

FCC MPE Report

Applicant : LITE-ON TECHNOLOGY CORP.
Product Name : WWAN module
Trade Name : Quectel
Model Number : EG91-NAXD
Applicable Standard : 47 CFR § 2.1091
Received Date : Jun. 17, 2023
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Taiwan Accreditation Foundation accreditation number: 1330

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Approved By :



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Revision History

<i>Rev.</i>	<i>Issued Date</i>	<i>Description</i>	<i>Revised by</i>
00	Oct. 30, 2023	Initial Issue	Abby Hsu

1. General Information

1.1 Reference Applicable Standard

Standard	Description	Version
IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York.	1992
47 CFR § 2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR § 1.1310	Radiofrequency radiation exposure limits.	-

1.2 Testing Location

Test Facilities

Company Name: Eurofins E&E Wireless Taiwan Co., Ltd.
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Test Site Location

- No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan
- No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan

Laboratory Accreditation

Location	TAF	FCC	ISED
No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan	Accreditation No.: 1330	Designation No.: TW0010	Company No.: 7381A CAB ID: TW1330
No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan	Accreditation No.: 1330	Designation No.: TW0034	Company No.: 28922 CAB ID: TW1330

2. Description of Equipment under Test (EUT)

Applicant	LITE-ON TECHNOLOGY CORP. Bldg. C, 90, Chien 1 Road, Chung Ho, New Taipei City 23585, Taiwan, R.O.C.		
Product Name	WWAN module		
Trade Name	Quectel		
Model Number	EG91-NAXD		
FCC ID	PPQ202008EG91NAXD		
Use Distance	20 cm		
Antenna Information	Type	Gain	
	PCB Antenna	WCDMA Band II	2.90 dBi
		WCDMA Band IV	2.31 dBi
		WCDMA Band V	1.51 dBi
		LTE Band 2	2.90 dBi
		LTE Band 4	1.51dBi
		LTE Band 5	2.31 dBi
		LTE Band 12	2.41 dBi
		LTE Band 13	0.89 dBi
		LTE Band 25	3.09 dBi
LTE Band 26		2.31 dBi	
Module Name	Quectel, EG91-NAXD		

Note:

The above information of DUT was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

EUT Modify Description :

Modify Description: 1.Add Antenna 2.Add Host Main model: M2-UM188-ETK3ER(RFID), M2UM188-ETK3EP(POS) Add Host Series model: M2-UK188-ETK3ER(RFID), M2-UK188-ETK3EP(POS). After the evaluation, retest of all test items is not required.

2.1 RF Specification

WCDMA				
Operation Band:	<input checked="" type="checkbox"/> Band II	<input checked="" type="checkbox"/> Band IV	<input checked="" type="checkbox"/> Band V	
Support type:	<input checked="" type="checkbox"/> UMTS Rel. 99 (Voice & Data)		<input checked="" type="checkbox"/> HSDPA	<input checked="" type="checkbox"/> HSUPA
Modulation type:	<input checked="" type="checkbox"/> QPSK			
Power Class:	Class 3			
LTE				
Operation Band (EUTRA) :	<input checked="" type="checkbox"/> Band 2	<input checked="" type="checkbox"/> Band 4	<input checked="" type="checkbox"/> Band 5	<input checked="" type="checkbox"/> Band 12
	<input checked="" type="checkbox"/> Band 13	<input checked="" type="checkbox"/> Band 25	<input checked="" type="checkbox"/> Band 26	<input type="checkbox"/> Band 28
Support type:	<input checked="" type="checkbox"/> Single Carrier	<input type="checkbox"/> CA-UL	<input type="checkbox"/> CA-DL	<input type="checkbox"/> MIMO-UL
	<input checked="" type="checkbox"/> CAT NB1	<input type="checkbox"/> CAT-M		
Modulation type:	<input checked="" type="checkbox"/> QPSK	<input checked="" type="checkbox"/> 16QAM	<input checked="" type="checkbox"/> 64QAM	
Power Class:	<input checked="" type="checkbox"/> Class 3	<input type="checkbox"/> Class 5		

3. RF Exposure Limit

For devices that operate at larger distances from persons, where there are minimal RF coupling interactions between a device and the user or nearby persons, RF exposure compliance using maximum permissible exposure (MPE) limits is applied. The limits for MPE is listed as below:

Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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 / 1,500	30
1,500-100,000	-	-	1.0	30
Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842 / f	4.89 / f	(900 / f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	F / 300	6
1,500-100,000	-	-	5	6

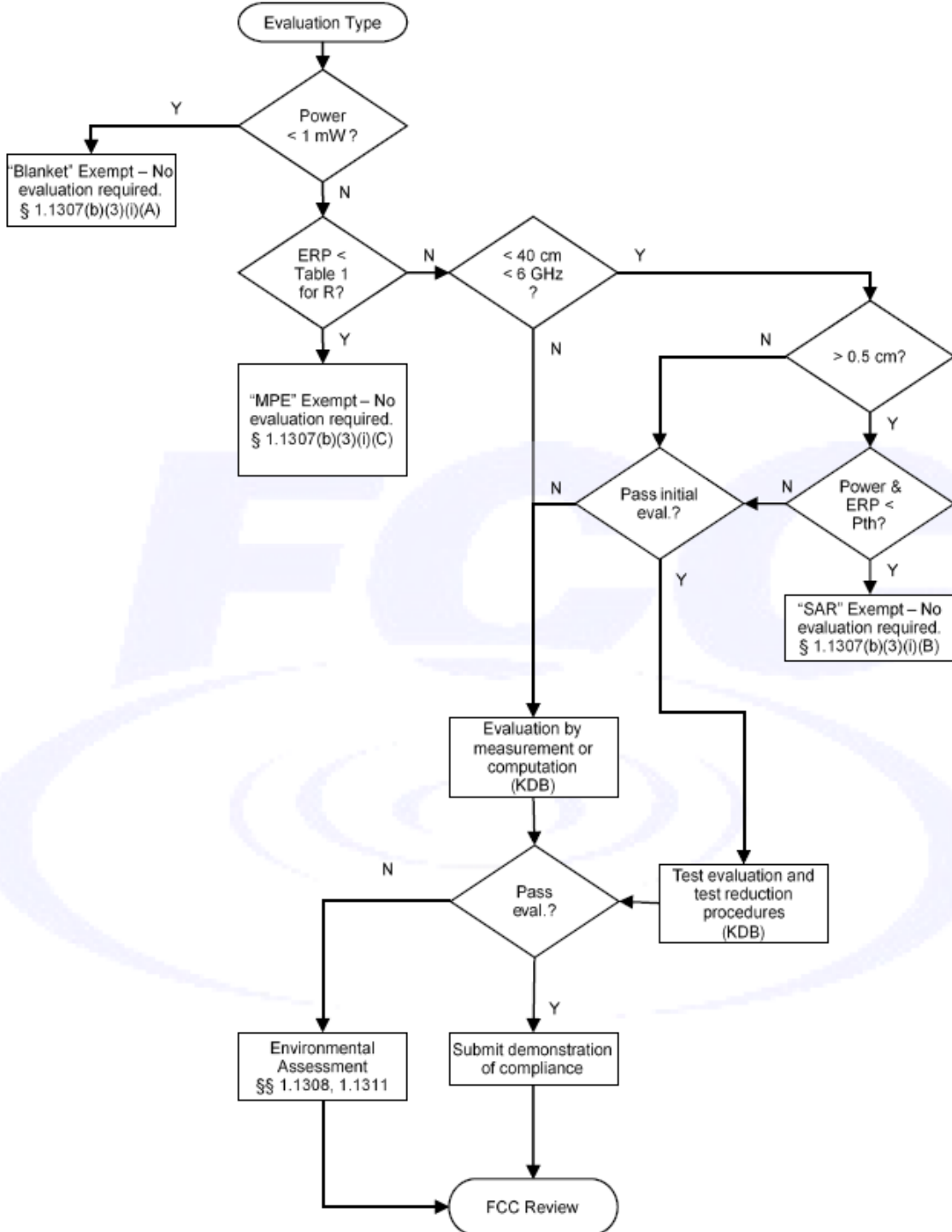
f = frequency in MHz. * = Plane-wave equivalent power density.

4. RF Exposure Assessment

4.1 Exemption Evaluation

Exemption evaluation was performed according to the appendix A and B in KDB447498 D04.

The General Sequence for Determination of Procedure demonstrated in Figure A.1 of KDB447498 D04 was applied.



4.2 Human Exposure Assessment

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device 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 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons."

Exposure evaluation

$$S_{eirp} = \frac{EIRP}{4\pi d^2} = \frac{PG}{4\pi d^2} (W / m^2)$$

Where

S: is the input power (W);

G: is the antenna gain;

d : is the distance between antennas and evaluation point (m).

5. Maximum Transmitting Mode Evaluation

Antenna transmission description
WWAN Band: 1Tx(Diversity)

6. Result

Band	Frequency (MHz)	MAX Conducted Power (dBm) [P]	ANT Gain (dBi)	Numeric Gain [G]	Power with Duty cycle (mW) [P]x[G]	Power Density (mW/cm ²) [S]	Standalone Limit (mW/cm ²)	Evaluated / Exposure Limit
WCDMA Band II	1852.4 - 1907.6	24.00	2.90	1.95	489.82	0.10	1.00	0.10
WCDMA Band IV	1712.4 - 1752.6	24.00	2.31	1.70	427.02	0.08	1.00	0.08
WCDMA Band V	826.4 - 846.6	24.00	1.51	1.42	356.69	0.07	0.55	0.13
LTE Band 2	1850.7 - 1909.3	24.50	2.90	1.95	549.58	0.11	1.00	0.11
LTE Band 4	1710.7 - 1754.3	24.50	1.51	1.42	400.21	0.08	1.00	0.08
LTE Band 5	824.7 - 848.3	24.50	2.31	1.70	479.13	0.10	0.55	0.18
LTE Band 12	699.7 - 715.3	24.50	2.41	1.74	490.40	0.10	0.47	0.21
LTE Band 13	779.5 - 784.5	24.50	0.89	1.23	346.66	0.07	0.52	0.13
LTE Band 25	1850.7 - 1914.3	25.00	3.09	2.04	645.10	0.13	1.00	0.13
LTE Band 26	814.7 - 848.3	25.00	2.31	1.70	537.59	0.11	0.54	0.20

Note:

1. The calculation uses the minimum distance defined by the regulations of 20 cm, which is more conservative than the actual use distance of the product.
2. The maximum power and gain were applied to evaluate MPE.

MAX MPE: 0.13 mW/cm²

Simultaneous Transmitting :

Note.

- 1.WLAN/BT result are referred to report No.USSC236154001.
- 2.RFID result is referred to BV CPS report No. MFBHLU-WTW-P2301187

WWAN+WLAN 2.4 GHz + RFID

WWAN+WLAN 5 GHz + RFID

TER: 0.21+0.03+0.51=0.75

7. Conclusion

The result shows that this device is compliance with the exposure limits in 47 CFR §1.1310.

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