



Test report No: 6170721.51

TEST REPORT

Radio Spectrum Matters (RF)

Identification of item tested	Wireless Module
Trademark	
Model and /or type reference	HRN71_BSNS
Features	3.3V DC
FCC ID	2BC2T-HRN71
ISED Number	31630-HRN71
Applicant's name / address	HooRii Technology Co., Ltd. Building H, Aicheng Road 198, Yuhang District, Hangzhou, Zhejiang, 311300, China
Test method requested, standard	FCC CFR Title 47 Part 15 Subpart C Section 15.247 ANSI C63.10: 2013 RSS-Gen Issue 5 RSS-247 Issue 3
Verdict Summary	IN COMPLIANCE
Prepared by (name / position & signature)	Lei Chen Senior Project Manager 
Approved by (name / position & signature)	Adrian Shi Technical Supervisor 
Date of issue	2023-11-21
Report template No	TRF_Part15C_247_RF01 V1.0

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COMPETENCES AND GUARANTEES

DEKRA is a testing laboratory competent to carry out the tests described in this report.

In order to assure the traceability to other national and international laboratories, DEKRA has a calibration and maintenance program for its measurement equipment.

DEKRA guarantees the reliability of the data presented in this report, which is the result of the measurements and the tests performed to the item under test on the date and under the conditions stated in the report and it is based on the knowledge and technical facilities available at DEKRA at the time of performance of the test.

DEKRA is liable to the client for the maintenance of the confidentiality of all information related to the item under test and the results of the test.

The results presented in this Test Report apply only to the particular item under test established in this document.

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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.

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 measured	N/M

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
Tx	: Transmitter
Rx	: Receiver
N/A	: Not Applicable
N/M	: Not Measured

DOCUMENT HISTORY

Report nr.	Date	Description
6170721.51	2023-11-21	First release.

REMARKS AND COMMENTS

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

The test results relate only to the samples tested.

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1 GENERAL INFORMATION

1.1 General Description of the Item(s)

Description of the item	Wireless Module
Model / Type number	HRN71_BSNS
Trademark.....	
FCC ID	2BC2T-HRN71
ISED Number	31630-HRN71
Test Sample Number	6170721-1, 6170721-2
Manufacturer.....	HooRii Technology Co., Ltd. Building H, Aicheng Road 198, Yuhang District, Hangzhou, Zhejiang, 311300, China

Mode of Operation	Thread 802.15.4
Operating frequency range(s)	2405~2480 MHz
Type of Modulation	DSSS-OQPSK
Antenna type	Omni Antenna
Antenna gain	0.5 dBi
Number of channel	16
Operating Temperature Range	-40 ~ 85°C

Note:

1. The antenna gain is provided by the manufacturer

Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 3.34V					
	☐	Battery:					
Mounting position.....	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other					

Intended use of the Equipment Under Test (EUT)
The product is Wireless Module which supports BLE & Thread function.

1.2 Test date

For conducted measurement

Test Location	DEKRA Testing and Certification (Shanghai) Ltd. No.250, Jiangchangsan Road, Shanghai, 200436 P.R. China
Date of receipt of test item	2023-09-18
Date (s) of performance of tests	2023-09-27 to 2023-11-13

For radiated measurement

Test Location	EMTEK (Shenzhen) Co., Ltd. Building 69, Majialong Industry Zone Nanshan District, Shenzhen, Guangdong, China
Date of receipt of test item	2023-09-18
Date (s) of performance of tests	2023-10-11 to 2023-10-13

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	☒	☒
2	---	☐	☐
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	Serial number	Manufacturer	Supplied by
SSCOM	5.13.1	N/A	Nordic	Applicant
Laptop	Latitude 3430	7XB4DS3	DELL	DEKRA
Supplemental information: ---				

2.3 Test Configuration / Block diagram used for tests

Refer to Annex 3.

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.
ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
KDB 558074 D01 v05r02	2019	Guidance for performing compliance measurements on Digital Transmission System (DTS) operating under section 15.247
RSS-Gen Issue 5 Amendment 1 Amendment 2	2018 2019 2021	General Requirements for Compliance of Radio Apparatus
RSS-247 Issue 3	2023	Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSs) and Licence-Exempt Local Area Network (LE-LAN) 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	Test lab
AC Power Line Conducted Emission	FCC 15.207	PASS	---	Dekra
Emissions in restricted frequency bands	FCC 15.247(d), 15.209, 15.205	PASS	---	EMTEK
Duty cycle	ANSI C63.10:2013	PASS	---	Dekra
Emissions in non-restricted frequency bands	FCC 15.247(d)	PASS	---	Dekra
Radiated Emission Band Edge	FCC 15.247(d), 15.209, 15.205	PASS	---	EMTEK
Fundamental emission output power	FCC 15.247(b)(3)	PASS	---	Dekra
DTS Bandwidth	FCC 15.247(a)(2)	PASS	---	Dekra
Power Spectral Density	FCC 15.247(e)	PASS	---	Dekra
Antenna Requirement	FCC 15.203	PASS	---	Dekra
Supplementary information: ---				

RSS measurement				
Requirement – Test case	Basic standard(s)	Verdict	Remark	Test lab
AC Power Line Conducted Emission	RSS-Gen Issue 5 Section 8.8	PASS	---	Dekra
Emissions in restricted frequency bands	RSS-Gen Issue 5 Section 8.9 & 8.10	PASS	---	EMTEK
Duty cycle	ANSI C63.10:2013	PASS	---	Dekra
Emissions in non-restricted frequency bands	RSS-247 Issue 2 Section 5.5	PASS	---	Dekra
Radiated Emission Band Edge	RSS-Gen Issue 5 Section 8.9 & 8.10	PASS	---	EMTEK
Fundamental emission output power	RSS-247 Issue 2 Section 5.4(d)	PASS	---	Dekra
DTS Bandwidth & Occupied Bandwidth	RSS-Gen Issue 5 Section 6.7 RSS-247 Issue 2 Section 5.2(a)	PASS	---	Dekra
Power Spectral Density	RSS-247 Issue 2 Section 5.2(b)	PASS	---	Dekra
Antenna Requirement	RSS-Gen Issue 5 Section 6.8	PASS	---	Dekra
Supplementary information: ---				

3.4 Test Facility

DEKRA Testing and Certification (Shanghai) Ltd.

FCC Designation Number	:	CN1358
ISED CAB identifier Number	:	CN0155

EMTEK (Shenzhen) Co., Ltd.

FCC Designation Number	:	CN1204
ISED CAB identifier Number	:	CN0008

3.5 Measurement procedure

The EUT was controlled by USB-TTL provided by applicant which connected to laptop. After connected, run the software “SSCOM” supplied by manufacturer to control the EUT work in required test mode as below table.

Mode	Channel Number	Frequency (MHz)	Power Setting
Thread	11	2405	8
	18	2440	
	26	2480	

4 TEST RESULTS

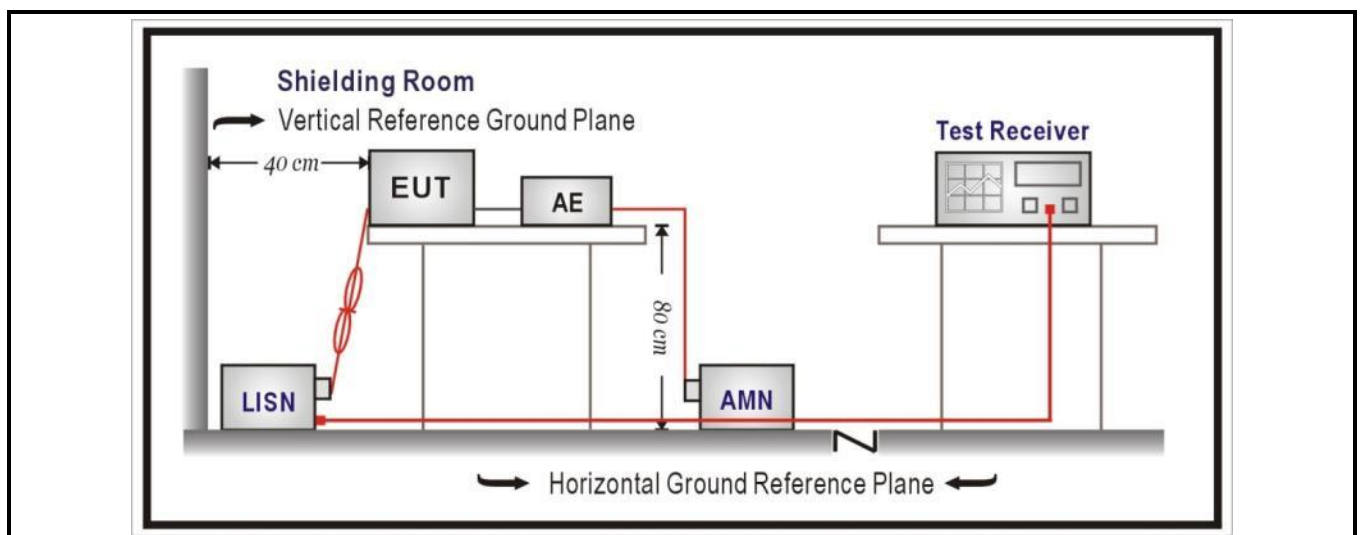
4.1	AC Power Line Conducted Emission	VERDICT: PASS
-----	----------------------------------	---------------

Limit

FCC Part 15 Subpart C Paragraph 15.207 & RSS-Gen Issue 5 Section 8.8				
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.

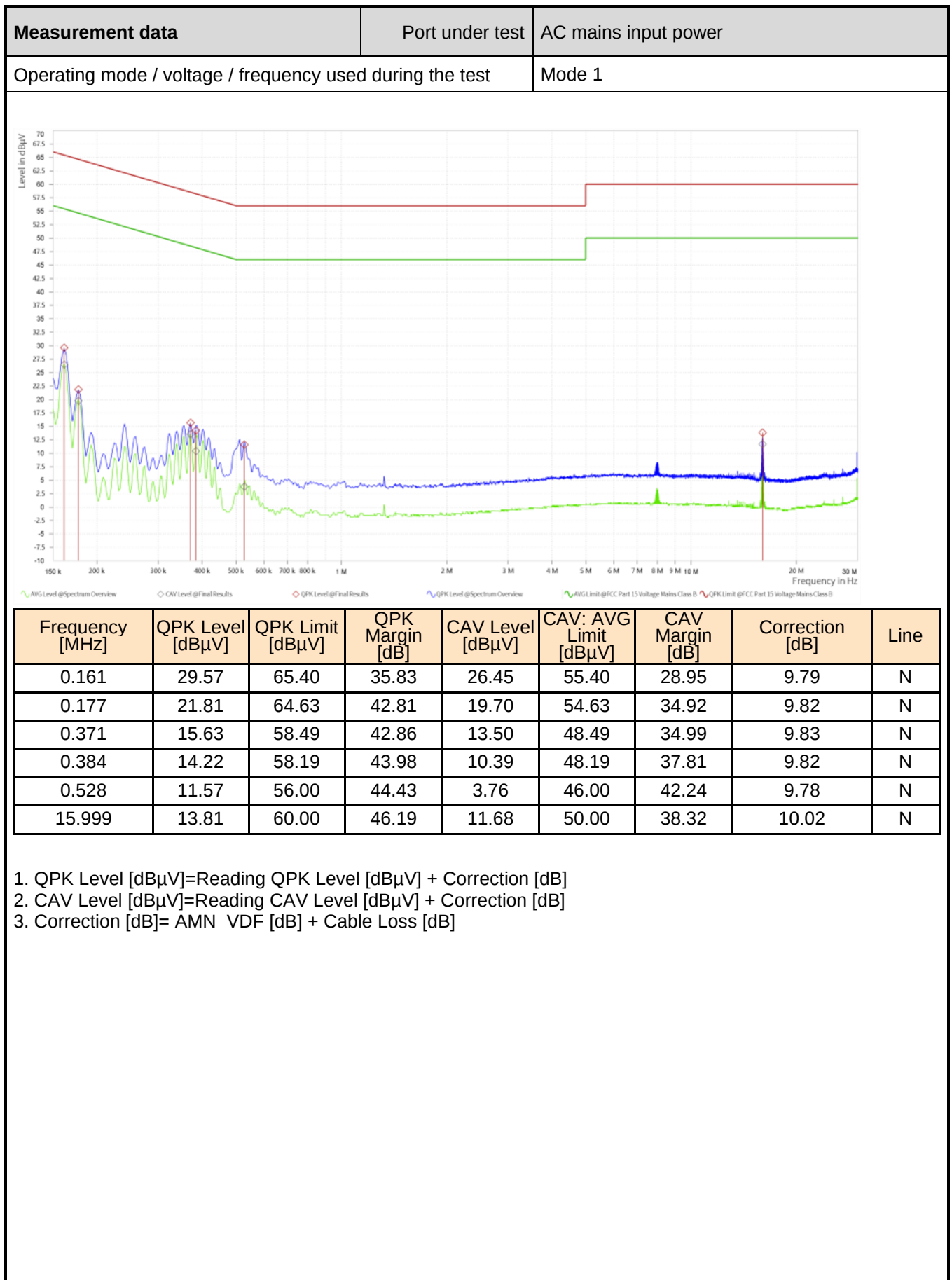
Test Configuration

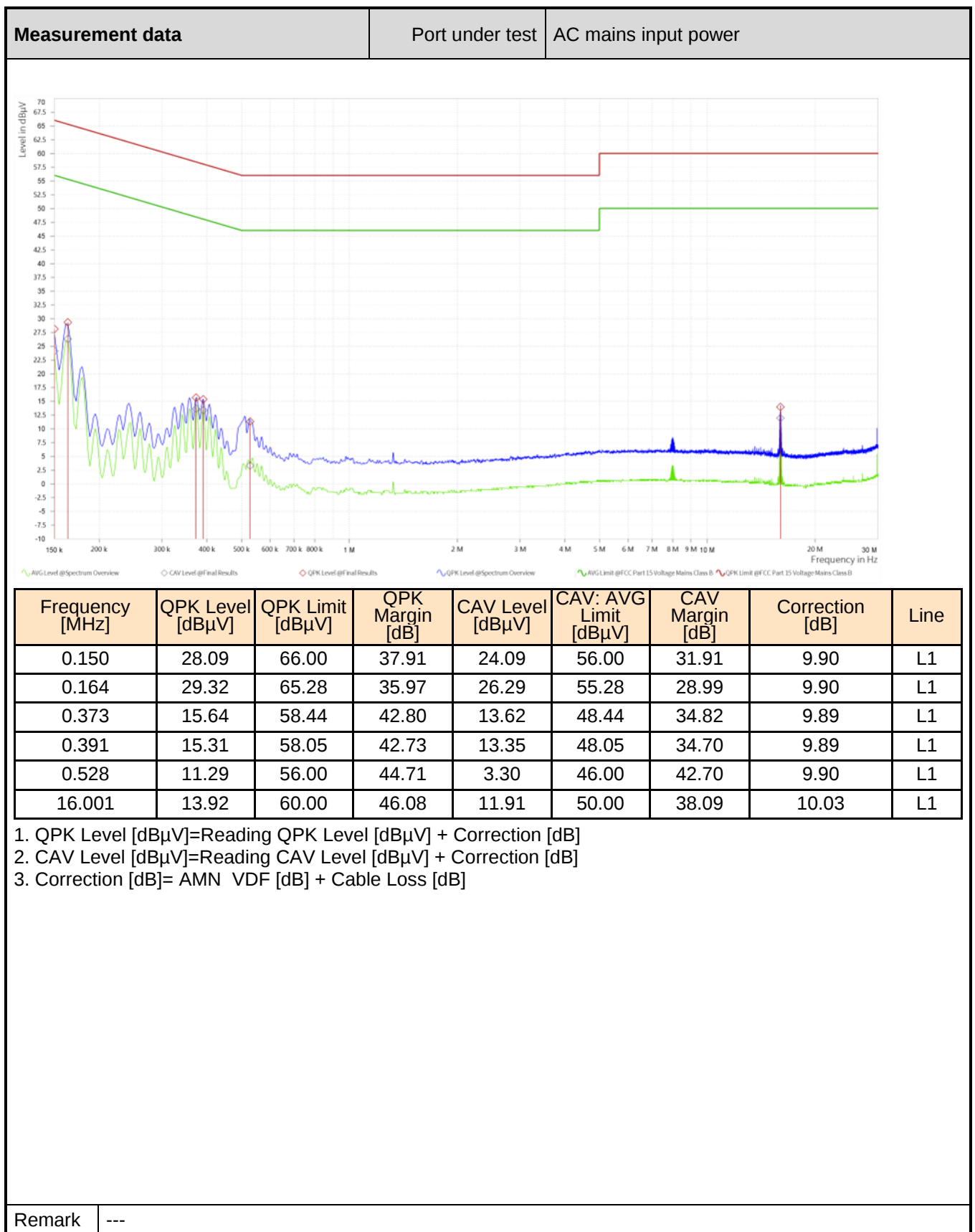


Performed measurements

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								
Remark	---								

See next page.





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

Limit

Standard		FCC Part 15 Subpart C Paragraph 15.247(d), 15.205, 15.209 & RSS-Gen Issue 5 Section 8.9 & 8.10	
Restricted Bands of operation for 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	Above 38.6
13.36 - 13.41	--	--	--
Restricted Bands of operation for ISED			
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	--	--

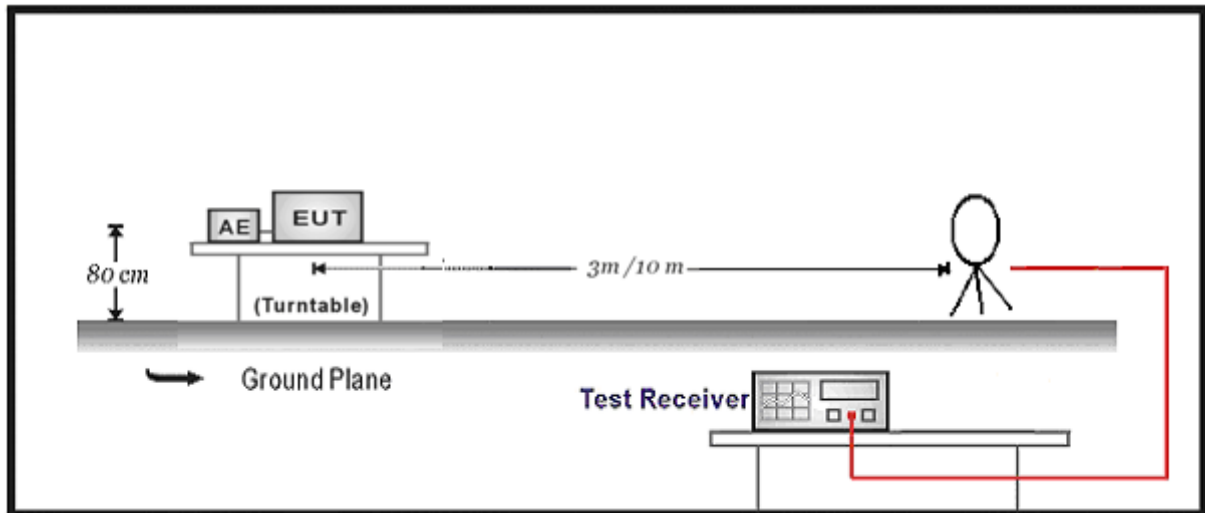
Restricted Band Emissions Limit			
Frequency (MHz)	Field strength (μ V/m)	Field strength (dB μ V/m)	Measurement distance (m)
0.009 - 0.49	2400/F(kHz)	48.5 - 13.8	300 _(Note 1)
0.49 - 1.705	24000/F(kHz)	33.8 - 23	30 _(Note 1)
1.705 - 30	30	29.5	30 _(Note 1)
30 - 88	100	40	3 _(Note 2)
88 - 216	150	43.5	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).

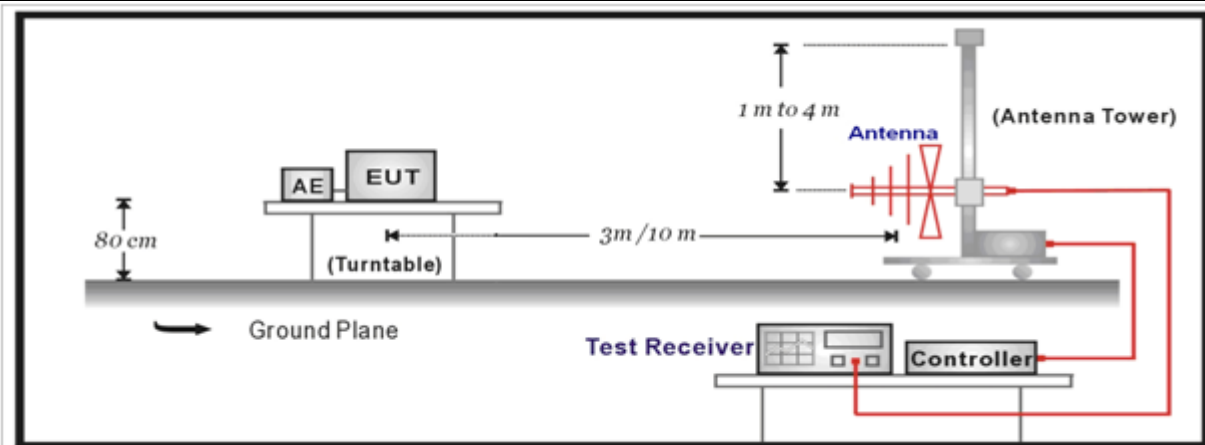
Note 2: At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided: measurements are not made in the near field except where it can be shown that near field measurements are appropriate due to the characteristics of the device; and it can be demonstrated 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

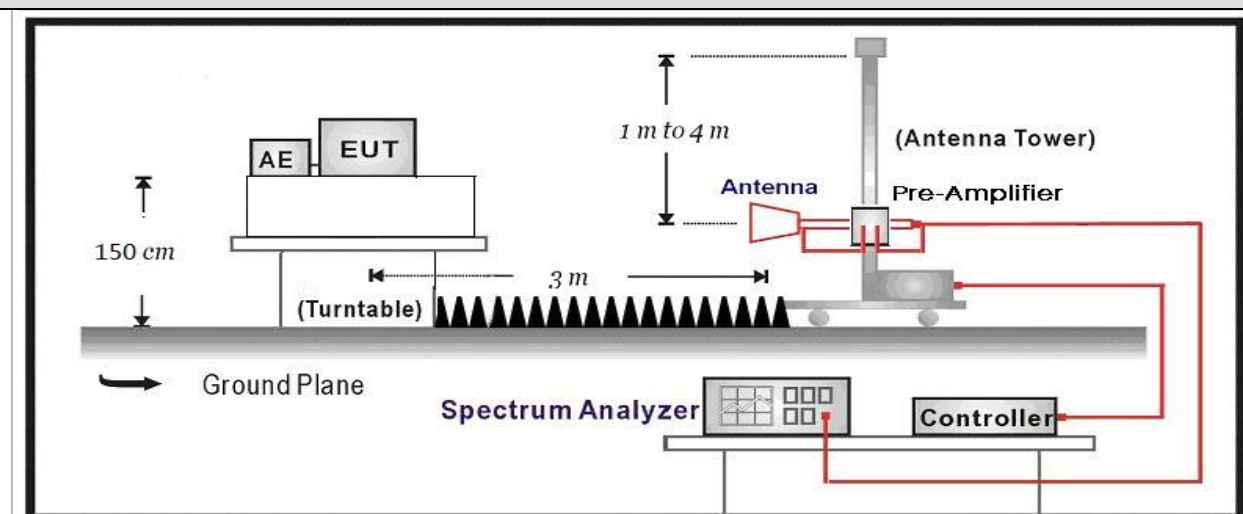
Below 30MHz Test Setup:



30MHz-1GHz Test Setup:



Above 1GHz Test Setup:



Performed measurements

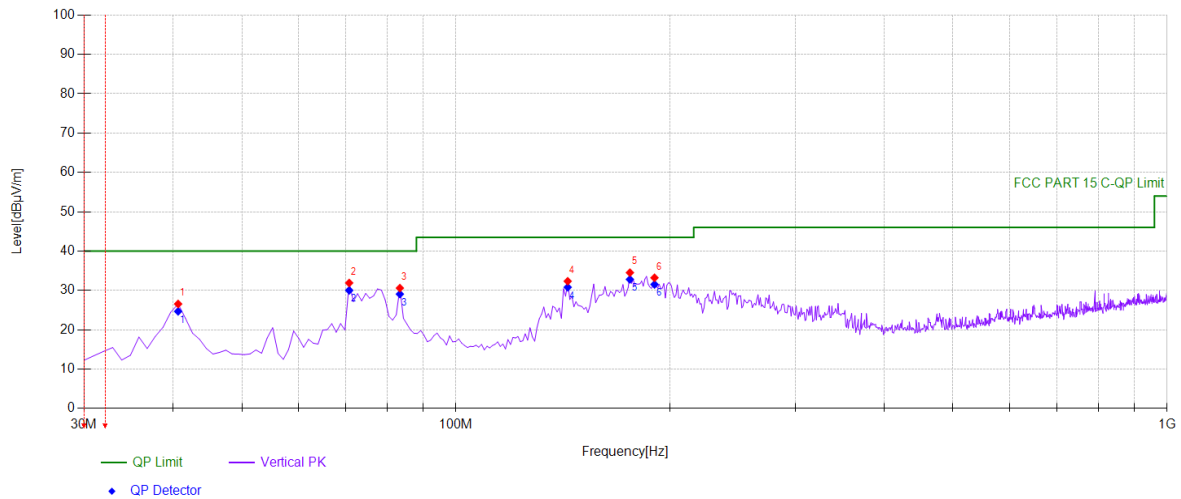
Port under test	Enclosure port	
Test method applied	☐	Conducted measurement
	☒	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	The test frequency range, 9kHz~30MHz, 18GHz~26GHz, both of the worst case are at least 20dB below the limits,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

Results

Emissions in restricted frequency bands

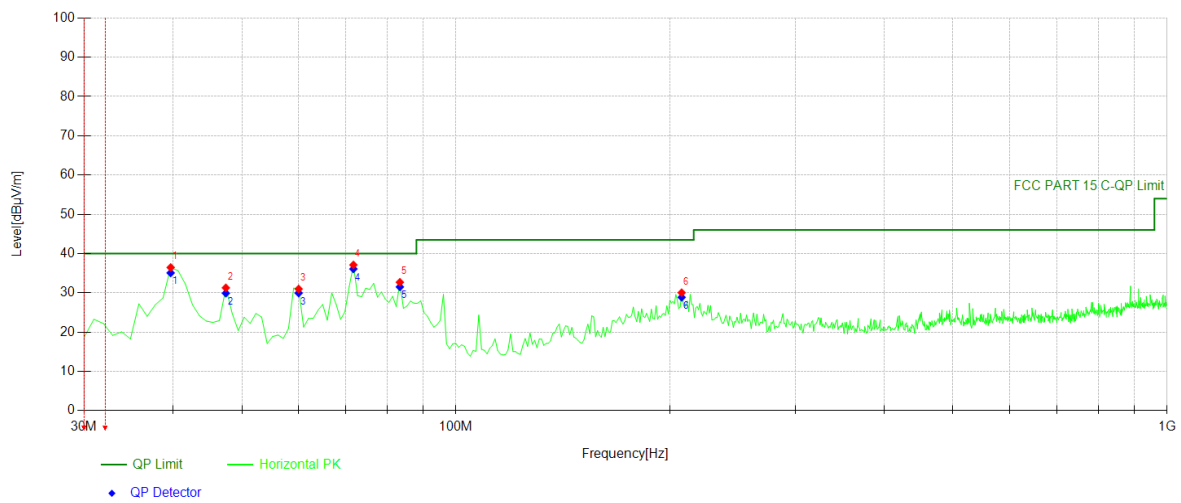
30MHz – 1GHz

2405MHz



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	40.6807	44.43	-17.86	26.57	PK	40.00	13.43	Vertical
2	70.7808	51.99	-20.08	31.91	PK	40.00	8.09	Vertical
3	83.4034	51.31	-20.70	30.61	PK	40.00	9.39	Vertical
4	143.603	52.27	-19.92	32.35	PK	43.50	11.15	Vertical
5	175.645	53.16	-18.64	34.52	PK	43.50	8.98	Vertical
6	190.210	50.97	-17.74	33.23	PK	43.50	10.27	Vertical

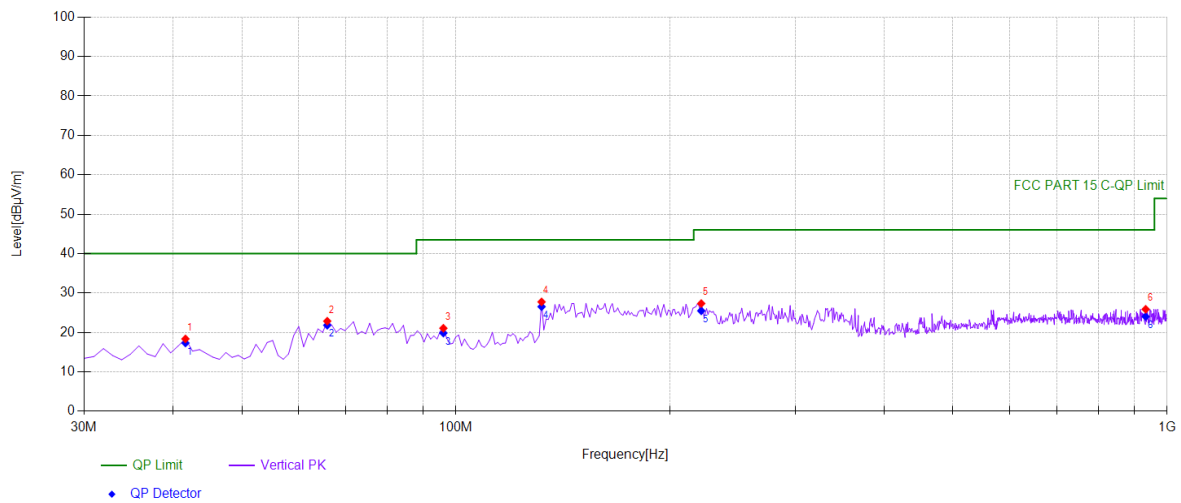
Final Data List					
NO.	Freq. [MHz]	Factor [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]
1	40.6807	-17.86	24.68	40.00	15.32
2	70.7808	-20.08	30.02	40.00	9.98
3	83.4034	-20.70	29.08	40.00	10.92
4	143.6036	-19.92	30.82	43.50	12.68
5	175.6456	-18.64	32.82	43.50	10.68
6	190.2102	-17.74	31.53	43.50	11.97



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	39.7097	54.39	-17.93	36.46	PK	40.00	3.54	Horizontal
2	47.4775	48.68	-17.39	31.29	PK	40.00	8.71	Horizontal
3	60.1001	49.55	-18.56	30.99	PK	40.00	9.01	Horizontal
4	71.7518	57.35	-20.23	37.12	PK	40.00	2.88	Horizontal
5	83.4034	53.40	-20.70	32.70	PK	40.00	7.30	Horizontal
6	207.687	47.18	-17.13	30.05	PK	43.50	13.45	Horizontal

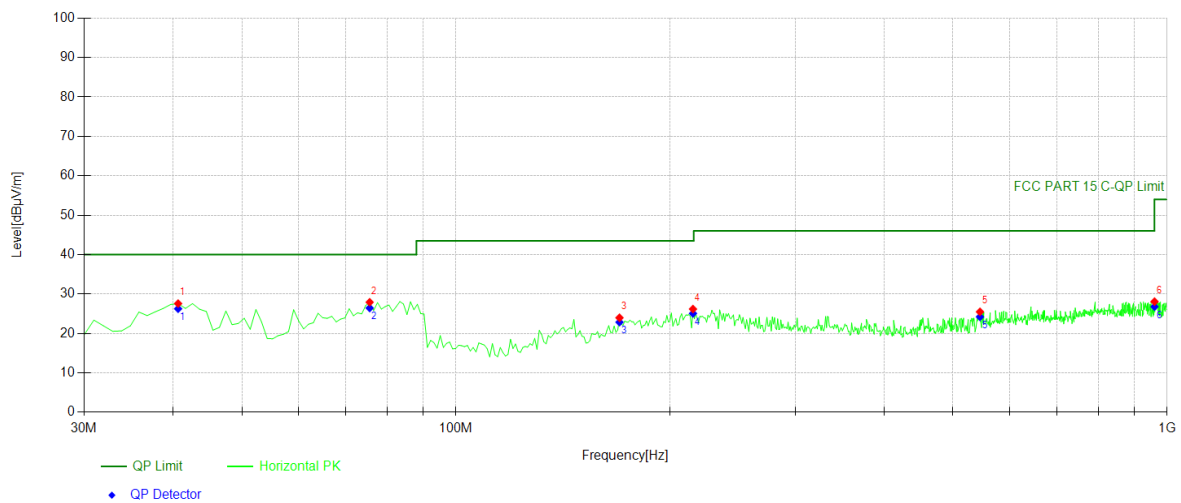
Final Data List					
NO.	Freq. [MHz]	Factor [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]
1	39.7097	-17.93	35.08	40.00	4.92
2	47.4775	-17.39	29.91	40.00	10.09
3	60.1001	-18.56	29.96	40.00	10.04
4	71.7518	-20.23	36.09	40.00	3.91
5	83.4034	-20.70	31.51	40.00	8.49
6	207.6877	-17.13	28.86	43.50	14.64

2480MHz



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	41.6517	36.17	-17.80	18.37	PK	40.00	21.63	Vertical
2	65.9259	42.26	-19.39	22.87	PK	40.00	17.13	Vertical
3	96.026	38.80	-17.73	21.07	PK	43.50	22.43	Vertical
4	131.952	46.95	-19.19	27.76	PK	43.50	15.74	Vertical
5	221.281	44.31	-16.97	27.34	PK	46.00	18.66	Vertical
6	933.003	28.44	-2.56	25.88	PK	46.00	20.12	Vertical

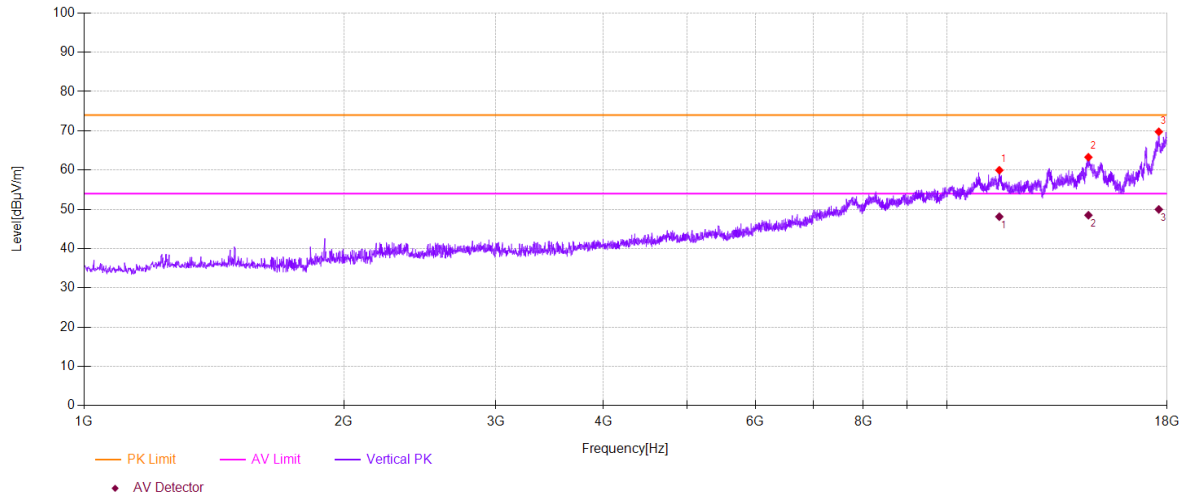
Final Data List					
NO.	Freq. [MHz]	Factor [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]
1	41.6517	-17.80	17.32	40.00	22.68
2	65.9259	-19.39	21.82	40.00	18.18
3	96.026	-17.73	19.85	43.50	23.65
4	131.952	-19.19	26.54	43.50	16.96
5	221.2813	-16.97	25.48	46.00	20.52
6	933.003	-2.56	24.02	46.00	21.98



Suspected Data List								
NO.	Freq. [MHz]	Reading [dBμV]	Factor [dB/m]	Level [dBμV/m]	Detector	Limit [dBμV/m]	Margin [dB]	Polarity
1	40.6807	45.44	-17.86	27.58	PK	40.00	12.42	Horizontal
2	75.6356	48.76	-20.83	27.93	PK	40.00	12.07	Horizontal
3	169.819	42.95	-18.97	23.98	PK	43.50	19.52	Horizontal
4	215.455	43.30	-17.11	26.19	PK	43.50	17.31	Horizontal
5	545.585	34.71	-9.22	25.49	PK	46.00	20.51	Horizontal
6	960.190	30.35	-2.28	28.07	PK	54.00	25.93	Horizontal

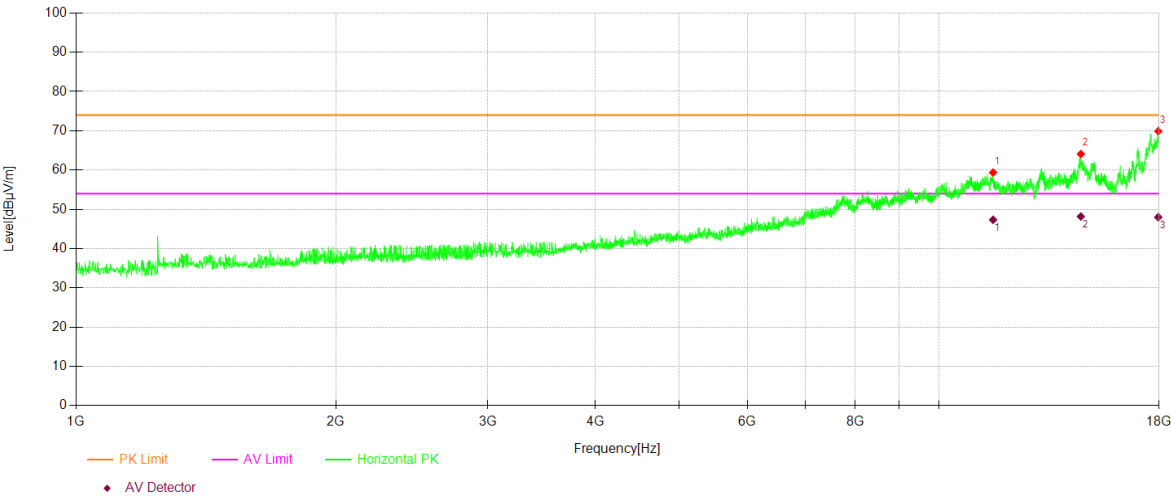
Final Data List					
NO.	Freq. [MHz]	Factor [dB/m]	QP Value [dBμV/m]	QP Limit [dBμV/m]	QP Margin [dB]
1	40.6807	-17.86	26.27	40.00	13.73
2	75.6356	-20.83	26.45	40.00	13.55
3	169.8198	-18.97	22.86	43.50	20.64
4	215.4555	-17.11	25.07	43.50	18.43
5	545.5856	-9.22	24.21	46.00	21.79
6	960.1902	-2.28	26.79	54.00	27.21

1GHz – 10th Harmonic
2405MHz



Suspected Data List							
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	11503.125	59.95	4.61	74.00	14.05	PK	Vertical
2	14591.25	63.27	10.96	74.00	10.73	PK	Vertical
3	17608.125	69.75	15.87	74.00	4.25	PK	Vertical

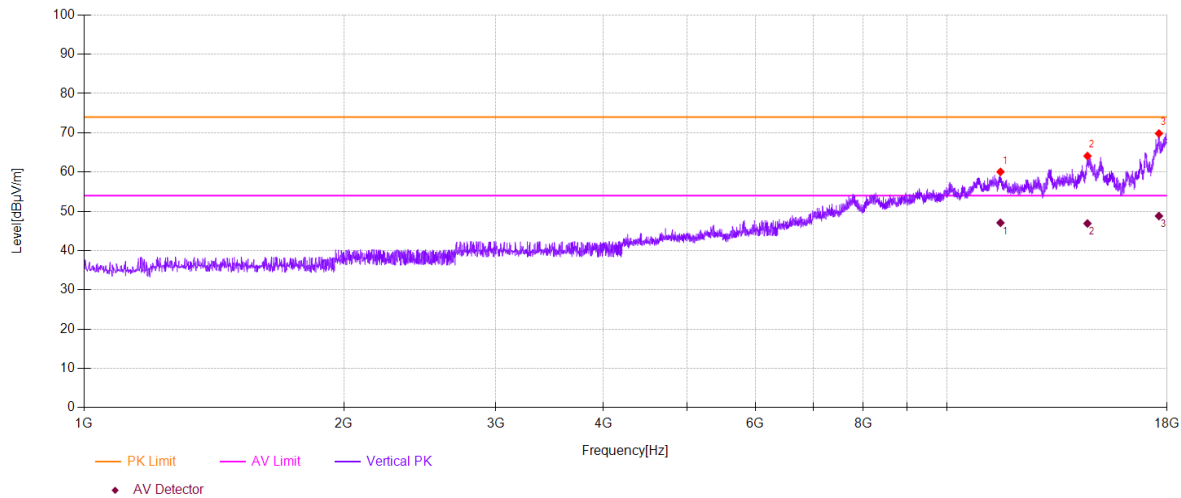
AV Final Data List						
NO.	Freq. [MHz]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Detector	Polarity
1	11503.125	48.13	54.00	5.87	AV	Vertical
2	14591.25	48.50	54.00	5.50	AV	Vertical
3	17608.125	49.98	54.00	4.02	AV	Vertical



Suspected Data List							
NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	11557.5	59.37	3.48	74.00	14.63	PK	Horizontal
2	14608.125	64.09	11.06	74.00	9.91	PK	Horizontal
3	17960.625	69.89	13.35	74.00	4.11	PK	Horizontal

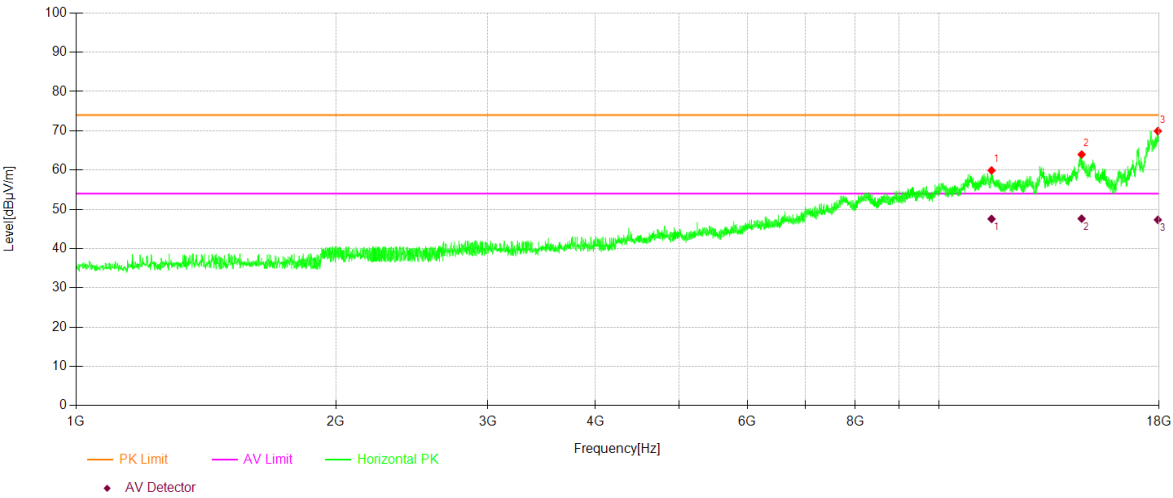
AV Final Data List						
NO.	Freq. [MHz]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Detector	Polarity
1	11557.5	47.33	54.00	6.67	AV	Horizontal
2	14608.125	48.17	54.00	5.83	AV	Horizontal
3	17960.625	48.00	54.00	6.00	AV	Horizontal

2480MHz



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity
1	11538.75	60.05	3.86	74.00	14.45	PK	Vertical
2	14553.75	64.09	9.80	74.00	10.41	PK	Vertical
3	17613.75	69.83	15.69	74.00	4.67	PK	Vertical

AV Final Data List						
NO.	Freq. [MHz]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Detector	Polarity
1	11538.75	47.08	54.00	6.92	AV	Vertical
2	14553.75	46.91	54.00	7.09	AV	Vertical
3	17613.75	48.81	54.00	5.19	AV	Vertical



NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity
1	11510.625	59.91	4.45	74.00	14.59	PK	Horizontal
2	14638.125	63.97	10.41	74.00	10.53	PK	Horizontal
3	17940	69.93	13.10	74.00	4.57	PK	Horizontal

AV Final Data List						
NO.	Freq. [MHz]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Detector	Polarity
1	11510.625	47.56	54.00	6.44	AV	Horizontal
2	14638.125	47.62	54.00	6.38	AV	Horizontal
3	17940	47.32	54.00	6.68	AV	Horizontal

4.3 Emissions in non-restricted frequency band	VERDICT: PASS
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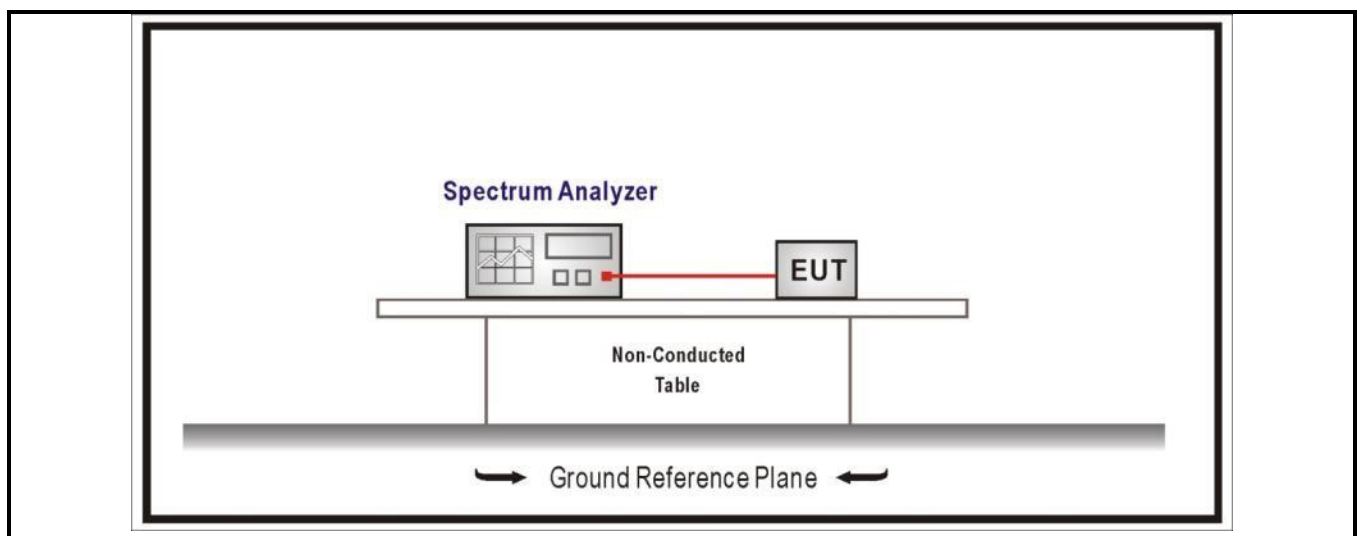
Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247(d) & RSS-247 Issue 2 Section 5.5	
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 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 least 20 dB relative to the maximum in-band peak PSD by Level in 100 kHz (i.e., 20 dBc).

Test Configuration

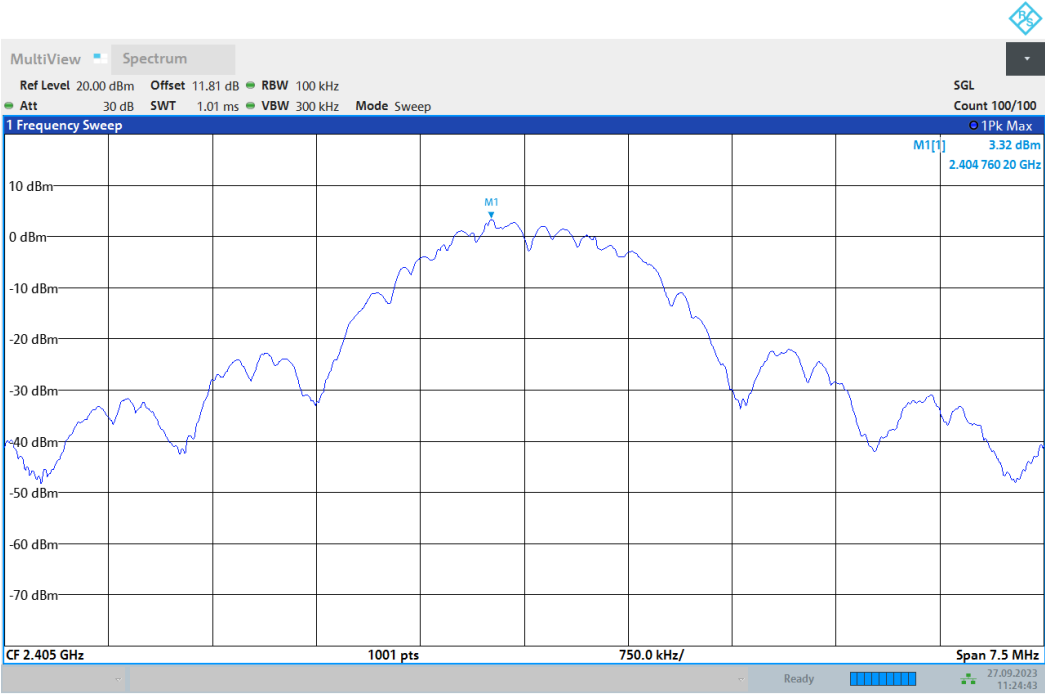


Performed measurements

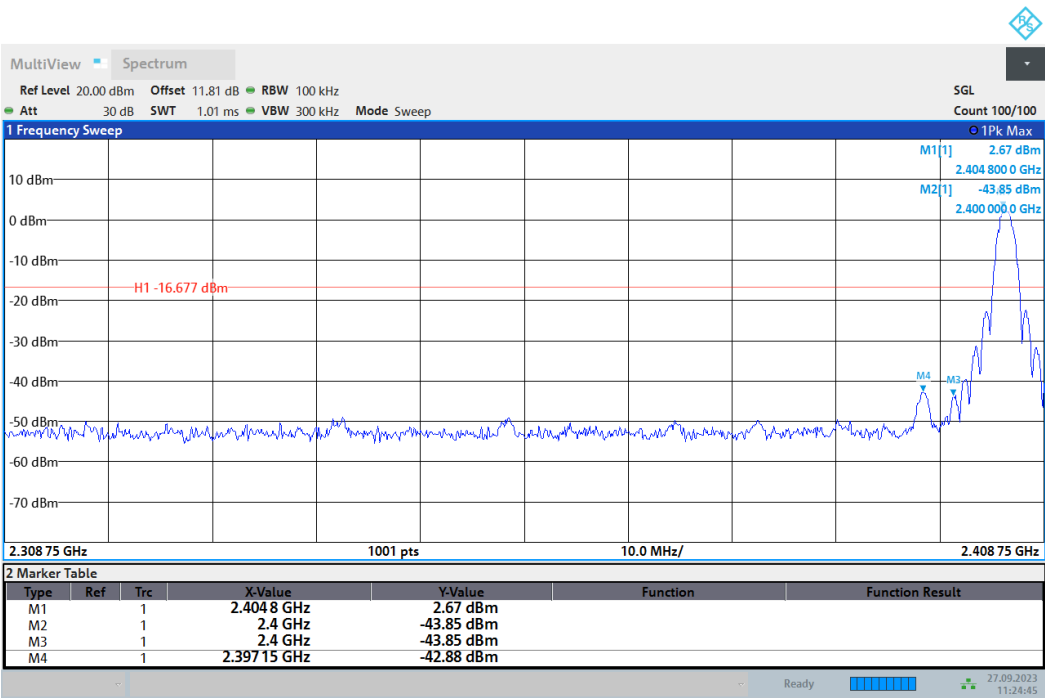
Port under test	Antenna port	
Test method applied	☒	Conducted measurement
	☐	Radiated measurement
Test setup	Refer to the Annex 3 for test setup photo(s).	
Operating mode(s) used	Mode 1	
Remark	---	

See next page

Results
Emissions in non-restricted frequency band
2405MHz

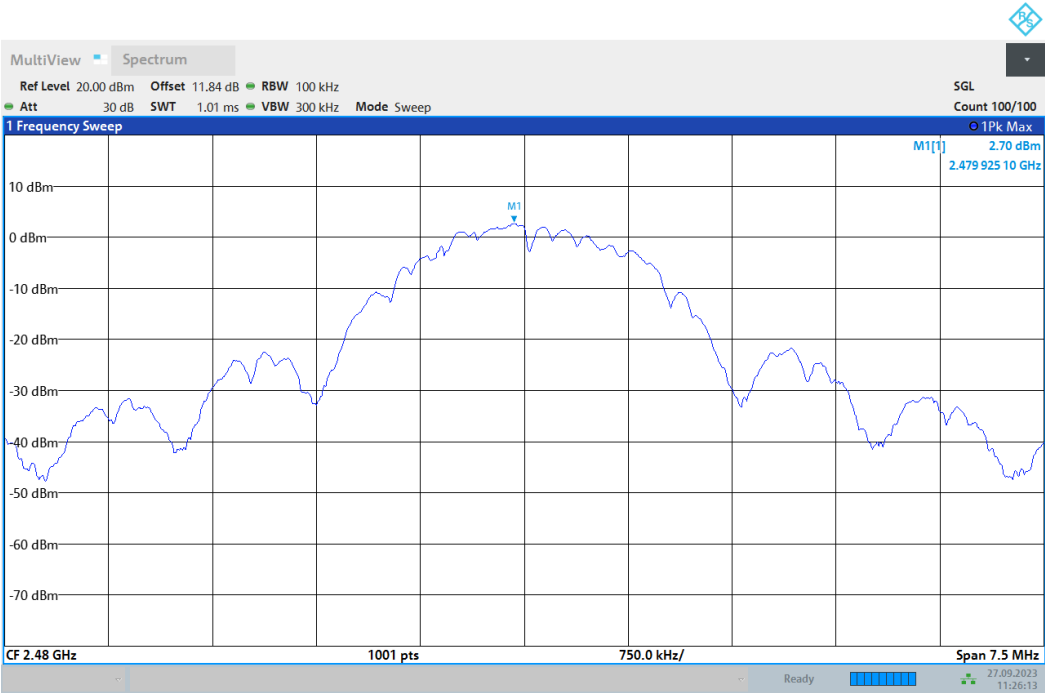


11:24:43 27.09.2023

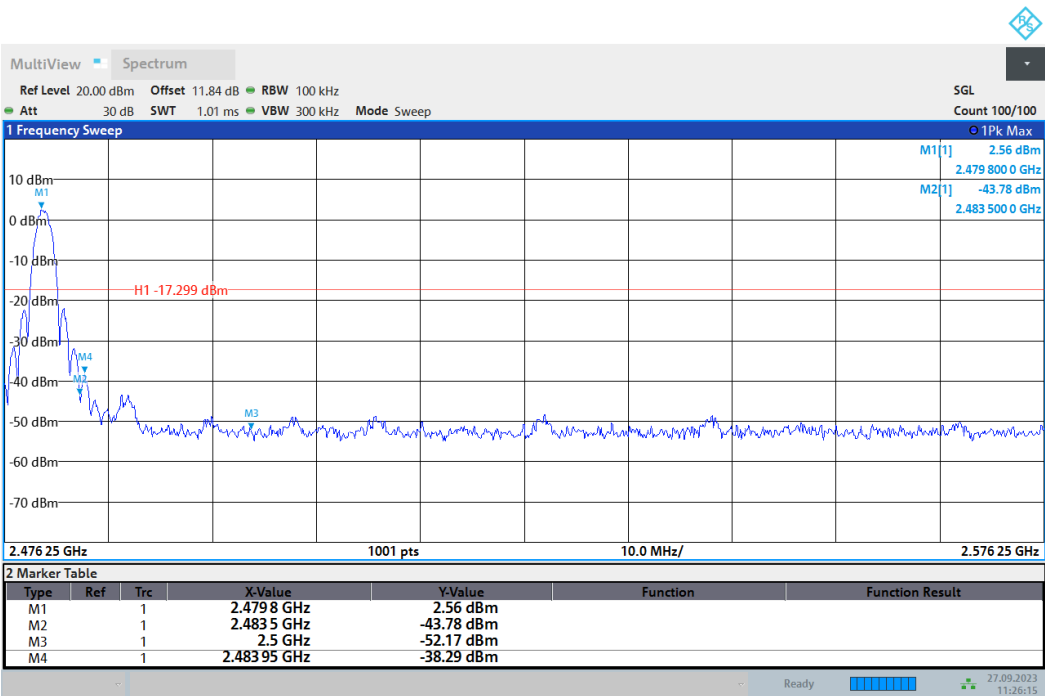


11:24:45 27.09.2023

2480MHz



11:26:14 27.09.2023



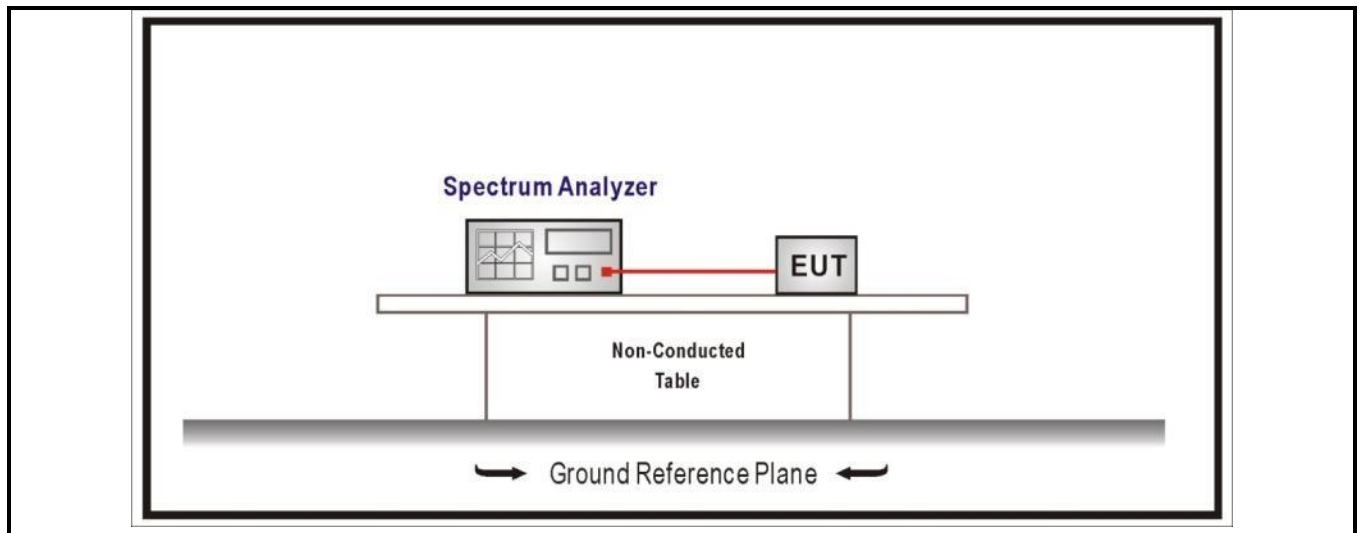
11:26:16 27.09.2023

4.4	Duty Cycle	VERDICT: PASS
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Limit

N/A

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	For reporting purpose only	

Results

Mode	CH.	Test Freq. (MHz)	Duty Cycle (%)	Correction Factor (dB)	1/T (kHz)
Thread	11	2405	100	0	0
	18	2440	100	0	0
	26	2480	100	0	0

Note:

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

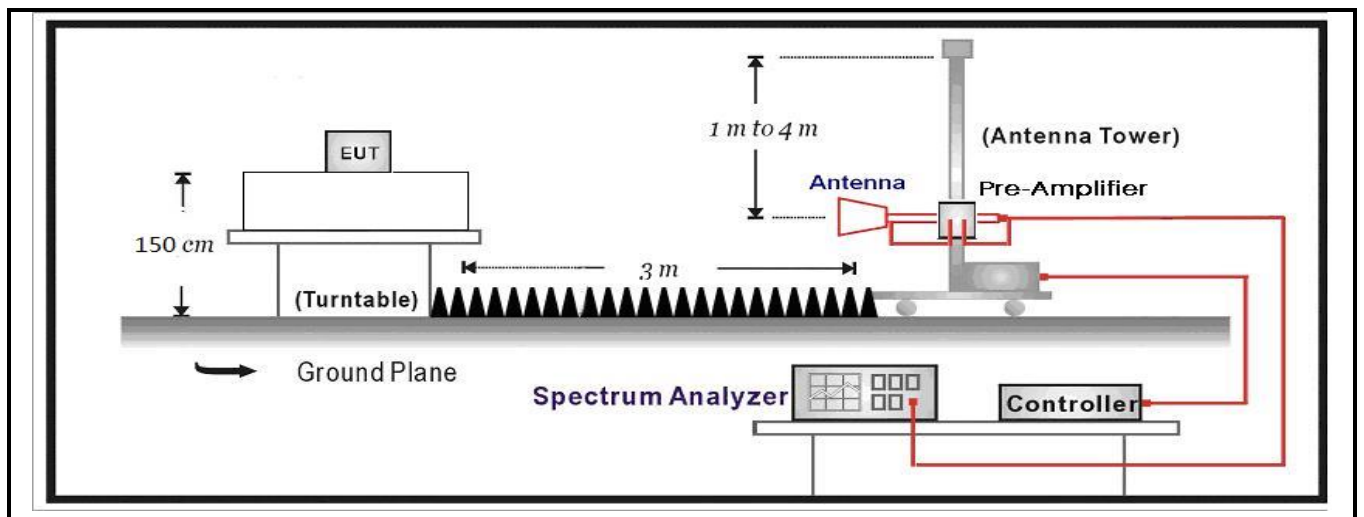
4.5	Radiated Emission Band Edge	VERDICT: PASS
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Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247(d), 15.205, 15.209 & RSS-Gen Issue 5 Section 8.9 & 8.10			
Frequency bands (MHz)	Detector	Limit (dB μ V/m)	RBW (MHz)	Distance (m)
2310-2390	PK	74	1	3
2483.5-2500	AV	54	1	3

Note: The field strength of emissions appearing within these frequency bands shall not exceed the limits.

Test Configuration

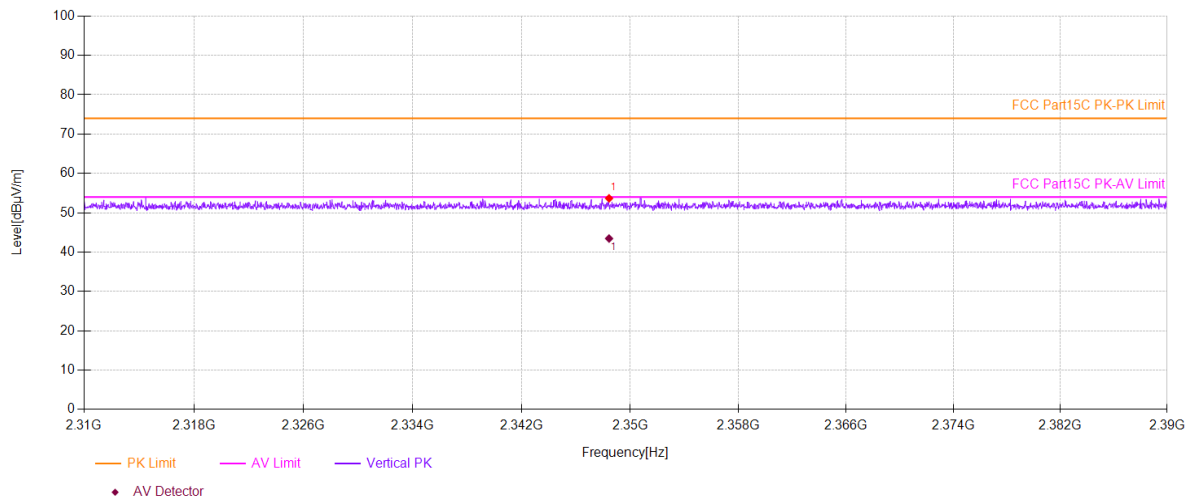


Performed measurements

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	---	

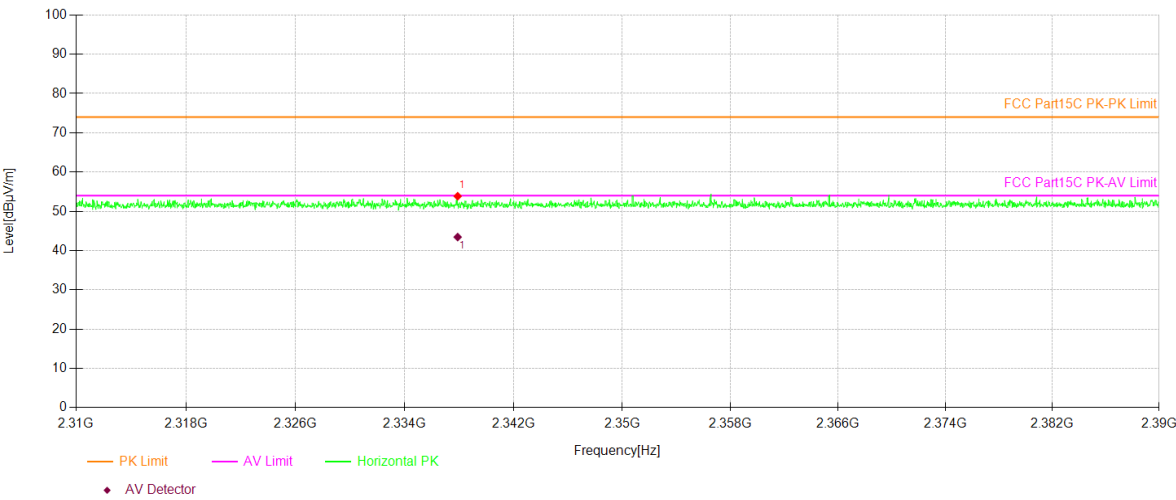
See next page

Results
Radiated Emission Band Edge
2405MHz



Suspected Data List							
NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity
1	2348.4395	53.67	30.99	74.00	20.33	PK	Vertical

AV Final Data List						
NO.	Freq. [MHz]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Detector	Polarity
1	2348.4395	43.45	54.00	10.55	AV	Vertical



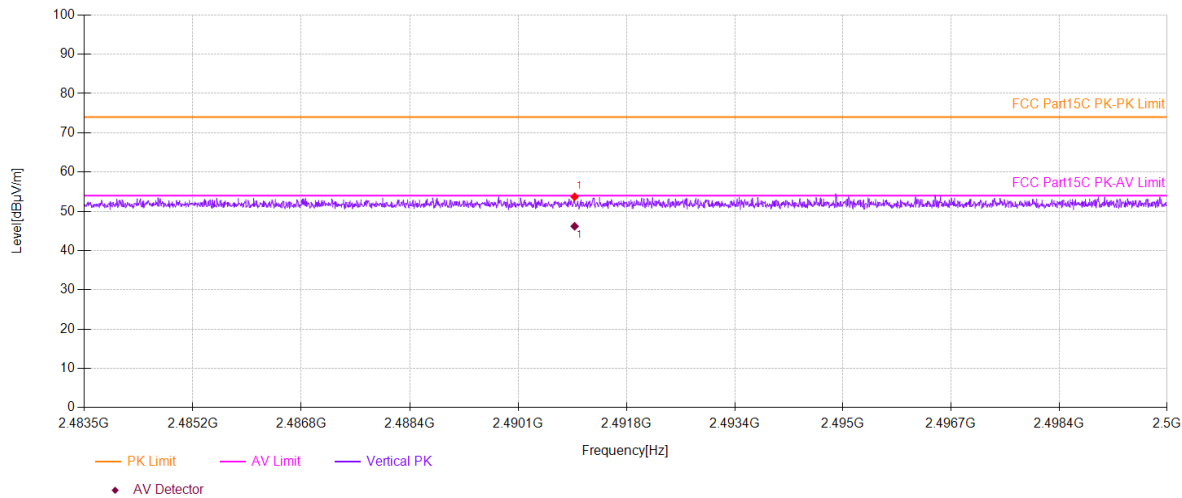
Suspected Data List

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity
1	2337.876	53.85	30.98	74.00	20.15	PK	Horizontal

AV Final Data List

NO.	Freq. [MHz]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Detector	Polarity
1	2337.876	43.44	54.00	10.56	AV	Horizontal

2480MHz

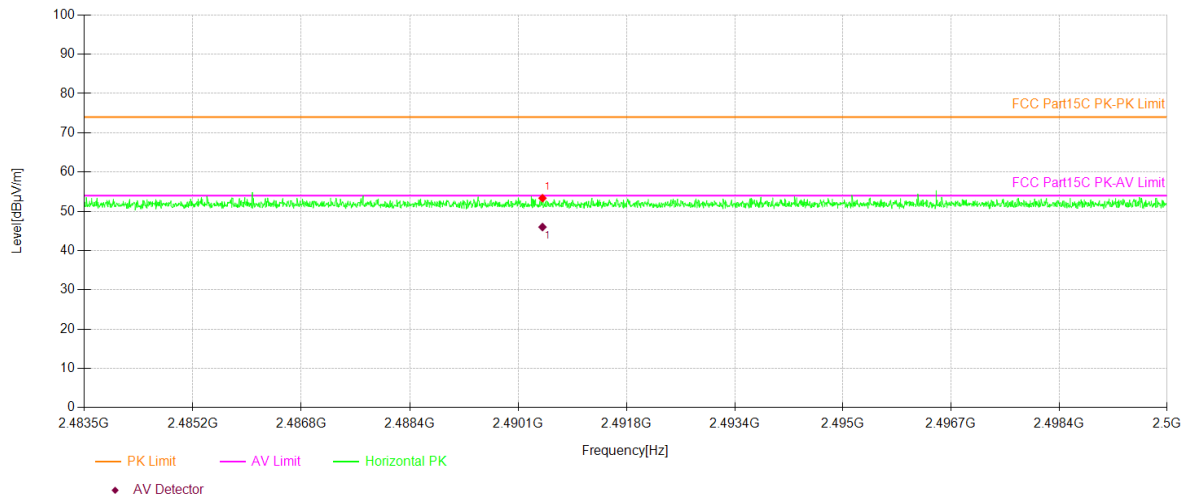


Suspected Data List

NO.	Freq. [MHz]	Level [dBμV/m]	Factor [dB/m]	Limit [dBμV/m]	Margin [dB]	Detector	Polarity
1	2490.9605	53.71	30.98	74.00	20.29	PK	Vertical

AV Final Data List

NO.	Freq. [MHz]	AV Value [dBμV/m]	AV Limit [dBμV/m]	AV Margin [dB]	Detector	Polarity
1	2490.9605	46.19	54.00	7.81	AV	Vertical



Suspected Data List

NO.	Freq. [MHz]	Level [dBµV/m]	Factor [dB/m]	Limit [dBµV/m]	Margin [dB]	Detector	Polarity
1	2490.4708	53.35	30.98	74.00	20.65	PK	Horizontal

AV Final Data List

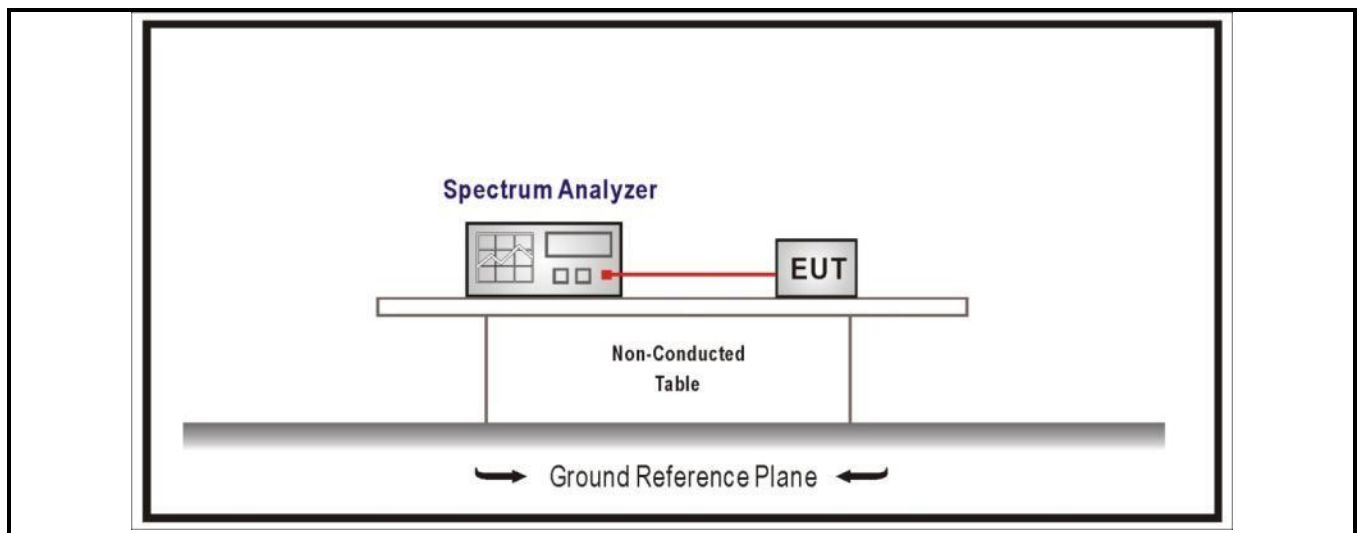
NO.	Freq. [MHz]	AV Value [dBµV/m]	AV Limit [dBµV/m]	AV Margin [dB]	Detector	Polarity
1	2490.4708	45.99	54.00	8.01	AV	Horizontal

4.6	DTS Bandwidth & Occupied Bandwidth	VERDICT: PASS
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Limit

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 least 500 kHz	
Standard	RSS-Gen Issue 5 Section 6.7 & RSS-247 Issue 2 Section 5.2(a)
The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs. The occupied bandwidth should within the required frequency range.	
The minimum 6 dB bandwidth shall be 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

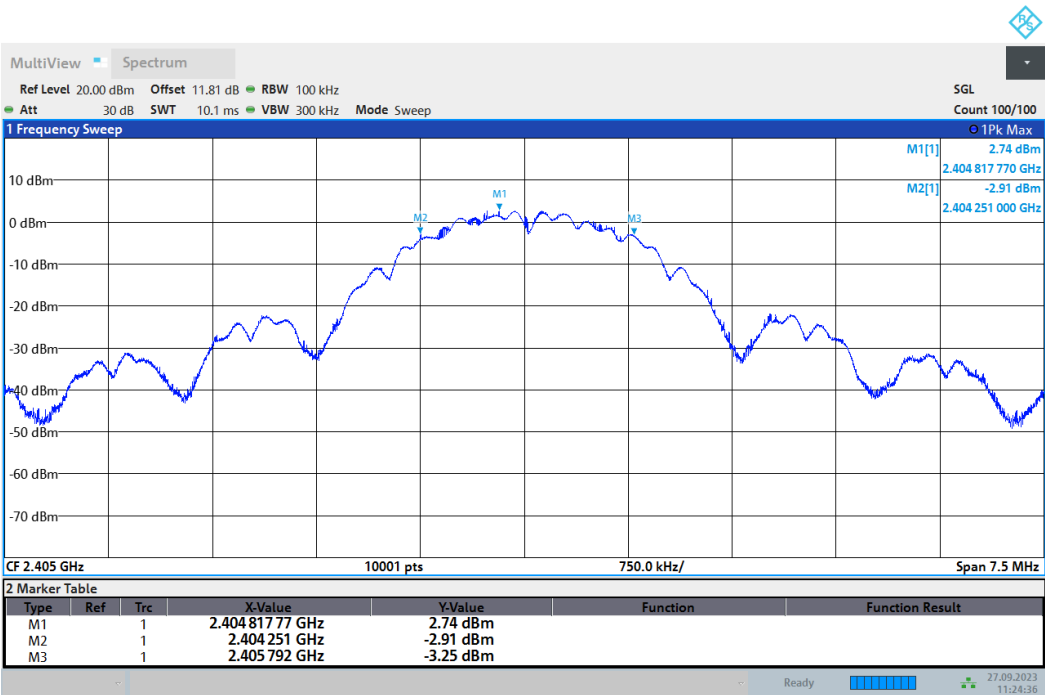
Mode	CH.	Test Freq. (MHz)	6dB Occupied Bandwidth (MHz)	Limit (MHz)	Result
Thread	11	2405	1.541	>0.5	Pass
	18	2440	1.364	>0.5	Pass
	26	2480	1.561	>0.5	Pass

Mode	CH.	Test Freq. (MHz)	99% Occupied Bandwidth (MHz)	Limit (MHz)	Result
Thread	11	2405	2.284	Within frequency range	Pass
	18	2440	2.272	Within frequency range	Pass
	26	2480	2.280	Within frequency range	Pass

DTS Bandwidth & Occupied Bandwidth

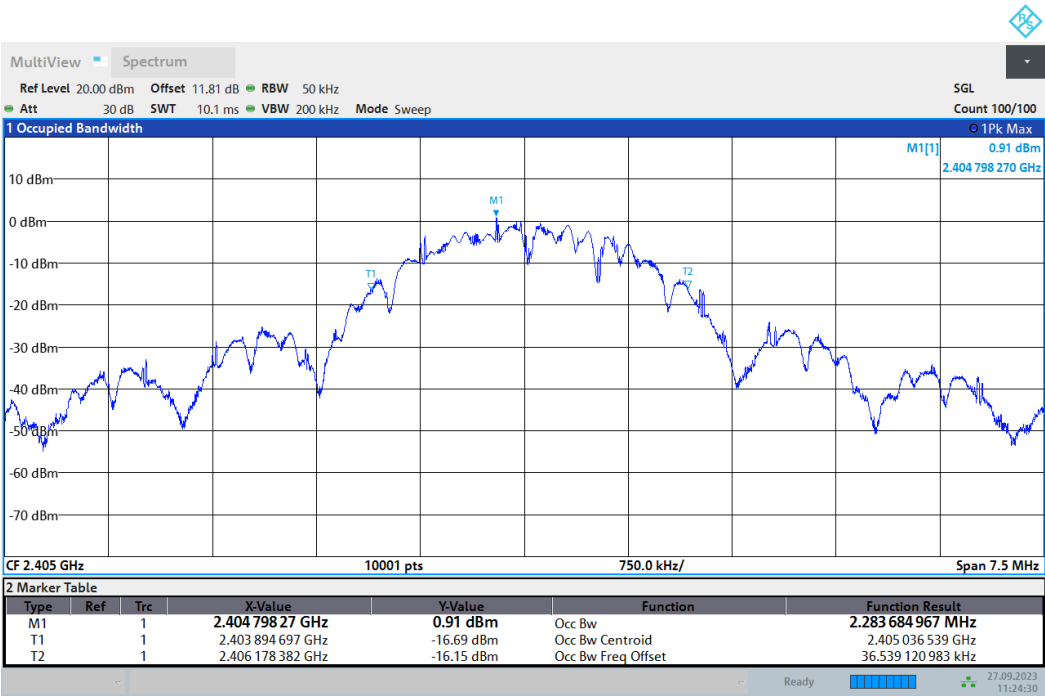
2405MHz

6dB Bandwidth



11:24:36 27.09.2023

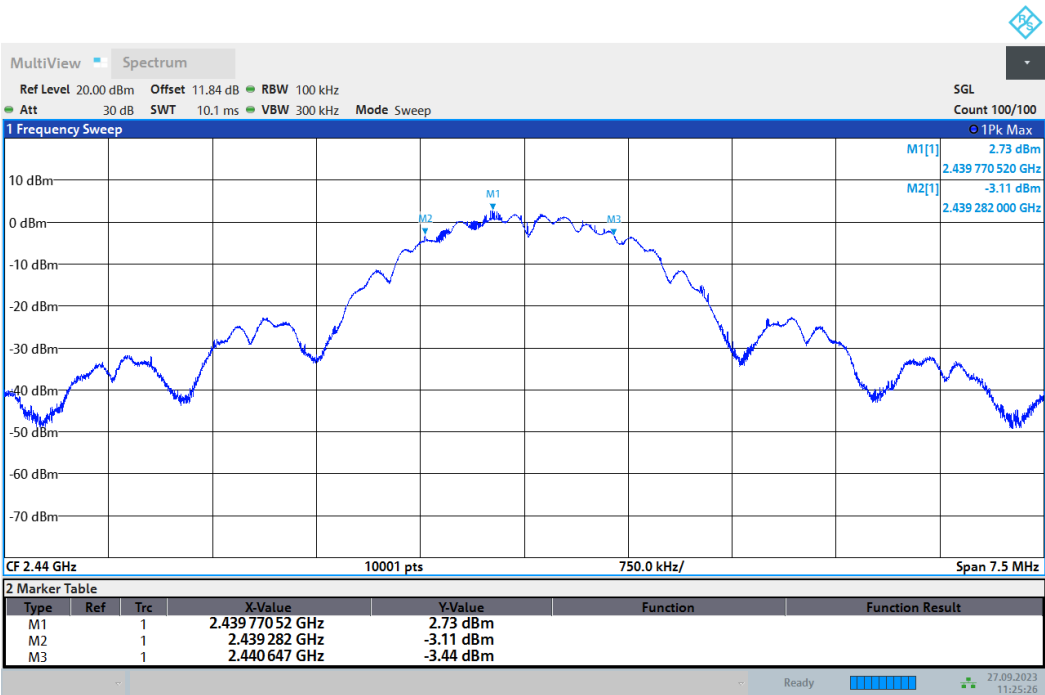
99% Occupied Bandwidth



11:24:30 27.09.2023

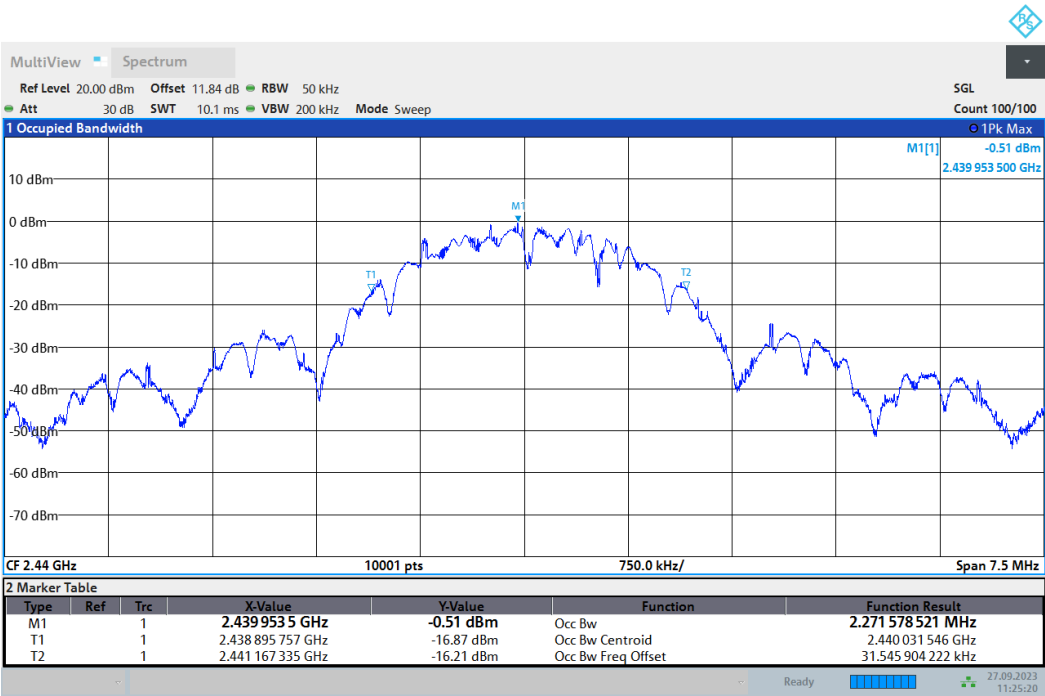
2440MHz

6dB Bandwidth



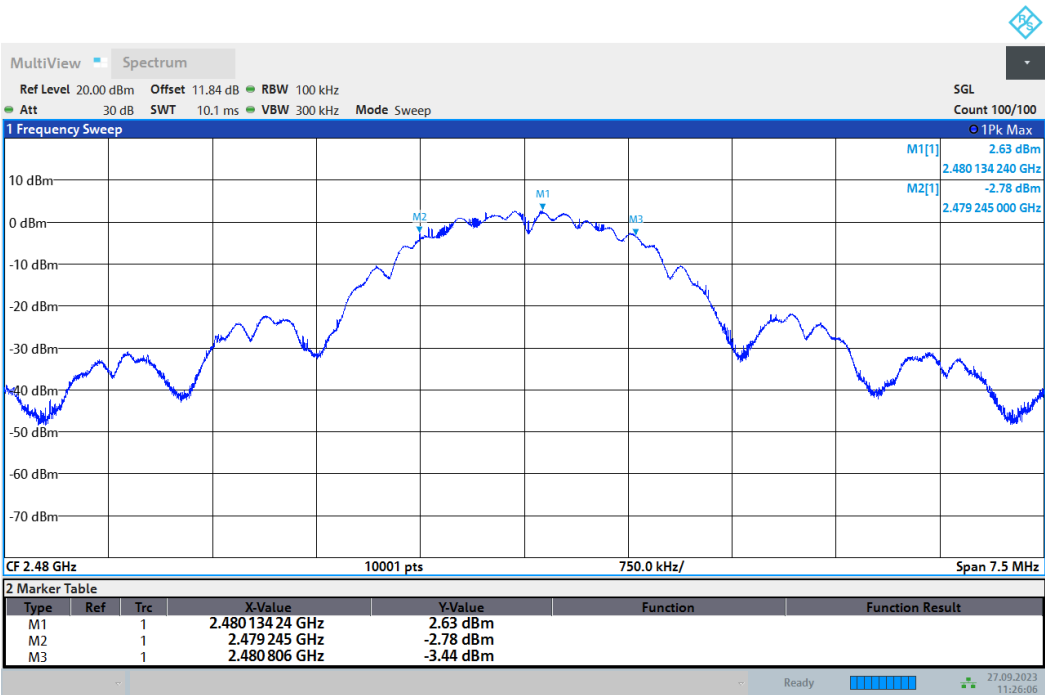
11:25:26 27.09.2023

99% Occupied Bandwidth



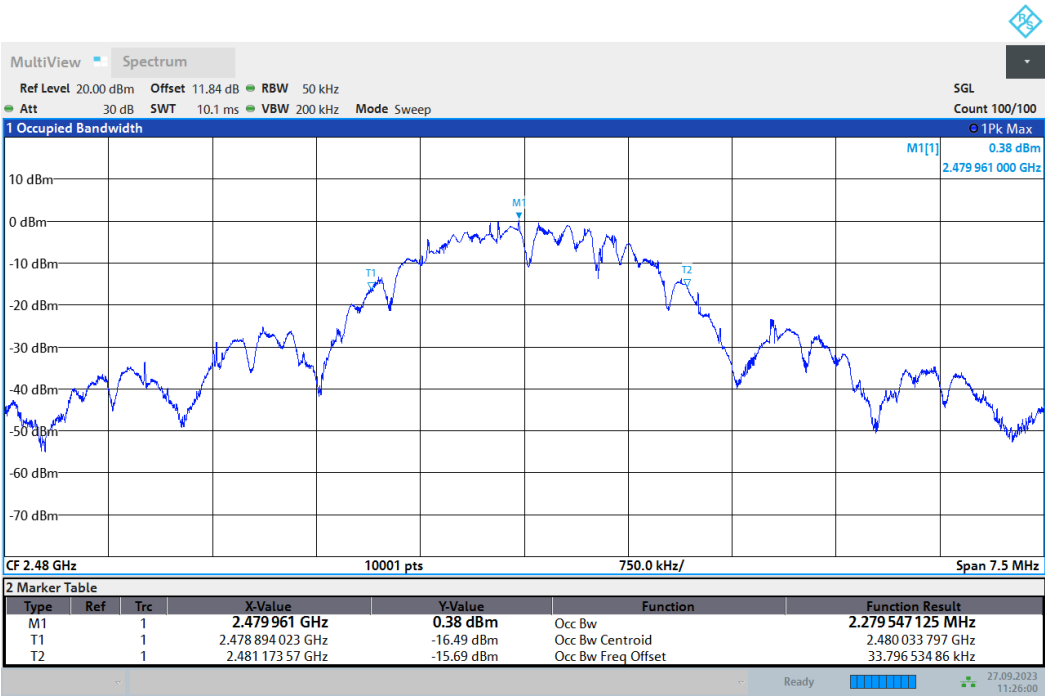
11:25:20 27.09.2023

2480MHz
6dB Bandwidth



11:26:07 27.09.2023

99% Occupied Bandwidth



11:26:00 27.09.2023

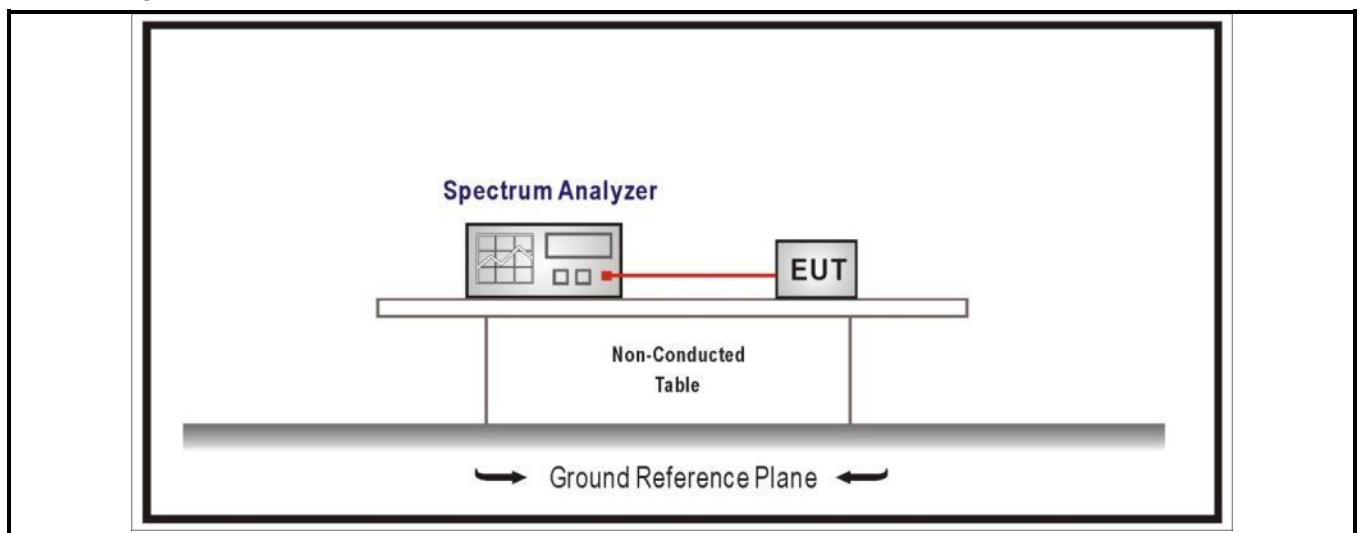
4.7	Fundamental emission output power	VERDICT: PASS
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Limit

Standard		FCC Part 15 Subpart C Paragraph 15.247 (b)(3) & RSS-247 Issue 2 Section 5.4(d)
☒	GTX < 6dBi	Pout≤30dBm, EIRP≤36dBm
☐	GTX > 6dBi	
☐	Non-Fix point-point	Pout≤30-(GTX -6), EIRP≤36dBm
☐	Fix point-point	Pout≤30-[(GTX-6)]/3, EIRP≤36dBm
☐	Point-to-multipoint	Pout≤30-(GTX-6) , EIRP≤36dBm
☐	Overlap Beams	Pout≤30-[(GTX-6)]/3, EIRP≤36dBm
☐	Aggregate power transmitted simultaneously on all beams	Pout≤30-[(GTX-6)]/3, EIRP≤36dBm
☐	single LE directional beam	Pout≤30-[(GTX-6)]/3+8dB, EIRP≤36dBm

Note 1 : GTX directional gain of transmitting antennas.
Note 2 : Pout is maximum peak conducted output power .
Note 3 : EIRP is equivalent isotropically radiated 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	---	

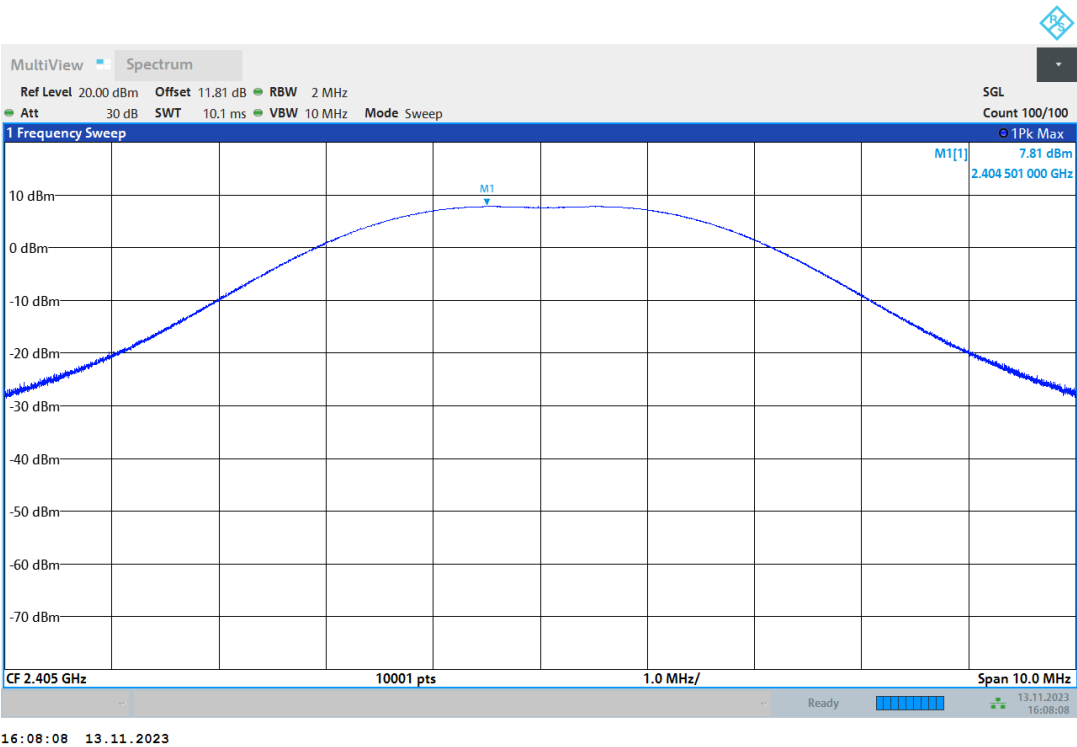
See next page.

Results

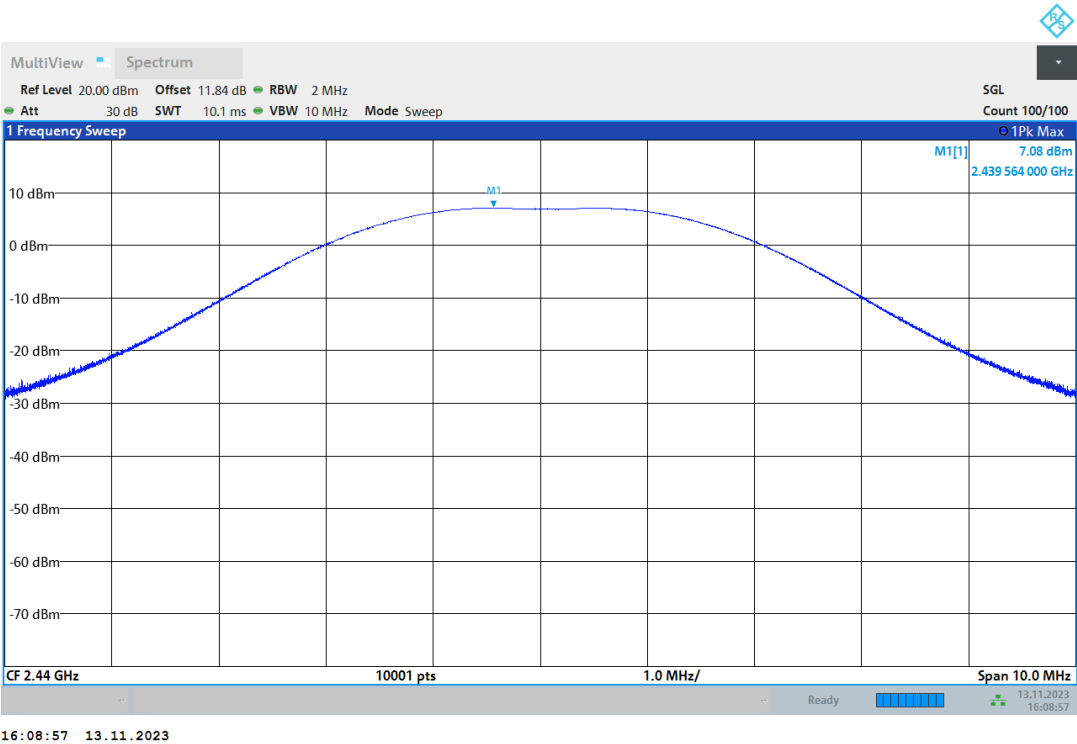
Mode	Channel	Test Frequency (MHz)	Output Power (dBm)	Output Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)	Result
Thread	11	2405	7.81	≤30	8.31	≤36	Pass
	18	2440	7.08	≤30	7.58	≤36	Pass
	26	2480	7.22	≤30	7.72	≤36	Pass

Note: EIRP = Output Power + Antenna Gain

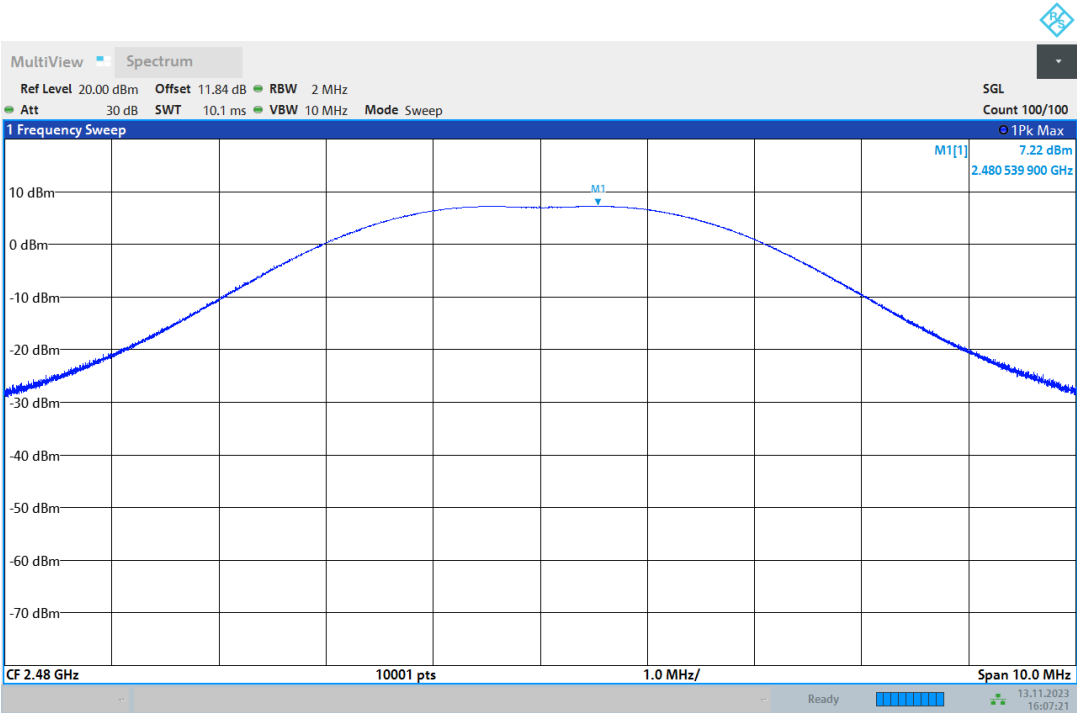
Fundamental emission output power
2405MHz



2440MHz



2480MHz



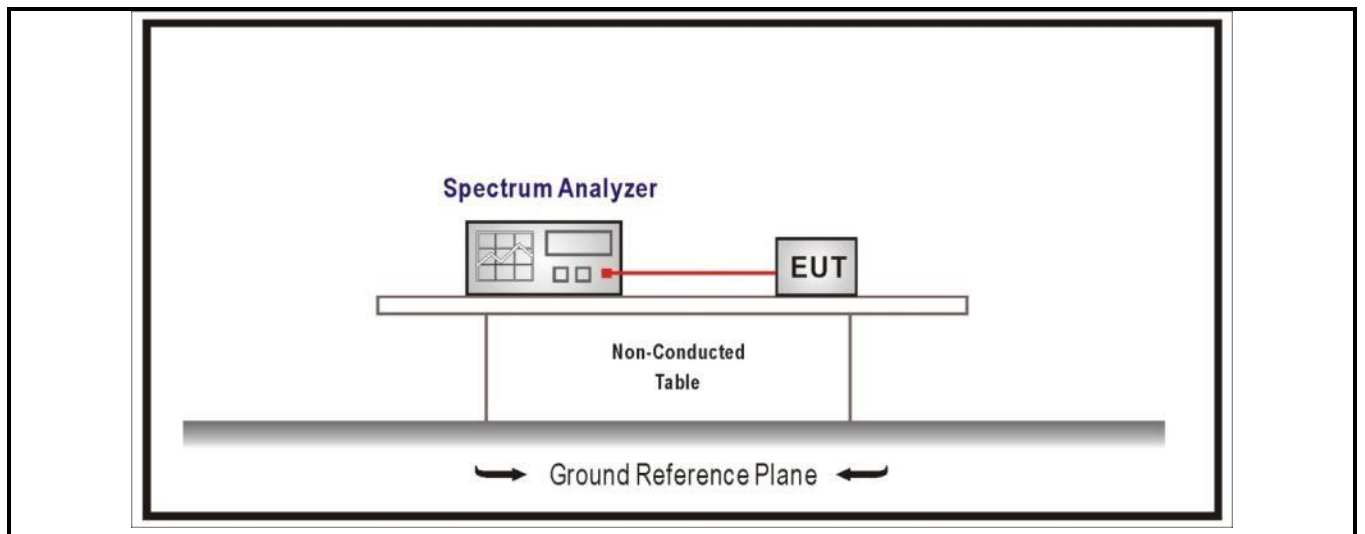
16:07:22 13.11.2023

4.8	Power Spectral Density	VERDICT: PASS
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Limit

Standard	FCC Part 15 Subpart C Paragraph 15.247 (b)(3) & RSS-247 Issue 2 Section 5.2(b)
Power Spectral Density $\leq 8\text{dBm}/3\text{kHz}$	

Test Configuration



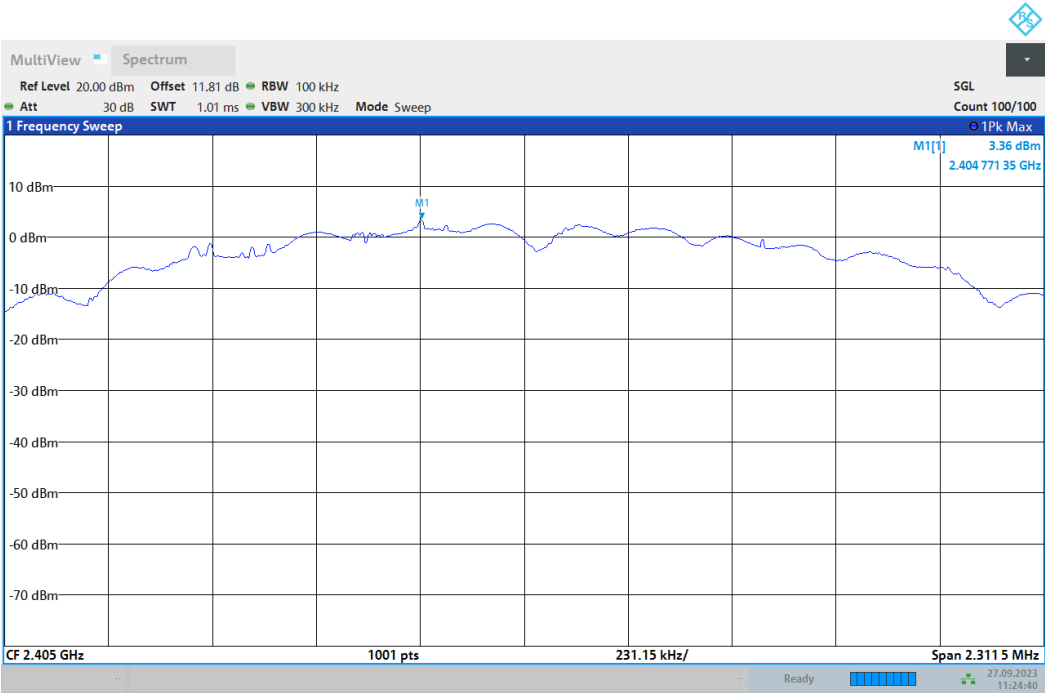
Performed measurements

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

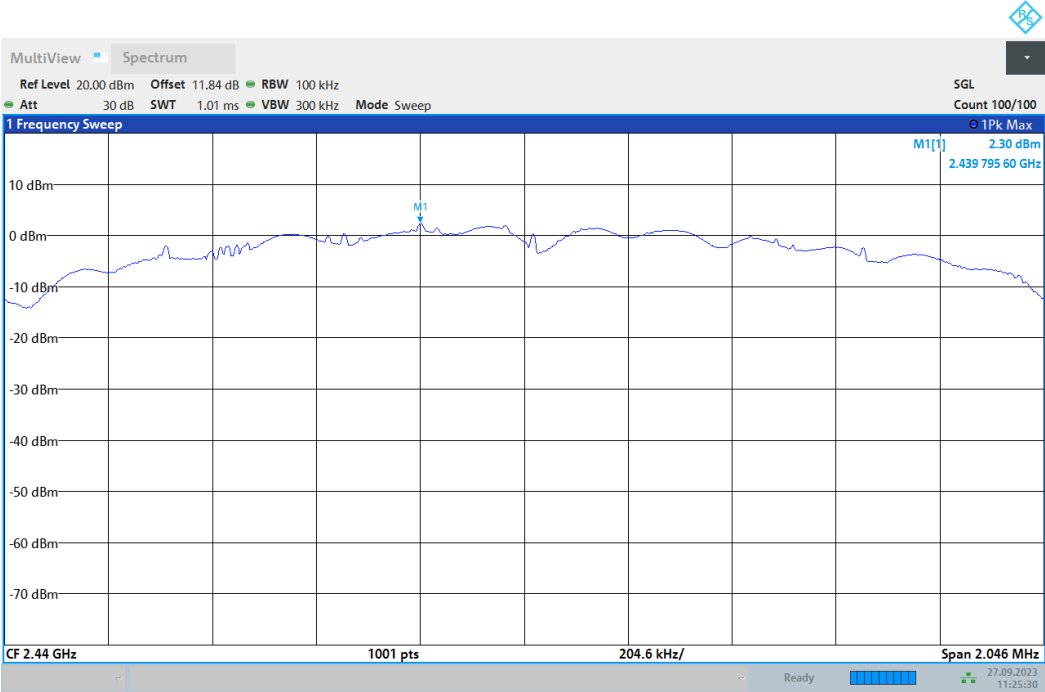
Mode	Channel	Test Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm/3kHz)	Result
Thread	11	2405	3.36	≤ 8	Pass
	18	2440	2.30	≤ 8	Pass
	26	2480	2.85	≤ 8	Pass

Power Spectral Density
2405MHz



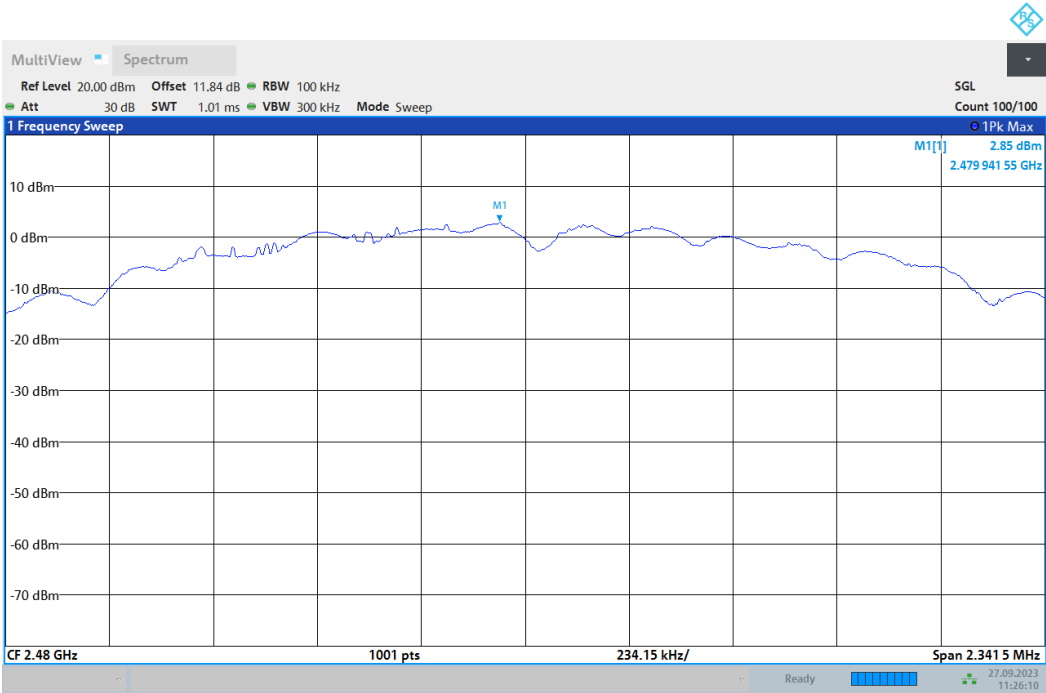
11:24:40 27.09.2023

2440MHz



11:25:30 27.09.2023

2480MHz



11:26:11 27.09.2023

4.9	Antenna Requirement	VERDICT: PASS
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Limit

Standard	FCC Part 15 Subpart C Paragraph 15.203
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, § 15.213, § 15.217, § 15.219, or § 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.	
Standard	RSS-Gen Issue 5 Section 6.8
A transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns.	

Antenna Connector Construction

☐	The use of a permanently attached antenna
☐	The antenna use of a unique coupling to the intentional radiator
☒	The use of a nonstandard antenna jack or electrical connector
Please refer to the attached document 'Internal Photograph' to show the antenna connector.	

5 IDENTIFICATION OF THE EQUIPMENT UNDER TEST

Remark: The test setup photo and EUT Photo please see appendix.

ANNEX 1 – MEASUREMENT UNCERTAINTY

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%.

Test Item	Uncertainty	
AC Power Line Conducted Emission	2.7 dB	
Radio frequency & Bandwidth	2 ppm	
RF power, conducted	0.216 dB	
Dwell Time	2.016 ms	
Spurious emissions, radiated	(9KHz~30MHz)	2.26 dB
	(30MHz~1GHz)	Horizontal: 3.992 dB
		Vertical: 3.986 dB
	(1GHz~8GHz)	Horizontal: 4.382 dB
		Vertical: 4.140 dB
	(8GHz~12.75GHz)	Horizontal: 4.266 dB
		Vertical: 4.186 dB
	(12.75GHz~18GHz)	Horizontal: 4.694 dB
		Vertical: 4.034 dB
	(18GHz~40GHz)	Horizontal: 4.010 dB
		Vertical: 4.024 dB
Humidity	1.4 %	
Temperature	0.5 °C	

ANNEX 2 – USED EQUIPMENT

For AC Power Line Conducted Emission (Dekra)

Equipment Name	Manufacturer	Type/Model	Serial Number	Last Cal Date	Cal Due date
EMI test receiver	R&S	ESR3	102958	2023/06/06	2024/06/05
Artificial Mains Network	R&S	ENV216	102772	2023/06/06	2024/06/05
Software	R&S	ELEKTRA	4.32.0	N/A	N/A

For Spurious Emissions Test (Emtek)

Equipment Name	Manufacturer	Type/Model	Serial Number	Last Cal Date	Cal Due date
EMI Test Receiver	Rohde & Schwarz	ESU 26	100154	2023/5/13	2024/5/12
Pre-Amplifie	Lunar EM	LNA30M3G-25	J10100000070	2023/5/13	2024/5/12
Bilog Antenna	Schwarzbeck	VULB9163	660	2023/5/16	2025/5/15
Horn antenna	Schwarzbeck	BBHA9120D	9120D-1177	2023/5/12	2025/5/11
Pre-Amplifie	SKET	LNPA_0118G-45	SK2019051801	2023/5/10	2024/5/9
Loop Antenna	Schwarzbeck	FMZB1519	1519-012	2023/5/12	2025/5/11
Spectrum Analyzer	Rohde & Schwarz	FSV40	100967	2023/5/10	2024/5/9
Pre-Amplifie	Lunar EM	LNA18G26-40	J1012131010001	2023/5/10	2024/5/9
Pre-Amplifie	Lunar EM	LNA26G40-40	J1013131028001	2023/5/10	2024/5/9
Universal Radio Communication	R&S	CMW500	171168	2022/11/2	2023/11/2

For other test items (Dekra)

Equipment Name	Manufacturer	Type/Model	Serial Number	Last Cal Date	Cal Due date
Vector signal generator	ROHDE & SCHWARZ	SMM100A	101780	2023/2/9	2024/2/8
Open switch and control platform	ROHDE & SCHWARZ	OSP150	100856	N/A	N/A
Signal and Spectrum analyzer	ROHDE & SCHWARZ	FSV3044	101287	2023/2/9	2024/2/8
Wireless connectivity tester	ROHDE & SCHWARZ	CMW270	102651	2023/2/9	2024/2/8
SIGNAL GENERATOR	ROHDE & SCHWARZ	SMB100A	183222	2023/2/9	2024/2/8

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