

Prüfbericht-Nr.: <i>Test report no.:</i>	CN24AX84 002	Auftrags-Nr.: <i>Order no.:</i>	168435965	Seite 1 von 27 Page 1 of 27
Kunden-Referenz-Nr.: <i>Client reference no.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	2023-07-20	
Auftraggeber: <i>Client:</i>	SZ DJI TECHNOLOGY CO., LTD Lobby of T2, DJI Sky City, No. 53 Xianyuan Road, Xili Community, Xili Street, Nanshan District, Shenzhen, China			
Prüfgegenstand: <i>Test item:</i>	DJI Matrice 3D, DJI Matrice 3TD			
Bezeichnung / Typ-Nr.: <i>Identification / Type no.:</i>	M3D, M3TD (Trademark: DJI)			
Auftrags-Inhalt: <i>Order content:</i>	Test Report			
Prüfgrundlage: <i>Test specification:</i>	CFR47 FCC Part 15: Subpart C Section 15.247			
Wareneingangsdatum: <i>Date of sample receipt:</i>	2023-11-21	Please refer to Photo Document		
Prüfmuster-Nr.: <i>Test sample no.:</i>	A003601954-016~030			
Prüfzeitraum: <i>Testing period:</i>	2024-01-08 - 2024-01-26			
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von: <i>tested by:</i>	<u>X Bell Hu</u>	genehmigt von: <i>authorized by:</i>	<u>X Jonathan Li</u>	
Datum: <i>Date:</i> 2024-01-31	<small>Signed by: Bell Hu</small>	Ausstellungsdatum: <i>Issue date:</i> 2024-01-31	<small>Signed by: Jonathan Li</small>	
Stellung / Position:	Sachverständige(r)/Expert	Stellung / Position:	Sachverständige(r)/Expert	
Sonstiges / <i>Other:</i>	FCC ID: SS3-M3D2308 This report is for Bluetooth LE, 2.4GHz Wi-Fi (2437MHz) and 2.4GHz SDR.			
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>	Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>			
<small>* Legende:</small>	<small>P(ass) = entspricht o.g. Prüfgrundlage(n)</small>	<small>F(ail) = entspricht nicht o.g. Prüfgrundlage(n)</small>	<small>N/A = nicht anwendbar</small>	<small>N/T = nicht getestet</small>
<small>* Legend:</small>	<small>P(ass) = passed a.m. test specification(s)</small>	<small>F(ail) = failed a.m. test specification(s)</small>	<small>N/A = not applicable</small>	<small>N/T = not tested</small>
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the above mentioned test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

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Anmerkungen
Remarks

1	<p>Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden.</p> <p><i>The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system. Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.</i></p>
2	<p>Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben.</p> <p><i>As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.</i></p>
3	<p>Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt.</p> <p><i>Test clauses with remark of * are subcontracted to qualified subcontractors and described under the respective test clause in the report.</i> <i>Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.</i></p>
4	<p>Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnissen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezüglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019.</p> <p><i>The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information on the resulting risk based of this decision rule please refer to ILAC G8:2019.</i></p>

Test Summary

5.1.1 ANTENNA REQUIREMENT

RESULT: Pass

5.1.2 MAXIMUM PEAK CONDUCTED OUTPUT POWER

RESULT: Pass

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 Bluetooth Low Energy

Appendix B: Test Results of 2.4GHz SDR

Appendix C: Test Results of 2437MHz

Appendix D: Photographs of the Test Set-up.

2 Test Sites

2.1 Test Facilities

TÜV Rheinland (Shenzhen) Co., Ltd.

No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. China.

FCC Accreditation Designation No.: 694916

ISED wireless device testing laboratory: 25069

2.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment

Radio Spectrum Testing (SRD-Tonscend)					
Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. until
EXA Signal Analyzer, Multi-touch	Keysight	N9010B	MY60241175	2023-09-22	2024-09-21
MXG X-Series RF Vector Signal Generator	Keysight	N5182B	MY61250137	2023-09-22	2024-09-21
EXG X-Series Microwave Analog Signal Generator	Keysight	N5173B	MY61250141	2023-09-22	2024-09-21
DC power supply	Keysight	E3642A	MY61276100	2023-09-22	2024-09-21
Power Control Unit	Tonscend	JS0806-4ADC	N/A	2023-09-22	2024-09-21
Automation Control Unit	Tonscend	JS0806-2	21C8060396	2023-09-22	2024-09-21
Test Software	Tonscend	JS1120-3	N/A	N/A	N/A
Control PC	Lenovo	TianYi510S-071MB	YLX23JMF	N/A	N/A
Shielding Room 8#	Albatross	SR8	APC17151-SR8	2021-06-22	2024-06-22
Unwanted Emission Testing (TS9975)					
Equipment	Manufacturer	Model	Serial No.	Cal. Date	Cal. until
EMI Test Receiver	R&S	ESR 7	102021	2023-07-26	2024-07-25
Signal Analyzer	R&S	FSV 40	101439	2023-07-26	2024-07-25
System Controller Interface	R&S	SCI-100	S10010038	N/A	N/A
Filterbank	R&S	Wlan	100759	2023-07-26	2024-07-25
OSP	R&S	OSP 120	102040	N/A	N/A
Pre-amplifier	R&S	SCU08F1	08320031	2023-07-26	2024-07-25
Amplifier	R&S	SCU-18F	180070	2023-07-26	2024-07-25
Amplifier	R&S	SCU40A	100475	2023-07-26	2024-07-25
Trilog Broadband Antenna (30 MHz - 7 GHz)	Schwarzbeck	VULB 9162	193	2022-08-07	2024-08-06

Double-Ridged Antenna (1 -18 GHz)	ETS-LINDGREN	3117	00218717	2022-08-07	2024-08-06
Wideband Ridged Horn Antenna (18-40 GHz)	Steatite	QMS-00880	19067	2022-08-28	2024-08-27
Active Loop Antenna	Schwarzbeck	FMZB 1513	302	2022-08-07	2024-08-06
Test software	R&S	EMC32 (V10.60.10)	N/A	N/A	N/A
Control PC	Dell	OptiPlex 7050	36NV9P2	N/A	N/A
3m Semi-Anechoic Chamber	Albatross	SAC-3m	APC17151-SAC	2021-06-22	2024-06-22

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.

Table 2: Measurement Uncertainty

Parameter	Uncertainty (k=2)
RF output power, conducted	± 0.99 dB
Occupied Channel Bandwidth	± 2.08 %
RF power density, conducted	± 0.99 dB
Unwanted Emissions, conducted	± 0.89 dB
All emissions, radiated	±4.17 dB

2.6 Location of Original Data

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

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2.7 Status of Facility Used for Testing

The TÜV Rheinland (Shenzhen) Co., Ltd. Test facility located at No. 362 Huanguan Road Middle, Longhua District, 518110, Shenzhen, P. R. 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 Products are DJI Aircraft, which supports Bluetooth, 2.4GHz SDR, 2.4GHz Wi-Fi, 5.2GHz SDR, 5.8GHz SDR and GNSS functions.

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

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

3.2 Ratings and System Details

Table 3: Technical Specification of EUT

General Information of EUT	Value
Kind of Equipment	DJI Matrice 3D, DJI Matrice 3TD
Type Designation	M3D, M3TD (They are identical on circuitry design, PCB layout, electrical components used and internal wiring, the only difference is that M3TD camera has thermal Imaging function which not supported by M3D camera.)
Trademark	DJI
FCC ID	SS3-M3D2308
Operating Voltage	14.76V DC, powered by battery
Testing Voltage	DC 14.76V by battery
Extreme Temperature Range	-20°C ~ +45°C
Radiofrequency operating mode	1) Bluetooth: operating within 2400-2483.5MHz, Bluetooth BLE (1Mbps&2Mbps) 2) 2.4GHz SDR: operating within 2400-2483.5MHz, supports 1.4MHz/3MHz/10MHz/20MHz/40MHz Bandwidth 3) 2.4GHz Wi-Fi 802.11g: operating at 2437MHz 4) 5.2GHz SDR: operating within 5150-5250MHz, supports 10MHz/20MHz/40MHz Bandwidth 5) 5.8GHz SDR: operating within 5725-5850MHz, supports 1.4MHz/3MHz/10MHz/20MHz/40MHz Bandwidth 6) GNSS (receiver)
Technical Specification of Bluetooth	
Operating Frequency	2402-2480MHz
Type of Modulation	GFSK
Data Rate	1Mbps, 2Mbps
Channel Number	40 channels
Channel Separation	2MHz
Antenna Type	Integral Antenna
Antenna Number	1
Antenna Gain	3.3 dBi (Provided by the Client)
The type of wideband data transmission equipment	DTS
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) 2410.5-2468.5MHz 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
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/20MHz/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), Completely uncorrelated signals.
Antenna Gain	2.8 dBi for ANT0 3.3 dBi for ANT1 2.9 dBi for ANT2 3.3 dBi for ANT3 (Provided by the Client)
The type of wideband data transmission equipment	DTS
Technical Specification of Wi-Fi (2437MHz only)	
Operating Frequency	2437-2437MHz
Type of Modulation	OFDM
Channel Number	1 channel
Antenna Type	Integral Antenna
Antenna Number	1
Antenna Gain	3.3 dBi Max (Provided by the Client)
The type of wideband data transmission equipment	DTS

Table 4: RF Channel and Frequency of Bluetooth LE

RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Table 5: RF Channel and Frequency of 2.4GHz SDR

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

2.4G 1.4MHz Bandwidth (CA Mode) (2405.12MHz-2471.12MHz)					
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)
1	2405.12	13	2429.12	25	2453.12
2	2407.12	14	2431.12	26	2455.12
3	2409.12	15	2433.12	27	2457.12
4	2411.12	16	2435.12	28	2459.12
5	2413.12	17	2437.12	29	2461.12
6	2415.12	18	2439.12	30	2463.12
7	2417.12	19	2441.12	31	2465.12
8	2419.12	20	2443.12	32	2467.12
9	2421.12	21	2445.12	33	2469.12
10	2423.12	22	2447.12	34	2471.12
11	2425.12	23	2449.12	/	/
12	2427.12	24	2451.12	/	/

2.4GHz 3MHz Bandwidth (2405.5MHz-2468.5MHz)					
RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)	RF Channel	Frequency (MHz)

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

2.4GHz 3MHz Bandwidth (CA Mode)
(2408.2MHz-2471.2MHz)

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

2.4GHz 10MHz Bandwidth
(2407.5MHz-2467.5MHz)

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

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, Bluetooth wireless transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- B. On, 2.4GHz SDR wireless transmitting mode
 - 1) Low Channel
 - 2) Middle Channel
 - 3) High Channel
- C. On, 2437MHz transmitting mode
- D. Off

3.4 Noise Generating and Noise Suppressing Parts

Refer to Circuit Diagram for further details.

3.5 Submitted Documents

- Application Form
- ID Label and Location Info
- User Manual
- Operation Description

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 testing were performed according to the procedures in ANSI C63.10: 2013.

According to clause 3.1, all tests were performed on model M3TD in this report.

4.3 Special Accessories and Auxiliary Equipment

Table 6: List of Accessories and Auxiliary Equipment

Description	Manufacturer	Model	Remark
Laptop	Lenovo	T480	PF-16A6N8

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)

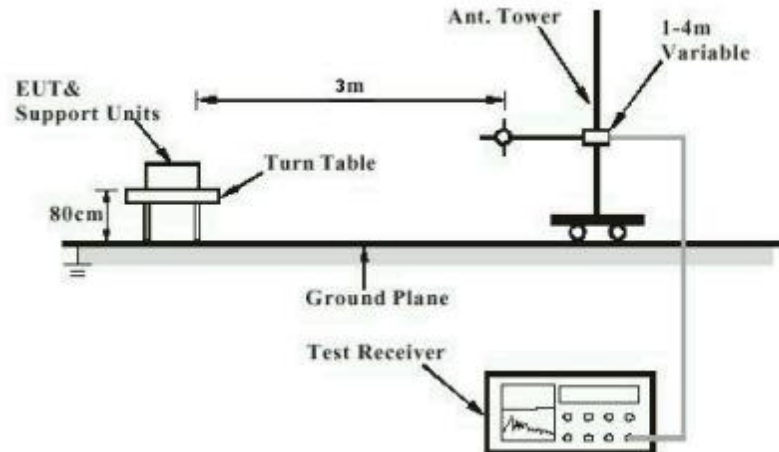


Diagram of Measurement Configuration for Radiation Test (Above 1GHz)

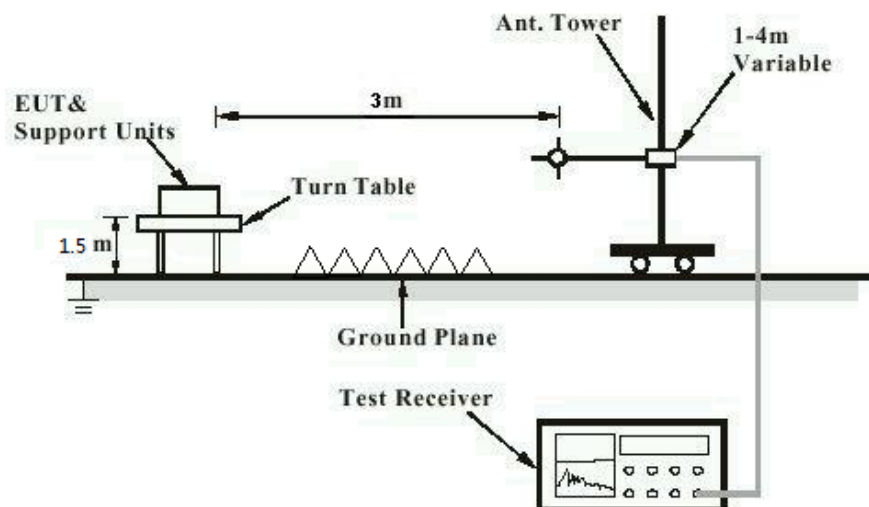


Diagram of Measurement Configuration for Mains Conduction Measurement

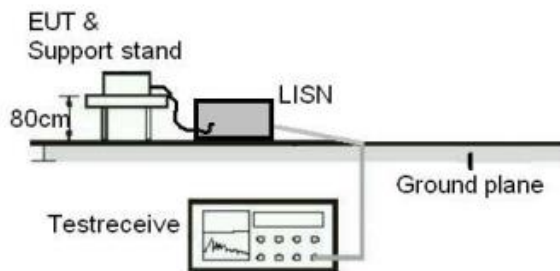
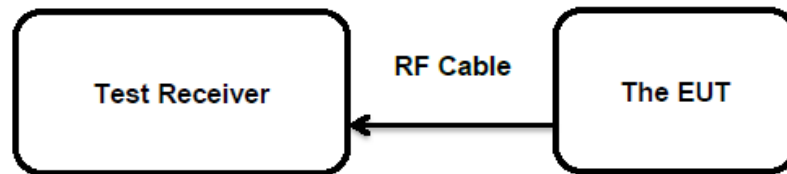


Diagram of Measurement Configuration for Conducted Transmitter Measurement



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
Limit : the use of antennas with directional gains that do not exceed 6 dBi

The EUT have four Integral Antennas, the max. uncorrelated antenna gain antenna is 3.3dBi for 2.4GHz SDR and 3.3dBi for BLE and 3.3dBi for 2437MHz, permanent attachment and no consideration of replacement.

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

Refer to EUT Photo for further details.

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5.1.2 Maximum Peak Conducted Output Power

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

Test standard : FCC Part 15.247(b)(3)
Basic standard : ANSI C63.10: 2013
Limits : < 1 W (Maximum Conducted Peak Power)
Kind of test site : Shielded Room

Test Setup

Date of testing : 2024-01-08 to 2024-01-26
Input voltage : DC 14.76V by battery
Operation mode : A, B, C
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 45 %
Atmospheric pressure : 101 kPa

For details refer to following test result.

Table 7: Test Result of Maximum Peak Conducted Output Power, Bluetooth LE

Test Mode	Data Rate	Test Channel (MHz)	Measured Peak Power		Limit (W)
			(dBm)	(W)	
Bluetooth LE	1 Mbps	2402	-0.15	0.0010	< 1.0
		2440	-0.22	0.0010	
		2480	-0.75	0.0008	
	2 Mbps	2402	0.04	0.0010	
		2440	0.32	0.0011	
		2480	-0.90	0.0008	
Maximum Measured Value			0.32	0.0011	
Max. e.i.r.p.=0.32dBm+3.3dBi=3.62dBm, which is less than 36dBm=4W.					

Table 8: Test Result of Maximum Conducted Output Power, 2.4GHz SDR

Worst case: SISO mode (ANT 1)

Test Mode	Test Channel (MHz)	Measured Average Power		Limit (W)
		(dBm)	(W)	
1.4MHz BW	2403.5	17.39	0.0548	< 1.0
	2435.5	18.00	0.0631	
	2469.5	16.93	0.0493	
1.4MHz BW CA	2405.12	18.03	0.0635	
	2437.12	17.9	0.0617	
	2471.12	17.45	0.0556	
3MHz BW	2405.5	16.91	0.0491	
	2435.5	17.48	0.0560	
	2468.5	16.59	0.0456	
3MHz BW CA	2408.2	17.07	0.0509	
	2438.2	17.59	0.0574	
	2471.2	17.11	0.0514	
10MHz BW	2407.5	25.58	0.3614	
	2437.5	27.99	0.6295	
	2463.5	25.28	0.3373	
	2465.5	24.28	0.2679	
	2467.5	23.19	0.2084	
20MHz BW	2412.5	24.15	0.2600	
	2414.5	25.09	0.3228	
	2437.5	27.73	0.5929	
	2455.5	24.95	0.3126	
	2457.5	23.31	0.2143	
	2462.5	21.46	0.1400	
40MHz BW	2422.5	22.58	0.1811	
	2428.5	24.64	0.2911	
	2437.5	27.59	0.5741	
	2446.5	24.76	0.2992	
	2452.5	21.99	0.1581	
Maximum Measured Value		27.99	0.6295	
Max. e.i.r.p.=27.99dBm+3.3dBi=31.29dBm, which is less than 36dBm=4W.				

Worst case: MIMO mode (ANT 2+1)

Test Mode	Test Channel (MHz)	Measured Average Power		Limit (W)
		(dBm)	(W)	
1.4MHz BW	2403.5	17.7	0.0589	< 1.0
	2435.5	18.17	0.0656	
	2469.5	17.2	0.0525	
1.4MHz BW CA	2405.12	18.13	0.0650	
	2437.12	18.27	0.0671	
	2471.12	17.5	0.0562	
3MHz BW	2405.5	17.98	0.0628	
	2435.5	18.45	0.0700	
	2468.5	17.75	0.0596	
3MHz BW CA	2408.2	17.29	0.0536	
	2438.2	17.7	0.0589	
	2471.2	17.33	0.0541	
10MHz BW	2407.5	25.2	0.3311	
	2437.5	27.87	0.6124	
	2463.5	25.16	0.3281	
	2467.5	22.57	0.1807	
20MHz BW	2412.5	23.74	0.2366	
	2414.5	24.79	0.3013	
	2437.5	27.67	0.5848	
	2455.5	24.78	0.3006	
	2462.5	21.14	0.1300	
40MHz BW	2422.5	23.19	0.2084	
	2427.5	24.79	0.3013	
	2428.5	25.25	0.3350	
	2437.5	27.71	0.5902	
	2444.5	24.62	0.2897	
	2446.5	24.09	0.2564	
	2452.5	20.66	0.1164	
Maximum Measured Value		27.87	0.6124	

Max. e.i.r.p.=27.87dBm+3.3dBi=31.17dBm, which is less than 36dBm=4W.

Table 9: Test Result of Maximum Conducted Output Power, 2437MHz

Test Mode	Test Channel (MHz)	Measured Peak Power		Limit (W)
		(dBm)	(W)	
20MHz	2437	26.15	0.4121	< 1.0

Max. e.i.r.p.=26.15dBm+3.3dBi=29.45dBm, which is less than 36dBm=4W.

Note:

- 1) The cable loss is taken into account in results, $e.i.r.p.=P_{(Peak\ power)}+G$
- 2) Antenna gain(G) of Bluetooth: 3.3dBi
 Antenna gain(G) of 2437MHz: 4dBi
 Antenna gain(G) of 2.4GHz SDR: 3.3dBi (uncorrelated antenna gain)

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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 : 2024-01-08 to 2024-01-26
Input voltage : DC 14.76V by battery
Operation mode : A, B, C
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 45 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A, B, C.

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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 : 2024-01-08 to 2024-01-26
Input voltage : DC 14.76V by battery
Operation mode : A, B, C
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 45 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A, B, C.

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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 : 2024-01-08 to 2024-01-26
Input voltage : DC 14.76V by battery
Operation mode : A, B, C
Test channel : Low / Middle / High
Ambient temperature : 25 °C
Relative humidity : 45 %
Atmospheric pressure : 101 kPa

For the measurement records, refer to the appendix A, B, C.

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	: 2024-01-08 to 2024-01-26
Input voltage	: DC 14.76V by battery
Operation mode	: A, B, C
Test channel	: Low / Middle / High
Ambient temperature	: 25 °C
Relative humidity	: 45 %
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, B, C.

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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 : 2024-01-13 to 2024-01-23
Input voltage : DC 14.76V by battery
Operation mode : A, B, C
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, B, C.

6 Photographs of the Test Set-Up

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

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