

Maximum Permissible Exposure Evaluation

FCC ID: 2A9JF-HY0608-YARBO

IC:29777-HY0608YARBO

1. Client Information

Applicant	:	Shenzhen Hanyang Technology Co., Ltd.
Address	:	Room 5018, Buildings 3, 4 and 5, Baoneng Science and Technology Park, Qinghu Community, Longhua Street, Longhua District, Shenzhen, China
Manufacturer	:	Shenzhen Hanyang Technology Co., Ltd.
Address	:	Room 5018, Buildings 3, 4 and 5, Baoneng Science and Technology Park, Qinghu Community, Longhua Street, Longhua District, Shenzhen, China

2. General Description of EUT

EUT Name	:	Yarbo Core
Models No./HVIN	:	HVIN2429
Model	:	2429 US
Sample ID	:	HC-C-202406-0011-01-05#
Product Description	:	Operation Frequency: Bluetooth&BLE: 2402MHz~2480MHz U-NII-1: 5180MHz~5240MHz U-NII-3: 5745MHz~5825MHz 802.11b/g/n/ax: 2412MHz~2462MHz LTE Band 2: TX: 1850MHz-1910MHz LTE Band 4: TX: 1710MHz-1755MHz LTE Band 5: TX: 824MHz-849MHz LTE Band 12: TX: 699MHz -716MHz LTE Band 13: TX: 777MHz -787MHz LTE Band 66: TX: 1710MHz -1780MHz LTE Band 71: TX: 663MHz -698MHz 908-924MHz for 802.11ah
Power Rating	:	Input: 100-240V~ 50/60Hz 5.0A Output:42.0V~7.7A
Li-ion Polymer Battery	:	Model No:DM3401012 DC 36V by 38.4Ah Rechargeable Li-ion Battery
Software Version	:	3.8
Hardware Version	:	1.3
Remark	:	The antenna gain provided by the manufacturer, the verified for the RF conduction test provided by TOBY test lab.

Method of Measurement for FCC

1. Max. Antenna Gain:

Band	Antenna Type	Antenna Gain(dBi)	
		Antenna 1	Antenna 2
Bluetooth	PCB	2.9	/
2.4G Wi-Fi	PCB	2.9	2.9
U-NII-1		5.1	5.1
U-NII-3		3.90	3.90
Halow	soft whip	0.65	/
LTE Band 2	PCB	4.26	/
LTE Band 4		3.61	/
LTE Band 5		1.96	/
LTE Band 12		3.75	/
LTE Band 13		2.86	/
LTE Band 66		3.61	/
LTE Band 71		1.22	/
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.			

2. EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3. Exposure Evaluation:

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=(PG)/4\pi R^2$$

Where

S: power density

P: power input to the antenna

G: power gain of the antenna in the direction of interest relative to an isotropic radiator.

R: distance to the center of radiation of the antenna

Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

This means that:

$$\sum \text{ of MPE ratios } \leq 1.0$$



4. Test Result:

Worst MPE Result							
Test Mode	Antenna	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	Max. ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
Bluetooth&BLE	/	5.031	5±1	6	2.90	20	0.0015
2.4G b	Ant1& Ant2	15.34	15±1	16	2.90	20	0.0154
2.4G g	Ant1& Ant2	15.09	15±1	16	2.90	20	0.0154
2.4G n20	Ant1& Ant2	15.08	15±1	16	2.90	20	0.0154
2.4G n40	Ant1& Ant2	15.14	15±1	16	2.90	20	0.0154
2.4G ax20	Ant1& Ant2	15.01	15±1	16	2.90	20	0.0154
2.4G ax40	Ant1& Ant2	15.17	15±1	16	2.90	20	0.0154
5G a	Ant1& Ant2	21.94	22±1	23	5.1	20	0.1284
5G n20	Ant1& Ant2	21.87	22±1	23	5.1	20	0.1284
5G n40	Ant1& Ant2	21.84	22±1	23	5.1	20	0.1284
5G ac20	Ant1& Ant2	21.88	22±1	23	5.1	20	0.1284
5G ac40	Ant1& Ant2	21.83	22±1	23	5.1	20	0.1284
5G ac80	Ant1& Ant2	21.74	22±1	23	5.1	20	0.1284
5G ax20	Ant1& Ant2	21.99	22±1	23	5.1	20	0.1284
5G ax40	Ant1& Ant2	22.05	22±1	23	5.1	20	0.1284
5G ax80	Ant1& Ant2	22.05	22±1	23	5.1	20	0.1284

Note: The antenna gain used max. antenna gain

Worst MPE Result							
Test Mode	Antenna	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	Max. ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
LTE Band 2	Ant1	25	25±1	26	4.26	20	0.2112
LTE Band 4	Ant1	25	25±1	26	3.61	20	0.1819
LTE Band 5	Ant1	25	25±1	26	1.96	20	0.1244
LTE Band 12	Ant1	25	25±1	26	3.75	20	0.1878
LTE Band 13	Ant1	25	25±1	26	2.86	20	0.1530
LTE Band 66	Ant1	25	25±1	26	3.61	20	0.1819
LTE Band 71	Ant1	25	25±1	26	1.22	20	0.1049

Note: The antenna gain used max. antenna gain

Worst MPE Result							
Mode	Channel Frequency (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	Max. ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
802.11ah 8M	908	25.23	25±1	26	0.65	20	0.0920
	916	25.37	25±1	26	0.65	20	0.0920
	924	25.41	25±1	26	0.65	20	0.0920



5. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/ cm ²)
300-1,500	F/1500
1,500-100,000	1.0

For:

2402~2480MHz&2412~2462MHz&5180MHz~5240MHz&5745MHz~5825MHz<E&Halow

MPE limit S: 1mW/ cm²

The MPE is calculated as $0.2112\text{mW} / \text{cm}^2 < \text{limit } 1\text{mW} / \text{cm}^2$.

6. Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna		CDD
		Antenna 1	Antenna 2	
Bluetooth	2.4GHz	Yes	/	/
Bluetooth LE	2.4GHz	Yes	/	/
IEEE 802.11a	U-NII-1/ U-NII-3	Yes	Yes	No
IEEE 802.11b	2.4GHz	Yes	Yes	No
IEEE 802.11g	2.4GHz	Yes	Yes	No
IEEE 802.11n HT20	2.4GHz	Yes	Yes	Yes
IEEE 802.11n HT40	2.4GHz	Yes	Yes	Yes
IEEE 802.11ax HE20	2.4GHz	Yes	Yes	Yes
IEEE 802.11ax HE40	2.4GHz	Yes	Yes	Yes
IEEE 802.11n HT20	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11n HT40	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT20	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT40	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT80	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE20	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE40	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE80	U-NII-1/ U-NII-3	Yes	Yes	Yes



7. Summary simultaneous transmission results

Antenna 1 and Antenna 2 for 2.4GWLAN& 5GWLAN<E&Halow

MPE WLAN Antenna 1 (mW/cm ²)	MPE RLAN Antenna 2 (mW/cm ²)	MPE LTE Antenna 1 (mW/cm ²)	MPE Halow Antenna (mW/cm ²)	ΣMPE ratios	Limit	Results
0.0154	0.1284	0.2112	0.0920	0.0447	1.0	PASS

Bluetooth and WiFi support Synchronization transmitter

Maximum MPE ratio Bluetooth	Maximum MPE ratio WiFi	ΣMPE ratios	Limit	Results
0.0015	0.1284	0.1299	1	PASS

So, RF exposure limit warning or SAR test are not required.

The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b). The RF Exposure Information page from the manual is included here for reference.



Method Of Measurement for IC

1. Applicable Standard

[RSS-102 Issue 6 December 15, 2023](#): Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands), sets out the requirements and measurement techniques used to evaluate radio frequency (RF) exposure compliance of radio communication apparatus designed to be used within the vicinity of the human body.

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

2. Evaluation Method and Limit

According to RSS-102 issue 6 Table 7, RF field strength and power density limits for devices used by the general public (uncontrolled environment)

Frequency range (MHz)	Electric field (V _{RMS} /m)	Magnetic field (A _{RMS} /m)	Power density (W/m ²)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142 f^{0.3417}$	$0.008335 f^{0.3417}$	$0.02619 f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000 / f^{1.2}$
150000-300000	$0.158 f^{0.5}$	$4.21 \times 10^{-4} f^{0.5}$	$6.67 \times 10^{-5} f$	$616000 / f^{1.2}$

Frequency Band	f (MHz)	Limit of Power Density (W/m ²)
2.4G	2402	5.35
5G	5180	9.05
Note: Limit=0.02619$f^{0.6834}$ (where f is in MHz). The f in the limit is the frequency of the lowest Channel.		



3. Calculation Formula

Prediction of power density at the distance of the applicable MPE limit:

$$S = \frac{PG}{4\pi R^2} = \text{Power density (in appropriate units, e.g. W/m}^2\text{)}$$

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

G=power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R=distance to the center of radiation of the antenna (in appropriate units, e.g. m)

Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

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4. Evaluation Results

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Test Mode	Antenna	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	Max. ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
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802.11ah 8M	908	15.2	15±1	16	0.65	20	0.0092
	916	14.305	14±1	15	0.65	20	0.0073
	924	14.663	15±1	16	0.65	20	0.0092



6. Summary simultaneous transmission information

Modulation Type	Work Frequency Band	Transmit Antenna		CDD
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Bluetooth LE	2.4GHz	Yes	/	/
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IEEE 802.11n HT40	2.4GHz	Yes	Yes	Yes
IEEE 802.11ax HE20	2.4GHz	Yes	Yes	Yes
IEEE 802.11ax HE40	2.4GHz	Yes	Yes	Yes
IEEE 802.11n HT20	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11n HT40	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT20	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT40	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ac VHT80	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE20	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE40	U-NII-1/ U-NII-3	Yes	Yes	Yes
IEEE 802.11ax HE80	U-NII-1/ U-NII-3	Yes	Yes	Yes

7. Summary simultaneous transmission results

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Maximum MPE ratio Bluetooth	Maximum MPE ratio WiFi	ΣMPE ratios	Limit	Results
0.0015	0.1284	0.1299	1	PASS

Remark:

1. Output power including turn-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer.

Note

For a more detailed features description, please refer to the RF Test Report.

-----END OF THE REPORT-----

