



FCC TEST REPORT

FCC ID: 2ABNA-TRM101A

On Behalf of
Guangzhou Geoelectron Science & Technology Company Limited
Wireless Data Transceiver Module
Model No.: TRM101

Prepared for : Guangzhou Geoelectron Science & Technology Company Limited
Address : No.704/702, No.7, Cai Pin Road, Science City, Huangpu District,
Guangzhou, Guangdong Province, China.

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,
518103, Shenzhen, Guangdong, China

Report Number : A2203204-C01-R04
Date of Receipt : March 25, 2022
Date of Test : March 25, 2022 – April 08, 2022
Date of Report : April 08, 2022
Version Number : V0

TABLE OF CONTENTS

Description	Page
1. Summary of Standards And Results -----	5
1.1. Description of Standards and Results -----	5
2. General Information -----	6
2.1. Description of Device (EUT)-----	6
2.2. Accessories of Device (EUT) -----	7
2.3. Tested Supporting System Details -----	7
2.4. Block Diagram of connection between EUT and simulators -----	7
2.5. Test Mode -----	8
2.6. Test Conditions -----	9
2.7. Test Facility -----	9
2.8. Measurement Uncertainty -----	9
2.9. Test Equipment List -----	10
3. Test Results and Measurement Data -----	12
3.1. Transmitter Power (Conducted)-----	12
3.2. Occupied Bandwidth and Emission Mask-----	15
3.3. Spurious Emissions(conducted) -----	29
3.4. Radiated Spurious Emission-----	36
3.5. Transient Frequency Behavior -----	46
3.6. Behavior Frequency Stability -----	48
3.7. Modulation Characteristic -----	51
4. Test setup photo -----	58
4.1. Photos of Radiated emission -----	58
5. Test setup photo -----	59

TEST REPORT DECLARATION

Applicant : Guangzhou Geoelectron Science & Technology Company Limited
Address : No.704/702, No.7, Cai Pin Road, Science City, Huangpu District, Guangzhou, Guangdong Province, China.
Manufacturer : Guangzhou Geoelectron Science & Technology Company Limited
Address : No.704/702, No.7, Cai Pin Road, Science City, Huangpu District, Guangzhou, Guangdong Province, China.
EUT Description : Wireless Data Transceiver Module
(A) Model No. : TRM101
(B) Trademark :  Geoelectron

Measurement Standard Used:

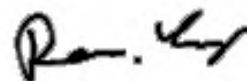
**FCC CFR Title 47 Part 90, FCC CFR Title 47 Part 2, RSS-119 Issue 12, RSS-Gen Issue 5,
ANSI C63.26: 2015, ANSI TIA-603-E:2016**

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 2, Part 90, RSS-119, RSS-Gen limits both conducted and radiated emissions. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these tests.

After the test, our opinion is that EUT compliance with the requirement of the above standards.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Reak Yang
Project Engineer



Approved by (name + signature).....: Simple Guan
Project Manager



Date of issue.....: April 08, 2022

Revision History

Revision	Issue Date	Revisions	Revised By
V0	April 08, 2022	Initial released Issue	Reak Yang

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Test Item	Test Requirement	Standards Paragraph	Result
Transmitter Power(Conducted)	FCC PART 90 RSS-119	§ 90.205, § RSS-119(5.4)	P
Occupied Bandwidth & Emission Mask	FCC PART 90 RSS-119	§ 90.209, § 90.210 § RSS-119(5.5)	P
Spurious Emissions(conducted)	FCC PART 90 RSS-119	§ 90.210, § RSS-119(5.8)	P
Spurious Emissions(Radiated)	FCC PART 90 RSS-119	§ 90.210, § RSS-119(5.8)	P
Transient Frequency Behavior	FCC PART 90 RSS-119	§ 90.214, § RSS-119(5.9)	P
Frequency Stability	FCC PART 90 RSS-119	§ 90.213, § RSS-119(5.3)	P
Modulation Characteristics - Audio Frequency Response	FCC PART 2 FCC PART 90	§ 2.1047(a), § 90.207	N/A
Modulation Characteristics - Modulation Limiting	FCC PART 2 FCC PART 90	§ 2.1047(b), § 90.207	N/A
Adjacent channel power	FCC PART 90	§ 90.221	P
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable. 4. The conclusion of this test report is judged by actual test data without considering measurement uncertainty.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : Wireless Data Transceiver Module

Trademark :  Geoelectron

Model Number : TRM101

DIFF. : N/A

Test Voltage : DC 3.3V From DC Power

UHF

Operation frequency : 410MHz-470MHz

Conducted Power : 0.5W(26.99dBm), 1W(30dBm)

Channel spacing : 6.25KHz, 12.5KHz, 25KHz

Modulation type : 4-FSK, GMSK

Antenna Type : External Antenna, Maximum Gain is 4.0dBi

Software version : V1.0

Hardware version : V1.3

Remark: 6.25KHz channel spacing transmit only with 4-FSK modulation.

Note: All Conducted Power have been tested, and recorded the worst case 1W(30dBm) results in this report.

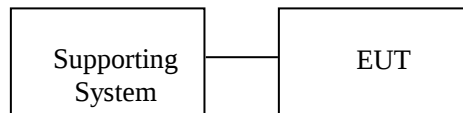
2.2. Accessories of Device (EUT)

Accessories	:	/
Manufacturer	:	/
Model	:	/
Ratings	:	/

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	DC Power	JUNKE	JK120100	/	/

2.4. Block Diagram of connection between EUT and simulators



The sample was placed 0.8m & 1.5m for the measurement below & above 1GHz above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

2.5. Test Mode

All modes and data rates and positions were investigated.

Test modes are chosen to be reported as the worst case configuration below:

Test Mode		
Item	Description of operation mode	Note
1	4-FSK+CS6.25KHz+TX	at maximum rated power for transmitter
2	GMSK+CS12.5KHz+TX	at maximum rated power for transmitter
3	4-FSK +CS12.5KHz+TX	at maximum rated power for transmitter
4	GMSK+CS25KHz+TX	at maximum rated power for transmitter
5	4-FSK +CS25KHz+TX	at maximum rated power for transmitter

Note: The worst case modes for all test are the item 1 and item 3.

Description Operation Frequency

GMSK, 4-FSK		
Test Channel	Channel spacing (KHz)	Frequency(MHz)
Low	6.25	410.050
	12.5	410.050
	25	410.050
Mid	6.25	451.000
	12.5	451.000
	25	451.000
High	6.25	469.950
	12.5	469.950
	25	469.950

2.6.Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	24℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	980kPa

2.7.Test Facility

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,
518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission
Registration Number: 293631

July 15, 2019 Certificated by IC
Registration Number: CN0085

2.8.Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	2.13 dB(Polarize: V)
	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.16dB(Polarize: H)
	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9.Test Equipment List

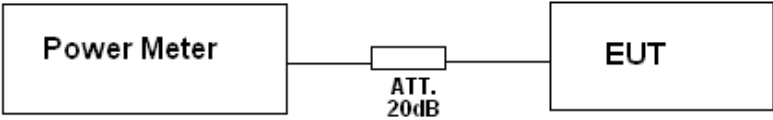
Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal Interval
Test Receiver	ROHDE&SCHWARZ	ESCI	101165	2021.08.25	1Year
Spectrum analyzer	ROHDE&SCHWARZ	FSU	1166.1660.26	2021.08.25	1 Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2021.08.25	1Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(2106)	2021.08.30	2Year
Filter	KANGMAI	ZLPF-LDC-1000-1959	1209002075	2021.08.25	1Year
RF Cable	Resenberger	Cable 4	N/A	2021.08.25	1Year
Signal Analyzer	Agilent	N9020A	MY499100060	2021.08.25	1Year
vector Signal Generator	Agilent	N5182A	MY49060042	2021.08.25	1Year
vector Signal Generator	Agilent	E4438C	US44271917	2021.08.25	1Year
Amplifier	Agilent	8449B	3008A02664	2021.08.25	1Year
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2021.08.25	1Year
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2020.04.12	2Year
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	/	/
RF Cable	Resenberger	Cable 1	N/A	2021.08.25	1Year
RF Cable	Resenberger	Cable 2	N/A	2021.08.25	1Year
RF Cable	Resenberger	Cable 3	N/A	2021.08.25	1Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	00128	2021.08.30	2Year
Attenuator	HP	8494B	DC-18G	2021.08.25	1Year
Attenuator	HP	8496B	DC-18G	2021.08.25	1Year
Temp. & Humid. Chamber	Wei Huang	WHTH-1000-40-880	100631	2021.08.25	1Year
Power Meter	Agilent	E9300A	MY41496625	2021.08.25	1Year
20dB Attenuator	ICPROBING	IATS1	82347	2021.08.25	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2021.08.25	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2021.08.25	1Year
Oscilloscope	Agilent	54833A	165521	2021.08.25	1Year

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	EZ	Alpha-3A1
CE	EZ-EMC	EZ	Alpha-3A1
RF-CE	MTS 8310	MW	V2.0.0.0

3. Test Results and Measurement Data

3.1. Transmitter Power (Conducted)

3.1.1. Test Specification

Test Requirement:	Part 90.205, RSS-119(5.4)
Test Method:	FCC part 2.1046
Limits:	Please refer section FCC Part 90.205 and , RSS-119(5.4)
Test Setup:	 <pre>graph LR; PM[Power Meter] --- ATT[ATT. 20dB] --- EUT[EUT]</pre>
Test Procedure:	a) Connect the equipment as illustrated. b) Turn on the power meter c) Record value
Test Result:	PASS

3.1.2. Test Results

GMSK mode (1W):						
Channel spacing (KHz)	Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP (dBm)	Stated ERP Power (dBm)	Conducted Output Power Limit (dBm)	Result
12.5	410.050	29.821	31.671	31.85	30 ± 1	PASS
25	410.050	29.772	31.622	31.85	30 ± 1	PASS
12.5	451.000	29.943	31.793	31.85	30 ± 1	PASS
25	451.000	29.817	31.667	31.85	30 ± 1	PASS
12.5	469.950	29.813	31.663	31.85	30 ± 1	PASS
25	469.950	29.754	31.604	31.85	30 ± 1	PASS

GMSK mode (0.5W):						
Channel spacing (KHz)	Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP (dBm)	Stated ERP Power (dBm)	Conducted Output Power Limit (dBm)	Result
12.5	410.050	26.798	28.648	28.84	26.99 ± 1	PASS
25	410.050	26.672	28.522	28.84	26.99 ± 1	PASS
12.5	451.000	26.835	28.685	28.84	26.99 ± 1	PASS
25	451.000	26.733	28.583	28.84	26.99 ± 1	PASS
12.5	469.950	26.711	28.561	28.84	26.99 ± 1	PASS
25	469.950	26.643	28.493	28.84	26.99 ± 1	PASS

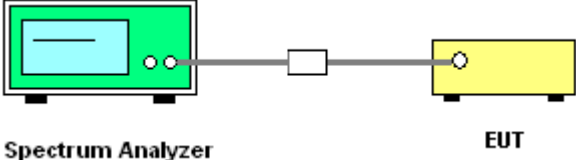
4-FSK mode (1W):						
Channel spacing (KHz)	Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP (dBm)	Stated ERP Power (dBm)	Conducted Output Power Limit (dBm)	Result
6.25	410.050	29.835	31.685	31.85	30 ± 1	PASS
12.5	410.050	29.793	31.643	31.85	30 ± 1	PASS
25	410.050	29.657	31.507	31.85	30 ± 1	PASS
6.25	451.000	29.953	31.803	31.85	30 ± 1	PASS
12.5	451.000	29.906	31.756	31.85	30 ± 1	PASS
25	451.000	29.831	31.681	31.85	30 ± 1	PASS
6.25	469.950	29.912	31.762	31.85	30 ± 1	PASS
12.5	469.950	29.781	31.631	31.85	30 ± 1	PASS
25	469.950	29.644	31.494	31.85	30 ± 1	PASS

4-FSK mode (0.5W):						
Channel spacing (KHz)	Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP (dBm)	Stated ERP Power (dBm)	Conducted Output Power Limit (dBm)	Result
6.25	410.050	26.802	28.652	28.84	26.99 ± 1	PASS
12.5	410.050	26.693	28.543	28.84	26.99 ± 1	PASS
25	410.050	26.612	28.462	28.84	26.99 ± 1	PASS
6.25	451.000	26.868	28.718	28.84	26.99 ± 1	PASS
12.5	451.000	26.751	28.601	28.84	26.99 ± 1	PASS
25	451.000	26.643	28.493	28.84	26.99 ± 1	PASS
6.25	469.950	26.813	28.663	28.84	26.99 ± 1	PASS
12.5	469.950	26.778	28.628	28.84	26.99 ± 1	PASS
25	469.950	26.715	28.565	28.84	26.99 ± 1	PASS

Note: 1. ERP= Maximum Conducted Output Power(Peak) + Antenna Gain – 2.15dB

3.2. Occupied Bandwidth and Emission Mask

3.2.1. Test Specification

Test Requirement:	FCC Part 90.209, FCC Part 90.210, RSS-119(5.5)
Test Setup:	 The diagram illustrates the test setup. On the left is a green box representing the Spectrum Analyzer. A cable connects it to a yellow box on the right, which is labeled EUT. A small white box is positioned in the middle of the cable. Below the green box is the label 'Spectrum Analyzer' and below the yellow box is the label 'EUT'.
Test Procedure:	The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the Frequency band $\pm 50\text{KHz}$ from the carrier frequency for Occupied Bandwidth, the resolution bandwidth of the spectrum analyzer was set at 100 Hz and the spectrum was recorded in the Frequency band $\pm 100\text{KHz}$ from the carrier frequency for Emission Mask.
Test Result:	PASS

3.2.2. Test data

Occupied Bandwidth:

GMSK 12.5KHz Channel Spacing:					
Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	6.186	5.079	11.25	PASS
Mid	451.000	6.173	5.098	11.25	PASS
High	469.950	6.195	5.074	11.25	PASS

GMSK 25KHz Channel Spacing:					
Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	6.455	5.005	20	PASS
Mid	451.000	6.024	4.958	20	PASS
High	469.950	6.478	5.096	20	PASS

Emission Mask:

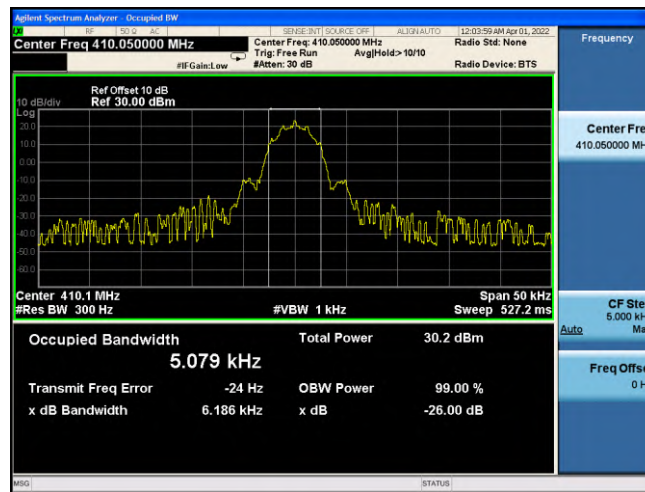
GMSK 12.5KHz Channel Spacing:				
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	D	100Hz	PASS
Mid	451.000	D	100Hz	PASS
High	469.950	D	100Hz	PASS

GMSK 25KHz Channel Spacing:				
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	C	100Hz	PASS
Mid	451.000	C	100Hz	PASS
High	469.950	C	100Hz	PASS

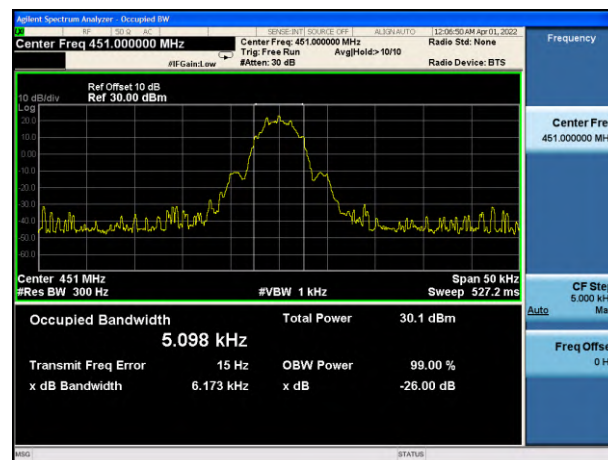
Test plots as follows:

GMSK 12.5KHz Channel Spacing: Occupied Bandwidth

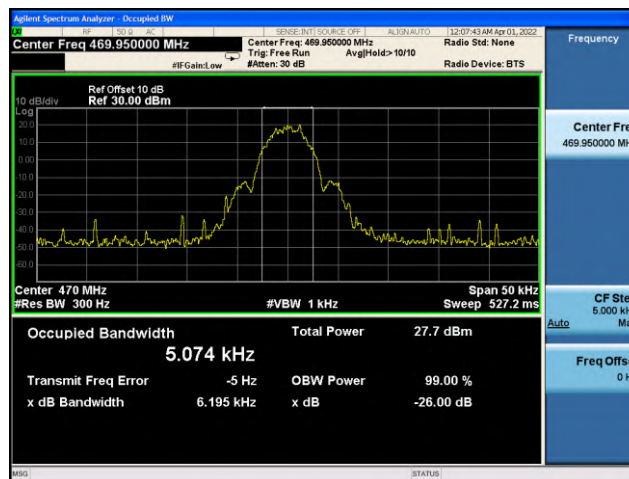
Low: 410.050MHz



Mid: 451.000MHz

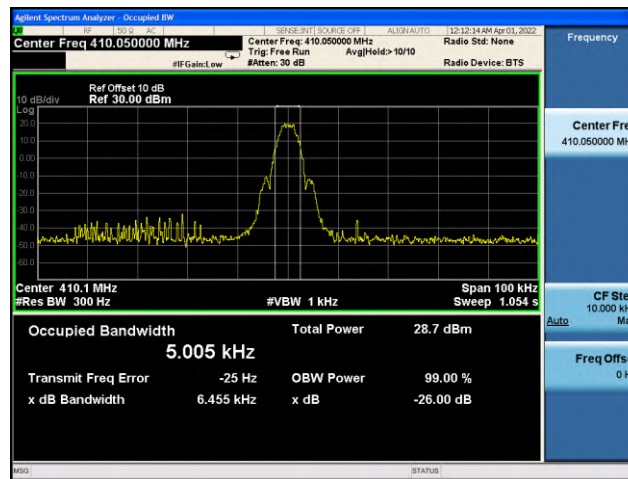


High: 469.950MHz

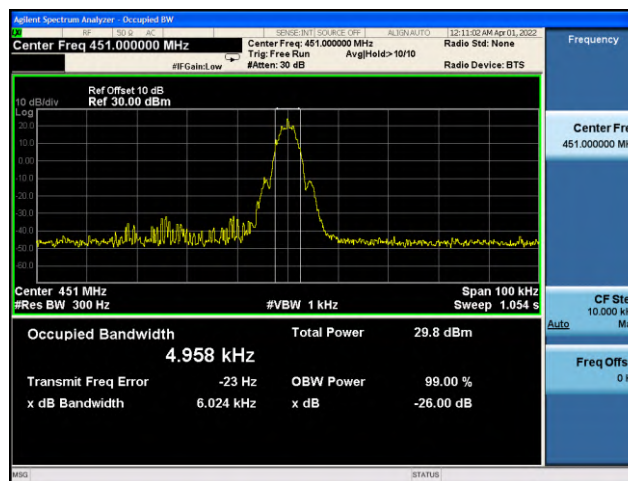


GMSK 25KHz Channel Spacing: Occupied Bandwidth

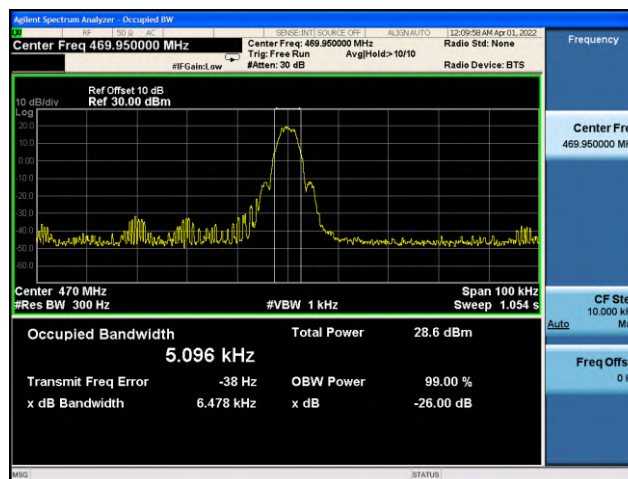
Low: 410.050MHz



Mid: 451.000MHz

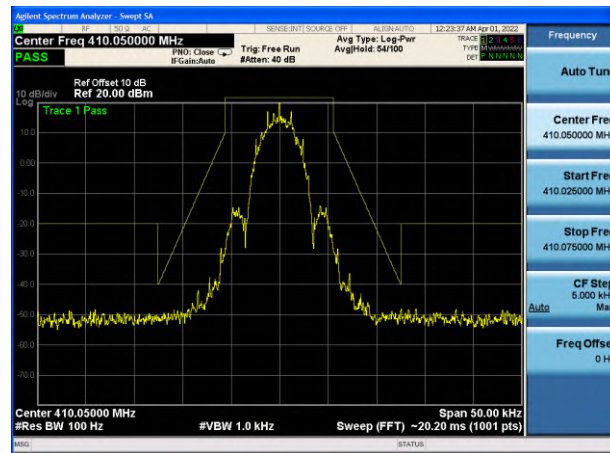


High: 469.850MHz

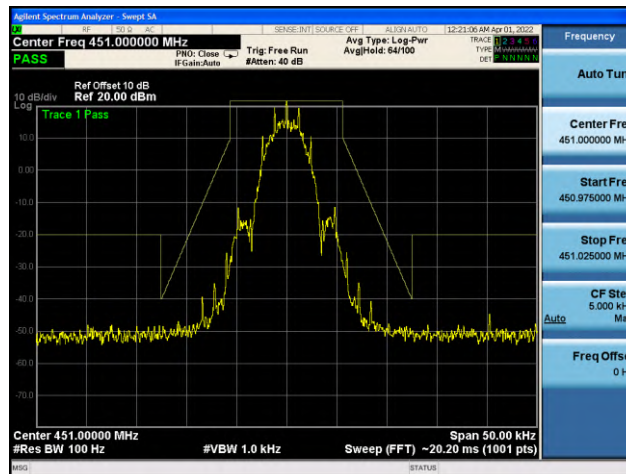


GMSK 12.5KHz Channel Spacing: Emission Mask

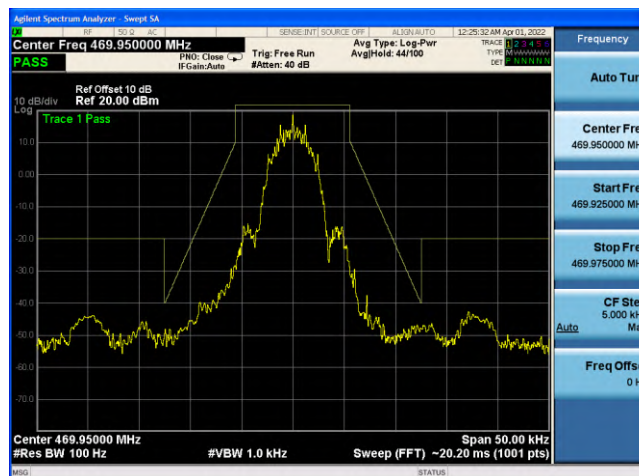
Low: 410.050MHz



Mid: 451.000MHz

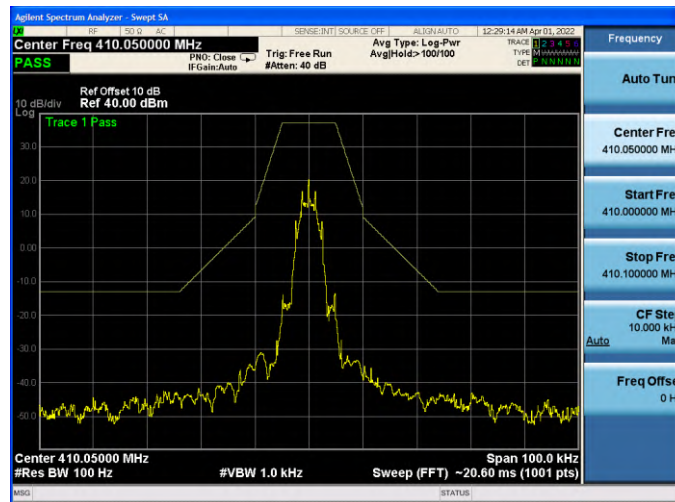


High: 469.950MHz

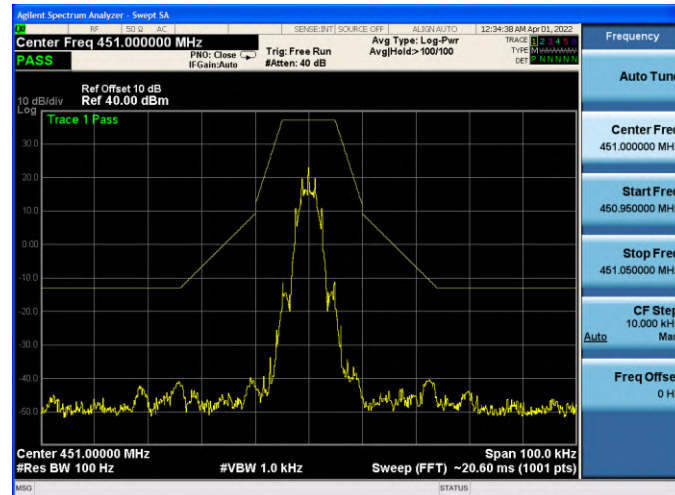


GMSK 25KHz Channel Spacing: Emission Mask

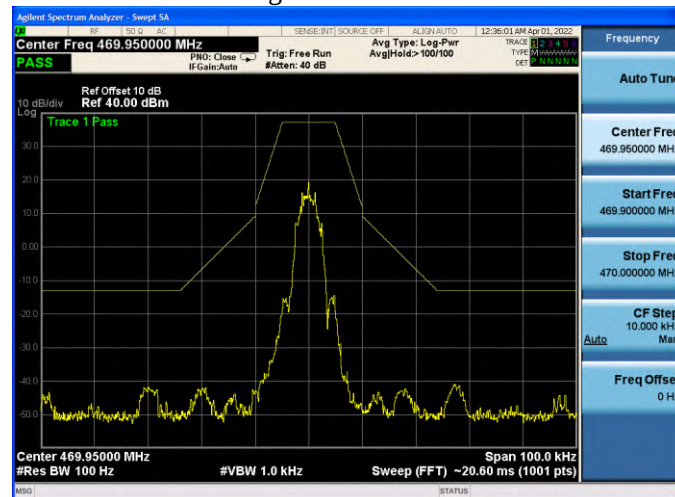
Low: 410.050MHz



Mid: 451.000MHz



High: 469.950MHz



Occupied Bandwidth:**4-FSK 6.25KHz Channel Spacing:**

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	5.128	3.798	6	PASS
Mid	451.000	5.119	3.889	6	PASS
High	469.950	5.151	4.168	6	PASS

4-FSK 12.5KHz Channel Spacing:

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	5.153	3.839	11.25	PASS
Mid	451.000	5.152	3.872	11.25	PASS
High	469.950	5.143	3.901	11.25	PASS

4-FSK 25KHz Channel Spacing:

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	5.191	3.810	20	PASS
Mid	451.000	5.187	4.071	20	PASS
High	469.950	5.200	4.108	20	PASS

4-FSK 6.25KHz Channel Spacing:

Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	E	100Hz	PASS
Mid	451.000	E	100Hz	PASS
High	469.950	E	100Hz	PASS

4-FSK 12.5KHz Channel Spacing:

Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	D	100Hz	PASS
Mid	451.000	D	100Hz	PASS
High	469.950	D	100Hz	PASS

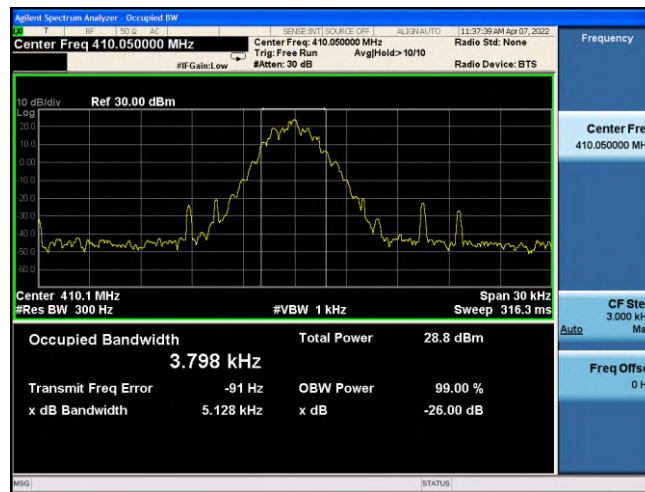
4-FSK 25KHz Channel Spacing:

Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	C	100Hz	PASS
Mid	451.000	C	100Hz	PASS
High	469.950	C	100Hz	PASS

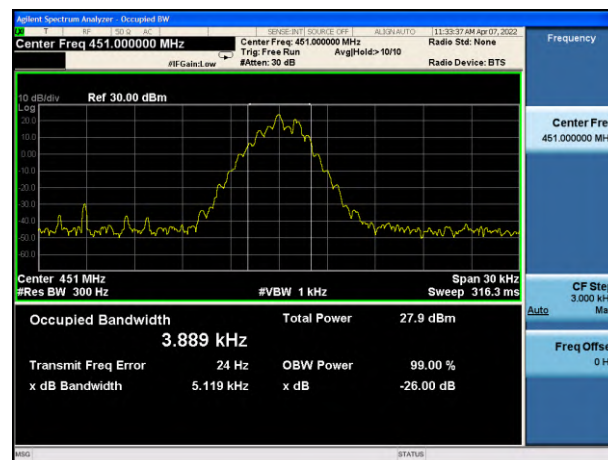
Test plots as follows:

4-FSK 6.25KHz Channel Spacing: Occupied Bandwidth

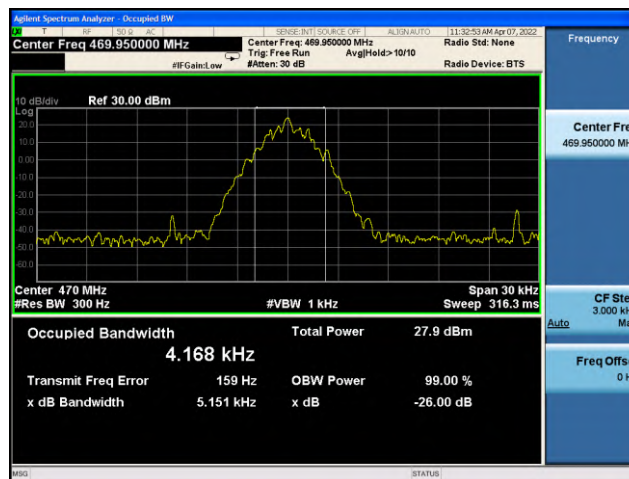
Low: 410.050MHz



Mid: 451.000MHz

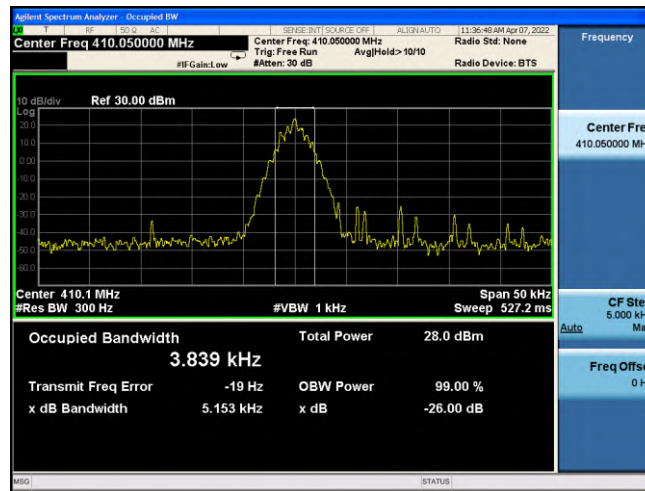


High: 469.950MHz

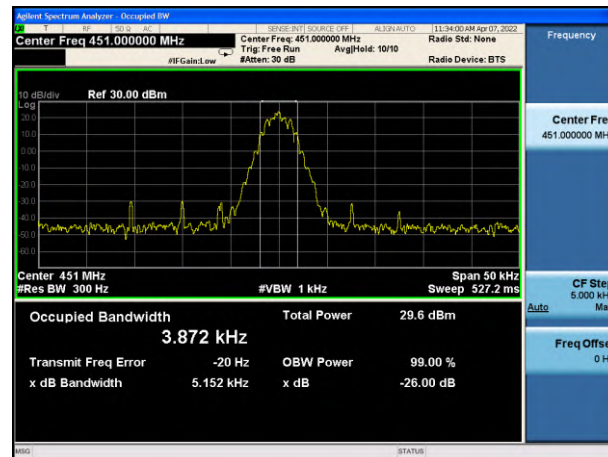


4-FSK 12.5KHz Channel Spacing: Occupied Bandwidth

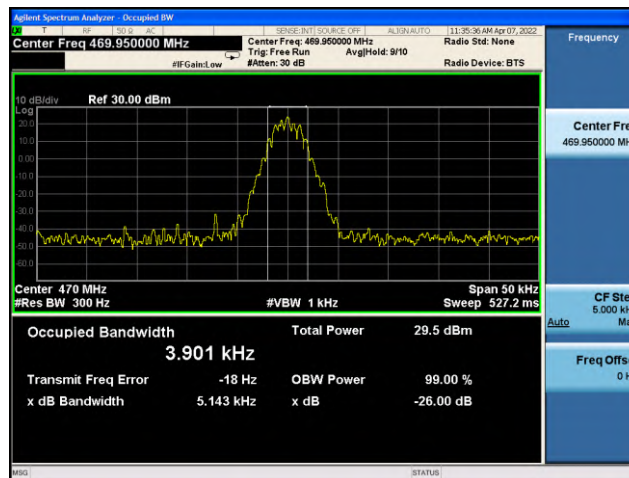
Low: 410.050MHz



Mid: 451.000MHz

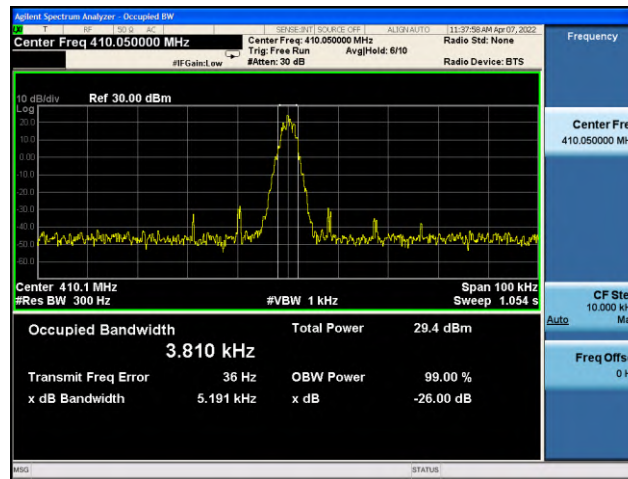


High: 469.950MHz

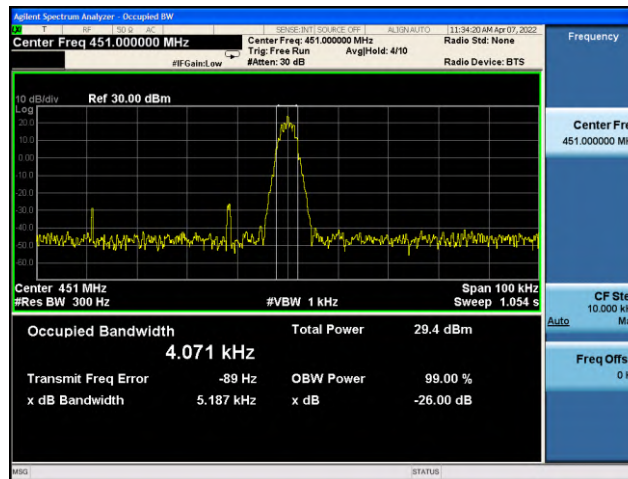


4-FSK 25KHz Channel Spacing: Occupied Bandwidth

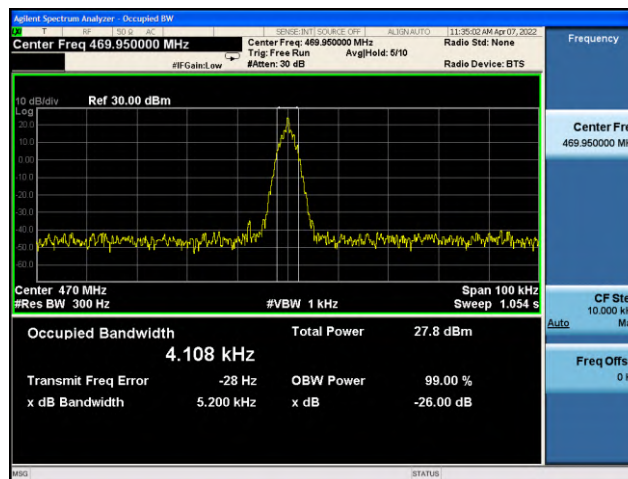
Low: 410.050MHz



Mid: 451.000MHz

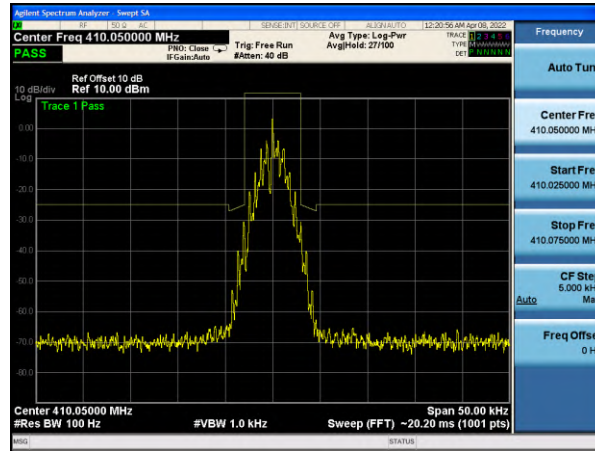


High: 469.950MHz

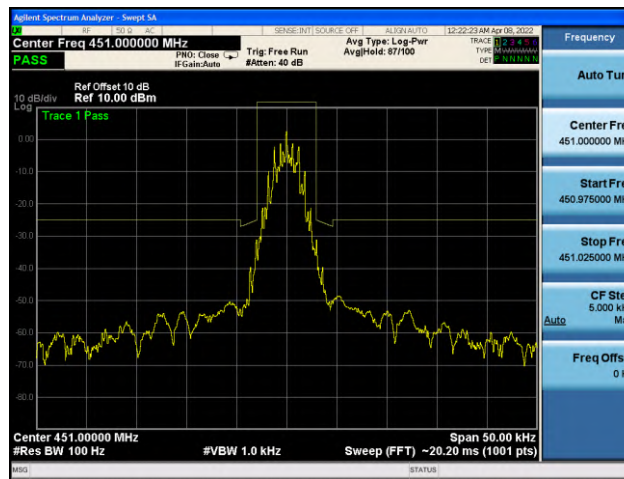


4-FSK 6.25KHz Channel Spacing: Emission Mask

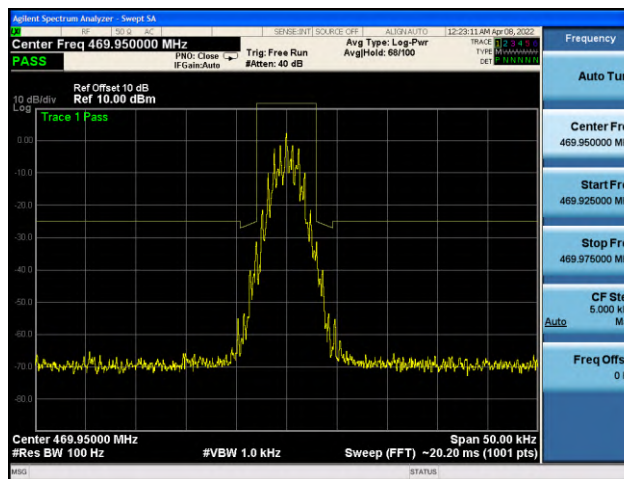
Low: 410.050MHz



Mid: 451.000MHz

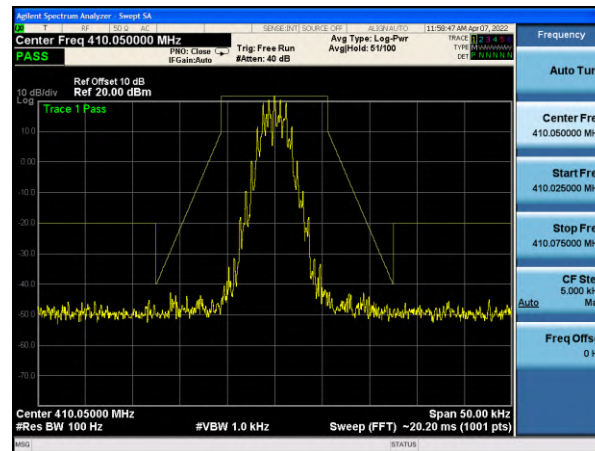


High: 469.950MHz

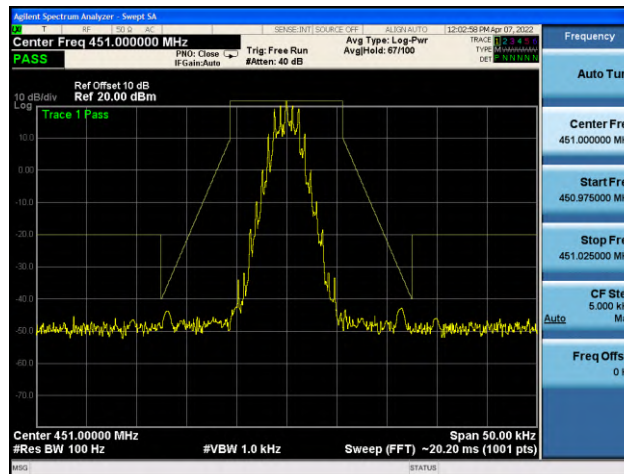


4-FSK 12.5KHz Channel Spacing: Emission Mask

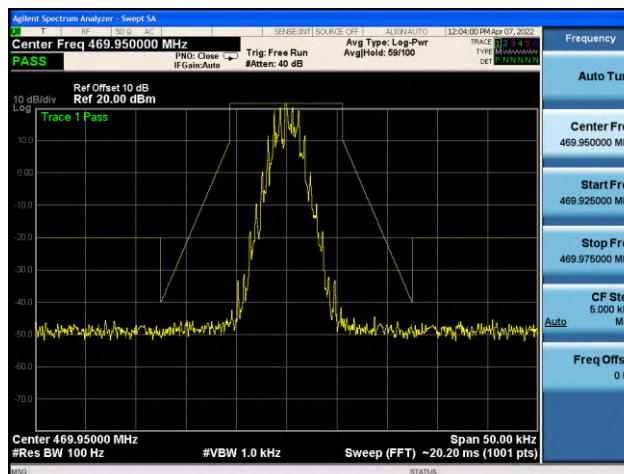
Low: 410.050MHz



Mid: 451.000MHz

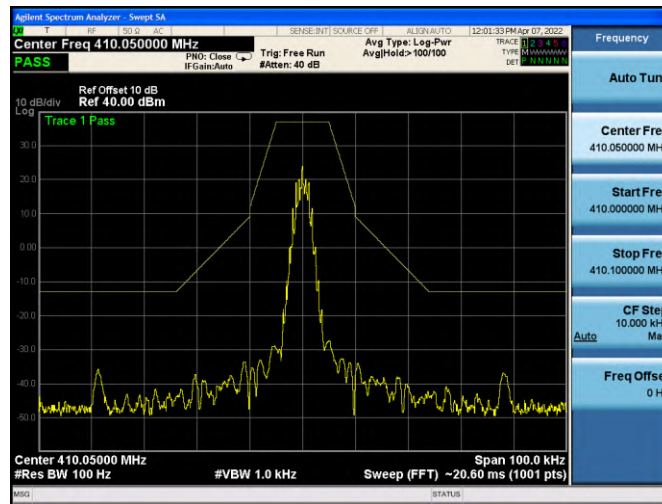


High: 469.950MHz

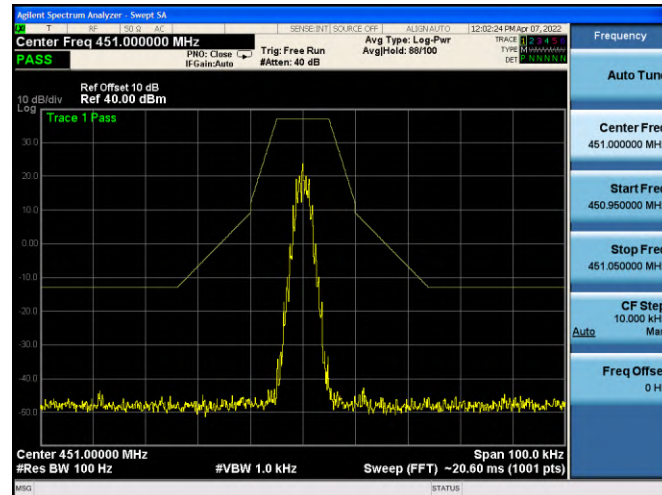


4-FSK 25KHz Channel Spacing: Emission Mask

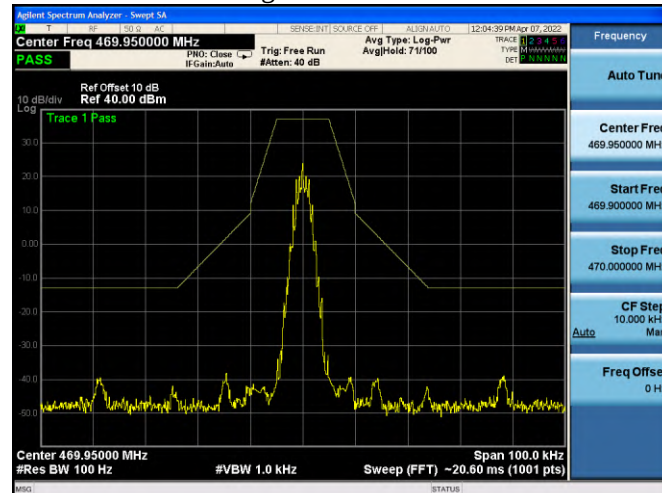
Low: 410.050MHz



Mid: 451.000MHz



High: 469.950MHz



3.3. Spurious Emissions(conducted)

3.3.1.Test Specification

Test Requirement:	FCC Part 90.210, RSS-119(5.8)
Test Setup:	 Spectrum Analyzer EUT
Test Limit:	Modulation Type: GMSK FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12: For 6.25 bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 6.25 kHz at least: $55 + 10 \log (P_{\text{watts}}) = 55 + 10 \log (1.0) = 55.00 \text{ dB}$ Calculation: Limit (dBm) = EL-55-10log10 (TP) Notes: EL is the emission level of the Output Power expressed in dBm, In this application, the EL is 30 dBm for High rated power. High: Limit (dBm) = $30 - 55 - 10 \log (3.0) = -25 \text{ dBm}$ For 12.5 bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz at least: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (1.0) = 50.00 \text{ dB}$ Note: In general, the worst case attenuation requirement shown above was applied. Calculation: Limit (dBm) = EL-50-10log10 (TP) Notes: EL is the emission level of the Output Power expressed in dBm, In this application, the EL is 30 dBm for High rated power. Limit (dBm) = $30.00 - 50 - 10 \log (1.0) = -20 \text{ dBm}$ For 25 kHz bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 62.5 kHz at least: $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (1.0) = 43.00 \text{ dB}$ Note: In general, the worst case attenuation requirement shown above was applied. Calculation: Limit (dBm) = EL-43-10log10 (TP) In this application, the EL is 30 dBm for High rated power. Limit (dBm) = $30.00 - 43 - 10 \log (1.0) = -13 \text{ dBm}$ Note: 1. In general, the worst case attenuation requirement shown above was applied. For emission inside from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of channel spacing, emission mask limit should be compliant. 2. The measurement frequency range from 9 KHz to 5 GHz. 3. *** means that the emission level is too low to be measured or at least 20 dB down than the limit. 4. ERP for below 1GHz and EIRP above 1GHz.

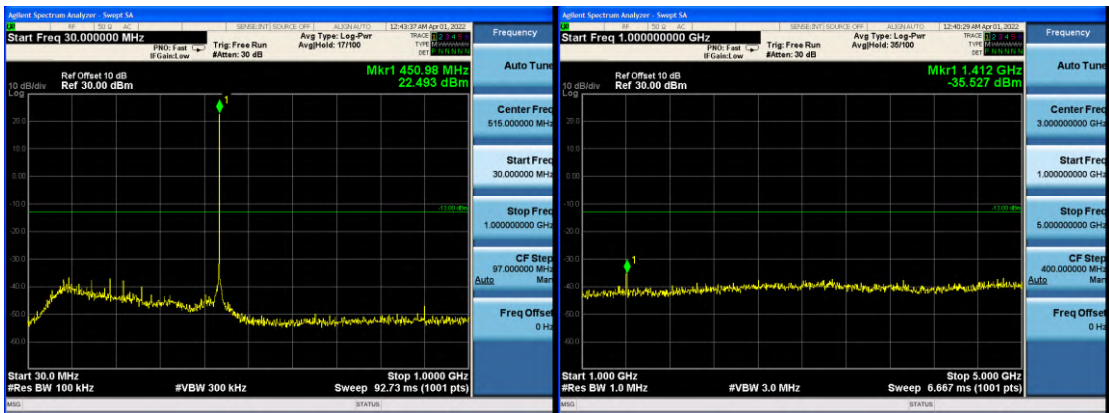
Test Result:	PASS
---------------------	------

3.3.2.Test data

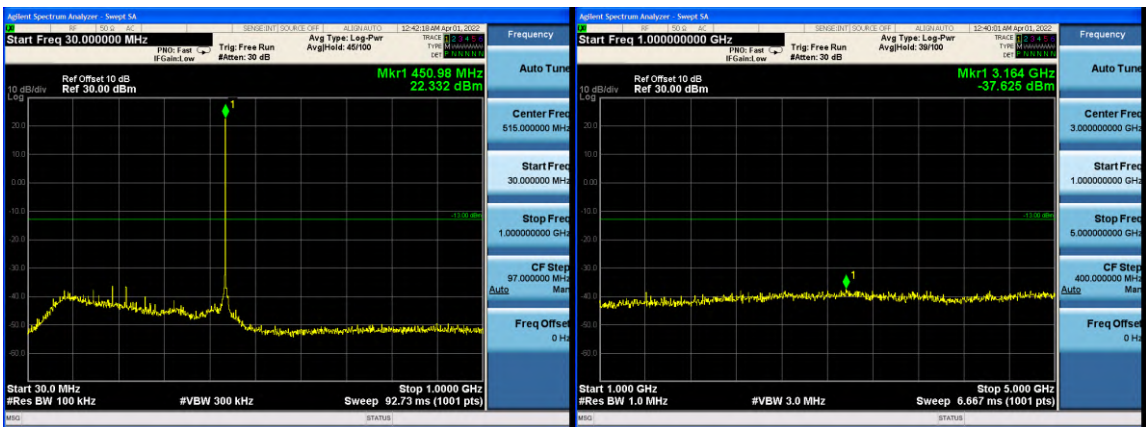
Test plots as follows:

GMSK 12.5KHz Channel Spacing:

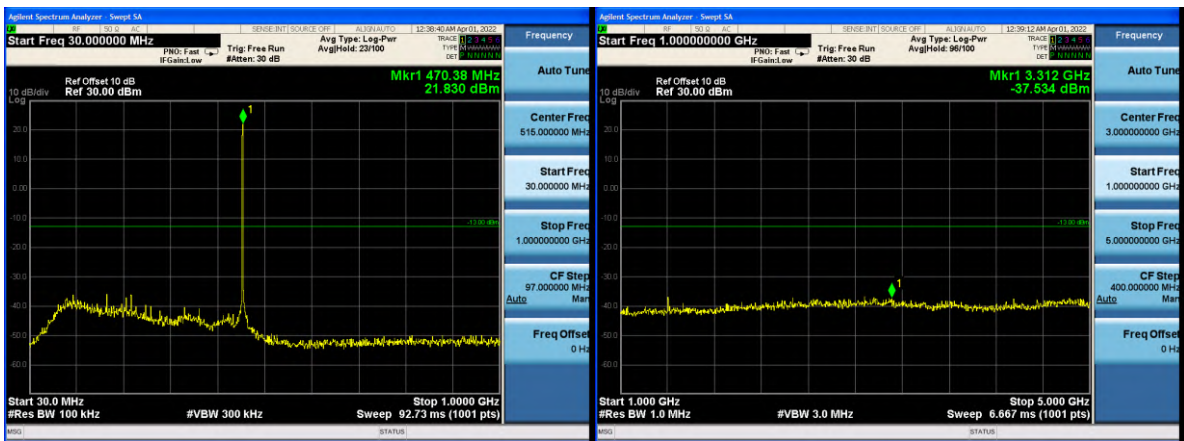
Low: 410.050MHz



Mid: 451.000MHz

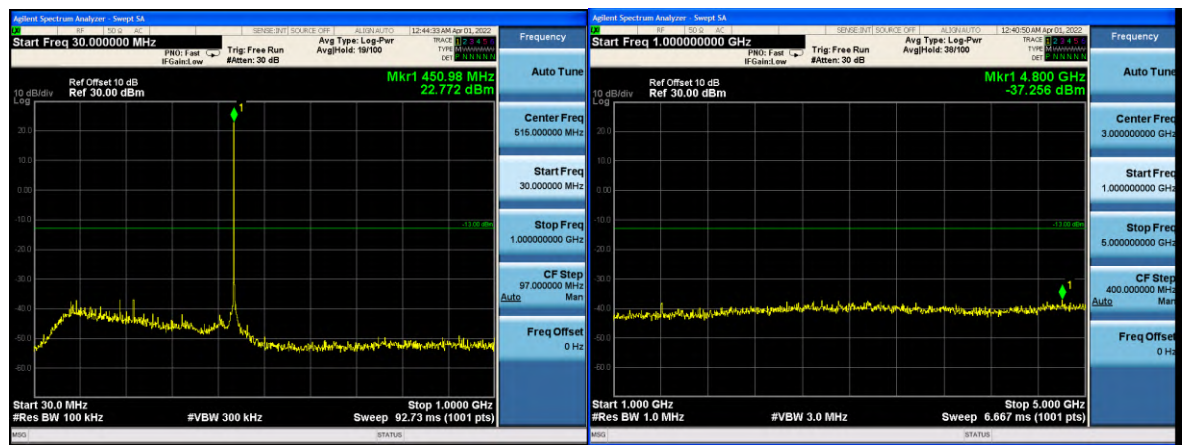


High: 469.950MHz

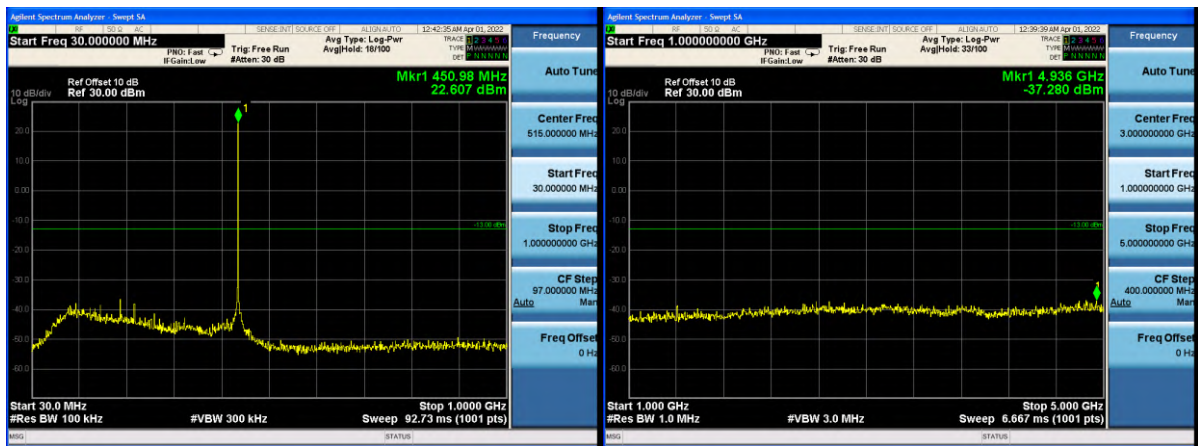


GMSK 25KHz Channel Spacing:

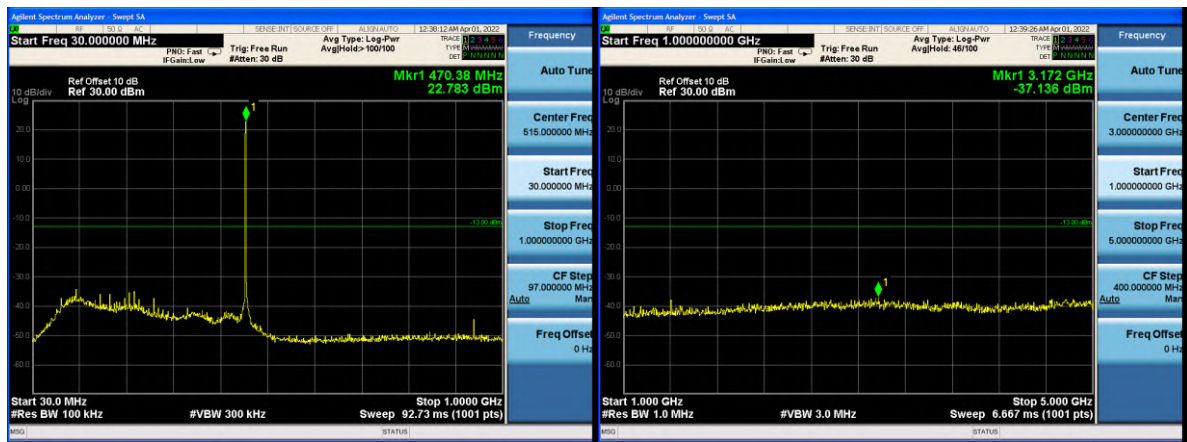
Low: 410.050MHz



Mid: 451.000MHz

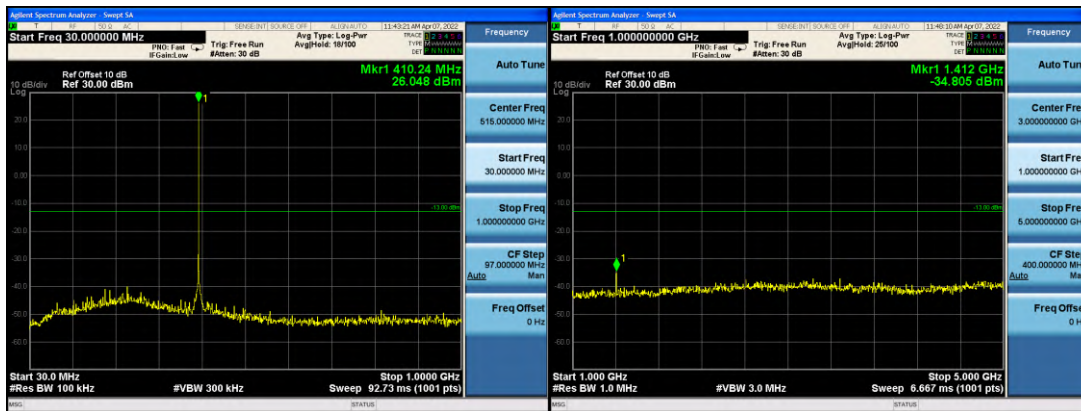


High: 469.950MHz

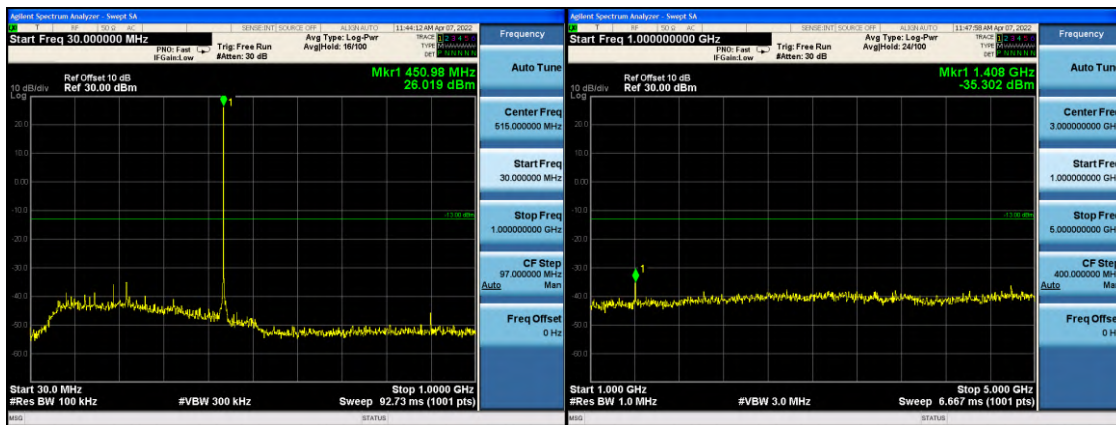


4-FSK 6.25KHz Channel Spacing:

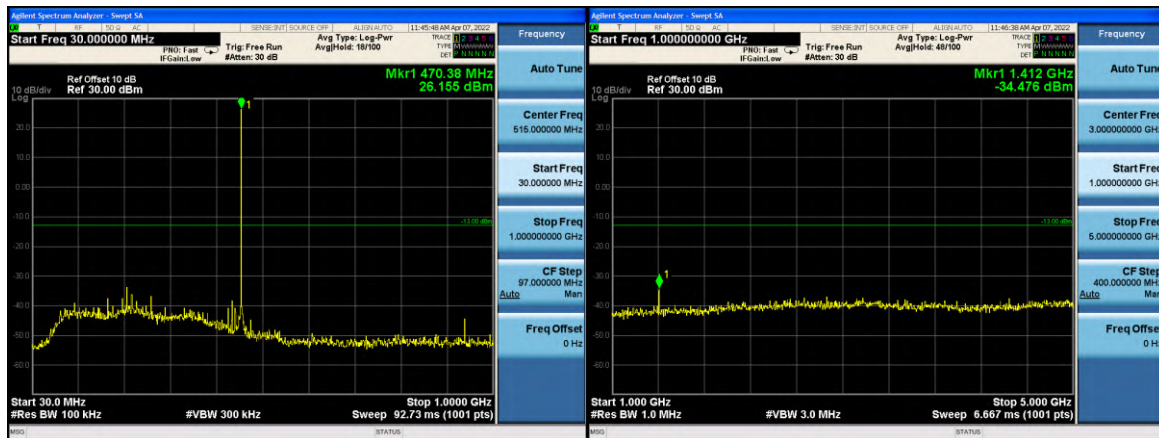
Low: 410.050MHz



Mid: 451.000MHz

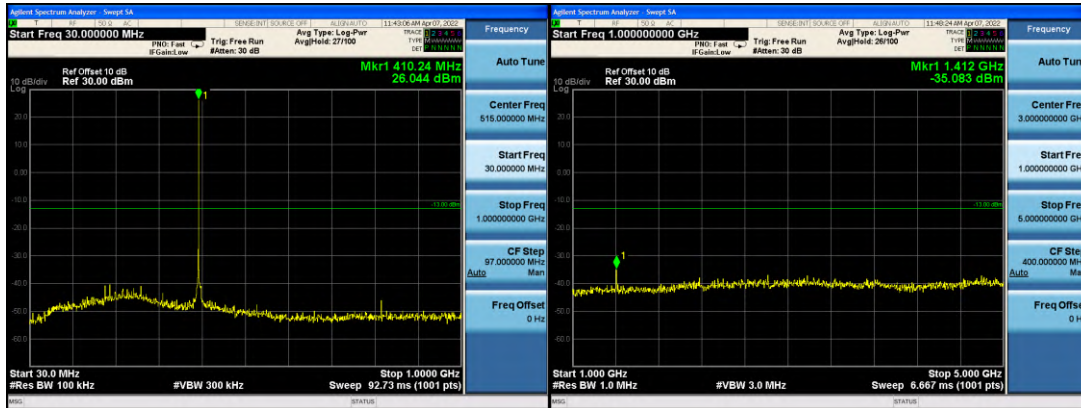


High: 469.950MHz

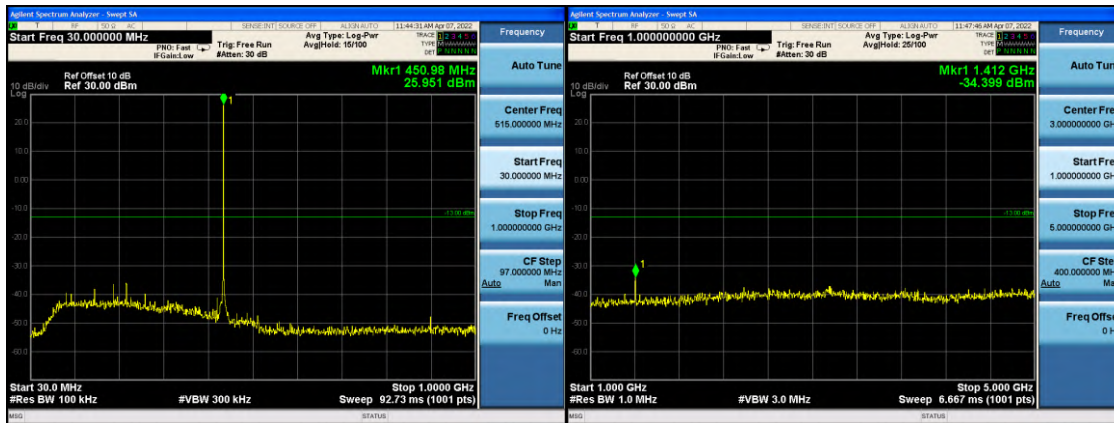


4-FSK 12.5KHz Channel Spacing:

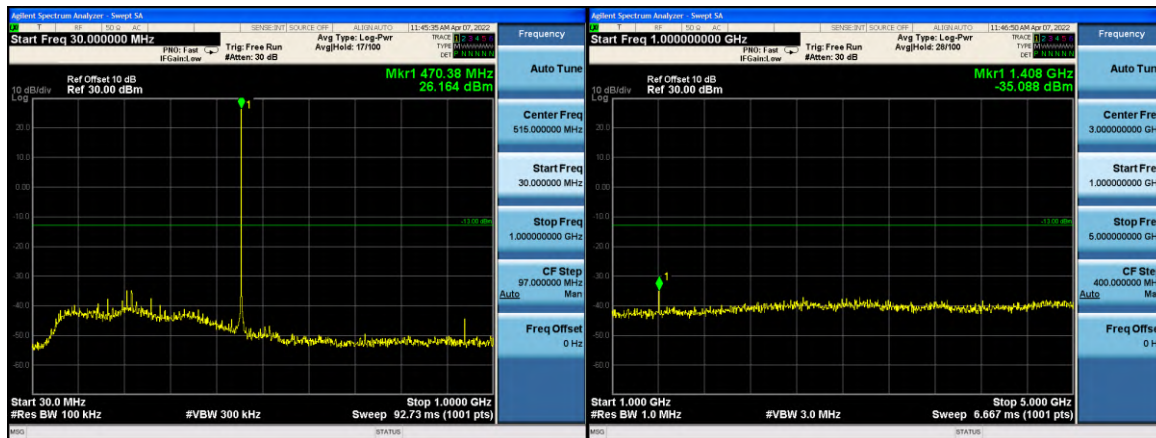
Low: 410.050MHz



Mid: 451.000MHz

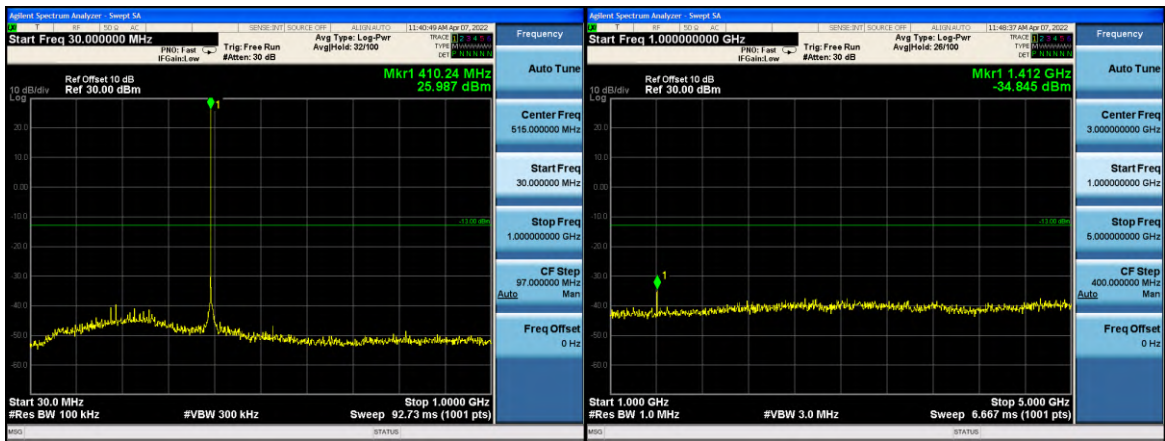


High: 469.950MHz

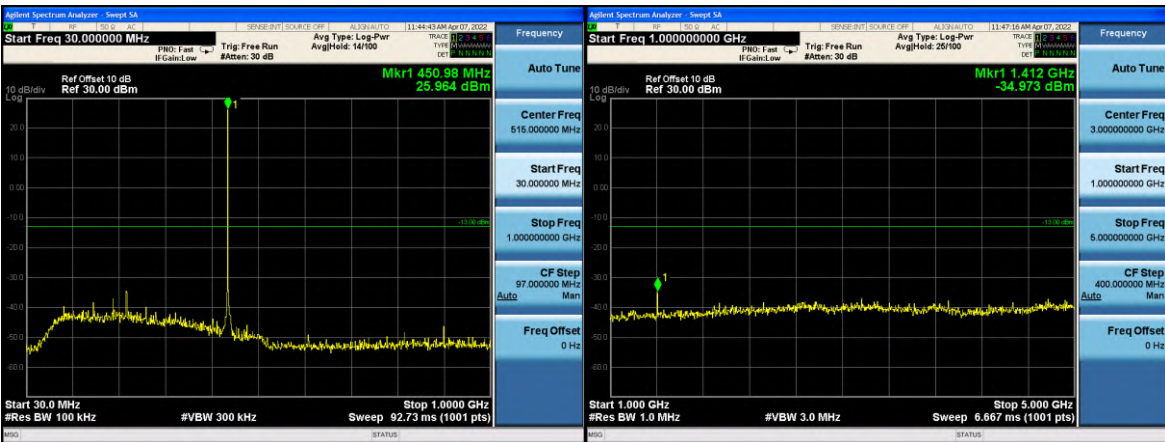


4-FSK 25KHz Channel Spacing:

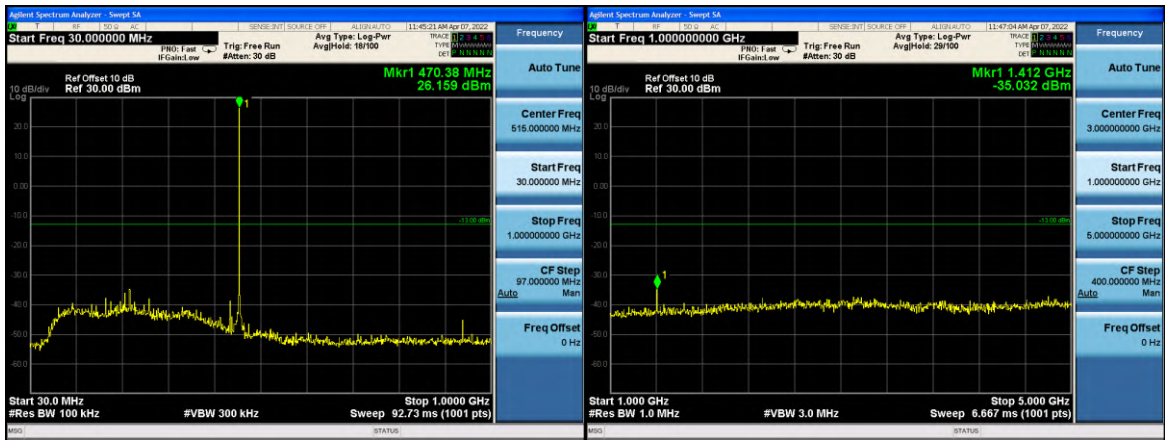
Low: 410.050MHz



Mid: 451.000MHz

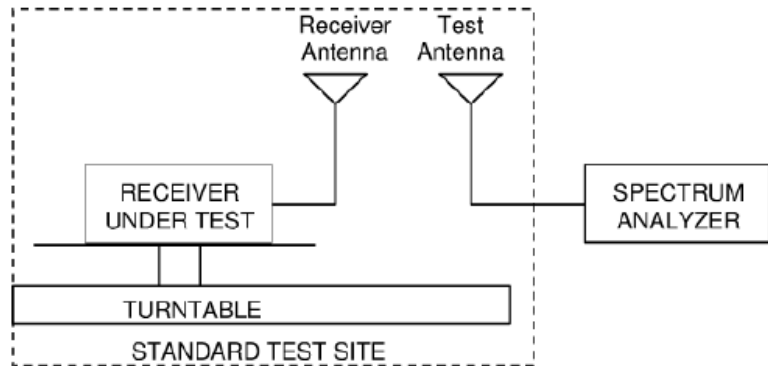


High: 469.950MHz



3.4. Radiated Spurious Emission

3.4.1. Test Specification

Test Requirement:	FCC Part 90.210, RSS-119(5.8)															
Test Method:	ANSI C63.26															
Measurement Distance:	3 m															
Antenna Polarization:	Horizontal & Vertical															
Operation mode:	Refer to item 4.1															
Receiver Setup:	<table><tr><td>Frequency</td><td>RBW</td><td>VBW</td></tr><tr><td>9kHz- 150kHz</td><td>200Hz</td><td>1kHz</td></tr><tr><td>150kHz- 30MHz</td><td>9kHz</td><td>30kHz</td></tr><tr><td>30MHz-1GHz</td><td>100KHz</td><td>300KHz</td></tr><tr><td>Above 1GHz</td><td>1MHz</td><td>3MHz</td></tr></table>	Frequency	RBW	VBW	9kHz- 150kHz	200Hz	1kHz	150kHz- 30MHz	9kHz	30kHz	30MHz-1GHz	100KHz	300KHz	Above 1GHz	1MHz	3MHz
Frequency	RBW	VBW														
9kHz- 150kHz	200Hz	1kHz														
150kHz- 30MHz	9kHz	30kHz														
30MHz-1GHz	100KHz	300KHz														
Above 1GHz	1MHz	3MHz														
Limit:	For equipment using 25 kHz channel spacing, on any frequency removed from the center of the authorized bandwidth by more than 250 percent of the authorized bandwidth: At least $43 + 10\log(P)$ dB. For equipment using 12.5 kHz channel spacing, on any frequency removed from the center of The authorized bandwidth by a displacement frequency (f_d in kHz) of more than 12.5 kHz: At least $50 + 10\log(P)$ dB or 70 dB, whichever is the lesser attenuation.															
Test setup:																
Test Procedure:	The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable. The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT .The test was performed by placing the EUT on 3-orthogonal axis. The frequency range up to teeth harmonic of the fundamental frequency was investigated. Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by															

	the substitution. Spurious emissions in dB =10, 1g (TXpwr in Watts/0.001)-the absolute level Spurious attenuation limit in dB =50+10 Log ₁₀ (power out in Watts) for EUT with a 12.5 kHz and 25KHz channel bandwidth.
Test results:	PASS

3.4.2.Test Data

GMSK:

Test Mode: Low: 410.050MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
152.648	-92.62	V	0.24	31.35	-61.51	-20	-41.51
360.904	-93.19	V	0.26	31.34	-62.11	-20	-42.11
673.313	-96.00	V	0.42	31.24	-65.18	-20	-45.18
863.444	-95.91	V	0.58	30.71	-65.78	-20	-45.78
1263.509	-84.37	V	1.23	26.38	-59.22	-20	-39.22
3864.166	-81.32	V	1.68	25.47	-57.53	-20	-37.53
285.253	-95.91	H	0.43	31.24	-65.10	-20	-45.10
399.050	-93.97	H	0.45	30.68	-63.74	-20	-43.74
479.190	-95.67	H	0.64	30.85	-65.46	-20	-45.46
675.773	-98.14	H	0.79	31.12	-67.81	-20	-47.81
1368.694	-84.46	H	1.29	26.12	-59.63	-20	-39.63
3258.712	-81.49	H	1.62	25.41	-57.7	-20	-37.7

Test Mode: Mid: 451.000MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
155.210	-92.77	V	0.24	31.35	-61.66	-20	-41.66
364.462	-93.80	V	0.26	31.34	-62.72	-20	-42.72
669.814	-96.66	V	0.42	31.24	-65.84	-20	-45.84
862.247	-95.54	V	0.58	30.71	-65.41	-20	-45.41
1261.405	-85.63	V	1.23	26.38	-60.48	-20	-40.48
3858.853	-81.03	V	1.68	25.47	-57.24	-20	-37.24
290.754	-97.12	H	0.43	31.24	-66.31	-20	-46.31
397.852	-94.51	H	0.45	30.68	-64.28	-20	-44.28
479.276	-97.20	H	0.64	30.85	-66.99	-20	-46.99
683.561	-98.25	H	0.79	31.12	-67.92	-20	-47.92
1368.272	-84.32	H	1.29	26.12	-59.49	-20	-39.49
3262.627	-80.66	H	1.62	25.41	-56.87	-20	-36.87

Test Mode: High: 469.950MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
149.976	-93.49	V	0.24	31.35	-62.38	-20	-42.38
363.698	-94.49	V	0.26	31.34	-63.41	-20	-43.41
672.157	-97.35	V	0.42	31.24	-66.53	-20	-46.53
867.135	-96.29	V	0.58	30.71	-66.16	-20	-46.16
1259.426	-85.62	V	1.23	26.38	-60.47	-20	-40.47
3858.867	-80.83	V	1.68	25.47	-57.04	-20	-37.04
290.920	-96.11	H	0.43	31.24	-65.30	-20	-45.30
405.147	-93.99	H	0.45	30.68	-63.76	-20	-43.76
473.758	-96.33	H	0.64	30.85	-66.12	-20	-46.12
677.316	-98.19	H	0.79	31.12	-67.86	-20	-47.86
1372.894	-85.06	H	1.29	26.12	-60.23	-20	-40.23
3264.131	-81.53	H	1.62	25.41	-57.74	-20	-37.74

Test Mode: Low: 410.050MHz, Channel Spacing 25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
149.365	-94.81	V	0.24	31.35	-63.70	-13	-50.70
360.122	-92.13	V	0.26	31.34	-61.05	-13	-48.05
672.254	-93.00	V	0.42	31.24	-62.18	-13	-49.18
867.320	-94.28	V	0.58	30.71	-64.15	-13	-51.15
1259.385	-82.67	V	1.23	26.38	-57.52	-13	-44.52
3856.570	-81.03	V	1.68	25.47	-57.24	-13	-44.24
287.978	-93.88	H	0.43	31.24	-63.07	-13	-50.07
402.660	-97.31	H	0.45	30.68	-67.08	-13	-54.08
475.190	-95.40	H	0.64	30.85	-65.19	-13	-52.19
678.902	-94.43	H	0.79	31.12	-64.1	-13	-51.1
1370.493	-83.12	H	1.29	26.12	-58.29	-13	-45.29
3258.430	-79.76	H	1.62	25.41	-55.97	-13	-42.97

Test Mode; Mid: 451.000MHz, Channel Spacing 25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
157.727	-95.11	V	0.24	31.35	-64.00	-13	-51.00
361.299	-91.28	V	0.26	31.34	-60.20	-13	-47.20
670.384	-93.77	V	0.42	31.24	-62.95	-13	-49.95
859.190	-94.03	V	0.58	30.71	-63.90	-13	-50.90
1262.116	-82.68	V	1.23	26.38	-57.53	-13	-44.53
3860.246	-80.11	V	1.68	25.47	-56.32	-13	-43.32
285.515	-94.95	H	0.43	31.24	-64.14	-13	-51.14
404.347	-97.23	H	0.45	30.68	-67	-13	-54
472.970	-95.86	H	0.64	30.85	-65.65	-13	-52.65
682.270	-94.14	H	0.79	31.12	-63.81	-13	-50.81
1370.178	-82.92	H	1.29	26.12	-58.09	-13	-45.09
3261.045	-79.05	H	1.62	25.41	-55.26	-13	-42.26

Test Mode: High: 469.950MHz, Channel Spacing 25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
154.820	-94.09	V	0.24	31.35	-62.98	-13	-49.98
363.368	-91.15	V	0.26	31.34	-60.07	-13	-47.07
670.811	-93.50	V	0.42	31.24	-62.68	-13	-49.68
865.805	-94.46	V	0.58	30.71	-64.33	-13	-51.33
1258.551	-79.43	V	1.23	26.38	-54.28	-13	-41.28
3858.923	-78.81	V	1.68	25.47	-55.02	-13	-42.02
291.012	-95.08	H	0.43	31.24	-64.27	-13	-51.27
400.454	-96.14	H	0.45	30.68	-65.91	-13	-52.91
475.645	-94.94	H	0.64	30.85	-64.73	-13	-51.73
680.453	-97.71	H	0.79	31.12	-67.38	-13	-54.38
1373.809	-82.19	H	1.29	26.12	-57.36	-13	-44.36
3264.509	-77.71	H	1.62	25.41	-53.92	-13	-40.92

4-FSK:

Test Mode: Low: 410.050MHz, Channel Spacing 6.25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
152.648	-93.28	V	0.24	31.35	-62.17	-27	-35.17
360.904	-93.37	V	0.26	31.34	-62.29	-27	-35.29
673.313	-96.47	V	0.42	31.24	-65.65	-27	-38.65
863.444	-96.49	V	0.58	30.71	-66.36	-27	-39.36
1263.509	-85.03	V	1.23	26.38	-59.88	-27	-32.88
3864.166	-81.37	V	1.68	25.47	-57.58	-27	-30.58
285.253	-96.54	H	0.43	31.24	-65.73	-27	-38.73
399.050	-94.18	H	0.45	30.68	-63.95	-27	-36.95
479.190	-96.12	H	0.64	30.85	-65.91	-27	-38.91
675.773	-98.43	H	0.79	31.12	-68.1	-27	-41.1
1368.694	-84.39	H	1.29	26.12	-59.56	-27	-32.56
3258.712	-81.49	H	1.62	25.41	-57.7	-27	-30.7

Test Mode: Mid: 451.000MHz, Channel Spacing 6.25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
155.210	-92.95	V	0.24	31.35	-61.84	-27	-34.84
364.462	-93.33	V	0.26	31.34	-62.25	-27	-35.25
669.814	-97.26	V	0.42	31.24	-66.44	-27	-39.44
862.247	-96.34	V	0.58	30.71	-66.21	-27	-39.21
1261.405	-85.19	V	1.23	26.38	-60.04	-27	-33.04
3858.853	-81.61	V	1.68	25.47	-57.82	-27	-30.82
290.754	-97.04	H	0.43	31.24	-66.23	-27	-39.23
397.852	-94.34	H	0.45	30.68	-64.11	-27	-37.11
479.276	-97.03	H	0.64	30.85	-66.82	-27	-39.82
683.561	-98.11	H	0.79	31.12	-67.78	-27	-40.78
1368.272	-84.37	H	1.29	26.12	-59.54	-27	-32.54
3262.627	-80.66	H	1.62	25.41	-56.87	-27	-29.87

Test Mode: High: 469.950MHz, Channel Spacing 6.25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
149.976	-93.69	V	0.24	31.35	-62.58	-27	-35.58
363.698	-94.27	V	0.26	31.34	-63.19	-27	-36.19
672.157	-96.96	V	0.42	31.24	-66.14	-27	-39.14
867.135	-96.46	V	0.58	30.71	-66.33	-27	-39.33
1259.426	-85.62	V	1.23	26.38	-60.47	-27	-33.47
3858.867	-80.80	V	1.68	25.47	-57.01	-27	-30.01
290.920	-96.73	H	0.43	31.24	-65.92	-27	-38.92
405.147	-94.02	H	0.45	30.68	-63.79	-27	-36.79
473.758	-96.53	H	0.64	30.85	-66.32	-27	-39.32
677.316	-98.51	H	0.79	31.12	-68.18	-27	-41.18
1372.894	-85.13	H	1.29	26.12	-60.30	-27	-33.3
3264.131	-81.52	H	1.62	25.41	-57.73	-27	-30.73

Test Mode: Low: 410.050MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
152.648	-93.06	V	0.24	31.35	-61.95	-20	-41.95
360.904	-93.37	V	0.26	31.34	-62.29	-20	-42.29
673.313	-96.36	V	0.42	31.24	-65.54	-20	-45.54
863.444	-95.59	V	0.58	30.71	-65.46	-20	-45.46
1263.509	-84.37	V	1.23	26.38	-59.22	-20	-39.22
3864.166	-80.96	V	1.68	25.47	-57.17	-20	-37.17
285.253	-95.67	H	0.43	31.24	-64.86	-20	-44.86
399.050	-93.66	H	0.45	30.68	-63.43	-20	-43.43
479.190	-96.45	H	0.64	30.85	-66.24	-20	-46.24
675.773	-98.85	H	0.79	31.12	-68.52	-20	-48.52
1368.694	-84.38	H	1.29	26.12	-59.55	-20	-39.55
3258.712	-81.51	H	1.62	25.41	-57.72	-20	-37.72

Test Mode: Mid: 451.000MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
155.210	-93.13	V	0.24	31.35	-62.02	-20	-42.02
364.462	-93.40	V	0.26	31.34	-62.32	-20	-42.32
669.814	-97.18	V	0.42	31.24	-66.36	-20	-46.36
862.247	-95.67	V	0.58	30.71	-65.54	-20	-45.54
1261.405	-85.15	V	1.23	26.38	-60.00	-20	-40.00
3858.853	-81.30	V	1.68	25.47	-57.51	-20	-37.51
290.754	-96.60	H	0.43	31.24	-65.79	-20	-45.79
397.852	-93.95	H	0.45	30.68	-63.72	-20	-43.72
479.276	-96.72	H	0.64	30.85	-66.51	-20	-46.51
683.561	-97.44	H	0.79	31.12	-67.11	-20	-47.11
1368.272	-84.38	H	1.29	26.12	-59.55	-20	-39.55
3262.627	-80.69	H	1.62	25.41	-56.9	-20	-36.9

Test Mode: High: 469.950MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
149.976	-93.59	V	0.24	31.35	-62.48	-20	-42.48
363.698	-94.09	V	0.26	31.34	-63.01	-20	-43.01
672.157	-97.03	V	0.42	31.24	-66.21	-20	-46.21
867.135	-95.99	V	0.58	30.71	-65.86	-20	-45.86
1259.426	-84.91	V	1.23	26.38	-59.76	-20	-39.76
3858.867	-80.55	V	1.68	25.47	-56.76	-20	-36.76
290.920	-96.73	H	0.43	31.24	-65.92	-20	-45.92
405.147	-93.64	H	0.45	30.68	-63.41	-20	-43.41
473.758	-96.66	H	0.64	30.85	-66.45	-20	-46.45
677.316	-98.86	H	0.79	31.12	-68.53	-20	-48.53
1372.894	-85.11	H	1.29	26.12	-60.28	-20	-40.28
3264.131	-81.53	H	1.62	25.41	-57.74	-20	-37.74

Test Mode: Low: 410.050MHz, Channel Spacing 25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
149.365	-95.21	V	0.24	31.35	-64.10	-13	-51.10
360.122	-92.19	V	0.26	31.34	-61.11	-13	-48.11
672.254	-93.36	V	0.42	31.24	-62.54	-13	-49.54
867.320	-94.55	V	0.58	30.71	-64.42	-13	-51.42
1259.385	-83.41	V	1.23	26.38	-58.26	-13	-45.26
3856.570	-81.18	V	1.68	25.47	-57.39	-13	-44.39
287.978	-93.87	H	0.43	31.24	-63.06	-13	-50.06
402.660	-98.10	H	0.45	30.68	-67.87	-13	-54.87
475.190	-95.15	H	0.64	30.85	-64.94	-13	-51.94
678.902	-94.20	H	0.79	31.12	-63.87	-13	-50.87
1370.493	-83.09	H	1.29	26.12	-58.26	-13	-45.26
3258.430	-79.73	H	1.62	25.41	-55.94	-13	-42.94

Test Mode; Mid: 451.000MHz, Channel Spacing 25KHz

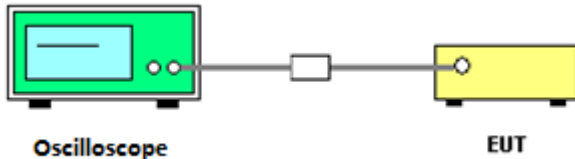
Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
157.727	-95.18	V	0.24	31.35	-64.07	-13	-51.07
361.299	-91.01	V	0.26	31.34	-59.93	-13	-46.93
670.384	-93.47	V	0.42	31.24	-62.65	-13	-49.65
859.190	-94.39	V	0.58	30.71	-64.26	-13	-51.26
1262.116	-82.82	V	1.23	26.38	-57.67	-13	-44.67
3860.246	-81.04	V	1.68	25.47	-57.25	-13	-44.25
285.515	-94.90	H	0.43	31.24	-64.09	-13	-51.09
404.347	-96.34	H	0.45	30.68	-66.11	-13	-53.11
472.970	-95.57	H	0.64	30.85	-65.36	-13	-52.36
682.270	-94.40	H	0.79	31.12	-64.07	-13	-51.07
1370.178	-82.95	H	1.29	26.12	-58.12	-13	-45.12
3261.045	-79.07	H	1.62	25.41	-55.28	-13	-42.28

Test Mode: High: 469.950MHz, Channel Spacing 25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
154.820	-94.57	V	0.24	31.35	-63.46	-13	-50.46
363.368	-91.10	V	0.26	31.34	-60.02	-13	-47.02
670.811	-93.62	V	0.42	31.24	-62.8	-13	-49.8
865.805	-93.80	V	0.58	30.71	-63.67	-13	-50.67
1258.551	-78.92	V	1.23	26.38	-53.77	-13	-40.77
3858.923	-78.72	V	1.68	25.47	-54.93	-13	-41.93
291.012	-95.23	H	0.43	31.24	-64.42	-13	-51.42
400.454	-95.85	H	0.45	30.68	-65.62	-13	-52.62
475.645	-95.05	H	0.64	30.85	-64.84	-13	-51.84
680.453	-97.84	H	0.79	31.12	-67.51	-13	-54.51
1373.809	-82.25	H	1.29	26.12	-57.42	-13	-44.42
3264.509	-77.67	H	1.62	25.41	-53.88	-13	-40.88

3.5. Transient Frequency Behavior

3.5.1. Test Specification

Test Requirement:	FCC Part 90.214, RSS-119(5.9)																																																		
Test Setup:	 OscilloscopeEUT																																																		
Test Limit	<table><tr><th rowspan="2">Channel Bandwidth (kHz)</th><th rowspan="2">Time Intervals (Notes 1, 2)</th><th rowspan="2">Maximum Frequency Difference (kHz)</th><th colspan="2">Transient Duration Limit (ms)</th></tr><tr><th>138-174 MHz</th><th>406.1-512 MHz</th></tr><tr><td rowspan="3">25</td><td>t₁</td><td>±25</td><td>5</td><td>10</td></tr><tr><td>t₂</td><td>±12.5</td><td>20</td><td>25</td></tr><tr><td>t₃</td><td>±25</td><td>5</td><td>10</td></tr><tr><td rowspan="3">12.5</td><td>t₁</td><td>±12.5</td><td>5</td><td>10</td></tr><tr><td>t₂</td><td>±6.25</td><td>20</td><td>25</td></tr><tr><td>t₃</td><td>±12.5</td><td>5</td><td>10</td></tr><tr><td rowspan="3">6.25</td><td>t₁</td><td>±6.25</td><td>5</td><td>10</td></tr><tr><td>t₂</td><td>±3.125</td><td>20</td><td>25</td></tr><tr><td>t₃</td><td>±6.25</td><td>5</td><td>10</td></tr></table>	Channel Bandwidth (kHz)	Time Intervals (Notes 1, 2)	Maximum Frequency Difference (kHz)	Transient Duration Limit (ms)		138-174 MHz	406.1-512 MHz	25	t ₁	±25	5	10	t ₂	±12.5	20	25	t ₃	±25	5	10	12.5	t ₁	±12.5	5	10	t ₂	±6.25	20	25	t ₃	±12.5	5	10	6.25	t ₁	±6.25	5	10	t ₂	±3.125	20	25	t ₃	±6.25	5	10				
Channel Bandwidth (kHz)	Time Intervals (Notes 1, 2)				Maximum Frequency Difference (kHz)	Transient Duration Limit (ms)																																													
		138-174 MHz	406.1-512 MHz																																																
25	t ₁	±25	5	10																																															
	t ₂	±12.5	20	25																																															
	t ₃	±25	5	10																																															
12.5	t ₁	±12.5	5	10																																															
	t ₂	±6.25	20	25																																															
	t ₃	±12.5	5	10																																															
6.25	t ₁	±6.25	5	10																																															
	t ₂	±3.125	20	25																																															
	t ₃	±6.25	5	10																																															
Test Procedure:	The EUT was set in the climate chamber and connected to an external DC power supply and AC power supply. The RF output was directly connected to Oscilloscope. The coupling loss of the additional cables was recorded and taken in account for all the measurements. The result was recorded.																																																		
Test Result:	PASS																																																		

3.5.2. Test data

Test Plots for channel spacing 25KHz, EUT power setting: Maximum.

Power On



Power Off



Remark: Only list the worst data for channel spacing 25KHz, modulation GMSK.

3.6. Behavior Frequency Stability

3.6.1. Test Specification

Test Requirement:	FCC Part 90.213, RSS-119(5.3)
Test Method:	ANSI C63.26, RSS-Gen
Test Setup:	<pre> graph LR Laptop[Laptop] --- EUT[Equipment Under Test] EUT --- ACDC[AC/DC Adapter] EUT --- Att[Attenuator(s)] Att --- MC[Mini-Circuit Combiner] MC --- RFCT[RF Communication Test Set] MC --- MA[Modulation Analyzer] RFCT --- RF[RF Detector] MA --- HPO[Hewlett Packard Infinium Digitizing Oscilloscope] </pre>
Test Procedure:	Method of Measurement: After temperature stabilization (approx. 20 min for each stage), the frequency for the lower, the middle and the highest frequency range was recorded. For Frequency stability Vs. Voltage the EUT was connected to a DC power supply or AC power supply and the voltage was adjusted in the required ranges.
Test Result:	PASS

3.6.2. Test data

Conclusion: PASS			
Mode	Voltage (V)	Frequency error (Hz)	frequency error (ppm)
Middle Channel 6.25KHz Channel Spacing	3.6	4	0.0089
	3.5	4	0.0089
	3.4	5	0.0111
	3.3	2	0.0044
	3.2	3	0.0067
	3.1	2	0.0044
Limit	1ppm		
Middle Channel 12.5KHz Channel Spacing	3.6	3	0.0067
	3.5	4	0.0089
	3.4	3	0.0067
	3.3	3	0.0067
	3.2	2	0.0044
	3.1	3	0.0067
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	3.6	5	0.0111
	3.5	5	0.0111
	3.4	4	0.0089
	3.3	3	0.0067
	3.2	3	0.0067
	3.1	4	0.0089
Limit	5ppm		

Mode	Temperature (°C)	Frequency error (Hz)	frequency error (ppm)
Middle Channel 6.25KHz Channel Spacing	-20	8	0.0177
	-10	5	0.0111
	0	6	0.0133
	10	5	0.0111
	20	5	0.0111
	30	6	0.0133
	40	8	0.0177
	50	7	0.0155
Limit	1ppm		
Middle Channel 12.5KHz Channel Spacing	-20	9	0.0200
	-10	7	0.0155
	0	8	0.0177
	10	8	0.0177
	20	6	0.0133
	30	7	0.0155
	40	9	0.0200
	50	10	0.0222
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	-20	16	0.0355
	-10	15	0.0333
	0	13	0.0288
	10	15	0.0333
	20	10	0.0222
	30	14	0.0310
	40	16	0.0355
	50	16	0.0355
Limit	5ppm		

3.7. Modulation Characteristic

Test Requirement:	FCC Part 90.207
Test Result:	According to FCC § 2.1047(d), Part 22, 74, 90 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

3.8. Adjacent channel power

Test Requirement:	FCC Part 90.221												
Test Setup:	 Spectrum AnalyzerEUT												
Test Limit:	Maximum adjacent power levels for frequencies in the 450–470 MHz band, no need compliance with below -36dBm: <table><thead><tr><th>Frequency offset</th><th>Maximum ACP (dBc) for devices 1 watt and less</th><th>Maximum ACP (dBc) for devices above 1 watt</th></tr></thead><tbody><tr><td>25 kHz</td><td>– 55 dBc</td><td>– 60 dBc</td></tr><tr><td>50 kHz</td><td>– 70 dBc</td><td>– 70 dBc</td></tr><tr><td>75 kHz</td><td>– 70 dBc</td><td>– 70 dBc</td></tr></tbody></table>	Frequency offset	Maximum ACP (dBc) for devices 1 watt and less	Maximum ACP (dBc) for devices above 1 watt	25 kHz	– 55 dBc	– 60 dBc	50 kHz	– 70 dBc	– 70 dBc	75 kHz	– 70 dBc	– 70 dBc
Frequency offset	Maximum ACP (dBc) for devices 1 watt and less	Maximum ACP (dBc) for devices above 1 watt											
25 kHz	– 55 dBc	– 60 dBc											
50 kHz	– 70 dBc	– 70 dBc											
75 kHz	– 70 dBc	– 70 dBc											
Test method:	The resolution bandwidth of the spectrum analyzer was set at 100 Hz and the spectrum was recorded in the Frequency band 0Kz from the wanted frequency												
Test result:	Pass.												

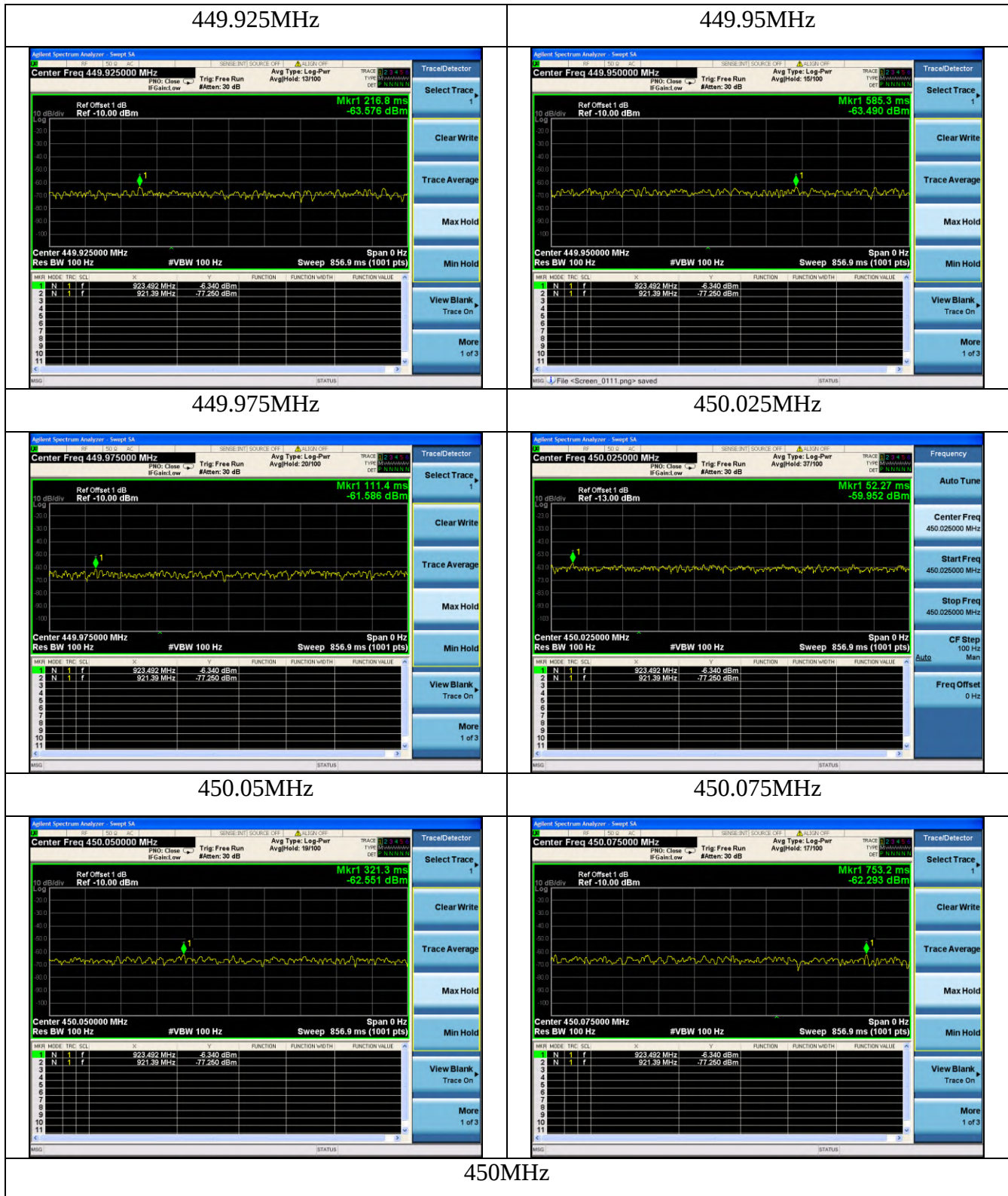
GMSK 25KHz spacing 450MHz-470MHz

Carrier frequency (MHz)	Test Frequency (MHz)	Test Value (dBm)	Limit (dBm)	Result
450.000	449.925	-63.576	30-70=-40	PASS
	449.95	-63.490	30-70=-40	PASS
	449.975	-61.586	30-55=-25	PASS
	450.025	-59.952	30-55=-25	PASS
	450.05	-62.551	30-70=-40	PASS
	450.075	-62.293	30-70=-40	PASS
469.950	469.875	-59.939	30-70=-40	PASS
	469.900	-59.133	30-70=-40	PASS
	469.925	-59.967	30-55=-25	PASS
	469.975	-60.853	30-55=-25	PASS
	470.000	-60.163	30-70=-40	PASS
	470.025	-58.410	30-70=-40	PASS

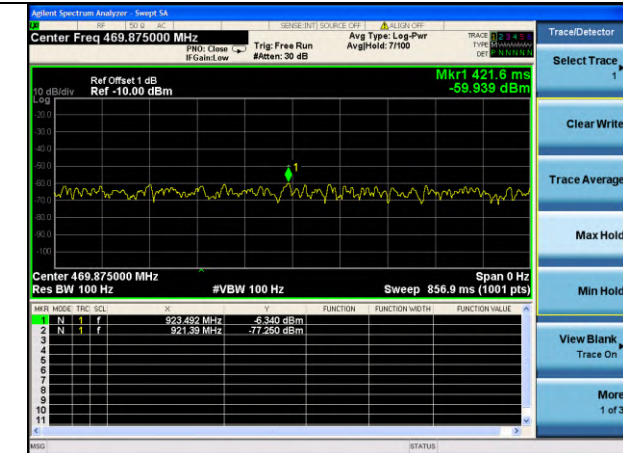
4-FSK 25KHz spacing 450MHz-470MHz

Carrier frequency (MHz)	Test Frequency (MHz)	Test Value (dBm)	Limit (dBm)	Result
450.000	449.925	-63.006	30-70=-40	PASS
	449.95	-63.241	30-70=-40	PASS
	449.975	-61.020	30-55=-25	PASS
	450.025	-60.623	30-55=-25	PASS
	450.05	-62.219	30-70=-40	PASS
	450.075	-62.134	30-70=-40	PASS
469.950	469.875	-59.899	30-70=-40	PASS
	469.900	-60.115	30-70=-40	PASS
	469.925	-59.332	30-55=-25	PASS
	469.975	-58.241	30-55=-25	PASS
	470.000	-59.819	30-70=-40	PASS
	470.025	-57.481	30-70=-40	PASS

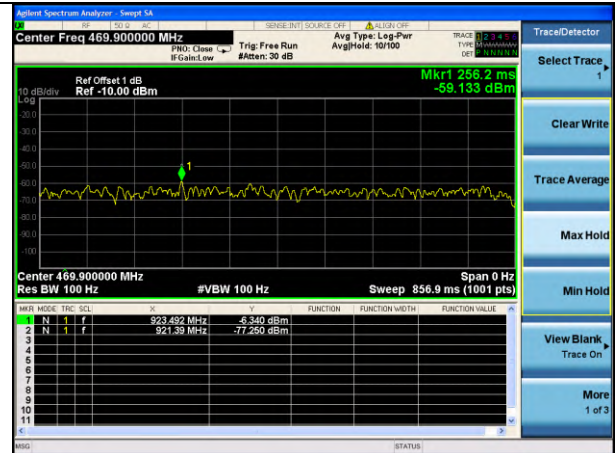
GMSK 25KHz spacing 450MHz-470MHz



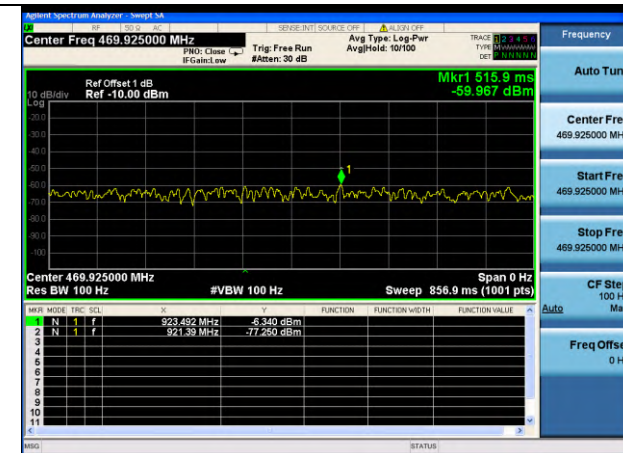
469.875MHz



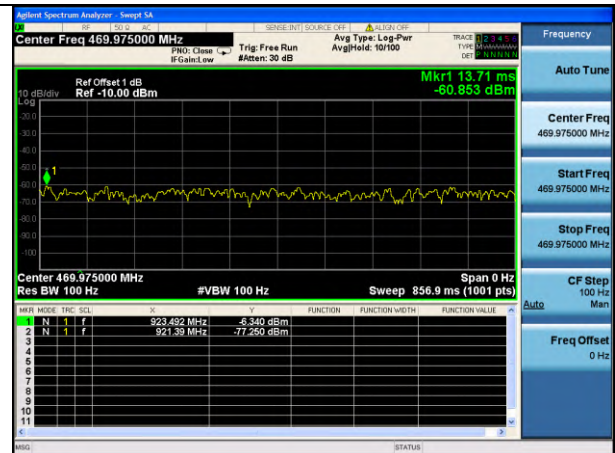
469.9MHz



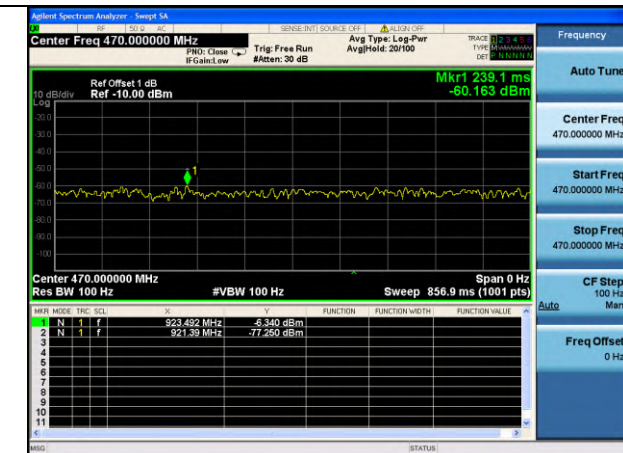
469.925MHz



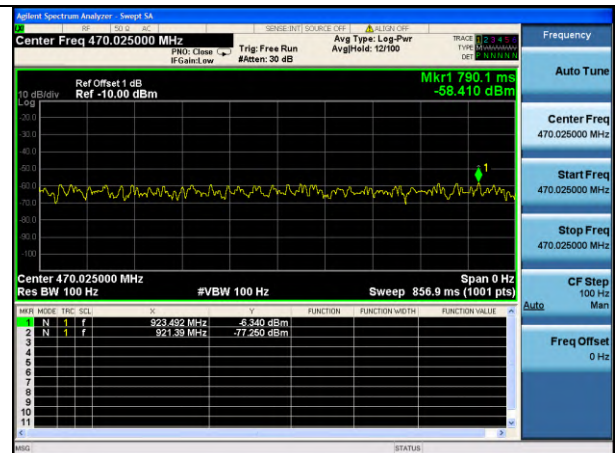
469.975MHz



470.0MHz



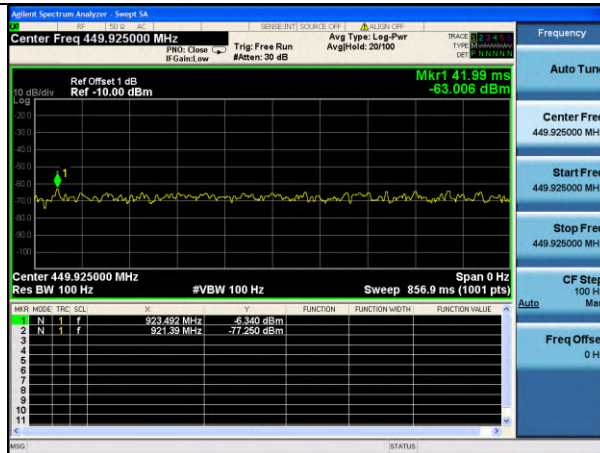
470.025MHz



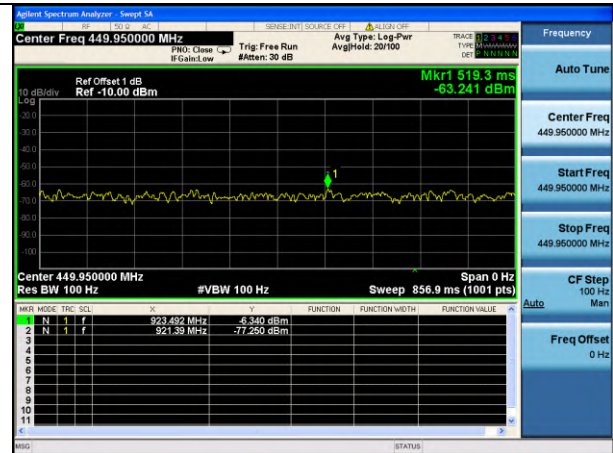
469.95MHz

4-FSK 25KHz spacing 450MHz-470MHz

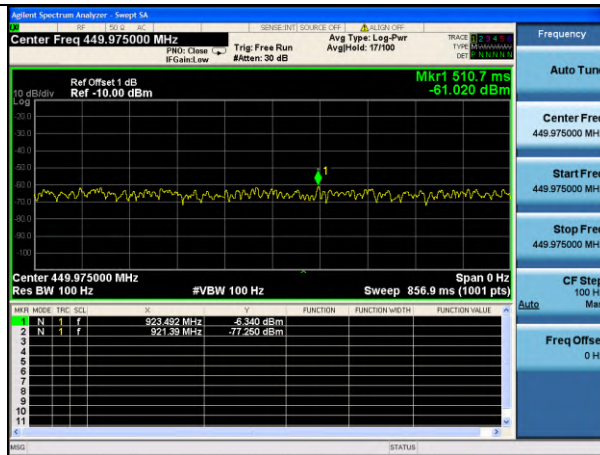
449.925MHz



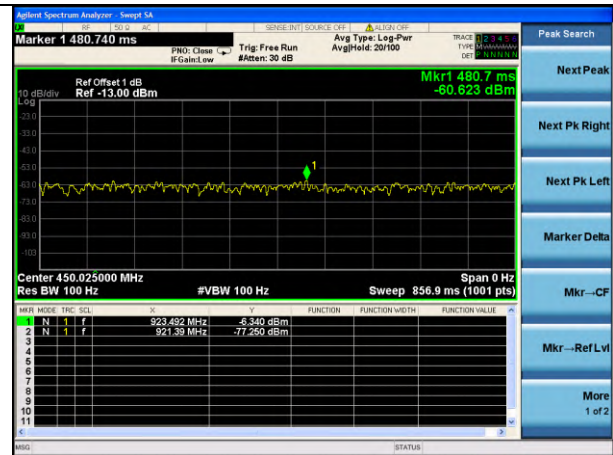
449.95MHz



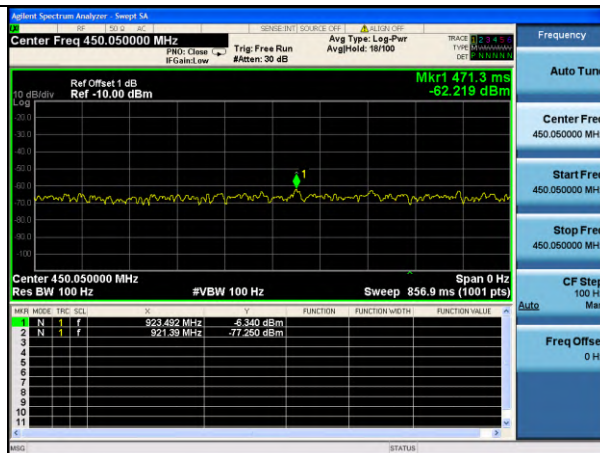
449.975MHz



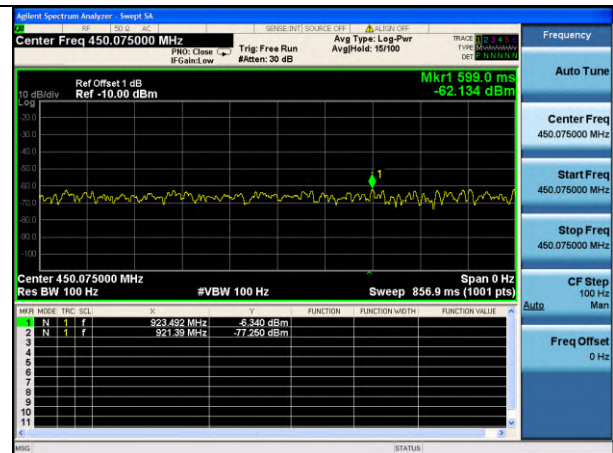
450.025MHz



450.05MHz

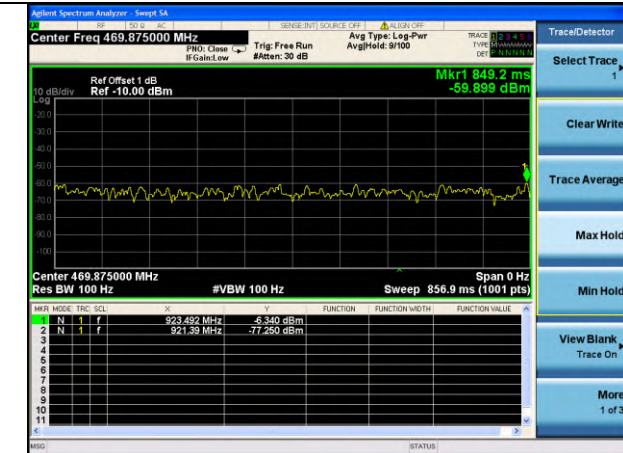


450.075MHz

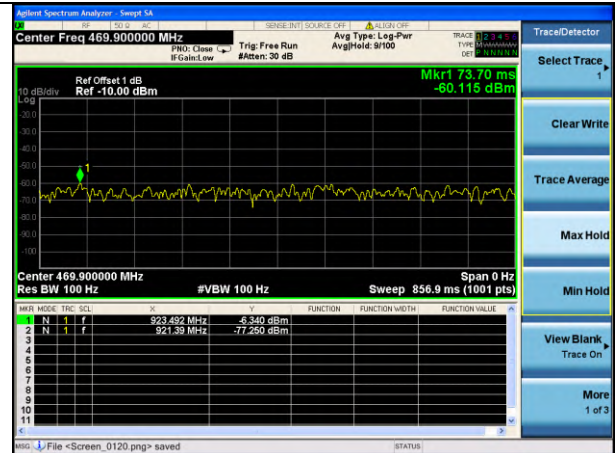


450MHz

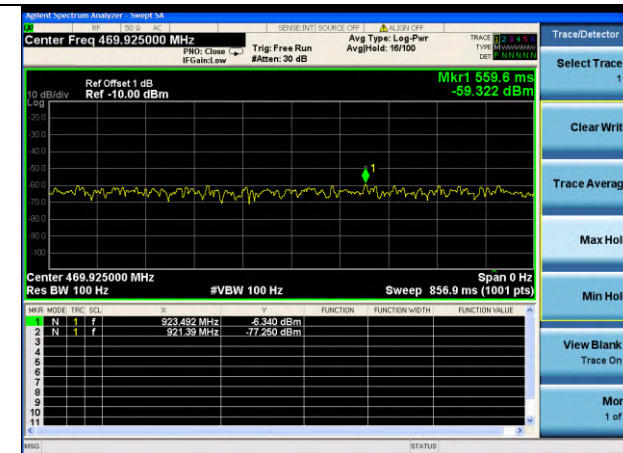
469.875MHz



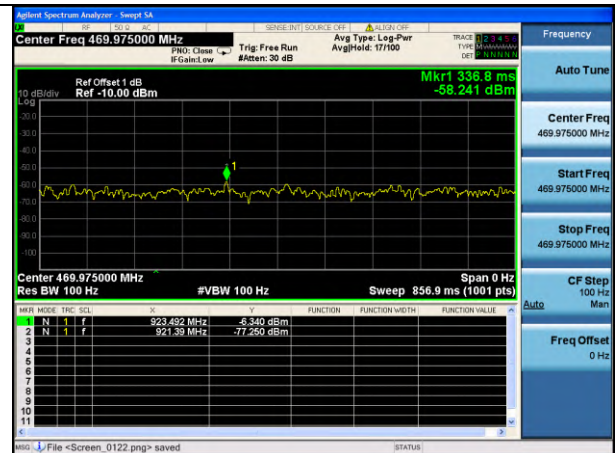
469.9MHz



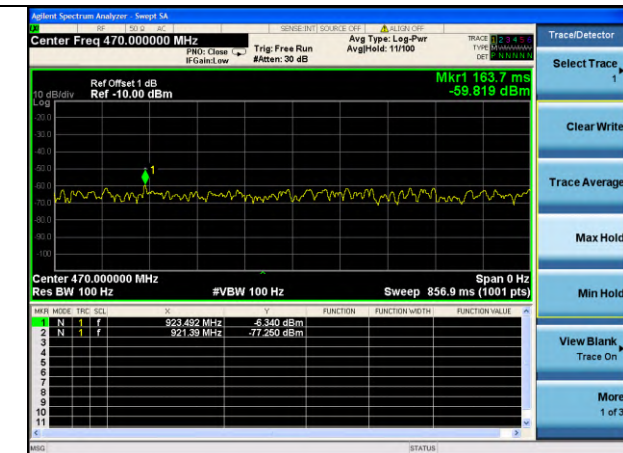
469.925MHz



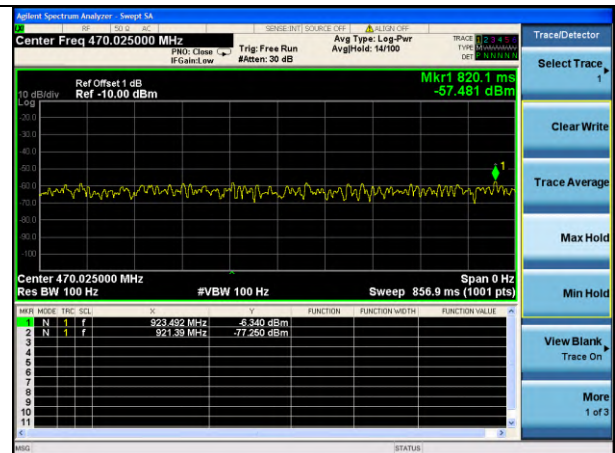
469.975MHz



470.0MHz



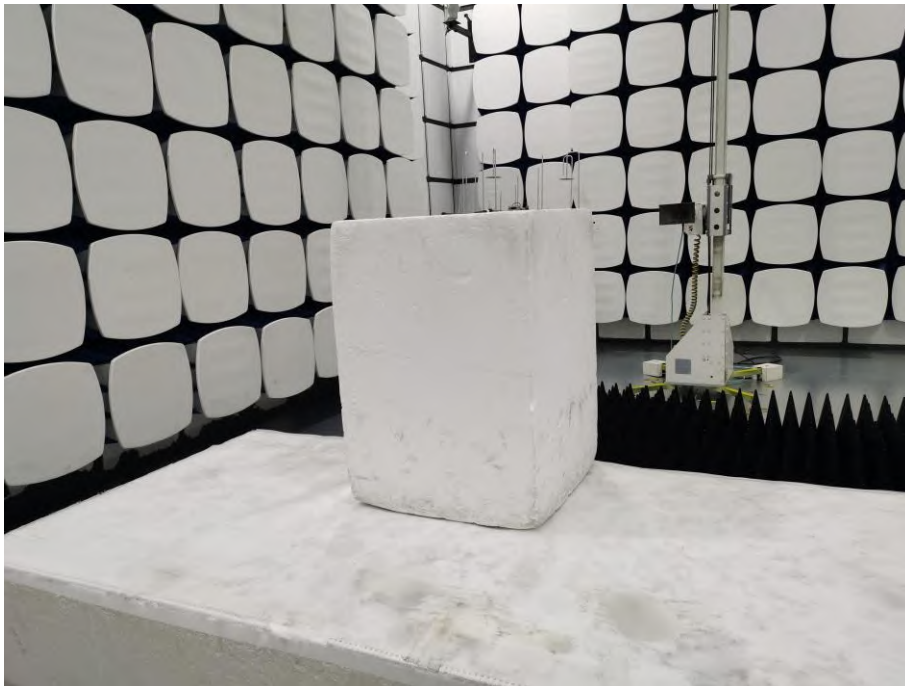
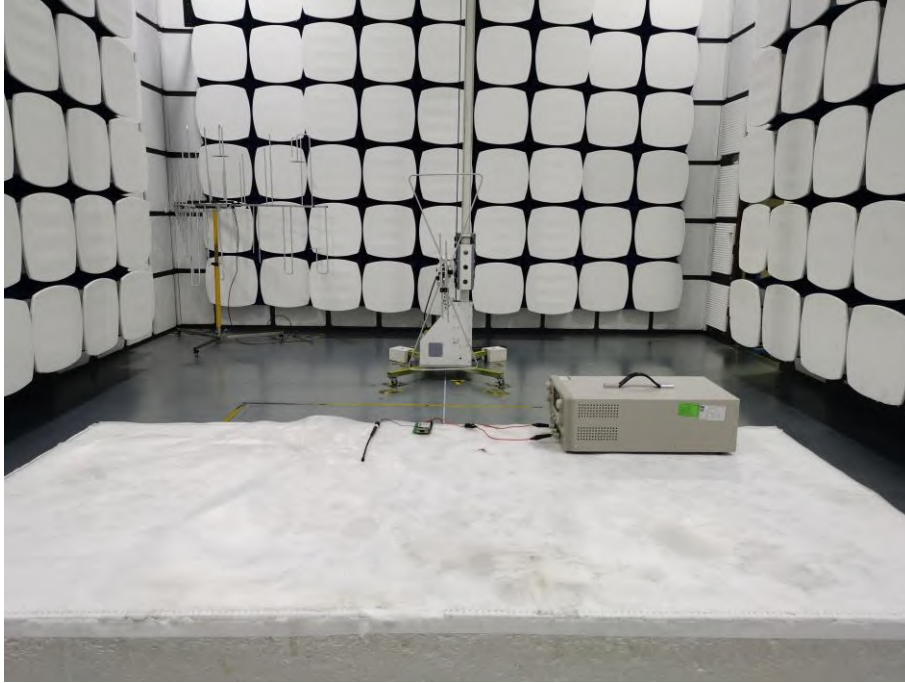
470.025MHz



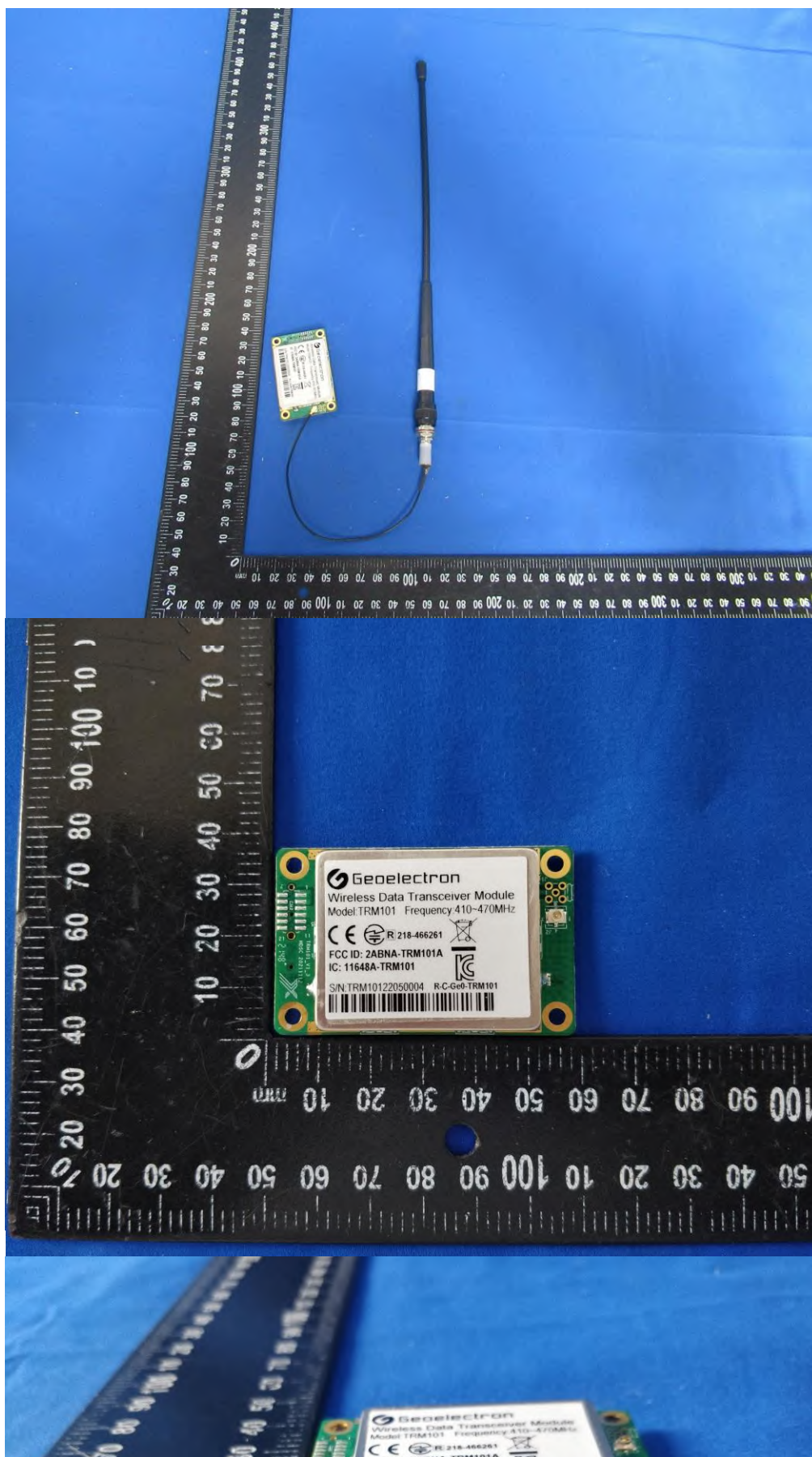
469.95MHz

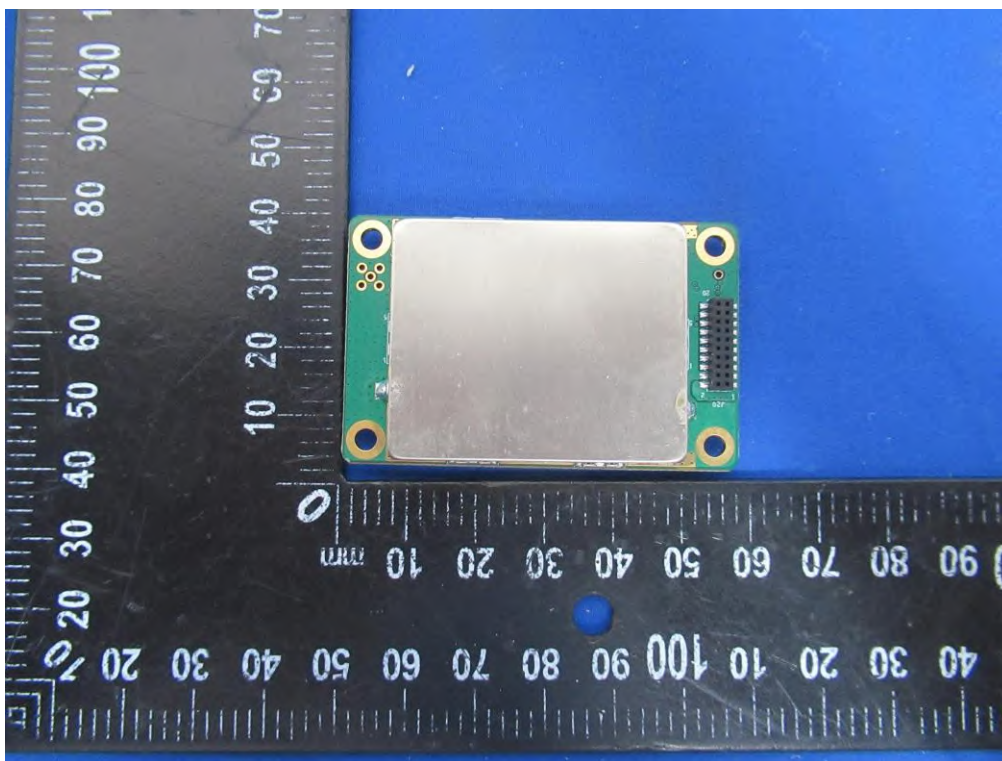
4. TEST SETUP PHOTO

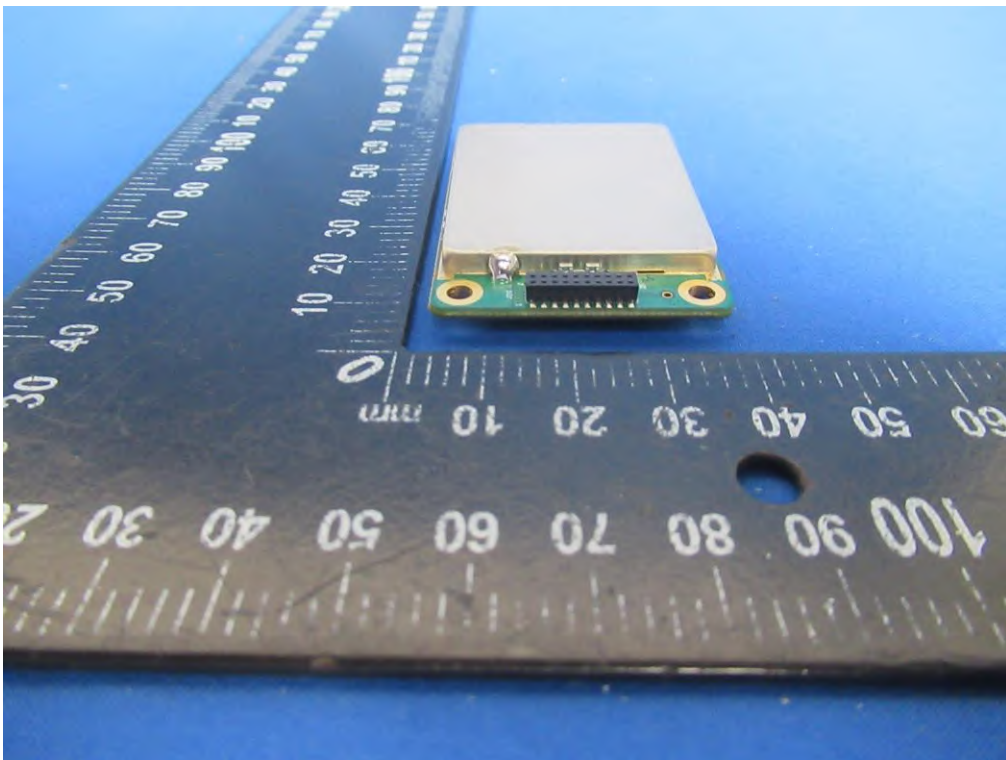
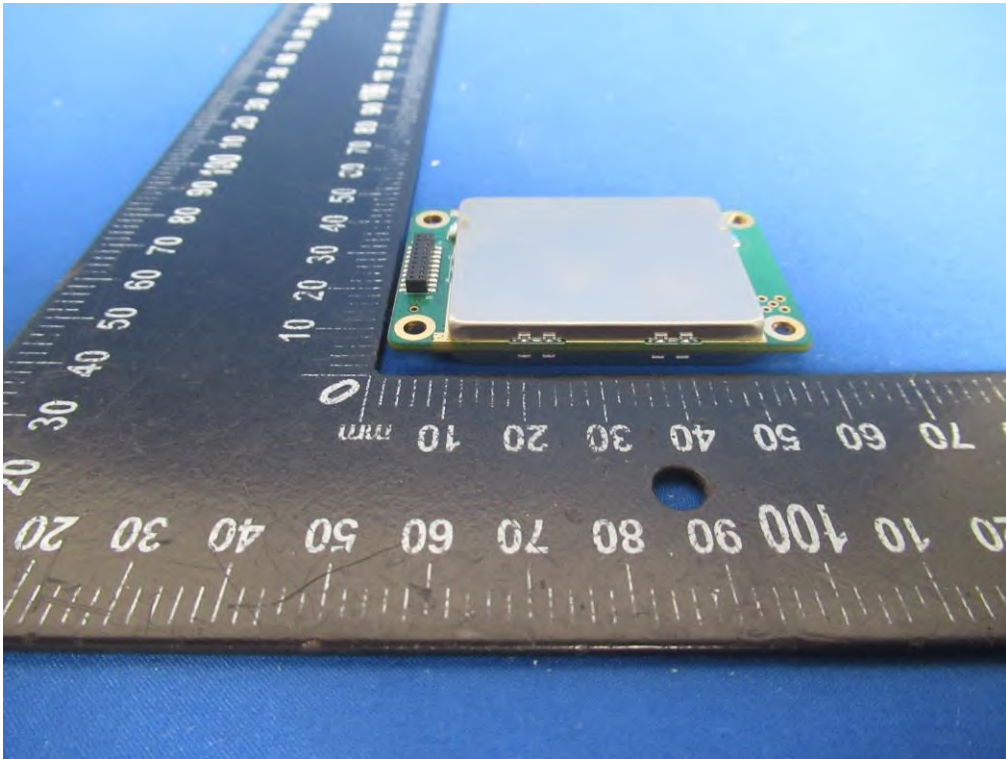
4.1.Photos of Radiated emission

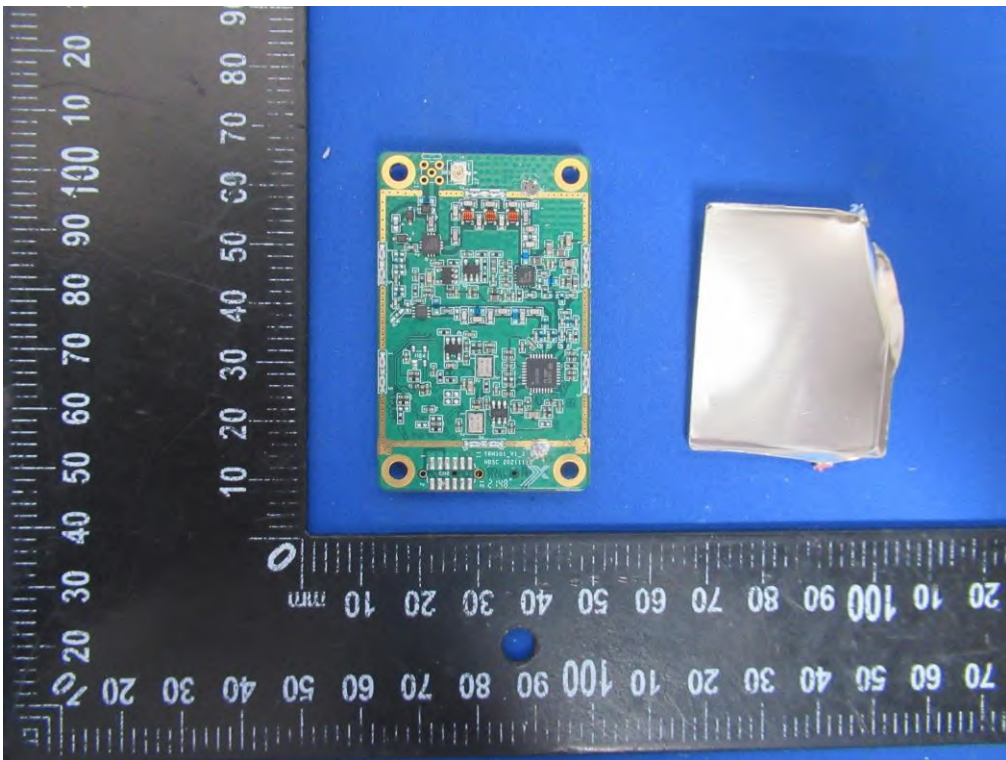
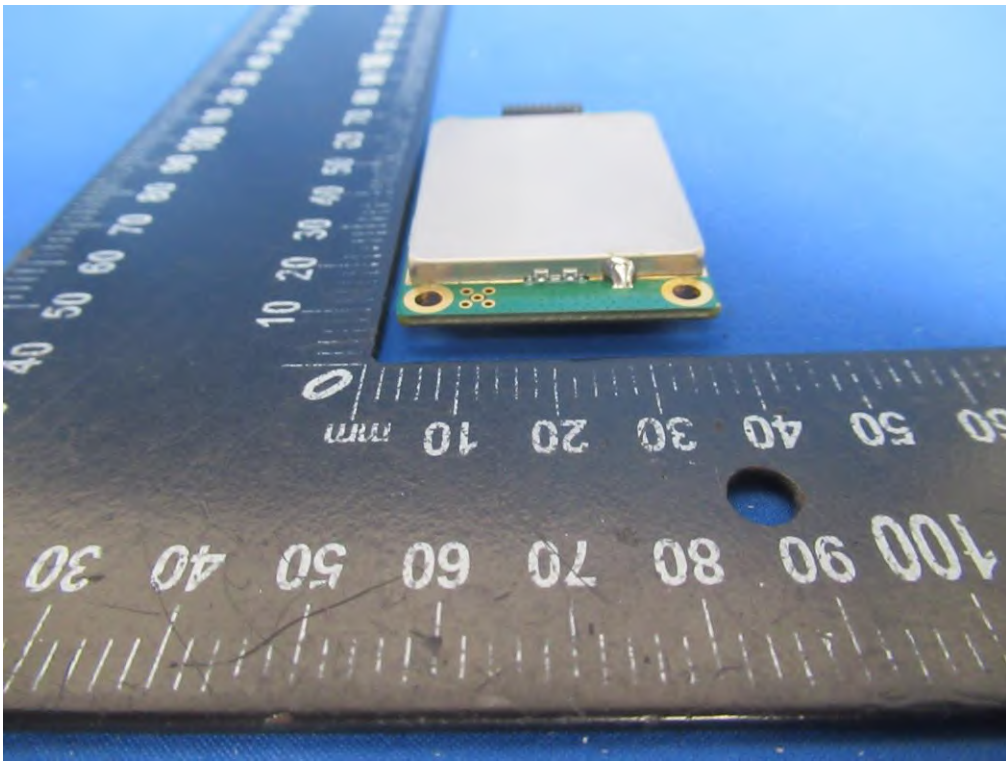


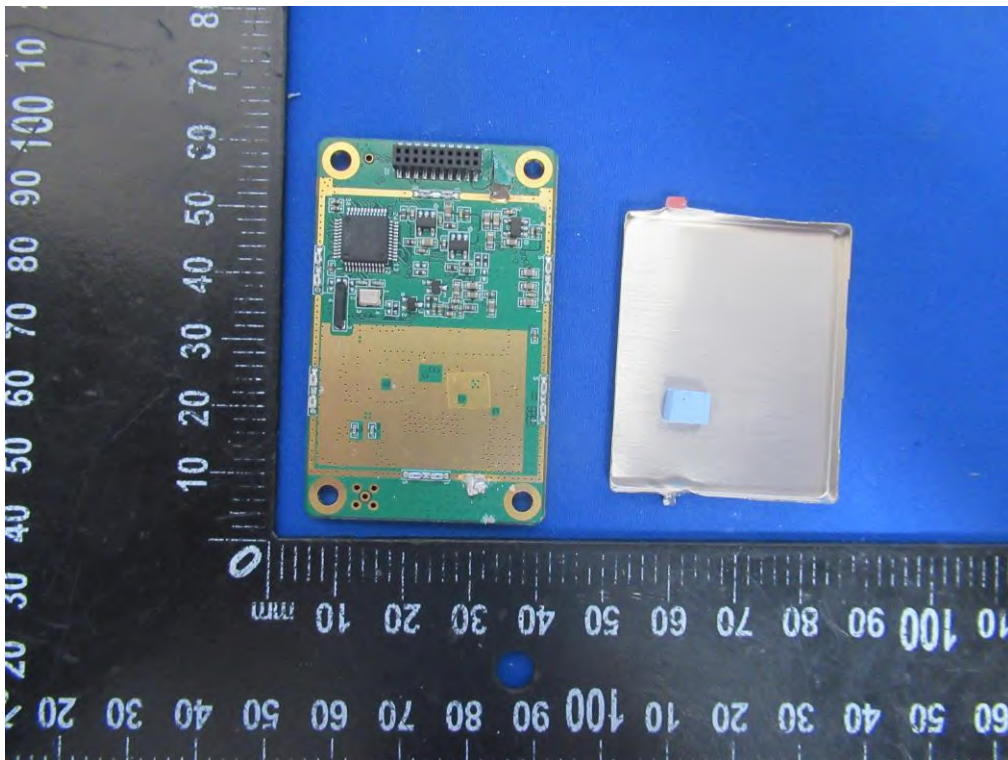
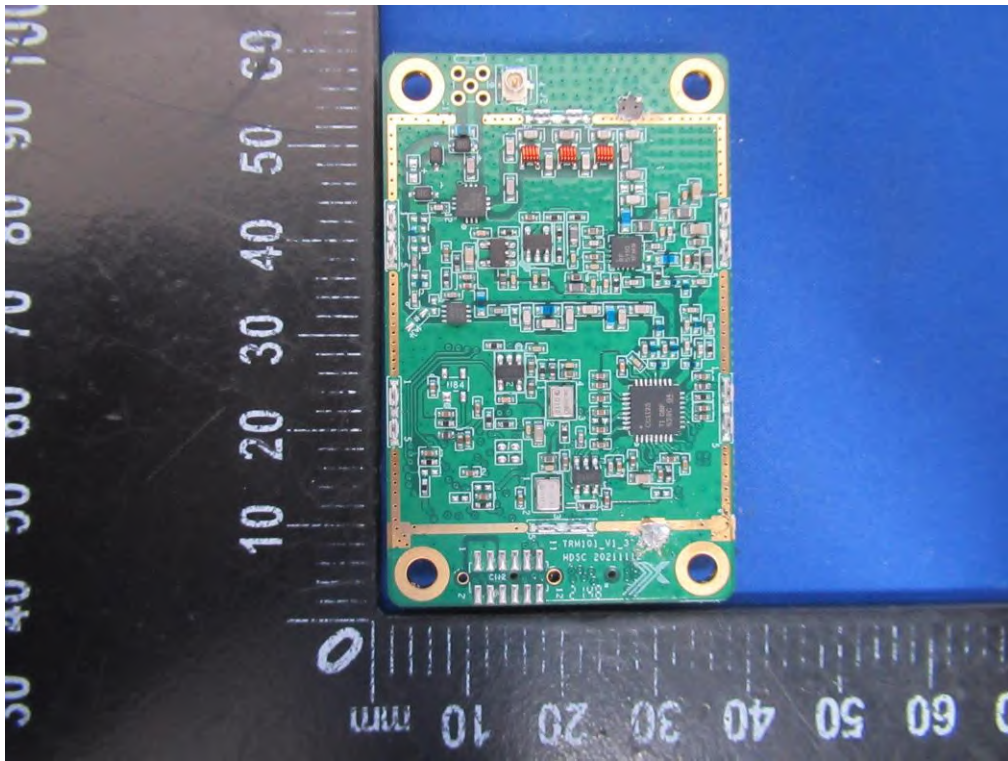
5. EUT PHOTO













----- END OF REPORT-----