TEST REPORT

Applicant Name:	South Surveying & Mapping Technology Co., Ltd.
Address:	No.39, Sicheng Road, Tianhe District, Guangzhou,China
Report Number:	RA230407-17721E-RF-00C
FCC ID:	2AJTU-INSIGHTV2

Test Standard (s)

FCC PART 90

Sample Description

Product Type:	GNSS RECEIVER
Model No.:	Insight V2, K58plus, G6pro, T5, C7, C8, C9, G3, G5, G9, RT300, J1, T12, ROVA 1S, ROVA 2S, ROVA 3S, ROVA 4S, ROVA 5S, Insight V1, Insight V3, Insight V4, Insight V5, S1, S2, S3, S4, S5, S6, S7,Rova1, Rova2, Rova3, Rova4, Rova5, INNO7, INNO8, INNO9, GalaxyG7, GalaxyG8, GalaxyG9, K6, K6S, K6X, K7, K7S, K7X, K8, K8S, K8X, K9, K9S, K9X, K30, K30Pro, K30X, K40, K40Pro, K40X, K50, K50Pro, K50X, RENO1, RENO2, RENO3, RENO4, RENO5, T12, T13, T14, T15, V2
Trade Mark:	SOUTH, KOLIDA, SANDING, RUIDE, TIANYU
Date Received:	2023-04-10
Date of Test:	2023-05-29 to 2023-06-05
Report Date:	2023-06-10

Test Result:	Pass*

* In the configuration tested, the EUT complied with the standards above.

Prepared and Checked By:

Bob.Liao
EMC Engineer

Approved By:

Candy Li
EMC Engineer

Note: This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "★".
Shenzhen Accurate Technology Co., Ltd. is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with an asterisk '*'. Customer model name, addresses, names, trademarks etc. are not considered data.
This report cannot be reproduced except in full, without prior written approval of the Company. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested. This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	RA230407-17721E-RF-00C	Original Report	2023-06-10

GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

Product Type	GNSS RECEIVER
Tested Model	Insight V2
Multiple Model	K58plus, G6pro, T5, C7, C8, C9, G3, G5, G9, RT300, J1, T12, ROVA 1S, ROVA 2S, ROVA 3S, ROVA 4S, ROVA 5S, Insight V1, Insight V3, Insight V4, Insight V5, S1, S2, S3, S4, S5, S6, S7,Rova1, Rova2, Rova3, Rova4, Rova5, INNO7, INNO8, INNO9, GalaxyG7, GalaxyG8, GalaxyG9, K6, K6S, K6X, K7, K7S, K7X, K8, K8S, K8X, K9, K9S, K9X, K30, K30Pro, K30X, K40, K40Pro, K40X, K50, K50Pro, K50X, RENO1, RENO2, RENO3, RENO4, RENO5, T12, T13, T14, T15, V2
Model Difference	Please refer to DOS letter
Frequency Range	410-470MHz
Rated Transmit Power	3Watts(High), 0.8Watt(Low)
Channel separation	12.5kHz
Modulation Technique	GMSK
Antenna Specification*	2.14 dBi (provided by the applicant)
Voltage Range	DC 7.2V from battery DC 5V/9V/15V/20V from adapter(PD) DC 3.3-11V from adapter(PPS) DC 5V/9V/12V from adapter(QC)
Sample number	24CH-11(CE&RE), 24CH-12 (RF Conducted Test)
Sample/EUT Status	Good condition
Adapter Information	Model No.: S045SU2000225 Input: 100-240V~50/60Hz 1.4A MAX Output: PD3.0: 5V⎓3A/9V⎓3A/15V⎓3A/20V⎓2.25A PSS: 3.3-11V⎓3A QC: 5V⎓3A/9V⎓3A/12V⎓3A

Objective

This test report is in accordance with Part 2, and Part 90 of the Federal Communication Commissions rules.

Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of federal Regulations Title 47 Part 2, Sub-part J as well as the following individual parts:

Part 90 – Private Land Mobile Radio Service

Applicable Standards: TIA 603-E, ANSI C63.26-2015.

All emissions measurement was performed at Shenzhen Accurate Technology Co., Ltd. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Each test item follows test standards and with no deviation.

Measurement Uncertainty

Parameter		Uncertainty
Occupied Channel Bandwidth		5%
RF Frequency		$0.082*10^{-7}$
RF output power, conducted		0.73dB
Unwanted Emission, conducted		1.6dB
AC Power Lines Conducted Emissions		2.74dB
Emissions, Radiated	30MHz - 1GHz	4.28dB
	1GHz - 18GHz	4.98dB
	18GHz - 26.5GHz	5.06dB
Temperature		1℃
Humidity		6%
Supply voltages		0.4%

Note: The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

Test Facility

The test site used by Shenzhen Accurate Technology Co., Ltd. to collect test data is located on the Floor 1, KuMaKe Building, Dongzhou Community, Guangming Street, Guangming District, Shenzhen, Guangdong, China.

The test site has been approved by the FCC under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No.: 708358, the FCC Designation No.: CN1189.

Accredited by American Association for Laboratory Accreditation (A2LA).The Certificate Number is 4297.01.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0016. The Registration Number is 30241.

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a test mode which has been done in the factory.

Equipment Modifications

No modification was made to the EUT.

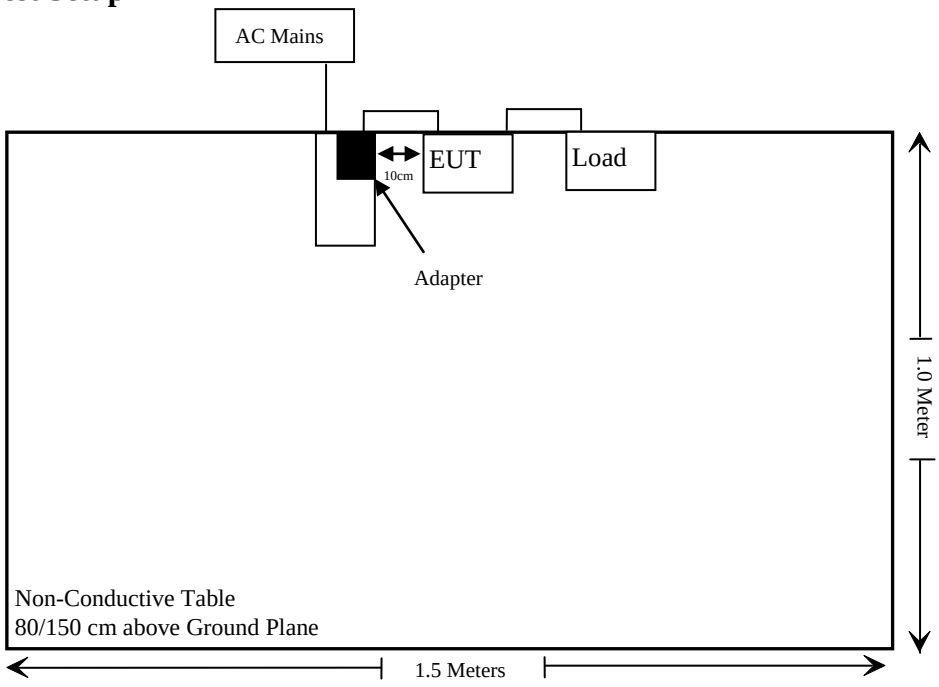
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
listed	Adapter	S045SU2000225	UNKNOW
UNKNOW	Load	UNKNOW	UNKNOW

External I/O Cable

Cable Description	Length (m)	From Port	To
Un-shielding Un-Detachable DC Cable	1.0	Adapter	EUT

Block Diagram of Test Setup



Note: the support table edge was flush with the center of turntable.

SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Results
§2.1091	Maximum Permissible Exposure (MPE)	Compliant
§2.1046; §90.205	RF Output Power	Compliant
§2.1047; §90.207	Modulation Characteristic	Not Applicable
§2.1049; §90.209; §90.210	Occupied Bandwidth & Emission Mask	Compliant
§2.1051;§90.210	Spurious Emission at Antenna Terminal	Compliant
§2.1053;§90.210	Spurious Radiated Emissions	Compliant
§2.1055;§90.213	Frequency Stability	Compliant
§90.214	Transient Frequency Behavior	Compliant

Not Applicable: The modulation is GMSK.

TEST EQUIPMENT LIST

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Radiated Emission Test					
Rohde& Schwarz	Test Receiver	ESR	102725	2022/11/25	2023/11/24
Rohde&Schwarz	Spectrum Analyzer	FSV40	101949	2022/11/25	2023/11/24
SONOMA INSTRUMENT	Amplifier	310 N	186131	2022/11/08	2023/11/07
A.H. Systems, inc.	Preamplifier	PAM-0118P	135	2022/11/08	2023/11/07
Schwarzbeck	Bilog Antenna	VULB9163	9163-194	2023/02/14	2026/02/13
Schwarzbeck	Bilog Antenna	VULB9163	9163-323	2021/07/06	2024/07/05
Schwarzbeck	Horn Antenna	BBHA9120D	837	2023/02/22	2026/02/21
Schwarzbeck	Horn Antenna	BBHA9120D	9120D-655	2022/12/26	2025/12/25
Mini-Circuits	High Pass Filter	NHP-600+	15542	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.10	N050	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.11	N1000	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.12	N040	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.13	N300	2022/11/25	2023/11/24
Unknown	RF Coaxial Cable	No.14	N800	2022/11/25	2023/11/24
Unknown	RFCoaxialCable	No.16	N200	2022/11/25	2023/11/24
Agilent	Signal Generator	N5183A	MY51040755	2022/11/25	2023/11/24
Radiated Emission Test Software: e3 19821b (V9)					
RF Conducted Test					
Rohde&Schwarz	Spectrum Analyzer	FSV-40	101495	2022/11/25	2023/11/24
AGILENT	Vector Signal Generator	N5182A	MY50143401	2022/10/24	2023/10/23
Rohde & Schwarz	Signal Analyzer	FSIQ26	837405/023	2023/04/24	2024/04/23
LONGWEI	DC source	TPR-64200	UNKNOW	2023/02/09	2024/02/08
BACL	Temp. & Humid. Chamber	BTH-150-40	30192	2023/02/09	2024/02/08
Aeroflex/Weinschel	30dB Attenuator (Input 250W /Output 50W)	58-30-33	PS467	2022/11/25	2023/11/24
Mini-Circuits	Power Splitter	DC-18000MHz	SF10944151S	2022/11/25	2023/11/24

*** Statement of Traceability:** Shenzhen Accurate Technology Co., Ltd. attests that all calibrations have been performed in accordance to requirements that traceable to National Primary Standards and International System of Units (SI).

§2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Applicable Standard

According to subpart 2.1091 systems operating under the provisions of this section shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for Maximum Permissible Exposure (MPE)

Limits for Occupational/Controlled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3 - 3.0	614	1.63	(100)*	6
3.0 - 30	1842/f	4.89/f	($900/f^2$)*	6
30 - 300	61.4	0.163	1.0	6
300 - 1500	/	/	f/300	6
1500 - 100000	/	/	5	6
Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3 - 1.34	614	1.63	(100)*	30
1.34 - 30	842/f	2.19/f	($180/f^2$)*	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	/	/	f/1500	30
1500 - 100000	/	/	1.0	30

f = frequency in MHz;
* = Plane-wave equivalent power density;

Result

Calculated Formulary:

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator,the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For worst case

Frequency (MHz)	Antenna Gain		Tune up conducted power		Distance (cm)	Power density (mW/cm^2)	MPE Limit (mW/cm^2)
	(dBi)	(numeric)	(dBm)	(mW)			
2402-2480	2.43	1.75	7	5.0119	40	0.0004	1
2412-2462	2.43	1.75	23	199.5262	40	0.0174	1
410-470	2.14	1.64	34.2	2630.2680	40	0.2142	0.2733

Note1: The BT function can't transmit at the same time with the Wi-Fi function.
Note2: The BT/Wi-Fi function can transmit at the same time with the DMR function.

Simultaneous transmitting consideration:

The ratio= $MPE_{2.4G\ Wi\text{-}Fi}$ /limit+MPE_{DMR} /limit=0.0174/1+0.2142/0.2733=0.80＜1.0

To maintain compliance with the FCC's RF exposure guidelines, place the equipment at least 40cm from nearby persons.

Result: Compliant.

FCC §2.1046 & §90.205 - RF OUTPUT POWER

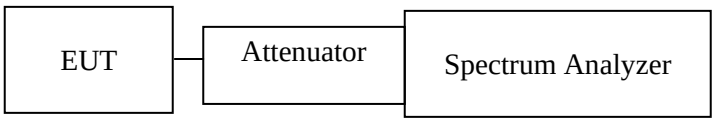
Applicable Standard

FCC §2.1046 and §90.205

Test Procedure

According to ANSI C63.26-2015 section 5.2.3.3

Conducted RF Output Power:



Note:The path loss from EUT to Specturm Analyer has included in the result.

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

Spectrum Analyzer Setting:

R B/W	Video B/W
100 kHz	300 kHz

Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	49%
ATM Pressure:	101.0 kPa

The testing was performed by Matt Liang on 2023-05-29.

Test Mode: Transmitting

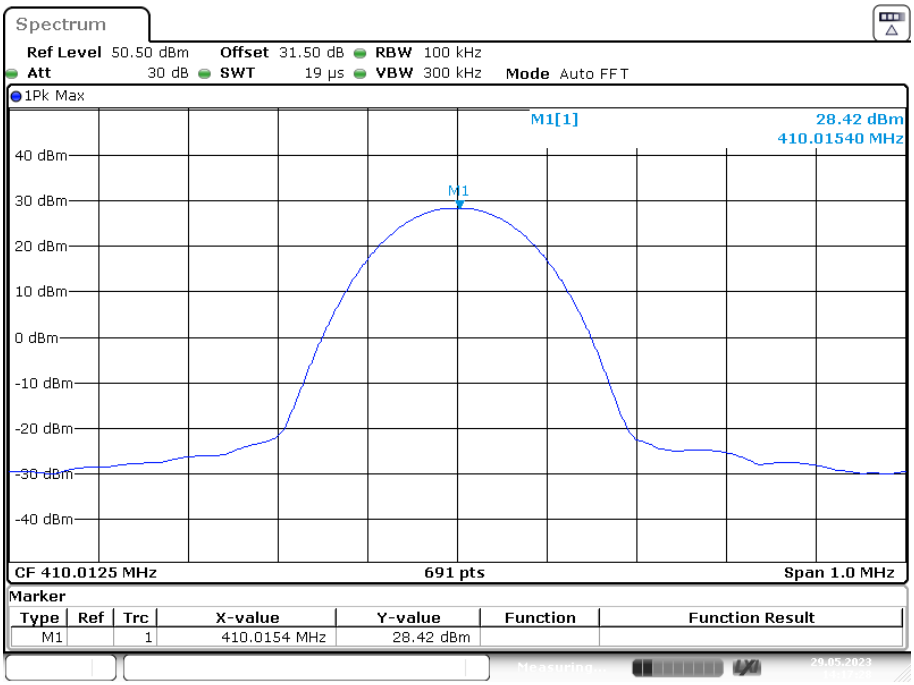
Test Result: *Pass. Please refer to following table and plots.*

Mode	Frequency Spacing (kHz)	Frequency (MHz)	Power level	Output (dBm)	Output Power (W)
Digital	12.5	410.0125	L	28.42	0.695
			H	33.93	2.472
	12.5	441.0000	L	28.51	0.710
			H	34.12	2.582
	12.5	469.9875	L	28.57	0.719
			H	33.87	2.438

Note: The output power shall not exceed by more than 20 percent the manufacturer's rated output power.
Rated high power: 3W (Limit: ≤3.6W)
Rated low power: 0.8W (Limit: ≤0.96W)

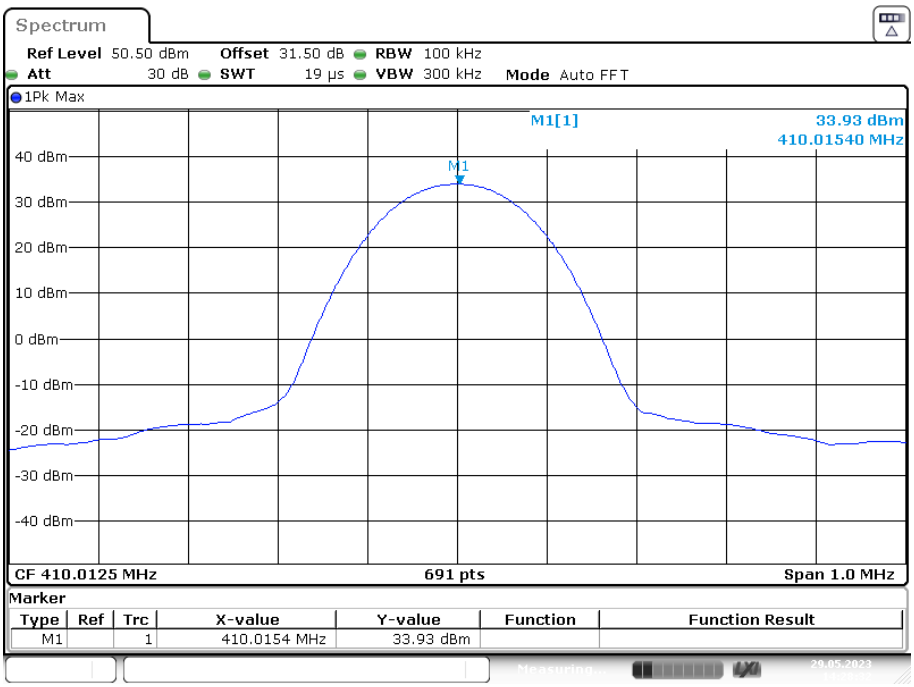
Digital:

Frequency 410.0125MHz, Low Power



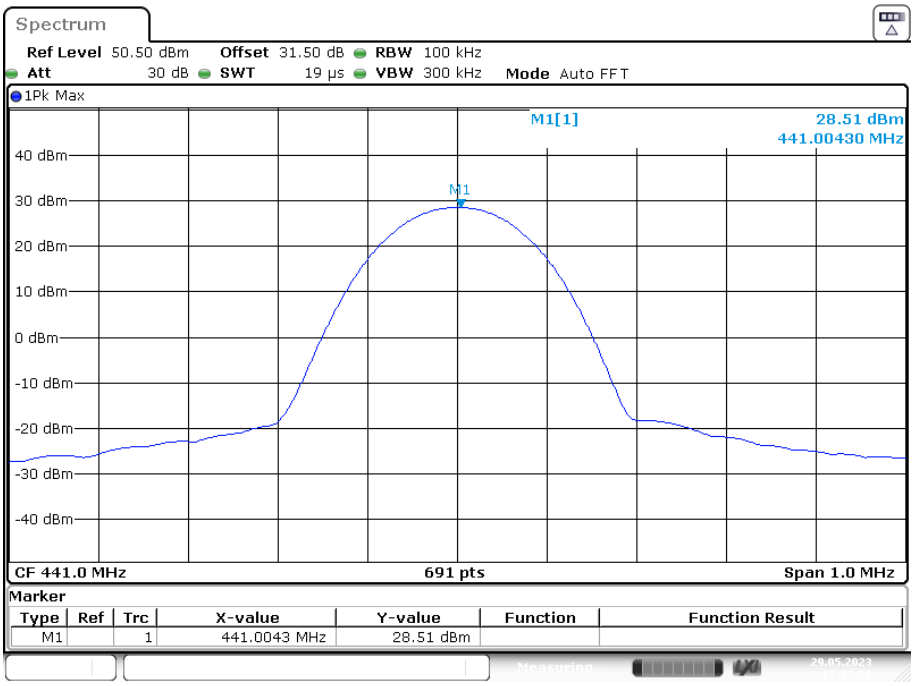
Date: 29.MAY.2023 14:17:28

Frequency 410.0125MHz, High Power



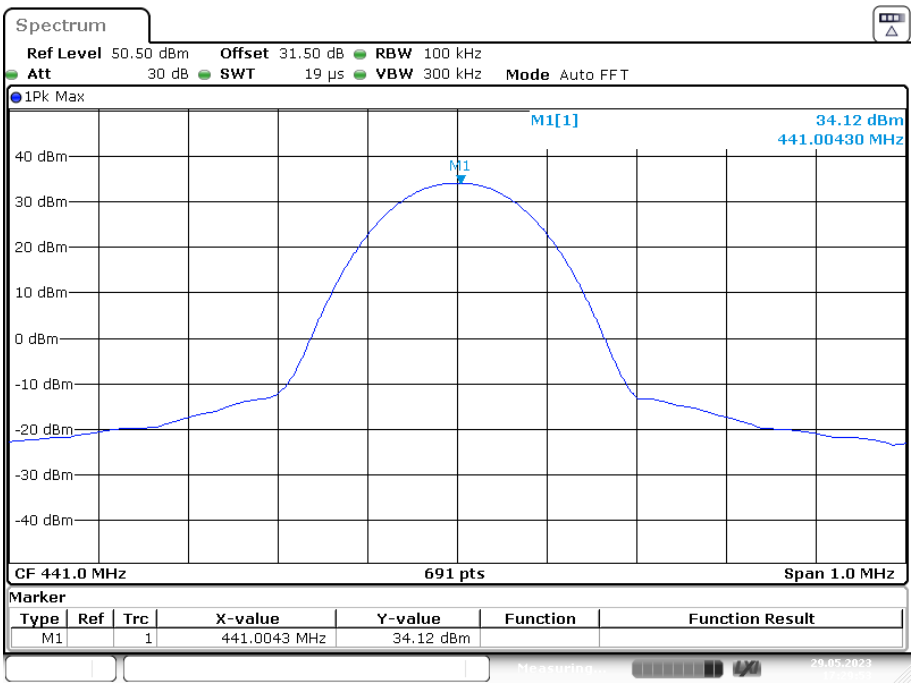
Date: 29.MAY.2023 14:28:32

Frequency 441.0000MHz, Low Power



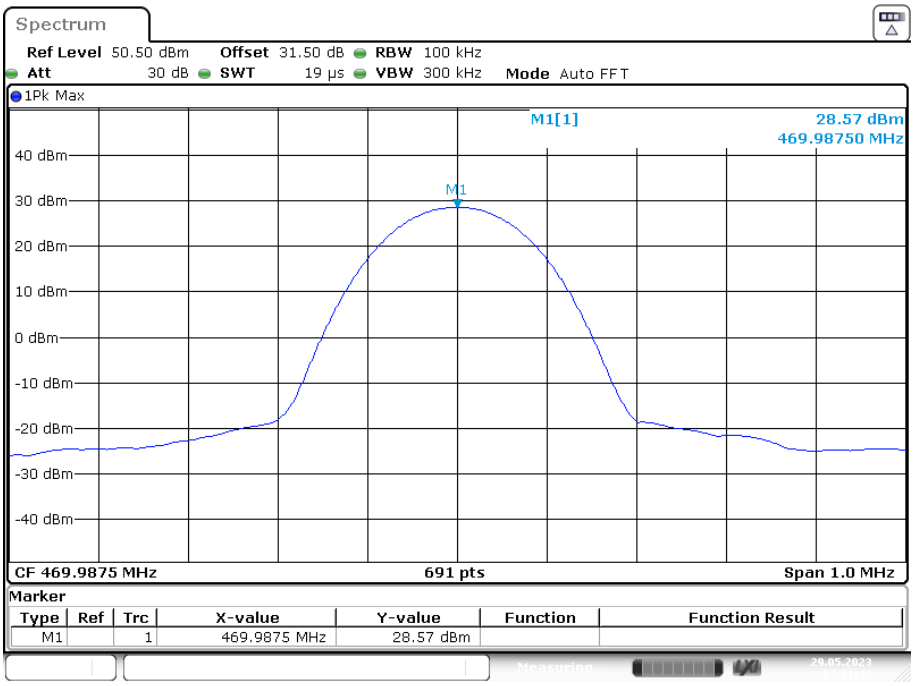
Date: 29.MAY.2023 17:27:49

Frequency 441.0000MHz, High Power



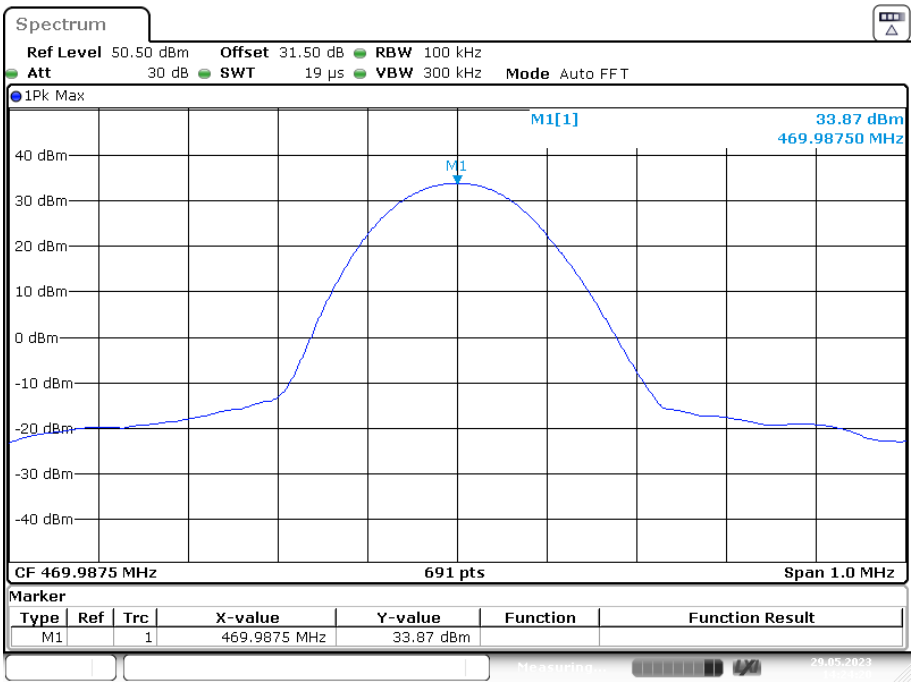
Date: 29.MAY.2023 17:29:53

Frequency 469.9875MHz, Low Power



Date: 29.MAY.2023 14:21:42

Frequency 469.9875MHz, High Power



Date: 29.MAY.2023 14:24:20

FCC §2.1049 & §90.209 & §90.210 – OCCUPIED BANDWIDTH & EMISSION MASK

Applicable Standard

FCC §2.1049 and §90.210

Emission Mask D - 12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0dB.

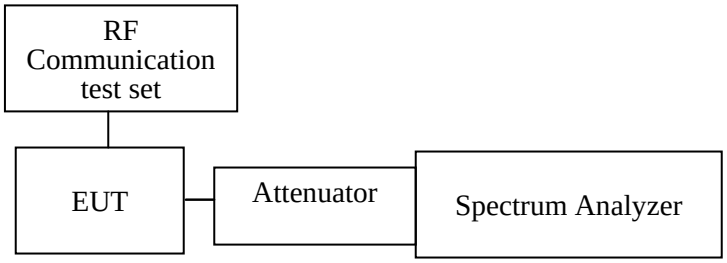
2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) 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: At least 50 + 10 log (P) dB or 70 dB, whichever is the lesser attenuation.

Test Procedure

According to ANSI C63.26-2015 section 5.4

Anolog mode:



Note:The path loss from EUT to Specturm Analyer has included in the result.

a) Connect the equipment as illustrated.

b) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth: 100Hz for 12.5Hz Channel spacing, 200Hz for 25Hz Channel spacing .
2) Video Bandwidth at least 10 times the resolution bandwidth.
3) Sweep Speed slow enough to maintain measurement calibration.
4) Detector Mode = Positive Peak.
5) Span that will allow proper viewing of the test bandwidth.

c) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0 dB reference for the measurement.

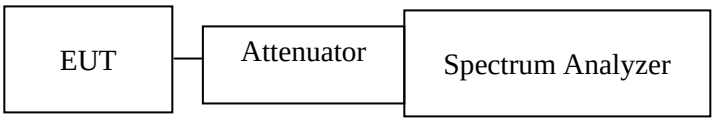
d) Modulate the transmitter with a 2500 Hz sine wave at an input level 16 dB greater than that necessary to produce 50% of rated system deviation. The input level shall be established at the frequency of maximum response of theaudio modulating circuit. Transmitters employing digital modulation techniques that bypass the limiter and the audio low-pass filter shall be modulated as specified by the manufacturer.

e) Path loss for the measurement included.

f) Measured the 26dB bandwidth, and use the spectrum analyzer Occupied bandwidth function to measurement the 99% Occupied bandwidth, save the plot

g) Record the resulting spectrum analyzer presentation of the emission level with an on-line recording device or in a photograph. It is recommended that the emission limit be drawn on the plotted graph or photograph. The spectrum analyzer presentation is the sideband spectrum

Digital mode:



a) Program and set radio to operate in desire test frequency and digital mode with modulation.

b) Connect the equipment as illustrated.

c) Adjust the spectrum analyzer for the following settings:
1) Resolution Bandwidth: 100Hz.
2) Video Bandwidth at least 10 times the resolution bandwidth.
3) Sweep Speed slow enough to maintain measurement calibration.
4) Detector Mode = Positive Peak.
5) Span that will allow proper viewing of the test bandwidth.

d) Set the center frequency of the spectrum analyzer to the assigned transmitter frequency. Key the transmitter, and set the level of the unmodulated carrier to a full scale reference line. This is the 0 dB reference for the measurement.

e) Path loss for the measurement included in plot

f) Measured the 26dB bandwidth, and use the spectrum analyzer Occupied bandwidth function to measurement the 99% Occupied bandwidth, save the plot

g) Record the resulting spectrum analyzer presentation of the emission level with an on-line recording device or in a photograph. It is recommended that the emission limit be drawn on the plotted graph or photograph. The spectrum analyzer presentation is the sideband spectrum

Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	49%
ATM Pressure:	101.0 kPa

The testing was performed by Matt Liang on 2023-05-29.

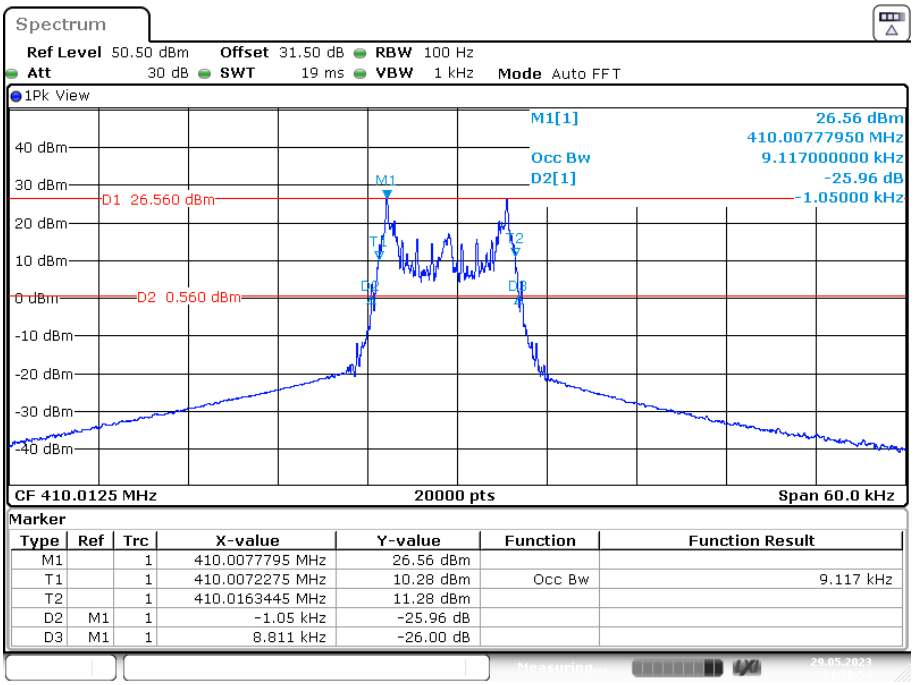
Test mode: transimitting

Test Result: *Pass. Please refer to the following table and plots.*

Modulation	Channel Separation (kHz)	Frequency (MHz)	Power Level	99% Occupied Bandwidth (kHz)	26 dB Emissions Bandwidth (kHz)
Digital	12.5	410.0125	L	9.117	9.861
			H	9.153	9.678
		441.0000	L	9.114	9.735
			H	9.117	9.735
		469.9875	L	9.123	9.858
			H	9.114	9.858

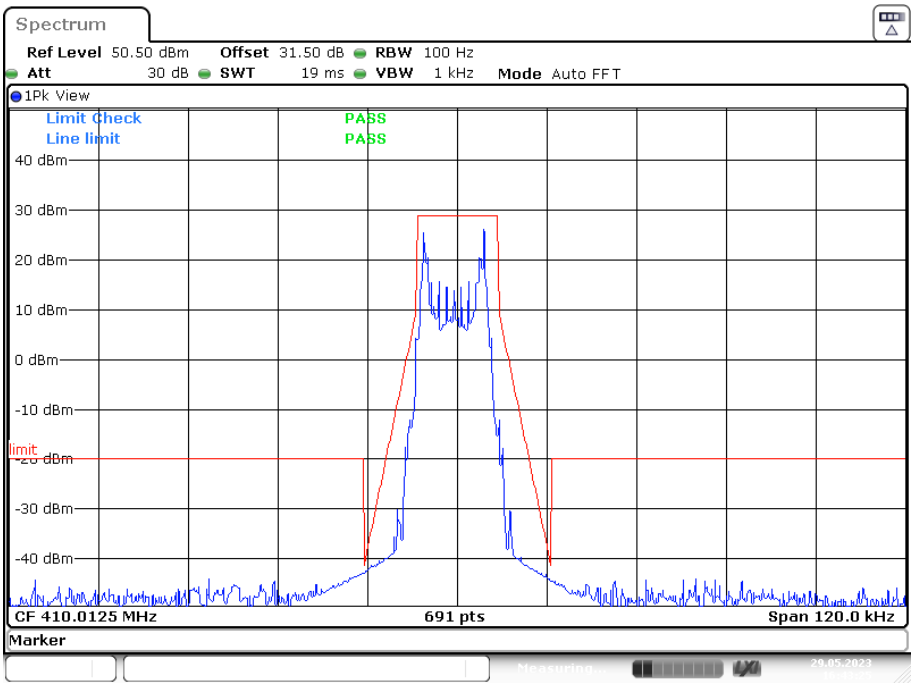
Digital

Frequency 410.0125MHz: 99% Occupied & 26 dB Bandwidth, Low Power



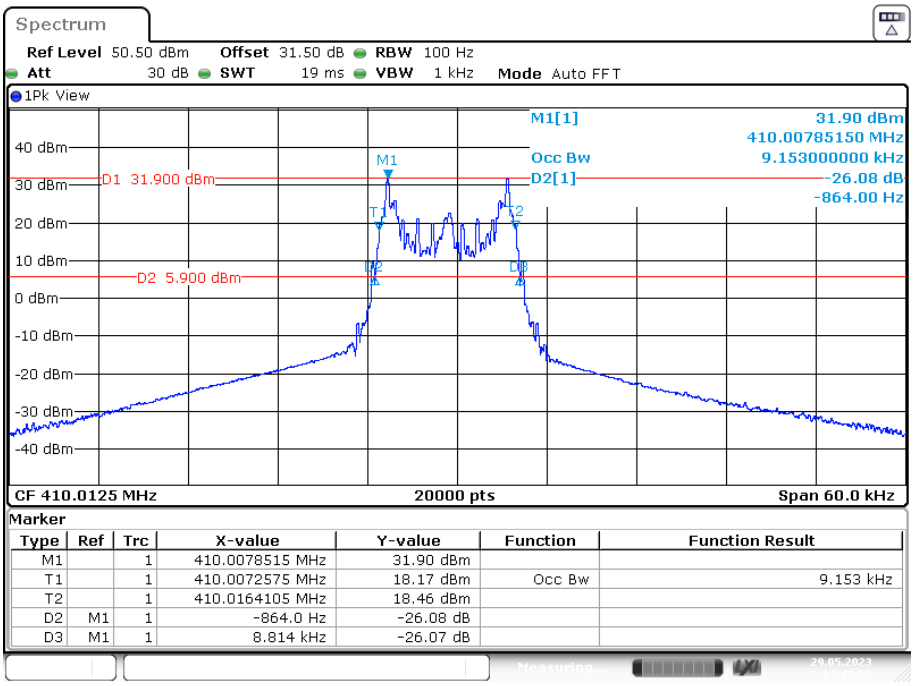
Date: 29.MAY.2023 14:58:54

Frequency 410.0125MHz: Emission Mask D, Low Power



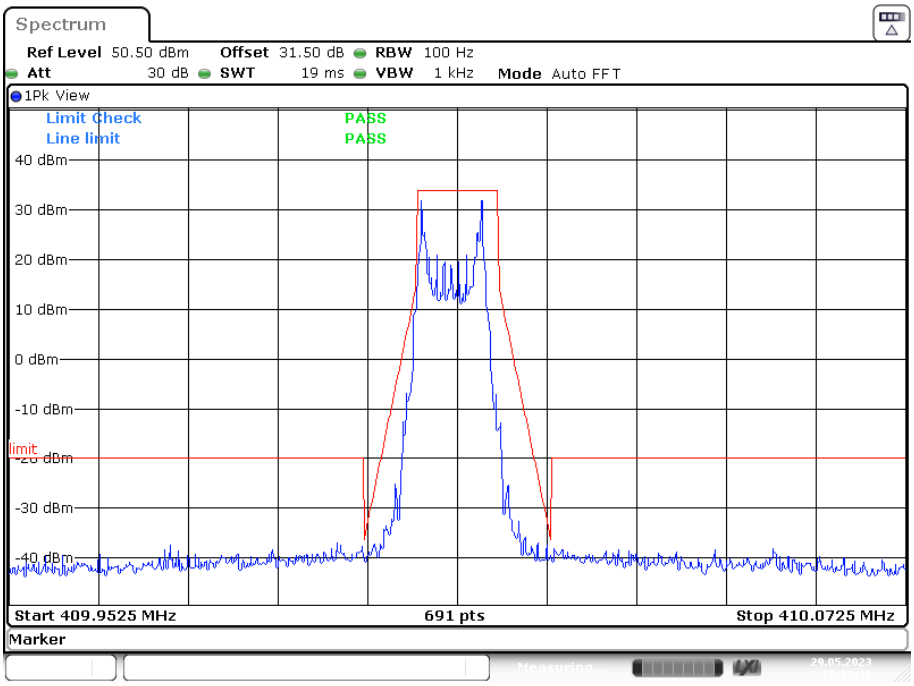
Date: 29.MAY.2023 16:43:25

Frequency 410.0125MHz: 99% Occupied & 26 dB Bandwidth, High Power



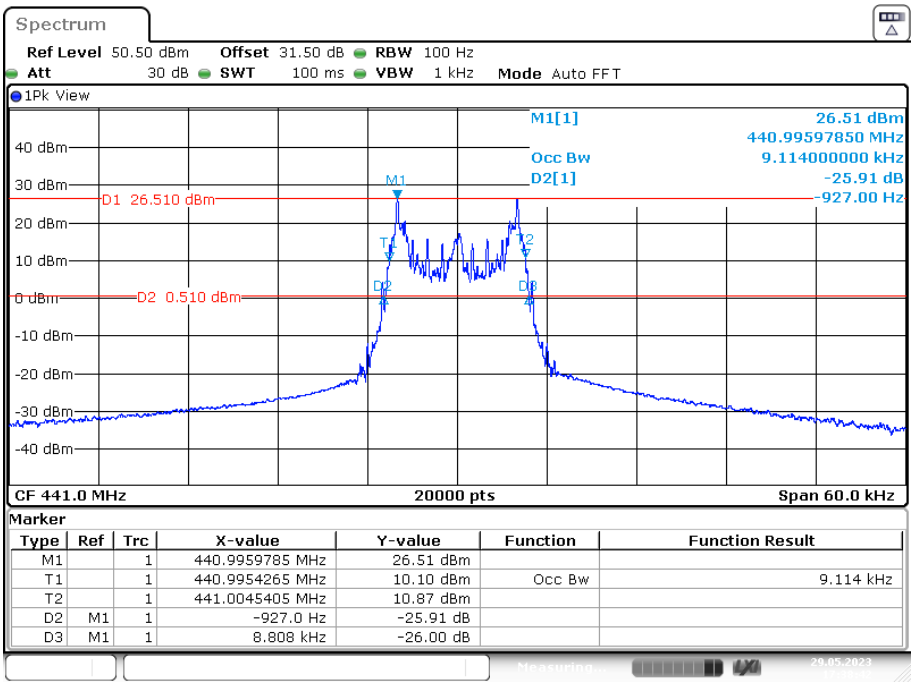
Date: 29.MAY.2023 14:47:50

Frequency 410.0125MHz: Emission Mask D, High Power



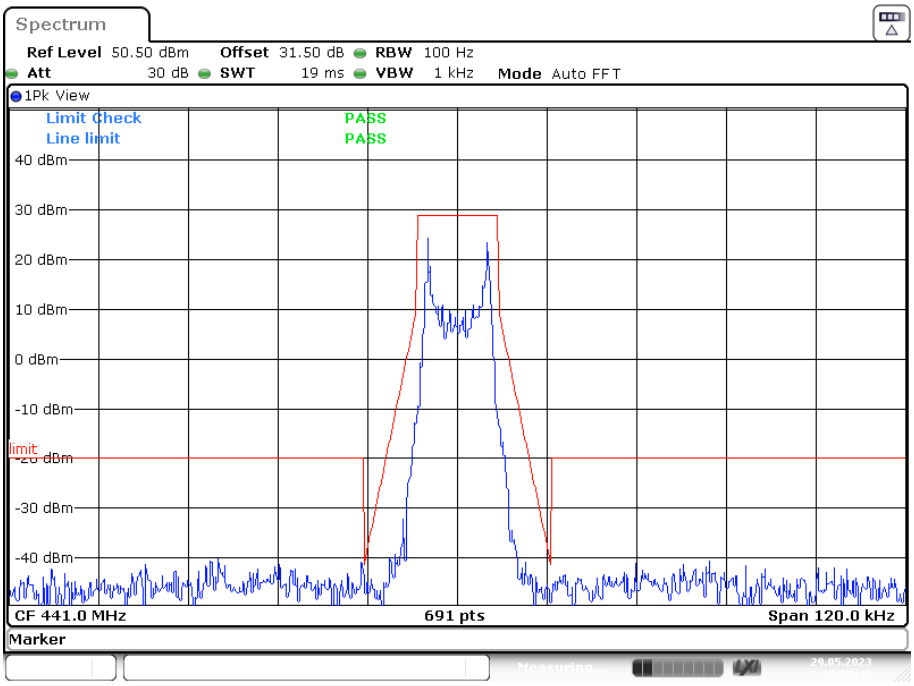
Date: 29.MAY.2023 10:23:16

Frequency 441.0000MHz: 99% Occupied & 26 dB Bandwidth, Low Power



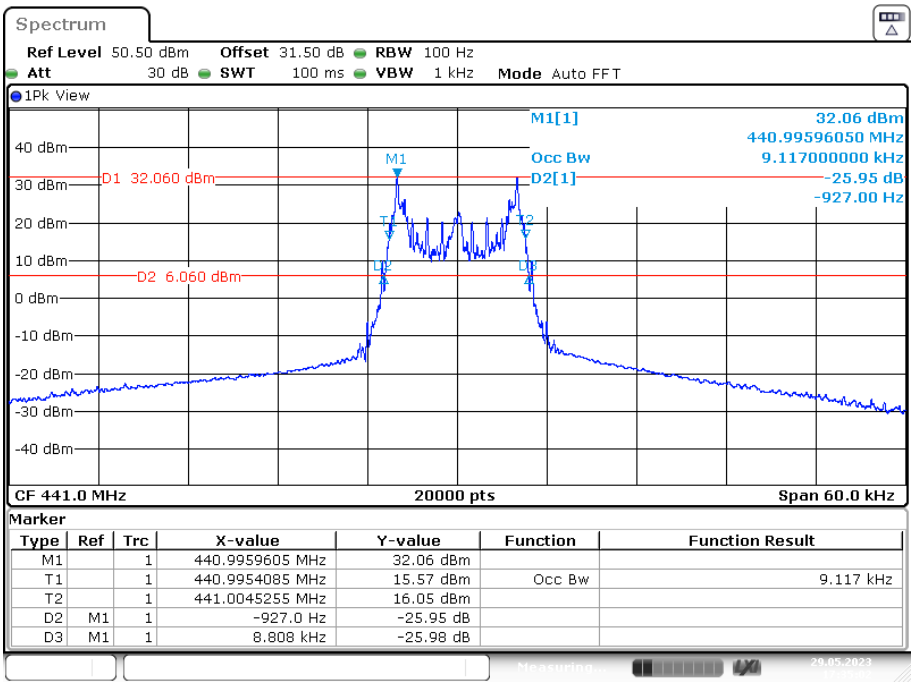
Date: 29.MAY.2023 17:38:42

Frequency 441.0000MHz: Emission Mask D, Low Power



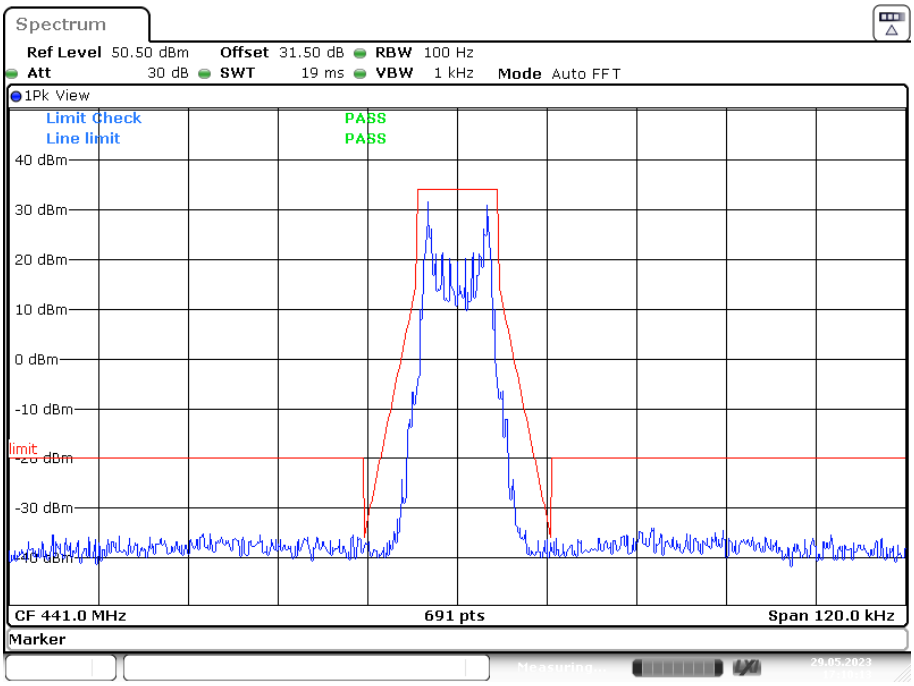
Date: 29.MAY.2023 17:05:49

Frequency 441.0000MHz: 99% Occupied & 26 dB Bandwidth, High Power



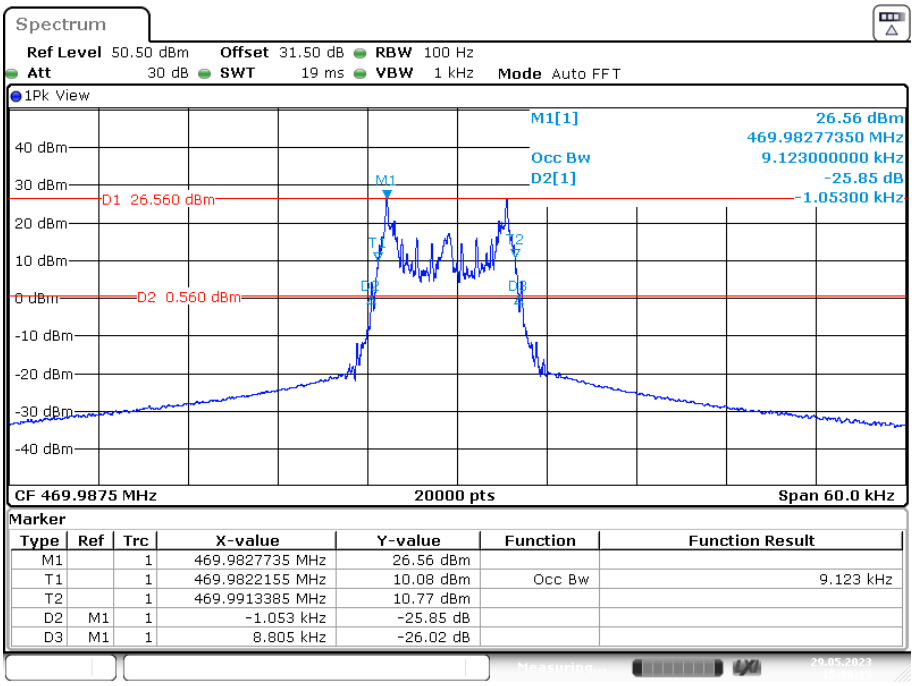
Date: 29.MAY.2023 17:35:02

Frequency 441.0000MHz: Emission Mask D, High Power



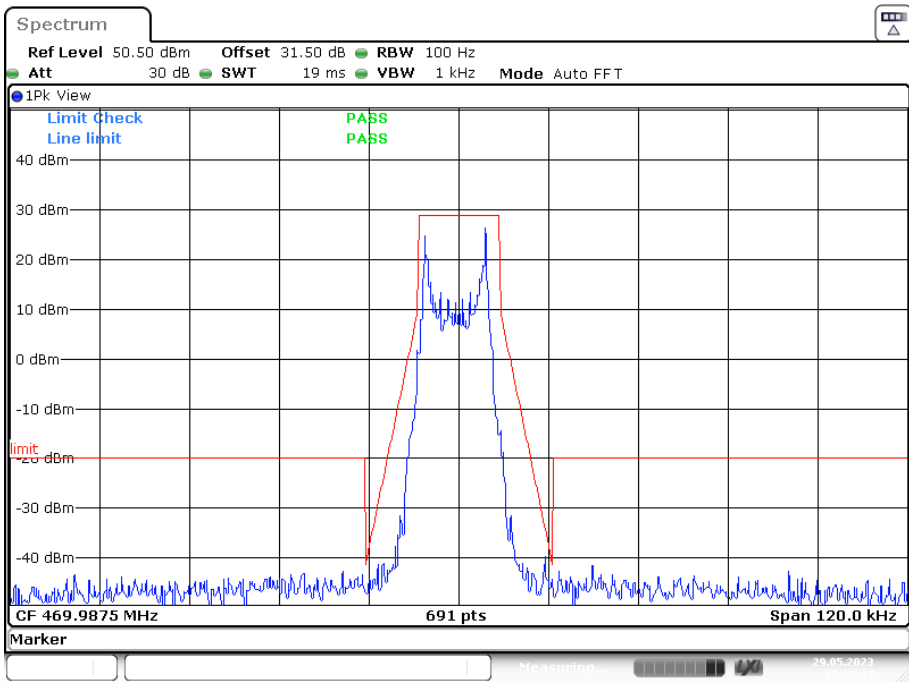
Date: 29.MAY.2023 17:10:14

Frequency 469.9875MHz: 99% Occupied & 26 dB Bandwidth



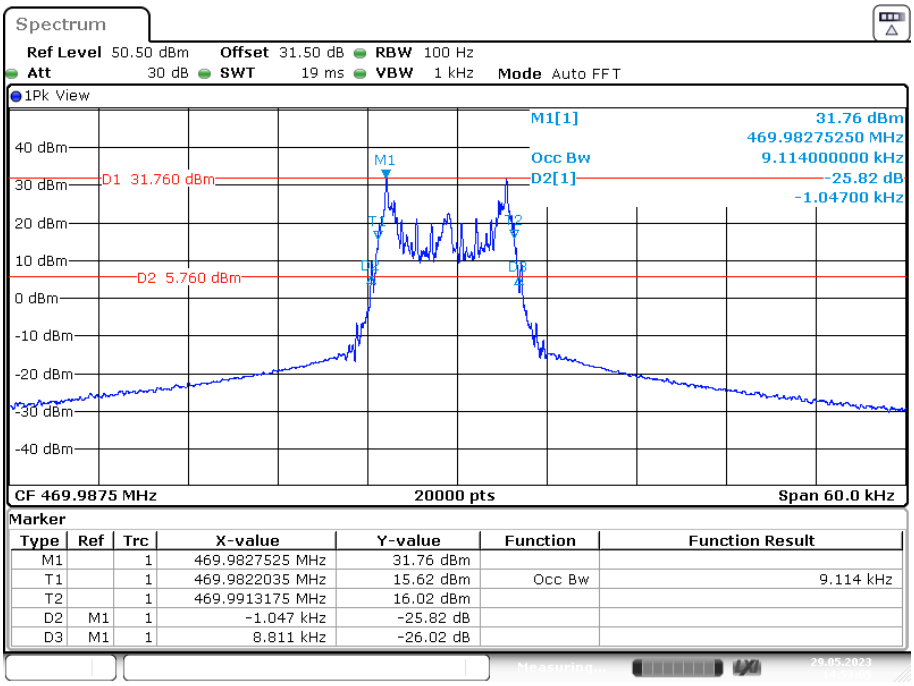
Date: 29.MAY.2023 15:06:16

Frequency 469.9875MHz: Emission Mask D, Low Power



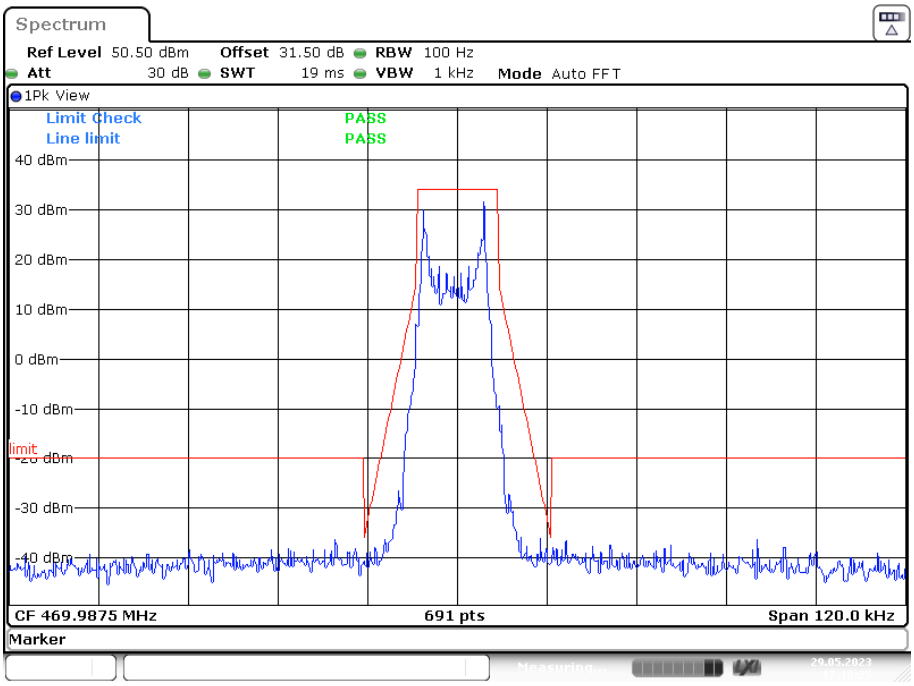
Date: 29.MAY.2023 17:22:44

Frequency 469.9875MHz: 99% Occupied & 26 dB Bandwidth, High Power



Date: 29.MAY.2023 14:53:05

Frequency 469.9875MHz: Emission Mask D, High Power



Date: 29.MAY.2023 17:18:26

FCC §2.1051 & §90.210 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

Applicable Standard

Emission Mask D—12.5 kHz channel bandwidth equipment. For transmitters designed to operate with a 12.5 kHz channel bandwidth, any emission must be attenuated below the power (P) of the highest emission contained within the authorized bandwidth as follows:

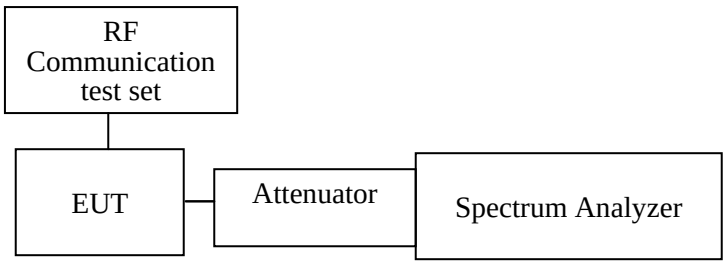
1) For any frequency removed from the center of the authorized bandwidth f_0 to 5.625 kHz removed from f_0, 0 dB.

2) On any frequency removed from the center of the authorized bandwidth by a displacement frequency (f_d in kHz) of more than 5.626 kHz but no more than 12.5 kHz, at least 7.27 (f_d –2.88 kHz) dB.

3) 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 Procedure

According to ANSI C63.26-2015 section 5.7



Note:The path loss from EUT to Specturm Analyer has included in the result.

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100kHz for below 1GHz, and 1MHz for above 1GHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

Test Data

Environmental Conditions

Temperature:	25℃
Relative Humidity:	50%
ATM Pressure:	101.0 kPa

The testing was performed by Matt Liang on 2023-06-02.

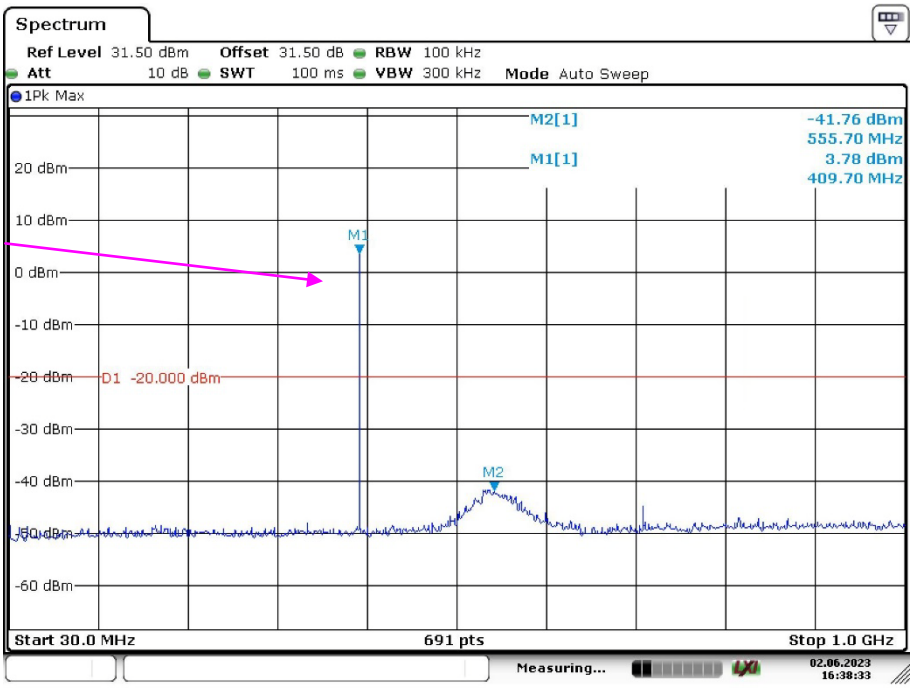
Test Mode: Transmitting, worst case for high power level.

Test Result: *Pass. Please refer to the following plots.*

Digital

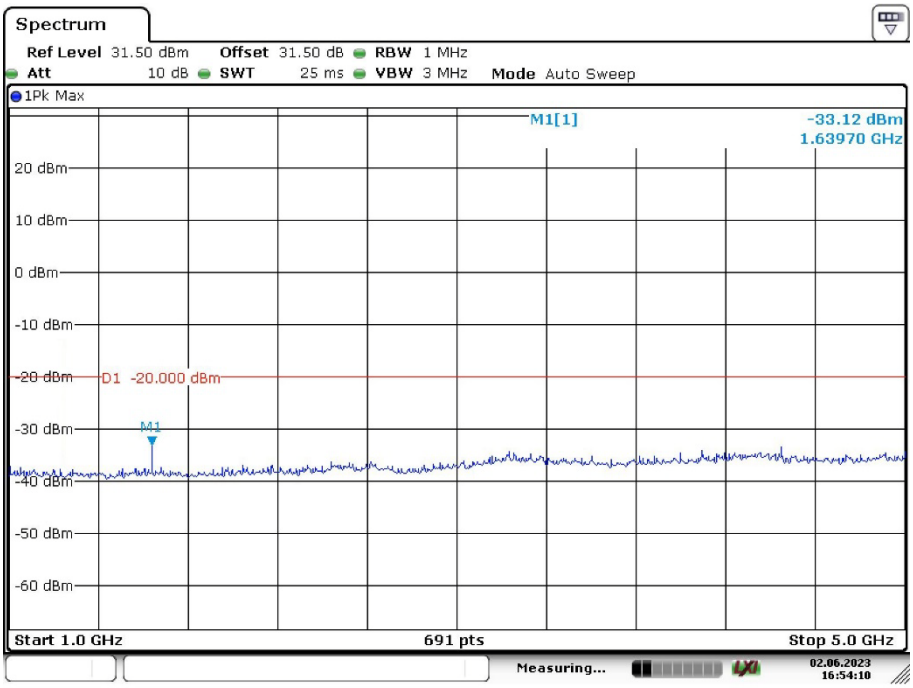
30MHz – 1 GHz_Low Channel

Fundamental test



Date: 2.JUN.2023 16:38:33

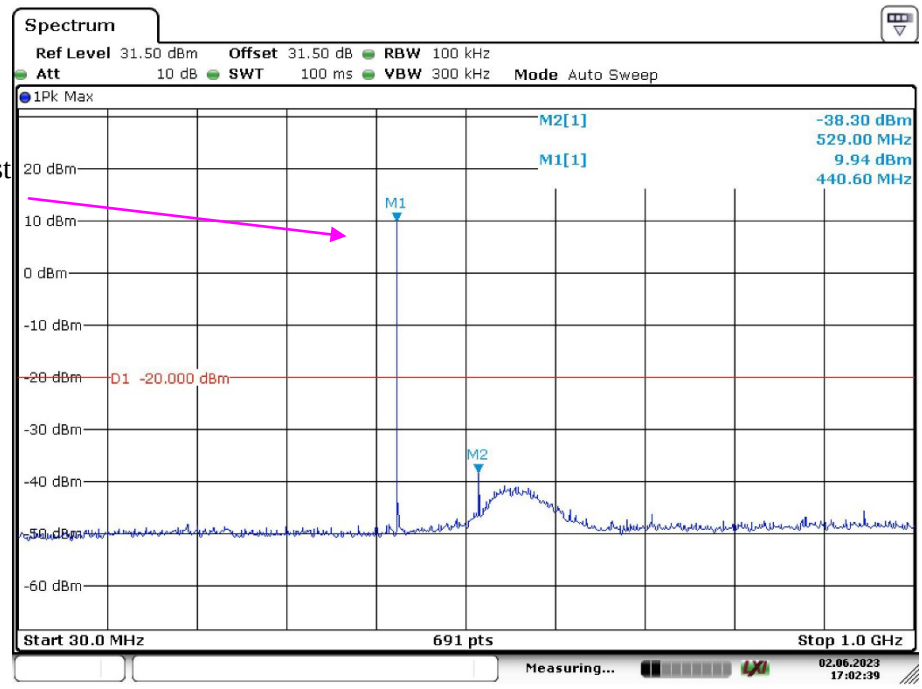
1 GHz – 5 GHz_Low Channel



Date: 2.JUN.2023 16:54:10

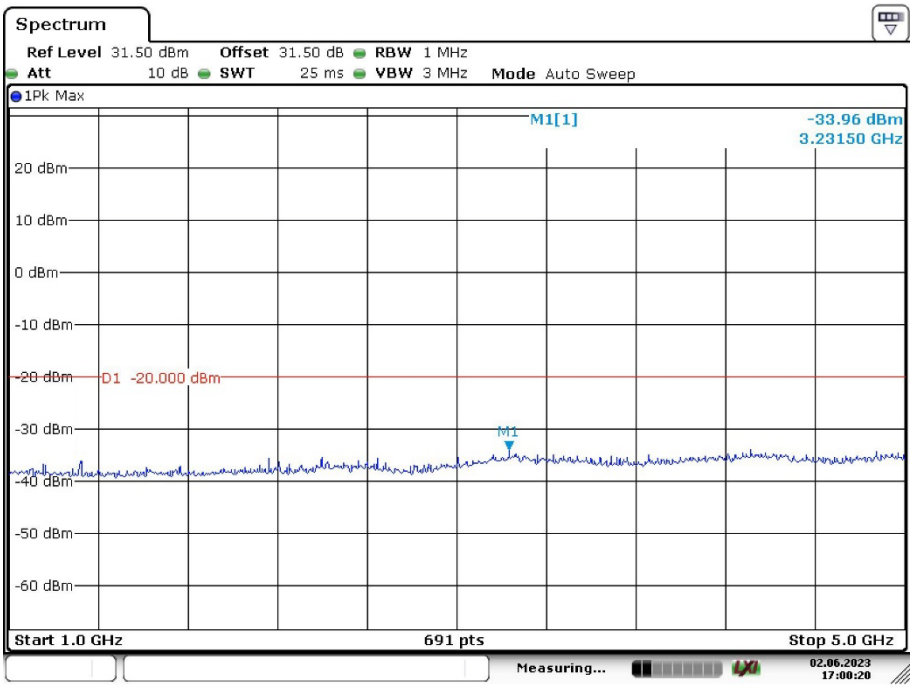
30MHz – 1 GHz_Middle Channel

Fundamental test



Date: 2.JUN.2023 17:02:39

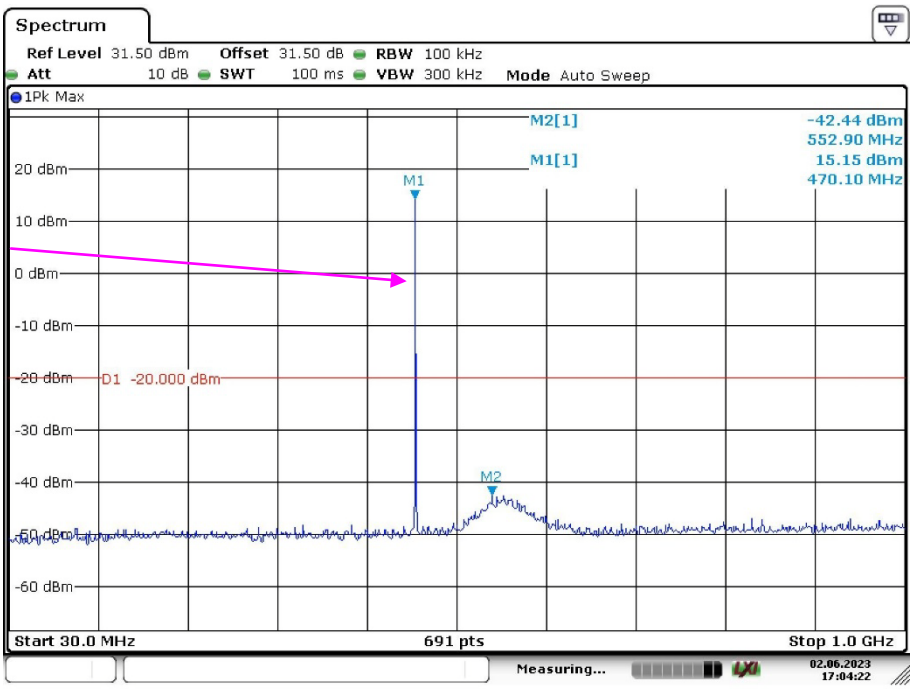
1 GHz – 5 GHz_Middle Channel



Date: 2.JUN.2023 17:00:20

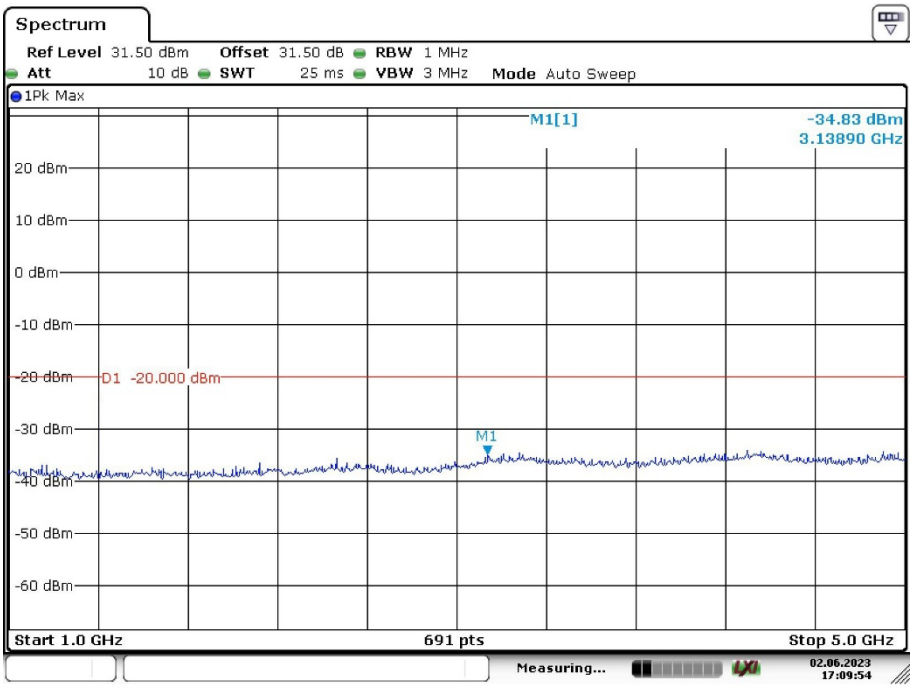
Fundamental test

30MHz – 1 GHz_High Channel



Date: 2.JUN.2023 17:04:23

1 GHz – 5 GHz_High Channel



Date: 2.JUN.2023 17:09:55

FCC §2.1053 & §90.210 - RADIATED SPURIOUS EMISSIONS

Applicable Standard

FCC §2.1053 and §90.210

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 channel bandwidth.

Test Data

Environmental Conditions

Temperature:	23℃
Relative Humidity:	57 %
ATM Pressure:	101.0 kPa

The testing was performed by Jason Liu on 2023-06-02.

Test Mode: Transmitting, worst case for high power level.

Note: Scan with X-AXIS, Y-AXIS, Z-AXIS, the worst case Y-AXIS was recorded

Test Result: *Pass. Please refer to the following tables.*

Digital:

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
410.0125MHz								
820.025	-47.04	85	1.6	H	9.28	-37.76	-20	-17.76
820.025	-47.65	242	2.3	V	11.56	-36.09	-20	-16.09
1230.038	-45.63	86	1.9	H	6.03	-39.60	-20	-19.6
1230.038	-47.57	9	2.4	V	5.85	-41.72	-20	-21.72
1640.05	-39.82	13	1.8	H	4.4	-35.42	-20	-15.42
1640.05	-43.60	316	1.7	V	3.58	-40.02	-20	-20.02
2050.063	-45.04	163	2.3	H	7.24	-37.80	-20	-17.8
2050.063	-44.92	82	2	V	6.71	-38.21	-20	-18.21
2460.075	-44.91	303	2.1	H	6.73	-38.18	-20	-18.18
2460.075	-45.36	130	2.3	V	6.33	-39.03	-20	-19.03
2870.088	-45.42	276	1.1	H	7.02	-38.40	-20	-18.4
2870.088	-46.72	211	1.2	V	6.28	-40.44	-20	-20.44
3280.1	-46.71	133	1.7	H	8.14	-38.57	-20	-18.57
3280.1	-44.57	112	2.1	V	7.63	-36.94	-20	-16.94
3690.113	-47.90	92	2.3	H	9.39	-38.51	-20	-18.51
3690.113	-44.98	107	1.6	V	8.54	-36.44	-20	-16.44
4100.125	-48.66	80	1.1	H	10.53	-38.13	-20	-18.13
4100.125	-46.31	171	2.4	V	10.12	-36.19	-20	-16.19
441.0000MHz								
882	-44.87	299	1.5	H	9.21	-35.66	-20	-15.66
882	-49.33	320	1.6	V	11.64	-37.69	-20	-17.69
1323	-42.39	228	1.5	H	5.83	-36.56	-20	-16.56
1323	-42.92	9	1.9	V	5.81	-37.11	-20	-17.11
1764	-39.86	324	1.8	H	4.17	-35.69	-20	-15.69
1764	-40.38	9	1.7	V	3.33	-37.05	-20	-17.05
2205	-44.62	35	1.1	H	7.26	-37.36	-20	-17.36
2205	-44.68	84	1.5	V	6.52	-38.16	-20	-18.16
2646	-42.57	227	2.2	H	6.74	-35.83	-20	-15.83
2646	-44.40	151	1.4	V	6.63	-37.77	-20	-17.77
3087	-43.18	323	2.4	H	6.7	-36.48	-20	-16.48
3087	-42.29	142	1.7	V	5.85	-36.44	-20	-16.44
3528	-44.13	322	1	H	8.73	-35.40	-20	-15.4
3528	-44.96	35	2	V	7.91	-37.05	-20	-17.05
3969	-45.06	189	2	H	9.34	-35.72	-20	-15.72
3969	-46.46	180	1.1	V	8.92	-37.54	-20	-17.54
4410	-46.72	223	1.6	H	10.73	-35.99	-20	-15.99
4410	-45.76	89	2.4	V	10.08	-35.68	-20	-15.68

Frequency (MHz)	Receiver Reading (dBm)	Turntable Degree	Rx Antenna		Substituted Factor (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (m)	Polar (H/V)				
469.9875MHz								
939.975	-44.63	108	1.9	H	9.22	-35.41	-20	-15.41
939.975	-47.23	280	1.4	V	11.65	-35.58	-20	-15.58
1409.963	-43.46	108	1.1	H	5.85	-37.61	-20	-17.61
1409.963	-41.97	14	1.3	V	5.8	-36.17	-20	-16.17
1879.95	-41.62	108	1.9	H	4.15	-37.47	-20	-17.47
1879.95	-40.04	235	1.1	V	3.35	-36.69	-20	-16.69
2349.938	-42.76	249	2.4	H	7.28	-35.48	-20	-15.48
2349.938	-42.04	348	2.1	V	6.49	-35.55	-20	-15.55
2819.925	-44.71	109	2.1	H	6.78	-37.93	-20	-17.93
2819.925	-44.76	356	1.4	V	6.67	-38.09	-20	-18.09
3289.913	-43.19	46	1.2	H	6.72	-36.47	-20	-16.47
3289.913	-41.66	300	1.9	V	5.91	-35.75	-20	-15.75
3759.9	-46.58	125	1.6	H	8.76	-37.82	-20	-17.82
3759.9	-43.71	212	2.1	V	7.93	-35.78	-20	-15.78
4229.888	-47.03	87	1.5	H	9.37	-37.66	-20	-17.66
4229.888	-46.36	316	1.4	V	8.97	-37.39	-20	-17.39
4699.875	-48.97	124	1.7	H	10.76	-38.21	-20	-18.21
4699.875	-48.22	8	1.3	V	10.05	-38.17	-20	-18.17

Note:
Absolute Level = Reading Level + Substituted Factor
Substituted Factor contains: SG Level - Cable loss+ Antenna Gain
Margin = Absolute Level – Limit

FCC §2.1055 & §90.213 - FREQUENCY STABILITY

Applicable Standard

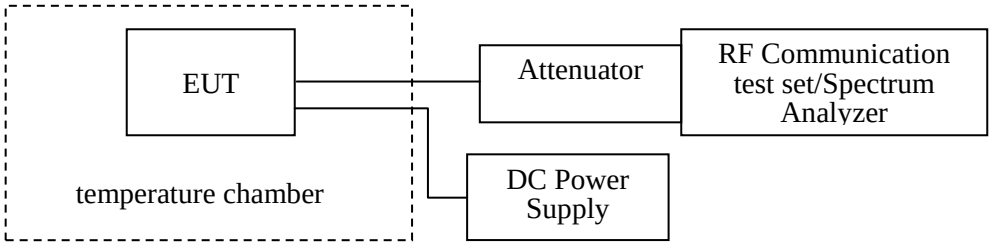
FCC §2.1055 and §90.213

Test Procedure

According to ANSI C63.26-2015 section 5.6

Frequency Stability vs. Temperature: The equipment under test was connected to an external DC power supply and the RF output was connected to communication test set via feed-through attenuators. The EUT was placed inside the temperature chamber. The power cable and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the counter.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	46 %
ATM Pressure:	101.0 kPa

The testing was performed by Matt Liang on 2023-06-02.

Test Mode: Transmitting, worst case for high power level.

Test Result: *Pass. Please refer to the following table.*

For Digital

Reference Frequency:441.0000MHz, Limit:2.5 ppm， 12.5kHz			
Environment Temperature (°C)	**Power Supplied (Vdc)**	**Frequency Measure with Time Elapsed**	
		MCF (MHz)	**PPM Error**
50	7.4	441.00012	0.272
40	7.4	441.00006	0.136
30	7.4	441.00019	0.431
20	7.4	441.00021	0.476
10	7.4	441.00009	0.204
0	7.4	441.00011	0.249
-10	7.4	441.00012	0.272
-20	7.4	441.00023	0.522
-30	7.4	441.00027	0.612
Frequency Stability Versus Input Voltage			
20	6.8	441.00017	0.385
20	8.4	441.00008	0.181

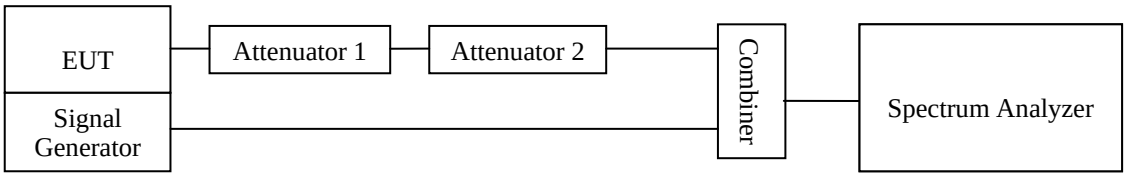
FCC §90.214 - TRANSIENT FREQUENCY BEHAVIOR

Applicable Standard

Regulations: FCC §90.214
Test method: ANSI C63.26-2015

Test Procedure

a) Connect the EUT and test equipment as shown on the following block diagram.
b) Set the Spectrum Analyzer to measure FM deviation, and tune the RF frequency to the transmitter assigned frequency.
c) Set the signal generator to the assigned transmitter frequency and modulate it with a 1 kHz tone at ±12.5 kHz deviation and set its output level to -100dBm.
d) Turn on the transmitter.
e) Supply sufficient attenuation via the RF attenuator to provide an input level to the Spectrum Analyzer that is 40 dB below the maximum allowed input power when the transmitter is operating at its rated power level. Note this power level on the Spectrum Analyzer as P_0.
f) Turn off the transmitter.
g) Adjust the RF level of the signal generator to provide RF power equal to P_0. This signal generator RF level shall be maintained throughout the rest of the measurement.
h) Remove the attenuation 1, so the input power to the Spectrum Analyzer is increased by 30 dB when the transmitter is turned on.
i) Adjust the vertical amplitude control of the spectrum analyzer to display the 1000 Hz at ±4 divisions vertically centered on the display. Set trigger mode of the Spectrum Analyzer to “Video”, and tune the “trigger level” on suitable level. Then set the “tiger offset” to -10ms for turn on and -15ms for turn off.
j) Turn on the transmitter and the transient wave will be captured on the screen of Spectrum Analyzer. Observe the stored display. The instant when the 1 kHz test signal is completely suppressed is considered to be t_{on}. The trace should be maintained within the allowed divisions during the period t_1 and t_2.
k) Then turn off the transmitter, and another transient wave will be captured on the screen of Spectrum Analyzer. The trace should be maintained within the allowed divisions during the period t_3.



Test Data

Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	45 %
ATM Pressure:	101.0 kPa

The testing was performed by Matr Liang on 2023-06-05.

Test Result: *Pass. Please refer to the following tables and plots.*

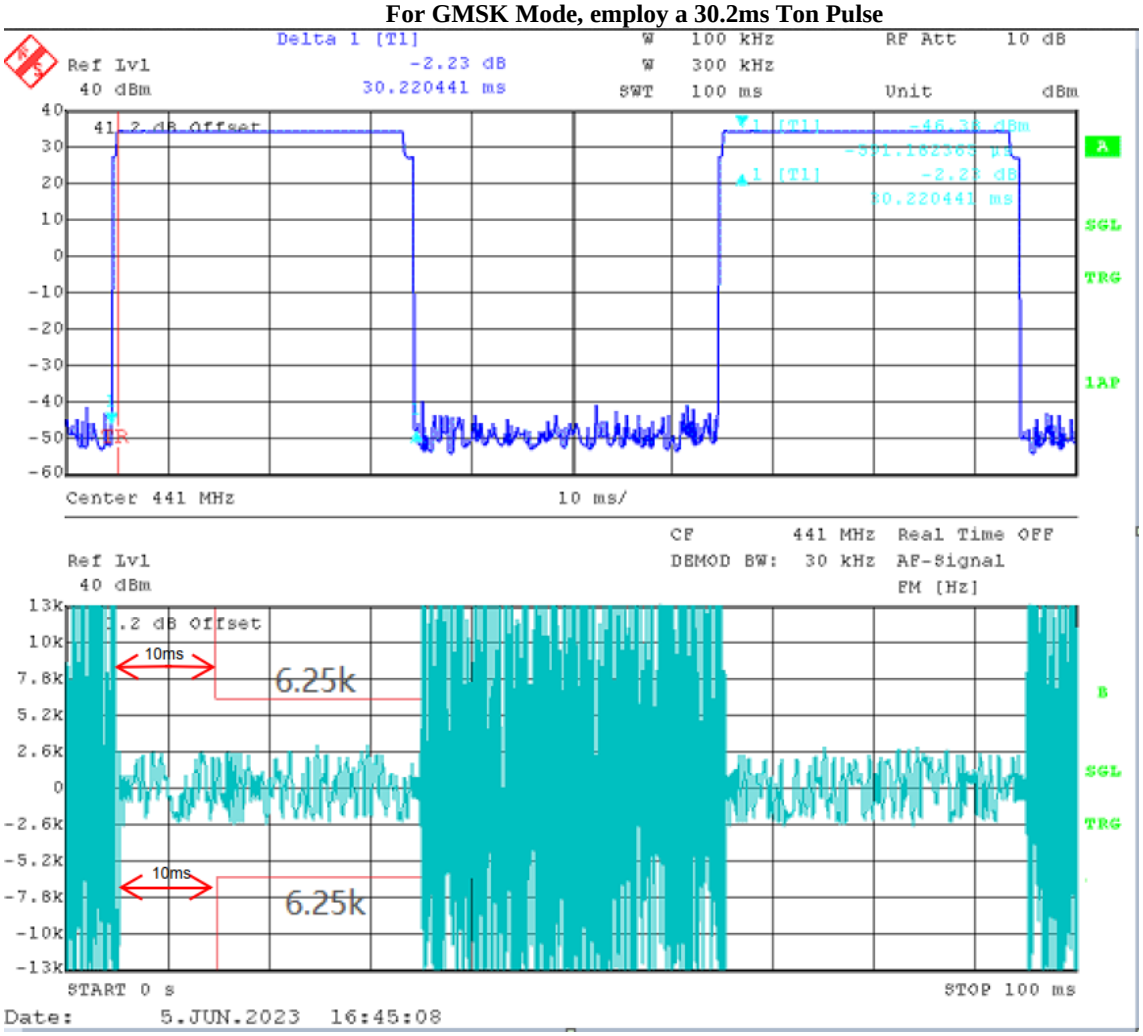
Channel Separation (kHz)	Transient Period (ms)	Transient Frequency	Result
12.5	10 (t1)	<+/-12.5 kHz	Pass*
	25(t2)	<+/-6.25 kHz	Pass
	10(t3)	<+/-12.5 kHz	Pass*

Note:
*:Transmitter carrier output power rating is 6 W or less, the frequency difference during the time periods t_1 and t_3 may exceed the maximum frequency difference for these time periods.

During the time from the end of t2 to the beginning of t3: it is not applicable for the Ton less than 25ms.

Test Graphs

For GMSK Mode, employ a 30.2ms Ton Pulse



******* END OF REPORT *******