DEKRA Certification, Inc.
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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:
2073ERM.002

Test report

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

Identification of item tested	NIS Radio
Trademark	APTIV
Model and /or type reference	NIS
Other identification of the product	FCC ID: L2C0075TR IC: 3432A-0075TR
Features	Bluetooth, AM/FM, DAB, GNSS, and touchscreen.
Manufacturer	APTIV SERVICES US, LLC 2151 E Lincoln Rd, Kokomo, IN 46902
Test method requested, standard	USA FCC Part 15.247, 10-1-17 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz USA FCC Part 15.209, 10-1-17 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 4 (November 2014). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas. Guidance v04 dated 05/04/2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager
Date of issue	11-21-2018
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
0,009 - 30	2.69	dB
30-180	3.82	dB
180-1000	2.61	dB
1000-18000	2.92	dB
18000-40000	2.15	dB

Data provided by the client

The NIS is a radio that is installed in medium and heavy-duty vehicles. There two hardware variants designated as Nav and Non-Nav. The Nav variant h/w increases memory capacity (2GB RAM, 32GB NAND) to support navigation. The Non-Nav variant has less memory (1GB RAM, 8GB NAND).

NIS has a Bluetooth transceiver used for hands-free operation of a mobile device, an AM/FM radio receiver, a DAB dual-tuner radio receiver, and a GNSS receiver.

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
2073.04	CNHI Radio RF Conducted sample	NIS STRAILS	T0BCC145810039	08/20/2018

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

   All conducted tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2073.07	CNHI Radio RF Radiated sample	NIS STRAILS	T0BCC145810041	08/20/2018

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

   All radiated tests indicated in appendix A.

Sample S/01 and S/02 used the following accessories during testing

Control Nº	Description	Model	Serial Nº	Date of reception
2073.18	CNHI Radio Harness cable	N/A	N/A	08/20/2018
2073.34	Saint Box	N/A	SZ01BE	08/20/2018
2073.33	Saint Box power supply	N/A	N/A	08/20/2018

Test sample description

Ports..... :	Port name and description	Cable				
		Specified max length [m]	Attached during test	Shielded	Coupled to patient(3)	
	Not Provided Data		☐	☐	☐	
			☐	☐	☐	
Supplementary information to the ports..... :						
Rated power supply ..... :	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☐	DC:					
	☒	DC: 13 Vdc					
Rated Power ..... :	*Data not provided*						
Clock frequencies ..... :	*Data not provided*						
Other parameters..... :	*Data not provided*						
Software version ..... :	*1828.01*						
Hardware version..... :	*C-Sample*						
Dimensions in cm (W x H x D)..... :	*Data not provided*						
Mounting position..... :	☐	Table top equipment					
	☐	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☒	Other: Car Equipment					
Modules/parts ..... :	Module/parts of test item			Type	Manufacturer		
	Not Provided Data						

Accessories (not part of the test item).....:	Description	Type	Manufacturer
	Not Provided Data		
Documents as provided by the applicant.....:	Description	File name	Issue date
	FDT30_14 Data Declaration Equipment Data		

Copy of marking plate:

Identification of the client

APTIV SERVICES US, LLC
2151 E Lincoln Rd, Kokomo, IN 46902

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	08-25-2018
Date (finish)	09-26-2018

Document history

Report number	Date	Description
2073ERM.002	11-21-2018	First release

Environmental conditions

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

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

In the semi-anechoic 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, Nasir Khan 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 LE and EDR)					
Report Section	**15.247 Spec Clause**	**RSS Spec Clause**	**Test Description**	**Verdict**	**Remark**
A.1	§ 15.247 (a) (1)	RSS-247 5.1 (4)	20dB Emission Bandwidth, Occupied Bandwidth & Carrier Frequency Separation	P	N/A
A.2	§ 15.247 (a) (1) (iii)	RSS-247 5.1 (4)	Number of hopping channels	P	N/A
A.3	§15.247(a) (1) (iii)	RSS-247 5.1 (4)	Time of Occupancy (Dwell Time)	P	N/A
A.4	§ 15.247 (b) (3)	RSS-247 5.4. (2)	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)		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: None					

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	2017/03	2019/03
1040	Switch unit Rohde & Schwarz with power detector OSP120 / OSP-B157	2017/03	2019/03
1041	RF generator Rohde & Schwarz SMB100A	2017/04	2019/04
1042	RF generator Rohde & Schwarz SMBV100A	2018/01	2019/01
101	Climatic chamber Espec	2017/12	2018/12

Radiated Measurements

CONTROL NUMBER	DESCRIPTION	LAST CALIBRATION	NEXT CALIBRATION
1179	Semi anechoic Absorber Lined Chamber Frankonia SAC 3 plus “L”	N/A	N/A
1065	BiconicalLog antenna ETS LINDGREN 3142E	2017/03	2020/03
1058	Double-ridge Waveguide Horn antenna 1-18 GHz 3115	2017/03	2019/03
1055	Double-ridge Waveguide Horn antenna 18-26 GHz – 3116C	2017/07	2019/07
1014	Spectrum analyzer Rohde & Schwarz FSV40	2017/03	2019/03
0980	RF pre-amplifier 30 MHz-6 GHz Bonn Elektronik BLMA 0360-01N	2017/05	2019/05
0981	RF pre-amplifier 1-18 GHz Bonn Elektronik BLMA 0118-2A	2017/05	2019/05
1015, 1017, 1019, 1020	Rohde & Schwarz EMC32 software	N/A	N/A

Appendix A: Test results

Appendix A Content

PRODUCT INFORMATION

The following information is provided by the client

Information	Description
Modulation	FHSS
Adaptive	Adaptive Equipment
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
Operating Frequency Range	2402 – 2480 MHz
Nominal Channel Bandwidth	1 MHz
Extreme operating conditions	
Temperature range	-40 ºC to +85 ºC
Antenna type	Integral antenna
Antenna gain	+3.13 dBi
Nominal Voltage	
Supply Voltage	12 Vdc
Type of power source	DC voltage from battery
Equipment type	Bluetooth EDR
Geo-location capability	No

Test modes available:

- Continuous modulated carrier at 2402 MHz, 2440 MHz and 2480 MHz
- Continuous reception at 2402 MHz, 2440 MHz and 2480 MHz

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01 (GFSK)	Power supply (V): $V_{nominal}$ = 13 Vdc Type of power supply: DC voltage from internal rechargeable battery. Temperature (ºC): T_{nom} = +15 to + 35 T_{min} = -40 (*) T_{max} = +85 (*) The subscript nom indicates normal test conditions. The subscripts min and max indicate extreme test conditions (minimum and maximum respectively). N/A: Not Applicable. (*) Declared by applicant. Test Frequencies for Conducted tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz Test Frequencies for Radiated tests: Lowest range: 2402 MHz Highest range: 2480 MHz

TEST CONDITIONS	DESCRIPTION
TC#02 (PI4DQSK)	Power supply (V): $V_{nominal}$ = 13 Vdc Type of power supply: DC voltage from internal rechargeable battery. Temperature (ºC): T_{nom} = +15 to + 35 T_{min} = -40 (*) T_{max} = +85 (*) The subscript nom indicates normal test conditions. The subscripts min and max indicate extreme test conditions (minimum and maximum respectively). N/A: Not Applicable. (*) Declared by applicant. Test Frequencies for Conducted tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz Test Frequencies for Radiated tests: Lowest range: 2402 MHz Highest range: 2480 MHz

TC#03 (8QPSK)	Power supply (V): $V_{nominal}$ = 13 Vdc Type of power supply: DC voltage from internal rechargeable battery. Temperature (ºC): T_{nom} = +15 to + 35 T_{min} = -40 (*) T_{max} = +85 (*) The subscript nom indicates normal test conditions. The subscripts min and max indicate extreme test conditions (minimum and maximum respectively). N/A: Not Applicable. (*) Declared by applicant. Test Frequencies for Conducted tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz Test Frequencies for Radiated tests: Lowest range: 2402 MHz Highest range: 2480 MHz

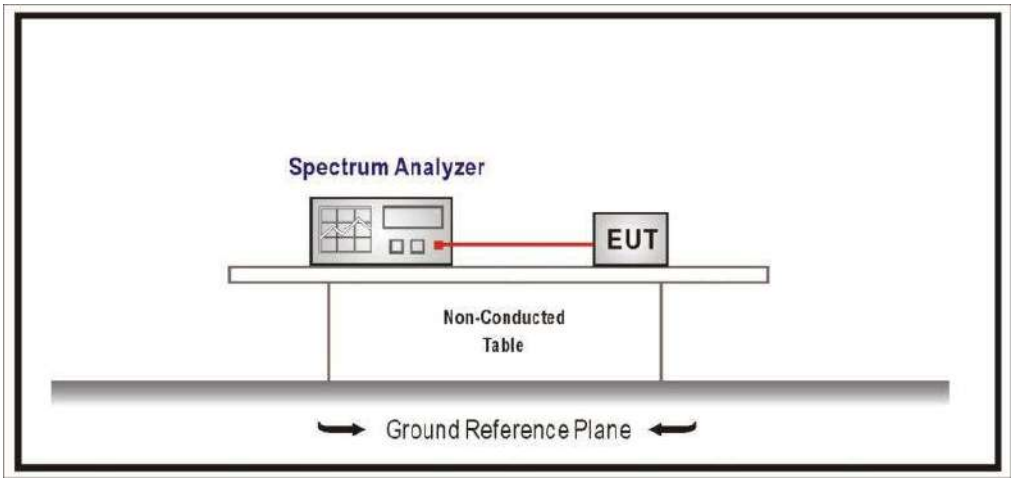
TEST A.1: 20DB EMISSION BANDWIDTH, OCCUPIED BANDWIDTH AND CARRIER FREQUENCY SEPARATION

LIMITS:	Product standard:	FCC 15.247 / RSS-247
	Test standard:	FCC 15.247 (a) (1) / RSS-247 5.1 (4)

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:	

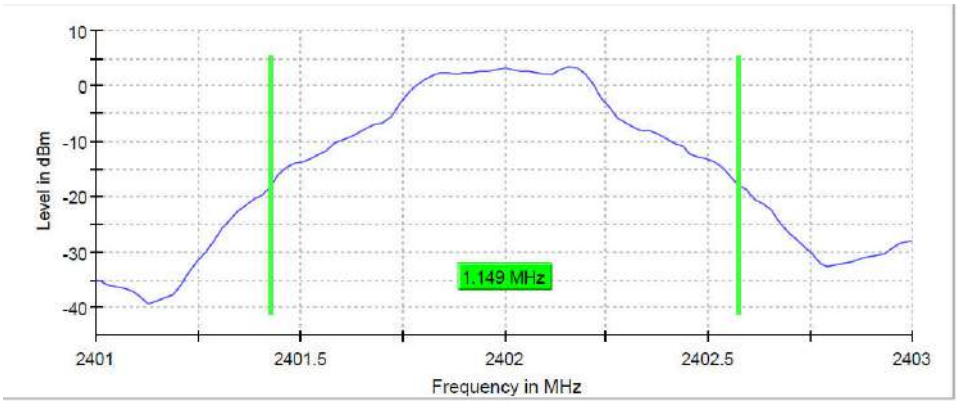


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

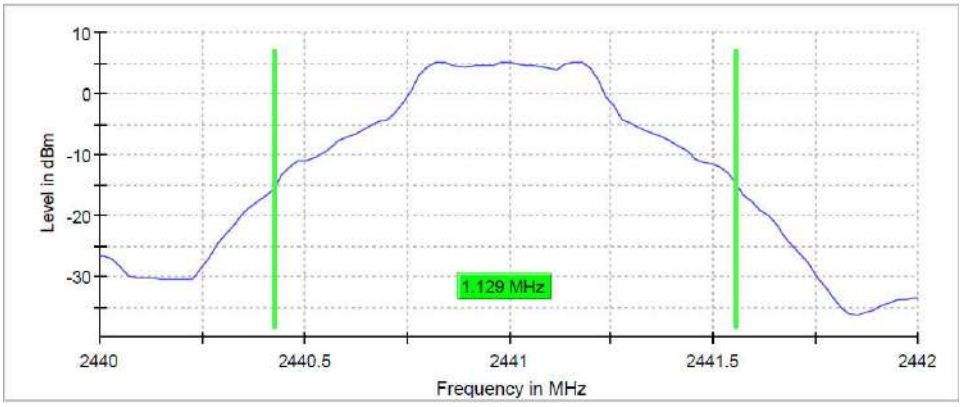
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
20dB Bandwidth (MHz)	1.14854	1.12872	1.12871
Occupied bandwidth (kHz)	950.496	970.298	950.496
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	20 dB BANDWIDTH

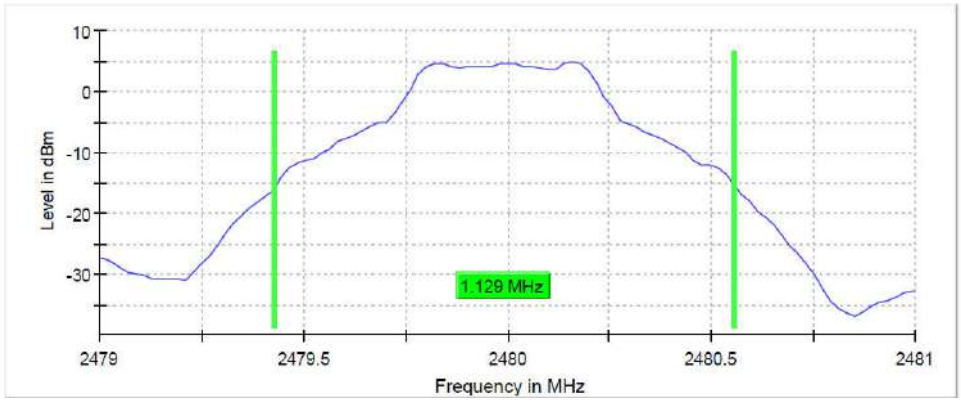
Lowest Channel



Middle Channel

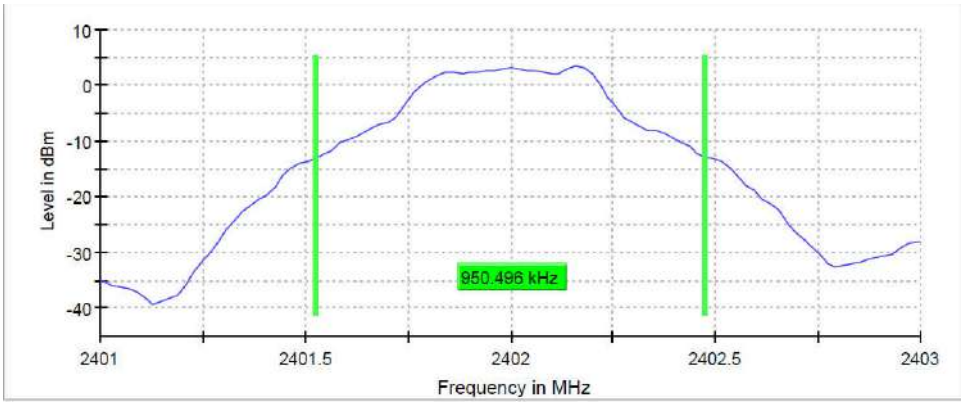


Highest Channel

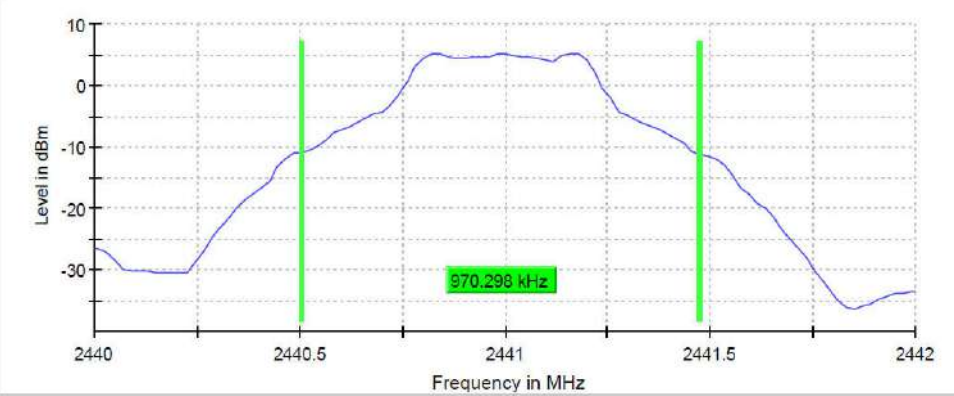


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

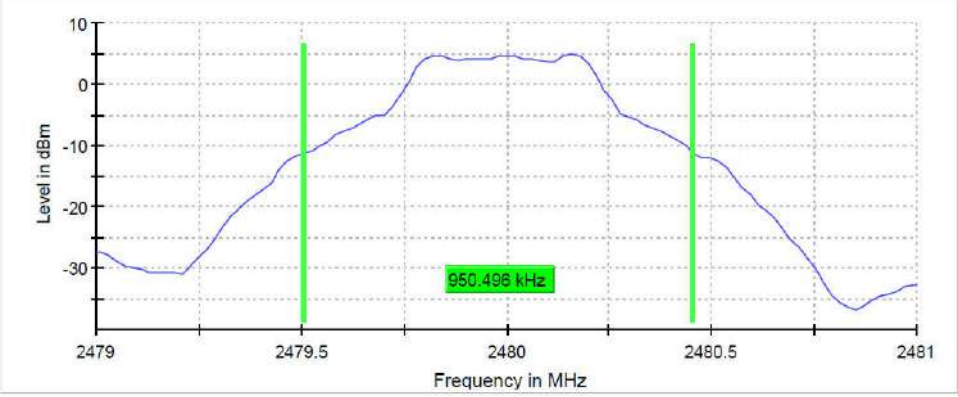
Lowest Channel



Middle Channel



Highest Channel

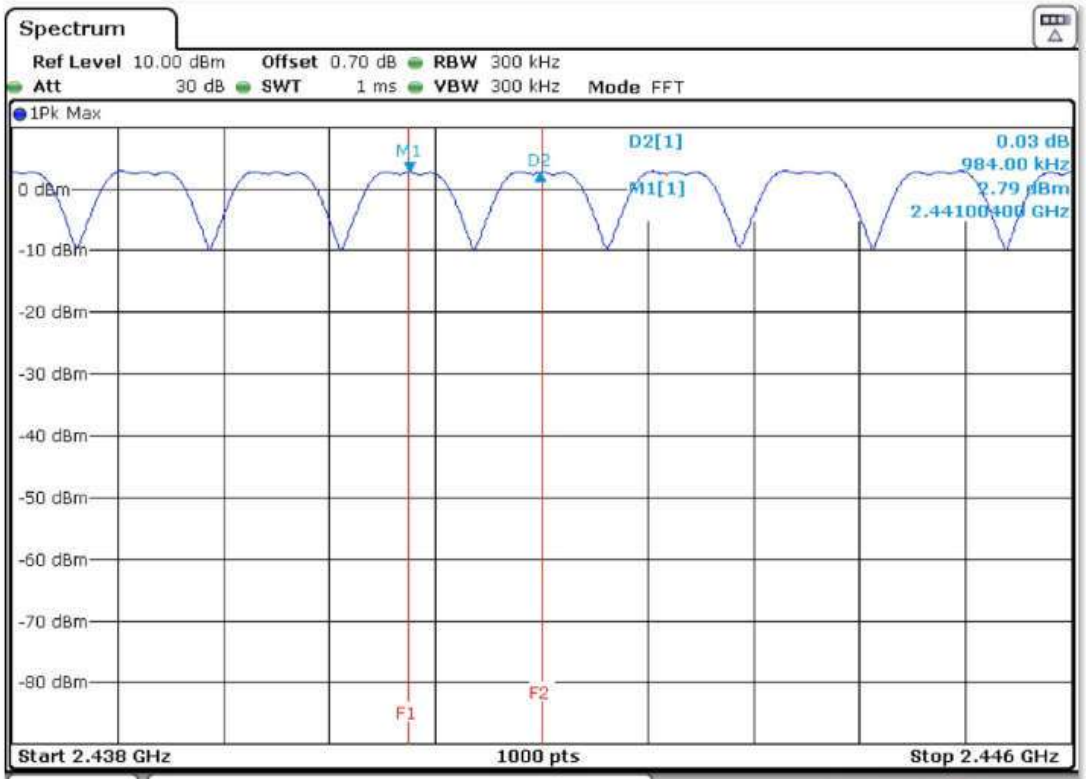


TEST RESULTS (Cont.)

Measurement

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	100.000	100.000	100.000
VBW	300.000	300.000	300.000
SweepPoints	101	101	101
Sweeptime	18.938 µs	18.938 µs	18.938 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	7 / max. 150	7 / max. 150	8 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.02 dB	0.00 dB	0.01 dB

TEST RESULTS (Cont.)	CARRIER FREQUENCY SEPARATION



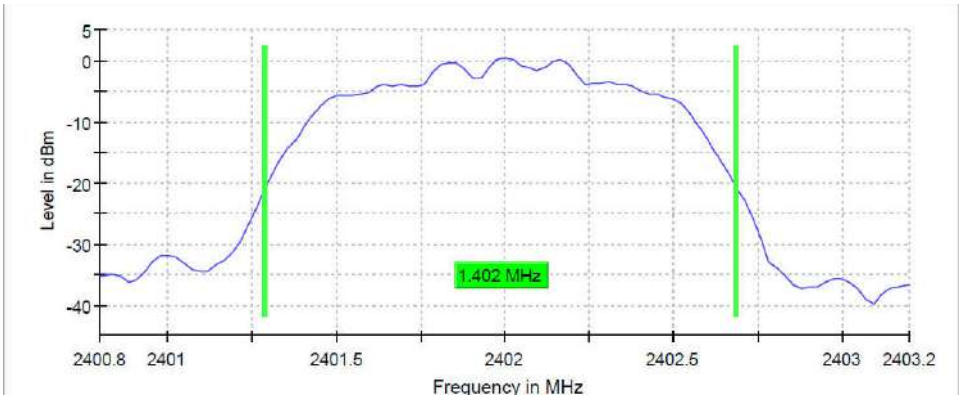
The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

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

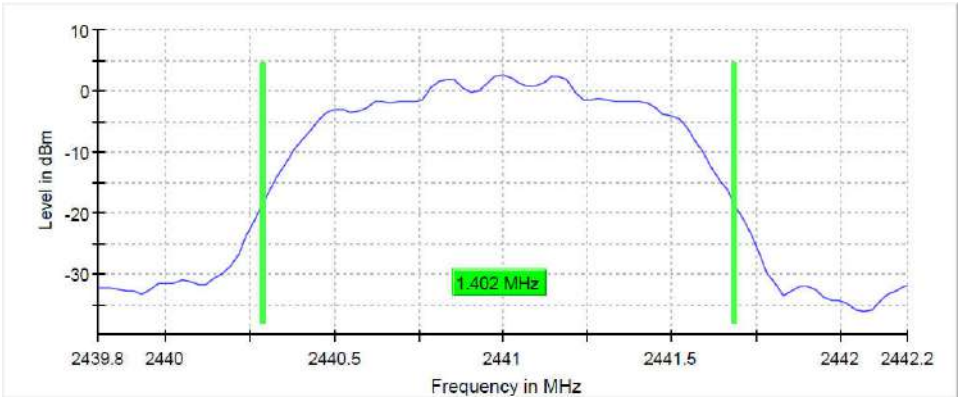
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
20db bandwidth (MHz)	1.40198	1.402	1.402
Occupied bandwidth (MHz)	1.212	1.212	1.212
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	20 dB BANDWIDTH

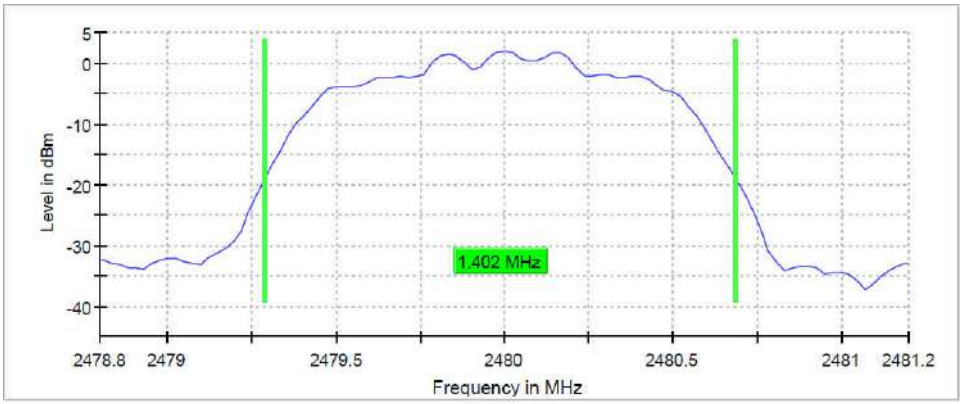
Lowest Channel



Middle Channel

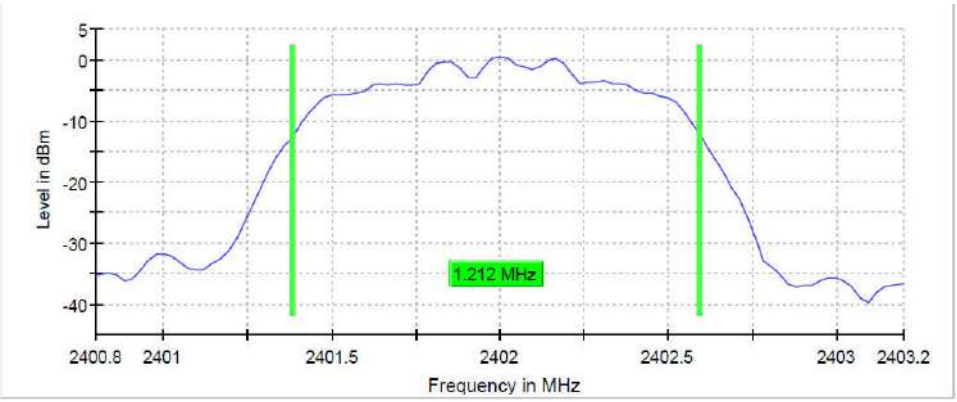


Highest Channel

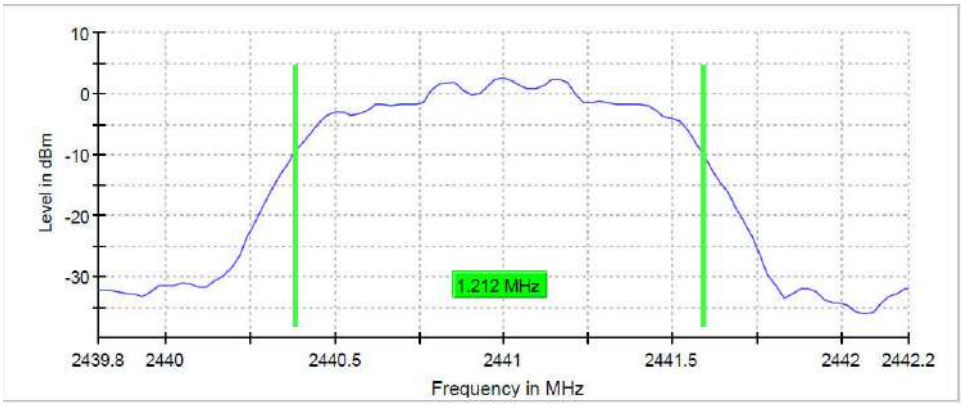


TEST RESULTS (Cont.):	OCCUPIED BANDWIDTH

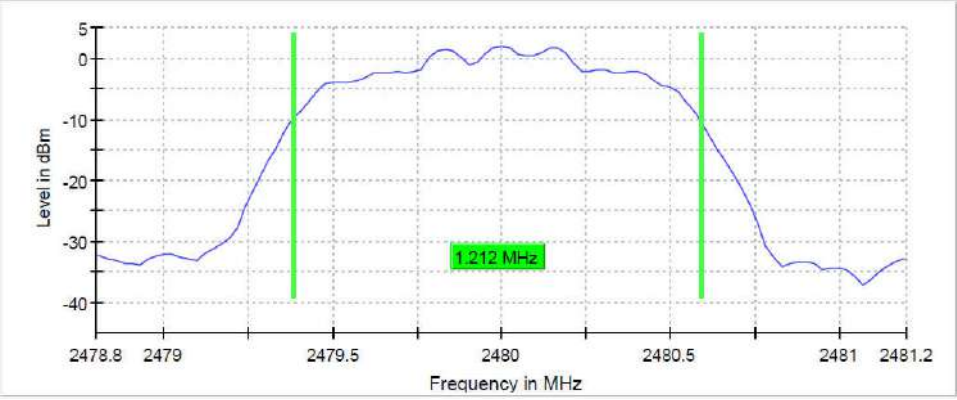
Lowest Channel



Middle Channel



Highest Channel

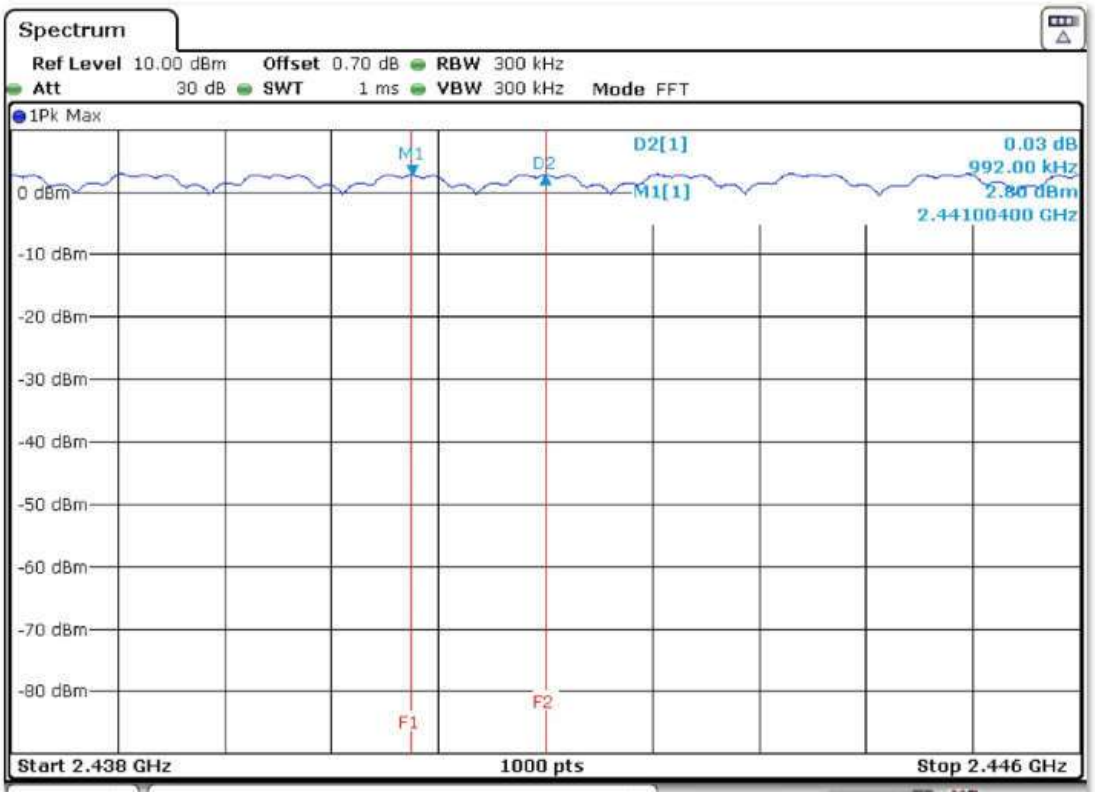


TEST RESULTS (Cont.)

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40080	2.43980	2.47880
Stop Frequency	2.40320	2.44220	2.48120
Span	2.400 MHz	2.400 MHz	2.400 MHz
RBW	100.000	100.000	100.000
VBW	300.000	300.000	300.000
SweepPoints	101	101	101
Sweeptime	18.905 µs	18.905 µs	18.905 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	11 / max.	14 / max.	9 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.00 dB	0.09 dB	0.14 dB

TEST RESULTS (Cont.)	CARRIER FREQUENCY SEPARATION



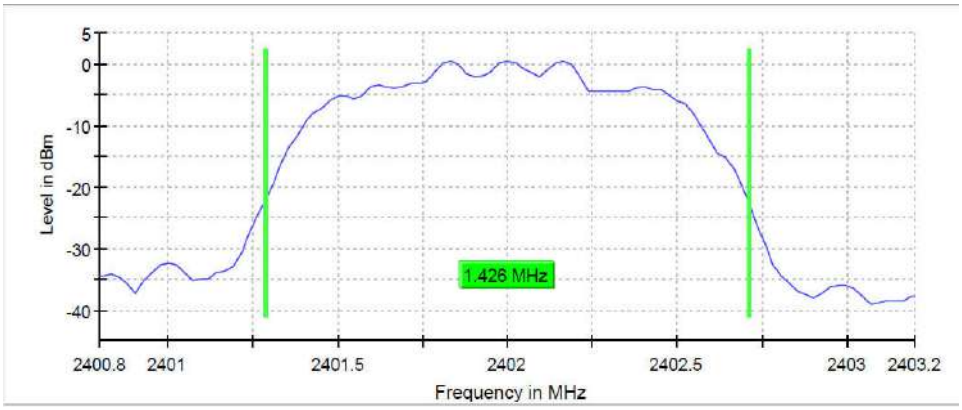
The hopping channel carrier frequencies are separated by a minimum of the two-thirds of the 20 dB bandwidth of the hopping channel.

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

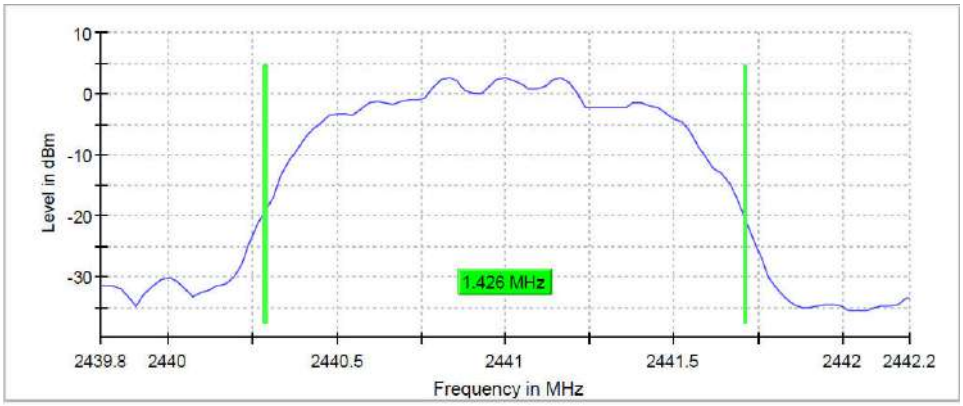
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
20db bandwidth (MHz)	1.425742	1.425742	1.425742
Occupied bandwidth (MHz)	1.212	1.212	1.212
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	20dB BANDWIDTH

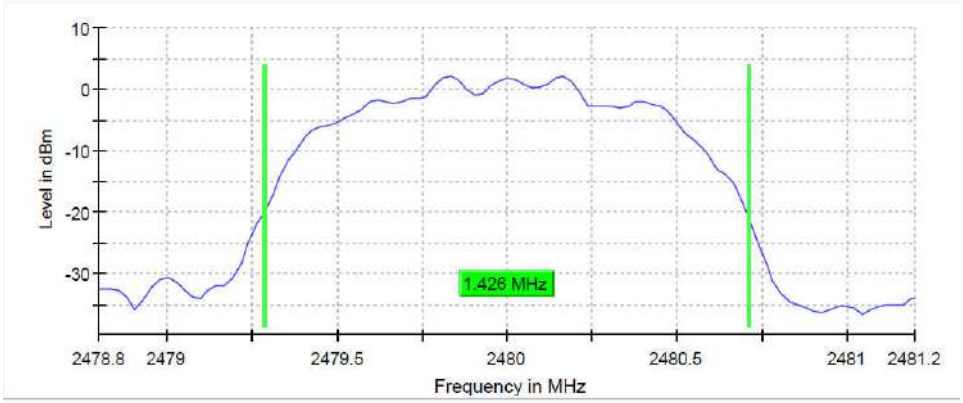
Lowest Channel



Middle Channel

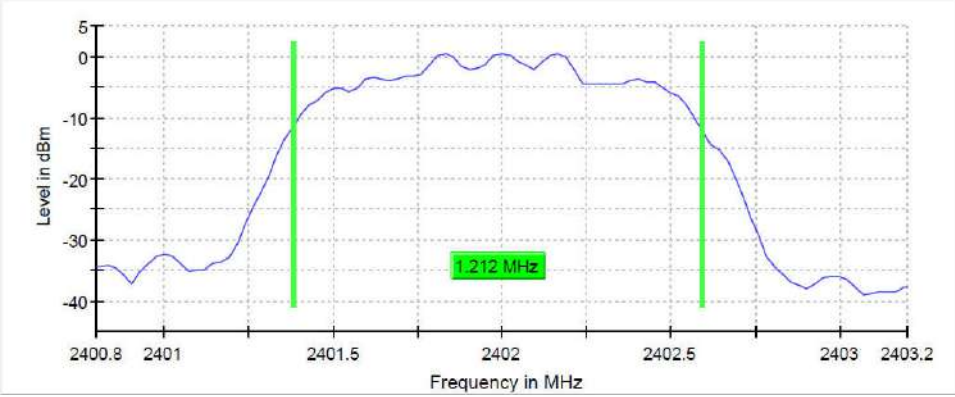


Highest Channel

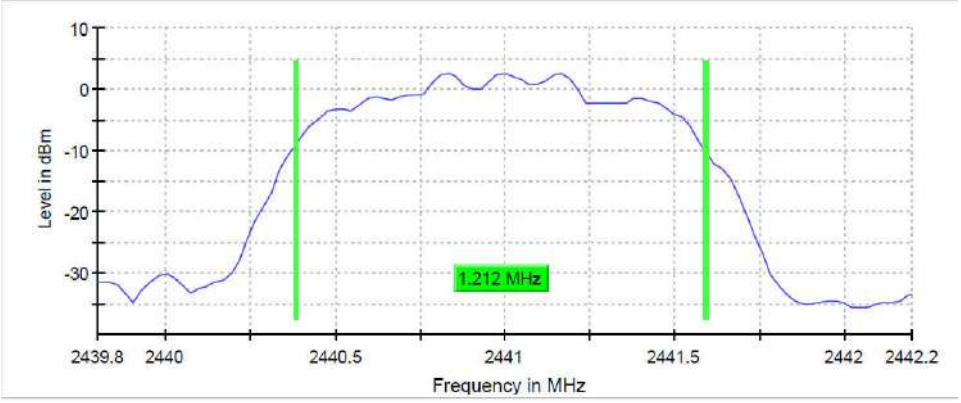


TEST RESULTS (Cont.)	OCCUPIED BANDWIDTH

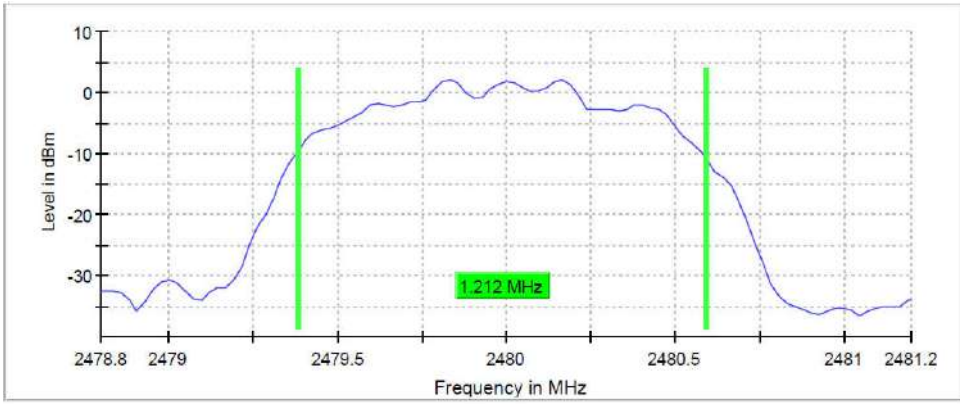
Lowest Channel



Middle Channel



Highest Channel

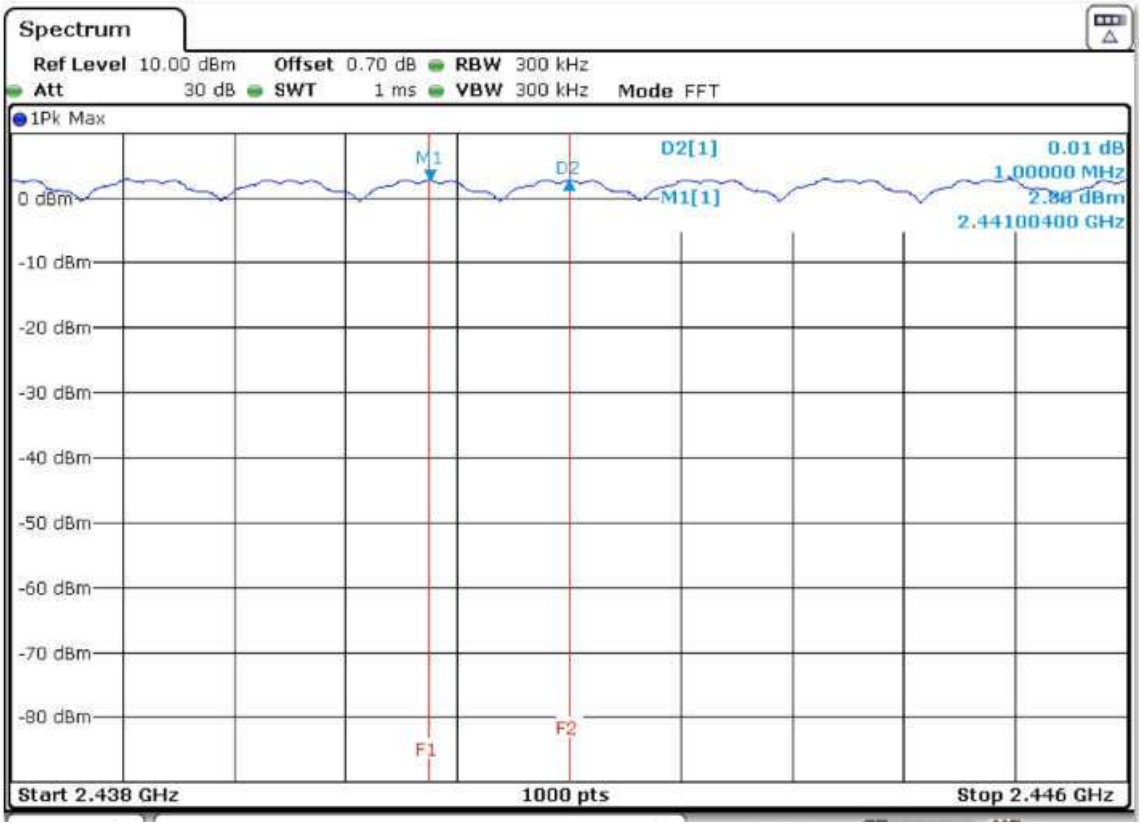


TEST RESULTS (Cont.)	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40080	2.43980	2.47880
Stop Frequency	2.40320	2.44220	2.48120
Span	2.400 MHz	2.400 MHz	2.400 MHz
RBW	100.000	100.000	100.000
VBW	300.000	300.000	300.000
SweepPoints	101	101	101
Sweeptime	18.905 µs	18.905 µs	18.905 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	200	200	200
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	11 / max.	15 / max.	8 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.02 dB	0.01 dB	0.09 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.

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) and RSS-247 5.1 (4)

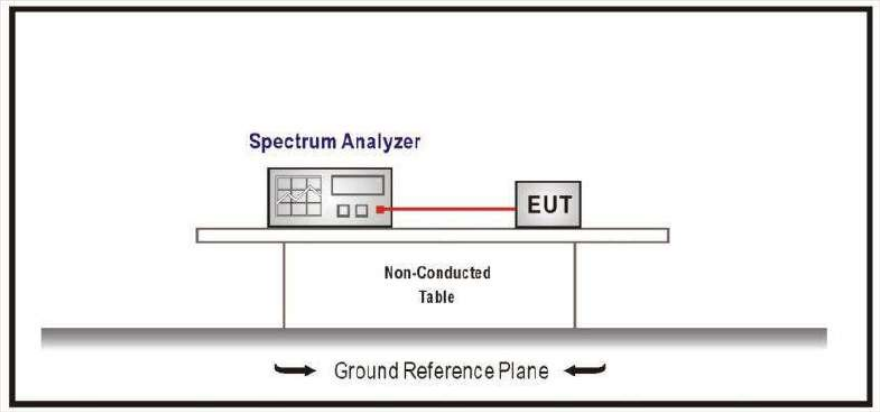
LIMITS

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

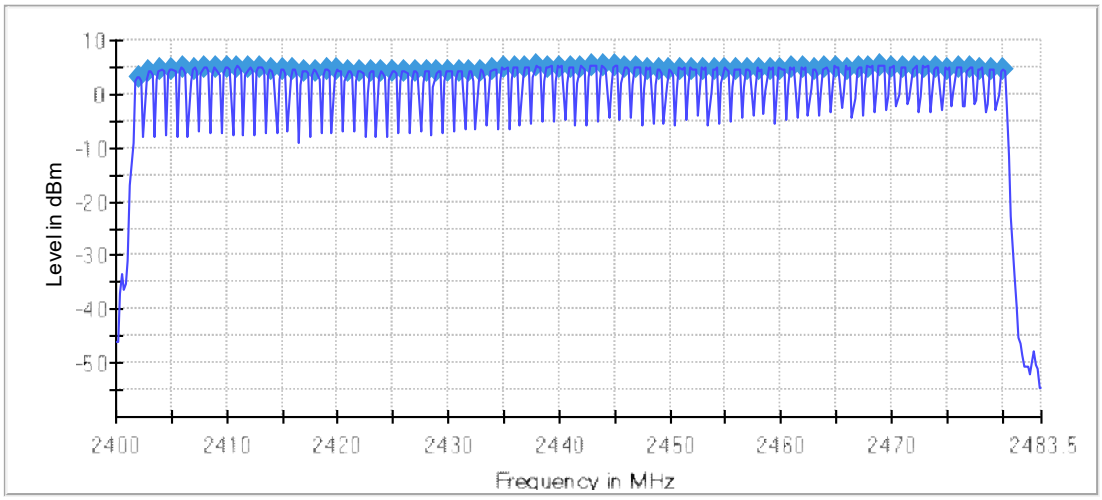
RESULTS

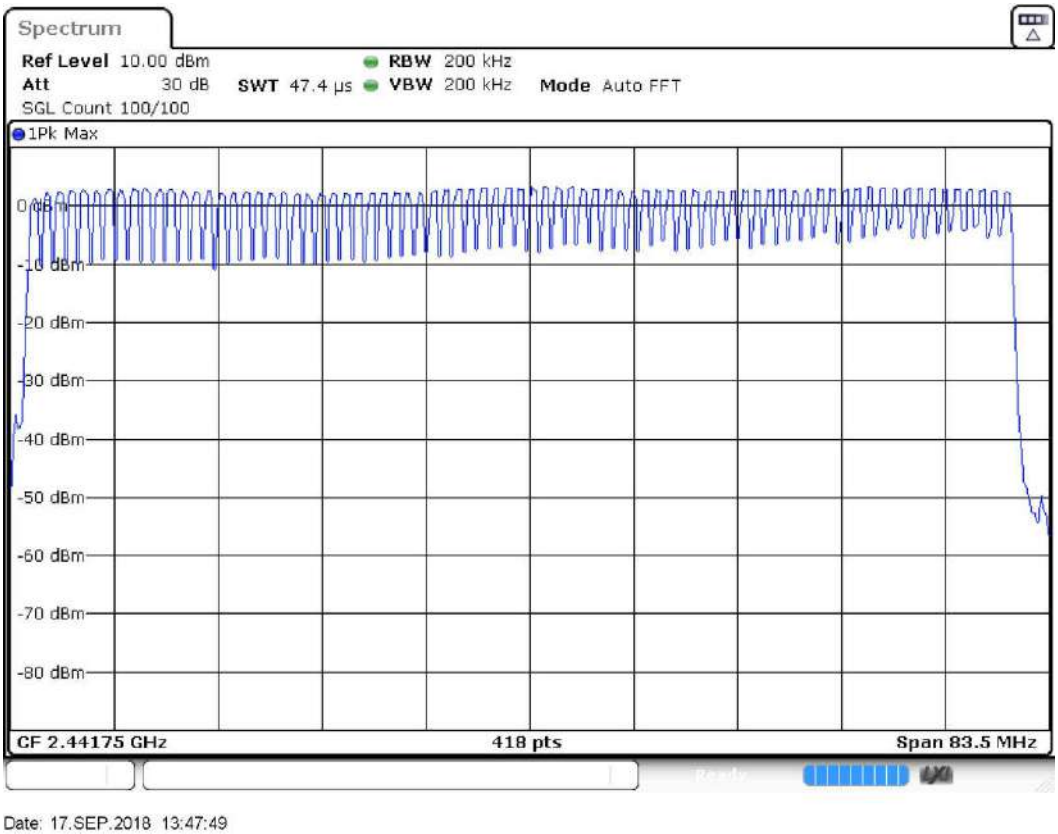
The number of hopping channels is 79 for all three modes (see next plots).

TEST SETUP:	



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

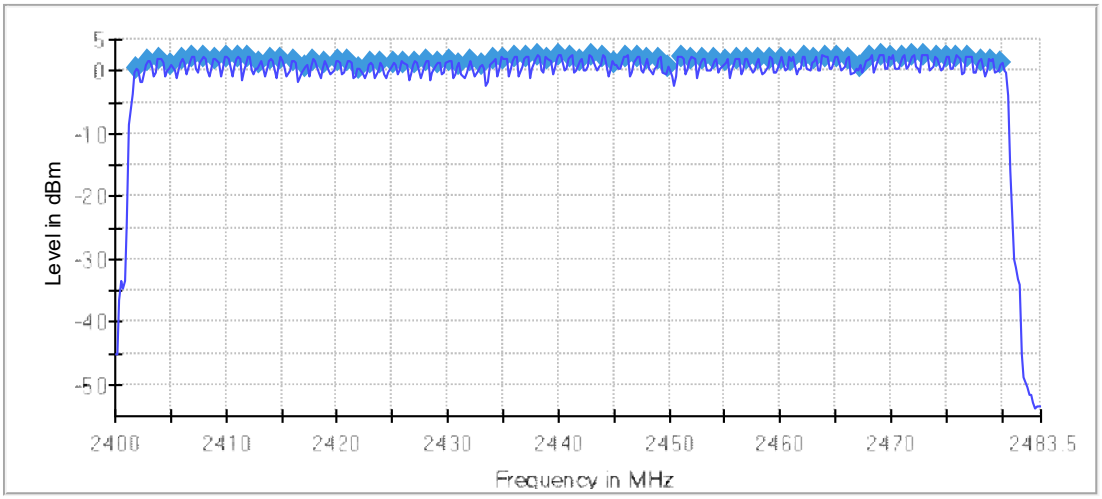


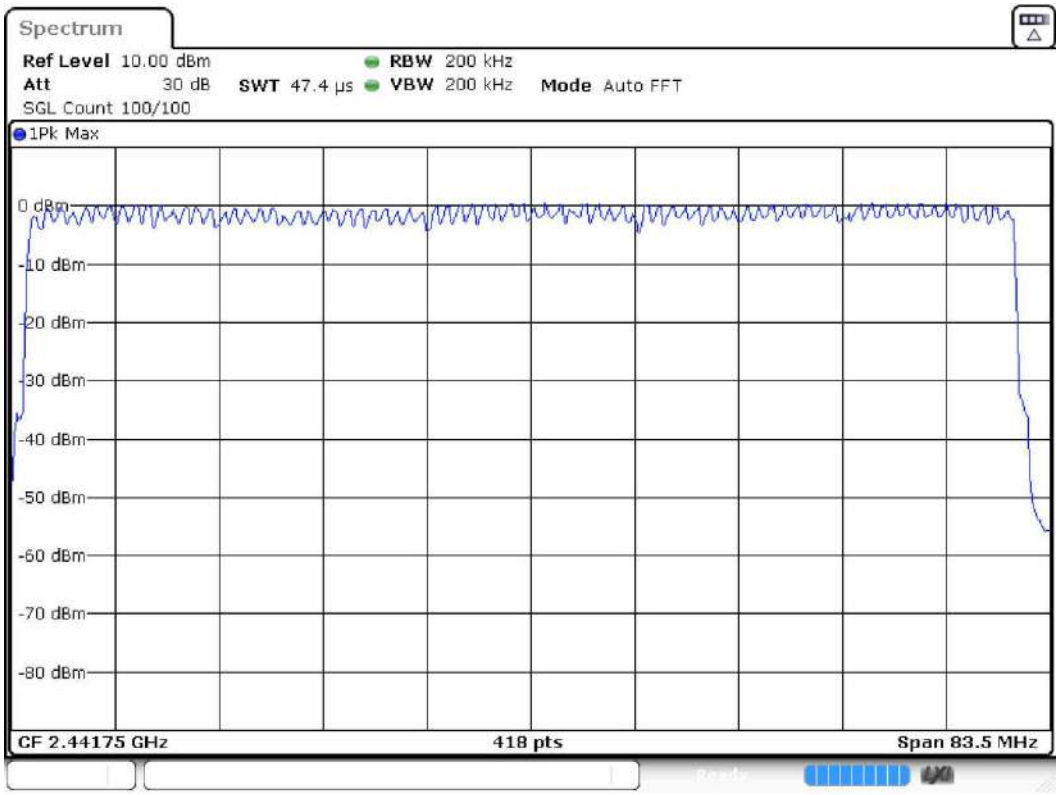


Date: 17.SEP.2018 13:47:49

Number of Hopping Frequencies : 79

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

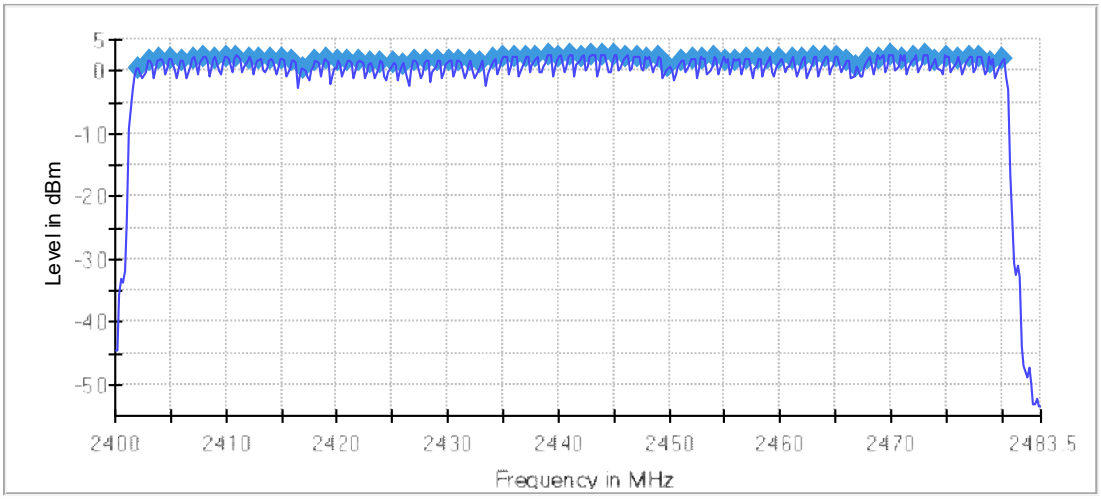


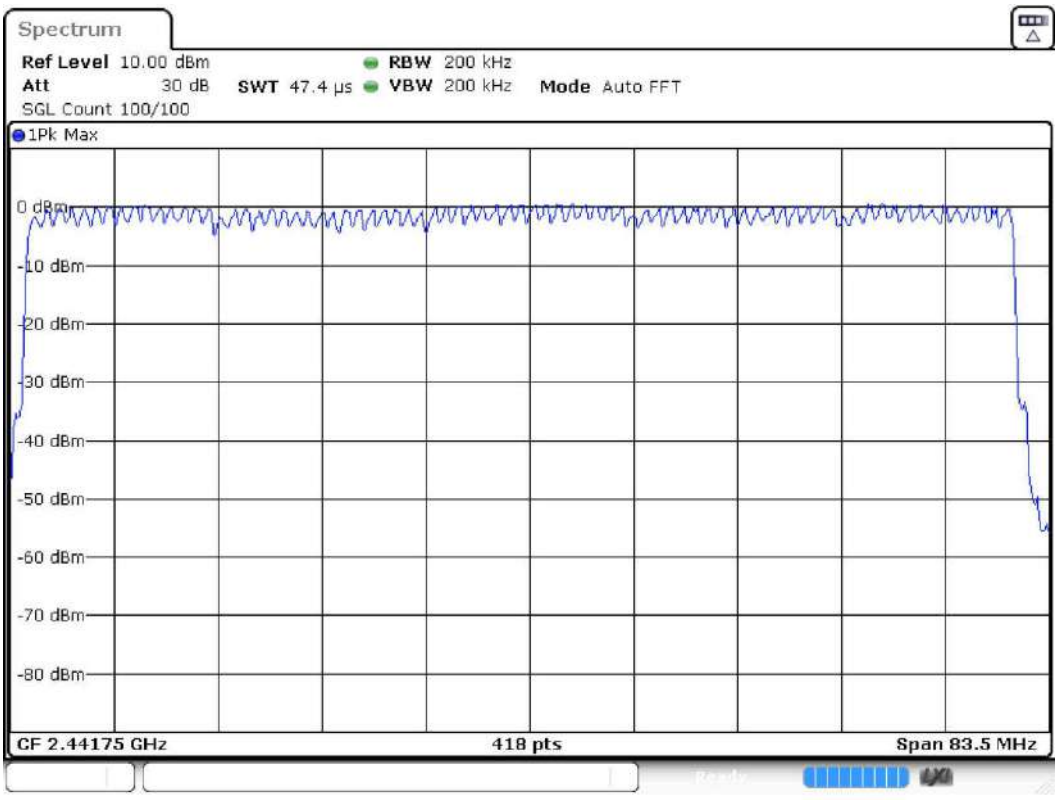


Date: 17.SEP.2018 15:22:37

Number of Hopping Frequencies : 79

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





Date: 17.SEP.2018 16:14:54

Number of Hopping Frequencies : 79

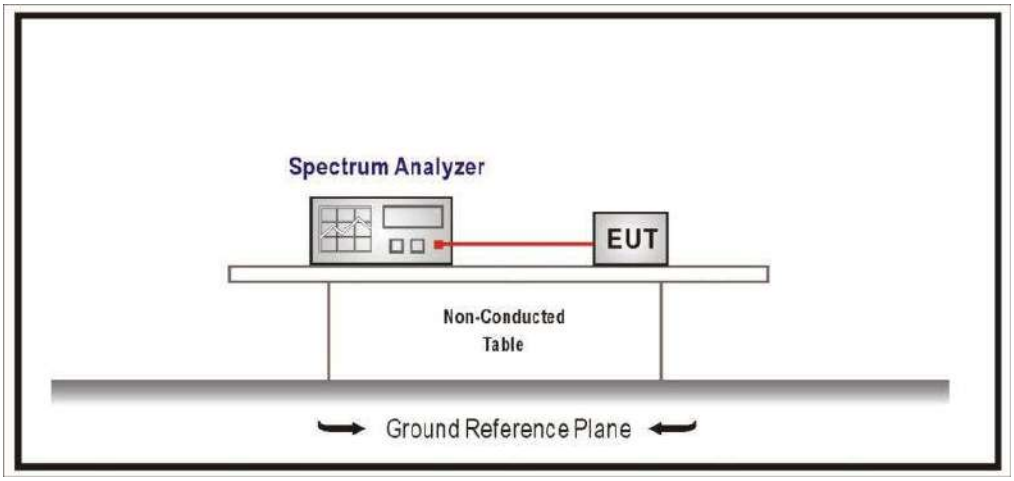
TEST A.3: TIME OF OCCUPANCY (DWELL TIME)

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(4)

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.

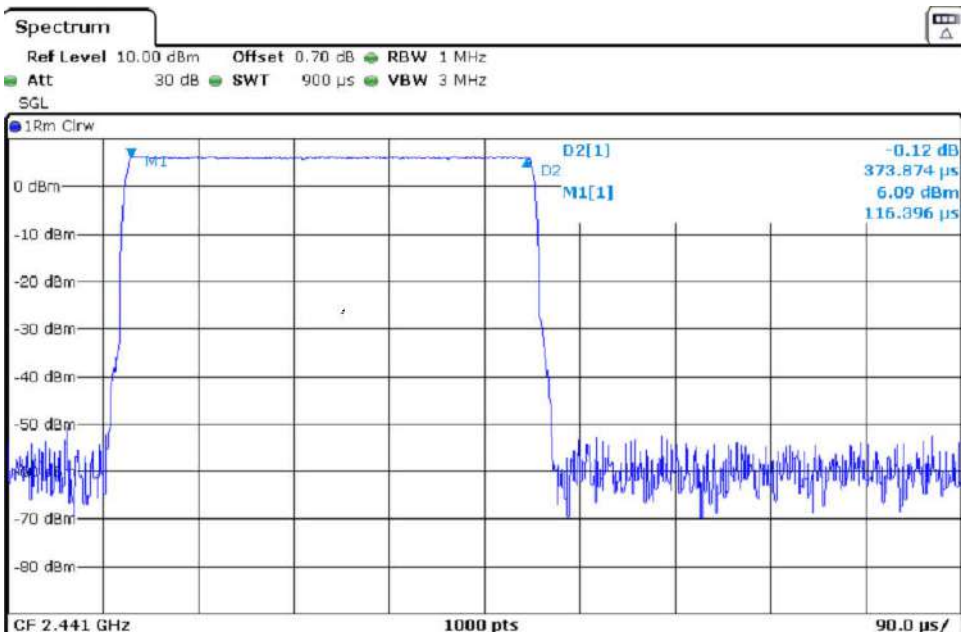
TEST SETUP:	



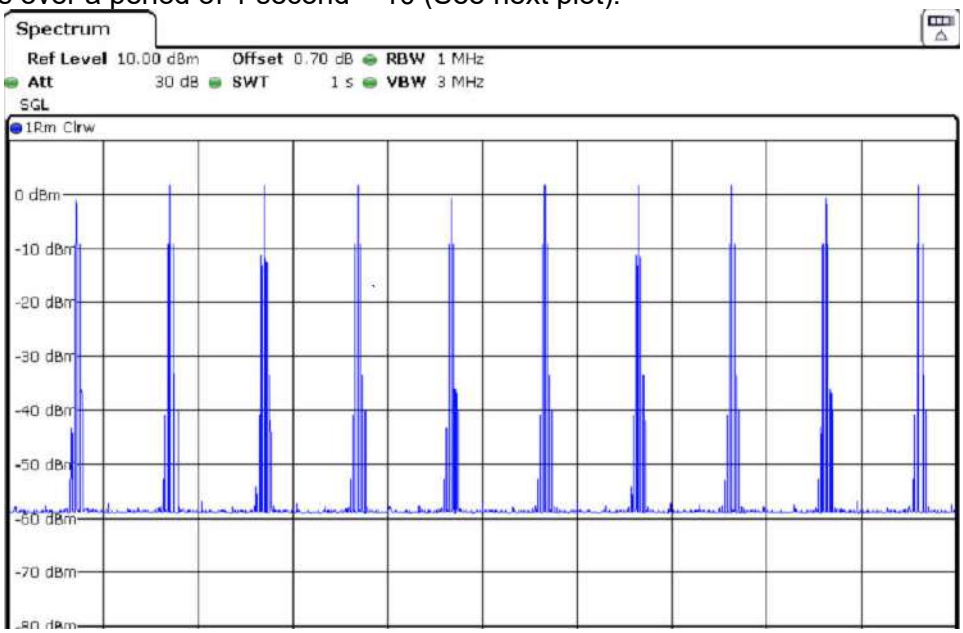
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

TEST RESULTS (Cont.)	PACKET TYPE DH1

Tx time per hop = 373. 874 µs (see next plot).



Number of hops over a period of 1 second = 10 (See next plot).



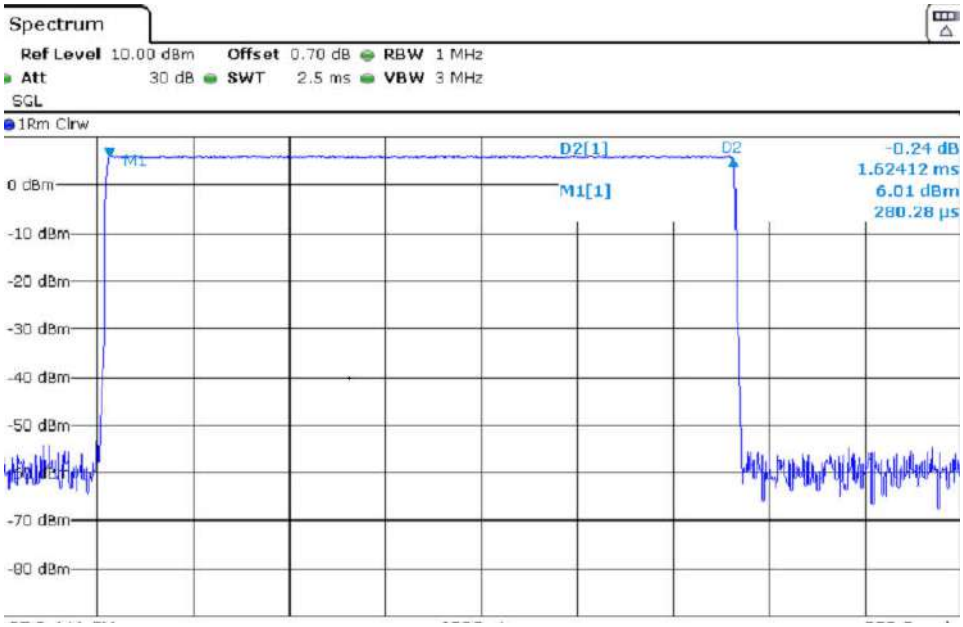
Number of hops in the period specified in the requirements = (10 hops) x (31.6 s/ 1s) = 316 hops.

Average time of occupancy = 373. 874 µs x 316 hops = 118.15 ms per 31.6 seconds.

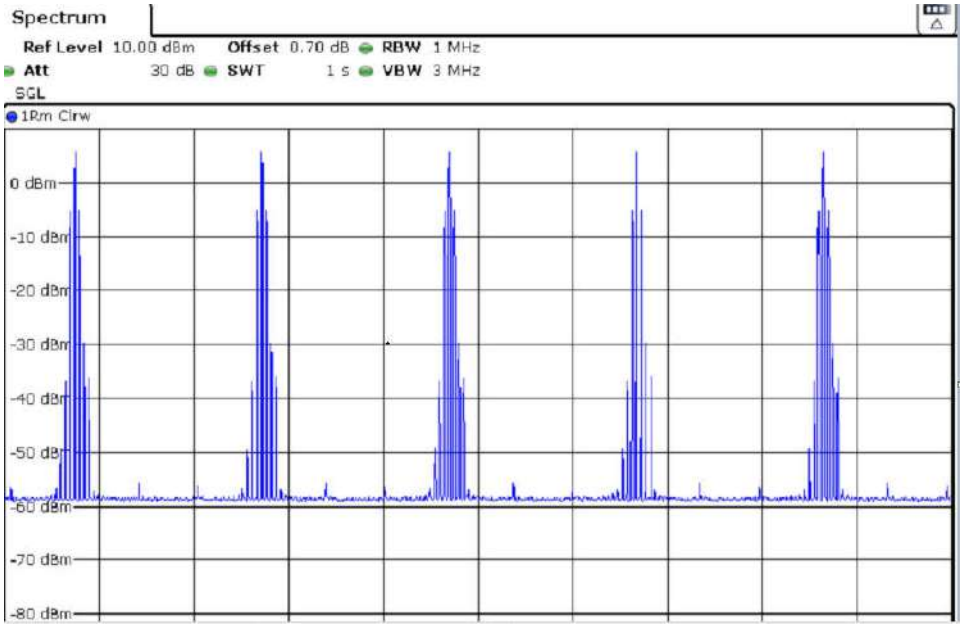
Measurement uncertainty (%)	<±0.12

TEST RESULTS (Cont.)	PACKET TYPE DH3

Tx time per hop = 1.62412 ms (see next plot).



Number of hops over a period of 1 second = 5 (See next plot).



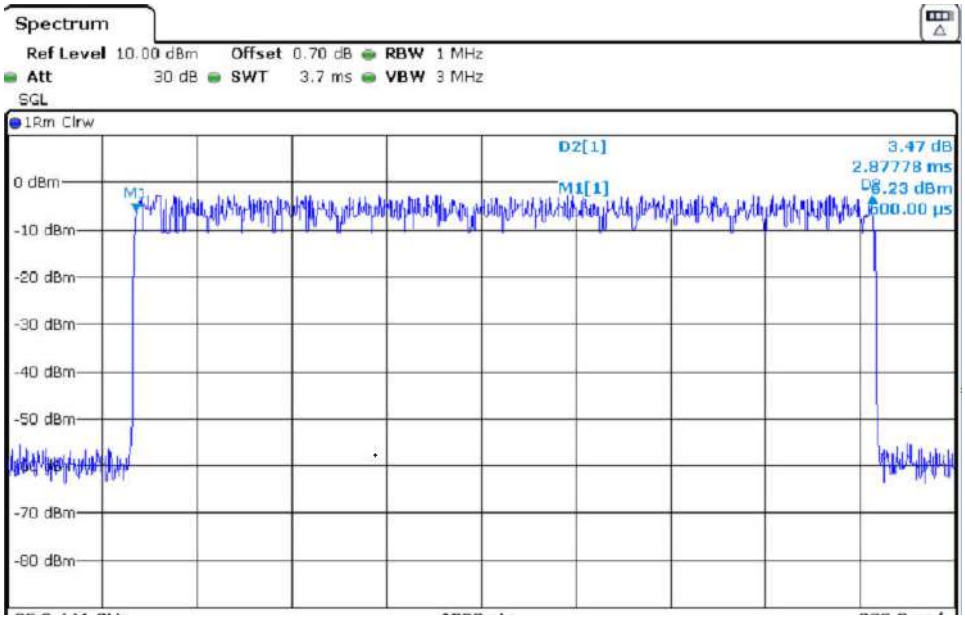
Number of hops in the period specified in the requirements = (5 hops) x (31.6 s/ 1s) = 158 hops.

Average time of occupancy = 1.63 ms x 158 hops = 257.54 ms per 31.6 seconds.

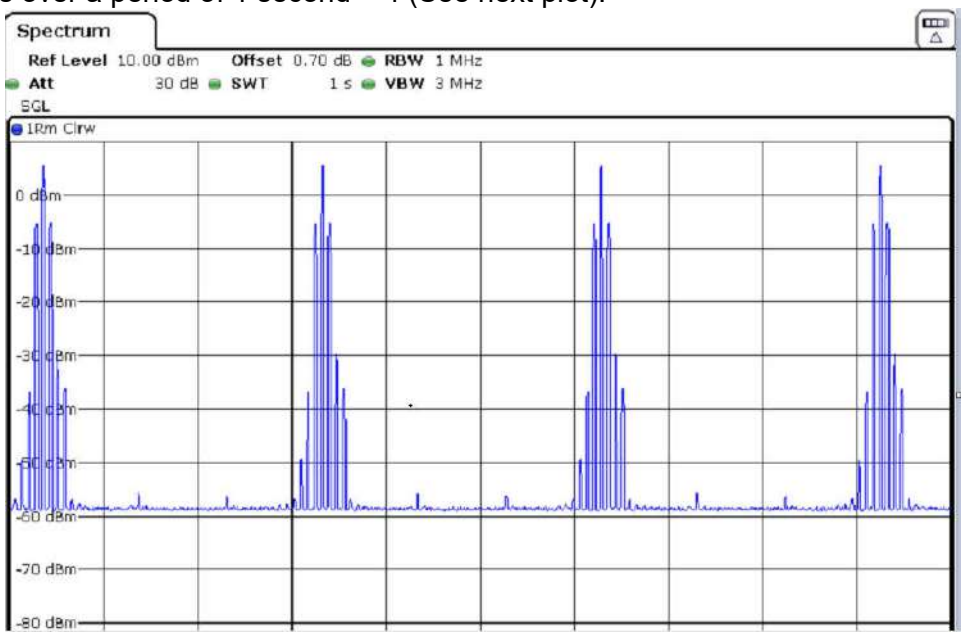
Measurement uncertainty (%)	<±0.12

TEST RESULTS (Cont.)	PACKET TYPE DH5

Tx time per hop = 2.88 ms (see next plot).



Number of hops over a period of 1 second = 4 (See next plot).



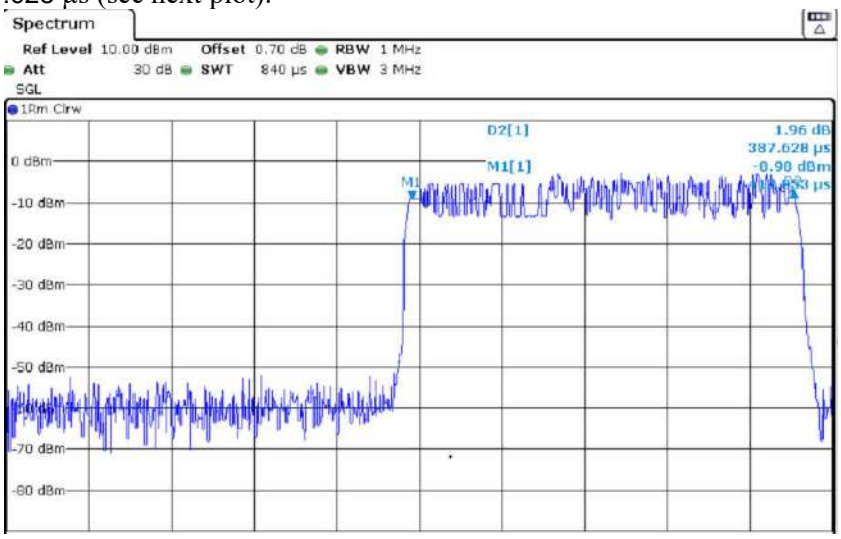
Number of hops in the period specified in the requirements = (4 hops) x (31.6 s/ 1s) = 126.4 hops.

Average time of occupancy = 2.88 ms x 126.4 hops = 364.032 ms per 31.6 seconds.

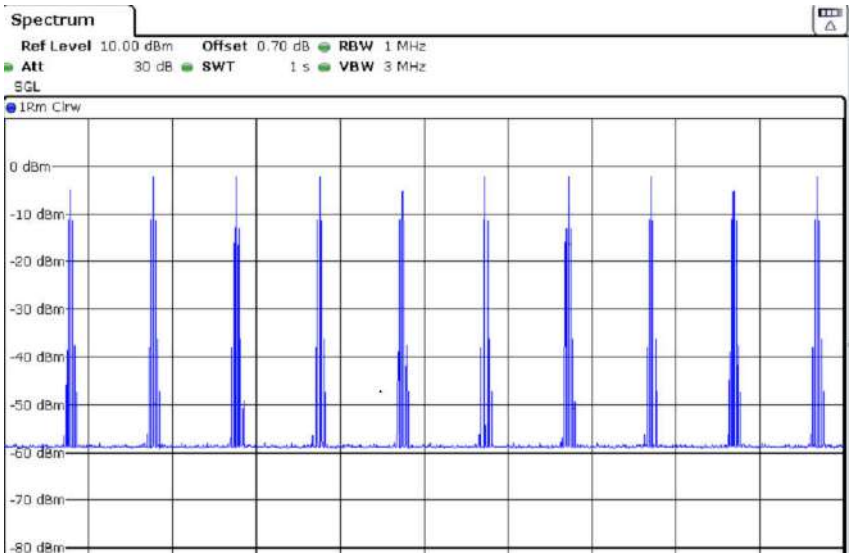
Measurement uncertainty (%)	<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	PASS
	PACKET TYPE 2DH1

Tx time per hop = 387.628 µs (see next plot).



Number of hops over a period of 1 second = 10 (See next plot).

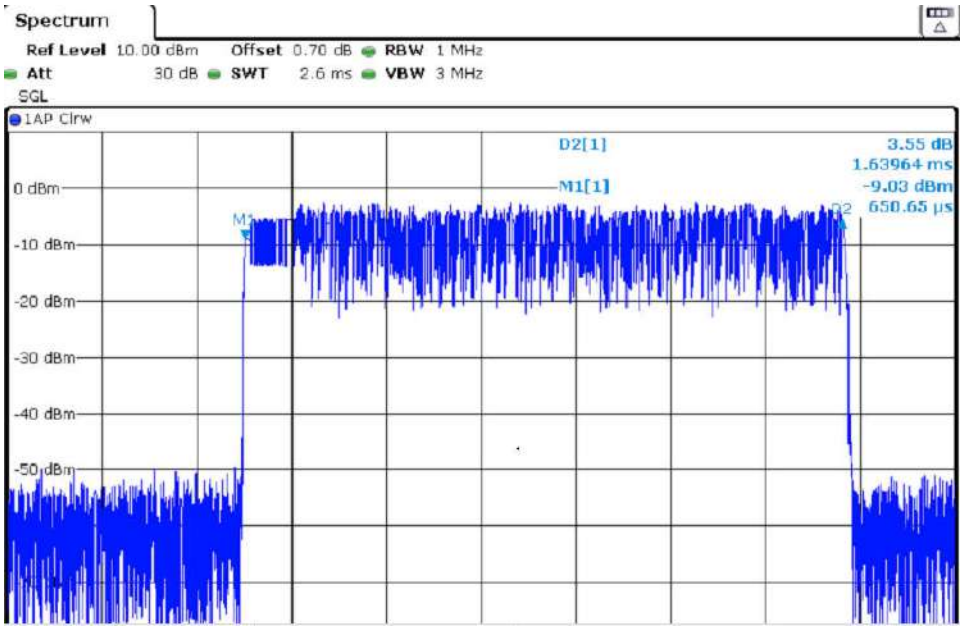


Number of hops in the period specified in the requirements = (10 hops) x (31.6 s/ 1s) = 316 hops.
Average time of occupancy = 387. 628 µs x 316 hops = 122.5 ms per 31.6 seconds.

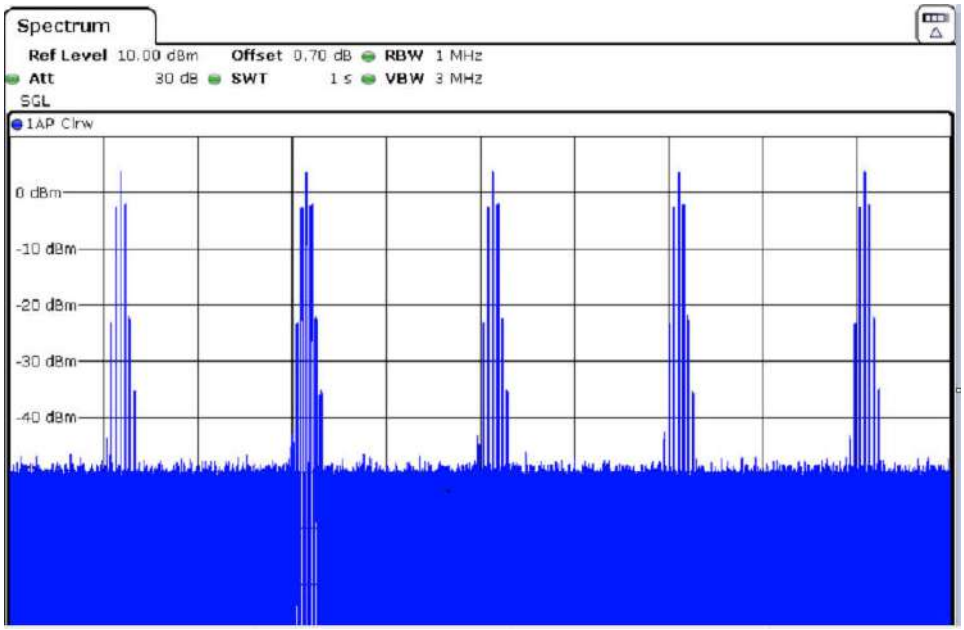
Measurement uncertainty (%)	<±0.12

	PACKET TYPE 2DH3

Tx time per hop = 1.64 ms (see next plot).



Number of hops over a period of 1 second = 5 (See next plot).



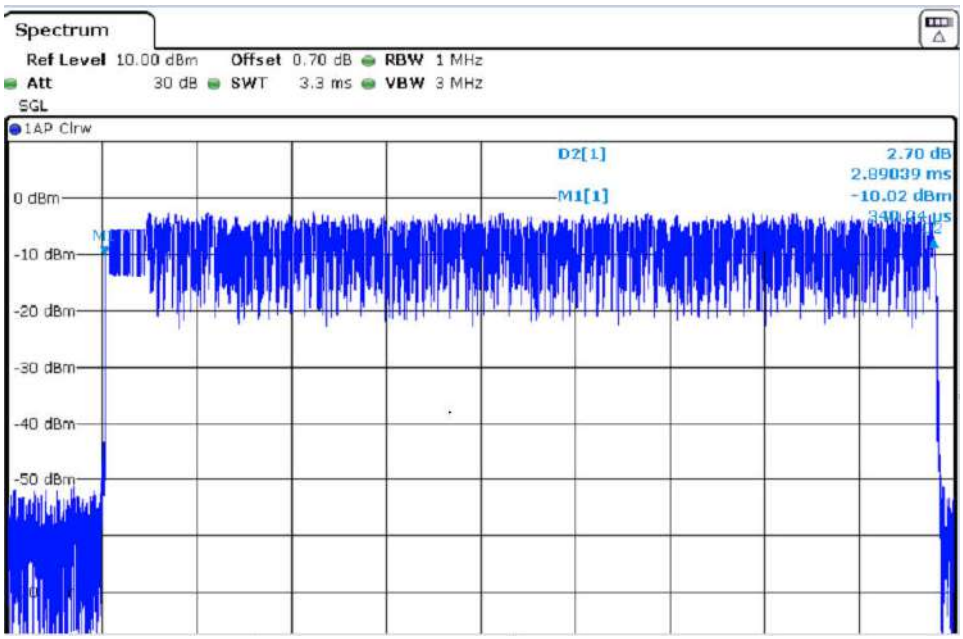
Number of hops in the period specified in the requirements = (5 hops) x (31.6 s/ 1s) = 158 hops.

Average time of occupancy = 1.64 ms x 158 hops = 259.12 ms per 31.6 seconds.

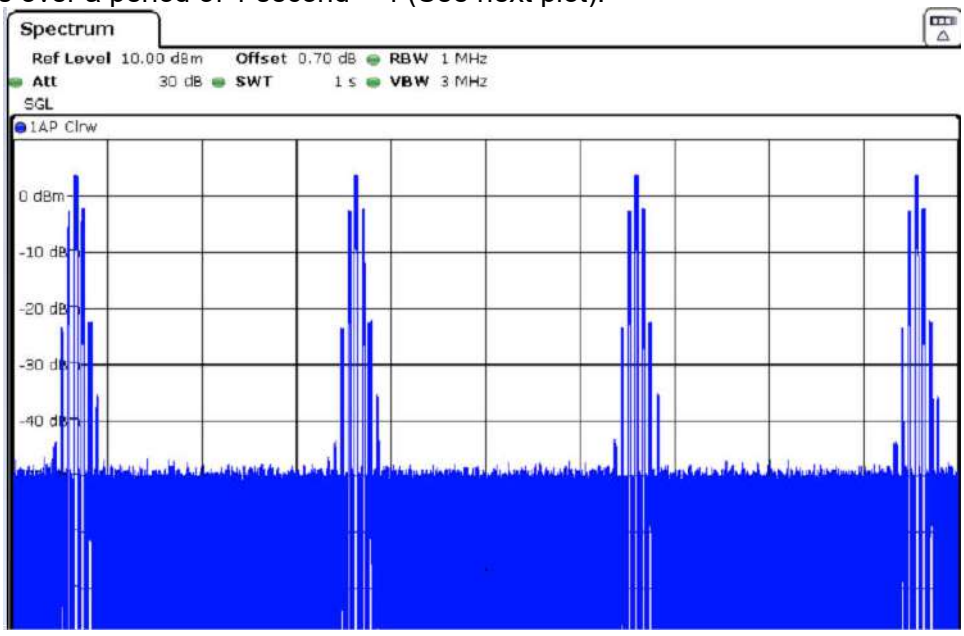
Measurement uncertainty (%)	<±0.12

	PACKET TYPE 2DH5

Tx time per hop = 2.9 ms (see next plot).



Number of hops over a period of 1 second = 4 (See next plot).



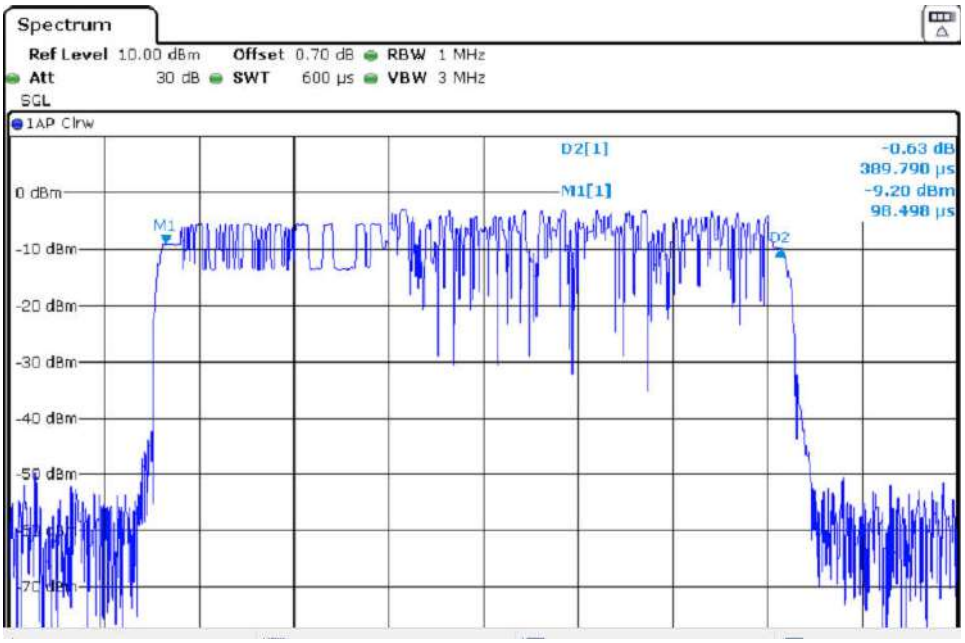
Number of hops in the period specified in the requirements = (4 hops) x (31.6 s/ 1s) = 126.4 hops.

Average time of occupancy = 2.9 ms x 126.4 hops = 366.56 ms per 31.6 seconds.

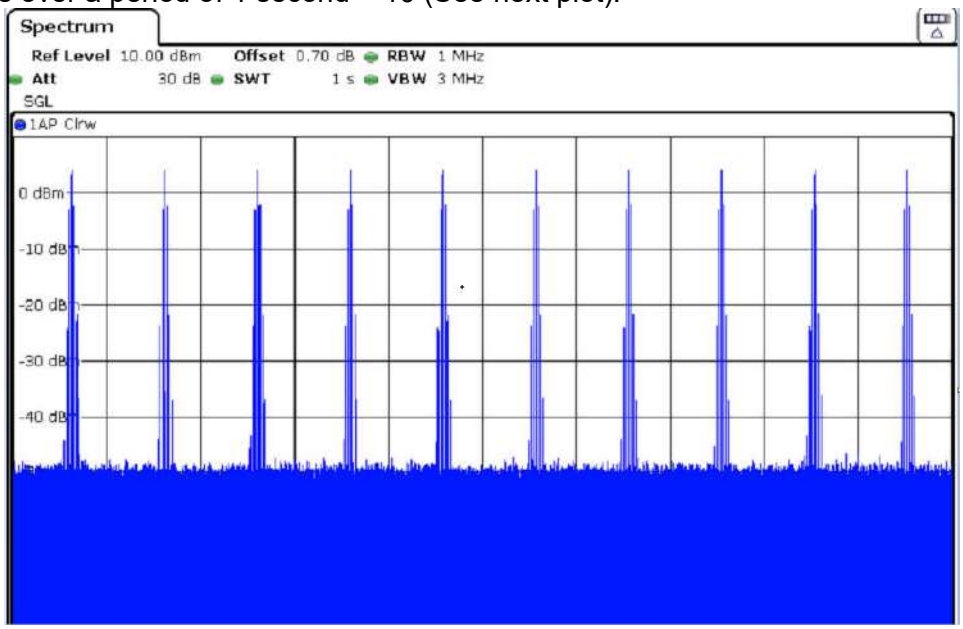
Measurement uncertainty (%)	<±0.12

TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS
	PACKET TYPE 3DH1

Tx time per hop = 389.790 µs (see next plot).



Number of hops over a period of 1 second = 10 (See next plot).

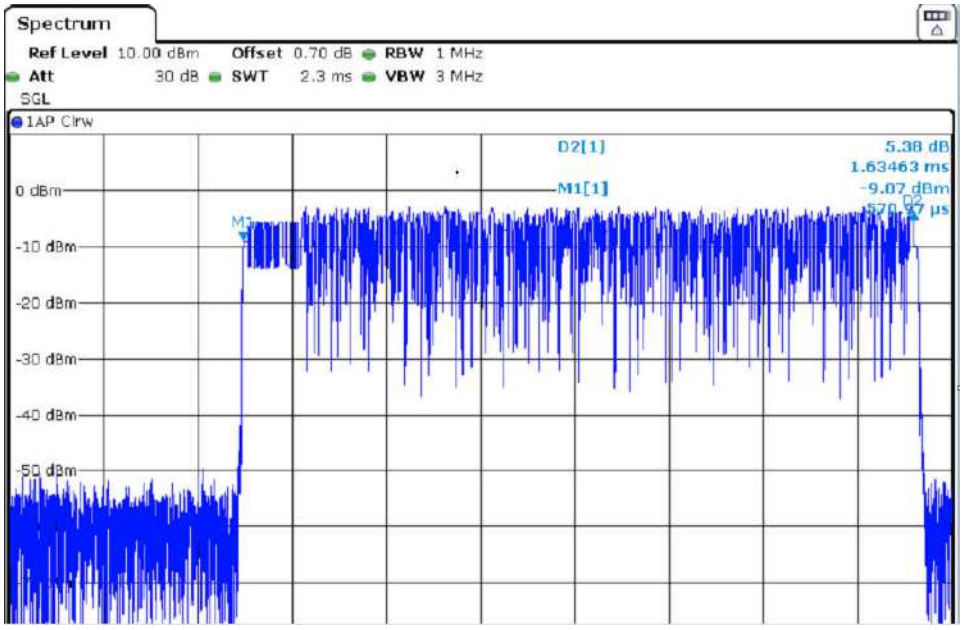


Number of hops in the period specified in the requirements = (10 hops) x (31.6 s/ 1s) = 316 hops.
Average time of occupancy = 389. 790 µs x 316 hops = 123.12 ms per 31.6 seconds.

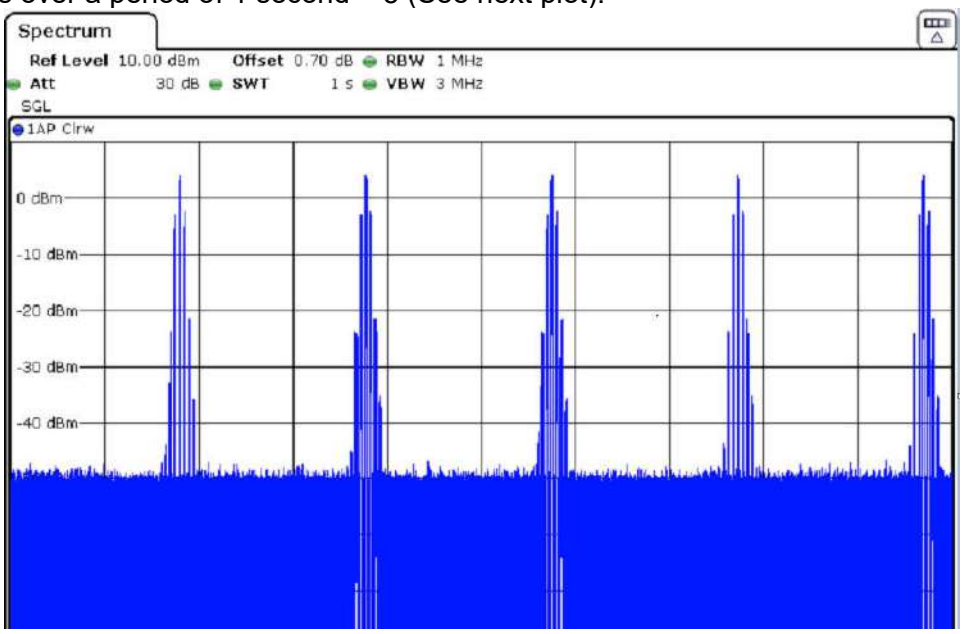
Measurement uncertainty (%)	<±0.12

TEST RESULTS (Cont.)	PACKET TYPE 3DH3

Tx time per hop = 1.64 ms (see next plot).



Number of hops over a period of 1 second = 5 (See next plot).

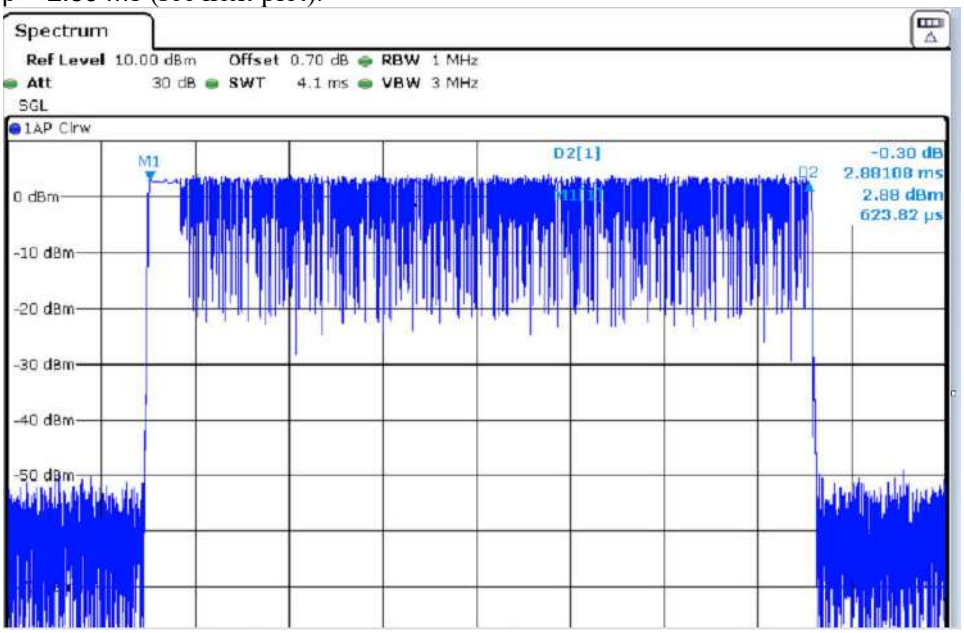


Number of hops in the period specified in the requirements = (5 hops) x (31.6 s/ 1s) = 158 hops.
Average time of occupancy = 1.64 ms x 158 hops = 259.12 ms per 31.6 seconds.

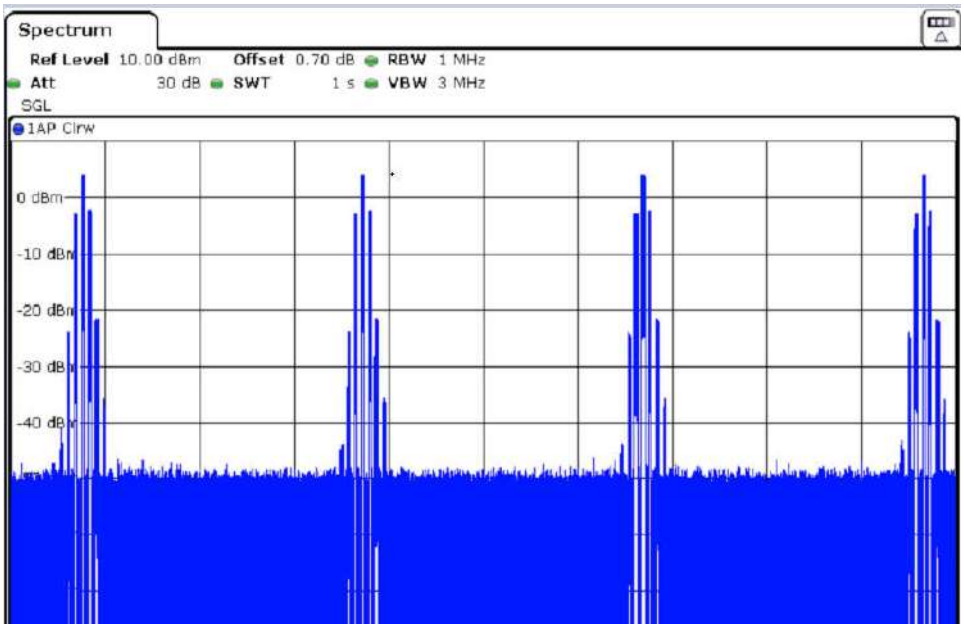
Measurement uncertainty (%)	<±0.12

	PACKET TYPE 3DH5

Tx time per hop = 2.89 ms (see next plot).



Number of hops over a period of 1 second = 4 (See next plot).



Number of hops in the period specified in the requirements = (4 hops) x (31.6 s/ 1s) = 126.4 hops.

Average time of occupancy = 2.89 ms x 126.4 hops = 365.296 ms per 31.6 seconds.

Measurement uncertainty (%)	<±0.12

TEST A.4: MAXIMUM PEAK CONDUCTED OUTPUT POWER AND ANTENNA GAIN

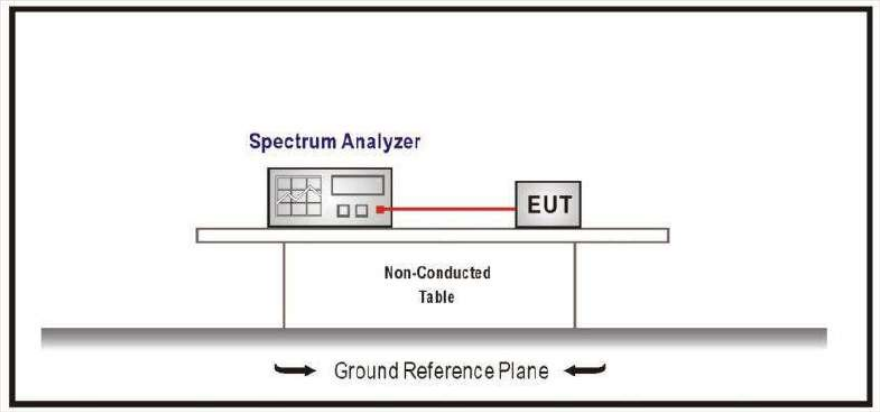
LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(b) and RSS-247 5.4(2)

LIMITS

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

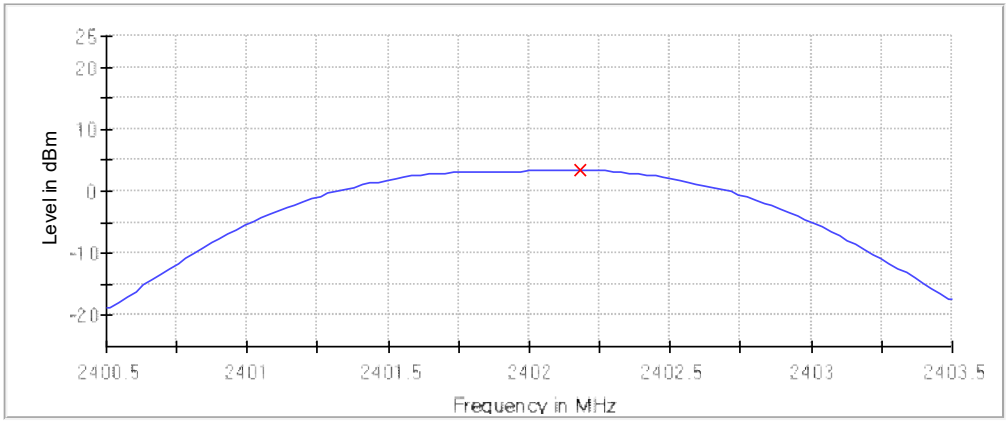
Maximum declared antenna gain: +3.13 dBi

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	3.4	5.5	5.0
Maximum EIRP power (dBm)	6.53	8.63	8.13
Measurement uncertainty (dB)	<±0.78		

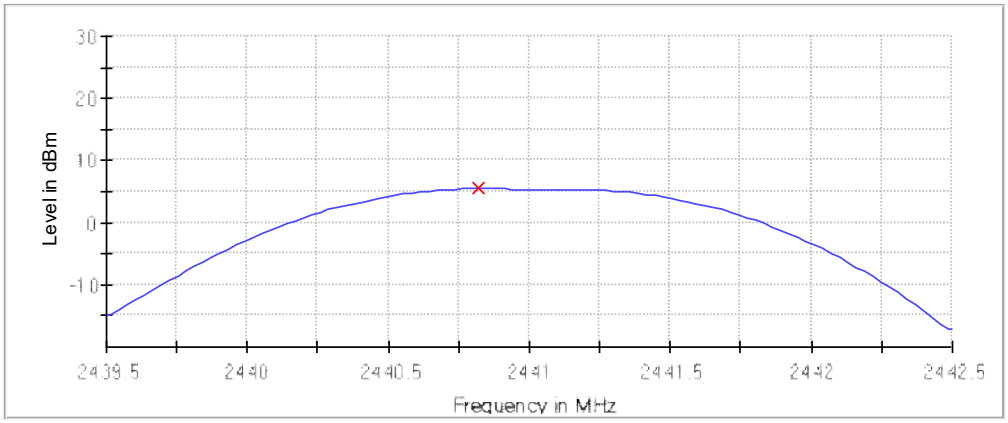
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED PEAK POWER

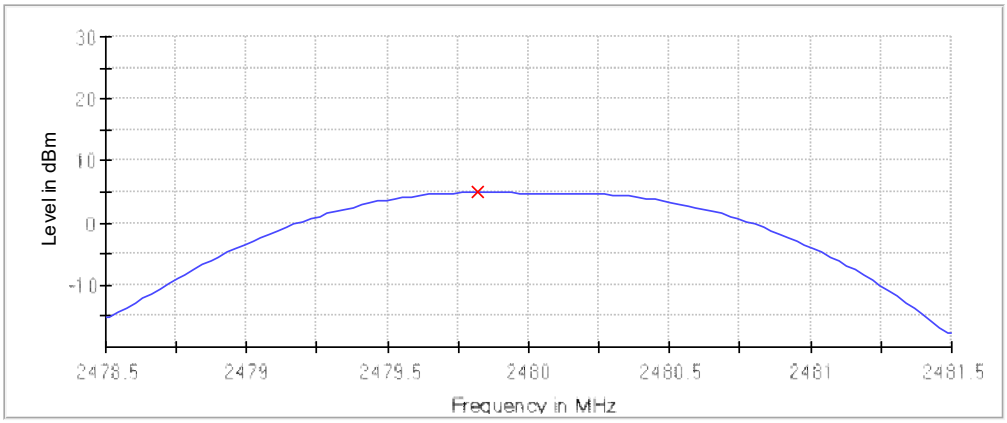
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050	2.43950	2.47850
Stop Frequency	2.40350	2.44250	2.48150
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	1.000 MHz	1.000 MHz	1.000 MHz
VBW	3.000 MHz	3.000 MHz	3.000 MHz
SweepPoints	101	101	101
Sweeptime	1.907 µs	1.907 µs	1.907 µs
Reference Level	20.000	20.000	20.000
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max.	4 / max.	4 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.03 dB	0.02 dB

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

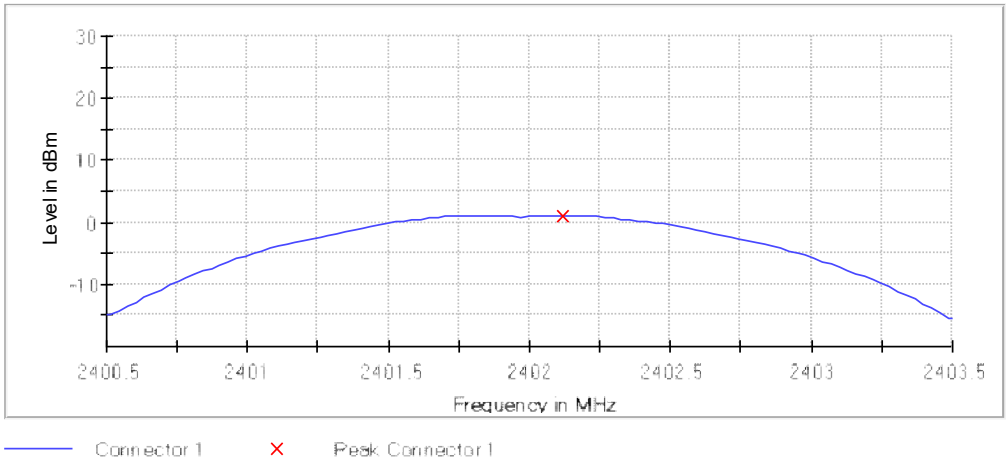
Maximum declared antenna gain: +3.13 dBi

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	1.1	3.2	2.6
Maximum EIRP power (dBm)	4.23	6.33	5.73
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.

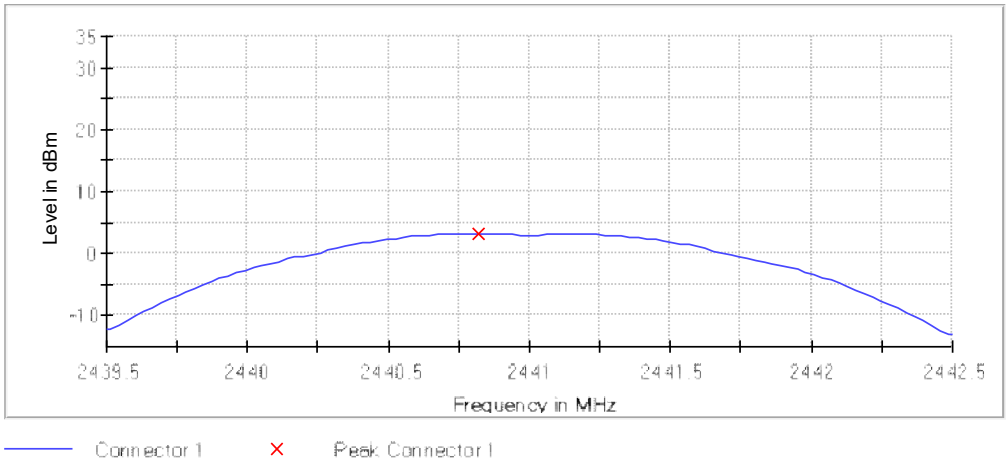
TEST RESULTS (Cont.):	**CONDUCTED PEAK POWER**

Lowest Channel

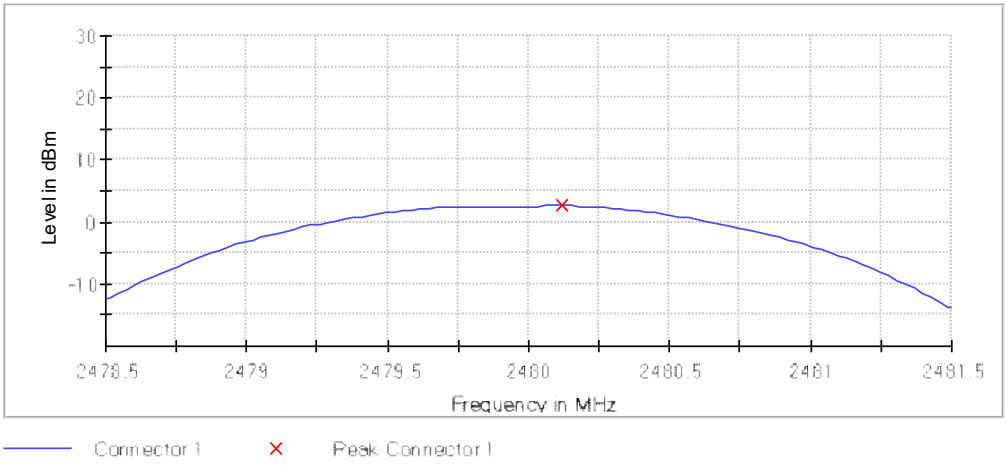


TEST RESULTS (Cont.)

Middle Channel



Highest Channel



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050	2.43950	2.47850
Stop Frequency	2.40350	2.44250	2.48150
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	1.000 MHz	1.000 MHz	1.000 MHz
VBW	3.000 MHz	3.000 MHz	3.000 MHz
SweepPoints	101	101	101
Sweeptime	1.907 µs	1.907 µs	1.907 µs
Reference Level	20.000	20.000	20.000
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	Off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max.	4 / max.	4 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable	0.31 dB	0.00 dB	0.17 dB

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

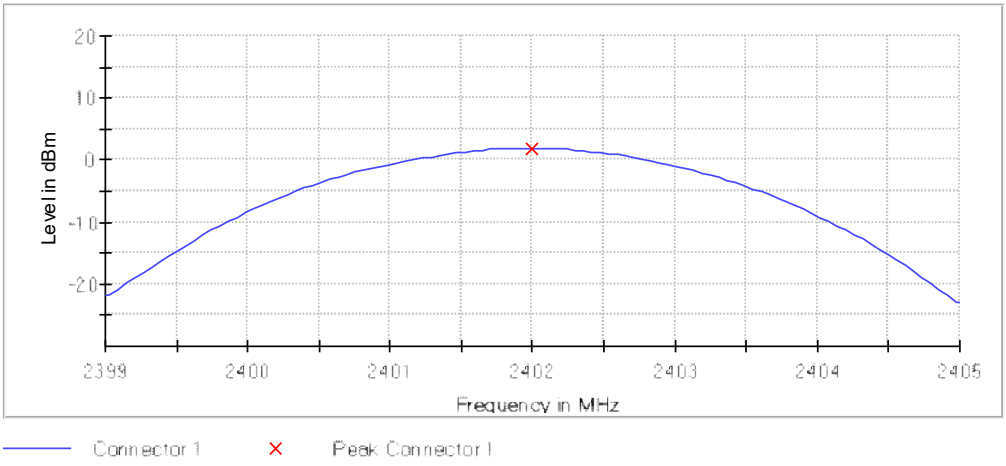
Maximum declared antenna gain: +3.13 dBi

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	1.9	3.8	3.4
Maximum EIRP power (dBm)	5.03	6.93	6.53
Measurement uncertainty (dB)	<±0.78		

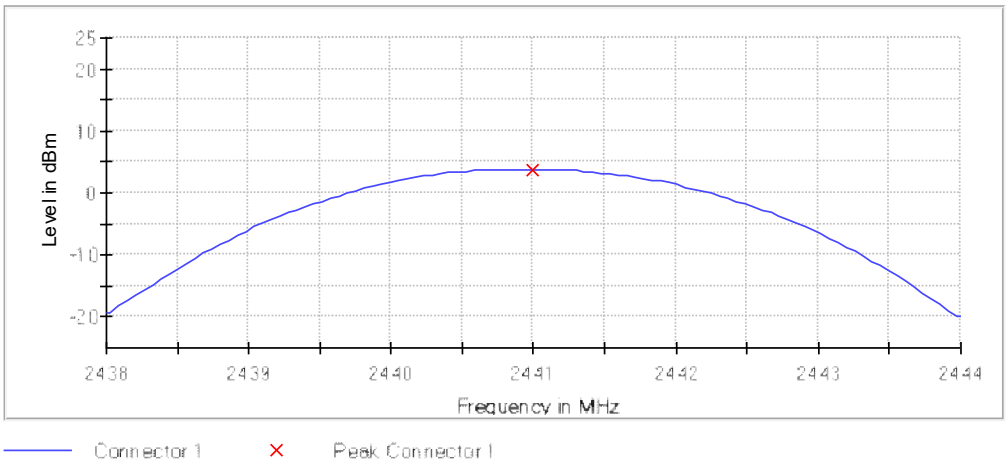
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

Results:

Lowest Channel

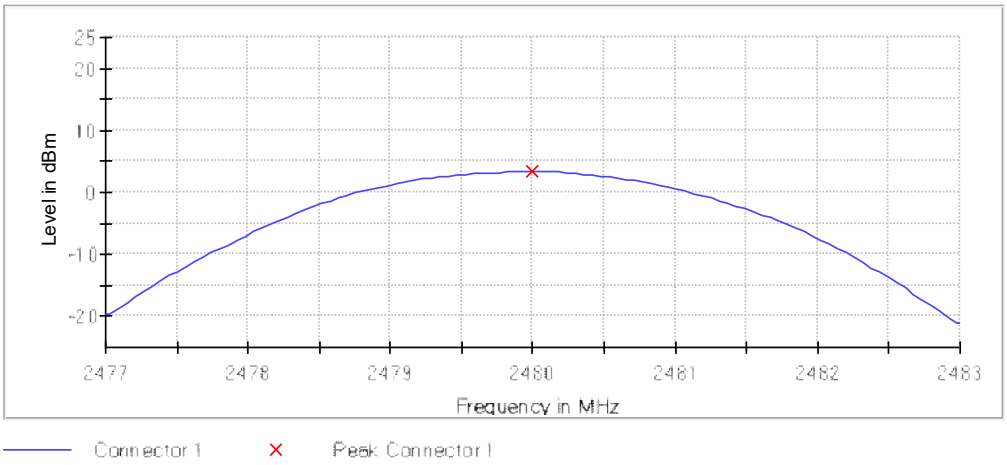


Middle Channel



TEST RESULTS (Cont.)	

Highest Channel



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.39900	2.43800	2.47700
Stop Frequency	2.40500	2.44400	2.48300
Span	6.000 MHz	6.000 MHz	6.000 MHz
RBW	2.000 MHz	2.000 MHz	2.000 MHz
VBW	10.000	10.000	10.000
SweepPoints	101	101	101
Sweeptime	953.450 ns	953.450 ns	953.450 ns
Reference Level	20.000	20.000	20.000
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	Off	off	Off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	5 / max.	5 / max.	4 / max.
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.04 dB	0.29 dB

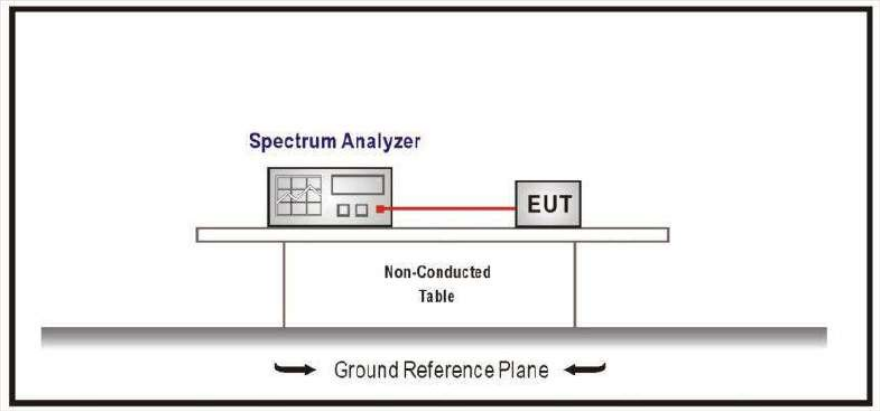
TEST A.5: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

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

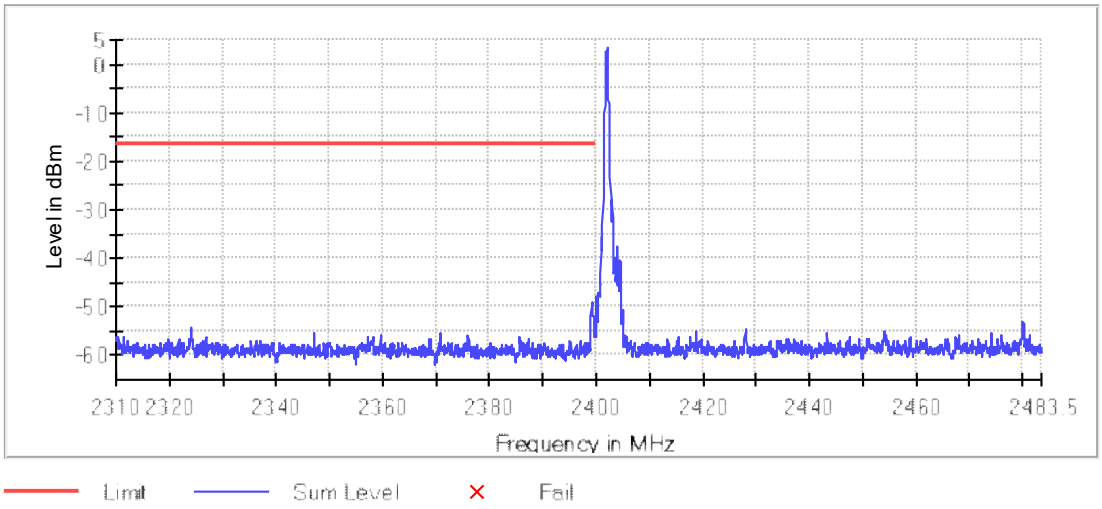
Emissions outside the frequency band in which the intentional radiator is operating shall be at least 20dB below the highest level of the desired power.

TEST SETUP	



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

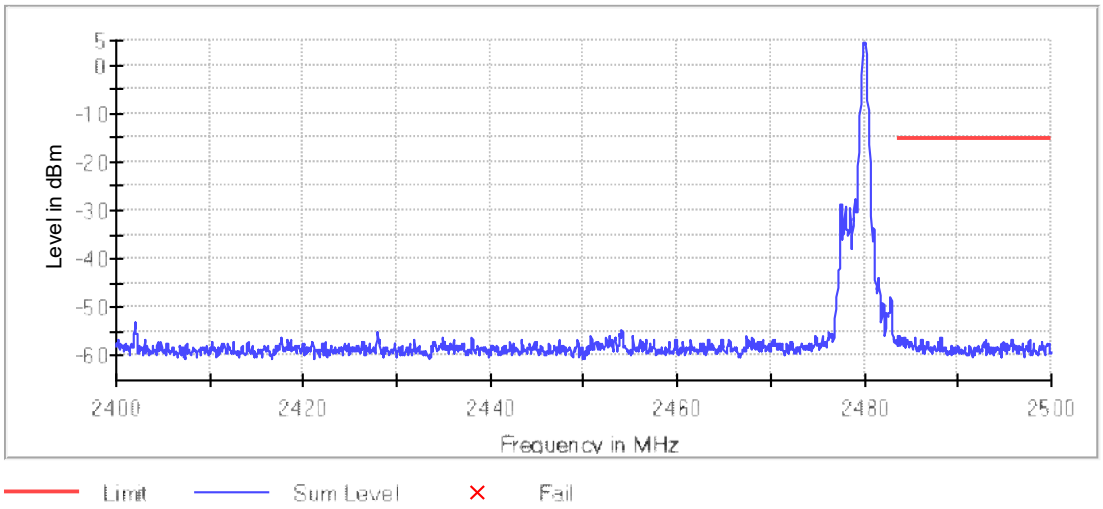
HOPPING OFF (LOWEST CHANNEL)



Measurement

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

TEST RESULTS (Cont.):	Highest Channel

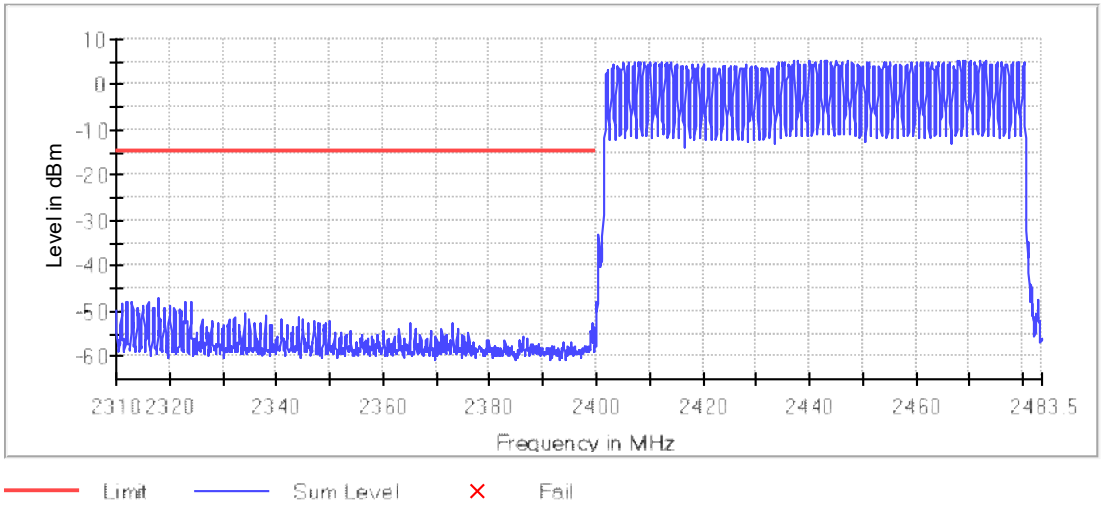


Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	6 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.14 dB	0.00 dB

TEST RESULTS (Cont.):	HOPPING ON

Low**est Channel**

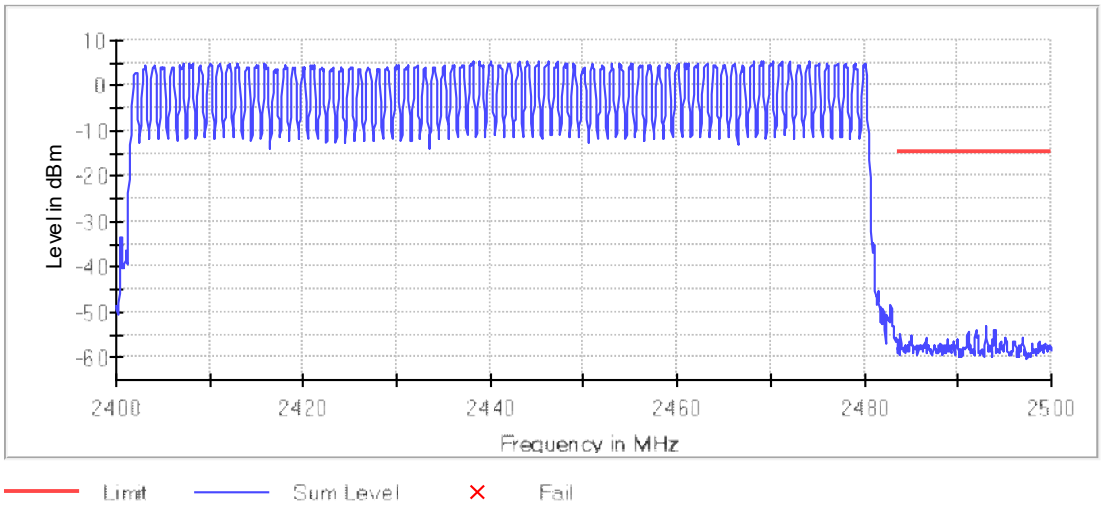


Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.31000	2.40000
Stop Frequency	2.40000	2.48350
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	5 / max. 150	150 / max.
Stable	3 / 3	1 / 3
Max Stable Difference	0.00 dB	0.29 dB

TEST RESULTS (Cont.):	

Highest Channel



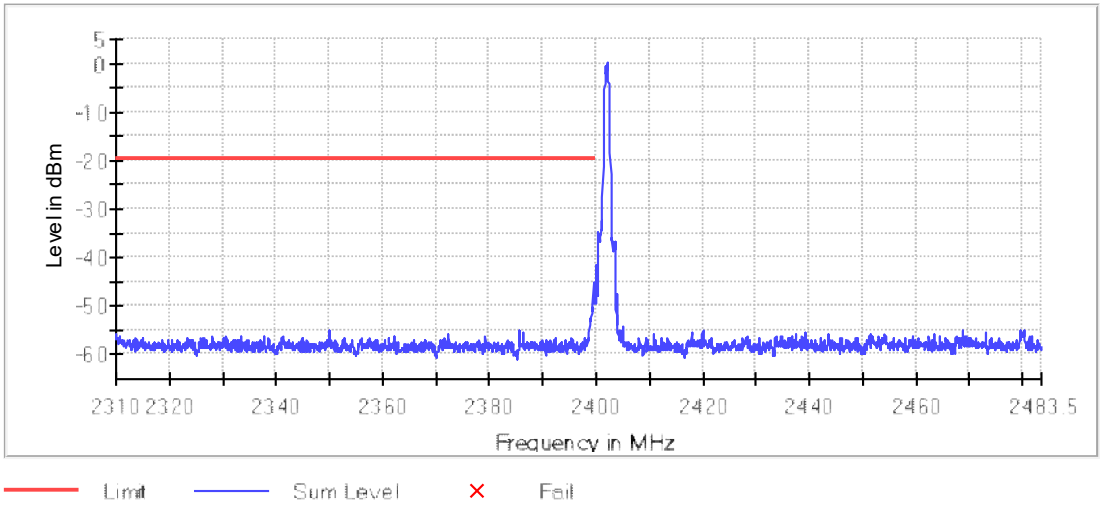
Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	132 / max.	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable	0.45 dB	0.00 dB

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

HOPPING OFF

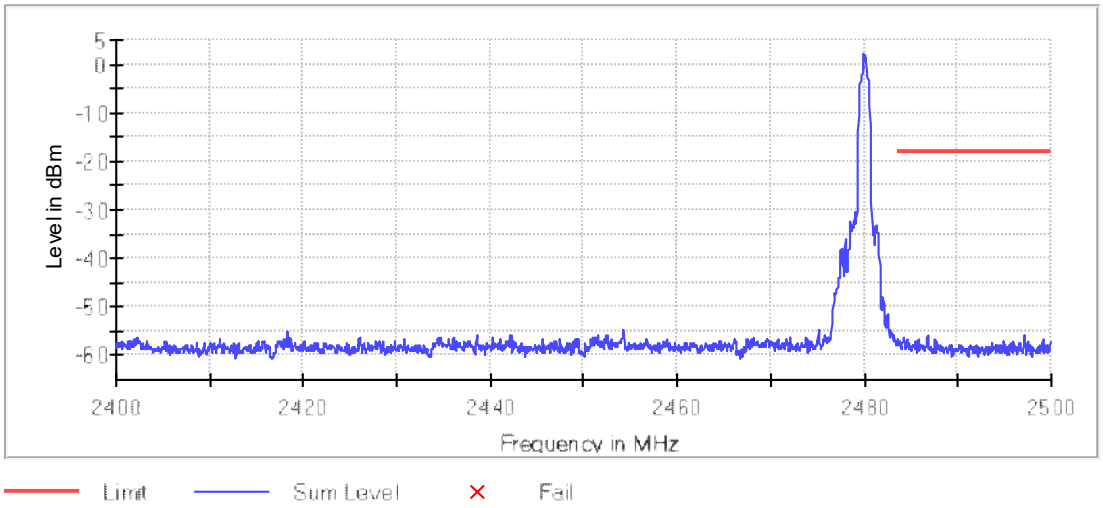
Low Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	Instrument	2.40000 GHz
Stop Frequency	2.31000	2.48350 GHz
Span	2.40000	83.500 MHz
RBW	90.000 MHz	100.000 kHz
VBW	100.000	300.000 kHz
SweepPoints	300.000	1670
Sweeptime	1800	94.727 µs
Reference Level	113.672 µs	10.000 dBm
Attenuation	10.000 dBm	30.000 dB
Detector	30.000 dB	MaxPeak
SweepCount	MaxPeak	100
Filter	100	3 dB
Trace Mode	3 dB	Max Hold
Sweeptype	Max Hold	FFT
Preamp	FFT	off
Stablemode	off	Trace
Stablevalue	Trace	0.50 dB
Run	0.50 dB	12 / max. 150
Stable	12 / max.	3 / 3
Max Stable	3 / 3	0.18 dB

TEST RESULTS (Cont.):	Highest Channel

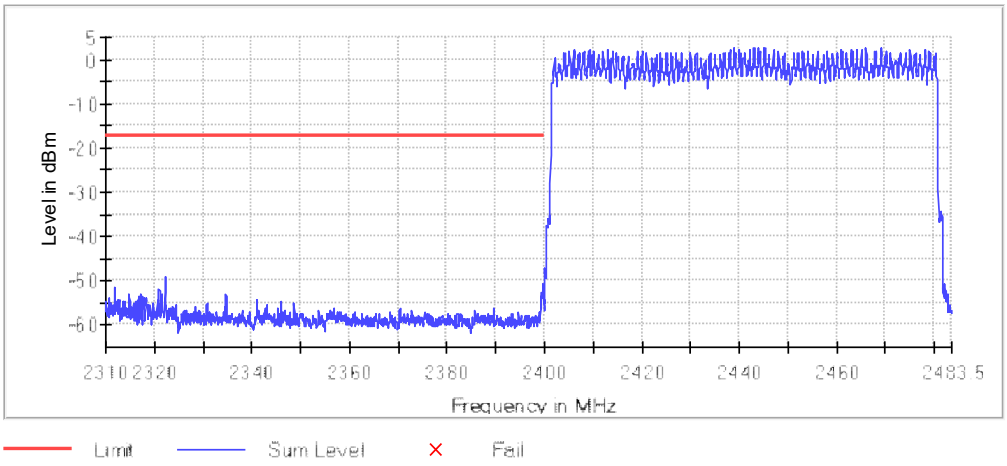


Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	10 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable	0.03 dB	0.00 dB

TEST RESULTS (Cont.):	HOPPING ON

Low**est Channel**

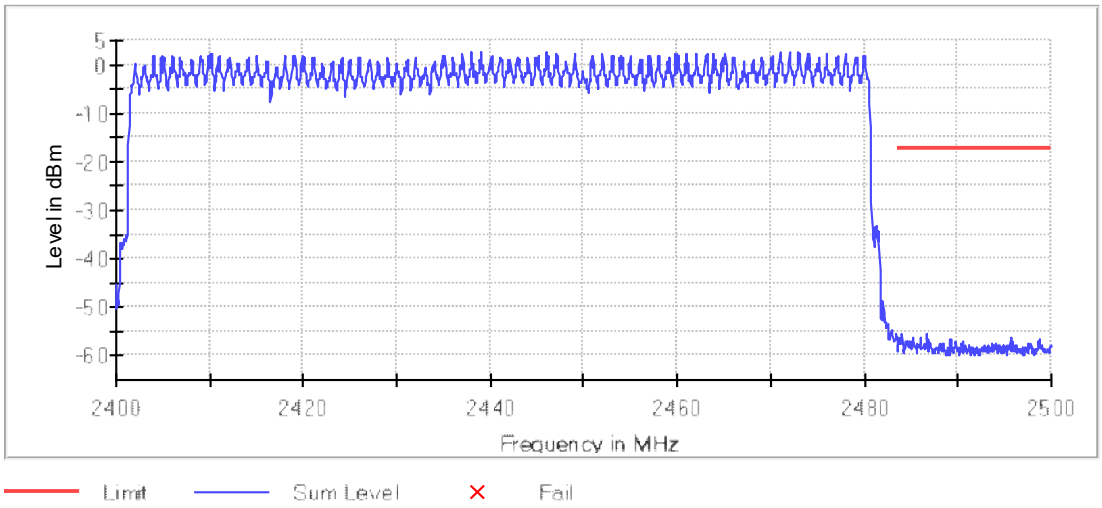


Measurement

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
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	150 / max.
Stable	3 / 3	0 / 3
Max Stable	0.00 dB	2.20 dB

TEST RESULTS (Cont.):	

Highest Channel



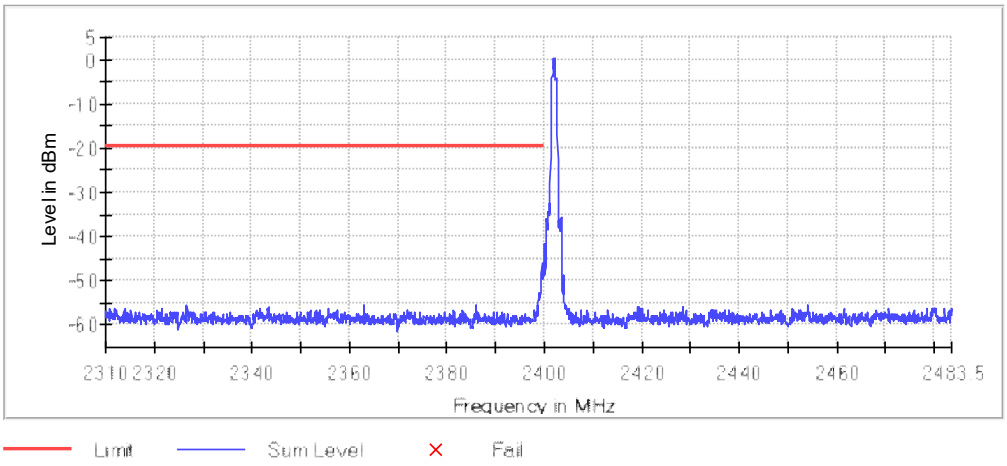
Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000	2.48350
Stop Frequency	2.48350	2.50000
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	150 / max.	4 / max. 150
Stable	0 / 3	3 / 3
Max Stable	2.21 dB	0.00 dB

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

HOPPING OFF

Lowest Channel:

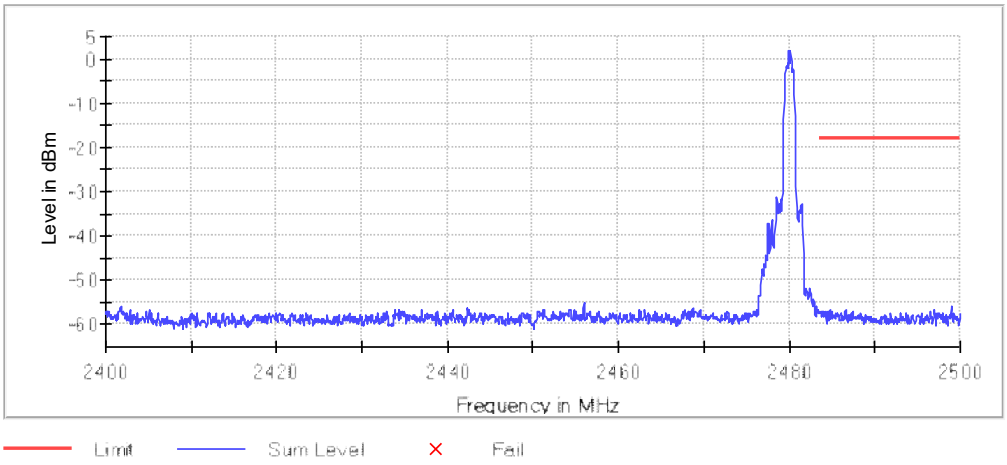


Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.31000	2.40000 GHz
Stop Frequency	2.40000	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000	100.000 kHz
VBW	300.000	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	150 / max.
Stable	3 / 3	0 / 3
Max Stable	0.00 dB	1.81 dB

TEST RESULTS (Cont.):	

Highest Channel

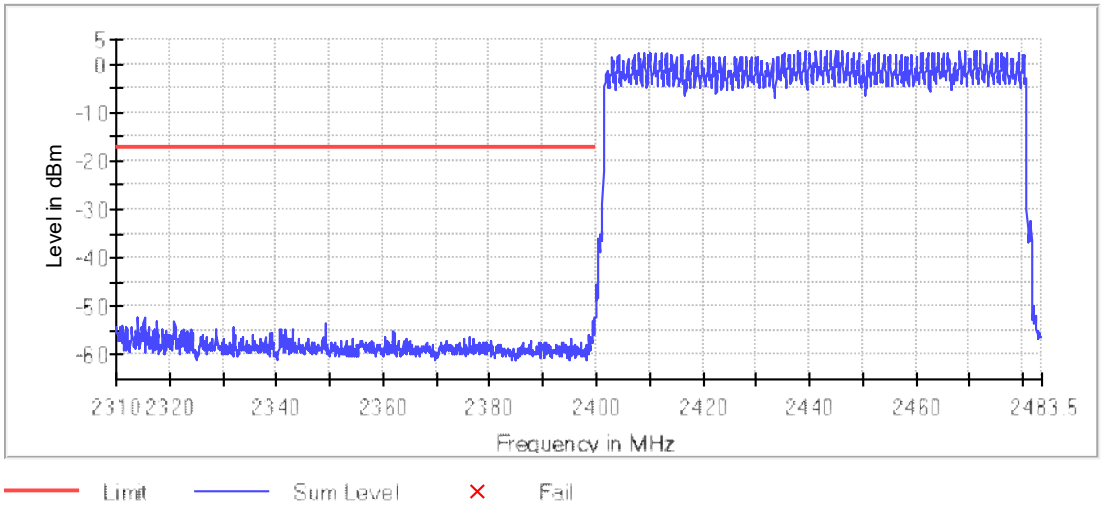


Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	5 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable	0.28 dB	0.00 dB

TEST RESULTS (Cont.):	HOPPING ON

Low**est Channel**

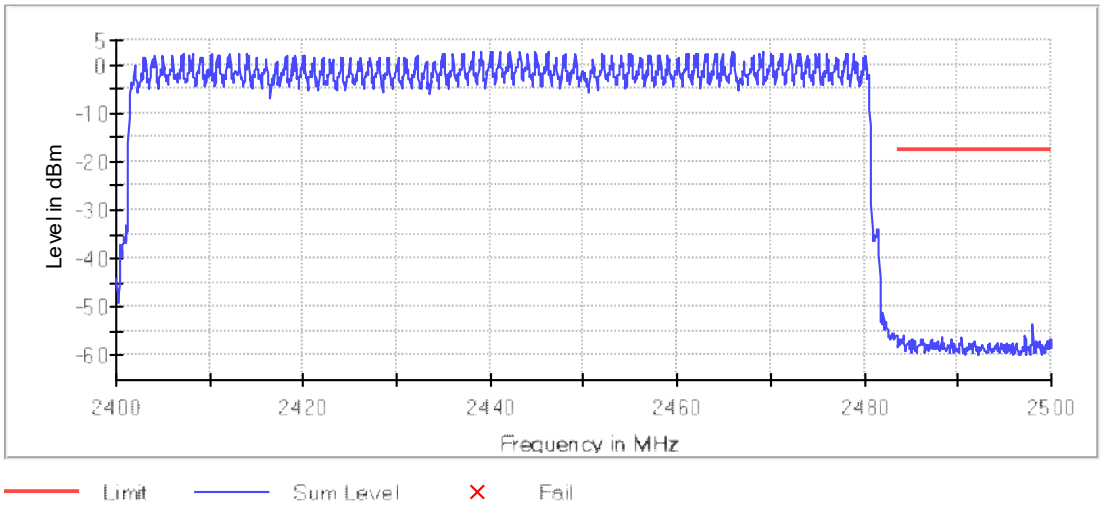


Measurement

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
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	150 / max.
Stable	3 / 3	0 / 3
Max Stable	0.00 dB	1.81 dB

TEST RESULTS (Cont.):	

Highest Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	150 / max.	4 / max. 150
Stable	0 / 3	3 / 3
Max Stable	1.65 dB	0.00 dB

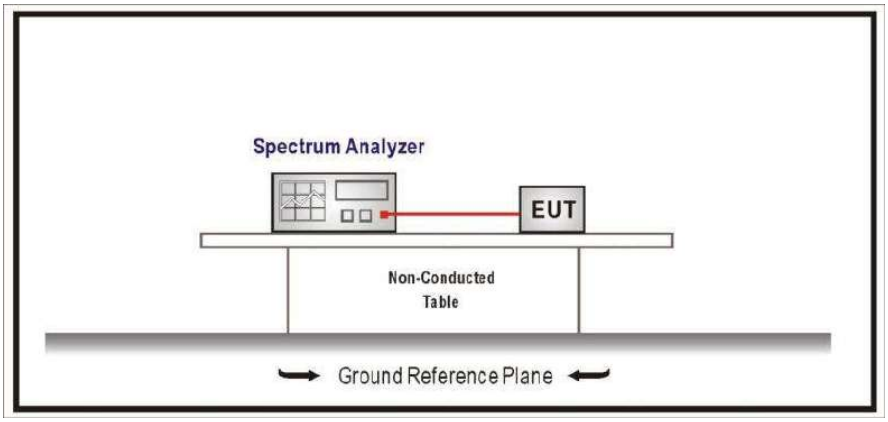
TEST A.6: EMISSIONS LIMITATIONS CONDUCTED (TRANSMITTER)

LIMITS:	Product standard:	Part 15 Subpart C §15.247
	Test standard:	Part 15 Subpart C §15.247(d)

LIMITS

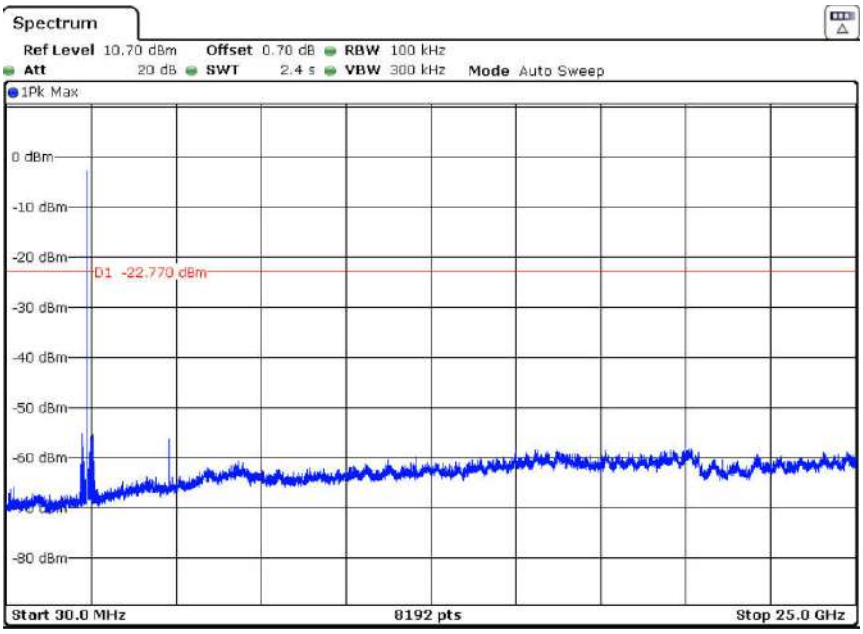
In any 100 kHz bandwidths outside the frequency band in which the intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.

TEST SETUP	



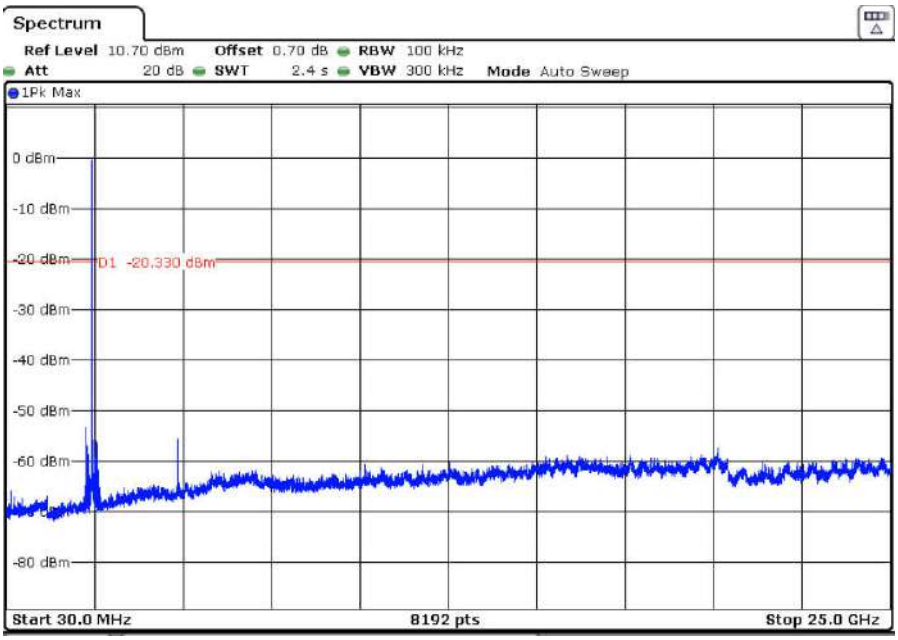
TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

LOWEST CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

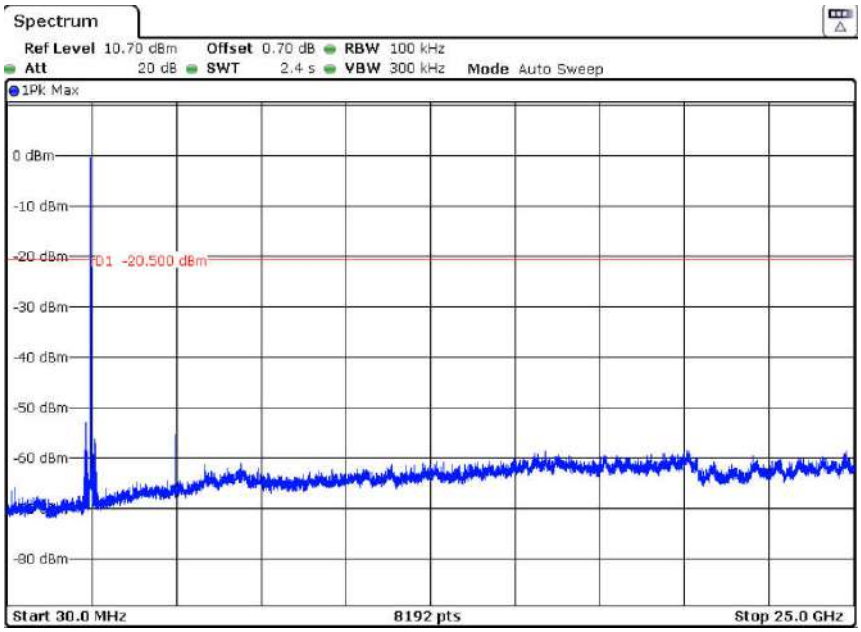
MIDDLE CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

TEST RESULTS (Cont.)	

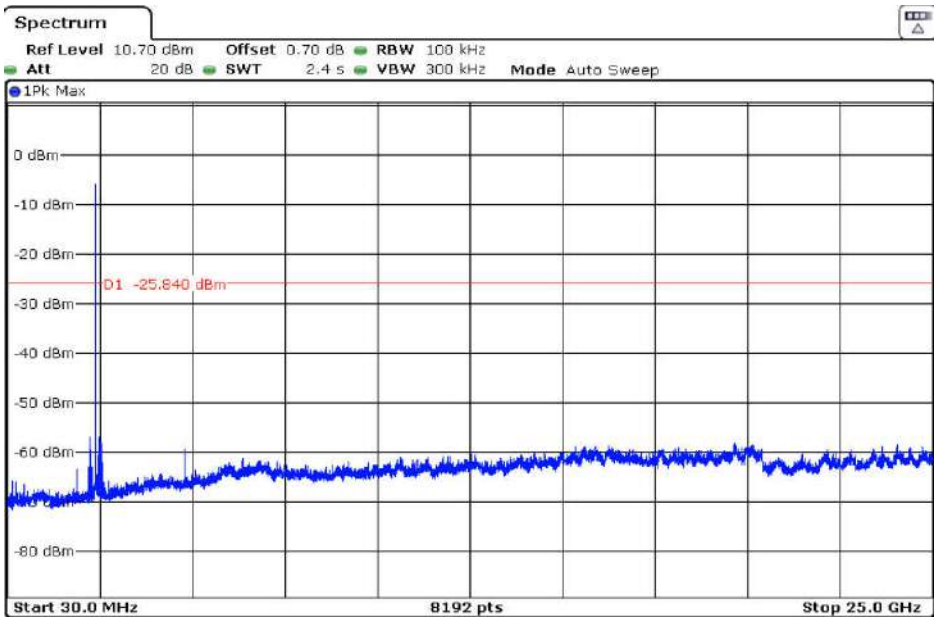
HIGHEST CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

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

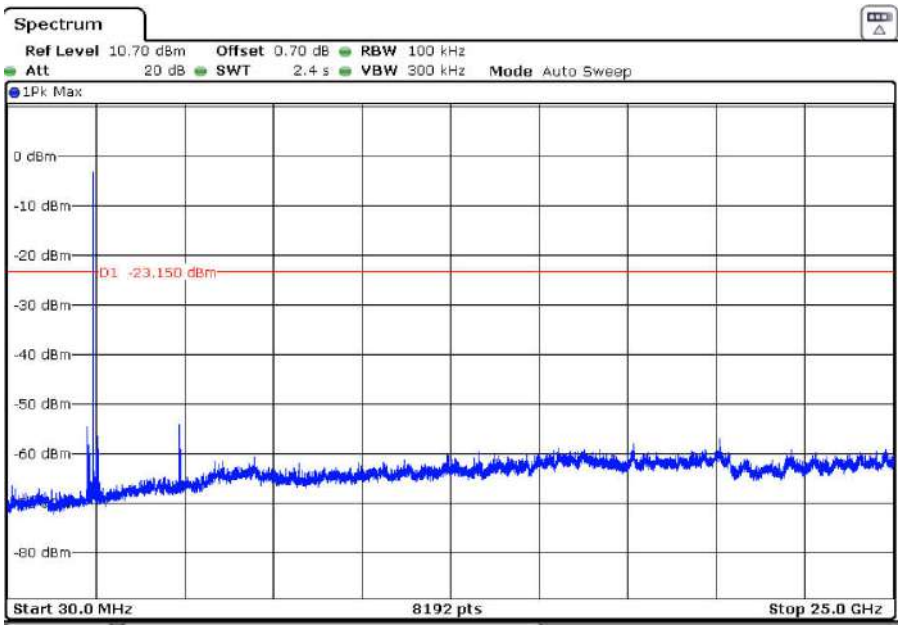
LOWEST CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

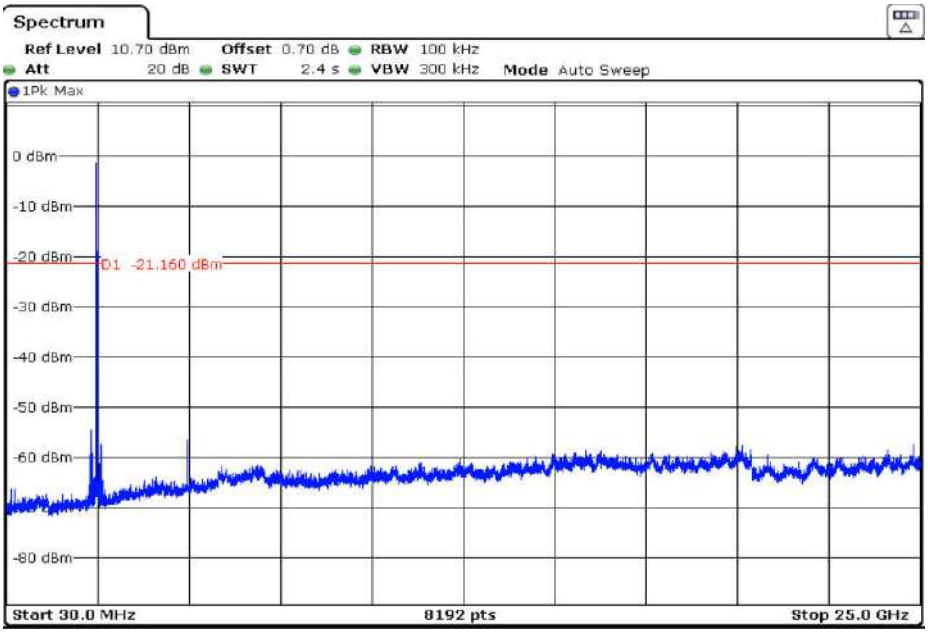
TEST RESULTS (Cont.)	

MIDDLE CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

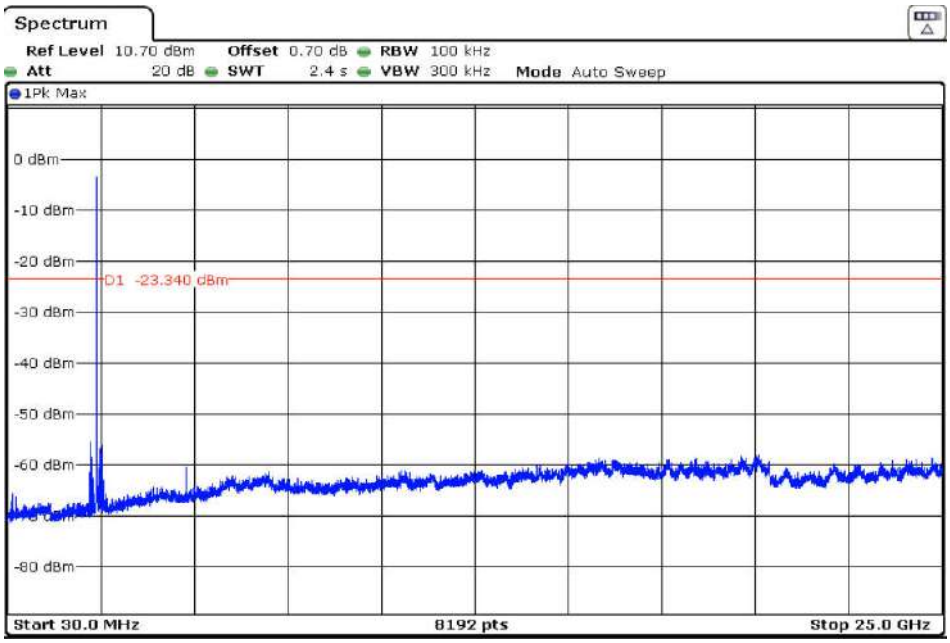
HIGHEST CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

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

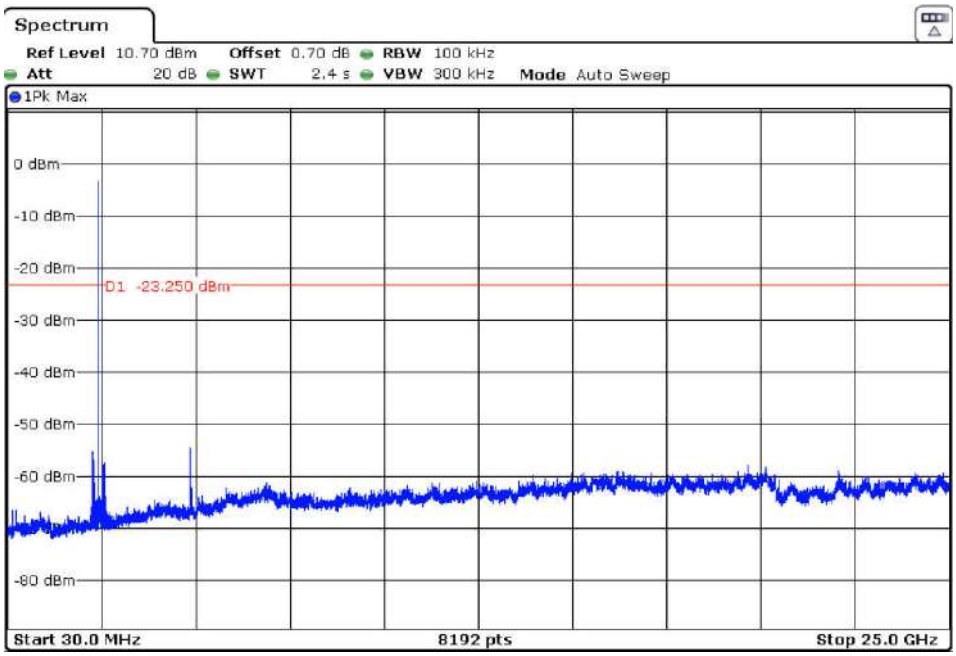
LOWEST CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

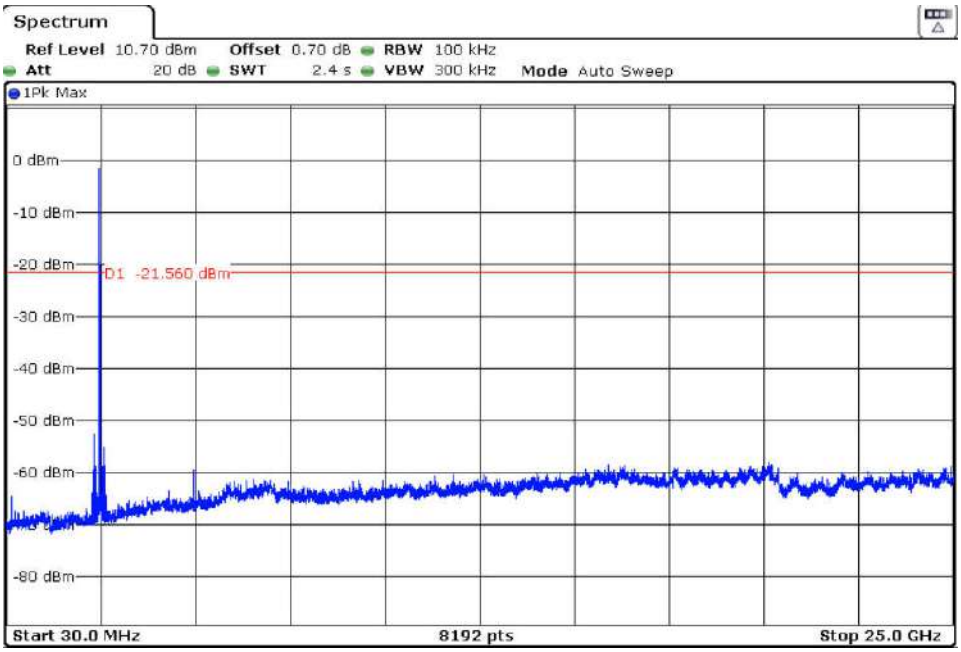
TEST RESULTS (Cont.)	

MIDDLE CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

HIGHEST CHANNEL: 30 MHz – 25 GHz



Note: The peak above the limit is the carrier frequency.

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.

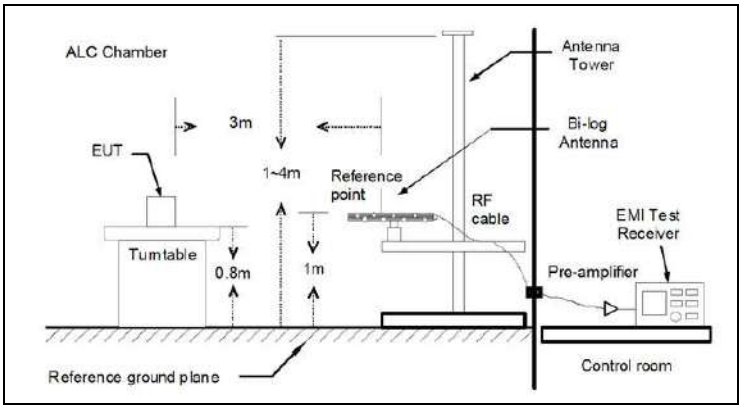
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

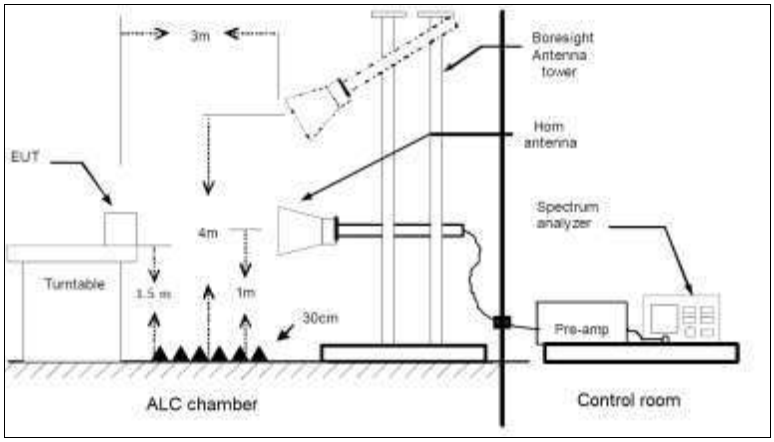
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)	

Radiated measurements Setup f < 1 GHz



Radiated measurements setup f > 1 GHz



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

Frequency range 30 MHz – 1000 MHz

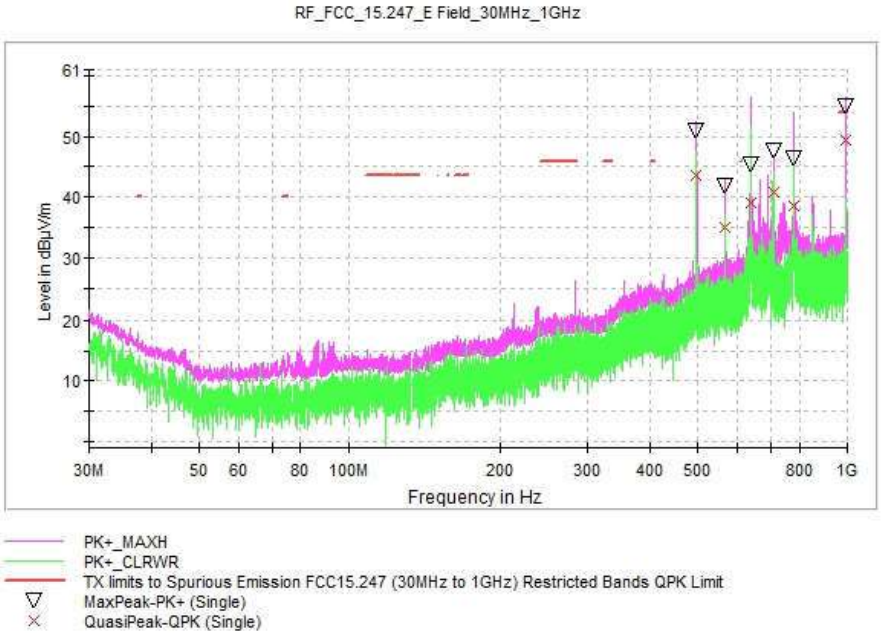
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
The radiated spurious signals detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

Frequency range 1 GHz – 25 GHz

The spurious emissions above 1 GHz do not depend on the operating channel selected in the EUT.
The radiated spurious signals detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

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

CHANNEL: Lowest (2402 MHz).

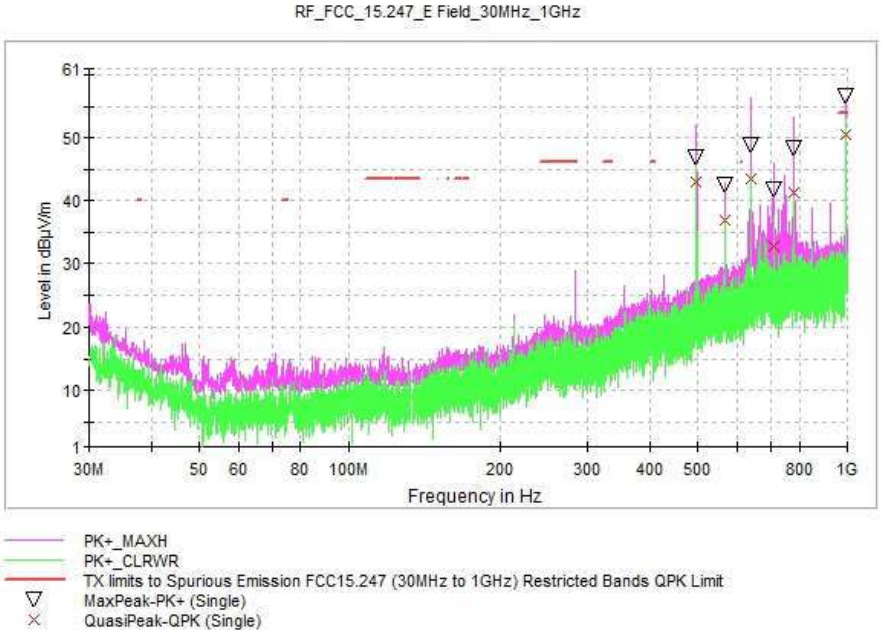


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
994.228500	54.8	49.4	V
781.556000	46.4	38.4	V
709.873000	47.6	40.9	H
639.257000	45.4	39.0	H
568.350000	41.8	34.9	H
497.103500	51.0	43.6	H

TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz).



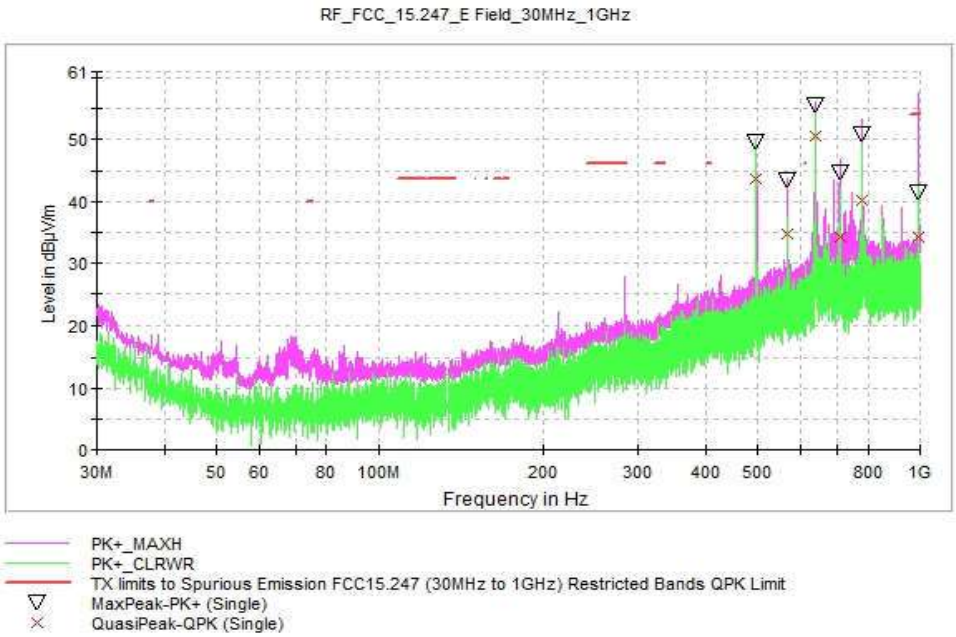
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
497.006500	46.9	42.9	V
638.917500	48.8	43.4	V
780.925500	48.4	41.3	V
993.743500	56.6	50.4	V
568.059000	42.5	36.8	V
710.212500	41.7	32.6	V

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz).



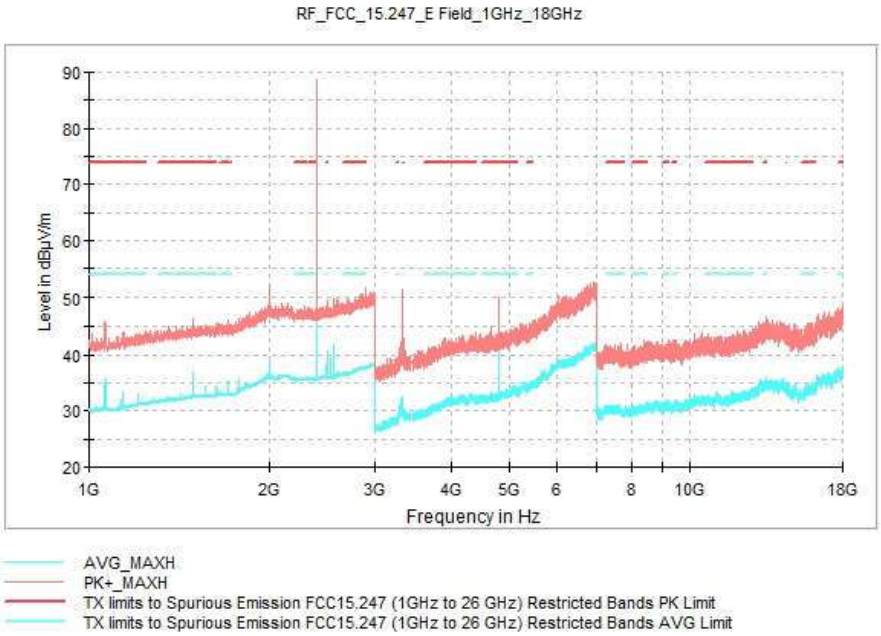
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)
497.103500	49.7	43.6
568.301500	43.3	34.7
639.354000	55.6	50.6
710.309500	44.6	34.1
781.410500	50.9	40.2
994.325500	41.4	34.1

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

CHANNEL: Lowest (2402 MHz).



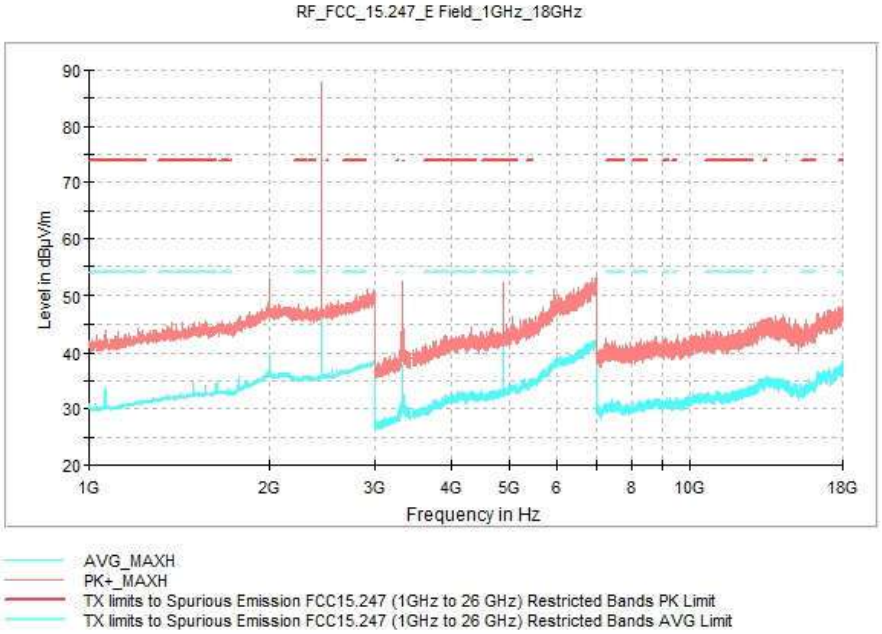
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1064.500000	45.79	38.26	V
2402.000000	92.65	91.79	V
2506.000000	50.53	43.47	V
4804.000000	52.84	50.22	V
6847.500000	50.66	42.11	H
17980.500000	48.66	38.02	V

TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz).



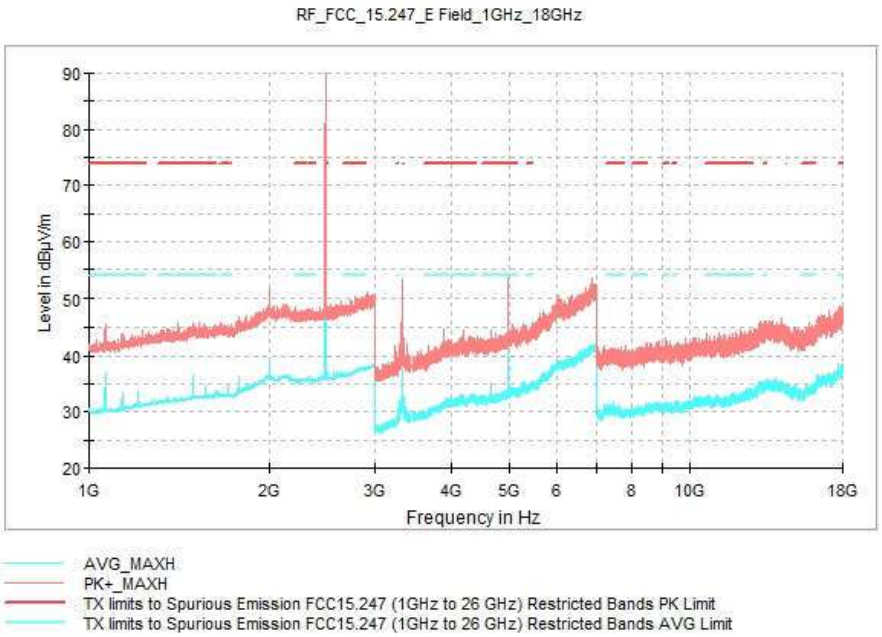
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1065.000000	47.02	38.55	V
1996.000000	52.18	36.38	V
2441.000000	97.35	96.73	V
3330.000000	49.65	40.00	H
4882.000000	57.79	53.63	V
6983.000000	52.74	41.70	H

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz).



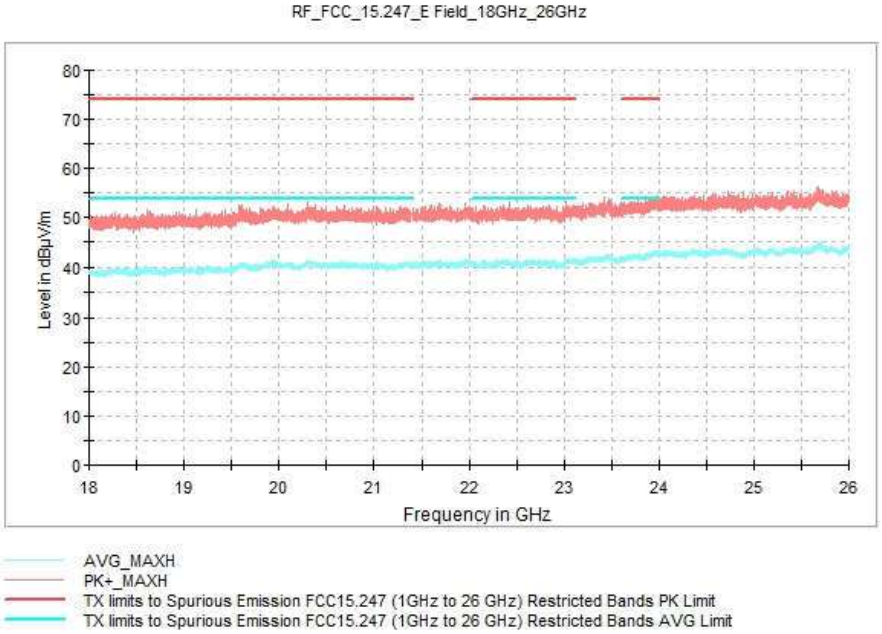
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

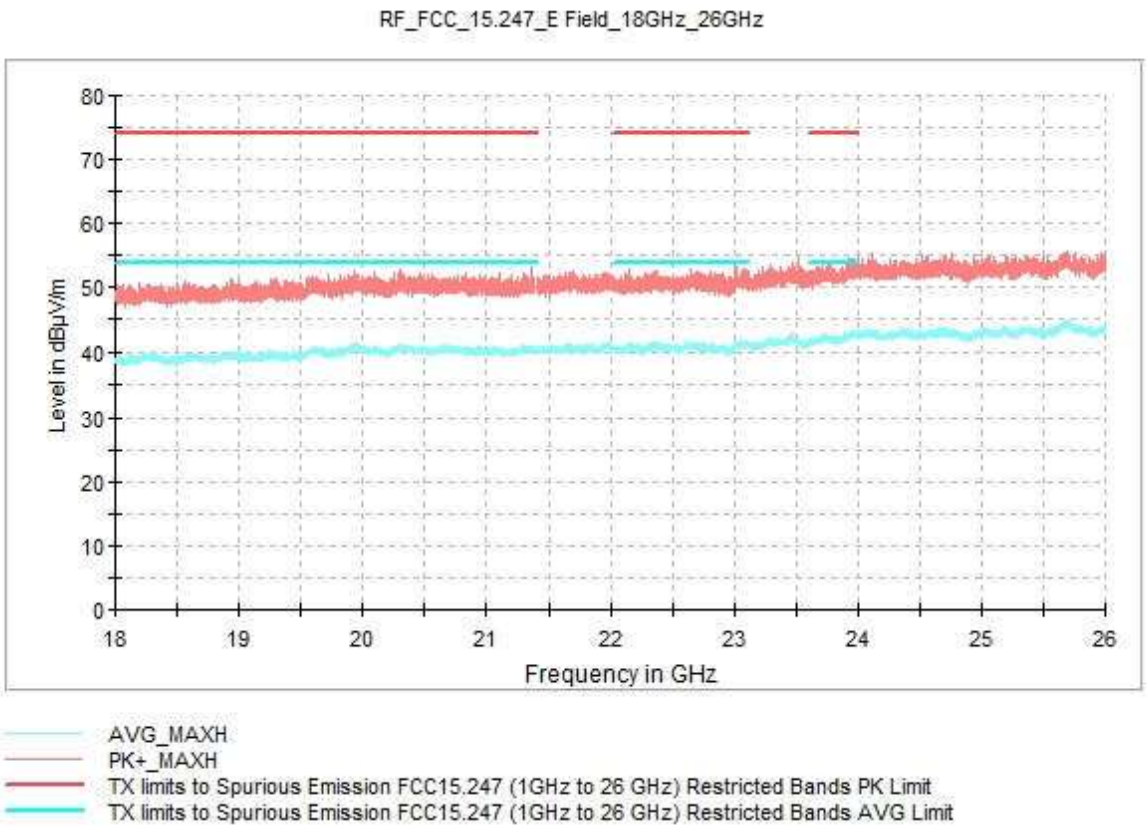
Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Height (cm)	Pol
1064.500000	43.2	34.1	155.0	H
1775.000000	47.3	37.1	155.0	H
2480.000000	92.8	92.1	155.0	H
3329.500000	46.8	34.1	155.0	V
4960.000000	57.3	55.5	155.0	V
7439.500000	42.1	35.4	155.0	V

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

CHANNEL: Lowest (2402 MHz).

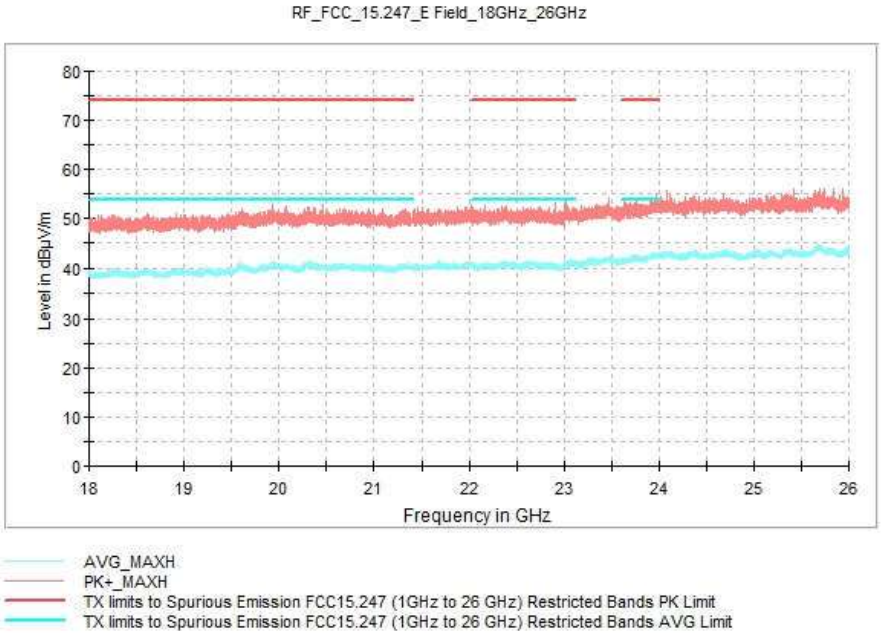


CHANNEL: Middle (2441 MHz).



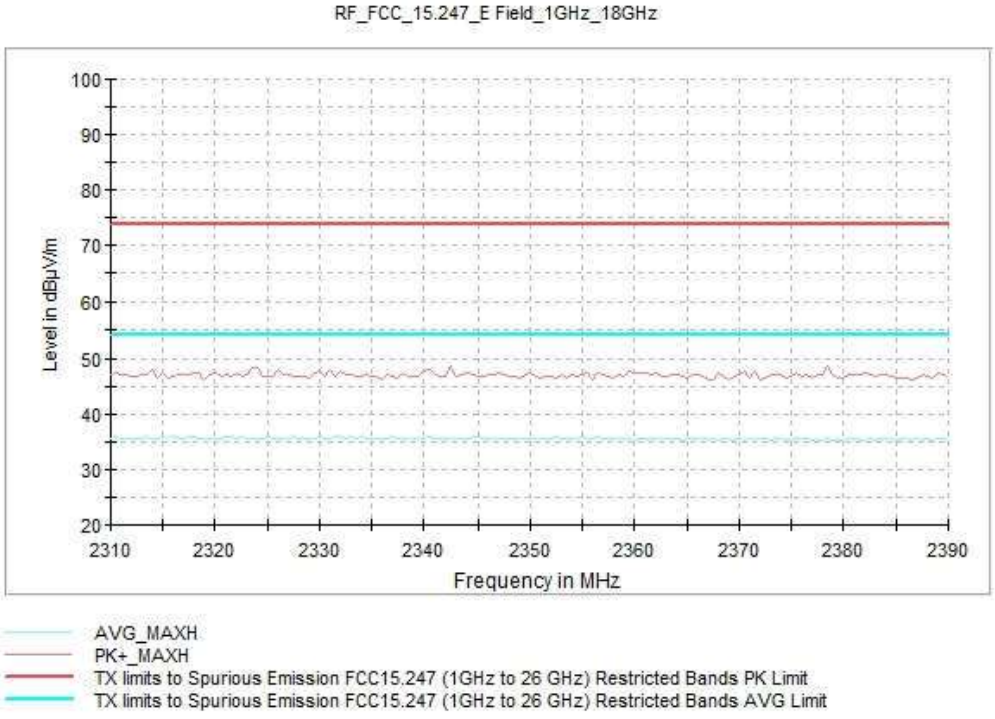
TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz).



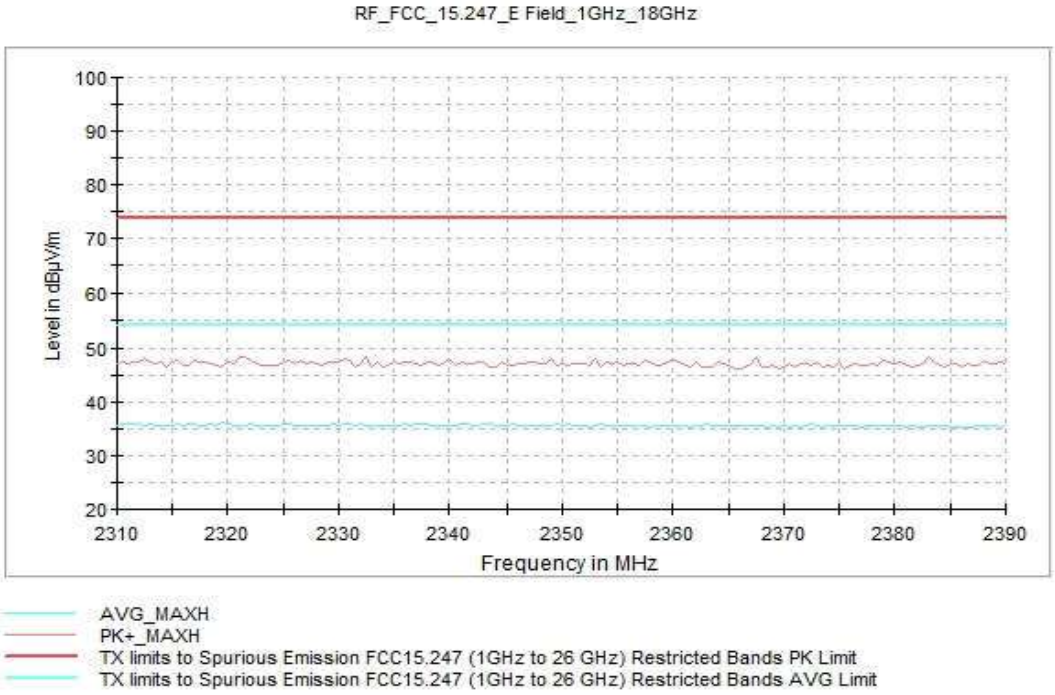
RESTRICTED BANDS	2.31 GHz – 2.39 GHz (GFSK)

CHANNEL: Lowest (2402 MHz)

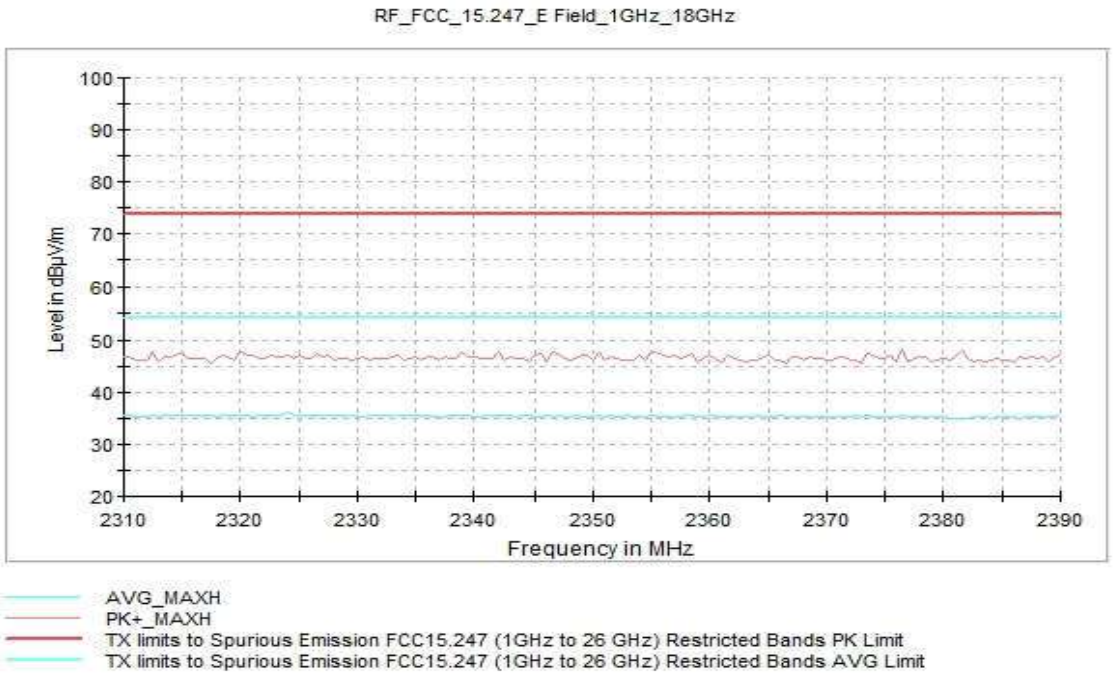


TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz)

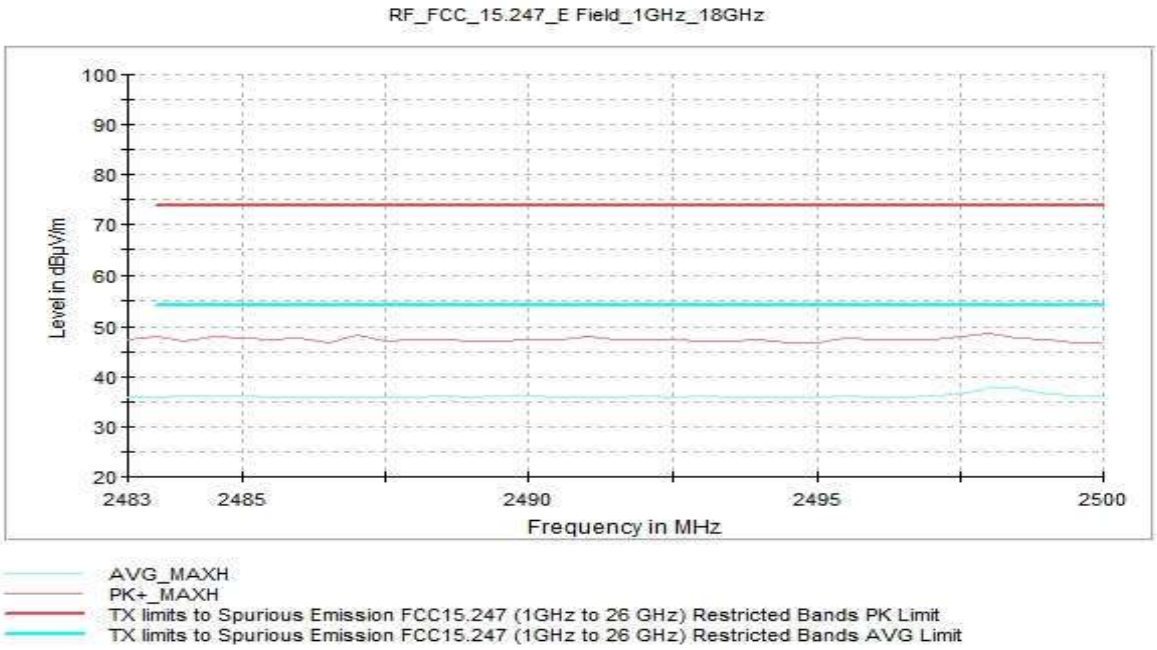


CHANNEL: Highest (2480 MHz)

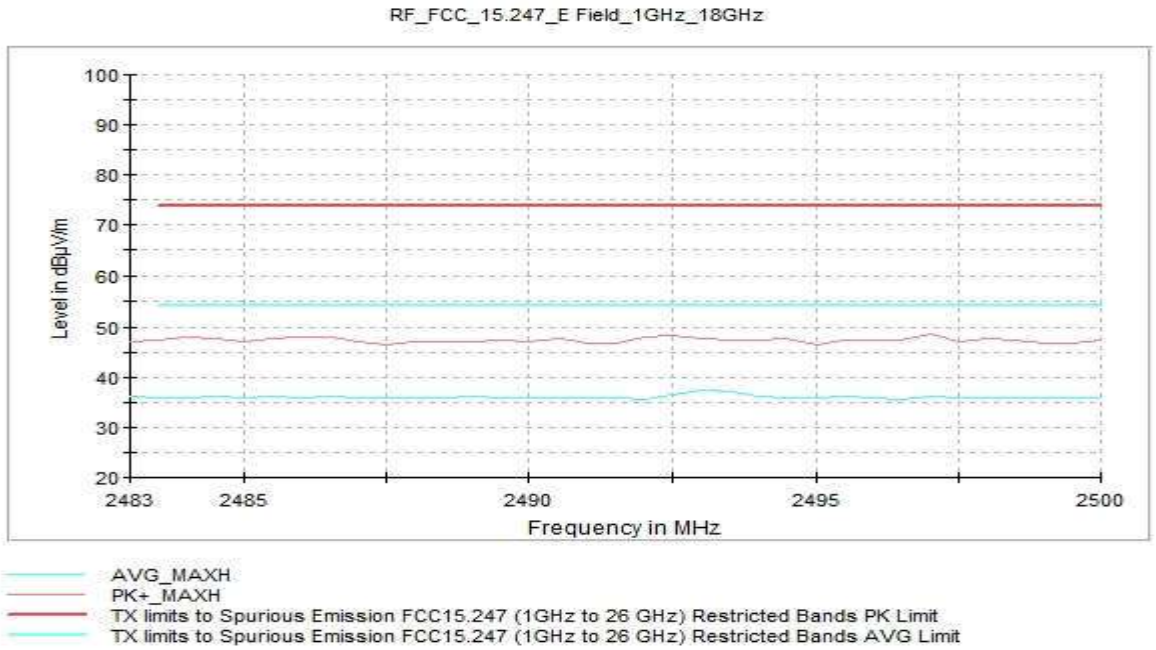


TEST RESULTS (Cont.)	
RESTRICTED BANDS	**2.483 GHz – 2.5 GHz (GFSK)**

CHANNEL: Lowest (2402 MHz)

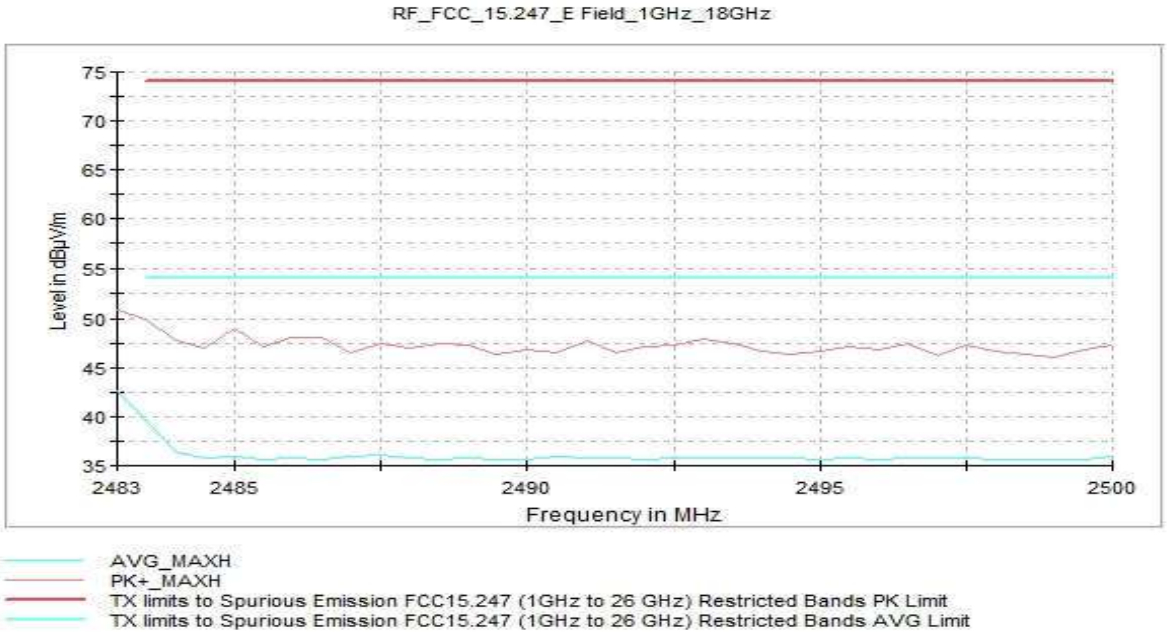


CHANNEL: Middle (2441 MHz)



TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



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

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
The radiated spurious signals detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

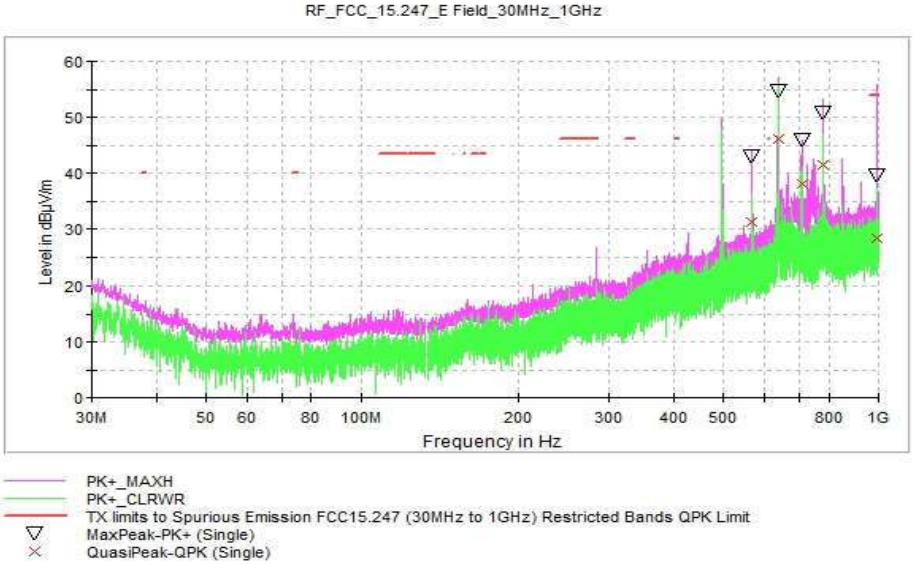
Frequency range 1 GHz – 25 GHz

The spurious emissions above 1 GHz do not depend on the operating channel selected in the EUT.

The radiated spurious signals detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

FREQUENCY RANGE	**30 MHz – 1000 MHz (PI4DQPSK)**

CHANNEL: Lowest (2402 MHz).

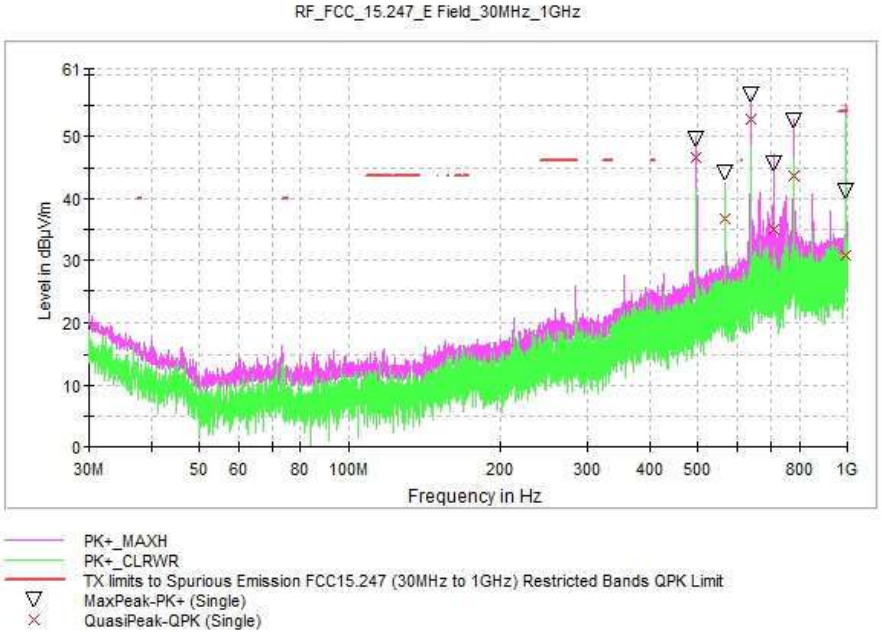


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
993.937500	39.5	28.3	H
781.022500	50.8	41.5	H
710.212500	45.9	38.0	H
638.966000	54.7	46.1	H
568.010500	43.0	31.3	H

TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz).

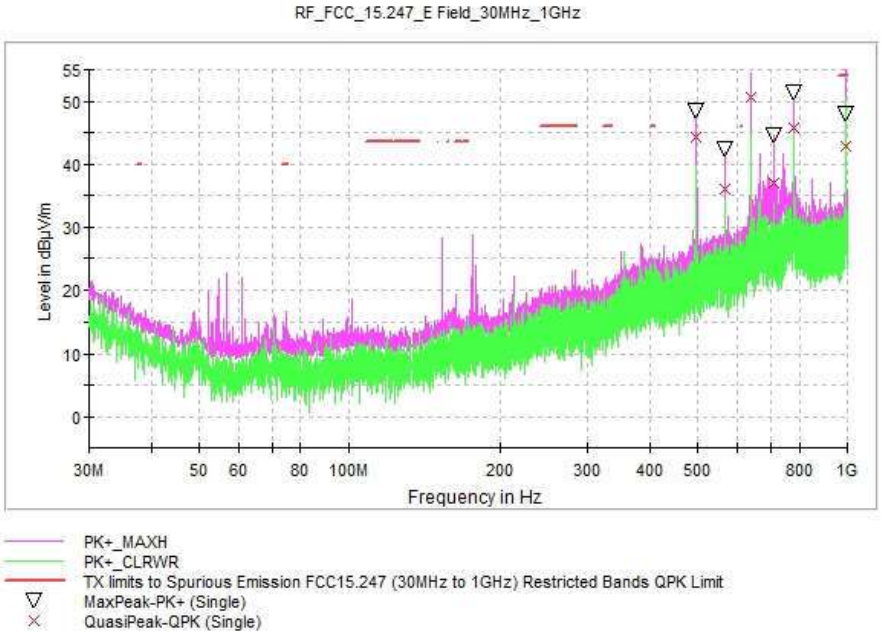


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
994.034500	41.1	30.8	H
781.071000	52.6	43.7	H
710.261000	45.5	34.9	H
638.917500	56.7	52.8	H
568.059000	44.1	36.7	H
496.909500	49.7	46.6	H

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz).

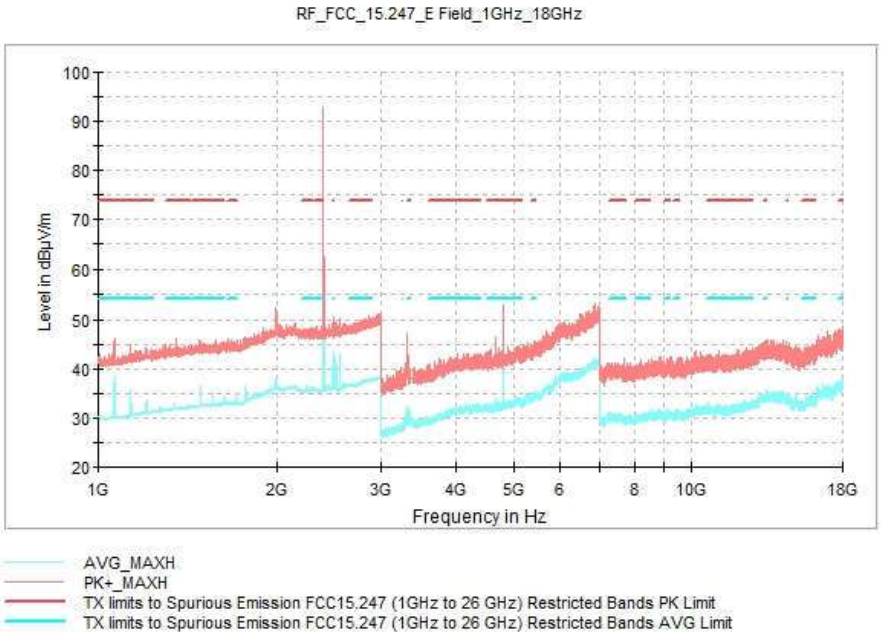


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
497.006500	48.4	44.2	H
567.962000	42.3	36.0	H
638.869000	56.4	50.5	H
709.824500	44.5	36.9	H
780.731500	51.2	45.8	H
993.986000	47.8	42.8	H

TEST RESULTS (Cont.)	
FREQUENCY RANGE	1 GHz – 18 GHz (PI4DQPSK)

CHANNEL: Lowest (2402 MHz).



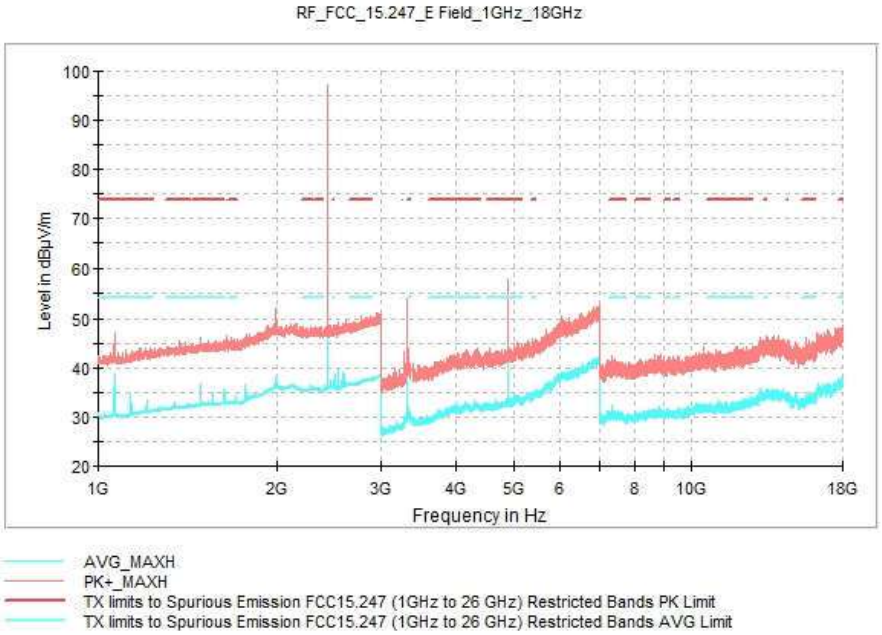
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1064.000000	45.2	35.7	V
1490.000000	46.3	36.1	V
2402.000000	88.6	85.5	V
3329.500000	44.0	32.2	V
4804.000000	48.7	42.8	V
6999.500000	51.2	42.5	V

TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz).



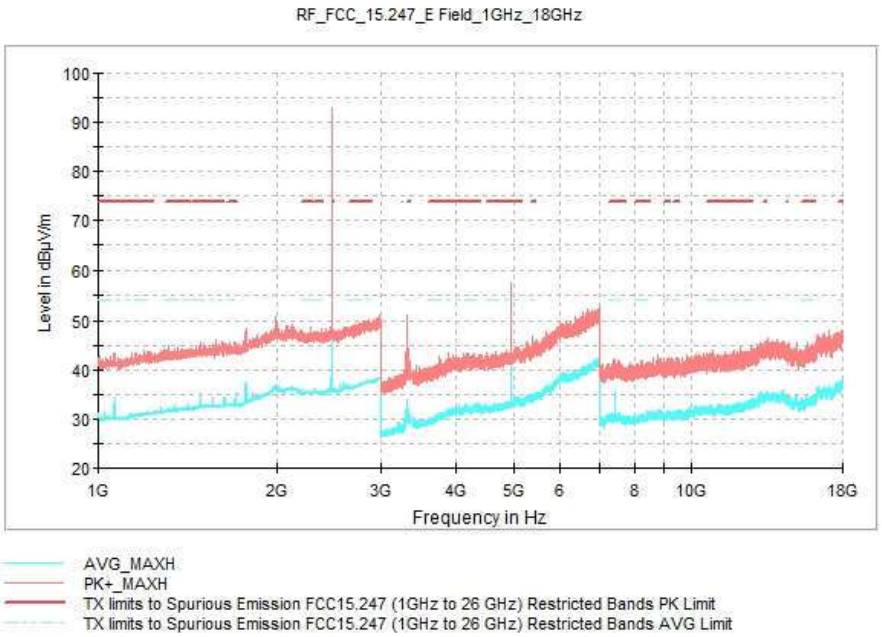
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1064.000000	43.3	33.5	H
1491.500000	44.8	34.7	H
1997.500000	50.9	39.9	H
2441.000000	87.8	84.5	H
3330.000000	49.5	38.1	V
4882.000000	51.6	47.0	V

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



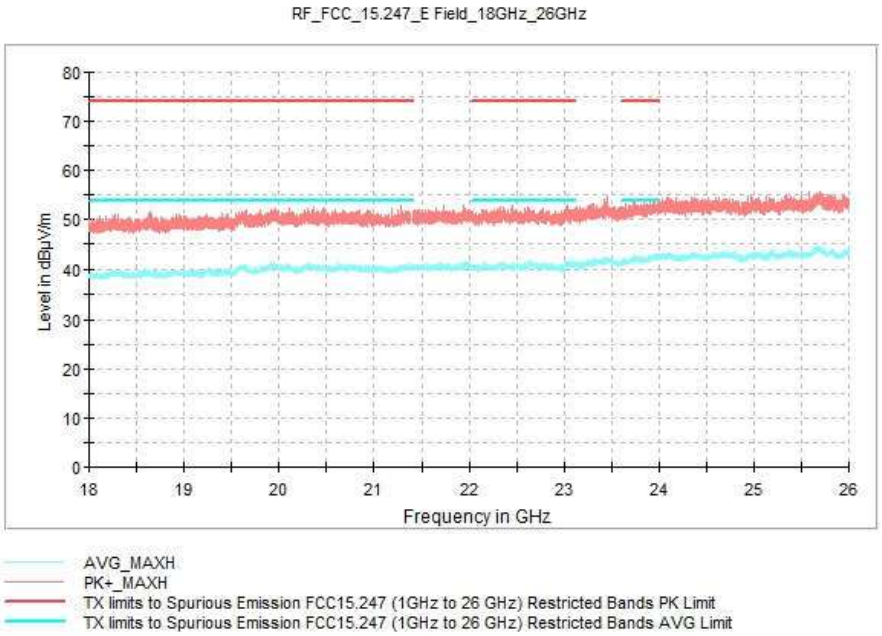
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1065.000000	45.6	36.8	V
1491.000000	45.9	36.5	V
1997.000000	51.1	38.9	V
2480.000000	97.6	94.8	V
3328.000000	53.3	37.2	H
4959.500000	53.4	48.3	V

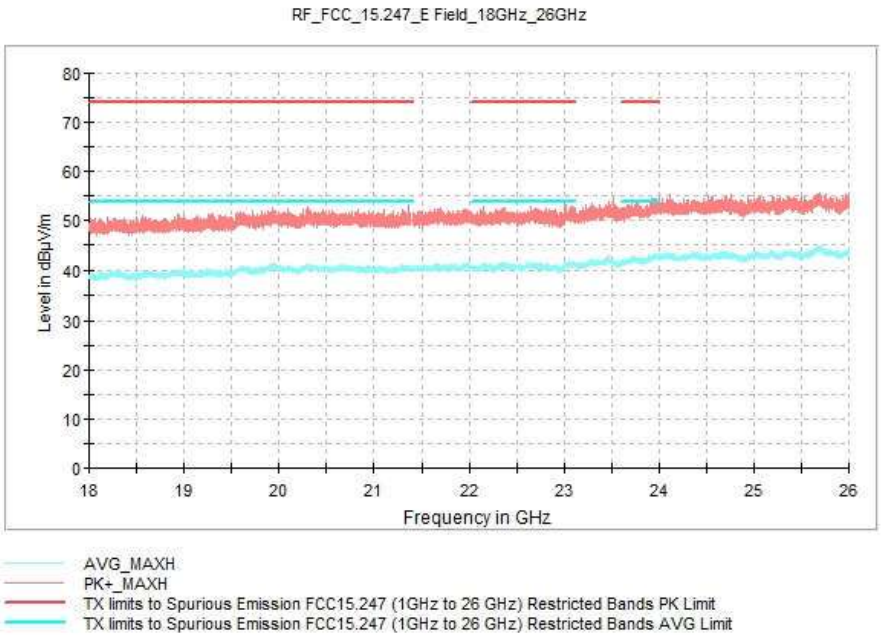
TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 26 GHz (PI4DQPSK)

CHANNEL: Lowest (2402 MHz)



Note: The peak shown in the plot above the limits is the carrier frequency.

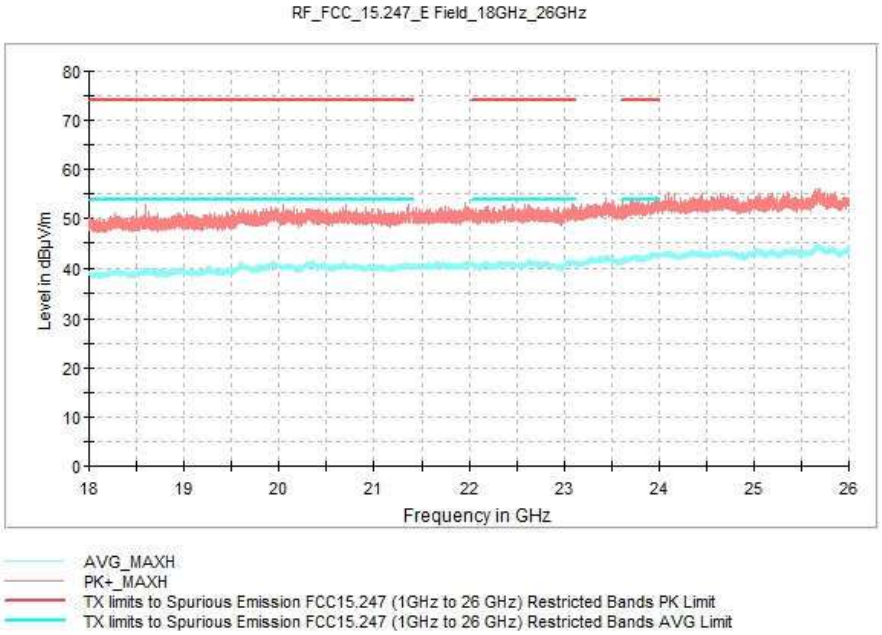
CHANNEL: Middle (2441 MHz)



Note: The peak shown in the plot above the limits is the carrier frequency.

TEST RESULTS (Cont.)	

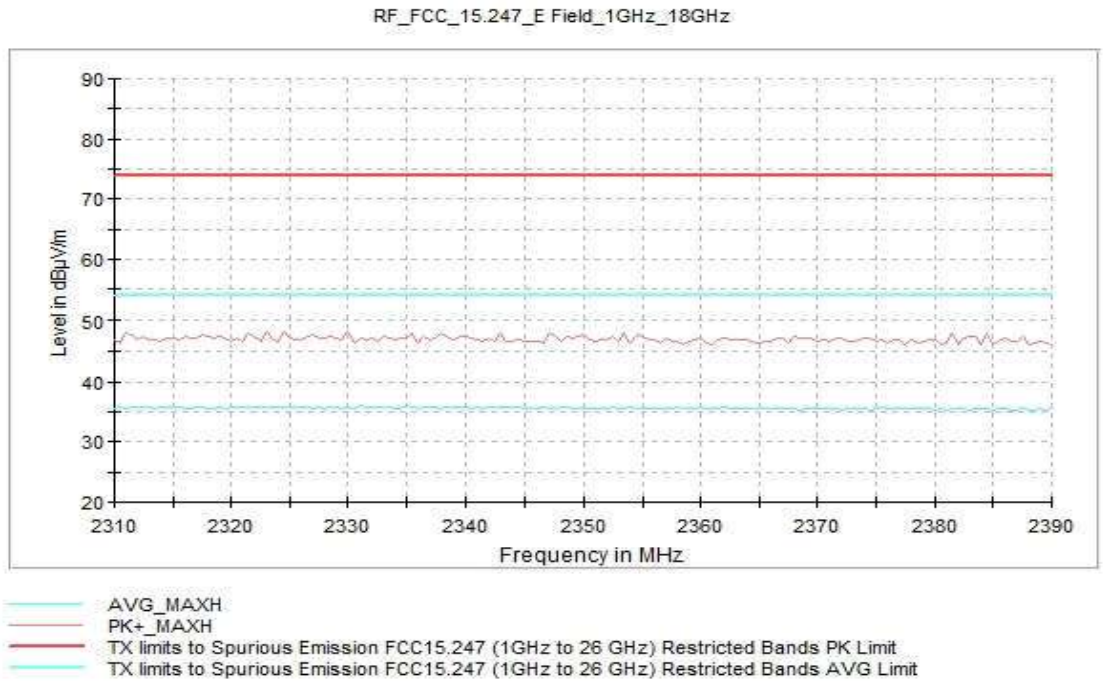
CHANNEL: Highest (2480 MHz)



Note: The peak shown in the plot above the limits is the carrier frequency.

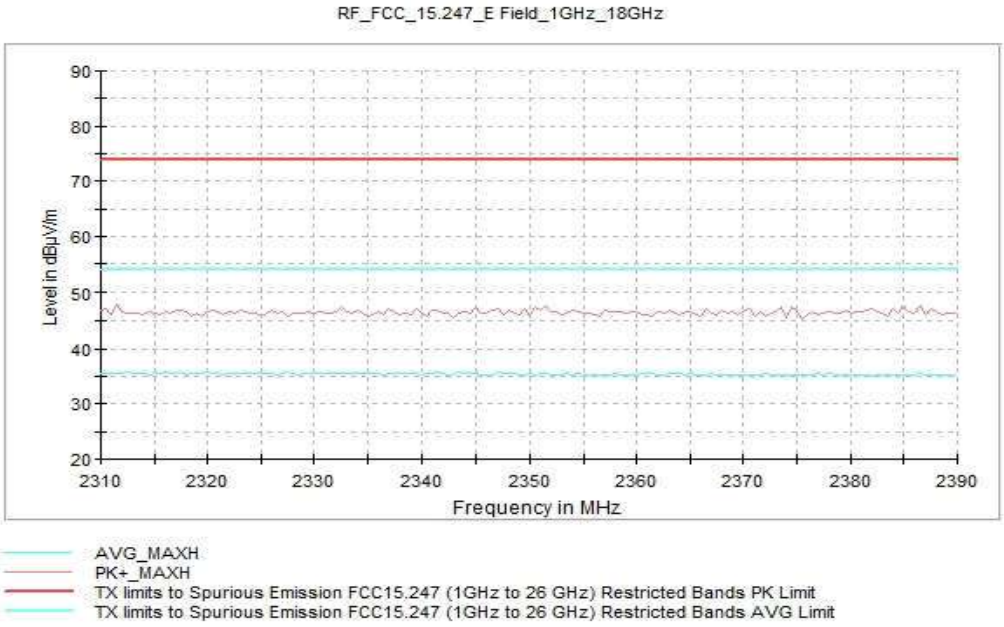
RESTRICTED BANDS	2.31 GHz – 2.39 GHz (PI4DQPSK)

CHANNEL: Lowest (2402 MHz)

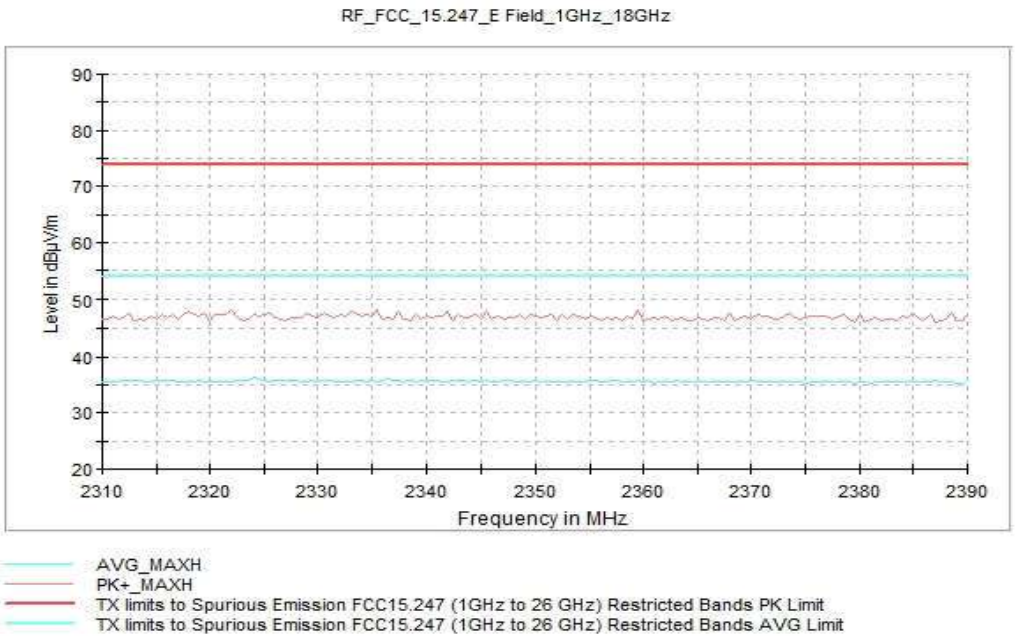


TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz)

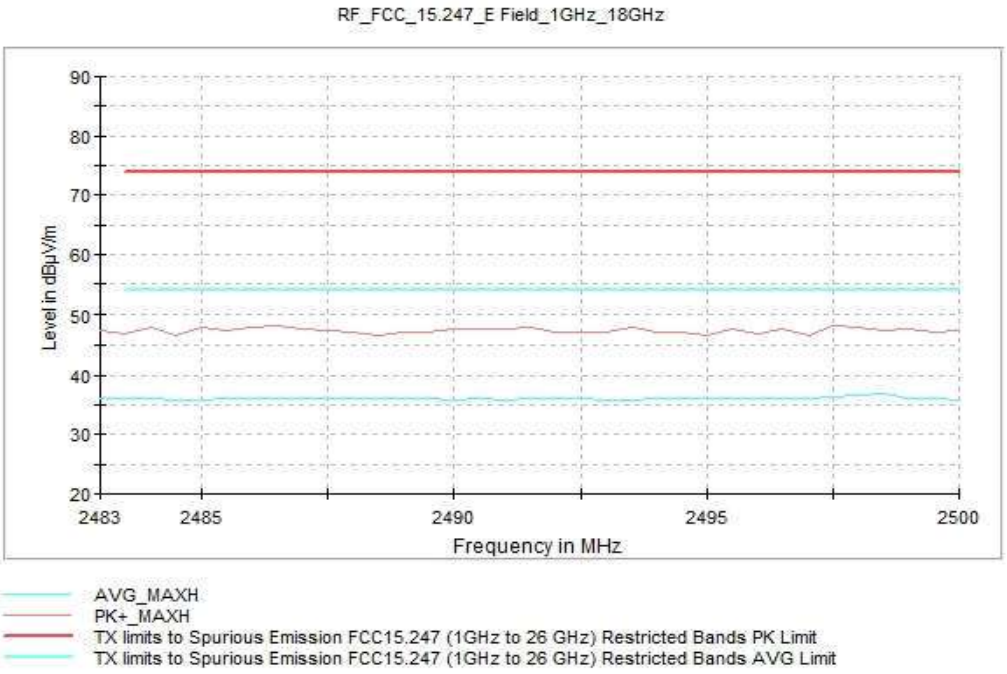


CHANNEL: Highest (2480 MHz)

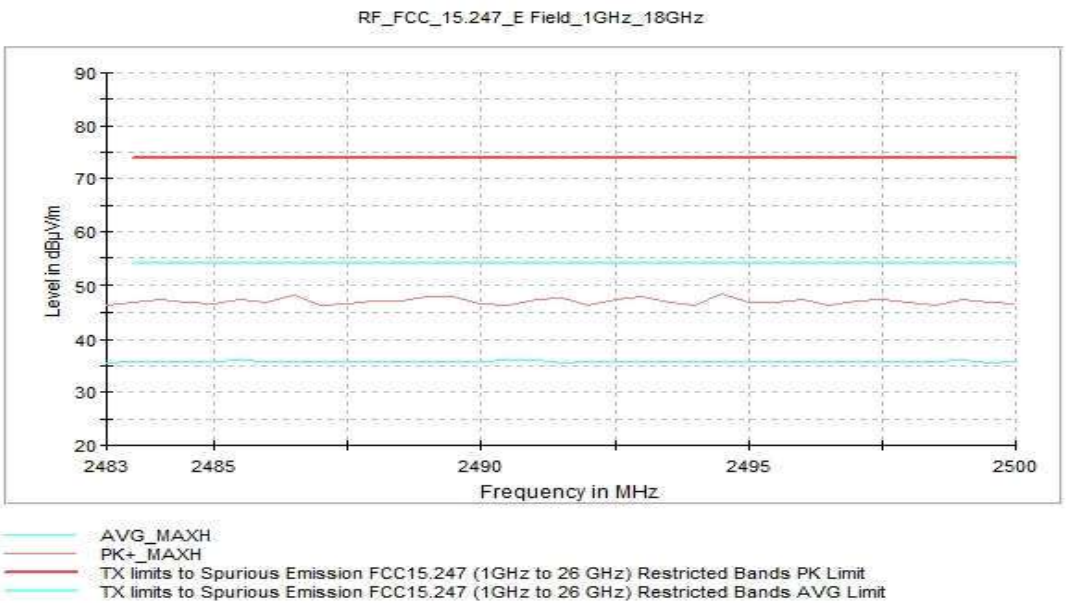


TEST RESULTS (Cont.)	
RESTRICTED BANDS	**2.483 GHz – 2.5 GHz (PI4DQPSK)**

CHANNEL: Lowest (2402 MHz)

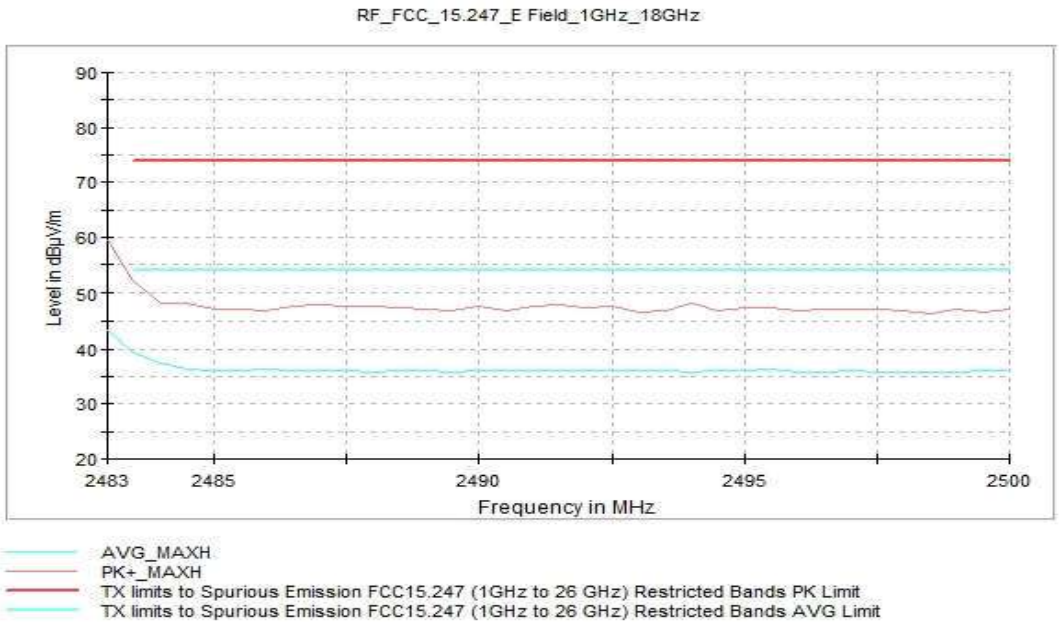


CHANNEL: Middle (2441 MHz)



TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



TESTED SAMPLES:	S/02
TESTED CONDITIONS MODES:	TC#03
TEST RESULTS:	PASS

Frequency range 30 MHz – 1000 MHz

The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
The radiated spurious signals detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

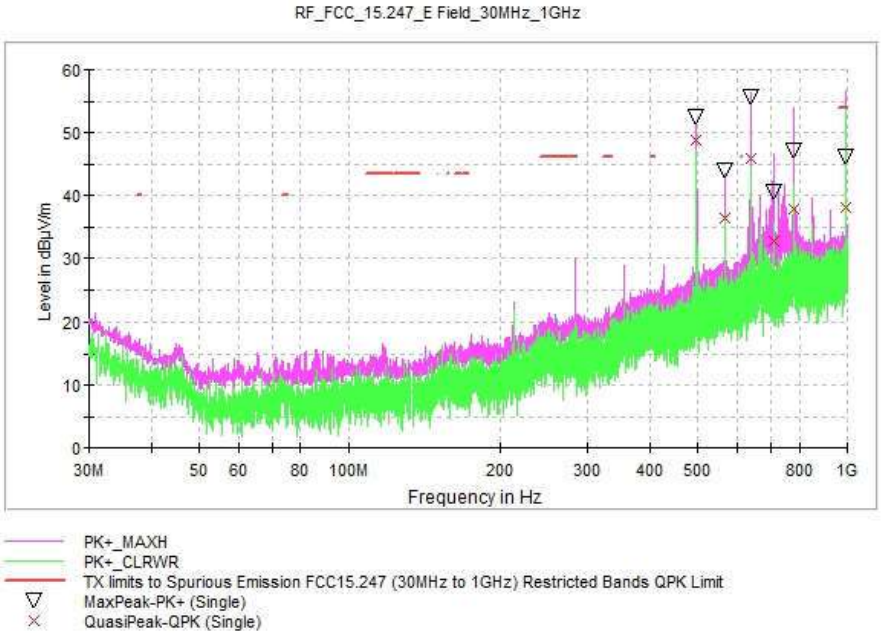
Frequency range 1 GHz – 25 GHz

The spurious emissions above 1 GHz do not depend on the operating channel selected in the EUT.

The radiated spurious signals detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels are showed in the tables below of each frequency range.

TEST RESULTS (Cont.)	
FREQUENCY RANGE	**30 MHz – 1000 MHz (8DPSK)**

CHANNEL: Lowest (2402 MHz)



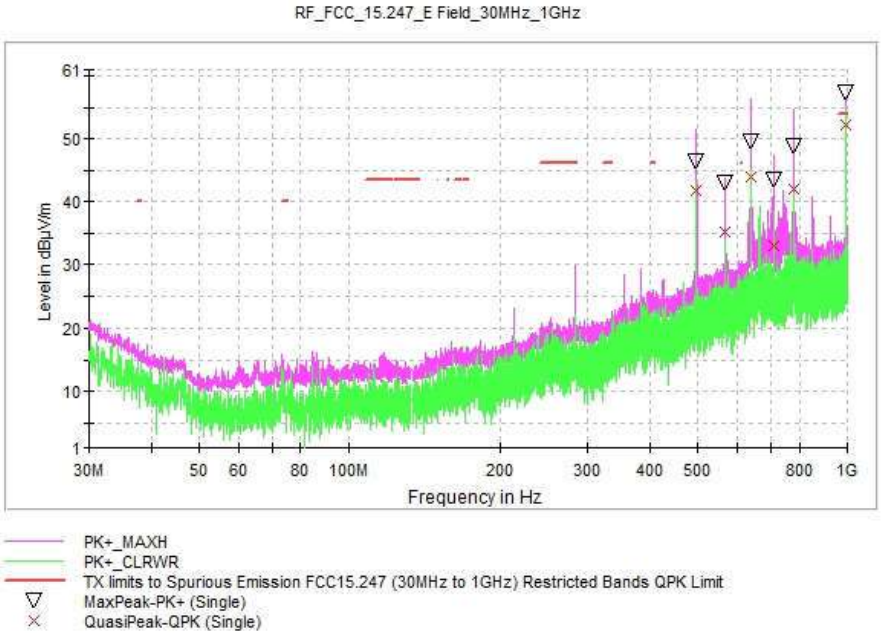
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
993.695000	46.0	38.1	V
781.022500	47.1	37.7	V
709.824500	40.6	32.6	H
638.869000	55.6	45.8	H
568.204500	44.0	36.4	H
497.006500	52.5	48.8	H

TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz)



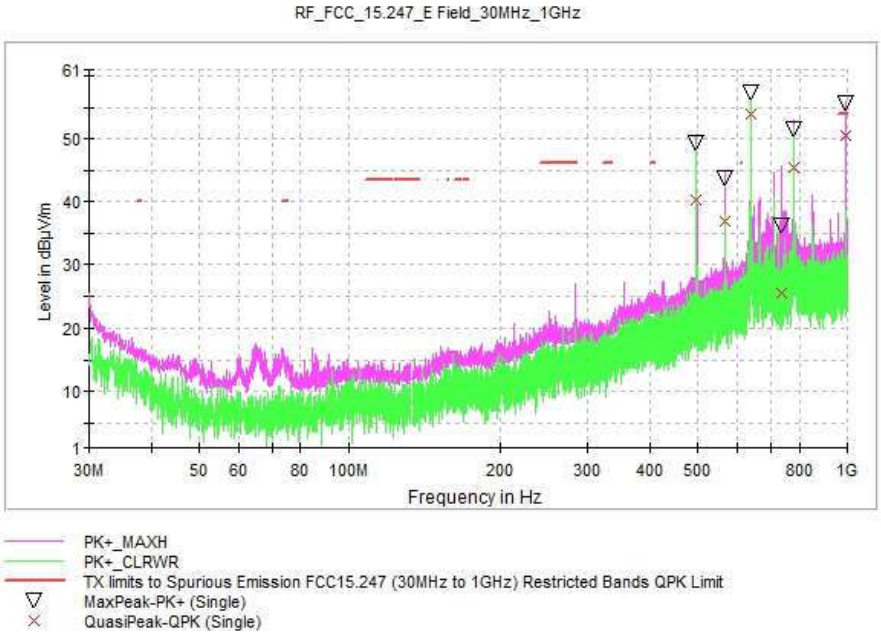
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
993.937500	57.3	52.2	H
781.119500	48.9	42.1	H
710.115500	43.5	33.0	H
638.869000	49.6	43.9	H
567.913500	43.0	35.2	H
496.909500	46.3	41.8	H

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



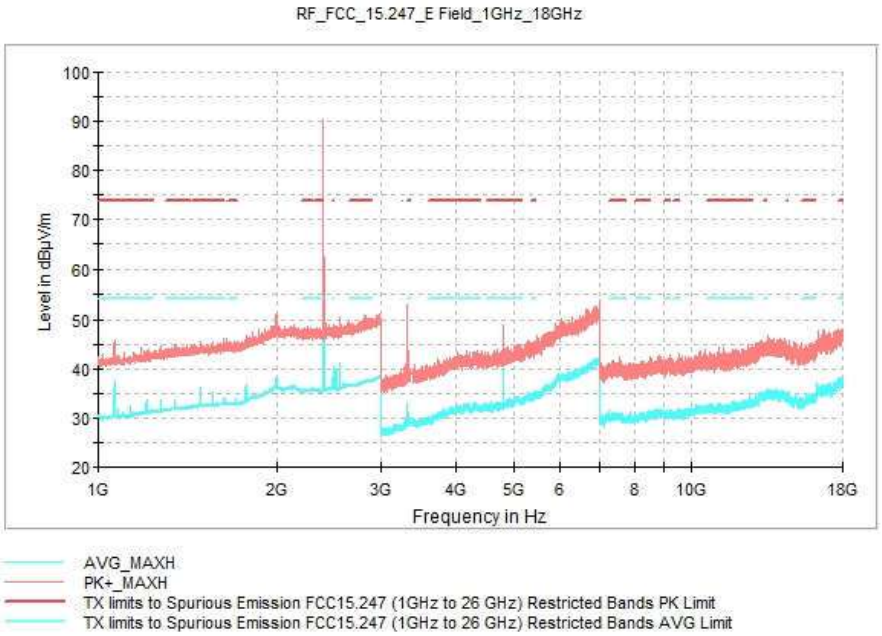
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
994.228500	55.7	50.5	H
780.877000	51.5	45.4	H
737.857500	36.2	25.3	H
639.111500	57.4	53.8	H
568.204500	43.8	36.9	H
496.812500	49.3	40.4	H

TEST RESULTS (Cont.)	
FREQUENCY RANGE	**1 GHz – 18 GHz (8DPSK)**

CHANNEL: Lowest (2402 MHz)



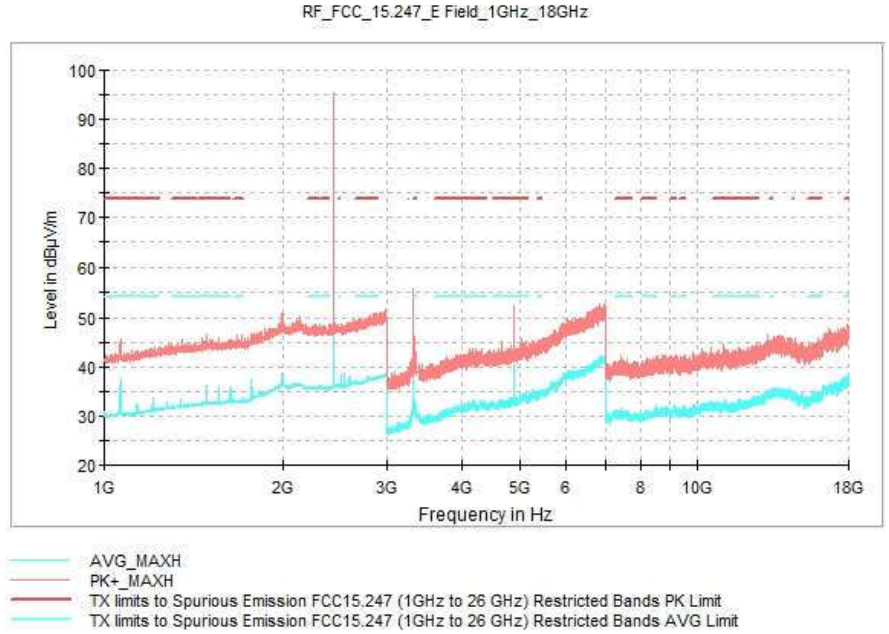
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1064.500000	44.4	37.6	V
1775.500000	45.8	36.9	H
2402.000000	90.3	86.9	V
2558.500000	50.4	41.1	V
3329.500000	47.1	33.0	H
4803.500000	49.0	42.8	V

TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz)



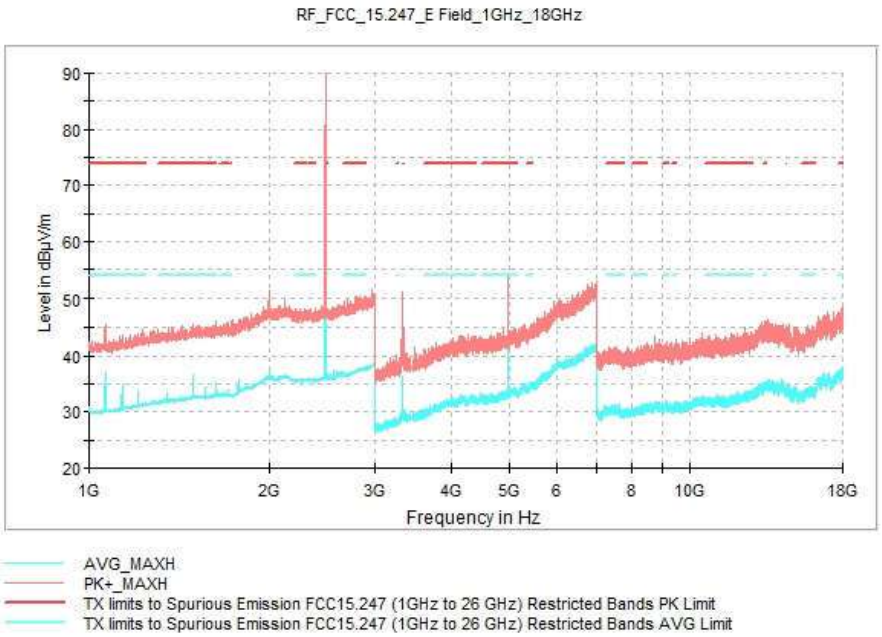
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol
1064.500000	45.6	37.1	V
1490.500000	46.0	36.1	V
1996.500000	49.9	37.8	H
2441.000000	95.2	91.9	V
3328.500000	49.2	39.9	H
4881.500000	51.9	46.6	V

TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)



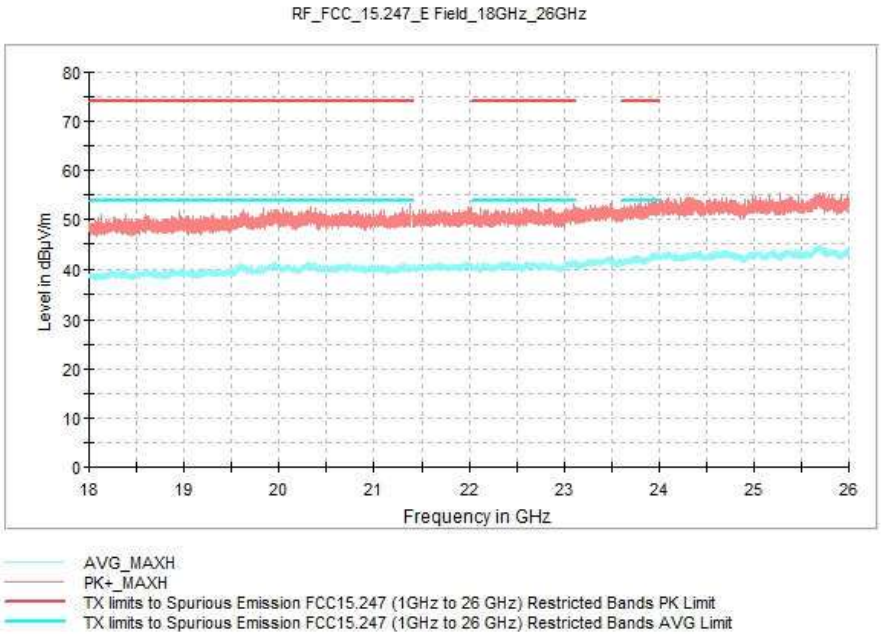
Note: The peak shown in the plot above is the carrier frequency.

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Height (cm)	Pol
1064.000000	44.8	35.8	155.0	V
1490.500000	45.6	36.4	155.0	V
2480.000000	98.2	95.2	155.0	V
3332.000000	47.9	35.4	155.0	V
4959.500000	54.0	48.5	155.0	V
6971.500000	50.7	42.5	155.0	H

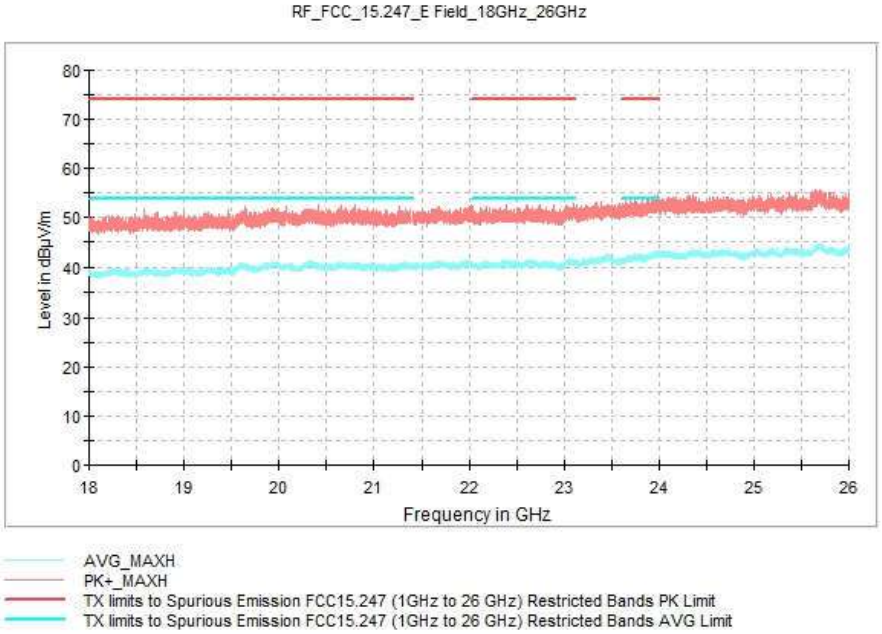
TEST RESULTS (Cont.)	
FREQUENCY RANGE	18 GHz – 26 GHz (8DPSK)

CHANNEL: Lowest (2402 MHz)



Note: The peak shown in the plot above is the carrier frequency.

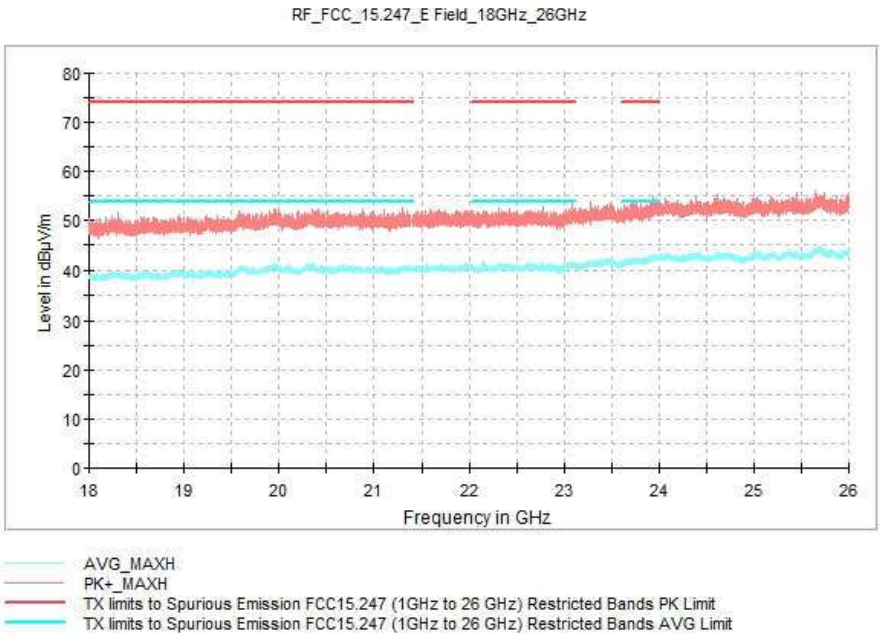
CHANNEL: Middle (2441 MHz)



Note: The peak shown in the plot above is the carrier frequency.

TEST RESULTS (Cont.)	

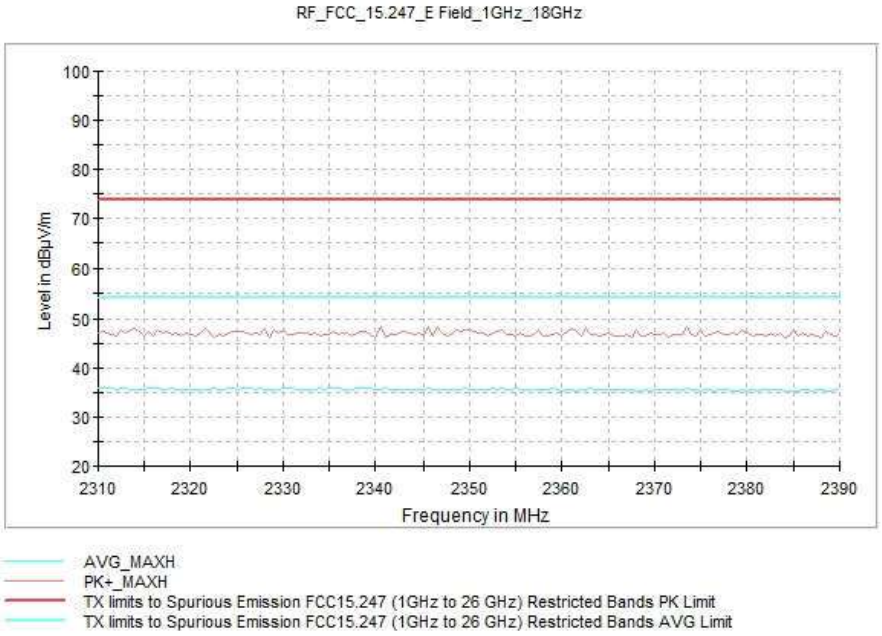
CHANNEL: Highest (2480 MHz)



Note: The peak shown in the plot above is the carrier frequency.

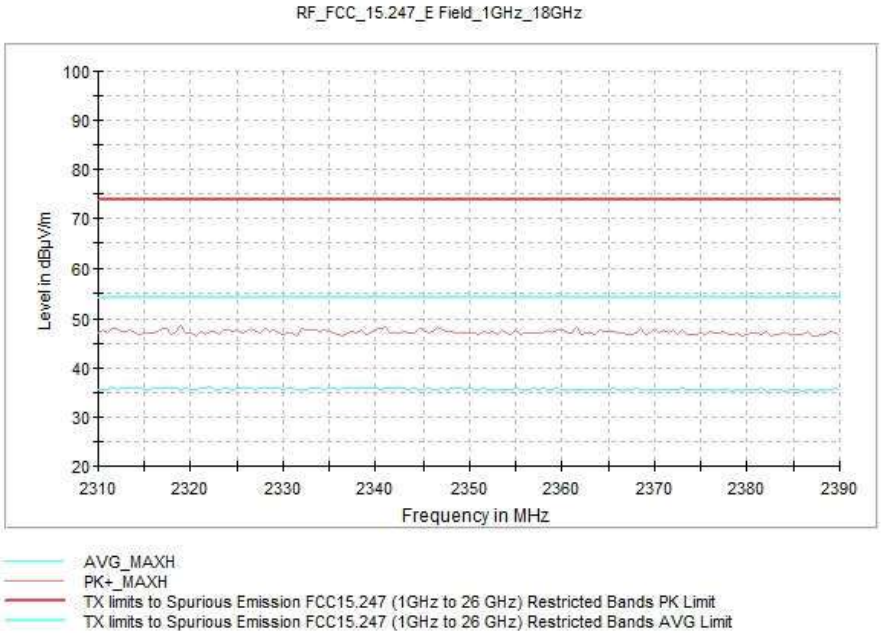
RESTRICTED BANDS	2.31 GHz – 2.39 GHz (8DPSK)

CHANNEL: Lowest (2402 MHz)

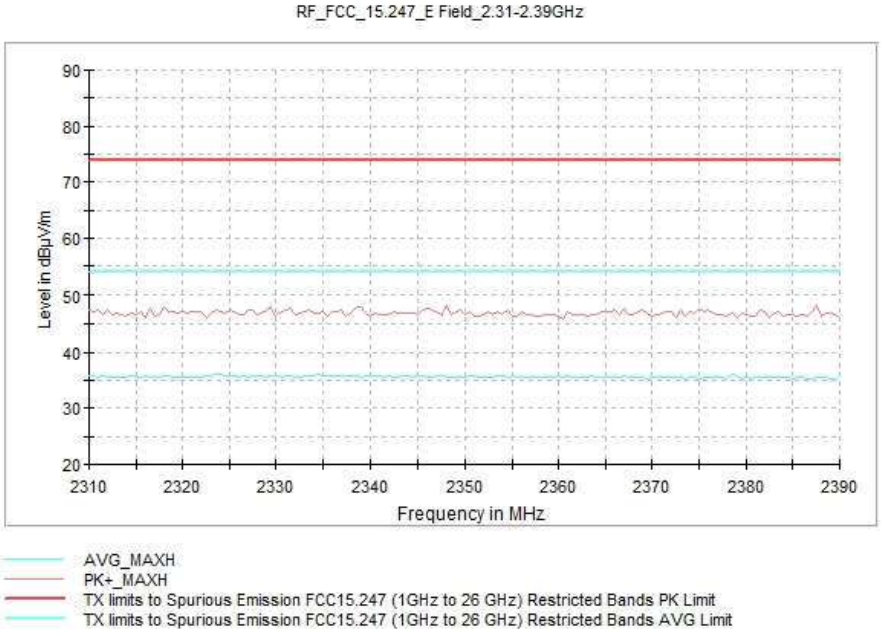


TEST RESULTS (Cont.)	

CHANNEL: Middle (2441 MHz)

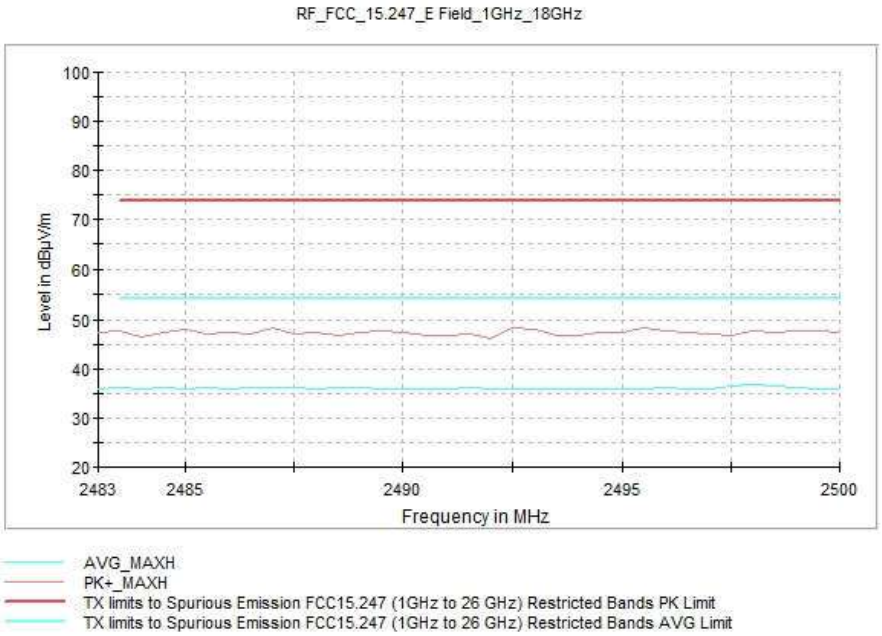


CHANNEL: Highest (2480 MHz)

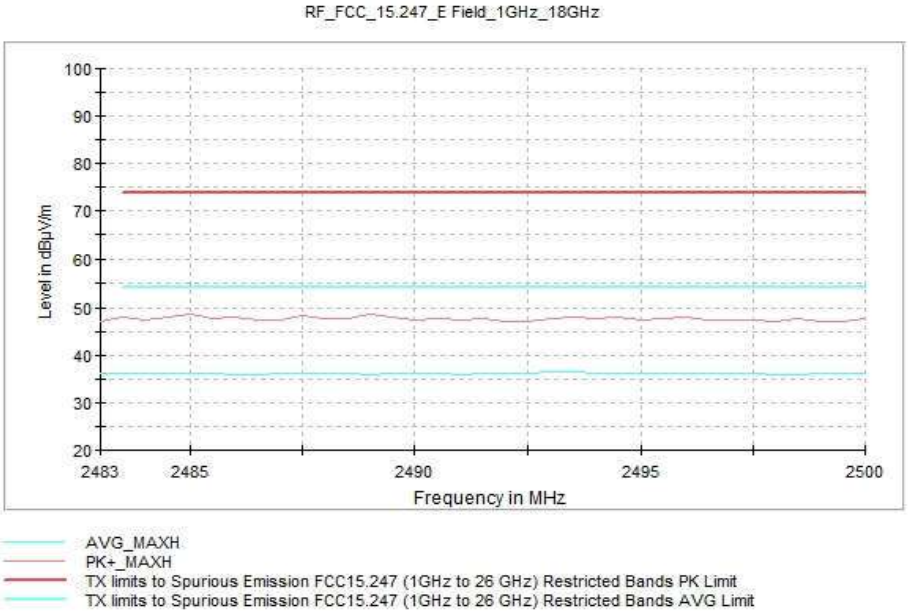


TEST RESULTS (Cont.)	
RESTRICTED BANDS	**2.483 GHz – 2.5 GHz (8DPSK)**

CHANNEL: Lowest (2402 MHz)



CHANNEL: Middle (2441 MHz)



TEST RESULTS (Cont.)	

CHANNEL: Highest (2480 MHz)