



FCC TEST REPORT

FCC ID: SY4-A02065

On Behalf of

Shanghai Huace Navigation Technology Ltd.

Geodetic GNSS Receiver

Model No.: i85

Prepared for : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, 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 : A2507136-C09-R04
Date of Receipt : July 9, 2025
Date of Test : July 9, 2025 – August 14, 2025
Date of Report : August 15, 2025
Version Number : V0
Result **Pass**

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 -----	10
2.9. Test Equipment List -----	11
3. Test Results and Measurement Data -----	15
3.1. Transmitter Power (Conducted) -----	15
3.2. Occupied Bandwidth and Emission Mask -----	21
3.3. Spurious Emissions(conducted) -----	31
3.4. Radiated Spurious Emission-----	34
3.5. Transient Frequency Behavior -----	40
3.6. Behavior Frequency Stability -----	43
3.7. Modulation Characteristic -----	46
3.8. Adjacent Channel Power -----	47
4. Test Setup Photo -----	50
4.1. Photos of Radiated Emission-----	50

TEST REPORT DECLARATION

Applicant : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China
Manufacturer : Shanghai Huace Navigation Technology Ltd.
Address : 577 Songying Road, Qingpu District, 201706 Shanghai, China
EUT Description : Geodetic GNSS Receiver
(A) Model No. : i85
(B) Trademark : 

Measurement Standard Used:

FCC CFR Title 47 Part 90, FCC CFR Title 47 Part 2

ANSI C63.26-2015

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 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).....:

Yannis Wen
Project Engineer



Approved by (name + signature).....:

Jack Xu
Project Manager



Date of issue.....:

August 15, 2025

Revision History

Revision	Issue Date	Revisions	Revised By
V0	August 15, 2025	Initial released Issue	Yannis Wen

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	§ 90.205,	P
Occupied Bandwidth & Emission Mask	FCC PART 90	§ 90.209, § 90.210	P
Spurious Emissions(conducted)	FCC PART 90	§ 90.210,	P
Spurious Emissions(Radiated)	FCC PART 90	§ 90.210,	P
Transient Frequency Behavior	FCC PART 90	§ 90.214,	P
Frequency Stability	FCC PART 90	§ 90.213,	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 : Geodetic GNSS Receiver
Model Number : i85
DIFF. : N/A
Test Voltage : DC 7.2V from battery and DC 5V form adapter

UHF

Operation frequency : 410MHz-470MHz
Conducted Power : 0.5W(26.99±1dBm), 1W(30.00±1dBm)
Channel spacing : 12.5KHz, 25KHz
Modulation type : GMSK
Antenna Type : Whip Antenna, Maximum Gain is -3.95dBi.
(Antenna information is provided by applicant.)
Software version : V1.0
Hardware version : V1.1.0
Intend use environment : Residential, commercial and light industrial environment

Note: All Conducted Power have been tested, and recorded the worst case 1W(30.00±1dBm) results in this report.

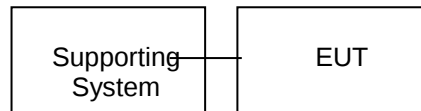
2.2. Accessories of Device (EUT)

Accessories	:	AC Adapter
Manufacturer	:	Yisheng Electronics Co., LTD
Model	:	EA1012AVRU-050
Ratings	:	AC Input: 100-240Vac, 1.0A, 50~60Hz DC Output: 5.0V=2.4A 12.0W

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	Notebook PC	Lenovo	ThinkPad L14	/	/

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	GMSK+CS12.5KHz+TX	at maximum rated power for transmitter
2	GMSK+CS25KHz+TX	at maximum rated power for transmitter

Note: The worst case modes for all test are the item 1 and item 2.

Description Operation Frequency

GMSK		
Test Channel	Channel spacing (KHz)	Frequency(MHz)
Low	12.5	410.050
	25	410.050
Mid	12.5	440.000
	25	440.000
High	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	98kPa

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: 12135A

SHENZHEN STS TEST SERVICES CO., LTD

101, Building B, Zhouke Science Park, No. 190 Chongqing Road, Zhancheng Shequ, Fuhai Sub-District,
Ban'an District, Shenzhen, Guangdong, China

FCC Registration No.: 625569; A2LA Certificate No.:4338.01.

Note: Except for the Transient Frequency Behavior projects that were completed in SHENZHEN STS TEST SERVICES CO., LTD, all other projects were completed in Shenzhen Alpha Product Testing Co., Ltd

2.8. Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	1.63dB
Uncertainty for Radiation Emission test in 3m chamber (below 30MHz)	3.5dB
Uncertainty for Radiation Emission test in 3m chamber (30MHz to 1GHz)	3.74dB(Polarize: V)
	3.76dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	3.77dB(Polarize: V)
	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (18GHz to 40GHz)	4.31 dB(Polarize: V)
	4.30 dB(Polarize: H)
Uncertainty for radio frequency	5.06×10^{-8} GHz
Uncertainty for conducted RF Power	0.40dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9. Test Equipment List

Shenzhen Alpha Product Testing Co., Ltd

Equipment	Manufacturer	Model No.	Firmware version	Serial No.	Last Cal.	Cal. Due day
9*6*6 anechoic chamber	CHENYU	9*6*6	/	N/A	2025.03.09	4Year
4*4*3 Shielded room	CHENYU	4*4*3	/	N/A	2025.03.09	4Year
Spectrum analyzer	ROHDE&SCHWARZ	FSV40-N	2.3	102137	2025.08.04	1Year
Spectrum analyzer	Agilent	N9020A	A.14.16	MY499100060	2025.08.04	1Year
Test Receiver	ROHDE&SCHWARZ	ESR	2.28 SP1	1316.3003K03-102082-Wa	2025.08.04	1Year
Test Receiver	ROHDE&SCHWARZ	ESCI	4.42 SP1	101165	2025.08.04	1Year
Bilog Antenna	SCHWARZBECK	VULB 9168	/	VULB 9168#627	2023.08.28	2Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	/	2106	2023.08.19	2Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	/	00128	2023.08.19	2Year
RF Cable	Resenberger	Cable 1	/	RE1	2025.08.04	1Year
RF Cable	Resenberger	Cable 2	/	RE2	2025.08.04	1Year
RF Cable	Resenberger	Cable 3	/	CE1	2025.08.04	1Year
Amplifier	HP	HP8347A	/	2834A00455	2025.08.04	1Year
Amplifier	Agilent	8449B	/	3008A02664	2025.08.04	1Year
L.I.S.N.#1	SCHWARZBECK	NSLK8126	/	8126-466	2025.08.04	1Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	/	101043	2025.08.04	1Year
Horn Antenna	SCHWARZBECK	BBHA 9170	/	00946	2023.08.19	2Year
Preamplifier	SKET	LNPA_1840-50	/	SK2018101801	2025.08.04	1 Year
Power Meter	Agilent	E4419B	/	GB40202122	2025.08.04	1 Year
Power Sensor	Agilent	E9300A	/	MY41496628	2025.08.04	1 Year
Power Sensor	Agilent	E9304A	/	MY41496815	2025.08.04	1 Year
Temp. & Humid. Chamber	Teelong	TL-HW408S	/	TL-20191205-01	2025.07.14	1 Year
Electronic Thermo-Hygrometer	S.H.Qixiang	HTC-1	/	N/A	2025.08.04	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	/	20140927-6	2025.08.04	1 Year
Adjustable attenuator	MWRFTest	N/A	/	N/A	N/A	N/A
10dB Attenuator	Mini-Circuits	DC-6G	/	N/A	N/A	N/A

SHENZHEN STS TEST SERVICES CO., LTD

RF Radiation Test Equipment						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
1	Temperature & Humidity	SW-108	SuWei	N/A	2025.02.24	2026.02.23
2	Wireless Communications Test Set	R&S	CMW 500	117239	2024.09.23	2025.09.22
3	Pre-Amplifier(0.1 M-3GHz)	EM	EM330	060665	2025.02.22	2026.02.21
4	Pre-Amplifier (1G-18GHz)	SKET	LNPA-01018 G-45	SK2018080901	2024.09.23	2025.09.22
5	Positioning Controller	MF	MF-7802	MF-780208587	N/A	N/A
6	Signal Analyzer	R&S	FSV 40-N	101823	2024.09.23	2025.09.22
7	Switch Control Box	N/A	N/A	N/A	N/A	N/A
8	Filter Box	BALUN Technology	SU319E	BL-SZ1530051	N/A	N/A
9	Video Controller	SKET	FCS C-3	N/A	N/A	N/A
10	Bilog Antenna	TESEQ	CBL6111D	34678	2024.09.30	2025.09.29
11	Horn Antenna	SCHWARZBECK	BBHA 9120D	02014	2024.09.25	2025.09.24
12	Antenna Mast	MF	MFA-440H	N/A	N/A	N/A
13	Turn Table	MF	N/A	N/A	N/A	N/A
14	AC Power Source	APC	KDF-11010G	F214050035	N/A	N/A
15	DC Power Supply	Zhaoxin	RXN 605D	20R605D11010081	N/A	N/A
16	Test SW	EMC Test Software	15.2.0.339			

SHENZHEN STS TEST SERVICES CO., LTD

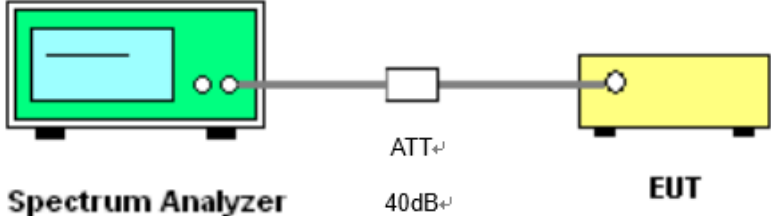
RF Connected Test Equipment						
Item	Kind of Equipment	Manufacturer	Type No.	Serial No.	Last Calibration	Calibrated Until
1	Temperature & Humidity	SW-108	SuWei	N/A	2025.02.24	2026.02.23
2	Universal Radio Communication Tester	R&S	CMU200	119907	2025.02.22	2026.02.21
3	MXG Vector Signal Generator	Keysight	N5182B	MY57301448	2024.09.23	2025.09.22
4	Signal Analyzer	Keysight	N9020A	MY52440124	2025.02.22	2026.02.21
5	Intercom comprehensive tester	HP	8920A	348A05658	2025.02.22	2026.02.21
6	Temperature& Humidity test chamber	Safety test	AG80L	171200018	2025.02.22	2026.02.21
7	Attenuator	HP	8494B	DC-18G	2025.02.25	2026.02.24
8	AC Power Source	APC	KDF-11010G	F214050035	N/A	N/A
9	DC Power Supply	Agilent	E3642A	MY40002025	N/A	N/A

Software Information			
Test Item	Software Name	Manufacturer	Version
RE	EZ-EMC	farad	Alpha-3A1
CE	EZ-EMC	farad	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
Test Method:	FCC part 2.1046, ANSI C63.26-2015 Section 5.2
Limits:	Please refer section FCC Part 90.205
Test Setup:	 The diagram illustrates the test setup. On the left is a green Spectrum Analyzer with a blue screen. A cable connects its output to a white rectangular attenuator (ATT) labeled '40dB'. Another cable connects the attenuator to the input of a yellow Equipment Under Test (EUT) on the right.
Test Procedure:	a) Connect the equipment as illustrated. b) Turn on the Spectrum Analyzer c) Record value
Test Result:	PASS

3.1.2. Test Results

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	27.030	20.930	21.00	26.99±1	PASS
25	410.050	26.860	20.760	21.00	26.99±1	PASS
12.5	440.000	26.928	20.828	21.00	26.99±1	PASS
25	440.000	26.810	20.710	21.00	26.99±1	PASS
12.5	469.950	26.178	20.078	21.00	26.99±1	PASS
25	469.950	26.119	20.019	21.00	26.99±1	PASS

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

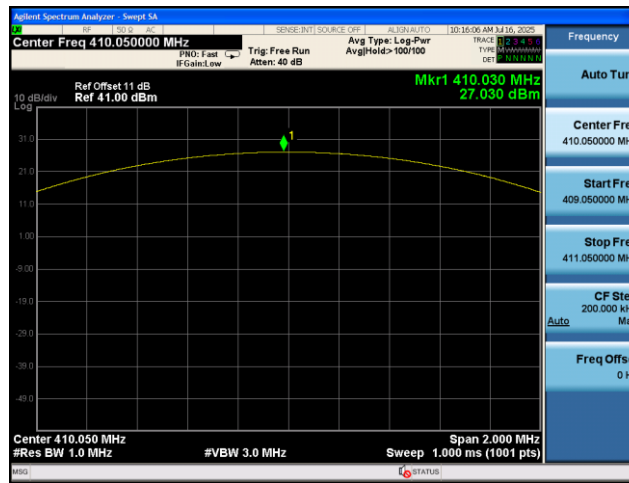
GMSK mode (1W):						
Channel spacing (KHz)	Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP (dBm)	Stated ERP Power (dBm)	Conducted Output Power Limit (dBm)	Result
12.5	410.050	29.488	23.388	34.00	30±1	PASS
25	410.050	29.349	23.249	34.00	30±1	PASS
12.5	440.000	29.318	23.218	34.00	30±1	PASS
25	440.000	29.212	23.112	34.00	30±1	PASS
12.5	469.950	29.483	23.383	34.00	30±1	PASS
25	469.950	29.318	23.218	34.00	30±1	PASS

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

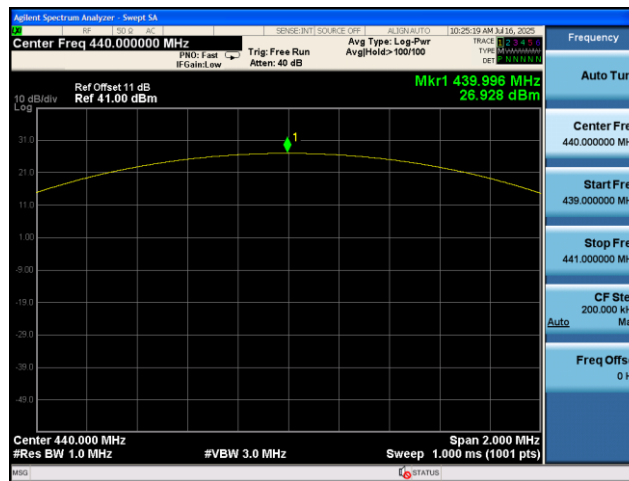
Test plots as follows:

GMSK 0.5W 12.5KHz Channel Spacing: Transmitter Power

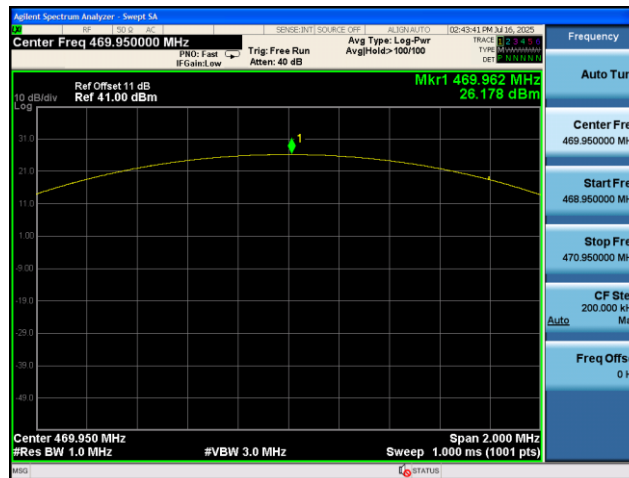
Low: 410.050MHz



Mid: 440.000MHz

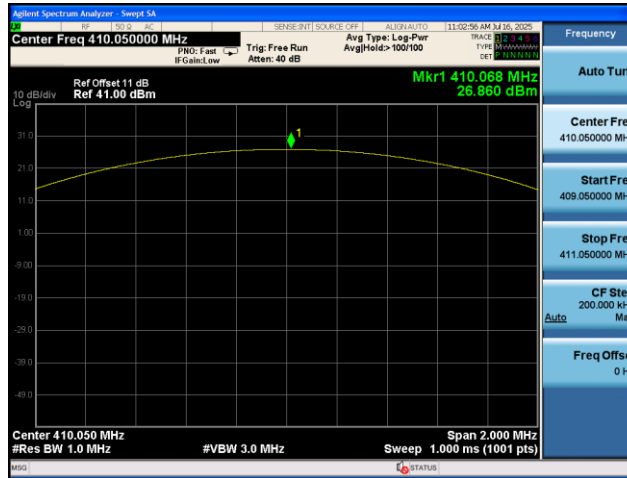


High: 470.00MHz

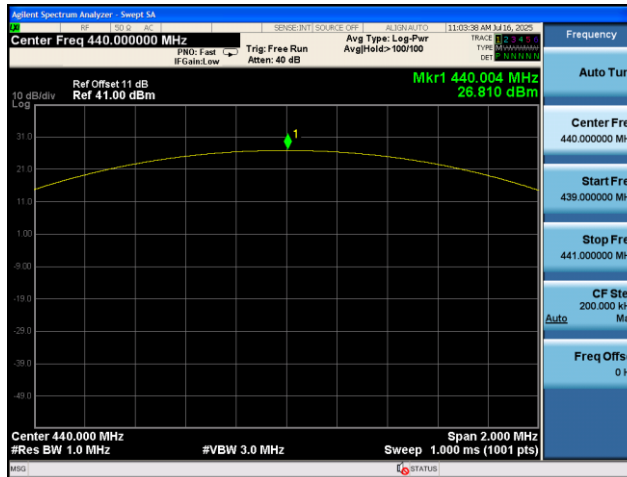


GMSK 0.5W 25KHz Channel Spacing: Transmitter Power

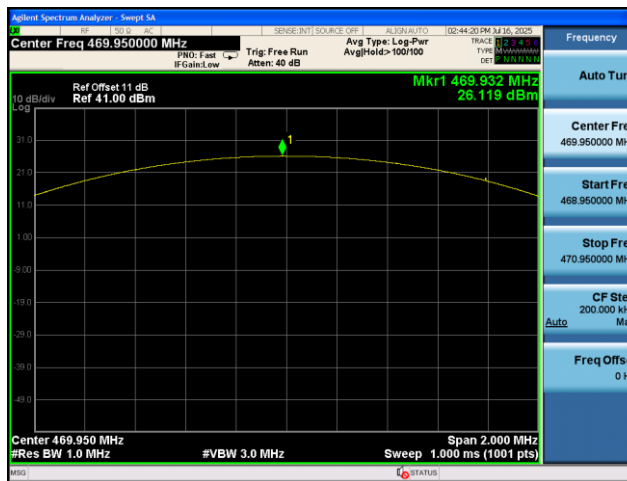
Low: 410.050MHz



Mid: 440.000MHz

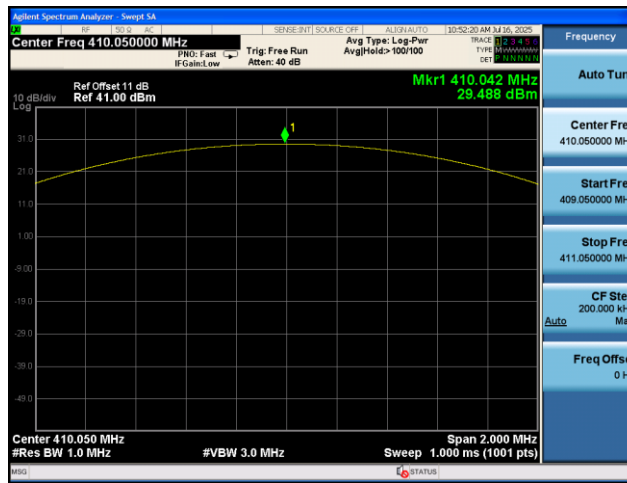


High: 470.00MHz

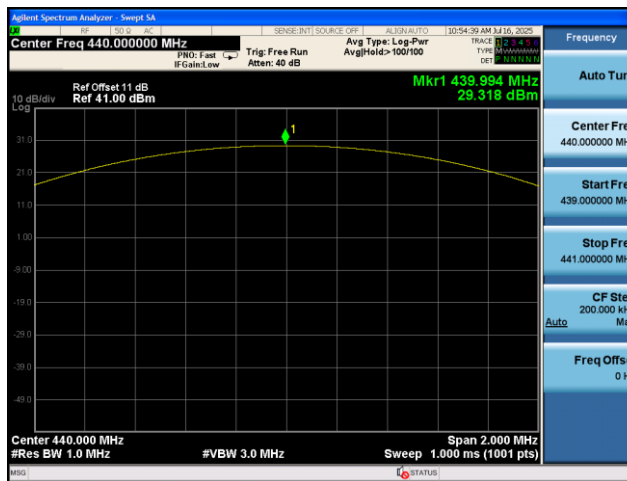


GMSK 1W 12.5KHz Channel Spacing: Transmitter Power

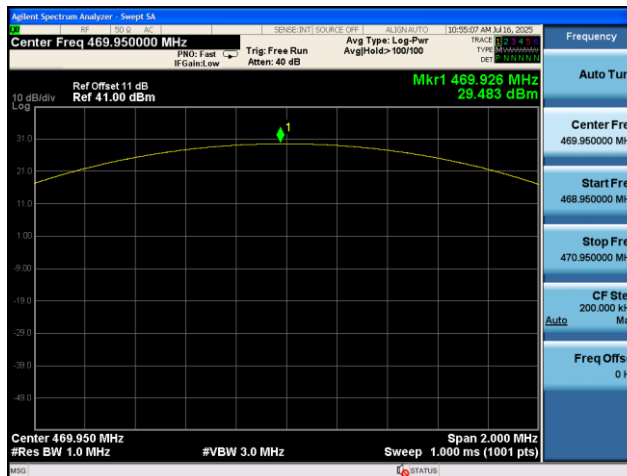
Low: 410.050MHz



Mid: 440.000MHz

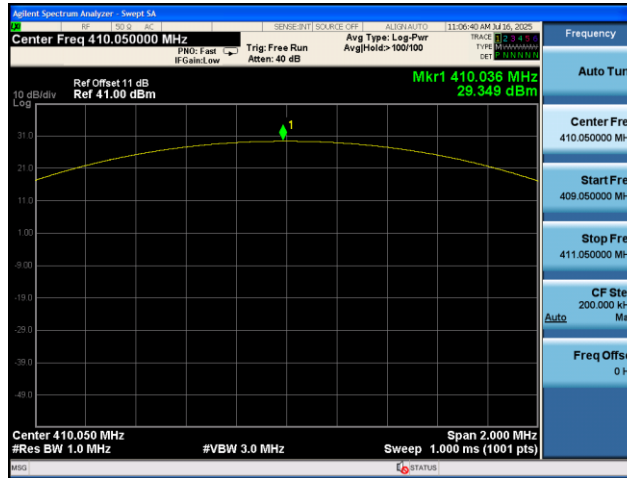


High: 470.00MHz

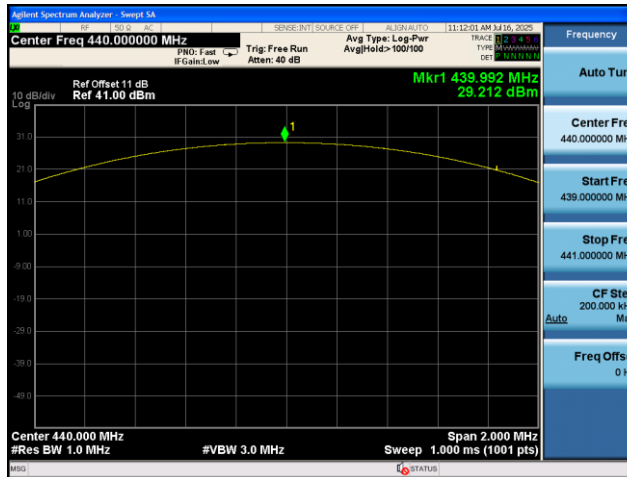


GMSK 1W 25KHz Channel Spacing: Transmitter Power

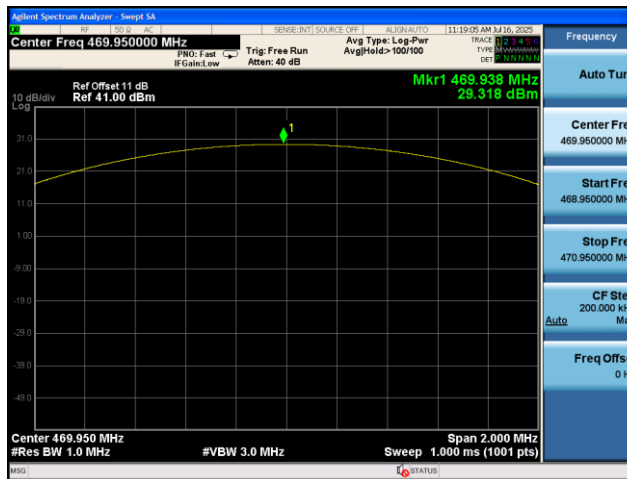
Low: 410.050MHz



Mid: 440.000MHz



High: 470.00MHz



3.2. Occupied Bandwidth and Emission Mask

3.2.1. Test Specification

Test Requirement:	FCC Part 90.209, FCC Part 90.210
Test Method:	FCC part 2.1049, ANSI C63.26-2015 Section 5.4
Test Setup:	 The diagram illustrates the test setup. On the left is a green rectangular box representing the Spectrum Analyzer, with a blue screen and two small circular ports. A grey cable connects these ports to a small white rectangular box in the middle. Another grey cable connects the right side of the white box to a yellow rectangular box on the right, which represents the EUT (Equipment Under Test) and has a single circular port. 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 mode (0.5W) 12.5KHz Channel Spacing:					
Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	6.597	5.922	11.25	PASS
Mid	440.000	7.224	5.936	11.25	PASS
High	469.950	6.605	5.934	11.25	PASS

GMSK mode (0.5W) 25KHz Channel Spacing:					
Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	12.07	11.181	20	PASS
Mid	440.000	12.07	11.188	20	PASS
High	469.950	11.97	11.199	20	PASS

GMSK mode (1W) 12.5KHz Channel Spacing:

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	6.547	5.925	11.25	PASS
Mid	440.000	6.390	5.931	11.25	PASS
High	469.950	6.416	5.929	11.25	PASS

GMSK mode (1W) 25KHz Channel Spacing:

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.050	11.97	11.232	20	PASS
Mid	440.000	11.91	11.218	20	PASS
High	469.950	11.94	11.224	20	PASS

Emission Mask:

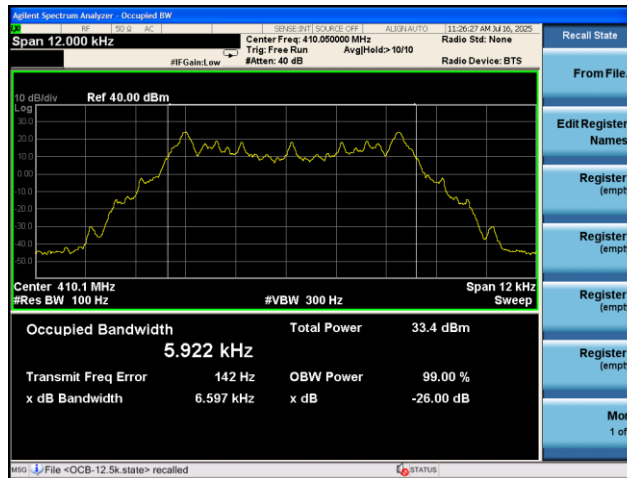
GMSK mode (1W) 12.5KHz Channel Spacing:				
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	D	100Hz	PASS
Mid	440.000	D	100Hz	PASS
High	469.950	D	100Hz	PASS

GMSK mode (1W) 25KHz Channel Spacing:				
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.050	C	300Hz	PASS
Mid	440.000	C	300Hz	PASS
High	469.950	C	300Hz	PASS

Test plots as follows:

GMSK mode (0.5W) 12.5KHz Channel Spacing: Occupied Bandwidth

Low: 410.050MHz



Mid: 440.000MHz

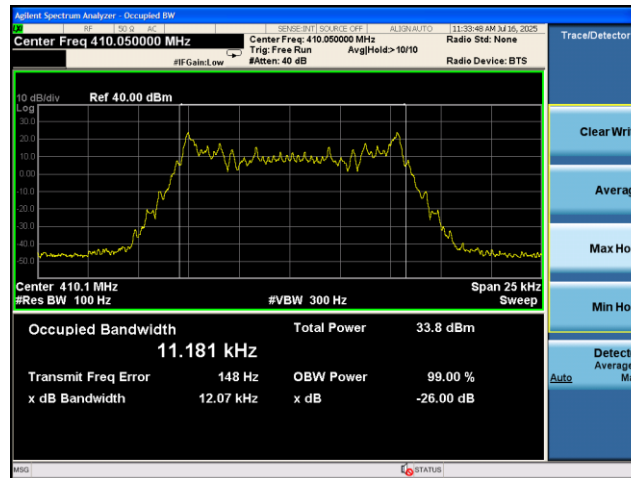


High: 470.00MHz

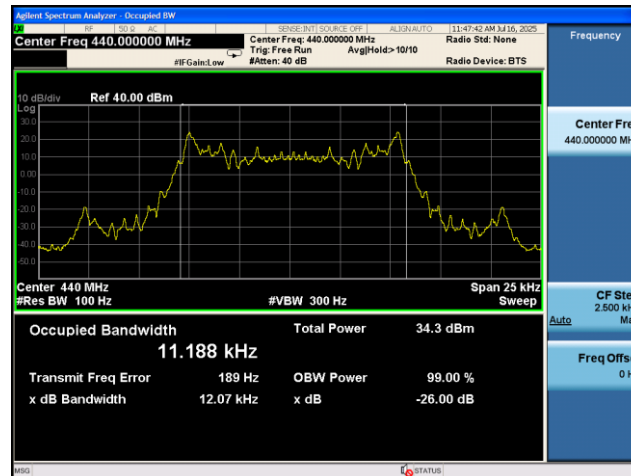


GMSK mode (0.5W) 25KHz Channel Spacing: Occupied Bandwidth

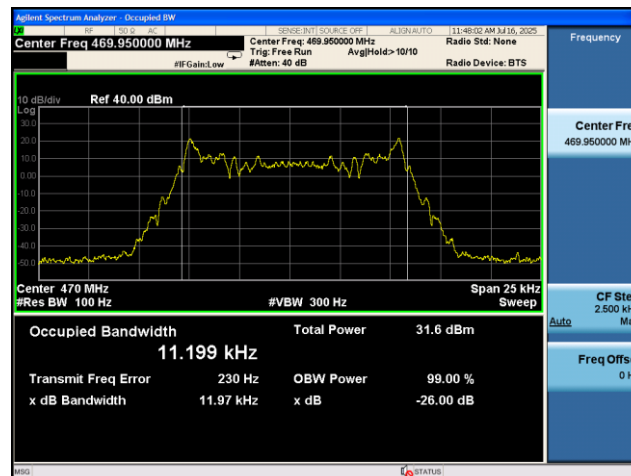
Low: 410.050MHz



Mid: 440.000MHz

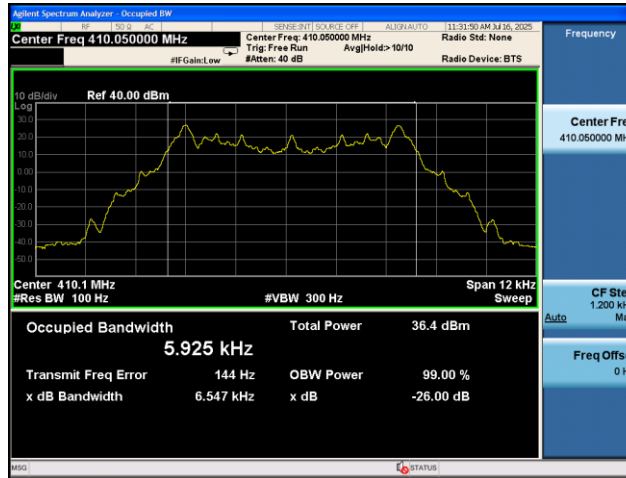


High: 469.850MHz



GMSK mode (1W) 12.5KHz Channel Spacing: Occupied Bandwidth

Low: 410.050MHz



Mid: 440.000MHz

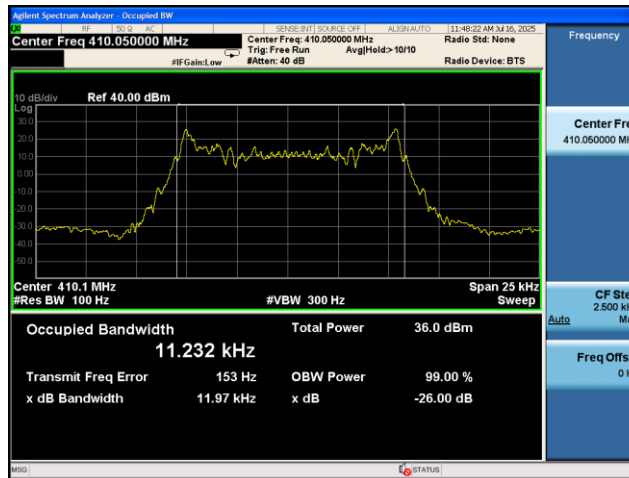


High: 470.00MHz

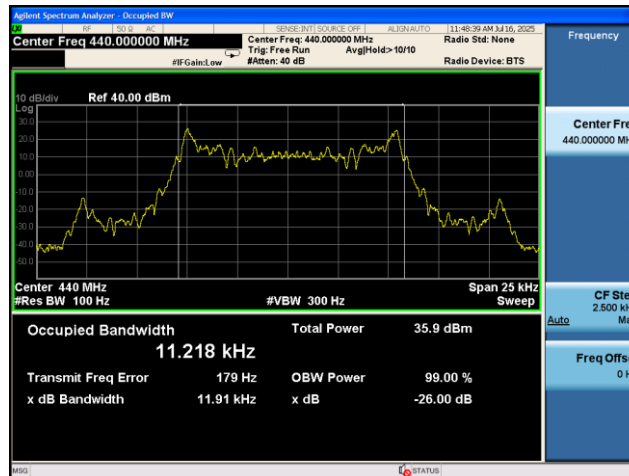


GMSK mode (1W) 25KHz Channel Spacing: Occupied Bandwidth

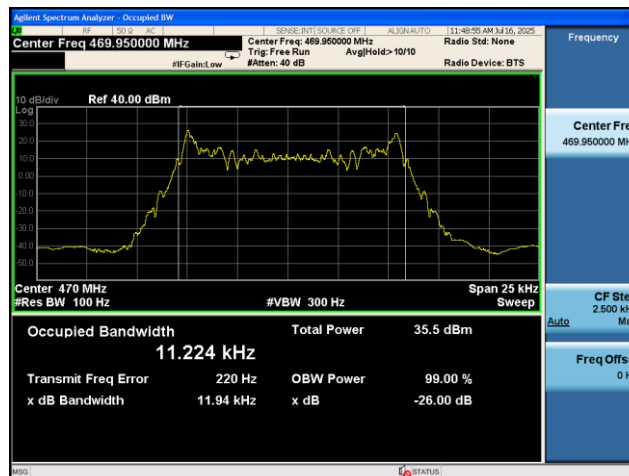
Low: 410.050MHz



Mid: 440.000MHz

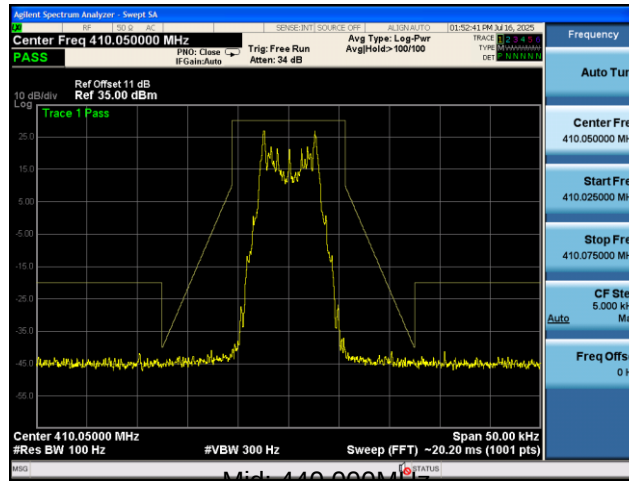


High: 469.850MHz

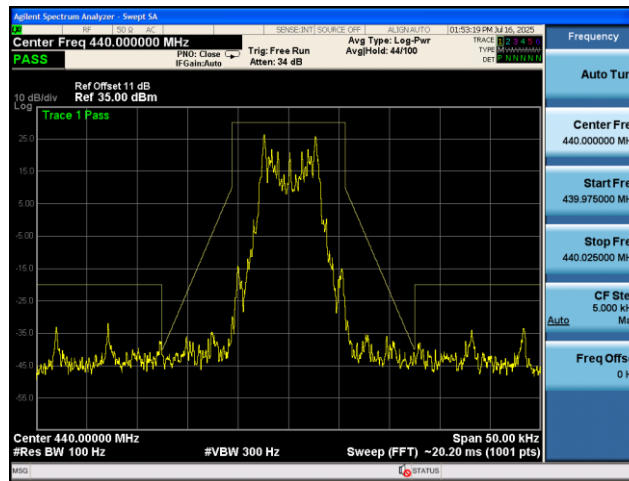


GMSK mode (1W) 12.5KHz Channel Spacing: Emission Mask

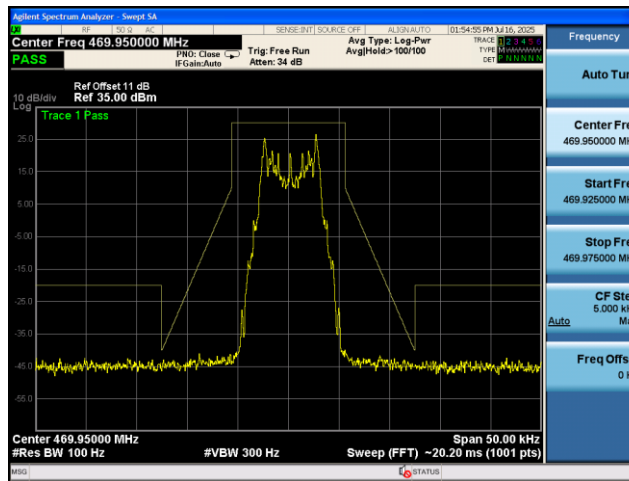
Low: 410.050MHz



Mid: 440.000MHz

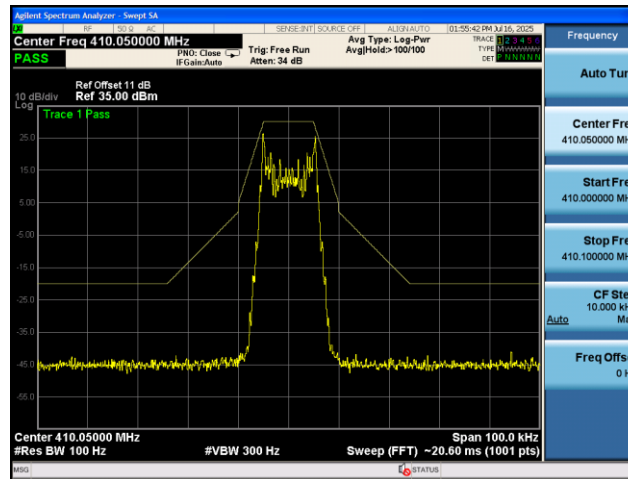


High: 469.950MHz

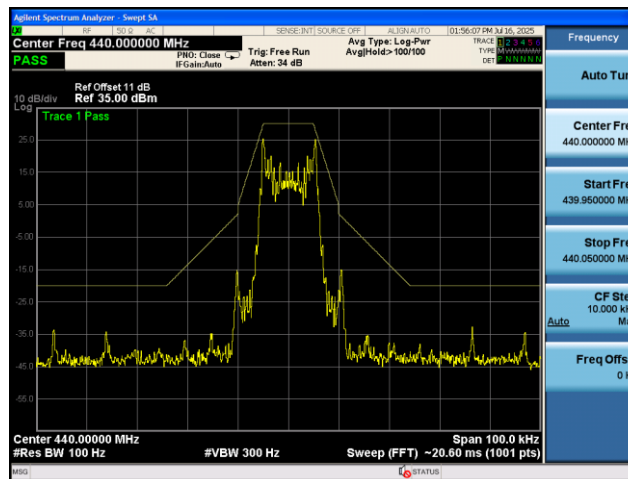


GMSK mode (1W) 25KHz Channel Spacing: Emission Mask

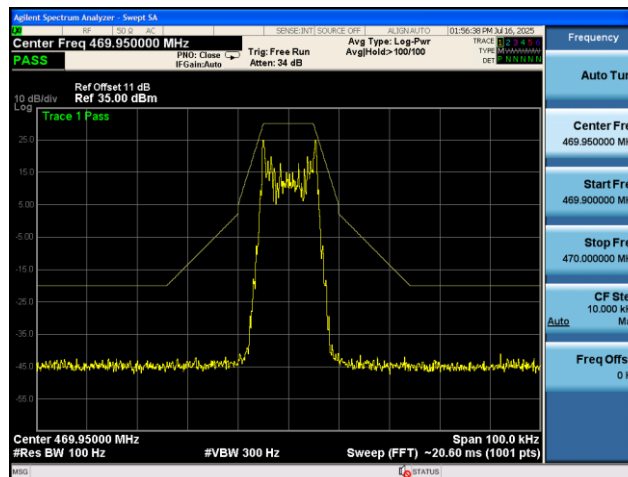
Low: 410.050MHz



Mid: 440.000MHz



High: 469.950MHz



3.3. Spurious Emissions(conducted)

3.3.1. Test Specification

Test Requirement:	FCC Part 90.210
Test Method:	FCC part 2.1051, ANSI C63.26-2015 Section 5.7
Test Setup:	 Spectrum Analyzer EUT
Test Limit:	Modulation Type: GMSK FCC Part 22.359, 74.462, 80.211 and 90.210: For 6.25 bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 4.6 kHz at least: $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation. Calculation: Limit (dBm) = $EL - 55 - 10 \log_{10} (TP)$ Notes: EL is the emission level of the Output Power expressed in dBm, For 12.5 bandwidth: 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. $50 + 10 \log (P \text{ watts}) = 50 + 10 \log (2) = 50$ dB Note: In general, the worst case attenuation requirement shown above was applied. Calculation: Limit (dBm) = $EL - 50 - 10 \log_{10} (TP)$ 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) = $30 - 50 - 10 \log (2) = -20$ dBm For 25 kHz bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 62.5 kHz at least: $43 + 10 \log (P \text{ watts}) = 43 + 10 \log (2) = 43$ dB Note: In general, the worst case attenuation requirement shown above was applied. Calculation: Limit (dBm) = $EL - 43 - 10 \log_{10} (TP)$ In this application, the EL is 30 dBm for High rated power. Limit (dBm) = $30 - 43 - 10 \log (2) = -13$ 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 (f_d 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.

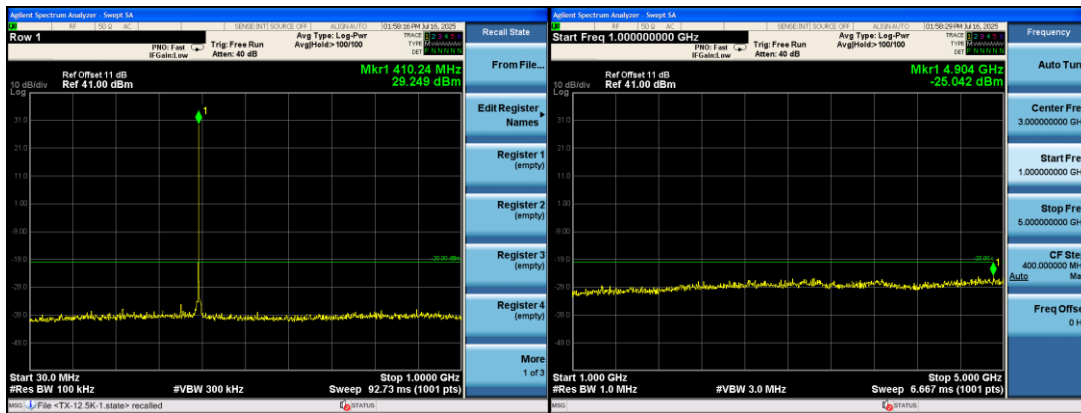
Test Result:**PASS**

3.3.2. Test Data

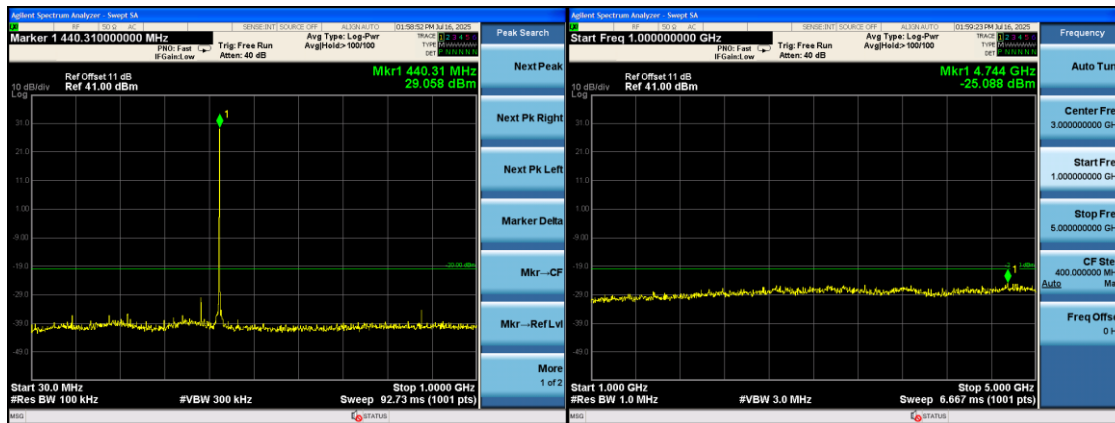
Test plots as follows:

GMSK 12.5KHz Channel Spacing:

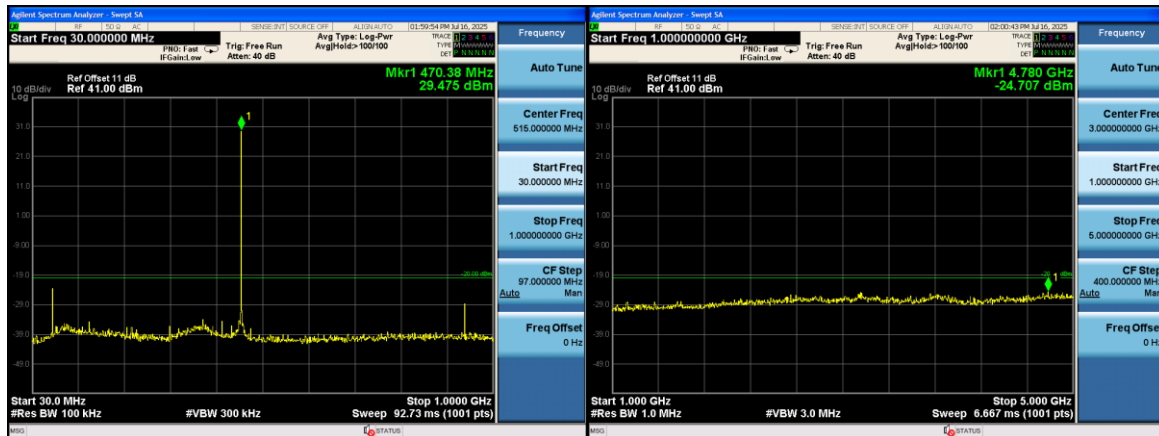
Low: 410.050MHz



Mid: 440.000MHz

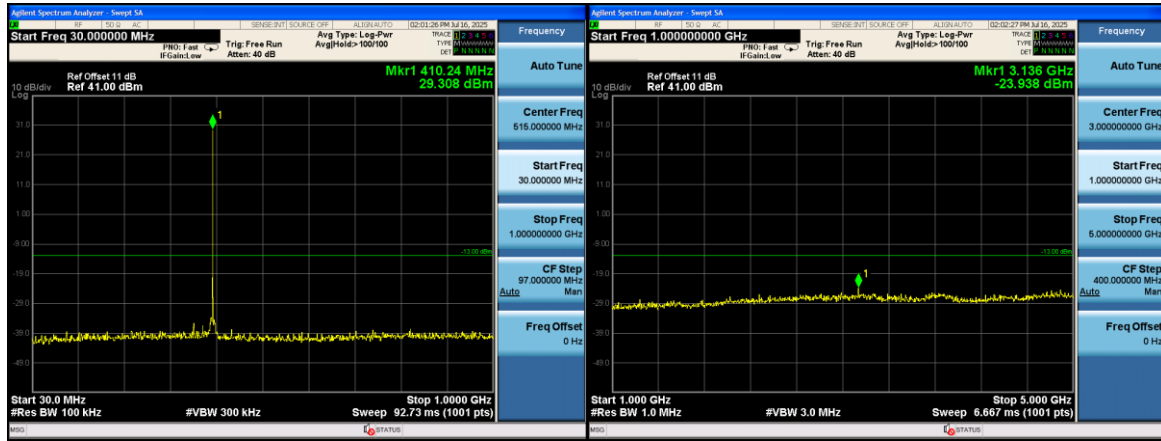


High: 469.950MHz

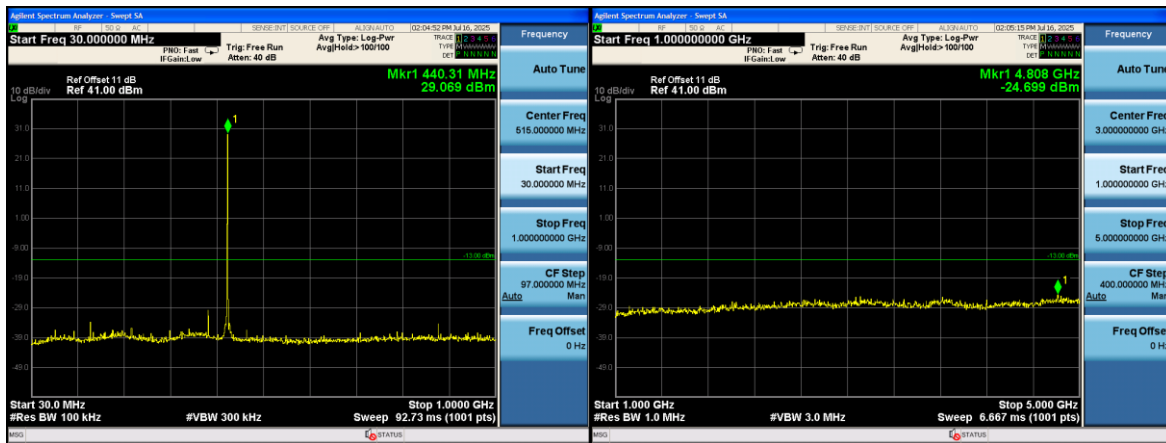


GMSK 25KHz Channel Spacing:

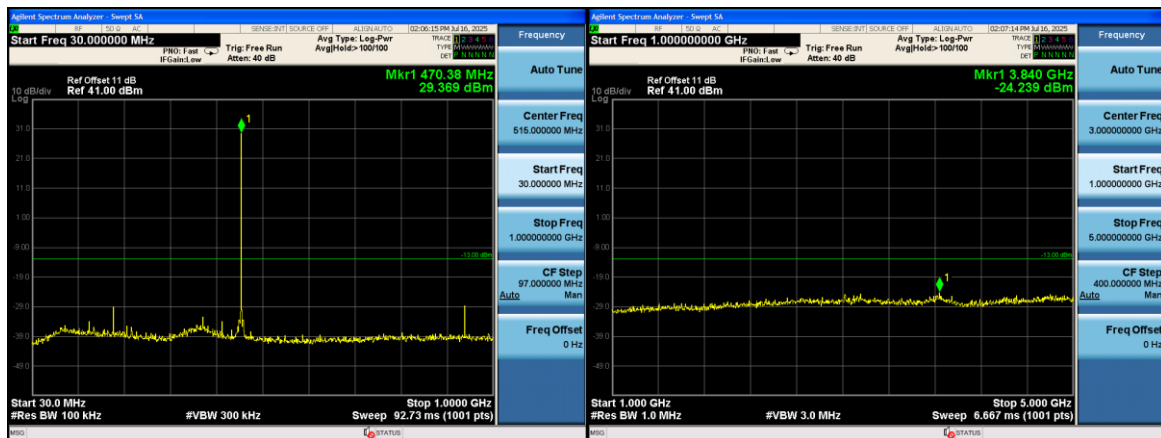
Low: 410.050MHz



Mid: 440.000MHz

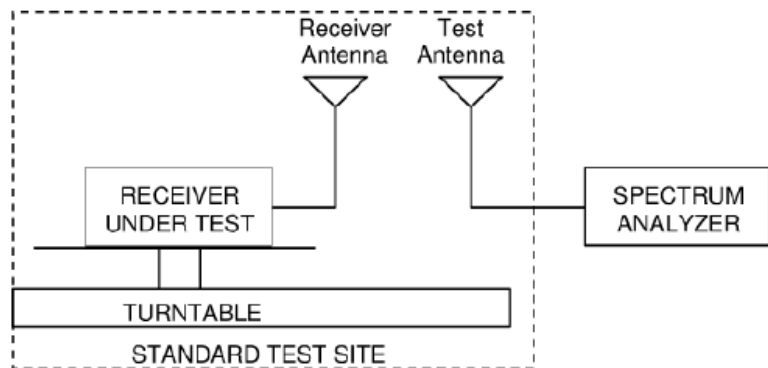


High: 469.950MHz



3.4. Radiated Spurious Emission

3.4.1. Test Specification

Test Requirement:	FCC Part 90.210															
Test Method:	FCC part 2.1051, ANSI C63.26-2015 Section 5.5															
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. For equipment using 6.25 kHz channel spacing, On any frequency removed from the center of the authorized bandwidth by more than 4.6 kHz: At least $55 + 10 \log (P)$ or 65 dB, whichever is the lesser attenuation.															
Test setup:	 The diagram illustrates the test setup within a 'STANDARD TEST SITE' (indicated by a dashed box). A 'RECEIVER UNDER TEST' is positioned on a 'TURNTABLE'. A 'Receiver Antenna' is connected to the receiver, and a 'Test Antenna' is connected to a 'SPECTRUM ANALYZER'. The receiver and antenna are connected by a line, and the test antenna is connected to the spectrum analyzer.															
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
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)
152.351	-89.650	V	0.24	31.35	-58.540	-20	-38.540
362.467	-95.288	V	0.26	31.34	-64.208	-20	-44.208
672.688	-97.075	V	0.42	31.24	-66.255	-20	-46.255
821.838	-96.068	V	0.58	30.71	-65.938	-20	-45.938
1228.268	-84.262	V	1.23	26.38	-59.112	-20	-39.112
3864.099	-79.277	V	1.68	25.47	-55.487	-20	-35.487
283.709	-96.956	H	0.43	31.24	-66.146	-20	-46.146
398.414	-91.812	H	0.45	30.68	-61.582	-20	-41.582
676.908	-97.014	H	0.64	30.85	-66.804	-20	-46.804
821.459	-98.167	H	0.79	31.12	-67.837	-20	-47.837
1228.512	-85.019	H	1.29	26.12	-60.189	-20	-40.189
3258.726	-78.556	H	1.62	25.41	-54.766	-20	-34.766

Test Mode: Mid: 440.000MHz, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
152.812	-94.523	V	0.24	31.35	-63.413	-20	-43.413
365.514	-90.470	V	0.26	31.34	-59.390	-20	-39.390
670.983	-98.327	V	0.42	31.24	-67.507	-20	-47.507
881.803	-93.020	V	0.58	30.71	-62.890	-20	-42.890
1320.724	-85.989	V	1.23	26.38	-60.839	-20	-40.839
3857.002	-78.465	V	1.68	25.47	-54.675	-20	-34.675
288.453	-102.043	H	0.43	31.24	-71.233	-20	-51.233
399.064	-94.128	H	0.45	30.68	-63.898	-20	-43.898
681.627	-100.804	H	0.64	30.85	-70.594	-20	-50.594
879.413	-95.108	H	0.79	31.12	-64.778	-20	-44.778
1317.979	-85.520	H	1.29	26.12	-60.690	-20	-40.690
3262.627	-78.063	H	1.62	25.41	-54.273	-20	-34.273

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)
152.315	-93.133	V	0.24	31.35	-62.023	-20	-42.023
363.927	-95.853	V	0.26	31.34	-64.773	-20	-44.773
673.786	-97.849	V	0.42	31.24	-67.029	-20	-47.029
940.774	-96.757	V	0.58	30.71	-66.627	-20	-46.627
1408.224	-86.940	V	1.23	26.38	-61.790	-20	-41.790
3858.760	-79.756	V	1.68	25.47	-55.966	-20	-35.966
290.436	-97.674	H	0.43	31.24	-66.864	-20	-46.864
403.936	-94.038	H	0.45	30.68	-63.808	-20	-43.808
679.544	-96.542	H	0.64	30.85	-66.332	-20	-46.332
942.034	-97.681	H	0.79	31.12	-67.351	-20	-47.351
1408.110	-83.949	H	1.29	26.12	-59.119	-20	-39.119
3265.622	-82.630	H	1.62	25.41	-58.840	-20	-38.840

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)
147.195	-92.369	V	0.24	31.35	-61.259	-13	-48.259
359.719	-94.355	V	0.26	31.34	-63.275	-13	-50.275
669.903	-91.815	V	0.42	31.24	-60.995	-13	-47.995
823.292	-95.543	V	0.58	30.71	-65.413	-13	-52.413
1231.515	-84.969	V	1.23	26.38	-59.819	-13	-46.819
3857.323	-81.363	V	1.68	25.47	-57.573	-13	-44.573
288.249	-95.816	H	0.43	31.24	-65.006	-13	-52.006
402.716	-98.854	H	0.45	30.68	-68.624	-13	-55.624
680.470	-93.583	H	0.64	30.85	-63.373	-13	-50.373
822.433	-95.011	H	0.79	31.12	-64.681	-13	-51.681
1231.230	-80.814	H	1.29	26.12	-55.984	-13	-42.984
3256.948	-77.930	H	1.62	25.41	-54.140	-13	-41.140

Test Mode; Mid: 440.000MHz, Channel Spacing 25KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
156.705	-97.040	V	0.24	31.35	-65.930	-13	-52.930
363.396	-92.986	V	0.26	31.34	-61.906	-13	-48.906
670.968	-94.506	V	0.42	31.24	-63.686	-13	-50.686
882.593	-95.128	V	0.58	30.71	-64.998	-13	-51.998
1319.331	-85.358	V	1.23	26.38	-60.208	-13	-47.208
3860.408	-80.433	V	1.68	25.47	-56.643	-13	-43.643
285.065	-95.650	H	0.43	31.24	-64.840	-13	-51.840
403.085	-98.091	H	0.45	30.68	-67.861	-13	-54.861
681.431	-97.240	H	0.64	30.85	-67.030	-13	-54.030
878.139	-93.931	H	0.79	31.12	-63.601	-13	-50.601
1321.873	-82.835	H	1.29	26.12	-58.005	-13	-45.005
3262.482	-81.690	H	1.62	25.41	-57.900	-13	-42.260

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)
155.278	-92.340	V	0.24	31.35	-61.230	-13	-48.230
362.943	-91.067	V	0.26	31.34	-59.987	-13	-46.987
667.490	-93.933	V	0.42	31.24	-63.113	-13	-50.113
937.132	-98.470	V	0.58	30.71	-68.340	-13	-55.340
1409.824	-78.432	V	1.23	26.38	-53.282	-13	-40.282
3858.408	-82.331	V	1.68	25.47	-58.541	-13	-45.541
289.654	-96.825	H	0.43	31.24	-66.015	-13	-53.015
397.186	-95.237	H	0.45	30.68	-65.007	-13	-52.007
677.213	-92.426	H	0.64	30.85	-62.216	-13	-49.216
938.276	-100.717	H	0.79	31.12	-70.387	-13	-57.387
1405.844	-85.720	H	1.29	26.12	-60.890	-13	-47.890
3264.224	-75.528	H	1.62	25.41	-51.738	-13	-38.738

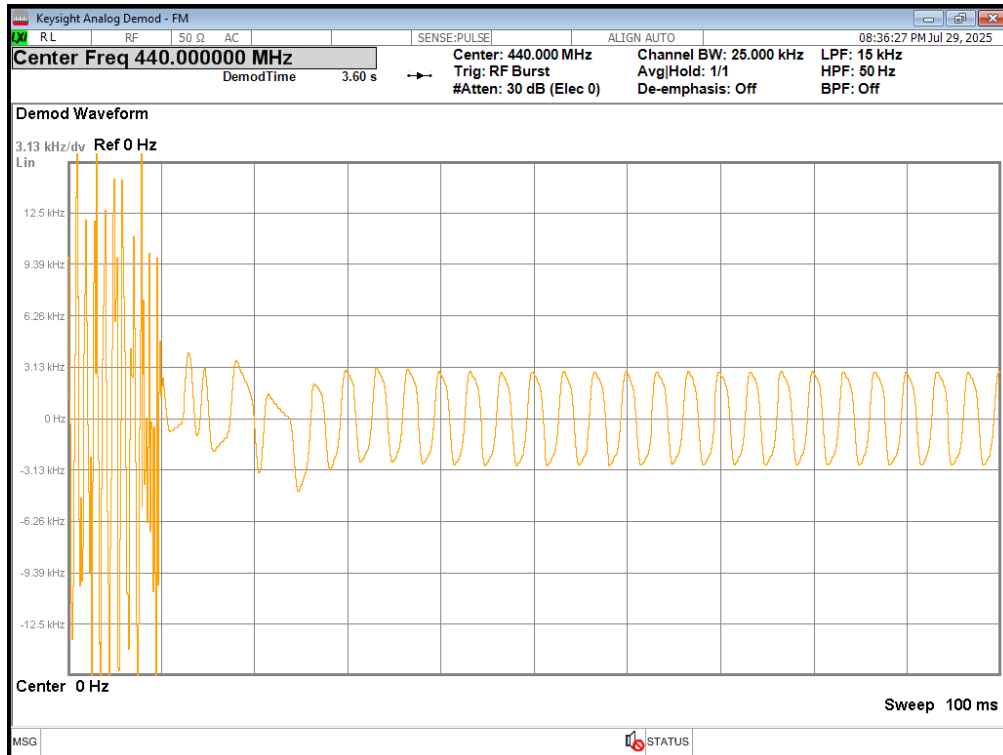
3.5. Transient Frequency Behavior

3.5.1. Test Specification

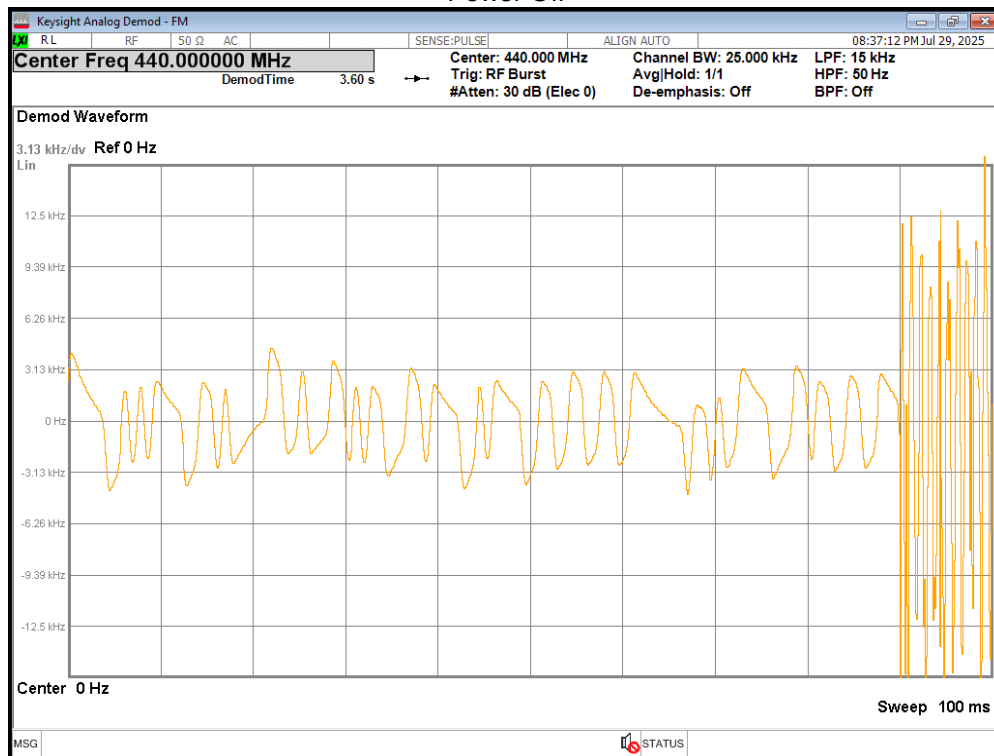
Test Requirement:	FCC Part 90.214				
Test Setup:	 Oscilloscope EUT				
Test Limit	Channel Bandwidth (kHz)	Time Intervals (Notes 1, 2)	Maximum Frequency Difference (kHz)	Transient Duration Limit (ms)	
				138-174 MHz	406.1-512 MHz
25	t ₁		±25	5	10
		t ₂	±12.5	20	25
		t ₃	±25	5	10
	12.5	t ₁	±12.5	5	10
		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

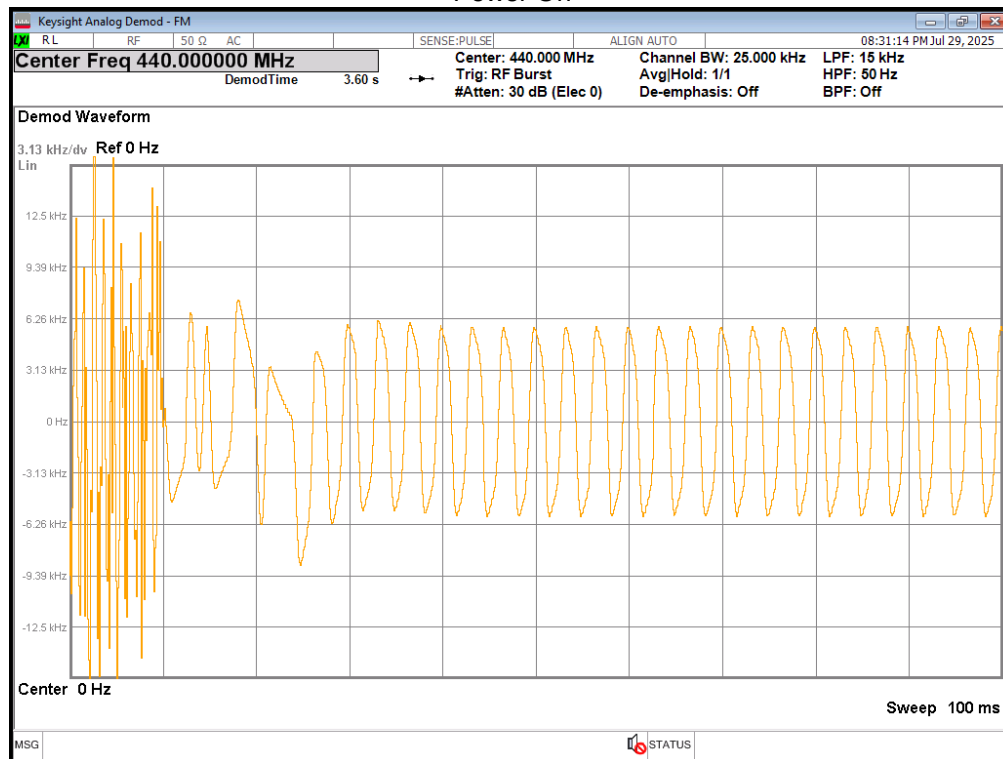
Test Plots for channel spacing 12.5KHz, EUT power setting: Maximum.
Power On



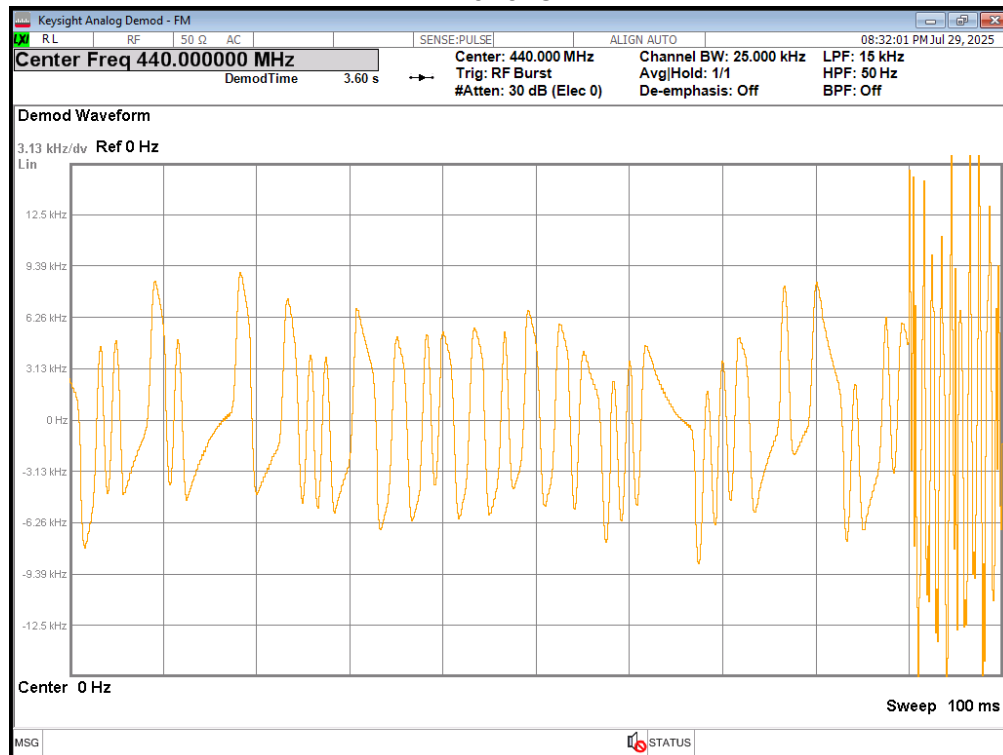
Power Off



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



Power Off



3.6. Behavior Frequency Stability

3.6.1. Test Specification

Test Requirement:	FCC Part 90.213
Test Method:	FCC part 2.1055, ANSI C63.26-2015 Section 5.6
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 --- RFCS[RF Communication Test Set] MC --- MA[Modulation Analyzer] MA --- RF[RF Detector] RF --- 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 12.5KHz Channel Spacing	5	20.58	0.047
	6	-1.07	-0.002
	7	-4.54	-0.010
	8	8.01	0.018
	9	9.03	0.021
	10	26.00	0.059
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	5	14.45	0.033
	6	4.72	0.011
	7	15.16	0.034
	8	10.81	0.025
	9	-8.31	-0.019
	10	26.49	0.060
Limit	5ppm		

Mode	Temperature (°C)	Frequency error (Hz)	frequency error (ppm)
Middle Channel 12.5KHz Channel Spacing	-30	-8.26	-0.019
	-20	0.52	0.001
	-10	0.63	0.001
	0	-7.65	-0.017
	10	20.51	0.047
	20	18.92	0.043
	30	3.99	0.009
	40	29.34	0.067
	50	11.13	0.025
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	-30	-2.12	-0.005
	-20	-1.90	-0.004
	-10	22.57	0.051
	0	17.32	0.039
	10	18.28	0.042
	20	-0.01	0.000
	30	1.59	0.004
	40	-3.32	-0.008
	50	0.67	0.002
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.

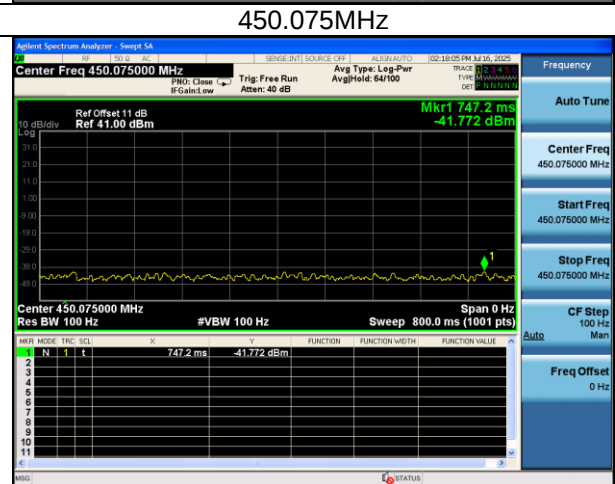
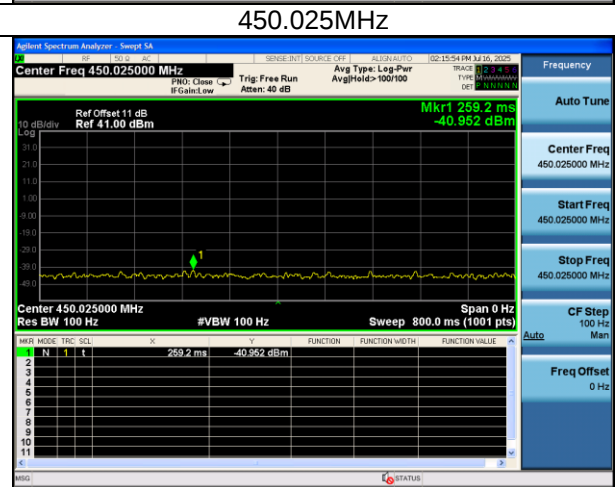
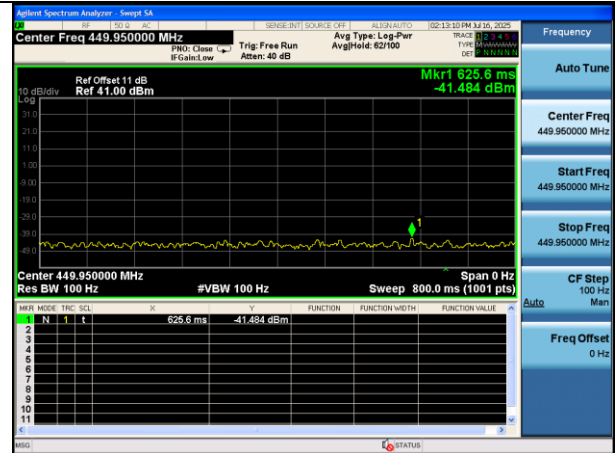
3.8. Adjacent Channel Power

Test Requirement:	FCC Part 90.221												
Test Setup:	 Spectrum Analyzer EUT												
Test Limit:	Maximum adjacent power levels for frequencies in the 450–470 MHz band, no need compliance with below -36dBm: <table><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><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></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.												

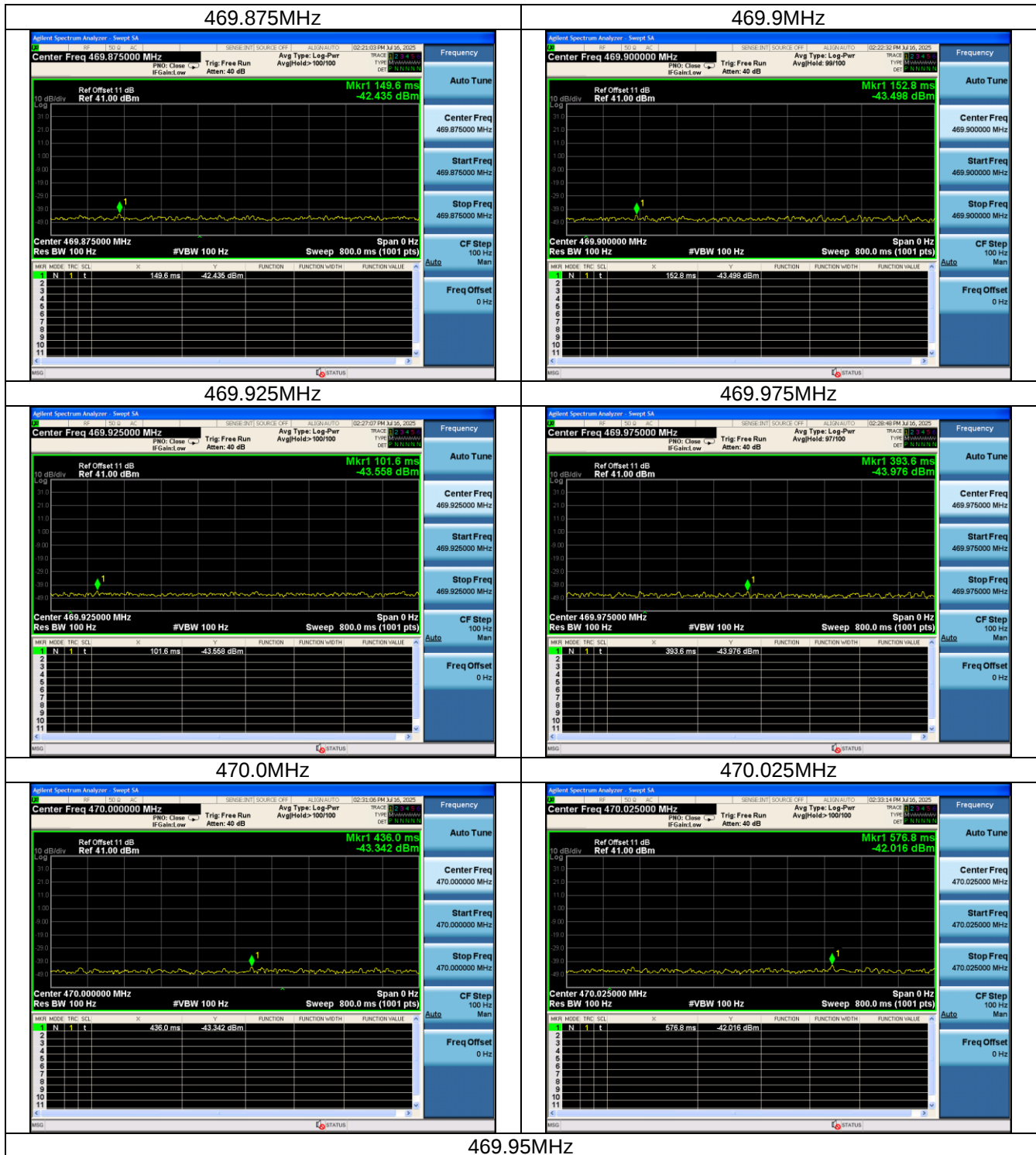
GMSK 25KHz spacing 450MHz-470MHz

Carrier frequency (MHz)	Test Frequency (MHz)	Test Value (dBm)	Limit (dBm)	Result
450.000	449.925	-41.559	44-70=-26	PASS
	449.95	-41.484	44-70=-26	PASS
	449.975	-41.704	44-60=-16	PASS
	450.025	-40.952	44-60=-16	PASS
	450.05	-42.630	44-70=-26	PASS
	450.075	-41.772	44-70=-26	PASS
469.950	469.875	-42.436	44-70=-26	PASS
	469.900	-43.498	44-70=-26	PASS
	469.925	-43.558	44-60=-16	PASS
	469.975	-43.976	44-60=-16	PASS
	470.000	-43.342	44-70=-26	PASS
	470.025	-42.016	44-70=-26	PASS

449.95MHz

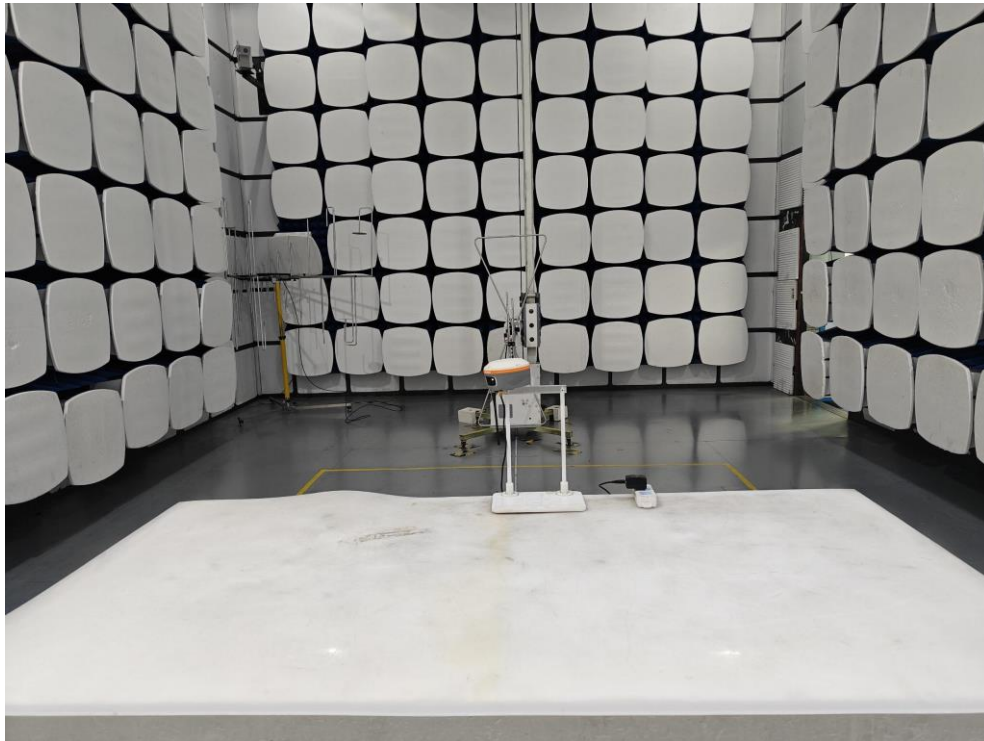


450MHz



4. Test Setup Photo

4.1. Photos of Radiated Emission



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