

RF EXPOSURE EVALUATION REPORT

Product Name: SET TOP BOX
Trade Mark: N/A
Model No.: KM2 PLUS
Add. Model No.: KM2 PRO, KM3 PRO, KM3 PLUS, KM5 PRO, KM5 PLUS, KM6 PRO, KM6 PLUS, KM7 RPO, KM7 PLUS, HP44H, HP4414
Report Number: 220608033RFC-5
Test Standards: FCC 47 CFR Part 1 Subpart I
FCC ID: 2AGKB-KM2PLUS
Test Result: PASS
Date of Issue: August 8, 2022

Prepared for:

Videostrong Technology Co., Ltd
604, Lushi industrial Building, 28 District Bao'an District, Shenzhen, China

Prepared by:

Shenzhen UnionTrust Quality and Technology Co., Ltd.
Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China
TEL: +86-755-2823 0888
FAX: +86-755-2823 0886

Prepared by:



Kieron Luo
Project Engineer

Reviewed by:



Henry Lu
Team Leader

Approved by:



Kevin Liang
Assistant Manager

Date:

August 8, 2022

Shenzhen UnionTrust Quality and Technology Co., Ltd.

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com

<http://www.uttlab.com>

UTTR-RF-RSS102-V1.1

Version

Version No.	Date	Description
V1.0	August 8, 2022	Original

**Shenzhen UnionTrust Quality and Technology Co., Ltd.**

Address: Unit D/E of 9/F and 16/F, Block A, Building 6, Baoneng science and technology park, Longhua district, Shenzhen, China

Tel: +86-755-28230888

Fax: +86-755-28230886

E-mail: info@uttlab.com<http://www.uttlab.com>UTTR-RF-RSS102-V1.1

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	Videostrong Technology Co., Ltd
Address of Applicant:	604, Lushi industrial Building, 28 District Bao'an District, Shenzhen, China
Manufacturer:	Videostrong Technology Co., Ltd
Address of Manufacturer:	604, Lushi industrial Building, 28 District Bao'an District, Shenzhen, China

1.2 EUT INFORMATION

Product Name:	SET TOP BOX		
Model No.:	KM2 PLUS		
Add. Model No.:	KM2 PRO, KM3 PRO, KM3 PLUS, KM5 PRO, KM5 PLUS, KM6 PRO, KM6 PLUS, KM7 RPO, KM7 PLUS, HP44H, HP4414		
Trade Mark:	N/A		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth 5.0	
	5 GHz U-NII Bands:	5 150 MHz to 5 250 MHz	IEEE 802.11a/n/ac
		5 250 MHz to 5 350 MHz	IEEE 802.11a/n/ac
		5 470 MHz to 5 725 MHz	IEEE 802.11a/n/ac
	5 725 MHz to 5 850 MHz	IEEE 802.11a/n/ac	
Software Version:	C2.1.4 (Provided by the customer)		
Hardware Version:	5800-2AHP44H-1102 (Provided by the customer)		
Sample Received Date:	June 6, 2022		
Note: The additional model KM2 PRO, KM3 PRO, KM3 PLUS, KM5 PRO, KM5 PLUS, KM6 PRO, KM6 PLUS, KM7 RPO, KM7 PLUS, HP44H, HP4414 is identical with the test model KM2 PLUS except the model number for marketing purpose.			

Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

For BT_LE	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth LE/2LE/LE Code
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Antenna Type:	PCB Antenna
Antenna Gain: (Provided by the customer)	1.2 dBi
Maximum Peak Power:	7.77 dBm

For BT_EDR	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth BR + EDR
Modulation Technique:	Frequency Hopping Spread Spectrum (FHSS)
Type of Modulation:	GFSK, $\pi/4$ DQPSK, 8DPSK
Number of Channels:	79
Channel Separation:	1 MHz
Hopping Channel Type:	Adaptive Frequency Hopping Systems
Antenna Type:	PCB Antenna
Antenna Gain: (Provided by the customer)	1.2 dBi
Maximum Peak Power:	7.41 dBm

For 2.4 GHz ISM Band of Wi-Fi	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2412 MHz to 2472 MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
Type of Modulation:	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM (64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM (64-QAM, 16-QAM, QPSK, BPSK)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS 15 IEEE 802.11n-HT40: Up to MCS 15
Number of Channels:	IEEE 802.11b: 13 IEEE 802.11g: 13 IEEE 802.11n-HT20: 13 IEEE 802.11n-HT40: 9
Channel Separation:	5 MHz
Antenna Type: (Provided by the customer)	Ant. 0 PCB Antenna Ant. 1 PCB Antenna
Antenna Gain: (Provided by the customer)	Ant. 0 0.8 dBi Ant. 1 0.8 dBi
Maximum conducted output power:	SISO_Ant. 0 IEEE 802.11b: 18.32 dBm IEEE 802.11g: 26.13 dBm IEEE 802.11n-HT20: 25.36 dBm IEEE 802.11n-HT40: 20.76 dBm
	SISO_Ant. 1 IEEE 802.11b: 18.04 dBm IEEE 802.11g: 25.00 dBm IEEE 802.11n-HT20: 24.41 dBm IEEE 802.11n-HT40: 22.78 dBm
	MIMO_Ant. 0+1 IEEE 802.11n-HT20: 27.92 dBm IEEE 802.11n-HT40: 24.70 dBm

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For 5 GHz U-NII Bands of Wi-Fi		
Frequency Bands:	5150 MHz to 5250 MHz (U-NII-1)	
	5250 MHz to 5350 MHz (U-NII-2A)	
	5470 MHz to 5725 MHz (U-NII-2C)	
	5 725 MHz to 5 850 MHz (U-NII-3)	
Frequency Ranges:	5180 MHz to 5240 MHz	
	5260 MHz to 5320 MHz	
	5500 MHz to 5700 MHz	
	5 745 MHz to 5 825 MHz	
Support Standards:	IEEE 802.11a/n/ac	
TPC Function:	Not Support	
DFS Operational mode:	Slave without radar Interference detection function	
Type of Modulation:	IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK)	
	IEEE 802.11n: OFDM(64QAM, 16QAM, QPSK, BPSK)	
	IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)	
Channel Spacing:	IEEE 802.11a/n-HT20/ac-VHT20: 20 MHz	
	IEEE 802.11n-HT40/ac-VHT40: 40 MHz	
	IEEE 802.11ac-VHT80: 80 MHz	
Data Rate:	IEEE 802.11a: Up to 54 Mbps	
	IEEE 802.11n-HT20: Up to MCS15	
	IEEE 802.11n-HT40: Up to MCS15	
	IEEE 802.11ac-VHT20: Up to MCS8	
	IEEE 802.11ac-VHT40: Up to MCS9	
	IEEE 802.11ac-VHT80: Up to MCS9	
Number of Channels:	5150 MHz to 5250 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11acVHT80	
	5250 MHz to 5350 MHz: 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11acVHT80	
	5470 MHz to 5725 MHz: 11 for IEEE 802.11a/n-HT20/ac-VHT20 5 for IEEE 802.11n-HT40/ac-VHT40 2 for IEEE 802.11ac-VHT80	
	5725 MHz to 5850 MHz: 5 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80	
Antenna Type:	Ant. 0	PCB Antenna
	Ant. 1	PCB Antenna
Antenna Gain: (Provided by the customer)	Ant. 0	5150 MHz to 5250 MHz: 2 dBi
		5250 MHz to 5350 MHz: 2 dBi
		5470 MHz to 5725 MHz: 2 dBi
		5725 MHz to 5850 MHz: 2 dBi
	Ant. 1	5150 MHz to 5250 MHz: 2 dBi
	5250 MHz to 5350 MHz: 2 dBi	

Shenzhen UnionTrust Quality and Technology Co., Ltd.

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		5470 MHz to 5725 MHz: 2 dBi			
		5725 MHz to 5850 MHz: 2 dBi			
Maximum conducted output power (dBm):	SISO_Ant. 0	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a:	15.89	16.21	17.46	18.29
	SISO_Ant. 1	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11a:	16.07	16.89	17.84	17.84
	MIMO_Ant. 0+1	U-NII-1	U-NII-2A	U-NII-2C	U-NII-3
	IEEE 802.11n-HT20:	17.87	18.75	19.59	21.38
	IEEE 802.11n-HT40:	17.19	17.81	18.87	20.45
	IEEE 802.11ac-VHT20:	18.00	18.90	19.64	21.51
	IEEE 802.11ac-VHT40:	17.16	17.80	18.77	20.37
	IEEE 802.11ac-VHT80:	16.23	17.05	17.41	20.20

1.4 OTHER INFORMATION

None.

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 1 Subpart I

All test items have been performed and recorded as per the above standards

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

2. EQUIPMENT LIST

Please refer to the RF test report.

3. MPE EVALUATION

3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	FCC Part 1.1307	Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
3	FCC Part 1.1310	Radiofrequency radiation exposure limits.

3.2 MPE COMPLIANCE REQUIREMENT

3.2.1 Limits

According to §1.1310(e)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

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 Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

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 Times 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)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	1	30

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

3.2.2 Test Procedure

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

3.3 MPE CALCULATION METHOD

$$S = PG/4\pi R^2 = EIRP/4\pi R^2$$

S = power density (in appropriate units, e.g., mw/cm²)

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

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., cm)

3.4 MPE CALCULATION RESULTS

Note: For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.

3.4.1 For WLAN

For Wi-Fi function, operating at 2412MHz to 2472 MHz for IEEE802.11b/g/n and operating at 5150 MHz to 5250 MHz for IEEE802.11a/n/ac and operating at 5250 MHz to 5350 MHz for IEEE802.11a/n/ac and operating at 5470 MHz to 5725 MHz for IEEE802.11a/n/ac and operating at 5725 MHz to 5850 MHz for IEEE802.11a/n/ac.

3.4.1.1 Antenna Type:

Ant. 0: PCB Antenna

Ant. 1: PCB Antenna

3.4.1.2 Antenna Gain:

Ant. 0: 2412MHz to 2472 MHz: 0.8 dBi

5150 MHz to 5250 MHz: 2 dBi

5250 MHz to 5350 MHz: 2 dBi

5470 MHz to 5725 MHz: 2 dBi

5725 MHz to 5850 MHz: 2 dBi

Ant. 1: 2412MHz to 2472 MHz: 0.8 dBi

5150 MHz to 5250 MHz: 2 dBi

5250 MHz to 5350 MHz: 2 dBi

5470 MHz to 5725 MHz: 2 dBi

5725 MHz to 5850 MHz: 2 dBi

3.4.1.3 Results for FCC 47 CFR Part 1 Subpart I

For 2.4GHz

Operating Mode	Freq.	Ant.	Maximum conducted output Avg power (dBm)	Max. positive tolerance according manufacturer (dB)	Max. Antenna Gain (dBi)	Calculated EIRP		MPE		MIMO	
								Limit	Value	Value	Limit
	(MHz)					(dBm)	(mW)	(mW/cm ²)			
IEEE 802.11b	2412-2472	Ant 0	16.41	2	0.8	19.21	83.3681	1	0.0166	/	/
		Ant 1	16.08	2	0.8	18.88	77.2681	1	0.0154		
IEEE 802.11g	2412-2472	Ant 0	17.42	2	0.8	20.22	105.1962	1	0.0209	/	/
		Ant 1	16.73	2	0.8	19.53	89.7429	1	0.0179		
IEEE 802.11n20	2412-2472	Ant 0	16.51	2	0.8	19.31	85.3100	1	0.0170	0.0321	1
		Ant 1	16.00	2	0.8	18.8	75.8578	1	0.0151		
IEEE 802.11n40	2422-2462	Ant 0	11.02	2	0.8	13.82	24.0991	1	0.0048	0.0131	1
		Ant 1	13.38	2	0.8	16.18	41.4954	1	0.0083		

For 5GHz

Operating Mode	Freq.	Ant.	Maximum conducted output Avg power (dBm)	Max. positive tolerance according manufacturer (dB)	Max. Antenna Gain (dBi)	Calculated EIRP		MPE		MIMO	
								Limit	Value	Value	Limit
	(MHz)					(dBm)	(mW)	(mW/cm ²)			
IEEE 802.11a	5180-5825	Ant 0	18.29	2	2	22.29	169.4338	1	0.0337	/	/
		Ant 1	17.84	2	2	21.84	152.7566	1	0.0304		
IEEE 802.11n20	5180-5825	Ant 0	18.53	2	2	22.53	179.0606	1	0.0356	0.0686	1
		Ant 1	18.20	2	2	22.2	165.9587	1	0.0330		
IEEE 802.11n40	5190-5795	Ant 0	18.35	2	2	22.35	171.7908	1	0.0342	0.0554	1
		Ant 1	16.27	2	2	20.27	106.4143	1	0.0212		
IEEE 802.11ac20	5180-5825	Ant 0	18.67	2	2	22.67	184.9269	1	0.0368	0.0707	1
		Ant 1	18.31	2	2	22.31	170.2159	1	0.0339		
IEEE 802.11ac40	5190-5795	Ant 0	18.30	2	2	22.3	169.8244	1	0.0338	0.0544	1
		Ant 1	16.16	2	2	20.16	103.7528	1	0.0206		
IEEE 802.11ac80	5210-5775	Ant 0	18.94	2	2	22.94	196.7886	1	0.0391	0.0536	1
		Ant 1	14.64	2	2	18.64	73.1139	1	0.0145		

Note:

1. MIMO MPE Value = Σ of MPE ratios

MPE ratios = Field strengths or power density / MPE limit at the test frequency

2. The maximum EIRP is calculated from max output power and antenna gain, the antenna gain provided by the customer, and the customer takes all the responsibilities for the accuracy of antenna gain.

3.4.2 For BT

For BT_LE/2LE/LE Code function, operating at 2402MHz to 2480 MHz for GFSK and

For BT_EDR function, operating at 2402MHz to 2480 MHz for GFSK, $\pi/4$ DQPSK, 8DPSK

3.4.2.1 Antenna Type:

Ant. 0: PCB Antenna

3.4.2.2 Antenna Gain:

Ant. 0: 2402MHz to 2480 MHz: 1.2 dBi

3.4.2.3 Results for FCC 47 CFR Part 1 Subpart I

Operating Mode	Freq.	Maximum conducted output power	Max. positive tolerance according manufacturer	Max. Antenna Gain	Calculated EIRP	Calculated output power	MPE Limit	MPE Value
	(MHz)	(dBm)	(dBm)	(dBi)	(dBm)	(mW)	(mW /cm ²)	
LE/2LE/LE Code	2402-2480	6.93	2	1.2	10.13	10.3039	1	0.0020
EDR	2402-2480	6.32	2	1.2	9.52	8.9536	1	0.0018

3.4.3 Simultaneous Multi-band Transmission MPE Analysis

3.4.3.1 List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Support/Not Support
1	2.4G_SISO_WLAN + BT	Support
2	2.4G_MIMO_WLAN + BT	Support
3	5G_SISO_WLAN + BT	Support
4	5G_MIMO_WLAN + BT	Support

3.4.3.2 Results for transmit simultaneously

FCC 47 CFR Part 1 Subpart I

No.	Configurations	Maximum MPE Value/ Ratios			Limits
		WLAN	BT	Transmit simultaneously	
1	2.4G_SISO_WLAN + BT	0.0209	0.0020	0.0229	1
2	2.4G_MIMO_WLAN + BT	0.0321	0.0020	0.0341	1
3	5G_SISO_WLAN + BT	0.0337	0.0020	0.0357	1
4	5G_MIMO_WLAN + BT	0.0707	0.0020	0.0727	1

Note:

Transmit simultaneously MPE = Σ of MPE ratios

MPE ratios = Field strengths or power density / MPE limit at the test frequency

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***

The test report is effective only with both signature and specialized stamp. The result(s) shown in this report refer only to the sample(s) tested. Without written approval of UnionTrust, this report can't be reproduced except in full.
