REPORT No.：XM19030031W02

RF EXPOSURE EVALUATION REPORT

APPLICANT	:	DELTA NETWORKS (XIAMEN) LTD.
PRODUCT NAME	:	Industrial Wi-Fi/LTE CATM module
MODEL NAME	:	VCB-5003L6-W
BRAND NAME	:	N/A
FCC ID	:	2AMVP-VCB5003L6W
STANDARD(S)		47 CFR§2.1091, KDB 447498 D01v06
TEST DATE	:	2019-05-06
ISSUE DATE	:	2019-05-07

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Lion Xiao (Project Engineer)

Approved by:

Anne Liu (Supervisor)

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Kehu-Morlab Test Laboratory

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Change History		
Version	**Date**	**Reason for change**
1.0	2019-05-07	First edition

1. Technical Information

Note: Provide by manufacturer.

1.1. Applicant and Manufacturer Information

Applicant:	DELTA NETWORKS (XIAMEN) LTD.
Applicant Address:	Room 416, 4F, Buliding No.39, Wanghai Road, Xiamen, Software Park,361008 Xiamen,Fujian,China
Manufacturer:	DELTA NETWORKS (XIAMEN) LTD.
Manufacturer Address:	Room 416, 4F, Buliding No.39, Wanghai Road, Xiamen, Software Park,361008 Xiamen,Fujian,China

1.2. Equipment Under Test (EUT) Description

Product Name:	Industrial Wi-Fi/LTE CATM module
Hardware Version:	V1.0
Software Version:	V1.0
Frequency Bands:	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8MHz LTE Band 2: 1850.7 MHz ~1909.3 MHz LTE Band 4: 1710.7 MHz ~1754.3 MHz LTE Band 5: 824.7 MHz ~848.3 MHz LTE Band 12: 699.7 MHz ~715.3 MHz LTE Band 13: 779.5 MHz ~784.5 MHz LTE Band 26: 814.7 MHz ~848.3 MHz 802.11b/g/n-20MHz: 2.412GHz ~2.462GHz 802.11n-40MHz: 2.422GHz ~2.452GHz
Modulation Mode:	GSM / GPRS: GMSK EDGE: 8PSK LTE: QPSK / 16QAM (Uplink) 802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g/n20/n40: OFDM (BPSK / QPSK / 16QAM / 64QAM)
Antenna type:	External Antenna

1.3. Applied Reference Documents

Leading reference documents for testing:

No.	Identity	Document Title
1	**47 CFR§2.1091**	Radiofrequency Radiation Exposure Evaluation: mobile devices
2	**KDB 447498 D01v06**	General RF Exposure Guidance

2. Device category and RF exposure limit

Per user manual, Based on 47CFR 2.1091, this device belongs to mobile device category with General Population/Uncontrolled exposure.

Mobile Devices:

47CFR 2.1091(b)

For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. In this context, the term “fixed location” means that the device is physically secured at one location and is not able to be easily moved to another location. Transmitting devices designed to be used by consumers or workers that can be easily re-located, such as wireless devices associated with a personal computer, are considered to be mobile devices if they meet the 20 centimeter separation requirement.

GENERAL POPULATION / UNCONTROLLED EXPOSURE

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

TABLE 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)	Averaging time (minutes)
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	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. RF Exposure Evaluation

Standalone transmission MPE evaluation

Band	Time-Average Maximum Turn-up Procedure (dBm)	Division Factors (dB)	Frame-Average Power (dBm)
GSM 850	33	-9.03	23.97
GSM 1900	30	-9.03	20.97

Mode	Frequency	Maximum conducted Power	Antenna Gain	Numeric gain
	(MHz)	(dBm)	(dBi)	(dB)
WLAN	2412-2462	17.50	2	1.585
LTE Band 2	1850.7-1909.3	24	4	2.512
LTE Band 4	1710.7-1754.3	23	4	2.512
LTE Band 5	824.7-848.3	24	4	2.512
LTE Band 12	699.7-715.3	24	4	2.512
LTE Band 13	779.5-784.5	24	4	2.512
LTE Band 26	814.7-748.3	24	4	2.512
GSM 850	824.2-848.8	23.97	4	2.512
GSM 1900	1850.2-1909.8	20.97	4	2.512
Note: The mu,eric gian(G) of the antenna with a gain specified in dB is determined by Numeric gian(G) = 10^(antenna gain / 10)				

Mode	PG	Power density(S)	Limit for MPE	The MPE ratio
	(mW)	(mW/cm²)	(mW/cm²)	--
WLAN	89.125	0.018	1.00	**0.018**
LTE Band 2	630.957	0.126	1.00	0.126
LTE Band 4	501.187	0.100	1.00	0.100
LTE Band 5	630.957	0.126	0.55	0.222
LTE Band 12	630.957	0.126	0.47	**0.263**
LTE Band 13	630.957	0.126	0.52	0.240
LTE Band 26	630.957	0.126	0.54	0.222
GSM 850	626.484	0.125	0.55	0.220
GSM 1900	313.986	0.062	1.00	0.062
Note: The MPE ratio = Max Power density / Limit for MPE				

Note:

1. The EUT used the WWAN Module provided by Quectel Wireless Solutions Company Limited, the Model is BG96, and the Module's **FCC ID:XMR201707BG96**
2. For Wi-Fi 2.4G Band, The Maximum transmit power is according to report XM19030031W01.
3. For transmitter, minimum separation distance is 20cm, even if calculations indicate MPE distance is less.

According to KDB447498 D01 General RF Exposure Guidance v06, simultaneous transmission is evaluated:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0.

Calculation method:

$$S= P \cdot G /4\pi R^2 = EIRP/4\pi R^2$$

Where:

S = power density (in appropriate units, e.g., mW/cm²)

P = power input to the antenna (in appropriate units, e.g., mW)

G = antenna gain

R = Separation distance (20cm)

For simultaneously transmit system, the calculated power density should comply with:

$$\text{The sum of MPE ratios} = \sum_{i} \frac{S_i}{S_{Limit,i}} \leq 1$$

The worst case is as below:

Max MPE ratios of WLAN + Max MPE ratios of WWAN (LTE Band 12)

=0.018 + 0.263=0.281<1.

Annex A General Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Kehu-Morlab Test Laboratory
Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian), P. R. China
Responsible Test Lab Manager:	Mr. Di Dehai
Telephone:	+86-592-5612050
Facsimile:	+86-592-5612095

2. Identification of the Responsible Testing Location

Name:	Kehu-Morlab Test Laboratory
Address:	Unit 101, No.1732 Gangzhong Road, Xiamen Area, Pilot Free Trade Zone (Fujian), P. R. China

3. Accreditation Certificate

Accredited Testing Laboratory:	The FCC designation number is CN1249. (Kehu-Morlab Test Laboratory)

END OF REPORT