

FCC TEST REPORT

FCC ID: 2AIN7-JW-05R

On Behalf of

JOYO TECHNOLOGY CO., LTD

Digital Wireless Transmitter & Receiver

Model No.: JW-05R, JW-05M

Prepared for : JOYO TECHNOLOGY CO., LTD

Address : 2/F, Lushi Industry Building, 28th District, Bao'an, Shenzhen, 518101

China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.

Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,

518103, Shenzhen, Guangdong, China

Report Number : A2305157-C05-R01

Date of Receipt : June 25, 2023

Date of Test : June 25, 2023-July 27, 2023

Date of Report : July 27, 2023

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TEST REPORT DECLARATION

Applicant : JOYO TECHNOLOGY CO., LTD

Address : 2/F, Lushi Industry Building, 28th District, Bao'an, Shenzhen, 518101 China

Manufacturer : JOYO TECHNOLOGY CO., LTD

Address : 2/F, Lushi Industry Building, 28th District, Bao'an, Shenzhen, 518101 China

EUT Description : Digital Wireless Transmitter & Receiver

(A) Model No. : JW-05R, JW-05M

(B) Trademark : JOYO

Measurement Standard Used:

Date of issue....:

FCC Rules and Regulations Part 15 Subpart C Section 15.249 ANSI C63.10:2013

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the FCC Part 15 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).......

Project Engineer

Reak Yang
Project Manager

July 27, 2023

Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 27, 2023	Initial released Issue	Lucas Pang

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

EMISSION					
Description of Test Item	Test Requirement	Standard Paragraph	Results		
Power Line Conducted Emission Test	FCC Part 15	Section 15.207	Р		
Spurious Emission Test	FCC Part 15	Section 15.249&15.209	Р		
Occupied bandwidth	FCC Part 15	Section 15. 249	Р		
Band edge Requirement	FCC Part 15	Section 15.249	Р		
Antenna Requirement	FCC Part 15	Section 15.203	Р		

Note:

- 1. P is an abbreviation for Pass.
- 2. F is an abbreviation for Fail.
- 3. N/A is an abbreviation for Not Applicable.

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2. GENERAL INFORMATION

2.1. Description of Device (EUT)

EUT Name : Digital Wireless Transmitter & Receiver

Model No. : JW-05R, JW-05M

1. There is no difference except the name of the model. All tests are made with

the JW-05R model.

DIFF. : 2. This product includes two transmitters: the circuit principle between the two

transmitters is the same, but the input interface is different (one is Lightning and

the other is Type-C).

Power supply : Transmitter: DC 5V from USB

2.4G Technology

Operation frequency : 2404MHz -2480MHz

Number of Channel : 8

Modulation : GFSK

Antenna Type : Internal antenna, max gain 2.5dBi.

Software version : V1.0 Hardware version : V1.0

2.2. Accessories of Device (EUT)

Accessories : /
Manufacturer : /
Model : /
Power supply : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1	Cellphone	Apple	iPhone 7	N/A	N/A
2	Adapter	Huoniu	N/A	N/A	N/A

2.4. Block Diagram of connection between EUT and simulators

EUT

2.5. Test Mode Description

Mode	Channel	Frequency (MHz)
GFSK	Low :CH1	2404
GFSK	Middle: CH4	2415
GFSK	High: CH8	2480

Note:

- 1. The test was used to control EUT work in Continuous TX mode, and select test channel, wireless mode
- 2. The EUT has been tested as an independent unit. And Continual Transmitting in maximum power.
- 3. New battery is used during all tests.
- 4. For the relevant Conducted Measurement, the temporary antenna connector is used during the measurement. Antenna Connector Impedance: 50Ω , Cable Loss: 1.0 dB

Channel list:

Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2404MHz	5	2471MHz	/	/
2	2408MHz	6	2474MHz		
3	2412MHz	7	2477MHz		
4	2415MHz	8	2480MHz		

2.6. Test Conditions

Temperature range	21-25℃
Humidity range	40-75%
Pressure range	86-106kPa

2.7. Test Facility

Shenzhen Alpha Product Testing Co., Ltd.
Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,
518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 15, 2019 Certificated by IC Registration Number: 12135A

2.8. Measurement Uncertainty

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber	3.74dB(Polarize: V)
(30MHz to 1GHz)	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber	3.77dB(Polarize: V)
(1GHz to 25GHz)	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber	4.31 dB(Polarize: V)
(18GHz to 40GHz)	4.30 dB(Polarize: H)
Uncertainty for radio frequency	5.06×10 ⁻⁸ GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

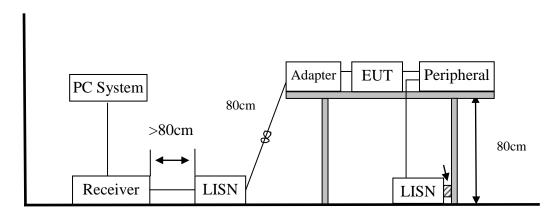
Equipment	Manufacture	Model No.	Firmware version	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2022.05.17	3Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2022.08.22	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2022.08.22	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-10 2082-Wa	2022.08.22	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2022.08.22	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2021.08.30	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2021.08.30	2Year
Active Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00059	2021.08.30	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2022.08.22	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2022.08.22	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2022.08.22	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2022.08.22	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2022.08.22	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2022.08.22	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2022.08.23	1 Year
Horn Antenna	SCHWARZBECK	BBHA9170	/	00946	2021.08.30	2 Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2022.08.22	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2022.08.22	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2022.08.22	1 Year
Temp. & Humid. Chamber	Weihuang	WHTH-1000 -40-880	/	100631	2022.08.22	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2022.08.22	1 Year
Adjustable attenuator	MWRFtest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

Software Information					
Test Item	Software Name	Manufacturer	Version		
RE	EZ-EMC	Farad	Alpha-3A1		
CE	EZ-EMC	Farad	Alpha-3A1		
RF-CE	MTS 8310	MW	V2.0.0.0		

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3. POWER LINE CONDUCTED EMISSION TEST

3.1. Block Diagram of Test Setup



3.2. Test Limits

	Maximum RF Line Voltage		
Frequency	Quasi-Peak Level	Average Level	
	dB(μV)	dB(μV)	
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*	
500kHz ~ 5MHz	56	46	
5MHz ~ 30MHz	60	50	

Notes:

- 1. Emission level=Read level + LISN factor-Preamp factor + Cable loss
- 2. * Decreasing linearly with logarithm of frequency.
- 3. The lower limit shall apply at the transition frequencies.

3.3. Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 3.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

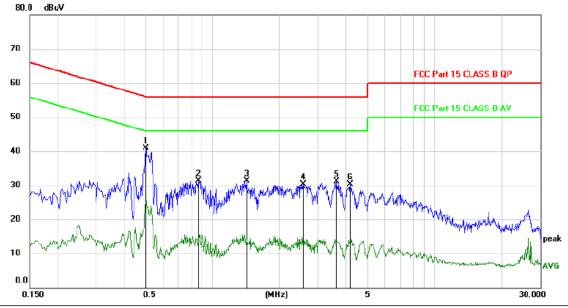
3.5. Test Procedure

- The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10:2013 on conducted Emission test.
- The frequency range from 150kHz to 30MHz is checked, the bandwidth of test receiver is set at 9kHz.
- (3) The frequency range from 30MHz to 1000MHz was pre-scanned with a Peak detector and all final readings of measurement from Test Receiver are Quasi-Peak and Average values.
- (4) The test results are reported on Section 3.6.

3.6. Test Results

EUT	:	Digital Wireless Transmitter & Receiver	Temperature	:	24℃				
M/N	:	JW-05R	Humidity	:	56%				
Test Engineer	:	Lucas Pang							
Test Mode	:	TX 2404MHz							
Test Results	:	PASS							
Note: 1. The	Note: 1. The test results are listed in next pages.								

Polarity: L



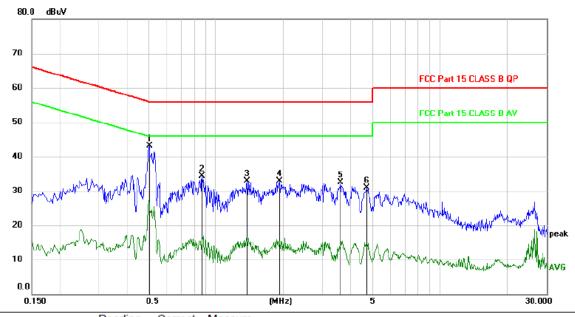
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margir	n	
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1 *	0.5010	31.02	9.83	40.85	56.00	-15.15	peak	
2	0.8640	21.42	9.84	31.26	56.00	-24.74	peak	
3	1.4220	21.59	9.81	31.40	56.00	-24.60	peak	
4	2.5560	20.59	9.79	30.38	56.00	-25.62	peak	
5	3.6270	21.26	9.83	31.09	56.00	-24.91	peak	
6	4.1610	20.45	9.85	30.30	56.00	-25.70	peak	

(Reference Only

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

^{*:}Maximum data x:Over limit !:over margin

Polarity: N



	No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margir	1	
-			MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
_	1	*	0.5039	33.25	9.83	43.08	56.00	-12.92	peak	
_	2		0.8640	24.45	9.84	34.29	56.00	-21.71	peak	
	3		1.3770	23.13	9.81	32.94	56.00	-23.06	peak	
	4		1.9140	23.11	9.77	32.88	56.00	-23.12	peak	
	5		3.5850	22.76	9.83	32.59	56.00	-23.41	peak	
_	6		4.7130	20.99	9.88	30.87	56.00	-25.13	peak	
_										

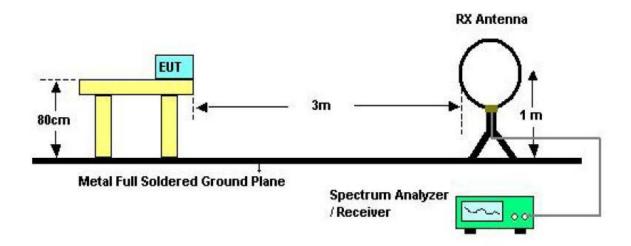
Note: This report only shall the worst case mode for TX 2404MHz.

^{*:}Maximum data x:Over limit !:over margin \(\text{Reference Only Note: Measurement=Reading Level+Correc Factor.} \) Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

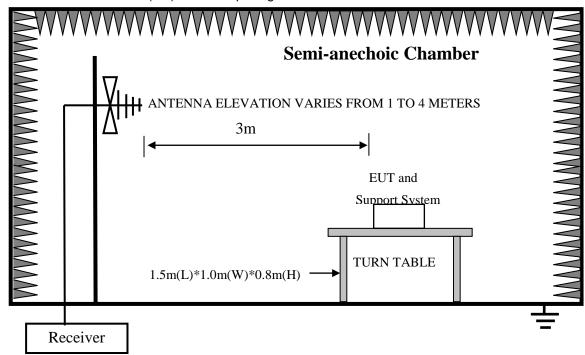
4. RADIATED EMISSION TEST

4.1. Block Diagram of Test Setup

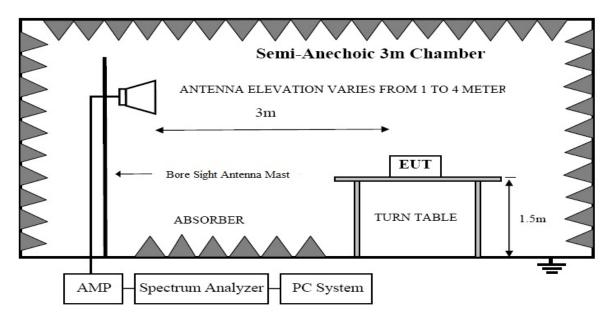
In Semi Anechoic Chamber (3m) Test Setup Diagram for 9KHz~30MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for 30MHz~1000MHz



In Semi Anechoic Chamber (3m) Test Setup Diagram for Above 1GHz



4.2. Test Limit

Frequency	Distance	Field Strengths Limits			
MHz	(Meters)	uV/m	dB uV/m		
0.009 ~ 0.490	300	2400/F(kHz)			
0.490 1.705	30	24000/F(kHz)			
1.705 30	30	30	29.5		
30 88	3	100(3nW)	40		
88 216	3	150(6.8nW)	43.5		
216 960	3	200(12nW)	46		
Above 960	3	500(75nW)	54		
Carrier frequency	3	50000(avg)	113.97(peak)		
Carner frequency		30000(avg)	93.97(avg)		

Notes:

- 1. Emission level = Read level + Antenna Factor Preamp Factor + Cable Loss
- 2. The smaller limit shall apply at the cross point between two frequency bands.
- 3. Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
- 4. For frequencies above 1000 MHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation.

4.3. Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

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4.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 4.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

4.5. Test Procedure

- The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber for below 1GHz and 150 cm above the ground plane inside a semi-anechoic chamber for above 1GHz. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.
- (2) For the radiated emission test above 1GHz:
 - Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- (3) Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions
- (4) For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP
- (5) The frequency range from 9KHz to 150KHz is checked, the bandwidth of test receiver is set at 200Hz.
 - The frequency range from 150KHz to 30MHz is checked, the bandwidth of test receiver is set at

9KHz.

The frequency range from 30MHz to 1000MHz is checked, the bandwidth of test receiver is set at 120kHz.

The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer is set at 1MHz.

- The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values, the frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (7) Test for all x, y, z axes is performed and only the worst case of X xes was recorded in the test report.
- (8) The test results are reported on Section 4.6.

4.6. Test Results

Frequency Range	:	9KHz~30MHz								
EUT	:	Digital Wireless Transmitter & Receiver	Temperature	:	24 ℃					
M/N	:	JW-05R	Humidity	:	56%					
Test Engineer	:	Lucas Pang								
Test Mode	:	TX 2404MHz								
Test Results	:	PASS								
1. Note: The	1. Note: The amplitude of spurious emissions which are attenuated by more than 20dB									
Note: below the permissible value has no need to be reported.										

Frequency Range : 30MHz~1000MHz`

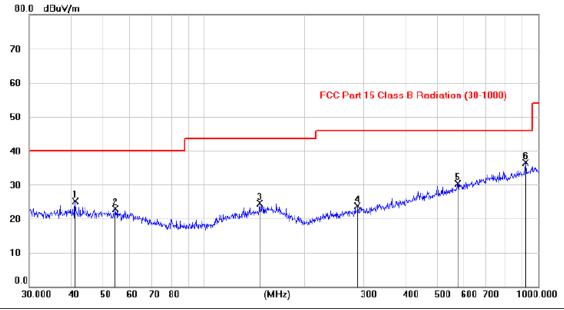
Test Mode : TX 2404MHz

Test Results : PASS

Note: 1. The test results are listed in next pages.

- 2. This mode is worst case mode, and this report only reflected the worst mode.
- 3. If the limits for the measurement with the quasi-peak detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the quasi-peak detector need not be carried out.

Vertical:



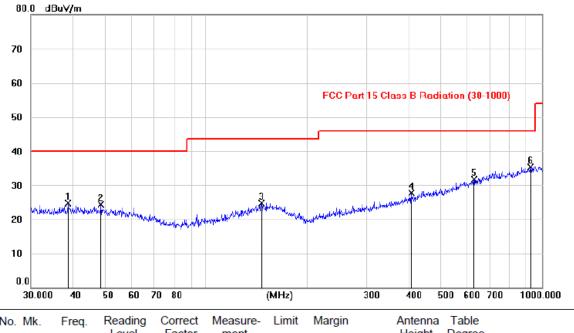
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		41.2331	10.70	14.34	25.04	40.00	-14.96	peak			
2		54.4452	9.28	13.65	22.93	40.00	-17.07	peak			
3	1	146.8705	9.71	14.83	24.54	43.50	-18.96	peak			
4	2	288.3609	9.81	13.83	23.64	46.00	-22.36	peak			
5	Ę	75.4324	10.63	19.69	30.32	46.00	-15.68	peak			
6	* (919.2866	12.18	24.31	36.49	46.00	-9.51	peak			

Note:1. *:Maximum data; x:Over limit; !:over margin.

^{2.}Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

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Horizontal:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margin		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		38.7518	10.24	14.38	24.62	40.00	-15.38	peak			
2		48.5980	10.27	14.05	24.32	40.00	-15.68	peak			
3		146.3735	9.95	14.78	24.73	43.50	-18.77	peak			
4		408.8504	11.17	16.46	27.63	46.00	-18.37	peak			
5		628.1542	10.87	20.80	31.67	46.00	-14.33	peak			
6	*	926.0810	10.99	24.37	35.36	46.00	-10.64	peak			

Note:1. *: Maximum data; x: Over limit; !: over margin.

Note: This report only shall the worst case mode for TX 2404MHz.

^{2.}Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Freque	ency Range	: 10	SHz~25GHz						
EUT		: Dig	: Digital Wireless Transmitter & Receiver Temperature : 24°C						
M/N		: JW	: JW-05R						
Test E	ngineer	: Luc	as Pang						
Test M	lode	: TX	2404MHz						
Test R	esults	: PA	SS						
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m	Limit) (dBuV/m)	Margin	Remark	
1	2404	Н	92.55	-3.41	89.14	113.97	-24.83	Peak	
2	2404	Н		-3.41		93.97		AVG	
3	4808	Н	48.26	-3.26	45.00	74	-29.00	Peak	
4	4808	Н		-3.26		54		AVG	
1	2404	V	95.56	-3.41	92.15	113.97	-21.82	Peak	
2	2404	V		-3.41		93.97		AVG	
3	4808	V	47.68	-3.26	44.42	74	-29.58	Peak	
4	4808	V		-3.26		54		AVG	
_	1. Moone other frequency and made comply with standard requirements and at least have 20dD								

Note:

- 1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
- 2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.

Result=Reading + Correct Factor.

Margin= Result-Limit.

- 3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.
- 4. Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: Avg.
- 5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

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Freque	ency Range	: 10	Hz~25GHz						
EUT		: Dig	ital Wireless T	ransmitter 8	Receiver	Temperature	: 24 ℃		
M/N		: JW	-05R			Humidity	: 56%		
Test E	ngineer	: Luc	as Pang						
Test M	lode	: TX	2415MHz						
Test R	esults	: PA	SS						
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m)	Limit (dBuV/m)	Margin	Remark	
1	2415	Н	92.08	-3.41	88.67	113.97	-25.30	Peak	
2	2415	Н		-3.41		93.97		AVG	
3	4830	Н	48.12	-3.26	44.86	74	-29.14	Peak	
4	4830	Н		-3.26		54		AVG	
1	2415	V	93.51	-3.41	90.10	113.97	-23.87	Peak	
2	2415	V		-3.41		93.97		AVG	
3	4830	V	47.11	-3.26	43.85	74	-30.15	Peak	
4	4830	V		-3.26		54		AVG	
	1 Means other frequency and mode comply with standard requirements and at least have 20dB								

Note:

- 1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
- 2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.

Result=Reading + Correct Factor.

Margin= Result-Limit.

- 3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.
- 4. Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: Avg.
- 5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

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Freque	ency Range	: 1GI	Hz∼25GHz							
EUT		: Dig	: Digital Wireless Transmitter & Receiver Temperature : 24°C							
M/N		: JW	-05R	FR Humidity : 56%						
Test E	est Engineer : Lucas Pang									
Test M	est Mode : TX 2480MHz									
Test R	esults	: PAS	SS							
No.	Freq MHz	Polarity	Reading (dBuV/m)	Correct Factor	Result (dBuV/m	Limit) (dBuV/m)	Margin	Remark		
1	2480	Н	92.51	-3.38	89.1	113.97	-24.84	Peak		
2	2480	Н		-3.38		93.97		AVG		
3	4960	Н	46.15	-3.26	42.9	74	-31.11	Peak		
4	4960	Н		-3.26		54		AVG		
1	2480	V	95.54	-3.38	92.16	113.97	-21.81	Peak		
2	2480	V		-3.38		93.97		AVG		
3	4960	V	47.32	-3.26	44.06	74	-29.94	Peak		
4	4960	V		-3.26		54		AVG		
	1. Many on the reference of mode comply with standard requirements and at least have 20-ID									

Note:

- 1. Means other frequency and mode comply with standard requirements and at least have 20dB margin.
- 2. Correct Factor=Cable Loss+ Antenna Factor-Amplifier Gain.

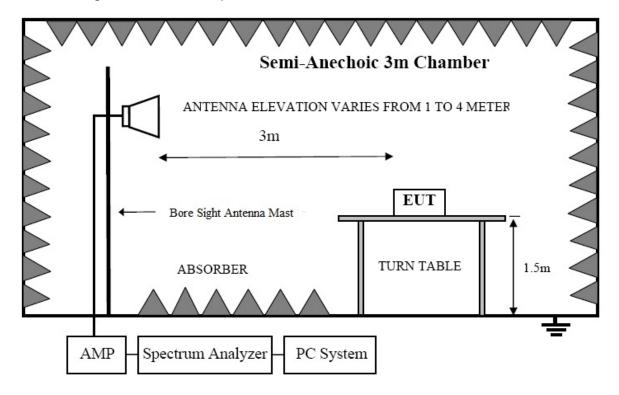
Result=Reading + Correct Factor.

Margin= Result-Limit.

- 3. Spectrum Set for PK measure: RBW=1MHz, VBW=1MHz, Sweep time=Auto, Detector: PK.
- 4. Spectrum Set for AV measure: RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector: Avg.
- 5. If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

5. BAND EDGE TEST

5.1. Block Diagram of Test Setup



5.2. Test Limit

Please refer section 15.249 and section 15.205.

249(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

249(e) As show in section 15.35(b), for frequencies above 1000MHz, the above field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak filed strength shall not exceed 2500 millivolts/meter at 3meters along the antenna azimuth.

5.3. Configuration of EUT on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

5.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 5.1.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode taking the test.

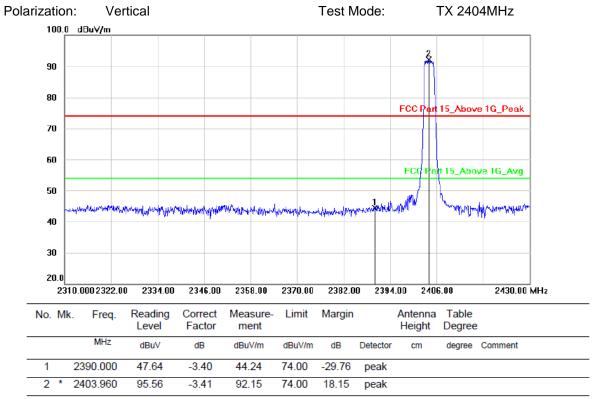
5.5. Test Procedure

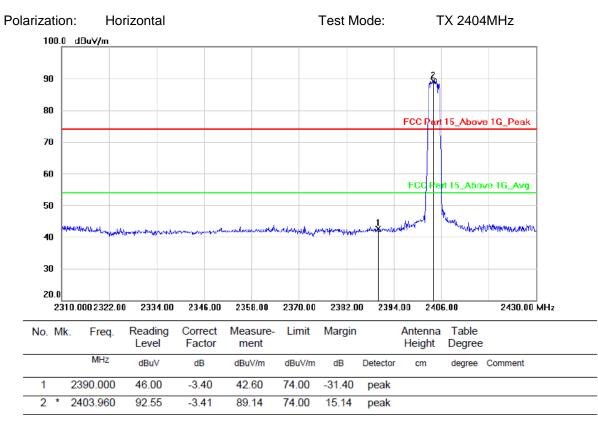
- The EUT was placed on a non-metallic table, 150 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10: 2013 on Radiated Emission test.
- (2) For the radiated emission test above 1GHz:
 - Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- (3) Test antenna was located 4m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.
 - (a) Change work frequency or channel of device if practicable.
 - (b) Change modulation type of device if practicable.
 - (c) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

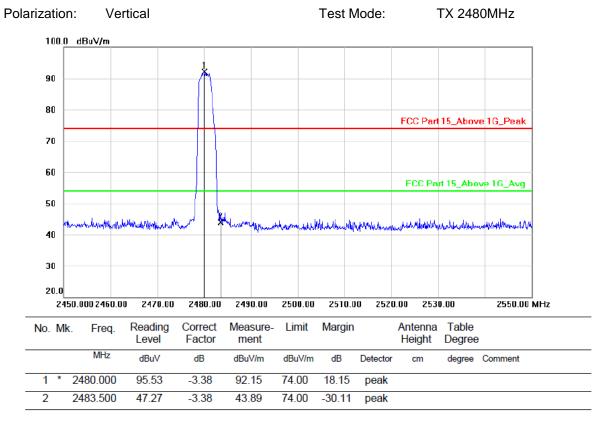
Report No.: A2305157-C05-R01

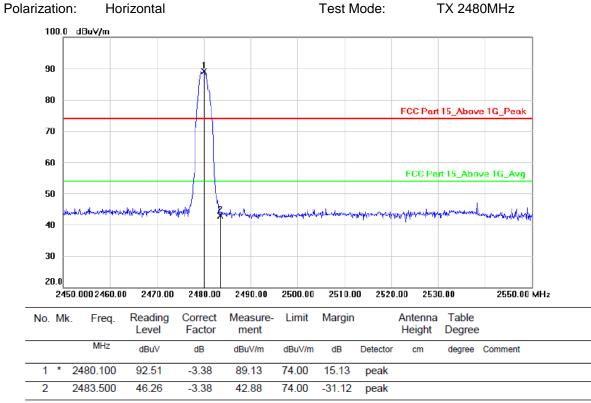
- The frequency range from above 1GHz is checked, the bandwidth of Signal Analyzer is set at 1MHz.
- (6) The frequency range from 1GHz to 6GHz was pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (7) Test for all x, y, z axes is performed and only the worst case of X xes was recorded in the test report.
- (8) The test results are reported on Section 5.6.

5.6. Test Results









Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

6. OCCUPIED BANDWIDTH TEST

6.1. Block Diagram of Test Setup



6.2. Test Limit

Please refer section 15.249 and section 15.205.

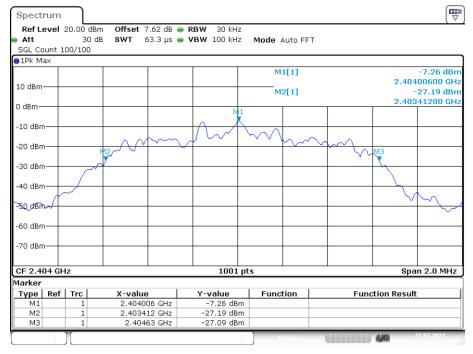
6.3. Test Procedure

- (1) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.
- (2) The test receiver RBW set 30KHz, VBW set 100KHz, Sweep time set auto.

6.4. Test Results

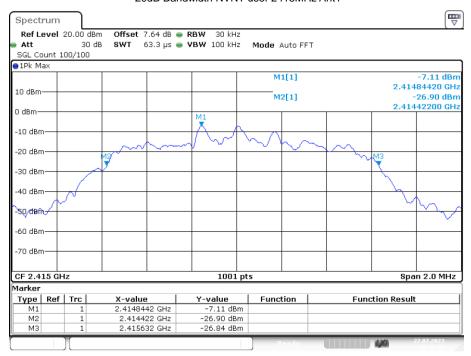
Mada	Frequency	20dB Bandwidth	99% Bandwidth	Limit						
Mode	MHz	(MHz)	(MHz)	(kHz)						
	2404	1.218	1.185	/						
GFSK	2415	1.21	1.173	/						
	2480	1.22	1.183	/						
Note: 1. The test results are listed in next pages.										

-20dB Bandwidth NVNT user 2404MHz Ant1



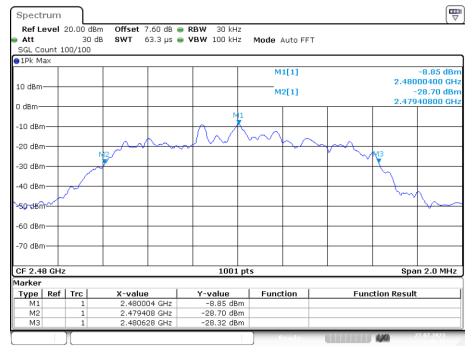
Date: 27.JUL.2023 12:39:50

-20dB Bandwidth NVNT user 2415MHz Ant1



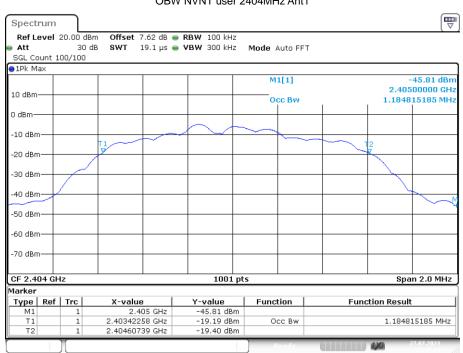
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-20dB Bandwidth NVNT user 2480MHz Ant1



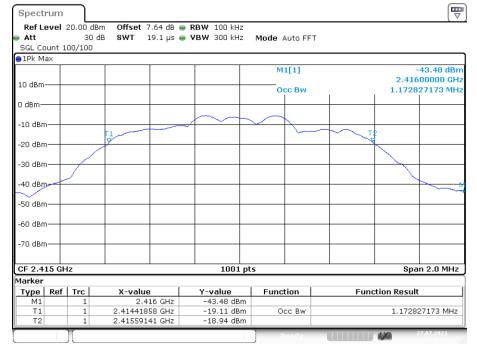
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OBW NVNT user 2404MHz Ant1



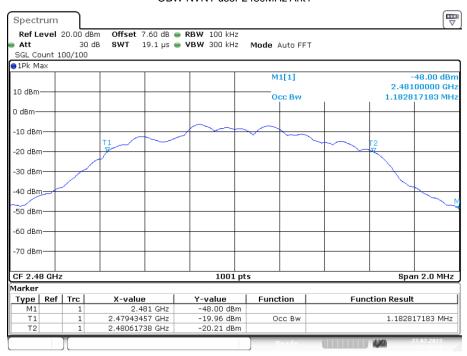
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OBW NVNT user 2415MHz Ant1



Date: 27.JUL.2023 12:40:10

OBW NVNT user 2480MHz Ant1



Date: 27.JUL.2023 12:40:35

7. ANTENNA REQUIREMENT

7.1. Standard Requirement

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 shall be considered sufficient to comply with the provisions of this Section. 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.

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7.2. Antenna Connected Construction

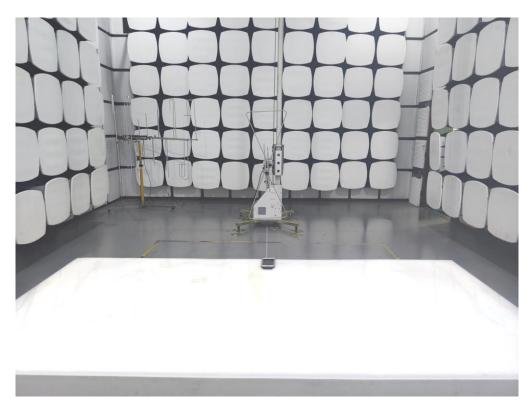
The directional gains of antenna used for transmitting is 2.5dBi, and the antenna is fixed antenna no consideration of replacement. Please see EUT photo for details.

7.3. Results

The EUT antenna is Internal Antenna. It complies with the standard requirement.

8. PHOTOGRAPH

8.1. Photos of Radiated Emission Test





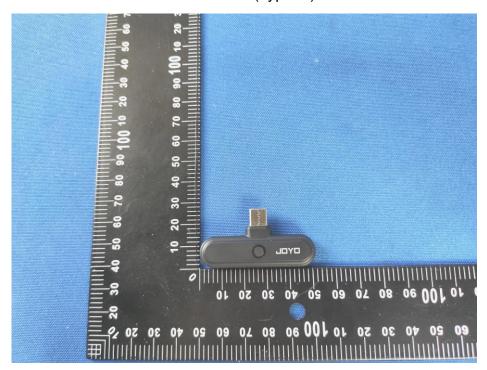


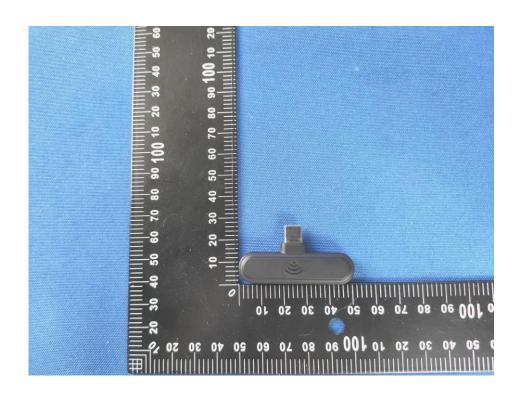
8.2. Power Line Conducted Emission Test

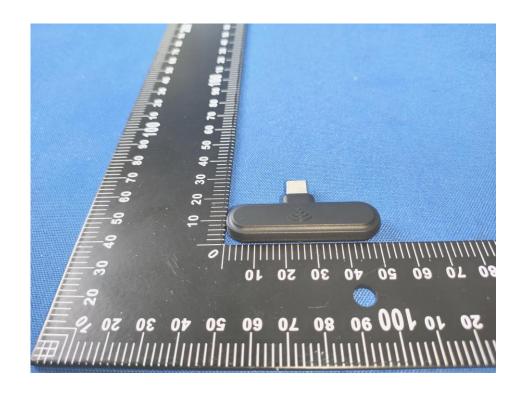


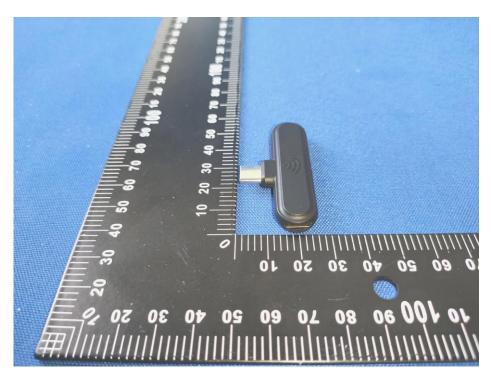
9. PHOTOS OF THE EUT

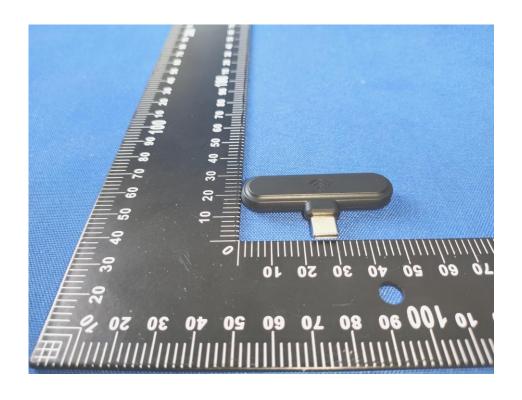


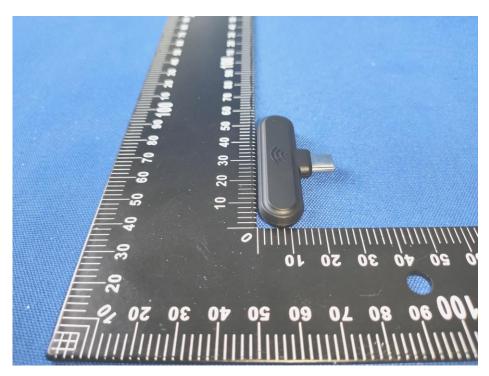


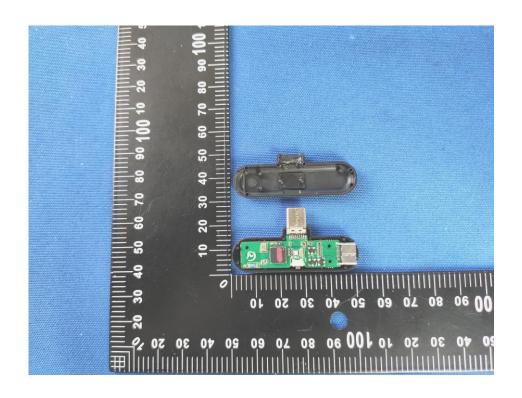


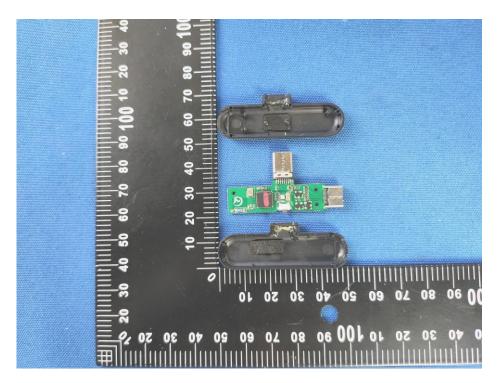


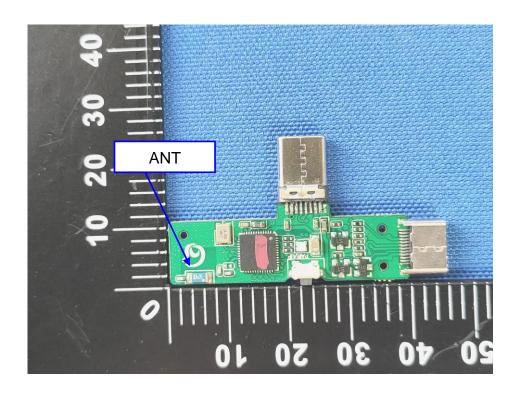


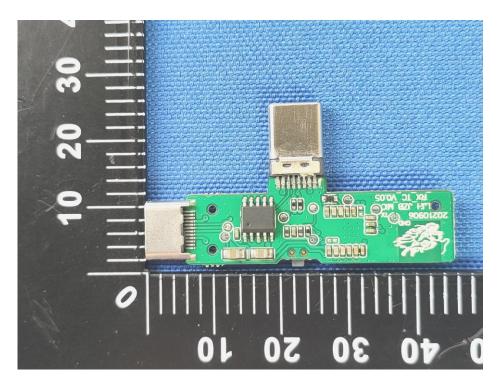




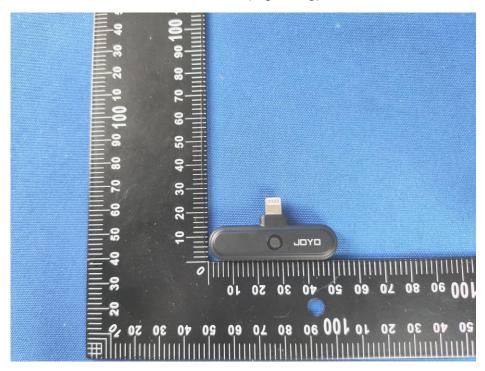


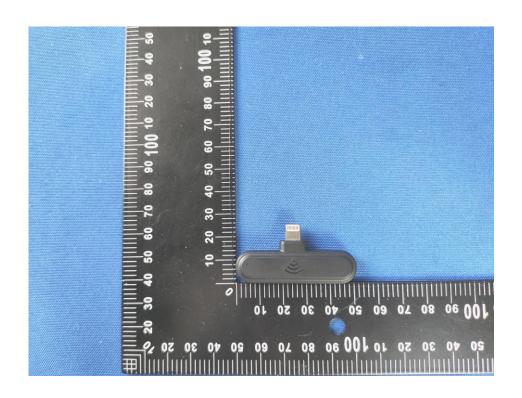


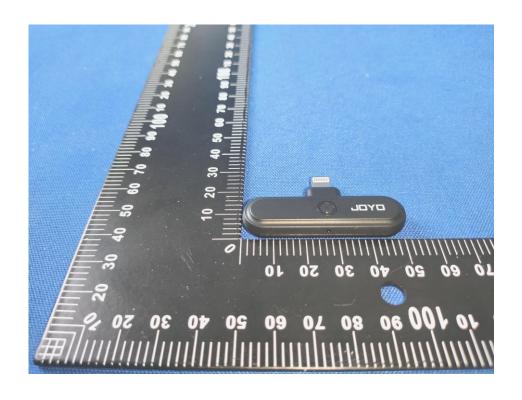


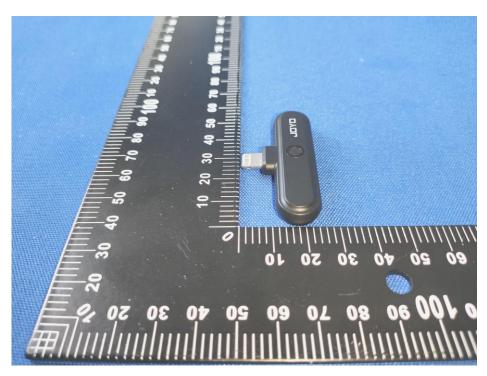


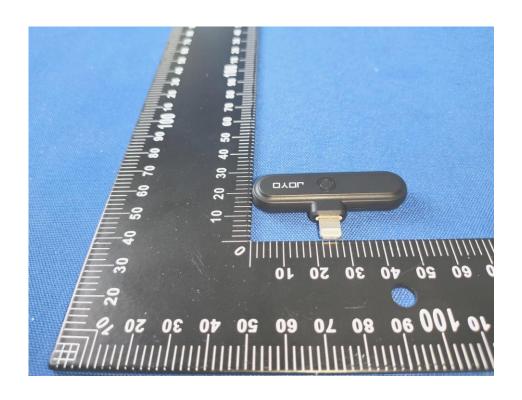
Transmitter(Lightning)

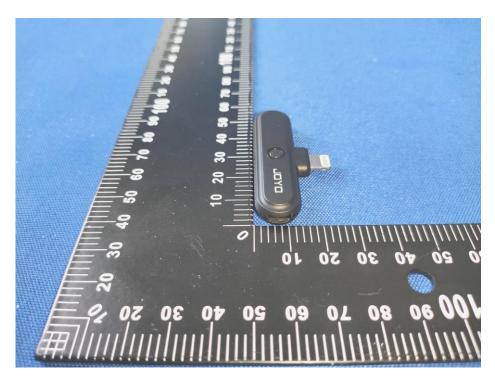


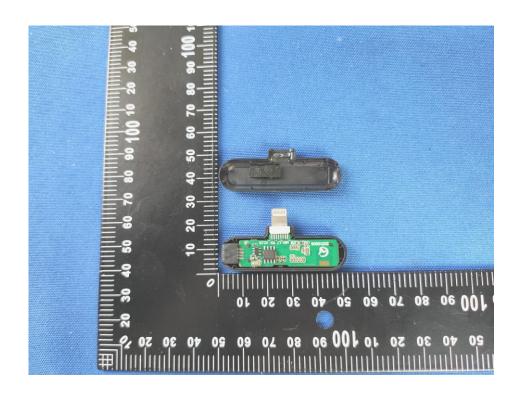


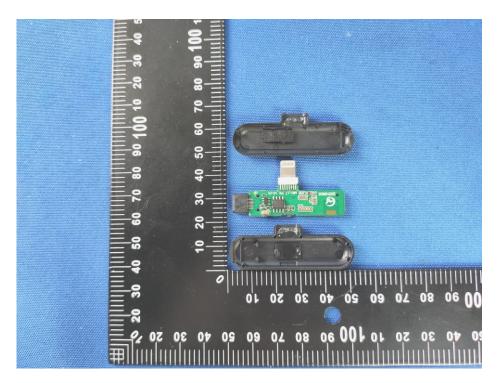


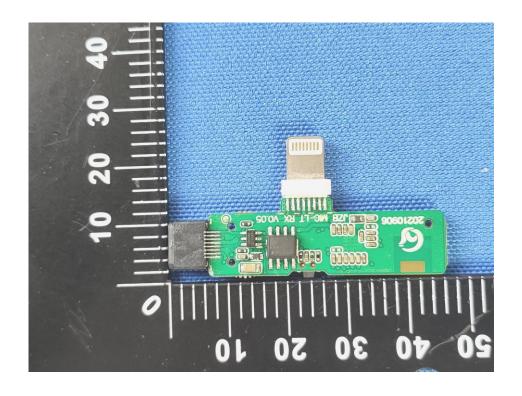


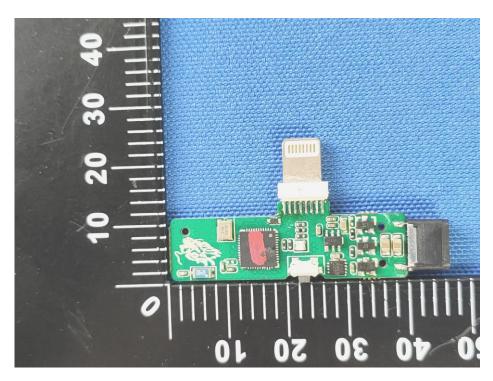


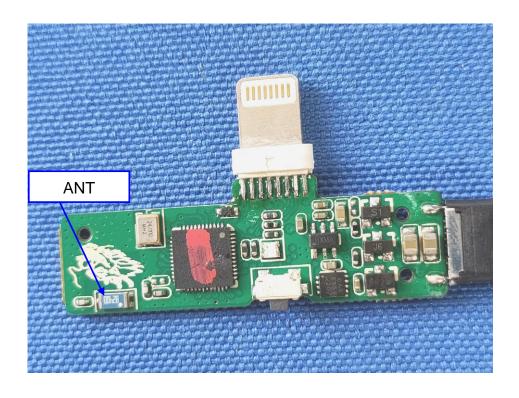












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