



TEST REPORT

REPORT NUMBER: I23W00016-CAT-M RF-Rev3

ON

Type of Equipment: Tracker
Type of Designation: Bolt-2
Brand Name: Prime
Manufacturer: Micron Electronics LLC.
FCC ID: ZKQ-G601

ACCORDING TO

FCC CFR Part 2, FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;
GENERAL RULES AND REGULATIONS, e-CFR
PART 24, PERSONAL COMMUNICATIONS SERVICES, e-CFR
PART 27, MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES, e-CFR
ANSI C63.26-2015 American National Standard for Compliance Testing of Transmitters
Used in Licensed Radio Services

Chongqing Academy of Information and Communications Technology

Month date, year

Jun, 13, 2023

Signature

Xiang Luoyong

Director

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 Chongqing Academy of Information and Communications Technology.



Report No.: I23W00016-CAT-M RF-Rev3

Revision Version

Report Number	Revision	Date	Memo
I23W00016-CAT-M RF-FCC	00	2023-05-24	Initial creation of test report
I23W00016-CAT-M RF-Rev1	01	2023-05-31	--
I23W00016-CAT-M RF-Rev2	02	2023-06-07	--
I23W00016-CAT-M RF-Rev3	03	2023-06-11	--

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1. Test Laboratory

1.1. Testing Location

Name:	Chongqing Academy of Information and Communications Technology
Designation Number:	CN1239
Address:	Building C, Technology Innovation Center, No.8, Yuma Road, Chayuan New Area, Nan'an District, Chongqing, People's Republic of China
Postal Code:	401336
Telephone:	0086-23-88069965
Fax:	0086-23-88608777

1.2. Testing Environment

Normal Temperature:	15-35°C
Relative Humidity:	30-60%

1.3. Project data

Testing Start Date:	2023-05-08
Testing End Date:	2023-05-31

1.4. Signature

2023-06-13

Tan Haoyue
(Prepared this test report)

Date

2023-06-13

Xiao Yu
(Reviewed this test report)

Date

2023-06-13

Xiang Luoyong
Director of the laboratory
(Approved this test report)

Date

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2. Client Information

2.1. Applicant Information

Company Name:	Micron Electronics LLC.
Address /Post:	1001 Yamato Road, Suite 400, Boca Raton, FL 33431, USA
City:	Boca Raton
Country:	USA
Telephone:	+1 888 538 3489
Fax:	--
Email:	pcheng@micron-electronics.com
Contact Person:	Ping Cheng

2.2. Manufacturer Information

Company Name:	Micron Electronics LLC.
Address /Post:	1001 Yamato Road, Suite 400, Boca Raton, FL 33431, USA
City:	Boca Raton
Country:	USA
Telephone:	+1 888 538 3489
Fax:	--
Email:	pcheng@micron-electronics.com
Contact Person:	Ping Cheng

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

3.1. About EUT

EUT Description	Tracker
Model name	Bolt-2
Brand name	Prime
Operation Frequency	B2/4/12/13
Modulation	QPSK/16QAM
Extreme Temperature	-20/+60°C
Battery Voltage	7.2VDC
Adapter power supply	12VDC

Note: Photographs of EUT are shown in ANNEX A of this test report.

Note: High and low voltage values in extreme condition test are given by manufacturer.

3.2. Internal Identification of EUT used during the test

EUT ID	SN or IMEI	HW Version	SW Version	Date of receipt
S1	IMEI:866238066361378	G601-V1	G601V02.01B03.I01	2023-04-17
S2	IMEI:866238066366773	G601-V1	G601V02.01B03.I01	2023-04-17
S3	IMEI:866238066361881	G601-V1	G601V02.01B03.I01	2023-04-17

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

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3.3. Outline of Equipment under Test

Technology	Band	UL Freq.(MHz)	DL Freq.(MHz)	Note
CAT-M	Band2	1850 – 1910	1930 – 1990	--
	Band4	1710 – 1755	2110 – 2155	--
	Band12	699 – 716	729 – 746	--
	Band13	777 – 787	746 – 756	--

3.4. Internal Identification of AE used during the test

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

AE ID*	Description	Manufacturer	Model
Adapter	--	XING YUAN ELECTRONICS CO.LTD	XY36SC-120300VQ-UW Input: AC 100-240V 0.9A Output: DC 12V 3A

antenna info are provided customer.

Frequency Band	AntennaGain (dBi)	AntennaGain (dBd)
CAT-M Band 2	-4	-6.15
CAT-M Band 4	-4	-6.15
CAT-M Band 12	-5	-7.15
CAT-M Band 13	-5	-7.15

4. Reference Documents

4.1. Documents supplied by applicant

PICS/PIXIT, referring to Annex B for detailed information, is supplied by the client or manufacturer, which is the basis of testing.

4.2. Reference Documents for testing

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

Reference	Title	Version
FCC CFR Part 2	FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS; GENERAL RULES AND REGULATIONS, e-CFR	--
PART 24	PERSONAL COMMUNICATIONS SERVICES,e-CFR,	--
PART 27	,MISCELLANEOUS WIRELESS OMMUNICATIONS SERVICES, e-CFR,	--
ANSI C63.26-2015	--	2015

5. Test Equipments Utilized

5.1. RF Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Universal Radio Communication Tester	CMW500	166779	--	--	R&S	2023-09-21
2	DC Power Supply	62015L-60-6	L0200000 1587	--	--	Chroma	2023-06-29

5.2. RSE Test System

No.	Equipment	Model	SN	HW Version	SW Version	Manufacture	Cal.Due Date
1	Test Receiver	ESU26	100367	01	4.43 SP3	R&S	2023-06-29
2	Ultra-wideband Log Periodic Antenna	VULB 9163	01392	--	--	Schwarzbeck	2024-05-04
3	Double Ridged Guide Antenna	HF907	100357	--	--	R&S	2025-03-25
4	Universal Radio Communication Tester	CMW500	109616	--	--	R&S	2023-06-29
5	Double Ridged Guide Antenna	HF907	100356	--	--	R&S	2023-07-07
6	Generator	SMU 200A	104517	--	--	R&S	2023-06-29
7	Ultra-wideband Log Periodic Antenna	VULB 9163	00995	--	--	R&S	2024-04-03
8	Amplifier1	150A	1429	--	--	Beehive	2023-06-18
9	Amplifier2	SCU 18	10141	--	--	R&S	--

5.3. Chamber

No.	Name	Type	SN	Manufacture	Cal.Due Date
1	Fully-Anechoic Chamber	FACT3-2	--	ETS	2023-06-25

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5.4. Vibration table

No.	Name	Type	SN	Manufacture	Cal.Due Date
--	--	--	--	--	--

5.5. Test software

No.	Name	version	SN	Manufacture
1	EMC32	V 8.51.00	--	R&S

6. Test Results

6.1. Summary of Test Results

A brief summary of the tests carried out is shown as following.

FCC Rules	Name of Test	Result
2.1046,24.232(c),27.50	Conducted RF Power Output	Pass ^{note1}
2.1046,24.232(c),27.50	ERP and EIRP	Pass
2.1049, 24.238(b)	Occupied Bandwidth	Pass ^{note1}
2.1051,24.238,2.1053,27.53	Conducted spurious emissions	Pass ^{note1}
2.1051,24.238,2.1053,27.53	Radiated Spurious Emission	Pass
2.1051,24.238, 2.1053, 27.53	Band Edge	Pass ^{note1}
2.1055, 24.235, 27.54	Frequency Stability	Pass ^{note1}
24.232, 27.50	Peak to Average Ratio	Pass ^{note1}
Note 1:Test data reference I22W00076-CAT-M RF-FCC_Rev2.		

6.2. Conducted RF Power Output

Specifications:	FCC Part 2.1046,24.232(c),27.50
DUT Serial Number:	IMEI:866238066361881
Test conditions:	Ambient Temperature:15°C-35°C Relative Humidity:30%-60% Air pressure: 86-106kPa
Test Results:	Pass

Limit Level Construction:

According to Part 24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to Part 27.50(c), portable stations (hand-held devices) in the 600 MHz uplink Band and the 698-746 MHz Band, and fixed and mobile stations in the 600 MHz uplink Band are limited to 3 watts ERP.

According to Part 27.50(d), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz Band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz Bands are limited to 1 watt EIRP.

Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty	0.62 dB (k=2)

Test Setup:

During the test, the EUT was controlled via the Wireless Telecommunications Test Set to ensure max power transmission and proper modulation



Test Method:

The EUT is connected to the Universal Radio Communication Tester through the RF cable, and the average power and peak power are obtained through the Universal Radio Communication Tester

Note: The full RB test result of 16QAM of CAT-M is configured as 5@0.

6.2.1 CAT-M B2 Conducted RF Power Output Results

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Band	Bandwidth	Modulation	Channel	RB Size	RB	NBIndex	Original data(dBm)	Test result(dBm)	deviation(dBm)
					Start				
Band2	1.4MHz	QPSK	18607	1	0	Low	24.26	23.85	0.41
Band2	1.4MHz	QPSK	18900	1	0	Low	23.79	23.43	0.36
Band2	1.4MHz	16QAM	18607	1	0	Low	23.42	23.72	0.30
Band2	1.4MHz	16QAM	18900	1	0	Low	22.98	23.34	0.36
Band2	1.4MHz	16QAM	19193	1	5	Low	23.47	22.96	0.51
Band2	3MHz	QPSK	18615	1	0	Low	24.21	23.95	0.26
Band2	3MHz	QPSK	18900	1	0	Low	23.91	23.39	0.52
Band2	3MHz	16QAM	18615	1	0	Low	23.48	23.85	0.37
Band2	3MHz	16QAM	18900	1	0	Low	23.19	23.28	0.09
Band2	5MHz	QPSK	18625	1	0	Low	24.23	23.90	0.33
Band2	5MHz	QPSK	18900	1	0	Low	23.86	23.43	0.43
Band2	5MHz	QPSK	19175	6	0	High	23.00	23.08	0.08
Band2	5MHz	16QAM	18625	1	0	Low	24.22	24.14	0.08
Band2	5MHz	16QAM	18900	1	0	Low	24.39	23.80	0.59
Band2	5MHz	16QAM	18900	6	0	Low	23.17	23.64	0.47
Band2	5MHz	16QAM	19175	6	0	High	23.45	23.30	0.15
Band2	10MHz	QPSK	18650	1	0	Low	24.19	23.88	0.31
Band2	10MHz	QPSK	18650	6	0	Low	24.01	23.71	0.30
Band2	10MHz	QPSK	18900	1	0	Low	23.97	23.54	0.43
Band2	10MHz	QPSK	19150	6	0	High	23.43	23.02	0.41
Band2	10MHz	16QAM	18650	1	0	Low	24.36	24.16	0.20
Band2	10MHz	16QAM	18650	6	0	Low	24.12	24.22	0.10
Band2	10MHz	16QAM	18900	1	0	Low	23.35	23.86	0.51
Band2	10MHz	16QAM	19150	1	5	High	23.69	23.49	0.20
Band2	15MHz	QPSK	18675	1	0	Low	24.31	23.89	0.42
Band2	15MHz	QPSK	18900	1	0	Low	23.56	23.59	0.03
Band2	15MHz	QPSK	19125	6	0	High	23.79	23.42	0.37
Band2	15MHz	16QAM	18675	1	0	Low	23.59	24.18	0.59
Band2	15MHz	16QAM	18900	1	0	Low	23.49	23.91	0.42
Band2	15MHz	16QAM	19125	1	5	High	23.78	23.55	0.23
Band2	20MHz	QPSK	18700	1	0	Low	23.91	23.94	0.03
Band2	20MHz	QPSK	18900	6	0	Low	23.43	23.78	0.35
Band2	20MHz	QPSK	19100	6	0	High	23.75	23.47	0.28

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Band2	20MHz	16QAM	18900	1	0	Low	23.67	23.95	0.28
Band2	20MHz	16QAM	19100	1	5	High	23.69	23.62	0.07

6.2.2 CAT-M B4 Conducted RF Power Output Results

Band	Bandwidth	Modulation	Channel	RB Size	RB	NBIndex	Original data(dBm)	Test result(dBm)	deviation(dBm)
					Start				
Band4	1.4MHz	QPSK	20393	6	0	Low	19.87	19.40	0.47
Band4	1.4MHz	16QAM	20175	1	0	Low	20.91	20.44	0.47
Band4	1.4MHz	16QAM	20175	6	0	Low	19.63	19.06	0.57
Band4	3MHz	QPSK	20175	1	0	Low	21.81	21.34	0.47
Band4	3MHz	16QAM	20385	1	5	High	21.25	20.81	0.44
Band4	5MHz	QPSK	20175	6	0	Low	20.58	19.99	0.59
Band4	5MHz	16QAM	20375	1	5	High	22.42	21.86	0.56
Band4	10MHz	QPSK	20175	1	0	Low	21.77	21.24	0.53
Band4	10MHz	16QAM	20000	6	0	Low	21.32	21.00	0.32
Band4	10MHz	16QAM	20350	1	5	High	21.49	21.64	0.15
Band4	15MHz	QPSK	20025	6	0	Low	20.44	20.88	0.44
Band4	15MHz	QPSK	20325	6	0	High	21.77	21.25	0.52
Band4	15MHz	16QAM	20025	1	0	Low	21.53	21.20	0.33
Band4	15MHz	16QAM	20025	6	0	Low	20.57	21.06	0.49
Band4	15MHz	16QAM	20175	1	0	Low	21.46	21.14	0.32
Band4	15MHz	16QAM	20325	1	5	High	21.79	21.53	0.26
Band4	20MHz	QPSK	20050	1	0	Low	21.31	21.08	0.23
Band4	20MHz	QPSK	20175	6	0	Low	21.23	20.93	0.30
Band4	20MHz	16QAM	20050	1	0	Low	21.69	21.55	0.14
Band4	20MHz	16QAM	20175	1	0	Low	21.47	21.28	0.19
Band4	20MHz	16QAM	20300	1	5	High	21.99	21.49	0.50
Band4	20MHz	16QAM	20300	6	0	High	20.93	21.46	0.53

6.2.3 CAT-M B12 Conducted RF Power Output Results

Band	Bandwidth	Modulation	Channel	RB Size	RB	NBIndex	Original data(dBm)	Test result(dBm)	deviation(dBm)
					Start				
Band12	1.4MHz	QPSK	23017	1	0	Low	22.27	22.27	0.00
Band12	1.4MHz	QPSK	23017	6	0	Low	20.06	20.22	0.16
Band12	1.4MHz	QPSK	23095	1	0	Low	21.73	22.17	0.44
Band12	1.4MHz	QPSK	23095	6	0	Low	19.89	20.19	0.30

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Band12	1.4MHz	16QAM	23017	1	0	Low	21.49	21.40	0.09
Band12	1.4MHz	16QAM	23017	6	0	Low	20.18	20.30	0.12
Band12	1.4MHz	16QAM	23095	1	0	Low	20.94	21.09	0.15
Band12	1.4MHz	16QAM	23095	6	0	Low	19.62	20.19	0.57
Band12	3MHz	QPSK	23025	1	0	Low	22.31	22.44	0.13
Band12	3MHz	QPSK	23095	6	0	Low	20.43	20.22	0.21
Band12	3MHz	16QAM	23025	1	0	Low	21.48	21.27	0.21
Band12	3MHz	16QAM	23025	6	0	Low	20.51	20.30	0.21
Band12	3MHz	16QAM	23095	1	0	Low	21.59	21.28	0.31
Band12	3MHz	16QAM	23095	6	0	Low	20.25	20.10	0.15
Band12	5MHz	QPSK	23035	1	0	Low	22.26	22.33	0.07
Band12	5MHz	QPSK	23035	6	0	Low	20.91	21.19	0.28
Band12	5MHz	QPSK	23095	1	0	Low	21.82	22.25	0.43
Band12	5MHz	QPSK	23095	6	0	Low	20.57	21.02	0.45
Band12	5MHz	QPSK	23155	1	5	High	21.70	21.89	0.19
Band12	5MHz	QPSK	23155	6	0	High	20.80	21.05	0.25
Band12	5MHz	16QAM	23035	1	0	Low	22.24	22.33	0.09
Band12	5MHz	16QAM	23035	6	0	Low	21.38	21.38	0.00
Band12	5MHz	16QAM	23095	1	0	Low	22.37	22.34	0.03
Band12	5MHz	16QAM	23095	6	0	Low	21.11	21.34	0.23
Band12	5MHz	16QAM	23155	1	5	High	21.59	22.19	0.60
Band12	5MHz	16QAM	23155	6	0	High	20.84	21.21	0.37
Band12	10MHz	QPSK	23060	1	0	Low	22.49	22.32	0.17
Band12	10MHz	QPSK	23060	6	0	Low	21.43	21.08	0.35
Band12	10MHz	QPSK	23095	6	0	Low	20.92	21.00	0.08
Band12	10MHz	QPSK	23130	1	5	High	21.90	21.87	0.03
Band12	10MHz	QPSK	23130	6	0	High	20.60	20.97	0.37
Band12	10MHz	16QAM	23060	1	0	Low	22.55	22.43	0.12
Band12	10MHz	16QAM	23095	1	0	Low	21.88	22.36	0.48
Band12	10MHz	16QAM	23130	1	5	High	21.81	22.15	0.34
Band12	10MHz	16QAM	23130	6	0	High	21.72	22.26	0.54

6.2.4 CAT-M B13 Conducted RF Power Output Results

Band	Bandwidth	Modulation	Channel	RB Size	RB	NBIndex	Original data(dBm)	Test	deviation(dBm)
					Start				

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								result(dBm)	
Band13	5MHz	QPSK	23205	1	0	Low	22.46	22.08	0.38
Band13	5MHz	QPSK	23205	6	0	Low	20.41	20.99	0.58
Band13	5MHz	QPSK	23230	1	0	Low	21.92	21.97	0.05
Band13	5MHz	16QAM	23205	1	0	Low	22.64	22.27	0.37
Band13	5MHz	16QAM	23205	6	0	Low	21.28	21.14	0.14
Band13	5MHz	16QAM	23230	1	0	Low	22.67	22.17	0.50
Band13	5MHz	16QAM	23255	1	5	High	22.25	21.95	0.30
Band13	5MHz	16QAM	23255	6	0	High	21.28	21.11	0.17
Band13	10MHz	QPSK	23230	1	0	Low	22.41	22.17	0.24
Band13	10MHz	QPSK	23230	6	0	Low	21.13	20.91	0.22
Band13	10MHz	16QAM	23230	1	0	High	22.35	22.33	0.02

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6.3. ERP and EIRP

This is the test for the maximum radiated power from the EUT.

According to Part 24.232(c), mobile and portable stations are limited to 2 watts EIRP and the equipment must employ a means for limiting power to the minimum necessary for successful communications.

According to Part 27.50(c), portable stations (hand-held devices) in the 600 MHz uplink Band and the 698-746 MHz Band, and fixed and mobile stations in the 600 MHz uplink Band are limited to 3 watts ERP.

According to Part 27.50(d), fixed, mobile, and portable (hand-held) stations operating in the 1710-1755 MHz Band and mobile and portable stations operating in the 1695-1710 MHz and 1755-1780 MHz Bands are limited to 1 watt EIRP.

Note: The full RB test result of 16QAM of CAT-M is configured as 5@0.

Conducted RF Power+Antenna Gain(dBi)=EIRP

Conducted RF Power+Antenna Gain(dBd)=ERP

Antenna Gain(dBd)= Antenna Gain(dBi)-2.15

Frequency Band	AntennaGain (dBi)	AntennaGain (dBd)
CAT-M Band 2	-4	-6.15
CAT-M Band 4	-4	-6.15
CAT-M Band 12	-5	-7.15
CAT-M Band 13	-5	-7.15

6.2.1 CAT-M Band 2 EIRP

Mode	Bandwidth	Channel	RB	Index	EIRP(Limits 33.0 dBm) Max EIRP: 20.49dBm		
					QPSK	16QAM	
Band2	1.4MHz	18607	1#0	0	20.26	19.42	
			6#0	0	18.02	18.15	
		18900	1#0	0	19.79	18.98	
			6#0	0	17.85	17.64	
		19193	1#5	0	20.17	19.47	
			6#0	0	17.88	18.36	
		3MHz	18615	1#0	0	20.21	19.48
				6#0	0	18.07	18.11
			18900	1#0	0	19.91	19.19
				6#0	0	18.00	18.05
			19185	1#5	1	20.42	19.65
				6#0	1	19.65	18.23
	5MHz	18625	1#0	0	20.23	20.22	
			6#0	0	18.99	19.34	
		18900	1#0	0	19.86	20.39	
			6#0	0	18.59	19.17	
		19175	1#5	3	20.26	20.48	
			6#0	3	19.00	19.45	

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	10MHz	18650	1#0	0	20.19	20.36
			4#0	0	20.01	20.12
		18900	1#0	0	19.97	19.35
			4#0	0	18.11	18.07
		19150	1#5	7	20.44	19.69
			4#2	7	19.43	18.18
	15MHz	18675	1#0	0	20.31	19.59
			6#0	0	18.47	18.54
		18900	1#0	0	19.56	19.49
			6#0	0	18.05	18.14
		19125	1#5	0	20.39	19.78
			6#0	0	19.79	18.28
	20MHz	18700	1#0	0	19.91	19.19
			6#0	0	18.00	18.05
		18900	1#0	0	20.49	19.67
			6#0	0	19.43	18.13
		19100	1#5	0	20.48	19.69
			6#0	0	19.75	18.63

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6.2.2 CAT-M Band 4 EIRP

Mode	Bandwidth	Channel	RB	Index	EIRP(Limits 30.0 dBm) MAX EIRP:18.54dBm	
					QPSK	16QAM
Band4	1.4MHz	19957	1#0	0	18.29	17.44
			6#0	0	16.07	16.18
		20175	1#0	0	17.74	16.91
			6#0	0	15.88	15.63
		20393	1#5	0	18.12	17.48
			6#0	0	15.87	16.37
	3MHz	19965	1#0	0	18.41	17.38
			6#0	0	16.57	16.41
		20175	1#0	0	17.81	17.49
			6#0	0	16.40	16.75
		20385	1#5	1	18.12	17.25
			6#0	1	17.15	16.43
	5MHz	19975	1#0	0	18.24	18.21
			6#0	0	16.93	17.37
		20175	1#0	0	17.84	18.37
			6#0	0	16.58	17.13
		20375	1#5	3	18.24	18.42
			6#0	3	17.08	17.49

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	10MHz	20000	1#0	0	18.31	18.46
			4#0	0	17.41	17.32
		20175	1#0	0	17.77	17.85
			4#0	0	16.91	16.17
		20350	1#5	7	18.54	17.49
			4#2	7	17.13	16.88
	15MHz	20025	1#0	0	18.39	17.53
			6#0	0	16.44	16.57
		20175	1#0	0	17.59	17.46
			6#0	0	16.04	16.15
		20325	1#5	0	18.38	17.79
			6#0	0	17.77	16.25
	20MHz	20050	1#0	0	17.31	17.69
			6#0	0	16.05	16.08
		20175	1#0	0	18.37	17.47
			6#0	0	17.23	16.17
		20300	1#5	0	18.34	17.99
			6#0	0	17.85	16.93

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6.2.3 CAT-M Band 12 ERP

Mode	Bandwidth	Channel	RB	Index	ERP (Limits 34.8dBm) MAX ERP: 15.40 dBm	
					QPSK	16QAM
Band12	1.4MHz	23017	1#0	0	15.12	14.34
			6#0	0	12.91	13.03
		23095	1#0	0	14.58	13.79
			6#0	0	12.74	12.47
		23173	1#5	0	14.54	13.26
			6#0	0	12.79	12.75
	3MHz	23025	1#0	0	15.16	14.33
			6#0	0	13.82	13.36
		23095	1#0	0	14.56	14.44
			6#0	0	13.28	13.10
		23165	1#5	1	14.74	13.49
			6#0	1	12.68	12.73
	5MHz	23035	1#0	0	15.11	15.09
			6#0	0	13.76	14.23
		23095	1#0	0	14.67	15.22
			6#0	0	13.42	13.96
		23155	1#5	3	14.55	14.44
			6#0	3	13.65	13.69
	10MHz	23060	1#0	0	15.34	15.40
			4#0	0	14.28	14.27
		23095	1#0	0	14.32	14.73
			4#0	0	13.77	12.99
		23130	1#5	7	14.75	14.66
			4#2	7	13.45	14.57

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6.2.4 CAT-M Band 13 ERP

Mode	Bandwidth	Channel	RB	Index	ERP (Limits 34.8dBm) MAX ERP:15.52dBm	
					QPSK	16QAM
Band13	5MHz	23205	1#0	0	15.31	15.49
			6#0	0	13.26	14.13
		23230	1#0	0	14.77	15.52
			6#0	3	13.02	14.59
		23255	1#5	3	15.23	15.10
			6#0	3	14.34	14.13
	10MHz	23230	1#0	0	15.26	15.20
			6#0	0	13.98	14.07
		23230	1#0	0	14.34	14.72
			6#0	0	13.17	13.29
		23230	1#5	7	15.23	14.81
			4#2	7	14.18	13.77

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6.4. Radiated Spurious Emission

Specifications:	FCC 2.1051,24.238,2.1053,27.53
DUT Serial Number:	IMEI:866238066366773
Test conditions:	Ambient Temperature:21.6°C-22.6°C Relative Humidity:55%-57% Air pressure: 98.7kPa
Test Results:	Pass

Limit Level Construction:

According to Part 24.238 (a), i.e., Out of Band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB, so the limit level is: $P(\text{dBm}) - (43 + 10 \log(P)) \text{ dB} = -13\text{dBm}$.

According to Part 27.53(c):

On any frequency outside the 776–788 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least $43 + 10 \log(P)$ dB;

According to Part 27.53(f):

For operations in the 746–758 MHz, 775–788 MHz, and 805–806 MHz bands, emissions in the band 1559–1610 MHz shall be limited to -70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and -80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

According to Part 27.53(h):

Except as otherwise specified below, for operations in the 1695-1710 MHz, 1710-1755 MHz, 1755-1780 MHz, 1915-1920 MHz, 1995-2000 MHz, 2000-2020 MHz, 2110-2155 MHz, 2155-2180 MHz, and 2180-2200 Bands, the power of any emission outside a licensee's frequency block shall be attenuated below the transmitter power (P) in watts by at least $43 + 10 \log_{10}(P)$ dB.

According to Part 27.53(g):

For operations in the 600 MHz Band and the 698-746 MHz Band, the power of any emission outside a licensee's frequency Band(s) of operation shall be attenuated below the transmitter power (P) within the licensed Band(s) of operation, measured in watts, by at least $43 + 10 \log(P)$ dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution Bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz Bands immediately outside and adjacent to a licensee's frequency block, a resolution Bandwidth of at least 30 kHz may be employed.

Limits for Radiated spurious emissions(UE)	
Frequency range	Limit Level /Resolution Bandwidth
30 MHz to 20000 MHz	-13dBm/1MHz

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Measurement Uncertainty:

Item	Uncertainty
Expanded Uncertainty (30MHz-150MHz)	2.03 dB (k=2)
Expanded Uncertainty (150MHz-1000MHz)	2.99 dB (k=2)
Expanded Uncertainty (1GHz-3GHz)	2.92dB (k=2)
Expanded Uncertainty (3GHz-6GHz)	2.93dB (k=2)
Expanded Uncertainty (6GHz-18GHz)	2.96dB (k=2)
Expanded Uncertainty (18GHz-26GHz)	4.60dB (k=2)
Expanded Uncertainty (26GHz-40GHz)	4.77dB (k=2)

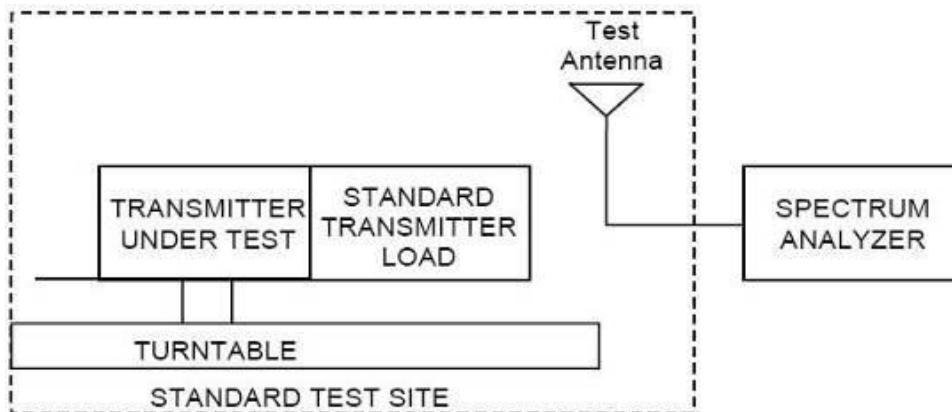
Test Setup:

The EUT was placed in an anechoic chamber. The Wireless Communications Test Set was used to set the TX channel and power level and modulate the TX signal with different bit patterns.

Test Method:

The measurement method is substitution method accordance with section 2.2.12 of ANSI/TIA-603-E: Land Mobile FM or PM Communications Equipment Measurement and Performance Standards.

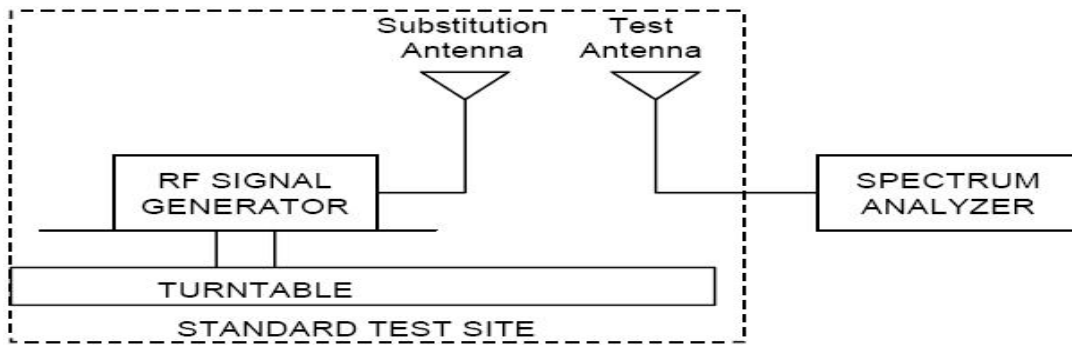
(a) Connect the equipment as illustrated and measure the spurious emissions as the method as above. The distance from the device to the antenna is 3 m .



(b) Reconnect the equipment as illustrated.

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(c) Remove the transmitter and replace it with a substitution antenna. The center of the substitution antenna should be approximately at the same location as the center of the transmitter.

(d) Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained. This should be done carefully repeating the adjustment of the test antenna and generator output.

(e) Repeat step d) with both antennas vertically polarized for each spurious frequency.

(f) Calculate power in dBm into a reference ideal half-wave dipole antenna by reducing the readings obtained in steps d) and e) by the power loss in the cable between the generator and the antenna, and further corrected for the gain of the substitution antenna used relative to an ideal half-wave dipole antenna by the following formula:

$$P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dB)}$$

where:

P_d is the dipole equivalent power and P_g is the generator output power into the substitution antenna.



Test frequency: 30MHz-20GHz

All modes were tested, only the worst case was reported.

CAT-M B2 Radiated Spurious Emission Results

Test Data (20M bandwidth QPSK Mode CH18700)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3720.0	-73.73	1.6	8.73	-66.6	V
5580.0	-73.34	2.2	10.94	-64.6	V
7440.0	-69.54	2.6	11.54	-60.6	V
9300.0	-67.51	3.0	12.41	-58.1	V
11160.0	-65.63	3.7	13.83	-55.5	V
13020.0	-64.05	4.0	14.05	-54.0	V

CAT-M B2 Radiated Spurious Emission Results

Test Data (20M bandwidth QPSK Mode CH18900)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3760.0	-73.03	1.6	8.73	-65.9	V
5640.0	-72.04	2.2	10.94	-63.3	V
7520.0	-68.74	2.6	11.54	-59.8	V
9400.0	-67.11	3.0	12.41	-57.7	V
11280.0	-65.23	3.7	13.83	-55.1	V
13160.0	-63.85	4.1	14.05	-53.9	V

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CAT-M B2 Radiated Spurious Emission Results

Test Data (20M bandwidth QPSK Mode CH19100)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3800.0	-72.63	1.6	8.73	-65.5	V
5700.0	-71.54	2.2	10.94	-62.8	V
7600.0	-68.74	2.6	11.54	-59.8	V
9500.0	-66.91	3.0	12.41	-57.5	V
11400.0	-65.13	3.7	13.83	-55.0	V
13300.0	-64.45	4.0	14.05	-54.4	V

CAT-M B4 Radiated Spurious Emission Results

Test Data (10M bandwidth QPSK Mode CH20000)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3430.0	-53.13	1.5	9.03	-45.6	V
5145.0	-67.09	2.0	10.39	-58.7	V
6860.0	-70.50	2.6	11.5	-61.6	V
8575.0	-66.73	3.2	12.03	-57.9	V
10290.0	-68.17	3.3	13.17	-58.3	V
12005.0	-64.62	3.6	13.92	-54.3	V

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**CAT-M B4 Radiated Spurious Emission Results**

Test Data (10M bandwidth QPSK Mode CH20175)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3465.0	-47.43	1.5	9.03	-39.9	V
5197.5	-71.79	2.0	10.39	-63.4	V
6930.0	-70.90	2.6	11.5	-62.0	V
8662.5	-66.93	3.2	12.03	-58.1	V
10395.0	-67.67	3.3	13.17	-57.8	V
12127.5	-64.92	3.6	13.92	-54.6	V

CAT-M B4 Radiated Spurious Emission Results

Test Data (10M bandwidth QPSK Mode CH20350)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
3500.0	-73.83	1.5	9.03	-66.3	V
5250.0	-71.09	2.0	10.39	-62.7	V
7000.0	-69.80	2.6	11.5	-60.9	V
8750.0	-67.63	3.2	12.03	-58.8	V
10500.0	-66.27	3.3	13.17	-56.4	V
12250.0	-64.52	3.6	13.92	-54.2	V

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**CAT-M B12 Radiated Spurious Emission Results**

Test Data (10M bandwidth 16QAM Mode CH23060)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1408.0	-73.5	0.9	7.8	-66.6	H
2112.0	-67.8	1.2	6.7	-62.3	H
2816.0	-61.5	1.4	5.7	-57.2	V
3520.0	-74.7	1.6	9.2	-67.1	V
4224.0	-72.16	1.8	8.76	-65.2	V
4928.0	-70.9	2.0	9.8	-63.1	V

CAT-M B12 Radiated Spurious Emission Results

Test Data (10M bandwidth 16QAM Mode CH23095)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1415.0	-74.0	0.9	7.8	-67.1	H
2122.5	-67.9	1.2	6.7	-62.4	V
2830.0	-61.5	1.4	5.3	-57.6	V
3537.5	-75	1.6	9.2	-67.4	V
4245.0	-71.86	1.8	8.76	-64.9	V
4952.5	-70.5	2.0	9.8	-62.7	V

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CAT-M B12 Radiated Spurious Emission Results

Test Data (10M bandwidth 16QAM Mode CH23130)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1422.0	-74.6	0.9	7.8	-67.7	H
2133.0	-68.3	1.2	6.7	-62.8	H
2844.0	-61.6	1.4	5.3	-57.7	V
3555.0	-74.9	1.6	9.2	-67.3	V
4266.0	-71.26	1.8	8.76	-64.3	V
4977.0	-71.3	2.0	9.8	-63.5	V

CAT-M B13 Radiated Spurious Emission Results

Test Data (5M bandwidth 16QAM Mode CH23205)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1559.0	-72.6	1.0	6.2	-67.4	V
2338.5	-65.8	1.3	6.4	-60.7	V
3118.0	-74.58	1.5	8.28	-67.8	V
3897.5	-72.53	1.7	9.03	-65.2	V
4677.0	-71.8	1.9	9.9	-63.8	V
5456.5	-72.25	2.1	10.35	-64.0	V

CAT-M B13 Radiated Spurious Emission Results

Test Data (5M bandwidth 16QAM Mode CH23230)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1564.0	-72.8	1.0	6.2	-67.6	V
2346.0	-65.7	1.3	6.4	-60.6	V
3128.0	-75.28	1.5	8.28	-68.5	V
3910.0	-73.13	1.7	9.03	-65.8	V
4692.0	-73.2	1.9	9.9	-65.2	V
5474.0	-72.55	2.1	10.35	-64.3	V

CAT-M B13 Radiated Spurious Emission Results

Test Data (5M bandwidth 16QAM Mode CH23255)

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1569.0	-72.7	1.0	6.2	-67.5	V
2353.5	-65.4	1.3	6.4	-60.3	H
3138.0	-75.48	1.5	8.28	-68.7	V
3922.5	-73.53	1.7	9.03	-66.2	V
4707.0	-72.9	1.9	9.9	-64.9	V
5491.5	-73.35	2.1	10.35	-65.1	V

Frequency [MHz]	Generator output power(Pg) [dBm]	Cable loss [dB]	Antenna Gain [dB]	Spurious Emission Power (Pd) [dBm]	Antenna Polarization [H/V]
1568.1	-66.2	1.0	6.2	-61.0	V

The max radiated power of 1559-1610 MHz is -61.0 dBm < -40dBm (-70dBW) .

There is no signal that bandwidth is less than 700 Hz bandwidth

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Annex A EUT Photos

See the document" I23W00016-External Photos".

See the document" I23W00016-Internal Photos".

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ANNEX B Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

*****END OF REPORT*****

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