

MPE Report

Applicant : Lightspeed International Co
Product Type : 5G gateway 500G
Trade Name : LIGHTSPEED
Model Number : 5G-500G
Applicable Standard : 47 CFR § 2.1091
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Issued by

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Taiwan Accreditation Foundation accreditation number: 1330
Test Firm MRA designation number: TW0010

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Revision History

Rev.	Issued Date	Revisions	Revised By
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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 Part §2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR Part §1.1310	Radiofrequency radiation exposure limits.	-

2. Description of Equipment under Test (EUT)

Applicant	Lightspeed International Co No.20, Lane 526 Niupu East Road HsinChu, Taiwan, ROC 30091				
Manufacturer	Lightspeed International Co No.20, Lane 526 Niupu East Road HsinChu, Taiwan, ROC 30091				
Product Type	5G gateway 500G				
Trade Name	LIGHTSPEED				
Model Number	5G-500G				
FCC ID	NGJ-5G-500G				
IMEI No.	355979860033311				
Frequency Range	Operate Band			Frequency Range (MHz)	
	LTE Band 5			824 - 849	
	5 G NR n5			824 - 849	
	IEEE 802.11b/g/n 2.4 GHz 20 MHz			2412 - 2462	
	IEEE 802.11n 2.4 GHz 40 MHz			2422 - 2452	
	IEEE 802.11a			5180 - 5240	
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz			5180 - 5240	
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz			5190 - 5230	
	IEEE 802.11ac 80 MHz			5210	
	Bluetooth LE			2402 - 2480	
Antenna Information		Model	Type	Max. Gain (dBi)	
	ANT-0	AN0750-74S05BSM	Linear Antenna	LTE Band 5	1.78
	ANT-0	AN0750-74S05BSM	Linear Antenna	5 G NR n5	1.78
	ANT-0	AN2400-67A10BGX	Linear Antenna	Bluetooth/Zigbee	3.07
	ANT-0	AN2450D-67A51BX	Linear Antenna	2.4 GHz	4.92
	ANT-1/2/3	AN2450D-67A52BGX	Linear Antenna	2.4 GHz	4.92
	ANT-0	AN2450D-67A51BX	Linear Antenna	5 GHz	3.67
	ANT-1/2/3	AN2450D-67A52BGX	Linear Antenna	5 GHz	3.67
Antenna Delivery	IEEE 802.11b/g/n 2.4 GHz 20 MHz / 40 MHz: 4TX / 4RX (CDD) IEEE 802.11a/ac/ax 20 MHz / 40 MHz / 80 MHz: 4TX / 4RX (CDD)				
RF Evaluation	0.168 mW/cm ²				
Operate Temp. Range	0 ~ +40°C				

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 / 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

3. *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. " This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: "IMPORTANT: To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

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).

4. Power Density Limit – RF Exposure Evaluation

Thv In 47 CFR § 1.1310, use of the device as based upon the user's awareness and ability to exercise control over human exposure. The two categories defined are Occupational / Controlled Exposure and General Population / Uncontrolled. These two categories are defined as follow:

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

4.1 Conducted Power

Band	Date Rate or Sub-test	CH	Frequency (MHz)	Average Conducted power				
				ANT-0	ANT-1	ANT-2	ANT-3	All ANT
				dBm	dBm	dBm	dBm	dBm
802.11b	1M	1	2412	14.15	14.31	14.00	14.03	20.14
		6	2437	14.08	14.51	14.05	14.16	20.22
		11	2462	14.16	14.45	14.33	14.39	20.35
802.11g	6M	1	2412	14.28	14.31	14.15	14.09	20.23
		6	2437	14.11	14.63	14.05	14.07	20.24
		11	2462	14.63	14.52	14.45	14.20	20.47
802.11n_HT20	26M	1	2412	13.44	13.42	13.04	12.81	19.21
		6	2437	14.35	14.97	14.44	14.16	20.51
		11	2462	12.35	12.82	12.65	12.37	18.57
802.11n_HT40	54M	3	2422	12.30	12.47	12.02	11.85	18.19
		6	2437	14.07	14.02	14.09	14.05	20.08
		9	2452	11.32	11.47	11.22	11.08	17.30

Band	Frequency (MHz)	Average Conducted power (dBm)
Bluetooth LE	2402	6.29
	2440	7.01
	2480	6.85
Zigbee	2405	8.87
	2440	8.85
	2480	8.83

Band	Date Rate or Sub-test	CH	Frequency (MHz)			Average Conducted power				
						ANT-0	ANT-1	ANT-2	ANT-3	All ANT
						dBm	dBm	dBm	dBm	dBm
802.11a	6M	36	5180			15.08	15.24	15.54	14.89	21.21
		40	5200			14.95	15.15	15.48	15.05	21.18
		44	5220			14.90	15.10	15.40	15.00	21.12
		48	5240			14.89	15.04	14.93	15.02	20.99
802.11n_5G_HT20	26M	36	5180			14.68	14.93	15.18	14.83	20.93
		40	5200			14.84	15.02	15.29	14.75	21.00
		44	5220			14.80	15.00	15.18	14.70	20.94
		48	5240			14.65	15.09	15.08	14.86	20.94
802.11n_5G_HT40	54M	38	5190			13.78	13.92	14.01	13.62	19.86
		46	5230			14.82	14.99	15.14	15.15	21.05
802.11ac_VHT20	26M	36	5180			14.79	15.01	15.59	14.94	21.11
		40	5200			14.92	15.10	15.39	14.85	21.09
		44	5220			14.82	15.07	15.25	14.82	21.01
		48	5240			14.78	15.14	15.19	15.00	21.05
802.11ac_VHT40	54M	38	5190			13.85	14.05	14.12	13.74	19.96
		46	5230			14.90	15.11	15.28	15.28	21.17
802.11ac_VHT80	117.2M	42	5210			14.91	15.00	15.14	15.04	21.04
Band	Date Rate or Sub-test	CH	Frequency (MHz)	RU	RU Number	Average Conducted power				
						ANT-0	ANT-1	ANT-2	ANT-3	All ANT
						dBm	dBm	dBm	dBm	dBm
802.11ax_HE20	MCS 0	36	5180	242	1	15.24	15.21	15.57	15.24	21.34
		40	5200	242	1	15.39	15.24	15.52	15.15	21.35
		44	5220	242	1	15.36	15.15	15.49	15.12	21.30
		48	5240	242	1	15.42	15.21	15.37	15.25	21.33
802.11ax_HE40	MCS 0	38	5190	484	1	14.07	13.87	14.27	13.83	20.03
		46	5230	484	1	15.28	15.29	15.36	15.55	21.39
802.11ax_HE80	MCS 0	42	5210	968	1	15.14	15.31	15.33	15.25	21.28

5. Test Result

Antenna	Band	Frequency (MHz)	Limit (mW)/cm ²	Distance	Tune-up Power	ANT Gain	Numeric Gain	Duty Cycle	Power with Duty cycle	Power Density
				(cm)	(dBm)				(mW)	(mW)/cm ²
				[R]	[P]				[P]x[G]	[S]
WWAN Antenna	LTE Band 5	824-849	0.566	20	24.00	1.78	1.51	1	379.29	0.075
	n5	824-849	0.566	20	24.00	1.78	1.51	1	379.29	0.075
Bluetooth Antenna	Bluetooth	2402-2480	1.000	20	7.50	3.07	2.03	1	11.42	0.002
Zibee Antenna	Zibee	2405-2480	1.000	20	9.00	4.92	3.10	1	24.62	0.005
Wi-Fi Antenna 0	2.4GHz	2412-2462	1.000	20	15.00	4.92	3.10	1	98.03	0.020
	5GHz	5150-5250	1.000	20	16.00	3.67	2.33	1	92.76	0.018
Wi-Fi Antenna 1	2.4GHz	2412-2462	1.000	20	15.00	4.92	3.10	1	98.03	0.020
	5GHz	5150-5250	1.000	20	16.00	3.67	2.33	1	92.76	0.018
Wi-Fi Antenna 2	2.4GHz	2412-2462	1.000	20	15.00	4.92	3.10	1	98.03	0.020
	5GHz	5725-5850	1.000	20	16.00	3.67	2.33	1	92.76	0.018
Wi-Fi Antenna 3	2.4GHz	2412-2462	1.000	20	15.00	4.92	3.10	1	98.03	0.020
	5GHz	5150-5250	1.000	20	16.00	3.67	2.33	1	92.76	0.018

Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. We used the maximum power and gain to provide MPE results.
3. The Numeric Gain calculated by $10^{(\text{ant. Gain(dBi)} / 10)}$.
4. The MPE results are evaluated by lowest data rate for WLAN.

Simultaneous Transmitting :

$$\text{Total MPE} = 0.158 \text{ (mW)/cm}^2 < 10 \text{ (mW)/cm}^2$$

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