DEKRA Testing and Certification, S.A.U.
Parque Tecnológico de Andalucía,
c/ Severo Ochoa nº 2 · 29590 Campanillas · Málaga · España
C.I.F. A29507456

ISED CABid: ES1909

Test Report No:
NIE: 64670RRF.004A1

Test Report
USA FCC Part 15.247, 15.209
CANADA RSS-247, RSS-Gen

(*) Identification of item tested	Smart Cooking Sensor
(*) Trademark	Safera
(*) Model and /or type reference	Sense Pro (Model code: IFU10B-PRO)
Other identification of the product	HW Version: B SW Version: 1.0.25 FCC ID: 2AT88-2000021194
(*) Features	Bluetooth LE, 802.15.4 (ZigBee-type), Wi-Fi 802.11 b/g/n (HT20)
Manufacturer	SAFERA OY Tekniikantie 4 B, FI-02150 Espoo, Finland.
Test method requested, standard	USA FCC Part 15.247 (10-1-20 Edition): Operation within the bands 902 - 928 MHz, 2400 -2483.5 MHz, and 5725 - 5850 MHz. USA FCC Part 15.209 (10-1-20 Edition): Radiated emission limits; general requirements. CANADA RSS-247 Issue 2 (February 2017). CANADA RSS-Gen Issue 5 amendment 1 (March 2019). Guidance for Performing Compliance Measurements on Digital Transmission System, Frequency Hopping Spread Spectrum System, and Hybrid Systems Devices Operating Under Section 15.247 of the FCC Rules. 558074 D01 Meas Guidance v05r02 dated April 2, 2019. ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.
Summary	IN COMPLIANCE
Approved by (name / position & signature)	Rafael López EMC Consumer & RF Lab. Manager 2022.06.08 12:26:13 +02'00'
Date of issue	2022-06-08
Report template No	FDT08_24 (*) "Data provided by the client"

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DEKRA Testing and Certification S.A.U. is a testing laboratory accredited by the National Accreditation Body (ENAC -Entidad Nacional de Acreditación), to perform the tests indicated in the Certificate No. 51/LE 147.

DEKRA Testing and Certification is a FCC-recognized accredited testing laboratory with appropriate scope of accreditation that covers the performed tests in this report.

DEKRA Testing and Certification is an ISED-recognized accredited testing laboratory, CABid: ES1909, with the appropriate scope of accreditation that covers the performed tests in this report.

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DEKRA Testing and Certification S.A.U. 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 Testing and Certification S.A.U. at the time of performance of the test.

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

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General conditions

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

Uncertainty (factor k=2) was calculated according to the DEKRA Testing and Certification S.A.U. internal document PODT000.

Data provided by the client

The following data has been provided by the client:

1. Information relating to the description of the sample ("Identification of the item tested", "Trademark", "Model and/or type reference tested").
2. The sample Safera Sense is a Smart Cooking Sensor with the following main features:
   Sensors for monitoring the stove area and detecting cooking processes, as well as estimating indoor air quality. Processor and algorithms for detecting stove overheating, which will result in an audible alarm. Support for Bluetooth communication to smartphones and iOS / Android application in order to visualize data. Support for proprietary 802.15.4 based radio protocol for controlling some Safera Accessories (for example Power Control Unit for Stove). Support for Wi-Fi for connection to Safera Cloud or other Internet of Things -services.

DEKRA Testing and Certification S.A.U. 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
64670/027	Smart Cooking Sensor	Sense Pro	--	2020-04-17

Sample S/01 has undergone the following test(s): The RADIATED tests indicated in Appendix A.

- Sample S/02 is composed of the following elements:

Control Nº	Description	Model	Serial Nº	Date of reception
64670/032	Smart Cooking Sensor	Sense Pro	--	2020-11-20

Sample S/02 has undergone the following test(s): The CONDUCTED tests indicated in Appendix A.

Test sample description

Ports…… :	Port name and description		Cable				
			Specified length [m]	Attached during test	Shielded		
	N/A			☐	☐		
Rated power supply .....:	Voltage and Frequency		Reference poles				
			L1	L2	L3	N	PE
	☐	AC:	☐	☐	☐	☐	☐
	☒	DC: For the final product: 3 x AA Alkaline batteries as power supply. Operational voltage from 3.0 V to 5.0 V. For testing purposes, power is wired externally to some sample units. This is done to make it possible to use an external power supply. When using an external power supply, allowed voltages are 3.0 VDC to 5.0 VDC.					
Rated Power .....:	Normal operating mode: approx. 0.1 mA average Max. short term current consumption 150 mA Max. very short peak current consumption approx. 400 mA (ms level)						
Clock frequencies.....:	64 MHz main processor clock (nRF52840) 80-160 MHz auxiliary network processor clock (ESP8285) 32.768 kHz RTC auxiliary clock						
Other parameters .....:	Not provided data						
Software version .....:	1.0.25						
Hardware version .....:	B						
Dimensions in mm (W x H 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		
	Sensor Unit				Safera		
Accessories (not part of the test item) .....:	Description		Type		Manufacturer		
	Power supply						
	Batteries						
Documents as provided by the applicant .....:	Description		File name		Issue date		
	User Manual						

(3) Only for Medical Equipment

Identification of the client

SAFERA OY
Tekniikantie 4 B, FI-02150 Espoo, Finland.

Testing period and place

Test Location	DEKRA Testing and Certification S.A.U.
Date (start)	2020-11-26
Date (finish)	2020-11-28

Document history

Report number	Date	Description
64670RRF.004	2021-12-23	First release.
64670RRF.004A1	2022-06-07	Second release. Updating equipment settings. This modification test report cancels and replaces the test report 64670RRF.004s.

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. = 20 % Max. = 75 %

In the semianechoic chamber, the following limits were not exceeded during the test.

Temperature	Min. = 15 ºC Max. = 35 ºC
Relative humidity	Min. = 20 % Max. = 75 %

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. = 20 % Max. = 75 %

Remarks and comments

The tests have been performed by the technical personnel: Alfonso Gutiérrez Martínez and Cristina Calle Villarrazo.

Used instrumentation:

Conducted Measurements

		Last Calibration	Due Calibration
1.	Shielded Room ETS LINDGREN S101	N/A	N/A
2.	Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2021/02	2023/02
3.	Open Switch Unit up to 40 GHz ROHDE AND SCHWARZ OSP-B157Wx	N.A.	N.A.
4.	Open Switch Unit up to 7.5GHz ROHDE AND SCHWARZ OSP-B157W8 PLUS	2021/08	2023/08
5.	Analog Power Supply DC 40V/40A NGPE 40/40 Rohde and Schwarz	N/A	N/A
6.	Digital multimeter FLUKE 179	2021/06	2022/06

Radiated Measurements:

		Last Calibration	Due Calibration
1.	Semianechoic Absorber Lined Chamber ETS LINDGREN FACT 3 200 STP	N/A	N/A
2.	Shielded Room ETS LINDGREN S101	N/A	N/A
3.	Biconical/Log Antenna 30 MHz - 6 GHz ETS LINDGREN 3142E	2020/04	2023/04
4.	Preamplifier G>40dB 10MHz-6GHz, BONN ELEKTRONIK, BLNA 0160-01N	2021/03	2022/03
5.	EMI Test Receiver, 9kHz-7GHz, ROHDE AND SCHWARZ ESR7	2021/11	2023/11
6.	Horn Antenna 1-18 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9120 D	2019/11	2022/11
7.	RF Preamplifier, G>40 dB ,1-18 GHz BONN ELEKTRONIK BLMA 0118-1M	2021/06	2022/06
8.	Horn Antenna 18-40 GHz SCHWARZBECK MESS-ELEKTRONIK BBHA 9170	2020/05	2023/05
9	RF Preamplifier, G>30 dB ,18-40 GHz BONN ELEKTRONIK BLMA 1840-3G	2019/11	2021/11
10.	Signal and Spectrum Analyzer 10 Hz - 40 GHz ROHDE AND SCHWARZ FSV40	2021/10	2023/10
11.	DC Power Supply, 30V/5A KEYSIGHT TECHNOLOGIES U8002A	N/A	N/A
12.	Digital Multimeter FLUKE 175	2021/11	2022/11

Testing verdicts

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

Summary

802.15.4 (ZigBee)

Requirement – Test case	FCC PART 15 PARAGRAPH / RSS-247	Verdict	Remark
RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth		Pass	
RSS-247 5.4 (d) / FCC 15.247 (b) (3) Maximum Peak Conducted output power		Pass	
RSS-247 5.2 (b) / FCC 15.247 (e) Power Spectral Density		Pass	
RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)		Pass	
RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)		Pass	
99dBw Occupied Channel Bandwidth 99%		Pass	
Supplementary information and remarks: None			

Appendix A: Test results. 802.15.4 (ZigBee)

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RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter) 28
Occupied Channel Bandwidth 99% 38

TEST CONDITIONS

(*): Data provided by the client.

POWER SUPPLY (*):

Vnominal:	4.5 V DC
Type of Power Supply:	External power supply

ANTENNA (*):

Type of Antenna:	Integral
Maximum Declared Antenna Gain:	1.5 dBi

TEST FREQUENCIES (*):

Low Channel:	2405 MHz
Middle Channel:	2445 MHz
High Channel:	2480 MHz

CONDUCTED MEASUREMENTS:

The equipment under test was set up in a shielded room and it is connected to the TS8997 using a low loss RF cable. The reading of the spectrum analyser is corrected taking into account the cable loss.

RADIATED MEASUREMENTS:

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna (Bilog antenna for the range between 30 MHz to 1000 MHz and 1 GHz-17 GHz Double ridge horn antenna) is situated at a distance of 3 m and at a distance of 1 m for the frequency range 17 GHz-26 GHz (antenna and 18 GHz-40 GHz horn antenna).

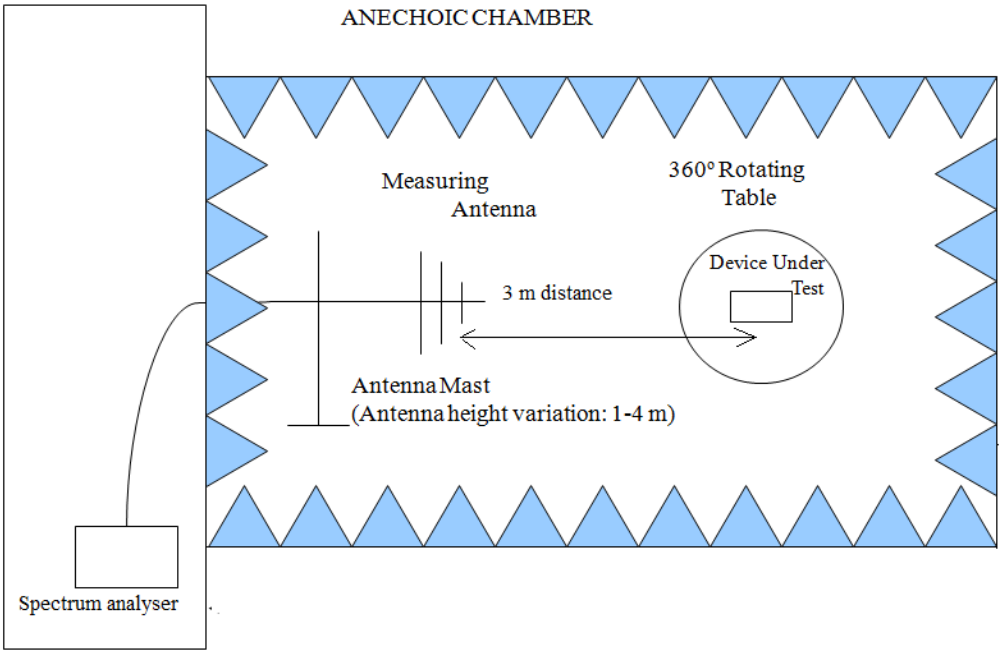
For radiated emissions in the range 17 GHz-26 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

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

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

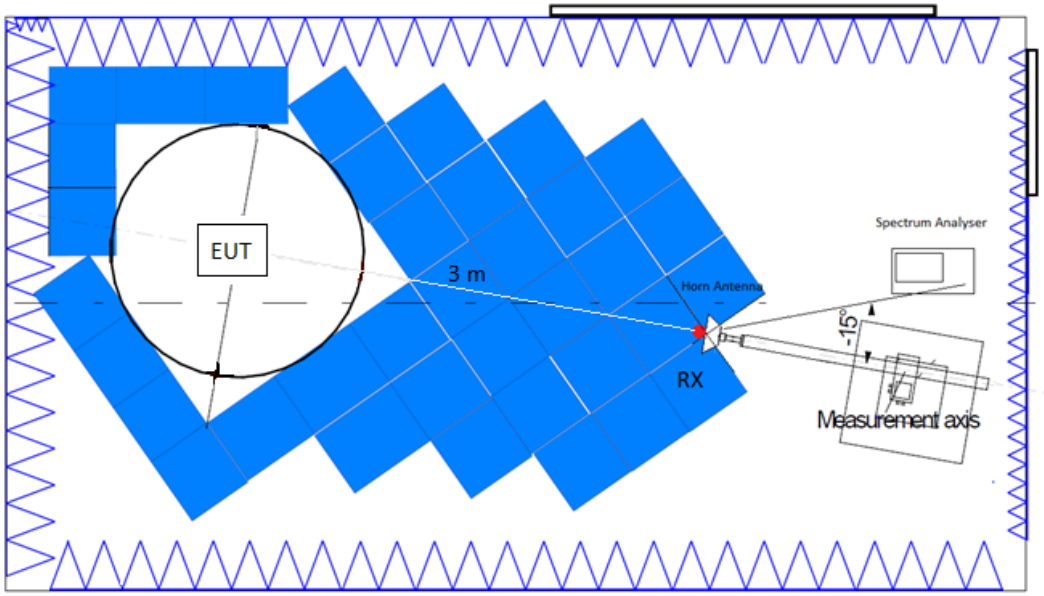
A resolution bandwidth/video bandwidth of 100 kHz / 300 kHz was used for frequencies below 1 GHz and 1 MHz / 3 MHz for frequencies above 1 GHz.

Radiated measurements setup from 30 MHz to 1 GHz:

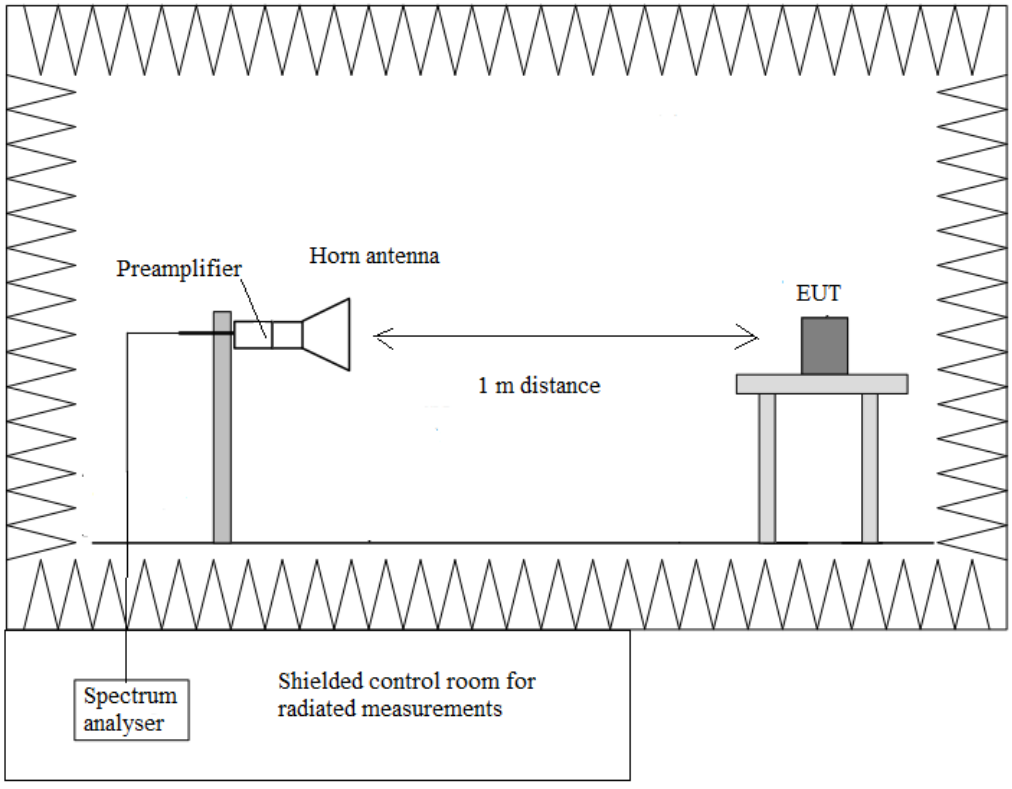


Shielded Control Room For Radiated Measurements

Radiated measurements setup from 1 GHz to 17 GHz:



Radiated measurements setup f > 17 GHz:



TEST CASES DETAILS

FCC 47 CFR Part 15.247 / RSS-247

RSS-247 5.2 (a) / FCC 15.247 (a) (2) 6 dB Bandwidth

Limits

The minimum 6 dB bandwidth shall be at least 500 kHz.

Results

Modulation: 802.15.4 (ZigBee)

Operation Band (MHz)	Equipment	Freq (MHz)	6dBw (MHz)
[2400, 2483.5]	Digital Transmission System (DTS)	2405.00	1.505
[2400, 2483.5]	Digital Transmission System (DTS)	2445.00	1.465
[2400, 2483.5]	Digital Transmission System (DTS)	2480.00	1.505

Verdict

Pass

Uncertainty 1.40%

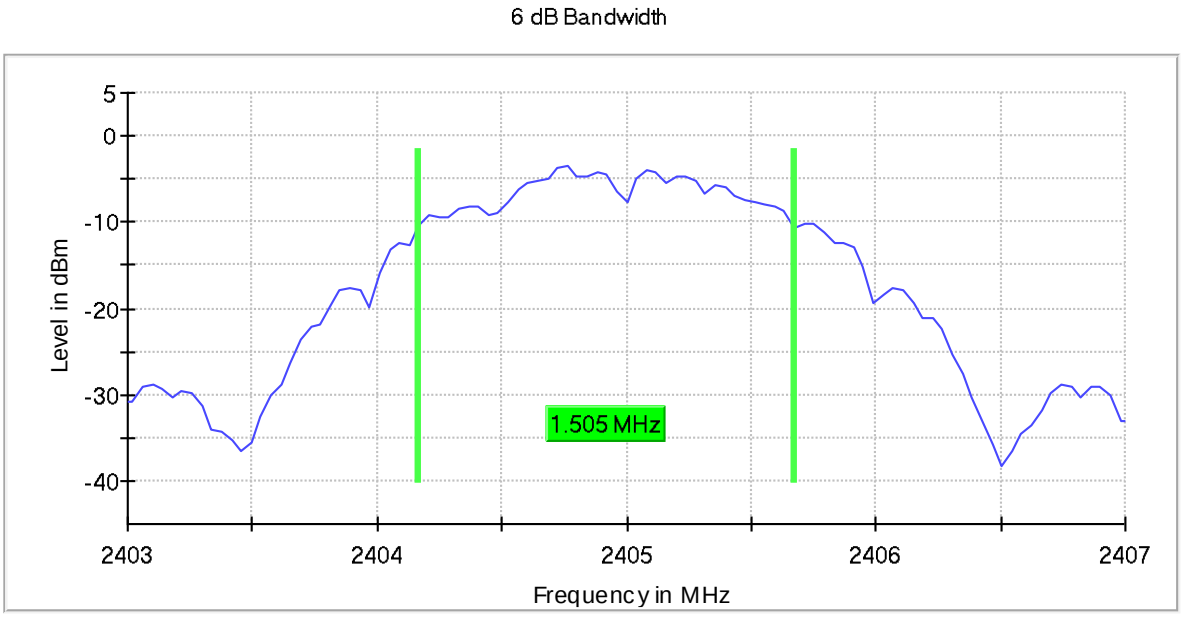
Attachments

Spectrum analyzer settings:

Setting	ZigBee
Span	4.000 MHz
RBW	100.000 kHz
VBW	300.000 kHz
SweepPoints	101
Sweeptime	18.938 µs
Reference Level	0.000 dBm
Detector	MaxPeak
Trace Mode	Max Hold

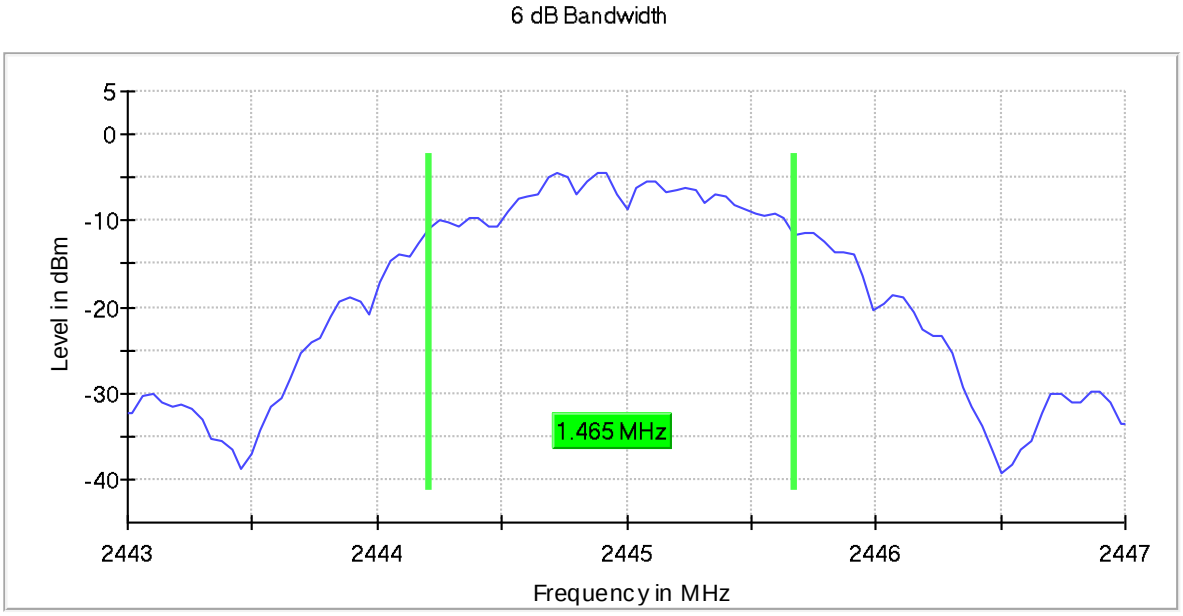
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



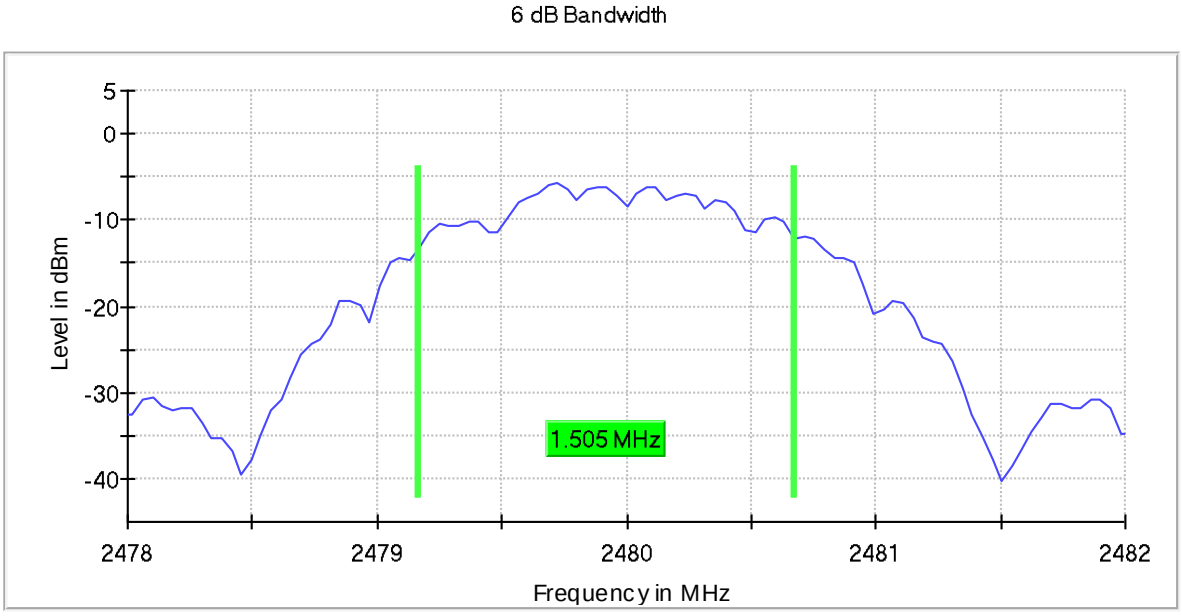
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2445.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



RSS-247 5.4 (d) / FCC 15.247 (b) (3) Maximum Peak Conducted output power

Limits

For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt (30 dBm).

The e.i.r.p. shall not exceed 4 W (36 dBm) (Canada).

Results

The maximum peak conducted output power level in the fundamental emission was measured using the method according to point 11.9.1.1 ”RBW ≥ DTS bandwidth” of ANSI C.63.10-2013.

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

Maximum Declared Antenna Gain: 1.5 dBi

Modulation: 802.15.4 (ZigBee)

Operation Band (MHz)	Equipment	Freq (MHz)	Max Conducted Power (dBm)	Max E.I.R.P (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2405.00	0.2	1.7
[2400, 2483.5]	Digital Transmission System (DTS)	2445.00	-1.1	0.4
[2400, 2483.5]	Digital Transmission System (DTS)	2480.00	-1.7	-0.2

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.

Verdict

Pass

Uncertainty 0.99dB

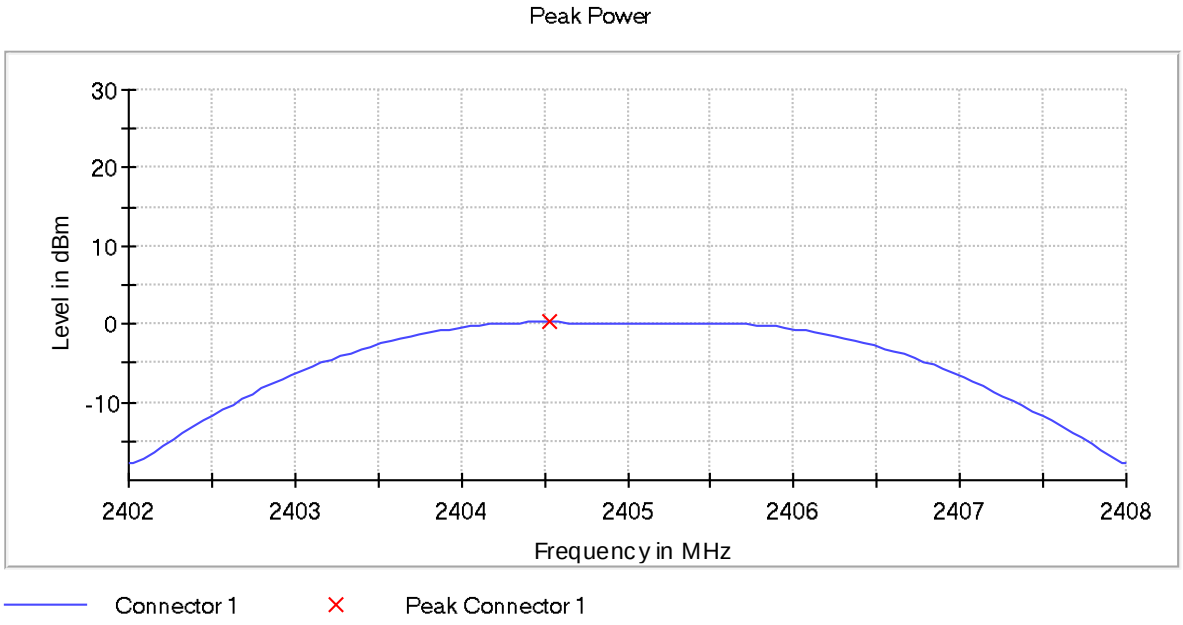
Attachments

Spectrum analyzer settings:

Setting	ZigBee
Span	6.000 MHz
RBW	2.000 MHz
VBW	10.000 MHz
SweepPoints	101
Sweeptime	953.450 ns
Reference Level	10.000 dBm
Detector	MaxPeak
Trace Mode	Max Hold

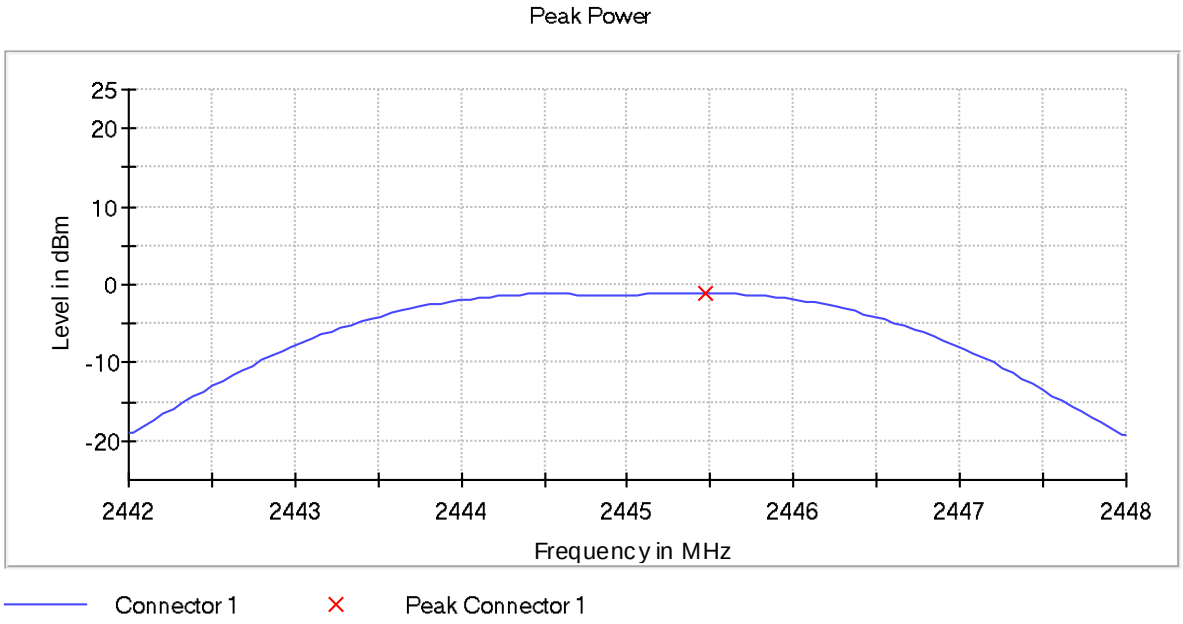
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



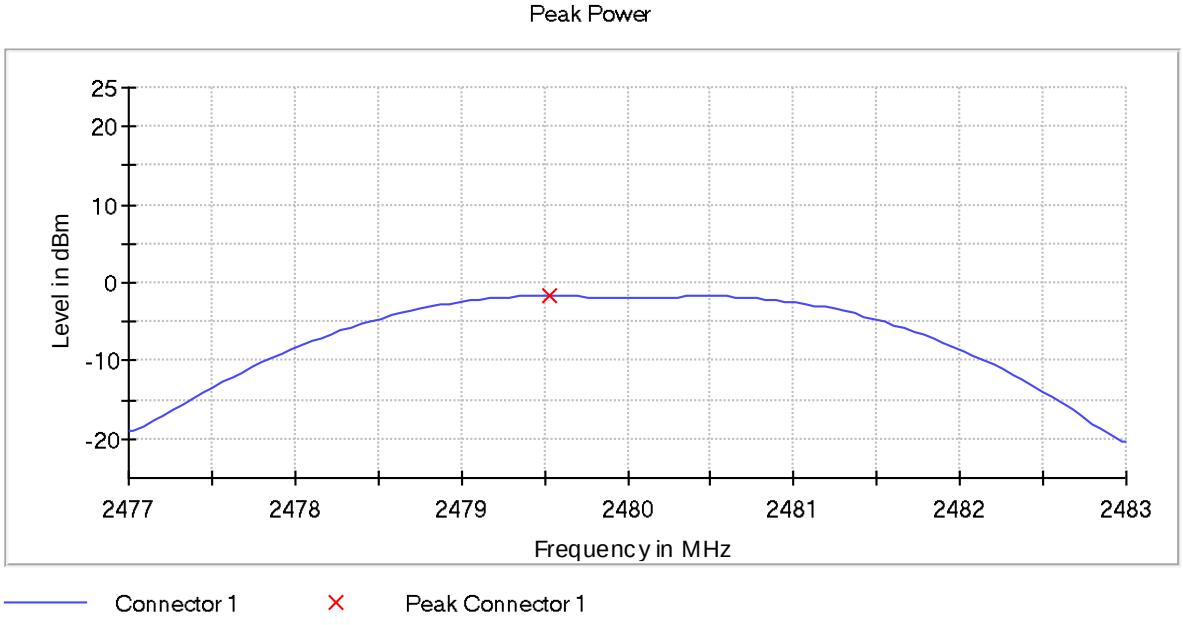
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2445.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



RSS-247 5.2 (b) / FCC 15.247 (e) Power Spectral Density

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.

Results

The maximum power spectral density level in the fundamental emission was measured using the method according to point 11.10.2." Method PKPSD (peak PSD)" of ANSI C.63.10-2013.

Modulation: 802.15.4 (ZigBee)

Operation Band (MHz)	Equipment	Freq (MHz)	Power Spectral Density (dBm)
[2400, 2483.5]	Digital Transmission System (DTS)	2405.00	-8.752
[2400, 2483.5]	Digital Transmission System (DTS)	2445.00	-10.114
[2400, 2483.5]	Digital Transmission System (DTS)	2480.00	-10.770

Verdict

Pass

Uncertainty 0.99dB

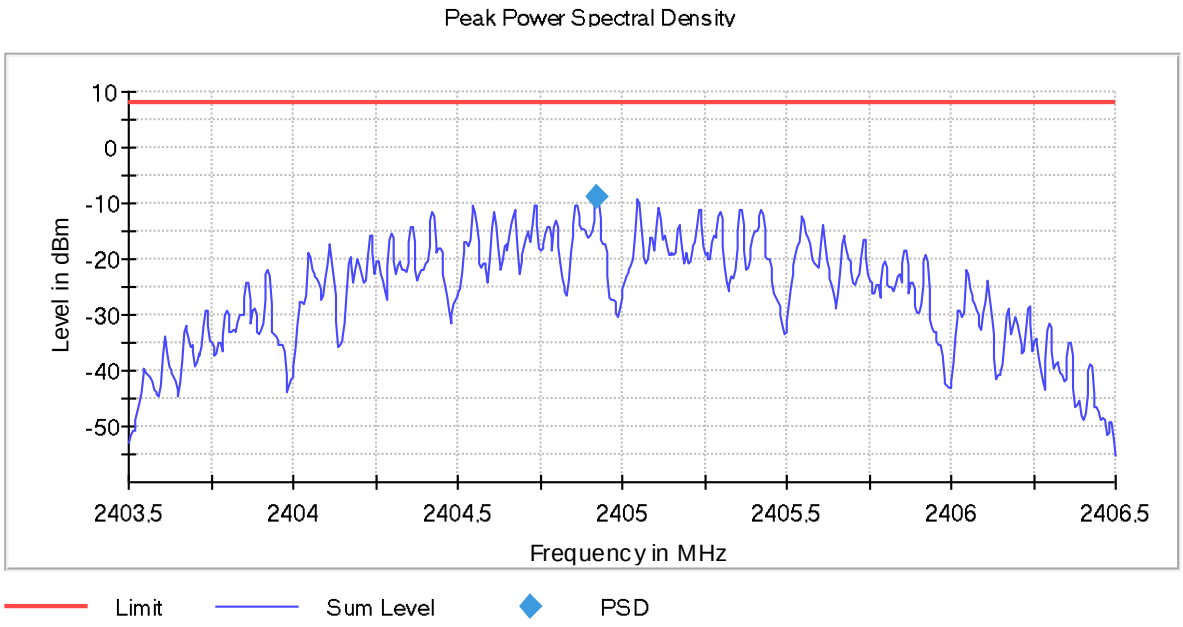
Attachments

Spectrum analyzer settings:

Setting	ZigBee
Span	3.000 MHz
RBW	10.000 kHz
VBW	30.000 kHz
SweepPoints	600
Sweeptime	3.000 ms
Reference Level	0.000 dBm
Detector	MaxPeak
Trace Mode	Max Hold

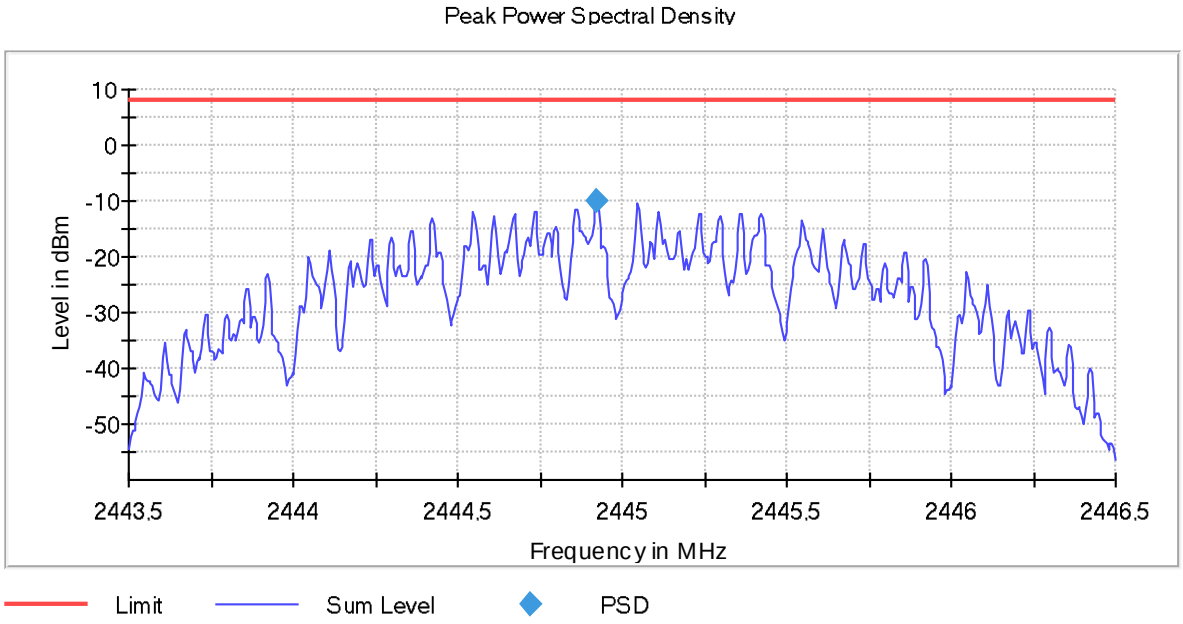
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



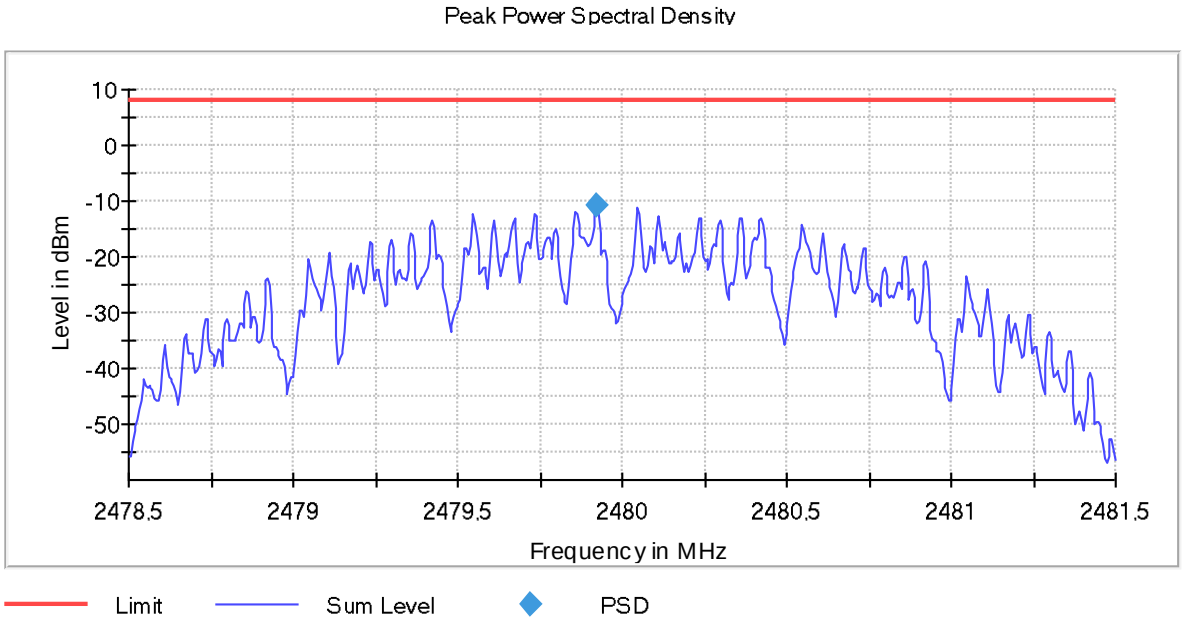
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2445.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



RSS-247 5.5 / FCC 15.247 (d) Band-edge emissions compliance (Transmitter)

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 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

Results

Modulation: 802.15.4 (ZigBee)

Verdict

Pass

Uncertainty 0.89dB

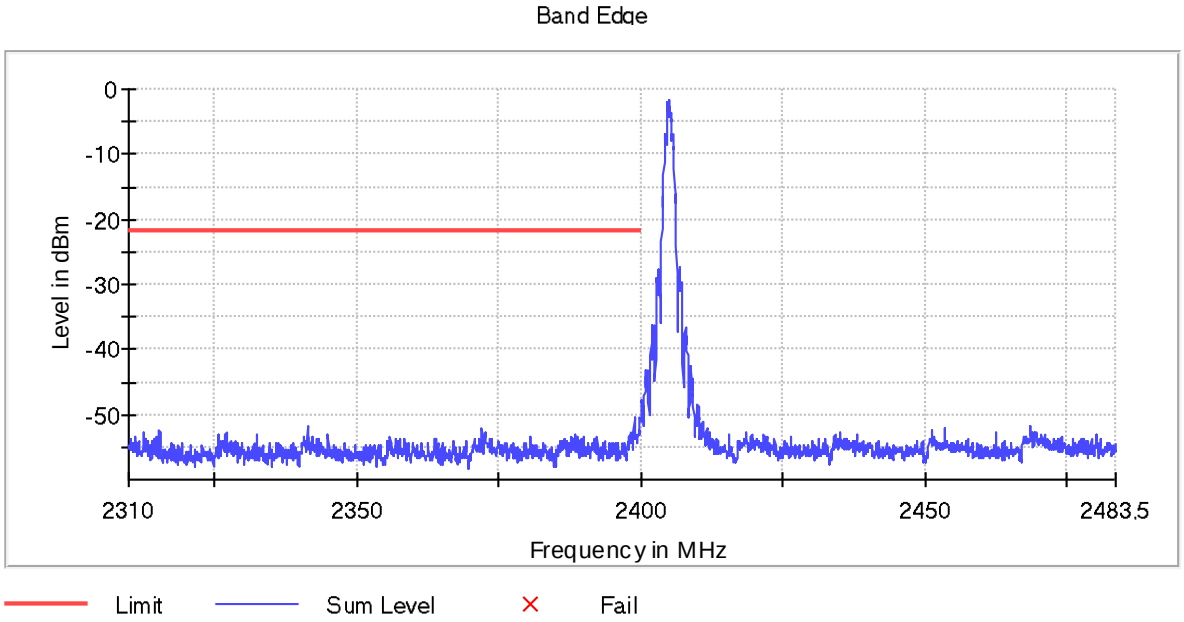
Attachments

Spectrum analyzer settings:

Setting	ZigBee (Low Channel)		ZigBee (High Channel)	
	Measurement 1	Measurement 2	Measurement 1	Measurement 2
Start Frequency	2.31000 GHz	2.40000 GHz	2.40000 GHz	2.48350 GHz
Stop Frequency	2.40000 GHz	2.48350 GHz	2.48350 GHz	2.50000 GHz
Span	90.000 MHz	83.500 MHz	83.500 MHz	16.500 MHz
RBW	100.000 kHz	100.000 kHz	100.000 kHz	100.000 kHz
VBW	300.000 kHz	300.000 kHz	300.000 kHz	300.000 kHz
SweepPoints	1800	1670	1670	330
Sweeptime	113.672 µs	94.727 µs	94.727 µs	18.945 µs
Reference Level	10.000 dBm	10.000 dBm	10.000 dBm	10.000 dBm
Detector	MaxPeak	MaxPeak	MaxPeak	MaxPeak
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold

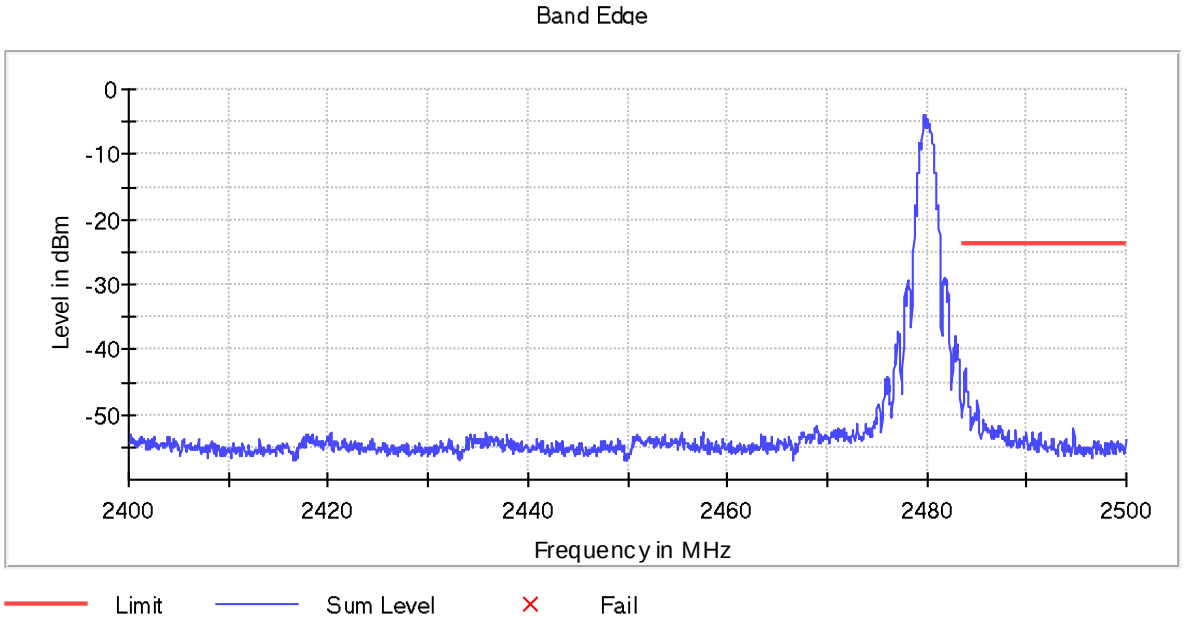
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1, Measurement Point = 1

Images:

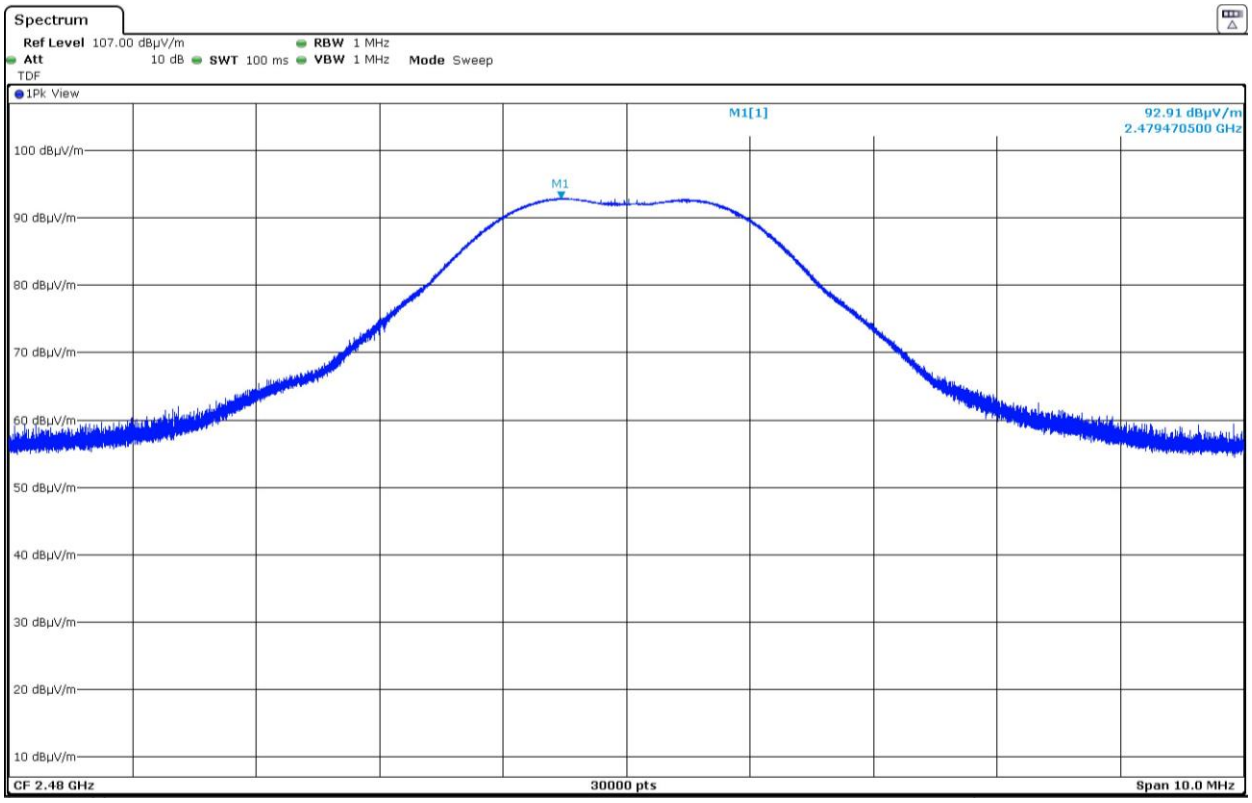


Band-edge compliance of radiated emissions.

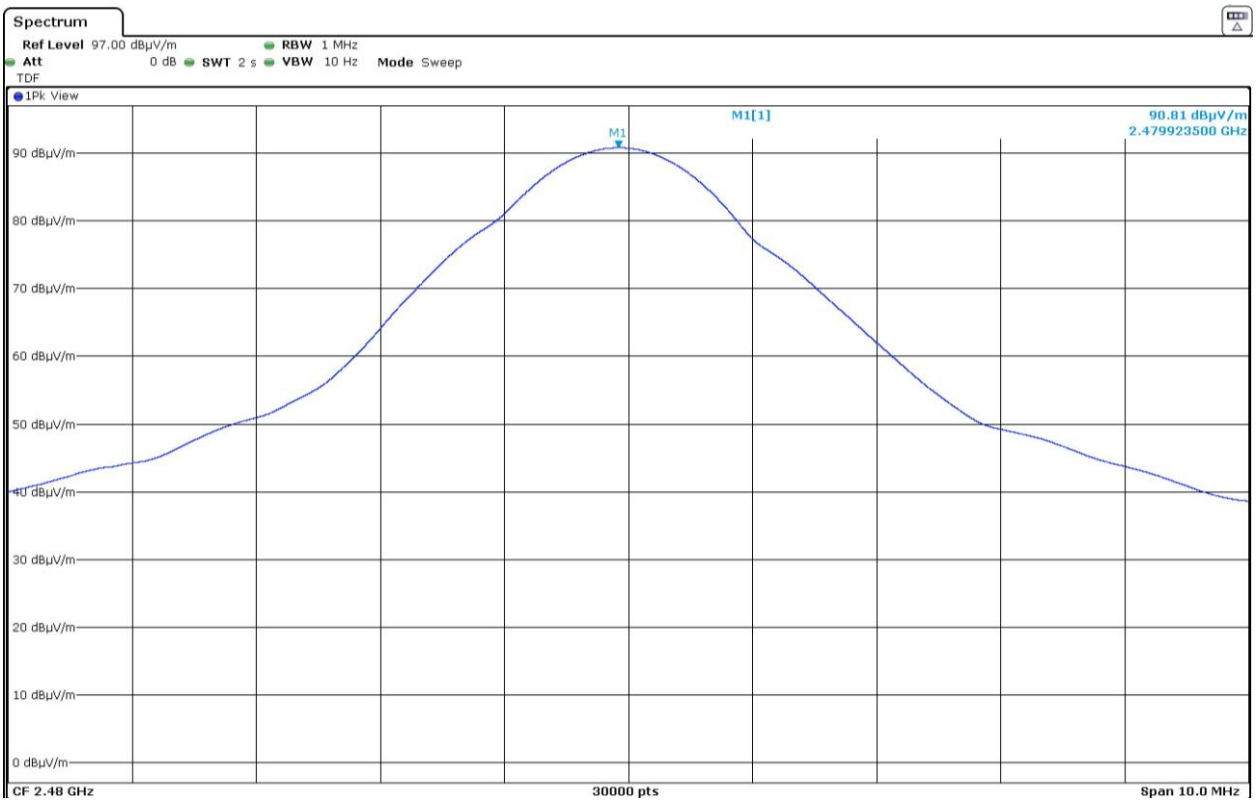
Maximum peak and average field strength of fundamental emission at 3 m distance

Channel 2480

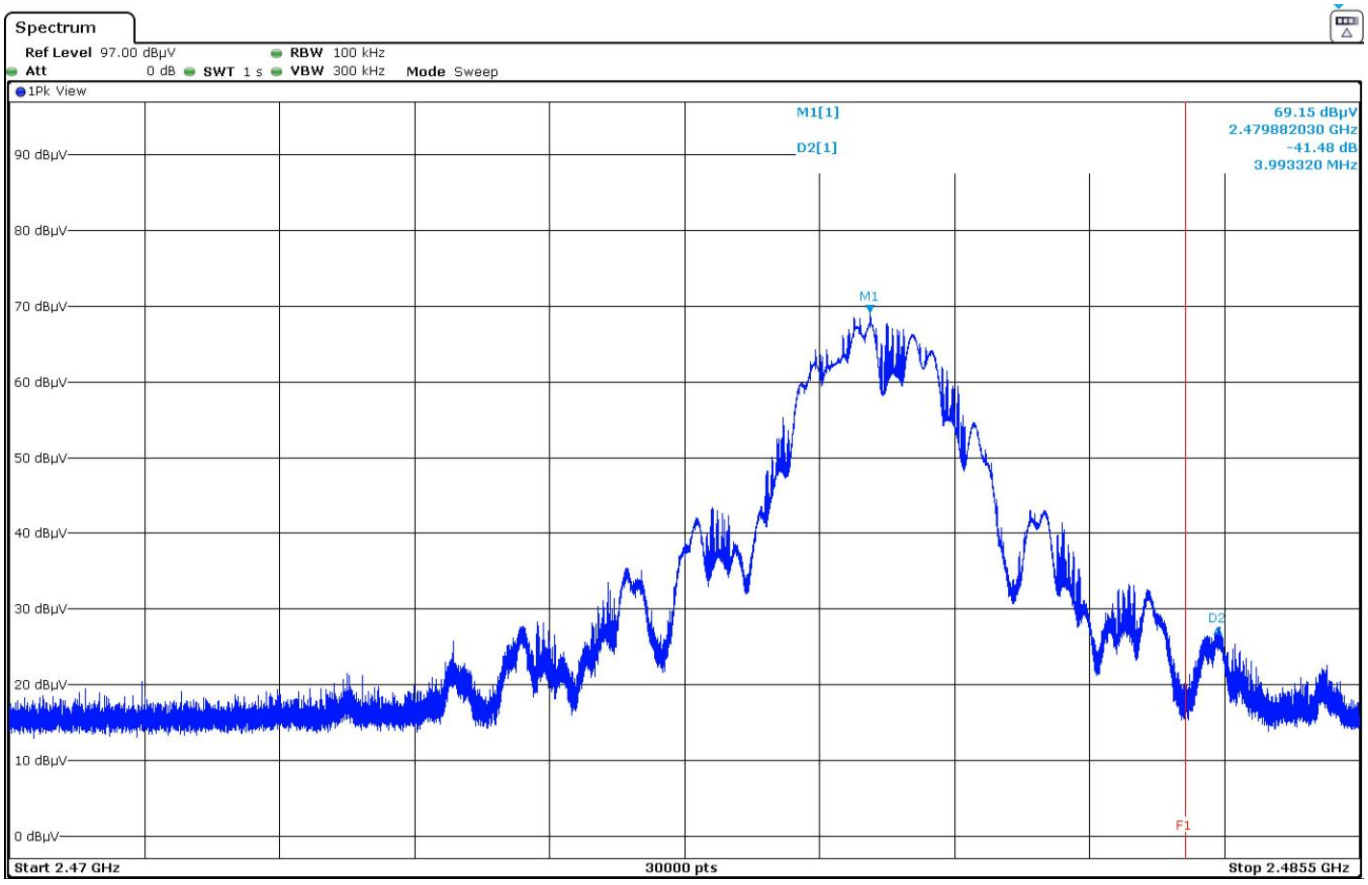
Maximum field strength at 3 m. Peak value:



Maximum field strength at 3 m. Average value:



BAND-EDGE COMPLIANCE. RADIATED. Marker-Delta Method.



Note: No correction is applied for this relative measurement.

Band edge compliance of radiated emissions

Fundamental max. Peak value 3 m	Delta value	Calculated value 3 m	Limit
92.91 dBµV/m	41.48 dB	51.43 dBµV/m	74 dBµV/m

Fundamental max. average value 3 m	Delta value	Calculated value 3 m	Limit
90.81 dBµV/m	41.48 dB	49.33 dBµV/m	54 dBµV/m

RSS-247 5.5 / FCC 15.247 (d) Emission limitations radiated (Transmitter)

Limits

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 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 - 10000	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.

Results

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.

All tests were performed in a semi-anechoic chamber at a distance of 3m for the frequency range 30 MHz-17 GHz and a distance of 1m for frequency range 17 GHz-26 GHz.

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.

Modulation: 802.15.4 (ZigBee)

Frequency range 30 MHz - 1 GHz

The spurious emissions below 1 GHz do not depend on either the operating channel or the modulation mode selected in the EUT.

No spurious frequencies detected at less than 20 dB below the limit.

Frequency range 1 - 26 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.

Spurious frequencies with peak levels above the average limit (54 dBµV/m at 3 m) are measured with average detector for checking compliance with the average limit.

- **Mode 802.15.4 (ZigBee)**

  - LOW CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector
4.8090	52.77	H	Peak
7.2135	56.97	H	Peak
9.6180	52.64	H	Peak

  - MIDDLE CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector
4.8890	51.40	H	Peak
7.3335	56.50	H	Peak
	49.16		AVG
9.7780	52.72	H	Peak

  - HIGH CHANNEL. Spurious frequencies detected at less than 20 dB below the limit:

Spurious frequency (GHz)	Emission Level (dBµV/m)	Polarization	Detector
2.48558	52.08	H	Peak
4.9590	48.04	H	Peak
7.4385	55.81	H	Peak
	47.88		AVG
9.9180	54.81	H	Peak

Verdict

Pass

Measurement Uncertainty (dB) 30MHz to 1GHz <±4.99
1GHz to 17GHz<±4.98
17GHz to 26GHz <±5.08
26GHz to 40GHz <±5.13

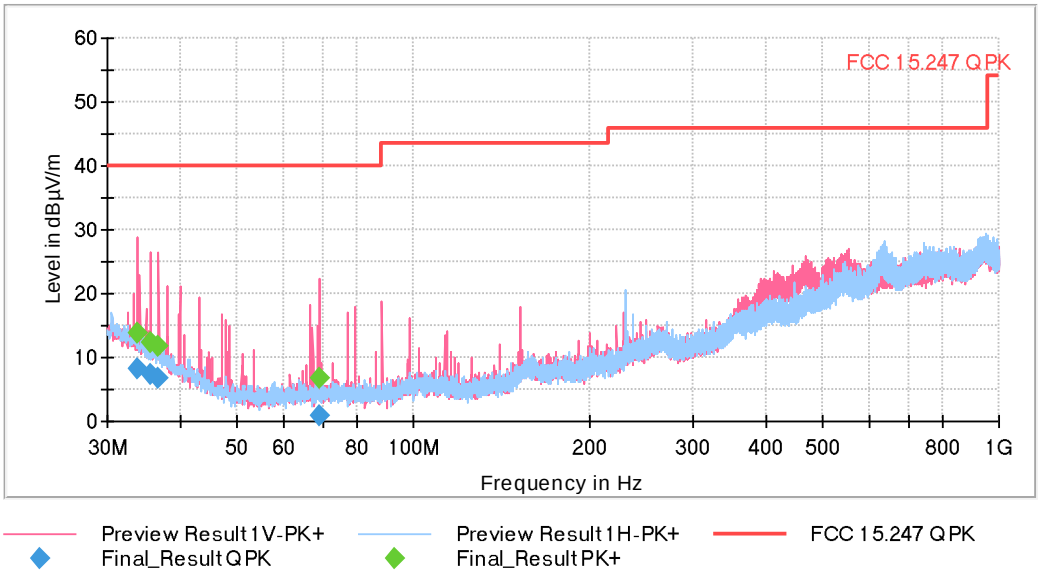
Attachments

Spectrum analyzer settings:

Setting	30 MHz – 1 GHz	1 GHz – 3 GHz	3 GHz – 17GHz	17 GHz – 26 GHz
Start Frequency	30.000 MHz	1.000 GHz	3.000 GHz	17.000 GHz
Stop Frequency	1000.000 MHz	3.000 GHz	17.000 GHz	26.000 GHz
RBW	100.000 kHz	1.000 MHz	1.000 MHz	1.000 MHz
VBW	300.000 kHz	3.000 MHz	3.000 MHz	3.000 MHz
SweepPoints	20001.000	30001.000	28001.000	28001.000
Sweeptime	1.000 s	1.000 s	1.000 s	1.000 s
Detector 1	Peak	Peak	Peak	Peak
Detector 2	N/A	Average	Average	Average
Trace Mode	Max Hold	Max Hold	Max Hold	Max Hold

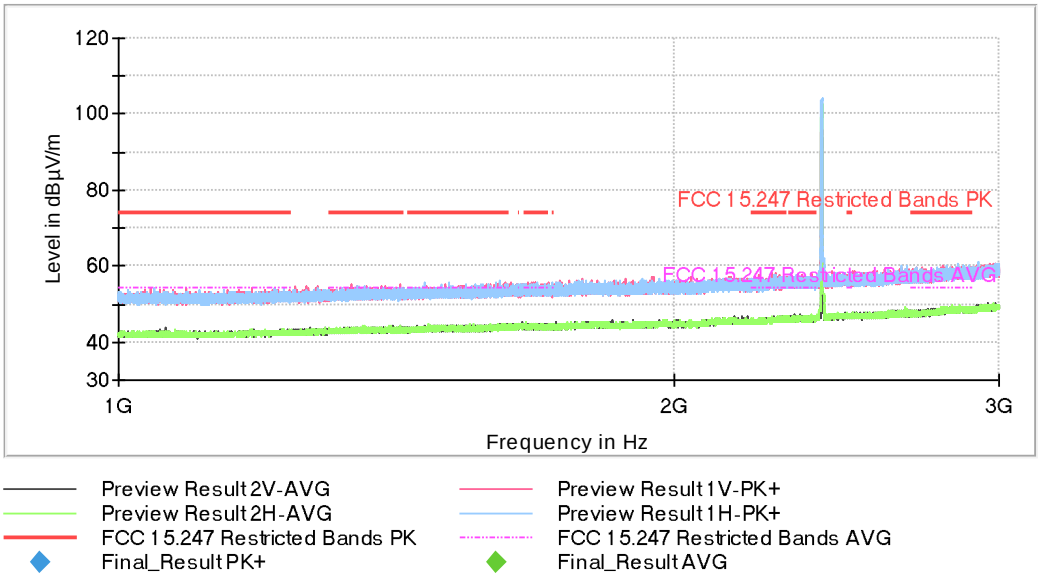
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [0.03, 1], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = QP, Measurement Point = 1

Images:

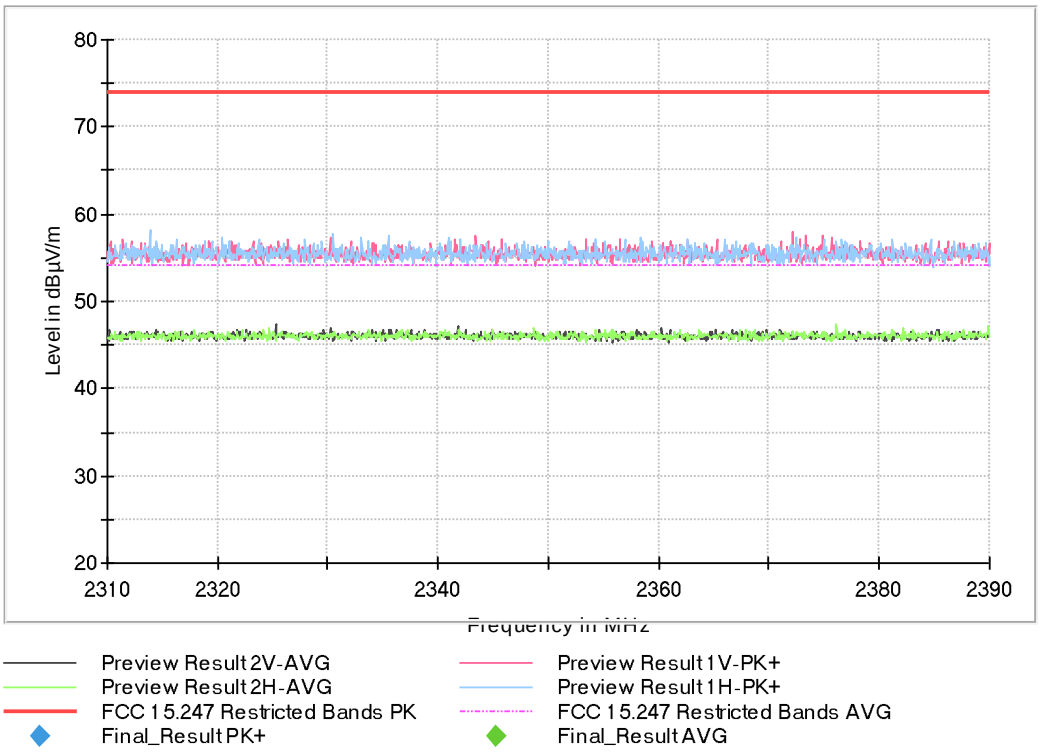


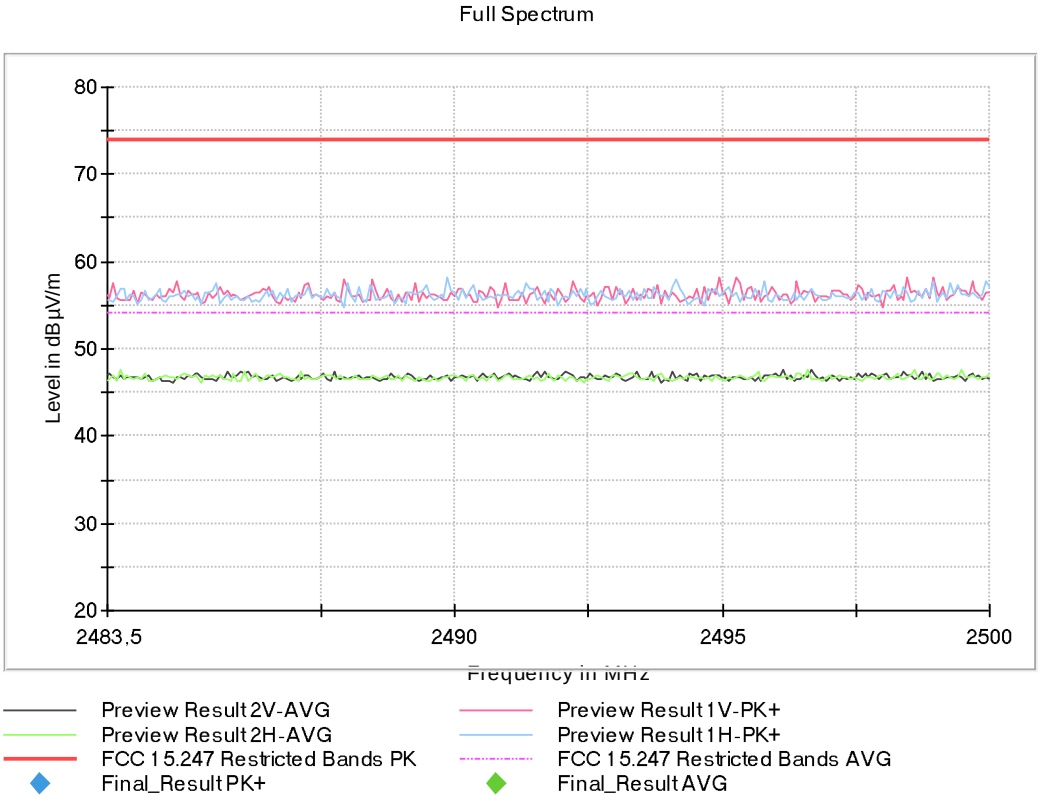
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [1, 3], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1

Images:

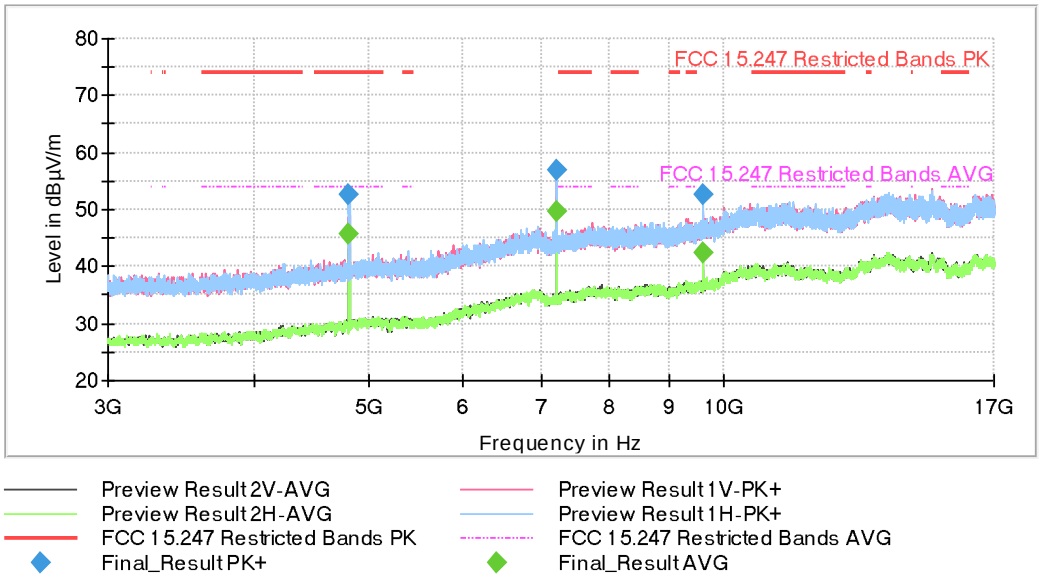


Full Spectrum



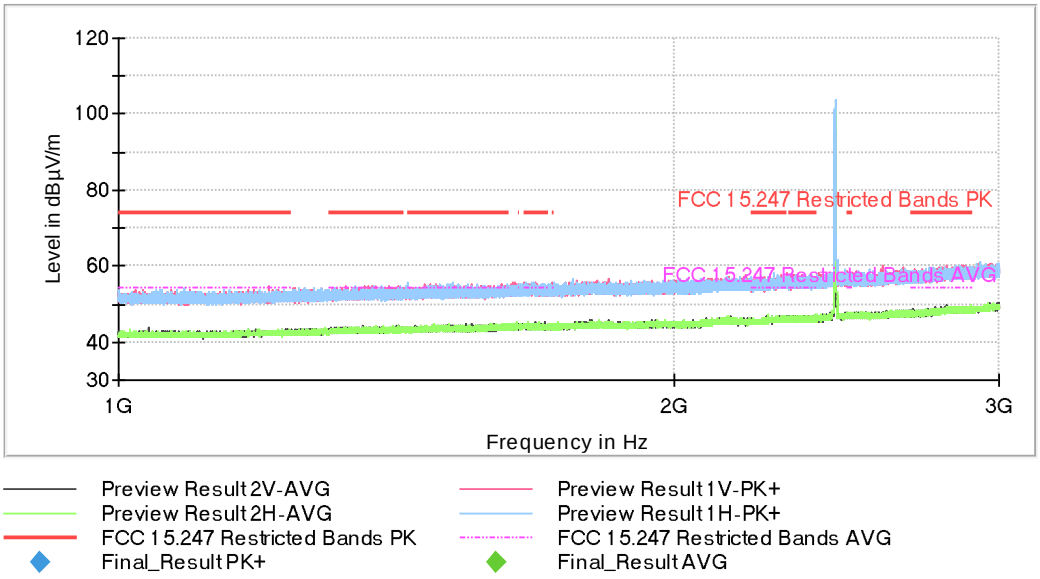


Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [3, 17], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1

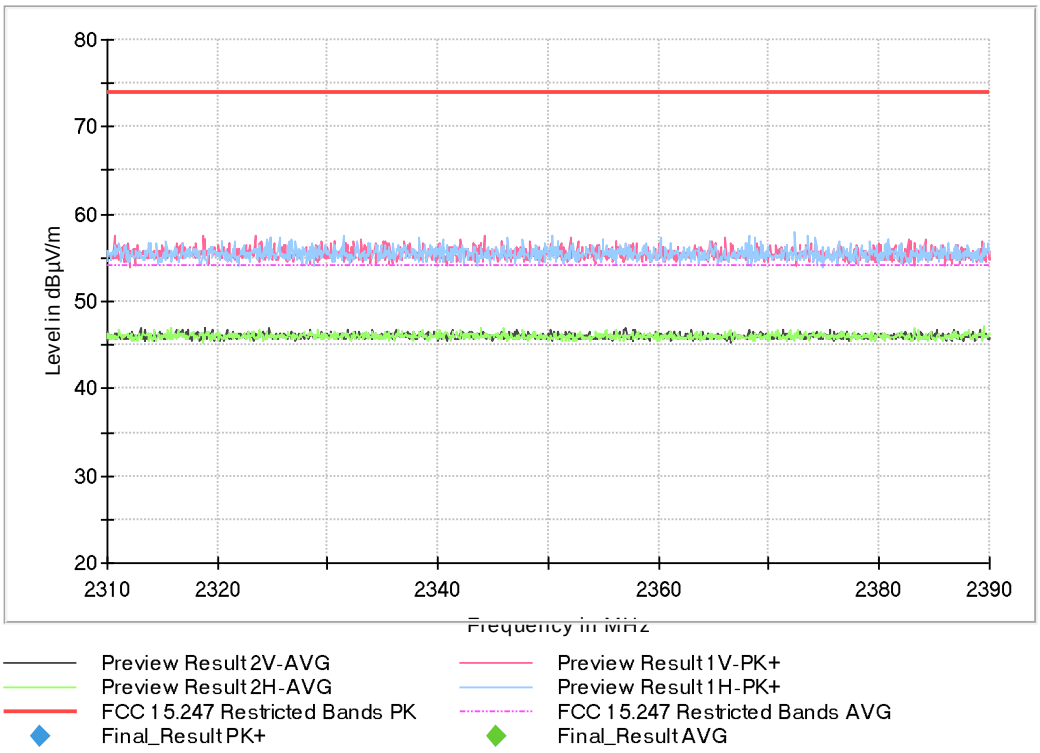


Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2445.00, Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [1, 3], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1

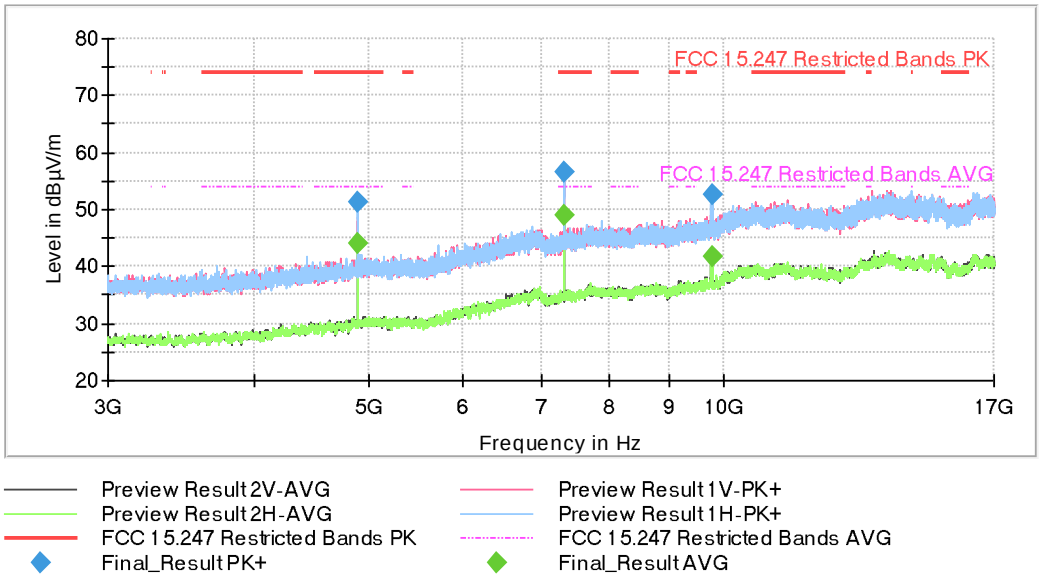
Images:



Full Spectrum

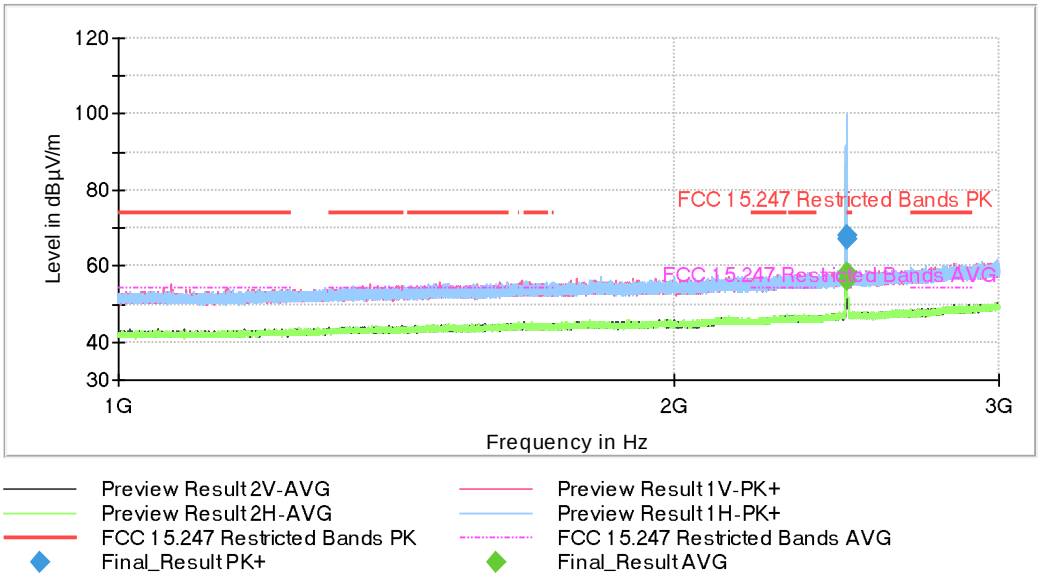


Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2445.00, Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [3, 17], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1

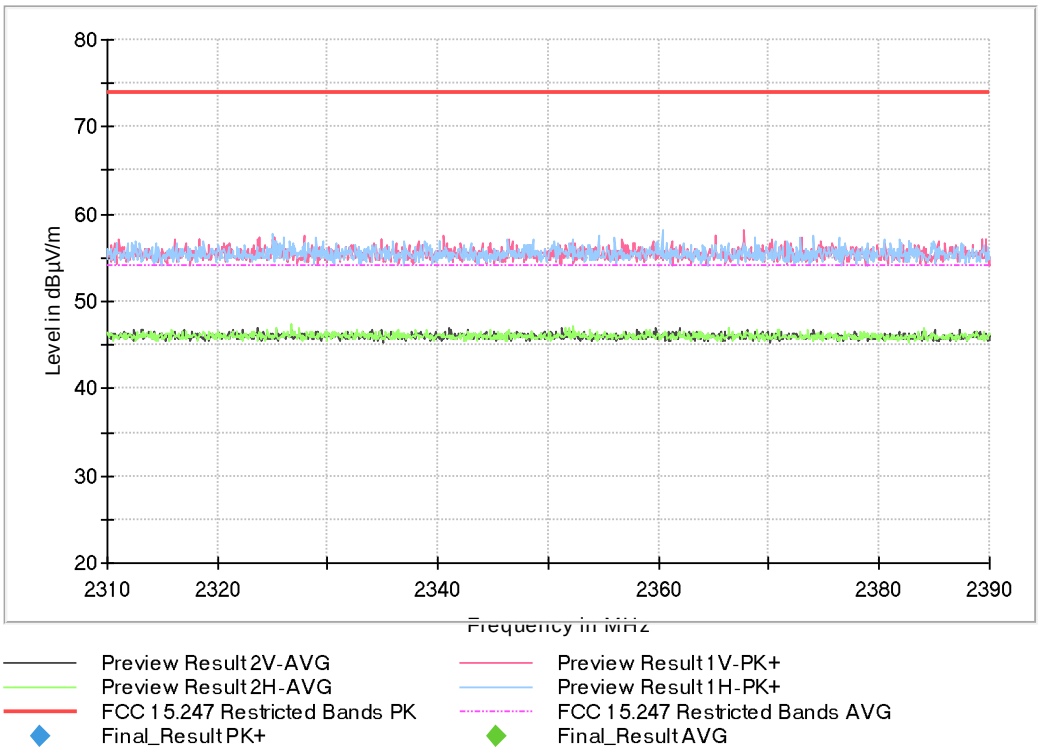


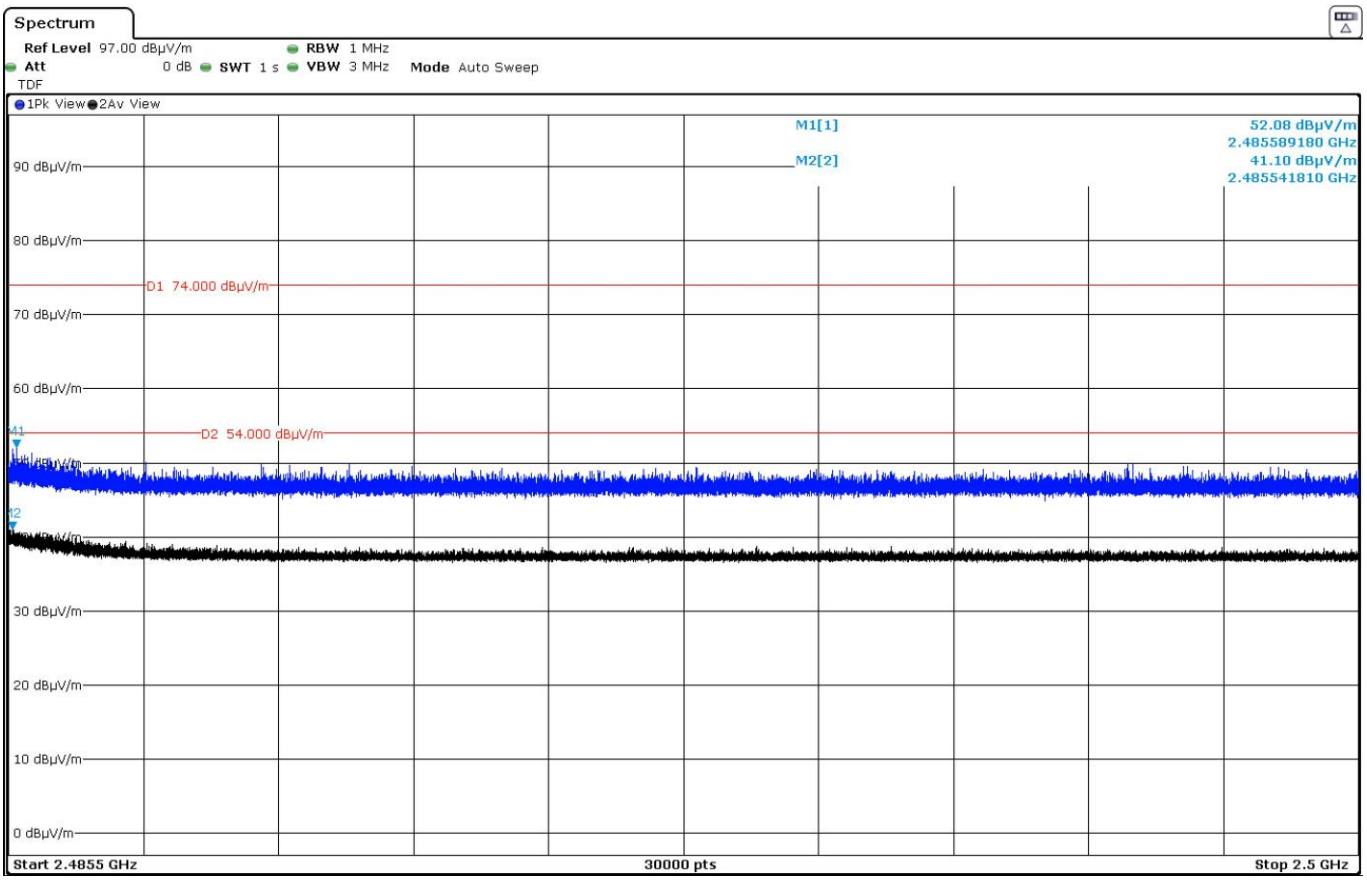
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [1, 3], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1

Images:

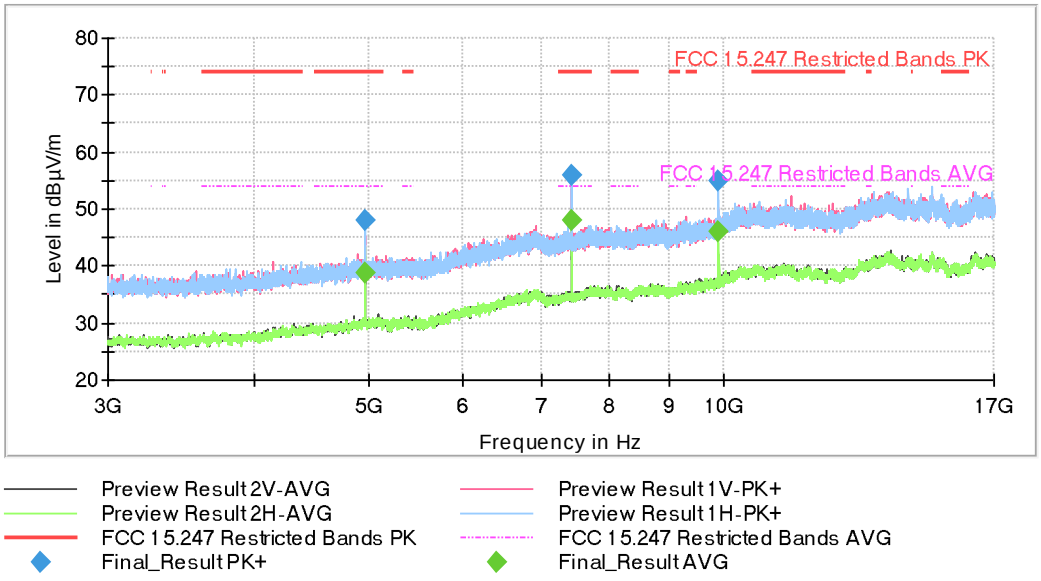


Full Spectrum

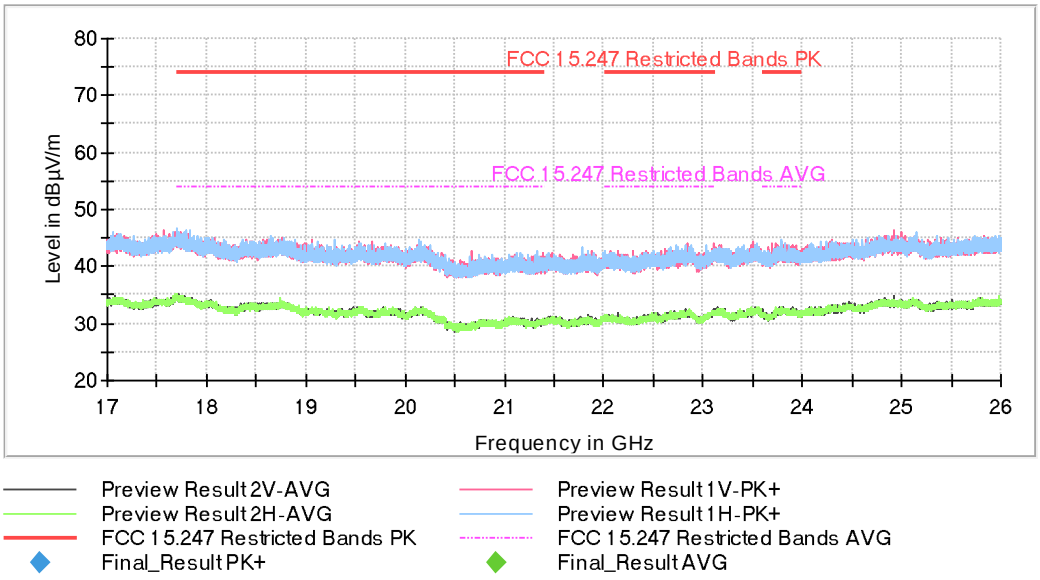




Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [3, 17], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Modulation = 802.15.4 (ZigBee), Frequency Range GHz = [17, 26], Number of Transmission Chains = 1, Available Number of Channels = 1, Detector used = AVG, Measurement Point = 1



Occupied Channel Bandwidth 99%

Results

Modulation: 802.15.4 (ZigBee)

Operation Band (MHz)	Freq (MHz)	Occ Ch BW (MHz)
[2400, 2483.5]	2405.00	2.240
[2400, 2483.5]	2445.00	2.250
[2400, 2483.5]	2480.00	2.240

Verdict

Pass

Uncertainty 1.40%

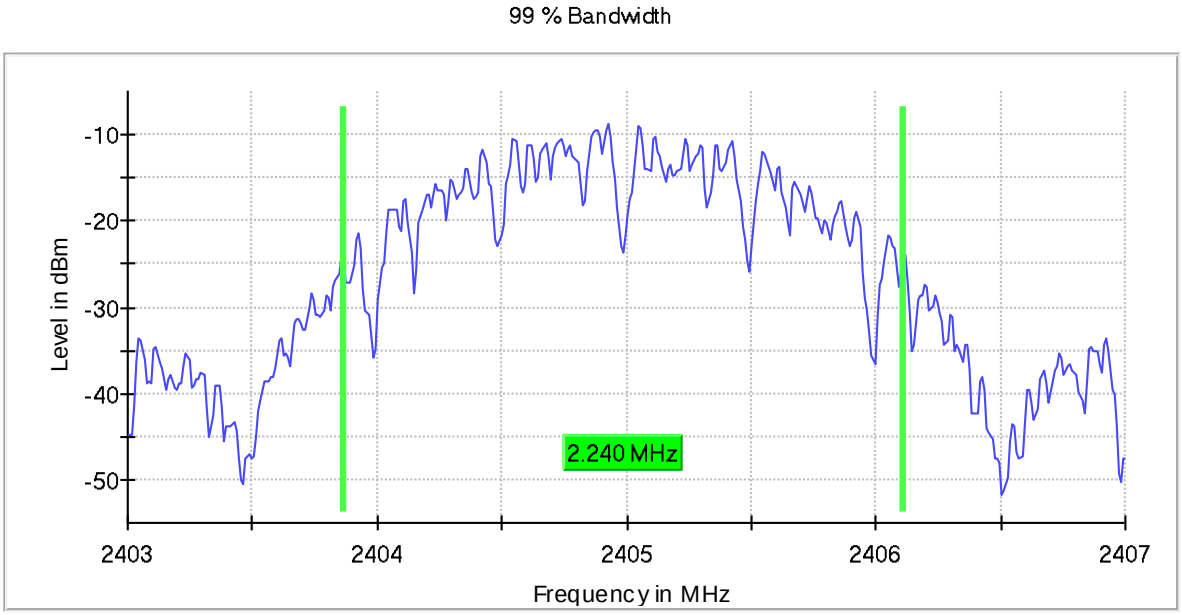
Attachments

Spectrum analyzer settings:

Setting	ZigBee
Span	**4.000 MHz**
RBW	**20.000 kHz**
VBW	**100.000 kHz**
SweepPoints	**400**
Sweeptime	**94.824 µs**
Reference Level	**0.000 dBm**
Detector	**MaxPeak**
Trace Mode	**Max Hold**

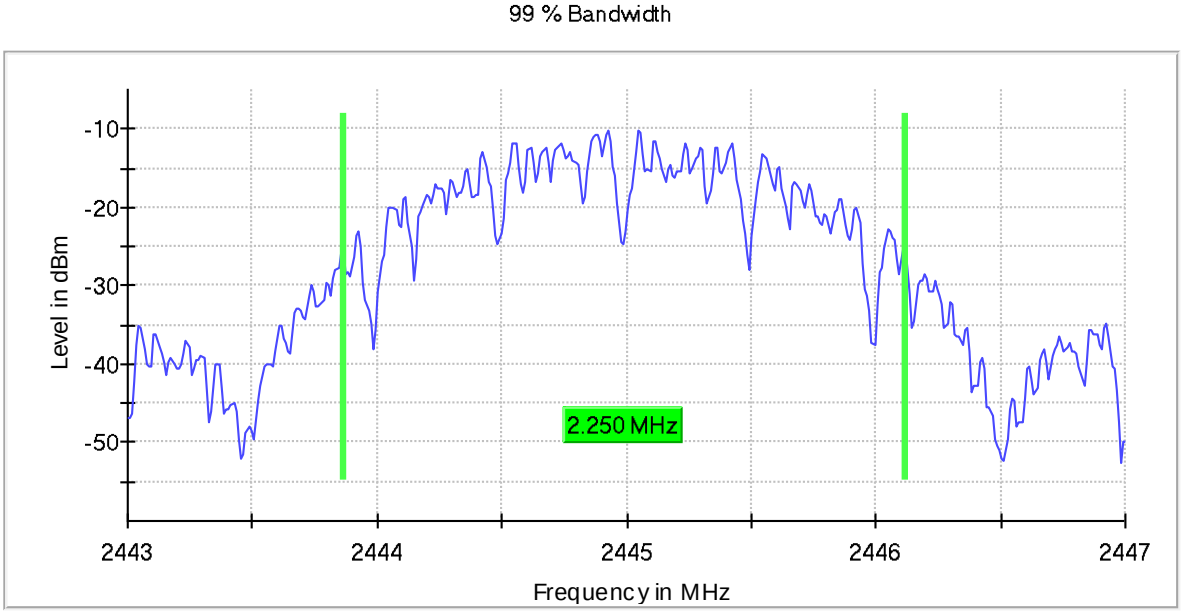
Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2405.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

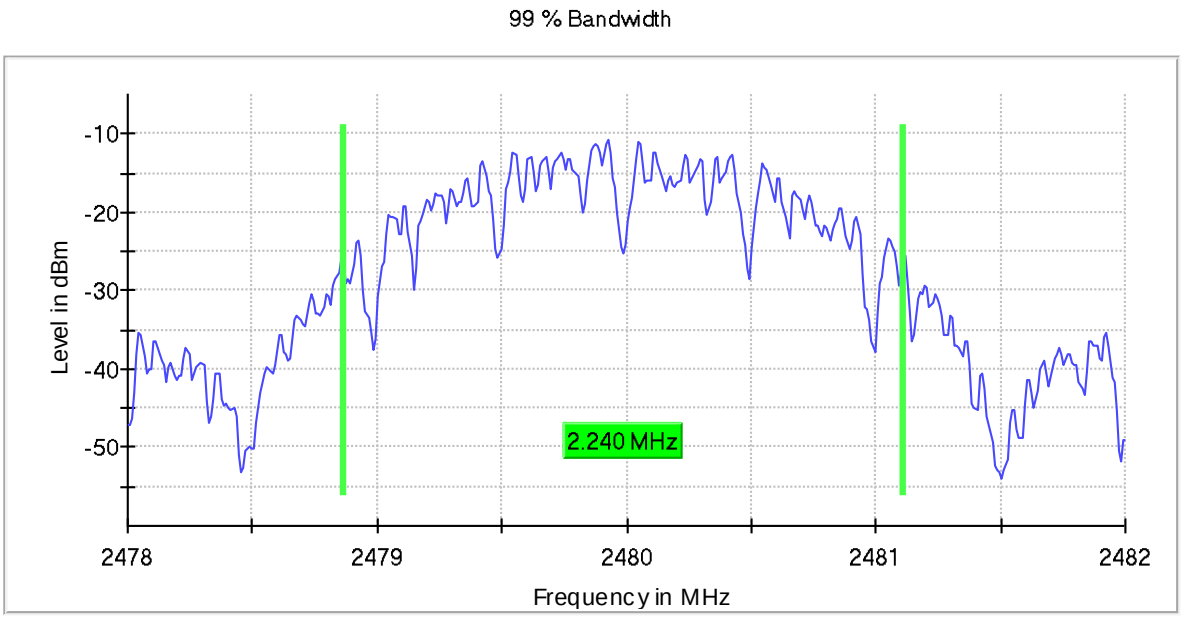
Images:



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2445.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

Images:



Operation Band MHz = [2400, 2483.5], Equipment Type = Digital Transmission System (DTS), Frequency MHz = 2480.00, Modulation = 802.15.4 (ZigBee), Number of Transmission Chains = 1, Available Number of Channels = 1

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