

Wireless Device Over the Air RF Performance LTE Cat-M1 Summary Report for PTCRB bands

REPORT NO.: OP200528E01

MODEL NO.: T402M / T404M

PTCRB/CTIA REQUEST NO.: 88876

RECEIVED DATE: 2020.6.8

TESTED DATE: 2020.6.8 ~ 2020.6.30

ISSUED: 2020.7.29

MANUFACTURER: Particle Industries, Inc

ADDRESS : 126 Post St, 4th floor, San Francisco, CA 94108 USA

ISSUED BY: Bureau Veritas Consumer Products Service (H.K.)
Ltd., Taoyuan Branch Lin Kou Laboratories.

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TEST LOCATION: No. 19, Hwa Ya 2nd rd., Kueishan, Taoyuan, Taiwan,
R.O.C.

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RELEASE CONTROL RECORD

REPORT NO.	REASON FOR CHANGE	DATE ISSUED
OP200528E01	Original release	2020.7.29

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BUREAU
VERITAS

GENERAL INFORMATION

APPLICANT:	Particle Industries, Inc	
MANUFACTURER:	Particle Industries, Inc	
MODEL NO.:	T402M / T404M	
SERIES NUMBER/ESN/IMEI:	860112043244560	
FCC ID NUMBER:	2AEMI-T40X	
HARDWARE VERSION:	1.0	
SOFTWARE VERSION:	1.5.4	
INTEGRATED MODULE	BRAND NAME:	Particle
	MODEL NAME:	BG96(3.0)
	FCC ID:	XMR201707BG96
	HW VERSION:	R1.2
	SW VERSION:	BG96MAR04A04M1G(SVN:04)
PRODUCT TYPE:	Tracker SoM LTE M1	
CELLULAR SYSTEM:	LTE	
CELLULAR BAND:	LTE Cat-M1: B 2/4/5/12/13/25	
POWER CLASS:	LTE: 5	
ANTENNA TYPE:	Embedded	
CONFIGURATION OF PRIMARY MECHANICAL MODE:	Monoblock	
TEST PLAN VERSION:	CTIA Test Plan for Wireless Device Over the Air Performance Revision 3.8.2	

The above equipment has been tested by **Bureau Veritas Consumer Products Service (H.K.) Ltd., Taoyuan Branch.**, and found compliance with the requirement of the above standards.

PREPARED BY : Ely Chen , **DATE :** 2020.7.29
Ely Chen / Engineer

APPROVED BY : Johnny Liu , **DATE :** 2020.7.29
Johnny Liu / Supervisor

1. Test Lab Environment Conditions

Temperature	23°C
Humidity	55%

2. Test Equipment List

TYPE OF EQUIPMENT	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
Radio Communication Analyzer	Anritsu MT8821C	6201664741	2020/9/17
Signal Analyzer	Agilent N9020A	MY50110101	2020/12/16

3. Device Configuration

3.1. Bands and Protocols Supported by Each Antenna

Antenna Label	Bands and Protocols for Which the Antenna Is Connected to the Transmitter	Bands and Protocols for Which the Antenna Is Connected to any Receiver and Is Always Active	Bands and Protocols for Which the Antenna Is Connected to any Receiver and Is Dynamically Active	Protocol/Band Pairs Which Cannot Be Used for Single Point Offset Tests per (Section 5.13, Section 6.15, and Section 6.13.3.3) Because the Antenna Tuning Changes
A	LTE Cat-M1: B2/4/5/12/13/25	LTE Cat-M1: B2/4/5/12/13/25	-	-

3.2. EUTs Used For Each Test

Serial number/ ESN/IMEI	CATL/ Chamber used	RAT(s)	Band(s)	Test Type(s)	Test Condition(s)
860112043244560	OTA2-HY	LTE Cat-M1	B2/4/5/12/13	All	FS



4. Evaluation Summary

4.1. Total Radiated Power (TRP)

Band	Chan.	Freq. (MHz)	TRP (dBm)			NHPRP \pm 45 (dBm)			NHPRP \pm 30 (dBm)		
			FS	WL	WR	FS	WL	WR	FS	WL	WR
LTE Cat-M1 FDD 2	18650	1851.04	22.8	-	-	22.0	-	-	20.9	-	-
	18900	1880.36	22.0	-	-	21.2	-	-	20.3	-	-
	19150	1908.96	21.8	-	-	21.0	-	-	19.9	-	-
LTE Cat-M1 FDD 4	20000	1711.04	23.4	-	-	22.3	-	-	21.0	-	-
	20175	1732.86	23.6	-	-	22.6	-	-	21.3	-	-
	20350	1753.96	23.3	-	-	22.4	-	-	21.1	-	-
LTE Cat-M1 FDD 5	20450	825.04	16.4	-	-	15.4	-	-	14.0	-	-
	20525	836.86	16.5	-	-	15.5	-	-	14.1	-	-
	20600	847.96	17.1	-	-	16.1	-	-	14.6	-	-
LTE Cat-M1 FDD 12	23035	699.34	19.6	-	-	19.1	-	-	18.0	-	-
	23095	707.68	20.1	-	-	19.6	-	-	18.6	-	-
	23155	715.66	20.9	-	-	20.4	-	-	19.5	-	-
LTE Cat-M1 FDD 13	23230	778.04	16.7	-	-	15.0	-	-	12.6	-	-
	23230	782.36	16.3	-	-	14.7	-	-	12.4	-	-
	23230	785.96	16.2	-	-	14.7	-	-	12.4	-	-



4.2. Total Isotropic Sensitivity (TIS), All Receivers Active

Band	Chan.	Freq. (MHz)	C-TIS (dBm)			NHPIS±45 (dBm)			NHPIS±30 (dBm)		
			FS	WL	WR	FS	WL	WR	FS	WL	WR
LTE Cat-M1 FDD 2	650	1931.04	-107.0	-	-	-106.0	-	-	-104.7	-	-
	900	1961.44	-107.4	-	-	-106.3	-	-	-105.0	-	-
	1150	1988.6	-106.0	-	-	-104.8	-	-	-103.4	-	-
LTE Cat-M1 FDD 4	2000	2111.04	-105.4	-	-	-104.1	-	-	-102.8	-	-
	2175	2133.94	-106.4	-	-	-105.2	-	-	-104.0	-	-
	2350	2153.6	-106.0	-	-	-104.9	-	-	-103.8	-	-
LTE Cat-M1 FDD 5	2450	870.04	-105.4	-	-	-104.2	-	-	-102.8	-	-
	2525	882.94	-104.7	-	-	-103.6	-	-	-102.1	-	-
	2600	892.6	-105.1	-	-	-104.0	-	-	-102.5	-	-
LTE Cat-M1 FDD 12	5035	729.61	-102.1	-	-	-101.5	-	-	-100.4	-	-
	5095	739.03	-102.9	-	-	-102.4	-	-	-101.6	-	-
	5155	745.03	-101.3	-	-	-100.8	-	-	-100.1	-	-
LTE Cat-M1 FDD 13	5230	747.04	-101.7	-	-	-100.4	-	-	-98.6	-	-
	5230	752.44	-99.6	-	-	-98.0	-	-	-96.5	-	-
	5230	754.6	-100.2	-	-	-98.9	-	-	-97.1	-	-



5. Pass/Fail Criteria

5.1. Total Radiated Power (TRP) Results

Band	Worn on Wrist	Channel	UL RB Allocation	TX Frequency (MHz) [center of UL RB allocation]	FS			WL			WR		
					Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	Limit (dBm)	Test Results (dBm)	Pass / Fail / Info
LTE Cat-M1 FDD 2	No	18650	4 RB with RBstart=1	1851.04	TBD	22.8	Info	-	-	-	-	-	-
		18900	4 RB with RBstart=25	1880.36		22.0		-	-	-	-	-	
		19150	4 RB with RBstart=45	1908.96		21.8		-	-	-	-	-	
LTE Cat-M1 FDD 4	No	20000	4 RB with RBstart=1	1711.04	TBD	23.4	Info	-	-	-	-	-	-
		20175	4 RB with RBstart=25	1732.86		23.6		-	-	-	-	-	
		20350	4 RB with RBstart=45	1753.96		23.3		-	-	-	-	-	
LTE Cat-M1 FDD 5		20450	4 RB with RBstart=1	825.04	TBD	16.4	Info	-	-	-	-	-	-
		20525	4 RB with RBstart=25	836.86		16.5		-	-	-	-	-	
		20600	4 RB with RBstart=45	847.96		17.1		-	-	-	-	-	
LTE Cat-M1 FDD 12	No	23035	1 RB with RBstart=0	699.34	TBD	19.6	Info	-	-	-	-	-	-
		23095	1 RB with RBstart=13	707.68		20.1		-	-	-	-	-	
		23155	1 RB with RBstart=24	715.66		20.9		-	-	-	-	-	
LTE Cat-M1 FDD 13	No	23230	4 RB with RBstart=1	778.04	TBD	16.7	Info	-	-	-	-	-	-
		23230	4 RB with RBstart=25	782.36		16.3		-	-	-	-	-	
		23230	4 RB with RBstart=45	785.96		16.2		-	-	-	-	-	

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Report the single arm orientation (WL or WR) based on the expected worst-case orientation and based on input from target operators. Modify header to reflect the single arm orientation tested.



5.2. Total Isotropic Sensitivity (TIS) Results, All Receivers Active

Band	Worn on Wrist	Channel	DL RB Allocation	RX Frequency (MHz)	FS			WL			WR			
					Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	
LTE Cat-M1 FDD 2	No	650	4 RB with RBstart=1	1931.04	TBD	-107.0	Info	-	-	-	-	-	-	
		900	4 RB with RBstart=31	1961.44		-107.4			-			-		-
		1150	4 RB with RBstart=43	1988.6		-106.0			-			-		-
LTE Cat-M1 FDD 4	No	2000	4 RB with RBstart=1	2111.04	TBD	-105.4	Info	-	-	-	-	-	-	
		2175	4 RB with RBstart=31	2133.94		-106.4			-			-		-
		2350	4 RB with RBstart=43	2153.6		-106.0			-			-		-
LTE Cat-M1 FDD 5		2450	4 RB with RBstart=1	870.04	TBD	-105.4	Info	-	-	-	-	-	-	
		2525	4 RB with RBstart=31	882.94		-104.7			-			-		-
		2600	4 RB with RBstart=43	892.6		-105.1			-			-		-
LTE Cat-M1 FDD 12	No	5035	4 RB with RBstart=0	729.61	TBD	-102.1	Info	-	-	-	-	-	-	
		5095	4 RB with RBstart=19	739.03		-102.9			-			-		-
		5155	4 RB with RBstart=19	745.03		-101.3			-			-		-
LTE Cat-M1 FDD 13	No	5230	4 RB with RBstart=1	747.04	TBD	-101.7	Info	-	-	-	-	-	-	
		5230	4 RB with RBstart=31	752.44		-99.6			-			-		-
		5230	4 RB with RBstart=43	754.60		-100.2			-			-		-

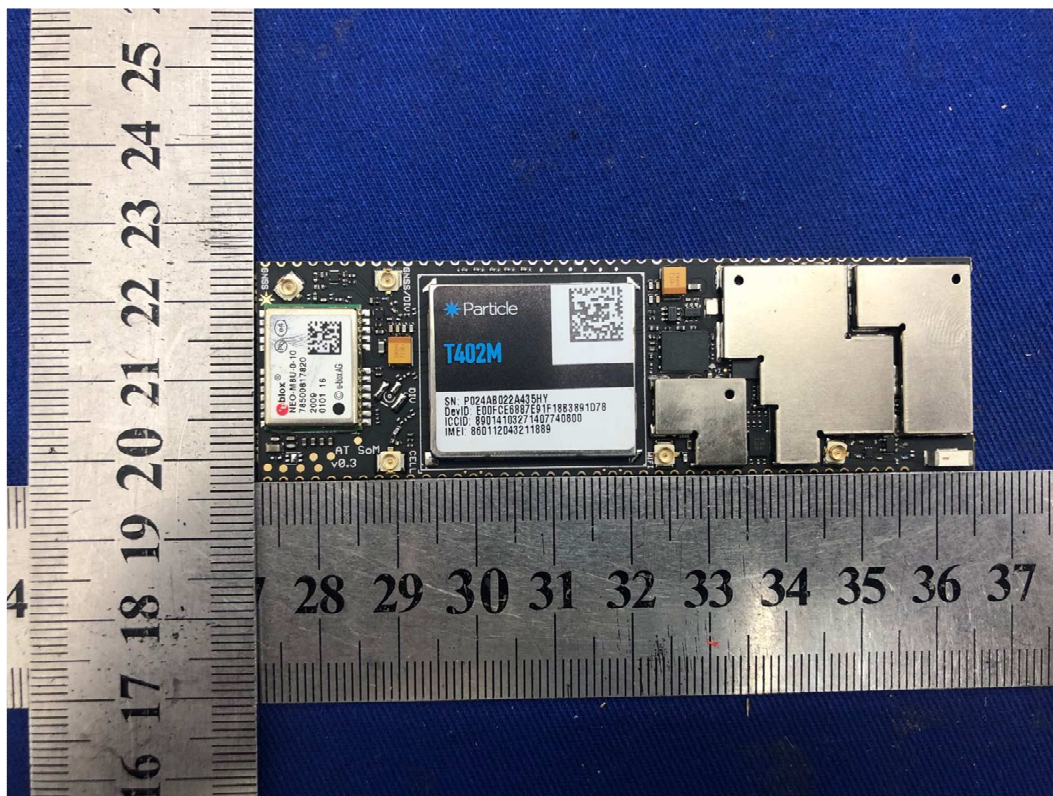
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).
Note 2: Report the single arm orientation (WL or WR) based on the expected worst-case orientation and based on input from target operators. Modify header to reflect the single arm orientation tested.

6. Measurement Uncertainty

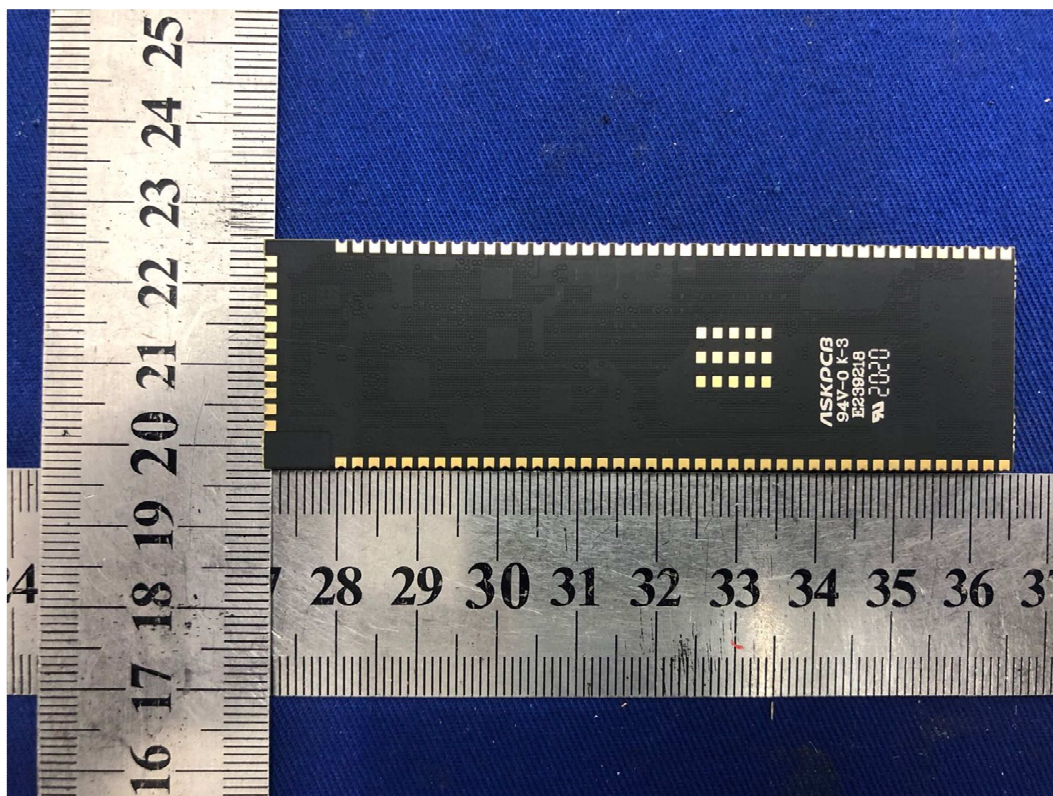
The expanded measurement uncertainties are listed below. These uncertainties refer to a coverage factor of 2, corresponding to 95% confidence level.

	TRP Measurement (dB)				
Test Configuration	LTE700	Cellular	AWS-1 Tx	PCS	LTE41
Free Space	1.25	1.34	1.43	1.46	1.52
Larger form over 30 cm	1.59	1.36	1.46	1.47	1.53
	TIS Measurement (dB)				
Test Configuration	LTE700	Cellular	PCS	AWS-1 Rx	LTE41
Free Space	1.61	1.68	1.78	1.73	1.82
Larger form over 30 cm	1.88	1.70	1.79	1.75	1.83

APPENDIX A. EUT Photographs

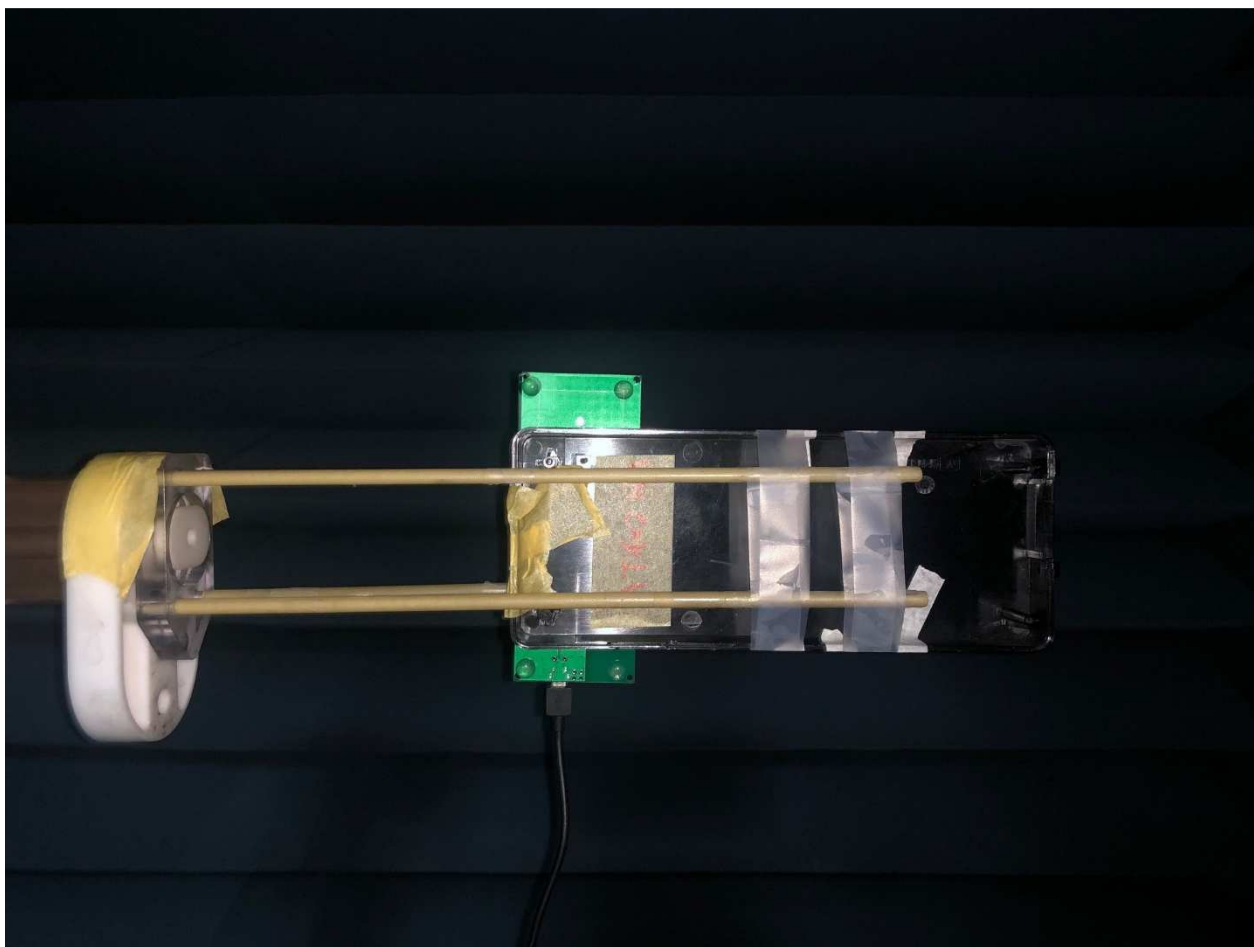


EUT front side



EUT rear side

APPENDIX B. EUT SETUP Photographs



Free Space