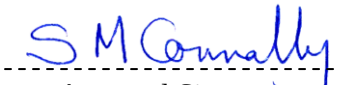
FCC Part 15C & Industry Canada Certification Report

for the

Displaydata Limited

Dynamic Communicator

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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Document History
Issue#1: 15th April 2014 was withdrawn and replaced by Issue#2: with 99% bandwidth plots added.

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 47:2010 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 Ethernet Communicator (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 mode and as a PC peripheral.

Note: The EUT in receiver mode and as a PC peripheral 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:	Dynamic Communicator
Serial number:	ZC00000025
Sample build:	Production

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 transmits retail information to shelf labels on the shop floor. The EUT has two similar transmitters, one set for 902-928MHz and the other for 868MHz, the transmitter is factory set according to which region the product is being shipped to. The EUT transmits with GFSK (Gaussian Frequency Shift Keying) modulation operating on any one channel in the frequency band 902.5 to 927.5 MHz. The EUT can operate in 2 modulation modes 38.4kHz and 100kHz modulation, both modes were tested. The EUT operates on a preset channel which can be changed to one of a number of channels within this frequency range. The EUT is controlled via an Ethernet connection, the preferred method of powering the EUT is via PoE (Power over Ethernet), alternatively the EUT can be powered via local mains adaptor.

2.3 Support Equipment

SUPPORTING EQUIPMENT	PART/MODEL NUMBER	SERIAL NUMBER
Dell Laptop	Precision M4800	17883430057
Dell Power Supply	Dell WW4XY	CN-OWW4XY-48661-3C6-6040G-A03
NetGear Hub	FS 108P	ZHK1163E007A7
NetGear Power Supply	NU60-F-480125-I	2411231811029004GP
Stontronics Mains Adaptor	3A-066WP05	001

2.4 Exerciser Program

The EUT was connected to a Laptop via an Ethernet switch, the laptop was used to control the operation of the EUT. The 902-928 MHz radio within the EUT was tested at the top, middle and bottom frequencies as well as powered over the Ethernet and via the mains adapter. The EUT was connected remotely to the laptop via a 40m unscreened Ethernet cable. The Ethernet hub provided both PoE ports and normal Ethernet ports (not powered), the EUT was tested in both modes with an AC adapter used to power the EUT in normal Ethernet mode.

The EUT was also tested in receive mode, with the transmitter in standby.

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	4th April & 6th May 2014
HEMCS References:	14R151

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 - 21 degrees Celsius	42 - 47% relative	997 - 1000 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
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	30/05/2014
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	Internal
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	16/05/2014
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	02/10/2014
466	2	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	29/01/2015

The data obtained from the profile scan was used as a guide for the final measurements.

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. 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
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	16/05/2014
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	28/05/2014
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	02/10/2014
466	2	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	29/01/2015

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

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)	10/01/2015
007	1	HP	8568B	1921A00797	Spectrum analyser	Internal
147	1	Rohde & Schwarz	ESH3 Z5	846695/011	Single phase (LISN / AMN)	23/05/2014
416	1	Rohde & Schwarz	ESH3Z2	1537	Pulse Limiter	21/01/2015

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 Power Line Conducted Emissions

4.1.1 Data

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	
0.5811	45.0	56.0	37.6	46.0	Pass
0.7075	43.8	56.0	29.6	46.0	Pass
0.8267	42.5	56.0	27.3	46.0	Pass

MAINS – NEUTRAL

Frequency (MHz)	Quasi-peak value (dBµV)		Average value (dBµV)		Status
	Measured	Limit	Measured	Limit	
0.5509	43.1	56.0	32.8	46.0	Pass
0.6756	43.7	56.0	26.9	46.0	Pass
0.7819	43.5	56.0	27.7	46.0	Pass

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

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

TEST ENGINEER: Ross Goodenough

4.2 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 powered by Ethernet and again with an AC adaptor as well as top, bottom and middle transmitter operating frequencies. Both modulation modes (38.4kHz and 100kHz modulation) were tested. 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.

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
30.574	21.5	10.8	0.7	33.02	40.0
53.592	17.2	13.1	0.9	31.20	40.0
98.063	10.8	11.3	1.3	23.43	40.0
113.532	12.4	10.4	1.4	24.22	40.0
400.030	7.8	15.9	2.9	26.59	46.0
480.080	5.6	17.0	3.3	25.89	46.0
901.950	17.3	21.9	5.0	44.24#	46.0
902.000	18.0	21.9	5.0	44.87#	46.0
*902.500	66.8	21.9	5.0	93.68#	94.0
*914.983	65.7	21.9	5.0	92.59#	94.0
*927.500	65.8	22.0	5.1	92.92#	94.0
928.000	17.8	22.0	5.1	44.92#	46.0
928.050	14.0	22.0	5.1	41.05	46.0

*Transmitter frequency

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

The measured result is below the specification limit by a margin less than the measurement uncertainty; it is not therefore possible to determine compliance at a level of confidence of 95%. However, the measured result indicates a higher probability that the EUT tested complies with the specification limit.

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
1.805	57.4	26.7	2.2	39.0	42.3	54.0
1.829	55.4	26.7	2.2	39.0	45.3	54.0
1.855	56.4	26.7	2.2	39.0	46.3	54.0

Frequency GHz	Receiver amplitude dBµV	Antenna factor dB	Cable loss dB	Pre-amp gain dB	Actual peak value @ 3m dBµV/m	Specified limit @ 3m dBµV/m
1.805	56.0	26.7	2.2	39.0	45.9	74.0
1.829	58.4	26.7	2.2	39.0	48.3	74.0
1.855	58.8	26.7	2.2	39.0	48.7	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.

Note: To meet the limit the transmitter amplitude was turned down from level 7 to level 5.

TEST ENGINEER: Ross Goodenough

4.3 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. The worst-case results with the EUT powered by the AC Adaptor or PoE are presented here.

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
30.574	21.7	10.8	0.7	33.24	40.0
53.592	18.9	13.1	0.9	32.85	40.0
98.063	6.5	11.3	1.3	19.14	40.0
113.607	12.3	10.4	1.4	24.13	40.0
400.030	8.1	15.9	2.9	26.88	46.0
480.080	5.6	17.0	3.3	25.89	46.0

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.

4.4 Occupied Bandwidth

Section 4.6 of RSS-GEN

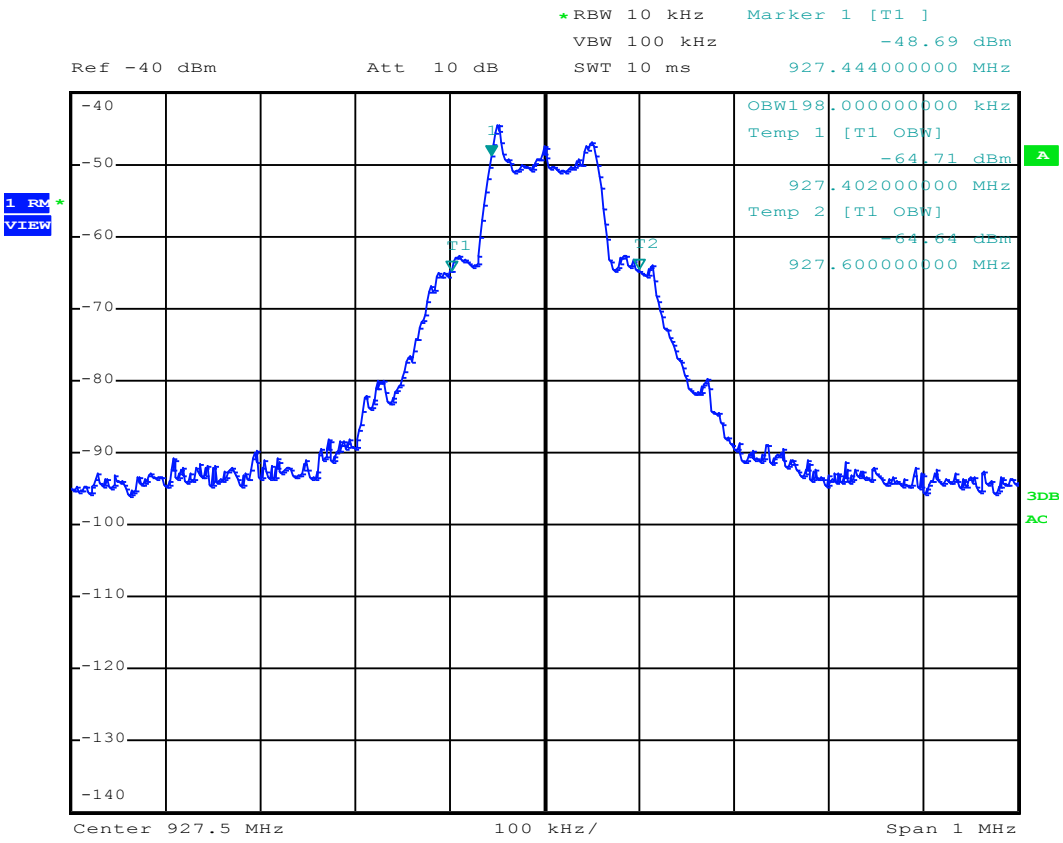
The output from the measuring antenna was fed into the input of the ESCI7 spectrum analyser/receiver. The bandwidth of the transmitter was measured with an ESCI7 analyser set to 99% Occupied Bandwidth with a sampling detector on max hold. The resolution bandwidth, span and video bandwidth are indicated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

The bandwidth of the modulated Transmitter signal was measured as 66 kHz.

TEST ENGINEER: Ross Goodenough

4.5 99% Bandwidth Plot (Nominal 100 kHz)

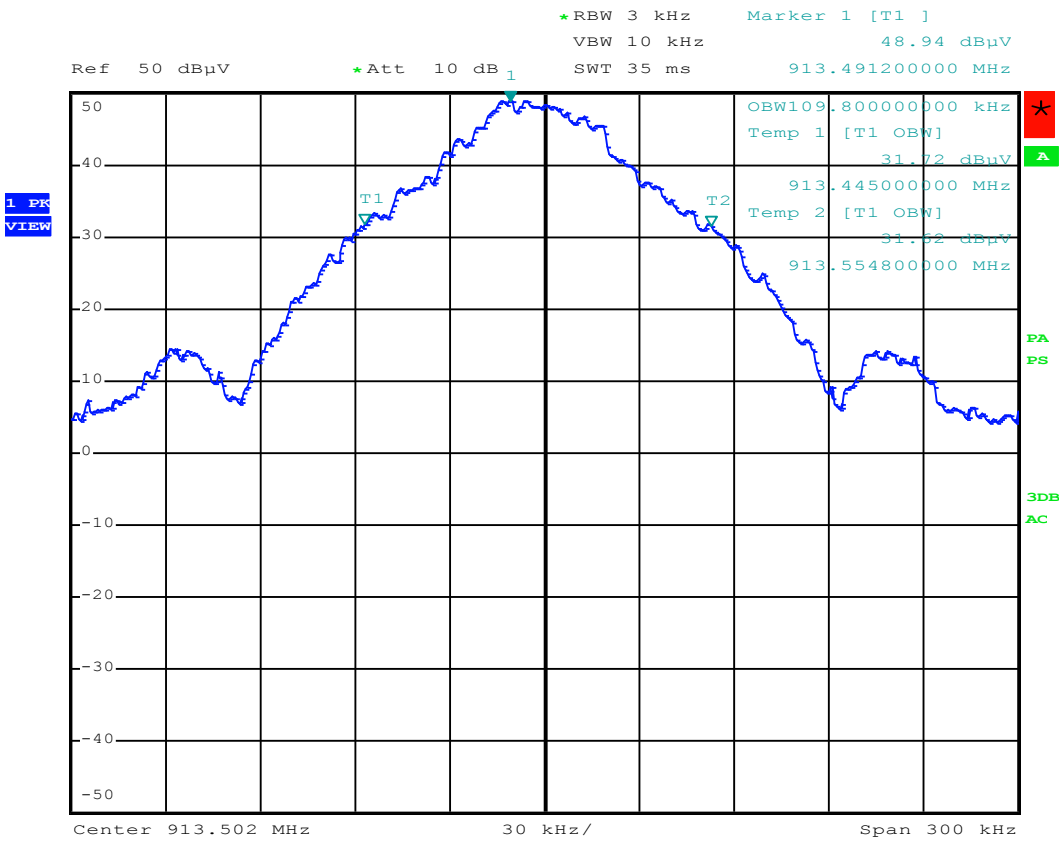
bandwidth measured as 198kHz



Date: 6.MAY.2014 13:52:00

4.6 99% Bandwidth Plot (Nominal 38.4kHz)

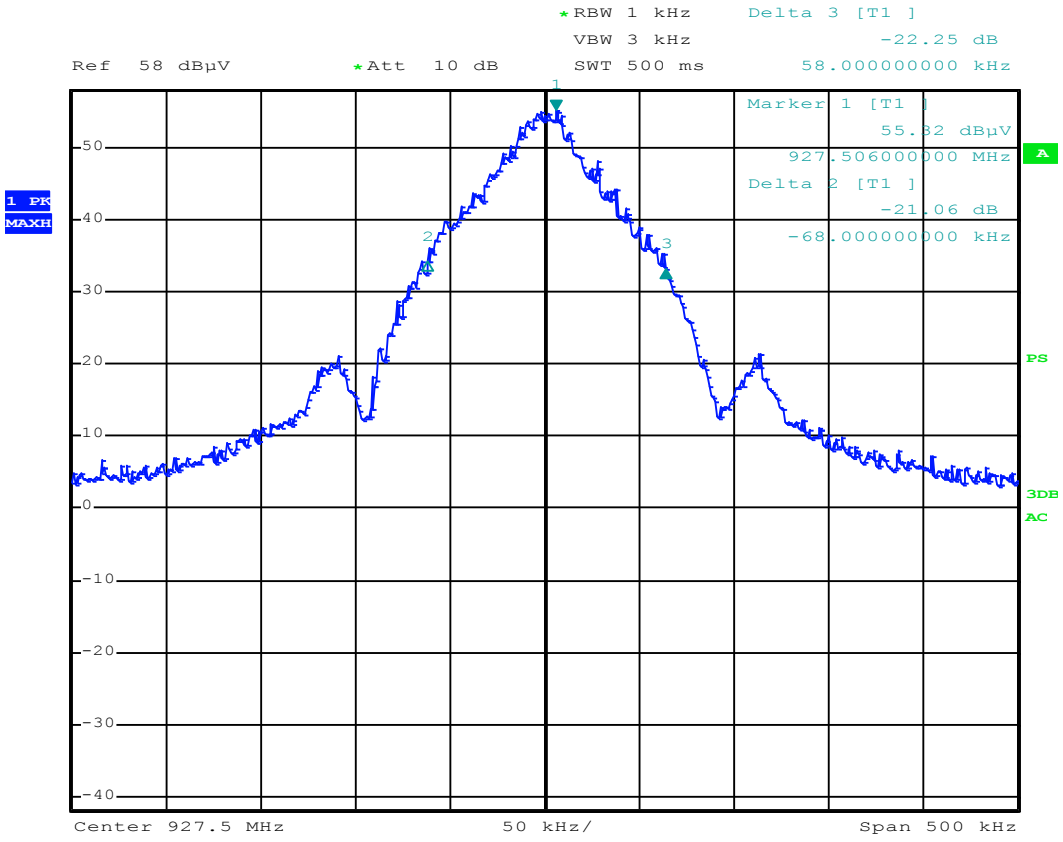
bandwidth measured as 109.8kHz



Date: 14.APR.2014 17:31:22

4.7 20dB Bandwidth Plot (Nominal 38.4kHz)

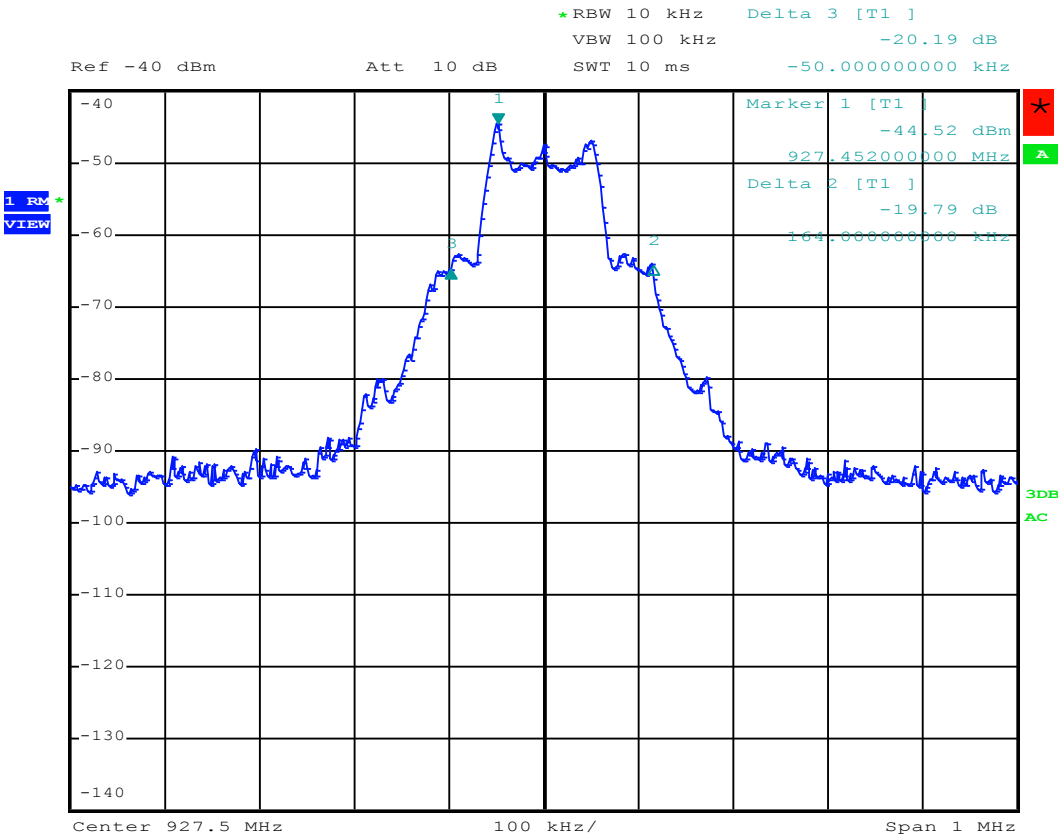
20dB bandwidth measured as 126kHz (126kHz = 58kHz +68 kHz from plot below)



Date: 4.APR.2014 17:08:52

4.8 20dB Bandwidth Plot (nominal 100kHz)

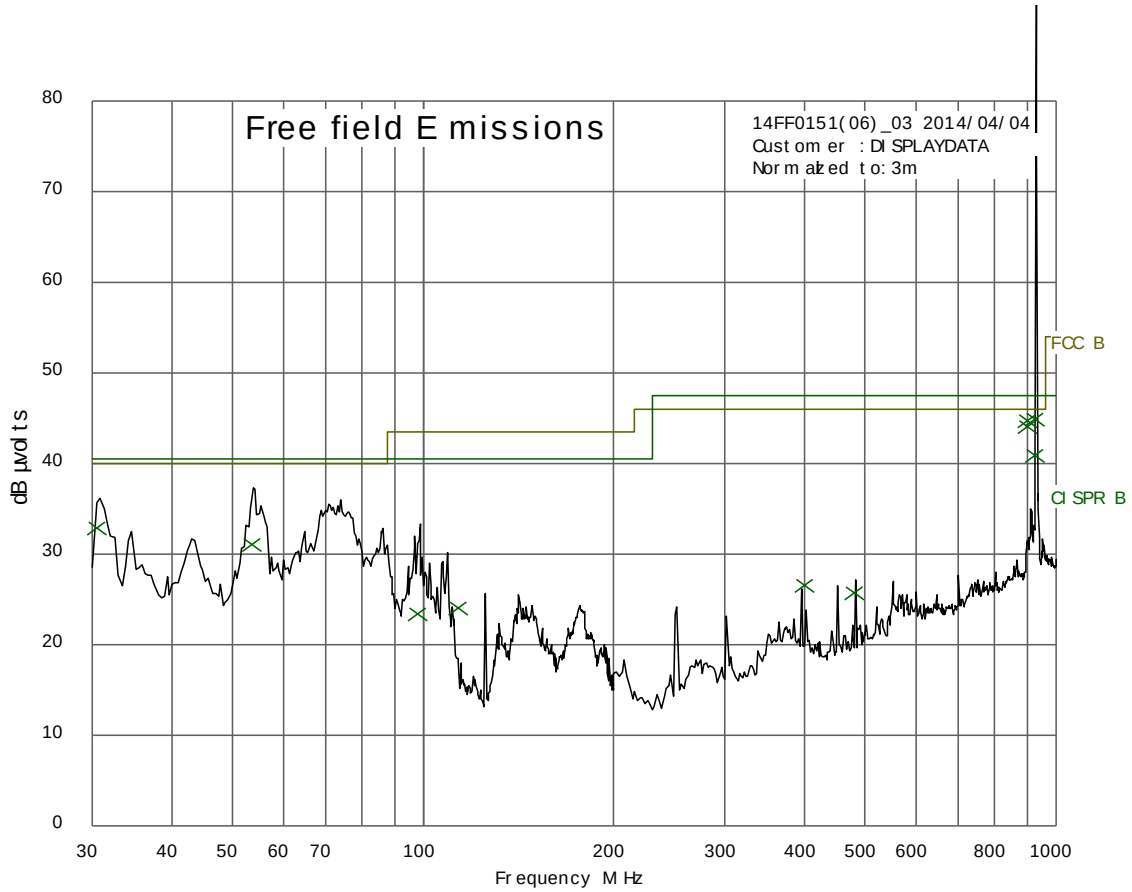
20dB bandwidth measured as 214kHz (214kHz = 50kHz +164 kHz from plot below)



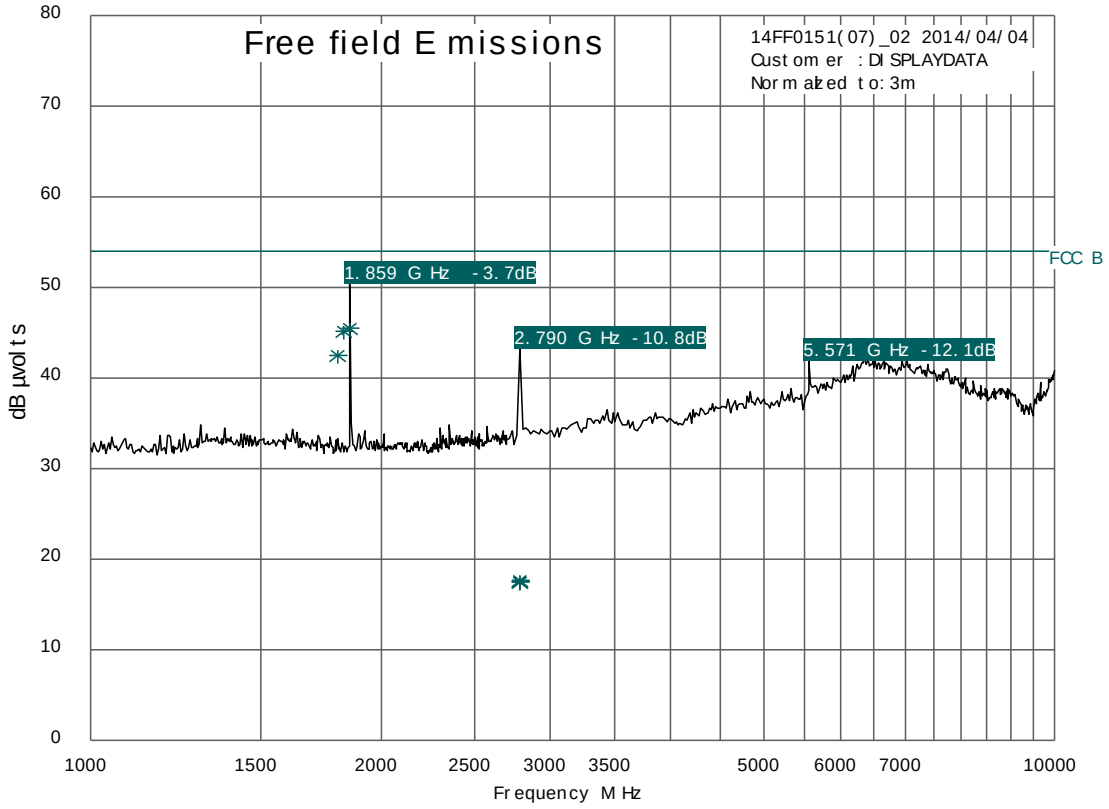
Date: 6.MAY.2014 13:54:33

5.0 TEST PLOTS

5.1 Radiated Emission Plot, 30 to 1000 MHz

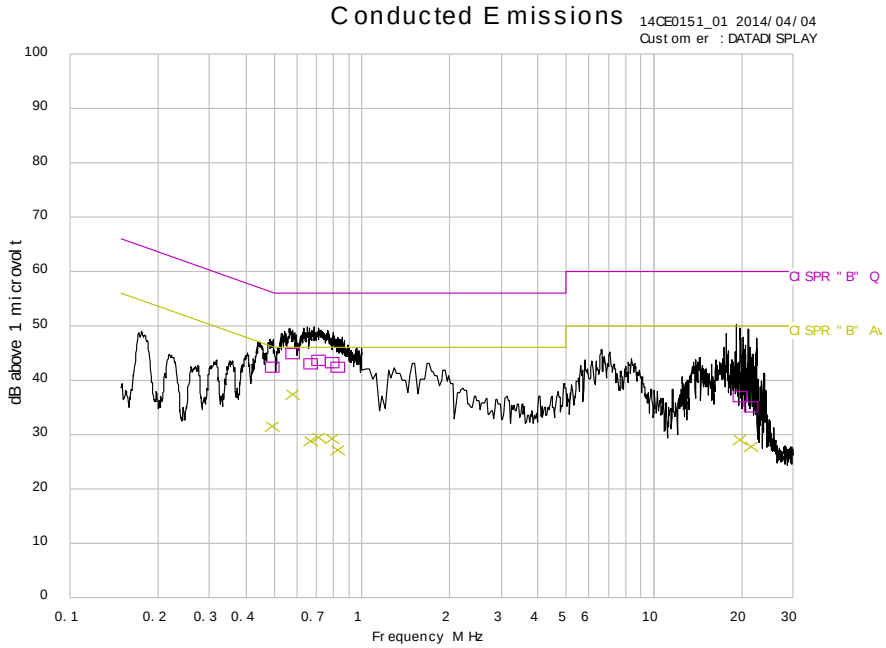


5.2 Radiated Emissions Plot, 1.0 to 10.0 GHz

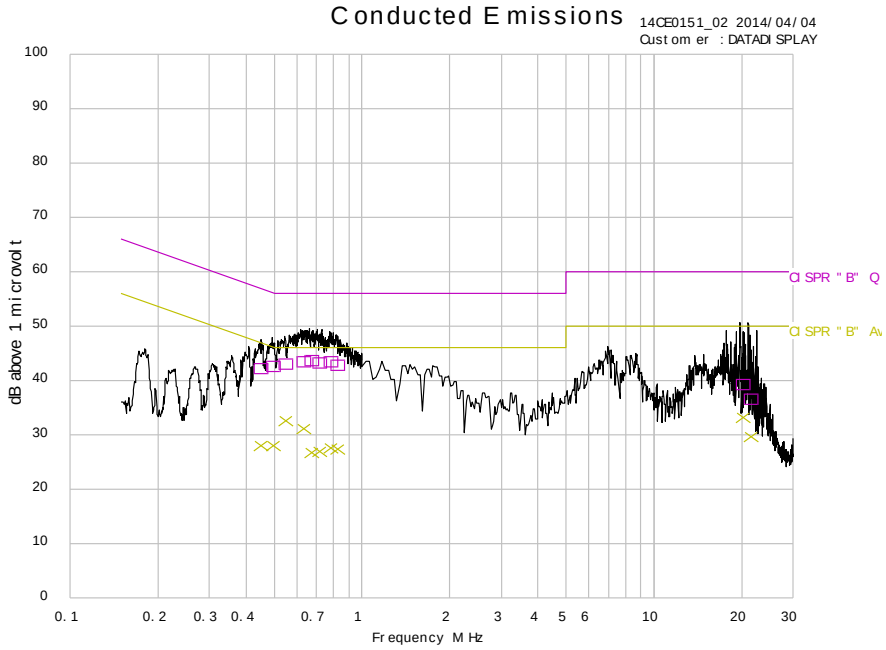


5.3 Conducted Emissions Plots

Shown here is the mains-line plot.



Shown here is the mains-neutral plot.



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