

Test Report



INTENTIONAL RADIATOR TESTS ACCORDING TO FCC PART 15 C and INDUSTRY CANADA REQUIREMENTS

Equipment Under Test: Framery Control Unit and Power Supply for
Soundproof meeting pod

Model: Framery Control Unit

Trade Mark: Framery

Manufacturer: Framery Oy
Patamäenkatu 7
FI-33900 Tampere
Finland

Customer: Framery Oy
Patamäenkatu 7
FI-33900 Tampere
Finland

FCC Rule Part: 15.249: 2019
IC Rule Part: RSS-210: Issue 10, 2019

Date: 05 January 2021

Issued by:

A blue ink signature of Pekka Kälviäinen.

Pekka Kälviäinen
Test Engineer

05 January 2021

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Rauno Repo
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Equipment Under Test (EUT)

Type:	Framery Control Unit and Power Supply for Soundproof meeting pod
Model:	Framery Control Unit
Trade Mark:	Framery
Serial no:	-
Software version:	-
Hardware version:	9000456-01A
Bluetooth module:	Dialog Semiconductor DA14531
Cellular radio module:	Quectel EG21-G, LTE Cat 1 module
FCC ID No (End product)	2AX4J9000456
IC# (End product)	26702-9000456

The equipment under test is Radio module and Power Supply for Soundproof meeting pod. The pod is equipped with Bluetooth Low Energy 5.1 and cellular (2G/3G/4G) radios.

Classification of the device

Fixed device	<input type="checkbox"/>
Mobile Device (Human body distance > 20cm)	<input type="checkbox"/>
Portable Device (Human body distance < 20cm)	<input checked="" type="checkbox"/>

Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

Ratings and declarations

Type of Modulation:	<input type="checkbox"/> FHSS <input checked="" type="checkbox"/> Other
Operating Frequency Range:	2402-2480 MHz
Conducted Power:	-
Channels:	40
Nominal Channel Bandwidth:	-
Channel Separation:	2 MHz
Adaptivity:	<input type="checkbox"/> Adaptive <input checked="" type="checkbox"/> Non-adaptive
	<input type="checkbox"/> LBT based (if adaptive) <input type="checkbox"/> Load based (if adaptive)
Antenna Type:	Integral PCB antenna
Antenna Gain:	+5 dBi
Antenna Count:	1
Geo-location Capability:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes
Beam Forming Capability:	<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes

GSM/GPRS/EDGE	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Supported bands:	850/900/1800/1900
Voice call	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
GPRS	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
EDGE/EGPRS	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
WCDMA	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Supported bands:	B1, B2, B4, B5, B6, B8, B19
LTE	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Supported bands:	LTE-FDD: B1, B2, B3, B4, B5, B7, B8, B12, B13, B18, B19, B20, B25, B26, B28 LTE-TDD: B38, B39, B40, B41
Antenna type/model:	Integral PCB antenna
Antenna Gain:	5 dBi

EUT Dimensions:	Radio Height: 18 cm Width: 16 cm Length: 9 cm Power supply Height: 34 cm Width: 25 cm Length: 5 cm
Power Requirements:	100-240 V, 50/60 Hz, 10 A

Ports and Cables

Cable / Port	Description
AC mains	L/N/PE, 4.5 m
DC power for Framery Control Unit	0.2 m
AC power output	AC output socket, 0.2 m

Disclaimer

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Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.

SUMMARY OF TESTING

Test Specification	Description of Test	Result
§15.203	Antenna requirement	PASS
§15.207(a) / RSS-GEN 8.8	Conducted Emissions on Power Supply Lines	PASS
§15.249, a / RSS-210 Issue 10, 2019	Maximum Peak Radiated Output Power	PASS
RSS-GEN 6.6	99 % Occupied Bandwidth	PASS
§15.249, a	20 dB Bandwidth	PASS
§15.249, a /RSS-210 Issue 10, 2019	Unintentional Radiated Emissions	PASS

EUT Test Conditions during Testing

The EUT was configured into the wanted channel and was in continuous transmit mode during all the tests. During the radiated measurements above 1 GHz the EUT was on 150 cm high Styrofoam table.

Following channels were used during the tests

BT:

Channel	Frequency/ MHz
Low	2402
Mid	2440
High	2480

LTE:

Channel	Frequency/ MHz
B7, Mid	2535

Both transmitters were operating during all tests.

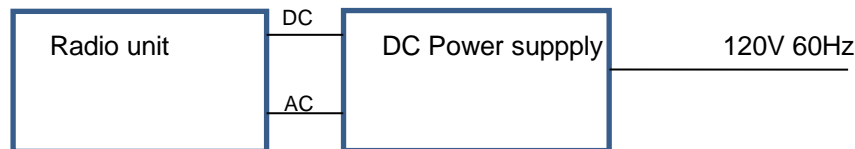


Figure 1: Test setup blocking diagram

Test Facility

Testing Laboratory / address: FCC designation number: FI0002 ISED CAB identifier: T004	SGS Fimko Ltd Takomotie 8 FI-00380, HELSINKI FINLAND
Test Site:	<input type="checkbox"/> K10LAB, ISED Canada registration number: 8708A-1 <input checked="" type="checkbox"/> K5LAB, ISED Canada registration number: 8708A-2 <input type="checkbox"/> T10LAB

Antenna requirement

Standard: FCC Rule §15.203
Tested by: PKA
Date: 04 January 2021

FCC Rule: 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

Specification	Requirement (at least one of the following shall be applied)	Conclusion
§15.203	<ol style="list-style-type: none"> 1. Permanently attached antenna 2. Unique coupling to the intentional radiator 3. Professionally installed radio. The installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded. 	PASS
Note	Option 1 is used	

Conducted Emissions In The Frequency Range 150 kHz - 30 MHz

Standard: ANSI C63.10 (2013)
Tested by: PKA
Date: 30 December 2020
Temperature: 23 ± 3°C
Humidity: 20 - 60 % RH
Barometric pressure: 1001 hPa
Measurement uncertainty: ± 2.9 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.207 (a)
RSS-GEN 8.8

Conducted disturbance voltage was measured with an artificial main network from 150 kHz to 30 MHz with 4.5 kHz steps and a resolution bandwidth of 9 kHz. Measurements were carried out with peak and average detectors.

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.

Full Spectrum

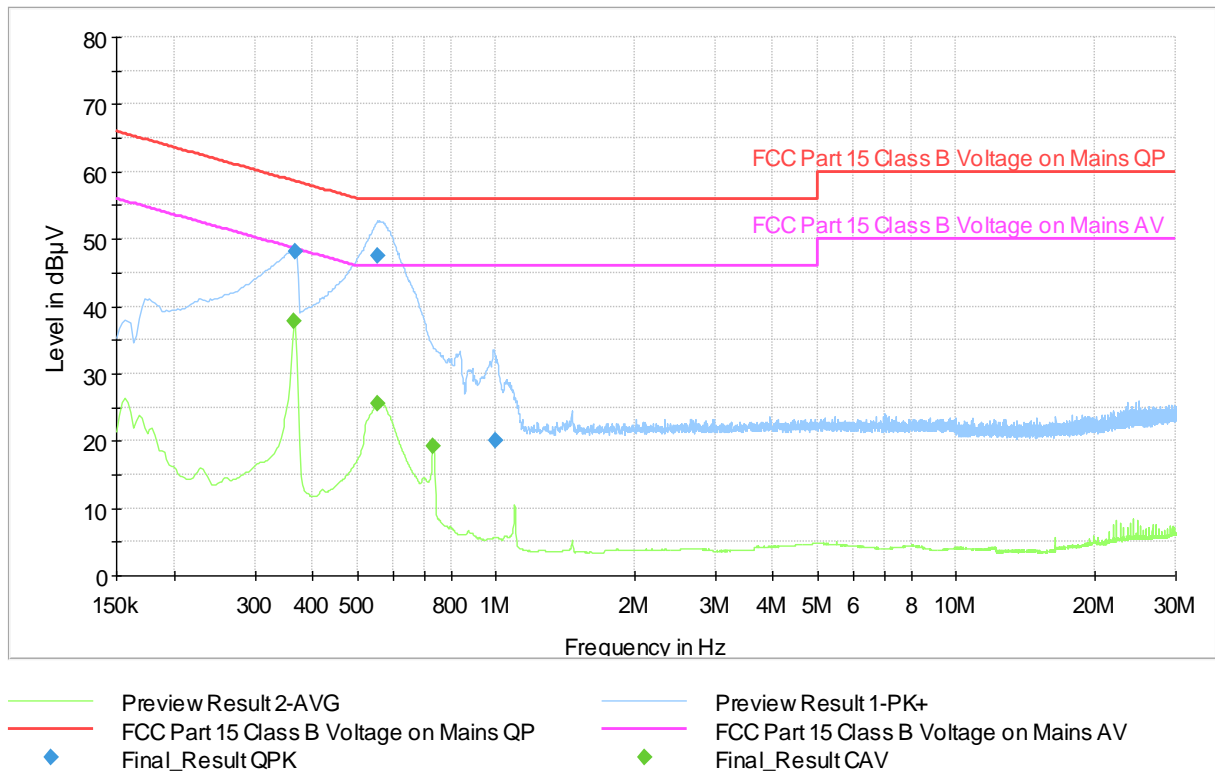


Figure 2: The measured curves with peak- and average detector

Conducted Emissions In The Frequency Range 150 kHz – 30 MHz

Final measurements from the worst frequencies

Table 1: Final QuasiPeak and Average measurements from the worst frequencies

Frequency (MHz)	QuasiPeak (dB μ V)	CAverage (dB μ V)	Limit (dB μ V)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.365000	---	37.78	48.61	10.83	1000.0	9.000	L1	ON	9.7
0.367250	48.11	---	58.56	10.45	1000.0	9.000	L1	ON	9.7
0.555750	---	25.55	46.00	20.45	1000.0	9.000	N	ON	9.7
0.555750	47.59	---	56.00	8.41	1000.0	9.000	N	ON	9.7
0.731750	---	19.29	46.00	26.71	1000.0	9.000	L1	ON	9.7
0.996250	19.96	---	56.00	36.04	1000.0	9.000	L1	ON	9.8

The correction factor in the final result table contains the sum of the transducers (transient limiter + cables).

The result value is the measured value corrected with the correction factor.

Maximum Peak Conducted Output Power
Maximum Peak Radiated Output Power

Standard: ANSI C63.10 (2013)
Tested by: PKA
Date: 28 - 29 December 2020
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH
Measurement uncertainty ± 4.5 dB Level of confidence 95 % (k = 2)

FCC Rule: 15.249
RSS-210 Issue 10, 2019

Results:

Channel	Radiated Power/Peak [dBµV/m]	Peak Limit [dBµV/m]	Margin [dB]	Result
Low	90.79	114.0	23.21	PASS
Mid	90.31	114.0	23.69	PASS
High	90.00	114.0	24.00	PASS

Channel	Radiated *) Power/Average [dBµV/m]	Average Limit [dBµV/m]	Margin [dB]	Result
Low	38.28	94.0	55.72	PASS
Mid	37.80	94.0	56.20	PASS
High	37.49	94.0	56.51	PASS

*) Calculated average: peak value – duty cycle correction factor = result
 duty cycle correction factor, See page 19

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz
Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

Standard: ANSI C63.10 (2013)
Tested by: PKA
Date: 28 - 30 December 2020
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH
Measurement uncertainty ± 4.51 dB Level of confidence 95 % (k = 2)

**FCC Rule: 15.249
RSS-2**

The correction factor in the final result table contains the sum of the transducers (antenna + amplifier + cables).
 The result value is the measured value corrected with the correction factor.

Results:

low channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
70.685000	23.91	40.00	16.09	120.000	220.0	H	160.0	16.1
164.475000	23.74	43.50	19.76	120.000	108.0	H	194.0	18.2
532.965000	36.70	46.00	9.30	120.000	108.0	H	4.0	24.8

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2136.475000	53.43	---	73.90	20.47	1000.000	221.0	H	322.0	12.9
2136.475000	---	0.92 *)	53.90	52.98	1000.000	221.0	H	322.0	12.9
2269.625000	71.26	---	73.90	2.64	1000.000	249.0	H	322.0	13.7
2269.625000	---	18.75 *)	53.90	35.15	1000.000	249.0	H	322.0	13.7
2400.000000	65.84 **)	---	73.90	8.06	1000.000	149.0	H	318.0	14.3
2400.000000	---	13.33 *) **)	53.90	40.57	1000.000	149.0	H	318.0	14.3
2668.000000	62.07	---	73.90	11.83	1000.000	100.0	H	317.0	14.3
2668.000000	---	9.56 *)	53.90	44.34	1000.000	100.0	H	317.0	14.3
4389.725000	52.79	---	73.90	21.11	1000.000	119.0	H	315.0	6.8
4804.525000	54.76	---	73.90	19.14	1000.000	191.0	V	292.0	7.6
4804.525000	---	2.25 *)	53.90	51.65	1000.000	191.0	V	292.0	7.6
5070.275000	58.42	---	73.90	15.48	1000.000	126.0	H	22.0	7.4
5070.275000	---	5.91 *)	53.90	47.99	1000.000	126.0	H	22.0	7.4
7603.575000	58.33	---	73.90	15.57	1000.000	147.0	H	308.0	10.8
7603.575000	---	5.82	53.90	48.08	1000.000	147.0	H	308.0	10.8
10140.175000	53.66	---	73.90	20.24	1000.000	224.0	V	10.0	15.0
10140.175000	---	1.15 *)	53.90	52.75	1000.000	224.0	V	10.0	15.0
12011.175000	51.96	---	73.90	21.94	1000.000	141.0	H	292.0	17.5

*) Calculated average: peak value – duty cycle correction factor = result (harmonic or intermodulation result)

***) Low band edge, 10MHz band scanned below band edge 2400.0 MHz, the highest value is reported

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

Mid Channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
69.025000	18.86	40.00	21.14	120.000	105.0	V	275.0	16.4
102.385000	16.58	43.50	26.92	120.000	164.0	H	225.0	14.1
165.265000	19.05	43.50	24.45	120.000	105.0	H	26.0	18.2
45.005000	17.74	46.00	28.26	120.000	145.0	V	27.0	23.5
532.945000	35.99	46.00	10.01	120.000	247.0	H	23.0	24.8
643.295000	18.89	46.00	27.11	120.000	321.0	V	342.0	27.5

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2250.625000	56.00	---	73.90	17.90	1000.000	229.0	H	310.0	13.4
2250.625000	---	3.49 *)	53.90	50.41	1000.000	229.0	H	310.0	13.4
2344.425000	73.05	51.90	73.90	0.85	1000.000	217.0	H	311.0	13.7
2344.425000	---	20.54 *)	53.90	33.36	1000.000	217.0	H	311.0	13.7
2626.200000	62.87	---	73.90	11.03	1000.000	171.0	H	299.0	14.2
2626.200000	---	10.36 *)	53.90	43.54	1000.000	171.0	H	299.0	14.2
4392.725000	53.44	---	73.90	20.46	1000.000	111.0	H	315.0	6.8
4879.975000	54.11	---	73.90	19.79	1000.000	116.0	H	324.0	7.5
4879.975000	---	1.60 *)	53.90	52.30	1000.000	116.0	H	324.0	7.5
5067.775000	58.05	---	73.90	15.85	1000.000	253.0	H	18.0	7.4
5067.775000	---	5.54 *)	53.90	48.36	1000.000	253.0	H	18.0	7.4
7509.825000	51.18	---	73.90	22.72	1000.000	162.0	H	327.0	10.6
7604.925000	58.17	---	73.90	15.73	1000.000	152.0	H	308.0	10.8
7604.925000	---	5.66 *)	53.90	48.24	1000.000	152.0	H	308.0	10.8
10139.975000	55.49	---	73.90	18.41	1000.000	142.0	V	13.0	15.0
10139.975000	---	2.98 *)	53.90	50.92	1000.000	142.0	V	13.0	15.0

*) Calculated average: peak value – duty cycle correction factor = result (harmonic or intermodulation result)

High channel

Frequency (MHz)	QuasiPeak (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
70.435000	19.16	40.00	20.84	120.000	100.0	V	270.0	16.1
163.245000	17.64	43.50	25.86	120.000	100.0	H	204.0	18.3
247.295000	12.61	46.00	33.39	120.000	232.0	H	225.0	17.6
346.485000	17.04	46.00	28.96	120.000	268.0	V	81.0	20.5
532.965000	37.37	46.00	8.63	120.000	100.0	H	354.0	24.8
599.995000	23.56	46.00	22.44	120.000	312.0	V	205.0	26.8

Frequency (MHz)	MaxPeak (dBµV/m)	CAverage (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
2370.625000	55.04	---	73.90	18.86	1000.000	265.0	H	311.0	13.4
2370.625000	---	2.53 *)	53.90	51.37	1000.000	265.0	H	311.0	13.4
2425.550000	72.65	---	73.90	1.25	1000.000	166.0	H	315.0	14.0
2425.550000	---	20.14 *)	53.90	33.76	1000.000	166.0	H	315.0	14.0
2484.100000	57.16 **)	---	73.90	16.74	1000.000	175.0	V	297.0	14.8
2484.100000	---	4.65 *) **)	53.90	49.25	1000.000	175.0	V	297.0	14.8
2590.300000	63.91	---	73.90	9.99	1000.000	230.0	H	298.0	14.8
2590.300000	---	11.40 *)	53.90	42.50	1000.000	230.0	H	298.0	14.8
4392.875000	52.73	---	73.90	21.17	1000.000	110.0	H	312.0	6.8
4953.275000	57.99	---	73.90	15.91	1000.000	116.0	H	282.0	7.5
4953.275000	---	5.48 *)	53.90	48.42	1000.000	116.0	H	282.0	7.5
5067.675000	60.48	---	73.90	13.42	1000.000	238.0	H	329.0	7.4
5067.675000	---	9.97 *)	53.90	43.93	1000.000	238.0	H	329.0	7.4
7605.175000	58.03	---	73.90	15.87	1000.000	147.0	H	308.0	10.8
7605.175000	---	5.52 *)	53.90	48.38	1000.000	147.0	H	308.0	10.8
10140.175000	52.54	---	73.90	21.36	1000.000	105.0	V	327.0	15.0
12398.575000	52.89	---	73.90	21.01	1000.000	136.0	H	38.0	17.4

*) Calculated average: peak value – duty cycle correction factor = result (harmonic or intermodulation result)

***) High band edge, 10MHz band scanned above band edge 2483.5MHz, the highest value is reported

Test results, graphics

Full Spectrum

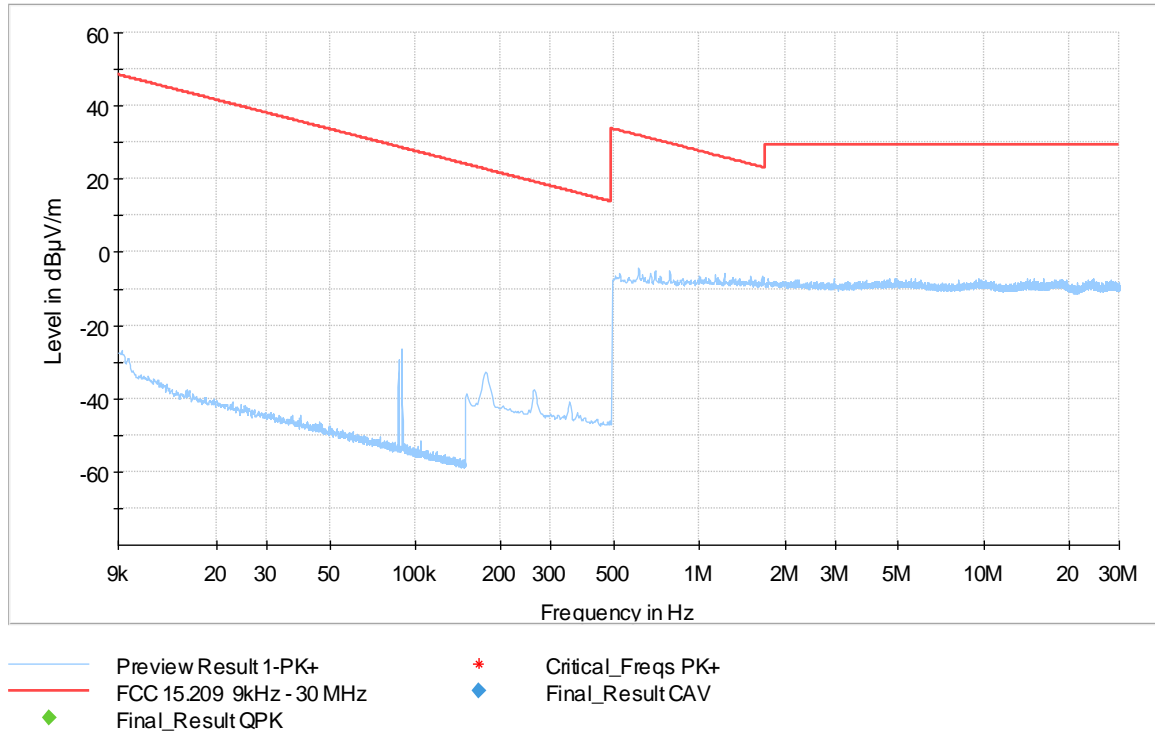


Figure 3. Measured curve with peak detector (Mid channel).

Full Spectrum

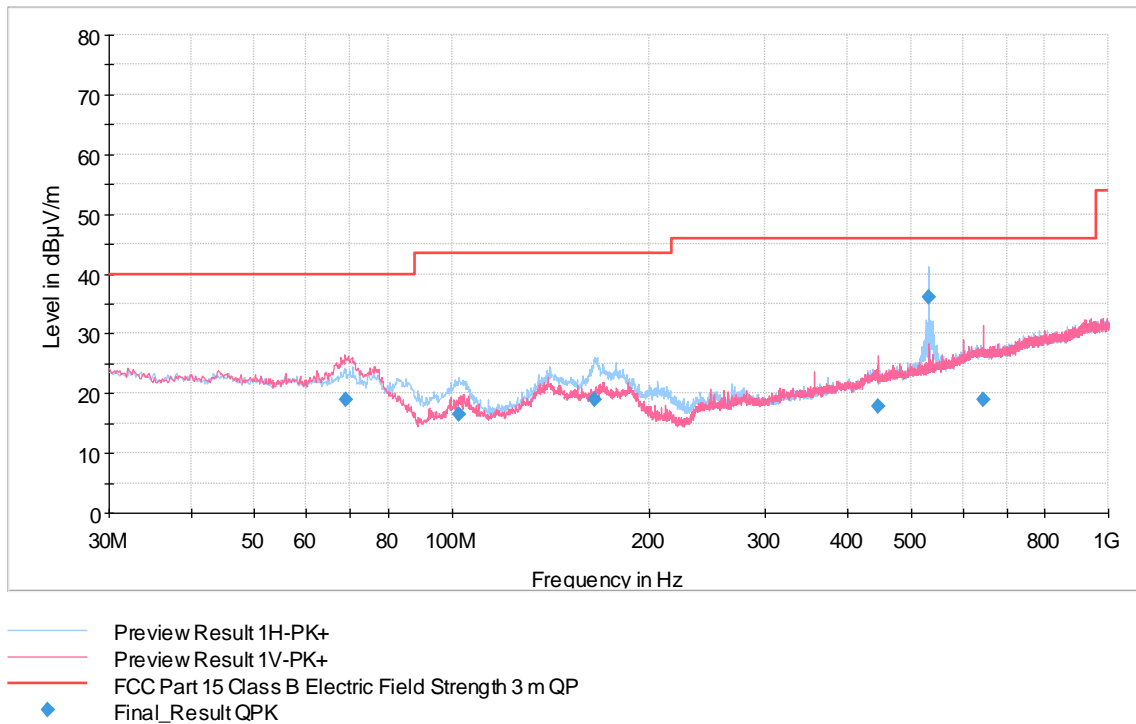
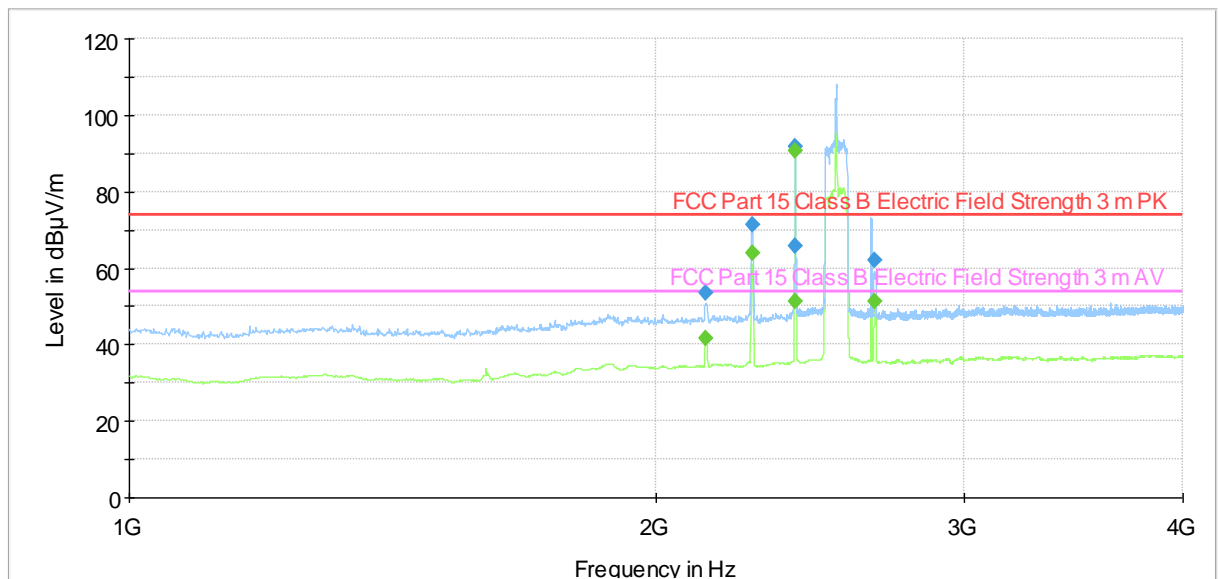


Figure 4. Measured curve with peak detector (Mid channel).

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

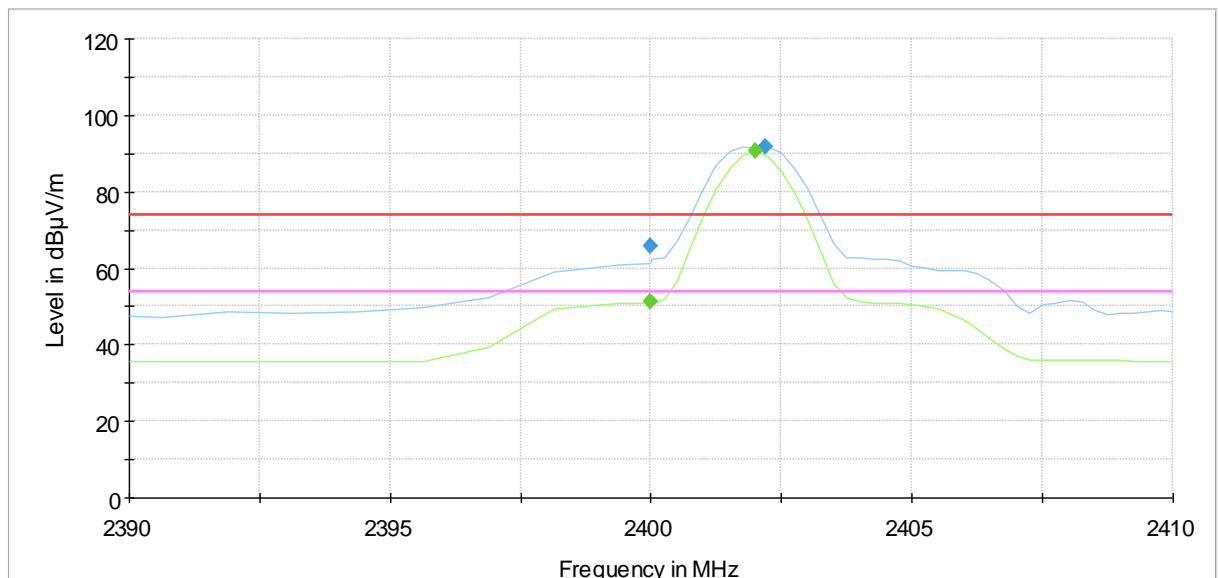
Full Spectrum



- Preview Result 2-AVG
- Preview Result 1-PK+
- FCC Part 15 Class B Electric Field Strength 3 m PK
- FCC Part 15 Class B Electric Field Strength 3 m AV
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Figure 5. Measured curve with peak and average detectors (Low channel).

Full Spectrum

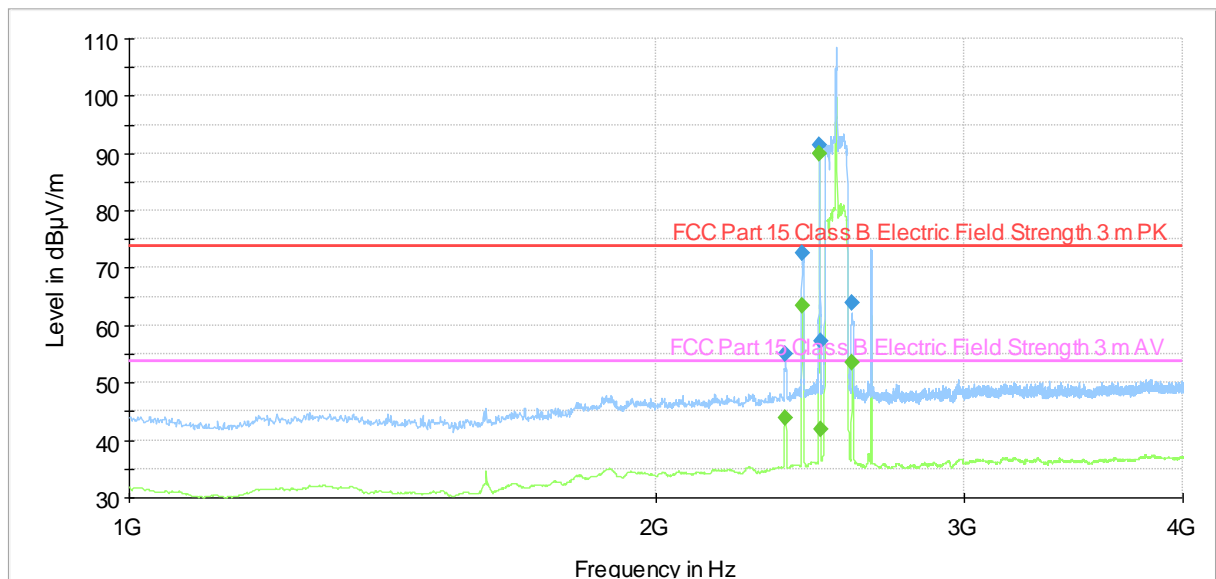


- Preview Result 2-AVG
- Preview Result 1-PK+
- FCC Part 15 Class B Electric Field Strength 3 m PK
- FCC Part 15 Class B Electric Field Strength 3 m AV
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Figure 6. Measured curve with peak and average detectors (Low channel).

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

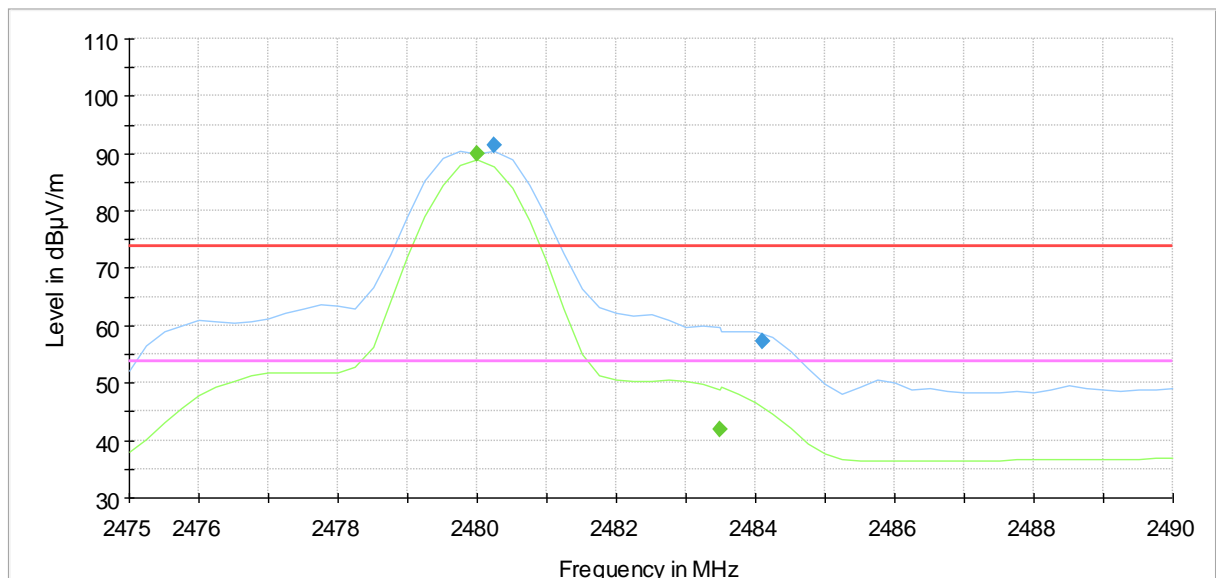
Full Spectrum



- Preview Result 2-AVG
- Preview Result 1-PK+
- FCC Part 15 Class B Electric Field Strength 3 m PK
- FCC Part 15 Class B Electric Field Strength 3 m AV
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Figure 7. Measured curve with peak and average detectors (High channel).

Full Spectrum



- Preview Result 2-AVG
- Preview Result 1-PK+
- FCC Part 15 Class B Electric Field Strength 3 m PK
- FCC Part 15 Class B Electric Field Strength 3 m AV
- ◆ Final_Result PK+
- ◆ Final_Result CAV

Figure 8. Measured curve with peak and average detectors (High channel).

Transmitter Radiated Emissions 0.009 MHz to 26.5 GHz

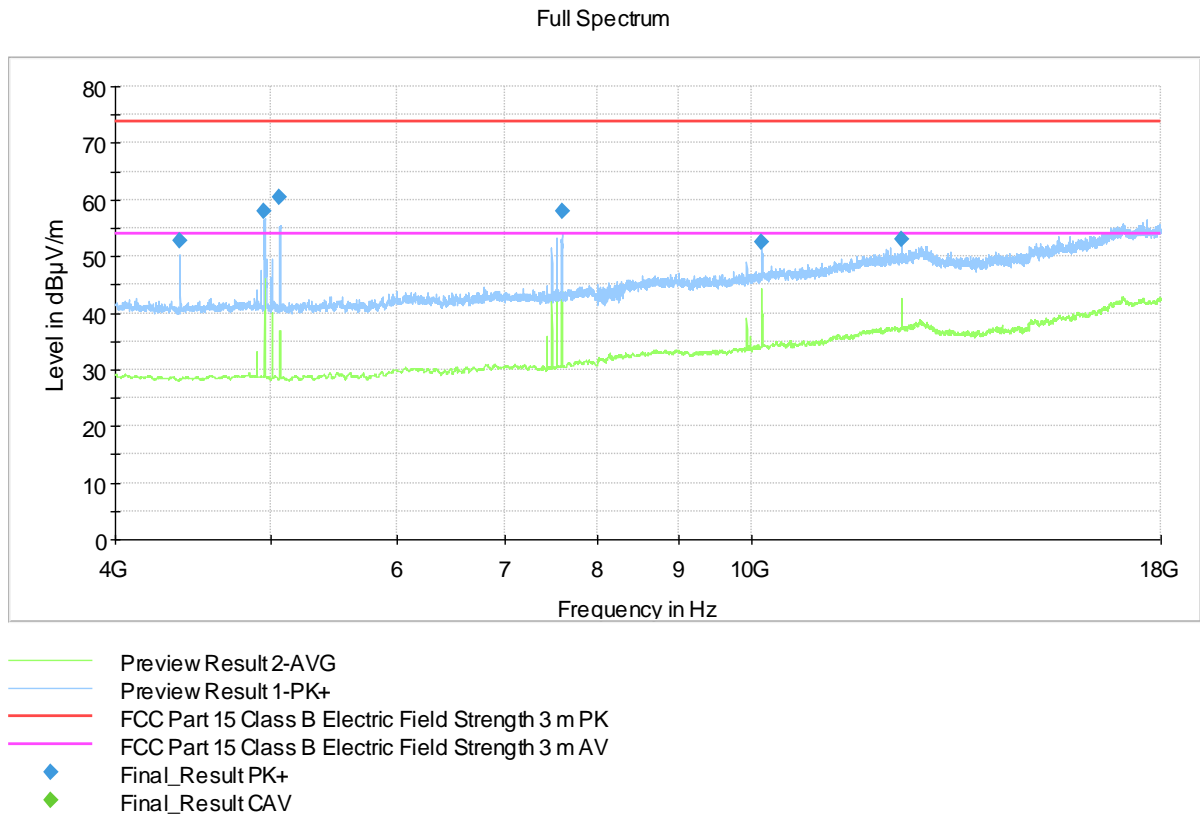


Figure 9. Measured curve with peak and average detectors (High channel).

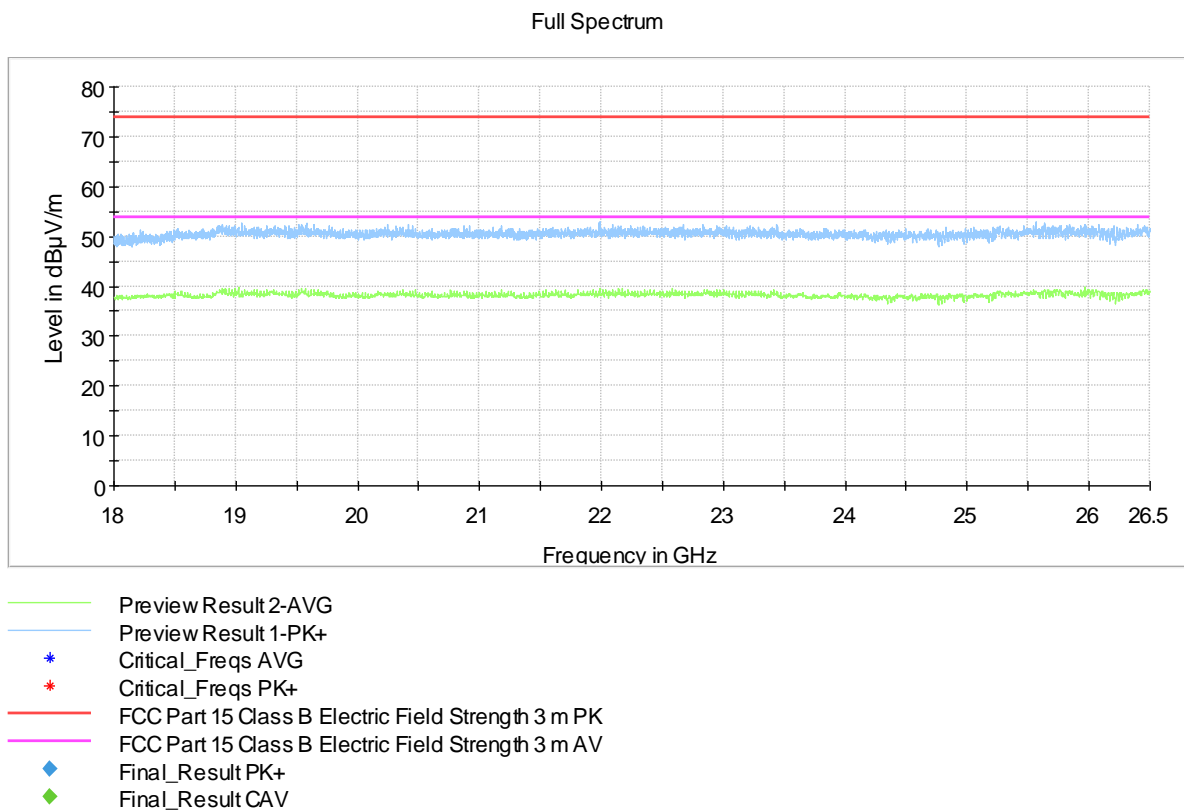


Figure 10. Measured curve with peak and average detectors (High channel).

99% Occupied Bandwidth, 20 dB Bandwidth

Standard: RSS-GEN (2019) ANSI C63.10 (2013)
Tested by: PKA
Date: 10 December 2020
Temperature: 22 ± 3 °C
Humidity: 30 - 60 % RH

RSS-GEN 6.6
FCC Rule: 15.249

Results:

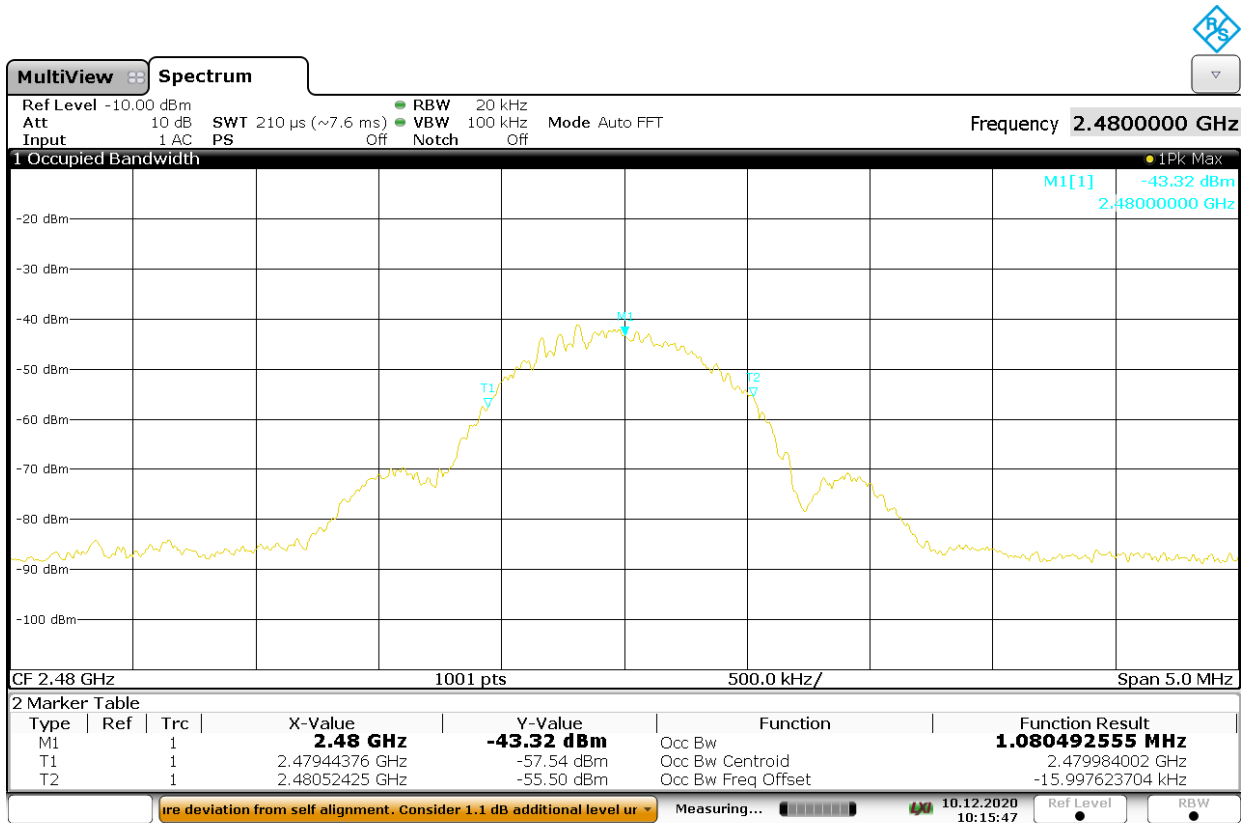
99 % OBW test results.

Channel	Limit	99 % BW [MHz]	Result
Low	-	1.089864091	PASS
Mid	-	1.088486913	PASS
High	-	1.080492555	PASS

20 dB BW test results.

Channel	Limit	20 dB BW [MHz]	Result
Low	-	1.22	PASS
Mid	-	1.24	PASS
High	-	1.21	PASS

99% Occupied Bandwidth



10:15:47 10.12.2020

Figure 11. 99 % OBW. High channel.



10:29:48 10.12.2020

Figure 12. 20 dB BW. Low channel.

Duty cycle correction factor, Transmit time in 100 ms

Spectrum analyzer with zero span was used to investigate spectrum.

15.35(c) Unless otherwise specified, e.g. § 15.255(b), when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

18 pulses / 30 s => maximum 1 pulse / 100ms

Length of one pulse = 0.2370 ms

DutyCycleCorrectionFactor = $20 \cdot \log(T_{occ}/100) = 20 \cdot \log(1 \cdot 0.2370/100) = -52.51 \text{ dB}$

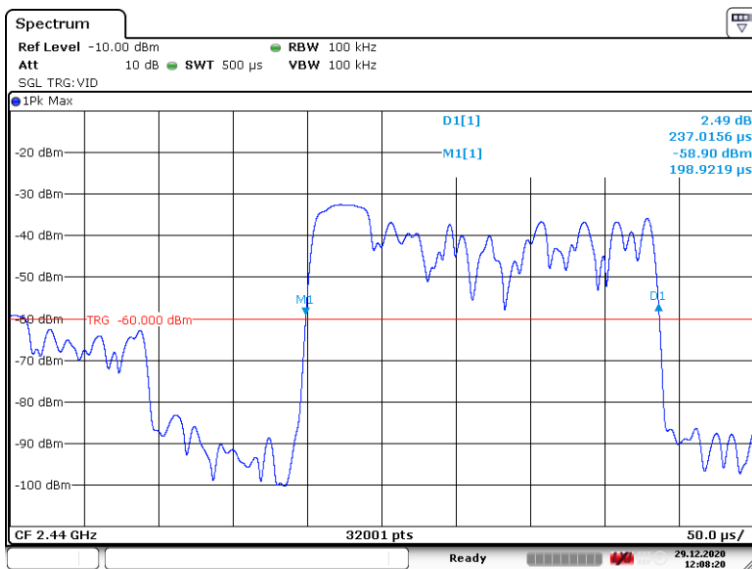


Figure 13. Pulse length

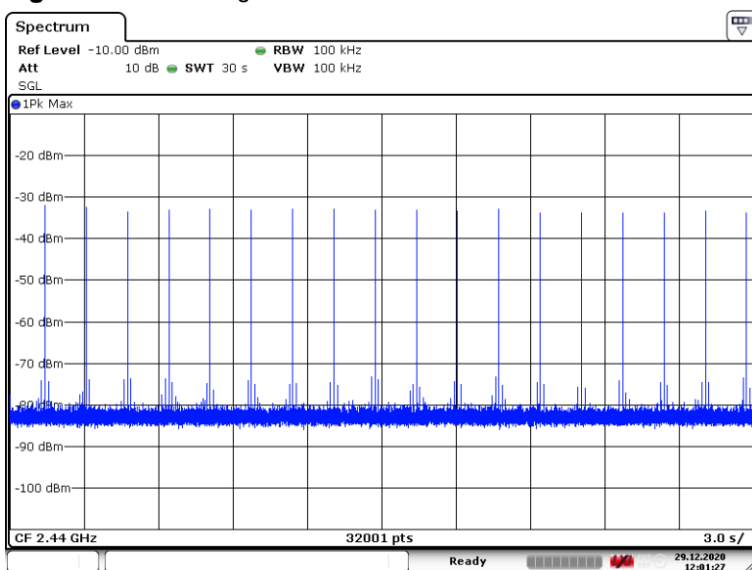


Figure 14. 30 s sweep at 2440 MHz

LIST OF TEST EQUIPMENT

Equipment	Manufacturer	Type	Inv or serial	Prev Calib	Next Calib
TURNTABLE	MATURO	DS430 UPGRADED	inv:10182	NCR	-
MAST & TURNTABLE CONTROLLER	MATURO	NCD	inv:10183	NCR	-
ANTENNA MAST	MATURO	TAM 4.0E	inv:10181	NCR	-
ATTENUATOR	PASTERNAK	PE 7004-4	inv:10126	2019-04-01	2021-04-01
TEST SOFTWARE	ROHDE & SCHWARZ	EMC-32	-	NCR	-
EMI TEST RECEIVER	ROHDE & SCHWARZ	ESW26	inv:10679	2020-07-20	2021-07-20
ANTENNA	SCHWARZBECK	VULB 9168	inv:8911	2020-11-04	2022-11-04
RF PREAMPLIFIER	CIAO	CA118-3123	inv:10278	2020-10-09	2021-10-09
RF PREAMPLIFIER	CIAO	CA1840-5019	inv:10593	2020-10-09	2021-10-09
ATTENUATOR	PASTERNAK	10 dB, DC-40 GHz	sn:A1	2019-04-01	2021-04-01
BAND REJECT FILTER	WAINWRIGHT	WRCGV16-2490-2500-2580-50SS	inv:11629	2020-12-07	2022-12-07
FILTER	WAINWRIGHT	HP, WHKX4.0/18G-10SS	inv:10403	2019-04-01	2021-04-01
ANTENNA	EMCO	3117, emi 1-18GHz	inv:7293	2020-03-11	2022-03-11
ANTENNA	EMCO	3160-09, emi 18-26.5GHz	inv:7294	2020-02-20	2021-02-20
ANTENNA	ROHDE & SCHWARZ	HFH2-Z2 , 335.4711.52	inv:8013	2020-10-28	2022-10-28
LISN	ROHDE & SCHWARZ	ENV216	inv:9611	2020-03-03	2021-03-03

NCR = No calibration required

END OF REPORT