FCC TEST REPORT

FCC ID: SY4-A020012

On Behalf of

Shanghai Huace Navigation Technology LTD.

GNSS Infrastructure

Model No.: P5E-Net

Prepared for	:	Shanghai Huace Navigation Technology LTD.
Address	:	Building C, 599 Gaojing Road, Qingpu District, 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	:	T1872102 11
Date of Receipt	:	Dec. 24, 2017
Date of Test	:	Dec. 24, 2017 – May 8, 2018
Date of Report	:	June 26, 2018
Version Number	:	REV0

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TEST REPORT DECLARATION

Applicant	:	Shanghai Huace Navigation Technology LTD.
Address	:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China
Manufacturer	:	Shanghai Huace Navigation Technology LTD.
Address	:	Building C, 599 Gaojing Road, Qingpu District, Shanghai, China
EUT Description	:	GNSS Infrastructure
	(A) Model No.	: P5E-Net
	(B) Trademark	: CHCNAV

Measurement Standard Used:

FCC CFR Title 47 Part 90:2017, FCC CFR Title 47 Part 2:2017

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).....:	Reak Yang Project Engineer	Reak Yang
Approved by (name + signature).....:	Simple Guan Project Manager	
Date of issue..... .....:	June 26, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	June 26, 2018	Initial released Issue	Simple Guan

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 90:2017	§ 90.205	P
Occupied Bandwidth & Emission Mask	FCC PART 90:2017	§ 90.209, § 90.210	P
Spurious Emissions(conducted)	FCC PART 90:2017	§ 90.210	P
Spurious Emissions(Radiated)	FCC PART 90:2017	§ 90.210	P
Transient Frequency Behavior	FCC PART 90:2017	§ 90.213	P
Frequency Stability	FCC PART 90:2017	§ 90.214	P
Modulation Characteristics - Audio Frequency Response	FCC PART 2:2017 FCC PART 90:2017	§ 2.1047(a); § 90.207	N/A
Modulation Characteristics - Modulation Limiting	FCC PART 2:2017 FCC PART 90:2017	§ 2.1047(b); § 90.207	N/A
Note:	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	:	GNSS Infrastructure
Model Number	:	P5E-Net
Diff	:	N/A
Trademark	:	CHCNAV
Test Voltage	:	DC 7.4V from battery or 12-36VDC, DC 12V From adapter
Operation frequency	:	410MHz-470MHz
Bandwidth	:	12.5KHz, 25KHz
Modulation type	:	GMSK
Antenna Type	:	External Antenna, Maximum Gain is 4.0dBi
Software version	:	N/A
Hardware version	:	N/A

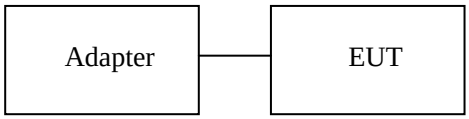
2.2.Accessories of Device (EUT)

No.	Description	Model	Serial Number	Certification or DOC	Trademark
1	AC/DC Adapter	DPS-40AB-11	/	/	/

2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1	Notebook	ACER	ZQT	N/A	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(MHz)	Channel	Frequency(MHz)
Low	12.5	1	410.125
	25	2	410.250
Mid	12.5	3	456.125
	25	4	456.250
High	12.5	5	469.975
	25	6	469.850

2.6.Test Conditions

Items	Required	Actual
Temperature range:	15-35℃	27℃
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 25, 2017 Certificated by IC
Registration Number: 12135A

2.8.Measurement Uncertainty

(95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.71dB
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)	3.90 dB (Polarize: V)
	3.92 dB (Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber (1GHz to 25GHz)	4.26 dB (Polarize: V)
	4.28 dB (Polarize: H)
Uncertainty for radio frequency	5.4×10-8
Uncertainty for conducted RF Power	0.16dB
Uncertainty for temperature	0.2℃
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.9.Test Equipment List

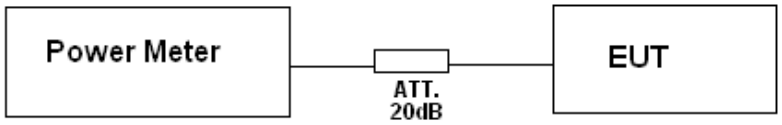
Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal. Due day
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-4 38	2017.09.30	2018.09.29
Test Receiver	ROHDE&SCHWARZ	ESCI	101165	2017.09.22	2018.09.21
Spectrum analyzer	Agilent	E4407B	MY49510055	2017.09.23	2018.09.22
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2017.09.30	2018.09.29
Filter	KANGMAI	ZLPF-LDC-1000- 1959	1209002075	2017.09.22	2018.09.21
Filter	WAINWRIGHT	WHKX2.80/18G- 12SS	SN1	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 4	N/A	2017.09.22	2018.09.21
CMU200	ROHDE&SCHWARZ	CMU200	116785	2017.09.22	2018.09.21
Signal Analyzer	Agilent	N9020A	MY499100060	2017.09.23	2018.09.22
vector Signal Generator	Agilent	N5182A	MY49060042	2017.09.22	2018.09.21
vector Signal Generator	Agilent	E4438C	US44271917	2017.09.28	2018.09.27
Amplifier	HP	HP8347A	2834A00455	2017.09.23	2018.09.22
Amplifier	Teseq	LNA6901	72718	2017.09.23	2018.09.22
Amplifier	Agilent	8449B	3008A02664	2017.09.23	2018.09.22
Filter	WAINWRIGHT	WHKX1.0G/15G- 10SS	SN40	2017.09.22	2018.09.21
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2017.09.23	2018.09.22
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2017.09.30	2018.09.29
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2017.07.21	2020.07.20
RF Cable	Resenberger	Cable 1	N/A	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 2	N/A	2017.09.22	2018.09.21
RF Cable	Resenberger	Cable 3	N/A	2017.09.28	2018.09.27
Power Sensor	Power Radio	RPR3006W	15100041SNO91	2017.09.23	2018.09.22
Power Sensor	Power Radio	RPR3006W	15100041SNO92	2017.09.23	2018.09.22
CMW500	ROHDE&SCHWARZ	CMW500	1201.0002K50-117239-sM	2017.09.22	2018.09.21
Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2017.09.29	2018.09.28

Attenuator	HP	8494B	DC-18G	2017.10.22	2018.10.23
Attenuator	HP	8496B	DC-18G	2017.10.22	2018.10.23
Temperature& Humidity test chamber	GZGONGWEN	GDS-250	080821	2017.10.22	2018.10.23
20dB Attenuator	ICPROBING	IATS1	82347	2017.09.22	2018.09.21
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2017.09.22	2018.09.21
L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2017.09.22	2018.09.21

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
Limits:	Please refer section FCC Part 90.205
Test Setup:	
Test Procedure:	a) Connect the equipment as illustrated. b) Turn on the power meter c) Record value
Test Result:	PASS

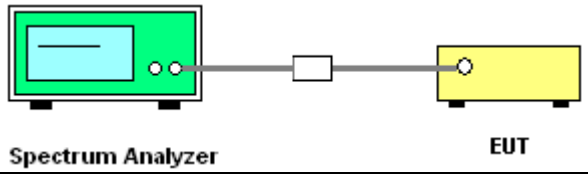
3.1.2. Test Results

GMSK mode					
Test channel	Maximum Conducted Output Power(Peak) (dBm)	Maximum ERP(dBm)	Stated ERP Power (dBm)	Limit (dBm)	Result
1	28.35	30.2	30	33	PASS
2	28.32	30.17	30	33	PASS
3	28.25	30.1	30	33	PASS
4	28.17	30.02	30	33	PASS
5	28.17	30.02	30	33	PASS
6	28.05	29.9	30	33	PASS

ERP= Maximum Conducted Output Power(Peak) + Antenna Gain – 2.15dB

3.2. Occupied Bandwidth and Emission Mask

3.2.1.Test Specification

Test Requirement:	FCC Part 90.209, FCC Part 90.210
Test Setup:	
Test Procedure:	The resolution bandwidth of the spectrum analyzer was set at 300 Hz and the spectrum was recorded in the Frequency band ± 50KHz from the carrier frequency.
Test Result:	PASS

3.2.2.Test data

Occupied Bandwidth:

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	Result
GMSK 12.5KHz Channel Spacing:				
1	410.125	9.81	7.55	PASS
2	456.125	9.83	7.65	PASS
3	469.975	10.10	7.55	PASS

Channel	Frequency (MHz)	26dB Bandwidth (KHz)	99% Occupied Bandwidth (KHz)	Result
GMSK 25KHz Channel Spacing:				
4	410.250	19.20	15.46	PASS
5	456.250	19.59	15.85	PASS
6	469.850	20.05	15.80	PASS

Emission Mask:

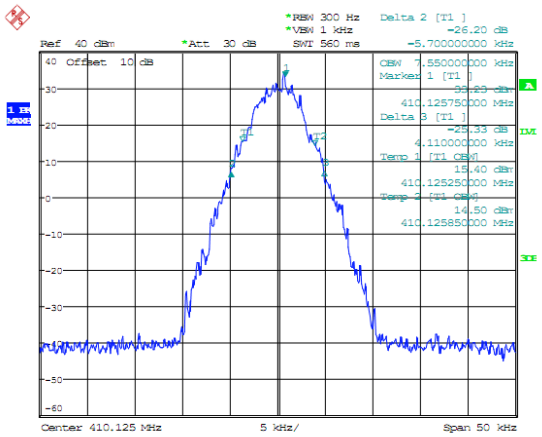
Channel	Frequency (MHz)	Applicable Mask	RBW	Result
GMSK 12.5KHz Channel Spacing:				
1	410.125	D	300	PASS
2	456.125	D	300	PASS
3	469.975	D	300	PASS

Channel	Frequency (MHz)	Applicable Mask	RBW	Result
GMSK 25KHz Channel Spacing:				
4	410.250	B	300	PASS
5	456.250	B	300	PASS
6	469.850	B	300	PASS

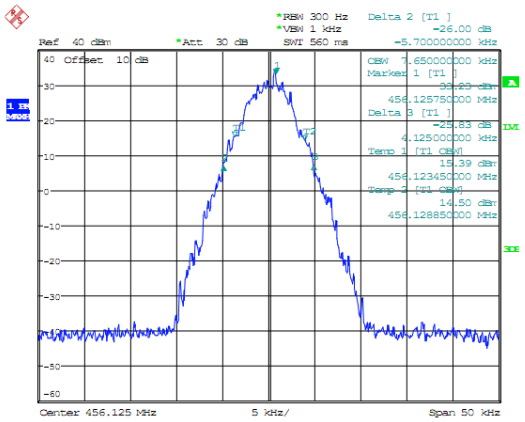
Test plots as follows:

GMSK mode: Occupied Bandwidth

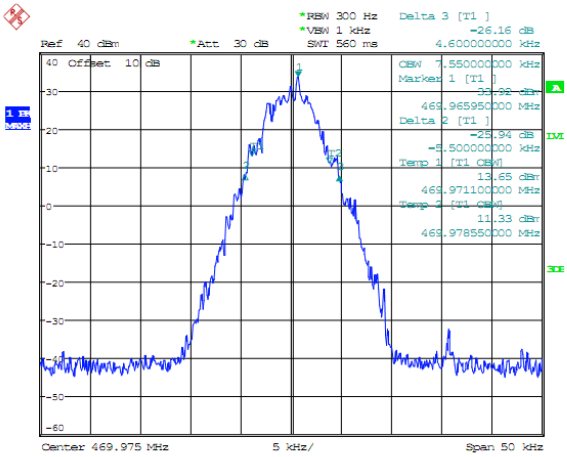
Channel 1



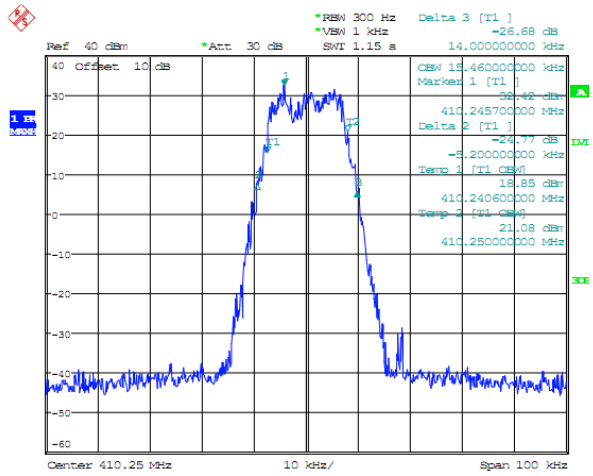
Channel 2



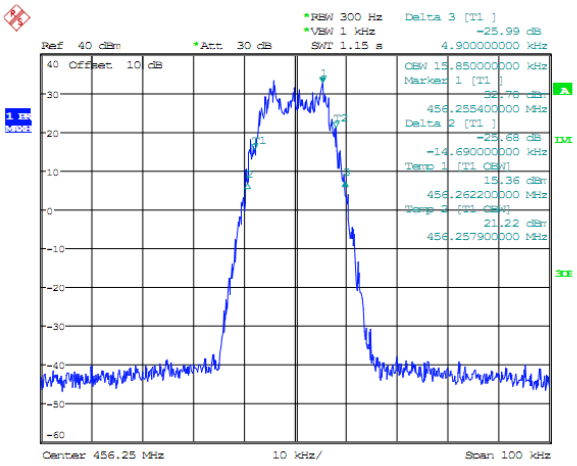
Channel 3



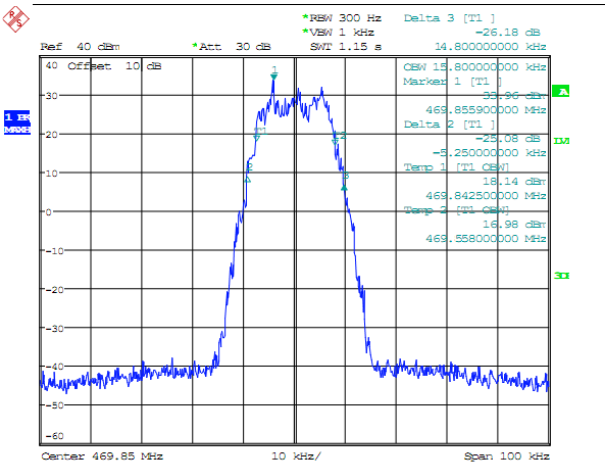
Channel 4



Channel 5

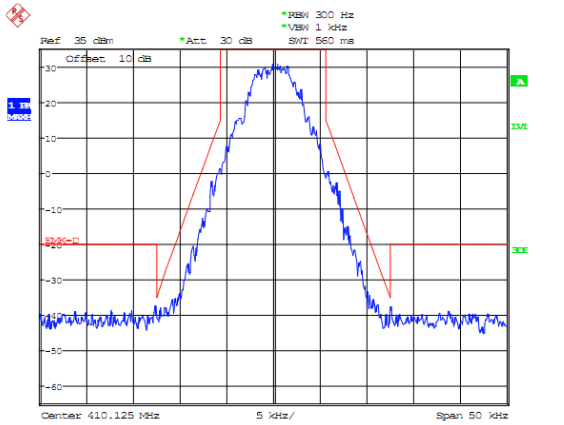


Channel 6

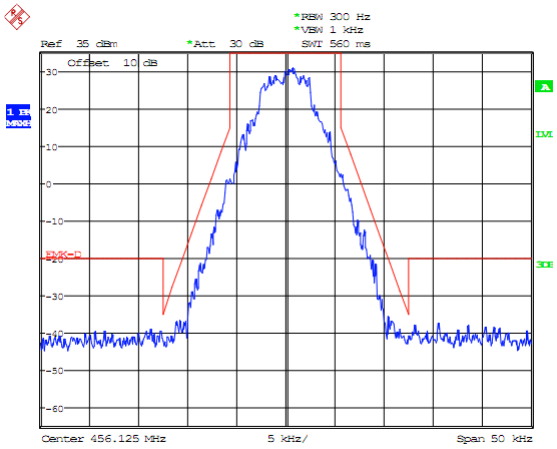


GMSK mode: Emission Mask

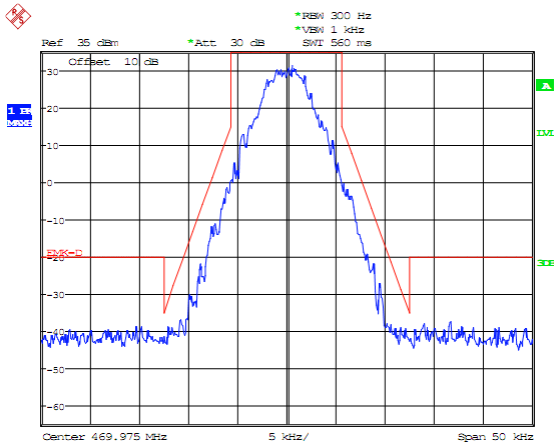
Channel 1



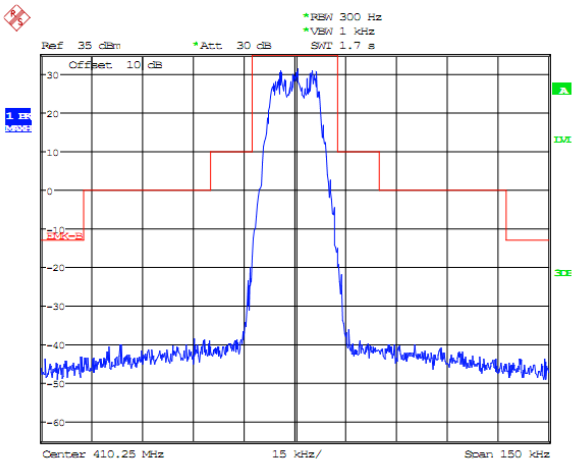
Channel 2



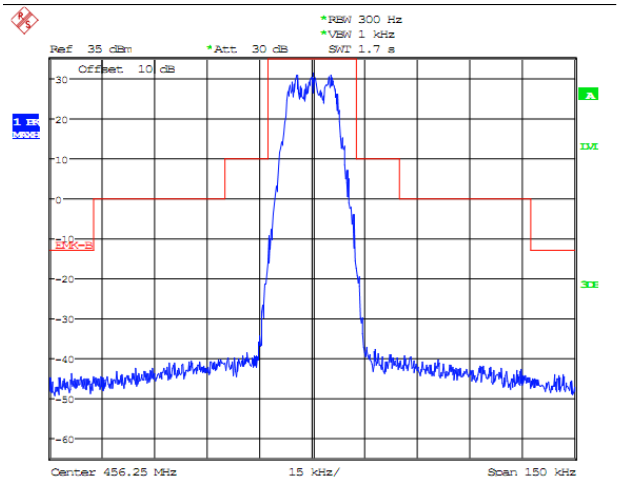
Channel 3



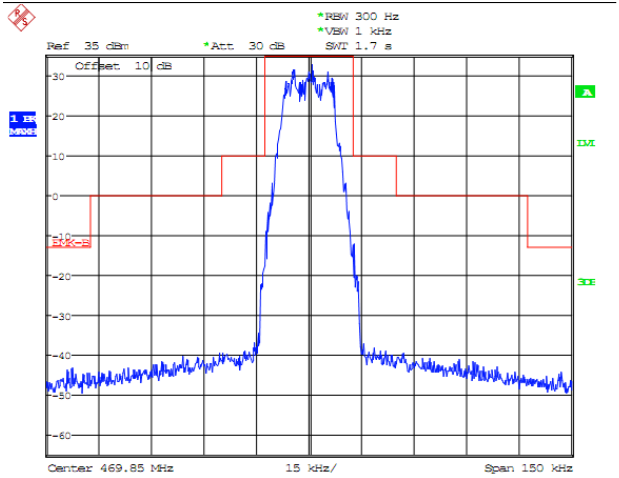
Channel 4



Channel 5

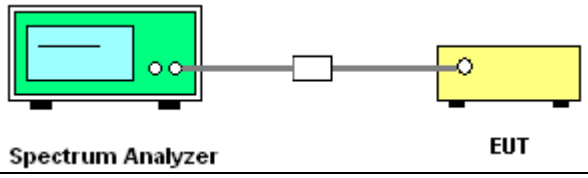


Channel 6



3.3. Spurious Emissions(conducted)

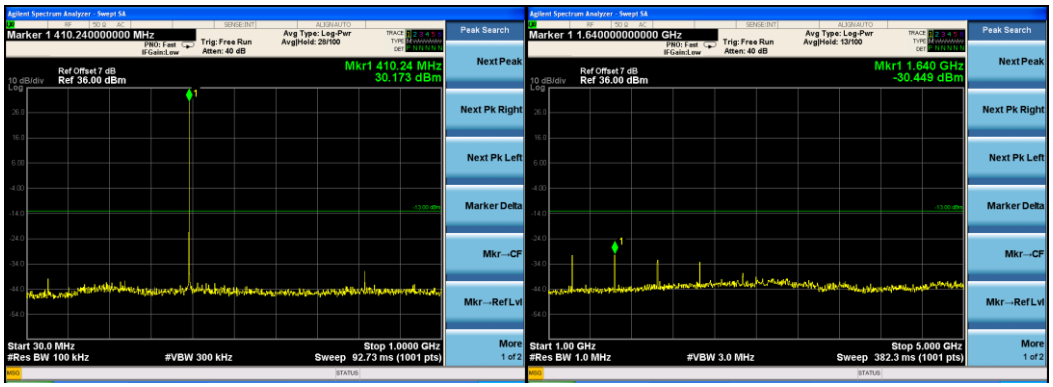
3.3.1.Test Specification

Test Requirement:	FCC Part 90.210
Test Setup:	
Test Limit:	Modulation Type: GMSK FCC Part 22.359, 74.462, 80.211 and 90.210 and RSS Gen, RSS 119 Issue 12: For 12.5 kHz 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 (Pwatts) = 50 + 10 log (3.0) =54.77 dB Low: 50 + 10 log (Pwatts) = 50 + 10 log (1.0) =50.00 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 – 10log (3.0) = -20 dBm Low: Limit (dBm) = 30.00 – 50 – 10log (1.0) = -20 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 (Pwatts) = 43 + 10 log (3.0) = 47.77 dB Low: 43 + 10 log (Pwatts) = 43 + 10 log (1.0) = 43.00 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 – 10log (3.0) = -13 dBm Low: Limit (dBm) = 30.00 – 43 – 10log (1.0) = -13 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.
Test Result:	PASS

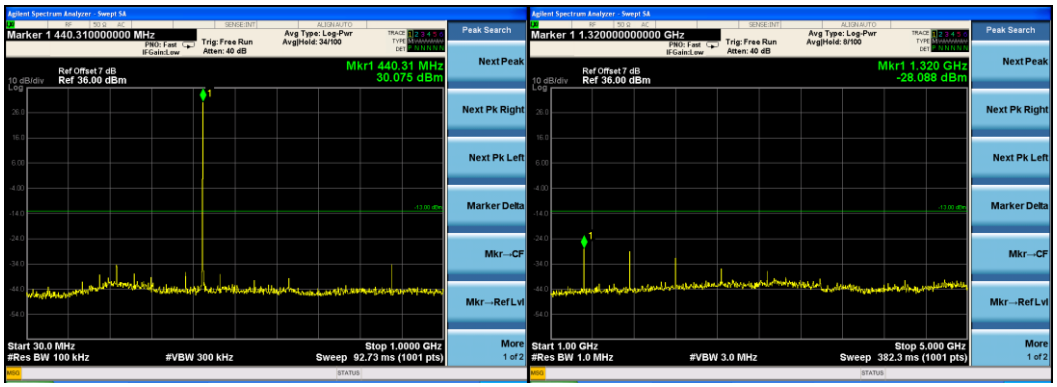
3.3.2.Test data

Test plots as follows:
GMSK mode

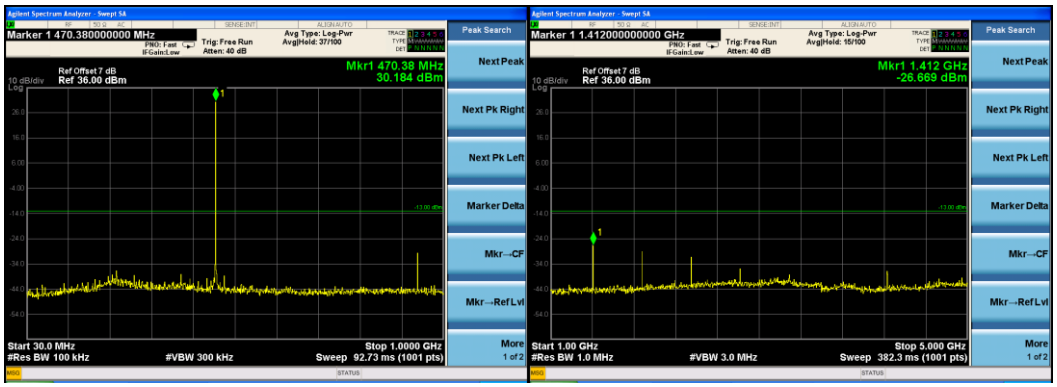
Channel 1



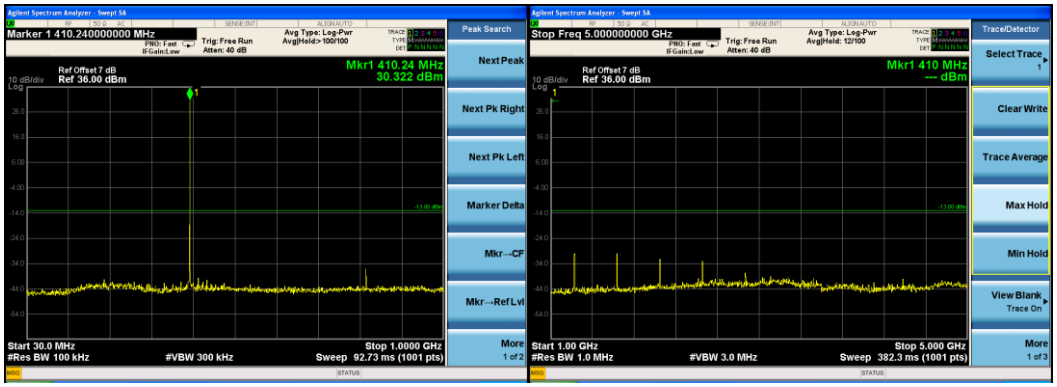
Channel 2



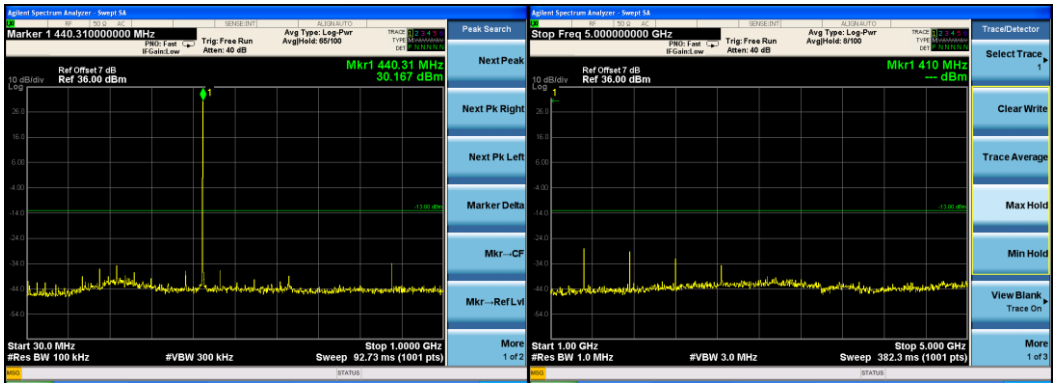
Channel 3



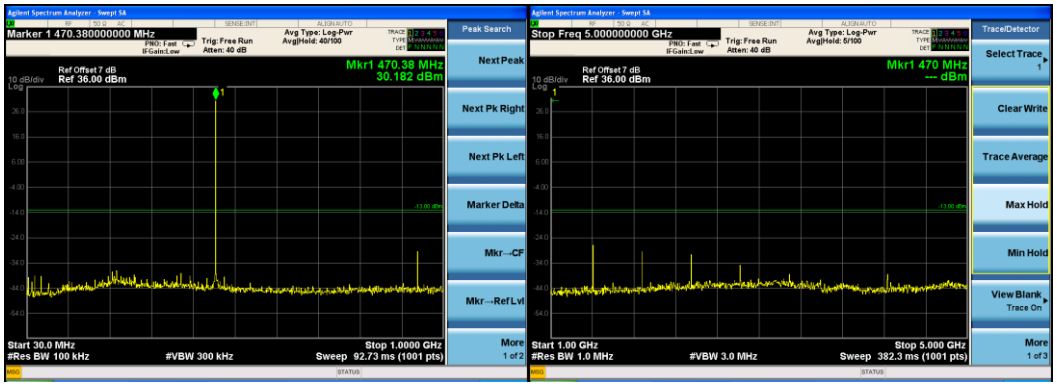
Channel 4



Channel 5

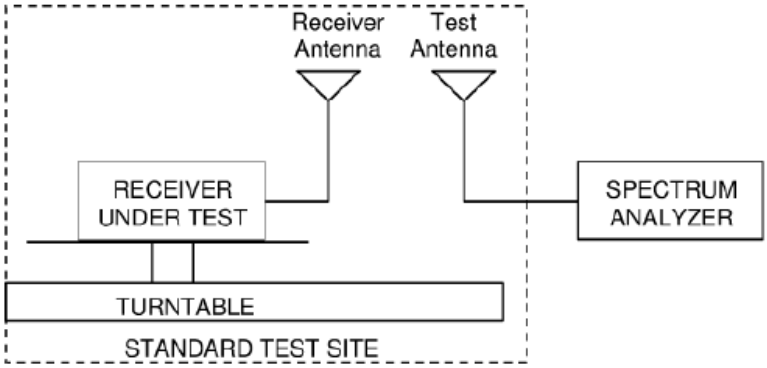


Channel 6



3.4. Radiated Spurious Emission

3.4.1.Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part 90.210</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.26</td></tr>
<tr><td>Measurement Distance:</td><td>3 m</td></tr>
<tr><td>Antenna Polarization:</td><td>Horizontal & Vertical</td></tr>
<tr><td>Operation mode:</td><td>Refer to item 4.1</td></tr>
<tr><td>Receiver Setup:</td><td>
<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>
</td></tr>
<tr><td>Limit:</td><td>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 + 10log (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 (fd in kHz) of more than 12.5 kHz: At least 50 + 10 log(P) dB or 70 dB, whichever is the lesser attenuation.</td></tr>
<tr><td>Test setup:</td><td> 
</td></tr>
<tr><td>Test Procedure:</td><td>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</td></tr>
</table>

	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 =43+10 Log_{10} (power out in Watts) for EUT with a 25 kHz channel bandwidth. Spurious attenuation limit in dB =50+10 Log_{10} (power out in Watts) for EUT with a 12.5 kHz channel bandwidth.
Test results:	PASS

3.4.2.Test Data

Test Mode： Channel 1, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
152.648	-93.54	V	0.24	31.35	-62.43	-20	-42.43
360.904	-92.86	V	0.26	31.34	-61.78	-20	-41.78
673.313	-94.59	V	0.42	31.24	-63.77	-20	-43.77
863.444	-93.27	V	0.58	30.71	-63.14	-20	-43.14
1263.509	-82.56	V	1.23	26.38	-57.41	-20	-37.41
3864.166	-81.43	V	1.68	25.47	-57.64	-20	-37.64
285.253	-94.63	H	0.43	31.24	-63.82	-20	-43.82
399.050	-95.82	H	0.45	30.68	-65.59	-20	-45.59
479.190	-94.66	H	0.64	30.85	-64.45	-20	-44.45
675.773	-96.37	H	0.79	31.12	-66.04	-20	-46.04
1368.694	-82.36	H	1.29	26.12	-57.53	-20	-37.53
3258.712	-80.58	H	1.62	25.41	-56.79	-20	-36.79

Test Mode： Channel 2, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
155.210	-93.02	V	0.24	31.35	-61.91	-20	-41.91
364.462	-92.70	V	0.26	31.34	-61.62	-20	-41.62
669.814	-94.14	V	0.42	31.24	-63.32	-20	-43.32
862.247	-93.12	V	0.58	30.71	-62.99	-20	-42.99
1261.405	-82.24	V	1.23	26.38	-57.09	-20	-37.09
3858.853	-80.48	V	1.68	25.47	-56.69	-20	-36.69
290.754	-93.89	H	0.43	31.24	-63.08	-20	-43.08
397.852	-95.59	H	0.45	30.68	-65.36	-20	-45.36
479.276	-94.30	H	0.64	30.85	-64.09	-20	-44.09
683.561	-95.46	H	0.79	31.12	-65.13	-20	-45.13
1368.272	-81.79	H	1.29	26.12	-56.96	-20	-36.96
3262.627	-79.99	H	1.62	25.41	-56.2	-20	-36.2

Test Mode： Channel 3, Channel Spacing 12.5KHz

Frequency (MHz)	Reading level (dBm)	Antenna Polarization	Cable loss (dB)	Ant.Gain (dBi)	Emission level (dBm)	Limit (dBm)	Margin (dB)
149.976	-93.18	V	0.24	31.35	-62.07	-20	-42.07
363.698	-92.44	V	0.26	31.34	-61.36	-20	-41.36
672.157	-94.57	V	0.42	31.24	-63.75	-20	-43.75
867.135	-92.83	V	0.58	30.71	-62.70	-20	-42.70
1259.426	-82.36	V	1.23	26.38	-57.21	-20	-37.21
3858.867	-80.96	V	1.68	25.47	-57.17	-20	-37.17
290.920	-93.93	H	0.43	31.24	-63.12	-20	-43.12
405.147	-95.61	H	0.45	30.68	-65.38	-20	-45.38
473.758	-94.51	H	0.64	30.85	-64.30	-20	-44.3
677.316	-95.65	H	0.79	31.12	-65.32	-20	-45.32
1372.894	-81.53	H	1.29	26.12	-56.70	-20	-36.7
3264.131	-80.05	H	1.62	25.41	-56.26	-20	-36.26

Test Mode： Channel 4, 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	-93.00	V	0.24	31.35	-61.89	-20	-41.89
360.122	-91.89	V	0.26	31.34	-60.81	-20	-40.81
672.254	-94.45	V	0.42	31.24	-63.63	-20	-43.63
867.320	-92.94	V	0.58	30.71	-62.81	-20	-42.81
1259.385	-82.28	V	1.23	26.38	-57.13	-20	-37.13
3856.570	-80.72	V	1.68	25.47	-56.93	-20	-36.93
287.978	-94.40	H	0.43	31.24	-63.59	-20	-43.59
402.660	-95.22	H	0.45	30.68	-64.99	-20	-44.99
475.190	-94.65	H	0.64	30.85	-64.44	-20	-44.44
678.902	-96.07	H	0.79	31.12	-65.74	-20	-45.74
1370.493	-81.64	H	1.29	26.12	-56.81	-20	-36.81
3258.430	-80.29	H	1.62	25.41	-56.5	-20	-36.5

Test Mode： Channel 5, 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	-92.54	V	0.24	31.35	-61.43	-20	-41.43
361.299	-92.03	V	0.26	31.34	-60.95	-20	-40.95
670.384	-93.87	V	0.42	31.24	-63.05	-20	-43.05
859.190	-92.88	V	0.58	30.71	-62.75	-20	-42.75
1262.116	-82.40	V	1.23	26.38	-57.25	-20	-37.25
3860.246	-80.78	V	1.68	25.47	-56.99	-20	-36.99
285.515	-93.68	H	0.43	31.24	-62.87	-20	-42.87
404.347	-94.88	H	0.45	30.68	-64.65	-20	-44.65
472.970	-94.54	H	0.64	30.85	-64.33	-20	-44.33
682.270	-95.84	H	0.79	31.12	-65.51	-20	-45.51
1370.178	-81.76	H	1.29	26.12	-56.93	-20	-36.93
3261.045	-80.56	H	1.62	25.41	-56.77	-20	-36.77

Test Mode： Channel 6, 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	-92.67	V	0.24	31.35	-61.56	-20	-41.56
363.368	-92.09	V	0.26	31.34	-61.01	-20	-41.01
670.811	-94.51	V	0.42	31.24	-63.69	-20	-43.69
865.805	-92.92	V	0.58	30.71	-62.79	-20	-42.79
1258.551	-81.66	V	1.23	26.38	-56.51	-20	-36.51
3858.923	-80.47	V	1.68	25.47	-56.68	-20	-36.68
291.012	-94.47	H	0.43	31.24	-63.66	-20	-43.66
400.454	-95.24	H	0.45	30.68	-65.01	-20	-45.01
475.645	-94.63	H	0.64	30.85	-64.42	-20	-44.42
680.453	-96.22	H	0.79	31.12	-65.89	-20	-45.89
1373.809	-81.67	H	1.29	26.12	-56.84	-20	-36.84
3264.509	-79.80	H	1.62	25.41	-56.01	-20	-36.01

3.5. Transient Frequency Behavior

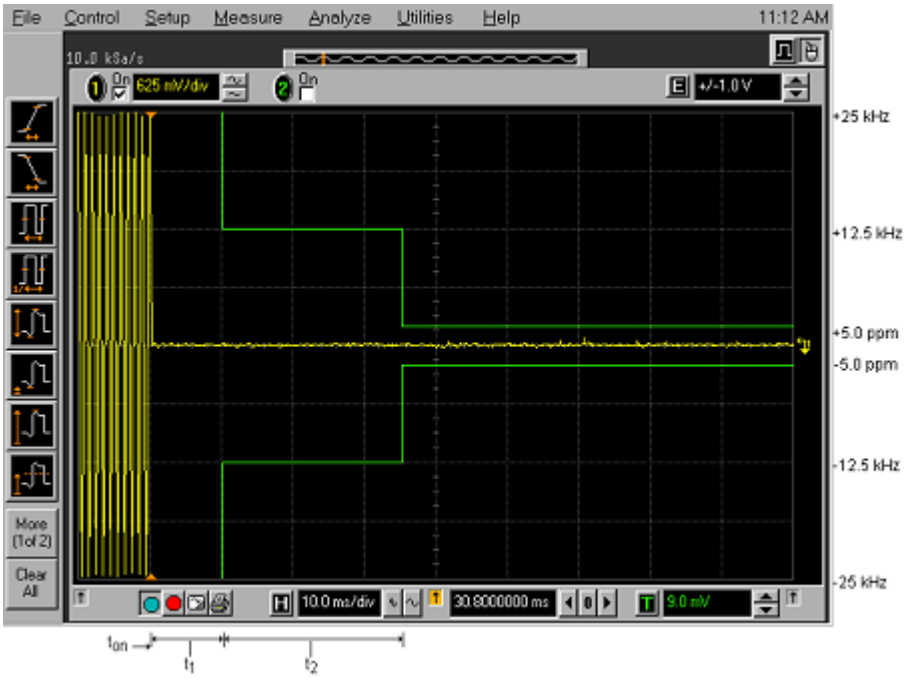
3.5.1.Test Specification

<table>
<tr><td>Test Requirement:</td><td>FCC Part 90.214</td></tr>
<tr><td>Test Setup:</td><td> 
Spectrum Analyzer EUT</td></tr>
<tr><td>Test Limit</td><td>
<table>
<tr><th rowspan="2">Frequency Range</th><th rowspan="2">Channel Bandwidth</th><th colspan="3">Frequency Tolerance (ppm)</th></tr>
<tr><th>Fixed and Base Station</th><th colspan="2">Mobile Stations</th></tr>
<tr><th></th><th></th><th>> 2W</th><th>≤ 2W</th></tr>
<tr><td rowspan="3">150-174MHz</td><td>6.25</td><td>1.0</td><td>2.0</td><td>2.0</td></tr>
<tr><td>12.5</td><td>2.5</td><td>5.0</td><td>5.0</td></tr>
<tr><td>25</td><td>5.0</td><td>5.0</td><td>50.0*</td></tr>
<tr><td rowspan="3">421-512MHz</td><td>6.25</td><td>0.5</td><td>1.0</td><td>1.0</td></tr>
<tr><td>12.5</td><td>1.5</td><td>2.5</td><td>2.5</td></tr>
<tr><td>25</td><td>2.5</td><td>5.0</td><td>5.0</td></tr>
</table>
* Stations operating in the 154.45 MHz or the 173.2 to 173.4 MHz bands must have a frequency stability of 5 ppm.
* Paging transmitters operating on paging-only frequencies must operate with frequency stability of 5 ppm in the 150-174 MHz band and 2.5 ppm in the 421-512 MHz band.
</td></tr>
<tr><td>Test Procedure:</td><td>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 Spectrum Analyzer ESCI. The coupling loss of the additional cables was recorded and taken in account for all the measurements. 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. The result was recorded.</td></tr>
<tr><td>Test Result:</td><td>PASS</td></tr>
</table>

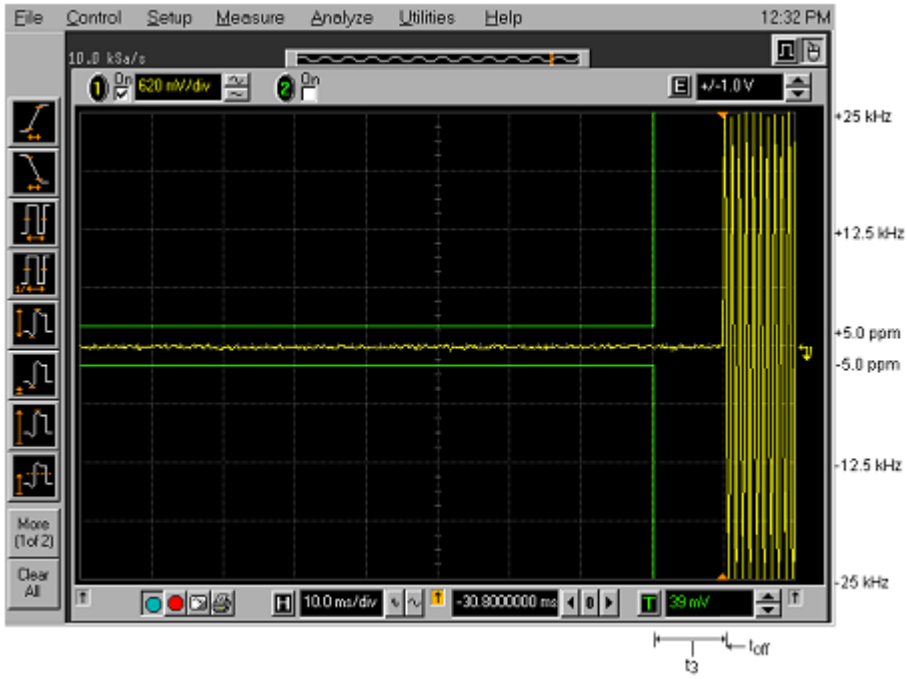
3.5.2.Test data

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

Power On

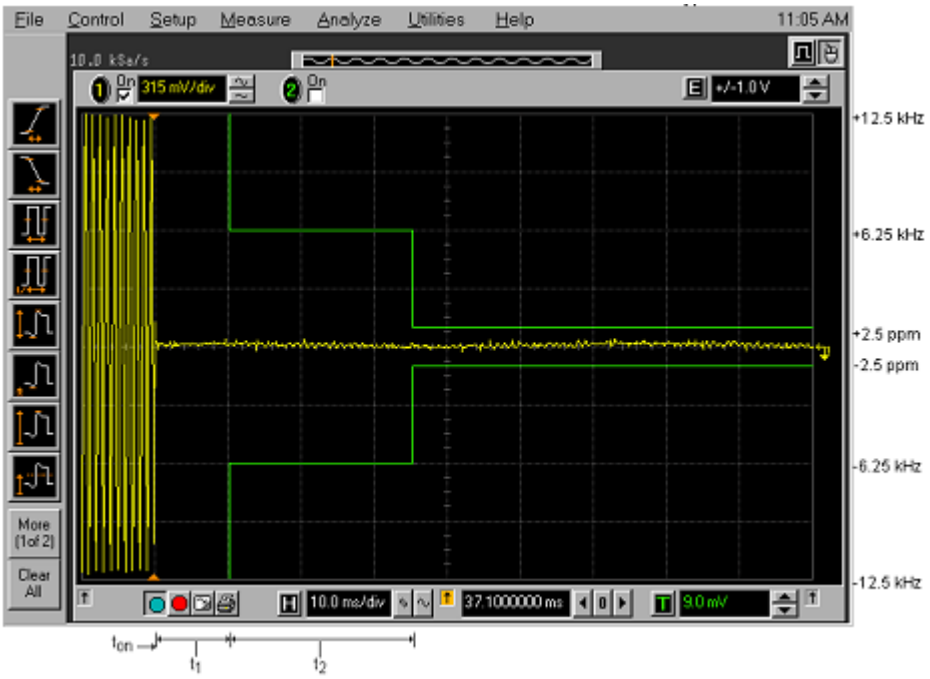


Power Off

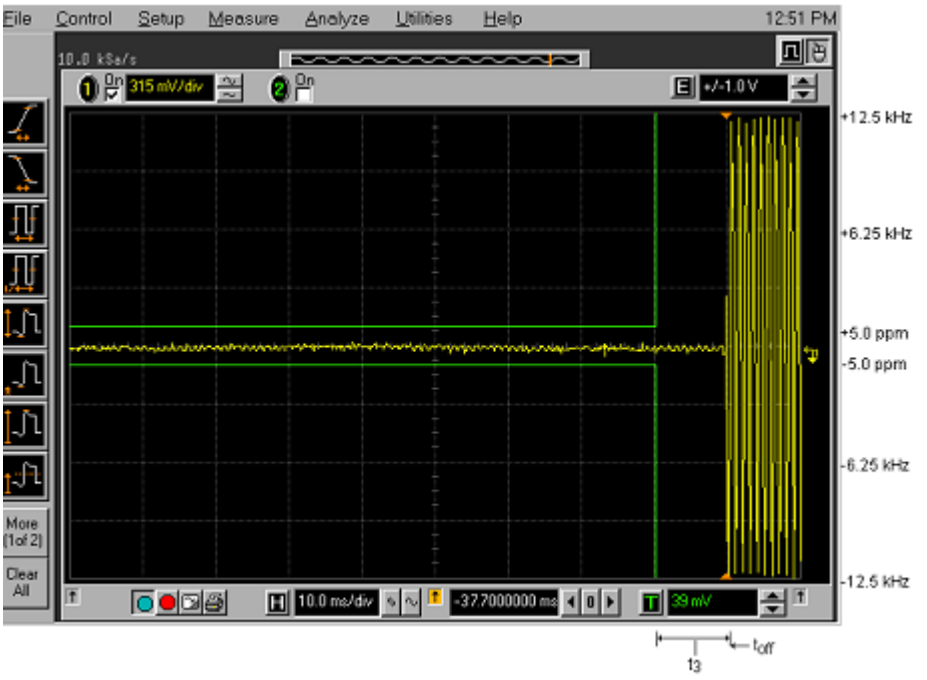


Test Plots for channel spacing 12.5KHz. EUT power setting: Maximum

Power On

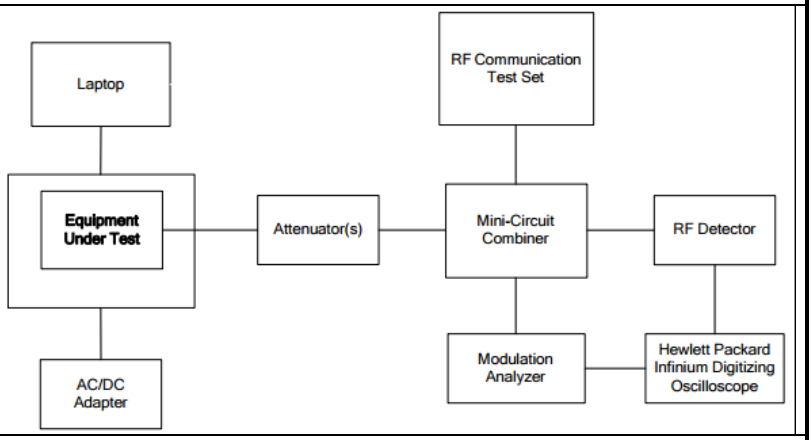


Power Off



3.6. Behavior Frequency Stability

3.6.1.Test Specification

Test Requirement:	FCC Part 90.213
Test Method:	ANSI C63.26
Test Setup:	
Test Procedure:	Method of Measurement (using a Modulation Domain Analyzer). The output of the EUT was connected to a power meter in order to get a reference power measurement. And the reference level is -20dBm. Once the reference power measurement was determined, an external signal source was connected to the Modulation Domain Analyzer in order to set the trigger level. The EUT was connected to the Modulation Domain Analyzer. In order to capture a single-shot turn-on of the transmitter signal, the modulation domain analyzer was set to trigger on the rising edge of the waveform. Plots were taken. The modulation domain analyzer was then adjusted to trigger on the falling edge of the transmitter waveform in order to capture a single-shot turn-off transient of the transmitter signal. Plots were taken.
Test Result:	PASS

3.6.2. Test data

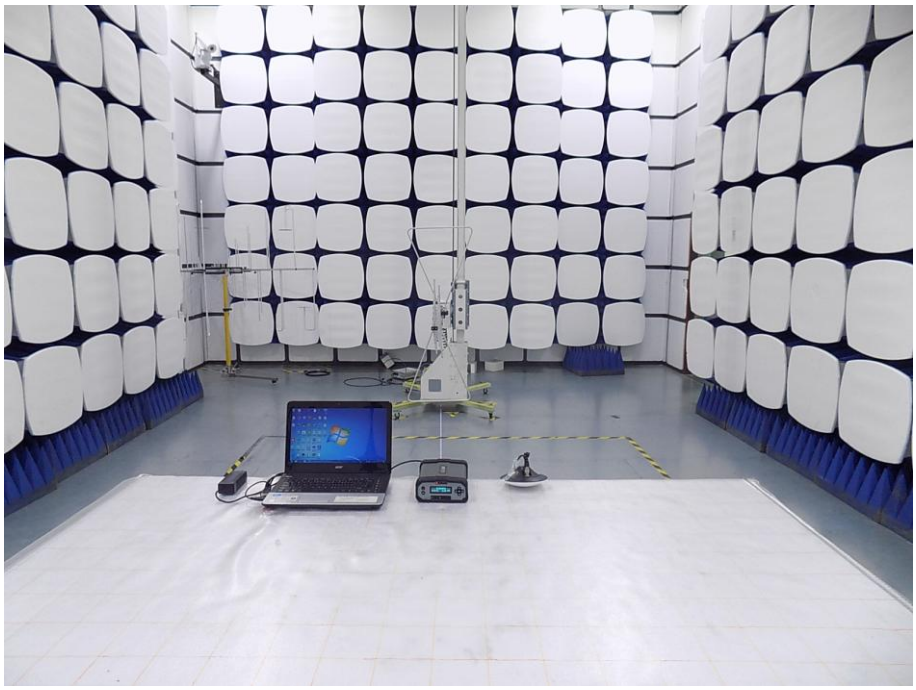
Conclusion: PASS			
Mode	Voltage (V)	Frequency error (Hz)	frequency error (ppm)
Middle Channel 12.5KHz Channel Spacing	7.2V	-27	-0.06136
	7.0V	-27	-0.06136
	6.8V	-27	-0.06136
	6.6V	-27	-0.06136
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	7.2V	-27	-0.06136
	7.0V	-27	-0.06136
	6.8V	-27	-0.06136
	6.6V	-27	-0.06136
Limit	5ppm		
Mode	Temperature (℃)	Frequency error (Hz)	frequency error (ppm)
Middle Channel 12.5KHz Channel Spacing	-30	-35	-0.07955
	-20	-27	-0.06136
	-10	-54	-0.12273
	0	-29	-0.06591
	10	-31	-0.07045
	20	-43	-0.09773
	30	-26	-0.05909
	40	-19	-0.04318
	50	-28	-0.06364
Limit	2.5ppm		
Middle Channel 25KHz Channel Spacing	-30	-31	-0.07045
	-20	-39	-0.08864
	-10	-29	-0.06591
	0	-29	-0.06591
	10	-31	-0.07045
	20	-33	-0.0750
	30	-28	-0.06364
	40	-26	-0.05909
	50	-22	-0.0500
Limit	5ppm		

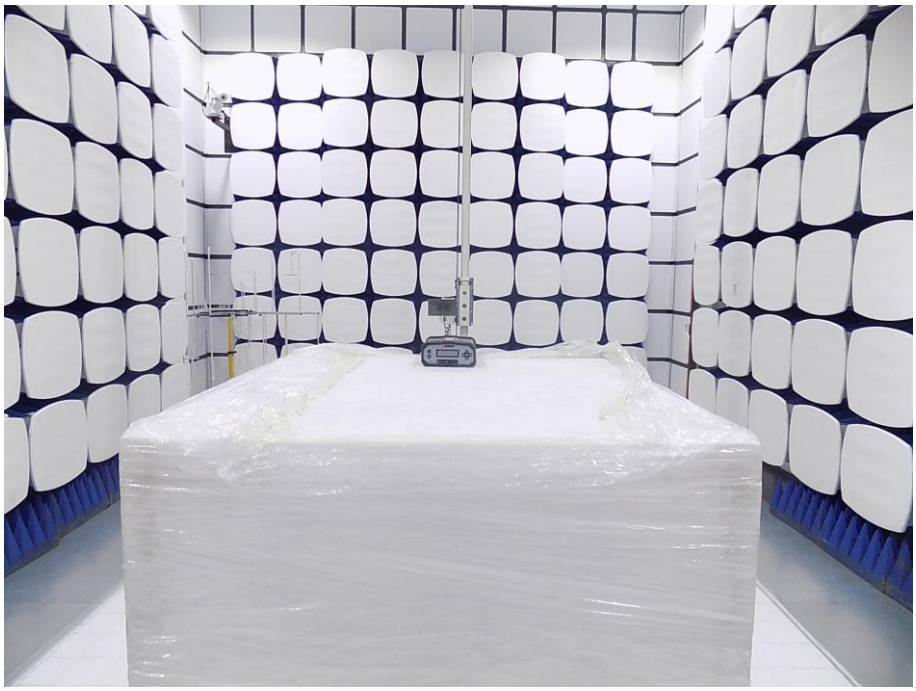
3.7. Modulation Characteristic

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

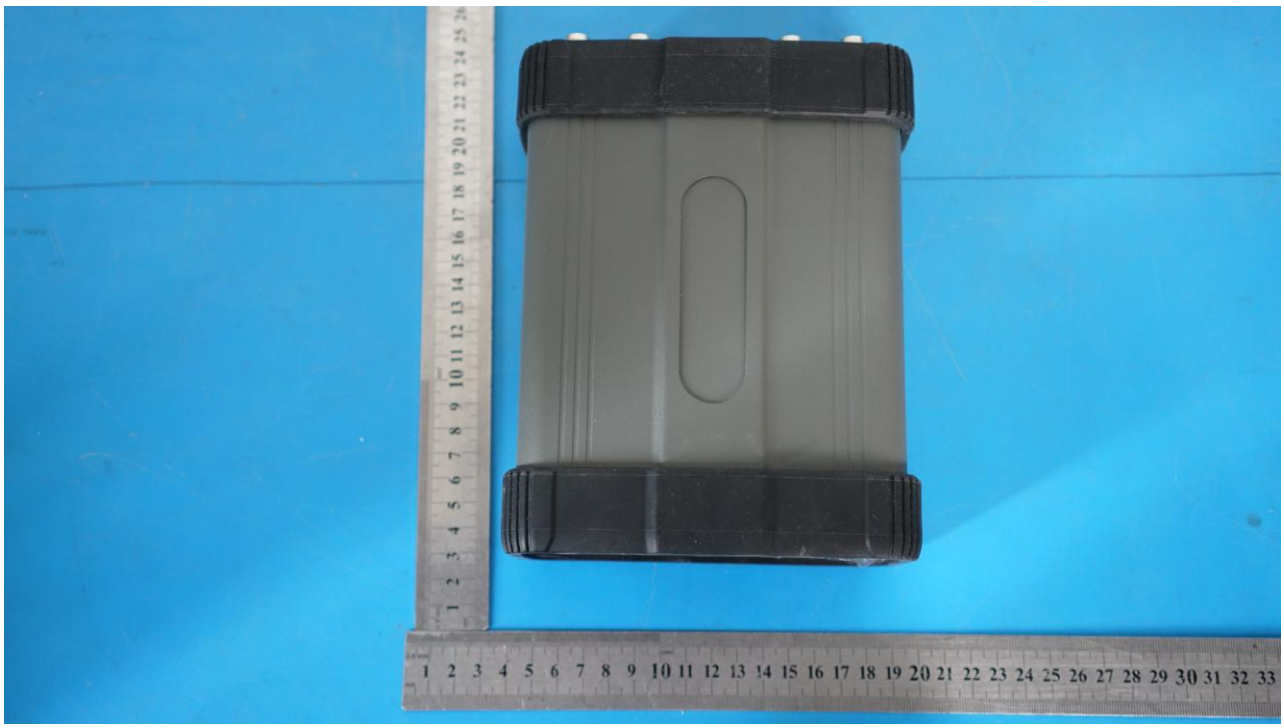
4.1.Photos of Radiated emission

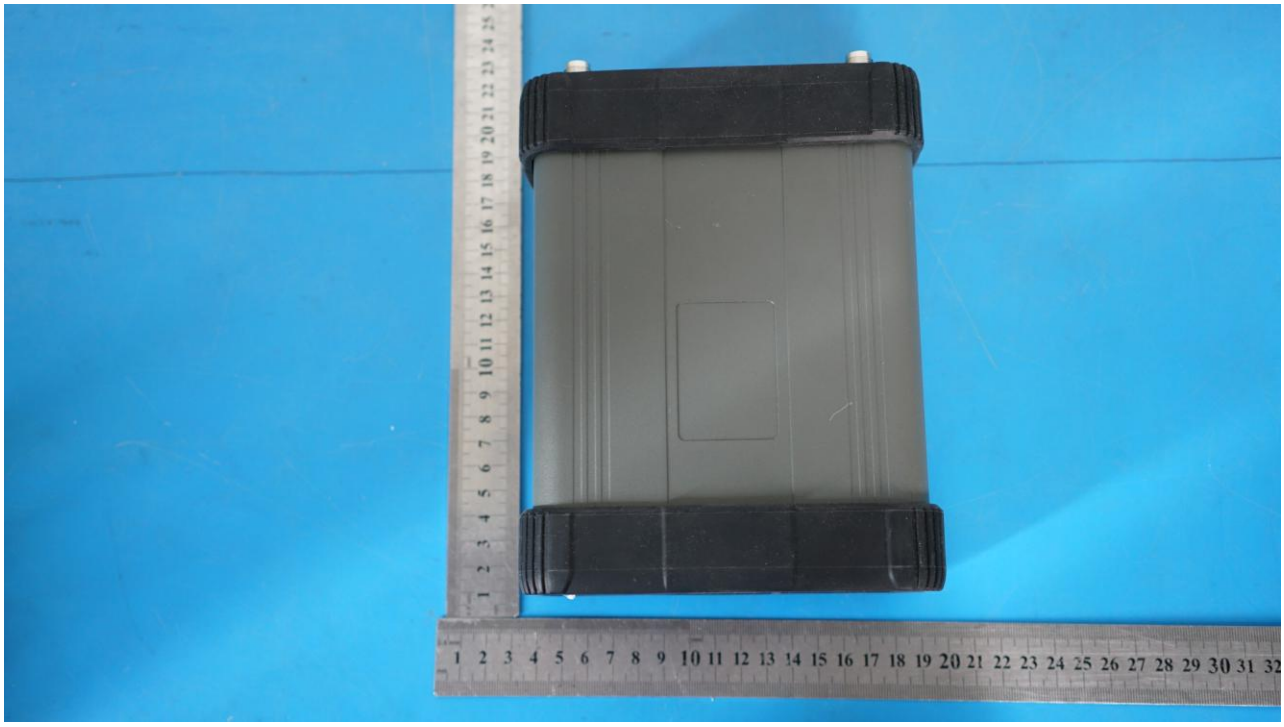




5. TEST SETUP PHOTO

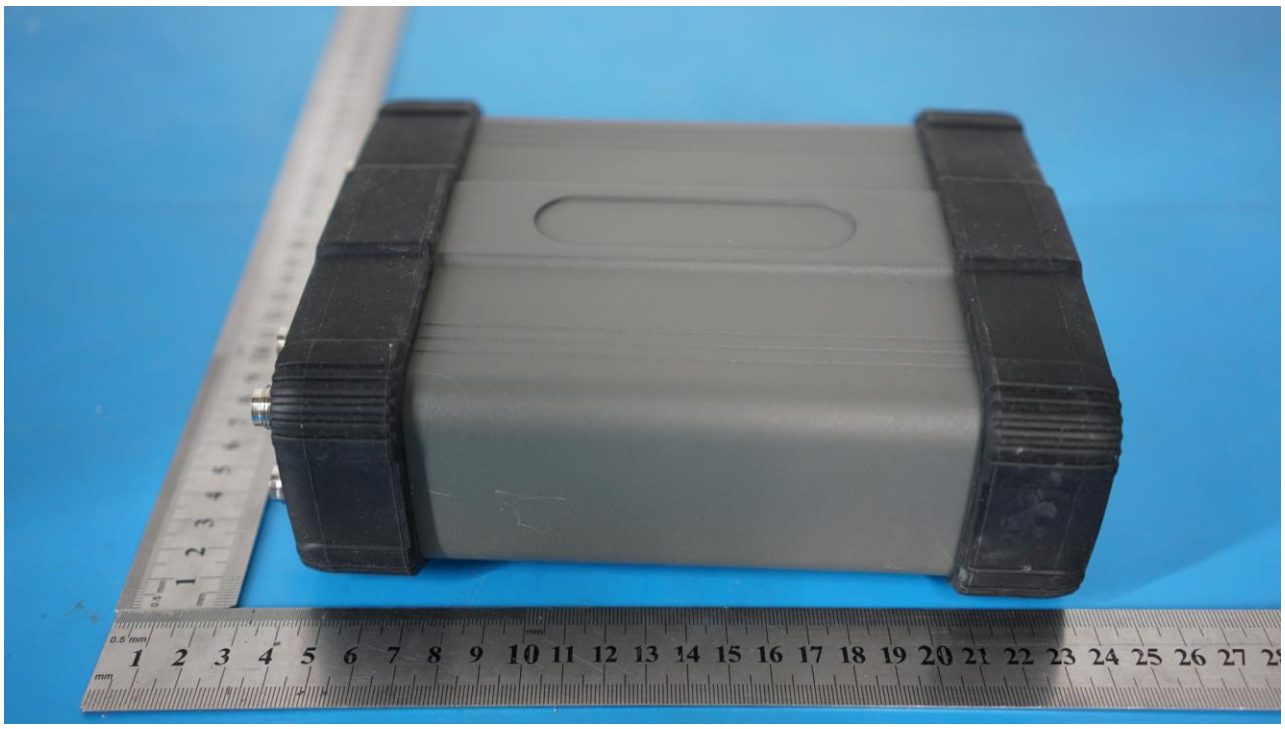
External Photo

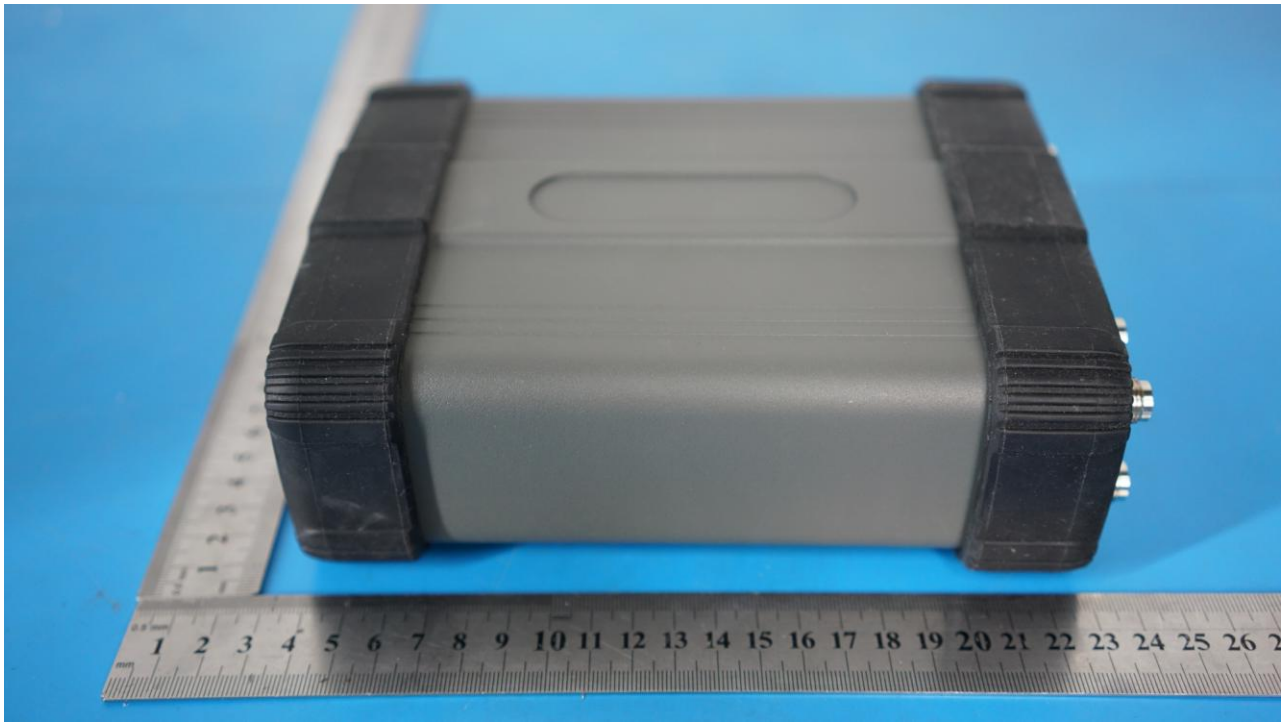





ESC
OK

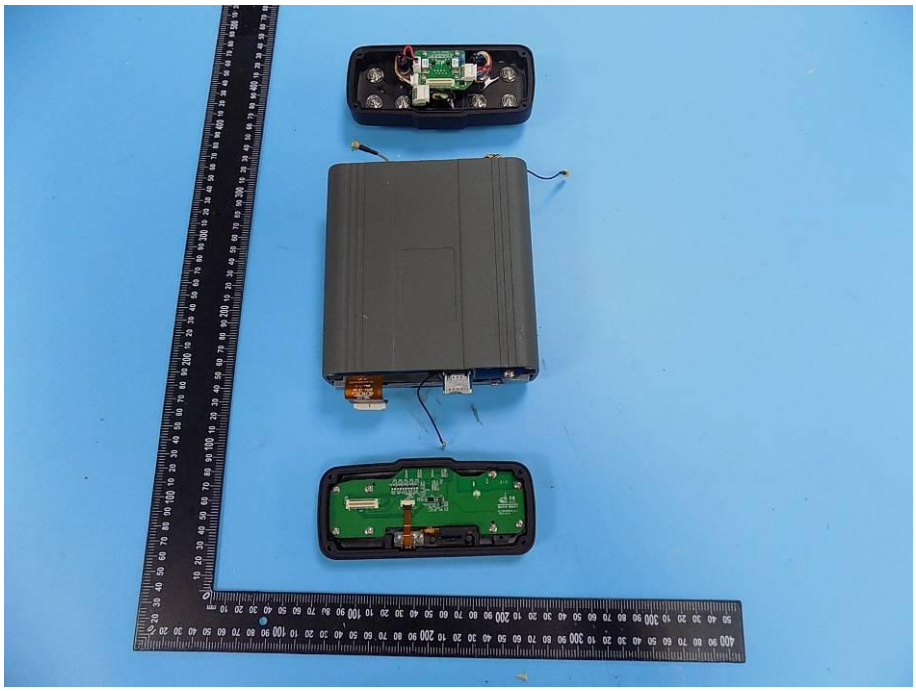

GNSS1
GNSS2
3G
RADIO

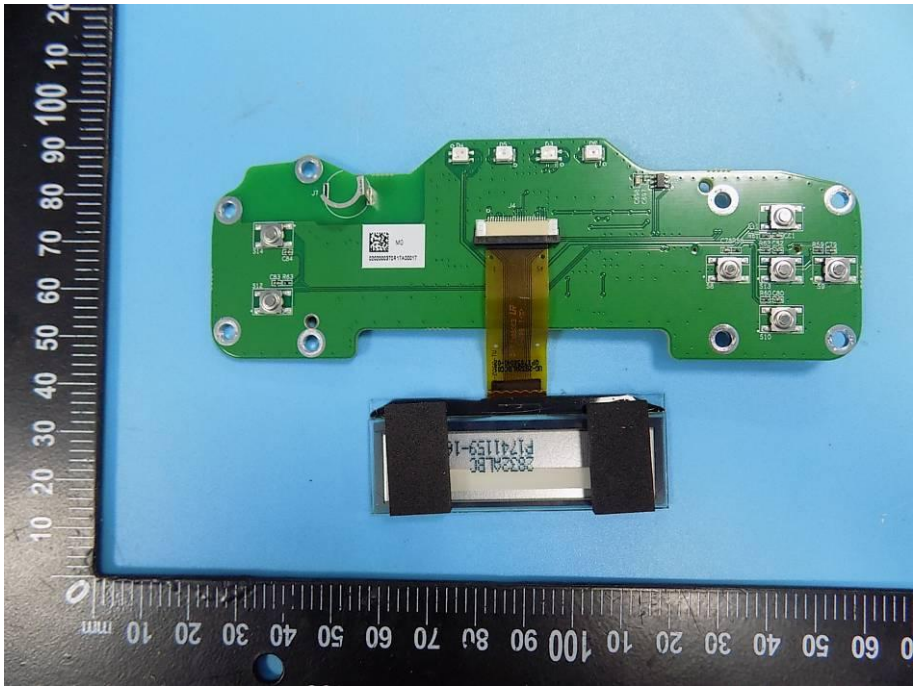


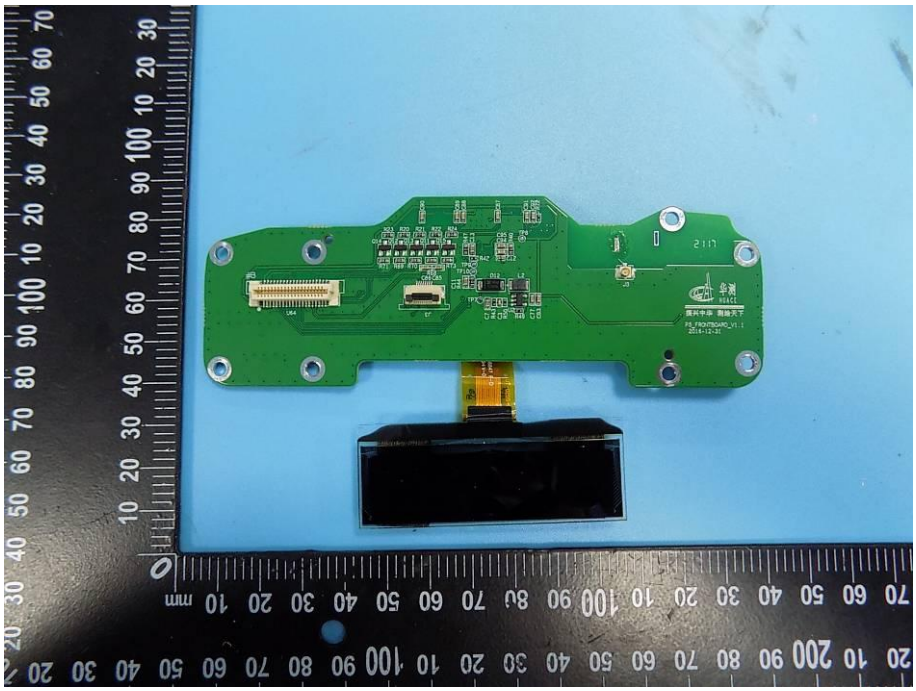


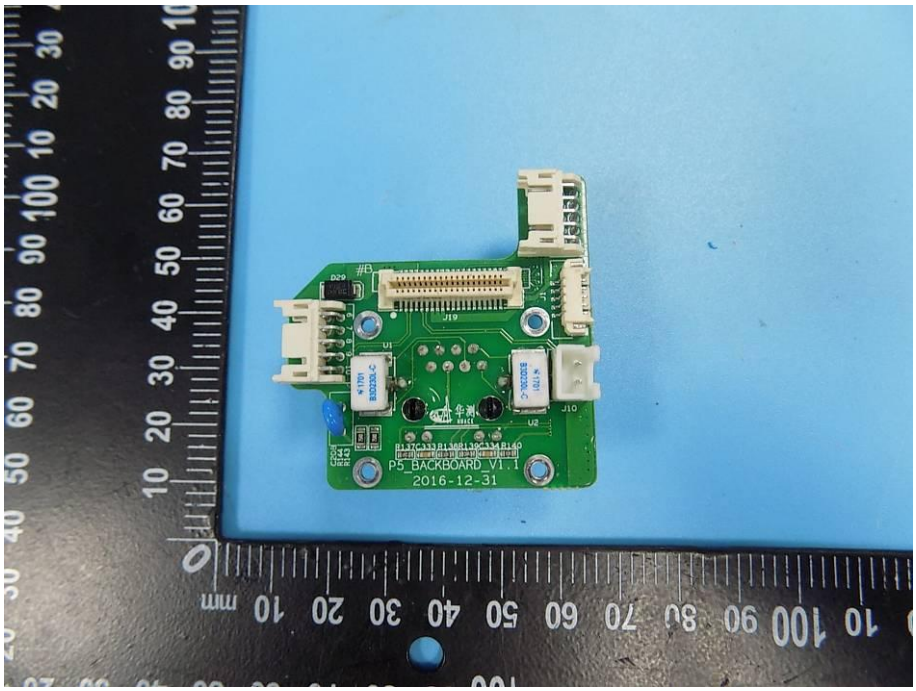

DELTA ELECTRONICS, INC.
Energy Verified
IS 13252(Part 1)
IEC 60950-1
R-41013528
S/N: JAVD1809000505
C.C.: E
REV: 00

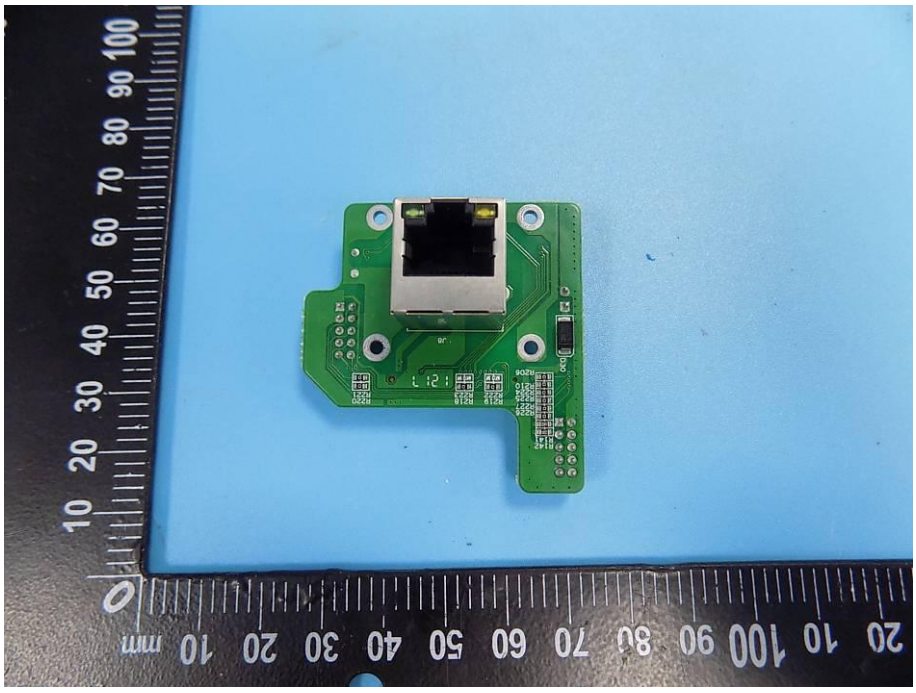
Internal Photo



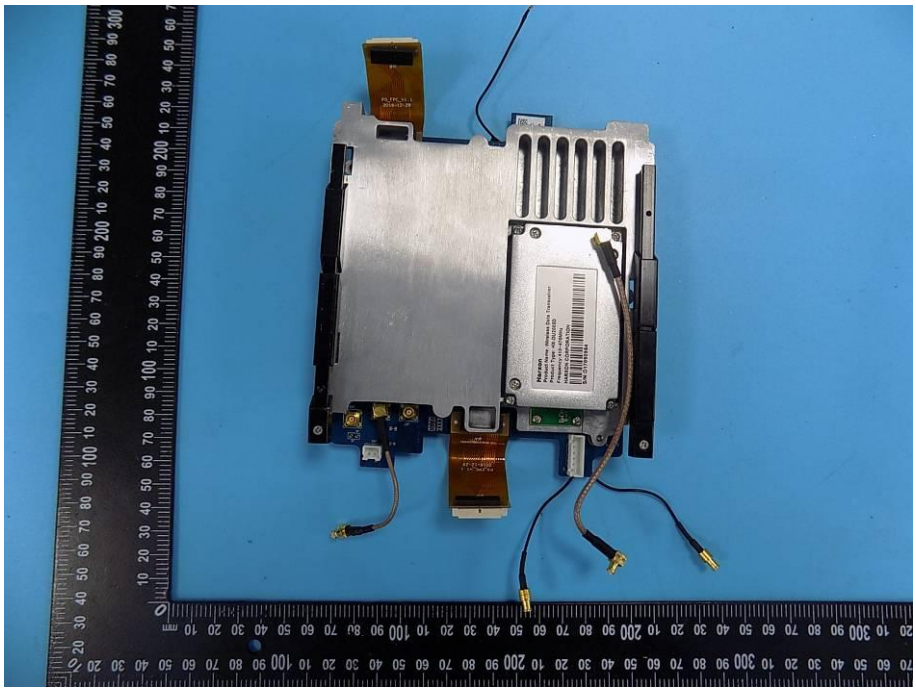




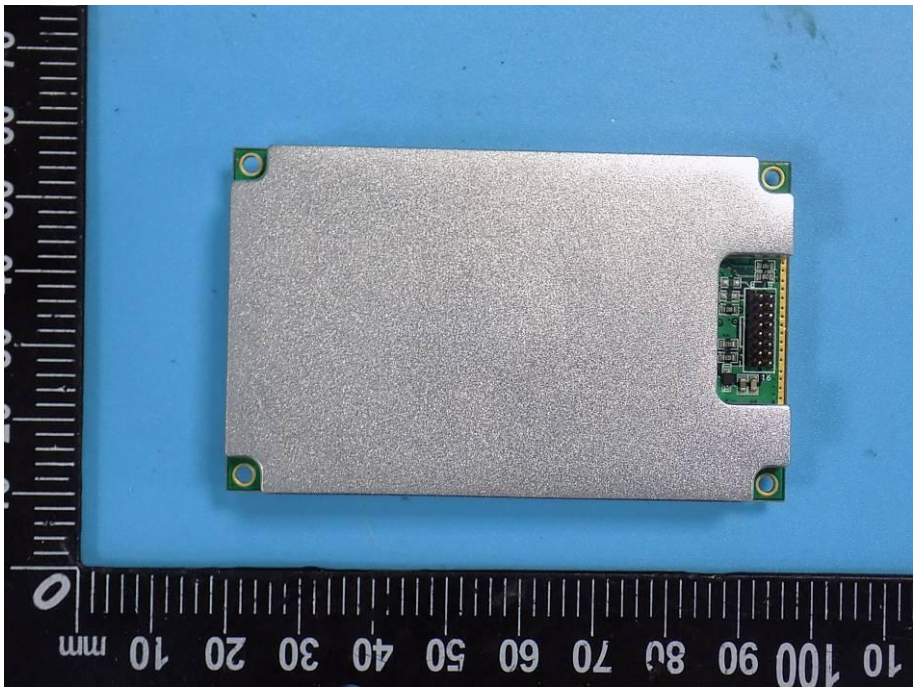

P5_BACKBOARD_V1.1
2016-12-31

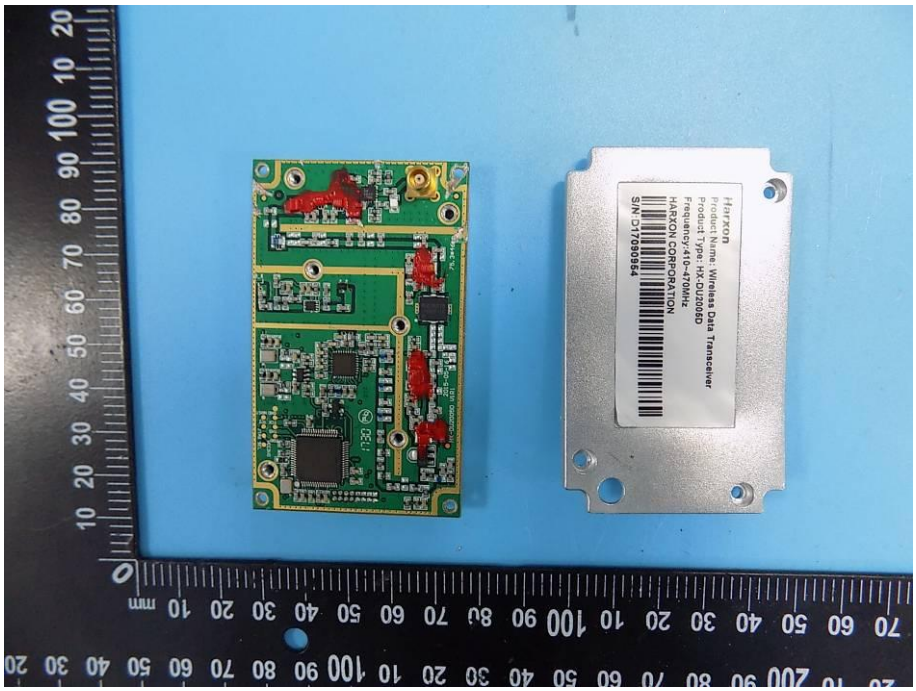


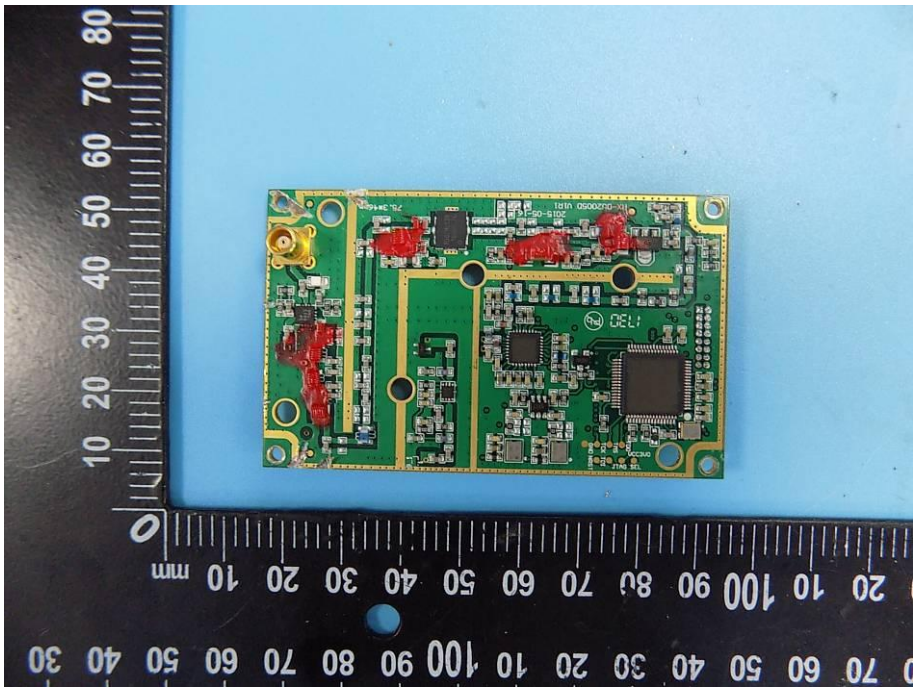

Li-ion Battery Pack
Model: SNLB-330A
Description:7.2V 17Ah Max watt-hour rating:122.4Wh
Max input Voltage:8.4V
P/N: 0101070029
S/N: 18900004
Do not dispose of in fire or put into water
Do not disassemble or short circuit
Do not use in high temperature or near a heat source

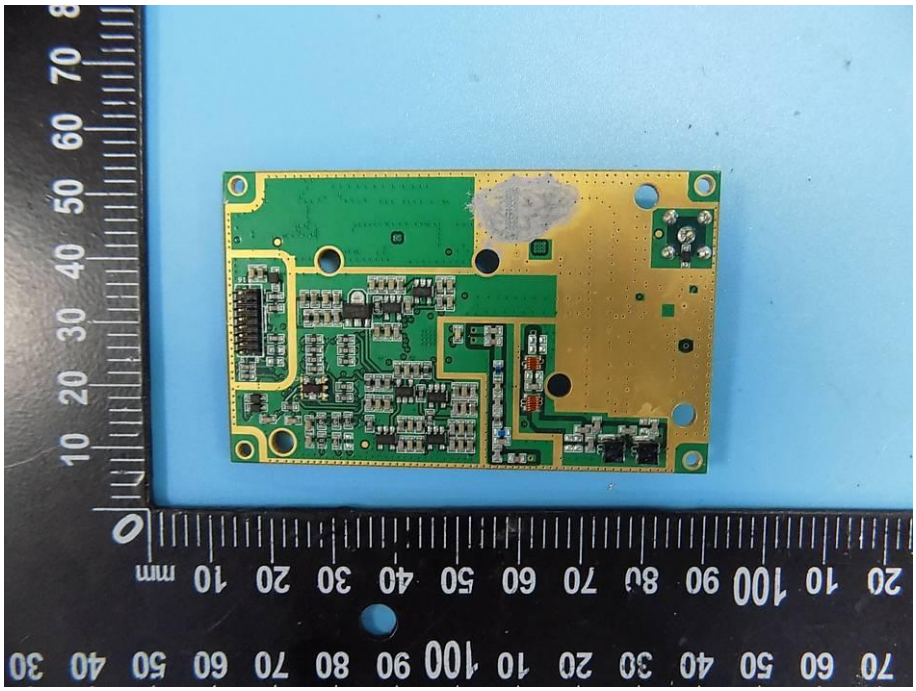


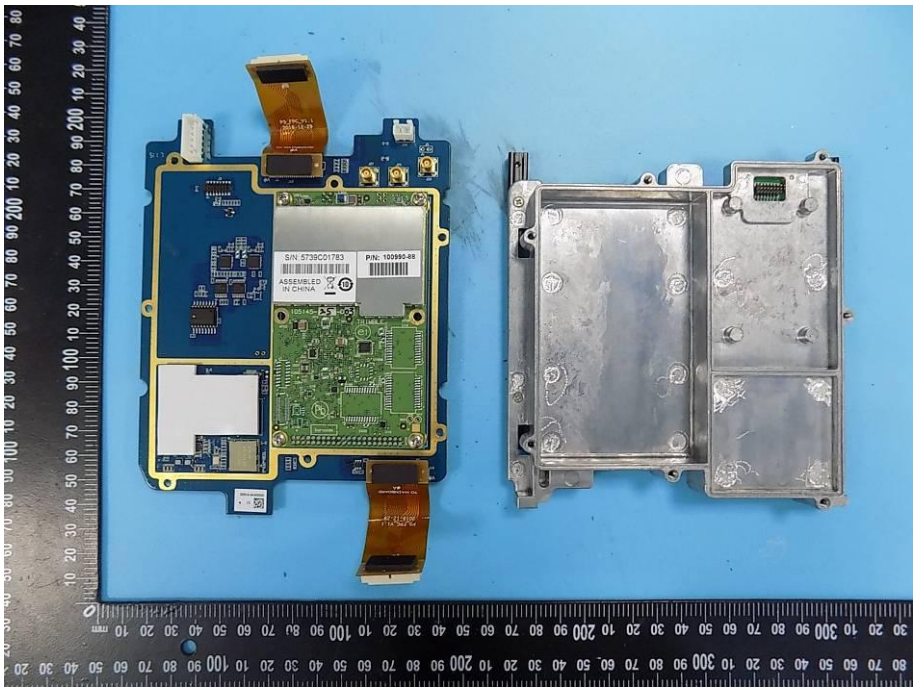

Harxon
Product Name: Wireless Data Transceiver
Product Type: HX-DU2005D
Frequency:410~470MHz
HARXON CORPORATION
S/N:D17090954




Harxon
Product Name: Wireless Data Transceiver
Product Type: HX-DU2006D
Frequency:410~470MHz
HARXON CORPORATION
S/N D17090564



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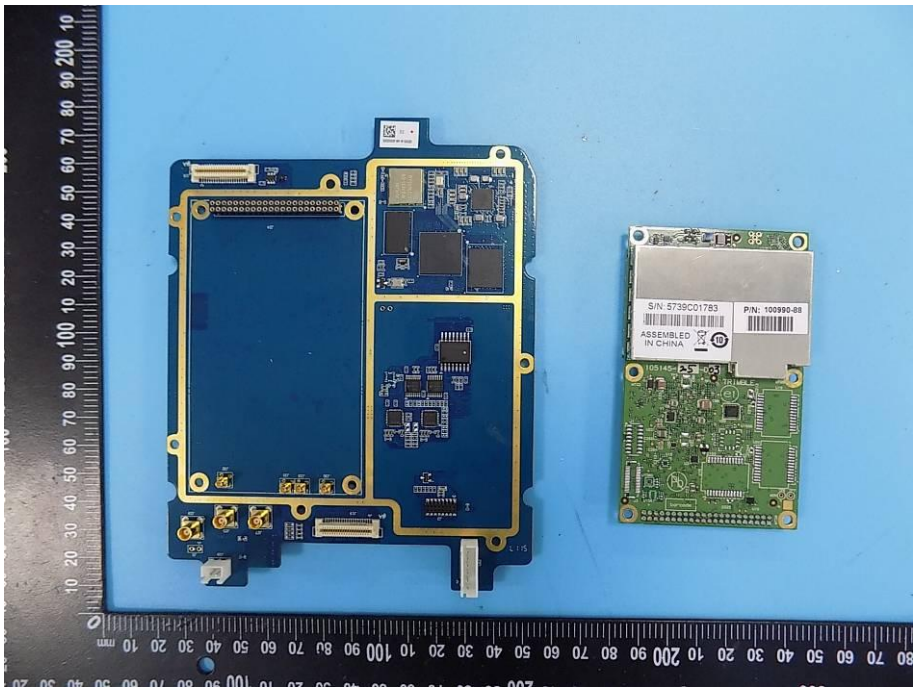
P/N: 100990-88
ASSEMBLED IN CHINA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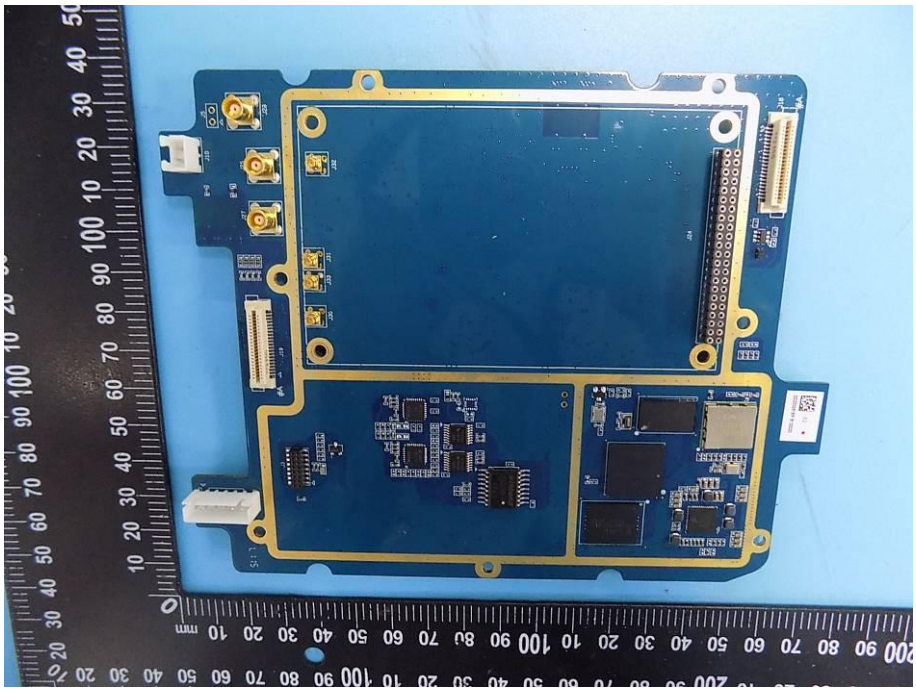

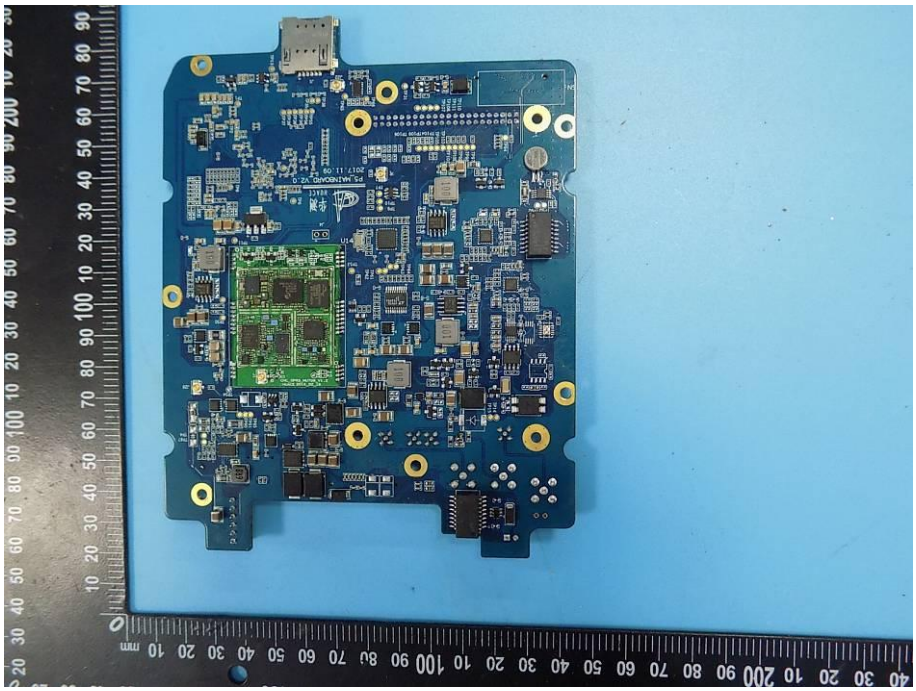

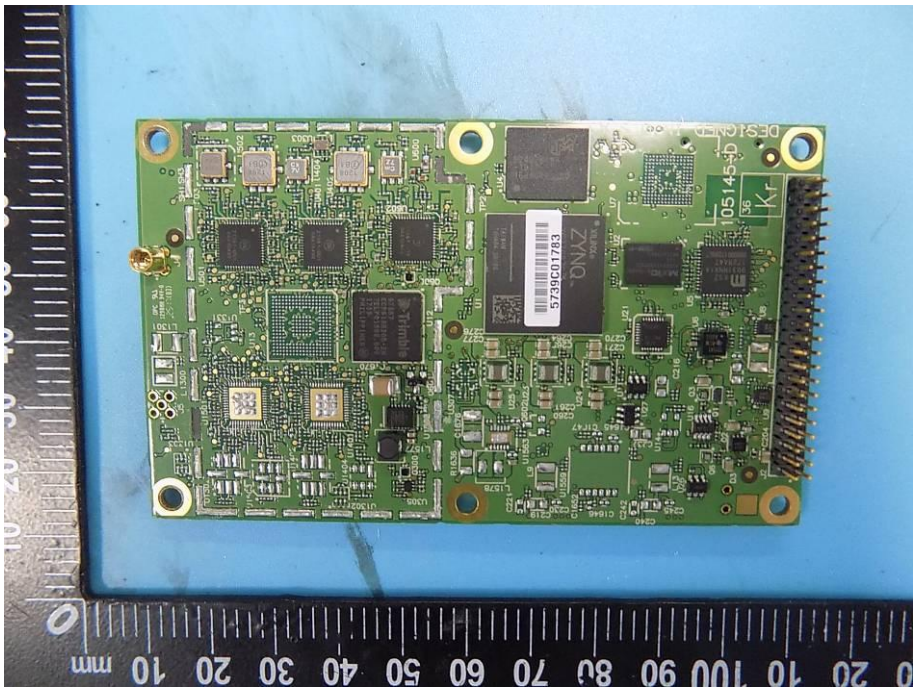

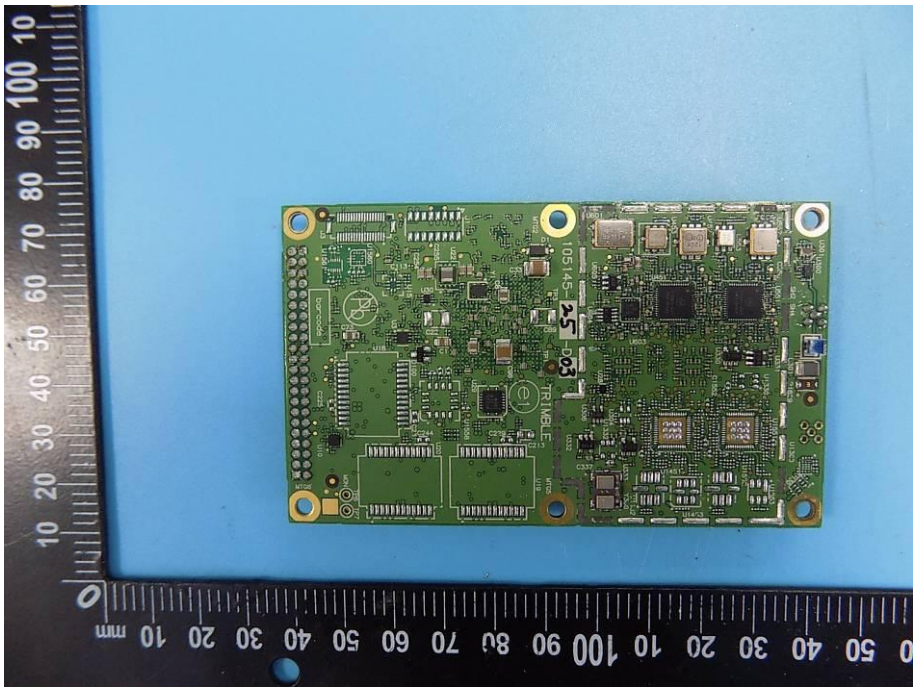

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