

RF Exposure Report

Report No.: SA160923E02

FCC ID: U8G-P1811AC

Test Model: MAX HD2 LTE

Series Model: MAX HD2 LTEA

Received Date: Sep. 23, 2016

Test Date: Oct. 28 to Nov. 01, 2016

Issued Date: Nov. 14, 2016

Applicant: Pismo Labs Technology Limited

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
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Release Control Record

Issue No.	Description	Date Issued
SA160923E02	Original release.	Nov. 14, 2016

1 Certificate of Conformity

Product: Pepwave / Peplink / Pismo Labs Wireless Product

Brand: Pepwave

Test Model: MAX HD2 LTE

Series Model: MAX HD2 LTEA

Sample Status: ENGINEERING SAMPLE

Applicant: Pismo Labs Technology Limited

Test Date: Oct. 28 to Nov. 01, 2016

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

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.

Prepared by :



Date:

Nov. 14, 2016

Wendy Wu / Specialist

Approved by :



Date:

Nov. 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

$$Pd = (Pout * G) / (4 * \pi * r^2)$$

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 27cm away from the body of the user.

So, this device is classified as **Mobile Device**.

This product could be applied with 3G USB cellular device, and the safe distance is 50cm for collocated radio.

2.4 Antenna Gain

For WLAN							
Antenna No.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
WAN(2.4G)-1	SmartAnt	SAA06-220690	3	2400 ~ 2500 MHz	Dipole	R-SMA	150
WAN(2.4G)-2	SmartAnt	SAA06-220690	3	2400 ~ 2500 MHz	Dipole	R-SMA	150
AP(5G)-1	SmartAnt	SAA06-220690	5.5	5150 ~ 5350 MHz	Dipole	R-SMA	260
			6	5350 ~ 5875 MHz			260
AP(5G)-2	SmartAnt	SAA06-220690	5.5	5150 ~ 5350 MHz	Dipole	R-SMA	260
			6	5350 ~ 5875 MHz			260
For GPS							
Antenna No.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	
1	MASTER WAVE TECHNOLOGY CO., LTD.	98335KSAF000	4.5 ±0.5	1575.42 MHz	Magnetic	SMA	
For WWAN(LTE)							
Antenna No.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	
Cellular 1 Main	MASTER WAVE TECHNOLOGY CO., LTD.	98619ZSAX025	1.99	699~960 MHz	Dipole	SMA	
Cellular 1 Diversity/Aux			4	1575~2170 MHz			
Cellular 2 Main			1	2300~2320 MHz			
Cellular 1 Diversity/Aux			2.8	2325~2690 MHz			

2.5 Calculation Result

For WLAN:

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	988.867	6.01	27	0.43072	1
5180-5240	197.885	8.51	27	0.15328	1
5745-5825	264.424	9.01	27	0.22981	1

NOTE:

2.4GHz: Directional gain = 3dBi + 10log(2) = 6.01dBi

5GHz: UNII-1: Directional gain = 5.5dBi + 10log(2) = 8.51dBi

UNII-3: Directional gain = 6dBi + 10log(2) = 9.01dBi

For WLAN / WWAN(LTE) / 3G device coexistence mode:

Condition	Coexistence				
1	WLAN (2.4GHz)	WLAN (5GHz)	WWAN(LTE) module (FCC ID: N7NMC7355)	WWAN(LTE) module (FCC ID: N7NMC7355)	-
2	WLAN (2.4GHz)	WLAN (5GHz)	WWAN(LTE) module (FCC ID: N7NMC7355)	WWAN(LTE) module (FCC ID: N7NMC7355)	3G/LTE (USB cellular device)
3	WLAN (2.4GHz)	WLAN (5GHz)	WWAN(LTE) module (FCC ID: N7NMC7455)	WWAN(LTE) module (FCC ID: N7NMC7455)	-
4	WLAN (2.4GHz)	WLAN (5GHz)	WWAN(LTE) module (FCC ID: N7NMC7455)	WWAN(LTE) module (FCC ID: N7NMC7455)	3G/LTE (USB cellular device)

Note: From the above conditions, the worst case was found in condition 1 and 2. Therefore only the test data of the condition were recorded in this report.

Condition 1

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	988.867	6.01	27	0.43072	1
5745-5825	264.424	9.01	27	0.22981	1
824-849	500	1.99	27	0.08630	0.5493
824-849	500	1.99	27	0.08630	0.5495

Condition 2

Frequency Band (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
2412-2462	988.867	6.01	50	0.12560	1
5745-5825	264.424	9.01	50	0.06701	1
824-849	500	1.99	50	0.02517	0.5493
824-849	500	1.99	50	0.02517	0.5495
824-849	11480*	-	50	0.36542	0.5495

* This product can operate with plug-in USB cellular device which has maximum of 7W(ERP) output power.

ERP is then converted to EIRP as follows:

Formula : $EIRP(W) = 1.64 \times ERP(W)$

$EIRP = 1.64 \times 7 W = 11.48 W = 11480mW$

Conclusion:

All of the WLAN / WWAN(LTE) / 3G device can transmit simultaneously, the formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Condition 1:

Therefore, the worst-case situation is $0.43072 / 1 + 0.22981 / 1 + 0.08630 / 0.5493 + 0.08630 / 0.5495 = 0.97469$,

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 $0.12560 / 1 + 0.06701 / 1 + 0.02517 / 0.5493 + 0.02517 / 0.5495 + 0.36542 / 0.5495 = 0.94929$,

which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.

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Appendix

3G/LTE module

MPE Evaluation for FCC ID: N7NMC7355 Radio Module:

Mode	Equipment Category	Max Transmitter Duty Cycle	Transmitter Range (MHz)		Maximum		Antenna Gain (dBi)	Power Density (mW/cm ²)		Ratio
			Start	Stop	(dBm)	(W)		Vaule	Limit	
GPRS	Class 10	25%	824	849	33	2	1.99	0.0863	0.54933	0.15710
		25%	1850	1910	30	1	4	0.06855	1	0.06855
EDGE	Class 10	25%	824	849	28	0.63	1.99	0.02719	0.54933	0.04950
		25%	1850	1910	27	0.5	4	0.03427	1	0.03427
	Class 11	37.50%	824	849	26.2	0.42	1.99	0.02719	0.54933	0.04950
		37.50%	1850	1910	25.2	0.33	4	0.03393	1	0.03393
	Class 12	50%	824	849	25	0.32	1.99	0.02762	0.54933	0.05028
		50%	1850	1910	24	0.25	4	0.03427	1	0.03427
CDMA	EvDo	100%	824	849	25	0.32	1.99	0.05523	0.54933	0.10054
		100%	1850	1910	25	0.32	4	0.08774	1	0.08774
		100%	817	824	25	0.32	1.99	0.05523	0.54466	0.10140
UMTS	HSDPA HSUPA	100%	824	849	24	0.25	1.99	0.04315	0.54933	0.07855
		100%	1710	1755	24	0.25	4	0.06855	1	0.06855
		100%	1850	1910	24	0.25	4	0.06855	1	0.06855
LTE	Band 17	100%	704	716	24	0.25	1.99	0.04315	0.46933	0.09194
	Band 13	100%	777	787	24	0.25	1.99	0.04315	0.518	0.08330
	Band 5	100%	824	849	24	0.25	1.99	0.04315	0.54933	0.07855
	Band 4	100%	1710	1755	24	0.25	4	0.06855	1	0.06855
	Band 2	100%	1850	1910	24	0.25	4	0.06855	1	0.06855
	Band 25	100%	1850	1915	24	0.25	4	0.06855	1	0.06855

Note: 1. Distance to Human Body: 27cm

2. The ratios which was indicated in bold type of the max ratio.

3G/LTE module

MPE Evaluation for FCC ID: N7NMC7455 Radio Module:

Operating Mode	TX Freq Range (MHz)		Max Time-Avg Cond Power		Antenna Gain (dBi)	Power Density (mW/cm ²)		Ratio
	Start	Stop	(dBm)	(W)		Vaule	Limit	
WCDMA Band II LTE Band 2	1850	1910	24	0.25	4	0.0686	1	0.06855
WCDMA Band IV LTE Band 4	1710	1755	24	0.25	4	0.0686	1	0.06855
WCDMA Band V LTE Band 5	824	849	24	0.25	1.99	0.0432	0.54933	0.07855
LTE Band 7	2500	2570	23	0.2	2.8	0.0416	1	0.04160
LTE Band 12	699	716	24	0.25	1.99	0.0432	0.466	0.09260
LTE Band 13	777	787	24	0.25	1.99	0.0432	0.518	0.08330
LTE Band 25	1850	1915	24	0.25	4	0.0686	1	0.06855
LTE Band 26	814	849	24	0.25	1.99	0.0432	0.54266	0.07952
LTE Band 30	2305	2315	23	0.2	1	0.0275	1	0.02748
LTE Band 41	2496	2690	23	0.2	2.8	0.0416	1	0.04160

Note: 1. Distance to Human Body: 27cm

2. The ratios which was indicated in bold type of the max ratio.