



FCC TEST REPORT

FCC ID: 2ARQ3-MTA42222

On Behalf of

By TechDesign SL

Door control system

Model No.: MTA 42222, MTA 42294

Prepared for : By TechDesign SL
Address : Calle Tomas Edison 5, Arganda del Rey, Madrid, Spain

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

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TEST REPORT DECLARATION

Applicant : By TechDesign SL
Address : Calle Tomas Edison 5, Arganda del Rey, Madrid, Spain
Manufacturer : By TechDesign SL
Address : Calle Tomas Edison 5, Arganda del Rey, Madrid, Spain
Model Name : Door control system
(A) Model No. : MTA 42222, MTA 42294
(B) Trademark : by

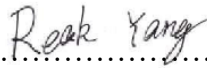
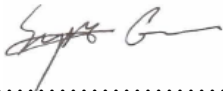
Measurement Standard Used:

**FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2017,
ANSI C63.10-2013**

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 15 Subpart C 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.....	November 13, 2018	

Revision History

Revision	Issue Date	Revisions	Revised By
00	November 13, 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
Conducted Emission	FCC PART 15:2017	15.207	P
6dB Bandwidth	FCC PART 15:2017	15.247 (a)(2)	P
Output Power	FCC PART 15:2017	15.247 (b)(3)	P
Radiated Spurious Emission	FCC PART 15:2017	15.247 (c)	P
Conducted Spurious & Band Edge Emission	FCC PART 15:2017	15.247 (d)	P
Power Spectral Density	FCC PART 15:2017	15.247 (e)	P
Radiated Band Edge Emission	FCC PART 15:2017	15.205	P
Antenna Requirement	FCC PART 15:2017	15.203	P
RF Exposure Evaluation	KDB447498 D01V06	4.1(f), 4.3.1(a)	P
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description	: The product is built with Bluetooth module and 13.56MHz module.
Model Name	: Door control system
Model Number	: MTA 42222, MTA 42294
Diff	: Both models are the same, except the appearance color, the results in this report belong to model MTA 42222.
Trademark	: by
Test Voltage	: DC 24V from Host
Bluetooth Version	: Bluetooth 4.0 BLE
Operation frequency	: 2402-2480MHz
Channel No.	: 40 Channels
Modulation type	: GFSK
Antenna Type	: PCB antenna, Maximum Gain is 2dBi
Software version	: 1.1.0.0
Hardware version	: V1
Product Size	: Length: 11.3cm Width: 11.3cm Height: 6.5cm

2.2.Accessories of Device (EUT)

Accessories1 : /

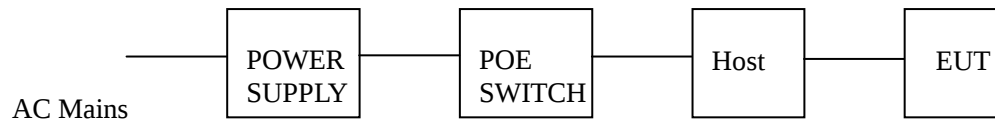
Manufacturer : /

Model : /

2.3.Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or sDOC
1	POWER SUPPLY	TP-LINK	HKI-D06-500	N/A	N/A
2	POE SWITCH	TP-LINK	POE31004P	N/A	N/A
3	Door control system(Host)	By TechDesign SL	MTA42209	N/A	sDOC

2.4.Block Diagram of connection between EUT and simulators



2.5.Test Mode Description

Tested mode, channel, and data rate information		
Mode	Channel	Frequency (MHz)
GFSK	Low :CH0	2402
	Middle: CH19	2440
	High: CH39	2480

2.6.Test Conditions

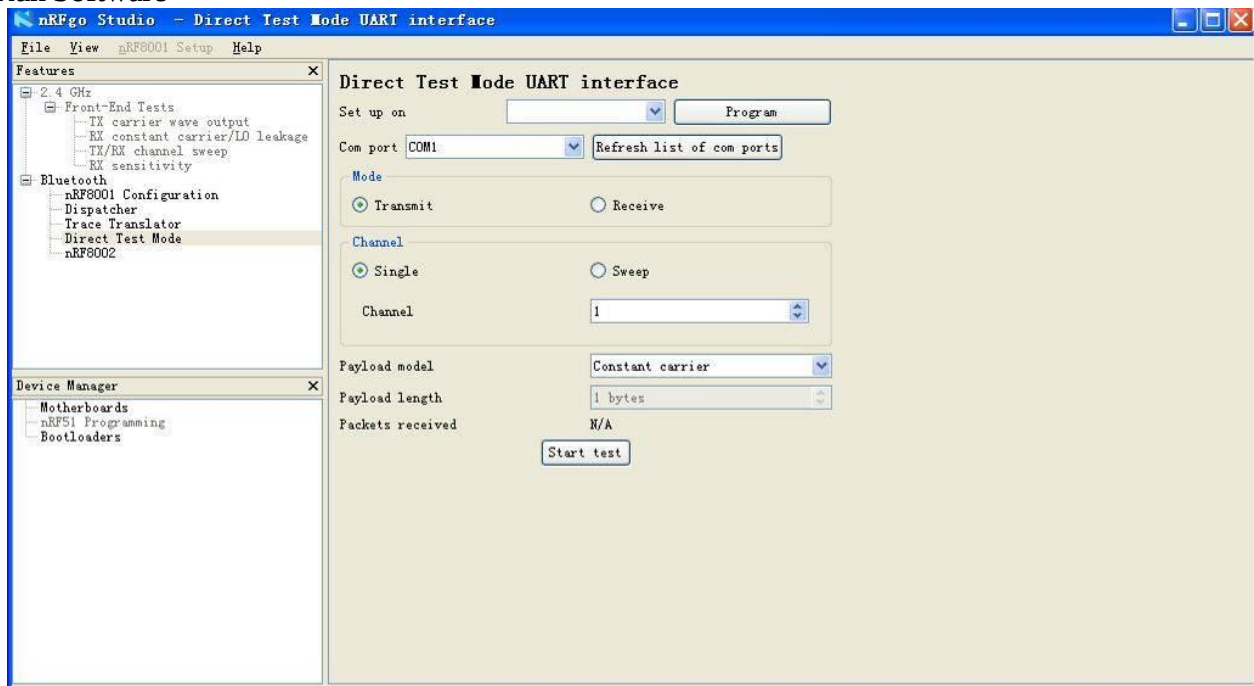
Items	Required	Actual
Temperature range:	15-35℃	25℃
Humidity range:	25-75%	56%
Pressure range:	86-106kPa	98kPa

2.7. Additional instructions

Software (Used for test) from client

Mode	Special software is used. The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually.		
Power level setup in software			
Test Software Name	nRFgo Studio		
Test Software Version	1.15.1		
Mode	Channel	Frequency (MHz)	Soft Set
GFSK	CH0	2402	TX level is set as defaults value.
	CH19	2440	
	CH39	2480	

Run Software



2.8.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: 293961
Designation Number: CN1236

July 25, 2017 Certificated by IC
Registration Number: 12135A

2.9.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	5.8×10^{-8}
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	%
Uncertainty for DC and low frequency voltages	0.06%

2.10.Test Equipment List

Equipment	Manufacturer	Model No.	Serial No.	Last cal.	Cal. Due day
Bilog Antenna	SCHWARZBECK	VULB 9168	9168-438	2018.04.13	2020.04.12
Spectrum analyzer	Agilent	E4407B	MY49510055	2018.09.21	2019.09.20
Horn Antenna	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D(1201)	2018.04.13	2020.04.12
Filter	KANGMAI	ZLPF-LDC-1000- 1959	1209002075	2018.09.21	2019.09.20
Filter	WAINWRIGHT	WHKX2.80 /18G- 12SS	SN1	2018.09.21	2019.09.20
RF Cable	Resenberger	Cable 4	N/A	2018.09.21	2019.09.20
Signal Analyzer	Agilent	N9020A	MY499100060	2018.09.11	2019.09.10
vector Signal Generator	Agilent	N5182A	MY49060042	2018.09.11	2019.09.10
vector Signal Generator	Agilent	E4438C	US44271917	2018.09.11	2019.09.10
Amplifier	HP	HP8347A	2834A00455	2018.09.21	2019.09.20
Amplifier	Agilent	8449B	3008A02664	2018.04.13	2020.04.12
Filter	WAINWRIGHT	WHKX1.0G/15G- 10SS	SN40	2018.09.21	2019.09.20
Test Receiver	ROHDE&SCHWARZ	ESR	1316.3003K03-102082-Wa	2018.09.21	2019.09.20
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2016.07.21	2020.07.20
RF Cable	Resenberger	Cable 1	N/A	2018.09.21	2019.09.20
RF Cable	Resenberger	Cable 2	N/A	2018.09.21	2019.09.20
RF Cable	Resenberger	Cable 3	N/A	2018.09.21	2019.09.20
Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2018.09.26	2020.09.25
Attenuator	HP	8494B	DC-18G	2018.09.21	2019.09.20
Attenuator	HP	8496B	DC-18G	2018.09.21	2019.09.20
20dB Attenuator	ICPROBING	IATS1	82347	2018.09.21	2019.09.20
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2018.09.21	2019.09.20
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA 9170294	2017.02.22	2019.02.21

3. SPURIOUS EMISSION

3.1. Test Limits

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

NOTE:

- a) The tighter limit applies at the band edges.
- b) $\text{Emission Level(dB uV/m)} = 20 \log \text{Emission Level(uV/m)}$

3.2. Test Procedure

The measuring distance of 3m shall be used for measurements at frequency up to 1GHz and above 1GHz, The EUT was placed on a rotating 0.8 m high above ground for below 1GHz and 1.5m high for above 1GHz testing, the table was rotated 360 degrees to determine the position of the highest radiation

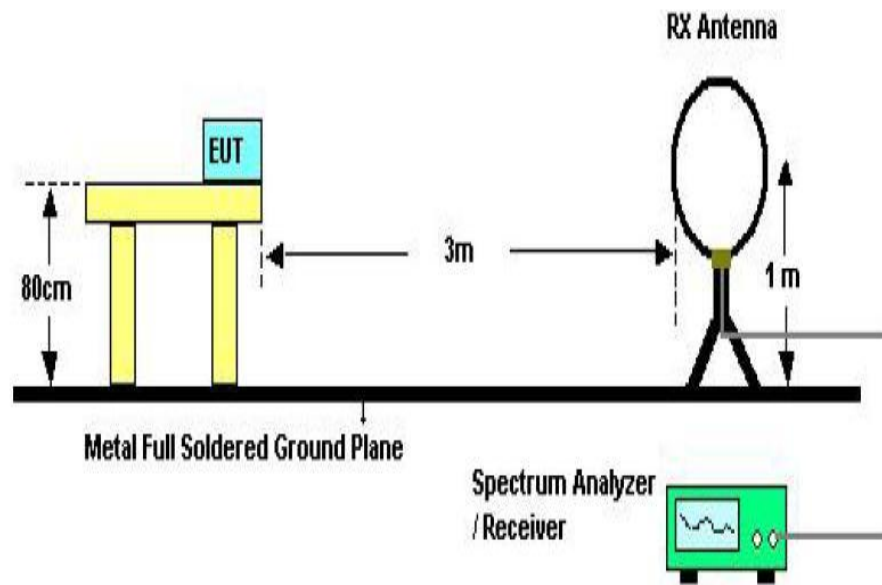
The Test antenna shall vary between 1m and 4m, Both Horizontal and Vertical antenna are set of make measurement.

The initial step in collecting conducted emission data is a spectrum analyzer Peak detector mode pre-scanning the measurement frequency range. Significant Peaks are then marked. and then Qusia Peak Detector mode premeasured

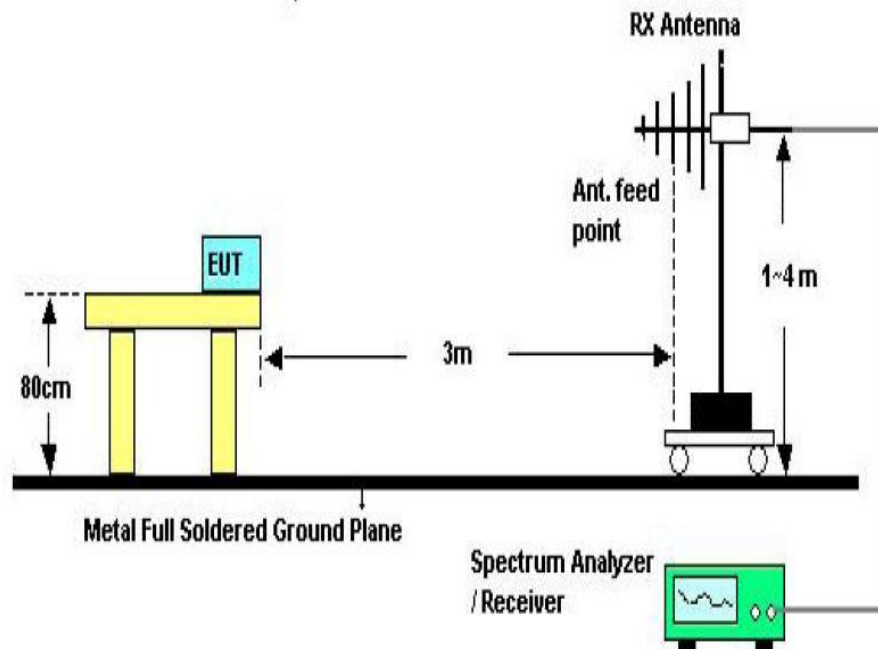
If Peak value comply with QP limit Below 1GHz. The EUT deemed to comply with QP limit. But the Peak value and average value both need to comply with applicable limit above 1GHz.

For the actual test configuration, please see the test setup photo.

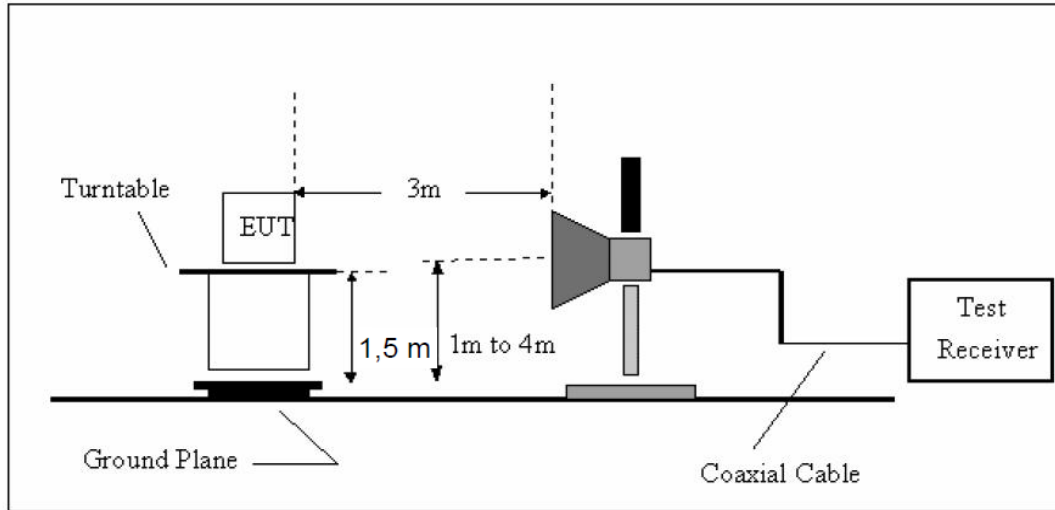
3.3. Test Setup



Below 30MHz Test Setup



Above 30MHz Test Setup



Above 1GHz Test Setup

3.4. Test Results

Test Condition

Continually Transmitting in maximum power.

9KHz~150KHz	RBW200Hz	VBW1KHz
150KHz~30MHz	RBW9KHz	VBW 30KHz
30MHz~1GHz	RBW120KHz	VBW 300KHz
Above1GHz	RBW1MHz	VBW 3MHz

We have scanned the 10th harmonic from 9 kHz to the EUT.

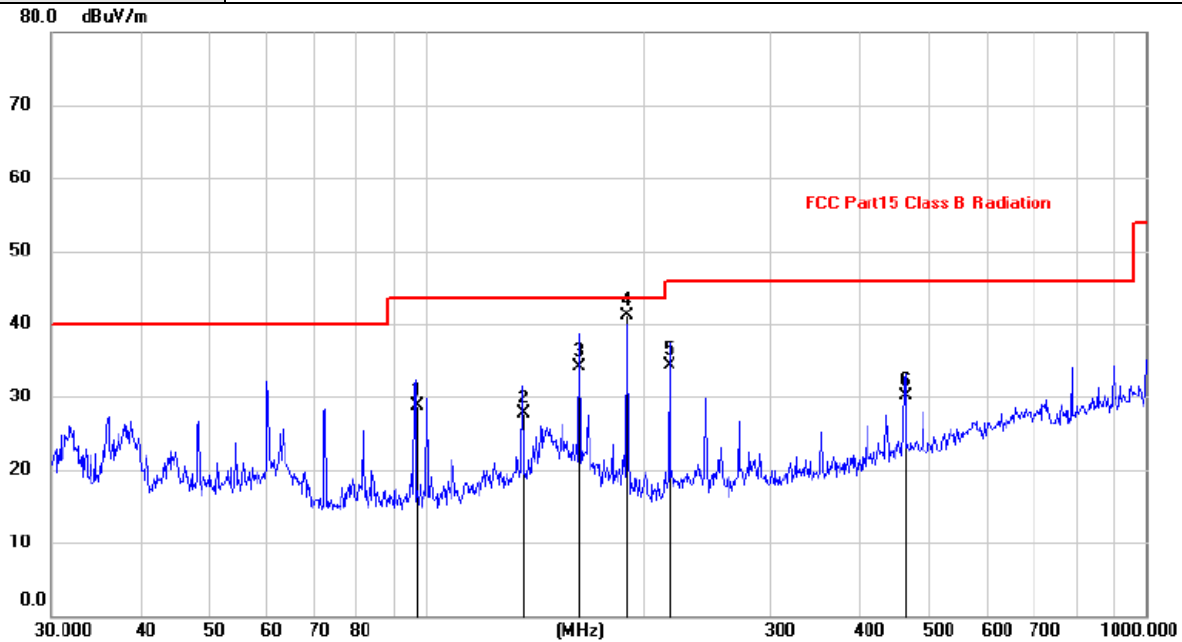
Detailed information please see the following page.

From 9KHz to 30MHz: Conclusion: PASS

Note: 1. If the amplitude of the spurious emission is more than 20dB above the allowable value, it's considered too low relative to the limit value, no necessary to report.

2. For above 1GHz test, if peak Result comply with AV limit, AV Result is deemed to comply with AV limit, no necessary to report.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Vertical
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2402MHz		

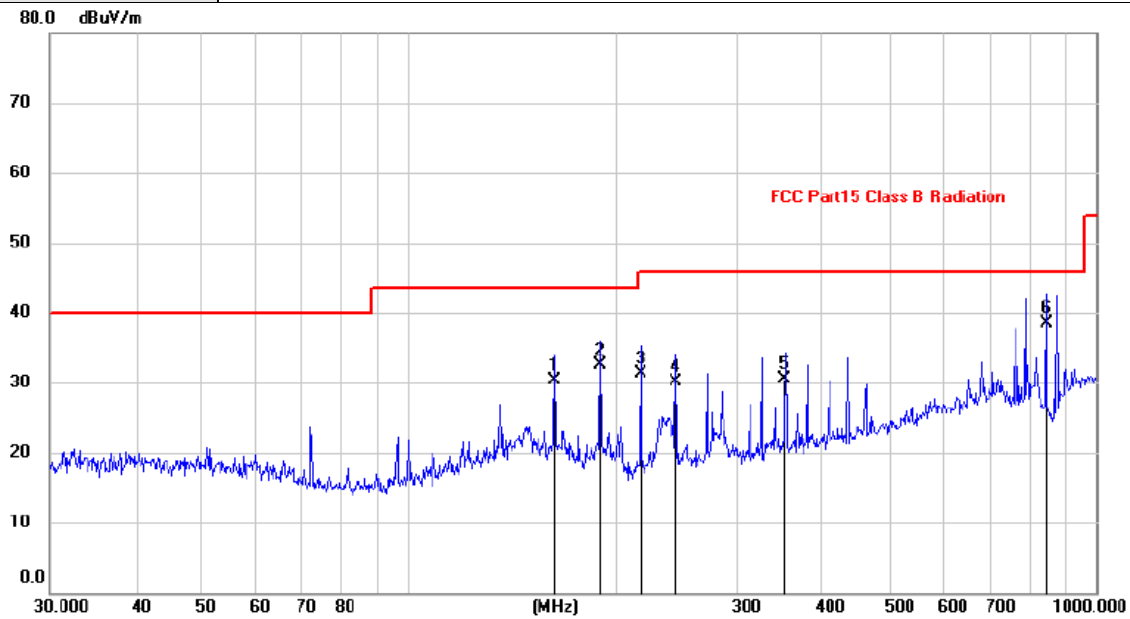


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		96.4362	18.36	10.31	28.67	43.50	-14.83	QP	300	0
2		135.9822	14.05	13.59	27.64	43.50	-15.86	QP	300	0
3		163.1818	19.74	14.32	34.06	43.50	-9.44	QP	300	360
4	*	189.7385	30.06	10.96	41.02	43.50	-2.48	QP	300	0
5		216.7828	23.12	11.11	34.23	46.00	-11.77	QP	300	360
6		462.3455	13.05	17.10	30.15	46.00	-15.85	QP	300	0

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Horizontal
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2402MHz		



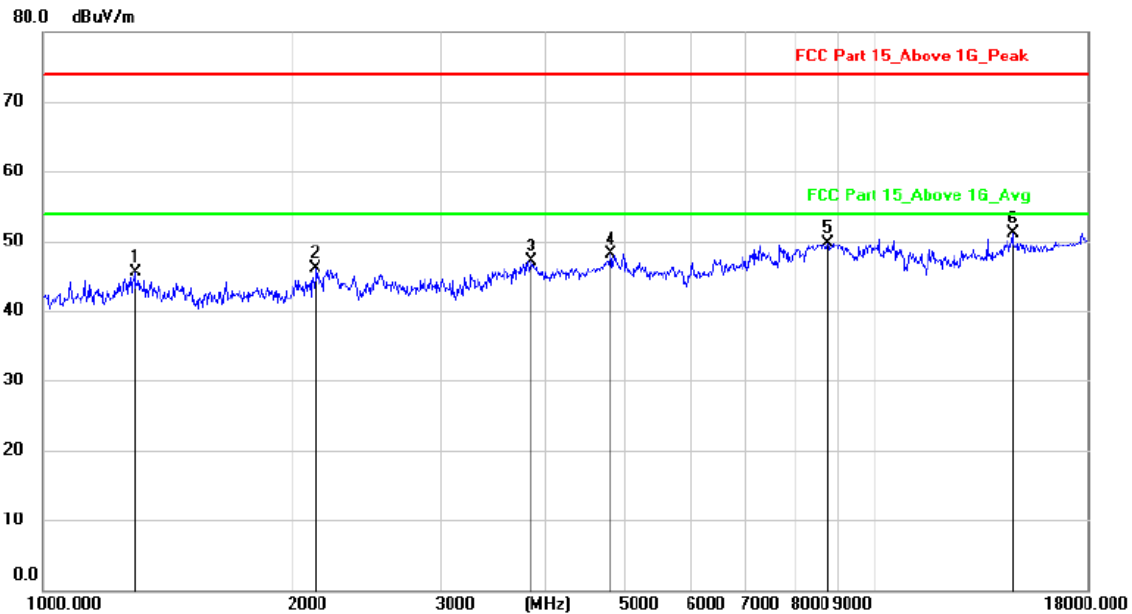
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		163.1818	16.07	14.32	30.39	43.50	-13.11	QP	100	360
2		189.7385	21.62	10.96	32.58	43.50	-10.92	QP	100	0
3		216.7828	20.16	11.11	31.27	46.00	-14.73	QP	100	360
4		244.2321	18.03	12.01	30.04	46.00	-15.96	QP	100	0
5		352.9433	16.02	14.44	30.46	46.00	-15.54	QP	100	360
6	*	845.0878	15.81	22.68	38.49	46.00	-7.51	QP	100	360

Note: 1. *: Maximum data; x: Over limit; !: over margin.

2. Measurement = Reading Level + Correct Factor; Correct Factor = Antenna Factor + Cable Loss.

Notes: Above is below 1GHz test data. This report only shall the worst case mode for TX 2402MHz.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Horizontal
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2402MHz		

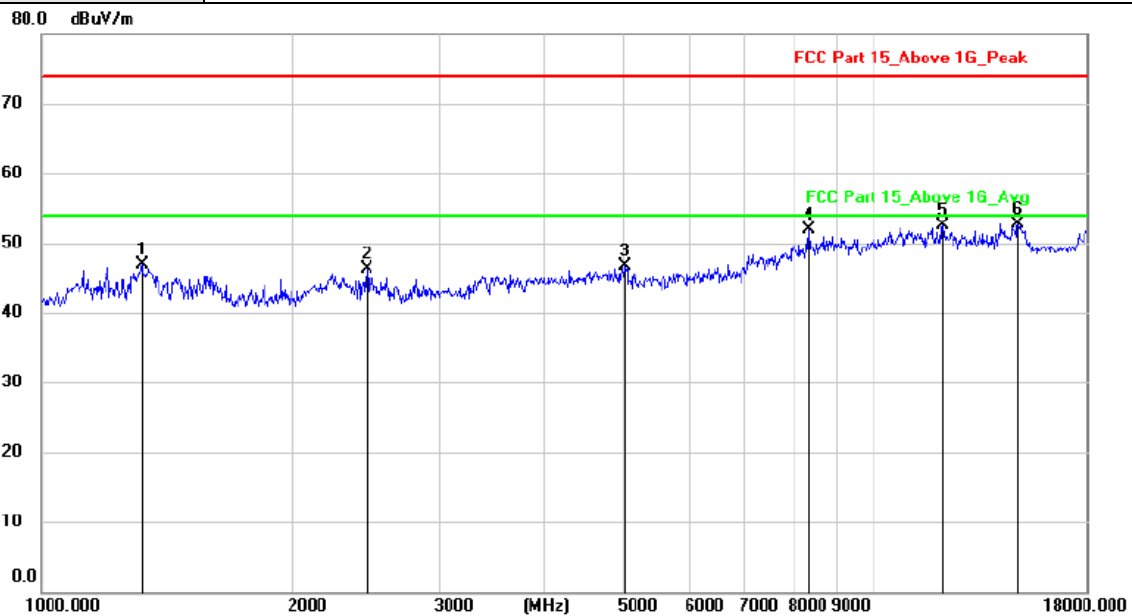


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	Comment
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	
1		1289.627	52.95	-7.42	45.53	74.00	-28.47	peak	100	360
2		2126.308	50.03	-3.92	46.11	74.00	-27.89	peak	100	360
3		3856.668	52.59	-5.53	47.06	74.00	-26.94	peak	100	360
4		4804.110	50.98	-2.93	48.05	74.00	-25.95	peak	100	360
5		8764.147	45.81	3.87	49.68	74.00	-24.32	peak	100	360
6	*	14618.16	43.39	7.63	51.02	74.00	-22.98	peak	100	360

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Vertical
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2402MHz		

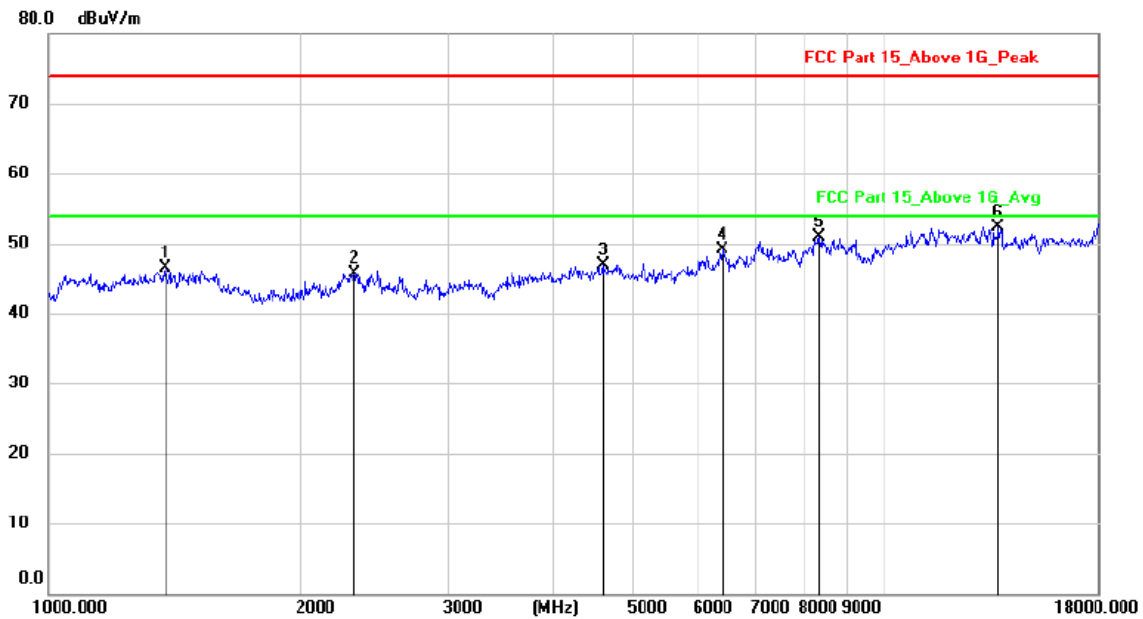


No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		1319.794	54.18	-7.27	46.91	74.00	-27.09	peak	100	0
2		2456.913	49.72	-3.39	46.33	74.00	-27.67	peak	100	0
3		5016.976	49.09	-2.46	46.63	74.00	-27.37	peak	100	0
4		8343.918	48.57	3.36	51.93	74.00	-22.07	peak	100	0
5		12079.38	46.85	5.58	52.43	74.00	-21.57	peak	100	360
6	*	14873.88	44.88	7.89	52.77	74.00	-21.23	peak	100	360

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Vertical
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2440MHz		

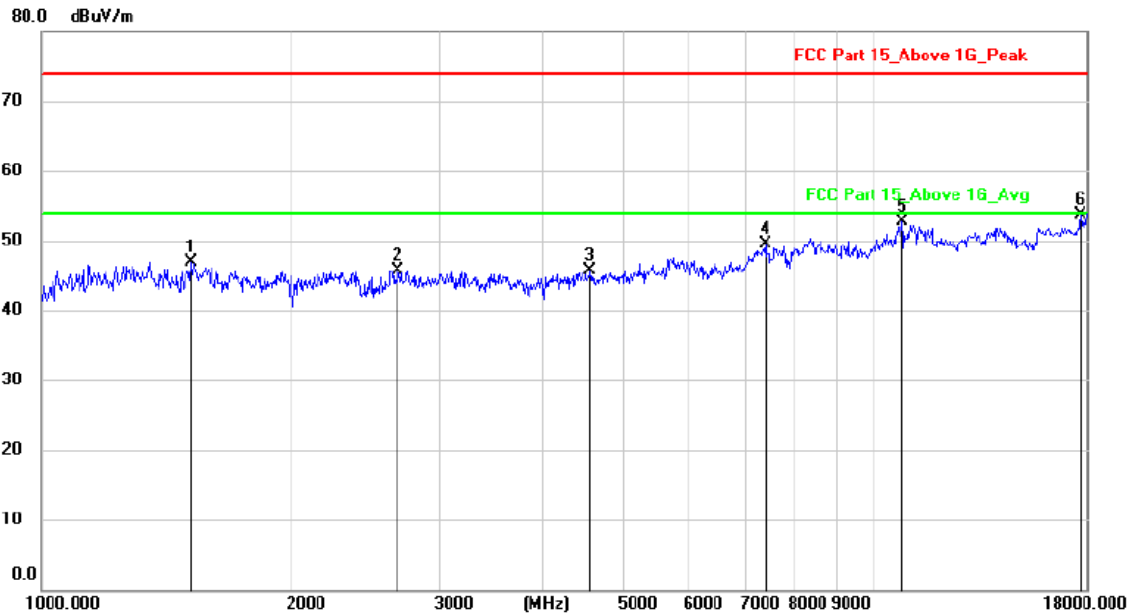


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		1378.273	53.57	-7.07	46.50	74.00	-27.50	peak	100	360
2		2318.912	48.97	-3.32	45.65	74.00	-28.35	peak	100	0
3		4600.276	50.45	-3.58	46.87	74.00	-27.13	peak	100	360
4		6395.654	48.85	0.31	49.16	74.00	-24.84	peak	100	0
5		8343.918	47.45	3.36	50.81	74.00	-23.19	peak	100	0
6	*	13677.96	45.96	6.43	52.39	74.00	-21.61	peak	100	360

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Horizontal
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2440MHz		

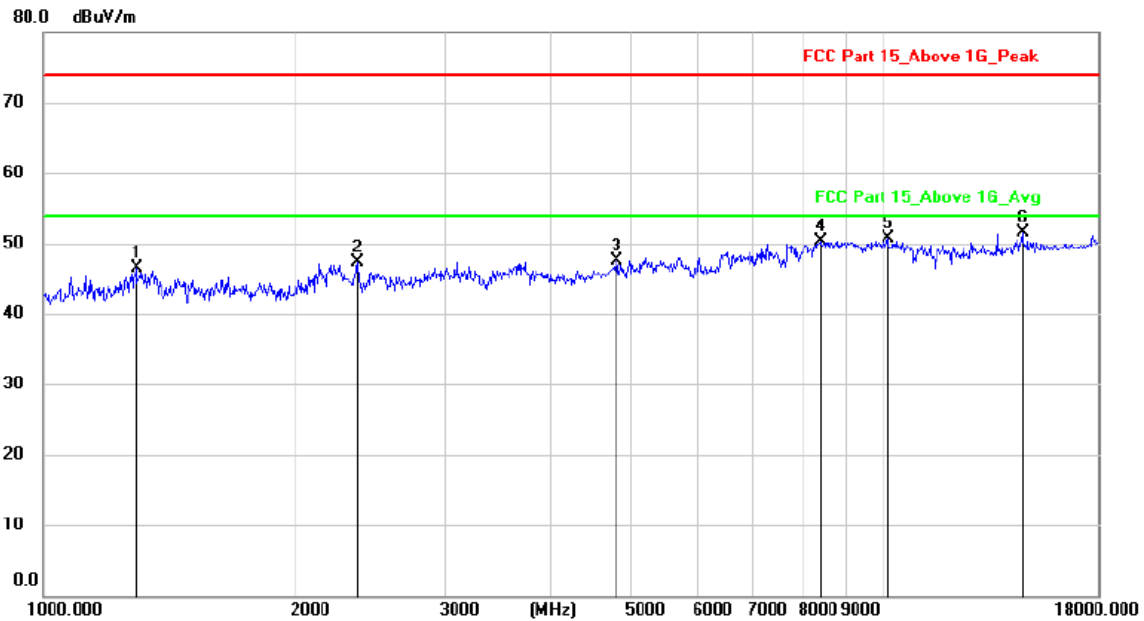


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		1511.833	53.97	-6.99	46.98	74.00	-27.02	peak	100	360
2		2679.464	48.69	-2.96	45.73	74.00	-28.27	peak	100	360
3		4560.559	49.44	-3.68	45.76	74.00	-28.24	peak	100	360
4		7390.070	46.08	3.44	49.52	74.00	-24.48	peak	100	0
5		10791.68	47.07	5.56	52.63	74.00	-21.37	peak	100	0
6 *		17690.53	42.70	10.95	53.65	74.00	-20.35	peak	100	360

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Horizontal
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2480MHz		

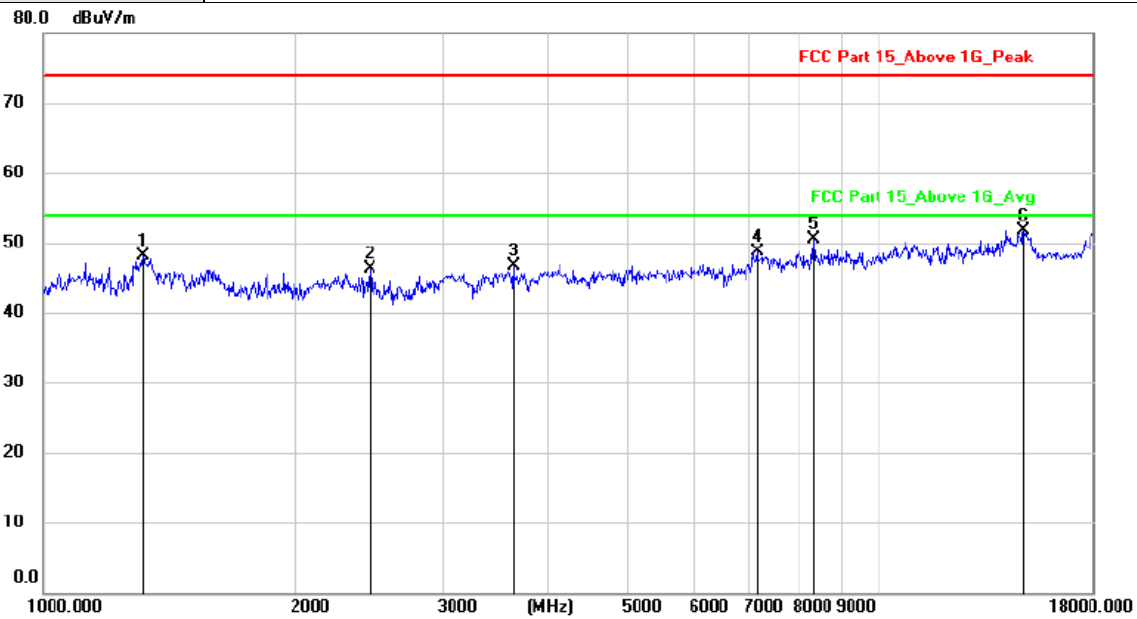


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		1289.627	53.95	-7.42	46.53	74.00	-27.47	peak	100	360
2		2366.308	50.69	-3.38	47.31	74.00	-26.69	peak	100	0
3		4804.110	50.48	-2.93	47.55	74.00	-26.45	peak	100	0
4		8392.292	46.84	3.38	50.22	74.00	-23.78	peak	100	0
5		10097.59	46.06	4.67	50.73	74.00	-23.27	peak	100	360
6	*	14618.16	43.89	7.63	51.52	74.00	-22.48	peak	100	0

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Temperature:	26 °C	Relative Humidity:	58%
Pressure:	1010hPa	Phase :	Vertical
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	TX 2480MHz		



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		1315.985	55.32	-7.27	48.05	74.00	-25.95	peak	100	360
2		2456.913	49.72	-3.39	46.33	74.00	-27.67	peak	100	0
3		3650.582	52.72	-6.01	46.71	74.00	-27.29	peak	100	360
4		7138.144	45.57	3.16	48.73	74.00	-25.27	peak	100	360
5		8343.918	47.07	3.36	50.43	74.00	-23.57	peak	100	360
6	*	14873.88	43.88	7.89	51.77	74.00	-22.23	peak	100	360

Note: 1. *: Maximum data; x: Over limit; !: over margin.

2. Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

The data for 18G-25GHz is very low, so not be shown

4. Power Line Conducted Emission

4.1. Test Limits

Frequency MHz	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 -0.50	66 -56*	56 - 46*
0.50 -5.00	56	46
5.00 -30.00	60	50

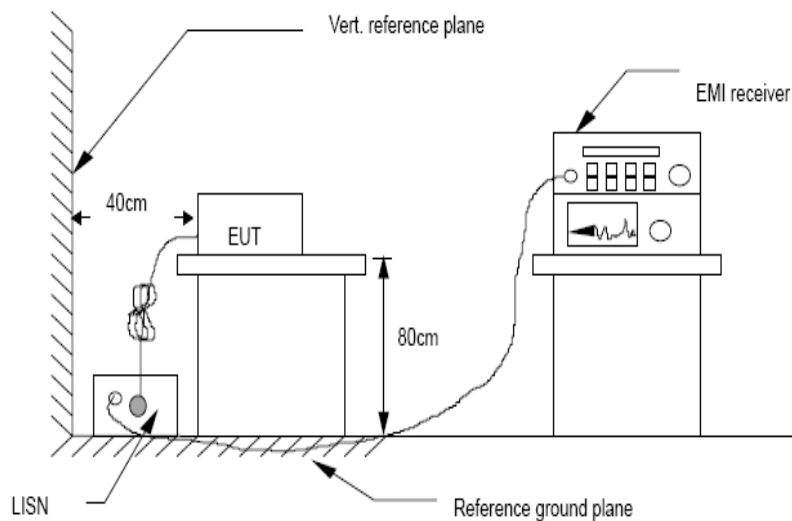
Notes: 1. *Decreasing linearly with logarithm of frequency.
 2. The lower limit shall apply at the transition frequencies.
 3. The limit decreases in line with the logarithm of the frequency in rang of 0.15 to 0.50 MHz.

4.2. Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.10:2013 on Conducted Emission Measurement.

The bandwidth of test receiver is set at 9 kHz.

4.3. Test Setup



4.4. Test Results

Temperature:	24 °C	Relative Humidity:	57%
Pressure:	1010hPa	Phase :	N
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	BT Link		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	*	0.3240	32.88	9.70	42.58	59.60	-17.02	QP	
2		0.8850	22.92	9.76	32.68	56.00	-23.32	QP	
3		1.7639	20.18	9.86	30.04	56.00	-25.96	QP	
4		13.7010	27.56	10.33	37.89	60.00	-22.11	QP	
5		18.1858	27.18	10.43	37.61	60.00	-22.39	QP	
6		22.4100	18.88	10.61	29.49	60.00	-30.51	QP	
7		0.3209	11.57	9.70	21.27	49.68	-28.41	AVG	
8		0.9030	7.54	9.76	17.30	46.00	-28.70	AVG	
9		1.7579	5.85	9.86	15.71	46.00	-30.29	AVG	
10		13.5660	22.27	10.35	32.62	50.00	-17.38	AVG	
11		18.2456	16.88	10.43	27.31	50.00	-22.69	AVG	
12		22.4100	17.69	10.61	28.30	50.00	-21.70	AVG	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Temperature:	24 °C	Relative Humidity:	57%
Pressure:	1010hPa	Phase :	L
Test Voltage:	DC 24V From Host with POE supply		
Test Mode:	BT Link		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1		0.3780	34.44	9.70	44.14	58.32	-14.18	QP	
2		0.4590	31.86	9.71	41.57	56.71	-15.14	QP	
3		1.7759	18.28	9.86	28.14	56.00	-27.86	QP	
4		2.8708	11.04	9.98	21.02	56.00	-34.98	QP	
5		13.4190	30.06	10.35	40.41	60.00	-19.59	QP	
6		17.2020	26.24	10.43	36.67	60.00	-23.33	QP	
7		0.3810	14.25	9.70	23.95	48.26	-24.31	AVG	
8	*	0.4680	27.59	9.71	37.30	46.55	-9.25	AVG	
9		1.7663	3.34	9.86	13.20	46.00	-32.80	AVG	
10		2.8708	-0.62	9.98	9.36	46.00	-36.64	AVG	
11		13.5630	21.44	10.35	31.79	50.00	-18.21	AVG	
12		17.2020	23.87	10.43	34.30	50.00	-15.70	AVG	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Remark: All modes and channels have been tested and only listed BT link mode that is worst data

5. CONDUCTED MAXIMUM OUTPUT POWER

5.1. Test limits

Please refer section 15.247.

5.2. Test Procedure

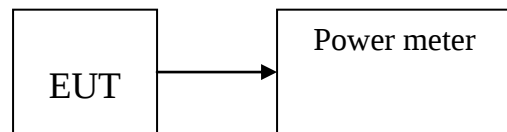
Details see the KDB558074 D01 Meas Guidance V05

5.2.1 Place the EUT on the table and set it in transmitting mode.

5.2.2 Measure out each mode and each bands peak output power of EUT.

Note: The cable loss and attenuator loss were offset into measure device as amplitude offset.

5.3. Test Setup



5.4. Test Results

Channel	Frequency (MHz)	PK Output Power (dBm)	PK Output Power (mW)	Limit (dBm)
CH0	2402	-3.910	0.41	30
CH19	2440	-3.986	0.40	30
CH39	2480	-3.623	0.43	30
Conclusion: PASS				

6. PEAK POWER SPECTRAL DENSITY

6.1. Test limits

6.1.1 Please refer section 15.247.

6.1.2 For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

6.1.3 The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

6.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V05

6.2.1 Place the EUT on the table and set it in transmitting mode.

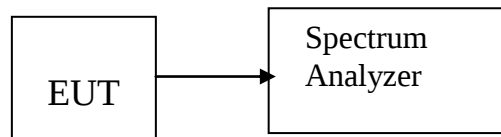
6.2.2 Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

6.2.3 Set the spectrum analyzer as RBW = 3kHz(Set the RBW to: $3\text{ kHz} \leq \text{RBW} \leq 100\text{ kHz}$.), VBW = 10kHz(Set the VBW $\geq 3 \times \text{RBW}$), span = $1.5 \times \text{DTS bandwidth}$., detail see the test plot.

6.2.4 Record the max reading.

6.2.5 Repeat the above procedure until the measurements for all frequencies are completed.

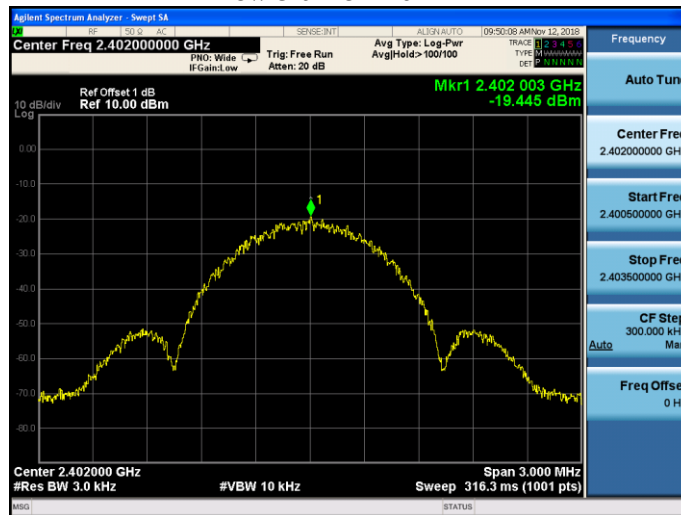
6.3. Test Setup



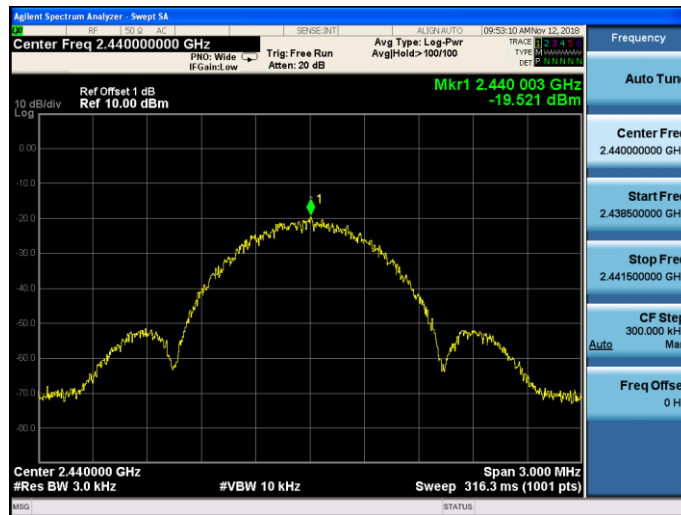
6.4. Test Results

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limit (dBm)	Result
CH0	2402	-19.445	8	PASS
CH19	2440	-19.521	8	PASS
CH39	2480	-19.202	8	PASS
Conclusion: PASS				

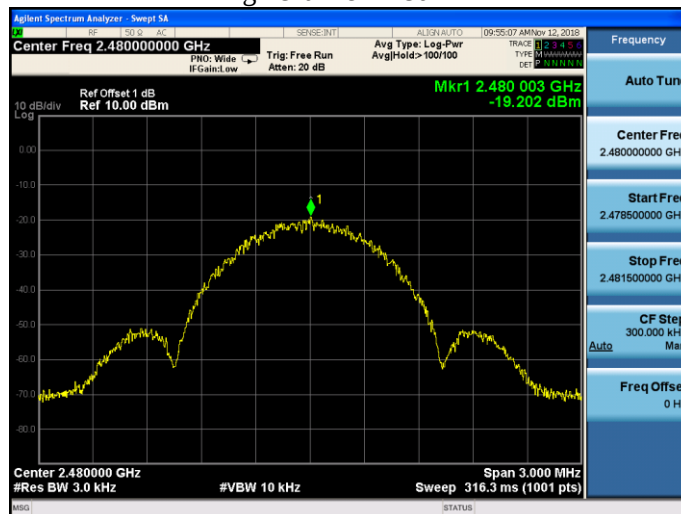
Low channel-2402MHz



Middle channel-2440MHz



High channel-2480MHz



7. BANDWIDTH

7.1. Test limits

Please refer section 15.247

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 kHz.

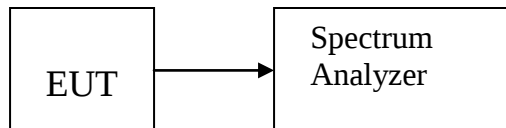
7.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V05

a) The bandwidth is measured at an amplitude level reduced 20dB from the reference level. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

b) The test receiver set RBW = 100kHz, VBW $\geq 3 \times$ RBW = 300kHz,, Sweep time set auto, detail see the test plot.

7.3. Test Setup



7.4. Test Results

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Result
CH0	2402	0.617	0.5	PASS
CH19	2440	0.613	0.5	PASS
CH39	2480	0.615	0.5	PASS

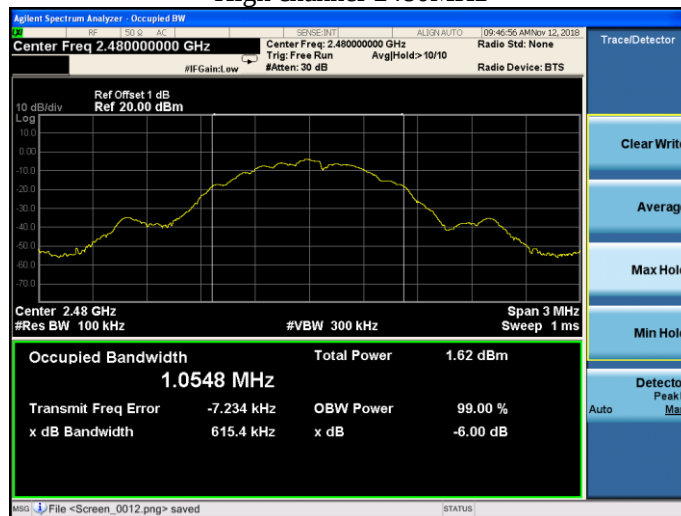
Low channel-2402MHz



Middle channel-2440MHz



High channel-2480MHz



8. BAND EDGE CHECK

8.1. Test limits

Please refer section 15.247.

8.2. Test Procedure

Details see the KDB558074 D01 Meas Guidance V05

8.2.1 Put the EUT on a 1.5m high table, power on the EUT. Emissions were scanned and measured rotating the EUT to 360 degrees, Find the maximum Emission

8.2.2 Check the spurious emissions out of band.

8.2.3 Both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure; RBW is set at 1MHz, VBW is set at 10Hz for Average measure. Test Setup Same as 5.2.2.

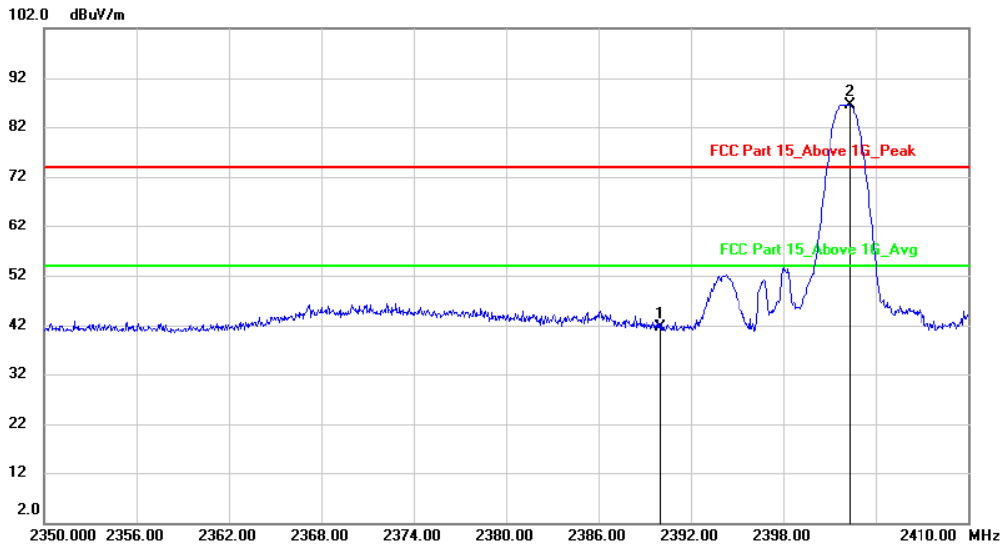
8.3. Test Results

We have scanned the 10th harmonic from 9KHz to the EUT's highest frequency..
Detailed information please see the following page.

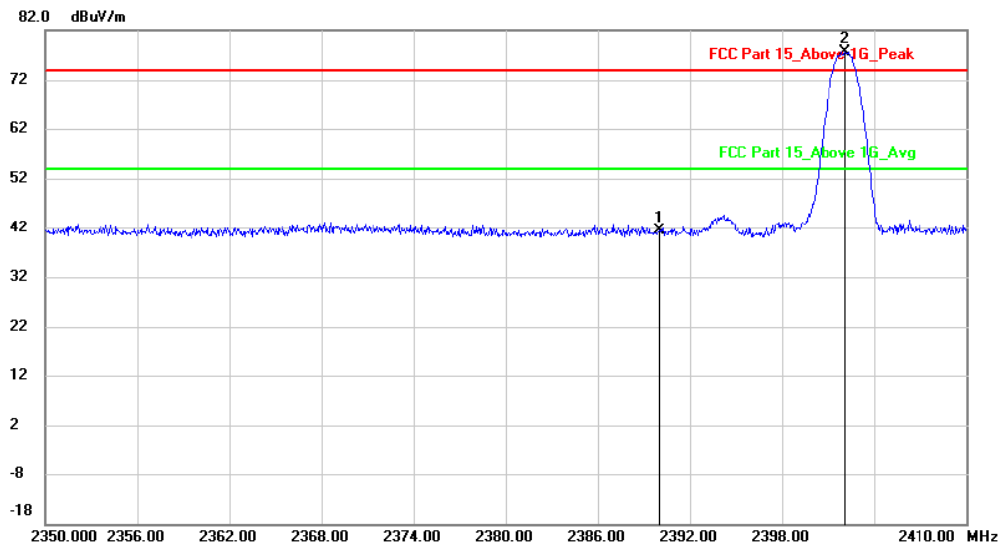
From 9KHz to 30MHz: Conclusion: PASS

Note: 1. The amplitude of the spurious emission is more than 20dB above the allowable value, it's considered too low relative to the limit value, no necessary to report.
2. For above 1GHz test, if peak Result comply with AV limit, AV Result is deemed to comply with AV limit, no necessary to report.

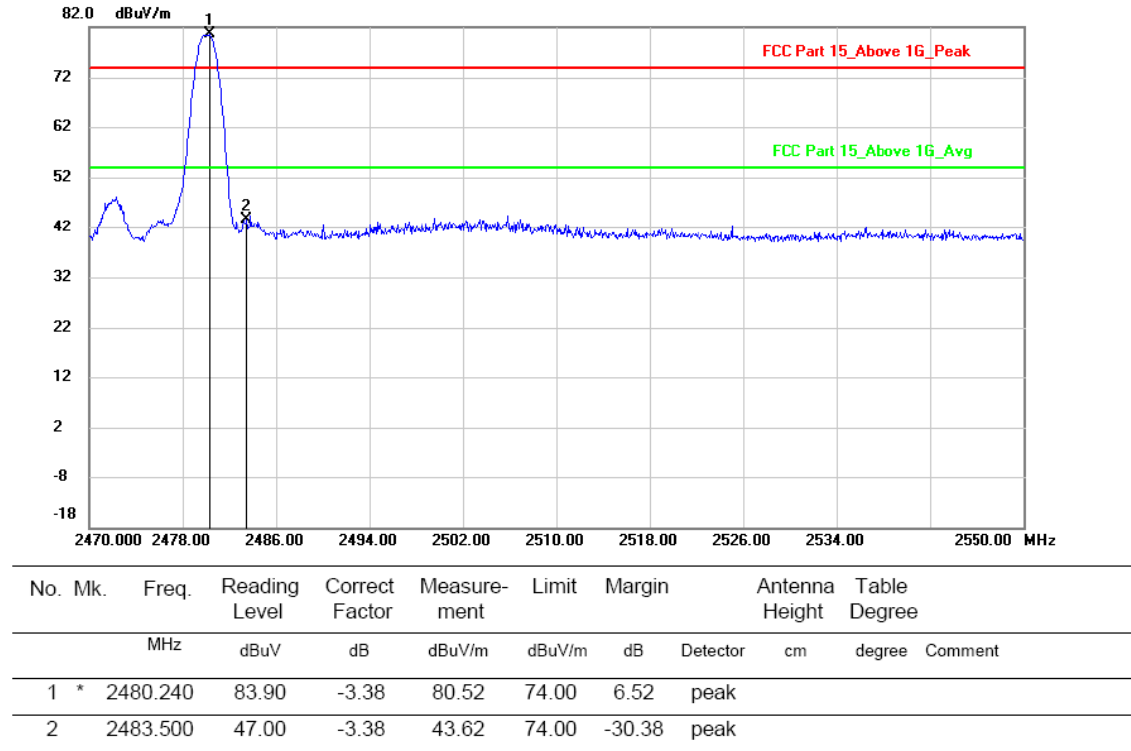
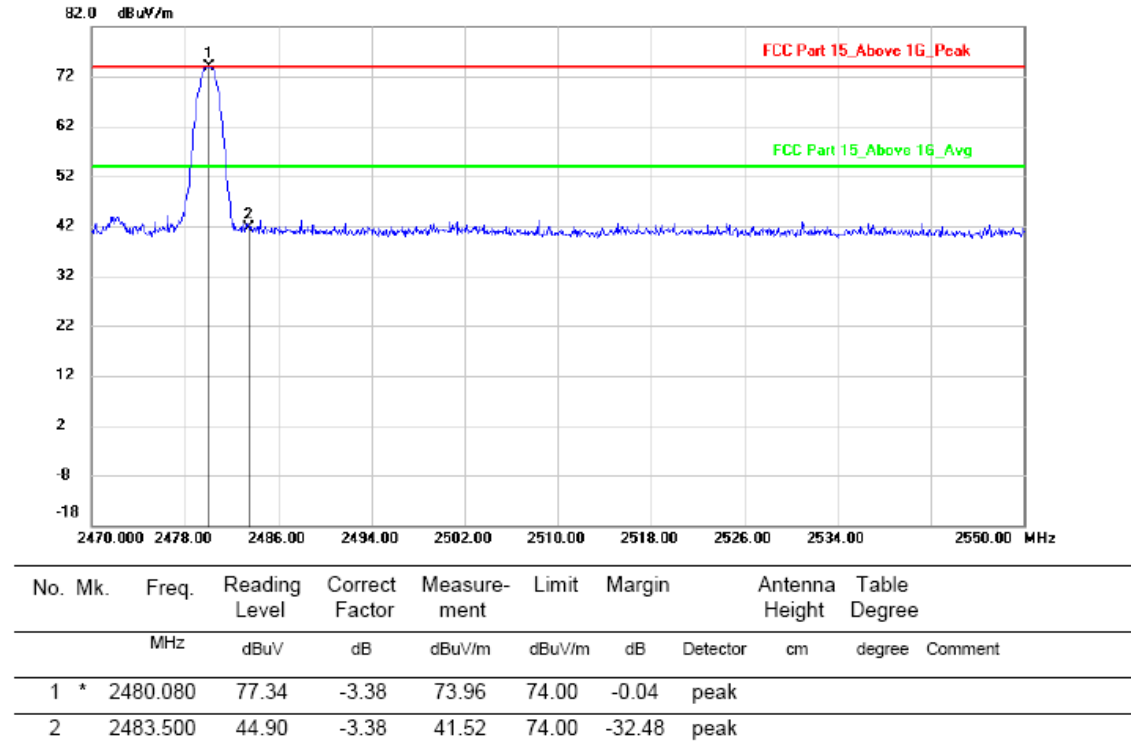
Radiated Method:

TX 2402MHz Horizontal

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		2390.000	45.11	-3.40	41.71	74.00	-32.29	peak		
2	*	2402.380	89.99	-3.41	86.58	74.00	12.58	peak		

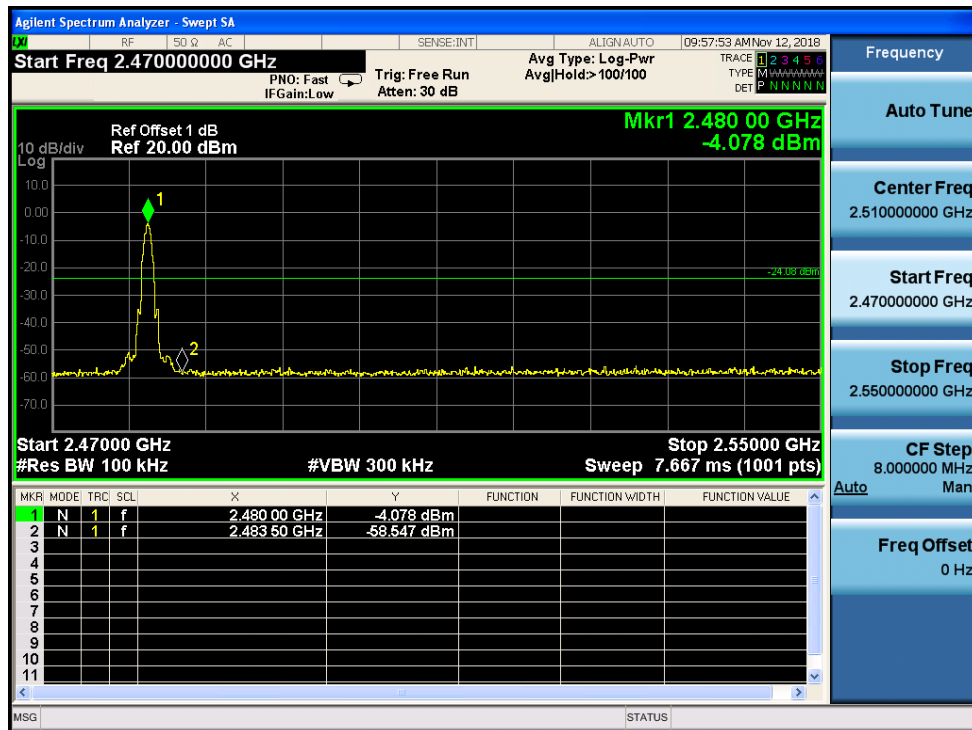
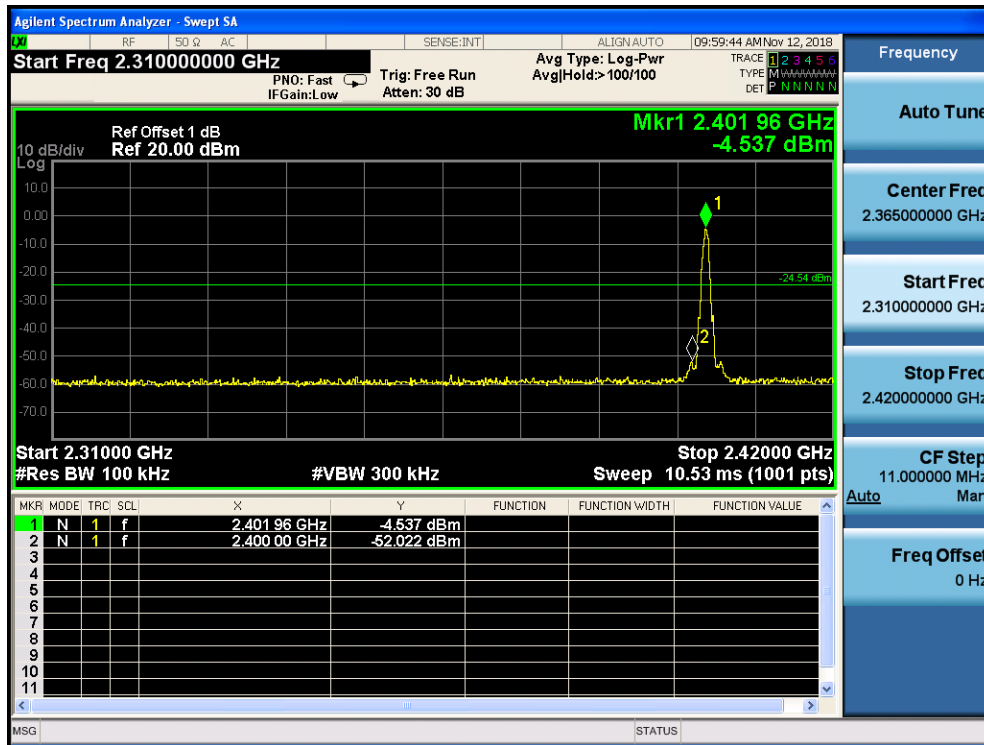
TX 2402MHz Vertical

No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		2390.000	44.86	-3.40	41.46	74.00	-32.54	peak		
2	*	2402.080	81.13	-3.41	77.72	74.00	3.72	peak		

TX 2480MHz Horizontal**TX 2480MHz Vertical**

Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Conducted Method:
GFSK



9. ANTENNA REQUIREMENT

9.1. Standard Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

9.2. Antenna Connected Construction

The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

9.3. Results

The EUT antenna is an internal Coaxial Antenna. It complies with the standard requirement.

10.RF EXPOSURE EVALUATION

According to 447498 D01 General RF Exposure Guidance v06

The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR, and ≤ 7.5 for 10-g extremity SAR, where

$f(\text{GHz})$ is the RF channel transmit frequency in GHz

Power and distance are rounded to the nearest mW and mm before calculation

The result is rounded to one decimal place for comparison

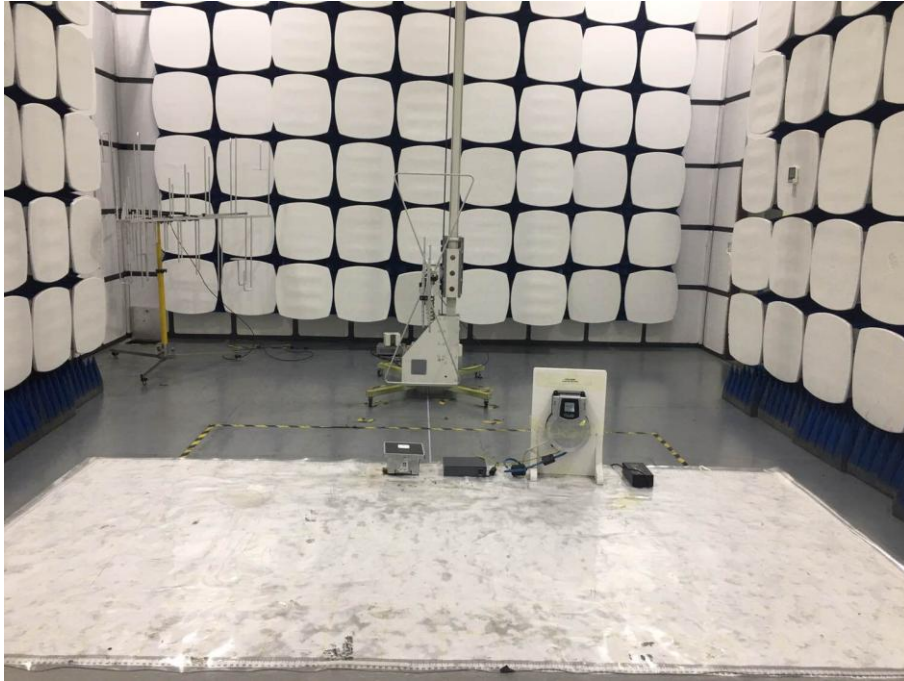
Worse case value= $P_{\text{max}}/\text{Distance}_{5\text{mm}} \cdot \sqrt{f(\text{GHz})}=0.43/5 \cdot \sqrt{2.48}=0.1354 < 3.0$ for 1-g SAR

Then SAR evaluation is not required

11. TEST SETUP PHOTO

11.1. Photos of Radiated emission

RE below 1G



RE above 1G

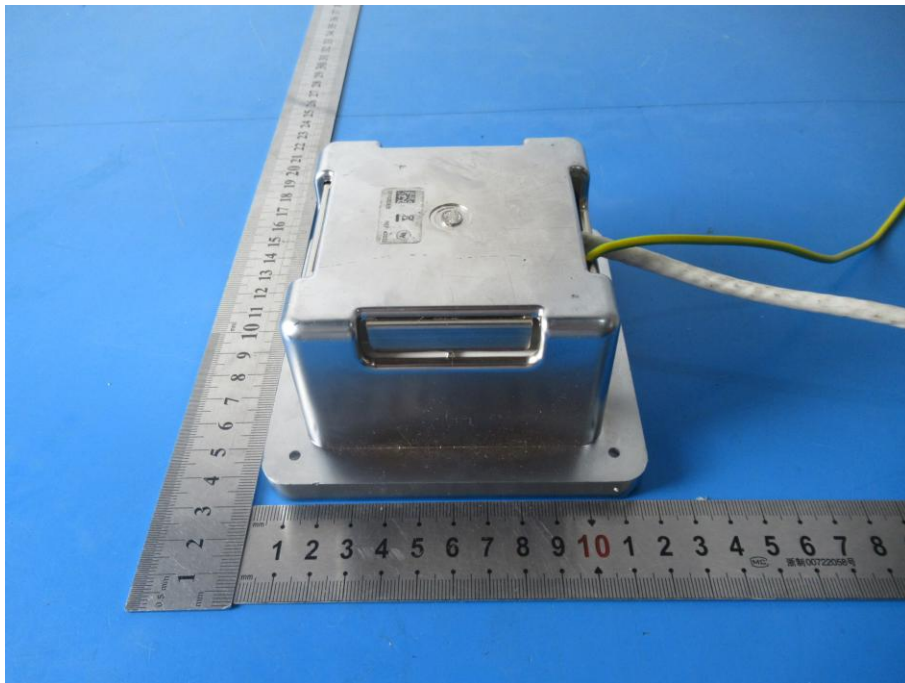


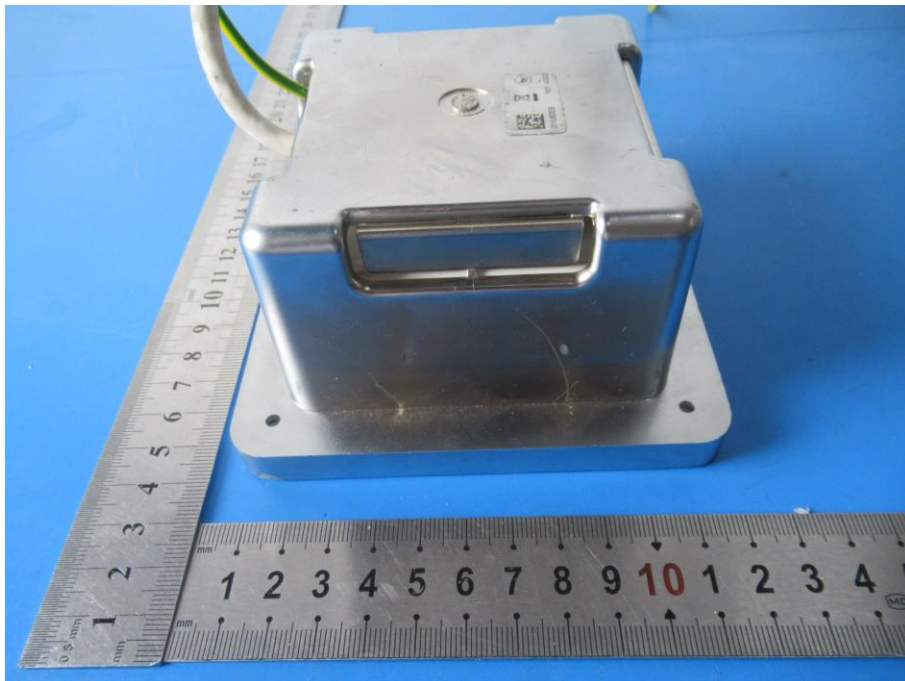
11.2.Photos of Conducted Emission test

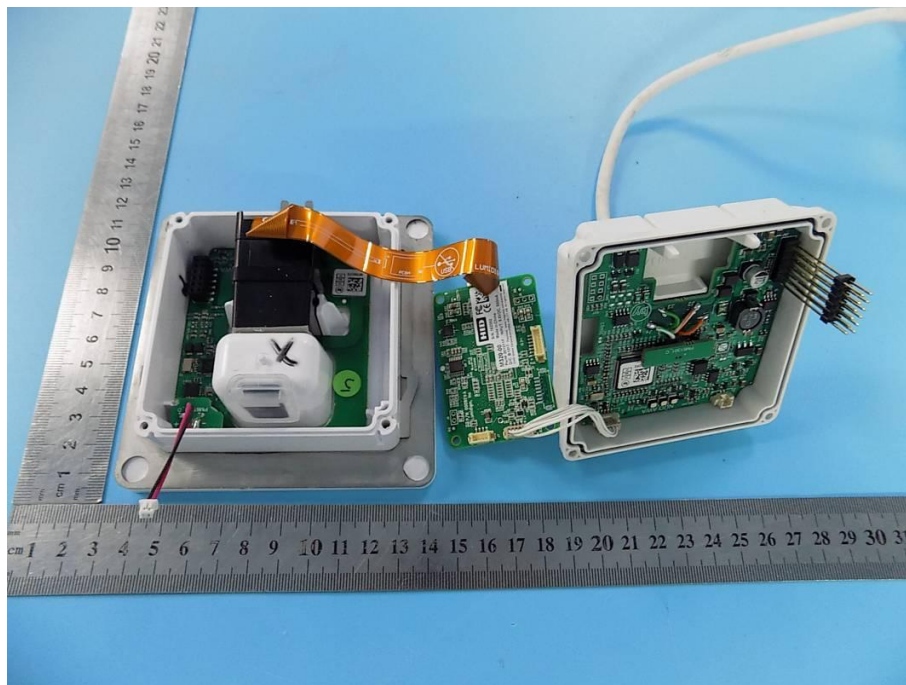
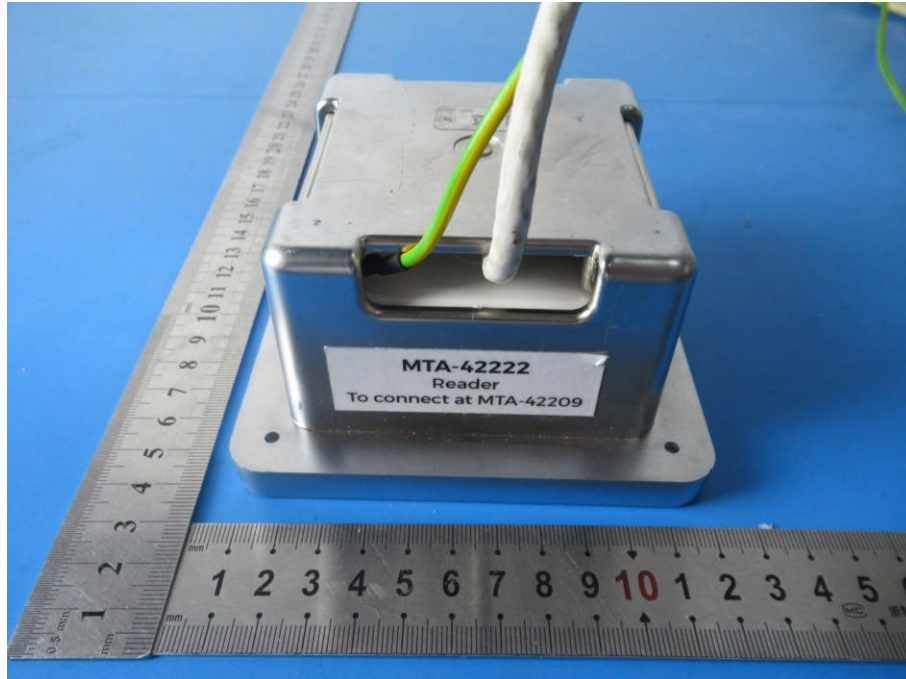


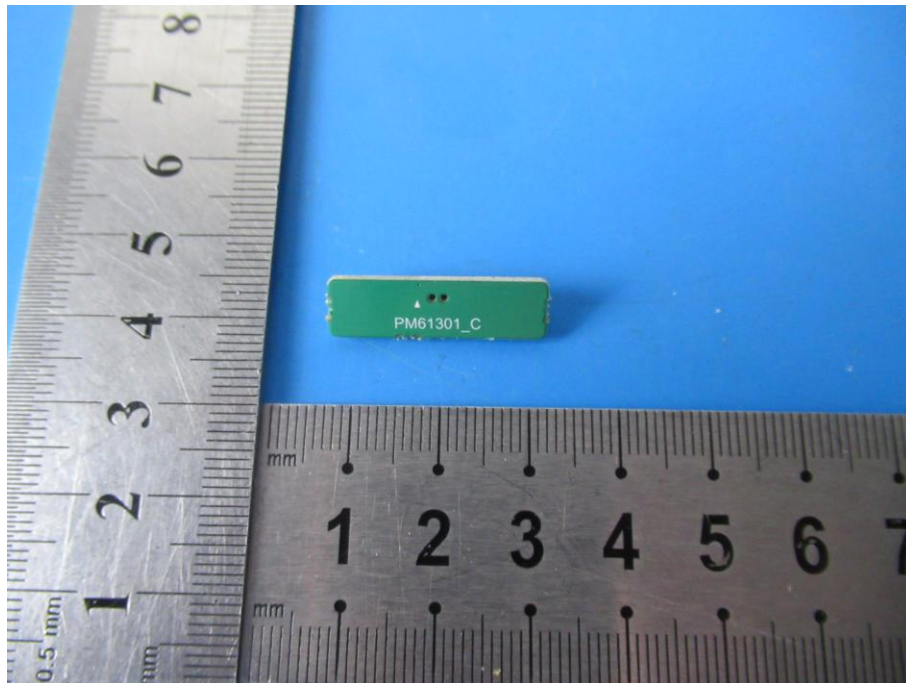
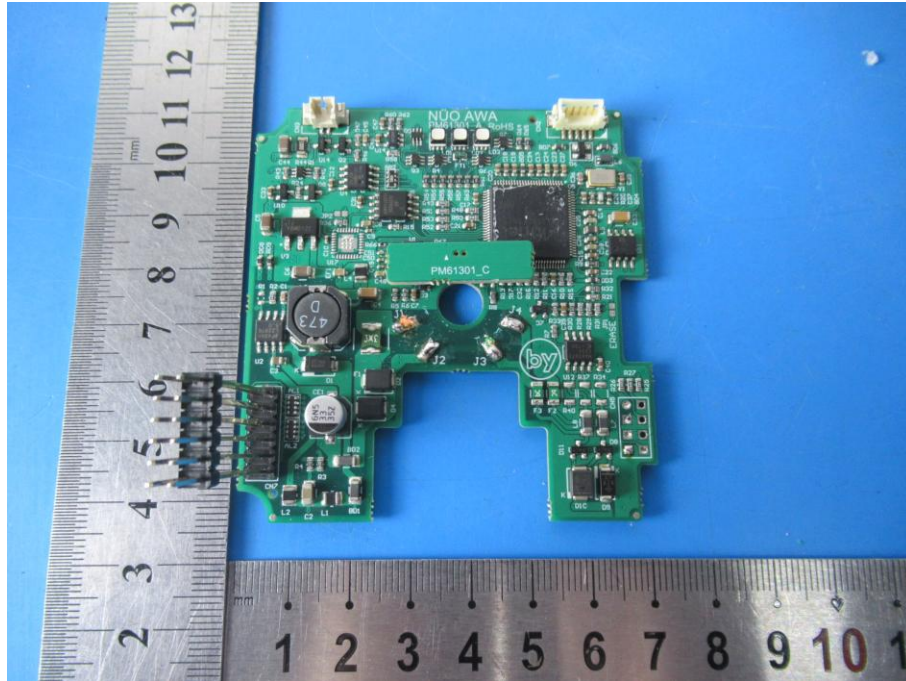
12.EUT PHOTO

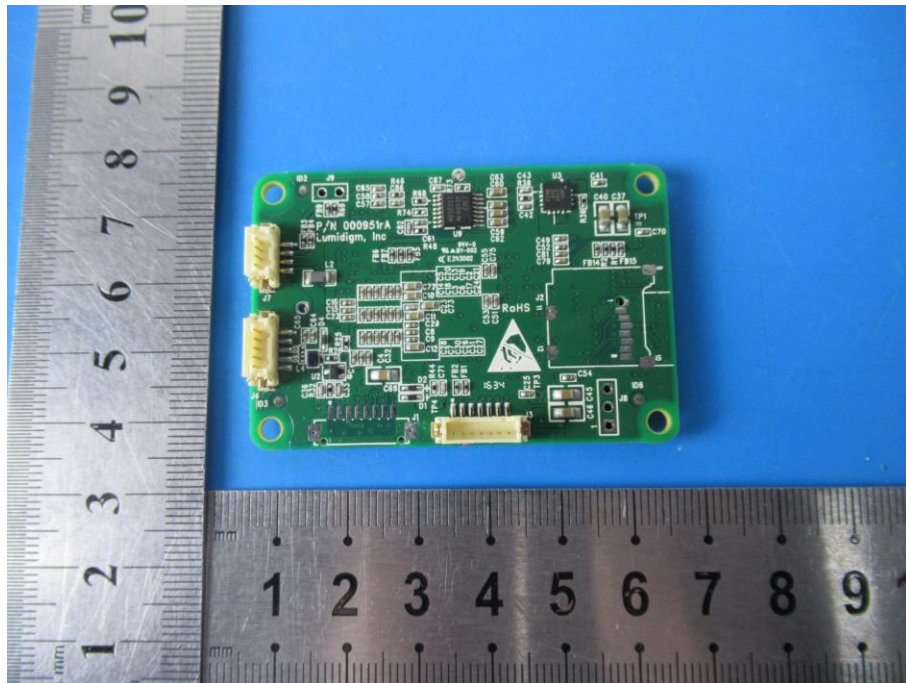
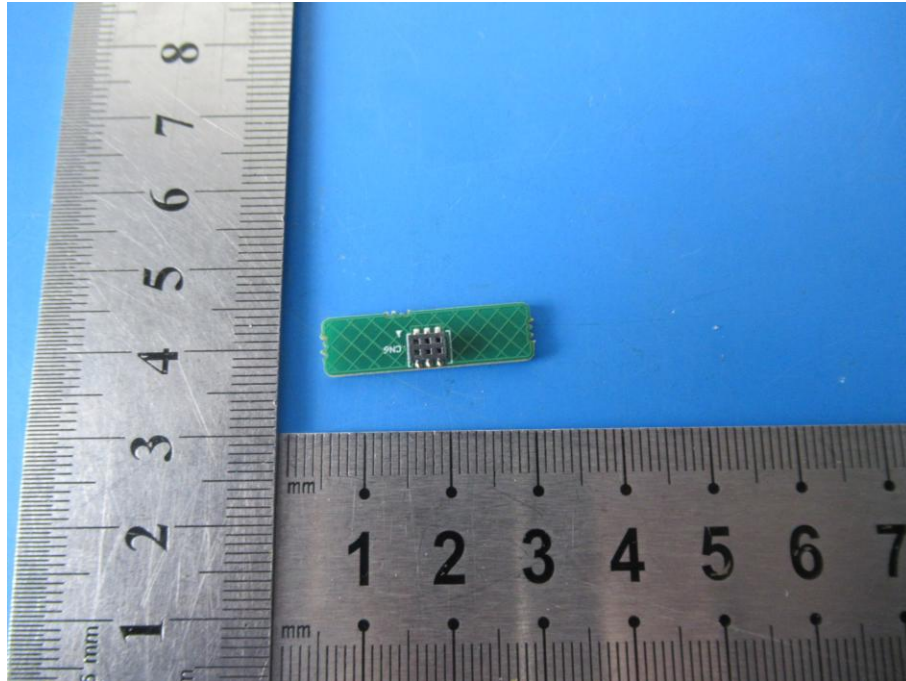


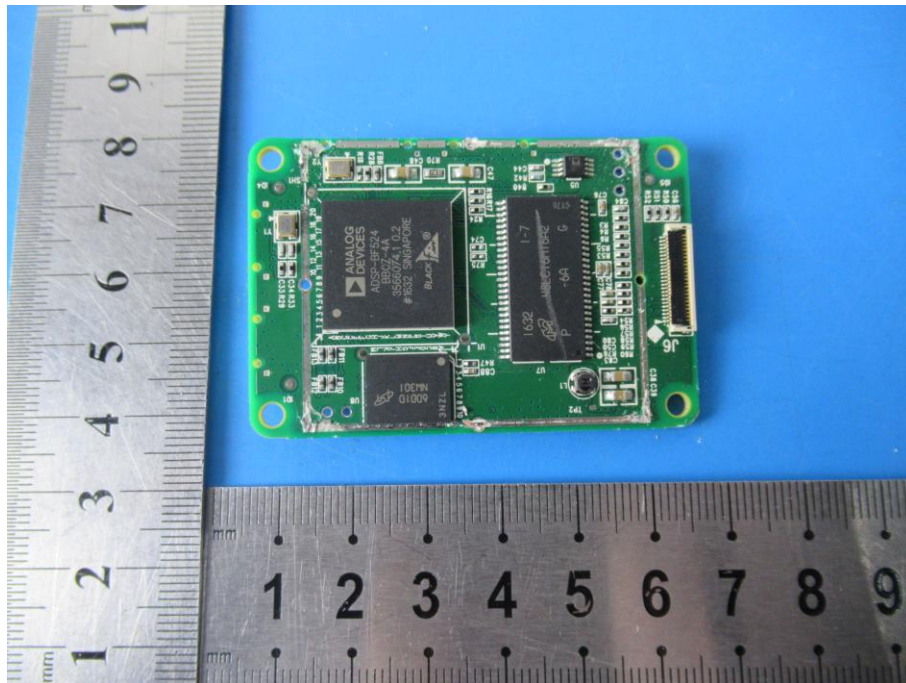
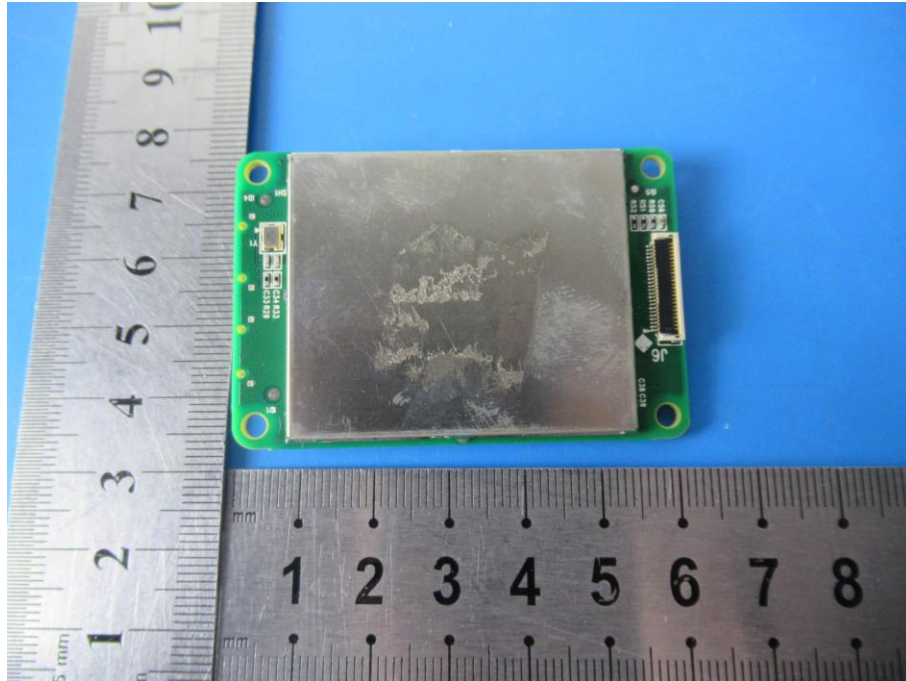


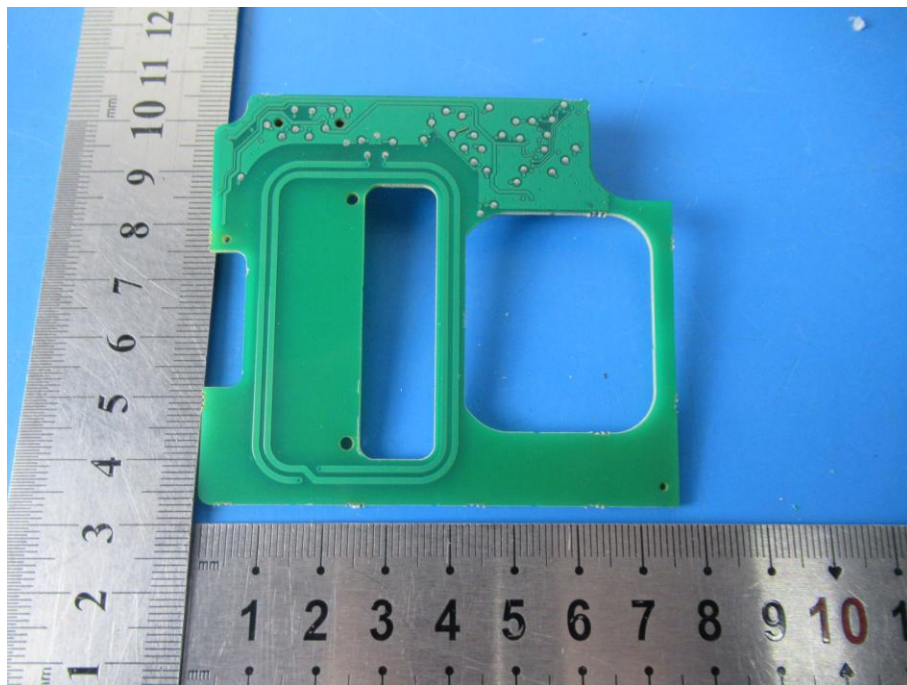
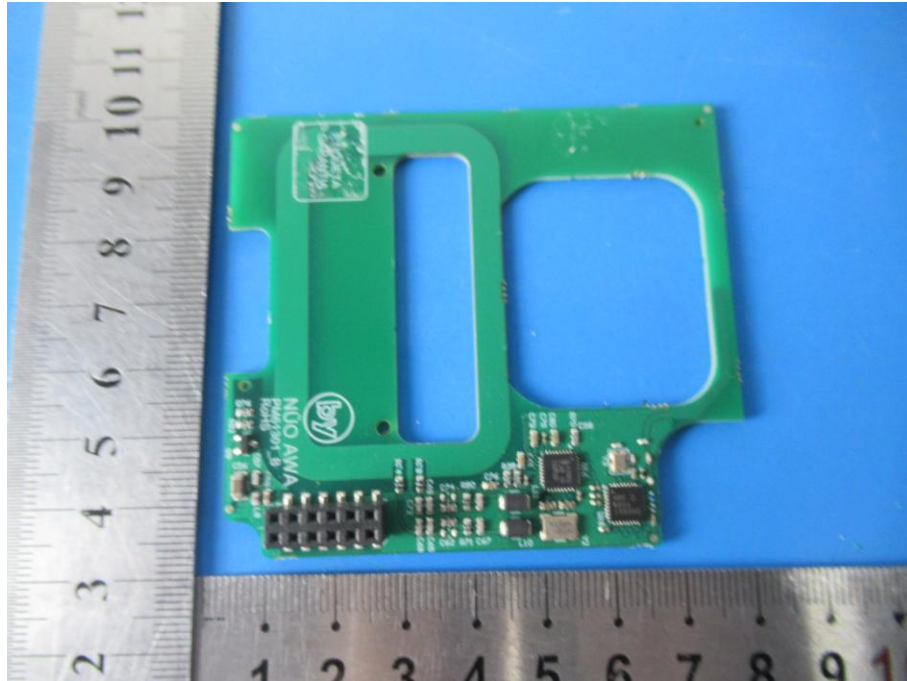


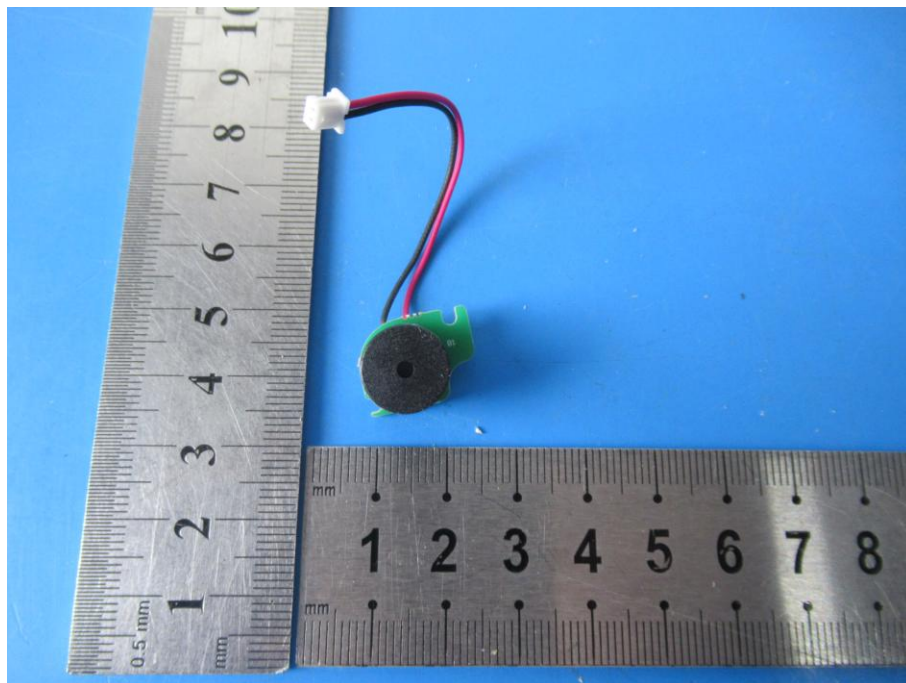
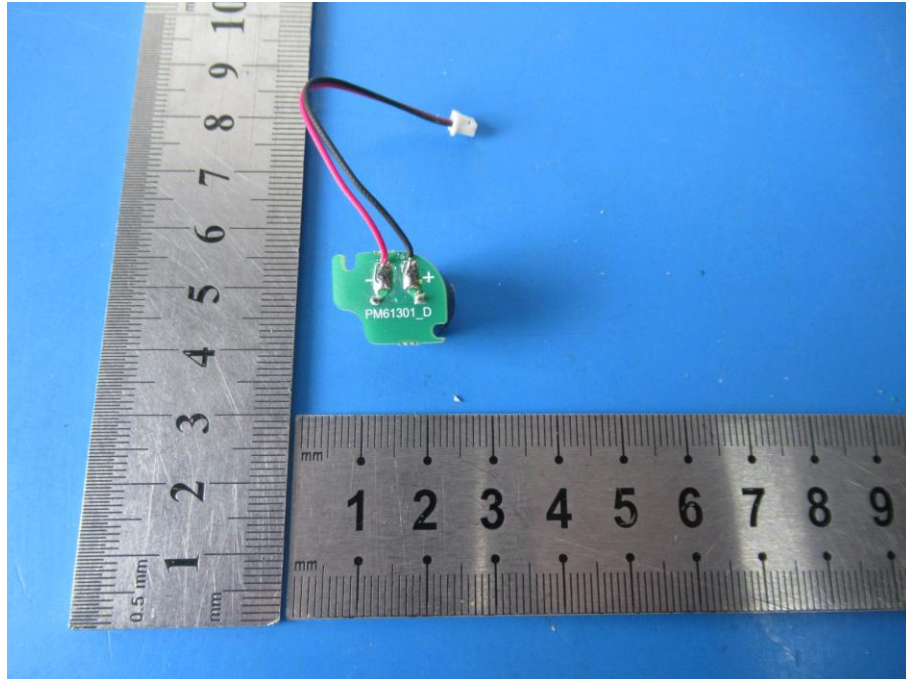


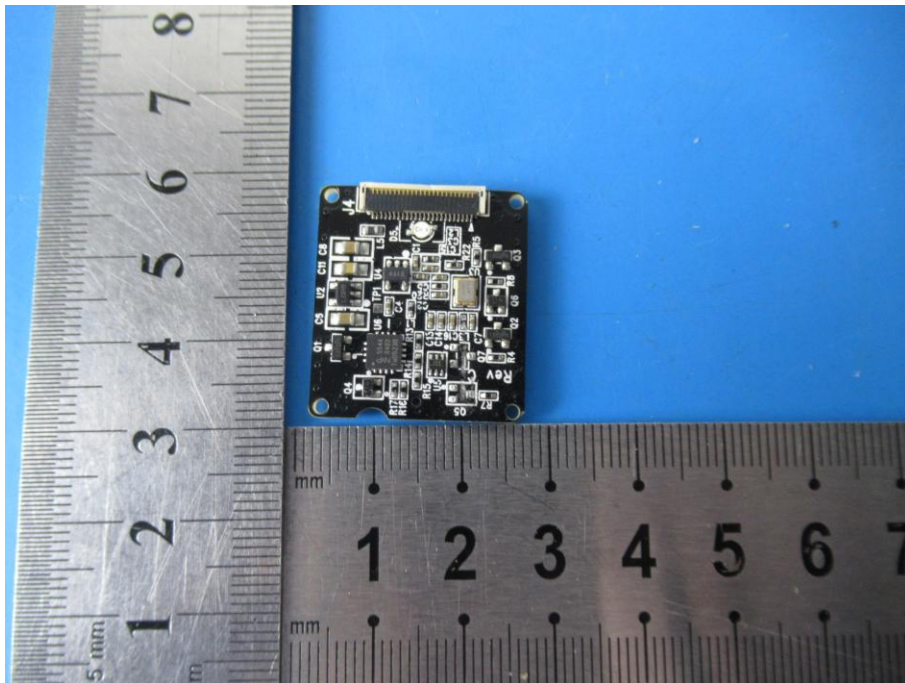
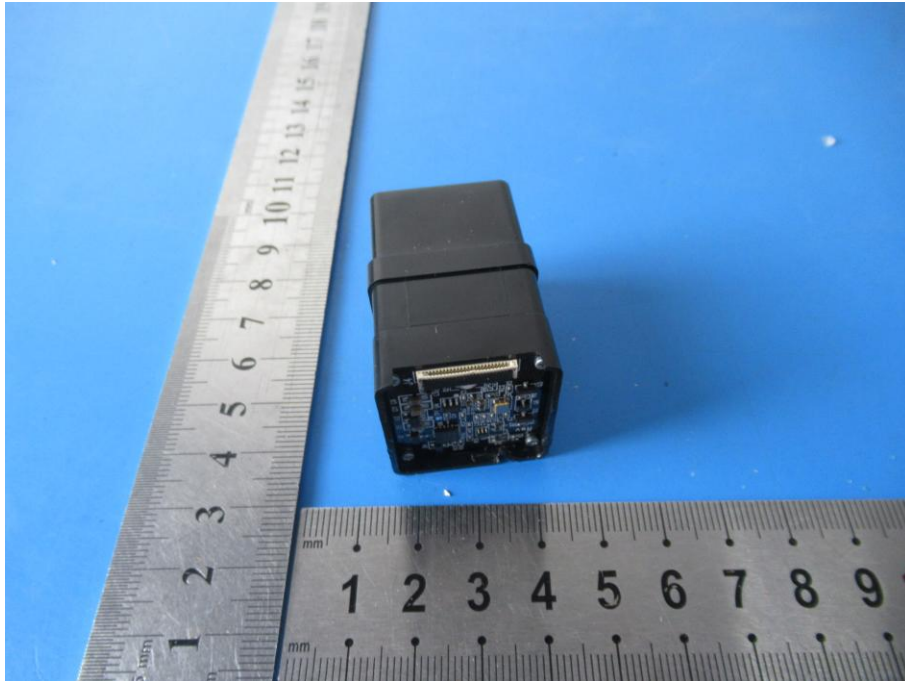


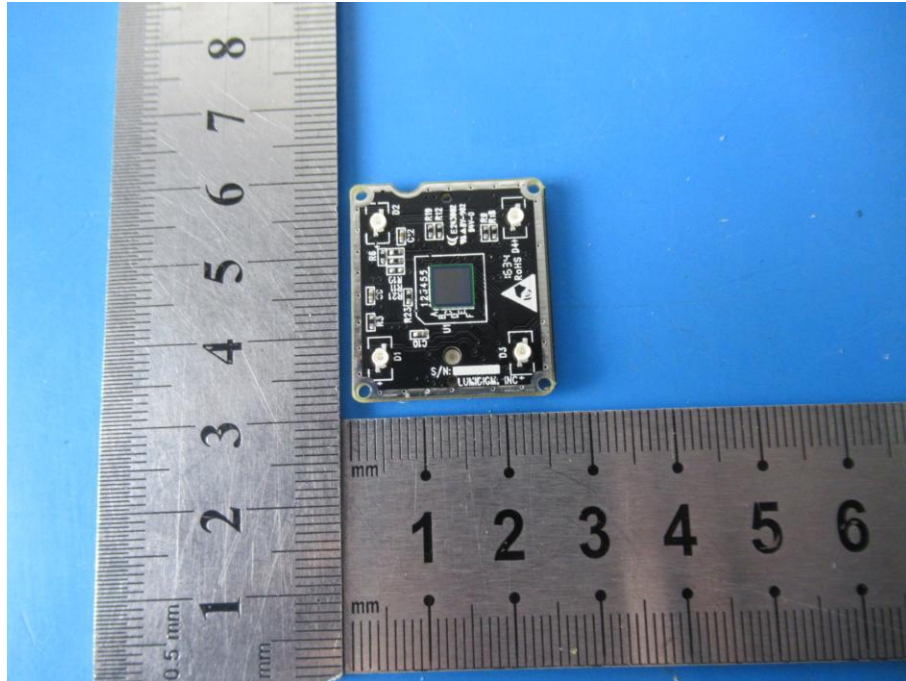












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