FCC - TEST REPORT

Report Number	:	**68.940.22.0037.01**	Date of Issue:	July 18, 2022
Model	:	**C51072W, C59001W, C51076W, C51077W, C51078W, C51079W, C51101W, C51102W, C51103W, C51104W, C51105W, C51106W, C51201W, C51202W, C51203W, C51204W, C51205W, C51206W, C55021W, C55022W, C55023W, C55024W, C55025W, C61049W, C61050W, C61027W, C62001W, C62002W, C62003W, C62004W, C62005W, C62006W, C62007W, C63001W, C63002W, C63003W, C63004W, C63005W, C63006W, C61046W, C61047W, C61036W, C64001W, C64002W, C64003W, C64004W, C61048W, C61051W, C61052W, C61501W, C61502W, C61503W, C61504W, C61082W, C65001W, C65002W, C65003W, C61005W, C61071W, C61072W, C61076W, C82001W, C82002W, C82003W, C82004W, C82005W, C81012W, C81024W, C81051W, C81052W, C81053W, C81054W, C81055W, C81056W, C81057W, C81058W, C81059W, C81060W, C81025W, C81026W**		
Product Type	:	Remote controller		
Applicant	:	DOUBLEEAGLE INDUSTRY (CHINA) LIMITED		
Address	:	XINGDA INDUSTRIAL PARK, CHENGHAI, SHANTOU CITY, GUANGDONG PROVINCE, CHINA		
Manufacturer	:	DOUBLEEAGLE INDUSTRY (CHINA) LIMITED		
Address	:	XINGDA INDUSTRIAL PARK, CHENGHAI, SHANTOU CITY, GUANGDONG PROVINCE, CHINA		
Test Result	:	■ **Positive** ☐ **Negative**		
Total pages including Appendices	:	**25**		

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1 Table of Contents

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2 Details about the Test Laboratory

Details about the Test Laboratory

Test Site 1

Company name:	TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch Building 12&13, Zhiheng Wisdomland Business Park, Guankou Erlu, Nantou, Nanshan District, Shenzhen, 518052 China
FCC Registration Number:	514049
FCC Designation Number:	CN5009
Telephone:	86 755 8828 6998
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3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product:	Remote controller
Model no.:	C51072W, C59001W, C51076W, C51077W, C51078W, C51079W, C51101W, C51102W, C51103W, C51104W, C51105W, C51106W, C51201W, C51202W, C51203W, C51204W, C51205W, C51206W, C55021W, C55022W, C55023W, C55024W, C55025W, C61049W, C61050W, C61027W, C62001W, C62002W, C62003W, C62004W, C62005W, C62006W, C62007W, C63001W, C63002W, C63003W, C63004W, C63005W, C63006W, C61046W, C61047W, C61036W, C64001W, C64002W, C64003W, C64004W, C61048W, C61051W, C61052W, C61501W, C61502W, C61503W, C61504W, C61082W, C65001W, C65002W, C65003W, C61005W, C61071W, C61072W, C61076W, C82001W, C82002W, C82003W, C82004W, C82005W, C81012W, C81024W, C81051W, C81052W, C81053W, C81054W, C81055W, C81056W, C81057W, C81058W, C81059W, C81060W, C81025W, C81026W
FCC ID:	2AAFASY-C51072W-03
Options and accessories:	NIL
Ratings:	2 x 1.5VDC AAA size battery (for remote controller)
RF Transmission Frequency:	2402MHz-2480MHz
Modulation:	GFSK
Antenna Type:	Monopole Antenna
Antenna Gain:	0dBi
Description of the EUT:	The product is remote controller operated with 2.4GHz wireless function, the transmitting frequency range is 2402MHz - 2480MHz.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C 10-1-2020 Edition	PART 15 - RADIO FREQUENCY DEVICES Subpart C - Intentional Radiators

All the test methods were according to ANSI C63.10-2013.

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5 Summary of Test Results

Technical Requirements					
FCC Part 15 Subpart C 15.249					
Test Condition	Pages	Test Site	Test Result		
			Pass	Fail	N/A
15.207 Conducted emission AC power port	see note 1	---	☐	☐	☒
§15.205(a), §15.209(a), §15.249(a), §15.249(c) Field strength of emissions and Restricted bands	10	Site 1	☒	☐	☐
§15.249(d) Out of band emissions	15	Site 1	☒	☐	☐
FCC §15.215(c) 20dB bandwidth	20	Site 1	☒	☐	☐
§15.203 Antenna requirement	See note 2		☒	☐	☐

Note 1: The EUT is battery operated device which can't connected to the AC mains directly or indirectly, therefore, this test item is not applicable.
Note 2: The EUT used a monopole antenna, which gain is 0dBi. According to §15.203, it is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks

All the models have same circuit, PCB layout and electric components, only the appearance, color and model named are different. Therefore, the EMC full tests were applied on model C51072W, other models are deemed to fulfill relevant EMC requirement without further testing.

This submittal(s) (test report) is intended for FCC ID: 2AAFASY-C51072W-03 complies with Section 15.205, 15.209, 15.249 of the FCC Part 15, Subpart C Rules.

SUMMARY:

All tests according to the regulations cited on page 5 were

■ - Performed

☐ - **Not** Performed

The Equipment Under Test

■ - **Fulfills** the general approval requirements.

☐ - **Does not** fulfill the general approval requirements.

Sample Received Date:	April 18, 2022
Testing Start Date:	May 07, 2022
Testing End Date:	July 18, 2022

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shenzhen Branch -

Reviewed by:	Prepared by:	Tested by:
Jessie He	Myron Yu	Carry Cai
EMC Project Manager	EMC Project Engineer	EMC Test Engineer

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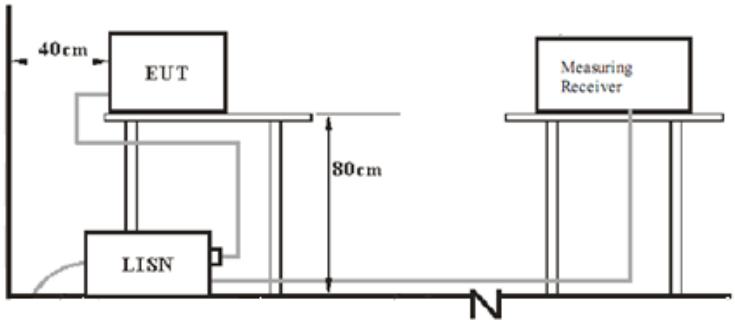
7 Test setups

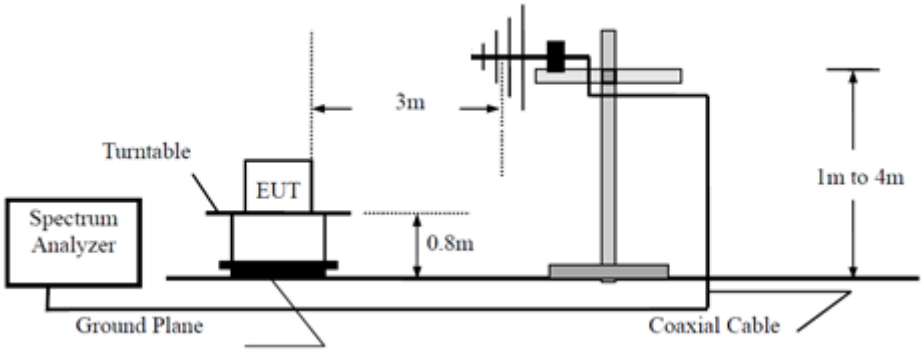
7.1 AC Power Line Conducted Emission test setups

AC Power Line Conducted Emission test setups

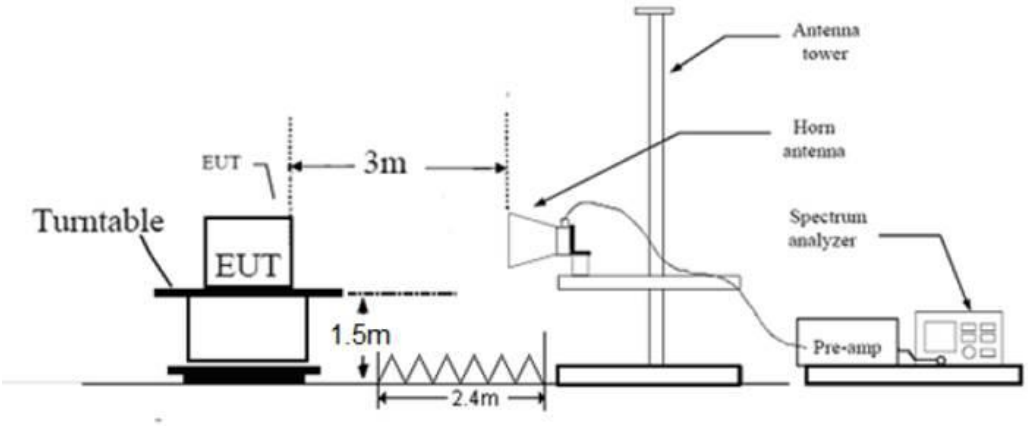


7.2 Radiated test setups

Below 1GHz



Above 1GHz



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8 Technical Requirement

8.1 Conducted Emission

Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through an Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. An EMI test receiver is used to test the emissions from both sides of AC line

Limit

Frequency MHz	QP Limit dBµV	AV Limit dBµV
0.150-0.500	66-56*	56-46*
0.500-5	56	46
5-30	60	50

*Decreasing linearly with logarithm of the frequency.

Test results
Not applicable

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8.2 Field strength of emissions and Restricted bands

Test Method

1: The EUT was place on a turn table which is 1.5m above ground plane for above 1GHz and 0.8m above ground for below 1GHz at 3-meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2: The EUT was set 3 meters away from the interference – receiving antenna, which was mounted on the top of a variable – height antenna tower.
3: The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4: For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5: Use the following spectrum analyzer settings According to C63.10:

For Above 1GHz
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 1MHz, VBW≥3RBW, Sweep = auto, Detector function = peak and average,
Trace = max hold.

For Below 1GHz
Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 120KHz, VBW≥3RBW, Sweep = auto, Detector function = QP,
Trace = max hold.

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Field strength of emissions and Restricted bands

Limits
According to §15.249 (a), the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

According to §15.249 (c), Field strength limits are specified at a distance of 3 meters.
According to §15.249 (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 §15.209, whichever is the lesser attenuation.
According to §15.205 Unwanted emissions falling into restricted bands in §15.205 (a) shall comply with the limits specified in §15.209.

Frequency MHz	Field Strength uV/m	Field Strength dBµV/m	Detector
30-88	100	40	QP
88-216	150	43.5	QP
216-960	200	46	QP
960-1000	500	54	QP
Above 1000	500	54	AV
Above 1000	5000	74	PK

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Field strength of emissions and Restricted bands

According to C63.10, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement, so AV emission value did not show in below table if the peak value complies with average limit.

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2402MHz

For Peak Value

Radiated Emission								
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading Level **dBµV/m**	Correction Factor **dB/m**	PK Emission **dBµV/m**	Limit **dBµV/m**	Margin **dBm**	Emission Type
PK	902.353333	H	9.87	25.70	35.57	46.00	10.43	Spurious
PK	944.494444	V	9.02	26.11	35.13	46.00	10.87	Spurious
PK	2402.000000	H	86.74	-2.92	83.82	114	30.18	Fundamental
PK	2402.500000	V	83.35	-2.92	80.43	114	33.57	Fundamental
PK	4804.000000*	H	50.69	3.00	53.69	74.00	20.31	Spurious
PK	16321.500000	V	30.49	20.59	51.08	74.00	22.92	Spurious

For AV Value

Radiated Emission										
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading Level **dBµV/m**	Correction Factor **dB**	PK Emission **dBµV/m**	Average Factor **dB**	AV Emission **dBµV/m**	Limit **dBµV/m**	Margin **dBm**	Emission Type
AV	2402.000000	H	86.74	-2.92	83.82	-17.02	66.80	94.00	27.20	Fundamental
AV	2402.500000	V	83.35	-2.92	80.43	-17.02	63.41	94.00	30.59	Fundamental
AV	4804.000000*	H	50.69	3.00	53.69	-17.02	36.67	54.00	17.33	Spurious
AV	16321.500000	V	30.49	20.59	51.08	-17.02	34.06	54.00	19.94	Spurious
Peak to average duty cycle correction factor =20log (duty cycle), duty cycle=14.09%										

Remark:
1: Data of measurement within this frequency range shown “/” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
2: “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
3: PK Emission = Reading Level + Correction Factor
4: AV Emission Level= PK Emission +20log(duty cycle)
Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

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Field strength of emissions and Restricted bands

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2441MHz

For Peak Value

Radiated Emission								
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading Level **dBµV/m**	Correction Factor **dB/m**	PK Emission **dBµV/m**	Limit **dBµV/m**	Margin **dBm**	Emission Type
PK	2440.000000	H	97.35	-2.74	94.61	114	19.39	Fundamental
PK	2440.000000	V	89.36	-2.74	86.62	114	27.38	Fundamental
PK	4852.500000*	H	49.84	3.56	53.40	74.00	20.60	Spurious
PK	17139.500000	V	27.77	22.78	50.55	74.00	23.45	Spurious

For AV Value

Radiated Emission										
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading Level **dBµV/m**	Correction Factor **dB**	PK Emission **dBµV/m**	Average Factor **dB**	AV Emission **dBµV/m**	Limit **dBµV/m**	Margin **dBm**	Emission Type
AV	2440.000000	H	97.35	-2.74	94.61	-17.02	77.59	94.00	16.41	Fundamental
AV	2440.000000	V	89.36	-2.74	86.62	-17.02	69.60	94.00	24.40	Fundamental
AV	4852.500000*	H	49.84	3.56	53.40	-17.02	36.38	54.00	17.62	Spurious
AV	17139.500000	V	27.77	22.78	50.55	-17.02	33.53	54.00	20.47	Spurious
Peak to average duty cycle correction factor =20log (duty cycle), duty cycle=14.09%										

Remark:
1: Data of measurement within this frequency range shown "/" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
2: "*" means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
3: PK Emission = Reading Level + Correction Factor
4: AV Emission Level= PK Emission +20log(duty cycle)
Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

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Field strength of emissions and Restricted bands

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2480MHz

For Peak Value

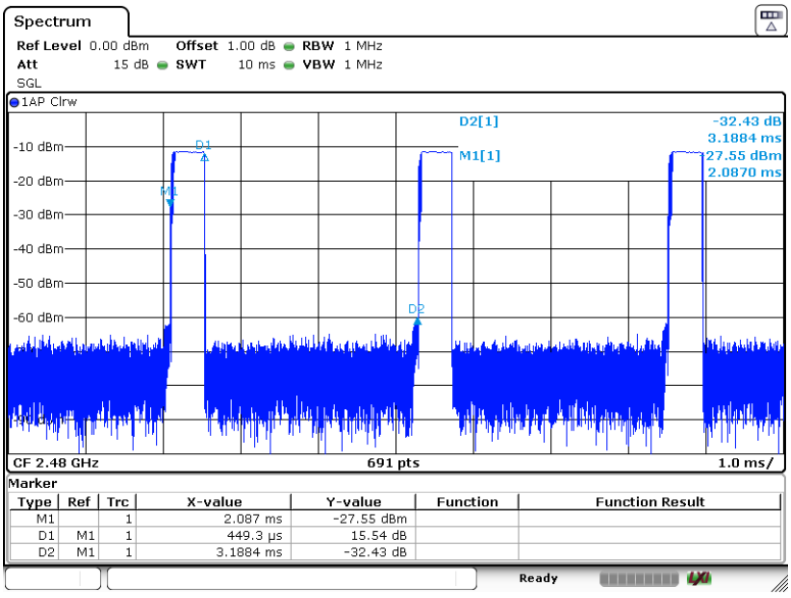
Radiated Emission								
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading Level **dBμV/m**	Correction Factor **dB/m**	PK Emission **dBμV/m**	Limit **dBμV/m**	Margin **dBm**	Emission Type
PK	2480.000000	H	96.5	-2.62	93.88	114	20.12	Fundamental
PK	2480.000000	V	90.7	-2.62	88.08	114	25.92	Fundamental
PK	4960.500000*	H	55.79	4.01	59.80	74.00	14.20	Spurious
PK	4960.500000*	V	50.79	4.01	54.80	74.00	19.20	Spurious

For AV Value

Radiated Emission										
Value	Emissions Frequency **MHz**	E-Field Polarity	Reading Level **dBμV/m**	Correction Factor **dB**	PK Emission **dBμV/m**	Average Factor **dB**	AV Emission **dBμV/m**	Limit **dBμV/m**	Margin **dBm**	Emission Type
AV	2480.000000	H	96.50	-2.62	93.88	-17.02	76.86	94.00	17.14	Fundamental
AV	2480.000000	V	90.70	-2.62	88.08	-17.02	71.06	94.00	22.94	Fundamental
AV	4960.500000*	H	55.79	4.01	59.80	-17.02	42.78	54.00	11.22	Spurious
AV	4960.500000*	V	50.79	4.01	54.80	-17.02	37.78	54.00	16.22	Spurious
Peak to average duty cycle correction factor =20log (duty cycle), duty cycle=14.09%										

Remark:
1: Data of measurement within this frequency range shown “/” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
2: “*” means the emission(s) appear within the restrict bands shall follow the requirement of section 15.205.
3: PK Emission = Reading Level + Correction Factor
4: AV Emission Level= PK Emission +20log(duty cycle)
Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)
Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)
(The Reading Level is recorded by software which is not shown in the sheet)

Duty Cycle=0.45 ms/3.19ms=14.09%



Date: 8.MAY.2022 17:02:15

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8.3 Out of Band Emissions

Test Method

1 Use the following spectrum analyzer settings:
Span = wide enough to capture the peak level of the in-band emission and all spurious
RBW = 100 kHz, VBW≥RBW, Sweep = auto, Detector function = peak, Trace = max hold.
2 Allow the trace to stabilize, use the peak and delta measurement to record the result.
3 The level displayed must comply with the limit specified in this Section.

Limits

According to §15.249(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 §15.209, whichever is the lesser attenuation.

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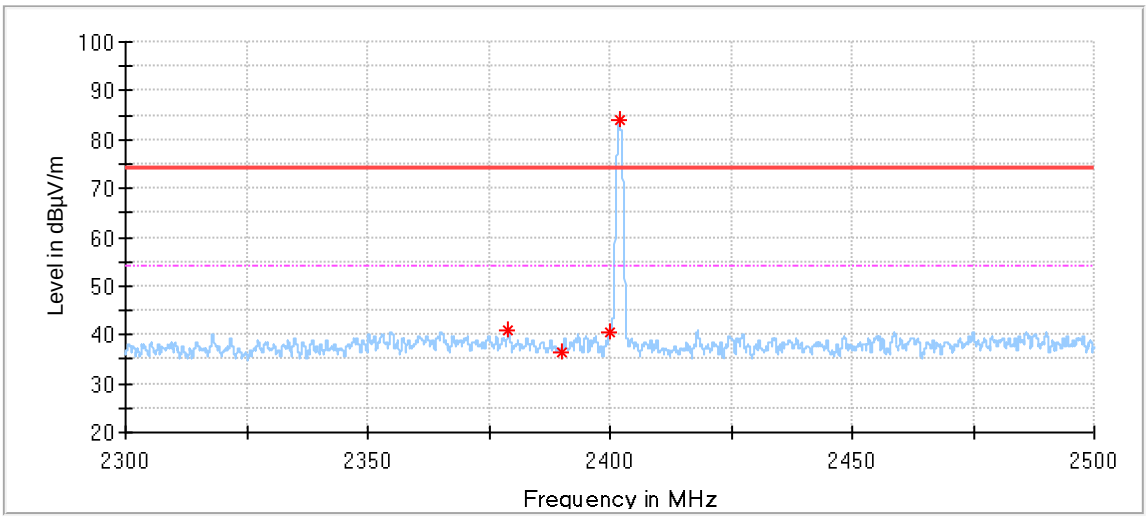
Out of Band Emissions

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2402MHz
Polarization: Horizontal



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2378.960000	40.92	74.00	33.08	150.0	H	285.0	-2.94
2390.000000	36.35	74.00	37.65	150.0	H	337.0	-2.93
2400.000000	40.70	74.00	33.30	150.0	H	295.0	-2.93
2402.000000	83.82	74.00	-9.82	150.0	H	321.0	-2.92

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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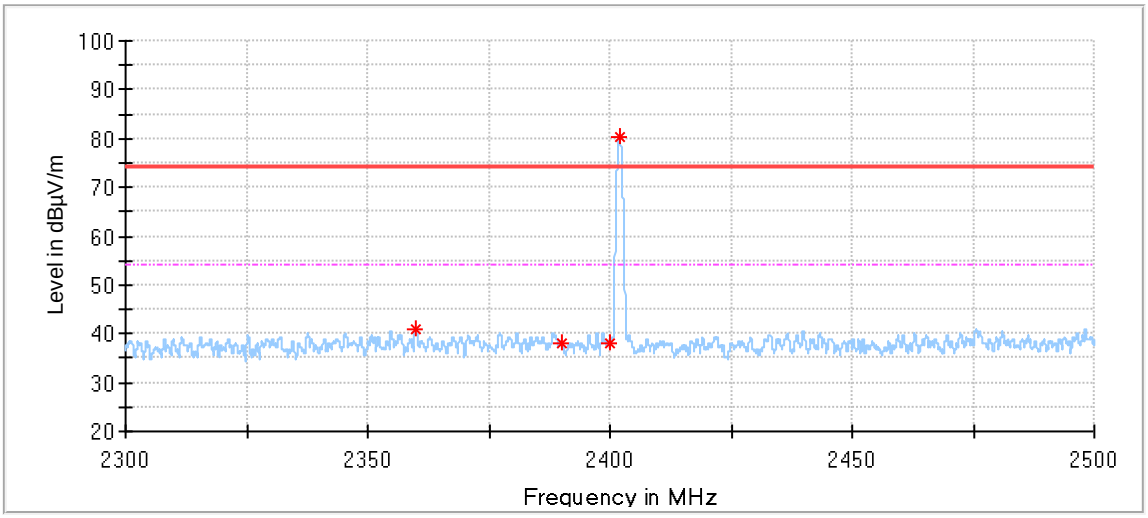
Out of Band Emissions

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2402MHz
Polarization: Vertical



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2359.920000	40.86	74.00	33.14	150.0	V	27.0	-2.84
2390.000000	38.05	74.00	35.95	150.0	V	60.0	-2.93
2400.000000	38.07	74.00	35.93	150.0	V	355.0	-2.93
2401.980000	80.43	74.00	-6.43	150.0	V	27.0	-2.92

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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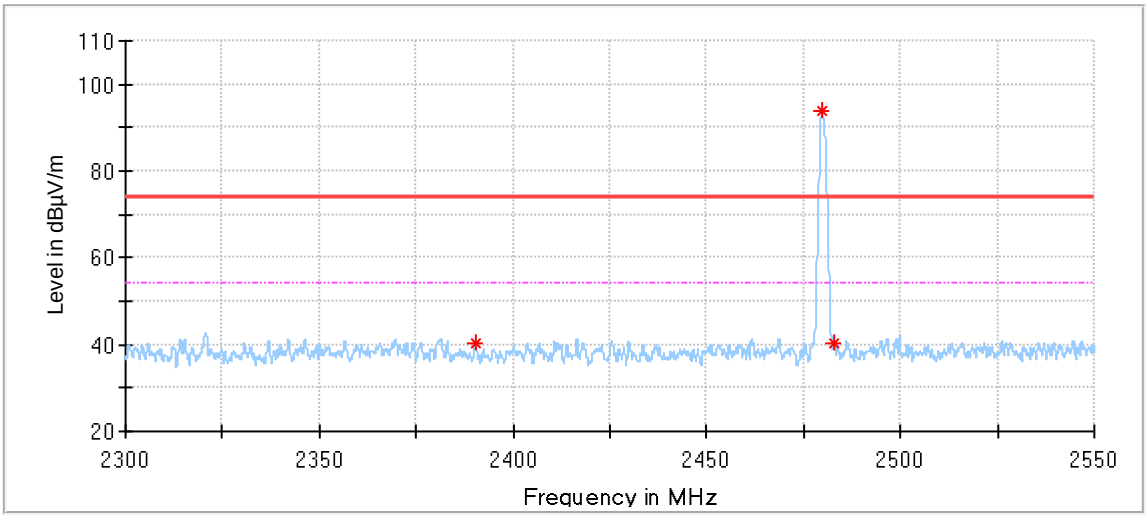
Out of Band Emissions

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2480MHz
Polarization: Horizontal



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2390.297619	40.52	74.00	33.48	150.0	H	271.0	-2.93
2479.761905	93.88	74.00	-19.88	150.0	H	271.0	-2.62
2482.916667	40.13	74.00	33.87	150.0	H	164.0	-2.60

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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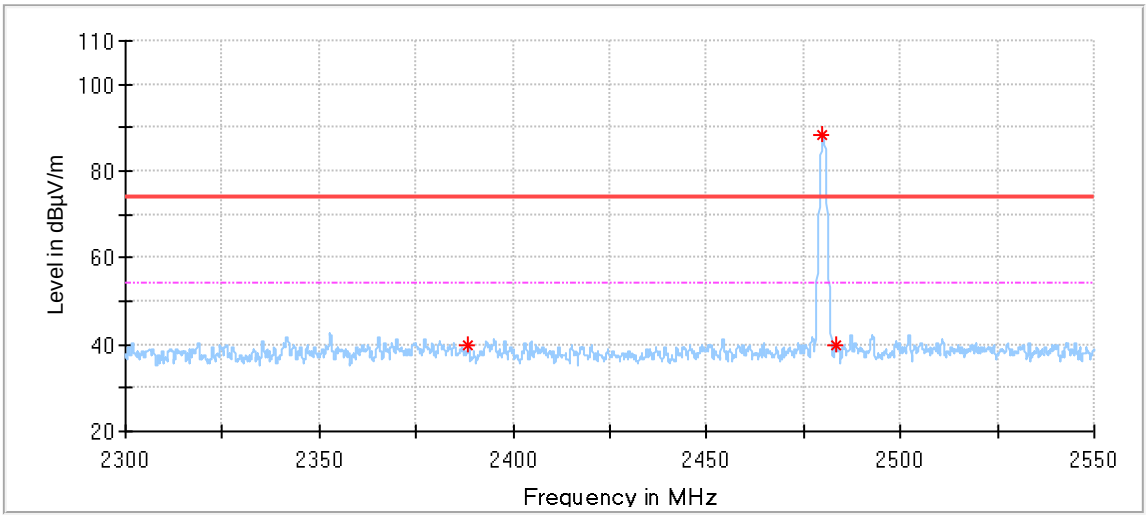
Out of Band Emissions

EUT: Remote controller
M/N: C51072W
Operating Condition: Tx 2480MHz
Polarization: Vertical



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2388.452381	39.69	74.00	34.31	150.0	V	271.0	-2.93
2480.000000	88.08	74.00	-14.08	150.0	V	260.0	-2.62
2483.214286	39.78	74.00	34.22	150.0	V	100.0	-2.60

Remark:
Level=Reading Level + Correction Factor
Correction Factor=Antenna Factor + Cable Loss – Pre-amplifier
(The Reading Level is recorded by software which is not shown in the sheet)

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8.4 20dB Bandwidth

Test Method

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to spectrum analyser. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.

Limits:

According to 15.215 (c) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

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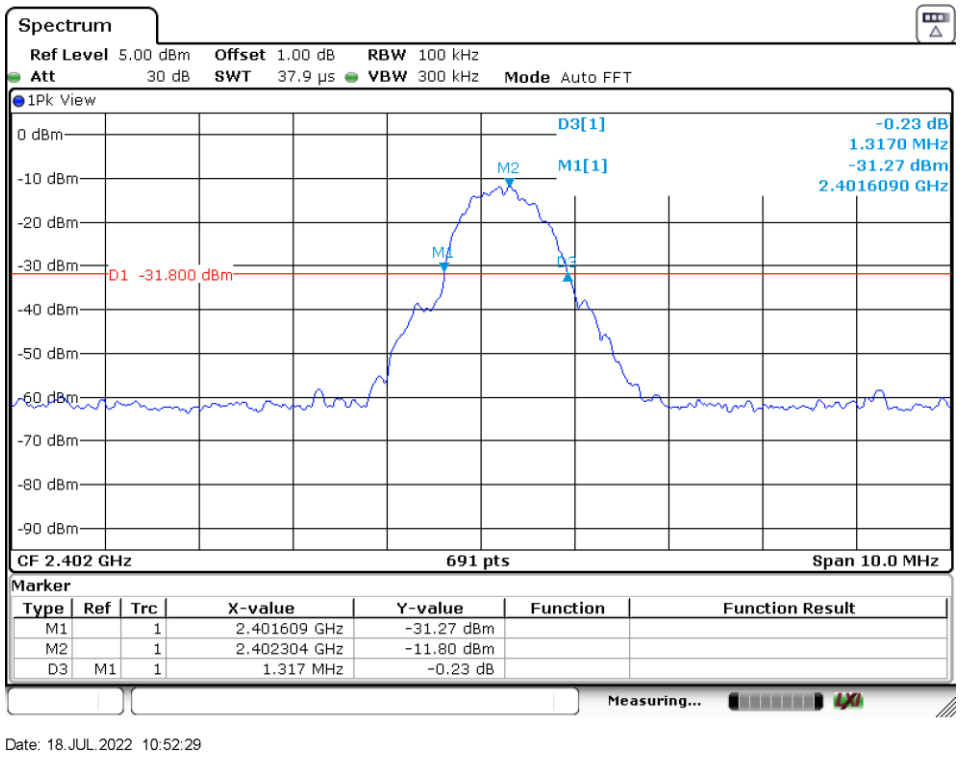
20dB Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2402	1.317	--



2402MHz

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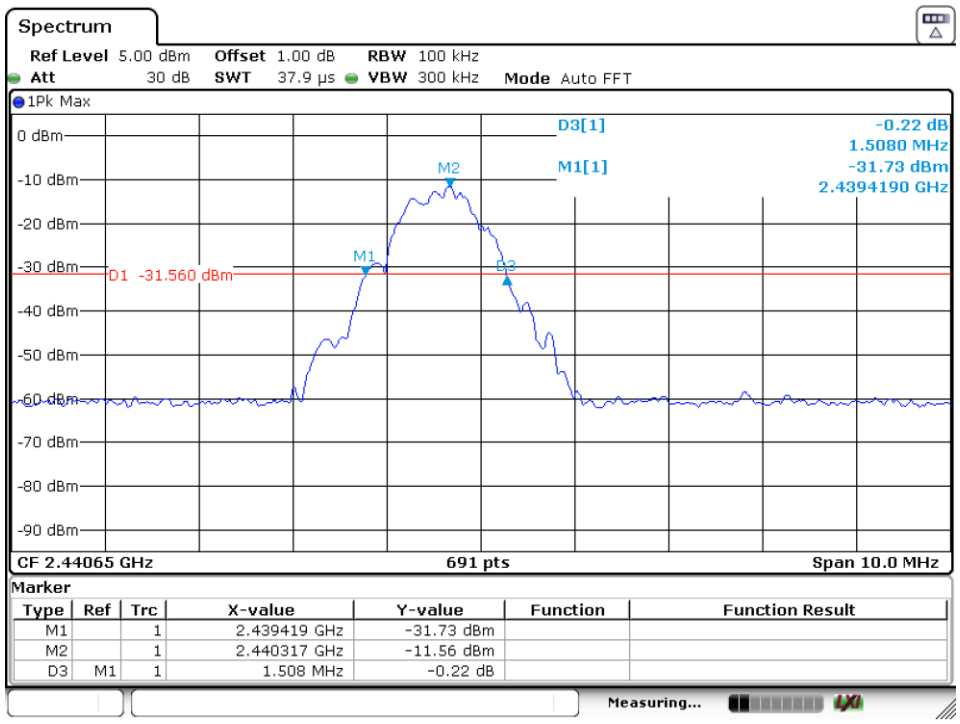
20dB Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2440	1.508	--



Date: 18.JUL.2022 10:59:00

2440MHz

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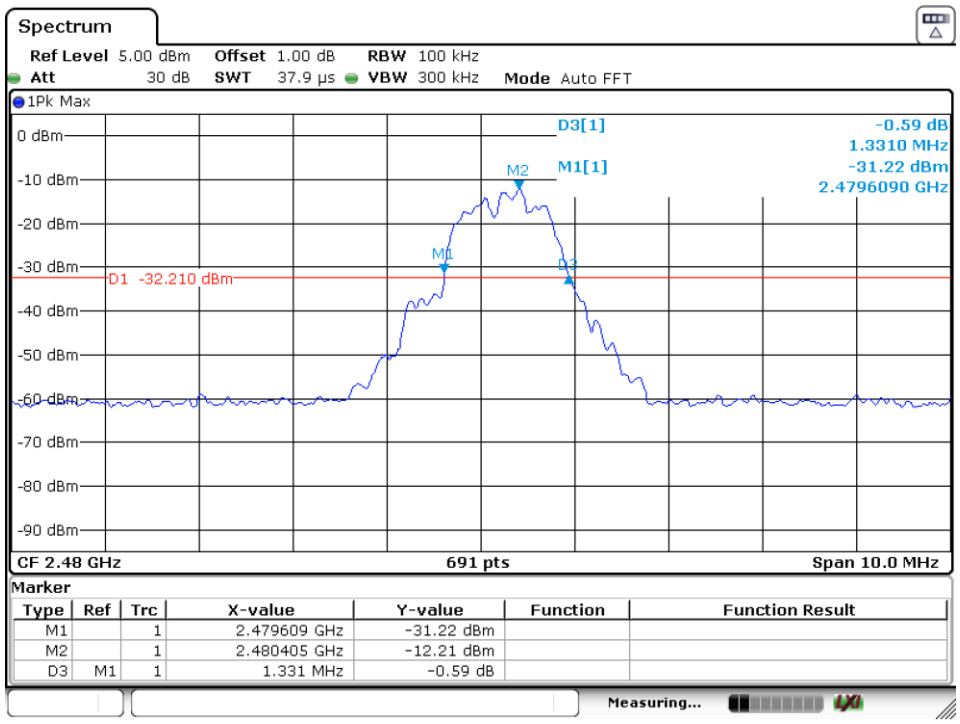
20dB Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2480	1.331	--



2480MHz

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9 Test equipment lists

Radiated Emission 2# Test Site

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
EMI Test Receiver	Rohde & Schwarz	ESR 26	68-4-74-14-002	101269	1	2023-5-28
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9162	68-4-80-19-003	284	1	2023-1-17
Wave Guide Antenna	ETS	3117	68-4-80-19-001	00218954	1	2023-5-9
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2023-5-28
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2023-5-28
Sideband Horn Antenna	Q-PAR	QWH-SL-18-40-K-SG	68-4-80-14-008	12827	1	2022-7-21
Pre-amplifier	Rohde & Schwarz	SCU 40A	68-4-29-14-002	100432	1	2022-7-27
Attenuator	Mini-circuits	UNAT-6+	68-4-81-21-002	15542	1	2023-5-27
3m Semi-anechoic chamber	TDK	SAC-3 #2	68-4-90-19-006	----	2	2023-5-28
Test software	Rohde & Schwarz	EMC32	68-4-90-19-006-A01	Version 10.35.02	N/A	N/A

RF Conducted Test

DESCRIPTION	MANUFACTURER	MODEL NO.	EQUIPMENT ID	SERIAL NO.	CAL INTERVAL (YEAR)	CAL. DUE DATE
Signal Analyzer	Rohde & Schwarz	FSV40	68-4-74-14-004	101030	1	2023-5-27

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10 System Measurement Uncertainty

For a 95% confidence level, the measurement expanded uncertainties for defined systems, in accordance with the recommendations of ISO 17025 were:

System Measurement Uncertainty	
Test Items	Extended Uncertainty
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 30MHz-1000MHz	Horizontal: 4.67dB; Vertical: 4.65dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 1000MHz-18000MHz	Horizontal: 4.76dB; Vertical: 4.75dB
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006) 18GHz-40GHz	Horizontal: 3.12dB; Vertical: 3.10dB
Uncertainty for Conducted RF test with TS 8997	RF Power Conducted: 1.27dB Frequency test involved: 0.6×10^{-7} or 1%

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.

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