

TEST REPORT

Application No.: SZCR2110023549AT
Applicant: Qorvo International Pte. Ltd.
Address of Applicant: 1 Changi Business Park Avenue 1, # 04-01, Singapore
Manufacturer: Qorvo International Pte. Ltd.
Address of Manufacturer: 1 Changi Business Park Avenue 1, # 04-01, Singapore
Factory: Victory Concept
Address of Factory: Building A, No 18 Shuiyuan Industrial District, Ruhu Town, Huizhou City, 516021, Guangdong

Equipment Under Test (EUT):
EUT Name: UWB Transceiver module
Model No.: DWM3001C
Trade Mark: Qorvo
Standard(s) : EN 300 328 V2.2.2
Date of Receipt: 2021-11-01
Date of Test: 2021-11-11 to 2021-11-19
Date of Issue: 2021-12-02

Test Result:

Pass*

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu

Keny Xu
EMC Laboratory Manager



SGS-CSTC Standards Technical Services Co., Ltd.
Shenzhen Branch EMC Laboratory

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Revision Record				
Version	Chapter	Date	Modifier	Remark
01		2021-12-02		Original

Authorized for issue by:				
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2 Test Summary

Radio Spectrum Technical Requirement				
Item	Standard	Method	Requirement	Result
Geo-location capability	EN 300 328 V2.2.2	N/A	EN 300 328 Clause 4.3.2.12.3	Pass

Radio Spectrum Matter Part				
Item	Standard	Method	Requirement	Result
RF Output Power	EN 300 328 V2.2.2	EN 300 328 Clause 5.4.2.2.1.2	EN 300 328 Clause 4.3.2.2.3	Pass
Power Spectral Density		EN 300 328 Clause 5.4.3.2.1	EN 300 328 Clause 4.3.2.3.3	Pass
Occupied Channel Bandwidth		EN 300 328 Clause 5.4.7.2.1	EN 300 328 Clause 4.3.2.7.3	Pass
Transmitter unwanted emissions in the OOB domain		EN 300 328 Clause 5.4.8.2.1	EN 300 328 Clause 4.3.2.8.3	Pass
Transmitter unwanted emissions in the spurious domain		EN 300 328 Clause 5.4.9.2	EN 300 328 Clause 4.3.2.9.3	Pass
Receiver spurious emissions		EN 300 328 Clause 5.4.10.2	EN 300 328 Clause 4.3.2.10.3	Pass
Receiver Blocking		EN 300 328 Clause 5.4.11.2.1	EN 300 328 Clause 4.3.2.11.4	Pass



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4 General Information

4.1 Details of E.U.T.

Power supply:	For RF Module: DC3.3V from debug board For Debug Board: DC5V from PC USB port
Bluetooth Version:	V5.0 LE
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Channel Spacing:	2MHz
Number of Channels:	40
Antenna Type:	Chip Antenna
Antenna Gain:	0.5dBi

4.2 Environment Parameter

Environment Parameter	Selected Values During Tests	
Relative Humidity	Ambient	
Value	Temperature(°C)	Voltage(V)
NTNV	25	3.3
LTLV	0	2.5
LTHV	0	3.6
HTLV	45	2.5
HTHV	45	3.6

Note:

NV:Normal Voltage LV:Low Extreme Test Voltage HV:High Extreme Test Voltage
NT:Normal Temperature LT:Low Extreme Test Temperature HT:High Extreme Test Temperature

4.3 Description of Support Units

Description	Manufacturer	Model No.	Serial No.
--	--	--	--

The EUT has been tested as an independent unit.

4.4 Measurement Uncertainty

Test Item	Measurement Uncertainty
RF Output Power	± 0.75dB
Power Spectral Density	± 2.84dB
Occupied Channel Bandwidth	± 3%
Transmitter unwanted emissions in the OOB domain	± 0.75dB
Transmitter unwanted emissions in the spurious domain	± 4.5dB (Below 1GHz), ± 4.8dB (Above 1GHz)
Receiver spurious emissions	± 4.5dB (Below 1GHz), ± 4.8dB (Above 1GHz)



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Receiver Blocking	± 3%
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4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI (Member No. 1937)**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

4.7 Deviation from Standards

None

4.8 Abnormalities from Standard Conditions

None



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5 Equipment List

RF Output Power					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR433	SEM001-11	2019-06-13	2022-06-12
EXA Signal Analyzer	KEYSIGHT	N9010A	SEM004-09	2021-04-08	2022-04-07
DC Power Supply	KEYSIGHT	E3642A	SEM011-07	2021-03-23	2022-03-22
Manual Step Attenuator	KEYSIGHT	8494B	SEM021-05	2021-04-08	2022-04-07
Power Sensor	KEYSIGHT	U2021XA	SEM009-13	2021-03-24	2022-03-23
Programmable Temperature&Humidity Chamber	Votsch Industrietechnik GmbH	VT 4002	SEM002-15	2021-03-23	2022-03-22
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.6	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM028-01	2021-07-09	2022-07-08

Power Spectral Density					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR433	SEM001-11	2019-06-13	2022-06-12
EXA Signal Analyzer	KEYSIGHT	N9010A	SEM004-09	2021-04-08	2022-04-07
DC Power Supply	KEYSIGHT	E3642A	SEM011-07	2021-03-23	2022-03-22
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.6	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM028-01	2021-07-09	2022-07-08

Occupied Channel Bandwidth					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR433	SEM001-11	2019-06-13	2022-06-12
EXA Signal Analyzer	KEYSIGHT	N9010A	SEM004-09	2021-04-08	2022-04-07
DC Power Supply	KEYSIGHT	E3642A	SEM011-07	2021-03-23	2022-03-22
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.6	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM028-01	2021-07-09	2022-07-08

Transmitter unwanted emissions in the OOB domain					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR433	SEM001-11	2019-06-13	2022-06-12
EXA Signal Analyzer	KEYSIGHT	N9010A	SEM004-09	2021-04-08	2022-04-07
DC Power Supply	KEYSIGHT	E3642A	SEM011-07	2021-03-23	2022-03-22
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.6	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM028-01	2021-07-09	2022-07-08



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Transmitter unwanted emissions in the spurious domain					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2021-03-26	2024-03-25
EXA Signal Analyzer	Agilent Technologies Inc	N9010A	SEM004-12	2021-02-01	2022-01-31
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2021-04-14	2023-04-13
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2021-09-23	2022-09-22
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2021-07-09	2022-07-08

Receiver spurious emissions					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
3m Semi-Anechoic Chamber	AUDIX	N/A	SEM001-02	2021-03-26	2024-03-25
EXA Signal Analyzer	Agilent Technologies Inc	N9010A	SEM004-12	2021-02-01	2022-01-31
Horn Antenna	Rohde&Schwarz	HF907	SEM003-07	2021-04-14	2023-04-13
Pre-Amplifier	Compliance Directions Systems Inc.	PAP-0126	SEM004-11	2021-09-23	2022-09-22
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM026-01	2021-07-09	2022-07-08

Receiver Blocking					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date
Shielding Room	SAEMC	MSR433	SEM001-11	2019-06-13	2022-06-12
EXA Signal Analyzer	KEYSIGHT	N9010A	SEM004-09	2021-04-08	2022-04-07
Signal Generator	KEYSIGHT	N5171B	SEM006-13	2021-03-24	2022-03-23
DC Power Supply	KEYSIGHT	E3642A	SEM011-07	2021-03-23	2022-03-22
Manual Step Attenuator	KEYSIGHT	8494B	SEM021-05	2021-04-08	2022-04-07
Manual Step Attenuator	KEYSIGHT	8496B	SEM021-06	2021-04-08	2022-04-07
Measurement Software	JS Tonscend	JS1120-2 BT/WIFI V2.6	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM028-01	2021-07-09	2022-07-08

General used equipment					
Equipment	Manufacturer	Model No	Inventory No	Cal Date	Cal Due Date



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Humidity/ Temperature Indicator	Mingle	N/A	SEM002-08	2021-09-14	2022-09-13
Humidity/ Temperature Indicator	Anymetre	TH101B	SEM002-09	2021-09-14	2022-09-13
Barometer	Changchun Meteorological Industry Factory	DYM3	SEM002-01	2021-03-30	2022-03-29



6 Radio Spectrum Technical Requirement

6.1 Geo-location capability

6.1.1 Test Requirement:

EN 300 328 Clause 4.3.2.12.3

Limit:

The geographical location determined by the non-FHSS equipment as defined in clause 4.3.2.12.2 shall not be accessible to the user in a way that would allow the user to alter it.

Definition:

Geo-location capability is a feature of the equipment to determine its geographical location with the purpose to configure itself according to the regulatory requirements applicable at the geographical location where it operates.

The geo-location capability may be present in the equipment or in an external device (temporary) associated with the equipment operating at the same geographical location during the initial power up of the equipment. The geographical location may also be available in equipment already installed and operating at the same geographical location.

6.1.2 Conclusion

The applicant declares:

The product has the geo-location function and the geo-location capability present in the equipment. The geo-location capability operates at the same geographical location during the initial power up of the equipment, and the equipment shall not be accessible to the user.



7 Radio Spectrum Matter Test Results

7.1 RF Output Power

Test Requirement EN 300 328 Clause 4.3.2.2.3
Test Method: EN 300 328 Clause 5.4.2.2.1.2

Limit:

Frequency band(MHz)	Limit
2400-2483.5	20dBm/(100mw) (e.i.r.p)

7.1.1 E.U.T. Operation

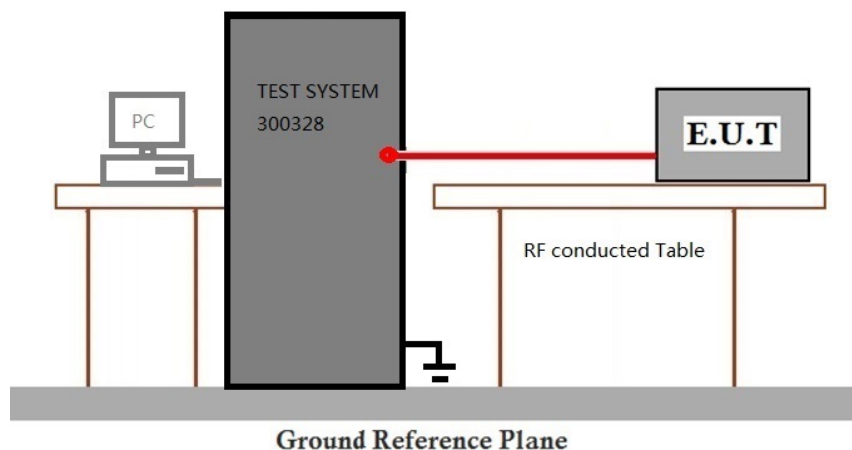
Operating Environment:

Temperature: 25.0 °C Humidity: 54.2 % RH Atmospheric Pressure: 1020 mbar

7.1.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.1.3 Test Setup Diagram



7.1.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.2 Power Spectral Density

Test Requirement EN 300 328 Clause 4.3.2.3.3

Test Method: EN 300 328 Clause 5.4.3.2.1

Limit:

Frequency band(MHz)	Limit
2400-2483.5	≤10dBm per MHz

7.2.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C

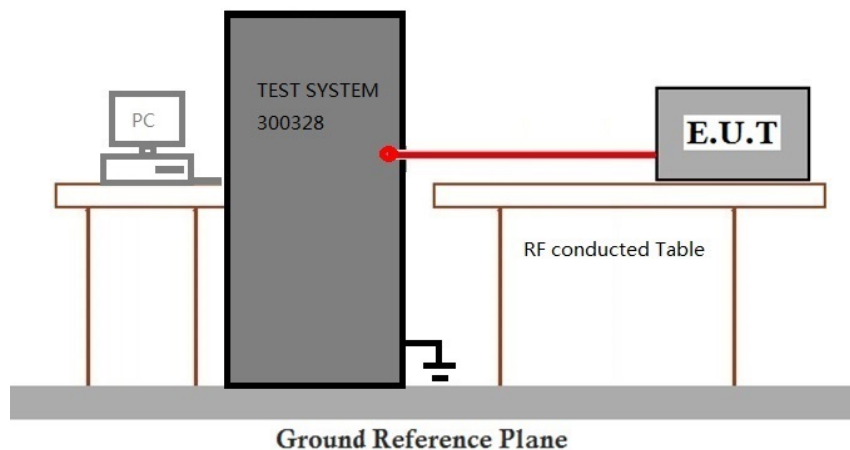
Humidity: 54.2 % RH

Atmospheric Pressure: 1020 mbar

7.2.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.2.3 Test Setup Diagram



7.2.4 Measurement Procedure and Data

Please Refer to Appendix for Details

7.3 Occupied Channel Bandwidth

Test Requirement EN 300 328 Clause 4.3.2.7.3

Test Method: EN 300 328 Clause 5.4.7.2.1

Limit:

The Occupied Channel Bandwidth shall be within the band given in table 1.

In addition, for non-adaptive non-FHSS equipment with e.i.r.p. greater than 10 dBm, the Occupied Channel Bandwidth shall be equal to or less than 20 MHz.

7.3.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C

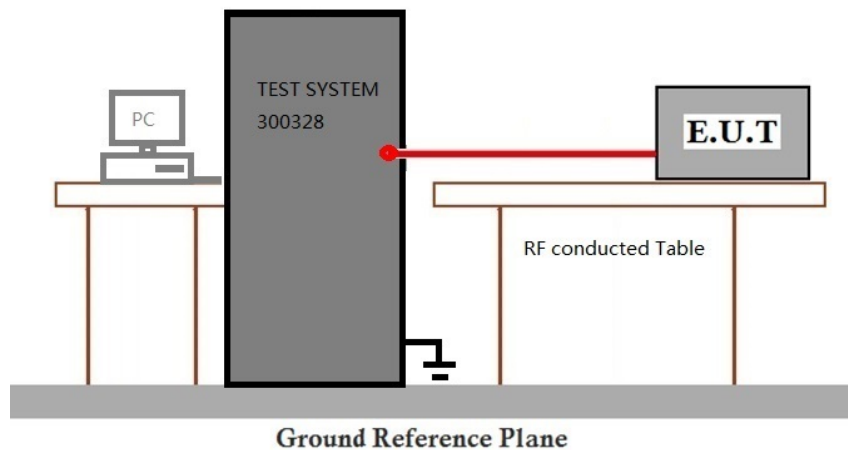
Humidity: 54.2 % RH

Atmospheric Pressure: 1020 mbar

7.3.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation

7.3.3 Test Setup Diagram



7.3.4 Measurement Procedure and Data

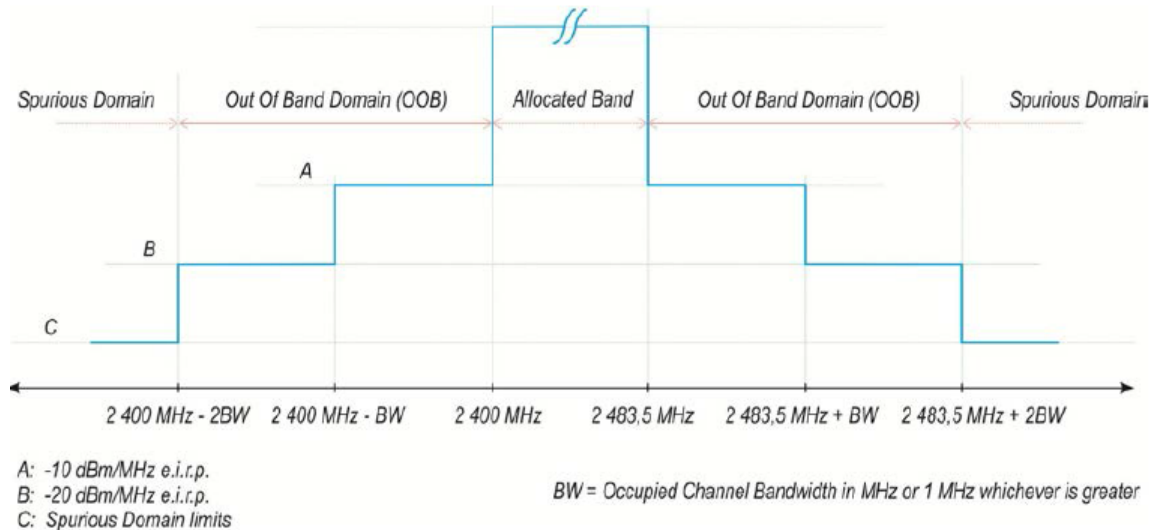
Please Refer to Appendix for Details

7.4 Transmitter unwanted emissions in the OOB domain

Test Requirement EN 300 328 Clause 4.3.2.8.3

Test Method: EN 300 328 Clause 5.4.8.2.1

Limit:



7.4.1 E.U.T. Operation

Operating Environment:

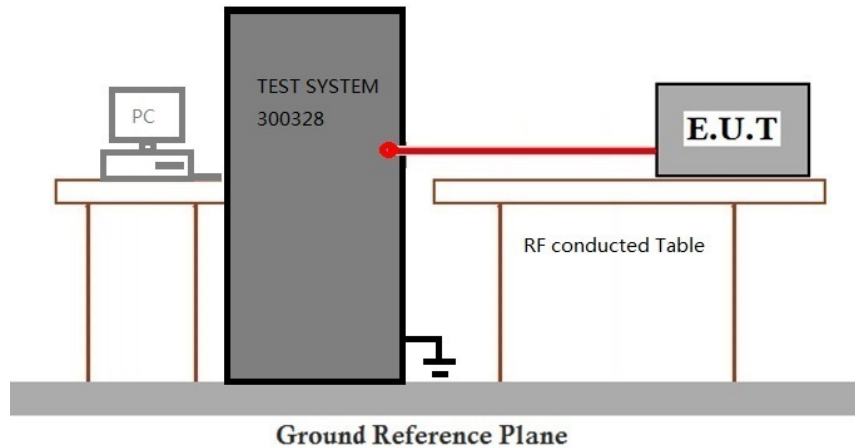
Temperature: 25.0 °C Humidity: 54.2 % RH Atmospheric Pressure: 1020 mbar

7.4.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation



7.4.3 Test Setup Diagram



7.4.4 Measurement Procedure and Data

Please Refer to Appendix for Details



7.5 Transmitter unwanted emissions in the spurious domain

Test Requirement EN 300 328 Clause 4.3.2.9.3

Test Method: EN 300 328 Clause 5.4.9.2

Limit:

Table 1: Transmitter limits for spurious emissions

Frequency range	Maximum power, e.r.p. (≤ 1 GHz) e.i.r.p. (> 1 GHz)	Bandwidth
30 MHz to 47 MHz	-36dBm	100 kHz
47 MHz to 74 MHz	-54dBm	100 kHz
74 MHz to 87,5 MHz	-36dBm	100 kHz
87,5 MHz to 118 MHz	-54dBm	100 kHz
118 MHz to 174 MHz	-36dBm	100 kHz
174 MHz to 230 MHz	-54dBm	100 kHz
230 MHz to 470 MHz	-36dBm	100 kHz
470 MHz to 694 MHz	-54dBm	100 kHz
694 MHz to 1 GHz	-36dBm	100 kHz
1 GHz to 12,75 GHz	-30dBm	1MHz

7.5.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

Humidity: 56.3 % RH

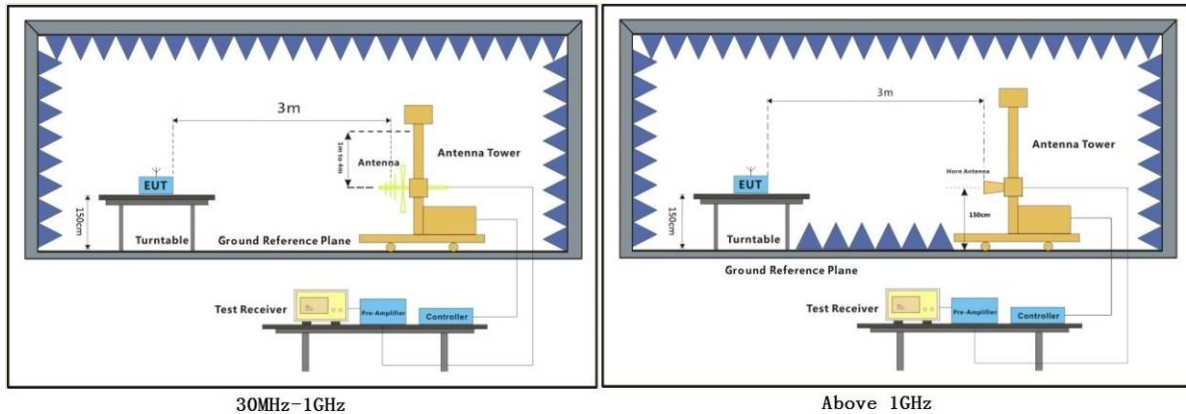
Atmospheric Pressure: 1020 mbar

7.5.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	00	TX mode_Keep the EUT in continuously transmitting mode with GFSK modulation



7.5.3 Test Setup Diagram



7.5.4 Measurement Procedure and Data

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Below 1GHz test procedure as below:

- 1) The EUT was powered on and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) Rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 3) Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 4) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 5) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.
- 6) The output power into the substitution antenna was then measured.
- 7) Steps 5) and 6) were repeated with both antennas vertically polarized.
- 8) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

where:

Pg is the generator output power into the substitution antenna.

Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.
- 2) Calculate power in dBm by the following formula:

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where:

Pg is the generator output power into the substitution antenna.

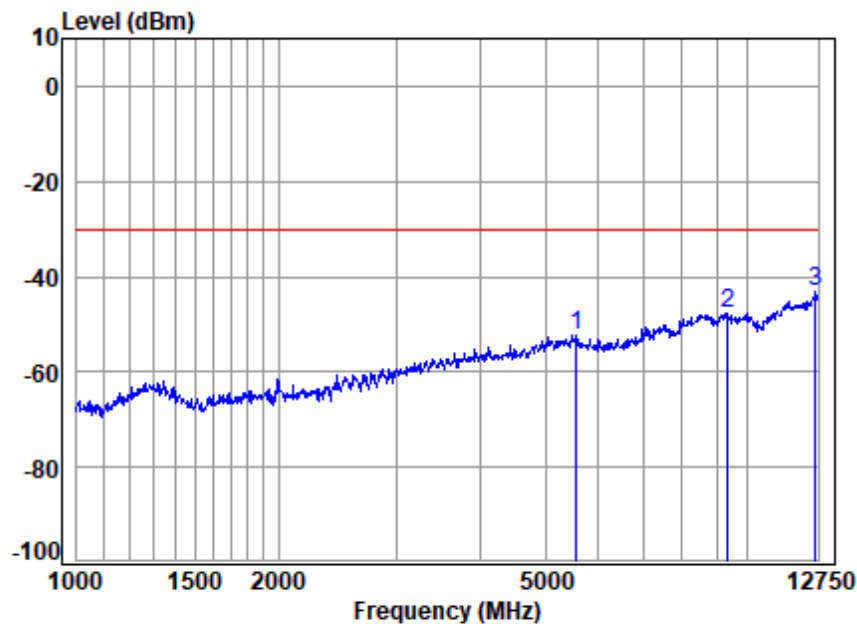
Remark:

The disturbance below 1GHz was very low and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



BLE1M:

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL

Job No: 23549AT

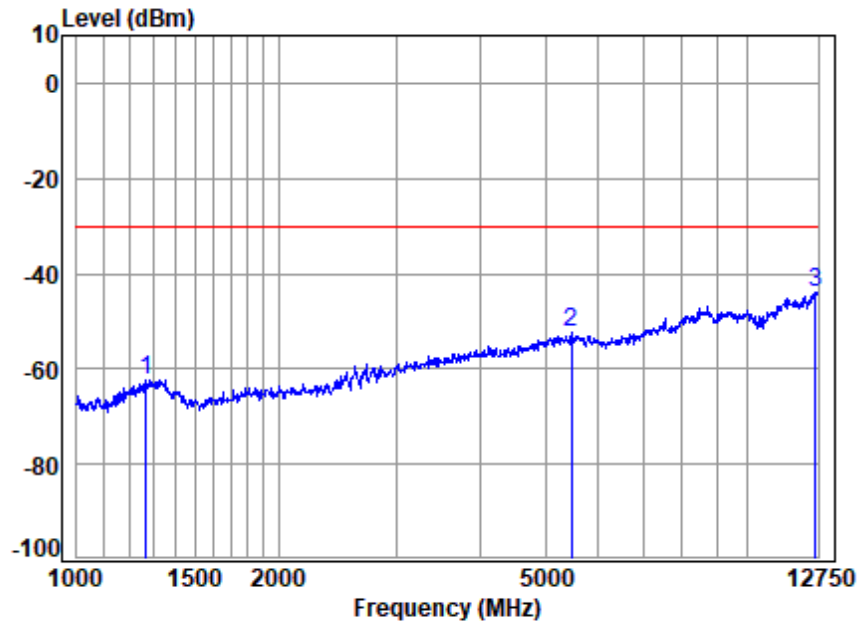
Test mode: 2402 TX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5560.50	-52.15	-30.00	-22.15
2	9346.26	-47.63	-30.00	-17.63
3	12620.84	-43.32	-30.00	-13.32



Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: Low

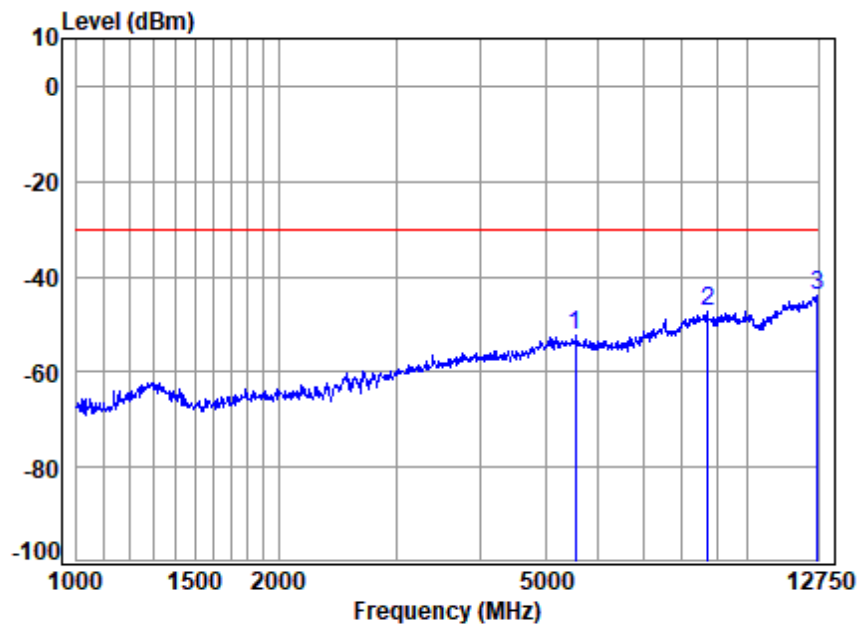


Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2402 TX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1267.10	-62.15	-30.00	-32.15
2	5462.30	-52.37	-30.00	-22.37
3	12653.00	-43.91	-30.00	-13.91



Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL

Job No: 23549AT

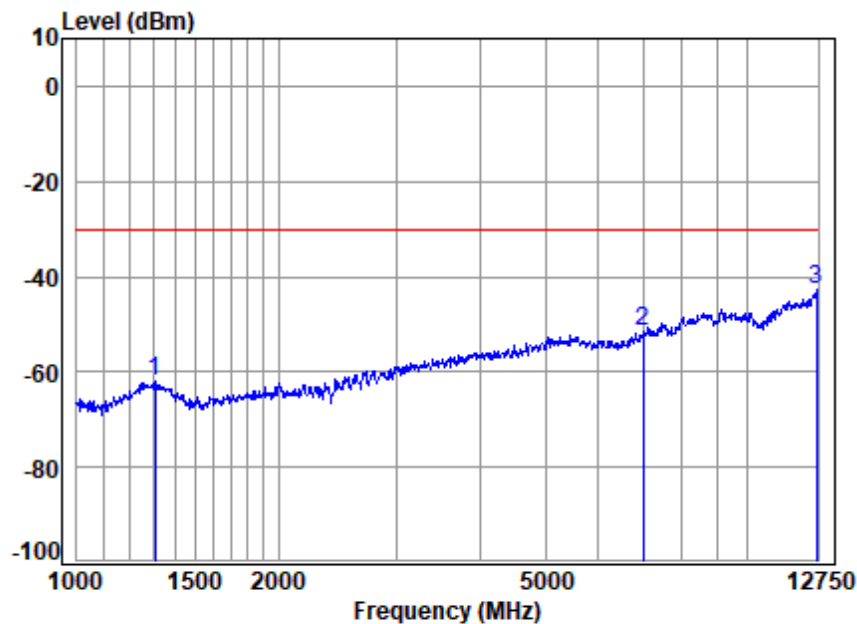
Test mode: 2480 TX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5546.36	-52.22	-30.00	-22.22
2	8725.48	-47.41	-30.00	-17.41
3	12717.59	-43.80	-30.00	-13.80



Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



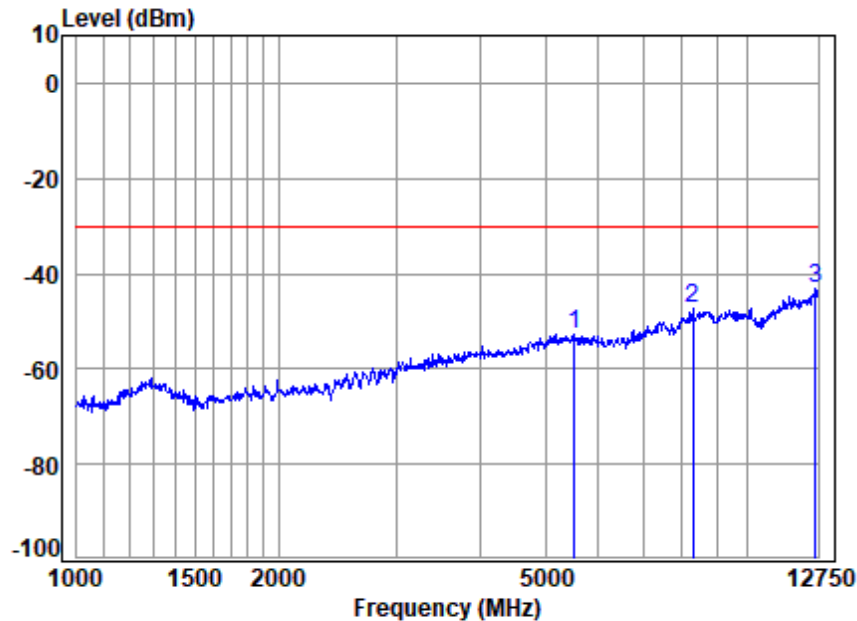
Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2480 TX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1309.74	-61.85	-30.00	-31.85
2	6992.14	-51.42	-30.00	-21.42
3	12685.25	-42.49	-30.00	-12.49



BLE2M

Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL

Job No: 23549AT

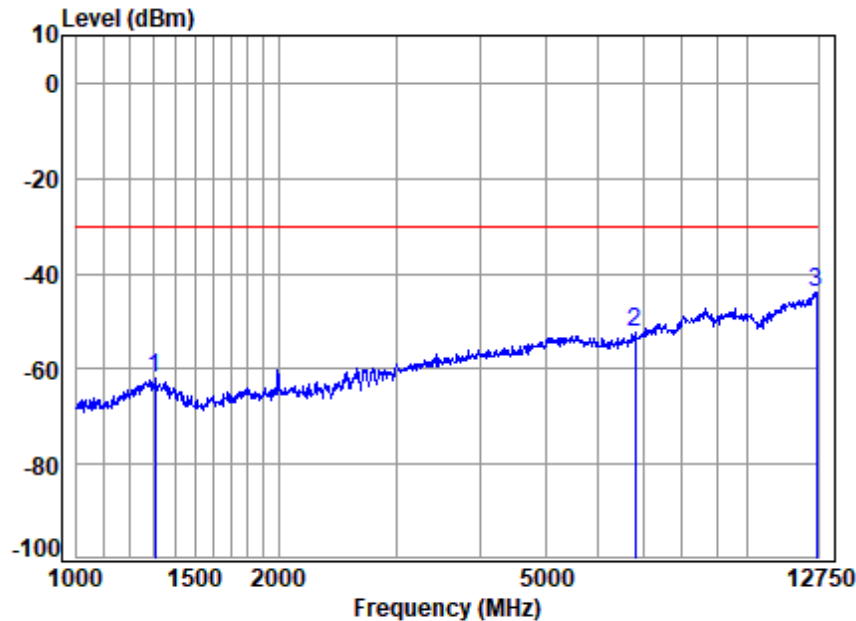
Test mode: 2402 TX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5518.20	-52.60	-30.00	-22.60
2	8292.38	-47.46	-30.00	-17.46
3	12653.00	-43.14	-30.00	-13.14



Test Mode: 00; Polarity: Vertical; Modulation: GFSK; Channel: Low

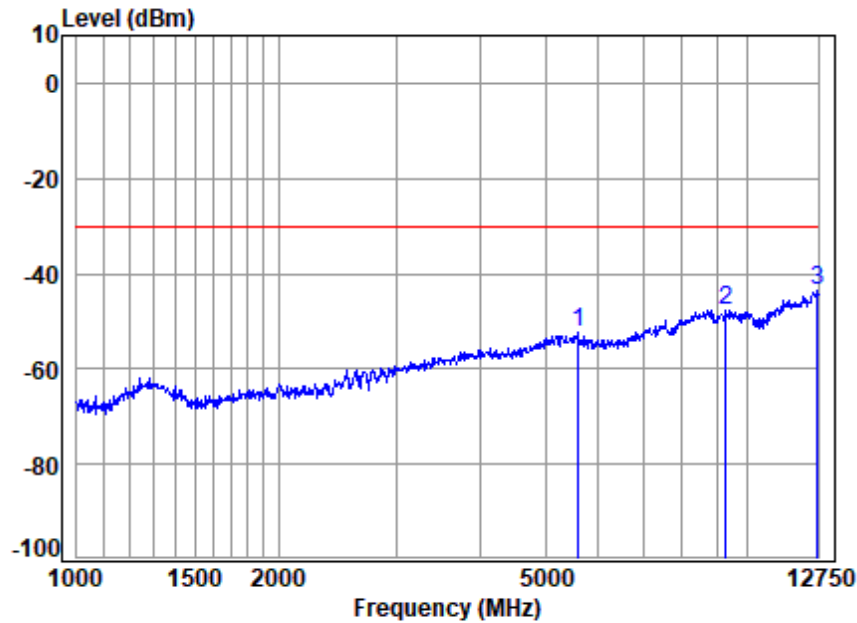


Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2402 TX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1309.74	-62.15	-30.00	-32.15
2	6799.06	-52.17	-30.00	-22.17
3	12685.25	-43.81	-30.00	-13.81



Test Mode: 00; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL

Job No: 23549AT

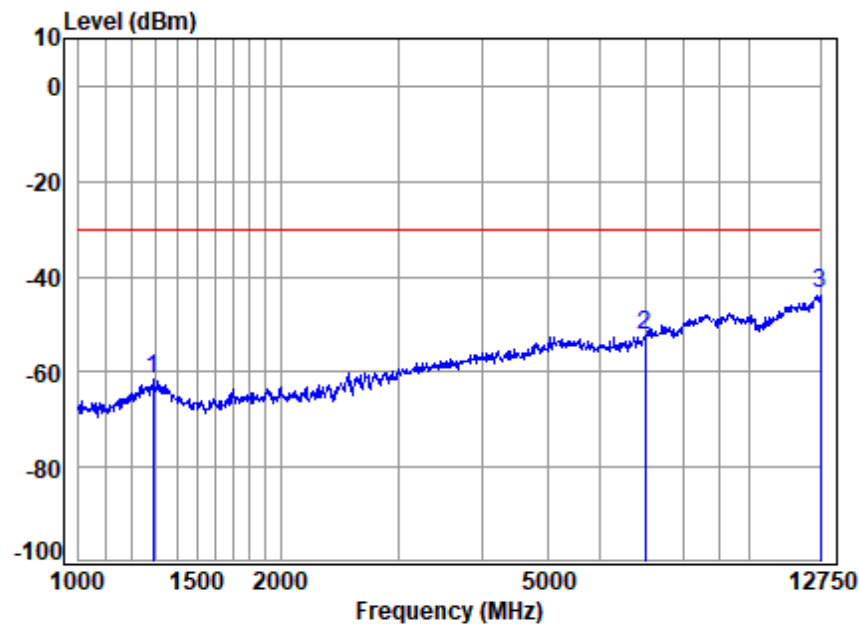
Test mode: 2480 TX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5603.13	-52.51	-30.00	-22.51
2	9275.16	-47.63	-30.00	-17.63
3	12717.59	-43.70	-30.00	-13.70



Test Mode: 00; Polarity: Vertical; Modulation:GFSK; Channel:High



Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2480 TX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1289.89	-61.59	-30.00	-31.59
2	6992.14	-52.47	-30.00	-22.47
3	12750.00	-43.68	-30.00	-13.68



7.6 Receiver spurious emissions

Test Requirement EN 300 328 Clause 4.3.2.10.3

Test Method: EN 300 328 Clause 5.4.10.2

Limit:

The spurious emissions of the receiver shall not exceed the values in tables in the indicated bands:

Frequency Range	Limit
30 MHz to 1 GHz	2nW(-57dBm)
Above 1GHz	20nW(-47dBm)

7.6.1 E.U.T. Operation

Operating Environment:

Temperature: 23.5 °C

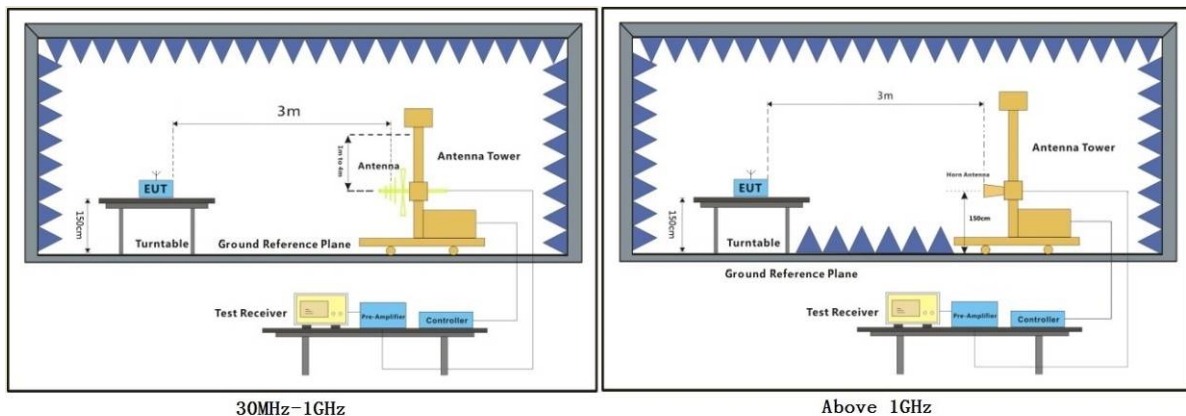
Humidity: 56.3 % RH

Atmospheric Pressure: 1020 mbar

7.6.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	01	RX_Keep the EUT in receiving mode with GFSK modulation.

7.6.3 Test Setup Diagram



7.6.4 Measurement Procedure and Data

1. Scan from 30MHz to 12.75GHz, find the maximum radiation frequency to measure.
2. The technique used to find the Spurious Emissions of the transmitter was the antenna substitution method. Substitution method was performed to determine the actual ERP/EIRP emission levels of the EUT.

Below 1GHz test procedure as below:

- 1) The EUT was powered on and placed on a table in the chamber. The antenna of the transmitter was extended to its maximum length. modulation mode and the measuring receiver shall be tuned to the frequency of the transmitter under test.
- 2) Rotating through 360° the turntable. After the fundamental emission was maximized, a field strength measurement was made.
- 3) Steps 1) and 2) were performed with the EUT and the receive antenna in both vertical and horizontal polarization.
- 4) The transmitter was then removed and replaced with another antenna. The center of the antenna was approximately at the same location as the center of the transmitter.
- 5) A signal at the disturbance was fed to the substitution antenna by means of a non-radiating cable. With both the substitution and the receive antennas horizontally polarized, the receive antenna was raised and lowered to obtain a maximum reading at the test receiver. The level of the signal generator was adjusted until the measured field strength level in step 2) is obtained for this set of conditions.
- 6) The output power into the substitution antenna was then measured.
- 7) Steps 5) and 6) were repeated with both antennas vertically polarized.
- 8) Calculate power in dBm by the following formula:

$$\text{ERP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

where:

Pg is the generator output power into the substitution antenna.

Above 1GHz test procedure as below:

- 1) Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber.
- 2) Calculate power in dBm by the following formula:

$$\text{EIRP(dBm)} = \text{Pg(dBm)} - \text{cable loss (dB)} + \text{antenna gain (dBi)}$$

$$\text{EIRP} = \text{ERP} + 2.15\text{dB}$$

where:

Pg is the generator output power into the substitution antenna.

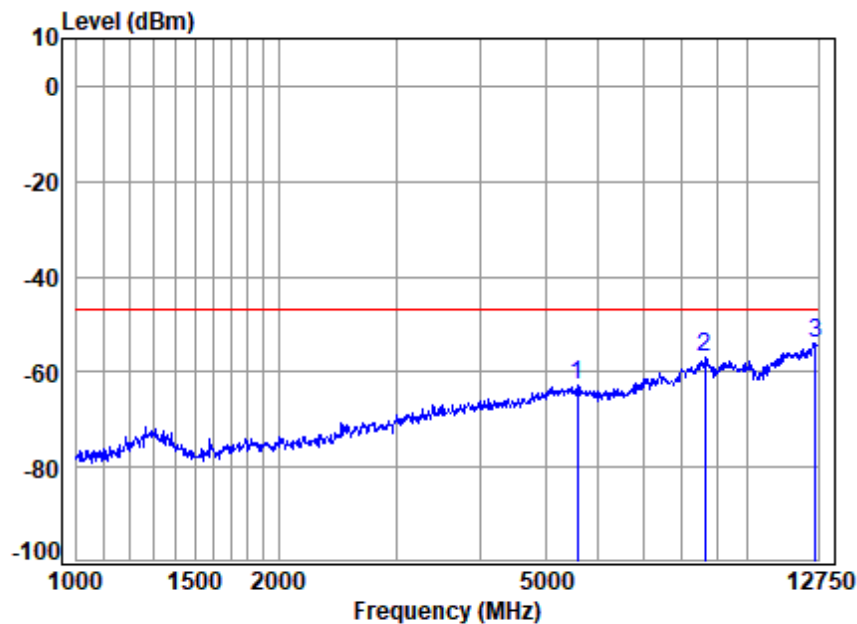
Remark:

The disturbance below 1GHz was very low and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.



BLE1M

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL

Job No: 23549AT

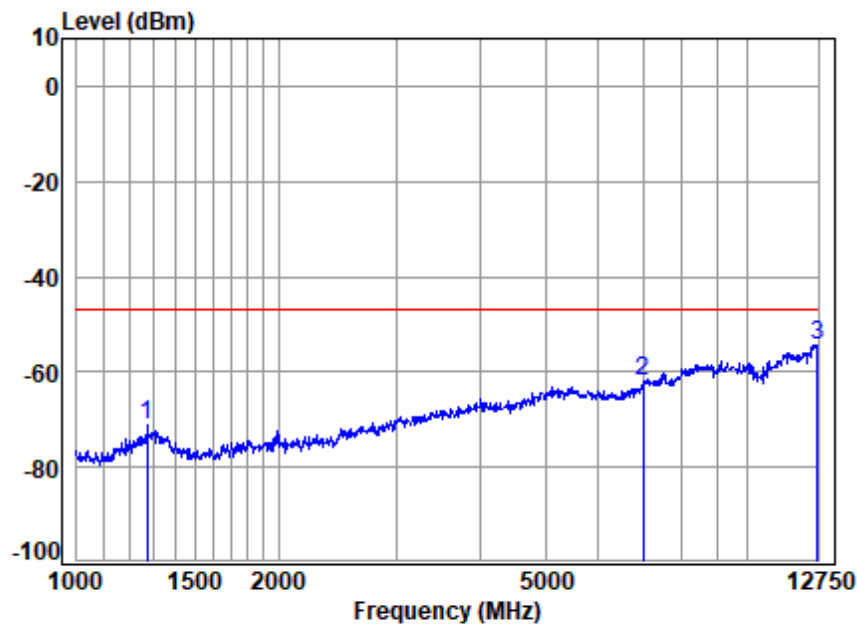
Test mode: 2402 RX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5574.67	-62.75	-47.00	-15.75
2	8637.08	-56.99	-47.00	-9.99
3	12653.00	-53.86	-47.00	-6.86



Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low

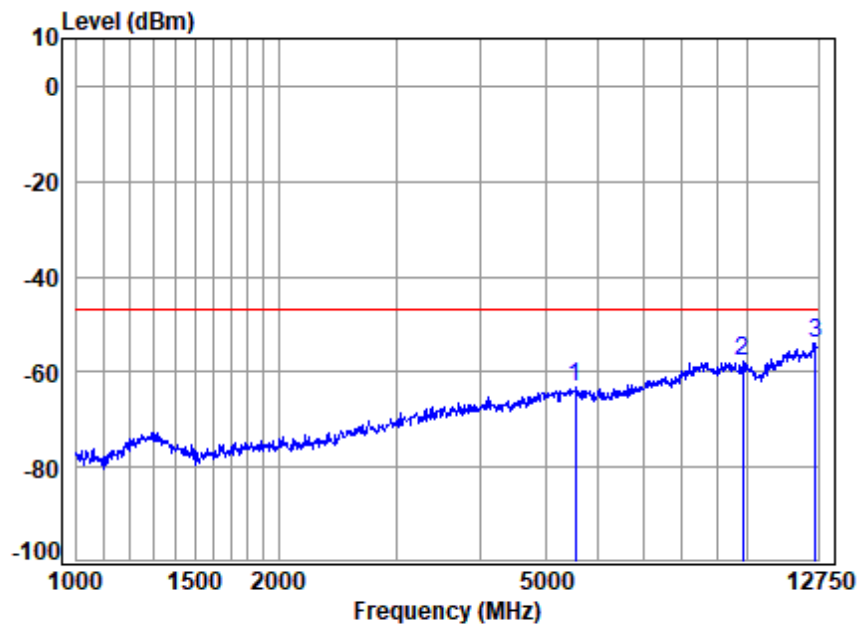


Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2402 RX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1273.57	-71.34	-47.00	-24.34
2	6992.14	-62.03	-47.00	-15.03
3	12717.59	-54.22	-47.00	-7.22



Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL

Job No: 23549AT

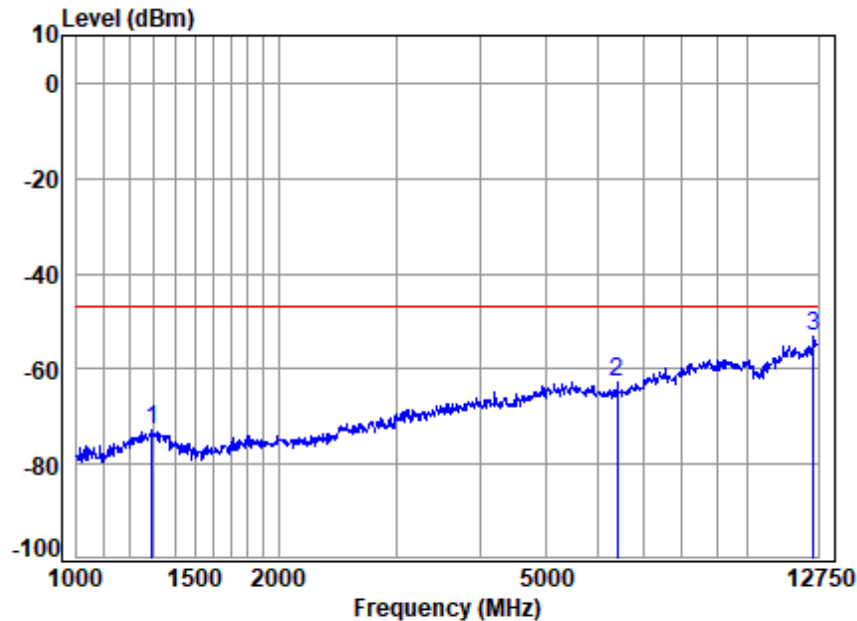
Test mode: 2480 RX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5546.36	-63.18	-47.00	-16.18
2	9834.41	-57.86	-47.00	-10.86
3	12620.84	-53.86	-47.00	-6.86



Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



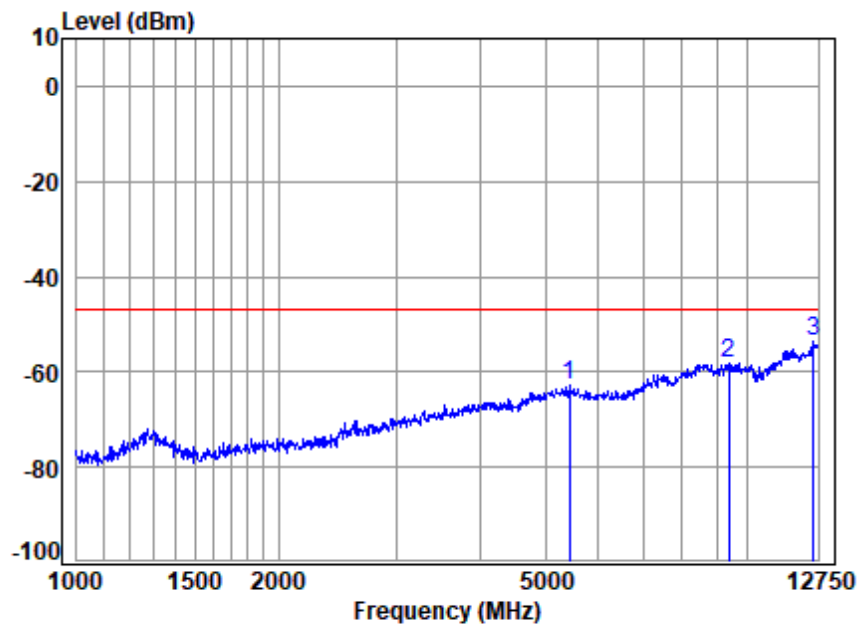
Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2480 RX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1296.47	-72.85	-47.00	-25.85
2	6396.13	-62.91	-47.00	-15.91
3	12556.75	-53.20	-47.00	-6.20



BLE2M

Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:Low



Condition: 3m HORIZONTAL

Job No: 23549AT

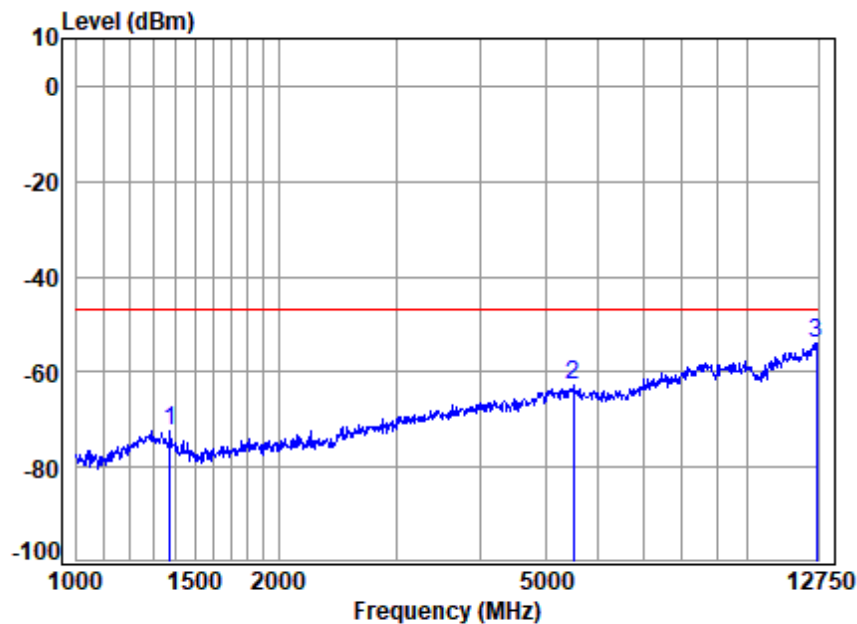
Test mode: 2402 RX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5420.74	-62.80	-47.00	-15.80
2	9370.08	-58.19	-47.00	-11.19
3	12556.75	-53.69	-47.00	-6.69



Test Mode: 01; Polarity: Vertical; Modulation: GFSK; Channel: Low

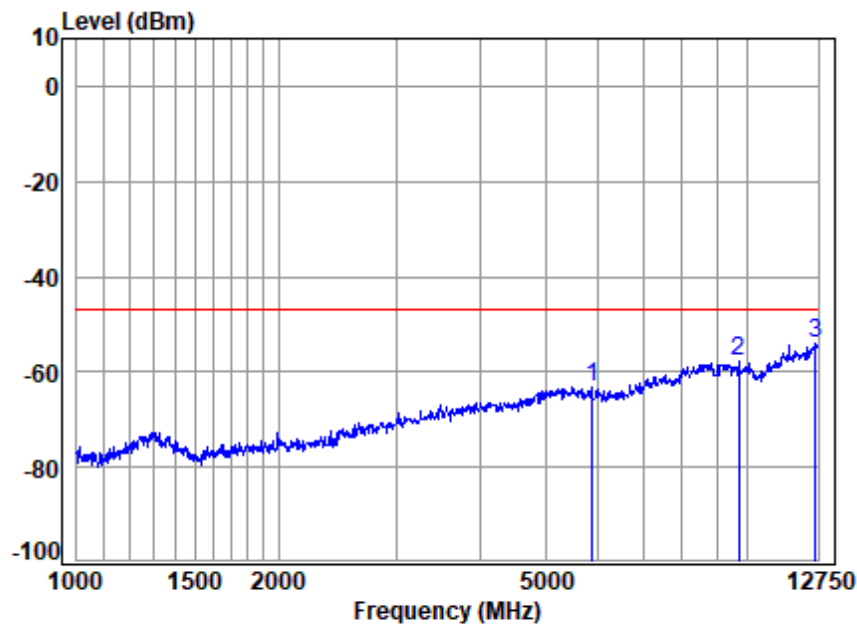


Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2402 RX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1378.14	-72.43	-47.00	-25.43
2	5504.17	-62.90	-47.00	-15.90
3	12685.25	-53.92	-47.00	-6.92



Test Mode: 01; Polarity: Horizontal; Modulation:GFSK; Channel:High



Condition: 3m HORIZONTAL

Job No: 23549AT

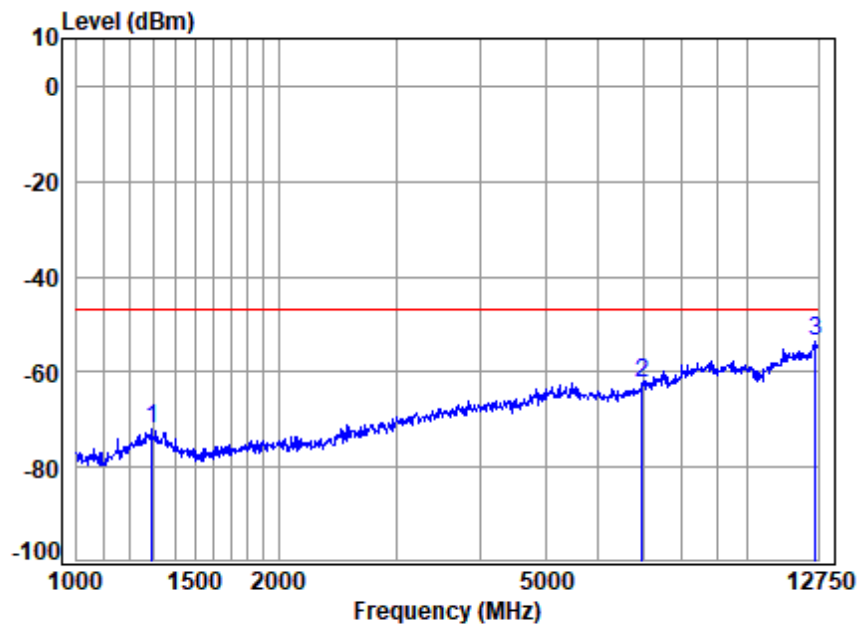
Test mode: 2480 RX RSE

Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	5865.83	-63.12	-47.00	-16.12
2	9710.03	-57.81	-47.00	-10.81
3	12653.00	-54.20	-47.00	-7.20



Test Mode: 01; Polarity: Vertical; Modulation:GFSK; Channel:High



Condition: 3m VERTICAL
Job No: 23549AT
Test mode: 2480 RX RSE
Note: BLE

Marker	Freq. MHz	Level dBm	Limit dBm	Over Limit dB
1	1293.17	-71.92	-47.00	-24.92
2	6974.36	-62.26	-47.00	-15.26
3	12653.00	-53.72	-47.00	-6.72



7.7 Receiver Blocking

Test Requirement EN 300 328 Clause 4.3.2.11.4

Test Method: EN 300 328 Clause 5.4.11.2.1

Limit:

For equipment that supports a PER or FER test to be performed, the minimum performance criterion shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER test to be performed, the minimum performance criterion shall be no loss of the wireless transmission function needed for the intended use of the equipment.

The blocking levels at specified frequency offsets shall be equal to or greater than the limits defined for the applicable receiver category provided below table.

Receiver Blocking parameters for Receiver Category 1 equipment			
Wanted signal mean power from companion device (dBm) (see notes 1 and 4)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 4)	Type of blocking signal
(-133 dBm + 10 × log10(OCBW)) or -68 dBm whichever is less (see note 2)	2380 2504	-34	CW
(-139 dBm + 10 × log10(OCBW)) or -74 dBm whichever is less (see note 3)	2 300 2 330 2 360 2 524 2 584 2 674		

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 26 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to Pmin + 20 dB where Pmin is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 4: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Blocking parameters for Receiver Category 2 equipment



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Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log ₁₀ (OCBW) + 10 dB) or (-74 dBm + 10 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 26 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

Receiver Blocking parameters for Receiver Category 3 equipment

Wanted signal mean power from companion device (dBm) (see notes 1 and 3)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	Type of blocking signal
(-139 dBm + 10 × log ₁₀ (OCBW) + 20 dB) or (-74 dBm + 20 dB) whichever is less (see note 2)	2 380 2 504 2 300 2 584	-34	CW

NOTE 1: OCBW is in Hz.

NOTE 2: In case of radiated measurements using a companion device and the level of the wanted signal from the companion device cannot be determined, a relative test may be performed using a wanted signal up to P_{min} + 30 dB where P_{min} is the minimum level of wanted signal required to meet the minimum performance criteria as defined in clause 4.3.1.12.3 in the absence of any blocking signal.

NOTE 3: The level specified is the level at the UUT receiver input assuming a 0 dBi antenna assembly gain. In case of conducted measurements, this level has to be corrected for the (in-band) antenna assembly gain (G). In case of radiated measurements, this level is equivalent to a power flux density (PFD) in front of the UUT antenna with the UUT being configured/positioned as recorded in clause 5.4.3.2.2.

7.7.1 E.U.T. Operation

Operating Environment:

Temperature: 25.0 °C

Humidity: 54.2 % RH

Atmospheric Pressure: 1020 mbar



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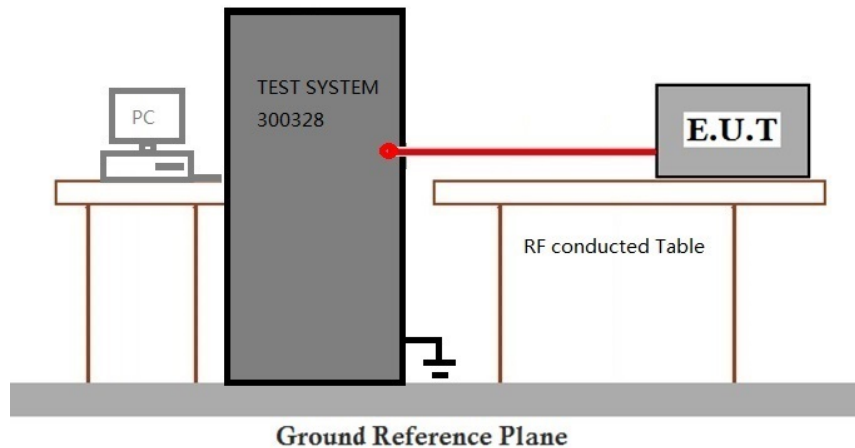
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Shenzhen Branch, EMC Laboratory

No.1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, China 518057 t (86-755) 26012053 f (86-755) 26710594 www.sgsgroup.com.cn
中国·深圳·科技园中区M-10栋一号厂房 邮编: 518057 t (86-755) 26012053 f (86-755) 26710594 sgs.china@sgs.com

7.7.2 Test Mode Description

Pre-scan / Final test	Mode Code	Description
Final test	02	Normal operating_Keep the EUT communication with the companion device.

7.7.3 Test Setup Diagram



7.7.4 Measurement Procedure and Data

Please Refer to Appendix for Details



8 Test Setup Photo

Transmitter unwanted emissions in the spurious domain



Receiver spurious emissions



9 EUT Constructional Details (EUT Photos)

Refer to Appendix - Photographs of EUT Constructional Details for SZCR2110023549AT



10 Appendix

1. RF Output Power, Duty Cycle, Tx-sequence, Tx-gap, Medium Utilization

1.1 Power

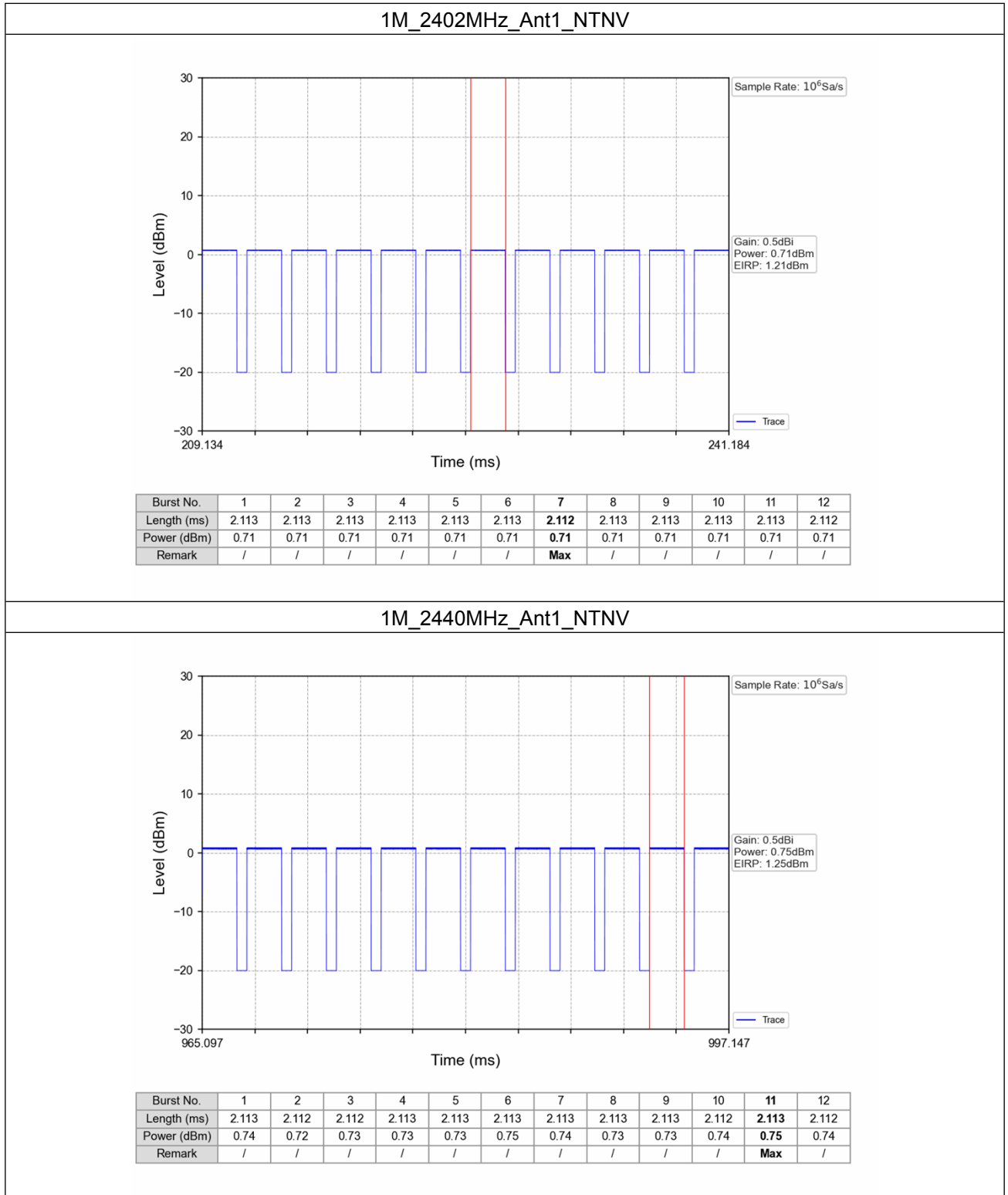
1.1.1 Test Result

ENV	Mode	TX Type	Frequency (MHz)	Ant	Gain (dBi)	Power (dBm)	EIRP (dBm)	Limit (dBm)	Verdict
NTNV	1M	SISO	2402	1	0.50	0.71	1.21	<=20	Pass
			2440	1	0.50	0.75	1.25	<=20	Pass
			2480	1	0.50	0.57	1.07	<=20	Pass
	2M	SISO	2402	1	0.50	0.71	1.21	<=20	Pass
			2440	1	0.50	0.74	1.24	<=20	Pass
			2480	1	0.50	0.56	1.06	<=20	Pass
HTNV	1M	SISO	2402	1	0.50	0.71	1.21	<=20	Pass
			2440	1	0.50	0.75	1.25	<=20	Pass
			2480	1	0.50	0.57	1.07	<=20	Pass
	2M	SISO	2402	1	0.50	0.71	1.21	<=20	Pass
			2440	1	0.50	0.74	1.24	<=20	Pass
			2480	1	0.50	0.56	1.06	<=20	Pass
LTVN	1M	SISO	2402	1	0.50	0.71	1.21	<=20	Pass
			2440	1	0.50	0.75	1.25	<=20	Pass
			2480	1	0.50	0.57	1.07	<=20	Pass
	2M	SISO	2402	1	0.50	0.71	1.21	<=20	Pass
			2440	1	0.50	0.74	1.24	<=20	Pass
			2480	1	0.50	0.57	1.07	<=20	Pass

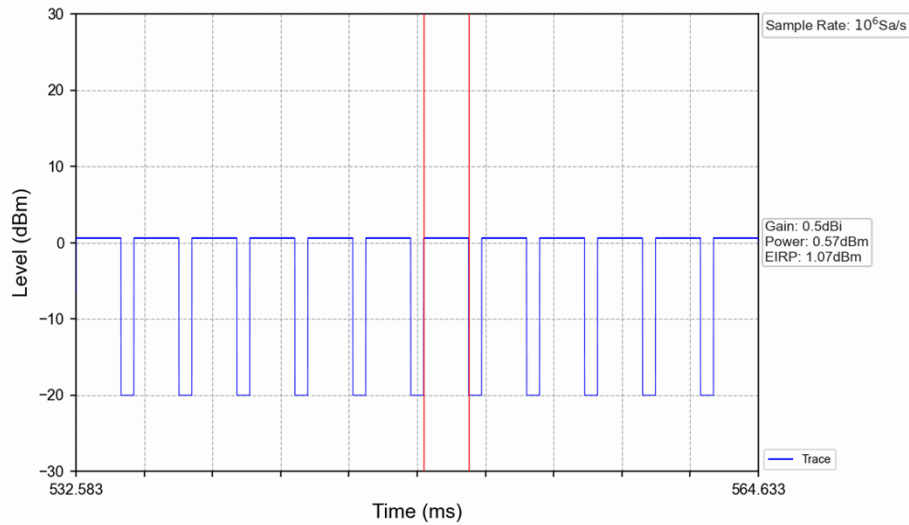
Note1: E.I.R.P = Measured Power + Antenna Gain



1.1.2 Test Graph

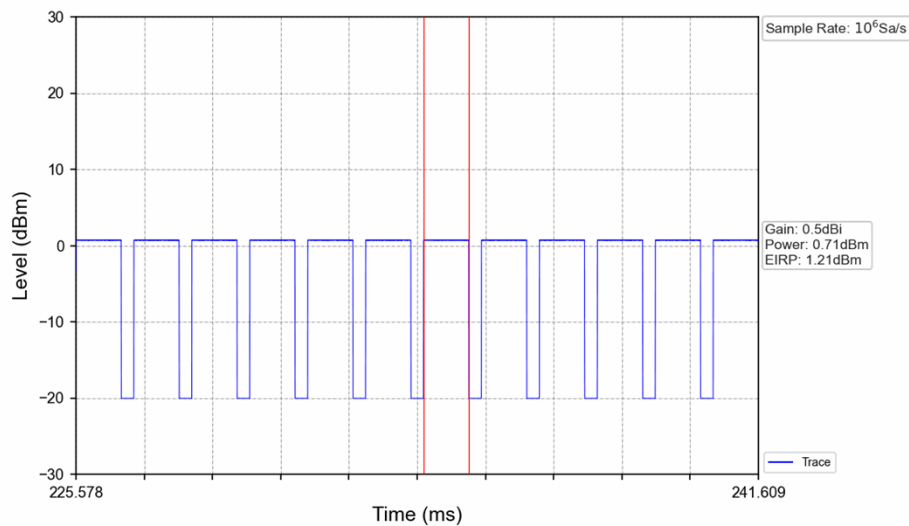


1M_2480MHz_Ant1_NTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.113	2.112	2.113	2.113	2.113	2.113	2.112	2.113	2.112	2.113	2.113	2.113
Power (dBm)	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.56	0.57	0.57	0.57	0.57
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

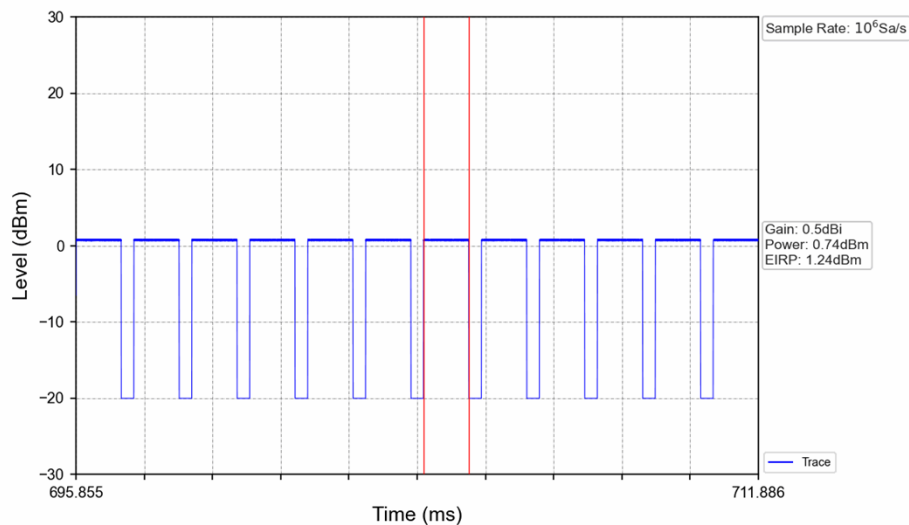
2M_2402MHz_Ant1_NTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.063	1.063	1.063	1.062	1.063	1.062	1.063	1.063	1.063	1.062	1.063
Power (dBm)	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.70	0.71	0.71	0.71
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

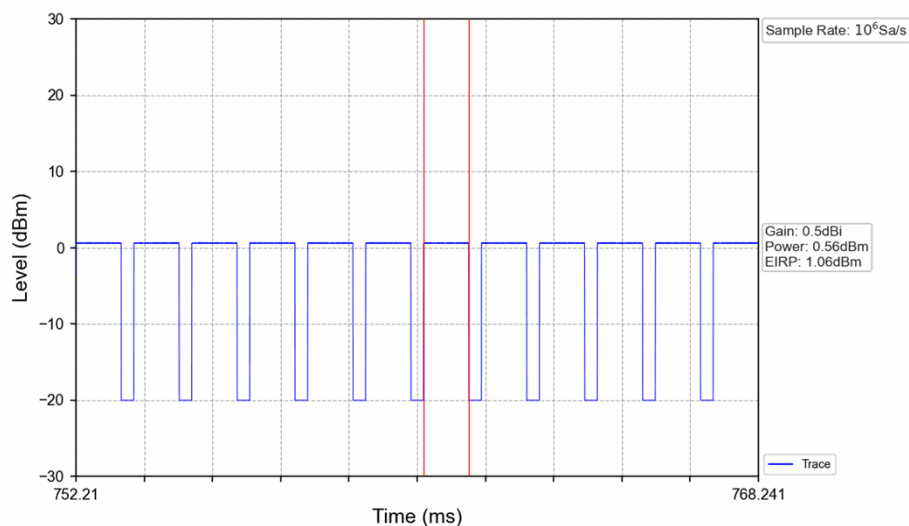


2M_2440MHz_Ant1_NTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.063	1.062	1.063	1.063	1.063	1.062	1.063	1.063	1.063	1.063	1.062
Power (dBm)	0.73	0.73	0.73	0.73	0.73	0.73	0.74	0.73	0.72	0.73	0.72	0.74
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

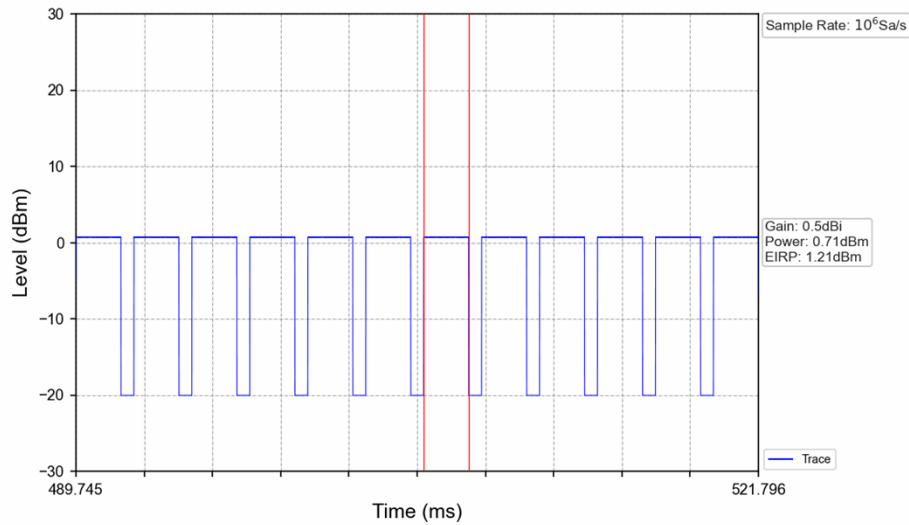
2M_2480MHz_Ant1_NTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.063	1.063	1.063	1.063	1.063	1.062	1.063	1.063	1.063	1.063	1.063
Power (dBm)	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

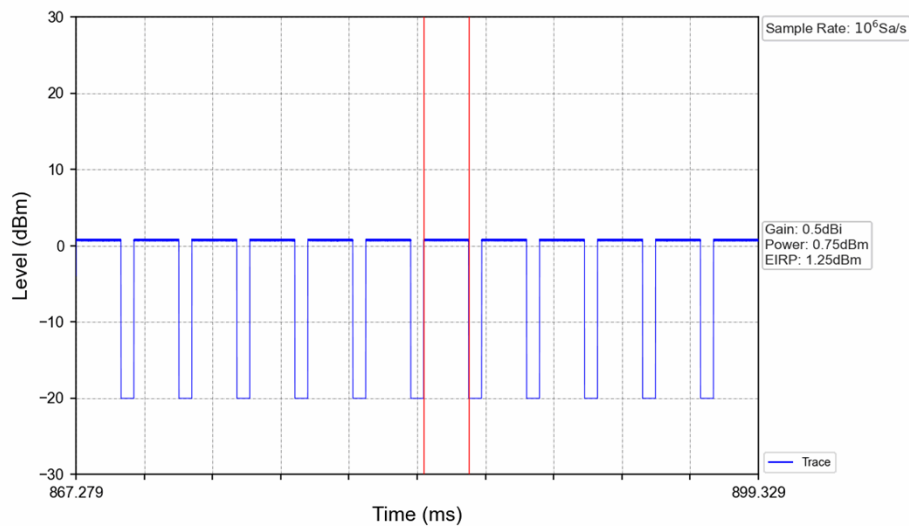


1M_2402MHz_Ant1_HTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.113	2.113	2.112	2.113	2.112	2.113	2.112	2.113	2.112	2.113	2.113	2.114
Power (dBm)	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

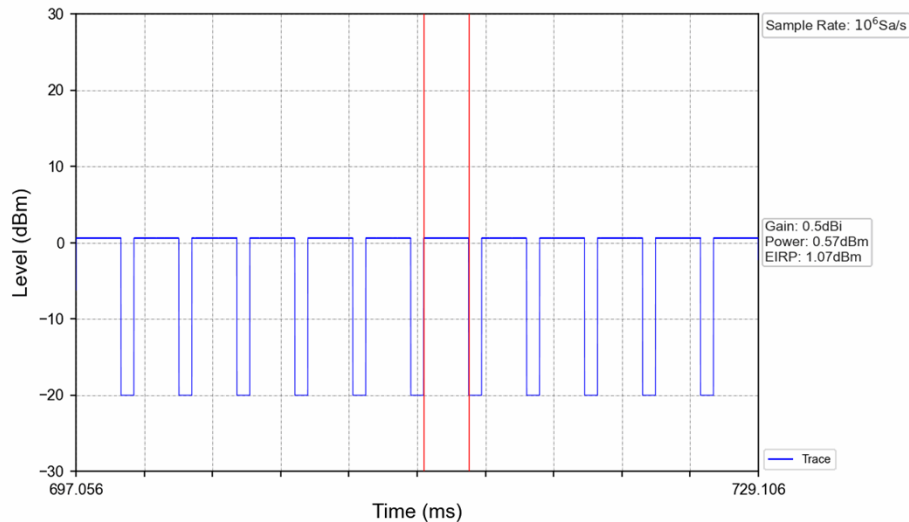
1M_2440MHz_Ant1_HTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.113	2.113	2.113	2.112	2.113	2.112	2.113	2.113	2.112	2.113	2.113	2.113
Power (dBm)	0.72	0.73	0.73	0.73	0.72	0.74	0.75	0.74	0.73	0.73	0.73	0.73
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

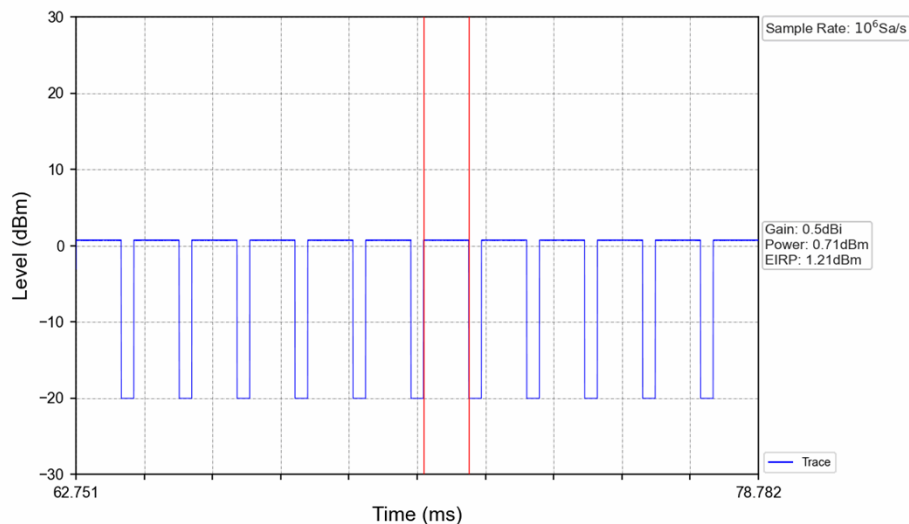


1M_2480MHz_Ant1_HTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.113	2.113	2.113	2.113	2.113	2.113	2.112	2.113	2.112	2.113	2.112	2.113
Power (dBm)	0.56	0.56	0.57	0.56	0.56	0.56	0.57	0.56	0.57	0.56	0.57	0.56
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

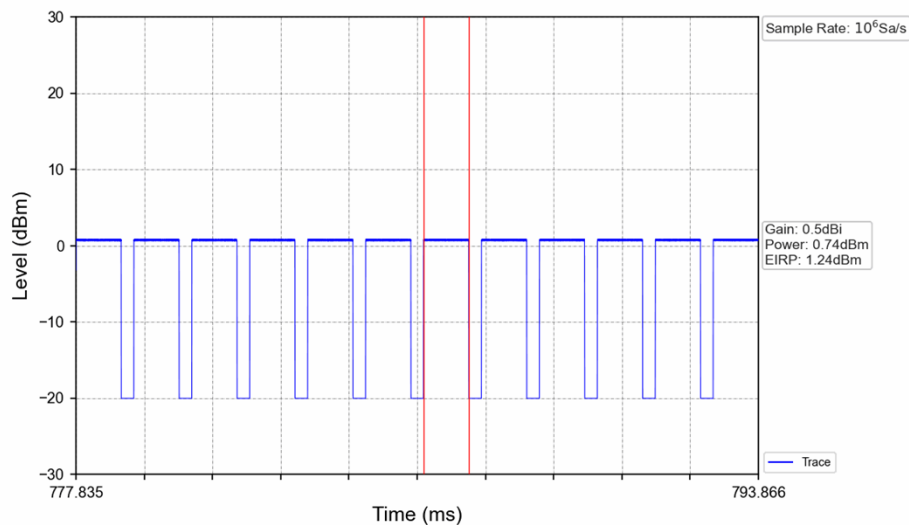
2M_2402MHz_Ant1_HTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.064	1.063	1.063	1.063	1.063	1.062	1.063	1.062	1.063	1.062	1.063
Power (dBm)	0.70	0.70	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

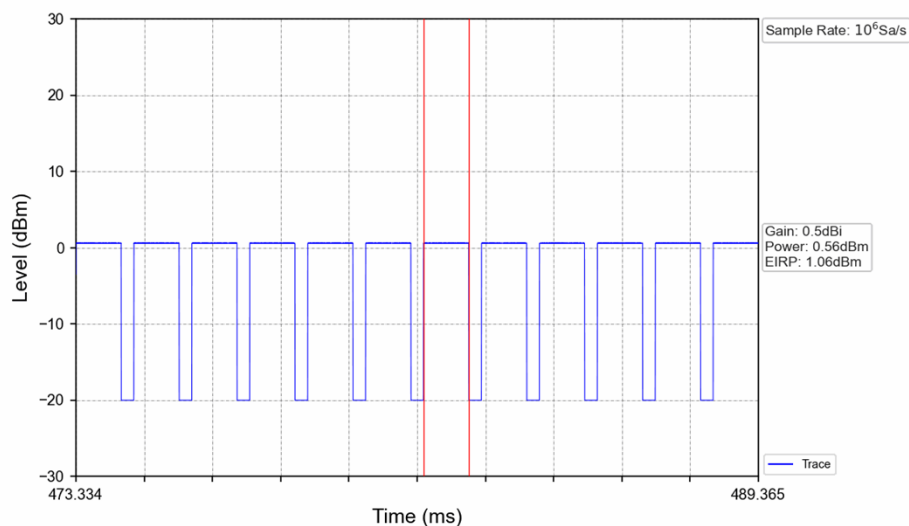


2M_2440MHz_Ant1_HTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.062	1.063	1.063	1.063	1.063	1.063	1.063	1.063	1.063	1.063	1.063
Power (dBm)	0.72	0.73	0.71	0.71	0.71	0.71	0.74	0.73	0.73	0.73	0.74	0.74
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

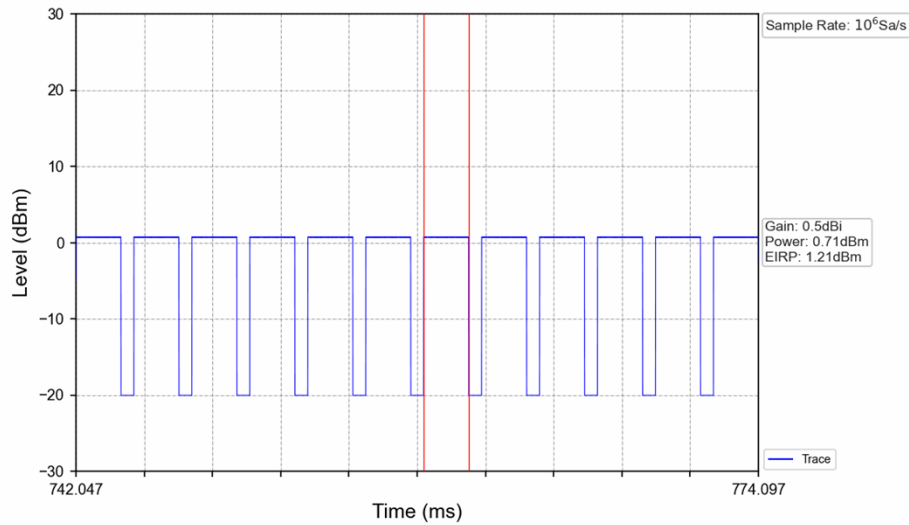
2M_2480MHz_Ant1_HTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.063	1.062	1.063	1.063	1.063	1.062	1.063	1.063	1.063	1.063	1.063
Power (dBm)	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

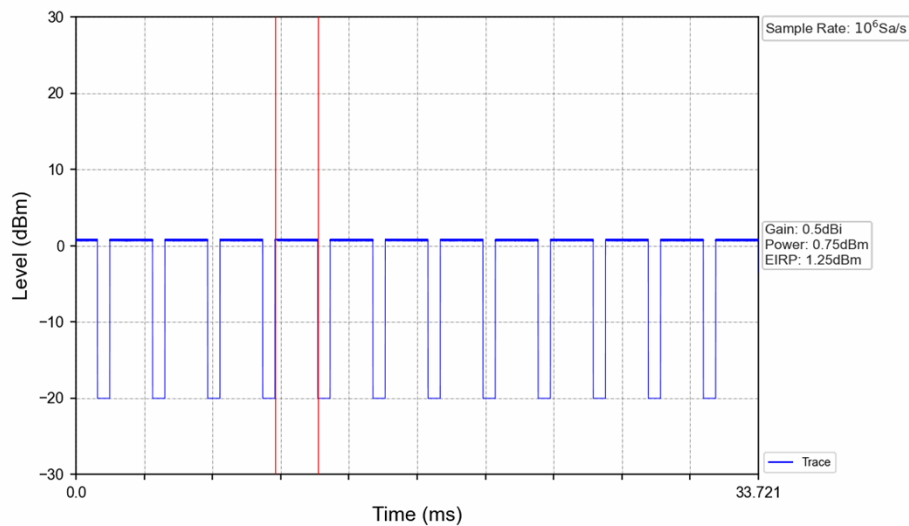


1M_2402MHz_Ant1_LTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.113	2.114	2.113	2.113	2.112	2.113	2.112	2.113	2.112	2.113	2.113	2.113
Power (dBm)	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

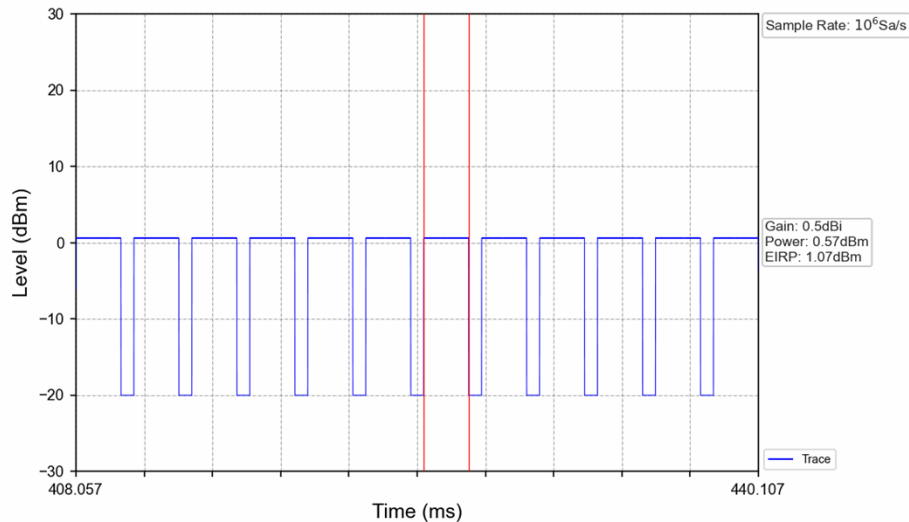
1M_2440MHz_Ant1_LTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.112	2.113	2.113	2.113	2.113	2.113	2.112	2.113	2.112	2.113	2.112	2.113
Power (dBm)	0.75	0.74	0.74	0.75	0.74	0.74	0.75	0.74	0.75	0.74	0.74	0.74
Remark	/	/	/	Max	/	/	/	/	/	/	/	/

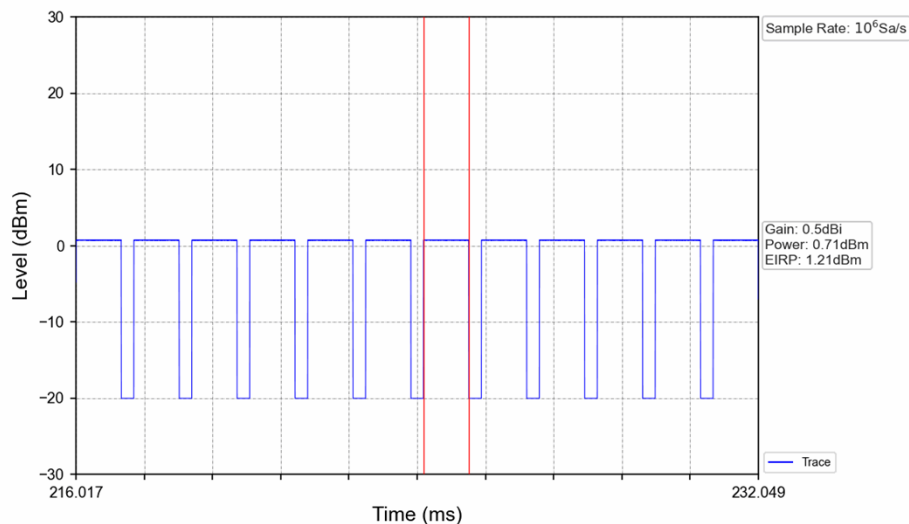


1M_2480MHz_Ant1_LTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	2.113	2.113	2.113	2.113	2.113	2.113	2.112	2.113	2.112	2.113	2.112	2.113
Power (dBm)	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.56	0.57	0.56	0.57	0.56
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

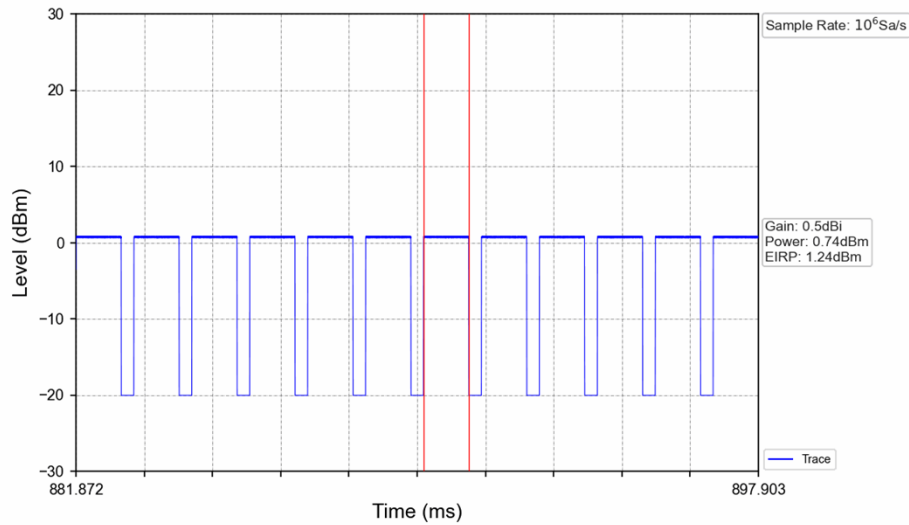
2M_2402MHz_Ant1_LTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.063	1.063	1.063	1.063	1.063	1.062	1.063	1.063	1.063	1.063	1.063
Power (dBm)	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

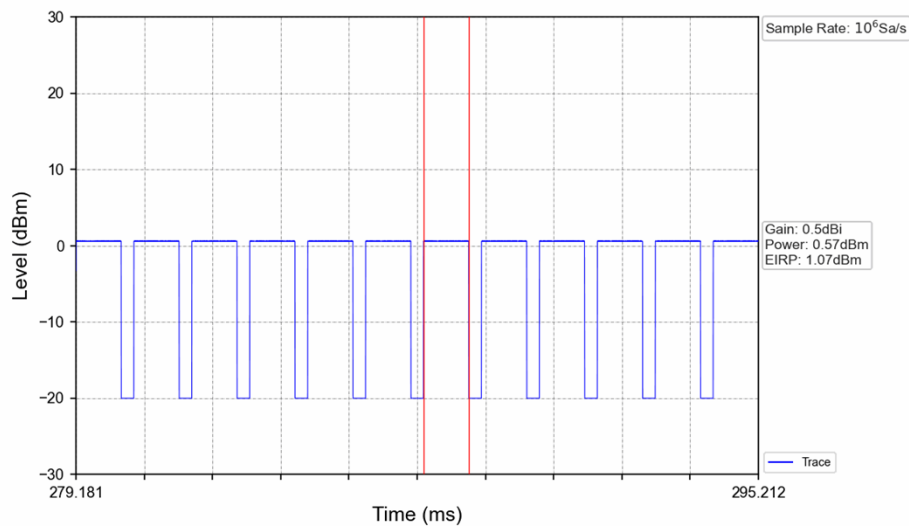


2M_2440MHz_Ant1_LTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.062	1.063	1.063	1.063	1.063	1.062	1.063	1.063	1.063	1.062	1.063
Power (dBm)	0.73	0.74	0.74	0.73	0.74	0.73	0.74	0.72	0.72	0.73	0.73	0.72
Remark	/	/	/	/	/	/	Max	/	/	/	/	/

2M_2480MHz_Ant1_LTNV



Burst No.	1	2	3	4	5	6	7	8	9	10	11	12
Length (ms)	1.063	1.063	1.063	1.063	1.063	1.063	1.062	1.063	1.063	1.063	1.063	1.063
Power (dBm)	0.56	0.56	0.56	0.56	0.56	0.56	0.57	0.56	0.56	0.56	0.56	0.56
Remark	/	/	/	/	/	/	Max	/	/	/	/	/



2. Power Spectral Density

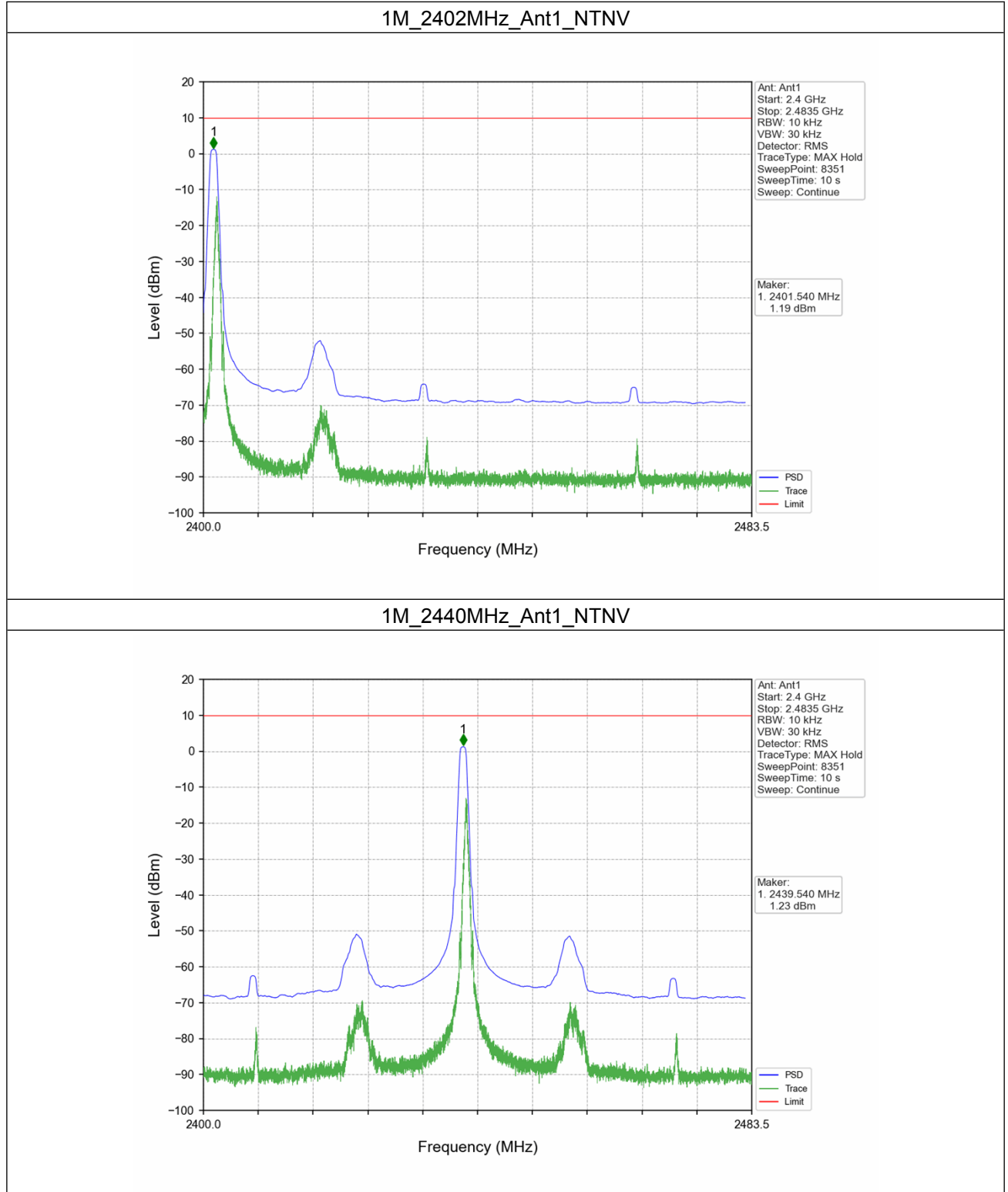
2.1 PSD

2.1.1 Test Result

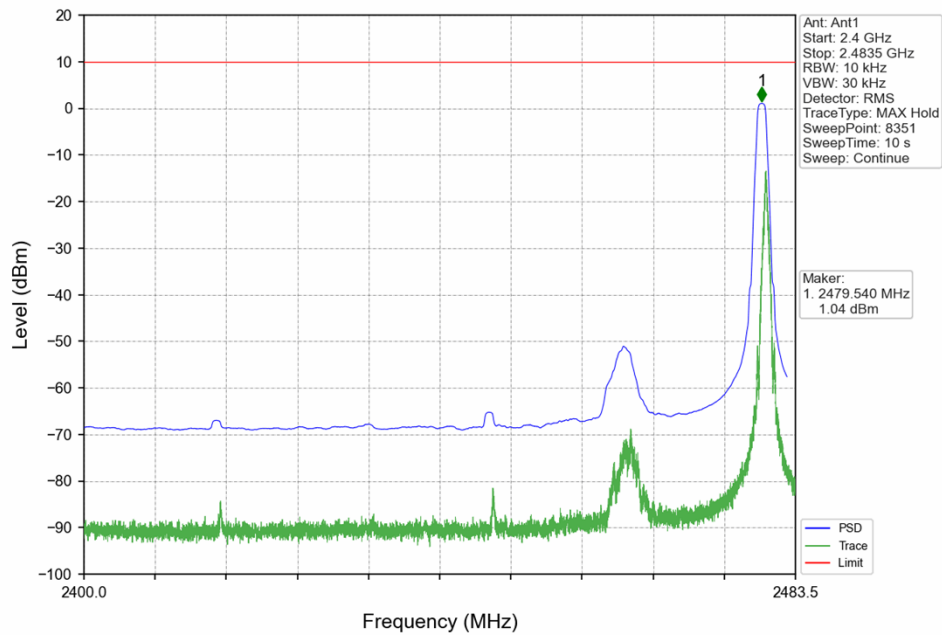
ENV	Mode	TX Type	Frequency (MHz)	Ant	E.I.R.PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
NTNV	1M	SISO	2402	1	1.19	<=10	Pass
			2440	1	1.23	<=10	Pass
			2480	1	1.04	<=10	Pass
	2M	SISO	2402	1	0.87	<=10	Pass
			2440	1	0.87	<=10	Pass
			2480	1	0.71	<=10	Pass



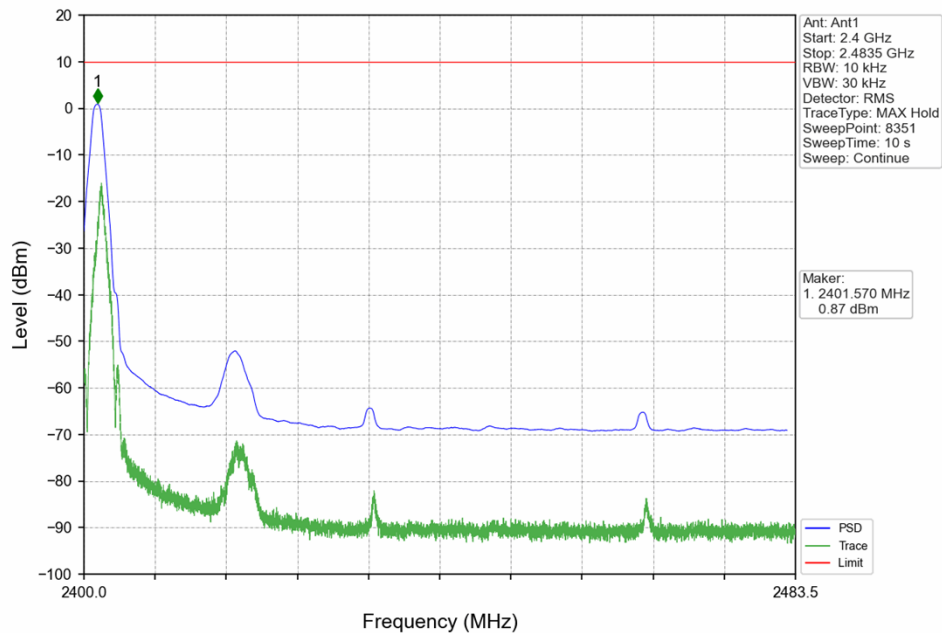
2.1.2 Test Graph



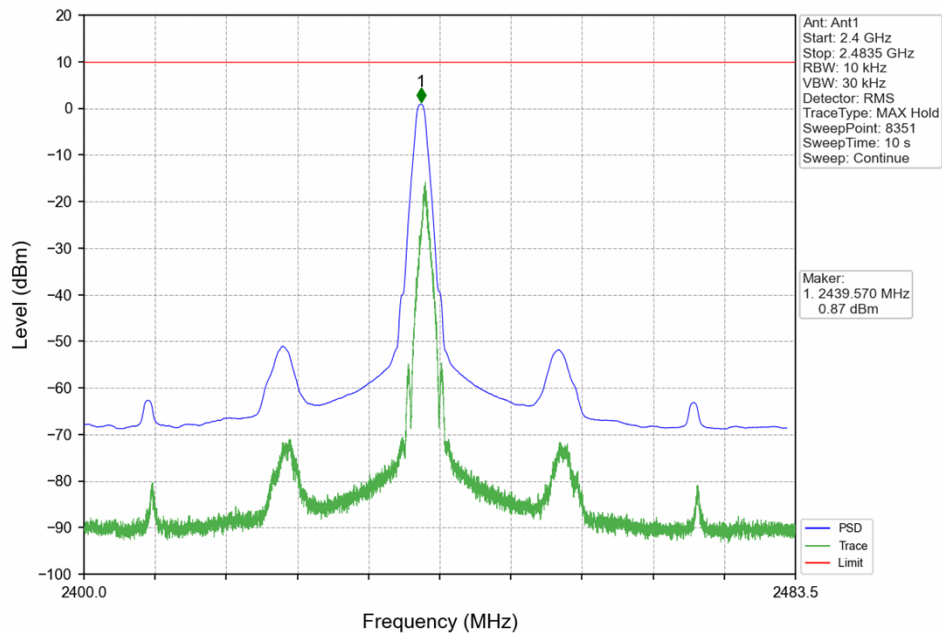
1M_2480MHz_Ant1_NTNV



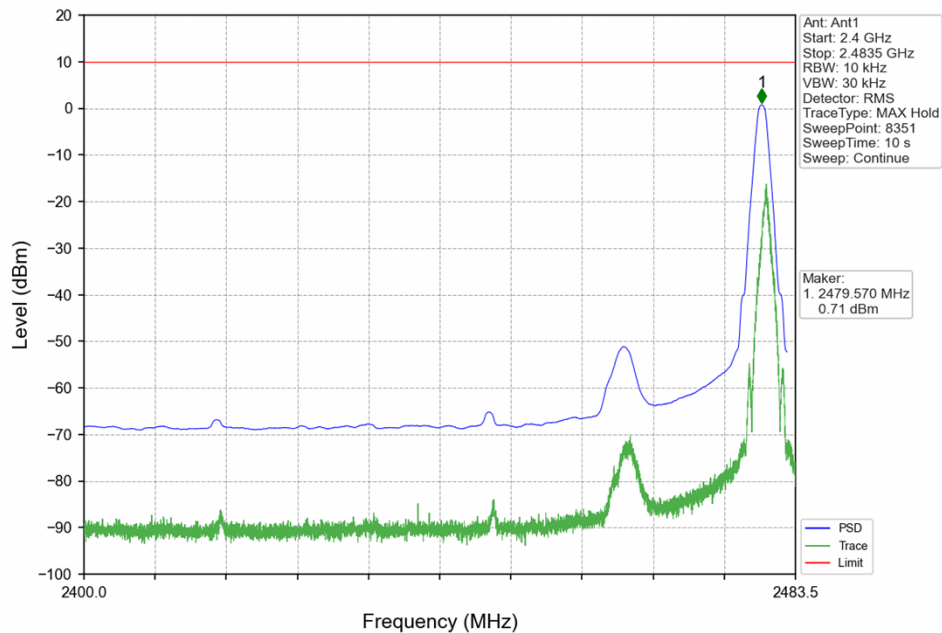
2M_2402MHz_Ant1_NTNV



2M_2440MHz_Ant1_NTNV



2M_2480MHz_Ant1_NTNV



3. Occupied Channel Bandwidth

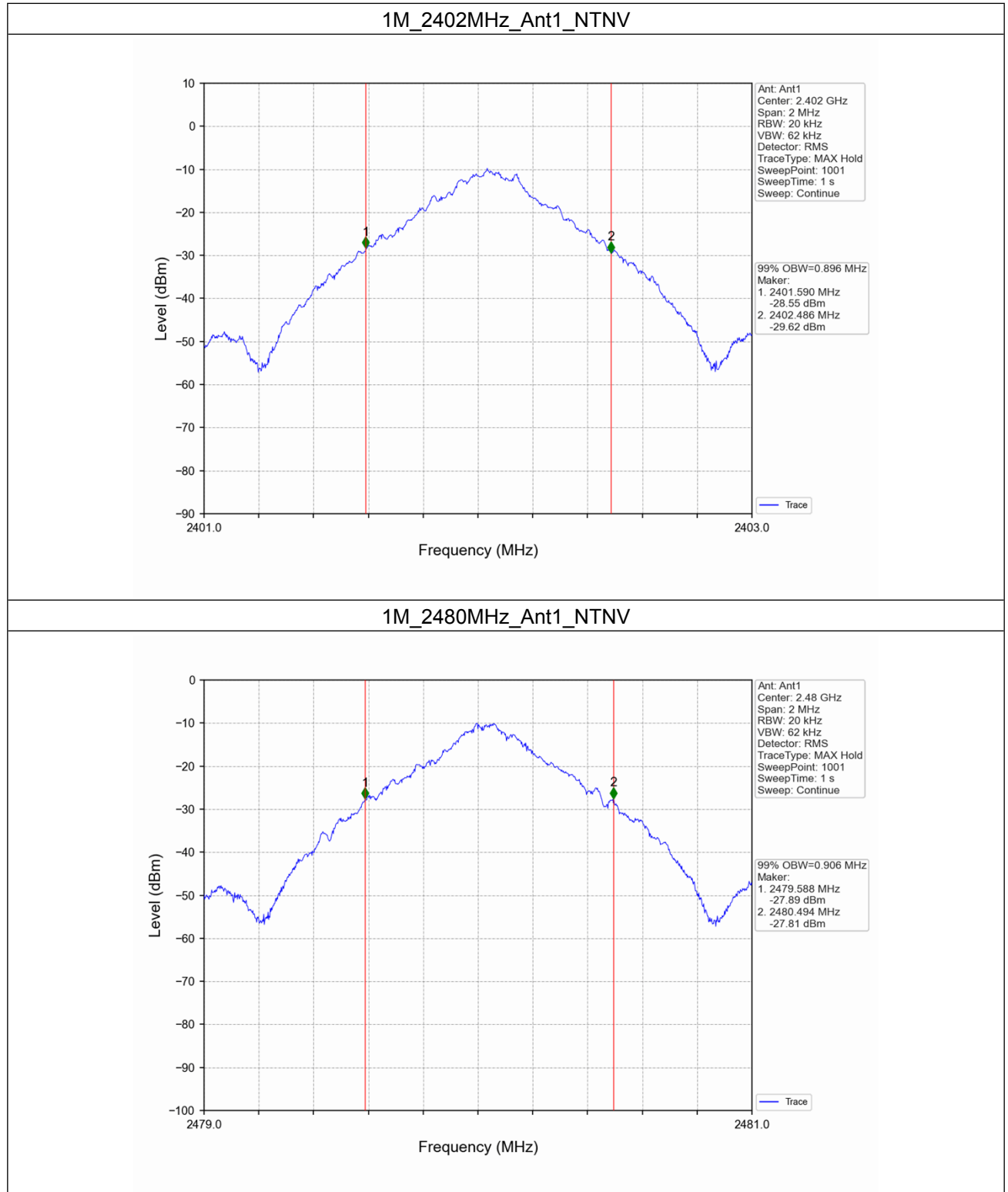
3.1 OBW_Ant1

3.1.1 Test Result

Ant1								
ENV	Mode	TX Type	Frequency (MHz)	OBW (MHz)	Frequency Range (MHz)			Verdict
				Result	FL	FH	Limit	
NTNV	1M	SISO	2402	0.896	2401.590	/	>=2400	Pass
			2480	0.906	/	2480.494	<=2483.5	Pass
	2M	SISO	2402	1.766	2401.154	/	>=2400	Pass
			2480	1.768	/	2480.926	<=2483.5	Pass



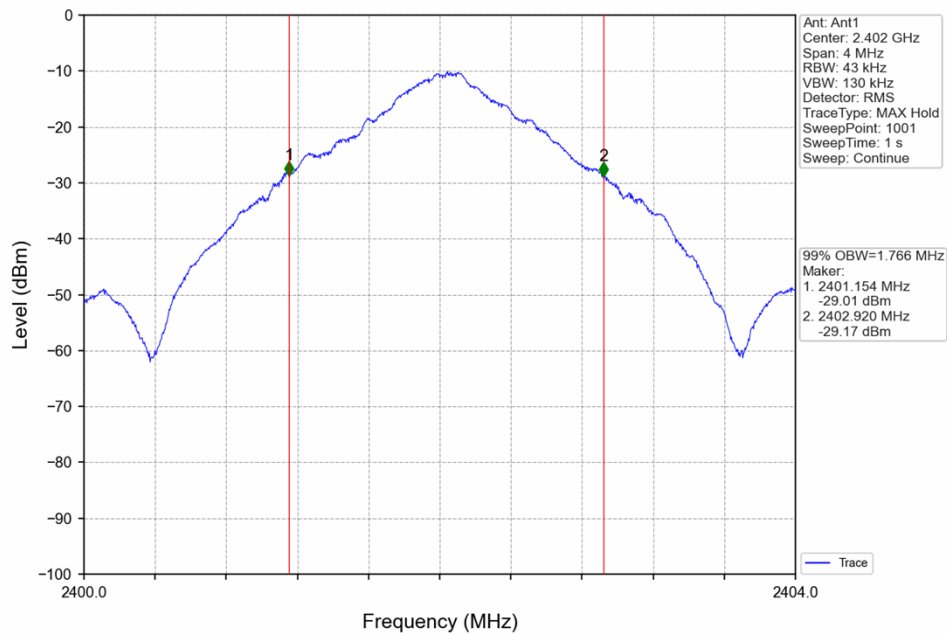
3.1.2 Test Graph



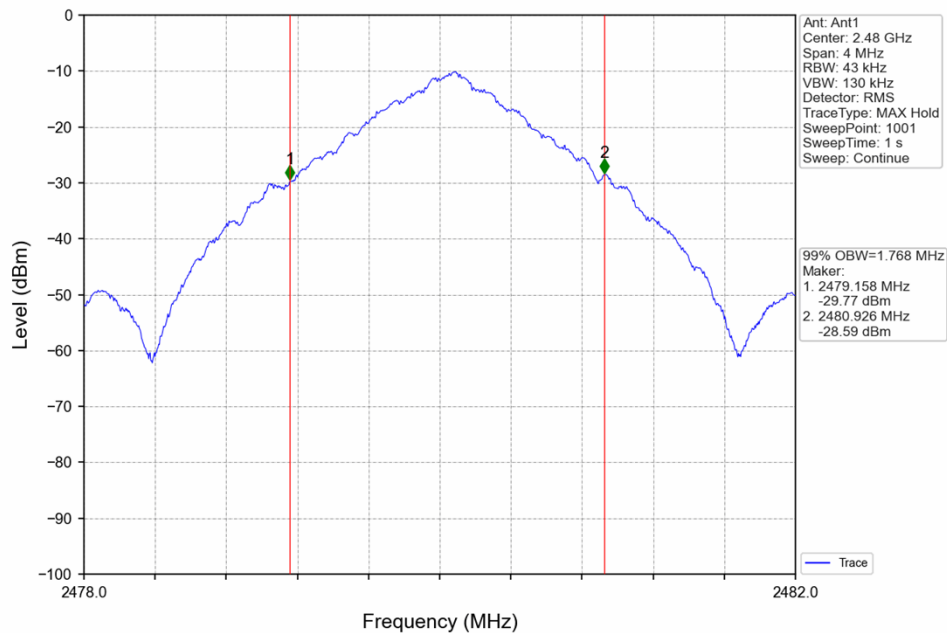
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2M_2402MHz_Ant1_NTNV



2M_2480MHz_Ant1_NTNV



4. Transmitter Unwanted Emissions In The Out-Of-Band Domain

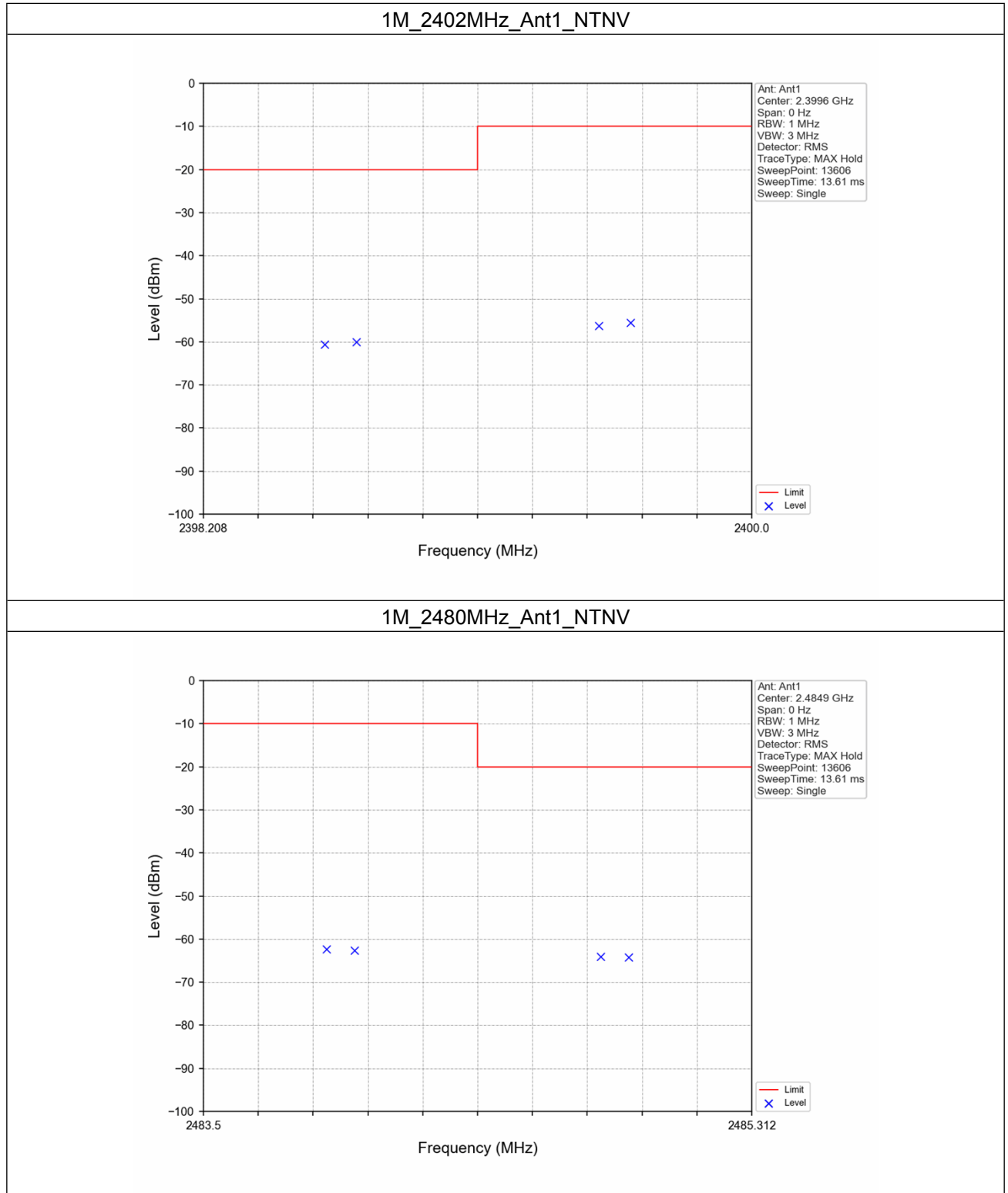
4.1 NTNV

4.1.1 Test Result

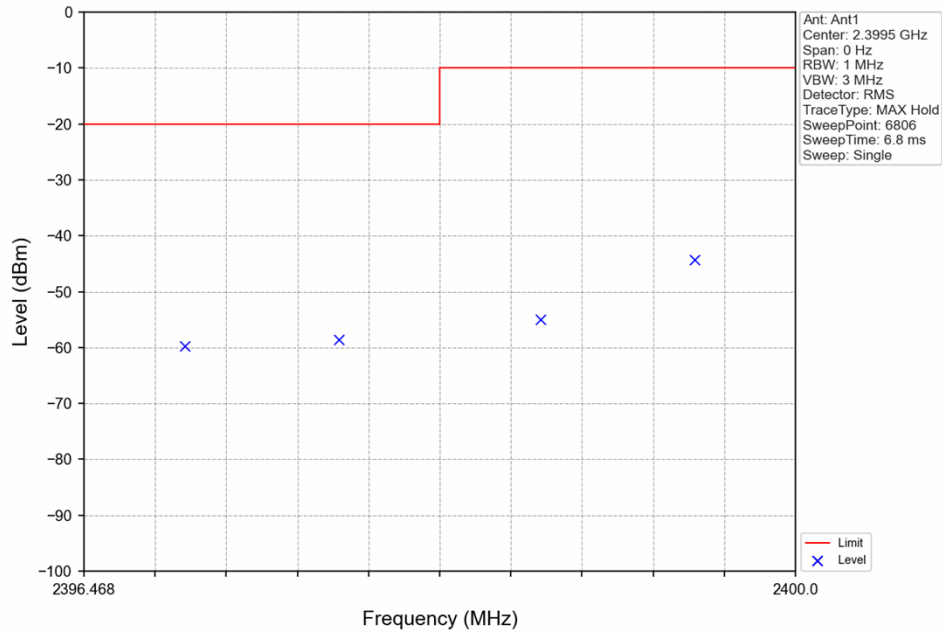
NTNV							
Mode	TX Type	Frequency (MHz)	Ant	Test Freq (MHz)	Result (dBm)	Limit (dBm)	Verdict
1M	SISO	2402	1	2398.604	-60.59	<=-20	Pass
				2398.708	-60.08	<=-20	Pass
				2399.500	-56.32	<=-10	Pass
				2399.604	-55.50	<=-10	Pass
		2480	1	2483.906	-62.38	<=-10	Pass
				2484.000	-62.60	<=-10	Pass
				2484.812	-64.02	<=-20	Pass
				2484.906	-64.22	<=-20	Pass
2M	SISO	2402	1	2396.968	-59.78	<=-20	Pass
				2397.734	-58.53	<=-20	Pass
				2398.734	-55.02	<=-10	Pass
				2399.500	-44.25	<=-10	Pass
		2480	1	2484.000	-57.81	<=-10	Pass
				2484.768	-58.86	<=-10	Pass
				2485.768	-60.46	<=-20	Pass
				2486.536	-61.31	<=-20	Pass



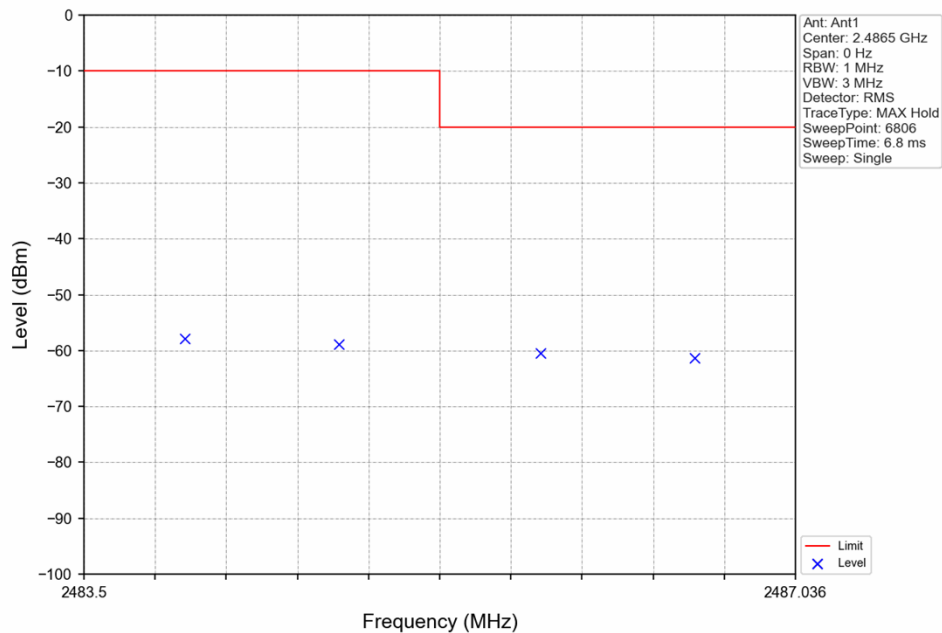
4.1.2 Test Graph



2M_2402MHz_Ant1_NTNV



2M_2480MHz_Ant1_NTNV



5. Receiver Blocking:

BLE

Receiver Category	Test Channel	Wanted signal mean power from companion device (dBm)	Blocking signal frequency (MHz)	Blocking signal power (dBm) (see note 3)	PER (%)	Limit (%)	Result
2	Lowest	-69	2300	-33.5	0.13	10	Pass
			2380		0.10	10	Pass
	Highest	-69	2504		0.21	10	Pass
			2584		0.14	10	Pass

- End of the Report -