Spurious Emissions (Tx Conducted)

PECIFICATION: FCC CFR 2.1051		RSS-119 5.8
12.5 kHz Channel Spacing	851.025 MHz @ 35 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	851.025 MHz @ 2 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz	± 3.0 dB
No emissions were	detected at a level greater than 20	dB below the limit.
Result Limit SU - Detector = Average (rms) 25 - Fc 2 2 MHz, 8001 Pts, 7s. Swp 0 - - -25 - - -50 - - -75 - - -50 - - -75 - - -50 - - -75 - - -50 - - -75 - - -50 - - -75 - - -50 - - -75 - - -50 - - -75 - - -50 - - -75 - - -50 - - -50 - - -20 - - -40 - - -50 - - -20 - - -50 - - -20 - - -20 - - -20 - - -20 - - -20 - - -20 - - -20 - - <td>Measured Point Number of the second sec</td> <td>rier Narrow RBW</td>	Measured Point Number of the second sec	rier Narrow RBW
1000 1500 2000 2500 3000 Result obtained by integration of nam 1k Hz RBW: 849.0 MHz to 853.0 MH	3500 4000 4500 5000 5500 6000 Frequency (MHz) row RBW filter measurements: iz	6500 7000 7500 8000 8700

FCC ID: CASTBDK4G IC: 737A-TBDK4G

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051			RSS-119 5.8	
12.5 kHz Channel Spacing	860.025 MHz @	35 W		Emission Mask D
Emission Frequency (MHz)	Level (dBm))	Lev	el (dBc)
~	~			~
12.5 kHz Channel Spacing	860.025 MHz @	2 W		Emission Mask D
Emission Frequency (MHz)	Level (dBm))	Lev	el (dBc)
~	~			~
Measurement Uncertainty:	5	12.75 GHz	± 3.0 dB	
No emissions were	detected at a level gre	ater than 20) dB below the l	limit.
860.025MHz 35W 12.5kHz 10 Unmodulated 1N Result Limit 25 Fc12 MHz, 8001 Pts, 75. Swp 0 - -25 - -50	OKHz RBW- 100KHz to 1GHz HHz RBW- 1GHz to 8.7GHz w Pass Filter used from 1000.0 M Measured Point	Hz to 3.6 GHz Wanted Cam Wanted Cam Revealed to the second	ier Nam	On Channel
Weep Speed = Abio, 20 - RMS average of 10 sweeps 0 -20 -20 -40 -50 -80 0 100 200	400 500	600	700 800	900 1000
SU Detector = Peak, 25 Sweep Speed = Auto, RMS average of 10 sweeps -25 -50 -75 -90 1000 1000 1000				Above 1GHz

Result obtained by integration of narrow RBW filter measurements: 1k Hz RBW: 858.0 MHz to 862.0 MHz

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

PECIFICATION: FCC CFR 2.1051		RSS-119 5.8
12.5 kHz Channel Spacing	868.975 MHz @ 35 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
12.5 kHz Channel Spacing	868.975 MHz @ 2 W	Emission Mask D
Emission Frequency (MHz)	Level (dBm)	Level (dBc)
~	~	~
Measurement Uncertainty:	≤12.75 GHz	± 3.0 dB
No emissions were	detected at a level greater than 20) dB below the limit.
868.975MHz 35W 12.5kHz Unmodulated 10 IN Ion Result Image: Comparison of the second	OkHz RBW- 100kHz to 1GHz MHz RBW- 1GHz to 8.7GHz w Pass Filter used from 1000.0 MHz to 3.6 GHz Measured Point Wanted Carr Measured Point 800 Wanted Carr 868.5 869 869.5	ier Narrow RBW
40 - Detector = Peak, 40 - Sweep Speed = Auto.		Below 1GHz
8 20 - RMS average of 10 sweeps		
20- -20-		
¥ -40-		
-80 -	طنتنا تخصت تتلالط عفقت	
0 100 200 30	0 400 500 800 7	700 800 900 1000
Detector = Peak , 25 _ Sweep Speed = Auto,		Above 1GHz
RMS average of 10 sweeps		
-25 -		
-50-	والالالة المترك والمترك والمترك والمترك والمترك	
-75		
1000 1500 2000 2500 3000	3500 4000 4500 5000 5500 6000	6500 7000 7500 8000 8700
	riequency (Mrz)	

Result obtained by integration of narrow RBW filter measurements: 1k Hz RBW: 867.0 MHz to 871.0 MHz

FCC ID: CASTBDK4G IC: 737A-TBDK4G

Spurious Emissions (Tx Conducted)



Spurious Emissions (Tx Conducted)

SPECIFICATION: FCC CFR 2.1051

RSS-119 5.8

LIMITS: FCC 47 CFR 90.210

RSS-119 5.8

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing 50 + 10 Log ₁₀ (P _{watts})	
35 W	-20 dBm	-65.4 dBc
2 W	-20 dBm	-53 dBc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

SPECIFICATION: FCC 47 CFR 2.1053

GUIDE: TIA-102.CAAA-C 2.2.6

MEASUREMENT PROCEDURE:

Initial Scan:

- 1. The EUT is placed in the S-Line TEM cell and emissions are measured from 30 MHz to 800 MHz. Any emission within 20 dB of the limit is then re-tested on the OATS.
- 2. The EUT is placed in the reverberation chamber and emissions are measured from 800 MHz to the upper frequency required (10 x Fc). Any emission within 20 dB of the limit is then re-tested on the OATS.
- 3. The harmonics emissions up to the 6th harmonic of the fundamental frequency are measured on the OATS

OATS Measurement:

- 1. The EUT is placed on a wooden turntable at a distance of three metres from the test antenna. The output terminal is connected to an RF dummy load.
- 2. The test antenna is raised from 1 m to 4 m to obtain a maximum reading; the turntable is then rotated through 360° to obtain the maximum response of each spurious emission. Valid emissions are determined by switching the EUT on and off.
- 3. The EUT is then replaced by a signal generator and substitution antenna to make measurements by the substitution method.

MEASUREMENT RESULTS: See the tables on the following pages

LIMIT CLAUSE: FCC 47 CFR 90.210

Spurious Emissions (Tx Radiated)

PECIFICATION: FCC CFR 2.1053			
12.5 kHz Channel Spacing	768.025 MHz @ 35 W	Emission Mask D	
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
12.5 kHz Channel Spacing	768.025 MHz @ 2 W	Emission Mask D	
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
Measurement Uncertainty	± 4.6	3 dB	
No emissions were o	letected at a level greater than 20) dB below the limit.	
12.5 kHz Channel Spacing	769.075 MHz @ 35 W	Emission Mask D	
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
12.5 kHz Channel Spacing	769.075 MHz @ 2 W	Emission Mask D	
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
Measurement Uncertainty	± 4.6	δ dB	
No emissions were o	letected at a level greater than 20) dB below the limit.	
12.5 kHz Channel Spacing	774.9 MHz @ 35 W	Emission Mask D	
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
5424.3	-39.51	-84.95	
~	~	~	
12.5 kHz Channel Spacing	774.9 MHz @ 2 W	Emission Mask D	
Emission Frequency (MHz)	Level (dBm)	Level (dBc)	
~	~	~	
Measurement Uncertainty	± 4.6	δ dB	
No other emissions wer	e detected at a level greater than	20 dB below the limit.	

Spurious Emissions (Tx Radiated)

SPECIFICATION: FCC CFR 2.1053			
775.975 MHz @ 35 W	Emission Mask D		
Level (dBm)	Level (dBc)		
~	~		
775.975 MHz @ 2 W	Emission Mask D		
Level (dBm)	Level (dBc)		
~	~		
± 4.6	6 dB		
detected at a level greater than 20) dB below the limit.		
851.025 MHz @ 35 W	Emission Mask D		
Level (dBm)	Level (dBc)		
-31.45	-76.89		
~	~		
851.025 MHz @ 2 W	Emission Mask D		
Level (dBm)	Level (dBc)		
~	~		
± 4.6	δ dB		
ere detected at a level greater than	20 dB below the limit.		
860.025 MHz @ 35 W	Emission Mask D		
Level (dBm)	Level (dBc)		
~	~		
860.025 MHz @ 2 W	Emission Mask D		
Level (dBm)	Level (dBc)		
~	~		
± 4.6	6 dB		
detected at a level greater than 20) dB below the limit.		

Spurious Emissions (Tx Radiated)

FCC CFR 2.1053

12.5 kHz Channel Spacing 868.975 MHz @ 35 W Emission Mask D Emission Frequency (MHz) Level (dBm) Level (dBc) 6951.8 -25.60 -71.04 ~ ~ ~ 12.5 kHz Channel Spacing 868.975 MHz @ 2 W Emission Mask D Emission Frequency (MHz) Level (dBm) Level (dBc) ~ ~ ~ Measurement Uncertainty ± 4.6 dB No other emissions were detected at a level greater than 20 dB below the limit.

LIMITS: FCC CFR 2.1053

SPECIFICATION:

Carrier Output Power	Emission Mask D 12.5 kHz Channel Spacing 50 + 10 Log ₁₀ (P _{Watts})	
35 W	-20 dBm	-65.4 dBc
2 W	-20 dBm	-53 dBc

Tx Radiated Emissions - Continued

Open Area Test Site Results:

12.5 kHz Channel Spacing	851.025 MHz @ 35 W	Emission Mask D
Harmonics Emission Frequency (MHz)	Level (dBm)	Level (dBc)
1702.050	-54.82	-100.26
2553.075	-49.45	-94.89
3404.100	-61.56	-107.00
4255.125	-50.63	-96.07
5106.150	-31.45	-76.89
5957.175	-51.44	-96.88
Measurement Uncertainty	± 4.6 dB	

Sample Calculation	Measurement						
	Reference		Substi	tution		Res	ult
Emission Frequency (MHz)	Reference Level (dBm)	Sig-gen Level	Cable and Attenuator Gain	Antenna Gain (dBd)	Path and Boresight corrections	dBm	nW
1702.050	-93.78	-39.84	-20.31	6.05	-0.72	-54.82	3.3
		A	В	С	D	E	

Photo: OATS Setup

Result (E) = A+B+C+D



FCC ID: CASTBDK4G IC: 737A-TBDK4G Page 85 of 105

Report Revision: 1 Issue Date: 14 October 2022

TRANSMITTER RADIATED EMISSIONS IN THE GNSS BAND

SPECIFICATION: FCC CFR 90.543

GUIDE:

TIA/EIA-603E 2.2.12

MEASUREMENT PROCEDURE:

- 1. Refer Annex A for equipment set up.
- 2. Spurious emissions were measured in the GNSS band. (1559 1610 MHz)
- 3. The EUT was placed on a wooden turntable at a distance of three metres from the test antenna.
- 4. The test antenna was raised from 1m to 4m to obtain a maximum reading; the turntable was then rotated through 360° to obtain the maximum response of each spurious emission.
- 5. Valid emissions were determined by switching the EUT on and off.
- 6. The EUT was replaced by a signal generator and substitution antenna to make measurements by the substitution method.
- 7. The antenna is normally installed remotely from the base station. For this test the antenna port of the EUT is terminated in 50 ohms. For conducted emissions from the EUT antenna port see results in the following test Transmitter Conducted Emissions in the GNSS Band.

MEASUREMENT RESULTS:

76	769.075 MHz 35 W		35 W	12.5 kHz Channel Spacing
		Emission Frequency	Antenna Polarity	Level dBW / MHz EIRP
	Wideband	1579 00 MH-	Horizontal	-84.125
	RBW 1 MHz	1576.99 MITZ	Vertical	-84.125
	Discrete	1560 16 MH-	Horizontal	-109.14
	RBW 1 kHz		Vertical	-109.14

LIMIT CLAUSE	-70 dBW / MHz EIRP for wideband signals
FCC 47 CFR 90.543 (f)	-80 dBW EIRP for discrete emissions of less than 700 Hz BW

Photo: GNSS Radiated Setup



TRANSMITTER CONDUCTED EMISSIONS IN THE GNSS BAND

SPECIFICATION:

RSS-119 5.8

MEASUREMENT PROCEDURE:

- 1. Refer Annex A for equipment set up.
- 2. Spurious emissions were measured in the GNSS band. (1559 1610 MHz)
- 3. The EUT was connected via an attenuator to a spectrum analyser.
- 4. Allowance was made for a theoretical dipole with a gain of 2.15dBm isotropic.

MEASUREMENT RESULTS:

775.975 MHz 35 W

Frequency	Level dBm / MHz EIRP	Level dBW / MHz EIRP
1583.225 MHz	-50.16	-80.16

LIMIT CLAUSE RSS-119 5.8.9.2	-70 dBW / MHz EIRP
---------------------------------	--------------------

Attenuation correction: (dB)

Jau							
	E5023 30dB 350W CK9178	32.46	Gain – Theoretical Dipole	2.15			
	E5028 1m5 Blue 501868	0.5					
	E5015 3m Blue 503429	1.12					
	E3785 Filter	4.43					
	Total Attenuation @ 1583 MHz	38.51	Offset = Loss - gain	38.51-2.15			
	Spectrum Analyser Reference Offset 36.36						



TRANSMITTER FREQUENCY STABILITY - TEMPERATURE

SPECIFICATION: FCC 47 CFR 2.1055 (a) (1)

RSS-119 5.3

GUIDE: ANSI C63.26 5.6.4

MEASUREMENT PROCEDURE:

1. Refer Annex A for equipment set up.

- 2. The EUT was tested for frequency error from -30° C to +50° C in 10° C increments
- 3. The frequency error was recorded in parts per million (ppm).

4. A 10 MHz reference was fitted to the EUT for this test.

MEASUREMENT RESULTS:

See the plots on the following pages.

	Error (ppm)							
Temperature (°C)	768.025 MHz	769.075 MHz	774.9 MHz	775.975 MHz	851.025 MHz	860.025 MHz	868.975 MHz	
-30	-0.04	-0.01	0	-0.01	-0.01	0	0	
-20	0.02	0.01	-0.01	0	-0.02	0	-0.01	
-10	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01	-0.03	
0	0.02	0.01	0	0.02	0.01	0.02	0.02	
10	-0.01	-0.02	-0.03	-0.01	-0.03	-0.02	-0.02	
20	-0.01	-0.02	-0.03	-0.03	-0.03	-0.02	-0.02	
30	0.02	0.01	0	0.04	-0.01	0.03	0.01	
40	0.01	0	-0.02	0	-0.02	0	-0.01	
50	-0.02	-0.02	-0.02	-0.02	-0.04	-0.02	-0.03	
Measurement Uncertainty				± 5 x 10 ⁻⁸				

