



HURSLEY  
**EMC**  
SERVICES

# EMC TEST REPORT

No. 16R205 FR

Issue#2: 17<sup>th</sup> June 2016

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

## FCC Part 15C, Industry Canada AS/NZS 4268 Certification Report

for the

### Chroma 16 Display

FCC ID = VC7120-0144

IC ID = 8910A-1200144

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Project Engineer: R. Pennell

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Approval Signatory

Approved signatories: R. P. St John James ☒ S. M. Connolly ☐ J. A. Jones ☐

*The above named are authorised Hursley EMC Services engineers.*

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### Document History:

Issue#1: 28<sup>th</sup> April 2016 was withdrawn and replaced by Issue#2: Incorrect pictures removed, antenna, cable and pre-amp factors on page 9 corrected, reference to ANSI C63.10 removed.

## 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 parts 15.109, 15.209 and 15.249 of the CFR 47:2015 FCC rules. 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 16 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 mode.

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 16
Serial numbers:	JE00000001 (38.4kbps 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 16 production.
Sample build:	Production  FCC ID = VC7120-0144  IC ID = 8910A-1200144

### 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 (portrait) position. 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.

All measurements were performed with the EUT operating at 38.4kbps data rate.

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
Test Dates	25 <sup>th</sup> to 27 <sup>th</sup> April 2016
HEMCS References:	16R205

#### 3.2 General Operating Conditions

Testing was performed according to the procedures in accordance with 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 Uncertainty

The following measurement uncertainties have been calculated in accordance with ANSI C63.23, CISPR 16-4-2 and in line with other available guidance to provide a confidence level of 95% (coverage factor,  $k = 2$ ) in the reported measurements:

For radiated emissions below 1 GHz:

3 m measurement distance	30 MHz – 200 MHz	200 MHz – 1 GHz
Vertical polarisation	$\pm 3.7$ dB	$\pm 5.1$ dB
Horizontal polarisation	$\pm 3.9$ dB	$\pm 3.8$ dB

For radiated emissions below 1 GHz:

10 m measurement distance	30 MHz – 200 MHz	200 MHz – 1 GHz
Vertical polarisation	$\pm 4.4$ dB	$\pm 4.8$ dB
Horizontal polarisation	$\pm 4.5$ dB	$\pm 4.6$ dB

For radiated emissions above 1 GHz:

3 m measurement distance	1 GHz – 6 GHz	6 GHz - 18 GHz	18 GHz – 40 GHz
Vertical polarisation	$\pm 4.5$ dB	$\pm 4.4$ dB	$\pm 4.3$ dB

Band Edge tests	
Conducted (absolute measurements)	$\pm 2.3$ dB
Close coupled radiated (relative measurements)	$\pm 0.3$ dB

Occupied bandwidth tests	
RBW setting $\leq 100$ kHz	$\pm 0.62$ %
RBW setting $> 100$ kHz	$\pm 1.66$ %

### 3.4 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated	23 degrees Celsius	28% relative	1013 millibars

### 3.5 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)	22/09/2016
050	1	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	Internal
073	3	Schwarzbeck	BBHA9120B	237	Horn antenna (1-10GHz)	03/07/2016
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	02/07/2016
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	12/06/2016
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	01/10/2018

The data obtained from the profile scan was used as a guide for the final measurements. Profiles were measured of the EUT in portrait orientation at 38.4kbps 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. 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
073	3	Schwarzbeck	BBHA9120B	237	Horn antenna (1-10GHz)	03/07/2016
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	02/07/2016
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	12/06/2016
452	3	CHASE	CBL 6141	4013	Pink 30M-2G Antenna	01/10/2018

**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.

#### 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
901.95	10.9	21.9	5.0	37.8	46	38.4	B	Portrait
902	11.8	21.9	5.0	38.7	46	38.4	B	Portrait
902.5*	51.0	21.9	5.0	77.9	46	38.4	B	Portrait
913.5*	52.4	21.9	5.0	79.3	46	38.4	M	Portrait
927.5*	52.7	22.0	5.1	79.8	46	38.4	T	Portrait
928	14.4	22.0	5.1	41.5	46	38.4	T	Portrait
928.05	13.3	22.0	5.1	40.4	46	38.4	T	Portrait

\*Transmitter frequency

Uncertainty of measurements:  $\pm 4.2$  dBμV for a 95% confidence level.

The table for transmitted frequencies shows test results measured with 38.4kbps data rates, in portrait orientation.



**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
1805	51.8	26.7	2.4	39.0	41.9	54	38.4	B	Portrait
1827	48.3	26.7	2.4	39.0	38.4	54	38.4	M	Portrait
1855	49.4	26.7	2.4	39.0	39.5	54	38.4	T	Portrait
5415	38.7	29.5	4.8	37.9	35.1	54	38.4	B	Portrait
5481	37.3	29.5	4.8	37.9	33.7	54	38.4	M	Portrait
5565	34.7	29.5	4.8	37.9	31.1	54	38.4	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
1805	54.3	26.7	2.4	39.0	44.4	74	38.4	B	Portrait
1827	51.6	26.7	2.4	39.0	41.7	74	38.4	M	Portrait
1855	52.1	26.7	2.4	39.0	42.2	74	38.4	T	Portrait
5415	49.5	29.5	4.8	37.9	45.9	74	38.4	B	Portrait
5481	48.3	29.5	4.8	37.9	44.7	74	38.4	M	Portrait
5565	42.5	29.5	4.8	37.9	42.5	74	38.4	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 at 38.4kbps in portrait orientation.

**4.2 FCC – Radiated Emissions (Idle)**

No emissions were within 12dB of the limit.

TEST ENGINEER: Richard Pennell

### 4.3 Occupied Bandwidth

Test instrumentation used was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
456	1	Rohde & Schwarz	ESCI7	1.145E+09	EMI Test Receiver	20/11/2016
--	1	EMCO	7045	1048	Near filed probe	Internal

### 4.4 Occupied Bandwidth (IC)

RSS-GEN Section 4.6

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.

In (913.5MHz) TX mode with a 38.4kbps data rate the bandwidth of the modulated transmitter signal was measured as 65.4kHz.

### 4.1 Occupied Bandwidth (FCC)

The output from the measuring antenna was fed into the input of the ESCI7 spectrum analyser/receiver. The bandwidth of the transmitter was measured 20dB down either side of the peak. The ESCI7 analyser was set to sampling detector on max hold. The resolution bandwidth, span and video bandwidth are indicated on the occupied bandwidth plot (modulated) included with this report.

In (913.5MHz) TX mode with a 38.4kbps data rate the bandwidth of the modulated transmitter signal was measured as 70.2kHz.

## 4.2 Occupied Bandwidth (As/Nz)

AS/NZ 4268 Section 8.3.2

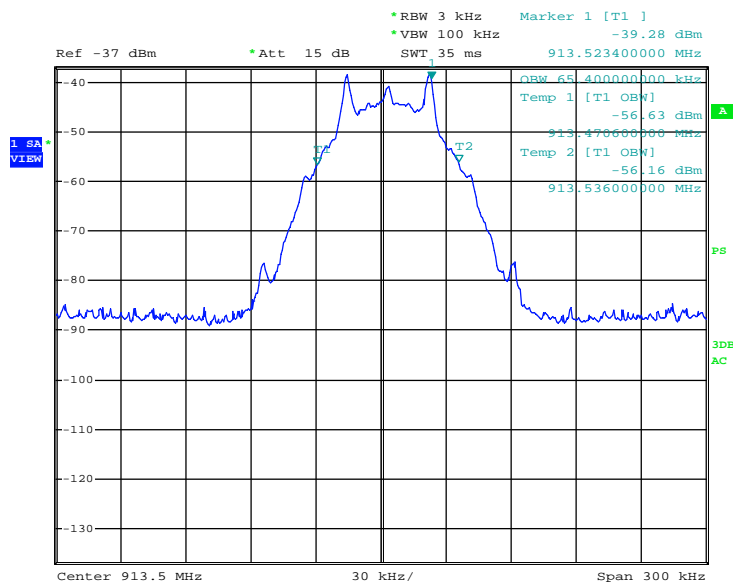
The output from the measuring antenna was fed into the input of the ESCI7 spectrum analyser/receiver. The bandwidth of the transmitter was measured with an ESCI7 analyser set to 99% Occupied Bandwidth with a sampling detector on max hold. The resolution bandwidth, span and video bandwidth are indicated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

In (913.5MHz) TX mode with a 38.4kbps data rate the bandwidth of the modulated transmitter signal was measured as 65.2kHz narrow span and 60kHz wide span.

TEST ENGINEER: Richard Pennell

### 4.3 99% Bandwidth Plots (IC)

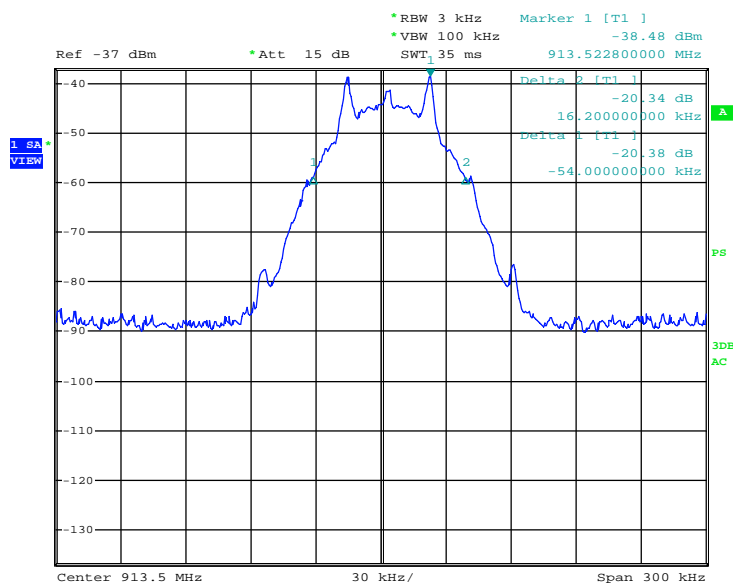
(913.5MHz) 99% bandwidth measured as 65.4kHz



Date: 27.APR.2016 16:41:10

### 4.4 20dB Bandwidth Plot (FCC)

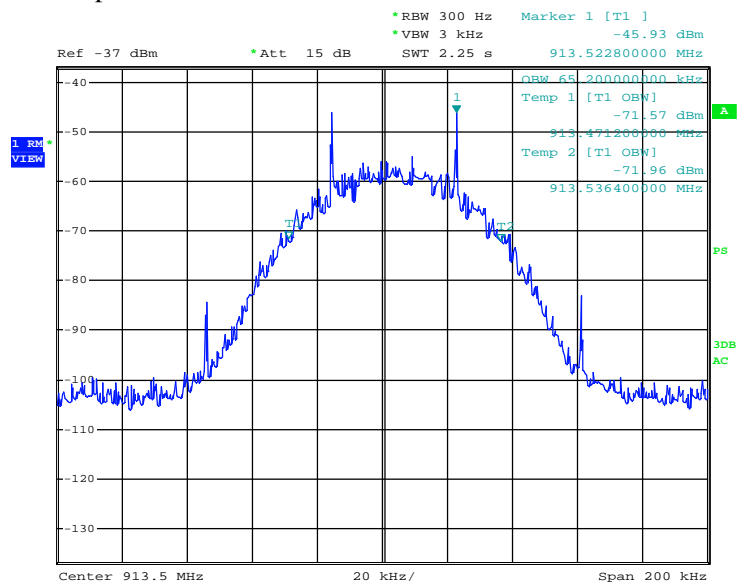
(913.5MHz) 20dB bandwidth measured as 70.2kHz (70.2kHz = 54kHz + 16.2kHz from plot below)



Date: 27.APR.2016 16:45:04

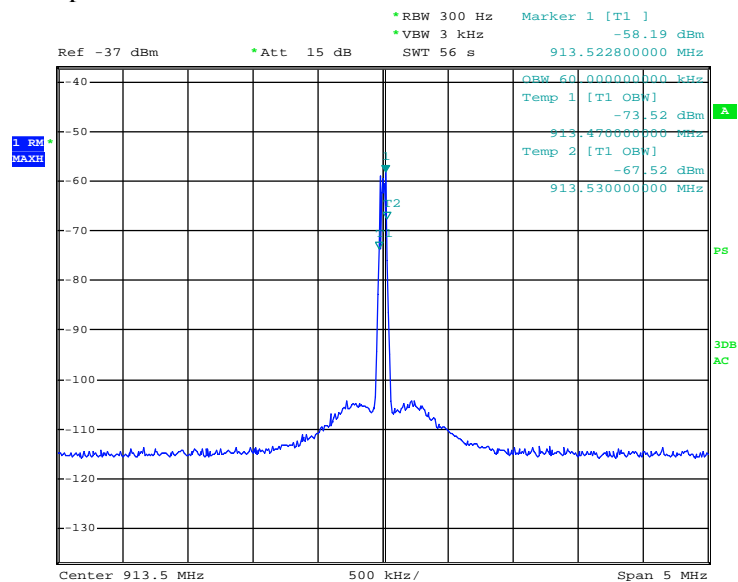
## 4.5 99% Bandwidth Plots (AS/NZ 4268)

(913.5MHz) Narrow span OBW = 65.2MHz



Date: 27.APR.2016 16:49:36

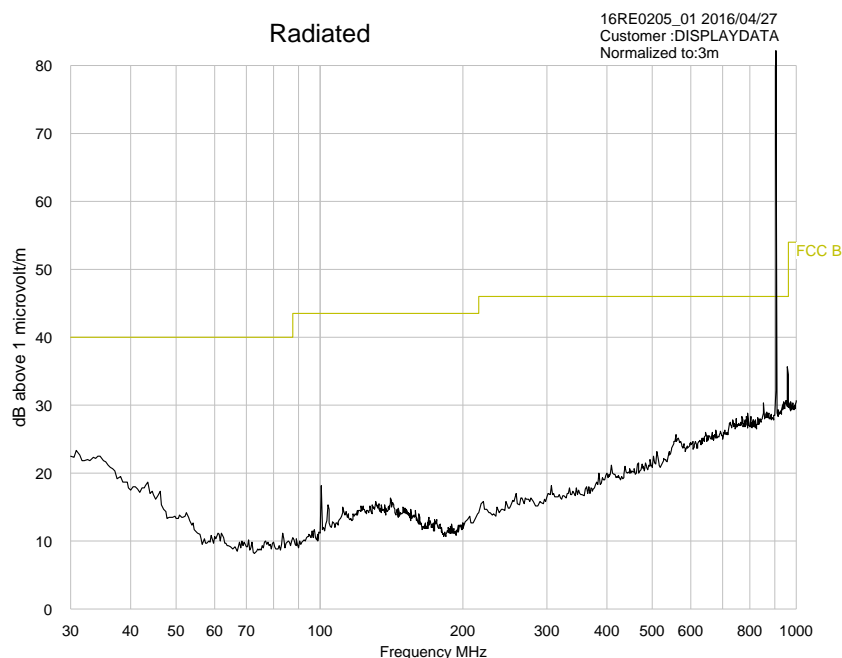
(913.5MHz) Wide span OBW = 60MHz



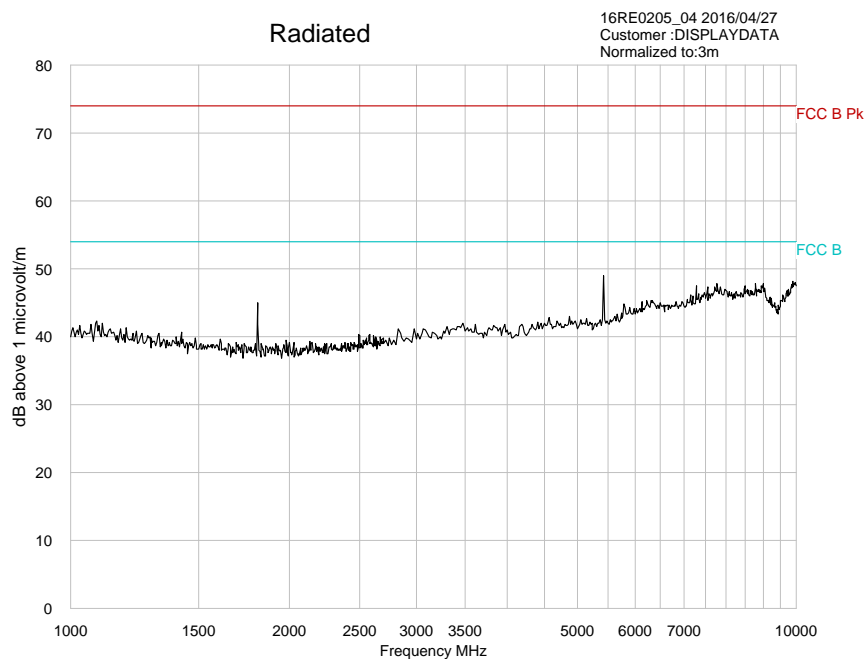
Date: 27.APR.2016 16:55:54

## 5.0 TEST PLOTS

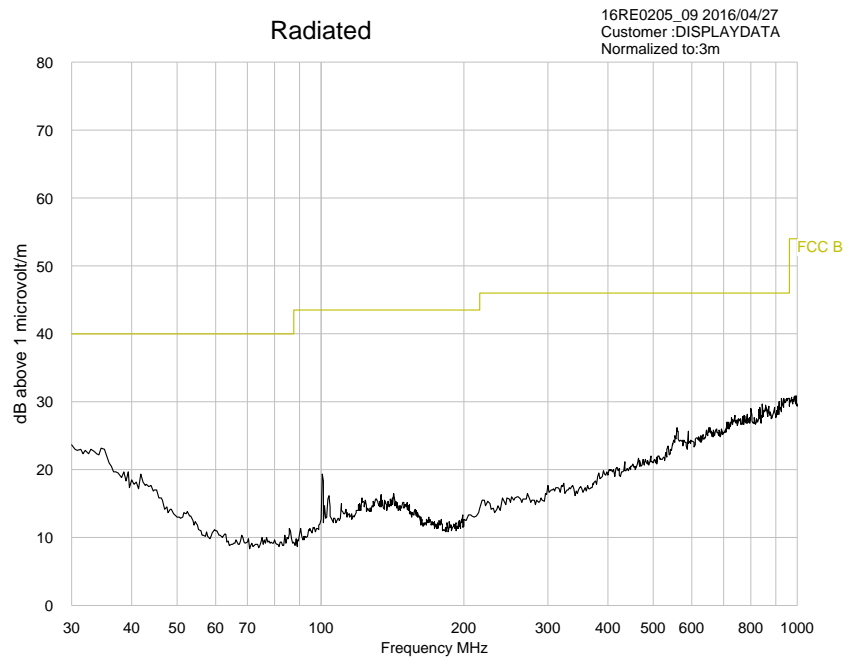
### 5.1 Radiated Emission Plot, 30 to 1000 MHz (TX)



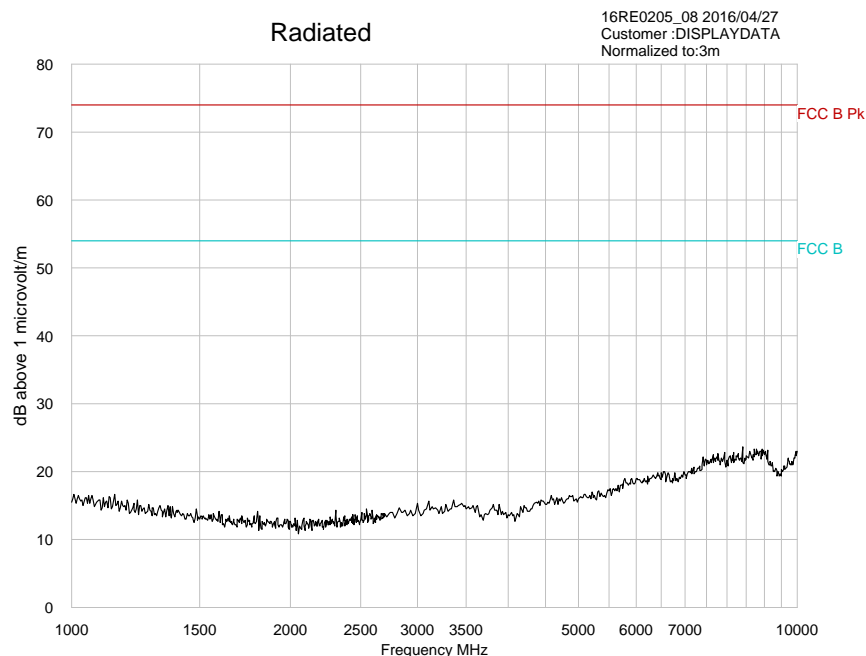
### 5.2 Radiated Emissions Plot, 1.0 to 10.0 GHz (TX)



### 5.3 Radiated Emission Plot, 30 to 1000 MHz (Idle)



### 5.4 Radiated Emissions Plot, 1.0 to 10.0 GHz (Idle)

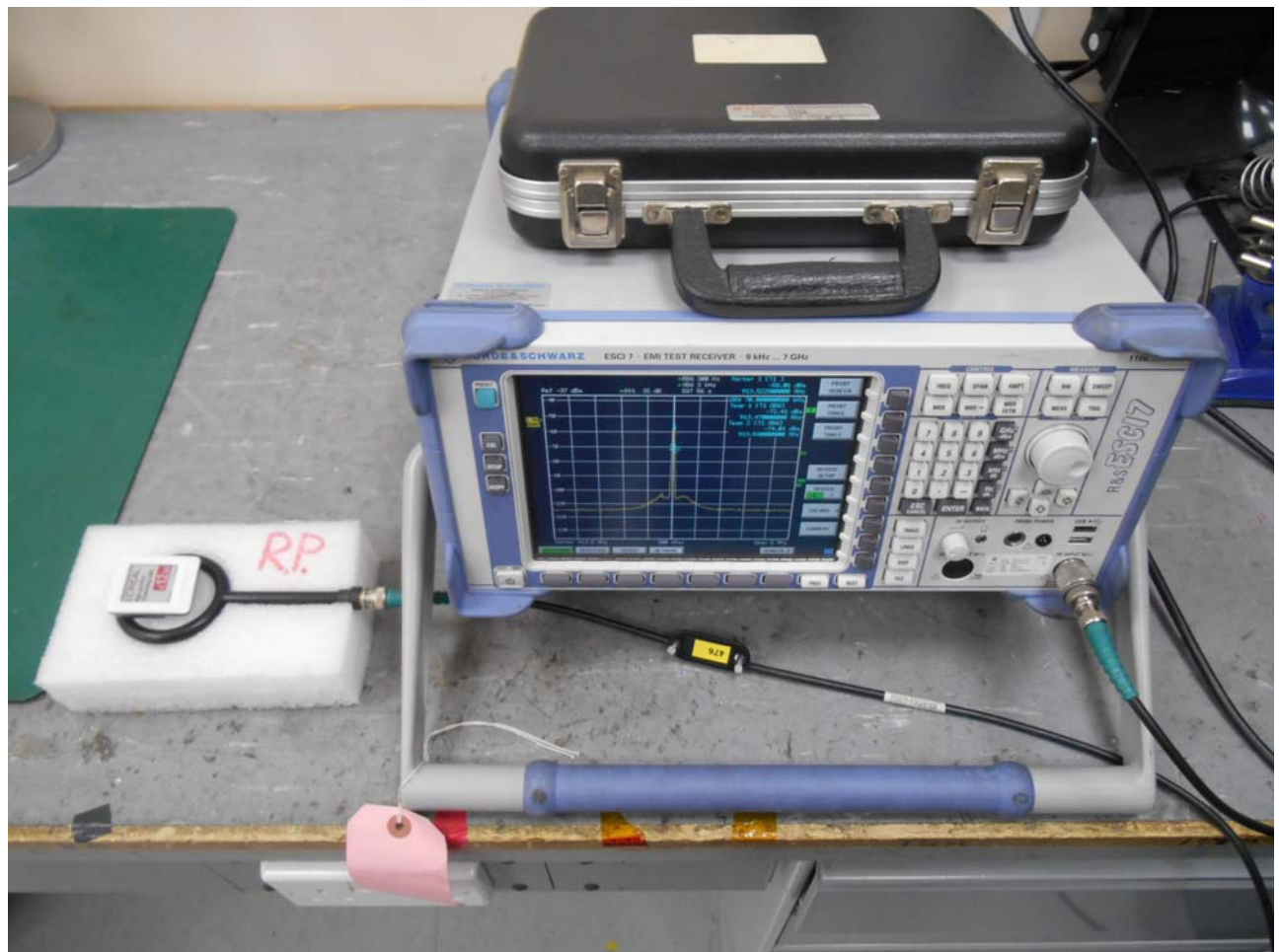


## **6.0 PHOTO**









## 7.0 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

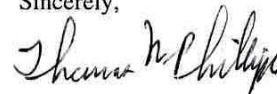
Dear Sir or Madam:

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