

**47 CFR Part 2.1091**  
**Radiofrequency radiation exposure evaluation:**  
**Mobile devices**

**Test Sample:** Thuraya WE  
**Model Number:** CIOF1701  
**FCC ID:** YP9CIOF1701  
**Tested For:** Beam Communications

**Report Number:** M161205-6R2  
(Supersedes report M161205-6R1)  
**Date of Issue:** 9 August 2017

EMC Technologies Pty Ltd reports apply only to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. EMC Technologies Pty Ltd shall have no liability for any deductions, inferences or generalisations drawn by the client or others from EMC Technologies Pty Ltd issued reports. This report shall not be used to claim, constitute or imply product endorsement by EMC Technologies Pty Ltd.

Contents

1 INTRODUCTION..... 4

2 GENERAL INFORMATION ..... 4

3 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), §1.1310 ..... 5

4 EVALUATION RESULT..... 5

5 MEASUREMENT RESULTS ..... 8

6 CONCLUSION ..... 8

## 47 CFR Part 2.1091

### Radiofrequency radiation exposure evaluation: Mobile devices

**Issued by:** **EMC TECHNOLOGIES PTY. LTD.,**

176 Harrick Road, Keilor Park, VIC 3042, Australia.

**Phone:** +61 3 9365 1000, **E-mail:** sales@emctech.com.au, **Web:** www.emctech.com.au

FCC registration number: 90560 and ISED Canada IOATS number: IC 3569B

**Test Sample:** Thuraya WE  
**Model Number:** CIOF1701  
**FCC ID:** YP9CIOF1701  
**Manufacturer:** Beam Communications

**Tested for:** Beam Communications  
**Address:** Unit 5, 8 Anzed Crt, Mulgrave  
Victoria 3170, AUSTRALIA  
**Phone:** +61 (0)3 985884500  
**Contact:** Greg Incoll  
**Email:** greg.incoll@beamcommunications.com.au

**KDB:** **447498 D01 General RF Exposure Guidance v06**  
RF exposure procedures and equipment authorization policies for mobile and portable devices.

**Result:** The CIOF1701 complied with the RF exposure requirements of 47 CFR Part 2.1091, however an exclusion zone of 0.57 m in front of the antenna applies, elsewhere the exposure level was below the mobile device limits.

**Test Date:** 17 May 2017

  
**Test Officer:** Rob Weir  
Wireless Certification Manager

  
**Checked by:** Chris Zombolas  
Technical Director  
EMC Technologies Pty Ltd

## 1 INTRODUCTION

This report is intended to demonstrate compliance of the CIOF1701 Thuraya WE with the RF exposure requirements of 47 CFR Part 2.1091. Evaluation was performed in accordance with FCC KDB 447498 D01.

The test sample was provided by the Client. The conclusion herein is based on the information provided by the client.

## 2 GENERAL INFORMATION

(Information supplied by the Client)

### 2.1 EUT (Transmitter) Details

|                                             |                                   |
|---------------------------------------------|-----------------------------------|
| <b>Radio Module:</b>                        | AFTERBURNER Satellite Transceiver |
| <b>Operating Band:</b>                      | 1626.5 MHz to 1660.5 MHz          |
| <b>Equivalent Isotropic Radiated Power:</b> | 40.7 Watts                        |
| <b>Antenna:</b>                             | Directive Stacked Patch           |
| <b>Antenna Assembly Gain:</b>               | 11.1 dBi                          |

|                         |                                           |                      |
|-------------------------|-------------------------------------------|----------------------|
| <b>Radio Module:</b>    | TOBY-L210 GSM/UMTS Module                 |                      |
| <b>FCC ID:</b>          | XPYTOBYL210 (Data taken from this filing) |                      |
| <b>Operating Bands:</b> | <b>Frequency:</b>                         | <b>Maximum EIRP:</b> |
| FDD 2 UMTS              | 1850-1907.6 MHz                           | 660.693 mW           |
| FDD 5 UMTS              | 824-846.6 MHz                             | 407.380 mW           |
| eFDD 5 LTE              | 824-849 MHz                               | 363.078 mW           |
| eFDD 7 LTE              | 2500-2570 MHz                             | 588.844 mW           |

Only these bands will be active.

|                        |                                            |                      |
|------------------------|--------------------------------------------|----------------------|
| <b>Radio Module:</b>   | RS9113 n-Link module                       |                      |
| <b>FCC ID:</b>         | XF6-RS9113SB (Data taken from this filing) |                      |
| <b>Operating Band:</b> | <b>Frequency:</b>                          | <b>Maximum EIRP:</b> |
| Wi-Fi 2.4 GHz          | 2400-2483.5 MHz                            | 51.3 mW              |

Only this band will be active.

For the purpose of this report it was assumed co-located antenna distance was 0 cm and all radios operated at 100 % duty cycle.

### 2.2 EUT (Host) Details

|                                     |                                                                        |
|-------------------------------------|------------------------------------------------------------------------|
| <b>Device under Test / PMN:</b>     | Thuraya WE                                                             |
| <b>Model Number / HVIN:</b>         | CIOF1701                                                               |
| <b>Manufacturer:</b>                | Beam Communications                                                    |
| <b>Declared Minimum separation:</b> | 0.57 m                                                                 |
| <b>Power Supply:</b>                | Internal 7.4 volt battery or external AC plug pack with 12 VDC output. |
| <b>Operating Temperature Range:</b> | -20°C to +55°C (-4°F to +131°F)                                        |

The Cioffi device accesses the Thuraya satellite network while at the same time establishing a Wi-Fi link to a Smartphone. This allowed the user (via a propriety application) to place calls from their Smartphone that are then routed via the satellite network. The device also incorporates a cellular modem which can operate in the same manner if a network is present.

### 3 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE), §1.1310

| Frequency range (MHz)                                          | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density (mW/cm <sup>2</sup> ) | Averaging time (minutes) |
|----------------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------------------|
| <b>(A) Limits for Occupational/Controlled Exposure</b>         |                               |                               |                                     |                          |
| 0.3-3.0                                                        | 614                           | 1.63                          | *100                                | 6                        |
| 3.0-30                                                         | 1842/f                        | 4.89/f                        | *900/f <sup>2</sup>                 | 6                        |
| 30-300                                                         | 61.4                          | 0.163                         | 1.0                                 | 6                        |
| 300-1,500                                                      |                               |                               | f/300                               | 6                        |
| 1,500-100,000                                                  |                               |                               | 5                                   | 6                        |
| <b>(B) Limits for General Population/Uncontrolled Exposure</b> |                               |                               |                                     |                          |
| 0.3-1.34                                                       | 614                           | 1.63                          | *100                                | 30                       |
| 1.34-30                                                        | 824/f                         | 2.19/f                        | *180/f <sup>2</sup>                 | 30                       |
| 30-300                                                         | 27.5                          | 0.073                         | 0.2                                 | 30                       |
| 300-1,500                                                      |                               |                               | f/1500                              | 30                       |
| 1,500-100,000                                                  |                               |                               | 1.0                                 | 30                       |

Where f = Frequency in MHz, \* = Plane-wave power density

### 4 EVALUATION RESULT

#### Limits:

The Maximum Permissible Exposure (MPE) limit defined in §1.1310 for a transmitter operating above 1.5 GHz is:

$$\text{MPE limit} = 1.00 \text{ mW/cm}^2 (= 61.4 \text{ V/m, calculated by: } \sqrt{(1200 \times \pi \times \text{mW/cm}^2)})$$

The Maximum Permissible Exposure (MPE) limit defined in §1.1310 for a transmitter operating above 846.6 MHz is:

$$\text{MPE limit} = 0.56 \text{ mW/cm}^2$$

The Maximum Permissible Exposure (MPE) limit defined in §1.1310 for a transmitter operating above 826.5 MHz is:

$$\text{MPE limit} = 0.55 \text{ mW/cm}^2$$

#### Calculation:

$$S = \frac{EIRP}{4\pi R^2}$$

Where: S = Power Spectral density (mW/cm<sup>2</sup>)  
 EIRP = Equivalent Isotropic Radiated Power (mW)  
 R = Separation distance (cm)

Satellite transceiver minimum distance for MPE limit:

$$\begin{aligned}\text{Distance} &= [\sqrt{(30 \times \text{transmitter power, W} \times \text{antenna gain})}] \div [\text{MPE limit, V/m}] \\ &= [\sqrt{(30 \times 40.7)}] \div 61.4 \text{ V/m} \\ &= 0.57 \text{ m}\end{aligned}$$

An exclusion zone of 0.57 m is required around the device. As the antenna had a high gain subsequent measurements were performed to verify that the exclusion zone was only applicable directly in front of the antenna. Refer to the next section.

Satellite transceiver MPE:

| EIRP (mW) | Separation distance (m) | Power density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) |
|-----------|-------------------------|-------------------------------------|-----------------------------|
| 40,700    | 0.57                    | 0.9969                              | 1.00                        |

Cellular modem MPE:

| Band       | EIRP (mW) | Separation distance (m) | Power density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) |
|------------|-----------|-------------------------|-------------------------------------|-----------------------------|
| FDD 2 UMTS | 660.693   | 0.57                    | 0.0162                              | 1.00                        |
|            |           | 0.20                    | 0.1314                              | 1.00                        |
| FDD 5 UMTS | 407.380   | 0.57                    | 0.0100                              | 0.56                        |
|            |           | 0.20                    | 0.0810                              | 0.56                        |
| eFDD 5 LTE | 363.078   | 0.57                    | 0.0089                              | 0.55                        |
|            |           | 0.20                    | 0.0722                              | 0.55                        |
| eFDD 7 LTE | 588.844   | 0.57                    | 0.0144                              | 1.00                        |
|            |           | 0.20                    | 0.1171                              | 1.00                        |

Wi-Fi radio MPE:

| EIRP (mW) | Separation distance (m) | Power density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) |
|-----------|-------------------------|-------------------------------------|-----------------------------|
| 51.3      | 0.57                    | 0.0013                              | 1.00                        |
|           | 0.20                    | 0.0102                              | 1.00                        |

**Co-location consideration:**

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is  $\leq 1.0$ .

$$\sum_{1}^N \frac{S_{eqN}}{S_{limN}} = \frac{S_{eq1}}{S_{lim1}} + \frac{S_{eq2}}{S_{lim2}} + \dots + \frac{S_{eqN}}{S_{limN}} \leq 1$$

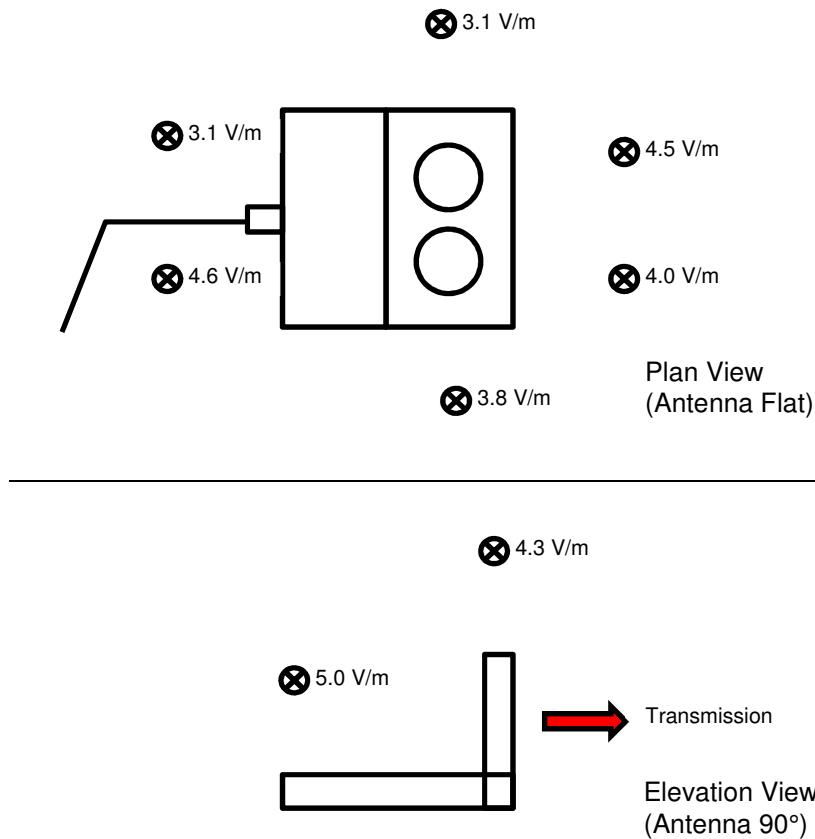
Where:  $S_{eq}$  = Power Spectral density (mW/cm<sup>2</sup>) of a specific transmitter  
 $S_{lim}$  = MPE limit (mW/cm<sup>2</sup>)

The following simultaneous transmissions are possible:

| Transmitter 1         | Transmitter 2 | 0.57 m MPE Ratio Sum | Result |
|-----------------------|---------------|----------------------|--------|
| Satellite Transceiver | Wi-Fi         | 0.9982               | Pass   |
| FDD 2 UMTS            | Wi-Fi         | 0.0175               | Pass   |
| FDD 5 UMTS            | Wi-Fi         | 0.0192               | Pass   |
| eFDD 5 LTE            | Wi-Fi         | 0.0175               | Pass   |
| eFDD 7 LTE            | Wi-Fi         | 0.0157               | Pass   |

## 5 MEASUREMENT RESULTS

As the antenna directionality was significant, measurements were performed around but not in front of the antenna. The transmitter was configured to transmit at full power and 100% duty cycle. The measurement distance of 20 cm was applied.



### Measurement Equipment:

| Equipment            | Description                                                                             | Calibrated    | Due           |
|----------------------|-----------------------------------------------------------------------------------------|---------------|---------------|
| <b>Meter</b>         | Asset Number: P-157<br>Manufacturer: NARDA<br>Model Number: NBM-520                     | 19 March 2016 | 19 March 2018 |
| <b>E-Field Probe</b> | Asset Number: P-157B<br>Manufacturer: NARDA<br>Model Number: EF6091<br>(100 MHz-60 GHz) | 19 March 2016 | 19 March 2018 |

## 6 CONCLUSION

The CIOF1701 was evaluated on behalf of Beam Communications with the RF exposure requirements of 47 CFR Part 2.1091. An exclusion zone of 0.57 m was required in front of the antenna, away from this area the electric field measured at 0.20 m did not exceed the MPE limit.