DEKRA Certification, Inc.
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Sterling, VA 20164
United States of America

ACCREDITED
Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report No:
2595ERM.004

Test report

USA FCC Part 15.247, 15.209, 15.207
CANADA RSS-247, RSS-Gen
Radio Frequency Devices. Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz
Digital Transmission Systems (DTSs), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices.

Identification of item tested	Smart Cooking Sensor
Trademark	Safera
Model and /or type reference	IFU10B
Other identification of the product	FCC ID: 2AT88-1000021194
Features	Bluetooth LE
Manufacturer	SAFERA OY Tekniikantie 4B, 02150 Espoo, Finland.
Test method requested, standard	USA FCC Part 15.247, 10-1-18 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209, 10-1-18 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (February 2018). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2020.01.28 18:54:55 -05'00'
Date of issue	01-15-2020
Report template No	FDT08_21

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Competences and guarantees

DEKRA Certification Inc. is a testing laboratory accredited by A2LA (The American Association for Laboratory Accreditation), to perform the tests indicated in the Certificate 2764.01

DEKRA Certification Inc. 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 Certification Inc. has a calibration and maintenance program for its measurement equipment.

DEKRA Certification Inc. 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 on the report and, it is based on the knowledge and technical facilities available at DEKRA Certification at the time of performance of the test.

DEKRA Certification Inc. 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.

IMPORTANT: No parts of this report may be reproduced or quoted out of context, in any form or by any means, except in full, without the previous written permission of DEKRA Certification Inc.

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 Certification Inc.
4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written permission of DEKRA Certification Inc. and the Accreditation Bodies.

Uncertainty

Uncertainty (factor k=2) was calculated according to the DEKRA Certification internal document PODT000.

Frequency (MHz)	U(k=2)	Units
0,009 - 30	2.69	dB
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

Bluetooth Low Energy

DEKRA declines any responsibility with respect to the information provided by the client and that may affect the validity of results.

Usage of samples

Samples undergoing test have been selected by: The client.

Sample S/01 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2595B.003	Conducted Test Sample	21092 01	----	07/23/2019

1. Sample S/01 has undergone following test(s).

   All conducted tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2595B.002	RadiatedTest Sample	21092 01	----	07/23/2019

1. Sample S/02 has undergone following test(s).

   All radiated tests indicated in appendix A.

Test sample description

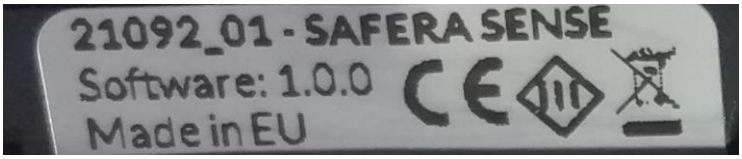
<table>
<tr><td>Ports…… :</td><td colspan="2">Port name and description</td><td colspan="5">Cable</td></tr>
<tr><td></td><td colspan="2"></td><td>Specified length [m]</td><td colspan="2">Attached during test</td><td>Shielded</td></tr>
<tr><td></td><td colspan="2">No Ports in Final product</td><td></td><td colspan="2">☐</td><td>☐</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td colspan="2">☐</td><td>☐</td></tr>
<tr><td></td><td colspan="2"></td><td></td><td colspan="2">☐</td><td>☐</td></tr>
<tr><td>Supplementary information to the ports…… :</td><td colspan="7">Not provided data</td></tr>
<tr><td>Rated power supply .....:</td><td colspan="2">Voltage and Frequency</td><td colspan="5">Reference poles</td></tr>
<tr><td></td><td colspan="2"></td><td>L1</td><td>L2</td><td>L3</td><td>N</td><td>PE</td></tr>
<tr><td></td><td>☐</td><td>AC:</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td></td><td>☐</td><td>AC:</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td><td>☐</td></tr>
<tr><td></td><td>☐</td><td colspan="5">DC:</td></tr>
<tr><td></td><td>☒</td><td colspan="5">DC: For the final product: 3 x AA Alkaline batteries as power supply. Operational voltage from 3.0 V to 5.0 V.

For testing purposes, power is wired externally to some sample units. This is done to make it possible to use an external power supply. When using an external power supply, allowed voltages are 3.0 VDC to 5.0 VDC.</td></tr>
<tr><td>Rated Power .....:</td><td colspan="7">Max. peak current consumption 150 mA</td></tr>
<tr><td>Clock frequencies .....:</td><td colspan="7">64 MHz processor main clock.

32.768 kHz RTC auxiliary clock</td></tr>
<tr><td>Other parameters.....:</td><td colspan="7">Data Not Provided</td></tr>
<tr><td>Software version .....:</td><td colspan="7">1.0.0</td></tr>
<tr><td>Hardware version.....:</td><td colspan="7">B</td></tr>
<tr><td>Dimensions in cm (L x W x D) ....:</td><td colspan="7">Data Not Provided</td></tr>
<tr><td>Mounting position.....:</td><td>☐</td><td colspan="6">Table top equipment</td></tr>
<tr><td></td><td>☒</td><td colspan="6">Wall/Ceiling mounted equipment</td></tr>
<tr><td></td><td>☐</td><td colspan="6">Floor standing equipment</td></tr>
<tr><td></td><td>☐</td><td colspan="6">Hand-held equipment</td></tr>
<tr><td></td><td>☐</td><td colspan="6">Other:</td></tr>
</table>

Modules/parts .....:	Module/parts of test item	Type	Manufacturer
	Sensor Unit		*Safera*
Accessories (not part of the test item) .....:	Description	Type	Manufacturer
	Power Supply (Only for testing)		
	Battery Holder (Only for testing)		
Documents as provided by the applicant.....:	Description	File name	Issue date
	FDT30_14 Declaration Equipment Data SLI 4.pdf		13-08-2019

Copy of marking plate:



Identification of the client

SAFERA OY

Tekniikantie 4 B, 02150 Espoo, Finland.

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	07-23-2019
Date (finish)	07-24-2019

Document history

Report number	Date	Description
2595ERM.004	01-15-2020	First release

Environmental conditions

In the control chamber, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 75 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

In the chamber for conducted measurements, the following limits were not exceeded during the test:

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 30 % Max. = 60 %
Air pressure	Min. = 860 mbar Max. = 1060 mbar

Remarks and comments

The tests have been performed by the technical personnel: Divya Adusumilli, Poojita Bhattu and Koji Nishimoto.

Testing verdicts

Not applicable :	N/A
Pass :	P
Fail :	F
Not measured :	N/M

Summary

FCC PART 15 PARAGRAPH / RSS-247 (Bluetooth Low Energy)					
Report Section	**15.247 Spec Clause**	**RSS Spec Clause**	**Test Description**	**Verdict**	**Remark**
A.1		RSS-Gen 6.7	99% Occupied Bandwidth	P	N/A
A.2	§ 15.247 (a) (2)	RSS-247 5.2. (a)	6dB Emission Bandwidth	P	N/A
A.3	§ 15.247 (b) (3)	RSS-247 5.4. (d)	Maximum peak conducted output power and antenna gain	P	N/A
A.4	§ 15.247 (d)	RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	N/A
A.5	§ 15.247 (e)	RSS-247 5.2. (b)	Power spectral density	P	N/A
A.6	§ 15.247 (d)	RSS-Gen 8.9 & 8.10.	Emission limitations radiated (Transmitter)	P	N/A
-	§15.207 (a)	RSS Gen 8.8	Conducted Emission Limits	N/A	Refer 1

Supplementary information and remarks:

1. Device under test powered by battery

List of equipment used during the test

Conducted Measurements

Test system Rohde & Schwarz TS 8997:

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1039	Signal Analyzer	ROHDE & SCHWARZ	FSV40	2018/10	2020/10
1040	Switch unit Rohde & Schwarz with power detector OSP120 / OSP-B157	ROHDE & SCHWARZ	OSP120 / OSPB157	2018/10	2020/10
1041	RF generator	ROHDE & SCHWARZ	SMB100A	2018/04	2020/04
1042	RF generator	ROHDE & SCHWARZ	SMBV100A	2018/01	2020/01
0101	Climatic Chamber	ESPEC NA	ESL-2CA	2019/01	2020/01

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1014	Signal Analyzer	ROHDE & SCHWARZ	FSV40	2018/10	2020/10
1012	EMI Test Receiver	ROHDE & SCHWARZ	ESR26	2018/09	2020/09
1058	Double Ridged Waveguide Horn Antenna	ETS LINDGREN	3115	2017/03	2020/03
1055	Double Ridged Waveguide Horn Antenna	ETS LINDGREN	3116C	2016/12	2019/12
1065	Biconilog Antenna	ETS LINDGREN	3142E	2017/03	2020/03
0981	Preamplifier	BONN ELEKTRONIK	BLMA 0118-2A	2018/10	2020/10
1017	EMC measurement software	ROHDE & SCHWARZ	EMC32 V9.01	---	---

Appendix A: Test results

Appendix A Content

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PRODUCT INFORMATION

The following information is provided by the client

Information	**Description**
Modulation	Other than FHSS
Adaptive	Non-Adaptive Equipment
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
- Operating Frequency Range	2402 – 2480 MHz
- Nominal Channel Bandwidth	1 MHz & 2MHz
- RF Output Power	2 dBm
Antenna type	Integral antenna
Antenna gain	+1.5 dBi
Nominal Voltage	3 – 5 V
- Type of power source	Battery Powered
Equipment type	Bluetooth Low Energy
Geo-location capability	No

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01 (1Mbps)	Power supply (V): Battery Powered Test Frequencies for Conducted tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz Test Frequencies for Radiated tests: Lowest range: 2402 MHz Middle channel: 2440 MHz Highest range: 2480 MHz
TC#02 (2Mbps)	Power supply (V): Battery Powered Test Frequencies for Conducted tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz Test Frequencies for Radiated tests: Lowest range: 2402 MHz Middle channel: 2440 MHz Highest range: 2480 MHz

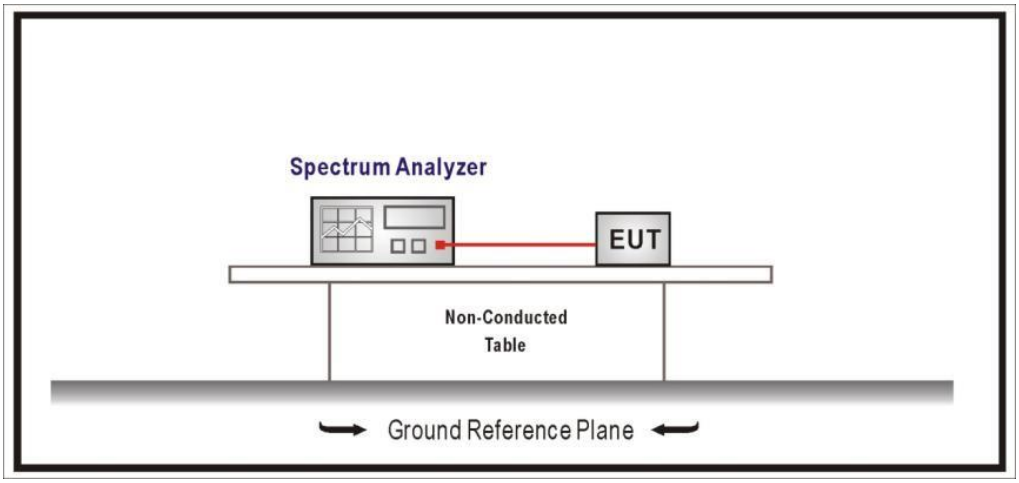
TEST A.1: 99% EMISSION BANDWIDTH

LIMITS:	Product standard:	RSS-Gen
	Test standard:	RSS-Gen 6.7

LIMITS

The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs

TEST SETUP	

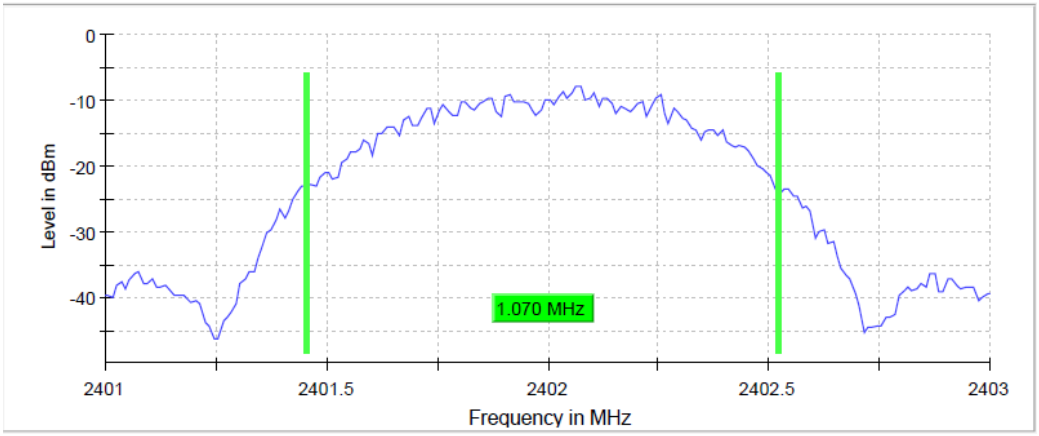


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

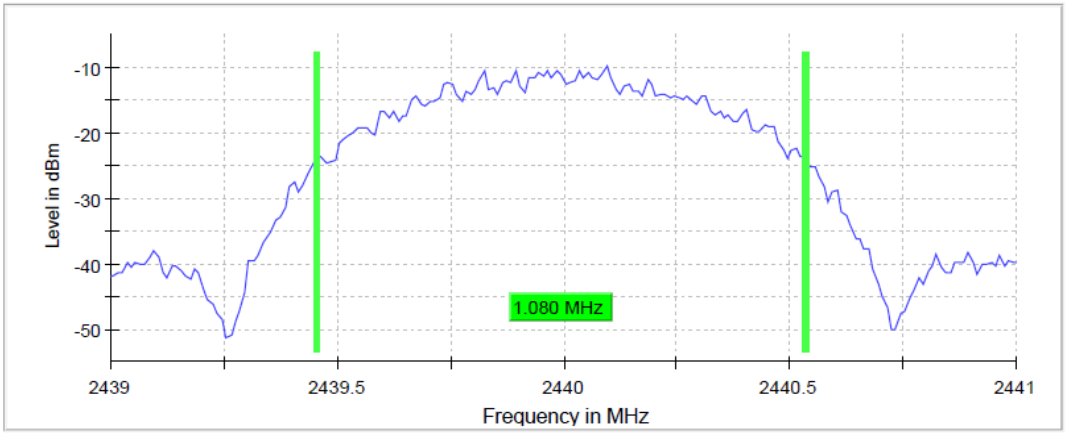
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	1.07	1.08	1.07
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	

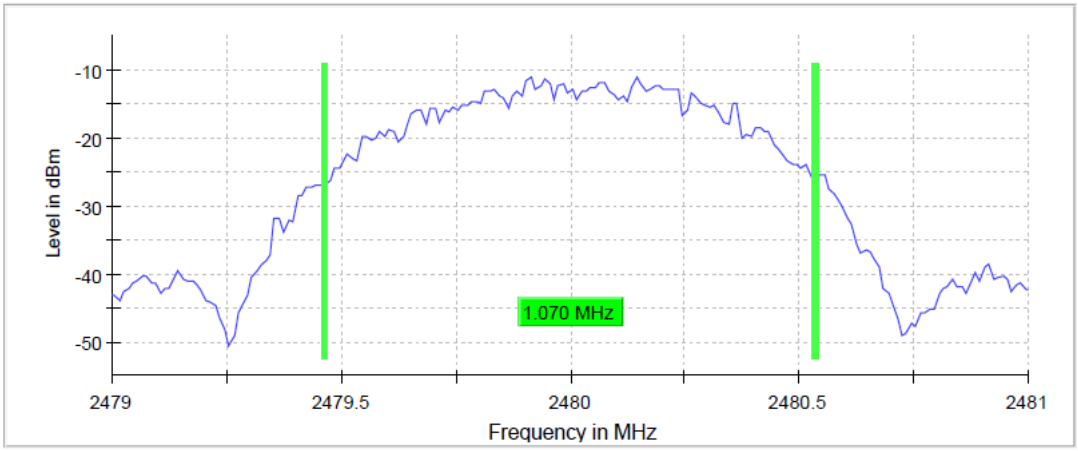
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

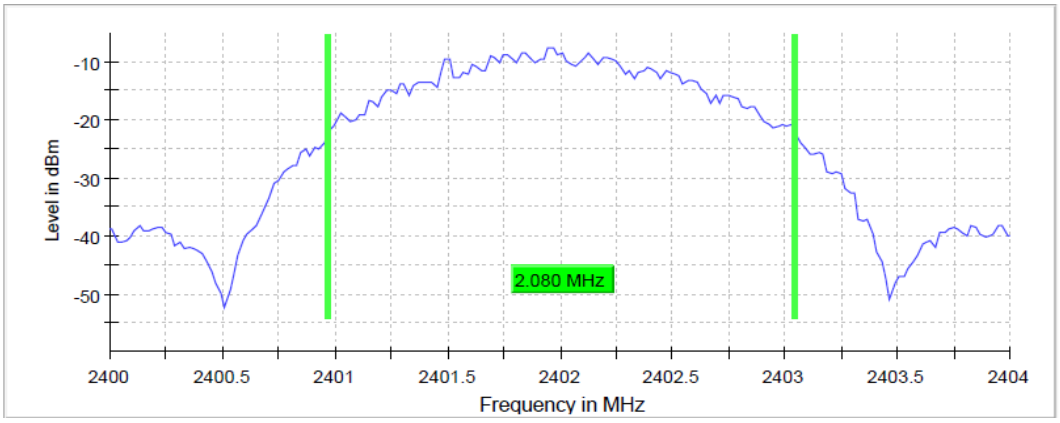
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	200	200	200
Sweeptime	189.620 µs	189.620 µs	189.620 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.30 dB	0.30 dB	0.30 dB
Run	10 / max. 150	8 / max. 150	8 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.21 dB	0.21 dB	0.27 dB

TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

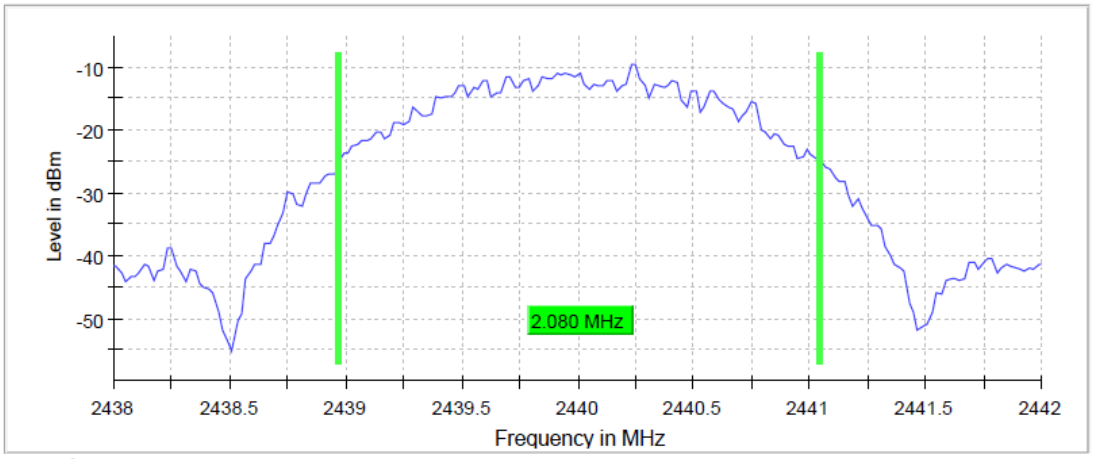
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	2.08	2.08	2.08
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	

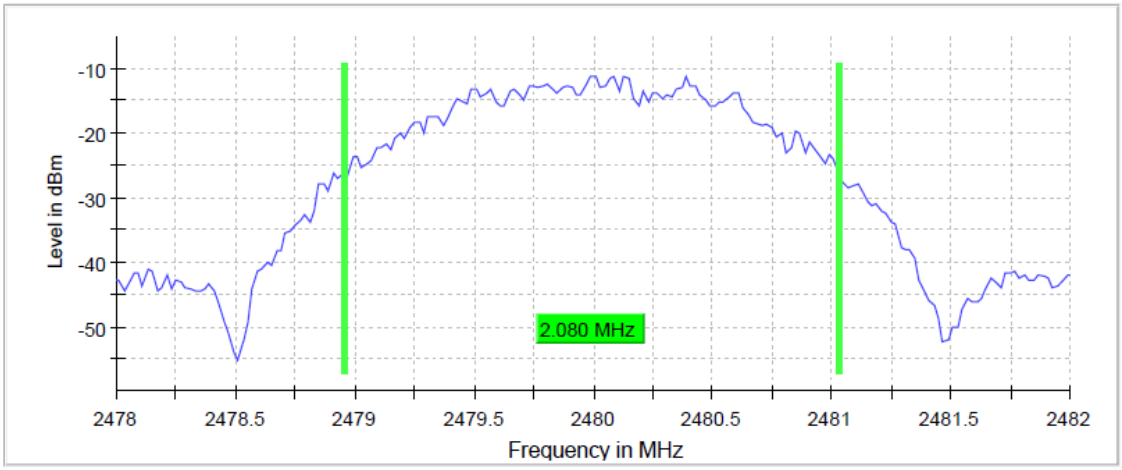
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.43800 GHz	2.47800 GHz
Stop Frequency	2.40400 GHz	2.44200 GHz	2.48200 GHz
Span	4.000 MHz	4.000 MHz	4.000 MHz
RBW	20.000 kHz	20.000 kHz	20.000 kHz
VBW	100.000 kHz	100.000 kHz	100.000 kHz
SweepPoints	200	200	200
Sweeptime	94.810 µs	94.810 µs	94.810 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.30 dB	0.30 dB	0.30 dB
Run	10 / max. 150	7 / max. 150	7 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.07 dB	0.18 dB	0.13 dB

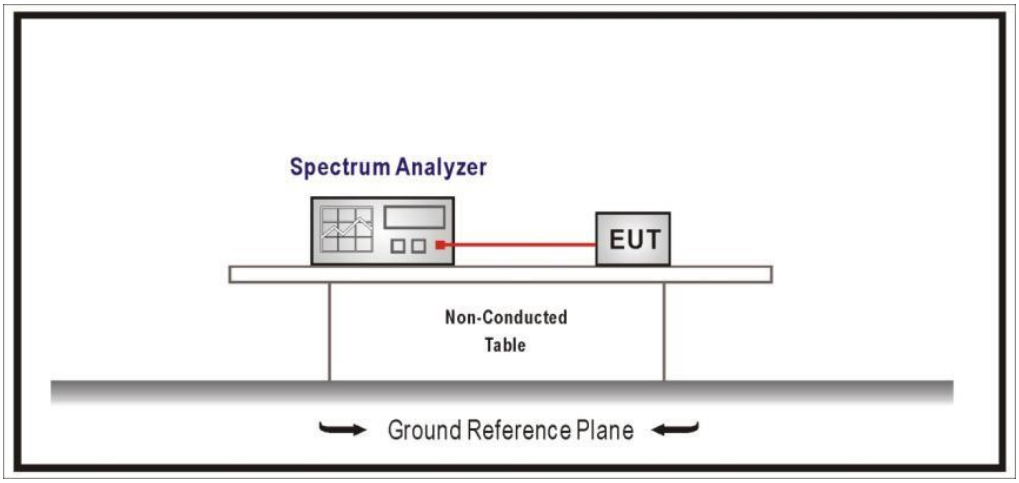
TEST A.2: 6DB BANDWIDTH

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(a)(2) and RSS-247 5.2(a)

LIMITS

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

TEST SETUP	

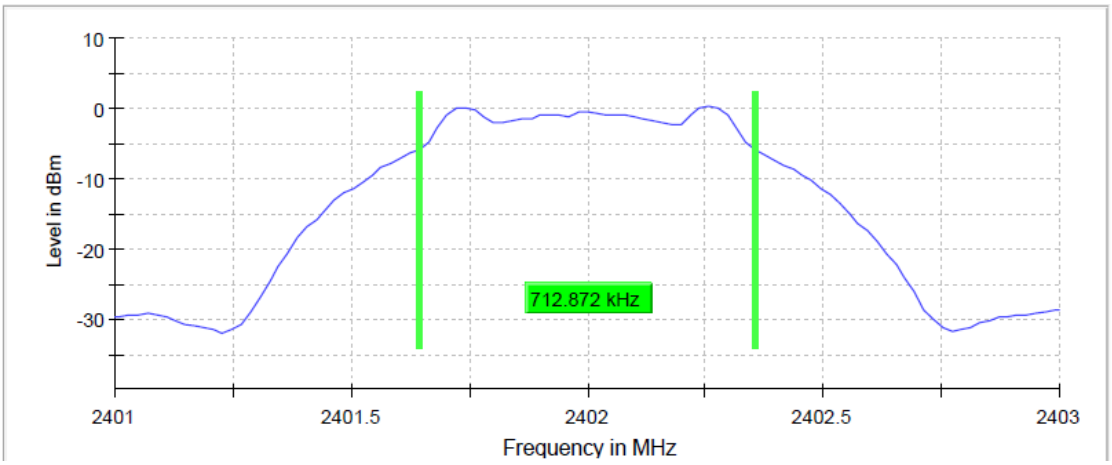


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

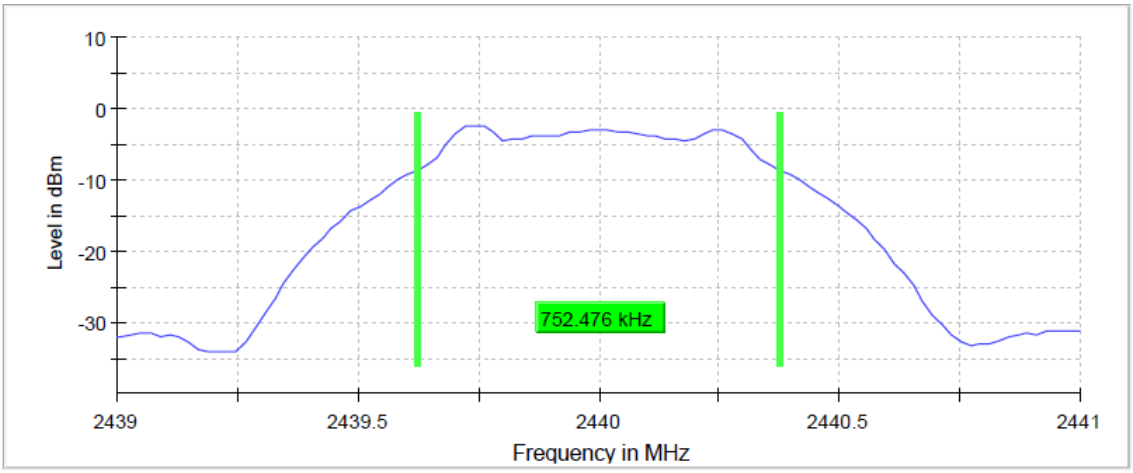
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6 dB Spectrum bandwidth (KHz)	712.872	752.476	772.278
Measurement uncertainty (kHz)	<±20.0		

TEST RESULTS (Cont.):	

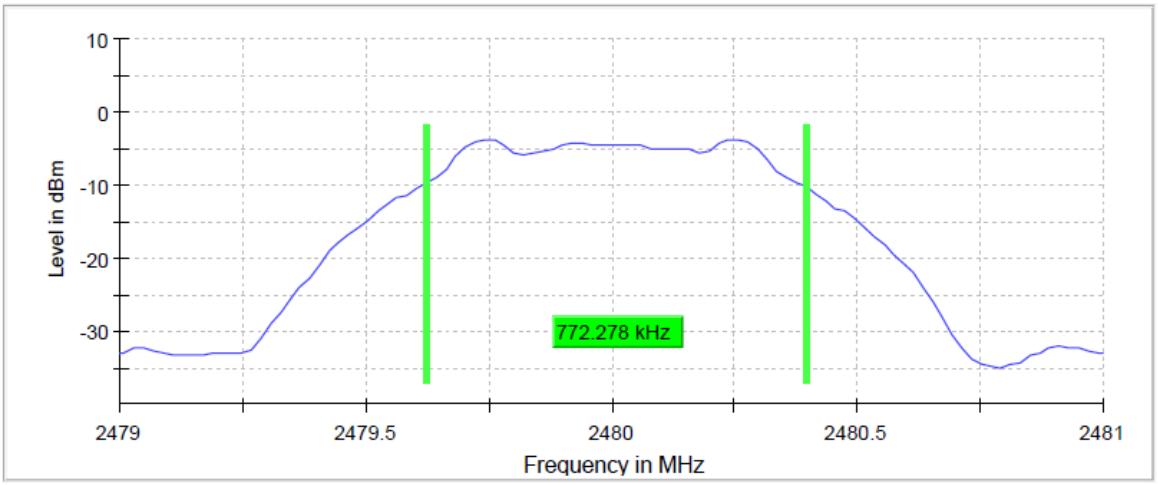
Low Channel:



Mid Channel:



High Channel:



TEST RESULTS (Cont.):	

Measurement

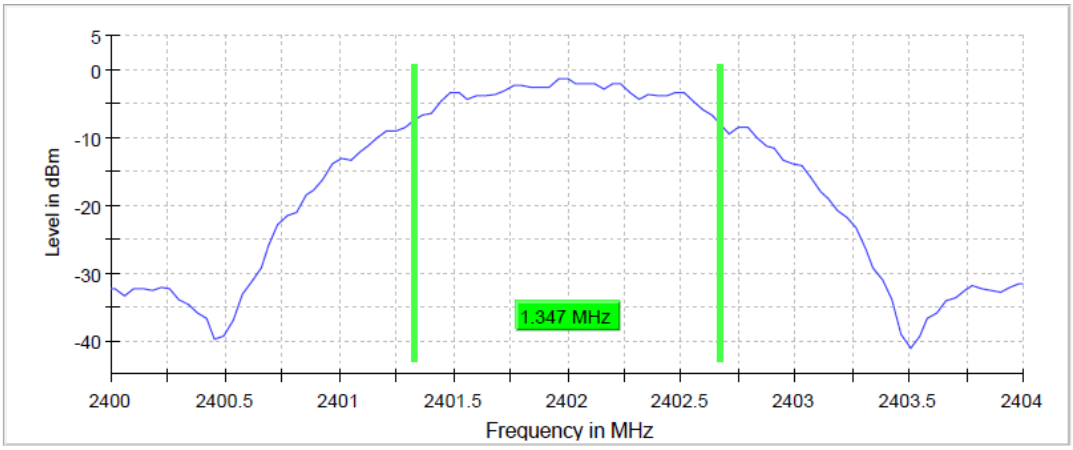
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	101	101	101
Sweeptime	18.938 µs	18.938 µs	18.938 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	9 / max. 150	8 / max. 150	7 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.31 dB	0.42 dB	0.25 dB

TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

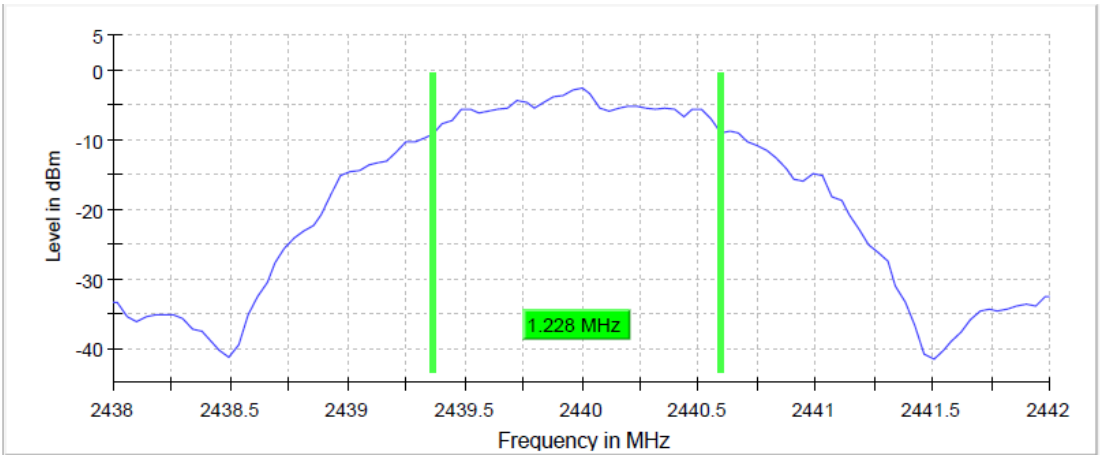
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6dB bandwidth (MHz)	1.347	1.228	1.426
Measurement uncertainty (kHz)	<±20.0		

TEST RESULTS (Cont.):	

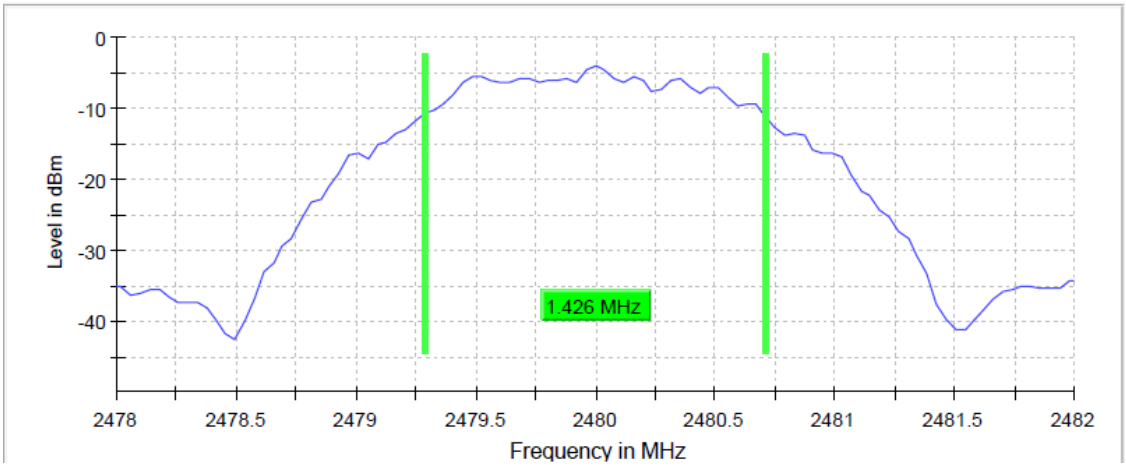
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.43800 GHz	2.47800 GHz
Stop Frequency	2.40400 GHz	2.44200 GHz	2.48200 GHz
Span	4.000 MHz	4.000 MHz	4.000 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	101	101	101
Sweeptime	18.938 µs	18.938 µs	18.938 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	10 / max. 150	12 / max. 150	12 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.05 dB	0.14 dB	0.10 dB

TEST A.3: MAXIMUM PEAK CONDUCTED OUTPUT POWER AND ANTENNA GAIN

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(b)(3) and RSS-247 5.4(d)

LIMITS

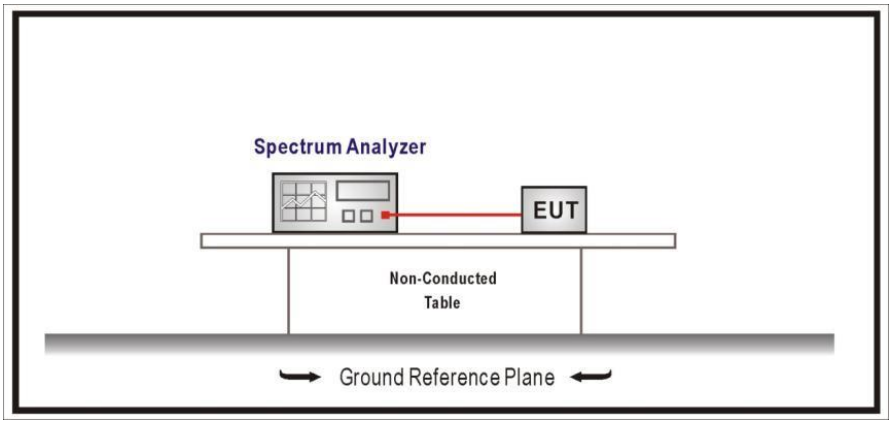
§15.247(b)(3) and RSS-247 5.4(d): For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

RSS-247 5.4(d): The e.i.r.p. shall not exceed 4 W (36 dBm)

TEST SETUP	

The maximum peak conducted output power was measured using the method according to point 9.1.1. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

The EIRP power (dBm) is calculated by adding the declared maximum antenna gain to the measured conducted power



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

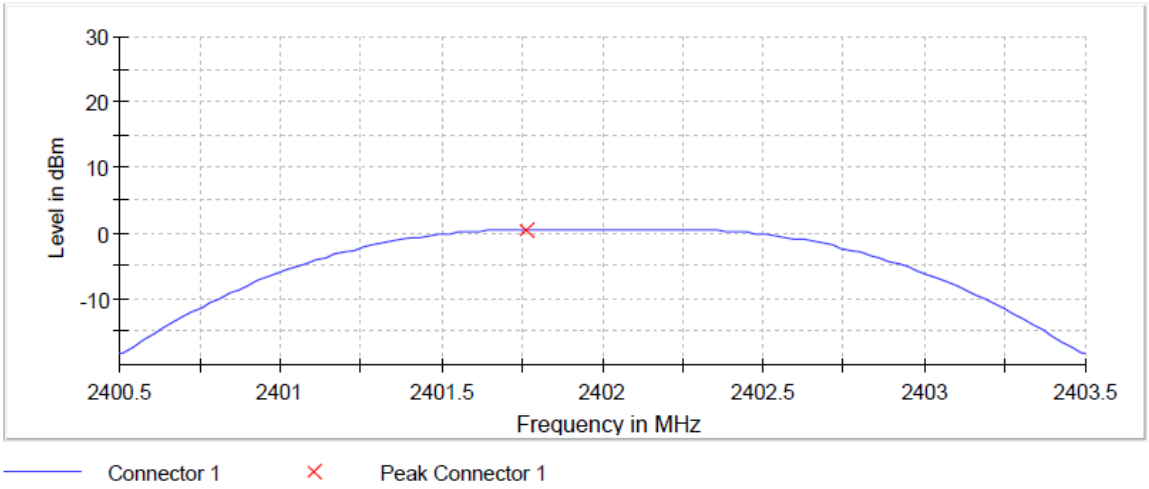
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	+0.5	-1.8	-3.0
Maximum EIRP power (dBm)	2.0	-0.3	-1.5
Measurement uncertainty (dB)	<±0.78		

Maximum declared antenna gain: +1.5 dBi

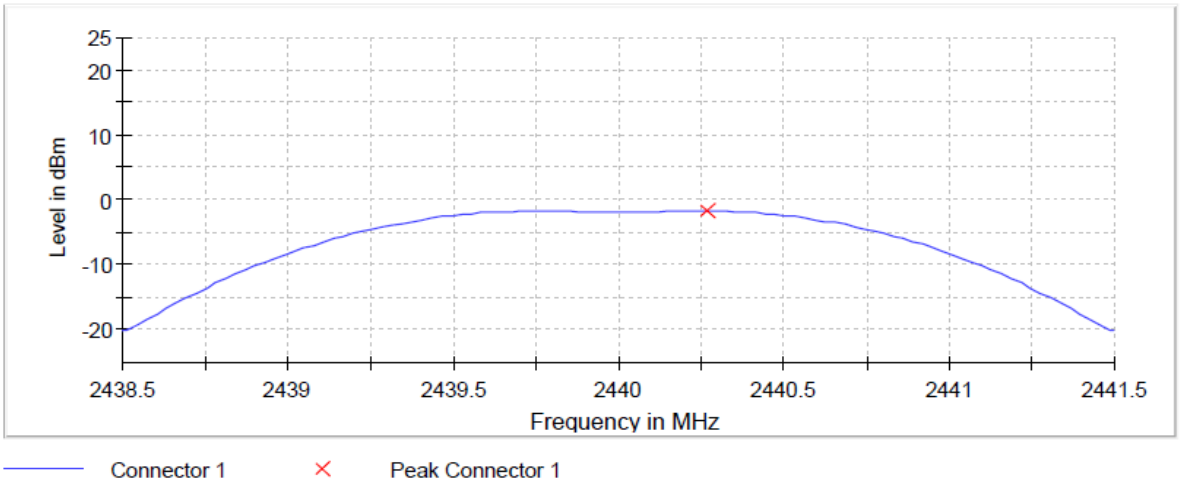
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED PEAK POWER

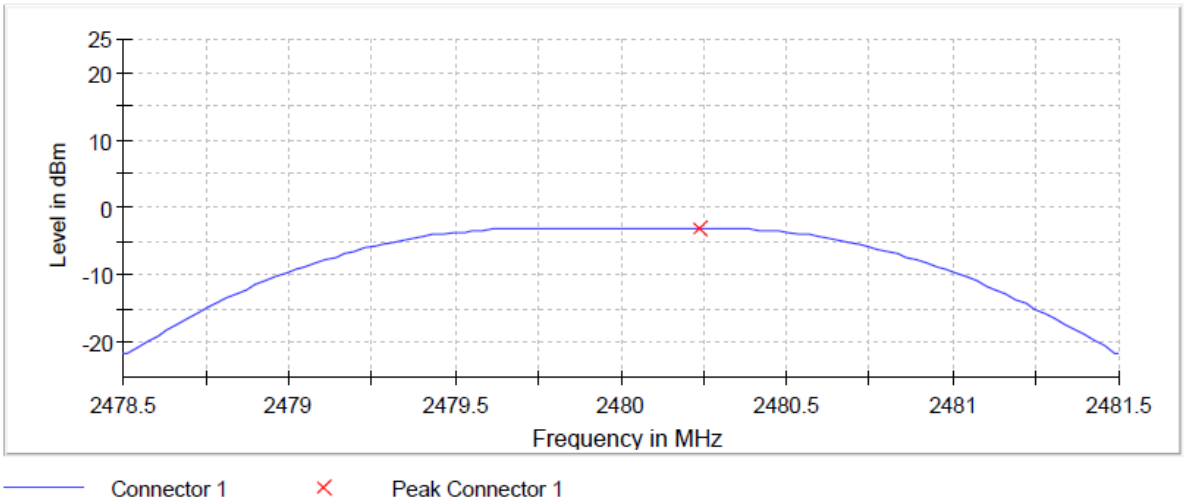
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43850 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44150 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	1.000 MHz	1.000 MHz	1.000 MHz
VBW	3.000 MHz	3.000 MHz	3.000 MHz
SweepPoints	101	101	101
Sweeptime	1.907 µs	1.907 µs	1.907 µs
Reference Level	20.000 dBm	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.03 dB	0.03 dB	0.09 dB

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

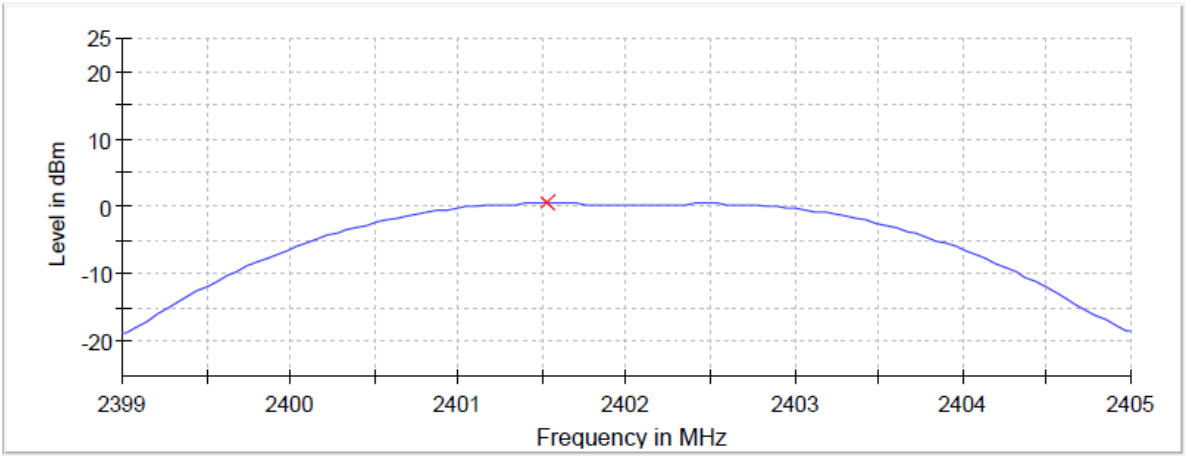
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	0.5	-1.8	-3.0
Maximum EIRP power (dBm)	2.0	-0.3	-1.5
Measurement uncertainty (dB)	<±0.78		

Maximum declared antenna gain: +1.5 dBi

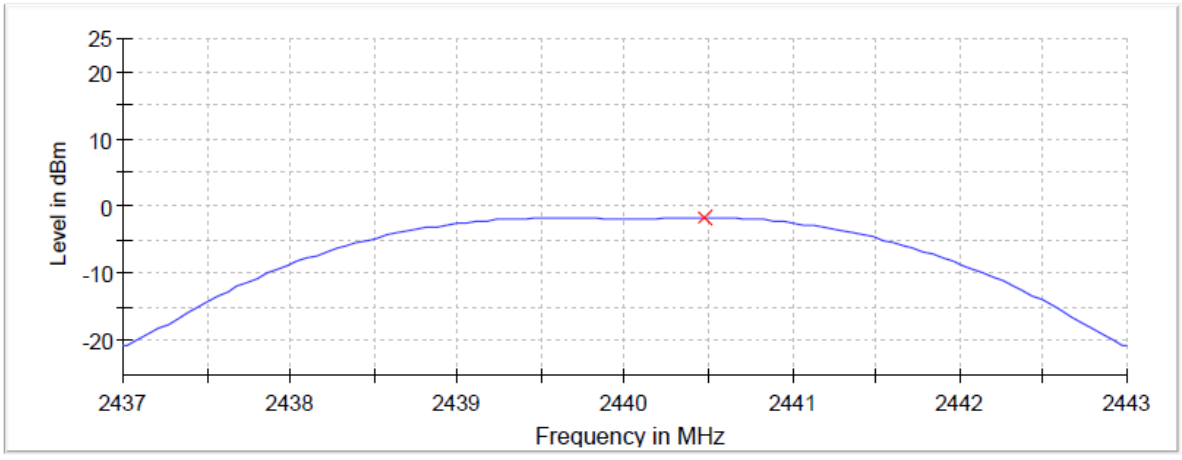
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED PEAK POWER

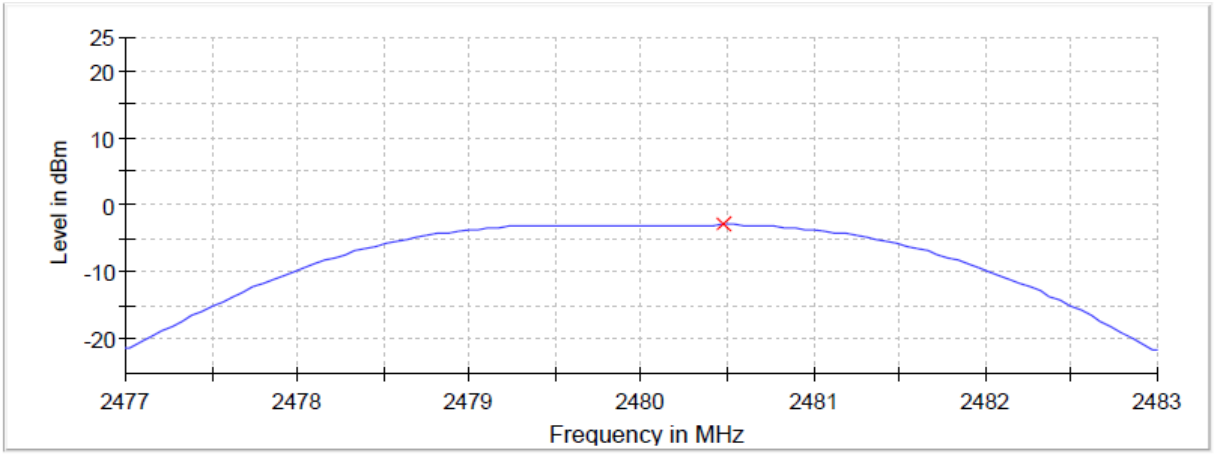
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39900 GHz	2.43700 GHz	2.47700 GHz
Stop Frequency	2.40500 GHz	2.44300 GHz	2.48300 GHz
Span	6.000 MHz	6.000 MHz	6.000 MHz
RBW	2.000 MHz	2.000 MHz	2.000 MHz
VBW	10.000 MHz	10.000 MHz	10.000 MHz
SweepPoints	101	101	101
Sweeptime	953.450 µs	953.450 µs	953.450 µs
Reference Level	20.000 dBm	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.02dB	0.04 dB	0.07 dB

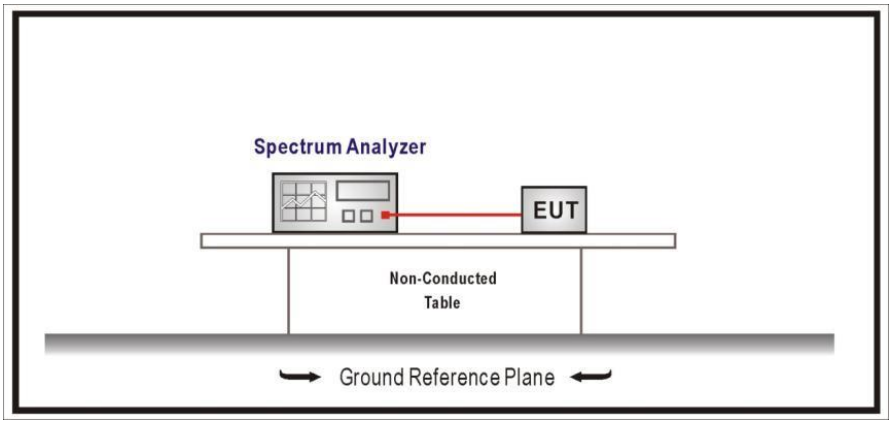
TEST A.4: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(d) and RSS-247 5.5

LIMITS

In any 100 kHz bandwidth outside the frequency band in which the 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. 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 instead of 20 dB.

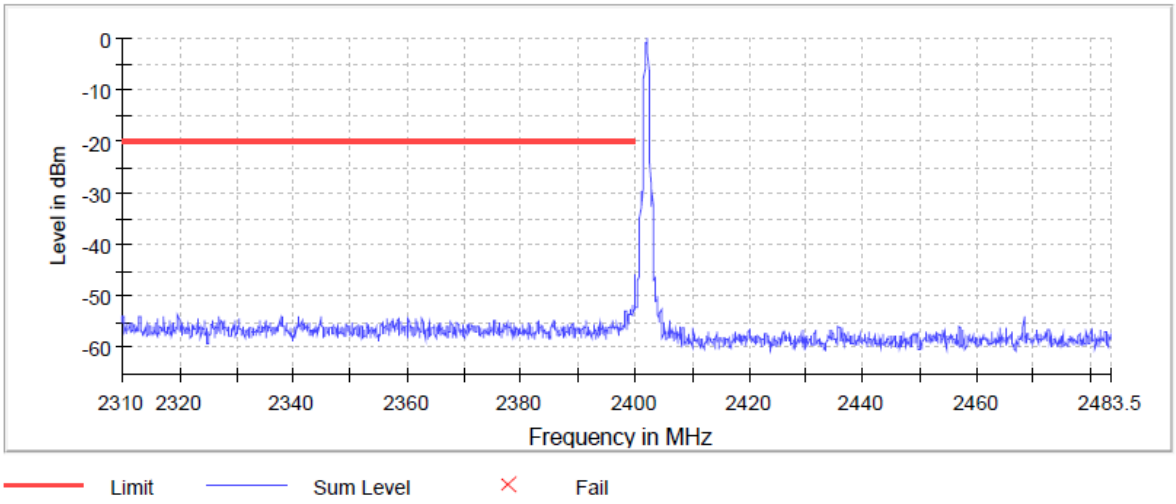
TEST SETUP	

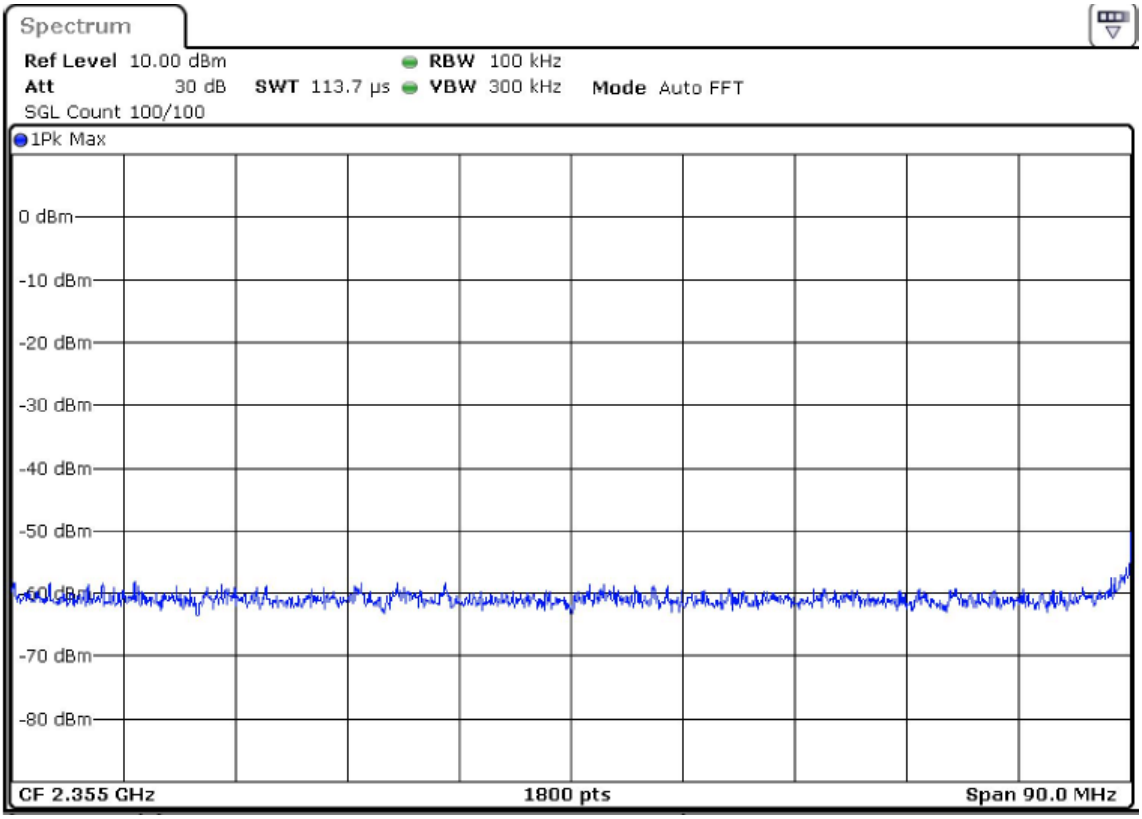


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

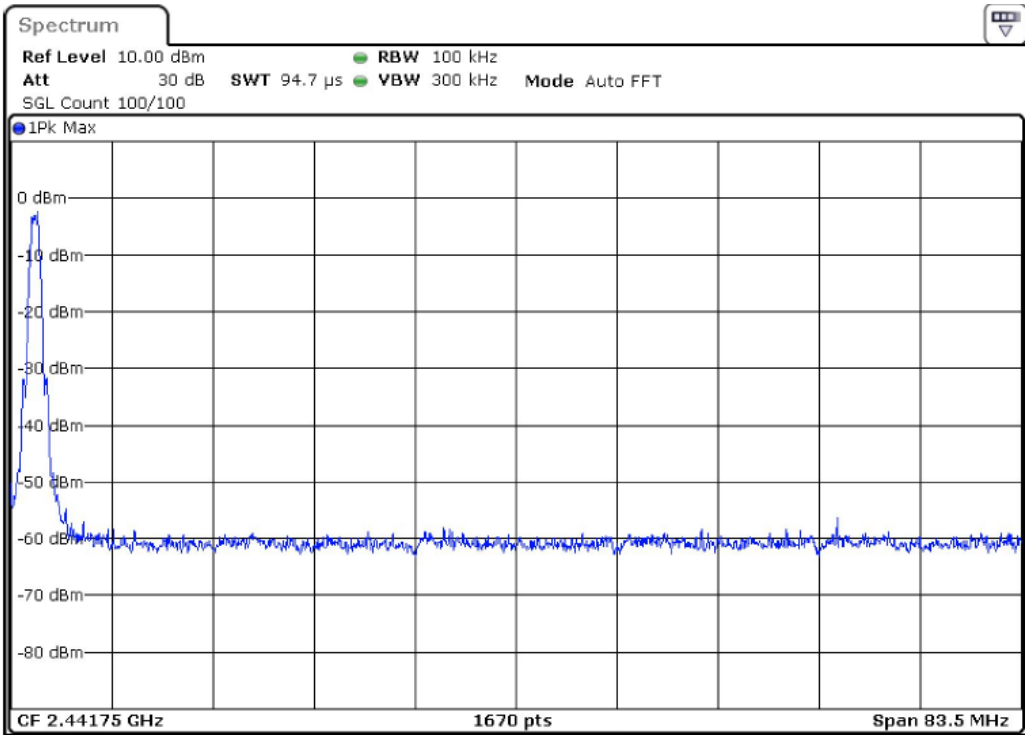
Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

TEST RESULTS (Cont.):	Lowest Channel





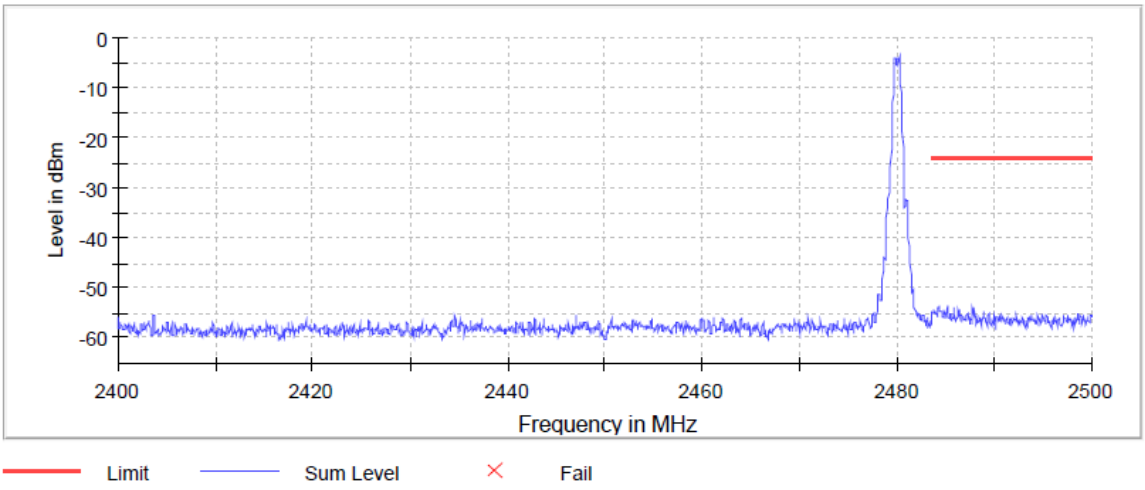
TEST RESULTS (Cont.):	Lowest Channel

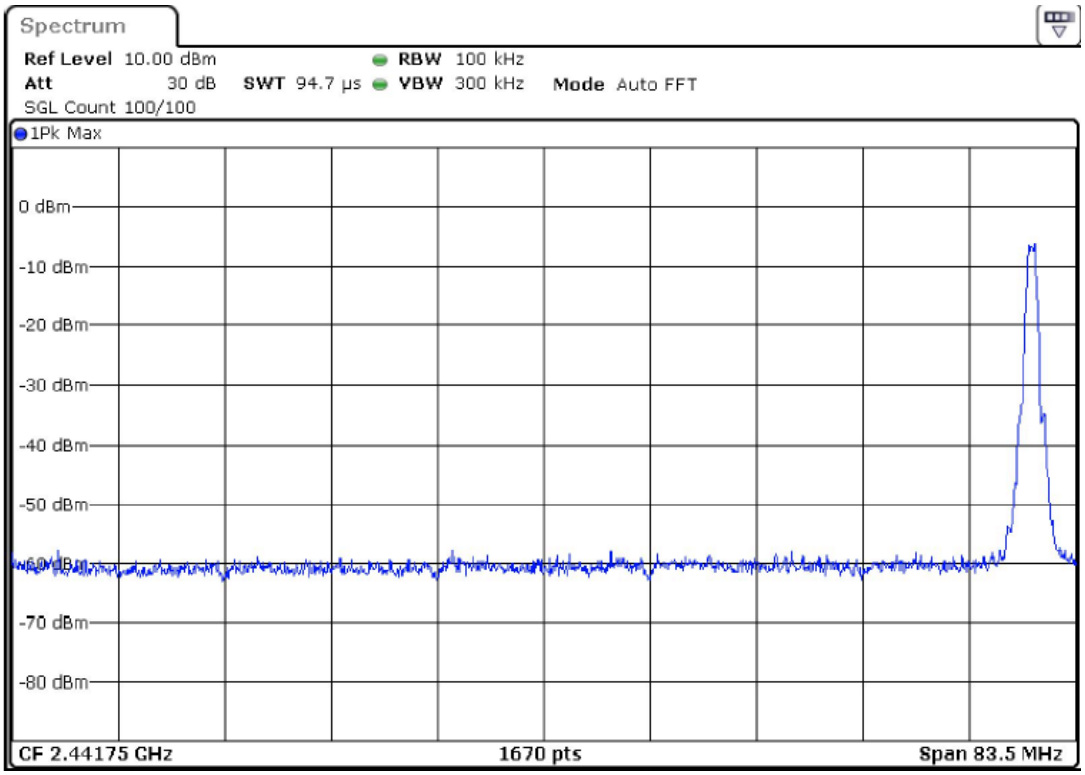


Measurement

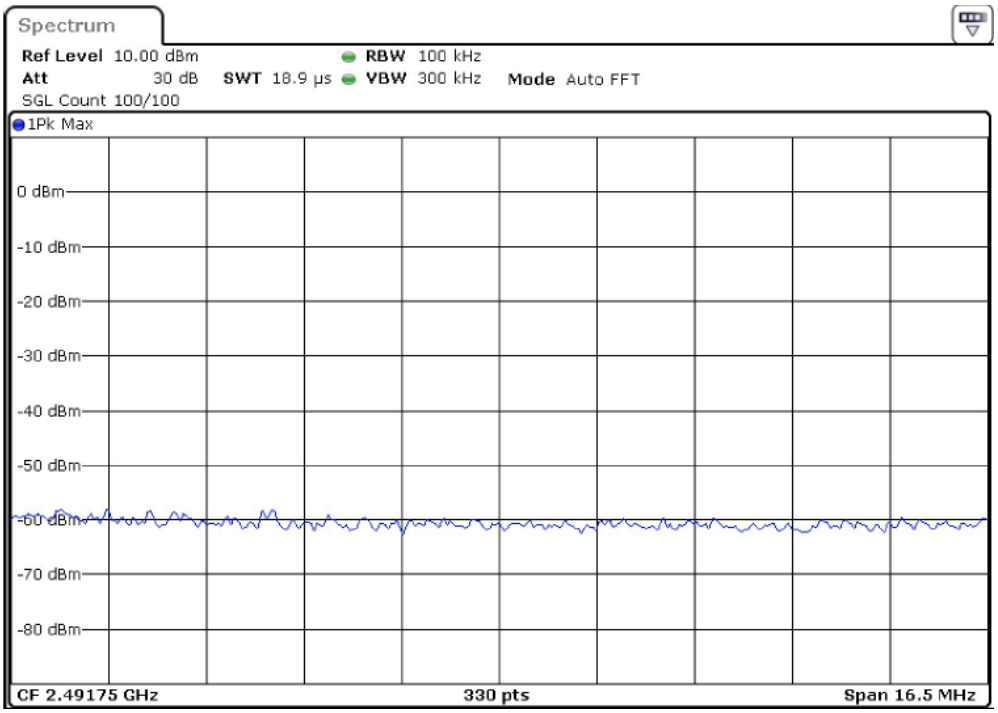
Setting	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.18 dB

TEST RESULTS (Cont.):	Highest Channel





TEST RESULTS (Cont.):	Highest Channel



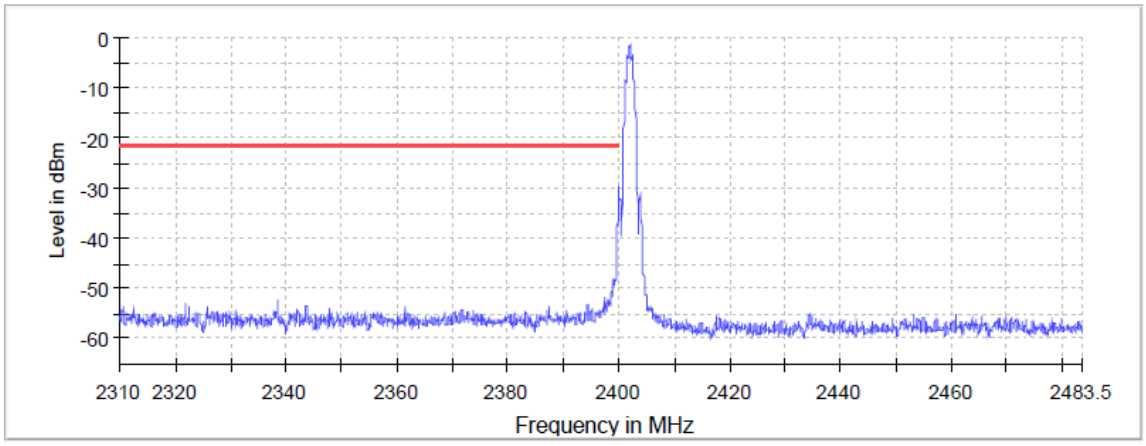
Measurement

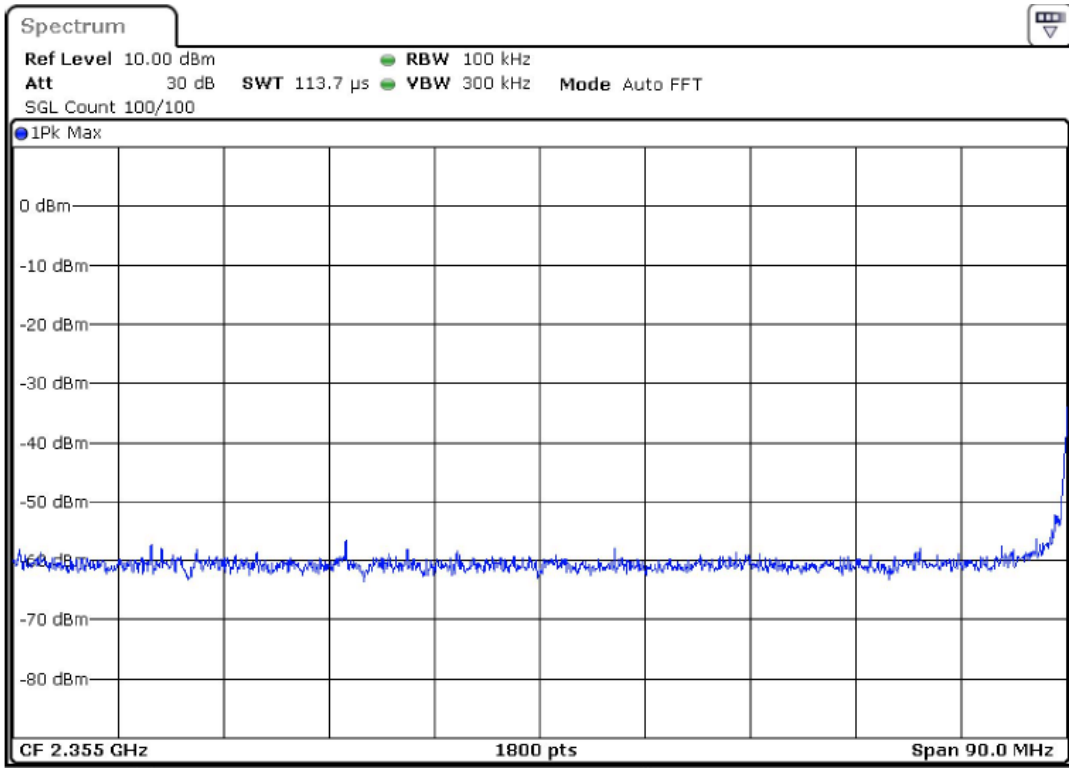
Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	8 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.03 dB	0.00 dB

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

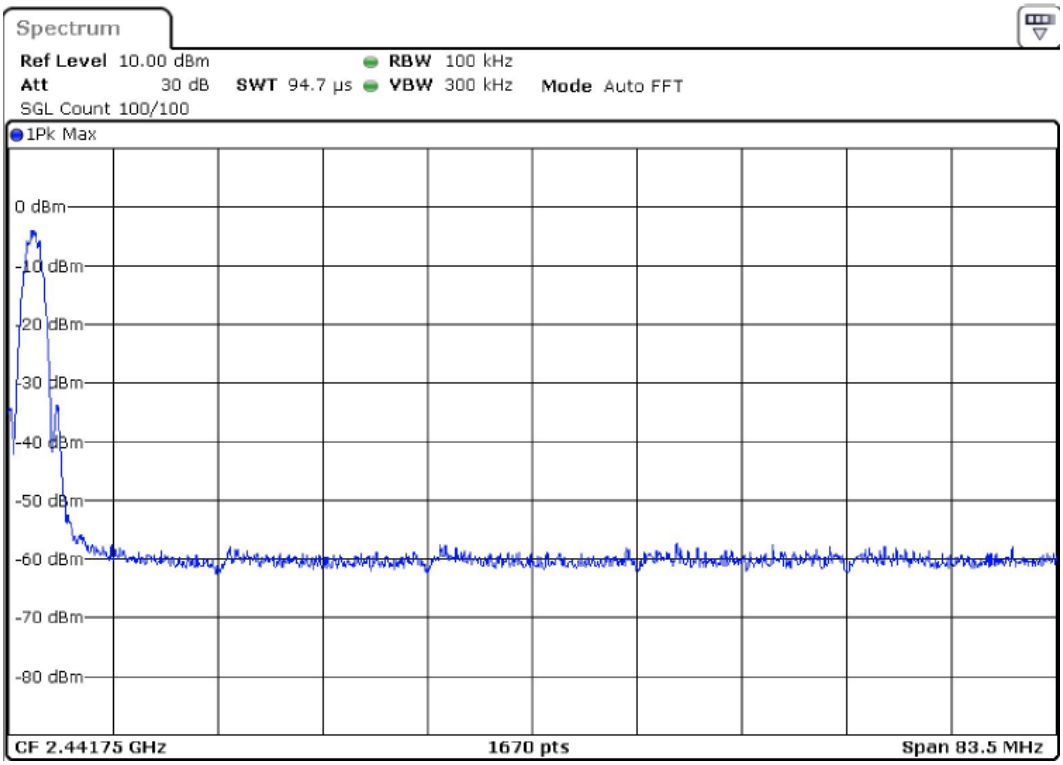
Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

TEST RESULTS:	**Lowest Channel**





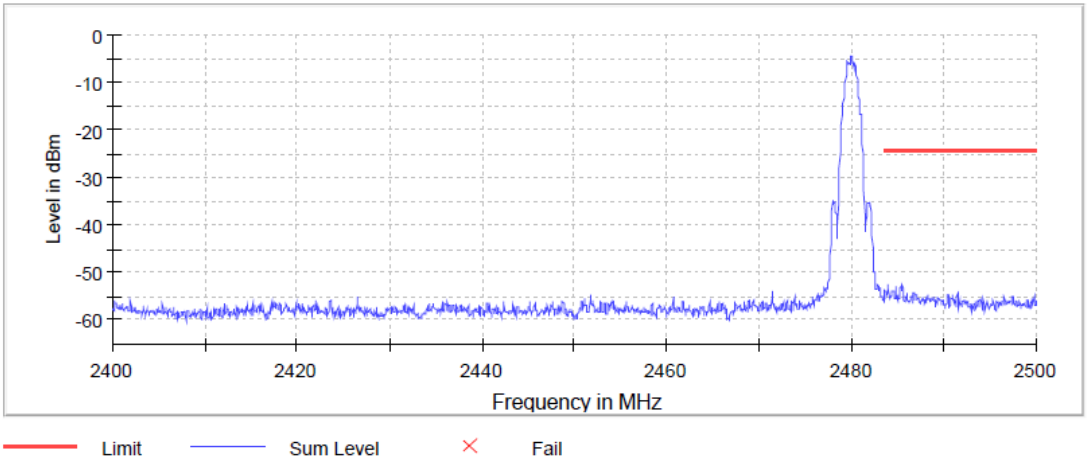
TEST RESULTS (Cont.):	Lowest Channel

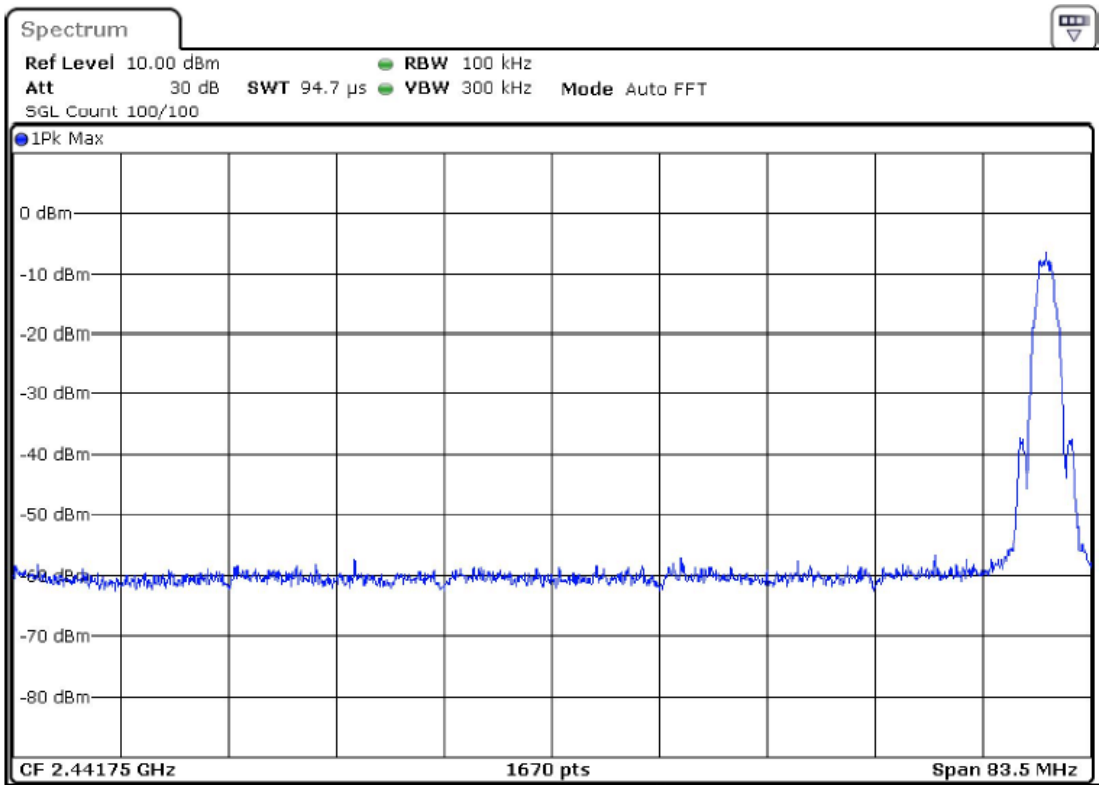


Measurement

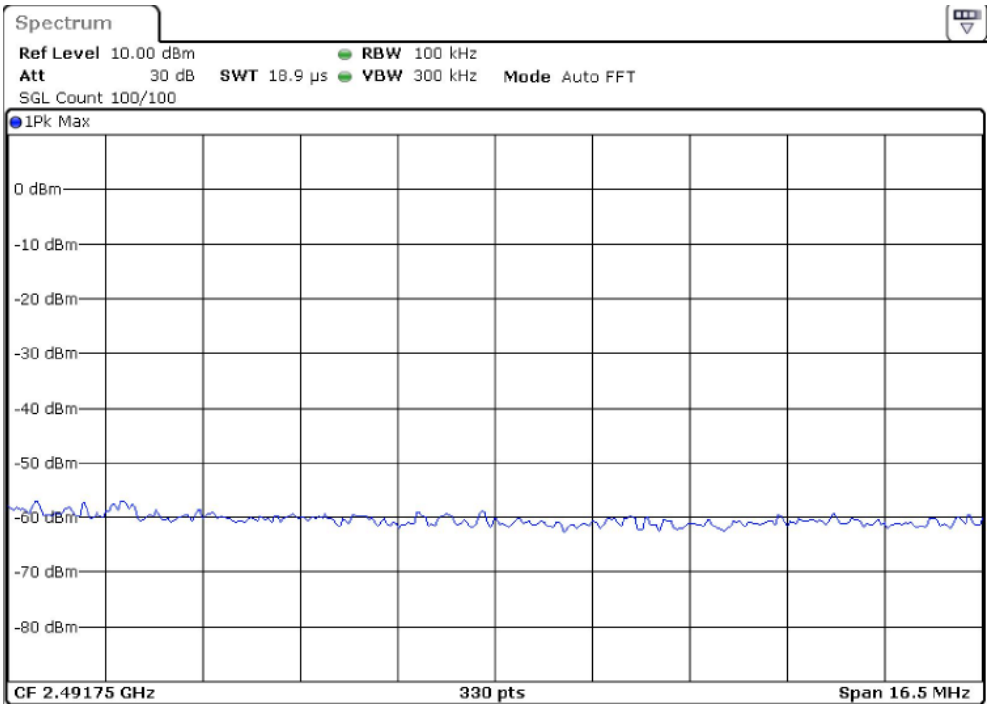
Setting	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	5 / max. 150	12 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.28 dB

TEST RESULTS (Cont.):	Highest Channel





TEST RESULTS (Cont.):	Highest Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	11 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.41 dB	0.00 dB

TEST A.5: POWER SPECTRAL DENSITY

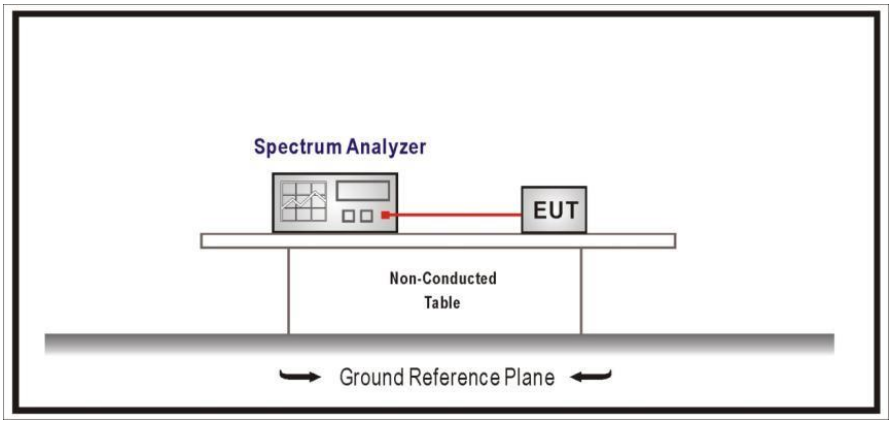
LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(e) and RSS-247 5.2 (b)

LIMITS

For digitally modulated systems, 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.

TEST SETUP	

The maximum power spectral density level in the fundamental emission was measured using the method PKPSD (Peak PSD) according to point 10.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017.

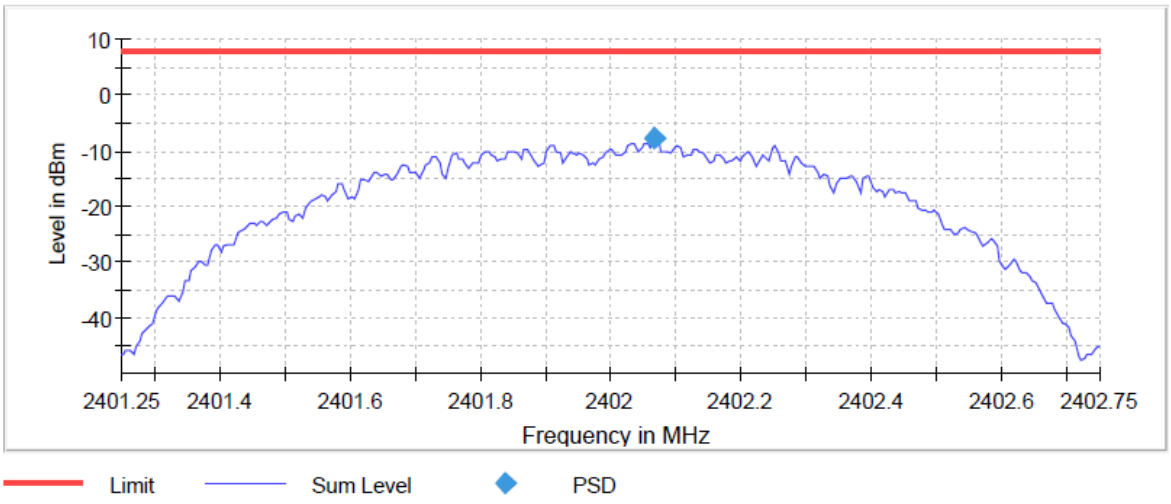


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

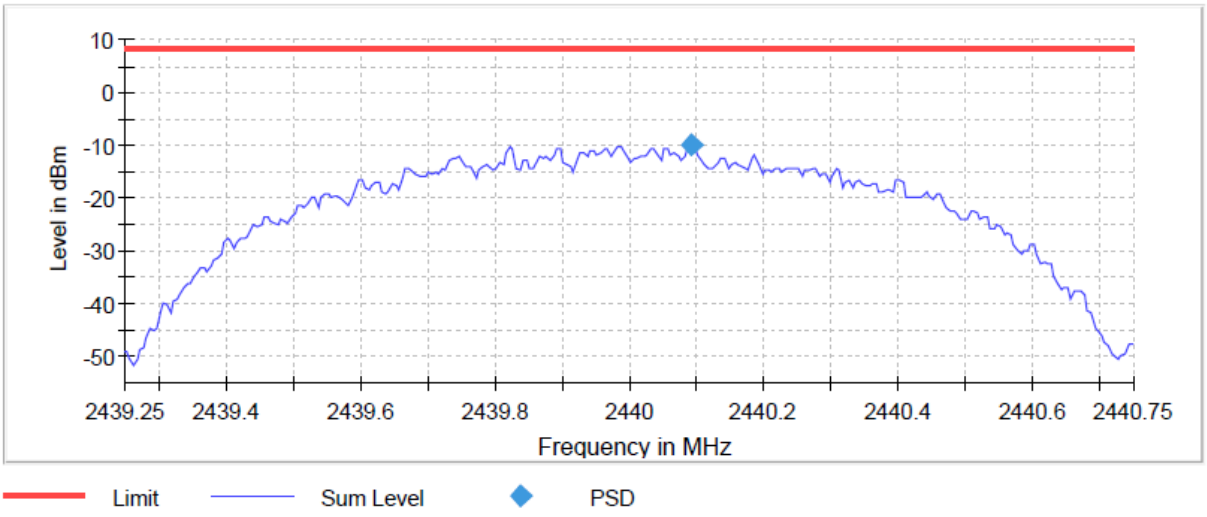
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	-7.818	-9.894	-10.848
Measurement uncertainty (dB)	<±0.78		

TEST RESULTS (Cont.):	

Low Channel:

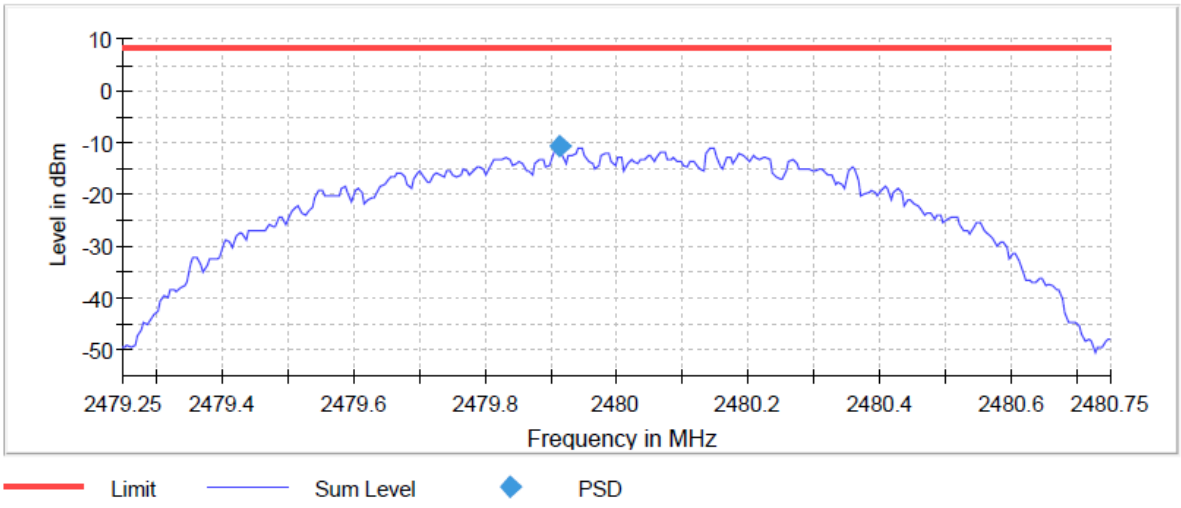


Mid Channel:



TEST RESULTS (Cont.):	

High Channel:



Measurement

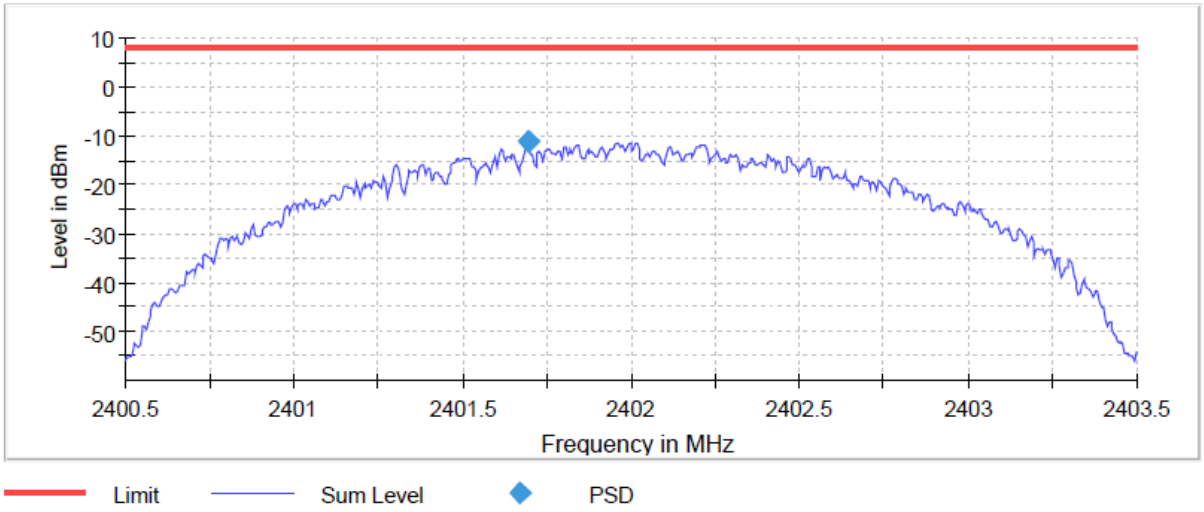
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40125 GHz	2.43925 GHz	2.47925 GHz
Stop Frequency	2.40275 GHz	2.44075 GHz	2.48075 GHz
Span	1.500 MHz	1.500 MHz	1.500 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	300	300	300
Sweeptime	1.500 ms	1.500 ms	1.500 ms
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 150	7 / max. 150	6 / max. 150
Stable	2 / 2	2 / 2	2 / 2
Max Stable Difference	0.20 dB	0.16 dB	0.29 dB

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

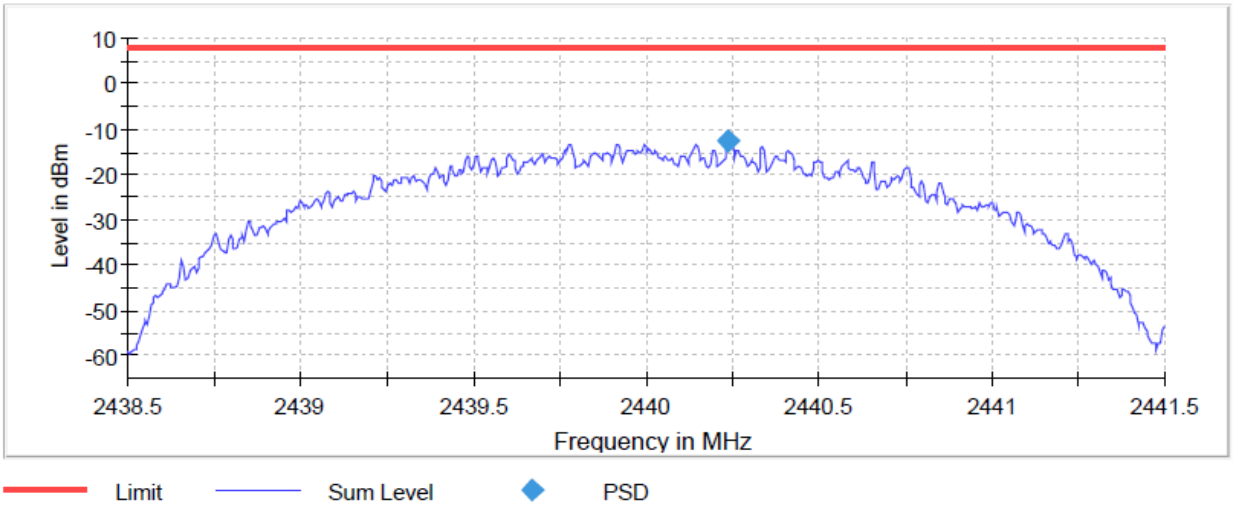
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	-11.207	-12.632	-13.222
Measurement uncertainty (dB)	<±0.78		

TEST RESULTS (Cont.):	

Low Channel:

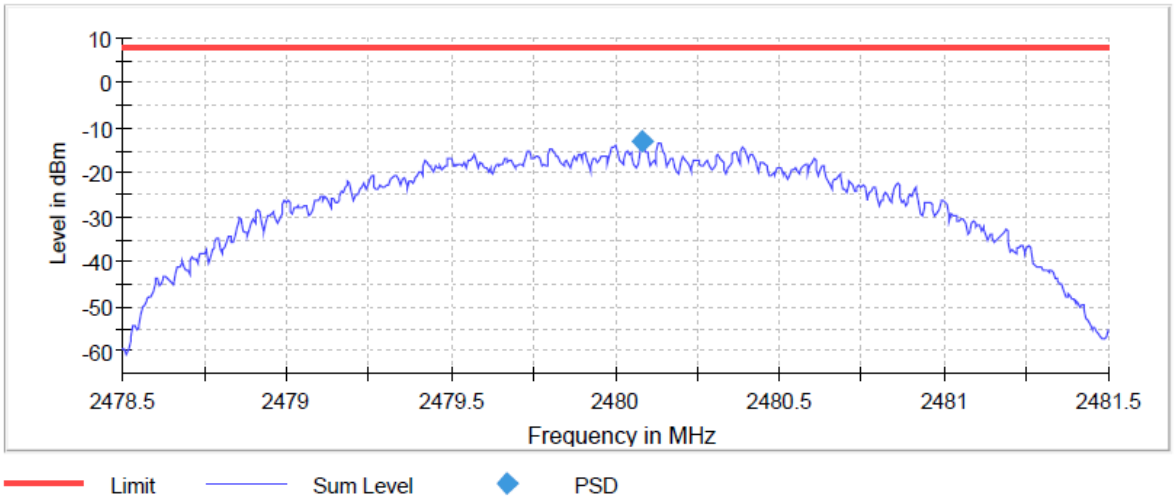


Mid Channel:



TEST RESULTS (Cont.):	

High Channel:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43850 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44150 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	600	600	600
Sweeptime	3.000 ms	3.000 ms	3.000 ms
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max. 150	4 / max. 150	5 / max. 150
Stable	2 / 2	2 / 2	2 / 2
Max Stable Difference	0.19 dB	0.22 dB	0.23 dB

TEST A.6: EMISSION LIMITATIONS RADIATED (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(d) and RSS-Gen 8.9 and 8.10

LIMITS

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) (see §15.205(c) / RSS-Gen):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RSS-247. Attenuation below the general field strength limits specified in RSS-Gen is not required

TEST SETUP

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30-1000 MHz (Bilog antenna) and at a distance of 1m for the frequency range 1-40 GHz (1 GHz-18 GHz and 18 GHz-40 GHz Double ridge horn antennas).

For radiated emissions in the range 1-40 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

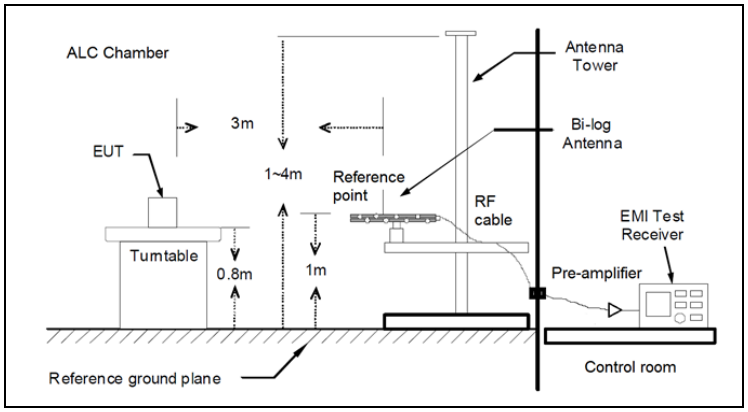
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

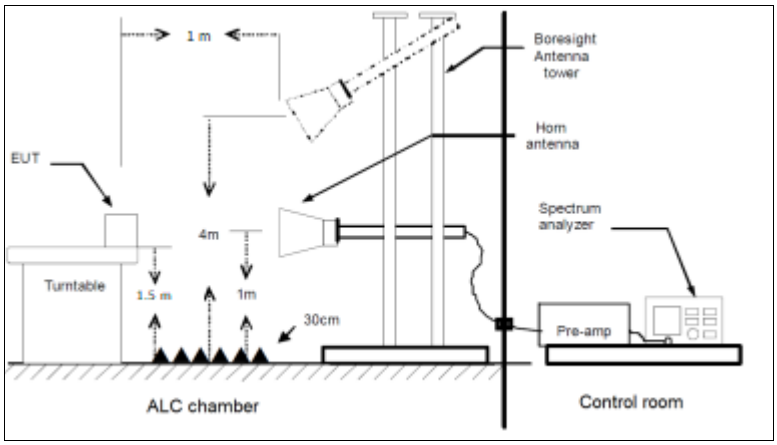
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)	

Radiated measurements Setup f < 1 GHz



Radiated measurements setup f > 1 GHz



TESTED SAMPLES:	S/02
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
The radiated spurious signals detected at less than 20 dB respect to the limit for the operating channel shown below in the plots and table.

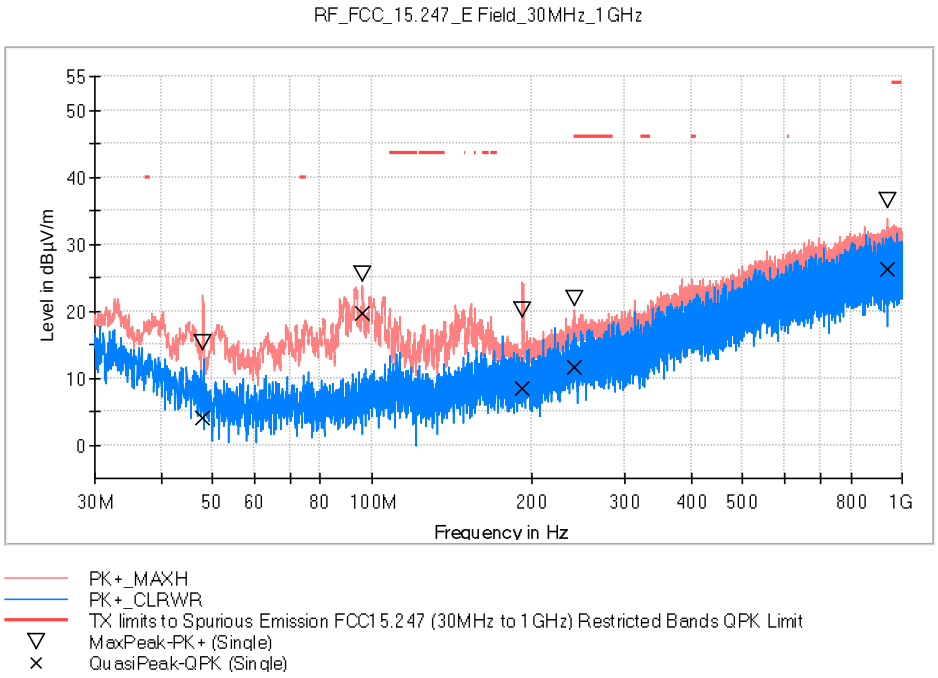
Frequency range 1 GHz – 26 GHz

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

The radiated spurious signals detected at less than 10 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

TEST RESULTS (Cont.):	
FREQUENCY RANGE	**30 MHz – 1000 MHz**

CHANNEL: Lowest (2402 MHz)

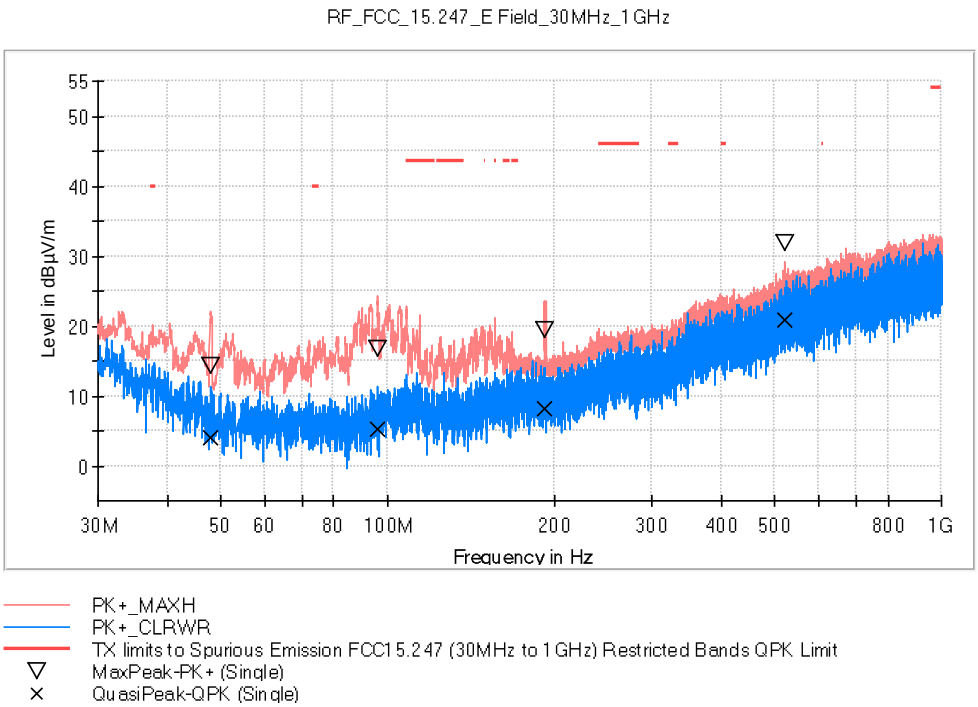


Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
96.105500	25.6	19.5	V
935.204000	36.5	26.3	V
47.945000	15.3	4.1	V
192.087000	20.2	8.4	V
240.926500	21.9	11.6	V

TEST RESULTS (Cont.):	

CHANNEL: Middle (2440 MHz)

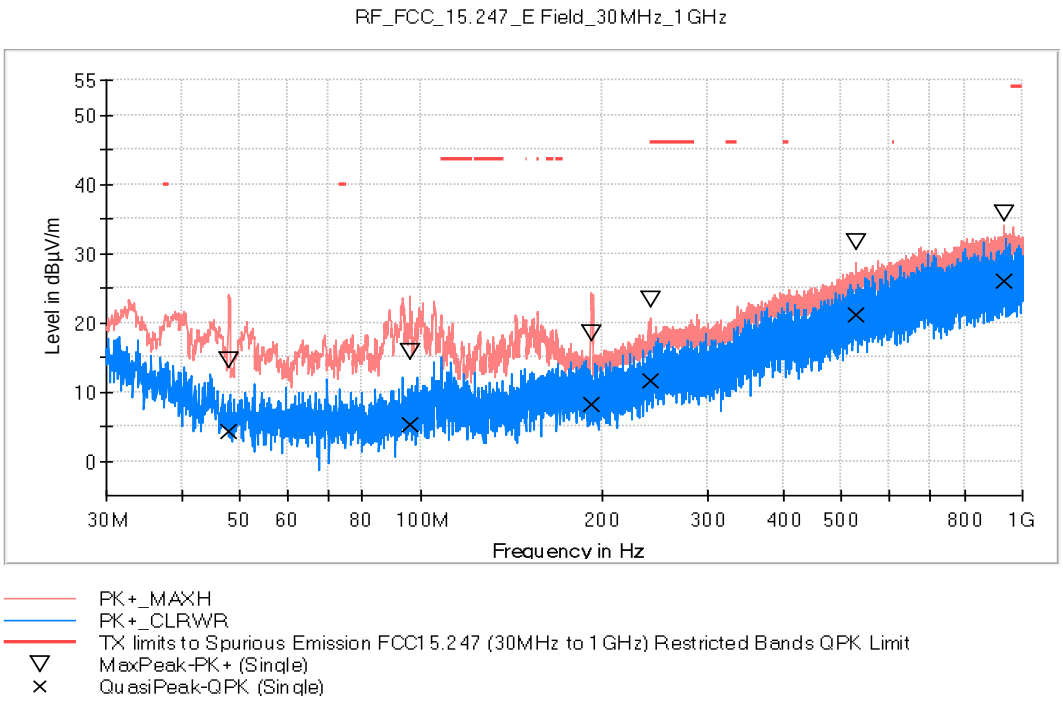


Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
522.663000	32.0	20.8	H
96.057000	16.7	5.3	V
47.993500	14.2	4.1	V
192.620500	19.3	8.3	V

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).



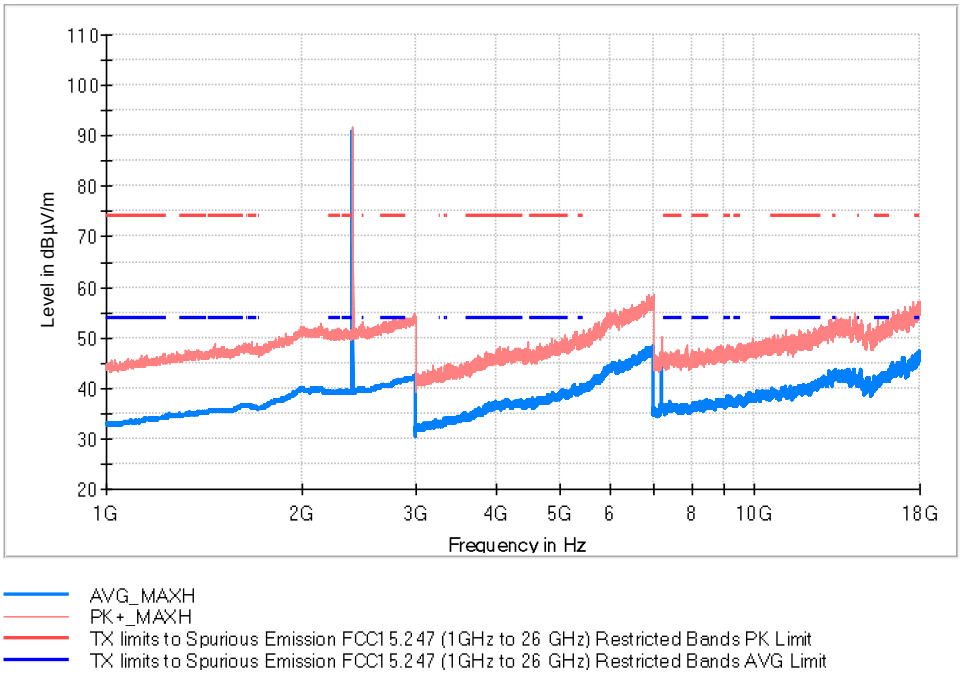
Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
527.707000	31.7	21.1	H
47.993500	14.5	4.2	V
240.684000	23.3	11.6	V
931.324000	35.7	26.0	V
191.941500	18.5	8.2	V
96.008500	15.7	5.3	V

TEST RESULTS (Cont.):	
FREQUENCY RANGE	**1 GHz – 18 GHz**

CHANNEL: Lowest (2402 MHz)

1GHz_18GHz_ HP & VP_CH Low



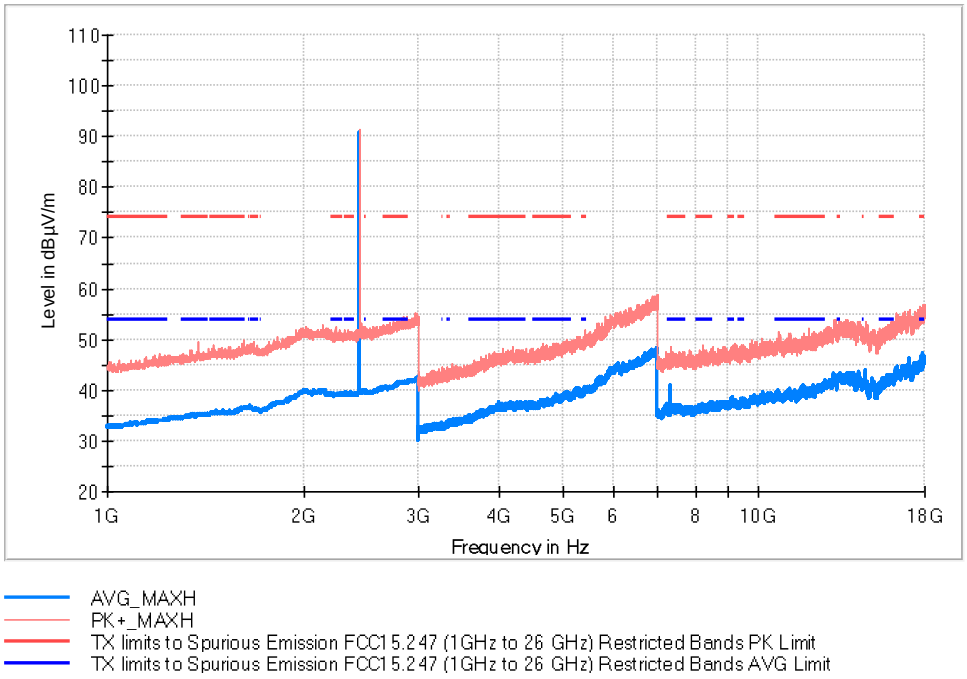
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2402.000000	91.70	90.84	H	Fundamental
7205.500000	49.58	44.21	H	

TEST RESULTS (Cont.):	

CHANNEL: Middle (2440 MHz).

1GHz_18GHz_HP & VP_CH Mid



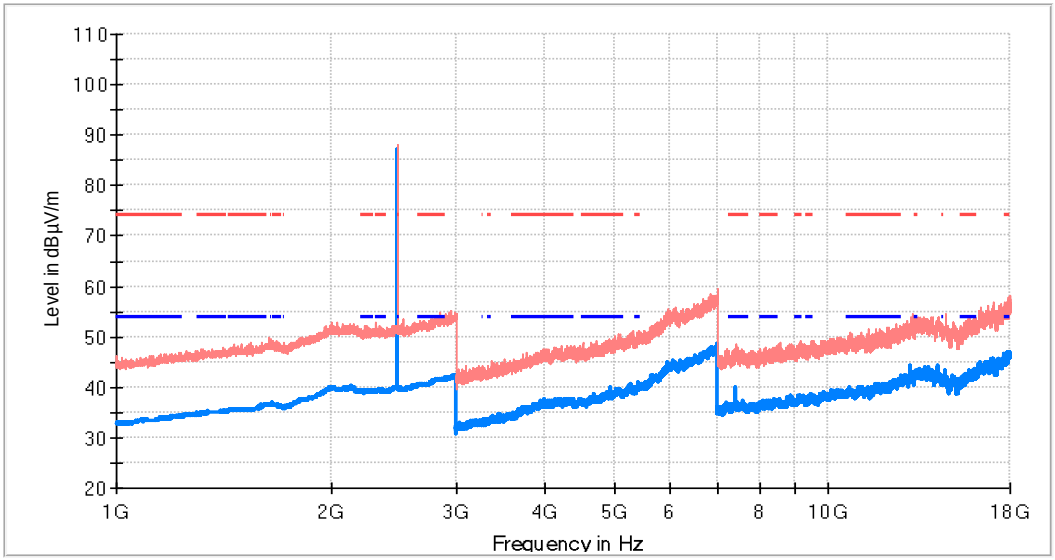
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2440.000000	91.42	90.65	H	Fundamental
7319.500000	48.30	40.79	H	

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).

1GHz_18GHz_HP & VP_CH High



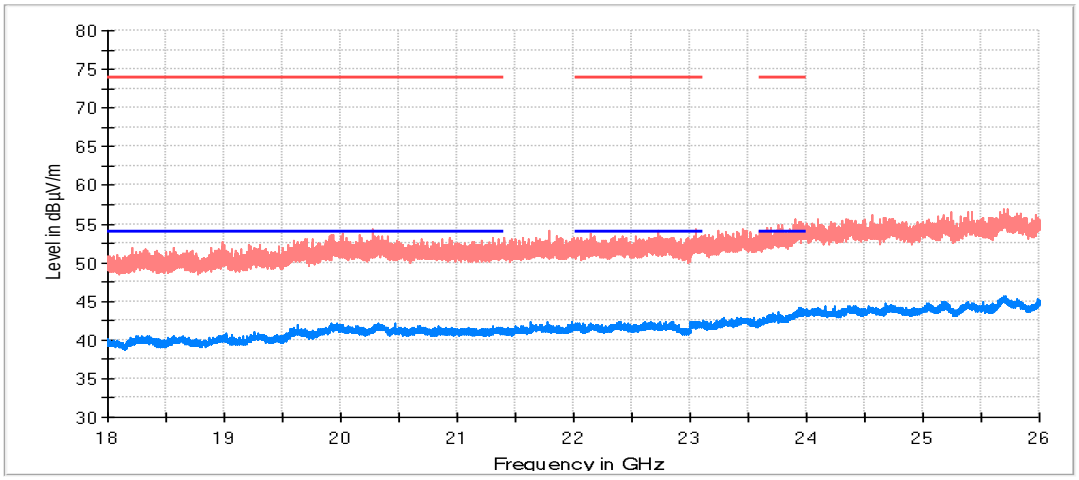
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

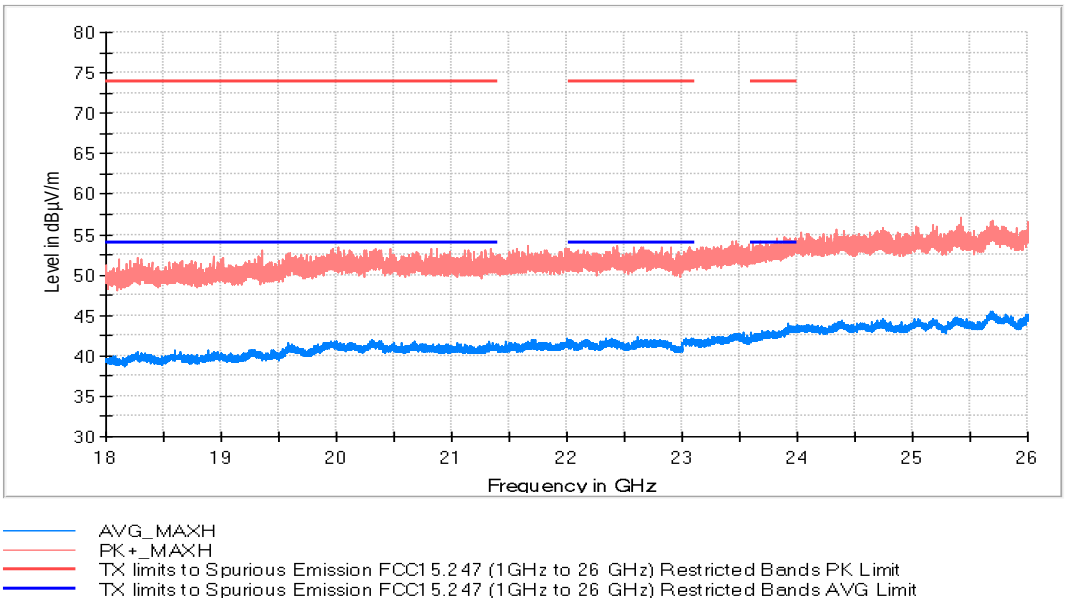
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2480.000000	88.11	87.19	H	Fundamental
7439.500000	48.58	39.91	V	

TEST RESULTS (Cont.):	
FREQUENCY RANGE	**18 GHz – 26 GHz**

CHANNEL: Lowest (2402 MHz)

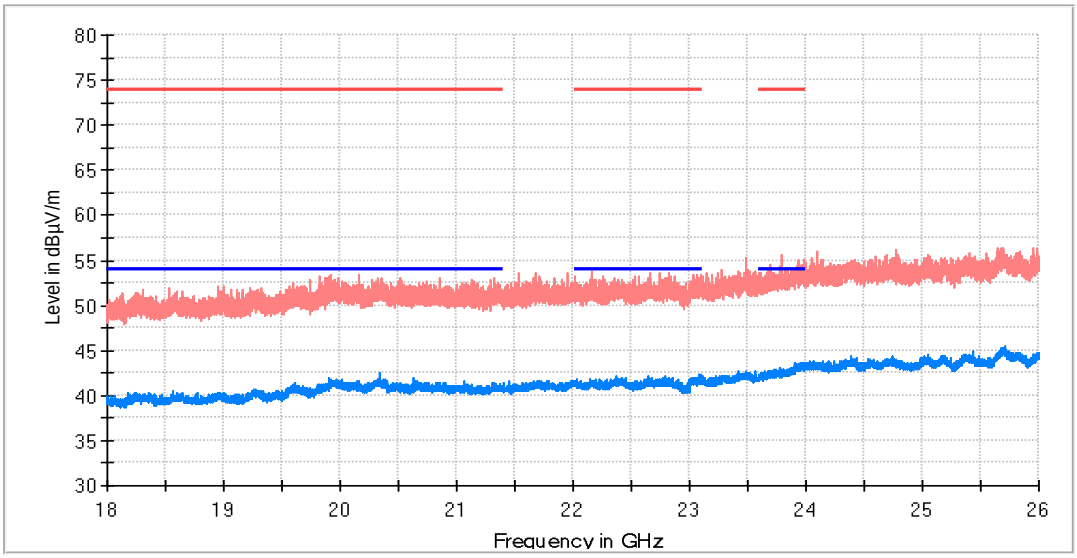


CHANNEL: Middle (2440 MHz)



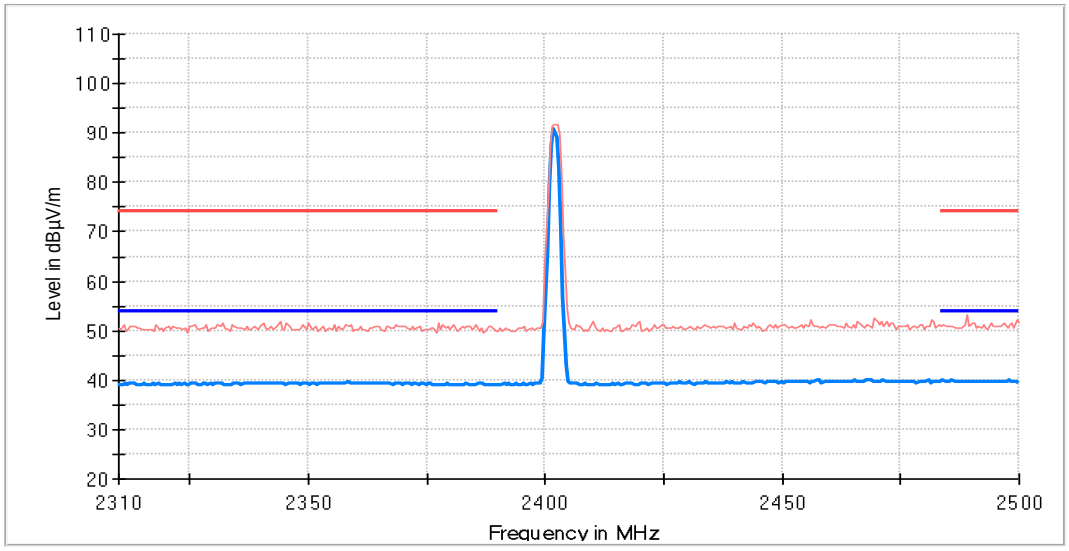
TEST RESULTS (Cont.):	

CHANNEL: High (2480 MHz).



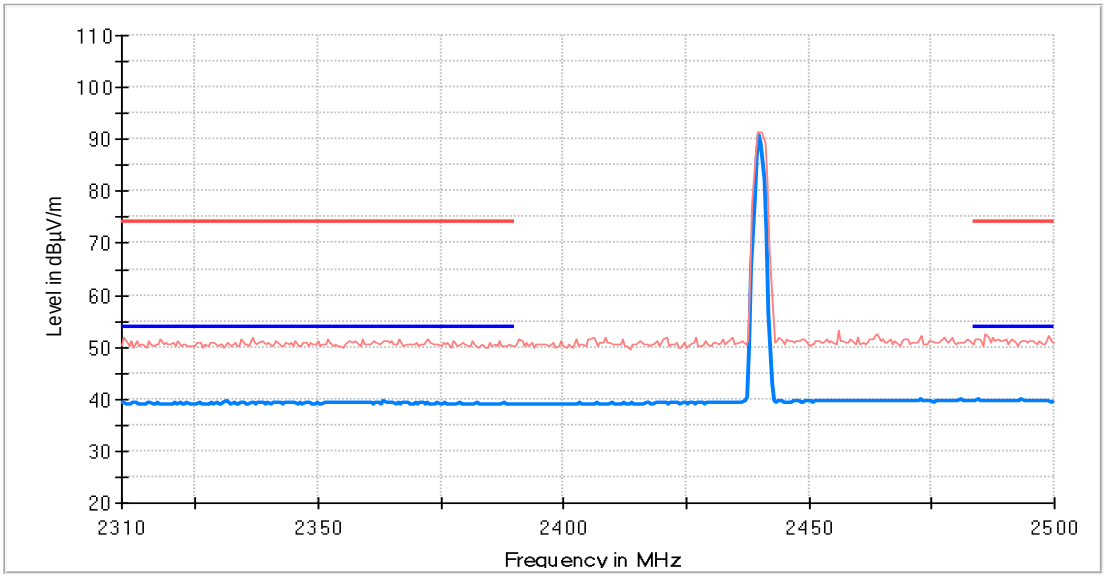
TEST RESULTS (Cont.):	RESTRICTED BAND (2.31 GHz to 2.5 GHz)

CHANNEL: Lowest (2402 MHz).



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

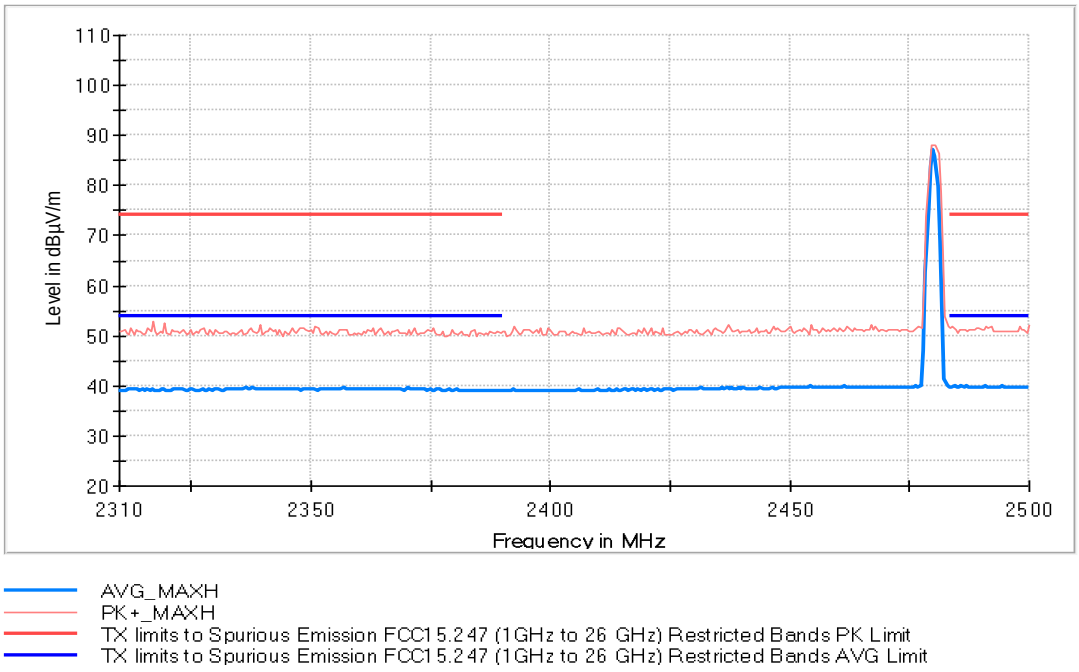
CHANNEL: Middle (2440 MHz).



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).



TESTED SAMPLES:	S/02
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
The radiated spurious signals detected at less than 20 dB respect to the limit for the operating channel shown below in the plots and table.

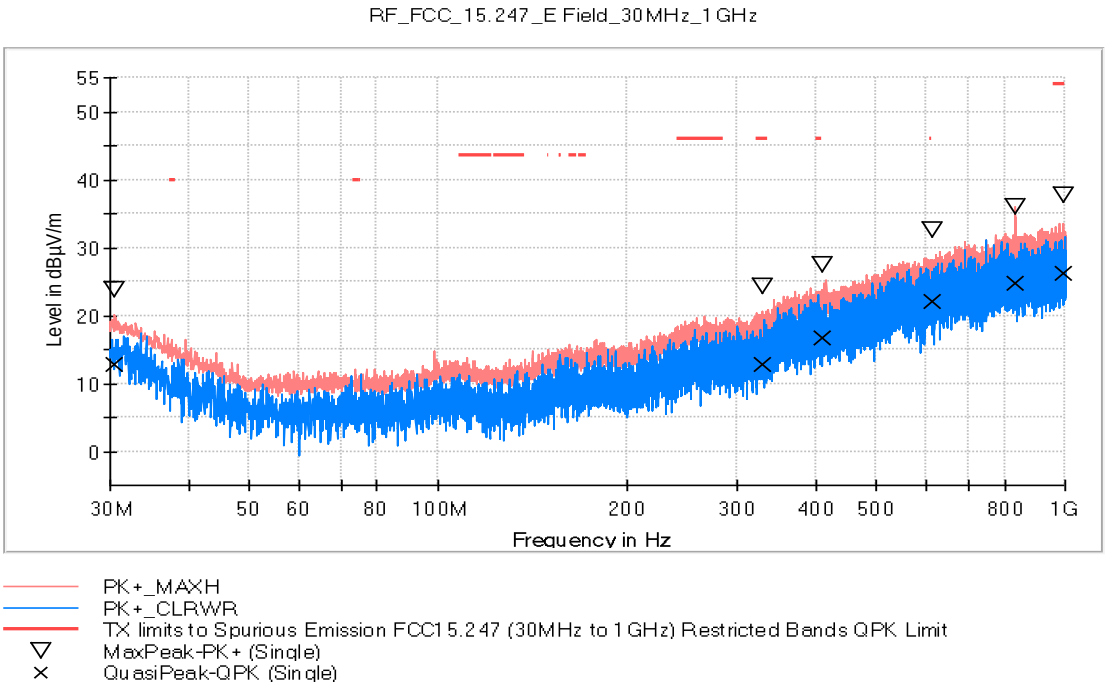
Frequency range 1 GHz – 26 GHz

The results in the next tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz (see next plots).

The radiated spurious signals detected at less than 10 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

TEST RESULTS (Cont.):	
FREQUENCY RANGE	**30 MHz – 1000 MHz**

CHANNEL: Lowest (2402 MHz)

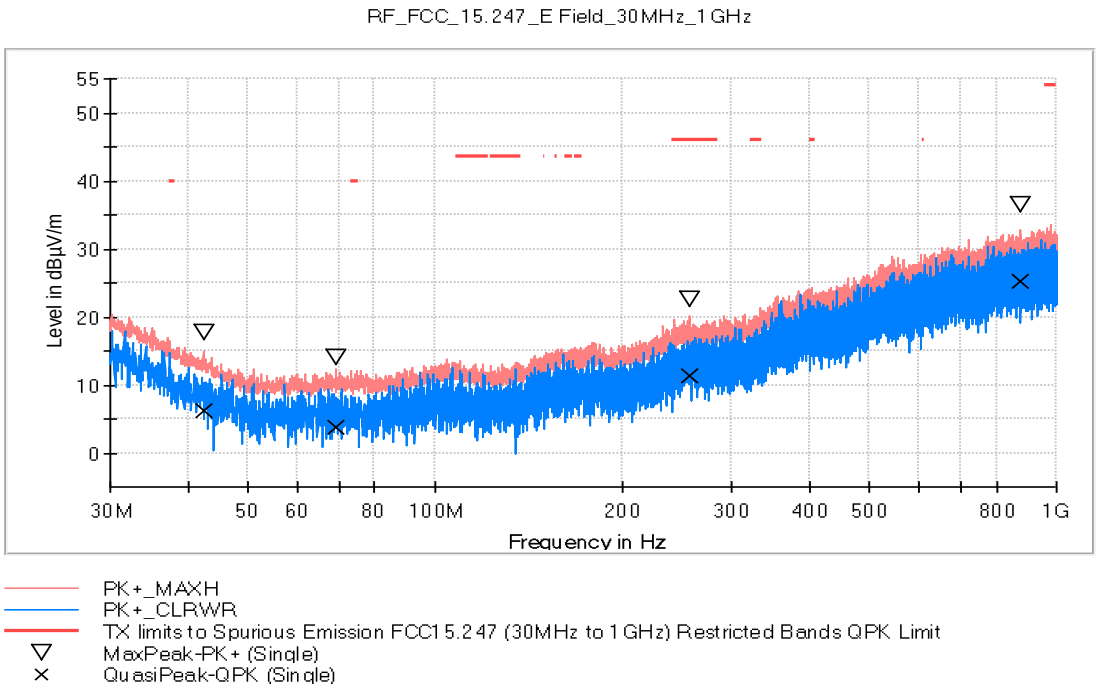


Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
830.201500	36.1	24.8	H
409.027500	27.5	16.8	H
328.420500	24.2	12.9	H
30.533500	23.8	12.9	H
611.272500	32.6	22.2	V
995.635000	37.7	26.1	V

TEST RESULTS (Cont.):	

CHANNEL: Middle (2440 MHz)

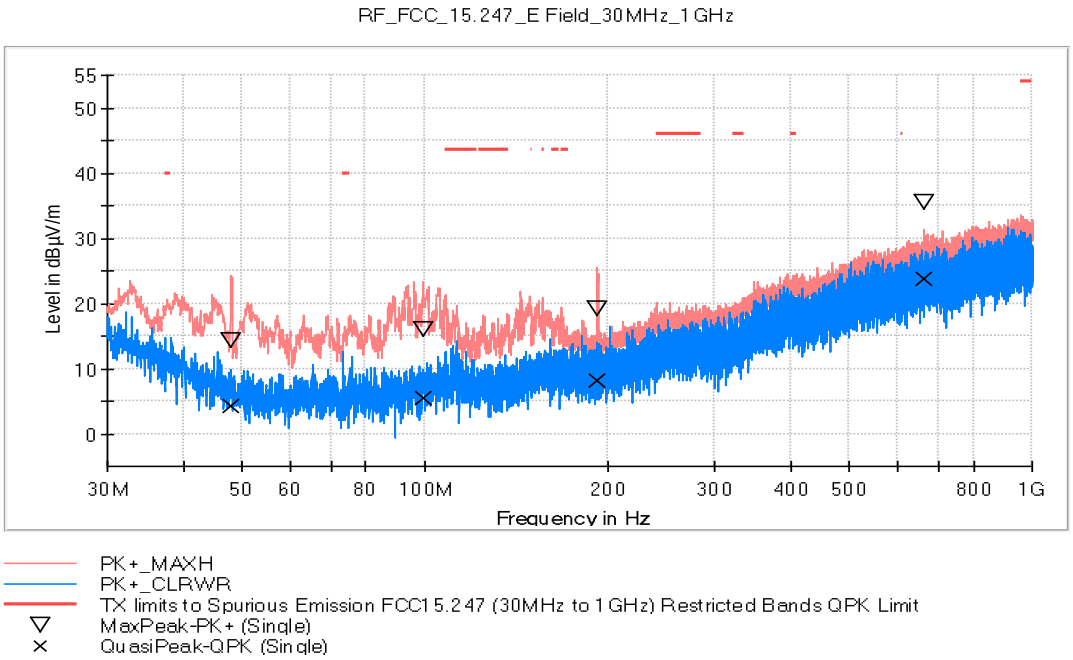


Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
255.816000	22.5	11.4	H
69.188000	14.1	3.9	H
42.319000	17.8	6.2	V
874.821500	36.5	25.3	V

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).



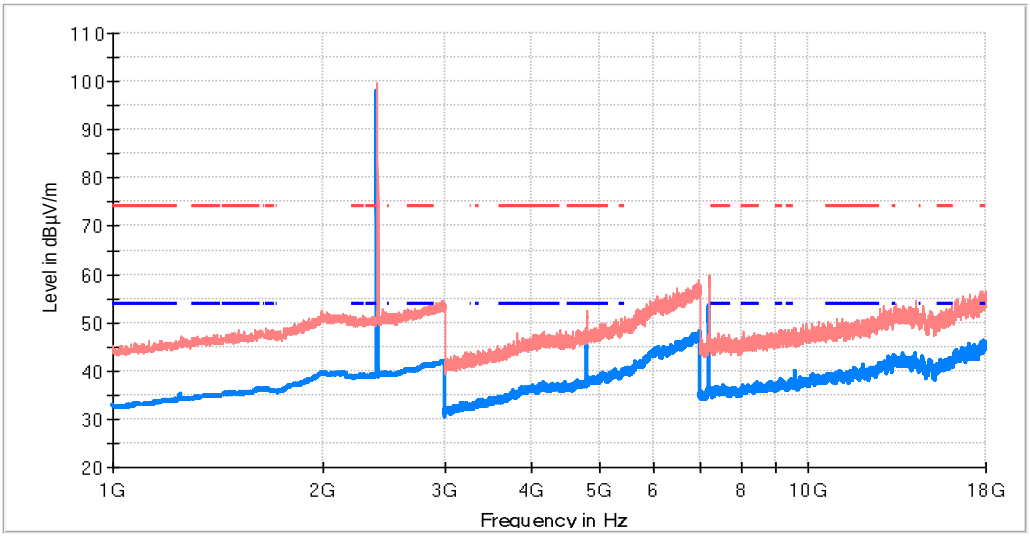
Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
662.197500	35.4	23.7	H
192.475000	19.0	8.3	V
99.161000	15.9	5.6	V
47.848000	14.3	4.2	V

TEST RESULTS (Cont.):	
FREQUENCY RANGE	**1 GHz – 18 GHz**

CHANNEL: Lowest (2402 MHz)

1GHz_18GHz_ HP & VP_CH Low



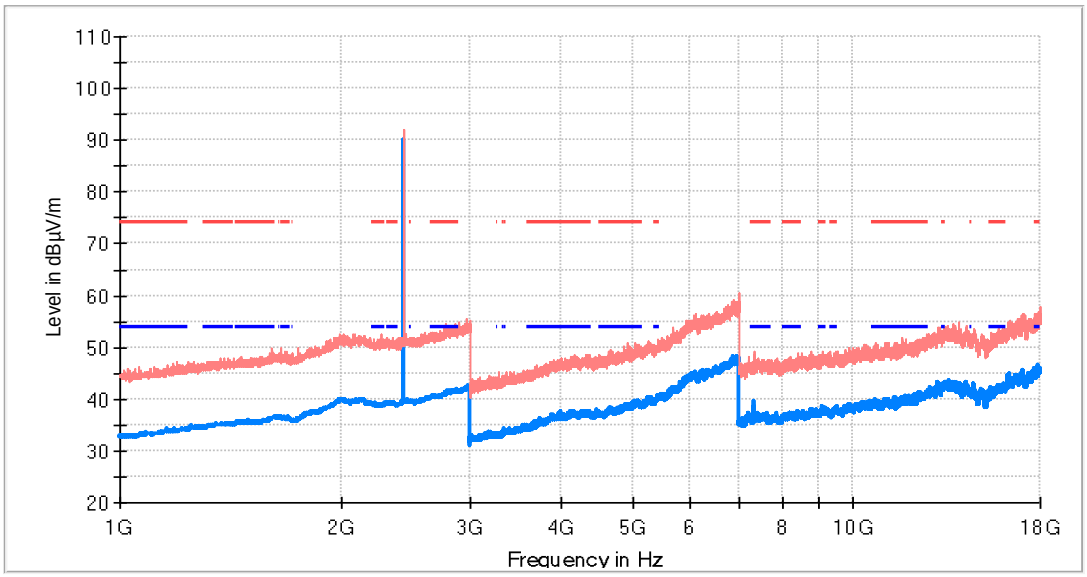
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2402.000000	99.71	98.14	H	Fundamental
4803.500000	51.00	45.41	V	
7207.500000	59.87	53.71	H	
9606.500000	49.02	40.09	V	

TEST RESULTS (Cont.):	

CHANNEL: Middle (2440 MHz).

1GHz_18GHz_HP & VP_CH Mid



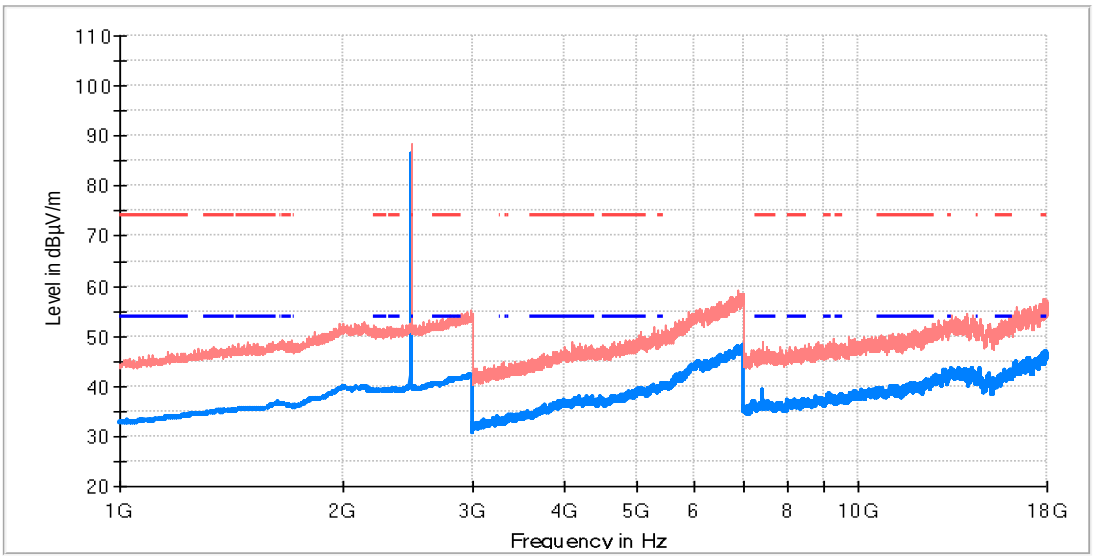
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2440.000000	91.75	90.00	H	Fundamental
7321.000000	47.24	39.51	H	

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).

1GHz_18GHz_HP & VP_CH High



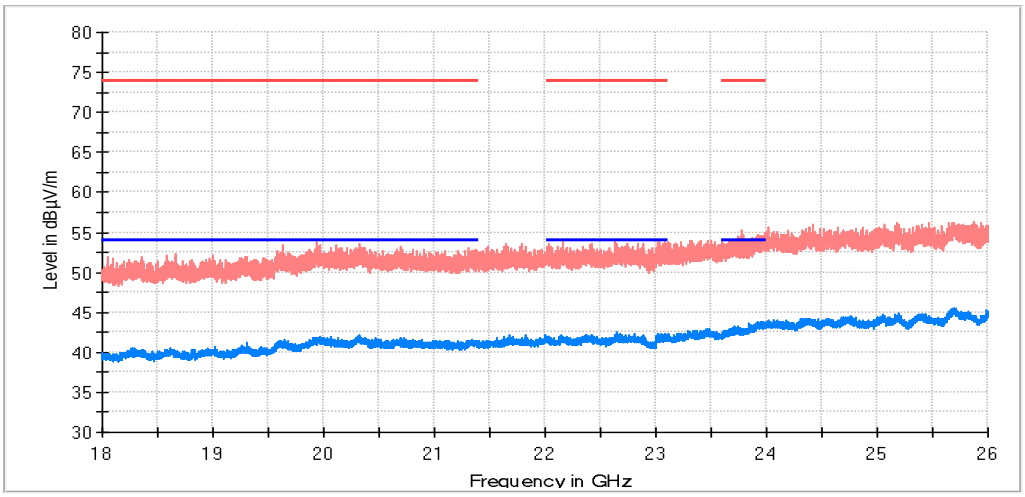
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

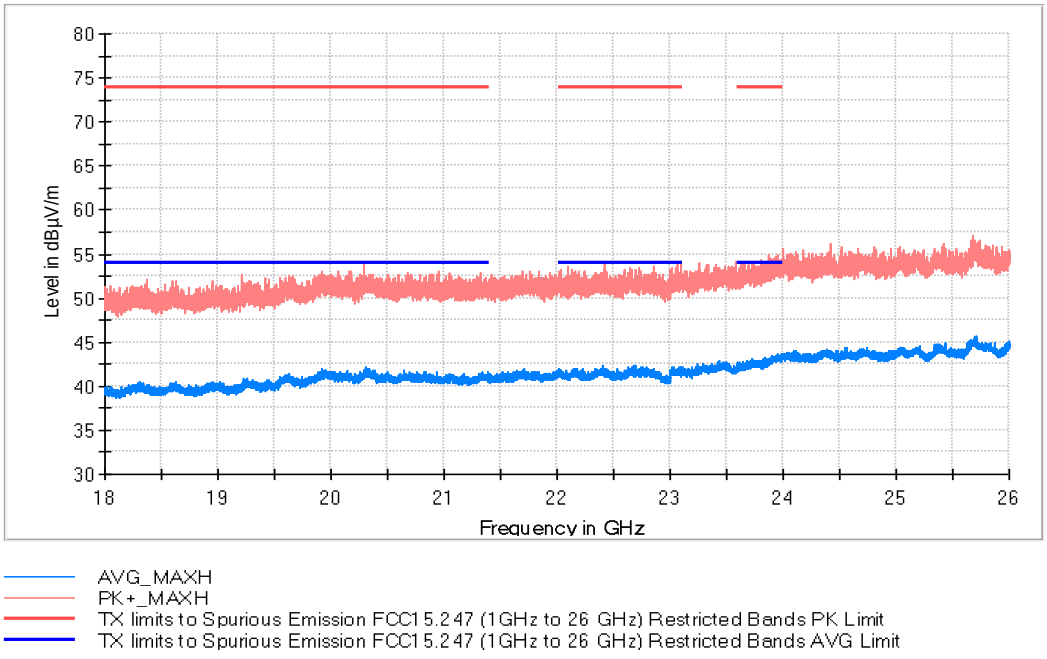
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2480.000000	88.29	86.48	H	Fundamental
7439.000000	46.77	39.21	V	

TEST RESULTS (Cont.):	
FREQUENCY RANGE	**18 GHz – 26 GHz**

CHANNEL: Lowest (2402 MHz)

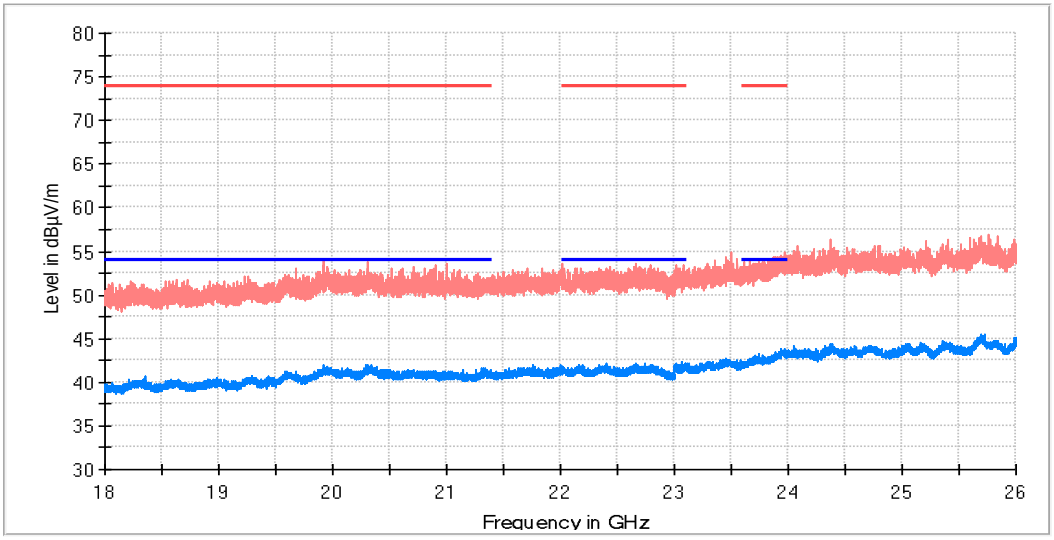


CHANNEL: Middle (2440 MHz)



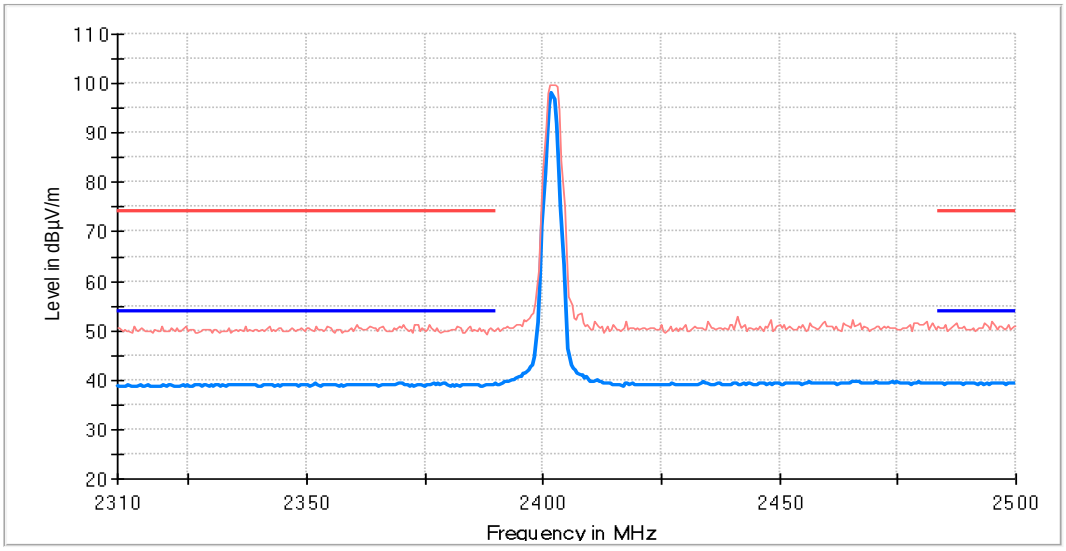
TEST RESULTS (Cont.):	

CHANNEL: High (2480 MHz).



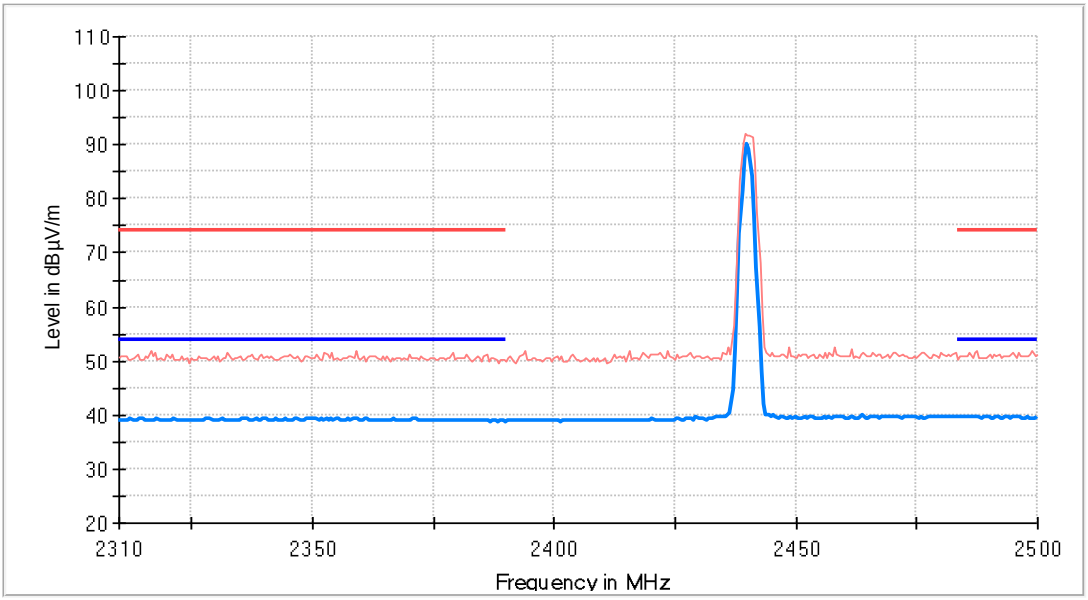
TEST RESULTS (Cont.):	RESTRICTED BAND (2.31 GHz to 2.5 GHz)

CHANNEL: Lowest (2402 MHz).



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

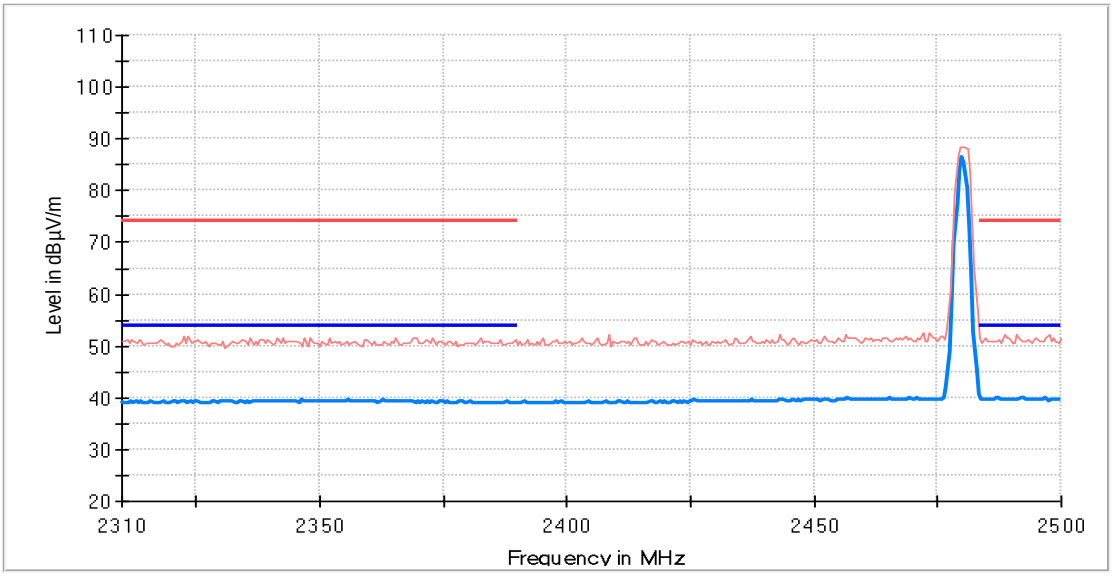
CHANNEL: Middle (2440 MHz).



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).



AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit