TEST REPORT

Report No.:	BCTC2609482020-1E
Applicant:	Shenzhen Viofo Technology Co.,Ltd
Product Name:	Car Dash Camera
Test Model:	A149 Pro
Tested Date:	2026-09-11 to 2026-09-23
Issued Date:	2026-10-09

Shenzhen BCTC Technology Co., Ltd.

FCC ID:2AMBW-A149PRO

Product Name:	Car Dash Camera
Trademark:	VIOFO
Model/Type Ref.:	A149 Pro,A149,A149 2CH,A149 Pro 2CH,A149 Plus,A149 Plus 2CH,A149 Ultra,A149 Ultra 2CH
Prepared For:	Shenzhen Viofo Technology Co.,Ltd
Address:	4th Floor, Tower F, Fuanna Industrial Park, Qingning Road, Longhua District, Shenzhen, China
Manufacturer:	Shenzhen Viofo Technology Co.,Ltd
Address:	4th Floor, Tower F, Fuanna Industrial Park, Qingning Road, Longhua District, Shenzhen, China
Prepared By:	Shenzhen BCTC Technology Co., Ltd.
Address:	Room 101M, Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang, Nanwan Subdistrict, Longgang District, Shenzhen, Guangdong, China.
Sample Received Date:	2026-09-11
Sample tested Date:	2026-09-11 to 2026-09-23
Report No.:	BCTC2609482020-1E
Test Standards:	47 CFR Part 15 Subpart C (clause 15.247) ANSI C63.10-2020+COR.1-2023+C63.10A-2024+ERRATA TO C63.10A-2024
Test Results:	PASS
Remark:	This is Bluetooth BLE radio test report.

Prepared by :	Reviewer by :	Approved by:
Louis.zeng	Mike zheng	Sewen Guo
Louis Zeng	Mike Zheng	Sewen Guo

The test report is effective only with both signature and specialized stamp.This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Technology Co., Ltd, this report can't be reproduced except in full.The tested sample(s) and the sample information are provided by the client.

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1. Version

Report No.	Issue Date	Description	Approved
BCTC2609482020-1E	2026-10-09	Original	Valid

2. Test Summary

The Product has been tested according to the following specifications:

No.	Test Parameter	Clause No.	Results
1	Conducted Emission	15.207	N/A[1]
2	6dB Bandwidth	15.247 (a)(2)	PASS*
3	Peak Output Power	15.247 (b)	PASS*
4	Radiated Spurious Emission	15.247 (d), 15.205	PASS*
5	Power Spectral Density	15.247 (e)	PASS*
6	Restricted Band of Operation	15.205	PASS*
7	Band Edge (Out of Band Emissions)	15.247(d)	PASS*
8	Antenna Requirement	15.203	PASS

NOTE1: N/A (Not Applicable)
NOTE2: According to FCC OET KDB 558074, the report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.
NOTE3:"*" indicates that the test results are determined base on CFR 47 FCC Part 15 Subpart C (clause 15.247). And the test results are took into account measurement uncertainty(see section 3 for measurement uncertainty information)
NOTE4:N/A[1]This product is DC vehicle equipment and is not applicable to this test.

3. Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2:2011/AMD2:2018. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

No.	Item	Uncertainty
1	3m chamber Radiated spurious emission(9kHz-30MHz)	U=3.7dB
2	3m chamber Radiated spurious emission(30MHz-1GHz)	U=4.8dB
3	3m chamber Radiated spurious emission(1GHz-18GHz)	U=5.5dB
4	3m chamber Radiated spurious emission(18GHz-40GHz)	U=5.0dB
5	Conducted Emission(150kHz-30MHz)	U=3.0dB
6	Power Spectral Density	U=3.46dB
7	Peak Power	U=0.31dB
8	Occupied Bandwidth/Frequency Range	U=3.46%
9	Conducted output power uncertainty	U=0.55dB
10	Frequency Error	U= 53.50 Hz
11	Frequency Drift	U=0.64 KHz
12	Temperature	U= 0.59 ℃
13	Humidity	U= 5.3 %

4. Product Information And Test Setup

4.1 Product Information

Model/Type reference:	A149 Pro,A149,A149 2CH,A149 Pro 2CH,A149 Plus,A149 Plus 2CH,A149 Ultra,A149 Ultra 2CH
Model differences:	The following models of units we produce are identical in electrical, mechanical and physical structure; The difference is only in the model name, we finally have A149 Pro as test model.
Bluetooth Version::	N/A
Hardware Version:	N/A
Software Version:	N/A
Operation Frequency:	Bluetooth: 2402-2480MHz
Type of Modulation:	Bluetooth: GFSK,1Mbps,2Mbps
Number Of Channel:	40channel
Antenna installation:	Internal antenna
Antenna Gain:	-0.86dBi
	Remark: ☒The antenna gain of the product comes from the antenna report provided by the customer, and the test data is affected by the customer information. Antenna gain information is provided by the client and the laboratory is not responsible for its authenticity ☐The antenna gain of the product is provided by the customer, and the test data is affected by the customer information. Antenna gain information is provided by the client and the laboratory is not responsible for its authenticity
Ratings:	Car charger: Input: DC 12V-24V Output1: 5V/2.4A Output2: 5V/2.4A Car Dash Camera: DC 5V/2.4A

4.2 Test Setup Configuration

See test photographs attached in eut test setup photographs for the actual connections between product and support equipment.

Radiated Spurious Emission:

E-1
EUT

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
E-1	Car Dash Camera	N/A	A149 Pro	N/A	EUT
N/A	N/A	N/A	N/A	N/A	N/A

Item	Shielded Type	Ferrite Core	Length	Note
N/A	N/A	N/A	N/A	N/A

Notes:
1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

Channel List GFSK 1M/2M					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	11	2422	21	2442
02	2404	12	2424	22	2444
03	2406	13	2426	23	2446
~	~	~	~	~	~
09	2418	19	2438	39	2478
10	2420	20	2440	40	2480

4.5 Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

For All Mode	Description	Modulation Type
Mode 1	CH01	GFSK 1M
Mode 2	CH20	
Mode 3	CH40	
Mode 4	CH01	GFSK 2M
Mode 5	CH20	
Mode 6	CH40	
Mode 7	Transmit mode (Radiated emission)	

Note:
(1) The measurements are performed at the highest, middle, lowest available channels.

4.6 Table Of Parameters Of Text Software Setting

During testing channel & power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters

RF Function	Mode Or Modulation type	Power Class	Software For Testing
BLE	GFSK 1Mbps	35	CRT
	GFSK 2Mbps	35	

5. Test Facility And Test Instrument Used

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at
Shenzhen BCTC Technology Co., Ltd.
Address: Room 101M, Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang, Nanwan Subdistrict, Longgang District, Shenzhen, Guangdong, China.
The site and apparatus are constructed in conformance with the requirements of ANSI C63.4a-2017 and CISPR 16-1-1:2019 other equivalent standards.
FCC Test Firm Registration Number: 754702
ANAB certificate registration number is: CN3479

5.2 Test Instrument Used

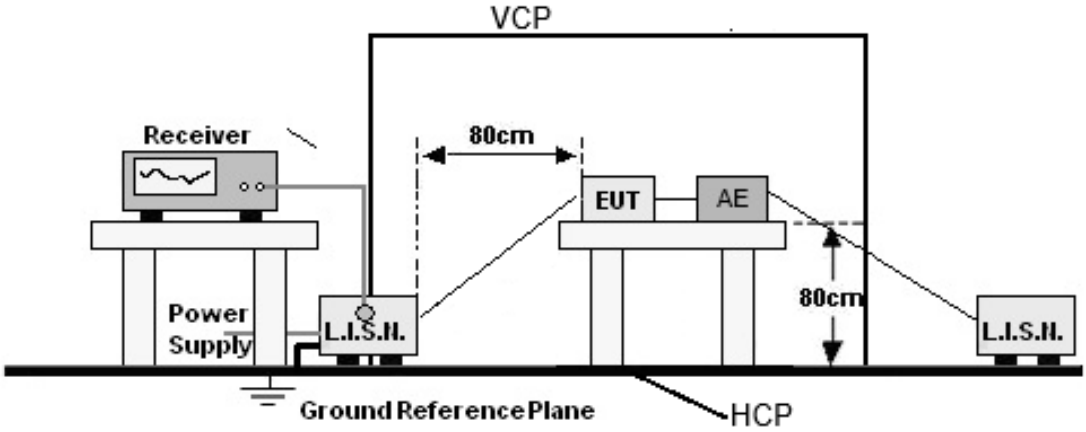
Radiated disturbance 2#					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Shielded room	ChengYu	9*6*6	/	2023.09.25	2026.09.24
Loop Antenna	Schwarzbeck	FMZB1519B	00014	2026.01.05	2027.01.04
Broadband antenna	SCHWHRZBECK	VULB9168	01620	2026.08.22	2027.08.21
Horn antenna(1 GHz -18GHz)	SCHWARZBECK	BBHA 9120 D	2792	2026.08.22	2027.08.21
Horn antenna (18 GHz -40GHz)	SCHWARZBECK	BBHA9170	00822	2025.12.29	2026.12.28
Receiver	R&S	ESR	1316	2026.08.24	2027.08.23
Spectrum Analyzer	R&S	FSV40	101328	2026.01.22	2027.01.21
Amplifier	SCHWHRZBECK	BBV9744	568	2026.08.24	2027.08.23
Amplifier	EMC INSTRUMENTS CORPORATION	EMC0518A45SEE	EMT-SZ2233	2026.08.24	2027.08.23
Amplifier (18GHz-40GHz)	MITEQ	TTA1840-35-HG	2034381	2026.05.09	2027.05.08
RF cable 3# (9kHz-6GHz)	Yunyi	10M	/	2026.08.24	2027.08.23
RF cable 9# (9kHz-1GHz)	Yunyi	2M	/	2025.10.28	2026.10.27
RF cable 5# (1GHz -18GHz)	SKET	9M	18038626	2026.08.24	2027.08.23
RF cable 6# (1GHz -18GHz)	SKET	5M	#10	2026.08.24	2027.08.23
RF cable 10# (18GHz-40GHz)	/	2M	2M	2026.05.09	2027.05.08
RF cable 11# (18GHz-40GHz)	/	2.5M	2.5M	2026.05.09	2027.05.08

Temperature & Humidity	Wetest	HTC-1	/	2026.08.25	2027.08.24
Software	EZ-EMC	Ver.FA-03A2	/	/	/

RF Conducted Test					
Equipment	**Manufacturer**	**Model#**	**Serial#**	**Last Cal.**	**Next Cal.**
Spectrum Analyzer	Keysight	N9020A	MY51287403	2026.08.24	2027.08.23
Signal Generator	Keysight	N5182A	MY50144088	2026.08.24	2027.08.23
Power Sensor	Keysight	U2001	MY51250006	2025.10.28	2026.10.27
Temperature & Humidity	Wetest	HTC-1	/	2026.08.25	2027.08.24
Communication test set	R&S	CMW500	157483	2026.08.24	2027.08.23
Radio frequency control box	MWRFtest	MW100-RFCB	\	\	\
Software	MWRFtest	MTS 8310	V 3.0.0.0	\	\
D.C. Power Supply	Elektro-Automatik GmbH & Co.KG	D-41747 Viersen	6230316	2026.08.24	2027.08.23
Temperature and humidity test chamber	Auchno	OJN-9606-408L	19120183	2026.07.07	2027.07.06

6. Conducted Emissions

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Limit (dBuV)	
	Quas-peak	Average
0.15 -0.5	66 - 56 *	56 - 46 *
0.50 -5.0	56.00	46.00
5.0 -30.0	60.00	50.00

Notes:
1. *Decreasing linearly with logarithm of frequency.
2. The lower limit shall apply at the transition frequencies.

6.3 Test procedure

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

a. The Product was placed on a nonconductive table 0.8 m above the horizontal ground reference plane, and 0.4 m from the vertical ground reference plane, and connected to the main through Line Impedance Stability Network (L.I.S.N).
b. The RBW of the receiver was set at 9 kHz in 150 kHz ~ 30MHz with Peak and AVG detector in Max Hold mode. Run the receiver's pre-scan to record the maximum disturbance generated from Product in all power lines in the full band.
c. For each frequency whose maximum record was higher or close to limit, measure its QP and AVG values and record.

6.4 EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

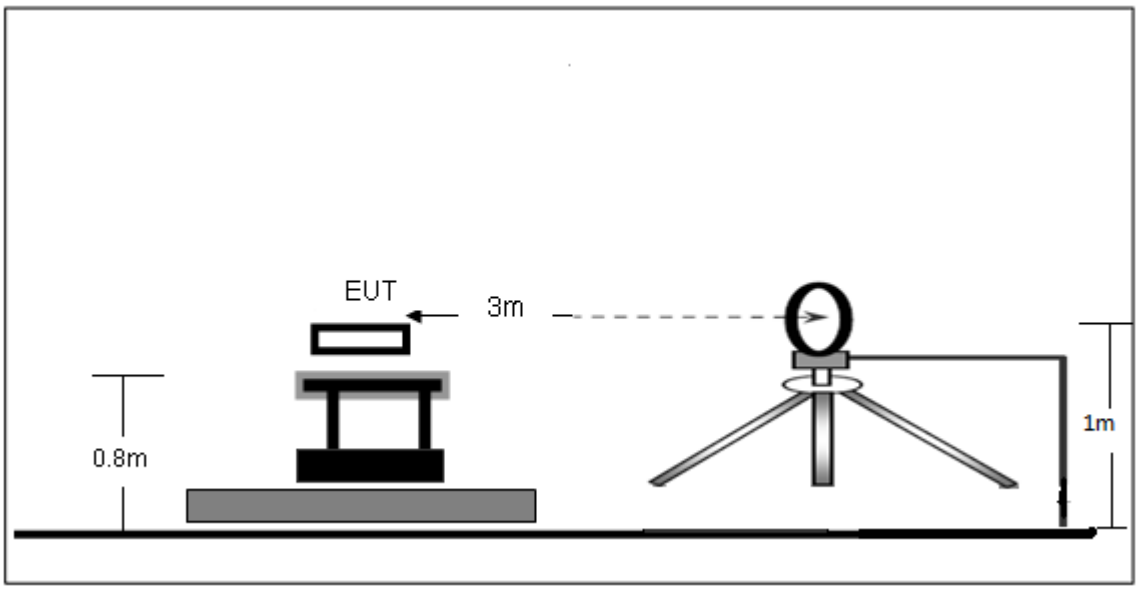
6.5 Test Result

This product is DC vehicle equipment and is not applicable to this test.

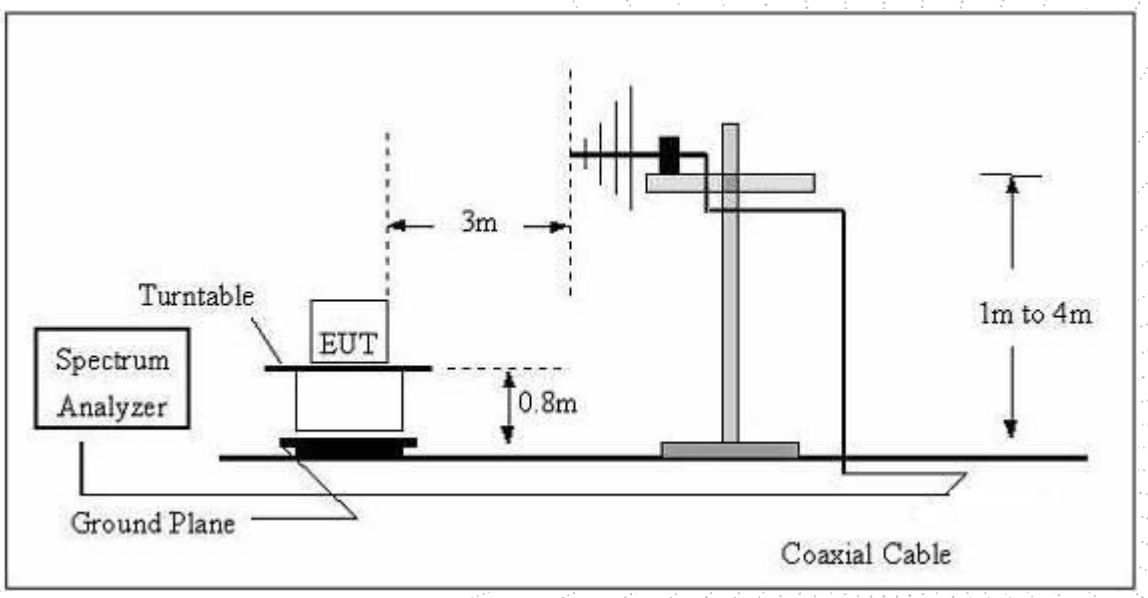
7. Radiated Emissions

7.1 Block Diagram Of Test Setup

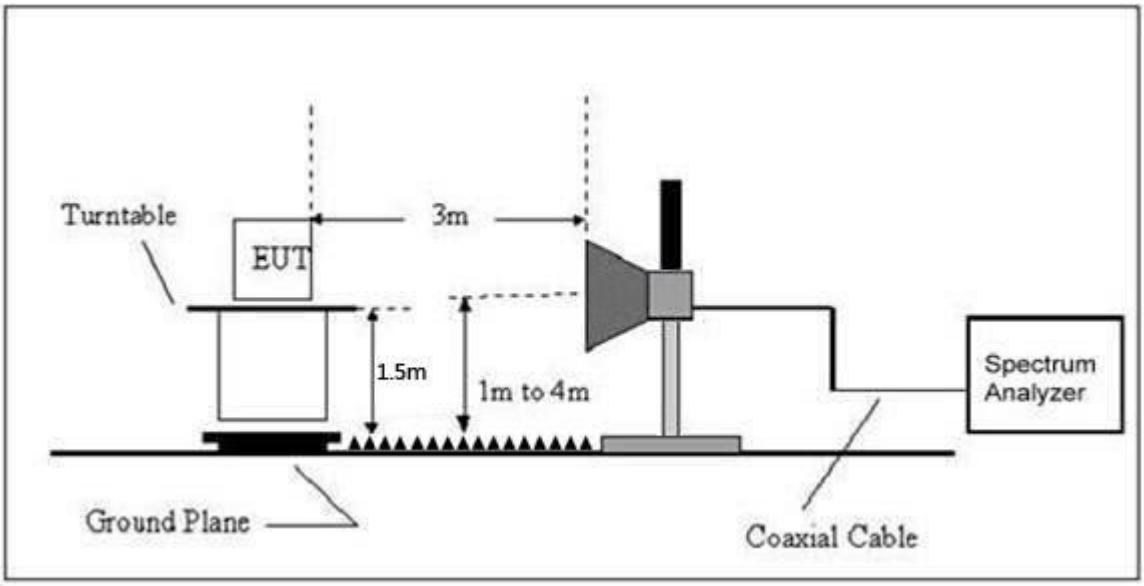
（A）Radiated Emission Test-Up Frequency Below 30MHz



（B）Radiated Emission Test-Up Frequency 30MHz~1GHz



（C）Radiated Emission Test-Up Frequency Above 1GHz



7.2 Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency	Field Strength	Distance	Field Strength Limit at 3m Distance	
(MHz)	uV/m	(m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:
(1)The limit for radiated test was performed according to FCC PART 15C.
(2)The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).

Frequency Range Of Radiated Measurement

(a) For an intentional radiator the spectrum shall be investigated from the lowest radio frequency signal generated in the device, without going below 9 kHz, up to at least the frequency shown in this paragraph:

(1) If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

(2) If the intentional radiator operates at or above 10 GHz and below 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 100 GHz, whichever is lower.

(3) If the intentional radiator operates at or above 30 GHz: to the fifth harmonic of the highest fundamental frequency or to 200 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(4) If the intentional radiator operates at or above 95 GHz: To the third harmonic of the highest fundamental frequency or to 750 GHz, whichever is lower, unless specified otherwise elsewhere in the rules.

(5) If the intentional radiator contains a digital device, regardless of whether this digital device controls the functions of the intentional radiator or the digital device is used for additional control or function purposes other than to enable the operation of the intentional radiator, the frequency range shall be investigated up to the range specified in paragraphs (a) (1)through (4) of this section or the range applicable to the digital device, as shown in paragraph (b)(1) of this section, whichever is the higher frequency range of investigation.

7.3 Test procedure

Receiver Parameter	Setting
Attenuation	Auto
9kHz~150kHz	RBW 200Hz for QP
150kHz~30MHz	RBW 9kHz for QP
30MHz~1000MHz	RBW 120kHz for QP

Spectrum Parameter	Setting
1-25GHz	RBW 1 MHz /VBW 1 MHz for Peak, RBW 1 MHz / VBW 10Hz for Average

Below 1GHz test procedure as below:
a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. The antenna height 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.
d. 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 (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not

have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

a.The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.

b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c.The antenna height 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.

d.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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

g. Test the EUT in the lowest channel, the middlest channel, the Highest channel.

Note:

Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

7.4 EUT operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

7.5 Test Result

Below 30MHz

Temperature:	26.8 ℃	Relative Humidity:	48%
Pressure:	101KPa	Test Voltage :	DC 12V
Test Mode:	Mode 7		

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	PASS
--	--	--	--	PASS

Note:

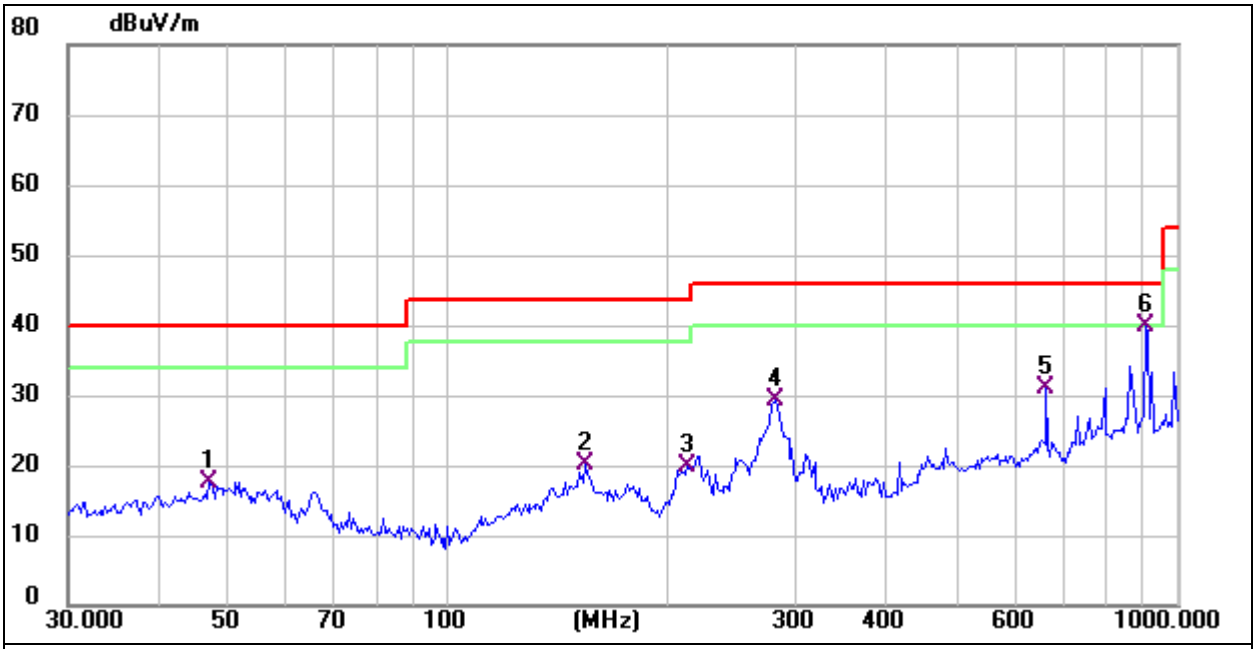
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =40 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

Between 30MHz – 1GHz

Temperature:	26.8 ℃	Relative Humidity:	48%
Pressure:	101KPa	Phase :	Horizontal
Test Mode:	Mode 7	Test Voltage :	DC 12V

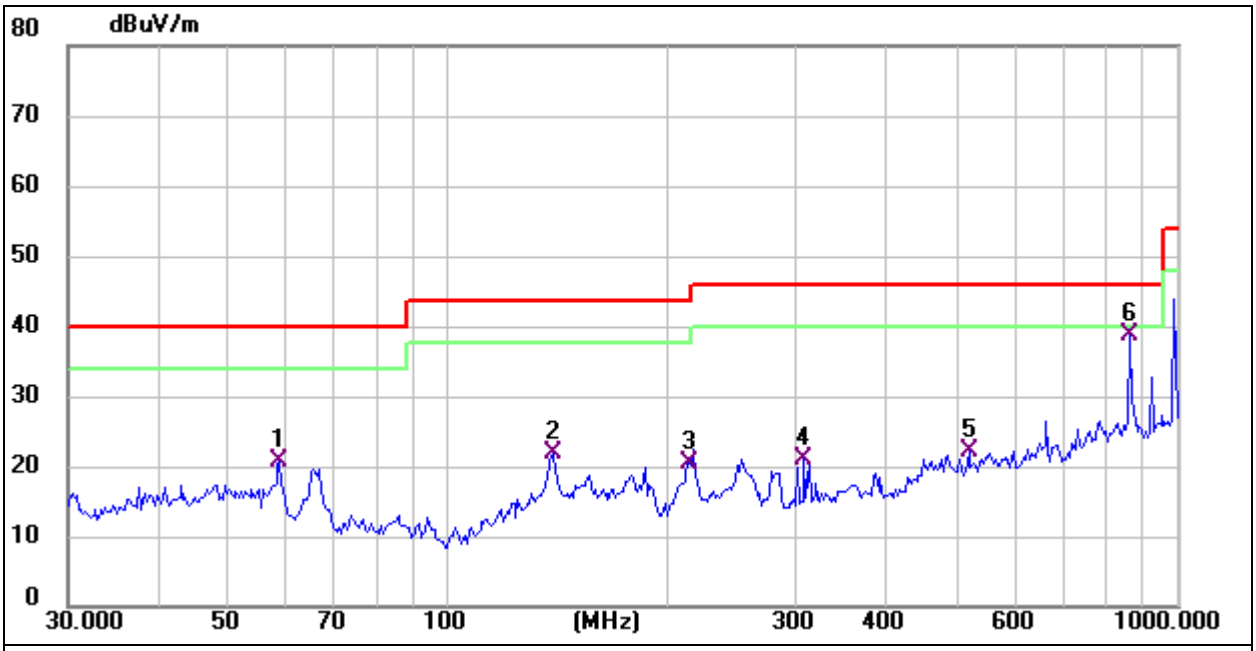


Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Margin = (Reading + Factor)–Limit

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	46.9948	28.45	-10.83	17.62	40.00	-22.38	QP
2	153.7385	30.15	-10.09	20.06	43.50	-23.44	QP
3	212.2695	33.13	-13.16	19.97	43.50	-23.53	QP
4	281.0075	40.67	-11.38	29.29	46.00	-16.71	QP
5	661.1505	33.70	-2.65	31.05	46.00	-14.95	QP
6 *	906.4824	39.01	0.75	39.76	46.00	-6.24	QP

* Indicates the worst data.

Temperature:	26.8 ℃	Relative Humidity:	48%
Pressure:	101KPa	Phase :	Vertical
Test Mode:	Mode 7	Test Voltage :	DC 12V



Remark:
Factor = Antenna Factor + Cable Loss – Pre-amplifier.
Margin = (Reading + Factor)–Limit

No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	58.4074	32.10	-11.42	20.68	40.00	-19.32	QP
2	139.3613	32.36	-10.57	21.79	43.50	-21.71	QP
3	213.7634	33.54	-13.04	20.50	43.50	-23.00	QP
4	307.8313	31.59	-10.58	21.01	46.00	-24.99	QP
5	517.2480	27.31	-5.21	22.10	46.00	-23.90	QP
6 *	863.0562	39.07	-0.25	38.82	46.00	-7.18	QP

* Indicates the worst data.

Between 1GHz – 25GHz

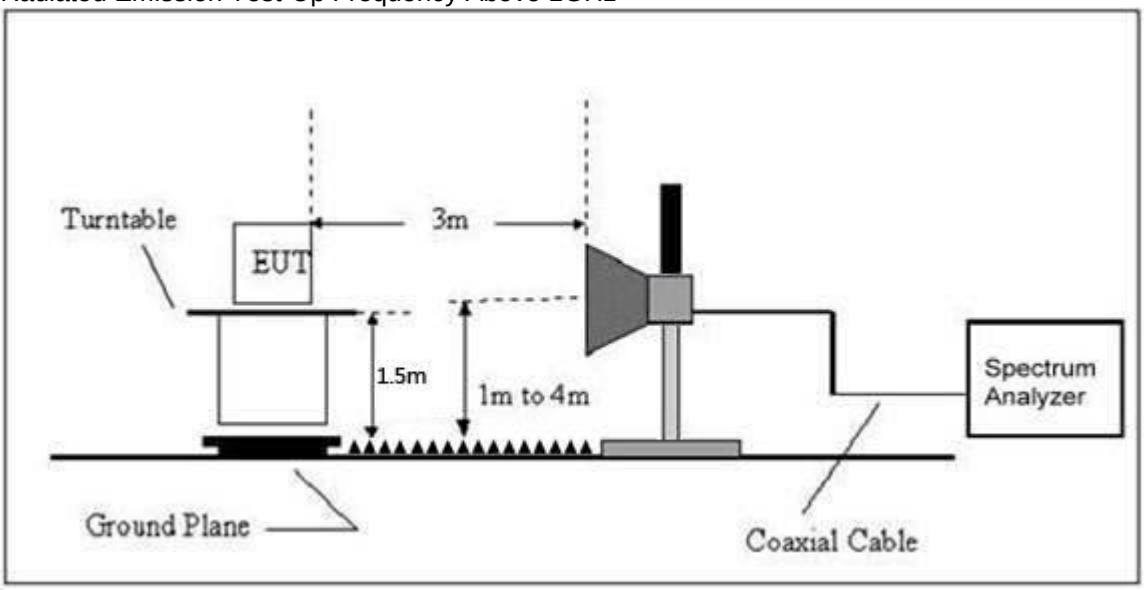
GFSK 1Mbps							
Polar (H/V)	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measure-ment (dBuV/m)	Limits (dBuV/m)	Over (dB)	Detector Type
Low channel							
V	4804.00	67.80	-9.61	58.19	74.00	-15.81	PK
V	4804.00	57.78	-9.61	48.17	54.00	-5.83	AV
V	7206.00	57.60	-4.13	53.47	74.00	-20.53	PK
V	7206.00	48.21	-4.13	44.08	54.00	-9.92	AV
H	4804.00	66.14	-9.61	56.53	74.00	-17.47	PK
H	4804.00	56.63	-9.61	47.02	54.00	-6.98	AV
H	7206.00	54.96	-4.13	50.83	74.00	-23.17	PK
H	7206.00	46.22	-4.13	42.09	54.00	-11.91	AV
Middle channel							
V	4880.00	65.44	-8.84	56.60	74.00	-17.40	PK
V	4880.00	58.18	-8.84	49.34	54.00	-4.66	AV
V	7320.00	57.32	-3.37	53.95	74.00	-20.05	PK
V	7320.00	47.67	-3.37	44.30	54.00	-9.70	AV
H	4880.00	61.18	-8.84	52.34	74.00	-21.66	PK
H	4880.00	52.02	-8.84	43.18	54.00	-10.82	AV
H	7320.00	55.05	-3.37	51.68	74.00	-22.32	PK
H	7320.00	47.34	-3.37	43.97	54.00	-10.03	AV
High channel							
V	4960.00	67.26	-8.65	58.61	74.00	-15.39	PK
V	4960.00	57.38	-8.65	48.73	54.00	-5.27	AV
V	7440.00	58.68	-3.4	55.28	74.00	-18.72	PK
V	7440.00	49.34	-3.4	45.94	54.00	-8.06	AV
H	4960.00	64.30	-8.65	55.65	74.00	-18.35	PK
H	4960.00	54.06	-8.65	45.41	54.00	-8.59	AV
H	7440.00	57.61	-3.4	54.21	74.00	-19.79	PK
H	7440.00	49.12	-3.4	45.72	54.00	-8.28	AV

Remark:
1.Emission Level = Meter Reading + Factor, Factor = Antenna Factor + Cable Loss – Pre-amplifier. Over= Emission Level - Limit
2. In restricted bands of operation, The spurious emissions below the permissible value more than 20dB
3. The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
4.The worst mode is GFSK 1Mbps, so only the worst mode is displayed

8. Radiated Band Emission Measurement and Restricted Bands Of Operation

8.1 Block Diagram Of Test Setup

Radiated Emission Test-Up Frequency Above 1GHz



8.2 Limit

FCC Part15 C Section 15.209 and 15.205

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	([2])
13.36-13.41			

Limits Of Radiated Emission Measurement (Above 1000MHz)

Frequency (MHz)	Limit (dBuV/m) (at 3M)	
	Peak	Average
Above 1000	74	54

Notes:
(1)The limit for radiated test was performed according to FCC PART 15C.
(2)The tighter limit applies at the band edges.
(3) Emission level (dBuV/m)=20log Emission level (uV/m).

8.3 Test Procedure

Receiver Parameter	Setting
Attenuation	Auto
Start Frequency	2300MHz
Stop Frequency	2520
RB / VB (emission in restricted band)	1 MHz / 1 MHz for Peak, 1 MHz / 10Hz for Average

Above 1GHz test procedure as below:
a.The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b.The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c.The antenna height 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.
d.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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
e.The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
g. Test the EUT in the lowest channel, the middlest channel, the Highest channel.
Note:
Both horizontal and vertical antenna polarities were tested and performed pretest to three orthogonal axis. The worst case emissions were reported.

8.4 EUT Operating Conditions

The EUT was configured for testing in a typical fashion (as a customer would normally use it). The EUT has been programmed to continuously transmit during test. This operating condition was tested and used to collect the included data.

8.5 Test Result

	Polar (H/V)	Frequency (MHz)	Reading Level (dBuV/m)	Correct Factor (dB)	Measure-ment (dBuV/m)	Limits (dBuV/m)		Result
					PK	PK	AV	
GFSK 1Mbps	Low Channel 2402MHz							
	H	2390.00	63.25	-17.27	45.98	74.00	54.00	PASS
	H	2400.00	66.39	-17.23	49.16	74.00	54.00	PASS
	V	2390.00	63.24	-17.27	45.97	74.00	54.00	PASS
	V	2400.00	66.89	-17.23	49.66	74.00	54.00	PASS
	High Channel 2480MHz							
	H	2483.50	65.52	-16.91	48.61	74.00	54.00	PASS
	H	2500.00	62.19	-16.71	45.48	74.00	54.00	PASS
	V	2483.50	65.34	-16.91	48.43	74.00	54.00	PASS
	V	2500.00	62.25	-16.71	45.54	74.00	54.00	PASS

Remark:

1. Emission Level = Meter Reading + Factor,

Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Over= Emission Level - Limit

2. If the PK measured levels comply with average limit, then the average level were deemed to comply with average limit.

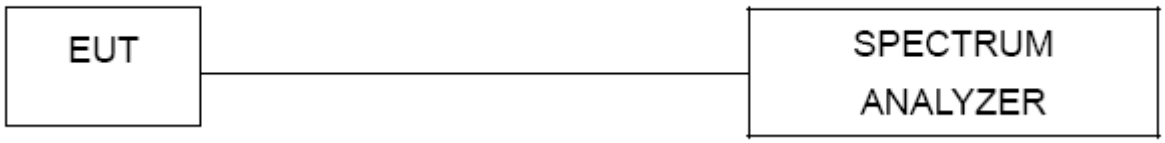
3 In restricted bands of operation, The spurious emissions below the permissible value more than 20dB

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

5.The worst mode is GFSK 1Mbps, so only the worst mode is displayed

9. Power Spectral Density Test

9.1 Block Diagram Of Test Setup



9.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

Limits Of Radiated Emission Measurement (Above 1000MHz)

9.3 Test procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: 3 kHz
4. Set the VBW ≥ 3 x RBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

9.4 EUT Operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.
Note: Power Spectral Density(dBm)=Reading+Cable Loss

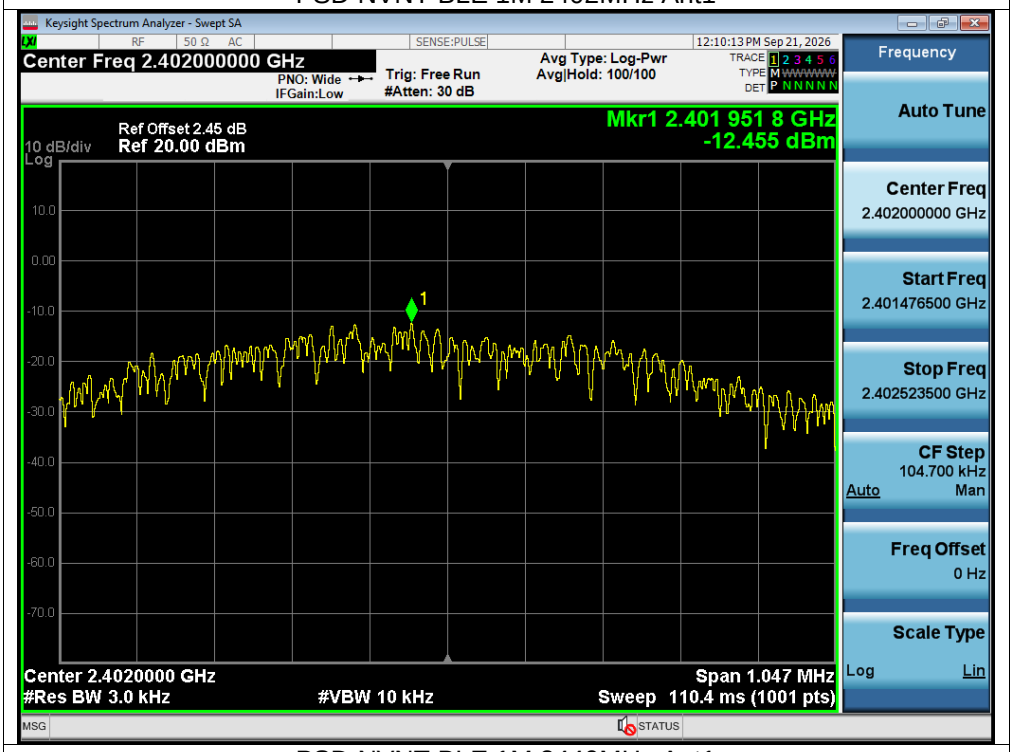
9.5 Test Result

Temperature:	23 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage :	DC 12V

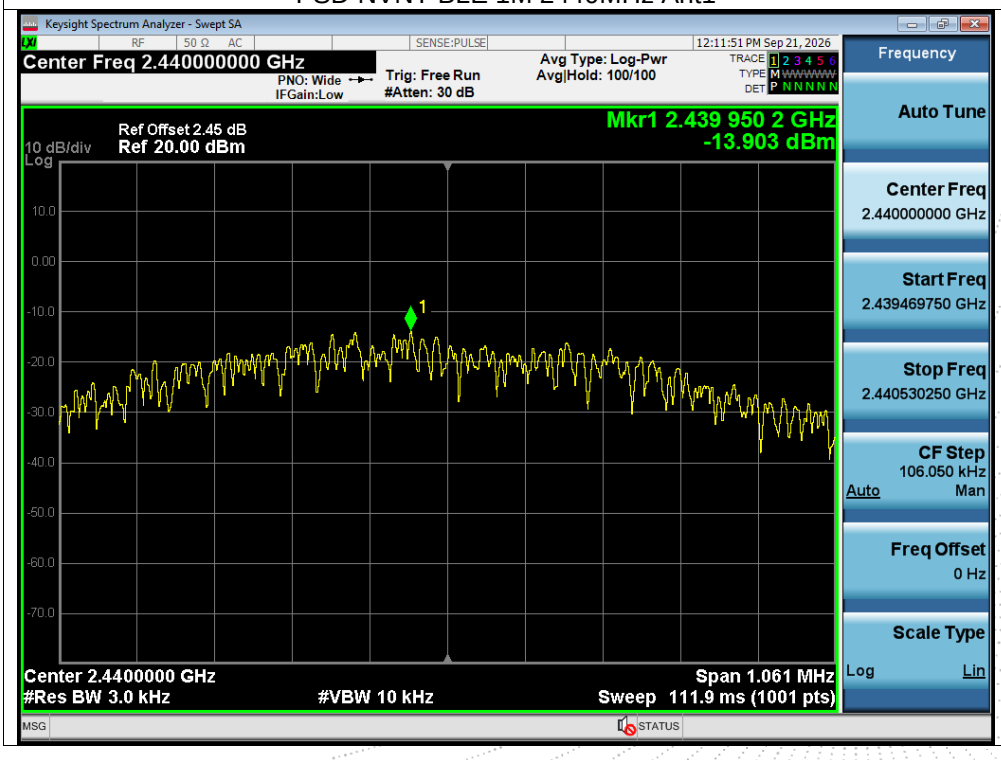
Frequency	Power Spectral Density(dBm/3kHz)	Limit (dBm/3kHz)	Result
2402 MHz BLE 1M	-12.46	8	PASS
2440 MHz BLE 1M	-13.9	8	PASS
2480 MHz BLE 1M	-15.84	8	PASS
2402 MHz BLE 2M	-16.38	8	PASS
2440 MHz BLE 2M	-17.85	8	PASS
2480 MHz BLE 2M	-19.78	8	PASS

Test Graphs

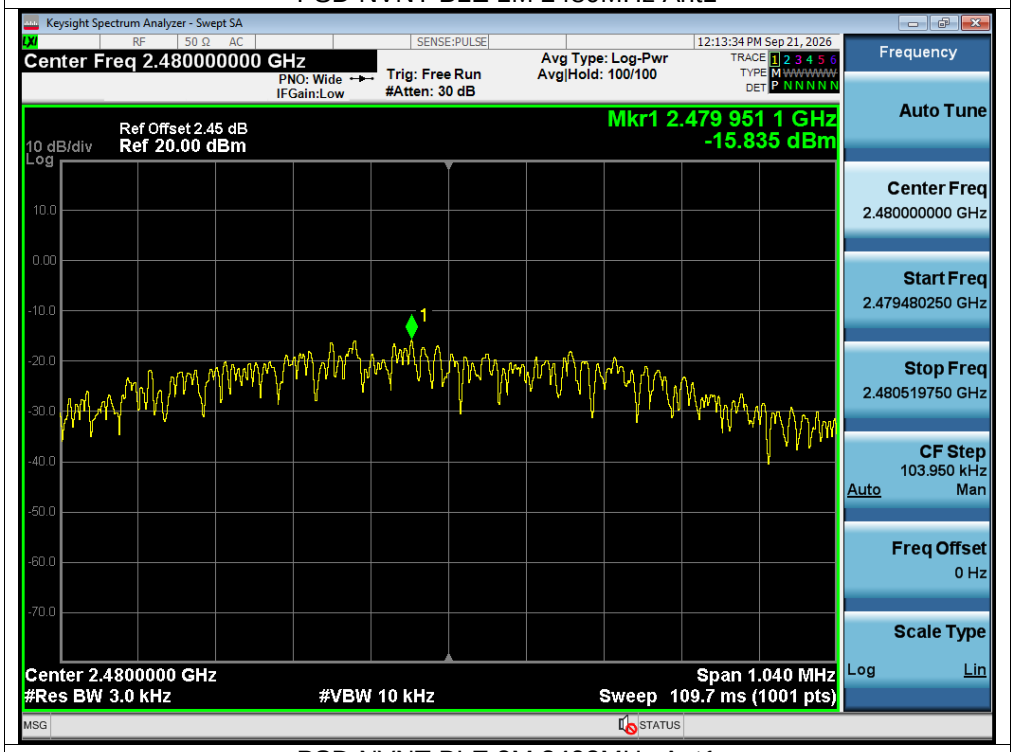
PSD NVNT BLE 1M 2402MHz Ant1



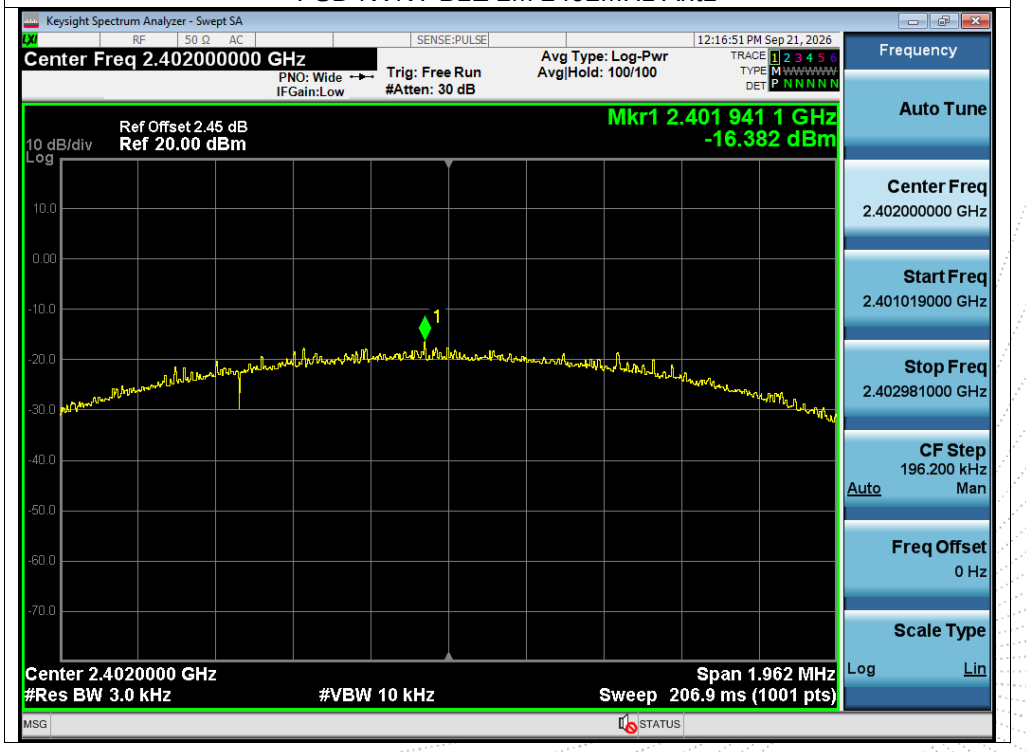
PSD NVNT BLE 1M 2440MHz Ant1



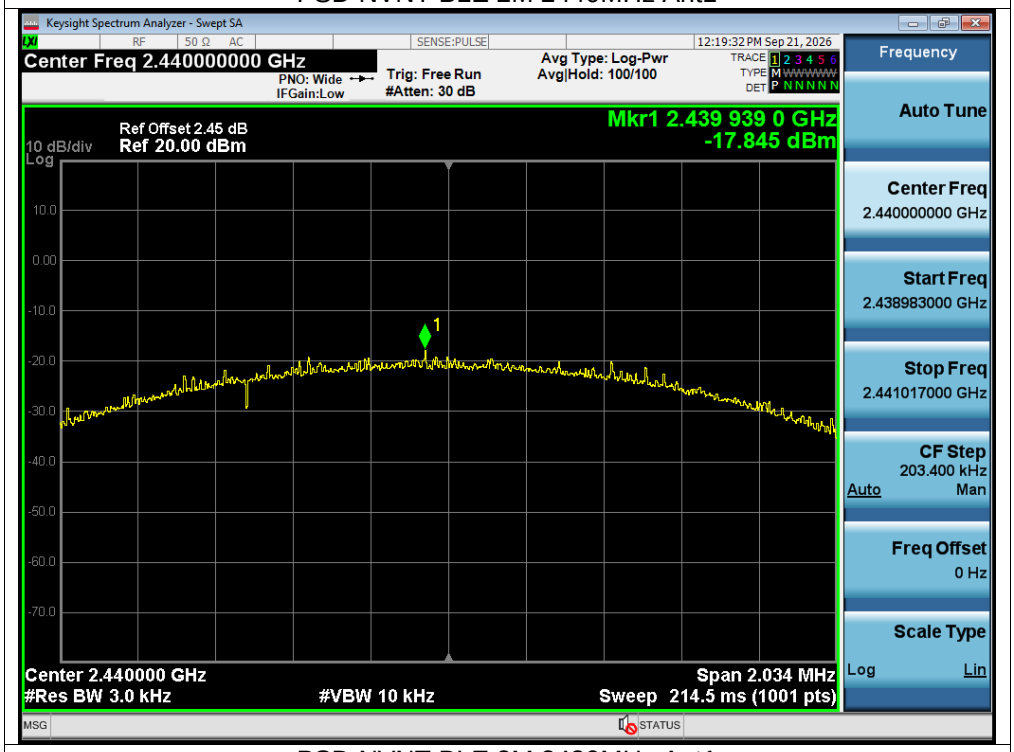
PSD NVNT BLE 1M 2480MHz Ant1



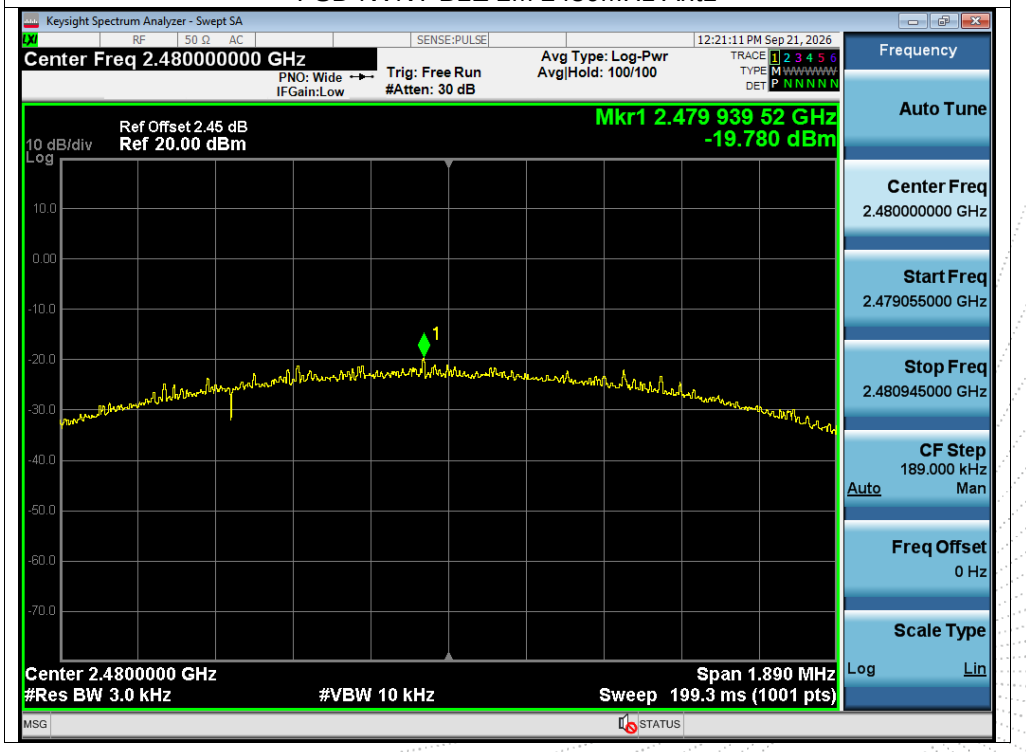
PSD NVNT BLE 2M 2402MHz Ant1



PSD NVNT BLE 2M 2440MHz Ant1

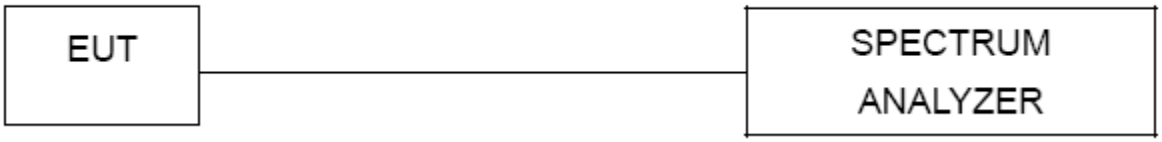


PSD NVNT BLE 2M 2480MHz Ant1



10. Bandwidth Test

10.1 Block Diagram Of Test Setup



10.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	**Test Item**	**Limit**	**Frequency Range (MHz)**	**Result**
15.247(a)(2)	Bandwidth	>= 500KHz (-6dB bandwidth)	2400-2483.5	PASS

10.3 Test procedure

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) ≥ 3 x RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

10.4 EUT operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.
Note: Power Spectral Density(dBm)=Reading+Cable Loss

10.5 Test Result

Temperature:	23 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage :	DC 12V

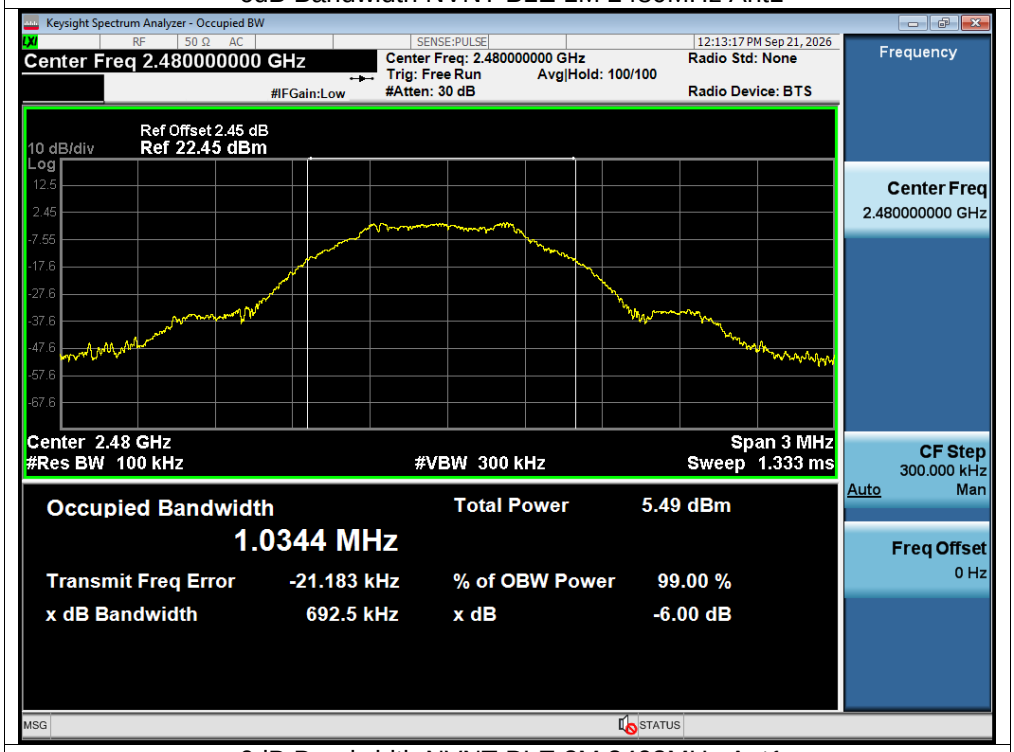
Frequency (MHz)	-6dB bandwidth (MHz)	Limit (MHz)	Result
2402 MHz BLE 1M	0.698	0.5	Pass
2440 MHz BLE 1M	0.707	0.5	Pass
2480 MHz BLE 1M	0.693	0.5	Pass
2402 MHz BLE 2M	1.308	0.5	Pass
2440 MHz BLE 2M	1.356	0.5	Pass
2480 MHz BLE 2M	1.26	0.5	Pass

Test Graphs

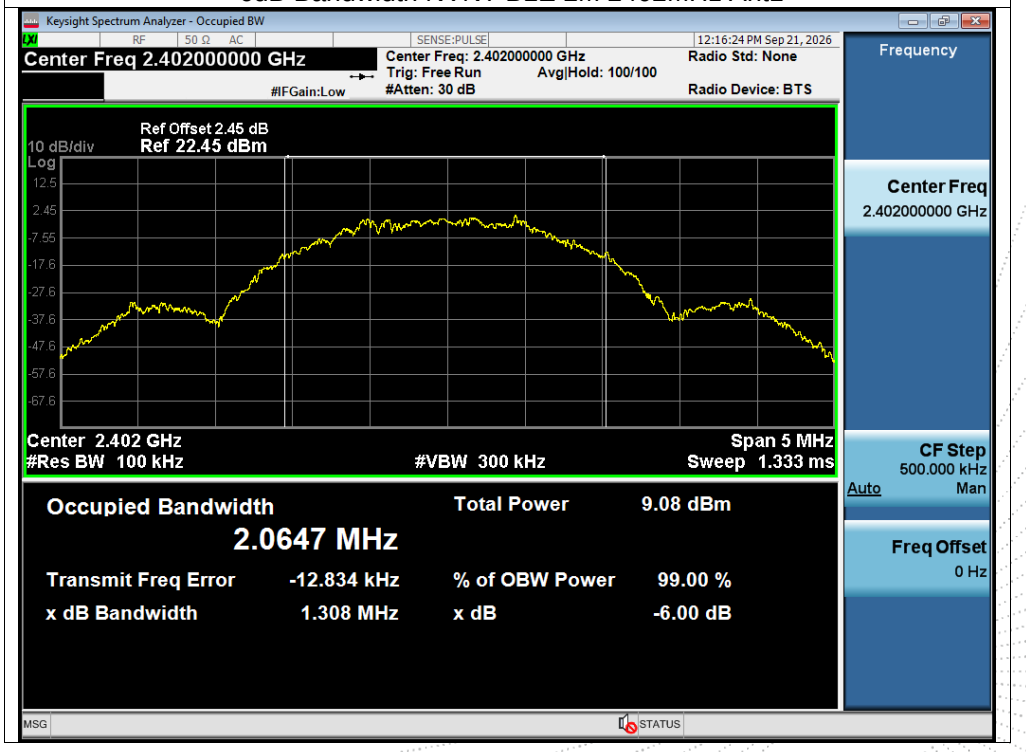
-6dB Bandwidth NVNT BLE 1M 2402MHz Ant1

-6dB Bandwidth NVNT BLE 1M 2440MHz Ant1

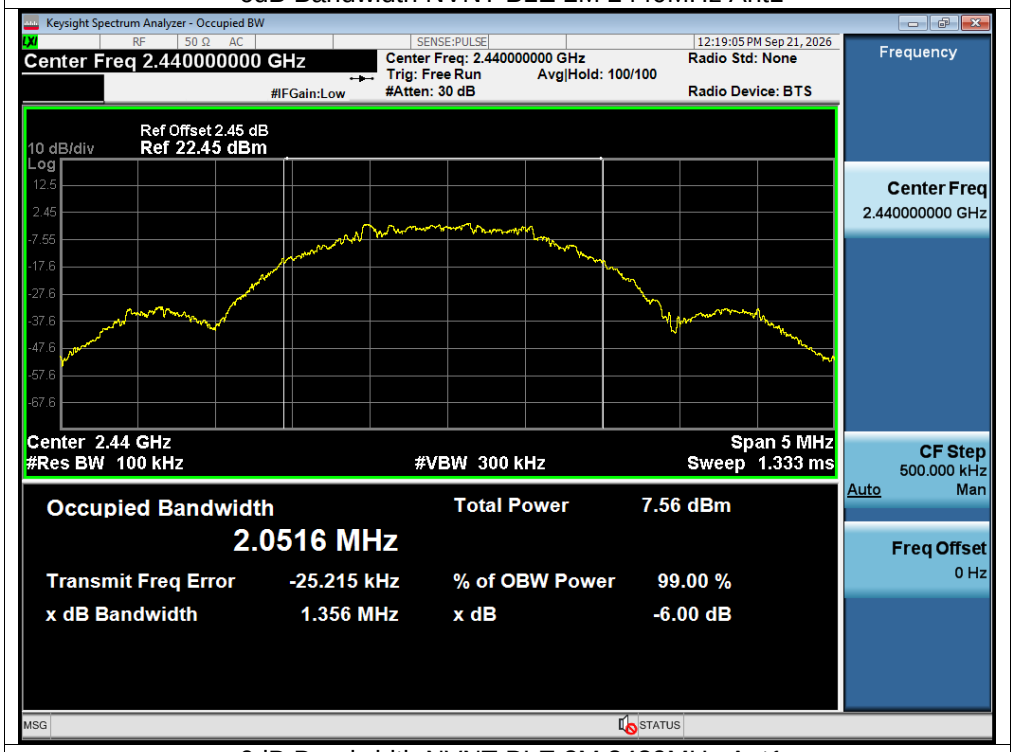
-6dB Bandwidth NVNT BLE 1M 2480MHz Ant1



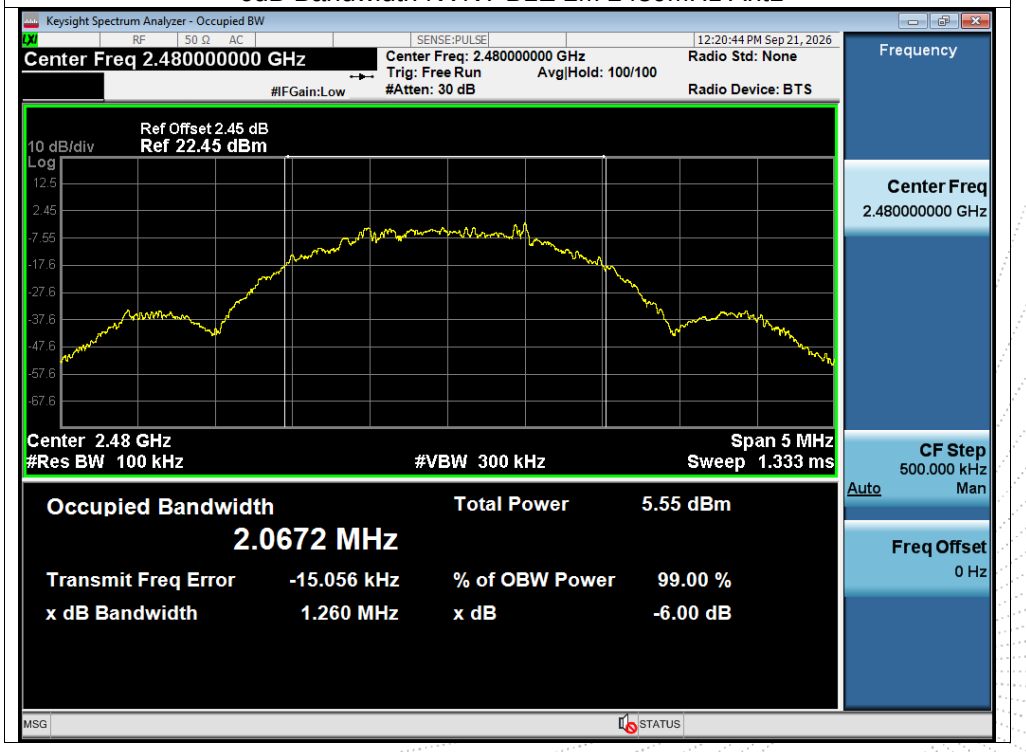
-6dB Bandwidth NVNT BLE 2M 2402MHz Ant1



-6dB Bandwidth NVNT BLE 2M 2440MHz Ant1

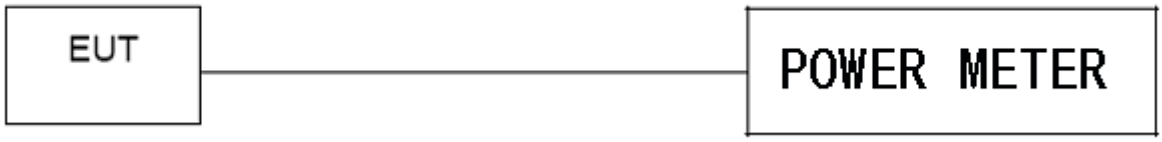


-6dB Bandwidth NVNT BLE 2M 2480MHz Ant1



11. Peak Output Power Test

11.1 Block Diagram Of Test Setup



11.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	**Test Item**	**Limit**	**Frequency Range (MHz)**	**Result**
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

11.3 Test Procedure

a. The EUT was directly connected to the Power meter

11.4 EUT Operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.
Note: Power Spectral Density(dBm)=Reading+Cable Loss

11.5 Test Result

Temperature:	23 ℃	Relative Humidity:	54%
Pressure:	101KPa	Test Voltage :	DC 12V

	Frequency(MHz)	Maximum Conducted Output Power(PK) (dBm)	Conducted Output Power Limit(dBm)
GFSK BLE 1M	2402	3.06	30
	2440	1.55	30
	2480	-0.35	30
GFSK BLE 2M	2402	3.04	30
	2440	1.56	30
	2480	-0.36	30

12. 100 kHz Bandwidth Of Frequency Band Edge

12.1 Block Diagram Of Test Setup

12.2 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

12.3 Test procedure

Using the following spectrum analyzer setting:
a) Set the RBW = 100KHz.
b) Set the VBW = 300KHz.
c) Sweep time = auto couple.
d) Detector function = peak.
e) Trace mode = max hold.
f) Allow trace to fully stabilize.

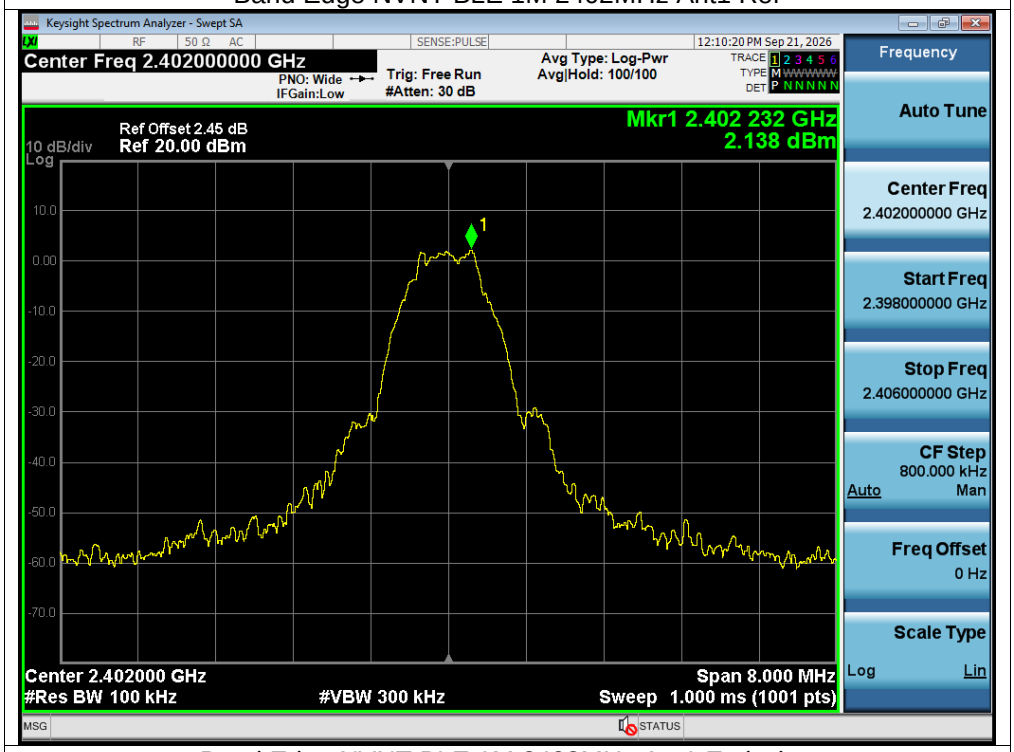
12.4 EUT operating Conditions

The EUT tested system was configured as the statements of 4.6 Unless otherwise a special operating condition is specified in the follows during the testing.
Note: Power Spectral Density(dBm)=Reading+Cable Loss

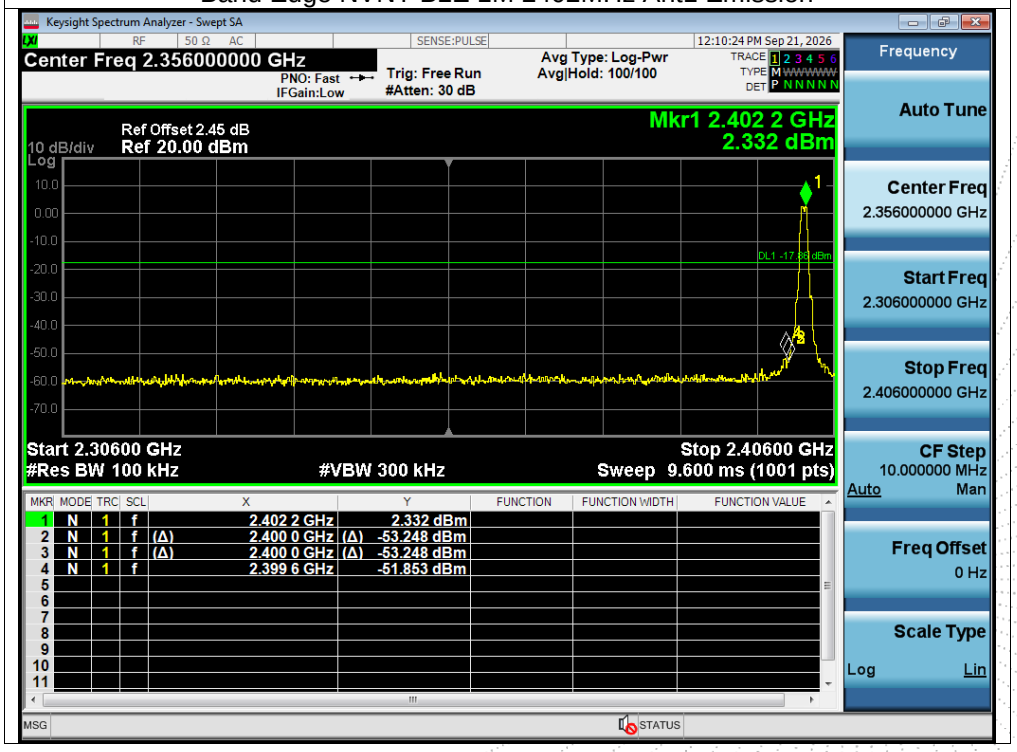
12.5 Test Result

Test Graphs

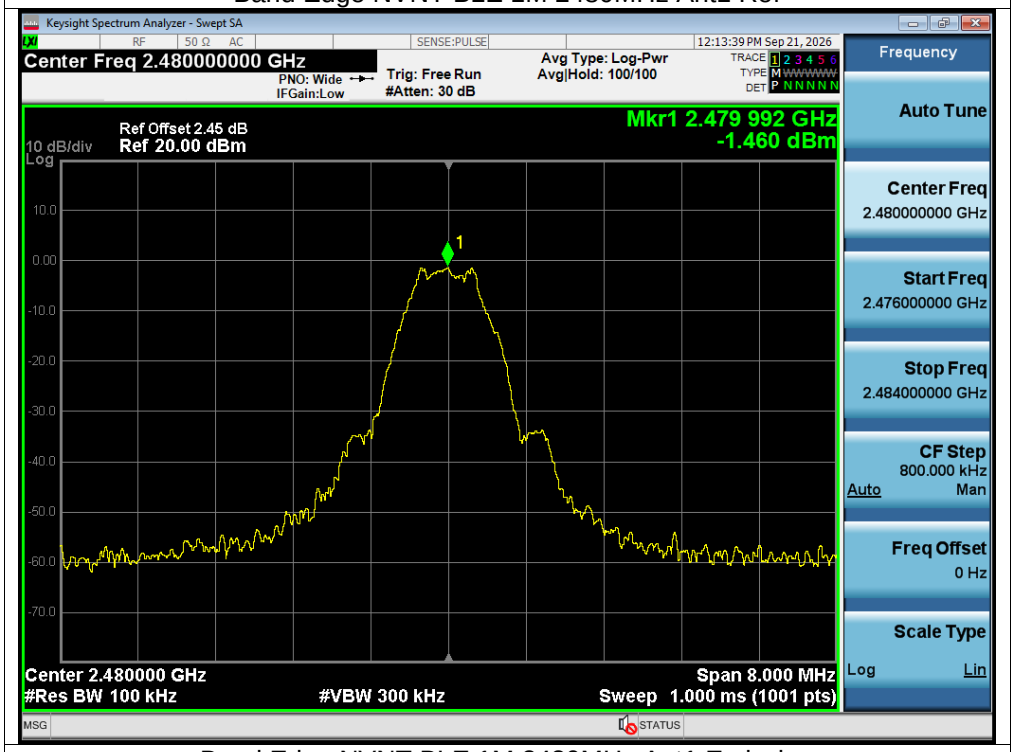
Band Edge NVNT BLE 1M 2402MHz Ant1 Ref



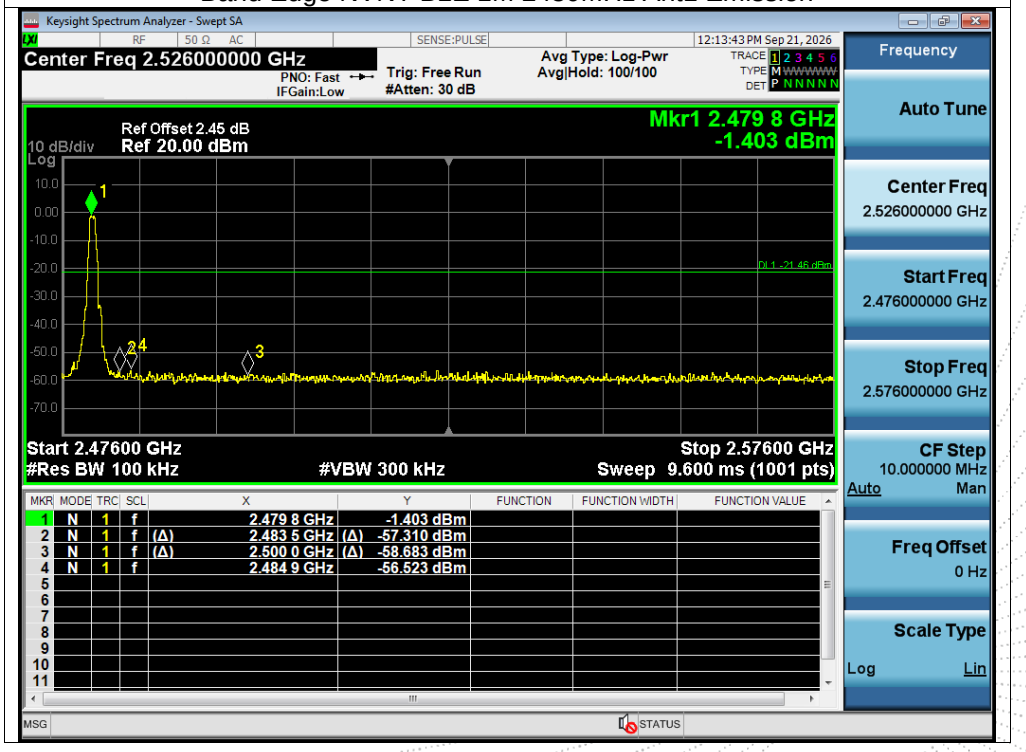
Band Edge NVNT BLE 1M 2402MHz Ant1 Emission



Band Edge NVNT BLE 1M 2480MHz Ant1 Ref

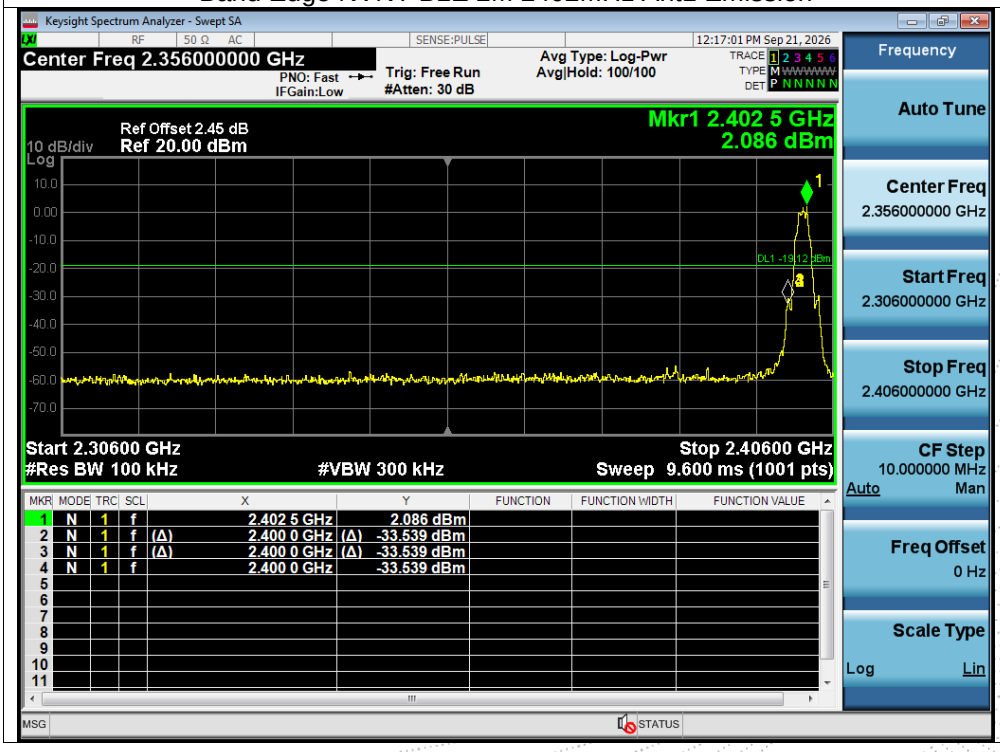


Band Edge NVNT BLE 1M 2480MHz Ant1 Emission

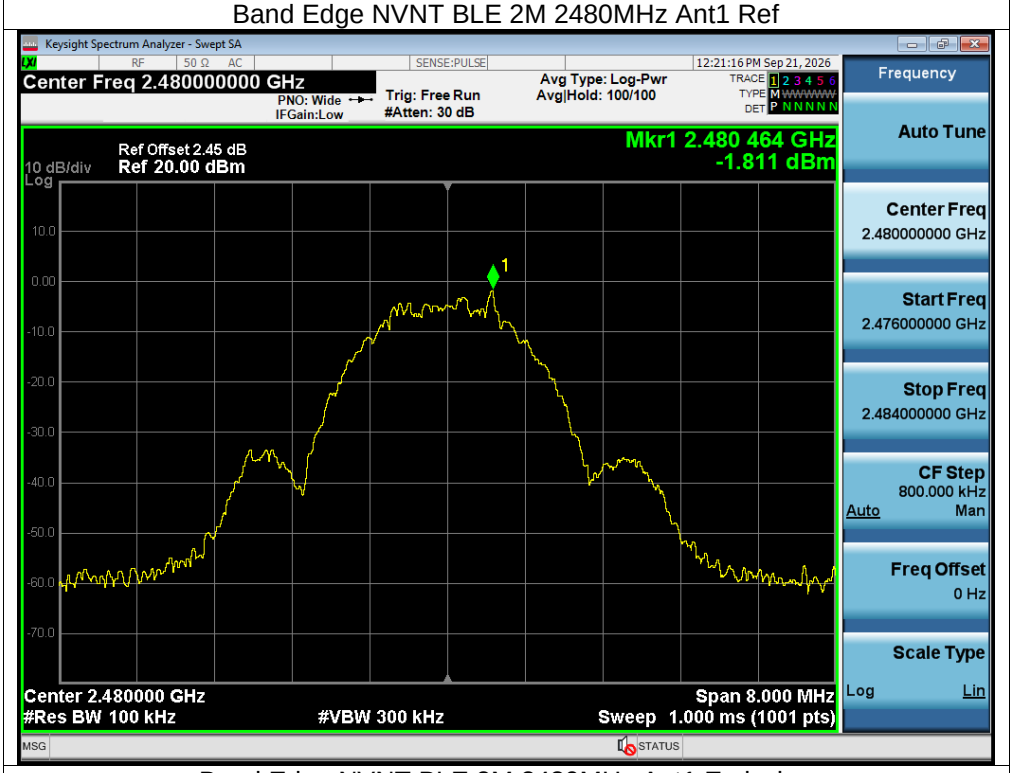


Band Edge NVNT BLE 2M 2402MHz Ant1 Ref

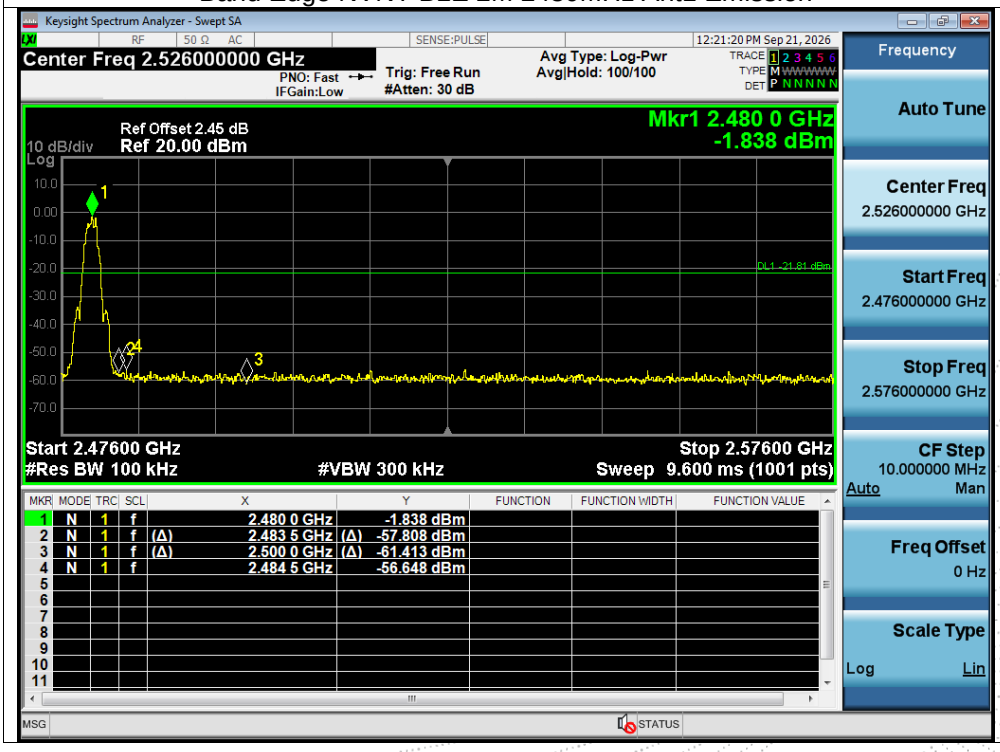
Band Edge NVNT BLE 2M 2402MHz Ant1 Emission



Band Edge NVNT BLE 2M 2480MHz Ant1 Ref



Band Edge NVNT BLE 2M 2480MHz Ant1 Emission

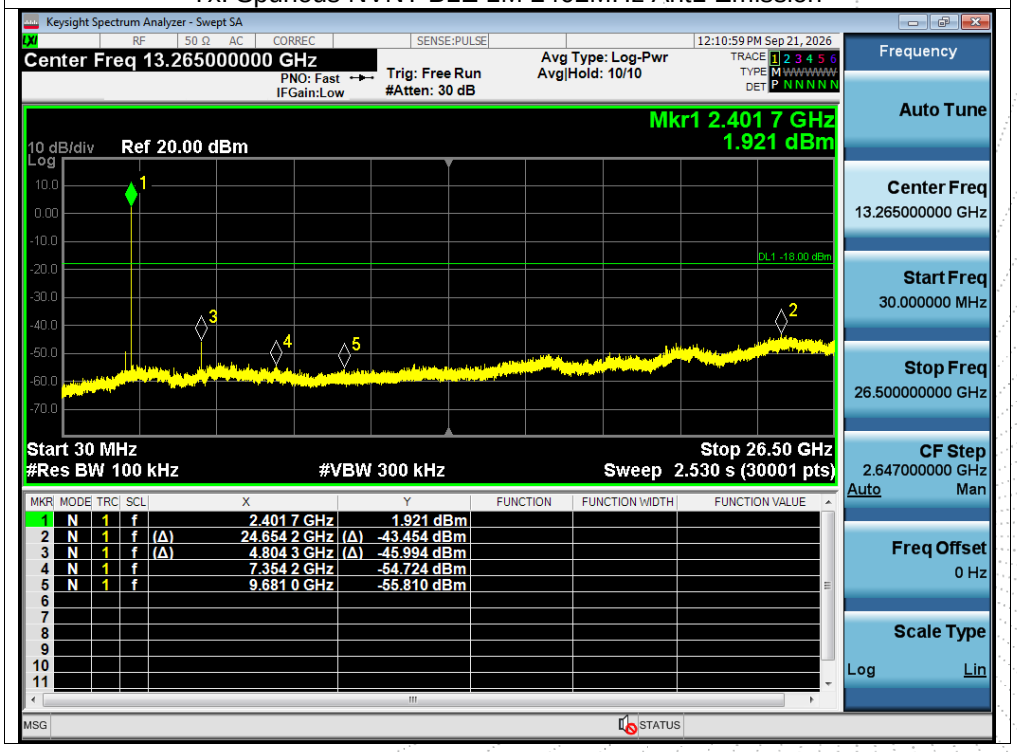


Conducted Emission Measurement

Test Graphs

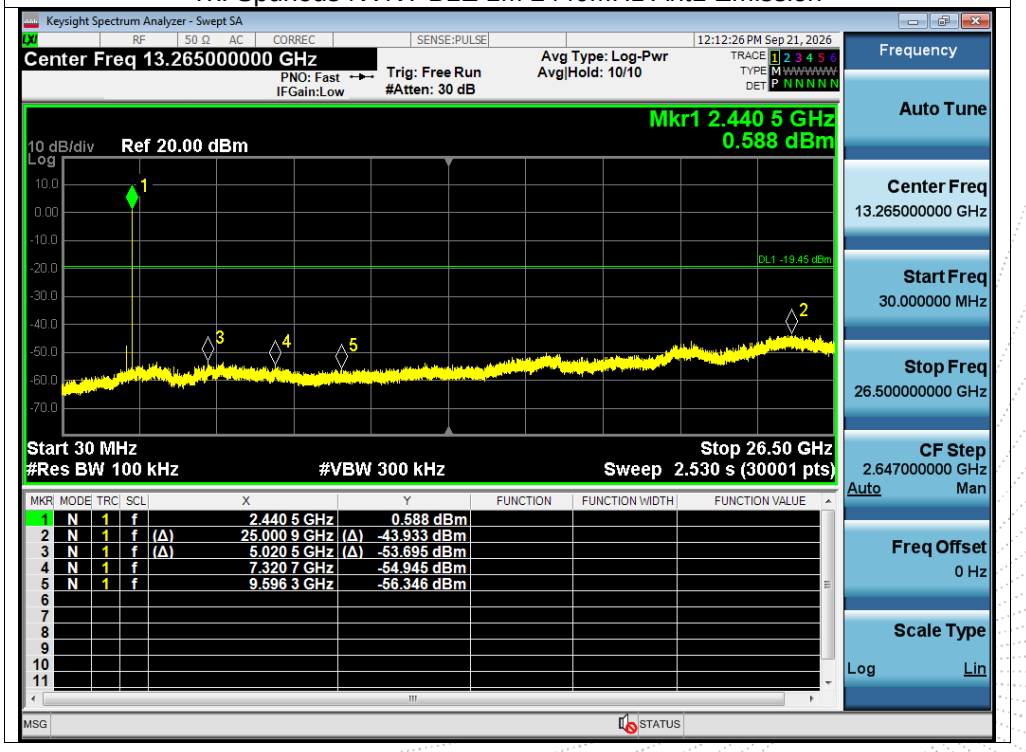
Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Ref

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 Emission



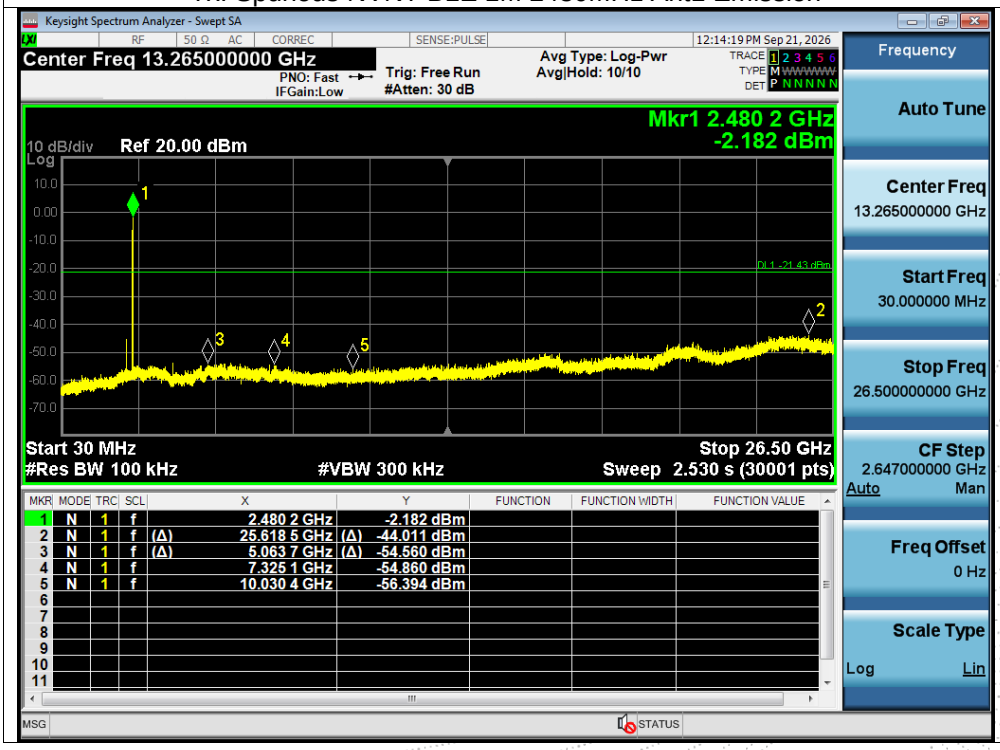
Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Ref

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 Emission



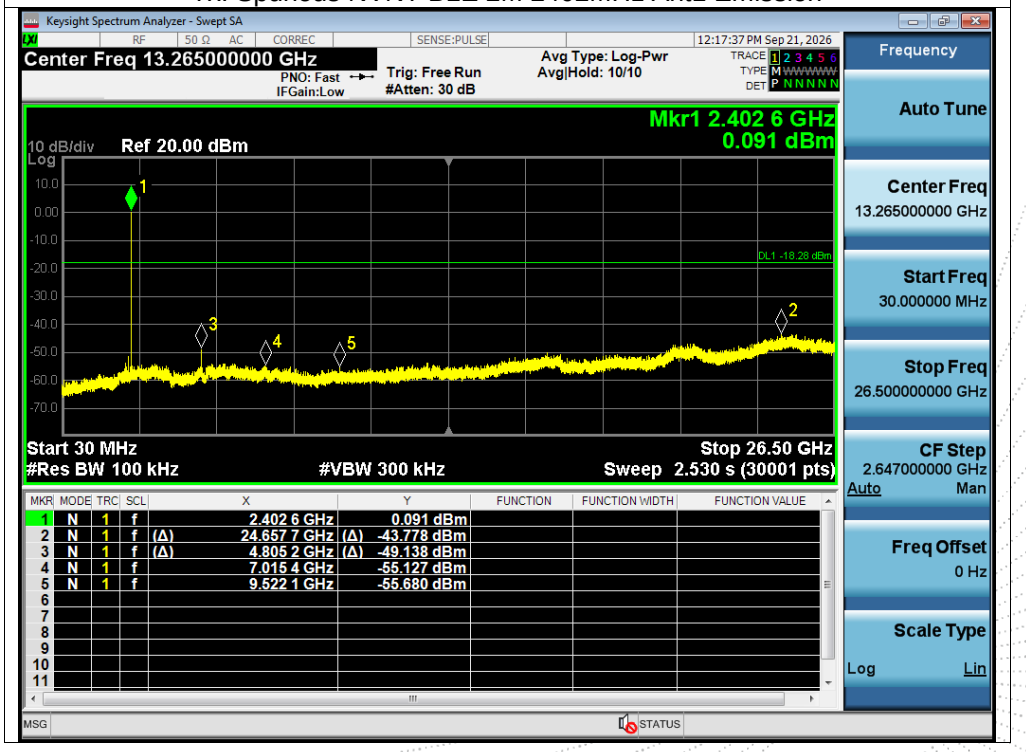
Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Ref

Tx. Spurious NVNT BLE 1M 2480MHz Ant1 Emission



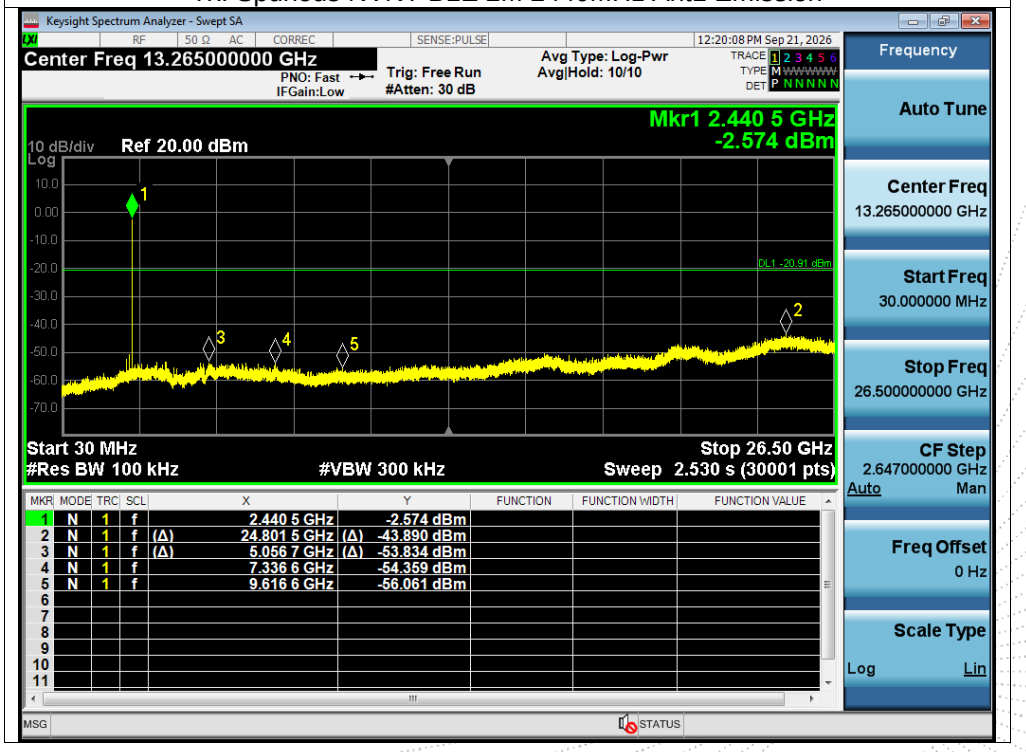
Tx. Spurious NVNT BLE 2M 2402MHz Ant1 Ref

Tx. Spurious NVNT BLE 2M 2402MHz Ant1 Emission



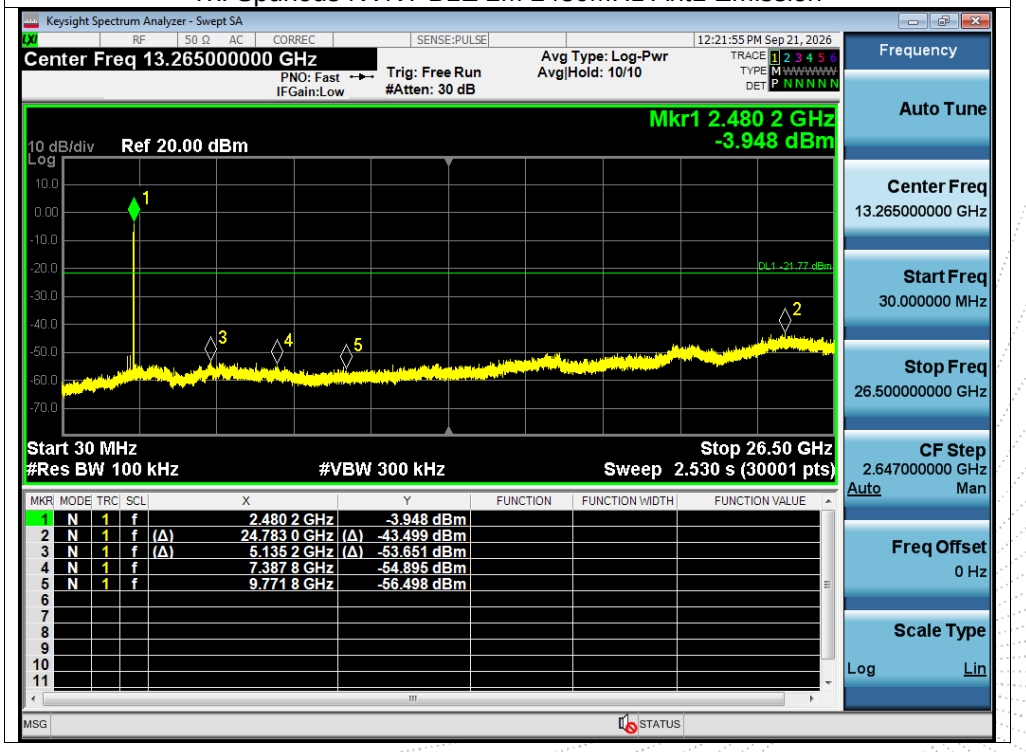
Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Ref

Tx. Spurious NVNT BLE 2M 2440MHz Ant1 Emission



Tx. Spurious NVNT BLE 2M 2480MHz Ant1 Ref

Tx. Spurious NVNT BLE 2M 2480MHz Ant1 Emission



13. Duty Cycle Of Test Signal

13.1 Standard Requirement

Pre-analysis Check: While conducting average power measurement, duty cycle of each mode shall be checked to ensure its duty cycle in order to compensate for the loss due to insufficient ratio of duty cycle.

All duty cycle is pre-scanned, and result as obtained below shows only the most representative ones where duty cycle is conducted as the given transmission with given virtual operation that expresses the percentage.

13.2 Formula

Duty Cycle = Ton / (Ton+Toff)

13.3 Test Procedure

1.Set span = Zero

2. RBW = 8MHz

3. VBW = 8MHz,

4. Detector = Peak

13.4 Test Result

Condition	Mode	Frequency (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
NVNT	BLE 1M	2402	100	0	0
NVNT	BLE 1M	2440	100	0	0
NVNT	BLE 1M	2480	100	0	0
NVNT	BLE 2M	2402	100	0	0
NVNT	BLE 2M	2440	100	0	0
NVNT	BLE 2M	2480	100	0	0

14. Antenna Requirement

14.1 Limit

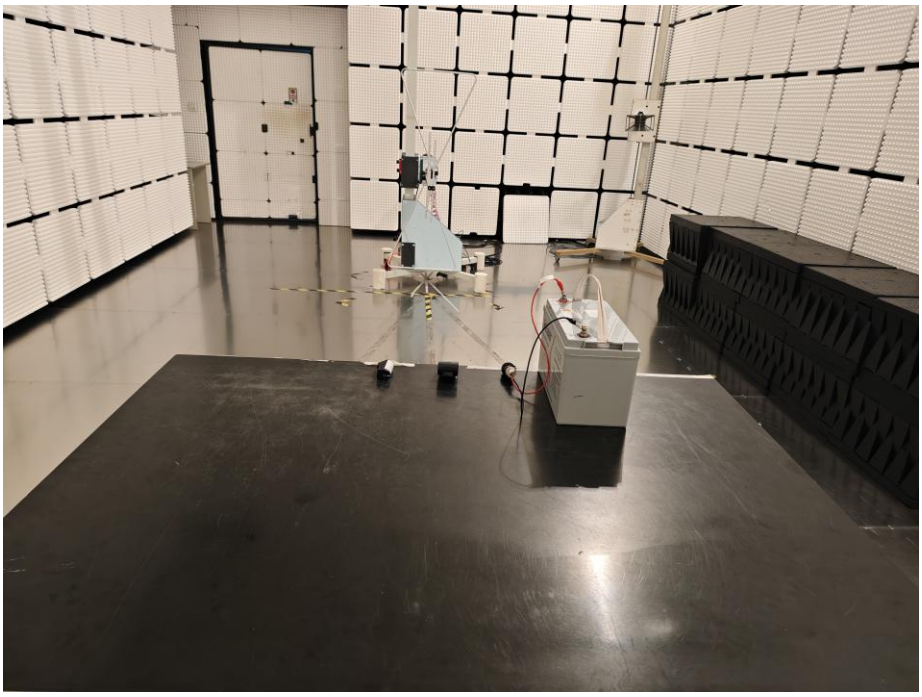
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply 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. This requirement does not apply to carrier current devices or to devices operated under the provisions of §§ 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

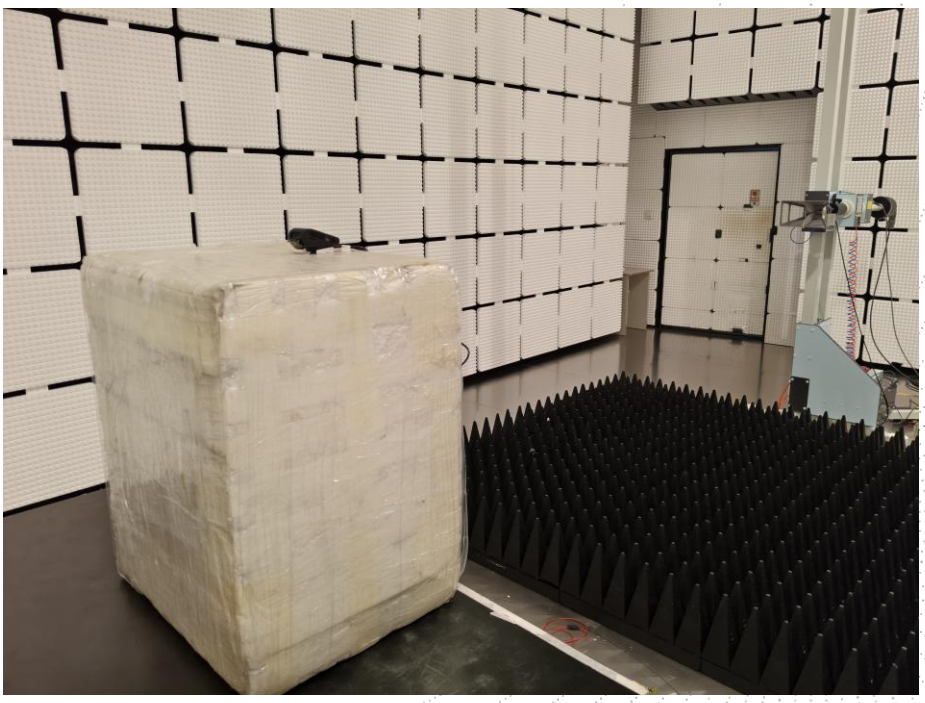
14.2 Test Result

The EUT antenna is Internal antenna, fulfill the requirement of this section.

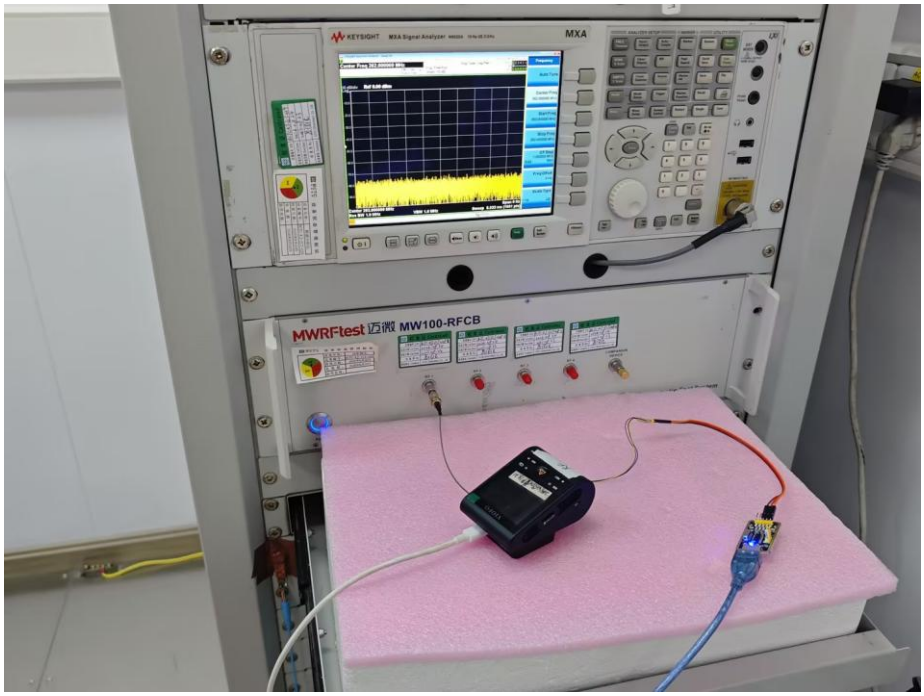
15. EUT Test Setup Photographs

Radiated Measurement Photos





RF Conducted Test



STATEMENT

1. The equipment lists are traceable to the International System of Units (SI)

2. The test report can not be partially copied unless prior written approval is issued from our lab.

3. The test report is invalid without the "special seal for inspection and testing".

4. The test report is invalid without the signature of the approver.

5. The test process and test result is only related to the Unit Under Test.

6. Sample information is provided by the client and the laboratory is not responsible for its authenticity.

7. The quality system of our laboratory is in accordance with ISO/IEC 17025:2017.

8. If there is any objection to this test report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:
Room 101M, Unit 1, Building1, Pengyuan, No.18, Lilang Road, Shanglilang, Nanwan Subdistrict, Longgang District, Shenzhen, Guangdong, China

TEL:400-788-9558

P.C.: 518116

FAX:0755-33229357

Website: http://www.chnbctc.com

Consultation E-mail: bctc@bctc-lab.com.cn

Complaint/Advice E-mail: advice@bctc-lab.com.cn

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