

FCC - TEST REPORT

Report Number	:	68.940.22.0015.01	Date of Iss	sue:	June 6, 2022
Model	:	C51009W, C51051W, C5 C51005W, C51006W, C5 C51012W, C51013W, C5 C51018W, C51019W, C5 C51024W, C51025W, C5 C51030W, C51031W, C5 C51036W, C51037W, C5 C51042W, C51043W, C5 C51048W, C51049W, C5 C51056W, C51057W, C5 C51071W, C51072W, C5 C51077W, C51078W, C5 C52002W, C52003W, C5	1007W, C51 1014W, C51 1020W, C51 1026W, C51 1032W, C51 1038W, C51 1044W, C51 1052W, C51 1073W, C51 1079W, C51	1008W, 1015W, 1021W, 1027W, 1033W, 1039W, 1045W, 1053W, 1061W, 1074W,	C51010W, C51011W, C51016W, C51017W, C51022W, C51023W, C51028W, C51029W, C51034W, C51035W, C51040W, C51041W, C51046W, C51047W, C51054W, C51055W, C51062W, C51063W, C51075W, C51076W, C51101W, C52001W,
Product Type	<u>:</u>	Remote controller			
Applicant	<u>:</u>	DOUBLEEAGLE INDUST	RY (CHINA) LIMITE	ED .
Address	<u>:</u>	XINGDA INDUSTRIAL PA	ARK, CHEN	GHAI, S	HANTOU CITY,
		GUANGDONG PROVINC	CE, CHINA		
Manufacturer	<u>:</u>	DOUBLEEAGLE INDUST	RY (CHINA) LIMITE	ED .
Address	<u>:</u>	XINGDA INDUSTRIAL PA	ARK, CHEN	GHAI, S	HANTOU CITY,
		GUANGDONG PROVINC	E, CHINA		
Test Result	:	■ Positive □ Negati	ive		
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 Fax: 86 755 8828 5299



3 Description of the Equipment Under Test

Description of the Equipment Under Test

Product: Remote controller

Model no.: C51009W, C51051W, C51001W, C51002W, C51003W, C51004W,

FCC ID: 2AAFASY-C51009W-04

Options and accessories: NIL

Ratings: 2 x 1.5VDC AA size battery (for remote controller)

RF Transmission Frequency: 2405MHz-2475MHz

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 2405MHz-2475MHz.



4 Summary of Test Standards

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

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



5 Summary of Test Results

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

Note 1: The device is battery powered and can not be directly or indirectly connected to the AC mains, therefore the conducted emission measurement 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.



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 C51009W, other models are deemed to fulfill relevant EMC requirement without further testing.

This submittal(s) (test report) is intended for FCC ID: 2AAFASY-C51009W-04 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: May 08, 2022

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

Reviewed by:

Prepared by:

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EMC Project Manager

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Tested by:

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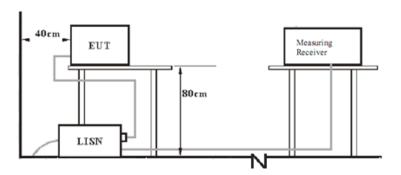
EMC Test Engineer



7 Test setups

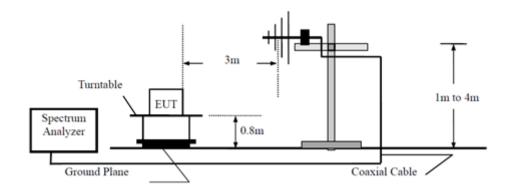
7.1 AC Power Line Conducted Emission test setups

AC Power Line Conducted Emission test setups

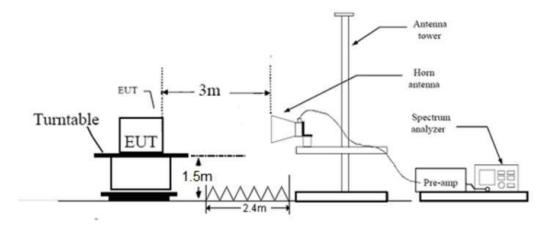


7.2 Radiated test setups

Below 1GHz



Above 1GHz





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	QP Limit	AV Limit	
 MHz	dΒμV	dΒμV	
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



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.



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:

		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	Field Strength	Field Strength	Detector
MHz	uV/m	dBµV/m	
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



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: C51009W

Operating Condition: Tx 2405MHz

For Peak Value

or r our	Value							
			F	Radiated Emissi	on			
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	945.680000	Н	9.94	25.51	35.45	46.00	10.55	Spurious
PK	944.871667	V	10.84	25.50	36.34	46.00	9.66	Spurious
PK	2405.00000	Н	86.80	-6.26	80.54	114.00	33.46	Fundamental
PK	2405.500000	V	79.59	-6.27	73.32	114.00	40.68	Fundamental
PK	17146.000000	Н	27.94	22.80	50.74	74.00	23.26	Spurious
PK	4810.500000*	V	48.25	3.06	51.31	74.00	22.69	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	2405.00000	Н	86.80	-6.26	80.54	-30.79	49.75	94.00	44.25	Fundamental		
AV	2405.500000	V	79.59	-6.27	73.32	-30.79	42.53	94.00	51.47	Fundamental		
AV	/	Н	/	/	/	/	/	54.00	/	Spurious		
AV	/	V	/	/	/	/	/	54.00	/	Spurious		
Peak to a	average duty cycl	e correction	factor =20lc	g (duty cycle)	, duty cycle=	=2.89%						

Remark:

Correction Factor=Antenna Factor + Cable Loss (For Below 1GHz)

Correction Factor = Antenna Factor + Cable Loss- Amplifier Gain (For Above 1GHz)

^{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: &}quot;*" 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)



Field strength of emissions and Restricted bands

EUT: Remote controller

M/N: C51009W

Operating Condition: Tx 2440MHz

For Peak Value

			F	Radiated Emissi	on			
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	2440.500000	Н	89.09	-5.91	83.18	114.00	30.82	Fundamental
PK	2440.500000	V	89.75	-5.91	83.84	114.00	30.16	Fundamental
PK	4880.000000*	Н	48.06	3.79	51.85	74.00	22.15	Spurious
PK	17444.500000	V	27.85	22.32	50.17	74.00	23.83	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	
ΑV	2440.500000	I	89.09	-5.91	83.18	-30.79	52.39	94.00	41.61	Fundamental	
ΑV	2440.500000	V	89.75	-5.91	83.84	-30.79	53.05	94.00	40.95	Fundamental	
ΑV	/	Н	/	/	/	/	/	54.00	/	Spurious	
ΑV	/	V	/	/	/	/	/	54.00	/	Spurious	

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)



Field strength of emissions and Restricted bands

EUT: Remote controller

M/N: C51009W

Operating Condition: Tx 2475MHz

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	2475.500000	Н	85.95	-5.71	80.24	114.00	33.76	Fundamental				
PK	2475.500000	V	89.74	-5.71	84.03	114.00	29.97	Fundamental				
PK	16820.000000	Н	28.01	22.01	50.02	74.00	23.98	Spurious				
PK	4950.500000*	V	47.91	4.04	51.95	74.00	22.05	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	
ΑV	2475.500000	Н	85.95	-5.71	80.24	-30.79	49.45	94.00	44.55	Fundamental	
ΑV	2475.500000	V	89.74	-5.71	84.03	-30.79	53.24	94.00	40.76	Fundamental	
ΑV	/	Н	/	/	/	/	/	54.00	/	Spurious	
ΑV	/	V	/	/	/	/	/	54.00	/	Spurious	

Teak to average duty cycle correction factor =2010g (duty cycle); duty cycle=2.00%

Remark:

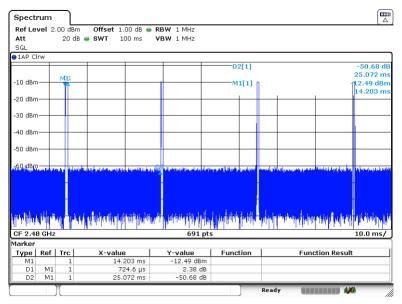
- 1: Data of measurement within this frequency range shown "/" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- 2: "*" means the emission(s) appear within the restrict bands shall follow the 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=0.73 ms/25.07 ms=2.89%



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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.



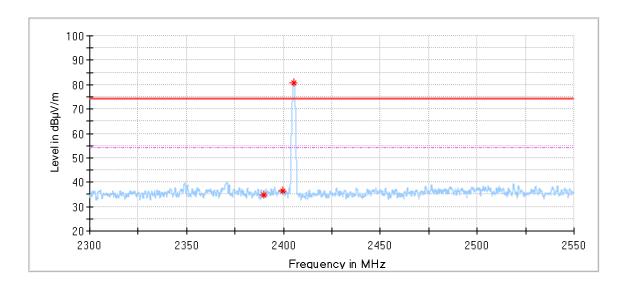
Out of Band Emissions

EUT: Remote controller

M/N: C51009W

Operating Condition: Tx 2405MHz

Polarization: Horizontal



Critical_Freqs

• · · · · · · · · · · · · · · · · · · ·	- 4-						
Frequency	MaxPeak	Limit	Margin	Height	Pol	Azimuth	Corr.
(MHz)	(dBµV/m)	(dBµV/m)	(dB)	(cm)		(deg)	(dB/m)
2389.975000	34.85	74.00	39.15	150.0	Н	320.0	-6.33
2399.750000	36.25	74.00	37.75	150.0	Н	225.0	-6.33
2405.500000	80.81	74.00	-6.81	150.0	Н	113.0	-6.27

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier



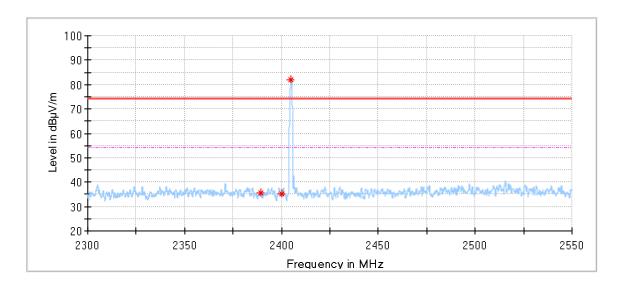
Out of Band Emissions

EUT: Remote controller

M/N: C51009W

Operating Condition: Tx 2405MHz

Polarization: Vertical



Critical Freqs

• · · · · · · · · · · · · · · · · · · ·							
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2389.275000	35.58	74.00	38.42	150.0	٧	0.0	-6.33
2400.000000	35.36	74.00	38.64	150.0	٧	296.0	-6.33
2405.000000	82.05	74.00	-8.05	150.0	٧	8.0	-6.27

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier



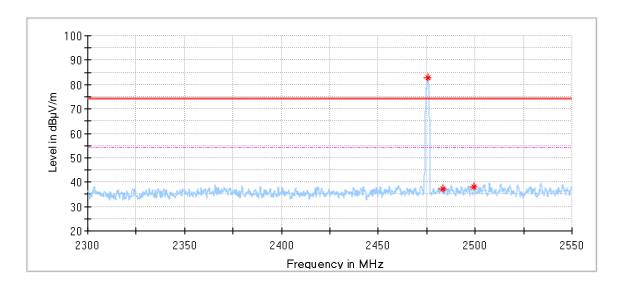
Out of Band Emissions

EUT: Remote controller

M/N: C51009W

Operating Condition: Tx 2475MHz

Polarization: Horizontal



Critical Freqs

• · · · · · · · · · · · · · · · · · · ·							
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2475.575000	82.82	74.00	-8.82	150.0	Н	294.0	-5.71
2483.400000	37.40	74.00	36.60	150.0	Н	294.0	-5.67
2499.575000	38.01	74.00	35.99	150.0	Н	333.0	-5.59

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier



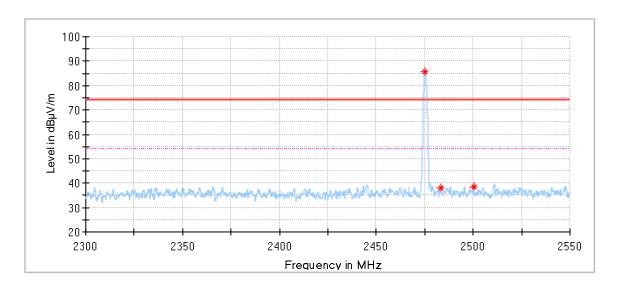
Out of Band Emissions

EUT: Remote controller

M/N: C51009W

Operating Condition: Tx 2475MHz

Polarization: Vertical



Critical Freqs

• · · · · · · · · · · · · · · · · · · ·							
Frequency (MHz)	MaxPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2474.925000	85.47	74.00	-11.47	150.0	٧	243.0	-5.71
2483.225000	37.97	74.00	36.03	150.0	٧	338.0	-5.67
2500.200000	38.37	74.00	35.63	150.0	٧	347.0	-5.58

Remark:

Level=Reading Level + Correction Factor

Correction Factor=Antenna Factor + Cable Loss - Pre-amplifier



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.
- 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.

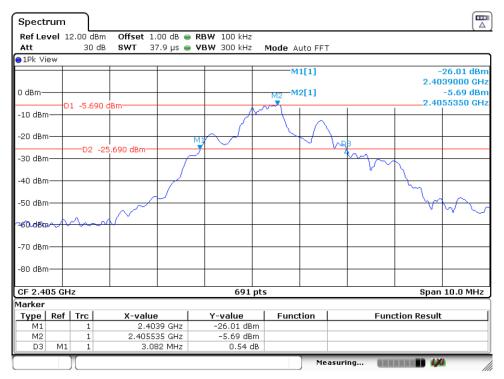
Limits:

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.



20dB Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2405	3.082	



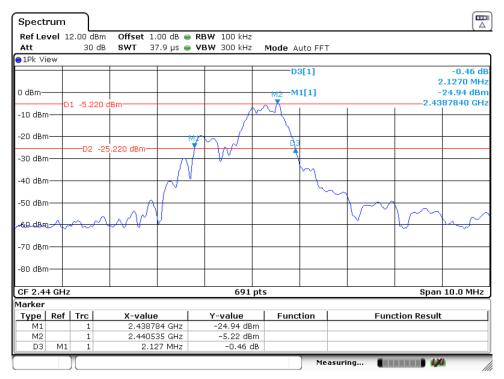
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2405MHz



20dB Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2440	2.127	



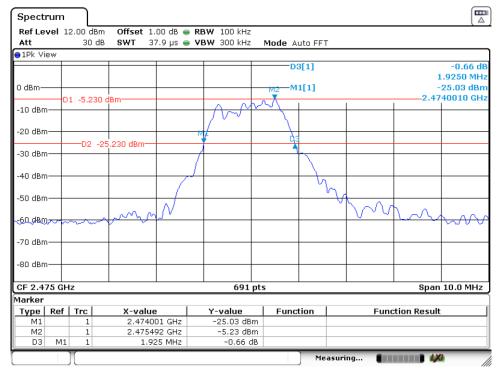
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2440MHz



20dB Bandwidth

Frequency	20dB Bandwidth	Limit
MHz	MHz	MHz
2475	1.925	



Date: 8.MAY.2022 16:28:09

2475MHz



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	2023-6-3
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	2022-5-24
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-001	100745	1	2022-10-10
Pre-amplifier	Rohde & Schwarz	SCU 18F	68-4-29-19-002	100746	1	2022-10-10
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	2022-8-23
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	Version10.35.02	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	2022-6-3



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)	Horizontal: 4.67dB;					
30MHz-1000MHz	Vertical: 4.65dB					
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006)	Horizontal: 4.76dB;					
1000MHz-18000MHz	Vertical: 4.75dB					
Uncertainty for Radiated Emission in new 3m chamber (68-4-90-19-006)	Horizontal: 3.12dB;					
18GHz-40GHz	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.