





NTN TEST REPORT No.24T04Z102024-022

for

HMD Global Oy

Model Name: TA-1698

FCC ID: 2AJOTTA-1698

with

Hardware Version: V0.21

Software Version: TA1698.GLO_001

Issued Date: 2024-11-06

Note:

The test results in this test report relate only to the devices specified in this report. This report shall not be reproduced except in full without the written approval of CTTL.

Test Laboratory:

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REPORT HISTORY

Report Number	Revision	Description	Issue Date
24T04Z102024-022	Rev.0	1 st edition	2024-11-06

Note: the latest revision of the test report supersedes all previous version.





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1. Test Laboratory

1.1. Introduction & Accreditation

Telecommunication Technology Labs, CAICT is an ISO/IEC 17025:2017 accredited test laboratory under American Association for Laboratory Accreditation (A2LA) with lab code 7049.01, and is also an FCC accredited test laboratory (CN1349), and ISED accredited test laboratory (CAB identifier:CN0066). The detail accreditation scope can be found on A2LA website.

1.2. Testing Location

Location 1: CTTL (huayuan North Road)

Address: No. 52, Huayuan North Road, Haidian District, Beijing, P. R. China 100191

1.3. Testing Environment

Normal Temperature:	15-35 ℃
Relative Humidity:	20-75%

1.4. Project Data

Testing Start Date:	2024-10-06
Testing End Date:	2024-11-06

1.5. Signature

(Prepared this test report)

係新到

(Reviewed this test report)

(Approved this test report)





2. Client Information

2.1. Applicant Information

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2.2. Manufacturer Information

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Telephone:	+491735287964
Fax:	1





3. Equipment Under Test (EUT) and Ancillary Equipment (AE)

3.1. <u>About EUT</u>	
Description	Locator
Model Name	TA-1698
FCC ID	2AJOTTA-1698
Antenna	Embedded
Output power	23.86dBm maximum conducted power for band23
	23.08dBm maximum conducted power for band255
Extreme Voltage	3.50VDC to 4.35VDC (nominal: 3.85VDC)
Extreme Temperature	-30°C to +50°C
NTN mode	NB-IoT NTN
Frequency	B23:US/UL:2000.1MHz-2019.9 MHz;DL:2180.1 MHz -2199.9 MHz
	B255:Global/UL:1626.6 MHz -1660.4 MHz;DL:1525.1 MHz
	-1558.9 MHz
Modulation	BPSK//QPSK
Sub-carrier spacing	15 kHz/3.75kHz
Antenna gain	B23: 1.17dBi
	B255: 0.87 dBi

Note: Components list, please refer to documents of the manufacturer; it is also included in the original test record of CTTL.

3.2. Internal Identification of EUT used during the test

EUT ID*	IMEI	HW Version	SW Version
EUT1	TA1698000000199	V0.21	TA1698.GLO_001
EUT2	TA1698000000180	V0.21	TA1698.GLO_001

*EUT ID: is used to identify the test sample in the lab internally.





4. <u>Reference Documents</u>

4.1. Documents supplied by applicant

EUT parameters are supplied by the customer, which are the bases of testing. CAICT is not responsible for the accuracy of customer supplied technical information that may affect the test results (for example, antenna gain and loss of customer supplied cable).

4.2. Reference Documents for testing

The following documents listed in this section are referred for testing.

Reference	Title	Version
FCC Part 25	Satellite Communications	10-1-23
		Edition
ANSI/TIA-603-E	Land Mobile FM or PM Communications Equipment	2016
	Measurement and Performance Standards	
ANSI C63.26	American National Standard for Compliance Testing of	2015
	Transmitters Used in Licensed Radio Services	
KDB 971168 D01	MEASUREMENT GUIDANCE FOR CERTIFICATION OF	v03r01
	LICENSED DIGITAL TRANSMITTERS	





5. Summary of Test Result

NTN band 23

Items	Test Name	Limit	Clause in FCC rules	EUT ID	Verdict
1	Output Power	-	25.204	EUT1	Information
					only
		Within 0.001	25.202/ 2.1055	EUT1	Р
2 Eroguanov Stability		percent of the			
2		reference			
3	Occupied Bandwidth	2.1049	2.1049	EUT1	Р
4	Band Edge Compliance	25.202(f)(1)(2)	25.202	EUT1	Р
E	Conducted Spurious	25.202(f)(3)	25.202/25.216	EUT1	Р
5	Emission				
6	Field Strength of	25.202	25.202	EUT2	Р
0	Spurious Radiation				

NTN band 255

Items	Test Name	Limit	Clause in FCC rules	EUT ID	Verdict
1	Output Power	-	25.204	EUT1	Information only
2	Frequency Stability	Within 0.001 percent of the reference frequency	25.202/2.1055	EUT1	P
3	Occupied Bandwidth	2.1049	2.1049	EUT1	Р
4	Band Edge Compliance	25.202(f)(1)(2)	25.202	EUT1	Р
5	Conducted Spurious Emission	25.202(f)(3)	25.202/25.216	EUT1	Р
6	Field Strength of Spurious Radiation	25.202	25.202	EUT2	Р

Terms used in Verdict column

Ρ	Pass. The EUT complies with the essential requirements in the standard.
NP	Not Performed. The test was not performed by CTTL.
NA	Not Applicable. The test was not applicable.
BR	Re-use test data from basic model report.
F	Fail. The EUT does not comply with the essential requirements in the
	standard.

All the test results are based on normal power.





Measurement uncertainty is not taken into account when stating conformity with a specified requirement.

Explanation of worst-case configuration

The worst-case scenario for all measurements is based on the conducted output power measurement investigation results unless otherwise stated. The test results shown in the following sections represent the worst case emission.





6. Test Equipments Utilized and test setup

Description	Туре	Series Number	Manufacture	Cal Due Date	Calibration Interval
Spectrum Analyzer	FSV	101576	R&S	2025-05-08	1 year
Communication Tester	CMW500	168471	R&S	2024-12-01	1 year
Spectrum Analyzer	FSV30	R&S	101525	2025-01-18	1 year
Antenna	VULB9163	Schwarzbeck	9163-482	2025-05-19	1 year
Antenna	9117	Schwarzbeck	167	2026-10-15	3 year
Antenna	LB-7180-NF	A-INFO	J2030013000005	2025-05-16	1 year
Antenna	3115	ETS-Lindgren	00146404	2025-05-16	1 year
Signal Generator	SMF100A	Agilent	101295	2025-02-04	1 year





Conductive testing layout is as Fig. 1:

As shown in Fig. 1, EUT is placed in a chamber. An RF cable is used to forward the testing commands from the communication tester to the EUT via a power divider. The communication tester is responsible to send the RF transmission command in signaling mode. The EUT is connected with a power divider via an RF cable. The Spectrum Analyzer is connected with the power divider and used to test the emission of the EUT in specific frequency range.





Annex A: Measurement Results

A.1 Output Power

A.1.1 Summary

During the process of testing, the EUT was controlled via communication tester to ensure max power transmission and proper modulation.

In all cases, output power is within the specified limits.

Output power is reused and the EIRP is calculated by EIRP=A+G, which A refers to the max power of the transmitter and the G is the antenna gain provided by applicant company.

A.1.2 Conducted

NTN band 23

A.1.2.1 Method of Measurements

The EUT was set up for the max output power with pseudo random data modulation.

These measurements were done at 3 frequencies (bottom, middle and top of operational frequency range) for each bandwidth.

The results below include a correction factor for cable loss that is provided by the customer.

A.1.2.2	Measurement	Result

Sub-carrier			Peak output power(dBm)		EIRP(dBm)	
Spacing	INtones	Frequency (MHZ)	BPSK	QPSK	BPSK	QPSK
		2019.90	23.47	23.49	24.64	24.66
	1SC46	2010.00	22.76	22.77	23.93	23.94
2 751/1-		2000.10	23.63	23.49	24.80	24.66
3.7 3KHZ		2019.90	23.46	23.48	24.63	24.65
	1SC1	2010.00	22.72	22.76	23.89	23.93
		2000.10	23.55	23.53	24.72	24.70
	1SC10	2019.90	23.21	23.17	24.38	24.34
		2010.00	22.95	23.13	24.12	24.30
		2000.10	23.86	23.81	25.03	24.98
	1SC1	2019.90	23.07	23.17	24.24	24.34
15kHz		2010.00	23.27	23.08	24.44	24.25
		2000.10	23.76	23.85	24.93	25.02
		2019.90	-	21.52	-	22.69
	12SC0	2010.00	-	21.12	-	22.29
		2000.10		21.76	-	22.93

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Sub-carrier	N		Peak output power(dBm)		EIRP(dBr	EIRP(dBm)	
Spacing	IN tones	Frequency (MHZ)	BPSK	QPSK	BPSK	QPSK	
		1660.40	22.51	22.58	23.38	23.45	
	1SC46	1643.50	22.75	22.89	23.62	23.76	
0.751/1-		1626.60	22.30	22.30	23.17	23.17	
3.7 OKHZ		1660.40	22.51	22.53	23.38	23.4	
	1SC1	1643.50	22.77	22.81	23.64	23.68	
		1626.60	22.34	22.35	23.21	23.22	
		1660.40	22.91	23.06	23.78	23.93	
	1SC10	1643.50	23.04	23.01	23.91	23.88	
		1626.60	22.57	22.56	23.44	23.43	
		1660.40	23.06	22.98	23.93	23.85	
15kHz	1SC1	1643.50	23.06	23.08	23.93	23.95	
		1626.60	22.63	22.70	23.5	23.57	
		1660.40	-	21.08		21.95	
	12SC0	1643.50	-	20.92		21.79	
		1626.60	-	21.04		21.91	

NTN band 255

Note: Expanded measurement uncertainty is ± 1 dB, k = 2.

A.2 Frequency Stability

A.2.1 Method of Measurement

Frequency stability is a measure of the frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at +20 °C and rated supply voltage. Two reference points are established at the applicable unwanted emissions limit using a RBW equal to the RBW required by the unwanted emissions specification of the applicable regulatory standard. These reference points measured using the lowest and highest channel of operation shall be identified as F_L and F_H respectively.

In order to measure the carrier frequency under the condition of AFC lock, it is necessary to make measurements with the EUT in a "call mode". This is accomplished with the use of CMW500.

- 1. Measure the carrier frequency at room temperature.
- 2. Subject the EUT to overnight soak at -30 $^{\circ}$ C.
- 3. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on mid channel of each band, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
- 4. Repeat the above measurements at 10°C increments from -30°C to +50°C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
- 5. Remeasure carrier frequency at room temperature with nominal voltage. Vary supply voltage from minimum voltage to maximum voltage, in 0.1Volt increments remeasuring carrier frequency at each voltage. Pause at nominal voltage for 1.5 hours unpowered, to allow any self-heating to stabilize, before continuing.





- 6. Subject the EUT to overnight soak at +50 $^{\circ}$ C.
- 7. With the EUT, powered via nominal voltage, connected to the CMW500 and in a simulated call on the centre channel, measure the carrier frequency. These measurements should be made within 2 minutes of Powering up the EUT, to prevent significant self-warming.
- 8. Repeat the above measurements at 10[°]C decrements from +50[°]C to -30[°]C. Allow at least 1.5 hours at each temperature, unpowered, before making measurements.
- 9. At all temperature levels hold the temperature to +/- 0.5° during the measurement procedure.

The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block. As this transceiver is considered "Hand carried, battery powered equipment" Section 2.1055(d)(2) applies. This requires that the lower voltage for frequency stability testing be specified by the manufacturer. This transceiver is specified to operate with an input voltage of the lower, higher and nominal voltage. Operation above or below these voltage limits is prohibited by transceiver software in order to prevent improper operation as well as to protect components from overstress.





A.2.2 Measurement results

NTN band 23 15kHz Sub-carrier Spacing

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F∟(MHz)	F _H (MHz)	Frequency error(Hz)	Deviation(ppm)
20				17.12	0.00856
50				25.47	0.012734
40				26.20	0.013099
30				22.02	0.011009
10	3.85	2000.1	2019.9	23.27	0.011634
0				26.54	0.013269
-10				24.05	0.012024
-20				27.95	0.013974
-30				20.42	0.010209

Frequency Error vs Voltage

	0				
Voltage(V)	Temperature(°C)	F∟(MHz)	F _H (MHz)	Frequency error (Hz)	(ppm)
3.50	20	2000 1	2010.0	21.83	0.010914
4.35	20	2000.1	2019.9	21.94	0.010969

NTN band 255 15kHz subcarrier spacing

Frequency Error vs Temperature

Temperature(°C)	Voltage(V)	F∟(MHz)	F _H (MHz)	Frequency error (Hz)	(ppm)
20				18.87	0.011601
50				20.96	0.012886
40				18.69	0.01149
30				21.50	0.013218
10	3.85	1626.6	1660.4	18.99	0.011675
0				16.63	0.010224
-10				21.55	0.013248
-20				22.39	0.013765
-30				13.89	0.008539

Frequency Error vs Voltage

	U				
Voltage(V)	Temperature(°C)	F∟(MHz)	F _H (MHz)	Frequency error (Hz)	(ppm)
3.50	20	1606.6	1660.4	18.01	0.011072
4.35	20	1020.0	1000.4	16.54	0.010168

Note: Expanded measurement uncertainty is <20 Hz, k = 2.





A.3 Occupied Bandwidth

Occupied bandwidth measurements are only provided for selected frequencies in order to reduce the amount of submitted data. Data were taken at the extreme and mid frequency. The table below lists the measured 99% BW. Spectrum analyzer plots are included on the following pages. The measurement method is from ANSI C63.26:

a) The spectrum analyzer center frequency is set to the nominal EUT channel center frequency. The frequency span for the spectrum analyzer shall be set wide enough to capture all modulation products including the emission skirts.

b) The nominal IF filter 3 dB bandwidth (RBW) shall be in the range of 1% to 5% of the anticipated OBW, and the VBW shall be set \ge 3 × RBW.

c) Set the reference level of the instrument as required to prevent the signal amplitude from exceeding the maximum spectrum analyzer input mixer level for linear operation.

d) Set the detection mode to peak, and the trace mode to max-hold.





Occupied Bandwidth

Mode		Band 23: 99%OBW(kHz)					
SCS	3.75kHz		15kHz				
Mod.	BPSK	QPSK	BPSK	QPSK	QPSK	QPSK	QPSK
SC Size	1SC1	1SC1	1SC1	1SC1	3SC0	6SC0	12SC0
Lowest CH	95.514	103.618	120.773	123.878	110.564	143.560	181.187
Middle CH	90.883	101.881	127.352	126.194	114.616	148.770	181.187
Highest CH	92.041	102.460	126.194	125.615	111.722	150.507	181.187

















NTN Band 23 SCS15kHz				
N/A	Lowest Channel / 3SC0 / QPSK			
	Spectrum max Rof Lavel 44.51 dbm Offset 14.51 dbm Offset 14.51 dbm 2000005022 GHz Att 45 db BWT 379.6 µs 9 WW 20 Hz 2000005022 GHz 91 /k Max 2.000005022 GHz 2.000005022 GHz 2.0000020 GHz 2.0000020 GHz 30 dbm 0 cc Bw 110.594994/21 Hz 0 cc Bw 110.594994/21 Hz 20 dbm 0 dbm 0 dbm 10 dbm 10 dbm 10 dbm 71 72 0 0 10 dbm 71 72 0 0 10 dbm 71 72 0 0 10 dbm 73 0 0 0 0 10 dbm 73 0 0 0 0 0 10 dbm 73 0 0 0 0 0 0 10 dbm 10 dbm 10 0 0 0 0 0 10 dbm 10 dbm 10 0 0 0 <t< th=""></t<>			
N/A	Middle Channel / 3SC0 / QPSK Middle Channel / 3SC0 / QPSK Image: State of the stat			
	0 dBm -10 dBm -20 dBm -20 dBm -30 dBm -30 dBm -30 dBm -50 d			
N/A	Highest Channel / 3SC0 / QPSK			







NTN Band 23 SCS15kHz				
N/A	Lowest Channel / 6SC0 / QPSK			
	Spectrum mail Ref Level 44.51 dBm Offset 14.51 dB ● RBW 5 kHz 2.000066758 GHz Att 45 dB SWT 370.6 µs ● VBW 20 kHz 2.00006758 GHz			
	• JPk Max M1[1] 19.04 dBm 40 dBm 0cc Bw 143.560057807 kHz 30 dBm 0cc Bw 143.560057807 kHz			
	20 dBm			
	-10 dBm			
	-50 dBm			
	CF 2.000 Gr2 B91 Pis Span 400.0 FR2 Image: Since Si			
N/A	Middle Channel / 6SC0 / QPSK			
	30 dBm N1 148.769898698 kHz 20 dBm M1			
	10 dBm T1 0 dBm			
	-20 dBm			
	-50 dBm CF 2.01 GHz 691 pts Span 400.0 KHz Measuring 11,5224 13,6324 13,6324			
N/A	Highest Channel / 6SC0 / QPSK			







NTN Band 23 SCS15kHz				
N/A	Lowest Channel / 12SC0 / QPSK			
	Spectrum Image: Constraint of the second secon			
	40 dBm (11) 2.000 DB21 0 CH2 2.000 DB21 0 CH2 0 cc Bw 181.18665962 kH2 20 dBm (11) (11) (11) (11) (11) (11) (11) (11			
	10 dBm			
	-30 dbm			
	CF 2.0001 GHz 691 pts Span 400.0 kHz Date: 31.0CT.2024 14:16:26 Neasuring Neasuring			
N/A	Middle Channel / 12SC0 / QPSK			
	Spectrum mma Ref Level 44.51 dBm Offset 14.51 dB RBW 5 kHz 2.010000521 GHz Att 45 dB SWT 379.6 µs WIW 20 kHz MOUDE FRUID FFT Image: mouse requirements Image: mouse requirements Image: mouse requirements			
	20 dBm			
	0 dBm			
	-30 dBm			
	Date: 31.0CT.2024 15:01:14			
N/A	Highest Channel / 12SC0 / QPSK			







Occupied Bandwidth

Mode	Band 255: 99%OBW(kHz)						
SCS	3.75kHz		3.75kHz 15kHz				
Mod.	BPSK	QPSK	BPSK	QPSK	QPSK	QPSK	QPSK
SC Size	1SC1	1SC1	1SC1	1SC1	3SC0	6SC0	12SC0
Lowest CH	83.936	92.041	122.142	122.721	107.091	136.634	101.187
Middle CH	81.621	93.777	121.563	122.721	101.881	133.719	180.608
Highest CH	83.357	92.619	122.721	121.563	105.355	128.509	181.187











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CAICT No.24T04Z102024-022

	Spectrum Ref Level 44-51 dBm Offs	set 14.51 dB = RBW 5		
	Att 45 dB SW	T 379.6 µs - VBW 20	kHz 1.04344964	GHZ
	40 dBm		M1[1]	19.47 dE
			Occ Bw	1.643449640 G 101.881331404 k
	30 dBm			
	20 dBm	M1		
	10 dBm			
	0 dBm			
	-10 dBm			
	-20-4800			m
				1 Martin
	-30 dBm			
	-40 dBm			
	-50 d8m			
	CE 1 6435 CH/2		691 pts	Span 400.0 ku
	GF 1.8433 GHZ		Measuring	31.10.2024
N/A	High	est Chanr	nel / 3SC0 /	/ QPSK
N/A	Basel 31.007.2024 ISTAT		nel / 3SC0	/ QPSK
N/A	Basel 31.007.2024 ISTAT	est Chann set 14.51 dB • RBW 5 r 379.6 µs • VBW 20	nel / 3SC0 /	/ QPSK
N/A	Spectrum Ref Level 44.51 d8m Offs Att 45 d8 SW 0 JPK Max 40 d8m	est Chani set 14.51 d8 • RBW 5 7 379.6 µs • VBW 20	nel / 3SC0 /	/ QPSK
N/A	Spectrum Ref Level 44.51 dbm Offs Att 45 dbm Offs 8 w 0 JPK Max 40 dbm 30 dbm 30 dbm	est Chani set 14.51 d8 • RBW 5 7 379.6 µs • VBW 20	nel / 3SC0 / 5 MH2 1.660034964 MILII Occ Bw	/ QPSK 4 GHz 1.660:49640 c 105:354538011 k
N/A	Spectrum Ref Level 44.51 dbm Offs Att 45 dbm Offs 8 w 0 dbm 30 dbm 20 dbm 20 dbm	est Chann set 14.51 d8 • RBW 5 r 370.6 µs • VBW 20 M1	nel / 3SC0 /	/ QPSK
N/A	Spectrum Ref Level 44.51 d8m Offs Att 45 d8 8W 0 d8m 30 d8m 30 d8m	est Chann set 14.51 d8 • PBW 5 7 370.6 µs • VBW 20 M1 M1	MIL1 MIL1 Occ BW	/ QPSK
N/A	Basel 31.007.2024 Istars High Spectrum Ref Level 44.51 d8m Off Att 45 d8 Ø JPK Max 40 d8m 30 d8m 20 d8m 10 d8m 10 d8m	est Chani	Mel / 3SC0 /	/ QPSK
N/A	Basel 31.007.2024 Bight Bight Bight Spectrum Bight Ref Level 44.51 dBm Off 40 dBm Bight 30 dBm Bight 10 dBm T	est Chani	nel / 3SC0 /	/ QPSK
N/A	Basel 31.007.2024 Bitain Bitain Bitain Bi	est Chanr set 14.51 db = RBW 5 7 379.6 µs = VBW 20 M1 1 1	Mel / 3SC0 / Mile 1.66034964 Mile 1.66034964 <t< td=""><td>/ QPSK</td></t<>	/ QPSK
N/A	Spectrum Ref Level 44.51 dbm Office 0 dbm 45 db Sw 0 dbm 20 dbm 10 dbm 10 dbm 0 dbm 7	est Chanr set 14.51 db = RBW 5 T 379.6 µs = VBW 20 M1 M1 J	nel / 3SC0 /	/ QPSK
N/A	Spectrum Ref Level 44.51 dbm Office 8 db 95 db 8W 9 dbm 90 dbm 90 dbm 10 dbm 7 -10 dbm -10 dbm 30 dbm 7	est Chann	nel / 3SC0 /	/ QPSK
N/A	Spectrum High Ref Level 44.51 dbm Off. 45 db BW 10 dbm 0 10 dbm T -10 dbm -30 dbm	est Chann	Mel / 3SC0 / Mel / 3SC0 / Mile 1.66034964 M	/ QPSK
N/A	Spectrum Ref Level 44.51 dbm Office Ref Level 44.51 dbm Office 40 dbm 46 db 30 dbm 0 10 dbm 7 -10 dbm 7 -30 dbm -40 dbm	est Chann	Mile 1.66034964 Mile 1.00034964 Mile 0cc BW Mile Mile Mile Mile	/ QPSK
N/A	Spectrum Ref Level 44.51 dbm Offs Att 45 db 8W 40 dbm 30 dbm 10 dbm -10 dbm -30 dbm -30 dbm	est Chani	Mel / 3SC0 / 5 Mil: 1.66034964 MILII Occ Biv Wire Wire	/ QPSK
V/A	Spectrum Ref Lavel 44.51 dBm Offs Att. 45 dB W 45 dB W 30 dBm 10 dBm 10 dBm -10 dBm -30 dBm -30 dBm -30 dBm	est Chann	Nel / 3SC0 / S kH2 1.66034964 MILII Occ Biv Wra Wra <td< td=""><td>/ QPSK</td></td<>	/ QPSK

NTN Band 255 SCS15kHz			
N/A	Lowest Channel / 6SC0 / QPSK		
	Spectrum Image: Constraint of the section		
	EJPK Max M1[1] 14.91 dBm Occ Bw 136.613603473 kHz Occ Bw 136.613603473 kHz		
	20 dBm		
	0 dBm		
	-20 dem		
	-40 dBm		
	CF 1.6266 GHz 691 pts Span 100.0 kHz		
N/A	Middle Channel / 6SC0 / QPSK		







NTN Band 255 SCS15kHz			
N/A	Lowest Channel / 12SC0 / QPSK		
	Spectrum The sector of the sect		
	Neasuring 1110282		
N/A	Middle Channel / 12SC0 / QPSK		







Note: Expanded measurement uncertainty is $\,<\!$ 20 Hz, k = 2 .





A.4 Band Edge Compliance

A.4.1 Measurement limit

Part 25.202(f) specifies The mean power of the emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50% up to and including 100% of the authorized bandwidth: 25dB;

(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100% up to and including 250% of the authorized bandwidth: 35dB;

(3)In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

According to KDB 971168, a relaxation of the reference bandwidth is often provided for measurements within a specified frequency range at the edge of the authorized frequency block/band. This is often implemented by permitting the use of a narrower RBW (typically limited to a minimum RBW of 1% of the OBW) for measuring the out-of-band emissions without a requirement to integrate the result over the full reference bandwidth.





A.4.2 Measurement result



NTN Band 2	23 SCS15kHz
Lowest Channel / 3SC0 / QPSK	N/A
Spectrum a	
RefLevel 25.00 dBm Offset 14.50 dB Mode Auto FFT Implem Max	
20 dbm chick PABS M11 2.00004990 GHz 10 dBm 7 10 2.00004990 GHz	
0 dBm	
-10 dBm	
-20 dBm	
-40 dBm	
-50 dBm	
-70 dBm	
CF 2.0001 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None	
TX Power Range Low Range Up RBW Frequency Power Ab Power Ab Power Ab -1.500 MHz -500.000 kHz 5.000 kHz 1.99960 GHz -45.41 dB -45.41 dB -30.41 dB	
-500.000 kHz -200.000 kHz 5.000 kHz 1.99990 GHz -31.32 dBm -31.32 dB -20.12 dB -200.000 kHz -100.000 kHz 5.000 kHz 2.00000 GHz -6.48 dBm -6.48 dB -5.28 dB 100.000 kHz 200.000 kHz 5.000 kHz 2.0002 GHz -2.7.30 dBm -2.7.30 dB -2.6.10 dB	
200.000 kHz 500.000 kHz 5.000 kHz 2.00030 GHz -39.15 dBm -39.15 dB -27.95 dB 500.000 kHz 1.500 MHz 5.000 kHz 2.00060 GHz -46.66 dBm -46.66 dB -31.66 dB -31.66 dB	
Date: 5.NOV.2024 16:34:48	
Middle Channel / 3SC0 / QPSK	N/A
Spectrum m	
Ref Level 25.00 d8m Offset 14.50 d8 Mode Auto FFT	
20 dby 200 M1[1] 13.17 dBm 2.00994470 GHz	
10 dBm	
-10 dBm	
-20 dBm	
-40 dBm	
-50 dBm	
-60 dBm	
CF 2.01 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None	
Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power Rel ΔLimit 1.500 MHz \$500 000 kHz 2.0050 GHz 42.055 GHz 42.55 GHz 42.55 GHz	
-500.000 kHz -200.000 kHz 5.000 kHz 2.00980 GHz -28.02 dBm -28.02 dB -16.22 dB -20.000 kHz -100.000 kHz 5.000 kHz 2.00990 GHz -3.07 dBm -3.07 dB -12.27 dB -100.000 kHz 5.000 kHz 5.000 kHz 2.00990 GHz -24.67 dBm -24.45 dB -25.65 dB	
200.000 kHz 500.000 kHz 5.000 kHz 2.01021 GHz -37.66 dB -37.66 dB -25.86 dB 500.000 kHz 1.500 MHz 5.000 kHz 2.01051 GHz -44.44 dB -44.44 dB -25.44 dB -25.44 dB	
Measuring With the state of	
Highest Channel / 3SC0 / QPSK	N/A
(Prostrum)	
Ref Level 25.00 dBm Offset 14.50 dB Mode Auto FFT	
20 dkmit dheck PASS M1[1] 13.79 dBm 22 0 dkmit dheck PASS M1[1] 2.01984690 GHz	
10 dBm	
-10 dBm-	
-20 dBm	
-50 UDIII	
50 6800-0	
-60 d8m	
CF 2.0199 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None	
Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power Rel ALImit	
-1.300 MHz -300.000 Hz 2.000 Hz 2.01940 GHZ -42.26 dBm -42.26 dB -27.26 dB -500.000 Hz -200.000 Hz -200.000 Hz -27.32 dB -1.54 2 dB -27.32 dB -1.33 dB -200.000 Hz -100.000 Hz -500.01 Hz 2.01990 GHz -3.23 dBm -3.23 dB -1.33 dB -1	
100.000 KHz 200.000 KHz 3.000 KHz 2.02010 GHz -24.77 dBm -22.87 dB 200.000 KHz 50.000 KHz 5.000 KHz 2.02010 GHz -35.69 dBm -35.59 dBm -35.79 dB 500.000 KHz 5.000 KHz 5.000 KHz 2.02040 GHz -44.60 dBm -44.60 dB -29.60 dBm	
Measuring • • • • • • • • • • • • • • • • • •	
Date: 5.NOV.2024 17:00:52	

NTN Band 23 SCS15kHz			
Lowest Channel / 6SC0 / QPSK	N/A		
Spectrum 🛄			
RefLevel 25.00 dBm Offset 14.50 dB Mode Auto FFT Imm Max			
20 dBmr check PAS			
-10 dBm-			
-20 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
CF 2.0001 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None			
Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power Rel Alimit Resolution of the pool of t			
-1.300 MHz -300,000 Hz -5000 HHz -19990 GHz -446.3 dBm -446.3 dB -446.3 dB -200,000 Hz -500,000 Hz -50			
Network Network <t< td=""><td></td></t<>			
Middle Channel / 6SC0 / QPSK	N/A		
Spectrum Ref Level 25.00 dBm Offset 14.50 dB Mode Auto FFT			
0 IRm Max 2n dljmit dheck PAβS M1[1] 9.25 dBm			
10 dBm			
-10 dBm			
-30 dBm			
-40 dBm			
-60 dBm			
-70 dBm-			
CF 2.01 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None			
Tx Power Tx Bondwidth 3.494 MHz Power Abs 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power Rel ALimit -1.500 MHz -500.000 kHz 5.000 kHz 2.00948 GHz -42.75 dBm -42.75 dB			
-500.000 kHz -200.000 kHz 5.000 kHz 2.00979 GHz -29.26 dBm -29.26 dB -17.06 dB -200.000 kHz -100.000 kHz 5.000 kHz 2.00990 GHz -7.15 dBm -7.15 dB -4.95 dB 100.000 kHz 200.000 kHz 25.000 kHz 25.000 kHz 3.0100 kHz 201.73 dBm -21.73 dB -19.53 dB			
200.000 kHz 500.000 kHz 5.000 kHz 2.01021 GHz -33.99 dB -33.99 dB -21.79 dB 500.000 kHz 1.500 MHz 5.000 kHz 2.01052 GHz -43.32 dB -43.32 dB -28.32 dB			
Measuring 17-20-10			
Pare: 21404-7074 1120110			
Highest Channel / 6SC0 / QPSK	N/A		
Ref Level 25.00 dBm Offset 14.50 dB Mode Auto FFT			
Arm Max 20 dpmit dheck PASS M1[1] S.30 dBm 2,01986600 GHz			
10 dBm			
-10 UBIII			
-30 dBm			
-40 dBm			
-00 dBm			
-70 dBm-			
CF 2.0199 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None			
Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power als Ads on 64 -1_500 MHz -500.000 kHz 5.000 kHz 5.000 kHz -300 6 r/m -45.0 6 r/m -45.0 6 r/m			
-500.000 kHz -200.000 kHz 5.000 kHz 5.000 kHz 2.01969 GHz -32.79 dbm -32.79 db -20.19 db -200.000 kHz -100.000 kHz 5.000 kHz 2.01969 GHz -11.44 dbm -11.44 db -6.88 db 100.000 kHz -100.000 kHz 5.000 kHz 5.000 kHz -11.44 dbm -11.44 db -6.88 db			
200.000 kHz 500.000 kHz 50.000 kHz 50.000 kHz 2.202011 GHz -247.20 dBm -247.20 dB -221.20 dB -251.70 dB 500.000 kHz 1.500 MHz 5.000 kHz 2.202011 GHz -47.70 dBm -47.70 dB -32.70 dB			
Neasuring 11.2224			
Date: 5.NOV.2024 17:04:23			

NTN Band 23 SCS15kHz			
Lowest Channel / 6SC6 / QPSK	N/A		
Spectrum III			
Ref Level 25.00 dBm Offset 14.50 dB Mode Auto FFT			
20 dkm ^m theck PASS M1[1] 5.68 dBm 2.00010850 GHz			
10 dBm			
-10 dBm			
-20 dbm			
-40 dBm			
-50 dBm			
-60 d8m			
-70 dBm			
CF 2.0001 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None			
Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power Rel ALimit			
-1.500 MHz -500.000 kHz 5.000 kHz 1,99956 GHz -40.10 dBm -40.10 dB -31.10 dB -500.000 kHz -200.000 kHz 5.000 kHz 1,99989 GHz -37.40 dBm -37.40 dB -25.10 dB -200.000 kHz -100.000 kHz 5.000 kHz 1,99999 GHz -23.46 dBm -23.46 dB -21.16 dB			
100.000 kHz 200.000 kHz 5.000 kHz 2.00020 GHz -11.34 dBm -11.34 dB -9.04 dB 200.000 kHz 500.000 kHz 5.000 kHz 2.00030 GHz -31.34 dBm -31.34 dB -19.04 dB			
500.000 kHz 1.500 MHz 5.000 kHz 2.00060 GHz -44.65 dBm -44.65 dB -29.65 dB			
Date: 5.NOV.2024 16:39:17			
Middle Channel / 6SC6 / QPSK	N/A		
Spectrum Ref Level 25.00 dBm Offset 14.50 dB Mode Auto FFT			
IRm Max Jimit theck PAks M1[1] 9.31 dBm			
20 dBm 2000 2.01000850 GHz			
0 dBm			
-10 dBm			
-20 dBm			
-30 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
-/U dBm CF 2.01 GHz 691 pts Span 3.0 MHz			
Spectrum Emission Mask Standard: None Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz			
Range Low Range Up RBW Frequency Power Abs Power Rel ∆Limit -1.500 MHz -500.000 kHz 5.000 kHz 2.00948 GHz -43.09 dBm -43.09 dB -28.09 dB			
-500.000 kHz -200.000 kHz 5.000 kHz 2.00979 GHz -33.51 dBm -33.51 dB -21.31 dB -200.000 kHz -100.000 kHz 5.000 kHz 2.00989 GHz -20.07 dB -17.87 dB 100.000 kHz -0.000 kHz 5.000 kHz 2.01980 GHz -38 GHz -20.07 dB -56 GHz			
200.000 kHz 500.000 kHz 5.000 kHz 2.01020 GHz -2.5.95 dBm -2.5.95 dB -13.75 dB 500.000 kHz 5.000 kHz 5.000 kHz 2.01020 GHz -25.95 dBm -41.43 dB -26.43 dB			
Measuring 12137+87			
Date: 5.NOV.2024 17:37:47			
Highest Channel / 6SC6 / QPSK	N/A		
Spectrum			
Ref Lever 25.00 upm Offset 14.50 up Mode Add PP1 Imit dhoot Imit dhoot Imit dhoot			
20 dB// C01900 2.01990850 GHz			
10 dBm			
-20 dBm			
-30 dBm			
-40 dBm			
-50 dBm			
-60 dBm			
-70 dBm			
Spectrum Emission Mask Standard None			
Is rows Transmit 3.840 MHz Kisw 3.000 KHz Range Low Range Up RBW Frequency Power Abs Power Rel ALimit 1.1500 MHz 500 000 kHz 2.01026 KHz -47.22 kHz -47.22 kHz -0.00 kHz			
-500.000 kHz -200.000 kHz 5.000 kHz 2.0196 GHz -37.92 dB -37.92 dB -32.92 dB -200.000 kHz -100.000 kHz 5.000 kHz 2.0196 GHz -37.91 dB -24.31 dB -24.31 dB -21.71 dB			
100.000 kHz 200.000 kHz 5.000 kHz 2.02000 GHz -11.74 dBm -11.74 dB -9.14 dB 200.000 kHz 500.000 kHz 5.000 kHz 2.02010 GHz -29.94 dBm -29.94 dB -17.34 dB			
SUUJUUU KHZ 1.500 MHZ 5.000 KHZ 2.02040 GHZ -45.49 dBm -45.49 dB -30.49 dB			
Date: 5.NOV.2024 17:03:47			

NTN Band 23 SCS15kHz			
Lowest Channel / 12SC0 / QPSK	N/A		
Spectrum T			
Ref Level 25:00 dBm Offset 14:50 dB Mode Auto FFT I/Bm Max			
20 dBm - 2.00010430 GHz			
0 dBm			
-10 dBm			
-20 dam			
-40 dBm			
-50 dBm			
-70 dBm			
CF 2: 0.001 GHz 691 pts Span 3.0 MHz Spectrum Emission Mask Standard: None TX Power TX Bandwidth 3.840 MHz BBW 5.000 kHz			
Range Low Range Up RBW Frequency Power Abs Power Rel ALimit 1.500 MHz -500.000 kHz 5.000 kHz 1.99959 GHz -45.60 dB -30.60 dB -30.60 dB			
-300.000 kHz - 100.000 kHz - 5.000 kHz - 1.9998 kHz - 33.95 dbm - 33.95 db - 20.75 db -200.000 kHz - 100.000 kHz - 5.000 kHz - 2.00000 GHz - 19.76 db - 19.76 db - 16.56 db 100.000 kHz - 200.000 kHz - 5.000 kHz - 2.00020 GHz - 17.48 dbm - 17.48 db - 14.28 db			
200.000 KHz 500.000 KHz 5.000 KHz 2.00032 GHz -33.13 dBm -33.13 dB -19.93 dB 500.000 KHz 1.500 MHz 5.000 KHz 2.00062 GHz -45.73 dBm -45.73 dB -30.73 dB Neawring 95.11.2824			
Date: 5.NOV.2024 16:40:45			
Middle Channel / 12SC0 / QPSK	N/A		
Spectrum			
RefLevel 25:00 d8m Offset 14:50 d8 Mode Auto FFT			
20 d <mark>ijmit Check PASS M1[1] 2.87 dBm</mark> 200 200 2.01000430 GHz			
10 dBm N1			
-10 dBm-			
-20 dBm-			
-40 dBm			
-50 dBm			
-60 dBm			
CF 2.01 GHz 691 pts Span 3.0 MHz			
T XP Dower Tx Bandwidth 3.840 MHz RBW 5.000 kHz Range Low Range Up RBW Frequency Power Abs Power Rel ΔLimit			
-1.500 MHz -500.000 KHz 5.000 KHz 2.00950 GHz -43.01 dBm -43.01 dB -28.01 dB -500.000 KHz -200.000 KHz 5.000 KHz 2.00978 GHz -30.57 dBm -30.57 dB -17.57 dB -200.000 KHz -100.000 KHz 5.000 KHz 2.00990 GHz -16.92 dBm -16.92 dB -13.92 dB			
100.000 kHz 200.000 kHz 5.000 kHz 2.01010 GHz -14.29 dB -11.29 dB 200.000 kHz 500.000 kHz 5.000 kHz 2.01021 GHz -31.09 dB -31.09 dB 500.000 kHz 5.000 kHz 2.01021 GHz -31.09 dB -31.09 dB -27.52 dB			
Measuring 11.2024			
Date: 5.NOV.2024 17:38:58			
Highest Channel / 12SC0 / OPSK	Ν/Δ		
Spectrum (Д) Ref Level 25.00 dBm Offset 14.50 dB Mode Auto FFT			
1Rm Max 20 dkmit dheck PA\$S			
P<200 2.01990430 GH2			
0 dBm			
-10 dBm-			
-30 dBm			
-40 dBm			
30 dBm			
-70 dBm			
Spectrum Emission Mask Standard: None Tx Power Tx Bandwidth 3.840 MHz RBW 5.000 kHz			
Range Low Range Up RBW Frequency Power Abs Power Rel ΔLimit -1.500 MHz -500.000 kHz 5.000 kHz 2.01939 GHz -48.09 dBn -48.09 dB -33.09 dB -500.000 kHz 2.000 kHz 5.000 kHz 0.000 kHz -60.000 kHz			
200.000 kHz -100.000 kHz 5.000 kHz 5.000 kHz 2.02900 GHz -18.39 dB -12.33 dB -17.89 dB 200.000 kHz 5.000 kHz 5.000 kHz 2.02000 GHz -18.39 dB -18.39 dB -14.89 dB 200.000 kHz 5.000 kHz 5.000 kHz 5.000 kHz 3.000 kHz 5.000 kHz 5.0000 kHz 5.			
Storogen Hit Storogen Hit<			
Date: 5.NOV.2024 17:05:41			