



Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION
NUMBER: 2764.01

ISED LISTED REGISTRATION
NUMBER: 23595-1

Test report No:

2668ERM.006

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 License-Exempt Local Area Network (LE-LAN) Devices.

Identification of item tested	Automotive Electronics Infotainment Head Unit
Trademark	Visteon Corporation
Model and /or type reference	MAZDA_68_CMU
Other identification of the product	--
Features	Bluetooth 4.0 + EDR, 802.11b/g/n
Manufacturer	VISTEON CORPORATION ONE VILLAGE CENTER DRIVE, VAN BUREN TOWNSHIP, MI, 48111 U.S. A
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 (April 2018). 558074 D01 15.247 Meas Guidance v05r02. Guidance for Compliance Measurements on Digital Transmission Systems, Frequency Hopping Spread Spectrum System, and Hybrid System Devices Operating Under section §15.247 of the FCC Rules 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
Date of issue	02-18-2020
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.

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

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General conditions

1. This report is only referred to the item that has undergone the test.
2. This report does not constitute or imply on its own an approval of the product by the Certification Bodies or competent Authorities.
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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
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

The CMU is an infotainment head unit that combines a wealth of options and features into the Mazda vehicle. Bluetooth, Wi-Fi, USB, touch screen capability, navigation and connected services are all features that the CMU has control over. The CMU is designed to have a multimodal interface where the user can exercise the system using voice control, multimodal commander input or touch screen interface.

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 N°	Description	Model	Serial N°	Date of reception
2668/01	Vehicular Radio Conducted sample	MAZDA_68_CMU	VPLFYF55885471AB	12/09/2019

Following Accessory items were used with Sample S/01 to perform testing:

Control N°	Description	Model	Serial N°	Date of reception
2668/07	Harness Cable	---	---	12/09/2019
2668/12	USB Cable	---	---	12/09/2019

1. Sample S/01 has undergone following test(s): All conducted tests indicated in appendix A&B.

Sample S/02 is composed of the following elements:

Control N°	Description	Model	Serial N°	Date of reception
2668/04	Vehicular Radio Radiated sample	MAZDA_68_CMU	VPLFYF55885494AB	12/09/2019

Following Accessory Accessory items were used with Sample S/02 to perform testing:

Control N°	Description	Model	Serial N°	Date of reception
2668/08	Harness Cable	---	---	12/09/2019
2668/13	USB Cable	---	---	12/09/2019

1. Sample S/02 has undergone following test(s): All radiated tests indicated in appendix A&B.

Test sample description

Ports..... :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	4 pin LVDS Connector			☐	☐		
	8 pin USB Connector			☐	☐		
	GPS Connector			☐	☐		
	28 pin Vehicle Connector		1	☐	☐		
	18 pin Power connector			☐	☐		
Supplementary information to the ports..... :	Not Provided						
Rated power supply	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: Nominal Voltage: 12 VDC					
	☐	DC:					
Rated Power	Not Provided						
Clock frequencies	Not Provided						
Other parameters.....	Not Provided						
Software version	74.00.040A						
Hardware version.....	VPHALF-14B115-FD						
Dimensions in cm (L x W x D)	178X150.9X50 mm						
Mounting position.....	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Vehicle / Automotive use					
Modules/parts	Module/parts of test item		Type		Manufacturer		
	N/A						
Accessories (not part of the test item)	Description		Type		Manufacturer		

Documents as provided by the applicant.....:	Description	File name	Issue date

Copy of marking plate:


Identification of the client

VISTEON CORPORATION
ONE VILLAGE CENTER DRIVE, VAN BUREN TOWNSHIP, MI, 48111 U.S.A

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	12-23-2019
Date (finish)	01-20-2020

Document history

Report number	Date	Description
2668ERM.006	02-18-2020	First release

Environmental conditions

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

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

In the semi-anechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 °C Max. = 35 °C
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 °C Max. = 35 °C
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, Bhagyashree Chaudhary, Sravani Gollamudi, 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 EDR)					
Section	FCC Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
A.1	§ 2.1049 & § 15.247 (a) (1)	RSS-247 5.1 (b)	20dB Emission Bandwidth, Occupied Bandwidth & Carrier Frequency Separation	P	N/A
A.2	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (d)	Number of hopping channels	P	N/A
A.3	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (d)	Time of Occupancy (Dwell Time)	P	N/A
A.4	§ 15.247 (b) (3)	RSS-247 5.4 (b)	Maximum peak conducted output power and antenna gain	P	N/A
A.5	§ 15.247 (d)	RSS-247 5.5	Band-edge conducted emissions compliance (Transmitter)	P	N/A
--	§ 15.247 (d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	N/A	Refer 1
A.6	§ 15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
<u>Supplementary information and remarks:</u> 1: Device has an internal antenna. No testing required.					

FCC PART 15 PARAGRAPH (WI-FI 2.4GHz)					
Section	FCC Spec Clause	RSS Spec Clause	Test Description	Verdict	Remark
B.1	§ 2.1049 & §15.247 (a) (2)	RSS-247 5.2 (a)	99% Occupied Bandwidth & 6dB Bandwidth	P	N/A
B.2	§ 15.247 (b)	RSS-247 5.4 (d)	Maximum Output Power and antenna gain	P	N/A
B.3	§ 15.247 (d)	RSS-247 5.5	Band-edge conducted emissions compliance (Transmitter)	P	N/A
B.4	§ 15.247 (e)	RSS-247 5.2 (b)	Power Spectral Density	P	N/A
--	§15.247(d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	N/A	Refer 1
B.5	§15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
<u>Supplementary information and remarks:</u> 1: Device has an internal antenna. No testing required.					

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
1042	RF generator	Rohde & Schwarz	SMBV100A	2018/01	2021/01
1041	RF generator	Rohde & Schwarz	SMB100A	2017/04	2020/04

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber	FRANKONIA	SAC 3 plus "L"	2017/08	2020/08
1064	Biconical Log antenna	ETS LINDGREN	3142E	2018/01	2020/01
1057	Double-ridge Waveguide Horn antenna 1-18 GHz	ETS LINDGREN	3115	2017/03	2020/03
1056	Double-ridge Waveguide Horn antenna 18-40 GHz	ETS LINDGREN	3115	2017/03	2020/03
1012	EMI Test Receiver	ROHDE & SCHWARZ	ESR26	2019/12	2021/12
1014	SIGNAL ANALYSER	ROHDE & SCHWARZ	FSV40	2019/04	2021/04
0981	LOW NOISE PREAMPLIFIER	BONN ELEKTRONIK	BLMA0118-2A	2018/10	2020/10

Appendix A:

Test results (Bluetooth EDR)

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PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	FHSS (GFSK, Pi/4-DQPSK, 8DPSK)
Adaptive	Adaptive equipment without the possibility to switch to a non-adaptive mode.
Operating Frequency Range	2402 – 2480 MHz
Nominal Channel Bandwidth	1 MHz
RF Output Power	< 4 dBm
Antenna type	Integral Antenna
Antenna gain	+1.0 dBi
Nominal Voltage	
- Supply Voltage	12 Vdc
- Type of power source	DC voltage
Equipment type	Bluetooth EDR
Geo-location capability	No

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Modulation:</u> GFSK <u>Test Frequencies for conducted/Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz
TC#02	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Modulation:</u> PI/4-DQPSK <u>Test Frequencies for Conducted/Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz
TC#03	<u>Power supply (V):</u> $V_{\text{nominal}} = 12 \text{ Vdc}$ <u>Modulation:</u> 8-DPSK <u>Test Frequencies for Conducted/Radiated tests:</u> Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz

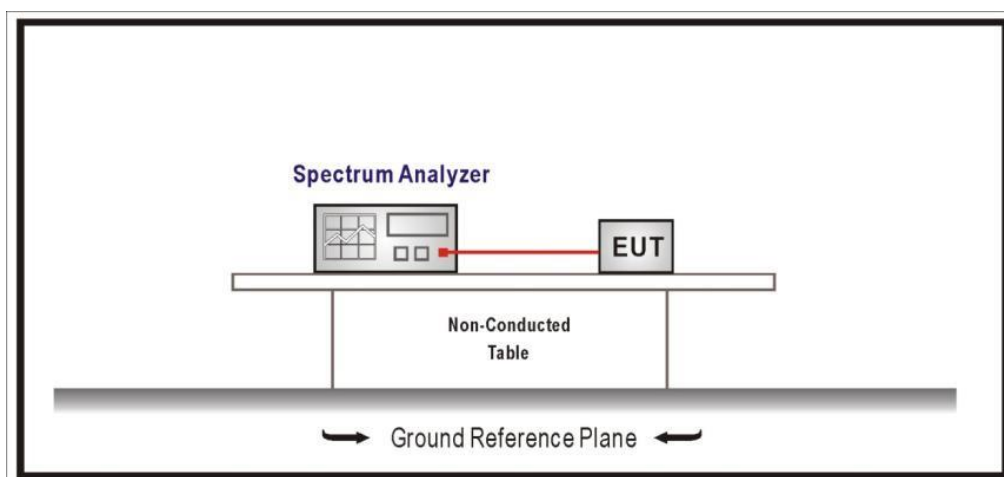
TEST A.1: 20DB EMISSION BANDWIDTH, OCCUPIED BANDWIDTH AND CARRIER FREQUENCY SEPARATION

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	§ 2.1049, Part 15 Subpart C §15.247(a) (1) and RSS-247 5.1 (b)

LIMITS

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST SETUP:



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

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB Bandwidth (kHz)	505	475	475
Occupied bandwidth (kHz)	700	695	695
Measurement uncertainty (kHz)	<± 1.80		

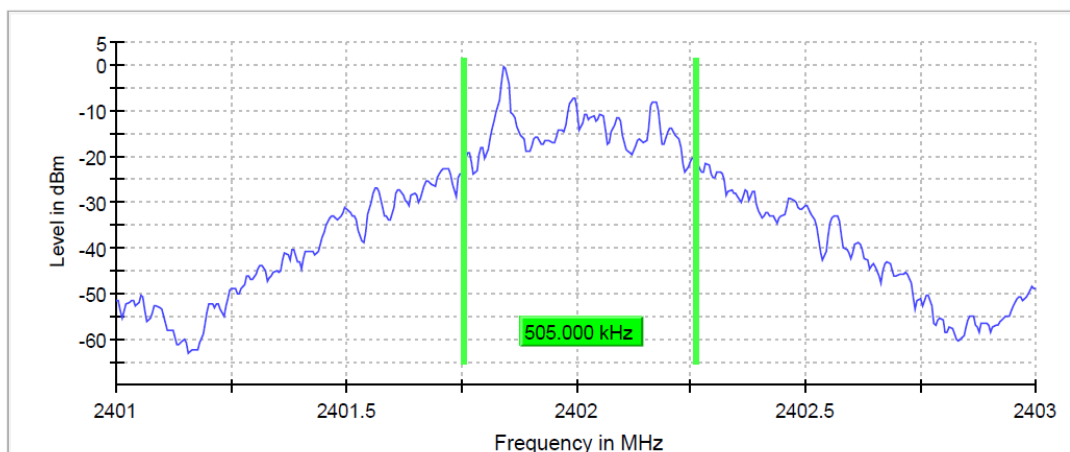
Measurement Set up

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
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamplifier	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	8 / max. 150	7 / max. 150	8 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.04 dB	0.11 dB	0.10 dB

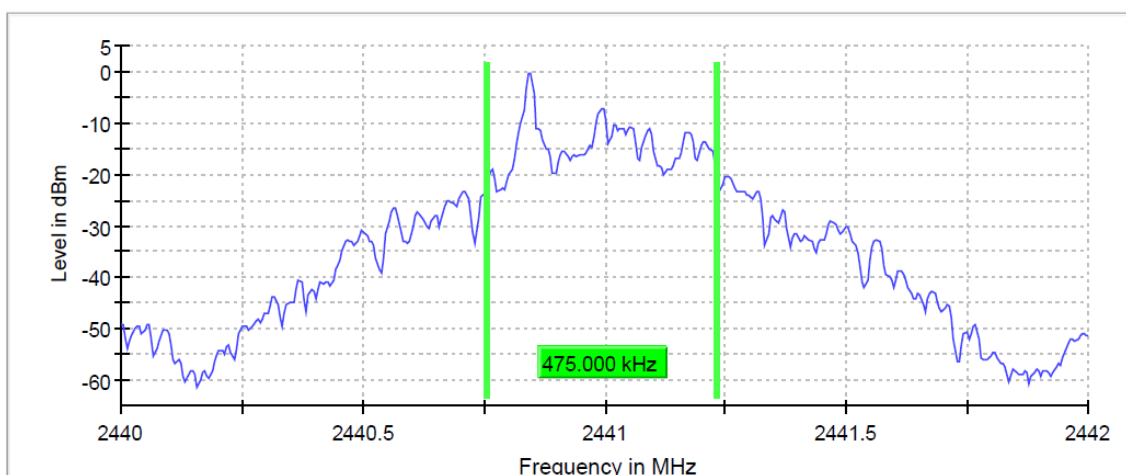
TEST RESULTS (Cont.):

20 dB BANDWIDTH

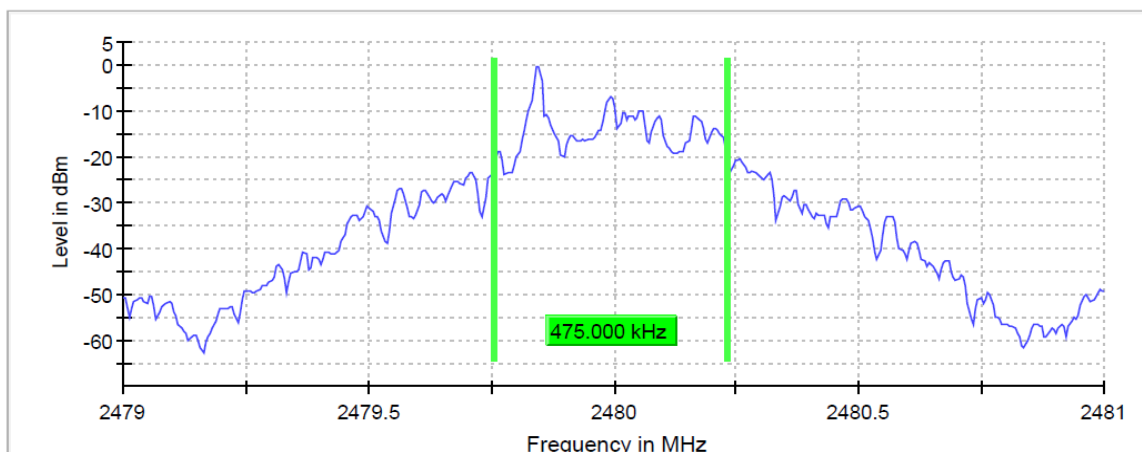
Lowest Channel



Middle Channel



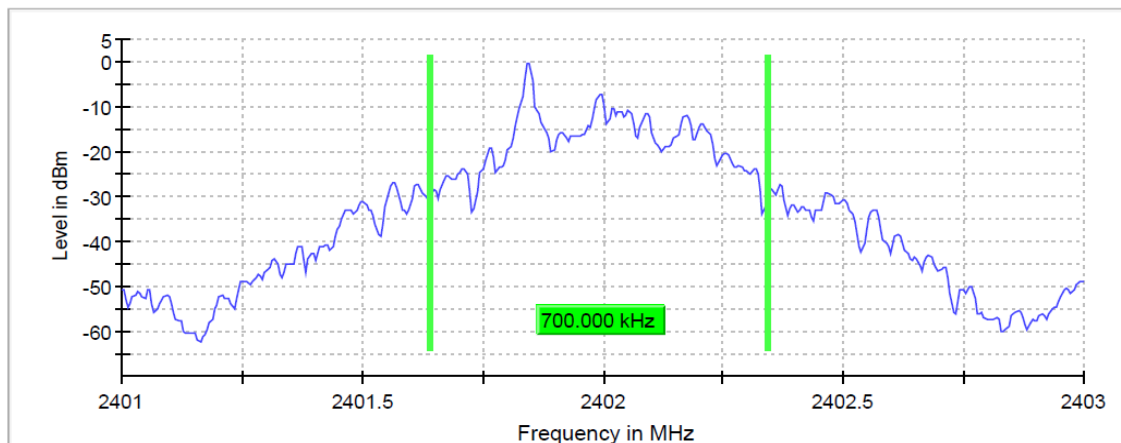
Highest Channel



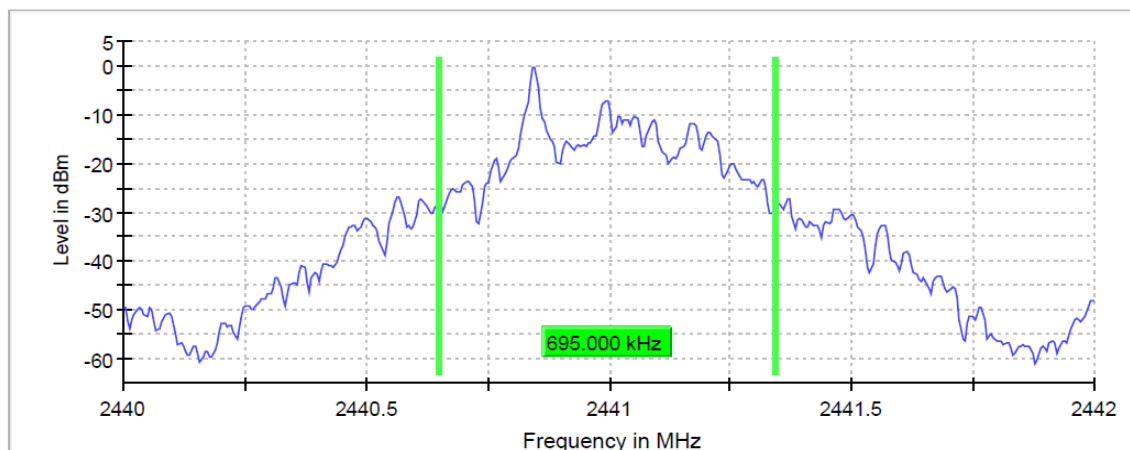
TEST RESULTS (Cont.):

OCCUPIED BANDWIDTH

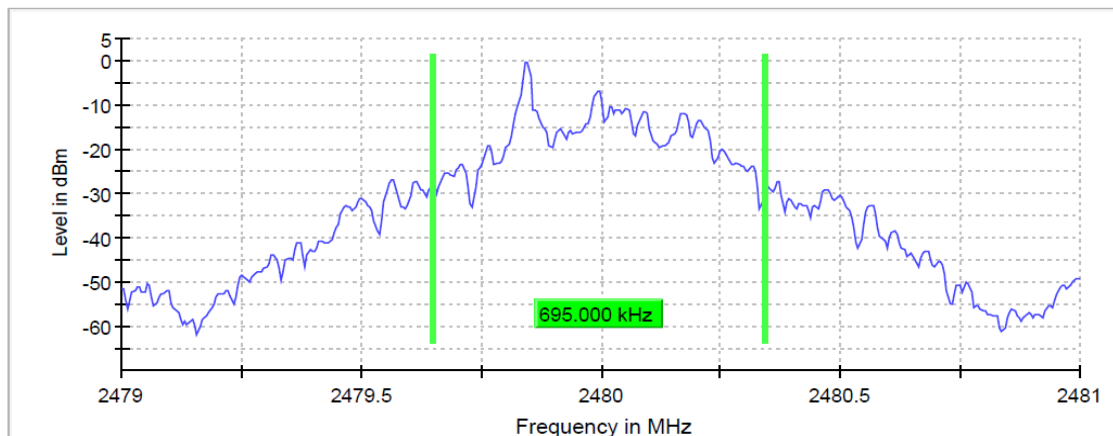
Lowest Channel



Middle Channel



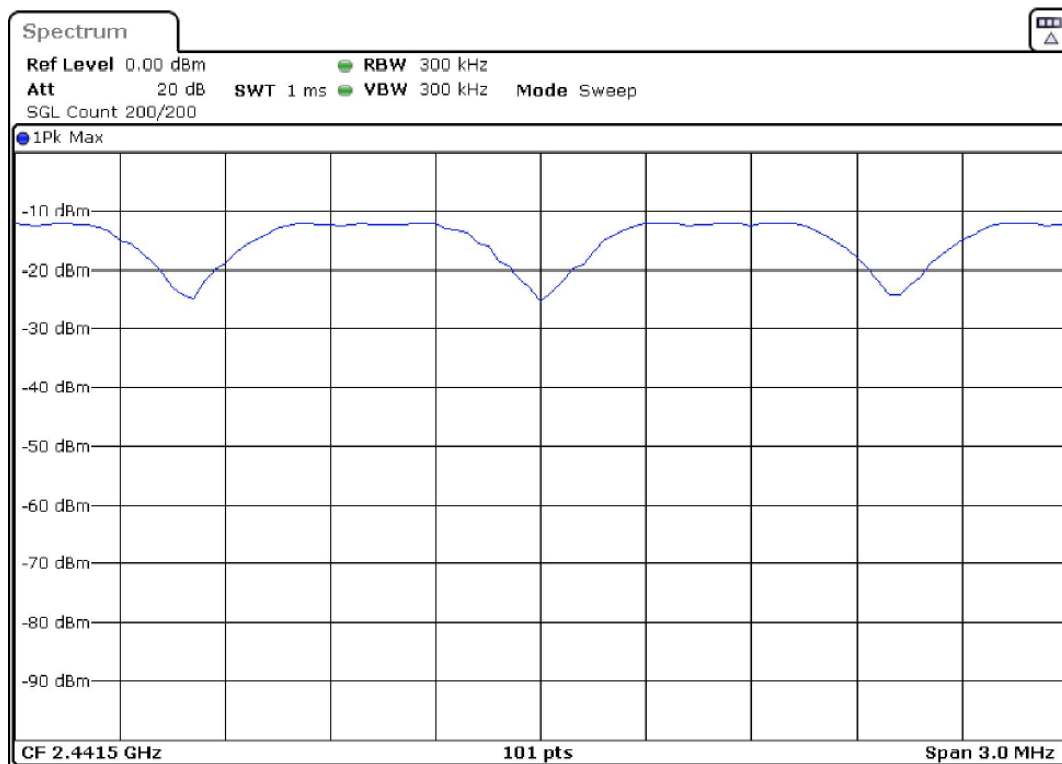
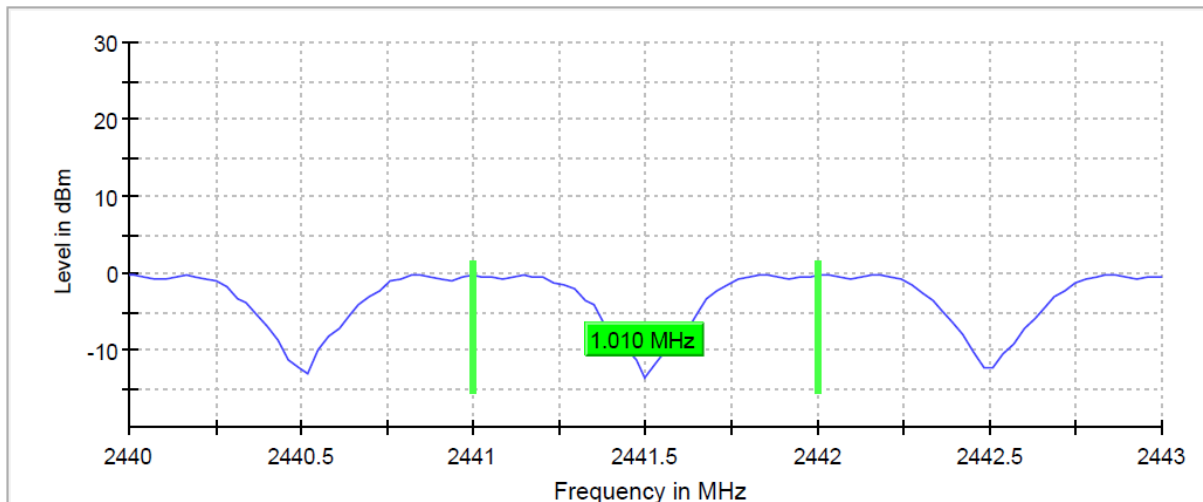
Highest Channel



TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH		
Measurement Set- up			
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
Sweep Points	400	400	400
Sweep time	189.648 μs	189.648 μs	189.648 μs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	500	500	500
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preampl	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.30 dB	0.30 dB	0.30 dB
Run	5 / max. 150	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.01 dB	0.03 dB	0.08 dB

TEST RESULTS (Cont.)

CARRIER FREQUENCY SEPARATION



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20dB bandwidth of the hopping channel.

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

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB bandwidth (MHz)	1.110	1.110	1.110
Occupied bandwidth (MHz)	1.070	0.990	1.070
Measurement uncertainty (kHz)	<± 1.80		

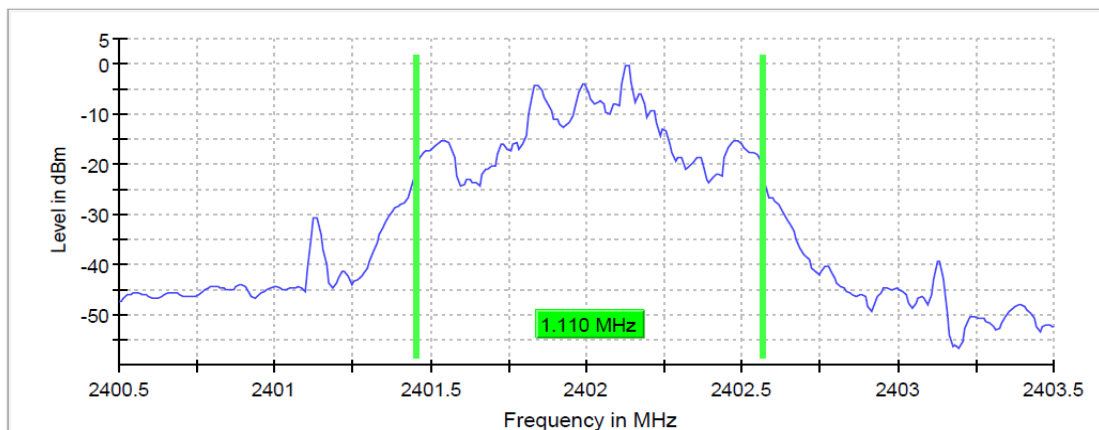
Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43950 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44250 GHz	2.48150 GHz
Span	3.00 MHz	3.00 MHz	3.00 MHz
RBW	20.000 KHz	20.000 KHz	20.000 KHz
VBW	100.000 kHz	100.000 kHz	100.000 kHz
Sweep Points	300	300	300
Sweep time	94.727 µs	94.727 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	16 / max. 150	12 / max. 150	8 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.14 dB	0.13 dB	0.10 dB

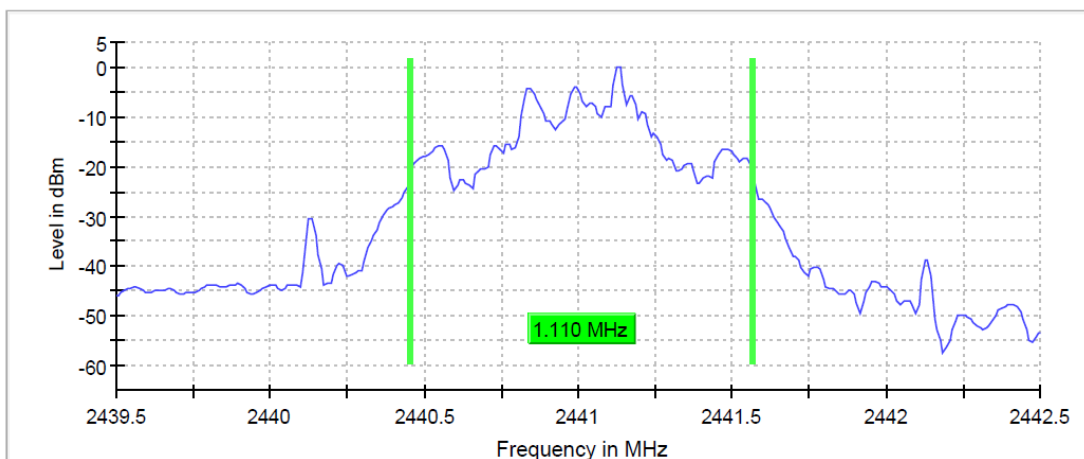
TEST RESULTS (Cont.):

20 dB BANDWIDTH

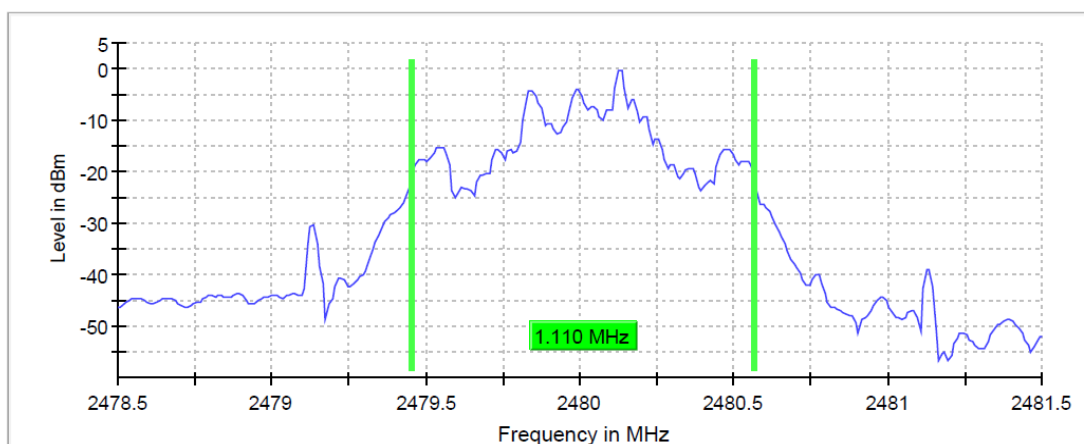
Lowest Channel



Middle Channel



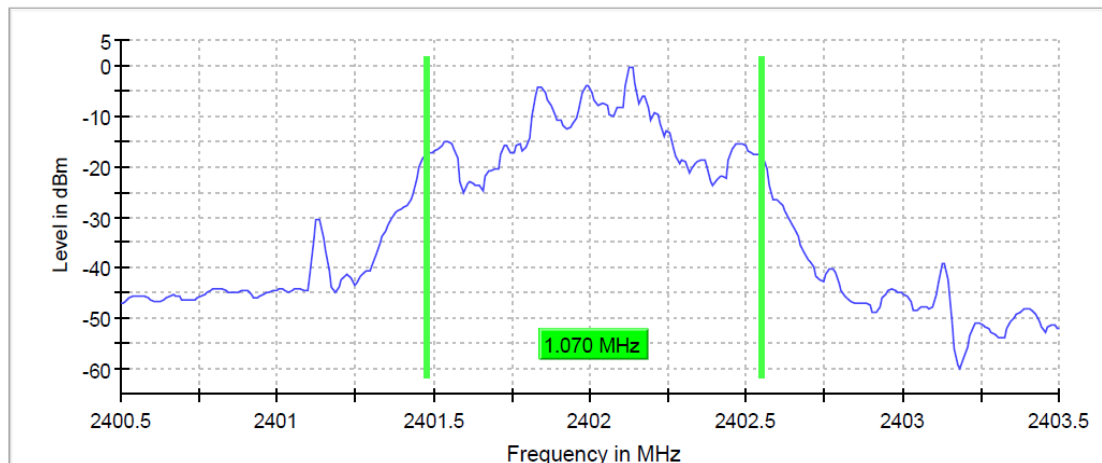
Highest Channel



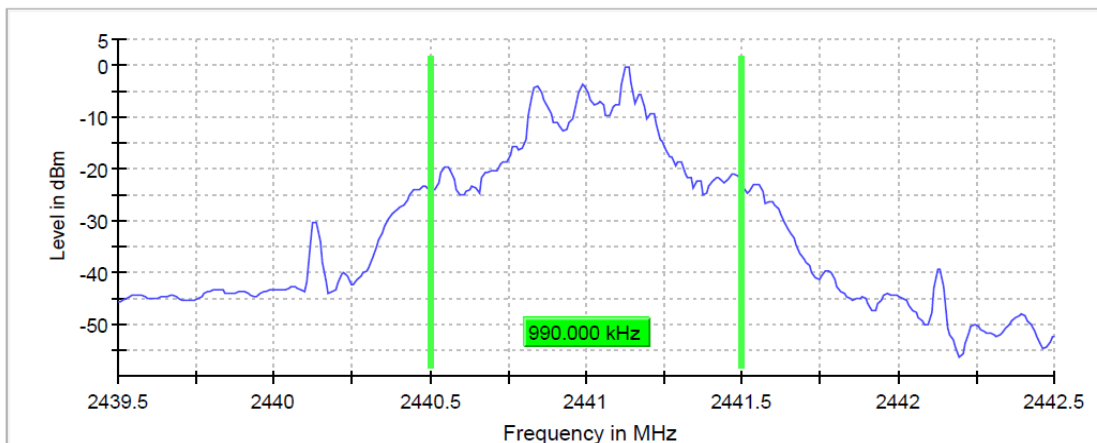
TEST RESULTS (Cont.):

OCCUPIED BANDWIDTH

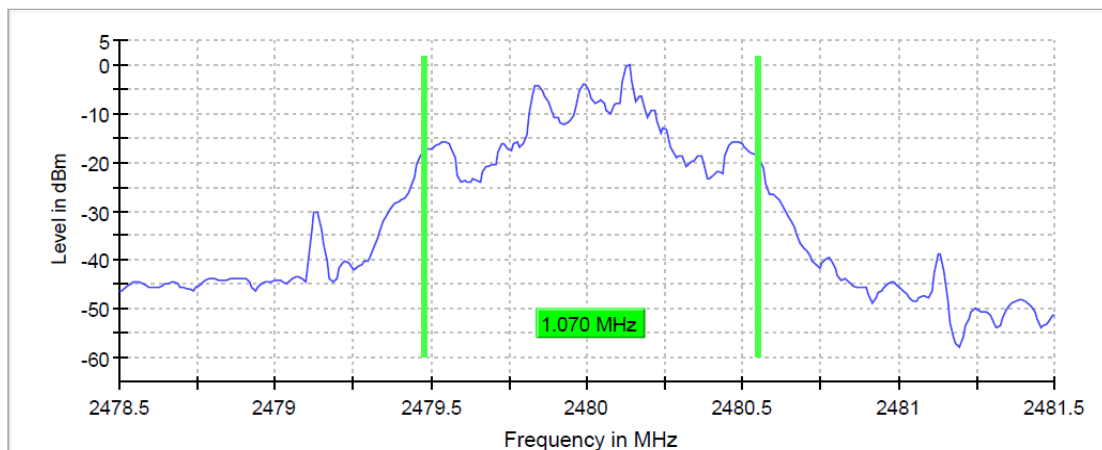
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):

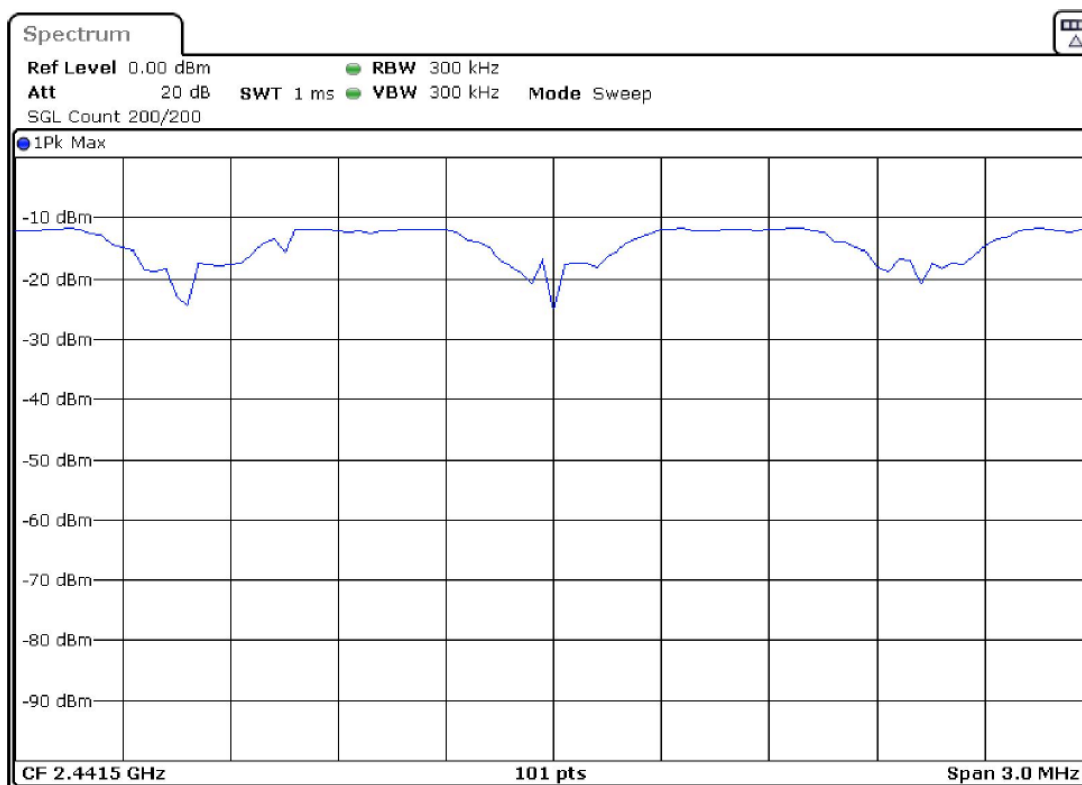
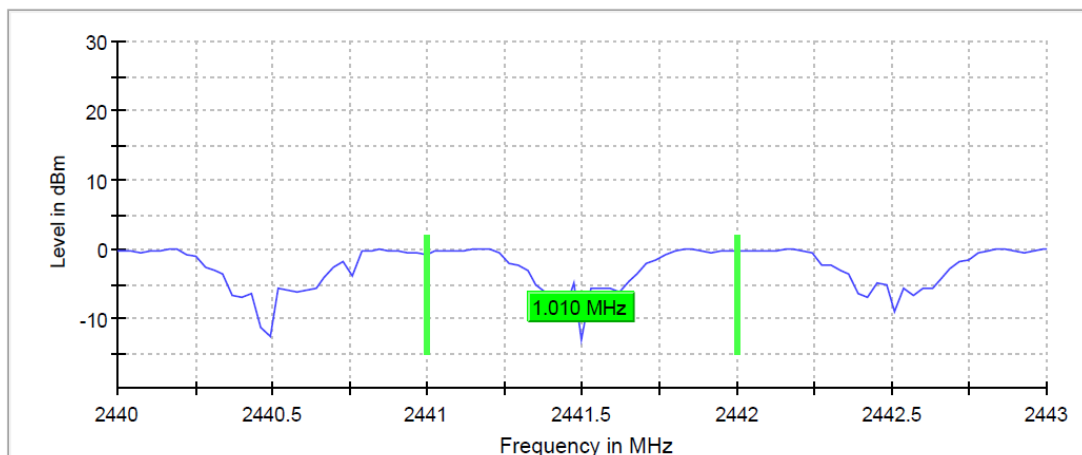
OCCUPIED BANDWIDTH

Measurement Set- up

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43950 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44250 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	20.000 kHz	20.000 kHz	20.000 kHz
VBW	100.000 kHz	100.000 kHz	100.000 kHz
Sweep Points	300	300	300
Sweep time	94.727 μ s	94.727 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	500	500	500
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamplifier	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.30 dB	0.30 dB	0.30 dB
Run	6 / max. 150	7 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.23 dB	0.09 dB	0.19 dB

TEST RESULTS (Cont.)

CARRIER FREQUENCY SEPARATION



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB bandwidth (MHz)	1.100	1.110	1.110
Occupied bandwidth (MHz)	1.060	1.060	1.060
Measurement uncertainty (kHz)	<± 1.80		

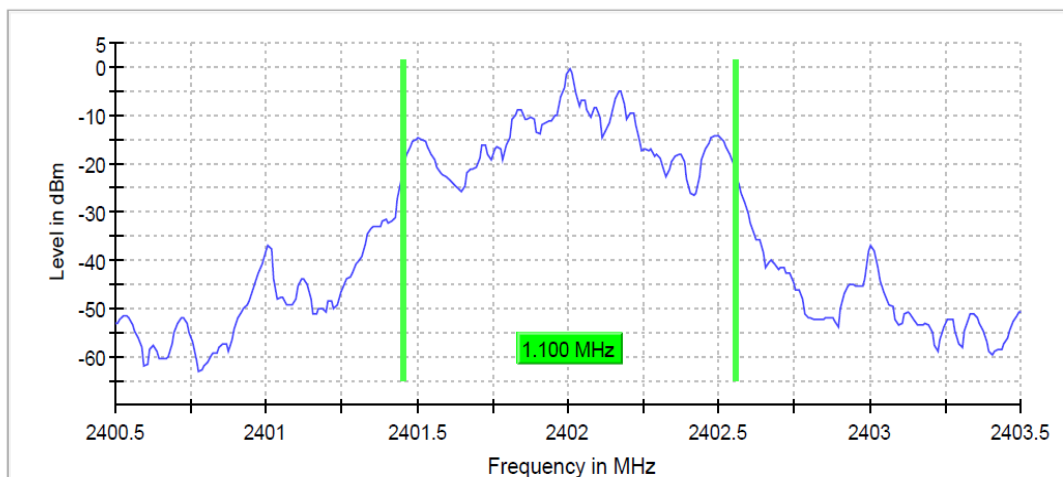
Measurement Setup

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43950 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44250 GHz	2.48150 GHz
Span	3.00 MHz	3.00 MHz	3.00 MHz
RBW	20.000 kHz	20.000 kHz	20.000 kHz
VBW	100.000 kHz	100.000 kHz	100.000 kHz
Sweep Points	300	300	300
Sweep time	94.727 µs	94.727 µs	94.727 µs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	8 / max. 150	9 / max. 150	10 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.00 dB	0.08 dB	0.09 dB

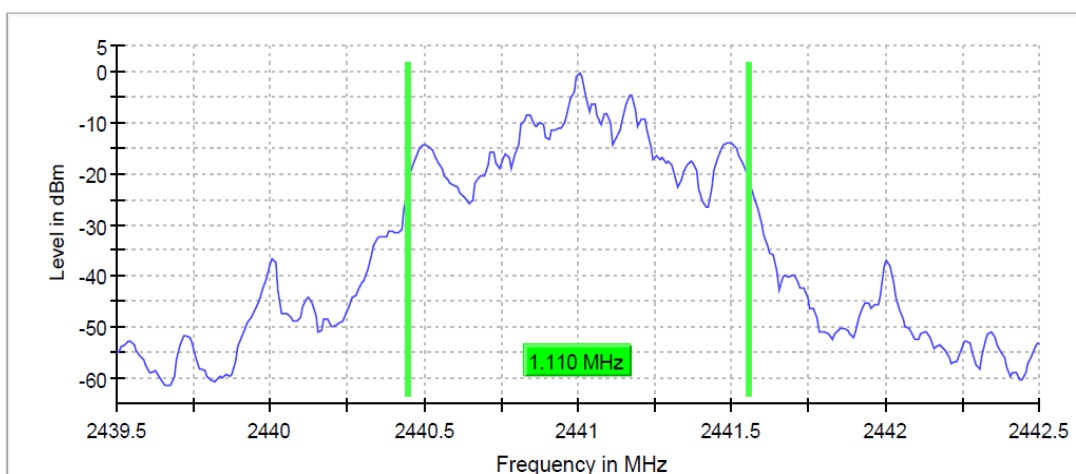
TEST RESULTS (Cont.):

20 dB BANDWIDTH

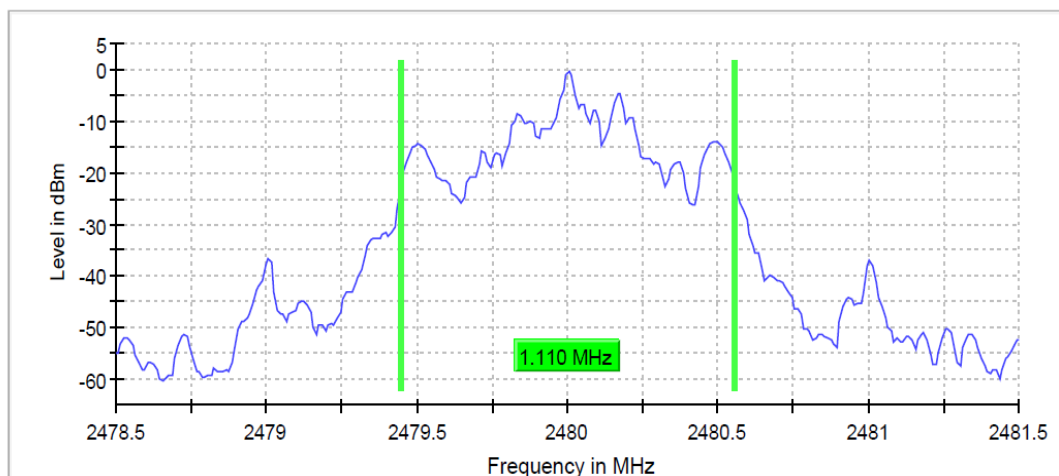
Lowest Channel



Middle Channel



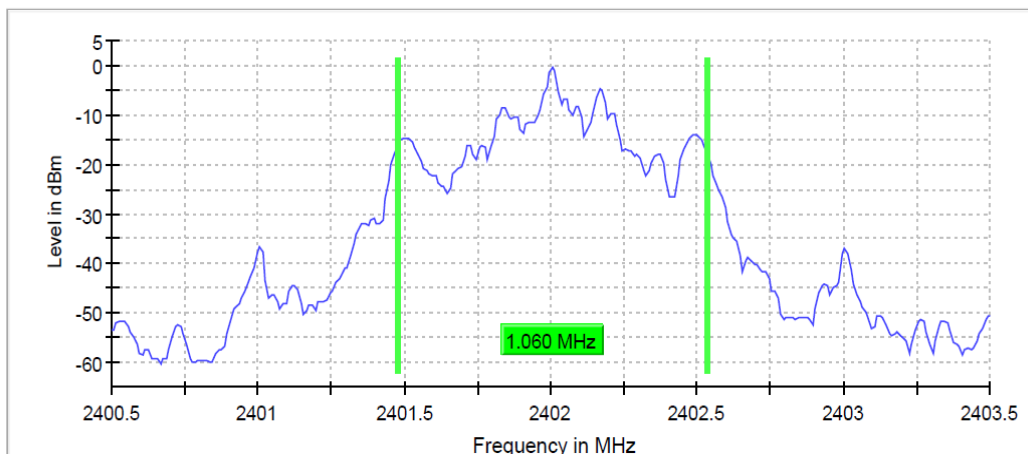
Highest Channel



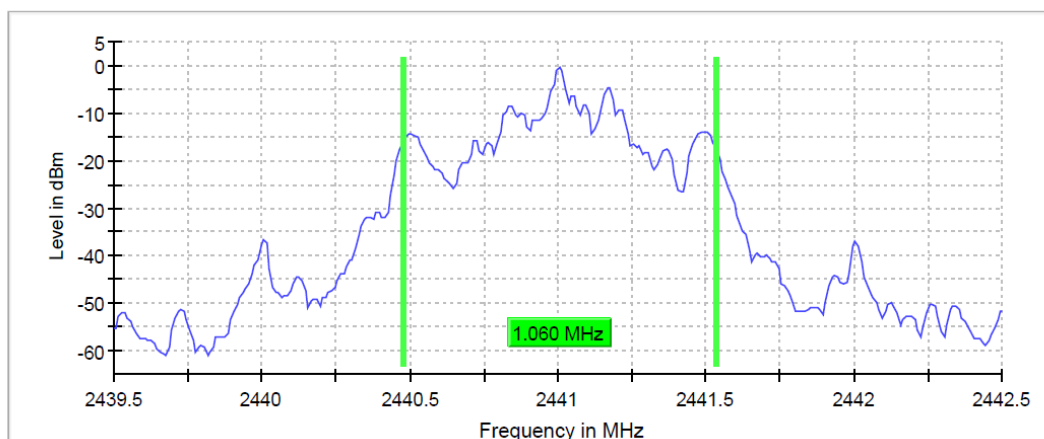
TEST RESULTS (Cont.)

OCCUPIED BANDWIDTH

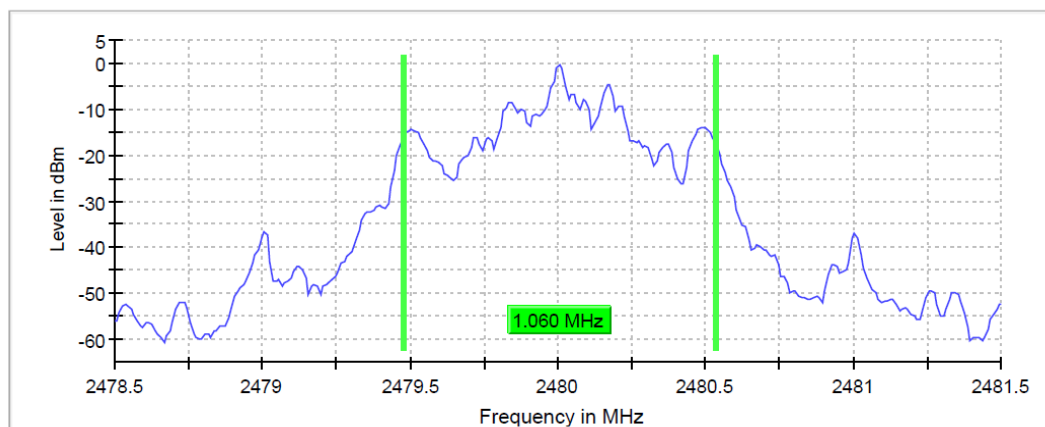
Lowest Channel



Middle Channel



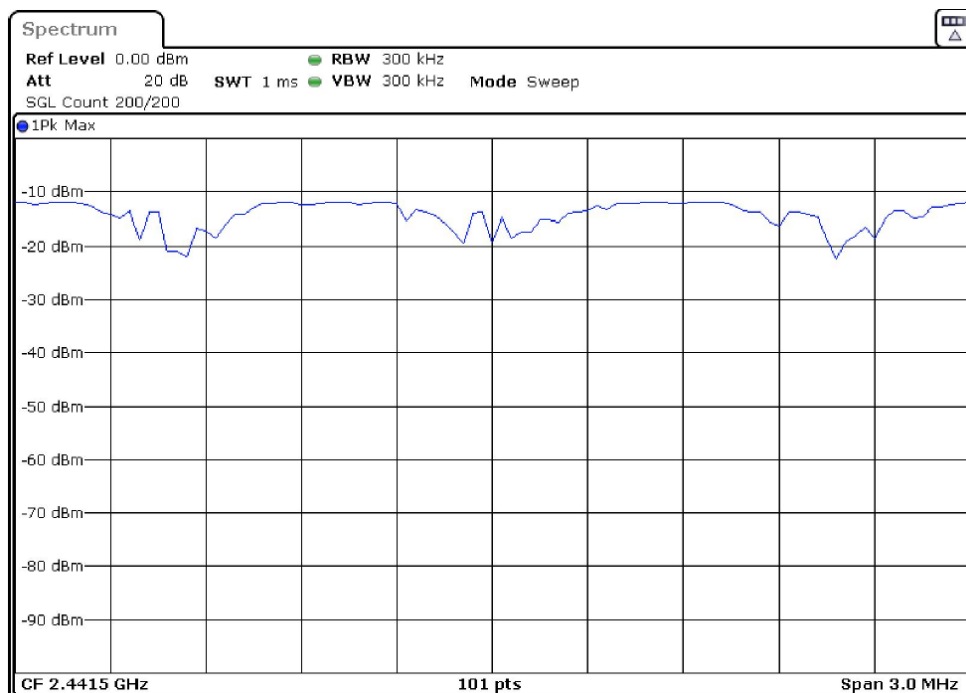
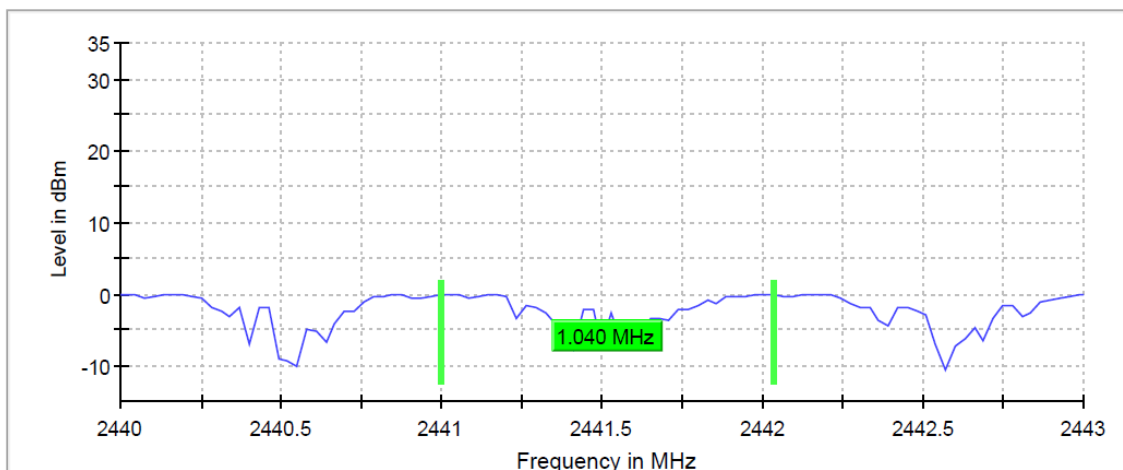
Highest Channel



TEST RESULTS (Cont.):		OCCUPIED BANDWIDTH	
Measurement Set- up			
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43950 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44250 GHz	2.48150 GHz
Span	3.00 MHz	3.00 MHz	3.00 MHz
RBW	20.000 kHz	20.000 kHz	20.000 kHz
VBW	100.000 kHz	100.000 kHz	100.000 kHz
Sweep Points	300	300	300
Sweep time	94.727 μs	94.727 μs	94.727 μs
Reference Level	0.000 dBm	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	500	500	500
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	FFT	FFT
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.30 dB	0.30 dB	0.30 dB
Run	9 / max. 150	6 / max. 150	8 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.06 dB	0.00 dB	0.05 dB

TEST RESULTS (Cont.)

CARRIER FREQUENCY SEPARATION



The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20dB bandwidth of the hopping channel.

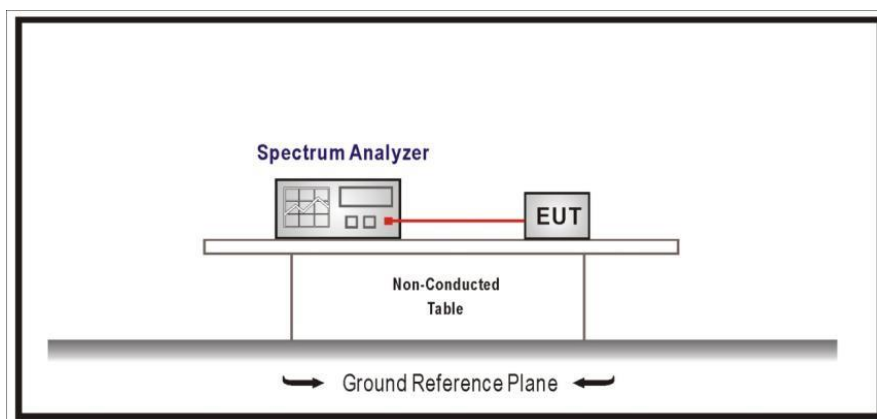
TEST A.2: NUMBER OF HOPPING CHANNELS

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(a) (1) (iii) and RSS-247 5.1 (d)

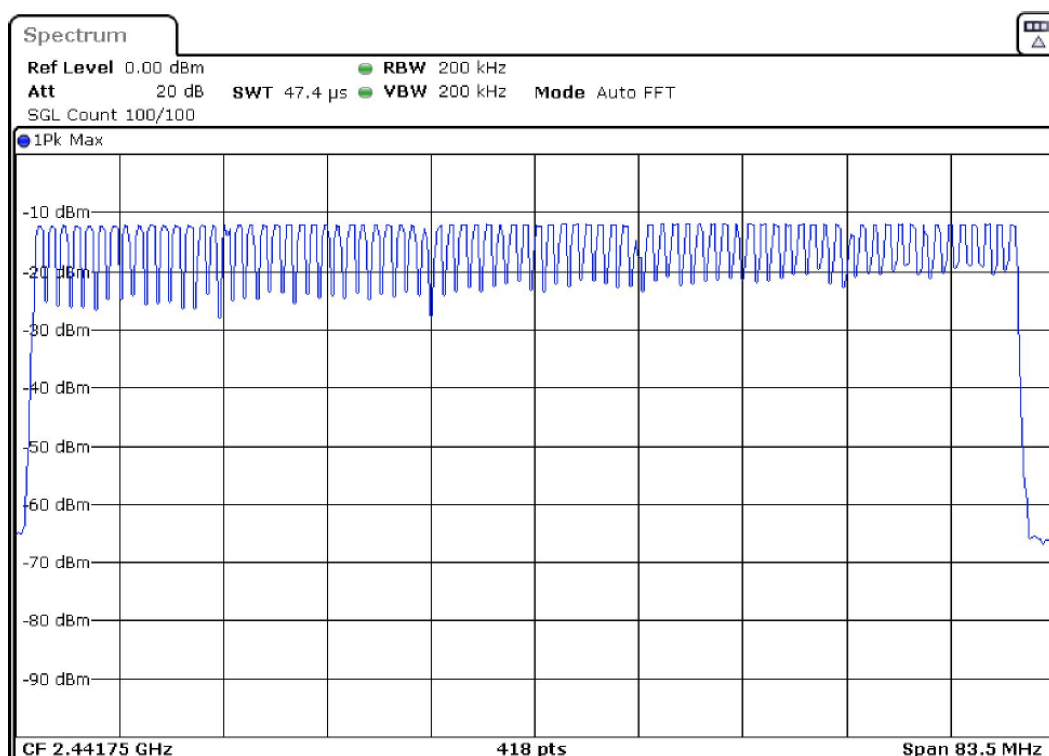
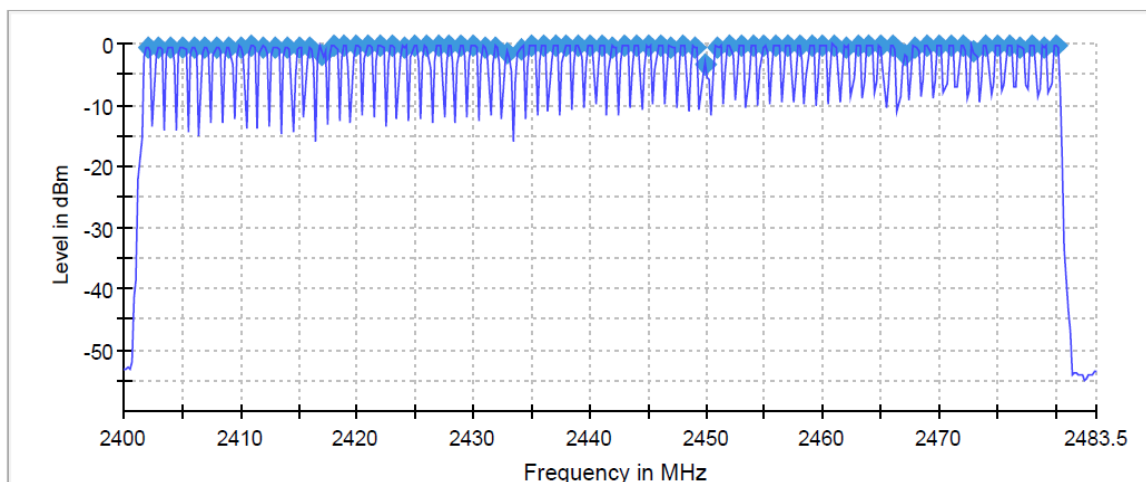
LIMITS

Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 channels.

TEST SETUP:

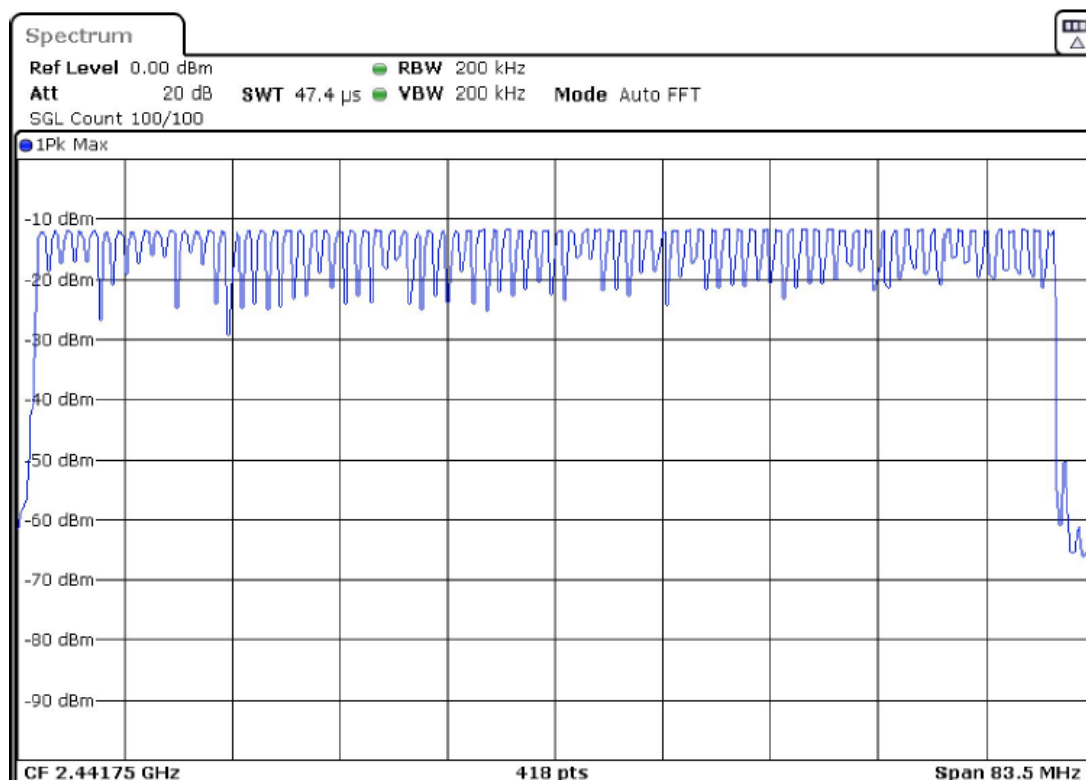
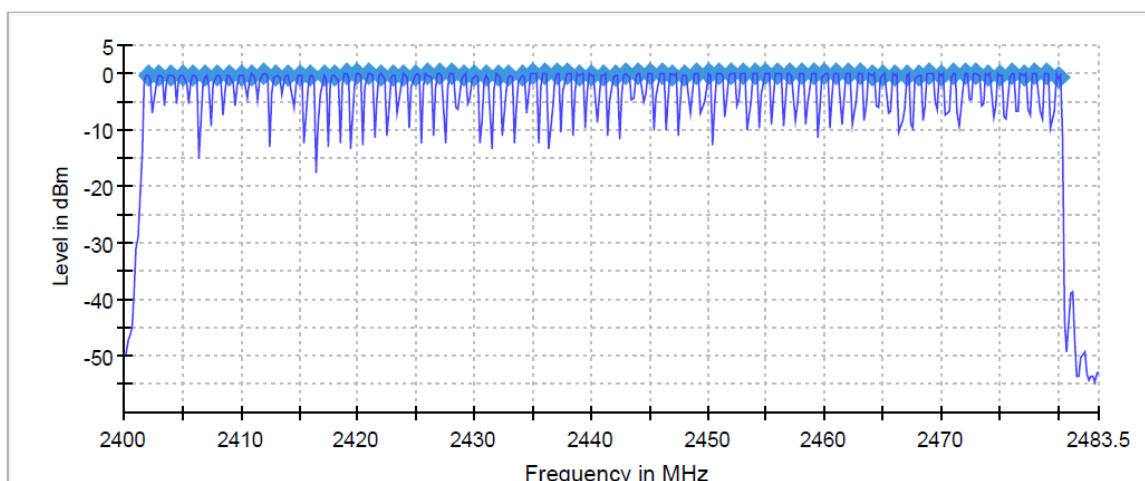


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS



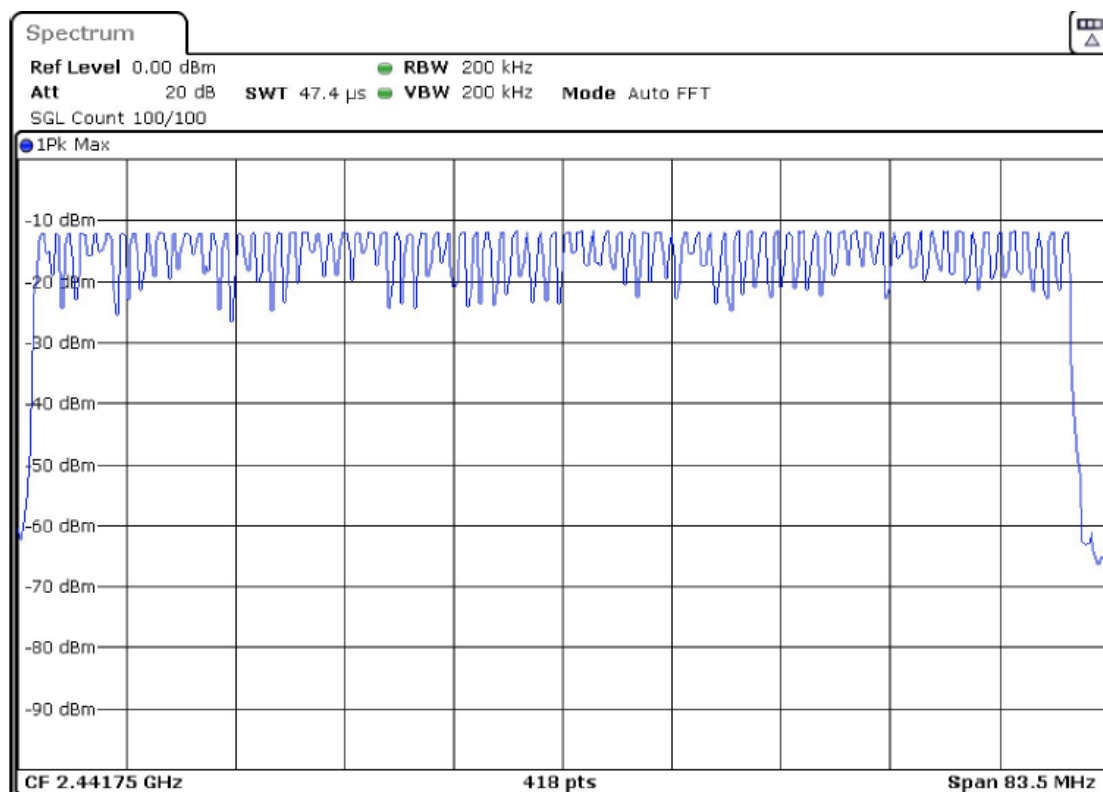
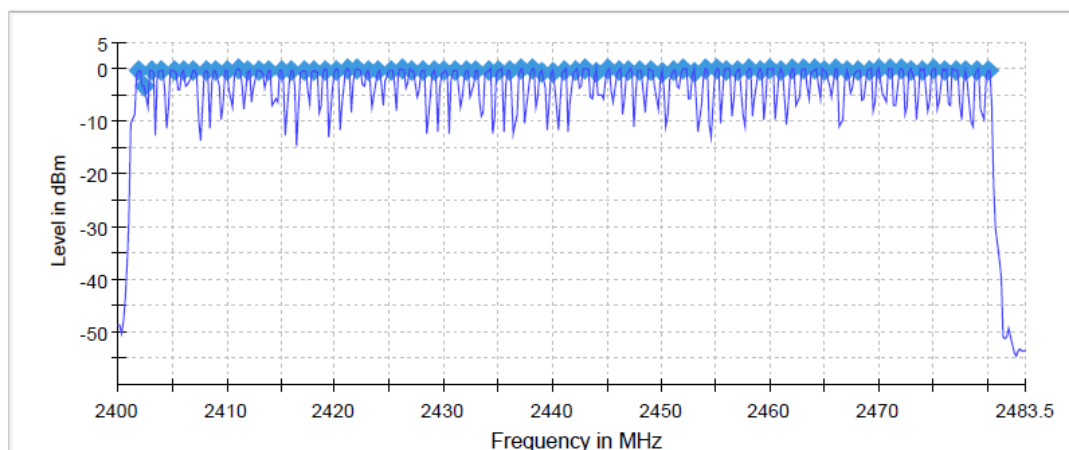
Number of Hopping Frequencies: 79

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



Number of Hopping Frequencies: 79

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS



Number of Hopping Frequencies: 79

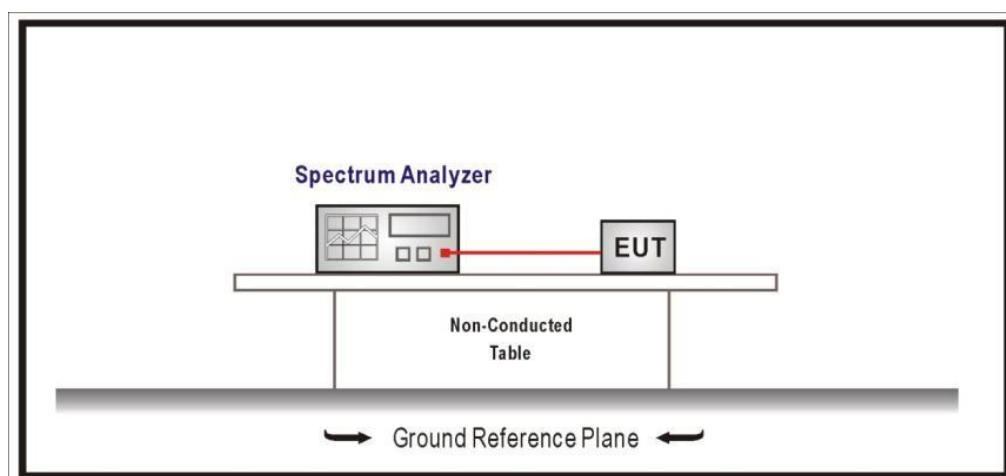
TEST A.3: TIME OF OCCUPANCY (DWELL TIME)

LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(a)(1)(iii) and RSS-247 5.1(d)

LIMITS

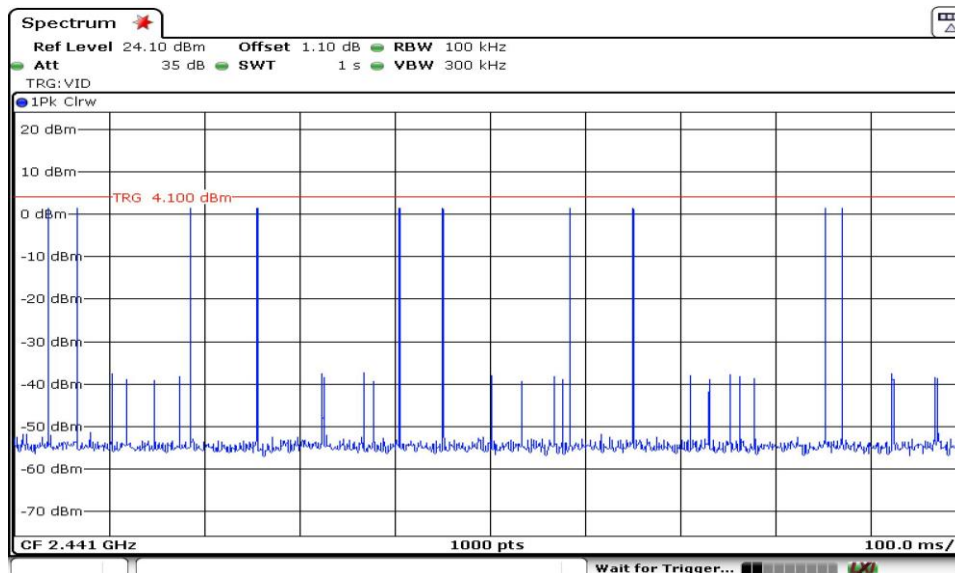
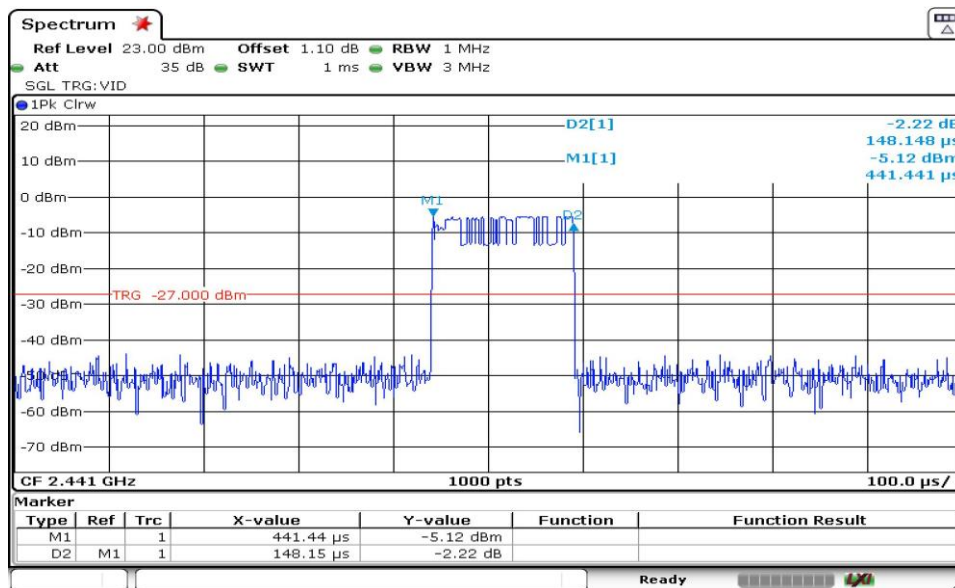
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = $0.4 \times 79 = 31.6$ seconds.

TEST SETUP:



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (GFSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE DH1

Transmit Time per Hop: 0.148 ms



Number of hops over a period of 1 seconds: 10 hops.

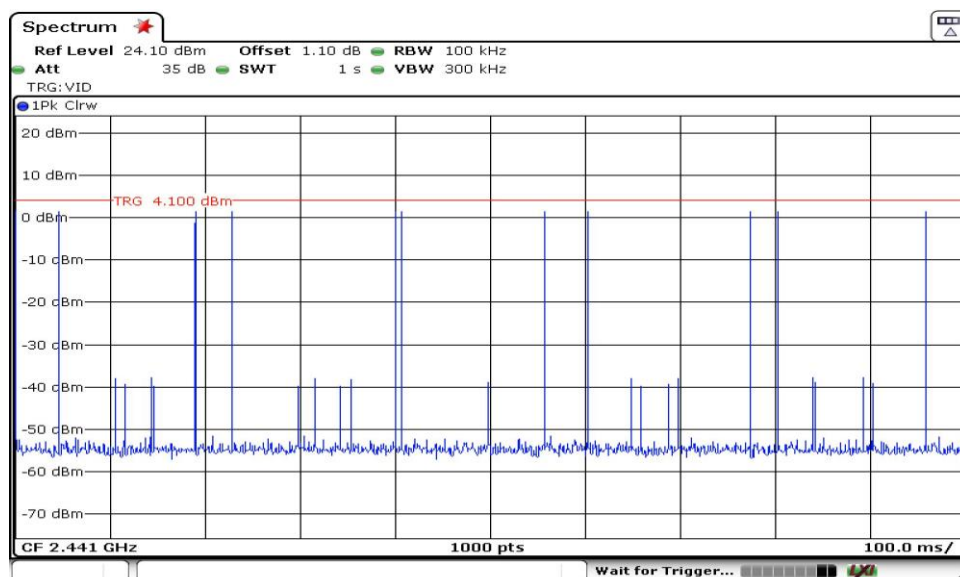
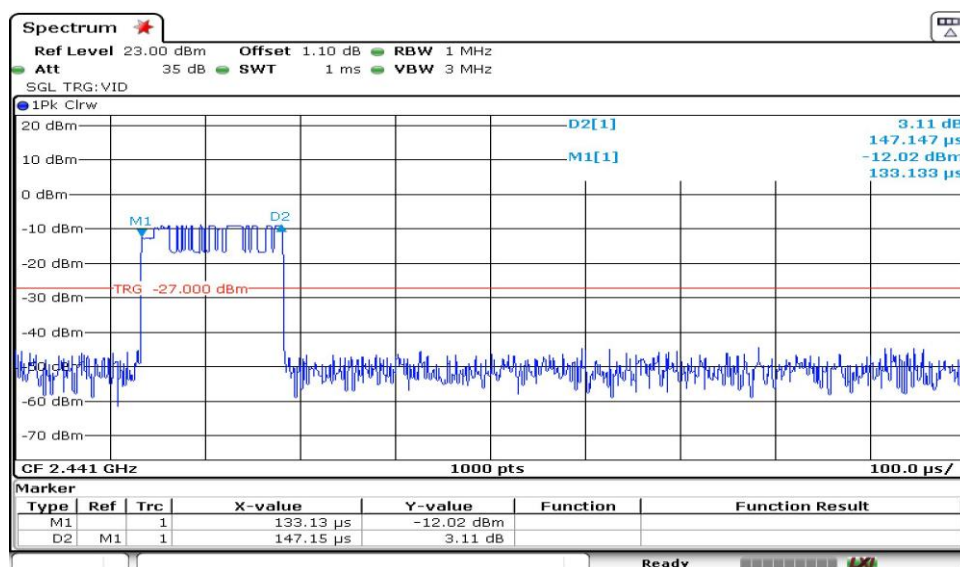
Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.

Averaging time of occupancy = 0.148ms x 316 hops = 46.76 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.12
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TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (GFSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE DH3

Transmit Time per Hop: 0.147 ms



Number of hops over a period of 1 seconds: 10 hops.

Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.

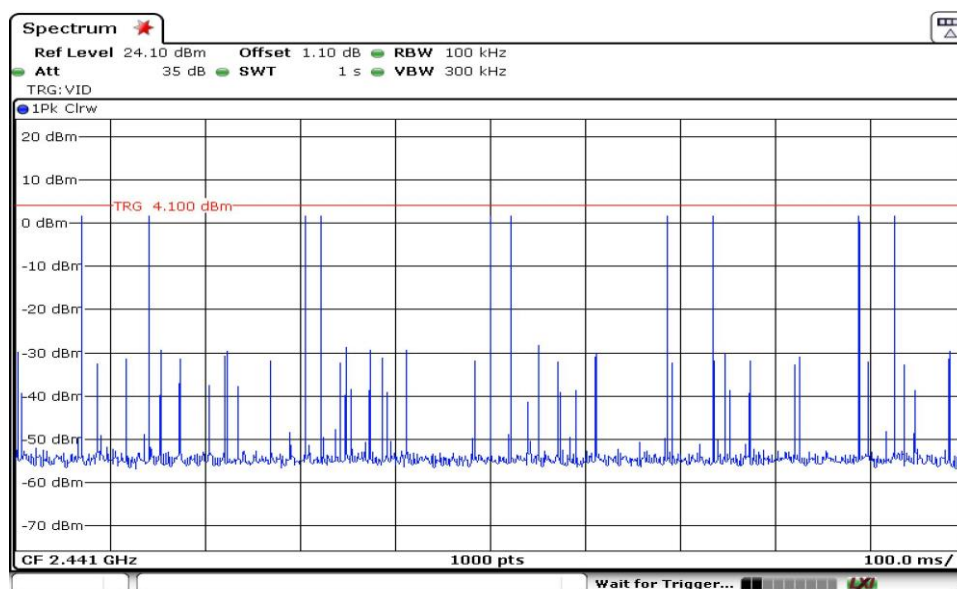
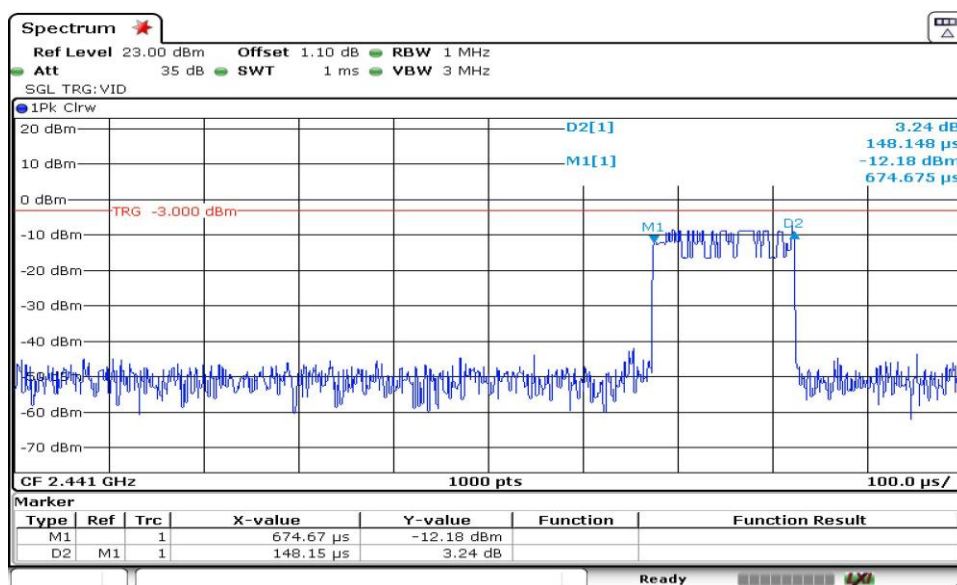
Averaging time of occupancy = 0.147 ms x 316 hops = 46.45 ms per 31.6 seconds.

Measurement uncertainty (%)

<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 2DH1

Transmit Time per Hop: 0.148 ms



Number of hops over a period of 1 seconds: 10 hops.

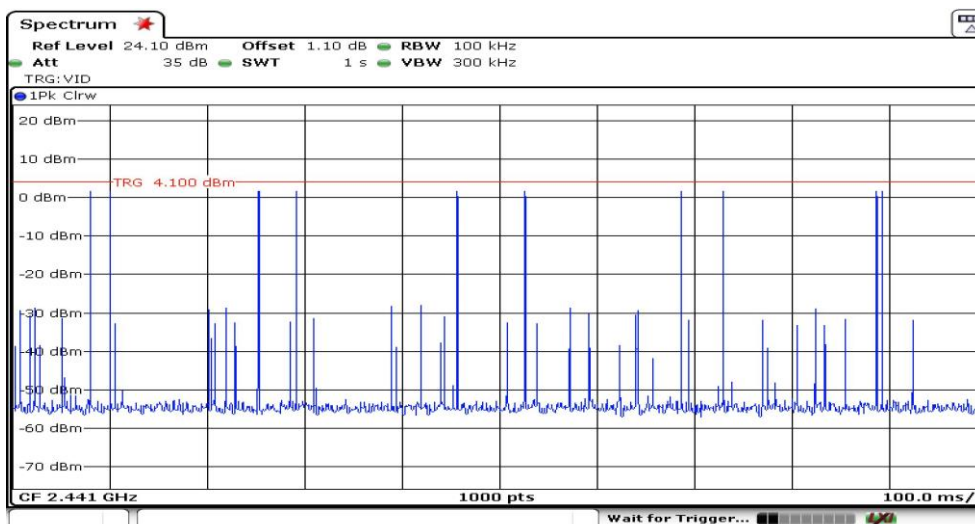
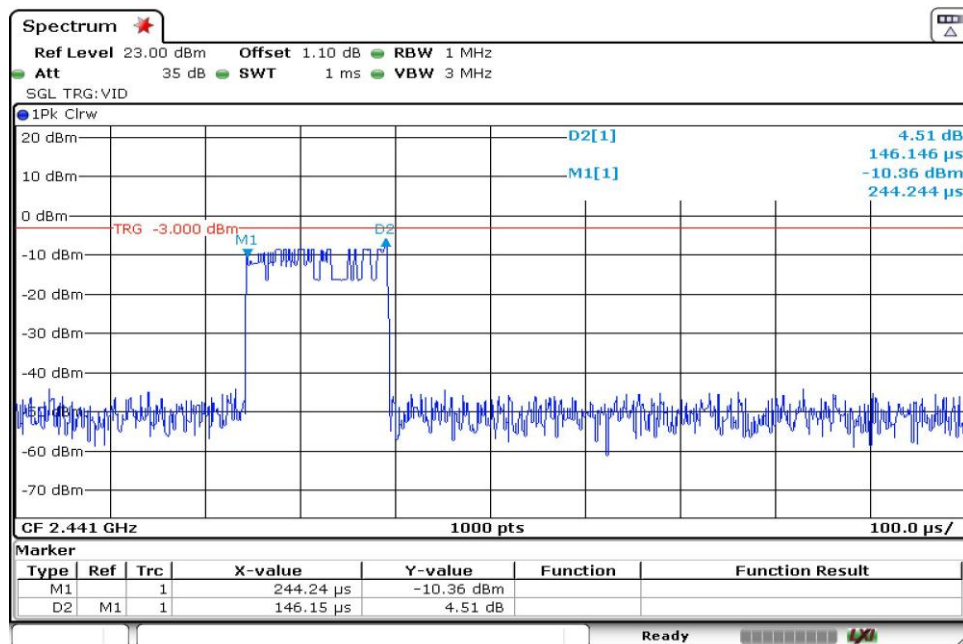
Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.

Averaging time of occupancy = 0.148 ms x 316 hops = 46.76 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.12
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TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 2DH3

Transmit Time per Hop: 0.146 ms



Number of hops over a period of 1 seconds: 10 hops.

Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.

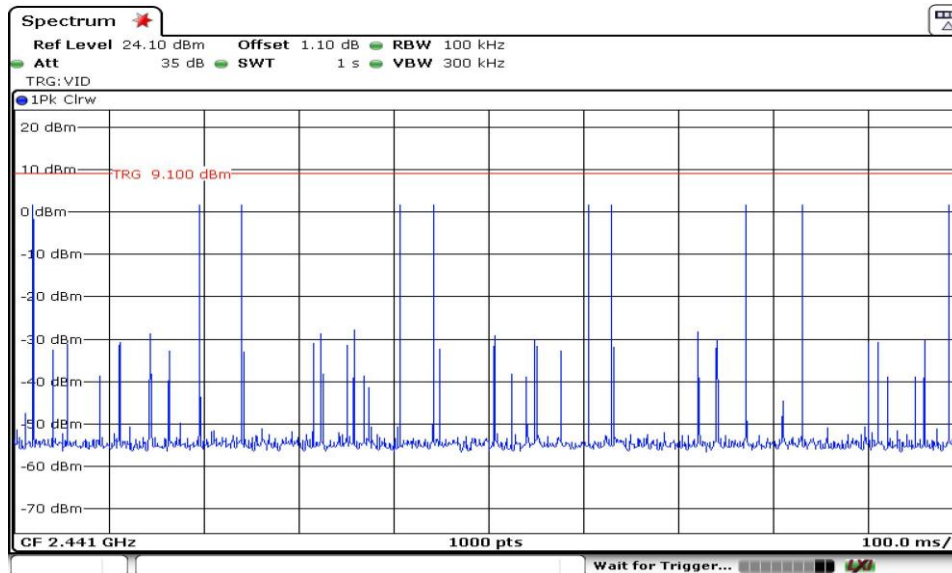
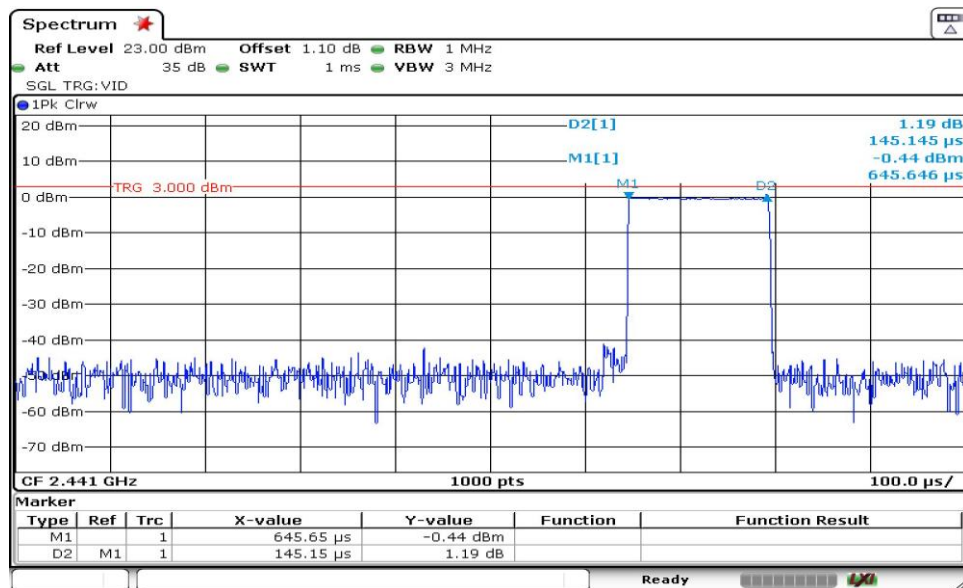
Averaging time of occupancy = 0.146 ms x 316 hops = 46.13 ms per 31.6 seconds.

Measurement uncertainty (%)

<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 2DH5

Transmit Time per Hop: 0.145 ms



Number of hops over a period of 1 seconds: 10 hops.

Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.

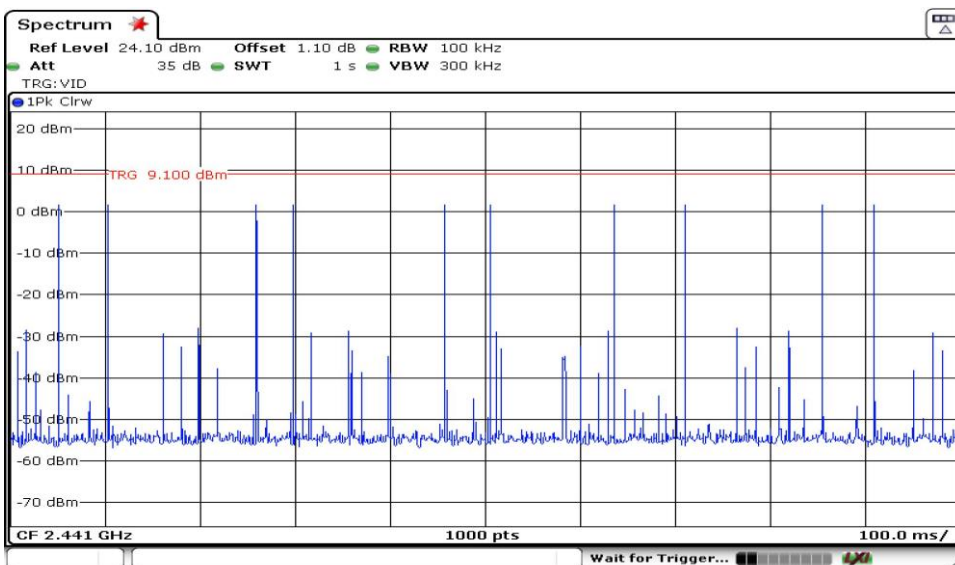
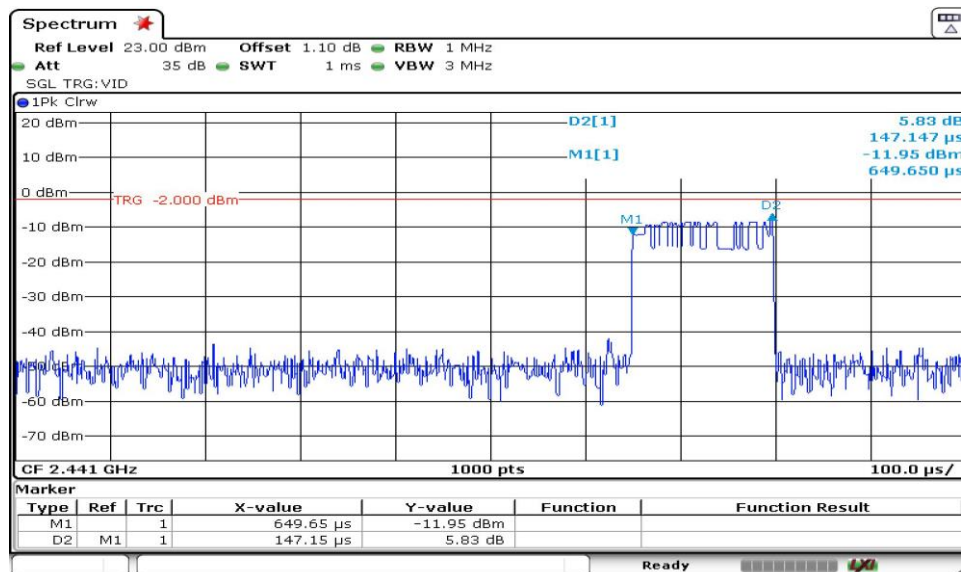
Averaging time of occupancy = 0.145 ms 316 hops = 45.82 ms per 31.6 seconds.

Measurement uncertainty (%)

<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 3DH1

Transmit Time per Hop: 0.147 ms



Number of hops over a period of 1 seconds: 10 hops.

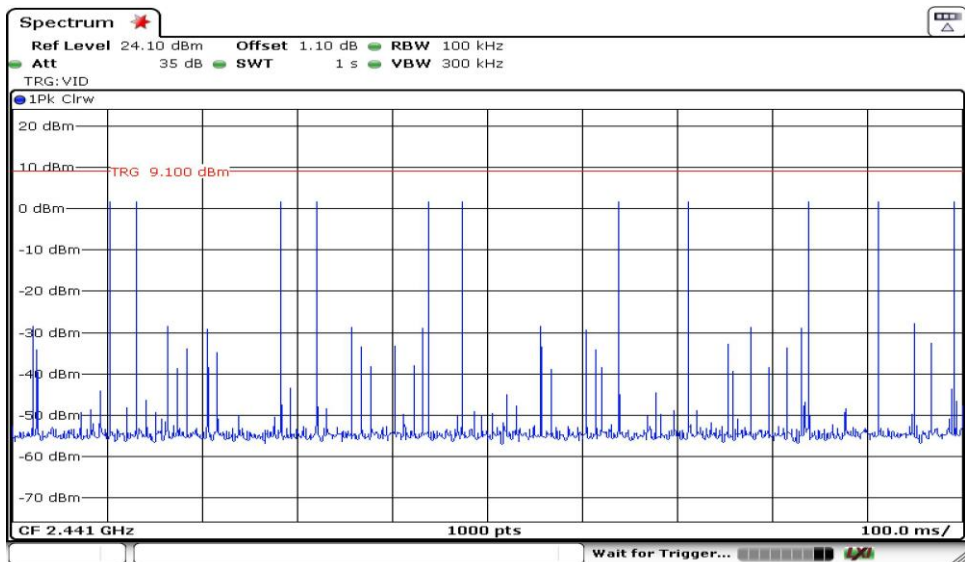
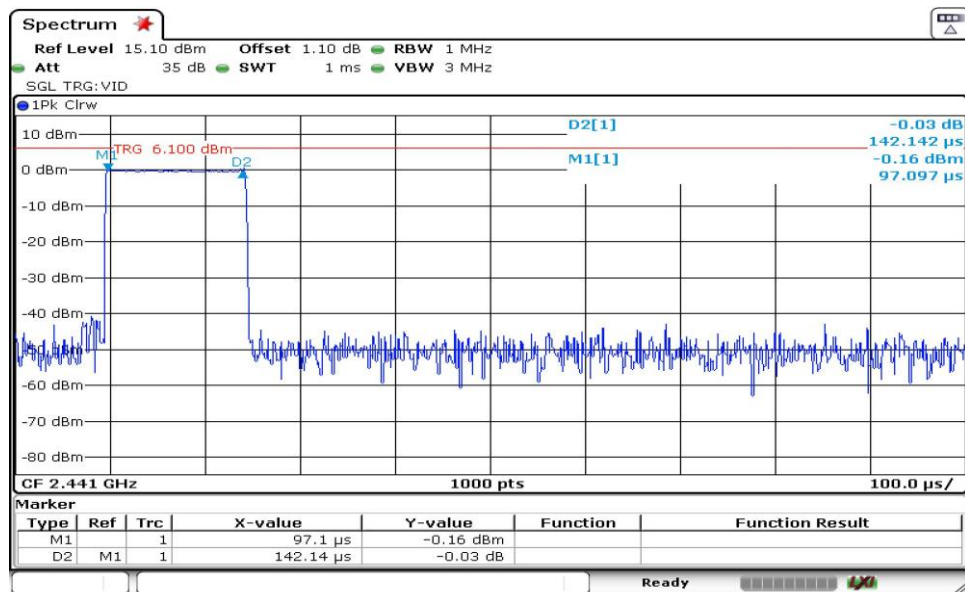
Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 1 s) = 316 hops.
Averaging time of occupancy = 0.147 ms x 316 hops = 46.45 ms per 31.6 seconds.

Measurement uncertainty (%)

<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 3DH3

Transmit Time per Hop: 0.142 ms



Number of hops over a period of 1 seconds: 11 hops.

Number of hops in the period specified in the requirements = (11 hops) x (31.6 s / 1 s) = 347.6 hops.

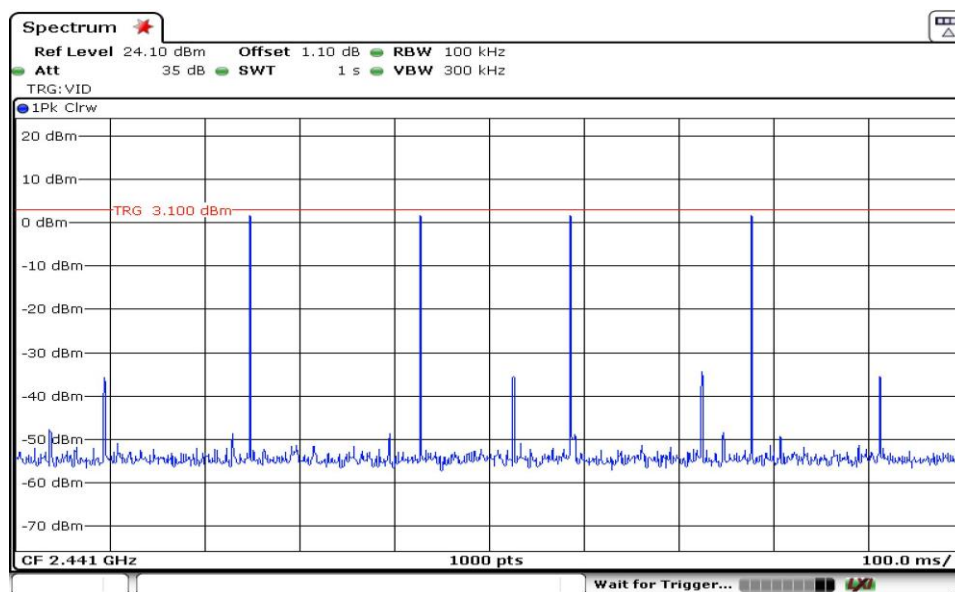
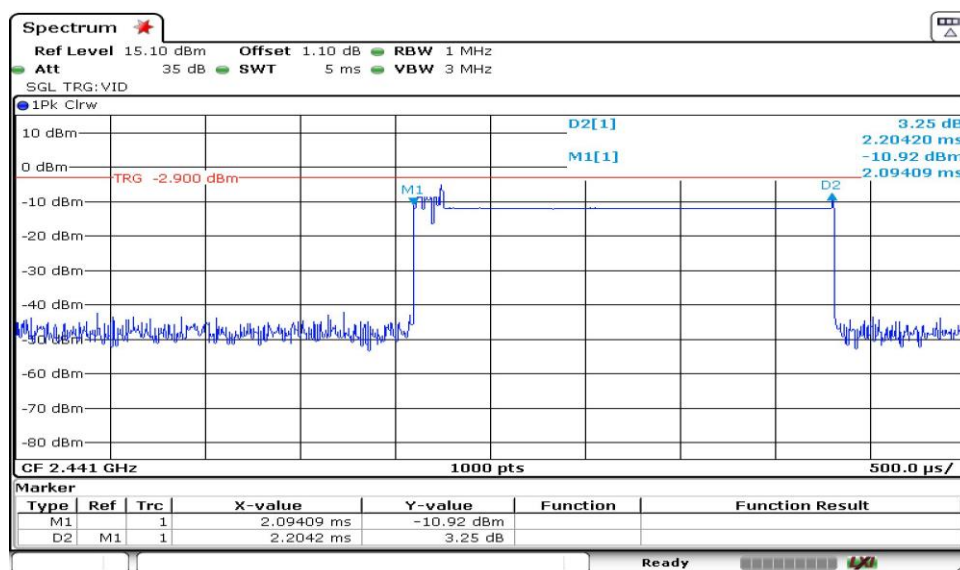
Averaging time of occupancy = 0.142 ms x 347.6 hops = 49.35 ms per 31.6 seconds.

Measurement uncertainty (%)

<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	PACKET TYPE 3DH5

Transmit Time per Hop: 2.204 ms



Number of hops over a period of 1 seconds 4 hops.

Number of hops in the period specified in the requirements = (4 hops) x (31.6 s / 1 s) = 126.4 hops.
Averaging time of occupancy = 2.204 ms x 126.4 hops = 278.58 ms per 31.6 seconds.

Measurement uncertainty (%)

< $\pm$ 0.12

TEST A.4: 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(b)

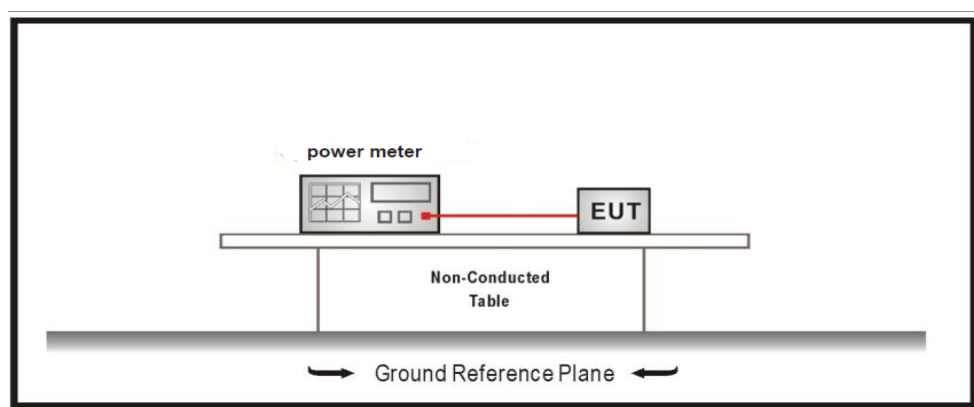
LIMITS

For Frequency Hopping systems operating in the 2400 – 2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm). (Part 15 Subpart C §15.247).

The e.i.r.p. shall not exceed 4 W (RSS-247).

TEST SETUP

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

Maximum declared antenna gain: +1 dBi

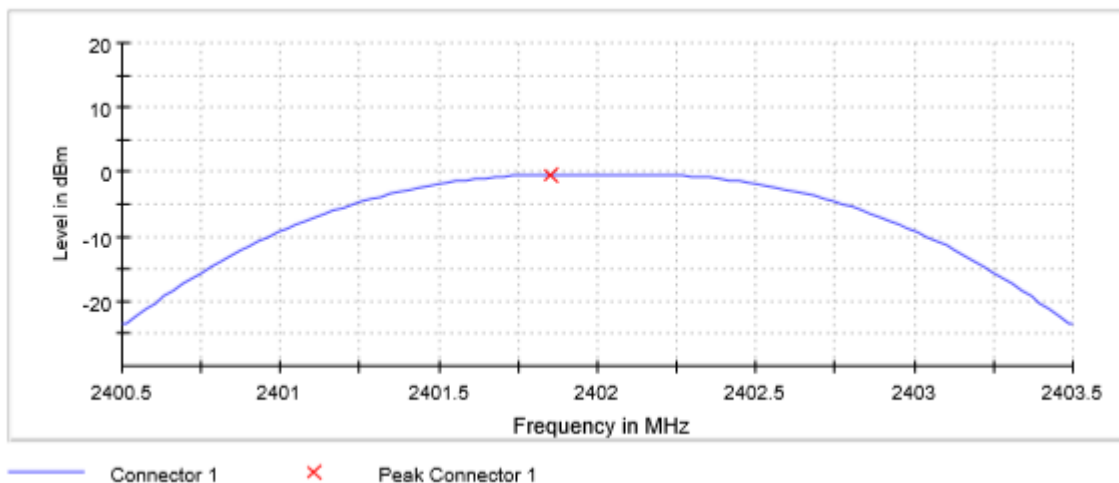
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-0.4	-0.3	-0.4
Maximum EIRP power (dBm)	0.6	0.7	0.6
Measurement uncertainty (dB)	<±0.78		

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.

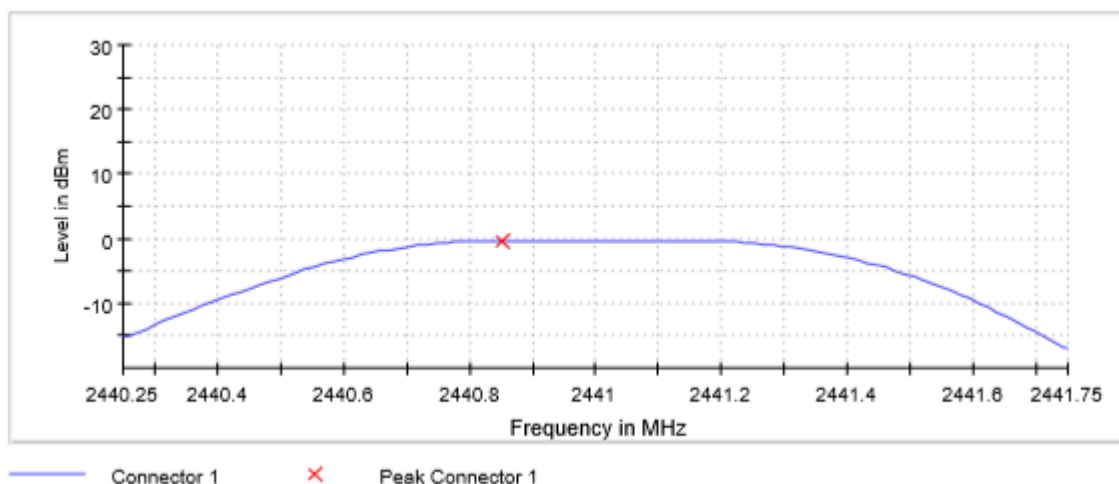
TEST RESULTS (Cont.):

CONDUCTED OUTPUT POWER

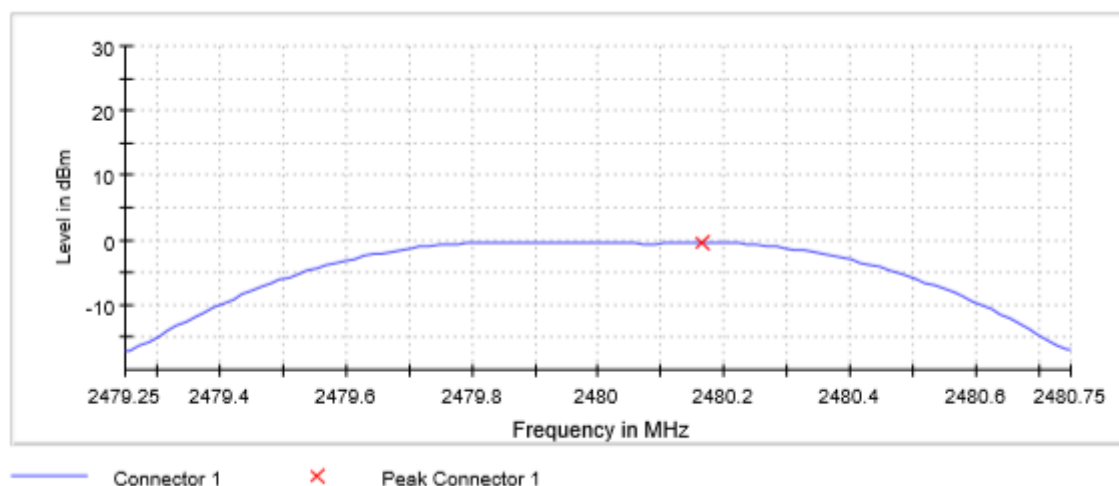
Lowest Channel



Middle Channel



Highest Channel



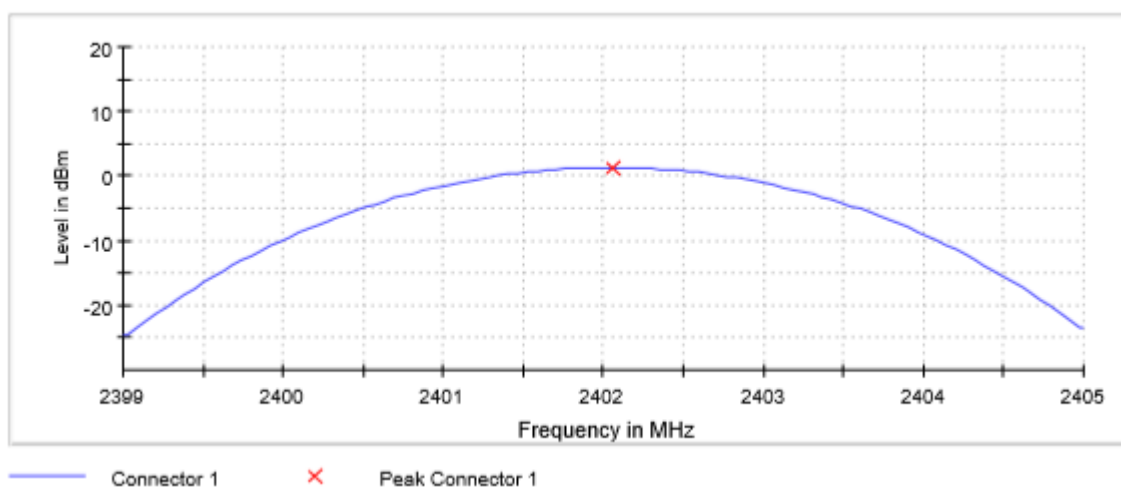
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

Maximum declared antenna gain: 1 dBi

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	1.4	0.0	1.0
Maximum EIRP power (dBm)	2.4	1.0	2.0
Measurement uncertainty (dB)	<±0.78		

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.

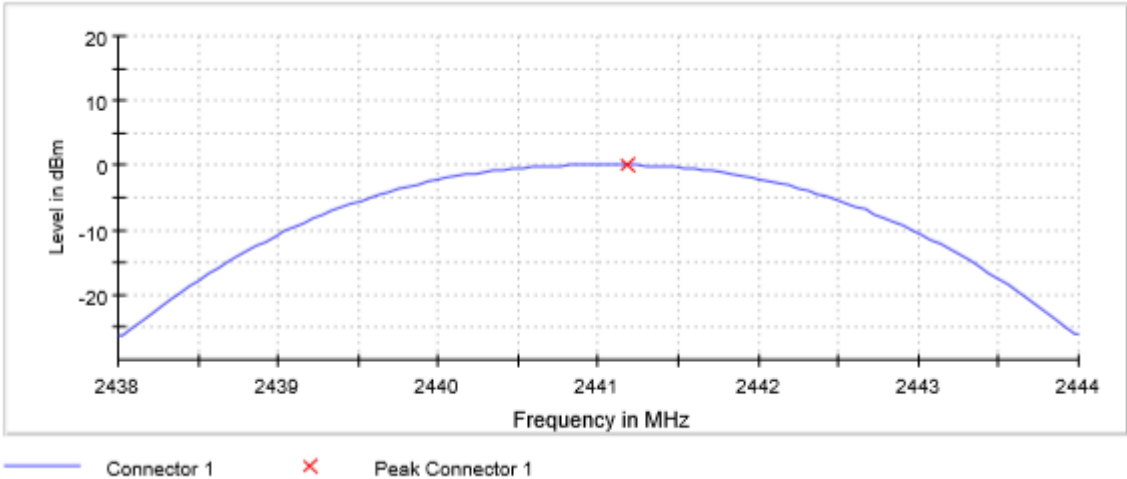
Lowest Channel



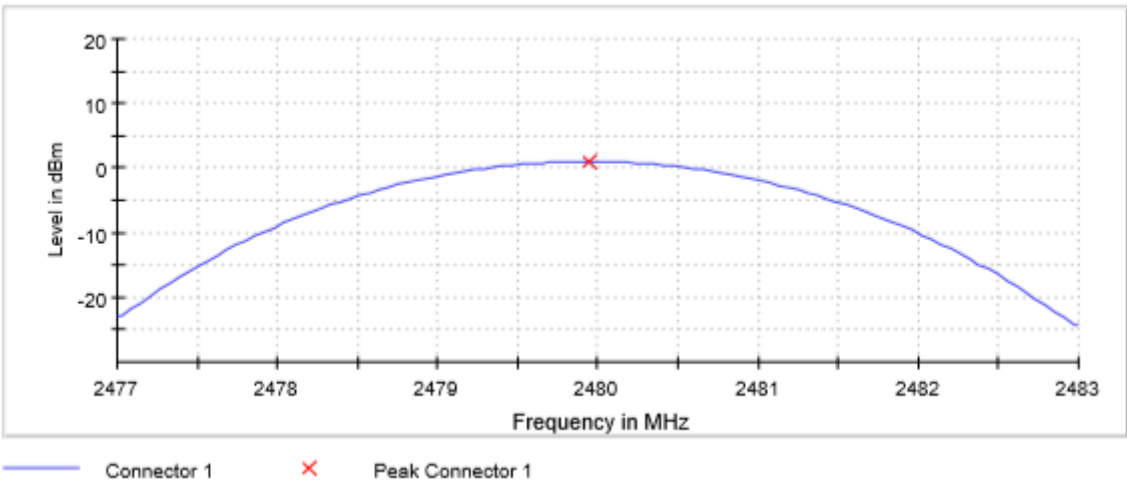
TEST RESULTS (Cont.)

CONDUCTED OUTPUT POWER

Middle Channel



Highest Channel



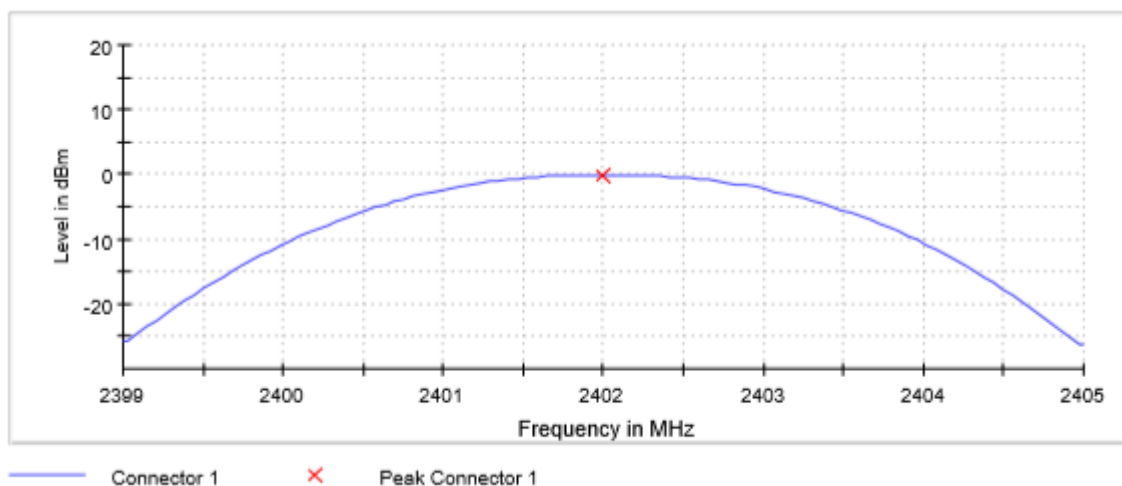
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS

Maximum declared antenna gain: 1 dBi

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-0.1	0.5	1.4
Maximum EIRP power (dBm)	0.9	1.5	2.4
Measurement uncertainty (dB)	<±0.78		

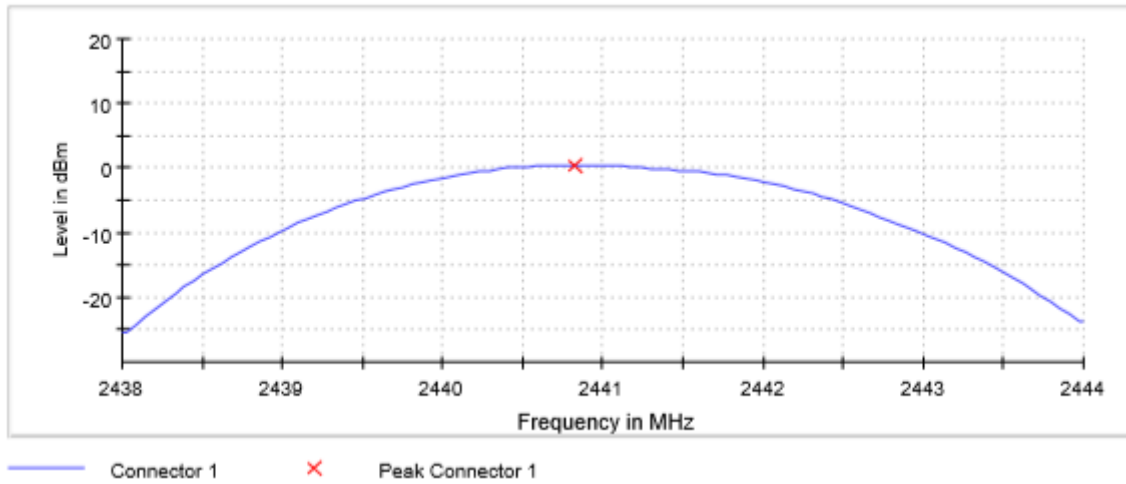
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Lowest Channel

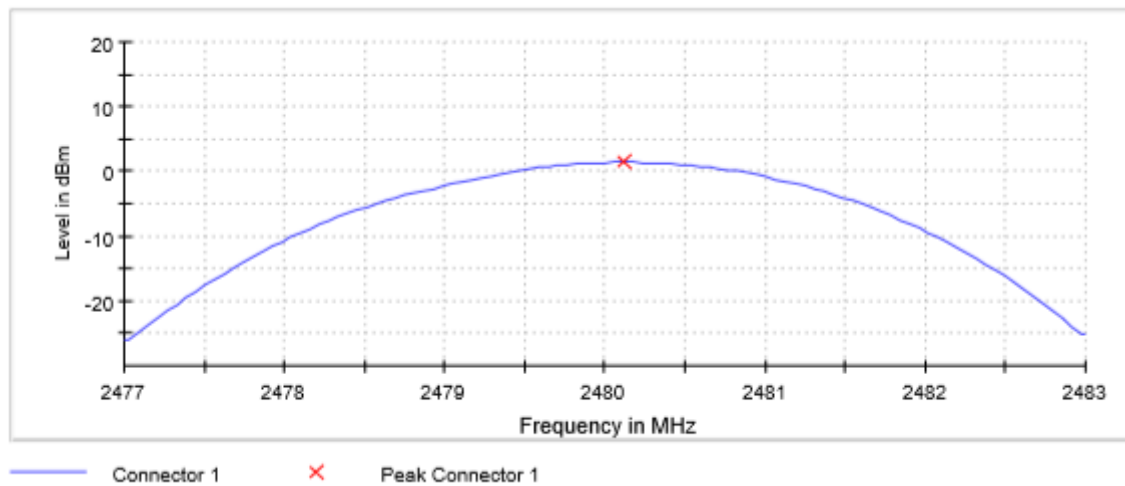


TEST RESULTS (Cont.)

Middle Channel



Highest Channel



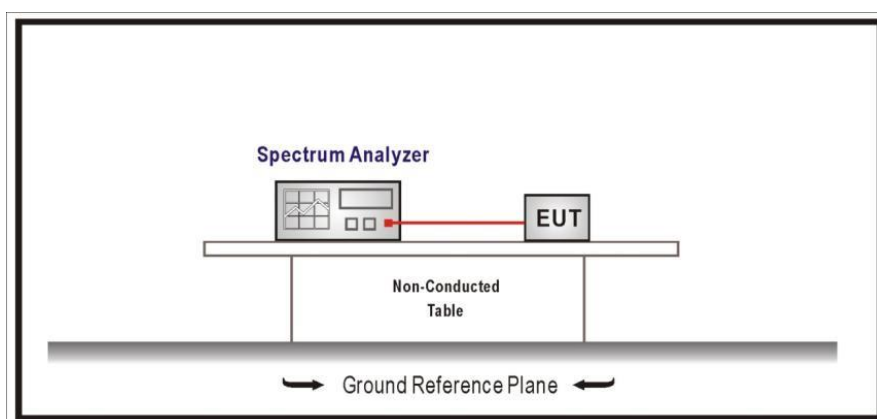
TEST A.5: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

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

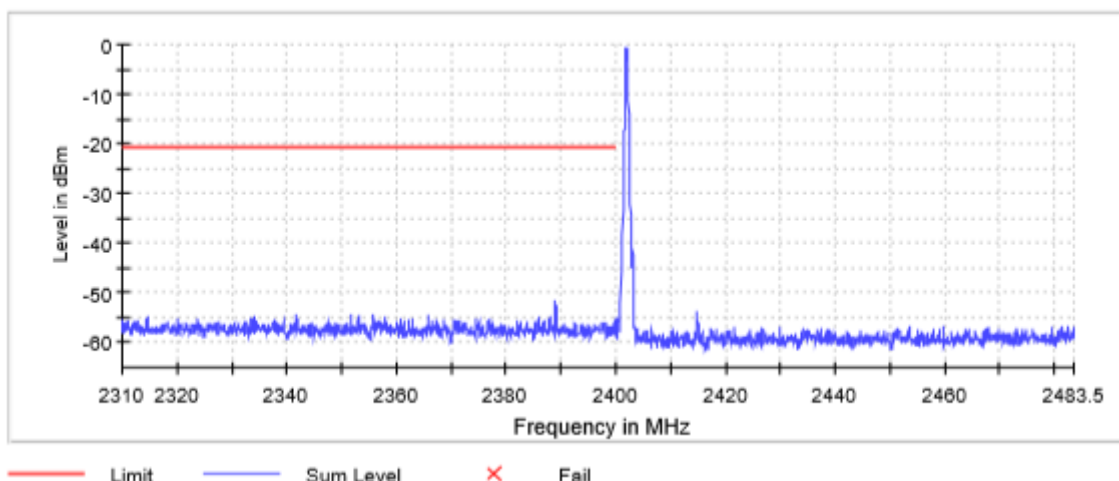
LIMITS

Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power.

TEST SETUP



TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	HOPPING OFF (Lowest channel)

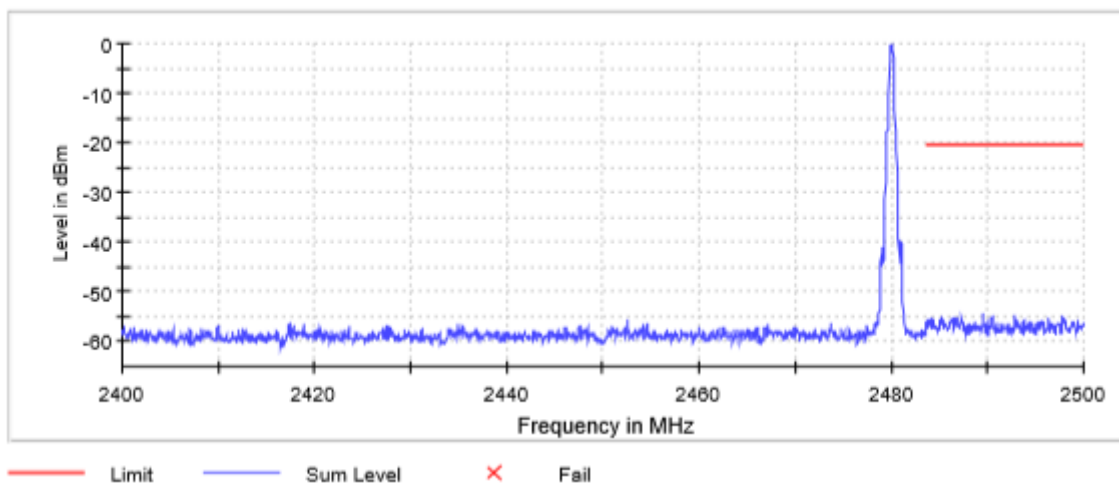


Measurement

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
Sweep Points	1800	1670
Sweep time	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.30 dB

TEST RESULTS (Cont.):

HOPPING OFF (Highest channel)

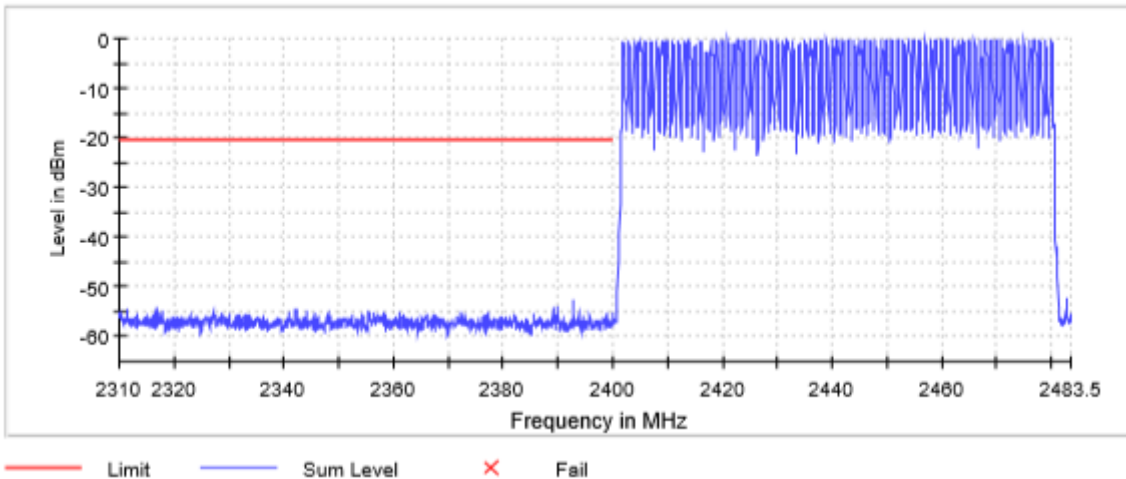


Measurement

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
Sweep Points	1670	330
Sweep time	94.727 μ s	18.945 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamp	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	7 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.03 dB	0.00 dB

TEST RESULTS (Cont.):

HOPPING ON (Lowest channel)

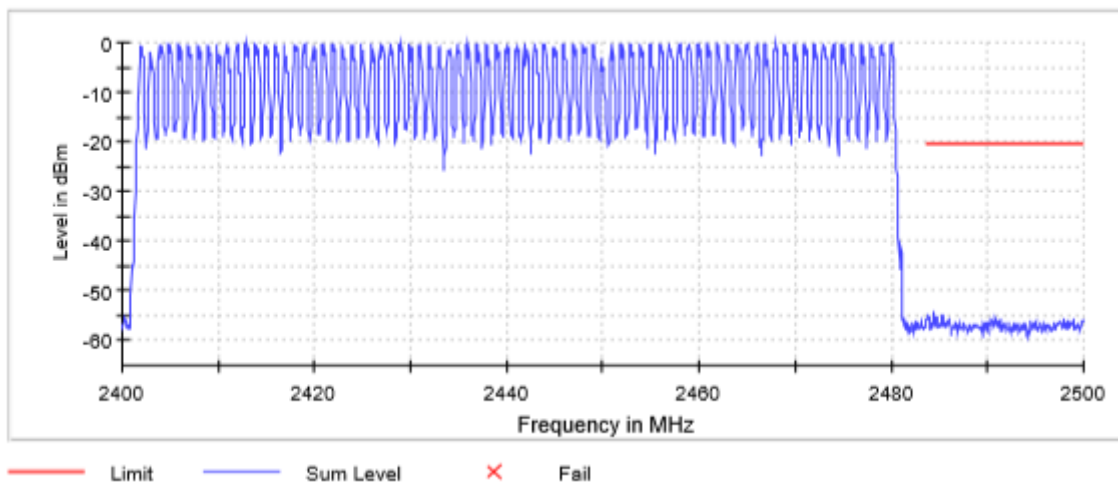


Measurement

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
Sweep Points	1800	1670
Sweep time	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamp	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	4 / max. 150	135 / max. 150
Stable	3 / 3	3/ 3
Max Stable Difference	0.00 dB	0.00 dB

TEST RESULTS (Cont.):

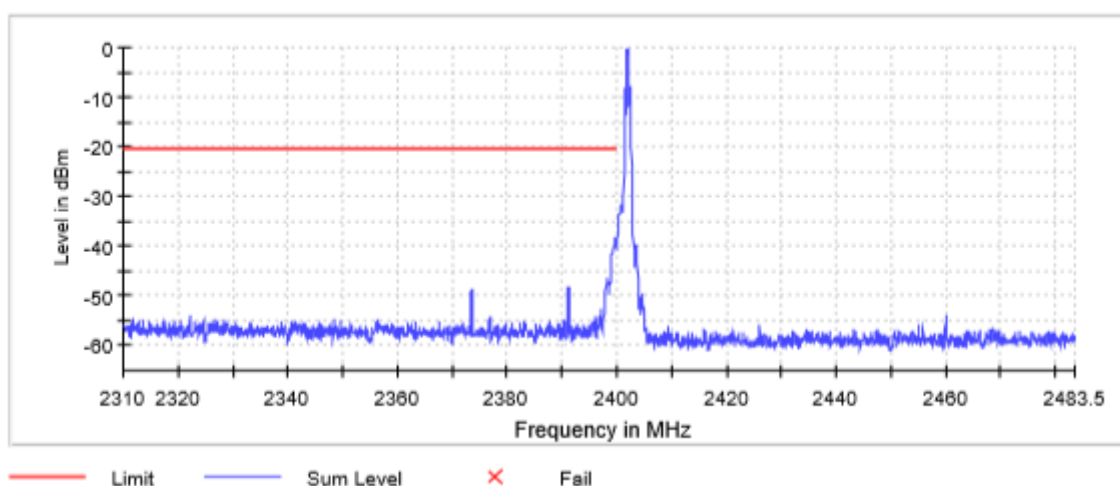
HOPPING ON (Highest channel)



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
Sweep Points	1670	330
Sweep time	94.727 μ s	18.945 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	91 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.04 dB	0.00 dB

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	HOPPING OFF (Lowest channel)

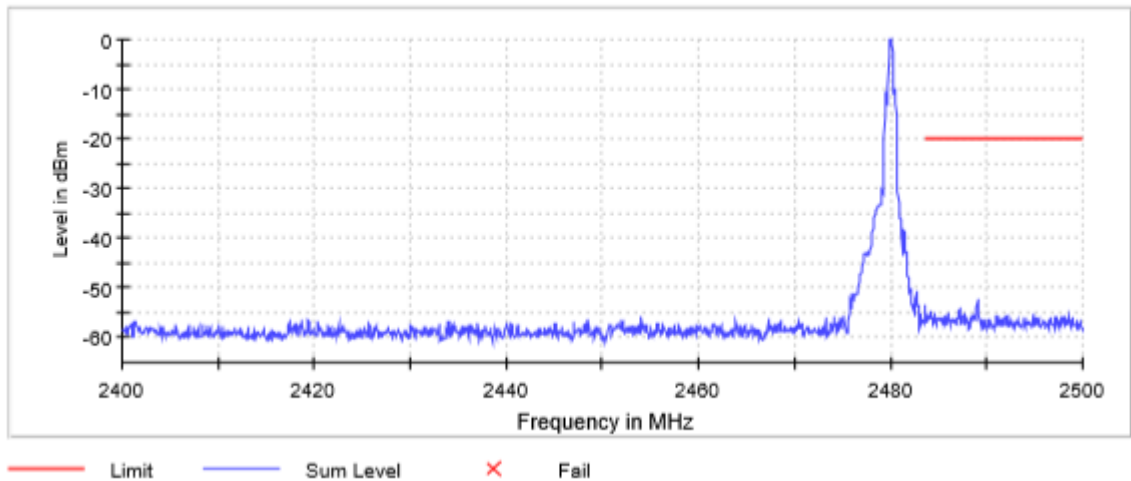


Measurement

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
Sweep Points	1800	1670
Sweep time	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	5 / max. 150	7 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.02 dB

TEST RESULTS (Cont.):

HOPPING OFF (Highest channel)



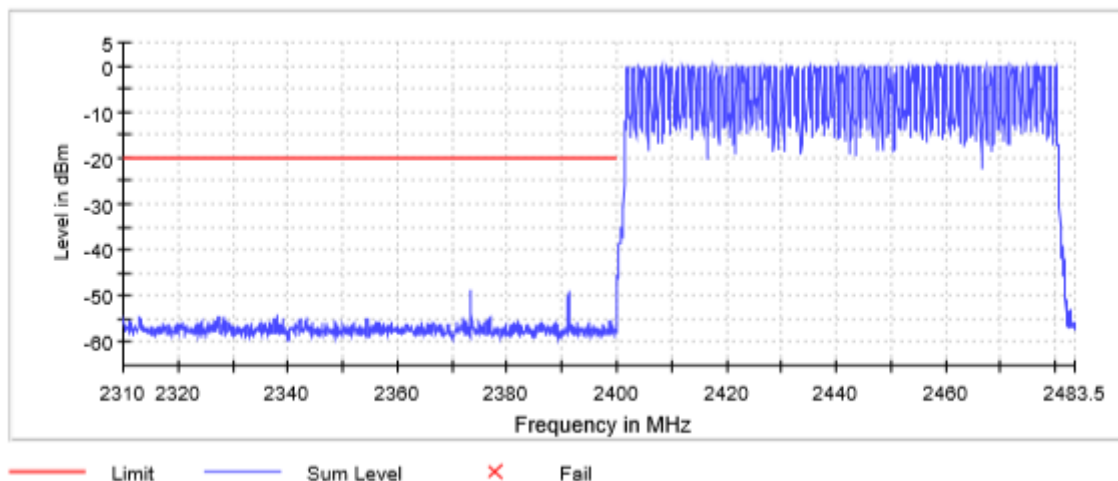
Measurement

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
Sweep Points	1670	330
Sweep time	94.727 μ s	18.945 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamp	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	7 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.21 dB	0.00 dB

TEST RESULTS (Cont.):

HOPPING ON (Lowest channel)

Lowest Channel

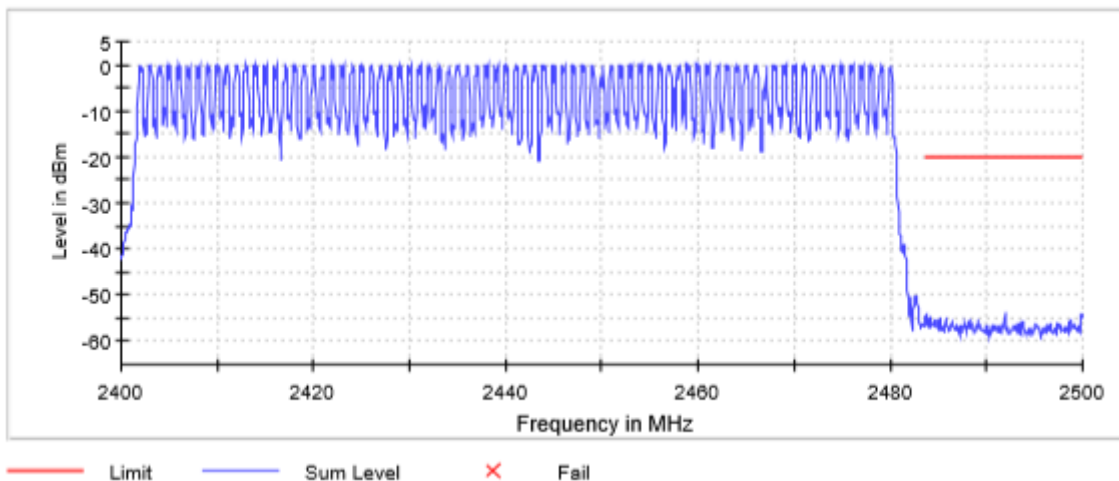


Measurement

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
Sweep Points	1800	1670
Sweep time	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	4 / max. 150	144 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 dB

TEST RESULTS (Cont.):

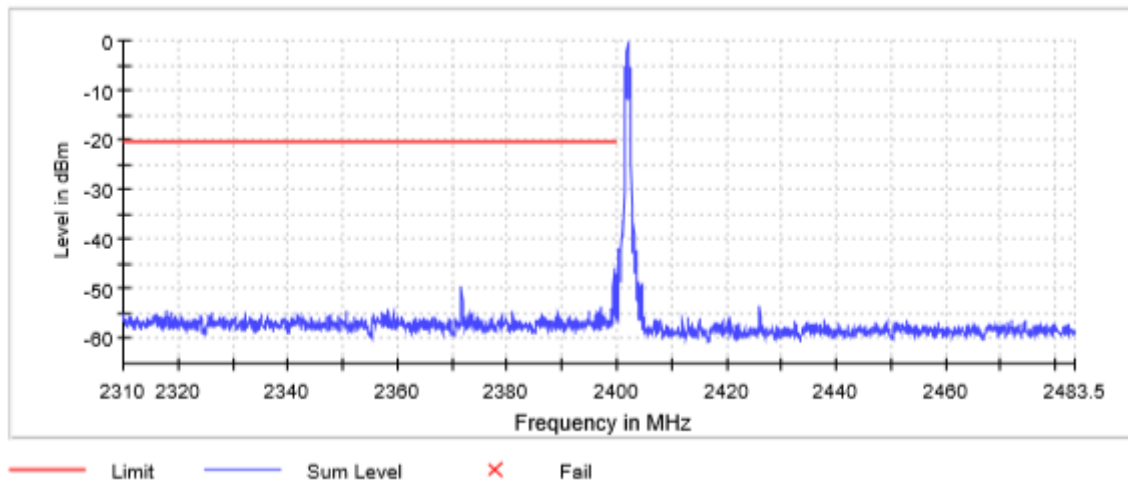
HOPPING ON (Highest channel)



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
Sweep Points	1670	330
Sweep time	94.727 μ s	18.945 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	139 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.15 dB	0.00 dB

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	HOPPING OFF (Lowest channel)

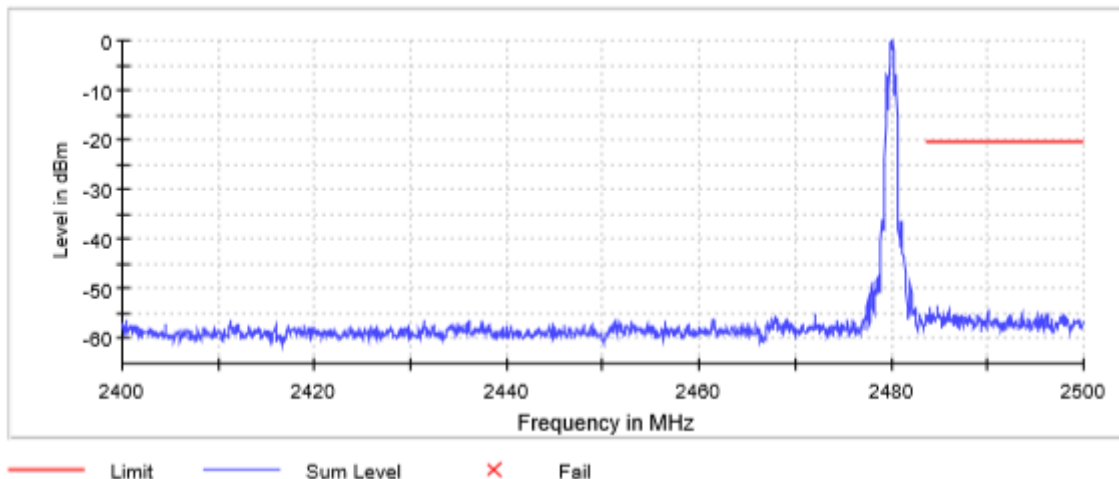


Measurement

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
Sweep Points	1800	1670
Sweep time	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	5 / max. 150	12 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.07 dB

TEST RESULTS (Cont.):

HOPPING OFF (Highest channel)

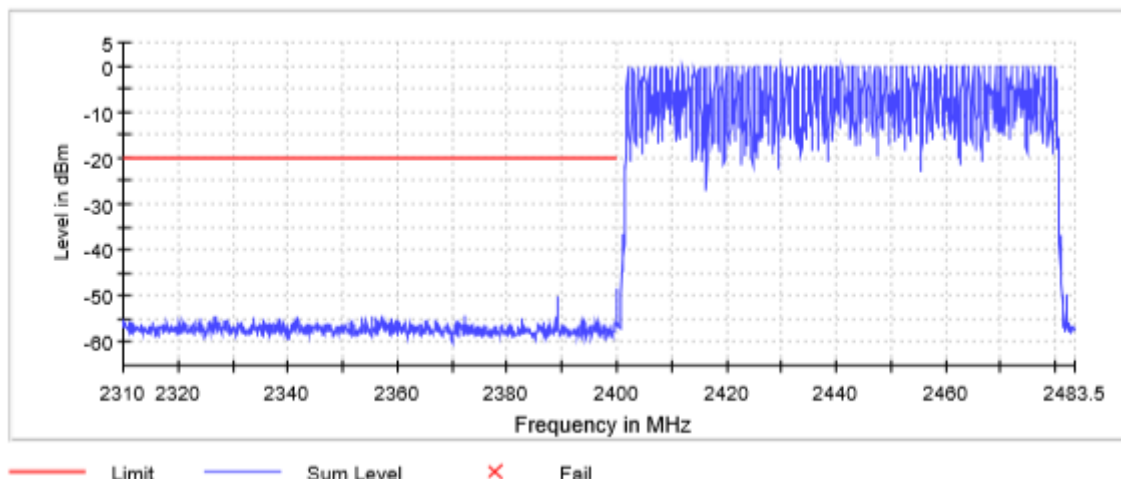


Measurement

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
Sweep Points	1670	330
Sweep time	94.727 μ s	18.945 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	9 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.15 dB	0.00 dB

TEST RESULTS (Cont.):

HOPPING ON (Lowest channel)

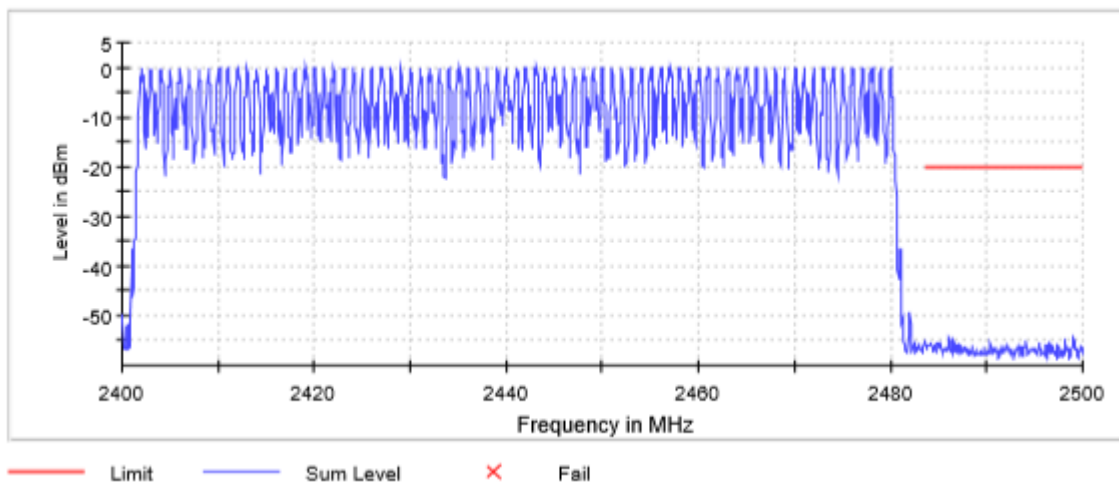


Measurement

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
Sweep Points	1800	1670
Sweep time	113.672 μ s	94.727 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamp	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	4 / max. 150	119 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.47 dB

TEST RESULTS (Cont.):

HOPPING ON (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
Sweep Points	1670	330
Sweep time	94.727 μ s	18.945 μ s
Reference Level	0.000 dBm	0.000 dBm
Attenuation	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak
Sweep Count	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamplifier	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	130 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 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-247 5.5

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 3 m for the frequency range 30-1000 MHz (Bilog antenna) and at 1m for the frequency range 1-26 GHz (1 GHz-18 GHz and 18 GHz-26 GHz Double ridge horn antennas).

For radiated emissions in the range 1-26 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.

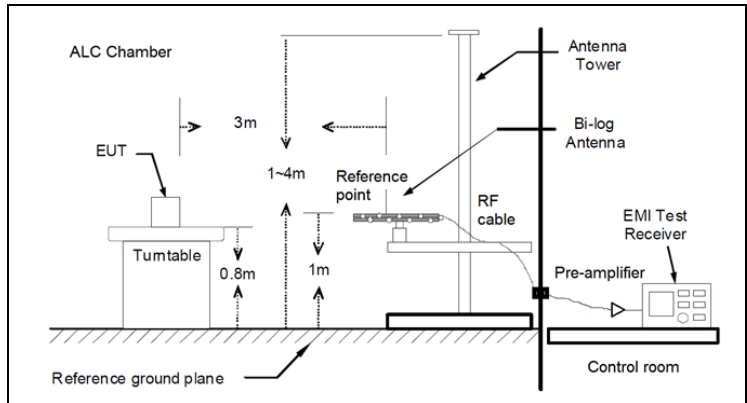
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

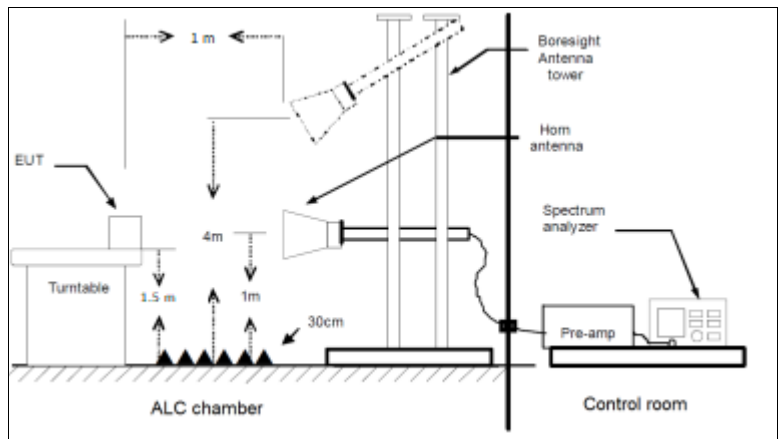
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)

Radiated measurements Setup $f < 1$ GHz



Radiated measurements setup $f > 1$ GHz



TESTED SAMPLES:

S/02

TESTED CONDITIONS MODES:

TC#01 (GFSK)

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 results in the following plots and tables show the maximum measured levels in the 30-1000 MHz range.

Frequency range 1 GHz – 26 GHz

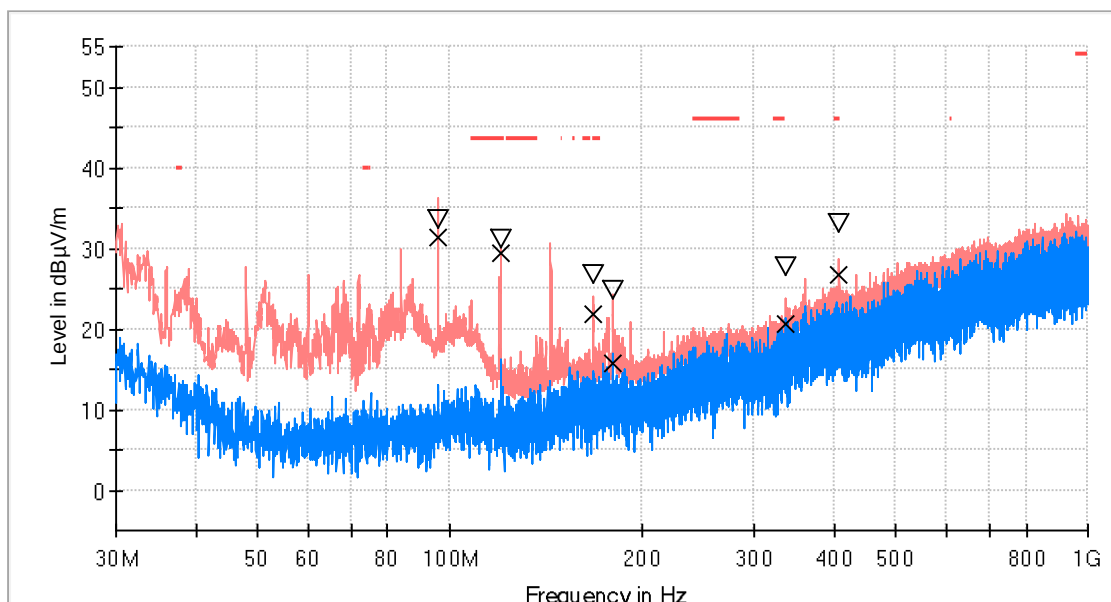
The results in the following plots and tables show the maximum measured levels in the 1-26 GHz range including the restricted bands 2.31 - 2.39 GHz and 2.4835 - 2.5 GHz.

TEST RESULTS (Cont.):

30 MHz – 1000 MHz (GFSK)

CHANNEL: Middle (2440 MHz).

RF_FCC15.247_E Field_30MHz_1GHz



- PK+_MAXH
- PK+_CLRWR
- TX limits to Spurious Emission FCC15.247 (30MHz to 1GHz) Restricted Bands QPK Limit
- ▽ MaxPeak-PK+ (Single)
- x QuasiPeak-QPK (Single)

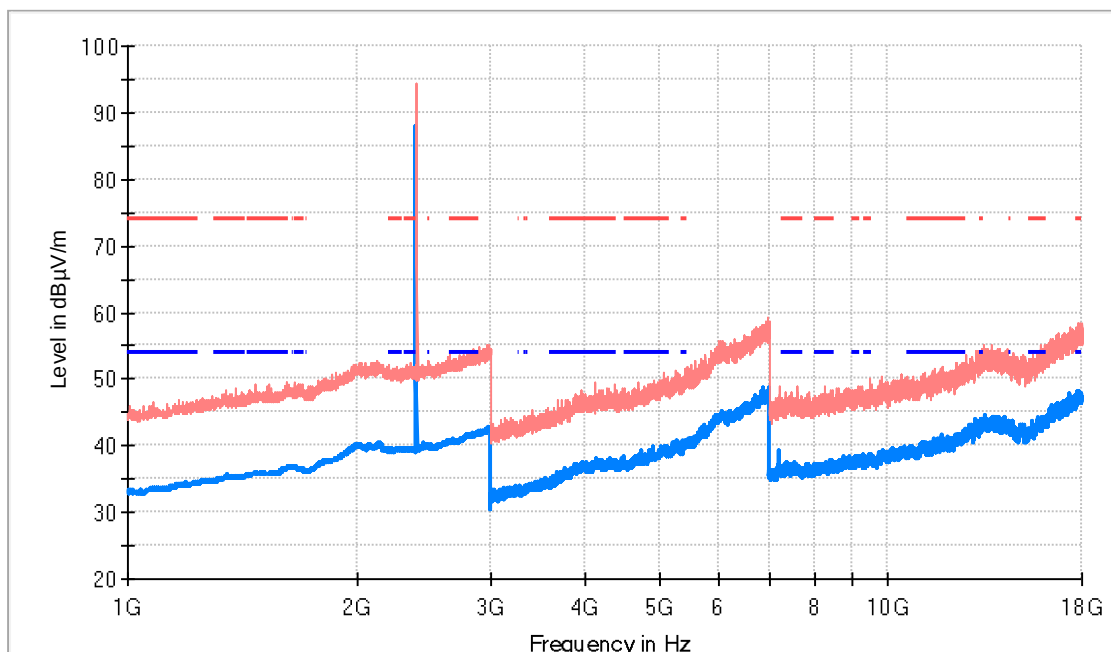
Maximizations

Frequency (MHz)	MaxPeak (dBμV/m)	QuasiPeak (dBμV/m)	Pol	Azimuth (deg)
95.960000	33.5	31.4	V	-180.0
120.016000	31.2	29.4	V	70.0
168.031000	26.8	21.9	V	16.0
179.962000	24.8	15.8	H	67.0
336.035000	27.7	20.6	H	180.0
408.057500	33.1	26.6	V	-20.0

TEST RESULTS (Cont.)

1 GHz – 18 GHz (GFSK)

CHANNEL: Lowest (2402 MHz).



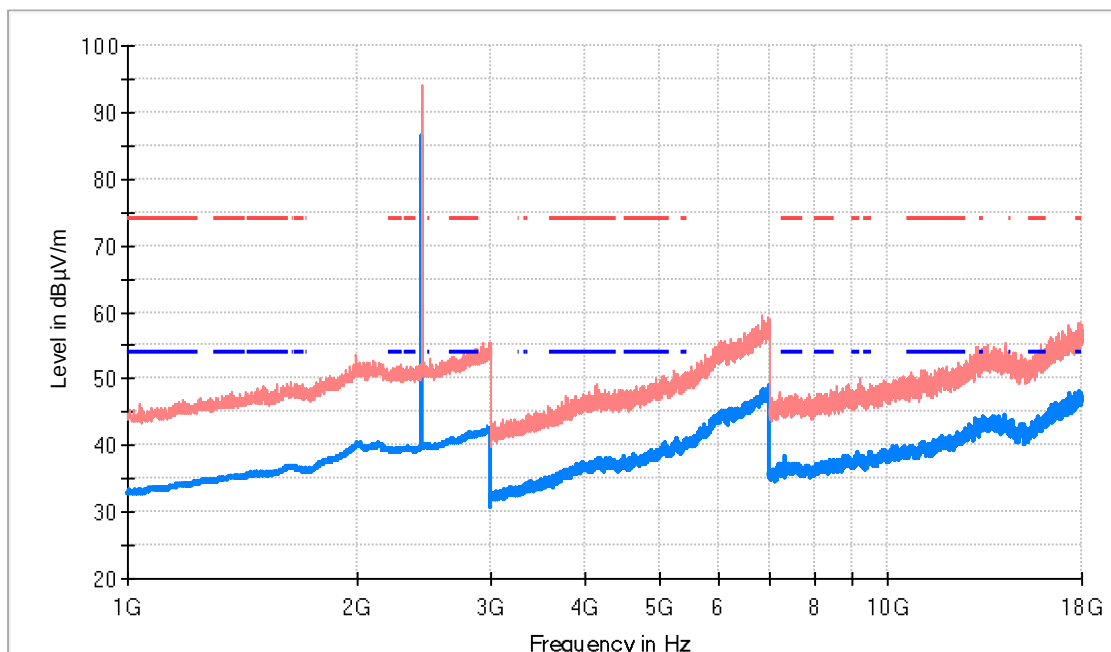
- AVG_MAXH
- PK+ MAXH
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+ MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comment
2402.000000	93.6	88.0	H	Fundamental
7206.000000	46.3	39.3	V	

TEST RESULTS (Cont.)

CHANNEL: Middle (2440 MHz).



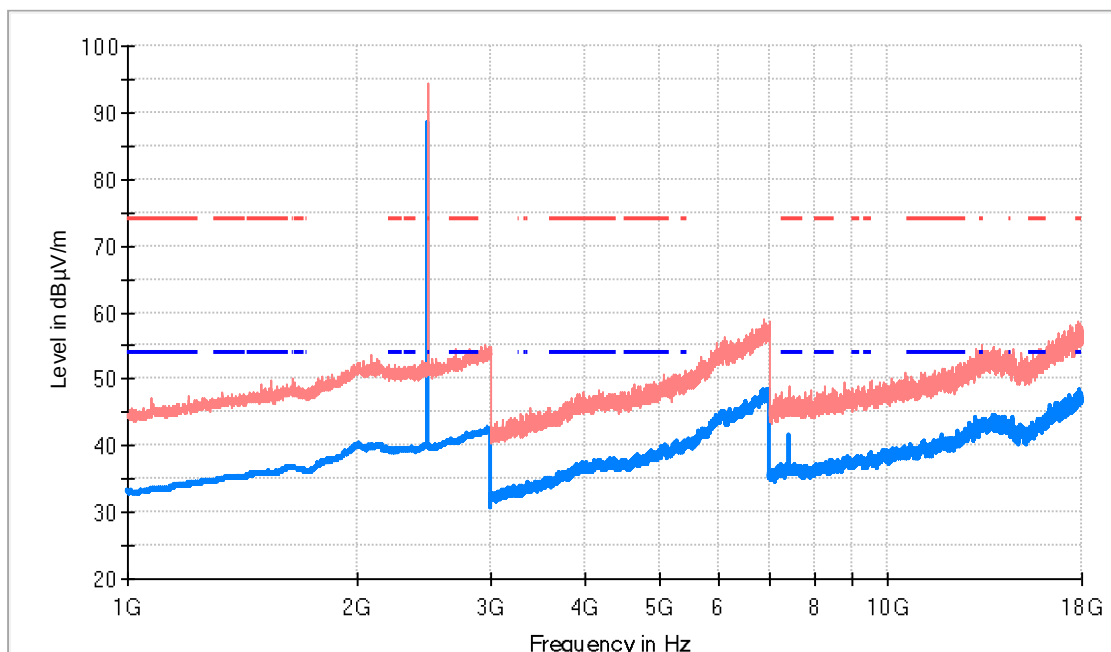
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2440.000000	94.1	86.6	H	Fundamental
7319.500000	45.4	38.2	H	

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

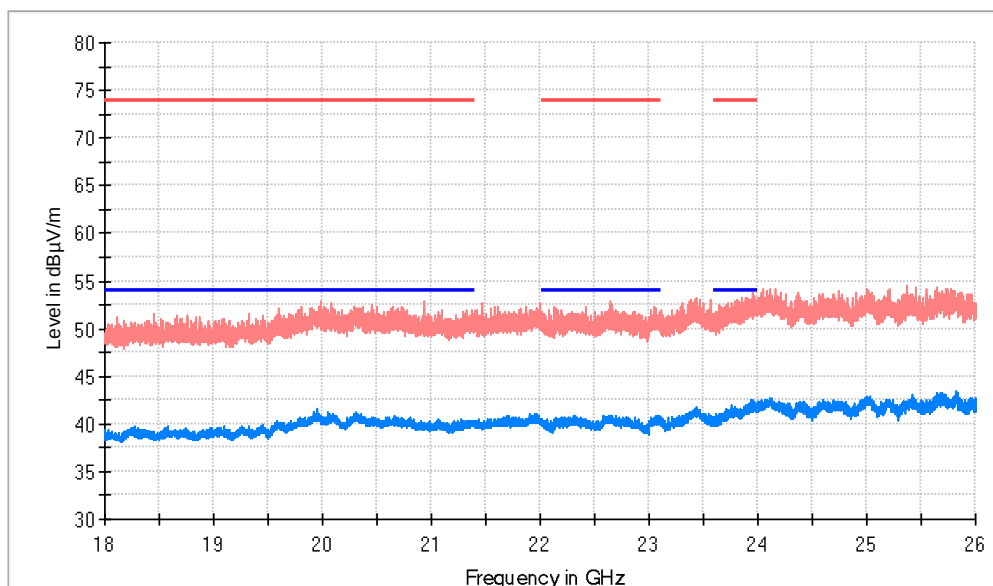
Maximizations

Frequency (MHz)	PK+ MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comment
2480.000000	94.3	88.5	H	Fundamental
7440.500000	48.2	41.5	V	

TEST RESULTS (Cont.)

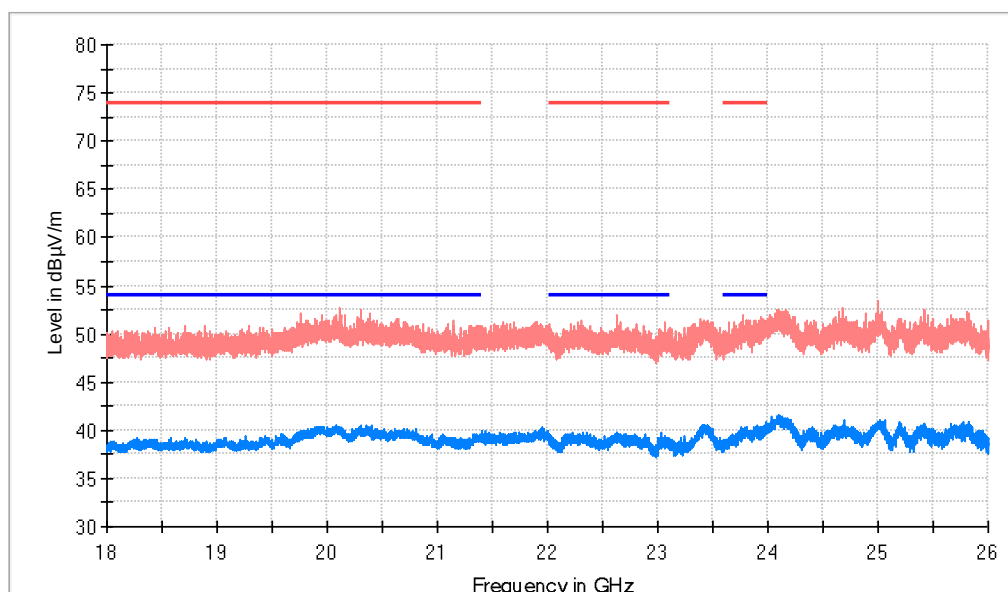
18 GHz – 26 GHz (GFSK)

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

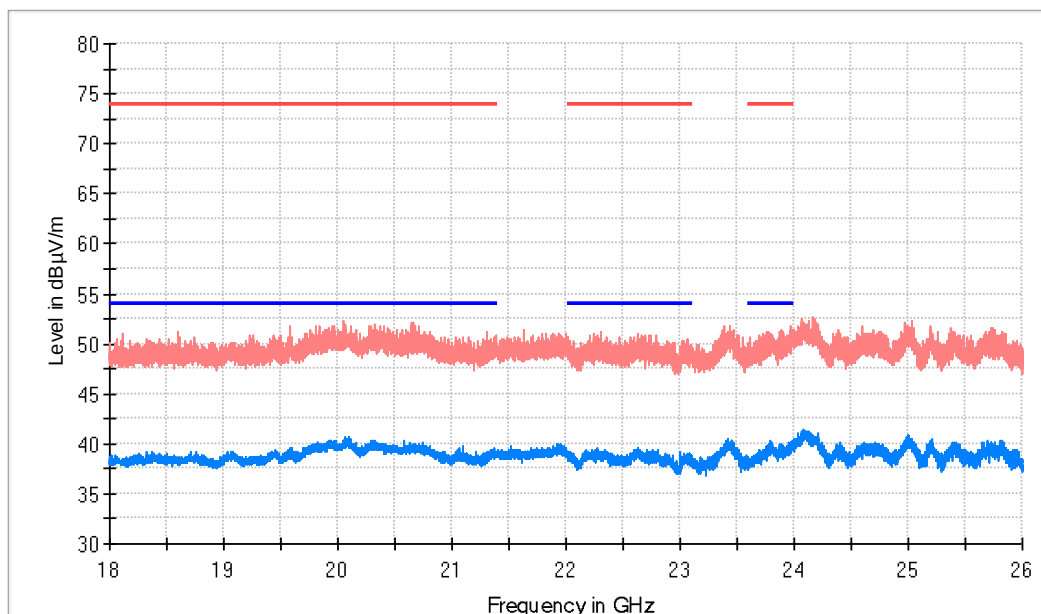
CHANNEL: Middle (2440 MHz).



- 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).

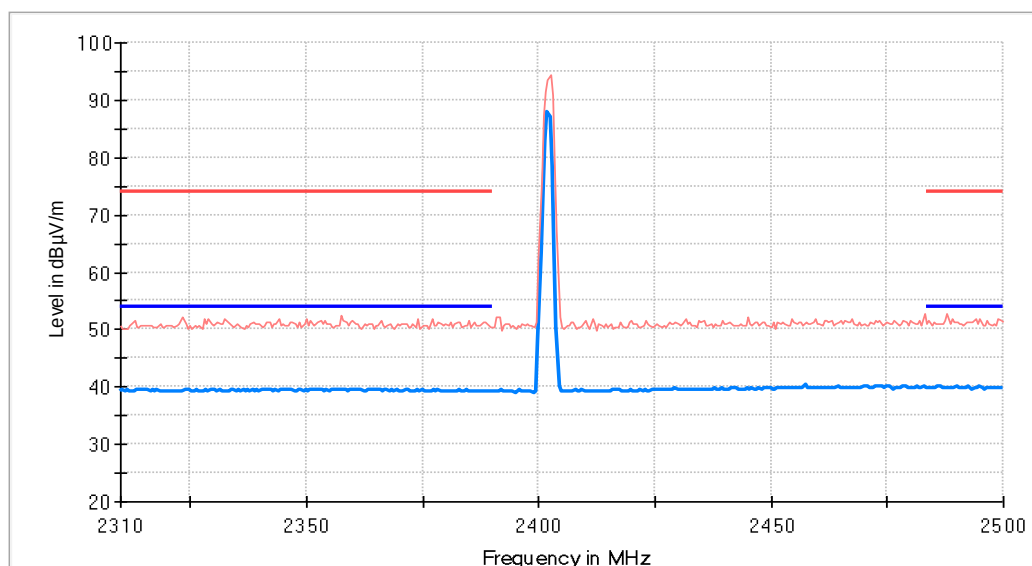


- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

RESTRICTED BANDS

2.31 GHz – 2.5 GHz (GFSK)

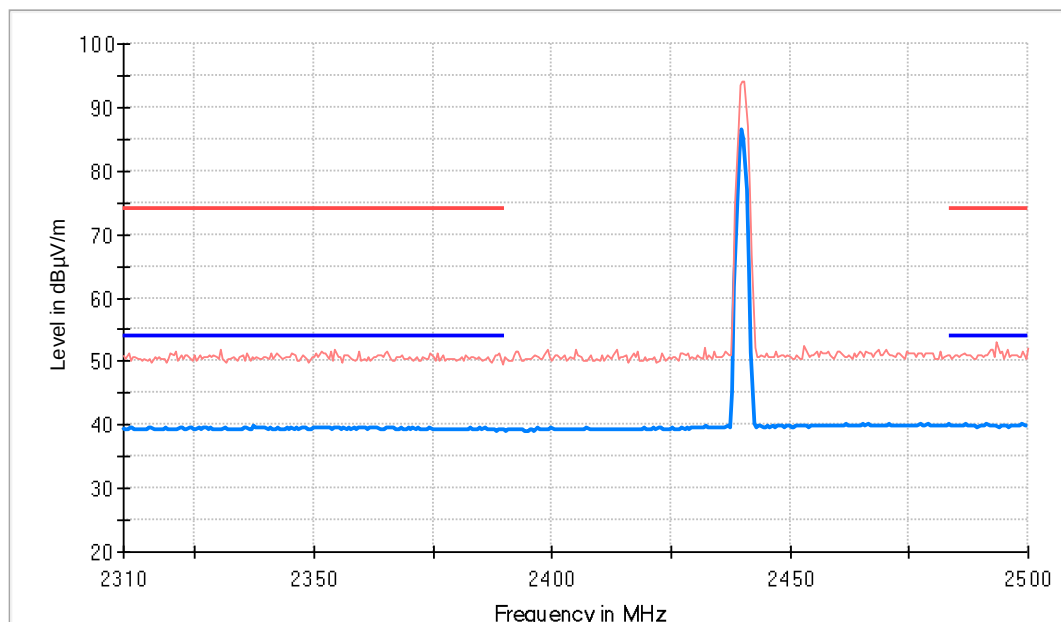
CHANNEL: Lowest (2402 MHz)



- 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

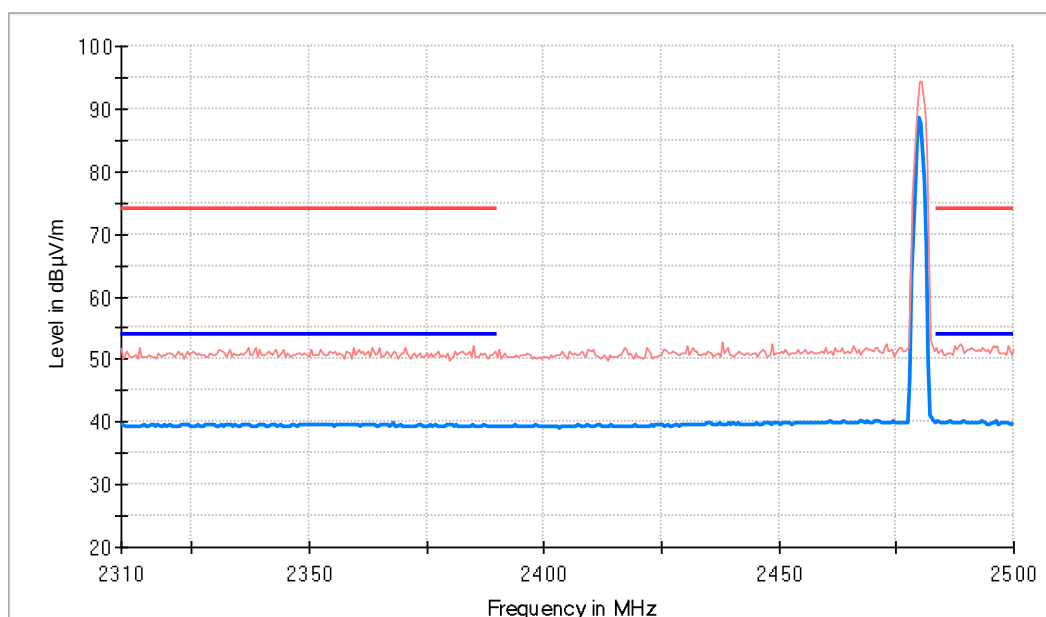
TEST RESULTS (Cont.)

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

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

TESTED SAMPLES:	S/02
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS

Frequency range 30 MHz – 1000 MHz

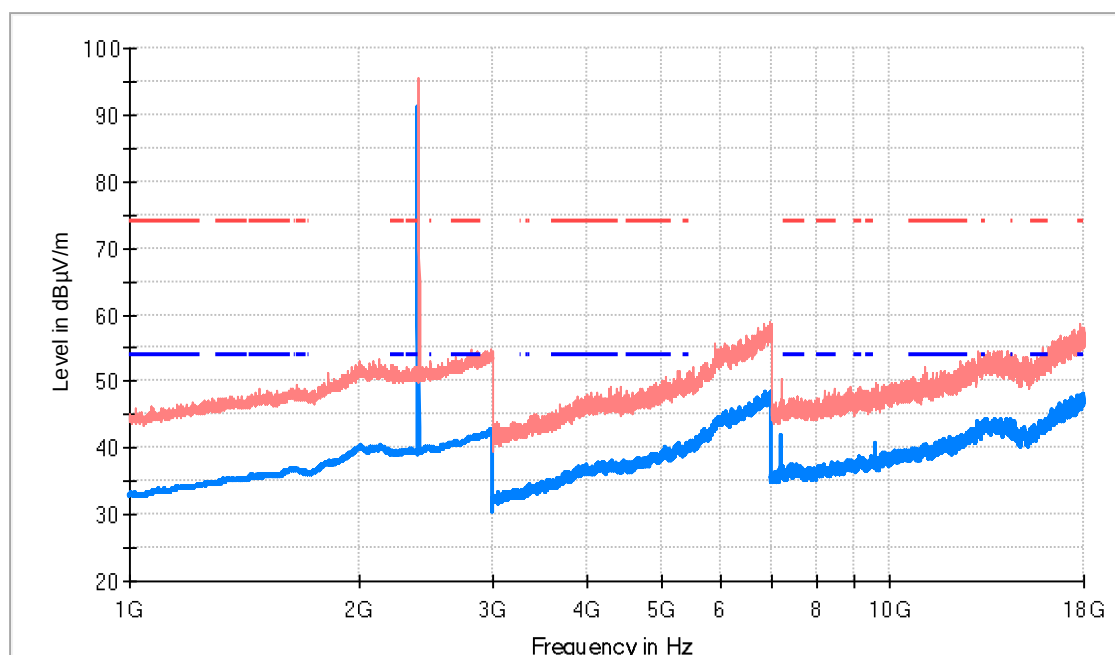
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT. GFSK Modulation was identified as a worst case.

Frequency range 1 GHz – 26 GHz

The results in the following plots and 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.

TEST RESULTS (Cont.)	1 GHz – 18 GHz (PI4DQPSK)
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CHANNEL: Lowest (2402 MHz).



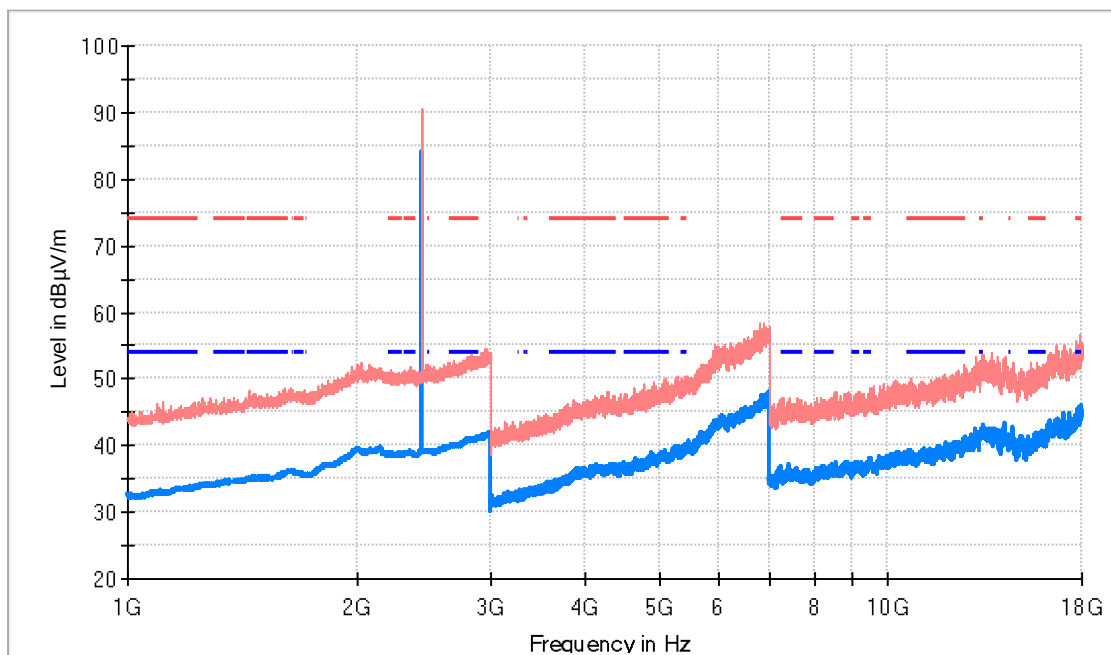
- AVG_MAXH
- PK+_MAXH
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2402.000000	95.7	91.3	H	Fundamental
7205.500000	50.5	41.9	V	
9607.000000	47.6	40.7	H	

TEST RESULTS (Cont.)

CHANNEL: Middle (2440 MHz).



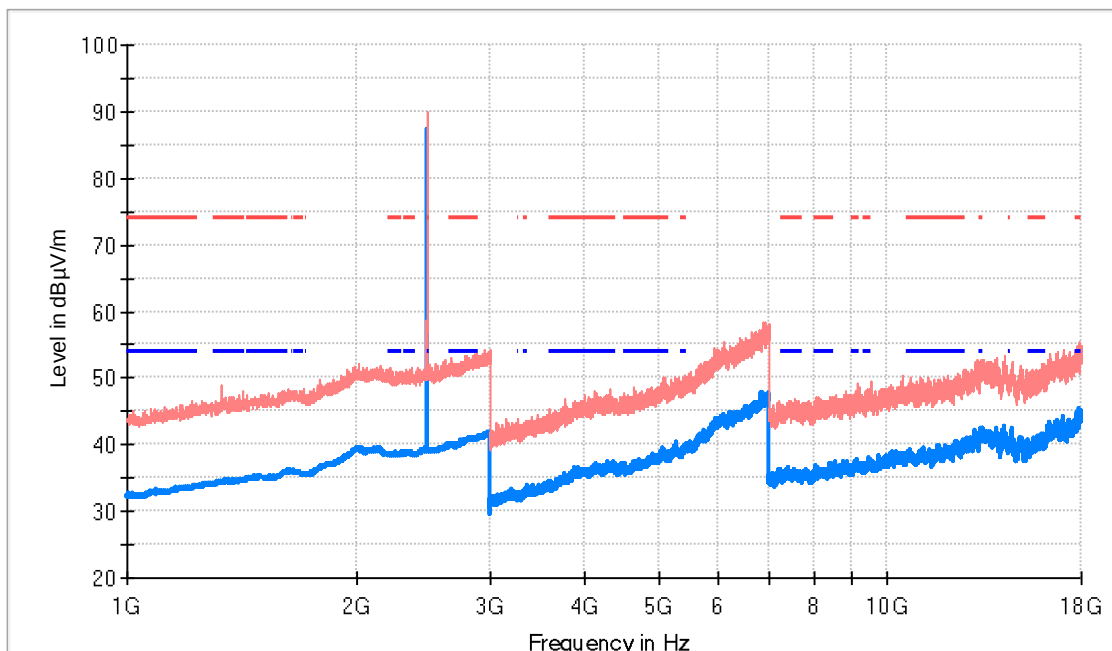
- AVG_ MAXH
- PK+ _MAXH
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
- TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+ _MAXH (dBμV/m)	AVG_ MAXH (dBμV/m)	Pol	Comment
2440.500000	90.7	83.8	V	Fundamental
7319.000000	44.4	35.2	V	

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

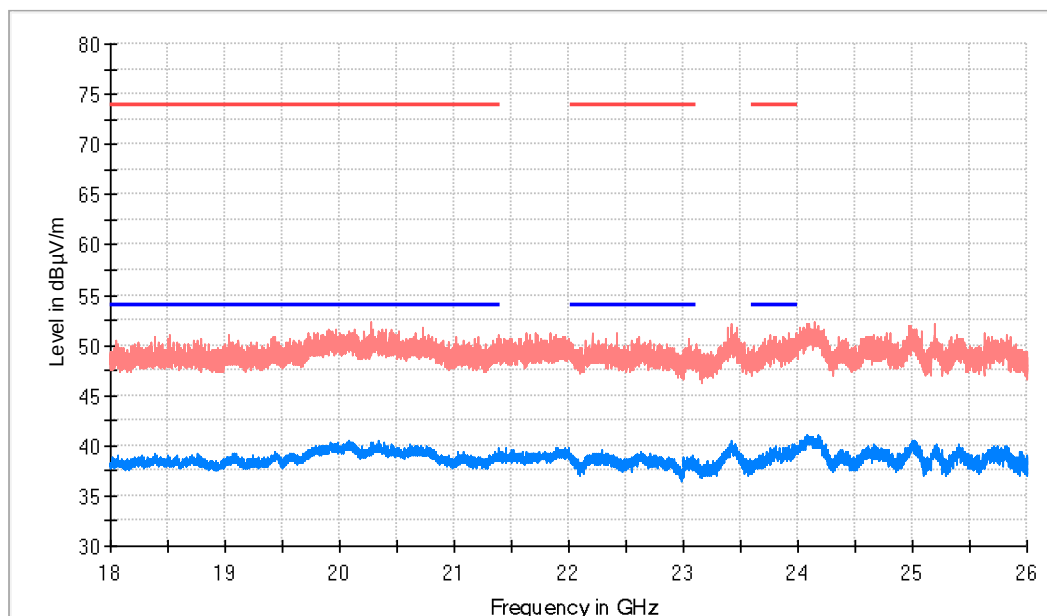
Maximizations

Frequency (MHz)	PK+_MAXH (dBμV/m)	AVG_MAXH (dBμV/m)	Pol	Comment
2480.500000	90.1	87.2	H	Fundamental
7440.500000	45.2	36.5	V	

TEST RESULTS (Cont.)

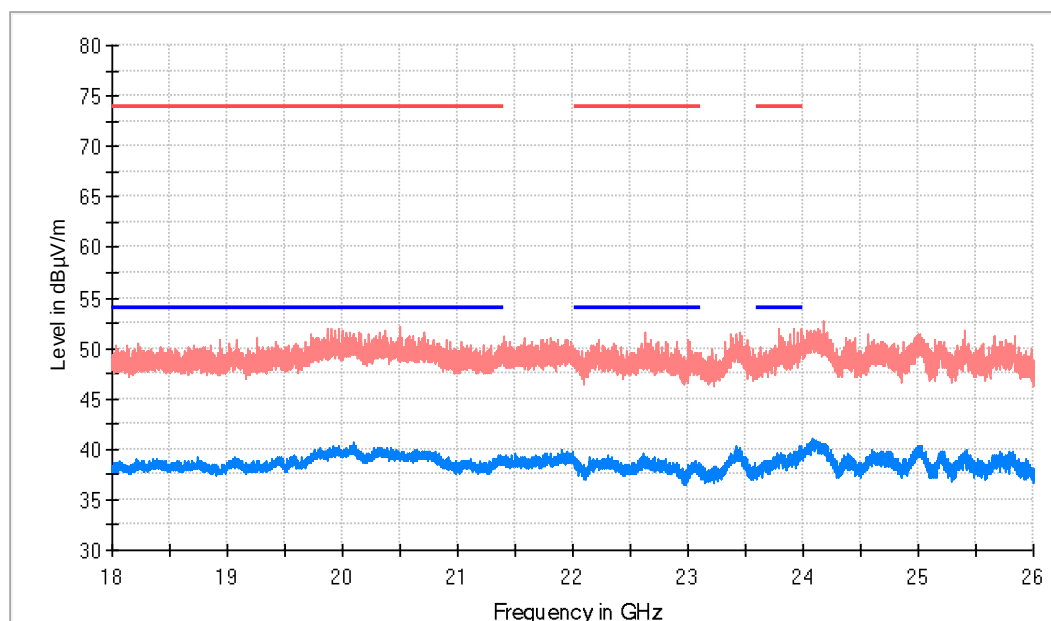
18 GHz – 26 GHz (PI4DQPSK)

CHANNEL: Lowest (2402 MHz)



— AVG_MAXH
 — PK+_MAXH
 — TX limits to Spurious Emission FCC1 5.2.47 (1GHz to 26 GHz) Restricted Bands PK Limit
 — TX limits to Spurious Emission FCC1 5.2.47 (1GHz to 26 GHz) Restricted Bands AVG Limit

CHANNEL: Middle (2440 MHz)



— AVG_MAXH
 — PK+_MAXH
 — TX limits to Spurious Emission FCC1 5.2.47 (1GHz to 26 GHz) Restricted Bands PK Limit
 — TX limits to Spurious Emission FCC1 5.2.47 (1GHz to 26 GHz) Restricted Bands AVG Limit