

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
JAPAN SPECIFIED RADIO REQUIREMENT**

OF

MAVPSG1

Model No.: K140A1, K140A2, K140L1, K140L2

Trademark: MOOD:

Report No.: E01A25070211J01102

Issue Date: July 08, 2025

Prepared for

DMX, LLC

2100 South Interstate Highway 35, Suite 200, Austin, TX 78704 U.S.A.

Prepared by

Guangdong GTG Testing Technology Co., Ltd.

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Songshan Lake High-Tech Industrial Development Zone, Dongguan,
Guangdong, China**

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Guangdong GTG Testing Technology Co., Ltd.**

VERIFICATION OF COMPLIANCE

Applicant:	DMX, LLC 2100 South Interstate Highway 35, Suite 200, Austin, TX 78704 U.S.A.
Manufacturer:	Sunniwell AIoT Tech. Ltd. Building 2, No. 23 Qinyuan Road, Songshan Lake Park, Dongguan City, Guangdong Province
Product Description:	MAVPSG1
Trademark:	MOOD:
Model Number:	K140A1, K140A2, K140L1, K140L2 (All models are the same except for the model name, we choose model: K140A1 for all tests.)

Measurement Procedure Used:

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
ARIB STD T-66 Ver.3.7	Complied
Article2 Paragraph 1, item 19	Complied

The device described above is tested by Guangdong GTG Testing Technology Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Guangdong GTG Testing Technology Co., Ltd. is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the ARIB STD T-66 Ver.3.7 requirements.

Measurement was conducted by the following test method:

the test method of Ordinance Concerning Technical Regulations Conformity Certification etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and Communication notification in Annex "43" of Article 88, Paragraph 1 or the test method more than equivalent.

Date of Test :

Jan. 24, 2022 to July 08, 2025

Lucy Su

Prepared by :

Lucy Su /Supervisor

Tiger Xu

Reviewer & Authorized Signer :

Tiger Xu/Supervisor



Modified Information

Version	Summary	Revision Date	Report No.
Ver.1.0	Original Report	/	E01A22010552J00102
Ver.2.0	Based on the original report E01A22010552J00102 changed the information of Manufacturer, it doesn't need to be retest after the engineer evaluated. From (Original): Guangdong GTG Testing Technology Co., Ltd. 1-2/F., Building A, and 1/F., Building B, No. 11, Zongbu 2nd Road, Songshan Lake High-Tech Industrial Development Zone, Dongguan, Guangdong, China To (Updated): Guangdong GTG Testing Technology Co., Ltd. 1-2/F., Building A, and 1/F., Building B, No. 11, Zongbu 2nd Road, Songshan Lake High-Tech Industrial Development Zone, Dongguan, Guangdong, China	July 08, 2025	E01A25070211J01102

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1. GENERAL INFORMATION

1.1 Product Description

The DMX, LLC, Model: K140A1 (referred to as the EUT in this report) The EUT is a short range, lower power Transmitter.

A major technical descriptions of EUT is described as following:

Operation Frequency	2402-2480MHz
Modulation	GFSK
Kind of Device	Bluetooth Ver. 5.0
Number of Channel	40
Rated Antenna Power	1mW
Antenna Type	PIFA antenna
Antenna Gain	2.17dBi
Power Supply	DC 12V, 1A from adapter
Software Version Number	8.1.0
Hardware Version Number	MK01

1.2. Facilities

All measurement facilities used to collect the measurement data are located at 1-2/F., Building A, and 1/F., Building B, No. 11, Zongbu 2nd Road, Songshan Lake High-Tech Industrial Development Zone, Dongguan, Guangdong, China The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.3. Equipment

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

1.4 Laboratory accreditations and listings

Site Description

Name of Firm : Guangdong GTG Testing Technology Co., Ltd.
Site Location : 1-2/F., Building A, and 1/F., Building B, No. 11, Zongbu
2nd Road, Songshan Lake High-Tech Industrial
Development Zone, Dongguan, Guangdong, China

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. the Tx frequency was fixed which was for the purpose of the measurements.

2.3 Configuration of Tested System

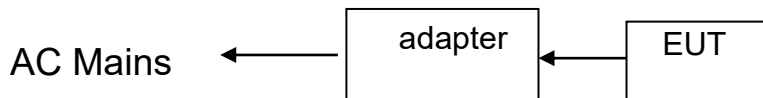


Table 2-1 Equipment Used in Tested System

Item	Equipment	Trademark	Model No.	Note
1.	MAVPSG1	MOOD:	K140A1	EUT
2.	Adapter	GSP	Model: GSCU1000S012V18Y Input: 100-240V~50/60Hz 0.5A max Output: DC 12V, 1A	Support EUT

Note:

- (1) Unless otherwise denoted as EUT in 『Remark』 column , device(s) used in tested system is a support equipment.

3. INSTRUMENT AND CALIBRATION

3.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated once a year or in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

3.2 MEASUREMENT EQUIPMENT USED

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
1.	EMI Test Receiver	Rohde & Schwarz	ESPI	100502	2022-11-12
2.	Pre-Amplifier	HP	8447D	2727A06172	2023-05-12
3.	Bilog Antenna	Schwarzbeck	VULB9163	VULB9163-588	2023-05-12
4.	Spectrum Analyzer	Rohde & Schwarz	FSV40	US40240623	2022-11-12
5.	Low noise Amplifiers	A-INFO	LA1018N4009	J101313052400 1	2023-05-12
6.	Horn antenna	A-INFO	LB-10180-SF	J203109061212 3	2023-05-12
7.	RF Cable	Gigalink Microwave	ZT40-2.92J-2.92J-2m	N/A	2022-11-12
8.	RF Cable	Gigalink Microwave	ZT40-2.92J-2.92J-0.3m	N/A	2022-11-12
9.	RF Cable	N/A	N/A	6#	2023-05-12
10.	RF Cable	N/A	N/A	1-1#	2023-05-12
11.	RF Cable	N/A	N/A	1-2#	2023-05-12
12.	RF Cable	N/A	N/A	7#	2023-05-12
13.	3m Semi-anechoic Chamber	chengyu	9m*6m*6m	N/A	2023-05-12

Remark: Each piece of equipment is scheduled for calibration once a year.

4. Test Environment

1. Environment:

Temperature : 25 degrees Celsius

Humidity :55 %

2. Tset Power supply

Test Voltage: DC 12V

The Bluetooth working voltage VDD is DC 3.3V. When the input voltage is DC 10.8V, the output VDD voltage is 3.3V after adjustment by the BMS chip. When the input voltage is DC 13.2V, the output VDD voltage is 3.3V after the BMS chip adjustment. So $\pm 10\%$ of the rated voltage test is not required.

3. Description of test modes

The following test mode was scanned during the preliminary test:

Mode : TX, RX

This EUT is a DSSS system, were conducted to determine the final configuration from all possible combinations. We use software control the EUT, Let EUT hopping on and transmit with highest power, all the modes GFSK have been tested. 40 Channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test.

Frequency and Channel list:

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	15	2430	29	2458
02	2404	16	2432	30	2460
03	2406	17	2434	31	2462
04	2408	18	2436	32	2464
05	2410	19	2438	33	2466
06	2412	20	2440	34	2468
07	2414	21	2442	35	2470
08	2416	22	2444	36	2472
09	2418	23	2446	37	2474
10	2420	24	2448	38	2476
11	2422	25	2450	39	2478
12	2424	26	2452	40	2480
13	2426	27	2454		
14	2428	28	2456		

Test Frequency and channel:

Lowest Frequency		Middle Frequency		Highest Frequency	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
01	2402	20	2440	40	2480

5. Summary of Test Results

Test Specification Clause	Test Case	Result
Article2 Paragraph 1, item 19	Frequency tolerance	Compliant
Article2 Paragraph 1, item 19	Antenna power	Compliant
Article2 Paragraph 1, item 19	Spurious emission intensity	Compliant
Article2 Paragraph 1, item 19	Spreading bandwidth	Compliant
Article2 Paragraph 1, item 19	Occupied bandwidth	Compliant
Article2 Paragraph 1, item 19	Dwell time	N/A
Article2 Paragraph 1, item 19	Receiver – limit of secondarily emitted radio wave strength	Compliant
Article2 Paragraph 1, item 19	Radio Interference prevention function	Compliant

6. Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01 " Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 1 " and TR-100028-02 " Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics;Part 2 " and is documented in the Shenzhen Global Test Service Co.,Ltd quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for Dongguan Anci laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Frequency error	25 Hz	(1)
Transmitter power conducted	0.57 dB	(1)
Transmitter power Radiated	2.20 dB	(1)
Adjacent and alternate channel power Conducted	1.20 dB	(1)
Conducted spurious emission	1.60 dB	(1)
Radiated spurious emission	2.20 dB	(1)
Intermodulation attenuation	1.00 dB	(1)
Maximum useable receiver sensitivity	2.80 dB	(1)
Co-channel rejection	2.80 dB	(1)
Adjacent channel selectivity	2.80 dB	(1)
Spurious response rejection	2.80 dB	(1)
Intermodulation response rejection	2.80 dB	(1)
Blocking or desensitization	2.80 dB	(1)

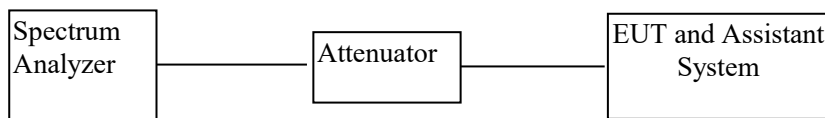
- (1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

7. FREQUENCY ERROR

LIMIT

+/- 50 x 10⁻⁶ or less (50ppm)

TEST CONFIGURATION



TEST PROCEDURE

1. Configure EUT and assistant system according clause 2.3 and 4.3
2. Set EUT work in carrier Tx mode as described in clause 2.3
3. (3) Connected the EUT's antenna port to the Spectrum Analyzer by suitable attenuator, set the Spectrum Analyzer as below:
 Centre Frequency: The centre frequency of the channel under test.
 Resolution BW: 10KHz.
 Video BW: 10KHz.
 Span: 1MHz.
 Detector: Peak.
 Trace Mode: Max Hold.
4. When the trace is complete, find the peak value of the power envelope and record the frequency.

Conditions of Equipment under Test

- (1) Set the EUT to test frequency and to transmission state.
- (2) Set the modulation mode to "continuous transmission without modulation" by suspending modulation (including the spreading). If it is not practicable, set to "continuing burst transmission without modulation" or to a modulation state to generate peculiar spectrum (one of sub-carriers for example) that enables frequency measurement with a spectrum analyzer.

MEASUREMENT DESCRIPTION

Performed:	☒	Conducted
	☐	Radiated (only if no conducted sample is provided)

Test Result

Test Date : June 20, 2022

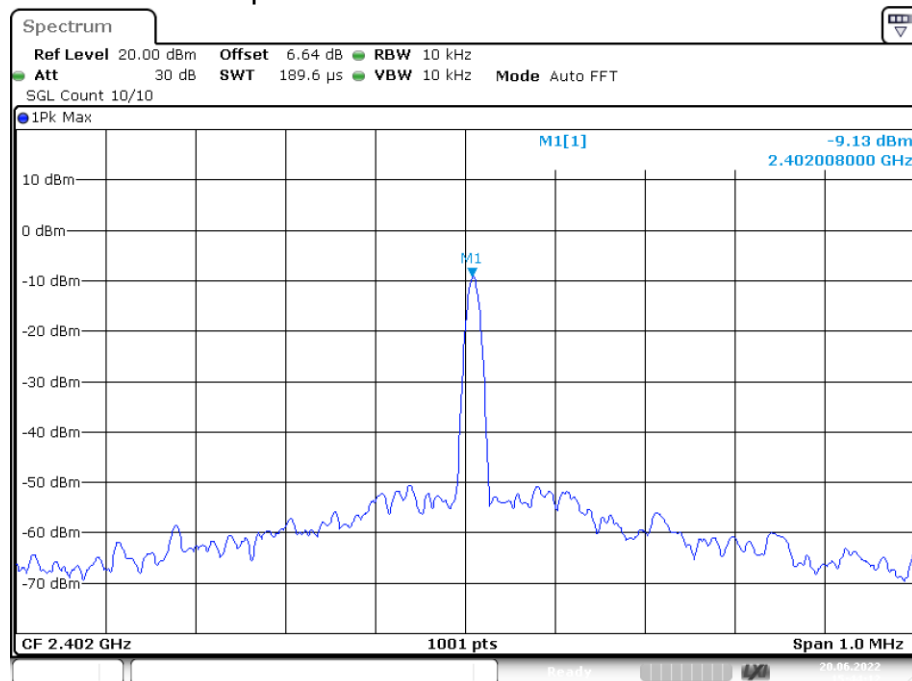
Tester : Best

Modulation: GFSK

Frequency (MHz)	Antenna	Measured Frequency (MHz)	Deviation (ppm)	Limit (ppm)	Verdict
2402	Ant1	2402.008	3.33	50	Pass
2440	Ant1	2440.008	3.28	50	Pass
2480	Ant1	2480.008	3.23	50	Pass

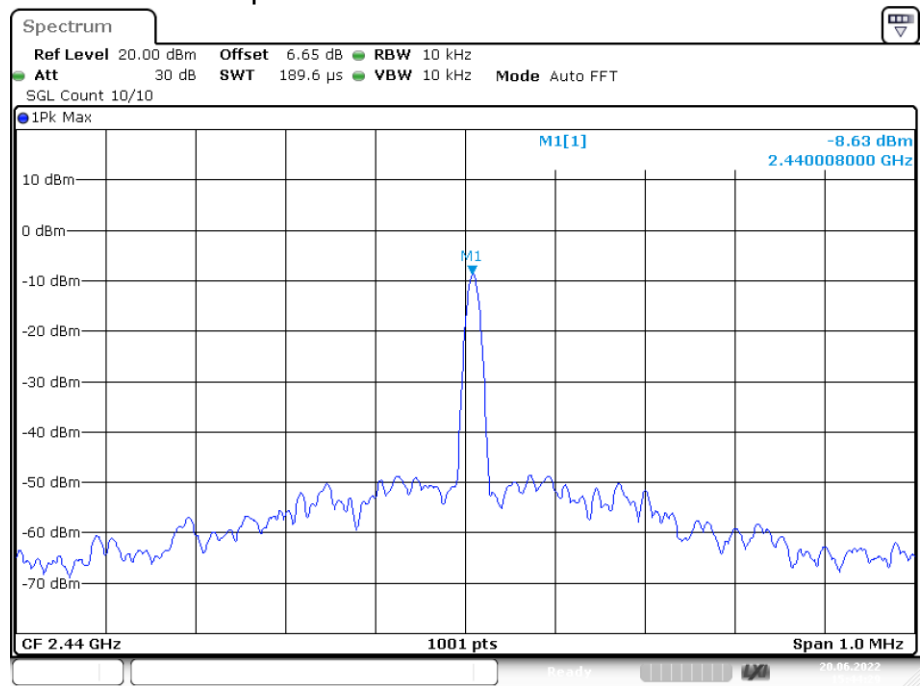
TEST PLOTS

Freq. Error NVNT BLE 1M 2402MHz Ant1



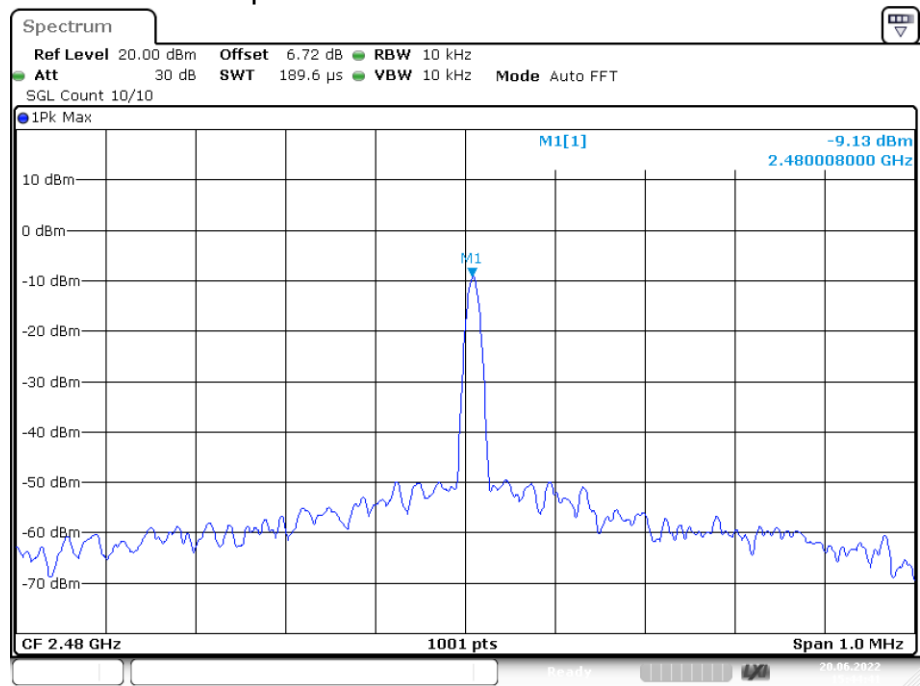
Date: 20.JUN.2022 15:44:11

Freq. Error NVNT BLE 1M 2440MHz Ant1



Date: 20.JUN.2022 15:44:29

Freq. Error NVNT BLE 1M 2480MHz Ant1



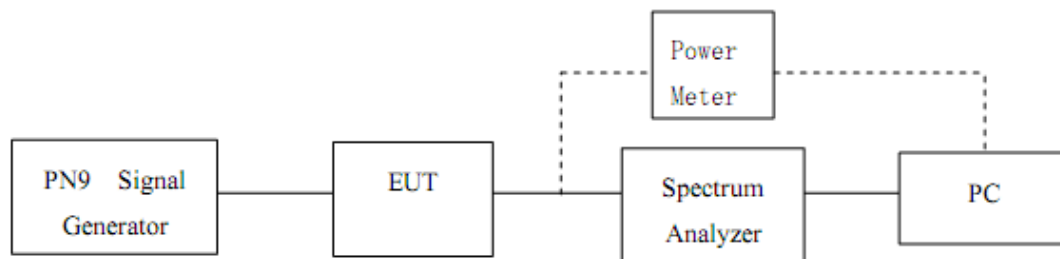
Date: 20.JUN.2022 15:44:41

8. ANTENNA POWER

Limit

Item	Mode	Limits
Antenna Power Density	FH form 2400~2483.5MHz	$\leq 3\text{mW/MHz}$
	OFDM,DS from 2400~2483.5MHz	$\leq 10\text{mW/MHz}$
	Other from 2400~2483.5MHz	$\leq 10\text{mW}$
Antenna Power Error	+20%, -80% (Base on manufacturer declare antenna power density)	

TEST CONFIGURATION



Note:

1. Connect the power meter directly to the output of the dummy load when it is necessary to measure the total power of EUT other than the direct sequence spread-spectrum system.
2. Use the computer for measuring the spread-spectrum bandwidth.

TEST PROCEDURE

1. Measure the equivalent noise bandwidth of the spectrum analyzer at the resolution bandwidth of 1 MHz to obtain correction coefficient.
If the spread-spectrum bandwidth is under 1 MHz, correct the measure value only when “spread-spectrum bandwidth (MHz) /equivalent noise bandwidth (MHz)” is over 1.
 1. Attenuation of the attenuator shall be set to provide an optimum input level to the spectrum analyzer if need.
 2. Set the spectrum analyzer as follows to search the frequency giving the maximum antenna power:
Center frequency: Center frequency of service bandwidth (e.g. 2412 MHz)
Frequency sweep width: 40 MHz
Resolution bandwidth: 1 MHz
Video bandwidth: Approximately 3 times the resolution bandwidth (e.g. 3 MHz)
Sweep time: Minimum time to ensure the measuring accuracy (In case of burst wave, one burst shall be included per data point).
Trigger condition: Free run
Data points: 400 points or more (e.g. 1001 points)
Sweep mode: Continuous sweep
Detection mode: Positive peak
Indication mode: Maximum hold
 3. Set the spectrum analyzer as follows for measuring antenna power. Connect the power meter to the

IF output of spectrum analyzer, and calibrate the indication of the power meter to the output value of the EUT.

Center frequency: Frequency giving the maximum power (searched frequency)

Frequency sweep width: 0 Hz

Resolution bandwidth: 1 MHz

Video bandwidth: Approximately the same bandwidth as resolution bandwidth

Sweep mode: Continuous sweep

Conditions of Equipment under Test

Set to the test frequency and spread-spectrum code. Modulate it with standard coded test signal.

Measuring Operation Procedures

In case of direct sequence spread-spectrum system, operate the EUT as follows:

1. Set the spectrum analyzer according to 3.4
2. Repeat the sweeping until the spectrum analyzer no longer indicates variation.
Measure a frequency that output the maximum power 1 MHz
3. Connect the power meter to the IF output of the spectrum analyzer.
4. Set the spectrum analyzer to 3.4
5. Antenna shall be as follows:
 - a. In case of continuous waves: Corrected value from power meter indication according to 3.6 (1).
 - b. In case of burst waves: Calculated value from the corrected value same as for continuous wave and the ratio of transmission time.
If there are sections where data is not transmitted and these signal level is lower than that of section where data is transmitted these sections are regarded as a burst stopping period and these sections shall not be measured.

In the case of the frequency hopping system or the combination of the system and the direct sequence spread-spectrum system, operate the EUT as follows:

1. Connect the power meter to the output of the attenuator and measure the total power.
2. Divide the total power with the spread-spectrum bandwidth and determine the mean power per 1 MHz.
3. Check and see if the hopping frequencies are uniformly distributed according to the submitted document. If not uniformly distributed, the measuring method should be considered particularly according to the submitted document.
4. Antenna power shall be as follows:
 - a. In case of continuous waves: Value in step (2).
 - b. In case of burst waves: Calculated value from the value in step (2) and ratio of transmission time.

In the case of other modulation mode, operate the equipment under the test as follows:

1. Connect the power meter to the output of the attenuator and measure the total power.
2. Antenna power shall be as follows:
 - a. In case of continuous waves: Value in step (1).
 - b. In case of burst waves: Calculated value from the value in step (2) and the transmission time ratio. Sections where data is not transmitted shall be treated as same as in case direct sequence spread-spectrum system

Test Result

Test Date : June 20, 2022

Tester : Best

Modulation: GFSK

Channel Frequency (MHz)	Power Density (dBm)	Power Density (mW)	Power Limit(mW)	Rated Antenna Power(mW)	Antenna Power Error (+20%-80%)
2402	-1.49	0.71	10	1	-29%
2440	-0.83	0.83	10	1	-17%
2480	-1.23	0.75	10	1	-25%

ERIP Power

Frequency (MHz)	Antenna	Antenna Power (dBm)	Gain (dBi)	EIRP Power (dBm)	Limit (dBm)	Verdict
2402	Ant1	-1.49	2.17	0.68	12.14	Pass
2440	Ant1	-0.83	2.17	1.34	12.14	Pass
2480	Ant1	-1.23	2.17	0.94	12.14	Pass

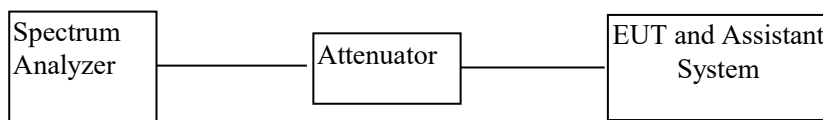
9. SPURIOUS EMISSIONS INTENSITY

LIMIT

Permissible mean power of spurious emission of each frequency supplied to a feeder, that is, mean power of spurious emission in the 1 MHz bandwidth at frequency f other than frequency band used shall be as follows:

- a. $2,387\text{MHz} \leq f \leq 2,400\text{MHz}$ and $2,483.5\text{MHz} < f \leq 2,496.5\text{MHz}$ 25 μW or less
- b. $2,387\text{MHz} > f$ and $2,496.5\text{MHz} < f$ 2.5 μW or less

TEST CONFIGURATION



Note :Connect the power meter directly to the output of the dummy load when it is necessary to measure the total power of EUT other than the direct sequence spread-spectrum system.

TEST PROCEDURE

1. When searching the spurious emissions, set spectrum analyzer as follows:
 - Frequency sweep width: (Note 2).
 - Resolution bandwidth: 1 MHz
 - Video bandwidth: 10 kHz
 - Y-axis scale: 10dB/Div.
 - Input level: Enough level for maximum dynamic range
 - Sweep time: Minimum time to ensure the measuring accuracy (In case of burst wave, one burst shall be included per data point.)
 - Data points: 400 points or more (e.g. 1001 points)
 - Sweep mode: Single sweep
 - Detection mode: Positive peak
 - Display mode: Maximum hold
 - Note 2: Search spurious emissions from a low frequency as much as possible to about 3 times the carrier wave frequency (e.g. from 10 MHz to 2400 MHz and from 2483.5 MHz to 12.75 GHz).
 - Setting the spectrum analyzer as
2. Set the spectrum analyzer for measuring spurious emissions as follows:
 - Center Frequency: Center of carrier frequency and spurious frequency (searched frequency)
 - Frequency sweep width: 0 MHz
 - Resolution bandwidth: 1 MHz
 - Video bandwidth: 1 MHz
 - Y-axis scale: 10 dB/Div
 - Input level: Transmission signal amplitude shall be in the vicinity of the maximum level in the linear region of the mixer.
 - Sweep mode: Single sweep
 - Detection mode: Sample

Conditions of Equipment under Test

Set the test frequency and test spread-spectrum code, and modulate it with a standard code test signal.

Measuring Operation Procedures

1. Set the spectrum analyzer according to 6.3.(1) and search for spurious emissions by repeating the sweeping until the spectrum analyzer no longer indicate variation. Determine the absolute value from the ratio of the spurious amplitude to the carrier wave amplitude and antenna power. If this value is under the standard value, do not measure by 6.3.(2) but use the determined absolute value as the measure value. If a value determined from the amplitude of searched spurious emission is over the tolerance value, narrowing down the frequency sweep bandwidth sequentially from 100 MHz to 1 MHz in order to raise the accuracy of the spectrum analyzer center frequency, obtain their spurious frequency.
2. Set the spectrum analyzer according to 6.3.(2) and determine the mean value of respective amplitude of the carrier wave and spurious. (In case of burst wave, these values are mean value within the burst period.) Determine an absolute value from the ration of these two mean values and antenna power separately measured, and it shall be the measured value.
3. In case of the frequency hopping(FH) system and its mixture with the direct sequence spread-spectrum system, an absolute value shall be determined by multiplying the absolute value in (1) and (2) with the [spread-spectrum bandwidth (MHz)] divided by the [spread-spectrum bandwidth (MHz)]

Test Result

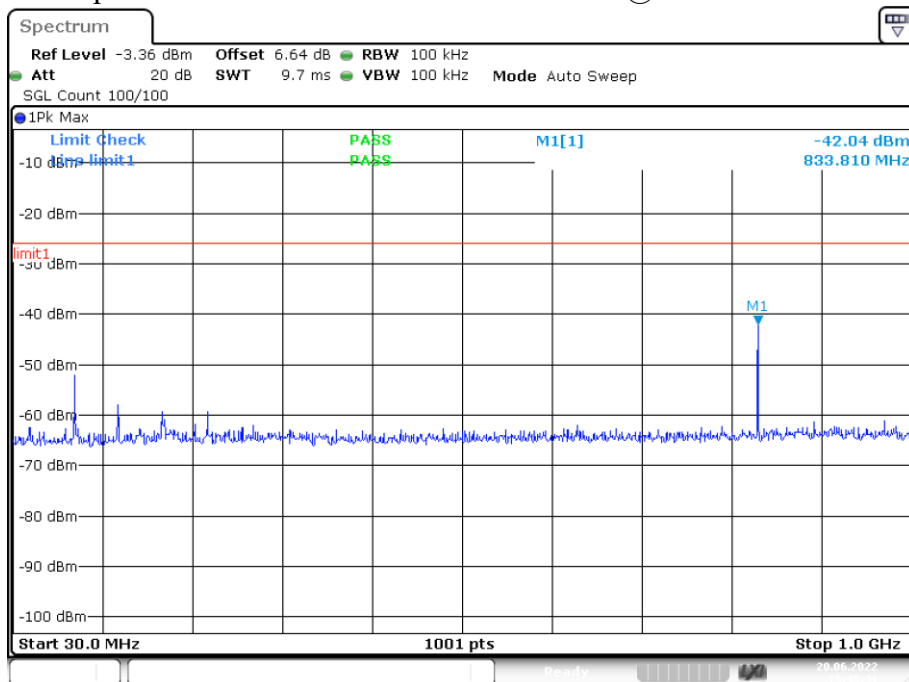
Modulation: GFSK

Test Date : June 20, 2022

Tester : Best

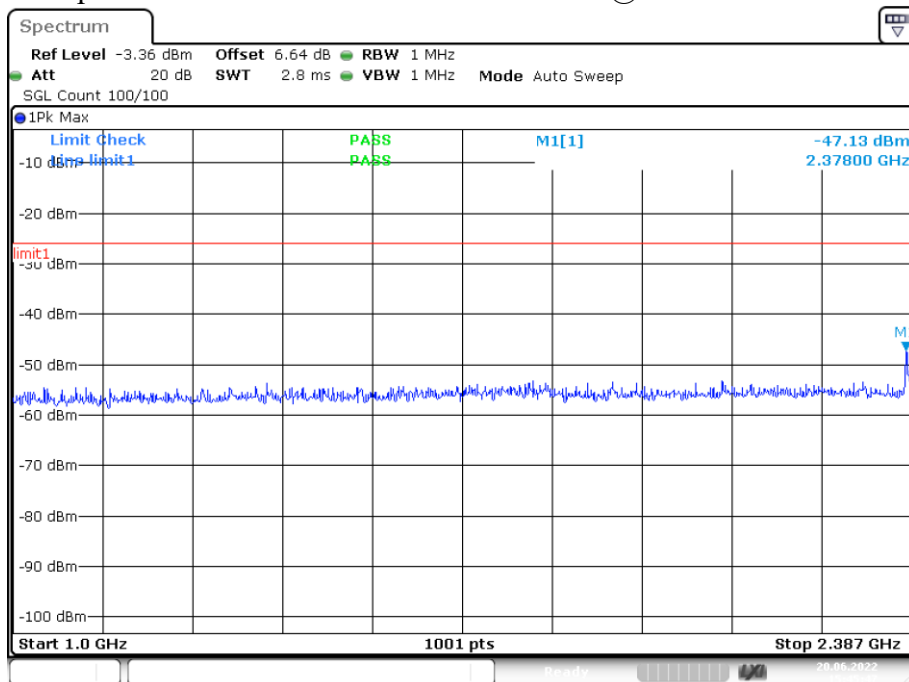
Frequency (MHz)	Antenna	Range (MHz)	Emission Frequency (MHz)	Max Value (dBm)	Limit (dBm)	Verdict
2402	Ant1	30-1000	833.81	-32.04	-26	Pass
2402	Ant1	1000-2387	2378	-47.13	-26	Pass
2402	Ant1	2387-2400	2399.99	-36.13	-16	Pass
2402	Ant1	2483.5-2496.5	2491.7	-54.7	-16	Pass
2402	Ant1	2496.5-13000	6940.5	-47.79	-26	Pass
2440	Ant1	30-1000	833.81	-30.2	-26	Pass
2440	Ant1	1000-2387	2305.9	-53.03	-26	Pass
2440	Ant1	2387-2400	2396.32	-55.39	-16	Pass
2440	Ant1	2483.5-2496.5	2487.87	-52.87	-16	Pass
2440	Ant1	2496.5-13000	6908.5	-47.06	-26	Pass
2480	Ant1	30-1000	832.84	-42.27	-26	Pass
2480	Ant1	1000-2387	2330.9	-32.16	-26	Pass
2480	Ant1	2387-2400	2397.64	-55.26	-16	Pass
2480	Ant1	2483.5-2496.5	2483.66	-44.82	-16	Pass
2480	Ant1	2496.5-13000	2501.5	-45.47	-26	Pass

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 30MHz-1000MHz



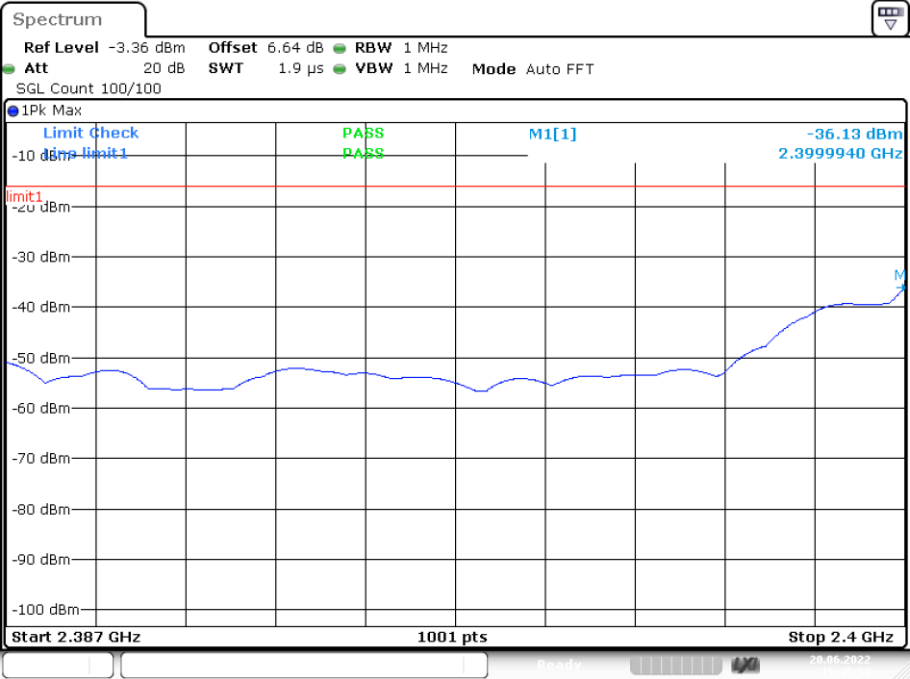
Date: 20.JUN.2022 15:45:41

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 1000MHz-2387MHz



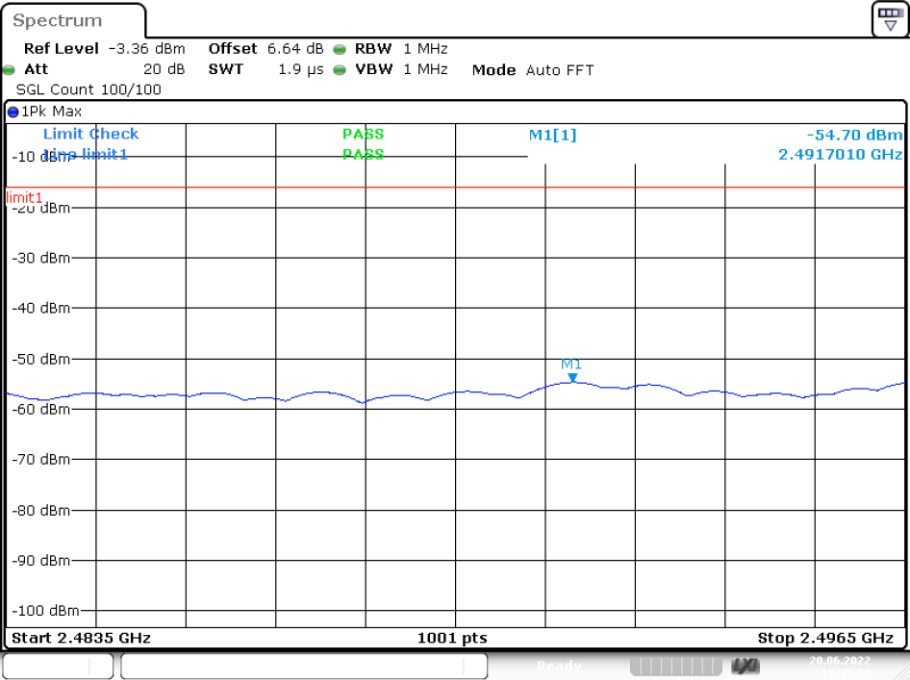
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Tx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 2387MHz-2400MHz



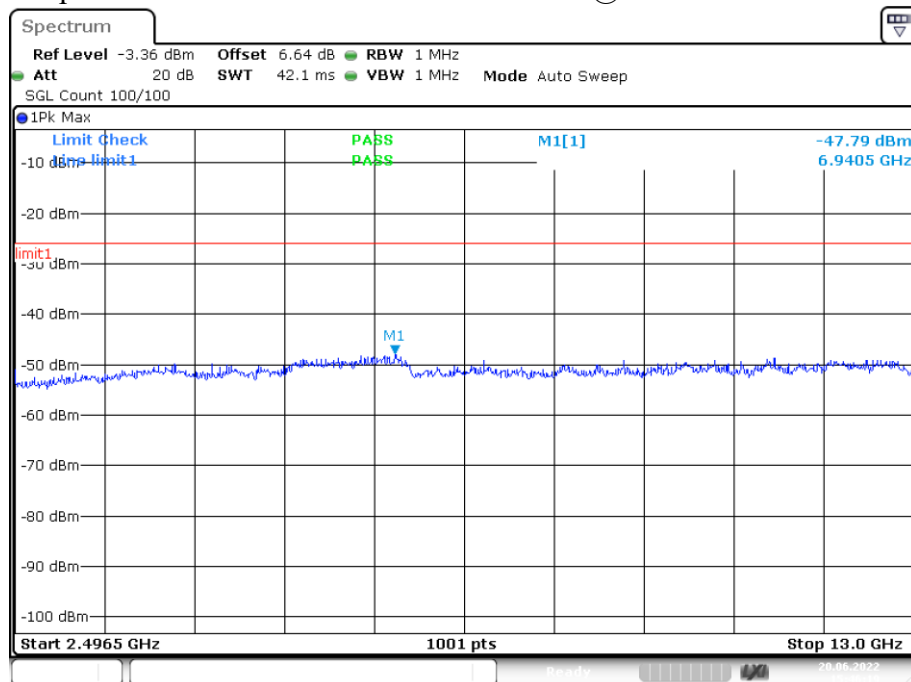
Date: 20.JUN.2022 15:45:49

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 2483.5MHz-2496.5MHz



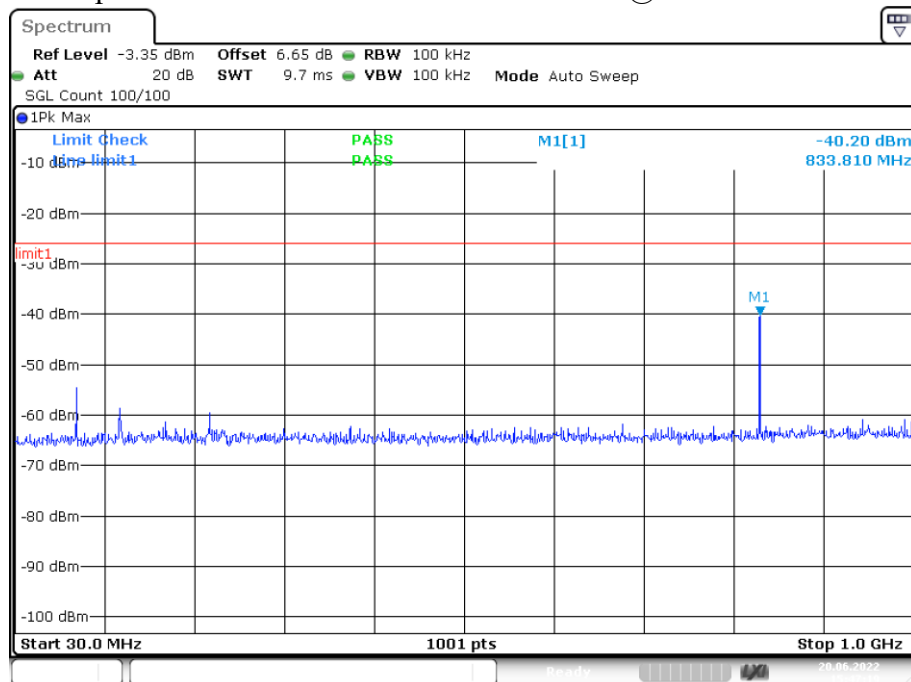
Date: 20.JUN.2022 15:45:52

Tx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 2496.5MHz-13000MHz



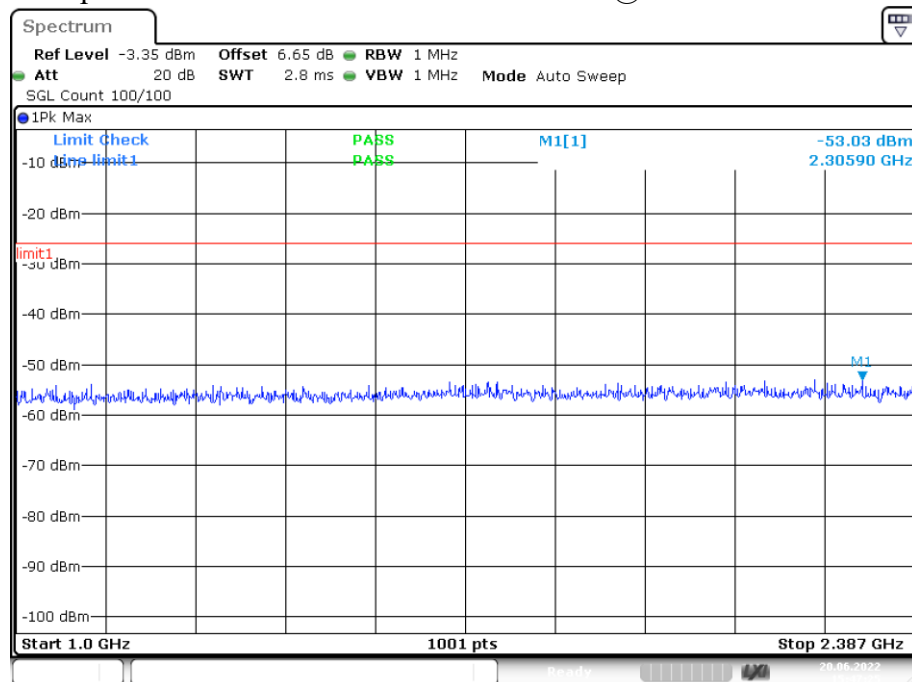
Date: 20.JUN.2022 15:46:19

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 30MHz-1000MHz



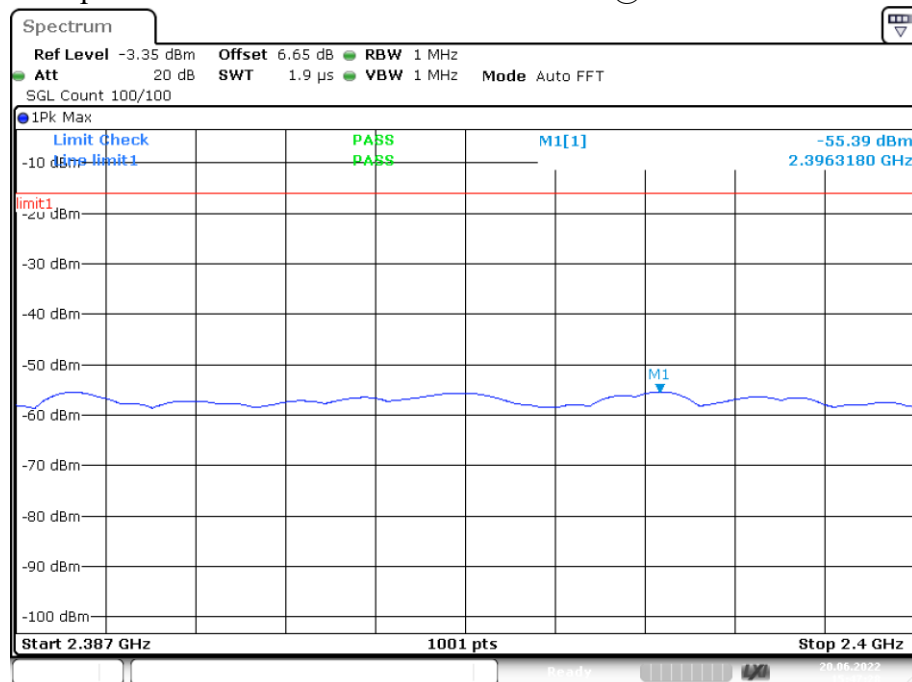
Date: 20.JUN.2022 15:47:19

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 1000MHz-2387MHz



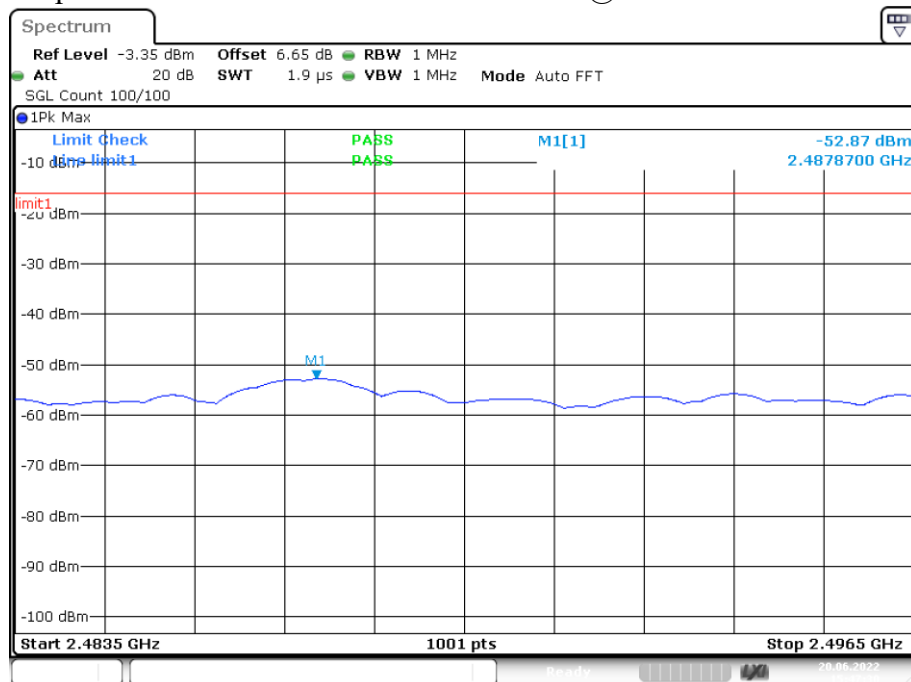
Date: 20.JUN.2022 15:47:24

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 2387MHz-2400MHz



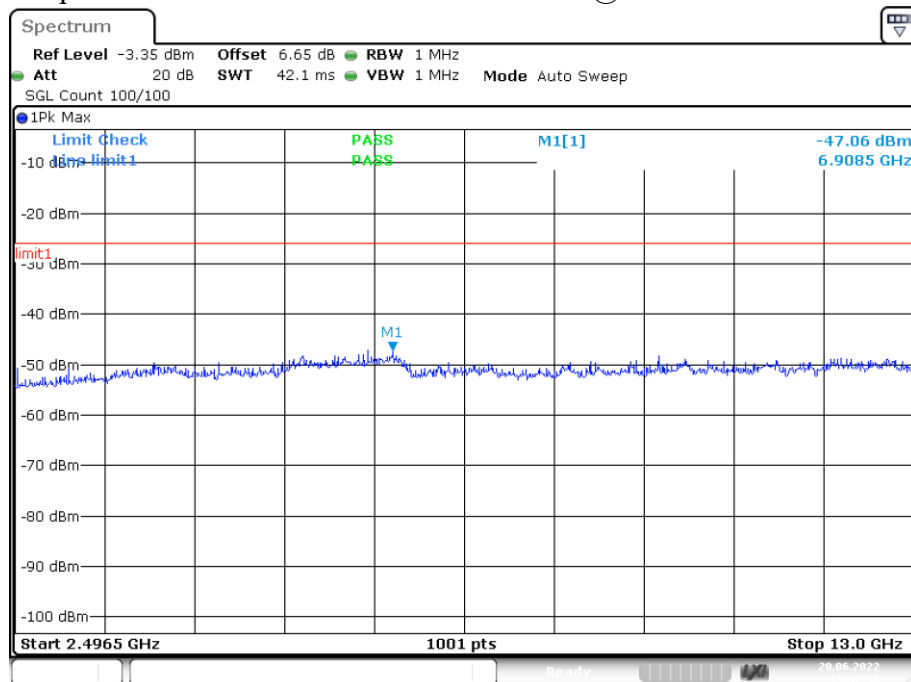
Date: 20.JUN.2022 15:47:27

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 2483.5MHz-2496.5MHz



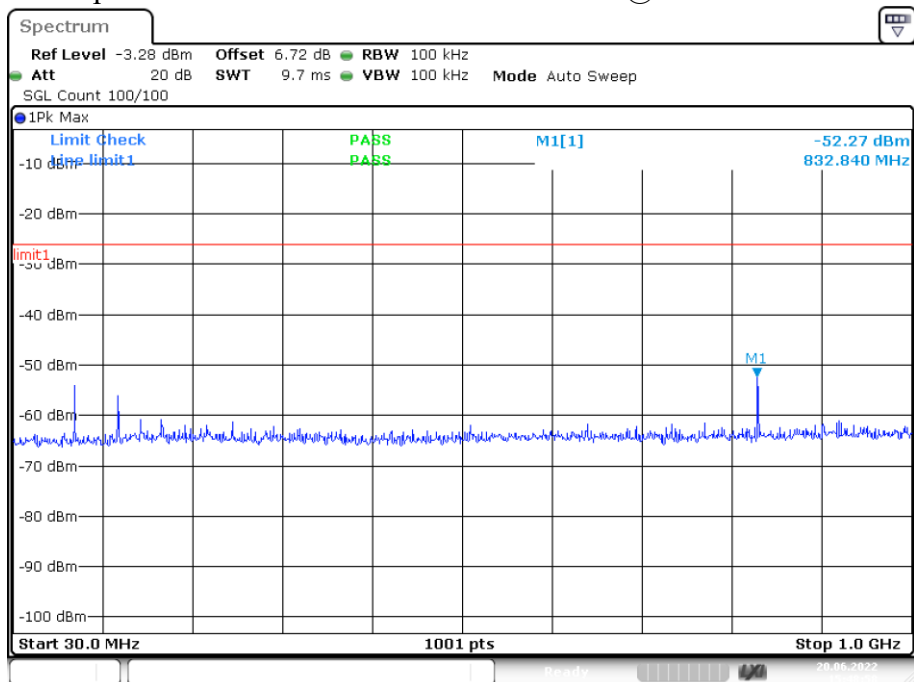
Date: 20.JUN.2022 15:47:30

Tx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 2496.5MHz-13000MHz



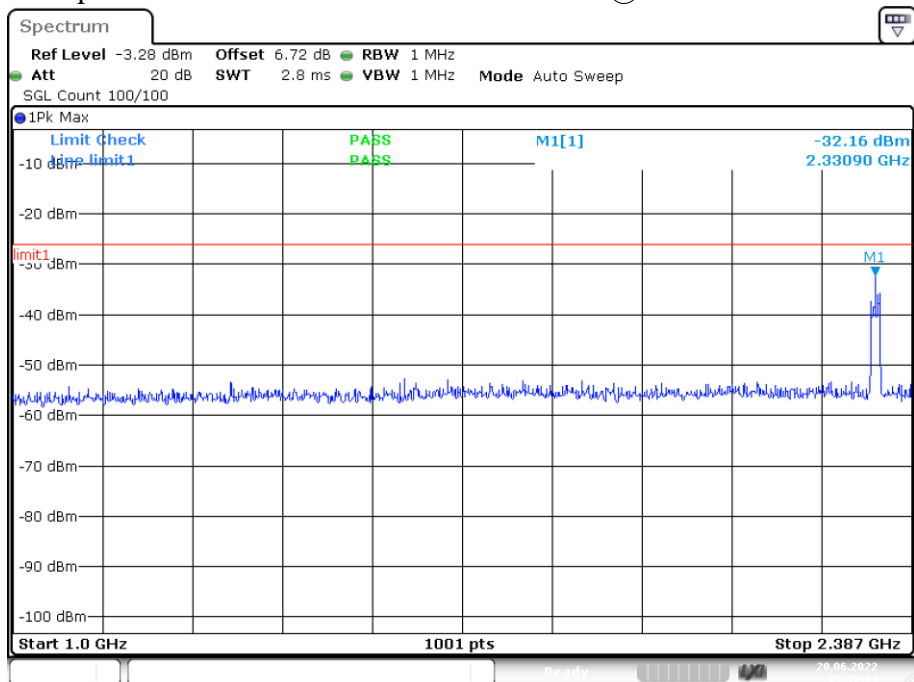
Date: 20.JUN.2022 15:47:57

Tx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 30MHz-1000MHz



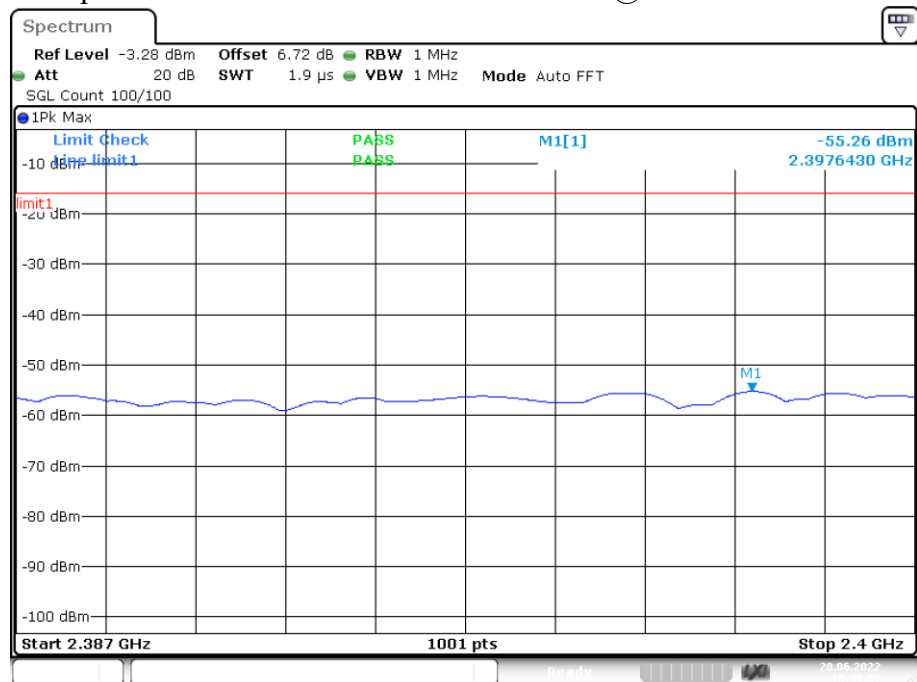
Date: 20.JUN.2022 15:48:58

Tx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 1000MHz-2387MHz

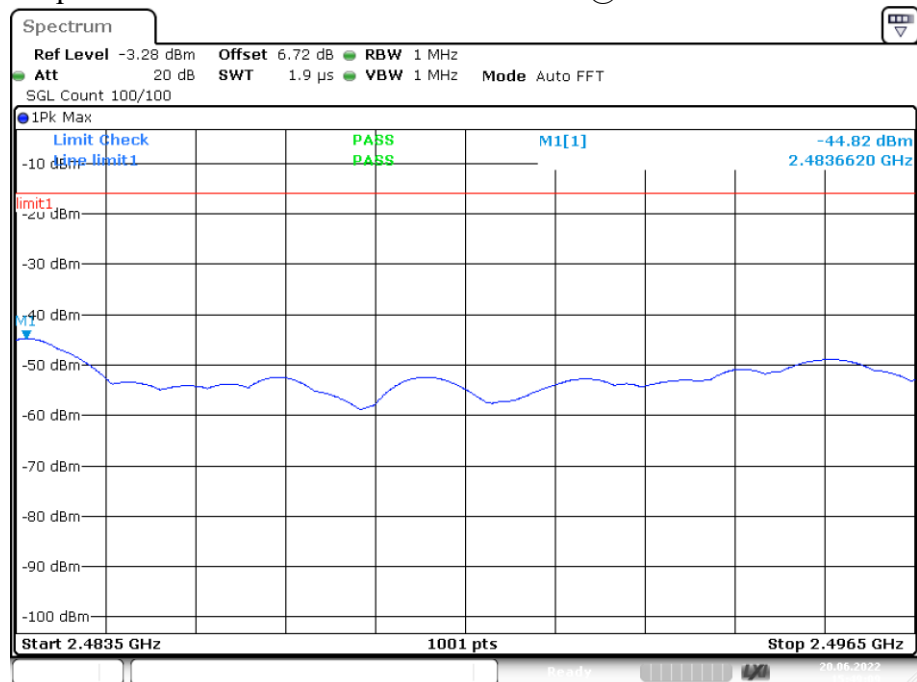


Date: 20.JUN.2022 15:49:04

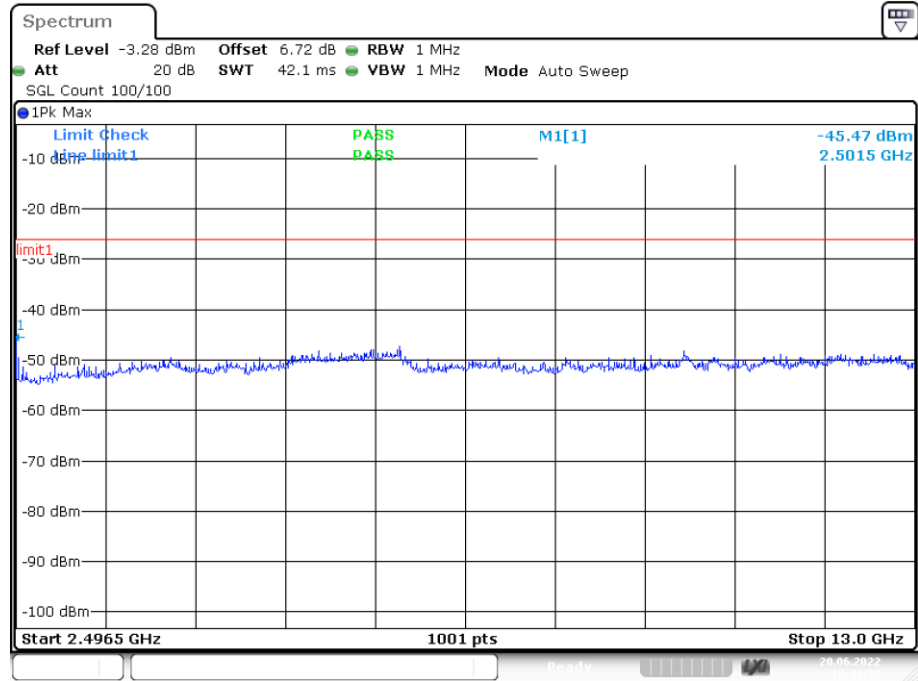
Tx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 2387MHz-2400MHz



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 2483.5MHz-2496.5MHz



Tx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 2496.5MHz-13000MHz



Date: 20.JUN.2022 15:49:37

10. OCCUPIED BANDWIDTH (99%)

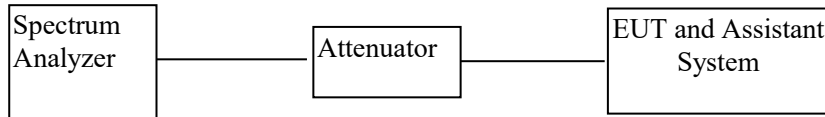
LIMIT

Occupied bandwidth: FH $\leq$ 83.5 MHz; OFDM $\leq$ 38 MHz, DS $\leq$ 26 MHz; Others $\leq$ 26 MHz

Spread Bandwidth: $\geq$ 500 kHz(FH,DS)

Spread factor > 5 .

TEST CONFIGURATION



Note : Connect the power meter directly to the output of the dummy load when it is necessary to measure the total power of EUT other than the direct sequence spread-spectrum system.

TEST PROCEDURE

1. Spectrum analyzer shall be follows:

Center frequency: Center frequency of service band (e.g. 2441 MHz).

Frequency sweep width: Approximately 2 to 3 times of the tolerance value (e.g. 3 MHz).

Resolution bandwidth: Approximately 3% of tolerance value (e.g. 30 kHz)

Video bandwidth: Approximately the same as the resolution bandwidth.

Y-axis scale: 10dB/Div.

Input level: Carrier level shall be enough higher than floor noise of spectrum analyzer.

Sweep time: Minimum time to ensure the measuring accuracy (In case of burst wave, one burst shall be included per data point.)

Data points: 400 points or more (e.g. 1001 points)

Sweep mode: Continuous

Detection mode: Positive peak

Display mode: Maximum hold

2. The values measured by the spectrum analyzer shall be processed by external or internal computer.

Conditions of Equipment under Test

Hopping mode. Set to testing frequency and modulate using standard encoding test signals.

Measuring Operation Procedures

1. After repeating sweeps until the display shows steady data, store the values at all data points to the array variables of computer.
2. Convert the dBm values at all data point to the antilogarithm values on the power dimension.
3. Obtain the sum total of the power at all data points, and store it as "Total power".
4. Accumulate the power at each data point sequentially upward from the data point for the lowest frequency. Obtain the limit data point where the accumulated power equals 0.5% (5% when spread-spectrum bandwidth) of the "total power". Convert this limit data point into frequency, and

store it as the “lower limit frequency”.

5. Accumulate the power at each data point sequentially downward from the data point for the highest frequency. Obtain the limit data point where the accumulated power equals 0.5% (5% when spread-spectrum bandwidth) of the “Total power”. Convert this limit data point into frequency, and store it as the “Upper limit frequency”.

Test Result

Test Date : June 20, 2022

Tester : Best

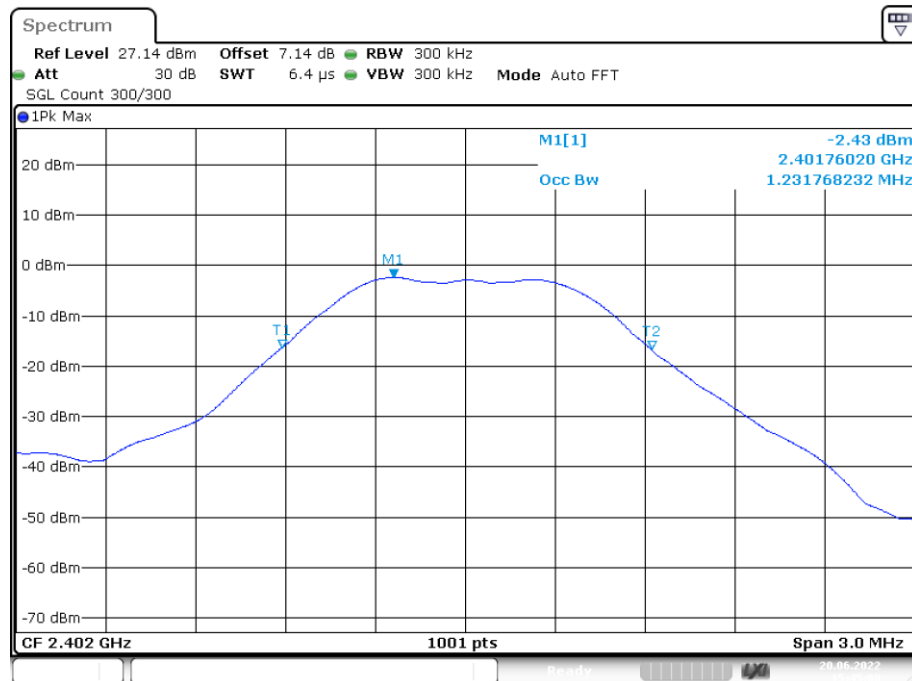
SPAN=3MHz, RBW=VBW=100KHz

Modulation: GFSK

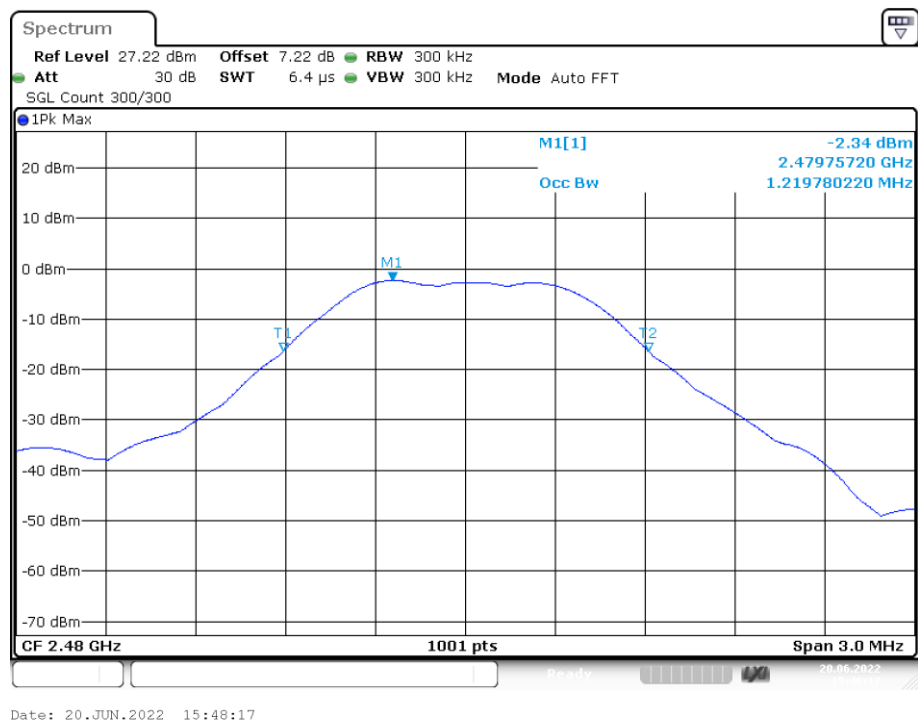
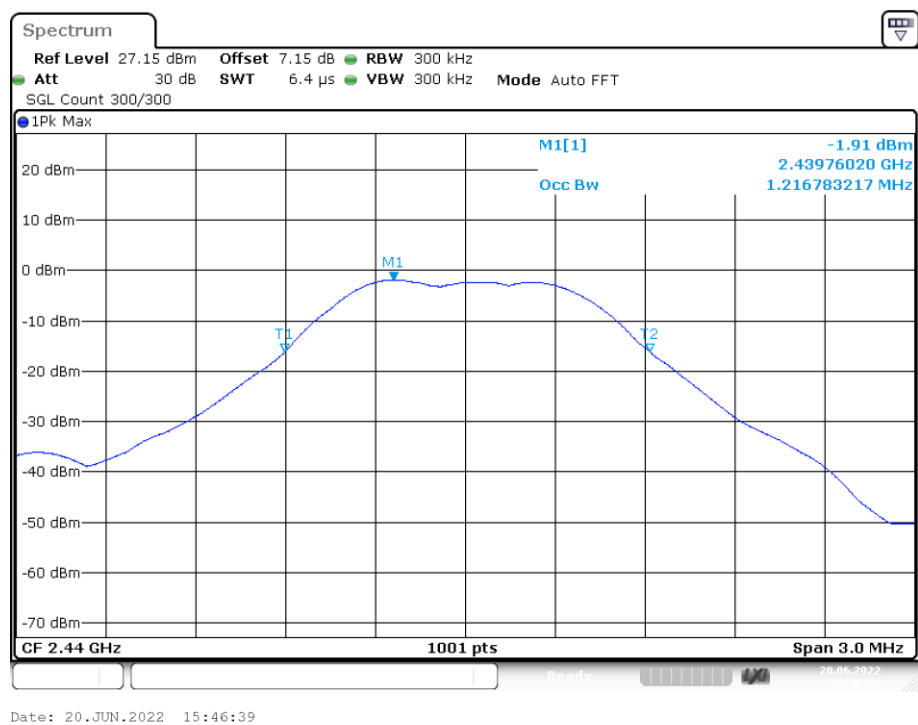
Modulation: GFSK

Channel number	Frequency(MHz)	Bandwidth(MHz)
1	2402	1.232
20	2440	1.217
40	2480	1.22

TEST PLOTS



Date: 20.JUN.2022 15:45:00



11. SPREAD-SPECTRUM BANDWIDTH (90%)

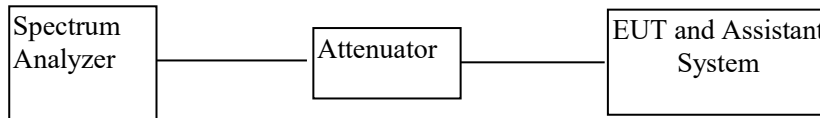
LIMIT

Occupied bandwidth: $FH \leq 83.5$ MHz; $OFDM \leq 38$ MHz, $DS \leq 26$ MHz; Others ≤ 26 MHz

Spread Bandwidth: ≥ 500 kHz(FH,DS)

Spread factor > 5 .

TEST CONFIGURATION



Note : Connect the power meter directly to the output of the dummy load when it is necessary to measure the total power of EUT other than the direct sequence spread-spectrum system.

TEST PROCEDURE

3. Spectrum analyzer shall be follows:

Center frequency: Center frequency of service band (e.g. 2441 MHz).

Frequency sweep width: Approximately 2 to 3 times of the tolerance value (e.g. 3MHz).

Resolution bandwidth: Approximately 3% of tolerance value (e.g. 30kHz)

Video bandwidth: Approximately the same as the resolution bandwidth.

Y-axis scale: 10dB/Div.

Input level: Carrier level shall be enough higher than floor noise of spectrum analyzer.

Sweep time: Minimum time to ensure the measuring accuracy (In case of burst wave, one burst shall be included per data point.)

Data points: 400 points or more (e.g. 1001 points)

Sweep mode: Continuous

Detection mode: Positive peak

Display mode: Maximum hold

4. The values measured by the spectrum analyzer shall be processed by external or internal computer.

Conditions of Equipment under Test

Hopping mode. Set to testing frequency and modulate using standard encoding test signals.

Measuring Operation Procedures

6. After repeating sweeps until the display shows steady data, store the values at all data points to the array variables of computer.
7. Convert the dBm values at all data point to the antilogarithm values on the power dimension.
8. Obtain the sum total of the power at all data points, and store it as "Total power".
9. Accumulate the power at each data point sequentially upward from the data point for the lowest frequency. Obtain the limit data point where the accumulated power equals 0.5% (5% when spread-spectrum bandwidth) of the "total power". Convert this limit data point into frequency, and

store it as the “lower limit frequency”.

10. Accumulate the power at each data point sequentially downward from the data point for the highest frequency. Obtain the limit data point where the accumulated power equals 0.5% (5% when spread-spectrum bandwidth) of the “Total power”. Convert this limit data point into frequency, and store it as the “Upper limit frequency”.

Test Result

SPAN=3MHz, RBW=VBW=100KHz

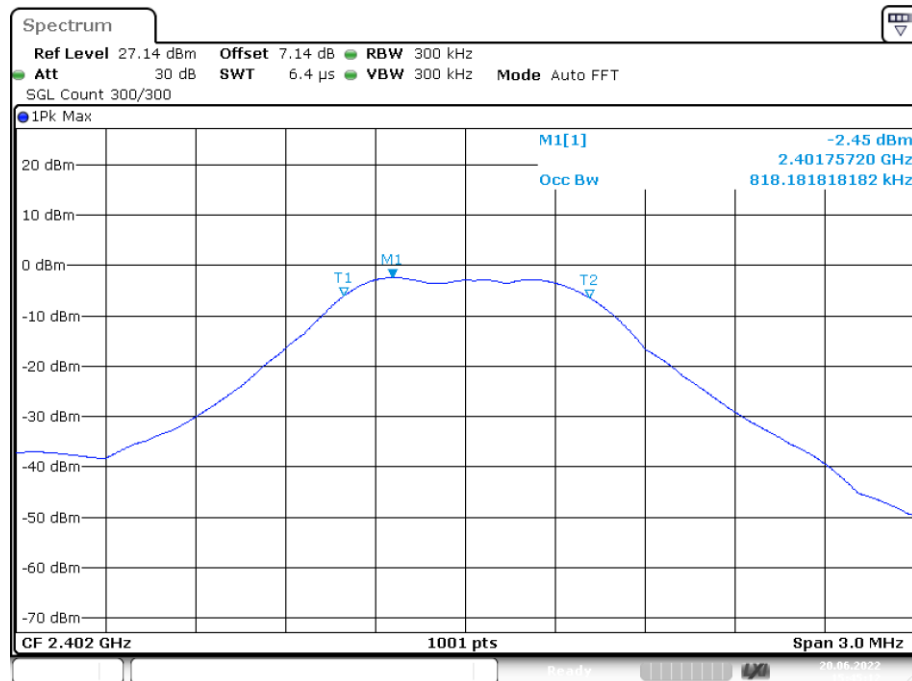
Test Date : June 20, 2022

Tester : Best

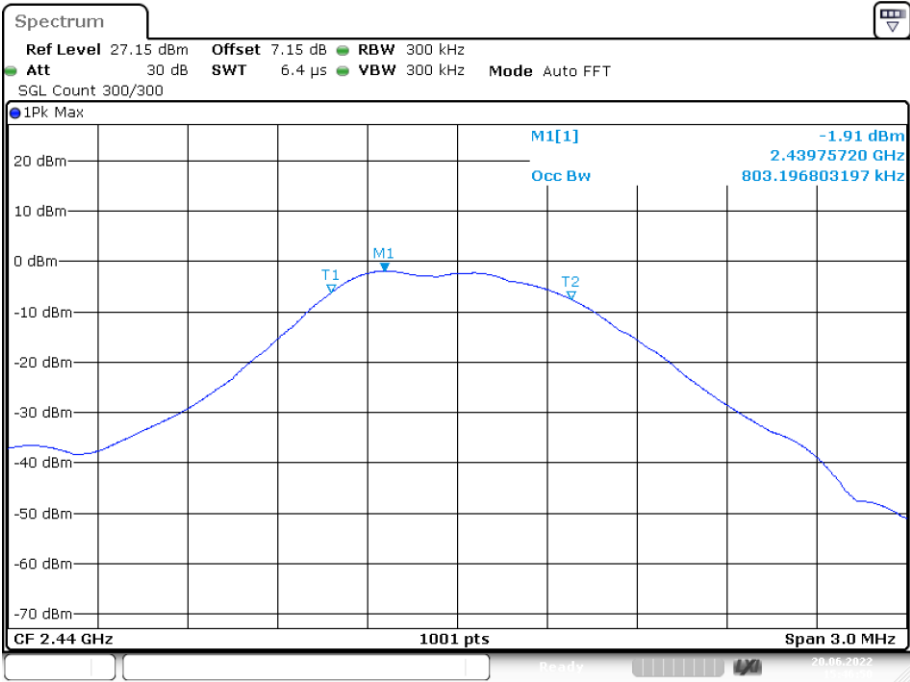
Modulation: GFSK

Channel number	Frequency(MHz)	Bandwidth(MHz)
1	2402	0.818
20	2440	0.803
40	2480	0.815

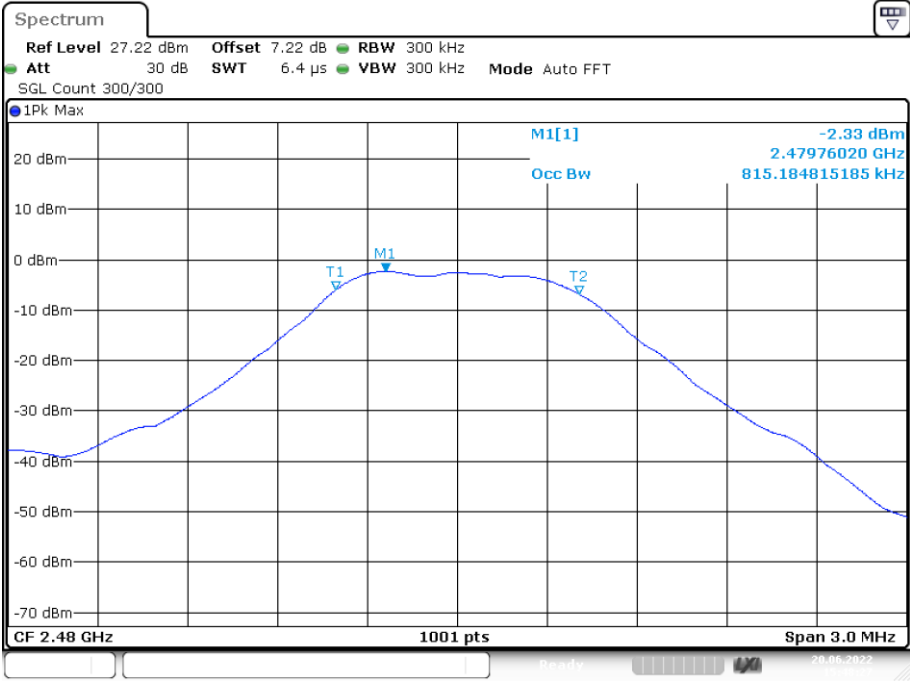
TEST PLOTS



Date: 20.JUN.2022 15:45:12



Date: 20.JUN.2022 15:46:50



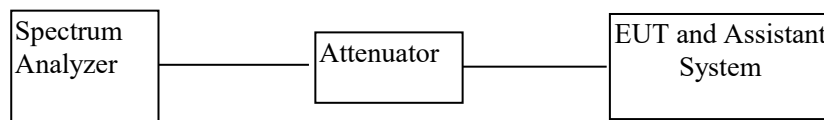
Date: 20.JUN.2022 15:48:27

12. LIMITATION OF COLLATERAL EMISSIONS OF RECEIVER

LIMIT

The limit on secondary emissions radiated from the receiving equipment within which the function of other radio equipment will not be impaired shall be, in terms of the power of a dummy antenna circuit that has the same electrical constant as the receiving antenna, 4 nW or less at a frequency below 1 GHz and 20 nW or less at a frequency of 1 GHz or higher as measured using the circuit.

TEST CONFIGURATION



Note :Connect the power meter directly to the output of the dummy load when it is necessary to measure the total power of EUT other than the direct sequence spread-spectrum system.

TEST PROCEDURE

1. Set the attenuation of the attenuator to under 20 dB because the subject for measurement is of low level.
2. Set the spectrum analyzer as follow:
 - Frequency sweep width: See 7.5 Measuring Operation Procedures
 - Resolution bandwidth: A value determined by the specified dynamic range and the sweep time. (e.g. 30 MHz for 12.75 GHz sweep width and 30 second sweep time.).
 - Video bandwidth: Approximately the same bandwidth as resolution bandwidth.
 - Y-axis scale: 10 dB/Div
 - Input level: 0 dB, if possible.
 - Sweep mode: Single sweep
 - Detection mode: Positive peak

Conditions of Equipment under Test

Set the EUT to receive the test frequency with forced continuous receiving control.

Measuring Operation Procedures

Sweep the spectrum analyzer from a low frequency to a frequency of 3 times if the carrier or over (e.g. 30 MHz to about 12.75 GHz) and measure the collateral radio emissions.

Test Result

Modulation: GFSK

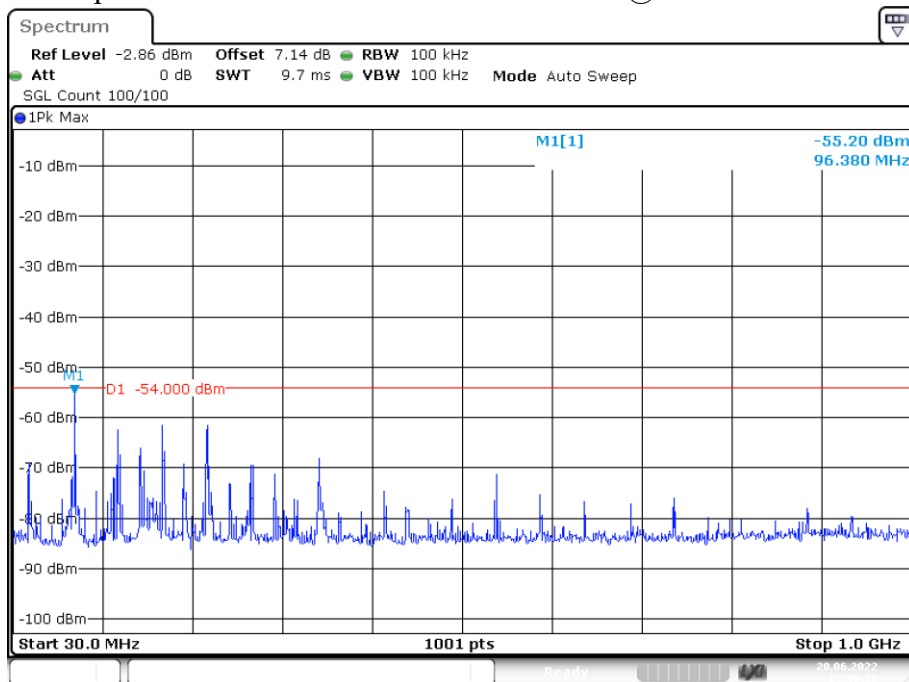
30MHz~1000MHz

Frequency(MHz)	Reading (MHz)	Reading (dBm)	Result (nW)
2402	950.335	-67.94	0.16069
2440	792.927	-67.31	0.18578
2480	916.598	-68.54	0.13996

TEST PLOTS

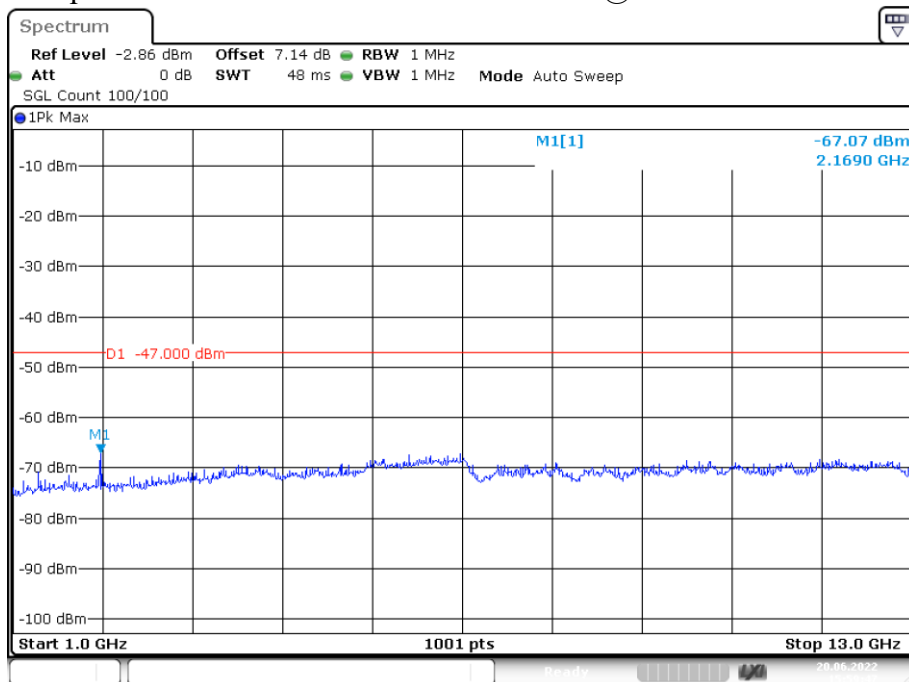
Frequency (MHz)	Antenna	Range (MHz)	Emission Frequency (MHz)	Max Value (dBm)	Limit (dBm)	Verdict
2402	Ant1	30-1000	96.38	-55.2	-54	Pass
2402	Ant1	1000-13000	2169	-67.07	-47	Pass
2440	Ant1	30-1000	96.38	-55.22	-54	Pass
2440	Ant1	1000-13000	2157	-66.36	-47	Pass
2480	Ant1	30-1000	96.38	-55.84	-54	Pass
2480	Ant1	1000-13000	2157	-66.66	-47	Pass

Rx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 30MHz-1000MHz



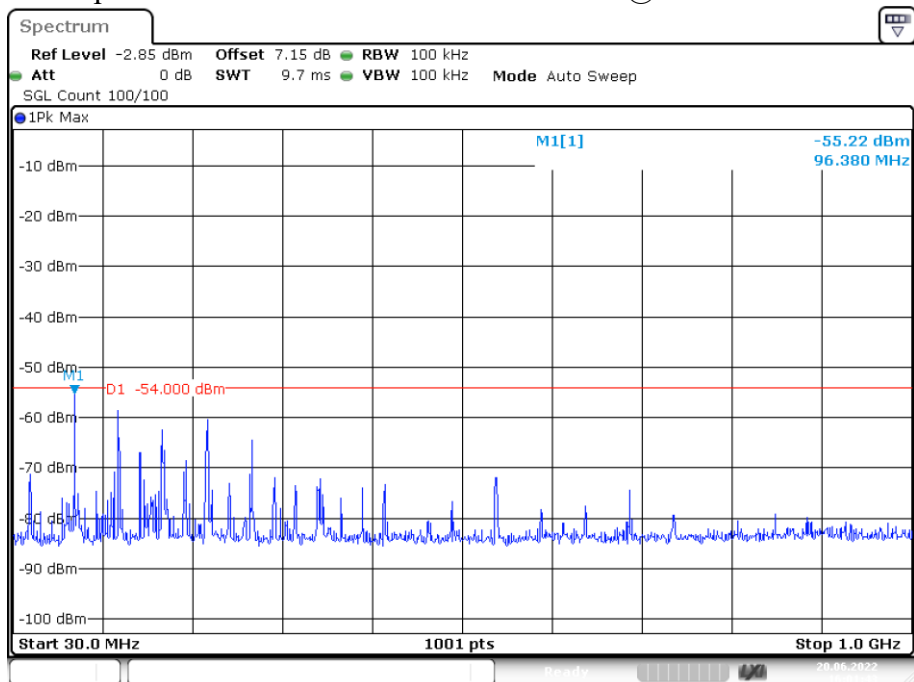
Date: 20.JUN.2022 15:59:19

Rx. Spurious NVNT BLE 1M 2402MHz Ant1 @ 1000MHz-13000MHz



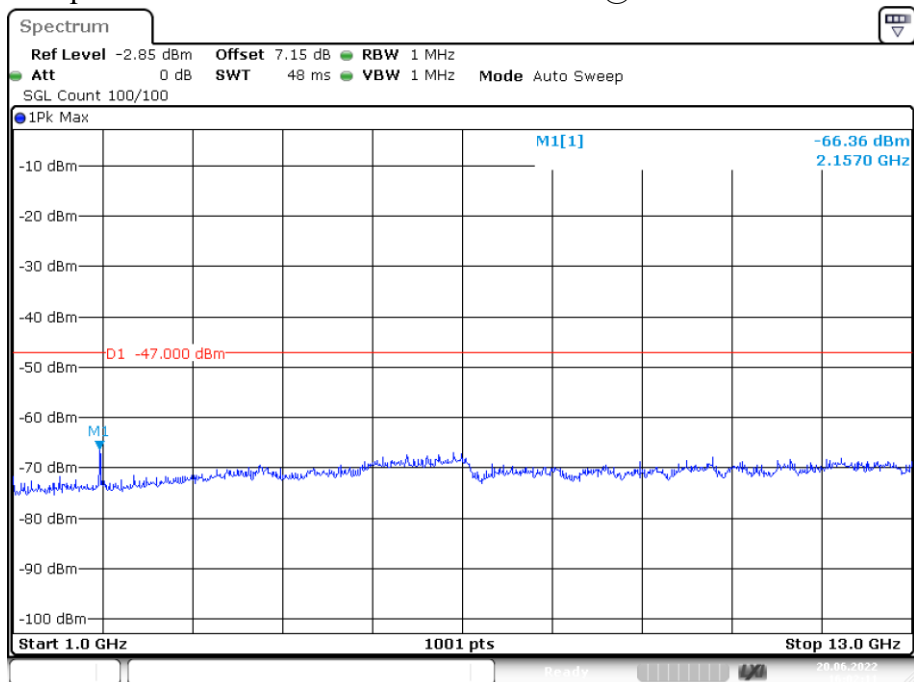
Date: 20.JUN.2022 15:59:46

Rx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 30MHz-1000MHz



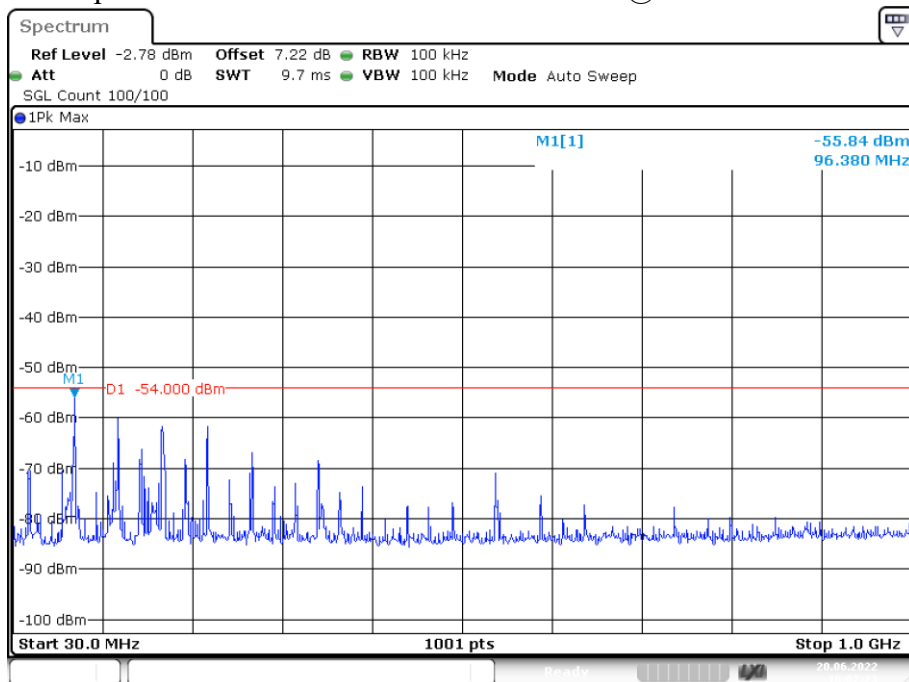
Date: 20.JUN.2022 16:01:43

Rx. Spurious NVNT BLE 1M 2440MHz Ant1 @ 1000MHz-13000MHz



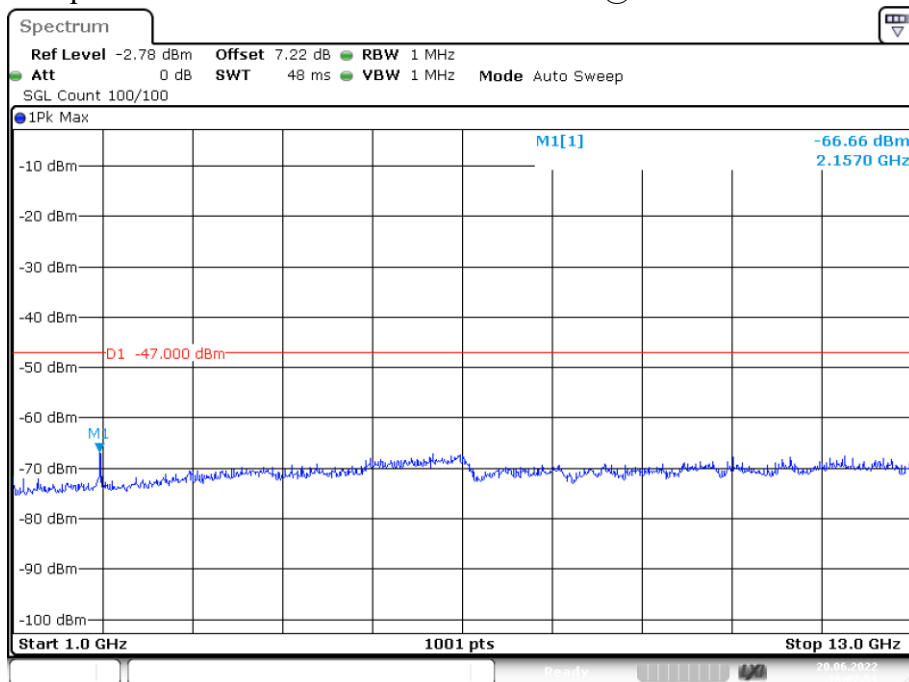
Date: 20.JUN.2022 16:02:11

Rx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 30MHz-1000MHz



Date: 20.JUN.2022 16:07:23

Rx. Spurious NVNT BLE 1M 2480MHz Ant1 @ 1000MHz-13000MHz



Date: 20.JUN.2022 16:07:51

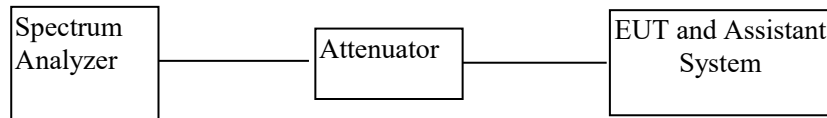
13. DWELL TIME

LIMIT

Tolerance: 0.4 sec or less

In addition, total sum of holding time at arbitrary frequency in the period obtained by multiplying 0.4 sec by spreading ratio ((spreading bandwidth) / (frequency equivalent to transmission rate of modulation signal)) shall be 0.4 sec or less.

TEST CONFIGURATION



Note :Connect the power meter directly to the output of the dummy load when it is necessary to measure the total power of EUT other than the direct sequence spread-spectrum system.

TEST PROCEDURE

(1) Set the spectrum analyzer according to below, and wait for a signal that hops into the hopping frequency.

Set the spectrum analyzer as follows;

Center frequency:	Hopping frequency to be measured
Frequency sweep width:	0 MHz
Resolution bandwidth:	Approximately 1MHz
Video bandwidth:	Approximately same as the resolution bandwidth
Y-axis scale:	10 dB / div.
Sweep time:	Hopping repetition period
Sweep mode:	Single sweep
Trigger condition:	Video trigger
Detection mode:	Positive peak

(2) Read the maximum holding time at the hopping frequency in a hopping repetition period from locus on the screen using a marker etc of the spectrum analyzer. Then confirm that the maximum holding time is 0.4 sec or less.

Conditions of Equipment under Test

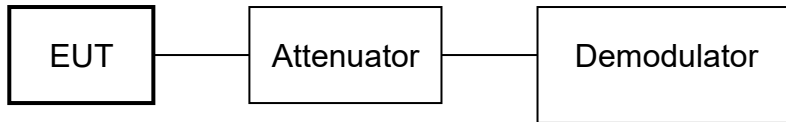
Hopping mode. Set the EUT to receive the test frequency with forced continuous receiving control.

Test Result

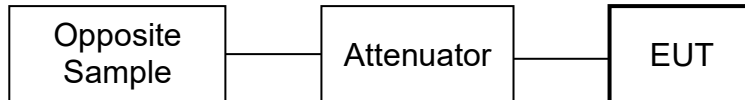
Not applicable.

14. RADIO INTERFACE PREVENTION FUNCTION

(1) In case identification code is transmitted



(2) In case identification code is received



(3) Measuring Equipment Conditions

The Demodulator shall demodulate the TX-signal transmitted by the EUT and be able to display the contents of the identification code.

The opposite sample shall be able to transmit TX-signal equivalent to the TX-signal transmitted by the EUT.

(4) Conditions of EUT

The EUT is set on the usual operating mode.

(5) Measurement Procedure

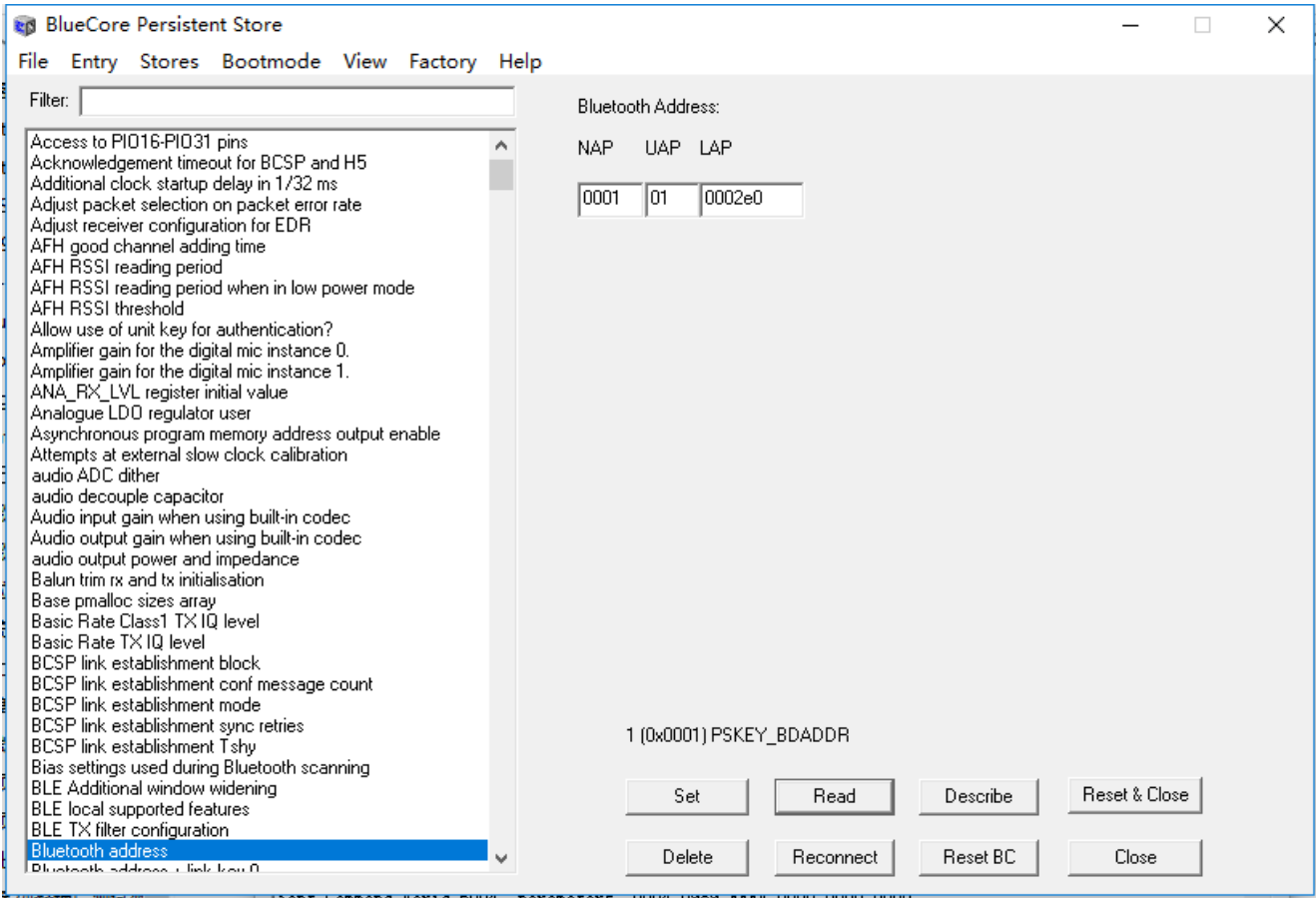
(1) In case the EUT possesses function to transmit identification code automatically
Predetermined identification code is transmitted by the EUT.
Verify the transmitted identification code.

(2) In case the EUT possesses function to receive identification code automatically
Predetermined identification code is transmitted by the opposite sample.
Verify the working of the normal communication.

Other code than the predetermined identification code is transmitted by the opposite sample.
Verify the EUT to stop transmitting or to display that the ID code is different.

Test Result

MAC IP: 00: 01: 01: 00: 02: E0



15.Photo of EUT

Please refer to the report: E01A25070211J01101.

-----The end of report-----