FCC / ISED Test Report

For:
June Life

Brand:
June Life Inc.

Model #:
JCH03

Product Description:
Smart Countertop Convection Oven

FCC ID: 2AJGA-CP20A
IC ID: 21848-CP20A

Applied Rules and Standards:
47 CFR Part 15.247 (DSS)
RSS-247 Issue 2 (FHSs) & RSS-Gen Issue 5

REPORT #: EMC_JUNEL-002-20001_FCC_15.247_ISED_BT_DSS

DATE: 10/20/2020

A2LA Accredited

IC recognized #
3462B-1
3462B-2

***CETECOM* Inc.**
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1 Assessment

The following device was evaluated against the applicable criteria specified in FCC rules Parts 15.247 of Title 47 of the Code of Federal Regulations and the relevant ISED Canada standard RSS-247.

No deviations were ascertained.

According to section 5 of this report, the overall result is Pass.

Company	Description	Model #
June Life	Smart Countertop Convection Oven	JCH03

Responsible for Testing Laboratory:

Date	Section	Name	Signature
10/20/2020	Compliance	Li, Cindy (EMC Lab Manager)	Cindy Li Digitally signed by cindy.li@cetecom.com DN: CN=cindy.li@cetecom.com Reason: I have reviewed this document Location: Date: 2020-10-21 09:49:22

Responsible for the Report:

Date	Section	Name	Signature
10/20/2020	Compliance	Ghanma, Issa (EMC Engineer)	Digitally signed by: Issa W Ghanma DN: CN = Issa W Ghanma email = Issaghanma@cetecom.com C = US O = CETECOM Inc. OU = EMC Date: 2020.10.21 08:07:53 -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:	Li, Cindy
Responsible Project Leader:	Palacios, Cathy

2.2 Identification of the Client

Applicant's Name:	June Life
Street Address:	1620 Folsom St
City/Zip Code	San Francisco CA, 94103
Country	USA

2.3 Identification of the Manufacturer

Manufacturer's Name:	Same as Client /----------
Manufacturers Address:	----------
City/Zip Code	----------
Country	----------

3 Equipment Under Test (EUT)

3.1 EUT Specifications

Model No:	JCH03
Marketing name:	June Oven
FCC-ID :	2AJGA-CP20A
IC-ID:	21848-CP20A
HW Version :	11-00012-00,ASSY,PENGUIN-04
SW Version :	1.22.0.33
HVIN:	JCH03
PMN:	June Oven
FVIN:	N/A
HMN	June Oven
Product Description:	Smart Countertop Convection Oven
Frequency Range/number of channels:	Nominal band: 2400 MHz – 2483.5 MHz Center to center: 2402 MHz (ch 0) – 2480 MHz (ch 78), 79 Channels
Radio Information:	❖ Bluetooth 2.1+EDR • Chipset name/number : Media Tek MT7668ASN • Modulation : GFSK, π/4-DQPSK, 8DPSK
Max. Measured Conducted Output Power:	+11.77 dBm
Power Supply/ Rated Operating Voltage Range:	Low 90 V, Nominal 110 V, High 130 V
Operating Temperature Range:	Low 0º C, Nominal 25º C, High +35º C

Antenna Information as declared:	❖ Flex Dual Band Wi-Fi (2.4GHz/5GHz) Antenna • Dipole Antenna • FPC High Efficiency Dual Band Wi-Fi Dipole Antenna • Designed for 2.4 GHz and 5GHz dual band Wi-Fi applications • Linear Polarization • Omni-Directional • IPEX Connector • Miniature and light weight • RoHS Compliance • 3M300LSE adhesive • Green Heat Shrink • Cable length 425mm • Maximum Gain: 2.3 dBi
Other Radios included in the device:	❖ Bluetooth 4.2 Low Energy ❖ Bluetooth 5.0 ❖ Wi-Fi 2.4GHz 802.11 b/g/n ❖ Wi-Fi 5 GHz a/n/ac
Sample Revision:	☐ Prototype Unit; ☐ Production Unit; ■ Pre-Production
Product dimensions [cm]:	50.4 x 49.0 x 32.5

3.2 EUT Sample details

EUT #	Serial Number	HW Version	SW Version	Notes/Comments
1	00738490008293830005	11-00012-00,ASSY,PENGUIN-04	1.22.0.33	Conducted measurement
2	00738490008293830009	11-00012-00,ASSY,PENGUIN-04	1.22.0.33	Radiated measurement

3.3 Accessory Equipment (AE) details

AE #	Type	Model	Manufacturer	Serial Number
N/A	-	-	-	-

3.4 Test Sample Configuration

EUT Set-up #	Combination of AE used for the test set up	Comments
1	EUT#1	The measurement equipment was connected to the 50 ohm RF port of the EUT.
2	EUT#2	The internal antenna was connected.

3.5 Mode of Operation details

Mode of Operation	Description of Operating modes	Additional Information
Op. 1	BT	❖ Putty terminal used to communicate with the device, and sending commands provided by client, that will not be available to end-user, to configure the BLE radio: ▪ Maximum output power. ▪ Continuous transmission. ▪ Modulated signal. ▪ Switch between supported moduleation. ▪ Switch between packet type(s). ▪ Select Tx channel(s): Low (0), Mid (40) and High (78)

Power setting as declared:

Power Mode		Mode-1		Mode-2	
BR(BLE) power level control		EDR power = BR power – 3dB 0x383[7:6] = 00b		EDR power = BR power 0x383[7:6] = 01b	
Main-Level 0x382 [7:4] 0x383 [3:0]	Sub-Level 0x383 [5:4]	BR(BLE) Power (dBm)	EDR Power (dBm)	BR (BLE) Power (dBm)	EDR Power (dBm)
7 (111b)	0 (00b)	13	10	10	10

3.6 Justification for Worst-Case Mode of Operation

During the testing process, the EUT was tested with transmitter sets on low, mid, and high channels, and the highest possible duty cycle and output power.

For radiated measurements;

- All data in this report show the worst case of BT radio, transmitting at the highest output power.
- All data in this report show 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 15.247 of Title 47 of the Code of Federal Regulations and Radio Standard Specification RSS-247 Issue 2 of ISED Canada.

This test report is to support a request for new equipment authorization under the:
FCC ID: 2AJGA-CP20A
IC ID: 21848-CP20A

Testing procedures are based on ANSI C63.10:2013 including section 7.8 for FHSS systems.

5 Measurement Results Summary

Test Specification	Test Case	Temperature and Voltage Conditions	Mode	Pass	NA	NP	Result
§15.247(a)(1) RSS-247 5.1(b)	Emission Bandwidth	Nominal	GFSK π/4-DQPSK 8DPSK	■	☐	☐	Complies
§15.247(b)(1) RSS-247 5.4(b)	Maximum Conducted Output Power and EIRP	Nominal	GFSK π/4-DQPSK 8DPSK	■	☐	☐	Complies
§15.247(d) RSS-247 5.5; RSS-Gen 8.10;	Band edge compliance Restricted and Unrestricted Band Edges	Nominal	8DPSK	■	☐	☐	Complies
§15.247(a)(1) RSS-247 5.1(b)	Carrier Frequency Separation	Nominal	8DPSK	■	☐	☐	Complies
§15.247(a)(1) RSS-247 5.1(d)	Number of Hopping Channels	Nominal	8DPSK	■	☐	☐	Complies
§15.247(a)(1)(iii) RSS-247 5.1(d)	Time of occupancy	Nominal	8DPSK	■	☐	☐	Complies
§15.247(d); §15.209 RSS-Gen 6.13	TX Spurious emissions-Radiated	Nominal	8DPSK	■	☐	☐	Complies
§15.207(a) RSS Gen 8.8	AC Conducted Emissions	Nominal	8DPSK	■	☐	☐	Complies

Note1: 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 a 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

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:

7/28/2020 – 8/14/2020

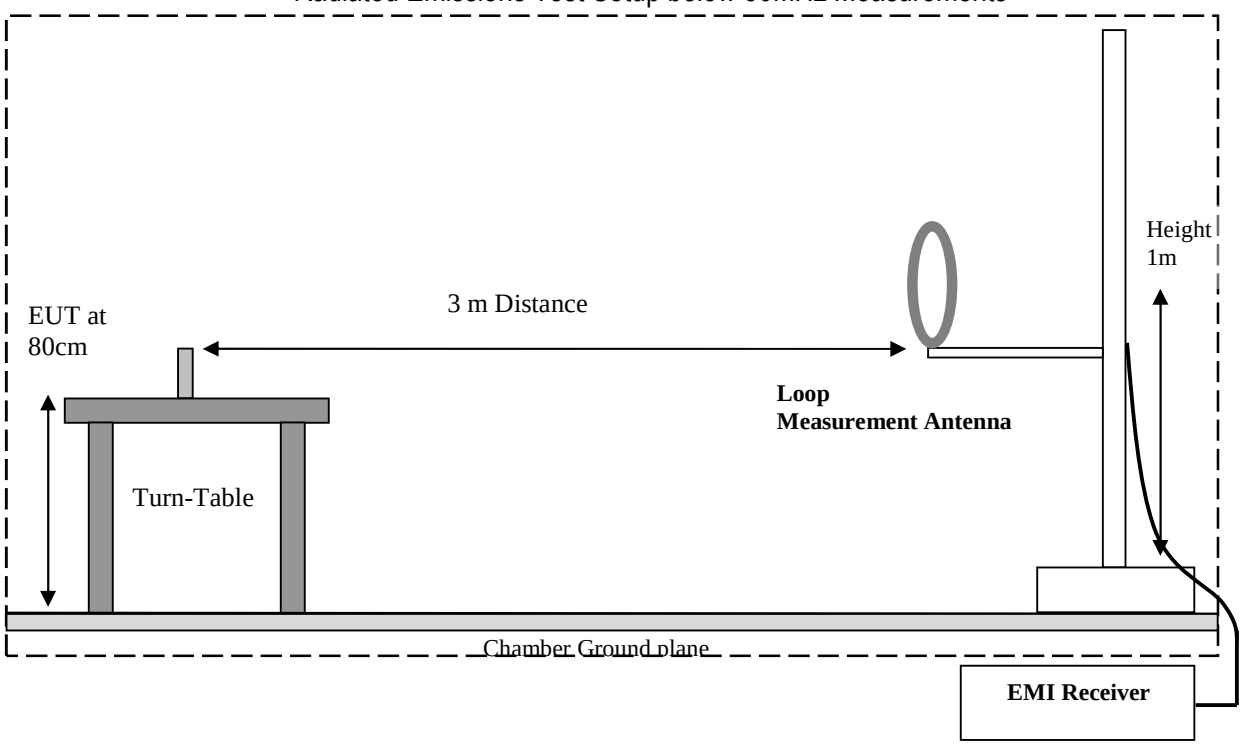
7 Measurement Procedures

7.1 Radiated Measurement

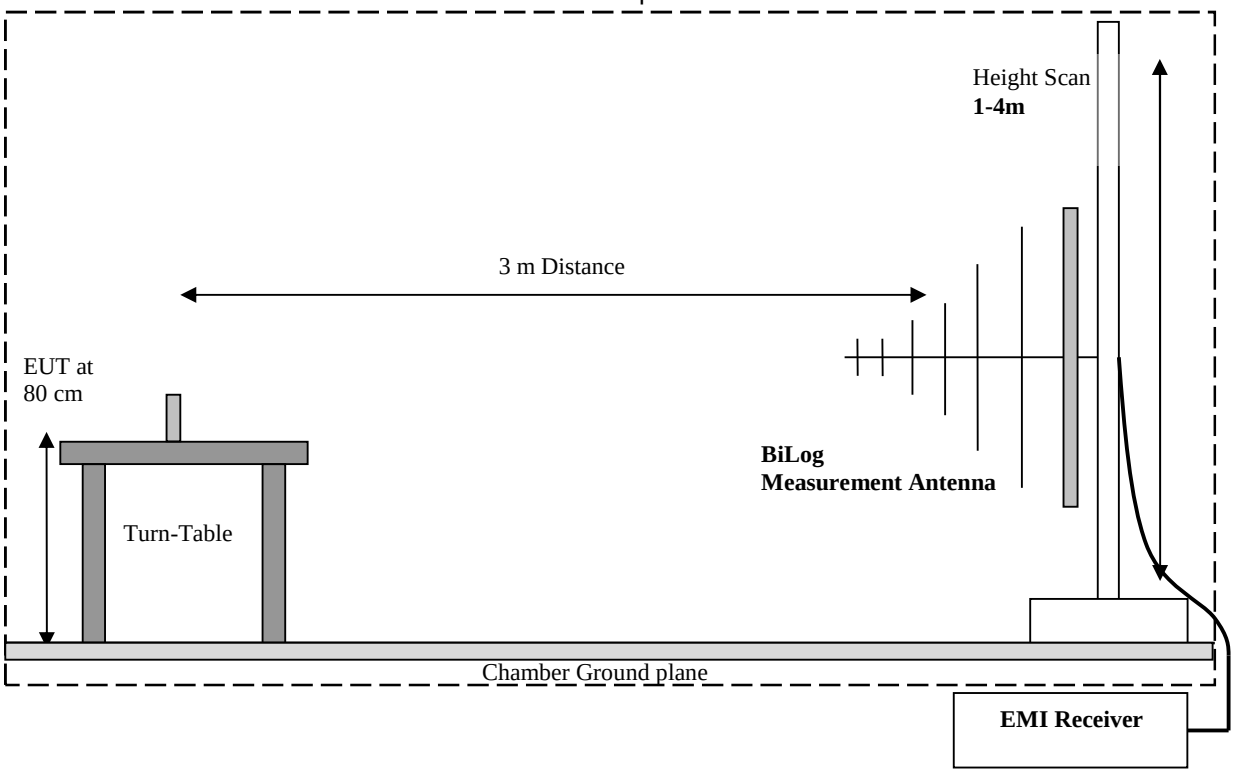
The radiated measurement is performed according to ANSI C63.10 (2013)

- The exploratory measurement is accomplished by running a matrix of 16 sweeps over the required frequency range with R&S Test-SW EMC32 for 360º continuous measurement 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 the frequency domain and height scan between 1m and 4m.
- The above procedure is repeated for all possible ways of power supply to EUT and all supported modulations.
- In case there are no emissions above the 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.

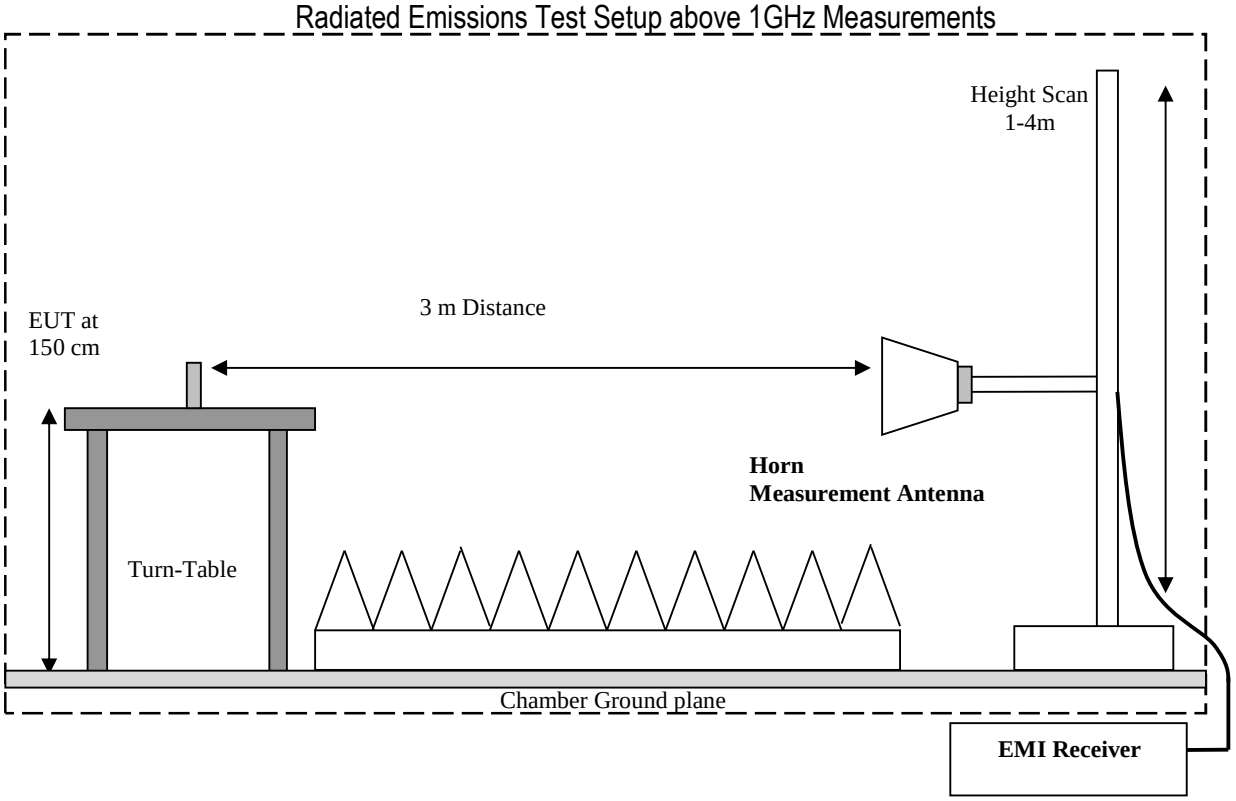
Radiated Emissions Test Setup below 30MHz Measurements



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:

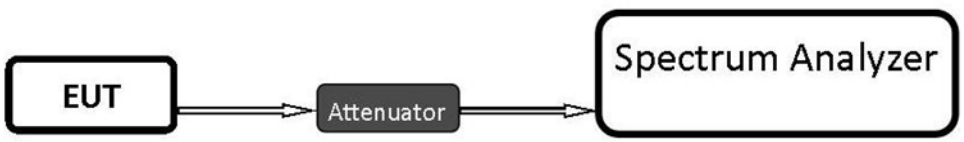
Frequency (MHz)	Measured SA (dBµV)	Cable Loss (dB)	Antenna Factor Correction (dB)	Field Strength Result (dBµV/m)
1000	80.5	3.5	14	98.0

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

Reference: ANSI C63.10 (2013) Section 6.9, 6.10, and 7.8



- 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 Duty Cycle

8.1.1 Measurement according to FCC 558074 D01 15.247 Meas Guidance v05r02;

Measurements of duty cycle and transmission duration shall be performed using the following technique:

b) The zero-span mode on a spectrum analyzer or EMI receiver if the response time and spacing between bins on the sweep are sufficient to permit accurate measurements of the on-and off-times of transmitted signal.

1. Set the center frequency of the instrument to the center frequency of the transmission.
2. Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value.
3. Set detector = peak or average.
4. The zero-span measurement method shall not be used unless both RBW and VBW are >50/T and the number of sweep points across duration T exceeds 100.
   (For example, if VBW and/or RBW are limited to 3 MHz, then the zero-span method of measuring duty cycle shall not be used if T ≥ 16.7 microseconds.)

8.1.2 Test conditions and setup:

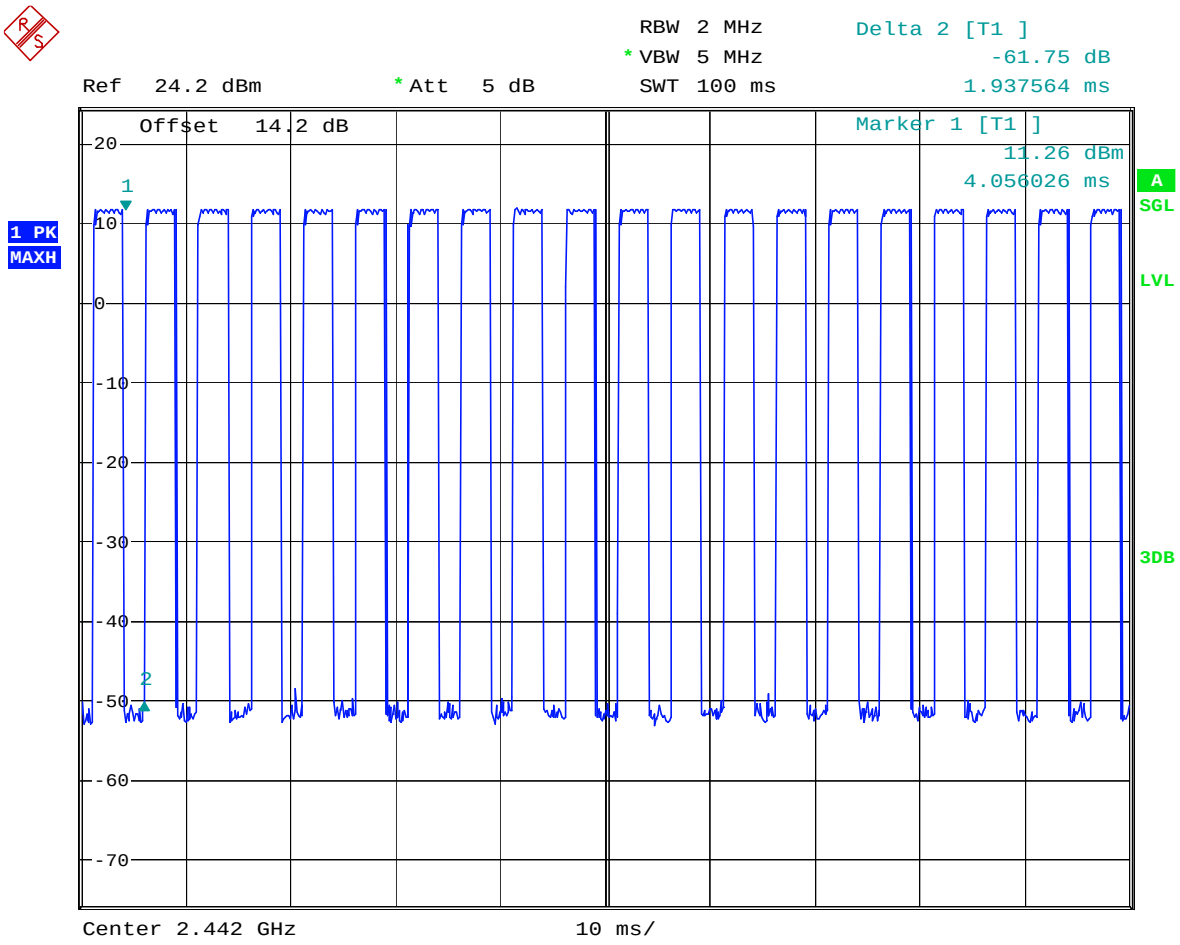
Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.1.3 Measurement result:

Plot #	Mode	TX Frequency	Off time over 100ms	Duty cycle
1	8DPSK 3DH5	2442 MHz	40.1ms	59.9%

8.1.4 Measurement plots:

Plot # 1	
Tx Frequency: 2442 MHz	Mode: BT 8DPSK 3DH5



Date: 27.AUG.2020 16:46:14

8.2 20dB Bandwidth

8.2.1 Measurement according to ANSI C63.10 Section 6.9.2

Spectrum Analyzer settings:

- Span: approximately 2 to 5 times the 20 dB bandwidth, centered on the hopping channel
- RBW = 1% to 5% of the 20 dB bandwidth
- VBW = 3 x RBW
- Sweep Time = Auto couple
- Detector = Peak
- Trace = Max hold

8.2.2 Limits: FCC §15.247(a)(1), RSS-247 5.1(b)

FCC §15.247(a)(1):
Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

RSS-247 5.1(b):
FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W

8.2.3 Test conditions and setup:

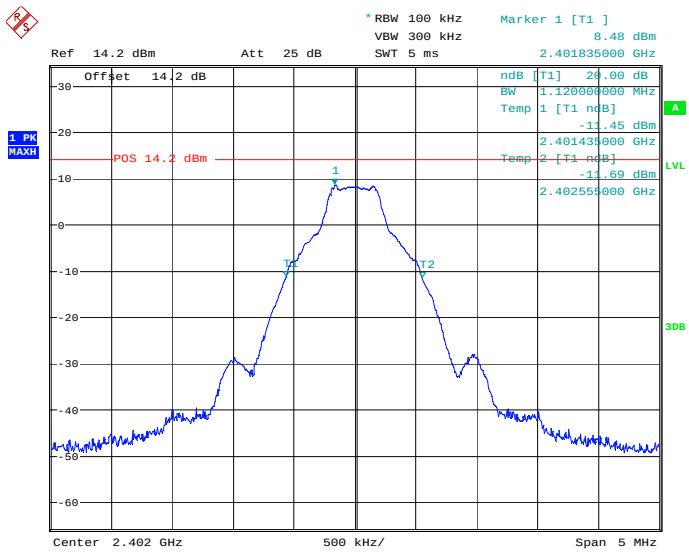
Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.2.4 Measurement result:

Plot #	EUT operating mode	Packet type	Channel #	TX Frequcncy (MHz)	20 dB Bandwidth (MHz)
2	GFSK	DM5	0	2402	1.12
3			40	2442	1.13
4			78	2480	1.12
5	GFSK	DH5	0	2402	1.12
6			40	2442	1.12
7			78	2480	1.12
8	GFSK	HV3	0	2402	1.10
9			40	2442	1.09
10			78	2480	1.10
11	GFSK	EV5	0	2402	1.10
12			40	2442	1.10
13			78	2480	1.10
14	π/4-DQPSK	2DH5	0	2402	1.37
15			40	2442	1.37
16			78	2480	1.37
17	π/4-DQPSK	2EV5	0	2402	1.28
18			40	2442	1.28
19			78	2480	1.28
20	8DPSK	3DH5	0	2402	1.38
21			40	2442	1.38
22			78	2480	1.38
23	8DPSK	3EV5	0	2402	1.28
24			40	2442	1.28
25			78	2480	1.28

8.2.5 Measurement Plots:

Plot # 2		
Tx Frequency: 2402 MHz	DM5	Mode: GFSK



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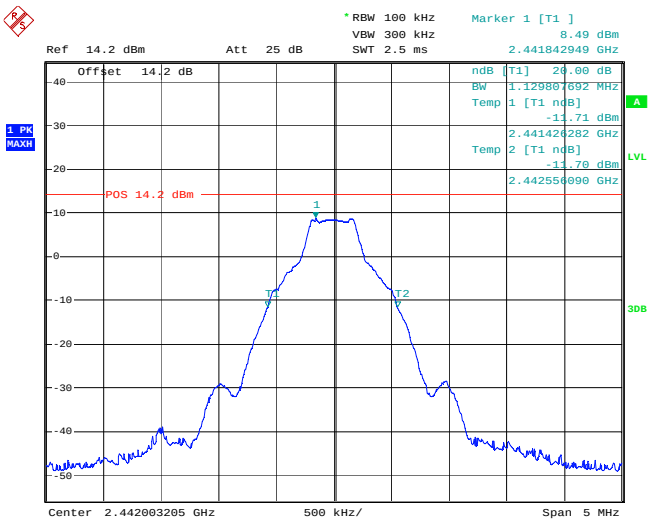
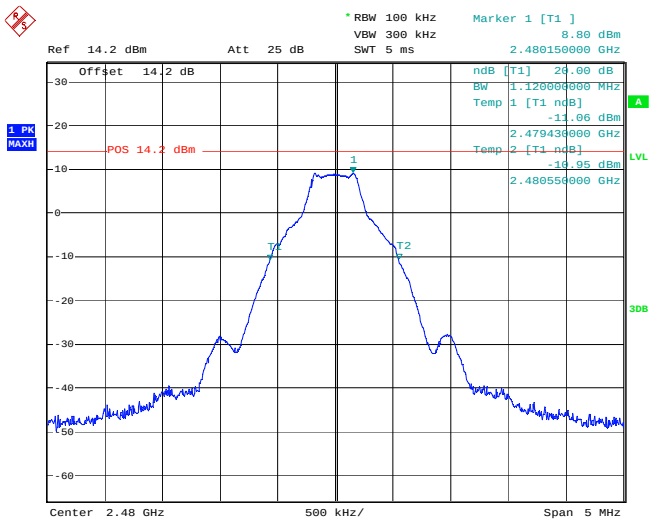
Plot # 3		
Tx Frequency: 2442 MHz	DM5	Mode: GFSK



Date: 28.JUL.2020 12:42:08

Plot # 4

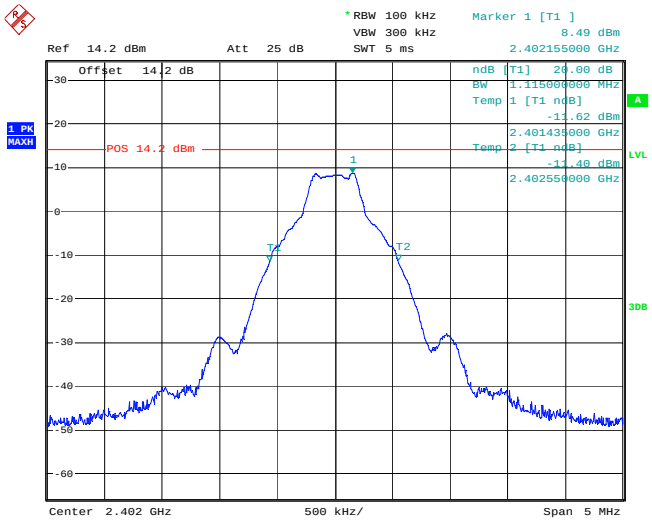
Tx Frequency: 2480 MHz	DM5	Mode: GFSK



Date: 29.JUL.2020 12:22:46

Plot # 5

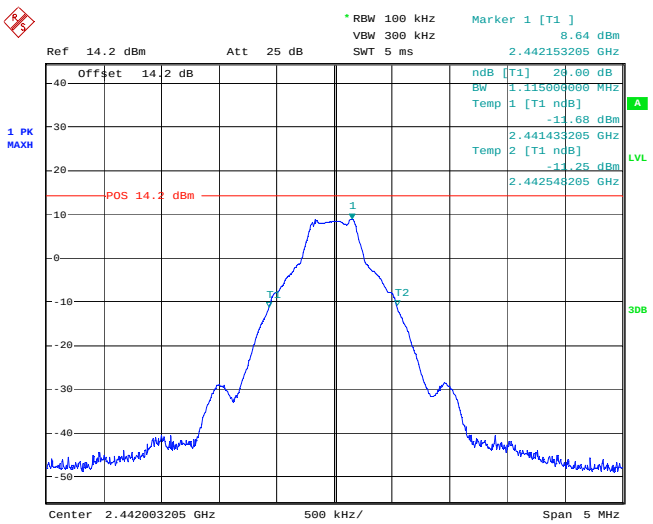
Tx Frequency: 2402 MHz	DH5	Mode: GFSK



Date: 29.JUL.2020 13:16:16

Plot # 6

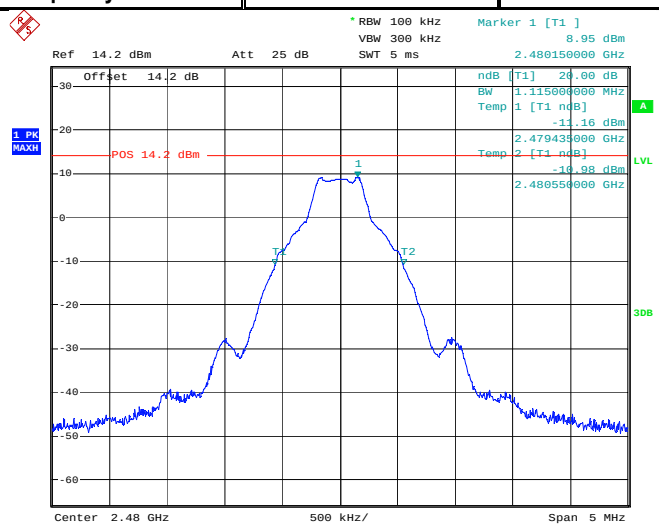
Tx Frequency: 2442 MHz	DH5	Mode: GFSK



Date: 28.JUL.2020 13:25:38

Plot # 7

Tx Frequency: 2480 MHz	DH5	Mode: GFSK



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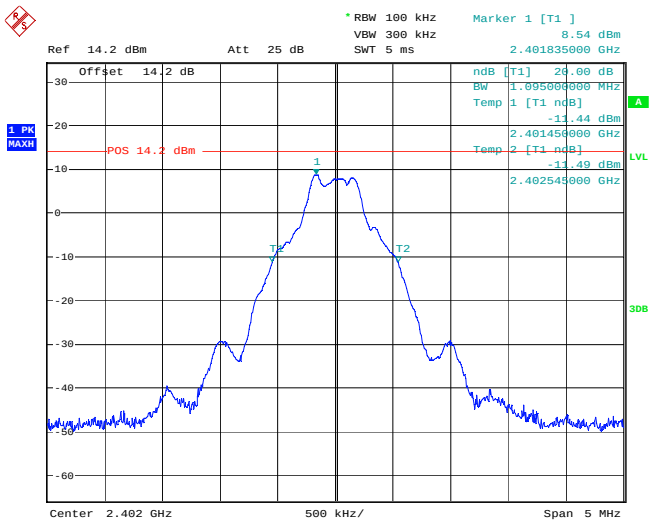
Plot # 8

Tx Frequency: 2402 MHz	HV3	Mode: GFSK



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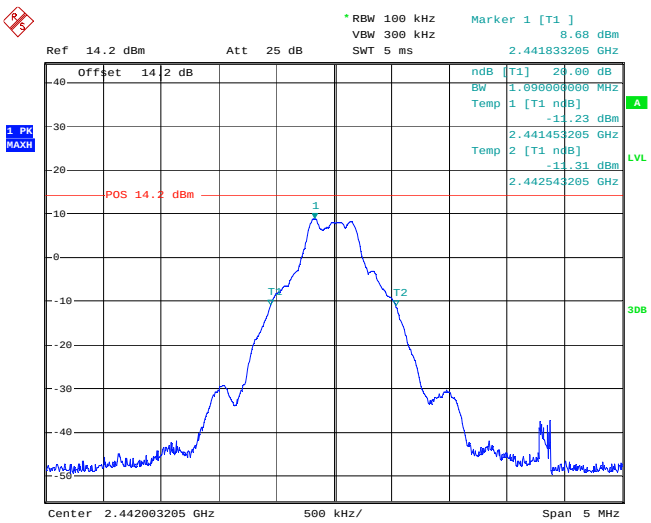
Plot # 9

Tx Frequency: 2442 MHz	HV3	Mode: GFSK



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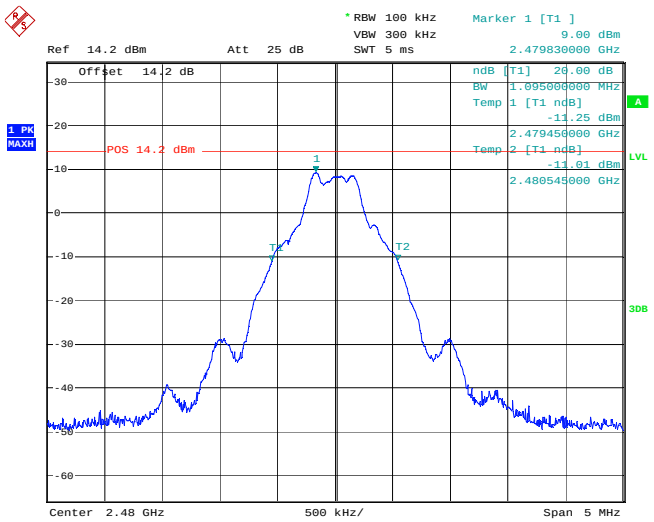
Plot # 10

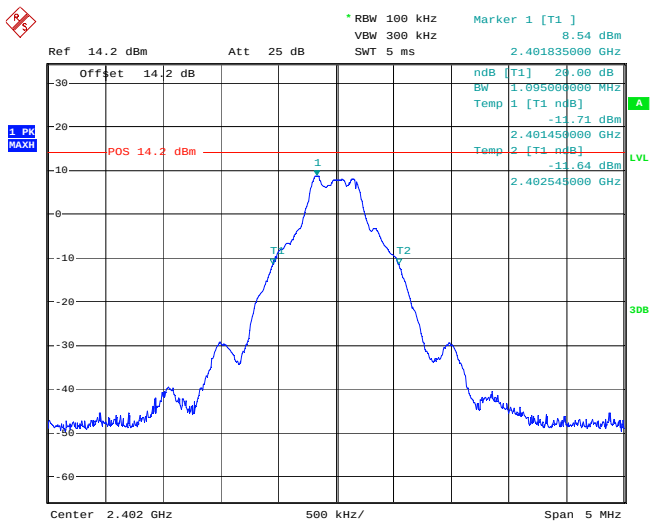
Tx Frequency: 2480 MHz	HV3	Mode: GFSK



Date: 29.JUL.2020 12:26:05

Plot # 11

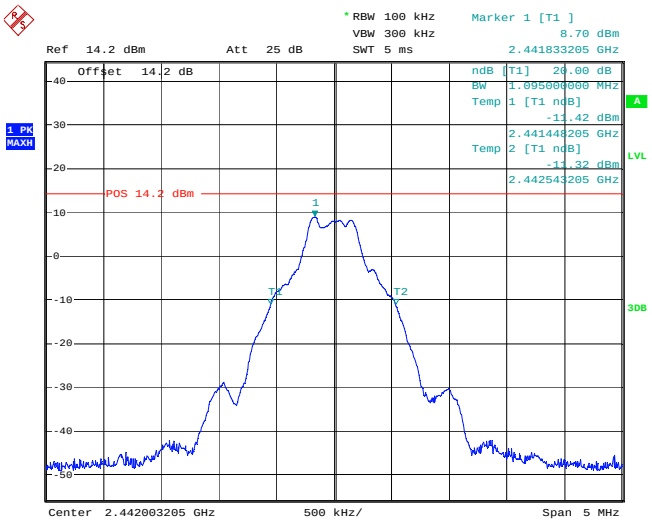
Tx Frequency: 2402 MHz	EV5	Mode: GFSK



Date: 29.JUL.2020 13:19:42

Plot # 12

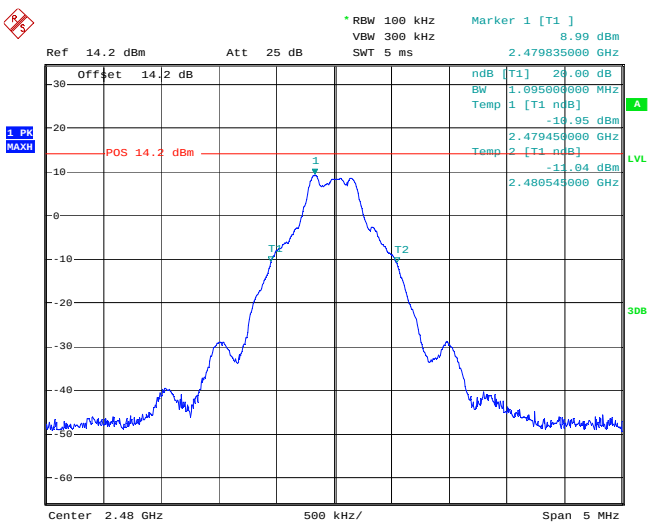
Tx Frequency: 2442 MHz	EV5	Mode: GFSK



Date: 28.JUL.2020 14:06:23

Plot # 13

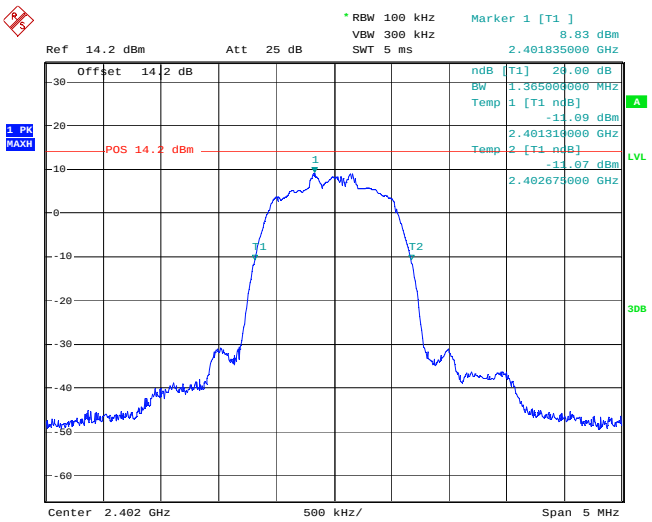
Tx Frequency: 2480 MHz	EV5	Mode: GFSK



Date: 29.JUL.2020 12:28:00

Plot # 14

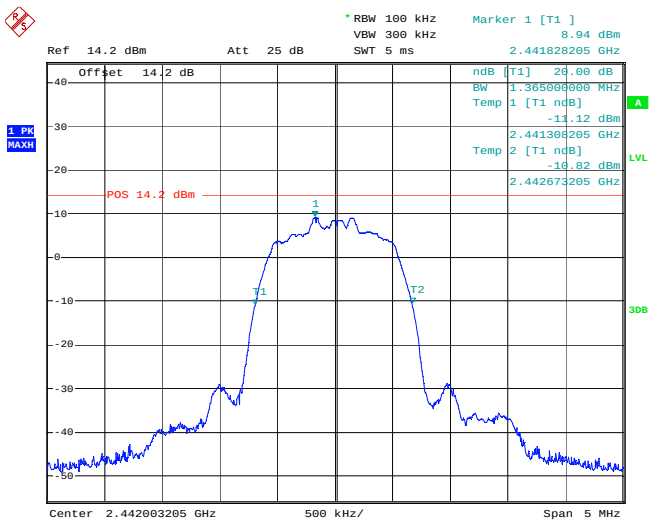
Tx Frequency: 2402 MHz	2DH5	Mode: π/4-DQPSK



Date: 29.JUL.2020 13:20:50

Plot # 15

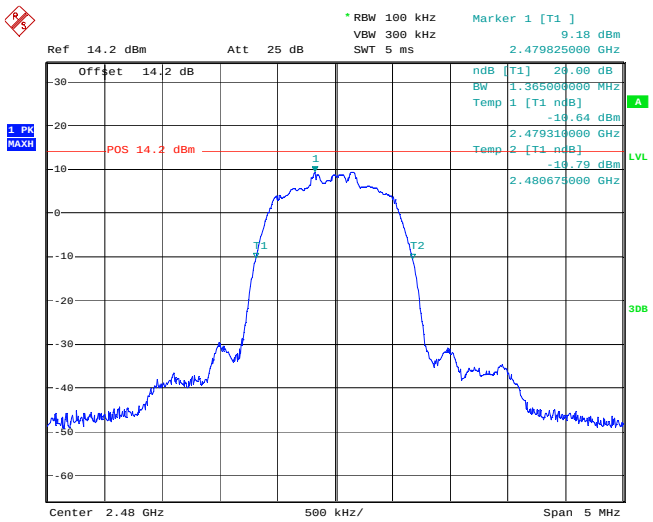
Tx Frequency: 2442 MHz	2DH5	Mode: π/4-DQPSK



Date: 28.JUL.2020 14:16:06

Plot # 16

Tx Frequency: 2480 MHz	2DH5	Mode: π/4-DQPSK



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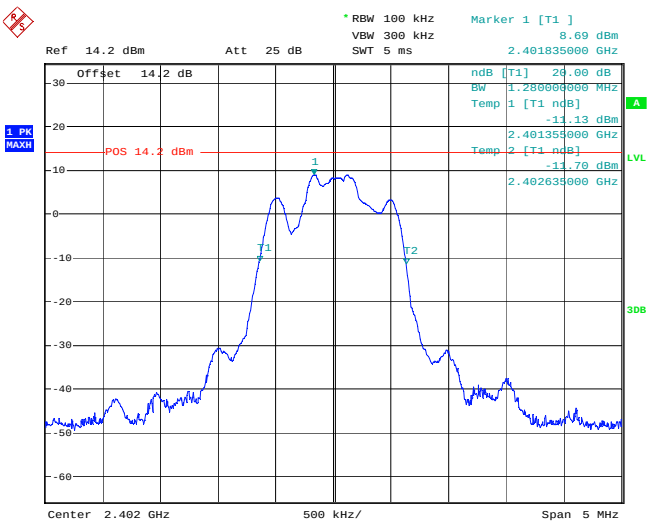
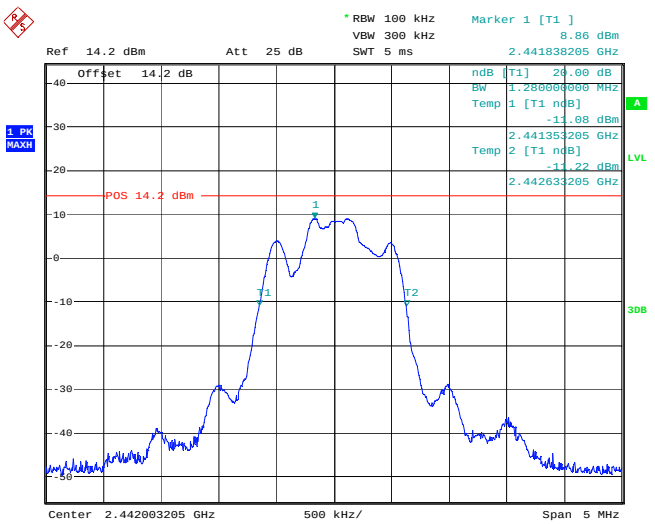
Plot # 17

Tx Frequency: 2402 MHz	2EV5	Mode: π/4-DQPSK



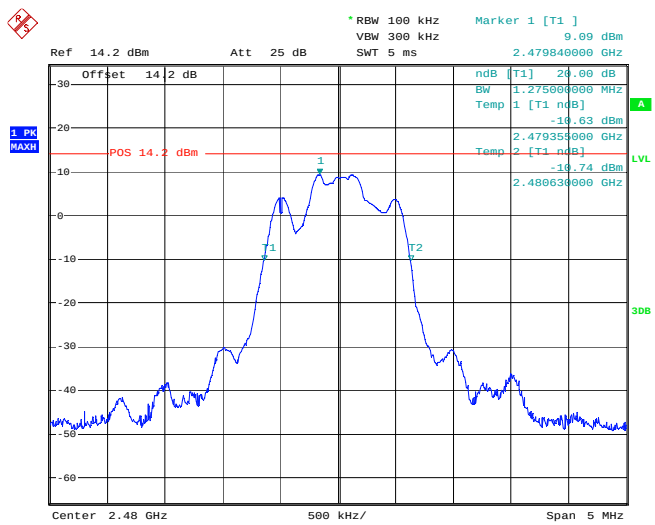
Date: 29.JUL.2020 13:22:31

Plot # 18		
Tx Frequency: 2442 MHz	2EV5	Mode: π/4-DQPSK



Date: 28.JUL.2020 14:22:19

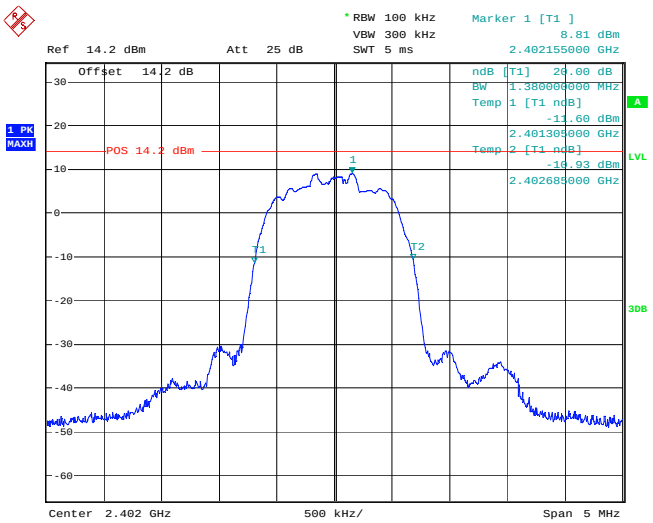
Plot # 19		
Tx Frequency: 2480 MHz	2EV5	Mode: π/4-DQPSK



Date: 29.JUL.2020 12:31:21

Plot # 20

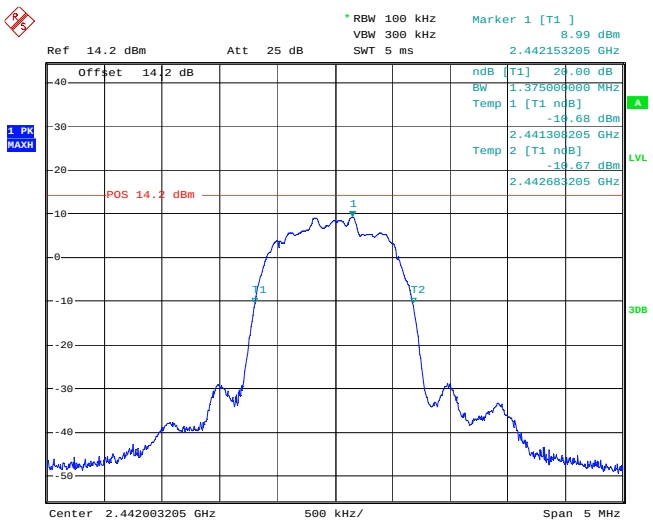
Tx Frequency: 2402 MHz	3DH5	Mode: 8DPSK



Date: 29.JUL.2020 13:24:07

Plot # 21

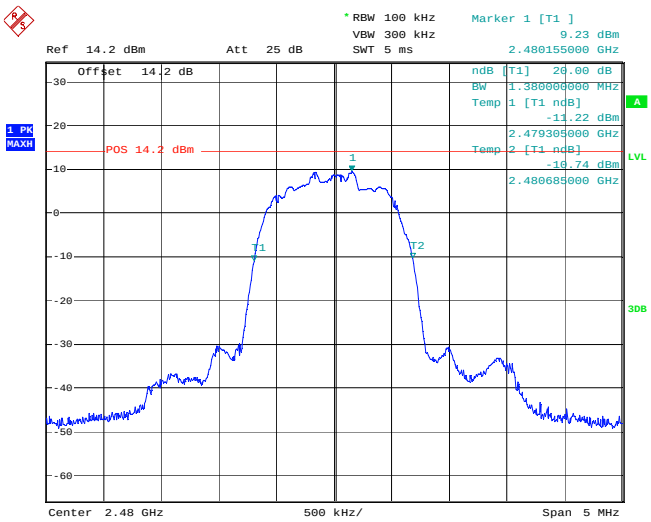
Tx Frequency: 2442 MHz	3DH5	Mode: 8DPSK



Date: 28.JUL.2020 14:24:53

Plot # 22

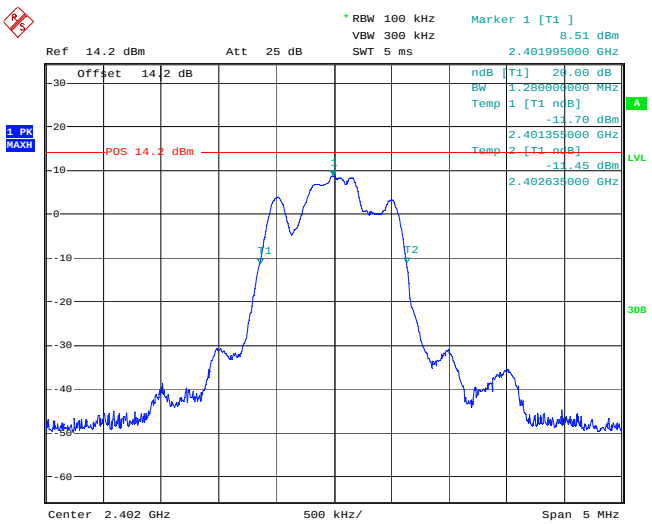
Tx Frequency: 2480 MHz	3DH5	Mode: 8DPSK



Date: 29.JUL.2020 12:32:45

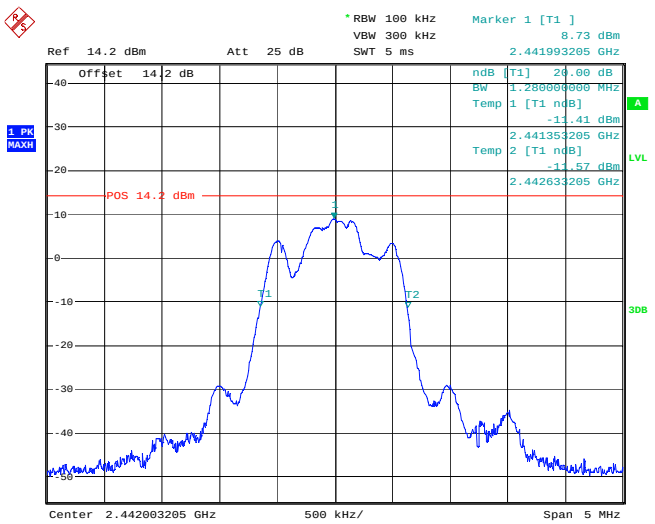
Plot # 23

Tx Frequency: 2402 MHz	3EV5	Mode: 8DPSK



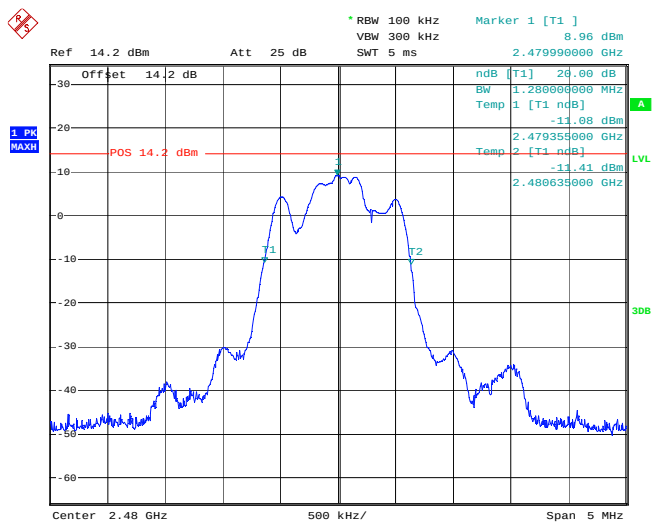
Date: 29.JUL.2020 13:25:24

Plot # 24		
Tx Frequency: 2442 MHz	3EV5	Mode: 8DPSK



Date: 28.JUL.2020 14:28:02

Plot # 25		
Tx Frequency: 2480 MHz	3EV5	Mode: 8DPSK



Date: 29.JUL.2020 12:34:07

8.3 Maximum Peak Conducted Output Power

8.3.1 Measurement according to ANSI C63.10 Section 7.8.5

Spectrum Analyzer settings:

- Span = approximately 5 times the 20 dB bandwidth
- RBW > the 20 dB bandwidth of the emission being measured
- VBW ≥ RBW
- Sweep = Auto Couple
- Detector function = Peak
- Trace = Max hold
- Use the marker-peak function to set the marker to the peak of the emission.

8.3.2 Limits:

Maximum Peak Output Power:

FCC §15.247: (b) The maximum peak conducted output power of the intentional radiator shall not exceed the following:

- (1) For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

IC RSS-247 5.4:

- (b) For FHSs operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W if the hopset uses 75 or more hopping channels; the maximum peak conducted output power shall not exceed 0.125 W if the hopset uses less than 75 hopping channels.

8.3.3 Test conditions and setup:

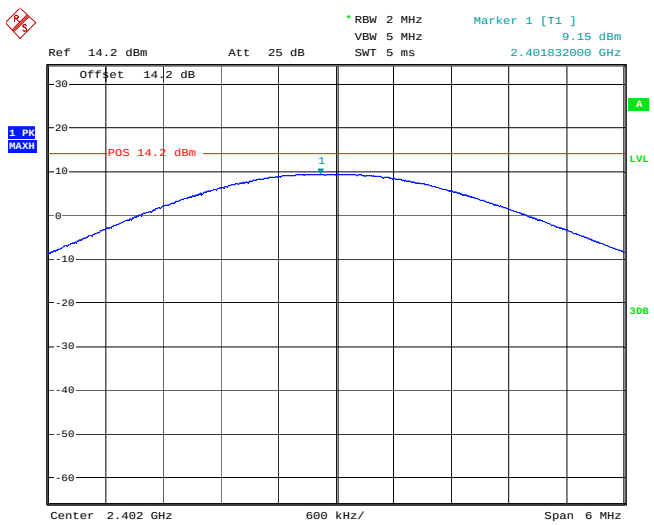
Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input	Antenna Gain
23.8°C	1	Op.1	110 V AC	2.3 dBi

8.3.4 Measurement result:

Plot #	EUT operating mode	Packet type	Channel #	TX Frequcncy (MHz)	Maximum Peak conducted power (dBm)	EIRP (dBm)	Limit (dBm)	Result
26	GFSK	DM5	0	2402	9.15	11.45	30(Pk) / 36(EIRP)	Pass
27			40	2442	9.36	11.66	30(Pk) / 36(EIRP)	Pass
28			78	2480	9.58	11.88	30(Pk) / 36(EIRP)	Pass
29	GFSK	DH5	0	2402	9.17	11.47	30(Pk) / 36(EIRP)	Pass
30			40	2442	9.38	11.68	30(Pk) / 36(EIRP)	Pass
31			78	2480	9.57	11.87	30(Pk) / 36(EIRP)	Pass
32	GFSK	HV3	0	2402	9.17	11.47	30(Pk) / 36(EIRP)	Pass
33			40	2442	9.39	11.69	30(Pk) / 36(EIRP)	Pass
34			78	2480	9.60	11.90	30(Pk) / 36(EIRP)	Pass
35	GFSK	EV5	0	2402	9.17	11.47	30(Pk) / 36(EIRP)	Pass
36			40	2442	9.45	11.75	30(Pk) / 36(EIRP)	Pass
37			78	2480	9.61	11.91	30(Pk) / 36(EIRP)	Pass
38	π/4-DQPSK	2DH5	0	2402	11.27	13.57	30(Pk) / 36(EIRP)	Pass
39			40	2442	11.51	13.81	30(Pk) / 36(EIRP)	Pass
40			78	2480	11.62	13.92	30(Pk) / 36(EIRP)	Pass
41	π/4-DQPSK	2EV5	0	2402	11.34	13.64	30(Pk) / 36(EIRP)	Pass
42			40	2442	10.53	12.83	30(Pk) / 36(EIRP)	Pass
43			78	2480	10.73	13.03	30(Pk) / 36(EIRP)	Pass
44	8DPSK	3DH5	0	2402	11.54	13.84	30(Pk) / 36(EIRP)	Pass
45			40	2442	11.77	14.07	30(Pk) / 36(EIRP)	Pass
46			78	2480	11.88	14.18	30(Pk) / 36(EIRP)	Pass
47	8DPSK	3EV5	0	2402	10.55	12.85	30(Pk) / 36(EIRP)	Pass
48			40	2442	10.78	13.08	30(Pk) / 36(EIRP)	Pass
49			78	2480	10.95	13.25	30(Pk) / 36(EIRP)	Pass

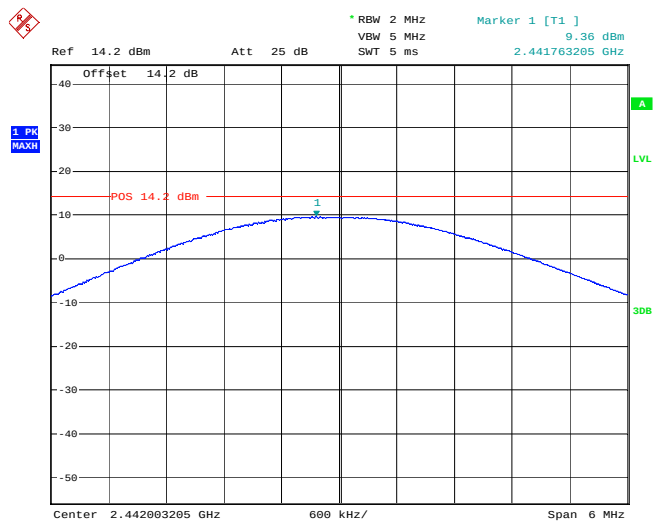
8.3.5 Measurement Plots:

Plot # 26		
Tx Frequency: 2402 MHz	DM5	Mode: GFSK



Date: 29.JUL.2020 11:47:28

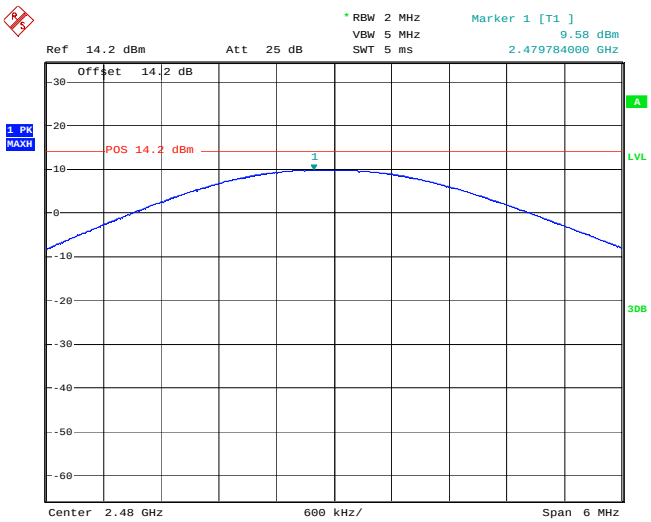
Plot # 27		
Tx Frequency: 2442 MHz	DM5	Mode: GFSK



Date: 28.JUL.2020 14:59:38

Plot # 28

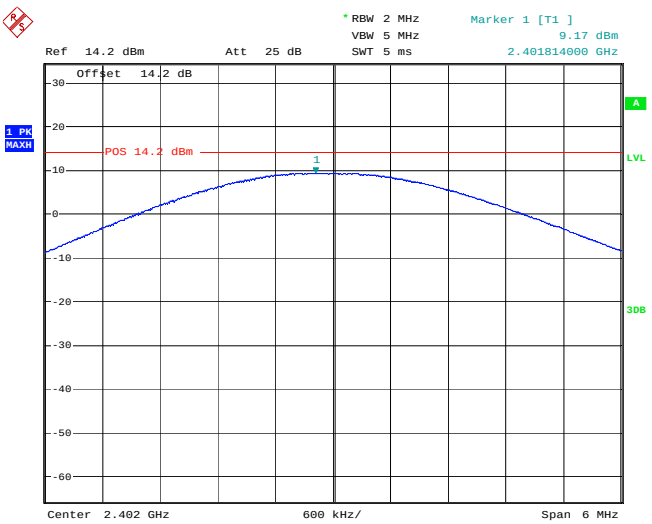
Tx Frequency: 2480 MHz	DM5	Mode: GFSK



Date: 29.JUL.2020 12:06:30

Plot # 29

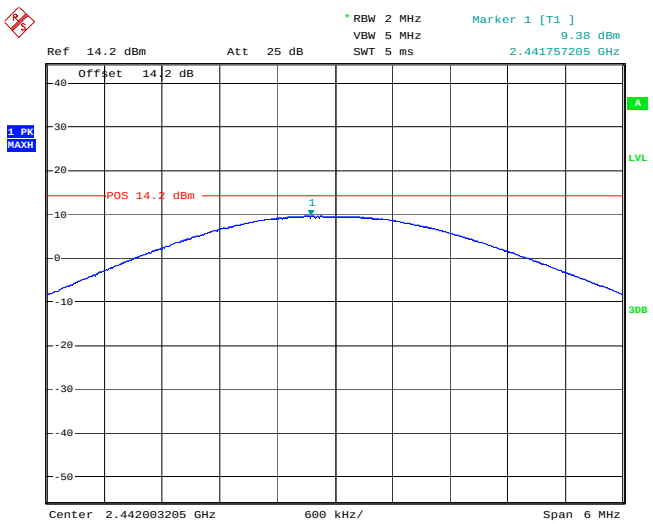
Tx Frequency: 2402 MHz	DH5	Mode: GFSK



Date: 29.JUL.2020 11:50:07

Plot # 30

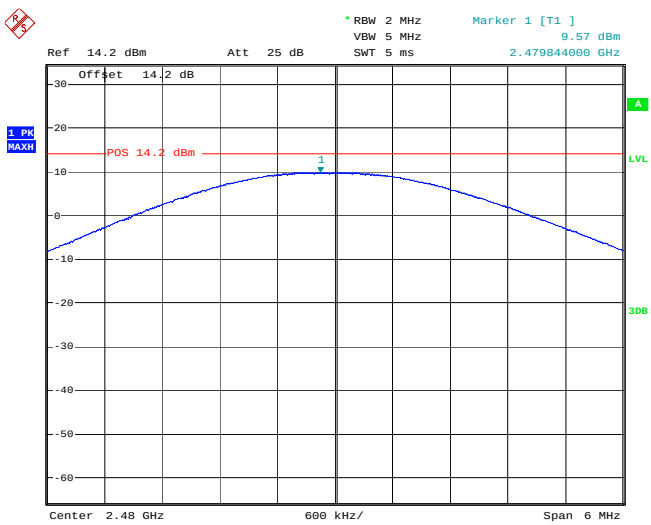
Tx Frequency: 2442 MHz	DH5	Mode: GFSK



Date: 28.JUL.2020 15:02:30

Plot # 31

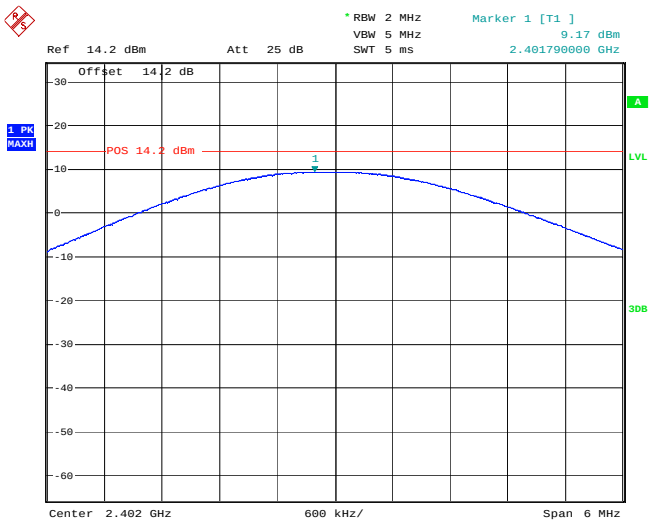
Tx Frequency: 2480 MHz	DH5	Mode: GFSK



Date: 29.JUL.2020 12:07:44

Plot # 32

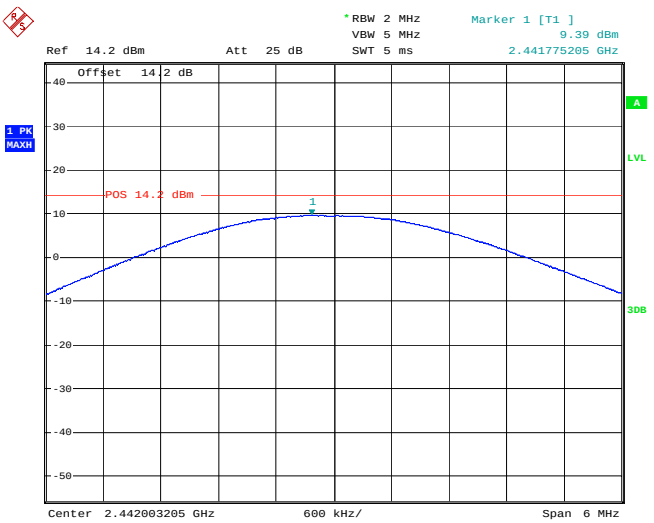
Tx Frequency: 2402 MHz	HV3	Mode: GFSK



Date: 29.JUL.2020 11:52:39

Plot # 33

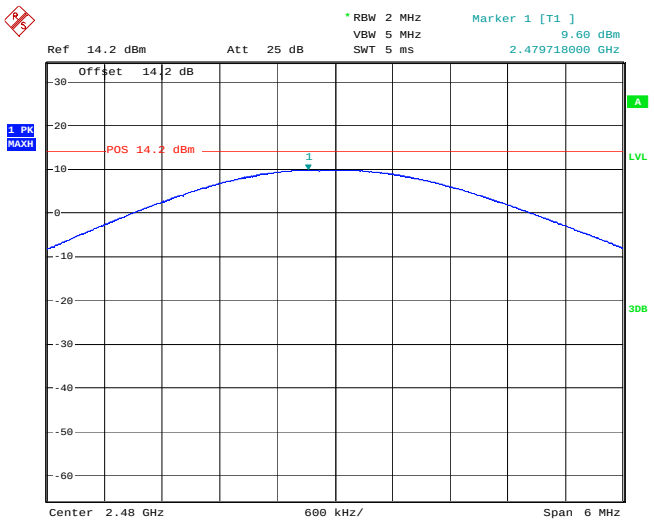
Tx Frequency: 2442 MHz	HV3	Mode: GFSK



Date: 28.JUL.2020 15:11:27

Plot # 34

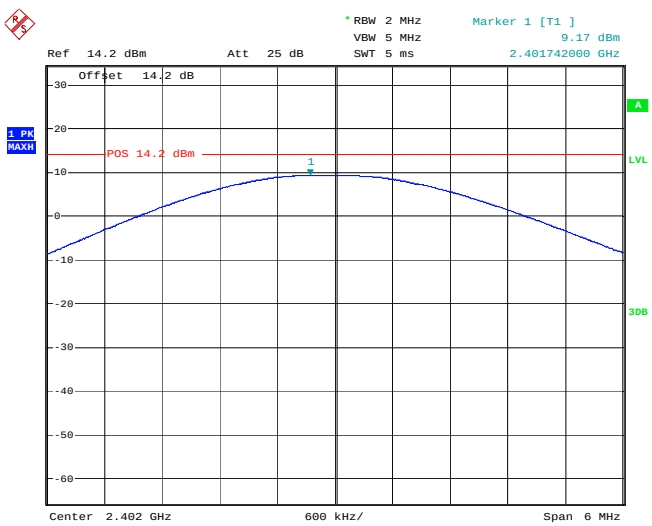
Tx Frequency: 2480 MHz	HV3	Mode: GFSK



Date: 29.JUL.2020 12:08:51

Plot # 35

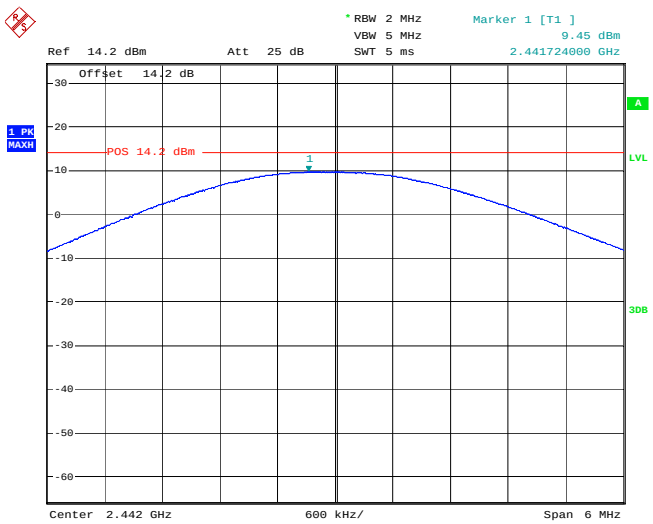
Tx Frequency: 2402 MHz	EV5	Mode: GFSK



Date: 29.JUL.2020 11:54:52

Plot # 36

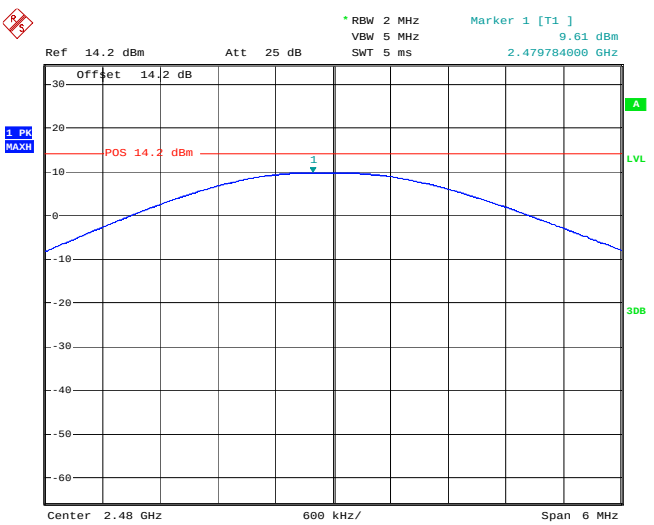
Tx Frequency: 2442 MHz	EV5	Mode: GFSK



Date: 29.JUL.2020 11:27:11

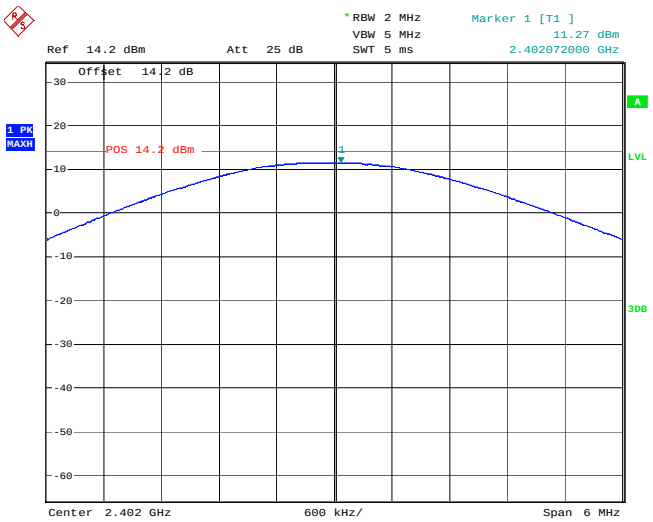
Plot # 37

Tx Frequency: 2480 MHz	EV5	Mode: GFSK



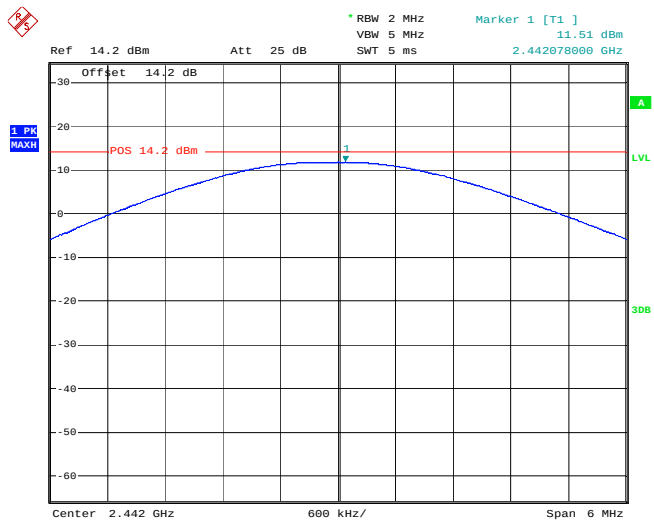
Date: 29.JUL.2020 12:11:48

Plot # 38		
Tx Frequency: 2402 MHz	2DH5	Mode: π/4-DQPSK



Date: 29.JUL.2020 11:56:15

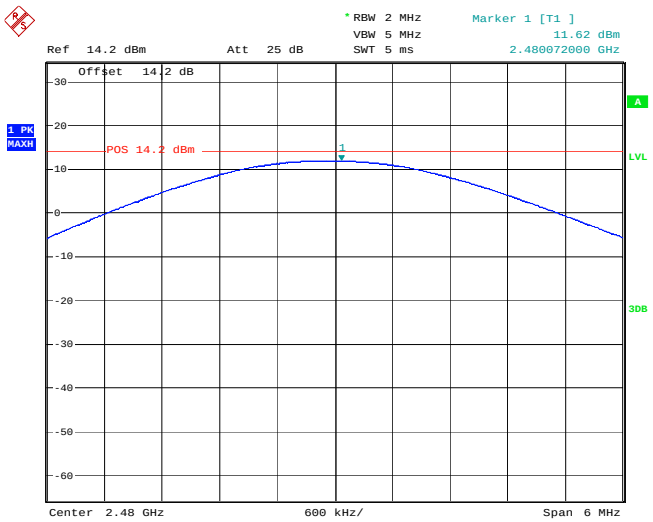
Plot # 39		
Tx Frequency: 2442 MHz	2DH5	Mode: π/4-DQPSK



Date: 29.JUL.2020 11:30:02

Plot # 40

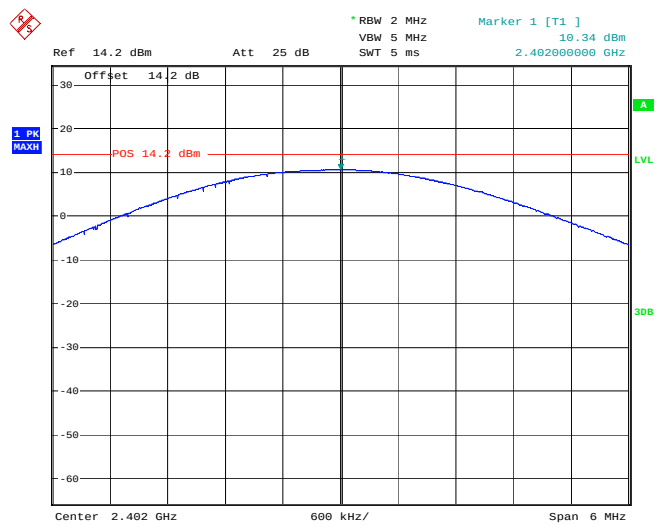
Tx Frequency: 2480 MHz	2DH5	Mode: π/4-DQPSK



Date: 29.JUL.2020 12:13:10

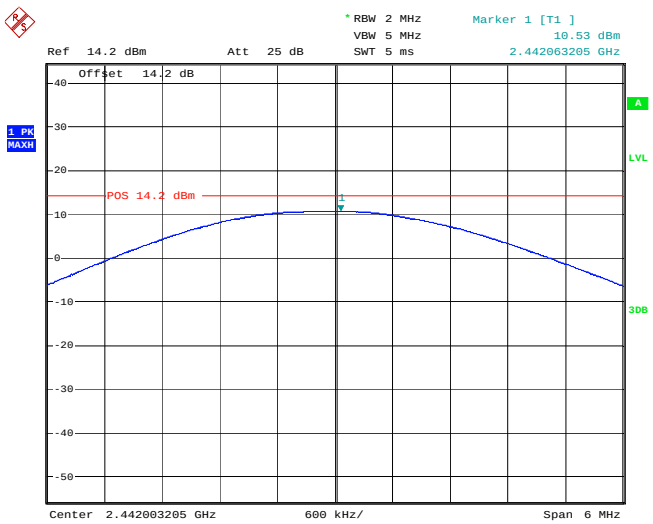
Plot # 41

Tx Frequency: 2402 MHz	2EV5	Mode: π/4-DQPSK



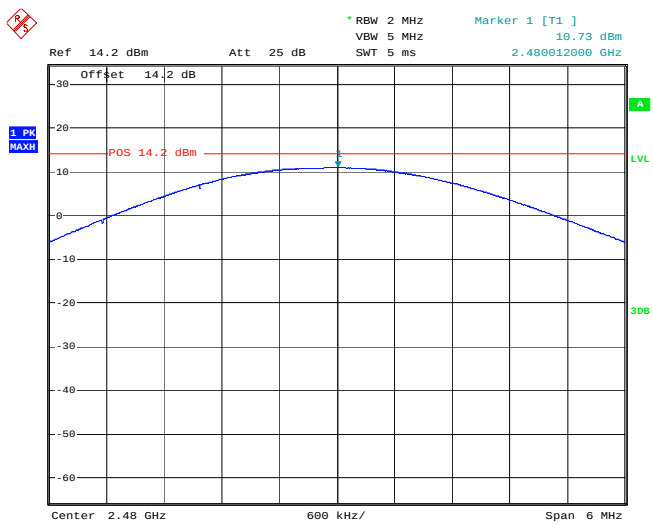
Date: 29.JUL.2020 11:58:20

Plot # 42		
Tx Frequency: 2442 MHz	2EV5	Mode: π/4-DQPSK



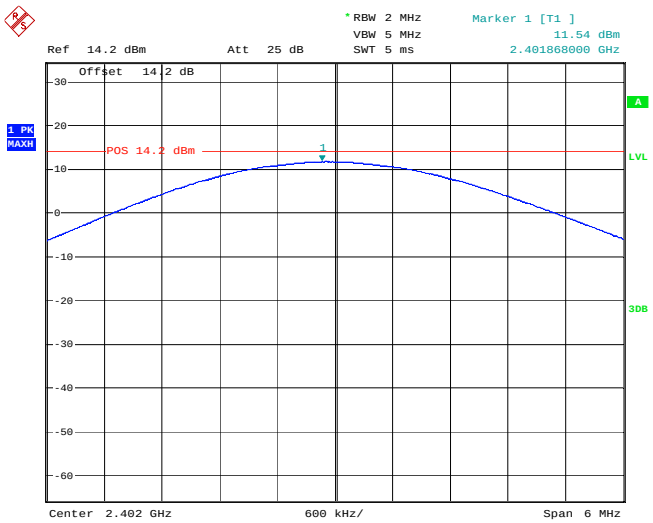
Date: 28.JUL.2020 15:41:34

Plot # 43		
Tx Frequency: 2480 MHz	2EV5	Mode: π/4-DQPSK



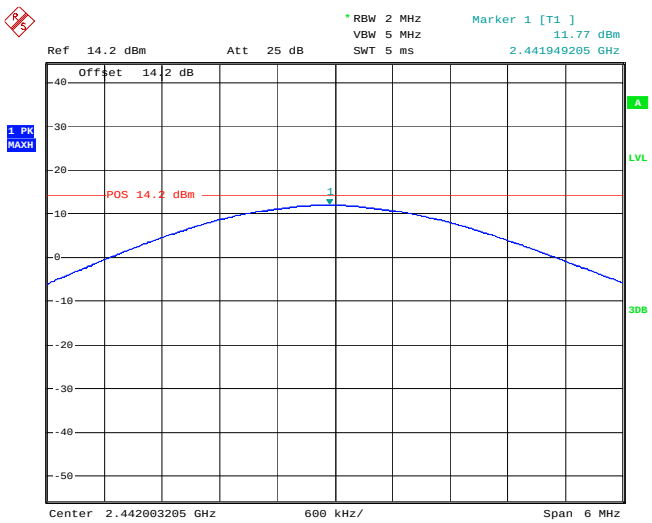
Date: 29.JUL.2020 12:15:06

Plot # 44		
Tx Frequency: 2402 MHz	**3DH5**	**Mode: 8DPSK**



Date: 29.JUL.2020 12:00:12

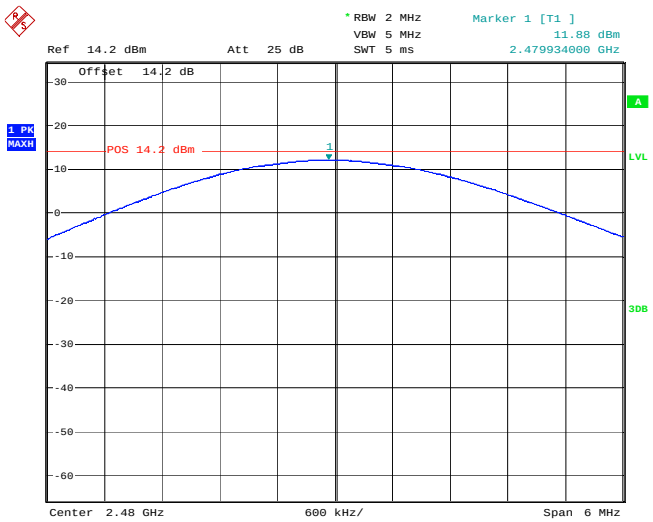
Plot # 45		
Tx Frequency: 2442 MHz	**3DH5**	**Mode: 8DPSK**



Date: 28.JUL.2020 15:45:07

Plot # 46

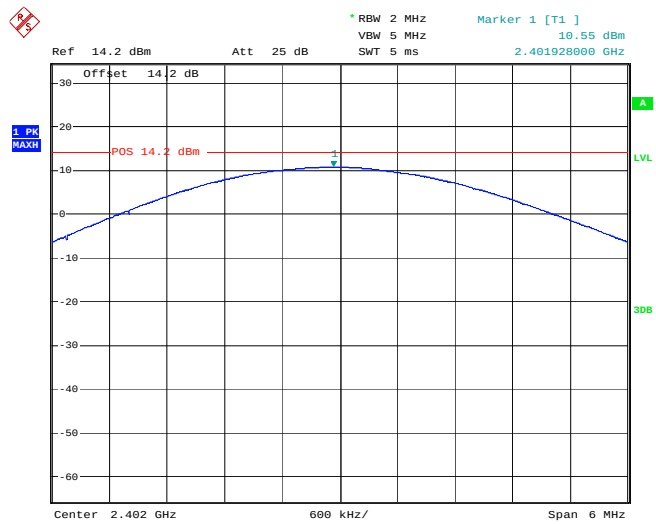
Tx Frequency: 2480 MHz	3DH5	Mode: 8DPSK



Date: 29.JUL.2020 12:16:01

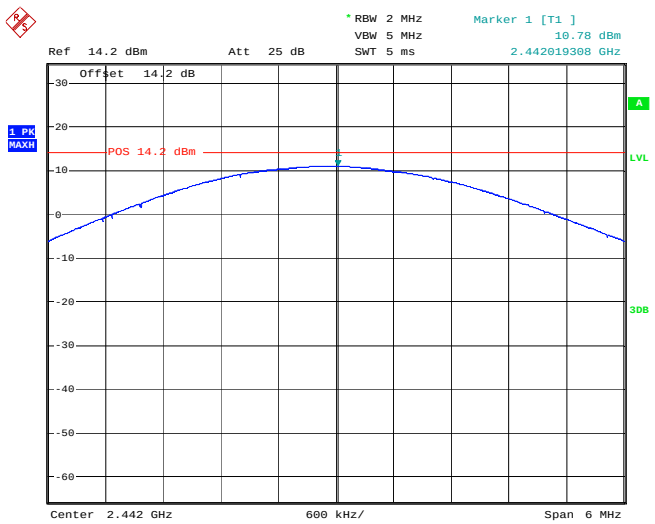
Plot # 47

Tx Frequency: 2402 MHz	3EV5	Mode: 8DPSK



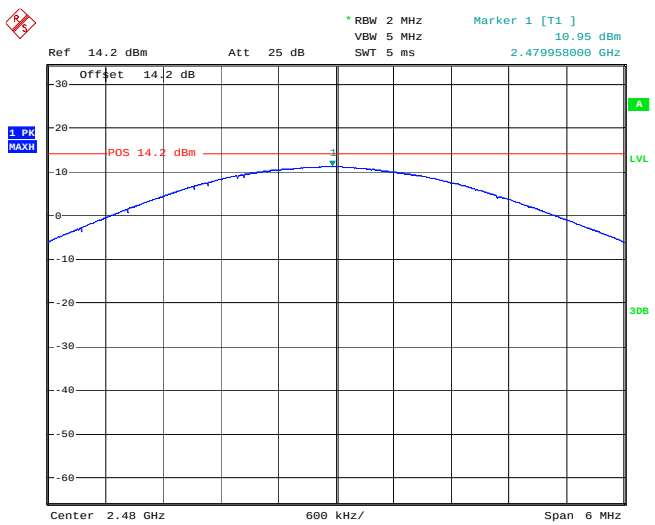
Date: 29.JUL.2020 12:01:56

Plot # 48		
Tx Frequency: 2442 MHz	**3EV5**	**Mode: 8DPSK**



Date: 29.JUL.2020 11:33:52

Plot # 49		
Tx Frequency: 2480 MHz	**3EV5**	**Mode: 8DPSK**



Date: 29.JUL.2020 12:17:34

8.4 Band Edge Compliance

8.4.1 Measurement according to ANSI C63.10 Section 6.10

Spectrum Analyzer settings for non-restricted band edge:

- Span: wide enough to capture the peak level of the emission operating on the channel closest to the band edge, as well as any modulation products which fall outside of the authorized band of operation.
- RBW ≥ 1% of the span
- VBW ≥ RBW
- Sweep Time: Auto couple
- Detector = Peak
- Trace = Max hold
- Allow the trace to stabilize. Set the marker on the emission at the band edge, or on the highest modulation product outside of the band, if this level is greater than that at the band edge.
- Enable the marker-delta function, and then use the marker-to-peak function to move the marker to the peak of the in-band emission.
- Now, using the same instrument settings, enable the hopping function of the EUT.
- Allow the trace to stabilize. Follow the same procedure listed above to determine if any spurious emissions caused by the hopping function also comply with the specified limit.

Spectrum Analyzer settings for restricted band:

- Peak measurements are made using a peak detector and RBW=1 MHz

8.4.2 Limits: Restricted Band FCC 15.209 and RSS-Gen 8.10

- PEAK LIMIT= 74 dBµV/m @3 m =-21.23 dBm
- AVG. LIMIT= 54 dBµV/m @3 m =-41.23 dBm
- Start frequency & stop frequency according to frequency range specified in the restricted band table in FCC section 15.205

Restricted bands of operation:

- Except as shown in CFR 47 Part 15.205 paragraph (d), 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
[10].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			

8.4.3 Limits: Non-restricted Band §15.247 and RSS-247 5.5

FCC15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or 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, 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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-247 5.5

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced 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 that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

8.4.4 Test conditions and setup:

Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input	Antenna gain
23.8°C	1	Op.1	110 V AC	2.3 dBi

8.4.5 Measurement result:

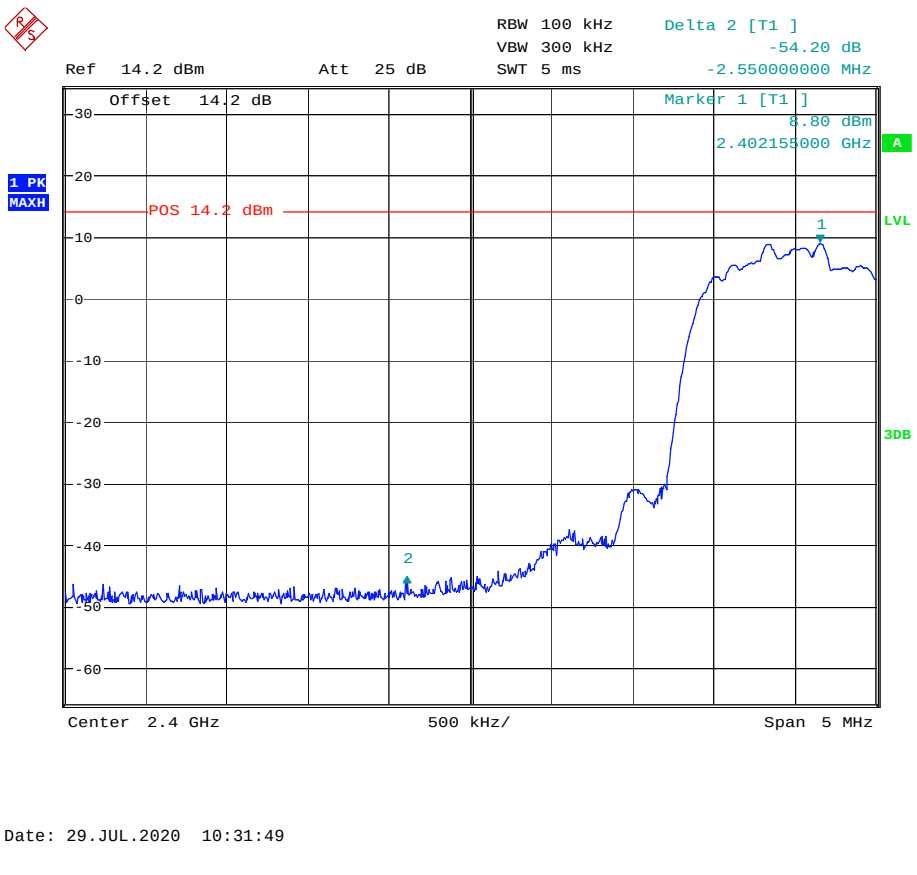
Plot #	EUT operating mode	Band Edge	Band Edge Delta (dBc)	Limit (dBc)	Result
50	8DPSK 3DH5 fixed channel	Lower, non-restricted	-54.20	- 20	Pass
51	8DPSK 3DH5 hopping	Lower, non-restricted	-53.35	- 20	Pass

Plot #	EUT operating mode	Band Edge	Measured value	Corrected by duty cycle	Corrected by Antenna gain	Limit (dBm)	Result
52	8DPSK 3DH5 fixed channel	Upper restricted peak	-43.63	NA due to peak detector	-41.33	-21.23 Peak -41.23 AVG	Pass
53	8DPSK 3DH5 hopping	Upper restricted peak	-45.12	NA due to peak detector	-42.82	-21.23 Peak -41.23 AVG	Pass

Note: The peak measurement passes both peak and average limits.

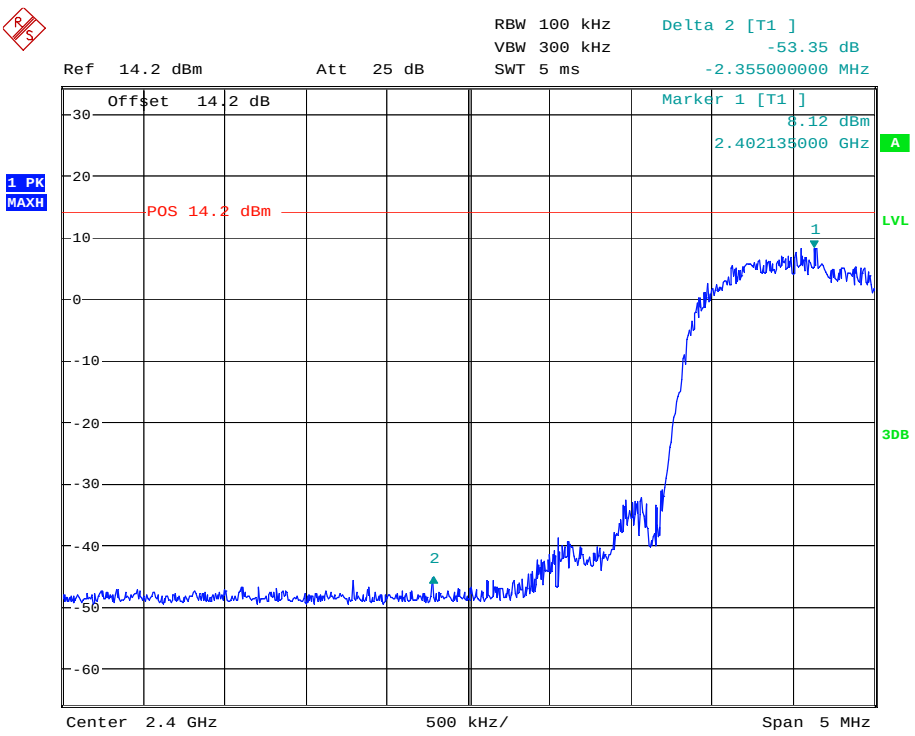
8.4.6 Measurement Plots:

Plot # 50 Lower Band Edge			
Low Band-edge	Hopping Disabled	Peak	8DPSK 3DH5



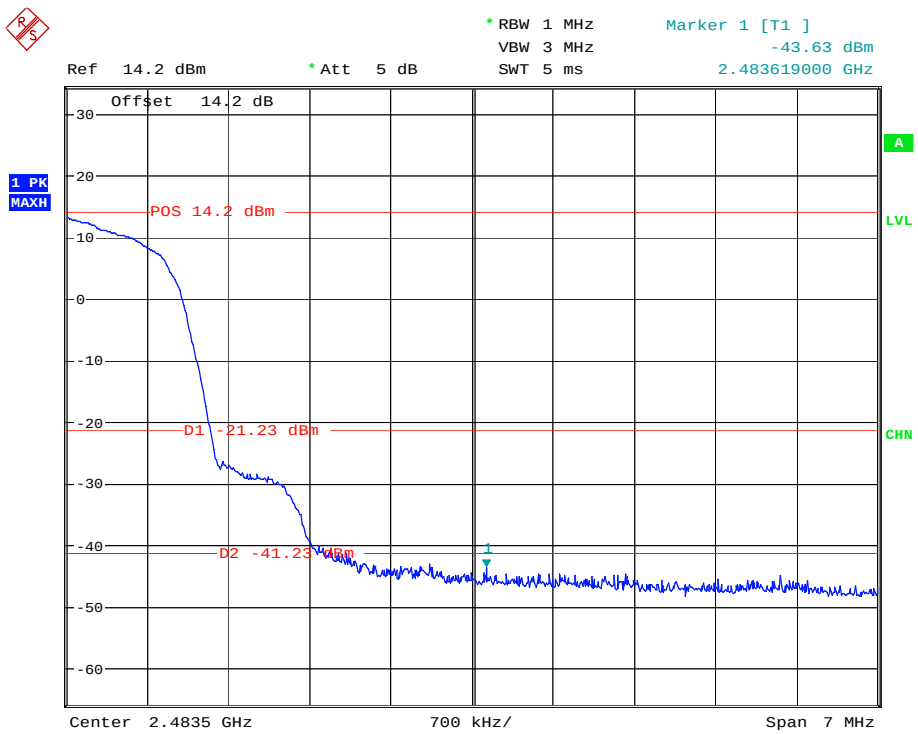
Plot # 51 Lower Band Edge

Low Band-edge	Hopping	Peak	8DPSK 3DH5



Plot # 52 Upper Band Edge

Upper Band-edge	Hopping Disabled	Peak	8DPSK 3DH5



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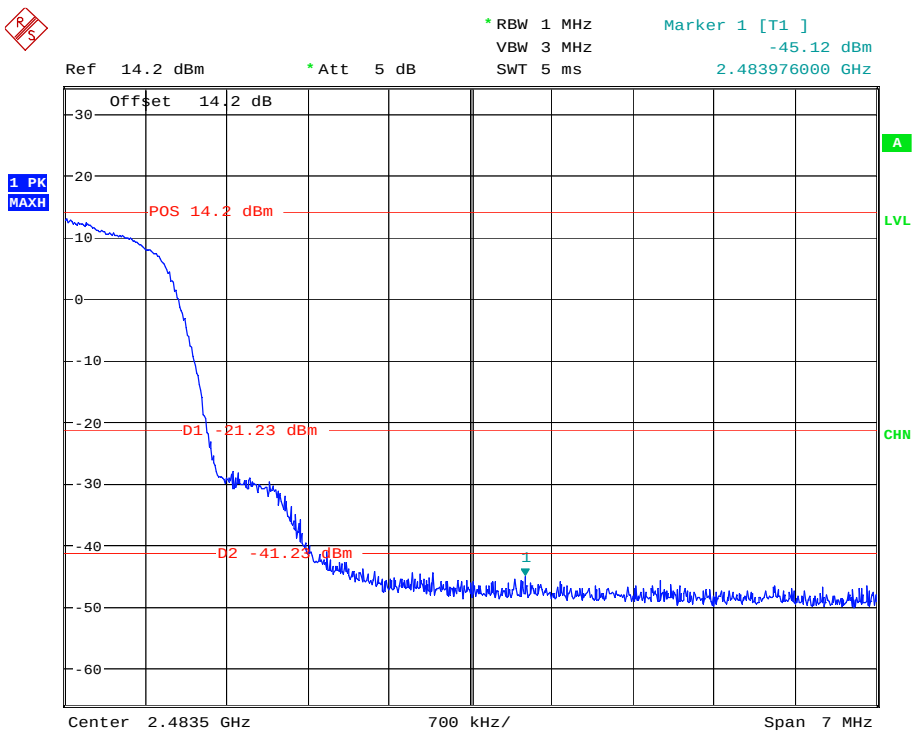
Plot # 53 Upper Band Edge

Upper Band-edge	Hopping	Peak	8DPSK 3DH5



8.5 Carrier Frequency Separation

8.5.1 Measurement according to ANSI C63.10 Section 7.8.2

Spectrum Analyzer settings:

- Span = Wide enough to capture the peaks of the two adjacent channels
- RBW ≥ 1% of the span
- VBW ≥ RBW or 3 x
- Sweep = Auto couple
- Detector function = Peak
- Trace = Max hold
- Use marker-delta function to determine the separation between the peaks of the two adjacent channels.

8.5.2 Limits: FCC §15.247(a)(1) & RSS-247 5.1(b)

FCC §15.247(a)(1):
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

RSS-247 5.1(b):
FHSs shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, FHSs operating in the band 2400-2483.5 MHz may have hopping channel carrier frequencies that are separated by 25 kHz or two thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided that the systems operate with an output power no greater than 0.125 W.

8.5.3 Test conditions and setup:

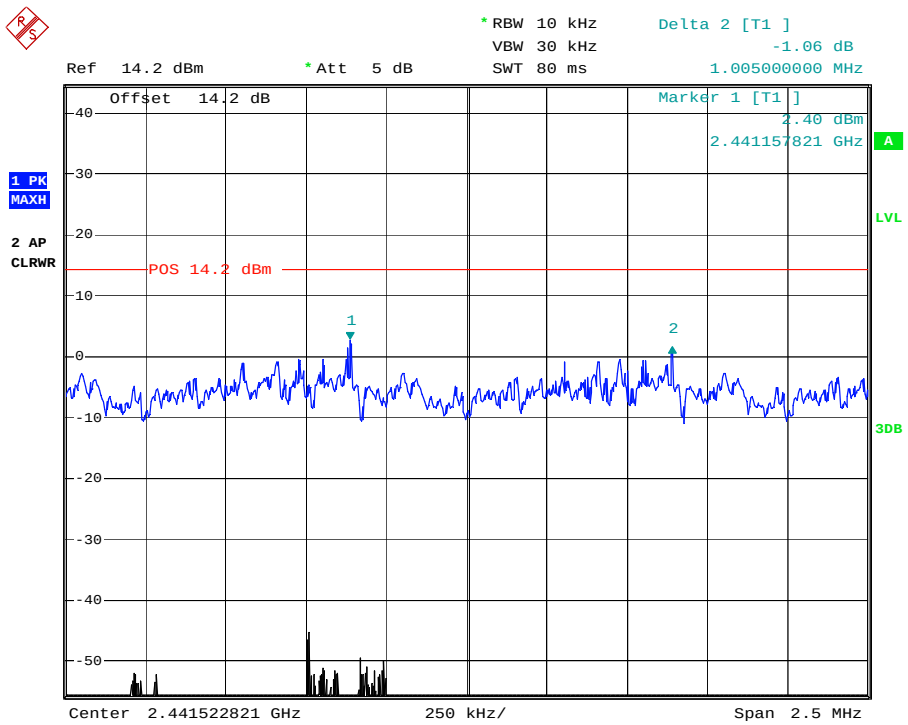
Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.5.4 Measurement result:

Plot #	Carrier Frequency Separation (MHz)	Limit (MHz)	Result
54	1.005	> 2/3 * OBW = 0.92	Pass

8.5.5 Measurement Plots:

Plot # 54 Carrier Frequency Separation	
Packet Type: 3DH5	Modulation: 8DPSK
Hopping On	Channel 39 & Channel 40



8.6 Number of hopping channels

8.6.1 Measurement according to ANSI C63.10 Section 7.8.3

Spectrum Analyzer settings:

- Span = the entire frequency band of operation
- RBW ≥ 50 KHz
- VBW ≥ RBW or 3X
- Sweep = Auto couple
- Detector function = Peak
- Trace = Max hold

8.6.2 Limits: FCC §15.247(a)(1)(ii)(iii) & RSS-247 5.1(d)

At least 15 non-overlapping channels

8.6.3 Test conditions and setup:

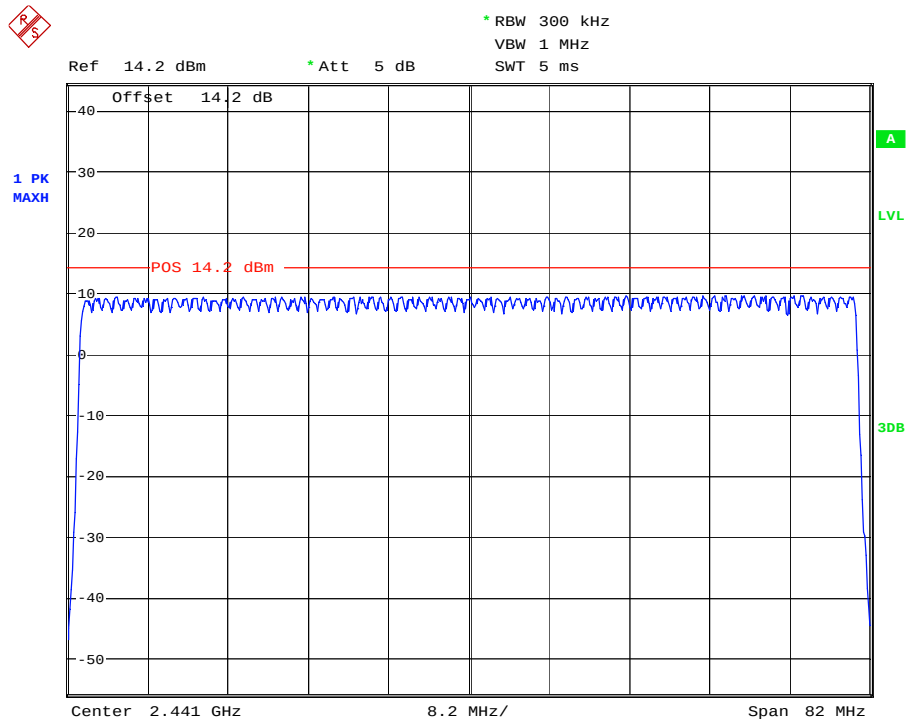
Ambient Temperature	EUT #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.6.4 Measurement result:

Plot #	Number of Hopping Frequencies	Limit	Result
55	79	15 non-overlapping channels	Pass

8.6.5 Measurement Plots:

Plot # 55 Number of Hopping Frequencies	
Packet Type: 3DH5	Modulation: 8DPSK
Hopping On	Total Hopping channels = 79



8.7 Time of Occupancy (Dwell Time)

8.7.1 Measurement according to ANSI C63.10 Section 7.8.4

Spectrum Analyzer settings:

Duration of Pulse Measurement

- RBW = 1 MHz
- VBW = 3 MHz
- Span = Zero Span
- Sweep Time = 10 ms
- Sweep Mode = Single
- Detector =Peak
- Trigger = Video

Observation Period

- RBW = 1 MHz
- VBW = 3 MHz
- Span = Zero Span
- Sweep Time = 31.6 s
- Sweep Mode = Single
- Detector = Peak
- Trigger = Free Run

Observation Period = 0.4s x No. of hopping channels = 0.4 x 79 = 31.6 s

8.7.2 Limits: FCC §15.247(a)(1)(iii) & RSS-247 5.1(d)

FCC §15.247(a)(1)(iii):
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

RSS-247 5.1(d):
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds, multiplied by the number of hopping channels employed. Transmissions on particular hopping frequencies may be avoided or suppressed provided that at least 15 hopping channels are used.

8.7.3 Test conditions and setup:

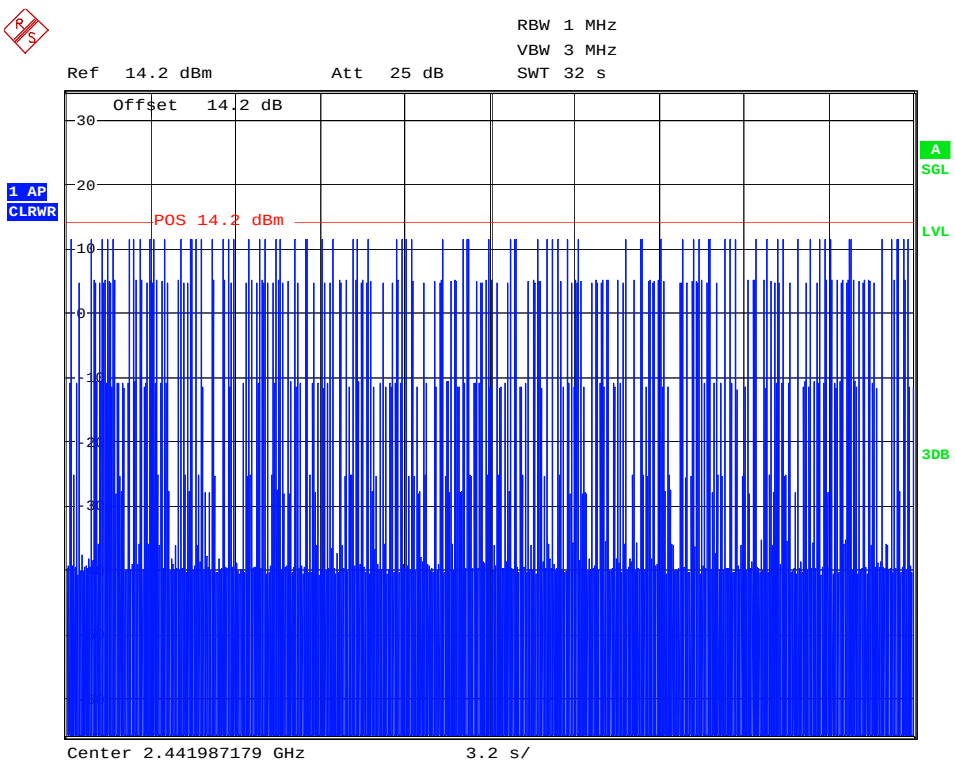
Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input
23.8°C	1	Op.1	110 V AC

8.7.4 Measurement result:

Plot #	Modulation	Timing	Number of hops 31.6s	Pulse Width (ms)	Total Dwell Time in 31.6s (ms)	Limit (ms)	Result
56	8DPSK	3DH5	83	2.9	240	< 400 in 31.6s	Pass

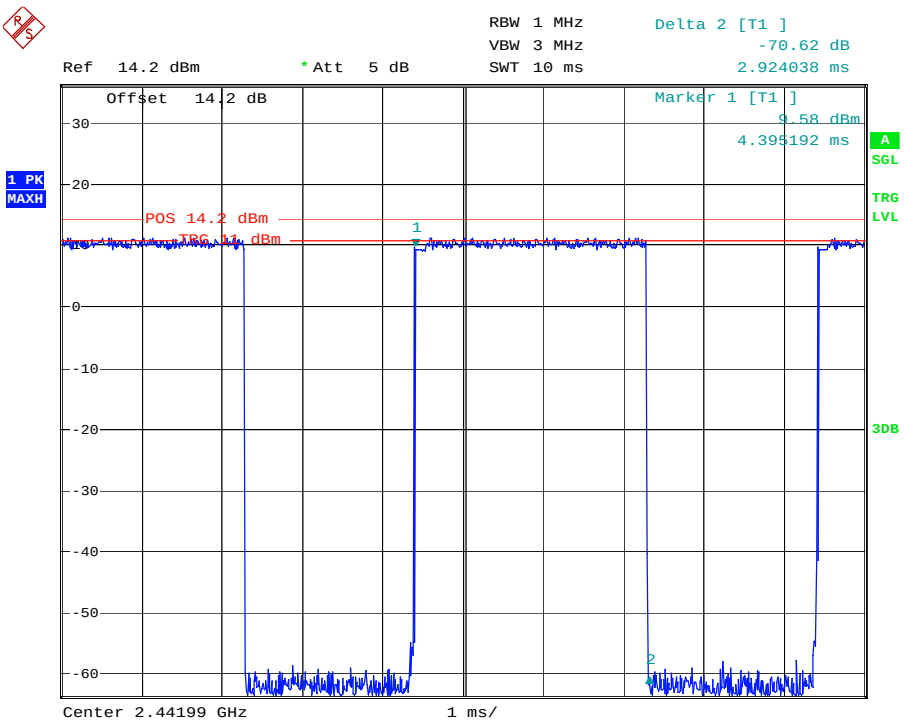
8.7.5 Measurement Plots:

Plot # 56 Transmission on Time in Observation Period > (31.6 s)	
Modulation: 8DPSK	Packet Type: 3DH5



Plot # 57 Pulse Duration

Modulation: 8DPSK	Packet Type: 3DH5



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8.8 Radiated Transmitter Spurious Emissions and Restricted Bands

8.8.1 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

8.8.2 Limits:

FCC §15.247

- In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or 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, 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, 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)).

- 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

8.8.3 Test conditions and setup:

Ambient Temperature	EUT Set-up #	EUT operating mode	Power Input
23.8°C	2	Op.1	110 V AC

8.8.4 Measurement result:

Plot #	Channel #	Scan Frequency	Limit	Result
58 – 60	Low	30 MHz – 18 GHz	See section 8.8.2	Pass
61 – 65	Mid	9 kHz – 40 GHz	See section 8.8.2	Pass
66 – 68	High	30 MHz – 18 GHz	See section 8.8.2	Pass

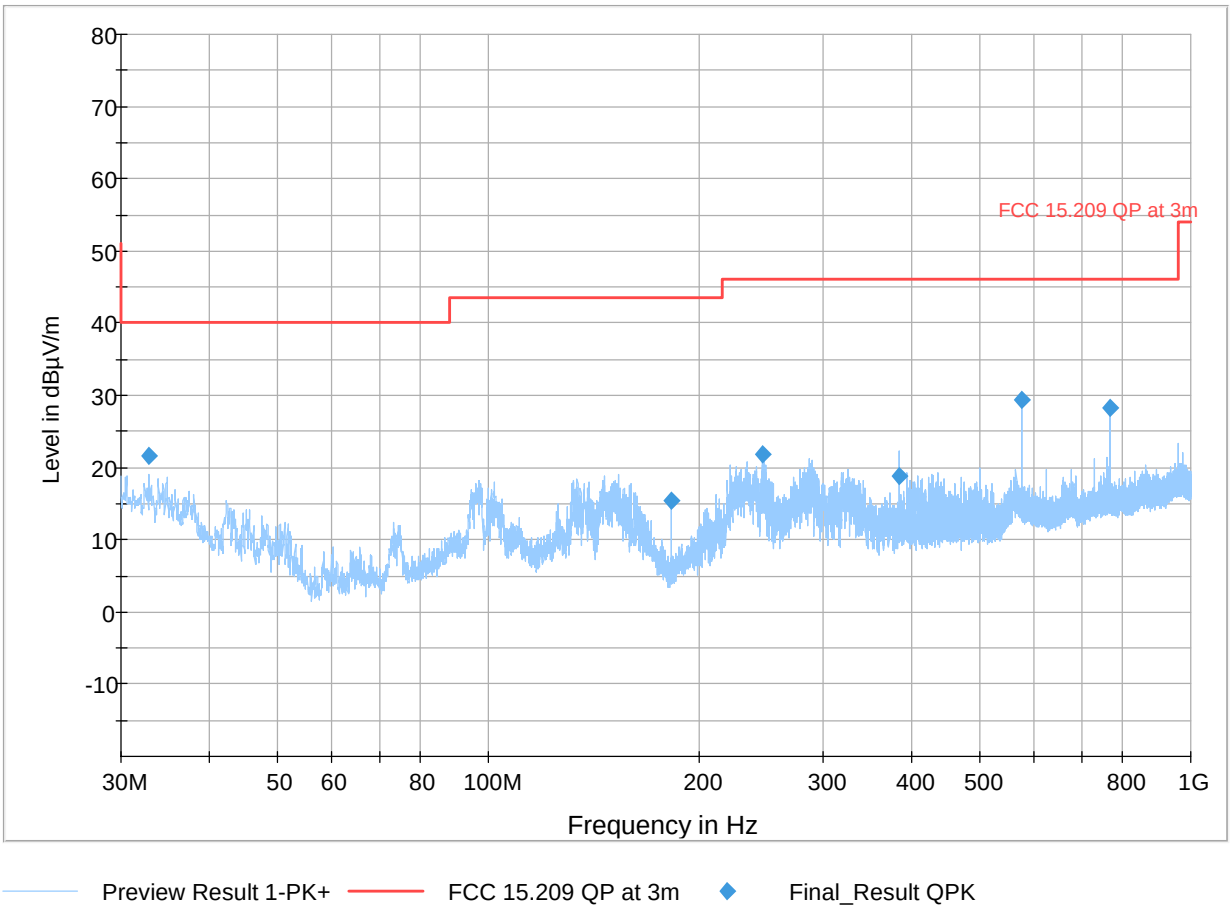
8.8.5 Measurement Plots:

Plot # 58 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2402 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
32.877667	21.61	40.00	18.39	500.0	120.000	244.0	V	56.0	-14.1
181.966667	15.36	43.50	28.14	500.0	120.000	176.0	H	142.0	-24.1
246.568667	21.74	46.02	24.28	500.0	120.000	125.0	H	248.0	-21.2
383.953000	18.91	46.02	27.11	500.0	120.000	125.0	V	111.0	-18.4
575.948333	29.26	46.02	16.76	500.0	120.000	171.0	H	5.0	-13.2
767.943667	28.35	46.02	17.67	500.0	120.000	159.0	V	12.0	-10.6

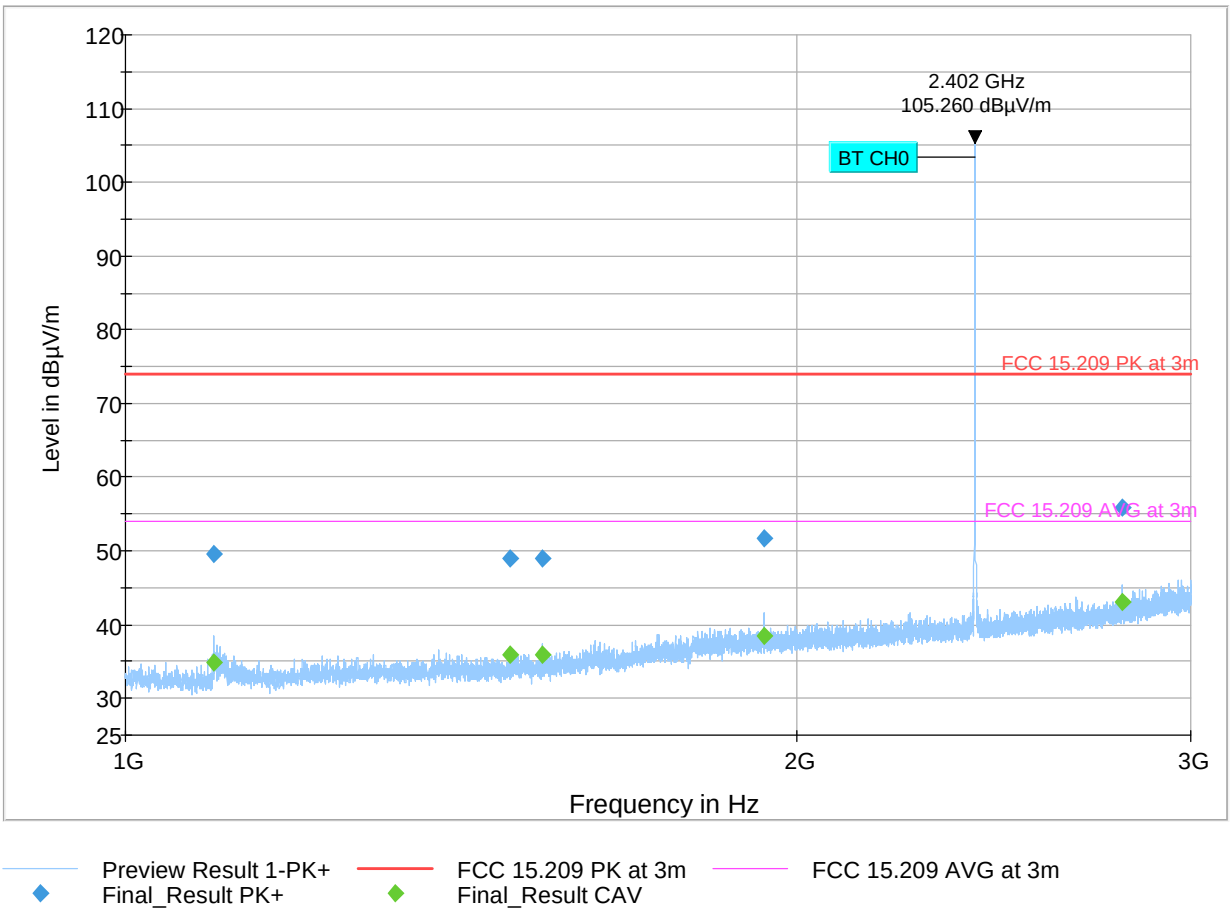


Plot # 59 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2402 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
1094.857	49.61	---	73.98	24.36	500.0	1000.000	239.0	H	-6.0	27.6
1094.857	---	34.87	53.98	19.11	500.0	1000.000	239.0	H	-6.0	27.6
1487.714	---	35.88	53.98	18.10	500.0	1000.000	295.0	H	216.0	28.6
1487.714	48.99	---	73.98	24.99	500.0	1000.000	295.0	H	216.0	28.6
1538.143	48.94	---	73.98	25.04	500.0	1000.000	210.0	V	55.0	29.1
1538.143	---	36.00	53.98	17.98	500.0	1000.000	210.0	V	55.0	29.1
1933.286	---	38.49	53.98	15.49	500.0	1000.000	243.0	H	319.0	31.1
1933.286	51.63	---	73.98	22.35	500.0	1000.000	243.0	H	319.0	31.1
2796.571	---	43.09	53.98	10.89	500.0	1000.000	100.0	V	16.0	34.2
2796.571	55.80	---	73.98	18.18	500.0	1000.000	100.0	V	16.0	34.2

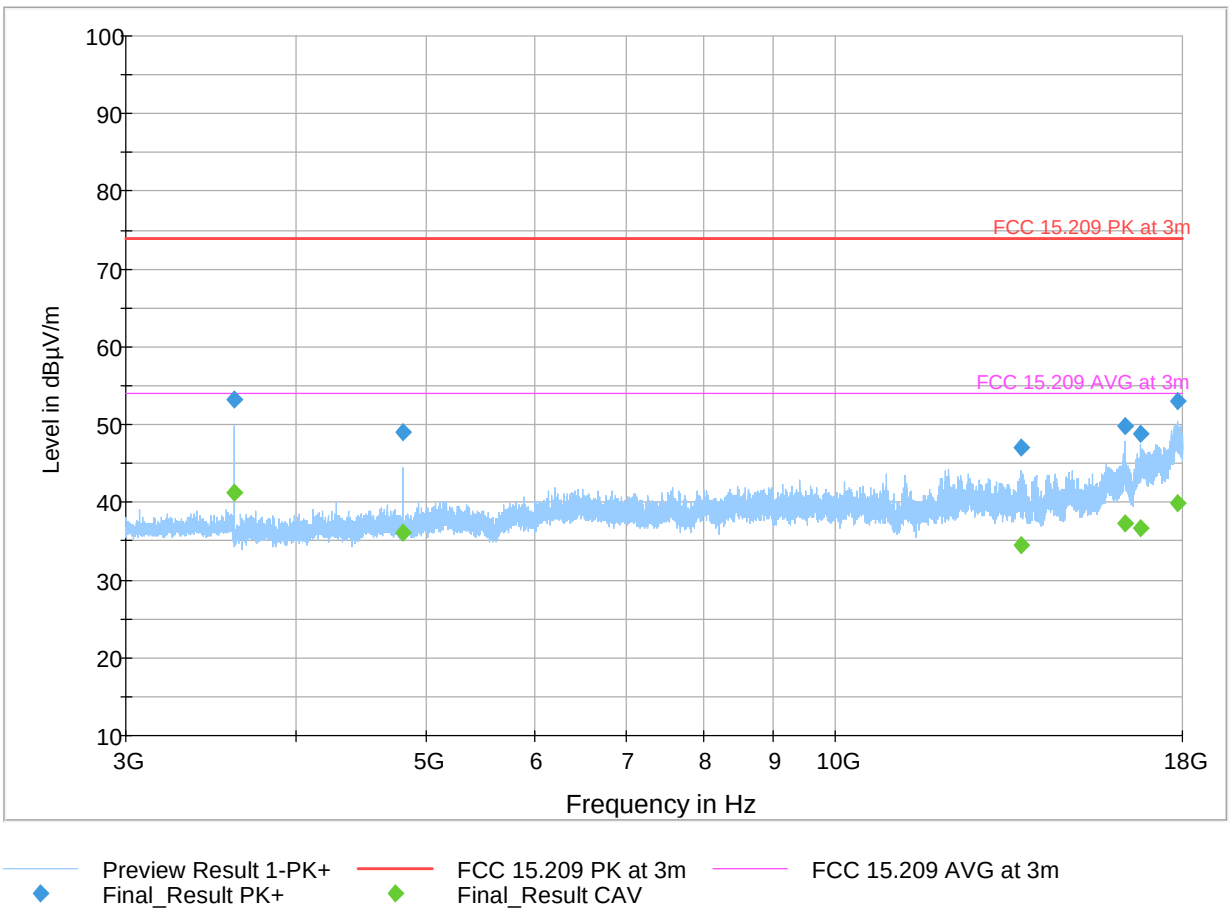


Plot # 60 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2402 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
3603.000	---	41.18	53.98	12.80	500.0	1000.000	195.0	V	-18.0	-7.2
3603.000	53.28	---	73.98	20.70	500.0	1000.000	195.0	V	-18.0	-7.2
4804.000	---	36.02	53.98	17.96	500.0	1000.000	244.0	V	46.0	-4.8
4804.000	48.98	---	73.98	25.00	500.0	1000.000	276.0	V	61.0	-4.8
13708.000	---	34.55	53.98	19.43	500.0	1000.000	256.0	V	237.0	6.0
13708.000	47.11	---	73.98	26.87	500.0	1000.000	256.0	V	237.0	6.0
16334.000	---	37.36	53.98	16.62	500.0	1000.000	152.0	H	79.0	10.5
16334.000	49.76	---	73.98	24.22	500.0	1000.000	152.0	H	79.0	10.5
16751.500	---	36.67	53.98	17.31	500.0	1000.000	207.0	H	178.0	11.9
16751.500	48.86	---	73.98	25.12	500.0	1000.000	207.0	H	178.0	11.9
17849.000	---	39.97	53.98	14.01	500.0	1000.000	173.0	V	46.0	16.6
17849.000	53.02	---	73.98	20.96	500.0	1000.000	173.0	V	46.0	16.6

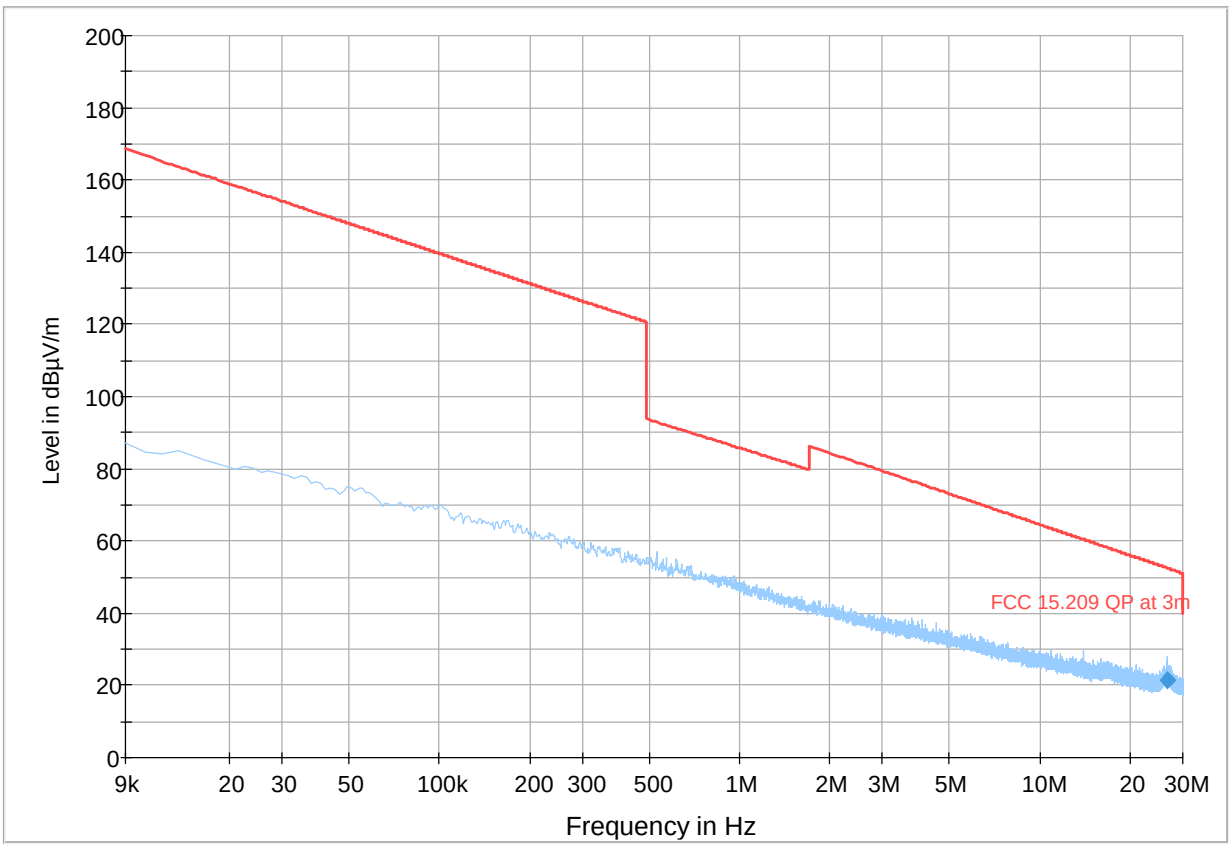


Plot # 61 Radiated Emissions: 9 KHz – 30 MHz

Tx Frequency: 2442 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
26.550	21.50	52.54	31.04	500.0	9.000	100.0	H	160.0	16.3

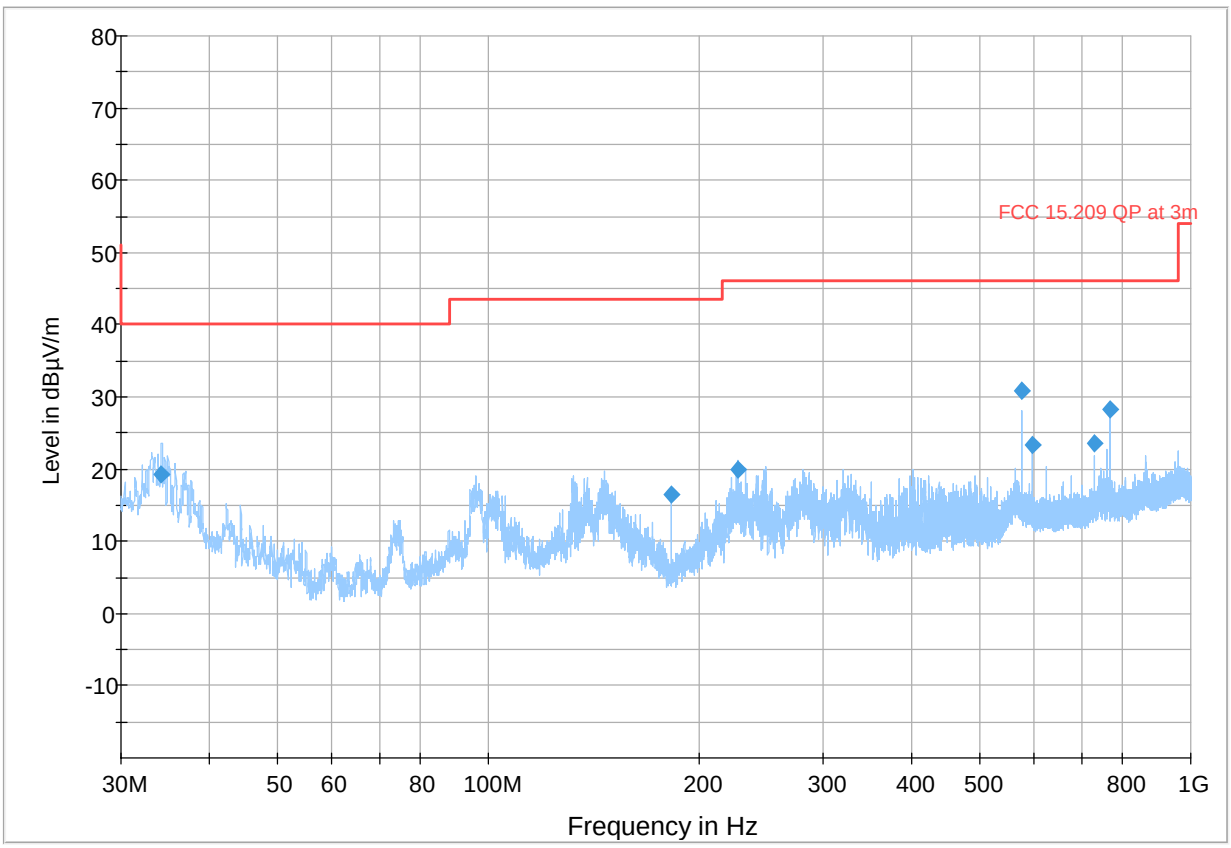


Plot # 62 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2442 MHz	Op. 1	Mode: 8DPSK 3DH5

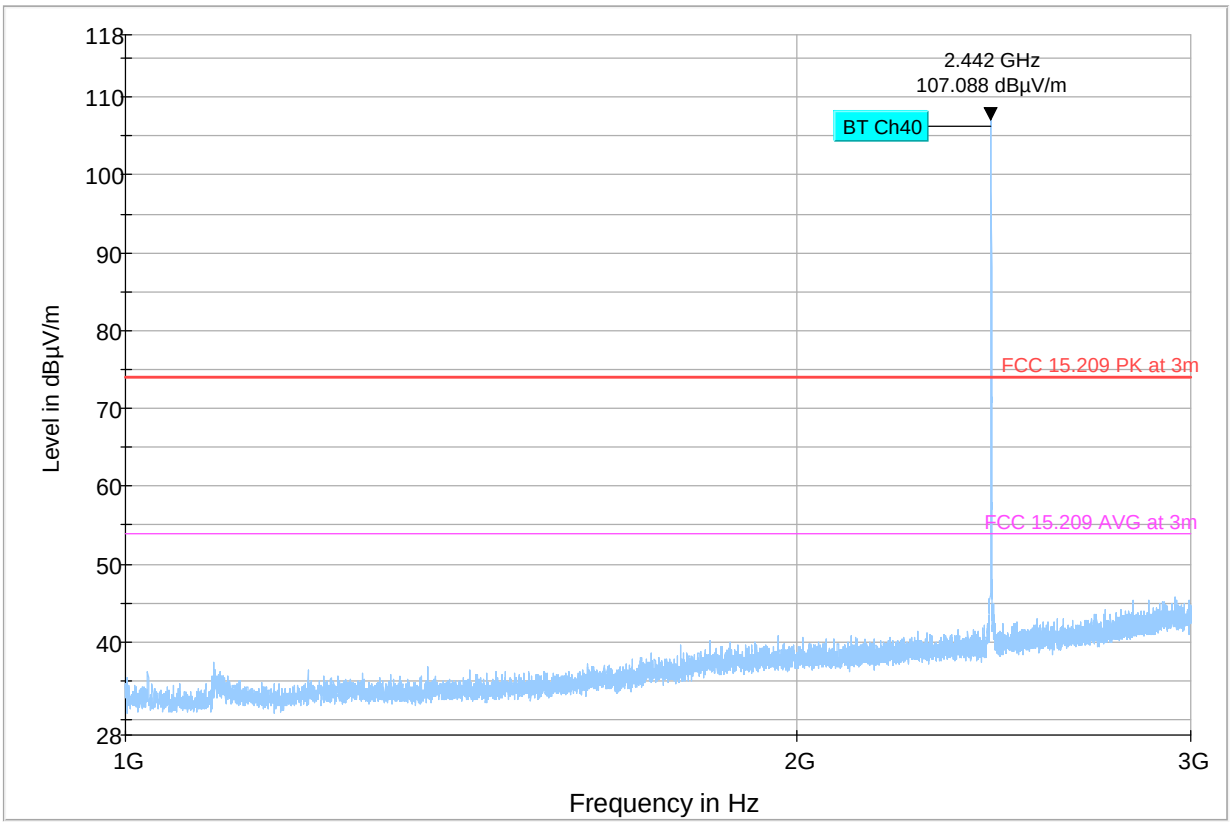
Final_Result

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
34.30	19.18	40.00	20.82	500.0	120.000	285.0	V	350.0	-14.9
181.967	16.56	43.50	26.94	500.0	120.000	241.0	H	308.0	-24.1
226.716	19.81	46.02	26.21	500.0	120.000	150.0	H	344.0	-20.8
575.948	30.84	46.02	15.19	500.0	120.000	100.0	V	351.0	-13.3
594.992	23.36	46.02	22.66	500.0	120.000	100.0	V	245.0	-13.2
727.947	23.52	46.02	22.50	500.0	120.000	158.0	V	-6.0	-10.8
767.943	28.25	46.02	17.77	500.0	120.000	159.0	V	18.0	-10.6



Plot # 63 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2442 MHz	Op. 1	Mode: 8DPSK 3DH5

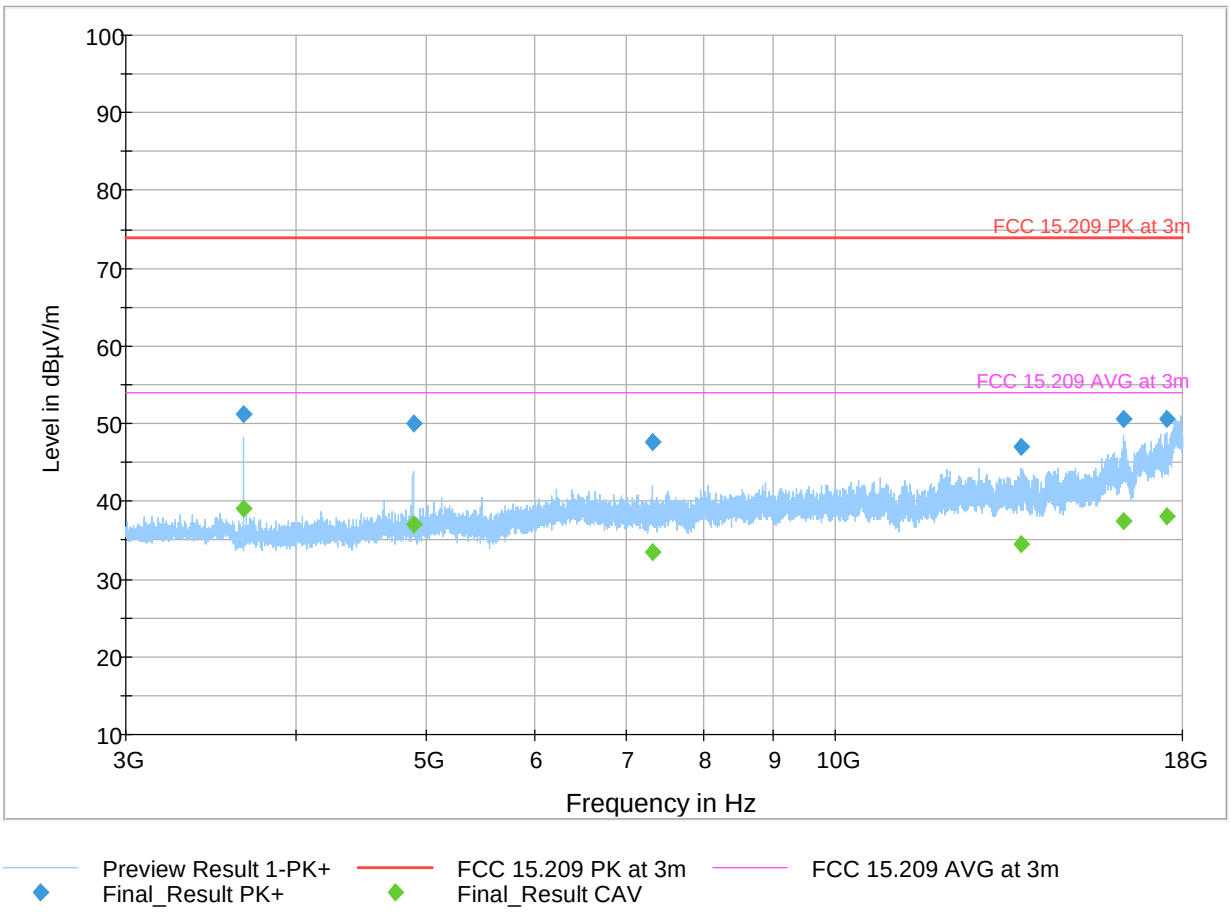


Plot # 64 Radiated Emissions: 3 – 18 GHz

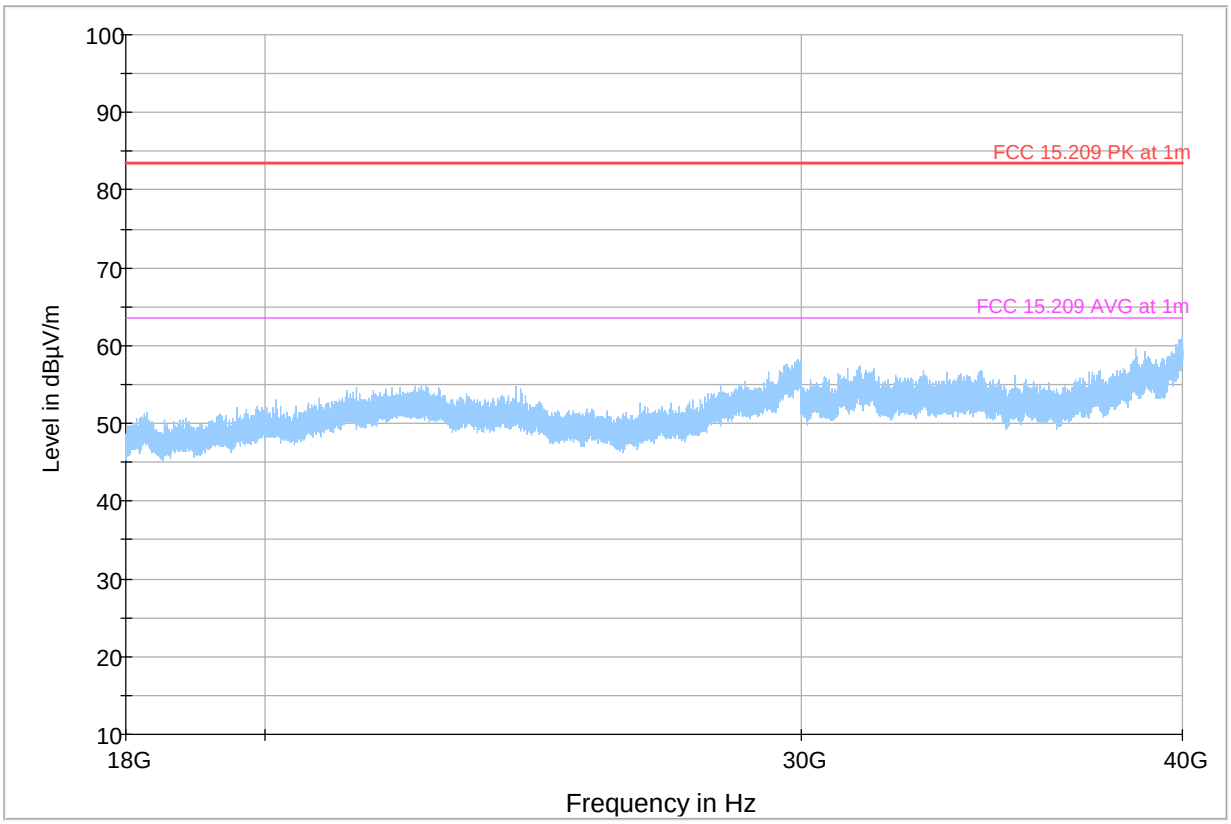
Tx Frequency: 2442 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
3663.0	51.18	---	73.98	22.80	500.0	1000.000	273.0	V	351.0	-6.7
3663.0	---	39.16	53.98	14.82	500.0	1000.000	273.0	V	351.0	-6.7
4884.0	---	37.18	53.98	16.80	500.0	1000.000	207.0	V	50.0	-5.0
4884.0	50.01	---	73.98	23.97	500.0	1000.000	207.0	V	50.0	-5.0
7326.50	---	33.47	53.98	20.51	500.0	1000.000	315.0	V	359.0	-0.5
7326.50	47.58	---	73.98	26.40	500.0	1000.000	315.0	V	359.0	-0.5
13709.50	47.01	---	73.98	26.97	500.0	1000.000	220.0	H	104.0	6.0
13709.50	---	34.47	53.98	19.51	500.0	1000.000	220.0	H	104.0	6.0
16301.50	---	37.58	53.98	16.40	500.0	1000.000	188.0	V	254.0	10.6
16301.50	50.56	---	73.98	23.42	500.0	1000.000	188.0	V	254.0	10.6
17520.0	50.67	---	73.98	23.30	500.0	1000.000	306.0	V	246.0	12.4
17520.0	---	38.04	53.98	15.94	500.0	1000.000	306.0	V	246.0	12.4



Plot # 65 Radiated Emissions: 18 – 40 GHz		
Tx Frequency: 2442 MHz	**Op. 1**	**Mode: 8DPSK 3DH5**

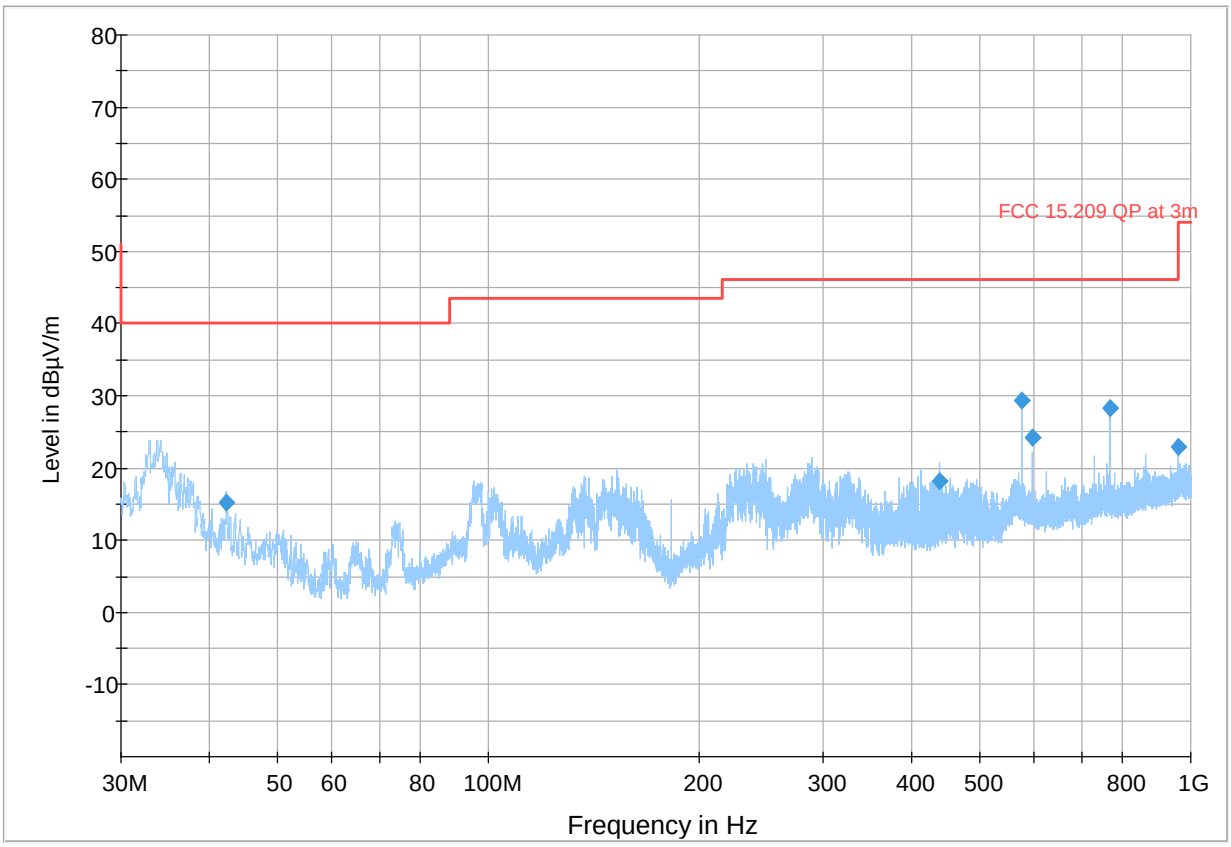


Plot # 66 Radiated Emissions: 30 MHz – 1 GHz

Tx Frequency: 2480 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
42.416	15.12	40.00	24.88	500.0	120.0	159.0	V	39.0	-18.1
437.950	18.14	46.02	27.88	500.0	120.0	116.0	V	0.0	-17.1
575.948	29.29	46.02	16.73	500.0	120.0	167.0	H	13.0	-13.2
594.993	24.26	46.02	21.76	500.0	120.0	205.0	V	190.0	-13.2
767.944	28.21	46.02	17.81	500.0	120.0	158.0	V	6.0	-10.6
959.939	22.96	46.02	23.06	500.0	120.0	142.0	V	38.0	-7.5

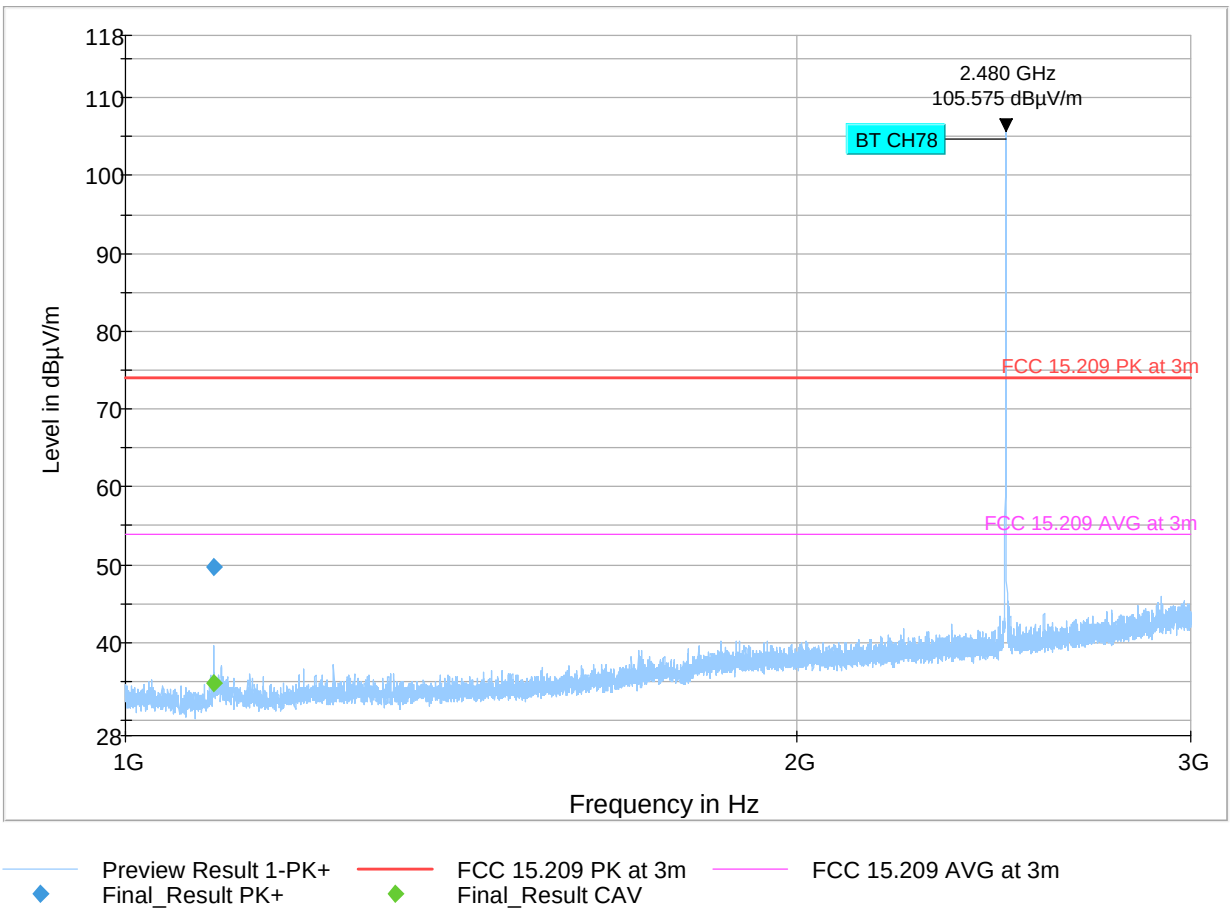


Plot # 67 Radiated Emissions: 1 – 3 GHz

Tx Frequency: 2480 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
1094.714	---	34.86	53.98	19.12	500.0	1000.0	100.0	H	-4.0	27.6
1094.714	49.73	---	73.98	24.25	500.0	1000.0	100.0	H	-4.0	27.6

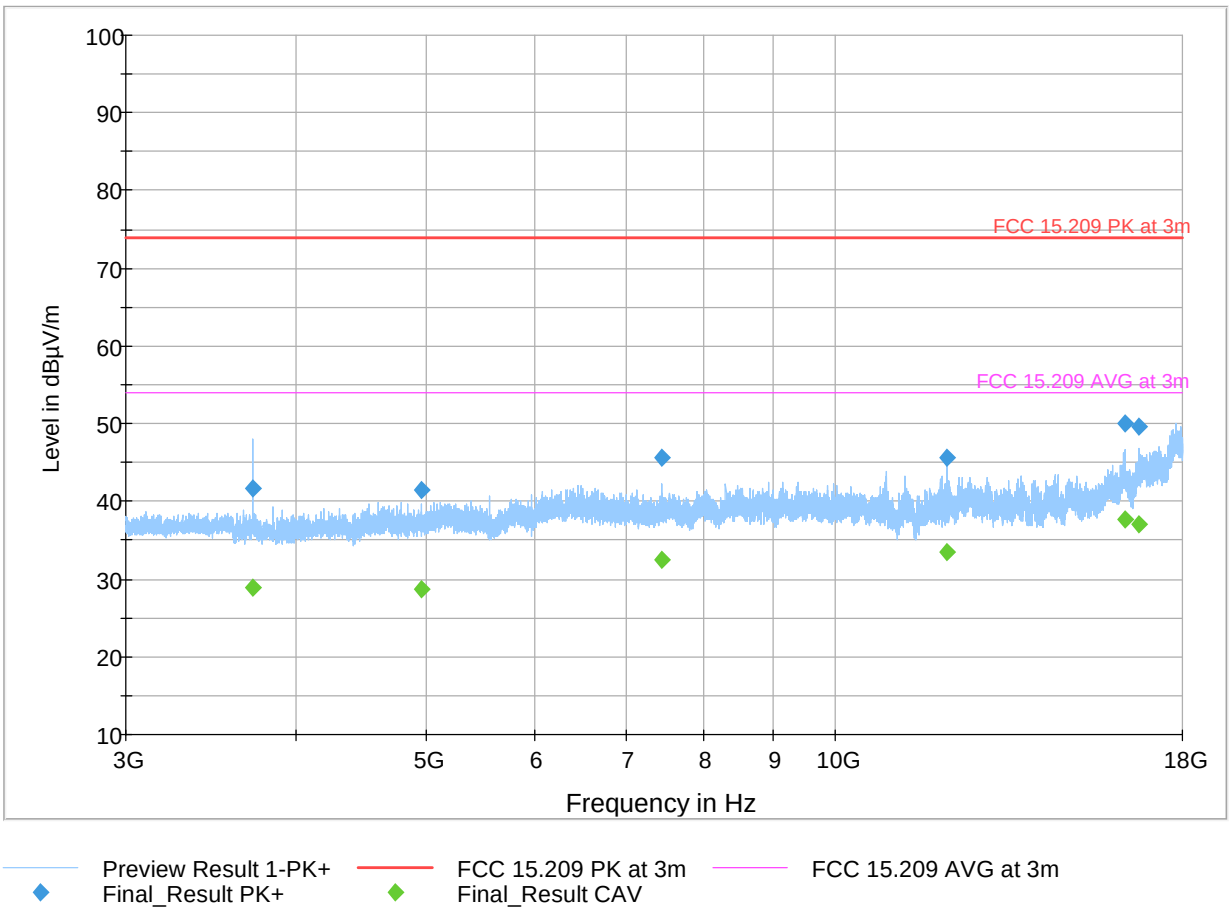


Plot # 68 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2480 MHz	Op. 1	Mode: 8DPSK 3DH5

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)
3720.0	---	28.82	53.98	25.16	500.0	1000.0	152.0	H	128.0	-6.4
3720.0	41.56	---	73.98	32.41	500.0	1000.0	152.0	H	128.0	-6.4
4958.0	---	28.72	53.98	25.26	500.0	1000.0	224.0	V	116.0	-4.5
4958.0	41.51	---	73.98	32.47	500.0	1000.0	224.0	V	116.0	-4.5
7440.50	---	32.50	53.98	21.48	500.0	1000.0	140.0	V	51.0	-0.2
7440.50	45.70	---	73.98	28.28	500.0	1000.0	140.0	V	51.0	-0.2
12088.0	---	33.45	53.98	20.52	500.0	1000.0	266.0	H	127.0	2.9
12088.0	45.61	---	73.98	28.37	500.0	1000.0	266.0	H	127.0	2.9
16331.0	---	37.63	53.98	16.35	500.0	1000.0	301.0	V	199.0	10.5
16331.0	50.07	---	73.98	23.91	500.0	1000.0	301.0	V	199.0	10.5
16726.50	---	37.12	53.98	16.86	500.0	1000.0	175.0	V	180.0	11.6
16726.50	49.55	---	73.98	24.43	500.0	1000.0	175.0	V	180.0	11.6



8.9 AC Power Line Conducted Emissions

8.9.1 Measurement according to ANSI C63.4

Analyzer Settings:

- RBW = 9 KHz (CISPR Bandwidth)
- Pre-scan Detector = Peak / Average for
- Final Measurements Detector = Quasi-Peak / Average

8.9.2 Limits: FCC 15.207 & RSS-Gen 8.8

(a) Except as shown in paragraphs (b) and (c) of this section of the CFR, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table (1), as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15–0.5	66 to 56*	56 to 46*
0.5–5	56	46
5–30	60	50

*Decreases with the logarithm of the frequency.

8.9.3 Test conditions and setup:

Ambient Temperature (C)	EUT operating mode	Power line (L1, L2, L3, N)	Power Input
23.8	Op.1	Line & Neutral	110 V / 60 Hz

8.9.4 Measurement Result:

Plot #	Port	EUT #	Scan Frequency	Limit	Result
69	AC Mains	2	150 kHz – 30 MHz	See section 8.9.2	Pass

8.9.5 Measurement Plots:

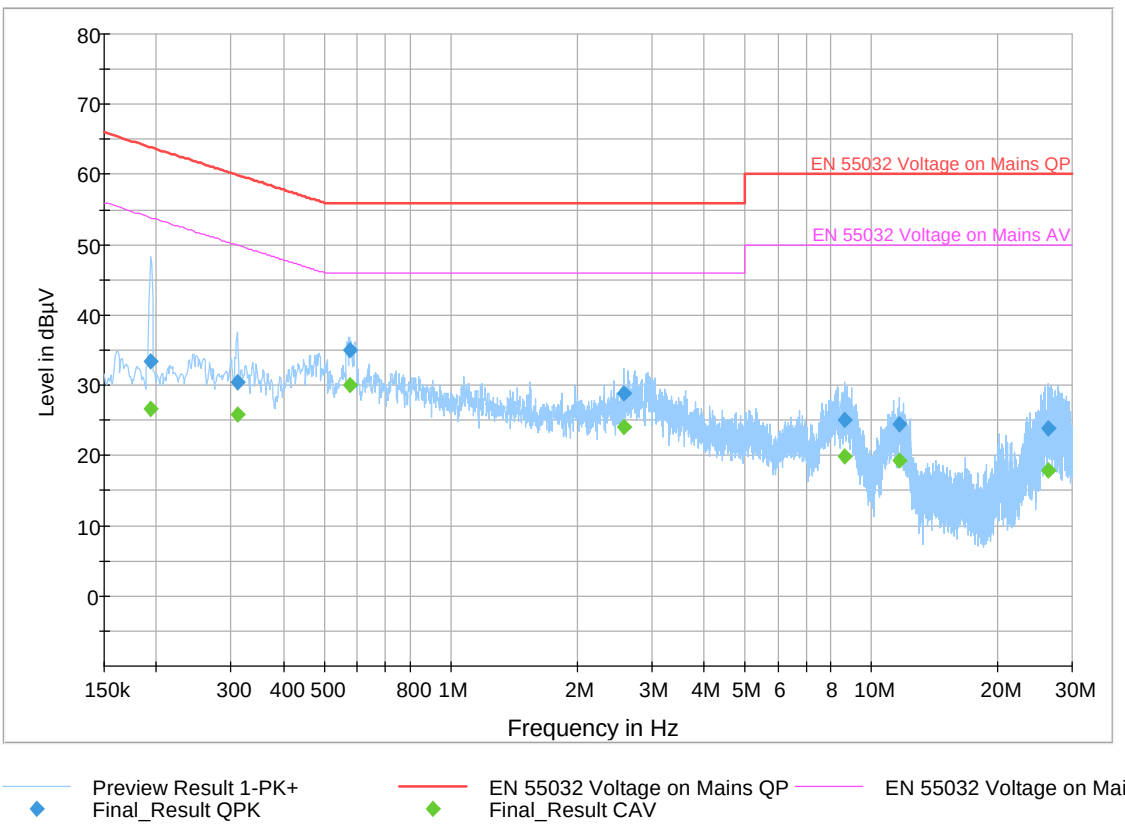
Disclaimer: Any measurement data within 2dB from the limit line is conditional PASS/FAIL due to measurement uncertainty considerations.

Plot # 69 Radiated Emissions: 3 – 18 GHz

Tx Frequency: 2442 MHz	Op. 1	Mode: 8DPSK 3DH5

Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	PE	Corr. (dB)
0.194	---	26.64	53.88	27.23	500.0	9.000	L1	GND	0.5
0.194	33.39	---	63.88	30.49	500.0	9.000	L1	GND	0.5
0.311	---	25.80	49.94	24.14	500.0	9.000	L1	GND	0.2
0.311	30.43	---	59.94	29.51	500.0	9.000	L1	GND	0.2
0.574	34.92	---	56.00	21.08	500.0	9.000	N	GND	0.2
0.574	---	30.07	46.00	15.93	500.0	9.000	N	GND	0.2
2.576	---	24.10	46.00	21.90	500.0	9.000	L1	GND	0.2
2.576	28.75	---	56.00	27.25	500.0	9.000	L1	GND	0.2
8.664	24.96	---	60.00	35.04	500.0	9.000	N	GND	0.2
8.664	---	19.89	50.00	30.11	500.0	9.000	N	GND	0.2
11.660	24.48	---	60.00	35.52	500.0	9.000	N	GND	0.2
11.660	---	19.20	50.00	30.80	500.0	9.000	N	GND	0.2
26.278	23.78	---	60.00	36.22	500.0	9.000	L1	GND	0.5
26.278	---	17.95	50.00	32.05	500.0	9.000	L1	GND	0.5



9 Test setup photos

Setup photos are included in supporting file name: "EMC_JUNEL-002-20001_FCC_ISED_Setup_Photos.pdf"

10 Test Equipment And Ancillaries Used For Testing

Equipment Type	Manufacturer	Model	Serial #	Calibration Cycle	Last Calibration Date
ACTIVE LOOP ANTENNA	ETS LINDGREN	6507	00161344	3 YEARS	10/26/2017
BILOG ANTENNA	TESEO	CBL 6141B	41106	3 YEARS	11/01/2017
HORN ANTENNA	EMCO	3115	00035111	3 YEARS	04/17/2019
HORN ANTENNA	ETS LINDGREN	3117	00215984	3 YEARS	1/26/2018
HORN ANTENNA	ETS LINDGREN	3116C	00169535	3 YEARS	9/23/2020
ESW.EMI TEST RECEIVER	R&S	ESW44	101715	3 YEARS	1/6/2020
Spectrum Analyzer	R&S	FSU26	200065	3 YEARS	07/16/2019
THERMOMETER HUMIDITY MONITOR	CONTROL COMPANY	36934-164	181230565	2 YEARS	01/10/2019

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
10/21/2020	EMC_JUNEL-002-20001_FCC_15.247_ISED_BT_DSS	Initial Version	Issa Ghanma

<<< The End >>>