

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

5.1.3 CONDUCTED POWER SPECTRAL DENSITY

RESULT: Pass

5.1.4 6dB BANDWIDTH

RESULT: Pass

5.1.5 99% BANDWIDTH

RESULT: Pass

5.1.6 CONDUCTED SPURIOUS EMISSIONS MEASURED IN 100 KHZ BANDWIDTH

RESULT: Pass

5.1.7 RADIATED SPURIOUS EMISSION

RESULT: Pass

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1 General Remarks

1.1 Complementary Materials

All attachments are integral parts of this test report. This applies especially to the following appendix:

Appendix A: Test Results of 2.4GHz SDR

Appendix B: Photographs of the Test Set-up

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China

FCC Registration No.: 694916

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

TÜV Rheinland (Shenzhen) Co., Ltd.

Equip. No.	Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
9039436	EXA Signal Analyzer, Multi-touch	Keysight	N9010B	MY60241 175	28.09.2022
9039437	MXG X-Series RF Vector Signal Generator	Keysight	N5182B	MY61250 137	28.09.2022
9039438	EXG X-Series Microwave Analog Signal Generator	Keysight	N5173B	MY61250 141	28.09.2022
9039439	DC Power Supply	Keysight	E3642A	MY61276 100	28.09.2022
9039440	Wireless Connectivity Tester	R&S	CMW270	102505	28.09.2022
9039441	Power Control Unit	Tonscend	JS0806-4ADC	N/A	28.09.2022
9039442	Automation Control Unit	Tonscend	JS0806-2	21C80603 96	28.09.2022
9039443	Test Software	Tonscend	JS1120-3	N/A	N/A
9039444	Control PC	Lenovo	TianYi510S-071MB	YLX23JM F	N/A
Equip. No.	Description	Manufacturer	Model	Serial No.	Calibrated until (DD.MM.YYYY)
G1826021	EMI Test Receiver	R&S	ESR 7	102021	10.08.2022
G1826023	Signal Analyzer	R&S	FSV 40	101439	09.08.2022
G1826024	System Controller Interface	R&S	SCI-100	S1001003 8	N/A
G1826025	Filterbank	R&S	Wlan	100759	09.08.2022
G1826026	OSP	R&S	OSP 120	102040	N/A
G1826028	Pre-amplifier	R&S	SCU08F1	08320031	09.08.2022
G1826029	Amplifier	R&S	SCU-18F	180070	09.08.2022
G1826030	Amplifier	R&S	SCU40A	100475	09.08.2022

G1826031	Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	08.08.2022
G1826032	Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	08.08.2022
G1826033	Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	08.08.2022
G1826034	Active Loop Antenna	Schwarzbeck	FMZB 1513	302	13.09.2022
G1826036	Test software	R&S	EMC32 (V10.60.10)	N/A	N/A
G1826037	Control PC	Dell	OptiPlex 7050	36NV9P2	N/A
G1826433	3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC1715 1-SAC	22.06.2024

2.3 Traceability

All measurement equipment calibrations are traceable to NIM (National Institute of Metrology) or where calibration is performed in other countries, to equivalent nationally recognized standards organizations.

2.4 Calibration

Equipment requiring calibration is calibrated periodically by the manufacturer or according to manufacturer's specifications. Additionally all equipment is verified for proper performance on a regular basis using in house standards or comparisons.

2.5 Measurement Uncertainty

The estimated combined standard uncertainty for radiated emissions and conducted emissions measurements as below table.

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-7}$
RF Power (conducted)	± 2.5 dB
Radiated Emission of Transmitter, valid up to 26.5 GHz	± 6 dB
Radiated Emission of Receiver, valid up to 26.5 GHz	± 6 dB
Conducted Emission, (9kHz to 150kHz)/(150kHz to 30MHz)	± 3.70 dB / ± 3.30 dB
Radiated Emission (3m SAC), 30MHz to 1000MHz	± 4.52 dB
Radiated Emission (3m SAC), above 1000MHz	± 4.37 dB
Temperature	± 1 °C
Humidity	± 5 %
Voltage (DC)	± 1 %
Voltage (AC, <10kHz)	± 2 %

2.6 Location of Original Data

The original copies of all test data taken during actual testing were attached at Appendix A & B of this report and delivered to the applicant. A copy has been retained in the TÜV Rheinland (Shenzhen) Co., Ltd. file for certification follow-up purposes.

2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at 362 Huanguan Road Middle Longhua District, Shenzhen 518110 People's Republic of China is listed on the US Federal Communications Commission list of facilities approved to perform measurements.

3 General Product Information

3.1 Product Function and Intended Use

The EUT (Equipment Under Test) is an aircraft (Matrice 30 with model M30 RTK, Matrice 30T with model M30T RTK). It supports 2.4GHz SDR, 5.8GHz SDR, GNSS and ADS-B functions.

*remark: SDR means specific defined radio, and cannot changes radio specification via software/firmware by end-users.

According to the declaration of the applicant, the electrical circuit design and PCB layout are identical for M30 RTK, M30T RTK, except M30T RTK supports infrared camera.

For details refer to the User Manual, Technical Description and Circuit Diagram.

3.2 Ratings and System Details

Table 2: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment:	Matrice 30, Matrice 30T
Type Designation:	M30 RTK, M30T RTK
Trademark:	DJI
Operating Temperature Range:	-20 °C ~ 50 °C
Operating Voltage:	Battery operated (DC 22.38V, 5880mAh)
Testing Voltage:	Built-in battery
Radiofrequency operating mode	1) 2.4GHz SDR: operating within 2400-2483.5MHz, supports 1.4MHz/3MHz/10MHz/20MHz/40MHz Bandwidth 2) 5.8GHz SDR: operating within 5725-5850MHz, supports 1.4MHz/3MHz/10MHz/20MHz/40MHz Bandwidth 3) GPS & BDS & Galileo (receiver): operating within 1559-1610MHz 4) ADS-B (receiver): operating at 978MHz (1MHz Bandwidth) and 1090MHz (2MHz Bandwidth)
Technical Specification of 2.4GHz SDR	
Operating Frequency	2403.5-2469.5MHz for 1.4MHz Bandwidth 2405.12-2471.12MHz for 1.4MHz Bandwidth (CA mode) 2405.5-2468.5MHz for 3MHz Bandwidth 2408.2-2471.2MHz for 3MHz Bandwidth (CA mode) 2407.5-2467.5MHz for 10MHz Bandwidth 2412.5-2462.5MHz for 20MHz Bandwidth 2422.5-2452.5MHz for 40MHz Bandwidth
Type of Modulation	OFDM (QPSK, 16QAM, 64QAM)
Channel Number	34 channels for 1.4MHz Bandwidth 34 channels for 1.4MHz Bandwidth (CA mode) 22 channels for 3MHz Bandwidth 22 channels for 3MHz Bandwidth (CA mode) 61 channels for 10MHz Bandwidth 51 channels for 20MHz Bandwidth

	31 channels for 40MHz Bandwidth
Channel Separation	2MHz for 1.4MHz Bandwidth 2MHz for 1.4MHz Bandwidth (CA mode) 3MHz for 3MHz Bandwidth 3MHz for 3MHz Bandwidth (CA mode) 1MHz for 10MHz Bandwidth 1MHz for 20MHz Bandwidth 1MHz for 40MHz Bandwidth
Antenna Type	Integral Antenna
Antenna Number	1Tx4Rx for SISO mode (ANT0 or ANT1 or ANT2 or ANT3) 2Tx4Rx for MIMO mode (ANT0+ANT1, or ANT0+ANT3, or ANT2+ANT1, or ANT2+ANT3)
Antenna Gain	4dBi for ANT0 2.8dBi for ANT1 2.8dBi for ANT2 4dBi for ATN3
The type of wideband data transmission equipment	Non-FHSS

Table 3: RF Channel and Frequency of 2.4GHz SDR

2.4GHz 1.4MHz Bandwidth (2403.5MHz-2469.5MHz)			
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2403.5	18	2437.5
2	2405.5	19	2439.5
3	2407.5	20	2441.5
4	2409.5	21	2443.5
5	2411.5	22	2445.5
6	2413.5	23	2447.5
7	2415.5	24	2449.5
8	2417.5	25	2451.5
9	2419.5	26	2453.5
10	2421.5	27	2455.5
11	2423.5	28	2457.5
12	2425.5	29	2459.5
13	2427.5	30	2461.5
14	2429.5	31	2463.5
15	2431.5	32	2465.5
16	2433.5	33	2467.5
17	2435.5	34	2469.5

2.4GHz 1.4MHz Bandwidth (CA Mode) (2405.12MHz-2471.12MHz)			
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2405.12	18	2439.12
2	2407.12	19	2441.12

3	2409.12	20	2443.12
4	2411.12	21	2445.12
5	2413.12	22	2447.12
6	2415.12	23	2449.12
7	2417.12	24	2451.12
8	2419.12	25	2453.12
9	2421.12	26	2455.12
10	2423.12	27	2457.12
11	2425.12	28	2459.12
12	2427.12	29	2461.12
13	2429.12	30	2463.12
14	2431.12	31	2465.12
15	2433.12	32	2467.12
16	2435.12	33	2469.12
17	2437.12	34	2471.12

2.4GHz 3MHz Bandwidth (2405.5MHz-2468.5MHz)			
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2405.5	12	2438.5
2	2408.5	13	2441.5
3	2411.5	14	2444.5
4	2414.5	15	2447.5
5	2417.5	16	2450.5
6	2420.5	17	2453.5
7	2423.5	18	2456.5
8	2426.5	19	2459.5
9	2429.5	20	2462.5
10	2432.5	21	2465.5
11	2435.5	22	2468.5

2.4GHz 3MHz Bandwidth (CA mode) (2408.2MHz-2471.2MHz)			
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2408.2	12	2441.2
2	2411.2	13	2444.2
3	2414.2	14	2447.2
4	2417.2	15	2450.2
5	2420.2	16	2453.2
6	2423.2	17	2456.2
7	2426.2	18	2459.2
8	2429.2	19	2462.2
9	2432.2	20	2465.2
10	2435.2	21	2468.2
11	2438.2	22	2471.2

2.4GHz 10MHz Bandwidth (2407.5MHz-2467.5MHz)							
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2407.5	17	2423.5	33	2439.5	49	2455.5
2	2408.5	18	2424.5	34	2440.5	50	2456.5
3	2409.5	19	2425.5	35	2441.5	51	2457.5
4	2410.5	20	2426.5	36	2442.5	52	2458.5
5	2411.5	21	2427.5	37	2443.5	53	2459.5
6	2412.5	22	2428.5	38	2444.5	54	2460.5
7	2413.5	23	2429.5	39	2445.5	55	2461.5
8	2414.5	24	2430.5	40	2446.5	56	2462.5
9	2415.5	25	2431.5	41	2447.5	57	2463.5
10	2416.5	26	2432.5	42	2448.5	58	2464.5
11	2417.5	27	2433.5	43	2449.5	59	2465.5
12	2418.5	28	2434.5	44	2450.5	60	2466.5
13	2419.5	29	2435.5	45	2451.5	61	2467.5
14	2420.5	30	2436.5	46	2452.5		
15	2421.5	31	2437.5	47	2453.5		
16	2422.5	32	2438.5	48	2454.5		

2.4GHz 20MHz Bandwidth (2412.5MHz-2462.5MHz)					
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2412.5	18	2429.5	35	2446.5
2	2413.5	19	2430.5	36	2447.5
3	2414.5	20	2431.5	37	2448.5
4	2415.5	21	2432.5	38	2449.5
5	2416.5	22	2433.5	39	2450.5
6	2417.5	23	2434.5	40	2451.5
7	2418.5	24	2435.5	41	2452.5
8	2419.5	25	2436.5	42	2453.5
9	2420.5	26	2437.5	43	2454.5
10	2421.5	27	2438.5	44	2455.5
11	2422.5	28	2439.5	45	2456.5
12	2423.5	29	2440.5	46	2457.5
13	2424.5	30	2441.5	47	2458.5
14	2425.5	31	2442.5	48	2459.5
15	2426.5	32	2443.5	49	2460.5
16	2427.5	33	2444.5	50	2461.5
17	2428.5	34	2445.5	51	2462.5

2.4GHz 40MHz Bandwidth (2422.5MHz-2452.5MHz)					
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)

1	2422.5	12	2433.5	23	2444.5
2	2423.5	13	2434.5	24	2445.5
3	2424.5	14	2435.5	25	2446.5
4	2425.5	15	2436.5	26	2447.5
5	2426.5	16	2437.5	27	2448.5
6	2427.5	17	2438.5	28	2449.5
7	2428.5	18	2439.5	29	2450.5
8	2429.5	19	2440.5	30	2451.5
9	2430.5	20	2441.5	31	2452.5
10	2431.5	21	2442.5		
11	2432.5	22	2443.5		

3.3 Independent Operation Modes

The basic operation modes are:

- A. On, 2.4GHz SDR wireless transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, Normal Operation
- C. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form

4 Test Set-up and Operation Modes

4.1 Principle of Configuration Selection

Radio Spectrum: The equipment under test (EUT) was configured at its highest power output in order to measure its highest possible radiation and conducted level. The test modes were adapted accordingly in reference to the instructions for use.

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

4.2 Test Operation and Test Software

Test operation refers to test setup in chapter 5. All tests were performed according to the procedures in ANSI C63.10: 2013 and ANSI C63.4: 2014.

According to clause 3.1, all tests were performed on model M30T RTK in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 4: Auxiliary Equipment Used during Test

Description	Manufacturer	Model	S/N	Rating
Laptop	Lenovo	T480	PF-16A6N8	N/A

4.4 Countermeasures to Achieve EMC Compliance

The test sample which has been tested contained the noise suppression parts as described in the Technical Construction File (TCF).

No additional measures were employed to achieve compliance.

4.5 Test Setup Diagram

Diagram of Measurement Configuration for Radiation Test (Below 1GHz)

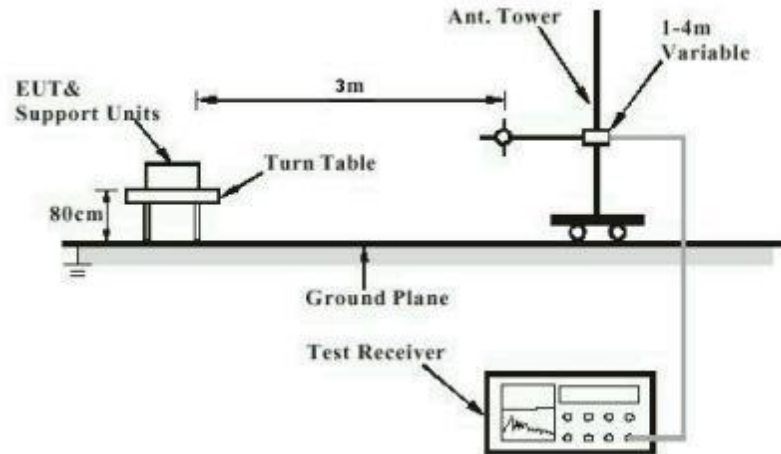


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

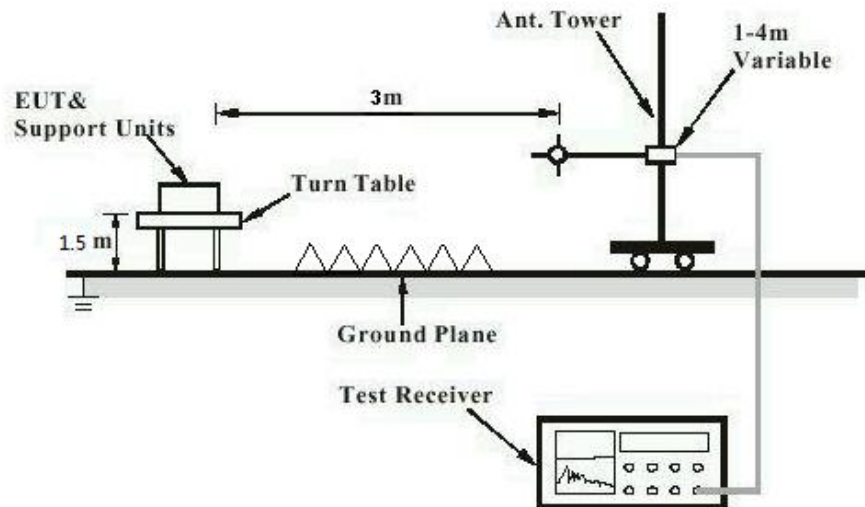


Diagram of Measurement Configuration for Mains Conduction Measurement

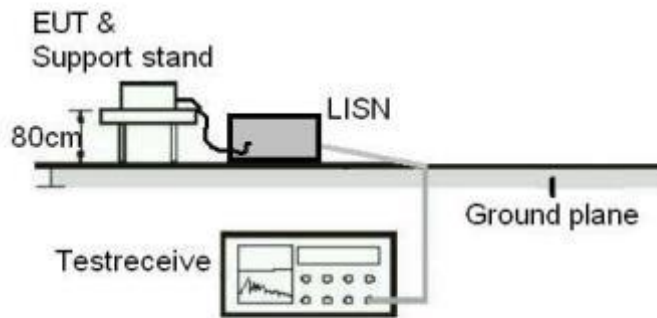
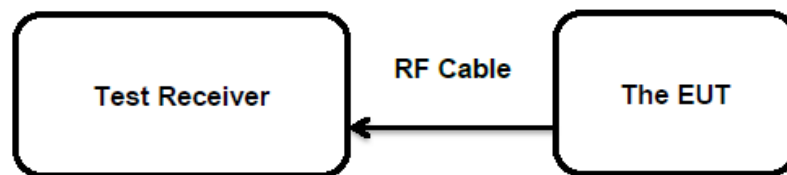


Diagram of Measurement Configuration for Conducted Transmitter Measurement



5 Test Results

5.1 Transmitter Requirement & Test Suites

5.1.1 Antenna Requirement

RESULT:

Pass

Test Specification

Test standard : FCC Part 15.247(b)(4) and Part 15.203

According to the manufacturer declared, the EUT has integral antennas, the max. uncorrelated antenna gain antenna is 4dBi, permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.

Therefore the EUT is considered sufficient to comply with the provision.

5.1.2 Maximum Peak Conducted Output Power

Test Specification

Test standard	: FCC Part 15.247(b)(3)
Basic standard	: ANSI C63.10: 2013
Limits	: 1.0 Watts
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2021-10-28 to 2021-12-31
Input voltage	: Full Battery
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

Table 5: Test Result of Maximum Average Conducted Output Power

Worst case for SISO mode

Test Mode	Test Channel (MHz)	Measured Average Power		Limit (W)
		(dBm)	(W)	
1.4MHz BW	2403.5	16.57	0.0454	< 1.0
	2435.5	16.67	0.0465	
	2469.5	17.39	0.0548	
1.4MHz BW CA	2405.12	16.53	0.0450	
	2437.12	16.89	0.0489	
	2471.12	17.19	0.0524	
3MHz BW	2405.5	16.66	0.0463	
	2435.5	17.08	0.0511	
	2468.5	17.42	0.0552	
3MHz BW CA	2408.2	16.75	0.0473	
	2438.2	17.04	0.0506	
	2471.2	17.28	0.0535	
10MHz BW	2407.5	23.53	0.2254	
	2437.5	27.01	0.5023	
	2466.5	21.70	0.1479	
	2467.5	21.08	0.1282	
20MHz BW	2412.5	22.33	0.1710	
	2420.5	23.41	0.2193	
	2425.5	24.12	0.2582	
	2437.5	27.49	0.5610	
	2445.5	23.85	0.2427	
	2461.5	22.87	0.1936	
40MHz BW	2462.5	20.92	0.1236	
	2422.5	18.29	0.0675	
	2430.5	20.92	0.1236	
	2437.5	24.57	0.2864	

	2445.5	19.71	0.0935	
	2452.5	16.89	0.0489	
Max. e.i.r.p.=27.49dBm+4dBi=31.49dBm, which is less than 36dBm=4W.				

Worst case for MIMO mode

Test Mode	Test Channel (MHz)	Measured Average Power		Limit (W)
		(dBm)	(W)	
1.4MHz BW	2403.5	16.64	0.0461	< 1.0
	2435.5	17.21	0.0526	
	2469.5	17.60	0.0575	
1.4MHz BW CA	2405.12	15.98	0.0396	
	2437.12	16.50	0.0447	
	2471.12	16.79	0.0478	
3MHz BW	2405.5	16.03	0.0401	
	2435.5	16.55	0.0452	
	2468.5	16.95	0.0495	
3MHz BW CA	2408.2	16.07	0.0405	
	2438.2	16.45	0.0442	
	2471.2	16.82	0.0481	
10MHz BW	2407.5	25.42	0.3483	
	2437.5	29.23	0.8375	
	2466.5	24.56	0.2858	
	2467.5	22.47	0.1766	
20MHz BW	2412.5	23.47	0.2223	
	2413.5	23.87	0.2438	
	2414.5	24.13	0.2588	
	2415.5	24.39	0.2748	
	2416.5	24.50	0.2818	
	2417.5	24.96	0.3133	
	2420.5	24.60	0.2884	
	2437.5	29.05	0.8035	
	2445.5	25.38	0.3451	
	2459.5	23.50	0.2239	
	2460.5	22.42	0.1746	
40MHz BW	2422.5	20.23	0.1054	
	2423.5	19.68	0.0929	
	2424.5	20.68	0.1169	
	2425.5	21.66	0.1466	
	2430.5	21.46	0.1400	
	2437.5	26.98	0.4989	
	2445.5	20.78	0.1197	
	2449.5	20.91	0.1233	
	2450.5	17.85	0.0610	
	2451.5	17.89	0.0615	
2452.5	17.40	0.0550		
Max. e.i.r.p.=26.24dBm+4dBi=33.23dBm, which is less than 36dBm=4W.				

Note:

- 1) The cable loss is taken into account in results.
- 2) Max. Antenna gain(G) of 2.4GHz SDR: 4dBi (uncorrelated antenna gain)
 e.i.r.p.=P_(Peak power)+ G, which is far below the 4 W

5.1.3 Conducted Power Spectral Density

RESULT:**Pass****Test Specification**

Test standard	:	FCC Part 15.247(e)
Basic standard	:	ANSI C63.10: 2013
Limits	:	< 8 dBm / 3kHz
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-10-28 to 2021-12-31
Input voltage	:	Full Battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 °C
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix A.

5.1.4 6dB Bandwidth

RESULT:**Pass****Test Specification**

Test standard	:	FCC Part 15.247(a)(2)
Basic standard	:	ANSI C63.10: 2013
Limits	:	> 500 KHz
Kind of test site	:	Shielded Room

Test Setup

Date of testing	:	2021-10-28 to 2021-12-31
Input voltage	:	Full Battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	25 °C
Relative humidity	:	56 %
Atmospheric pressure	:	101 kPa

For the measurement records, refer to the appendix A.

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5.1.5 99% Bandwidth

RESULT:**Pass****Test Specification**

Test standard : FCC Part 15.247(a)
Basic standard : ANSI C63.10: 2013
Kind of test site : Shielded Room

Test Setup

Date of testing : 2021-10-28 to 2021-12-31
Input voltage : Full Battery
Operation mode : A
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 56 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A.

5.1.6 Conducted Spurious Emissions Measured in 100 kHz Bandwidth

RESULT:**Pass****Test Specification**

Test standard	: FCC Part 15.247(d)
Basic standard	: ANSI C63.10: 2013
Limits	: 20dB (below that in the 100kHz bandwidth within the band that contains the highest level of the desired power); In addition, radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits specified in 15.209(a)
Kind of test site	: Shielded Room

Test Setup

Date of testing	: 2021-10-28 to 2021-12-31
Input voltage	: Full Battery
Operation mode	: A
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 56 %
Atmospheric pressure	: 101 kPa

Test results of 100kHz Bandwidth of Frequency Band Edge by Conducted method refer to test plots, and compliance is achieved as well.

For the measurement records, refer to the appendix A.

5.1.7 Radiated Spurious Emission

RESULT:**Pass****Test Specification**

Test standard	:	FCC Part 15.247(d) & FCC Part 15.205
Basic standard	:	ANSI C63.10: 2013
Limits	:	Refer to 15.209(a) of FCC part 15.247(d)
Kind of test site	:	3m Semi-anechoic Chamber

Test Setup

Date of testing	:	2021-10-28 to 2021-12-31
Input voltage	:	Full Battery
Operation mode	:	A
Test channel	:	Low / Middle / High
Ambient temperature	:	Refer to test result
Relative humidity	:	Refer to test result
Atmospheric pressure	:	101 kPa

Remark:

Testing was carried out within frequency range 9kHz to the tenth harmonics. Only the worst case spurious emissions configuration of the each mode were reported.

For the measurement records, refer to the appendix A.

6 Photographs of the Test Set-Up

For photographs of the test set-up, refer to the appendix B.

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