FCC / ISED Test Report

For:

Garmin International, Inc.

Model Name:
A03804

Product Description:
Portable Wireless Transceiver

FCC ID: IPH-03804
IC ID: 1792A-03804

Applied Rules and Standards:
47 CFR Part 15.249
RSS-210 Issue 10 & RSS-Gen Issue 5

REPORT #: EMC_GARMI-080-20001_15.249_ANT

DATE: 2021-07-02

A2LA Accredited

IC recognized #
3462B-1,2

***CETECOM* Inc.**
411 Dixon Landing Road ◆ Milpitas, CA 95035 ◆ U.S.A.
Phone: + 1 (408) 586 6200 ◆ Fax: + 1 (408) 586 6299 ◆ E-mail: info@cetecom.com ◆ http://www.cetecom.com
CETECOM Inc. is a Delaware Corporation with Corporation number: 2905571

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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.249 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-210.

No deviations were ascertained.

Company	Description	Model #
Garmin International Inc.	Portable wireless transceiver	A03804

Responsible for Testing Laboratory:

Date	Section	Name	Signature
2021-07-02	Compliance	Kevin Wang (EMC Lab Manager)	kevin.wang@cetecom.com Digitally signed by: kevin.wang@cetecom.com DN: CN = kevin.wang@cetecom.com Date: 2021.07.02 11:36:53 -07'00'

Responsible for the Report:

Date	Section	Name	Signature
2021-07-02	Compliance	Yuchan Lu (EMC Engineer)	Yuchan Lu Digitally signed by: Yuchan Lu DN: CN = Yuchan Lu email = Yuchan.Lu@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2021.07.02 11:31:12 -07'00'

2 Administrative Data

2.1 Identification of the Testing Laboratory Issuing the EMC Test Report

Company Name:	CETECOM Inc.
Department:	Compliance
Street Address:	411 Dixon Landing Road
City/Zip Code	Milpitas, CA 95035
Country	USA
Telephone:	+1 (408) 586 6200
Fax:	+1 (408) 586 6299
EMC Lab Manager:	Kevin Wang
Responsible Project Leader:	Sangeetha Sivaraman

2.2 Identification of the Client

Client's Name:	Garmin International, Inc.
Street Address:	1200 East 151st Street
City/Zip Code	Olathe, KS 66062
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Garmin Corporation
Manufacturers Address:	No. 68, Zhangshu 2nd Rd., Xizhi Dist.,
City/Zip Code	New Taipei City 221,
Country	TAIWAN, R.O.C.

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	A03804
HW Version :	1
SW Version :	0.31
FCC-ID :	IPH-03804
IC-ID:	1792A-03804
FWIN:	N/A
HVIN:	A03804
PMN:	N/A
Product Description:	Portable wireless transceiver
Frequency Range / number of channels:	Nominal band: 2400 MHz – 2483.5 MHz; Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 39), 40 channels
Radio Information:	ANT: • Module Name: Nordic Semiconductor • Module Number: nRF52832 • Modulation: ANT • Frequency of Operation: 2.4 GHz
Antenna Information as declared:	Maximum Gain: 1.6 dBi
Max. Conducted Output Power:	Peak: 3.56 dBm, Average: -10.64 dBm
Power Supply/ Rated Operating Voltage Range:	Vmin: 4.5 VDC/ Vnom: 5.0 VDC / Vmax: 5.5 VDC
Operating Temperature Range	0°C to +60°C
Other Radios included in the device:	Cellular; GPS; WiFi; BTLE
Sample Revision	☐Prototype Unit; ■Production Unit; ☐Pre-Production

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	6K2000505	1	0.31	Conducted Sample
2	6K2000331	1	0.31	Radiated Sample

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
1	USB Cable	----------	Garmin	----------

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for test set up	Comments
1	EUT#1+AE#1	Conducted Setup: The radio of the EUT was configured using the "Factory Test" software: • Modulation: ANT Modulate Test • Channel (Fixed): ○ Ch. 0 (Low, 2402 MHz) ○ Ch. 20 (Mid, 2442 MHz) ○ Ch. 39 (High, 2480 MHz) The "Factory Test" software will not available to the end user. The power was controlled through software updated by the client. The latest software was used for the measurements. The measurement equipment was connected to the 50 ohm RF port of the EUT.
2	EUT#2+AE#1	Radiated Setup: The radio of the EUT was configured using the "Factory Test" software: • Modulation: ANT Modulate Test • Channel (Fixed): ○ Ch. 0 (Low, 2402 MHz) ○ Ch. 20 (Mid, 2442 MHz) ○ Ch. 39 (High, 2480 MHz) The "Factory Test" software will not available to the end user. The power was controlled through software updated by the client. The latest software was used for the measurements. The internal antenna was connected.

3.5 Justification for Worst Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid and high channels. For radiated measurements, all data in this report shows the worst case between horizontal and vertical antenna polarizations and for all orientations of the EUT.

4 Subject of Investigation

The objective of the measurements done by CETECOM Inc. was to assess the performance of the EUT according to the relevant requirements specified in FCC rules Part 15.249 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-210 of ISED Canada.

This test report is to support a request for new equipment authorization under
FCC ID: IPH-03804
IC ID: 1792A-03804

Testing procedures are based on ANSI C63.10 (2013) – "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices" – IEEE Standards Association, Accredited by the American National Standards Institute

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.215(c) RSS-Gen 6.7	20 dB Bandwidth; 99% Occupied Bandwidth	Nominal	ANT	■	☐	☐	Complies
§15.249(a)(c) RSS-210 B.10(a) RSS-Gen 6.12	Transmitter Output Power	Nominal	ANT	■	☐	☐	Complies
§15.249(a)(c)(d)(e); §15.209; §15.205 RSS-210 B.10(b) RSS-Gen 6.13; 8.9; 8.10	Radiated Transmitter Spurious Emissions and Restricted Bands	Nominal	ANT	■	☐	☐	Complies

Note: NA= Not Applicable; NP= Not Performed.

6 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus, with 95% confidence interval (in dB delta to result), based on a coverage factor k=1.

Radiated measurement

9 kHz to 30 MHz	±2.5 dB (Magnetic Loop Antenna)
30 MHz to 1000 MHz	±2.0 dB (Biconilog Antenna)
1 GHz to 40 GHz	±2.3 dB (Horn Antenna)

Conducted measurement

150 kHz to 30 MHz	±0.7 dB (LISN)
RF conducted measurement	±0.5 dB

According to TR 102 273 a multiplicative propagation of error is assumed for RF measurement systems. For this reason the RMS method is applied to dB values and not to linear values as appropriate for additive propagation of error.

6.1 Environmental Conditions During Testing:

The following environmental conditions were maintained during the course of testing:

- Ambient Temperature: 20-25° C
- Relative humidity: 40-60%

6.2 Dates of Testing:

11/23/2020 – 12/04/2020

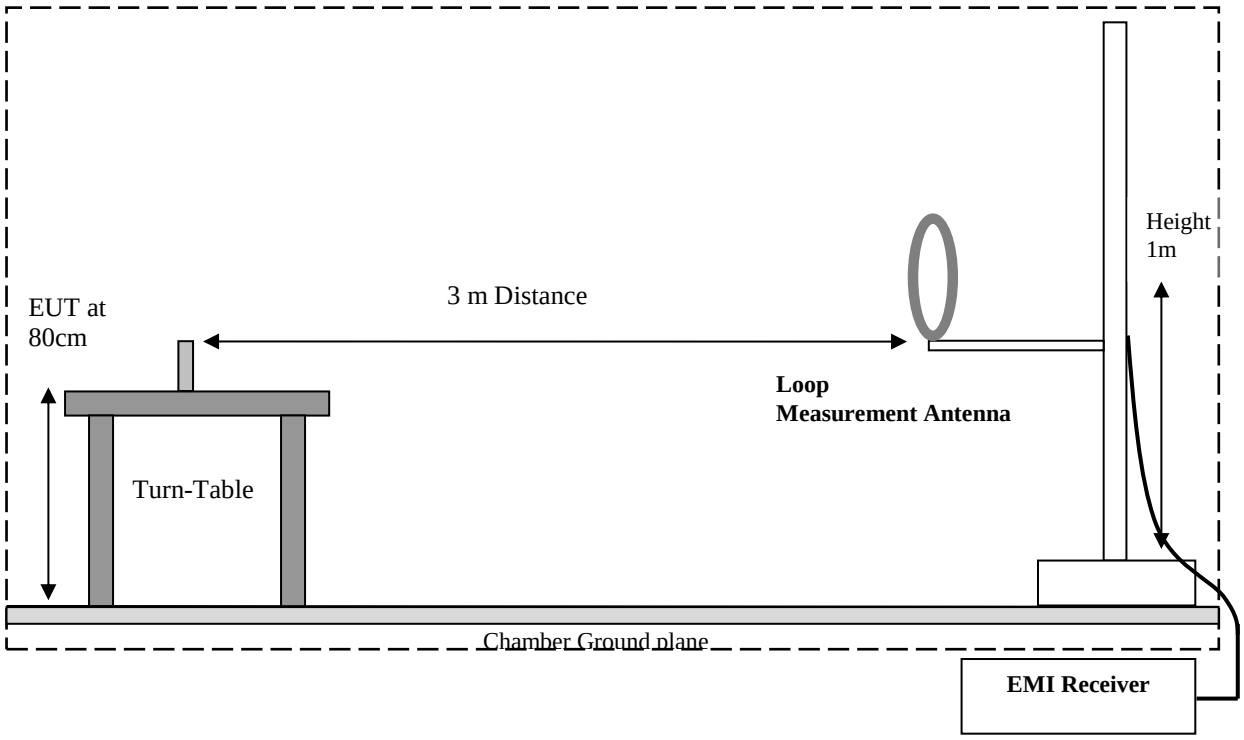
7 Measurement Procedures

7.1 Radiated Measurement

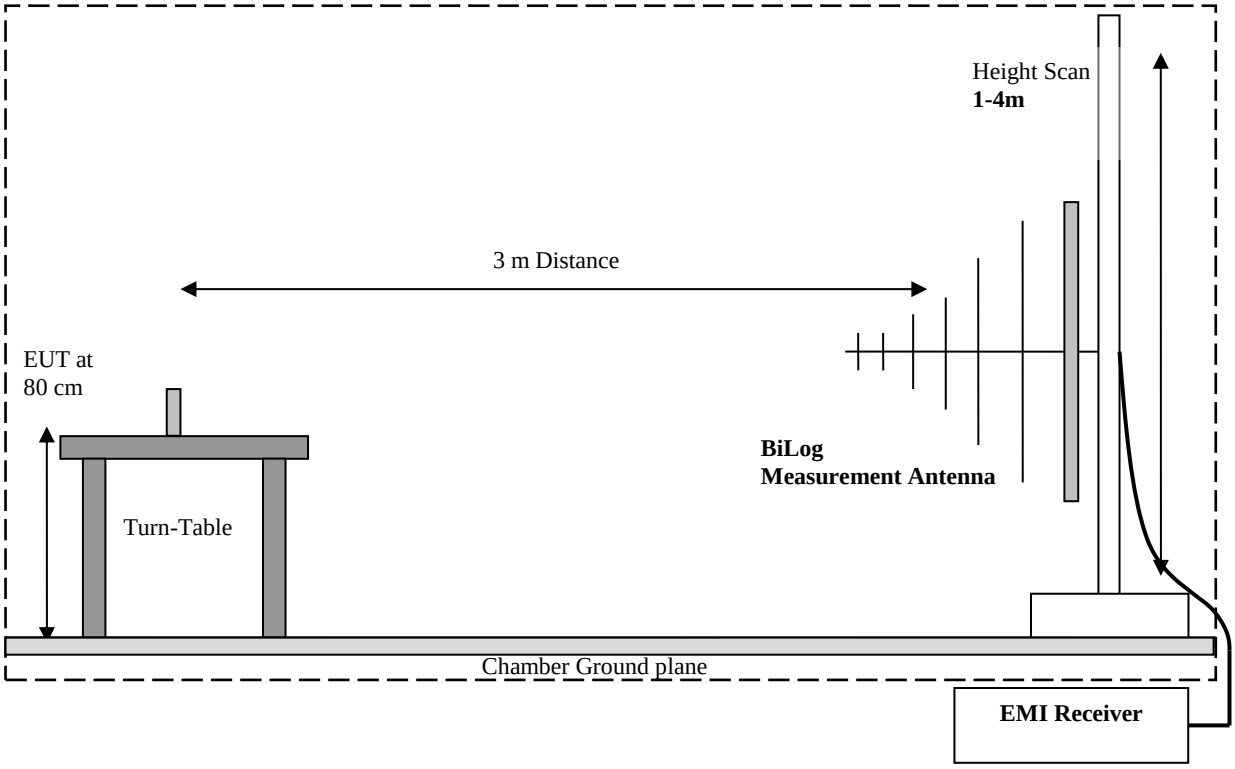
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 4 positions of the turntable, two orthogonal positions of the EUT and both antenna polarizations. This procedure exceeds the requirement of the above standards to cover the 3 orthogonal axis of the EUT. A max peak detector is utilized during the exploratory measurement. The Test-SW creates an overall maximum trace for all 12 sweeps and saves the settings for each point of this trace. The maximum trace is part of the test report.
- The 10 highest emissions are selected with an automatic algorithm of EMC32 searching for peaks in the noise floor and ensuring that broadband signals are not selected multiple times.
- The maxima are then put through the final measurement and again maximized in a 90deg range of the turntable, fine search in frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and for all supported modulations.
- In case there are no emissions above noise floor level only the maximum trace is reported as described above.
- The results are split up into up to 4 frequency ranges due to antenna bandwidth restrictions. A magnetic loop is used from 9 kHz to 30 MHz, a Biconilog antenna is used from 30 MHz to 1 GHz, and two different horn antennas are used to cover frequencies up to 40 GHz.

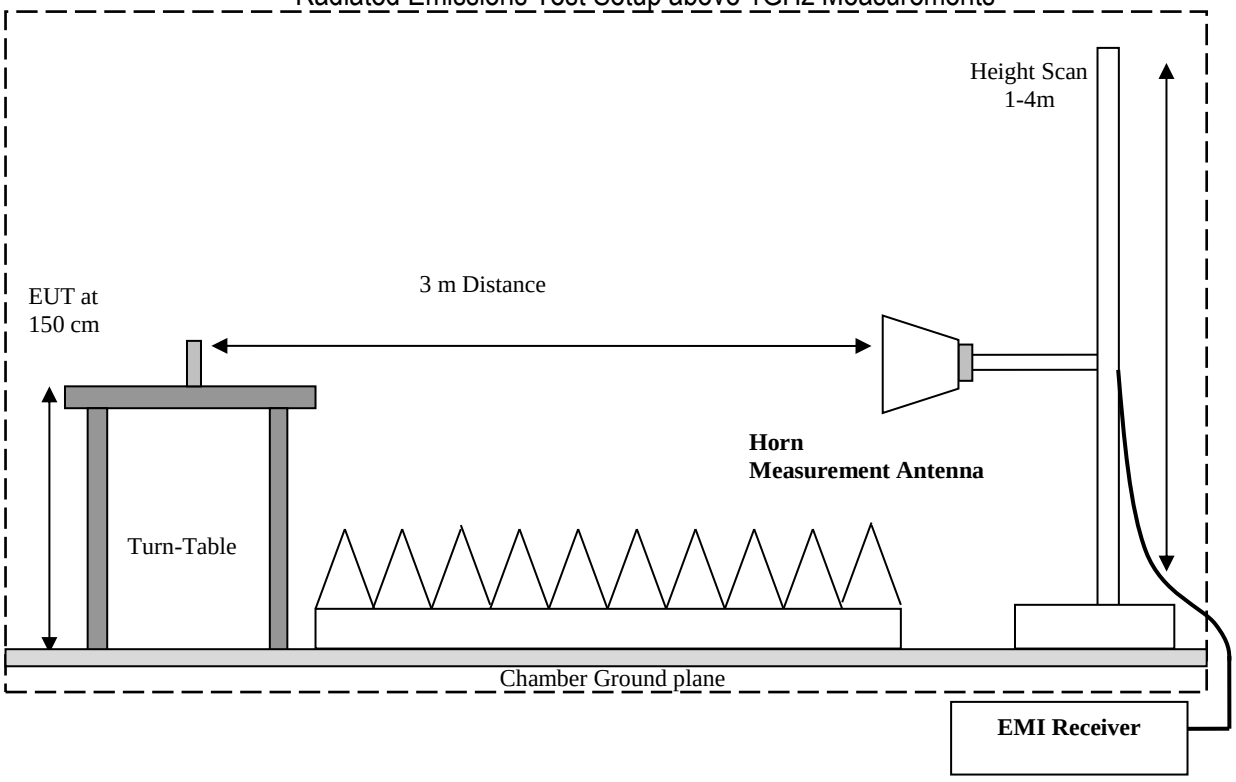
Radiated Emissions Test Setup below 30MHz Measurements



Radiated Emissions Test Setup 30MHz-1GHz Measurements



Radiated Emissions Test Setup above 1GHz Measurements



7.1.1 Sample Calculations for Field Strength Measurements

Field Strength is calculated from the Spectrum Analyzer/ Receiver readings, taking into account the following parameters:

1. Measured reading in dBµV
2. Cable Loss between the receiving antenna and SA in dB and
3. Antenna Factor in dB/m

All radiated measurement plots in this report are taken from a test SW that calculates the Field Strength based on the following equation:

FS (dBµV/m) = Measured Value on SA (dBµV)+ Cable Loss (dB)+ Antenna Factor (dB/m)

Example:

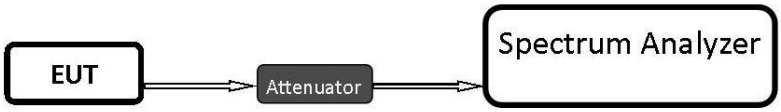
Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

7.2 Power Line Conducted Measurement Procedure

AC Power Line conducted emissions measurements performed according to: ANSI C63.4 (2014)

7.3 RF Conducted Measurement Procedure

Testing procedures are based on ANSI C63.10 (2013) – "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices" – IEEE Standards Association, Accredited by the American National Standards Institute



- Connect the equipment as shown in the above diagram.
- Adjust the settings of the SA (Rohde-Schwarz Spectrum Analyzer) to connect the EUT at the required mode of test.
- Measurements are to be performed with the EUT set to the low, middle and high channels and for worst case modulation schemes.

8 Test Result Data

8.1 Transmitter Output Power

8.1.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer settings:

- RBW = 1 MHz
- VBW ≥ 3 x RBW
- Sweep = Auto couple
- Detector function = Peak
- Trace = Max hold
- Use peak marker function to determine the peak amplitude level

8.1.2 Limits:

FCC §15.249

(a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

(c) Field strength limits are specified at a distance of 3 meters.

Linear to log conversion:

- E = 20*log(Field strength of fundamental)
  where
  - E is the electric field strength in dBµV/m
  - Field strength of fundamental is in µV/m

Field strength of fundamental converted to EIRP formula:

- EIRP = E – 20*log(d) + 104.8
  where
  - E is the electric field strength in dBµV/m
  - EIRP is the equivalent isotropically radiated power in dBm
  - d is the specified measurement distance in m

8.1.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	ANT	5 VDC	1.6 dBi

8.1.4 Measurement result:

Plot #	Frequency (MHz)	Maximum Peak Transmitter Output Power (dBm)	Duty Cycle Correction Factor (dB)	Maximum Average Transmitter Output Power (dBm)	EIRP (dBm)	Limit (dBm)	Result
1	2402	3.49	14.2	-10.71	-9.11	-1.28 (EIRP)	Pass
2	2441	3.34	14.2	-10.86	-9.26	-1.28 (EIRP)	Pass
3	2480	3.56	14.2	-10.64	-9.04	-1.28 (EIRP)	Pass

Note 1: Transmitter output power measurements performed conducted. Field strength of fundamental limit specified in millivolts/meter converted to EIRP limit in dBm as described in Section 8.1.2.

Note 2: Average measurements determined by applying duty cycle correction factor to peak measurements:

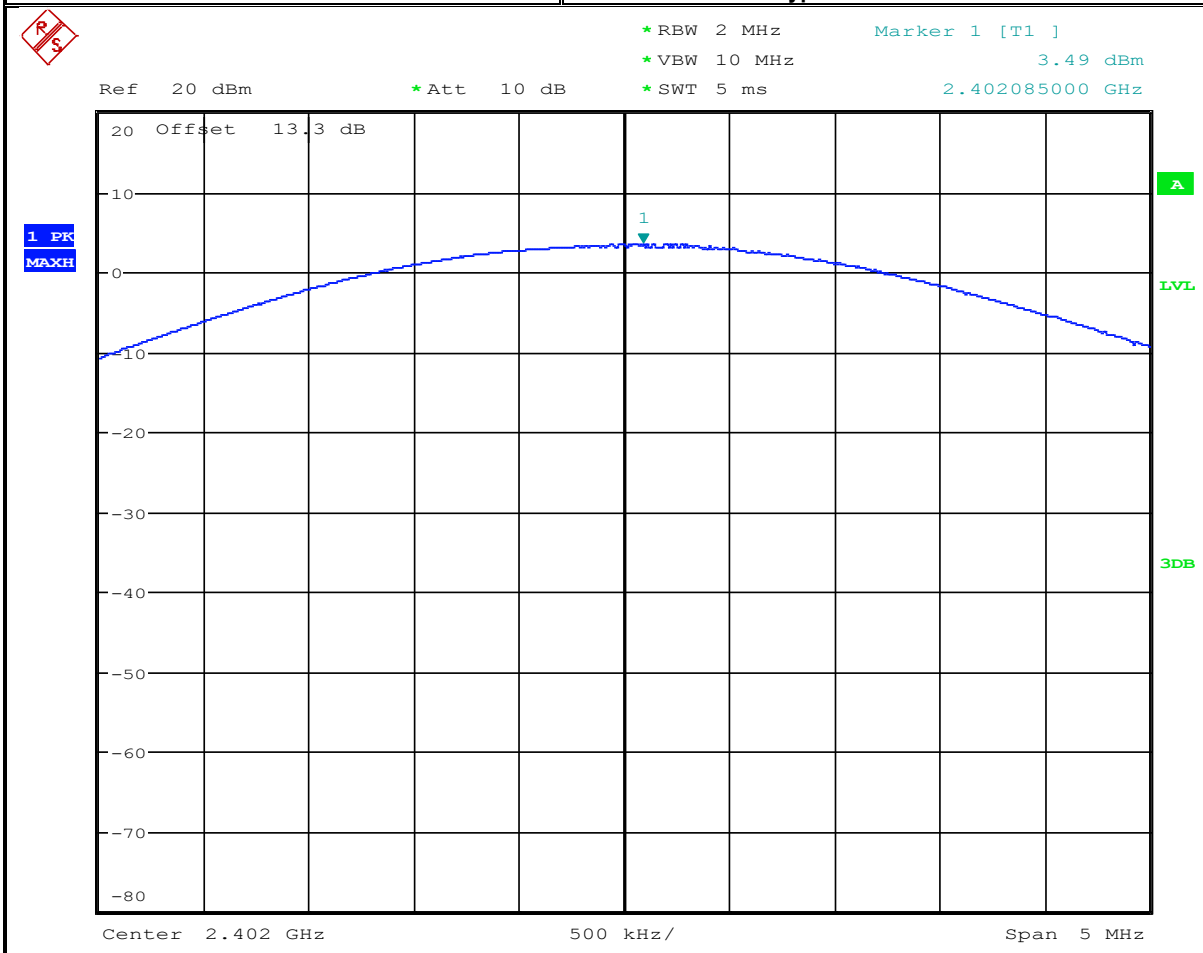
- Maximum Average Transmitter Output Power (dBm) = Maximum Peak Transmitter Output Power (dBm) - Duty Cycle Correction Factor (dB)

Note 3: Antenna gain of 1.6 dBi added to Maximum Average Transmitter Output Power to determine EIRP values

8.1.5 Measurement Plots:

Plot #1

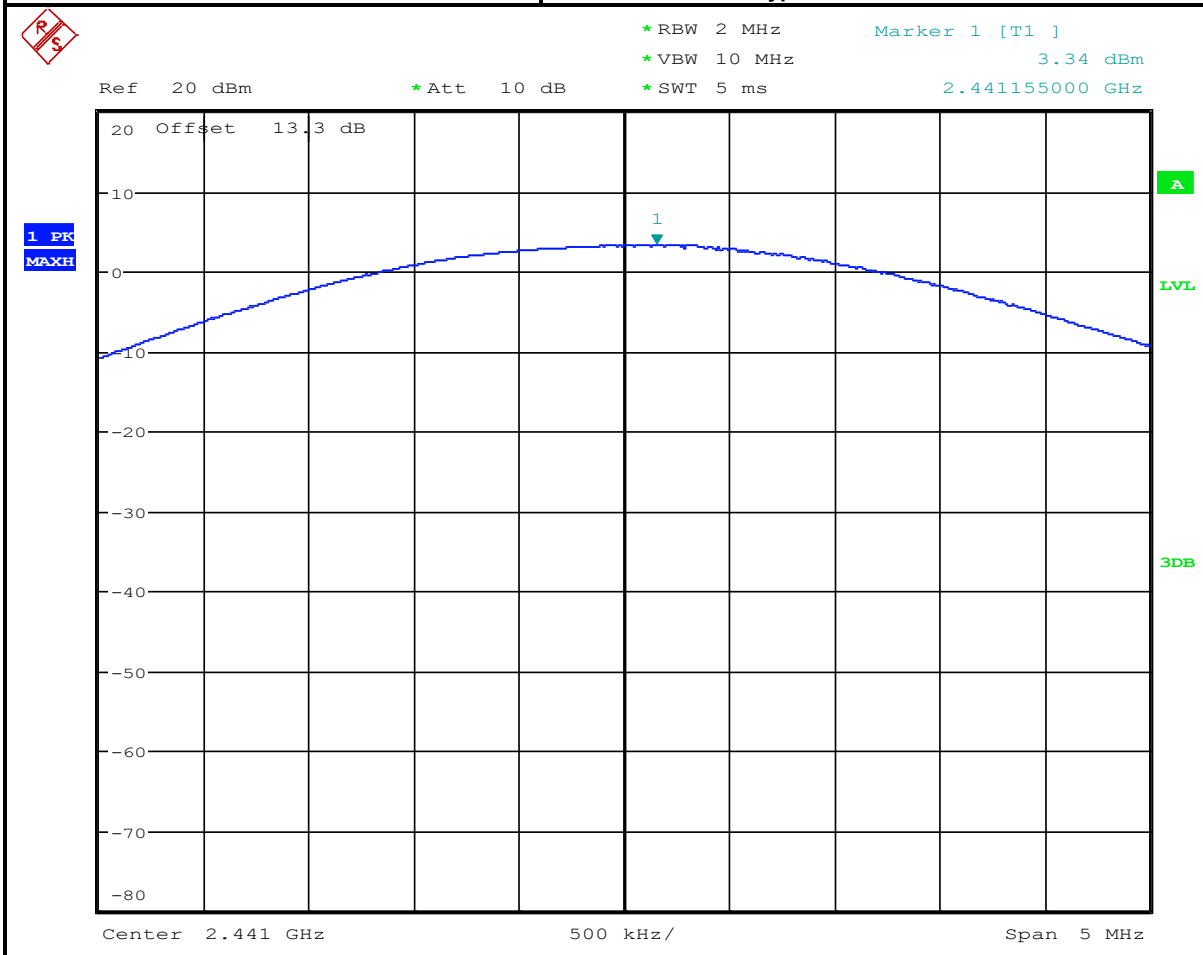
Low channel / 2402 MHz	Modulation/Packet Type: ANT



Date: 24.NOV.2020 10:19:06

Plot #2

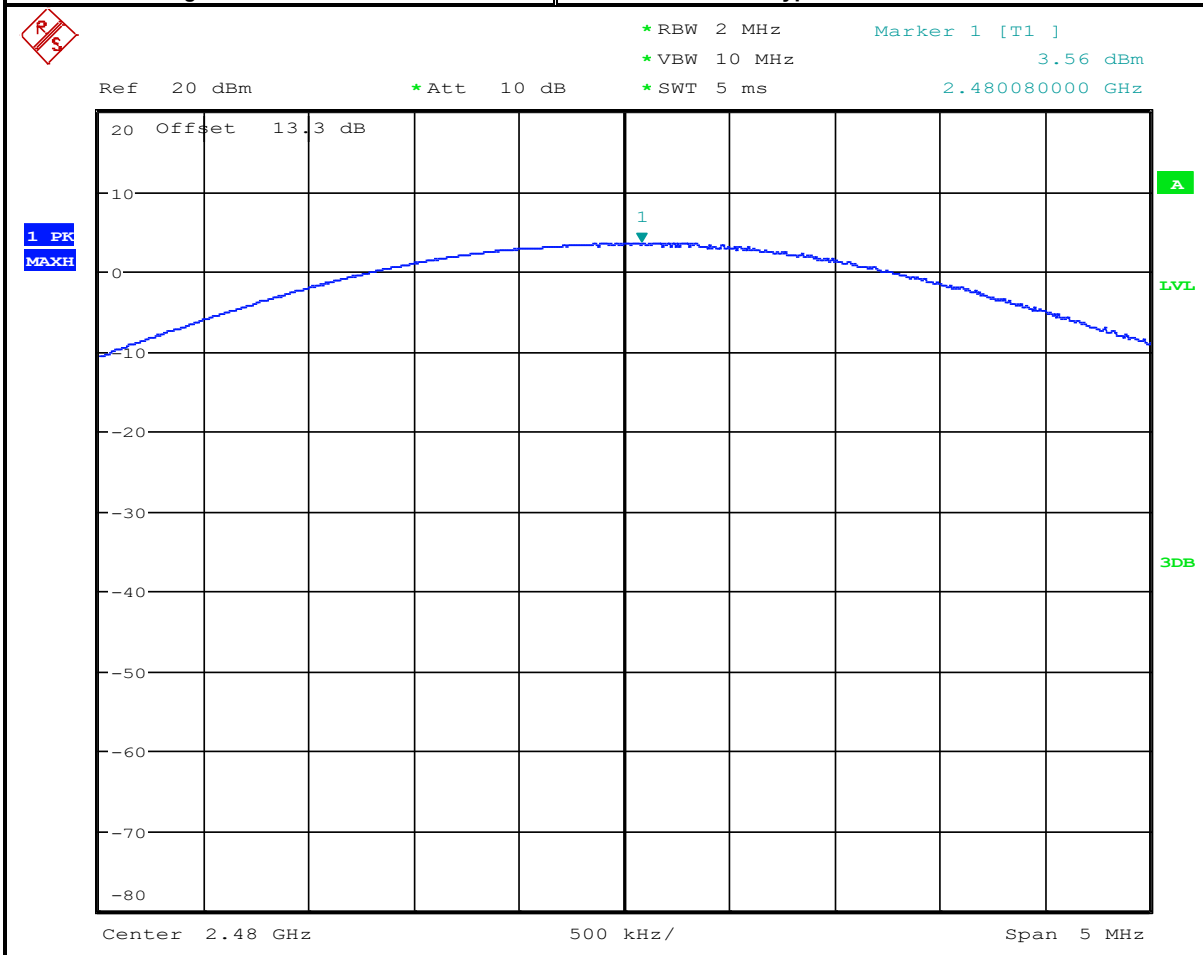
Mid channel 2442 MHz | **Modulation/Packet Type: ANT**



Date: 24.NOV.2020 10:17:29

Plot #3

High channel 2480 MHz	Modulation/Packet Type: ANT



Date: 24.NOV.2020 10:18:37

8.2 Duty cycle

8.2.1 Measurement according to ANSI C63.10 (2013)

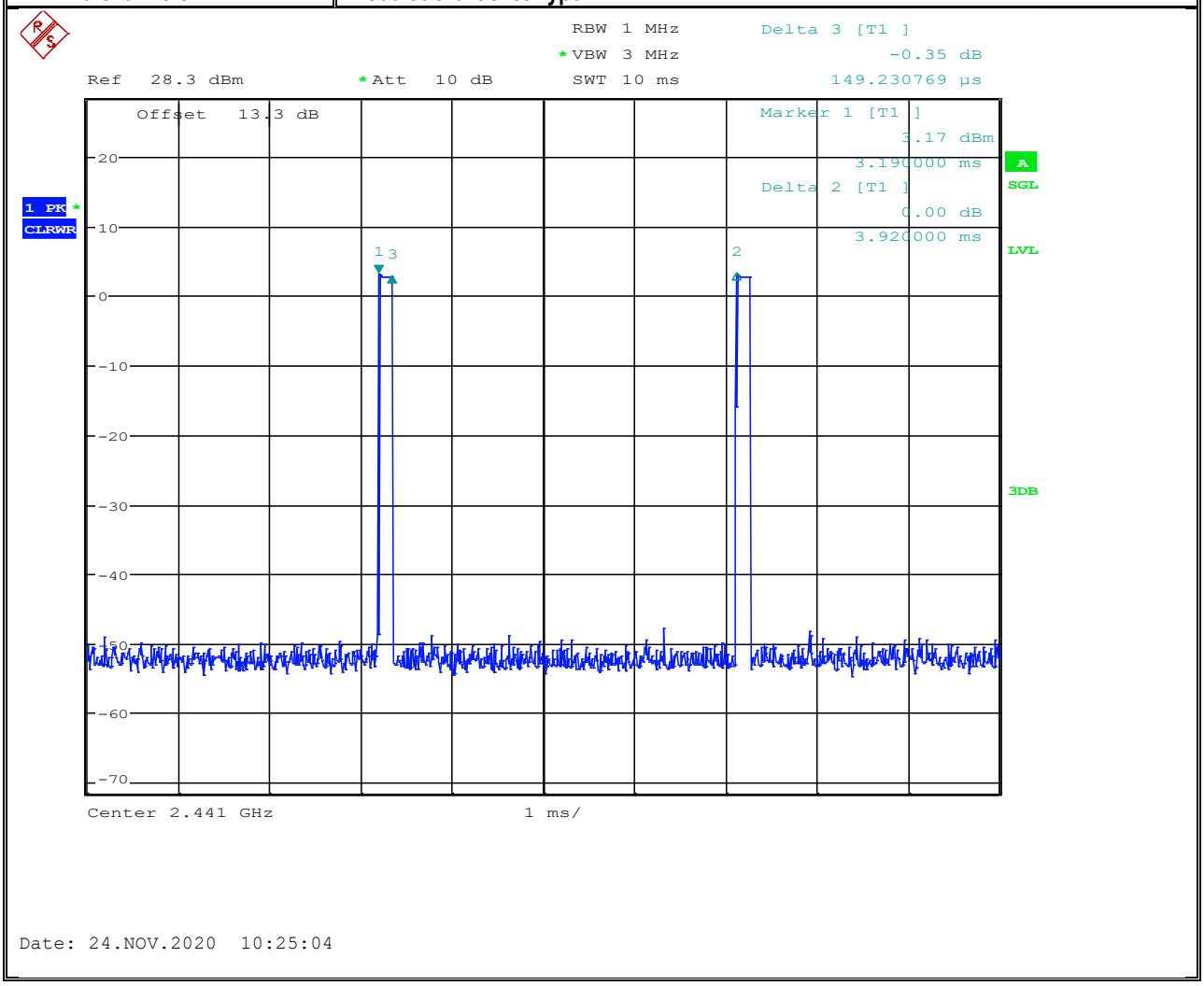
Spectrum Analyzer settings:

- Set the center frequency and of the instrument to the center frequency of the transmission
- Zero span
- Set RBW >=OBW if possible; otherwise, set RBW to the largest available value
- Detector = Peak or average

8.2.2 Measurement result

Duty cycle measurement

Mid channel / 2441 MHz | **Modulation/Packet Type: ANT**



Duty cycle = 3.8%
Duty cycle correction factor = 10*log(1/0.038) = 14.2 dB

8.3 Emission Bandwidth 20dB and 99% Occupied Bandwidth

8.3.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer settings:

- Set RBW = 100 kHz
- Set the video bandwidth (VBW) ≥ 3 x RBW
- Detector = Peak
- Trace mode = Max hold
- Sweep = Auto couple
- Allow the trace to stabilize
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

8.3.2 Limits:

FCC §15.215(c)

- Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.3.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
22.0°C	1	ANT	5 VDC

8.3.4 Measurement result:

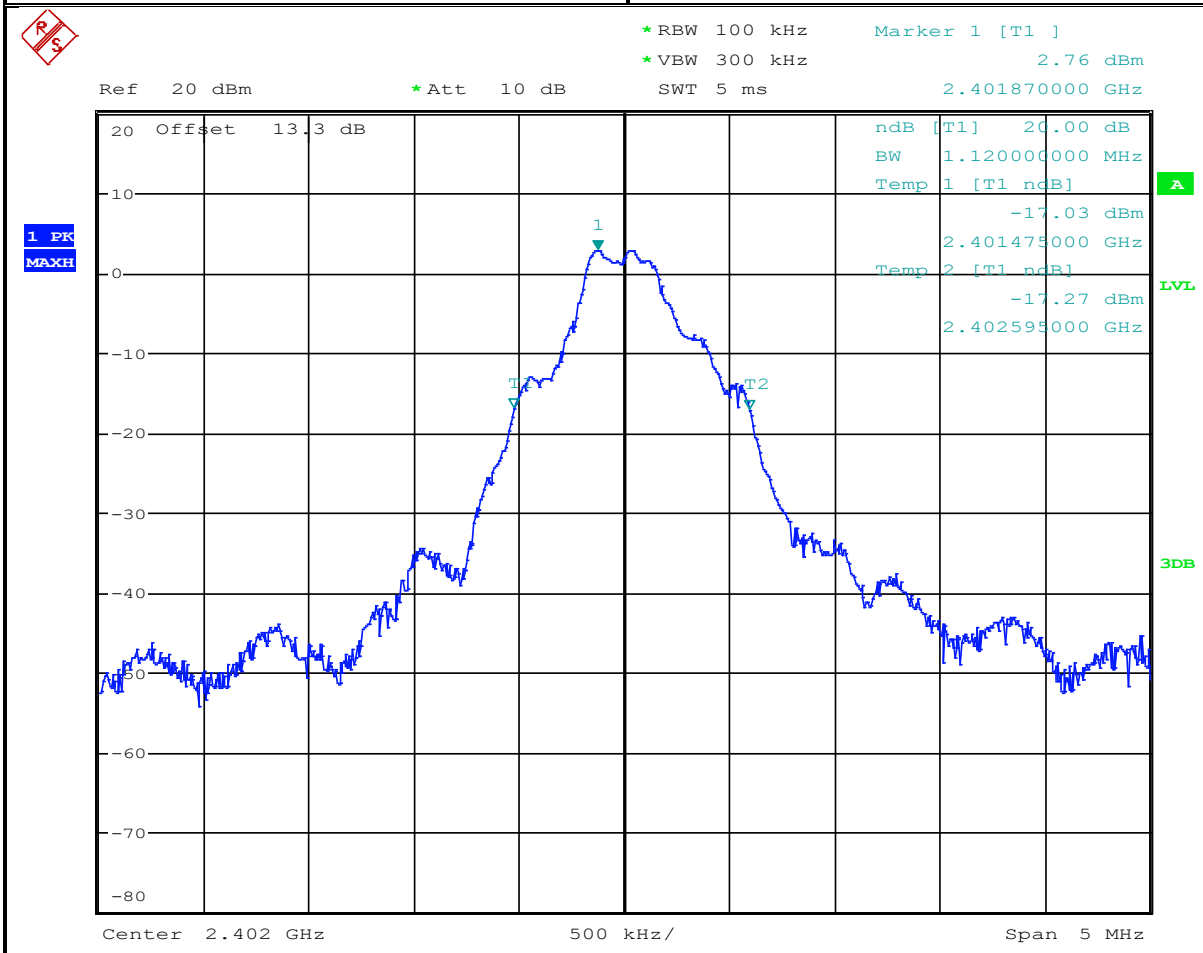
Plot #	Frequency (MHz)	20dB Emissions Bandwidth (MHz)	Result
1	2402	1.12	Pass
2	2442	1.13	Pass
3	2480	1.13	Pass

Plot #	Frequency (MHz)	99% Occupied Bandwidth (MHz)	Result
4	2402	0.99	Pass
5	2442	1	Pass
6	2480	1.005	Pass

8.3.5 Measurement Plots:

Plot #1

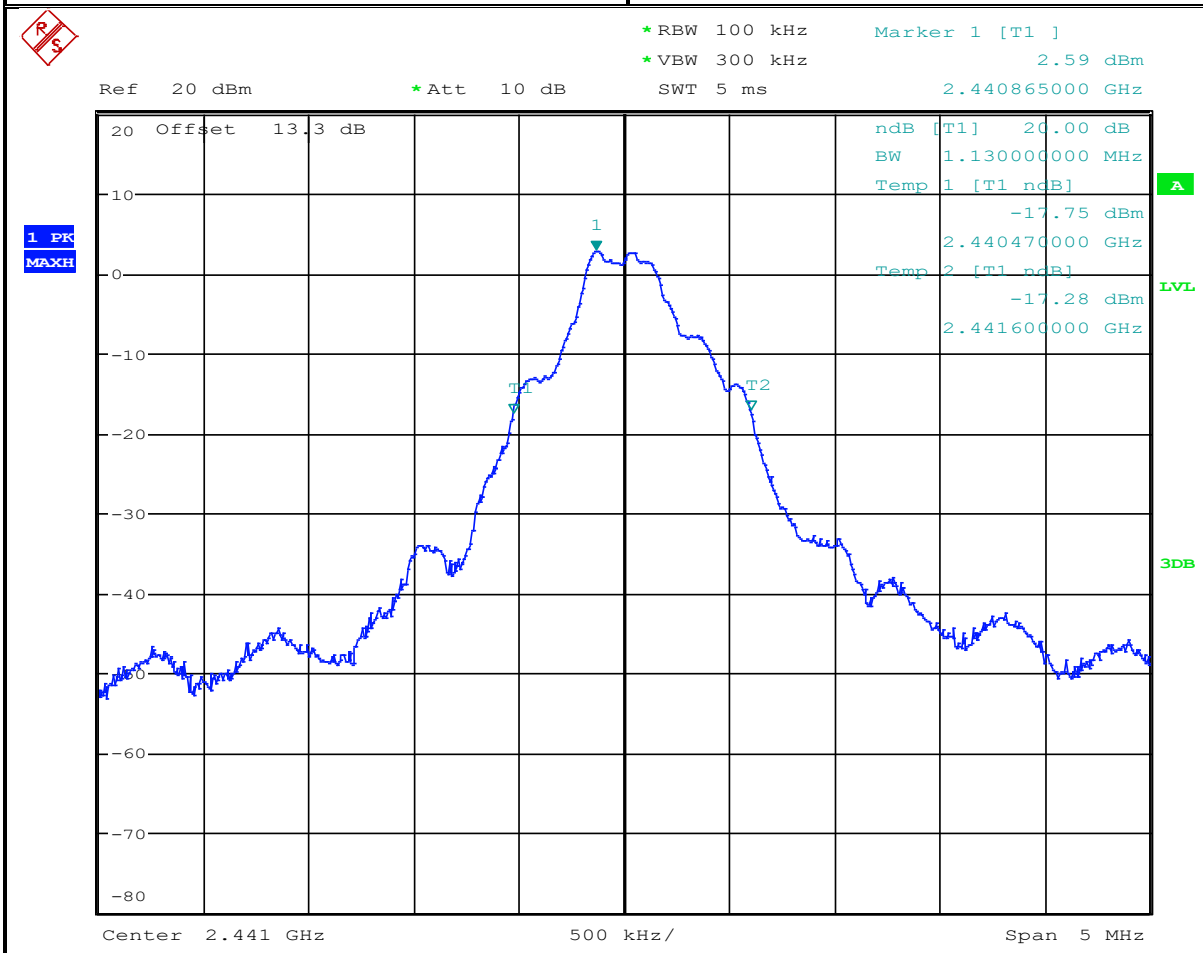
2402 MHz	Mode: ANT



Date: 4.DEC.2020 12:04:53

Plot #2

2442 MHz	Mode: ANT



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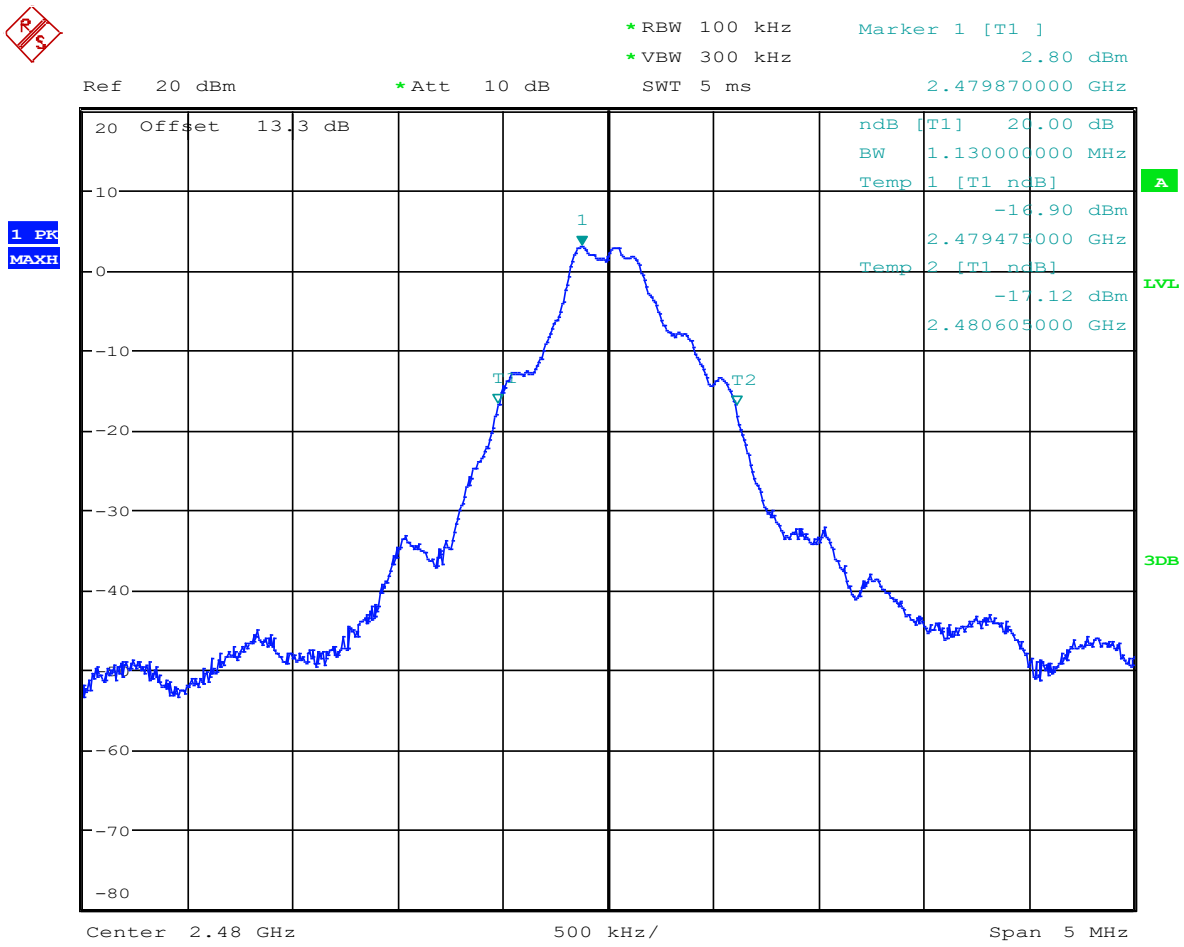
Plot #3

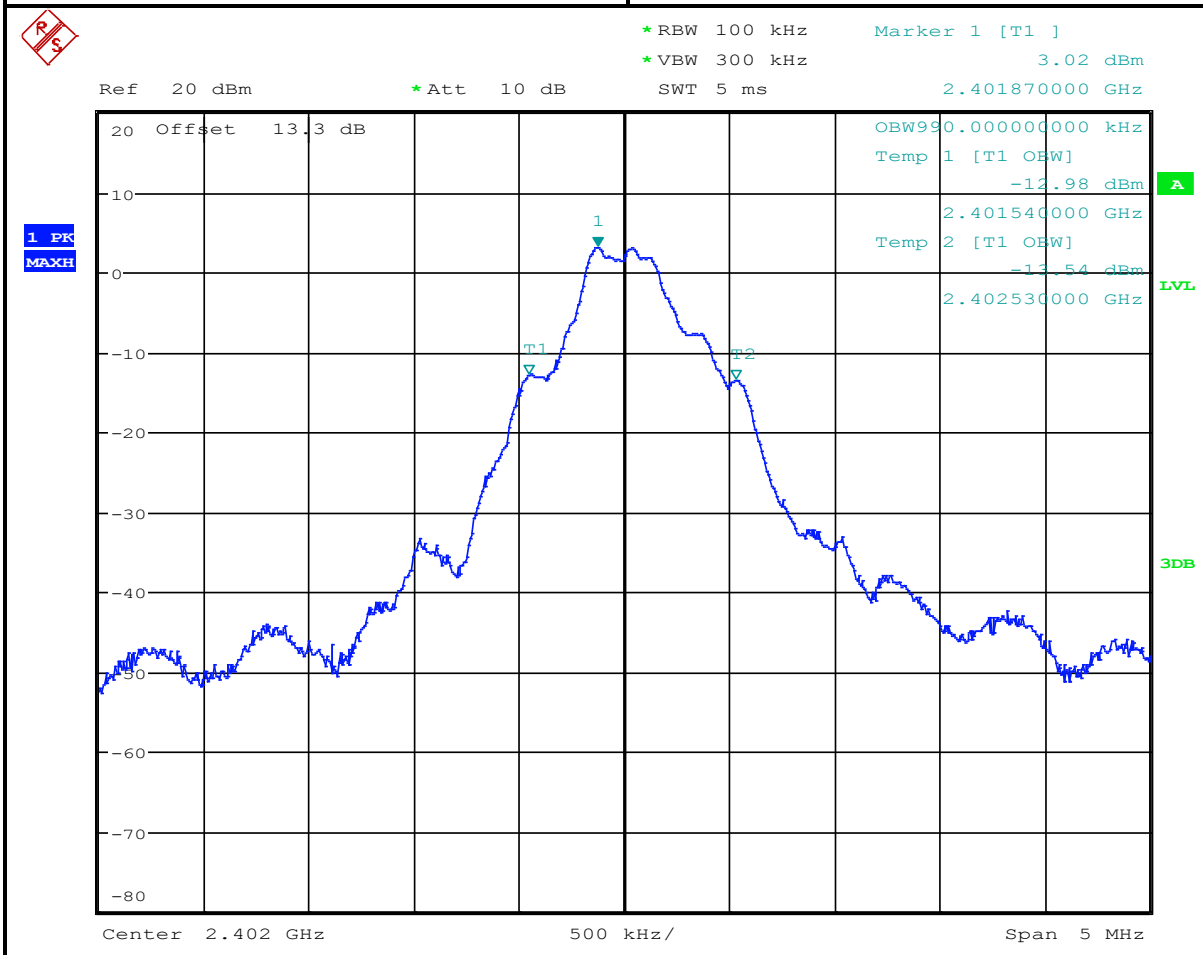
2480 MHz	Mode: ANT



Date: 4.DEC.2020 12:09:32

Plot #4

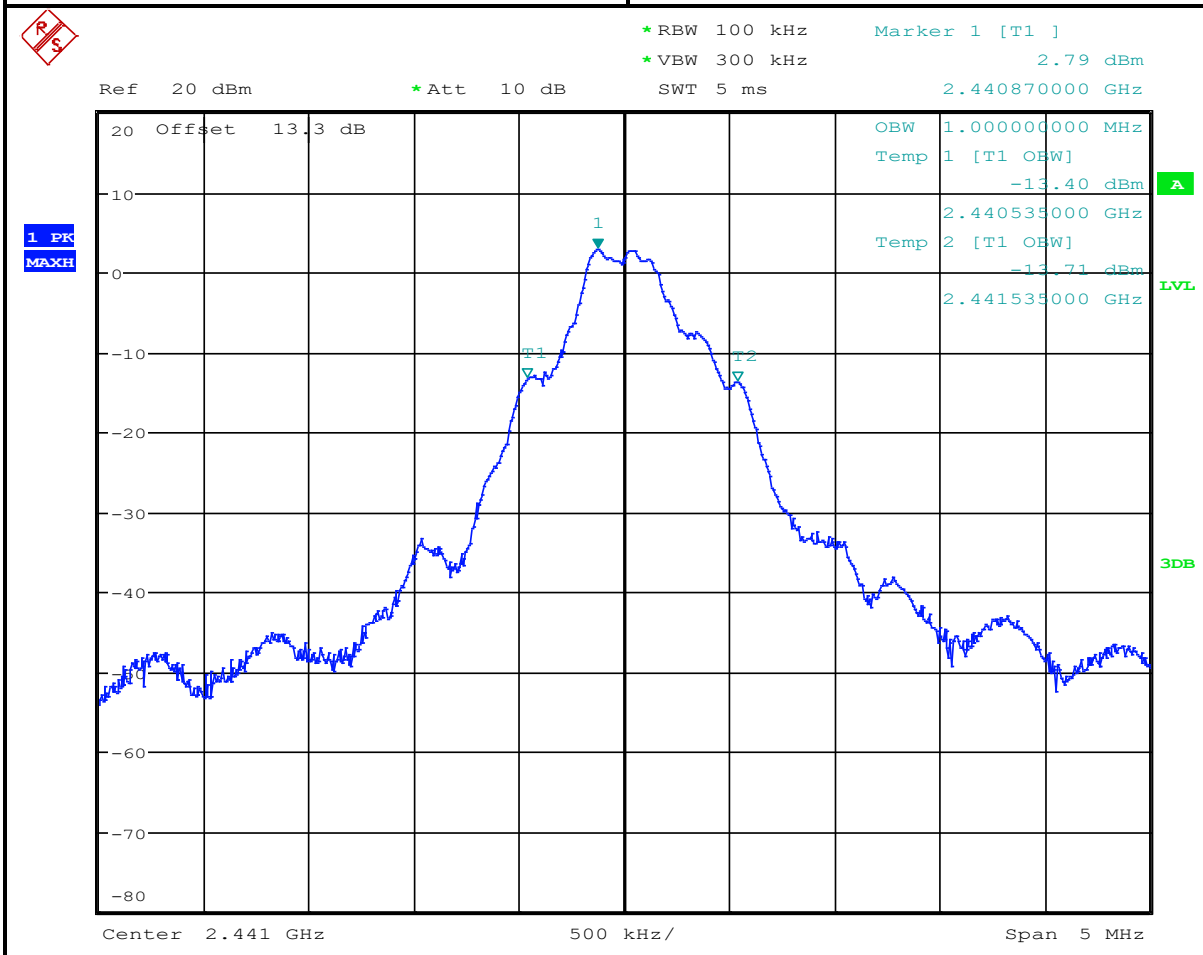
2402 MHz	Mode: ANT



Date: 24.NOV.2020 12:42:12

Plot #5

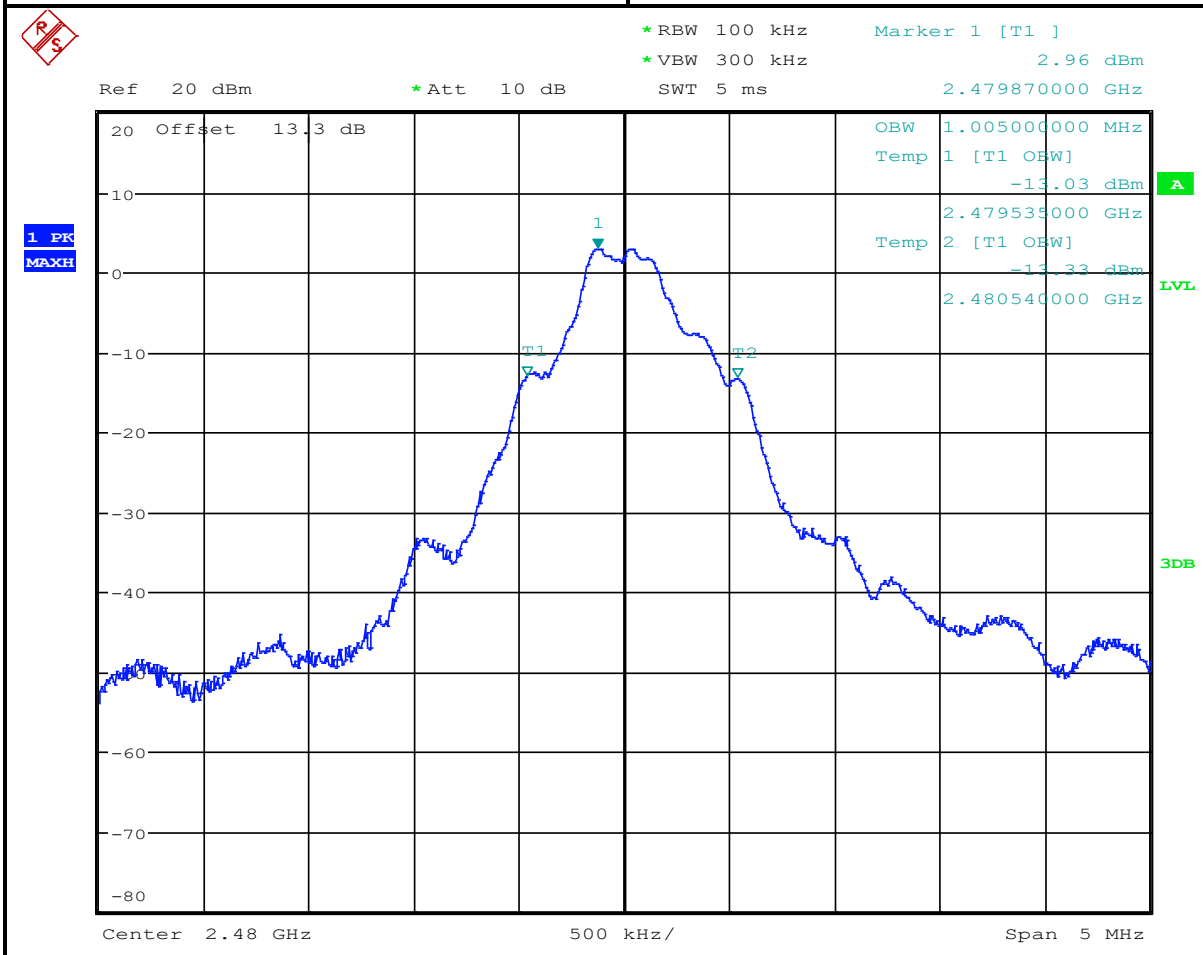
2442 MHz	Mode: ANT



Date: 24.NOV.2020 12:38:15

Plot #6

2480 MHz	Mode: ANT



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8.4 Radiated Transmitter Spurious Emissions and Restricted Bands

8.4.1 Measurement according to ANSI C63.10 (2013)

Spectrum Analyzer Settings:

- Frequency = 9 KHz – 30 MHz
- RBW = 9 KHz
- Detector: Peak

- Frequency = 30 MHz – 1 GHz
- Detector = Peak / Quasi-Peak
- RBW= 120 KHz (<1GHz)

- Frequency > 1 GHz
- Detector = Peak / Average
- RBW = 1 MHz

- Radiated spurious emissions shall be measured for the transmit frequencies, transmit power, and data rate for the lowest, middle and highest channel in each frequency band of operation and for the highest gain antenna for each antenna type, and using the appropriate parameters and test requirements.
- The highest (or worst-case) data rate shall be recorded for each measurement.
- For testing at distance other than the specified in the standard, the limit conversion is calculated by using 40 dB/decade extrapolation factor as follow: Conversion factor (CF) = 40 log (D/d) = 40 log (300m / 3m) = 80dB

8.4.2 Limits:

FCC §15.249

- (a) Except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50	500
2400-2483.5 MHz	50	500
5725-5875 MHz	50	500
24.0-24.25 GHz	250	2500

- (c) Field strength limits are specified at a distance of 3 meters.
- (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.
- (e) As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not

exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. For point-to-point operation under paragraph (b) of this section, the peak field strength shall not exceed 2500 millivolts/meter at 3 meters along the antenna azimuth.

FCC §15.209 & RSS-Gen 8.9

- Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency of emission (MHz)	Field strength (µV/m)	Measurement Distance (m)	Field strength @ 3m (dBµV/m)
0.009–0.490	2400/F(kHz) / ---------	300	-
0.490–1.705	24000/F(kHz) / --------	30	-
1.705–30.0	30 / (29.5)	30	-
30–88	100	3	40 dBµV/m
88–216	150	3	43.5 dBµV/m
216–960	200	3	46 dBµV/m
Above 960	500	3	54 dBµV/m

FCC §15.205 & RSS-Gen 8.10

- Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
[1]0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	Above 38.6
13.36-13.41			

- 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)).
  *PEAK LIMIT= 74 dBµV/m
  *AVG. LIMIT= 54 dBµV/m

8.4.3 Test conditions and setup:

Ambient Temperature	EUT Set-Up #	EUT operating mode	Power Input
23.8° C	2	ANT	5 VDC

8.4.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
1-3	Low	30 MHz – 18 GHz	See section 8.4.2	Pass
4-8	Mid	9 kHz – 26 GHz	See section 8.4.2	Pass
9-11	High	30 MHz – 18 GHz	See section 8.4.2	Pass

Note: tested co-transmission with LTE B2.

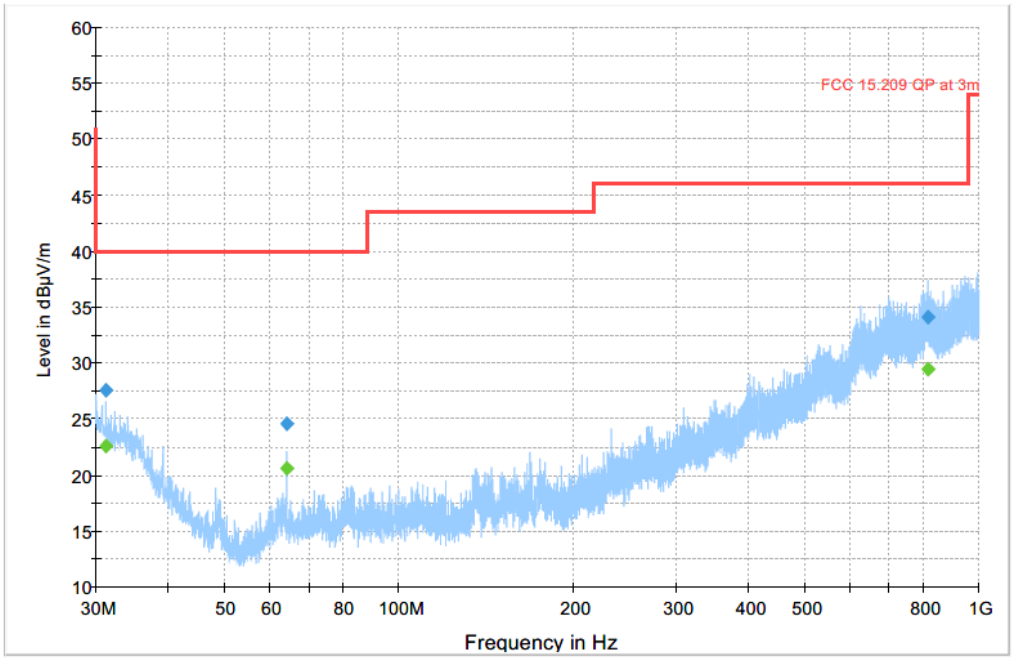
8.4.5 Measurement Plots:

Plot #1 Radiated Emissions: 30 MHz – 1GHz

Modulation: ANT	Channel: Low	3.8% Duty Cycle

Final_Result

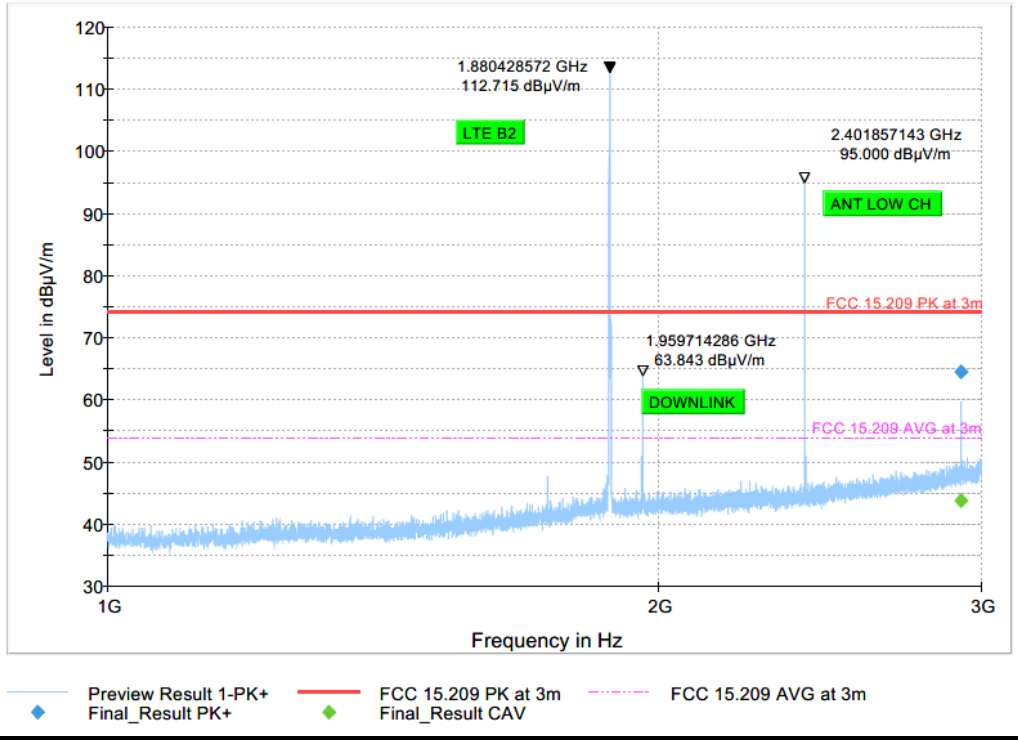
Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
31.196	27.55	---	40.00	12.45	500.0	120.000	140.0	V	177.0	20.2	
31.196	---	22.58	---	---	500.0	120.000	140.0	V	177.0	20.2	
63.982	24.65	---	40.00	15.35	500.0	120.000	140.0	V	38.0	10.8	
63.982	---	20.65	---	---	500.0	120.000	140.0	V	38.0	10.8	
818.998	---	29.42	---	---	500.0	120.000	220.0	V	21.0	30.0	
818.998	34.17	---	46.02	11.85	500.0	120.000	220.0	V	21.0	30.0	



Plot #2 Radiated Emissions: 1-3 GHz		
Modulation: ANT	**Channel: Low**	**3.8% Duty Cycle**

Final_Result

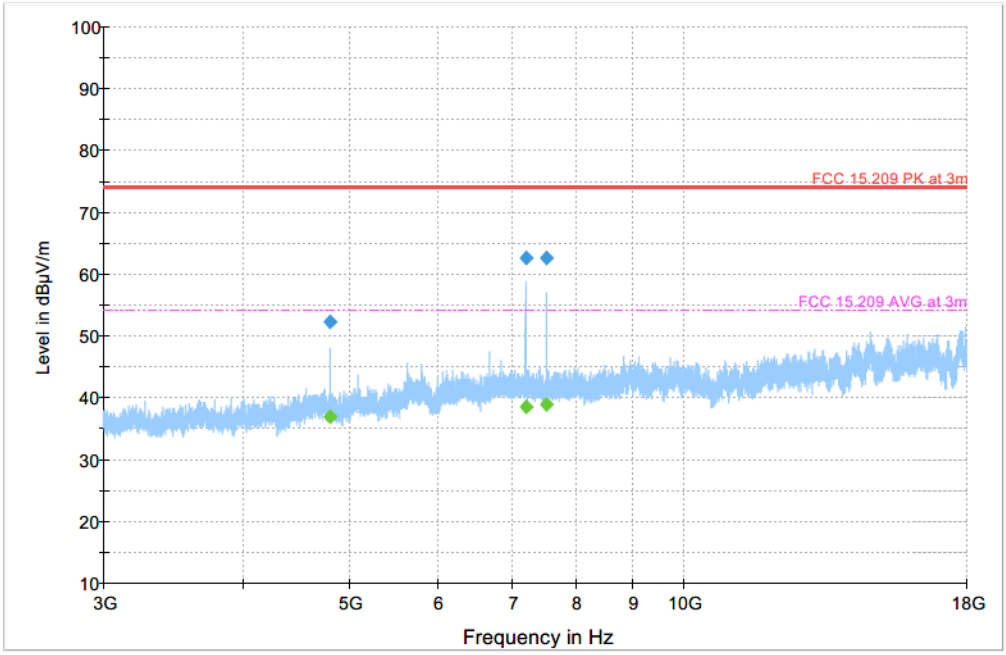
Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
2923.286	---	43.75	53.98	10.23	500.0	1000.000	100.0	V	123.0	35.0	
2923.286	64.44	---	73.98	9.54	500.0	1000.000	100.0	V	123.0	35.0	



Plot #3 Radiated Emissions: 3-18 GHz		
Modulation: ANT	**Channel: Low**	**3.8% Duty Cycle**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
4802.000	52.17	---	73.98	21.81	500.0	1000.000	120.0	H	166.0	-3.2	
4802.000	---	36.80	53.98	17.18	500.0	1000.000	120.0	H	166.0	-3.2	
7205.500	62.54	---	73.98	11.44	500.0	1000.000	228.0	H	232.0	-0.6	
7205.500	---	38.56	53.98	15.42	500.0	1000.000	228.0	H	232.0	-0.6	
7521.500	---	38.91	53.98	15.07	500.0	1000.000	268.0	H	328.0	0.2	
7521.500	62.60	---	73.98	11.38	500.0	1000.000	268.0	H	328.0	0.2	

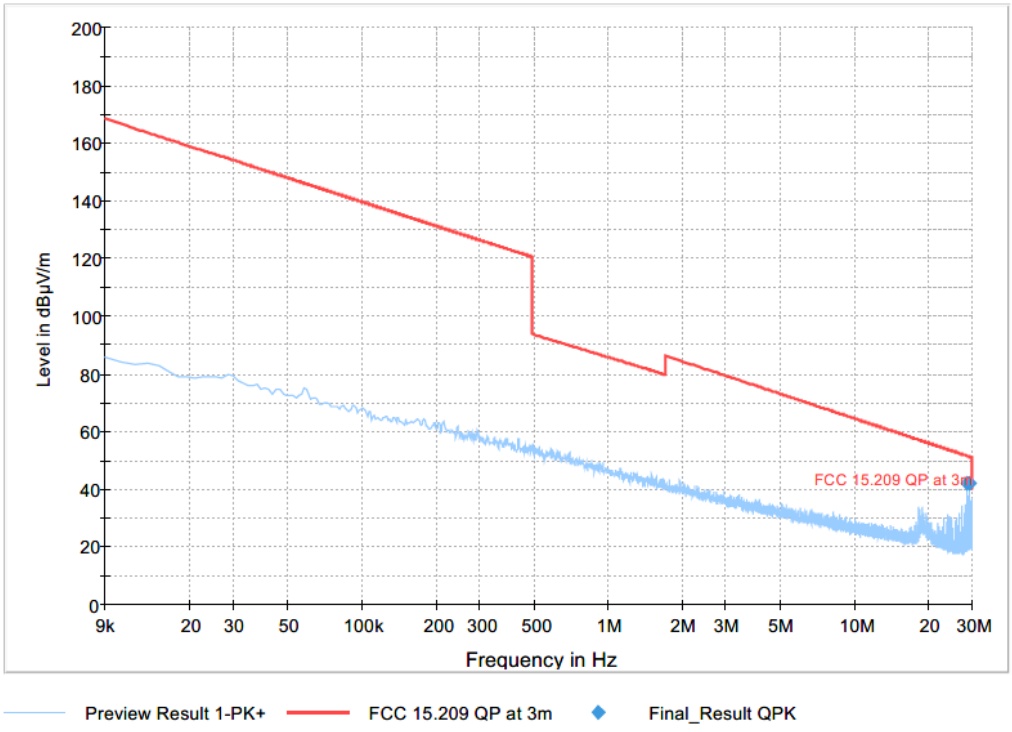


Plot #4 Radiated Emissions: 9 KHz – 30 MHz

Modulation: ANT	Channel: Mid	3.8% Duty Cycle

Final_Result

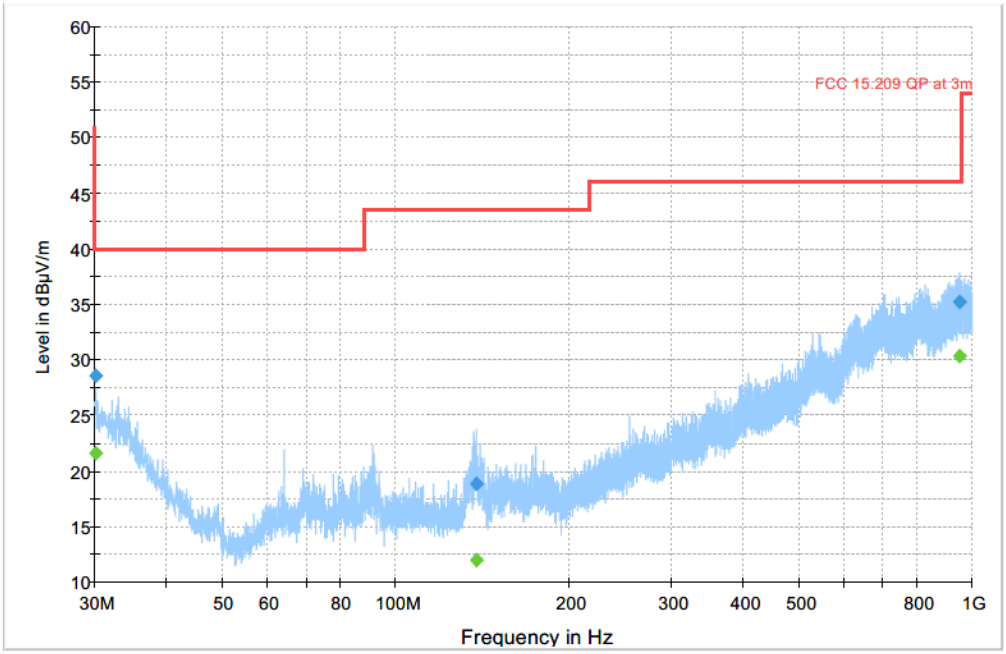
Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
28.686	42.07	51.59	9.52	500.0	9.000	100.0	H	115.0	16.3	
29.237	42.09	51.36	9.26	500.0	9.000	107.0	H	13.0	16.3	



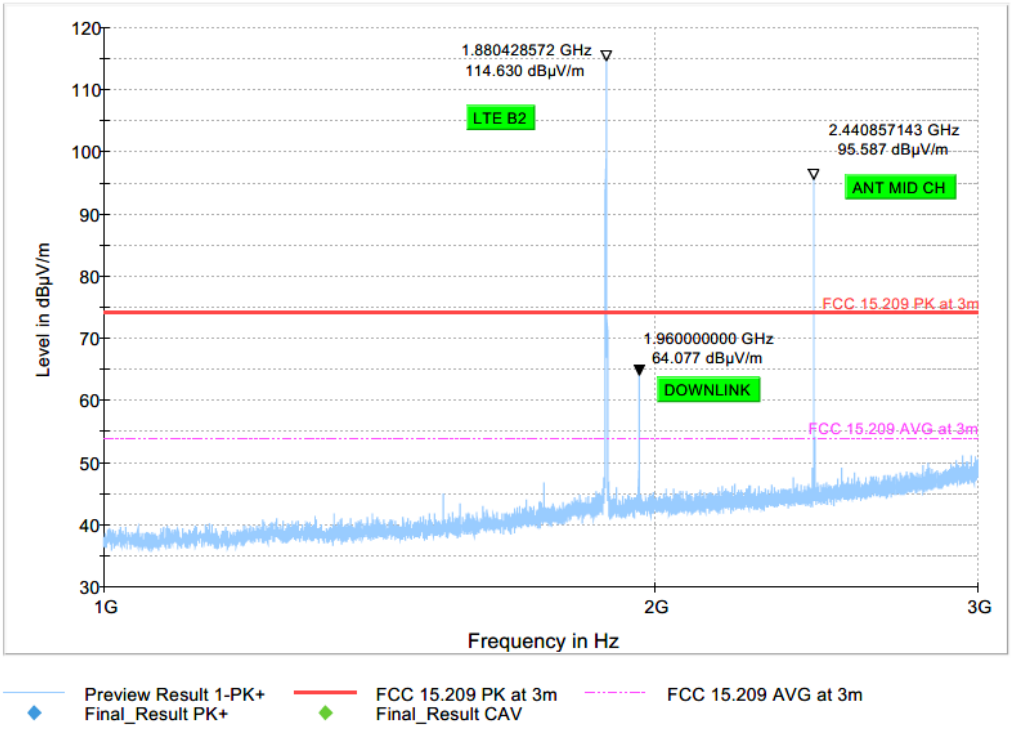
Plot #5 Radiated Emissions: 30 MHz – 1GHz		
Modulation: ANT	**Channel: Mid**	**3.8% Duty Cycle**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
30.194	28.62	---	40.00	11.38	500.0	120.000	140.0	V	49.0	20.9	
30.194	---	21.61	---	---	500.0	120.000	140.0	V	49.0	20.9	
137.864	18.89	---	43.50	24.61	500.0	120.000	140.0	H	100.0	13.0	
137.864	---	11.99	---	---	500.0	120.000	140.0	H	100.0	13.0	
949.334	---	30.38	---	---	500.0	120.000	252.0	V	195.0	30.9	
949.334	35.24	---	46.02	10.78	500.0	120.000	252.0	V	195.0	30.9	



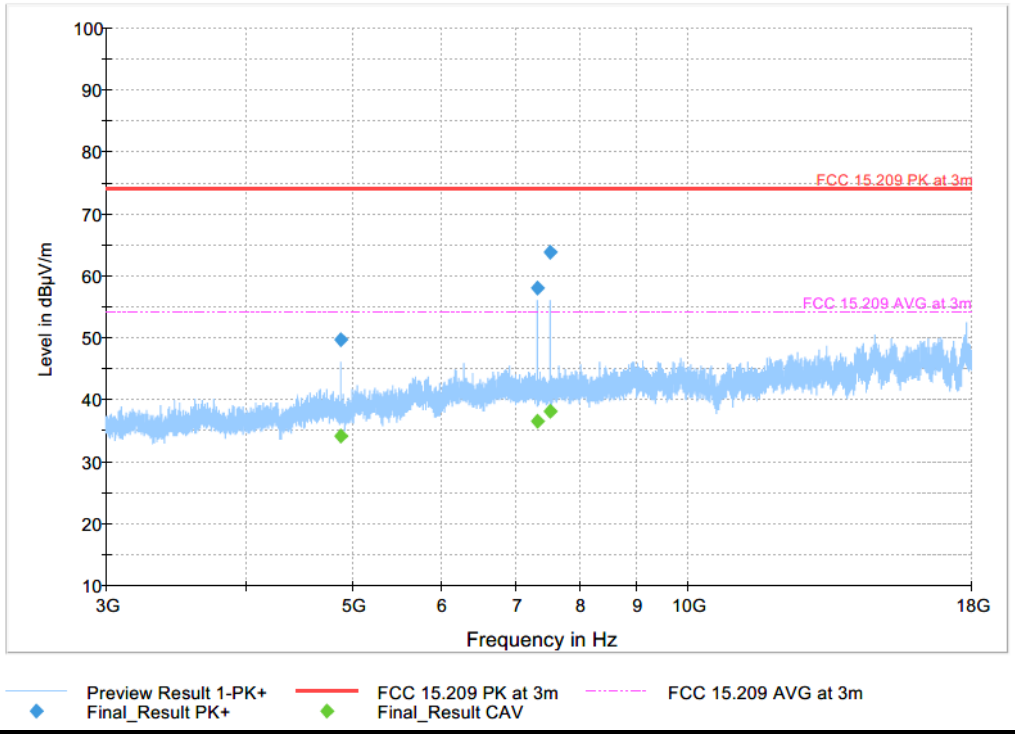
Plot #6 Radiated Emissions: 1-3 GHz		
Modulation: ANT	**Channel: Mid**	**3.8% Duty Cycle**



Plot #7 Radiated Emissions: 3-18 GHz		
Modulation: ANT	**Channel: Mid**	**3.8% Duty Cycle**

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
4879.750	---	34.12	53.98	19.86	500.0	1000.000	202.0	V	171.0	-3.8	
4879.750	49.69	---	73.98	24.29	500.0	1000.000	202.0	V	171.0	-3.8	
7322.500	57.96	---	73.98	16.02	500.0	1000.000	133.0	H	166.0	-0.4	
7322.500	---	36.52	53.98	17.46	500.0	1000.000	133.0	H	166.0	-0.4	
7521.750	63.70	---	73.98	10.28	500.0	1000.000	248.0	H	306.0	0.2	
7521.750	---	38.03	53.98	15.95	500.0	1000.000	248.0	H	306.0	0.2	

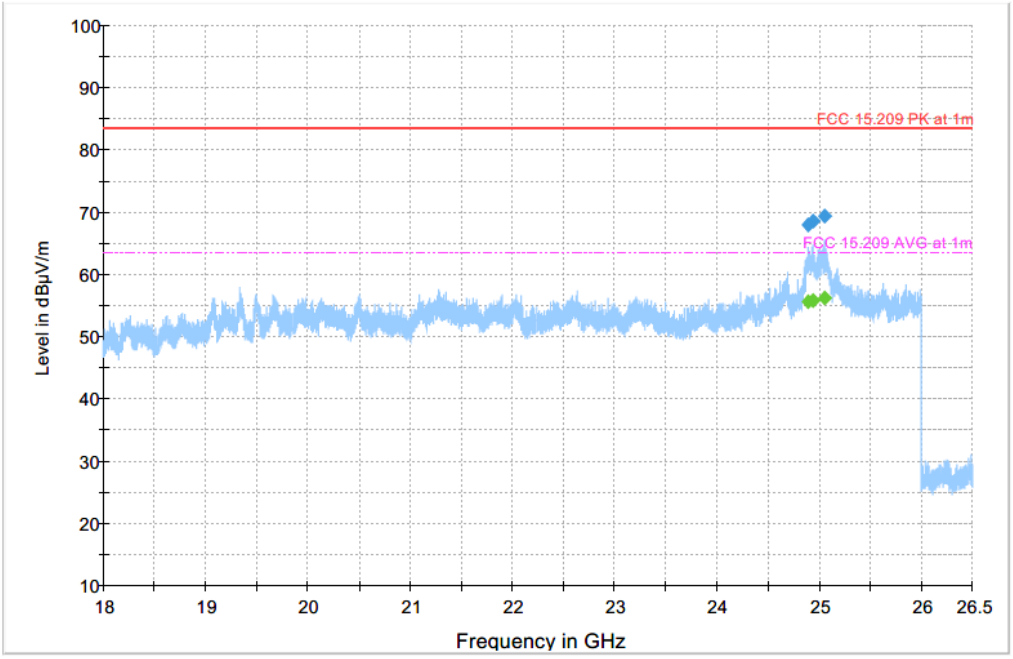


Plot #8 Radiated Emissions: 18-26 GHz

Modulation: ANT	Channel: Mid	3.8% Duty Cycle

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
24893.234	68.02	---	83.50	15.48	500.0	1000.000	150.0	H	271.0	30.3	
24893.234	---	55.59	63.50	7.91	500.0	1000.000	150.0	H	271.0	30.3	
24936.266	68.58	---	83.50	14.92	500.0	1000.000	150.0	H	262.0	30.0	
24936.266	---	55.71	63.50	7.79	500.0	1000.000	150.0	H	262.0	30.0	
25048.891	---	56.11	63.50	7.39	500.0	1000.000	150.0	V	105.0	30.4	
25048.891	69.38	---	83.50	14.12	500.0	1000.000	150.0	V	105.0	30.4	

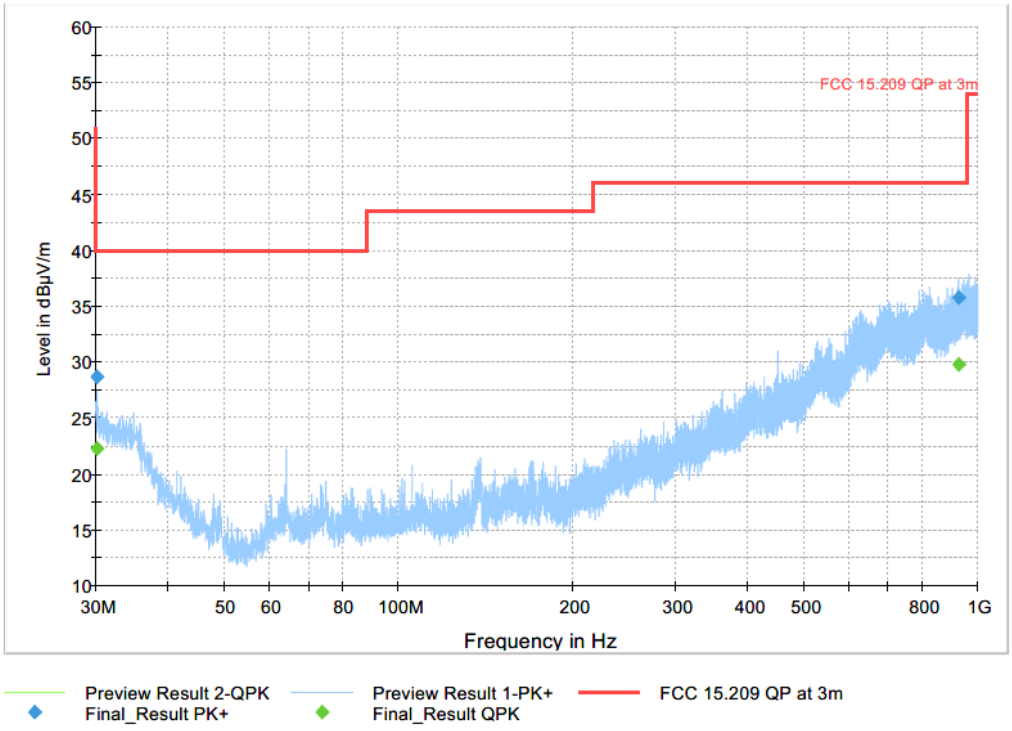


Plot #9 Radiated Emissions: 30 MHz – 1GHz

Modulation: ANT	Channel: High	3.8% Duty Cycle

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
30.129	28.71	---	40.00	11.29	500.0	120.000	152.0	V	150.0	20.9	
30.129	---	22.32	---	---	500.0	120.000	152.0	V	150.0	20.9	
926.636	35.80	---	46.02	10.22	500.0	120.000	315.0	H	134.0	30.2	
926.636	---	29.80	---	---	500.0	120.000	315.0	H	134.0	30.2	

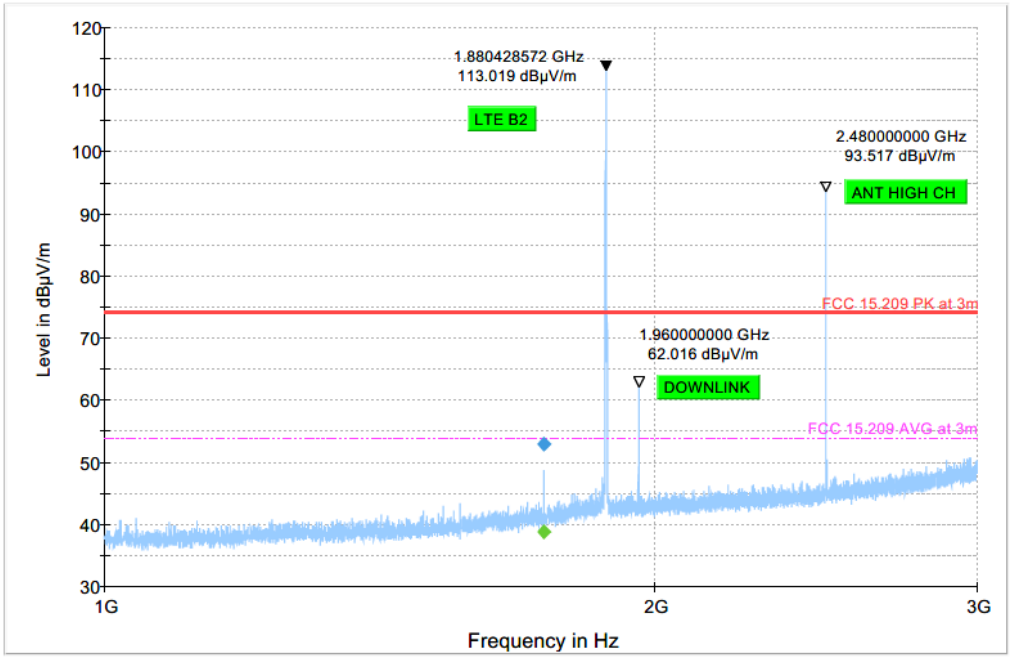


Plot #10 Radiated Emissions: 1-3 GHz

Modulation: ANT	Channel: High	3.8% Duty Cycle

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
1738.714	---	38.68	53.98	15.30	500.0	1000.000	100.0	V	21.0	30.4	
1738.714	52.94	---	73.98	21.04	500.0	1000.000	100.0	V	21.0	30.4	

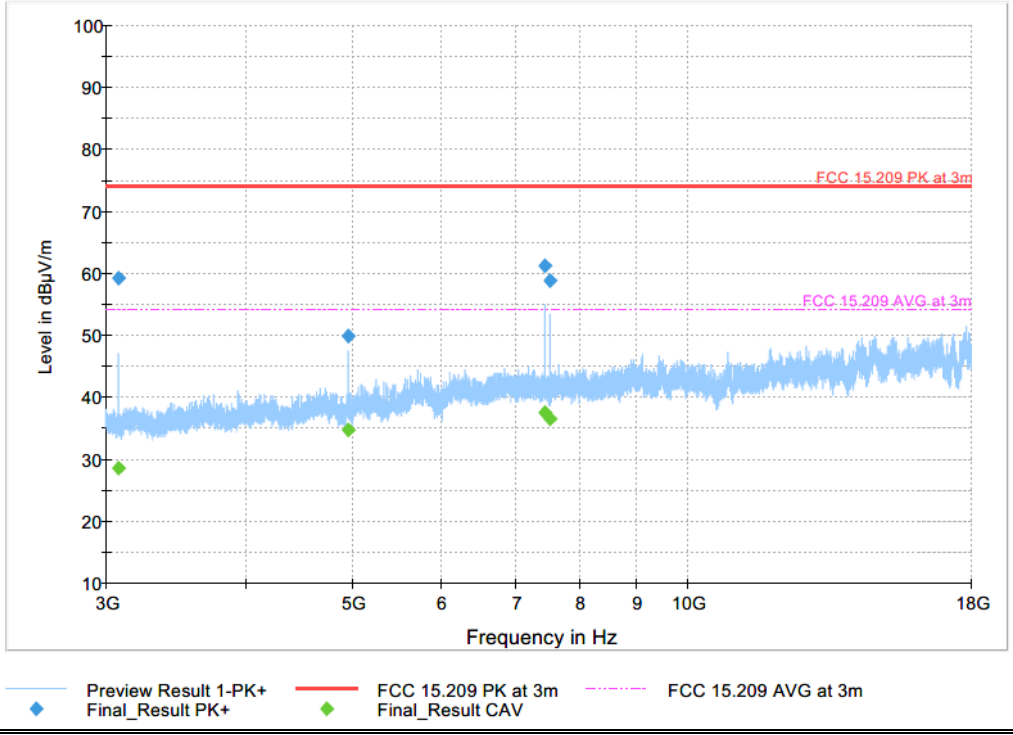


Plot #11 Radiated Emissions: 3-18 GHz

Modulation: ANT	Channel: High	3.8% Duty Cycle

Final_Result

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
3080.250	59.28	---	73.98	14.70	500.0	1000.000	169.0	V	112.0	-8.3	
3080.250	---	28.53	53.98	25.45	500.0	1000.000	169.0	V	112.0	-8.3	
4958.000	49.81	---	73.98	24.17	500.0	1000.000	177.0	V	188.0	-3.2	
4958.000	---	34.71	53.98	19.27	500.0	1000.000	177.0	V	188.0	-3.2	
7440.000	61.26	---	73.98	12.72	500.0	1000.000	250.0	H	144.0	0.2	
7440.000	---	37.39	53.98	16.59	500.0	1000.000	250.0	H	144.0	0.2	
7521.750	58.83	---	73.98	15.15	500.0	1000.000	151.0	H	230.0	0.2	
7521.750	---	36.40	53.98	17.58	500.0	1000.000	151.0	H	230.0	0.2	



9 Test setup photos

Setup photos are included in supporting file name: "EMC_GARMI-080-20001_FCC_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Item Name	Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
Antenna Biconilog 3142E	Biconlog Antenna	EMCO	3142E	166067	3 years	03/12/2020
Magnetic Loop Antenna	Loop Antenna	ETS Lindgren	6507	161344	3 years	10/30/2020
Antenna Horn 3115 SN 35111	Horn Antenna	EMCO	3115	35111	3 years	04/17/2019
Antenna Horn 3116	Horn Antenna	ETS Lindgren	3116	70497	3 years	11/23/2020
Antenna Horn 3117	Horn Antenna	ETS Lindgren	3117-PA	169547	3 years	09/01/2020
FSU26	Spectrum Analyzer	R&S	FSU26	200302	3 years	7/16/2019
EMI Receiver	EMI Receiver	R&S	ESU40	100251	3 years	07/16/2019
LISN	Line Impedance Stabilization Network	FCC	FCC-LISN-50-25-2-08	8014	3 Year	7/19/2019
Thermometer Humidity	Thermometer Humidity	Control Company	36934-164	191871994	2 Year	1/10/2019

Note: Equipment used meets the measurement uncertainty requirements as required per applicable standards for 95% confidence levels. Calibration due dates, unless defined specifically, falls on the last day of the month. Items indicated "N/A" for cal status either do not specifically require calibration or is internally characterized before use.

11 History

Date	Report Name	Changes to report	Report prepared by
2021-06-29	EMC_GARMI-080-20001_15.249_ANT	Initial Version	Yuchan Lu

<<< The End >>>