



Wireless Device Over the Air RF Performance LTE Cat. M1 Summary Report for AT&T Bands

REPORT NO.: OP180528C08 R1

MODEL NO.: E402

RECEIVED DATE: 2018.08.14

TESTED DATE: 2018.08.24 ~ 2018.08.30

ISSUED: 2018.09.03

MANUFACTURER: Particle Industries, Inc

MANUFACTURER 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.

ADDRESS: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New
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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
OP180528C08	Original release	2018.09.03
OP180528C08 R1	Update Module photographs	2018.09.03

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GENERAL INFORMATION

APPLICANT:	Particle Industries, Inc
MANUFACTURER:	Particle Industries, Inc
MODEL NO.:	E402
SERIES NUMBER/ESN/IMEI:	352753090695450
HARDWARE VERSION:	V007
SOFTWARE VERSION:	V0.8.0
PRODUCT TYPE:	IOT device
CELLULAR SYSTEM:	LTE
CELLULAR BAND:	LTE: FDD 2/4/12
POWER CLASS:	LTE: 3
ANTENNA TYPE:	Embedded
CONFIGURATION OF PRIMARY MECHANICAL MODE:	Monoblock
REFERENCE DOCUMENT:	CTIA OTA V 3.8 Draft 3 CPWG180122-1_R1

The above equipment has been tested by **Bureau Veritas Consumer Products Service (H.K.) Ltd., Taoyuan Branch.**

PREPARED BY : Ely Chen , **DATE :** 2018.09.03
 Ely Chen / Engineer

APPROVED BY : Johnny Liu , **DATE :** 2018.09.03
 Johnny Liu / Supervisor

1. Test Lab Environment Conditions

Temperature	25°C
Humidity	46%

2. Test Equipment List

TYPE OF EQUIPMENT	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
Radio Communication Analyzer	Anritsu MT8821C	6201664741	2019/7/04
Signal Analyzer	Agilent N9020A	MY50110101	2018/11/01

3. Evaluation Summary

3.1. Total Radiated Power (TRP)

Band	Chan.	Freq. (MHz)	Cond. Pwr. (dBm)	TRP (dBm)					NHPRP±45 (dBm)					NHPRP±30 (dBm)				
				FS	HL	HR	BHHL	BHHR	FS	HL	HR	BHHL	BHHR	FS	HL	HR	BHHL	BHHR
LTE FDD 2	18650	1851.04	22.4	20.9	-	-	-	-	19.7	-	-	-	-	18.3	-	-	-	-
	18900	1880.36	22.0	20.4	-	-	-	-	19.1	-	-	-	-	17.7	-	-	-	-
	19150	1908.96	22.0	20.0	-	-	-	-	18.8	-	-	-	-	17.5	-	-	-	-
LTE FDD 4	20000	1711.04	22.5	21.9	-	-	-	-	21.4	-	-	-	-	20.4	-	-	-	-
	20175	1732.86	22.3	21.3	-	-	-	-	20.2	-	-	-	-	18.7	-	-	-	-
	20350	1753.96	22.3	21.3	-	-	-	-	20.8	-	-	-	-	19.8	-	-	-	-
LTE FDD 12	23035	699.34	23.1	21.9	-	-	-	-	21.1	-	-	-	-	19.9	-	-	-	-
	23095	707.68	23.2	21.9	-	-	-	-	21.0	-	-	-	-	19.7	-	-	-	-
	23155	715.66	23.1	21.4	-	-	-	-	20.5	-	-	-	-	19.2	-	-	-	-



3.2. Total Isotropic Sensitivity (TIS)

Band	Chan.	Freq. (MHz)	Cond. Sens. (dBm)	TIS (dBm)					NHPIS±45 (dBm)					NHPIS±30 (dBm)				
				FS	HL	HR	BHHL	BHHR	FS	HL	HR	BHHL	BHHR	FS	HL	HR	BHHL	BHHR
LTE FDD 2	650	1931.04	-105.7	-104.2	-	-	-	-	-103.3	-	-	-	-	-101.8	-	-	-	-
	900	1961.44	-106.2	-104.7	-	-	-	-	-103.8	-	-	-	-	-102.3	-	-	-	-
	1150	1988.6	-105.8	-104.3	-	-	-	-	-103.4	-	-	-	-	-101.9	-	-	-	-
LTE FDD 4	2000	2111.04	-106.3	-99.4	-	-	-	-	-98.7	-	-	-	-	-97.4	-	-	-	-
	2175	2133.94	-106.3	-101.1	-	-	-	-	-100.3	-	-	-	-	-99.1	-	-	-	-
	2350	2153.6	-106.3	-101.2	-	-	-	-	-100.5	-	-	-	-	-99.3	-	-	-	-
LTE FDD 12	5035	729.61	-106.3	-100.5	-	-	-	-	-99.3	-	-	-	-	-97.9	-	-	-	-
	5095	739.03	-107.3	-101.1	-	-	-	-	-99.8	-	-	-	-	-98.4	-	-	-	-
	5155	745.03	-107.3	-101.7	-	-	-	-	-100.5	-	-	-	-	-99.1	-	-	-	-

4. Pass/Fail Criteria

4.1. Total Radiated Power (TRP) Results

Band	Device Held Up to Head for Voice (Yes/No)	Channel	UL RB Allocation	TX Frequency (MHz) [center of UL RB allocation]	FS			BHHL			BHHR			HL			HR		
					Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	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 FDD 2	No	18650	4 RB with RBstart=1	1851.04	20	20.9	Pass	-	-	-	-	-	-	-	-	-	-	-	
		18900	4 RB with RBstart=25	1880.36		20.4	Pass	-	-	-	-	-	-	-	-	-	-	-	
		19150	4 RB with RBstart=45	1908.87		20.0	Pass	-	-	-	-	-	-	-	-	-	-	-	
LTE FDD 4	No	20000	4 RB with RBstart=1	1711.04	20	21.9	Pass	-	-	-	-	-	-	-	-	-	-	-	
		20175	4 RB with RBstart=25	1732.86		21.3	Pass	-	-	-	-	-	-	-	-	-	-		
		20350	4 RB with RBstart=45	1753.96		21.3	Pass	-	-	-	-	-	-	-	-	-	-		
LTE FDD 12	No	23035	1 RB with RBstart=0	699.34	18	21.9	Pass	-	-	-	-	-	-	-	-	-	-	-	
		23095	1 RB with RBstart=13	707.68		21.9	Pass	-	-	-	-	-	-	-	-	-	-		
		23155	1 RB with RBstart=24	715.66		21.4	Pass	-	-	-	-	-	-	-	-	-	-		

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: "Yes" applies if the device supports voice operation in the talking position against the head in any cellular radio mode

Note 3: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions



4.2. Total Isotropic Sensitivity (TIS) Results

Band	Device Held Up to Head for Voice (Yes/No)	Channel	DL RB Allocation	RX Frequency (MHz)	FS			BHHL			BHHR			HL			HR		
					Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	Limit (dBm)	Test Results (dBm)	Pass / Fail / Info	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 FDD 2	No	650	4 RB with RBstart=1	1931.04	-96	-104.2	Pass	-	-	-	-	-	-	-	-	-	-	-	
		900	4 RB with RBstart=31	1961.44		-104.7	Pass	-	-	-	-	-	-	-	-	-	-	-	-
		1150	4 RB with RBstart=43	1988.6		-104.3	Pass	-	-	-	-	-	-	-	-	-	-	-	-
LTE FDD 4	No	2000	4 RB with RBstart=1	2111.04	-98	-99.4	Pass	-	-	-	-	-	-	-	-	-	-	-	
		2175	4 RB with RBstart=31	2133.94		-101.1	Pass	-	-	-	-	-	-	-	-	-	-	-	
		2350	4 RB with RBstart=43	2153.6		-101.2	Pass	-	-	-	-	-	-	-	-	-	-	-	
LTE FDD 12	No	5035	4 RB with RBstart=0	729.61	-93	-100.5	Pass	-	-	-	-	-	-	-	-	-	-	-	
		5095	4 RB with RBstart=19	739.03		-101.1	Pass	-	-	-	-	-	-	-	-	-	-	-	
		5155	4 RB with RBstart=19	745.03		-101.7	Pass	-	-	-	-	-	-	-	-	-	-	-	

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)

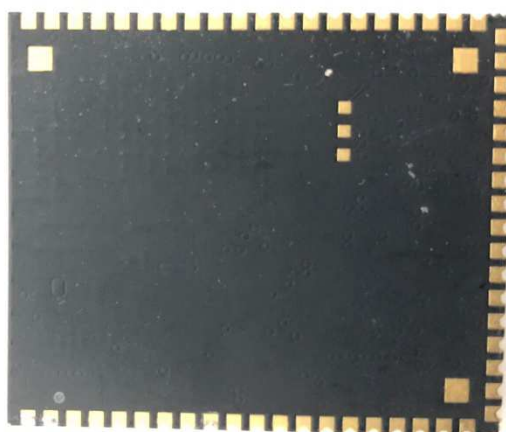
Note 2: "Yes" applies if the device supports voice operation in the talking position against the head in any cellular radio mode

Note 3: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions

APPENDIX A. EUT Photographs

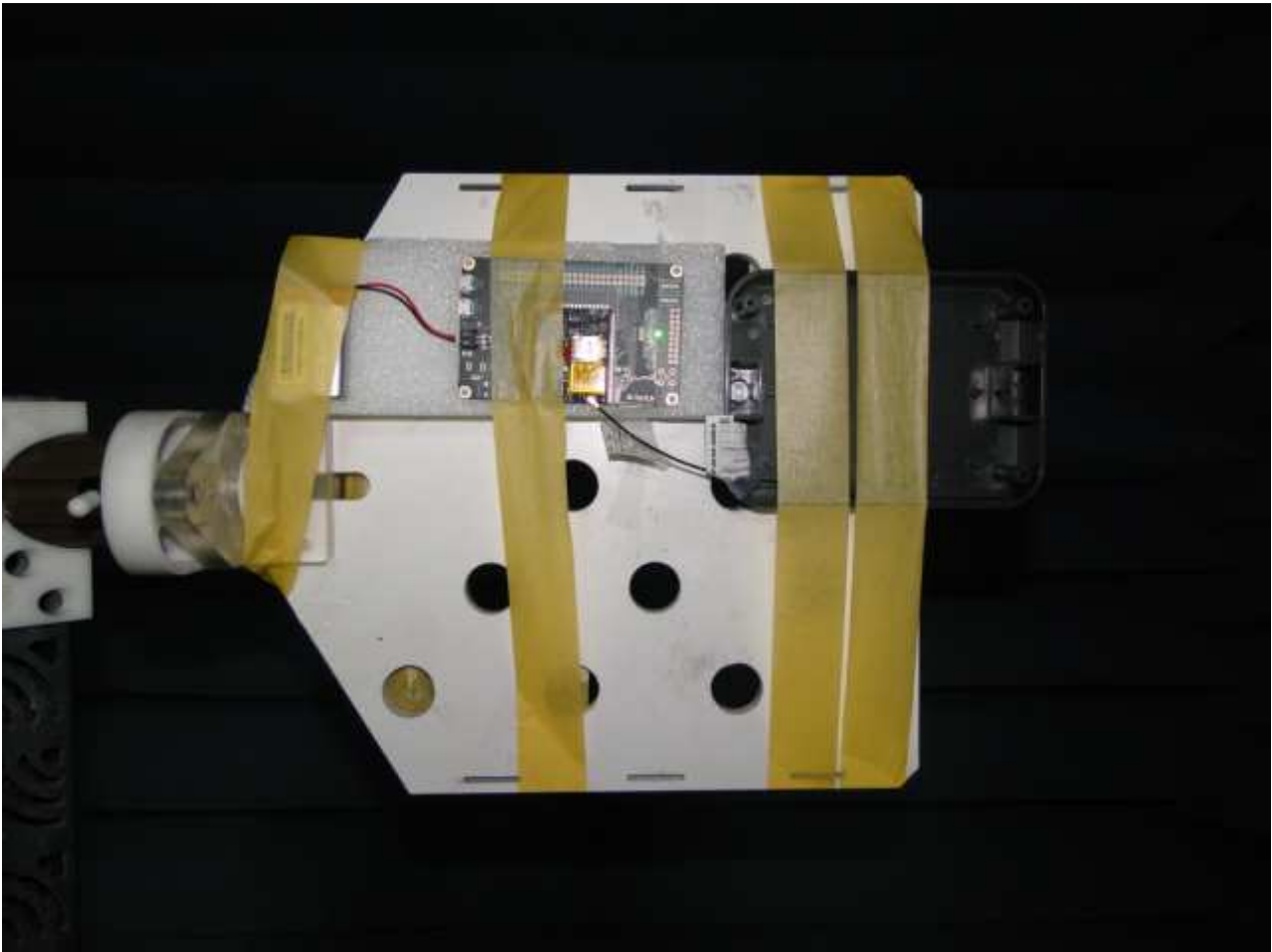


Module only - front



Module only - rear

APPENDIX B. EUT SETUP Photographs



Free Space