DEKRA Certification, Inc.
405 Glenn Dr. Suite 12,
Sterling, VA 20164
United States of America

DEKRA

ACCREDITED
Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report No:
2581ERM.004A2

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 Infotainment System
Trademark	Mercedes-Benz
Model and /or type reference	NTG7RSU
Other identification of the product	FCC ID: T8GNTG7RSU IC: 6434A-NTG7RSU HW Version: C0 SW Version: E13.205
Features	Bluetooth, WLAN
Manufacturer	HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH BECKER-GOERING-STR. 16; 76307 KARLSBAD GERMANY.
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 Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2020.01.31 00:01:20 -05'00'
Date of issue	01-27-2020
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.

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
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

Automotive Rear Seat Unit (RSU) for installation in cars. Features: BT, WLAN, Display interface, interface to Head Unit.

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
2581/03	NTG7RSU USA Unit	NTG7 RSU	HBM411K4001000	10/22/2019

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 Nº	Description	Model	Serial Nº	Date of reception
2581/04	NTG7RSU USA Unit	NTG7 RSU	HBM411K4001002	10/22/2019

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

Sample S/01 & S/02 is composed of the following accessories:

Control Nº	Description	Model	Serial Nº	Date of reception
2581/16	Harness	--	--	10/22/2019
2581/17	Ethernet Cable	--	--	10/22/2019
2581/18	USB/Ethernet Adapter	UE300	218C420000396	10/22/2019
2581/19	USB Cable	--	--	10/22/2019
2581/20	Fakra to SMA Connector	--	--	10/22/2019
2581/5	Harness	--	--	10/22/2019
2581/6	Ethernet Cable	--	--	10/22/2019
2581/7	USB/Ethernet Adapter	UE300	218C420002210	10/22/2019
2581/8	USB Cable	--	--	10/22/2019
2581/9	Fakra to SMA Connector	--	--	10/22/2019
2581/23	BT/WLAN Antenna	--	--	10/22/2019

Test sample description

Ports..... :	Port name and description	Cable			
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)
	Car Connector	>3m(x1)	☒	☐	☐
	BT/WLAN-Antenna	tbd	☒	☒	☐
	USB Connector - ***not used by customer***		☐	☐	☐
	Display Connector (Video IN / OUT)	>3m(x1	☒	☒	☐
	HDBase-T	>3m(x1)	☐	☐	☐
			☐	☐	☐
Supplementary information to the ports..... :					

Rated power supply..... :	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: 12V Car battery / attenuator (9,5-15,5V normal operation)					
	☐	DC:					
Rated Power..... :	9,5-15,5V normal operation						
Clock frequencies..... :	see schematics						
Other parameters..... :	See Technical Description						
Software version..... :	D2						
Hardware version..... :	E13.205						
Dimensions in cm (W x H x D).... :	225 x 140 x 48 mm						
Mounting position..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: automotive RSU (Rear Seat Unit)					

Modules/parts .....:	Module/parts of test item	Type	Manufacturer
	n/a	-	
Accessories (not part of the test item).....:	Description	Type	Manufacturer
	RSU-Testbench including NTG7 HU	-	HBAS
	Cable harness		HBAS
	Two RSU Displays		Phanasonic
	BT/WLAN-Antenna		Hirschmann
Documents as provided by the applicant .....:	Description	File name	Issue date
	Technical Description		

Copy of marking plate:

Identification of the client

HARMAN BECKER AUTOMOTIVE SYSTEMS GMBH
BECKER-GOERING-STR. 16;76307 KARLSBAD GERMANY

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	10-24-2019
Date (finish)	12-10-2019

Document history

Report number	Date	Description
2581ERM.004	12-12-2019	First release
2581ERM.004A1	01-13-2020	Second release
2581ER.004A2	01-27-2020	Third release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2581ERM.004A1 related with the same samples, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
Title Page / Data Provided by the client	Modified the features supported by DUT	Documentation Error
Product Information (Appendix-B)	Removed the MIMO power value as it not supported.	Documentation Error

This modification test report cancels and replaces the test report 2581ERM.004A1.

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, BhagyaShree Chaudhary, 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)					
Report 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
A.6	§ 15.247 (d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	P	N/A
A.7	§ 15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
Supplementary information and remarks: N/A					

FCC PART 15 PARAGRAPH / RSS-247 (WIFI 2.4GHz)					
Report 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
B.5	§15.247(d)	RSS-247 5.5	Emission limitations Conducted (Transmitter)	P	N/A
B.6	§15.247 (d)	RSS-247 5.5	Emission limitations Radiated (Transmitter)	P	N/A
Supplementary information and remarks: N/A.					

List of equipment used during the test

Conducted Measurements

Test system Rohde & Schwarz TS 8997:

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1039	Signal analyzer Rohde & Schwarz FSV40	2018/10	2020/10
1009	RF generator Rohde & Schwarz SMB100A	2019/08	2021/08
1042	RF generator Rohde & Schwarz SMBV100A	2018/01	2021/01
101	Climatic chamber Espec	2019/01	2020/01

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber Frankonia SAC 3 plus “L”	N/A	N/A
1064	BiconicalLog antenna ETS LINDGREN 3142E	2017/03	2020/03
1057	Double-ridge Waveguide Horn antenna 1-18 GHz	2017/03	2020/03
1056	Double-ridge Waveguide Horn antenna 18-40 GHz	2017/03	2020/03
1014	Spectrum analyzer Rohde & Schwarz FSV40	2019/04	2021/04
0980	RF pre-amplifier 30 MHz-6 GHz Bonn Elektronik BLMA 0360-01N	2019/08	2021/05
0981	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-2A	2018/10	2021/05
1015, 1017, 1019, 1020	Rohde & Schwarz EMC32 software	N/A	N/A

Appendix A:
Test results (Bluetooth EDR)

Appendix A Content

PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	FHSS
Adaptive	Non-adpative equipment
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
Operating Frequency Range	2400 – 2483.5 MHz
Nominal Channel Bandwidth	20 MHz
RF Output Power	<10 dBm
Extreme operating conditions	
- Temperature range	-20 ºC to +55 ºC
Antenna type	Dedicated Antenna
Antenna gain	Chip1: +3.0 dBi
Nominal Voltage	
- Supply Voltage	13.5 Vdc
- Type of power source	DC voltage
Equipment type	Bluetooth EDR
Geo-location capability	No

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01	Power supply (V): $V_{nominal}$ = 13.5 Vdc Modulation: GFSK Test Frequencies for conducted/Radiated tests:**(Port 2 CHIP 1):** Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz
TC#02	Power supply (V): $V_{nominal}$ = 13.5 Vdc Modulation: PI/4-DQPSK Test Frequencies for Conducted/Radiated tests **(Port 2 CHIP 1):** Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz
TC#03	Power supply (V): $V_{nominal}$ = 13.5 Vdc Modulation: 8-DPSK Test Frequencies for Conducted/Radiated tests **(Port 2 CHIP 1):** Lowest range: 2402 MHz Middle channel: 2441 MHz Highest range: 2480 MHz

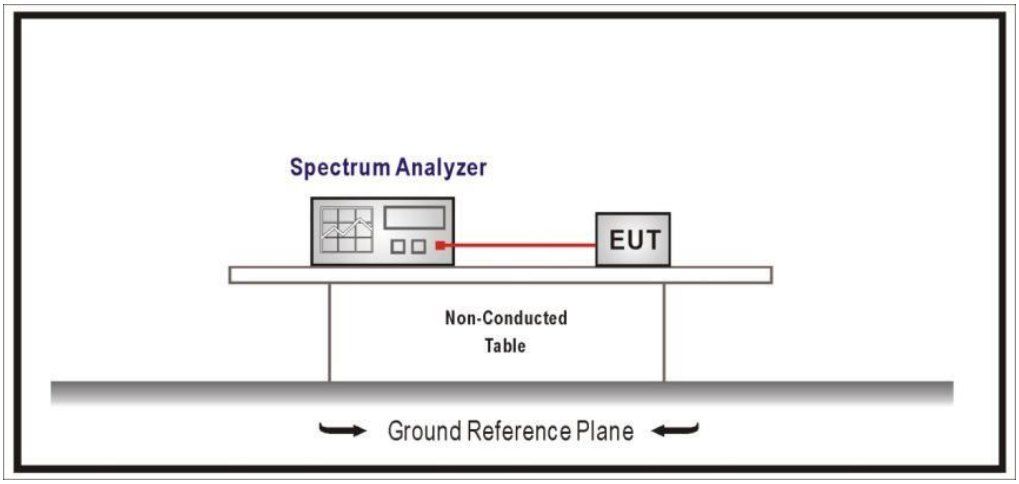
TEST A.1: 20DB EMISSION BANDWIDTH, OCCUPIED BANDWIDTH AND CARRIER FREQUENCY SEPARATION

LIMITS:	Product standard:	§ 2.1049, Part 15 Subpart C §15.247 and RSS-247
	Test standard:	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

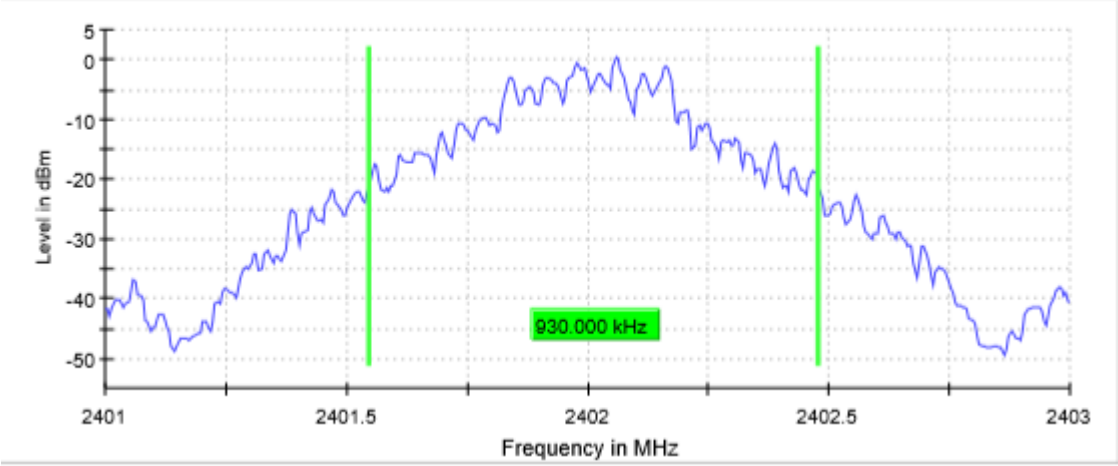
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB Bandwidth (kHz)	930	930	930
Occupied bandwidth (kHz)	875	875	875
Measurement uncertainty (kHz)	<± 1.80		

Measurement Set up

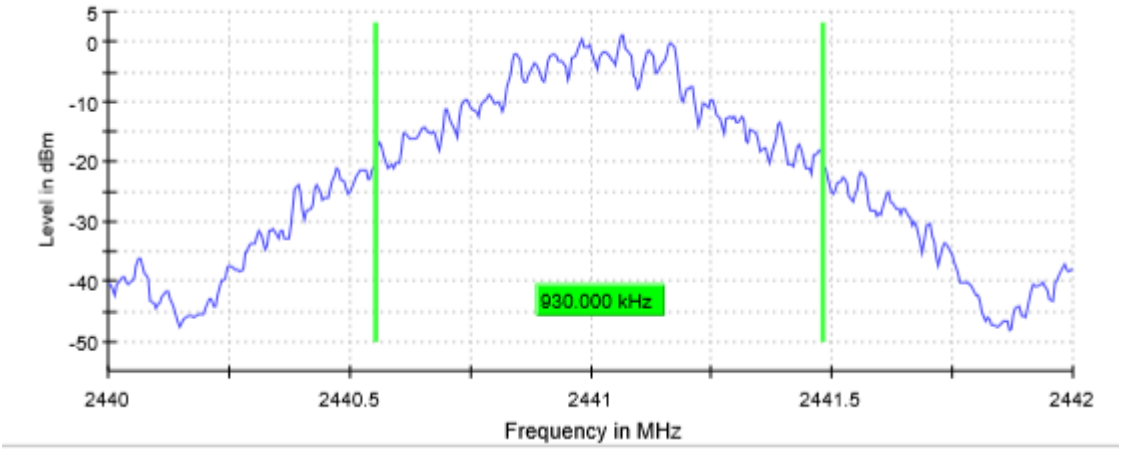
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	0.000 dBm	10.000 dBm	0.000 dBm
Attenuation	20.000 dB	30.000 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	9 / max. 150	8 / max. 150	8 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.07 dB	0.17 dB	0.30 dB

TEST RESULTS (Cont.):	20 dB BANDWIDTH

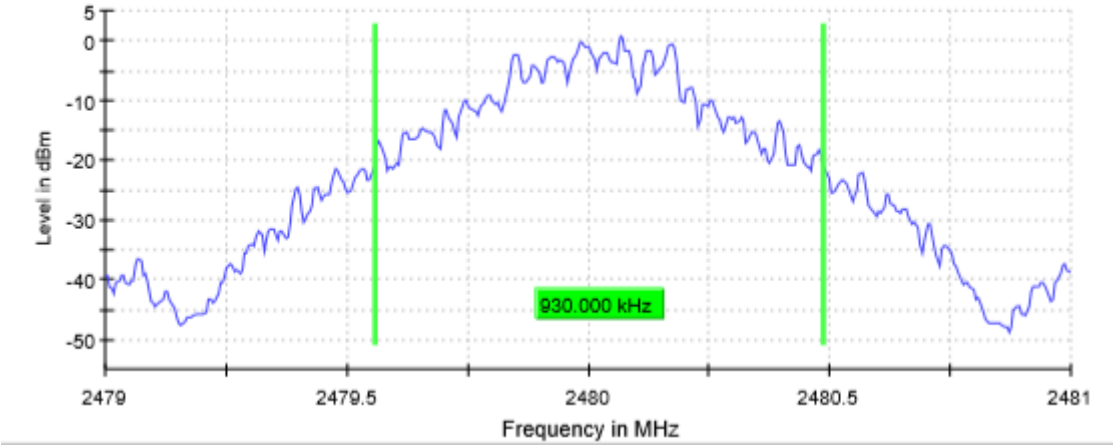
Lowest Channel



Middle Channel

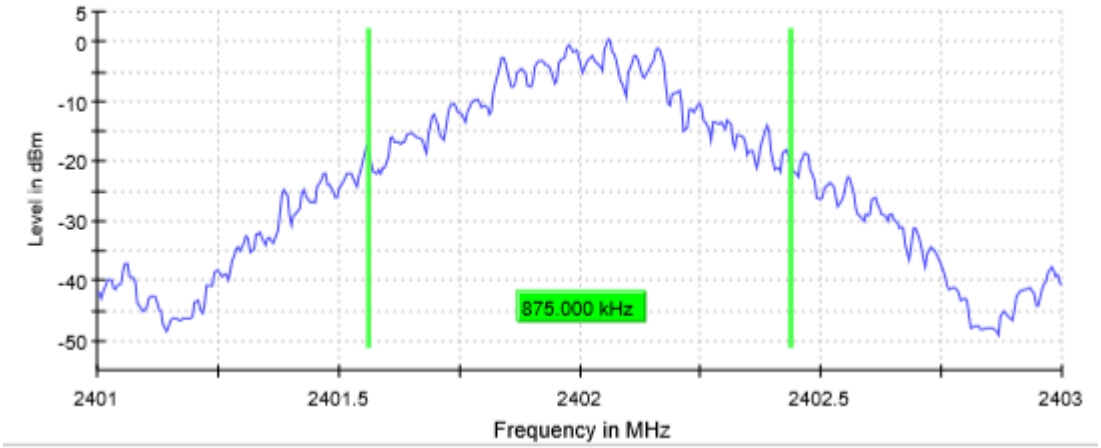


Highest Channel

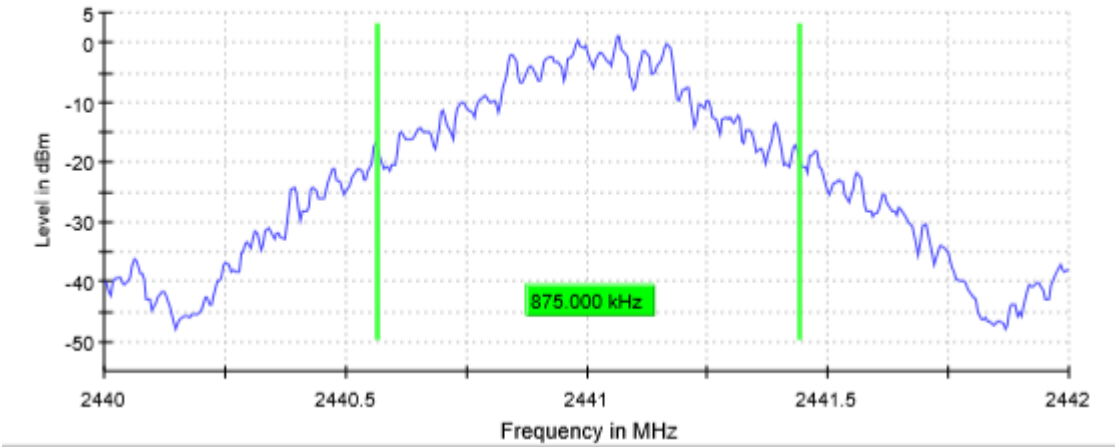


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

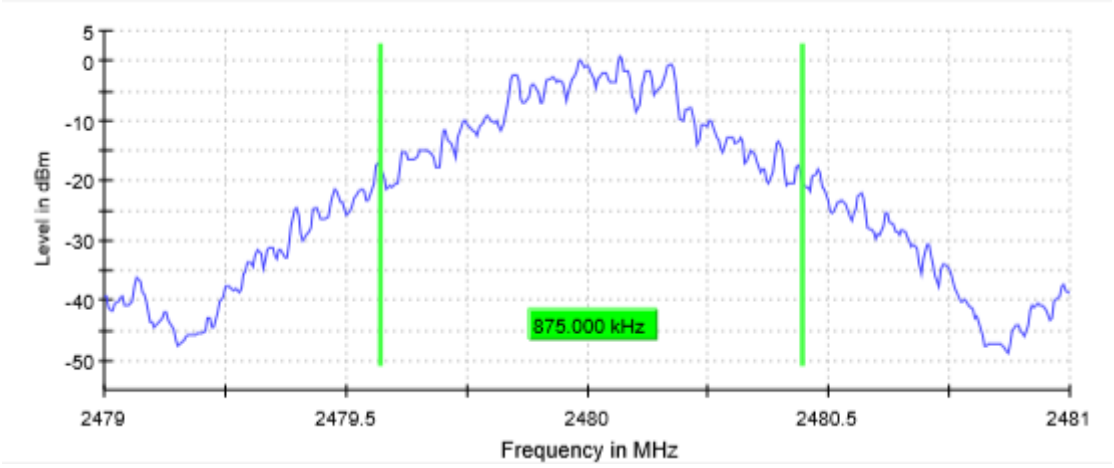
Lowest Channel



Middle Channel



Highest Channel

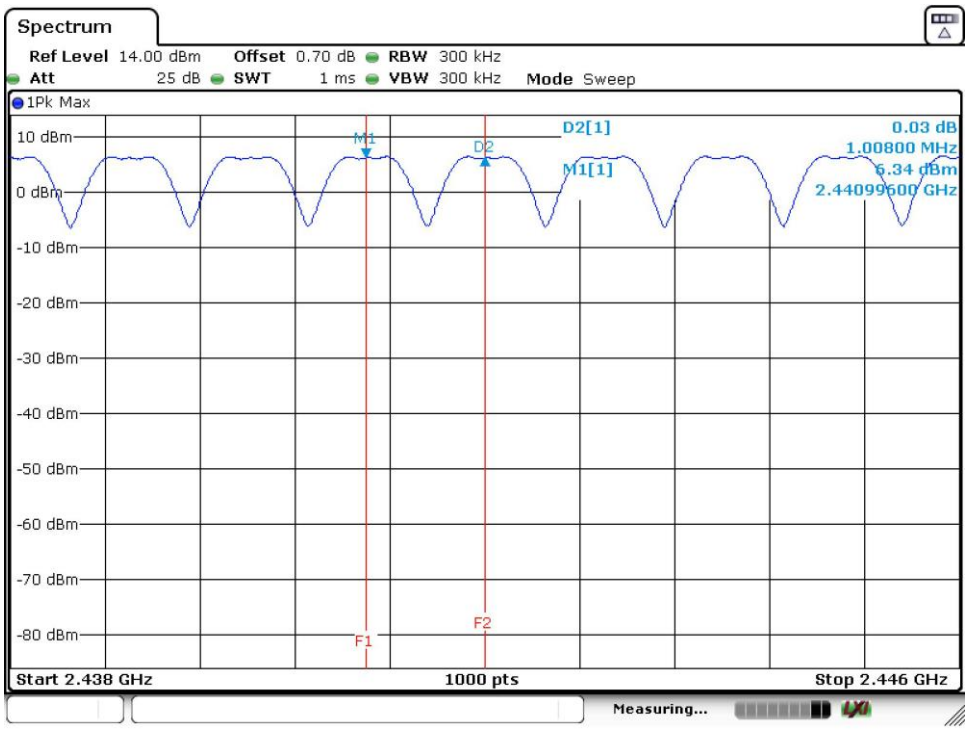


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

Measurement Set- up

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 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	00.000 dBm	10.000 dBm	00.000 dBm
Attenuation	20.000 dB	30.000 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	5 / max. 150	6 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.26 dB	0.14 dB	0.21 dB

TEST RESULTS (Cont.)	CARRIER FREQUENCY SEPARATION



Date: 25.OCT.2019 12:38:21

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

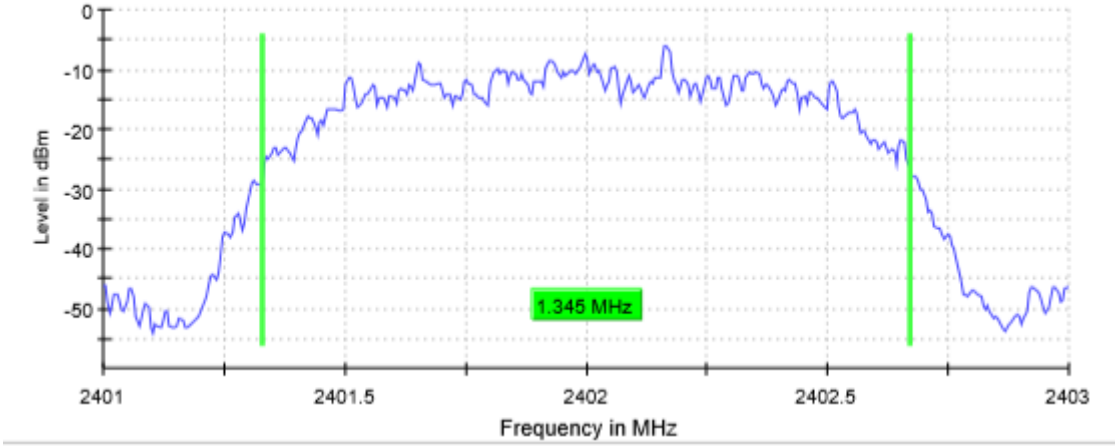
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB bandwidth (MHz)	1.345	1.345	1.345
Occupied bandwidth (MHz)	1.210	1.210	1.210
Measurement uncertainty (kHz)	<± 1.80		

Measurement Setup

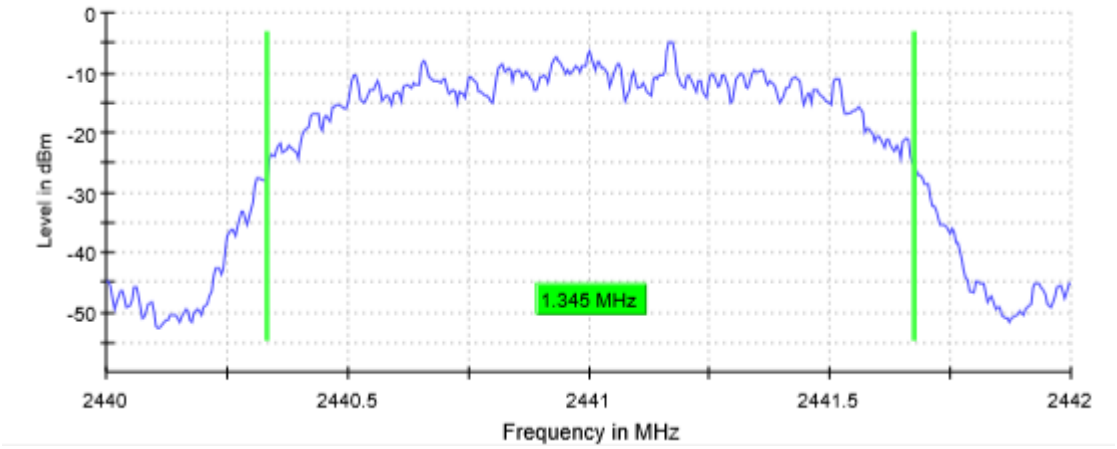
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.00 MHz	2.00 MHz	2.00 MHz
RBW	10.000 KHz	10.000 KHz	10.000 KHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	00.000 dBm	00.000 dBm	10.000 dBm
Attenuation	20.000 dB	20.000 dB	30.000 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	7 / max. 150	8 / max. 150	7 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.14 dB	0.23 dB	0.19 dB

TEST RESULTS (Cont.):	20 dB BANDWIDTH

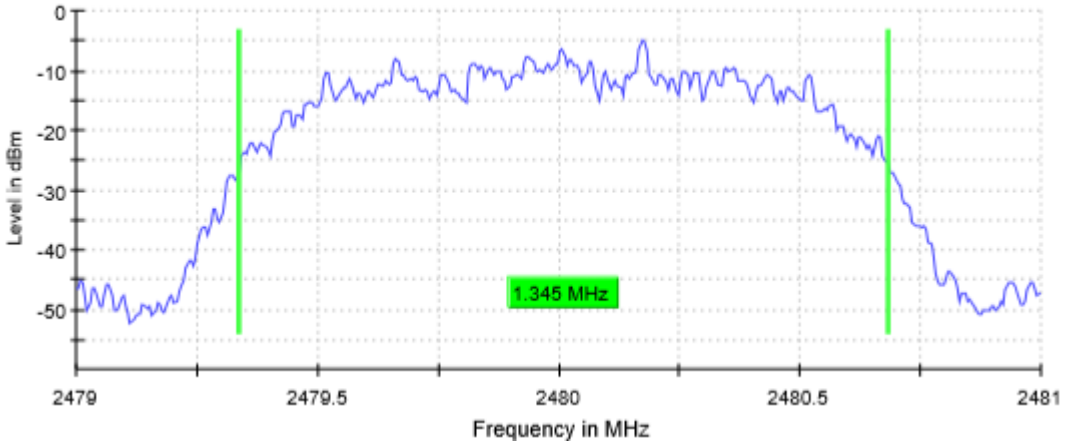
Lowest Channel



Middle Channel

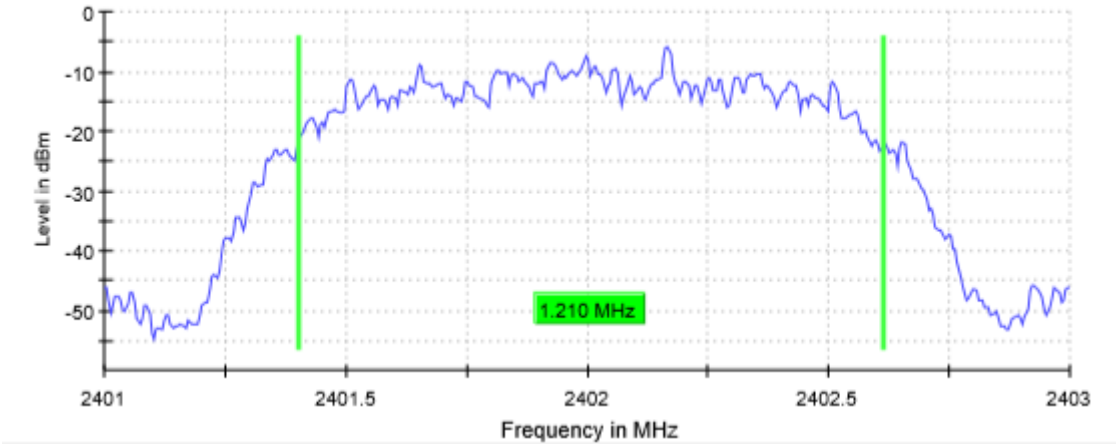


Highest Channel

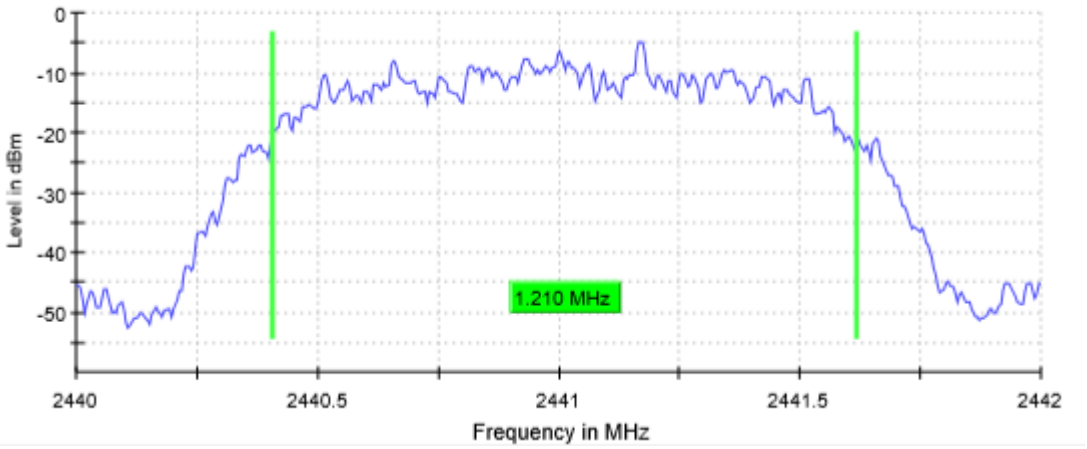


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

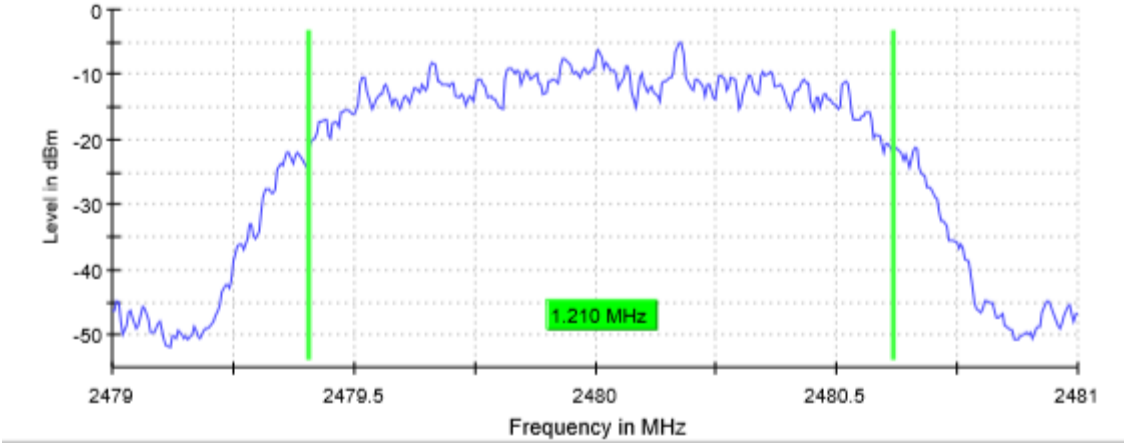
Lowest Channel



Middle Channel



Highest Channel

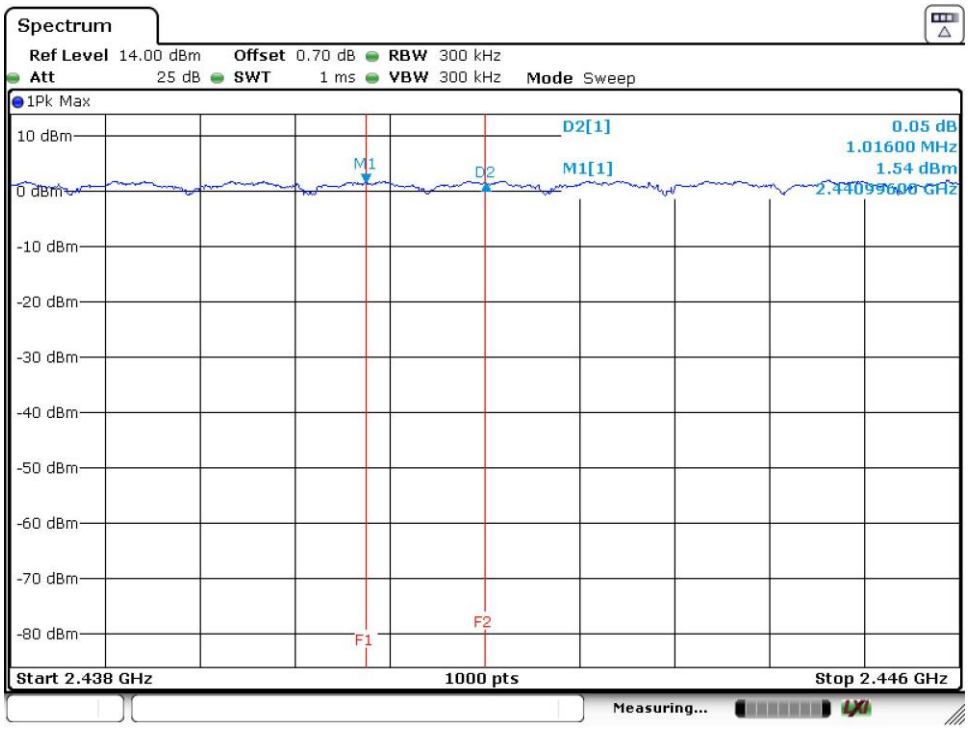


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

Measurement Set- up

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	00.000 kHz
VBW	30.000 kHz	30.000 kHz	20.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	10.000 dBm	00.000 dBm	10.000 dBm
Attenuation	30.000 dB	20.000 dB	30.000 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	5 / max. 150	5 / max. 150	6 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.14 dB	0.17 dB	0.28 dB

TEST RESULTS (Cont.)	CARRIER FREQUENCY SEPARATION



Date: 25.OCT.2019 12:39:44

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

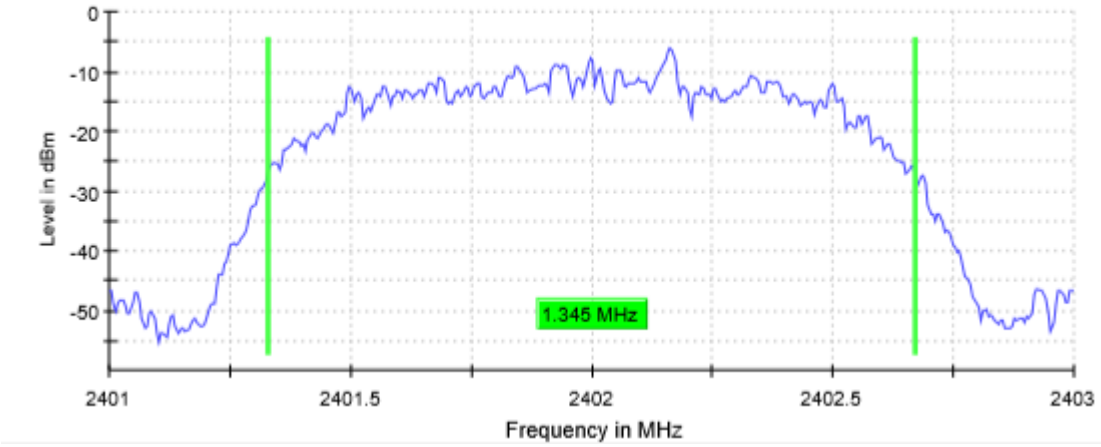
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
20dB bandwidth (MHz)	1.345	1.345	1.350
Occupied bandwidth (MHz)	1.215	1.215	1.215
Measurement uncertainty (kHz)	<± 1.80		

Measurement Setup

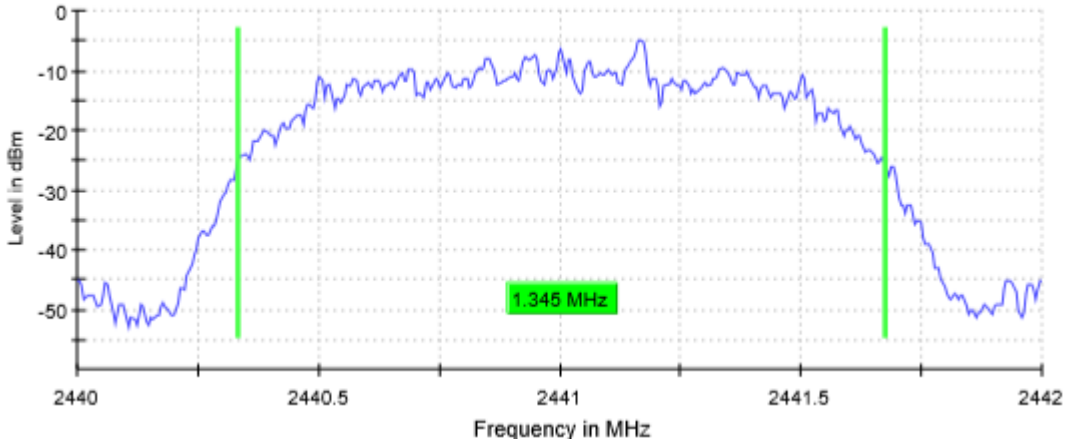
Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 GHz	2.48100 GHz
Span	2.00 MHz	2.00 MHz	2.00 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
Sweep Points	400	400	400
Sweep time	189.648 µs	189.648 µs	189.648 µs
Reference Level	00.000 dBm	00.000 dBm	00.000 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	9 / max. 150	7 / max. 150	10 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.21 dB	0.25 dB	0.13 dB

TEST RESULTS (Cont.):	20 dB BANDWIDTH

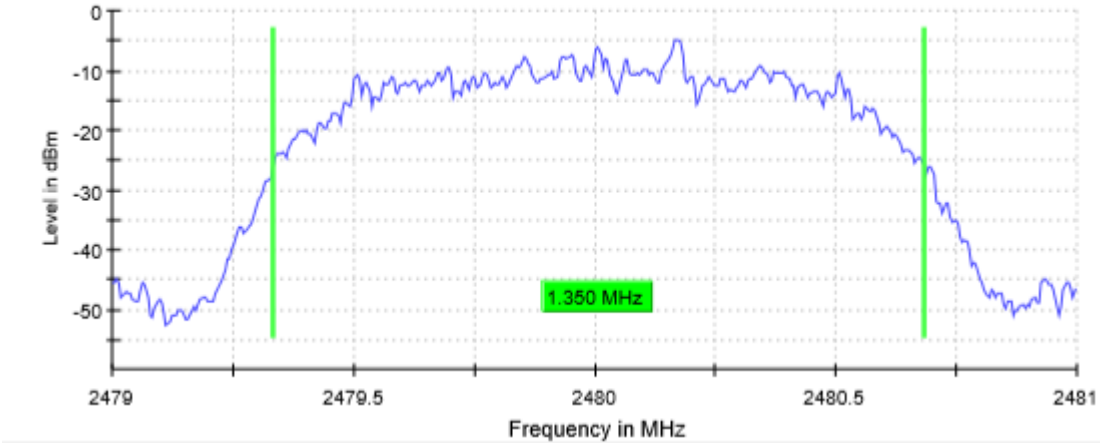
Lowest Channel



Middle Channel

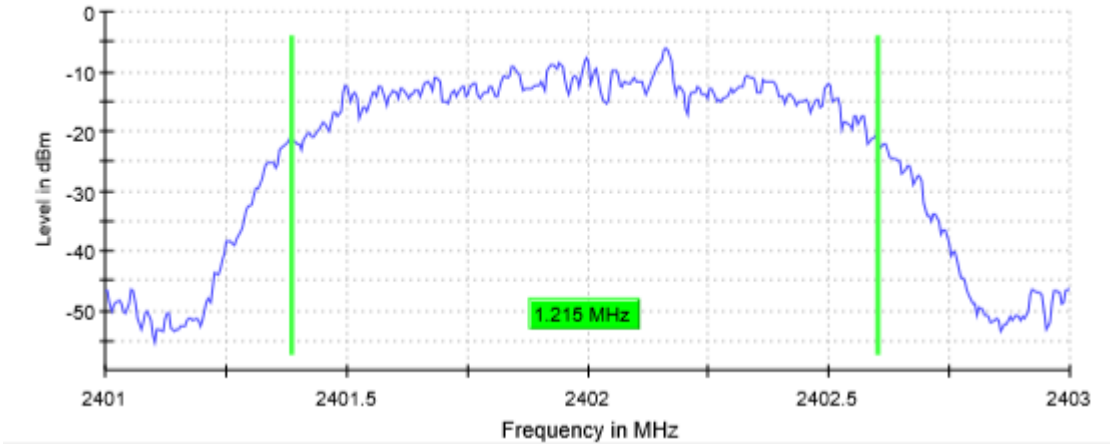


Highest Channel

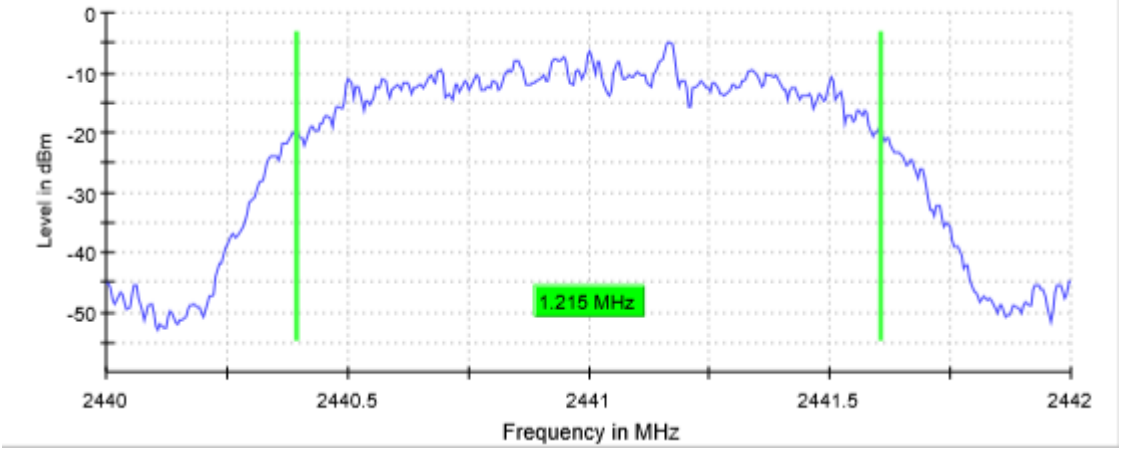


TEST RESULTS (Cont.)	OCCUPIED BANDWIDTH

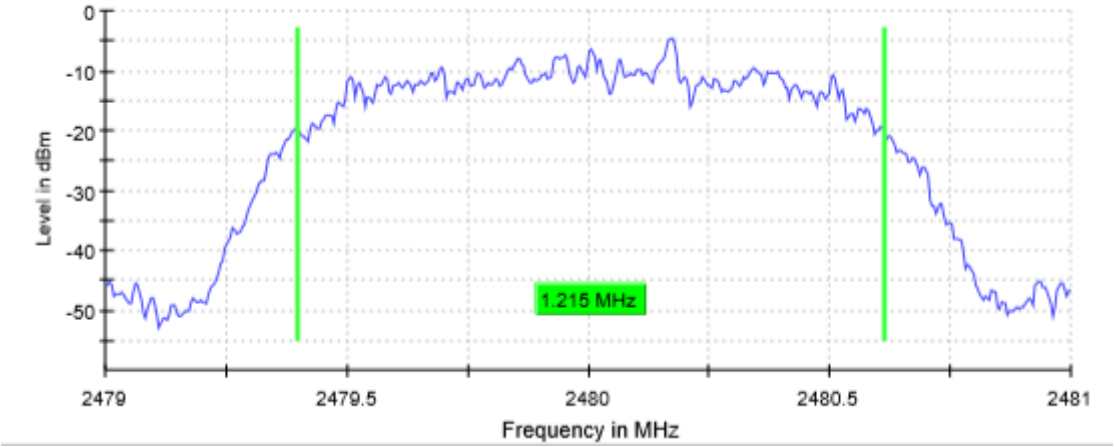
Lowest Channel



Middle Channel



Highest Channel

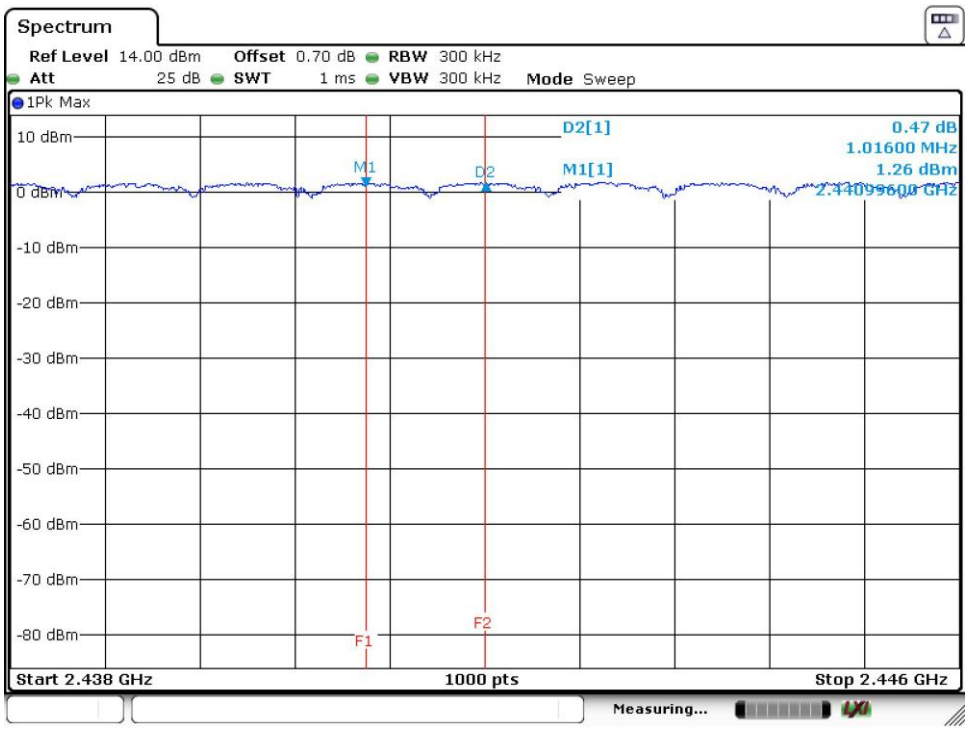


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

Measurement Set- up

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.44000 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44200 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	00.000 dBm	00.000 dBm	00.000 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	6 / max. 150	5 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.22 dB	0.21 dB	0.24 dB

TEST RESULTS (Cont.)	CARRIER FREQUENCY SEPARATION



Date: 25.OCT.2019 12:41:01

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

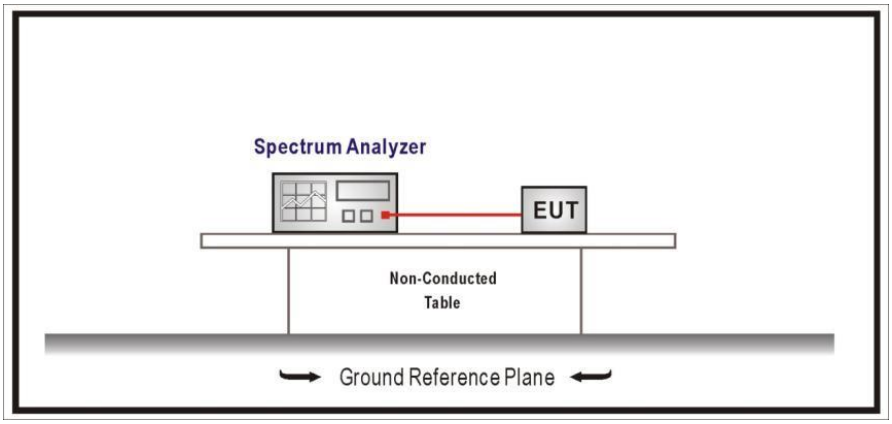
TEST A.2: NUMBER OF HOPPING CHANNELS

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)

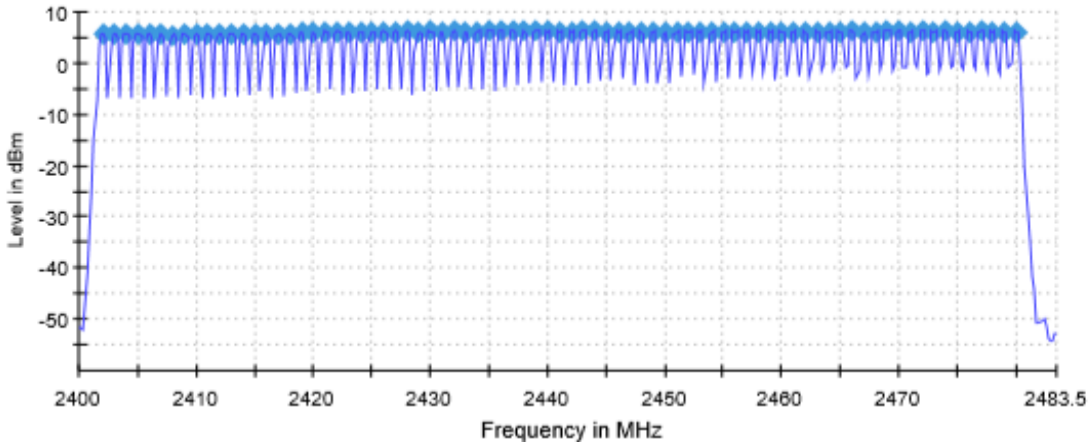
LIMITS

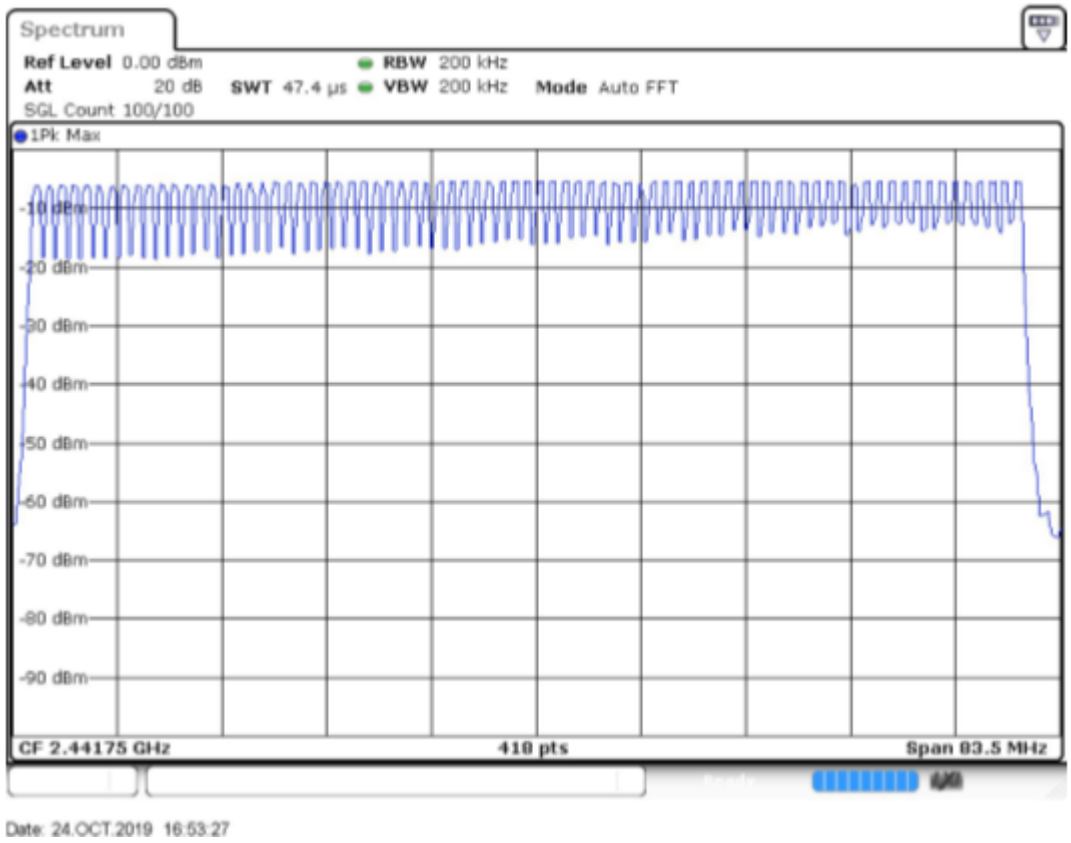
Frequency hopping system in the 2400-2483.5 MHz band shall use at least 15 channels.

TEST SETUP:	



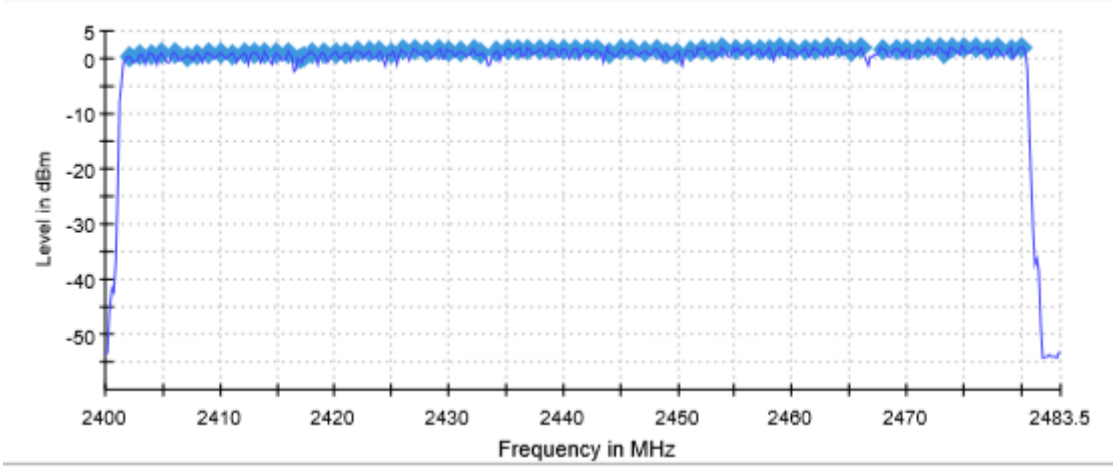
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

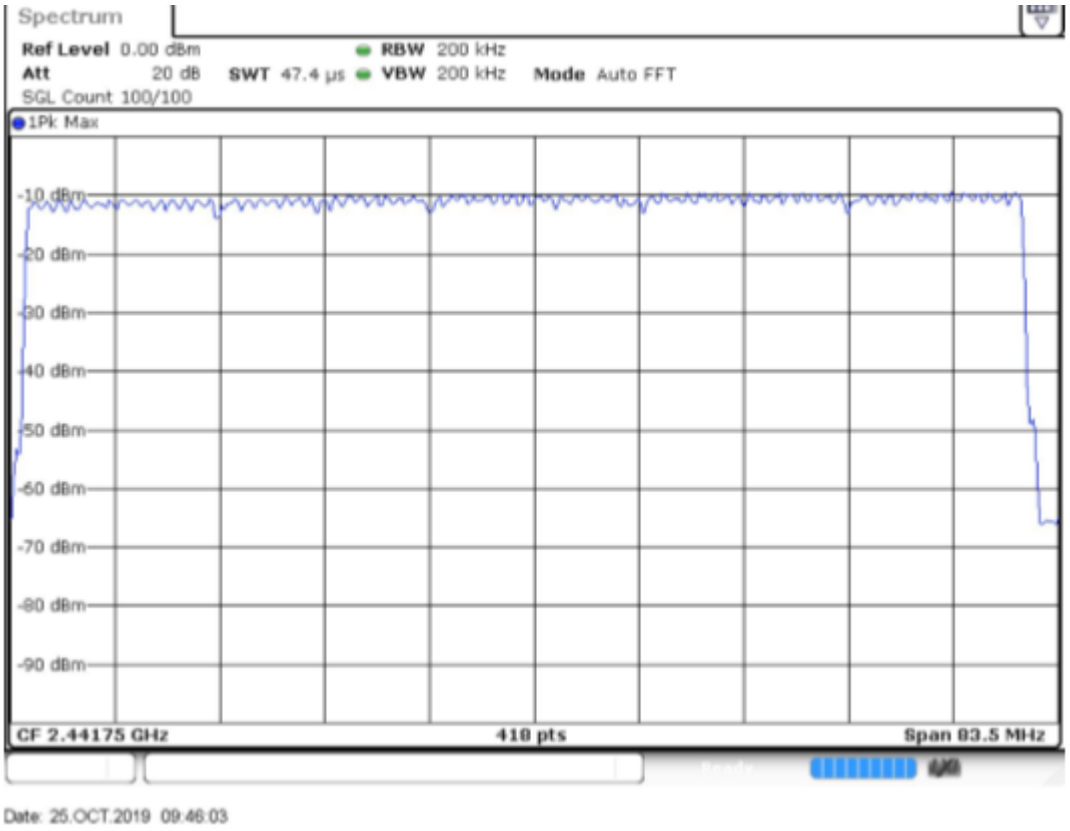




Number of Hopping Frequencies: 79

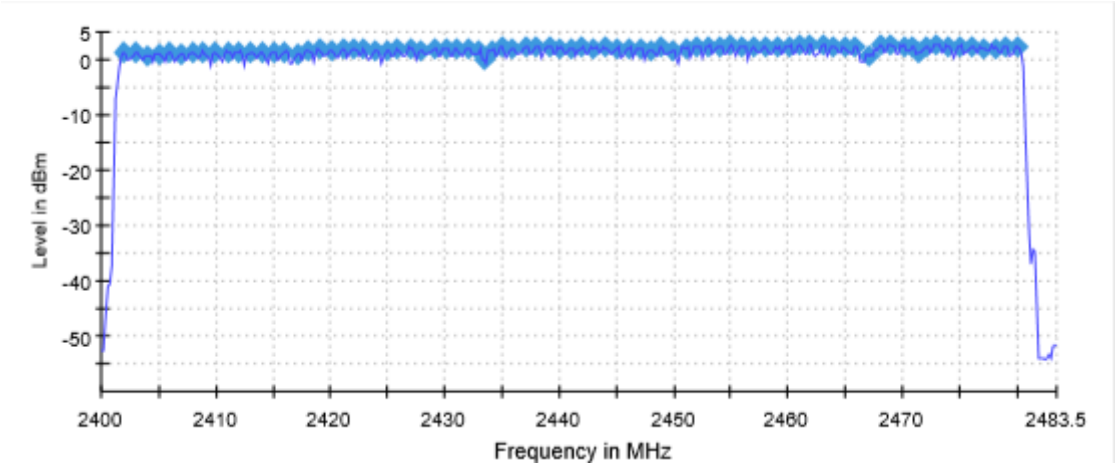
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

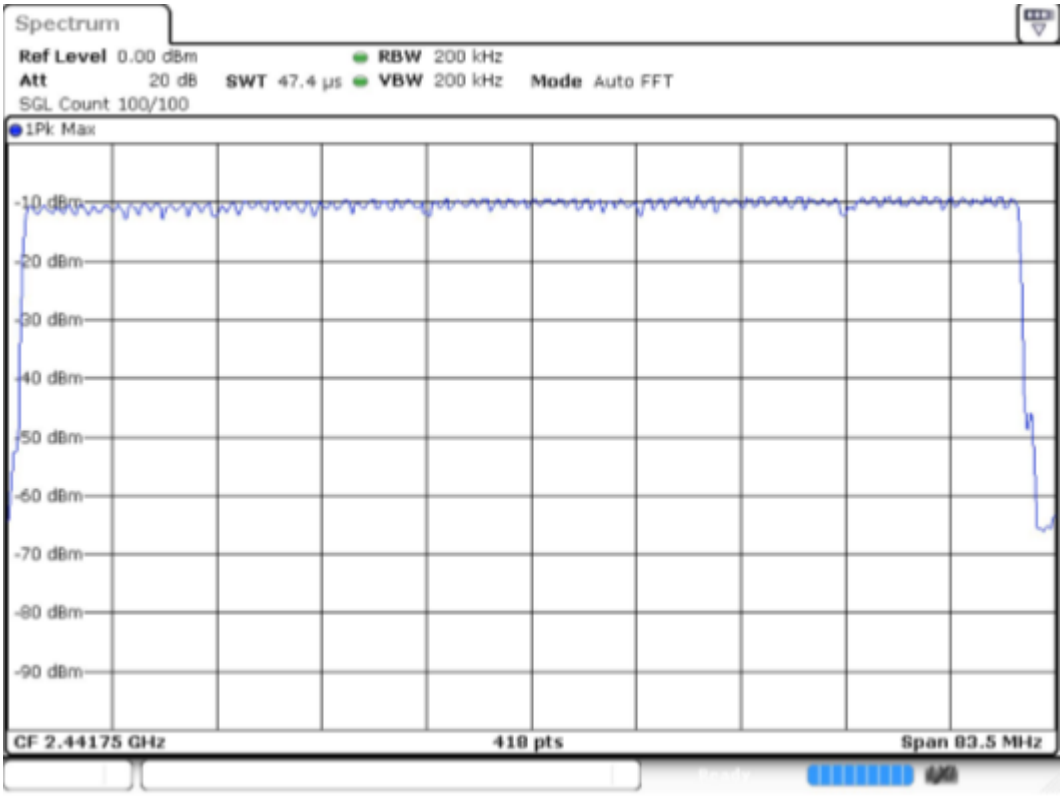




Number of Hopping Frequencies: 79

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





Number of Hopping Frequencies: 79

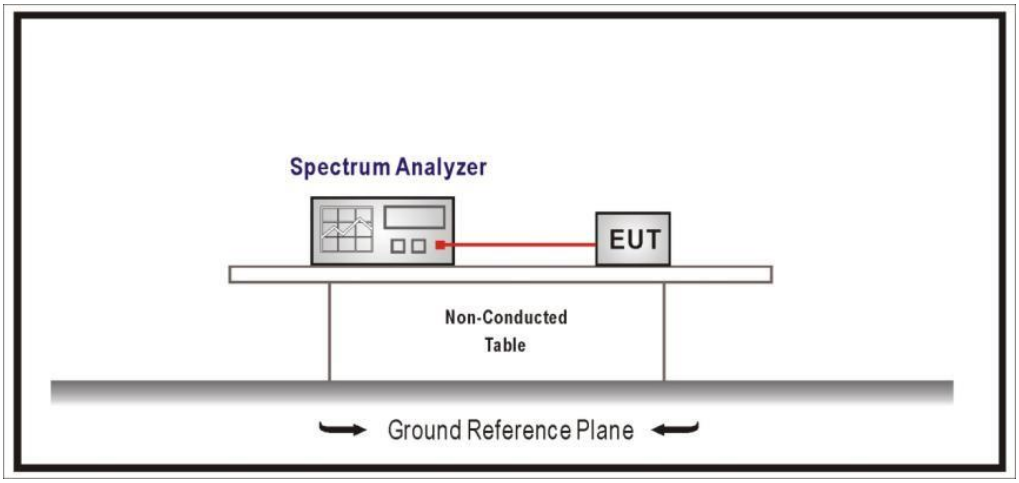
TEST A.3: TIME OF OCCUPANCY (DWELL TIME)

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

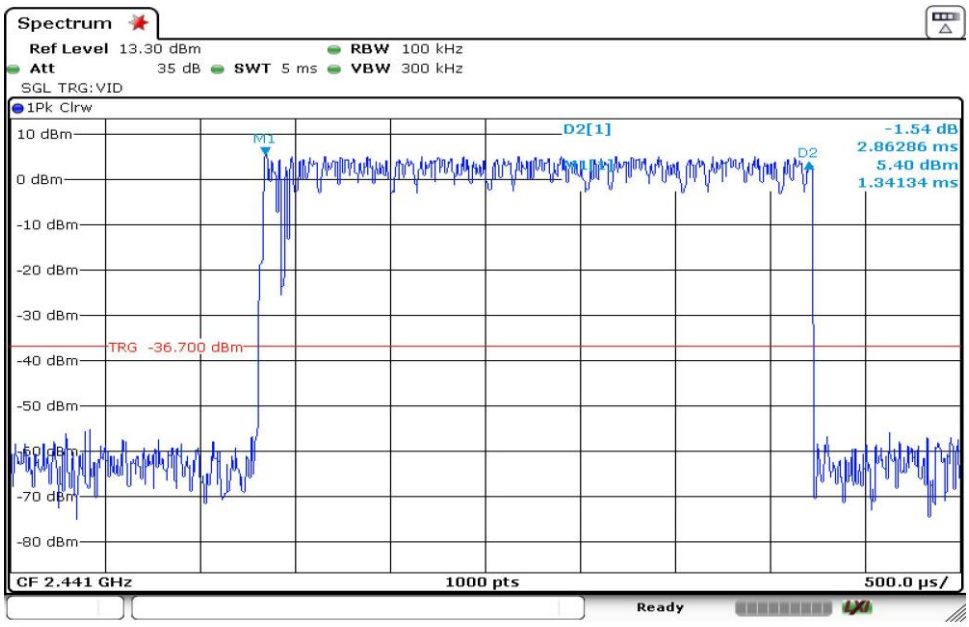
The average time of occupancy on any channel shall not be greater than 0.4 seconds (400 ms) within a period of 0.4 seconds multiplied by the number of hopping channels employed = 0.4 x 79= 31.6 seconds.

TEST SETUP:	

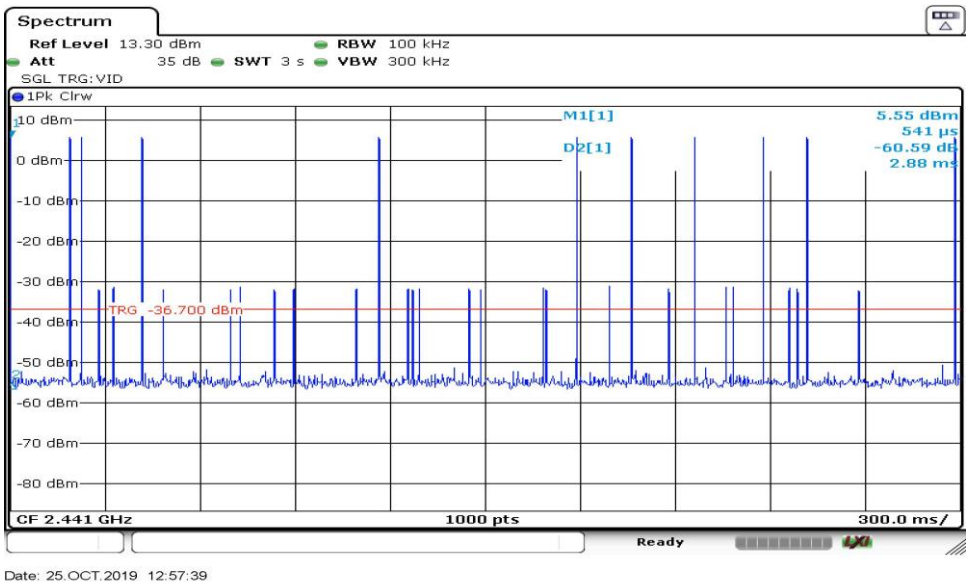


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (GFSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	**PACKET TYPE DH5**

Transmit Time per Hop: 2.863 ms



Date: 25.OCT.2019 13:16:30



Date: 25.OCT.2019 12:57:39

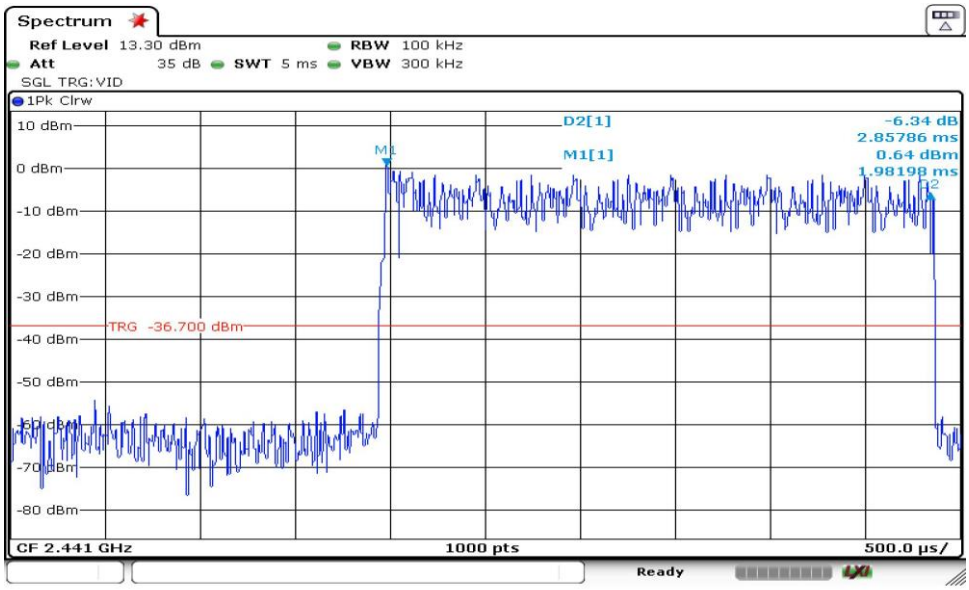
Number of hops over a period of 3 seconds: 10 hops.

Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 3 s) = 105.33 hops.
Averaging time of occupancy = 2.863 ms x 105.33 hops = 301.55 ms per 31.6 seconds.

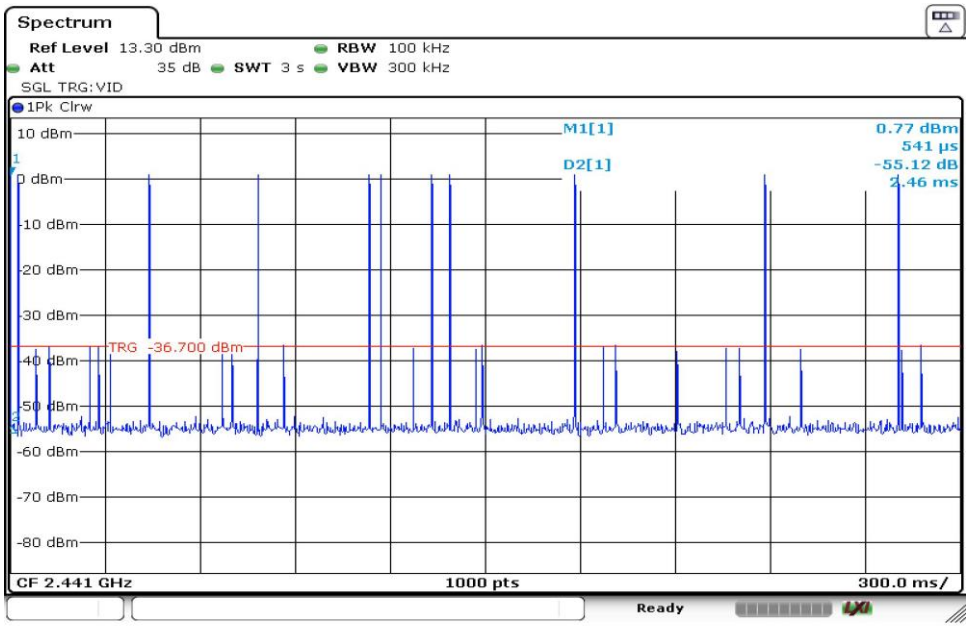
Measurement uncertainty (%)	<±0.12

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

Transmit Time per Hop: 2.857 ms



Date: 25.OCT.2019 13:12:52



Date: 25.OCT.2019 13:10:29

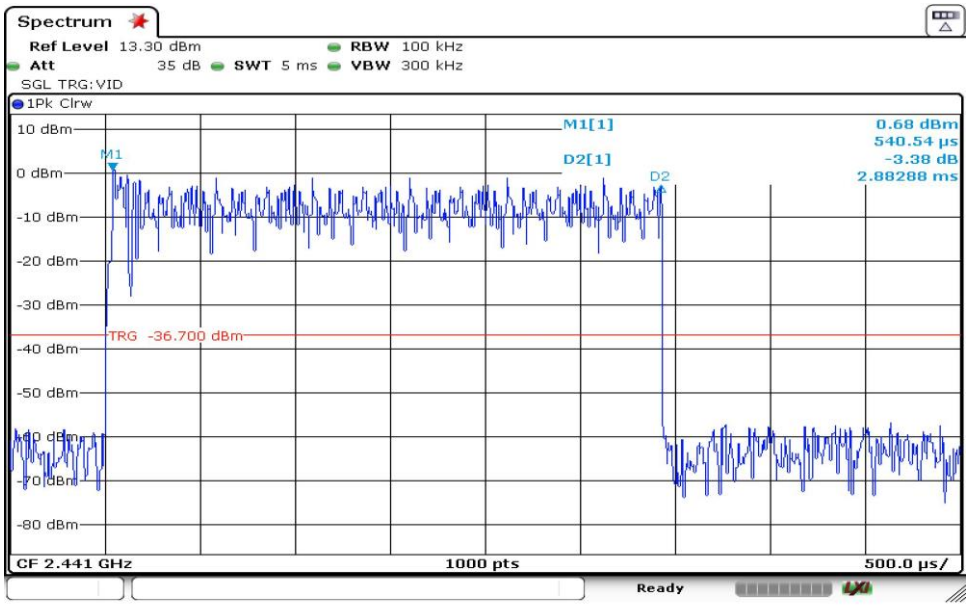
Number of hops over a period of 3 seconds: 10 hops.

Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 3 s) = 105.3 hops.
Averaging time of occupancy = 2.857 ms x 105.3 hops = 300.93 ms per 31.6 seconds.

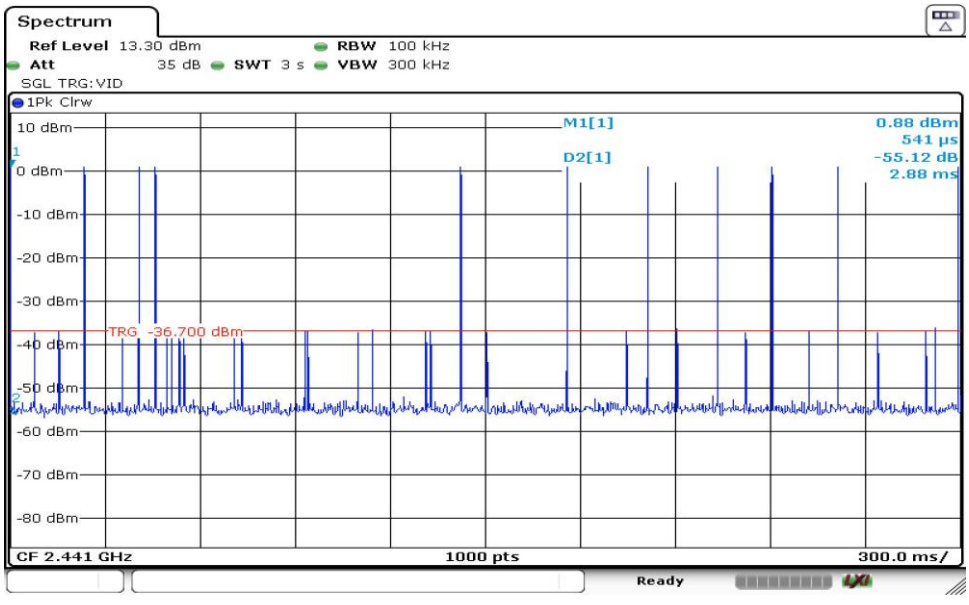
Measurement uncertainty (%)	<±0.12

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

Transmit Time per Hop: 2.883 ms



Date: 25.OCT.2019 12:53:45



Date: 25.OCT.2019 12:55:33

Number of hops over a period of 3 seconds: 10 hops.

Number of hops in the period specified in the requirements = (10 hops) x (31.6 s / 3 s) = 105.33 hops.
Averaging time of occupancy = 2.883 ms x 105.33 hops = 303.66 ms per 31.6 seconds.

Measurement uncertainty (%)	<±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)

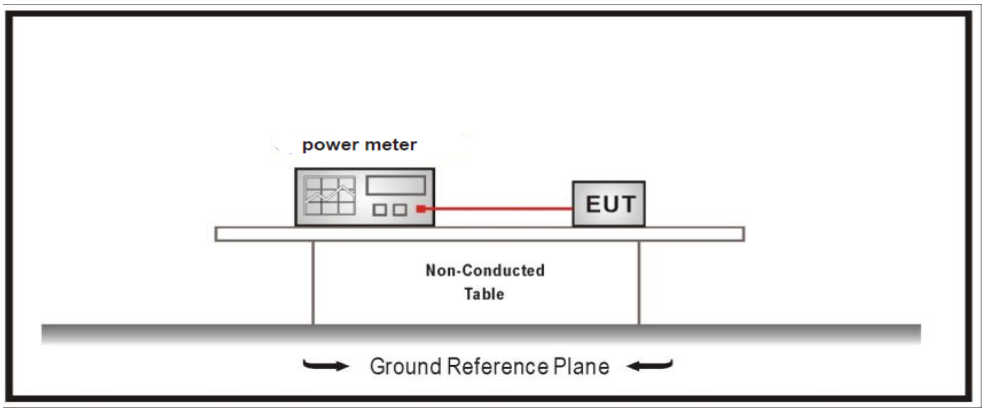
LIMITS

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

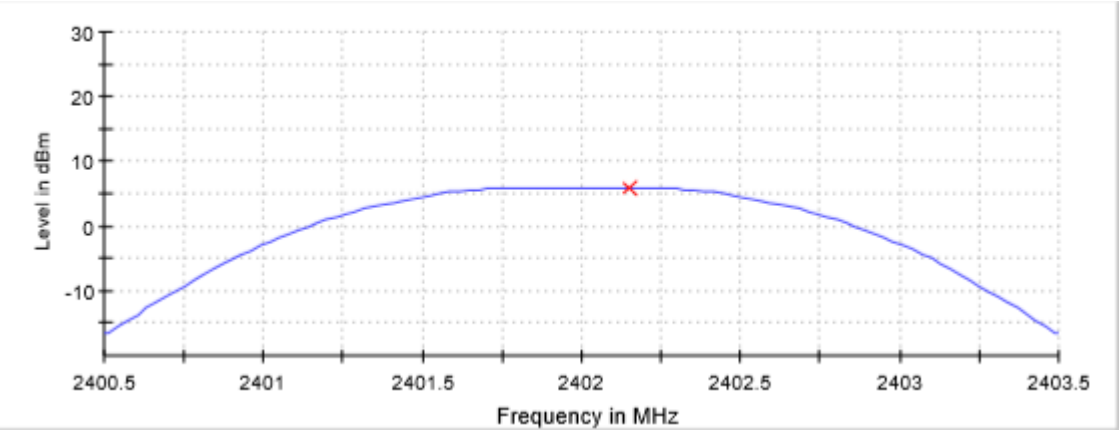
Maximum declared antenna gain: + 3.0 dBi

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	6.0	6.7	6.4
Maximum EIRP power (dBm)	9.0	9.7	9.4
Measurement uncertainty (dB)	<±0.78		

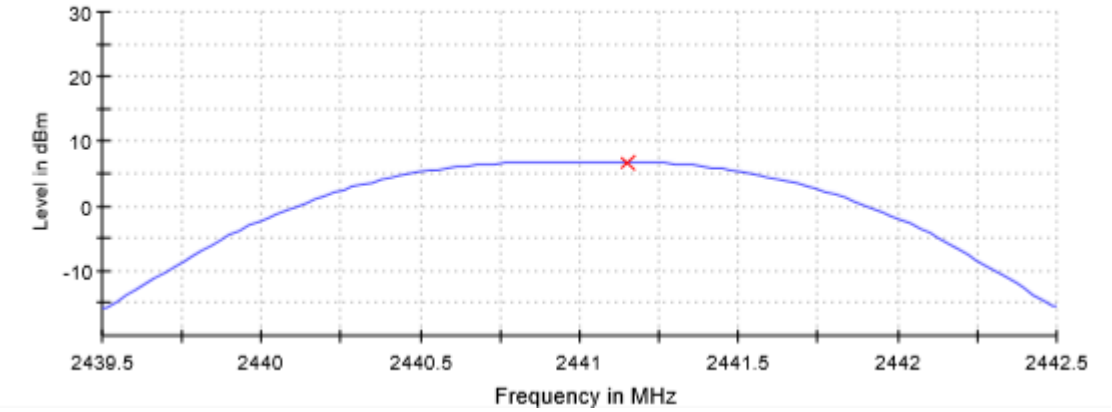
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED OUTPUT POWER

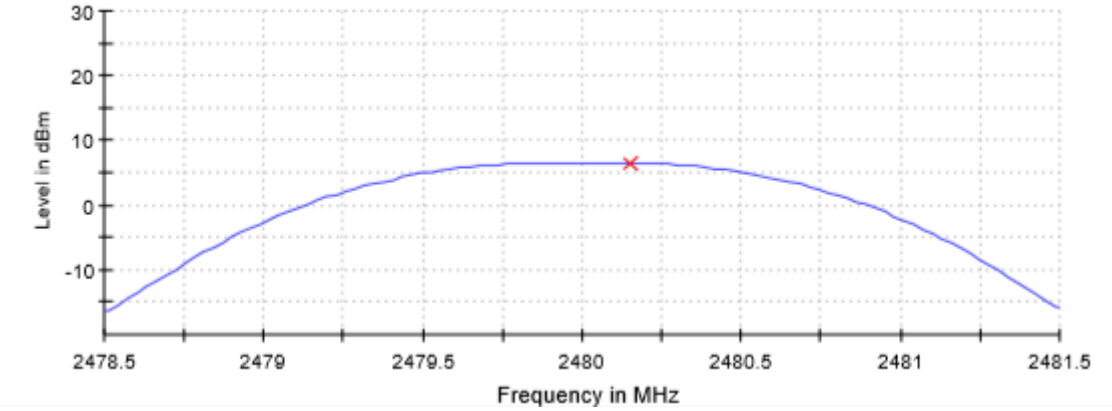
Lowest Channel



Middle Channel



Highest Channel



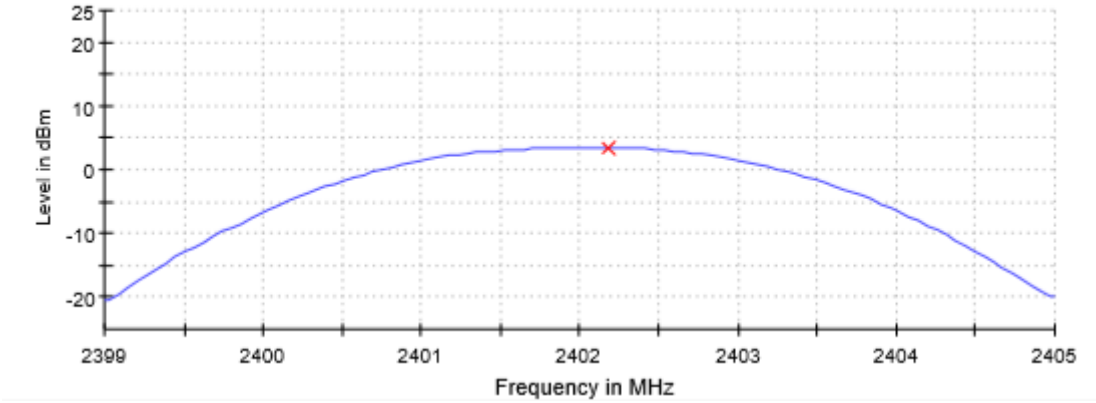
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS

Maximum declared antenna gain: +3.0 dBi

	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	3.5	4.4	4.5
Maximum EIRP power (dBm)	6.5	7.4	7.5
Measurement uncertainty (dB)	<±0.78		

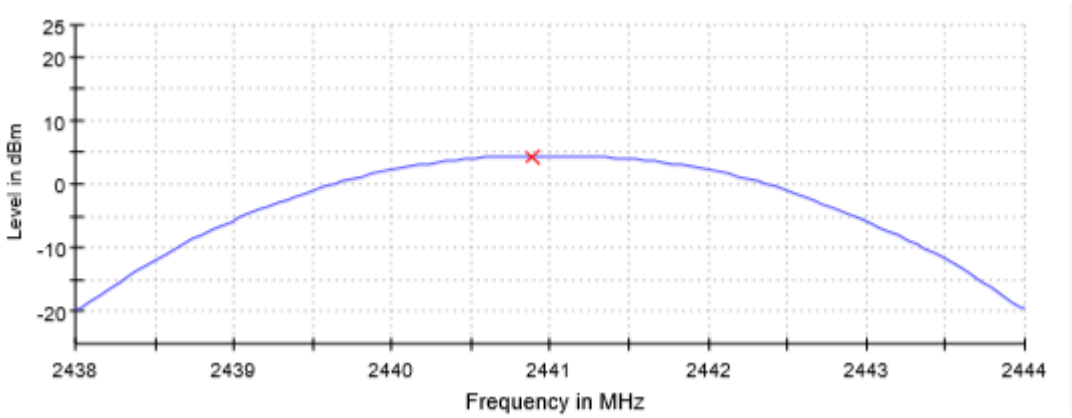
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Lowest Channel

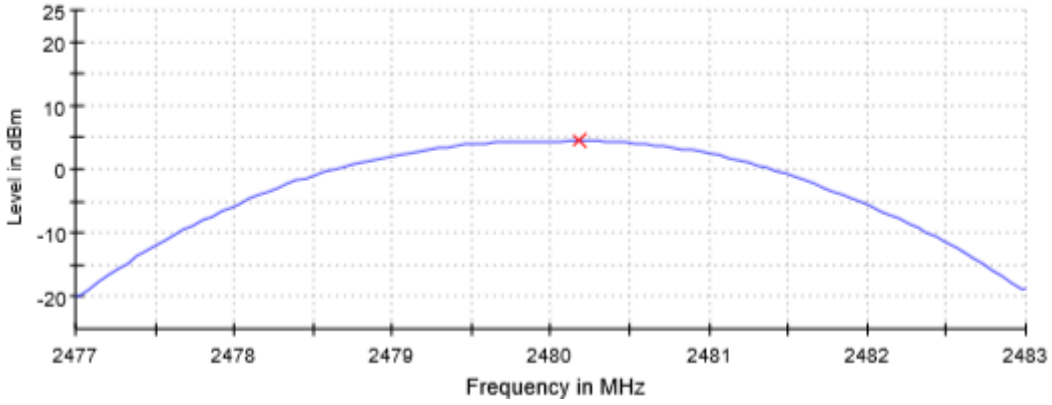


TEST RESULTS (Cont.)	CONDUCTED OUTPUT POWER

Middle Channel



Highest Channel



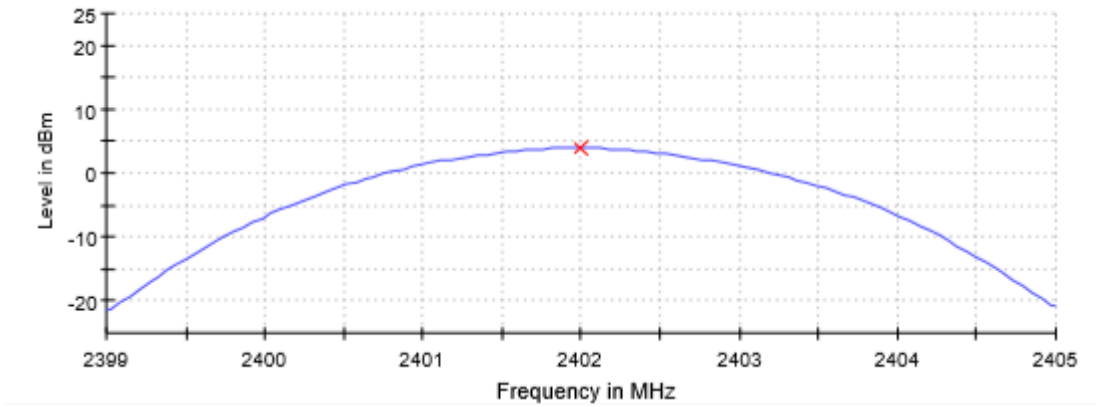
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS

Maximum declared antenna gain: +3.0 dBi

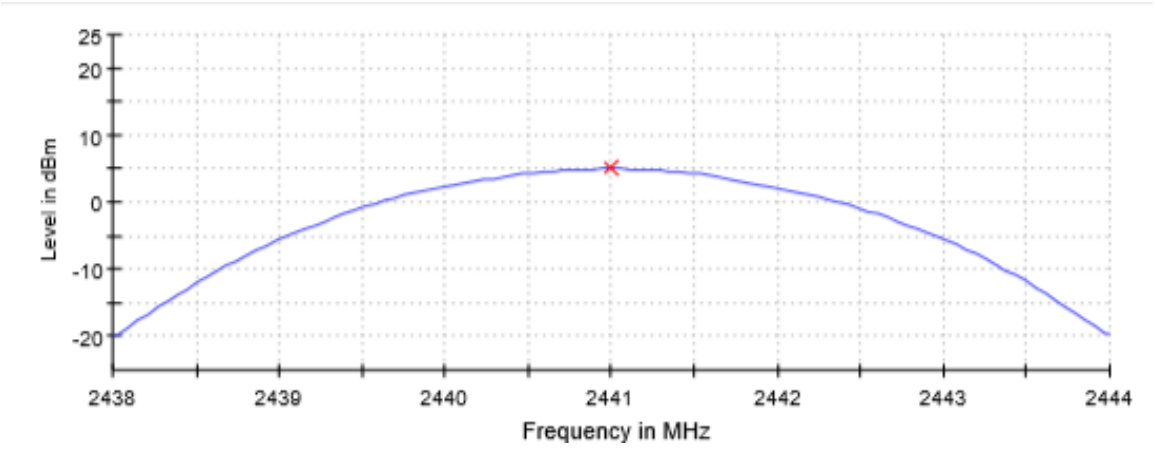
	Lowest frequency 2402 MHz	Middle frequency 2441 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	3.9	5.0	5.1
Maximum EIRP power (dBm)	6.9	8.0	8.1
Measurement uncertainty (dB)	<±0.78		

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

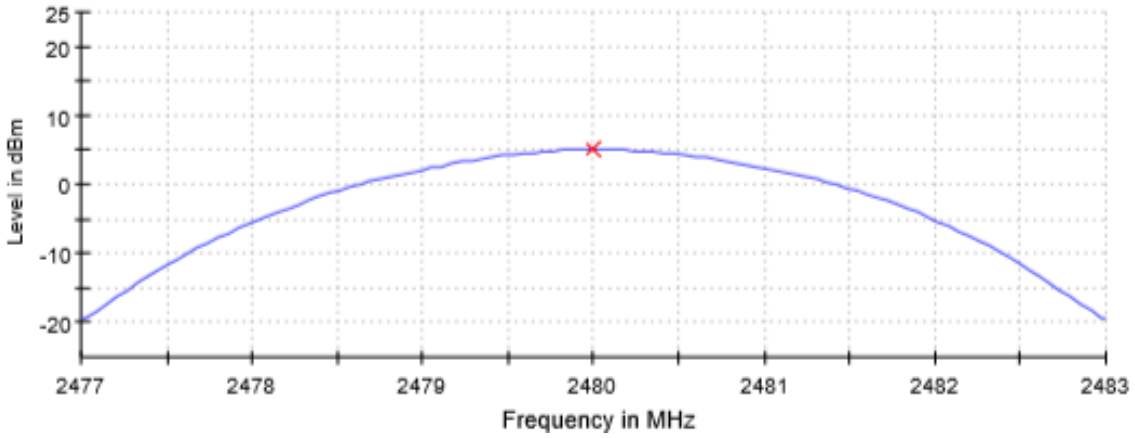


Middle Channel



TEST RESULTS (Cont.)	

Highest Channel



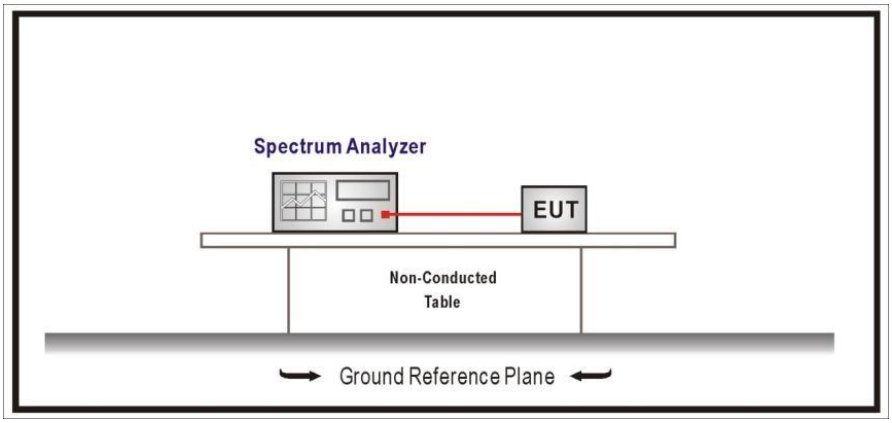
TEST A.5: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

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

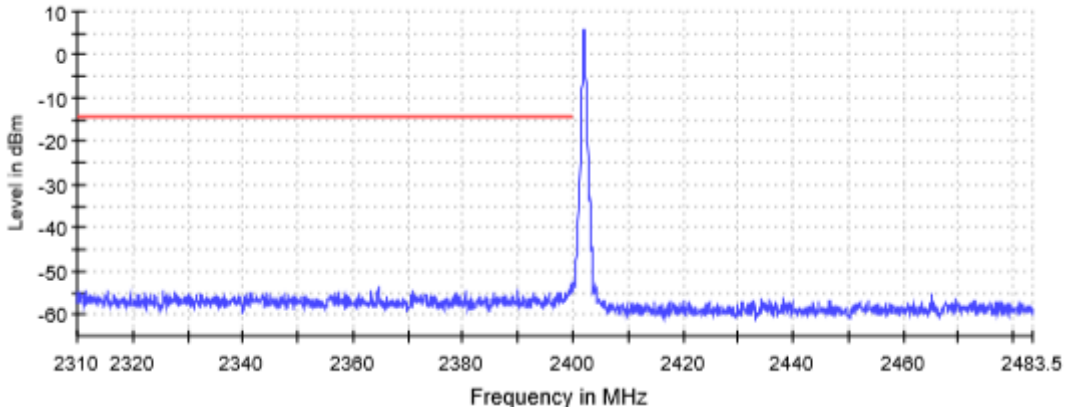
LIMITS

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	



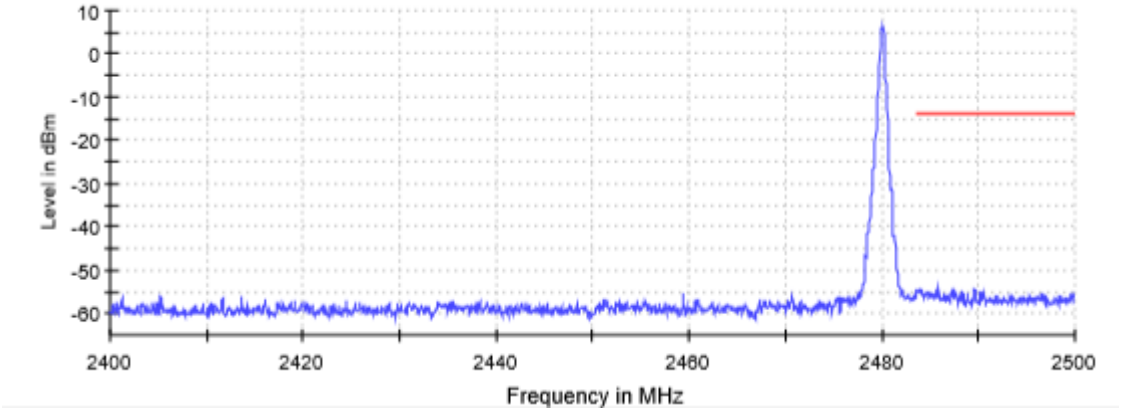
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	**HOPPING OFF (Lowest channel)**



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 µs	94.727 µs
Reference Level	00.000 dBm	00.000 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	5 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.31dB

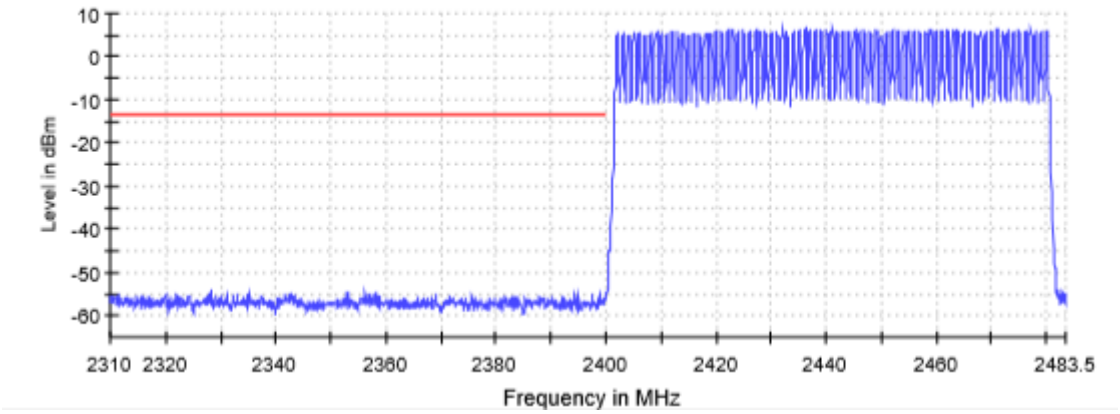
TEST RESULTS (Cont.):	HOPPING OFF (Highest channel)



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 µs	18.945 µs
Reference Level	00.000 dBm	00.000 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	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.11 dB	0.00 dB

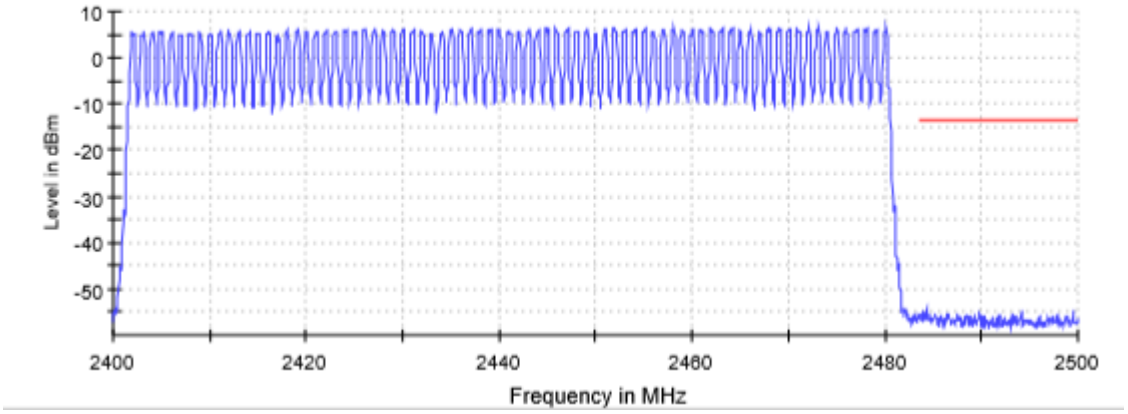
TEST RESULTS (Cont.):	HOPPING ON (Lowest channel)



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 µs	94.727 µs
Reference Level	00.000 dBm	00.000 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	97 / max. 150
Stable	3 / 3	3/ 3
Max Stable Difference	0.00 dB	0.43 dB

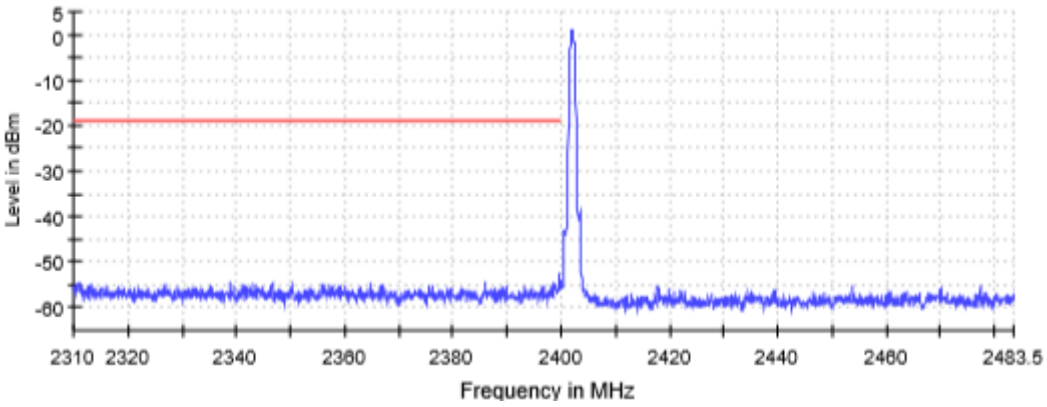
TEST RESULTS (Cont.):	HOPPING ON (Highest channel)



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 µs	18.945 µs
Reference Level	00.000 dBm	00.000 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	93 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.35 dB	0.00 dB

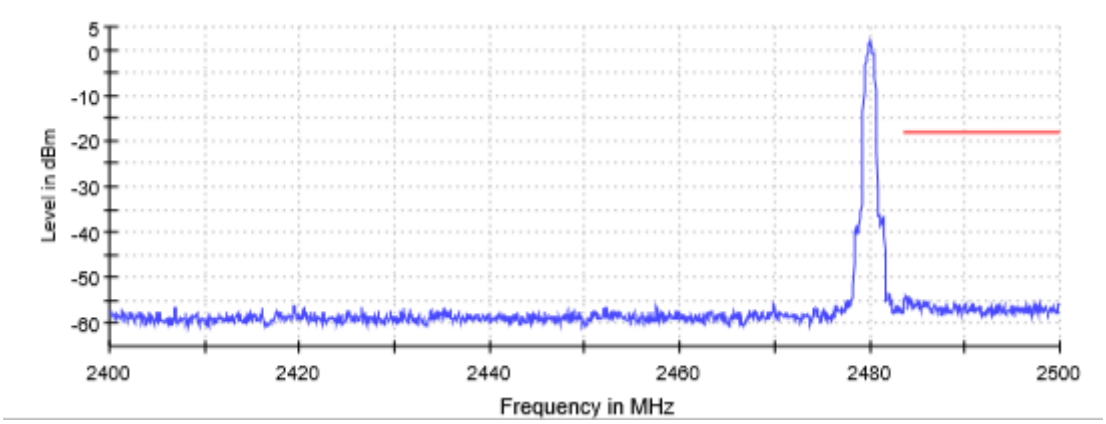
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	**HOPPING OFF (Lowest channel)**



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 µs	94.727 µs
Reference Level	00.000 dBm	00.000 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	8 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.25 dB

TEST RESULTS (Cont.):	HOPPING OFF (Highest channel)

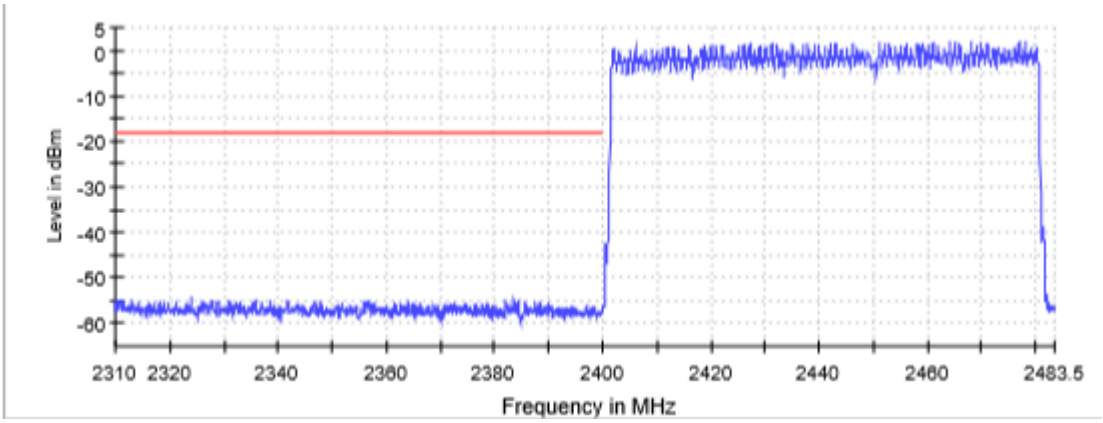


Measurement

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 µs	18.945 µs
Reference Level	00.000 dBm	00.000 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	6 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.07 dB	0.00 dB

TEST RESULTS (Cont.):	HOPPING ON (Lowest channel)

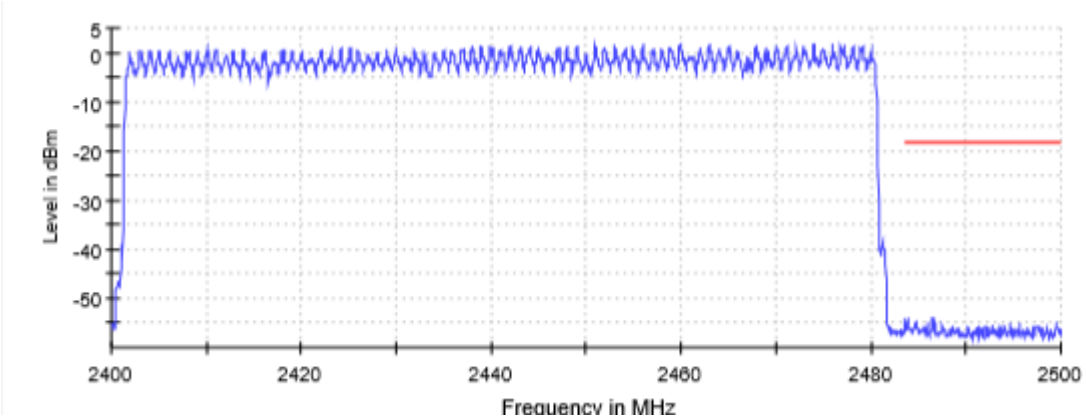
Low**est Channel**



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 µs	94.727 µs
Reference Level	00.000 dBm	00.000 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	128 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 dB

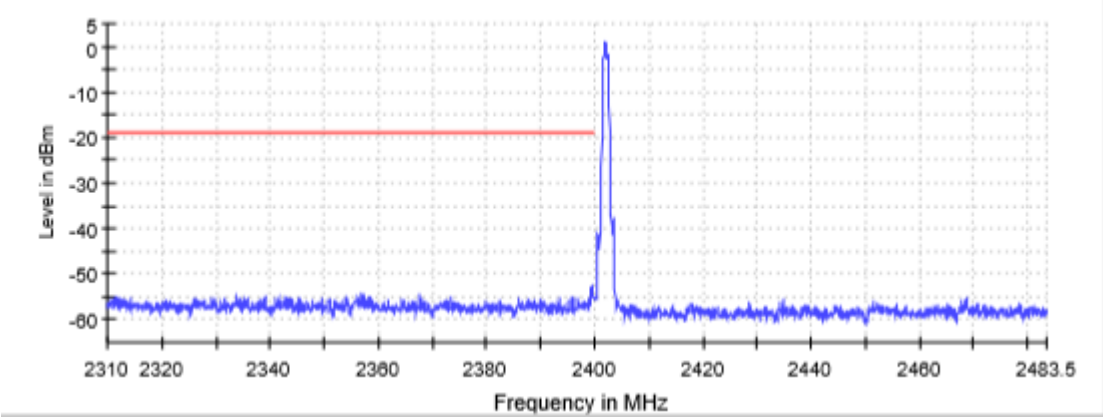
TEST RESULTS (Cont.):	HOPPING ON (Highest channel)



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 µs	18.945 µs
Reference Level	00.000 dBm	00.000 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	142 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.28 dB	0.00 dB

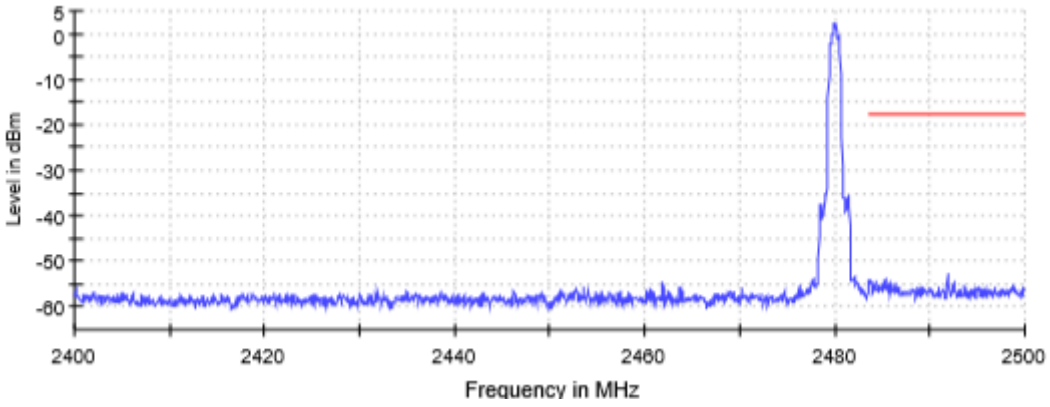
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS
TEST RESULTS (Cont.)	**HOPPING OFF (Lowest channel)**



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 µs	94.727 µs
Reference Level	00.000 dBm	00.000 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	10 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.17 dB

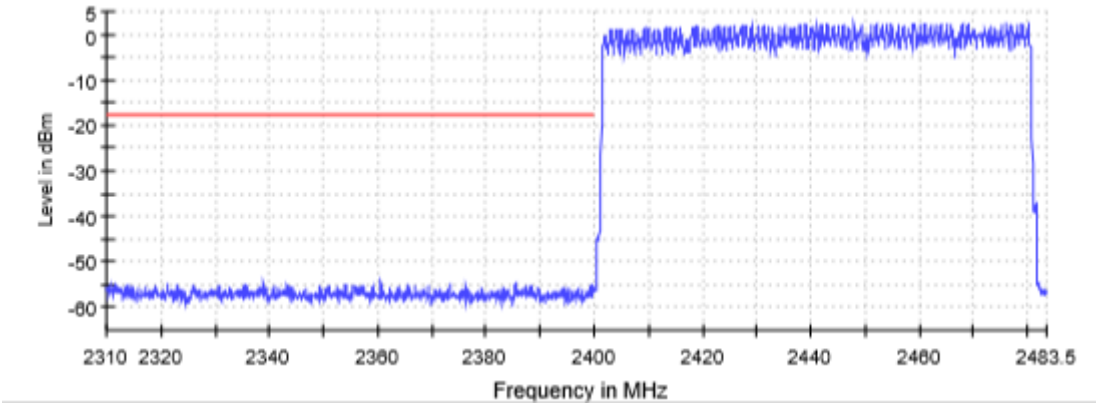
TEST RESULTS (Cont.):	HOPPING OFF (Highest channel)



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 µs	18.945 µs
Reference Level	00.000 dBm	00.000 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	11 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.07 dB	0.00 dB

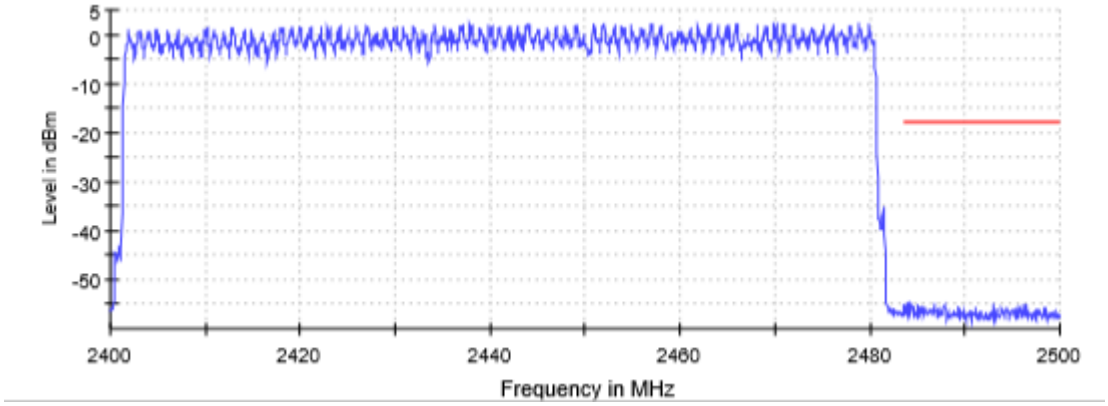
TEST RESULTS (Cont.):	HOPPING ON (Lowest channel)



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 µs	94.727 µs
Reference Level	00.000 dBm	00.000 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	143 / 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 µs	18.945 µs
Reference Level	00.000 dBm	00.000 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	138 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.00 dB

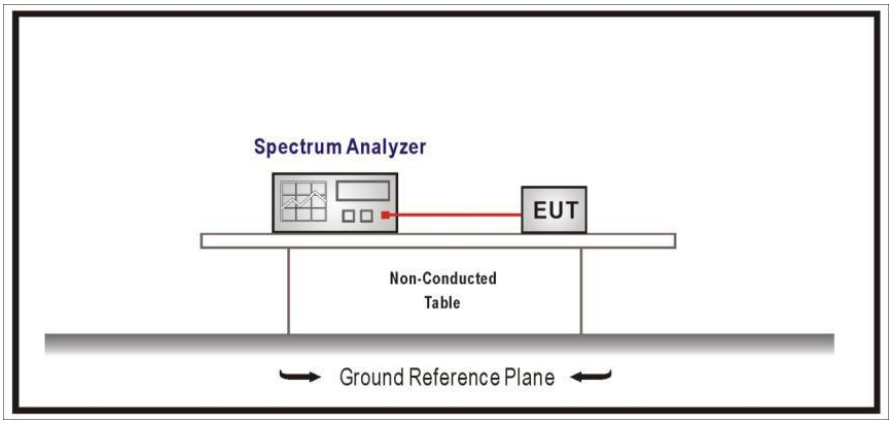
TEST A.6: EMISSION LIMITATIONS CONDUCTED (TRANSMITTER)

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

SPECIFICATION

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.

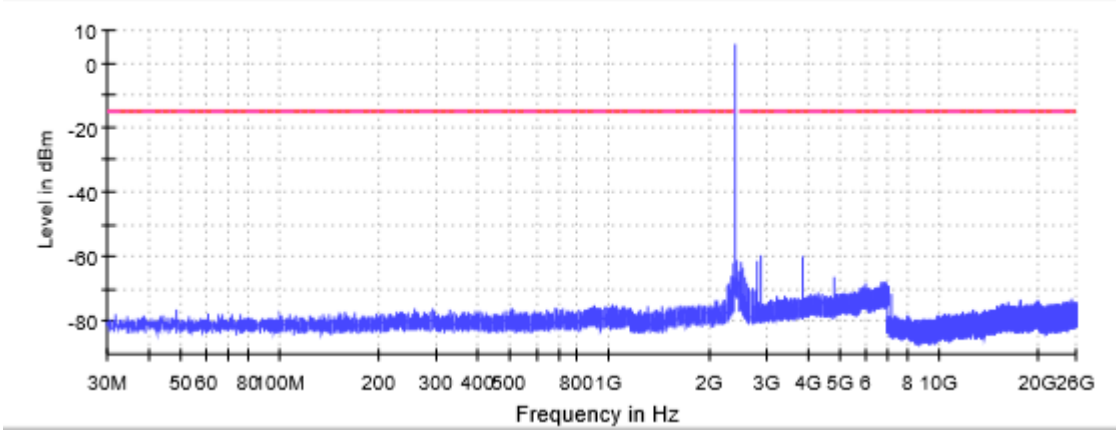
TEST SETUP	



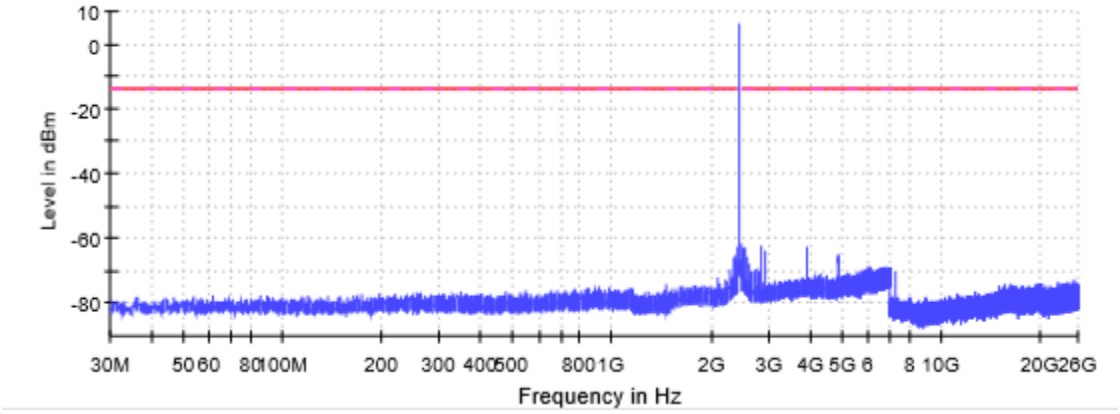
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01 (GFSK)
TEST RESULTS:	PASS

Frequency range 30 MHz – 26 GHz
The conducted spurious signals detected at less than 20 dB respect to the limit for low, mid and high operating channels are shown below with plots.

Low Channel:

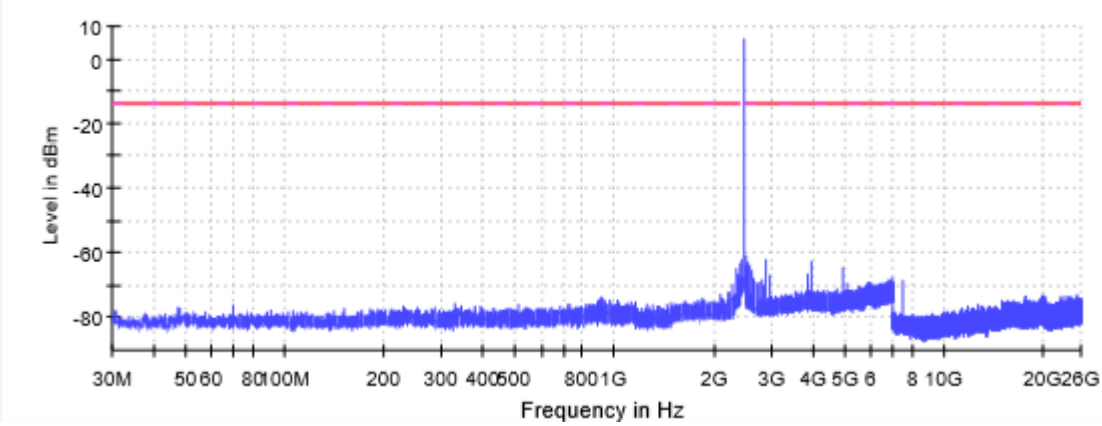


Mid Channel:



TEST RESULTS (Cont.):	

High Channel:



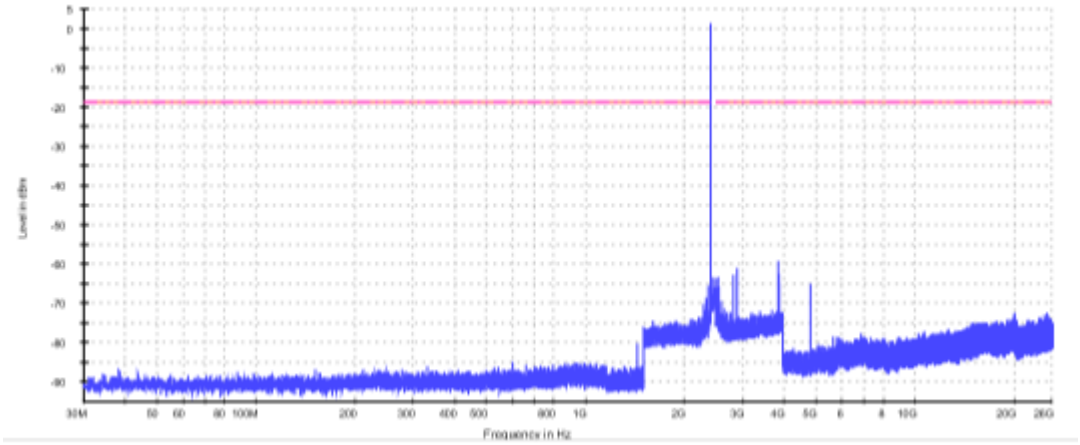
Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
Sweep Points	29400	29400	29400
Sweep time	29.400 ms	29.400 ms	29.400 ms
Reference Level	-20.000 dBm	-20.000 dBm	-20.000 dBm
Attenuation	10.000 dB	10.000 dB	10.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	30	30	30
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	sweep	sweep	sweep
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	1.00 dB	1.00 dB	1.00 dB
Run	2 / max. 40	2 / max. 40	2 / max. 40
Stable	1 / 1	1 / 1	1 / 1
Max Stable Difference	0.00 dB	0.00 dB	0.00 dB

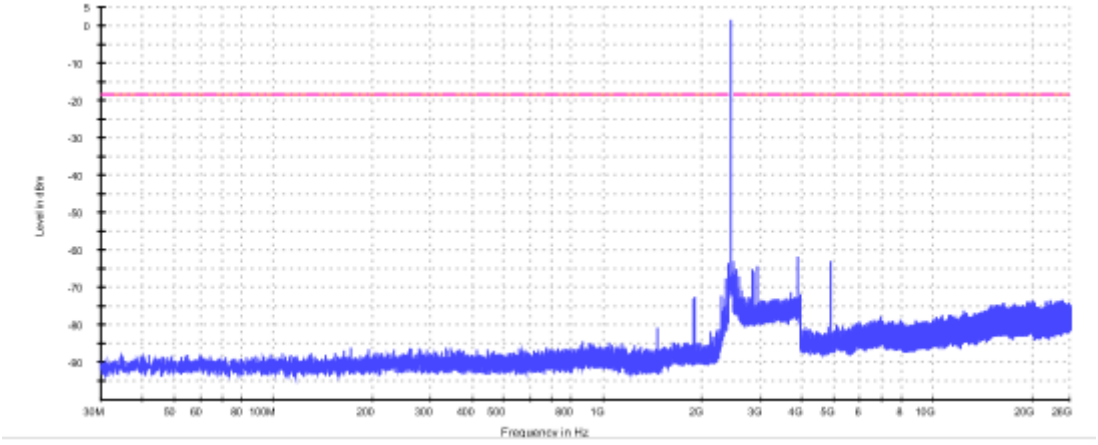
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02 (PI4DQPSK)
TEST RESULTS:	PASS

Frequency range 30 MHz – 26 GHz
The conducted spurious signal detected at less than 20 dB respect to the limit for low and high operating channels are shown below with plots.

Low Channel:

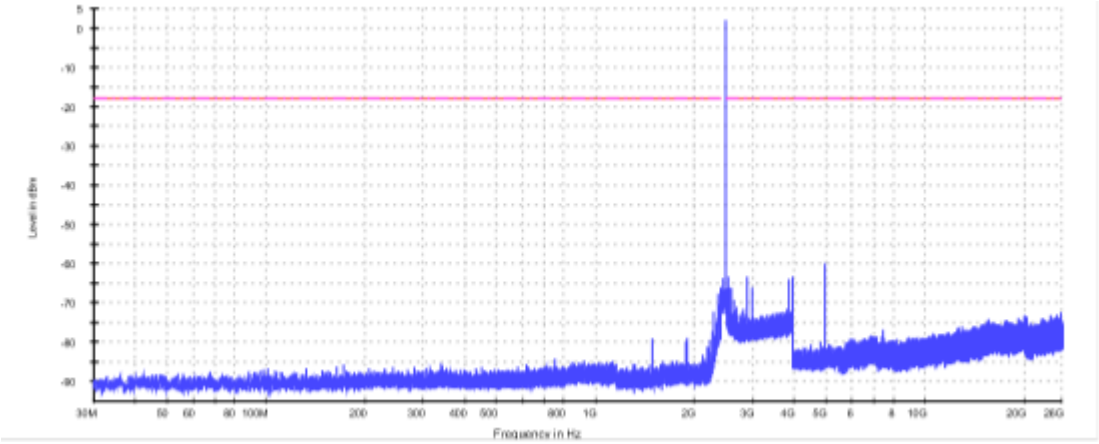


Mid Channel:



TEST RESULTS (Cont.):	

High Channel:



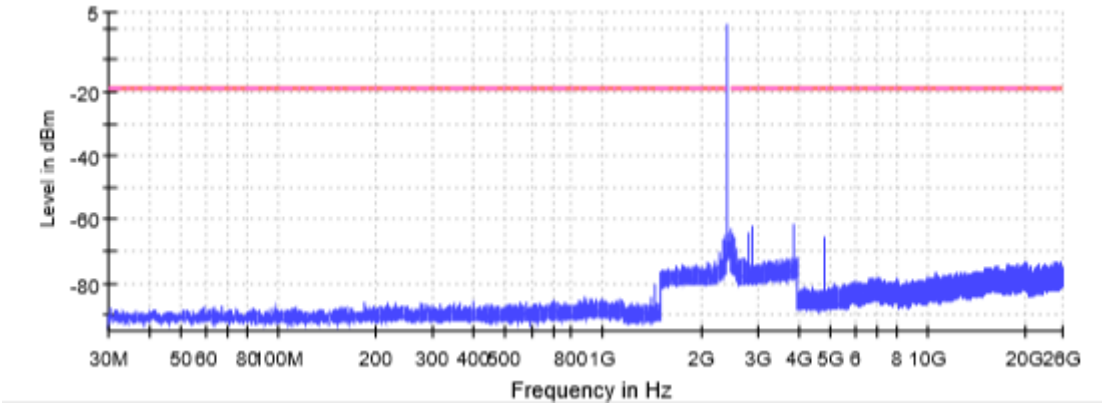
Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
Sweep Points	29400	29400	29400
Sweep time	29.400 ms	29.4 ms	29.400 ms
Reference Level	-20.000 dBm	-30.000 dBm	-20.000 dBm
Attenuation	10.000 dB	0.000 dB	10.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	30	30	30
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	sweep	FFT	sweep
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	1.00 dB	1.00 dB	1.00 dB
Run	3 / max. 40	2 / max. 40	4 / max. 40
Stable	1 / 1	1 / 1	1 / 1
Max Stable Difference	0.00 dB	0.00 dB	0.00 dB

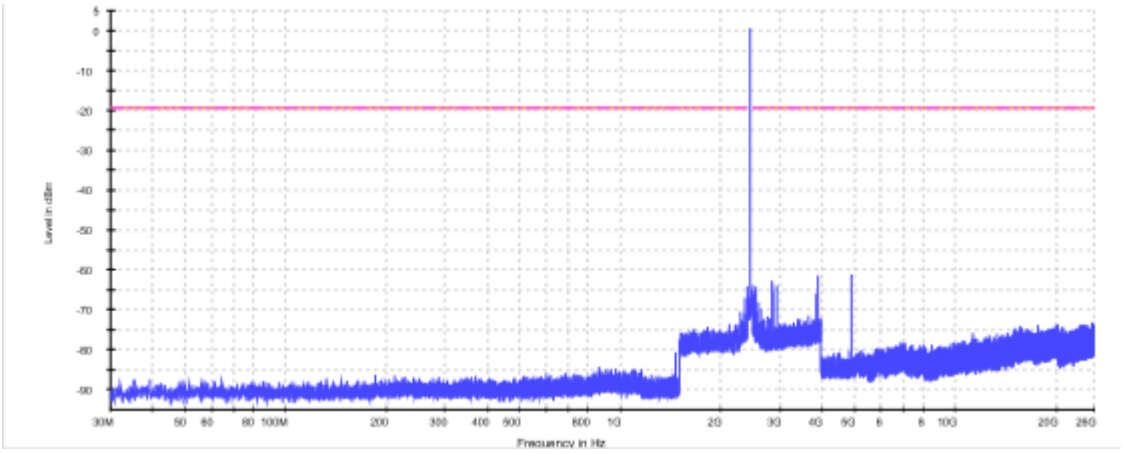
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03 (8DPSK)
TEST RESULTS:	PASS

Frequency range 30 MHz – 26 GHz
The conducted spurious signal detected at less than 20 dB respect to the limit for low and high operating channels are shown below with plots.

Low Channel:

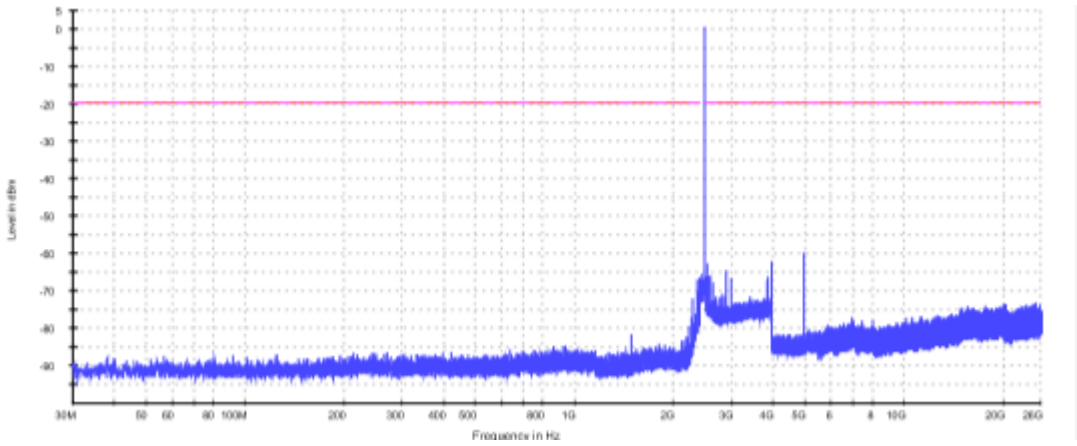


Mid Channel:



TEST RESULTS (Cont.):	

High Channel:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
Sweep Points	29400	29400	29400
Sweep time	29.4 ms	29.400 ms	29.400 ms
Reference Level	-30.000 dBm	-20.000 dBm	-20.000 dBm
Attenuation	0.000 dB	10.000 dB	10.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
Sweep Count	30	30	30
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	FFT	sweep	sweep
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	1.00 dB	1.00 dB	1.00 dB
Run	3 / max. 40	3 / max. 40	2 / max. 40
Stable	1 / 1	1 / 1	1 / 1
Max Stable Difference	0.00 dB	0.00 dB	0.00 dB

TEST A.7: 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 1-40 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.

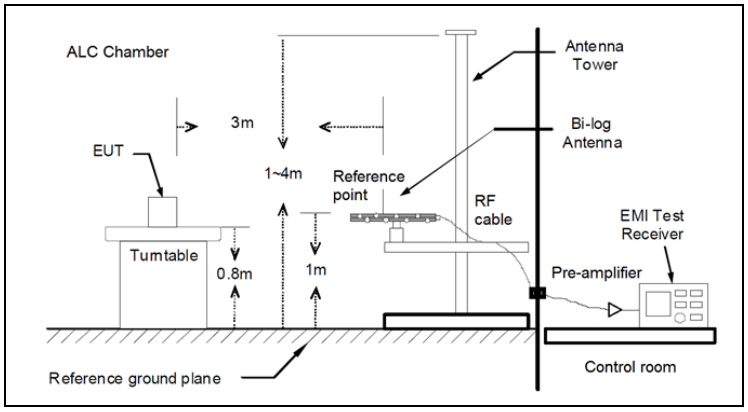
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

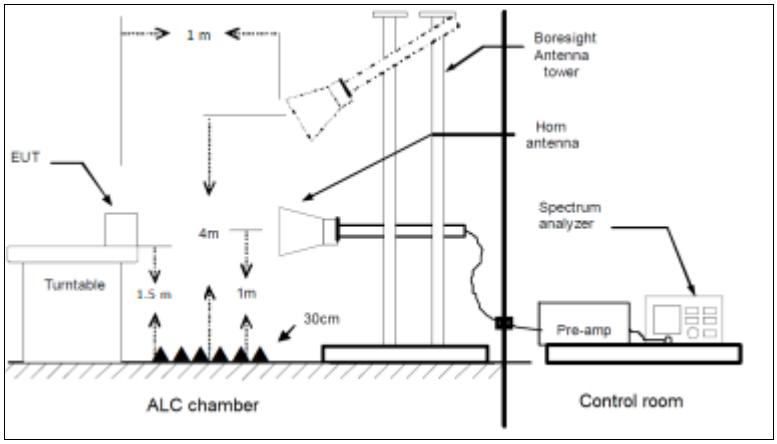
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)	

Radiated measurements Setup f < 1 GHz



Radiated measurements setup f > 1 GHz



TESTED SAMPLES:	S/02
TESTED CONDITIONS MODES:	TC#01 (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.

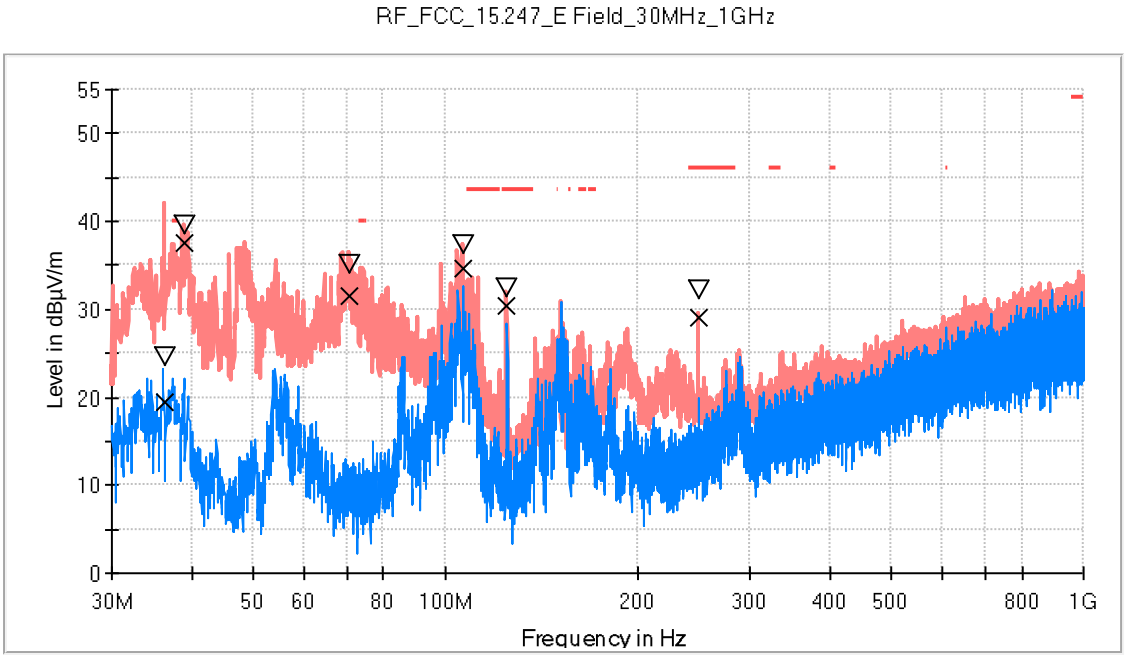
The radiated spurious signals detected at or above 20 dB below the limit were shown in below tables and graphs.

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 2.31-2.5 GHz.

TEST RESULTS (Cont.):	30 MHz – 1000 MHz (GFSK)

CHANNEL: Middle (2440 MHz)

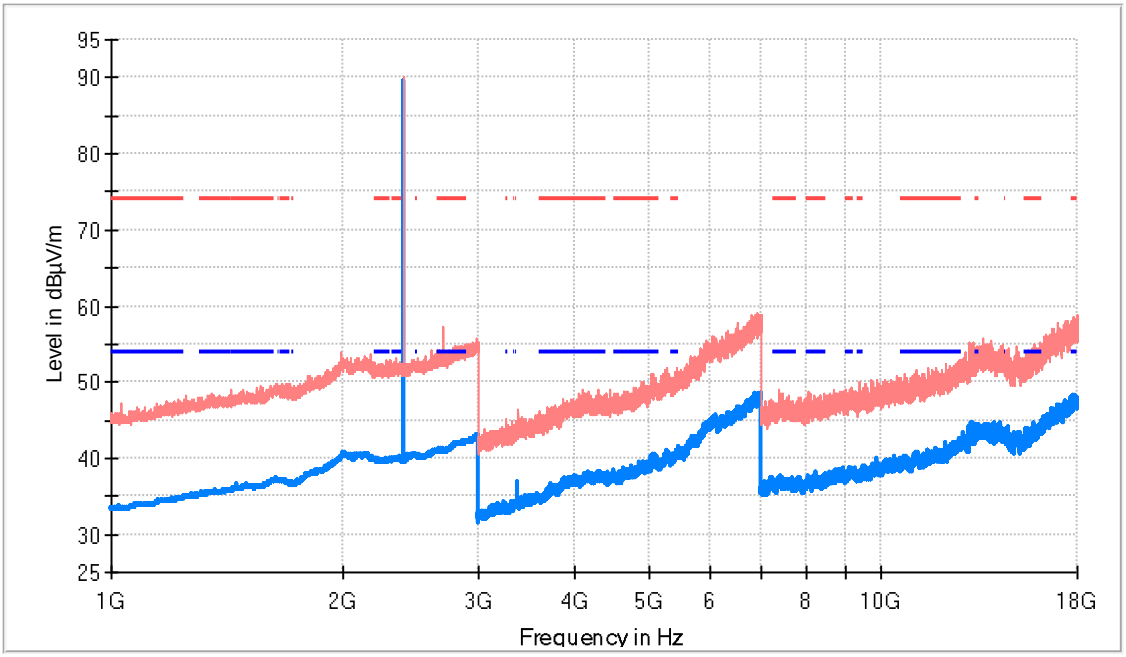


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol	Azimuth (deg)
36.353500	24.7	19.5	V	-108.0
38.924000	39.6	37.6	V	-39.0
70.788500	35.1	31.6	V	-180.0
106.678500	37.4	34.6	H	115.0
125.011500	32.4	30.5	V	-81.0
249.996000	32.1	29.1	V	10.0

TEST RESULTS (Cont.):	1 GHz – 18 GHz (GFSK)

CHANNEL: Lowest (2402 MHz)



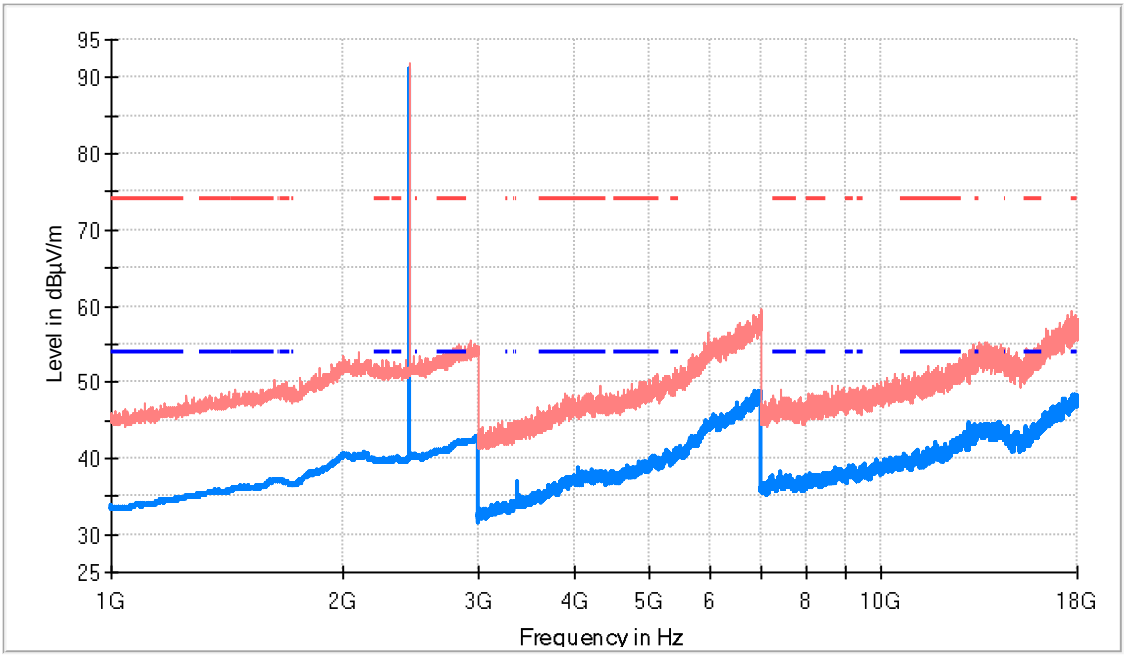
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2402.000000	90.2	89.6	V	Fundamental
3370.500000	44.2	36.9	V	

TEST RESULTS (Cont.)	

CHANNEL: Middle (2440 MHz)



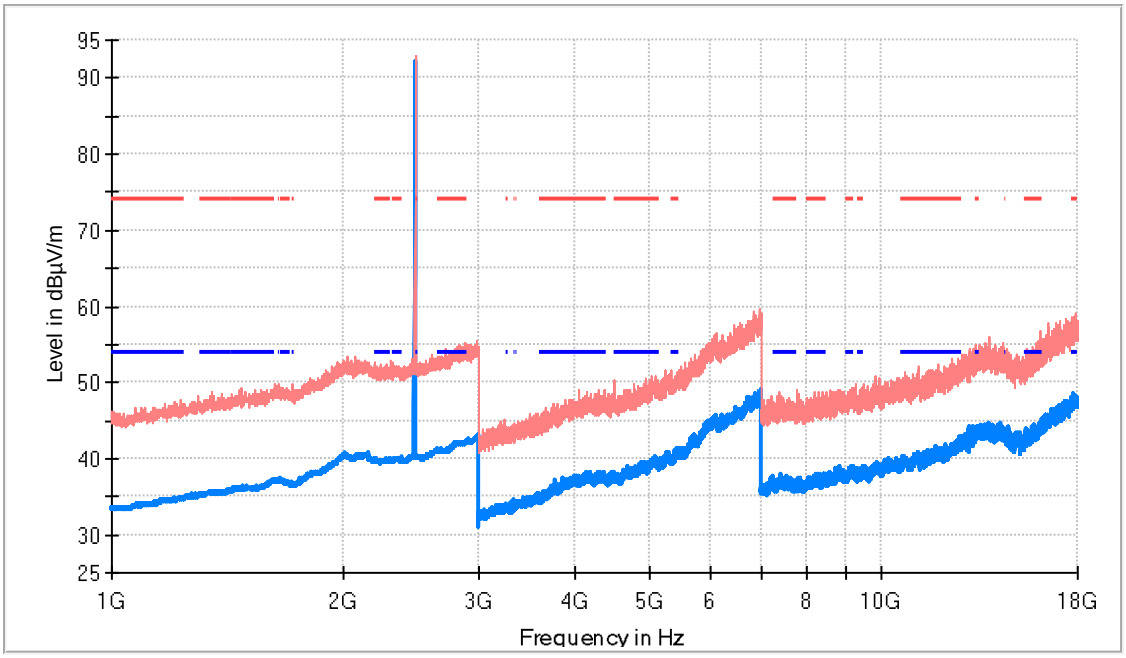
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2441.000000	91.8	91.1	H	Fundamental
3370.500000	44.1	36.8	H	

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



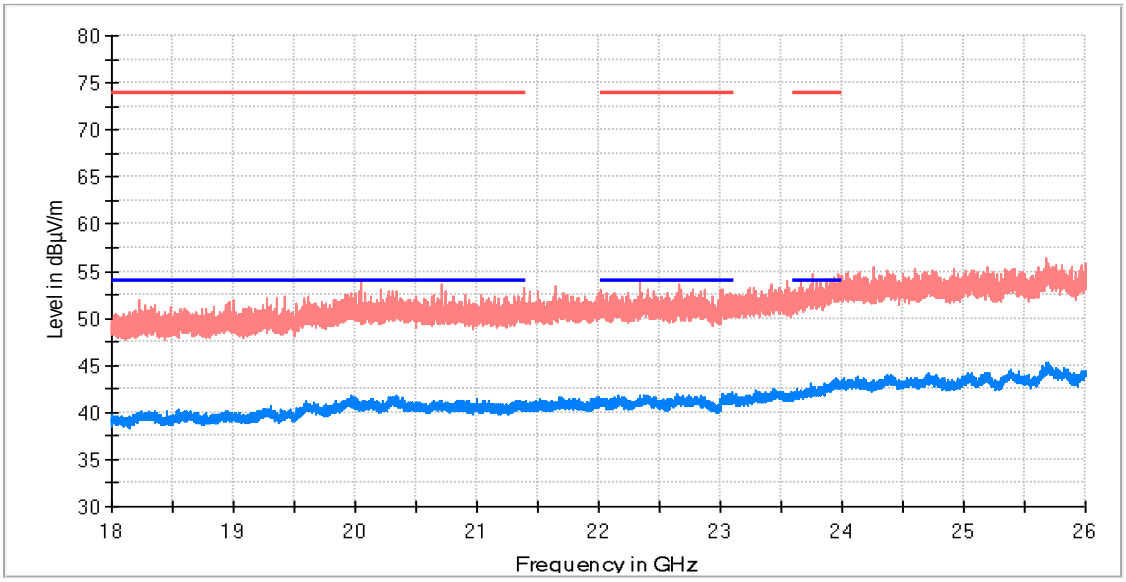
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2480.000000	92.9	92.2	H	Fundamental

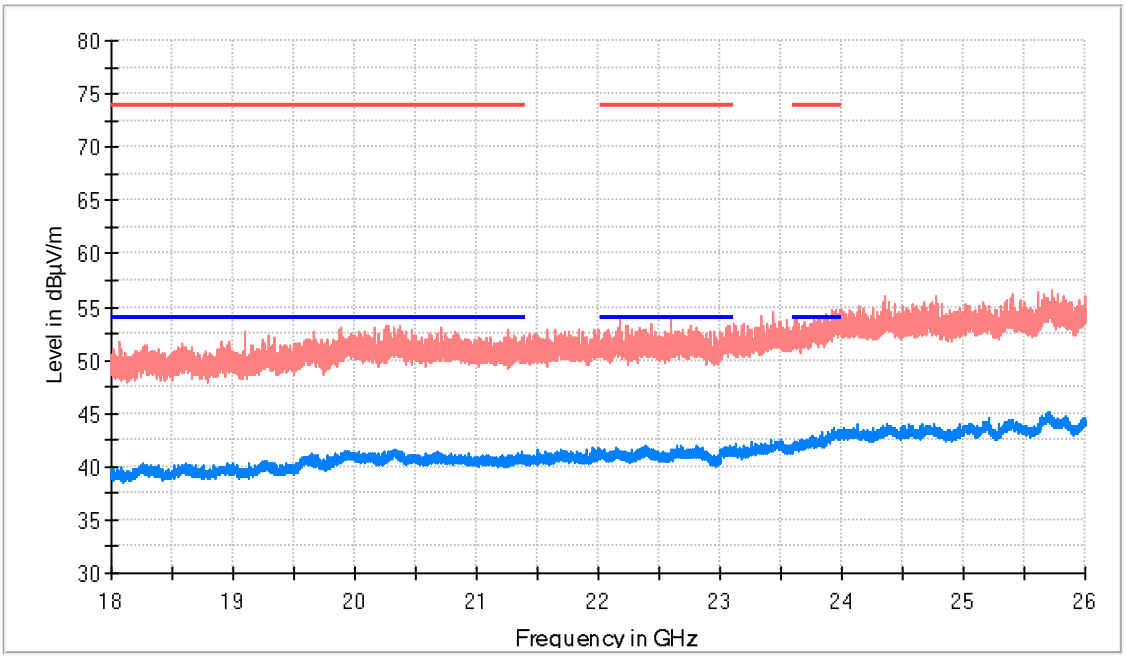
TEST RESULTS (Cont.)	18 GHz – 26 GHz (GFSK)

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

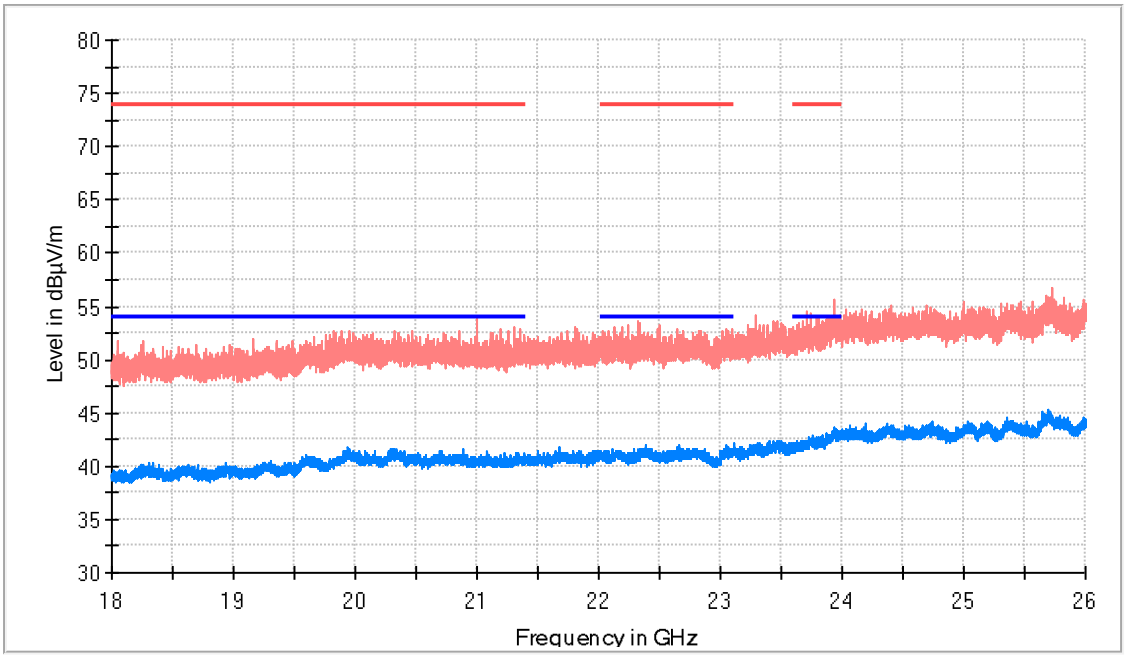
CHANNEL: Middle (2440 MHz)



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.)	

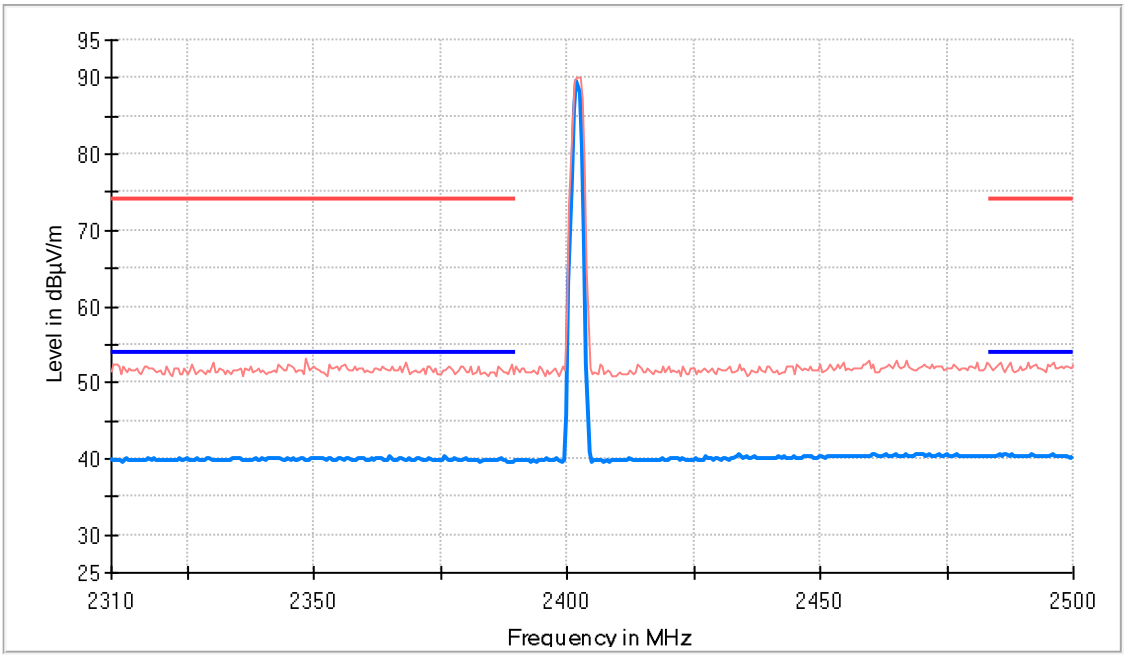
CHANNEL: Highest (2480 MHz)



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

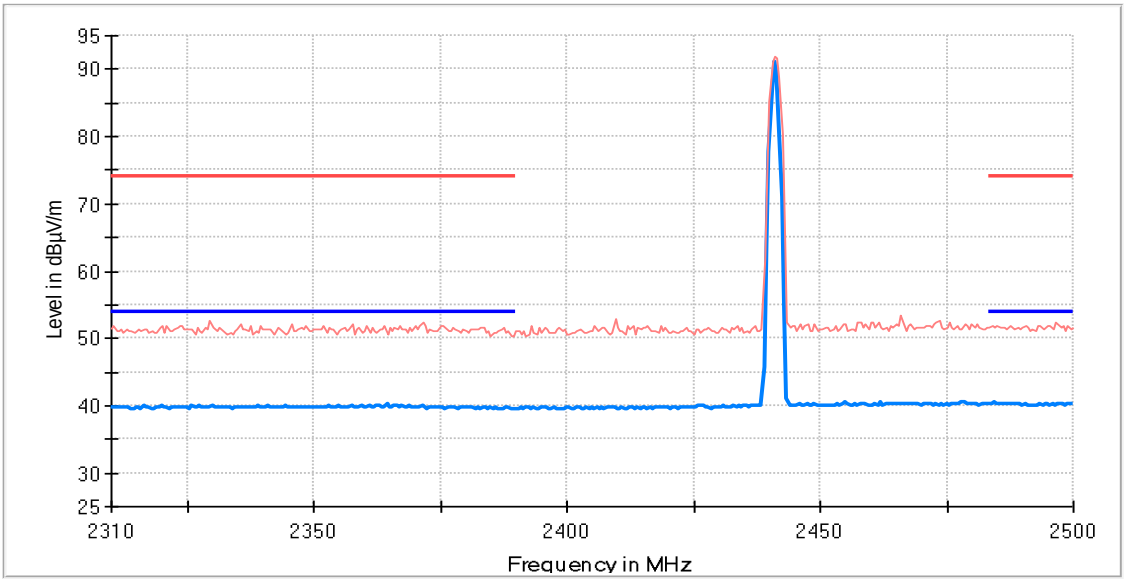
RESTRICTED BANDS	2.31 GHz – 2.5 GHz (GFSK)

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

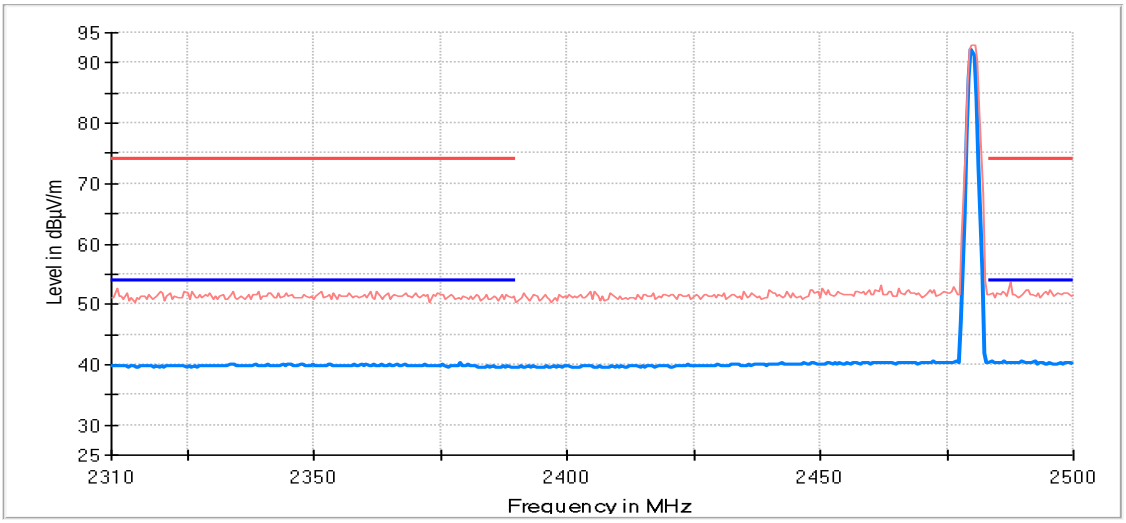
CHANNEL: Middle (2440 MHz)



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

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

Frequency range 30 MHz – 1000 MHz

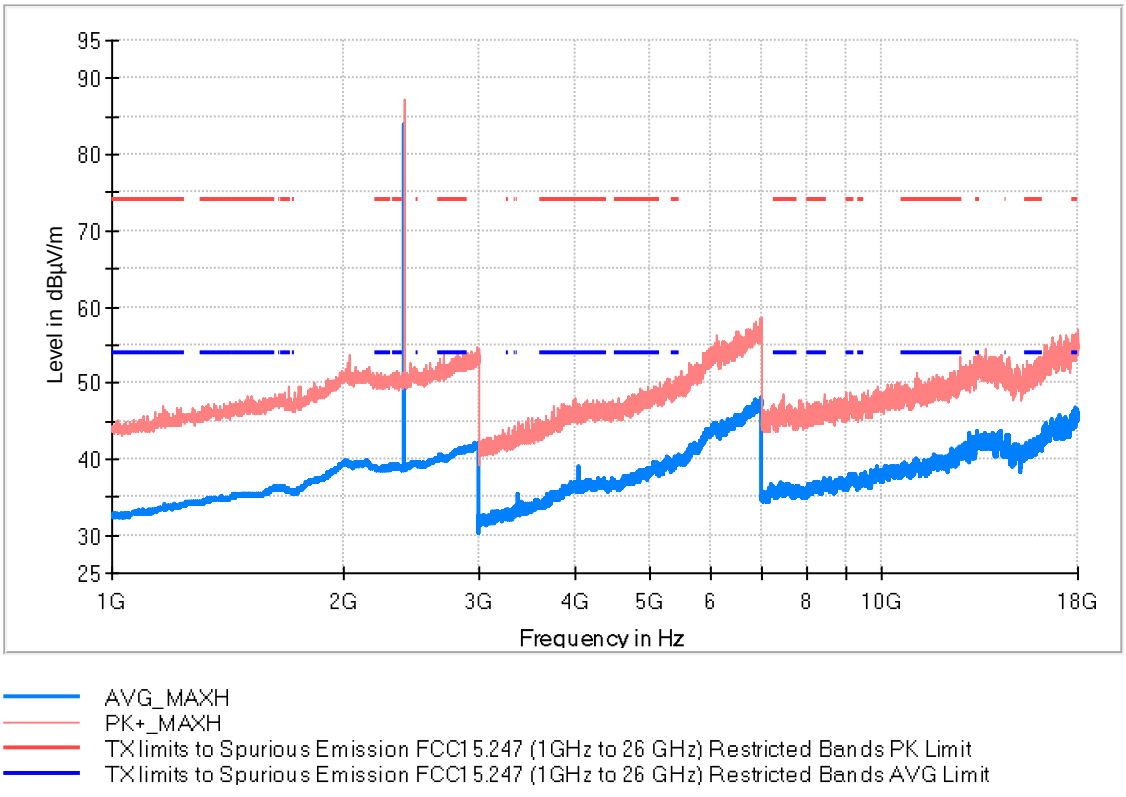
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT. Worst case selected GFSK Modulation only.

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 2.31-2.5 GHz.

TEST RESULTS (Cont.)	**1 GHz – 18 GHz (PI4DQPSK)**

CHANNEL: Lowest (2402 MHz).



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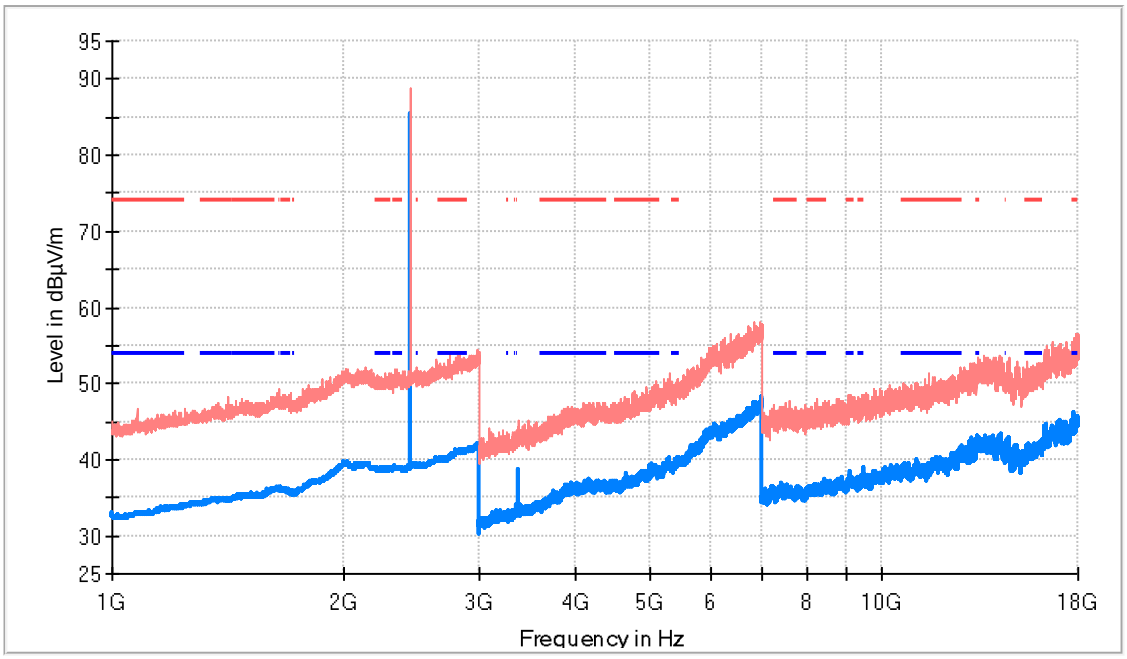
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2402.000000	86.9	84.0	V	Fundamental
4045.000000	46.4	39.0	H	

TEST RESULTS (Cont.)	

CHANNEL: Middle (2440 MHz).

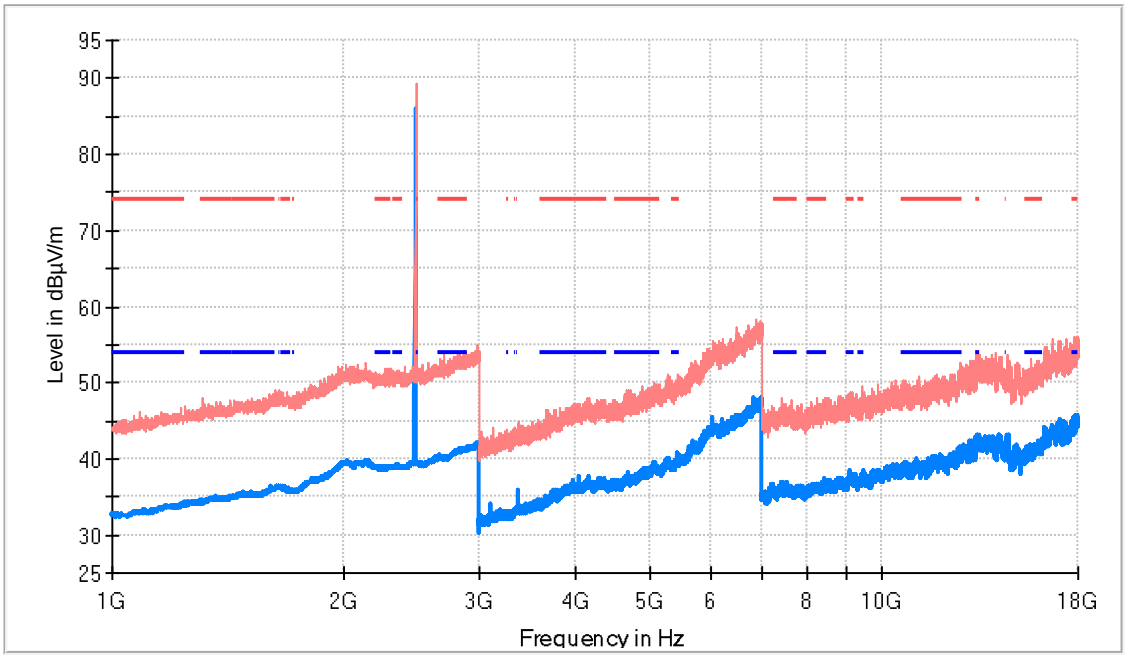


Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2441.000000	88.8	85.5	H	Fundamental
3370.500000	45.1	38.8	V	

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



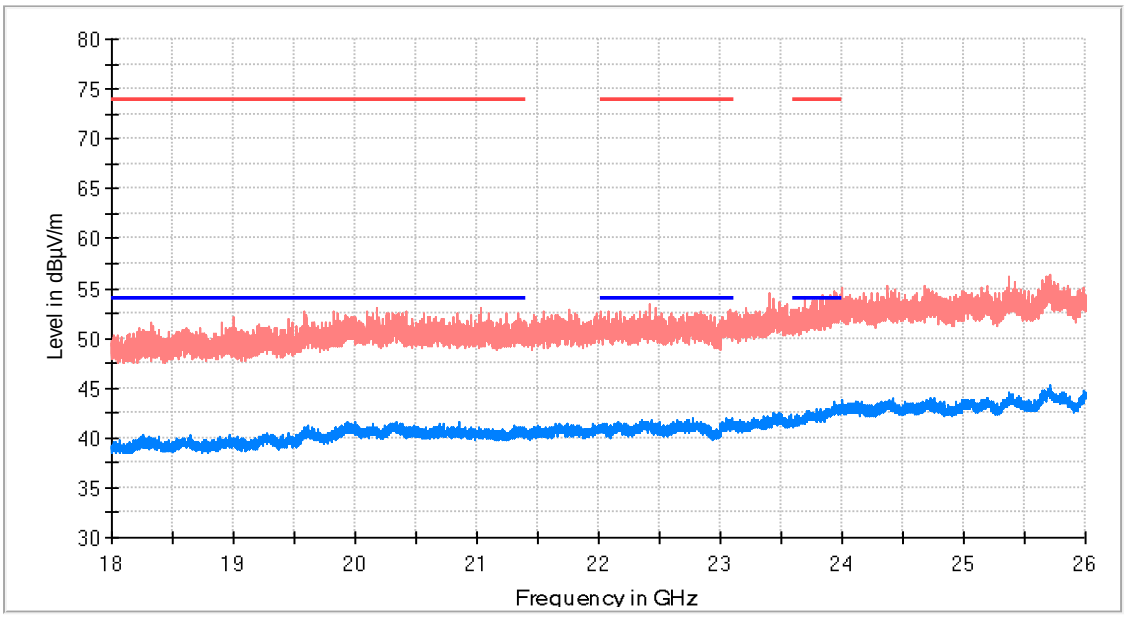
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2480.000000	89.4	86.0	H	Fundamental
3370.500000	44.5	35.7	V	

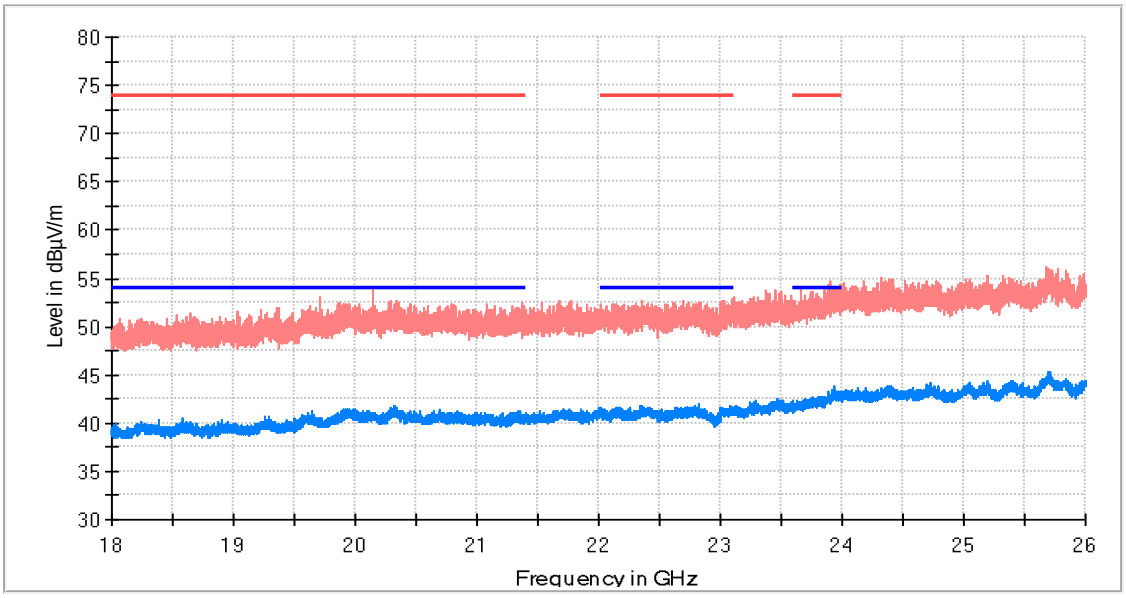
TEST RESULTS (Cont.)	18 GHz – 26 GHz (PI4DQPSK)

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

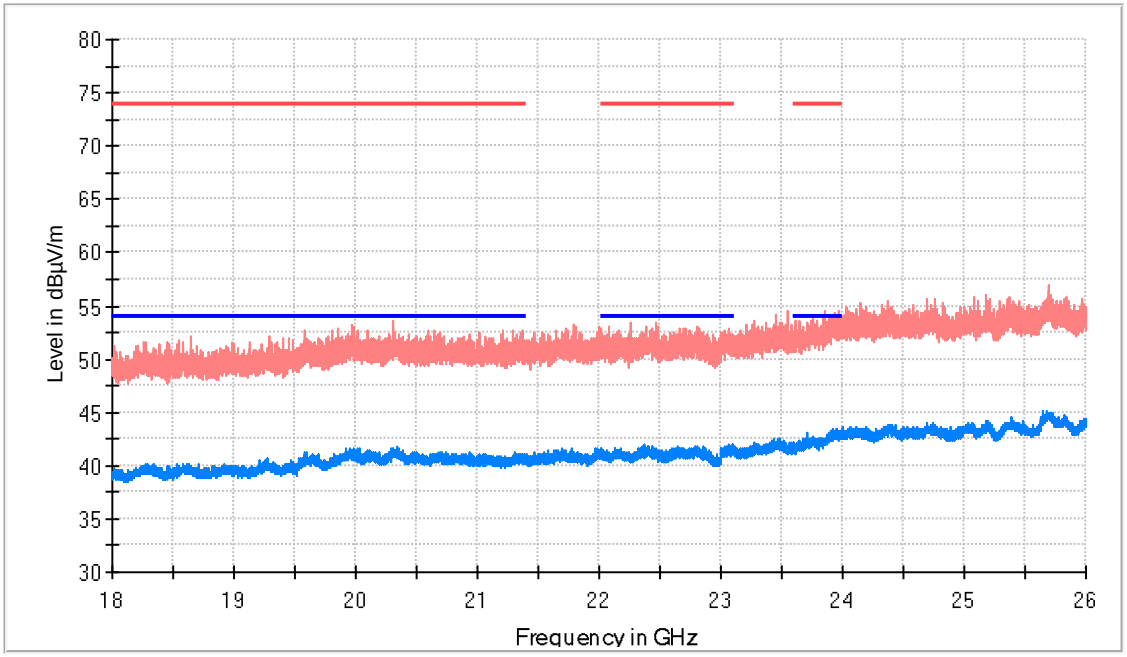
CHANNEL: Middle (2440 MHz)



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.)	

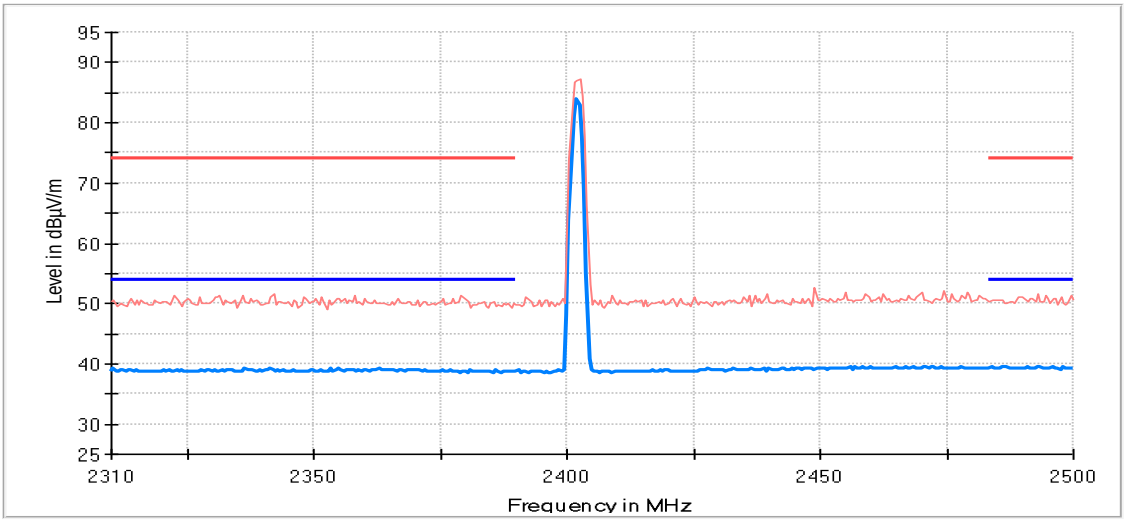
CHANNEL: Highest (2480 MHz)



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

TEST RESULTS (Cont.):	RESTRICTED BAND 2.31 GHz – 2.5 GHz (PI4DQPSK)

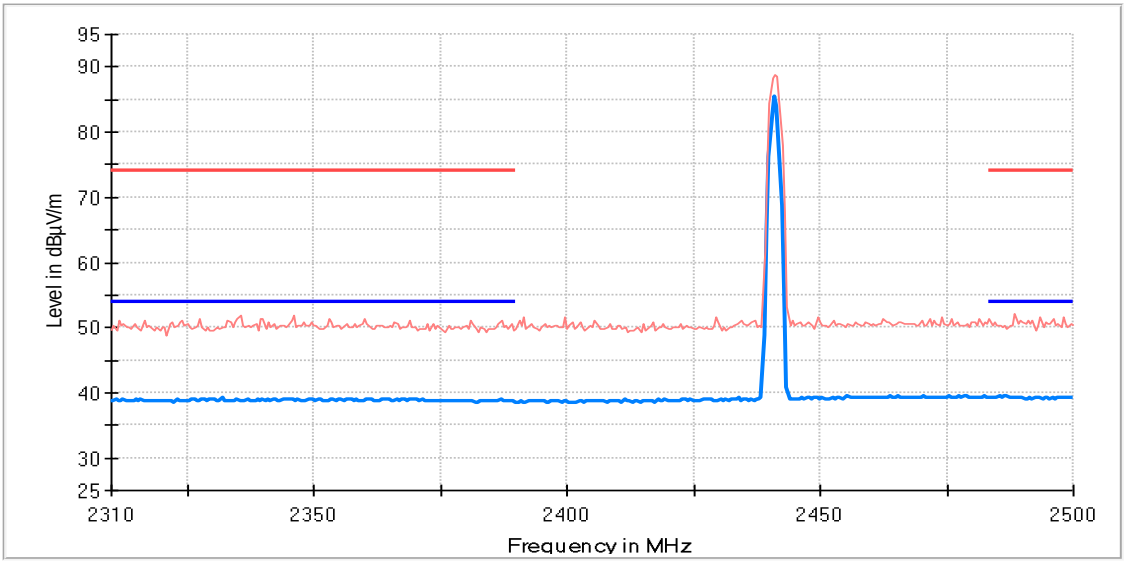
CHANNEL: Lowest (2402 MHz)



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

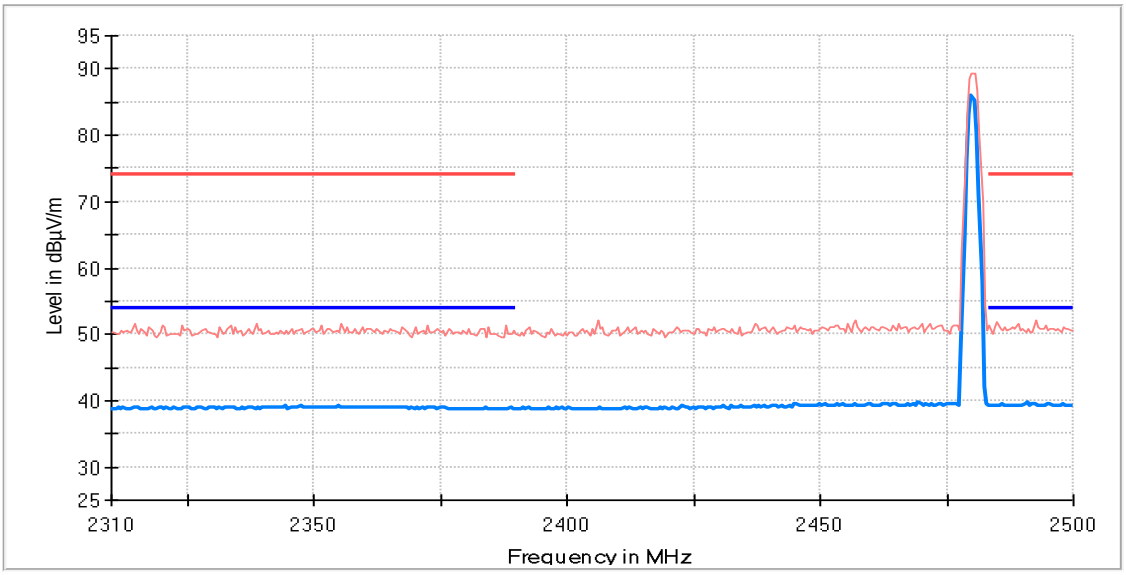
TEST RESULTS (Cont.)	

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