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DEKRA

ACCREDITED
Test Lab
Cert 2764.01

FCC LISTED, REGISTRATION NUMBER: 2764.01

ISED LISTED REGISTRATION NUMBER: 23595-1

Test report No:
2279ERM.005A1

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

Identification of item tested	Wireless Sensor Node
Trademark	AIRTHINGS AS
Model and /or type reference	Wave Mini
Other identification of the product	FCC ID: 2APPT-2920 IC: 23900-2920
Features	Wave Mini (VOC, Pressure, Temp, Humidity sensors) Visual indicator: Red/Yellow/Green glow point Long battery life Wireless connection Bluetooth or Airthings Smart Link
Manufacturer	AIRTHINGS AS Wergelandsveien 7, 0167 Oslo, Norway
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 Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2019.01.04 02:34:17 -05'00'
Date of issue	01-03-2019
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 item under test established in this document.

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General conditions

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

Indoor Air Quality Instrument.

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
2279/06	Wireless Sensor Node CERT 4 Device (Conducted Sample)	CERT 4	N/A	08/08/2018

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

   All conducted tests indicated in appendix B.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2279/02	Wireless Sensor Node CERT 2 Device (Radiated Sample)	CERT 2	N/A	08/08/2018

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

   All radiated tests indicated in appendix A.

Test sample description

Ports…… :	Port name and description		Cable			
			Specified length [m]	Attached during test	Shielded	
	Not provided data			☐	☐	
				☐	☐	
Supplementary information to the ports…… :	*Not provided data*					
Rated power supply .....:	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☐	DC:					
	☒	DC: 4.5 V (3AA Batteries)					
Rated Power .....:	*Not provided data*						
Clock frequencies .....:	*Not provided data*						
Other parameters.....:	*Not provided data*						
Software version .....:	1.0						
Hardware version.....:	1.0						
Dimensions in cm (L x W x D) ....:	*Not provided data*						
Mounting position.....:	☐	Table top equipment					
	☒	Wall/Ceiling mounted equipment					
	☐	Floor standing equipment					
	☐	Hand-held equipment					
	☐	Other:					
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	Description		File name		Issue date	

applicant.....:	Declaration Equipment Data	FDT30_14 Declaration Equipment Data	
	Transmission equipment Data	FCC15247+FCC15249_FDT58_02 Test Samples for RF Testing v 1.0_Generic (1)	

Copy of marking plate:

Identification of the client

AIRTHINGS AS
WERGELANDSVEIEN 7, 0167 OSLO, NORWAY

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	11-09-2018
Date (finish)	11-14-2018

Document history

Report number	Date	Description
2279ERM.005	12-20-2018	First reléase
2279ERM.005A1	01-03-2019	Second release

Modifications to the reference test report

It was introduced the following modifications in respect to the test report number 2279ERM.005 related with the same samples, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
Page 1/ Trademark	Changed to correct details	Customer input

This modification test report cancels and replaces the test report 2279ERM.005

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 and Koji Nishimoto.

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-247 (Bluetooth Low Energy)					
Section	**15.247 Spec Clause**	**RSS Spec Clause**	**Test Description**	**Verdict**	**Remark**
A.1		RSS-Gen 6.7	99% Emission Bandwidth	P	N/A
A.2	§ 15.247 (a) (2)	RSS-247 5.2. (a)	6 dB Bandwidth	P	N/A
A.3	§ 15.247 (b) (3)	RSS-247 5.4. (d)	Maximum peak conducted output power and antenna gain	P	N/A
A.4	§ 15.247 (d)	RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	N/A
A.5	§ 15.247 (e)	RSS-247 5.2. (b)	Power spectral density	P	N/A
A.6	§ 15.247 (d)	RSS-Gen 8.9 & 8.10.	Emission limitations radiated (Transmitter)	P	N/A
-	§15.207 (a)	RSS Gen 8.8	Conducted Emission Limits	P	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	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	2017/03	2019/03
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

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PRODUCT INFORMATION

The following information is provided by the client

Information	**Description**
Modulation	Other than FHSS
Adaptive	Adaptive Equipment which can operate in Non-Adaptive mode
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	-20 ºC to +54 ºC
Antenna type	Integral antenna
Antenna gain	+3.3 dBi
Nominal Voltage	
- Supply Voltage	4.5 Vdc
- Type of power source	DC voltage from battery
Equipment type	Bluetooth Low Energy
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	<u>Power supply (V):</u> $V_{nominal}$ = 4.5 Vdc <u>Type of power suppl:</u> DC voltage from internal rechargeable battery. <u>Temperature (ºC):</u> T_{nom} = +15 to + 35 T_{min} = -20 (*) T_{max} = +54 (*) 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. <u>Test Frequencies for Conducted tests:</u> Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz <u>Test Frequencies for Radiated tests:</u> Lowest range: 2402 MHz Highest range: 2480 MHz

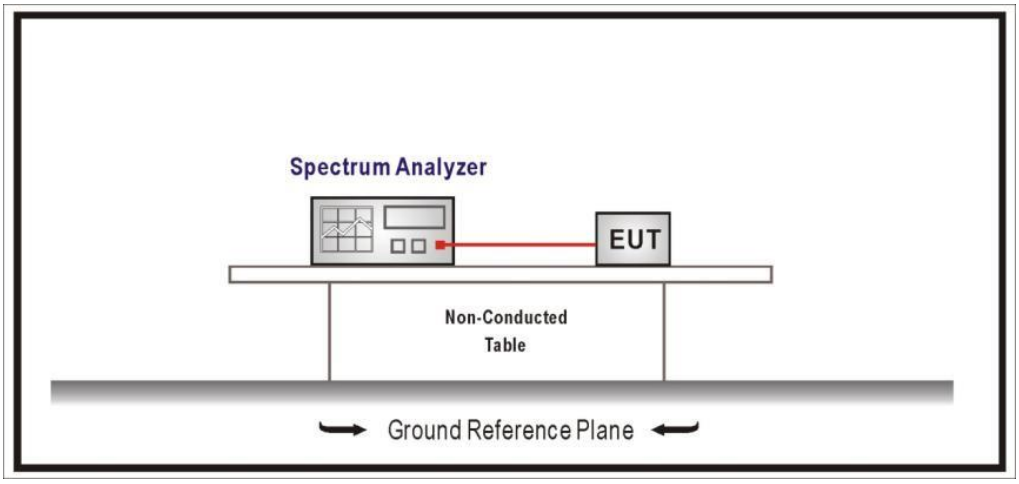
TEST A.1: 99% EMISSION BANDWIDTH

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

LIMITS

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

TEST SETUP	

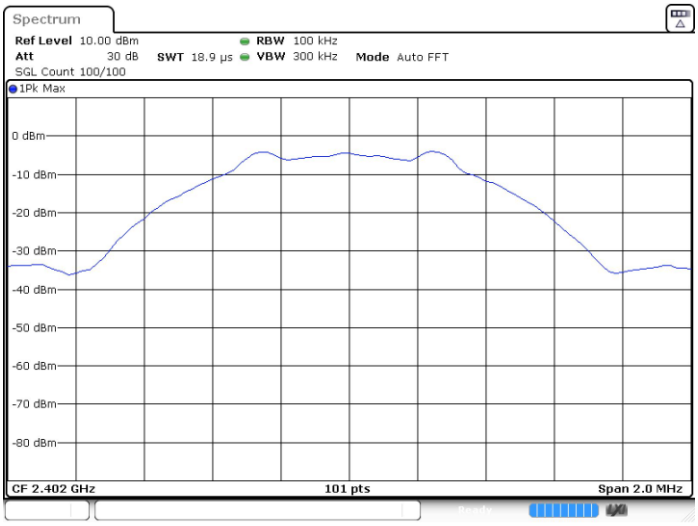


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

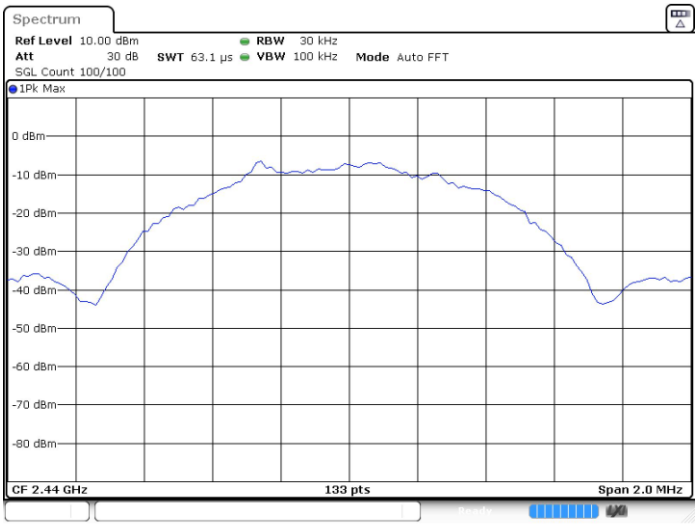
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	1.267	1.218	1.233
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	

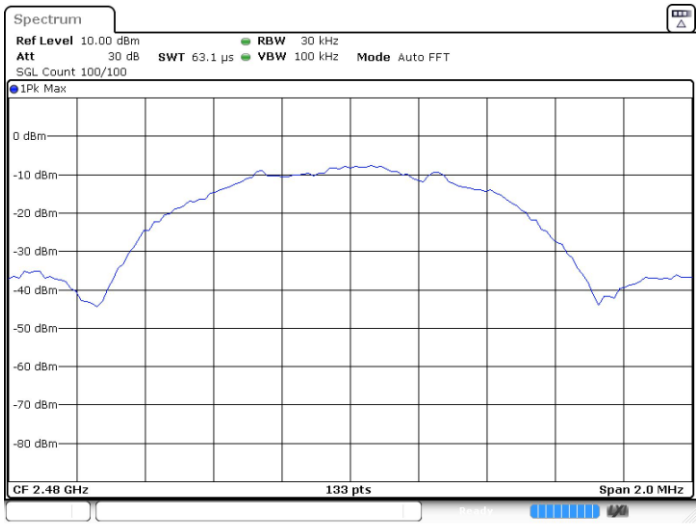
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	100.000 kHz	30.000 kHz	30.000 kHz
VBW	300.000 kHz	100.000 kHz	100.000 kHz
SweepPoints	101	133	133
Sweeptime	18.938 µs	63.123 µs	63.123 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
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	13 / max. 150	34 / max. 150	20 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.11 dB	0.00 dB	0.38 dB

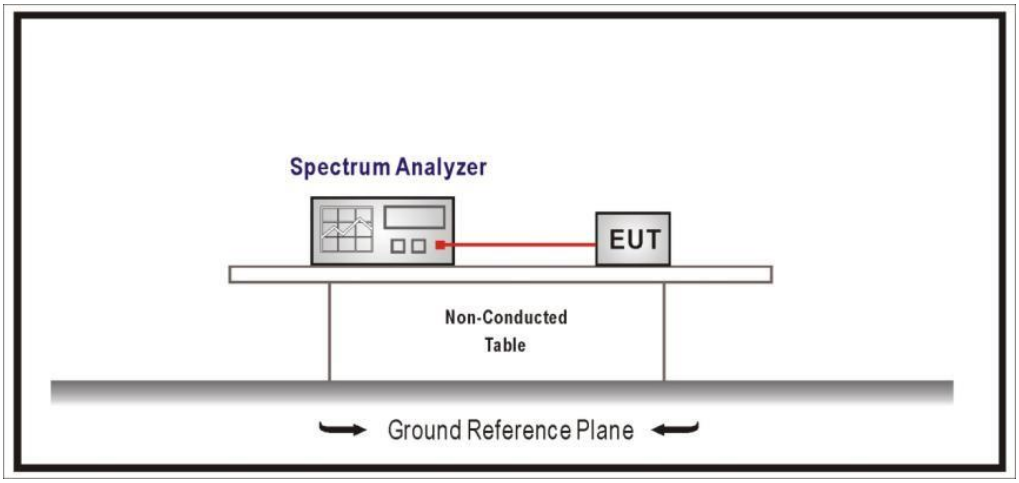
TEST A.2: 6 DB BANDWIDTH.

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

LIMITS

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

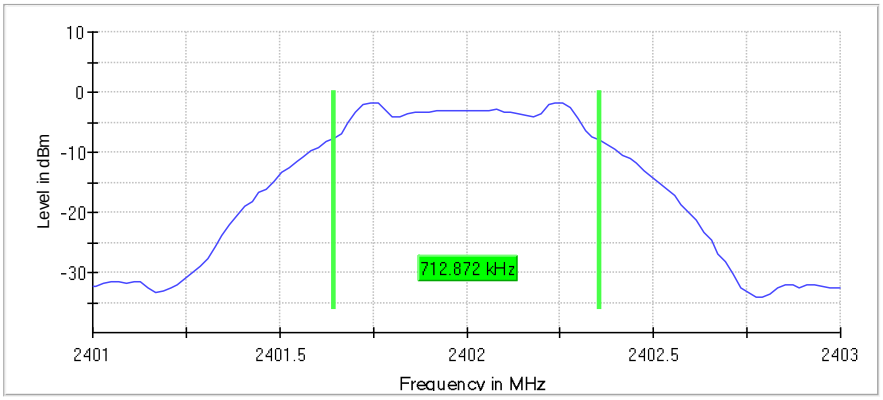
TEST SETUP	

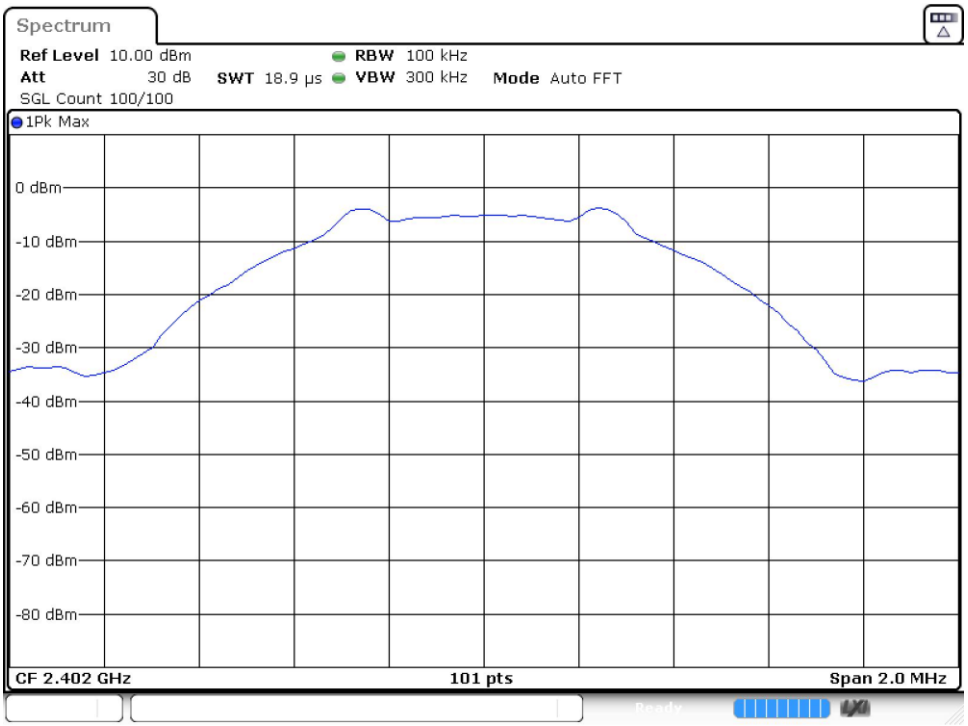


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

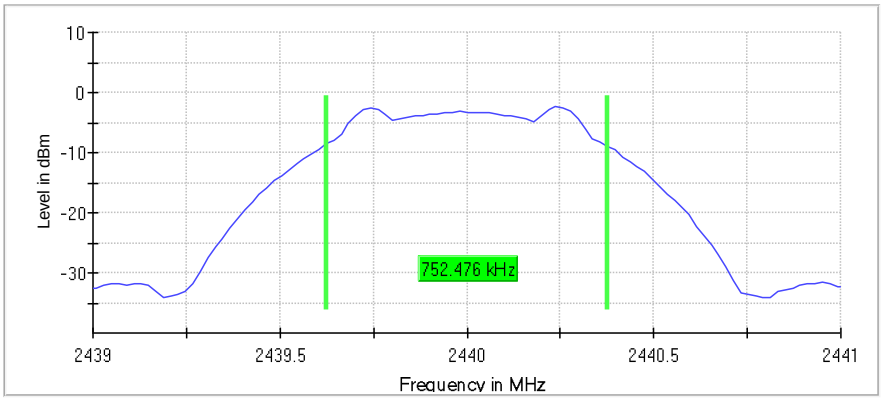
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6 dB Spectrum bandwidth (kHz)	712.872	752.476	772.278
Measurement uncertainty (kHz)	<±20.0		

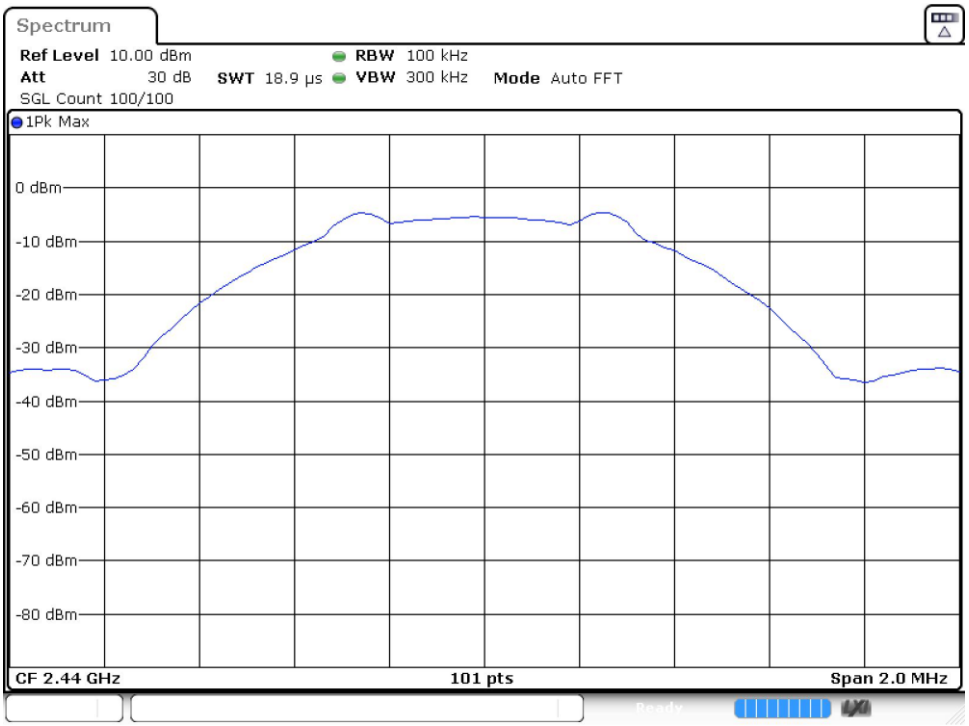
TEST RESULTS (Cont.):	Lowest Channel



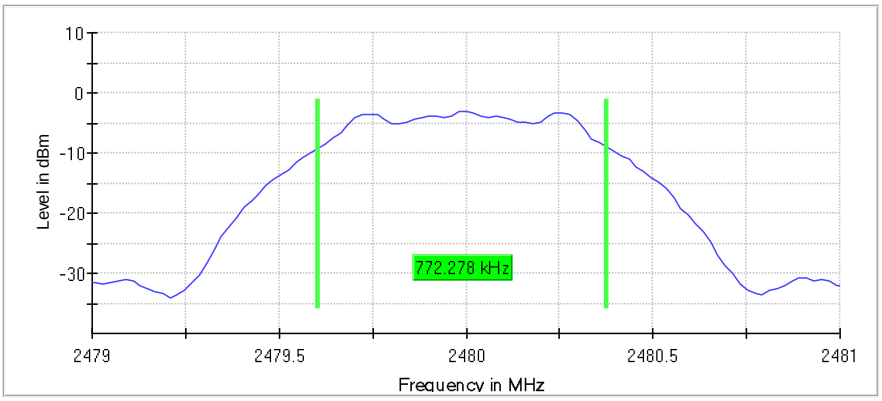


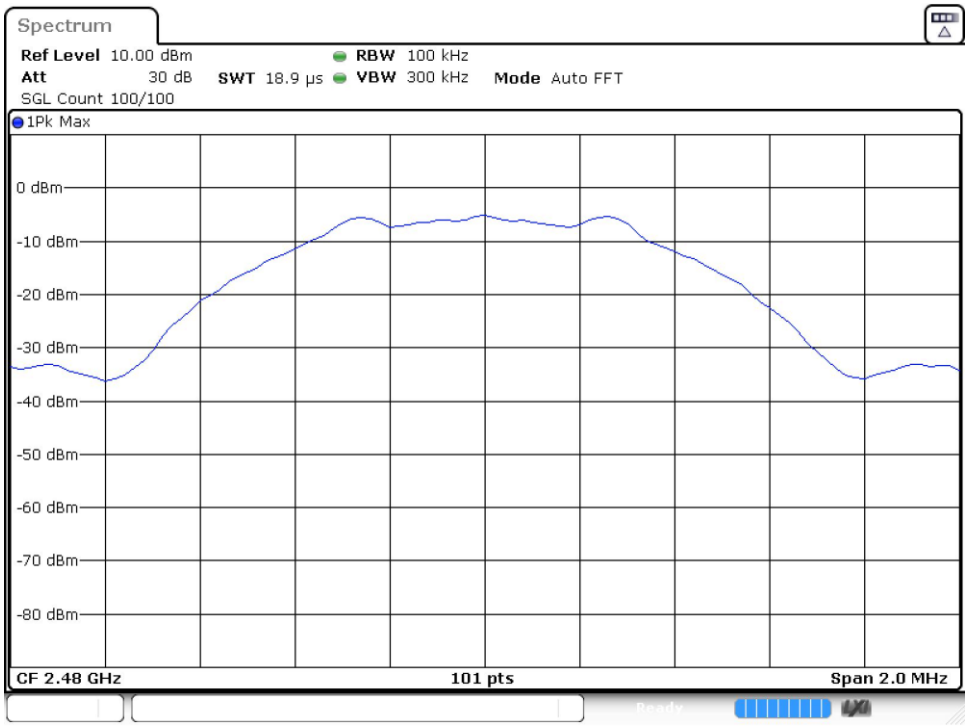
TEST RESULTS (Cont.):	Middle Channel





TEST RESULTS (Cont.):	Highest Channel





TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	101	101	101
Sweeptime	18.938 µs	18.938 µs	18.938 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
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	10 / max. 150	8 / max. 150	12 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.00 dB	0.23 dB	0.06 dB

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

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

LIMITS

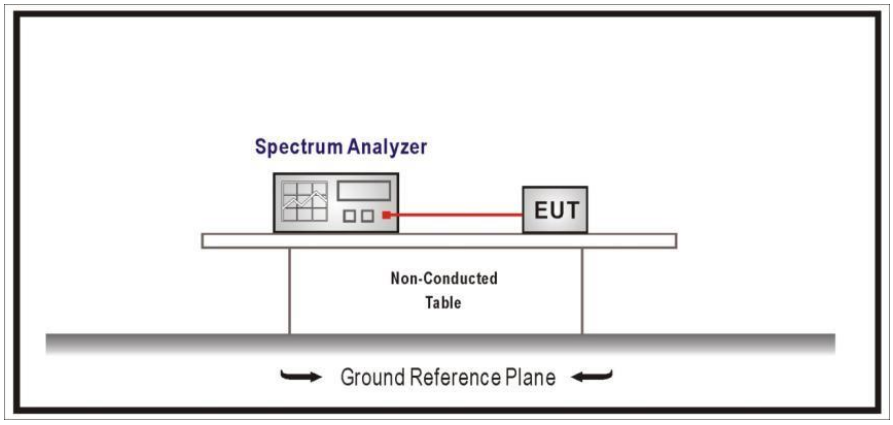
§15.247(b)(3) and RSS-247 5.4(d): For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

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

TEST SETUP	

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

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



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

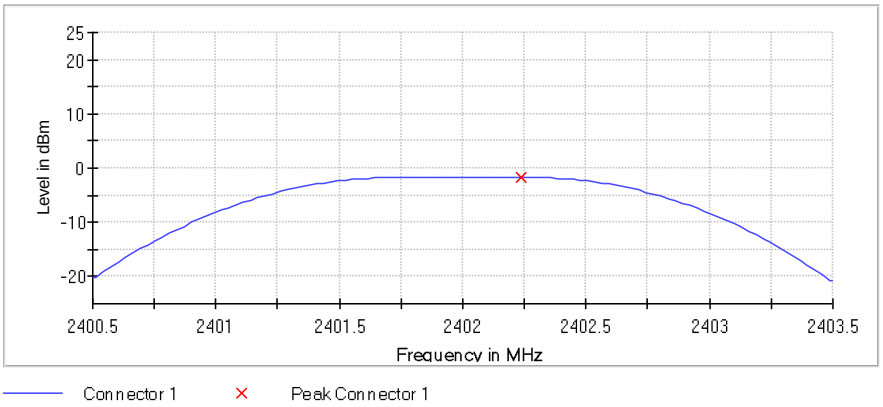
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	-1.6	-1.9	-2.3
Measurement uncertainty (dB)	<±0.78		

Maximum declared antenna gain: +3.3 dBi

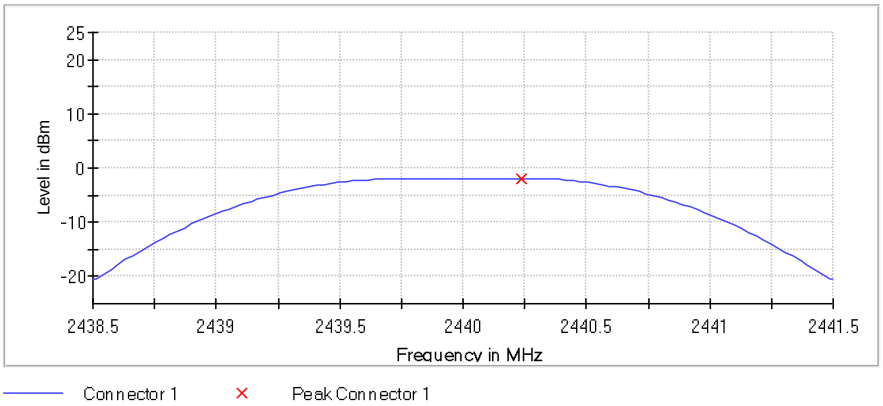
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED PEAK POWER

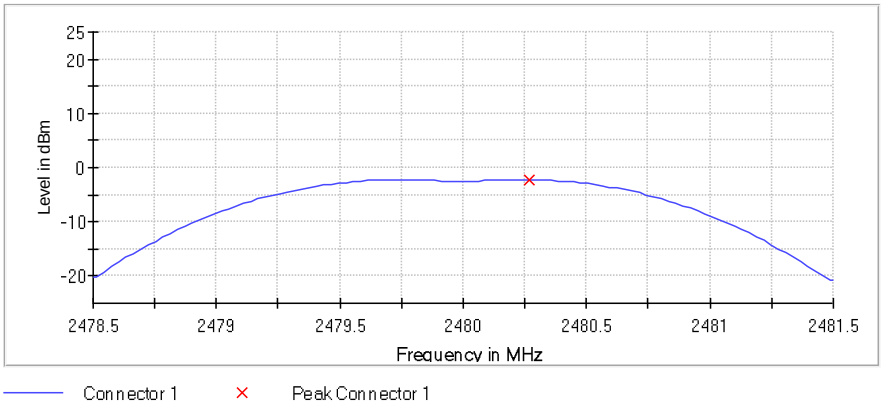
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43850 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44150 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	1.000 MHz	1.000 MHz	1.000 MHz
VBW	3.000 MHz	3.000 MHz	3.000 MHz
SweepPoints	101	101	101
Sweeptime	1.907 µs	1.907 µs	1.907 µs
Reference Level	20.000 dBm	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
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	4 / max. 150	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.04 dB	0.04 dB	0.02 dB

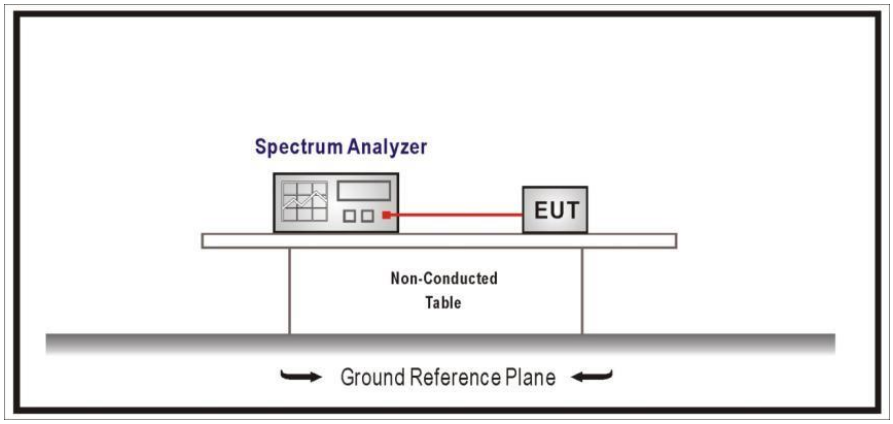
TEST A.4: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

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

LIMITS

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

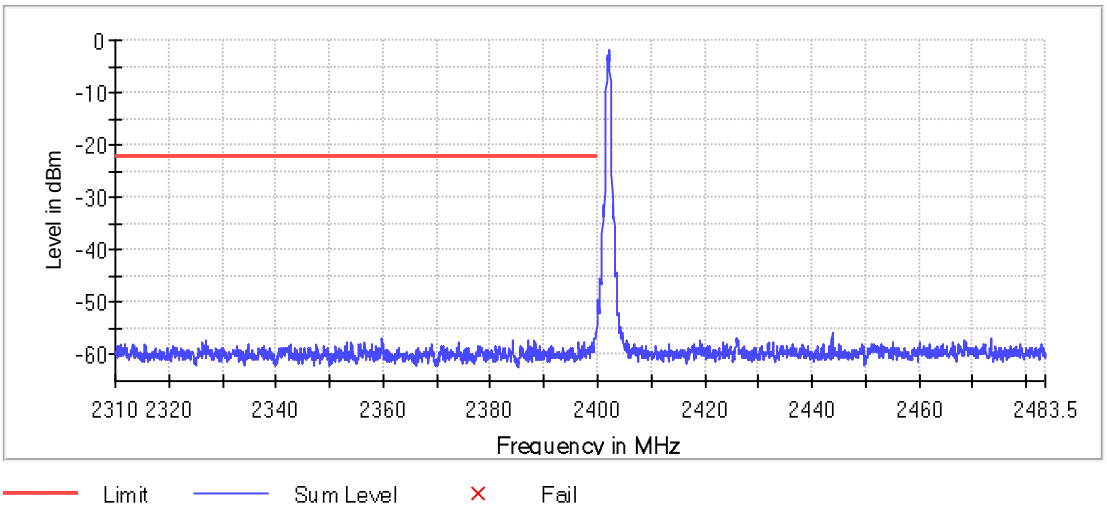
TEST SETUP	

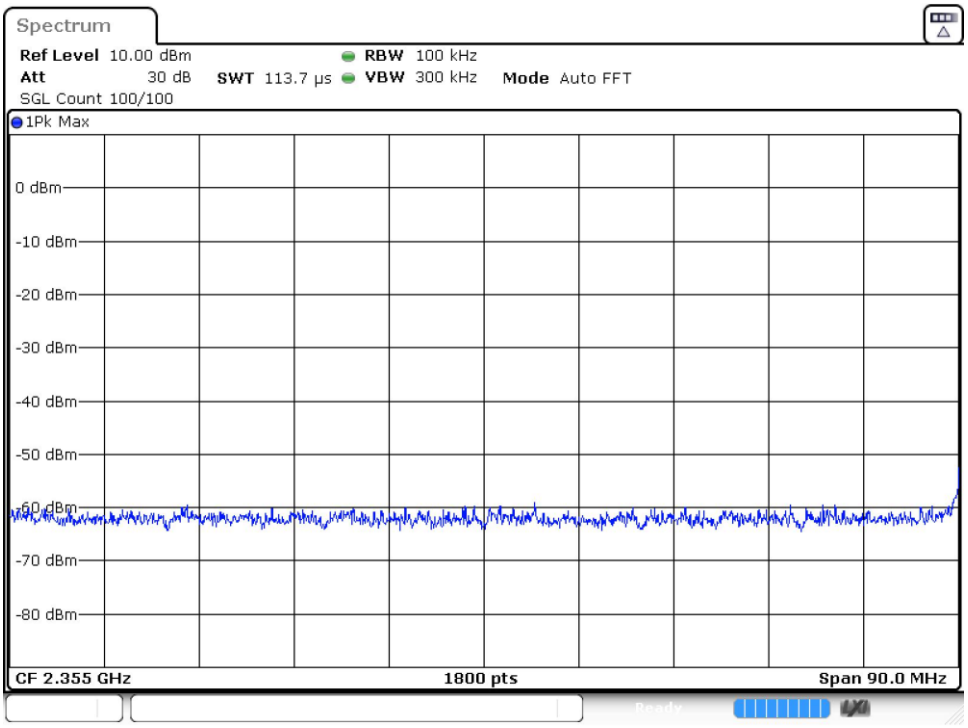


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

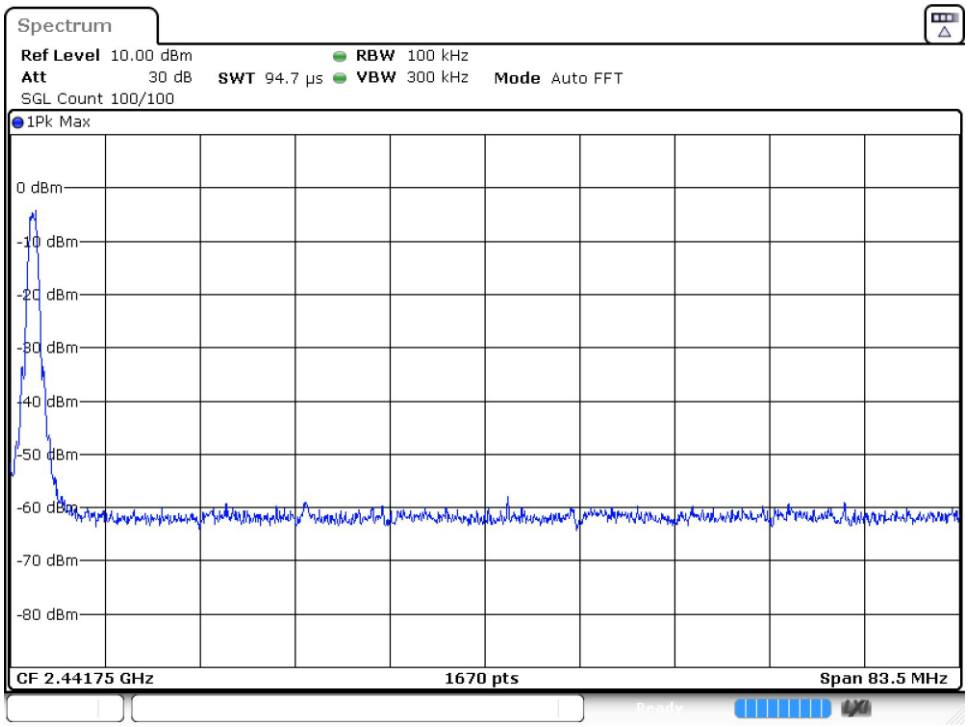
Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

TEST RESULTS (Cont.):	Lowest Channel





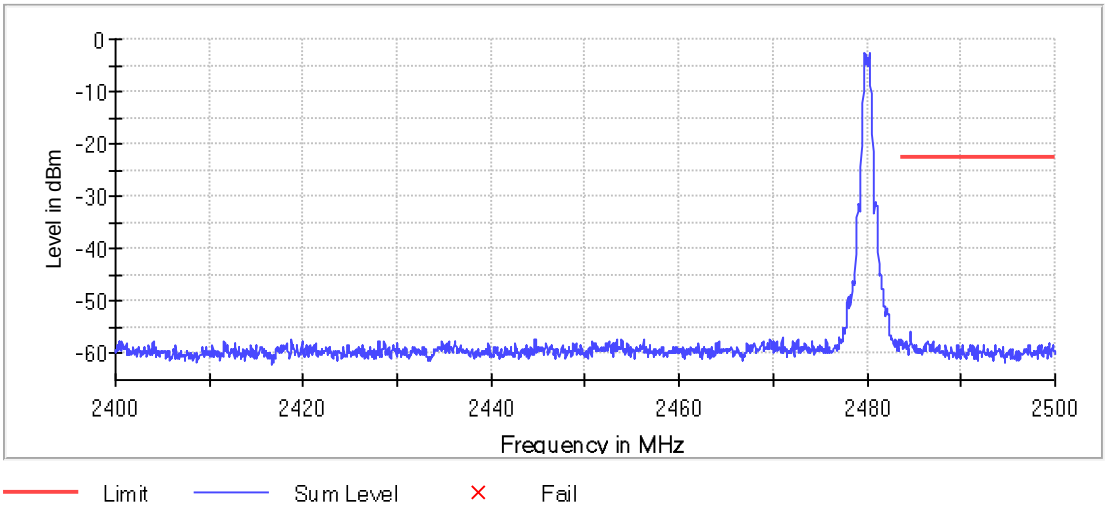
TEST RESULTS (Cont.):	Lowest Channel

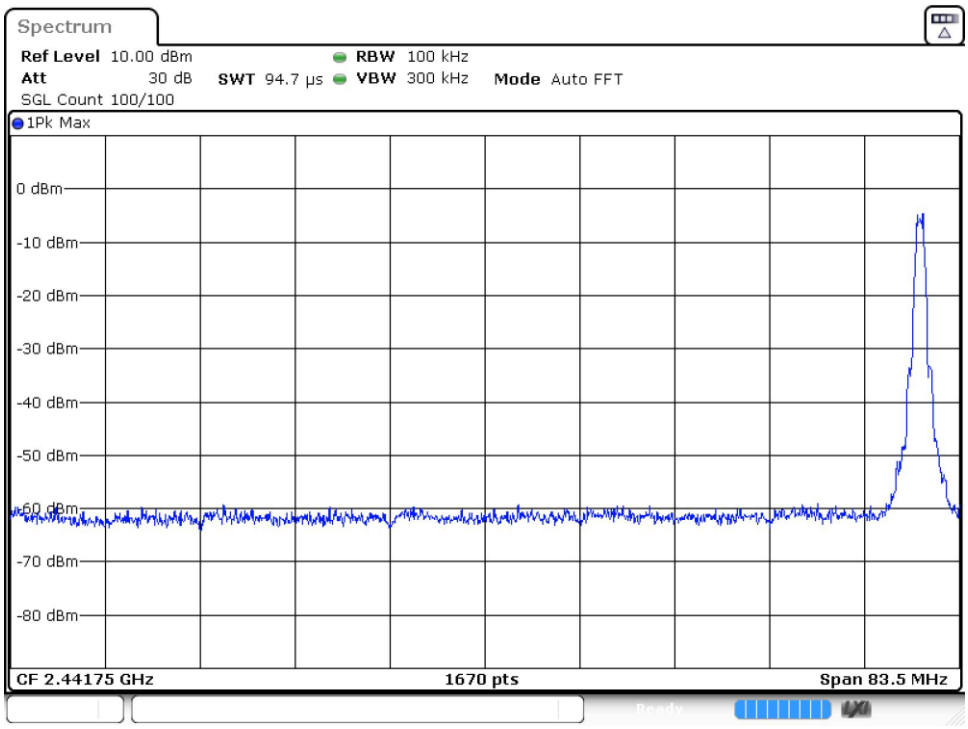


Measurement

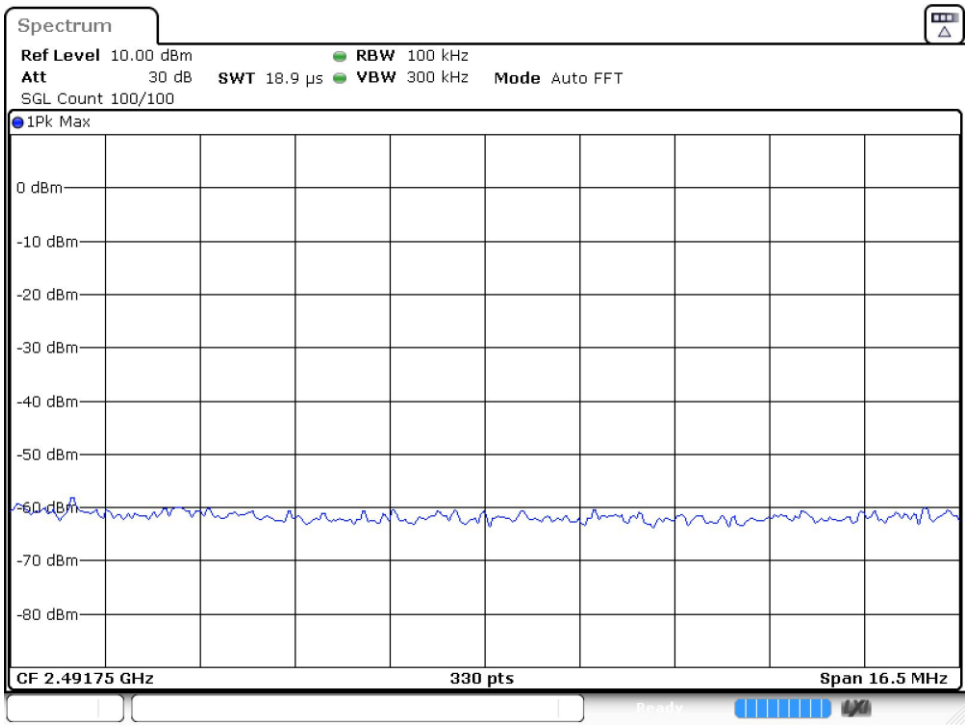
Setting	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	6 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.48 dB

TEST RESULTS (Cont.):	Highest Channel





TEST RESULTS (Cont.):	Highest Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweep type	FFT	FFT
Preamp	off	off
Stable mode	Trace	Trace
Stable value	0.50 dB	0.50 dB
Run	7 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.01 dB	0.00 dB

TEST A.5: POWER SPECTRAL DENSITY

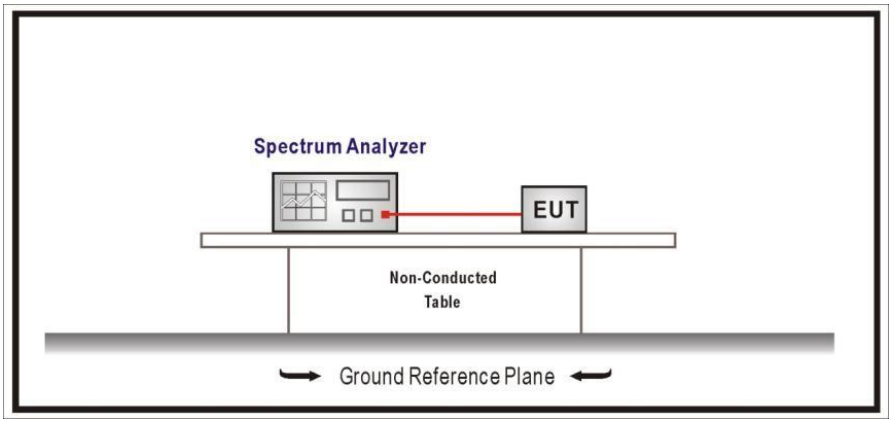
LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(e) and RSS-247 5.2 (b)

LIMITS

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST SETUP

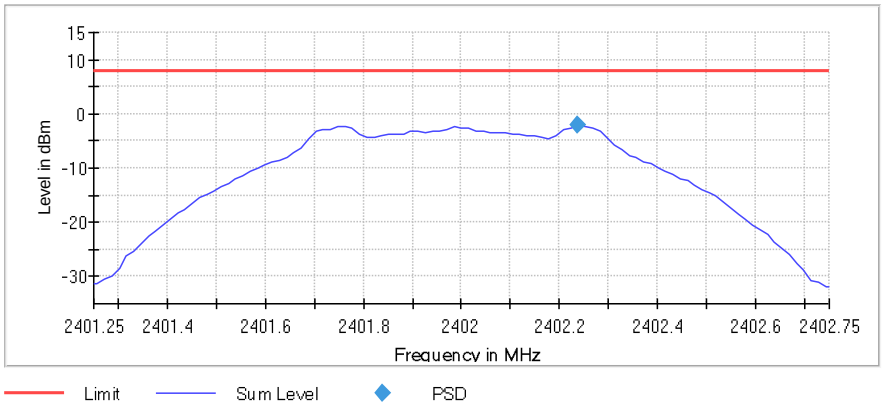
The maximum power spectral density level in the fundamental emission was measured using the method PKPSD (Peak PSD) according to point 10.2. of Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas. Guidance v04 dated 05/04/2017.

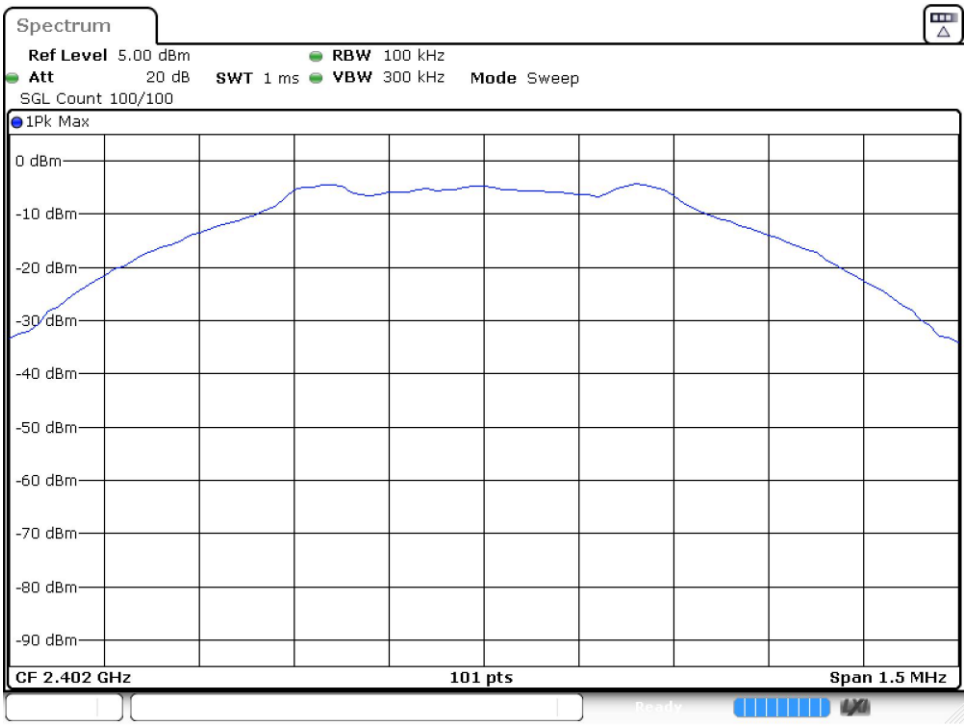


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

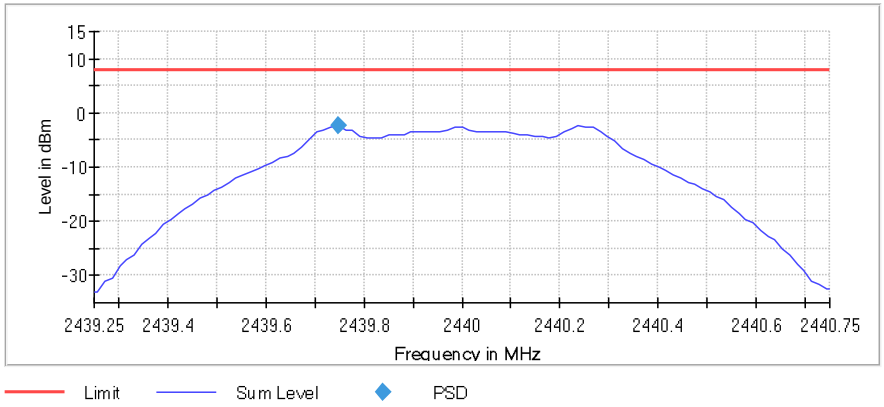
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	-2.155	-2.284	-2.564
Measurement uncertainty (dB)	<±0.78		

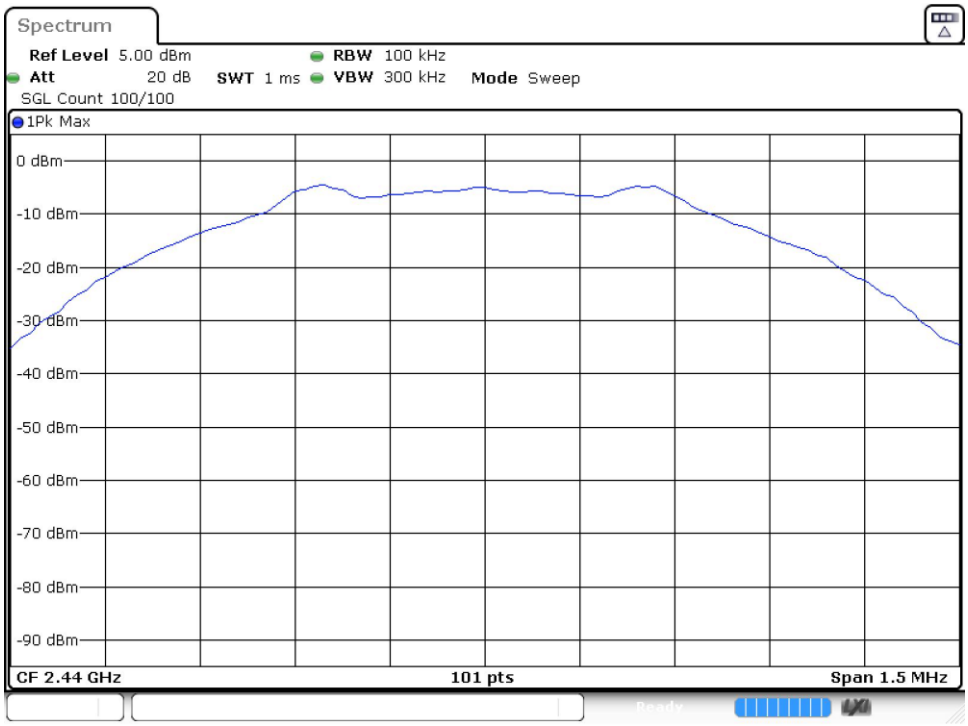
TEST RESULTS (Cont.):	Lowest Channel



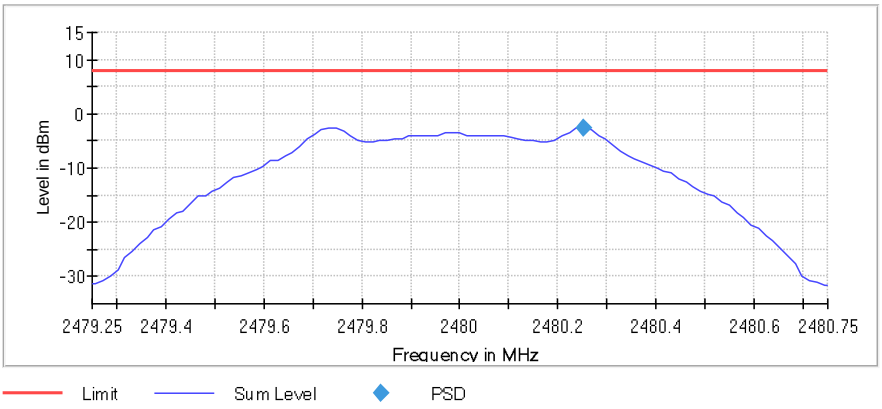


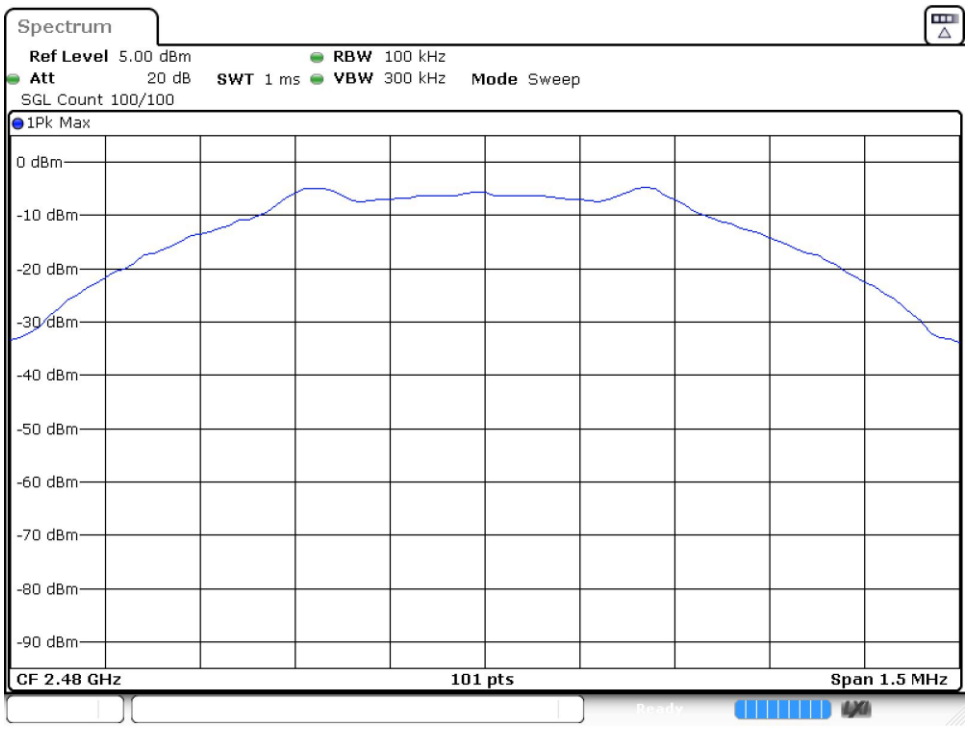
TEST RESULTS (Cont.):	Middle Channel





TEST RESULTS (Cont.):	Highest Channel





TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40125 GHz	2.43925 GHz	2.47925 GHz
Stop Frequency	2.40275 GHz	2.44075 GHz	2.48075 GHz
Span	1.500 MHz	1.500 MHz	1.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	101	101	101
Sweeptime	1.000 ms	1.000 ms	1.000 ms
Reference Level	5.000 dBm	5.000 dBm	5.000 dBm
Attenuation	20.000 dB	20.000 dB	20.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweep type	Sweep	Sweep	Sweep
Preamp	off	off	off
Stable mode	Trace	Trace	Trace
Stable value	0.50 dB	0.50 dB	0.50 dB
Run	7 / max. 150	5 / max. 150	6 / max. 150
Stable	2 / 2	2 / 2	2 / 2
Max Stable Difference	0.33 dB	0.42 dB	0.20 dB

TEST A.6: EMISSION LIMITATIONS RADIATED (TRANSMITTER)

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

LIMITS

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c) / RSS-Gen):

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

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

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

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

TEST SETUP

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

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

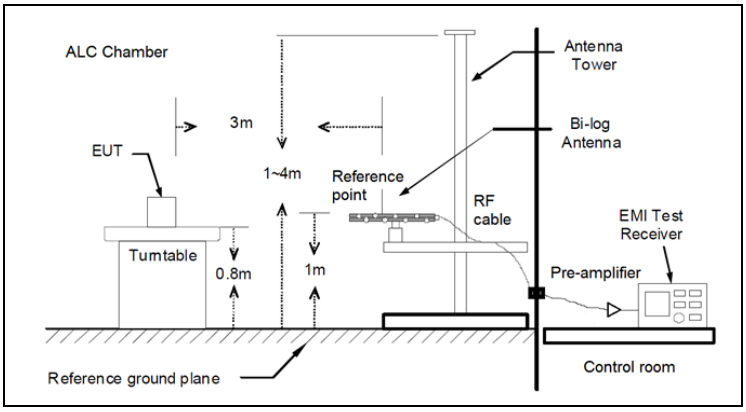
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

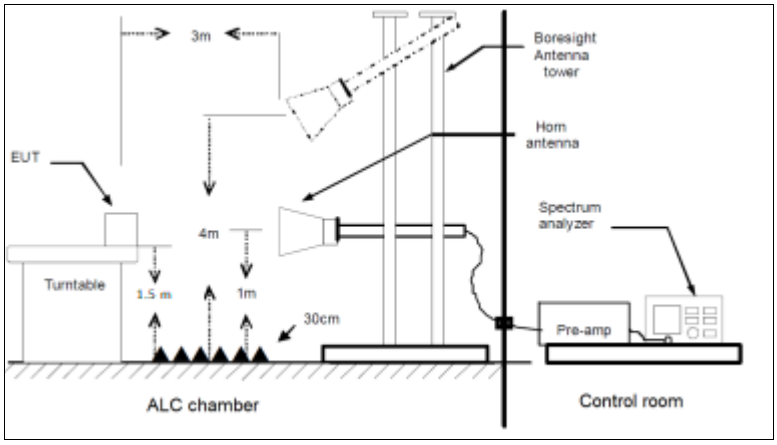
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)	

Radiated measurements Setup f < 1 GHz



Radiated measurements setup f > 1 GHz



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

Frequency range 30 MHz – 1000 MHz

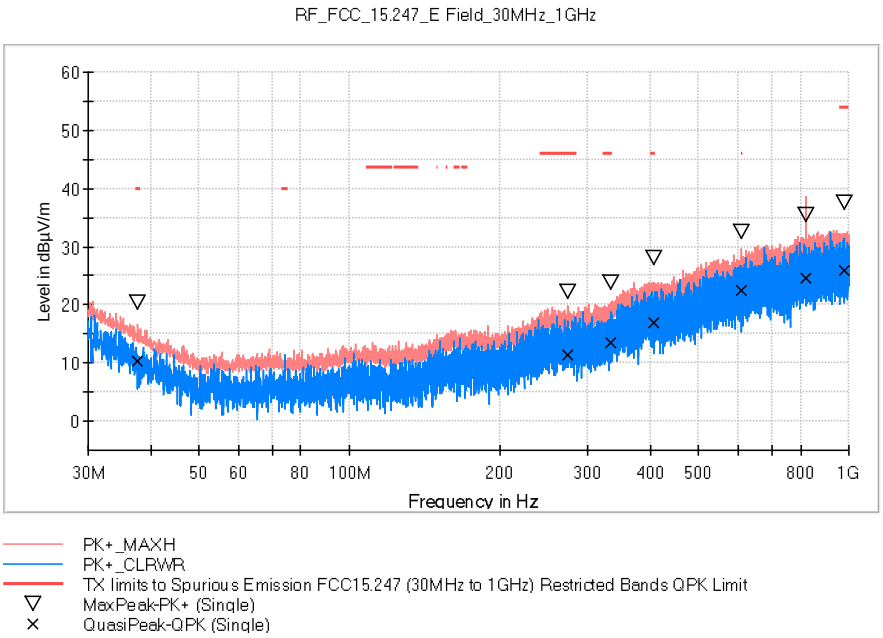
The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.
No radiated spurious signals were detected at less than 20 dB respect to the limit for the lowest, middle and highest operating channels.

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 of each frequency range.

TEST RESULTS (Cont.):	30-1000 MHz (Lowest Channel)

30MHz_1GHz_HP & VP_CH Low

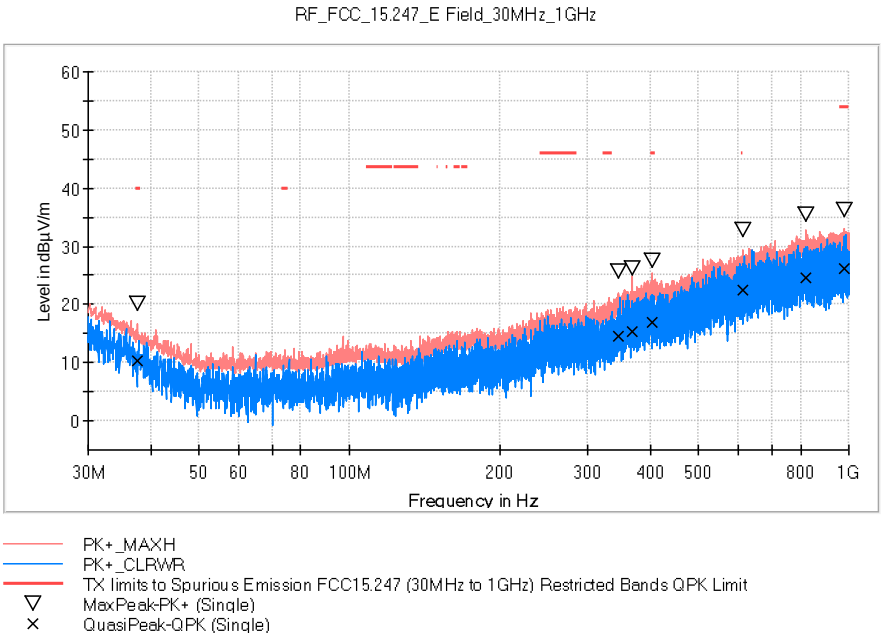


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)
37.760000	20.34	10.40
272.839500	22.10	11.46
333.755500	23.88	13.57
407.524000	27.93	16.84
608.750500	32.61	22.35
817.834000	35.31	24.64
979.290500	37.54	26.03

TEST RESULTS (Cont.):	30-1000 MHz (Middle Channel)

30MHz_1GHz_HP & VP_CH Mid

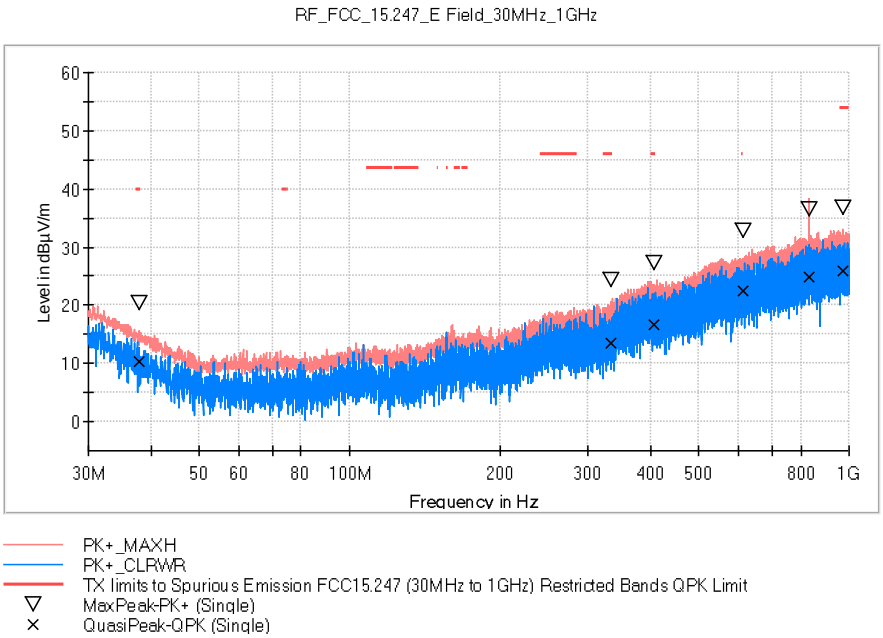


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)
37.711500	20.17	10.44
345.589500	25.57	14.59
368.481500	26.07	15.22
402.819500	27.55	17.00
613.309500	32.88	22.42
818.028000	35.30	24.63
977.593000	36.09	26.22

TEST RESULTS (Cont.):	30-1000 MHz (Highest Channel)

30MHz_1GHz_HP & VP_CH High

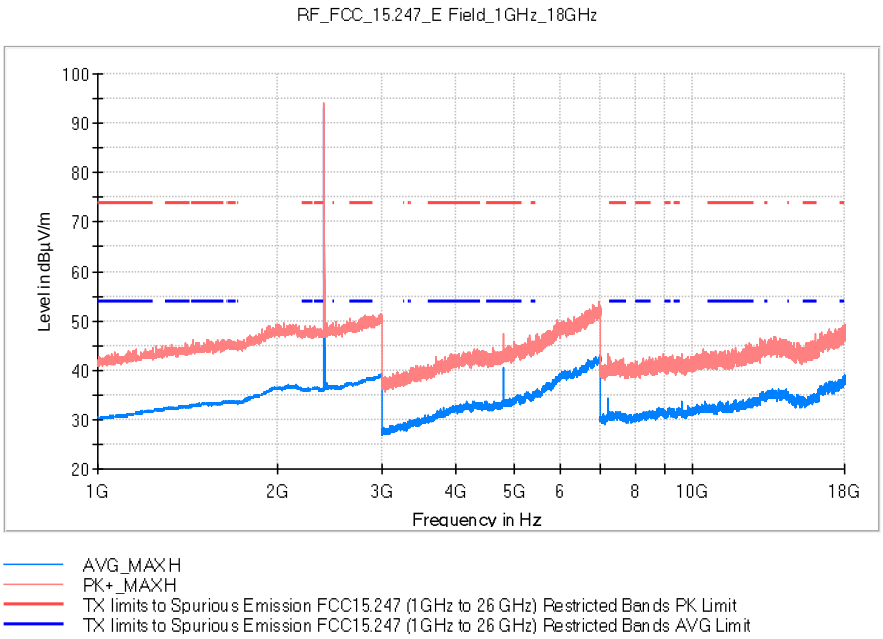


Maximizations

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)
37.857000	20.29	10.33
333.270500	24.28	13.46
407.427000	27.16	16.79
612.436500	32.79	22.38
830.250000	36.41	24.85
970.463500	36.86	26.01

TEST RESULTS (Cont.):	1-18 GHz (Lowest Channel)

1GHz_18GHz_ HP & VP_CH Low



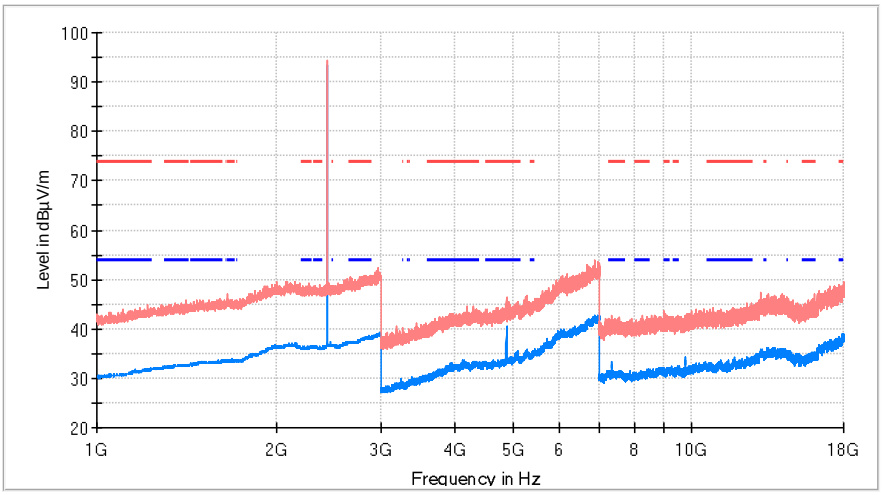
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Azimuth (deg)	Comment
2402.000000	93.94	93.16	H	-5.0	Fundamental
4803.500000	46.29	40.60	H	180.0	
7206.500000	42.43	34.22	H	180.0	
9607.500000	41.49	33.55	H	180.0	

TEST RESULTS (Cont.):	1-18 GHz (Middle Channel)

1GHz_18GHz_HP & VP_CH Mid

RF_FCC_15.247_E Field_1GHz_18GHz



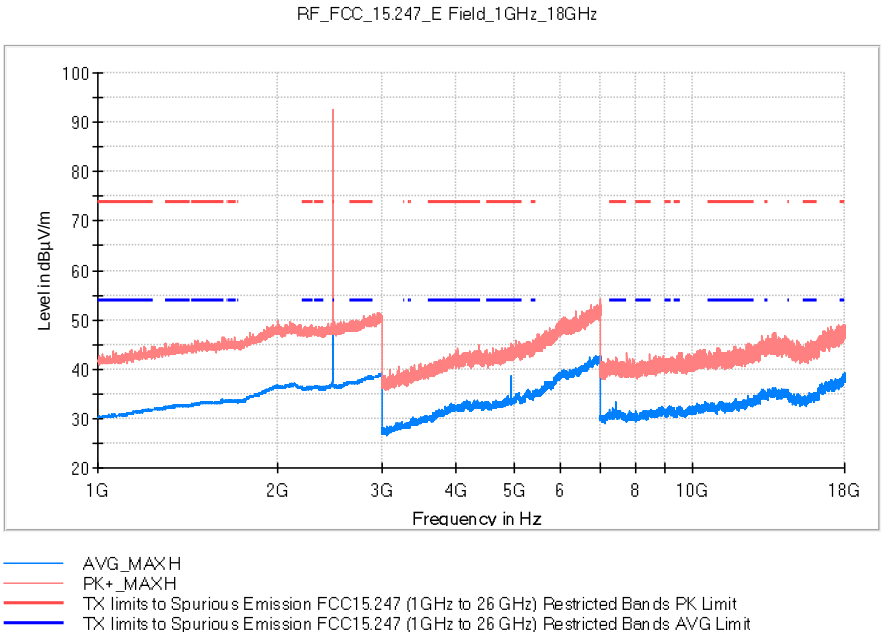
AVG_MAXH
PK+_MAXH
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands PK Limit
TX limits to Spurious Emission FCC15.247 (1GHz to 26 GHz) Restricted Bands AVG Limit

Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Azimuth (deg)	Comment
2440.000000	94.35	93.42	H	-88.0	Fundamental
4880.000000	46.16	40.66	H	94.0	
7319.000000	41.39	33.40	H	111.0	
9759.000000	41.96	34.35	V	-35.0	

TEST RESULTS (Cont.):	1-18 GHz (Highest Channel)

1GHz_18GHz_HP & VP_CH High

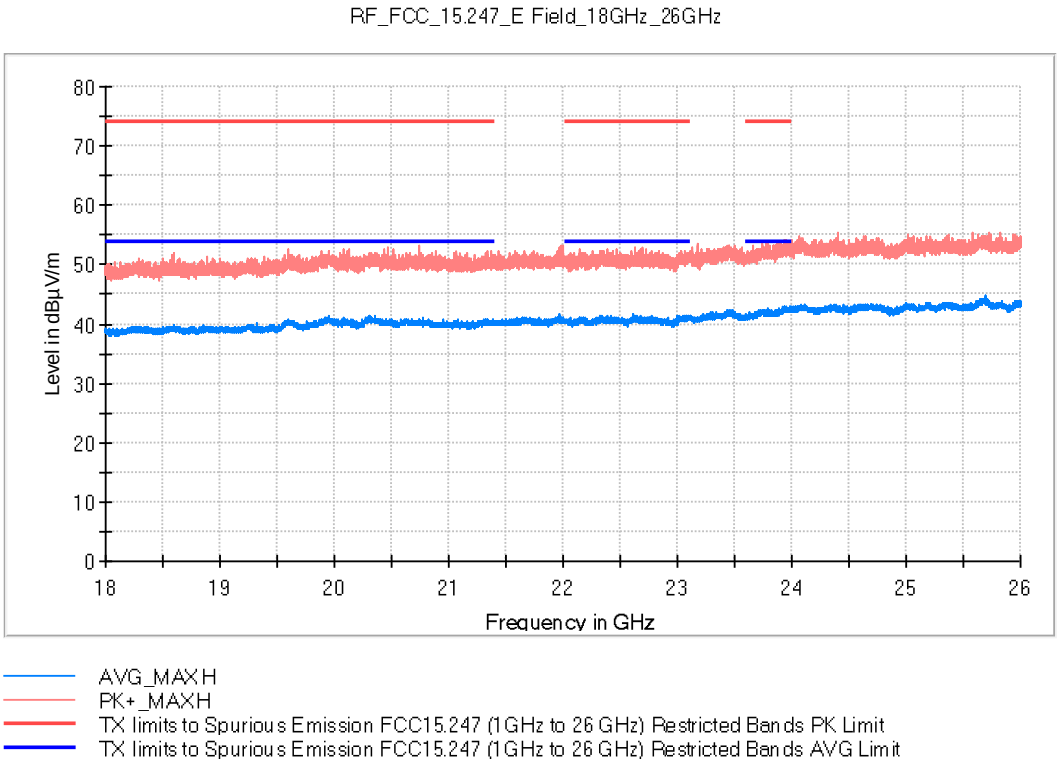


Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Azimuth (deg)	Comment
2480.000000	92.39	91.47	H	-15.0	Fundamental
4959.500000	44.87	38.73	H	150.0	
7440.000000	40.85	33.47	H	170.0	

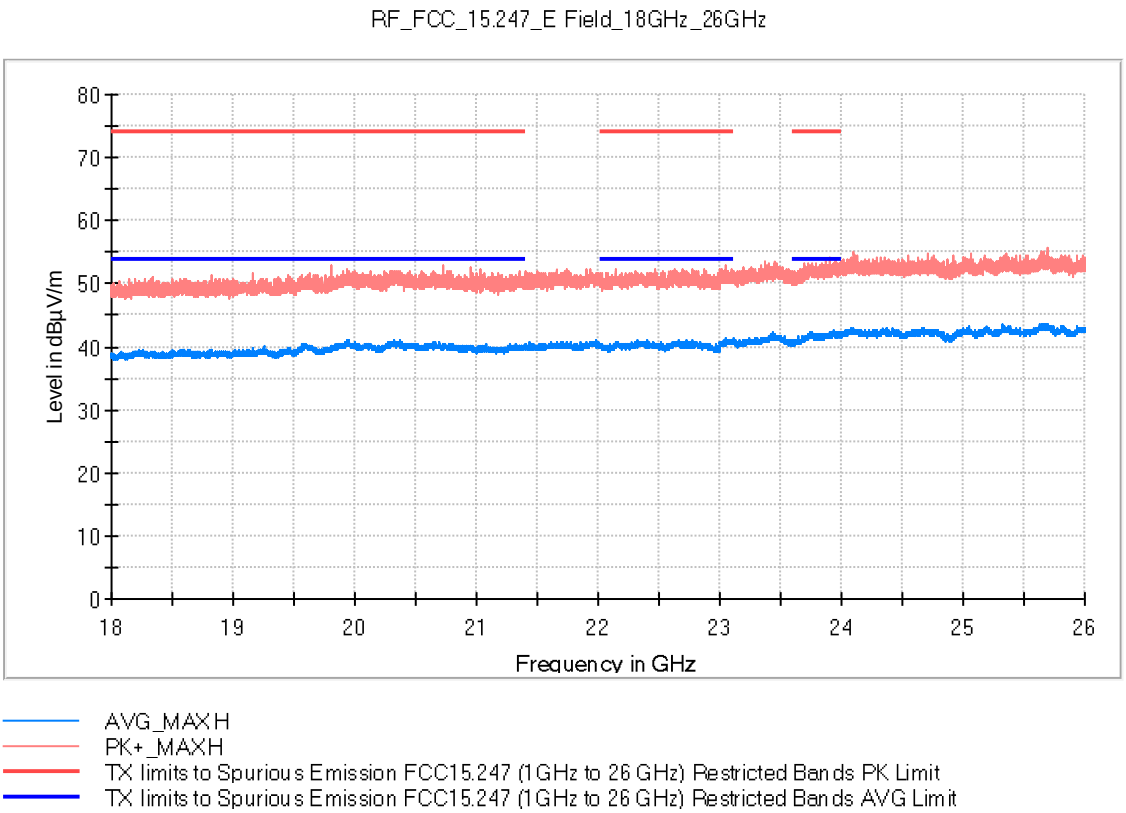
TEST RESULTS (Cont.):	18-26 GHz (Lowest Channel)

18GHz_26GHz_HP & VP_CH Low



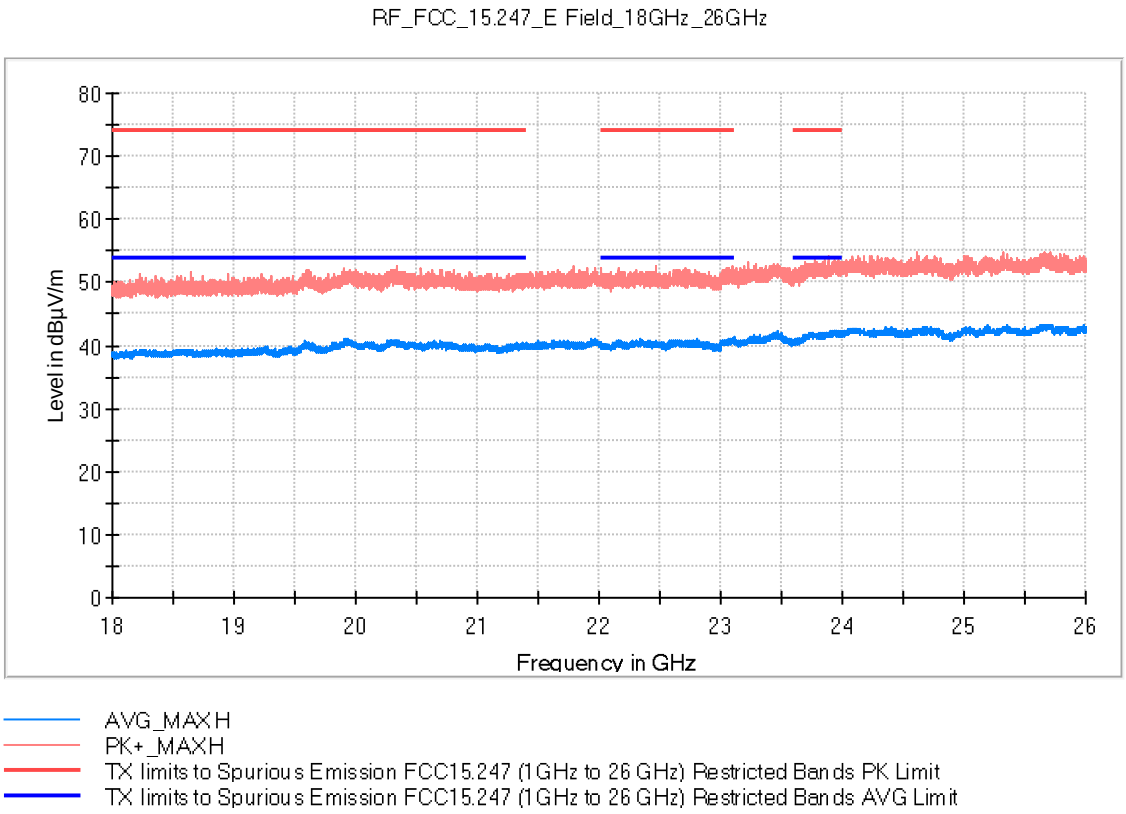
TEST RESULTS (Cont.):	18-26 GHz (Middle Channel)

18GHz_26GHz_HP & VP_CH Mid



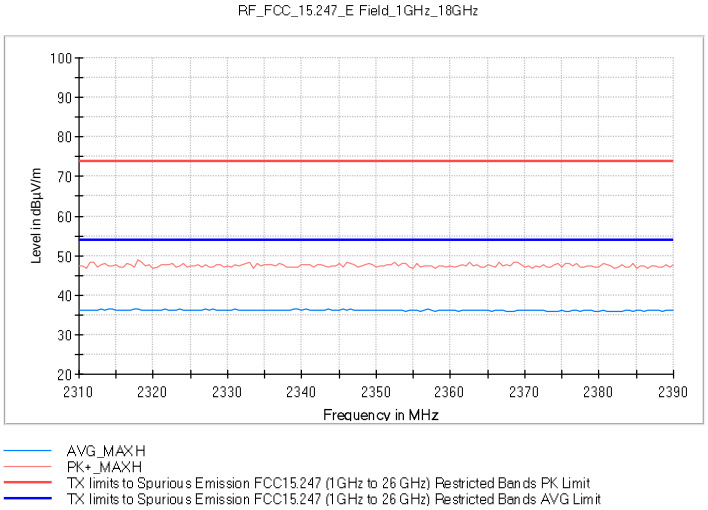
TEST RESULTS (Cont.):	18-26 GHz (Highest Channel)

18GHz_26GHz_HP & VP_CH High

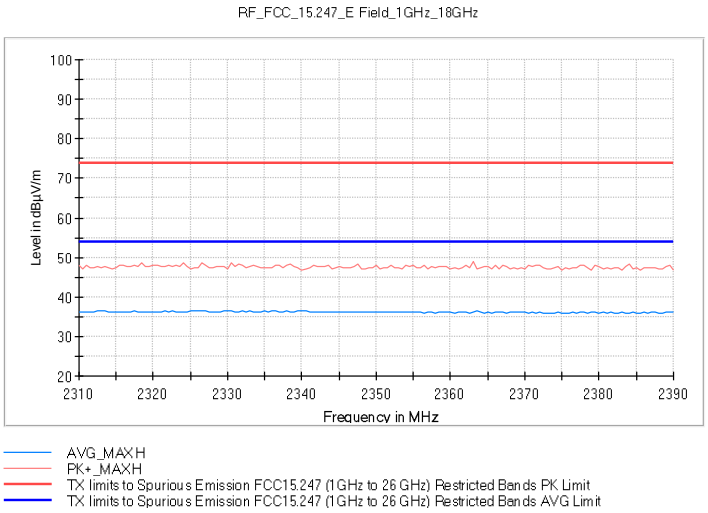


TEST RESULTS (Cont.):	RESTRICTED BAND (2.31 GHz to 2.39 GHz)

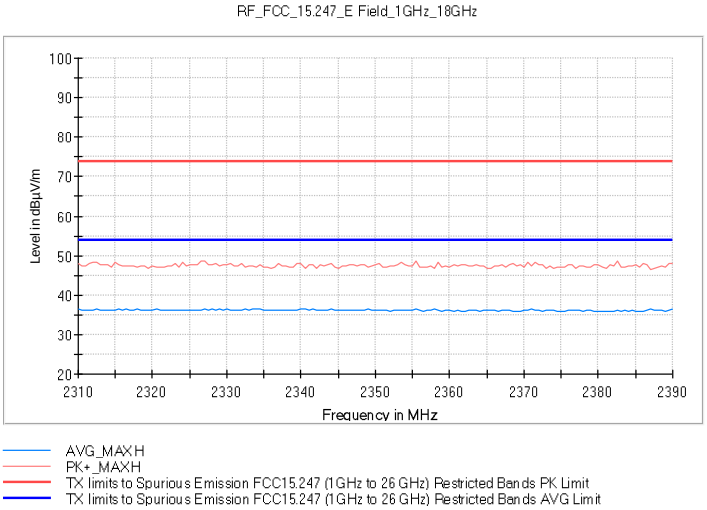
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).

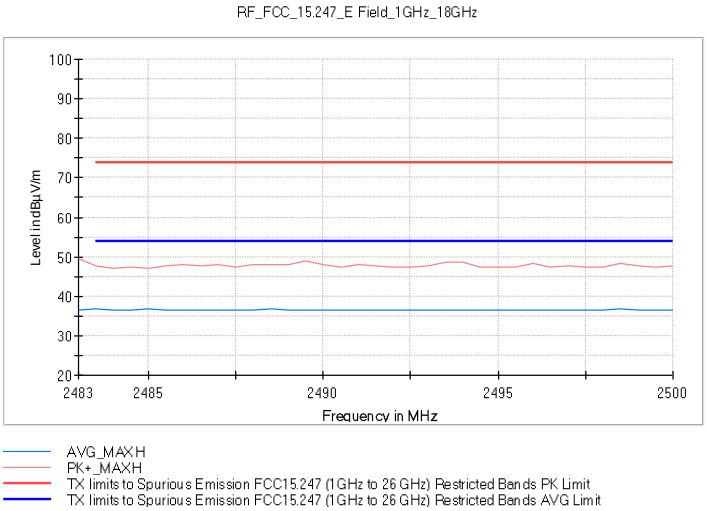


CHANNEL: Highest (2480 MHz).

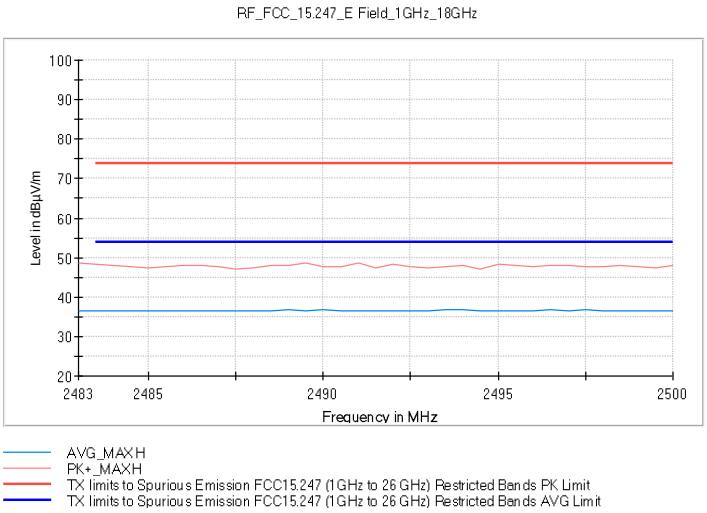


TEST RESULTS (Cont.):	RESTRICTED BAND (2.4835 GHz to 2.5 GHz)

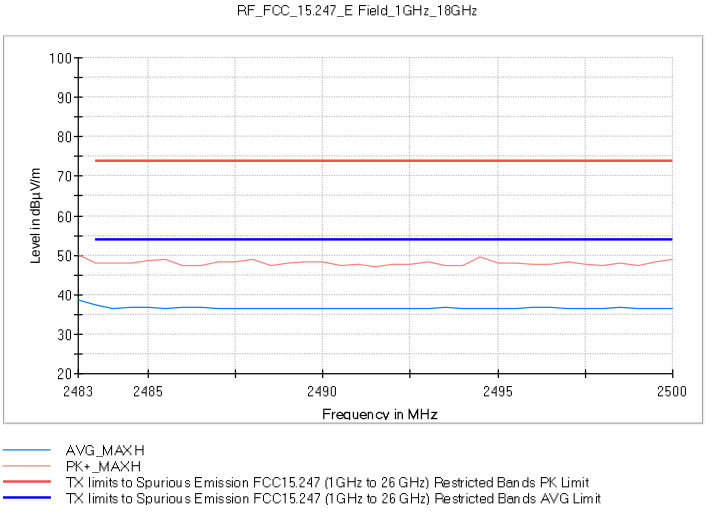
CHANNEL: Lowest (2402 MHz).



CHANNEL: Middle (2440 MHz).



CHANNEL: Highest (2480 MHz).



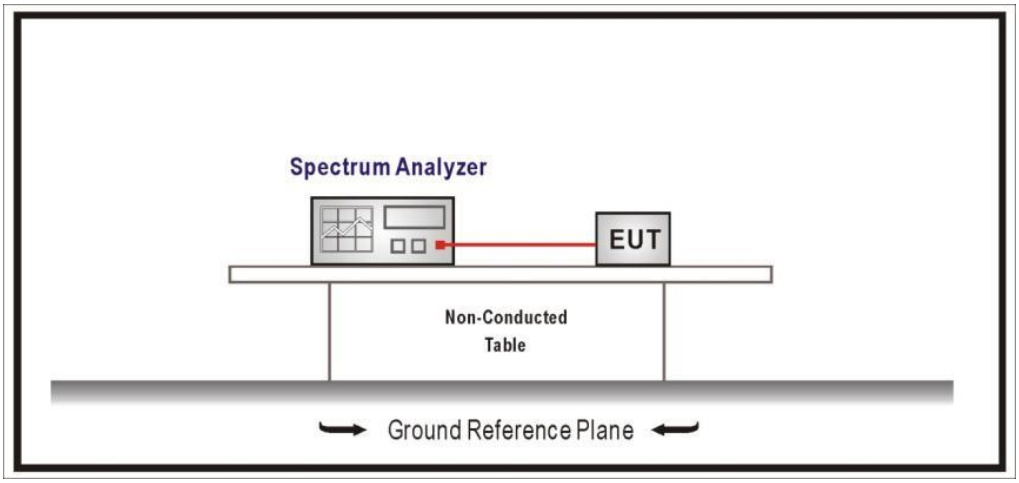
TEST A.6: EMISSION LIMITATIONS CONDUCTED (TRANSMITTER)

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

LIMITS

In any 100 kHz bandwidth outside the frequency band in which the digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required shall be 30 dB instead of 20 dB.

TEST SETUP	



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

Results:

Reference Level Measurement:

	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Reference Level Measurement (dBm)	-2.155	-2.284	-2.564
Measurement uncertainty (dB)	<± 0.78		

Lowest Channel:

Frequency (GHz)	Emission limitations conducted (dBm)	Limit (dBm)
2399.750000	-48.2	-22.2

Middle Channel:

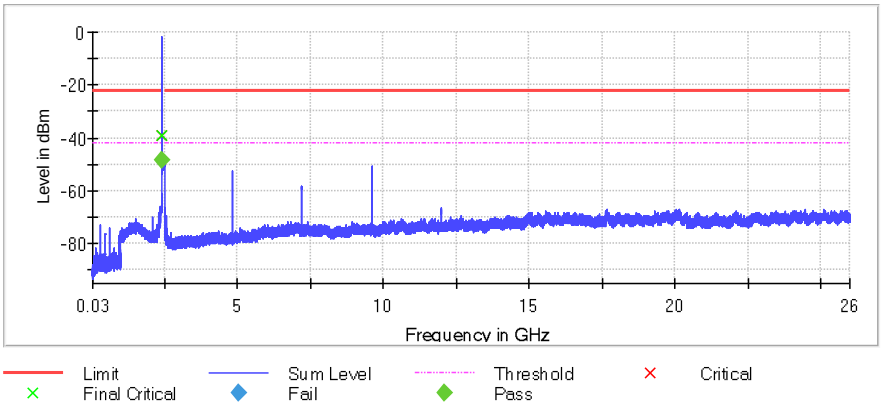
No conducted spurious signals were detected.

Highest Channel:

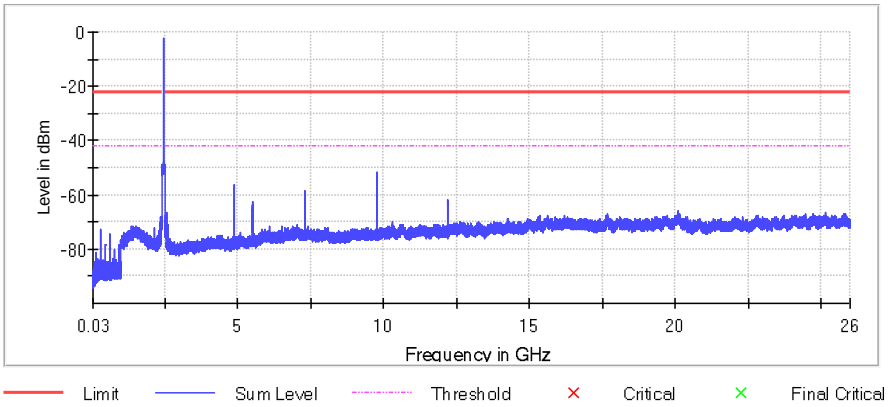
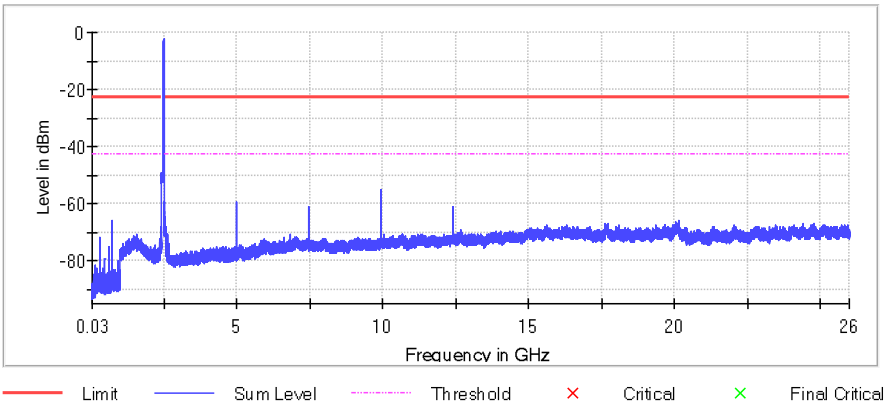
No conducted spurious signals were detected.

TEST RESULTS (Cont.):	

Lowest Channel



Middle Channel



Highest Channel