

---

**FCC Part 15C & Industry Canada  
Verification Report**

**for the**

**Avonwood**

**ZoneSafe VibraTag Pedestrian  
(FCC)**

**ZST6687-FCC**

-----  
Project Engineer: R. Pennell-----  
Approval Signatory

Approved signatories: J. A. Jones ☐ R. P. St John James ☒ A. V. Jones ☐

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

## Contents

|            |                                                  |           |
|------------|--------------------------------------------------|-----------|
| <b>1.0</b> | <b>DECLARATION</b>                               | <b>3</b>  |
| 1.1        | FCC PART 15C AND INDUSTRY CANADA STATEMENT       | 3         |
| 1.2        | RELATED SUBMITTAL(S) GRANTS                      | 3         |
| 1.3        | EUT MANUFACTURER                                 | 3         |
| <b>2.0</b> | <b>EUT DESCRIPTION</b>                           | <b>4</b>  |
| 2.1        | IDENTITY                                         | 4         |
| 2.2        | PRODUCT OPERATION                                | 4         |
| 2.3        | SUPPORT EQUIPMENT                                | 4         |
| 2.4        | EXERCISER PROGRAM                                | 4         |
| <b>3.0</b> | <b>MEASUREMENT PROCEDURE AND INSTRUMENTATION</b> | <b>5</b>  |
| 3.1        | EMI SITE ADDRESS & TEST DATE                     | 5         |
| 3.2        | GENERAL OPERATING CONDITIONS                     | 5         |
| 3.3        | ENVIRONMENTAL AMBIENT                            | 5         |
| 3.4        | RADIATED EMISSIONS                               | 6         |
| 3.5        | CONDUCTED EMISSIONS                              | 7         |
| 3.6        | FCC – RADIATED EMISSIONS                         | 8         |
| <b>4.0</b> | <b>RESULTS</b>                                   | <b>8</b>  |
| 4.1        | CARRIER POWER                                    | 8         |
| 4.2        | RESULTS - 30 MHz TO 1000 MHz ACTIVE              | 8         |
| 4.3        | RESULTS - 30 MHz TO 1000 MHz STANDBY             | 9         |
| 4.4        | RESULTS - 1 GHz TO 10 GHz ACTIVE                 | 9         |
| 4.5        | RESULTS - 1 GHz TO 10 GHz STANDBY                | 9         |
| 4.6        | OCCUPIED BANDWIDTH TEST EQUIPMENT                | 10        |
| 4.7        | 99% OCCUPIED BANDWIDTH (IC)                      | 10        |
| 4.8        | 20dB OCCUPIED BANDWIDTH (FCC)                    | 10        |
| 4.9        | PLOTS                                            | 11        |
| 4.10       | 99% BANDWIDTH PLOT (IC)                          | 13        |
| 4.11       | 20dB BANDWIDTH PLOT (FCC)                        | 14        |
| <b>5.0</b> | <b>FCC DETAILS</b>                               | <b>15</b> |
| <b>6.0</b> | <b>INDUSTRY CANADA LETTER</b>                    | <b>16</b> |

### Document History:

Issue#1: 4<sup>th</sup> December 2017 was withdrawn and replaced by Issue#2: updated with editorial corrections.

Issue#2: 30<sup>th</sup> January 2018 was withdrawn and replaced by Issue#3: frequency in section 1.1 corrected.

## 1.0 DECLARATION

### 1.1 FCC Part 15C and Industry Canada Statement

The Equipment Under Test (EUT), as described and reported within this document, complies with the parts 15.209 and 15.249 of the CFR 47:2015 FCC rules in accordance with ANSI C63.10-2013. The EUT operates at a transmit frequency of 902.4MHz and complies with part 15C emission requirements. The EUT also complies with Industry Canada RSS-210 Issue 9.

Note: The EUT works in conjunction with other Avonwood products.

### 1.2 Related Submittal(s) Grants

ZoneSafe Standard Control Unit (FCC)  
ZoneSafe Standard Antenna Unit (FCC)  
Standard Tag - Pedestrian (FCC)  
TufTag (FCC)  
VibraTag - Pedestrian (FCC)  
Plus Reader (FCC)

### 1.3 EUT Manufacturer

|                         |                                                                                                             |
|-------------------------|-------------------------------------------------------------------------------------------------------------|
| Trade name:             | Avonwood Developments Ltd                                                                                   |
| Company name:           | Avonwood Developments Ltd                                                                                   |
| Company address:        | Knoll Technology Centre<br>Stapehill Road<br>Hampreston<br>Wimborne<br>Dorset<br>BH21 7ND<br>United Kingdom |
| Manufacturing address:  | As above.                                                                                                   |
| Company representative: | Mr Adrian Nash<br>Tel: +44 (0) 1202 868000                                                                  |

## 2.0 EUT DESCRIPTION

### 2.1 Identity

|                 |                                   |
|-----------------|-----------------------------------|
| EUT:            | ZoneSafe VibraTag Pedestian (FCC) |
| Model:          | ZST6687-FCC                       |
| Serial numbers: | 32496                             |
| Sample build:   | Production                        |

### 2.2 Product Operation

The ZoneSafe VibraTag Pedestrian (FCC) has been designed for use with a Zonesafe control unit which reads microchips that are housed in the tags. The ZoneSafe system transmits a 125kHz signal which is detected by the tags when nearby, the detector which in turn respond by transmitting at 902.4MHz which is received by the ZoneSafe system.

### 2.3 Support Equipment

None.

### 2.4 Exerciser Program

None.

### 3.0 MEASUREMENT PROCEDURE AND INSTRUMENTATION

#### 3.1 EMI Site Address & Test Date

|                      |                                                                                                       |
|----------------------|-------------------------------------------------------------------------------------------------------|
| EMI Company Offices  | Hursley EMC Services Ltd<br>Trafalgar House, Trafalgar Close, Chandlers Ford, Hampshire               |
| EMI Measurement Site | Hursley EMC Services Ltd<br>Hursley Park, Winchester; FCC Registered<br>UK Designation number: UK0006 |
| Test Date            | 15 <sup>th</sup> November 2017 to 29 <sup>th</sup> November 2017                                      |
| HEMCS References:    | 17R616                                                                                                |

#### 3.2 General Operating Conditions

Testing was performed according to the procedures in ANSI C63.10-2013. Final radiated testing was performed at a EUT to antenna distance of three metres (above 30 MHz).

Below 30 MHz the EUT was measured at an antenna distance of three and ten metres and the extrapolation factor calculated.

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  | 21.4 - 22 degrees Celsius | 56 - 59% relative | 1016.8 – 1023.5 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 |
|------|----|-----------------|---------------|------------|----------------------------------|----------------------|
| 762  | 3  | Schwarzbeck     | VULB9162      | 129        | 30-7000MHz                       | 07/04/2019           |
| 762a | 3  | Schwarzbeck     | DGA 9552N     | 0          | 6dB attenuator for #762          | 07/04/2019           |
| 050  | 1  | HP              | 8447D         | 1937A02341 | Pre-amplifier (30-1000MHz)       | 06/10/2019           |
| 033  | 1  | HP              | 8593EM        | 3726U00203 | Spectrum analyser (9kHz-26.5GHz) | 29/11/2017           |
| 289  | 1  | Rohde & Schwarz | ESCI 7        | 100765     | CISPR 7GHz Receiver              | 24/08/2018           |
| 250  | 1  | HP              | 8449B         | 3008A01077 | Pre-amplifier (1.0-26.5GHz)      | 31/08/2018           |
| 466  | 3  | Schwarzbeck     | BBHA 9120 571 | 571        | 1-10GHz Horn                     | 24/02/2019           |
| 674  | 1  | Rohde & Schwarz | ESH3-Z5       | 838576-018 | 1 phase LISN                     | 26/05/2018           |
| 158  | 1  | Rohde & Schwarz | ESH3-Z2       | 357881052  | Pulse limiter                    | 07/10/2018           |
| 698  | 1  | Gauss           | TDEMI30M      | 1510002    | Time Domain Conducted Receiver   | 09/01/2018           |
| 047  | 3  | Rohde & Schwarz | HFH2-Z2       | 879021/22  | Loop antenna (9kHz-30MHz)        | 01/06/2019           |

The data obtained from the profile scan was used as a guide for the final Open Area Test Site (OATS) measurements.

#### Final Measurements

The system under test was transferred to the OATS from the semi-anechoic chamber. 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. Below 30 MHz the loop antenna was set at a height of 1m, the EUT was measured with the antenna in the vertical and horizontal polarity and each emission was maximised by revolving the system on the turntable. The EUT was tested in 3 orientations, the worst-case data is presented in this report. Test instrumentation used in the OAT's measurements was as follows:

| #ID  | CP | Manufacturer    | Type          | Serial No  | Description                      | Calibration due date |
|------|----|-----------------|---------------|------------|----------------------------------|----------------------|
| 762  | 3  | Schwarzbeck     | VULB9162      | 129        | 30-7000MHz                       | 07/04/2019           |
| 762a | 3  | Schwarzbeck     | DGA 9552N     | 0          | 6dB attenuator for #762          | 07/04/2019           |
| 050  | 1  | HP              | 8447D         | 1937A02341 | Pre-amplifier (30-1000MHz)       | 06/10/2019           |
| 033  | 1  | HP              | 8593EM        | 3726U00203 | Spectrum analyser (9kHz-26.5GHz) | 29/11/2017           |
| 289  | 1  | Rohde & Schwarz | ESCI 7        | 100765     | CISPR 7GHz Receiver              | 24/08/2018           |
| 250  | 1  | HP              | 8449B         | 3008A01077 | Pre-amplifier (1.0-26.5GHz)      | 31/08/2018           |
| 466  | 3  | Schwarzbeck     | BBHA 9120 571 | 571        | 1-10GHz Horn                     | 24/02/2019           |
| 047  | 3  | Rohde & Schwarz | HFH2-Z2       | 879021/22  | Loop antenna (9kHz-30MHz)        | 01/06/2019           |

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.  
 '\*\*' denotes that the calibration, as defined by Hursley EMC Services quality system, remains valid whilst within four calendar months of the due date.

### 3.5 Conducted Emissions

N/A (Battery powered)

### 3.6 FCC – Radiated Emissions

A search was made of the frequency spectrum from 30MHz 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.

Between 110 and 490 kHz measurements were made using an average detector with a 200 Hz bandwidth.

## 4.0 RESULTS

### 4.1 Carrier Power

| Frequency<br>MHz | Receiver<br>amplitude<br>dB $\mu$ V | Antenna<br>factor<br>dB | Cable<br>loss<br>dB | Preamp<br>Gain<br>dB | Actual<br>quasi-peak value<br>3m | Specified limit<br>@ 3m |      |
|------------------|-------------------------------------|-------------------------|---------------------|----------------------|----------------------------------|-------------------------|------|
|                  |                                     |                         |                     |                      | dB $\mu$ V/m                     | dB $\mu$ V/m            | mV/m |
| 902.4            | 80.2                                | 33.7                    | 6.1                 | 38.6                 | 81.4                             | 94                      | 50   |

### 4.2 RESULTS - 30 MHz to 1000 MHz Active

| Frequency<br>MHz | Receiver<br>amplitude<br>dB $\mu$ V | Antenna<br>factor<br>dB | Cable<br>loss<br>dB | Actual<br>quasi-peak value<br>@ 3m | Specified limit<br>@ 3m |           |
|------------------|-------------------------------------|-------------------------|---------------------|------------------------------------|-------------------------|-----------|
|                  |                                     |                         |                     | dB $\mu$ V/m                       | dB $\mu$ V/m            | $\mu$ V/m |
| 67.89            | 6.7                                 | 9.6                     | 1.0                 | 17.3                               | 40                      | 100       |
| 69.98            | 3.6                                 | 8.7                     | 1.0                 | 13.3                               | 40                      | 100       |
| 99.2             | 3.4                                 | 11.4                    | 1.3                 | 16.1                               | 43.5                    | 150       |
| 262              | 10.8                                | 11.9                    | 2.2                 | 24.9                               | 46                      | 200       |
| 901.95           | 12.1                                | 21.9                    | 5.0                 | 38.97                              | 46                      | 200       |
| 902              | 14.2                                | 21.9                    | 5.0                 | 41.12                              | 46                      | 200       |
| 928              | 2.9                                 | 22.0                    | 5.1                 | 29.95                              | 46                      | 200       |
| 928.05           | 2.8                                 | 22.0                    | 5.1                 | 29.92                              | 46                      | 200       |

Uncertainty of measurement:  $\pm 4.2$  dB $\mu$ V/m for a 95% confidence level.

### 4.3 RESULTS - 30 MHz to 1000 MHz Standby

| Frequency<br>MHz | Receiver<br>amplitude<br>dBμV | Antenna<br>factor<br>dB | Cable<br>loss<br>dB | Actual<br>quasi-peak value<br>@ 3m | Specified limit<br>@ 3m |      |
|------------------|-------------------------------|-------------------------|---------------------|------------------------------------|-------------------------|------|
|                  |                               |                         |                     | dBμV/m                             | dBμV/m                  | μV/m |
| 40.625           | 10.1                          | 12.8                    | 0.8                 | 23.7                               | 40                      | 100  |
| 41.9             | 10.7                          | 12.9                    | 0.8                 | 24.4                               | 40                      | 100  |
| 60.6             | 13.8                          | 12.7                    | 1.0                 | 27.5                               | 40                      | 100  |
| 62.725           | 14.7                          | 11.8                    | 1.0                 | 27.5                               | 40                      | 100  |
| 68.675           | 22.4                          | 9.1                     | 1.0                 | 32.5                               | 40                      | 100  |
| 92.05            | 9.9                           | 10.3                    | 1.2                 | 21.4                               | 43.5                    | 150  |
| 104.8            | 9.1                           | 11.4                    | 1.3                 | 21.8                               | 43.5                    | 150  |

### 4.4 RESULTS - 1 GHz to 10 GHz Active

| Frequency | AVERAGE @ 3m |                               |                | PEAK @ 3m |                               |                | Antenna<br>polarity | Antenna<br>height | Turntable<br>azimuth | STATUS |
|-----------|--------------|-------------------------------|----------------|-----------|-------------------------------|----------------|---------------------|-------------------|----------------------|--------|
|           | Measured     | Specified<br>CLASS B<br>Limit | Pass<br>Margin | Measured  | Specified<br>CLASS B<br>Limit | Pass<br>Margin |                     |                   |                      |        |
| GHz       | dBμV/m       | dBμV/m                        | dB             | dBμV/m    | dBμV/m                        | dB             | H/V                 | m                 | deg                  |        |
| 1.8048    | 25.23        | 54                            | 26.94          | 59.77     | 74                            | 24.31          | V                   | 1.2               | 332                  | Pass   |

V = Vertical / H = Horizontal

### 4.5 RESULTS - 1 GHz to 10 GHz Standby

| Frequency                      | AVERAGE @ 3m |                               |                | PEAK @ 3m |                               |                | Antenna<br>polarity | Antenna<br>height | Turntable<br>azimuth | STATUS |
|--------------------------------|--------------|-------------------------------|----------------|-----------|-------------------------------|----------------|---------------------|-------------------|----------------------|--------|
|                                | Measured     | Specified<br>CLASS B<br>Limit | Pass<br>Margin | Measured  | Specified<br>CLASS B<br>Limit | Pass<br>Margin |                     |                   |                      |        |
| GHz                            | dBμV/m       | dBμV/m                        | dB             | dBμV/m    | dBμV/m                        | dB             | H/V                 | m                 | deg                  |        |
|                                |              |                               |                |           |                               |                |                     |                   |                      |        |
| No spurious emissions observed |              |                               |                |           |                               |                |                     |                   |                      |        |

V = Vertical / H = Horizontal

## 4.6 Occupied Bandwidth test equipment

| #ID | CP | Manufacturer    | Type  | Serial No | Description      | Calibration due date |
|-----|----|-----------------|-------|-----------|------------------|----------------------|
| 289 | 1  | Rohde & Schwarz | ESCI7 | 100765    | 7GHz Receiver    | 24/08/2018           |
| --  | 1  | EMCO            | 7045  | 1048      | Near filed probe | Internal             |

## 4.7 99% Occupied Bandwidth (IC)

Section 4.6 of RSS-GEN

The output from the measuring antenna was fed into the input of the ESCI spectrum analyser/receiver. The bandwidth of the transmitter was measured with an ESCI receiver 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 Transmitter was measured as 75.6 kHz.

## 4.8 20dB Occupied Bandwidth (FCC)

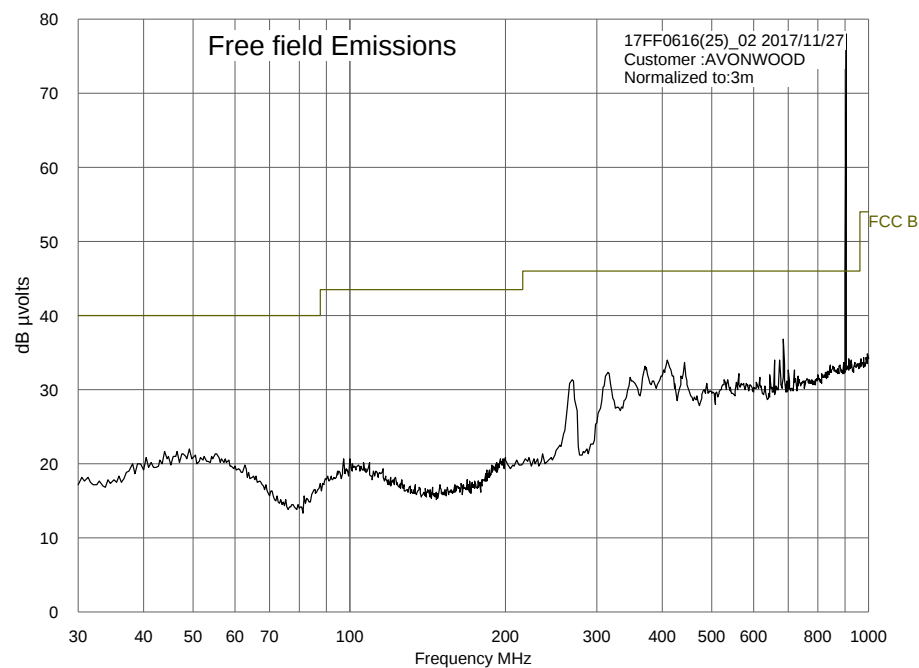
ANSI 63.10 6.9.3

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

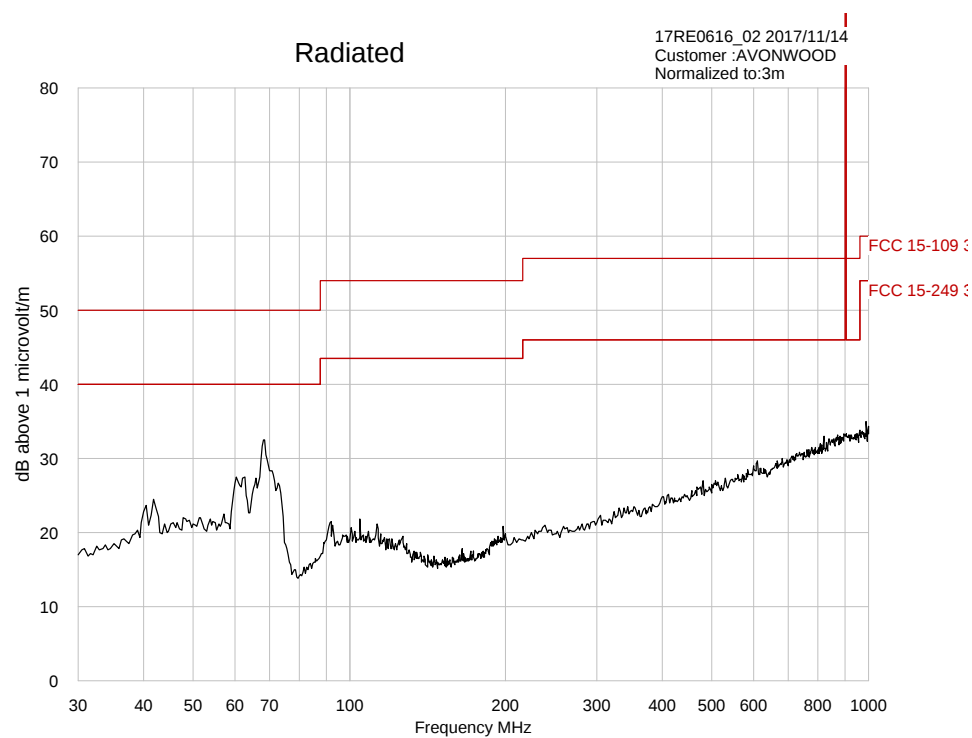
The bandwidth of the Transmitter signal was measured as 78.0 kHz.

## 4.9 Plots

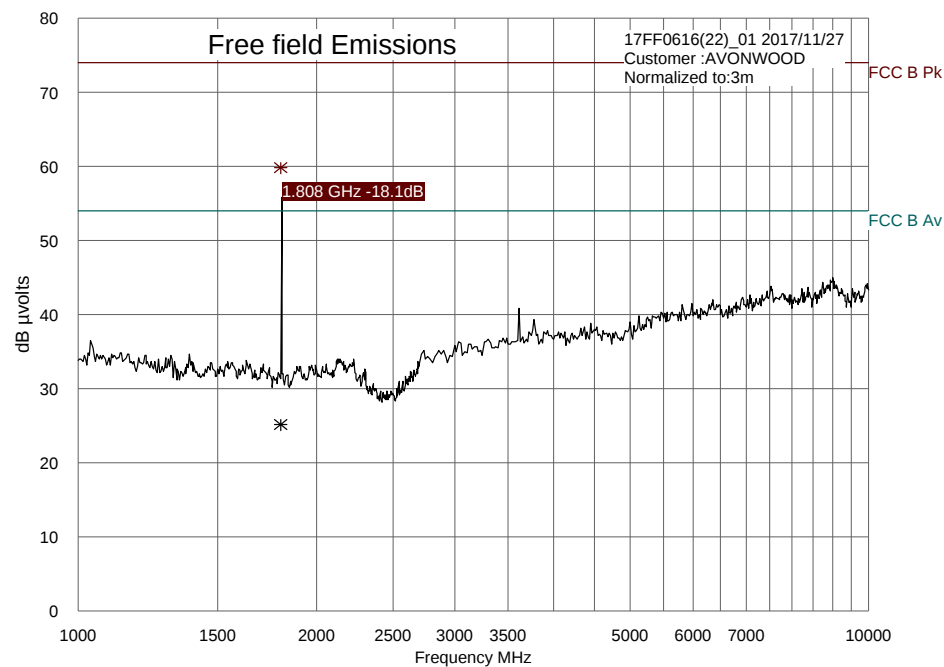
Emissions 30MHz -1GHz Active



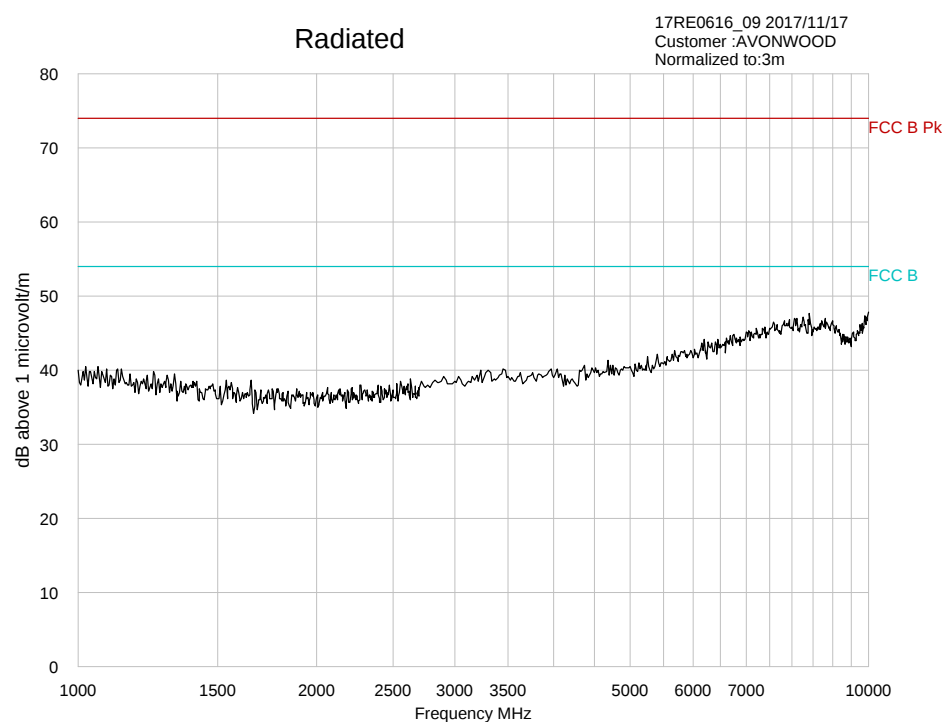
Emissions plots 30MHz – 1GHz Standby



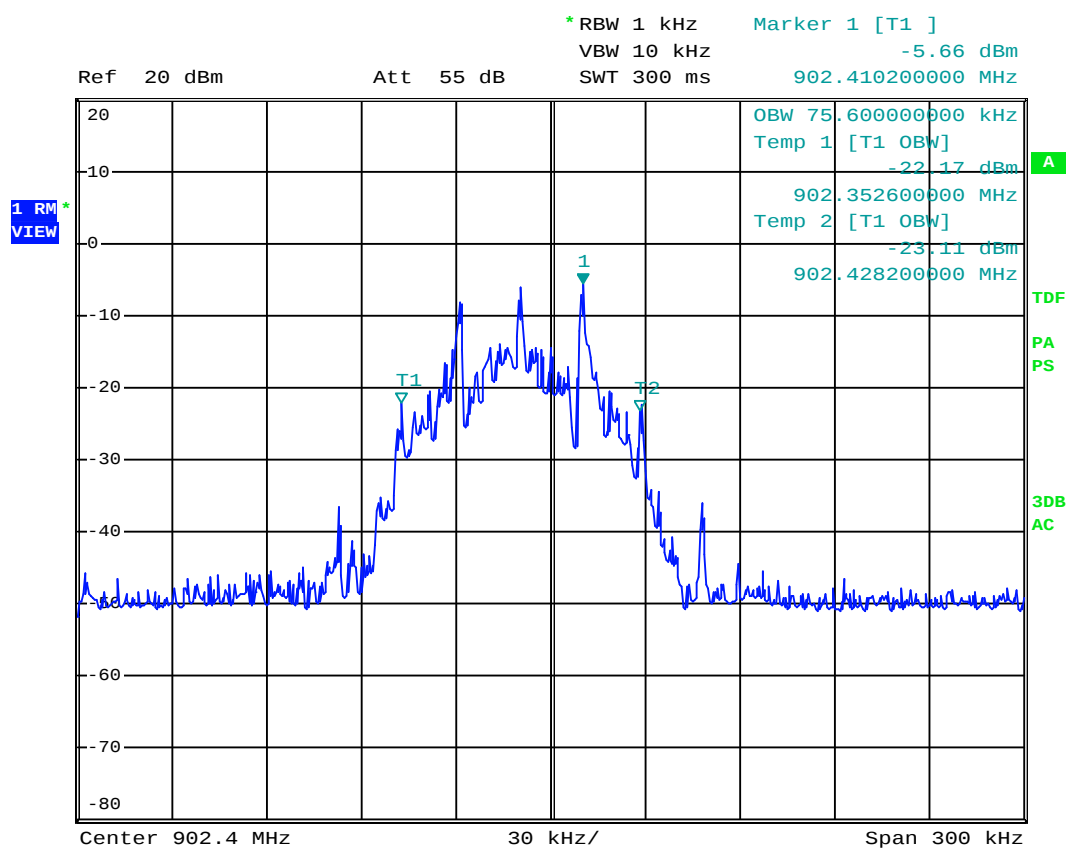
## Emissions plots &gt; 1GHz Active



## Emissions plots &gt; 1GHz Standby

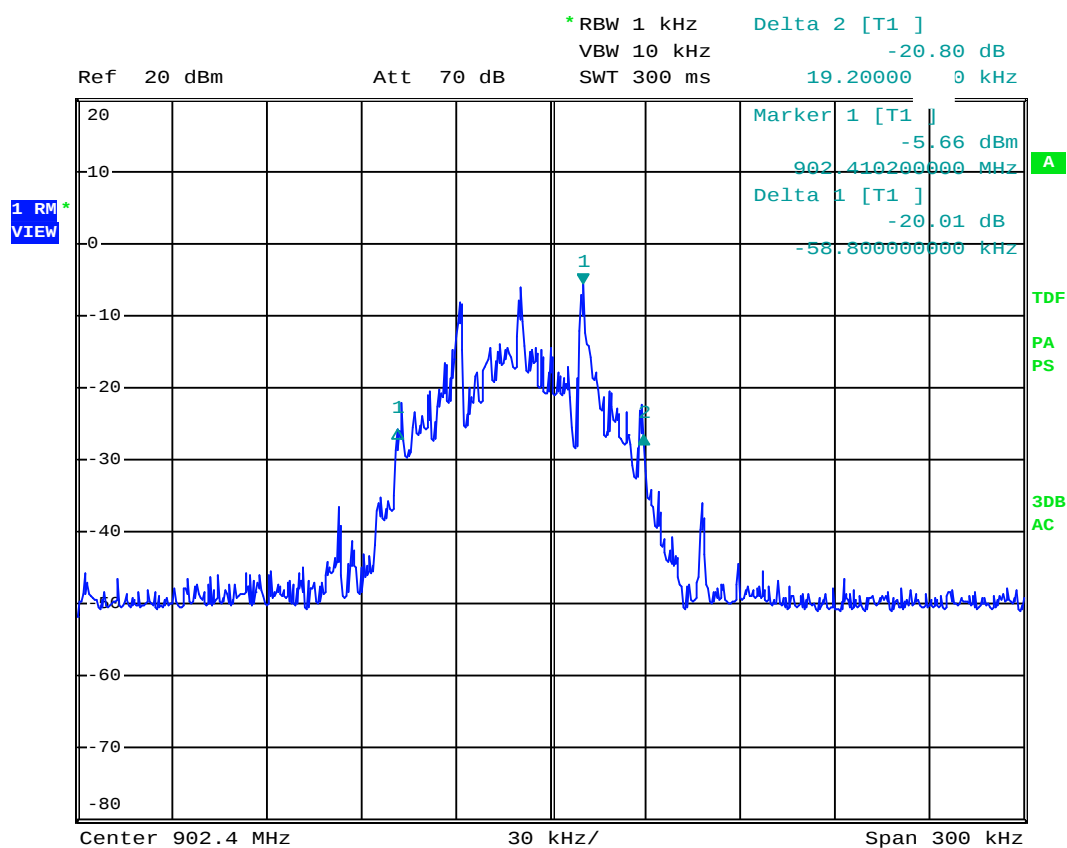


## 4.10 99% Bandwidth Plot (IC)



Date: 23.NOV.2017 14:02:10

## 4.11 20dB Bandwidth Plot (FCC)



Date: 23.NOV.2017 14:04:28

## 5.0 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

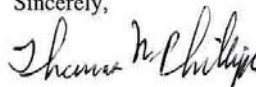
Dear Sir or Madam:

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

## 6.0 INDUSTRY CANADA LETTER



September 24, 2010

OUR FILE: 46405-7104

Submission No: 142641

**Hursley EMC Services Ltd.**  
Unit 16, Brickfield Lane, Eastleigh  
Hampshire, SO53 4DP  
Great Britain

*Attention:* Rob St. John James

Dear Sir/Madame:

The Bureau has received your application for the renewal of a 3/10m OATS. Be advised that the information received was satisfactory to Industry Canada. The following number(s) is now associated to the site(s) for which registration / renewal was sought ( **7104A-1** ). Please reference the appropriate site number in the body of test reports containing measurements performed on the site. In addition, please keep for your records the following information;

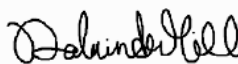
- The company address code associated to the site(s) located at the above address is: **7104A**

Furthermore, to obtain or renew a unique site number, the applicant shall demonstrate that the site has been accredited to ANSI C63.4-2003 or later. A scope of accreditation indicating the accreditation by a recognized accreditation body to ANSI C63.4-2003 or later shall be accepted. Please indicate in a letter the previous assigned site number if applicable and the type of site (example: 3 metre OATS or 3 metre chamber). If the test facility is not accredited to ANSI C63.4-2003 or later, the test facility shall submit test data demonstrating full compliance with the ANSI standard. The Bureau will evaluate the filing to determine if recognition shall be granted.

The frequency for re-validation of the test site and the information that is required to be filed or retained by the testing party shall comply with the requirements established by the accrediting organization. However, in all cases, test site re-validation shall occur on an interval not to exceed two years. There is no fee or form associated with an OATS filing. OATS submissions are encouraged to be submitted electronically to the Bureau using the following URL;  
[http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h\\_tt00052e.html](http://strategis.ic.gc.ca/epic/internet/inceb-bhst.nsf/en/h_tt00052e.html).

If you have any questions, you may contact the Bureau by e-mail at [certification.bureau@ic.gc.ca](mailto:certification.bureau@ic.gc.ca) Please reference our file and submission number above for all correspondence.

Yours sincerely,



Dalwinder Gill  
For: Wireless Laboratory Manager  
**Certification and Engineering Bureau**  
3701 Carling Ave., Building 94  
P.O. Box 11490, Station "H"  
Ottawa, Ontario K2H 8S2  
Email: [dalwinder.gill@ic.gc.ca](mailto:dalwinder.gill@ic.gc.ca)  
Tel. No. (613) 998-8363  
Fax. No. (613) 990-4752