RF Exposure Evaluation

FCC ID: 2A9PI-LIXELL2

1. Client Information

Applicant	:	SHENZHEN XGRIDS-INNOVATION CO., LTD
Address	:	2207, SHENZHEN OVERSEAS STUDENTS INCUBATOR PARK, BUILDING 1, SHENZHEN, CHINA
Manufacturer	:	SHENZHEN XGRIDS-INNOVATION CO., LTD
Address	:	2207, SHENZHEN OVERSEAS STUDENTS INCUBATOR PARK, BUILDING 1, SHENZHEN, CHINA

2. General Description of EUT

EUT Name	:	Mobile Lidar Scanner	
Model(s) No.	:	Lixel L2 PRO-16, Lixel L2 PRO-32	
Model Difference	:	All these models are identical in the same PCB, layout and electrical circuit, the only difference is model name for commercial.	
Product Description	:	Operation Frequency:	Bluetooth&LE:2402MHz~2480MHz 2.4GWiFi:2412MHz~2462MHz U-NII-1: 5180MHz~5240MHz U-NII-3: 5745MHz~5825MHz
		Antenna Gain:	-0.69dBi FPC Antenna for 2402~2480MHz -0.69dBi FPC Antenna 1&2 for 2412~262MHz 0.79dBi FPC Antenna1&2 for U-NII-1 5180MHz~5240MHz 0.79dBi FPC Antenna1&2 for U-NII-3 5745MHz~5825MHz
		Modulation Type:	GFSK, Pi/4-DQPSK, 8-DPSK 802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (QPSK, BPSK, 16QAM, 64QAM) 802.11a: OFDM (QPSK, BPSK, 16QAM, 64QAM) 802.11ac: OFDM (QPSK, BPSK, 16QAM, 64QAM, 256QAM)
Power Supply	:	Battery Charger (Model: FY1682000): Input: 100-240V~50/60Hz 1.5A 80VA Output: 16.8V⎓2.0A 33.6W	
Li-ion Polymer Battery	:	DC 14.4V 3.25Ah 46.8Wh Rechargeable Li-ion battery	
Software Version	:	1.1.2	
Hardware Version	:	P2	
Remark: The above antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.			

Note: More test information about the EUT please refer the RF Test Report.

1 A/F., Building.6, Rundongsheng Industrial Zone, Longzhu, Xixiang, Bao'an, Shenzhen, Guangdong, China
Tel: +86 75526509301 Fax: +86 75526509195

SAR Test Exclusion Calculations

1. **FCC: According to KDB 447498 D01 Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies v06.**
   (1) Clause 4.3: General SAR test reduction and exclusion guidance
   Sub clause 4.31: Standalone SAR test exclusion considerations
   1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6GHz at test separation distance≤5 mm are determined by:
   [(max. power of channel, including tune-up tolerance, mW)/(min. test separation, mm)]*[$\sqrt{f_{(GHz)}}$] ≤3.0 for 1-g SAR
   [(max. power of channel, including tune-up tolerance, mW)/(min. test separation, mm)]*[$\sqrt{f_{(GHz)}}$] ≤7.5.0 for 10-g SAR

2. **Summary simultaneous transmission for SAR Exclusion**

The SAR exemption limits outlined in clause 4.3.2(b) of KDB 447498 have been derived based on an approximate SAR value of 0.4 W/kg using half-wave dipole antennas Footnote 1. As such, when simultaneous transmitter SAR evaluations include transmitters that have been exempt from routine SAR evaluation, the SAR must be estimating based on the ratio between the maximum tune-up tolerance limit of the transmitter that has been exempt and the exemption limit at the specific distance and frequency for that transmitter. This ratio must be multiplied by 0.4 W/kg (2.0 W/kg for controlled use and 1.0 W/kg for limb worn devices) in order to calculate the estimated SAR level.

The estimate SAR value is calculated based the following equation:

(maximum power level including tune-up tolerance for transmitter A / maximum power level of exemption at the same frequency and distance) * 0.4W/kg

1) [(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)]·[$\sqrt{f_{(GHz)}}/x$] W/kg, for *test separation distances* ≤ 50 mm;
   where x = 7.5 for 1-g SAR and x = 18.75 for 10-g SAR.
2) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distance* is > 50 mm.[37]

The [Σ of (the highest measured or estimated SAR for each standalone antenna configuration, adjusted for maximum tune-up tolerance) / 1.6 W/kg] + [Σ of MPE ratios] is ≤ 1.0.
The SAR to peak location separation ratios of all simultaneously transmitting antenna pairs operating in portable device exposure conditions are all ≤ 0.04, and the [Σ of MPE ratios] is ≤ 1.0.

3. Calculation:

Test separation: 5mm							
Worst MPE Result							
Test Mode	**Antenna**	**Max. Conducted Power (dBm)**	**Turn-up Power Tolerance (dB)**	**Max power of tune up tolerance (dBm)**	**Max power of tune up tolerance (mw)**	**Calculation Value**	**Threshold Value**
Bluetooth	/	8.345	8±1	9	7.943	2.502	3.0
2.4G b	Ant1	4.96	5±1	6	3.981	1.249	3.0
	Ant2	5.20	5±1	6	3.981	1.249	3.0
2.4G g	Ant1	4.54	5±1	6	3.981	1.249	3.0
	Ant2	5.19	5±1	6	3.981	1.249	3.0
2.4G n20	Ant1	5.05	5±1	6	3.981	1.249	3.0
	Ant2	4.46	5±1	6	3.981	1.249	3.0
2.4G n40	Ant1	5.06	5±1	6	3.981	1.249	3.0
	Ant2	4.33	5±1	6	3.981	1.249	3.0
5G a	Ant1	5.18	5±1	6	3.981	1.922	3.0
	Ant2	4.00	5±1	6	3.981	1.922	3.0
5G n20	Ant1	4.76	5±1	6	3.981	1.922	3.0
	Ant2	4.12	5±1	6	3.981	1.922	3.0
5G n40	Ant1	4.67	5±1	6	3.981	1.922	3.0
	Ant2	4.12	5±1	6	3.981	1.922	3.0
5G ac20	Ant1	4.43	5±1	6	3.981	1.922	3.0
	Ant2	4.35	5±1	6	3.981	1.922	3.0
5G ac40	Ant1	4.67	5±1	6	3.981	1.922	3.0
	Ant2	3.99	4±1	5	3.162	1.526	3.0
5G ac80	Ant1	4.46	5±1	6	3.981	1.922	3.0
	Ant2	4.73	5±1	6	3.981	1.922	3.0
Note: The Frequency used Highest Frequency for bluettooth&2.4G/5G WiFi.							

Simultaneous Transmission for SAR Exclusion			
Simultaneous Transmission for SAR Exclusion		**Total Calculation Value**	**Limit**
Ant1	**Ant2**		
0.641	**0.641**	**0.801**	**1.0**
Σ of (the highest measured or estimated SAR_{Ant1}+SAR_{Ant2})/1.6 = (0.641 +0.641)/1.6 = 0.801 < 1.0;			

Conclusion:

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB 447498 v06.

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