

Report on the FCC and IC Testing of the Siemens AG

Model: SIMATIC RTLS4060T

In accordance with FCC 47 CFR Part 15C and ISED Canada RSS-247 and ISED Canada RSS-GEN

Prepared for: Siemens AG
Gleiwitzer Str. 555
90475 Nürnberg
Germany

FCC ID: NXW4060T
IC: 267X-4060T



Product Service

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Date: 2020-02-12

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Michael Ingerl	2020-02-12	
Authorised Signatory	Markus Biberger	2020-02-12	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service document control rules.

ENGINEERING STATEMENT

The measurements 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 FCC 47 CFR Part 15C and ISED Canada RSS-247 and ISED Canada RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Michael Ingerl	2020-02-12	

Laboratory Accreditation

DAkKS Reg. No. D-PL-11321-11-02

Laboratory recognition

Registration No. BNetzA-CAB-16/21-15

ISED Canada test site registration

3050A-2

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN:2016 and Issue 2 (2017-02) and Issue 4 (2014-11).

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1 Report Summary

1.1 Report Modification Record

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

Issue	Description of Change	Date of Issue
1	First Issue	2019-10-23
2	Changed Model Number and at chapter 2.9 the separation distance between the user and the transmitting device	2020-02-12

Table 1

1.2 Introduction

Applicant	Siemens AG
Manufacturer	Siemens AG
Model Number(s)	SIMATIC RTLS4060T
MLFB(s)	6GT2700-6DE13 6GT2700-6DE33
Serial Number(s)	---
Hardware Version(s)	0613
Software Version(s)	2.1.4
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C, ISED Canada RSS-247 and ISED Canada RSS-GEN:2016 and Issue 2 (2017-02) and Issue 4 (2014-11), FCC rule Part 2.1093, KDB 447498 D01, RSS-102 Issue 5
Test Plan/Issue/Date	---
Order Number	5121883
Date	2018-07-30
Date of Receipt of EUT	2018-11-19
Start of Test	2019-01-07
Finish of Test	2019-04-04
Name of Engineer(s)	Michael Ingerl, Alex Fink
Related Document(s)	ANSI C63.10 (2013) KDB 662911 D01 v02r02



1.3 Technical data of EUT

Application frequency range: 2400.0 - 2483.5 MHz

Operating frequency: 2410 – 2480 MHz

Modulation scheme(s): OQPSK

Number of RF-channels: 14

Channel spacing: 5 MHz

Spectrum Access: ☐ Frequency hopping ☒ Digital Modulated

Type of antenna: Internal antenna

Antenna nominal Gain: 2 dBi

Rated carrier Power: 9 dBm

Size/length of antenna: ---

Connection of antenna: ☐ Detachable ☒ Not detachable

Type of power supply: ☐ AC ☒ DC

Nominal Voltage: 24V

Minimum Voltage: 8V

Maximum Voltage: 30V

1.4 Configuration Mode(s)

1. Configuration Mode-1

Transmitting continuously on selected Channel



1.5 Brief Summary of Results

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

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: Configuration Mode-1				
2.1	15.207. N/A and 8.8	AC Power Line Conducted Emissions	Pass	ANSI C63.10 (2013)
2.2	15.247 (b). 5.4 and 6.12	Maximum Conducted Output Power	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r02
2.3	15.247 (e). 5.2 and 6.12	Power Spectral Density	Pass	ANSI C63.10 (2013) KDB 662911 D01 v02r02
2.4	15.247 (a)(2). 5.2 and 6.6	Emission Bandwidth	Pass	ANSI C63.10 (2013)
2.5	15.247 (d). 5.5 and N/A	Authorised Band Edges	Pass	ANSI C63.10 (2013)
2.6	15.205 N/A and 8.10	Restricted Band Edges	Pass	ANSI C63.10 (2013)
2.7	15.247 (d). 15.205. 5.5 and 6.13	Spurious Radiated Emissions	Pass	ANSI C63.10 (2013)
2.8	NA. NA. 6.11	Transmitter Frequency Stability	Pass	ANSI C63.10 (2013)
2.9	15.107 and 6.1	Exposure of Humans to RF Fields	Pass	ANSI C63.4: 2014

Table 2



1.6 EUT Modification Record

The table below details modifications made to the EUT during the test programme.
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
Serial Number: ---			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.7 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing Test Laboratory.

Test Name	Name of Engineer(s)
Configuration and Mode: Configuration Mode-1	
AC Power Line Conducted Emissions	Michael Ingerl
Maximum Conducted Output Power	Michael Ingerl
Power Spectral Density	Michael Ingerl
Emission Bandwidth	Michael Ingerl
Authorised Band Edges	Michael Ingerl
Restricted Band Edges	Michael Ingerl
Spurious Radiated Emissions	Alex Fink, Michael Ingerl
Transmitter Frequency Stability	Michael Ingerl
Exposure of Humans to RF Fields	Michael Ingerl

Table 4

Office Address:

Äußere Frühlingstraße 45
94315 Straubing
Germany



Product Service

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.207. N/A and 8.8

2.1.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

2.1.3 Date of Test

2019-01-07

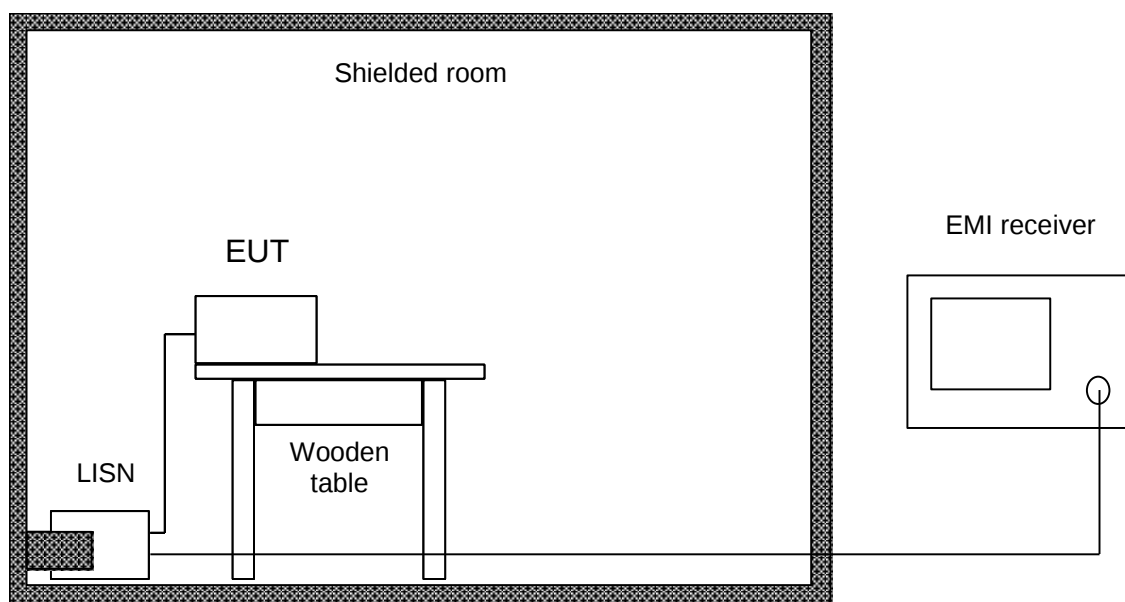
2.1.4 Test Method

The test was performed in accordance with ANSI C63.10. clause 6.2.

Conducted emission tests in the frequency range 150 kHz to 30 MHz are performed using Line Impedance Stabilization Networks (LISNs). To simplify testing with quasi-peak and average detector the following procedure is used:

First the whole spectrum of emission caused by the equipment under test (EUT) is recorded with detector set to peak using CISPR bandwidth of 10 kHz. After that all emission levels having less margin than 10 dB to or exceeding the average limit are retested with detector set to quasi-peak. If average limit is kept with quasi-peak levels no additional scan with average detector is necessary. In cases of emission levels between quasi-peak and average limit an additional scan with detector set to average is performed.

According to ANSI C63.4. section 13.1.3.1. testing of intentional radiators with detachable antenna shall be performed using a suitable dummy load connected to the antenna output terminals. Otherwise, the tests shall be made with the antenna connected and, if adjustable, fully extended. Testing with dummy load may be necessary to distinguish (unintentional) conducted emissions on the supply lines from (intentional) emissions radiated by the antenna and coupling directly to supply lines and/or LISN. Usage of dummy load has to be stated in the appropriate test record(s) and notes should be added to clarify the test setup.



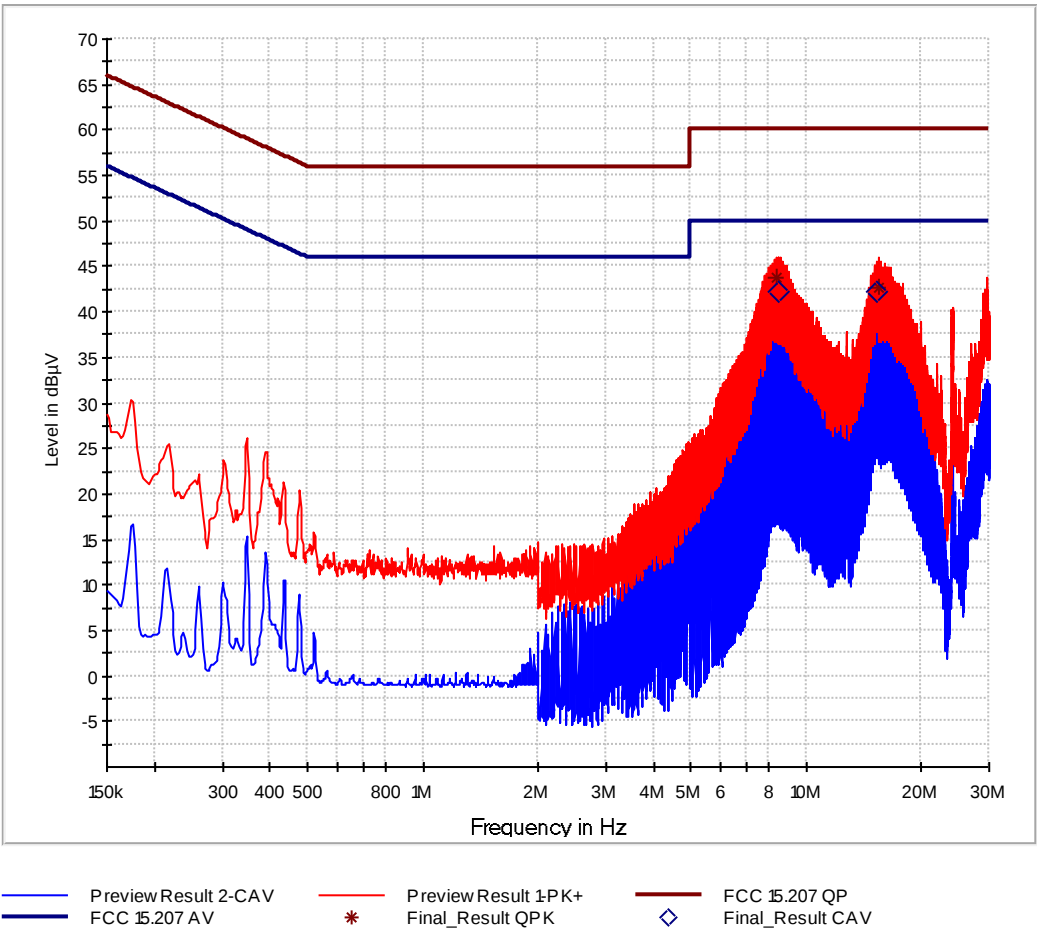
2.1.5 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	30 %



2.1.6 Test Results

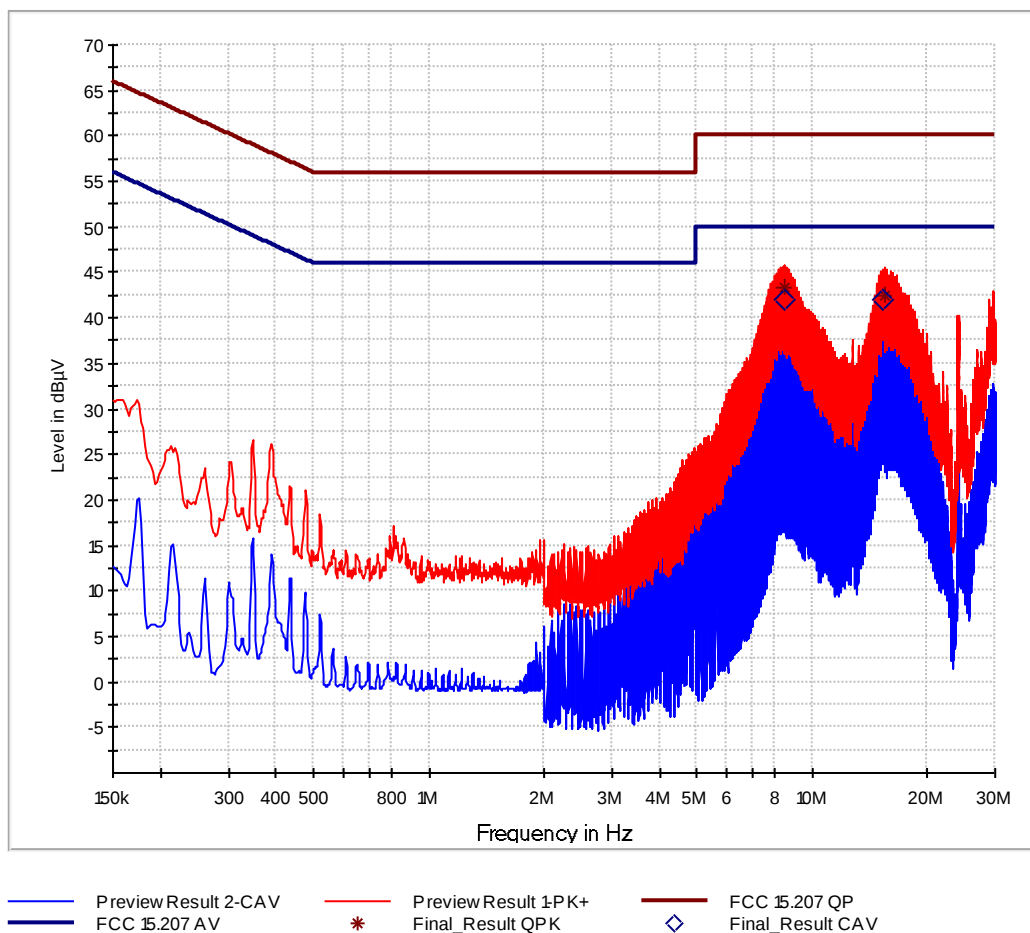
Configuration Mode-1



Final Results 1:

Frequency MHz	QuasiPeak dBµV	CAverage dBµV	Limit dBµV	Margin dB	Meas. Time ms	Bandwidth kHz	Line	PE	Corr. dB
8.344500	43.82	---	60.00	16.18	1000.0	9.000	L1	GND	0.0
8.517750	---	42.16	50.00	7.84	1000.0	9.000	L1	GND	0.0
15.252000	---	42.17	50.00	7.83	1000.0	9.000	L1	GND	0.4
15.560250	42.69	---	60.00	17.31	1000.0	9.000	L1	GND	0.4

Figure 1 - Live Line - 150 kHz to 30 MHz



Final Results 1:

Frequency MHz	QuasiPeak dBμV	CAverage dBμV	Limit dBμV	Margin dB	Meas. Time ms	Bandwidth kHz	Line	PE	Corr. dB
8.432250	43.42	---	60.00	16.58	1000.0	9.000	N	GND	0.0
8.517750	---	41.97	50.00	8.03	1000.0	9.000	N	GND	0.0
15.252000	---	42.11	50.00	7.89	1000.0	9.000	N	GND	0.4
15.470250	42.48	---	60.00	17.52	1000.0	9.000	N	GND	0.4

Figure 2 - Neutral Line - 150 kHz to 30 MHz

Sample calculation of final values:

Final Value (dBμV) = Reading Value (dBμV) + Correction Factor (dB)



FCC 47 CFR Part 15. Limit Clause 15.207 and ISED Canada RSS-GEN. Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 5

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in Shielded room - cabin no. 9.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
EMI test receiver	Rohde & Schwarz	ESU8	19904	12	2019-12-31
V-network	Rohde & Schwarz	ESH 3-Z5	18919	36	2019-10-31
EMC Measurement Software	Rohde&Schwarz	EMC32 V9.26.01	20090	N/A	N/A

Table 6

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

2.2 Maximum Conducted Output Power

2.2.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.247 (b). 5.4 and 6.12

2.2.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

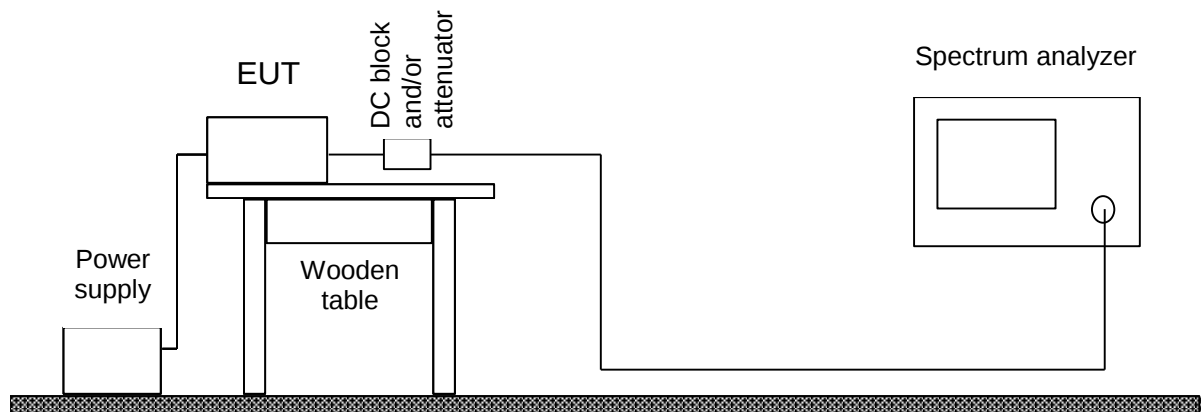
2.2.3 Date of Test

2019-03-07

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10. clause 11.9.1.

The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.



2.2.5 Environmental Conditions

Ambient Temperature 21 °C
Relative Humidity 30 %

2.2.6 Test Results

Configuration Mode-1

Frequency (MHz)	dBm	mW
2410	8.043	6.372
2440	9.021	7.982
2480	8.202	6.610

Table 7

FCC 47 CFR Part 15. Limit Clause 15.247 (b)(3)

For systems using digital modulation in the 902–928 MHz. 2400–2483.5 MHz. and 5725–5850 MHz bands: 1 Watt.

ISED Canada RSS-247. Limit Clause 5.4 (d)

For DTSs employing digital modulation techniques operating in the bands 902-928 MHz and 2400-2483.5 MHz. the maximum peak conducted output power shall not exceed 1 W. The e.i.r.p. shall not exceed 4 W. except as provided in section 5.4(e) of the specification.

2.2.7 Test Location and Test Equipment Used

This test was carried out in a non-shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2.4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 8

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

2.3 Power Spectral Density

2.3.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.247 (e). 5.2 and 6.12

2.3.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

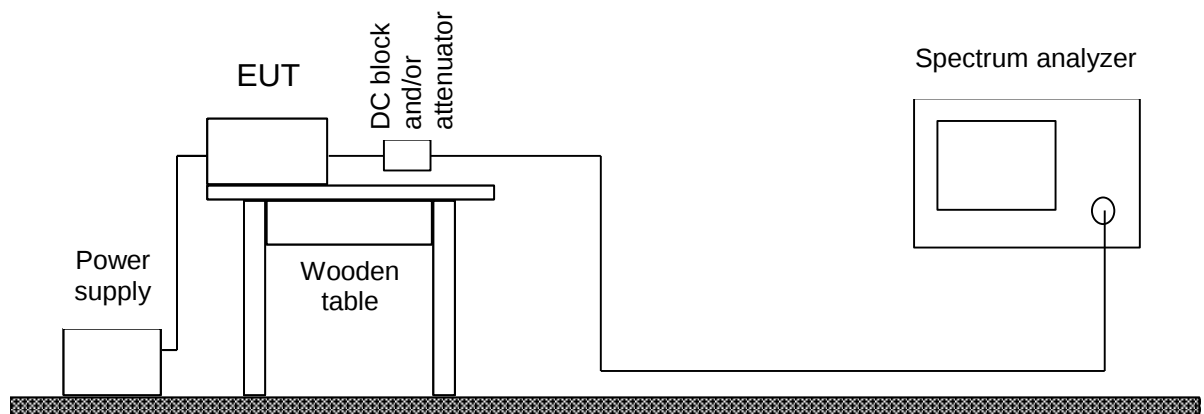
2.3.3 Date of Test

2019-03-07

2.3.4 Test Method

This test was performed in accordance with ANSI C63.10. clause 11.10.2.

The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.



2.3.5 Environmental Conditions

Ambient Temperature 21 °C
Relative Humidity 30 %

2.3.6 Test Results

Configuration Mode-1

Frequency (MHz)	Power Spectral Density (dBm)
2410	-2.90
2440	-2.91
2480	-3.37

Table 9

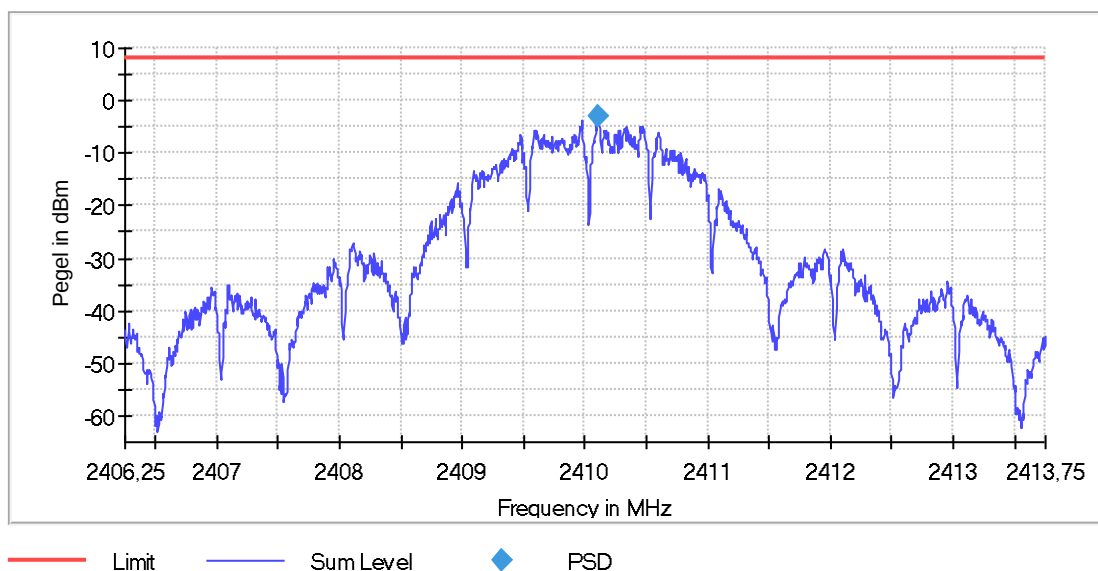


Figure 3 – 2410 MHz – Power Spectral Density

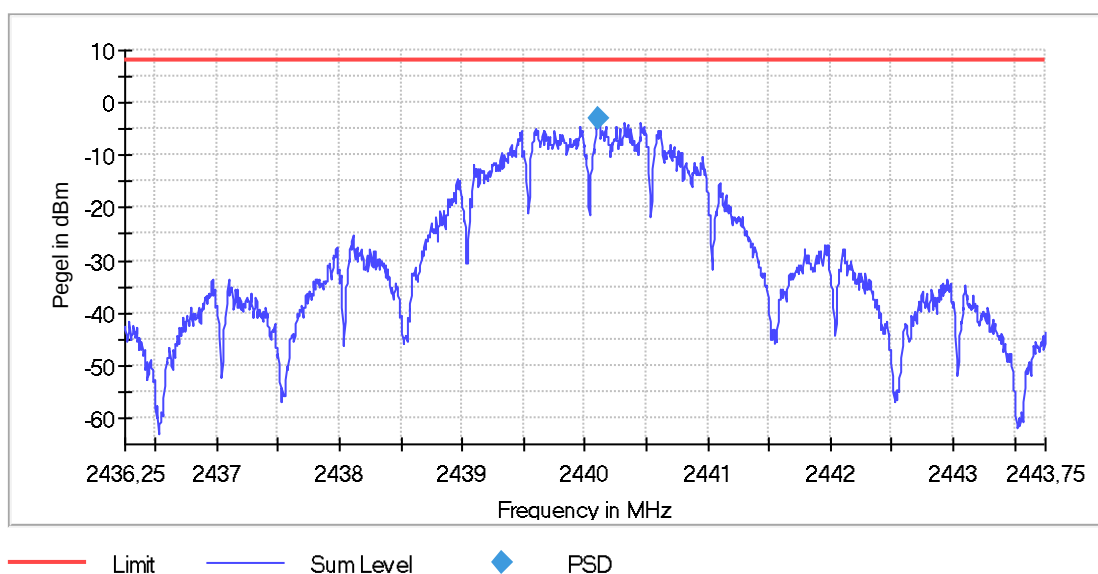


Figure 4 – 2440 MHz – Power Spectral Density

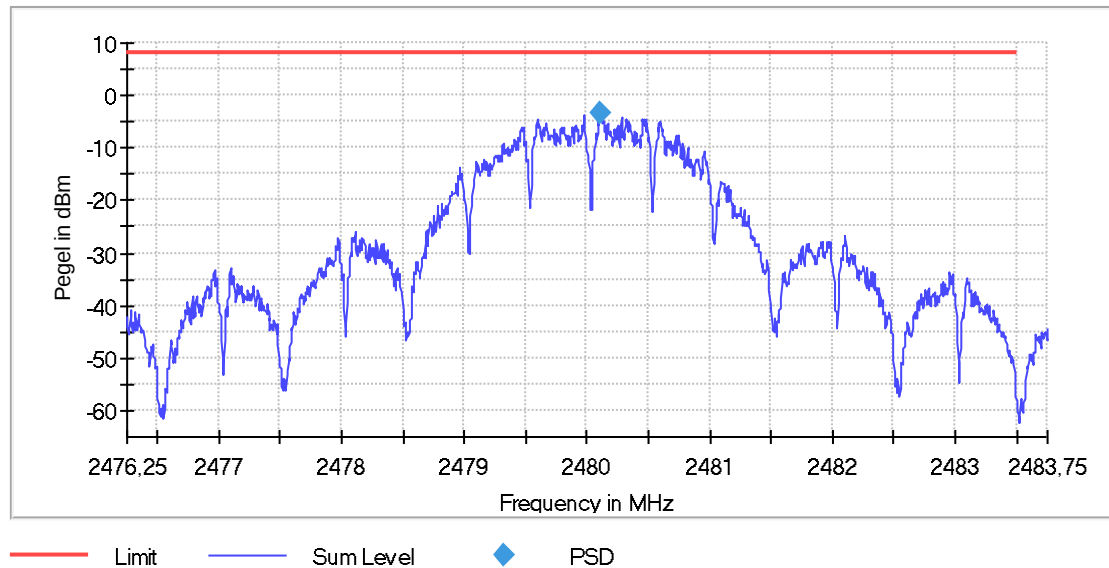


Figure 5 – 2480 MHz – Power Spectral Density

FCC 47 CFR Part 15. Limit Clause 15.247 (e)

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.

ISED Canada RSS-247. Limit Clause 5.2(b)

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



2.3.7 Test Location and Test Equipment Used

This test was carried out in non-shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2.4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 10

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

2.4 Emission Bandwidth

2.4.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.247 (a)(2). 5.2 and 6.6

2.4.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

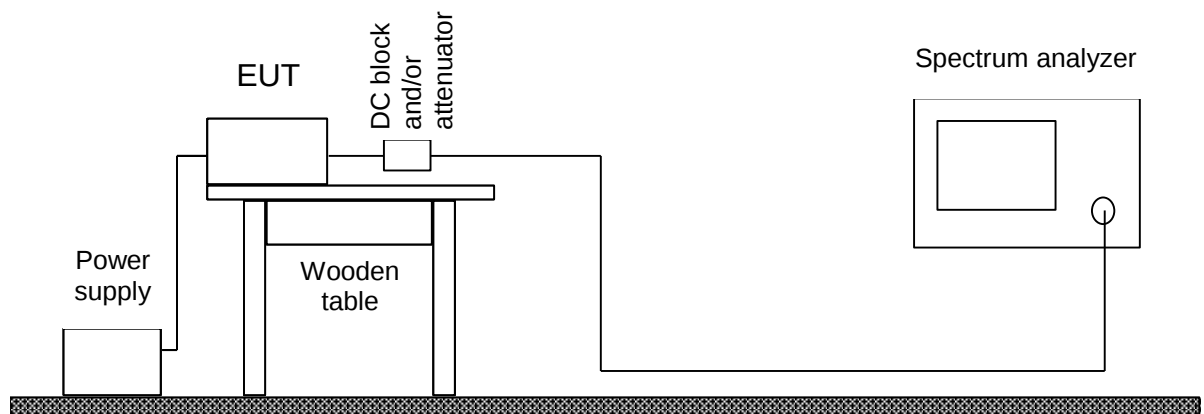
2.4.3 Date of Test

2019-03-07

2.4.4 Test Method

This test was performed in accordance with ANSI C63.10. clause 11.8.1.

The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.



2.4.5 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	30 %

2.4.6 Test Results

Configuration Mode-1

Frequency (MHz)	6 dB Bandwidth (MHz)	99% Bandwidth (MHz)
2410	1.65	2.35
2440	1.65	2.40
2480	1.70	2.45

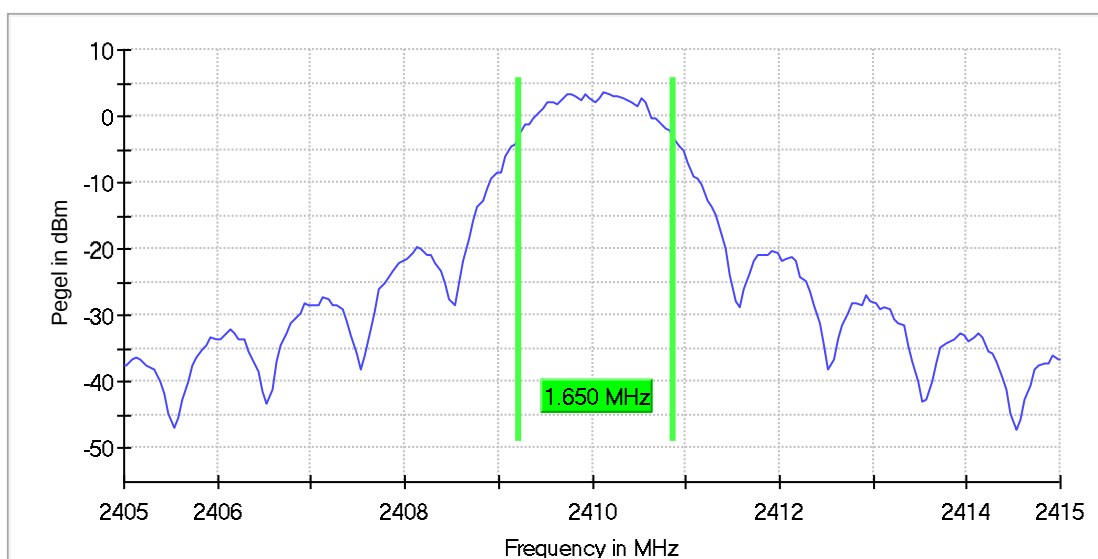


Figure 6 – 2410 MHz – 6 dB Bandwidth

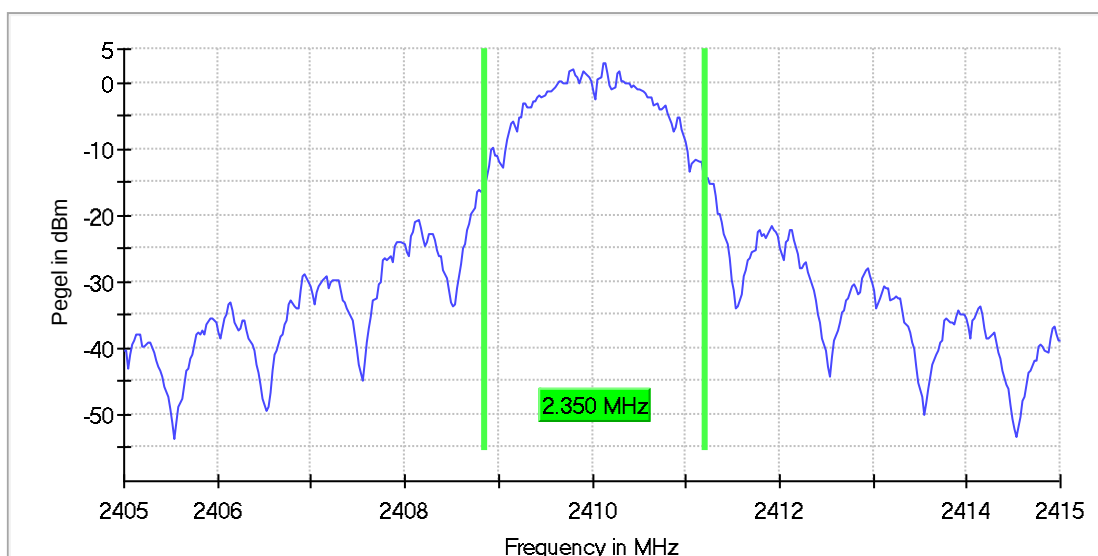


Figure 7 - 2410 MHz – 99% Bandwidth

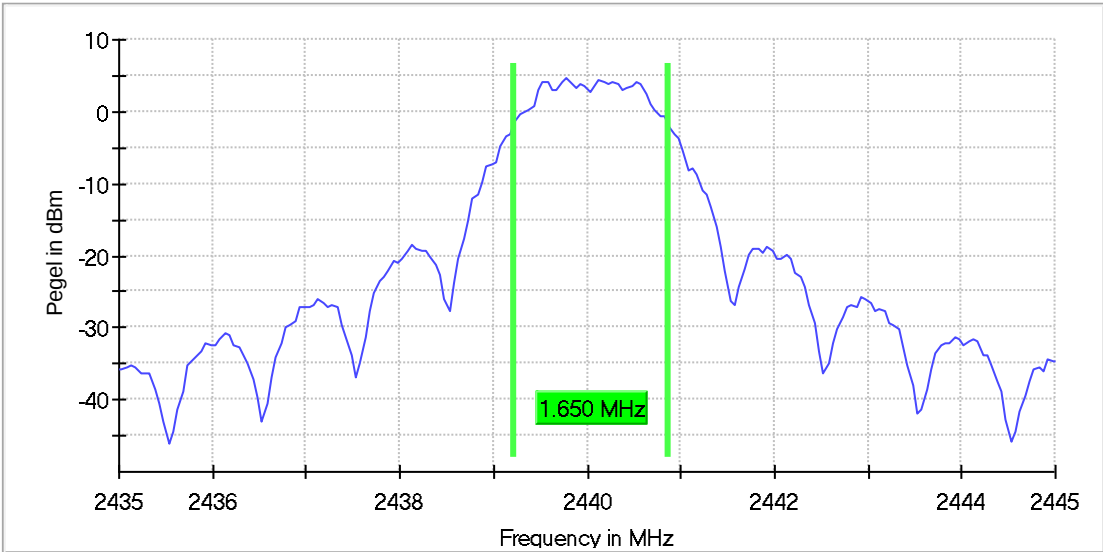


Figure 8 – 2440 MHz – 6 dB Bandwidth

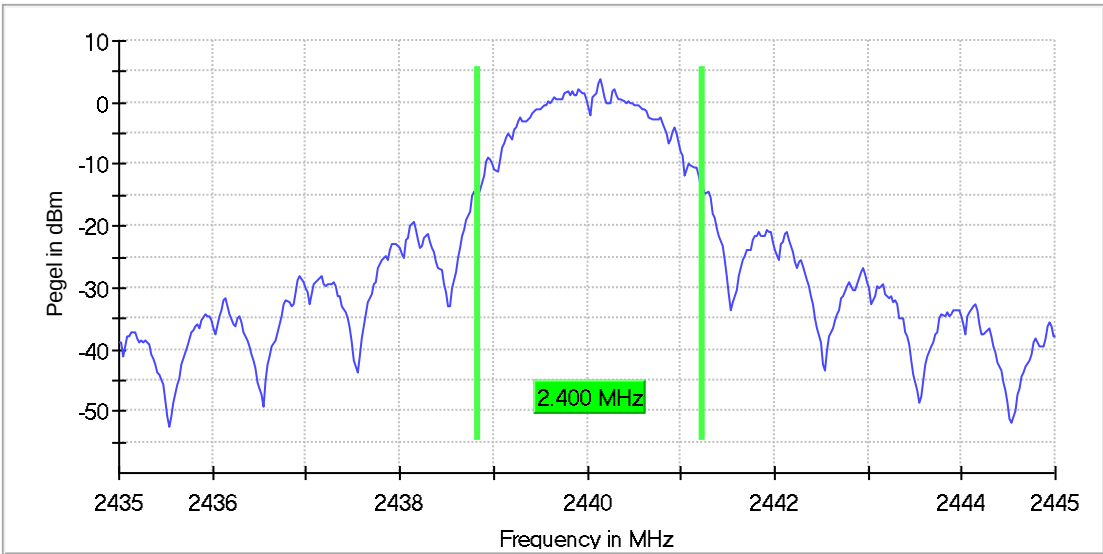


Figure 9 - 2440 MHz – 99% Bandwidth

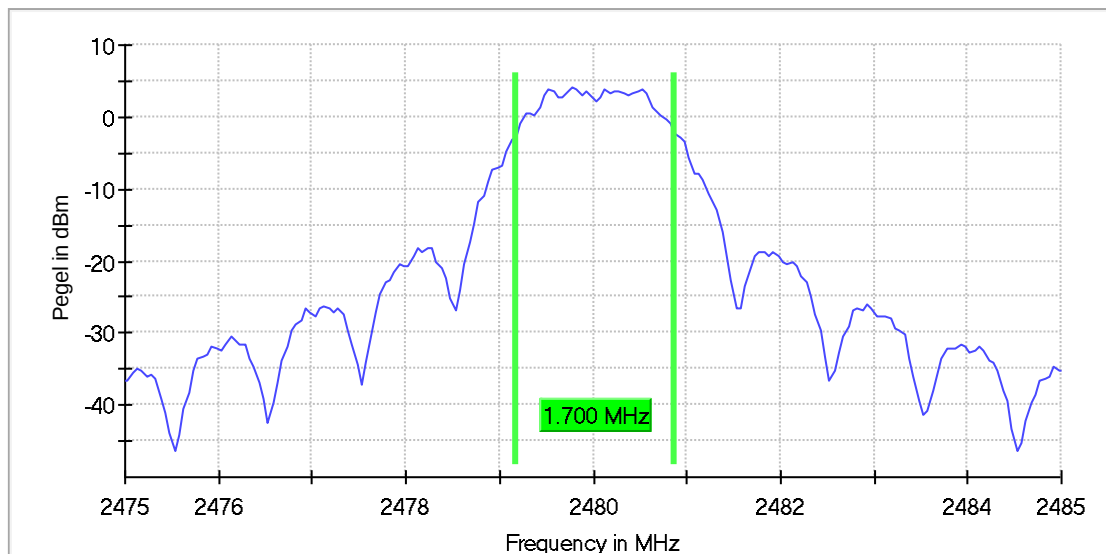


Figure 10 – 2480 MHz – 6 dB Bandwidth

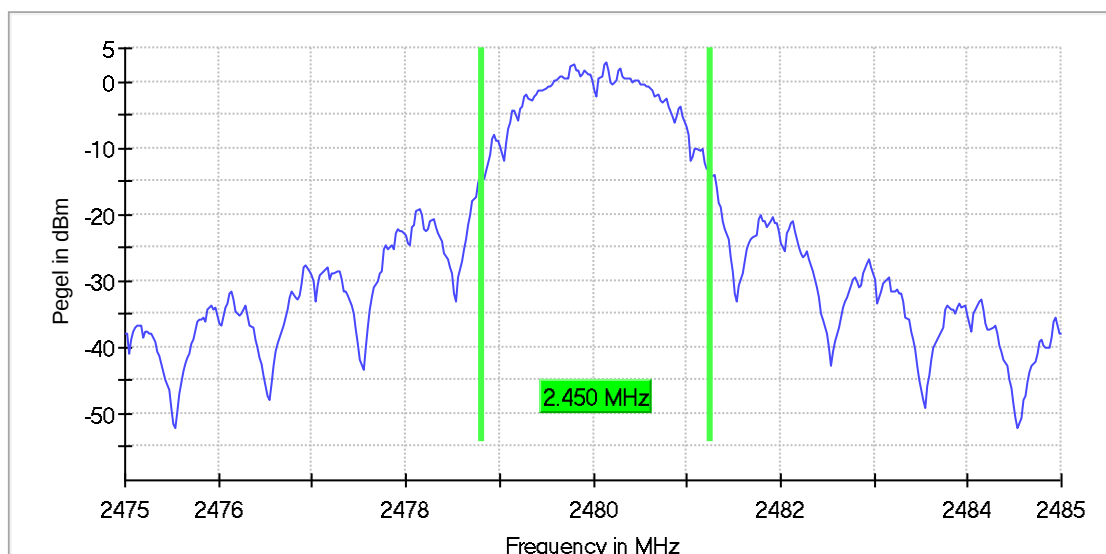


Figure 11 - 2480 MHz – 99% Bandwidth

FCC 47 CFR Part 15. Limit Clause 15.247(a)(2) and ISED Canada RSS-247. Clause 5.2(a)

The minimum 6 dB Bandwidth shall be at least 500 kHz.



2.4.7 Test Location and Test Equipment Used

This test was carried out in non-shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2.4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 11

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

2.5 Authorised Band Edges

2.5.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.247 (d). 5.5 and N/A

2.5.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

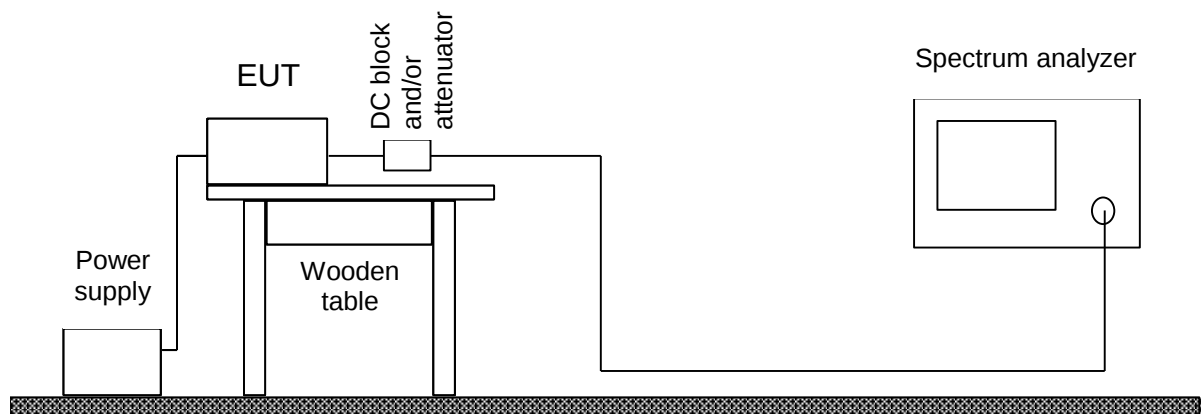
2.5.3 Date of Test

2019-03-07

2.5.4 Test Method

The test was performed in accordance with ANSI C63.10. clause 6.10.4.

The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.



2.5.5 Environmental Conditions

Ambient Temperature 21 °C
Relative Humidity 30 %

2.5.6 Test Results

Configuration Mode-1

EUT Frequency (MHz)	Frequency (MHz)	Peak Level (dBm)
2410	2399.975	-47.2
2410	2399.825	-47.3
2480	2483.675	-35.0
2480	2483.725	-33.6

Table 12

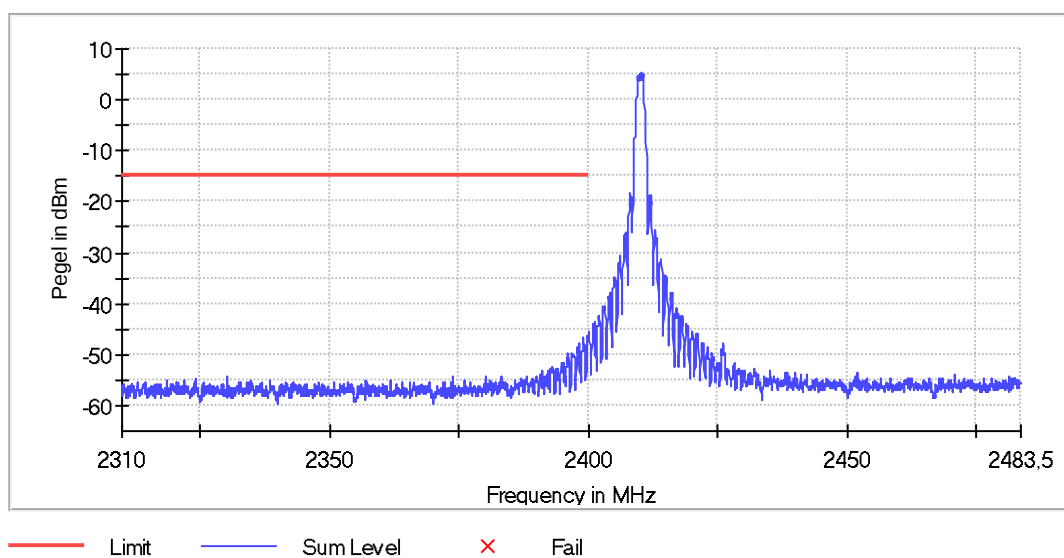


Figure 12 – 2410 MHz

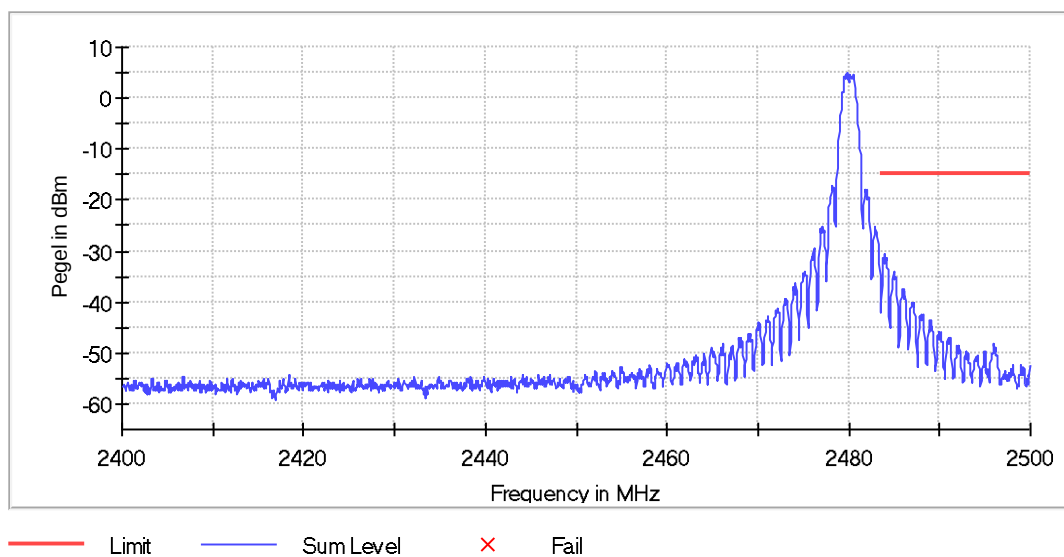


Figure 13 – 2480 MHz



FCC 47 CFR Part 15. Limit Clause 15.247 (d)

20 dB below the fundamental measured in a 100 kHz bandwidth using a peak detector. If the transmitter complies with the conducted power limits. based on the use of RMS averaging over a time interval. the attenuation required shall be 30 dB below the fundamental instead of 20 dB.

ISED Canada RSS-247. Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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 the desired power. based on either an RF conducted or a 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 under Section 5.4(4). the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

2.5.7 Test Location and Test Equipment Used

This test was carried out in non-shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2.4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 13

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable

2.6 Restricted Band Edges

2.6.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.205 N/A and 8.10

2.6.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

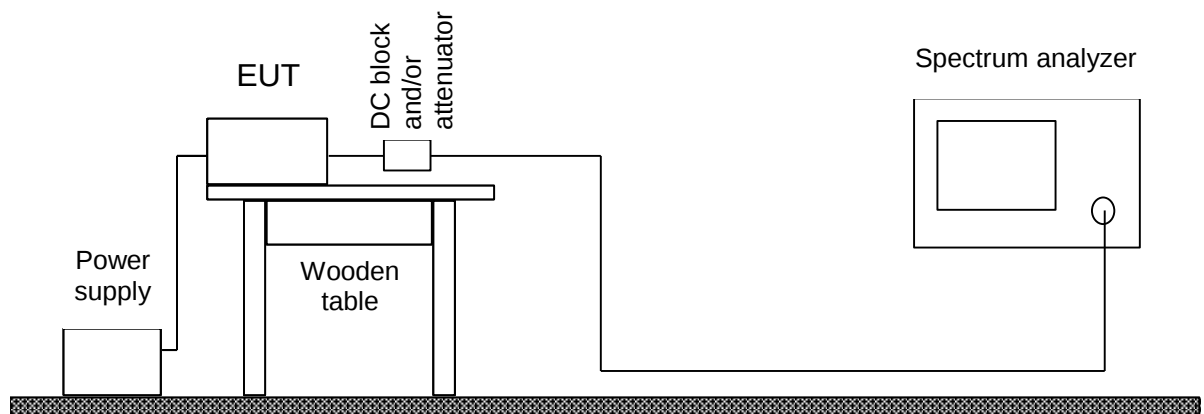
2.6.3 Date of Test

2019-03-07

2.6.4 Test Method

This test was performed in accordance with ANSI C63.10. clause 11.12.2.

The RF output terminals are connected to a spectrum analyzer. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). The electrical characteristics of the radio frequency load attached to the output terminals shall be stated, if applicable.



2.6.5 Environmental Conditions

Ambient Temperature 21 °C
Relative Humidity 30 %



2.6.6 Test Results

Configuration Mode-1

See plots for details

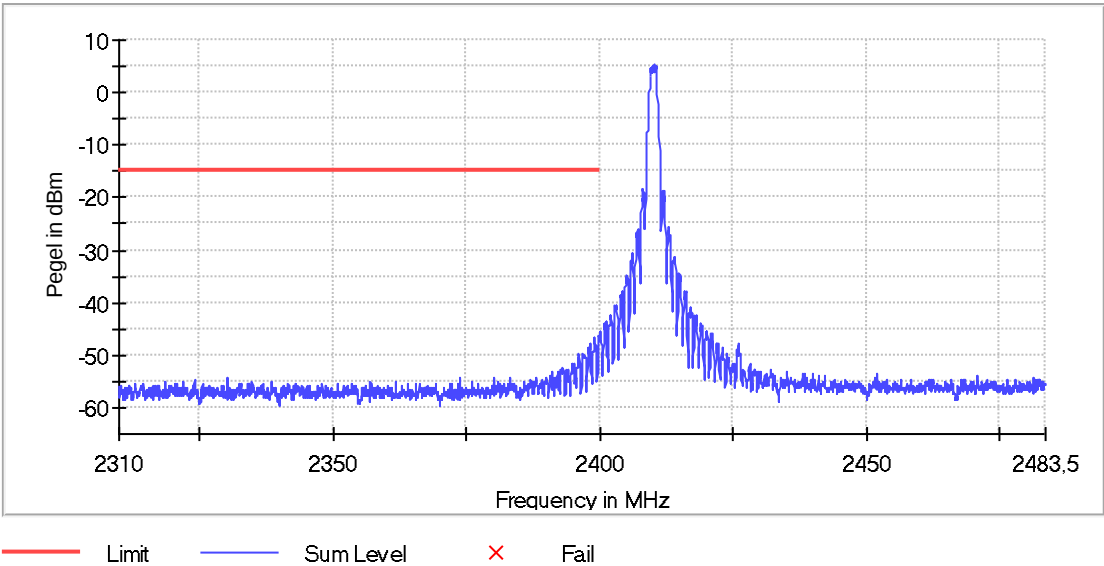


Figure 14 – 2410 MHz – Restricted Band

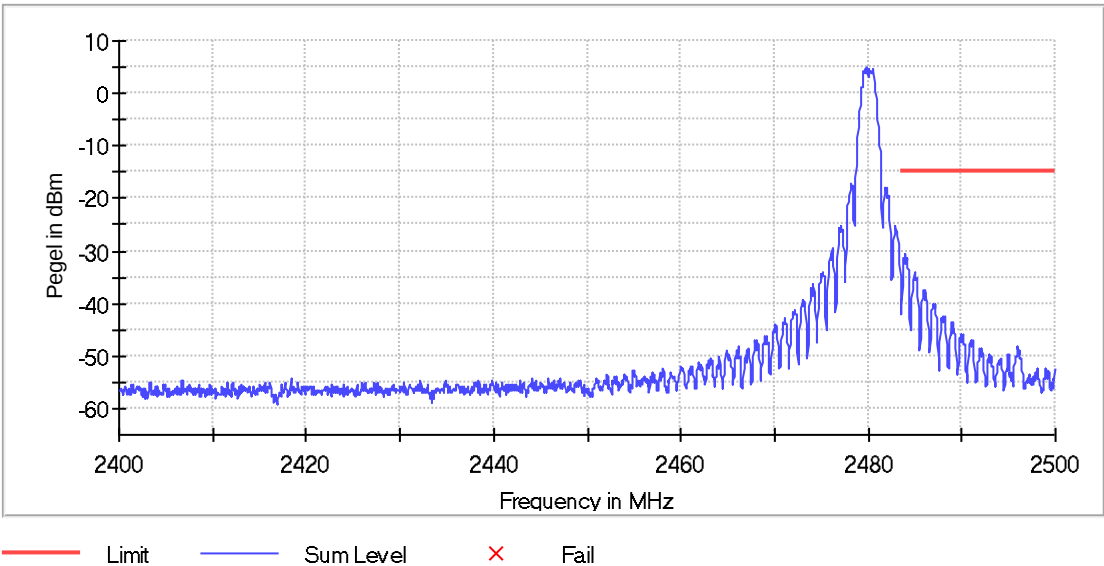


Figure 15 – 2480 MHz – Restricted Band



FCC 47 CFR Part 15. Limit Clause 15.209

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 14

ISED Canada RSS-GEN. Limit Clause 8.9

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

Table 15

*Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

2.6.7 Test Location and Test Equipment Used

This test was carried out in non-shielded room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2.4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 16

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



Product Service

2.7 Spurious Radiated Emissions

2.7.1 Specification Reference

FCC 47 CFR Part 15C. ISED Canada RSS-247 and ISED Canada RSS-GEN. Clause 15.247 (d). 15.205. 5.5 and 6.13

2.7.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T. S/N: --- - Modification State 0

2.7.3 Date of Test

2019-04-04

2.7.4 Test Method

Testing was performed in accordance with ANSI C63.10-2013 clause 6.3, 6.5 and 6.6. Radiated emission in the frequency range 30 MHz to 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 polarized logarithmic periodic antenna combined with a 4:1 broadband dipole ("Trilog broadband antenna") is used. The measurement bandwidth of the test receiver is set to 120 kHz with quasi-peak detector selected.

If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit.

Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are tested in the position producing the highest emission relative to the limit as verified by prescans in fully anechoic room.

If no prescan in a fully anechoic room is used first a peak scan is performed in four positions to get the whole spectrum of emission caused by EUT with the measuring antenna raised and lowered from 1 to 4 m to find table position, antenna height and antenna polarization for the maximum emission levels.

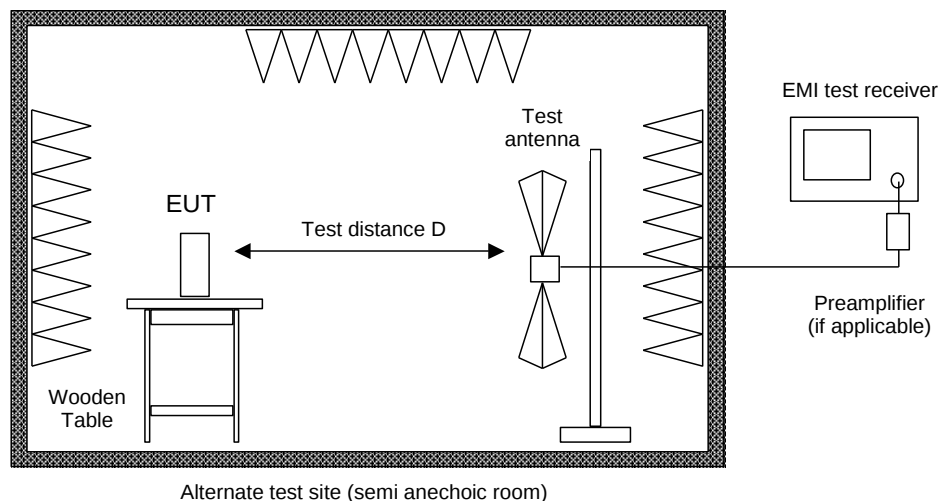
Data reduction is applied to these results to select those levels having less margin than 10 dB to or exceeding the limit using subranges and limited number of maximums. Further maximization is following.

With detector of the test receiver set to quasi-peak final measurements are performed immediately after frequency zoom (for drifting disturbances) and maximum adjustment.

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

In cases where prescans in a fully anechoic room are taken (e. g. if EUT is operating for a short time only or battery is discharged quickly) final measurements with quasi-peak detector are performed manually at frequencies indicated by prescan with EUT rotating all around and receiving antenna raising and lowering within 1 meter to 4 meters to find the maximum levels of emission. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For measuring emissions of intentional radiators and receivers a test distance D of 3 meters is selected. Testing of unintentional radiators is performed at a distance of 10 meters. If limits specified for 3 meters shall be used for measurements performed at 10 meters distance the limits are calculated according to CFR 47 Part 15 section 15.31(d) and (f)(1) using an inverse linear-distance extrapolation factor of 20 dB/decade.



Radiated emission in fully or semi anechoic room is measured in the frequency range from 1 GHz to the maximum frequency as specified in CFR 47 Part 15 section 15.33.

Measurements are made in both the horizontal and vertical planes of polarization using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwidth set 1 MHz (above 1 GHz).

All tests below 8.2 GHz are performed at a test distance D of 3 meters. For higher frequencies the test distance may be reduced (e.g. to 1 meter) due to the sensitivity of the measuring instrument(s) and the test results are calculated according to CFR 47 Part 15 section 15.31(f)(1) using an extrapolation factor of 20 dB/decade. If required, preamplifiers are used for the whole frequency range. Special care is taken to avoid overload, using appropriate attenuators and filters, if necessary.

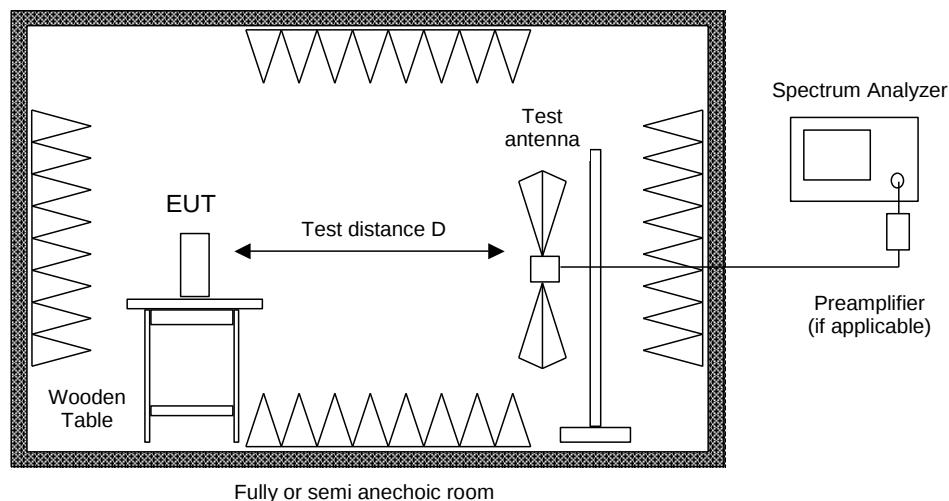
If the radiated emission limits are expressed in terms of the average value of the emission there also is a peak limit corresponding to 20 dB above the maximum permitted average limit.

Additionally, if pulsed operation is employed, the average field strength is determined by averaging over one complete pulse train, including blanking intervals, as specified in CFR 47 Part 15 section 15.35(c). If the pulse train exceeds 0.1 second that 0.1 second interval during which the value of the emission is at its maximum is selected for calculation. The pulse train correction is added to the peak value of the emission to get the average value.

Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration produces the highest emission relative to the limit and therefore shall be used for final testing.

During testing the EUT is rotated all around to find the maximum levels of emissions. Equipment and cables are placed and moved within the range of position likely to find their maximum emissions.

For final testing below 1 GHz a semi anechoic room complying with the NSA requirements of ANSI C63.4 for alternative test sites is used (see 6.5). If prescans are recorded in fully anechoic room they are indicated appropriately.



2.7.5 Environmental Conditions

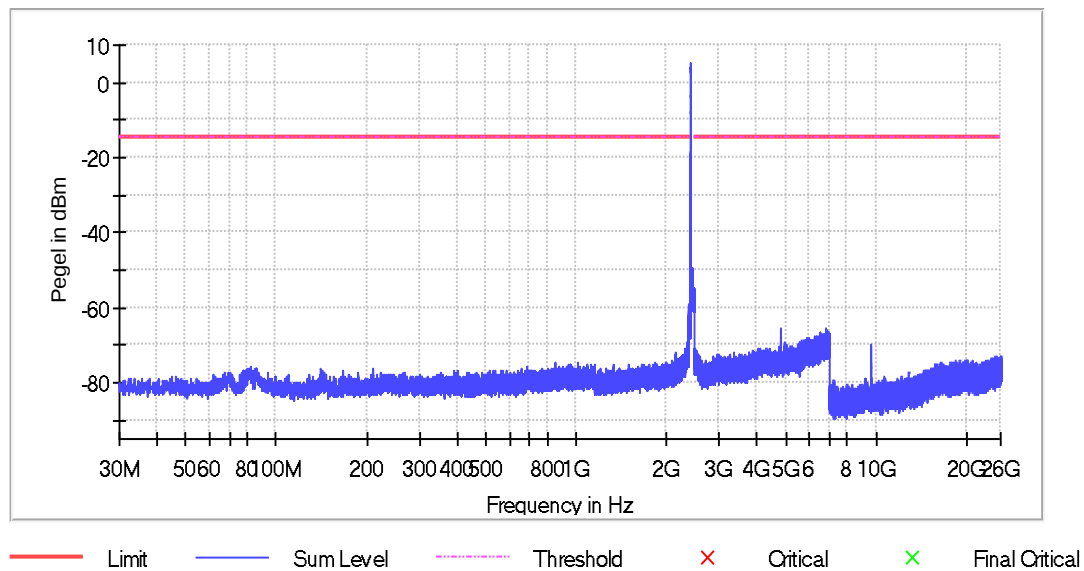
Ambient Temperature	20 °C
Relative Humidity	32 %



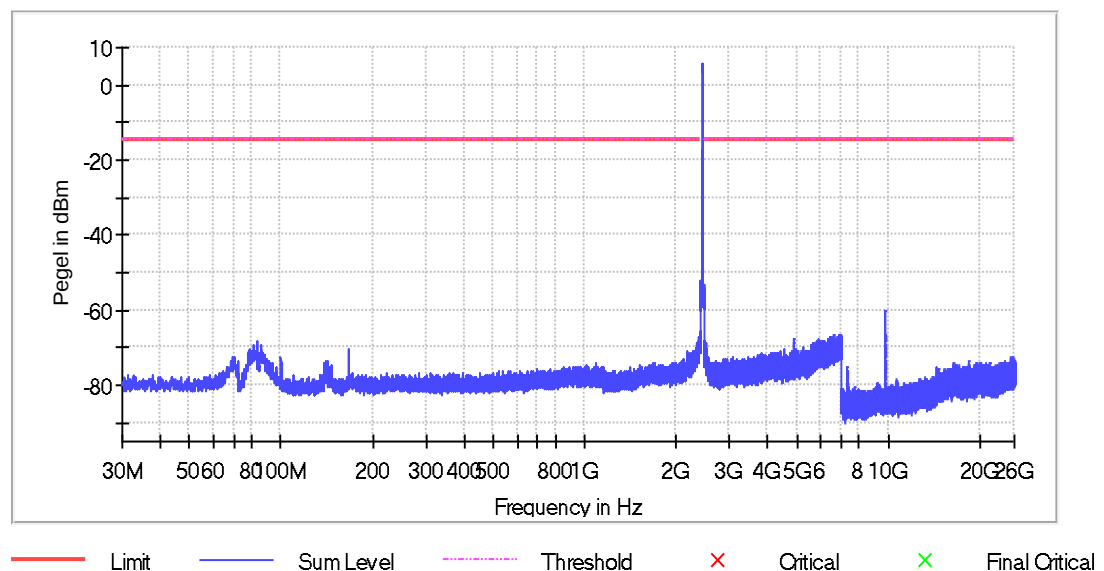
2.7.6 Test Results

Configuration Mode-1 (conducted)

2410 MHz



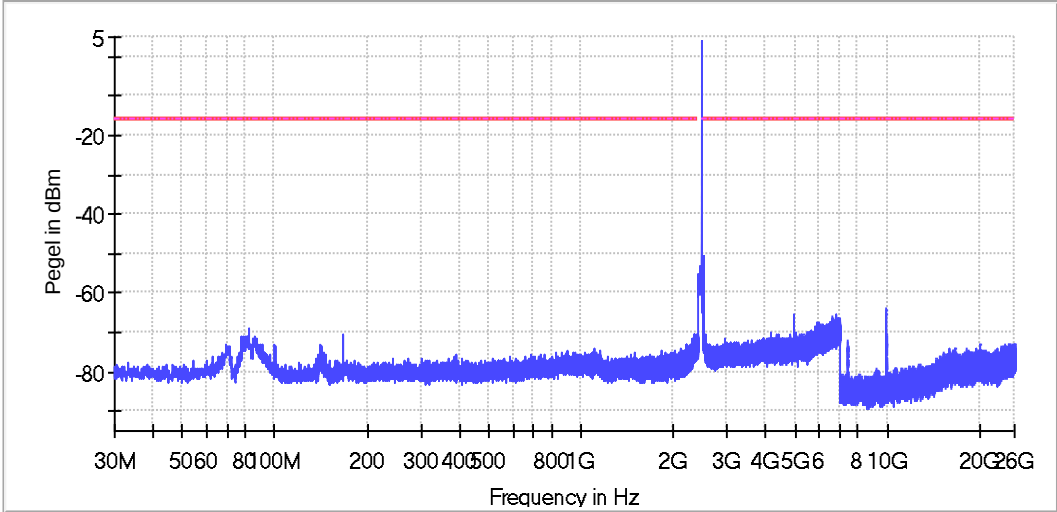
2440 MHz





Product Service

2480 MHz

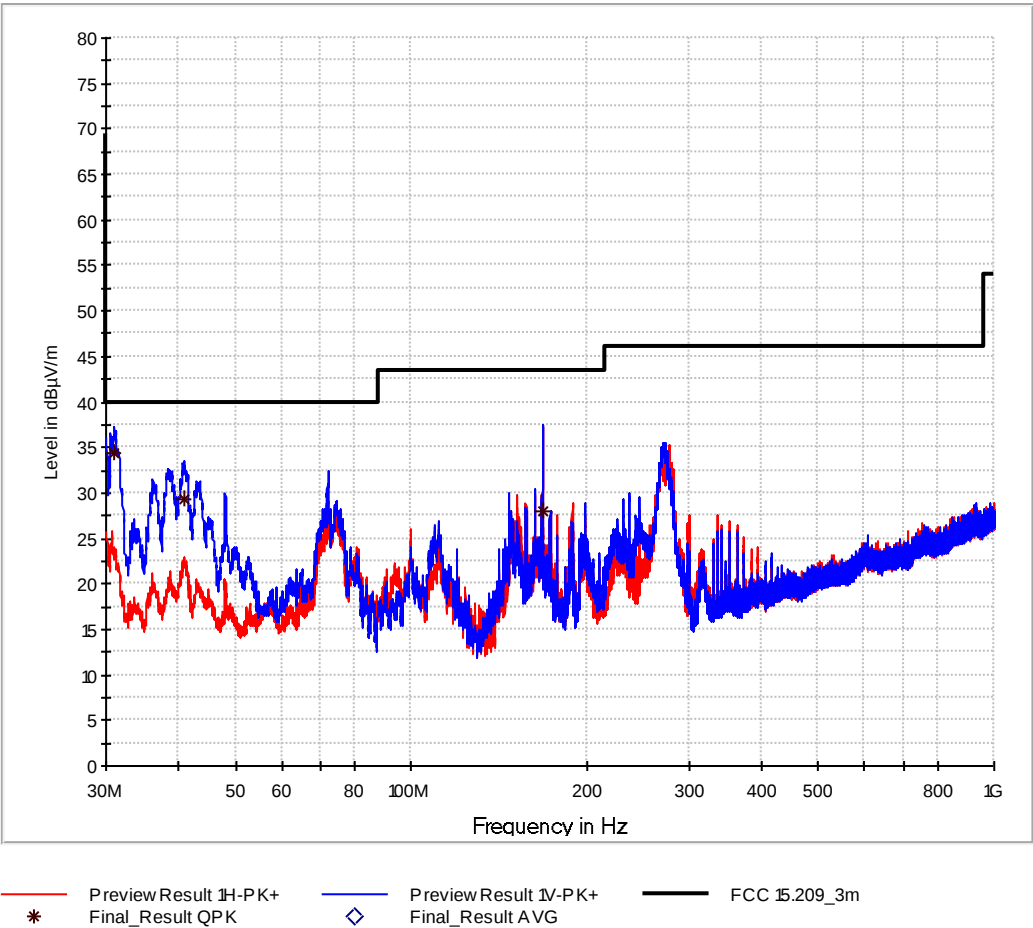


— Limit — Sum Level - - - - - Threshold × Critical × Final Critical



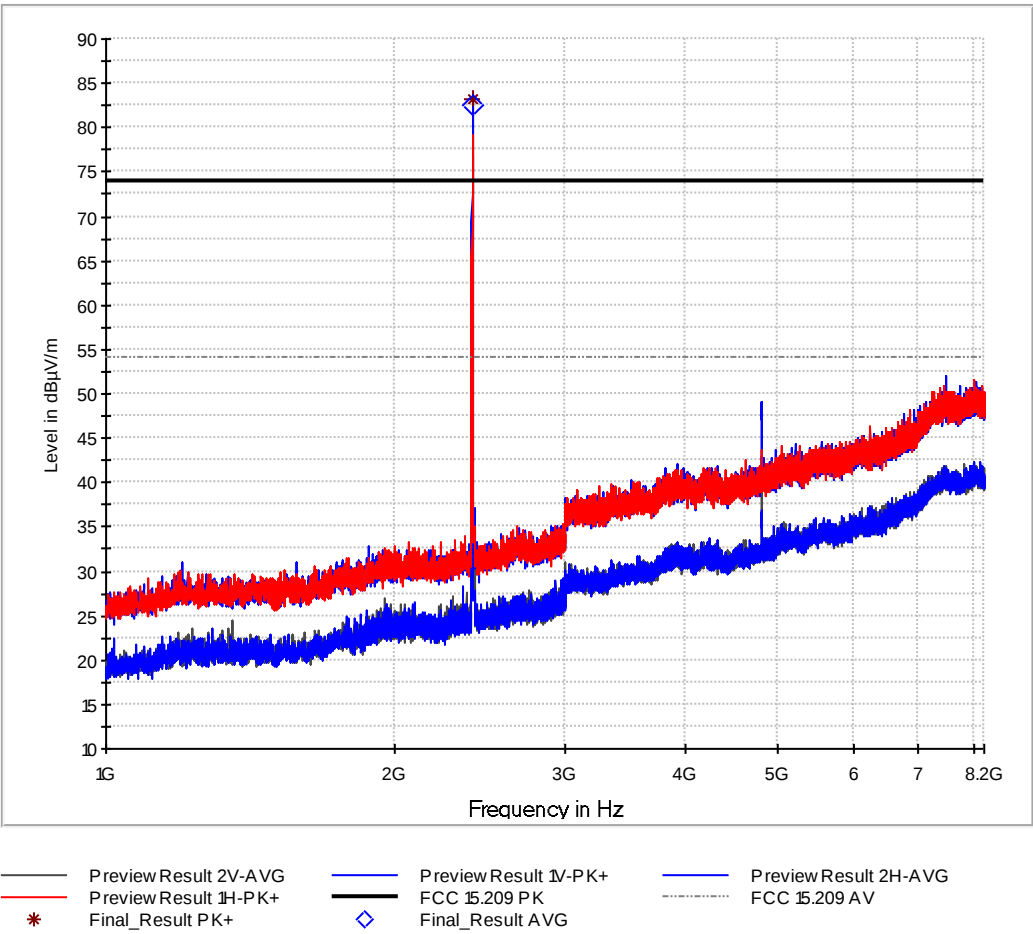
Configuration Mode-1 (radiated)

2410 MHz



Final Results 1:

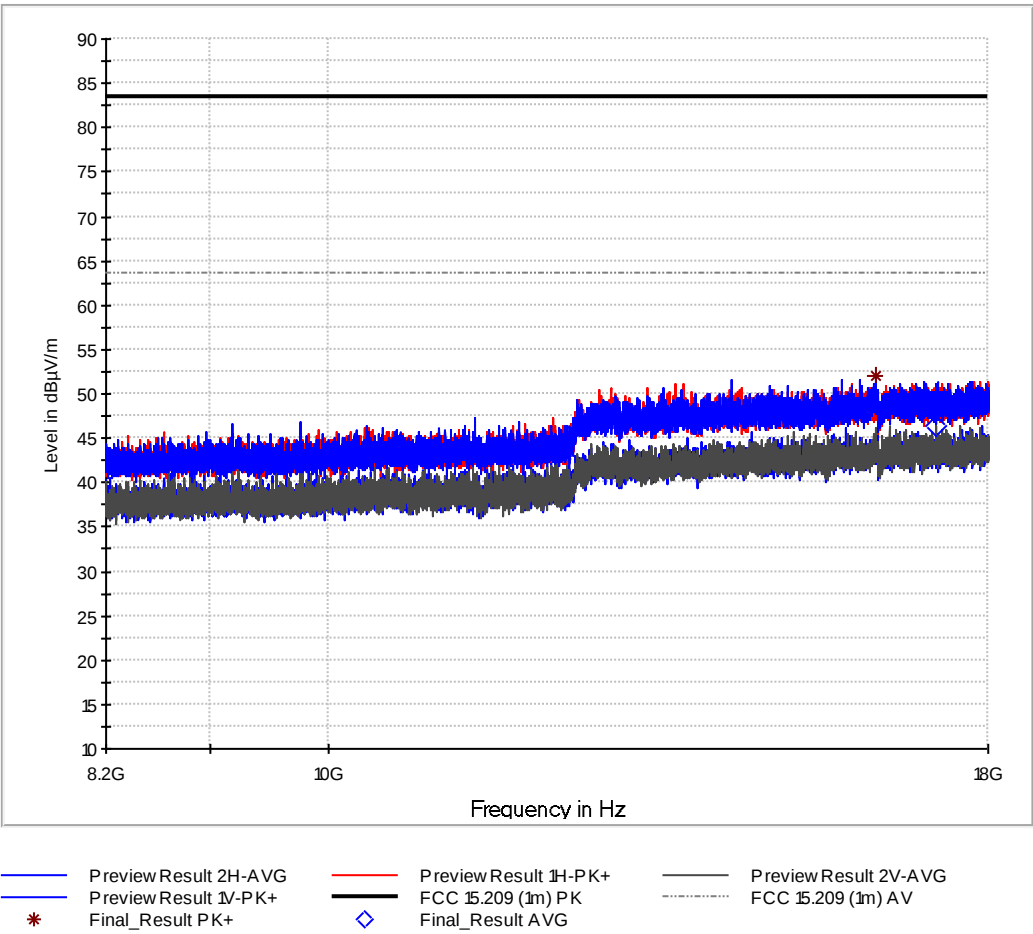
Frequency	QuasiPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
31.050000	34.36	40.00	5.64	1000.0	120.000	106.0	V	192.0	13.1
40.730000	29.38	40.00	10.62	1000.0	120.000	102.0	V	132.0	14.9
168.000000	28.08	43.50	15.42	1000.0	120.000	134.0	H	160.0	10.6



Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
2405.500000	---	82.60	#1	#1	2.5	1000.000	150.0	V	63.0	-1
2405.500000	83.32	---	#1	#1	2.5	1000.000	150.0	V	63.0	-1

#1 Intentional Radiator

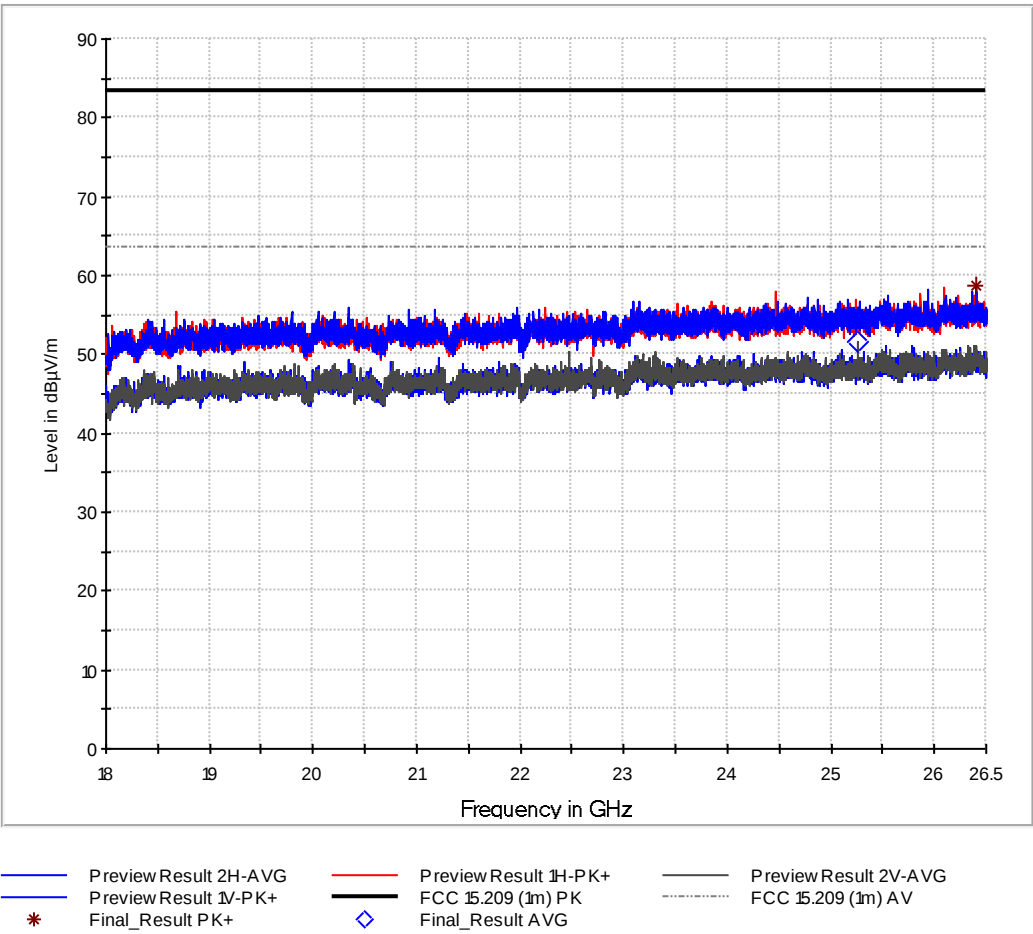


Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
16287.100000	51.95	---	83.50	31.55	5.0	1000.000	150.0	V	228.0	37
17170.500000	---	46.47	63.50	17.03	5.0	1000.000	150.0	V	0.0	37



Product Service

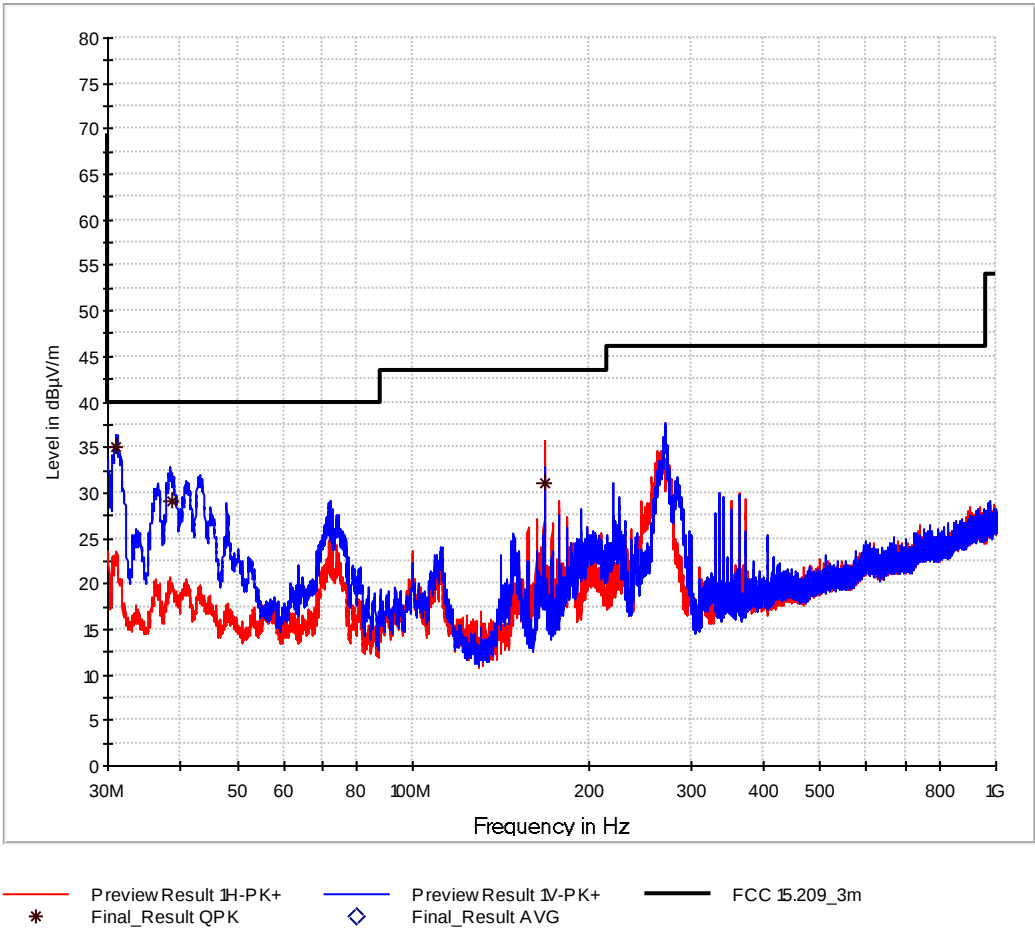


Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
25265.375000	---	51.66	63.50	11.84	5.0	1000.000	150.0	V	218.0	40
26407.562500	58.68	---	83.50	24.82	5.0	1000.000	150.0	V	121.0	41

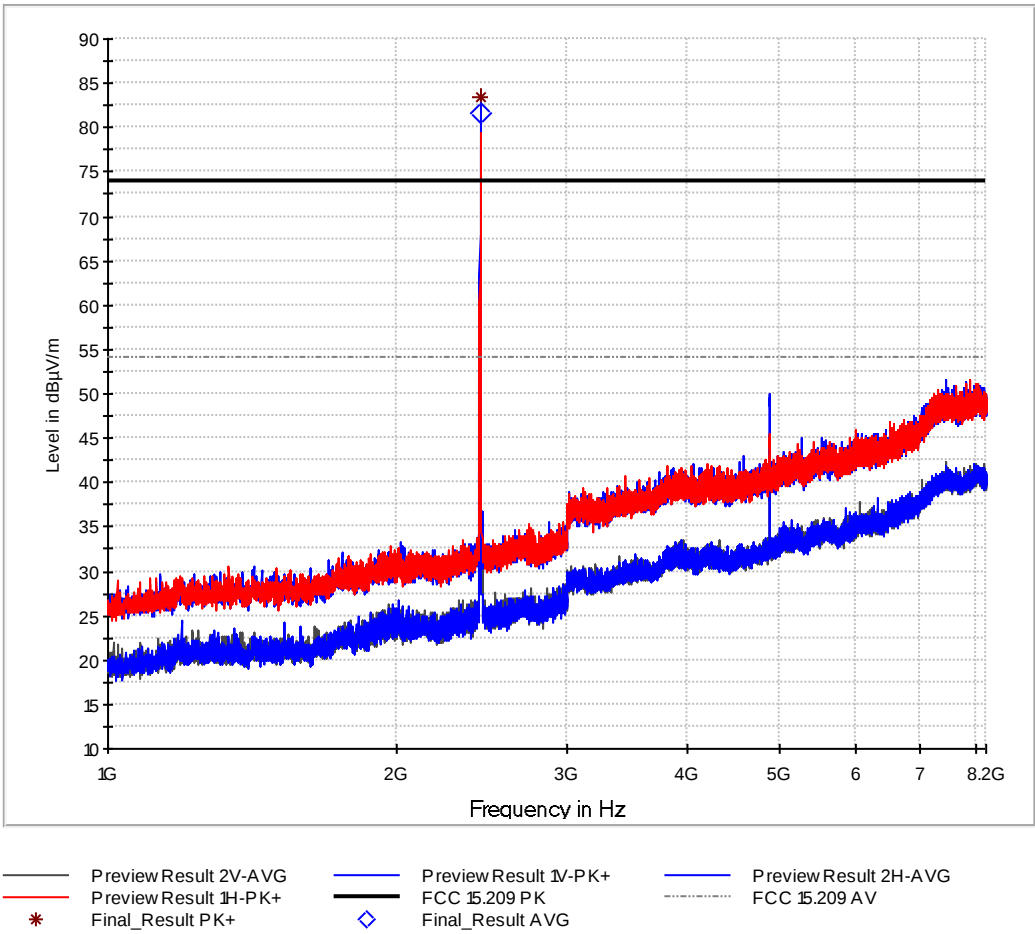


2440 MHz



Final Results 1:

Frequency	QuasiPeak	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB
31.060000	35.07	40.00	4.93	1000.0	120.000	103.0	V	147.0	13.1
38.635000	29.13	40.00	10.87	1000.0	120.000	103.0	V	-55.0	14.5
167.995000	31.09	43.50	12.41	1000.0	120.000	150.0	H	15.0	10.6



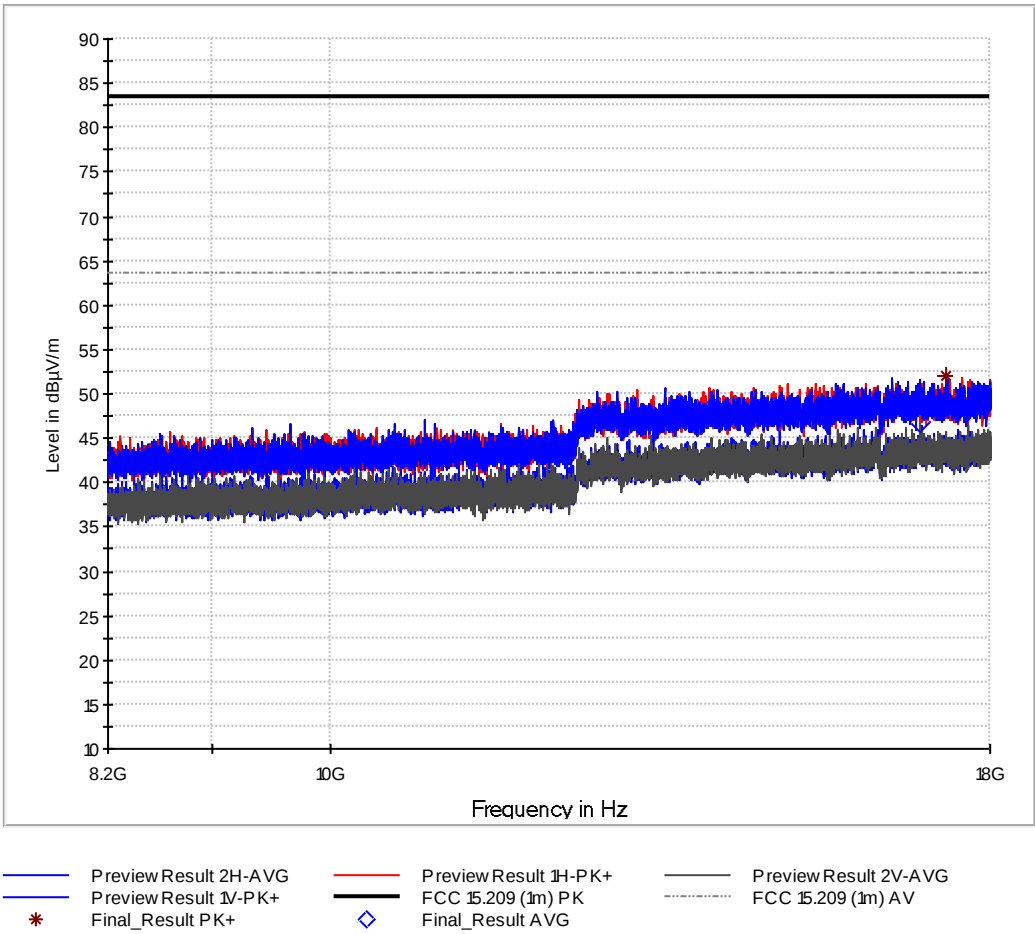
Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
2440.000000	---	81.70	#1	#1	2.5	1000.000	150.0	V	67.0	0
2440.000000	83.36	---	#1	#1	2.5	1000.000	150.0	V	67.0	0

#1 Intentional Radiator



Product Service

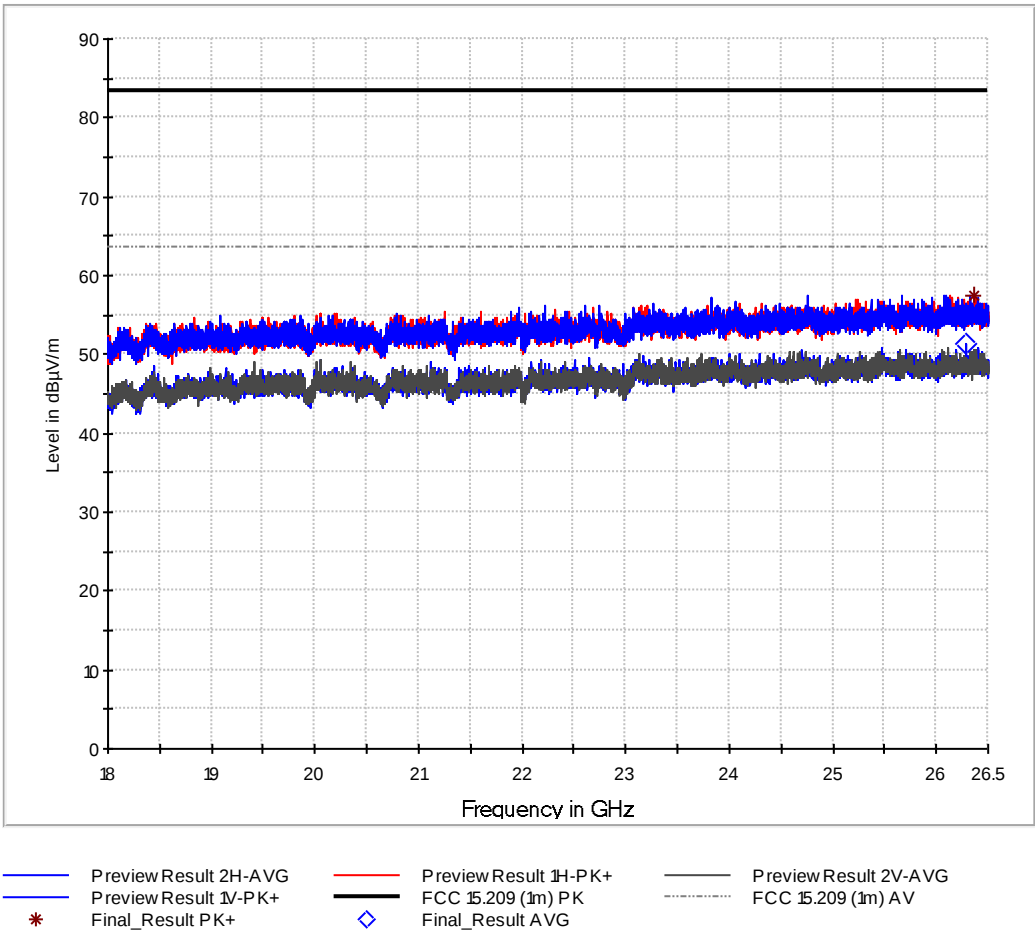


Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
16915.700000	---	46.91	63.50	16.59	5.0	1000.000	150.0	V	226.0	37
17295.800000	51.96	---	83.50	31.54	5.0	1000.000	150.0	V	341.0	37



Product Service

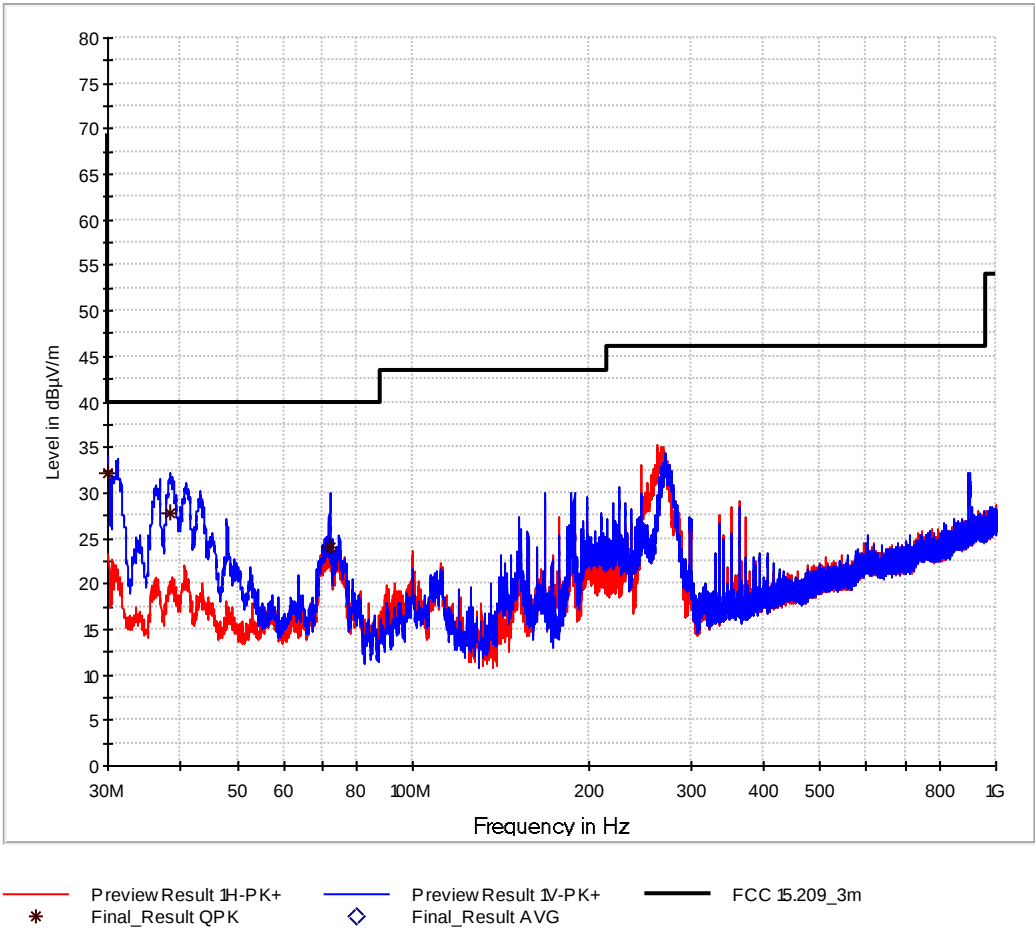


Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
26285.375000	---	51.23	63.50	12.27	5.0	1000.000	150.0	H	249.0	41
26361.875000	57.52	---	83.50	25.98	5.0	1000.000	150.0	H	226.0	41

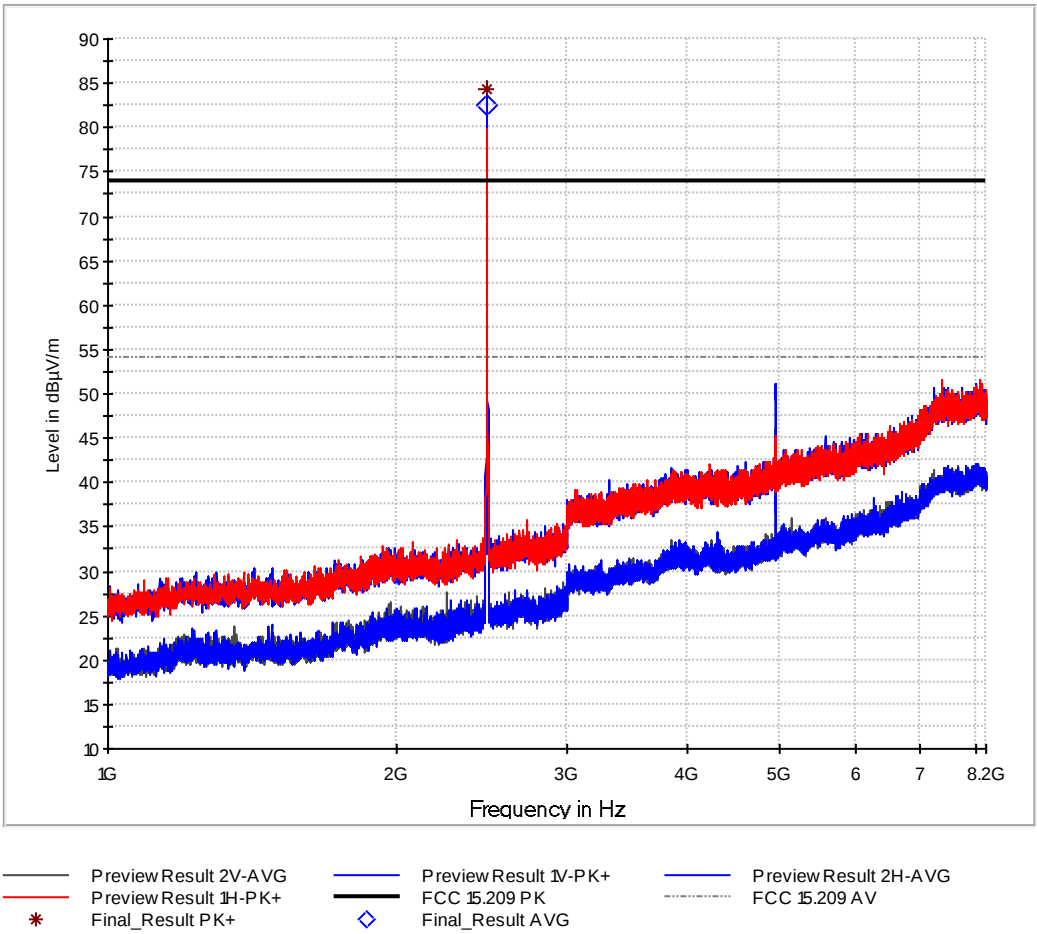


2480 MHz



Final Results 1:

Frequency MHz	QuasiPeak dBµV/m	Limit dBµV/m	Margin dB	Meas. Time ms	Bandwidth kHz	Height cm	Pol	Azimuth deg	Corr. dB
30.020000	32.26	40.00	7.74	1000.0	120.000	103.0	V	145.0	13.6
38.420000	27.69	40.00	12.31	1000.0	120.000	119.0	V	148.0	14.5
72.080000	24.08	40.00	15.92	1000.0	120.000	103.0	V	-109.0	10.4



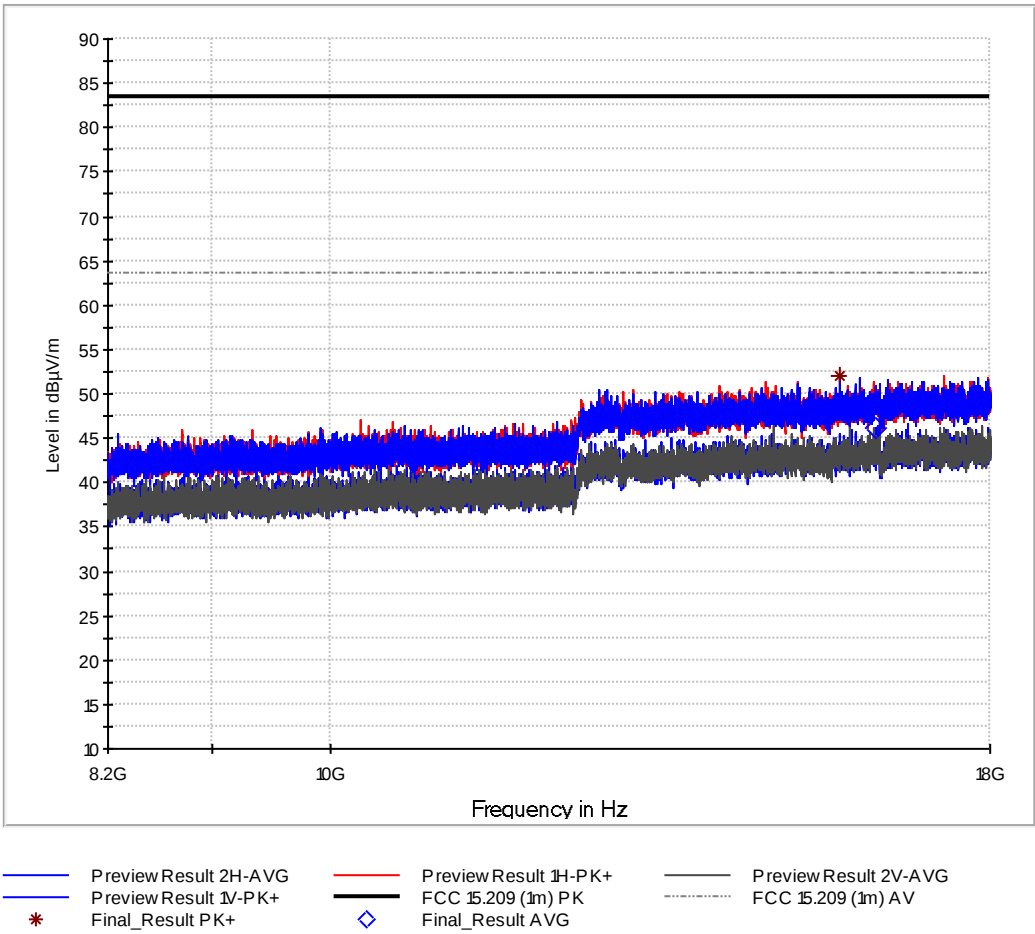
Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
2480.000000	84.32	---	#1	#1	2.5	1000.000	150.0	V	84.0	0
2480.500000	---	82.52	#1	#1	2.5	1000.000	150.0	V	84.0	0

#1 Intentional Radiator

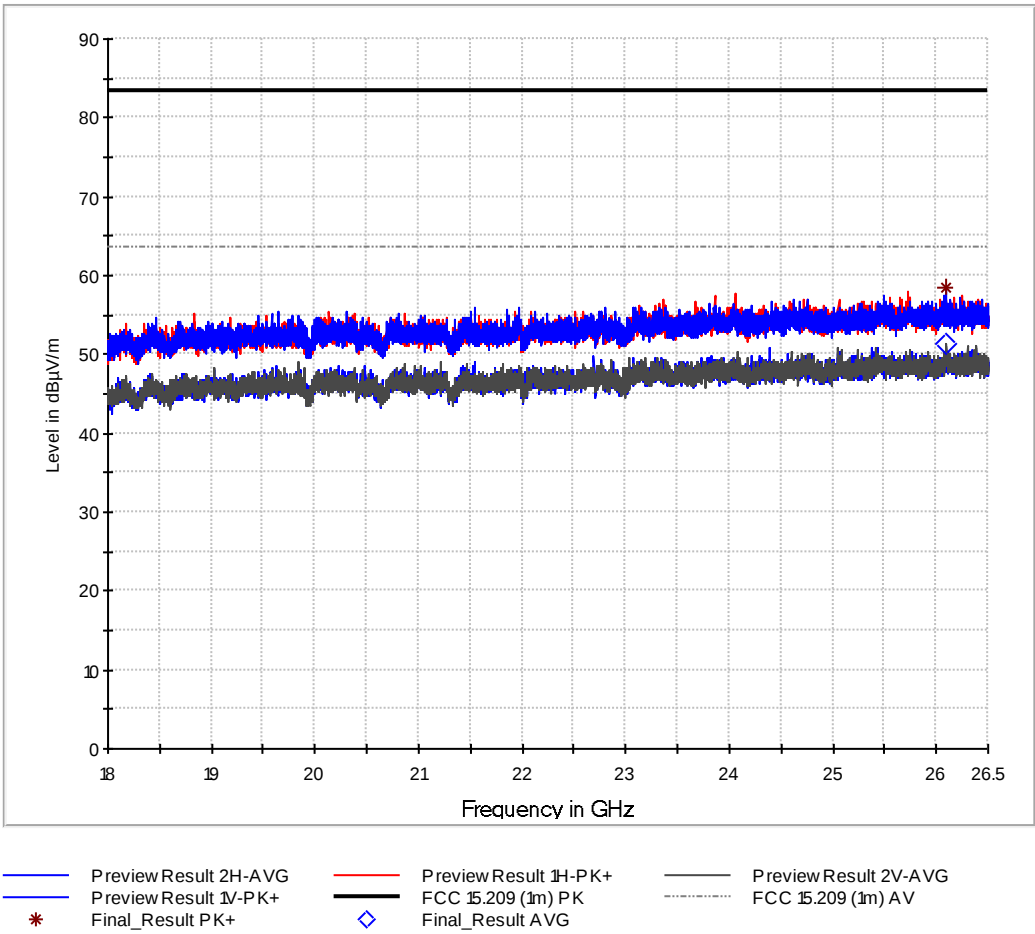


Product Service



Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
15753.700000	52.06	---	83.50	31.44	5.0	1000.000	150.0	V	257.0	37
16268.200000	---	46.16	63.50	17.34	5.0	1000.000	150.0	H	299.0	37



Final Results 1:

Frequency	MaxPeak	Average	Limit	Margin	Meas. Time	Bandwidth	Height	Pol	Azimuth	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	ms	kHz	cm		deg	dB/m
26100.500000	---	51.27	63.50	12.23	5.0	1000.000	150.0	V	234.0	41
26100.500000	58.45	---	83.50	25.05	5.0	1000.000	150.0	V	234.0	41

Sample calculation of final values:

Final Value (dBµV/m) = Reading Value (dBµV/m) + Correction Factor (dB)

Test Info: Radiated measurements are made with worst case position of the EUT.
Evaluated with Pretests.



FCC 47 CFR Part 15, Limit Clause 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in 15.209(a)

ISED Canada RSS-247, Limit Clause 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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 the desired power, based on either an RF conducted or a 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 under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.



2.7.7 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8 and a non-shielded-room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
TRILOG Antenna (4dB)	Schwarzbeck	VULB 9162	20116	36	2022-01-31
Horn antenna	Rohde & Schwarz	HF907	19933	24	2019-06-30
Horn antenna	EMCO	3160-09	19125	N/A	N/A
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2019-05-31
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.20.01	19719	N/A	N/A
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2.4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 17

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



2.8 Transmitter Frequency Stability

2.8.1 Specification Reference

ISED Canada RSS-GEN Clause 6.8

2.8.2 Equipment Under Test and Modification State

SIMATIC RTLS4060T, S/N: --- - Modification State 0

2.8.3 Date of Test

2019-03-07

2.8.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.8.1 and 6.8.2.

The frequency tolerance of the carrier signal is measured at the temperatures of -30°C, +20°C and +50°C, and at the manufacturer's rated 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.

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 dc block and appropriate attenuators (50 Ohms). In cases 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. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth are set to values appropriate to the 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 on 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 allowed is larger than the uncertainty of the measured frequency tolerance.

2.8.5 Environmental Conditions

Ambient Temperature	21 °C
Relative Humidity	30 %



2.8.6 Test Results

Configuration Mode-1

Operation Condition	EUT Frequency (MHz)	Measured Lower 99%-BW Frequency (MHz)	Measured Upper 99%-BW Frequency (MHz)
20°C / 24.00V	2410	2408.85	2411.20
20°C / 27.60V	2410	2408.65	2411.12
20°C / 20.40V	2410	2408.82	2411.41
-30°C / 24.00V	2410	2408.21	2410.95
+50°C / 24.00V	2410	2408.35	2411.25

Table 18

Operation Condition	EUT Frequency (MHz)	Measured Lower 99%-BW Frequency (MHz)	Measured Upper 99%-BW Frequency (MHz)
20°C / 24.00V	2440	2438.84	2441.25
20°C / 27.60V	2440	2438.91	2441.35
20°C / 20.40V	2440	2438.64	2441.05
-30°C / 24.00V	2440	2438.61	2441.25
+50°C / 24.00V	2440	2438.54	2441.06

Table 19

Operation Condition	EUT Frequency (MHz)	Measured Lower 99%-BW Frequency (MHz)	Measured Upper 99%-BW Frequency (MHz)
20°C / 24.00V	2480	2478.80	2481.25
20°C / 27.60V	2480	2478.62	2481.01
20°C / 20.40V	2480	2478.95	2481.55
-30°C / 24.00V	2480	2478.55	2481.20
+50°C / 24.00V	2480	2478.71	2481.11

Table 20

ISED Canada RSS-GEN, Limit Clause 8.11

Frequency stability is not specified in RSS-247. Measurement of the frequency stability is not required provided that the occupied bandwidth of the licence-exempt radio apparatus lies entirely outside the restricted bands and the prohibited TV bands of 54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz and 614-806 MHz.



2.8.7 Test Location and Test Equipment Used

This test was carried out in a non-shielded Room.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal and Spectrum Analysator	Rohde & Schwarz GmbH & Co. KG	FSV40 for TS8997	20219	12	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	20248	24	2020-01-31
Testsystem 2,4 & 5 GHz Band	Rohde & Schwarz GmbH & Co. KG	TS8997	20251	24	2020-01-31
Switching device	Rohde & Schwarz GmbH & Co. KG	OSP120 for TS8997	38807	24	2020-09-30
Climatic test chamber	ESPEC Corp.	PL-2J	18843	36	2020-03-31
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.50.00	19893	N/A	N/A

Table 21

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

N/A - Not Applicable



Product Service

2.9 Exposure of Humans to RF Fields

2.9.1 Specification Reference

IC RSS-GEN Issue 4, section 3.2 and
IC RSS-102, Issue 5, section 2.5 and
KDB 447498 D01 V06, section 4.3.1 a)

2.9.2 Guide

IC RSS-102 Issue 5, section 2.5

2.9.3 Equipment Under Test and Modification State

SIMATIC RTLS4060T, S/N: --- - Modification State 0

2.9.4 Date of Test

2019-04-04

2.9.5 Test Results

Detailed results are shown below.



Exposure of Humans to RF Fields	Applicable	Declared by applicant	Measured	Exemption
The antenna is				
☐ detachable				
The conducted output power (CP in watts) is measured at the antenna connector: $CP = \dots\dots\dots W$ The effective isotropic radiated power (EIRP in watts) is calculated using ☐ the numerical antenna gain: $G = \dots\dots\dots$ $EIRP = G \cdot CP \Rightarrow EIRP = \dots\dots\dots W$ ☐ the field strength¹ in V/m: $FS = \dots\dots\dots V/m$ $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = \dots\dots\dots W$ with: Distance between the antennas in m: $D = \dots\dots\dots m$			☐	
☒ not detachable				
A field strength measurement is used to determine the effective isotropic radiated power (EIRP in milliwatts) given by: $EIRP = \frac{(FS \cdot D)^2}{30} \Rightarrow EIRP = 0.081 \text{ mW}$ with: Field strength in V/m: $FS = 0.0016 \text{ V/m}$ Distance between the two antennas in m: $D = 3$			☒	☒
Selection of output power				
The output power TP is the higher of the conducted or effective isotropic radiated power (e.i.r.p.): $TP = 0.081 \text{ mW}$				

¹ The conversion formula is valid only for properly matched antennas. In other cases the transmitter output power may have to be measured by a terminated measurement when applying the exemption clauses. If an open area test site is used for field strength measurement, the effect due to the metal ground reflecting plane should be subtracted from the maximum field strength value in order to reference it to free space, before calculating TP.



Exposure of Humans to RF Fields (continued)		Applicable	Declared by applicant	Measured	Exemption
Separation distance between the user and the transmitting device is					
☒ less than or equal to 20 cm	☐ greater than 20 cm		☐		
Transmitting device is					
☐ in the vicinity of the human head	☐ body-worn		☐		

SAR evaluation										
SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in the table. For controlled use devices where the 8 W/kg for 1 gram of tissue applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 5. For limb-worn devices where the 10 gram value applies, the exemption limits for routine evaluation in the table are multiplied by a factor of 2.5. If the operating frequency of the device is between two frequencies located in the table, linear interpolation shall be applied for the applicable separation distance. For test separation distance less than 5 mm, the exemption limits for a separation distance of 5 mm can be applied to determine if a routine evaluation is required. For medical implants devices, the exemption limit for routine evaluation is set at 1 mW. The output power of a medical implants device is defined as the higher of the conducted or e.i.r.p to determine whether the device is exempt from the SAR evaluation.										
Frequency (MHz)	Exemption limits (mW) ² at separation distance of									
	≤5 mm	10 mm	15 mm	20 mm	25 mm	30 mm	35 mm	40 mm	45 mm	≥50 mm
≤300 ³	71	101	132	162	193	223	254	284	315	345
450	52	70	88	106	123	141	159	177	195	213
835	17	30	42	55	67	80	92	105	117	130
1900	7	10	18	34	60	99	153	225	316	431
2450	4	7	15	30	52	83	123	173	235	309
3500	2	6	16	32	55	86	124	170	225	290
5800	1	6	15	27	41	56	71	85	97	106

² The exemption limit in the table are based on measurements and simulations on half-wave dipole antennas at separation distances of 5 mm to 25 mm from a flat phantom, providing a SAR value of approximately 0.4 W/kg for 1 g of tissue. For low frequencies (300 MHz to 835 MHz), the exemption limits are derived from a linear fit. For high frequencies (1900 MHz and above), the exemption limits are derived from a third order polynomial fit.

³ Transmitters operating between 3 kHz and 10 MHz, meeting the exemption from routine SAR evaluation, shall demonstrate compliance to the instantaneous limits in IC RSS-102, issue 5, section 4.



Product Service

Carrier frequency:	f	=	2480 MHz				
Distance:	d	=	5 mm				
Transmitter output power:	TP	=	0.081 mW				
Limit:	TP_{limit}	=	3.98 mW				☒
☐ SAR evaluation is documented in test report no. ...							



Specifications:	RSS-102, Issue 5, Section 4, Table 4, Uncontrolled Environment SPR-002, Issue 1
Operation mode:	Configuration Mode-1
Comment:	---

Test procedure:	IEC 62236-1, Section 4.2 "Measurement to show accordance to the reference levels"			
Test distance:	Direct contact to EUT			
Limit:	<i>Frequency Range (MHz)</i>	<i>Electric Field (V/m_{rms})</i>	<i>Magnetic Field (A/m_{rms})</i>	<i>Reference Periode (min)</i>
	10-20	27.46	0.0728	6
	300-6000	3.142 f ^{0.3417}	0.008335 f ^{0.3417}	6
	f in MHz			
Test positions:	All surfaces: The antenna was moved all over the equipment under test using a test distance as stated above.			

Measured maximum value (V/m)	Maximum Limit at 2480 MHz (V/m)	Margin to reference value (V/m)
4.54	45.40	40.86

Measured maximum value (A/m)	Maximum Limit at 2480 MHz (A/m)	Margin to reference value (A/m)
0.0082	0.1204	0.1122

SAR Exclusion threshold

Maximum Radiated Fields Strength: (see chapter 2.1.6 of this test report)	84.32 dB μ V/m (at 3 m distance and 2480 MHz)
Calculated Equivalent Radiated Power:	0.081 mW (e.i.r.p.) < 1 mW
Minimum separation distance:	5 mm ($\leq$ 50 mm)
1-g numeric threshold:	$(1 \text{ mW} / 5 \text{ mm}) \cdot \sqrt{(2.480 \text{ GHz})} = 0.31$
1-g numeric threshold limit:	3.0

Note 1: For test distances below 5 mm according to 4.3.1 a) the test distance is fixed to 5 mm.

$$EIRP = \frac{(FS \cdot D)^2}{30}$$

2.9.6 Test Location and Test Equipment Used

This test was carried out in Semi anechoic room - cabin no. 8.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Horn antenna	Rohde & Schwarz	HF907	19933	24	2019-06-30
EMI test receiver	Rohde & Schwarz	ESW26	28268	12	2019-05-31
EMC Measurement Software	Rohde&Schwarz	EMC32 V10.20.01	19719	N/A	N/A
Electromagnetic radiation meter	Narda Safety	EMR-200	19590	36	2019-10-31
Electric field probe	Narda Safety	Type 8.3	19591	36	2019-10-31
Magnetic field probe	Narda Safety	Type 12.1	19592	36	2019-10-31
Exposure level tester	Narda Safety	ELT-400	19725	24	2020-06-30

Table 22



3 Measurement Uncertainty

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

Radio Testing			
Test Name	kp	Expanded Uncertainty	Note
Occupied Bandwidth	2.0	$\pm 1.14 \%$	2
RF-Frequency error	1.96	$\pm 1 \cdot 10^{-7}$	7
RF-Power, conducted carrier	2	$\pm 0.079 \text{ dB}$	2
RF-Power uncertainty for given BER	1.96	$+0.94 \text{ dB} / -1.05$	7
RF power, conducted, spurious emissions	1.96	$+1.4 \text{ dB} / -1.6 \text{ dB}$	7
RF power, radiated			
25 MHz – 4 GHz	1.96	$+3.6 \text{ dB} / -5.2 \text{ dB}$	8
1 GHz – 18 GHz	1.96	$+3.8 \text{ dB} / -5.6 \text{ dB}$	8
18 GHz – 26.5 GHz	1.96	$+3.4 \text{ dB} / -4.5 \text{ dB}$	8
40 GHz – 170 GHz	1.96	$+4.2 \text{ dB} / -7.1 \text{ dB}$	8
Spectral Power Density, conducted	2.0	$\pm 0.53 \text{ dB}$	2
Maximum frequency deviation			
300 Hz – 6 kHz	2	$\pm 2.89 \%$	2
6 kHz – 25 kHz	2	$\pm 0.2 \text{ dB}$	2
Maximum frequency deviation for FM	2	$\pm 2.89 \%$	2
Adjacent channel power 25 MHz – 1 GHz	2	$\pm 2.31 \%$	2
Temperature	2	$\pm 0.39 \text{ K}$	4
(Relative) Humidity	2	$\pm 2.28 \%$	2
DC- and low frequency AC voltage			
DC voltage	2	$\pm 0.01 \%$	2
AC voltage up to 1 kHz	2	$\pm 1.2 \%$	2
Time	2	$\pm 0.6 \%$	2

Table 23



Radio Interference Emission Testing			
Test Name	kp	Expanded Uncertainty	Note
Conducted Voltage Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
100 kHz to 200 MHz (50Ω/5μH AMN)	2	± 3.6 dB	1
Discontinuous Conducted Emission			
9 kHz to 150 kHz (50Ω/50μH AMN)	2	± 3.8 dB	1
150 kHz to 30 MHz (50Ω/50μH AMN)	2	± 3.4 dB	1
Conducted Current Emission			
9 kHz to 200 MHz	2	± 3.5 dB	1
Magnetic Fieldstrength			
9 kHz to 30 MHz (with loop antenna)	2	± 3.9 dB	1
9 kHz to 30 MHz (large-loop antenna 2 m)	2	± 3.5 dB	1
Radiated Emission			
Test distance 1 m (ALSE)			
9 kHz to 150 kHz	2	± 4.6 dB	1
150 kHz to 30 MHz	2	± 4.1 dB	1
30 MHz to 200 MHz	2	± 5.2 dB	1
200 MHz to 2 GHz	2	± 4.4 dB	1
2 GHz to 3 GHz	2	± 4.6 dB	1
Test distance 3 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 5.0 dB	1
1 GHz to 6 GHz	2	± 4.6 dB	1
Test distance 10 m			
30 MHz to 300 MHz	2	± 4.9 dB	1
300 MHz to 1 GHz	2	± 4.9 dB	1
Radio Interference Power			
30 MHz to 300 MHz	2	± 3.5 dB	1
Harmonic Current Emissions			4
Voltage Changes, Voltage Fluctuations and Flicker			4

Table 24



Immunity Testing			
Test Name	kp	Expanded Uncertainty	Note
Electrostatic Discharges			4
Radiated RF-Field			
Pre-calibrated field level	2	+32.2 / -24.3 %	5
Dynamic feedback field level	2.05	+21.2 / -17.5 %	3
Electrical Fast Transients (EFT) / Bursts			4
Surges			4
Conducted Disturbances, induced by RF-Fields			
via CDN	2	+15.1 / -13.1 %	6
via EM clamp	2	+42.6 / -29.9 %	6
via current clamp	2	+43.9 / -30.5 %	6
Power Frequency Magnetic Field	2	+20.7 / -17.1 %	2
Pulse Magnetic Field			4
Voltage Dips, Short Interruptions and Voltage Variations			4
Oscillatory Waves			4
Conducted Low Frequency Disturbances			
Voltage setting	2	± 0.9 %	2
Frequency setting	2	± 0.1 %	2
Electrical Transient Transmission in Road Vehicles			4

Table 25

Note 1:

The expanded uncertainty reported according to CISPR 16-4-2:2003-11 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 2:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 3:

The expanded uncertainty reported according to UKAS Lab 34 (Edition 1, 2002-08) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2.05$, providing a level of confidence of $p = 95.45\%$

Note 4:

It has been demonstrated that the used test equipment meets the specified requirements in the standard with at least a 95% confidence.

Note 5:

The expanded uncertainty reported according to IEC 61000-4-3 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 6:

The expanded uncertainty reported according to IEC 61000-4-6 is based on a standard uncertainty multiplied by a coverage factor of $k_p = 2$, providing a level of confidence of $p = 95.45\%$

Note 7:

The expanded uncertainty reported according to ETSI TR 100 028 V1.4.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$

Note 8:

The expanded uncertainty reported according to ETSI TR 102 273 V1.2.1 (all parts) is based on a standard uncertainty multiplied by a coverage factor of $k_p = 1.96$, providing a level of confidence of $p = 95.45\%$