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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:
2579ERM.002A1

Test report

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

Identification of item tested	GPS Tracker
Trademark	Automile
Model and /or type reference	Automile Tracker Mini
Other identification of the product	FCC ID: 2AUAJATMV1 Contains FCC ID: XPY1DIQN3NN
Features	Bluetooth, GPS/Glonass, LTE Band 12, 4, 2
Manufacturer	AUTOMILE AB, Sergels Torg 12, Floor 7, 11157 Stockholm, SWEDEN.
Test method requested, standard	USA FCC Part 15.247, 10-1-18 Edition: Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209, 10-1-18 Edition: Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 (February 2018). Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 558074 D01 DTS Meas Guidance v04 dated 05/04/2017. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Domingo Galvez EMC&RF Lab Manager Digitally signed by Domingo Galvez DN: cn=Domingo Galvez, o=DEKRA Certification Inc., ou=Regulatory Lab, email=dgalvez@dekra.com, c=US Date: 2019.09.13 19:30:05 -04'00'
Date of issue	08-08-2019
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 particular item under test established in this document.

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General conditions

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

GPS based asset tracker with internal battery and 5VDC power input via USB-C.

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
2579.005	Automile Tracker mIni	---	IMEI356935082288744	07/08/2019

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

   All conducted tests indicated in appendix A.

Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2579.003	Automile Tracker mini	---	IMEI:356935082279909	07/08/2019

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

All radiated tests indicated in appendix A.Sample S/01 & S/02 is composed of the following Accessories:

Control Nº	Description	Model	Serial Nº	Date of reception
2579.012	BLE USB Dongle	---	681346329	07/08/2019
2579.011	USB to Type C Cable	---	---	07/08/2019

Sample S/03 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
2579.001	Automile Tracker mini	---	IMEI:356935082279784	07/08/2019

1. Sample S/03 was used in following testing: conducted emission **A.7** of Appendix A **§15.207 (a)/ RSS Gen 8.8**

Following accessories were used with Sample S/03 to perform the testing

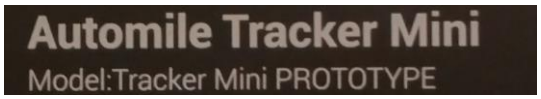
Control Nº	Description	Model	Serial Nº	Date of reception
2579.010	USB to Type C Cable	---	---	07/08/2019

Following Auxiliary device was used with Sample S/03 for charging DUT for execution of Conducted Emission testing.

Control Nº	Description	Model	Serial Nº
Dekra 1	120VAC to 5V DC charger	EPTA10JWE	DK2G226V8/B-E

Test sample description

Ports…… :	Port name and description		Cable			
			Specified length [m]	Attached during test	Shielded	
	Data not provided			☐	☐	
				☐	☐	
				☐	☐	
Supplementary information to the ports…… :	*Data not provided*					
Rated power supply .....:	Voltage and Frequency		Reference poles			
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☐	AC:	☐	☐	☐	☐	☐
	☐	DC:					
	☒	DC: DC: Battery powered (5Vdc)					
Rated Power .....:	*Data not provided*						
Clock frequencies .....:	*Data not provided*						
Other parameters.....:	*Data not provided*						
Software version .....:	1						
Hardware version.....:	B1						
Dimensions in cm (L x W x D) ....:	*Data not provided*						
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		
	Data not provided					
Accessories (not part of the test item) .....:	Description		Type	Manufacturer		
	Data not provided					
Documents as provided by the applicant.....:	Description		File name	Issue date		
	Data not provided					

Copy of marking plate:


Identification of the client

HALTIAN LTD

Yrttipellontie 1D, 90230 Oulu, FINLAND.

Testing period and place

Test Location	DEKRA Certification Inc.
Date (start)	07-11-2019
Date (finish)	09-13-2019

Document history

Report number	Date	Description
2579ERM.002	07-17-2019	First release
2579ERM.002A1	09-13-2019	2nd release

Modifications to the reference test report

Following modifications were introduced in the test report number 2579ERM.002 related with the same sample, in the next clauses and sub-clauses:

Clauses/ Sub-Clauses	Modification	Justification
Usage of samples	A new Sample (S/03) added	Required to test DUT for conducted emission while charging
Summary	A.7 Conducted emission test (150 kHz to 30MHz) Added	Certification Body requested additional test case
List of equipment used during the test	Equipment list updated	Updated test equipment used
Appendix A: Test results	Test results updated	Results added for conducted emission test case
Appendix B: Photographs	Picture Added	Added Pictures for Conducted emission test setup

This modification test report cancels and replaces the test report 2579ERM.002

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, Poojita Bhattu and Koji Nishimoto. Nasir Khan

Testing verdicts

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

Summary

FCC PART 15 PARAGRAPH / RSS-247 (Bluetooth Low Energy)					
Report Section	**15.247 Spec Clause**	**RSS Spec Clause**	**Test Description**	**Verdict**	**Remark**
A.1		RSS-Gen 6.7	99% Occupied Bandwidth	P	N/A
A.2	§ 15.247 (a) (2)	RSS-247 5.2. (a)	6dB Emission Bandwidth	P	N/A
A.3	§ 15.247 (b) (3)	RSS-247 5.4. (d)	Maximum peak conducted output power and antenna gain	P	N/A
A.4	§ 15.247 (d)	RSS-247 5.5.	Band-edge emissions compliance (Transmitter)	P	N/A
A.5	§ 15.247 (e)	RSS-247 5.2. (b)	Power spectral density	P	N/A
A.6	§ 15.247 (d) §15.209 (a)	RSS-Gen 8.9 & 8.10.	Emission limitations radiated (Transmitter)	P	N/A
A.7	§15.207 (a)	RSS Gen 8.8	Conducted Emission Limits	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	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
0101	Climatic Chamber	ESPEC NA	ESL-2CA	2019/01	2020/01
1039	Signal Analyzer	ROHDE & SCHWARZ	FSV40	2018/10	2020/10
1040	Switch unit Rohde & Schwarz with power detector OSP120 / OSP-B157	ROHDE & SCHWARZ	OSP120 / OSPB157	2018/10	2020/10
1041	RF generator	ROHDE & SCHWARZ	SMB100A	2018/04	2020/04
1042	RF generator	ROHDE & SCHWARZ	SMBV100A	2018/01	2020/01

Radiated Measurements

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

Conducted Emission

CONTROL NUMBER	DESCRIPTION	MANUFACTURER	MODEL	LAST CALIBRATION	NEXT CALIBRATION
0997	LISN	Narda	PMM L3-32	2019/06	2021/06
1012	EMI Test Receiver	ROHDE & SCHWARZ	ESR26	2018/09	2020/09
1110	Ethernet SNMP Thermometer Monitoring room	HW GROUP	HWg-STE Plain	2017/09	2019/09

Appendix A: Test results

Appendix A Content

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PRODUCT INFORMATION

The following information is provided by the client

Information	**Description**
Modulation	Other than FHSS
Adaptive	Non-Adaptive Equipment
Operation mode 1: Single Antenna Equipment	Equipment with only one antenna
- Operating Frequency Range	2402 – 2480 MHz
- Nominal Channel Bandwidth	1 MHz
- RF Output Power	4 dBm
Antenna type	Integral antenna
Antenna gain	3.5 dBi
Nominal Voltage	
- Type of power source	Battery Powered
Equipment type	Bluetooth Low Energy
Geo-location capability	No

DESCRIPTION OF TEST CONDITIONS

TEST CONDITIONS	DESCRIPTION
TC#01	Power supply (V): Battery Powered Test Frequencies for Conducted tests: Lowest channel: 2402 MHz Middle channel: 2440 MHz Highest channel: 2480 MHz Test Frequencies for Radiated tests: Lowest range: 2402 MHz Middle channel: 2440 MHz Highest range: 2480 MHz
TC#02	EUT ON, BLE RX/TX mode, charging from USB adapter (120Vac to 5Vdc)

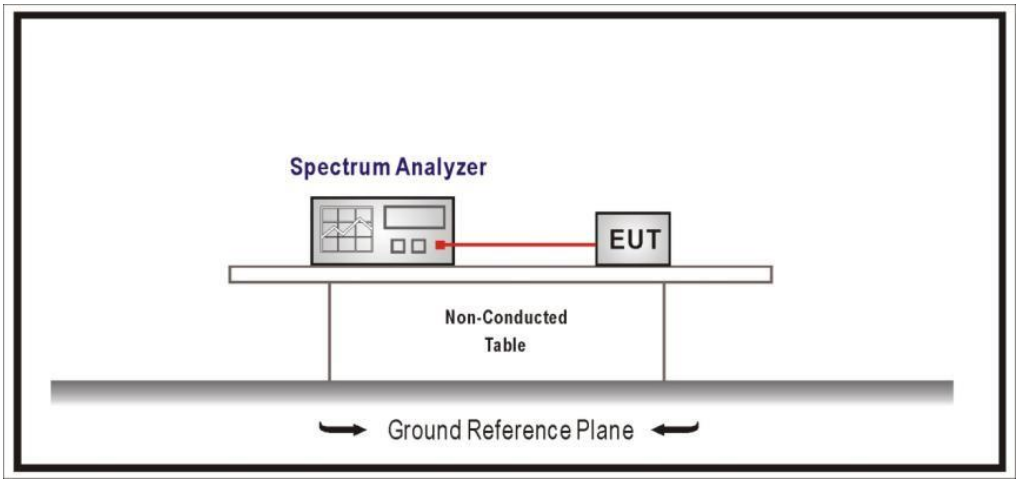
TEST A.1: 99% EMISSION BANDWIDTH

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	

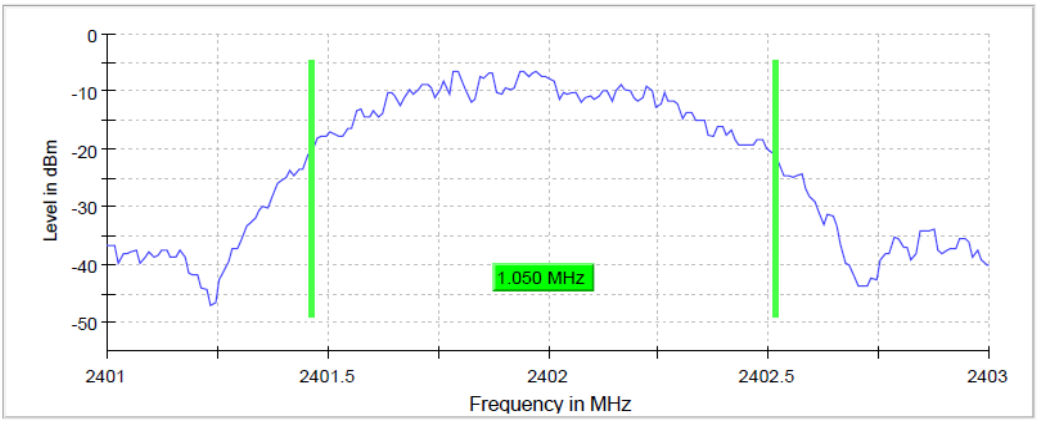


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

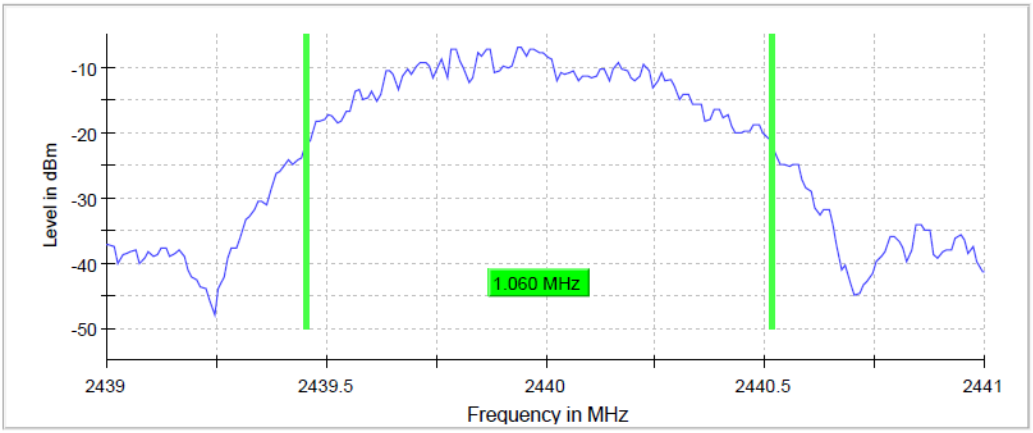
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
99% bandwidth (MHz)	1.05	1.06	1.06
Measurement uncertainty (kHz)	<± 8.33		

TEST RESULTS (Cont.):	

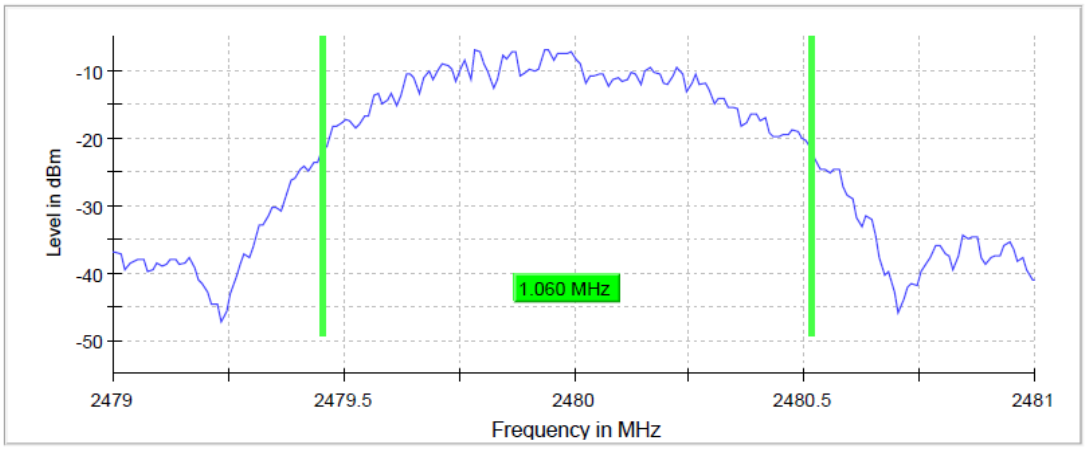
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	200	200	200
Sweeptime	189.620 µs	189.620 µs	189.620 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.30 dB	0.30 dB	0.30 dB
Run	5 / max. 150	5 / max. 150	5 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.19 dB	0.29 dB	0.19 dB

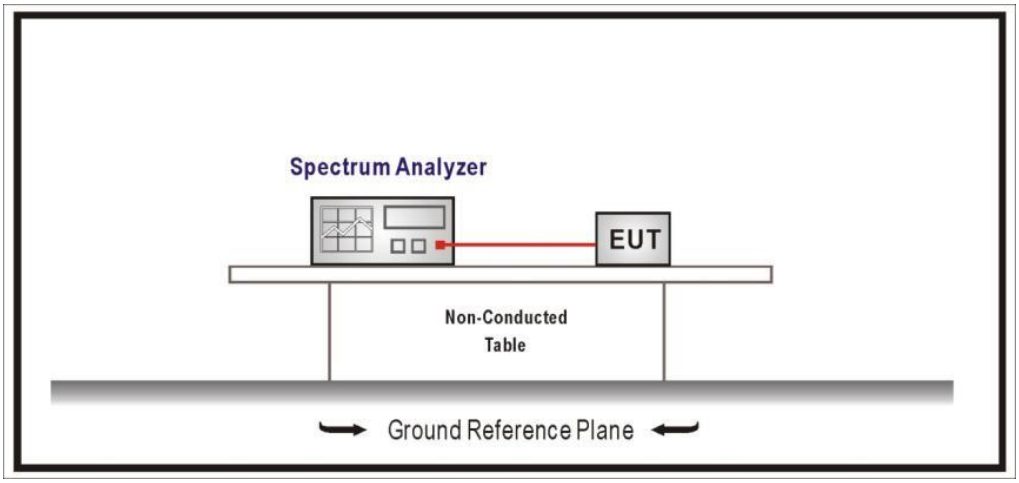
TEST A.2: 6DB BANDWIDTH

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

LIMITS

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

TEST SETUP	

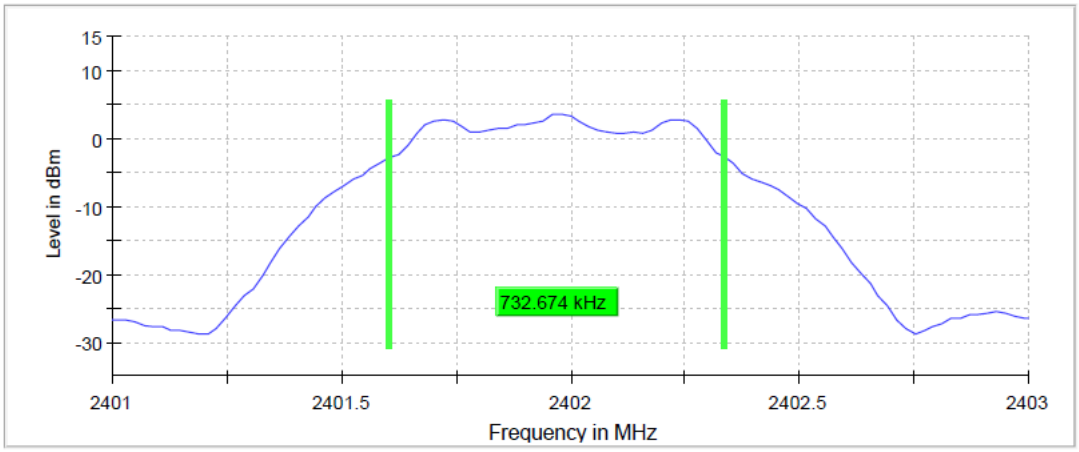


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

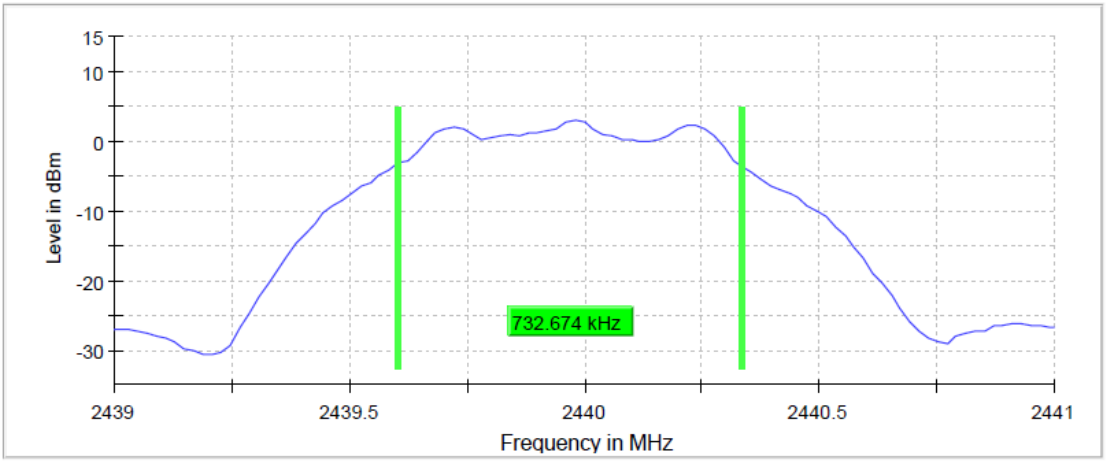
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
6 dB Spectrum bandwidth (kHz)	732.674	732.674	732.674
Measurement uncertainty (kHz)	<±20.0		

TEST RESULTS (Cont.):	

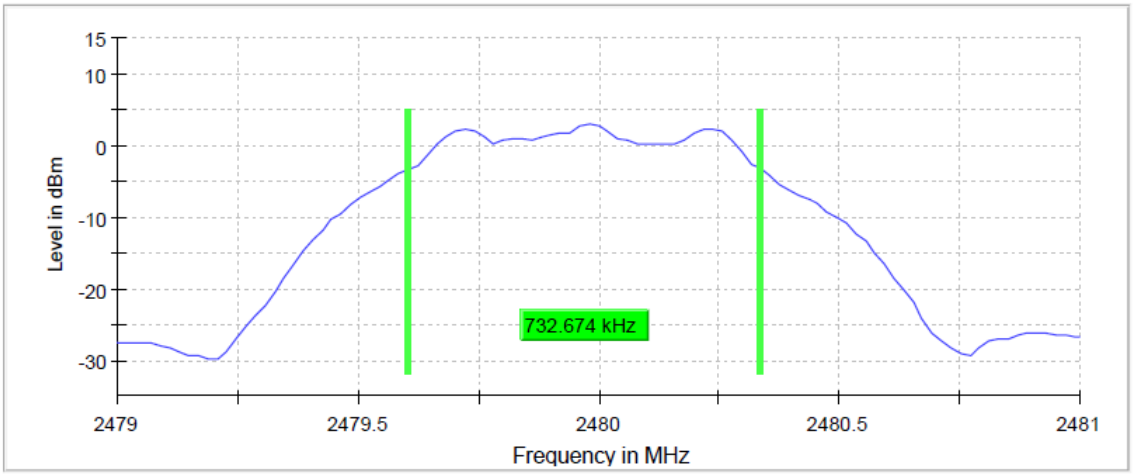
Low Channel:



Mid Channel:



High Channel:



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40100 GHz	2.43900 GHz	2.47900 GHz
Stop Frequency	2.40300 GHz	2.44100 GHz	2.48100 GHz
Span	2.000 MHz	2.000 MHz	2.000 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	101	101	101
Sweeptime	18.938 µs	18.938 µs	18.938 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	9 / max. 150	8 / max. 150	11 / max. 150
Stable	5 / 5	5 / 5	5 / 5
Max Stable Difference	0.00 dB	0.16 dB	0.05 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

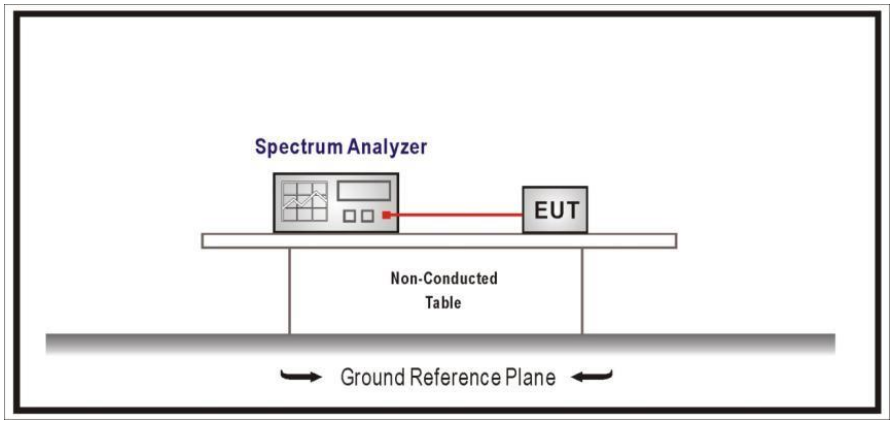
§15.247(b)(3) and RSS-247 5.4(d): For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

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

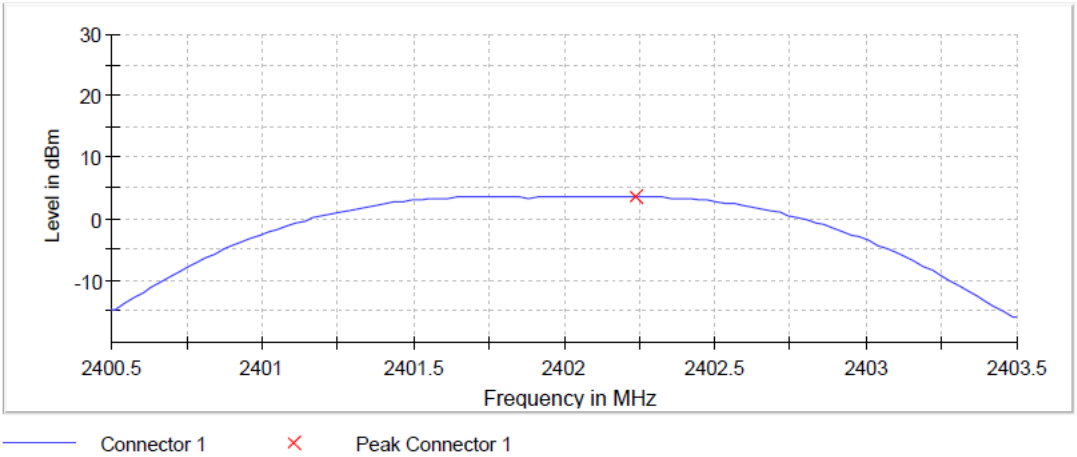
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Maximum conducted power (dBm)	3.6	3.0	3.0
Maximum EIRP power (dBm)	7.1	6.5	6.5
Measurement uncertainty (dB)	<±0.78		

Maximum declared antenna gain: 3.5 dBi

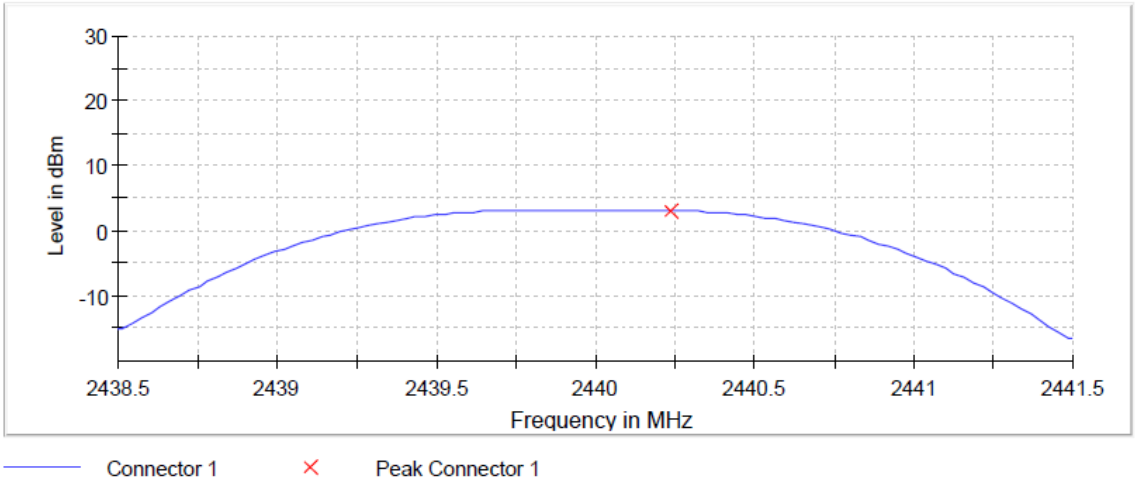
The maximum directional gain of the antenna is less than 6 dBi and therefore the maximum output power is not required to be reduced from the stated values.

TEST RESULTS (Cont.):	CONDUCTED PEAK POWER

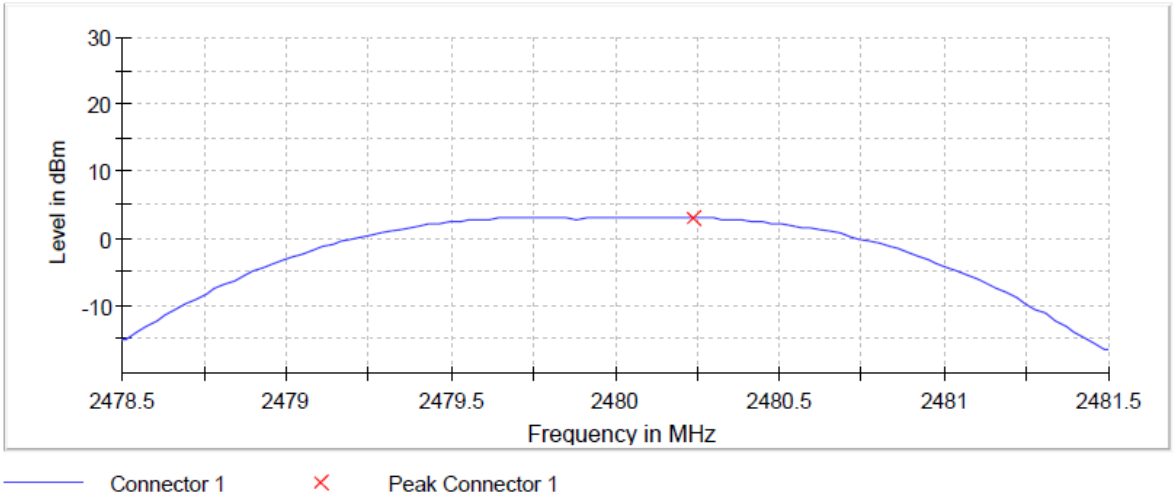
Lowest Channel



Middle Channel



Highest Channel



TEST RESULTS (Cont.):	

Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40050 GHz	2.43850 GHz	2.47850 GHz
Stop Frequency	2.40350 GHz	2.44150 GHz	2.48150 GHz
Span	3.000 MHz	3.000 MHz	3.000 MHz
RBW	1.000 MHz	1.000 MHz	1.000 MHz
VBW	3.000 MHz	3.000 MHz	3.000 MHz
SweepPoints	101	101	101
Sweeptime	1.907 µs	1.907 µs	1.907 µs
Reference Level	20.000 dBm	20.000 dBm	20.000 dBm
Attenuation	40.000 dB	40.000 dB	40.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	FFT	FFT	FFT
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3	3 / 3
Max Stable Difference	0.00 dB	0.19 dB	0.04 dB

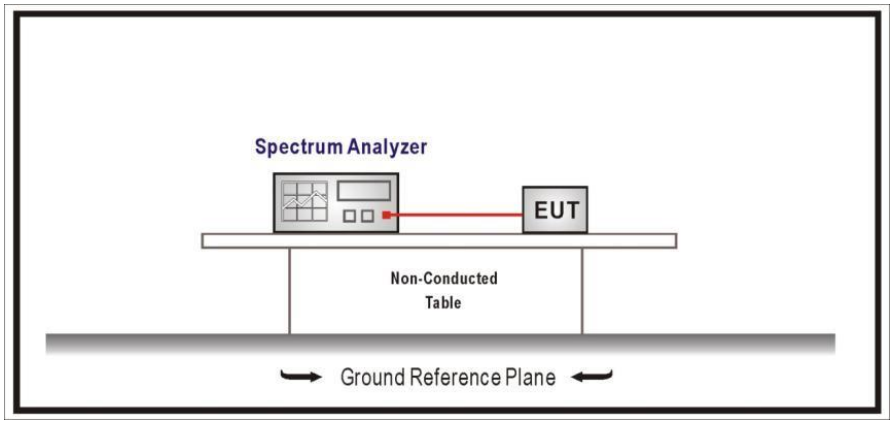
TEST A.4: BAND-EDGE EMISSIONS COMPLIANCE (TRANSMITTER)

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.

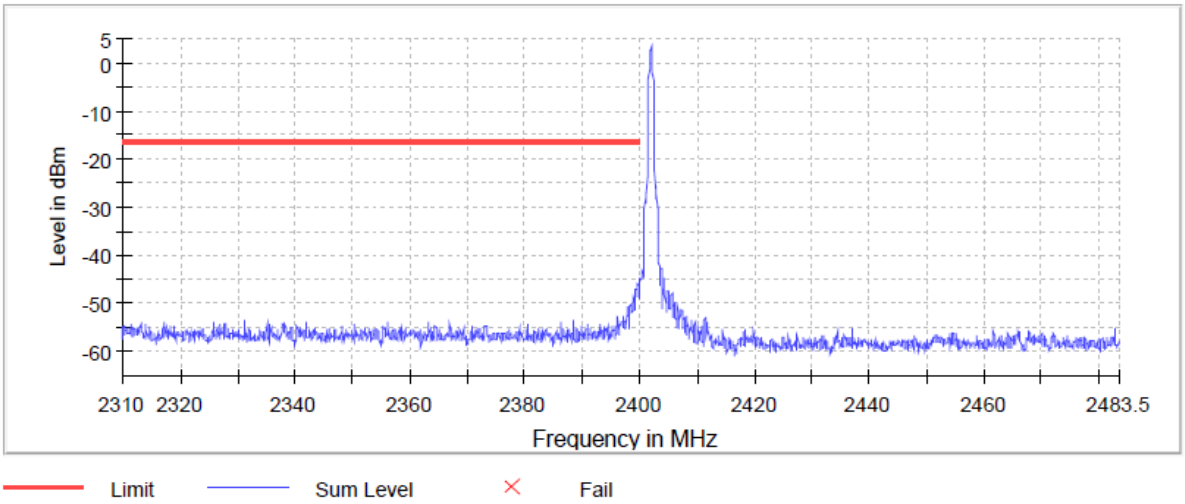
TEST SETUP	

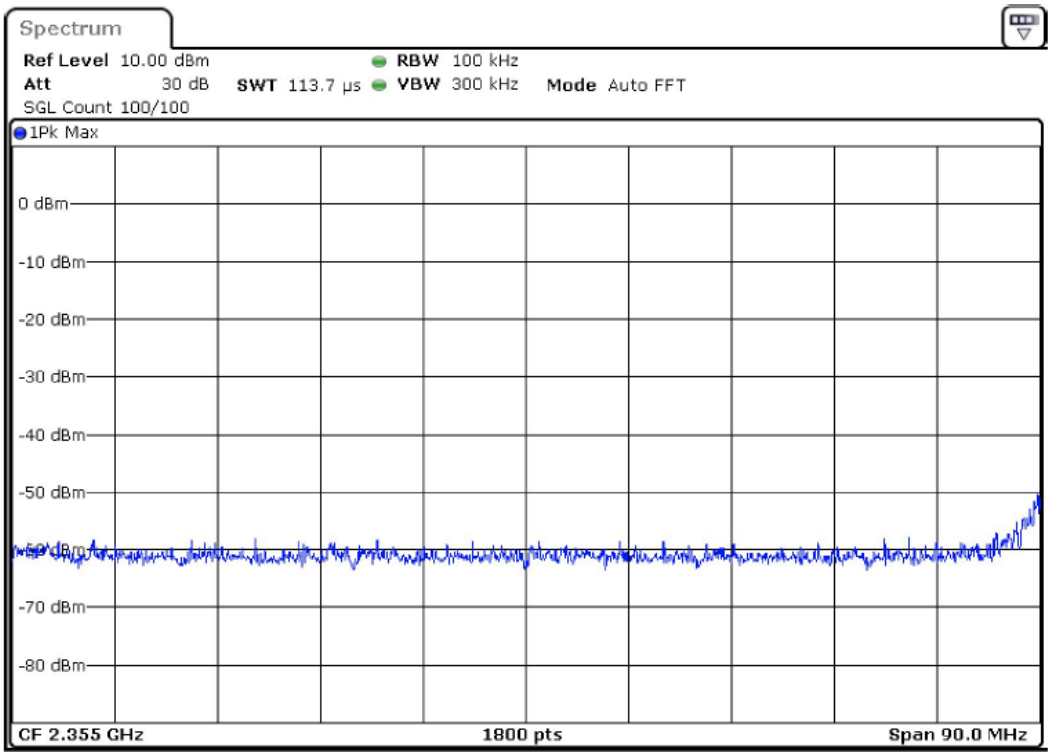


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

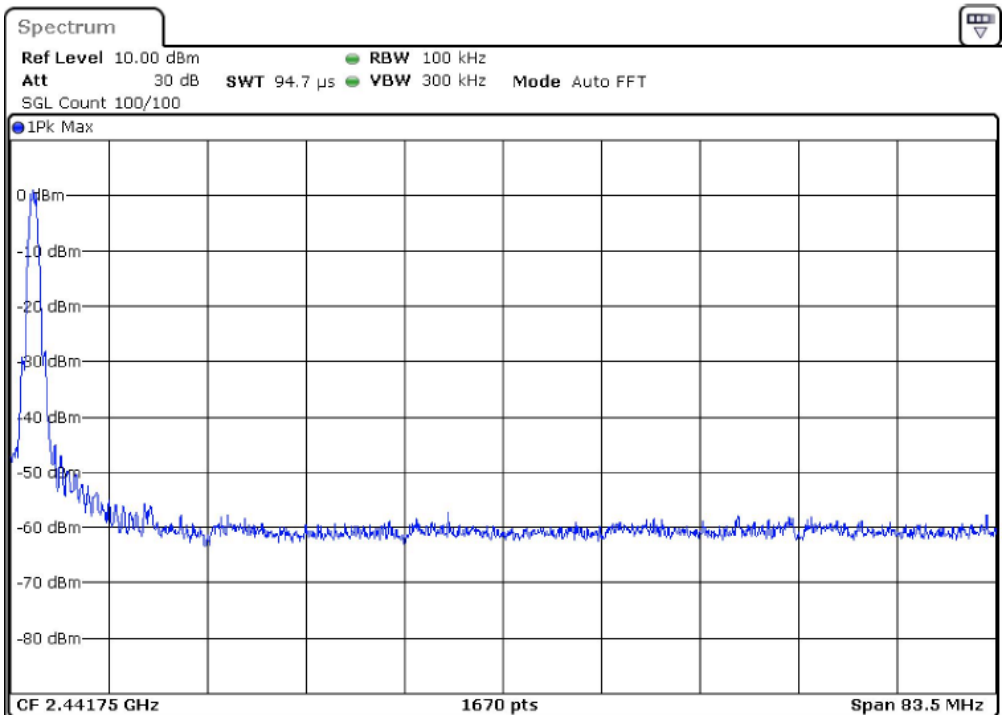
Note: Radiated measurements were used to show compliance with the limits in the restricted bands 2.31-2.39 GHz and 2.4835-2.5 GHz.

TEST RESULTS (Cont.):	Lowest Channel





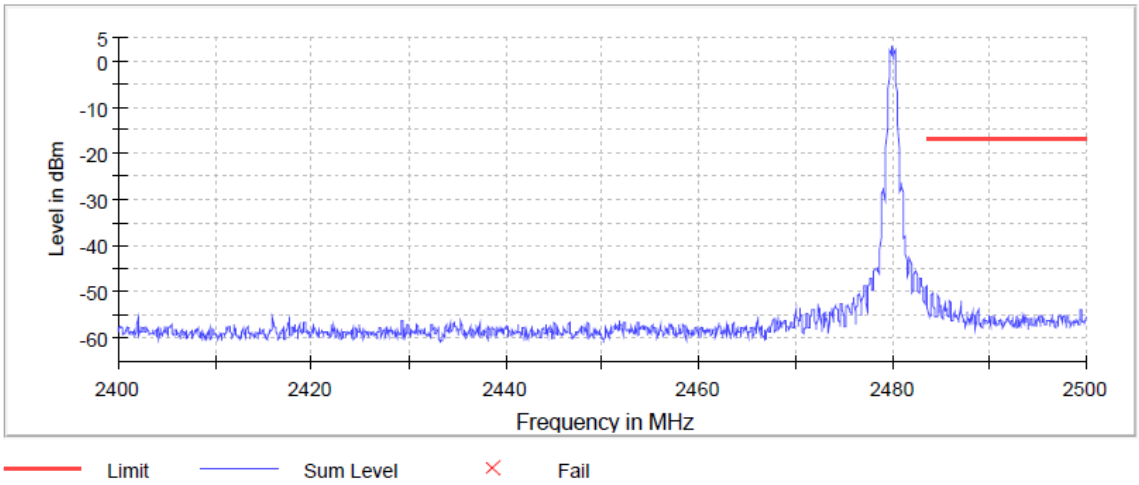
TEST RESULTS (Cont.):	Lowest Channel

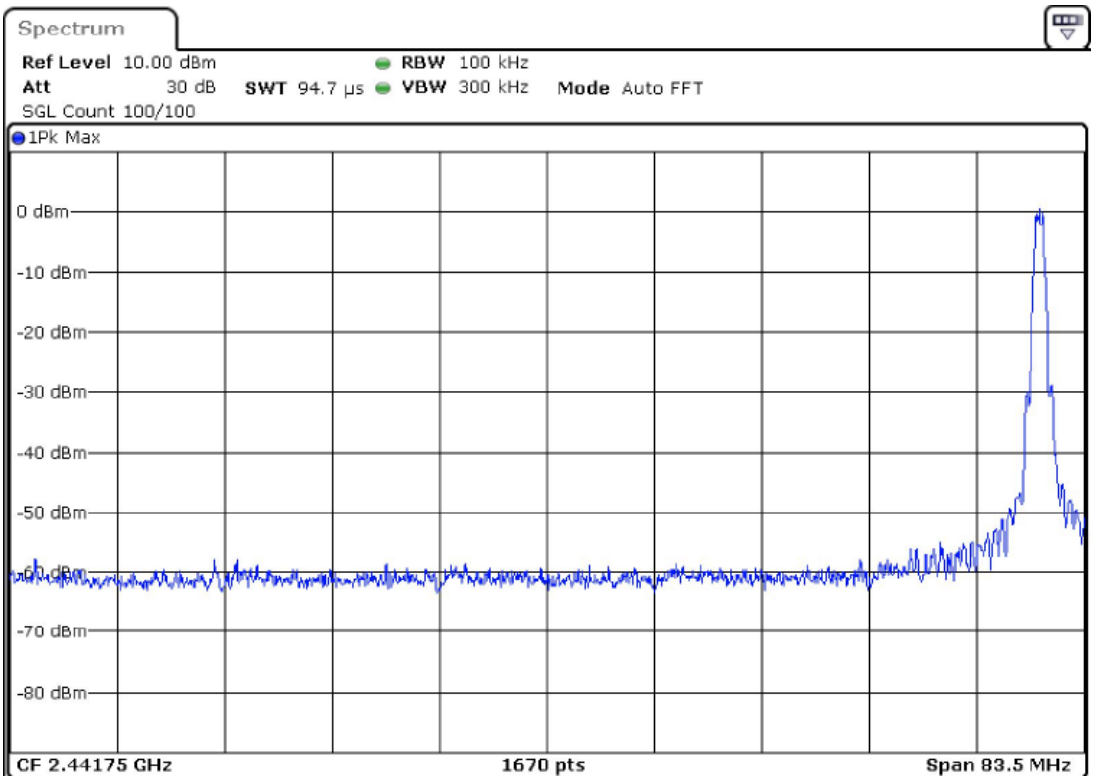


Measurement

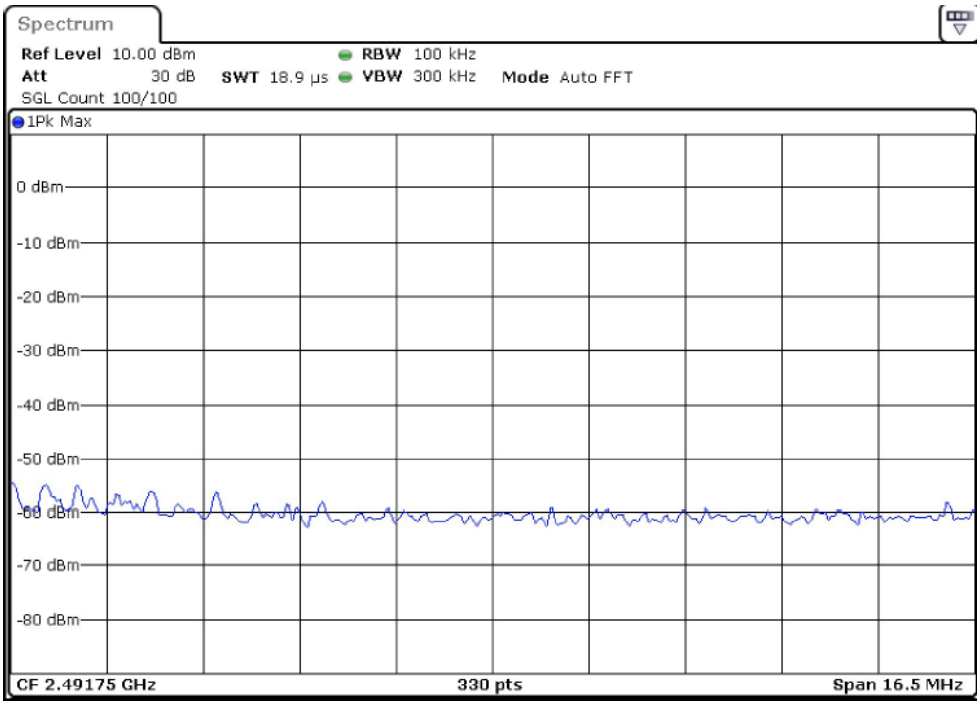
Setting	Instrument Value	Instrument Value
Start Frequency	2.31000 GHz	2.40000 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz
Span	90.000 MHz	83.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1800	1670
Sweeptime	113.672 µs	94.727 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	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	0.41 dB

TEST RESULTS (Cont.):	Highest Channel





TEST RESULTS (Cont.):	Highest Channel



Measurement

Setting	Instrument Value	Instrument Value
Start Frequency	2.40000 GHz	2.48350 GHz
Stop Frequency	2.48350 GHz	2.50000 GHz
Span	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz
SweepPoints	1670	330
Sweeptime	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak
SweepCount	100	100
Filter	3 dB	3 dB
Trace Mode	Max Hold	Max Hold
Sweeptype	FFT	FFT
Preamp	off	off
Stablemode	Trace	Trace
Stablevalue	0.50 dB	0.50 dB
Run	4 / max. 150	4 / max. 150
Stable	3 / 3	3 / 3
Max Stable Difference	0.02 dB	0.00 dB

TEST A.5: POWER SPECTRAL DENSITY

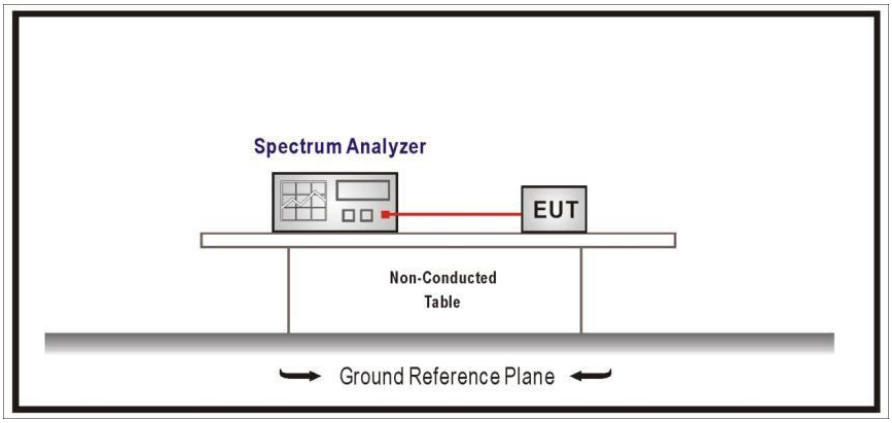
LIMITS:	Product standard:	Part 15 Subpart C §15.247 and RSS-247
	Test standard:	Part 15 Subpart C §15.247(e) and RSS-247 5.2 (b)

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.

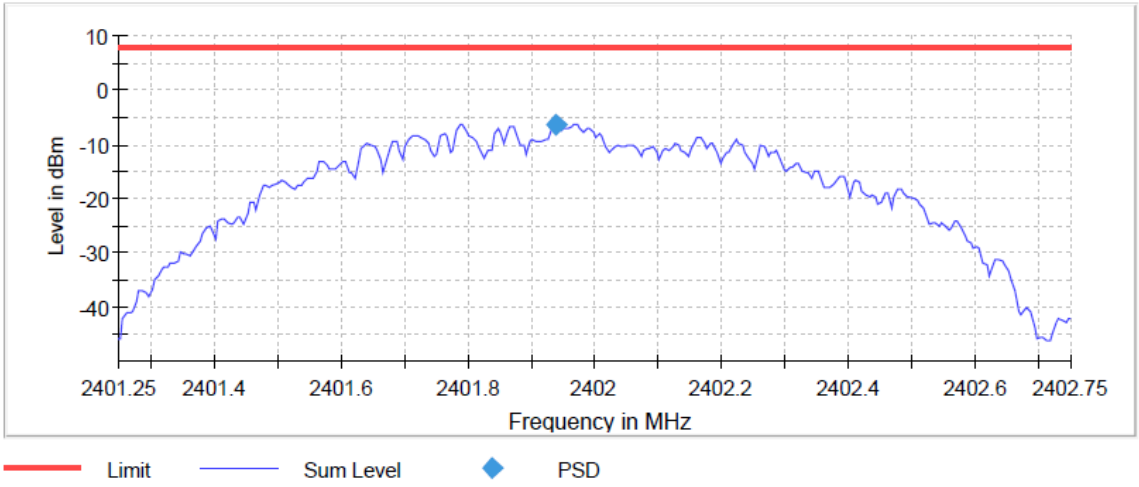


TESTED SAMPLES:	S/01
TESTED CONDITIONS MODES:	TC#01
TEST RESULTS:	PASS

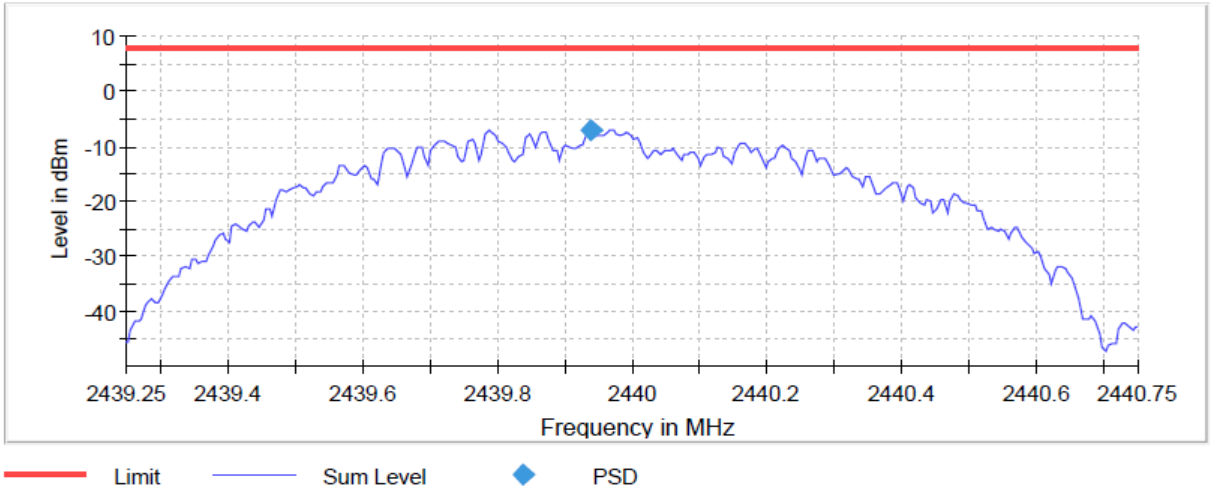
	Lowest frequency 2402 MHz	Middle frequency 2440 MHz	Highest frequency 2480 MHz
Power spectral density (dBm)	-6.217	-6.981	-6.778
Measurement uncertainty (dB)	<±0.78		

TEST RESULTS (Cont.):	

Low Channel:

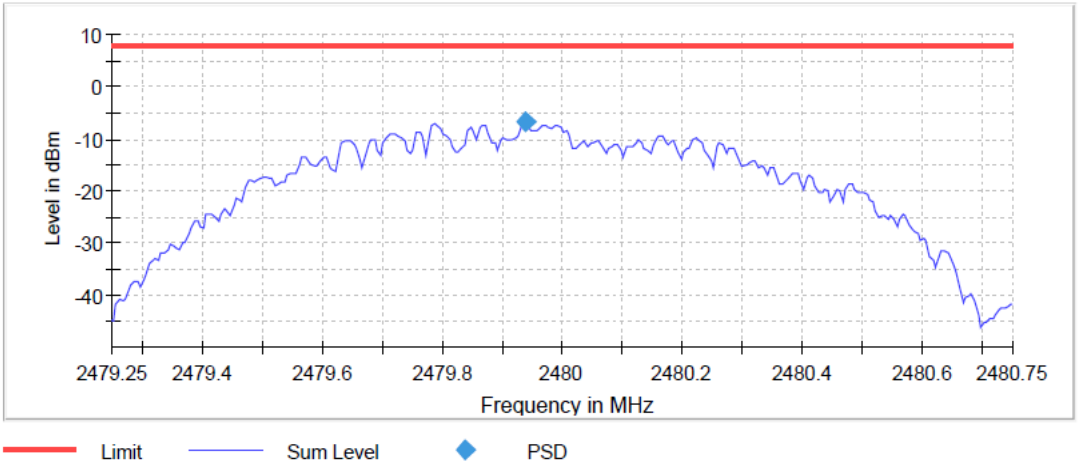


Mid Channel:



TEST RESULTS (Cont.):	

High Channel:



Measurement

Setting	Instrument Value	Instrument Value	Instrument Value
Start Frequency	2.40125 GHz	2.43925 GHz	2.47925 GHz
Stop Frequency	2.40275 GHz	2.44075 GHz	2.48075 GHz
Span	1.500 MHz	1.500 MHz	1.500 MHz
RBW	10.000 kHz	10.000 kHz	10.000 kHz
VBW	30.000 kHz	30.000 kHz	30.000 kHz
SweepPoints	300	300	300
Sweeptime	1.500 ms	1.500 ms	1.500 ms
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm
Attenuation	30.000 dB	30.000 dB	30.000 dB
Detector	MaxPeak	MaxPeak	MaxPeak
SweepCount	100	100	100
Filter	3 dB	3 dB	3 dB
Trace Mode	Max Hold	Max Hold	Max Hold
Sweeptype	Sweep	Sweep	Sweep
Preamp	off	off	off
Stablemode	Trace	Trace	Trace
Stablevalue	0.50 dB	0.50 dB	0.50 dB
Run	4 / max. 150	4 / max. 150	4 / max. 150
Stable	2 / 2	2 / 2	2 / 2
Max Stable Difference	0.22 dB	0.17 dB	0.21 dB

TEST A.6: EMISSION LIMITATIONS RADIATED (TRANSMITTER)

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

LIMITS

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

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

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

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

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

TEST SETUP

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

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

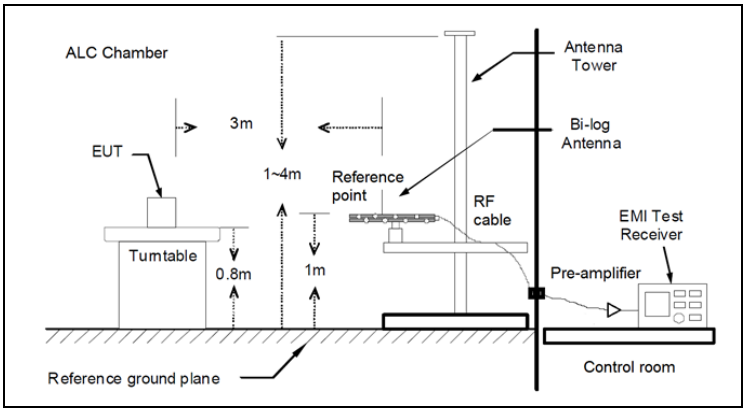
The equipment under test was set up on a non-conductive platform above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360º and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

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

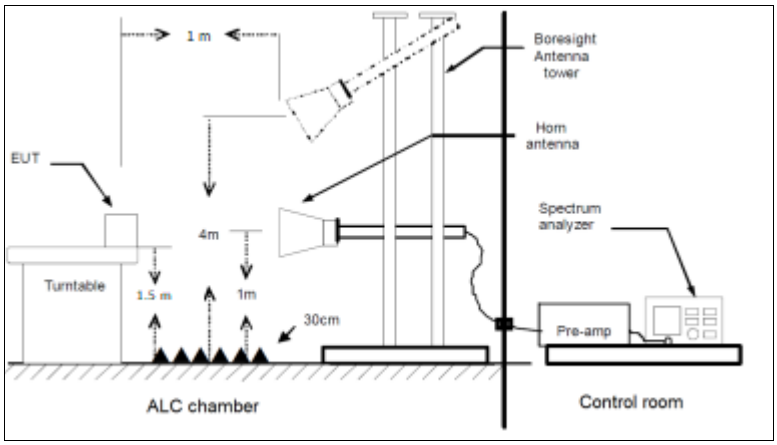
The field strength is calculated by adding correction factor to the measured level from the spectrum analyzer. This correction factor includes antenna factor, cable loss and pre-amplifiers gain.

TEST SETUP (CONT.)	

Radiated measurements Setup f < 1 GHz



Radiated measurements setup f > 1 GHz



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

Frequency range 30 MHz – 1000 MHz

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

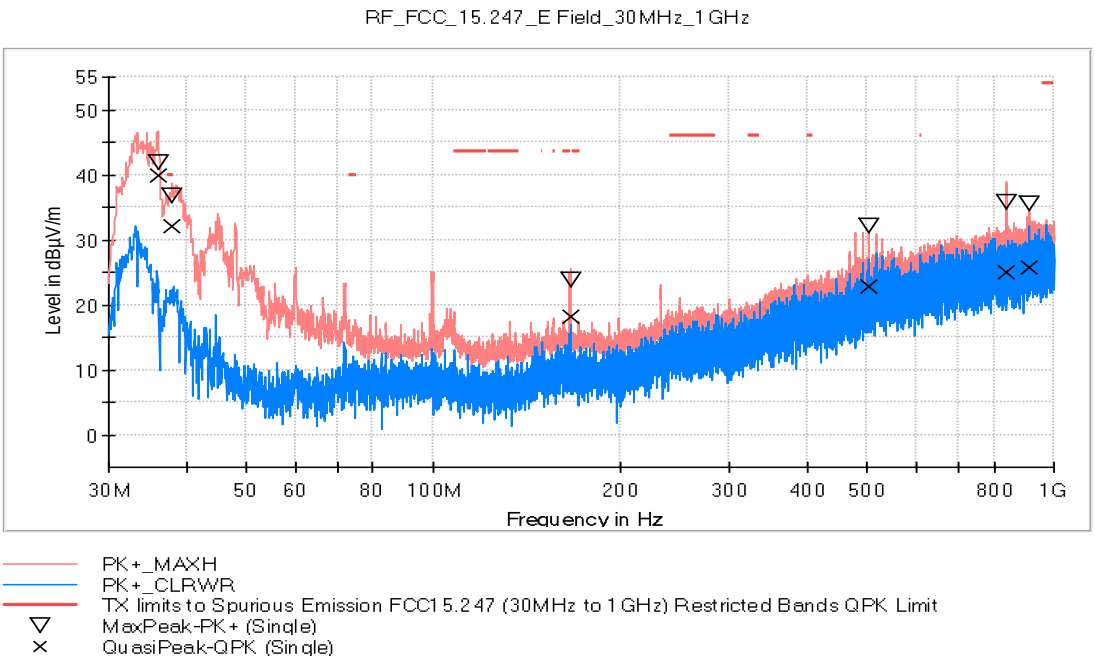
Frequency range 1 GHz – 18 GHz

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

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

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

CHANNEL: Lowest (2402 MHz)

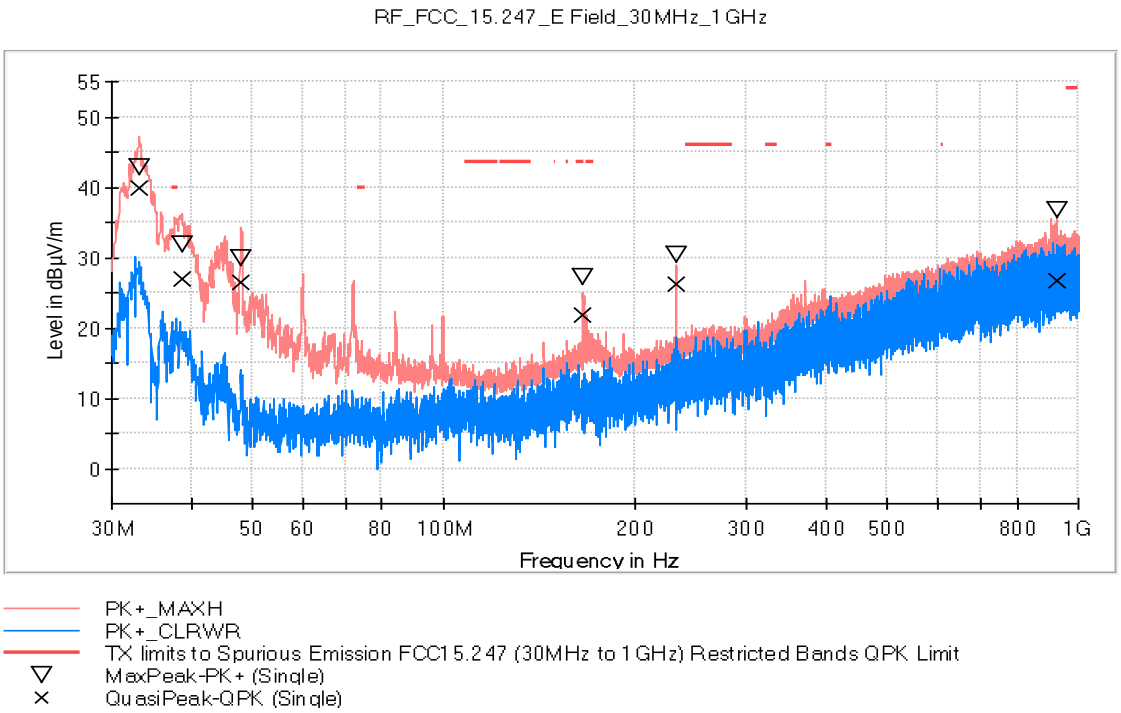


Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
908.868500	35.5	25.7	V
166.236500	23.9	18.1	V
836.603500	35.7	25.0	V
38.002500	36.7	32.0	V
35.965500	41.8	39.9	V
504.087500	32.1	22.9	V

TEST RESULTS (Cont.):	

CHANNEL: Middle (2440 MHz)

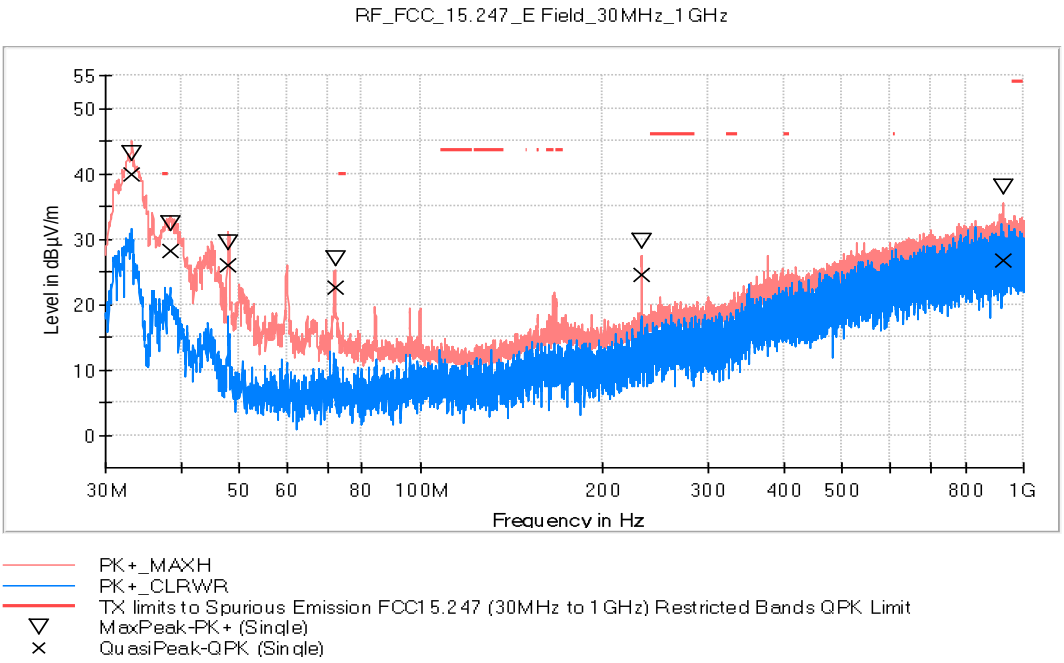


Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
33.152500	42.7	39.8	V
165.945500	27.1	21.9	V
38.681500	31.8	27.1	V
48.042000	29.8	26.5	V
232.778500	30.3	26.1	V
923.321500	36.6	26.8	V

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).



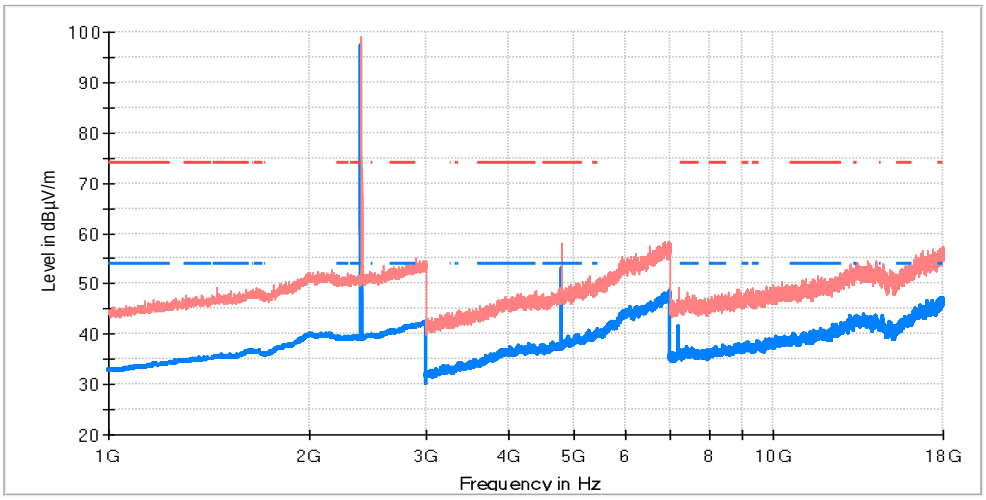
Result Table_Single

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Pol
47.993500	29.5	26.0	V
922.982000	38.0	26.8	V
38.439000	32.3	28.2	V
72.001000	27.0	22.6	V
33.152500	43.0	39.8	V
232.342000	29.5	24.6	V

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

CHANNEL: Lowest (2402 MHz)

1GHz_18GHz_ HP & VP_CH Low



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

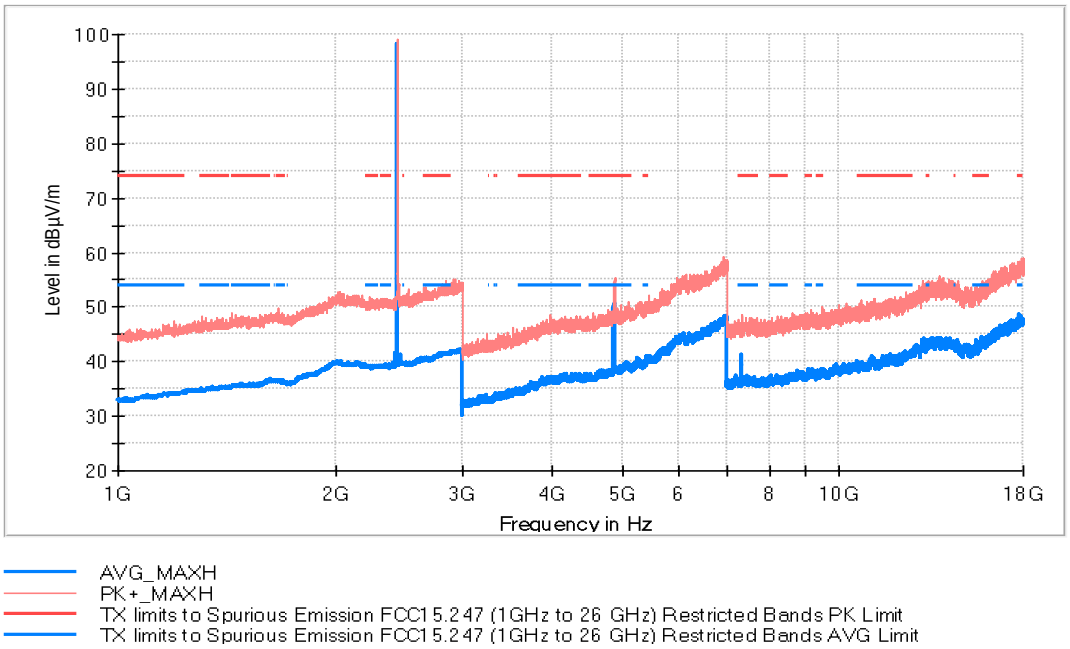
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2402.000000	98.98	97.41	H	Fundamental
4803.500000	57.94	53.00	H	
7205.500000	48.81	41.50	V	

TEST RESULTS (Cont.):	

CHANNEL: Middle (2440 MHz).

1GHz_18GHz_HP & VP_CH Mid



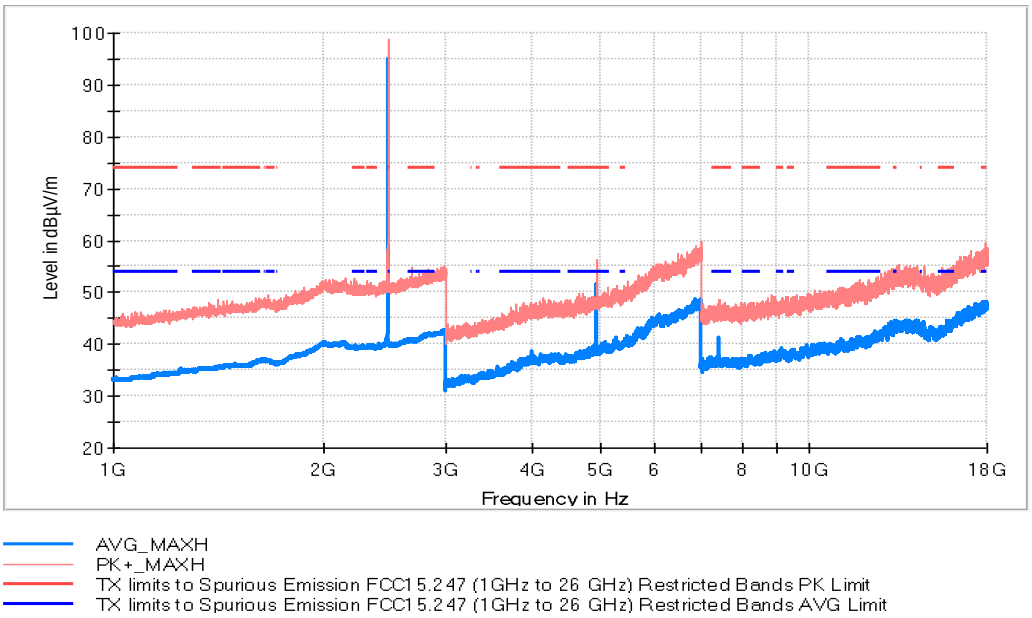
Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2440.000000	99.07	98.32	H	fundamental
4879.500000	55.52	50.68	H	
7319.000000	48.73	41.12	V	

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).

1GHz_18GHz_HP & VP_CH High

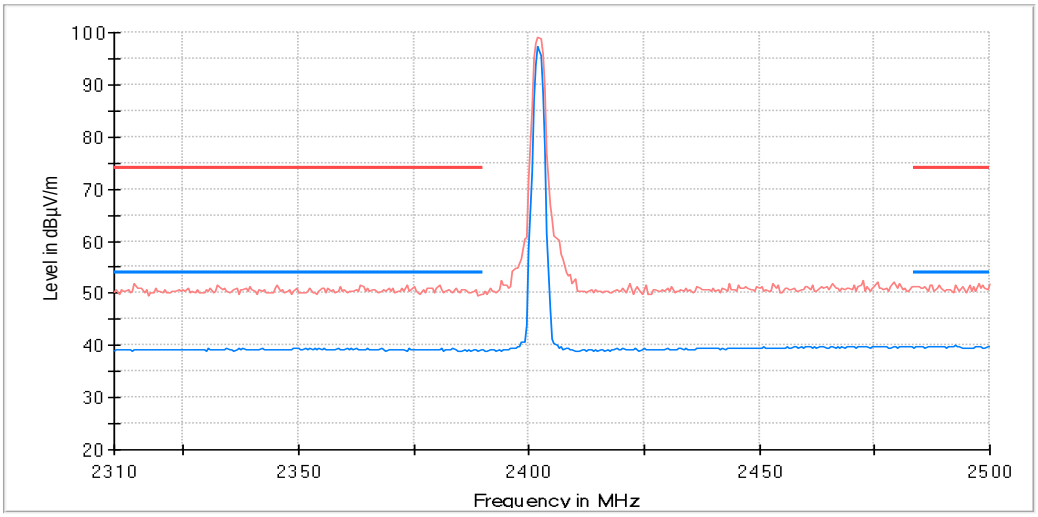


Maximizations

Frequency (MHz)	PK+_MAXH (dBµV/m)	AVG_MAXH (dBµV/m)	Pol	Comment
2480.000000	98.79	93.68	H	Fundamental
4960.000000	56.16	51.72	H	
7439.000000	48.68	41.22	V	

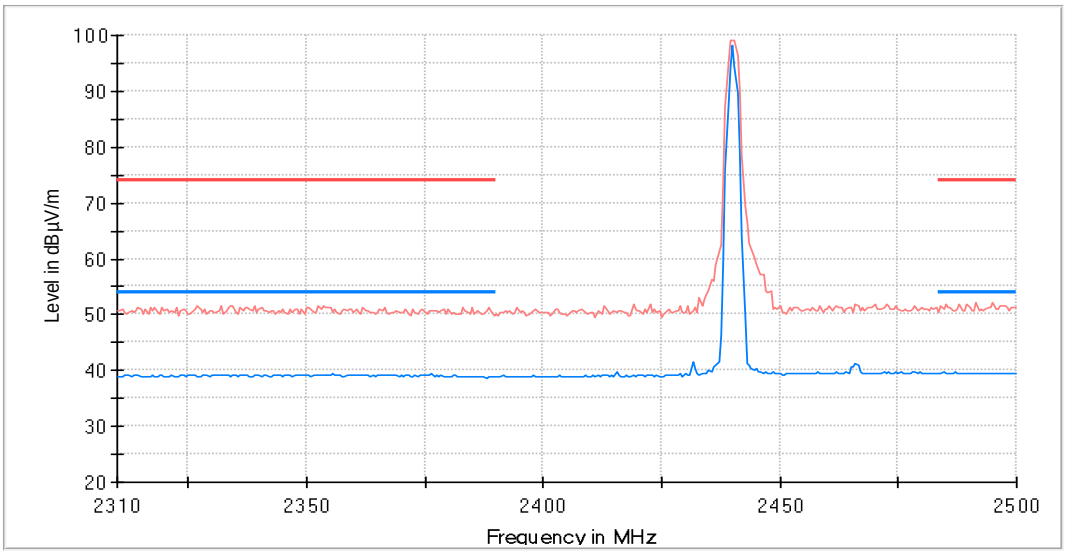
TEST RESULTS (Cont.):	RESTRICTED BAND (2.31 GHz to 2.5 GHz)

CHANNEL: Lowest (2402 MHz).



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

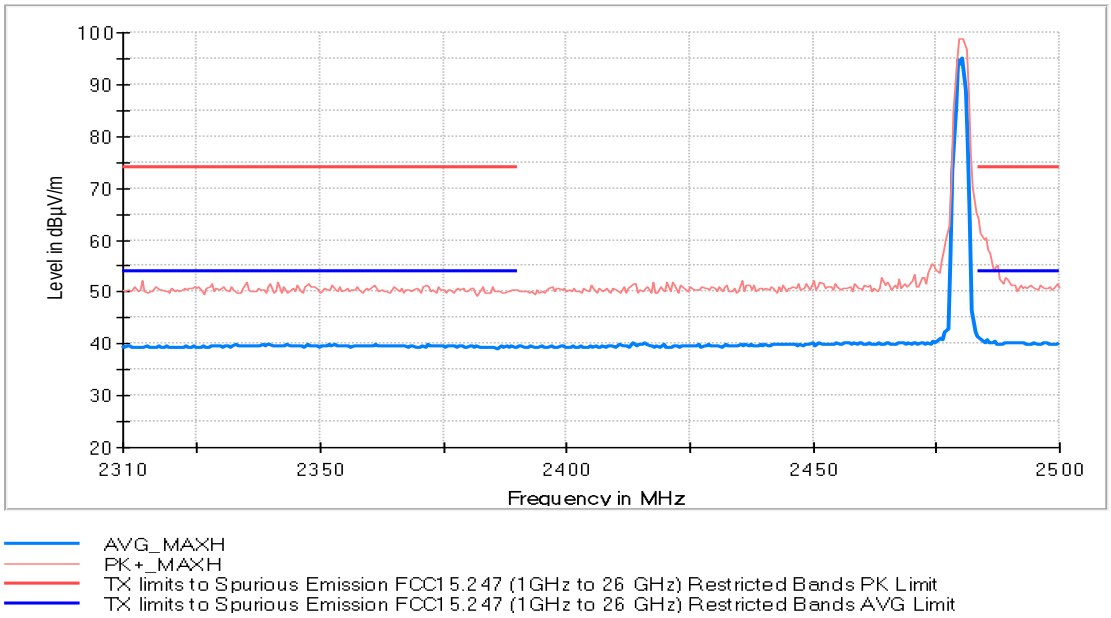
CHANNEL: Middle (2440 MHz).



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

TEST RESULTS (Cont.):	

CHANNEL: Highest (2480 MHz).



TEST A.7. CONTINOUS CONDUCTED EMISSION ON POWER LEADS

LIMITS:	Product standard:	FCC CFR 47, Part 15, Subpart B (10-1-18 Edition), Secs. 15.107 & ICES-003 Issue 6 – Update April (2017)
	Test standard:	FCC CFR 47, Part 15, Subpart B (10-1-18 Edition), Secs. 15.107 & ICES-003 Issue 6 – Update April (2017); ANSI C63.4 (2014)

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B (10-01-18 Edition), Secs. 15.107 & ICES Issue 6 (2017), in the frequency range 0,15 to 30 MHz, for Class B equipment was:

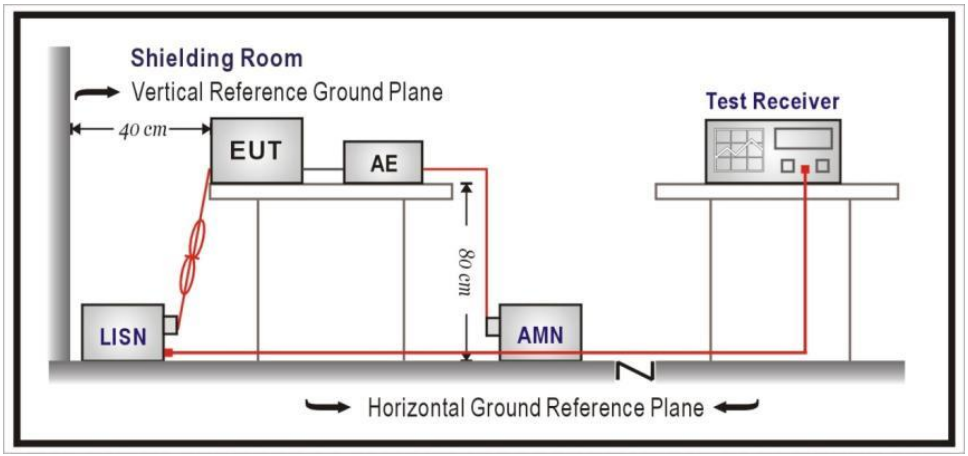
Frequency range (MHz)	**Limit**	
	Quasi-peak [dB(μV)[1)]]	**Average [dB(μV)[1)]]**
0,15 to 0,5	66-56 [2)]	56-46[2)]
0,5 to 5	56	46
5 to 30	60	50

[1)] At the transition frequency, the lower limit applies.
[2)] The limit decreases linearly with the logarithm of the frequency.

TEST SETUP	

The EUT is placed on the test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the reat of the EUT.

The EUT is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 ohms LISN port.

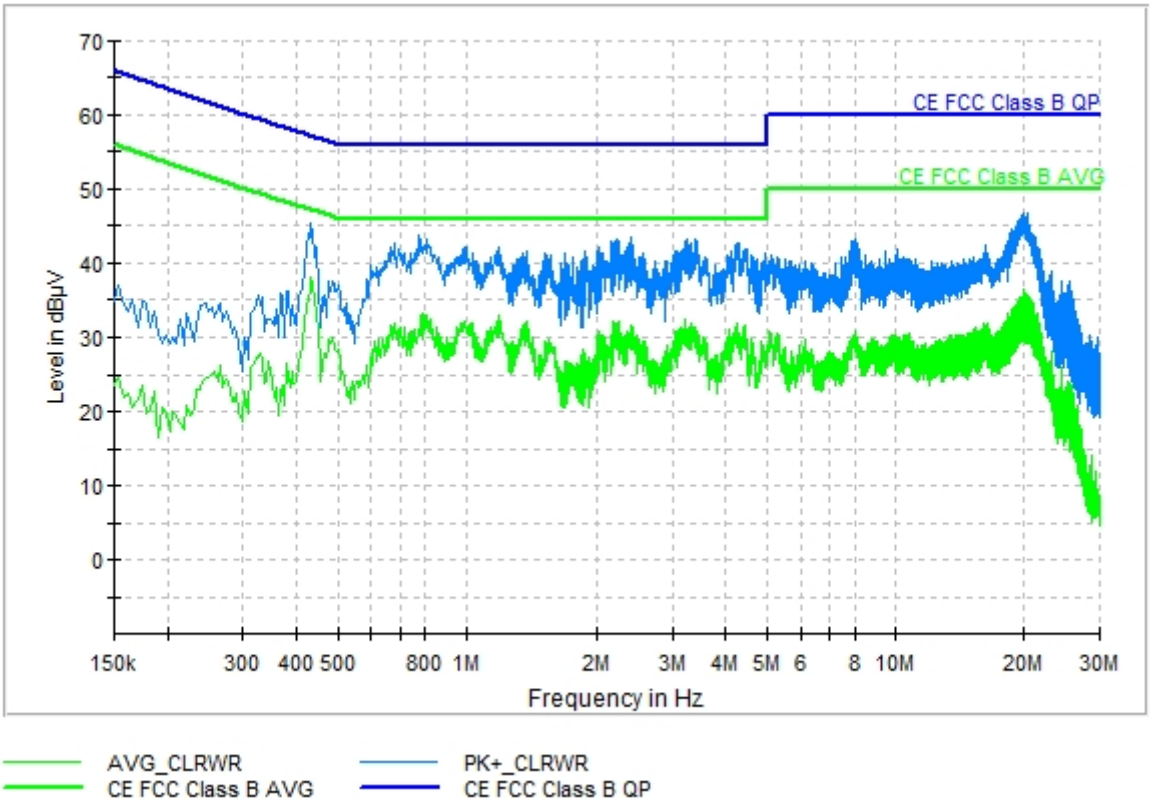


TESTED SAMPLES:	S/03
TESTED CONDITIONS MODES:	TC#02
TEST RESULTS:	CCmmnnhh: CC, Conducted Condition; mm: Sample number; nn: Test condition mode; hh: wire

CRmmnnhh	**DESCRIPTION**	**RESULT**
CC0302L1	Phase wire noise.	P
CC03020N	Neutral wire noise.	P

TEST RESULTS (Cont.):	CC0302L1

Project: 02579ERM002
Company: Haltian
Sample: S/03
Operation mode: TC#02
Description: EUT ON, BLE RX/TX mode charging with 120Vac to 5Vdc Adaptor, L1_wire

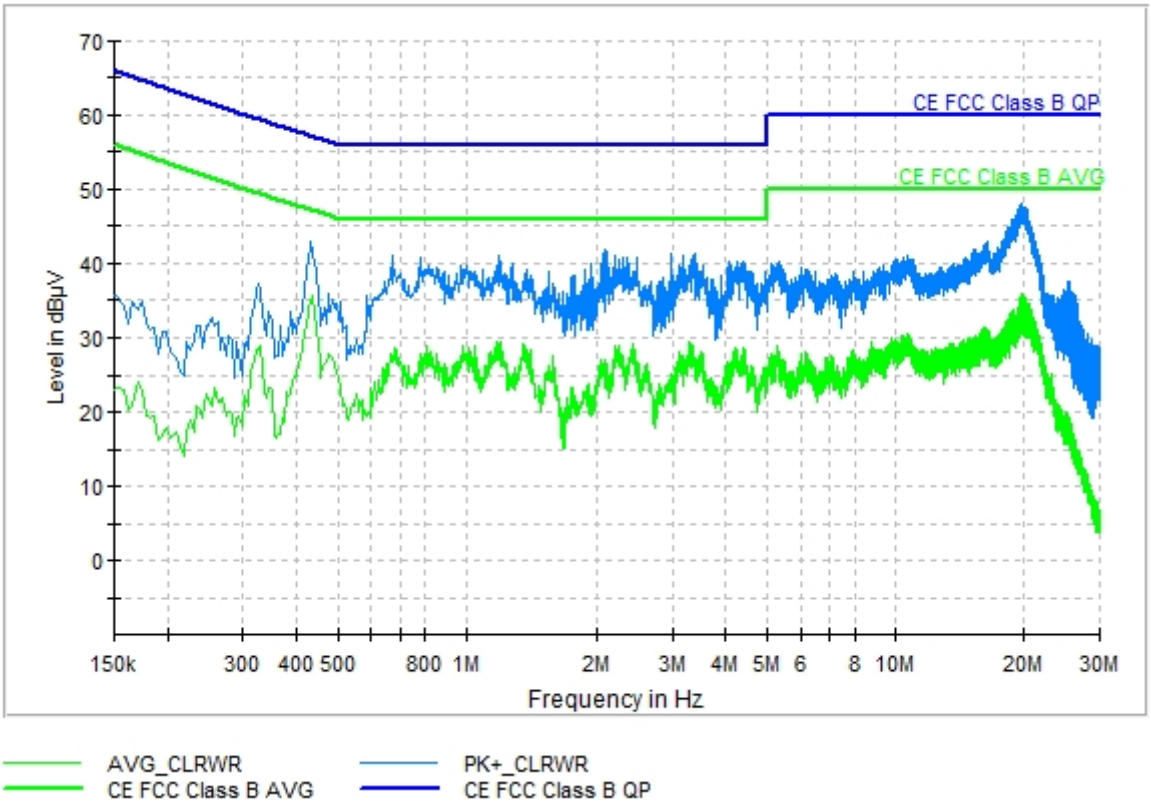


Maximizations

Frequency (MHz)	PK+_CLRWR (dBµV)	AVG_CLRWR (dBµV)
0.434000	45.5	38.1
3.246000	43.2	31.1
8.026000	43.0	30.7
10.066000	41.7	28.8
14.826000	40.4	28.9
16.274000	42.2	30.0
19.962000	46.8	32.8
21.130000	43.5	30.0
24.534000	37.4	25.1

TEST RESULTS (Cont.):	CC03020N

Project: 02579ERM002
Company: Haltian
Sample: S/03
Operation mode: TC#02
Description: EUT ON, BLE RX/TX mode charging with 120Vac to 5Vdc Adaptor, N_wire



Maximizations

vfrrtlk	PK+_CLRWR (dBµV)	AVG_CLRWR (dBµV)
0.434000	42.8	34.9
3.390000	41.4	26.8
6.186000	39.1	26.5
10.662000	41.1	28.3
15.034000	41.3	29.1
18.030000	44.1	28.5
19.698000	48.1	32.2
21.046000	43.5	32.4
25.522000	37.4	17.0