MPE Report
RF Exposure Exemption

Applicant	:	Hitachi Energy USA, Inc.
Product Name	:	Router
Trade Name	:	Hitachi Energy
Model Number	:	TRO610
Applicable Standard	:	47 CFR § 2.1091
Received Date	:	Dec. 01, 2022
Issue Date	:	Apr. 19, 2023

Issued by

Approved By : 

(William Chung)

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Taiwan Accreditation Foundation accreditation number: 1330

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Revision History

Rev.	Issued Date	Revisions	Revised By
00	Apr. 19, 2023	Initial Issue	Rowan Hsieh

Contents

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.	2023
47 CFR § 1.1310	Radiofrequency radiation exposure limits.	2023
KDB 447498 D04	RF exposure procedures and equipment authorization policies for mobile and portable devices	v01

1.2 Testing Location

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

Site Address: ■ No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.)

Site Address: □ No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan (R.O.C.)

2. Description of Equipment under Test (EUT)

Applicant	Hitachi Energy USA, Inc. 3055 Orchard Drive San Jose, CA 95134 USA
Manufacturer	Hitachi Energy USA, Inc. 3055 Orchard Drive San Jose, CA 95134 USA
Product Name	Router
Trade Name	Hitachi Energy
Model Number	TRO610
FCC ID	LTE: RI7LE910CXWWX Bluetooth: P9J-TRO600B1
IMEI No.	353338970004534
Frequency Range	GSM 850: 824.2 - 848.8 MHz GSM 1900: 1850.2 - 1909.8 MHz WCDMA Band II 1852.4 - 1907.6 MHz WCDMA Band IV 1712.4 - 1752.6 MHz WCDMA Band V 826.4 - 846.6 MHz LTE Band 2 1850.7 - 1909.3 MHz LTE Band 4 1710.7 - 1754.3 MHz LTE Band 5 824.7 - 848.3 MHz LTE Band 7 2502.5 - 2567.5 MHz LTE Band 12 699.7 - 715.3 MHz LTE Band 13 779.5 - 784.5 MHz LTE Band 14 788 - 798 MHz LTE Band 25 1850.7 - 1914.3 MHz LTE Band 26 814.7 - 848.3 MHz Bluetooth LE 2402 – 2480 MHz
Supported Modulations	GSM: GMSK,PSK
	WCDMA: RMC 12.2Kbps / HSDPA / HSUPA / DC-HSDPA
	LTE: QPSK, 16QAM
	Bluetooth LE: GFSK
USE Distance	20 cm
Module Name	Telit LE910C4-WWXD

Note:

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

Antenna Manufacture	Model No.	Band	Freq.(Range)	ANT Gain (dBi)
INPAQ	DAM-D3-R-N0-000-04-16	GSM850	824.2 - 848.8	3.21
		GSM1900	1850.2 - 1909.8	3.32
		WCDMA Band II	1852.4 - 1907.6	3.32
		WCDMA Band IV	1712.4 - 1752.6	3.19
		WCDMA Band V	826.4 - 846.6	3.21
		LTE Band 2	1850.7 - 1909.3	3.32
		LTE Band 4	1710.7 - 1754.3	3.19
		LTE Band 5	824.7 - 848.3	3.21
		LTE Band 7	2502.5 - 2567.5	3.27
		LTE Band 12	699.7 - 715.3	3.28
		LTE Band 13	779.5 - 784.5	3.78
		LTE Band 14	790.5 – 795.5	3.78
		LTE Band 25	1850.7 - 1914.3	3.32
		LTE Band 26	814.7 - 848.3	3.21
		Bluetooth	2402 - 2480	2.24

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/cm²)	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 / f²)*	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/cm²)	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 / f²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	F / 300	6
1,500-100,000	-	-	5	6

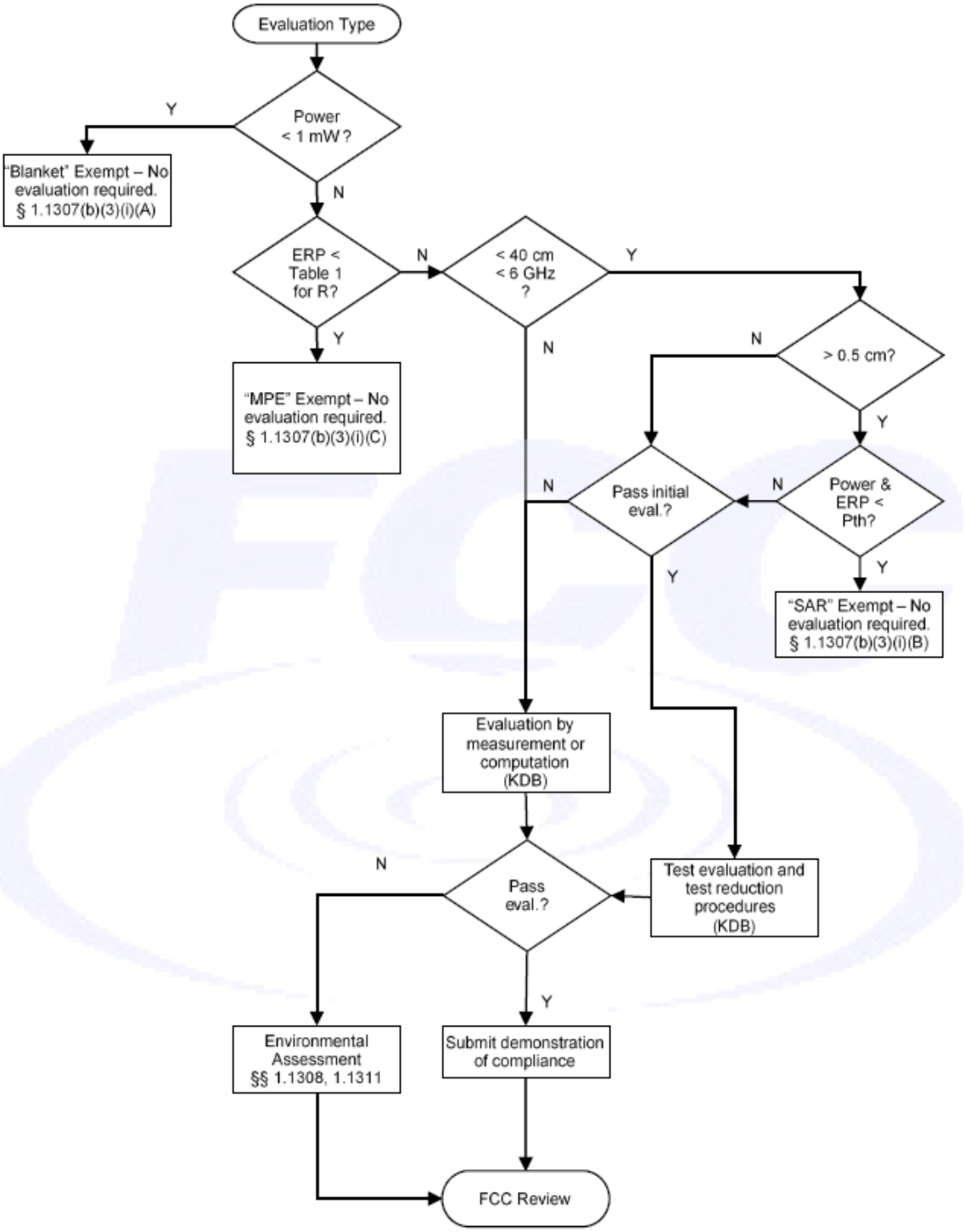
f = frequency in MHz. * = Plane-wave equivalent power density.

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
$$S_{eirp} = \frac{EIRP}{4\pi d^2} = \frac{PG}{4\pi d^2}\left(W/m^2\right)$$ Where S: is the input power (W); G: is the antenna gain; d : is the distance between antennas and evaluation point (m).

5. Maximum Tune-up Power

Band	Frequency (MHz)	Tune-up Power (dBm)
GSM850	824.2 - 848.8	27.50
GSM1900	1850.2 - 1909.8	24.50
WCDMA Band II	1852.4 - 1907.6	24.50
WCDMA Band IV	1712.4 - 1752.6	24.50
WCDMA Band V	826.4 - 846.6	24.50
LTE Band 2	1850.7 - 1909.3	24.00
LTE Band 4	1710.7 - 1754.3	24.00
LTE Band 5	824.7 - 848.3	24.00
LTE Band 7	2502.5 - 2567.5	24.00
LTE Band 12	699.7 - 715.3	24.00
LTE Band 13	779.5 - 784.5	24.00
LTE Band 14	790.5 – 795.5	24.00
LTE Band 25	1850.7 - 1914.3	24.00
LTE Band 26	814.7 - 848.3	24.00
Bluetooth	2402 - 2480	6.58

Note:

1. WWAN Power Refer to Telit LE910C4-WWXD MPE report (FCCID: RI7LE910CXWWX)

2. To average GSM power, transmit time slot is considered:

1TX-slot = 1 transmit time slot out of 8 time slots=> conducted power divided by (8/1) => -9.03dB

2TX-slots = 2 transmit time slots out of 8 time slots=> conducted power divided by (8/2) => -6.02dB

3TX-slots = 3 transmit time slots out of 8 time slots=> conducted power divided by (8/3) => -4.26dB

4TX-slots = 4 transmit time slots out of 8 time slots=> conducted power divided by (8/4) => -3.01dB

6. Result

Band	Frequency (MHz)	Tune-up Power (dBm)	Tune-up Power (mW)	ANT Gain (dBi)	ERP (W)	<§1.1307(b)(3)(i)(C)> Exemption Threshold ERP (W)	<§1.1307(b)(3)(i)(C)> Exemption considerations
GSM850	824.2 - 848.8	27.50	562.34	3.21	0.718	0.435	Not Qualified
GSM1900	1850.2 - 1909.8	24.50	281.84	3.32	0.369	0.768	Qualified
WCDMA Band II	1852.4 - 1907.6	24.50	281.84	3.32	0.369	0.768	Qualified
WCDMA Band IV	1712.4 - 1752.6	24.50	281.84	3.19	0.358	0.768	Qualified
WCDMA Band V	826.4 - 846.6	24.50	281.84	3.21	0.360	0.433	Qualified
LTE Band 2	1850.7 - 1909.3	24.00	251.19	3.32	0.329	0.768	Qualified
LTE Band 4	1710.7 - 1754.3	24.00	251.19	3.19	0.319	0.768	Qualified
LTE Band 5	824.7 - 848.3	24.00	251.19	3.21	0.321	0.434	Qualified
LTE Band 7	2502.5 - 2567.5	24.00	251.19	3.27	0.325	0.768	Qualified
LTE Band 12	699.7 - 715.3	24.00	251.19	3.28	0.326	0.366	Qualified
LTE Band 13	779.5 - 784.5	24.00	251.19	3.78	0.366	0.402	Qualified
LTE Band 14	790.5 - 795.5	24.00	251.19	3.78	0.366	0.407	Qualified
LTE Band 25	1850.7 - 1914.3	24.00	251.19	3.32	0.329	0.768	Qualified
LTE Band 26	814.7 - 848.3	24.00	251.19	3.21	0.321	0.434	Qualified
Bluetooth	2402 - 2480	6.58	4.55	2.24	0.020	0.768	Qualified

Band	Frequency (MHz)	Tune-up Power (dBm) [P]	ANT Gain (dBi)	Power with Duty cycle (mW) [P]x[G]	Power Density (mW/cm^2) [S]	Standalone Limit (mW/cm^2)
GSM850	824.2 - 848.8	27.50	3.21	1175.29	0.23	0.55

Note:

1. The Calculation are based on Max tune power and Max Antenna gain.
2. Except GSM, other transmission generated by the device is qualified for exemption under 47 CFR §1.1307(b)(3)(i)(C).

Simultaneous Transmitting：

2. The simultaneous transmission possibilities for this device are listed as below.

Simultaneous TX Combination	Capable Transmit Configurations	Product Specific Exposure Condition
A	WWAN + BT	Yes

Simultaneous Transmission Evaluation			
Product Specific Exposure Condition	1	2	A(1+2)
	GSM850	Bluetooth	Total Exposure Ratio
	(mW/cm^2)	(W)	
Results	0.23	0.768	**0.42**

Total Exposure Ratio: 0.42

7. Conclusion

The result shows that this device is qualified for MPE-Based Exemption in KDB447498 and compliant to exposure limits in 47 CFR §1.1310.

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