

FCC TEST REPORT

FCC ID: 2AQY4-VE008

On Behalf of

Shenzhen Kaadas Intelligent Technology Co., Ltd. Smart Door Knob Model No.: VE008

Prepared for	:	Shenzhen Kaadas Intelligent Technology Co., Ltd.
		Floor 11, Building B2, Phase 2, Creative City, Xiandong Road, Xili
Address	:	Community, Xili Street, Nanshan District, Shenzhen, Guangdong, 518000, 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

:	A2403242-C01-R01
:	March 26, 2024
:	March 26, 2024 - April 16, 2024
:	April 16, 2024
:	V0
	Pass
	::

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TEST REPORT DECLARATION

Applicant	:	Shenzhen Kaadas Intelligent Technology Co., Ltd.			
Address	:		Floor 11, Building B2, Phase 2, Creative City, Xiandong Road, Xili Community, Xili Street, Nanshan District, Shenzhen, Guangdong, 518000, China		
Manufacturer	:	Zhor	Zhongshan Meta Intelligence Technology Co., Ltd.		
Address	:	No.1	No.18, Yonghui Road, Nantou Town, Zhongshan, Guangdong, China		
EUT Description	:	Sma	Smart Door Knob		
		(A)	Model No.	VE008	
		(B)	Trademark	Veise	

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247

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. The maximum emission levels are compared to the FCC Part 15 Subpart C limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

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):	Yannis Wen Project Engineer	Yonnis wen
Approved by (name + signature):	Reak Yang Project Manager 	Rr. 45
Date of issue	April 16, 2024	

Revision History

Revision	Issue Date	Issue Date Revisions	
V0	April 16, 2024	Initial released Issue	Yannis Wen

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:

Test Item	Test Requirement	Standards Paragraph	Result
Conducted Emission	FCC PART 15	15.207	Р
6dB Bandwidth	FCC PART 15	15.247 (a)(2)	Р
Output Power	FCC PART 15	15.247 (b)(3)	Р
Radiated Spurious Emission	FCC PART 15	15.247 (c)	Р
Conducted Spurious & Band Edge Emission	FCC PART 15	15.247 (d)	Р
Power Spectral Density	FCC PART 15	15.247 (e)	Р
Radiated Band Edge Emission	FCC PART 15	15.205	Р
Antenna Requirement	FCC PART 15	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.

4. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description	:	Smart Door Knob
Model Number	:	VE008
Diff	:	N/A
Power supply	:	DC 5V from type-C and DC 6V from battery.
Radio Technology	:	Bluetooth BLE
Operation frequency	:	2402-2480MHz
Channel No.	:	40 Channels
Channel spacing	:	2MHz
Rate	:	1Mbps, 2Mbps
Modulation type	:	GFSK
Antenna Type	:	Internal antenna, Maximum Gain is 2.12dBi. (Antenna information is provided by applicant.)
Software version	:	V1.0
Hardware version	:	V1.0
Intend use environment	:	Residential, commercial and light industrial environment

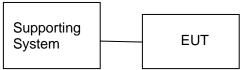
2.2. Accessories of Device (EUT)

Accessories	:	/
Manufacturer	:	/
Model	:	/
Ratings	:	/

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDoC
1	Notebook PC	Lenovo	ThinkPad E14	N/A	N/A

2.4. Block Diagram of connection between EUT and simulators



2.5. Test Mode Description

Tested mode, channel, and data rate	information	
Mode	Channel	Frequency (MHz)
	Low :CH1	2402
GFSK (1M, 2M)	Middle: CH20	2440
	High: CH40	2480

2.6. Test Conditions

Items	Required	Actual		
Temperature range:	15-35 ℃	24 ℃		
Humidity range:	25-75%	56%		
Pressure range:	86-106kPa	98kPa		

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 25, 2017 Certificated by IC Registration Number: 12135A

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

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	2023.08.16	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2023.08.16	1Year
Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-10 2082-Wa	2023.08.16	1Year
Receiver	R&S	ESCI	4.42 SP1	101165	2023.08.16	1Year
Bilog Antenna	Schwarzbeck	VULB 9168	/	VULB 9168#627	2023.08.28	1Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	1Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	1Year
RF Cable	Resenberger	Cable 1	/	RE1	2023.08.16	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2023.08.16	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2023.08.16	1Year
Pre-amplifier	HP	HP8347A	/	2834A00455	2023.08.16	1Year
Pre-amplifier	Agilent	8449B	/	3008A02664	2023.08.16	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	/	8126-466	2023.08.16	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2023.08.16	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	1Year
Preamplifier	SKET	LNPA_1840 -50	/	SK2018101801	2023.08.16	1 Year
Power Meter	Agilent	E9300A	/	MY41496628	2023.08.16	1 Year
Power Sensor	DARE	RPR3006W	/	15100041SNO91	2023.08.16	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205-01	2023.07.25	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2023.08.16	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	EZ	Alpha-3A1						
CE	EZ-EMC	EZ	Alpha-3A1						
RF-CE	MTS 8310	MW	V2.0.0.0						

3. SPURIOUS EMISSION

3.1. Test Limits

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other 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 comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

- a) The tighter limit applies at the band edges.
- b) Emission Level(dB uV/m)=20log Emission Level(uv/m)

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency up to 1GH and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above1GHz testing, The table was rotated 360 degrees to determine the position of the highest radiation

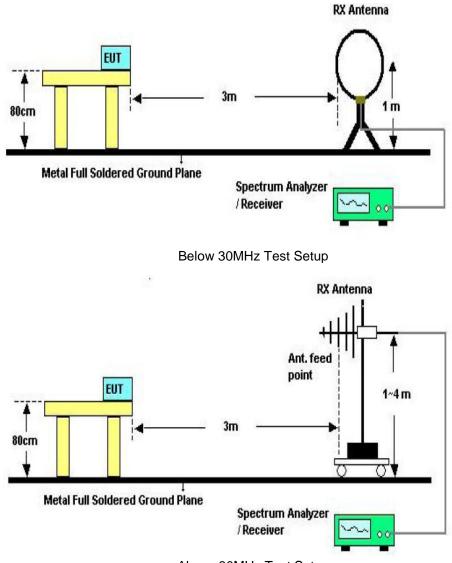
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured

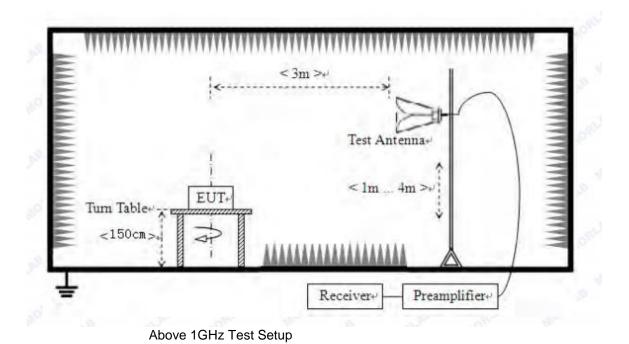
If Peak value comply with QP limit Below 1GHz. The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

3.3. Test Setup



Above 30MHz Test Setup



3.4. Test Results

Test Condition

Continual Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHZ~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

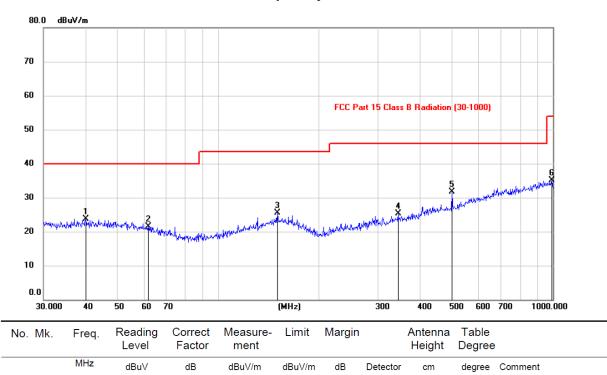
We have scanned the 10th harmonic from 9 kHz to the EUT.

Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: 1.The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

2. Only show the test data of the worst Channel in this report.



40.00

40.00

43.50

46.00

46.00

54.00

-16.33

-18.52

-18.05

-20.60

-14.30

-18.97

peak

peak

peak

peak

peak

peak

Antenna polarity: Horizontal

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

9.22

8.60

10.39

10.24

13.49

10.27

14.45

12.88

15.06

15.16

18.21

24.76

23.67

21.48

25.45

25.40

31.70

35.03

1

2

3

4

5

6

*

40.1488

61.9516

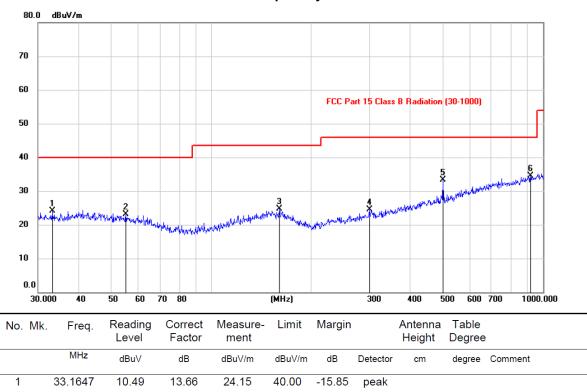
150.3795

345.4741

500.1257

994.0566

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



40.00

43.50

46.00

46.00

46.00

-16.85

-18.88

-21.50

-12.68

-11.47

peak

peak

peak

peak

peak

Antenna polarity: Vertical

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

9.58

9.62

10.40

15.11

10.22

13.57

15.00

14.10

18.21

24.31

23.15

24.62

24.50

33.32

34.53

2

3

4

5

6 *

55.2982

160.4582

300.0514

500.1257

919.2866

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

Remark: All modes have been tested, and only worst data of GFSK 1M mode, Channel 2402MHz was listed in this report.

From 1G-25GHz GFSK 1M

				Test M	lode: TX I	_ow			
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	46.47	V	33.95	10.18	34.26	56.34	74	-17.66	PK
4804	36.14	V	33.95	10.18	34.26	46.01	54	-7.99	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	43.45	Н	33.95	10.18	34.26	53.32	74	-20.68	PK
4804	37.04	Н	33.95	10.18	34.26	46.91	54	-7.09	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
				Test M	lode: TX	Mid			
4880	43.68	V	33.93	10.2	34.29	53.52	74	-20.48	PK
4880	36.67	V	33.93	10.2	34.29	46.51	54	-7.49	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	46.32	Н	33.93	10.2	34.29	56.16	74	-17.84	PK
4880	36.29	Н	33.93	10.2	34.29	46.13	54	-7.87	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
				Test M	lode: TX ł	ligh			
4960	44.98	V	33.98	10.22	34.25	54.93	74	-19.07	PK
4960	35.51	V	33.98	10.22	34.25	45.46	54	-8.54	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.36	Н	33.98	10.22	34.25	54.31	74	-19.69	PK
4960	32.03	Н	33.98	10.22	34.25	41.98	54	-12.02	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	1	/	/	/	/	/	/

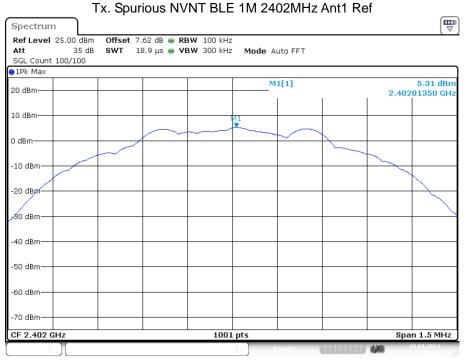
1, Result = Read level + Antenna factor + cable loss-Amp factor 2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

GFSK	2M
------	----

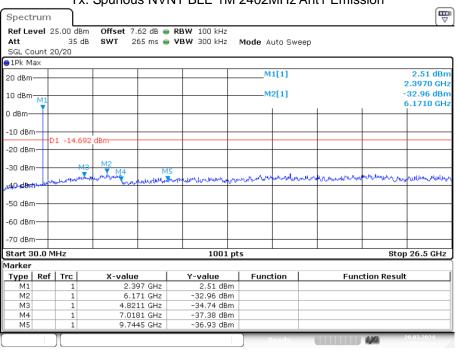
			T	Test M	lode: TX I	_ow	r		
Freq (MHz)	Read Level (dBuV/m)	Polar (H/V)	Antenna Factor (dB/m)	Cable loss(dB)	Amp Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
4804	45.97	V	33.95	10.18	34.26	55.84	74	-18.16	PK
4804	35.95	V	33.95	10.18	34.26	45.82	54	-8.18	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
4804	46.50	Н	33.95	10.18	34.26	56.37	74	-17.63	PK
4804	36.75	Н	33.95	10.18	34.26	46.62	54	-7.38	AV
7206	/	/	/	/	/	/	/	/	/
9608	/	/	/	/	/	/	/	/	/
				Test M	lode: TX	Mid			
4880	43.76	V	33.93	10.2	34.29	53.60	74	-20.40	PK
4880	35.08	V	33.93	10.2	34.29	44.92	54	-9.08	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
4880	43.91	Н	33.93	10.2	34.29	53.75	74	-20.25	PK
4880	33.21	Н	33.93	10.2	34.29	43.05	54	-10.95	AV
7320	/	/	/	/	/	/	/	/	/
9760	/	/	/	/	/	/	/	/	/
				Test M	ode: TX H	ligh			
4960	44.80	V	33.98	10.22	34.25	54.75	74	-19.25	PK
4960	35.76	V	33.98	10.22	34.25	45.71	54	-8.29	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/
4960	44.75	Н	33.98	10.22	34.25	54.70	74	-19.30	PK
4960	35.23	Н	33.98	10.22	34.25	45.18	54	-8.82	AV
7440	/	/	/	/	/	/	/	/	/
9920	/	/	/	/	/	/	/	/	/

2, All the other emissions not reported were too low to read and deemed to comply with FCC limit.

Conducted RF Spurious Emission



Date: 29.MAR.2024 11:46:50



Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission

Date: 29.MAR.2024 11:47:23



Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref

Date: 29.MAR.2024 11:48:30



Spectrun	n									
Ref Level				RBW 100 kHz						
Att	35	dB SWT 2	65 ms 😑	VBW 300 kHz	Mode A	uto Swi	еер			
SGL Count	10/10									
					м	1[1]				2.53 dBm
20 dBm				+ +		1[1]				2.4500 GHz
10 dBm				_	M	2[1]				-32.38 dBm
M.										6.3034 GHz
0 dBm				+ +			-			
-10 dBm—										
10 00111	D1 -14.	642 dBm		++						
-20 dBm				+ +						
-30 dBm-		M2 M2								
SO GDIII			MS	whenty when we wanted	In the Market	maria	wante	and marken	any multilly and	handrage
4. dBroku	HUNDOW	Share	Phylophy and	Color design of Color						
-50 dBm										
00 0011										
-60 dBm—				+ +						
-70 dBm										
	L									
Start 30.0	MHZ			1001	pts				Sto	26.5 GHz
Marker	f Trc	X-value	1	Y-value	Func			F	ction Resul	
Type Re M1	1 1 1 1		45 GHz	2.53 dBm		tion		Fun	ction Resul	<u> </u>
M2	1		34 GHz	-32.38 dBr						
M3	1		11 GHz	-34.92 dBm						
M4	1		53 GHz	-37.04 dBm						
M5	1	9.876	58 GHz	-36.64 dBm	ו					
					R	e a d y	- 0		1,00	29.03.2024

Date: 29.MAR.2024 11:48:47



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref

Date: 29.MAR.2024 13:29:13



Spectrum										
Ref Level 2				RBW 100 kHz						
Att SGL Count 1	35	dB SWT 26	i5 ms 😑	VBW 300 kHz	Mode A	uto Swi	еер			
1Pk Max	10/10									
20 dBm-					M	1[1]				4.55 dBm
										2.4760 GHz
10 dBm M1					M	2[1]				-33.16 dBm
0 dBm										10.1700 driz
-10 dBm)1 -14.8	312 dBm								
-20 dBm										
-30 dBm		ма		45	M2					
	للبرر ويتر المالي	moundent M4	had alkeying A	Junior Marchander	montal	burgery	un	what when	human	when with the way
4. dBm	(June -		0100000-40-0						· · ·	
-50 dBm		_								
60 JB-										
-60 dBm										
-70 dBm										
Start 30.0 M	1Hz	I		1001	pts				Sto	p 26.5 GHz
Marker										
	Trc	X-value		Y-value	Func	tion		Fun	ction Resu	lt
M1	1		6 GHz	4.55 dBn						
M2 M3	1	15.170	3 GHZ	-33.16 dBn -34.99 dBn						
M4	1		8 GHz	-37.31 dBn						
M5	1	10.062	1 GHz	-35.02 dBn	n					
)[R	eady			1,0	29.03.2024

Date: 29.MAR.2024 13:29:31



Tx. Spurious NVNT BLE 2M 2402MHz Ant1 Ref

Date: 29.MAR.2024 13:33:10



Spectrum					/	
Ref Level 2 Att SGL Count 1	30 c			Mode Auto Sw	еер	· · · · · · · · · · · · · · · · · · ·
⊖1Pk Max						
10 dBm				M1[1] M2[1]		2.38 dBm 2.3970 GHz -37.96 dBm
0 dBm					1	24.7530 GHz
-10 dBm	01 -14.5	93 dBm				
-20 dBm						
-30 dBm		12	45			M2
-40 dBm	۹ بر ال ا	13 M4	Theoretica Characterite Andread	a A propriet at low and	water and the second state	and a way out of the state of t
-50 dBm	Wall Light and	13 M4 N Therefore Marine Ma Marine Marine Mari				
-60 dBm						
-70 dBm						
Start 30.0 N	/IHz		1001 pt	5		Stop 26.5 GHz
Marker						
	Trc	X-value	Y-value	Function	Fu	nction Result
M1	1	2.397 GHz	2.38 dBm			
M2	1	24.753 GHz 4.9269 GHz	-37.96 dBm -41.70 dBm			
M3 M4	1	4.9269 GHZ 7.1504 GHz	-41.70 dBm			
M5	1	9.6916 GHz	-41.14 dBm			
	1			Ready		29.03.2024

Date: 29.MAR.2024 13:33:28



Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Ref

Date: 29.MAR.2024 13:38:58



Spectru	m	-					
Ref Leve	l 20.00 0	Bm Offset 7.	78 dB 🔵	RBW 100 kHz			
Att	30	dB SWT 2	65 ms 👄	VBW 300 kHz	Mode Auto Sw	/eep	
SGL Cour	t 10/10						
⊖1Pk Max							
					M1[1]		2.35 dBm
10 dBm-N							2.4500 GHz
N					M2[1]		-36.82 dBm
0 dBm							17.8708 GHz
-10 dBm—	D1 -14	.468 dBm					
-20 dBm—	01 -14	.400 0011					
20 000							
-30 dBm—						M2	
		M3 M4	M	5		T.	
-40 dBm—	a worke	white we want the	unhorson	>	and many and a second and a second	May and a stranger of	ABI APARATON PARATON DARAGE AND A CARE
-50 dBm—							
-50 0011							
-60 dBm—							
-70 dBm—							
Start 30.	D MHz			1001 pt	s		Stop 26.5 GHz
Marker							
Type R	ef Trc	X-value	.	Y-value	Function	F	unction Result
M1	1		45 GHz	2.35 dBm			
M2	1		08 GHz	-36.82 dBm			
M3	1		74 GHz	-41.18 dBm			
M4	1		57 GHz	-41.50 dBm			
M5	1	9.87	68 GHz	-41.36 dBm		<u> </u>	
					Ready		29.03.2024

Date: 29.MAR.2024 13:39:16



Tx. Spurious NVNT BLE 2M 2480MHz Ant1 Ref

Date: 29.MAR.2024 13:40:32



Spect	rum		·								
Ref Le	vel 2	0.00 di	Bm Offset 7.	60 dB 😑	RBW 100 kHz						
Att		30	dB SWT 26	55 ms 👄	VBW 300 kHz	Mode	Auto Sw	еер			
SGL Co	ount 1	0/10									
⊖1Pk M	ах										
							M1[1]				0.80 dBm
10 dBm											2.4760 GHz
	M1						M2[1]				38.09 dBm
0 dBm-	- T -									2	2.0795 GHz
-10 dBr							-				
-20 dBr		1 -14.8	814 dBm								
-20 001	'										
-30 dBm	η						_				
			M3 M4	N	15					M2	
-40 dBrr	η 	المعربين الم	La hypernet in I.		10 Low Low Son Marin	~www.	the work of the second	white ward	Landerson and the	and the second second	With Million
physical and the second	UUUdrille	- Colleron									
-50 dBr	ד ו										
-60 dBm											
-00 ubii											
-70 dBm	∩						_				
Start 3	0.0 M	IHz			1001	pts				Stop	26.5 GHz
Marker											
Туре	Ref	Trc	X-value		Y-value	Fun	ction		Funct	ion Result	: 1
M1		1		76 GHz	0.80 dBr						
M2		1	22.079		-38.09 dBr						
M3		1		54 GHz	-41.55 dBr						
M4		1		04 GHz	-41.83 dBr						
M5		1	9.929	98 GHz	-39.09 dBr	n					
							Ready			120	29.03.2024

Date: 29.MAR.2024 13:40:50

4. POWER LINE CONDUCTED EMISSION

4.1. Test Limits

Frequency	Limits dB(µV)					
MHz	Quasi-peak Level	Average Level				
0.15 -0.50	66 -56*	56 - 46*				
0.50 -5.00	56	46				
5.00 -30.00	60	50				

Notes: 1. *Decreasing linearly with logarithm of frequency.

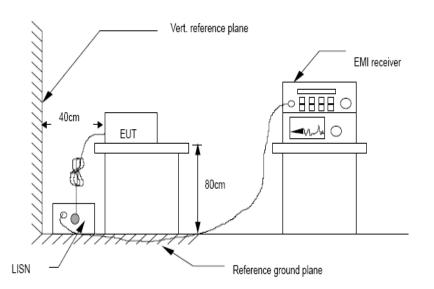
- 2. The lower limit shall apply at the transition frequencies.
 - 3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.

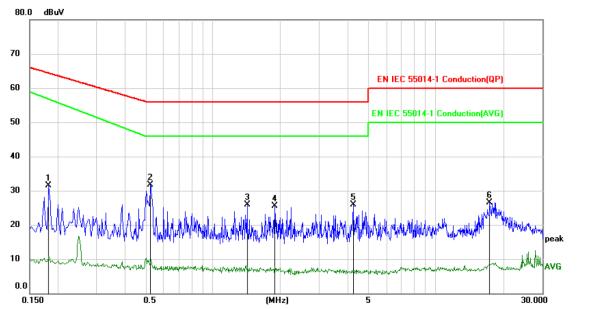
The bandwidth of test receiver is set at 9 kHz.

4.3. Test Setup



4.4. Test Results

Pass



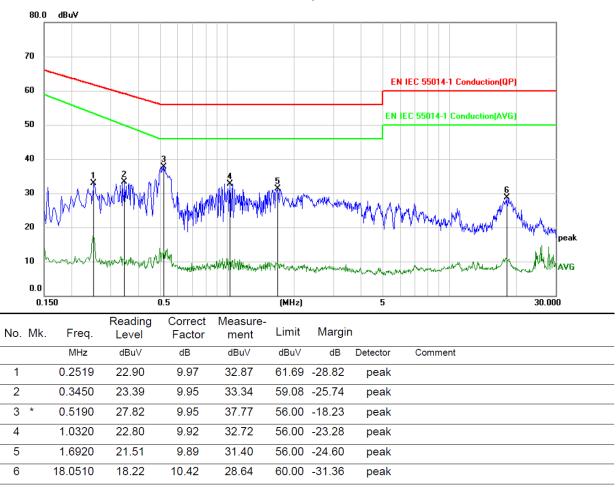
No. Mk.	Freq.	Reading Level	Correct Factor	Measure- ment	Limit	Margii	n		
	MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment	
1	0.1830	21.48	9.93	31.41	64.35	-32.94	peak		
2 *	0.5220	21.73	9.95	31.68	56.00	-24.32	peak		
3	1.4250	16.03	9.90	25.93	56.00	-30.07	peak		
4	1.8960	15.72	9.88	25.60	56.00	-30.40	peak		
5	4.2510	16.00	9.98	25.98	56.00	-30.02	peak		
6	17.3940	16.09	10.40	26.49	60.00	-33.51	peak		

*:Maximum data x:Over limit !:over margin

<Reference Only

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

Polarity: L



Polarity: N

*:Maximum data x:Over limit !:over margin

(Reference Only

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

Remark: All modes have been tested, and only worst data of GFSK 1M mode, Channel 2402MHz was listed in this report.

5. CONDUCTED MAXIMUM OUTPUT POWER

5.1. Test limits

Please refer section RSS-247 & 15.247.

5.2. Test Procedure

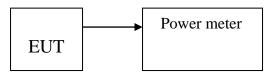
Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

Condition	Mode	Frequency	Antenna	Conducted Power	EIRP	Limit	Verdict
		(MHz)		(dBm)	(dBm)	(dBm)	
NVNT	BLE 1M	2402	Ant1	3.495	5.615	30	Pass
NVNT	BLE 1M	2440	Ant1	3.584	5.704	30	Pass
NVNT	BLE 1M	2480	Ant1	3.516	5.636	30	Pass

Condition	Mode	Frequency	Antenna	Conducted Power	EIRP	Limit	Verdict
		(MHz)		(dBm)	(dBm)	(dBm)	
NVNT	BLE 2M	2402	Ant1	3.727	5.847	30	Pass
NVNT	BLE 2M	2440	Ant1	3.715	5.835	30	Pass
NVNT	BLE 2M	2480	Ant1	3.522	5.642	30	Pass

6. PEAK POWER SPECTRAL DENSITY

6.1. Test limits

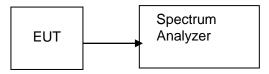
- 6.1.1 Please refer section RSS-247 & 15.247.
- 6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.
- 6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

- 6.2.1 Place the EUT on the table and set it in transmitting mode.
- 6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
- 6.2.3 Set the spectrum analyzer as RBW = 3kHz(Set the RBW to: 3 kHz≤RBW≤100 kHz.), VBW = 10kHz(Set the VBW≥3×RBW), span=1.5×DTS bandwidth., detail see the test plot.
- 6.2.4 Record the max reading.
- 6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

6.3. Test Setup

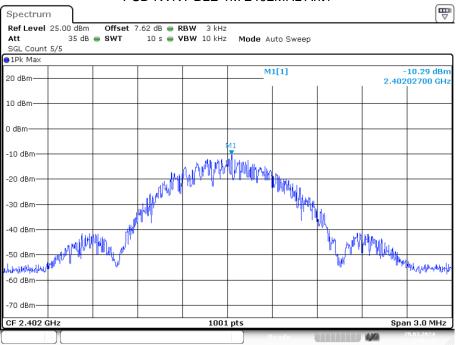


6.4. Test Results

Pass

The test results are listed in next pages.

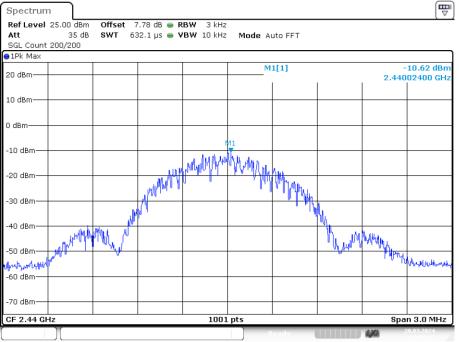
Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 1M	2402	Ant1	-10.291	8	Pass
NVNT	BLE 1M	2440	Ant1	-10.62	8	Pass
NVNT	BLE 1M	2480	Ant1	-9.816	8	Pass



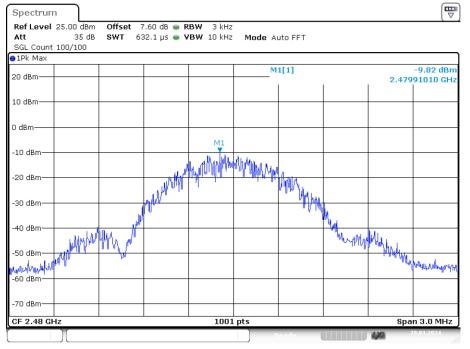
PSD NVNT BLE 1M 2402MHz Ant1

Date: 29.MAR.2024 11:46:33

PSD NVNT BLE 1M 2440MHz Ant1



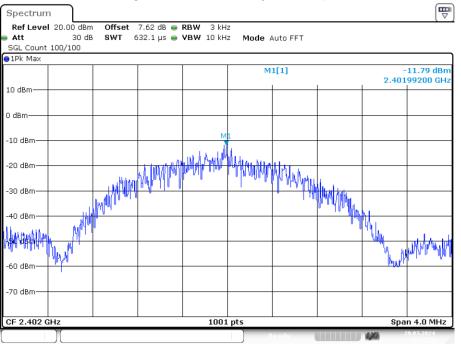
Date: 29.MAR.2024 11:48:23



PSD NVNT BLE 1M 2480MHz Ant1

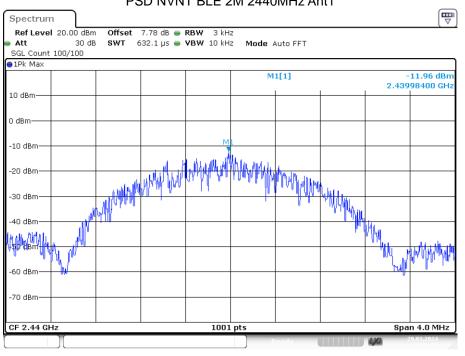
Date: 29.MAR.2024 13:28:53

Condition	Mode	Frequency (MHz)	Antenna	Max PSD (dBm)	Limit (dBm)	Verdict
NVNT	BLE 2M	2402	Ant1	-11.788	8	Pass
NVNT	BLE 2M	2440	Ant1	-11.963	8	Pass
NVNT	BLE 2M	2480	Ant1	-13.763	8	Pass



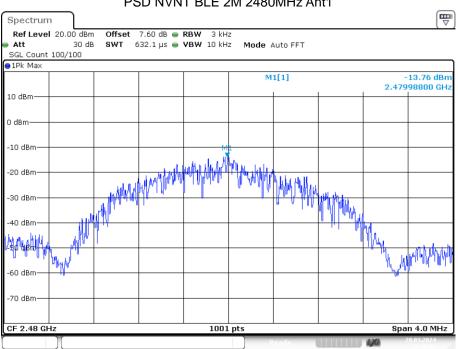
PSD NVNT BLE 2M 2402MHz Ant1

Date: 29.MAR.2024 13:32:52



PSD NVNT BLE 2M 2440MHz Ant1

Date: 29.MAR.2024 13:38:52



PSD NVNT BLE 2M 2480MHz Ant1

Date: 29.MAR.2024 13:40:12

7. BANDWIDTH

7.1. Test limits

Please refer section RSS-247 & 15.247

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

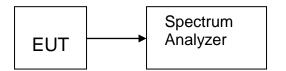
7.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

a) 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.

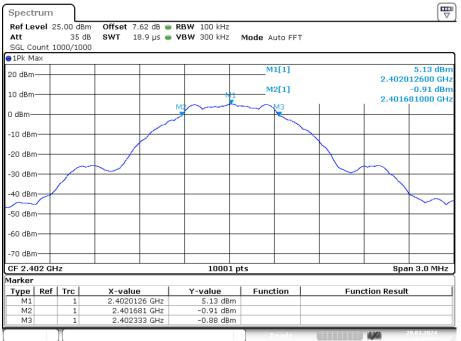
b) The test receiver set RBW = 100kHz, VBW≥3*RBW =300kHz, sweep time set auto, detail see the test plot.

7.3. Test Setup



7.4. Test Results

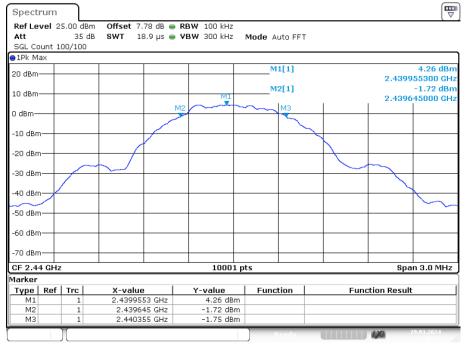
Conditio	Mode	Frequency	Antenna	99% OBW	-6 dB Bandwidth	Limit -6 dB	Verdic
n		(MHz)		(MHz)	(MHz)	Bandwidth (MHz)	t
NVNT	BLE 1M	2402	Ant 1	1.034	0.651	0.5	Pass
NVNT	BLE 1M	2440	Ant 1	1.04	0.71	0.5	Pass
NVNT	BLE 1M	2480	Ant 1	1.028	0.669	0.5	Pass



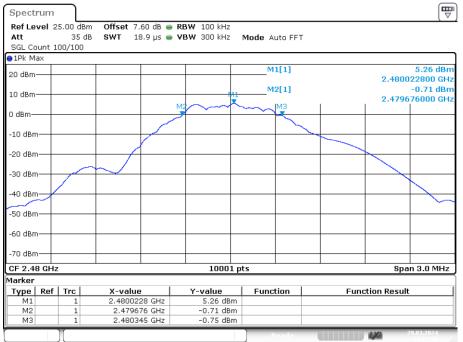
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1

Date: 29.MAR.2024 11:45:36





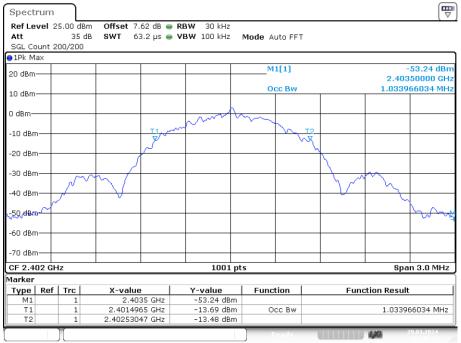
Date: 29.MAR.2024 11:48:14



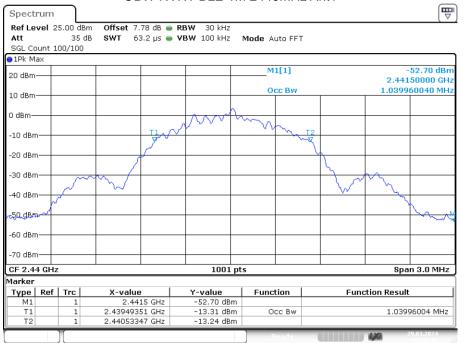
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1

Date: 29.MAR.2024 13:28:45

OBW NVNT BLE 1M 2402MHz Ant1



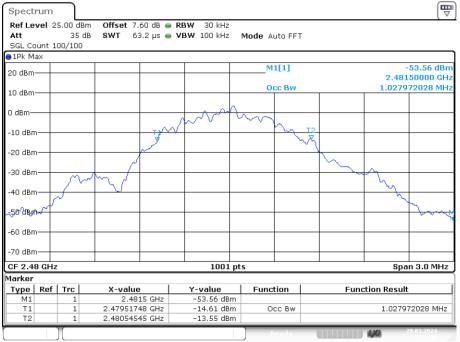
Date: 29.MAR.2024 11:45:21



OBW NVNT BLE 1M 2440MHz Ant1

Date: 29.MAR.2024 11:48:05

OBW NVNT BLE 1M 2480MHz Ant1

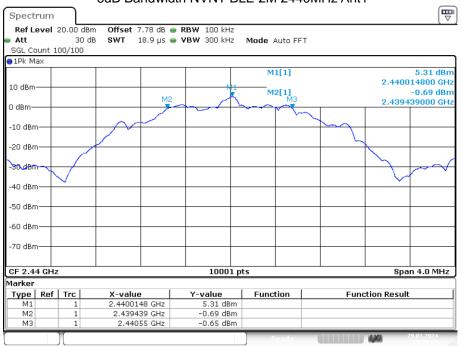


Date: 29.MAR.2024 13:28:36

Conditio	Mode	Frequency	Antenna	99% OBW	-6 dB Bandwidth	Limit -6 dB	Verdic
n		(MHz)		(MHz)	(MHz)	Bandwidth (MHz)	t
NVNT	BLE 2M	2402	Ant 1	2.026	0.904	0.5	Pass
NVNT	BLE 2M	2440	Ant 1	2.074	1.112	0.5	Pass
NVNT	BLE 2M	2480	Ant 1	2.042	0.888	0.5	Pass

		-6dB Ba	andwidth	n NVNT B	LE 2M 2402	MHz Ant	1
Spectrum	ı)						
Ref Leve		Bm Offset	7.62 dB 👄 1	RBW 100 kHz			('
Att			_	VBW 300 kHz	Mode Auto FFT		
SGL Count			2010 p5 🖕		Mode Autorn		
1Pk Max							
			1		M1[1]		5.24 dBm
							2.402007200 GHz
10 dBm				- M	M2[1]		-0.73 dBm
0 dBm			M2		M3		2.401468000 GHz
U UDIII			\sim	4 ×			
-10 dBm							
10 00.00						- ~~ ~	
-20 dBm						_	
	1						
-30 dBm							
	h/						
-40 dBm							
-50 dBm							
co do-							
-60 dBm							
-70 dBm							
-70 ubiii							
CF 2.402 C	iHz			10001 p	its		Span 4.0 MHz
larker							
	f Trc	X-valu		Y-value	Function	Fund	ction Result
M1	1	2.40200		5.24 dBm			
M2 M3	1		68 GHz	-0.73 dBm -0.76 dBm			
610	1 1	2.4023		5.70 übili			
	Л				Ready		29.03.2024

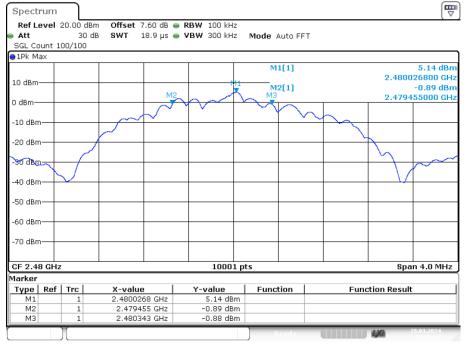
Date: 29.MAR.2024 13:32:45



-6dB Bandwidth NVNT BLE 2M 2440MHz Ant1

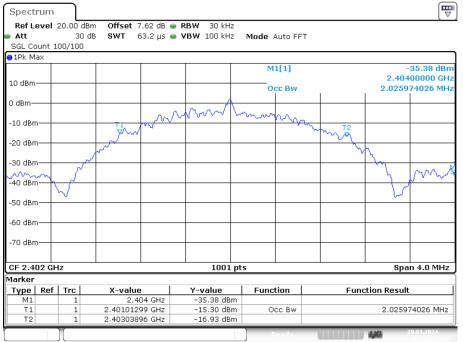
Date: 29.MAR.2024 13:38:44





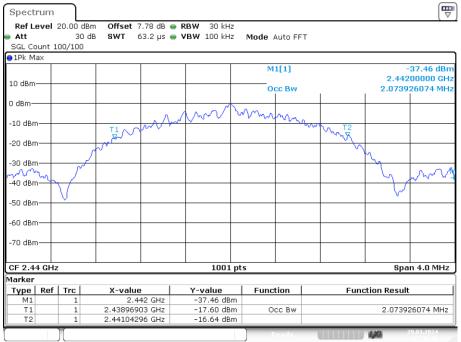
Date: 29.MAR.2024 13:40:04



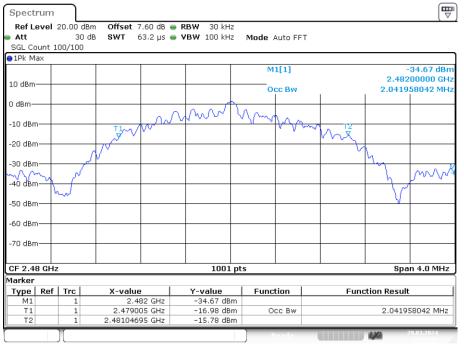


Date: 29.MAR.2024 13:32:37

OBW NVNT BLE 2M 2440MHz Ant1



Date: 29.MAR.2024 13:38:35



OBW NVNT BLE 2M 2480MHz Ant1

Date: 29.MAR.2024 13:39:54

8. BAND EDGE CHECK

8.1. Test limits

Please refer section RSS-GEN&15.247.

8.2. Test Procedure

Details see the KDB 558074 D01 15.247 Meas Guidance v05r02

8.2.1 Put the EUT on a 0.8m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

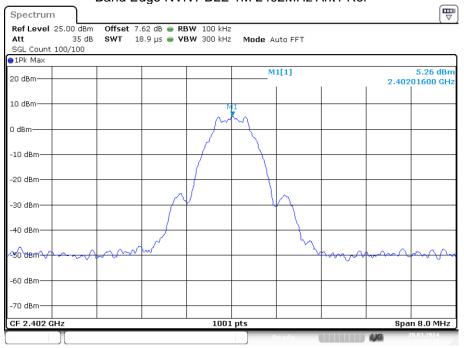
8.2.3 RBW 1MHz, VBW 3MHz, peak detector for peak value, RBW 1MHz, VBW 3MHz, RMS detector for AV value.

8.3. Test Setup

Same as 5.2.2.

8.4. Test Results

Pass The test results are listed in next pages.



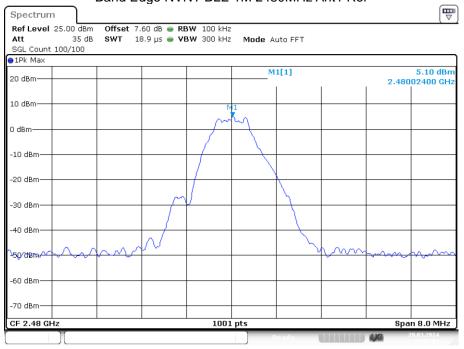
Band Edge NVNT BLE 1M 2402MHz Ant1 Ref

Date: 29.MAR.2024 11:46:38



Spectrum						
Ref Level 2 Att SGL Count 1	35 c		 RBW 100 kHz VBW 300 kHz 	Mode Auto FF	т	
∋1Pk Max						
20 dBm				M1[1]		5.22 dBr 2.40205000 GH
10 dBm				M2[1]		-47.88 dBr 2.40000000 gGH
0 dBm						
-10 dBm	01 -14.7	29 dBm				
-20 dBm	.1 -14.7					
-30 dBm						\vdash
-40 dBm						M2 M2
-sonaisth/www.	And Andrea of	and any and the second s	enter and more than the	an the second second second	in the law the second second	the management of
-60 dBm						
-70 dBm						
Start 2.306	GHz		1001 pt	s		Stop 2.406 GHz
Marker						
	Trc	X-value	Y-value	Function	Fun	ction Result
M1	1	2.40205 GHz	5.22 dBm			
M2	1	2.4 GHz	-47.88 dBm			
M3 M4	1	2.39 GHz 2.3408 GHz	-50.42 dBm -44.83 dBm			
	1			Ready		29.03.2024

Date: 29.MAR.2024 11:46:44



Band Edge NVNT BLE 1M 2480MHz Ant1 Ref

Date: 29.MAR.2024 13:29:00



Spectrum										
Ref Level 2 Att SGL Count 1	35 c			RBW 100 kHz VBW 300 kHz	Mode /	\uto FF	т			
∋1Pk Max										
20 dBm						1[1] 2[1]				5.00 dBn 05000 GH: 49.01 dBn
To a la l									2.483	50000 GH
0 d8m										
-10 cBm										
	1 -14.9	02 dBm								
-20 d <mark>8</mark> m										
-30 dBm		_								
-40 dBm										
1.1.10	whow where	M3	mychlumiger	Munhanathana	When Maria	Nherikulandh	when	MANAM	your marked	linkingen
-60 dBm										
-oo abiii										
-70 dBm				+						
Start 2.476	GHz			1001 p	ots				Stop	2.576 GHz
4arker										
	Trc	X-value		Y-value	Func	tion		Fund	tion Result	
M1	1	2.4800		5.00 dBm						
M2 M3	1	2.483	5 GHz 5 GHz	-49.01 dBm -49.29 dBm						
M4	1	2.495		-45.56 dBm						
	1) R	eady			4,00	29.03.2024

Date: 29.MAR.2024 13:29:06



Band Edge NVNT BLE 2M 2402MHz Ant1 Ref

Date: 29.MAR.2024 13:32:58

Band Edge NVNT BLE 2M 2402MHz Ant1 Emission

Spectru	ım											[₩
Ref Lev	el 2				RBW 100 kHz							
Att		30	dB SWT 113	3.8 µs 🧉	VBW 300 kHz	Mode	Auto F	FT				
SGL Cou		0/100										
1Pk Max												
						M	1[1]			0.40		i dBn
10 dBm—	-				+ +		2[1]			2.40	20500	
							2[1]			2 40	000000	
0 dBm—	-						I	1		2.40	1	17
-10 dBm-												71
-10 ubiii	-D1	-14.5	00 dBm								_	\square
-20 dBm-	_				+						-	\vdash
											Ma	Εl.
-30 dBm-	-				+ +						- /	
											- l'	୍ୟ
-40 dBm—	-											\neg
-50 dBm-							M4			MЗ		
	Mar	Mahan	mound warman	UNAN	montering	Muluhania	entrade	worker	Marshill	ung John y	wayer	
-60 dBm-						•		V V	1.1.00.0	- UX	<u> </u>	
-70 dBm—					+						+	
Start 2.3	06 G	Hz			1001 p	ts	-			Stop	2.406	GHz
1arker												
Type F	Ref	Trc	X-value		Y-value	Func	tion		Fund	tion Resu	lt	
M1		1	2.40205		5.56 dBm							
M2		1		GHz	-27.38 dBm							
M3		1	2.39		-51.63 dBm							
M4		1	2.3676	GHZ	-50.86 dBm							

Date: 29.MAR.2024 13:33:04



Band Edge NVNT BLE 2M 2480MHz Ant1 Ref

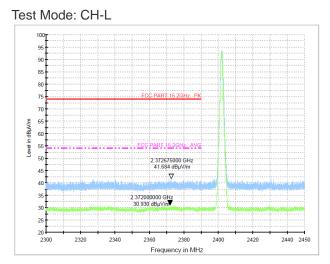
Date: 29.MAR.2024 13:40:19



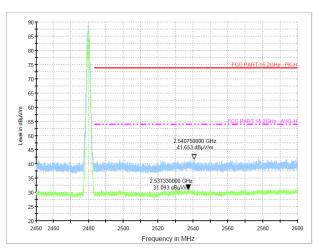
M1[1] 5.20 dBr	● Att 30 dB SWT 113.8 µs 🖷 VBW 300 kH	Hz Mode Auto FFT
10/d8m M1[1] 5.20 d8m 10/d8m M2[1] 2.4805000 GH 0 d8m M2[1] 2.4835000 GH 10 d8m 2.4835000 GH 2.4835000 GH 10 d8m 0 1 2.4835000 GH 10 d8m 0 1 2.4835000 GH 10 d8m 0 0 1 10 d8m 0 0 0		2.48005000 M2[1] -50.64 c
101/Bm 2.48005000 GH 0 dBm -50.64 dBr 10 dBm 2.48350000 GH -10 dBm 2.48350000 GH -10 dBm -10 dBm -20 dBm	10 idBm-	2.48005000 M2[1] -50.64 c
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M3 M3 50 dBm M3 -60 dBm M3 -60 dBm M3 -70 dBm M3 1 2.4805 GHz -50.64 dBm M3 1 2.5 GHz -50.64 dBm M3 1 2.5 GHz -50.64 dBm		
ستان المراب المراب 60 dBm		
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Type Ref Trc X-value Y-value Function Function Result M1 1 2.48005 GHz 5.20 dBm M2 1 2.4835 GHz -50.64 dBm M3 1 2.5 GHz -52.61 dBm		1 pts 3ttp 2.370 G
M1 1 2.48005 GHz 5.20 dBm M2 1 2.4835 GHz -50.64 dBm M3 1 2.5 GHz -52.61 dBm		Function Function Result
M3 1 2.5 GHz -52.61 dBm		
M4 1 2.4836 GHZ -5U.49 dBm		
	M4 1 2.4836 GHz -50.49 dBn	3m

Date: 29.MAR.2024 13:40:25

Radiated Method: GFSK(1M)

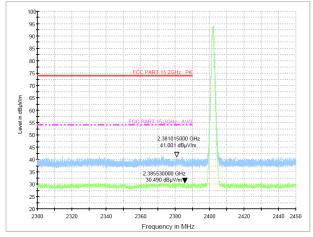


Test Mode: CH-H

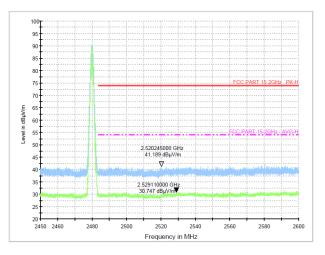


Radiated Method: GFSK(2M)

Test Mode: CH-L



Test Mode: CH-H



9. ANTENNA REQUIREMENT

9.1. 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.

9.2. Antenna Connected Construction

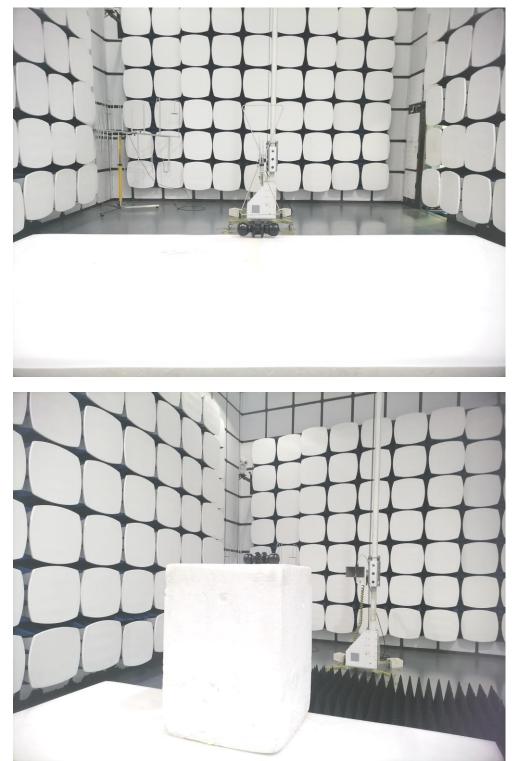
The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

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

10. TEST SETUP PHOTO

10.1.Photo of Radiated Emission test





10.2.Photo of Conducted Emission test

11. EUT PHOTO





