EMC TEST REPORT

No. 18R084 FR

Issue#2: 22nd October 2018

FCC Part 15C

Test Report

for

RF Solutions Limited

LAMBDA

FCC ID: P9OLAMDA9

Project Engineer: R. Pennell

Approval Signatory

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1.0 DECLARATION

1.1 FCC Part 15C Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with the selected sections of part 15C of the CFR 47:2017 FCC rules.

- CONDUCTED EMISSIONS - Power Line, from 0.15 MHz to 30.0 MHz
- RADIATED EMISSIONS - Airborne, from 30.0 MHz to 10 GHz

Note: The highest associated operating frequency on the system, as declared by the manufacturer, was 915.0 MHz.

The uncertainty of measurement for each test has been included to support a level of confidence of approximately 95%.

For emissions outside the 902 - 928 MHz 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, ANSI C63.4:2014 and KDB 558074 D01 DTS Meas Guidance v04.

This report relates to the sample tested and may not represent the entire population. It is valid only for the product identified, either in part or in full, to the relevant electromagnetic requirements necessary for compliance.

Hursley EMC Services Limited is recognised by the Federal Communications Commissions (FCC) as an EMI laboratory, outside of the USA, for the measurement of conducted emissions and radiated emissions at three and ten metres.

1.2 Product Modifications

None to sample submitted.

1.3 Document History

Issue#1: 10th May 2018 was withdrawn and replaced by Issue#2: updated with editorial correction.

1.4 EMC Test Lab Reference

Hursley EMC Services file: 18R084.

1.5 EUT Manufacturer

Trade name:	RF Solutions Limited
Company name:	RF Solutions Limited
Company address:	William Alexander House William Way Burgess Hill RH15 9AG United Kingdom
Manufacturing address:	As above.

2.0 EUT DESCRIPTION

2.1 Identity

Product (EUT):	LAMBDA Models: Mode 9 & Mode 12 Serial numbers: 001 & 002 (designed by Hursley EMC Services)
Product build level:	Production sample

2.2 EUT Description

The device operates inside the 902 – 928 MHz band. The EUT operates on a single carrier frequency at two modes of modulation. The EUT is DC battery powered.

The following test indicates the frequency used and modes of operation of the device:

Test Channel	Centre Frequency (MHz)
mode 9	915.0
mode 12	915.0

2.3 EUT Support Equipment

Not applicable.

2.4 EUT Test Exerciser

For the purposes of testing, the EUT was configured with test firmware that transmitted continuously with a 100% duty cycle. The Antenna port was terminated for the radiated emission tests.

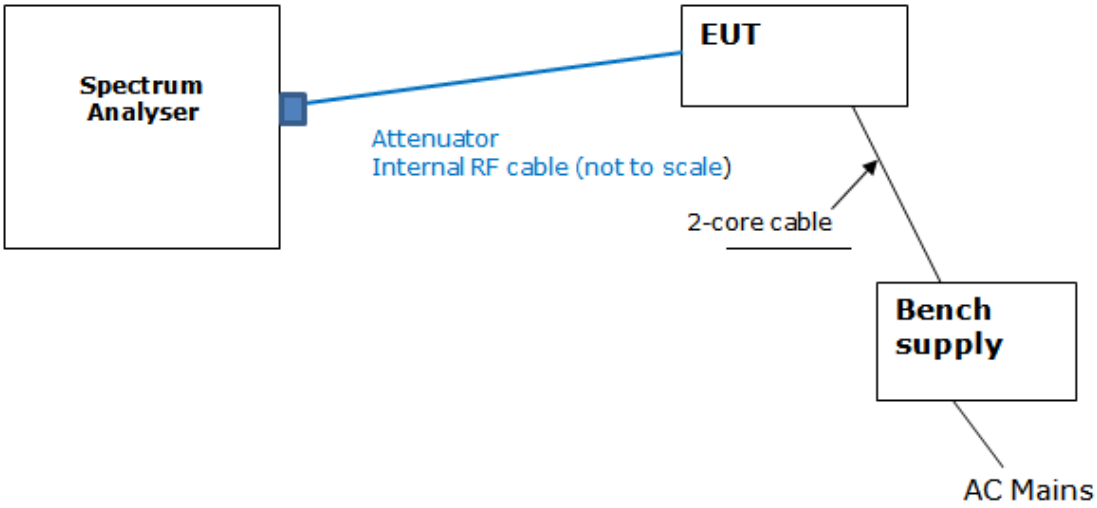
2.5 Supported Antennae

The EUT supports operation with the following antennae:

Antenna type	Type	Gain
Internal	PCB mount	1.0 dBi

Note: The antenna is integral to the unit, but is connected to the main PCB via an F-type to reverse SMA cable. The SMA cable is connected direct to Spectrum Analyser when making antenna port measurements

2.6 EUT Test Configuration



3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

3.1 EMI Site Address & Test Date

EMI Company Office	Hursley EMC Services Ltd Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire
EMI Measurement Site	Hursley EMC Services Ltd Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire
Test Dates	19th to the 26th March 2018
FCC Test Site Designation	UK0006

3.2 General Operating Conditions

Testing was performed according to the procedures in accordance with ANSI C63.10 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 Environmental Ambient

Temperature	19.6º Celsius
Relative Humidity	24%
Atmospheric Pressure	1020 millibars

3.4 Summary of Tests Performed

Test	Clause	Limit / Requirement	Result
Max peak conducted TX power	15.247(b)(3)	1 W	Pass
Out of Band Emissions Non-restricted bands	15.247(d)	-20 dBc (peak power)	Pass
Out of Band Emissions Restricted-band: Conducted	15.247(d) / 15.205(a) and 15.209(a)	15.209(a) table	Pass
Max antenna gain	15.247(b)(4)(11)	≤ 6dBi	Pass
Enclosure radiated emissions with antenna fitted	15.209	Class B	Pass
Conducted Emission	15.207	Class B	Pass
6 dB BW evaluation	(15.247 (a)(2))	>500 kHz	Pass
Power Spectral Density	(15.247 (d))	8 dBm/3kHz	Pass
Antenna Requirement	(15.203)	15.203	Pass

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3.5 Conducted Emissions

Test Configuration

A filtered 110V/60Hz supply was fed to the EUT 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 30.0 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 C63.4-2014.

The worst-case results are presented in this report.

Test instrumentation used in the conducted test was as follows:

#ID	CP	Manufacturer	Type	Serial Nø	Description	Calibration due date
147	1	Rohde & Schwarz	ESH3 Z5	846695/011	Single phase (LISN / AMN)	05/07/2018
158	1	Rohde & Schwarz	ESH3-Z2	357881052	Pulse limiter	07/10/2018
698	2	Gauss	TDEMI30M	1510002	Conducted Receiver	24/01/2019

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.

3.6 Radiated Emissions

Initial Scan

Radiated profile scans were taken on eight azimuths between 30.0 MHz and 10 GHz in both the vertical and horizontal polarities of the antennae in a semi-anechoic chamber. The resulting data obtained from these scans was used to determine subsequent measurement for final measurement evaluation.

Final Measurements

The EUT was then measured at three metres in the chamber using the pre-scan results as a guide. Emissions from the EUT were maximised by revolving the system on the turntable and moving the antennae in height and azimuth. Cable and system component positions had been investigated for maximum emissions, and the system under test represented the worst-case configuration. The highest values obtained are presented in this report.

The instrumentation used in the CISPR 16-1-4 compliant semi-anechoic chamber was as below:

#ID	CP	Manufacturer	Type	Serial Nø	Description	Calibration due date
033	1	HP	8593EM	3726U00203	Spectrum analyser (9kHz-26.5GHz)	29/11/2018
050	2	HP	8447D	1937A02341	Pre-amplifier (30-1000MHz)	06/10/2019
250	1	HP	8449B	3008A01077	Pre-amplifier (1.0-26.5GHz)	31/08/2018
289	1	Rohde & Schwarz	ESCI 7	100765	CISPR 7GHz Receiver	24/08/2018
466	3	Schwarzbeck	BBHA 9120 571	571	1-10GHz Horn	24/02/2019
651	1	Rohde & Schwarz	ESIB 40 no.2	100262	40GHz receiver	07/07/2018
762	3	Schwarzbeck	VULB9162	129	30-7000MHz	07/04/2019
762a	3	Schwarzbeck	DGA 9552N	0	6dB attenuator for #762	07/04/2019
439	1	Microtronics	BRC50722	2	902 to 928MHz Notch filter	Internal

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

The EUT was tested for radiated and disturbance measurements. The worst-case results are reported within this document.

4.1 Power Line Conducted Emissions; 0.15 to 30.0 MHz

A search was made of the frequency spectrum between 0.15 MHz to 30.0 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.

4.1.1 Data; EUT Mode 9 with Weir 413D Power Supply, s/n 166731

MAINS – LINE

Frequency	Quasi-peak value (dBµV)			Average value (dBµV)			Status
	Measured	Class A Limit	Pass Margin	Measured	Class A Limit	Pass Margin	
345.707 kHz	46.32	59.06	12.75	27.93	46.00	18.07	Pass
10.016 MHz	29.07	60.00	30.93	23.75	50.00	26.25	Pass
13.754 MHz	29.74	60.00	30.26	24.44	50.00	25.56	Pass
19.572 MHz	30.36	60.00	29.64	25.13	50.00	24.87	Pass
24.998 MHz	31.16	60.00	28.84	25.87	50.00	24.13	Pass
29.614 MHz	30.98	60.00	29.02	25.62	50.00	24.38	Pass

MAINS – NEUTRAL

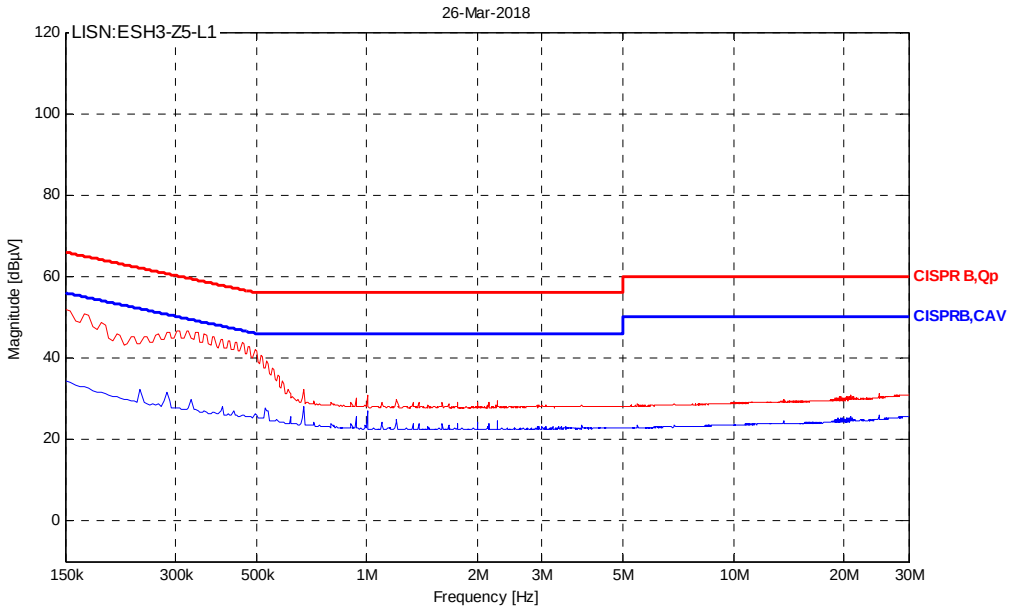
Frequency	Quasi-peak value (dBµV)			Average value (dBµV)			Status
	Measured	Class A Limit	Pass Margin	Measured	Class A Limit	Pass Margin	
174.046 kHz	51.95	64.77	12.81	28.06	46.00	17.94	Pass
10.016 MHz	29.06	60.00	30.94	23.74	50.00	26.26	Pass
12.500 MHz	29.56	60.00	30.44	24.34	50.00	25.66	Pass
19.634 MHz	30.82	60.00	29.18	25.68	50.00	24.32	Pass
20.854 MHz	31.34	60.00	28.66	26.31	50.00	23.69	Pass
29.829 MHz	31.04	60.00	28.96	25.66	50.00	24.34	Pass

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

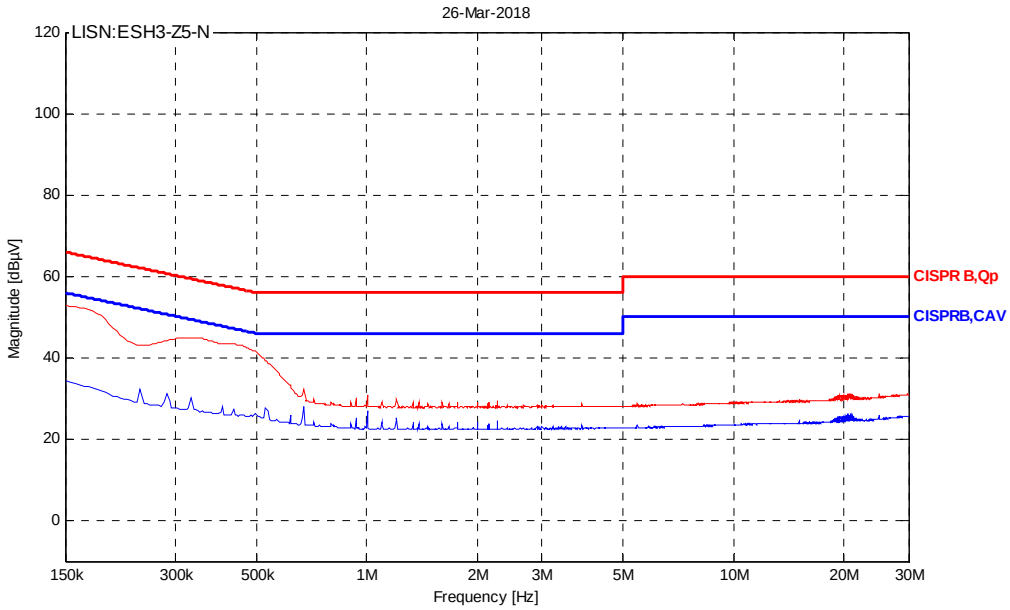
TEST ENGINEER: Richard Pennell

4.1.2 Profiles; EUT Mode 9 with Weir 413D Power Supply, s/n 166731

0.15 MHz to 30.0 MHz, line



0.15 MHz to 30.0 MHz, neutral



Conducted emissions (continued)

4.1.3 Data; EUT Mode 12 with Weir 413D Power Supply, s/n 166731

MAINS – LINE

Frequency	Quasi-peak value (dBµV)			Average value (dBµV)			Status
	Measured	Class A Limit	Pass Margin	Measured	Class A Limit	Pass Margin	
345.707 kHz	45.56	59.06	13.50	28.00	46.00	18.00	Pass
10.016 MHz	29.04	60.00	30.96	23.73	50.00	26.27	Pass
12.500 MHz	29.46	60.00	30.54	24.21	50.00	25.79	Pass
19.572 MHz	30.36	60.00	29.64	25.11	50.00	24.89	Pass
22.275 MHz	31.49	60.00	28.51	25.85	50.00	24.15	Pass
29.905 MHz	31.03	60.00	28.97	25.66	50.00	24.34	Pass

MAINS – NEUTRAL

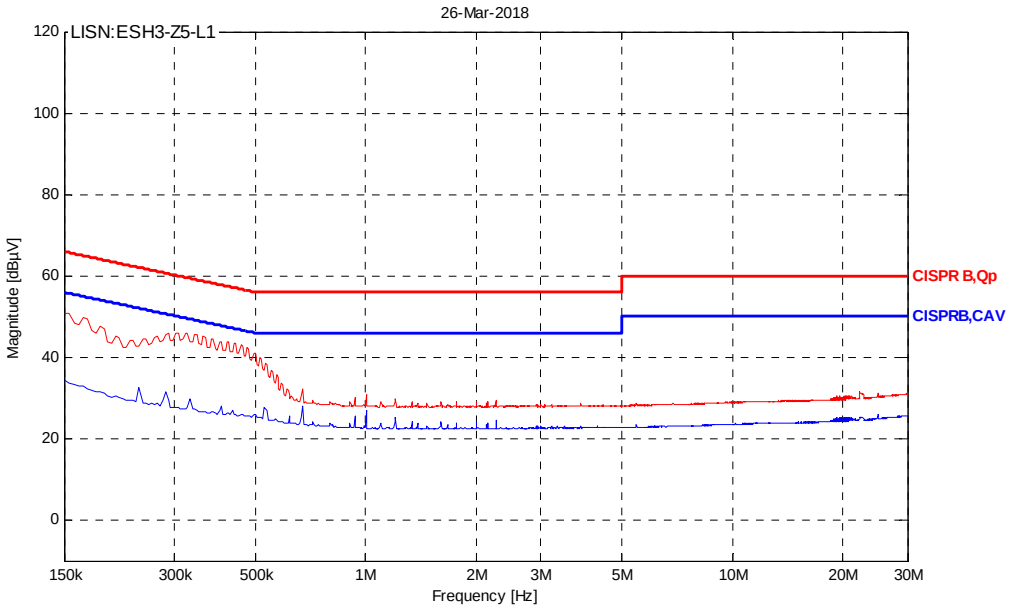
Frequency	Quasi-peak value (dBµV)			Average value (dBµV)			Status
	Measured	Class A Limit	Pass Margin	Measured	Class A Limit	Pass Margin	
169.277 kHz	52.07	65.00	12.93	27.97	46.00	18.03	Pass
10.016 MHz	29.06	60.00	30.94	23.71	50.00	26.29	Pass
12.500 MHz	29.45	60.00	30.55	24.22	50.00	25.78	Pass
19.572 MHz	30.75	60.00	29.25	25.61	50.00	24.39	Pass
22.271 MHz	31.67	60.00	28.33	26.23	50.00	23.77	Pass
29.905 MHz	31.05	60.00	28.95	25.64	50.00	24.36	Pass

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

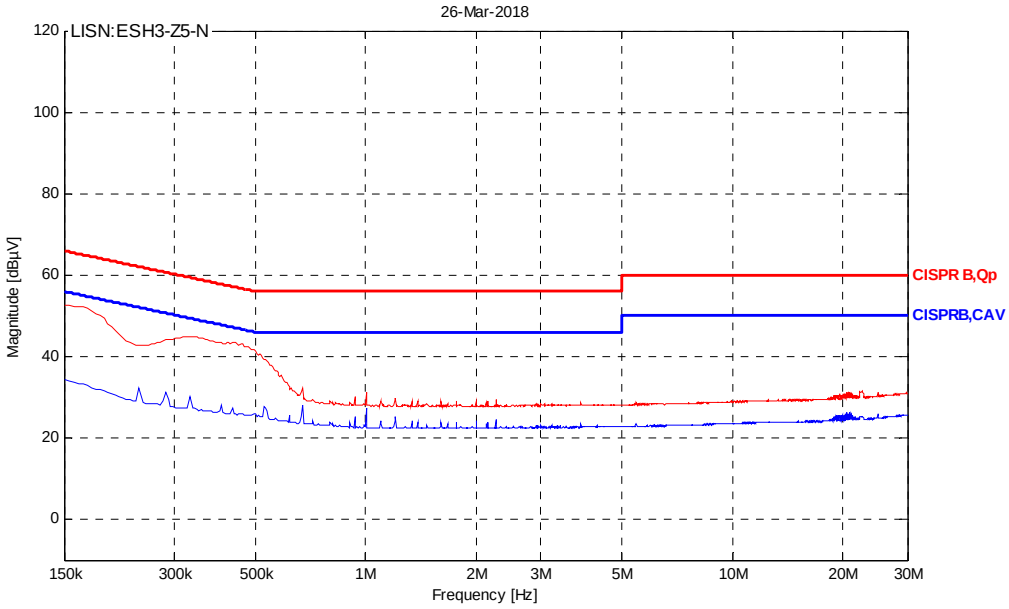
TEST ENGINEER: Richard Pennell

4.1.4 Profiles; EUT Mode 12 with Weir 413D Power Supply, s/n 166731

0.15 MHz to 30.0 MHz, line



0.15 MHz to 30.0 MHz, neutral



4.2 DTS Bandwidth

4.3 Measurement method

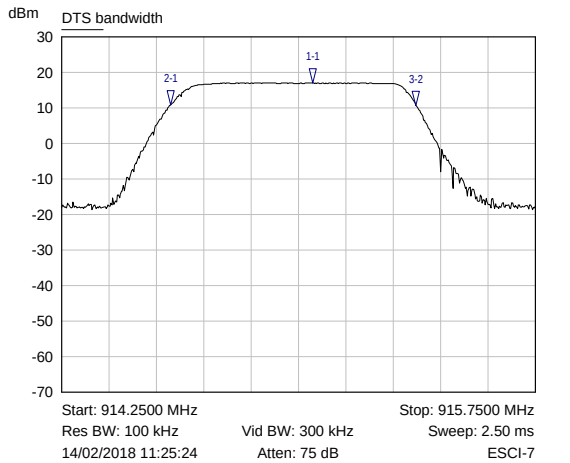
Test was conducted in accordance with KDB 558074 section 8.1 Option 1:

a) Set resolution bandwidth to 100 kHz
b) Set the video bandwidth to ≥ 3 x RBW
c) Detector = Peak.
d) Trace mode = max hold.
e) Sweep = auto couple.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.4 Test Results

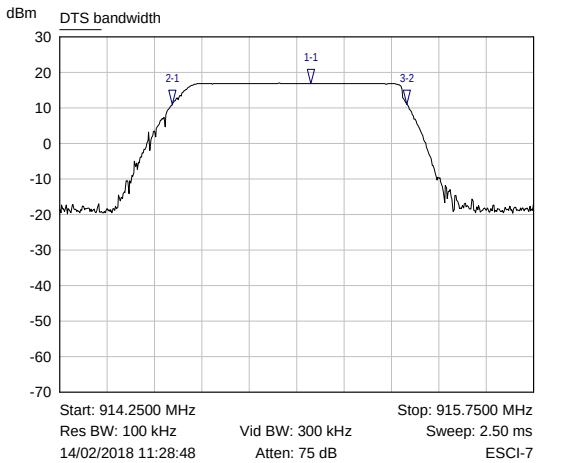
Freq (MHz)	Mode	6dB DTS Bandwidth (kHz)	Requirement	Result
915.0	9	1227	>500	Pass
	12	1179	>500	Pass

DTS Bandwidth



Mkr	Trace	X-Axis	Value	Notes
1-1	DTS bandwidth	915.0450 MHz	16.96 dBm	
2-1	DTS bandwidth	-450.0000 kHz	-6.13 dB	
3-2	DTS bandwidth	777.0000 kHz	-0.08 dB	DTS bandwidth

Mode 9



Mkr	Trace	X-Axis	Value	Notes
1-1	DTS bandwidth	915.0450 MHz	16.87 dBm	
2-1	DTS bandwidth	-438.0000 kHz	-5.90 dB	
3-2	DTS bandwidth	741.0000 kHz	0.02 dB	DTS bandwidth

Mode 12

DTS Bandwidth plots

5.0 MAXIMUM PEAK CONDUCTED OUTPUT POWER

5.1 Measurement Method

As the analyser could be set RBW ≥ DTS bandwidth, the test was conducted in accordance with KDB 558074 section 9.2.2.3:

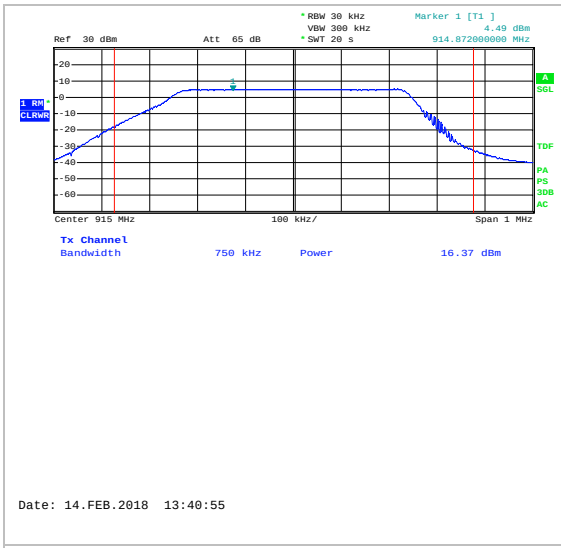
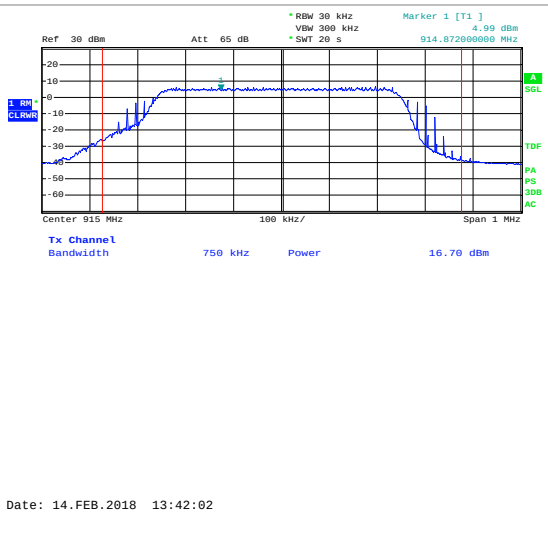
Method AVGSA-1 Alternative (RMS detection with slow sweep and EUT transmitting continuously at full power):

a) Set span to at least 1.5 x OBW.
b) Set RBW = 1 % to 5 % of the OBW, not to exceed 1 MHz.
c) Set VBW ≥ 3 x RBW.
d) Number of points in sweep ≥ 2 x span / RBW.
e) Manually set sweep time ≥ 10 x (number of points in sweep) x (transmission symbol period), but not less than the automatic default sweep time.
f) Set detector = RMS.
g) The EUT shall be operated at ≥ 98 % duty cycle or sweep triggering/signal gating shall be employed such that the sweep time is less than or equal to the transmission duration T.
h) Perform a single sweep.
i) Compute power by integrating the spectrum across the OBW of the signal using the instrument's band power measurement function, with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.

5.2 Test Results

Freq	Mode	Channel Power (dBm)	Limit (dBm)	Result
915.0	9	16.37	30.0	
	12	16.70	30.0	

Conducted Output Power

	
Mode 9	Mode 12

Conducted Power plots

6.0 MAXIMUM POWER SPECTRAL DENSITY

6.1 Average Method

This method requires Conducted Spurious Emissions to be -30dBc

6.1.1 Measurement Method

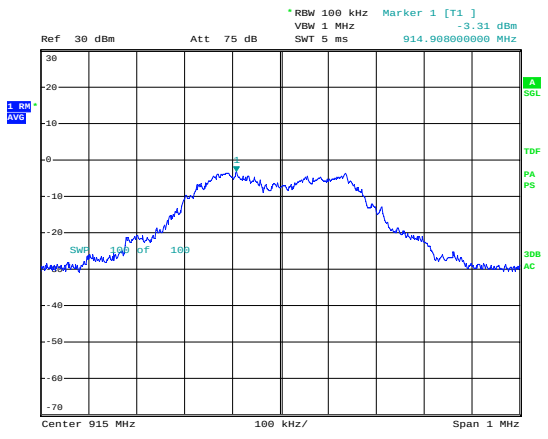
As conducted power was measured as RMS Conducted Power, measurement was performed in accordance with KDB 558074 section 10.3:

a) Set instrument center frequency to DTS channel center frequency.
b) Set span to at least 1.5 x OBW.
c) Set RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d) Set VBW ≥ 3 x RBW.
e) Detector = power averaging (RMS)
f) Ensure that the number of measurement points in the sweep ≥ 2 x span/RBW.
g) Sweep time = auto couple.
h) Employ trace averaging (RMS) mode over a minimum of 100 traces.
i) Use the peak marker function to determine the maximum amplitude level.

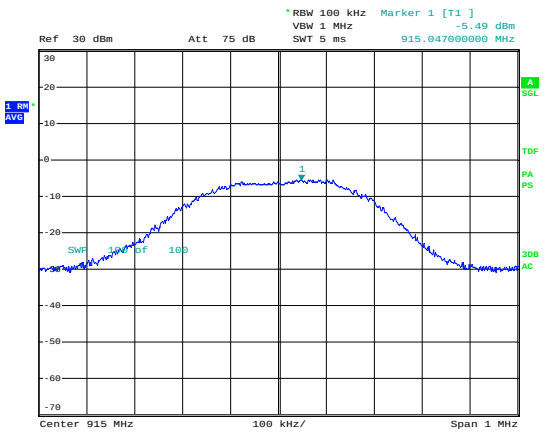
6.1.2 Test Results

Mode	Peak Marker reading (dBm)	Limit (dBm/3kHz)	Result
9	-3.3	8.0	Pass
12	-5.5	8.0	Pass

Spectral Density results (RMS)



Mode 9



Mode 12

Spectral Density plots (RMS)

7.0 EMISSIONS IN NON-RESTRICTED FREQUENCY BANDS

7.1 Measurement Method

Since compliance with conducted power requirements was demonstrated using a RMS detector, the unwanted emissions shall be at least 30dB lower than the wanted emission.

First, establish a reference level in accordance with KDB 558074 section 11.2:

a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 x DTS bandwidth.
c) Set the RBW = 100 kHz.
d) Set the VBW ≥ 3 x RBW.
e) Detector = peak.
f) Sweep time = auto couple.
g) Trace mode = max hold.
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

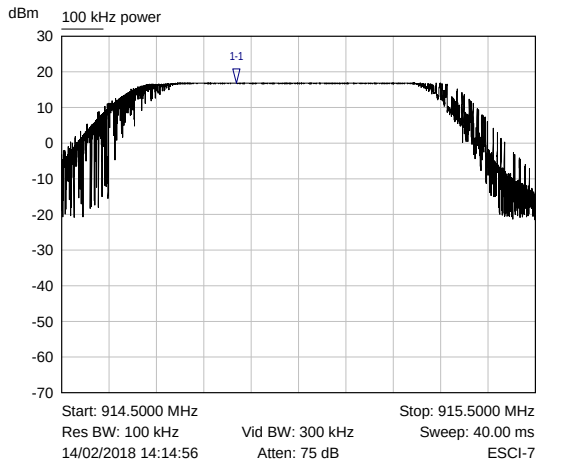
Then measure the emission levels in accordance with KDB 558074 section 11.3

a) Set the center frequency and span to encompass frequency range to be measured.
b) Set the RBW = 100 kHz.
c) Set the VBW ≥ 3 x RBW.
d) Detector = peak.
e) Sweep time = auto couple.
f) Trace mode = max hold.
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

7.2 Test Results

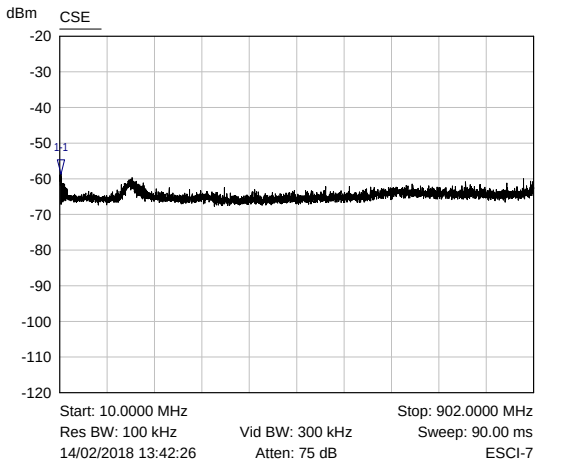
Mode	Reference level in 100 kHz RBW (dBm)	-30 dBc (dBm)	Maximum emission (dBm)	Result
9	16.88	-13.12	-14.26	Pass
12	16.90	-13.10	-27.97	Pass

Emissions in non-restricted bands



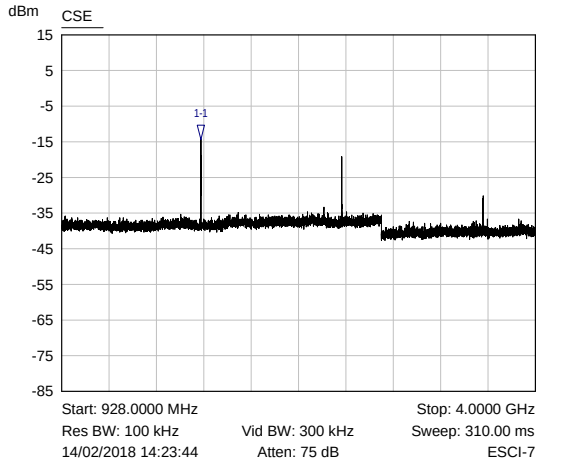
Mkr	Trace	X-Axis	Value	Notes
1-1	100 kHz power	914.8690 MHz	16.88 dBm	

CSE Mode 9: reference trace



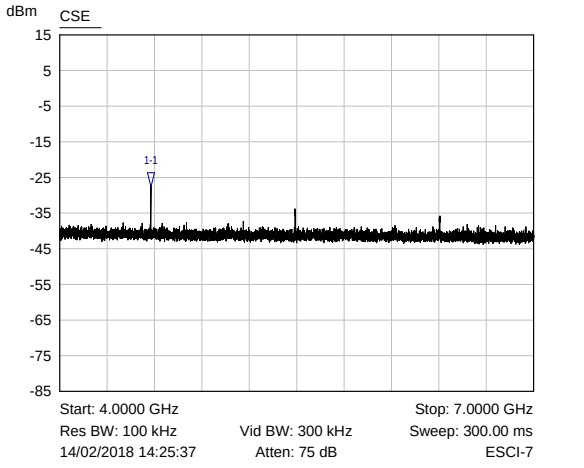
Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	11.7840 MHz	-58.73 dBm	

CSE Mode 9: trace 1



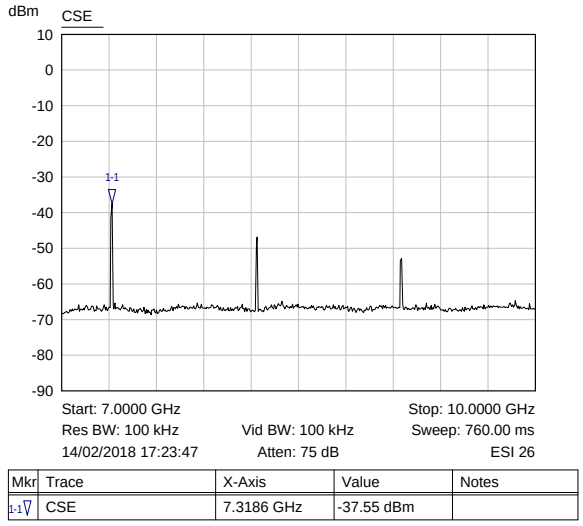
Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	1.8296 GHz	-14.26 dBm	

CSE Mode 9: trace 2



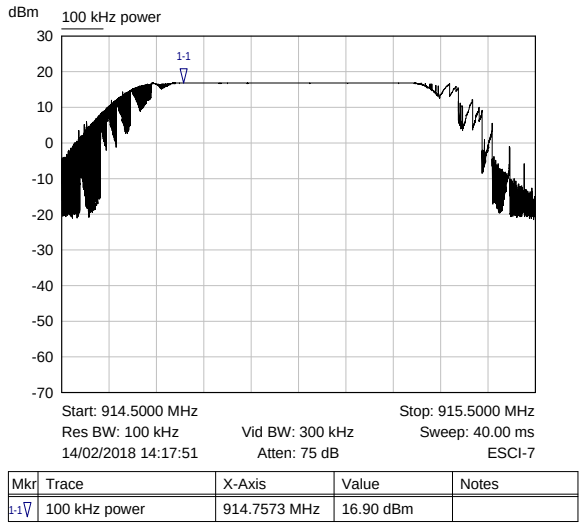
Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	4.5756 GHz	-27.68 dBm	

CSE Mode 9: trace 3



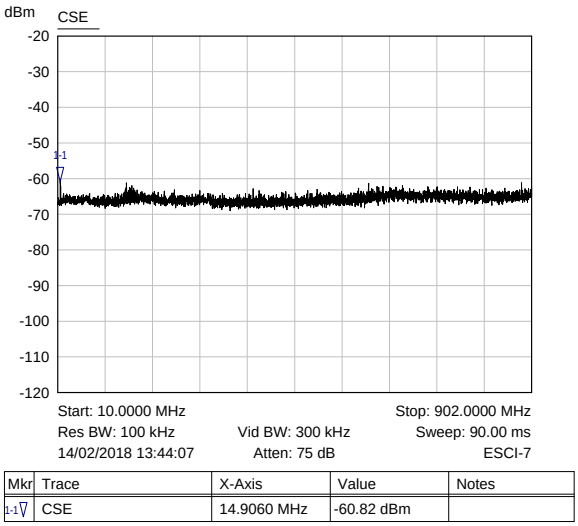
Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	7.3186 GHz	-37.55 dBm	

CSE Mode 9: trace 4



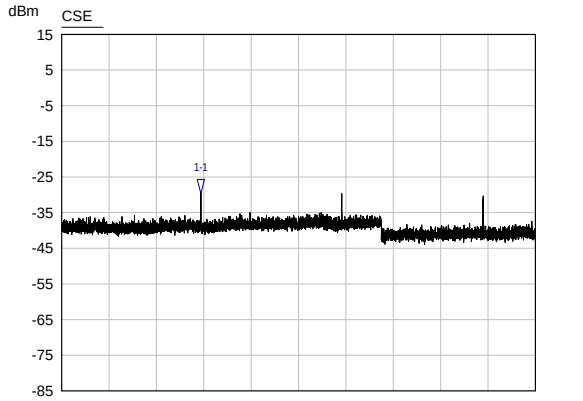
Mkr	Trace	X-Axis	Value	Notes
1-1	100 kHz power	914.7573 MHz	16.90 dBm	

CSE Mode 12: reference



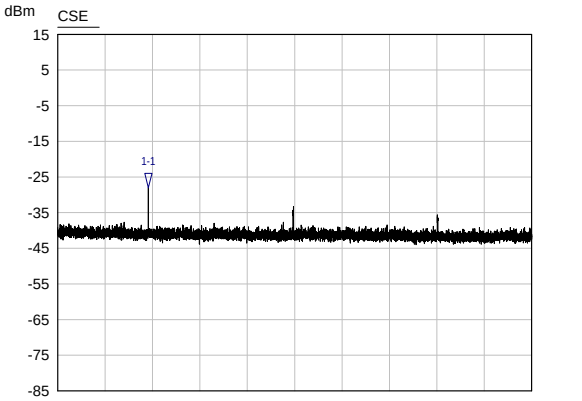
Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	14.9060 MHz	-60.82 dBm	

CSE Mode 12: trace 1



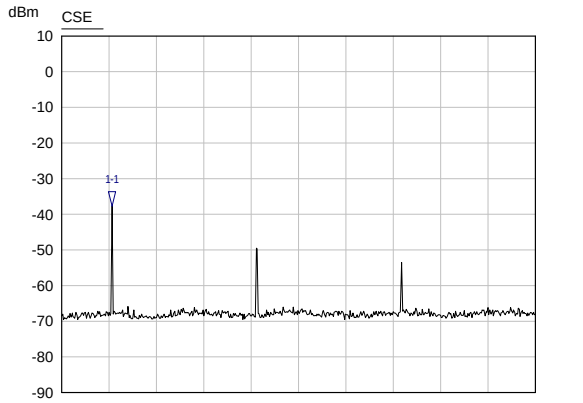
Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	1.8296 GHz	-29.63 dBm	

CSE Mode 12: trace 2



Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	4.5745 GHz	-27.97 dBm	

CSE Mode 12: trace 4



Mkr	Trace	X-Axis	Value	Notes
1-1	CSE	7.3186 GHz	-37.67 dBm	

Mode 12: trace 4

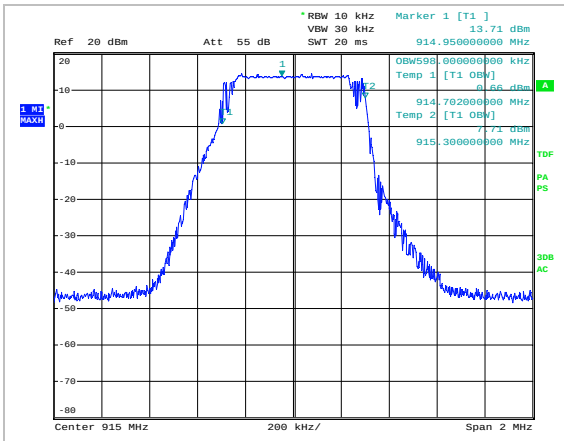
Emissions in non-restricted frequency bands

8.0 OCCUPIED BANDWIDTH

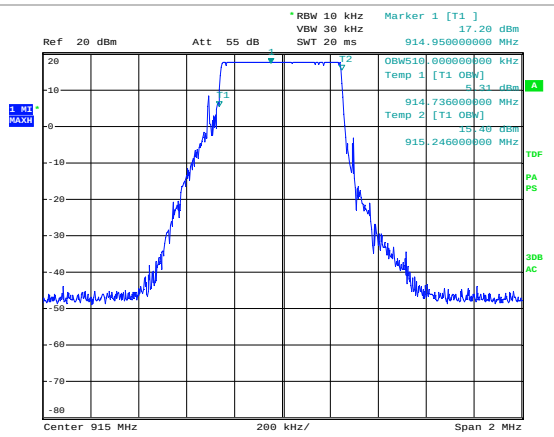
99% occupied bandwidth measured using the inbuilt function in the spectrum analyser.

Mode	Occupied Bandwidth (kHz)	Requirement	Result
9	598	None	For information
12	510	None	For information

Occupied Bandwidth



Mode 9



Mode 12

Occupied Bandwidth

9.0 TEST EQUIPMENT

Description	Manufacturer	Name	Serial Number	Calibration certificate
Spectrum Analyser	Rohde & Schwarz	ESCI7	552	
Spectrum Analyser	Rohde & Schwarz	ESI26	400	
10 dB attenuator	HP	33340A	01175	internal

10.0 MAXIMUM EMISSIONS IN RESTRICTED BAND

Radiated testing was performed with the antenna fitted.

10.1 Radiated Emissions; 30 to 1000 MHz

A peak detector max-hold 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.

Final measurements were taken for emissions in restricted bands. 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 measurements were made according to ANSI C63-10 test standard and Hursley EMC Services test procedure RAD-01.

10.1.1 Data; EUT Mode 9

Emission frequency	Measured quasi-peak value	Class B specified quasi-peak limit	Pass Margin	Antenna polarity	Antenna height	Turntable azimuth	
MHz	dBµV/m	dBµV/m	dB	H/V	m	deg	Status
47.130	17.00	40.0	23.00	H	1.3	271	Pass
99.880	15.36	43.5	28.14	H	1.0	275	Pass
138.600	12.23	43.5	31.27	V	1.0	13	Pass
209.360	25.47	43.5	18.03	V	1.4	173	Pass
723.400	28.08	46.0	17.92	V	1.1	181	Pass
902.000	29.90	46.0	64.10	V	1.0	52	Pass
915.000	97.63	127.4	29.77	V	1.0	52	Pass
928.000	29.98	46.0	16.02	V	1.0	52	Pass

V = Vertical
H = Horizontal

[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)

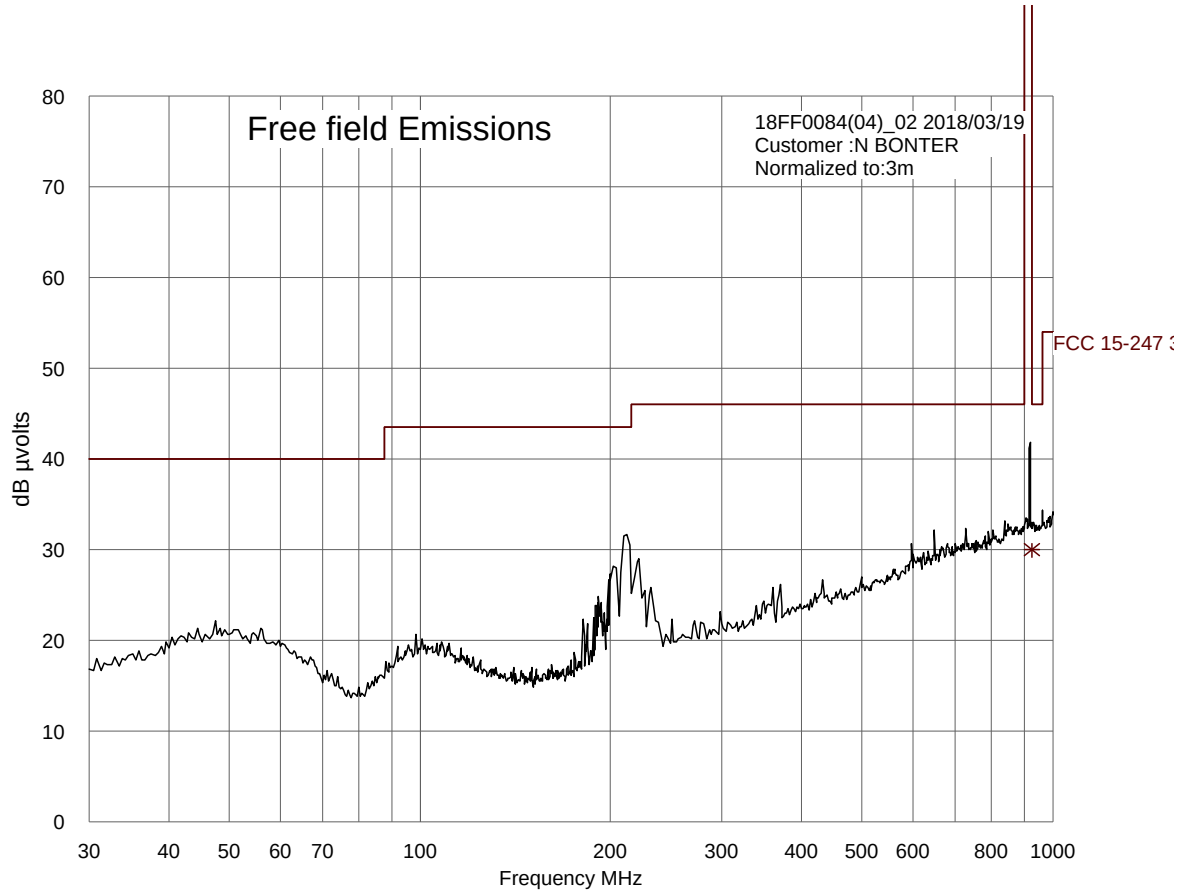
Sample calculation: 35.52dBµV/m (field strength) = 7.62dBµV (receiver reading) + 27.9dB (Correction factor)

V = Vertical
H = Horizontal

TEST ENGINEER: Richard Pennell

10.1.2 Profile; EUT Mode 9

Maximum peak hold trace with quasi-peak values (✳)



Radiated emissions (continued)

10.1.3 Data; EUT Mode 12

Emission frequency	Measured quasi-peak value	Class B specified quasi-peak limit	Pass Margin	Antenna polarity	Antenna height	Turntable azimuth	
MHz	dBµV/m	dBµV/m	dB	H/V	m	deg	Status
47.130	17.01	40.0	22.99	H	1.3	271	Pass
99.880	15.38	43.5	28.12	H	1.0	275	Pass
209.360	18.70	43.5	24.80	V	1.4	173	Pass
723.400	28.22	46.0	17.78	V	1.1	181	Pass
902.000	29.93	46.0	64.07	V	1.0	52	Pass
915.000	97.67	127.4	29.73	V	1.0	52	Pass
928.000	29.90	46.0	16.10	V	1.0	52	Pass

V = Vertical
H = Horizontal

[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)

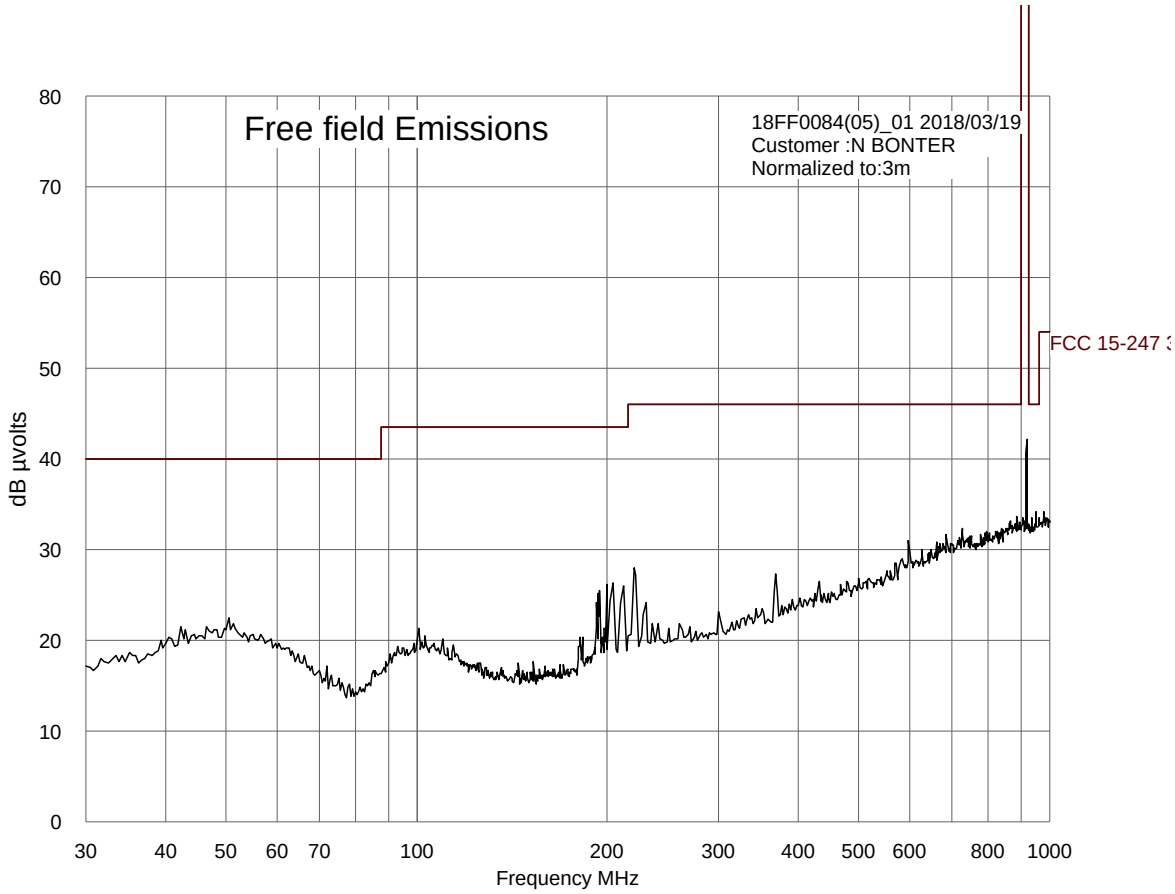
Sample calculation: 35.52dBµV/m (field strength) = 7.62dBµV (receiver reading) + 27.9dB (Correction factor)

V = Vertical
H = Horizontal

TEST ENGINEER: Richard Pennell

10.1.4 Profile; EUT Mode 12

Maximum peak hold trace with quasi-peak values (✳)



10.2 Radiated Emissions; 1.0 to 10 GHz (worst-case)

Radiated emissions pre-scan profile measurements were taken at a distance of three metres with the EUT turned through 360°, with both horizontal and vertical antennae polarities in an anechoic chamber. This pre-scan profile was made from 1.0 GHz to 10 GHz and evaluated against the FCC limits.

Using the pre-scan results as a guide, each emission from the EUT was maximised. Measurements were carried out a distance of three metres in a CISPR 16-1-4 compliant semi-anechoic chamber. Cable positions were then finally adjusted to produce the maximum emission levels. The worst-case results are recorded below.

The results below show compliance with 15.247 limit for restricted bands meeting the 15.209 limit.

10.2.1 Data; Mode 9

	AVERAGE @ 3m				PEAK @ 3m						
Restricted & Unrestricted	Frequency	Measured	Specified CLASS B Limit	Pass Margin	Measured	Specified CLASS B Limit	Pass Margin	Antenna polarity	Antenna height	Turntable azimuth	
	GHz	dBµV/m	dBµV/m	dB	dBµV/m	dBµV/m	dB	H/V	m	deg	STATUS
R	2.7456	51.93	54.0	2.07	66.09	74.0	7.91	H	1.3	10	Pass
R	7.3215	52.01	54.0	1.99	66.84	74.0	7.16	H	1.6	10	Pass
R	3.6612	42.32	54.0	11.68	57.83	74.0	16.17	H	1.4	250	Pass
R	8.2376	39.84	54.0	14.16	58.49	74.0	15.51	H	1.6	50	Pass
R	9.1520	44.69	54.0	9.31	59.64	74.0	14.36	H	1.6	185	Pass

V = Vertical / H = Horizontal

[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)

Sample calculation: 51.93dBµV/m (field strength) = 61.43dBµV (receiver reading) + 28.8dB (Correction factor) -38.3dB (Preamp gain)

V = Vertical
H = Horizontal

The measurements reported are the highest emissions relative to the FCC limits and take into account the antenna and cable loss factors. Measurements made according to the ANSI C63-10 test standard and Hursley EMC Services test procedure RHF-01.

Procedure: In accordance with ANSI C63.10:2013 and ANSI C63.4:2014.

TEST ENGINEER: Richard Pennell

Radiated emissions (continued)

10.2.2 Data; Mode 12

	AVERAGE @ 3m				PEAK @ 3m						
Restricted & Unrestricted	Frequency	Measured	Specified CLASS B Limit	Pass Margin	Measured	Specified CLASS B Limit	Pass Margin	Antenna polarity	Antenna height	Turntable azimuth	
	GHz	dBµV/m	dBµV/m	dB	dBµV/m	dBµV/m	dB	H/V	m	deg	STATUS
R	2.7456	53.17	54.0	0.83	66.62	74.0	7.38	H	1.3	10	Pass
R	7.3215	53.80	54.0	0.20	68.17	74.0	5.83	H	1.6	10	Pass
R	3.6612	44.22	54.0	9.78	58.36	74.0	15.64	H	1.4	250	Pass
R	8.2376	40.44	54.0	13.56	58.73	74.0	15.27	H	1.6	50	Pass
R	9.1520	45.92	54.0	8.08	60.38	74.0	13.62	H	1.6	185	Pass

V = Vertical / H = Horizontal

[1] Field strength (dBµV/m) = receiver/spectrum analyzer value (dBµV) + correction factor (dB)
[2] Correction factor = antenna factor ACF (dB) + cable loss (dB)

Sample calculation: 51.93dBµV/m (field strength) = 61.43dBµV (receiver reading) + 28.8dB (Correction factor) -38.3dB (Preamp gain)

V = Vertical
H = Horizontal

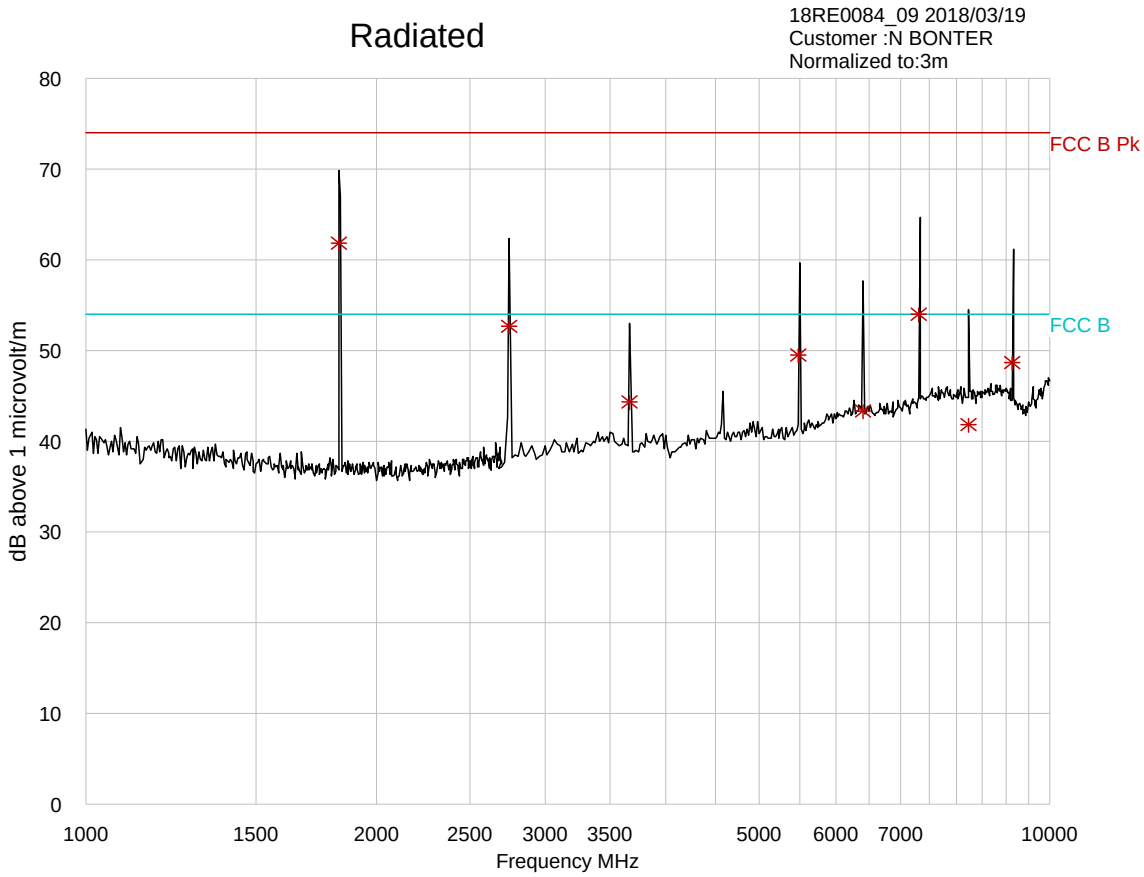
The measurements reported are the highest emissions relative to the FCC limits and take into account the antenna and cable loss factors. Measurements made according to the ANSI C63-10 test standard and Hursley EMC Services test procedure RHF-01.

Procedure: In accordance with ANSI C63.10:2013 and ANSI C63.4:2014.

TEST ENGINEER: Richard Pennell

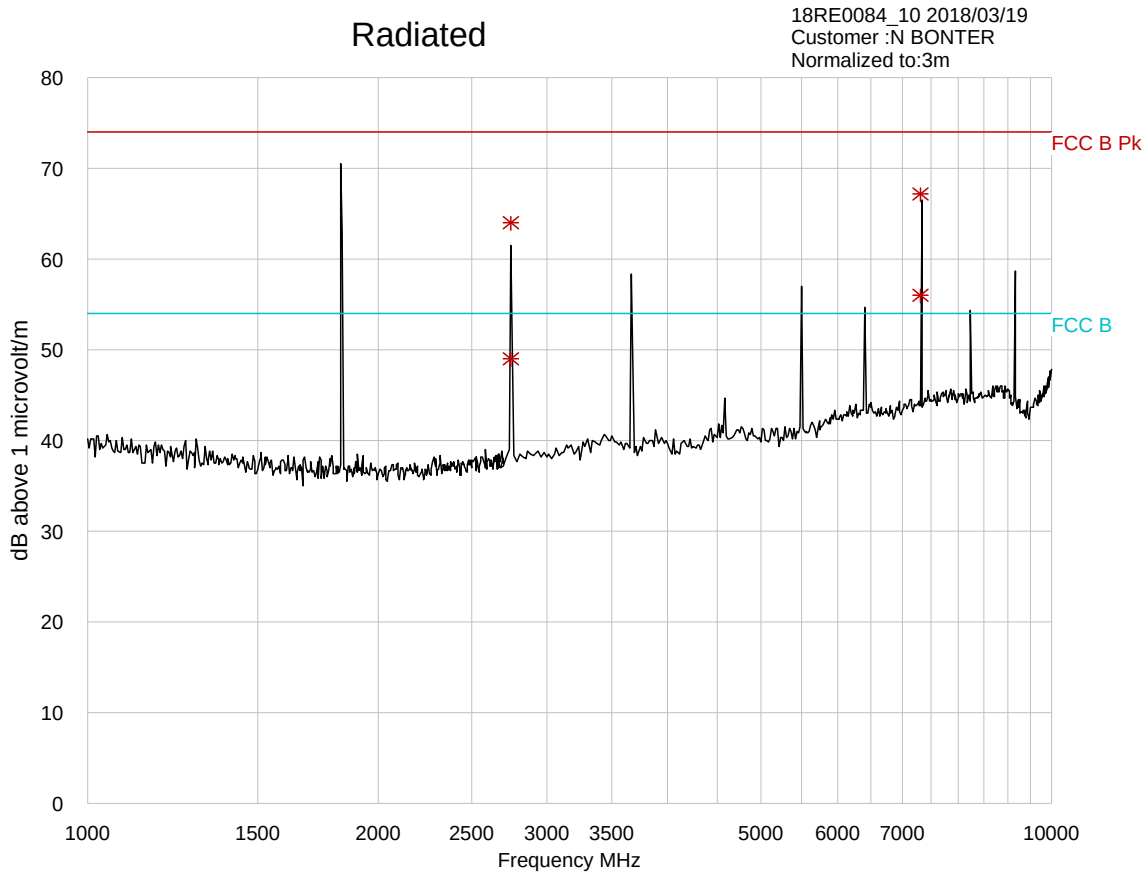
10.2.3 Profiles

Portrait Mode 9, maximum peak hold trace



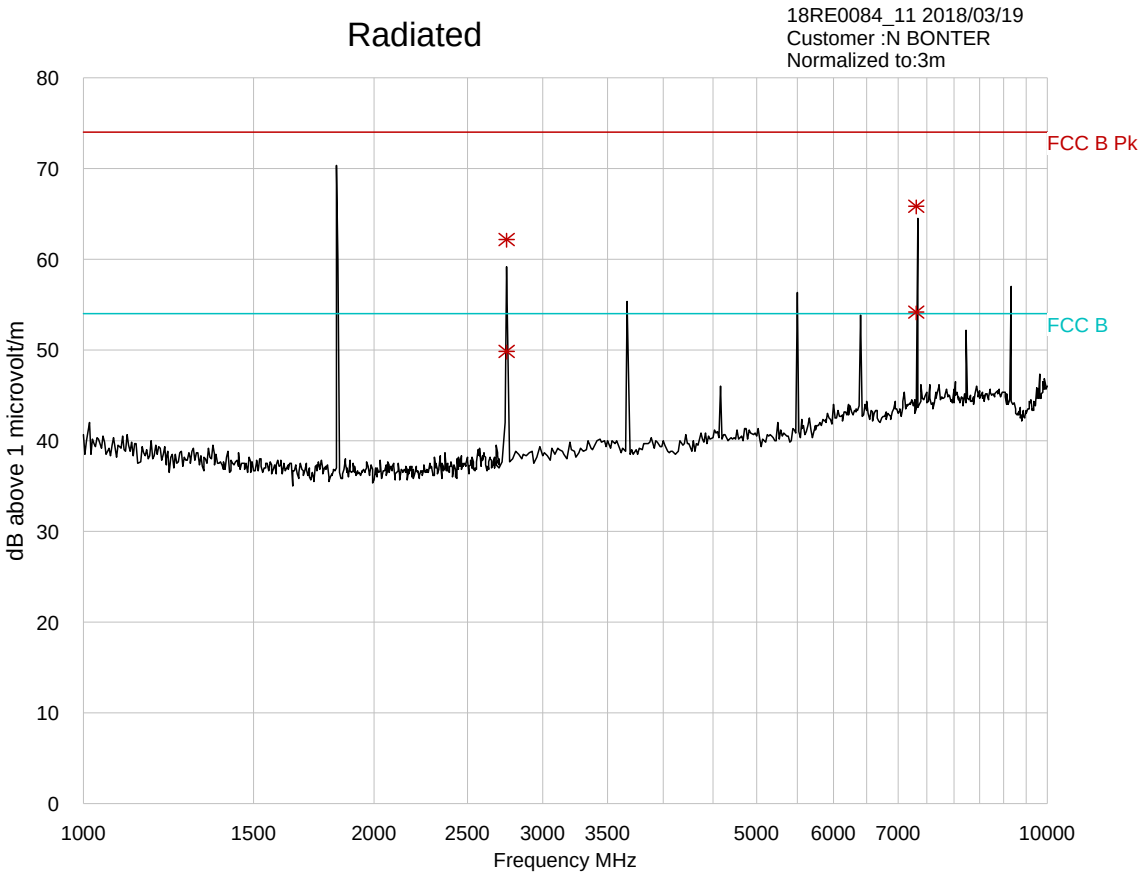
Profiles (continued)

Landscape Mode 9, maximum peak hold trace



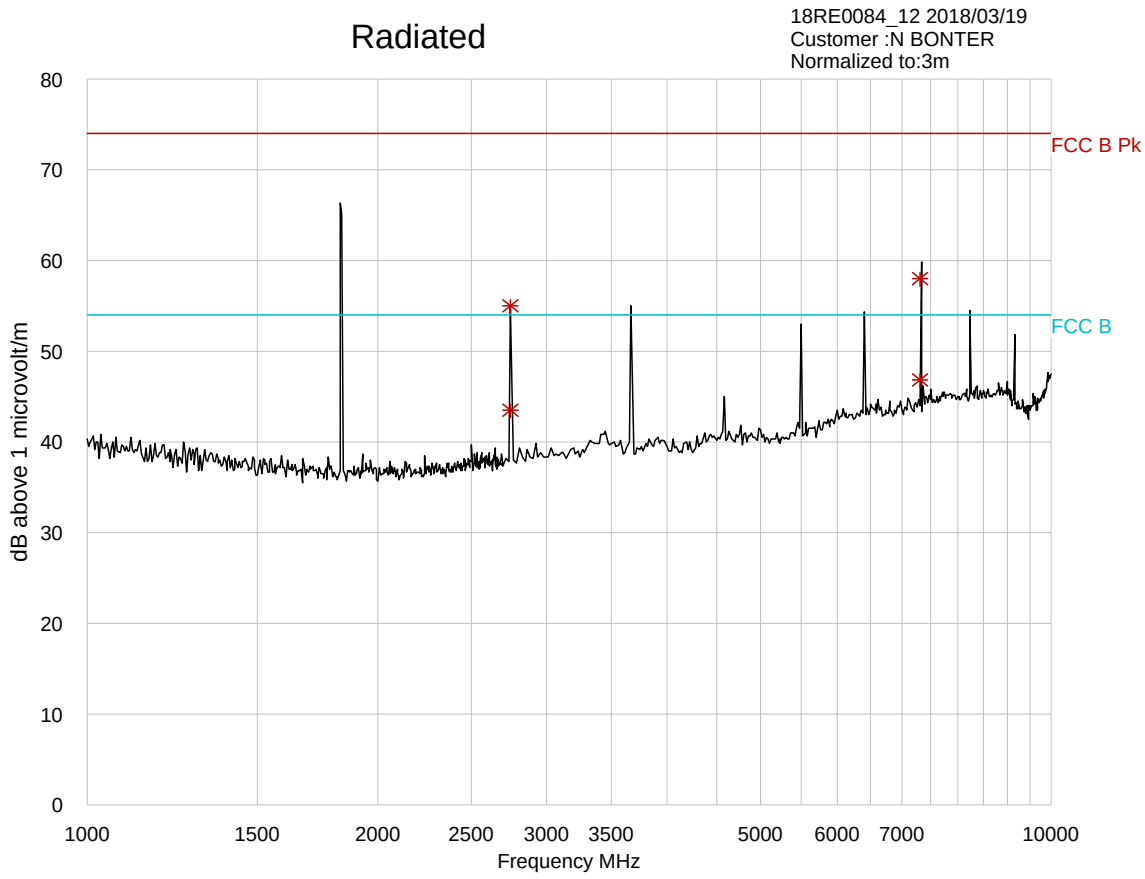
Profiles (continued)

Horizontal Mode 9, maximum peak hold trace (worst-case)



Profiles (continued)

Horizontal Mode 12, maximum peak hold trace (worst-case)



11.0 PHOTO LOG (EXAMPLES)

Emissions:

Conducted emissions

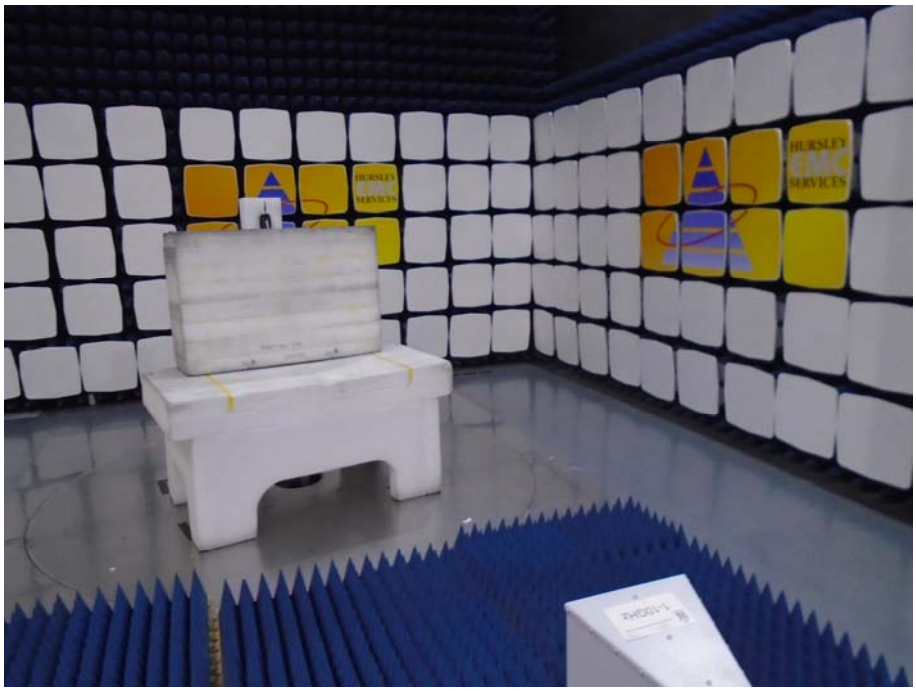
Photo Log (continued)

Emissions:

Radiated emissions; below 1.0 GHz

Photo Log (continued)

Radiated emissions; above 1.0 GHz



12.0 FCC SITE COMPLIANCE STATEMENT

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

13.0 MEASUREMENT UNCERTAINTIES

Emissions tests

For all emissions tests, measurement uncertainties have been calculated in line with the requirements of CISPR 16-4-2 to give a confidence level of greater than 95%. In all cases the laboratories calculated uncertainty values (known as Ulab) are equal to or are less than the expected uncertainty values contained in CISPR 16-4-2 (known as Ucispr).

Below is a list of the laboratories calculated measurement uncertainties:

Conducted emissions:

Via AMN/LISN:	±3.3 dB (9 kHz – 150 kHz), ±3.3 dB (150 kHz – 30 MHz)
Via AAN/ISN:	±5.0 dB (150 kHz – 30 MHz)
Via CVP:	±3.5 dB (150 kHz – 30 MHz)
Via CP:	±2.7 dB (150 kHz – 30 MHz)
Via 100 Ω:	±2.7 dB (150 kHz – 30 MHz)
Clicks:	±2.8 dB (150 kHz – 30 MHz)
Harmonics:	±5.8 % (100 Hz – 2 kHz)
Flicker:	±3.8 % (worst case for all parameters)

Radiated emissions:

H-Field:	±2.7 dB (9 kHz – 3 MHz), ±2.9 dB (3 MHz – 30 MHz)
D = 3.0 m:	±2.8 dB (30 MHz – 200 MHz), ±2.9 dB (200 MHz – 1 GHz)
D = 3.0 m:	±4.5 dB (1 GHz – 6 GHz), ±4.4 dB (6 GHz – 40 GHz)
D = 10.0 m:	±4.4 dB (30 MHz – 200 MHz), ±4.8 dB (200 MHz – 1 GHz)

End of document