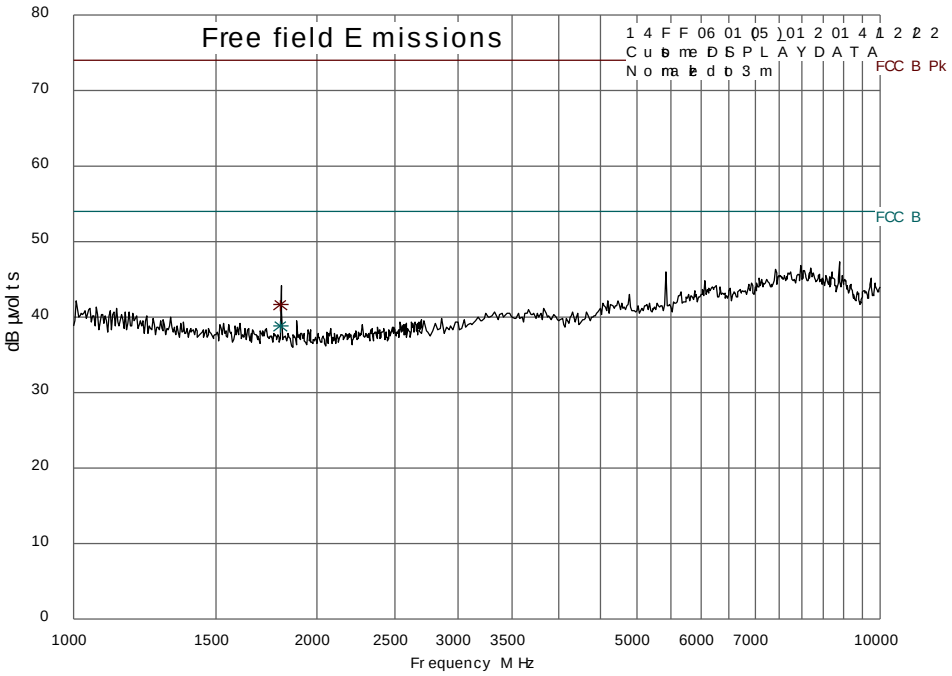
Note: The spectrum analyser used for the above plot had an incorrect date set , the date of testing for the above plot was the 23d December 2014.

5.0 TEST PLOTS

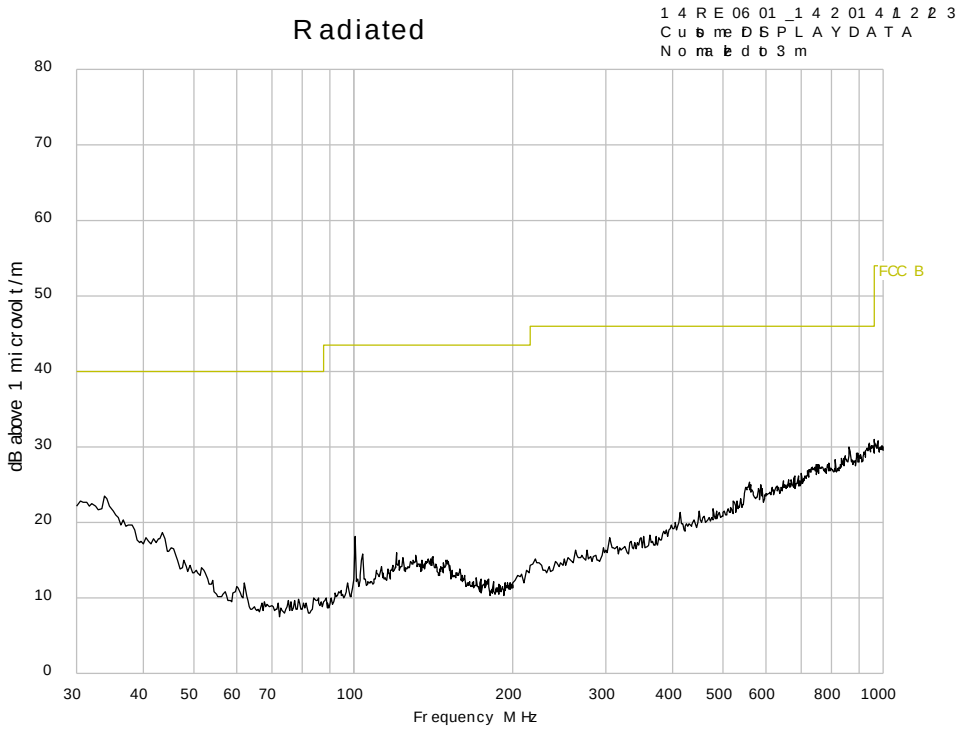
5.1 Radiated Emission Plot, 30 to 1000 MHz

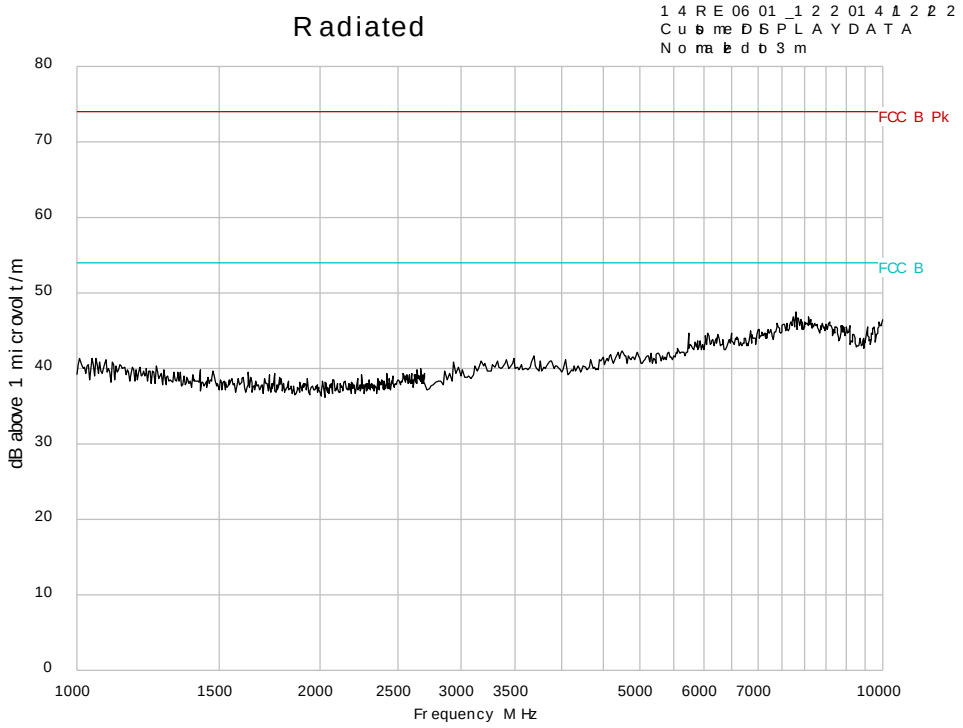


5.2 Radiated Emissions Plot, 1.0 to 10.0 GHz



5.3 Radiated Emissions Plots – Receive Mode





6.0 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