



HURSLEY
EMC
SERVICES

EMC TEST REPORT

No. 14R406 FR

Issue#2: 13th November 2014

UKAS Accredited
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FCC & VCCI Registered
BSMI Lab ID: SL2-IN-E-3008
KC Lab ID: EU0184

FCC Part 15C & Industry Canada Certification Report

for the

AURA 42 Display

FCC ID = VC7120-0129

IC = 8910A-1200129

Project Engineer: R. P. St John James

Approval Signatory

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Document History:

Issue#1: 25th September 2014 was withdrawn and replaced by Issue#2: updated with editorial correction.

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 an AURA 42 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: AURA 42

Serial numbers: JC00000999 (38.4kbps data rate)
LA00000004 (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 Aura 42 production.

Sample build: Production

FCC ID = VC7120-0129

IC = 8910A-1200129

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	Precision M4800	17883430057
Dell Power Supply	Dell FWCRC	48661-38S-473G-A03
Displaydata Communicator	Dynamic Communicator	ZC0000035

2.4 Exerciser Program

The EUT was set to transmit continuously at the top, middle and bottom of the 902-928MHz radio operating range, this being 927.5, 913.5 and 902.5MHz 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 38.4kbps 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 JC00000999 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	18 th & 19 th September 2014
HEMCS References:	14R406

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	23 to 25 degrees Celsius	55 to 60% relative	1005 to 1007 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)	10/10/2014
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	Internal
070	1	HP	8449B	3008A00481	Pre-amplifier (1.0-26.5GHz) + 0.5m cable	05/12/2014
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	R & S	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
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	06/06/2015
466	2	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	29/01/2015
109	3	Schwarzbeck	VULB 9163	9163-321	Trilog antenna (OATS)	19/10/2015

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, the worse results are shown for the band edge tests.

RESULTS - 30 MHz to 1000 MHz

Frequency MHz	Receiver amplitude dB μ V	Antenna factor dB	Cable loss dB	Actual quasi-peak value @ 3m dB μ V/m	Specified limit @ 3m dB μ V/m
901.950	14.7	21.9	5.0	41.62	46.0
902.000	16.2	21.9	5.0	43.08	46.0
902.000	15.8	21.9	5.0	42.68	46.0
902.000	15.7	21.9	5.0	42.58	46.0
902.500*	58.1	21.9	5.0	85.03	94.0
902.500*	55.8	21.9	5.0	82.67	94.0
902.500*	57.7	21.9	5.0	84.63	94.0
902.500*	57.6	21.9	5.0	84.53	94.0
913.500*	59.3	21.9	5.0	86.22	94.0
913.500*	55.5	21.9	5.0	82.38	94.0
913.500*	55.6	21.9	5.0	82.46	94.0
913.500*	57.4	21.9	5.0	84.34	94.0
927.500*	59.7	22.0	5.1	86.76	94.0
927.500*	58.2	22.0	5.1	85.29	94.0
927.500*	55.3	22.0	5.1	82.35	94.0
927.500*	52.3	22.0	5.1	79.36	94.0
928.000	17.5	22.0	5.1	44.61	46.0
928.000	11.6	22.0	5.1	38.72	46.0
928.050	16.4	22.0	5.1	43.51	46.0

*Transmitter frequency

Uncertainty of measurements: ± 4.2 dB μ V 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 dB μ V	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual average value @ 3m dB μ V/m	Specified average limit @ 3m dB μ V/m
1.805	48.6	26.7	2.4	39.0	38.70	54.0
1.805	50.1	26.7	2.4	39.0	40.17	54.0
1.827	49.7	26.7	2.4	39.0	39.77	54.0
1.827	49.4	26.7	2.4	39.0	39.47	54.0
1.855	51.6	26.7	2.4	39.0	41.73	54.0
1.855	50.8	26.7	2.4	39.0	40.92	54.0
5.415	54.4	29.5	4.8	37.9	50.78	54.0
5.415	55.2	29.5	4.8	37.9	51.56	54.0
5.481	56.5	29.5	4.8	37.9	52.91	54.0
5.481	54.3	29.5	4.8	37.9	50.67	54.0
5.565	54.0	30.1	4.8	37.9	50.95	54.0
5.565	53.0	30.1	4.8	37.9	49.98	54.0

Frequency GHz	Receiver amplitude dB μ V	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual peak value @ 3m dB μ V/m	Specified limit @ 3m dB μ V/m
1.805	51.9	26.7	2.4	39.0	42.03	74.0
1.805	52.8	26.7	2.4	39.0	42.91	74.0
1.827	51.9	26.7	2.4	39.0	42.00	74.0
1.827	51.6	26.7	2.4	39.0	41.68	74.0
1.855	54.0	26.7	2.4	39.0	44.13	74.0
1.855	53.4	26.7	2.4	39.0	43.49	74.0
5.415	56.2	29.5	4.8	37.9	52.55	74.0
5.415	56.9	29.5	4.8	37.9	53.28	74.0
5.481	58.0	29.5	4.8	37.9	54.36	74.0
5.481	56.1	29.5	4.8	37.9	52.46	74.0
5.565	55.6	30.1	4.8	37.9	52.60	74.0
5.565	54.7	30.1	4.8	37.9	51.71	74.0

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 dB μ V	Antenna factor dB	Cable loss dB	Actual quasi-peak value @ 3m dB μ V/m	Specified limit @ 3m dB μ V/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

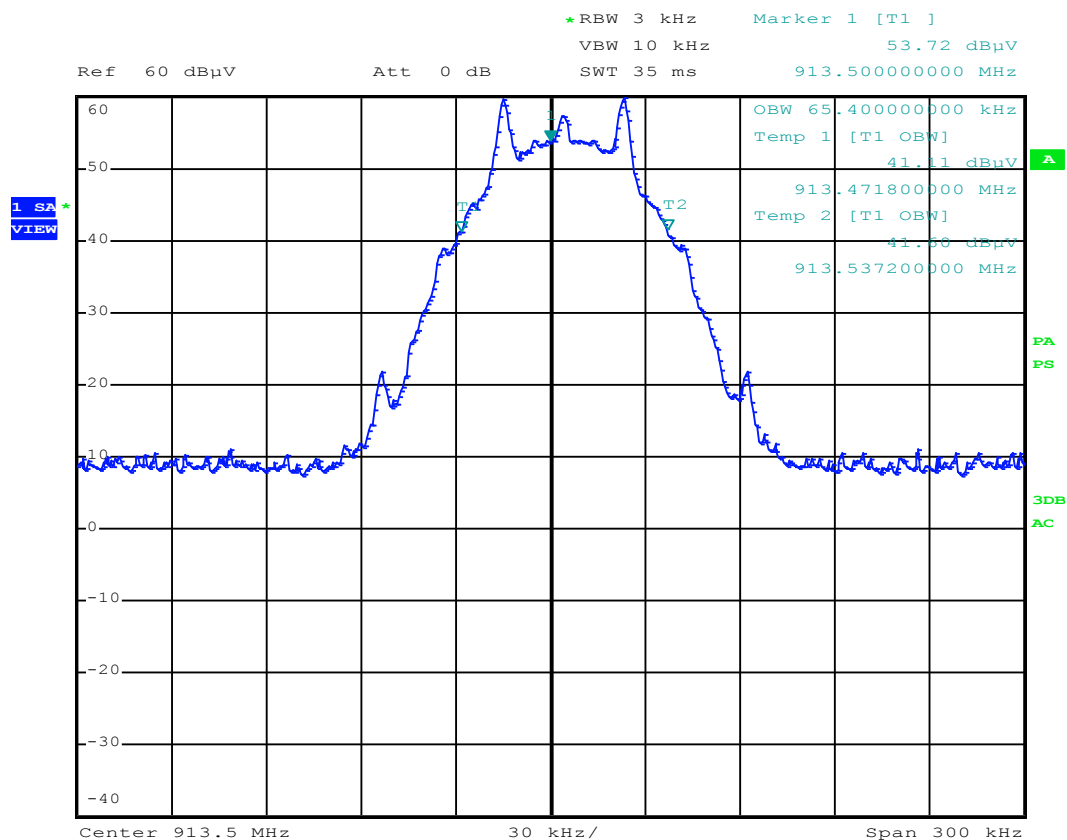
The output from the measuring antenna was fed into the input of the ESCI7 spectrum analyser/receiver. The bandwidth of the transmitter was measured with an ESCI7 analyser set to 99% Occupied Bandwidth with a sampling detector on max hold. The resolution bandwidth, span and video bandwidth are indicated 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 94.2kHz at the 100kbps data rates.

TEST ENGINEER: Rob St John James

4.4 99% Bandwidth Plots

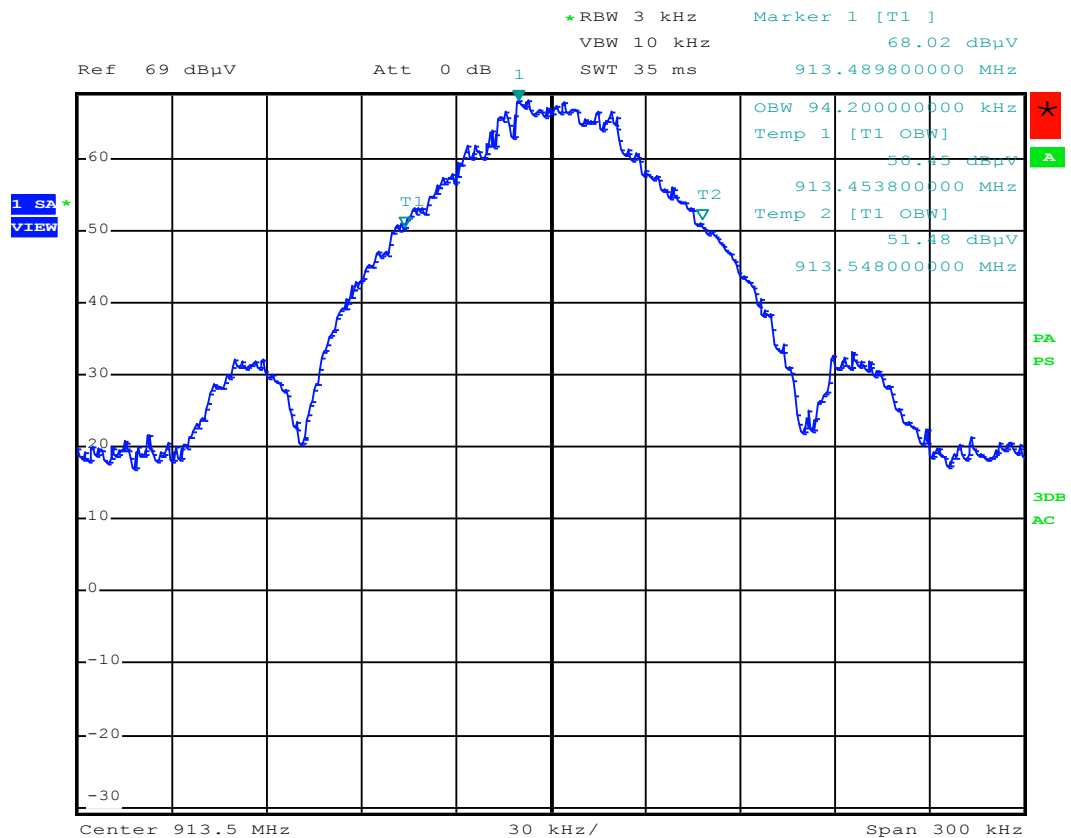
38.4kbps data rate bandwidth measured as 65.4kHz



Date: 19.SEP.2014 11:06:18

99% Bandwidth Plots (continued)

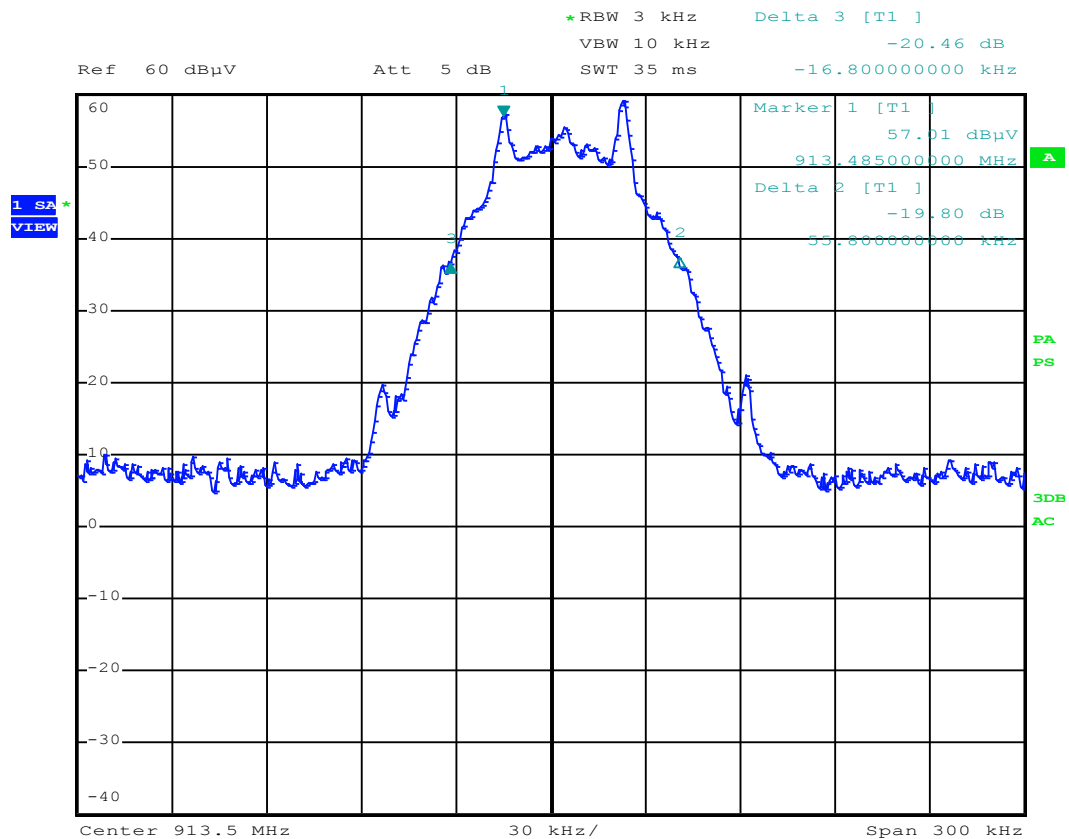
100kbps data rate bandwidth measured as 94.2kHz.



Date: 19.SEP.2014 11:27:00

4.5 20dB Bandwidth Plot

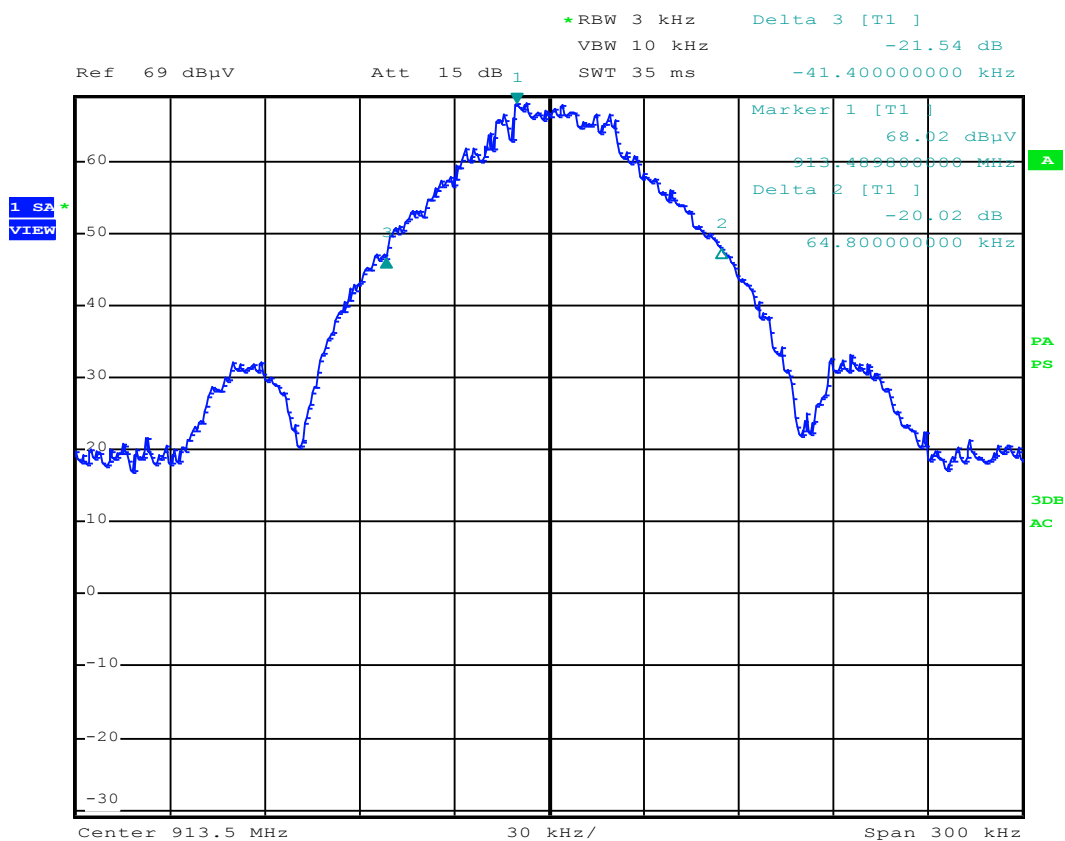
38.4kbps data rate 20dB bandwidth measured as 72.6kHz (72kHz = 55.8kHz + 16.8kHz from plot below)



Date: 19.SEP.2014 11:14:32

20dB Bandwidth Plot (continued)

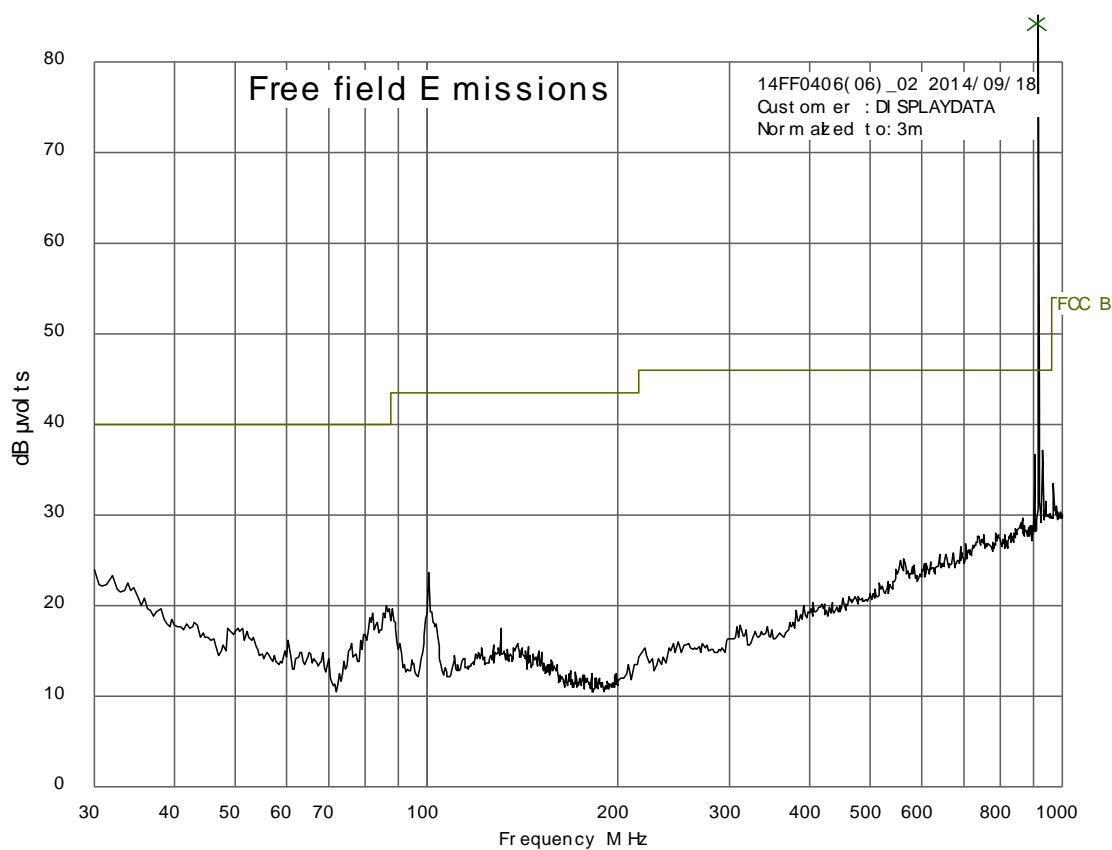
100kbps data rate 20dB bandwidth measured as 106.2kHz (106.2kHz = 64.8kHz + 41.4kHz from plot below)



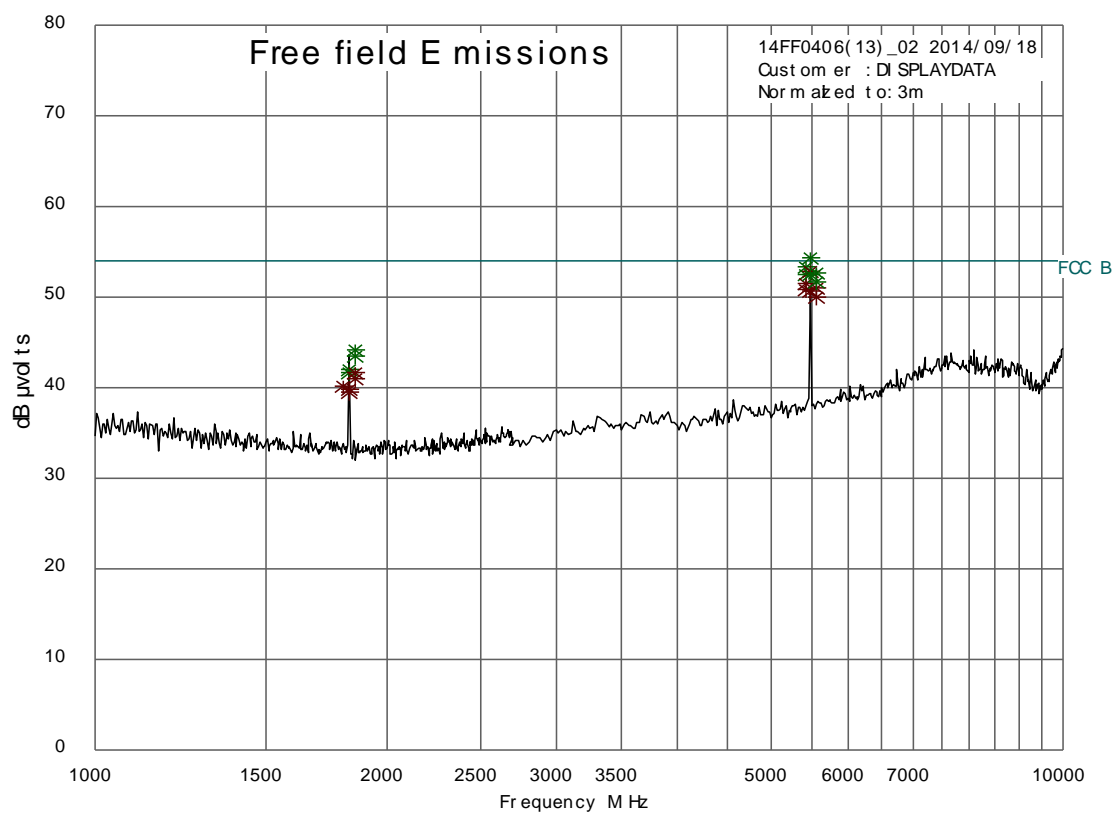
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5.0 TEST PLOTS

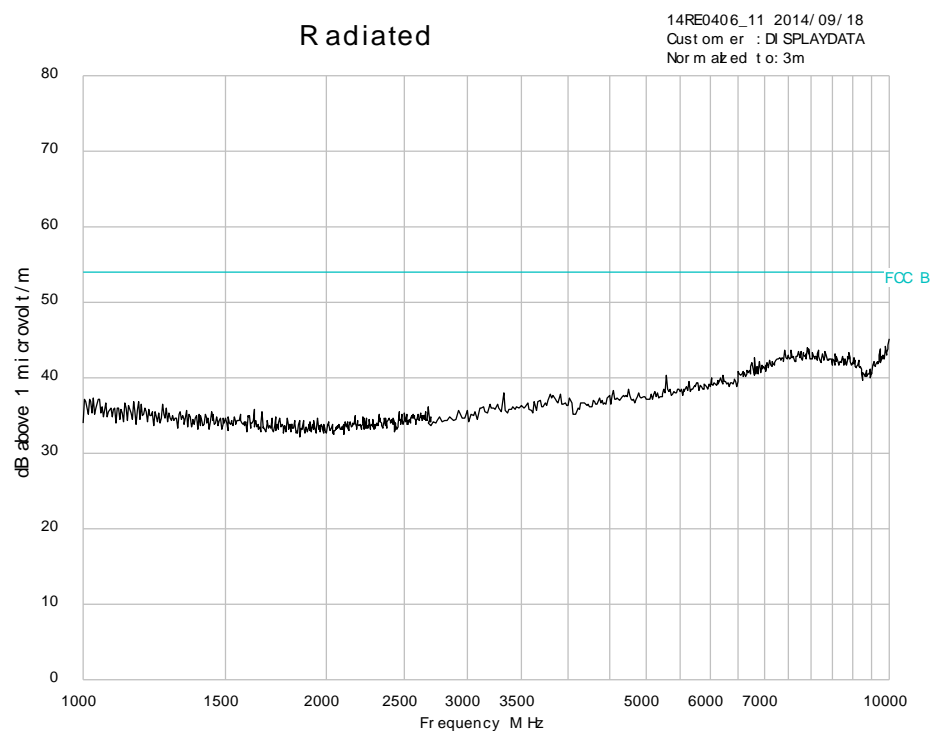
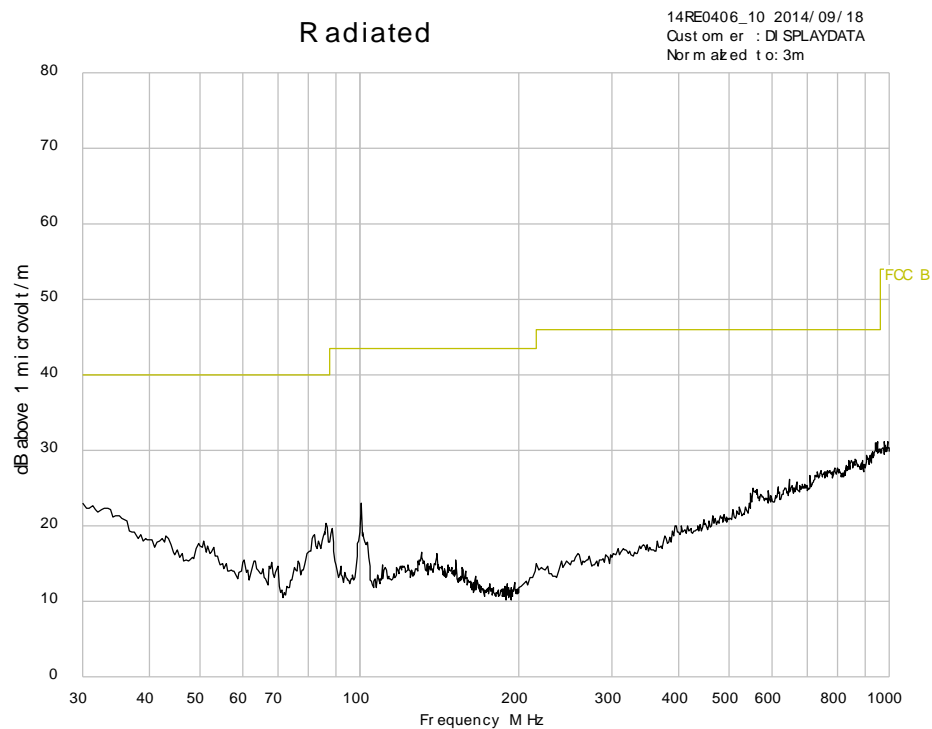
5.1 Radiated Emission Plot, 30 to 1000 MHz



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

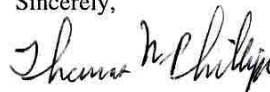
Dear Sir or Madam:

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