China

FCC - TEST REPORT

Report Number	:	**709502283606-00A**	Date of Issue:	February 10, 2023
Model	:	RC4693701/01BR, RC469XXXX/XXR, RC469XXXX/XXBR ("X"=0-9,"B" means packed with battery)		
Product Type	:	Remote control		
Applicant	:	HCS (Suzhou) Limited		
Address	:	19F-20F, Building B-3rd, No.209 Zhuyuan Road, New District, Suzhou, P.R.China		
Factory	:	Himit (Yueyang) Technology Ltd.		
Address	:	Building 4, Lingang High-tech Industrial Park, Yueyang Area, China (Hunan) Free, Trade Pilot Zone, P.R.China		
Test Result	:	■ Positive ☐ Negative		
Total pages including Appendices	:	25		

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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. Shanghai Branch No.16 Lane, 1951 Du Hui Road, Shanghai 201108, P.R. China
Test Firm FCC Registration Number:	820234
Designation number:	CN1183
IC Company Number:	25988
CAB identifier:	CN0101
Telephone:	+86 21 6141 0123
Fax:	+86 21 6140 8600

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3 Description of the Equipment Under Test

Product: Remote control

PMN / HVIN / Model no.: RC4693701/01BR, RC469XXXX/XXR, RC469XXXX/XXBR
("X"=0-9,"B" means packed with battery)

FCC ID: 2AGOFRC469A

Rating: 3V DC

RF Transmission Frequency: Bluetooth LE:2402~2480MHz

No. of Operated Channel: Bluetooth LE:40

Modulation: For 2.4GHz BLE: GFSK

Channel list:

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

Antenna Type: PCB dipole Antenna for BLE

Antenna Gain: For 2.4GHz: -3.5 dBi

Description of the EUT: The Equipment Under Test (EUT) is a Remote control which have 2.4GHz BLE (support 1Mbps data rate).

The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment, antenna gain or any information supplied.

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4 Summary of Test Standards

Test Standards	
FCC Part 15 Subpart C	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				
Test Condition		Pages	Test Site	Test Result
§15.207	Conducted emission AC power port	N/A	N/A	Not Applicable
§15.205(a), §15.209(a), §15.249(a), §15.249(c)	Field strength of emissions and Restricted bands	11-16	Site 1	Pass
§15.215(c)	20dB bandwidth	17-19	Site 1	Pass
§15.249(d)	Out of band emissions	20-21	Site 1	Pass
§15.203	Antenna requirement	--	See Note 2	Pass

Note 1: N/A – Not Applicable. Conducted emission is not apply for battery operated device.
Note 2: The EUT uses an PCB dipole Antenna, which gain is -3.5 dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.

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6 General Remarks

Remarks
This submittal(s) (test report) is intended for FCC ID: 2AGOFRC469A complies with Section 15.205, 15.209, 15.249 of the FCC Part 15, Subpart C Rules.

All models are identical in electrical structure, mechanical, PCB and RF performance.
There are only cosmetic differences (color/painting/printed).
We chose model RC4693701/01BR to perform test and listed the worst data in this report.

This report is for the 2.4GHz BLE test report.

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: December 5, 2022

Testing Start Date: January 10, 2023

Testing End Date: February 1, 2023

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

Reviewed by:	Prepared by:	Tested by:
Zhining ZHANG	Yong ZHANG	Yiquan WANG
EMC Project Manager	EMC Project Engineer	EMC Test Engineer

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7 Systems test configuration

Auxiliary Equipment Used during Test:

DESCRIPTION	MANUFACTURER	MODEL NO.(SHIELD)	S/N(LENGTH)
Notebook	Lenove	E470	PF-OU5TS7 17/09

Test software: RadioControlConsole_v3.1.0.0.

The system was configured to channel 0, 19, and 39 for the test.

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

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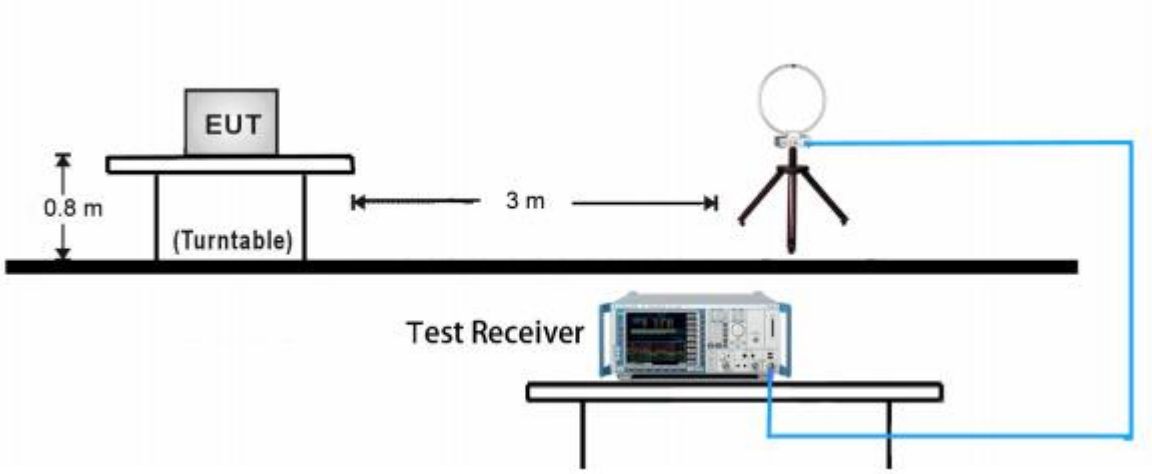
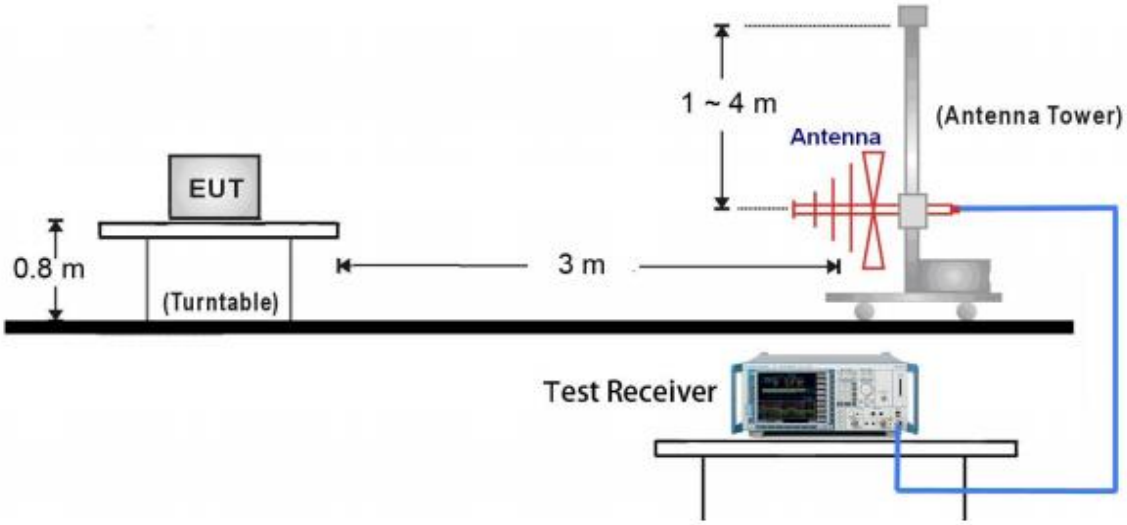
8 Test setups

8.1 Radiated test setups

9kHz ~ 30MHz Test Setup:



30MHz ~ 1GHz Test Setup:



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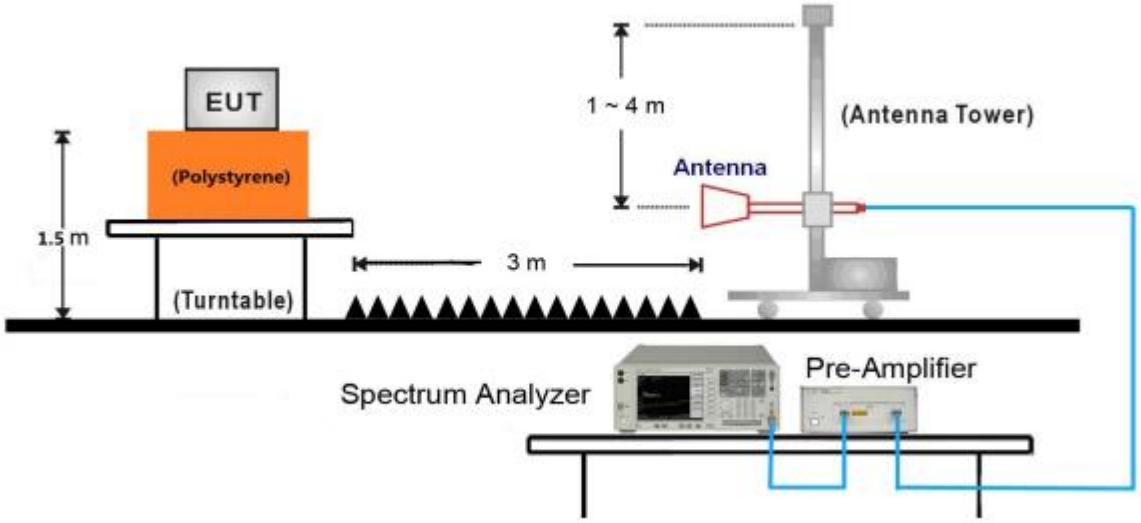
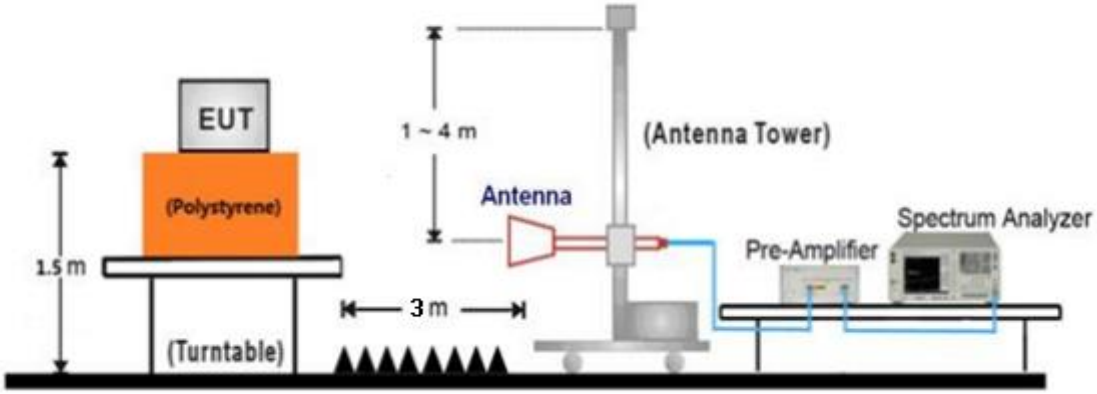
1GHz ~ 18GHz Test Setup:



18GHz ~ 40GHz Test Setup:



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8 Technical Requirement

8.1 Field strength of emissions and Restricted bands

Test Method

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
3. Use the following spectrum analyzer settings:
   Span = wide enough to fully capture the emission being measured ,RBW = 1 MHz for f ≥ 1GHz, 100 kHz for f < 1 GHz, VBW ≥ RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Follow the guidelines in ANSI C63.4-2014 with respect to maximizing the emission by rotating the EUT, adjusting the measurement antenna height and polarization, etc. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, submit this data. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
5. Set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the duty cycle per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from 20log(duty cycle/100 ms), in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

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 and Unwanted emissions falling into restricted bands in §15.205 (a) Table 3 shall comply with the limits specified in §15.209.

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Field strength of emissions and Restricted bands

30MHz-1GHz:

30-1000MHz Radiated Emission Test

EUT Information

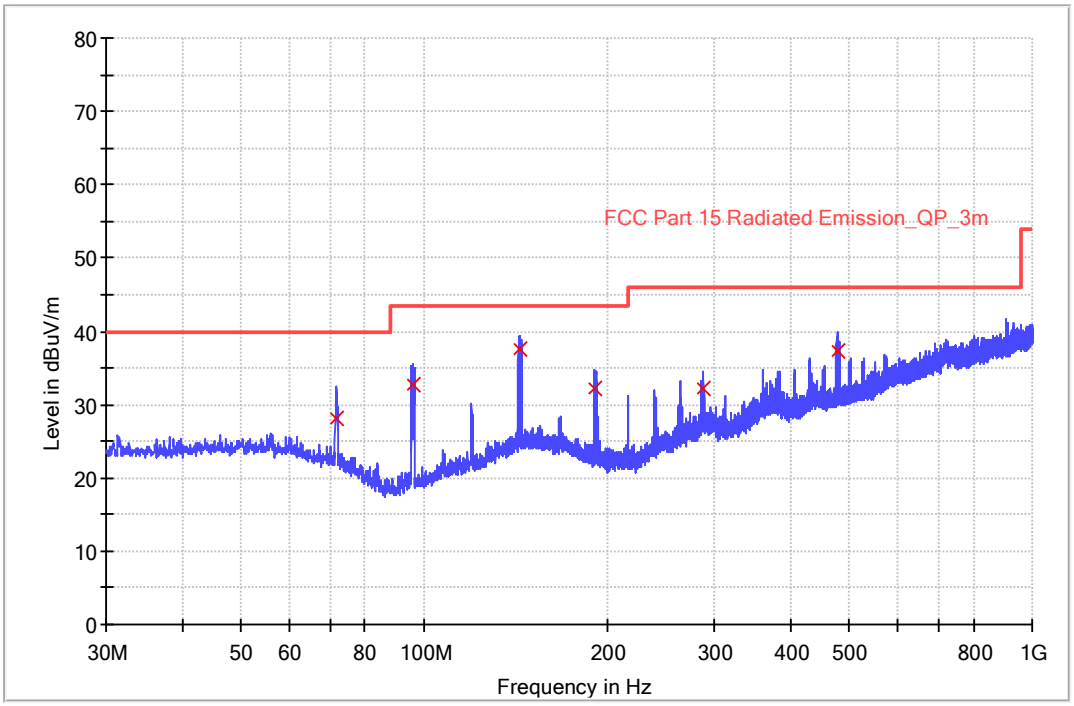
EUT Name:	Remote control
Model:	RC4693701/01BR
Client:	HCS (Suzhou) Limited
Op Cond:	Power on and Tx, DC 3V, T21.3, H40.7%, P103.4kPa
Operator:	Wang Yiquan
Test Spec:	FCC Part 15
Comment:	Horizontal
Sample No:	SHA-697169-1

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup:	RE_VULB9168
Receiver:	[ESR 3]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.005 s	20 dB

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
71.720000	28.2	1000.0	120.000	100.0	H	255.0	18.2	11.8	40.0
95.880000	32.6	1000.0	120.000	150.0	H	304.0	15.6	10.9	43.5
143.480000	37.7	1000.0	120.000	100.0	H	343.0	20.6	5.8	43.5
190.760000	32.3	1000.0	120.000	200.0	H	199.0	18.5	11.2	43.5
287.000000	32.1	1000.0	120.000	100.0	H	70.0	21.2	13.9	46.0
479.320000	37.4	1000.0	120.000	150.0	H	150.0	26.2	8.6	46.0

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30-1000MHz Radiated Emission Test

EUT Information

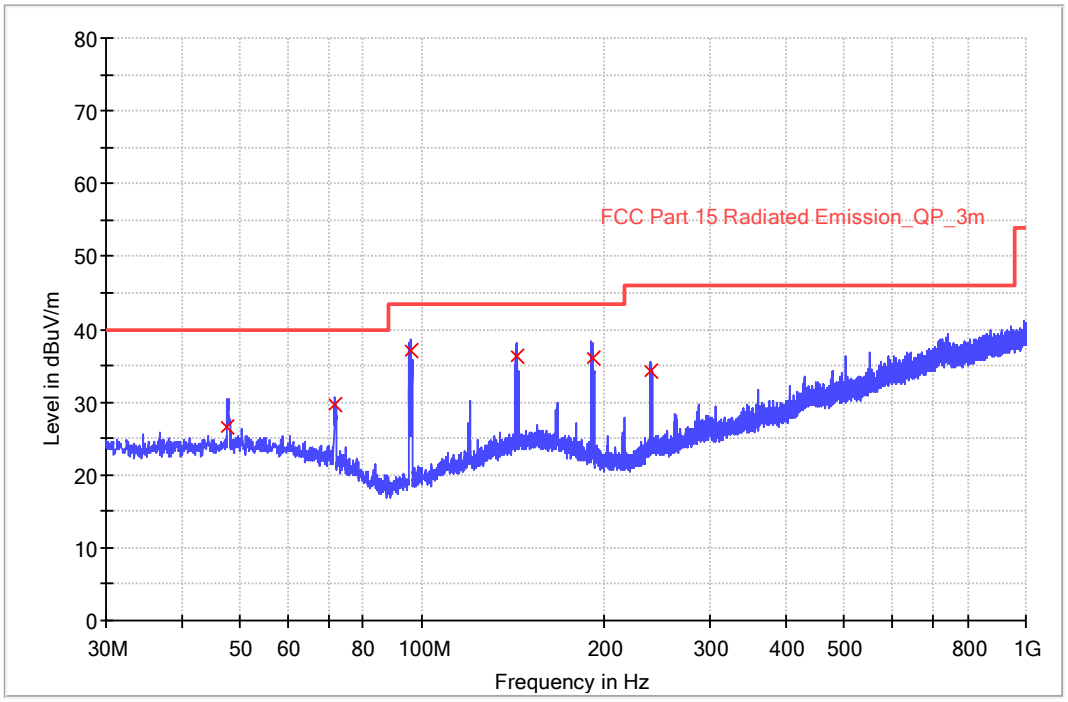
EUT Name:	Remote control
Model:	RC4693701/01BR
Client:	HCS (Suzhou) Limited
Op Cond:	Power on and Tx, DC 3V, T21.3, H40.7%, P103.4kPa
Operator:	Wang Yiquan
Test Spec:	FCC Part 15
Comment:	Vertical
Sample No:	SHA-697169-1

Sweep Setup: RE_VULB9168_pre_Cont_30-1000 [EMI radiated]

Hardware Setup:	RE_VULB9168
Receiver:	[ESR 3]
Level Unit:	dBuV/m

Subrange	Step Size	Detectors	Bandwidth	Sweep Time	Preamp
30 MHz - 1 GHz	48.5 kHz	PK+	120 kHz	0.005 s	20 dB

RE_VULB9168_pre_Cont_30-1000



Limit and Margin

Frequency (MHz)	QuasiPeak (dBuV/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Margin - QPK (dB)	Limit - QPK (dBuV/m)
47.640000	26.5	1000.0	120.000	100.0	V	45.0	20.5	13.5	40.0
71.920000	29.5	1000.0	120.000	150.0	V	114.0	18.2	10.5	40.0
95.880000	37.2	1000.0	120.000	100.0	V	340.0	15.6	6.4	43.5
143.120000	36.3	1000.0	120.000	200.0	V	290.0	20.6	7.2	43.5
191.680000	36.0	1000.0	120.000	100.0	V	248.0	18.4	7.5	43.5
238.520000	34.3	1000.0	120.000	200.0	V	198.0	19.4	11.7	46.0

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Above 1GHz:

Tx at channel 1: 2402MHz

Antenna polarization	Frequency (MHz)	Duty Cycle Factor(dB)	Corrected Reading (dBuV/m)	Emission Type	Limit (dBuV/m)	Margin (dB)	Detector
H	2402.06	0	98.73	Fundamental	114.0	15.27	PK
H	2402.06	-20	78.73	Fundamental	94.0	15.27	AV
V	2402.06	0	91.35	Fundamental	114.0	22.65	PK
V	2402.06	-20	71.35	Fundamental	94.0	22.65	AV
H	4804.00	0	48.60	Harmonics	74.0	25.40	PK
H	9608.00	0	49.89	Harmonics	74.0	24.11	PK
H	12190.00	0	52.13	Harmonics	74.0	21.87	PK
V	4803.50	0	42.37	Harmonics	74.0	31.63	PK
V	7374.00	0	45.54	Harmonics	74.0	28.46	PK

Tx at channel 19: 2440MHz

Antenna polarization	Frequency (MHz)	Duty Cycle Factor(dB)	Corrected Reading (dBuV/m)	Emission Type	Limit (dBuV/m)	Margin (dB)	Detector
H	2442.06	0	97.89	Fundamental	114.0	16.11	PK
H	2442.06	-20	77.89	Fundamental	94.0	16.11	AV
V	2442.06	0	90.37	Fundamental	114.0	23.63	PK
V	2442.06	-20	70.37	Fundamental	94.0	23.63	AV
H	4884.00	0	45.07	Harmonics	74.0	28.93	PK
H	7370.00	0	46.30	Harmonics	74.0	27.70	PK
H	9768.00	0	51.95	Harmonics	74.0	22.05	PK
V	4765.00	0	43.06	Harmonics	74.0	30.94	PK
V	7364.50	0	45.29	Harmonics	74.0	28.71	PK

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Tx at channel 39: 2480MHz

Antenna polarization	Frequency (MHz)	Duty Cycle Factor(dB)	Corrected Reading (dBuV/m)	Emission Type	Limit (dBuV/m)	Margin (dB)	Detector
H	2480.00	0	97.26	Fundamental	114.0	16.74	PK
H	2480.00	-20	77.26	Fundamental	94.0	16.74	AV
V	2480.00	0	91.38	Fundamental	114.0	22.62	PK
V	2480.00	-20	71.38	Fundamental	94.0	22.62	AV
H	4960.00	0	44.74	Harmonics	74.0	29.26	PK
H	7440.00	0	46.85	Harmonics	74.0	27.15	PK
H	9920.00	0	53.39	Harmonics	74.0	20.61	PK
V	3528.50	0	41.96	Harmonics	74.0	32.04	PK
V	6994.50	0	46.04	Harmonics	74.0	27.96	PK

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.

The only worse case test result is listed in the report.

Remark:

1) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Pre-amplifier
   Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
   Emission Level =Reading level +Correction Factor
   (The Reading Level is recorded by software which is not shown in the sheet)
2) If the Peak value below the AV Limit, the AV test doesn't perform for this submission.
3) The test trace is same as the ambient noise and the amplitude of the emissions are attenuated more than 20dB below the permissible (the test frequency range: 9kHz ~ 30MHz, 18GHz ~ 25GHz), therefore no data appear in the report.
4) Average= Peak- Duty Cycle factor.

TX Duty cycle: 0.395/40.62 = 0.972 %.
Duty Cycle Factor =20log (Duty Cycle) = 20 * Log10(0.00972) = -40.25 dB.
It is also possible to calculate the max duty cycle for an individual BLE channel.
The BLE standard requires a minimum number of used channels of 2. The pulses or the TX power will be equally spread over the 2 channels, so the max duty cycle per individual channel will be -40.25 - 6 =-46.25 dB. FCC will limit the correction factor to 20 dB.
So, Duty Cycle factor =20 dB.

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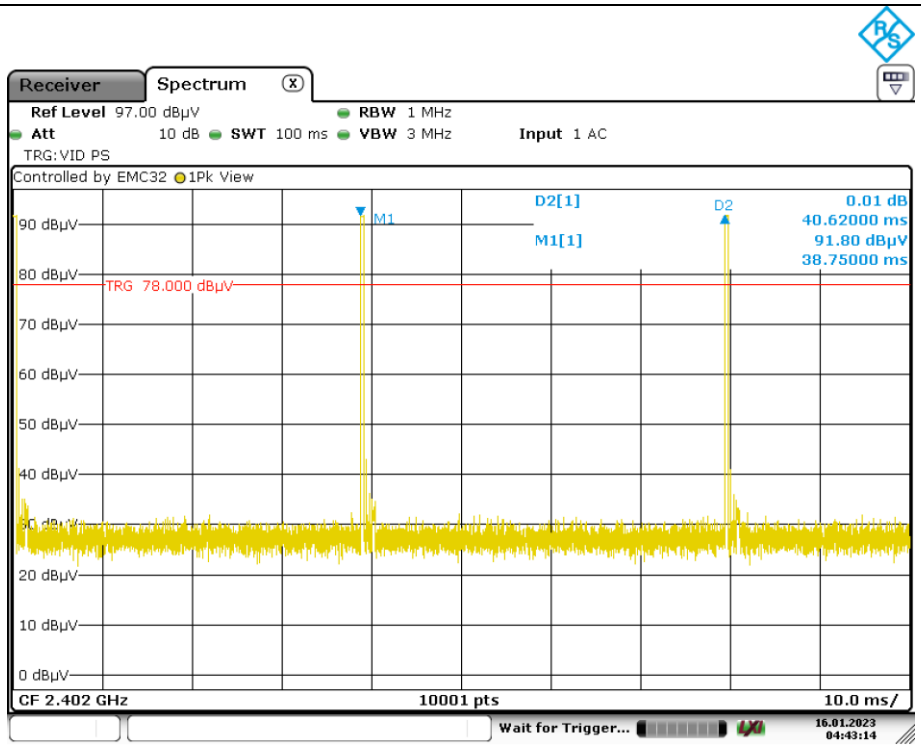

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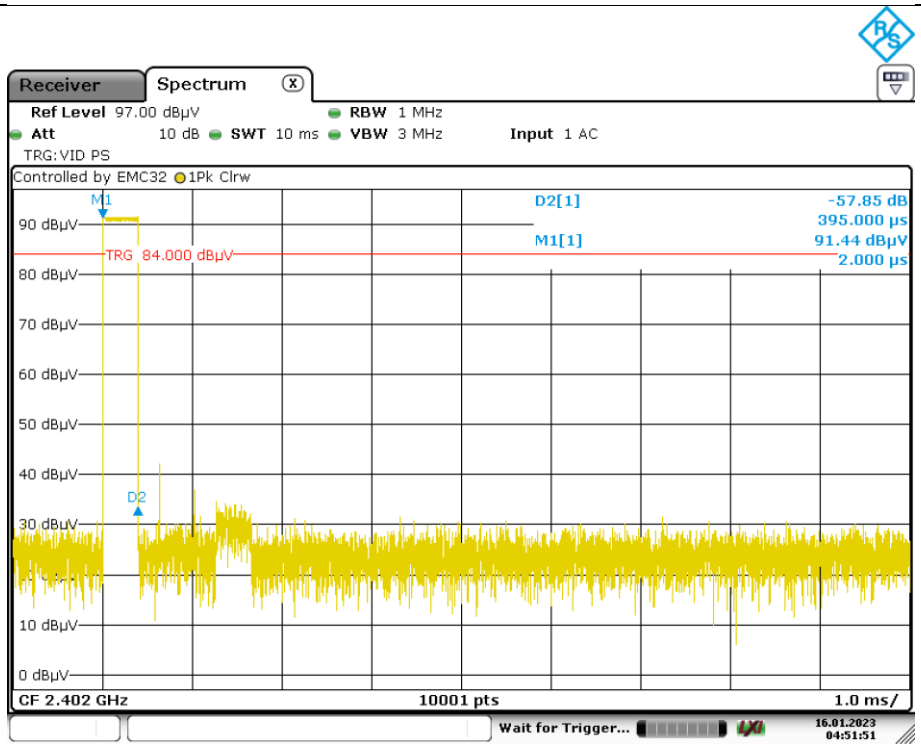

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8.3 20dB Bandwidth

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 measurement instrument. 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 20 dB 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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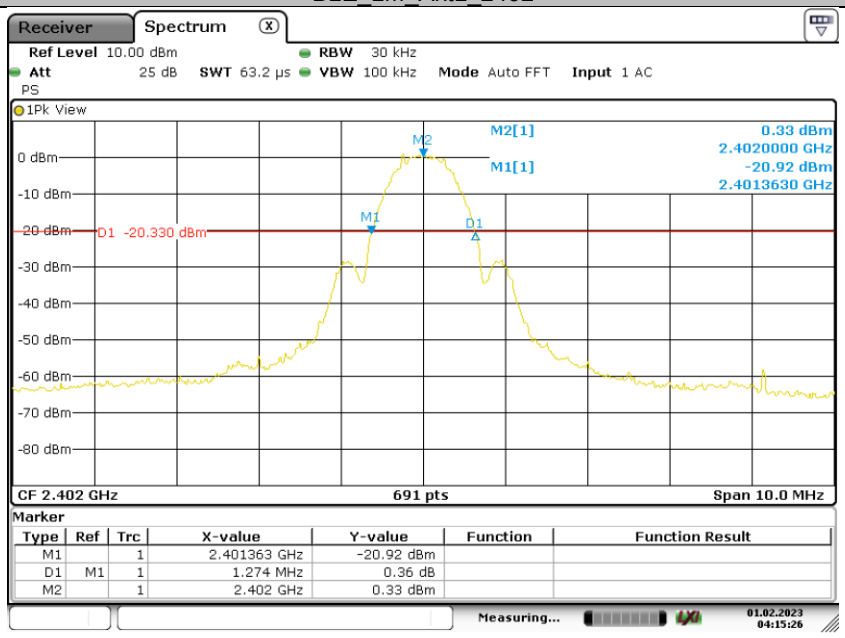
20dB Bandwidth

Frequency MHz	20dB Bandwidth MHz	Limit kHz	Result
2402	1.274	N/A	Pass
2440	1.259	N/A	Pass
2480	1.274	N/A	Pass

BLE_1M_Ant1_2402



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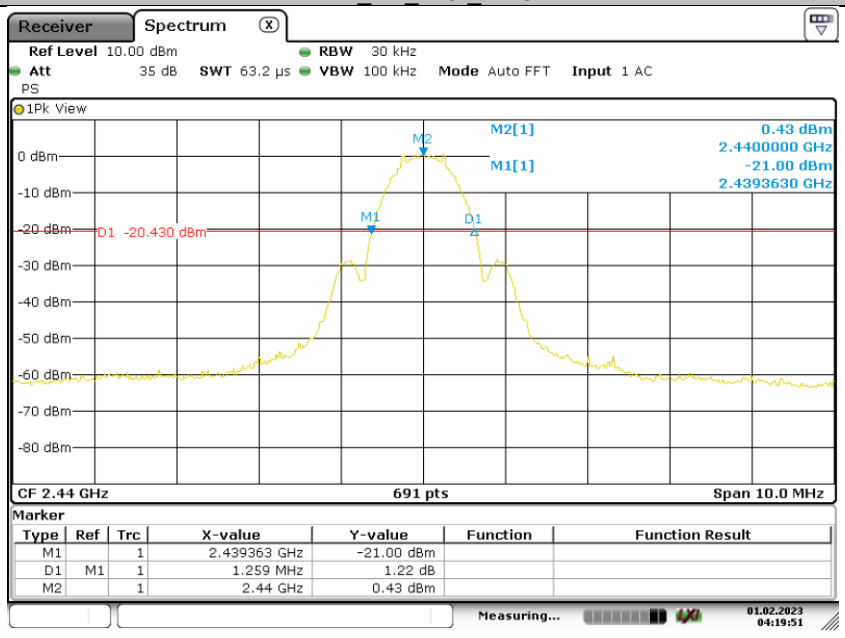

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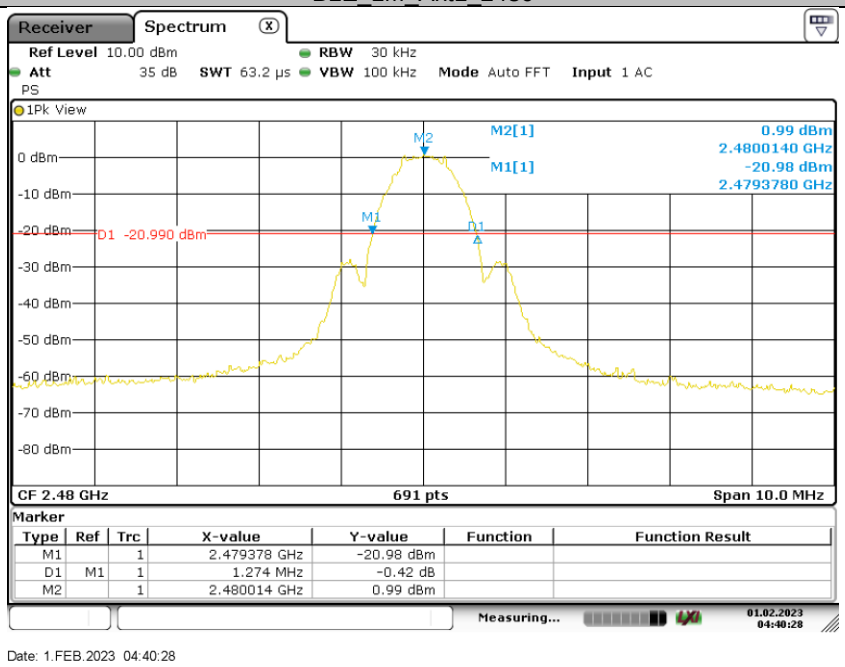
BLE_1M_Ant1_2480



8.4 Band edge testing

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. .
4 Repeat the test at the hopping off and hopping on mode, submit all the plots.

Limit:

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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Band edge testing

Tx at channel 1: 2402MHz

Fundamental Frequency (MHz)	Polarisation (Vertical/ Horizontal)	Field Strength	Margin	Limit	Type
		dBµV/m	(dB)	(dBµV/m)	AV/PK
2337.85	H	51.20	22.80	74.0	PK
2337.89	V	45.31	28.69	74.0	PK

Tx at channel 39: 2480MHz

Fundamental Frequency (MHz)	Polarisation (Vertical/ Horizontal)	Field Strength	Margin	Limit	Type
		dBµV/m	(dB)	(dBµV/m)	AV/PK
2483.63	H	44.21	29.79	74.0	PK
2483.69	V	40.69	33.31	74.0	PK

Remark:

1) Above 1GHz: Corrector factor = Antenna Factor + Cable Loss- Pre-amplifier
   Below 1GHz: Corrector factor = Antenna Factor + Cable Loss
   Emission Level =Reading level +Correction Factor
   (The Reading Level is recorded by software which is not shown in the sheet).
2) If the Peak value below the AV Limit, the AV test doesn't perform for this submission.
3) Average= Peak- Duty Cycle factor.

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9 Test equipment list

List of Test Instruments

Test Site1

	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	CAL. DATE	CAL. DUE DATE
RE	EMI Test Receiver	Rohde & Schwarz	ESR3	101906	2022-8-1	2023-7-31
	Signal Analyzer	Rohde & Schwarz	FSV40	101091	2022-8-1	2023-7-31
	Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	961	2019-3-16	2022-3-15
	Horn Antenna	Rohde & Schwarz	HF907	102393	2021-3-15	2024-3-14
	Pre-amplifier	Rohde & Schwarz	SCU-18D	19006451	2022-8-1	2023-7-31
	Loop antenna	Rohde & Schwarz	HFH2-Z2	100443	2022-6-13	2023-6-12
	DOUBLE-RIDGED WAVEGUIDE HORN WITH PRE-AMPLIFIER (18 GHZ - 40 GHZ)	ETS-Lindgren	3116C-PA	002222727	2020-9-23	2023-9-22
	3m Semi-anechoic chamber	TDK	9X6X6	----	2021-5-8	2024-5-7
CE	EMI Test Receiver	Rohde & Schwarz	ESR3	101907	2022-8-1	2023-7-31
	LISN	Rohde & Schwarz	ENV216	101924	2022-8-1	2023-7-31

Measurement Software Information			
Test Item	Software	Manufacturer	Version
RE	EMC 32	Rohde & Schwarz	V10.50.40
CE	EMC 32	Rohde & Schwarz	V10.50.40

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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:

Items	Extended Uncertainty
Conducted Disturbance at Mains Terminals	150kHz to 30MHz, LISN, 3.16dB
Radiated Disturbance	30MHz to 1GHz, 5.03dB (Horizontal) 5.12dB (Vertical) 1GHz to 18GHz, 5.49dB 18GHz to 40GHz, 5.63dB
Carrier power conducted measurement	50MHz~18GHz, 1.238dB
Spurious Emission Conducted Measurement	9kHz ~40GHz, 1.224dB

Measurement Uncertainty Decision Rule:

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2021, clause 4.4.3 and 4.5.1.

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11 Photographs of Test Set-ups

Refer to the < Test Setup photos >.

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12 Photographs of EUT

Refer to the < External Photos > & < Internal Photos >.

----------End of Test Report----------

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