



Global Product Certification
EMC-EMF Safety Approvals

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)
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47 CFR Part 2.1091

Radiofrequency radiation exposure evaluation: Mobile devices

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


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


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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

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

Radio Module:	TOBY-L210 GSM/UMTS Module	
FCC ID:	XPYTOBYL210 (Data taken from this filing)	
Operating Bands:	Frequency:	Maximum EIRP:
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.

Radio Module:	RS9113 n-Link module	
FCC ID:	XF6-RS9113SB (Data taken from this filing)	
Operating Band:	Frequency:	Maximum EIRP:
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

Device under Test / PMN:	Thuraya WE
Model Number / HVIN:	CIOF1701
Manufacturer:	Beam Communications
Declared Minimum separation:	0.57 m
Power Supply:	Internal 7.4 volt battery or external AC plug pack with 12 VDC output.
Operating Temperature Range:	-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 ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f ²	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:

MPE limit = 1.00 mW/cm² (= 61.4 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:

MPE limit = 0.56 mW/cm²

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

MPE limit = 0.55 mW/cm²

Calculation:

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

Where: S = Power Spectral density (mW/cm²)
 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/cm²)	Limit (mW/cm²)
40,700	0.57	0.9969	1.00

Cellular modem MPE:

Band	EIRP (mW)	Separation distance (m)	Power density (mW/cm²)	Limit (mW/cm²)
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/cm²)	Limit (mW/cm²)
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 ≤ 1.0 .

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

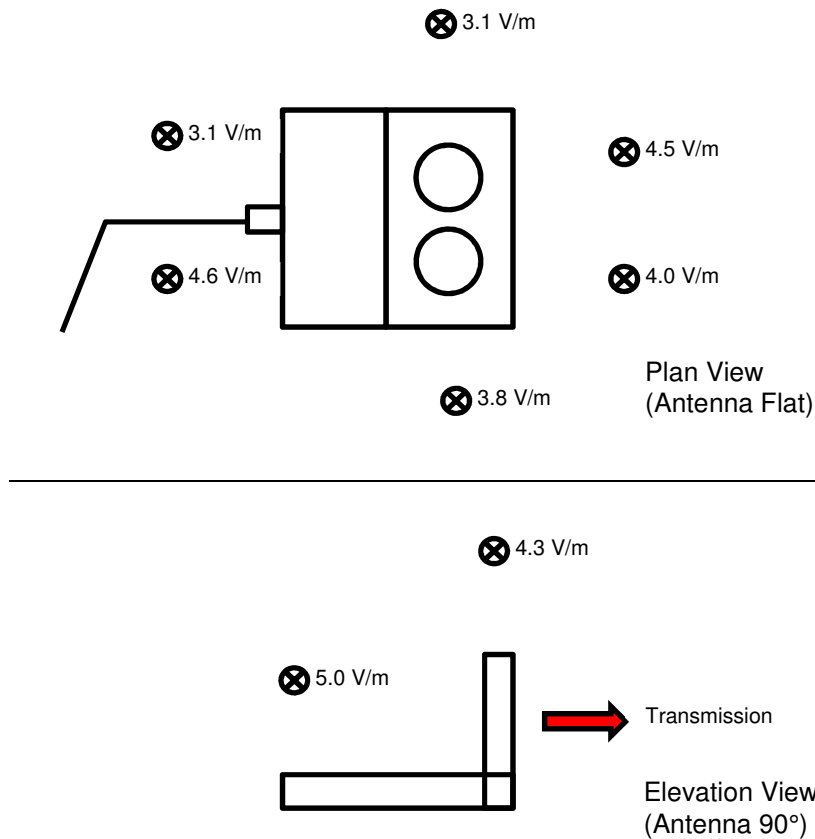
Where: S_{eq} = Power Spectral density (mW/cm²) of a specific transmitter
 S_{lim} = MPE limit (mW/cm²)

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
Meter	Asset Number: P-157 Manufacturer: NARDA Model Number: NBM-520	19 March 2016	19 March 2018
E-Field Probe	Asset Number: P-157B Manufacturer: NARDA Model Number: EF6091 (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.