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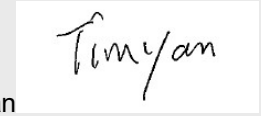
Test report No: 4398538.55

TEST REPORT
Radio Spectrum Matters (RF)

Identification of item tested	Bluetooth module
Trademark	TRIDONIC
Model and /or type reference	TR003BNANO
FCC ID	2AMXZ-TR003BNANO
Features	3.3 Vdc
Applicant´s name / address	Tridonic GmbH & Co KG. Faerbergasse 15 6851 Dornbirn, Austria
Test method requested, standard	FCC CFR Title 47 Part15 Subpart C Section 15.247; KDB558074 D01v05r02;
Verdict Summary	COMPLIANCE
Tested by (name & signature)	Jazz Liang 
Approved by (name & signature)	Tim Yan 
Date of issue	2024-03-15
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GENERAL CONDITIONS

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.
3. This document is only valid if complete; no partial reproduction can be made without previous written permission of DEKRA.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA.
5. This report will not be used for social proof function in China market.

UNCERTAINTY

For all measurements where guidance for the calculation of the instrumentation uncertainty of a measurement is specified in EN 55016-4-2 (CISPR 16-4-2), EN/IEC 61000-4 series or a product standard, the measurement instrumentation uncertainty has been calculated and applied in accordance with these standards.

Uncertainties have been calculated according to the DEKRA internal document. The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

ENVIRONMENTAL CONDITIONS

The climatic conditions during the tests are within the limits specified by the manufacturer for the operation of the EUT and the test equipment. The climatic conditions during the tests were within the following limits:

Ambient temperature	15 °C – 35 °C
Relative Humidity air	30% - 60%
Atmospheric pressure	86 kPa – 106 kPa

If explicitly required in the basic standard or applied product / product family standard the climatic values are recorded and documented separately in this test report.

POSSIBLE TEST CASE VERDICTS

Test case does not apply to test object	N/A
Test object does meet requirement	P (Pass) / PASS
Test object does not meet requirement	F (Fail) / FAIL
Not tested	N/T

DEFINITION OF SYMBOLS USED IN THIS TEST REPORT

☒ Indicates that the listed condition, standard or equipment is applicable for this report/test/EUT.				
☐ Indicates that the listed condition, standard or equipment is not applicable for this report/test/EUT.				
Decimal separator used in this report	☒	Comma (,)	☐	Point (.)

ABBREVIATIONS

For the purposes of the present document, the following abbreviations apply:

EUT	:	Equipment Under Test
QP	:	Quasi-Peak
CAV	:	CISPR Average
AV	:	Average
CDN	:	Coupling Decoupling Network
SAC	:	Semi-Anechoic Chamber
OATS	:	Open Area Test Site
BW	:	Bandwidth
AM	:	Amplitude Modulation
PM	:	Pulse Modulation
HCP	:	Horizontal Coupling Plane
VCP	:	Vertical Coupling Plane
U_N	:	Nominal voltage
*T*x	:	Transmitter
*R*x	:	Receiver
N/A	:	Not Applicable
N/M	:	Not Measured

DOCUMENT HISTORY

Report nr.	Date	Description
4398538.55	2024-03-15	First release.

REMARKS AND COMMENTS

The equipment under test (EUT) does meet the essential requirements of the stated standard(s)/test(s).

1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Description of the item .....:	Bluetooth module
Trademark.....:	TRIDONIC
Model / Type number.....:	TR003BNANO
FCC ID .....:	2AMXZ-TR003BNANO
Hardware .....:	Version 1.2
Software.....:	N/A
Firmware .....:	Version 1.0
Ratings.....:	3.3 Vdc
Manufacturer.....:	Tridonic GmbH & Co KG. Faerbergasse 15 6851 Dornbirn, Austria
Factory .....:	Shenzhen FangPeng Technology Co.,Ltd. B4 Building, Haosan No.1 Industry Park, Shajing Town, Baoan District, Shenzhen, Guangdong, China.

Operating frequency range(s).....:	2402 MHz – 2480 MHz
Type of Modulation .....:	GFSK
Maximum RF output power.....:	7.5 dBm
Antenna type.....:	External Antenna
Operating Temperature Range.....:	-40 – 105 ℃
BT version.....:	Bluetooth 5.1BLE
Antenna gain.....:	2.5 dbi

			Reference poles				
Rated power supply .....:	Voltage and Frequency		L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3.3V					
	☐	Battery:					
Mounting position.....:	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Installed on the circuit board					

Intended use of the Equipment Under Test (EUT)
The apparatus as supplied for the test is Bluetooth module which designed to integrated into LED driver, different lighting control applications sensors etc. According to customer description, the EUT is Wireless modules designed to be integrated into LED drivers, different lighting control applications, sensors etc. Hence,model TR003BNANO were chosen for full test.

Copy of marking plate:
No provide.

1.2 Test data

Test Location	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch Block 5, No.3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China FCC Designation Number: CN1324;
Date of receipt of test item	2023-02-02
Date (s) of performance of tests	2023-02-02 to 2023-03-08
Test sample	Normal sample: TR003BNANO(Lab no.4398538-3), RF conducted sample: TR003BNANO(Lab no.4398538-4), RF radiated sample: TR003BNANO(Lab no.4398538-3)

1.3 The environment(s) in which the EUT is intended to be used

The equipment under test (EUT) is intended to be used in the following environment(s):

☒	Residential (domestic) environment.
☒	Commercial and light-industrial environment.
☒	Industrial environment.

1.4 Channel List

The radio module (Bluetooth) operating channels are:

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

2 DESCRIPTION OF TEST SETUP

2.1 Operating mode(s) used for tests

During the tests the following operating mode(s) has(have) been used.

Operating mode	Operating mode description	Used for methos	
		Conducted	Radiated
1	Transmitting at 1 Mbit/s,	☒	☒
2			
3			
4			
Supplemental information: ---			

2.2 Support / Auxiliary equipment / unit / software for the EUT

The EUT has been tested with the following auxiliary equipment / unit / software:

Auxiliary equipment / unit / software	Type / Version	Manufacturer	Supplied by
Laptop	Latitude 5488	DELL	DEKRA
TELINK BDT(Burning and Debugging tool)	-	-	Client
nRFgo Studio (soft ware)	V1.21.2.10	-	Client
Supplemental information: ---			

2.3 Test Configuration / Block diagram used for tests

Refer to Annex 3.

2.4 Measurement procedure

The EUT was controlled by a serial PCB(TELINK BDT) which provided by manufacturer which connected to laptop through the com port. After connected, run the software “nRFgo Studio” supplied by manufacturer to control the EUT work in required test mode as below table.

RF Mode	Set_channel(MHz)	Set_channel in software
BLE_1M	2402	0
	2440	19
	2480	39

3 VERDICT SUMMARY SECTION

This chapter presents an overview of standards and results. Refer to the next chapters for details of measured test results and applied test levels.

3.1 Standards

Standard	Year	Description
FCC CFR Title 47 Part 15 Subpart C Section 15.247	2022	Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.
KDB 558074 D01 v05r02	2019	Guidance for performing compliance measurements on Digital Transmission System (DTS) operating under section 15.247
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

3.2 Deviation(s) from the Standard(s) / Test Specification(s)

The following deviation(s) was / were made from the published requirements of the listed standards: N/A.

3.3 Overview of results

FCC measurement			
Requirement – Test case	**Basic standard(s)**	**Verdict**	**Remark**
AC Power Line Conducted Emission	FCC 15.207	N/A	See 1)
Emissions in non-restricted frequency bands	FCC 15.247(d), FCC 15.209	PASS	---
Emissions in restricted frequency bands	FCC 15.247(b)(3)	PASS	---
Duty cycle	ANSI C63.10:2013	PASS	---
Band Edge	FCC 15.247(d)	PASS	---
Fundamental emission output power	FCC 15.247(d), FCC 15.209	PASS	---
DTS Bandwidth	FCC 15.247(a)(2)	PASS	---
Power Spectral Density	FCC 15.247(e)	PASS	---
Antenna Requirement	FCC 15.203	PASS	---
Supplementary information:			
1) The EUT is BLE module which is built-in used.			

The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to calculate the uncertainty associated with the measurement result.

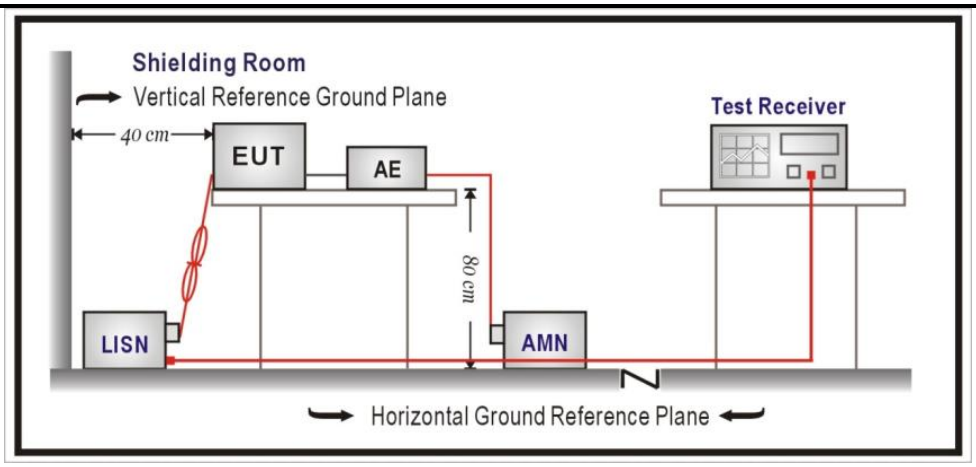
4 TRANSMITTER TEST RESULTS

4.1 AC Power Line Conducted Emission	VERDICT: N/A

Limits

FCC Part 15 Subpart C Paragraph 15.207				
Frequency range [MHz]	Limit: QP [dB(μV)[1)]]	Limit: AV [dB(μV) [1)]]	IF BW	Detector(s)
0,15 - 0,50	66 – 56 [2)]	56 - 46 [2)]	9 KHz	QP, AV
0,50 - 5,0	56	46	9 KHz	QP, AV
5,0 - 30	60	50	9 KHz	QP, AV
[1)] At the transition frequency, the lower limit applies. [2)] The limit decreases linearly with the logarithm of the frequency.				

Test Configuration



Performed measurements

~~Port under test~~			~~Terminal~~							
☒	~~AC mains input power~~		☒	~~N~~	☒	~~L1~~	☐	~~L2~~	☐	~~L3~~
☐	~~DC input power~~		☐	~~Positive (+)~~			☐	~~Negative (-)~~		
~~Test method applied~~		☒	~~Artificial mains network~~							
		☐	~~Voltage probe~~							
~~Test setup~~		☒	~~Table top~~		☐	~~Artificial hand applied~~				
		☐	~~Floor standing~~		☐	~~Other:~~				
		~~Refer to the Annex 2 for test setup photo(s).~~								
~~Operating mode(s) used~~		~~Mode 1~~								
~~Envirment condition (temperature; humidiry)~~		~~23,0 °C; 45,0 %~~								
~~Remark~~		~~---~~								

4.2 Emissions in non-restricted frequency bands — VERDICT: PASS

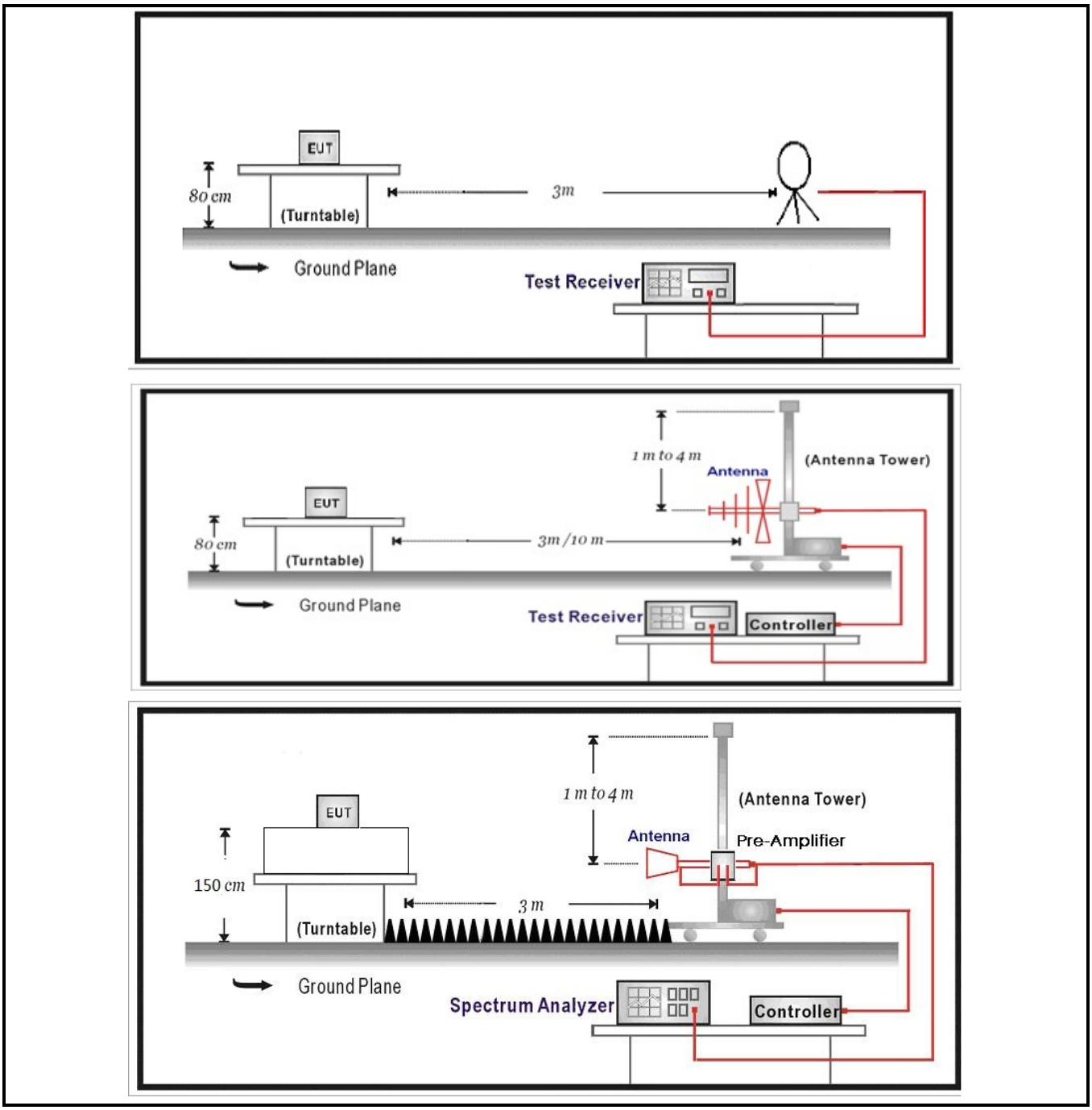
Emissions Limit 15.209(a)

Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30(Note 1)
1.705 - 30	30	29.5	30(Note 1)
30 - 88	100	40	3(Note 2)
88 - 216	150	43.5	3(Note 2)
216 - 960	200	46	3(Note 2)
Above 960	500	54	3(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

Test Configuration



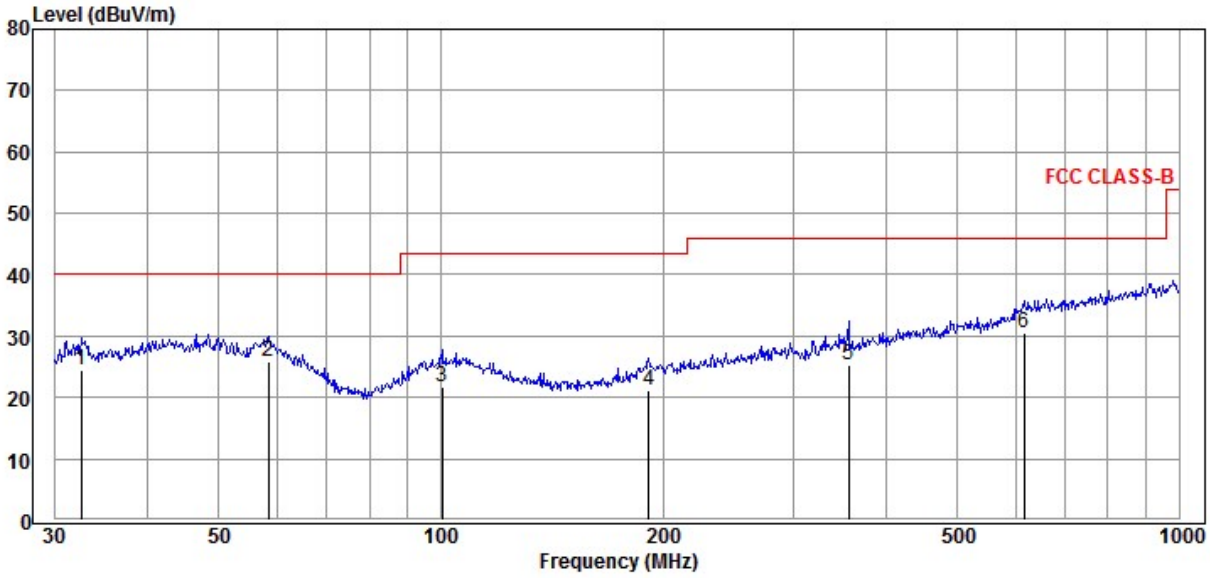
Performed measurements

Port under test	Enclosure port	
Test method applied	☐	Conducted measurement
	☒	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	1)The test frequency range, 9kHz~30MHz, 18GHz~26GHz, both of the worst case are at least 20dB below the limits, therefore no data appear in the report. 2)The EUT are tested in three orientations. The record is the worst orientation which refer to the Annex 3 for test setup photo(s).	

Results of 30 – 1000 MHz

Model	TR003BNANO
Operation Mode	Mode 1 @2402MHz (worst case)
Test voltage	3.3 Vdc

Results
Horizontal



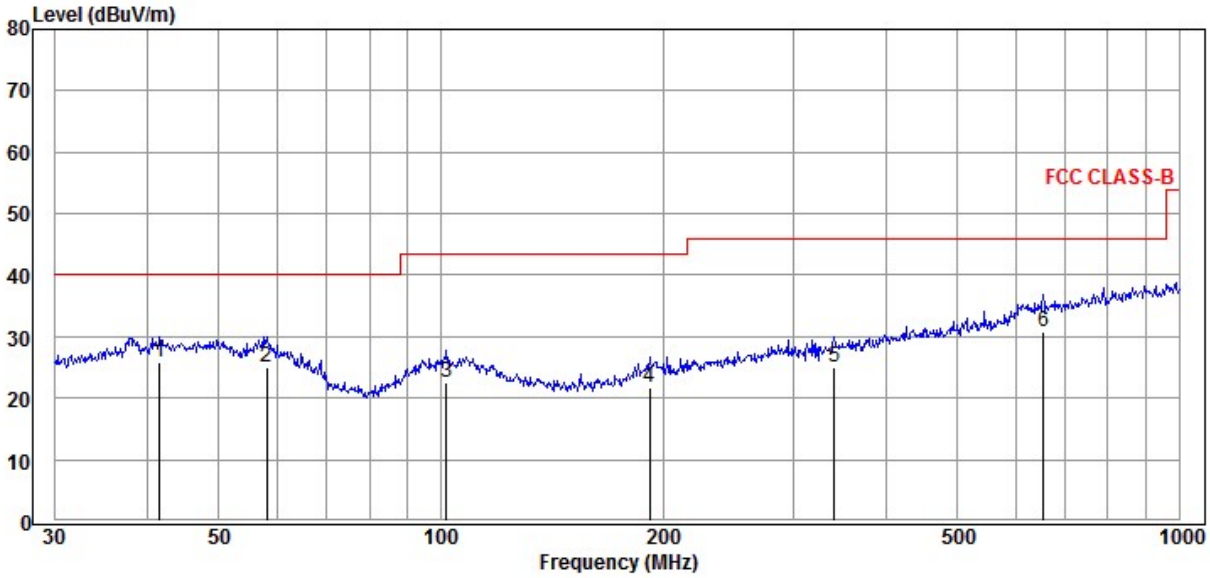
Freq (MHz)	Reading (dBuV)	C.F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin=limit-result (dB)
32.52	11.54	13.02	24.56	40.00	15.44
58.41	10.61	15.24	25.85	40.00	14.15
100.23	9.10	12.72	21.82	43.50	21.68
191.07	9.53	11.73	21.26	43.50	22.24
356.68	9.88	15.45	25.33	46.00	20.67
616.37	10.72	19.93	30.65	46.00	15.35

Remarks:

1) C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
2) Result = Reading + C.F (Correction Factor)

No other significant emissions were measured at the frequency range of interest employing the QP detectors.

Vertical



Freq (MHz)	Reading (dBuV)	C.F (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin=limit-result (dB)
41.57	10.43	15.45	25.88	40.00	14.12
58.00	9.48	15.50	24.98	40.00	15.02
101.64	9.90	12.78	22.68	43.50	20.82
191.75	9.88	11.90	21.78	43.50	21.72
340.78	9.75	15.24	24.99	46.00	21.01
654.23	10.89	20.00	30.89	46.00	15.11

Remarks:

1) C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain
2) Result = Reading + C.F (Correction Factor)

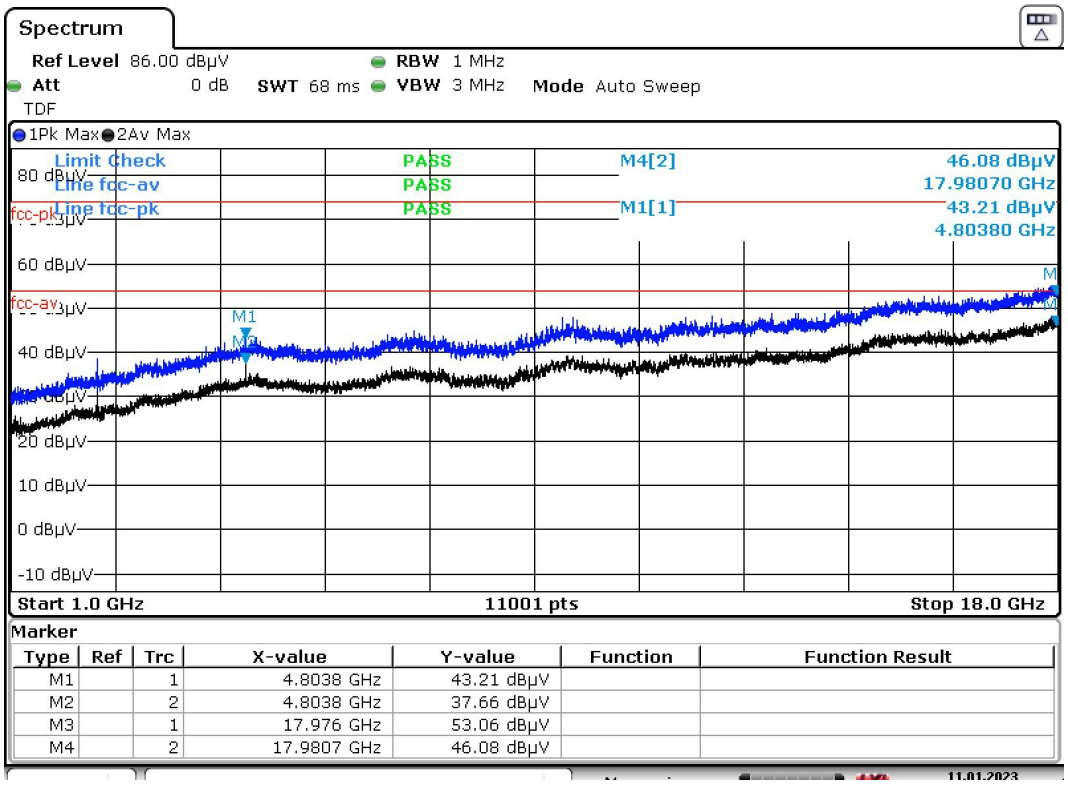
No other significant emissions were measured at the frequency range of interest employing the QP detectors.

Results of 1 – 18 GHz

Model	TR003BNANO
Operation Mode (worst case)	Mode 1 @2402 MHz
Test voltage	3.3 Vdc

Results

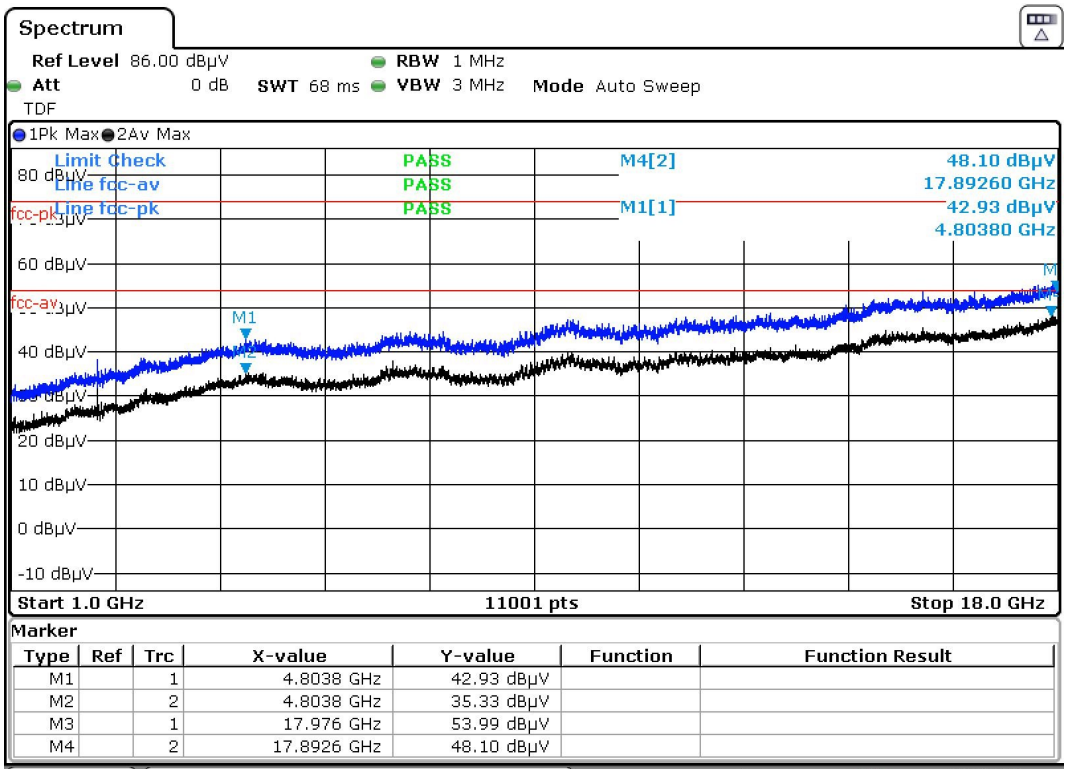
Horizontal



Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Vertical



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	4.8038 GHz	42.93 dBµV		
M2		2	4.8038 GHz	35.33 dBµV		
M3		1	17.976 GHz	53.99 dBµV		
M4		2	17.8926 GHz	48.10 dBµV		

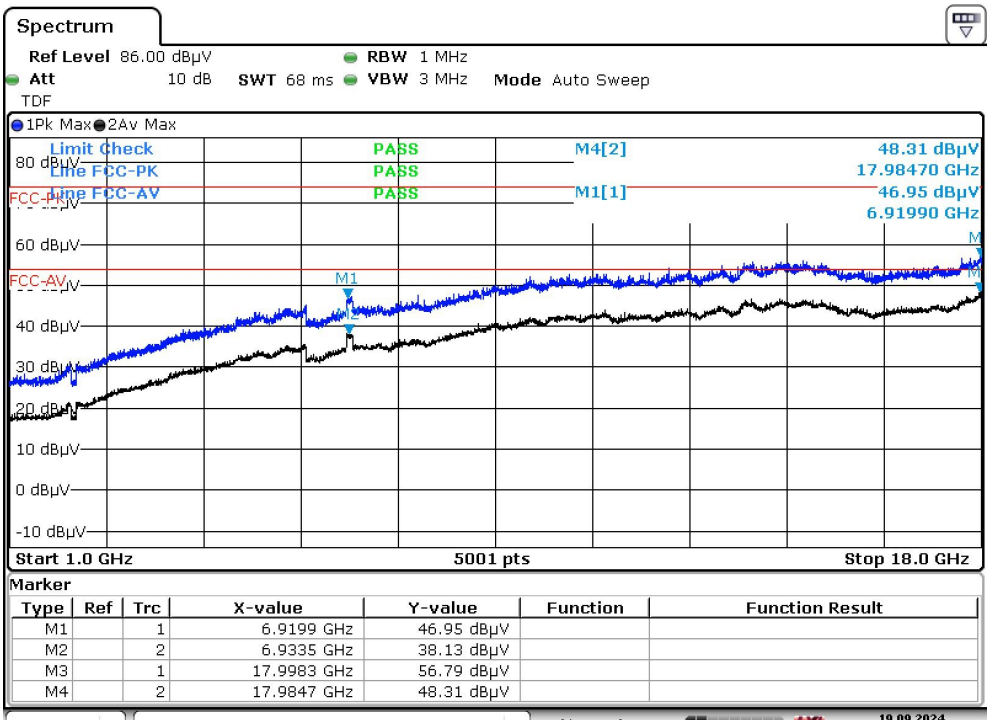
Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Model	TR003BNANO
Operation Mode (worst case)	Mode 1 @2440 MHz
Test voltage	3.3 Vdc

Results

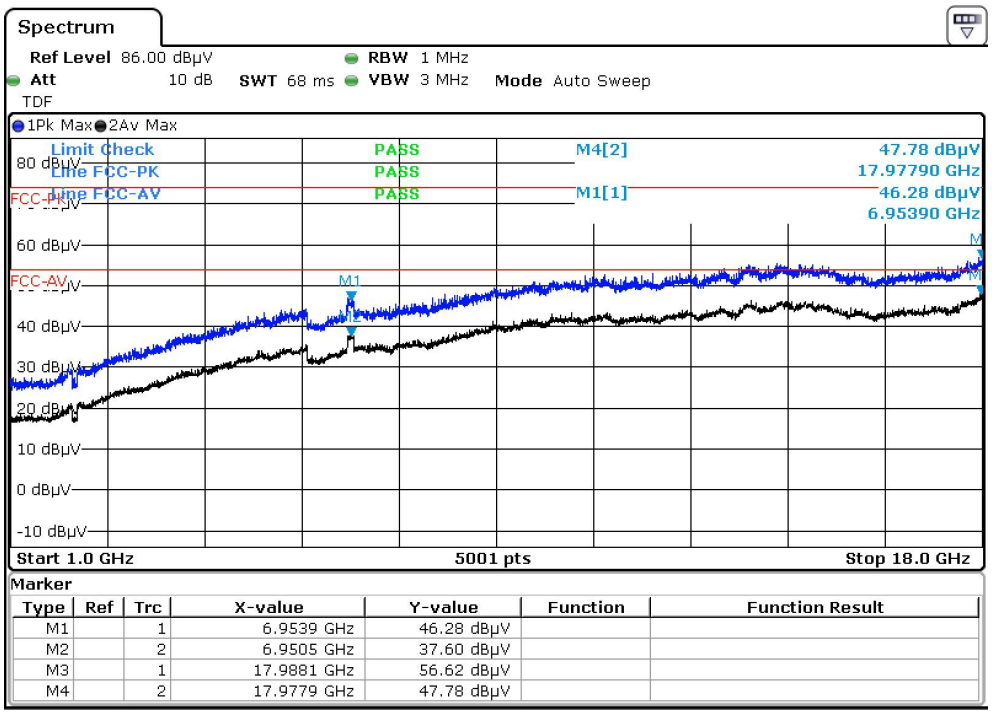
Horizontal



Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Vertical



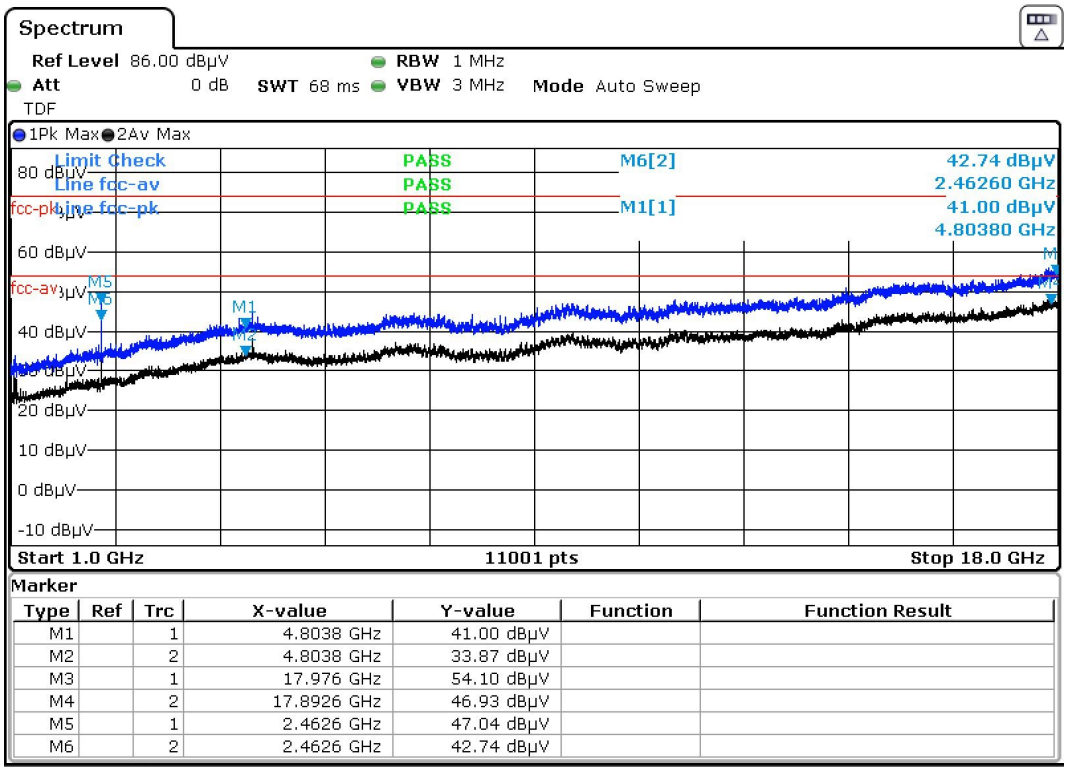
Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Model	TR003BNANO
Operation Mode (worst case)	Mode 1 @2480 MHz
Test voltage	3.3 Vdc

Results

Horizontal



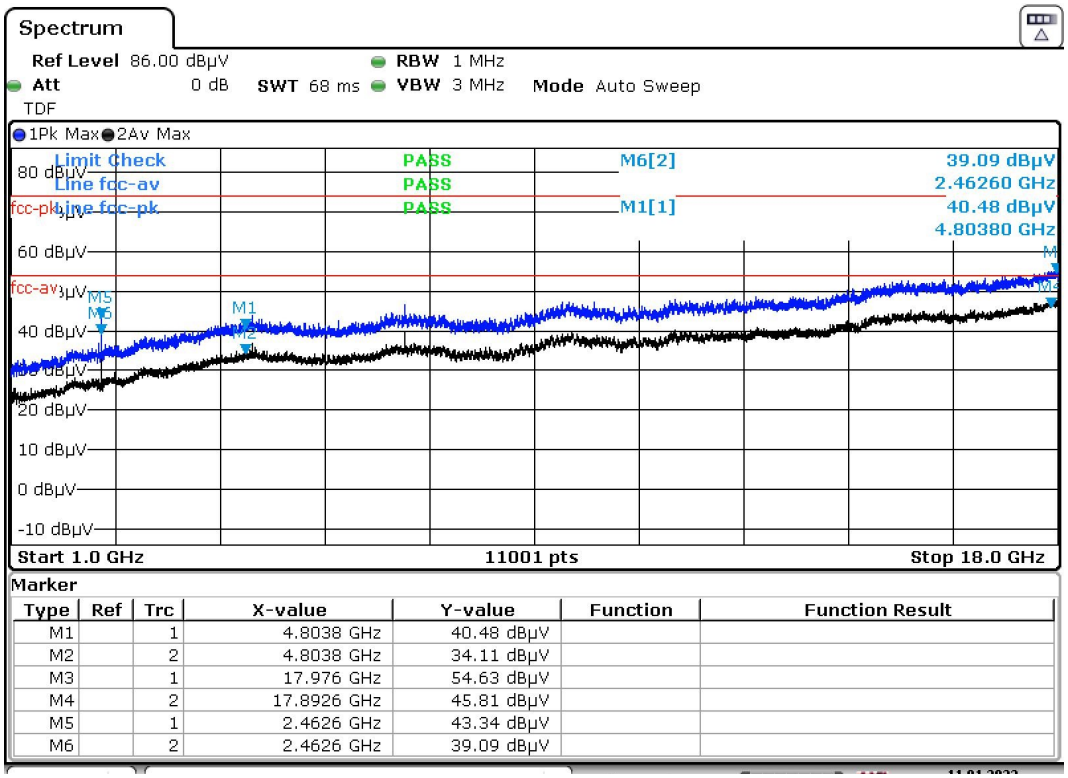
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	4.8038 GHz	41.00 dBµV		
M2		2	4.8038 GHz	33.87 dBµV		
M3		1	17.976 GHz	54.10 dBµV		
M4		2	17.8926 GHz	46.93 dBµV		
M5		1	2.4626 GHz	47.04 dBµV		
M6		2	2.4626 GHz	42.74 dBµV		

Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Vertical



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	4.8038 GHz	40.48 dBµV		
M2		2	4.8038 GHz	34.11 dBµV		
M3		1	17.976 GHz	54.63 dBµV		
M4		2	17.8926 GHz	45.81 dBµV		
M5		1	2.4626 GHz	43.34 dBµV		
M6		2	2.4626 GHz	39.09 dBµV		

Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

4.3 Emissions in restricted frequency bands	VERDICT: PASS

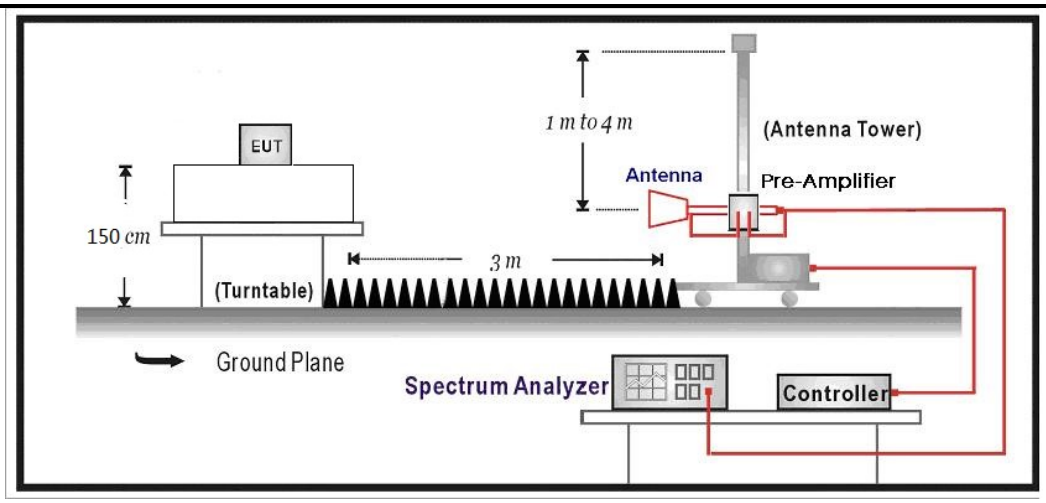
Restricted Bands of operation of FCC			
Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 – 0.110	16.42 – 16.423	399.9 – 410	4.5 – 5.15
0.495 – 0.505	16.69475 –16.69525	608 – 614	5.35 – 5.46
2.1735 – 2.1905	16.80425 – 16.80475	960 – 1240	7.25 – 7.75
4.125 – 4.128	25.5 – 25.67	1300 – 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
8.81425 – 8.81475	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	
13.36 – 13.41			
Restricted Bands of operation for IC			
0.090 - 0.110	13.36 - 13.41	960 - 1427	9.0 - 9.2
0.495 - 0.505	16.42 - 16.423	1435 - 1626.5	9.3 - 9.5
2.1735 - 2.1905	16.69475 - 16.69525	1645.5 - 1646.5	10.6 - 12.7
3.020 - 3.026	16.80425 - 16.80475	1660 - 1710	13.25 - 13.4
4.125 - 4.128	25.5 - 25.67	1718.8 - 1722.2	14.47 - 14.5
4.17725 - 4.17775	37.5 - 38.25	2200 - 2300	15.35 - 16.2
4.20725 - 4.20775	73 - 74.6	2310 - 2390	17.7 - 21.4
5.677 - 5.683	74.8 - 75.2	2483.5 - 2500	22.01 - 23.12
6.215 - 6.218	108 - 138	2655 - 2900	23.6 - 24.0
6.26775 - 6.26825	149.9 - 150.05	3260 - 3267	31.2 - 31.8
6.31175 - 6.31225	156.52475 - 156.52525	3332 - 3339	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3345.8 - 3358	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3500 - 4400	
8.37625 - 8.38675	167.72 - 173.2	4500 - 5150	
8.41425 - 8.41475	240 - 285	5350 - 5460	
12.29 - 12.293	322 - 335.4	7250 - 7750	
12.51975 - 12.52025	399.9 - 410	8025 - 8500	
12.57675 - 12.57725	608 - 614	--	

Restricted Band Emissions Limit			
Frequency (MHz)	Field strength (μV/m)	Field strength (dBμV/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 – 13.8	300(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30(Note 1)
1.705 - 30	30	29.5	30(Note 1)
30 - 88	100	40	3(Note 2)
88 - 216	150	43.5	3(Note 2)
216 - 960	200	46	3(Note 2)
Above 960	500	54	3(Note 2)

Note 1: At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations; however, an attempt should be made to avoid making measurements in the near field. Pending the development of an appropriate measurement procedure for measurements performed below 30 MHz, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade).

Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated that the signal levels needed to be measured at the distance employed can be detected by the measurement equipment. Measurements shall not be performed at a distance greater than 30 meters unless it can be further demonstrated that measurements at a distance of 30 meters or less are impractical. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements).

Test Configuration



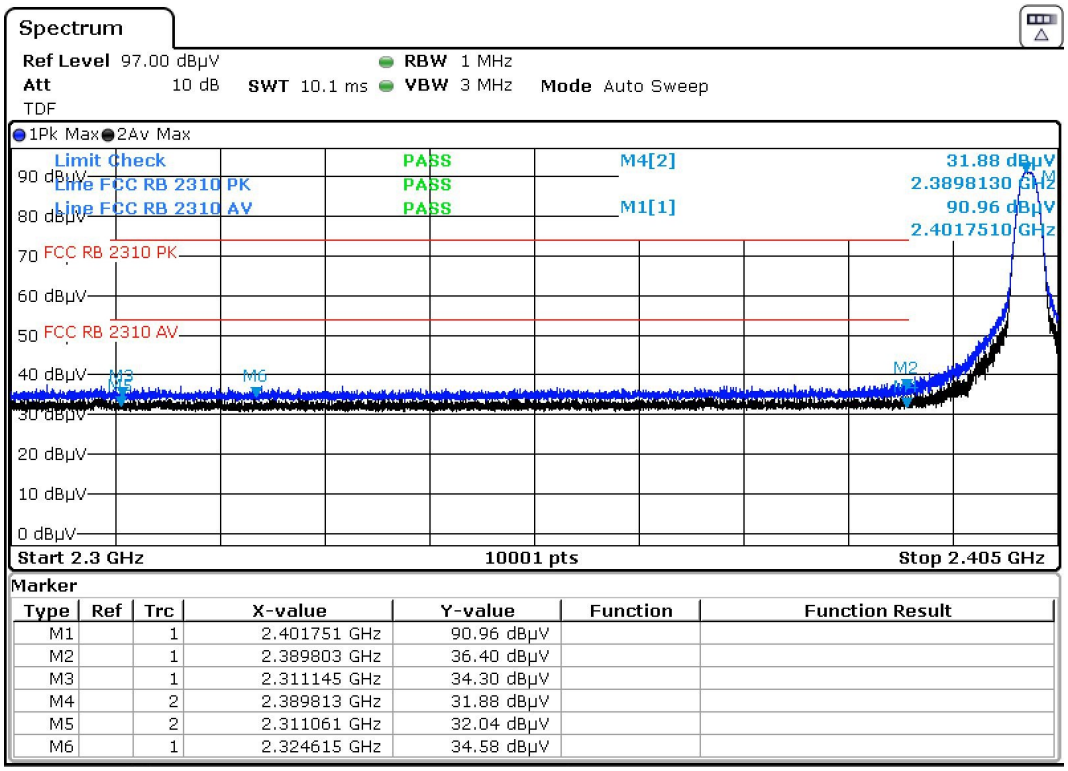
Performed measurements

Port under test	Enclosure port	
Test method applied	☐	Conducted measurement
	☒	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

Model	TR003BNANO
Operation Mode (worst case)	Mode 1 @2402 MHz
Test voltage	3.3 Vdc

Results

Horizontal



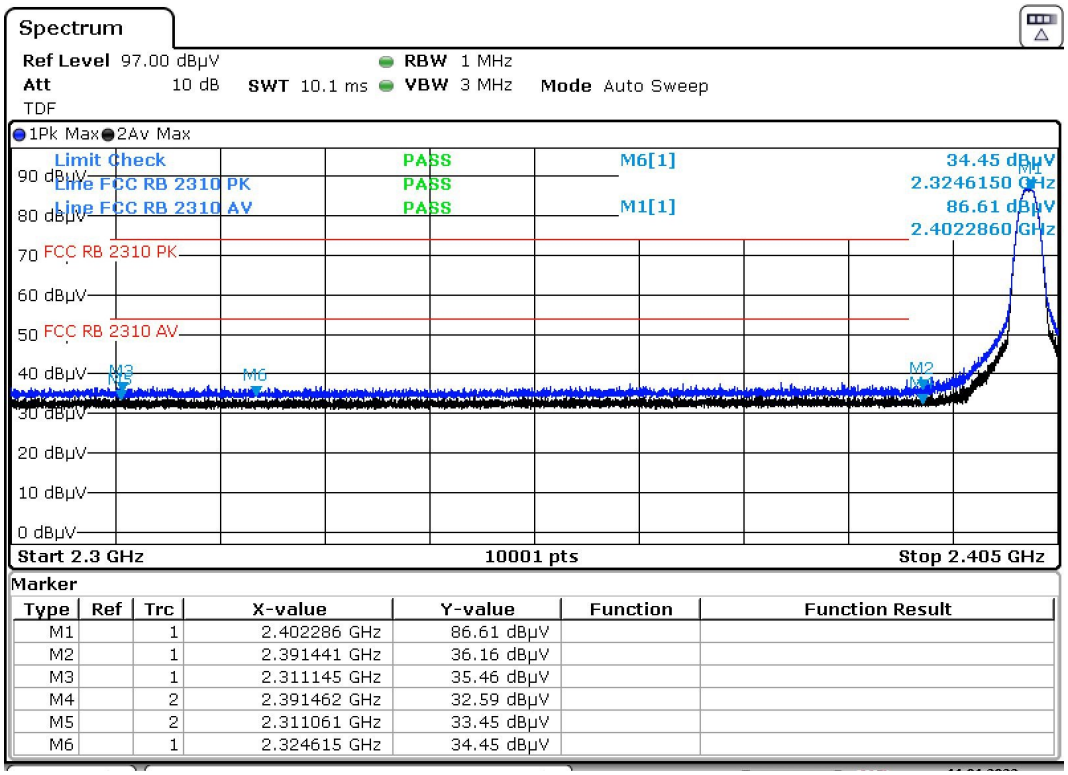
Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.401751 GHz	90.96 dBµV		
M2		1	2.389803 GHz	36.40 dBµV		
M3		1	2.311145 GHz	34.30 dBµV		
M4		2	2.389813 GHz	31.88 dBµV		
M5		2	2.311061 GHz	32.04 dBµV		
M6		1	2.324615 GHz	34.58 dBµV		

Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Vertical



Marker

Type	Ref	Trc	X-value	Y-value	Function	Function Result
M1		1	2.402286 GHz	86.61 dBµV		
M2		1	2.391441 GHz	36.16 dBµV		
M3		1	2.311145 GHz	35.46 dBµV		
M4		2	2.391462 GHz	32.59 dBµV		
M5		2	2.311061 GHz	33.45 dBµV		
M6		1	2.324615 GHz	34.45 dBµV		

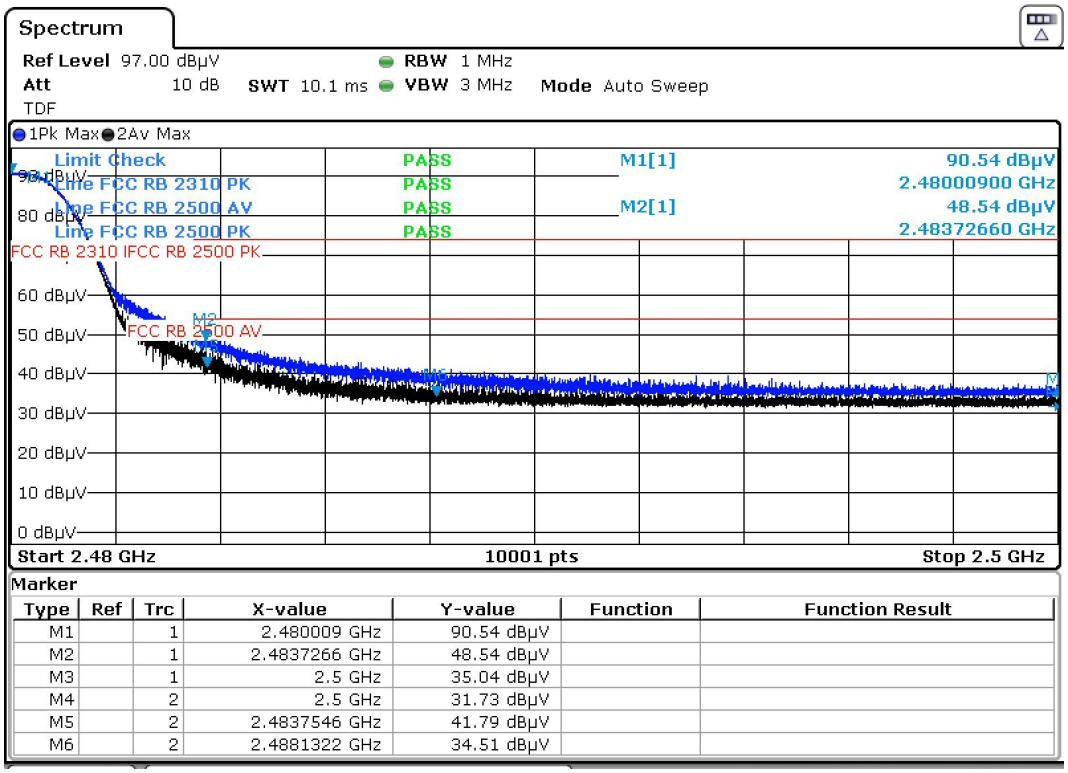
Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Model	TR003BNANO
Operation Mode (worst case)	Mode 1 @2480 MHz
Test voltage	3.3 Vdc

Results

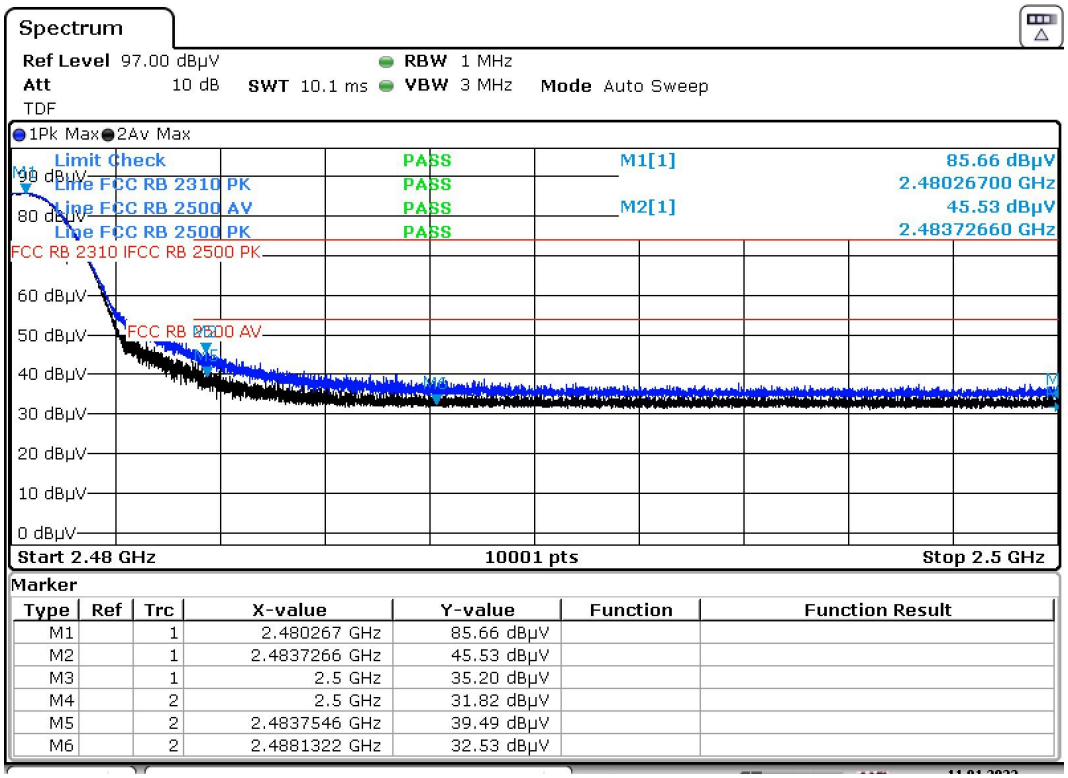
Horizontal



Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

Vertical



Remarks: Y-Value = received value + Correction Factor (Antenna factor + Cable loss - Preamp gain)

No other significant emissions were measured at the frequency range of interest employing the PK and AV detectors.

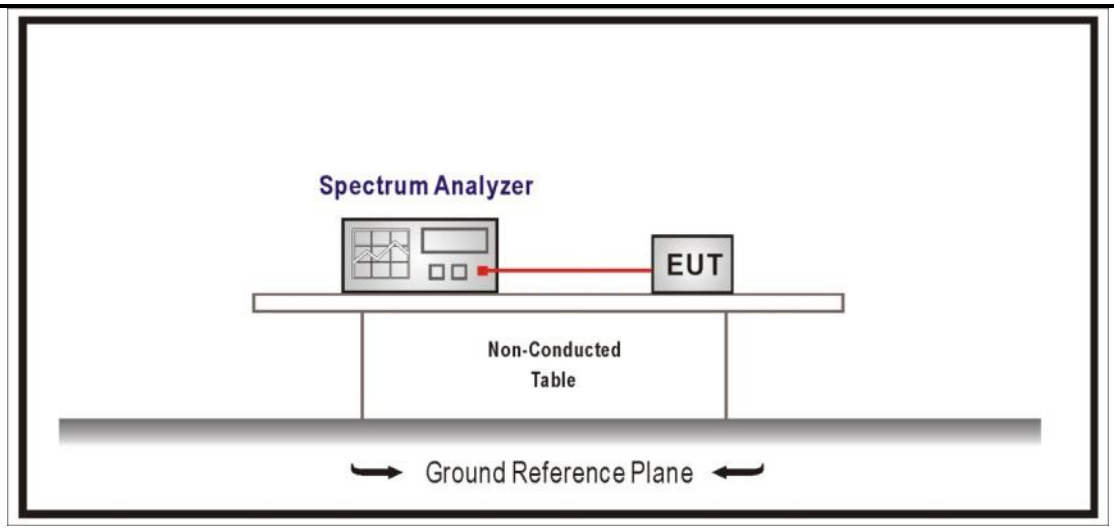
4.4 Band Edge — VERDICT: PASS

Standard	FCC Part 15 Subpart C Paragraph 15.247(d)
RF Output power (Detection methods)	Limit(dB)
RF Output power(Average detector)	30dBc(Note1)
RF Output power(PK detector)	20dBc(Note2)

Note 1: If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at by LEast 30 dB relative to the maximum in-band peak PSD by LEvel in 100 kHz (i.e., 30 dBc).

Note 2: If the maximum peak conducted output power procedure was used, then the peak output power measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at by least 20 dB relative to the maximum in-band peak PSD by level in 100 kHz (i.e., 20 dBc).

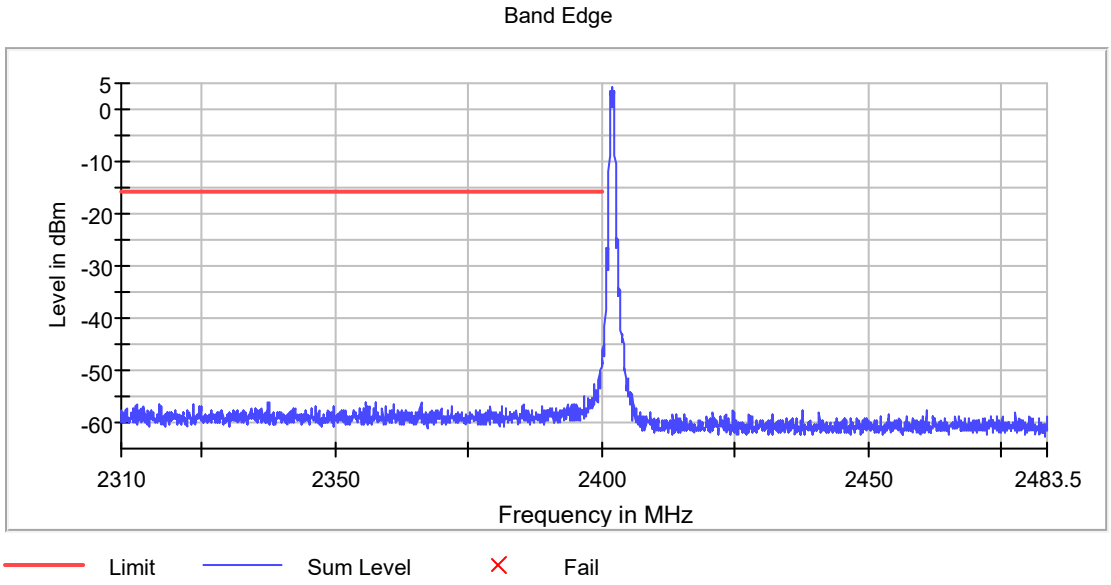
Test Configuration



Performed measurements

Port under test	Antenna port	
Test method applied	☒	Conducted measurement
	☐	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

Results of mode 1 @2402 MHz



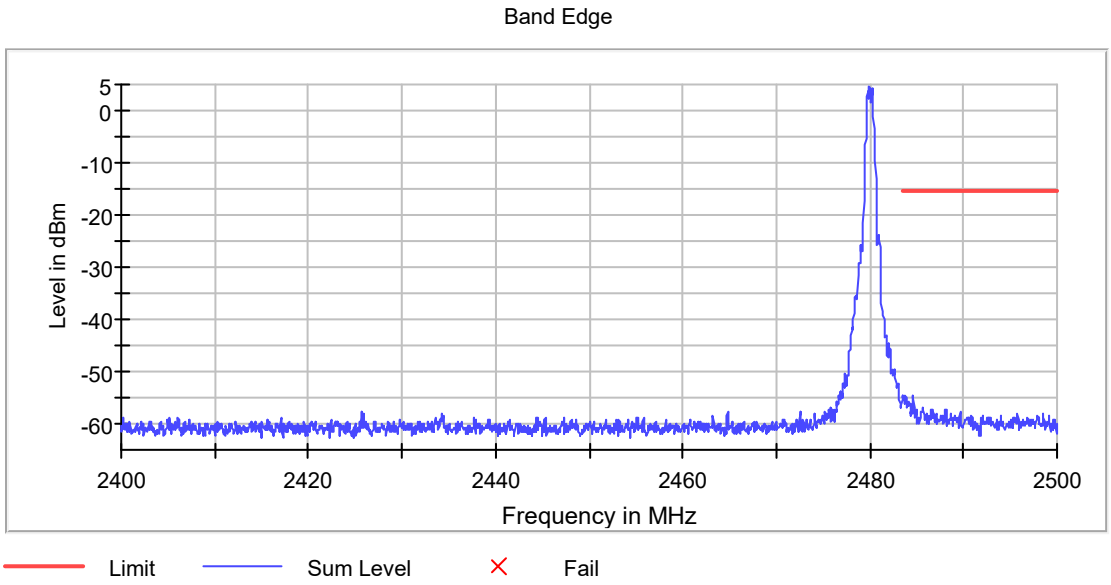
Inband Peak

Frequency (MHz)	Level (dBm)
2402.0000	4.1

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2399.975000	-49.4	33.4	-15.9	PASS
2399.925000	-49.9	33.9	-15.9	PASS
2399.575000	-50.3	34.4	-15.9	PASS
2399.875000	-50.5	34.6	-15.9	PASS
2399.825000	-51.5	35.5	-15.9	PASS
2399.525000	-51.7	35.8	-15.9	PASS
2399.475000	-51.9	36.0	-15.9	PASS
2399.425000	-51.9	36.0	-15.9	PASS
2399.625000	-52.1	36.2	-15.9	PASS
2399.725000	-52.3	36.3	-15.9	PASS
2399.775000	-52.4	36.4	-15.9	PASS
2398.625000	-52.7	36.8	-15.9	PASS
2398.575000	-53.1	37.2	-15.9	PASS
2399.675000	-53.5	37.6	-15.9	PASS
2398.775000	-53.7	37.8	-15.9	PASS

Results of mode 1 @2480 MHz



Inband Peak

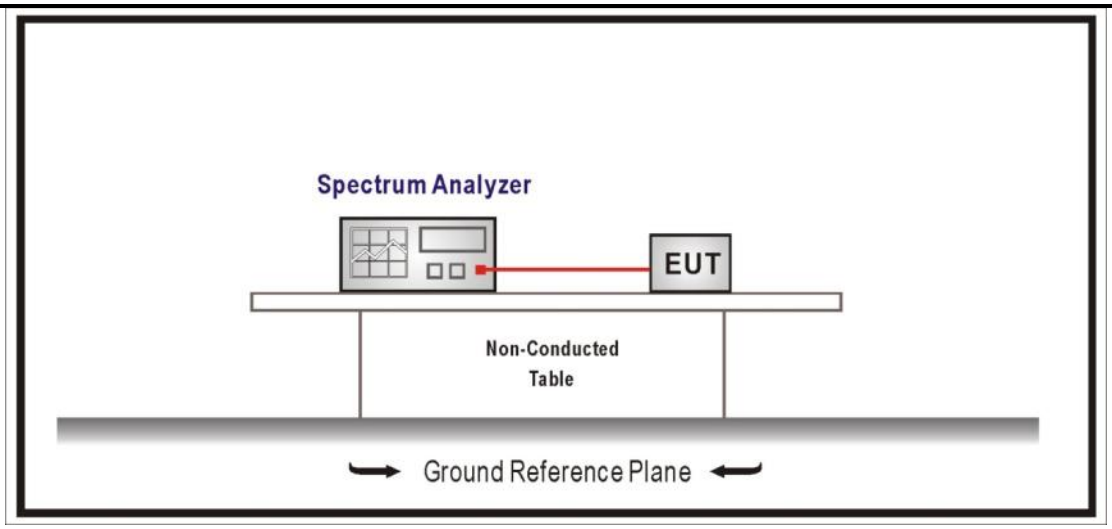
Frequency (MHz)	Level (dBm)
2480.0000	4.5

Measurements

Frequency (MHz)	Level (dBm)	Margin (dB)	Limit (dBm)	Result
2484.625000	-54.4	39.0	-15.5	PASS
2483.575000	-54.7	39.2	-15.5	PASS
2483.825000	-54.8	39.3	-15.5	PASS
2484.575000	-54.8	39.4	-15.5	PASS
2483.875000	-54.9	39.4	-15.5	PASS
2484.675000	-55.1	39.6	-15.5	PASS
2483.625000	-55.1	39.6	-15.5	PASS
2483.525000	-55.2	39.7	-15.5	PASS
2483.675000	-55.6	40.1	-15.5	PASS
2484.075000	-55.9	40.5	-15.5	PASS
2483.925000	-55.9	40.5	-15.5	PASS
2483.975000	-56.1	40.6	-15.5	PASS
2483.725000	-56.1	40.6	-15.5	PASS
2483.775000	-56.2	40.7	-15.5	PASS
2484.125000	-56.2	40.7	-15.5	PASS

4.5 Duty cycle	VERDICT: PASS

Test Configuration



Performed measurements

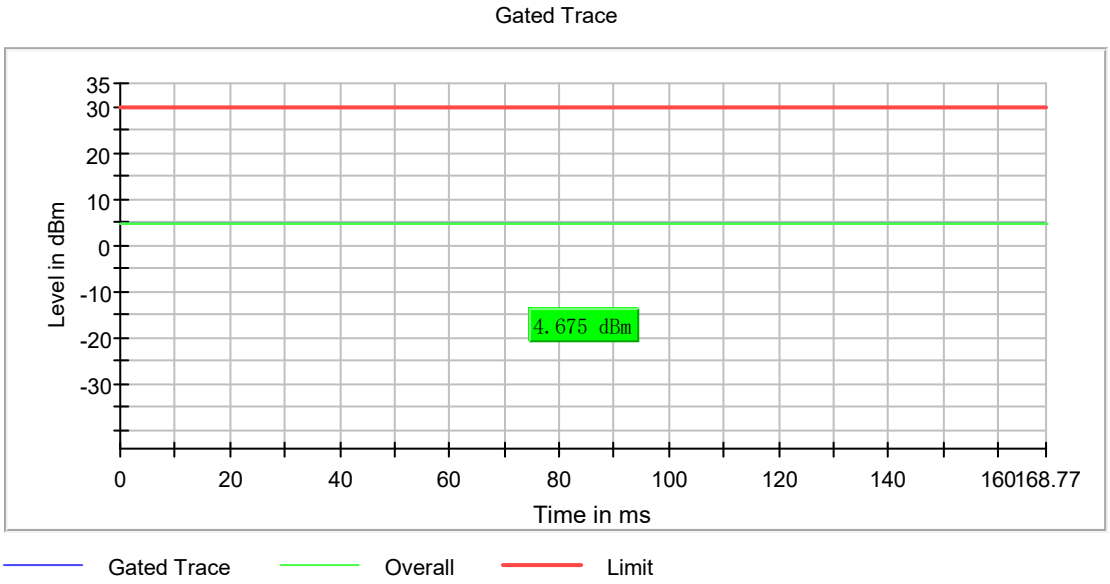
Port under test	Antenna port	
Test method applied	☒	Conducted measurement
	☐	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

Results

Test Mode	Tx On (ms)	Tx On + Tx Off (ms)	Duty Cycle
Mode 1	---	---	100%

Note 1: T means the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control Level for the tested mode of operation.

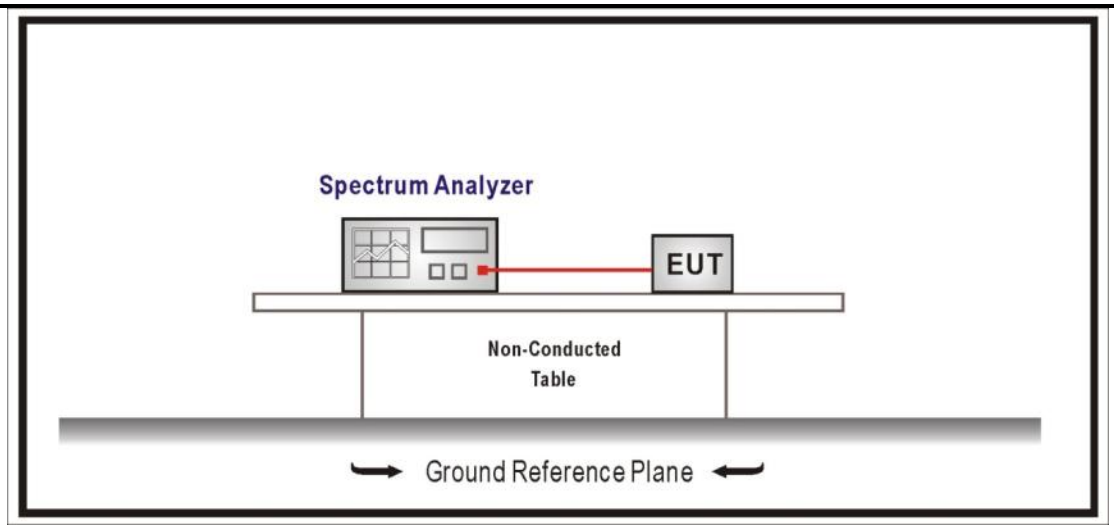
Note 2: According to KDB 558074, when test for Radiated Emission Band Edge and Radiated Emission, for average detector set: VBW ≥ 1/T will be used.



4.6 DTS Bandwidth	VERDICT: PASS

Standard	FCC Part 15 Subpart C Paragraph 15.247 (a)(2)
Systems using digital modulation techniques operate in the 2400-2483.5 MHz .The minimum 6 dB bandwidth shall be at by least 500 kHz	

Test Configuration



Performed measurements

Port under test	Antenna port	
Test method applied	☒	Conducted measurement
	☐	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

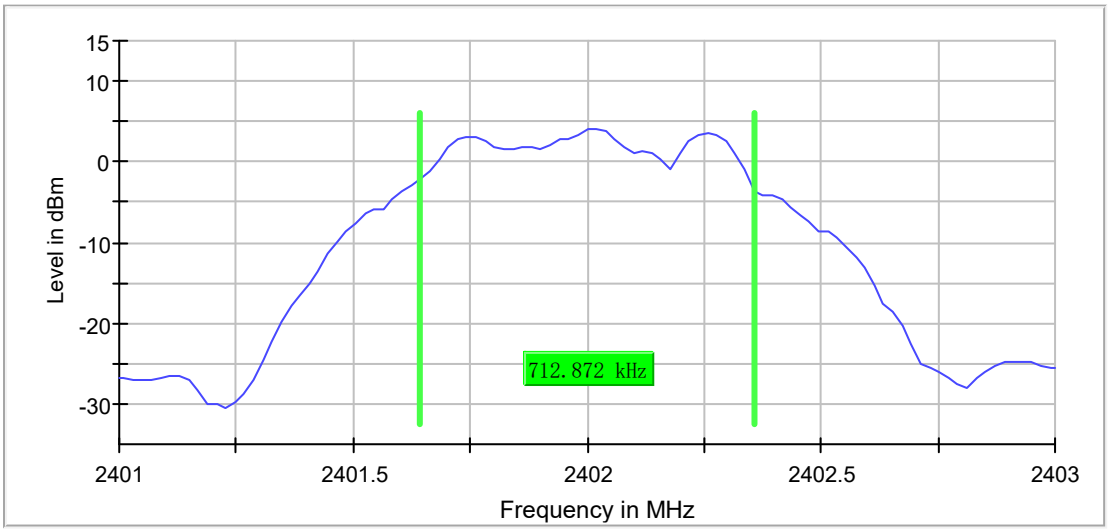
Results

Mode	CH.	Test Freq. (MHz)	6dB Occupied Bandwidth (kHz)	Limit (kHz)	Result
1	1	2402	712,87	>500	Pass
	19	2440	712,87	>500	Pass
	39	2480	732,67	>500	Pass

6dB Occupied Bandwidth

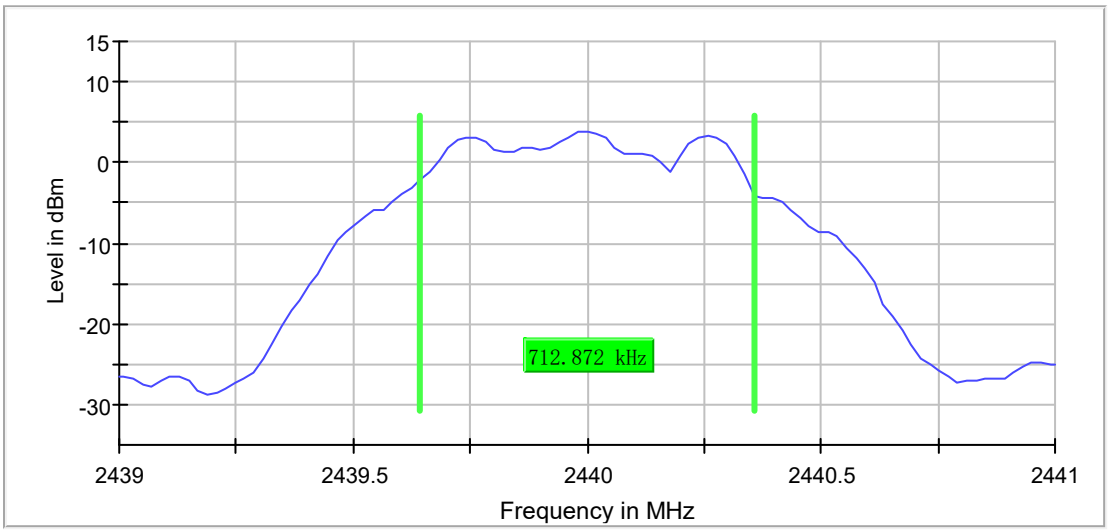
Mode 1 / CH1 (2402MHz)

6 dB Bandwidth



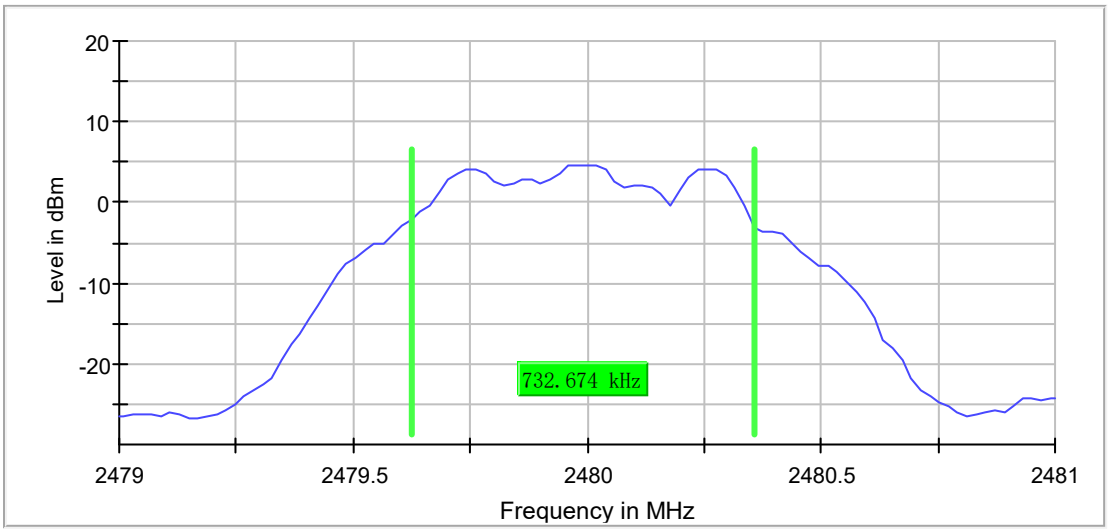
Mode 1 / CH19 (2440MHz)

6 dB Bandwidth



Mode 1 / CH39 (2480MHz)

6 dB Bandwidth

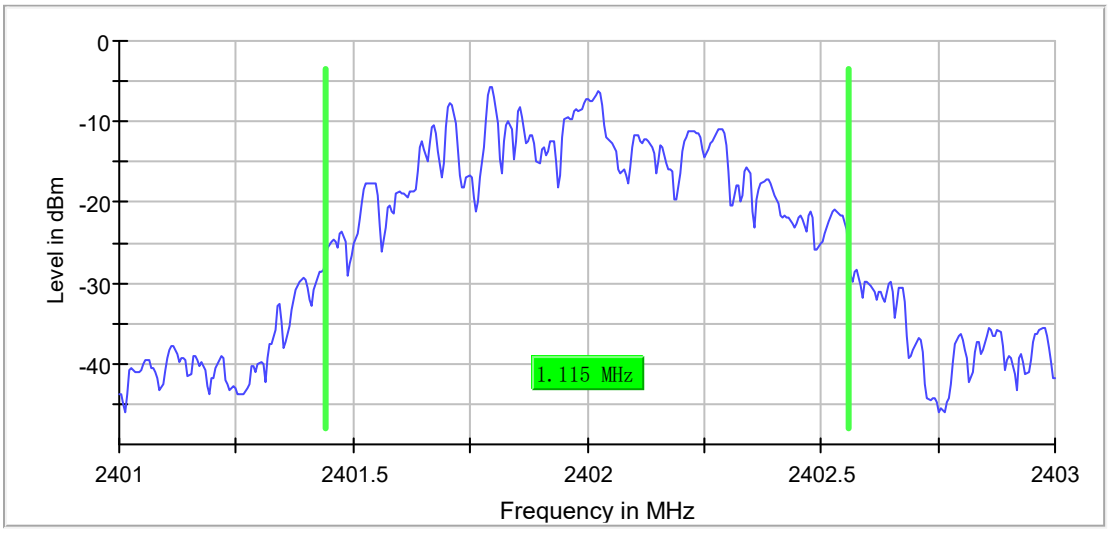


Mode	CH.	Test Freq. (MHz)	99% Occupied Bandwidth (MHz)	Limit	Result
1	1	2402	1.115	Within frequency range	Pass
	19	2440	1.030	Within frequency range	Pass
	39	2480	1.055	Within frequency range	Pass

99% Occupied Bandwidth

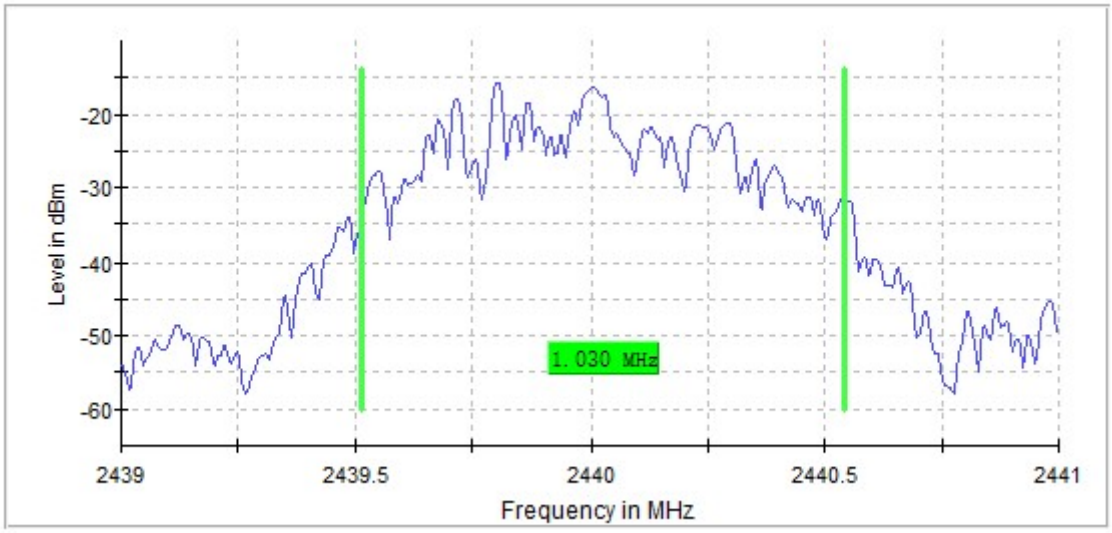
Mode 1 / CH1 (2402 MHz)

20 dB Bandwidth



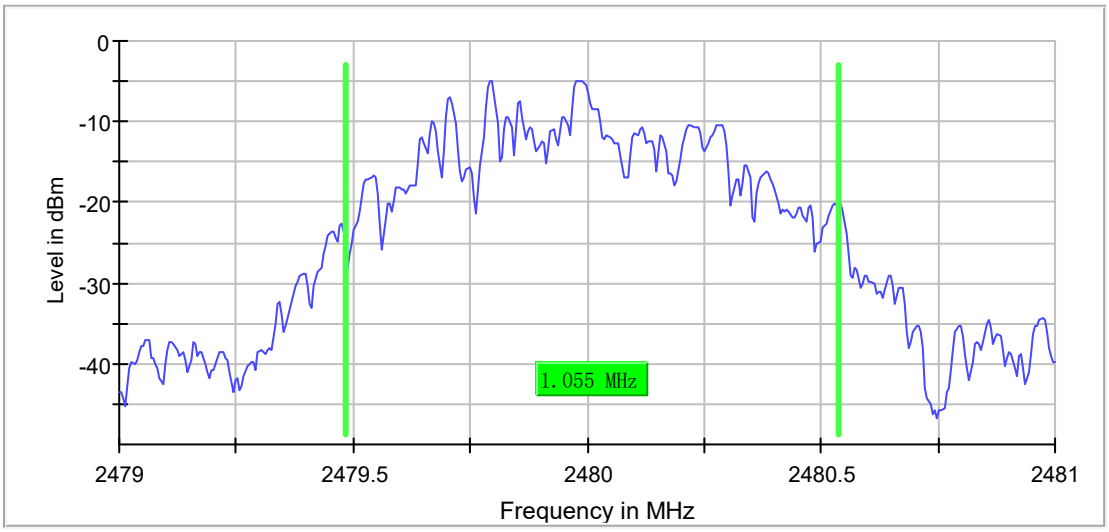
Mode 1 / CH19 (2440 MHz)

99 % Bandwidth



Mode 1 / CH39 (2480 MHz)

99 % Bandwidth

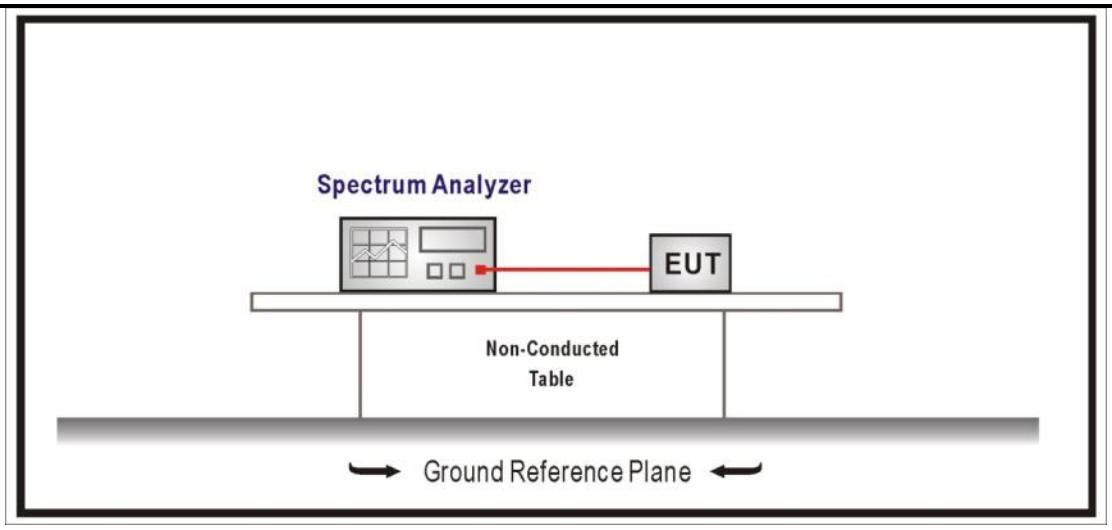


4.7 Fundamental emission output power — VERDICT: PASS

Standard			FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
☒	GTX ＜6dBi		Pout≤30dBm
☐	GTX ＞6dBi		
	☐	Non-Fix point-point	Pout≤30-(GTX -6)
	☐	Fix point-point	Pout≤30-[(GTX-6)]/3
	☐	Point-to-multipoint	Pout≤30-(GTX-6)
	☐	Overlap Beams	Pout≤30-[(GTX-6)]/3
	☐	Aggregate power transmitted simultaneously on all beams	Pout≤30-[(GTX-6)]/3
	☐	singby LE directional beam	Pout≤30-[(GTX-6)]/3+8dB

Note 1 : GTX directional gain of transmitting antennas.
Note 2 : Pout is maximum peak conducted output power .

Test Configuration



Performed measurements

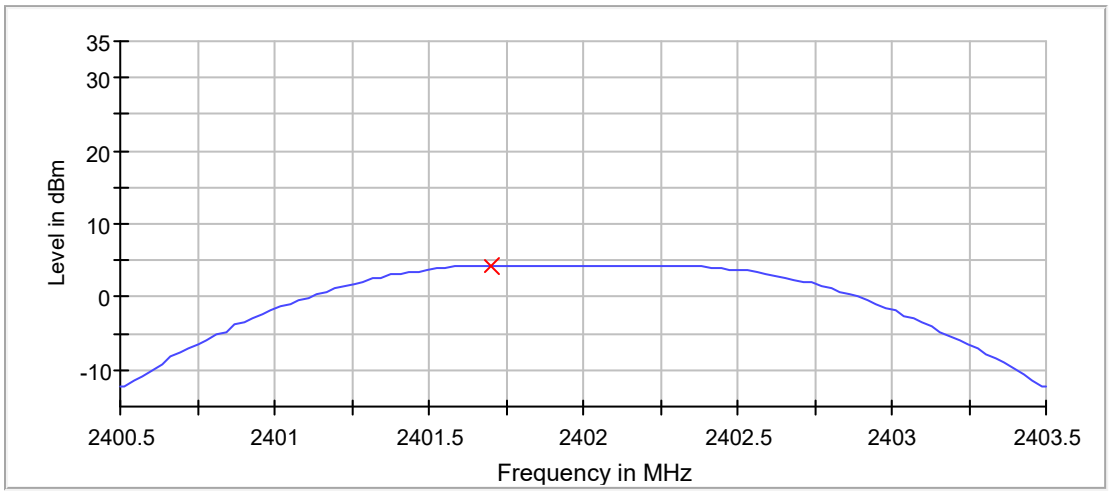
Port under test	Antenna port	
Test method applied	☒	Conducted measurement
	☐	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

Results

Mode	Channel	Test Frequency (MHz)	Power Output (dBm)	Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
Mode 1	1	2402	4,3	≤30	6,8	≤36	Pass
	17	2440	4,0	≤30	6,5	≤36	Pass
	39	2480	5,0	≤30	7,5	≤36	Pass

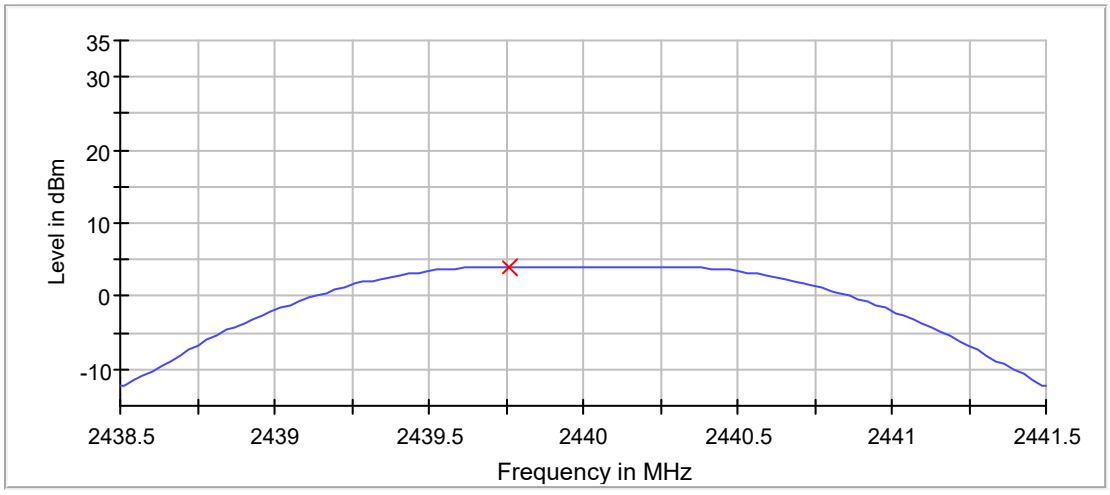
Data of Mode 1

Peak Power



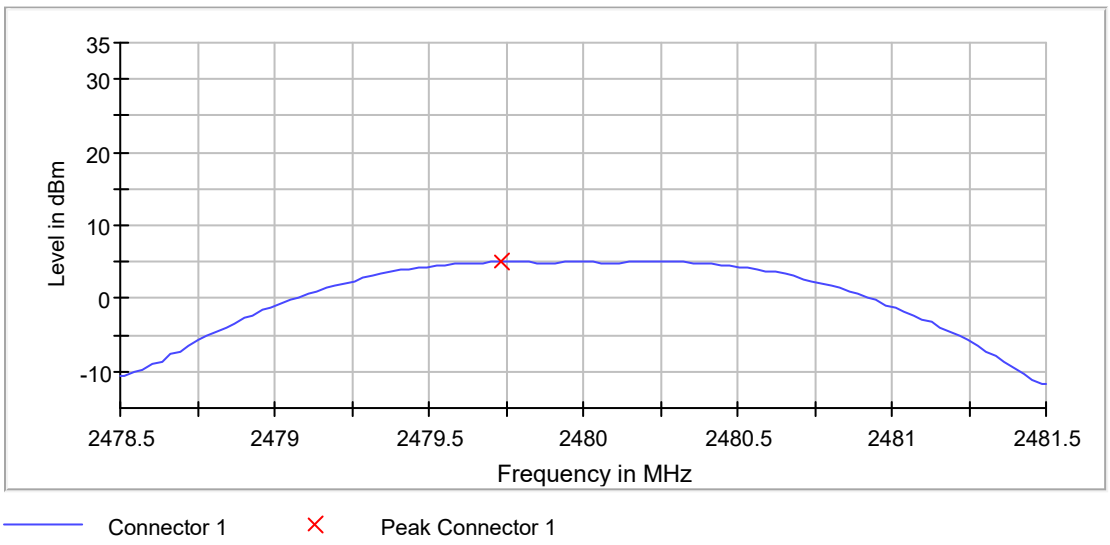
Connector 1 Peak Connector 1

Peak Power



Connector 1 Peak Connector 1

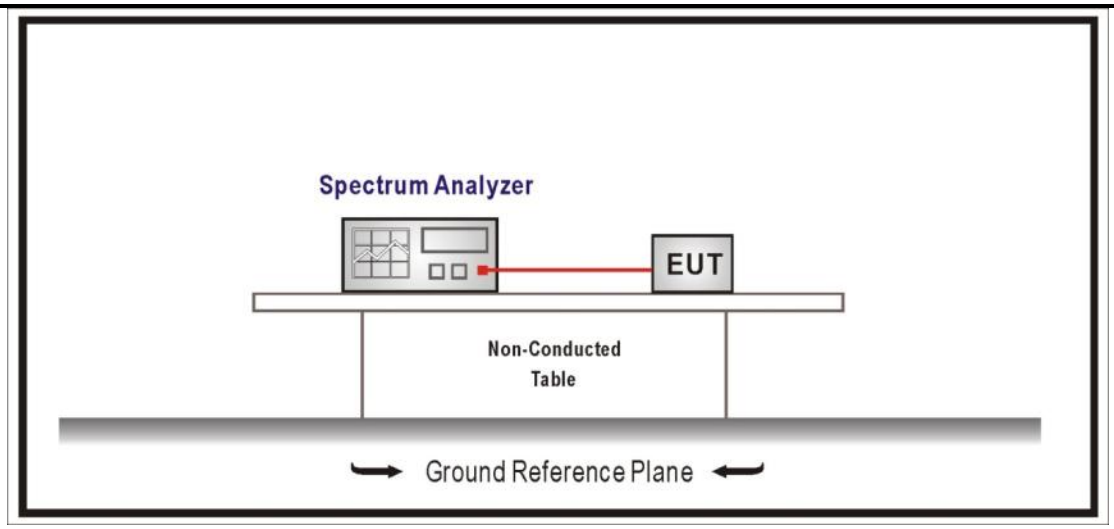
Peak Power


35
30
20
10
0
-10
Level in dBm
2478.5
2479
2479.5
2480
2480.5
2481
2481.5
Frequency in MHz
Connector 1
Peak Connector 1

4.8 Power Density	VERDICT: PASS

Standard	FCC Part 15 Subpart C Paragraph 15.247 (b)(3)
Power Spectral Density≤8dBm/3kHz	

Test Configuration



Performed measurements

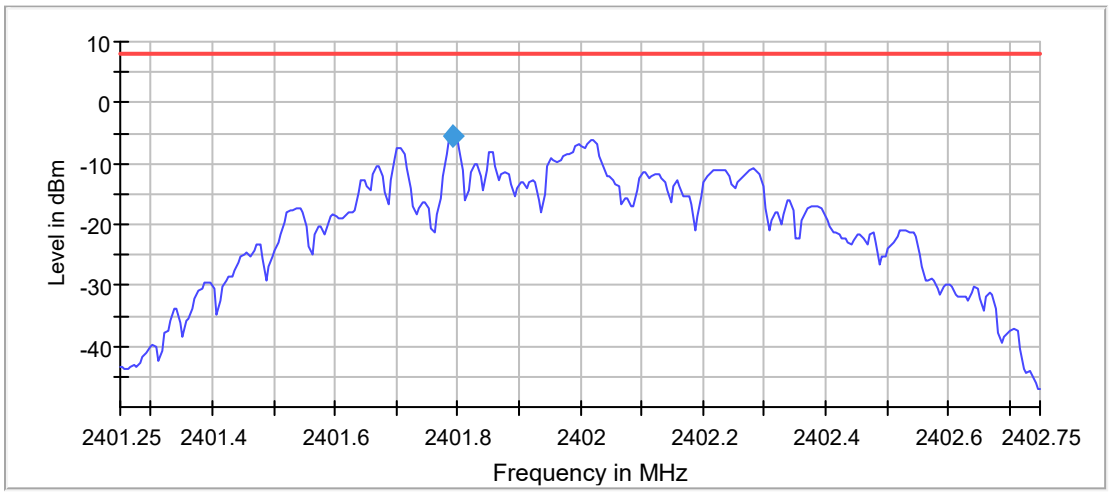
Port under test	Antenna port	
Test method applied	☒	Conducted measurement
	☐	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

Results

Mode	Channel	Test Frequency (MHz)	Power Output (dBm)	Limit (dBm/3kHz)	Result
Mode 1	1	2402	-5,43	≤8	Pass
	19	2440	-5,74	≤8	Pass
	39	2480	-4,62	≤8	Pass

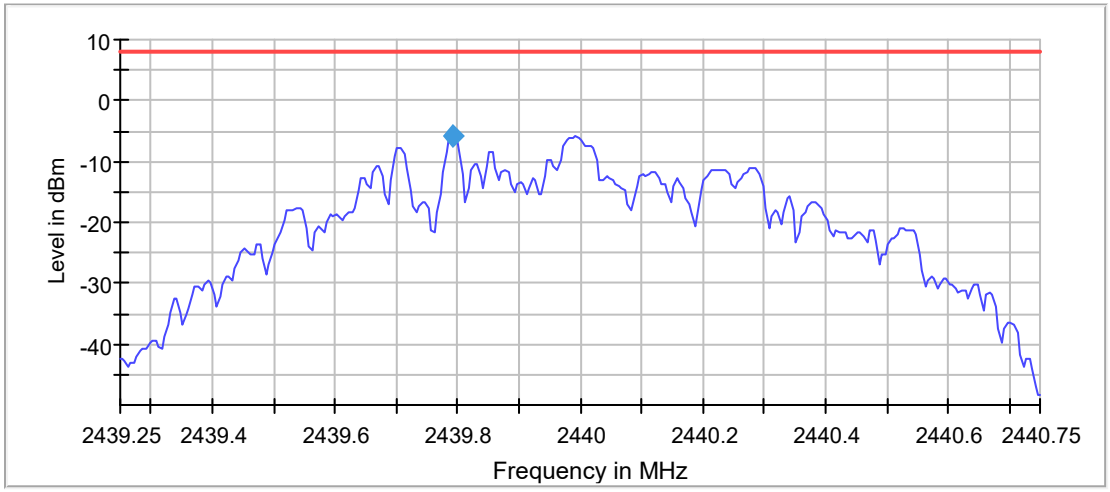
Data of Mode 1

Peak Power Spectral Density



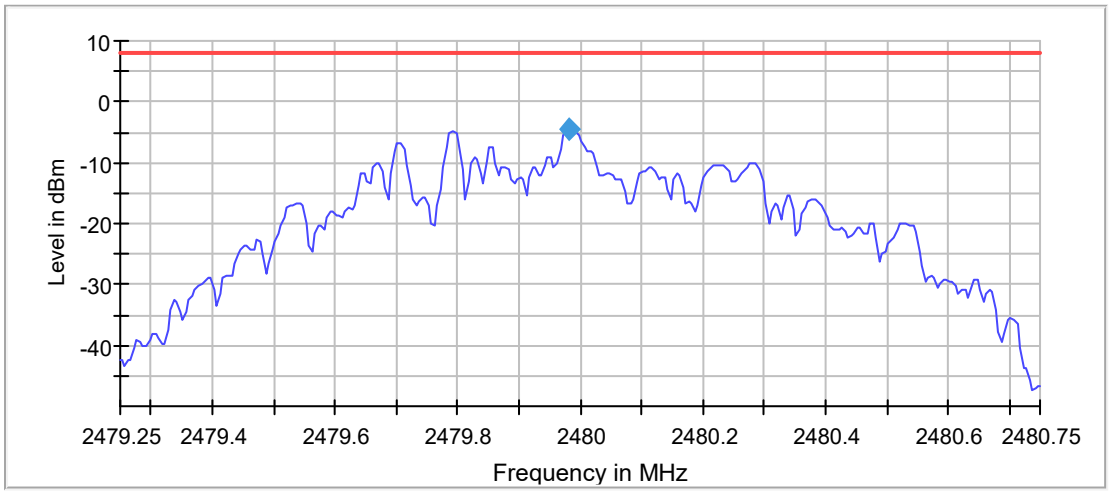
Limit Sum Level PSD

Peak Power Spectral Density



Limit Sum Level PSD

Peak Power Spectral Density



Limit Sum Level PSD

5 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

The photographs show the tested device.

Refer to documents External photo and Internal photo.

ANNEX 1 – MEASUREMENT UNCERTAINTY

Test Item	Uncertainty
Occupied Channel Bandwidth	±0,7%
RF Output power, conducted	±0,6dB
Power Spectral Density, Conducted	±0,6dB
Unwanted Emissions, Conducted	±0.7dB
Spurious (30-1000MHz)	±4,4dB
Spurious (1-12,75GHz)	±4,4dB

ANNEX 2 - USED EQUIPMENT

Continuous disturbances conducted (150 kHz to 30 MHz)

Item	Instrumentation	Manufacturer	Model No.	Serial No.	DEKRA No.	Cal. Due date
1	EMI Receiver	R&S	ESCI	101206	G/L858	2024/07/21
2	LISN	R&S	ENV216	101336	G/L859	2024/07/21
3	Shielding Room	Changzhou Feite	/	/	G/L861	2024/06/17

Emissions in non-restricted frequency bands/ Emissions in restricted frequency bands

Item	Instrumentation	Manufacturer	Model No.	Serial No.	DEKRA No.	Cal. Due date
1	EMI receiver	R&S	ESCI	101205	G/L857	2024/07/21
2	Antenna (30MHz-3GHz)	SCHWARZBECK	VULB9163	506	G/L864	2024/10/26
3	Chamber	ETS	/	/	G/L856	2024/06/10
4	Antenna (1GHz-18GHz)	R&S	HF907	102306	G/L1236	2025/02/23
5	Horn antenna preamplifier	Schwarzbeek	SCU-18	102234	G/L1236-1	2025/02/21
6	Spectrum analyzer	R&S	FSV	SN101012	G/L1235	2025/01/17
7	HF antenna (18 – 26.5 GHz)	ETS	3160-09	00164643	G/L1237	2025/01/16
8	High frequency antenna preamplifier (18 – 26.5 GHz)	Schwarzbeck	SCU-26	1879064	G/L1237-1	2025/01/10
9	Broadband horn antenna (15 – 40 GHz)	Schwarzbeck	BBHA9170	00908	GZ1901	2025/05/06
10	High frequency antenna preamplifier (18 – 26.5 GHz)	Schwarzbeck	SCU-26	1879064	G/L1237-1	2025/01/10
11	Annular magnetic field antenna	TESEQ	HLA6121	540045	GZ1905	2025/05/12

Duty cycle/Band Edge/Fundamental emission output power/DTS Bandwidth/Power Spectral Density

Item	Instrumentation	Manufacturer	Model	Serial no.	DEKRA No.	Cal Due date
1	Spectrum analyzer	R&S	FSV	SN101012	G/L1235	2025/01/17
2	Chamber	ETS	/	/	G/L856	2025/06/10
3	OSP	R&S	OSP 150	101907	GZ1894	2025/04/27

ANNEX 3 - TEST PHOTOS

Refer to document Test setup.

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