Shenzhen CTL Testing Technology Co., Ltd.
Tel: +86-755-89486194 E-mail: ctl@ctl-lab.com

TEST REPORT

FCC PART 15.247

Report Reference No......: **CTL2508214041-WF**

Compiled by: (position+printed name+signature)	Happy Guo (File administrators)	
Tested by: (position+printed name+signature)	Lydia Ou (Test Engineer)	
Approved by: (position+printed name+signature)	Ivan Xie (Manager)	

Product Name..... :	Capacitive pen
Model/Type reference.....:	ZP-9APro
List Model(s).....:	ZP1, ZP1-ABL, ZP1-AP, ZP3, ZP3-A, ZP4, ZP4-AW, ZP4-A, ZP5-M, ZP5-MA, ZP6-ASG, ZP6-SG, ZP9-S, ZP9-AS, ZP10-ATPro
Trade Mark..... :	N/A
FCC ID..... :	**2BR99-ZP9A**
Applicant's name..... :	**Dongguan Zhongtuo Ling Intelligent Technology Co., Ltd.**
Address of applicant.....:	Room 359, No. 221, Kangle South Road, Houjie Town, Dongguan City
Test Firm.....:	**Shenzhen CTL Testing Technology Co., Ltd.**
Address of Test Firm.....:	Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
Test specification.....:	
Standard.....:	**FCC Part 15.247:** Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.
TRF Originator.....:	Shenzhen CTL Testing Technology Co., Ltd.
Master TRF..... :	Dated 2011-01
Date of receipt of test item..... :	Aug. 27, 2025
Date of Test Date.....:	Aug. 28, 2025- Sep. 15, 2025
Date of Issue.....:	Sep. 18, 2025
Result..... :	**Pass**

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TEST REPORT

Test Report No. :	CTL2508214041-WF	Sep. 18, 2025 Date of issue

Equipment under Test	:	Capacitive pen
Sample No	:	CTL250821404003, CTL250821404004, CTL250821404005
Model /Type	:	ZP-9APro
Listed Models	:	ZP1, ZP1-ABL, ZP1-AP, ZP3, ZP3-A, ZP4, ZP4-AW, ZP4-A, ZP5-M, ZP5-MA, ZP6-ASG, ZP6-SG, ZP9-S, ZP9-AS, ZP10-ATPro
Applicant	:	**Dongguan Zhongtuo Ling Intelligent Technology Co., Ltd.**
Address	:	Room 359, No. 221, Kangle South Road, Houjie Town, Dongguan City
Manufacturer	:	**Dongguan Zhongtuo Ling Intelligent Technology Co., Ltd.**
Address	:	Room 359, No. 221, Kangle South Road, Houjie Town, Dongguan City

Test result	**Pass ***

* In the configuration tested, the EUT complied with the standards specified page 5.

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the issuing testing laboratory.

This device (product name: Capacitive pen) model name: ZP-9APro, SZP1, ZP1-ABL, ZP1-AP, ZP3, ZP3-A, ZP4, ZP4-AW, ZP4-A, ZP5-M, ZP5-MA, ZP6-ASG, ZP6-SG, ZP9-S, ZP9-AS, ZP10-ATPro. The only difference in the model names of this equipment is that the PCB boards, circuits, structures and interiors of these models are the same, which does not affect the test results.

** Modified History **

Revisions	Description	Issued Data	Report No.	Remark
Version 1.0	Initial Test Report Release	2025-09-18	CTL2508214041-WF	Tracy Qi

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1. SUMMARY

1.1. TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

ANSI C63.10: 2020: American National Standard for Testing Unlicensed Wireless Devices

KDB 558074 D01 v05r02: KDB558074 D01 15.247 Meas Guidance v05r02

1.2. Test Description

FCC PART 15.247		
FCC Part 15.207	AC Power Conducted Emission	PASS
FCC Part 15.247(a)(2)	6dB Bandwidth	PASS
FCC Part 15.247(d)	Spurious RF Conducted Emission	PASS
FCC Part 15.247(b)	Maximum Conducted Output Power	PASS
FCC Part 15.247(e)	Power Spectral Density	PASS
FCC Part 15.109/ 15.205/ 15.209	Radiated Emissions	PASS
FCC Part 15.247(d)	Band Edge	PASS
FCC Part 15.203/15.247 (b)	Antenna Requirement	PASS

1.3. Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co.,Ltd.
Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055
There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.10 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832.

1.4. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16 - 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for CTL laboratory is reported:

Test	Measurement Uncertainty	Notes
Transmitter power Radiated	±2.20 dB	(1)
Occupied Bandwidth	±0.02ppm	(1)
Radiated Emission 30~1000MHz	±4.08dB	(1)
Radiated Emission Above 1GHz	±4.32dB	(1)
Conducted Disturbance0.15~30MHz	±2.96dB	(1)
20dB Emission Bandwidth	±1.9%	(1)
Carrier Frequency Separation	±1.9%	(1)

Maximum Power Spectral Density Level	±0.98 dB	(1)
Number of Hopping Channel	±1.9%	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95%
(2) confidence level using a coverage factor of k=1.96.

1.5. Auxiliary test equipment information

Manufacturer	Description	Model	Serial Number
Huawei	SuperCharge	HW-100225C00	HC78E2N4121901
Apple Inc.	iPad Air 5	MM9E3CH/A	P6NWJCP66W

2. GENERAL INFORMATION

2.1. Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C
Relative Humidity:	55 %
Air Pressure:	101 kPa

2.2. General Description of EUT

Product Name:	Capacitive pen
Model/Type reference:	ZP-9APro
Power supply:	Input: 5V ⎓ 0.13A Battery: 3.7V, 130mAh, 0.481Wh
Working voltage:	DC 3.7V from battery, charged by AC-DC adapter
Bluetooth LE	
Supported type:	Bluetooth Low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	Internal Antenna
Antenna gain:	0 dBi

Note1: For more details, please refer to the user's manual of the EUT.
Note2: Antenna gain provided by the applicant.

2.3. Description of Test Modes and Test Frequency

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing.

There are 40 channels provided to the EUT and Channel 00/19/39 were selected for BLE test.

Test Modes	BLE 1M Continuous Transmitting	BLE 2M Continuous Transmitting
1	■	
2		■

Operation Frequency List：

Channel	Frequency (MHz)
00	**2402**
02	2404
03	2406
⋮	⋮
19	**2440**
⋮	⋮
37	2476
38	2478
39	**2480**

Note: The line display in grey were the channel selected for testing

2.4. Equipments Used during the Test

Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2025/04/29	2026/04/28
LISN	ROHDE & SCHWARZ	ESH2-Z5	860014/010	2025/04/29	2026/04/28
Limitator	ROHDE & SCHWARZ	ESH3-Z2	100408	2025/04/29	2026/04/28
Software:					
Name of Software:			Version:		
ES-K1			V1.71		

Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
Ring antenna	Da Ze	ZN30900A	/	2024/04/30	2027/04/29
Double cone logarithmic antenna	Schwarzbeck	VULB 9168	824	2023/02/13	2026/02/12
Horn Antenna	Sunol Sciences Corp.	DRH-118	A062013	2024/11/25	2027/11/24
Horn Antenna	Ocean Microwave	OBH100400	26999002	2025/02/21	2028/02/20
Amplifier	/	XSD-LNA-1-18G-45A	/	2025/04/30	2026/04/29
Amplifier	Agilent	8449B	3008A02306	2025/05/01	2026/04/30
Amplifier	Brief&Smart	LNA-4018	2104197	2025/04/30	2026/04/29
EMI Test Receiver	ROHDE & SCHWARZ	ESCI	1166.5950.03	2025/04/29	2026/04/28
Spectrum Analyzer	RS	FSP	1164.4391.38	2025/04/29	2026/04/28
9kHz-40GHz coaxial line chamber 2	/	Z108-NJ-NJ-9.5M	21121049	2025/11/30	2026/11/29
Software:					
Name of Software:			Version:		
EZ_EMC(Below 1GHz)			V1.1.4.2		
EZ_EMC(Above 1GHz)			V1.1.4.2		

Test Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal.Due
Spectrum Analyzer	Keysight	N9020A	MY53420874	2025/04/29	2026/04/28
Temperature/Humidity Meter	Ji Yu	MC501	/	2025/05/06	2026/05/05
Software:					
Name of Software:			Version:		
TST-PASS			V2.0		

2.5. Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.6. Modifications

No modifications were implemented to meet testing criteria.

3. TEST CONDITIONS AND RESULTS

3.1. Conducted Emissions Test

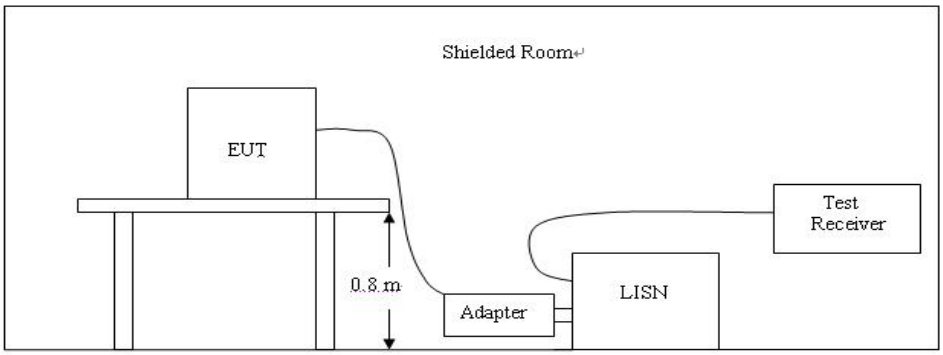
LIMIT

FCC CFR Title 47 Part 15 Subpart C Section 15.207

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST CONFIGURATION



TEST PROCEDURE

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system; a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10:2020.
2. Support equipment, if needed, was placed as per ANSI C63.10:2020.
3. All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2020.
4. The adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5. All support equipments received AC power from a second LISN, if any.
6. The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7. Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8. During the above scans, the emissions were maximized by cable manipulation.

TEST RESULTS

Remark:
All low, middle and high channel were tested; only the worst result of low channel was reported as below:

Line:	L

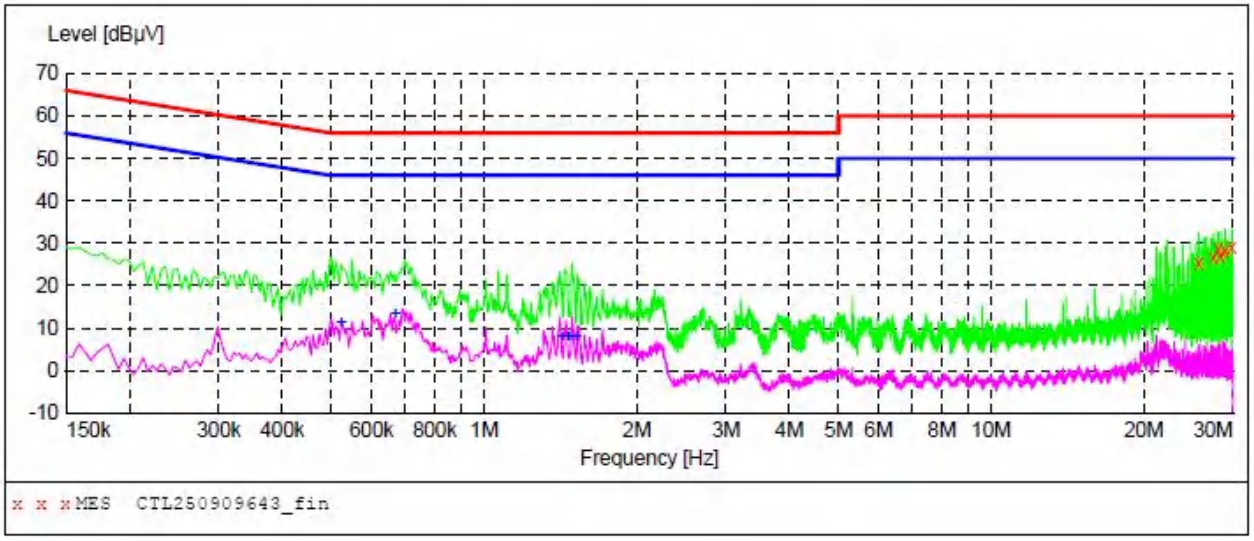
Shenzhen CTL Testing Technology Co., Ltd.

Voltage Mains Test FCC PART 15 C

```
EUT:
Manufacturer:
Operating Condition: BLE2M 2402MHz
Test Site:           /
Operator:            JYP
Test Specification:  AC 120V/60Hz
Comment:             CTL2508214041-WF
Start of Test:       9/9/2025 / 3:55:05PM
```

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL250909643_fin"

9/9/2025 3:57PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
25.665000	25.50	11.1	60	34.5	QP	L1	GND
27.451500	26.80	11.1	60	33.2	QP	L1	GND
28.045500	28.50	11.1	60	31.5	QP	L1	GND
28.342500	27.00	11.1	60	33.0	QP	L1	GND
28.941000	28.40	11.1	60	31.6	QP	L1	GND
29.841000	29.00	11.2	60	31.0	QP	L1	GND

MEASUREMENT RESULT: "CTL250909643_fin2"

9/9/2025 3:57PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.523500	11.10	10.0	46	34.9	AV	L1	GND
0.667500	13.30	10.0	46	32.7	AV	L1	GND
1.428000	8.10	10.1	46	37.9	AV	L1	GND
1.464000	8.10	10.1	46	37.9	AV	L1	GND
1.468500	7.80	10.1	46	38.2	AV	L1	GND
1.518000	7.90	10.1	46	38.1	AV	L1	GND

Line:	N

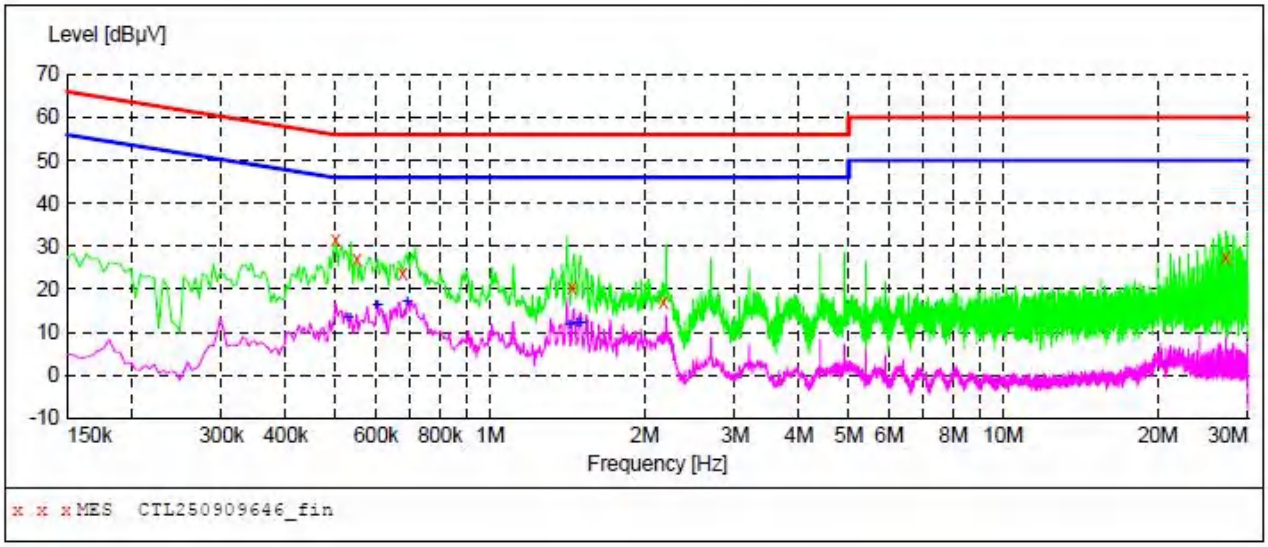
Shenzhen CTL Testing Technology Co., Ltd.

Voltage Mains Test FCC PART 15 C

```
EUT:
Manufacturer:
Operating Condition: BLE2M 2402MHz
Test Site:           /
Operator:            JYP
Test Specification:  AC 120V/60Hz
Comment:             CTL2508214041-WF
Start of Test:       9/9/2025 / 4:03:19PM
```

SCAN TABLE: "Voltage (9K-30M)FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT: "CTL250909646_fin"

9/9/2025 4:05PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.501000	31.50	10.0	56	24.5	QP	N	GND
0.550500	26.90	10.0	56	29.1	QP	N	GND
0.676500	23.80	10.0	56	32.2	QP	N	GND
1.446000	20.40	10.1	56	35.6	QP	N	GND
2.179500	17.00	10.2	56	39.0	QP	N	GND
27.154500	27.50	11.1	60	32.5	QP	N	GND

MEASUREMENT RESULT: "CTL250909646_fin2"

9/9/2025 4:05PM

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Detector	Line	PE
0.528000	13.30	10.0	46	32.7	AV	N	GND
0.604500	16.40	10.0	46	29.6	AV	N	GND
0.690000	17.20	10.0	46	28.8	AV	N	GND
1.428000	11.60	10.1	46	34.4	AV	N	GND
1.477500	12.00	10.1	46	34.0	AV	N	GND
1.500000	11.90	10.1	46	34.1	AV	N	GND

3.2. Radiated Emissions and Band Edge

Limit

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission out of authorized band shall not exceed the following table at a 3 meters measurement distance.

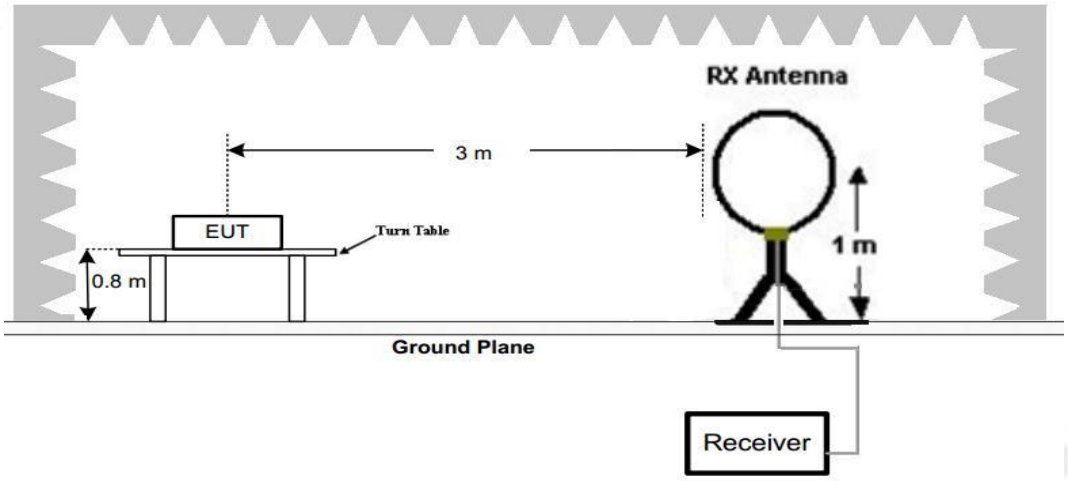
In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a)

Radiated emission limits

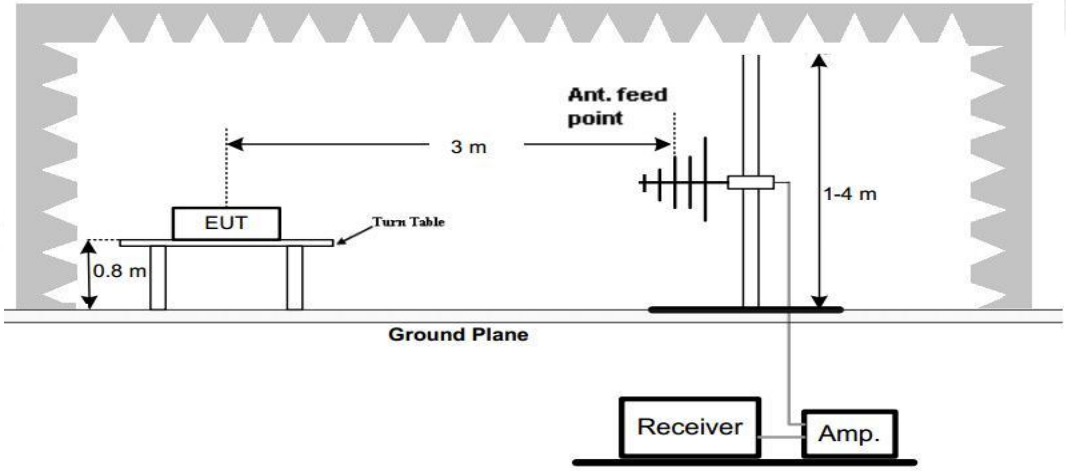
Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

TEST CONFIGURATION

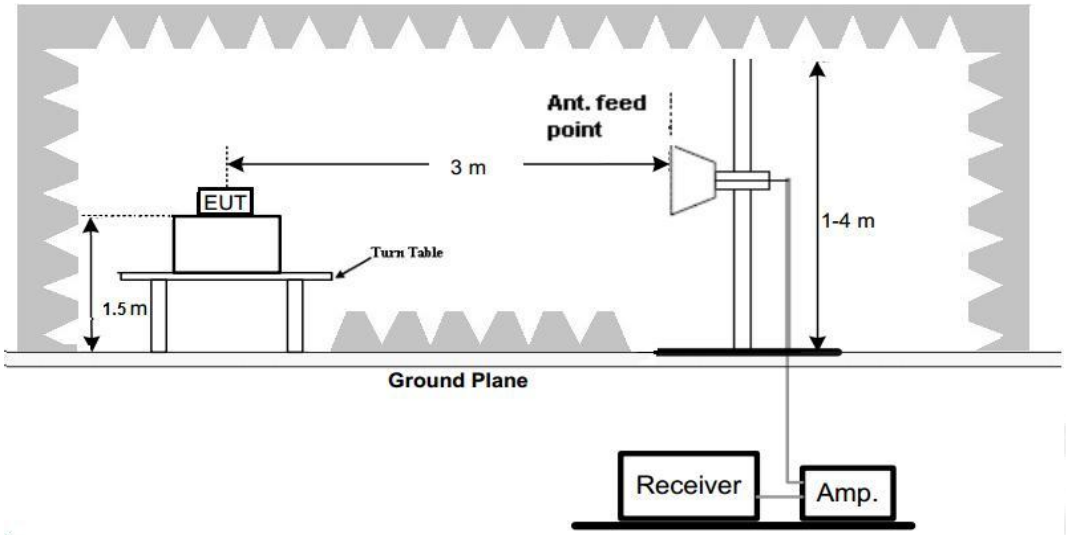
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



Test Procedure

1. Below 1GHz measurement the EUT is placed on a turntable which is 0.8m above ground plane, and above 1GHz measurement EUT was placed on a low permittivity and low loss tangent turn table which is 1.5m above ground plane.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement –X, Y, and Z-plane. The X-plane results were found as the worst case and were shown in this report.

TEST RESULTS

Remark:
1. We have tested low channel, middle channel, high channel of all modes.
2. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, Found the emission level are attenuated 20dB below the limits from 9 kHz to 30MHz, so it does not recorded in report.

For 30MHz-1GHz

Horizontal

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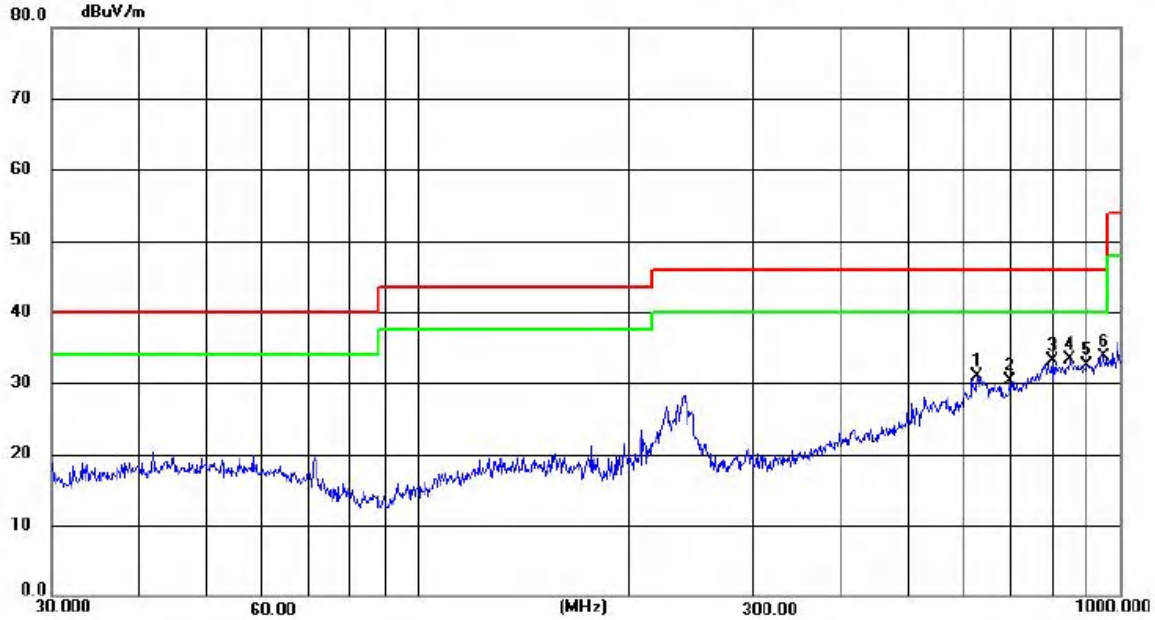
Tel: +86-755-89486194

Radiated Emission Measurement

File :RF_9 Data :#331 Date: 2025/09/09 Time: 9:13:55



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT:
M/N:
Mode: BLE2M 2402MHz
Note: TL2508214041-WF

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	626.7241	8.50	22.40	30.90	46.00	15.10	peak	100	26	P	
2	694.7218	7.53	22.75	30.28	46.00	15.72	peak	100	264	P	
3	799.3300	7.52	25.63	33.15	46.00	12.85	peak	100	264	P	
4	845.8290	7.10	26.22	33.32	46.00	12.68	peak	100	68	P	
5	897.7832	6.07	26.53	32.60	46.00	13.40	peak	100	351	P	
6	949.1770	6.64	27.11	33.75	46.00	12.25	peak	100	0	P	

Vertical

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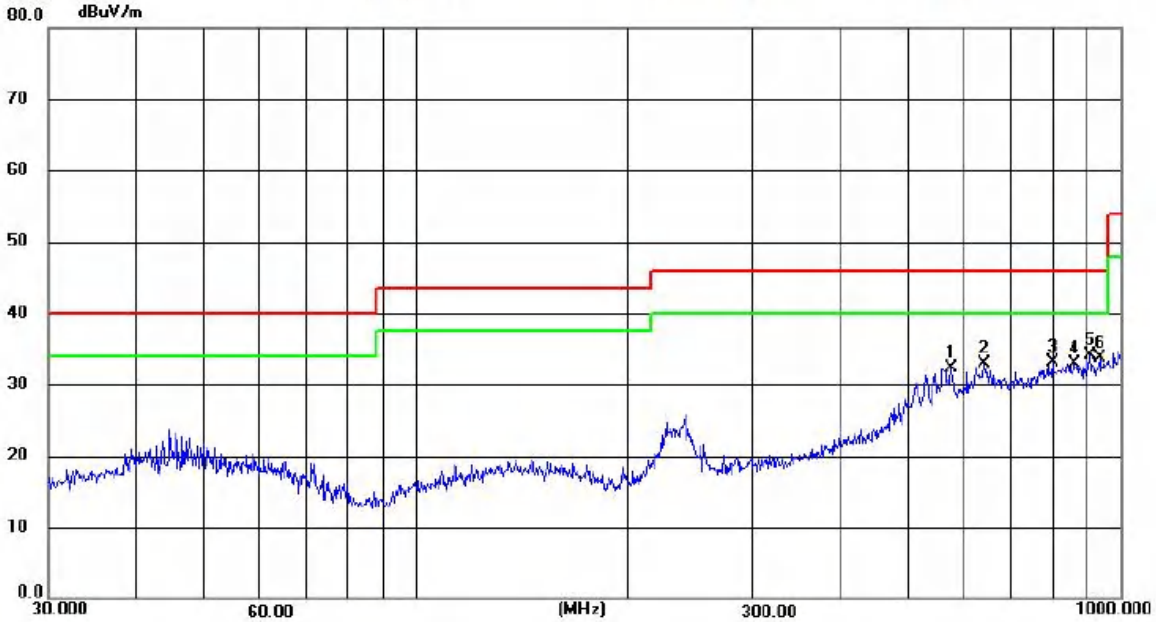
Tel: +86-755-89486194

Radiated Emission Measurement

File :RF_9 Data :#332 Date: 2025/09/09 Time: 9:14:46



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_30-1000MHz
EUT:
M/N:
Mode: BLE2M 2402MHz
Note: TL2508214041-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	576.3916	11.20	21.07	32.27	46.00	13.73	peak	100	351	P	
2	638.3686	10.19	22.75	32.94	46.00	13.06	peak	100	195	P	
3	800.0310	7.47	25.64	33.11	46.00	12.89	peak	100	309	P	
4	860.0352	6.64	26.35	32.99	46.00	13.01	peak	100	309	P	
5	904.1016	7.41	26.63	34.04	46.00	11.96	peak	100	82	P	
6	935.5463	6.62	27.08	33.70	46.00	12.30	peak	100	39	P	

For 1GHz-18GHz

BLE Mode (above 1GHz)

CH00	Horizontal

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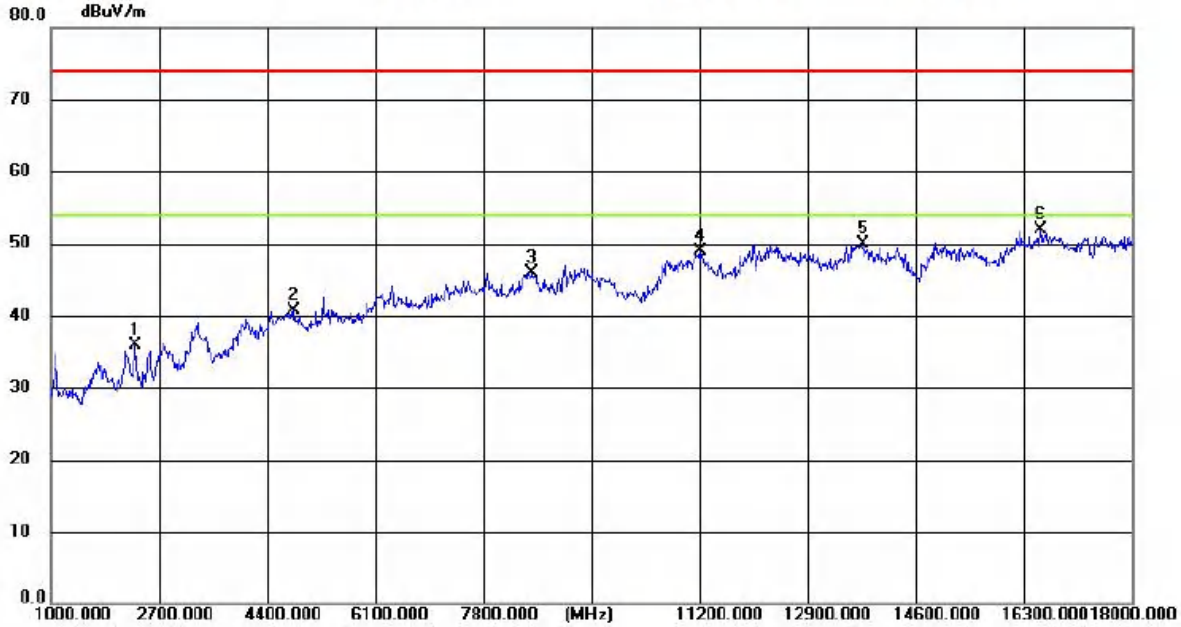
Radiated Emission Measurement

File :RF_9 Data :#477 Date: 2025/09/10 Time: 18:08:34



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N:
Mode: BLE2M 2402MHz TX
Note: CTL2508214041-WF

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2336.625	53.00	-17.15	35.85	74.00	38.15	peak	150	342	P	
2	4833.500	48.70	-8.03	40.67	74.00	33.33	peak	150	285	P	
3	8556.500	47.66	-1.71	45.95	74.00	28.05	peak	150	214	P	
4	11223.375	48.01	0.83	48.84	74.00	25.16	peak	150	143	P	
5	13777.625	46.14	3.76	49.90	74.00	24.10	peak	150	171	P	
6	16561.375	45.58	6.25	51.83	74.00	22.17	peak	150	28	P	

CH00	Vertical

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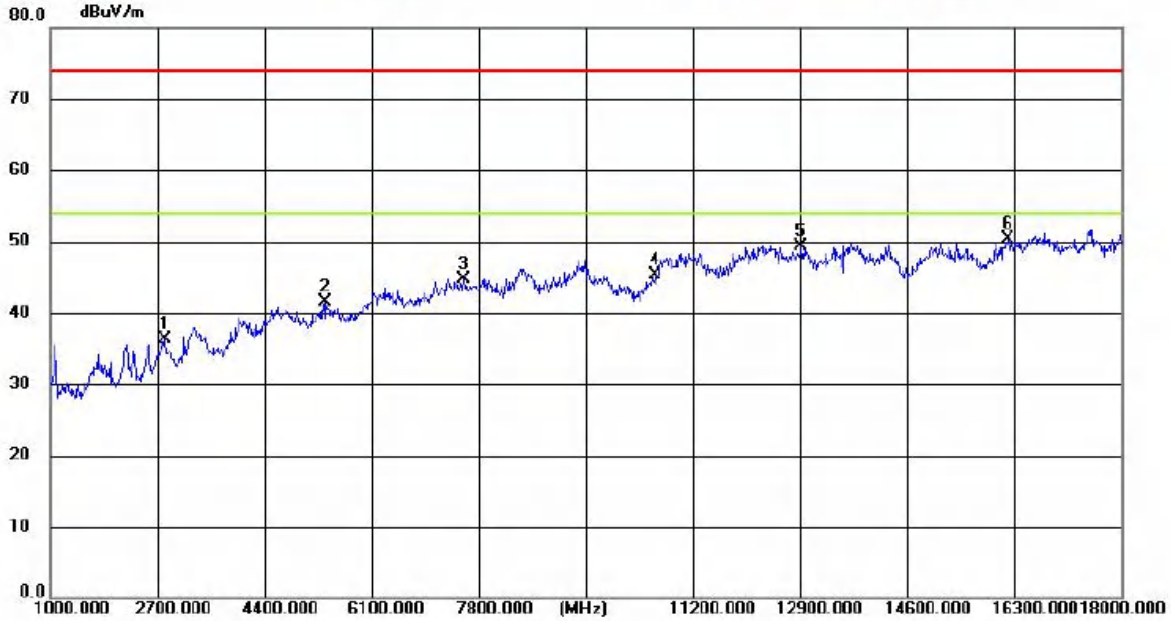
Radiated Emission Measurement

File :RF_9 Data :#478 Date: 2025/09/10 Time: 18:09:26



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N:
Mode: BLE2M 2402MHz TX
Note: CTL2508214041-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2831.750	51.16	-14.89	36.27	74.00	37.73	peak	150	304	P	
2	5383.875	49.27	-7.76	41.51	74.00	32.49	peak	150	304	P	
3	7566.250	47.41	-2.75	44.66	74.00	29.34	peak	150	289	P	
4	10619.875	45.98	-0.72	45.26	74.00	28.74	peak	150	233	P	
5	12917.000	47.37	1.98	49.35	74.00	24.65	peak	150	48	P	
6	16208.625	45.12	5.26	50.38	74.00	23.62	peak	150	34	P	

CH19	Horizontal

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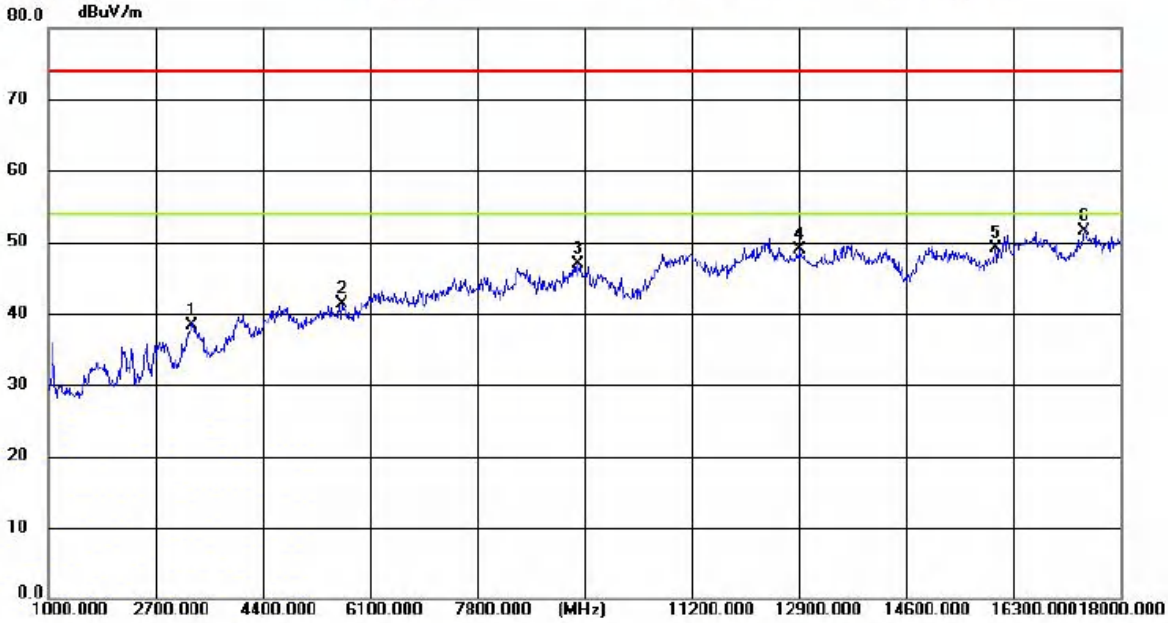
Radiated Emission Measurement

File :RF_9 Data :#475 Date: 2025/09/10 Time: 18:06:10



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N:
Mode: BLE2M 2440MHz TX
Note: CTL2508214041-WF

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	3290.750	51.14	-12.76	38.38	74.00	35.62	peak	150	213	P	
2	5670.750	48.27	-6.93	41.34	74.00	32.66	peak	150	1	P	
3	9404.375	46.69	0.21	46.90	74.00	27.10	peak	150	142	P	
4	12917.000	46.92	1.98	48.90	74.00	25.10	peak	150	360	P	
5	16013.125	44.40	4.79	49.19	74.00	24.81	peak	150	86	P	
6	17422.000	42.76	8.84	51.60	74.00	22.40	peak	150	185	P	

CH19	Vertical

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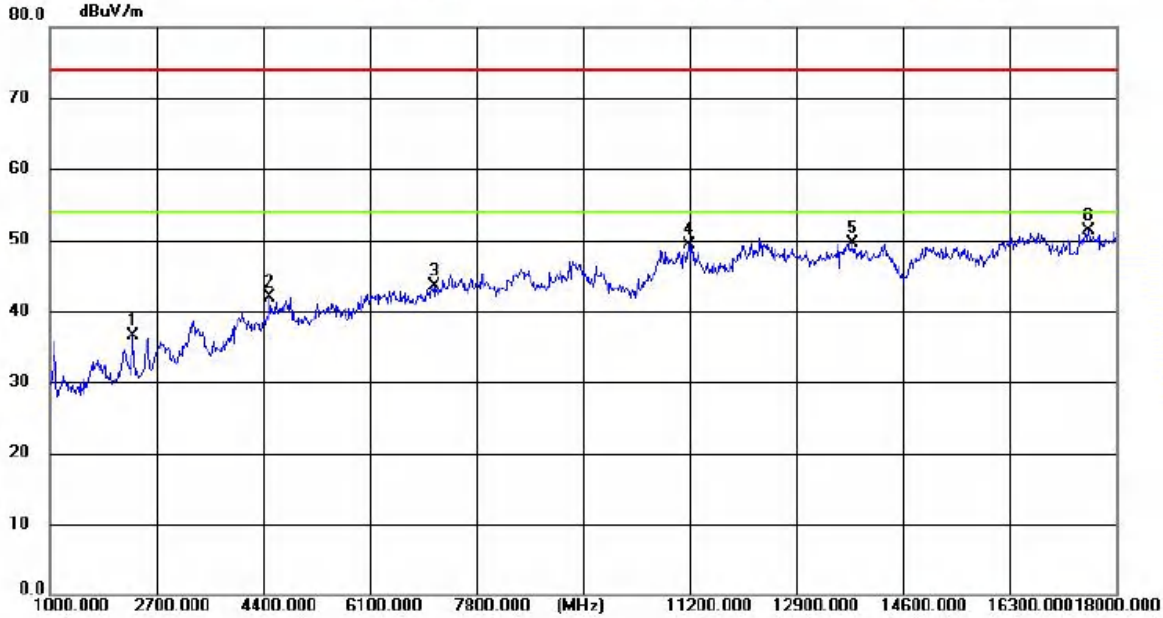
Radiated Emission Measurement

File :RF_9 Data :#476 Date: 2025/09/10 Time: 18:07:02



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N:
Mode: BLE2M 2440MHz TX
Note: CTL2508214041-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2338.750	53.60	-17.15	36.45	74.00	37.55	peak	150	119	P	
2	4508.375	50.41	-8.48	41.93	74.00	32.07	peak	150	246	P	
3	7134.875	47.14	-3.55	43.59	74.00	30.41	peak	150	161	P	
4	11191.500	48.47	0.83	49.30	74.00	24.70	peak	150	304	P	
5	13803.125	45.77	3.73	49.50	74.00	24.50	peak	150	175	P	
6	17558.000	42.28	9.12	51.40	74.00	22.60	peak	150	119	P	

CH39	Horizontal

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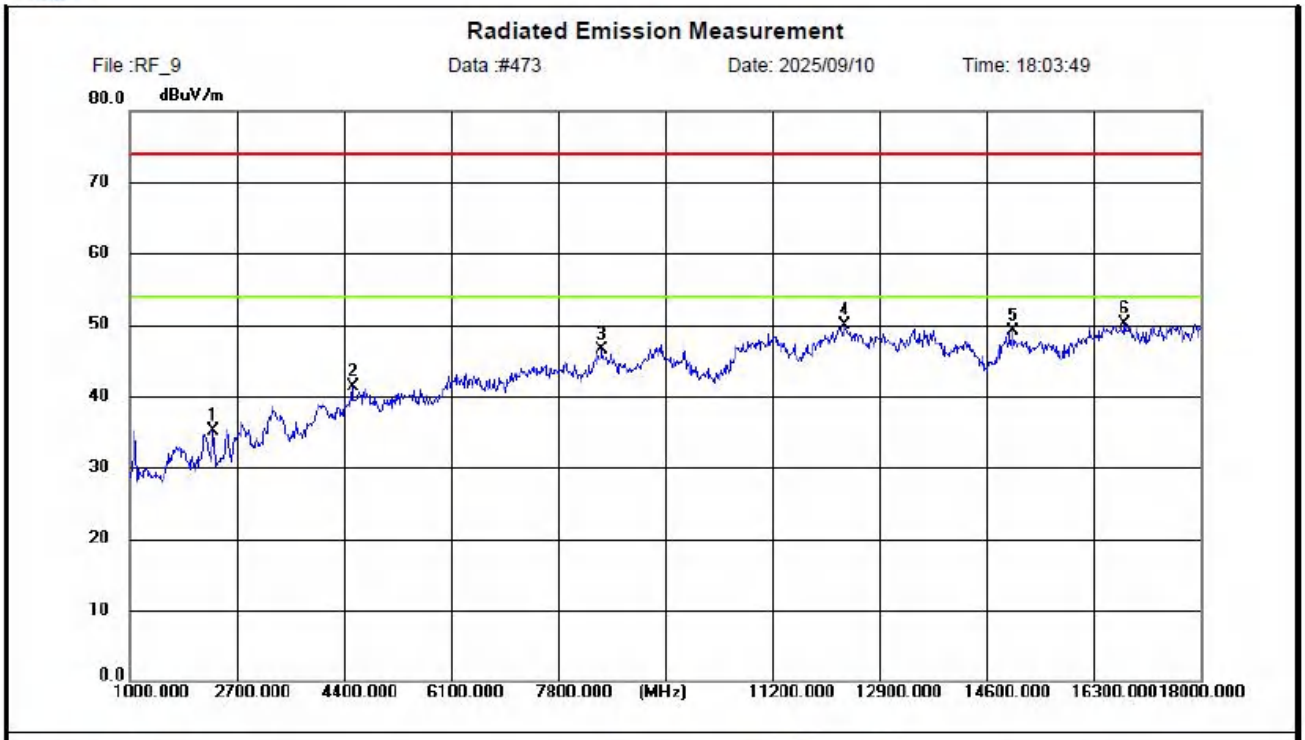

Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N:
Mode: BLE2M 2480MHz TX
Note: CTL2508214041-WF

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2338.750	52.23	-17.15	35.08	74.00	38.92	peak	150	297	P	
2	4538.125	49.64	-8.43	41.21	74.00	32.79	peak	150	311	P	
3	8505.500	48.22	-1.74	46.48	74.00	27.52	peak	150	184	P	
4	12339.000	47.64	2.19	49.83	74.00	24.17	peak	150	1	P	
5	15035.625	45.73	3.37	49.10	74.00	24.90	peak	150	360	P	
6	16799.375	43.50	6.58	50.08	74.00	23.92	peak	150	227	P	

CH39	Vertical

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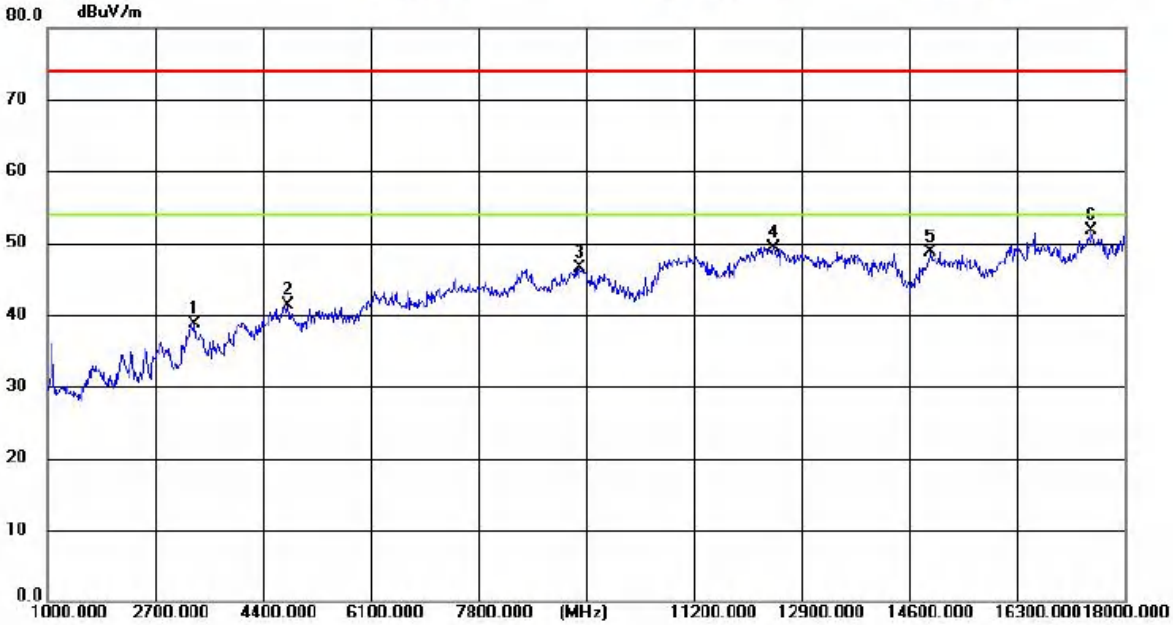
Radiated Emission Measurement

File :RF_9 Data :#474 Date: 2025/09/10 Time: 18:04:40



Site LAB Chamber 2
Limit: FCC Part15 RE-Class C_Above 1GHz_PK
EUT:
M/N:
Mode: BLE2M 2480MHz TX
Note: CTL2508214041-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	3331.125	51.25	-12.62	38.63	74.00	35.37	peak	150	147	P	
2	4803.750	49.37	-8.09	41.28	74.00	32.72	peak	150	175	P	
3	9406.500	46.28	0.22	46.50	74.00	27.50	peak	150	218	P	
4	12466.500	47.06	2.27	49.33	74.00	24.67	peak	150	247	P	
5	14923.000	45.54	3.19	48.73	74.00	25.27	peak	150	304	P	
6	17487.875	42.69	9.11	51.80	74.00	22.20	peak	150	360	P	

REMARKS:
1.Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2.Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)-Pre-amplifier Factor
3.Margin value = Limit value- Emission level.
4.PK detector measurement value is lower than the average limit. Therefore, there is no need to test AV detector measurements.
5.RBW1MHz VBW3MHz Peak detector is for PK value; RBW 1MHz VBW10Hz Peak detector is for AV value.
6.For fundamental frequency, RBW 3MHz VBW 3MHz Peak detector is for PK Value; RMS detector is for AV value.
7.Other emissions are attenuated 20dB below the limits from 9kHz to 30MHz, so it does not recorded in report.
8.18GHz-26GHz not recorded for no spurious point have a margin of less than 6 dB with respect to the limits.

Results of Band Edges Test (Radiated)

CH00	Horizontal

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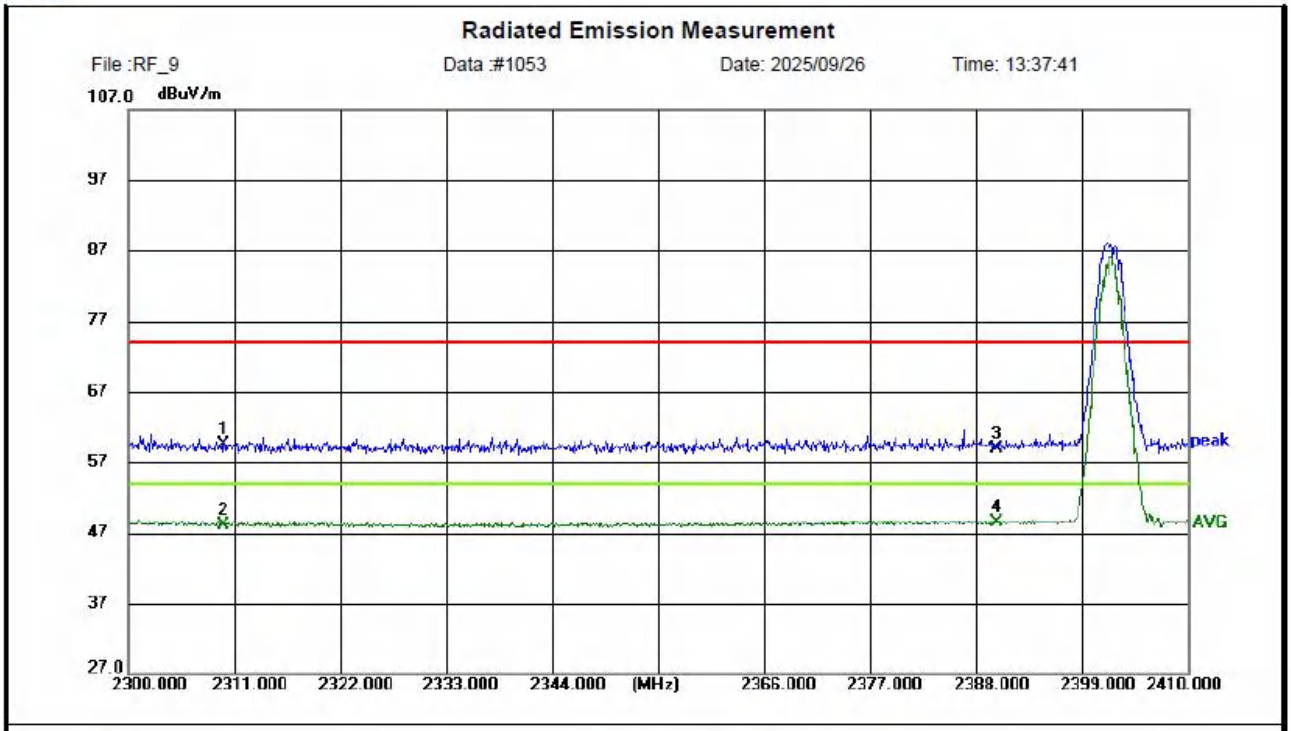

Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N:
Mode: BLE2M 2402MHz
Note: CTL2508214041-WF

Polarization: ***Horizontal***
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	24.88	34.57	59.45	74.00	14.55	peak	150	360	P	
2	2310.000	13.50	34.57	48.07	54.00	5.93	AVG	150	360	P	
3	2390.000	24.24	34.75	58.99	74.00	15.01	peak	150	360	P	
4	2390.000	13.77	34.75	48.52	54.00	5.48	AVG	150	360	P	

CH00	Vertical

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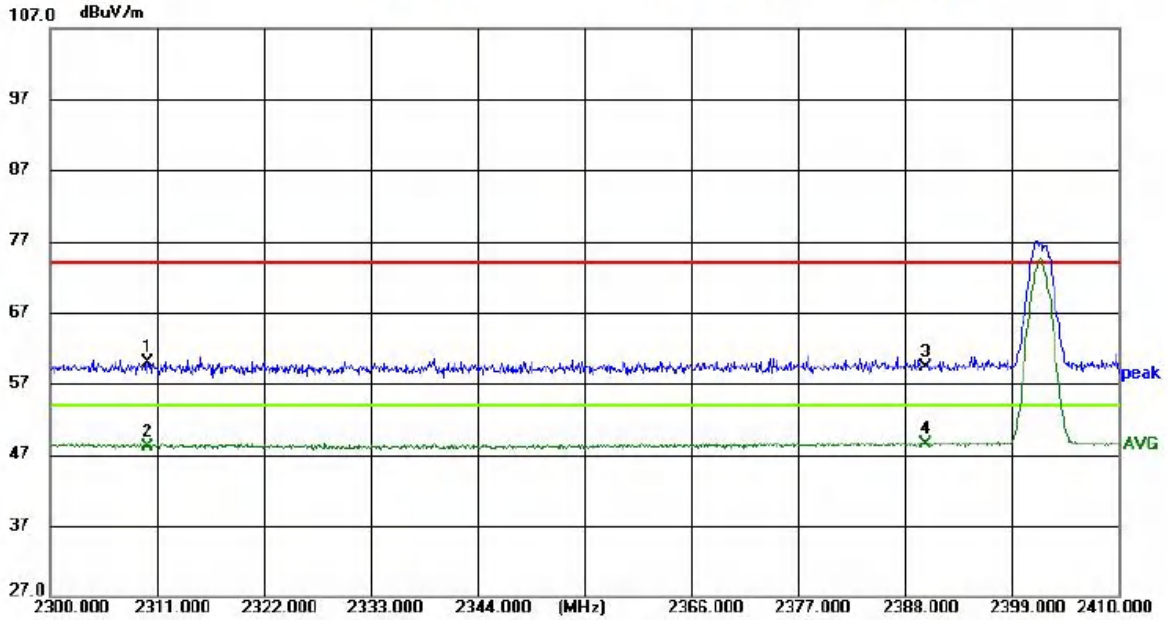
Radiated Emission Measurement

File :RF_9 Data :#1054 Date: 2025/09/26 Time: 13:41:34



Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N:
Mode: BLE2M 2402MHz
Note: CTL2508214041-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2310.000	25.24	34.57	59.81	74.00	14.19	peak	150	360	P	
2	2310.000	13.59	34.57	48.16	54.00	5.84	AVG	150	360	P	
3	2390.000	24.65	34.75	59.40	74.00	14.60	peak	150	360	P	
4	2390.000	13.66	34.75	48.41	54.00	5.59	AVG	150	360	P	

CH39	Horizontal

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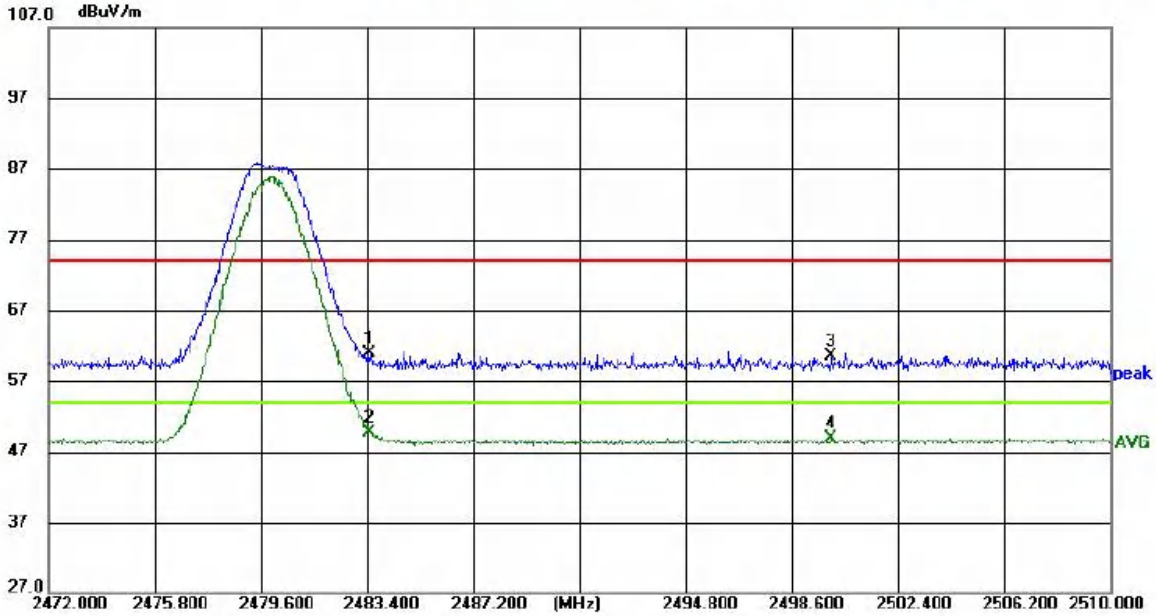
Radiated Emission Measurement

File :RF_9 Data :#1051 Date: 2025/09/26 Time: 13:33:24



Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N:
Mode: BLE2M 2480MHz
Note: CTL2508214041-WF

Polarization: *Horizontal*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.500	25.88	35.03	60.91	74.00	13.09	peak	150	360	P	
2	2483.500	14.73	35.03	49.76	54.00	4.24	AVG	150	360	P	
3	2500.000	25.45	35.12	60.57	74.00	13.43	peak	150	360	P	
4	2500.000	13.70	35.12	48.82	54.00	5.18	AVG	150	360	P	

CH39	Vertical

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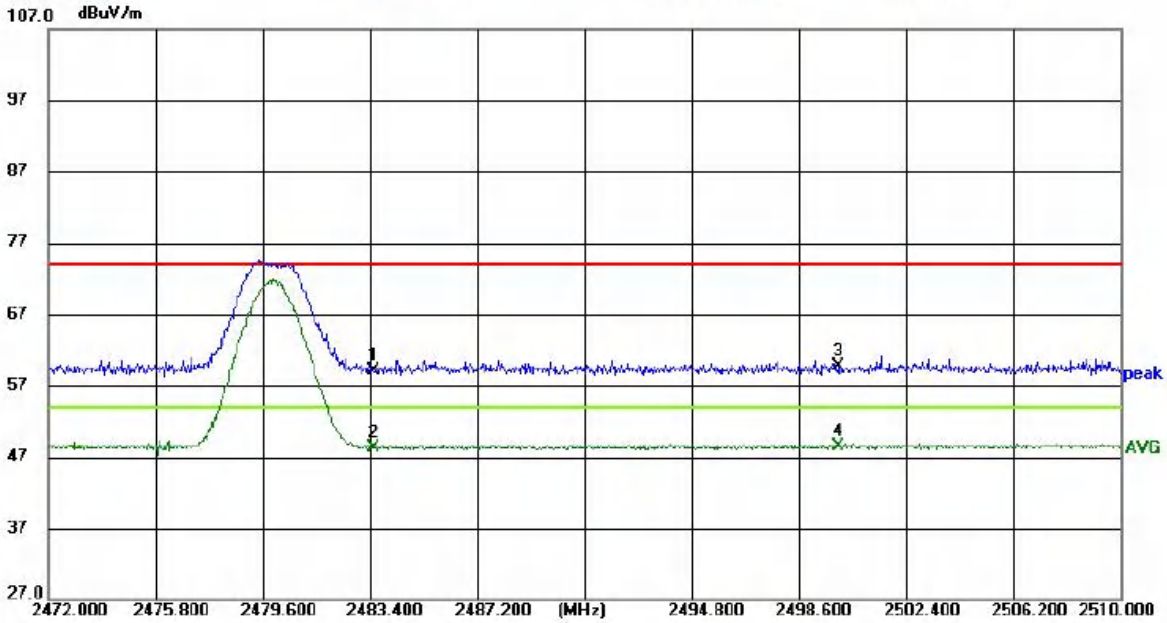
Radiated Emission Measurement

File :RF_9 Data :#1052 Date: 2025/09/26 Time: 13:34:28



Site LAB Chamber 2
Limit: FCC Part 15 C
EUT:
M/N:
Mode: BLE2M 2480MHz
Note: CTL2508214041-WF

Polarization: *Vertical*
Power:
Distance: 3m

Temperature: 25(C)
Humidity: 50 %

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F	Remark
1	2483.500	24.06	35.03	59.09	74.00	14.91	peak	150	0	P	
2	2483.500	13.33	35.03	48.36	54.00	5.64	AVG	150	0	P	
3	2500.000	24.63	35.12	59.75	74.00	14.25	peak	150	0	P	
4	2500.000	13.31	35.12	48.43	54.00	5.57	AVG	150	0	P	

3.3. Maximum Conducted Output Power

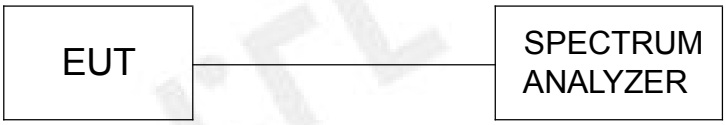
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum.

Test Configuration



Test Results

Raw data reference to Section 2 of document No. CTL2508214041-WF_Appendix of BLE.

3.4. Power Spectral Density

Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW ≥ 3× RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

Test Configuration

Test Results

Raw data reference to Section 3 of document No. CTL2508214041-WF_Appendix of BLE.

3.5. 6dB Bandwidth

Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Test Configuration

Test Results

Raw data reference to Section 1 of document No. CTL2508214041-WF_Appendix of BLE.

3.6. Out-of-band Emissions

Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

Test Configuration

Test Results

Raw data reference to Section 4 of document No. CTL2508214041-WF_Appendix of BLE.

3.7. Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203:

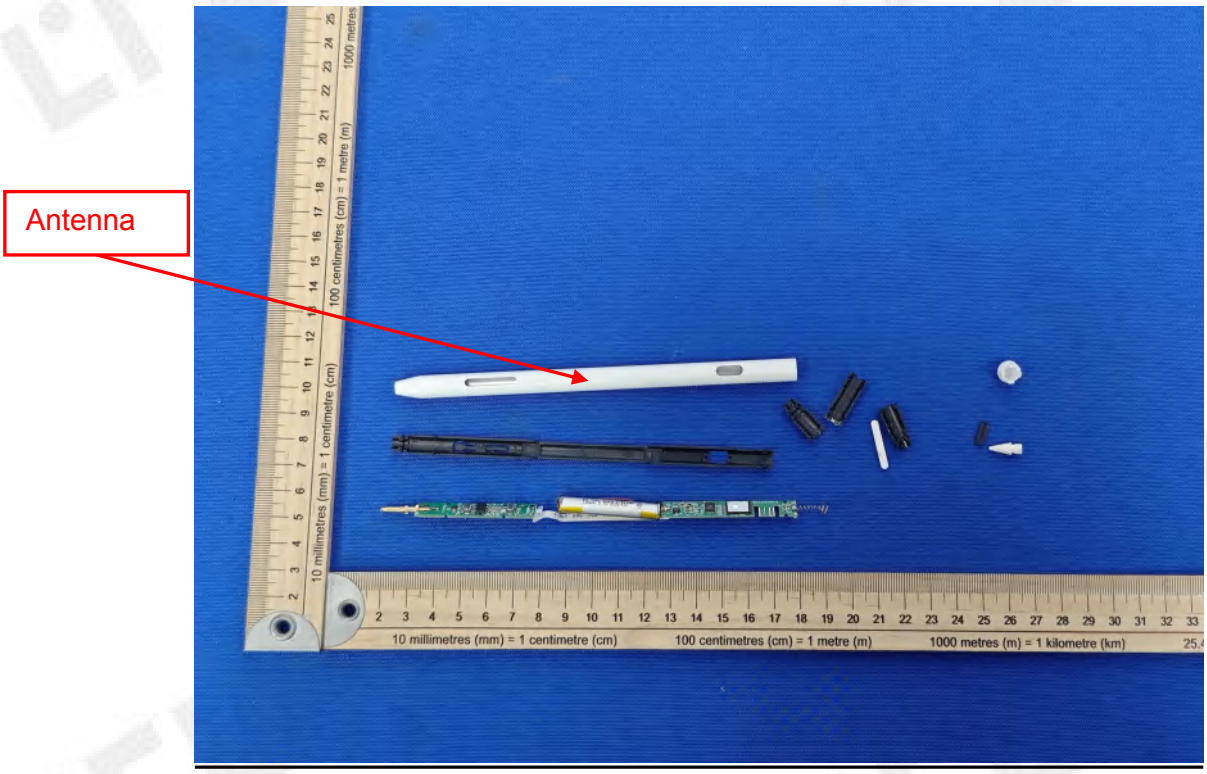
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited

FCC CFR Title 47 Part 15 Subpart C Section 15.247(b) (4):

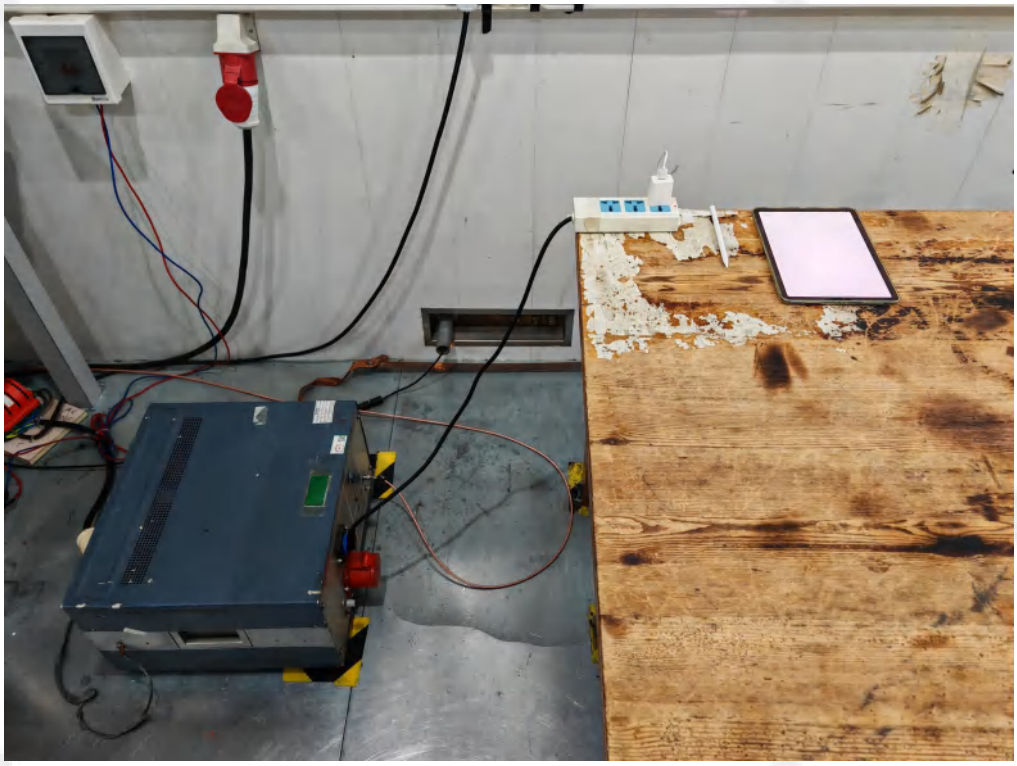
(4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

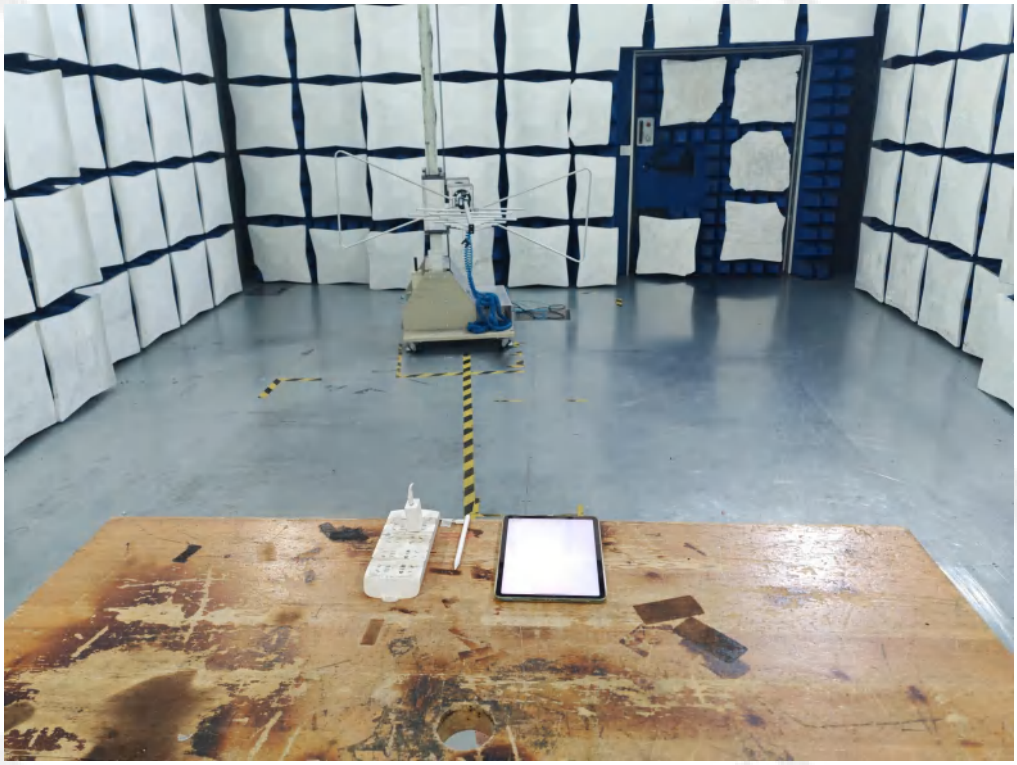
Test Result:

The maximum gain of antenna was 0dBi.

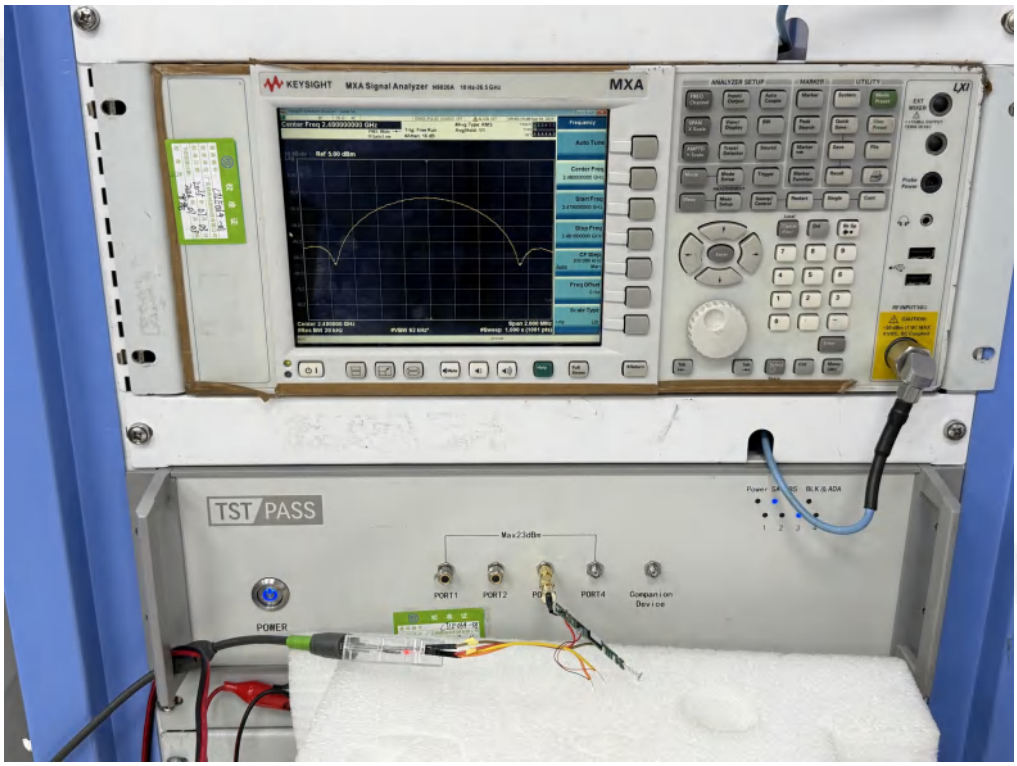


4. Test Setup Photos of the EUT



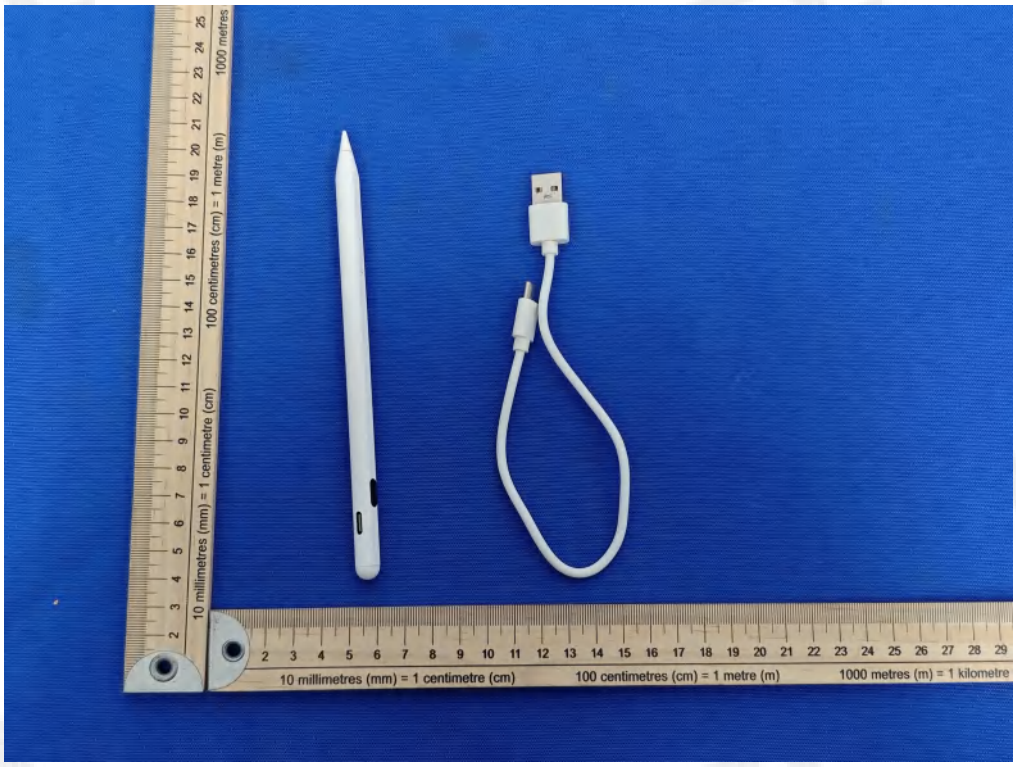


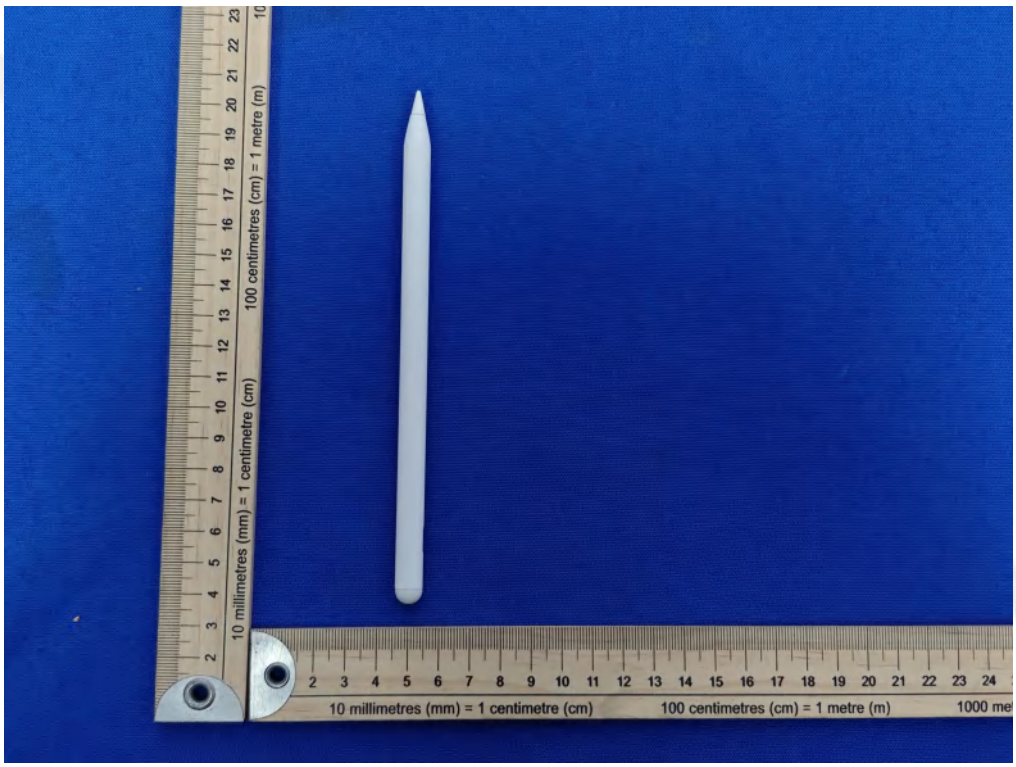
EUT

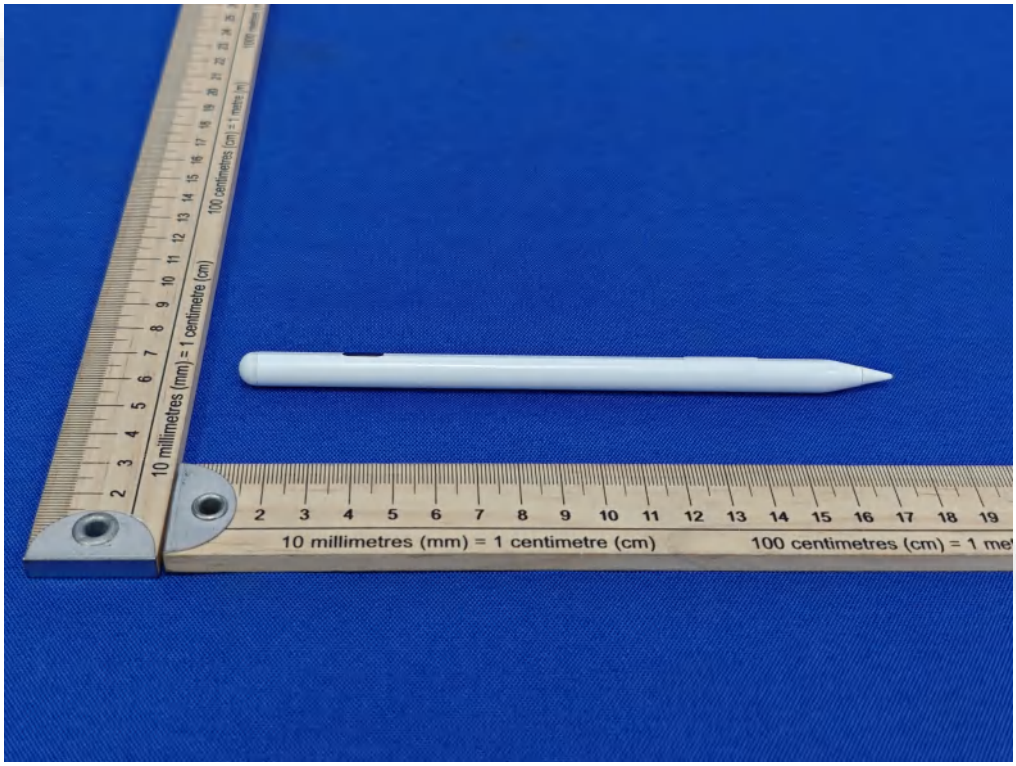

KEYSIGHT
MXA Signal Analyzer
MXA
TST PASS
POWER
PORT1
PORT2
PORT4
Companion Device

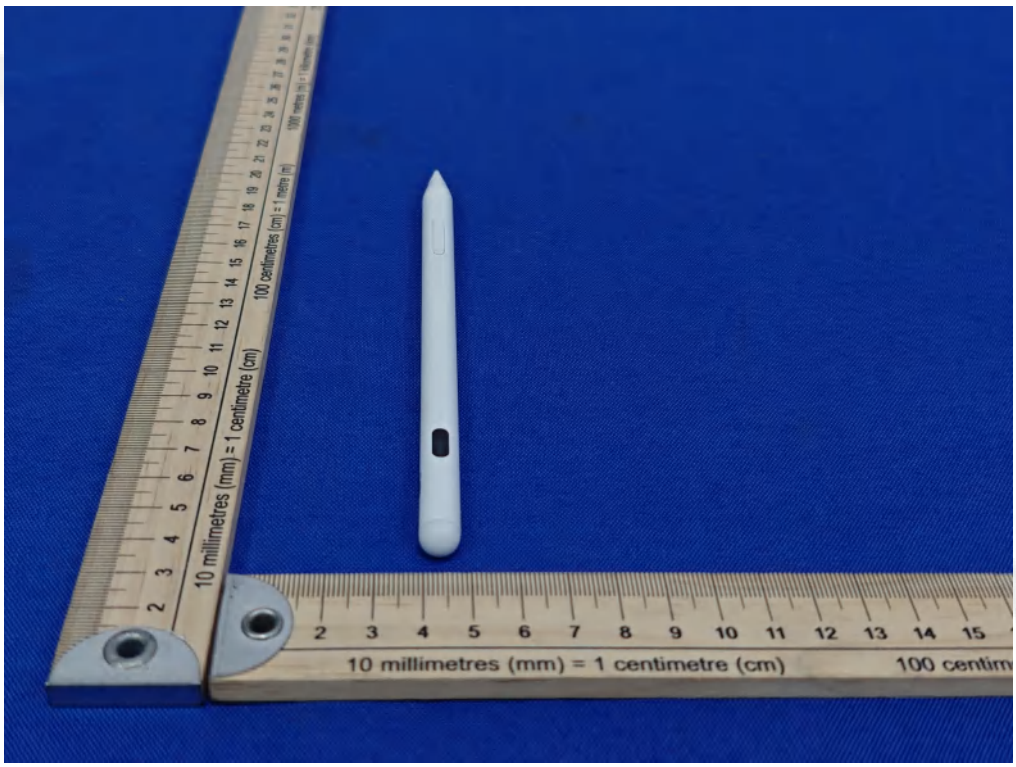
5. Photos of the EUT

External Photos of EUT




10 millimetres (mm) = 1 centimetre (cm)
100 centimetres (cm) = 1 metre (m)


10 millimetres (mm) = 1 centimetre (cm)
100 centimetres (cm) = 1 metre (m)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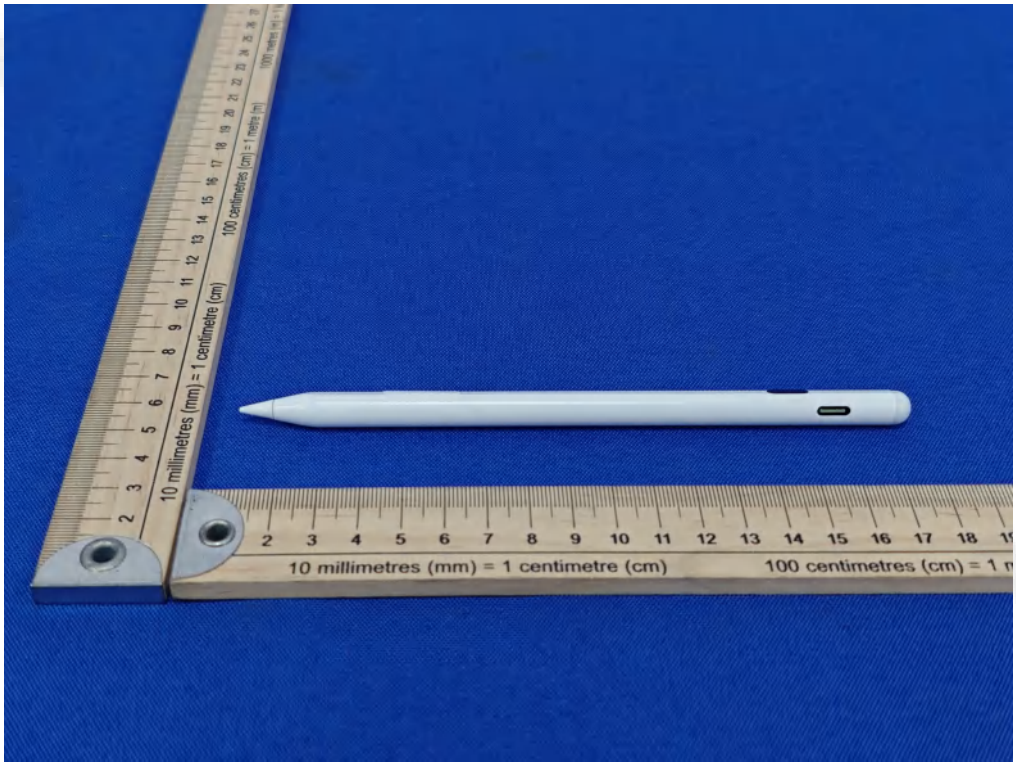
100 centimetres (cm) = 1 metre (m)
10 millimetres (mm) = 1 centimetre (cm)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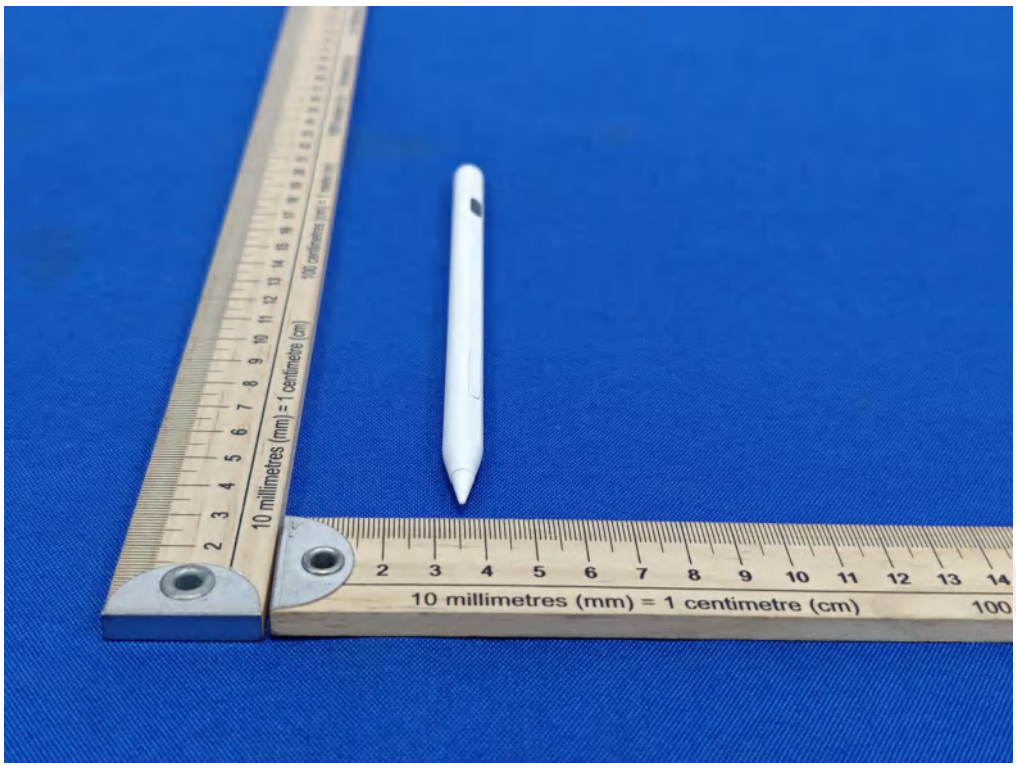
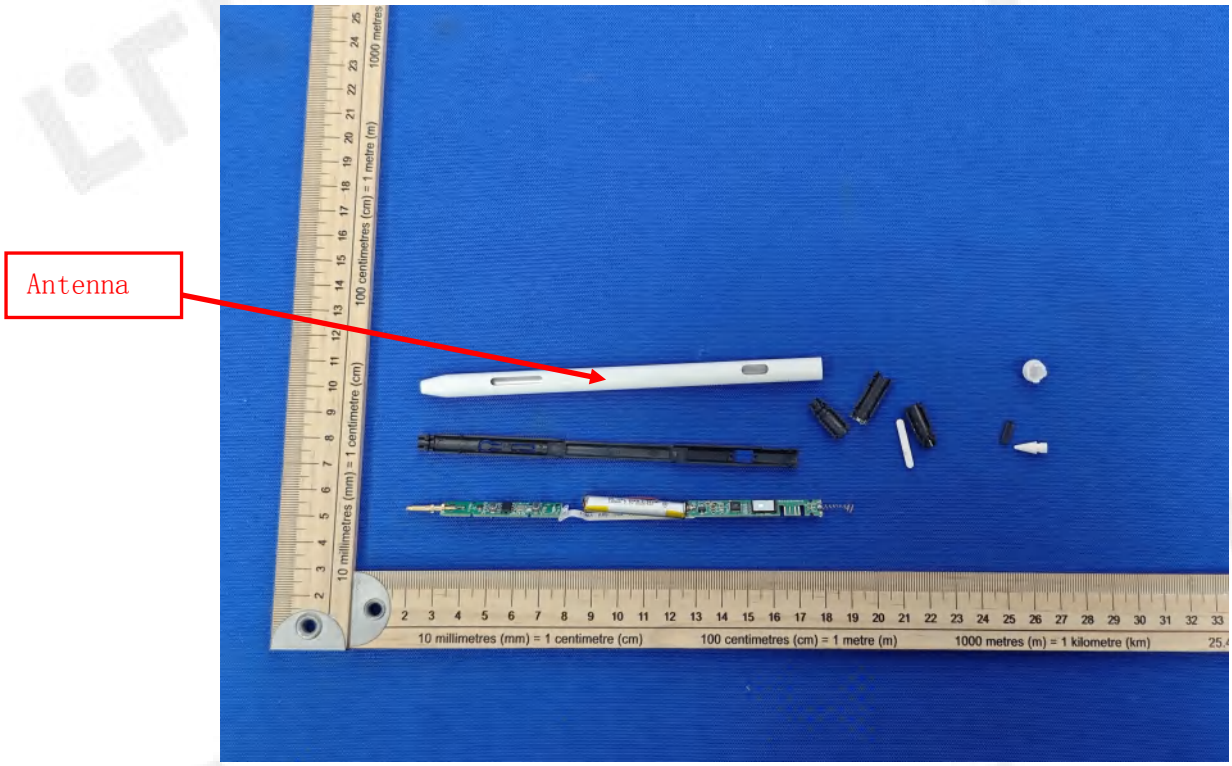
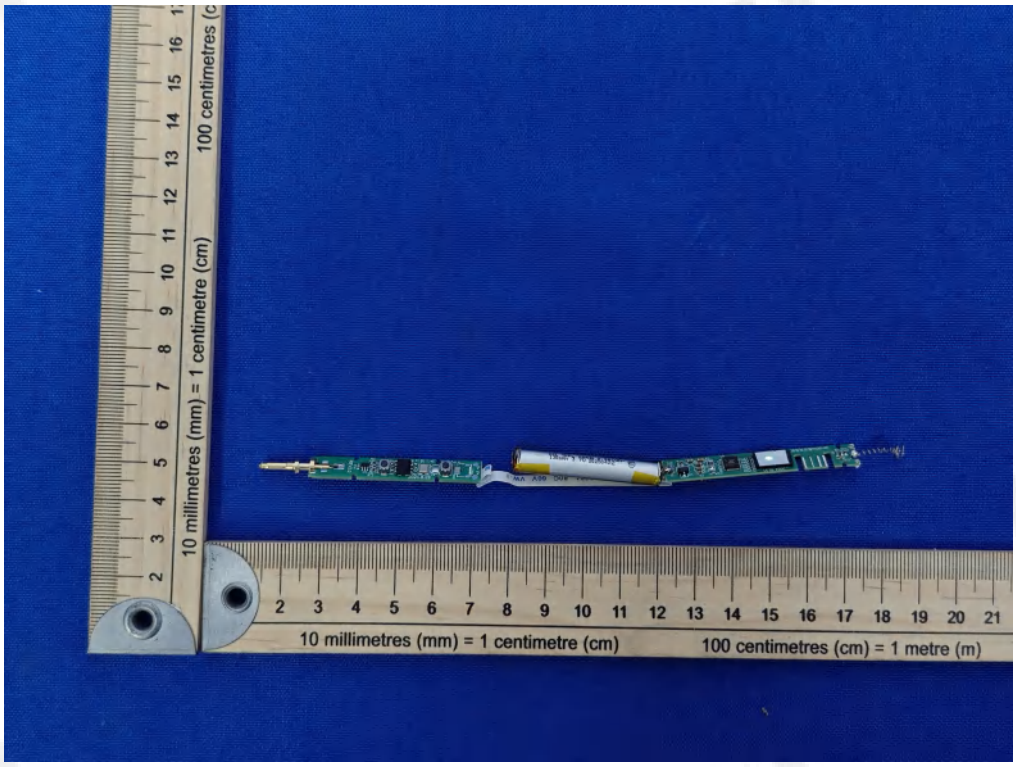
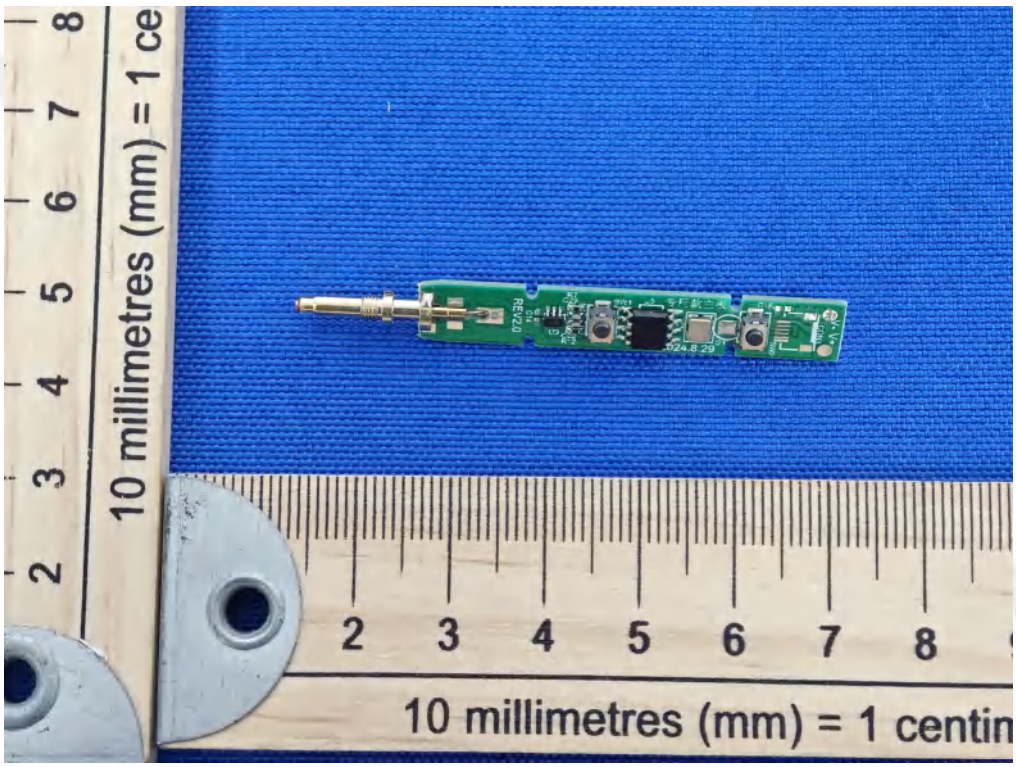
100 centimetres (cm) = 1 metre (m)
10 millimetres (mm) = 1 centimetre (cm)


10 millimetres (mm) = 1 centimetre (cm)

Internal Photos of EUT



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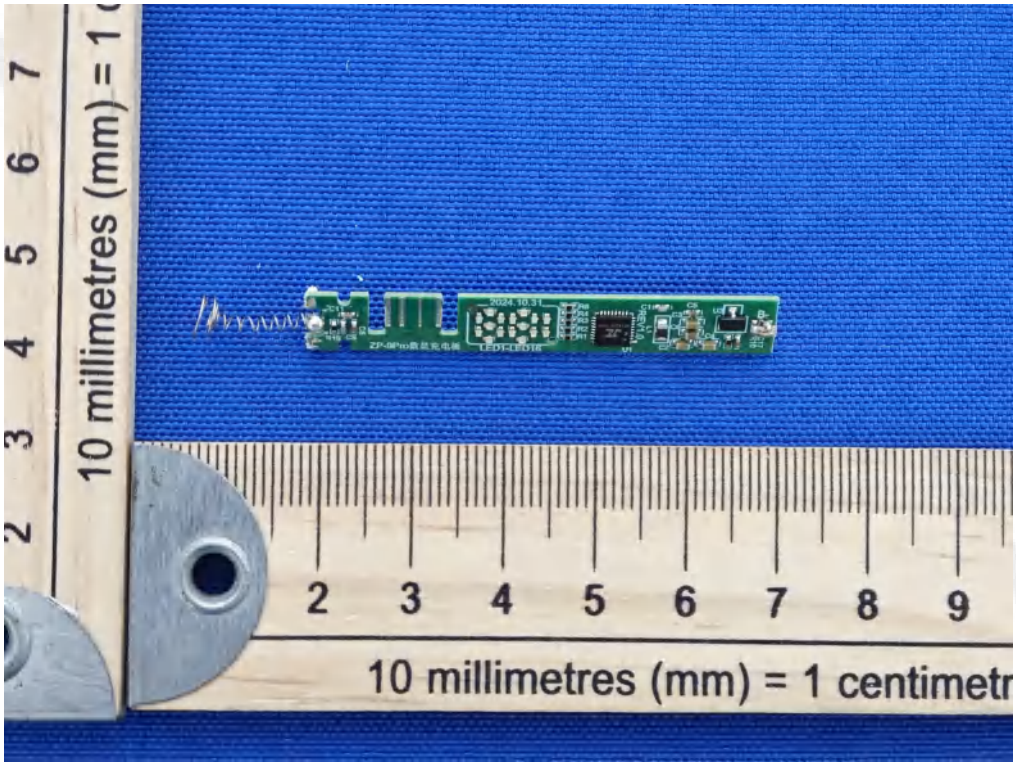
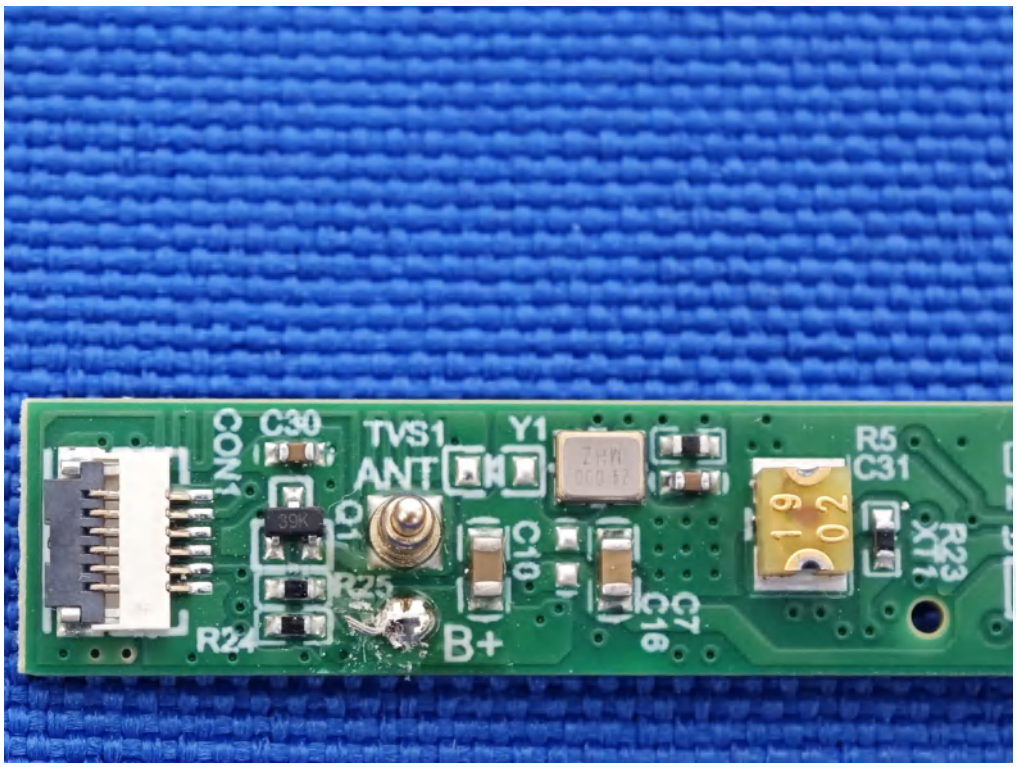
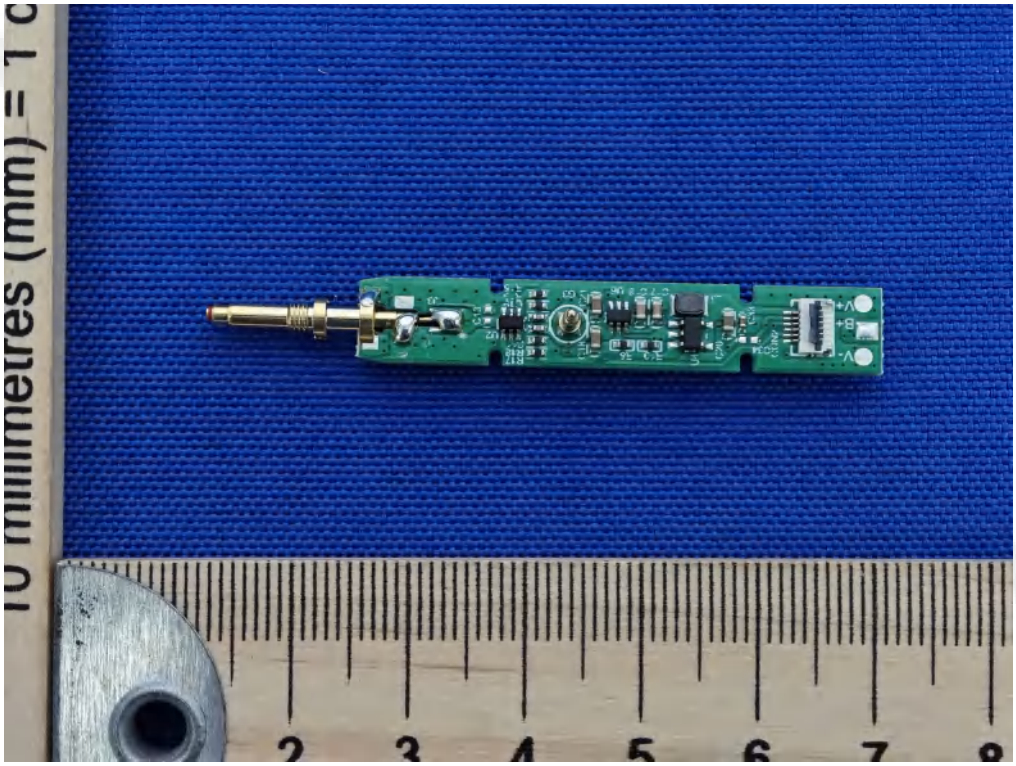
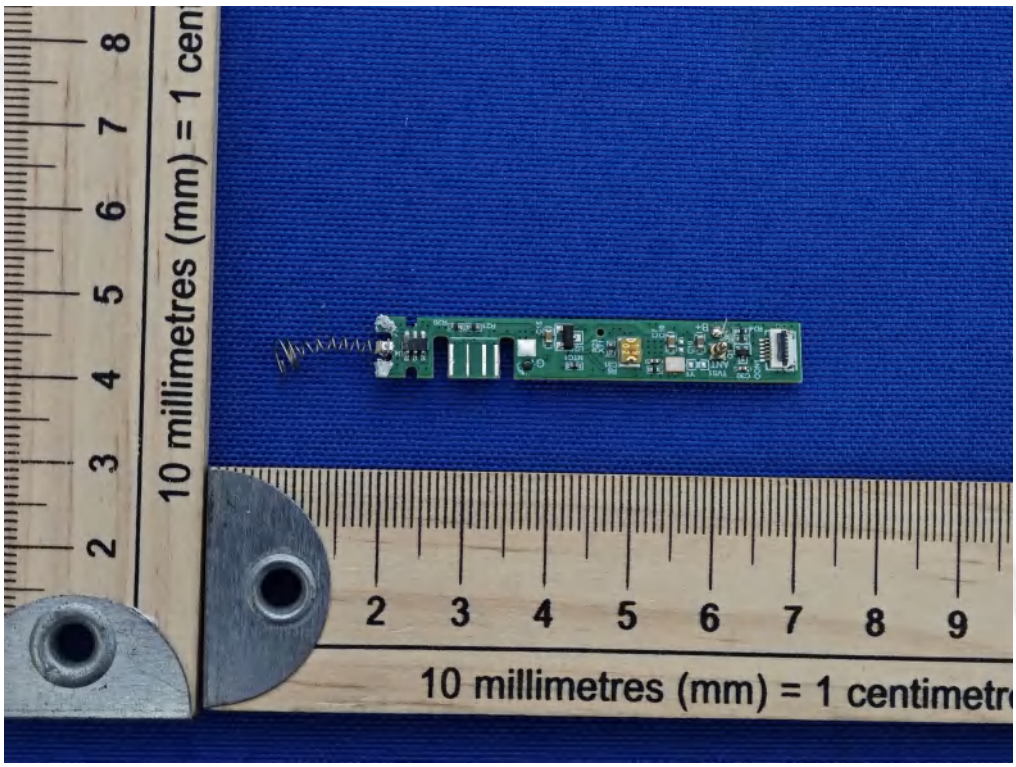

10 millimetres (mm) = 1 centimetr


CON1
C30
TVS1
ANT
Y1
Q1
R25
R24
C10
C7
C16
B+
R5
C31
R23
XT1


2
3
4
5
6
7
8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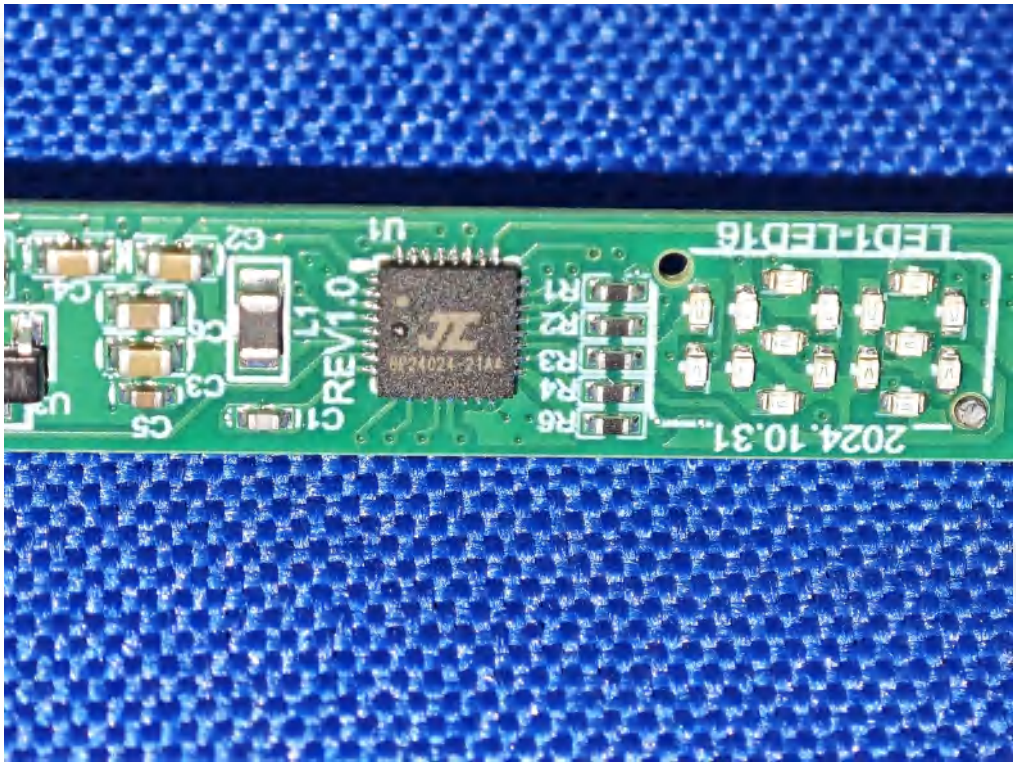
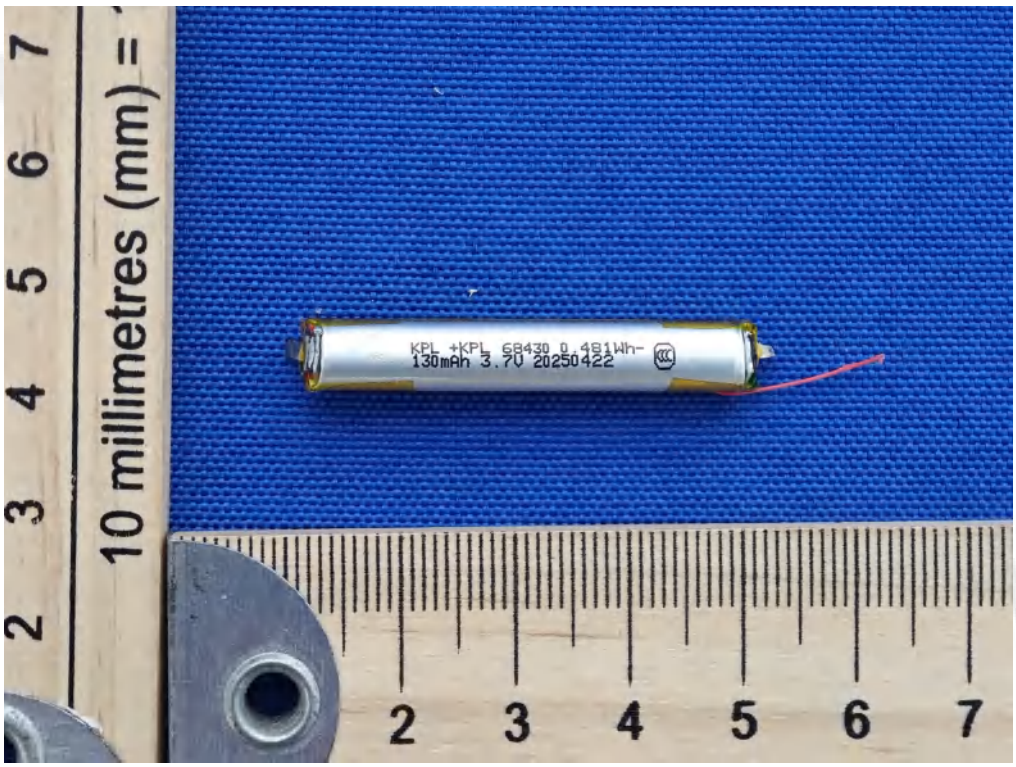

LED1-LED16
2024.10.31
R6
R4
R3
R2
R1
U1
L1
REV1.0
C1
C5
C3
C2



********** End of Report **********