

JAPAN MIC Radio Test Report

FOR

Applicant: Medical Measurement Systems B.V.
Colosseum 25, 7521 PV, Enschede, Netherlands

Product Name: Ambulatory impedance, PH and/or pressure diagnostic device

Brand Name: Ohmega

Model No.: G2-5, G2-1, G2-2, G2-3, G2-4

Model Difference: For the detailed, please refer to section 1.1 in this report.

Report Number: ER/2020/20049

Issue Date: Dec. 29, 2020

Date of Test: Aug. 03, 2020 ~ Aug. 21, 2020, Dec. 28, 2020

Date of EUT Received: Feb. 18, 2020

Place of Testing No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803

Test Result PASS

Classification of Specified Radio Equipment Article 2 Clause 1 Item 19

We hereby declare that:

The data presented with this application to be true and correct; and That our testing equipment is regularly serviced and properly calibrated; and We agree to maintain records of data for a minimum of ten (10) years in our laboratory for immediate presentation upon request by SGS Japan Inc..

Measurement was conducted by the following test method:

the test method of Ordinance Concerning Technical Regulations
Conformity Certification etc. of Specified Radio Equipment in Annex 1, the Ministry of Internal Affairs and Communication notification in Annex 43 of Article 88, Paragraph 1 or the test method more than equivalent.

Approved By: _____



Jim Chang / Manager

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Revision History

Report Number	Revision	Description	Issue Date	Remark
ER/2020/20049	Rev.00	Original.	Dec. 29, 2020	Revised By: Karen Huang

Note:**1. Multiple Model numbers or Trademarks**

The variant model numbers are assessed as identical in RF parameters to each other, the HW version difference does not affect compliance, hence all variants are fully covered by the test results in this test report without further verification test.

2. Disclaimer

Antenna information and Variant information among model numbers are provided by the applicant, the test results of this report are applicable to the sample EUT received.

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1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

1.1 General information

Product Name:	Ambulatory impedance, PH and/or pressure diagnostic device
Brand Name:	Ohmega
Model No.:	G2-5, G2-1, G2-2, G2-3, G2-4
Product HW version:	N/A
Product SW version:	N/A
Power Supply:	1.5Vdc from battery

Type, frequency of
transmittable radio wave and
rated output

Bluetooth GFSK include AFH	F1D 2441MHz 0.000263 ~ 0.00102W/MHz
Bluetooth $\pi/4$ -DQPSK include AFH	G1D 2441MHz 0.000081 ~ 0.000313W/MHz
Bluetooth 8DPSK include AFH	G1D 2441MHz 0.000059 ~ 0.000227W/MHz

Model Difference:

- Internal Component: While the PCB layout is similar, based on the model, the number of channels used for each integrated circuit (IC) will be different. The same IC is used, but the number of channels for the ICs used will be different or not used at all.
- Based on the model, the device has different channels / capabilities:

G2-1:

- 4 pH channels Antimony or 2 pH channels Glass, RJ-45
- 2 pH channels ISFET, RJ-11
- 1 LES locator pressure channel, Lemo-4
- USB cable and Bluetooth dongle for PC
- Blue leather carrying bag

G2-2:

- 4 pH channels Antimony or 2 pH channels Glass, RJ-45
- 2 pH channels ISFET, RJ-11
- 7 Impedance channels (8 rings), RJ-45
- 4 Pressure channels, 2x Lemo-6. One channel can be used as LES locator
- USB cable and Bluetooth dongle for PC
- Blue leather carrying bag

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G2-3:

- 4 pH channels Antimony or 2 pH channels Glass, RJ-45
- 2 pH channels ISGET, RJ-11
- 1 LES locator pressure channel, Lemo-4
- Connector for 12 impedance channels (13 rings), RJ-45
- USB cable and Bluetooth dongle for PC
- Blue leather carrying bag

G2-4:

- 4 pH channels Antimony or 2 pH channels Glass, RJ-45
- 12 Impedance channels (13 rings), RJ-45
- 4 Pressure channels, 2x Lemo-6. One channel can be used as LES locator
- USB cable and Bluetooth dongle for PC
- Blue leather carrying bag

G2-5:

- 4 pH channels Antimony or 2 pH channels Glass, RJ-45
- 2 pH channels ISFET, RJ-11
- 12 Impedance channels (13 rings), RJ-45
- 2 Pressure channels, 1x Lemo-6. One channel can be used as LES locator
- USB cable and Bluetooth dongle for PC
- Blue leather carrying bag

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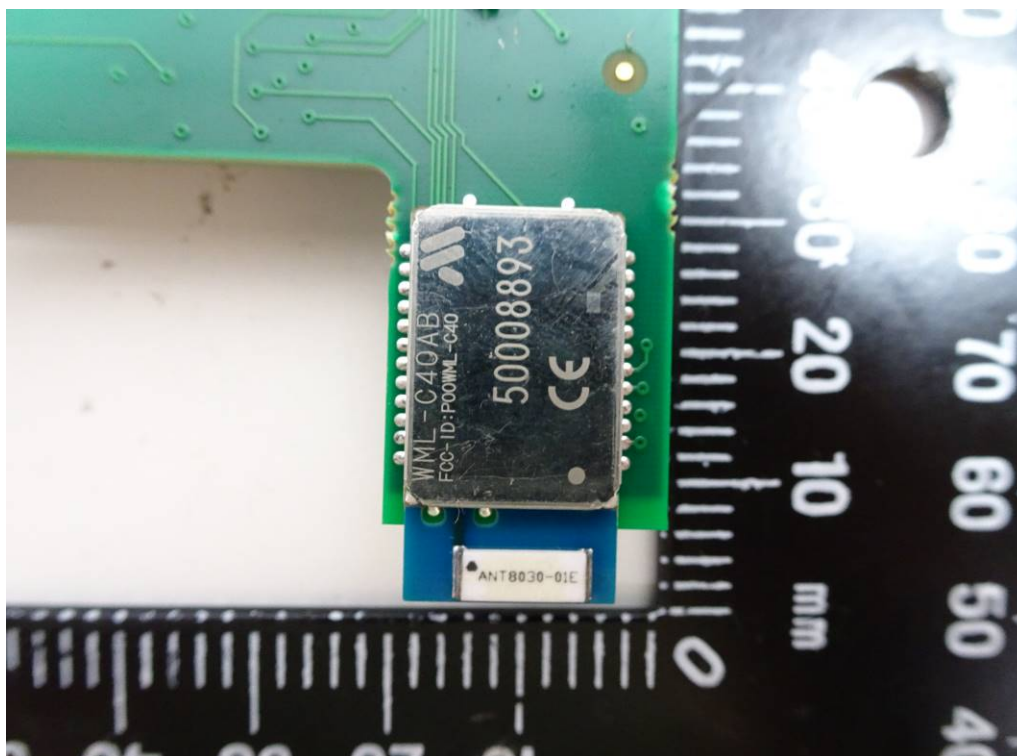
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1.2 Antenna Designation

Antenna Type	Part Number	Supplier	Polarization (H or V)	Peak Gain (dBi)
Chip	N/A	N/A	H+V	2

1.3 Assemble

The shielding is directly soldered to the PCB board. The inner shielding is shown in the illustration below



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2 DESCRIPTION OF TEST

2.1 Test Conditions

				Limit	Result	Note	
Environment of Test Room	Temperature	°C	23.6		$5 \leq x \leq 35$	PASS	
	Humidity	%	62		$45 \leq x \leq 85$	PASS	
Peak Antenna Gain		dBi	2		-----	-----	
Number of hopping channel		-----	79	20	-----	-----	
Rated output		mW/MHz	0.26300	1.02000	≤ 3 mW/MHz	PASS	
Rated output		dBm/MHz	-5.80	0.09	≤ 4.77 dBm/MHz	PASS	
E.I.R.P.		dBm/MHz	-3.80	2.09	≤ 6.91 dBm/MHz	PASS	
Tested Circuit Insertion Loss		dB	0.50	0.50	-----	-----	
Input Voltage		VDC	1.50		-----	-----	
Packet Type (Mode)		-----	DH5		-----	-----	
Frequency equal to the transmission rate of the modulation signal		MHz	1		-----	-----	
Test Category		2.4GHz Band Wideband Low-Power Data Communication System (Bluetooth GFSK include AFH)					
The reason why test are performed only rated voltage							
When the input voltage to receiver RF circuit varies below ± 1% as the input voltage from the external power supply to the receiver varies ± 10% (excluding power supply).							

				Limit	Result	Note	
Environment of Test Room	Temperature	°C	23.6		$5 \leq x \leq 35$	PASS	
	Humidity	%	62		$45 \leq x \leq 85$	PASS	
Peak Antenna Gain		dBi	2		-----	-----	
Number of hopping channel		-----	79	20	-----	-----	
Rated output		mW/MHz	0.08100	0.31300	≤ 3 mW/MHz	PASS	
Rated output		dBm/MHz	-10.92	-5.04	≤ 4.77 dBm/MHz	PASS	
E.I.R.P.		dBm/MHz	-8.92	-3.04	≤ 6.91 dBm/MHz	PASS	
Tested Circuit Insertion Loss		dB	0.50	0.50	-----	-----	
Input Voltage		VDC	1.50		-----	-----	
Packet Type (Mode)		-----	2DH5		-----	-----	
Frequency equal to the transmission rate of the modulation signal		MHz	1		-----	-----	
Test Category		2.4GHz Band Wideband Low-Power Data Communication System (Bluetooth $\pi/4$ -DQPSK include AFH)					
The reason why test are performed only rated voltage							
When the input voltage to receiver RF circuit varies below $\pm 1\%$ as the input voltage from the external power supply to the receiver varies $\pm 10\%$ (excluding power supply).							

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				Limit	Result	Note	
Environment of Test Room	Temperature	°C	23.6		$5 \leq x \leq 35$	PASS	
	Humidity	%	62		$45 \leq x \leq 85$	PASS	
Peak Antenna Gain		dBi	2		-----	-----	
Number of hopping channel		-----	79	20	-----	-----	
Rated output		mW/MHz	0.05900	0.22700	≤ 3 mW/MHz	PASS	
Rated output		dBm/MHz	-12.29	-6.44	≤ 4.77 dBm/MHz	PASS	
E.I.R.P.		dBm/MHz	-10.29	-4.44	≤ 6.91 dBm/MHz	PASS	
Tested Circuit Insertion Loss		dB	0.50	0.50	-----	-----	
Input Voltage		VDC	1.50		-----	-----	
Packet Type (Mode)		-----	3DH5		-----	-----	
Frequency equal to the transmission rate of the modulation signal		MHz	1		-----	-----	
Test Category		2.4GHz Band Wideband Low-Power Data Communication System (Bluetooth 8DPSK include AFH)					
The reason why test are performed only rated voltage							
When the input voltage to receiver RF circuit varies below ± 1% as the input voltage from the external power supply to the receiver varies ± 10% (excluding power supply).							

2.2 VOLTAGE VARIATION

Voltage Fluctuation Test	Normal Voltage	High Voltage + 10% of Normal Voltage	Low Voltage - 10% of Normal Voltage
Input DC Power	1.5	1.65	1.35
Output DC Power	3.29	3.31	3.28
Voltage Variation (%)	0	0.60	-0.30
Note: Voltage Variation (%) = (Output High or Low Voltage - Output Normal Voltage)/Output Normal Voltage X 100			
During the input supply voltage to the EUT from the external power source is varied by +/- 10%, if output voltage had been confirmed that the fluctuation of power supply to the RF circuit of EUT (excluding power source) is equal to or less than +/- 1%. Exempt extremely high and low supply voltage condition tests, EUT only operated in normal voltage to test all regulations.			

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3 ABOUT UNCERTAINTY OF MEASURED VALUE

*In this test, the influence of an error or uncertainty may be done according to the following factors.

Bias of a measurement equipment, Change by aging, Attrition, Noise

- Skill and capability of an inspector
- Environment (Temperature, Humidity)
- Dispersion in a EUT (Equipment Under Test)
- Uncertainty of calibration of a measurement equipment

Therefore, Synthetic uncertainty is calculated using "k=2" of coverage factor, and about 95% of confidence level shall be obtained.

In consideration of the above, it judged as follows.

JUDGE	Measured value and Standard limit value	
PASS	Case1	Standard limit value +uncertainty -uncertainty Measured value *Even if it takes uncertainty into consideration, a standard limit value is fulfilled.
	Case2	*Although measured value is in a standard limit value, a limit value won't be fulfilled if uncertainty is taken into consideration.
FAIL	Case3	*Although measured value exceeds a standard limit value, a limit value will be fulfilled if uncertainty is taken into consideration.
	Case4	*Even if it takes uncertainty into consideration, a standard limit value isn't fulfilled.

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4 MEASUREMENT EQUIPMENT LIST

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Calibration Authority	Cal. Method
Power Meter	Anritsu	ML2496A	1242004	11/05/2019	ETC	c)
Power Sensor	Anritsu	MA2411B	1207365	11/05/2019	ETC	c)
Power Sensor	Anritsu	MA2411B	1207368	11/05/2019	ETC	c)
PXA Spectrum Analyzer	Agilent	N9030A	MY53120760	04/21/2020	ETC	c)
DC Block	Mini-Circuits	BLK-18-S+	1	01/02/2020	SGS	c)
Attenuator	Mini-Circuit	BW-S10W2+	2	01/02/2020	SGS	c)
DC Power Supply	Agilent	E3640A	MY40000811	12/23/2019	SGS	c)

Note: The measurement was taken place with the long duration of the time, and additional equipment list as shown blow indicate those equipment of which has been subject to undertake the calibration in intermediate period of time of the measurement.

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	Calibration Authority	Cal. Method
Power Meter	Anritsu	ML2496A	1242004	11/06/2020	ETC	c)
Power Sensor	Anritsu	MA2411B	1207365	11/06/2020	ETC	c)
Power Sensor	Anritsu	MA2411B	1207368	11/06/2020	ETC	c)
DC Power Supply	Agilent	E3640A	MY40005907	10/29/2020	SGS	c)

Note 1: The validity of measurement equipment is one year from the first day of the following month of the calibration date.

(e.g. If the calibration date is December 15th, 2014, measurement equipment can be used from December 15th, 2014 to December 31st, 2015.)

Note 2: Calibration Method

- a): Calibration conducted by the National Institute of Information and Communications Technology(NICT)(hereinafter referred to as "NICT") or a designated calibration agency under Article 102-18 paragraph (1)
- b): Correction conducted pursuant to the provisions of Article 135 or Article 144 of the Measurement Law (Law No. 51 of 1992)
- c) : Calibration conducted in foreign countries, which shall be equivalent to the calibration conducted by the NICT or a designated calibration agency under Article 102-18 paragraph (1)
- d) : Calibration conducted by using measuring instruments and other equipment listed in the right column of Table No. 3 attached hereto, which shall have been given any of calibration, etc. listed above from a) to c)

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5 TEST RESULTS

Measurement Frequency		MHz	2402	2441		2480	Limit	Result	Note
Channel Number		Ch.	0	39		78	----	----	
Number of hopping channel		----	-	79	20	-	----	----	
Reading Frequency		MHz	2401.999	2440.99794		2479.997	----	----	
Frequency Tolerance		ppm	-0.56203	-0.84392		-1.02016	-50≤x≤+50	PASS	
Occupied Bandwidth		MHz	-	78.1	19.575	-	≤83.5 MHz	PASS	
Spread Bandwidth		MHz	-	70.15	18.095	-	≥0.5 MHz	PASS	
Transmission Output Power	Calculated result	mW/MHz	-	0.26301	1.01963	-	≤3 mW/MHz	----	
	Tolerance	%	-	0.00	-0.04	-	-80≤x≤+20	PASS	
	Measured value	dBm	-	12.660		-	----	----	
	On Time	msec	-	2.916		-	≤400 msec	PASS	
	Off Time	msec	-	0.840		-	----	----	
	Burst Ratio	%	-	77.6		-	----	----	
Unwanted Emission Strength	2387MHz Under	μW/MHz	-	0.049659		-	≤2.5uW/MHz	PASS	
		MHz	-	1723.5		-	----	----	
	2387-2400MHz	μW/MHz	-	1.963360		-	≤25uW/MHz	PASS	
		MHz	-	2399.94		-	----	----	
	2483.5-2496.5MHz	μW/MHz	-	0.155597		-	≤25uW/MHz	PASS	
		MHz	-	2483.64		-	----	----	
	2496.5MHz Over	μW/MHz	-	0.116950		-	≤2.5uW/MHz	PASS	
		MHz	-	4831.07		-	----	----	
Secondarily Emitted Radio Wave Strength (RX Spurious)	1GHz Under	nW	-	0.017498		-	≤4 nW	PASS	
		MHz	-	777.51		-	----	----	
	1GHz Over	nW	-	0.353183		-	≤20 nW	PASS	
		MHz	-	4607.5		-	----	----	
	Tested Circuit Insertion Loss for RX Spurious								1
Spread Factor		----	-	70.2	18.10	-	≥5	PASS	
Dwell Time		mSec	-	275.75		-	≤400 msec	PASS	
Interference Prevention Function		----	-	good		-	----	PASS	

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Measurement Frequency	MHz	2402	2441	2480	Limit	Result	Note
Channel Number	Ch.	0	39	78	-----	-----	
Number of hopping channel	-----	-	79	20	-	-----	-----
Reading Frequency	MHz	2401.998	2440.9977	2479.997	-----	-----	
Frequency Tolerance	ppm	-0.7244	-0.94224	-1.08468	$-50 \leq x \leq +50$	PASS	
Occupied Bandwidth	MHz	-	78.26	19.903	≤ 83.5 MHz	PASS	
Spread Bandwidth	MHz	-	70.585	18.239	≥ 0.5 MHz	PASS	
Transmission Output Power	Calculated result	mW/MHz	-	0.08096	0.31333	≤ 3 mW/MHz	-----
	Tolerance	%	-	-0.05	0.10	$-80 \leq x \leq +20$	PASS
	Measured value	dBm	-	7.57	-	-----	-----
	On Time	msec	-	2.929	-	≤ 400 msec	PASS
	Off Time	msec	-	0.814	-	-----	-----
	Burst Ratio	%	-	78.3	-	-----	-----
Unwanted Emission Strength	2387MHz Under	μ W/MHz	-	0.069984	-	≤ 2.5 uW/MHz	PASS
		MHz	-	1940.94	-	-----	-----
	2387-2400MHz	μ W/MHz	-	10.185914	-	≤ 25 uW/MHz	PASS
		MHz	-	2400	-	-----	-----
	2483.5-2496.5MHz	μ W/MHz	-	0.874984	-	≤ 25 uW/MHz	PASS
		MHz	-	2483.54	-	-----	-----
	2496.5MHz Over	μ W/MHz	-	0.031915	-	≤ 2.5 uW/MHz	PASS
		MHz	-	4072.05	-	-----	-----
Secondarily Emitted Radio Wave Strength (RX Spurious)	1GHz Under	nW	-	0.016368	-	≤ 4 nW	PASS
		MHz	-	777.63	-	-----	-----
	1GHz Over	nW	-	0.377572	-	≤ 20 nW	PASS
		MHz	-	4040.5	-	-----	-----
	Tested Circuit Insertion Loss for RX Spurious						1
Spread Factor	-----	-	70.6	18.24	-	≥ 5	PASS
Dwell Time	mSec	-	279.67	-	-	≤ 400 msec	PASS
Interference Prevention Function	-----	-	good	-	-----	PASS	

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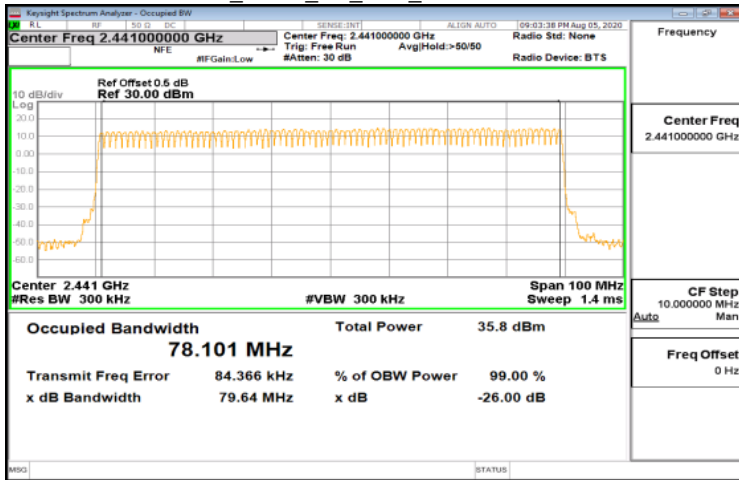
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Measurement Frequency		MHz	2402	2441		2480	Limit	Result	Note
Channel Number		Ch.	0	39		78	-----	-----	
Number of hopping channel		-----	-	79	20	-	-----	-----	
Reading Frequency		MHz	2401.998	2440.9971		2479.997	-----	-----	
Frequency Tolerance		ppm	-0.73272	-1.18804		-1.26613	-50≤x≤+50	PASS	
Occupied Bandwidth		MHz	-	78.2	19.862	-	≤83.5 MHz	PASS	
Spread Bandwidth		MHz	-	70.652	18.244	-	≥ 0.5 MHz	PASS	
Transmission Output Power	Calculated result	mW/MHz	-	0.05873	0.22745	-	≤3 mW/MHz	-----	
	Tolerance	%	-	-0.45	0.20	-	-80≤x≤+20	PASS	
	Measured value	dBm	-	6.18		-	-----	-----	
	On Time	msec	-	2.929		-	≤400 msec	PASS	
	Off Time	msec	-	0.83		-	-----	-----	
	Burst Ratio	%	-	78.0		-	-----	-----	
Unwanted Emission Strength	2387MHz Under	μW/MHz	-	0.061660		-	≤2.5uW/MHz	PASS	
		MHz	-	1946.83		-	-----	-----	
	2387-2400MHz	μW/MHz	-	17.338040		-	≤25uW/MHz	PASS	
		MHz	-	2400		-	-----	-----	
	2483.5-2496.5MHz	μW/MHz	-	0.826038		-	≤25uW/MHz	PASS	
		MHz	-	2483.56		-	-----	-----	
	2496.5MHz Over	μW/MHz	-	0.033420		-	≤2.5uW/MHz	PASS	
		MHz	-	4027.04		-	-----	-----	
Secondarily Emitted Radio Wave Strength (RX Spurious)	1GHz Under	nW	-	0.015171		-	≤ 4 nW	PASS	
		MHz	-	777.63		-	-----	-----	
	1GHz Over	nW	-	0.401791		-	≤ 20 nW	PASS	
		MHz	-	4000		-	-----	-----	
	Tested Circuit Insertion Loss for RX Spurious								1
Spread Factor		-----	-	70.7	18.24	-	≥5	PASS	
Dwell Time		mSec	-	278.97		-	≤400 msec	PASS	
Interference Prevention Function		-----	-	good		-	-----	PASS	

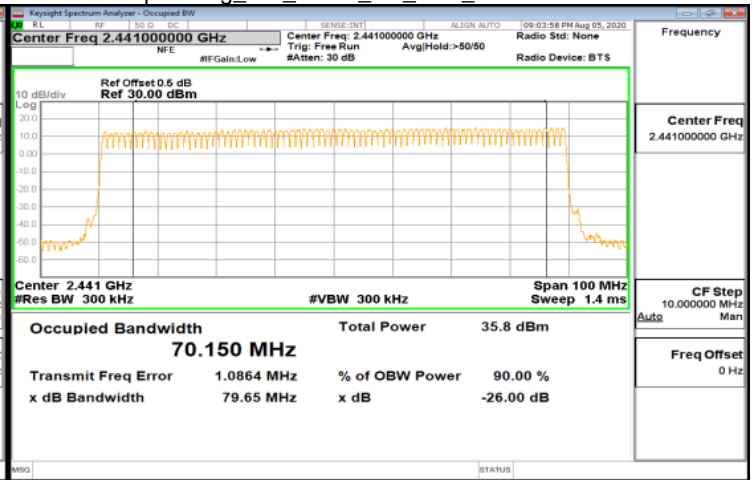
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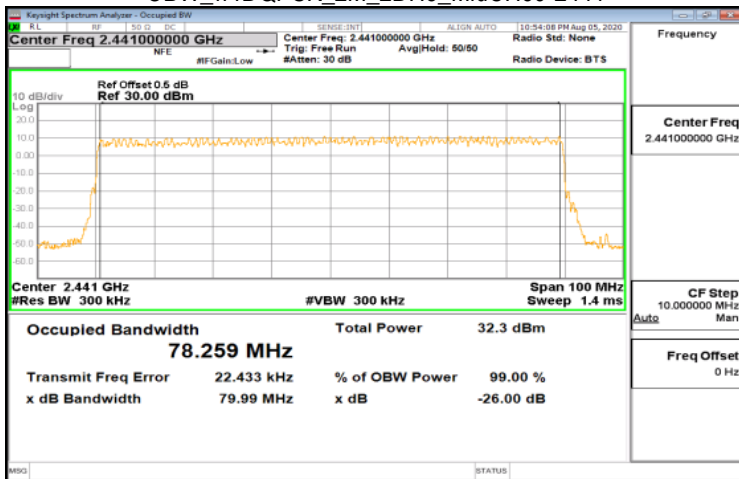
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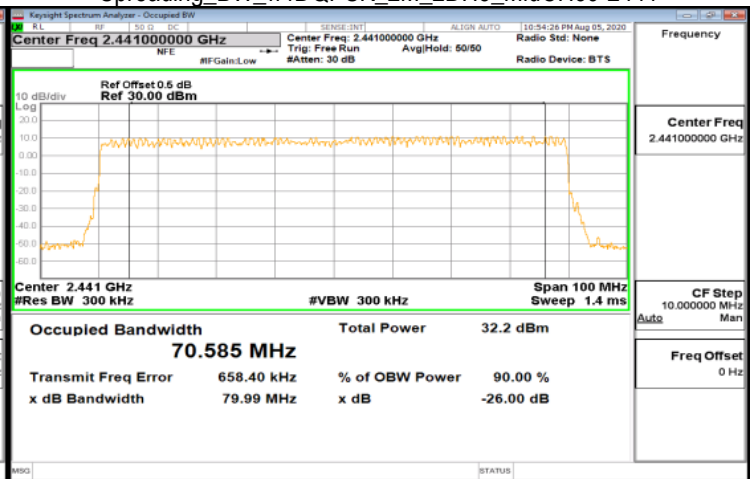
Spreading BW_GFSK_1M_DH5_MidCH39-2441



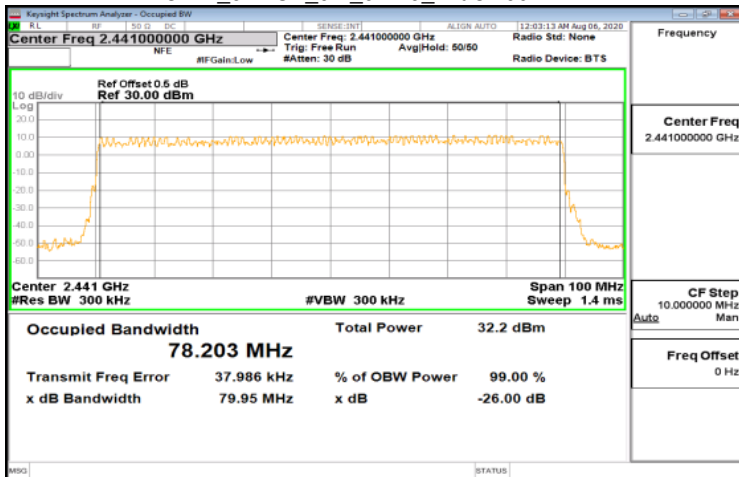
OBW_π4DQPSK_2M_2DH5_MidCH39-2441



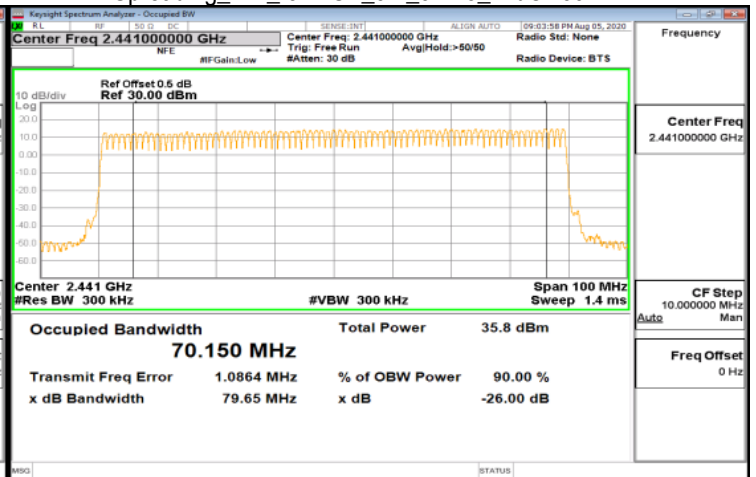
Spreading BW_π4DQPSK_2M_2DH5_MidCH39-2441



OBW_8DPSK_3M_3DH5_MidCH39-2441



Spreading BW_8DPSK_3M_3DH5_MidCH39-2441

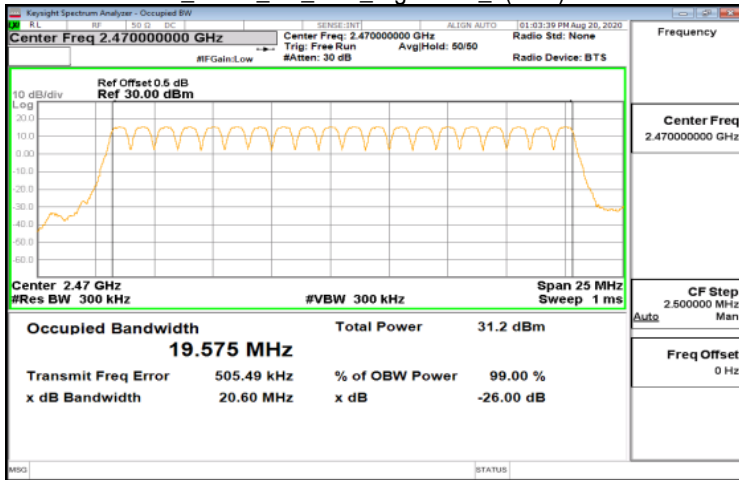


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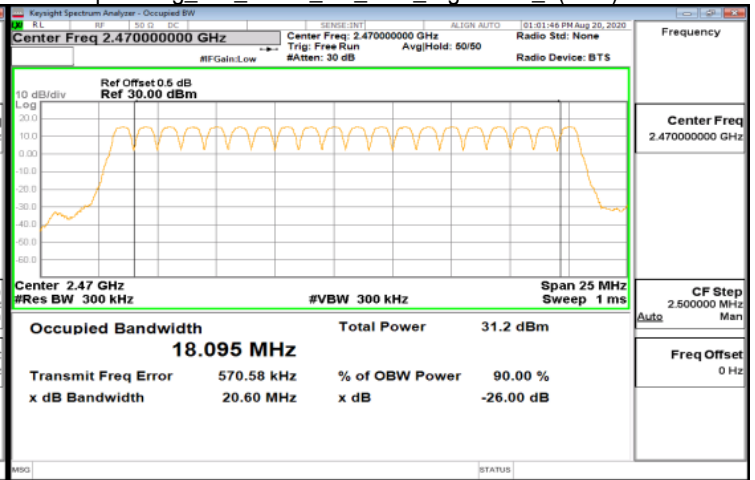
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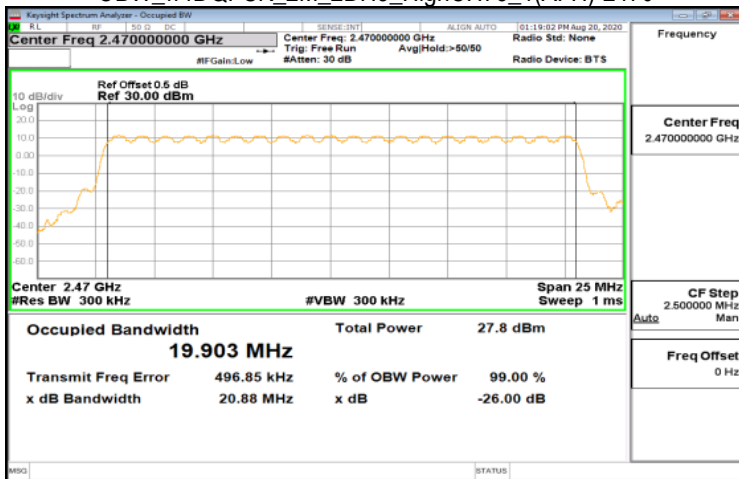
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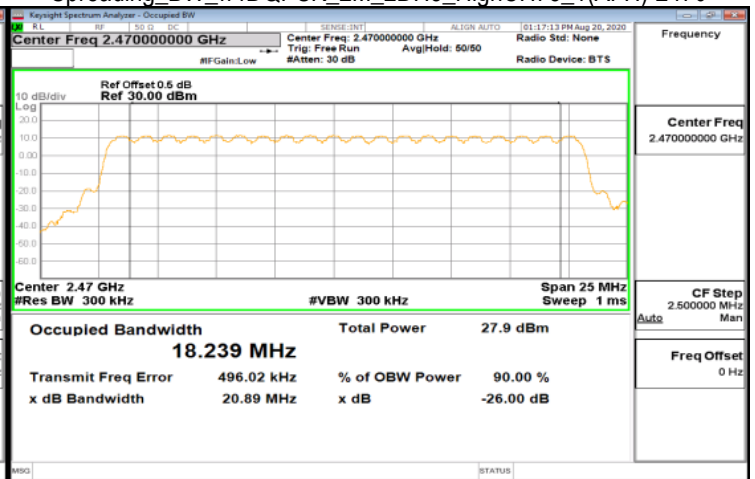
Spreading BW_GFSK_1M_DH5_HighCH78_1(AFH)-2470



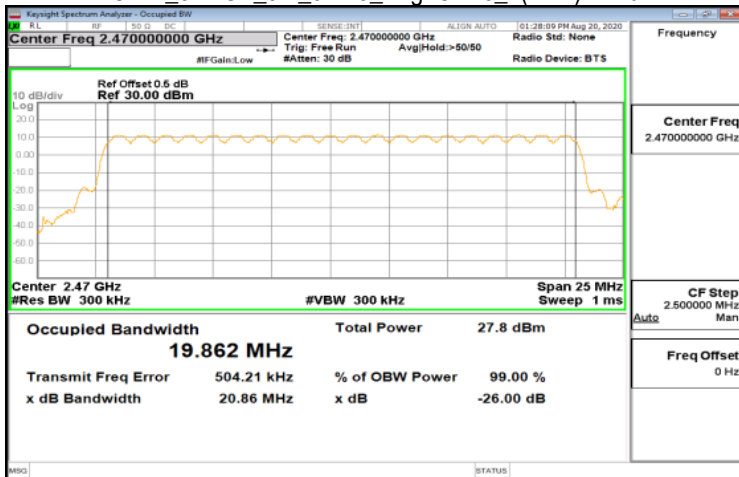
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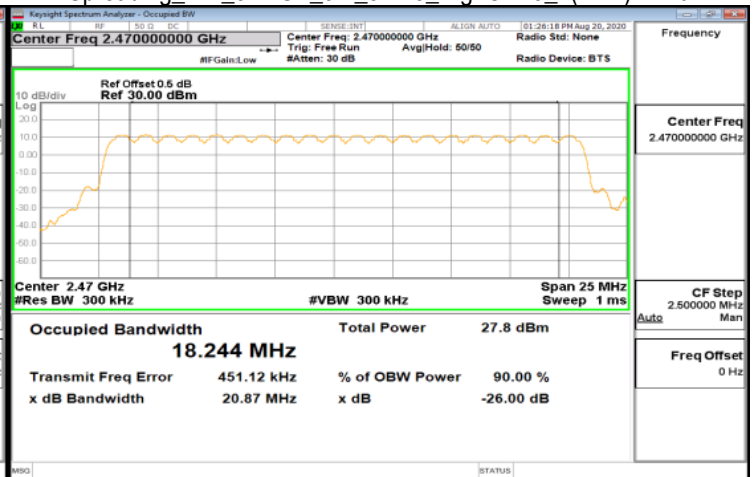
Spreading BW_π4DQPSK_2M_2DH5_HighCH78_1(AFH)-2470



OBW_8DPSK_3M_3DH5_HighCH78_1(AFH)-2470



Spreading BW_8DPSK_3M_3DH5_HighCH78_1(AFH)-2470

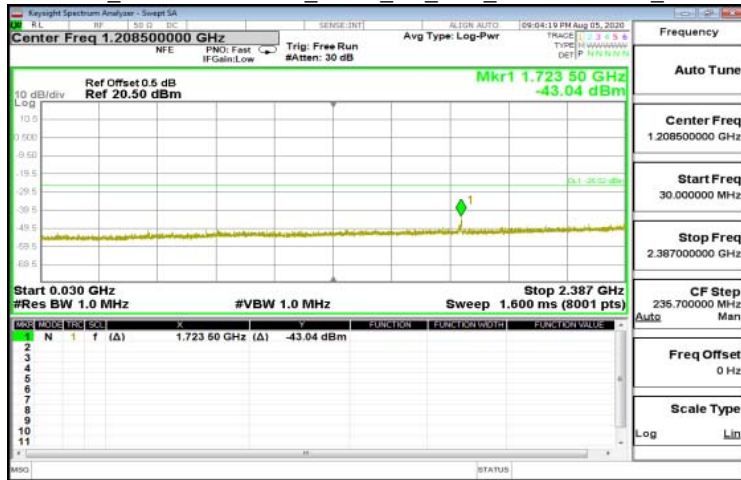


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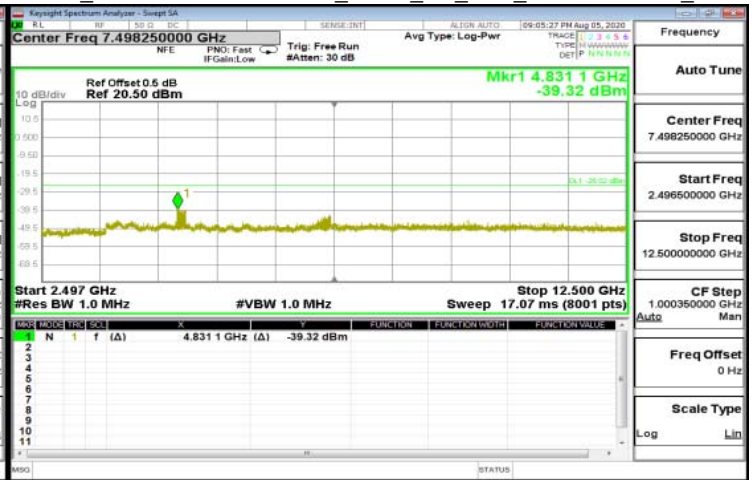
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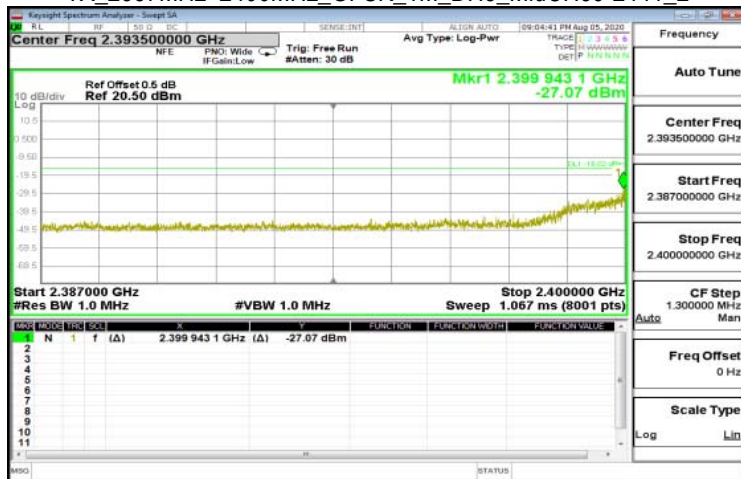
TX_30MHz~2387MHz_GFSK_1M_DH5_MidCH39-2441_1



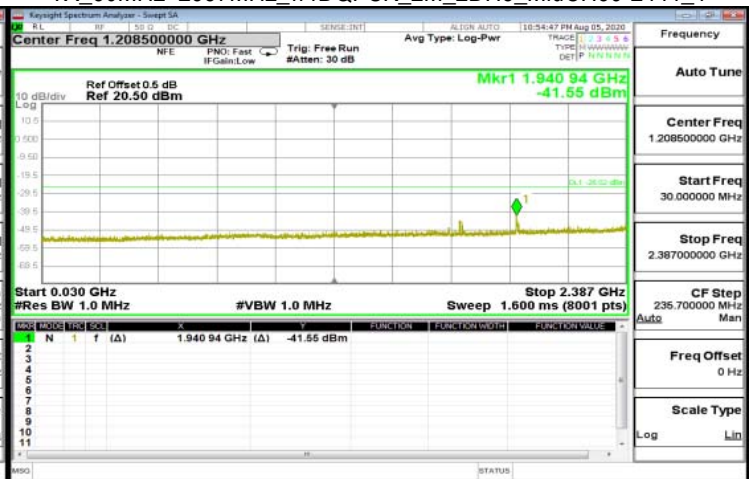
TX_2496.5MHz~12500MHz_GFSK_1M_DH5_MidCH39-2441_4



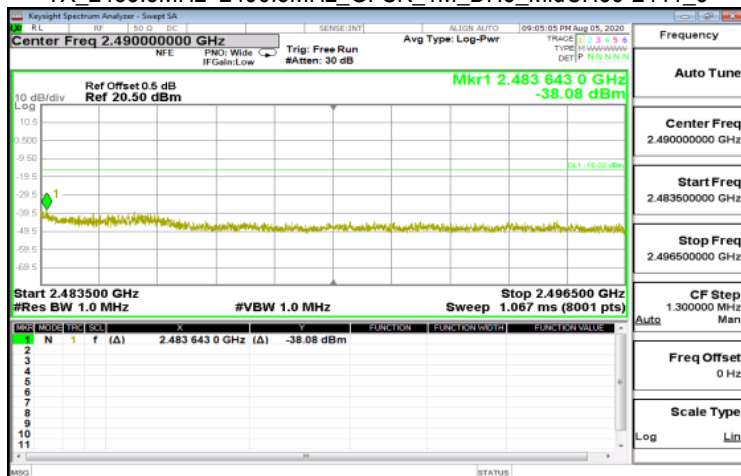
TX_2387MHz~2400MHz_GFSK_1M_DH5_MidCH39-2441_2



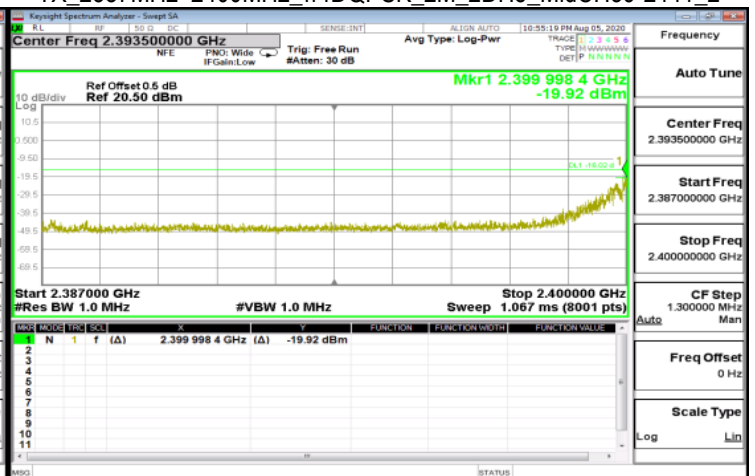
TX_30MHz~2387MHz_π4DQPSK_2M_2DH5_MidCH39-2441_1



TX_2483.5MHz~2496.5MHz_GFSK_1M_DH5_MidCH39-2441_3



TX_2387MHz~2400MHz_π4DQPSK_2M_2DH5_MidCH39-2441_2

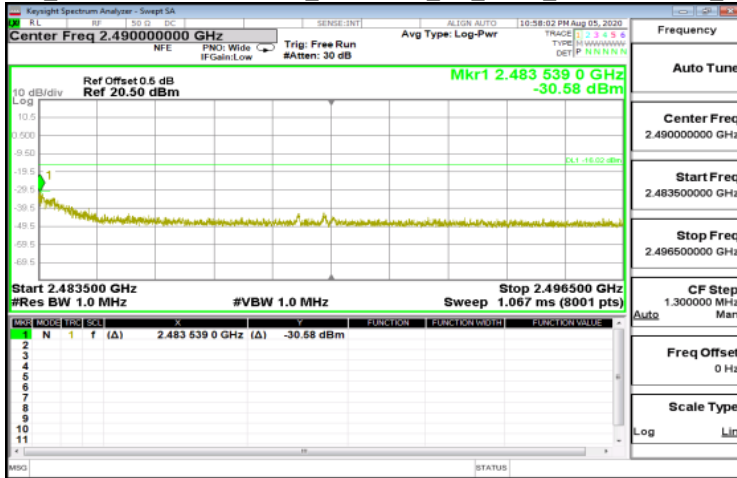


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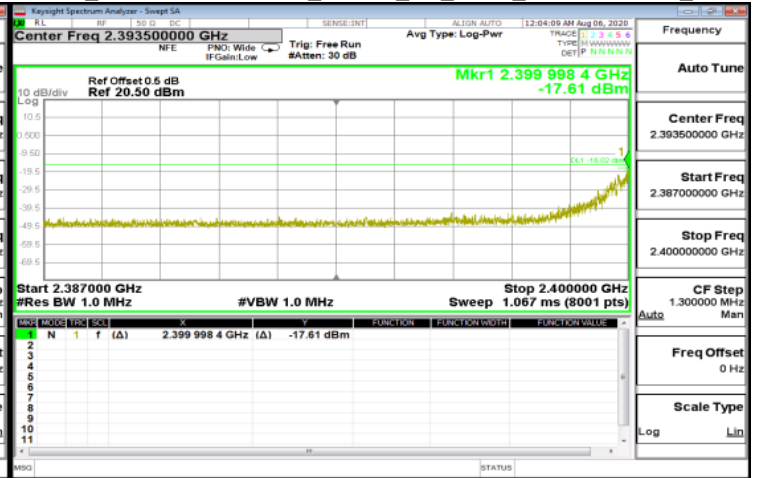
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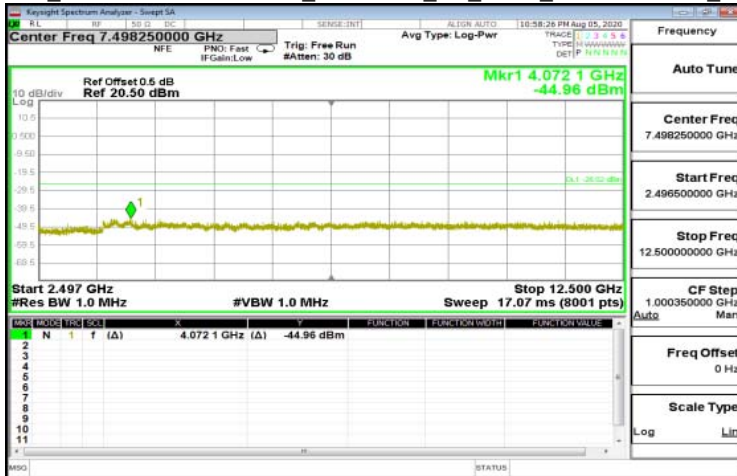
TX_2483.5MHz~2496.5MHz_π4DQPSK_2M_2DH5_MidCH39-2441_3



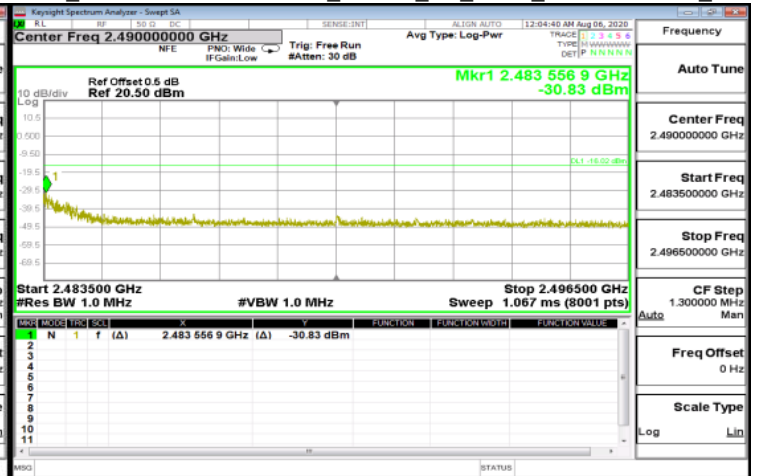
TX_2387MHz~2400MHz_8DPSK_3M_3DH5_MidCH39-2441_2



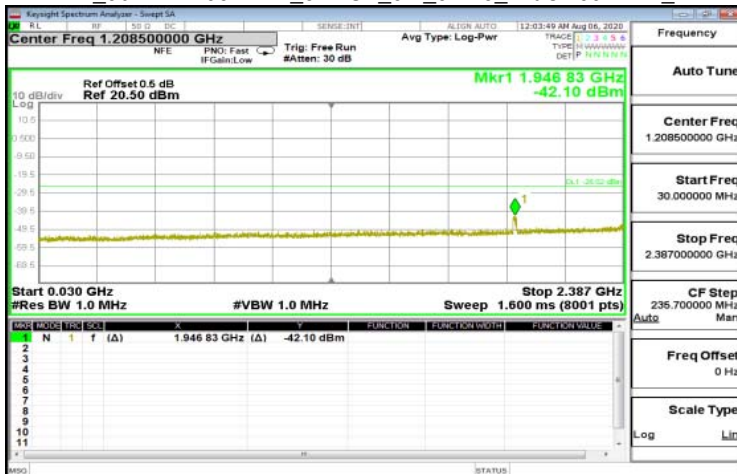
TX_2496.5MHz~12500MHz_π4DQPSK_2M_2DH5_MidCH39-2441_4



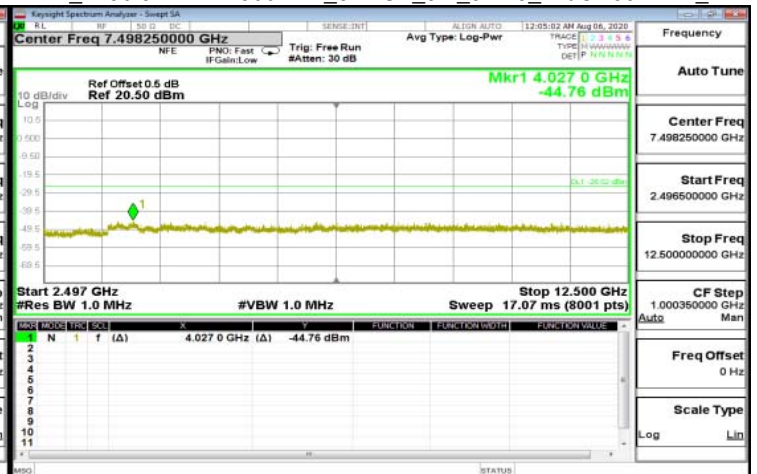
TX_2483.5MHz~2496.5MHz_8DPSK_3M_3DH5_MidCH39-2441_3



TX_30MHz~2387MHz_8DPSK_3M_3DH5_MidCH39-2441_1



TX_2496.5MHz~12500MHz_8DPSK_3M_3DH5_MidCH39-2441_4



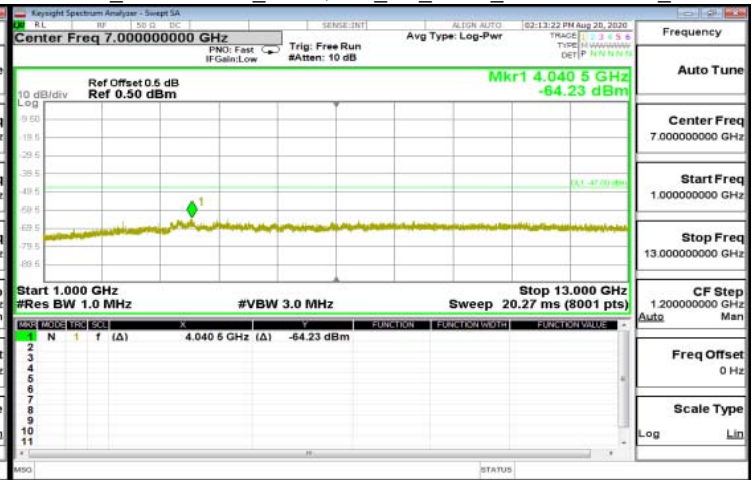
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RX_Below 1GHz_GFSK_1M_DH5_MidCH39-2441_1



RX_Above 1GHz_π4DQPSK_2M_2DH5_MidCH39-2441_2



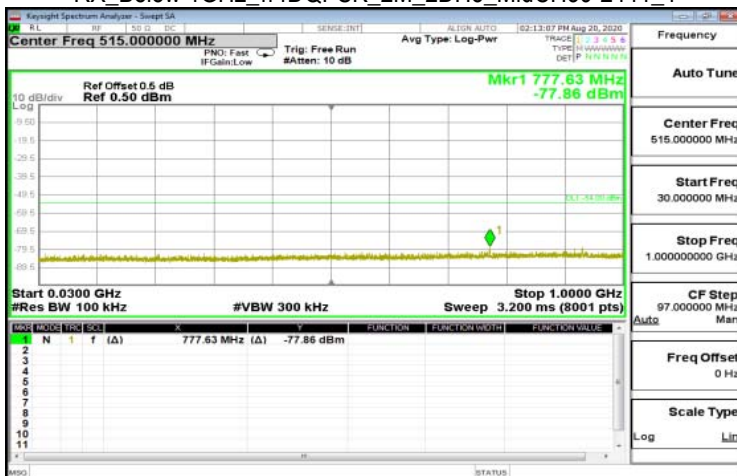
RX_Above 1GHz_GFSK_1M_DH5_MidCH39-2441_2



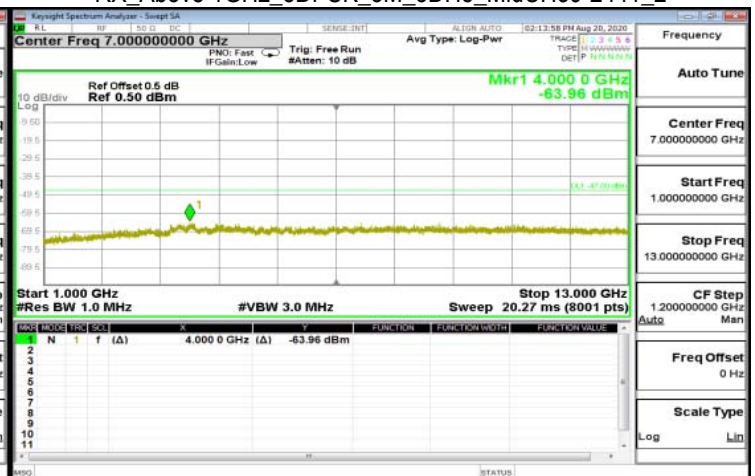
RX_Below 1GHz_8DPSK_3M_3DH5_MidCH39-2441_1



RX_Below 1GHz_π4DQPSK_2M_2DH5_MidCH39-2441_1



RX_Above 1GHz_8DPSK_3M_3DH5_MidCH39-2441_2



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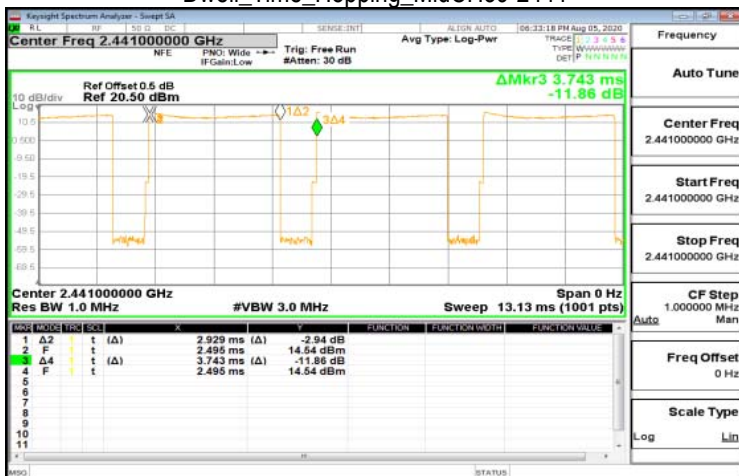
Dwell Time Hopping MidCH39-2441



Dwell Time Hopping MidCH39-2441



Dwell Time Hopping MidCH39-2441



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