

Report on the FCC and IC Testing of the
Konrad Hornschuch AG
Model: P53
In accordance with FCC 47 CFR Part 15 C
and ISSED RSS-247 and ISSED RSS-GEN



Prepared for: Konrad Hornschuch AG
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Germany

FCC ID: 2BCO4V54-B01
IC: ---



COMMERCIAL-IN-CONFIDENCE

Date: 2024-02-21
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Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

Engineering Statement:

This measurement shown in this report were made in accordance with the procedures described on test pages.
All reported testing was carried out on a sample equipment to demonstrate limited compliance with with FCC 47 CFR Part 15 C and ISSED RSS-247 and RSS-GEN.
The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Alexander Deese	2024-02-21	 SIGN-ID 886092

Laboratory Accreditation DAkS Reg. No. D-PL-11321-11-02 DAkS Reg. No. D-PL-11321-11-03	Laboratory recognition Registration No. BNetzA-CAB-16/21-15	Industry Canada test site registration 3050A-2
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Executive Statement:

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15 C:2019 and ISSED RSS-247:2023 and RSS-GEN:2019

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1 Report Summary

1.1 Modification Report

Alternations and additions of this report will be issued to the holders of each copy in the form of a complete document.

<i>Issue</i>	<i>Description of changes</i>	<i>Date of Issue</i>
1	First Issue	2022-04-12
2	FCC ID added. Applicant and Manufacturer name updated.	2023-11-08
3	Antenna Gain corrected to 0.2 dBi	2023-12-18
4	Test specification "ISED RSS-247, Issue 2" updated to "Issue 3"	2024-02-21

Table 1: Report of Modifications

1.2 Introduction

Applicant	Konrad Hornschuch AG
Manufacturer	Konrad Hornschuch AG
Model Number(s)	P53
Serial Number(s)	-- 12539921361002 (Conducted Sample for Tests)
Firmware	---
Number of Samples Tested	2
Test Specification(s) /	FCC 47 CFR Part 15 C : 2019
Issue / Date	ISED RSS-247, Issue 3 : 2023 ISED RSS-GEN, Issue 5, Amendment 1 : 2019
Test Plan/Issue/Date	---
Order Number	5589320
Date of Receipt of EUT	2022-02-21
Start of Test	2022-02-28
Finish of Test	2022-04-08
Name of Engineer(s)	Michael Ingerl, Alexander Deese
Related Document(s)	ANSI C63.4: 2014 ANSI C63.10: 2013 FCC 47 CFR Part 2 J : 2019 KDB 558074 D01 V05R02 ISED RSS-102, Issue 5, 2015



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15 C, ISSED RSS-247 and ISSED RSS-GEN is shown below.

Section	Specification Clause	Test Description	Result
Battery powered (3.7 V DC) – Transmitting continuously			
2.1	15.247(a)(2)	Emission Bandwidth	Pass
2.2	15.247(b)(3)	Output Power	Pass
2.3	15.247(e)	Power Spectral Density	Pass
2.4	15.247(d)	Frequency Band Edge	Pass
2.5	15.247(d), 15.205, 15.209	Spurious Emissions	Pass
N/A	15.207	Conducted Emissions on Mains Terminals	(Only Battery powered)

Table 2: Results according to FCC 47 CFR Part 15 C

Section	Specification Clause	Test Description	Result
Battery powered (3.7 V DC) – Transmitting continuously			
2.1	5.2 a.	Emission Bandwidth	Pass
2.2	5.4 d.	Output Power	Pass
2.3	5.2 b.	Power Spectral Density	Pass
2.4	5.5	Frequency Band Edge	Pass
2.5	5.5	Spurious Emissions	Pass

Table 3: Results according to ISSED RSS-247

Section	Specification Clause	Test Description	Result
Battery powered (3.7 V DC) – Transmitting continuously			
2.1	6.7	Emission Bandwidth	Pass
2.5	8.9, 8.10	Spurious Emissions	Pass
2.6	8.11	Frequency Stability	Pass
N/A	8.8	Conducted Emissions on Mains Terminals	(Only Battery powered)

Table 4: Results according to RSS-Gen



1.4 Product Information

1.4.1 Technical Description

Equipment characteristics:			
Type designation	P53		
Type of equipment:	Portable Electronic Device		
Power supply	<input type="checkbox"/> AC Nominal: Minimum: Maximum: Nominal frequency:	<input type="checkbox"/> DC Nominal: Minimum: Maximum:	<input checked="" type="checkbox"/> Battery Nominal: 3.7 V
Kind of equipment:	Transceiver		
Frequency range:	2400-2483.5 MHz		
Number of RF-channels:	40		
Channel spacing	2 MHz		
Adaptive	No		
FHHS	No		
Type(s) of Modulation (e.g. BPSK, FSK, ASK, ...)	As per Bluetooth 4.2 Low Energy Standard		
Type of radio transmission / Use of frequency spectrum (e.g. DSSS, OFDM,.)	As per Bluetooth 4.2 Low Energy Standard		
Number / Type of Antenna(s)	Fractus Antenna Micro Reach Xtend™ NN01-110 (Integral Antenna)		
Antenna Gain:	0.2 dBi		
Temperature Range:	-20°C – 53°C		



1.4.2 EUT Ports / Cables identification

Port	Max Cable Length specified	Usage	Type	Screened
---	---	---	---	---

Table 2 Ports and Cables identification

1.5 Test Configuration

Battery powered (3.7 V DC) – Transmitting continuously

1.6 Deviations from Standard

None

1.7 EUT Modifications Record

The table below details modifications made to the EUT during the test program.
The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer / SN: ---	Not Applicable	Not Applicable

Table 3

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
0	As supplied by the customer / SN: 12539921361002 (Conducted Sample for Tests)	Not Applicable	Not Applicable

Table 4



Product Service

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

Test Name	Name of Engineer(s)
Battery powered (3.7 V DC) – Transmitting continuously	
Emission Bandwidth	Michael Ingerl, Alexander Deese
Output Power	Michael Ingerl, Alexander Deese
Power Spectral Density	Michael Ingerl, Alexander Deese
Frequency Band Edge	Michael Ingerl, Alexander Deese
Spurious Emissions	Michael Ingerl, Alexander Deese
Frequency Stability	Michael Ingerl, Alexander Deese

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



2 Test Details

2.1 Emission Bandwidth

2.1.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(a)(2)
ISED RSS-247, Clause 5.2 a
ISED RSS-Gen, Clause 6.7

2.1.2 Equipment under Test and Modification State

P52, S/N: 12539921361002 – Modification State 0

2.1.3 Date of Test

2022-03-09

2.1.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	20 %

2.1.5 Specification Limits

For systems using digital modulation techniques, operating in the 902 MHz – 928 MHz, 2400 MHz – 2483.5 MHz and/or 5725 MHz – 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz

ISED RSS-GEN:

The occupied (99 %) bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSS.

2.1.6 Test Method

The test was performed according to ANSI C63.10, clauses 6.9.3 and 11.8.1



2.1.7 Test Results

Frequency Channel	6 dB Bandwidth (MHz)	Limit (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402 MHz	1.188	0.500	2401.485149	2402.673267
2440 MHz	1.188	0.500	2439.485149	2440.673267
2480 MHz	1.188	0.500	2479.485149	2480.673267

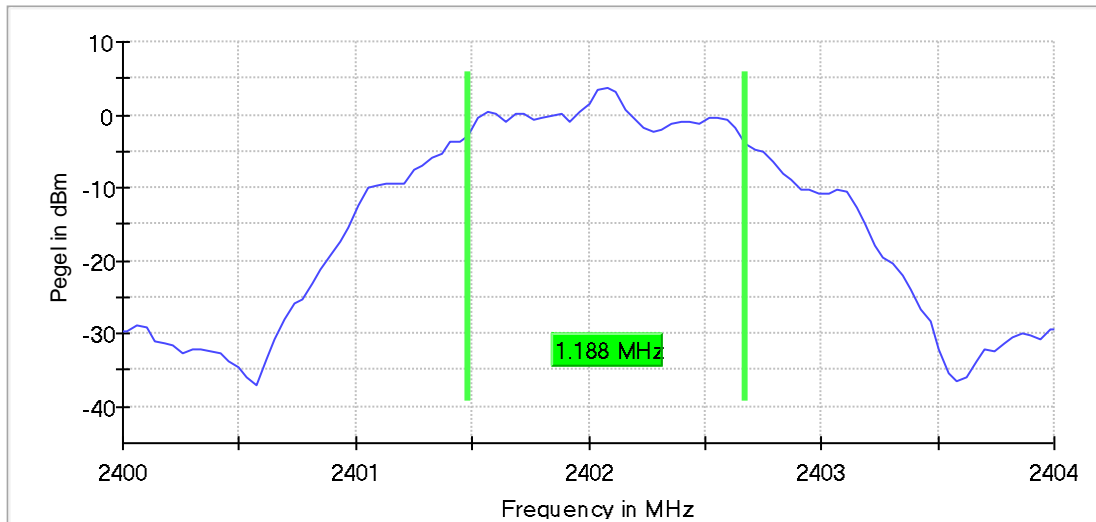
Table 5: 6 dB bandwidth

Frequency Channel	99% Bandwidth (MHz)	Band Edge Left (MHz)	Band Edge Right (MHz)
2402 MHz	2.000	2401.085000	2403.085000
2440 MHz	2.010	2439.085000	2441.095000
2480 MHz	2.010	2479.085000	2481.095000

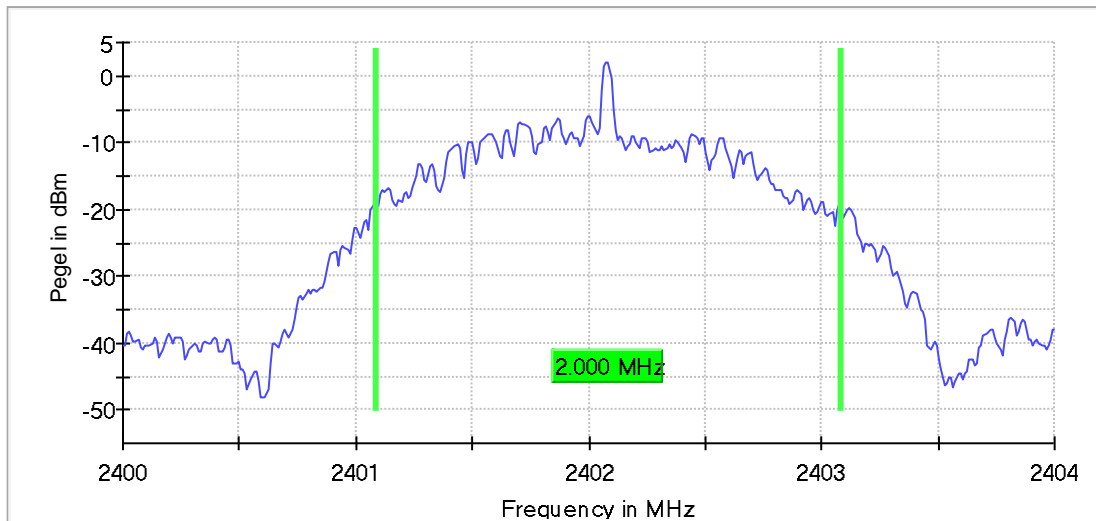
Table 6: 99% bandwidth

Test Plots from Channel 2402 MHz

6 dB Bandwidth

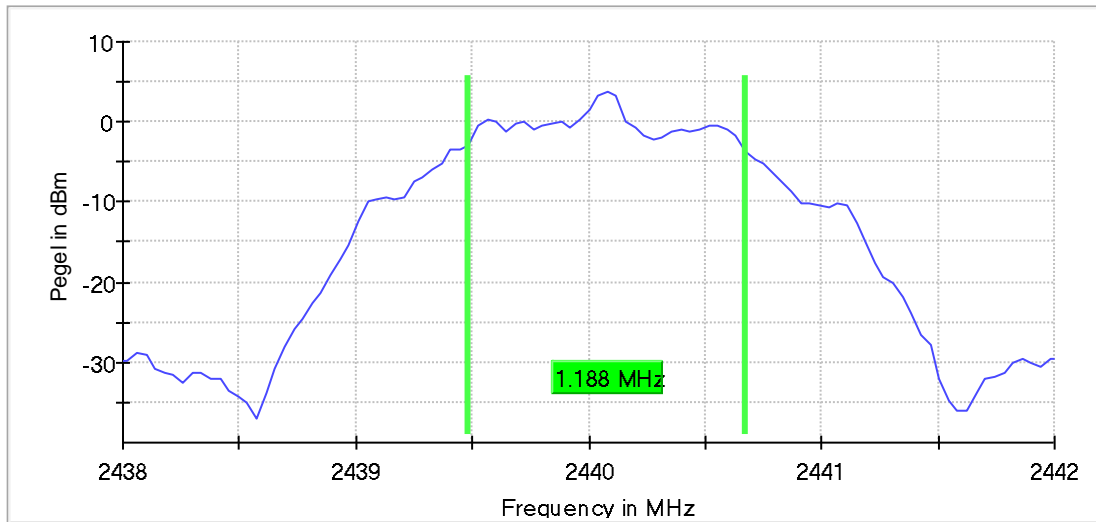


99 % Bandwidth

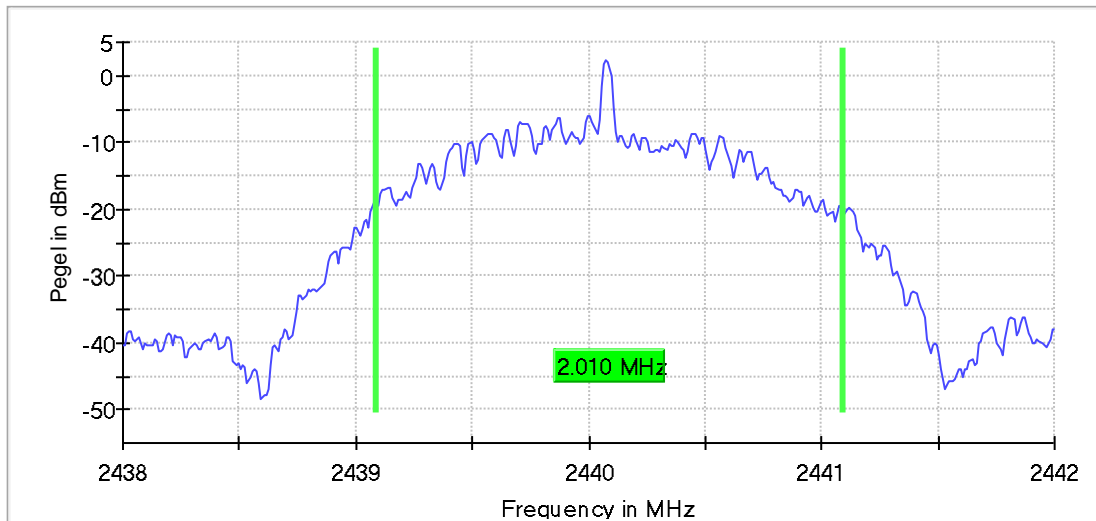


Test Plots from Channel 2440 MHz

6 dB Bandwidth

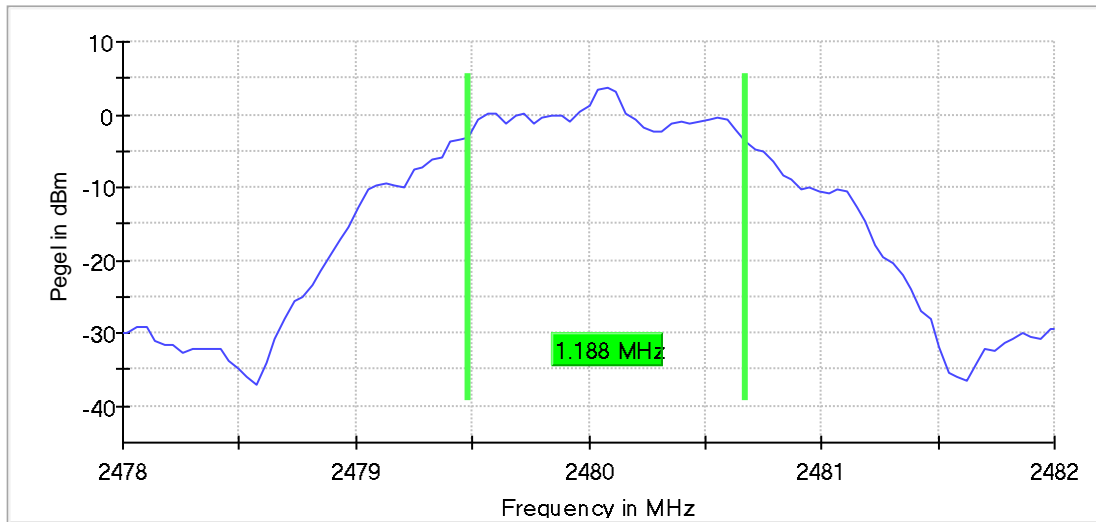


99 % Bandwidth

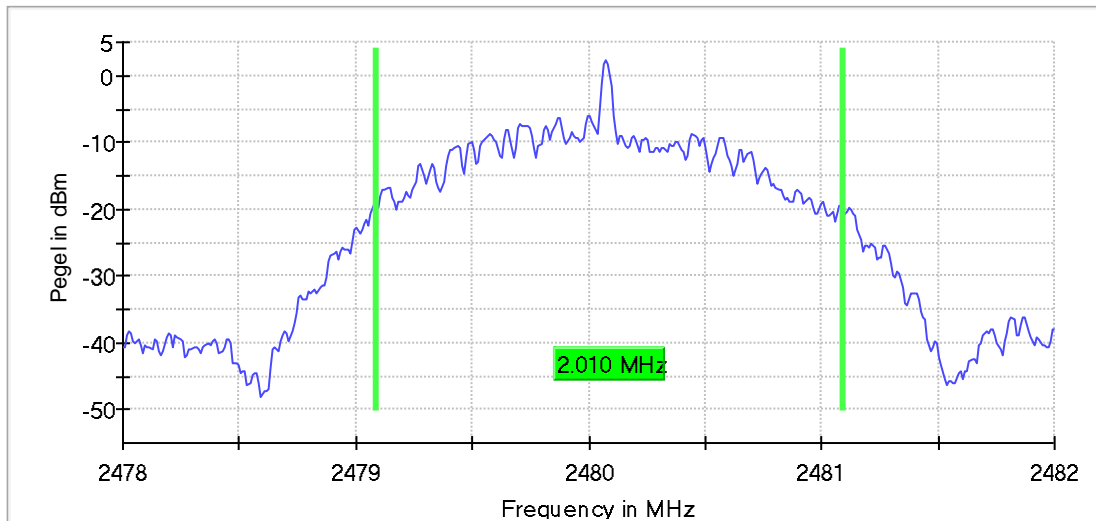


Test Plots from Channel 2480 MHz

6 dB Bandwidth



99 % Bandwidth





2.1.8 Test Location and Test Equipment

This test was carried out in Non shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyser	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	24	2024-02-29
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	36	2023-02-28
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	N/A	N/A
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	36	2023-11-30
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2023-02-28

Table 7



2.2 Output Power

2.2.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(b)(3)
ISED RSS-247, Clause 5.4 d.

2.2.2 Equipment under Test and Modification State

P53, S/N: 12539921361002 – Modification State 0

2.2.3 Date of Test

2022-03-09

2.2.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	20 %

2.2.5 Specification Limits

The maximum conducted output power shall not exceed 1 W (30 dBm).

2.2.6 Test Method

The test was performed according to ANSI C63.10, section 11.9



2.2.7 Test Results

<i>Frequency Channel</i>	<i>Conducted Output Power (dBm)</i>	<i>Limit (dBm)</i>
2402 MHz	3.536	30.0
2440 MHz	3.442	30.0
2480 MHz	3.362	30.0

Table 8: Conducted Output Power

2.2.8 Test Location and Test Equipment

This test was carried out in Non shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyser	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	24	2024-02-29
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	36	2023-02-28
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	N/A	N/A
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	36	2023-11-30
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2023-02-28

Table 9



2.3 Power Spectral Density

2.3.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(e)
ISED RSS-247, Clause 5.2 b

2.3.2 Equipment under Test and Modification State

P53, S/N: 12539921361002– Modification State 0

2.3.3 Date of Test

2022-03-09

2.3.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	20 %

2.3.5 Specification Limits

FCC 47 CFR, section 15.257(e)
ISED RSS-247, Clause 5.2.(b)

The power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

The same method (detector) of determining the conducted output power shall be used to determine the power spectral density.

2.3.6 Test Method

The test was performed according to ANSI C63.10, section 11.10



2.3.7 Test Results

Frequency Channel	Power Spectral Density (dBm)	Limit (dBm)
2402 MHz	-2.738	8.0
2440 MHz	-2.073	8.0
2480 MHz	-2.424	8.0

Table 10: Power Spectral Density

2.3.8 Test Location and Test Equipment

This test was carried out in Non shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyser	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	24	2024-02-29
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	36	2023-02-28
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	N/A	N/A
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	36	2023-11-30
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2023-02-28

Table 11



2.4 Frequency Band Edge

2.4.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.247(d)
ISED RSS-247, Clause 5.5

2.4.2 Equipment under Test and Modification State

P53, S/N: 12539921361002 – Modification State 0

2.4.3 Date of Test

2022-03-09

2.4.4 Environmental Conditions

Ambient Temperature	23 °C
Relative Humidity	20 %

2.4.5 Specification Limits

In any 100 kHz bandwidth outside the frequency band in which the device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either conducted or radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits is not required.

In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.

ISED RSS-247 Clause 6.2.4.2

The power and e.i.r.p. of the equipment unwanted emission shall be measured in peak value. However, the equipment is restricted to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands.

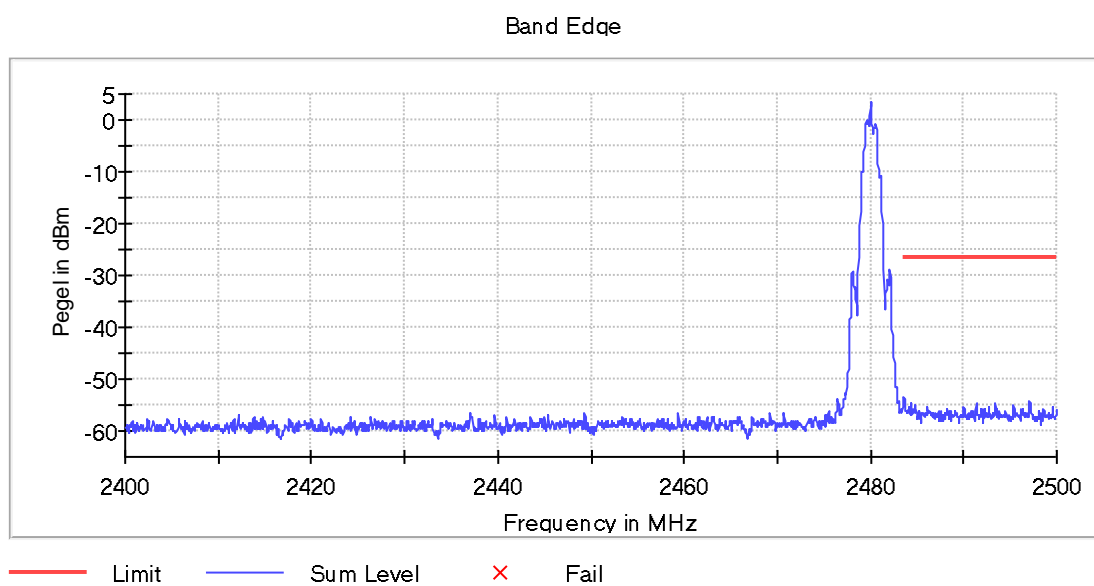
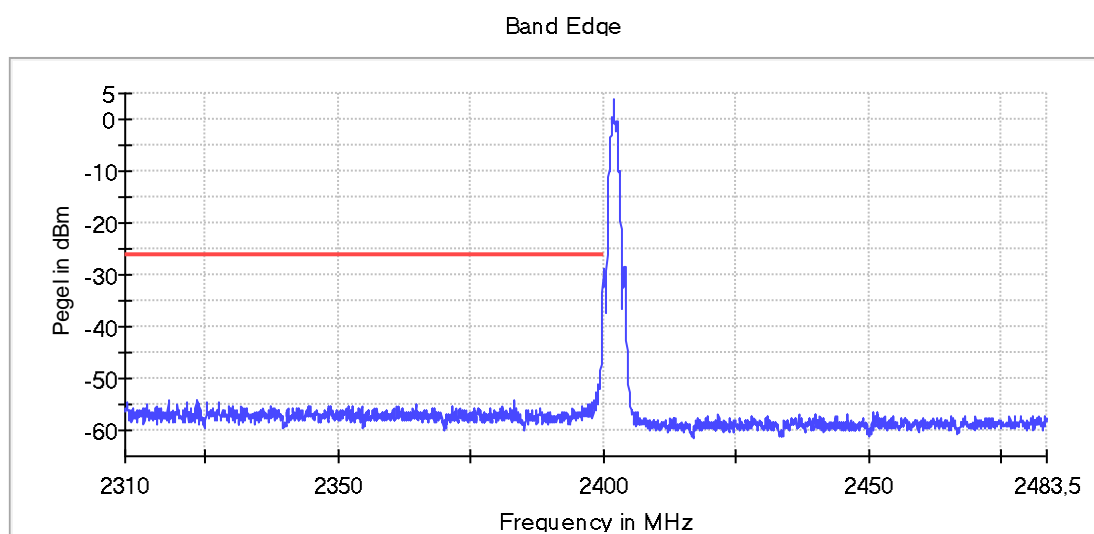
Devices operating in the band 5725 MHz – 5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

- 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm at 75 MHz above or below the band edges; and
- 27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

2.4.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11

2.4.7 Test Results





2.4.8 Test Location and Test Equipment

This test was carried out in Non shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyser	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	24	2024-02-29
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	36	2023-02-28
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	N/A	N/A
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	36	2023-11-30
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2023-02-28

Table 12



2.5 Spurious emissions

2.5.1 Specification Reference

FCC 47 CFR Part 15 C, Clause 15.205, 15.209, 15.247(d)
ISED RSS-247, Clause 5.5 / 6.2.4.2
ISED RSS-Gen, Clauses 8.9 and 8.10

2.5.2 Equipment under Test and Modification State

P53, S/N: --- – Modification State 0 (For Radiated Tests)
P52, S/N: 12539921361002 – Modification State 0 (For Conducted Tests)

2.5.3 Date of Test

2022-03-08 to 2022-04-08

2.5.4 Environmental Conditions

Ambient Temperature	24 °C
Relative Humidity	21 %

2.5.5 Specification Limits

In any 100 kHz bandwidth outside the frequency band in which the device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on either conducted or radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits is not required.

In addition, radiated emissions which fall in the restricted bands must also comply with the radiated emission limits.



General radiated emission limits:					
Frequency Range (MHz)	Test distance (m)	Field strength		Field strength	
		($\mu\text{A/m}$)	($\text{dB}\mu\text{A/m}$)	($\mu\text{V/m}$)	($\text{dB}\mu\text{V/m}$)
0.009 – 0.49	300	$6.37 / f$	$20*\lg(6.37 / f)$	$2400 / f$	$20*\lg(2400 / f)$
0.49 – 1.705	30	$63.7 / f$	$20*\lg(63.7 / f)$	$24000 / f$	$20*\lg(24000 / f)$
1.705 – 30	30	0.08	$20*\lg(0.08 / f)$	30	$20*\lg(30 / f)$
30 – 88	3	---	--	100	40
88 – 216	3	--	--	150	43.5
126 – 960	3	--	--	200	46
above 960	3	--	--	500	54
Note 1: f in kHz					

Table 13 General radiated emission limits

ISED RSS-247 Clause 6.2.4.2

The power and e.i.r.p. of the equipment unwanted emission shall be measured in peak value. However, the equipment is restricted to comply with the provisions in RSS-Gen with respect to emissions falling within restricted frequency bands.

Devices operating in the band 5725 MHz – 5850 MHz shall have e.i.r.p. of unwanted emissions comply with the following:

- 27 dBm/MHz at frequencies from the band edges decreasing linearly to 15.6 dBm/MHz at 5 MHz above or below the band edges;
- 15.6 dBm/MHz at 5 MHz above or below the band edges decreasing linearly to 10 dBm/MHz at 25 MHz above or below the band edges;
- 10 dBm/MHz at 25 MHz above or below the band edges decreasing linearly to -27 dBm at 75 MHz above or below the band edges; and
- 27 dBm/MHz at frequencies more than 75 MHz above or below the band edges.

2.5.6 Test Method

The test was performed according to ANSI C63.10, sections 11.11 and 11.12

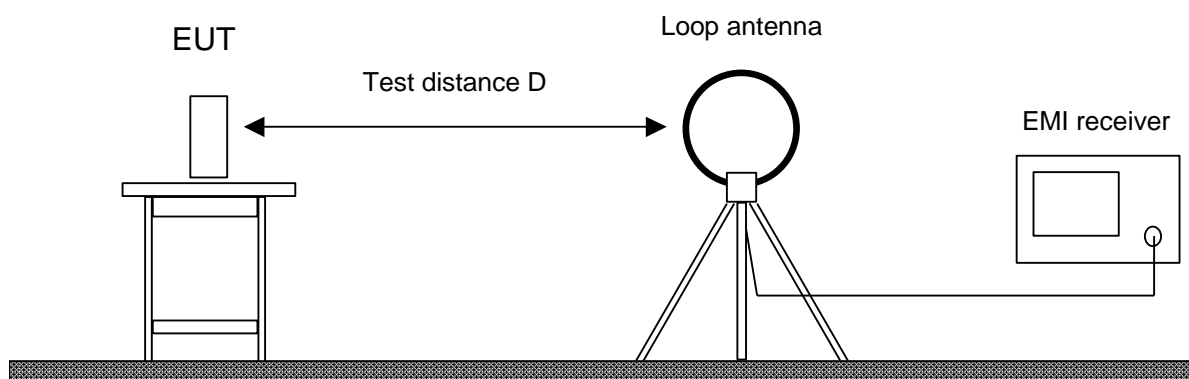
Prescans are performed in six positions of the EUT to get the full spectrum of emission caused by the EUT with the measuring antenna raised and lowered from 1 m to 4 m with vertical and horizontal polarisation to find the combination of table position, antenna height and antenna polarisation for the maximum emission levels.

Data reduction is applied to these results to select those levels having less margin than 10 dB or exceeding the limit using subranges and limited number of maximums.

Further maximisation for adjusting the maximum position is following.

Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

2.5.6.1 Frequency range 9 kHz – 30 MHz

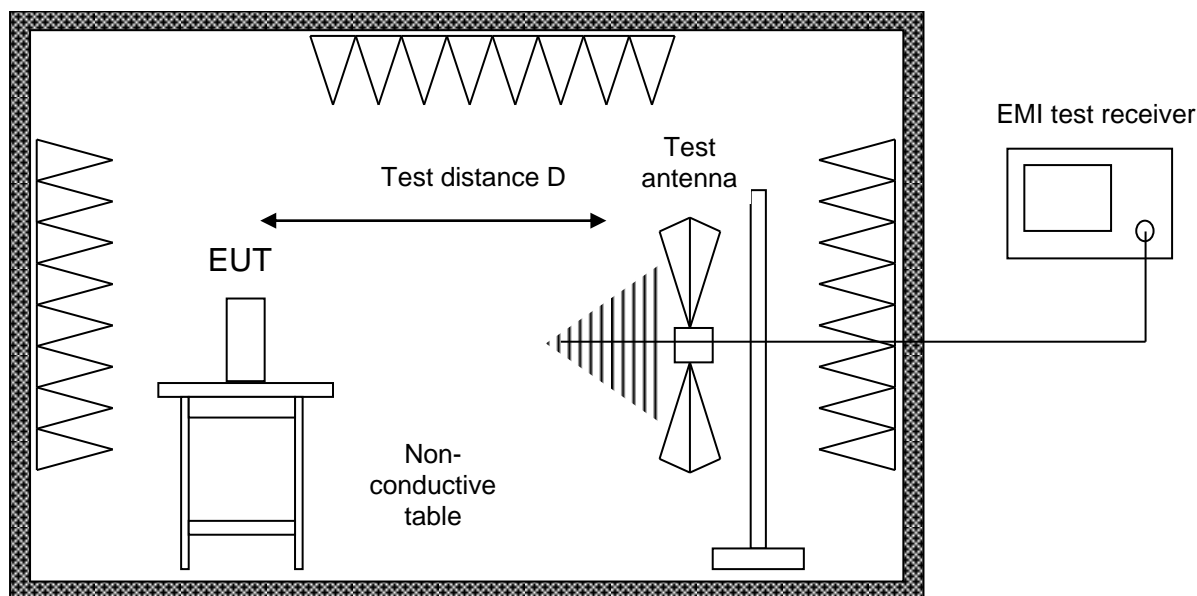


The EUT was placed on a non-conductive table, 0.8 m above the ground.

Radiated emissions in the frequency 9 kHz – 30 MHz is measured within a semi-anechoic room with an active loop antenna with the measurement detector set to peak. In addition in the frequency range 9 kHz to 490 kHz also an average detector was used. The measurement bandwidth of the receiver was set to 300 Hz in the frequency range 9 kHz to 150 kHz and 10 kHz in the frequency range 150 kHz to 30 MHz. Prescans were performed in six positions of the EUT.

For final measurements the detector was set to CISPR quasi-peak and in addition to CISPR average in the frequency range 9 kHz to 490 kHz with a resolution bandwidth 200 Hz in the frequency range 9 kHz to 150 kHz and 9 kHz in the frequency range 150 kHz to 30 MHz. Final tests were performed immediately after a final frequency and zoom (for drifting disturbances) and maximum adjustment.

2.5.6.2 Frequency range 30 MHz – 1 GHz



Alternate test site (semi anechoic room)

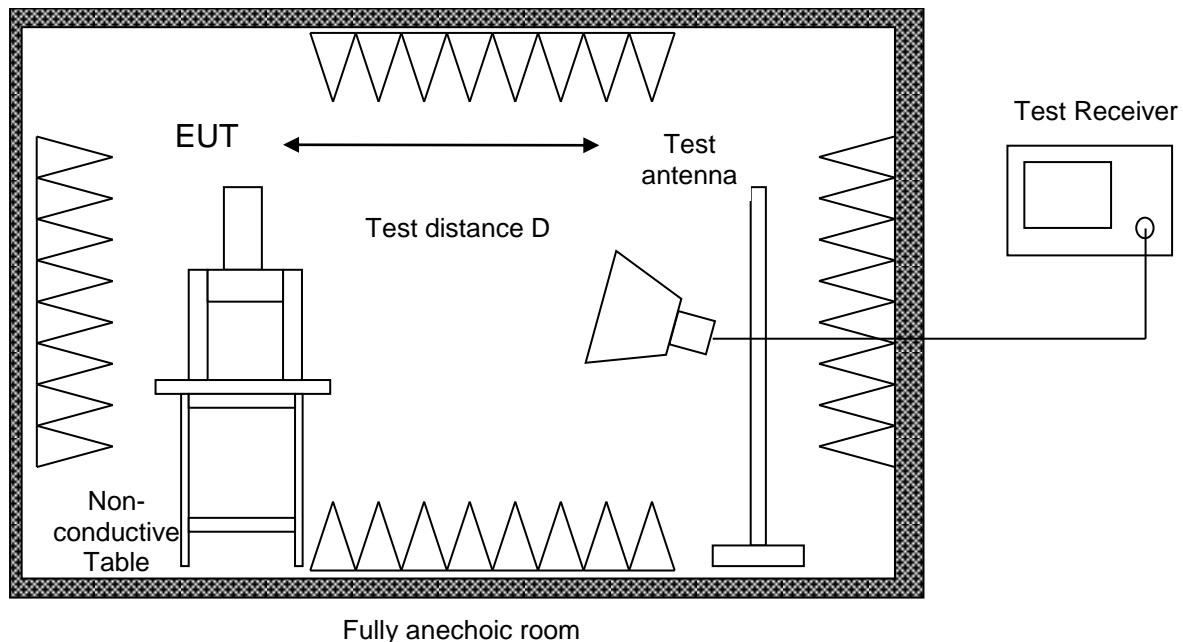
The EUT was placed on a non-conductive table, 0.8 m above the ground plane

Radiated emissions in the frequency range 30 MHz – 1 GHz is measured within a semi-anechoic room with groundplane complying with the NSA requirements of ANSI C63.4. for alternative test sites. A linear polarised logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used.

For prescan tests the test receiver is set to peak-detector with a bandwidth of 120 kHz.

With the measurement bandwidth of the test receiver set to 120 kHz CISPR quasi-peak detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.

2.5.6.3 Frequency range above 1 GHz



The EUT was placed on a non-conductive table, 1.5 m above the ground plane. Radiated emission tests above 1 GHz are performed in a fully anechoic room with the S_{VSWR} requirements of ANSI C63.4. Measurements are performed both in the horizontal and vertical planes of polarisation using a test receiver with the detector function set to peak and average and the resolution bandwidth set to 1 MHz. Testing above 1 GHz is performed with horn antennas with the EUT in boresight of the antenna.

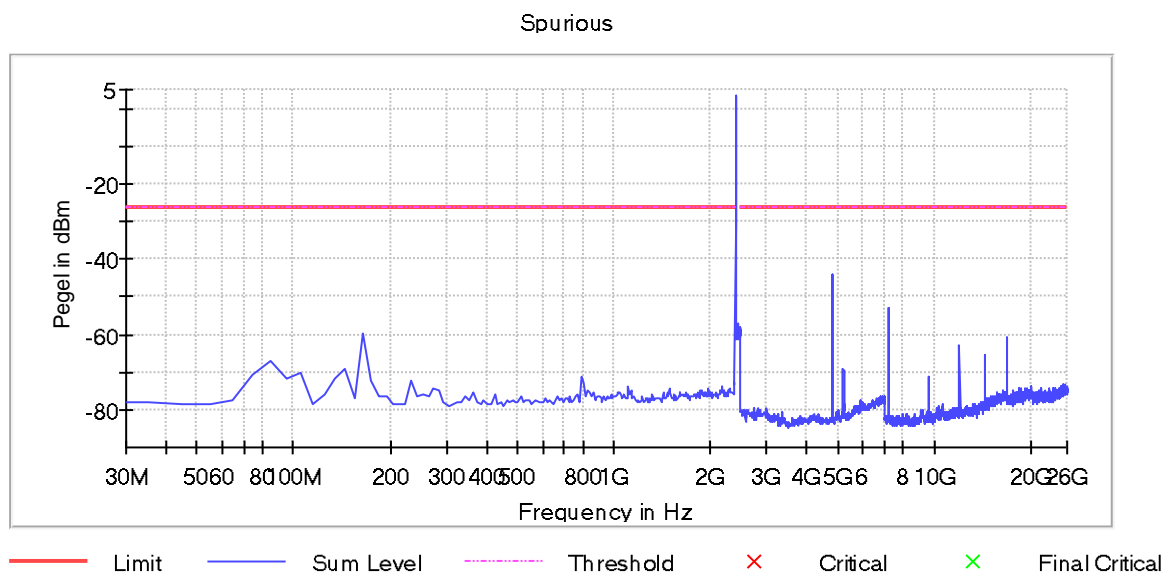
For prescan tests the test receiver is set to peak- and average-detector with a bandwidth of 1 MHz. With the measurement bandwidth of the test receiver set to 1 MHz and peak- and CISPR average-detector is selected for final measurements following immediately after a final frequency zoom (for drifting disturbances) and maximum adjustment.



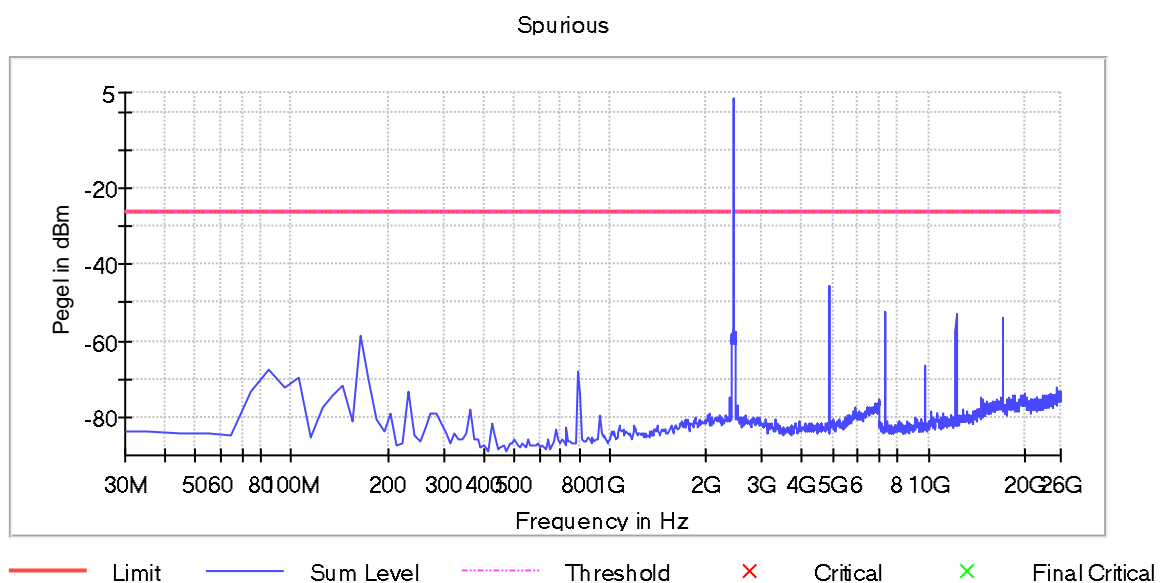
2.5.7 Test Results

2.5.7.1 Conducted emission test

Ch. 2402 MHz



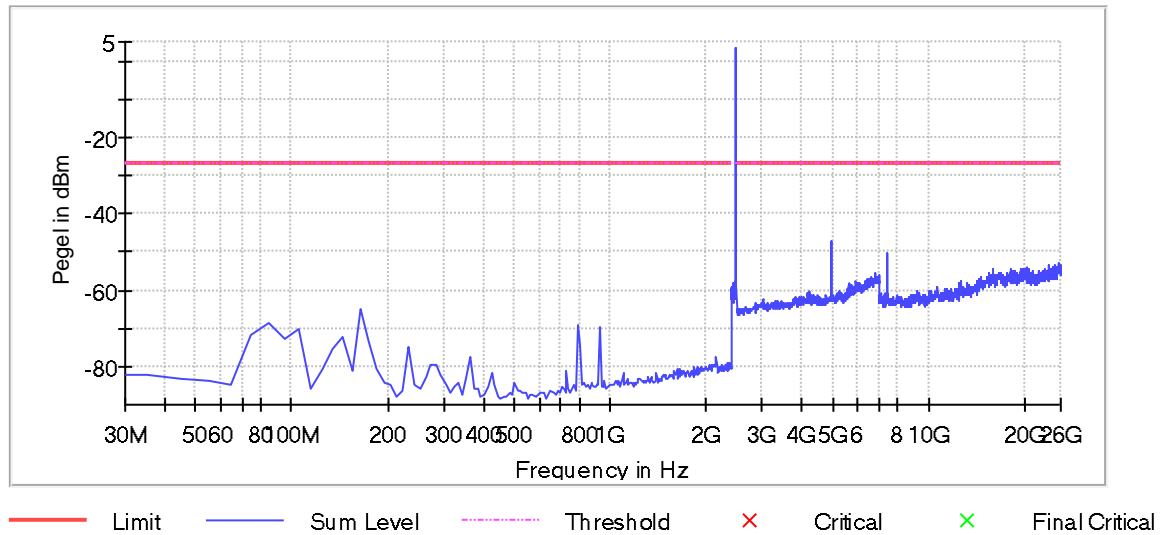
Ch. 2440 MHz





Ch. 2480 MHz

Spurious





2.5.7.2 Radiated emission test with Hopping Mode

Sample calculation:

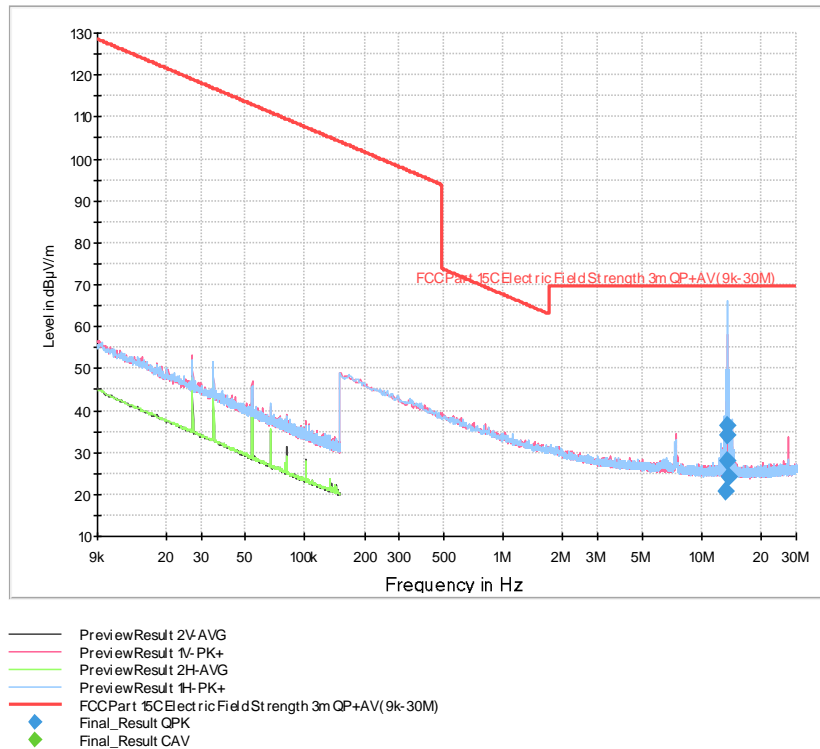
$$\text{Final Value (dB}\mu\text{V/m)} = \text{Reading Value (dB}\mu\text{V)} + (\text{Cable attenuation (dB)} + \text{Antenna Transducer (dB(1/m)))}$$

<i>Frequency range</i>	<i>Limit applied</i>	<i>Test distance</i>
9 kHz – 8 GHz	15.209 / RSS-GEN	3 m
8 GHz – 26 GHz	15.209 / RSS-GEN	1 m

Table 14



Frequency range 9 kHz – 30 MHz:



Final Results:

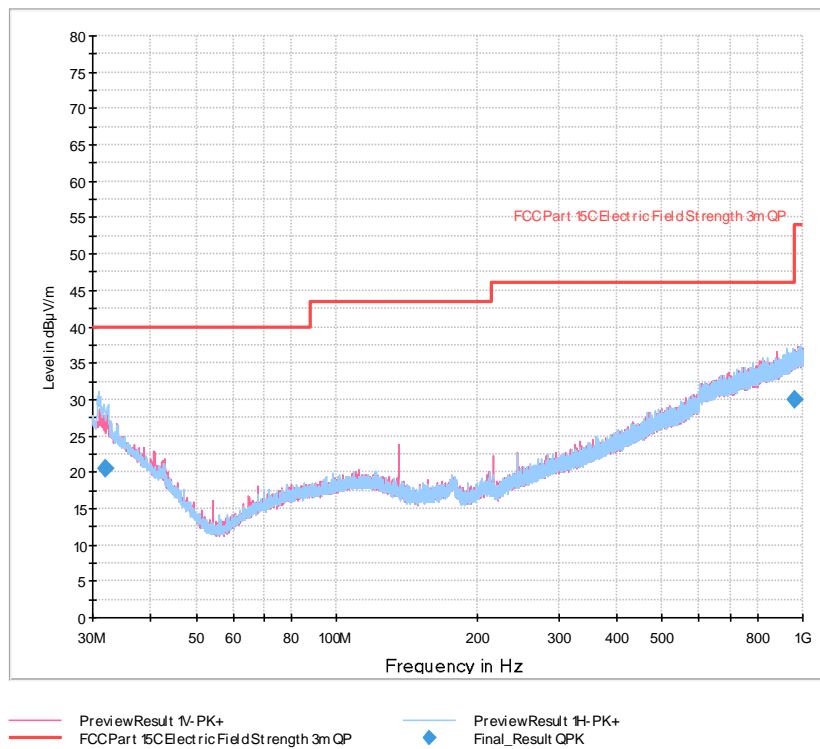
Frequency MHz	QuasiPeak dBµV/m	CAverage dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB/m
13.290000	20.74	---	70.00	#1	1000.0	9.000	100.0	H	17.0	18.9
13.434000	28.08	---	70.00	#1	1000.0	9.000	100.0	H	190.0	18.9
13.587000	36.45	---	70.00	#1	1000.0	9.000	100.0	H	-7.0	18.9
13.596000	34.25	---	70.00	#1	1000.0	9.000	100.0	H	194.0	18.9
13.735500	23.97	---	70.00	#1	1000.0	9.000	100.0	H	193.0	18.9

#1: Intentional radiation



Product Service

Frequency range 30 MHz – 1 GHz:



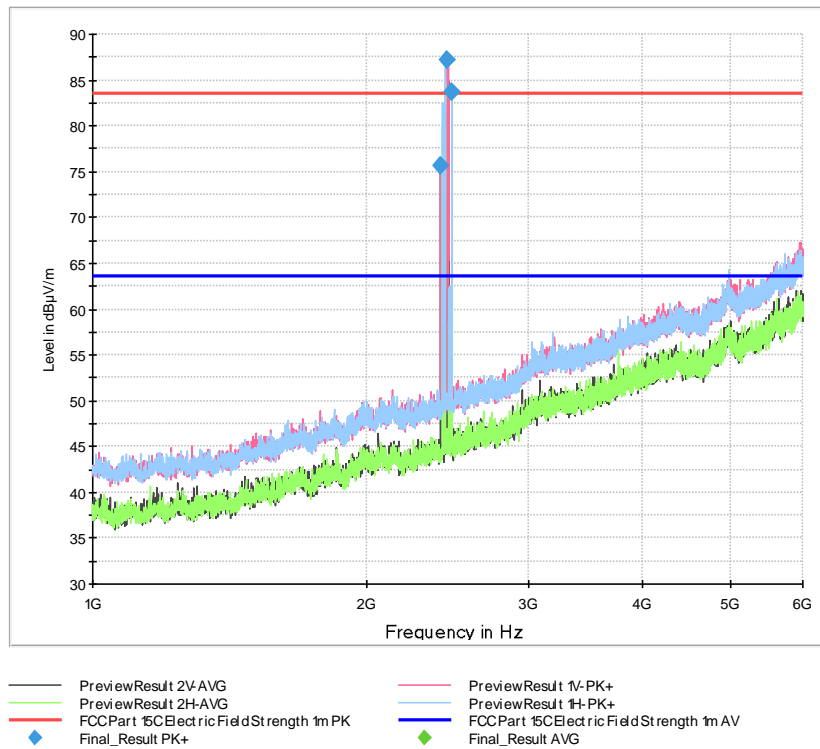
Final Results:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB/m
32.070000	20.41	40.00	19.59	1000.0	120.000	100.0	H	229.0	24.2
957.690000	30.04	46.02	15.98	1000.0	120.000	391.0	H	-110.0	31.3



Product Service

Frequency range 1 GHz – 6 GHz:



Final Results:

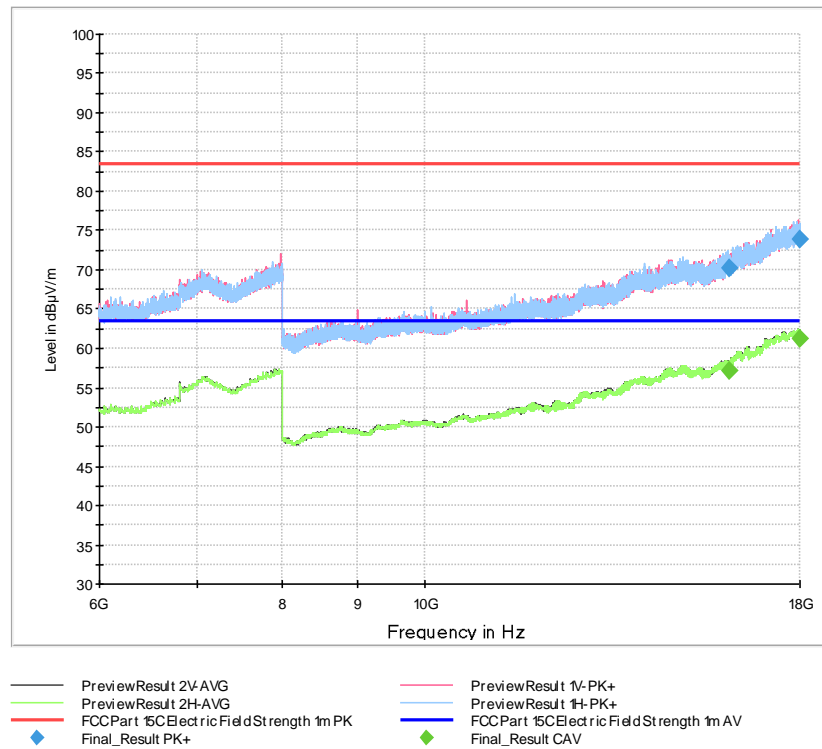
Frequency MHz	Max- Peak dBµV/m	Aver- age dBµV/m	Limit dBµV/m	Mar- gin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB/m
2406.218750	75.65	---	83.50	#1	5.0	1000.000	300.0	V	165.0	34.0
2449.250000	87.12	---	83.50	#1	5.0	1000.000	300.0	V	115.0	34.1
2475.812500	83.78	---	83.50	#1	5.0	1000.000	300.0	H	-162.0	34.2

#1 Intentional radiation



Product Service

Frequency range 6 GHz – 18 GHz:

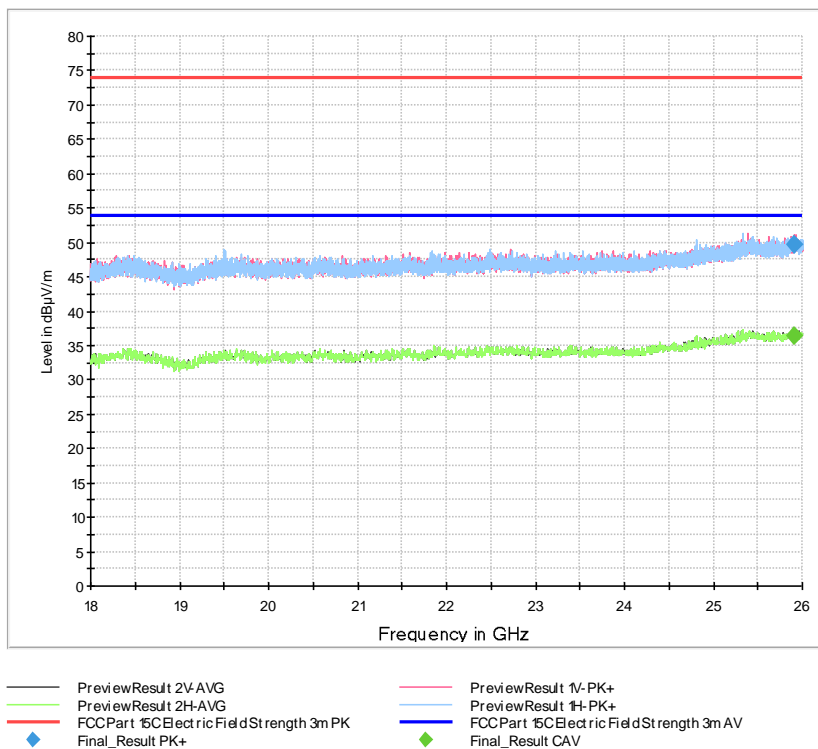


Final Results:

Frequency MHz	Max- Peak dBμV/m	CAver- age dBμV/m	Limit dBμV/m	Mar- gin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB/m
16125.000000	---	57.12	63.50	6.38	1000.0	1000.000	100.0	H	-111.0	55.2
16125.000000	70.27	---	83.50	13.23	1000.0	1000.000	100.0	H	-111.0	55.2
17996.750000	---	61.18	63.50	2.32	1000.0	1000.000	125.0	V	-156.0	59.3
17996.750000	73.96	---	83.50	9.54	1000.0	1000.000	125.0	V	-156.0	59.3



Frequency range 18 GHz – 26 GHz:



Final Results:

Frequency MHz	Max- Peak dBµV/m	CAver- age dBµV/m	Limit dBµV/m	Mar- gin dB	Meas. Time ms	Band- width kHz	Height cm	Pol	Azi- muth deg	Corr. dB/m
25914.250000	---	36.37	53.98	17.61	1000.0	1000.000	170.0	V	-175.0	31.1
25914.250000	49.77	---	73.98	24.21	1000.0	1000.000	170.0	V	-175.0	31.1



2.5.8 Test Location and Test Equipment

The test was carried out in semi anechoic room, No. 11 and non shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz GmbH & Co. KG	ESW44	39897	12	2023-04-30
EMI test receiver	Rohde & Schwarz GmbH & Co. KG	ESU8	19904	12	2023-02-28
Loop antenna	Schwarzbeck Mess-Elektronik	FMZB 1519 B	44334	36	2023-01-31
TRILOG Broadband Antenna	Schwarzbeck Mess-Elektronik	VULB 9163	19918	36	2022-09-30
Fixed attenuator	Aeroflex / Weinschel, Inc.	Model:1 6dB	39632	36	2022-11-30
Double ridged horn antenna	Rohde & Schwarz GmbH & Co. KG	HF907	40089	24	2023-02-28
Horn antenna with preamplifier	Rohde & Schwarz GmbH & Co. KG	A-INFOWM LB-180400-Kf + TS-LNA1840	43661	24	2022-12-31
Semi anechoic room	Frankonia	Cabin no. 11	42961	36	2024-09-30
EMC measurement software	Rohde & Schwarz GmbH & Co. KG	EMC32 Emission K11 - V10.60.20	42986	---	---
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	24	2024-02-29
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	36	2023-02-28
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	N/A	N/A
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	36	2023-11-30
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2023-02-28

Table 15



2.6 Temperature Stability

2.6.1 Specification Reference

ISED RSS-Gen, Clause 6.11, 8.11

2.6.2 Equipment under Test and Modification State

P53, S/N: 12539921361002 – Modification State 0

2.6.3 Date of Test

2022-03-09

2.6.4 Environmental Conditions

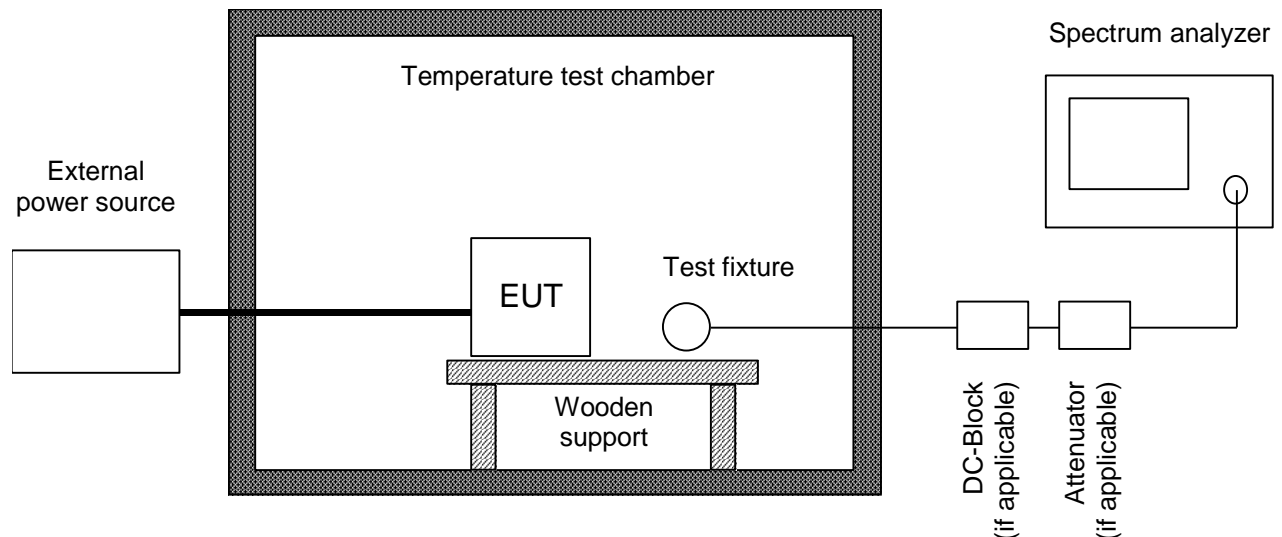
Ambient Temperature	23 °C
Relative Humidity	20 %

2.6.5 Specification Limits

If the stability of the license-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80 % of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In additions, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 54 MHz – 72 MHz, 76 MHz – 88 MHz, 174 MHz – 216 MHz, and 470 MHz – 602 MHz, unless otherwise indicated.

2.6.6 Test Method

The test was performed according to ANSI C63.10, section 6.8.



The frequency tolerance of the carrier signal is measured over a temperature variation of -20°C to $+50^{\circ}\text{C}$ at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20°C . Temperature and voltage range may vary if the manufacturer states another temperature or voltage range.

If the EUT provides an antenna connector the spectrum analyzer is connected to this port. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as a DC block and appropriate (50 Ω) attenuators. In case where the EUT does not provide an antenna connector a test fixture is used.

For battery operated equipment, the test is performed using a new battery. Alternatively, an external supply voltage can be used and is at least set to:

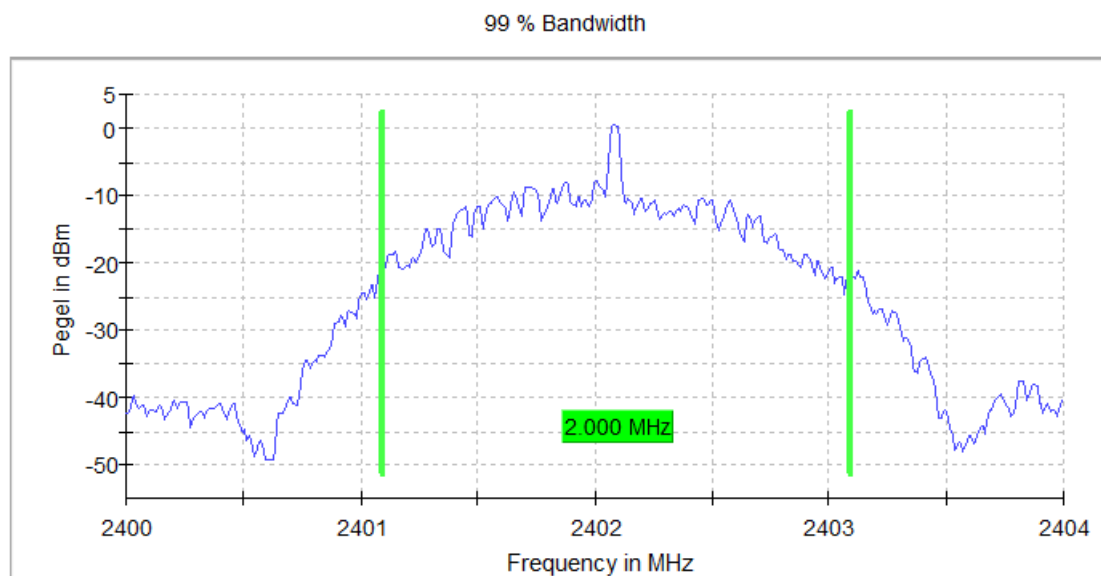
- The maximum battery voltage as delivered by a new battery or 115 % of the battery nominal voltage;
- The battery nominal voltage
- 85 % of the battery nominal voltage
- The battery operating end point voltage which shall be specified by the equipment manufacturer.

The EUT is operating providing an unmodulated carrier for frequency error tests. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth are set to values appropriate to shape of the spectrum of the EUT. The frequency counter mode of the spectrum analyzer is used to maximize the accuracy of the measured frequency tolerance.

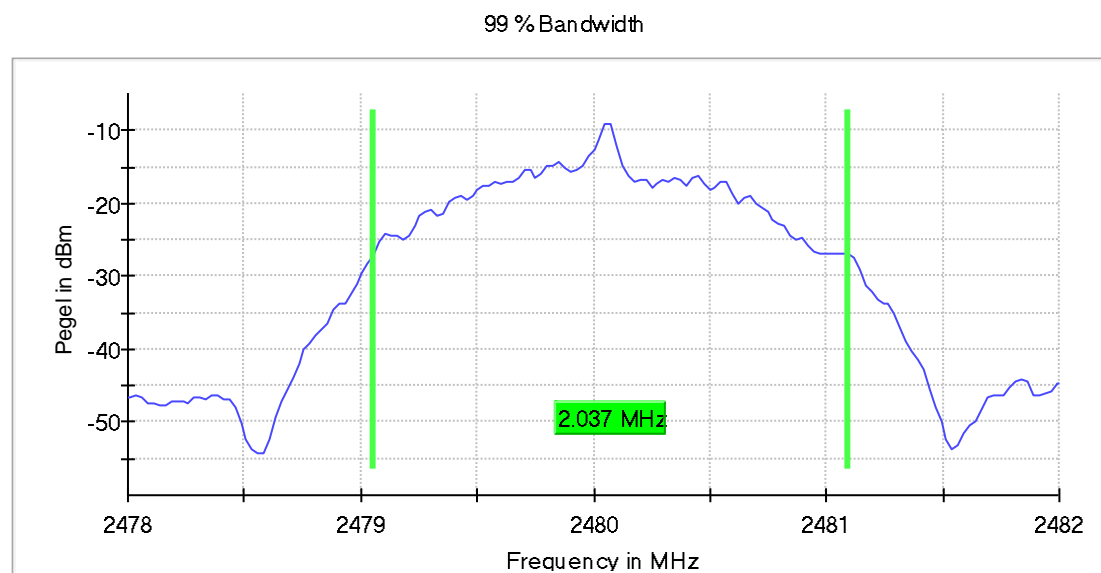
If an unmodulated carrier is not available a significant and stable point of the spectrum is selected and the span is reduced to a value that delivers an accuracy which shall be better than 1 % of the maximum frequency tolerance allowed for the carrier signal. This method may be performed as long as the margin to the frequency tolerance is larger than the uncertainty of the measured frequency tolerance.

2.6.7 Test Results

Note: - Measured Frequency Error does not affect any band edge requirements.



Transmission on 2402 MHz, -20 °C, 3.7 V DC



Transmission on 2480 MHz, 53 °C, 3.7 V DC



2.6.8 Test Location and Test Equipment

This test was carried out in Non shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analyser	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	24	2024-02-29
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	36	2023-02-28
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	N/A	N/A
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	36	2023-11-30
Temperature test chamber	Feutron Klimasimulation	KPK200-2	19868	18	2023-02-28

Table 16



3 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 (U_{CISPR}). This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

<i>Radio Interference Emission Testing</i>		
<i>Test Name</i>	<i>kp</i>	<i>Expanded Uncertainty</i>
Conducted Voltage Emission		
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB
Discontinuous Conducted Emission		
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB
Conducted Current Emission		
9 kHz to 200 MHz	2	± 3.5 dB
Magnetic Fieldstrength		
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB
Radiated Emission		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 5.0 dB
1 GHz to 6 GHz	2	± 4.6 dB
Test distance 10 m		
30 MHz to 300 MHz	2	± 4.9 dB
300 MHz to 1 GHz	2	± 4.9 dB
The expanded uncertainty reported according to CISPR16-4-2: 2011 + A1 + A2 + Cor1 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$		

Table 17 Measurement uncertainty based on CISPR 16-4-2



<i>Radio Interference Emission Testing</i>		
<i>Test Name</i>	<i>kp</i>	<i>Expanded Uncertainty</i>
Occupied Bandwidth	2	± 5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	± 1.0 dB
30 MHz ≤ f < 1 GHz	2	± 1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	± 2.5 dB
1 MS/s power sensor (TS8997)	2	± 1.5 dB
Occupied Bandwidth	2	± 5 %
Power Spectral Density	2	± 3.0 dB
Radiated Power		
9 kHz ≤ f < 26.5 GHz	2	± 6.5 dB
26.5 GHz ≤ f < 60 GHz	2	± 8.0 dB
60 GHz ≤ f < 325 GHz	2	± 10 dB
Conducted Spurious Emissions	2	± 3.0 dB
Radiated Spurious Emissions	2	± 6.0 dB
Voltage		
DC	2	± 1.0 %
AC	2	± 2.0 %
Time (automatic)	2	± 5 %
Frequency	2	± 10 ⁻⁷
The expanded uncertainty reported according to to ETSI TR 100 028:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 18 Measurement uncertainty based on ETSI TR 100 028