FCC Test Report

Report No.: AGC02390201205FE02

FCC ID	:	2ABRU-RFM207B
APPLICATION PURPOSE	:	Original Equipment
PRODUCT DESIGNATION	:	Multiprotocol 2.4G Wireless Module - Industrial Grade
BRAND NAME	:	BDE
MODEL NAME	:	BDE-RFM207B
APPLICANT	:	Guangzhou BDE Technology Inc.
DATE OF ISSUE	:	Jan. 27, 2021
STANDARD(S)	:	FCC Part 15.247
REPORT VERSION	:	V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd

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REPORT REVISE RECORD

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Jan. 27, 2021	Valid	Initial Release

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1. VERIFICATION OF COMPLIANCE

Applicant	Guangzhou BDE Technology Inc.
Address	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Manufacturer	Guangzhou BDE Technology Inc.
Address	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Factory	Guangzhou BDE Technology Inc.
Address	B2-403, Chuangyi Building, 162 Science Avenue, Huangpu District, Guangzhou 510663, China
Product Designation	Multiprotocol 2.4G Wireless Module - Industrial Grade
Brand Name	BDE
Test Model	BDE-RFM207B
Date of test	Dec. 25, 2020 to Jan. 27, 2021
Deviation	No any deviation from the test method
Condition of Test Sample	Normal
Test Result	Pass
Report Template	AGCRT-US-BLE/RF

We hereby certify that:

The above equipment was tested by Attestation of Global Compliance (Shenzhen) Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC part 15.247.

Prepared By	Sky Dong (Project Engineer)	Jan. 27, 2021
Reviewed By	Max Zhang (Reviewer)	Jan. 27, 2021
Approved By	Forrest Lei (Authorized Officer)	Jan. 27, 2021

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2. GENERAL INFORMATION

2.1. PRODUCT DESCRIPTION

The EUT is designed as a “Multiprotocol 2.4G Wireless Module - Industrial Grade”. It is designed by way of utilizing the GFSK technology to achieve the system operation.

A major technical description of EUT is described as following

Operation Frequency	2.402 GHz to 2.480GHz
RF Output Power	3.644dBm (Max) For BLE 125KHz 3.707dBm (Max) For BLE 500KHz 4.808dBm (Max) For BLE 1M 3.643dBm (Max) For BLE 2M
Bluetooth Version	V5.0
Modulation	BR ☐GFSK, EDR ☐π /4-DQPSK, ☐8DPSK BLE ☒GFSK 125KHz☒GFSK 500KHz ☒GFSK 1Mbps ☒GFSK 2Mbps
Number of channels	40 Channels
Antenna Designation	PCB Antenna (Comply with requirements of the FCC part 15.203)
Antenna Gain	2.18dBi
Hardware Version	V1.1
Software Version	V1.0
Power Supply	DC 3.3V
Note: 1. The EUT doesn’t support BR/EDR. 2. All of the models are tested and the main model test data recorded in this report.	

2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
2400~2483.5MHz	0	2402 MHz
	1	2404 MHz
	:	:
	38	2478 MHz
	39	2480 MHz

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2.3. RELATED SUBMITTAL(S)/GRANT(S)

This submittal(s) (test report) is intended for **FCC ID: 2ABRU-RFM207B** filing to comply with the FCC Part 15.247 requirements.

2.4. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013). Radiated testing was performed at an antenna to EUT distance 3 meters.

2.5. SPECIAL ACCESSORIES

Refer to section 5.2.

2.6. EQUIPMENT MODIFICATIONS

Not available for this EUT intended for grant.

2.7. ANTENNA REQUIREMENT

This intentional radiator is designed with a permanently attached antenna of an antenna to ensure that no antenna other than that furnished by the responsible party shall be used with the device.
For more information of the antenna, please refer to the APPENDIX B: PHOTOGRAPHS OF EUT.

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3. MEASUREMENT UNCERTAINTY

The reported uncertainty of measurement y ±U, where expended uncertainty U is based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

- Uncertainty of Conducted Emission, Uc = ±3.1 dB
- Uncertainty of Radiated Emission below 1GHz, Uc = ±4.0 dB
- Uncertainty of Radiated Emission above 1GHz, Uc = ±4.8 dB
- Uncertainty of total RF power, conducted, Uc = ±0.8 dB
- Uncertainty of RF power density, conducted, Uc = ±2.6 dB
- Uncertainty of spurious emissions, conducted, Uc = ±2.7 dB
- Uncertainty of Occupied Channel Bandwidth: Uc = ±2 %

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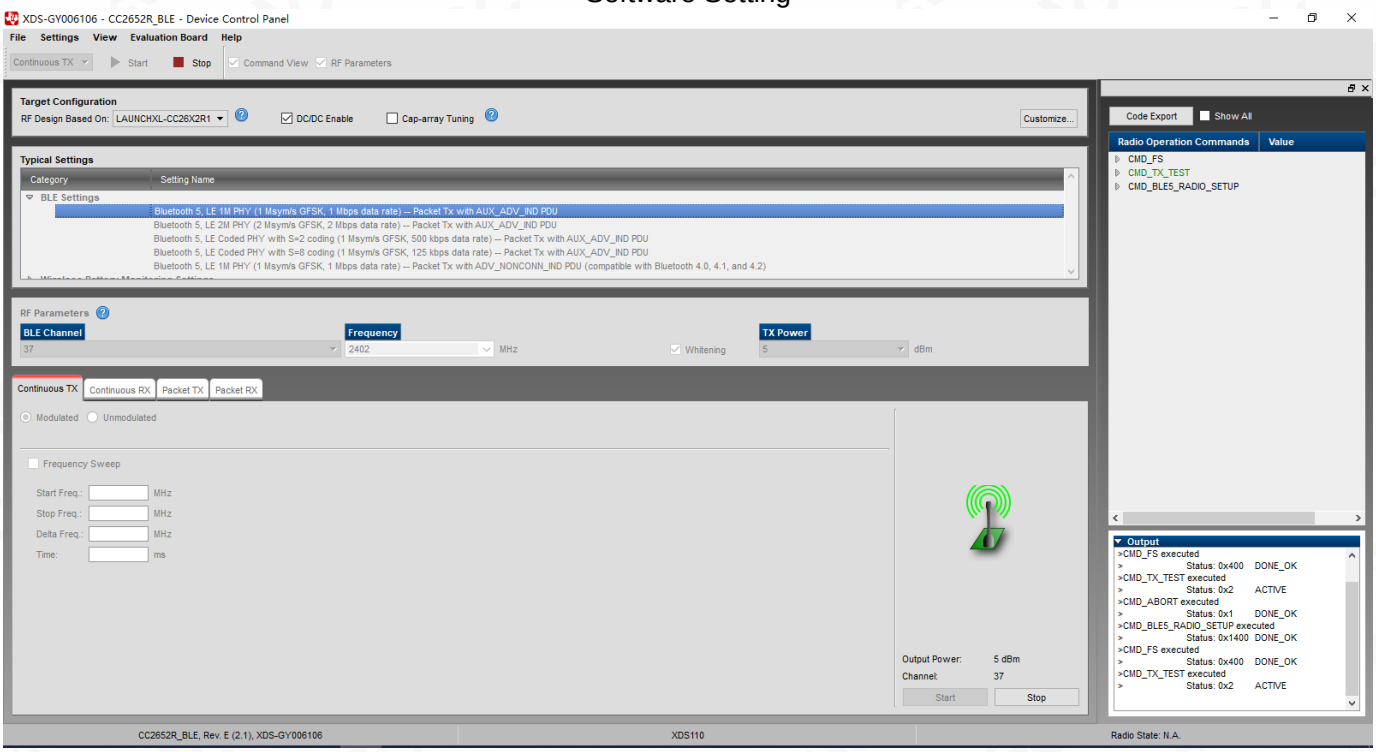
4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX(2402MHz)
2	Middle channel TX(2440MHz)
3	High channel TX(2480MHz)

Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.
3. For Conducted Test method, a temporary antenna connector is provided by the manufacture.

Software Setting



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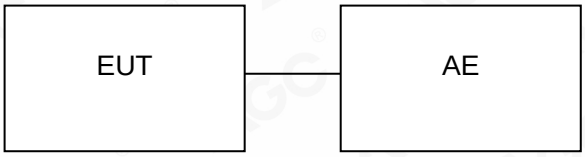
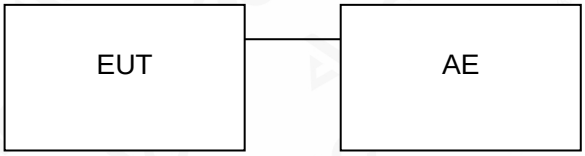
5. SYSTEM TEST CONFIGURATION

5.1. CONFIGURATION OF TESTED SYSTEM

Radiated Emission Configure:



Conducted Emission Configure:



5.2. EQUIPMENT USED IN TESTED SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	Multiprotocol 2.4G Wireless Module - Industrial Grade	BDE-RFM207B	2ABRU-RFM207B	EUT
2	Mobile phone	TCL	J326T	AE
3	PC	HUAWEI	DC 5V	AE
4	Control board	C3	DC 3.3V	AE

5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
15.247 (b)(3)	Peak Output Power	Compliant
15.247 (a)(2)	6 dB Bandwidth	Compliant
15.247 (d)	Conducted Spurious Emission	Compliant
15.247 (e)	Maximum Conducted Output Power Density	Compliant
15.209	Radiated Emission	Compliant
15.207	Conducted Emission	Compliant

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6. TEST FACILITY

Test Site	Attestation of Global Compliance (Shenzhen) Co., Ltd
Location	1-2/F, Building 19, Junfeng Industrial Park, Chongqing Road, Heping Community, Fuhai Street, Bao'an District, Shenzhen, Guangdong, China
Designation Number	CN1259
FCC Test Firm Registration Number	975832
A2LA Cert. No.	5054.02
Description	Attestation of Global Compliance (Shenzhen) Co., Ltd is accredited by A2LA

TEST EQUIPMENT OF CONDUCTED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESPI	101206	May 15, 2020	May 14, 2021
LISN	R&S	ESH2-Z5	100086	Jul. 03, 2020	Jul. 02, 2021
Test software	R&S	ES-K1(Ver.V1.71)	N/A	N/A	N/A

TEST EQUIPMENT OF RADIATED EMISSION TEST

Equipment	Manufacturer	Model	S/N	Cal. Date	Cal. Due
TEST RECEIVER	R&S	ESCI	10096	May 15, 2020	May 14, 2021
EXA Signal Analyzer	Aglient	N9010A	MY53470504	Dec. 07, 2020	Dec. 06, 2021
2.4GHz Filter	EM Electronics	2400-2500MHz	N/A	Mar. 23, 2020	Mar. 22, 2022
Attenuator	ZHINAN	E-002	N/A	Sep. 03, 2020	Sep. 02, 2022
Horn antenna	SCHWARZBECK	BBHA 9170	#768	Sep. 21, 2019	Sep. 20, 2021
Active loop antenna (9K-30MHz)	ZHINAN	ZN30900C	18051	May 22, 2020	May 21, 2022
Double-Ridged Waveguide Horn	ETS LINDGREN	3117	00034609	May 17, 2019	May 16, 2021
Broadband Preamplifier	ETS LINDGREN	3117PA	00225134	Sep. 03, 2020	Sep. 02, 2022
ANTENNA	SCHWARZBECK	VULB9168	494	Sep. 20, 2019	Sep. 19, 2021
Test software	Tonscend	JS32-RE (Ver.2.5)	N/A	N/A	N/A

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7. PEAK OUTPUT POWER

7.1. MEASUREMENT PROCEDURE

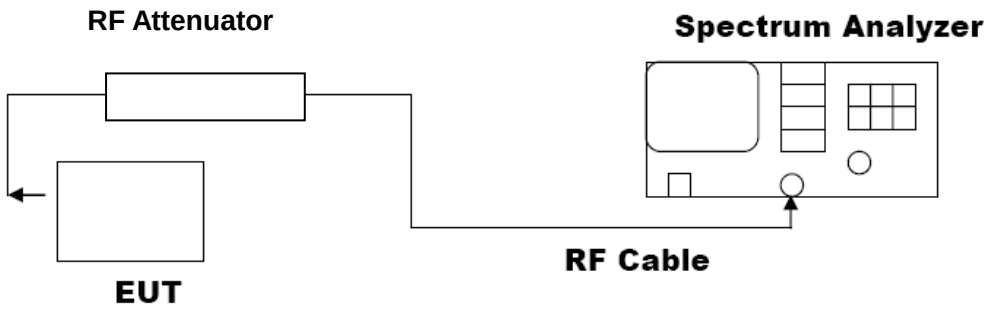
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. RBW≥DTS bandwidth
3. VBW≥3*RBW.
4. SPAN≥VBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

PEAK POWER TEST SETUP



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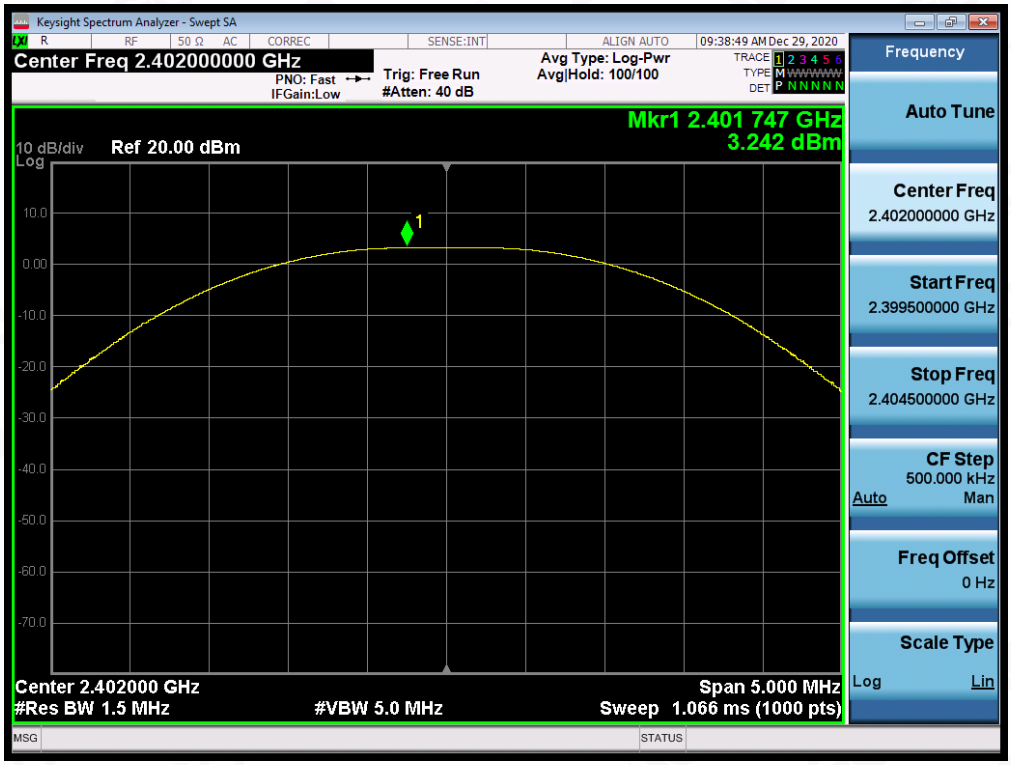
7.3. LIMITS AND MEASUREMENT RESULT

125 KHz

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
2.402	3.242	30	Pass
2.440	3.424	30	Pass
2.480	3.644	30	Pass

CH0



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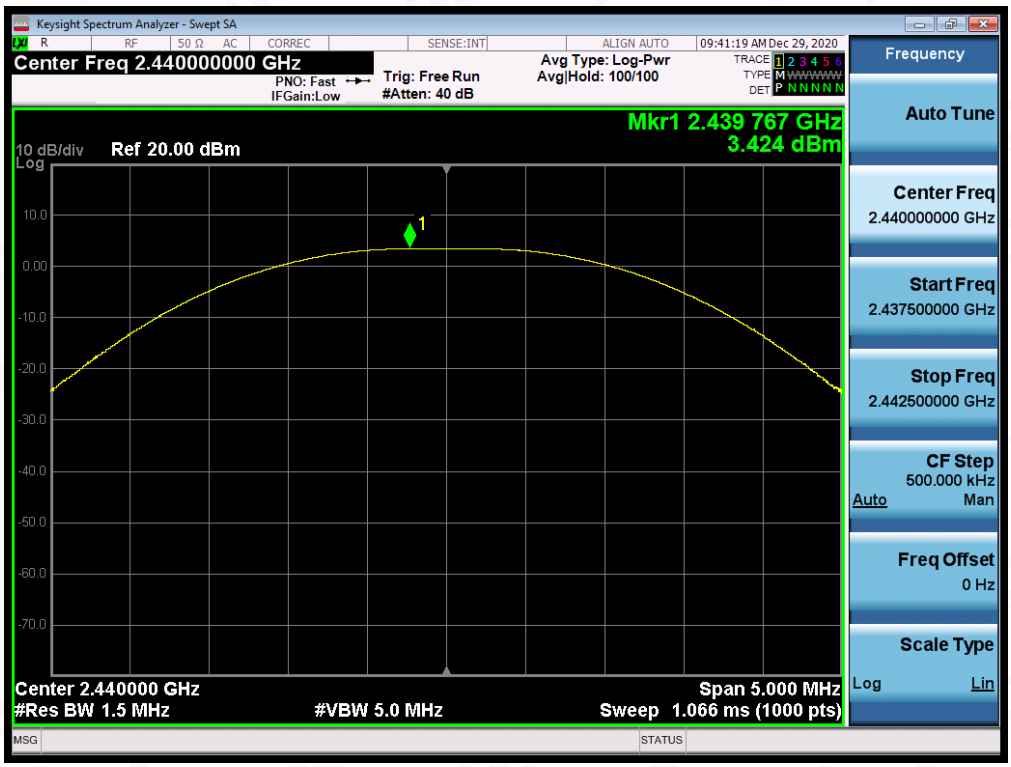
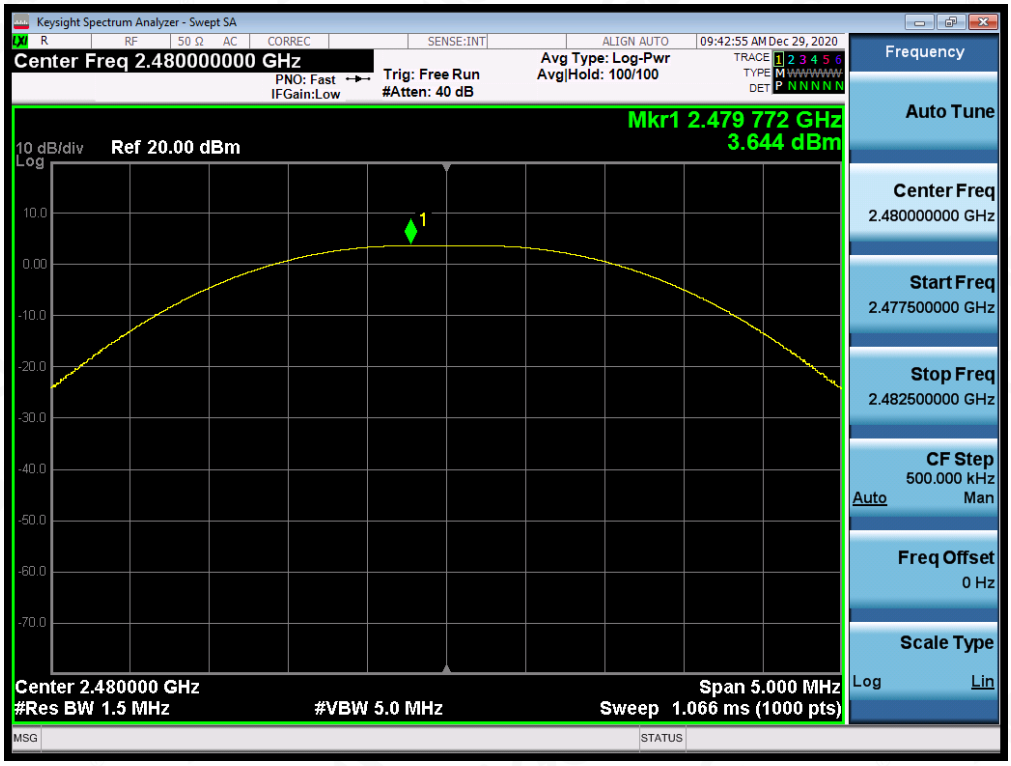
CH19



CH39



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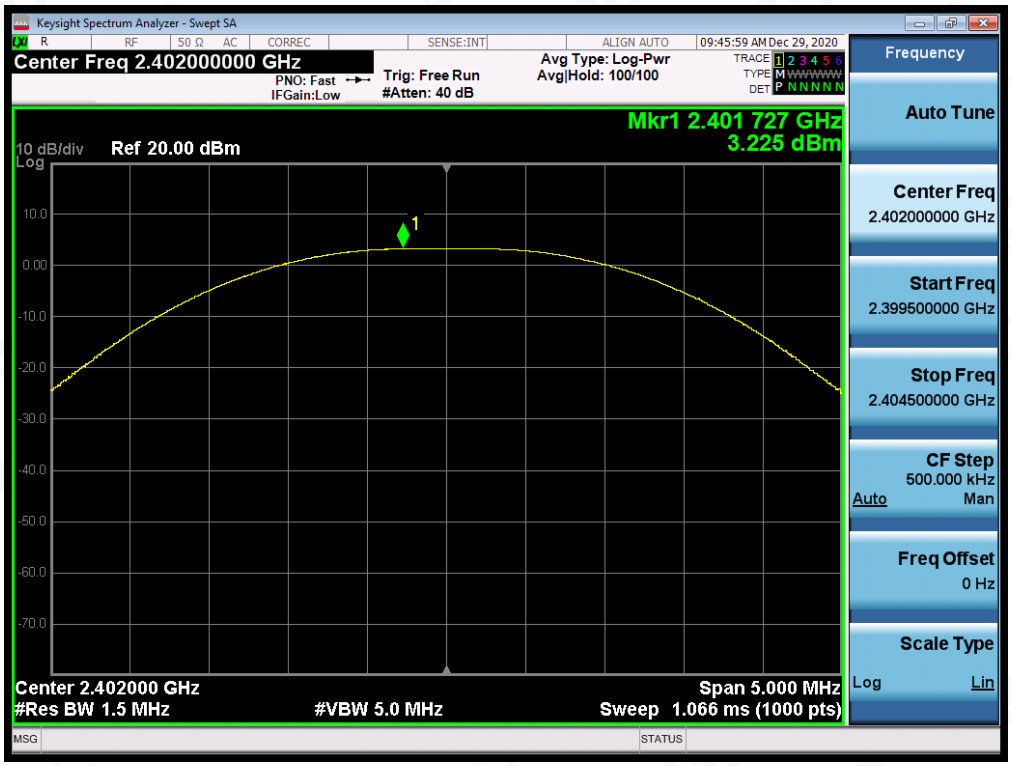
500 KHz

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Pass or Fail**
2.402	3.225	30	Pass
2.440	3.471	30	Pass
2.480	3.707	30	Pass

CH0



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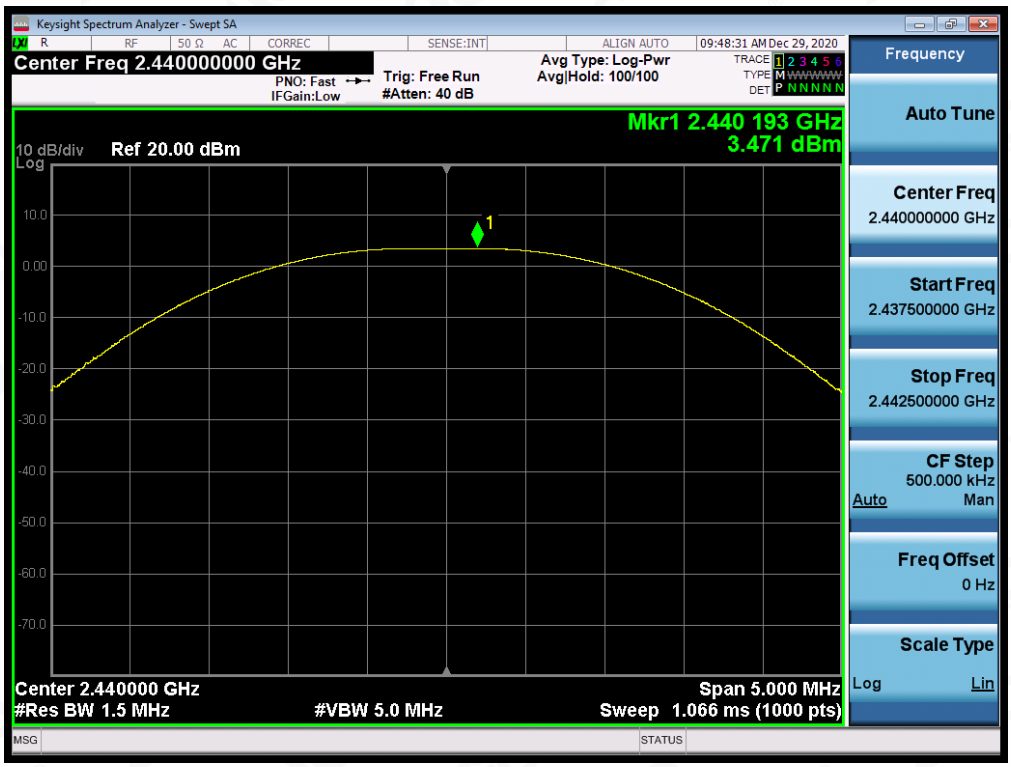
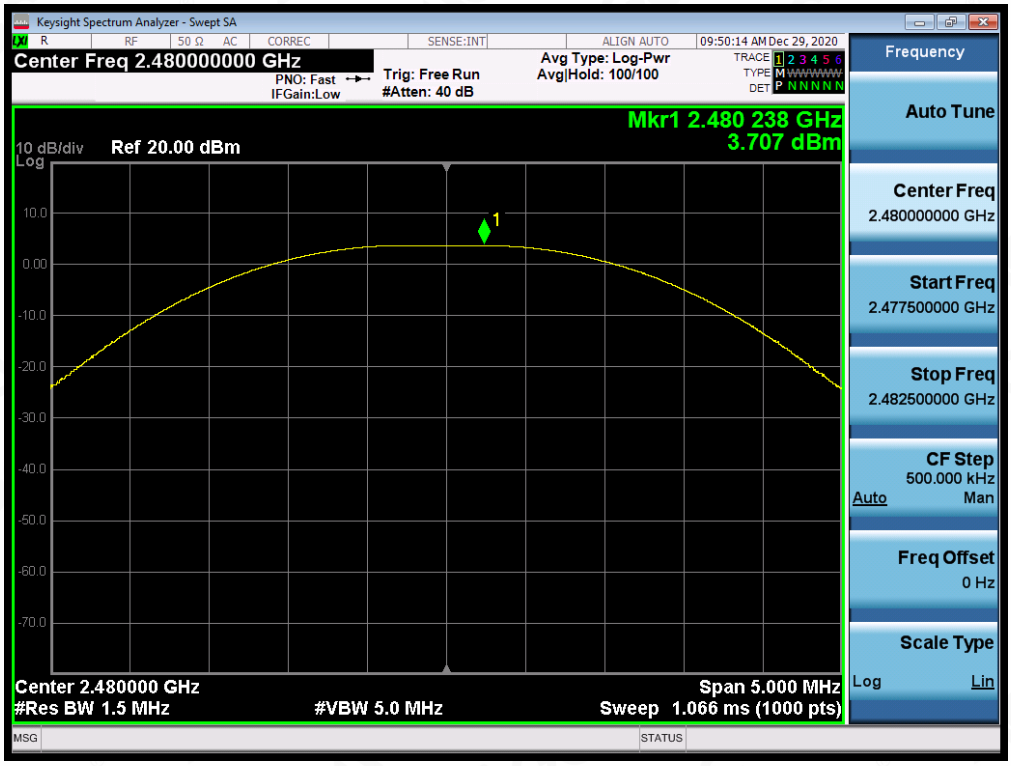
CH19



CH39



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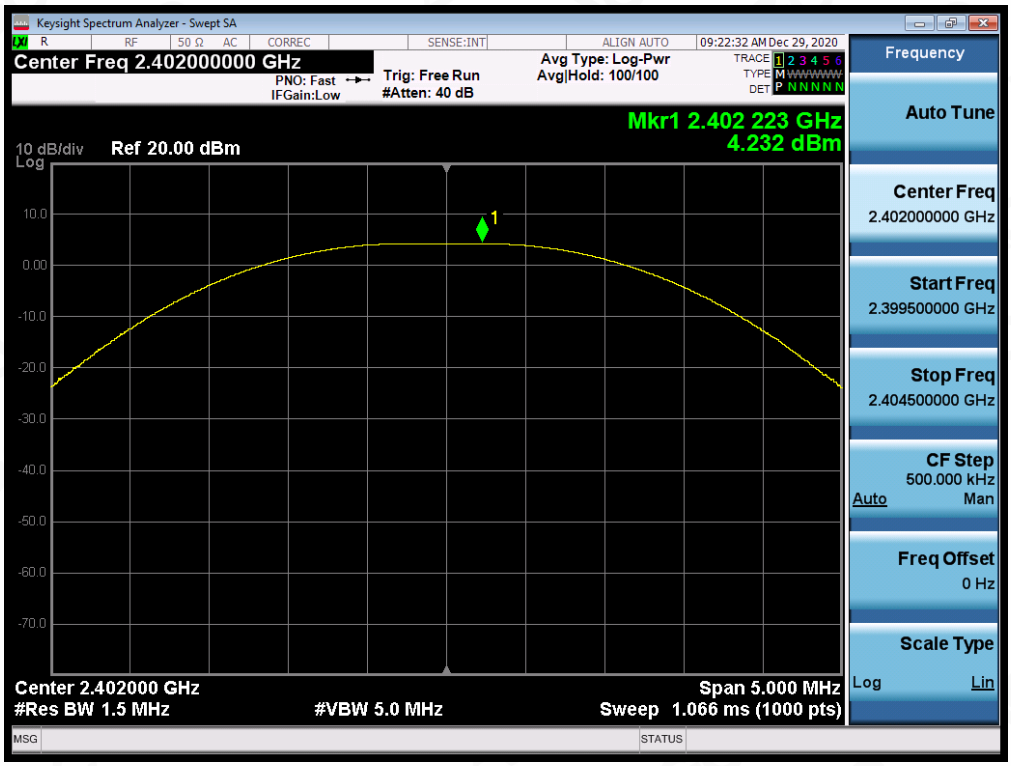
1M

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Pass or Fail**
2.402	4.232	30	Pass
2.440	4.508	30	Pass
2.480	4.808	30	Pass

CH0



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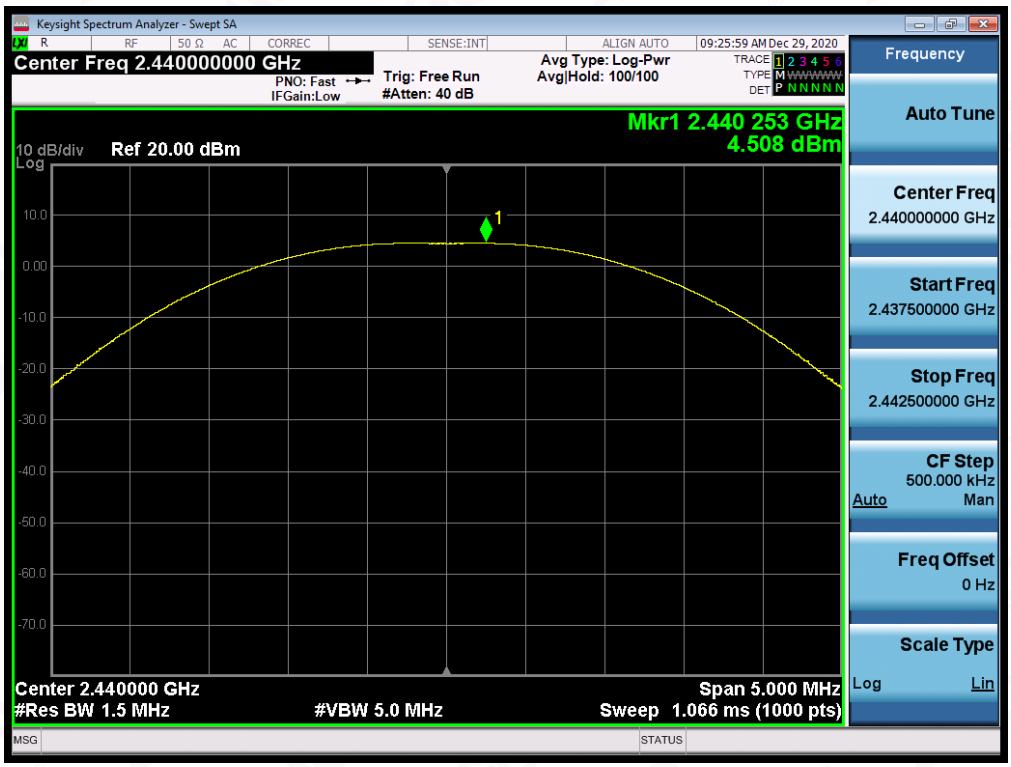
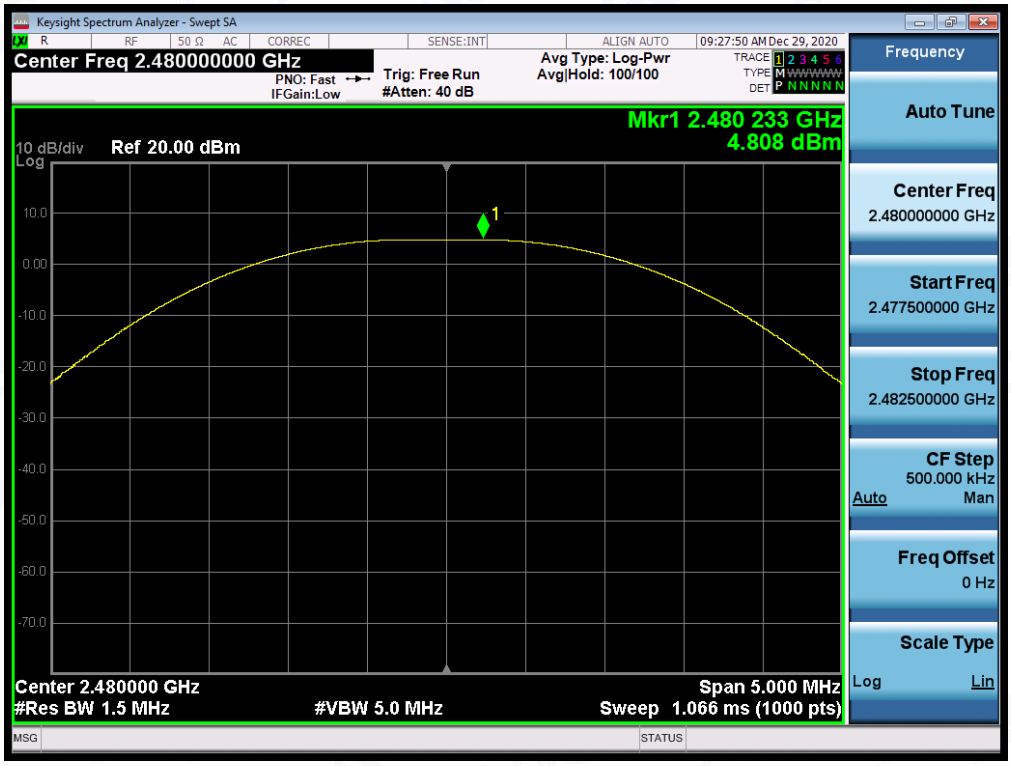
CH19



CH39



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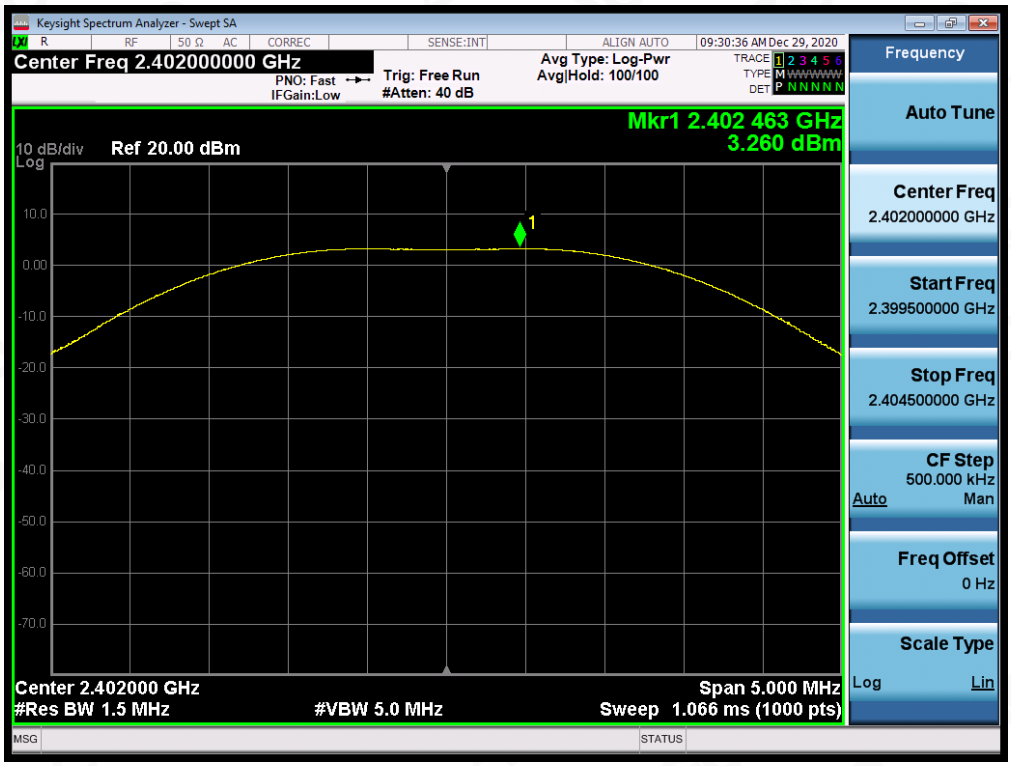
2M

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (GHz)	**Peak Power (dBm)**	**Applicable Limits (dBm)**	**Pass or Fail**
2.402	3.260	30	Pass
2.440	3.464	30	Pass
2.480	3.643	30	Pass

CH0



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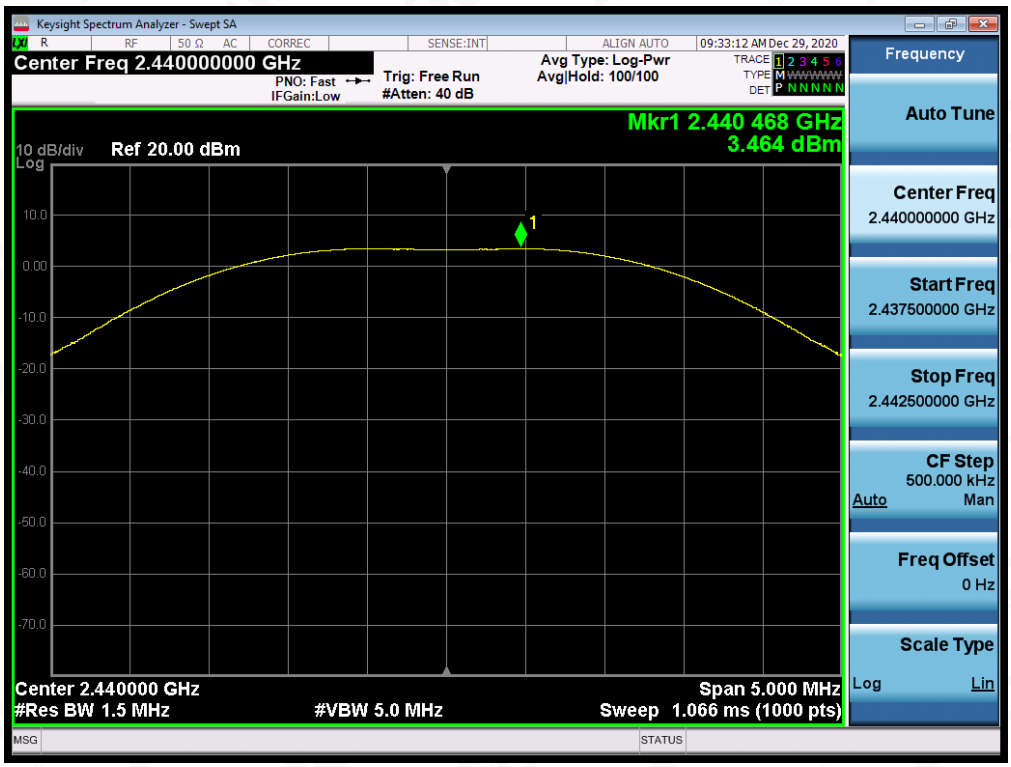
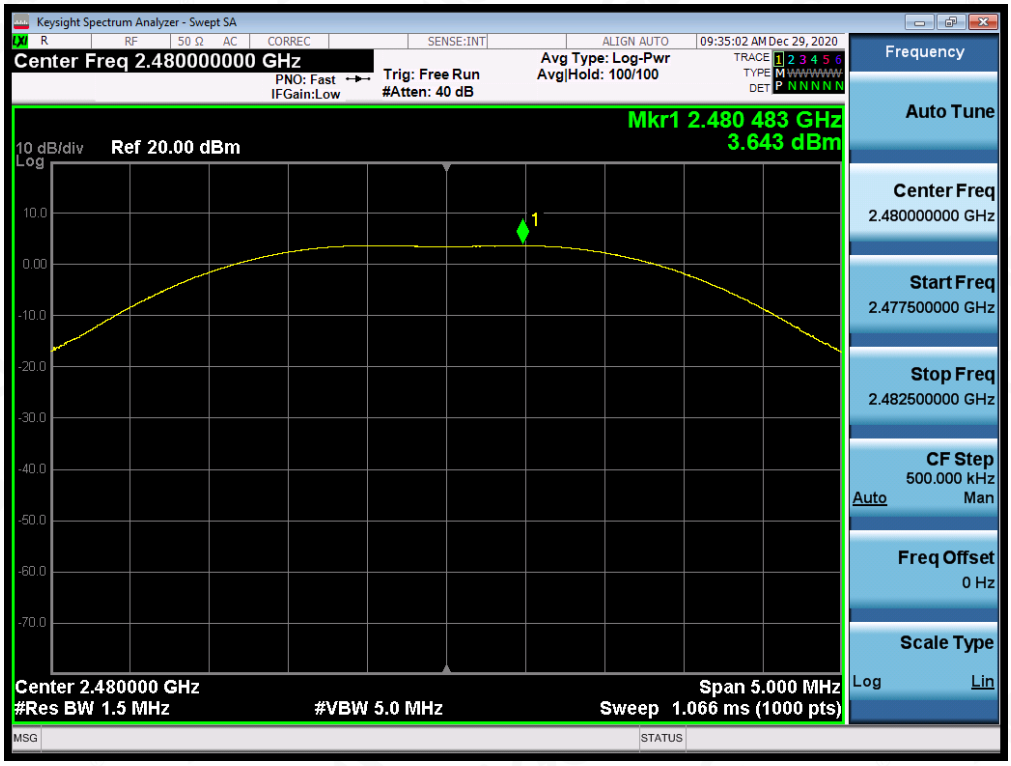
CH19



CH39



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8. 6 DB BANDWIDTH

8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Centre Frequency = Operation Frequency, RBW= 100 kHz, VBW≥3×RBW.
4. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

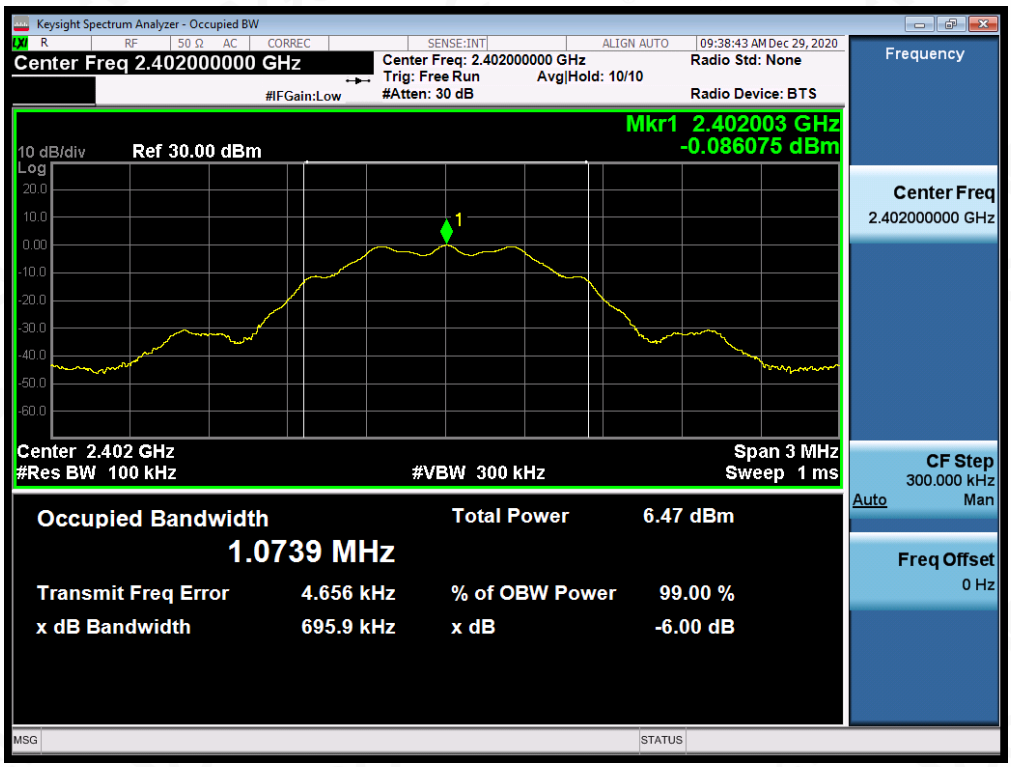
The same as described in section 7.2.

8.3. LIMITS AND MEASUREMENT RESULTS

125 KHz

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	**Applicable Limits**		
	Test Data (kHz)		**Criteria**
>500KHZ	Low Channel	695.9	PASS
	Middle Channel	684.6	PASS
	High Channel	688.5	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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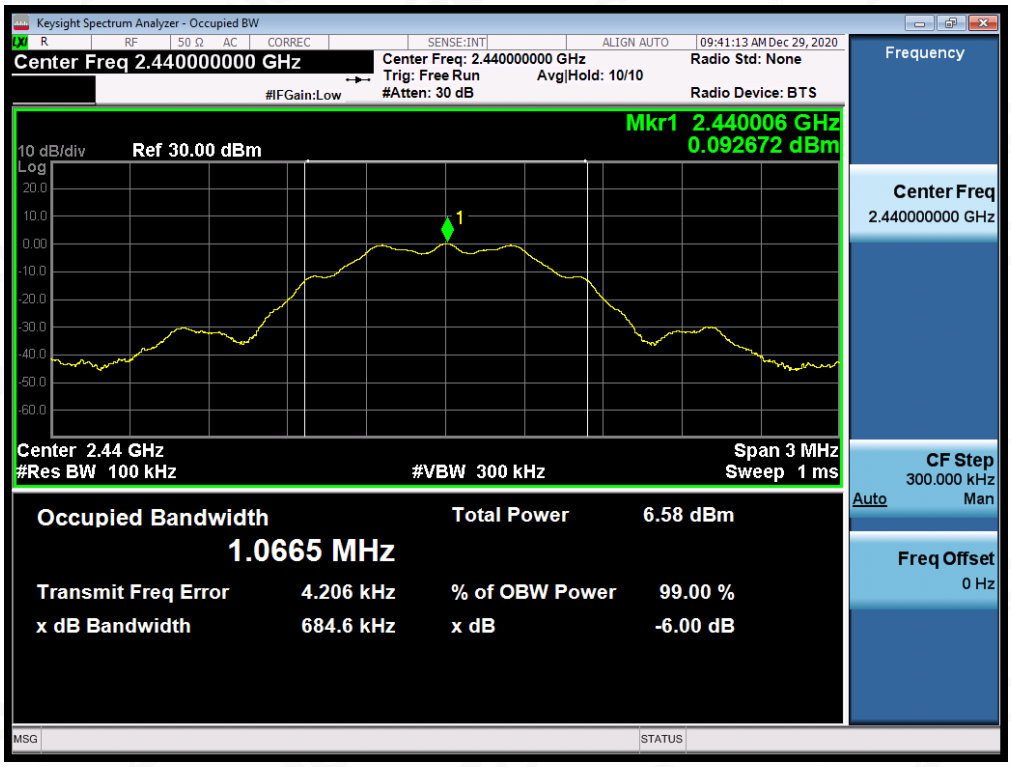
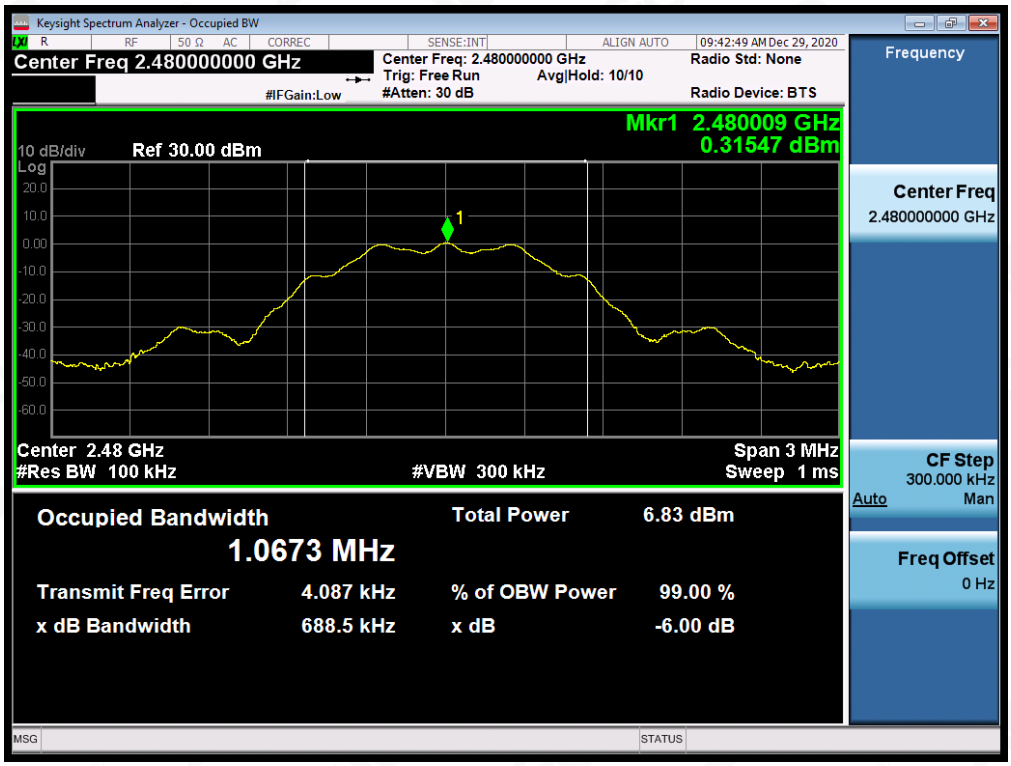
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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500 KHz

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	**Applicable Limits**		
	Test Data (kHz)		**Criteria**
>500KHZ	Low Channel	665.6	PASS
	Middle Channel	655.2	PASS
	High Channel	667.8	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

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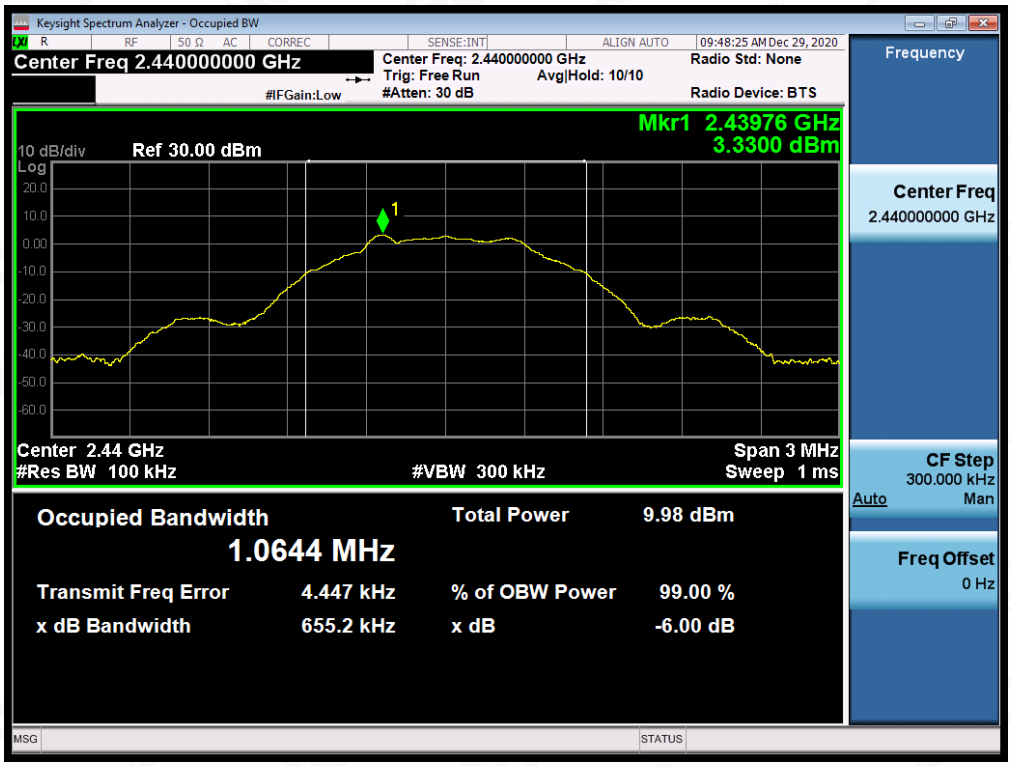
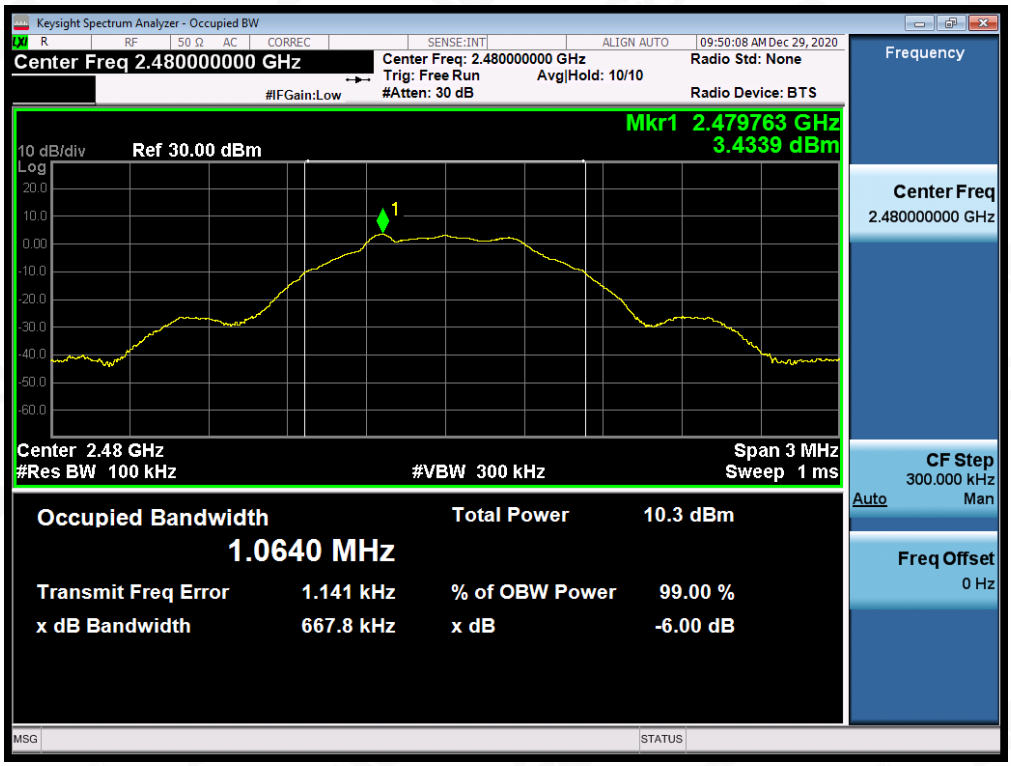
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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1M

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	**Applicable Limits**		
	Test Data (kHz)		**Criteria**
>500KHZ	Low Channel	700.1	PASS
	Middle Channel	673.5	PASS
	High Channel	676.1	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL

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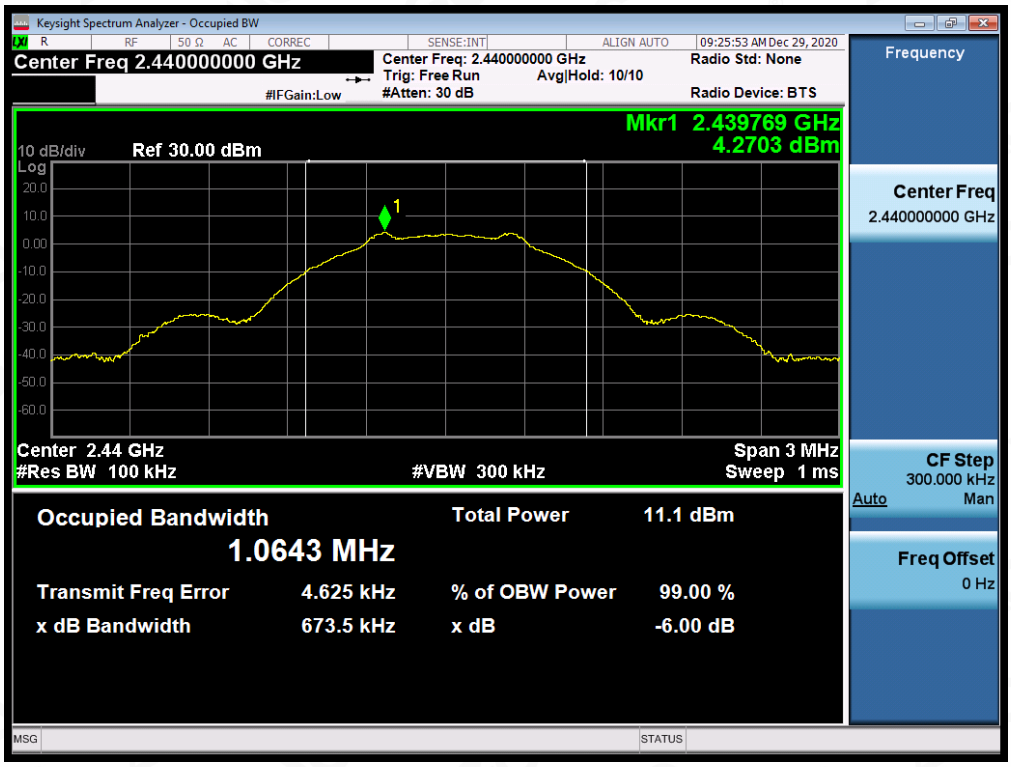
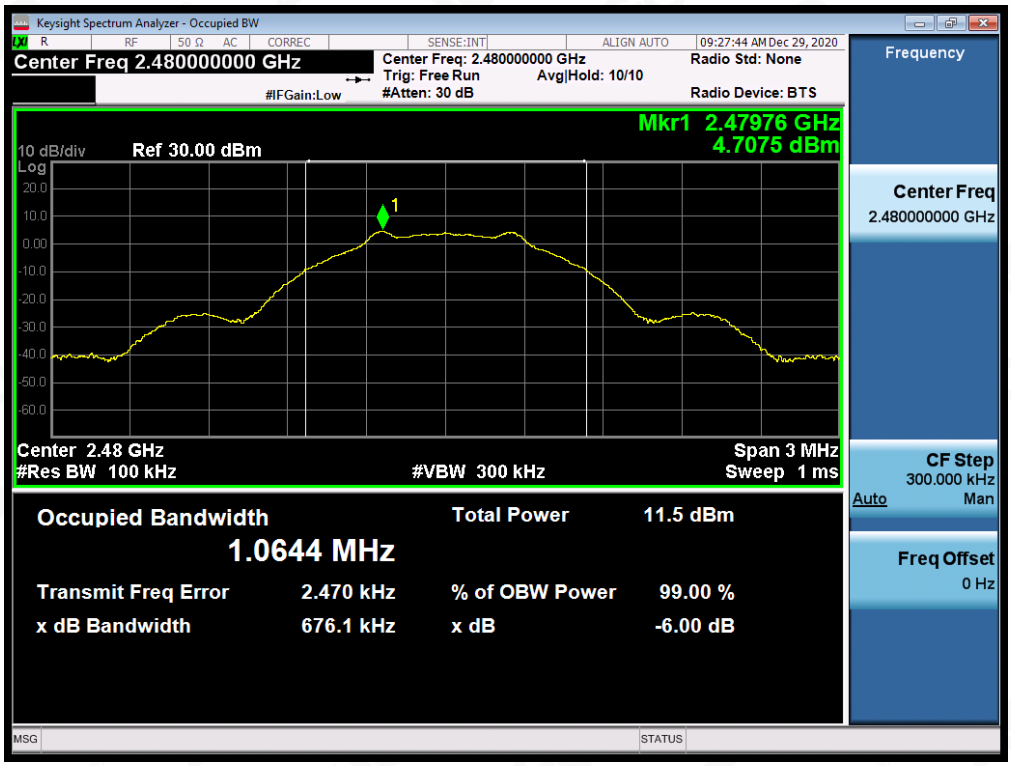
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



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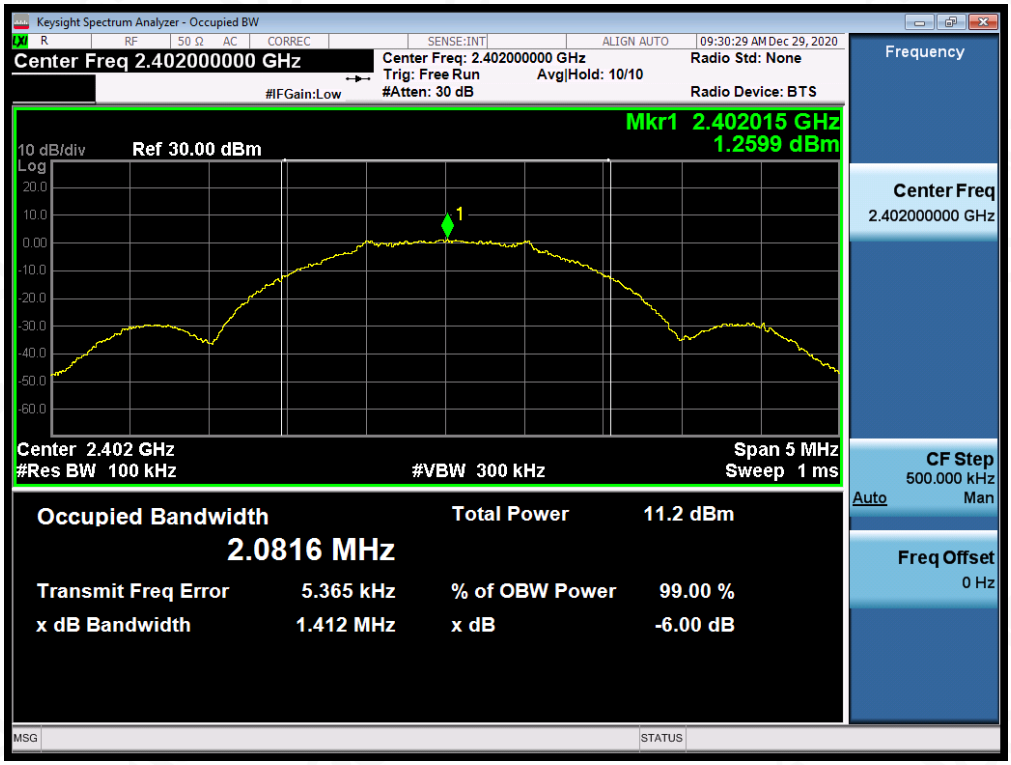
2M

LIMITS AND MEASUREMENT RESULT			
Applicable Limits	**Applicable Limits**		
	Test Data (MHz)		**Criteria**
>500KHZ	Low Channel	1.412	PASS
	Middle Channel	1.376	PASS
	High Channel	1.350	PASS

TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



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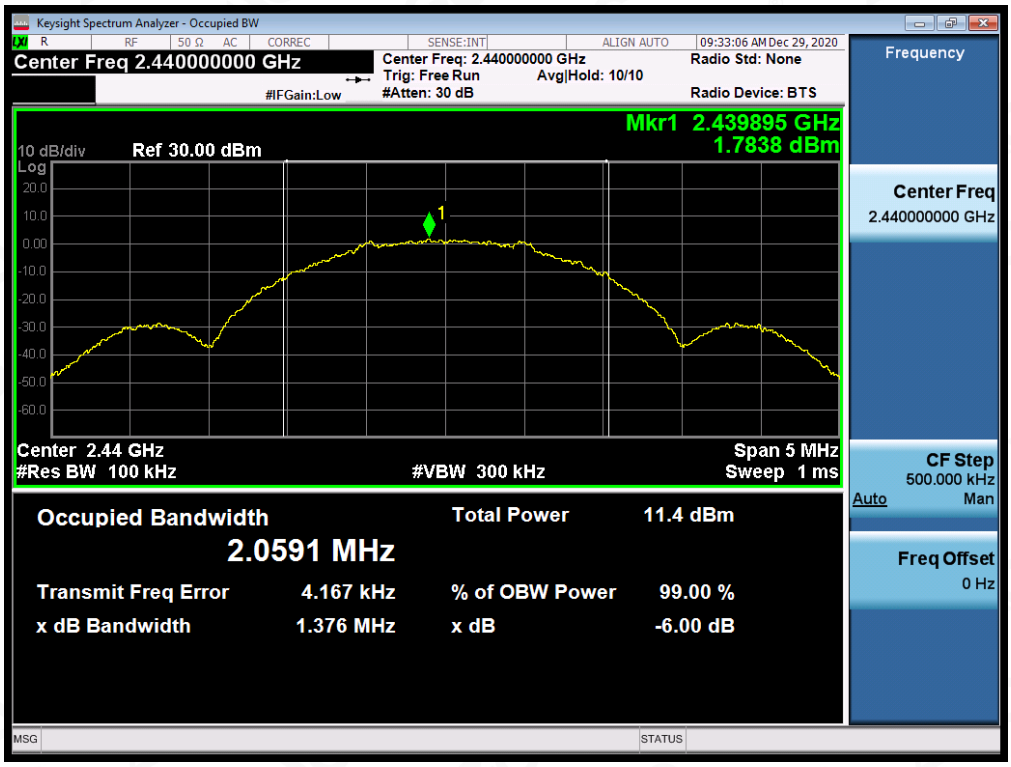
TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL

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9. CONDUCTED SPURIOUS EMISSION

9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2, Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set SPA Trace 1 Max hold, then View.

Note: The EUT was tested according to ANSI C63.10 for compliance to FCC PART 15.247 requirements.

9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.

9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	**Measurement Result**	
	Test Data	**Criteria**
In any 100 kHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power.	At least -20dBc than the reference level	PASS

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TEST RESULT FOR ENTIRE FREQUENCY RANGE

125 KHz

GFSK MODULATION IN LOW CHANNEL

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GFSK MODULATION IN MIDDLE CHANNEL

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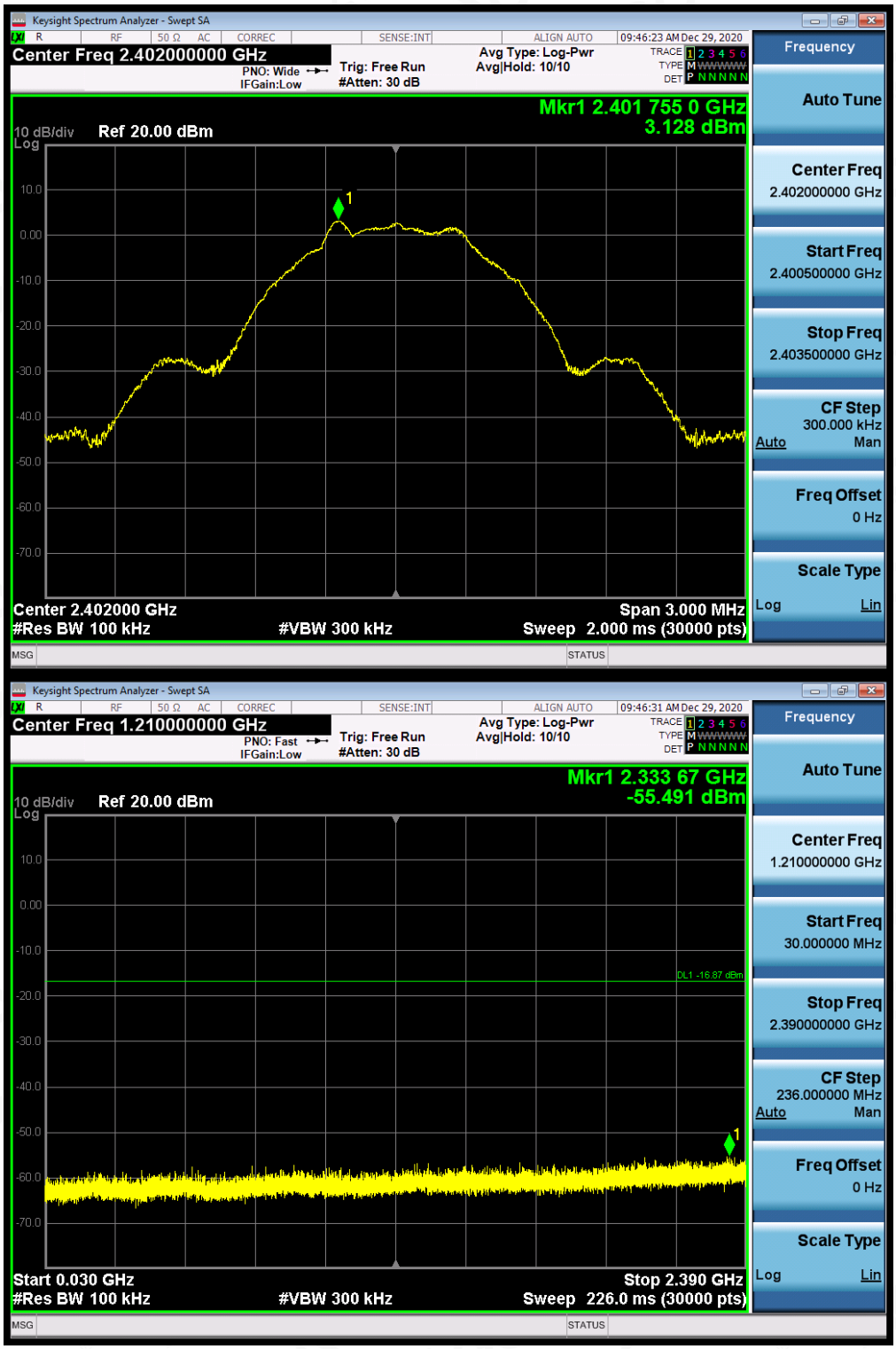
500 KHz

GFSK MODULATION IN LOW CHANNEL



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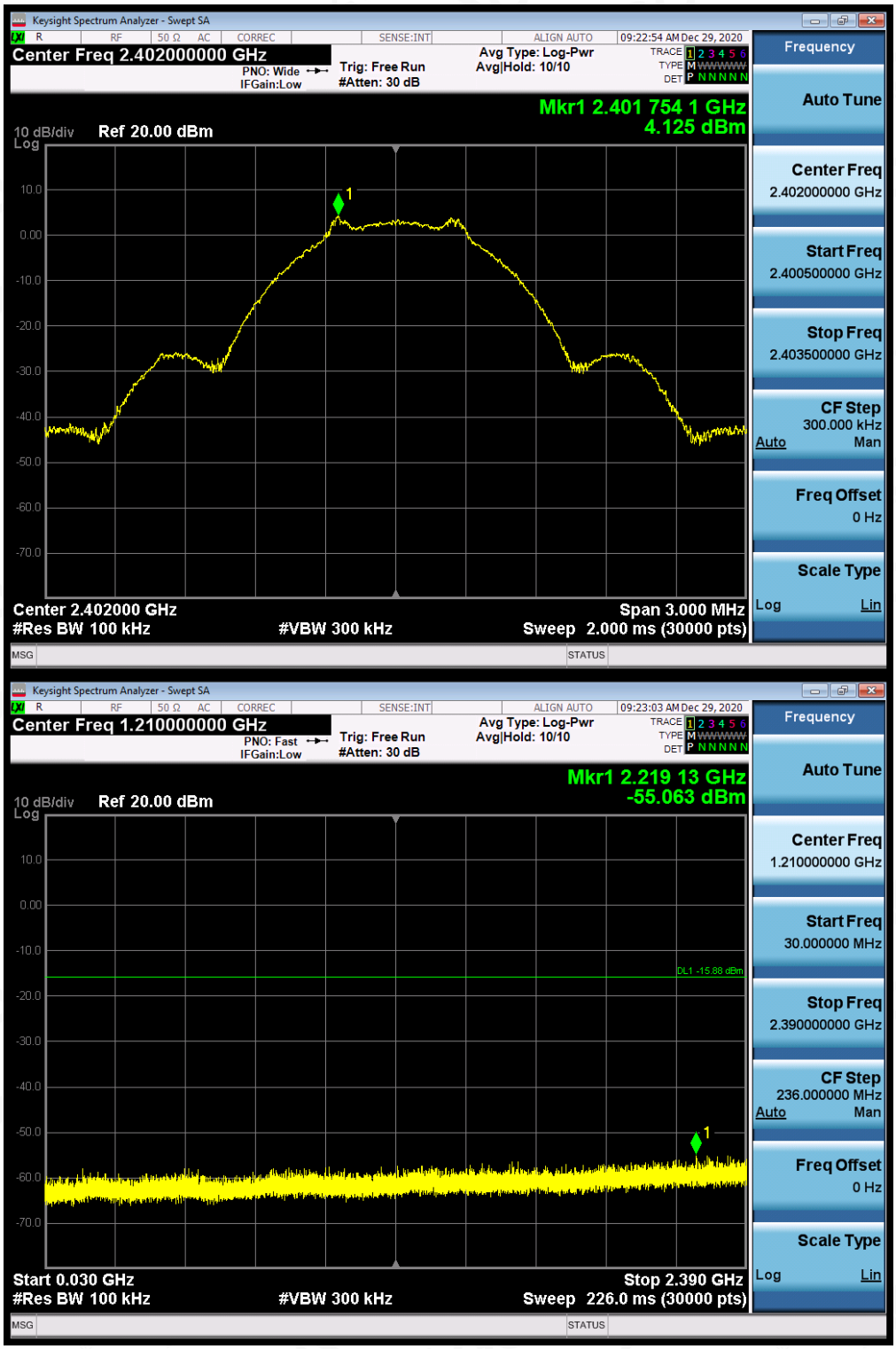
1M

GFSK MODULATION IN LOW CHANNEL



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GFSK MODULATION IN MIDDLE CHANNEL

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2M

GFSK MODULATION IN LOW CHANNEL

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