



RF Exposure evaluation

Report Reference No..... : CTA-01-160700204

FCC ID..... : H79Q3PLUS

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Date of issue.....: July. 20, 2016

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Applicant's name: Delta Electronics Incorporated

Address.....: 3, Tungyuan Road Chungli Industrial Zone Taoyuan County 32063, Taiwan

Test specification :

447CFR §1.1310

Standard: **47CFR §2.1091**

KDB447498 D01 V06

TRF Originator.....: Shenzhen CTA Testing Technology Co., Ltd.

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Test item description: HD Pocket Projector

Trade Mark: VIVITEK

Manufacturer: **Delta Electronics Incorporated**

Model/Type reference.....: Q3PLUS

Listed Models: Q3PLUS-WH, Q3PLUS-BK, Q3PLUS-RD, Q3PLUS-GD, Q3-BK, Q3-WH, Q3HP2704A, Q3HP2702A, Q3HP2706A, Q3HP2708

Operation Frequency.....: From 2402MHz to 2480MHz / From 2412-2462 MHz

Exposure category.....: General population/uncontrolled environment

EUT Type: Production Unit

Device Type.....: Mobile Device

Rating: DC 7.40V / DC 12V adapter from AC 120V/60Hz

Result.....: **PASS**

TEST REPORT

Test Report No. :	CTA-01-160700204	July. 20, 2016
		Date of issue

Equipment under Test : HD Pocket Projector

Model /Type : Q3PLUS

Listed Models : Q3PLUS-WH, Q3PLUS-BK, Q3PLUS-RD, Q3PLUS-GD,
Q3-BK, Q3-WH, Q3HP2704A, Q3HP2702A, Q3HP2706A,
Q3HP2708

Applicant : **Delta Electronics Incorporated**

Address : 3, Tungyuan Road Chungli Industrial Zone Taoyuan
County 32063, Taiwan

Manufacturer : **Delta Electronics Incorporated**

Address : 3, Tungyuan Road Chungli Industrial Zone Taoyuan
County 32063, Taiwan

Test Result:	PASS
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The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
V1.0	2016-07-20	Initial Issue	Eric Wang

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1. SUMMARY

1.1. EUT configuration

The following peripheral devices and interface cables were connected during the measurement:

● - supplied by the manufacturer

○ - supplied by the lab

☐	Power Cable	Length (m) :	/
☐		Shield :	/
☐		Detachable :	/

2. TEST ENVIRONMENT

2.1. Address of the test laboratory

Dongguan Yaxu (AiT) Technology Limited

Floor 1-A, Baisha Technology Park, No. 3011, Shahexi Road, Nanshan, Shenzhen 518055 China

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 22/EN 55022 requirements.

2.2. Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

CNAS- Registration No: L6177

Dongguan Yaxu (AiT) technology Limited is accredited to ISO/IEC 17025:2005 general Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the competence of testing and calibration laboratories) on Apr. 18, 2013

FCC- Registration No: 248337

The 3m Semi-Anechoic Chamber, 3m/10m Open Area Test Site and Shielding Room of Dongguan Yaxu (AiT) Technology Limited have been registered by Federal Communications Commission (FCC) on Aug.29, 2014.

Industry Canada(IC)-Registration No: IC6819A

The 3m Semi-Anechoic Chamber and 3m/10m Open Area Test Site of Dongguan Yaxu (AiT) Technology Limited have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing on Oct. 01, 2014.

VCCI- Registration No: 2705

The 3m/10m Open Area Test Site, Shielding Room and 3m Chamber of Dngguan Yaxu (AiT) technology Limited have been registered by Voluntary Control Council for Interference on Nov. 21, 2012. The Telecommunication Ports Conducted Disturbance Measurement of Asia Institute Technology (Dongguan) Limited have been registered by Voluntary Control Council for Interference on May. 13, 2013.

2.3. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	950-1050mbar

2.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Dongguan Yaxu (AiT) Technology Limited quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Dongguan Yaxu (AiT) Technology Limited is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	0.57 dB	(1)

- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

3. Method of measurement

3.1. Applicable Standard

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB447498 D01 v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

3.2. Requirement

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3.3. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

3.4. Conducted Power Results

2.4GWLAN

Mode	Channel	Frequency (MHz)	Worst case Data rate	Conducted Peak Output Power (dBm)
802.11b	1	2412	1Mbps	18.32
	6	2437	1Mbps	18.55
	11	2462	1Mbps	18.68
802.11g	1	2412	6Mbps	20.05
	6	2437	6Mbps	20.18
	11	2462	6Mbps	20.10
802.11n HT20	1	2412	6.5 Mbps	19.71
	6	2437	6.5 Mbps	20.02
	11	2462	6.5 Mbps	20.19

BT4.0

Mode	Channel	Frequency (MHz)	Data rate	Conducted Peak Output Power (dBm)
GFSK-LE	00	2402	1 Mbps	6.795
	19	2440	1 Mbps	4.244
	39	2480	1 Mbps	3.311

BT3.0

Mode	Channel	Frequency (MHz)	Data rate	Conducted Peak Output Power (dBm)
GFSK	00	2402	1 Mbps	9.821
	39	2440	1 Mbps	7.904
	78	2480	1 Mbps	6.891
$\pi/4$ DQPSK	00	2402	2 Mbps	8.372
	39	2440	2 Mbps	5.016
	78	2480	2 Mbps	3.820
8DPSK	00	2402	3 Mbps	8.381
	39	2440	3 Mbps	5.060
	78	2480	3 Mbps	3.835

Manufacturing tolerance

2.4GWLAN

IEEE 802.11b (Peak)			
Frequency	2412	2437	2462
Target (dBm)	18.0	18.0	18.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11g (Peak)			
Frequency	2412	2437	2462
Target (dBm)	20.0	20.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0
IEEE 802.11n HT20 (Peak)			
Frequency	2412	2437	2462
Target (dBm)	20.0	20.0	20.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

BT

GFSK-BLE (Average)			
Frequency	2402	2440	2480
Target (dBm)	6.0	4.0	3.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0

Bluetooth 3.0			
GFSK (Peak)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	9.0	8.0	7.0
Tolerance ±(dB)	1	1	1
π/4DQPSK (Average)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	8.0	5.0	4.0
Tolerance ±(dB)	1	1	1
8DPSK (Average)			
Channel	Channel 00	Channel 39	Channel 78
Target (dBm)	8.0	5.0	4.0
Tolerance ±(dB)	1	1	1

3.5. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

As declared by the Applicant, the EUT transmits with the maximum source-based Duty Cycle of 100%-see the User manual, and the EUT is a wireless device used in a mobile application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum mobile separation distance, $r = 20\text{cm}$, as well as the gain of the used antenna is 2.541dBi for WLAN and BT, and the power drift from Turn-up Procedure provide by manufacturer as following states, the RF power density can be obtained..

4. Test Result

2.1 Standalone MPE

Test Mode	Minimum Separation Distance (cm)	Maximum Output Power		Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit (mW/cm ²)	Test Results
		dBm	mW				
IEEE 802.11b	20.00	19.0	79.4328	1.7951	0.0284	1.0000	PASS
IEEE 802.11g	20.00	21.0	125.8925	1.7951	0.0450	1.0000	PASS
IEEE 802.11n HT20	20.00	21.0	125.8925	1.7951	0.0450	1.0000	PASS
BT*	20.00	10.0	10.0000	1.7951	0.0036	1.0000	PASS

Remark:

1. BT* - including Lower Energy Bluetooth and Classics Bluetooth
2. Maximum output power including tune-up tolerance
3. The minimum distance is 20cm from manufacturer declaration of user manual.

2.2 Simultaneous transmission MPE Considerations

According to KDB447498 :For mobile exposure host platform to qualify for simultaneous transmission MPE test exclusion, all transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

This means that:

$$\sum \text{ of MPE ratios } \leq 1.0$$

The WLAN and BT modular share same antenna, without any simultaneous transmission, so not need consider simultaneous transmission.

5. Conclusion

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

.....**End of Report**.....