



RF Exposure Report

Report No.: SA160315E11

FCC ID: UXX-S3A616A

Test Model: S3A616A

Series Model: S3A617A, S3A621A, S3A622A

Received Date: Mar. 16, 2016

Test Date: Mar. 28, 2016

Issued Date: Apr. 14, 2016

Applicant: Cradlepoint, Inc

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A D T

Release Control Record

Issue No.	Description	Date Issued
SA160315E11	Original release.	Apr. 14, 2016



A D T

1 Certificate of Conformity

Product: Integrated Broadband Router

Brand: cradlepoint

Test Model: S3A616A

Series Model: S3A617A, S3A621A, S3A622A

Sample Status: ENGINEERING SAMPLE

Applicant: Cradlepoint, Inc

Test Date: Mar. 28, 2016

Standards: FCC Part 2 (Section 2.1091)

447498 D01 General RF Exposure Guidance v06

ANSI/ IEEE C95.1-1992

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

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Wendy Wu / Specialist

Approved by : May Chen , **Date:** Apr. 14, 2016
May Chen / Manager

2 RF Exposure

2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
Limits For General Population / Uncontrolled Exposure				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

2.2 MPE Calculation Formula

$$Pd = (P_{out} * G) / (4 * \pi * r^2)$$

where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 21cm away from the body of the user. So, this device is classified as **Mobile Device**.

This product could be applied with **3G/LTE Dock** device, and the safe distance is 23cm for collocated radio.

2.4 Antenna Gain

The antennas provided to the EUT, please refer to the following table:

WLAN							
Ant. Set	Transmitter Circuit	Ant. Gain (dBi)	Cable Loss (dB)	Frequency range (MHz to MHz)	Ant. Type	Connector Type	Cable Length (mm)
1	Chain (0)	5	-	2400~2500	Dipole	R-SMA	-
2	Chain (1)	5	1	2400~2500	Dipole	R-SMA	100
LTE							
Ant. Set	Transmitter Circuit	Ant. Gain (dBi)	Frequency range (MHz to MHz)		Ant. Type	Connector Type	
1	Chain (0)	3.47	690~2300		Dipole	SMA	
		1	2300~2320				
		3.47	2320~2700				
	Chain (1)	3.47	690~2300				
		1	2300~2320				
		3.47	2320~2700				

Note: For WLAN: 1TX configuration mode will fix transmission on Chain (0).

Note: For WLAN: 1TX configuration mode will fix transmission on Chain (0).

For 3G/LTE Dock device

Ant. Set	Transmitter Circuit	Ant. Gain (dBi)	Frequency range (MHz to MHz)	Ant. Type	Connector Type
1	Chain (0)	3	690~2300	Dipole	SMA
		1	2300~2320		
		3	2320~2700		
	Chain (1)	3	690~2300		
		1	2300~2320		
		3	2320~2700		

Note: For WLAN: 1TX configuration mode will fix transmission on Chain (0).

3 Calculation Result of Maximum Conducted Power

For WLAN:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	617.674	8.01	21	0.70487	1

Note: Directional gain = 5dBi + 10log(2) = 8.01dBi

For WLAN /3G/LTE coexistence mode:

Condition	Coexistence		
1	WLAN(2.4GHz)	3G/LTE module	-
2	WLAN(2.4GHz)	3G/LTE module	3G/LTE Dock

Condition 1

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	617.674	8.01	21	0.70487	1
826.4-846.6	295.12	3.47	21	0.11840	0.55093*

Condition 2

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	617.674	8.01	23	0.58761	1
826.4-846.6	295.12	3.47	23	0.09870	0.55093*
699-716	250	3.33	23	0.08096	0.466*

Note: *Limit of Power Density = F/1500

Conclusion:

Both of the WLAN/3G/LTE can transmit simultaneously, the formula of calculated the MPE is:

$$CPD_1 / LPD_1 + CPD_2 / LPD_2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Condition 1:

Therefore, the worst-case situation is $0.70487 / 1 + 0.11840 / 0.55093 = 0.91978$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

Condition 2:

Therefore, the worst-case situation is $0.58761 / 1 + 0.009870 / 0.55093 + 0.08096 / 0.466 = 0.94050$, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

--- END ---

Appendix

3G/LTE module

MPE Evaluation for FCC ID: N7NHL7588 Radio Module(For distance 21cm):

Mode	Frequency Range (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)		Ratio	Distance to Human Body (cm)
				Vaule	Limit		
WCDMA 850	826.4	24.7	3.47	0.11840	0.55093	0.2149093	21
	836.4	24.73	3.47	0.11922	0.5576	0.2138092	21
	846.6	24.74	3.47	0.1195	0.5644	0.2117293	21
LTE Band 5	824.7	23.71	3.47	0.09427	0.5498	0.1714623	21
	836.5	23.55	3.47	0.09086	0.55766	0.1629308	21
	848.3	23.62	3.47	0.09233	0.56553	0.1632628	21
LTE Band 13	779.5	23.42	3.47	0.08818	0.51966	0.1696879	21
	782	23.57	3.47	0.09127	0.52133	0.1750715	21
	784.5	23.3	3.47	0.08577	0.523	0.1639962	21
LTE Band 17	706.5	23.51	3.47	0.09002	0.471	0.1911253	21
	710	23.38	3.47	0.08737	0.47333	0.1845858	21
	713.5	23.47	3.47	0.0892	0.47566	0.1875289	21
WCDMA 1900	1852.4	25.45	3.47	0.14072	1	0.14072	21
	1880	25.41	3.47	0.13943	1	0.13943	21
	1907.6	25.5	3.47	0.14235	1	0.14235	21
LTE Band 2	1850.7	23.79	3.47	0.09602	1	0.09602	21
	1880	23.88	3.47	0.09803	1	0.09803	21
	1909.3	23.95	3.47	0.09962	1	0.09962	21
LTE Band 4	1710.7	24.13	3.47	0.10384	1	0.10384	21
	1732.5	24.1	3.47	0.10312	1	0.10312	21
	1754.3	24.22	3.47	0.10601	1	0.10601	21

3G/LTE module

MPE Evaluation for FCC ID: N7NHL7588 Radio Module(For distance 23cm):

Mode	Frequency Range (MHz)	Maximum Conducted Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm ²)		Ratio	Distance to Human Body (cm)
				Vaule	Limit		
WCDMA 850	826.4	24.7	3.47	0.09870	0.55093	0.1791516	23
	836.4	24.73	3.47	0.09939	0.5576	0.1782461	23
	846.6	24.74	3.47	0.09962	0.5644	0.176506	23
LTE Band 5	824.7	23.71	3.47	0.07858	0.5498	0.1429247	23
	836.5	23.55	3.47	0.07574	0.55766	0.1358175	23
	848.3	23.62	3.47	0.07697	0.56553	0.1361024	23
LTE Band 13	779.5	23.42	3.47	0.07351	0.51966	0.1414579	23
	782	23.57	3.47	0.07609	0.52133	0.1459536	23
	784.5	23.3	3.47	0.0715	0.523	0.1367113	23
LTE Band 17	706.5	23.51	3.47	0.07505	0.471	0.1593418	23
	710	23.38	3.47	0.07283	0.47333	0.1538673	23
	713.5	23.47	3.47	0.07436	0.47566	0.1563302	23
WCDMA 1900	1852.4	25.45	3.47	0.11731	1	0.11731	23
	1880	25.41	3.47	0.11623	1	0.11623	23
	1907.6	25.5	3.47	0.11867	1	0.11867	23
LTE Band 2	1850.7	23.79	3.47	0.08004	1	0.08004	23
	1880	23.88	3.47	0.08172	1	0.08172	23
	1909.3	23.95	3.47	0.08305	1	0.08305	23
LTE Band 4	1710.7	24.13	3.47	0.08656	1	0.08656	23
	1732.5	24.1	3.47	0.08597	1	0.08597	23
	1754.3	24.22	3.47	0.08838	1	0.08838	23

3G/LTE Dock
MPE Evaluation for FCC ID: N7NMC7455 Radio Module:

Mode	Transmitter Range (MHz)		Maximum Conducted Power (dBm)		Antenna Gain (dBi)	Power Density (mW/cm ²)		Ratio	Distance to Human Body (cm)
	Start	Stop	(dBm)	(W)		Vaule	Limit		
WCDMA Band II LTE Band 2	1850	1910	24	0.25	3	0.07504	1	0.07504	23
WCDMA Band IV LTE Band 4	1710	1755	24	0.25	3	0.07504	1	0.07504	23
WCDMA Band V LTE Band 5	824	849	24	0.25	3	0.07504	0.54933	0.136603	23
LTE Band 7	2500	2570	23	0.2	3	0.06003	1	0.06003	23
LTE Band 12	699	716	24	0.25	3	0.07504	0.466	0.16103	23
LTE Band 13	777	787	24	0.25	3	0.07504	0.518	0.144865	23
LTE Band 25	1850	1915	24	0.25	3	0.07504	1	0.07504	23
LTE Band 26	814	849	24	0.25	3	0.07504	0.54266	0.138282	23
LTE Band 30	2305	2315	23	0.2	1	0.03788	1	0.03788	23
LTE Band 41	2496	2690	23	0.2	3	0.06003	1	0.06003	23