EMC TEST REPORT
No. 1029a FR

Issue#2: 14th August 2019

FCC Part 15C, Industry Canada

Displaydata Certification Report

for

Electronic Shelf Labels

Model: Chroma 27L

FCC ID's: VC7120-0199
IC ID's: 8910A-1200199

Project Engineer: R. Pennell

Approval Signatory

Approved signatories: J. A. Jones ☑ D. Tiroke ☐ A. Coombes ☐

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1871

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Document History:

Issue#1: 1st August 2019 was withdrawn and replaced by Issue#2: updated with editorial correction.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 ISED RSS-Gen Issue 4 November 2014 and IC RSS-210 Issue 9 and the 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.

For emissions outside the 902 - 928MHz band the EUT, as described and reported within this document, complies with the parts 15.207 and 15.209 of the CFR 47 FCC rules in accordance with ANSI C63.10:2013 and ANSI C63.4:2014.

1.2 Related Submittal(s) Grants

This is an application for certification of a DD27X (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:	Greenwood House London Road Bracknell Berkshire RG12 2AA United Kingdom
Manufacturing address:	As above.
Company representative:	Mr Oli Bailey E-mail - oli.bailey@Displaydata.com

2.0 EUT DESCRIPTION

2.1 Product Information

EUT:	Electronic Shelf Label
Model:	Chroma 27L
Serial number:	DD00002701C
Sample build:	Production
FCC ID:	VC7120-0199
IC ID:	8910A-1200199
Power supply:	Battery
Firmware version:	Emissions: 1.0.2.0
	Immunity: 1.0.2.0
Lowest Clock frequency:	32.768 kHz
Highest Clock frequency:	24.000 MHz

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 horizontal (landscape) 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
Dynamic Communicator	N/A	ZC00000035

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 100kbps 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	Eurofins Hursley Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire
EMI Measurement Site	Eurofins Hursley Hursley Park, Winchester; FCC Registered UK Designation number: UK0006 Canada Registration Number: 7104A-1
Test Dates	23rd to the 26th April and 17th July 2019
Eurofins Hursley References:	1029

3.2 General Operating Conditions

Testing was performed according to the procedures in accordance with ANSI C63.4:2014 and 63.10 2013. 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	± 3.7 dB	± 5.1 dB
Horizontal polarisation	± 3.9 dB	± 3.8 dB

For radiated emissions below 1 GHz:

10 m measurement distance	30 MHz – 200 MHz	200 MHz – 1 GHz
Vertical polarisation	± 4.4 dB	± 4.8 dB
Horizontal polarisation	± 4.5dB	± 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
Both polarisations	± 4.5 dB	± 4.4 dB	± 4.3 dB

Band Edge tests	
Conducted (absolute measurements)	± 2.3 dB
Close coupled radiated (relative measurements)	± 0.3 dB

Occupied bandwidth tests	
RBW setting </= 100 kHz	± 0.62 %
RBW setting > 100 kHz	± 1.66 %

3.4 Environmental Ambient

Test Type	Temperature	Humidity	Atmospheric Pressure
Radiated	23.5 degrees Celsius	43 % relative	998 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
750	1	Global	CISPR16 chamber	1	11 x 7 x 6.2m	10/12/2019
762	3	Schwarzbeck	VULB9162	129	30-7000MHz	07/04/2020
762a	3	Schwarzbeck	DGA 9552N	0	6dB attenuator for #762	07/04/2020
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	04/12/2019
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	10/09/2019
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	18/09/2019
050	2	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	06/10/2019
466	3	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	28/02/2022
651	1	Rohde & Schwarz	ESIB 40 no.2	100262	40GHz receiver	26/07/2019

The data obtained from the profile scan was used as a guide for the final measurements. Profiles were measured of the EUT in landscape orientation at 100kbps 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	Ext Calibration
750	1	Global	CISPR16 chamber	1	11 x 7 x 6.2m	10/12/2019
762	3	Schwarzbeck	VULB9162	129	30-7000MHz	07/04/2020
762a	3	Schwarzbeck	DGA 9552N	0	6dB attenuator for #762	07/04/2020
033	1	HP	8593EM	3726U00203	Spectrum analyser	04/12/2019
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	10/09/2019
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	18/09/2019
050	2	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	06/10/2019
466	3	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	28/02/2022
651	1	Rohde & Schwarz	ESIB 40 no.2	100262	40GHz receiver	26/07/2019

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 Eurofins Hursley procedures

4.0 TEST DATA

4.1 Radiated Emissions

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.

'ISED RSS-210 issue 8 Annex 2 section 2.9'

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.

4.1.1 Radiated Emissions (Transmitting); Chroma 27L

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	4.1	21.9	5.0	22.8	46.0	100	B	Landscape
902.0000	3.2	21.9	5.0	23.7	94.0	100	B	Landscape
902.5000*	51.0	21.9	5.0	77.9	94.0	100	B	Landscape
913.5000*	52.1	21.9	5.0	79.0	94.0	100	M	Landscape
927.5000*	53.5	22.0	5.1	80.6	94.0	100	T	Landscape
928.0000	2.6	22.0	5.1	24.6	94.0	100	T	Landscape
928.0500	3.2	22.	5.1	23.9	46.0	100	T	Landscape

*Transmitter frequency

Uncertainty of measurements: ± 4.2 dBµV for a 95% confidence level.
The table for transmitted frequencies shows test results measured with 100kbps data rates, in landscape orientation.

PEAK RESULTS - 1.0 GHz to 10.0 GHz

Frequency MHz	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
1805.00	39.5	33.7	6.1	38.6	40.7	74	100	B	Landscape
2707.49	52.6	33.7	6.1	38.6	53.8	74	100	B	Landscape

AVERAGE RESULTS - 1.0 GHz to 10.0 GHz

Frequency MHz	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
1805.00	30.8	33.7	6.1	38.6	32.0	54	100	B	Landscape
2707.49	50.9	33.7	6.1	38.6	52.1	54	100	B	Landscape

4.1.2 Radiated Emissions (Idle); Chroma 27L

No emissions were within 20dB of the limit.

Procedure: In accordance with ANSI C63.4:2014

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 100kbps in landscape orientation. The emissions are for the worst case channel

TEST ENGINEER: Richard Pennell

4.2 Occupied Bandwidth

Test instrumentation used was as follows:

#ID	CP	Manufacturer	Type	Serial No	Description	Calibration due date
750	1	Global	CISPR 16 chamber	1	11 x 7 x 6.2	10/12/2019
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 1GHz Receiver	10/09/2019

4.3 Occupied Bandwidth (IC)

RSS-GEN Section 6.6

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 TX mode with a 100kbps data rate the bandwidth of the modulated transmitter signal was measured.

4.4 Occupied Bandwidth (FCC)

FCC 15.215 (c) / Ansi C63.10 Section 6.9

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 TX mode with a 100kbps data rate the bandwidth of the modulated transmitter signal was measured.

4.5 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 TX mode with a 100kbps data rate the bandwidth of the modulated transmitter signal was measured.

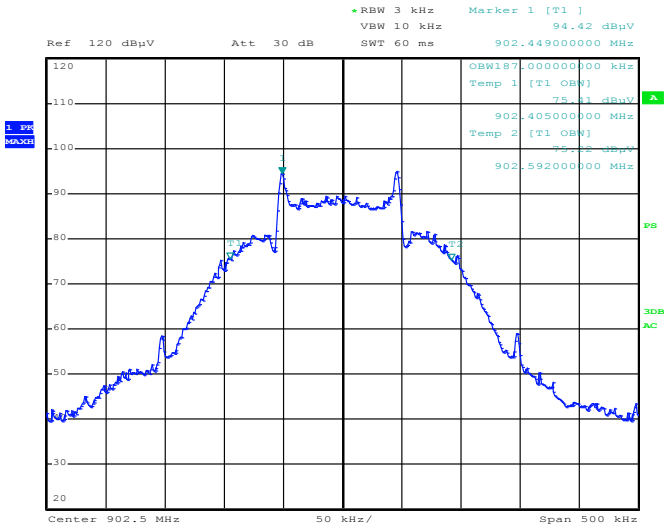
TEST ENGINEER: Richard Pennell

5.0 TEST PLOTS

5.1 99% Bandwidth Plots (IC)

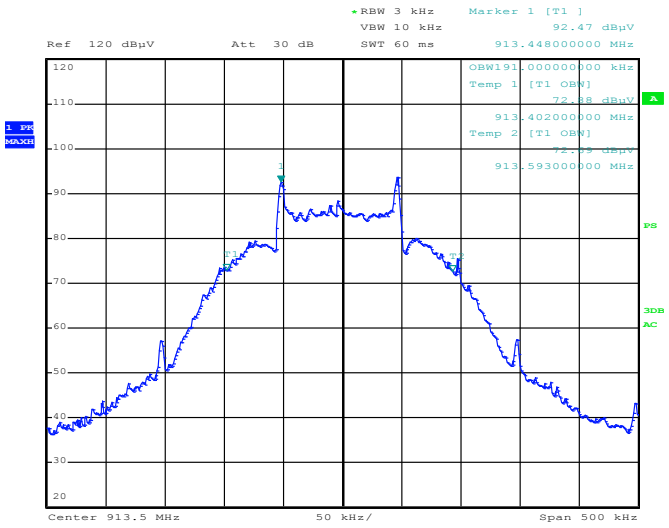
Chroma 27L

(902.5MHz - Bottom) 99% bandwidth measured as 187kHz



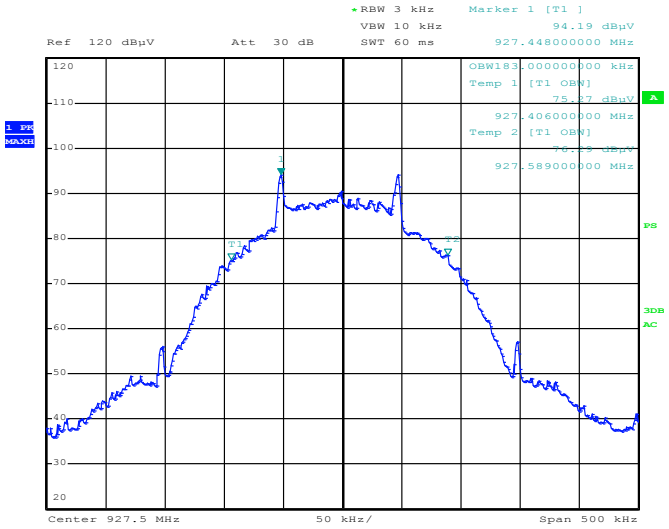
Date: 24.APR.2019 14:29:27

(913.5MHz - Middle) 99% bandwidth measured as 191kHz



Date: 24.APR.2019 14:34:43

(927.5MHz -Top) 99% bandwidth measured as 183kHz

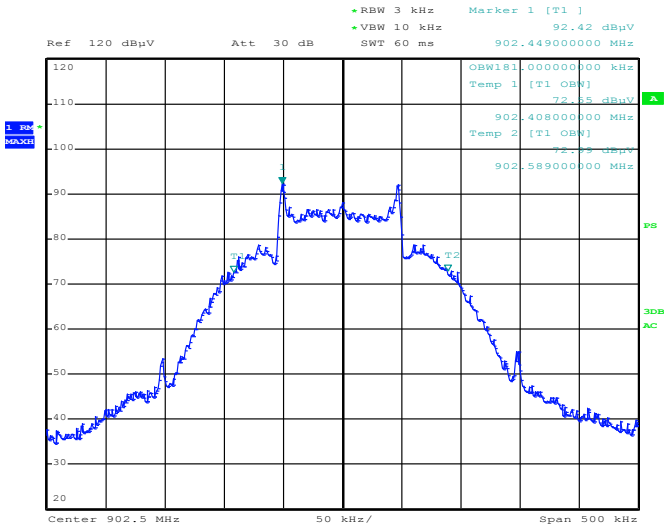


Date: 24.APR.2019 14:42:22

5.2 99% Bandwidth Plots (AS/NZ 4268)

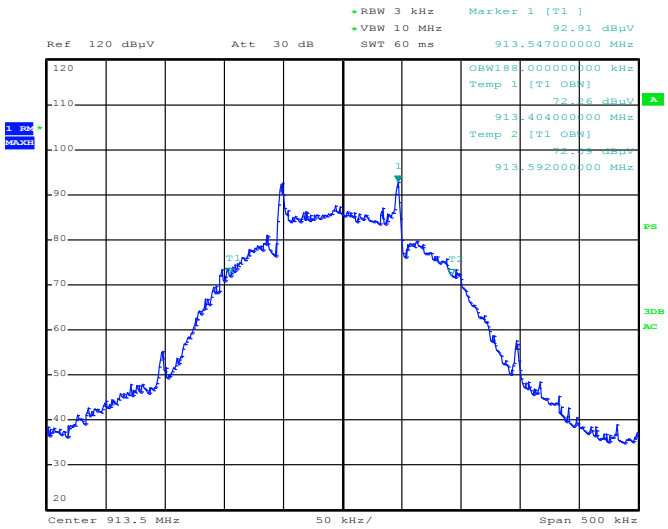
Chroma 27L

(902.5MHz - Bottom) 99% bandwidth measured as 181kHz



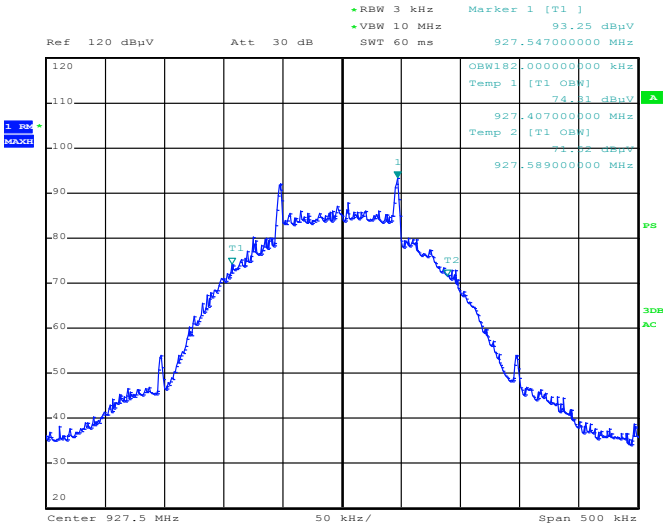
Date: 24.APR.2019 15:29:24

(913.5MHz - Middle) 99% bandwidth measured as 188kHz



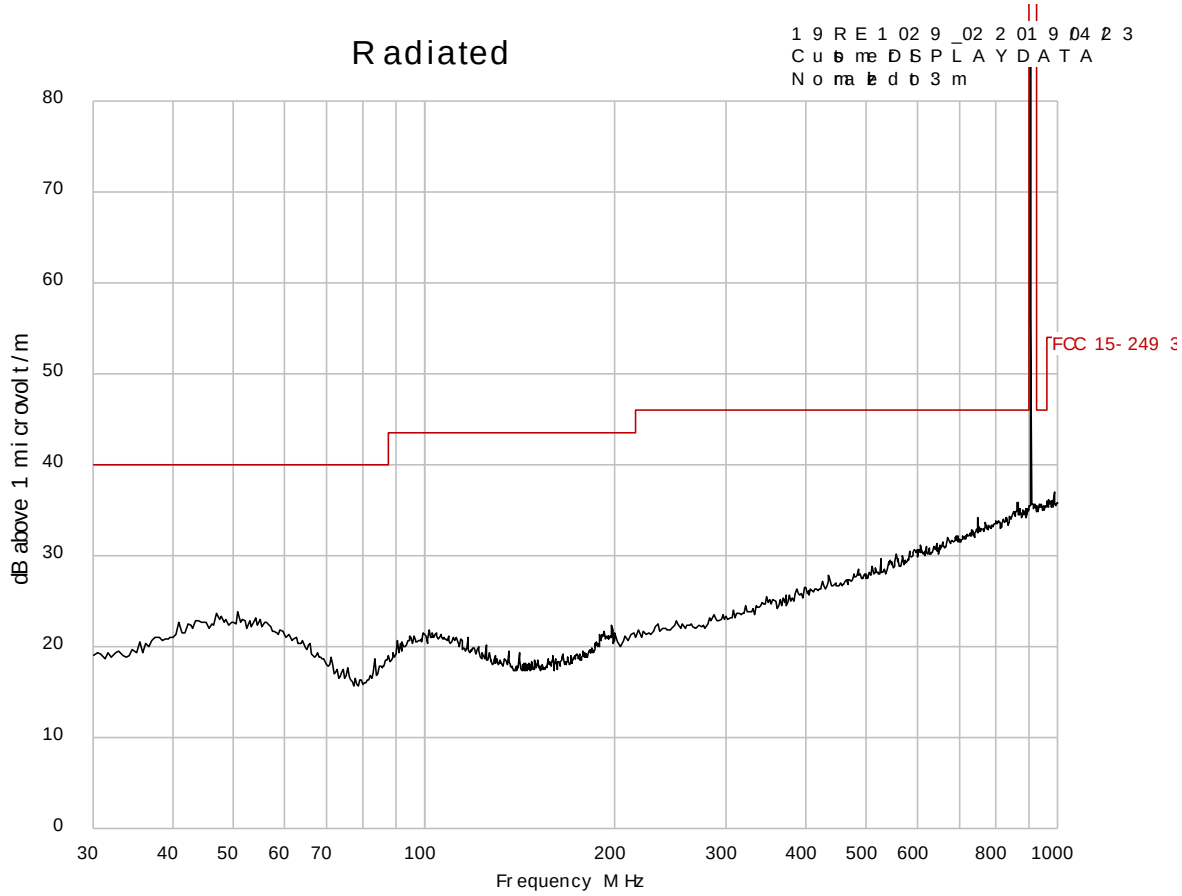
Date: 24.APR.2019 15:36:17

(927.5MHz -Top) 99% bandwidth measured as 182kHz

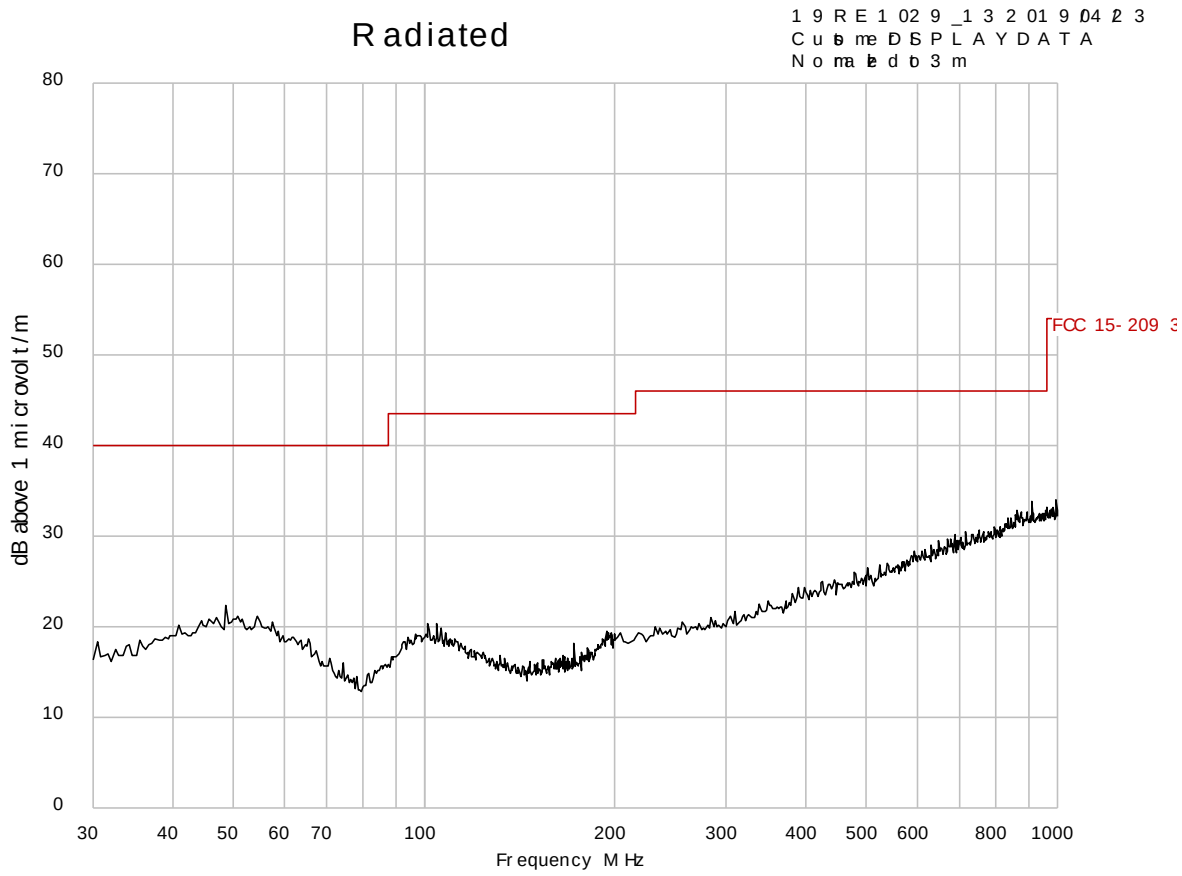


Date: 24.APR.2019 15:37:34

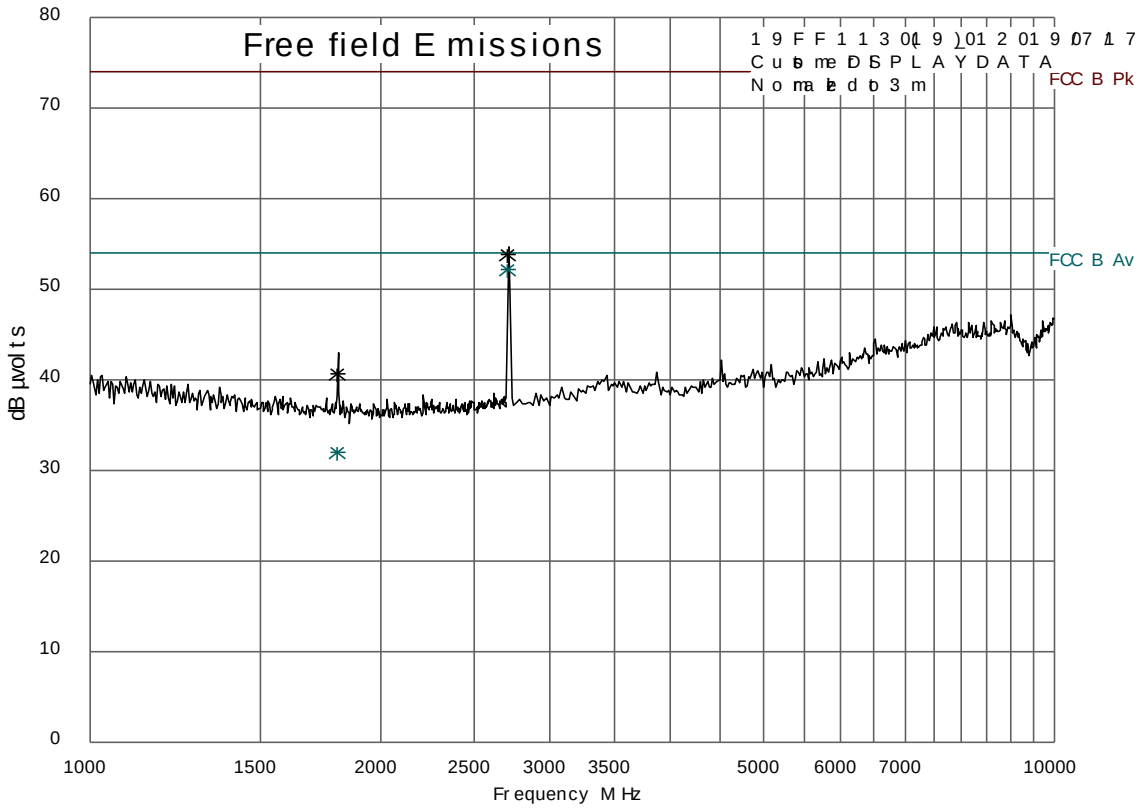
5.3 Radiated Emission Plot, 30 to 1000 MHz (TX); 27L – Bottom (worst case)



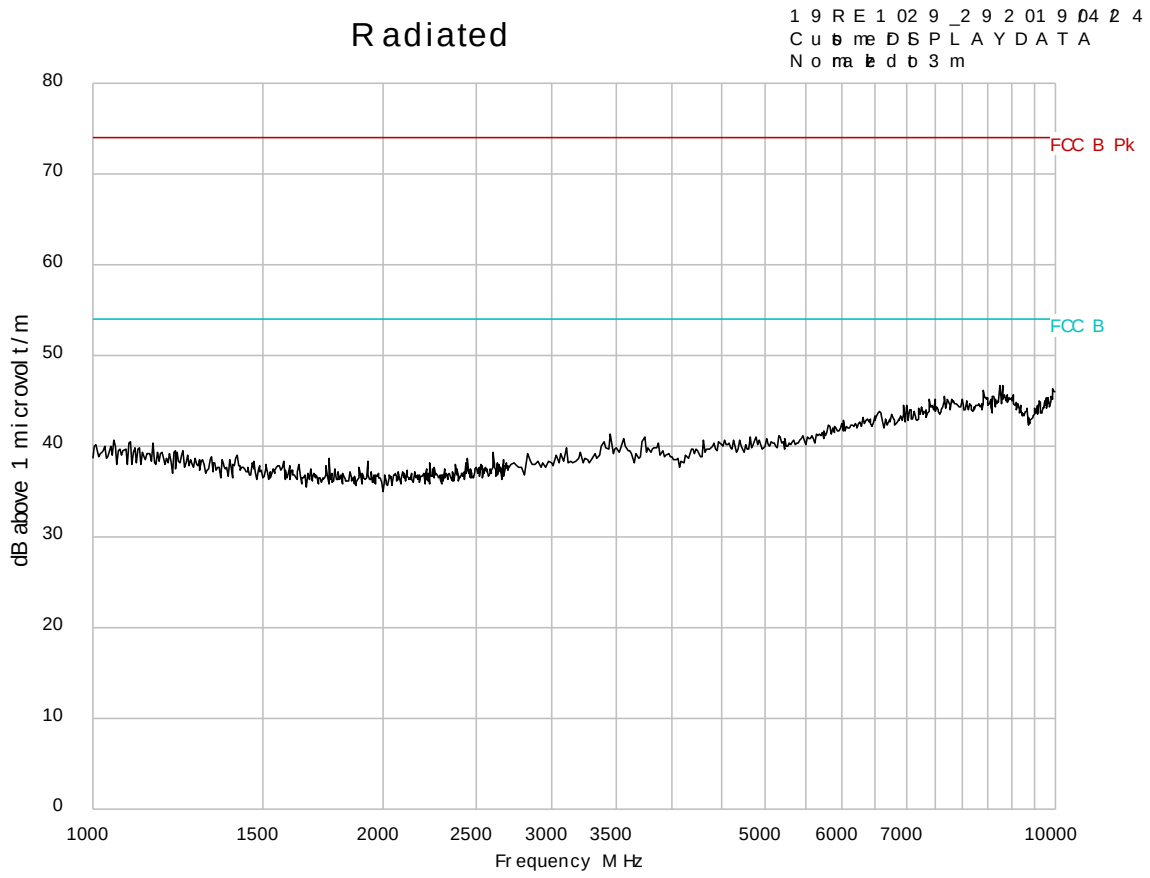
5.4 Radiated Emission Plot, 30 to 1000 MHz (Idle); 27L



5.5 Radiated Emissions Plot, 1.0 to 10.0 GHz (TX); 27L – Bottom (worst case)



5.6 Radiated Emissions Plot, 1.0 to 10.0 GHz (Idle)



6.0 PHOTO LOG

Emissions:

Radiated emissions, Pre-scan, 30 MHz to 1000 MHz; 27L

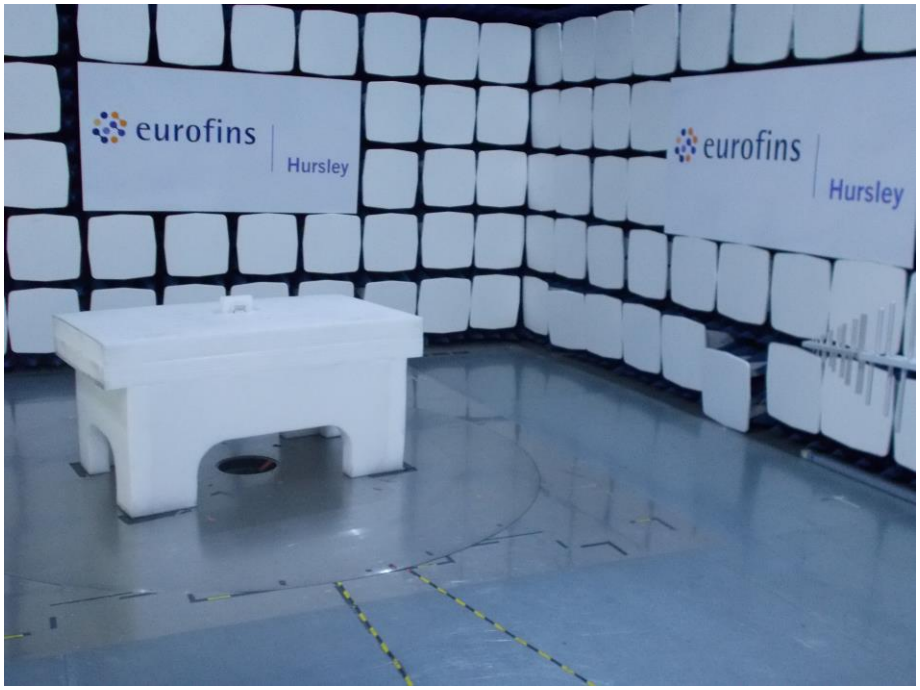


Photo Log (continued)

Radiated emissions, Pre-scan, > 1000 MHz; 27L

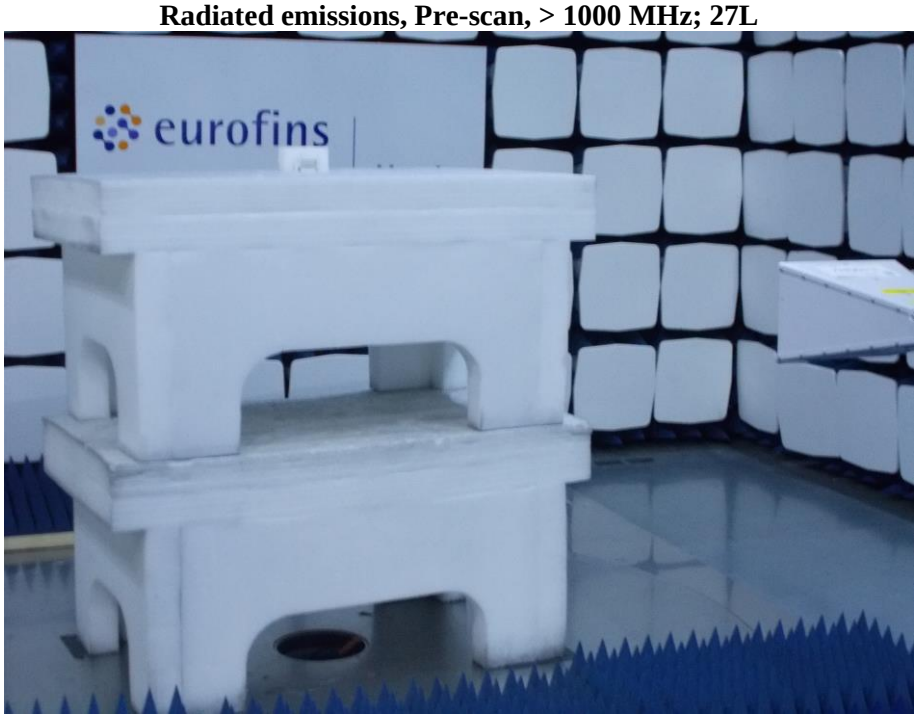


Photo Log (continued)

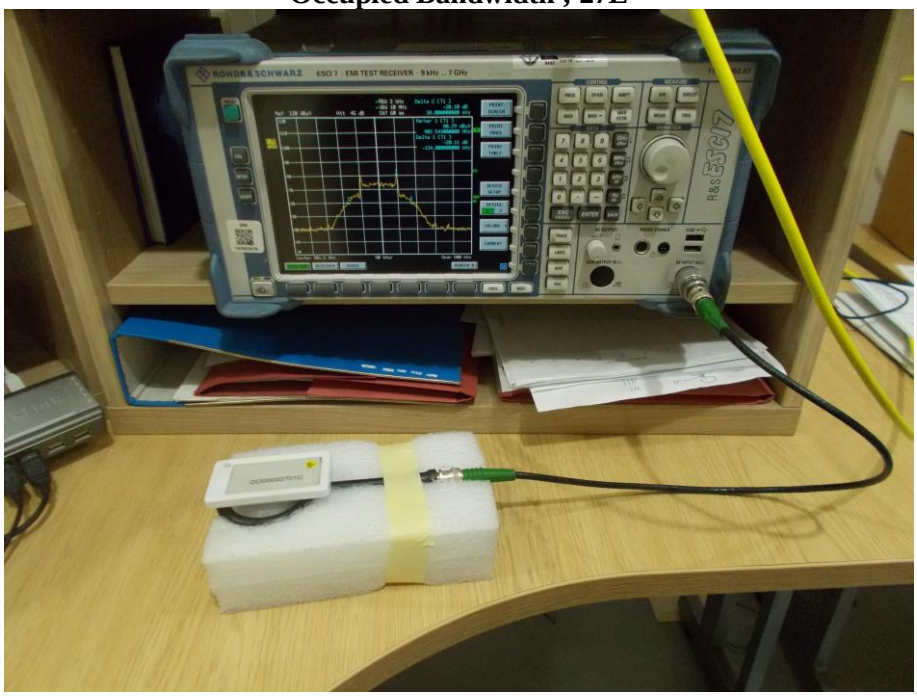
Radiated emissions, OATS, 30 MHz to 1000 MHz; 27L

Photo Log (continued)

Radiated emissions, OATS, > 1000 MHz; 27L

Photo Log (continued)

Occupied Bandwidth ; 27L



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