



FCC TEST REPORT

FCC ID: 2ABNA-TRM501

On Behalf of
**Guangzhou Geoelectron Science & Technology Company
Limited**
Wireless Data Transceiver Module
Model No.: TRM501

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.
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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. : TRM501
(B) Trademark : Geoelectron

Measurement Standard Used:

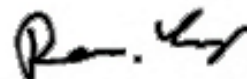
**FCC CFR Title 47 Part 90, FCC CFR Title 47 Part 2, RSS-119 Issue 12, RSS-Gen Issue 5,
ANSI C63.26: 2015, ANSI TIA-603-E:2016**

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.....: July 21, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	July 21, 2021	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
<p>Note:</p> <ol style="list-style-type: none"> 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable. 			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : Wireless Data Transceiver Module
Trademark : Geoelectron
Model Number : TRM501
DIFF. : N/A
Test Voltage : DC 7.5V From DC Power

UHF

Operation frequency : 410MHz-470MHz
Conducted Power : 2W(33.01dBm), 5W(36.98dBm)
Bandwidth : 12.5KHz, 25KHz
Modulation type : GMSK
Antenna Type : External Antenna, Maximum Gain is 4.0dBi
Software version : 20.11.19
Hardware version : V1.0

Note: All Conducted Power have been tested, and recorded the worst case 5W(36.98dBm) results in this report.

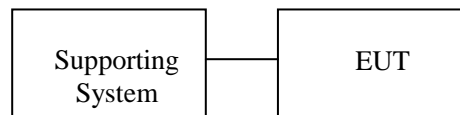
2.2. Accessories of Device (EUT)

Accessories1 : /
 Manufacturer : /
 Model : /
 Ratings : /

2.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
/	/	/	/	/	/

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+BW12.5KHz+TX	at maximum rated power for transmitter
2	GMSK+BW12.5KHz+TX	at minimum rated power for transmitter
3	GMSK+BW25KHz+TX	at maximum rated power for transmitter
4	GMSK+BW25KHz+TX	at minimum rated power for transmitter

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

Description Operation Frequency

QMSK		
Test Channel	BW(KHz)	Frequency(MHz)
Low	12.5	410.125
	25	410.250
Mid	12.5	456.125
	25	456.250
High	12.5	469.975
	25	469.850

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%

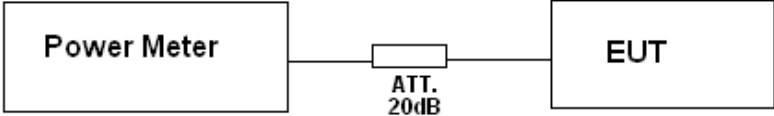
2.9. Test Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal Interval
Test Receiver	ROHDE&SCHWARZ	ESCI	101165	2020.09.02	1 Year
Spectrum analyzer	ROHDE&SCHWARZ	FSU	1166.1660.26	2020.09.02	1 Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1 Year
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2020.09.02	1 Year
Filter	KANGMAI	ZLPF-LDC-1000-1959	1209002075	2020.09.02	1 Year
RF Cable	Resenberger	Cable 4	N/A	2020.09.02	1 Year
Signal Analyzer	Agilent	N9020A	MY499100060	2020.09.02	1 Year
vector Signal Generator	Agilent	N5182A	MY49060042	2020.09.02	1 Year
vector Signal Generator	Agilent	E4438C	US44271917	2020.09.02	1 Year
Amplifier	Agilent	8449B	3008A02664	2020.09.02	1 Year
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2020.09.02	1 Year
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2020.04.12	2 Year
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	/	/
RF Cable	Resenberger	Cable 1	N/A	2020.09.02	1 Year
RF Cable	Resenberger	Cable 2	N/A	2020.09.02	1 Year
RF Cable	Resenberger	Cable 3	N/A	2020.09.02	1 Year
Loop Antenna	SCHWARZBECK	FMZB 1519B	00059	2019.09.07	2 Year
Attenuator	HP	8494B	DC-18G	2020.09.02	1 Year
Attenuator	HP	8496B	DC-18G	2020.09.02	1 Year
Temp. & Humid. Chamber	Wei Huang	WHTH-1000-40-880	100631	2020.09.02	1 Year
Power Meter	Agilent	E9300A	MY41496625	2020.09.02	1 Year
20dB Attenuator	ICPROBING	IATS1	82347	2020.09.02	1 Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2020.09.02	1 Year
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2020.09.02	1 Year
Oscilloscope	Agilent	54833A	165521	2020.09.02	1 Year

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:	
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

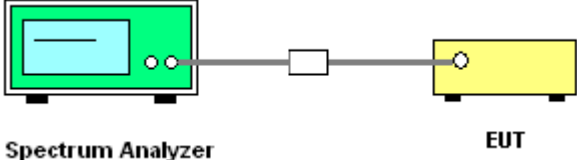
GMSK mode (5W):					
Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP(dBm)	Stated ERP Power (dBm)	Limit (dBm)	Result
410.125	37.003	38.853	38.83	38.83 ± 1	PASS
410.250	36.724	38.574	38.83	38.83 ± 1	PASS
456.125	36.847	38.697	38.83	38.83 ± 1	PASS
456.250	36.815	38.665	38.83	38.83 ± 1	PASS
469.975	36.892	38.742	38.83	38.83 ± 1	PASS
469.850	36.855	38.705	38.83	38.83 ± 1	PASS

GMSK mode (2W):					
Frequency (MHz)	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP(dBm)	Stated ERP Power (dBm)	Limit (dBm)	Result
410.125	32.592	34.442	34.86	34.86 ± 1	PASS
410.250	32.606	34.456	34.86	34.86 ± 1	PASS
456.125	32.613	34.463	34.86	34.86 ± 1	PASS
456.250	32.558	34.408	34.86	34.86 ± 1	PASS
469.975	32.589	34.439	34.86	34.86 ± 1	PASS
469.850	32.602	34.452	34.86	34.86 ± 1	PASS

Note: 1. $ERP = \text{Maximum Conducted Output Power(Peak)} + \text{Antenna Gain} - 2.15\text{dB}$

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:	 <p>The diagram illustrates the test setup. On the left is a green Spectrum Analyzer with a blue screen and two red input ports. A black cable connects these ports to a small white rectangular block. This block is connected to a yellow rectangular block on the right, which is labeled 'EUT' (Equipment Under Test). Below the Spectrum Analyzer is the label 'Spectrum Analyzer' and below the yellow block is the label 'EUT'.</p>
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	410.125	12.08	10.084	11.25	PASS
Mid	456.125	12.35	10.225	11.25	PASS
High	469.975	12.23	10.128	11.25	PASS

GMSK 25KHz Channel Spacing:					
Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	99% Occupied Bandwidth Limit (KHz)	Result
Low	410.250	22.28	19.232	20	PASS
Mid	456.250	22.01	19.135	20	PASS
High	469.850	22.18	19.260	20	PASS

Emission Mask:

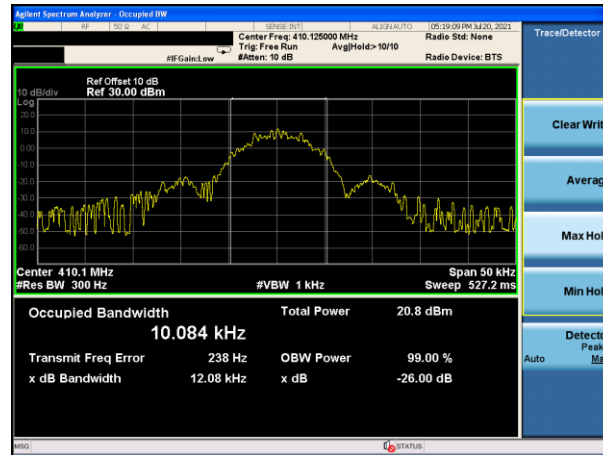
GMSK 12.5KHz Channel Spacing:				
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.125	D	300	PASS
Mid	456.125	D	300	PASS
High	469.975	D	300	PASS

GMSK 25KHz Channel Spacing:				
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
Low	410.250	C	300	PASS
Mid	456.250	C	300	PASS
High	469.850	C	300	PASS

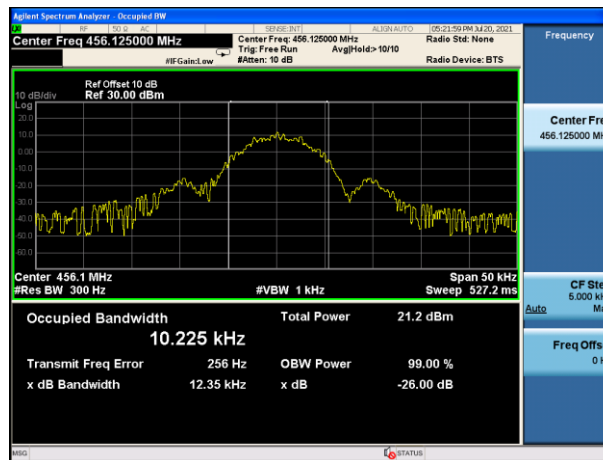
Test plots as follows:

GMSK 12.5KHz Channel Spacing: Occupied Bandwidth

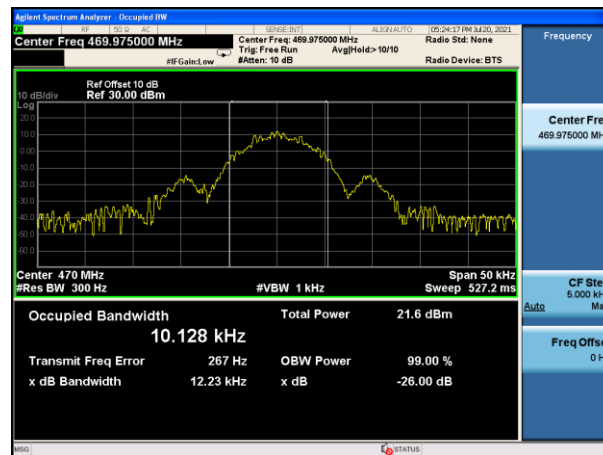
Low: 410.125MHz



Mid: 456.125MHz

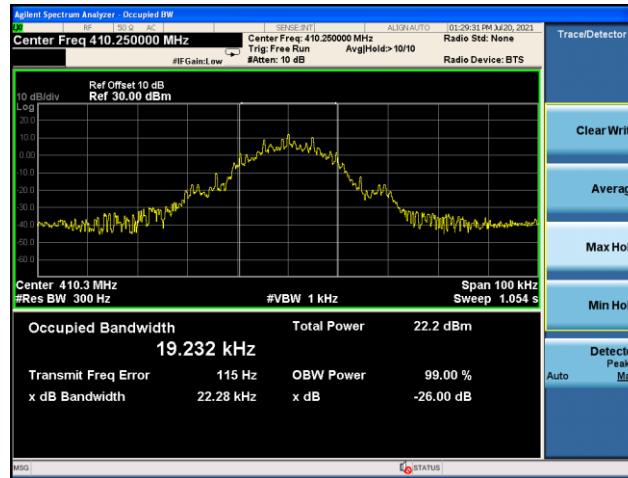


High: 469.975MHz

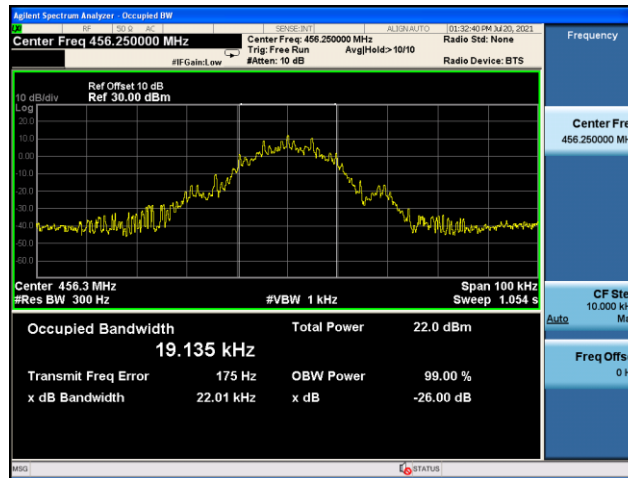


GMSK 25KHz Channel Spacing: Occupied Bandwidth

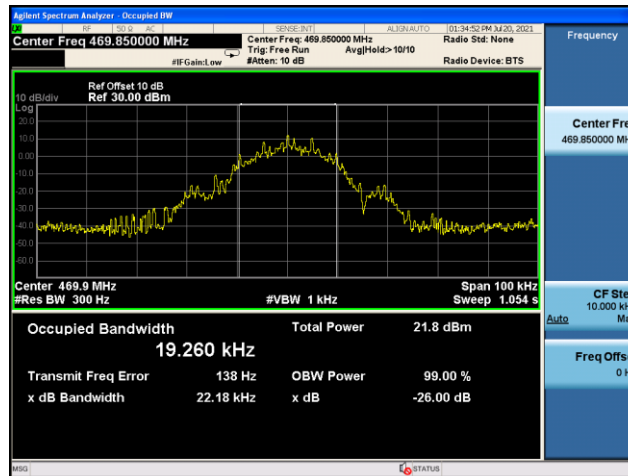
Low: 410.250MHz



Mid: 456.250MHz

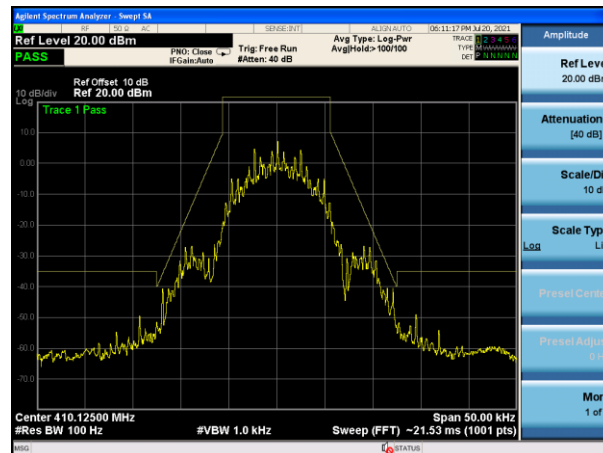


High: 469.850MHz

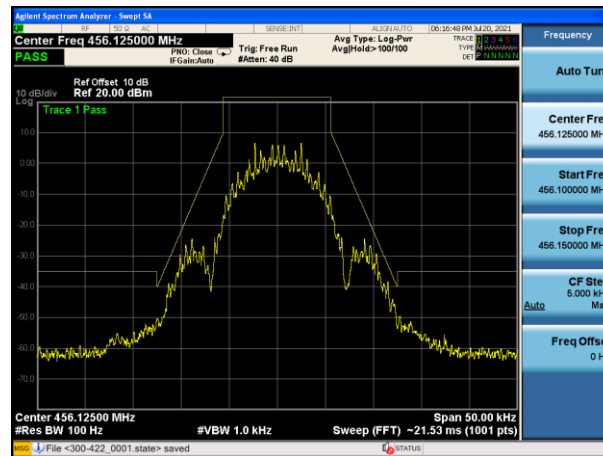


GMSK 12.5KHz Channel Spacing: Emission Mask

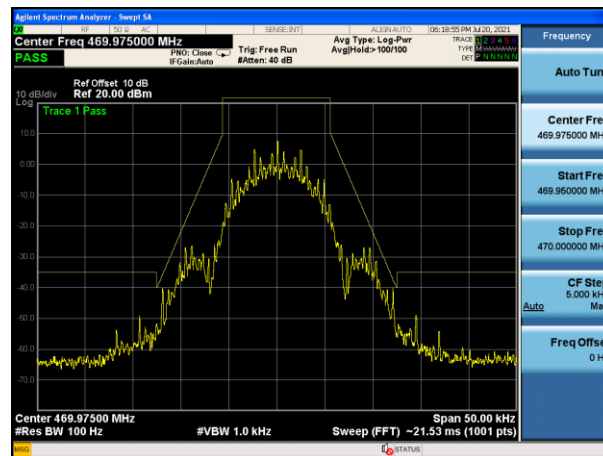
Low: 410.125MHz



Mid: 456.125MHz

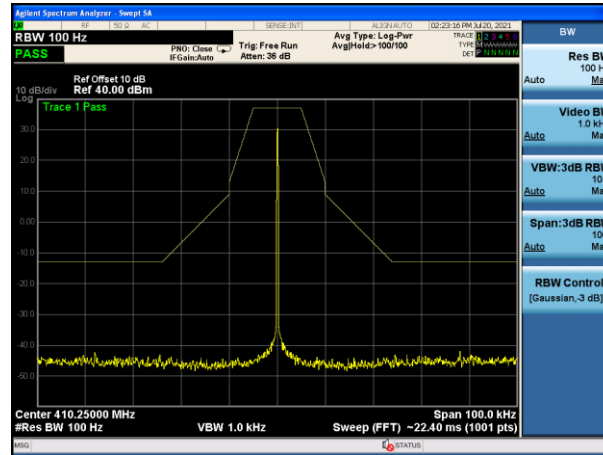


High: 469.975MHz

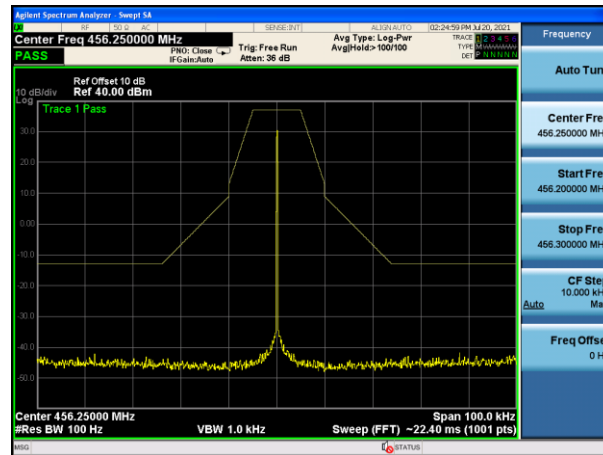


GMSK 25KHz Channel Spacing: Emission Mask

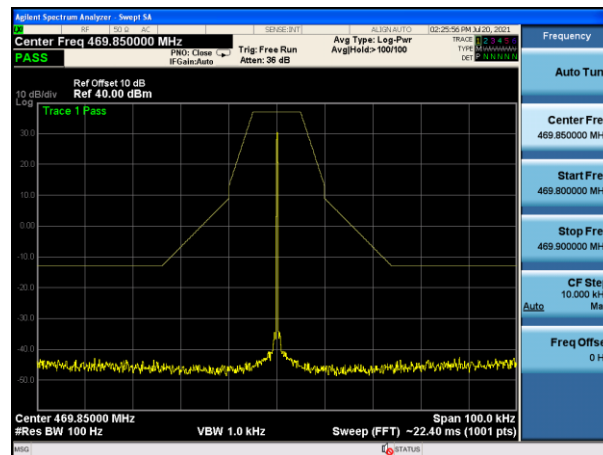
Low: 410.250MHz



Mid: 456.250MHz




High: 469.850MHz



3.3. Spurious Emissions(conducted)

3.3.1.Test Specification

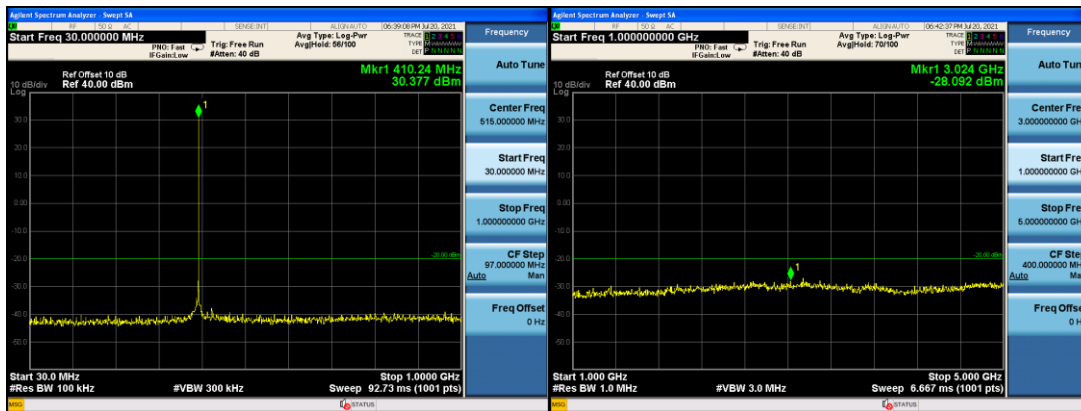
Test Requirement:	FCC Part 90.210, RSS-119(5.8)
Test Setup:	 <p style="text-align: center;">Spectrum Analyzer EUT</p>
Test Limit:	<p>Modulation Type: GMSK FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12: For 12.5 bandwidth: On any frequency removed from the center of the authorized bandwidth by a displacement frequency (fd in kHz) of more than 12.5 kHz at least: High: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (3.0) = 54.77 \text{ dB}$ Low: $50 + 10 \log (P_{\text{watts}}) = 50 + 10 \log (1.0) = 50.00 \text{ dB}$ 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 34.77 dBm for High rated power and 30.00 for lower rated power. High: Limit (dBm) = $34.77 - 50 - 10 \log (3.0) = -20 \text{ dBm}$ Low: 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: High: $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (3.0) = 47.77 \text{ dB}$ Low: $43 + 10 \log (P_{\text{watts}}) = 43 + 10 \log (1.0) = 43.00 \text{ dB}$ 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 34.77 dBm for High rated power and 30.00 for lower rated power. High: Limit (dBm) = $34.77 - 43 - 10 \log (3.0) = -13 \text{ dBm}$ Low: 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. 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.</p>
Test Result:	PASS

3.3.2.Test data

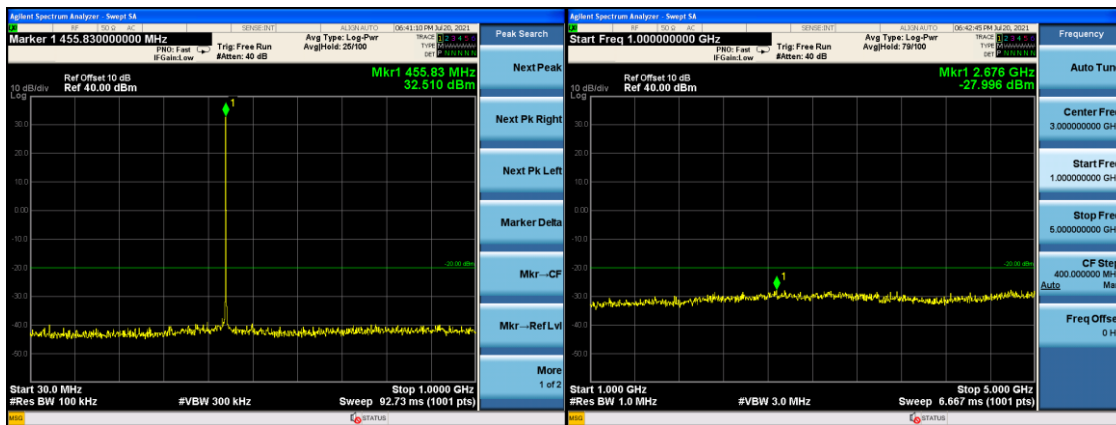
Test plots as follows:

GMSK 12.5KHz Channel Spacing:

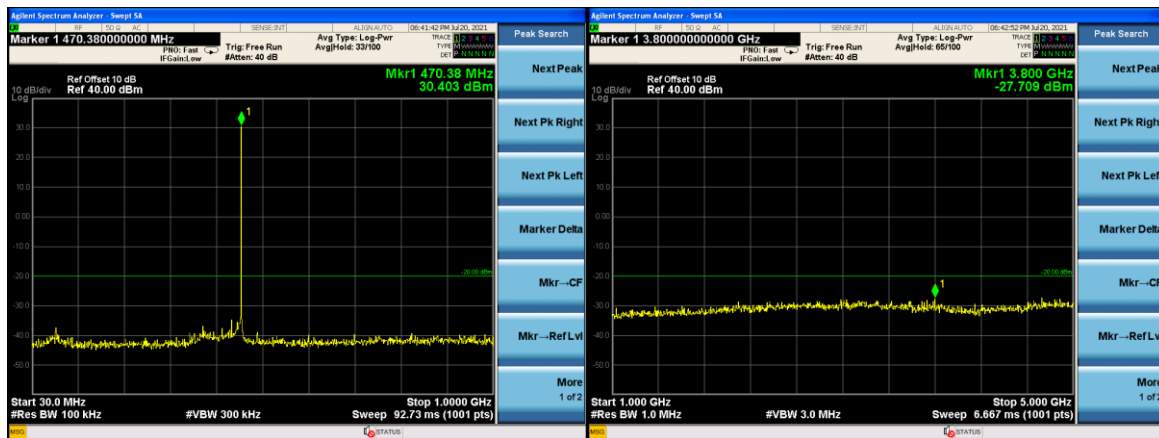
Low: 410.125MHz



Mid: 456.125MHz

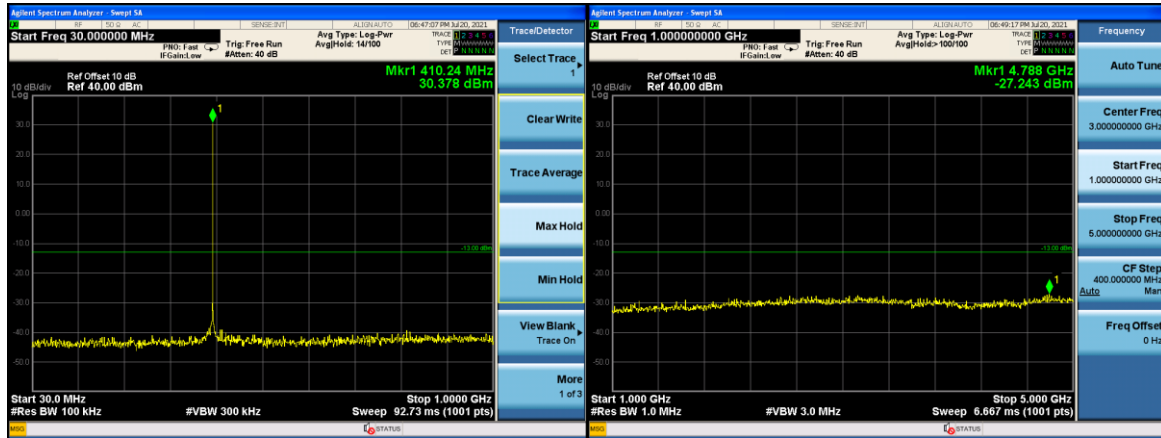


High: 469.975MHz

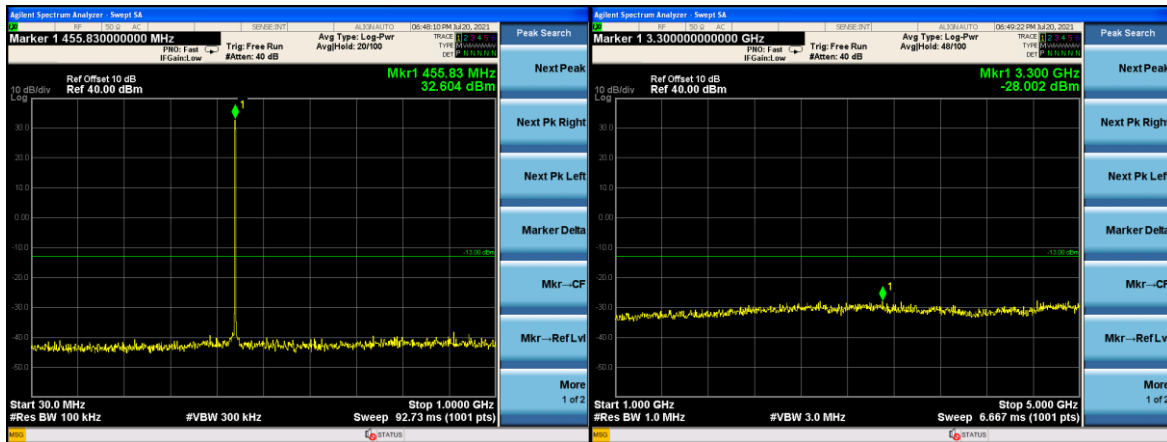


GMSK 25KHz Channel Spacing:

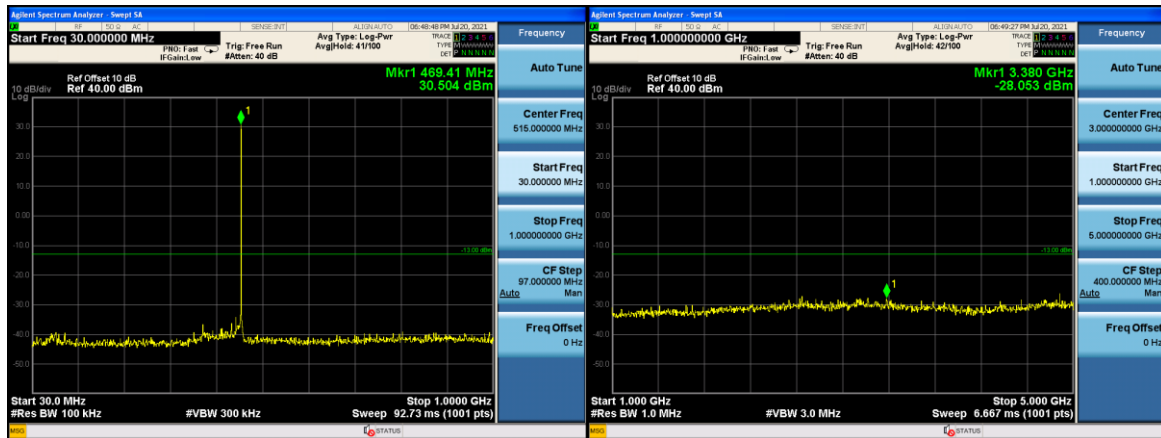
Low: 410.250MHz



Mid: 456.250MHz

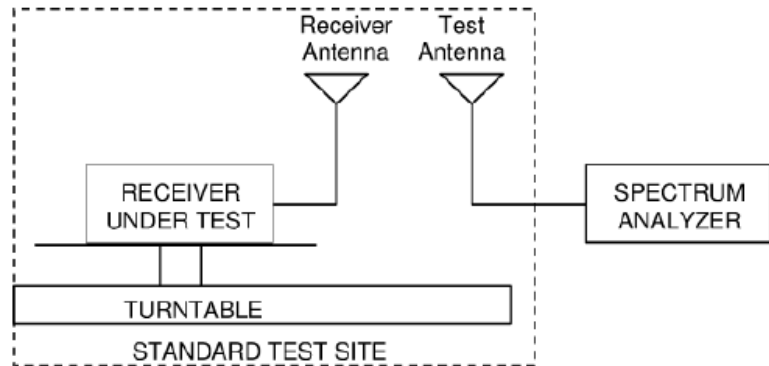


High: 469.850MHz



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:	<p>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.</p> <p>For equipment using 12.5 kHz channel spacing, on any frequency removed from the center of</p> <p>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.</p>															
Test setup:																
Test Procedure:	<p>The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load, which was also placed on the turntable.</p> <p>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.</p> <p>The frequency range up to teeth harmonic of the fundamental frequency was investigated.</p> <p>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</p>															

	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

Test Mode: Low: 410.125MHz, 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	-92.38	V	0.24	31.35	-61.27	-20	-41.27
360.904	-93.07	V	0.26	31.34	-61.99	-20	-41.99
673.313	-95.90	V	0.42	31.24	-65.08	-20	-45.08
863.444	-95.50	V	0.58	30.71	-65.37	-20	-45.37
1263.509	-84.29	V	1.23	26.38	-59.14	-20	-39.14
3864.166	-80.43	V	1.68	25.47	-56.64	-20	-36.64
285.253	-95.65	H	0.43	31.24	-64.84	-20	-44.84
399.050	-93.28	H	0.45	30.68	-63.05	-20	-43.05
479.190	-95.52	H	0.64	30.85	-65.31	-20	-45.31
675.773	-98.13	H	0.79	31.12	-67.8	-20	-47.8
1368.694	-84.46	H	1.29	26.12	-59.63	-20	-39.63
3258.712	-81.57	H	1.62	25.41	-57.78	-20	-37.78

Test Mode: Mid: 456.125MHz, 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	-92.42	V	0.24	31.35	-61.31	-20	-41.31
364.462	-93.08	V	0.26	31.34	-62.00	-20	-42.00
669.814	-96.42	V	0.42	31.24	-65.6	-20	-45.6
862.247	-95.53	V	0.58	30.71	-65.40	-20	-45.40
1261.405	-84.65	V	1.23	26.38	-59.50	-20	-39.50
3858.853	-80.92	V	1.68	25.47	-57.13	-20	-37.13
290.754	-96.46	H	0.43	31.24	-65.65	-20	-45.65
397.852	-93.55	H	0.45	30.68	-63.32	-20	-43.32
479.276	-96.30	H	0.64	30.85	-66.09	-20	-46.09
683.561	-97.44	H	0.79	31.12	-67.11	-20	-47.11
1368.272	-84.40	H	1.29	26.12	-59.57	-20	-39.57
3262.627	-80.74	H	1.62	25.41	-56.95	-20	-36.95

Test Mode: High: 469.975MHz, 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	-92.73	V	0.24	31.35	-61.62	-20	-41.62
363.698	-93.73	V	0.26	31.34	-62.65	-20	-42.65
672.157	-96.74	V	0.42	31.24	-65.92	-20	-45.92
867.135	-95.74	V	0.58	30.71	-65.61	-20	-45.61
1259.426	-84.76	V	1.23	26.38	-59.61	-20	-39.61
3858.867	-80.37	V	1.68	25.47	-56.58	-20	-36.58
290.920	-95.84	H	0.43	31.24	-65.03	-20	-45.03
405.147	-93.62	H	0.45	30.68	-63.39	-20	-43.39
473.758	-95.81	H	0.64	30.85	-65.60	-20	-45.6
677.316	-98.08	H	0.79	31.12	-67.75	-20	-47.75
1372.894	-85.13	H	1.29	26.12	-60.30	-20	-40.3
3264.131	-81.57	H	1.62	25.41	-57.78	-20	-37.78

Test Mode: Low: 410.250MHz, 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	-94.40	V	0.24	31.35	-63.29	-13	-50.29
360.122	-91.70	V	0.26	31.34	-60.62	-13	-47.62
672.254	-92.49	V	0.42	31.24	-61.67	-13	-48.67
867.320	-93.88	V	0.58	30.71	-63.75	-13	-50.75
1259.385	-82.54	V	1.23	26.38	-57.39	-13	-44.39
3856.570	-80.66	V	1.68	25.47	-56.87	-13	-43.87
287.978	-93.79	H	0.43	31.24	-62.98	-13	-49.98
402.660	-97.20	H	0.45	30.68	-66.97	-13	-53.97
475.190	-94.82	H	0.64	30.85	-64.61	-13	-51.61
678.902	-93.93	H	0.79	31.12	-63.6	-13	-50.6
1370.493	-83.14	H	1.29	26.12	-58.31	-13	-45.31
3258.430	-79.80	H	1.62	25.41	-56.01	-13	-43.01

Test Mode; Mid: 456.250MHz, Channel Spacing 25KHz

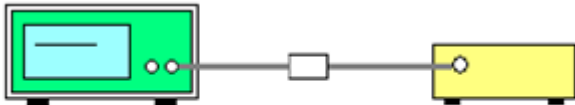
Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
157.727	-94.78	V	0.24	31.35	-63.67	-13	-50.67
361.299	-90.91	V	0.26	31.34	-59.83	-13	-46.83
670.384	-92.94	V	0.42	31.24	-62.12	-13	-49.12
859.190	-93.79	V	0.58	30.71	-63.66	-13	-50.66
1262.116	-82.31	V	1.23	26.38	-57.16	-13	-44.16
3860.246	-80.09	V	1.68	25.47	-56.3	-13	-43.3
285.515	-94.15	H	0.43	31.24	-63.34	-13	-50.34
404.347	-96.32	H	0.45	30.68	-66.09	-13	-53.09
472.970	-95.54	H	0.64	30.85	-65.33	-13	-52.33
682.270	-93.90	H	0.79	31.12	-63.57	-13	-50.57
1370.178	-82.99	H	1.29	26.12	-58.16	-13	-45.16
3261.045	-79.08	H	1.62	25.41	-55.29	-13	-42.29

Test Mode: High: 469.850MHz, 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	-90.41	V	0.26	31.34	-59.33	-13	-46.33
670.811	-93.07	V	0.42	31.24	-62.25	-13	-49.25
865.805	-93.73	V	0.58	30.71	-63.60	-13	-50.60
1258.551	-78.65	V	1.23	26.38	-53.50	-13	-40.50
3858.923	-78.18	V	1.68	25.47	-54.39	-13	-41.39
291.012	-94.95	H	0.43	31.24	-64.14	-13	-51.14
400.454	-95.83	H	0.45	30.68	-65.6	-13	-52.6
475.645	-94.42	H	0.64	30.85	-64.21	-13	-51.21
680.453	-97.57	H	0.79	31.12	-67.24	-13	-54.24
1373.809	-82.25	H	1.29	26.12	-57.42	-13	-44.42
3264.509	-77.73	H	1.62	25.41	-53.94	-13	-40.94

3.5. Transient Frequency Behavior

3.5.1. Test Specification

Test Requirement:	FCC Part 90.214, RSS-119(5.9)																																																		
Test Setup:	<div><p>OscilloscopeEUT</p></div>																																																		
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



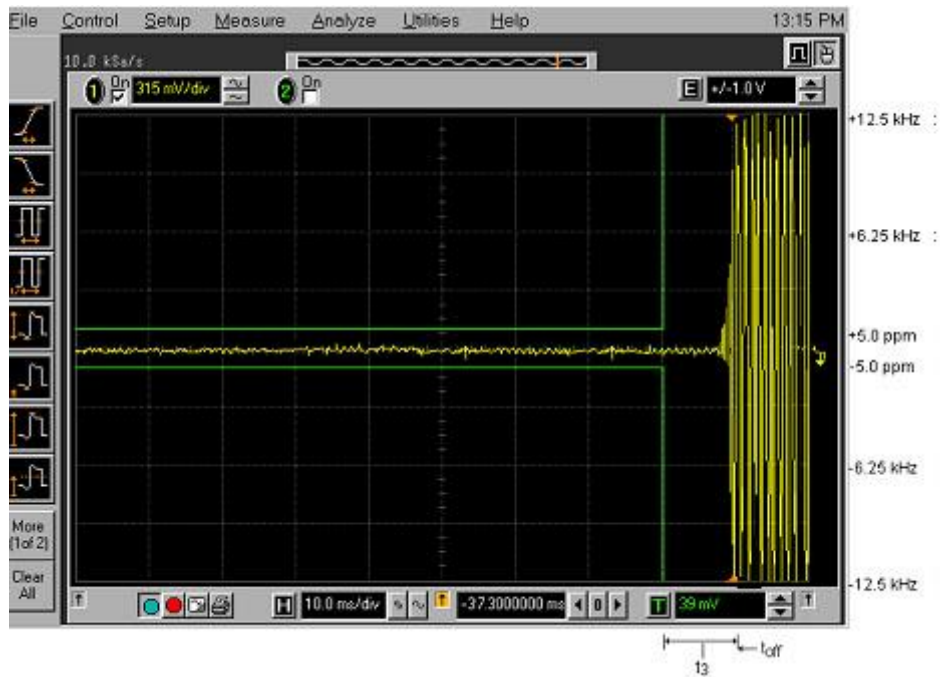
Power Off



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



Power Off



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] MA --- RF[RF Detector] RF --- HPO[Hewlett Packard Infinium Digitizing Oscilloscope] </pre>
Test Procedure:	<p>Method of Measurement:</p> <p>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.</p>
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	7.5	20	0.0438
	7.3	20	0.0438
	7.1	22	0.0482
	6.9	22	0.0482
	6.7	22	0.0482
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	7.5	26	0.0570
	7.3	26	0.0570
	7.1	26	0.0570
	6.9	26	0.0570
	6.7	30	0.0658
Limit	5ppm		

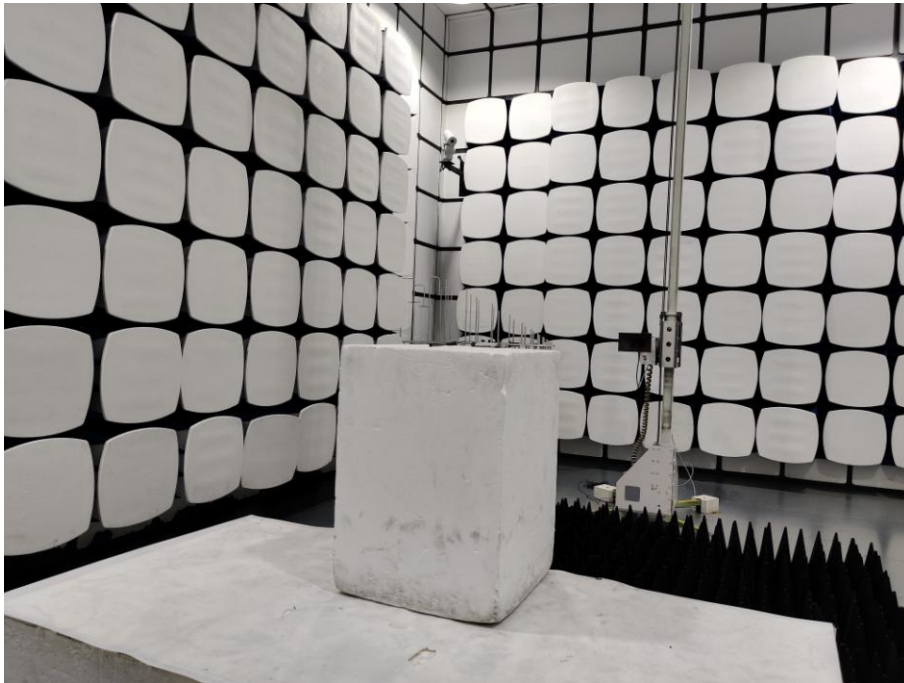
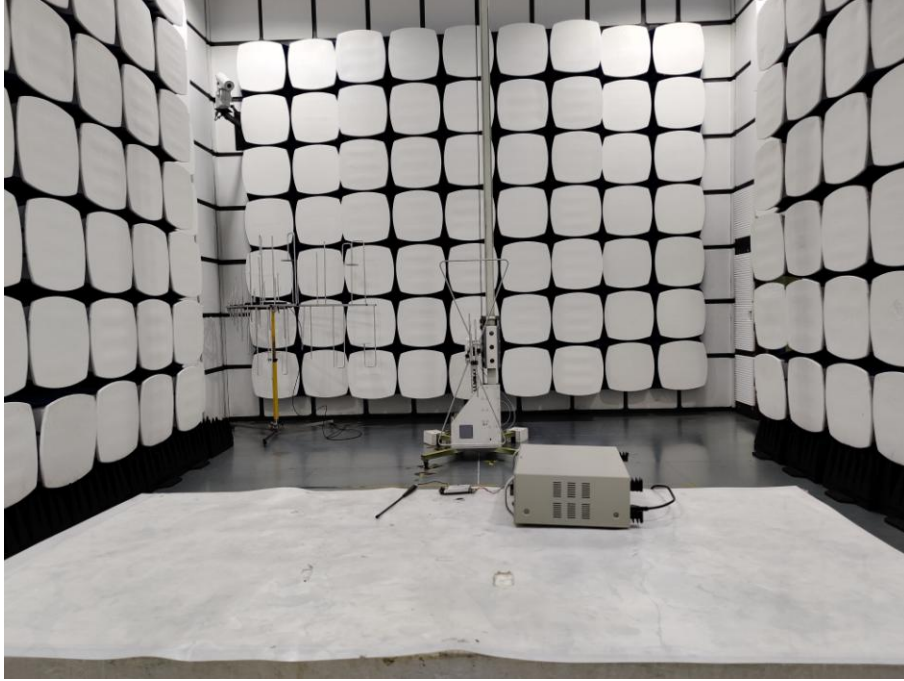
Mode	Temperature (°C)	Frequency error (Hz)	frequency error (ppm)
Middle Channel 12.5KHz Channel Spacing	-20	28	0.0614
	-10	28	0.0614
	0	28	0.0614
	10	24	0.0526
	20	20	0.0438
	30	20	0.0438
	40	24	0.0526
	50	24	0.0526
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	-20	38	0.0833
	-10	34	0.0745
	0	36	0.0789
	10	32	0.0701
	20	26	0.0570
	30	26	0.0570
	40	34	0.0745
	50	36	0.0789
Limit	5ppm		

3.7. Modulation Characteristic

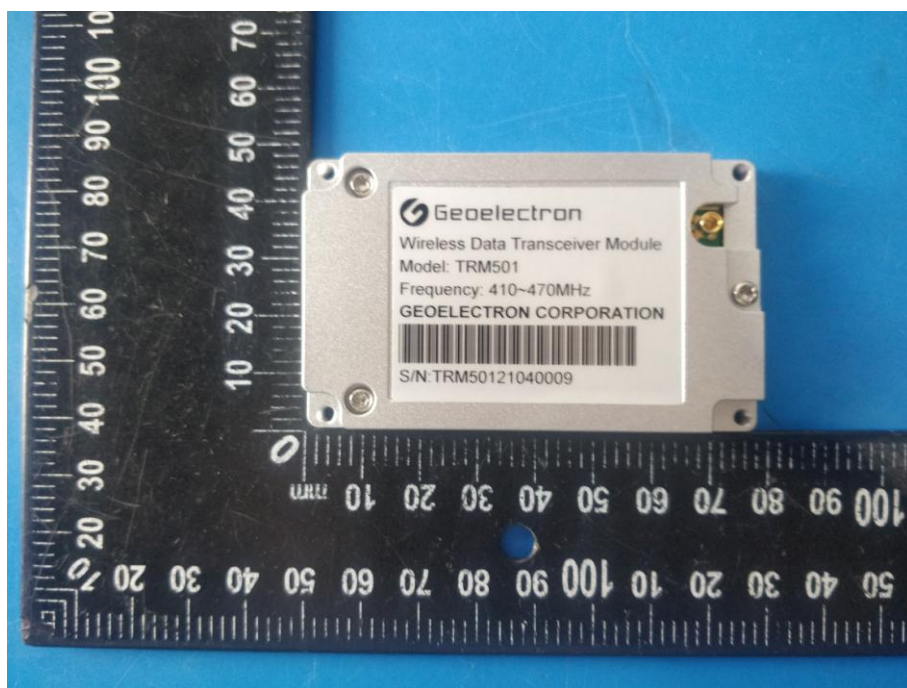
Test Requirement:	FCC Part 90.207
Test Result:	According to FCC § 2.1047(d), Part 22, 74, 90 there is no specific requirement for digital modulation, therefore modulation characteristic is not presented.

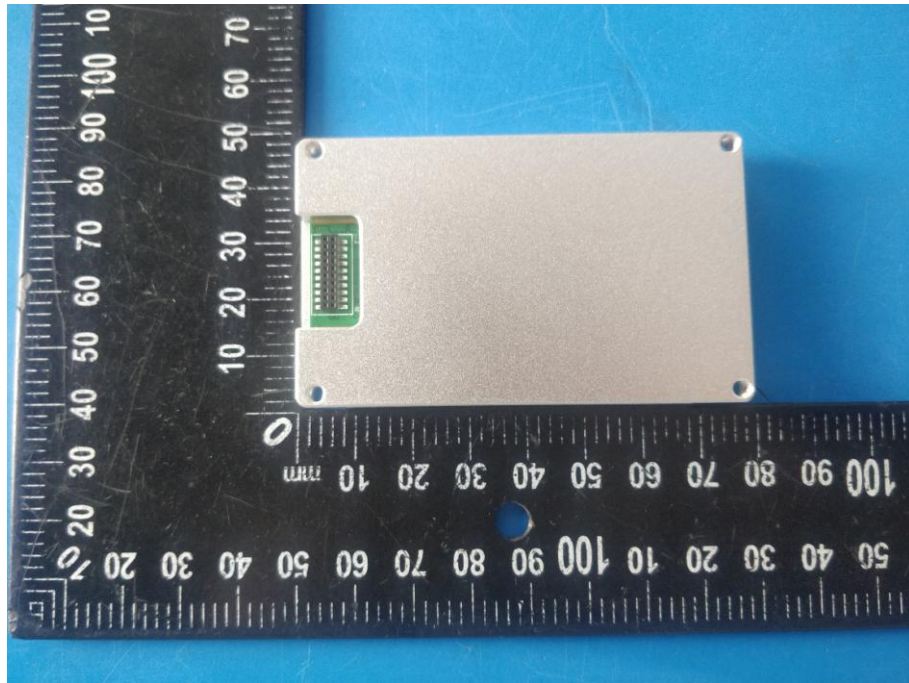
4. TEST SETUP PHOTO

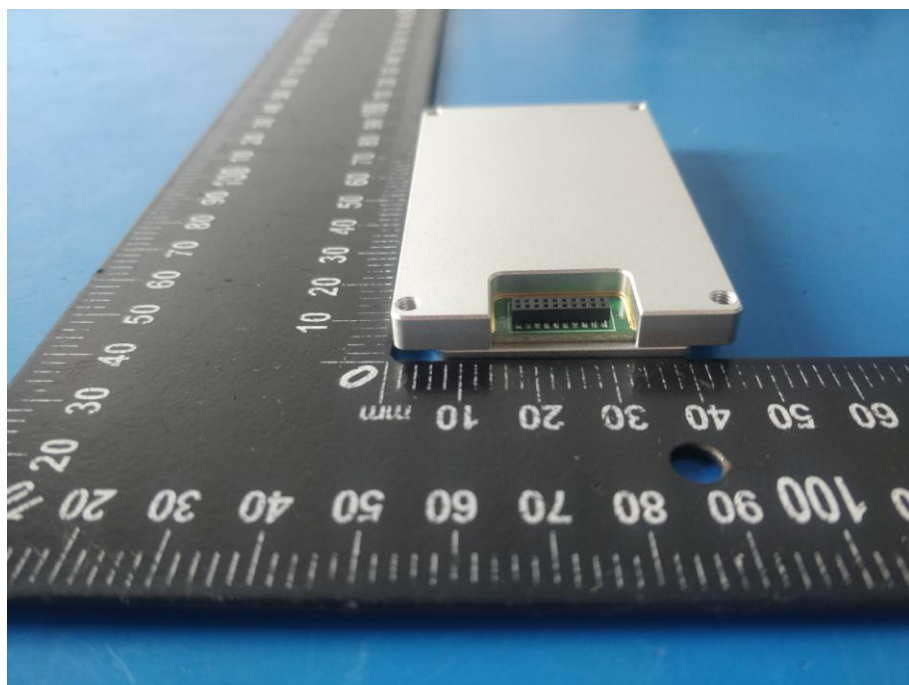
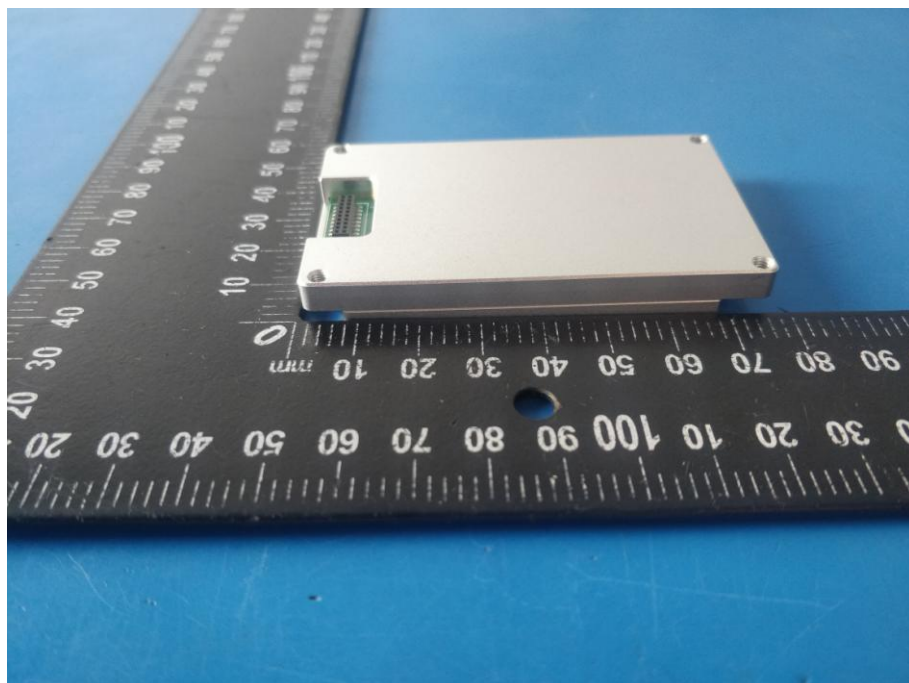
4.1.Photos of Radiated emission

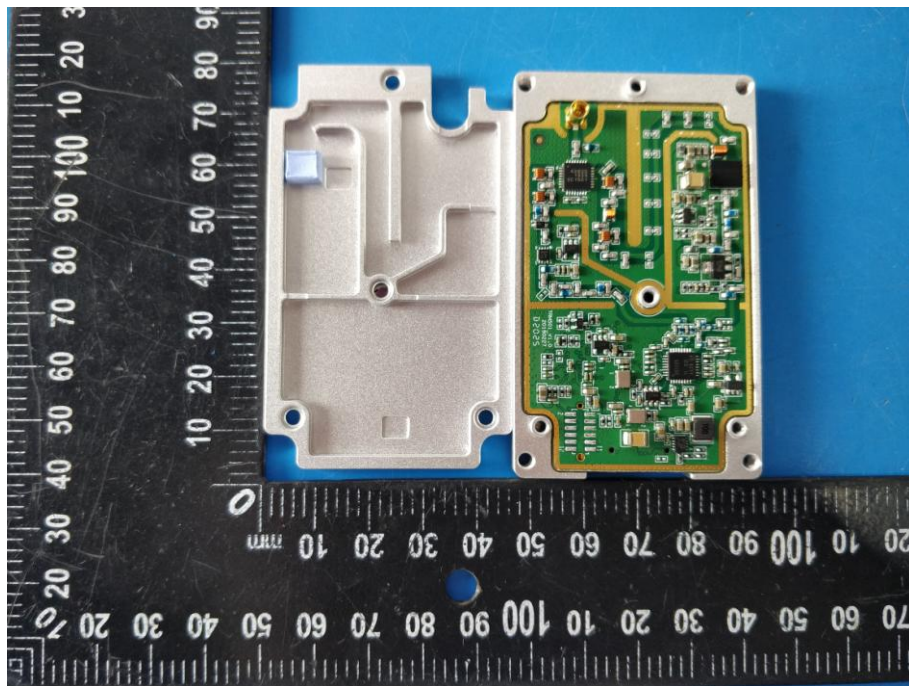
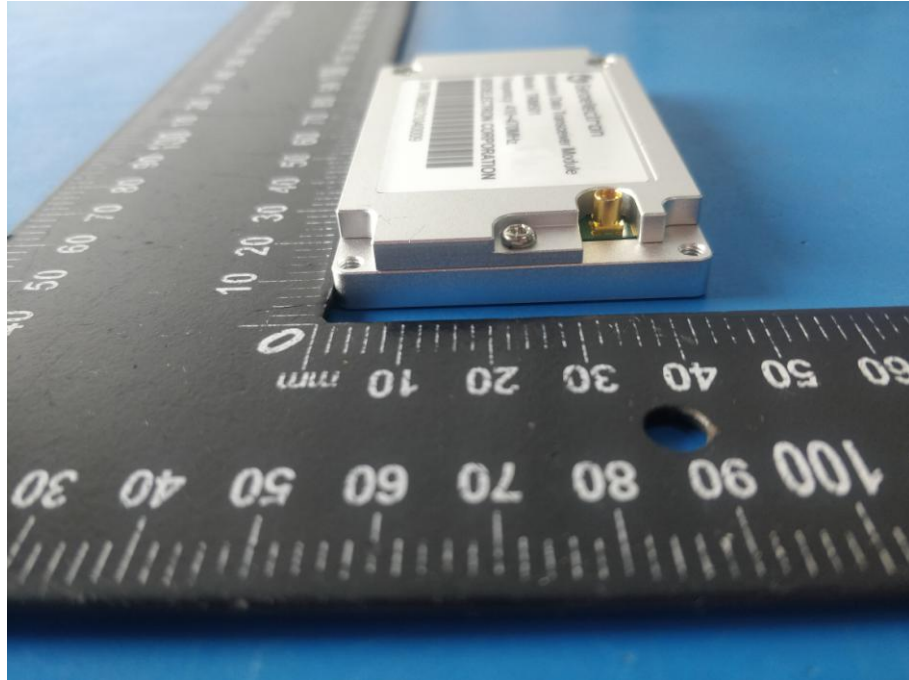


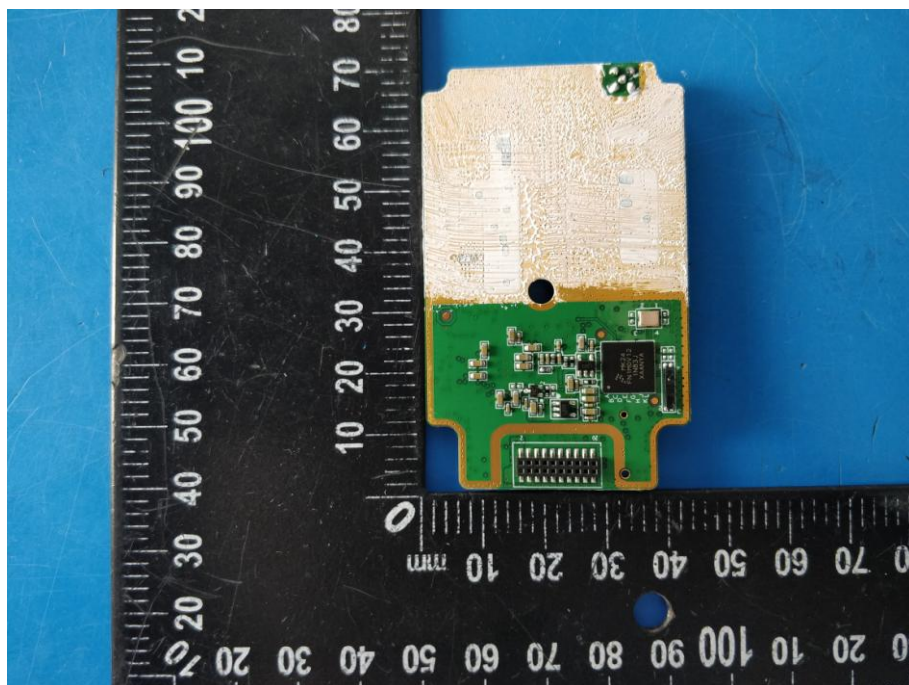
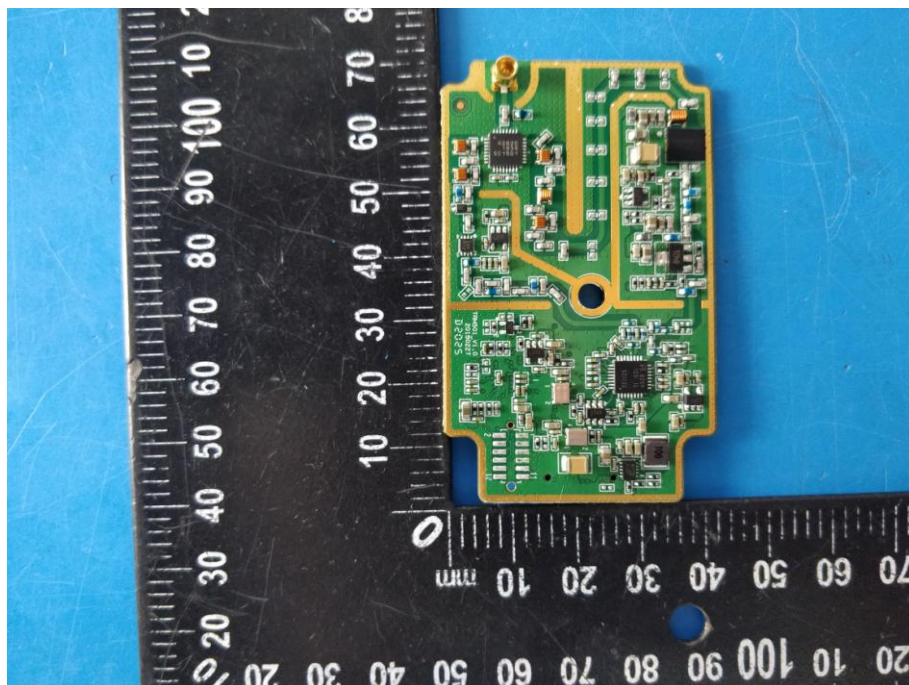
5. EUT PHOTO











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