



# **FCC TEST REPORT**

**Test report  
On Behalf of  
ConnectScale, LLC  
For  
ConnectScale  
Model No.: ConnectScale 2.**

**FCC ID: 2AEP3CS2018**

**Prepared for :**     **ConnectScale, LLC**  
**104 Cardinal PT, Blountville, TN 37617, USA**

**Prepared By :**     **Shenzhen HUAK Testing Technology Co., Ltd.**  
**1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street,**  
**Bao'an District, Shenzhen City, China**



# TEST REPORT

**Applicant's name** ..... : ConnectScale, LLC

Address ..... : 104 Cardinal PT, Blountville, TN 37617, USA.

**Manufacture's Name** ..... : ConnectScale, LLC

Address ..... : 104 Cardinal PT, Blountville, TN 37617, USA

## Product description

Trade Mark: /

Product name ..... : ConnectScale

Model and/or type reference : ConnectScale 2.

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

This publication may be reproduced in whole or in part for non-commercial purposes as long as the Shenzhen HUAK Testing Technology Co., Ltd. is acknowledged as copyright owner and source of the material. Shenzhen HUAK Testing Technology Co., Ltd. takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

**Date of Test** ..... :

Date (s) of performance of tests ..... : June. 06, 2018 ~ June.21,2018

Date of Issue ..... : June.21, 2018

Test Result ..... : **Pass**

Testing Engineer :

(Gary Qian)

Technical Manager :

(Eden Hu)

Authorized Signatory :

(Jason Zhou)



<b>Table of Contents</b>	<b>Page</b>
1 . TEST SUMMARY	5
2 . GENERAL INFORMATION	7
2.1 GENERAL DESCRIPTION OF EUT	7
Operation of EUT during testing	8
2.2 DESCRIPTION OF TEST SETUP	8
2.3 MEASUREMENT INSTRUMENTS LIST	9
3 . CONDUCTED EMISSIONS TEST	10
3.1 Conducted Power Line Emission Limit	10
3.2 Test Setup	10
3.3 Test Procedure	10
3.4 Test Result	10
4 RADIATED EMISSION TEST	11
4.1 Radiation Limit	11
4.2 Test Setup	11
4.3 Test Procedure	12
4.4 Test Result	12
5 BAND EDGE	17
5.1 Limits	17
5.2 Test Procedure	17
5.3 Test Result	17
6 6dB Bandwidth	20
6.1 Test Limit	20
6.2 Test Procedure	20
6.3 Test Result	20
7 POWER SPECTRAL DENSITY TEST	22
7.1 Test Limit	22
7.2 Test Procedure	22
7.3 Test Result	22
8 PEAK OUTPUT POWER TEST	24
8.1 Test Limit	24
8.2 Test Procedure	24
8.3 Test Result	24
9 OUT OF BAND EMISSIONS TEST	26
9.1 Test Limit	26



<b>Table of Contents</b>	<b>Page</b>
9.2 Test Procedure	26
9.3 Test Setup	26
7.4 Test Result	26
10 ANTENNA REQUIREMENT	29
11 PHOTOGRAPH OF TEST	30
11.1 Radiated Emission	30



## 1. TEST SUMMARY

### 1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
POWER SPECTRAL DENSITY	COMPLIANT
PEAK OUTPUT POWER <sub>Peak</sub>	COMPLIANT
OUT OF BAND EMISSIONS	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

### 1.2 TEST FACILITY

Test Firm : Shenzhen HUAKE Testing Technology Co., Ltd.

Address 1F, B2 Building, Junfeng Zhongcheng Zhizao Innovation Park, Fuhai Street, Bao'an District, Shenzhen City, China

### 1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty	
Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.06dB, k=2



## 1.4 Test Description

Test Specification clause	Test case	Test Channel	Recorded In Report		Pass	Fail	NA	NP	Remark
§15.247(b)(4)	Antenna gain	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(e)	Power spectral density	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(b)(1)	Maximum output power	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	Band edge compliance conducted	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.205	Band edge compliance radiated	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions conducted	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.247(d)	TX spurious emissions radiated	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	GFSK	<input checked="" type="checkbox"/> Lowest <input checked="" type="checkbox"/> Middle <input checked="" type="checkbox"/> Highest	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies
§15.109	RX spurious emissions radiated	-/-	- / -	-/-	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	complies
§15.209(a)	TX spurious Emissions Radiated < 30 MHz	-/-	GFSK	-/-	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	complies

## Remark:

The measurement uncertainty is not included in the test result.

NA = Not Applicable; NP = Not Performed



## 2. GENERAL INFORMATION

### 2.1 GENERAL DESCRIPTION OF EUT

Equipment	ConnectScale
Model Name	ConnectScale 2.
Serial Model	/
FCC ID	2AEP3CS2018
Antenna Type	Internal antenna
Antenna Gain	4 dBi
Operation frequency	2402~2480 MHz
Number of Channels	40
Modulation Type	GFSK
Power Rating	DC 3.0V From Battery



### 2.1.1 Carrier Frequency of Channels

The Applicant provides communication tools software to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 40 channels provided to the EUT. Channel 00/19/39 was selected to test.

Channel	Frequency(MHz)	Channel	Frequency(MHz)
<b>0</b>	<b>2402</b>	20	2442
1	2404	21	2444
2	2406	22	2446
3	2408	23	2448
4	2410	24	2450
5	2412	25	2452
6	2414	26	2454
7	2416	27	2456
8	2418	28	2458
9	2420	29	2460
10	2422	30	2462
11	2424	31	2464
12	2426	32	2466
13	2428	33	2468
14	2430	34	2470
15	2432	35	2472
16	2434	36	2474
17	2436	37	2476
18	2438	38	2478
<b>19</b>	<b>2440</b>	<b>39</b>	<b>2480</b>

### Operation of EUT during testing

#### Operating Mode

The mode is used: **Transmitting mode for GFSK**

Low Channel: 2402MHz

Middle Channel: 2440MHz

High Channel: 2480MHz

## 2.2 DESCRIPTION OF TEST SETUP

Operation of EUT during conducted testing and Radiation and Above1GHz Radiation testing:

EUT





## 2.3 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	R&S	ENV216	HKE-002	Dec. 28, 2017	1 Year
2.	Receiver	R&S	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
3.	RF automatic control unit	Tonscend	JS0806-2	HKE-060	Dec. 28, 2017	1 Year
4.	Spectrum analyzer	R&S	FSP40	HKE-025	Dec. 28, 2017	1 Year
5.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
6.	Preamplifier	Schwarzbeck	BBV 9743	HKE-006	Dec. 28, 2017	1 Year
7.	EMI Test Receiver	Rohde & Schwarz	ESCI 7	HKE-010	Dec. 28, 2017	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	HKE-012	Dec. 28, 2017	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB 1519 B	HKE-014	Dec. 28, 2017	1 Year
10.	Horn Antenna	Schwarzbeck	9120D	HKE-013	Dec. 28, 2017	1 Year
11.	Pre-amplifier	EMCI	EMC051845 SE	HKE-015	Dec. 28, 2017	1 Year
12.	Pre-amplifier	Agilent	83051A	HKE-016	Dec. 28, 2017	1 Year
13.	EMI Test Software EZ-EMC	Tonscend	JS1120-B Version	HKE-083	Dec. 28, 2017	N/A
14.	Power Sensor	Agilent	E9300A	HKE-086	Dec. 28, 2017	1 Year
15.	Spectrum analyzer	Agilent	N9020A	HKE-048	Dec. 28, 2017	1 Year
16.	Signal generator	Agilent	N5182A	HKE-029	Dec. 28, 2017	1 Year
17.	Signal Generator	Agilent	83630A	HKE-028	Dec. 28, 2017	1 Year
18.	Shielded room	Shiel Hong	4*3*3	HKE-039	Dec. 28, 2017	3 Year



### 3. CONDUCTED EMISSIONS TEST

#### 3.1 Conducted Power Line Emission Limit

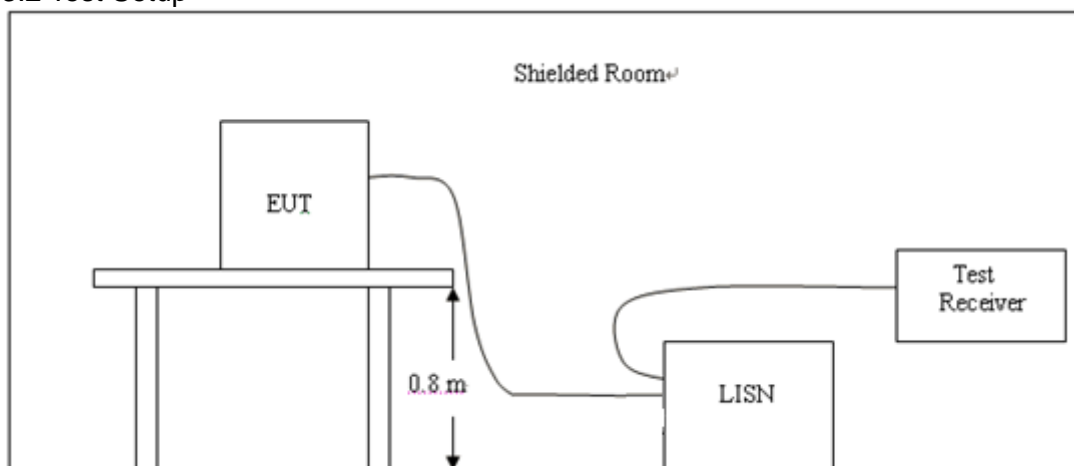
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage (dB $\mu$ V)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

\* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

#### 3.2 Test Setup



#### 3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.

#### 3.4 Test Result

The EUT is powered by battery, So this test item is not applicable for the EUT.

## 4 RADIATED EMISSION TEST

### 4.1 Radiation Limit

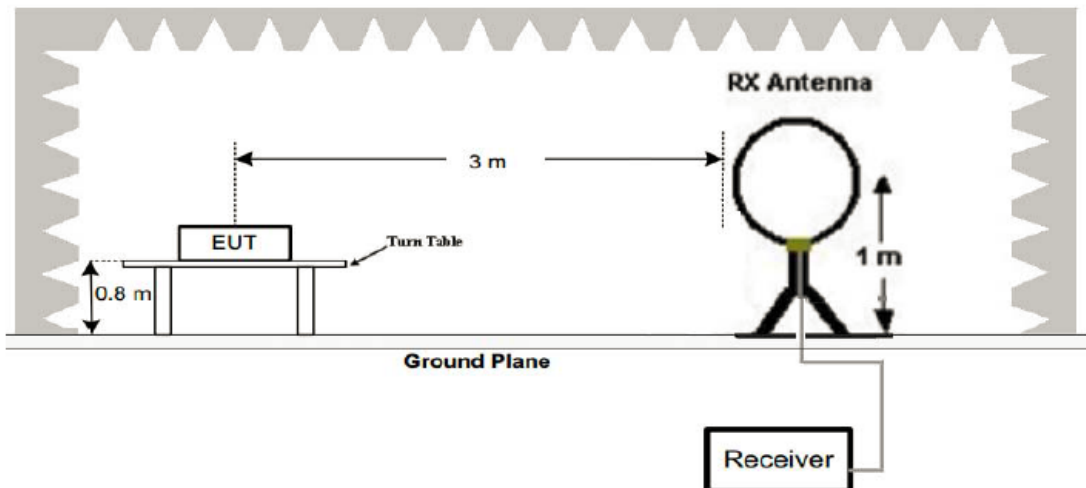
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	$20\log(2400/F(\text{KHz}))+40\log(300/3)$	$2400/F(\text{KHz})$
0.49-1.705	3	$20\log(24000/F(\text{KHz}))+40\log(30/3)$	$24000/F(\text{KHz})$
1.705-30	3	$20\log(30)+40\log(30/3)$	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

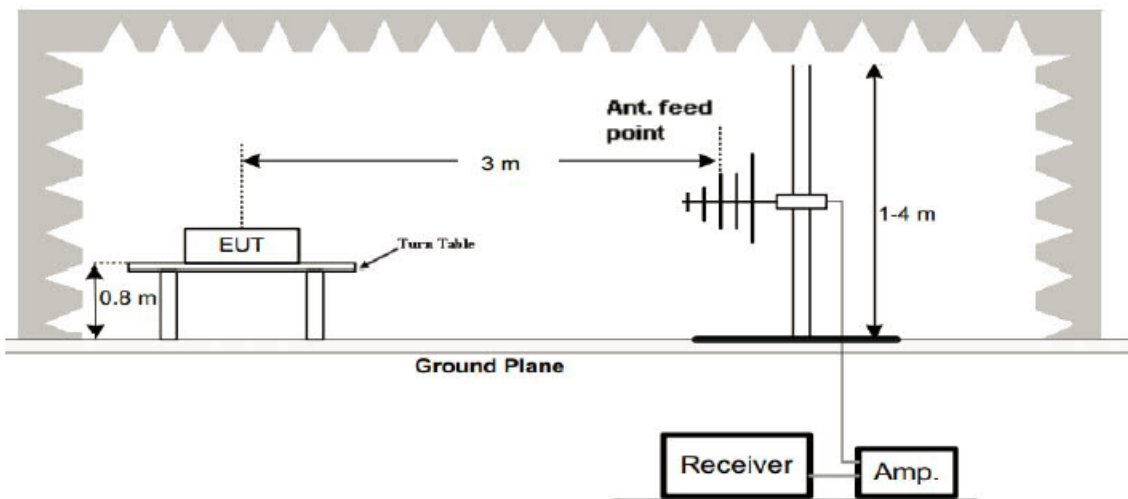
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

### 4.2 Test Setup

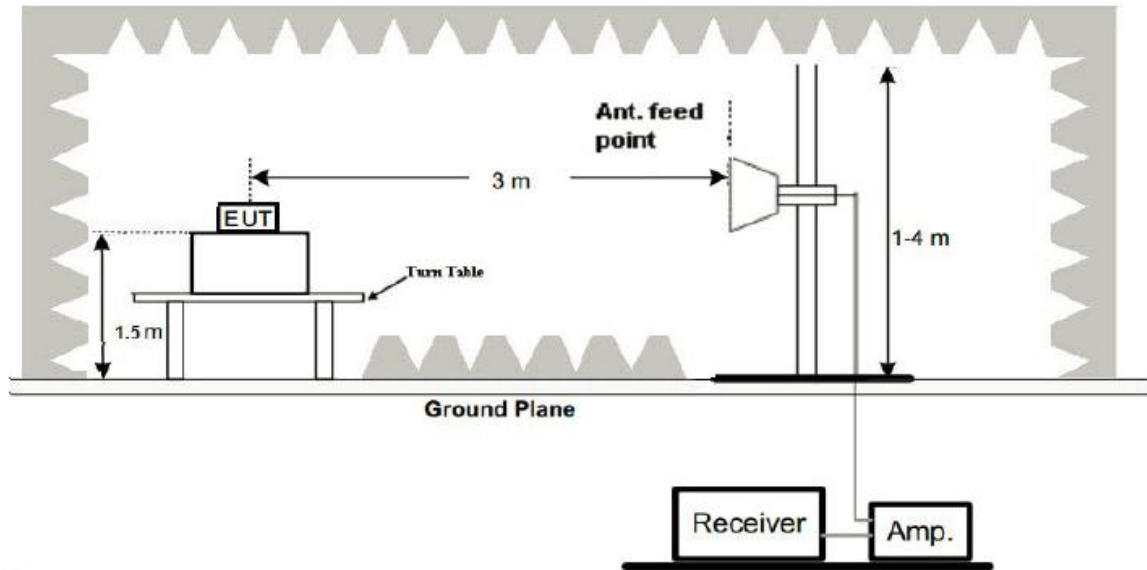
#### (1) Radiated Emission Test-Up Frequency Below 30MHz



#### (2) Radiated Emission Test-Up Frequency 30MHz~1GHz



### (3) Radiated Emission Test-Up Frequency Above 1GHz



#### 4.3 Test Procedure

- Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until the measurements for all frequencies are complete.
- The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

#### 4.4 Test Result

PASS

##### For 9 KHz-30MHz

All the test modes completed for test. The worst case of Radiated Emission (BLE Transmitting Low Channel-2402MHz (worst case) ); the test data of this mode was reported.

Frequency (MHz)	Corrected Reading (dBuV/m)@3m	FCC Limit (dBuV/m)@3m	Margin(dB)	Detector	Result
0.27	50.68	98.98	48.30	QP	PASS
0.65	44.75	71.35	26.60	QP	PASS
18.26	45.69	69.54	23.85	QP	PASS
23.42	44.76	69.54	24.78	QP	PASS

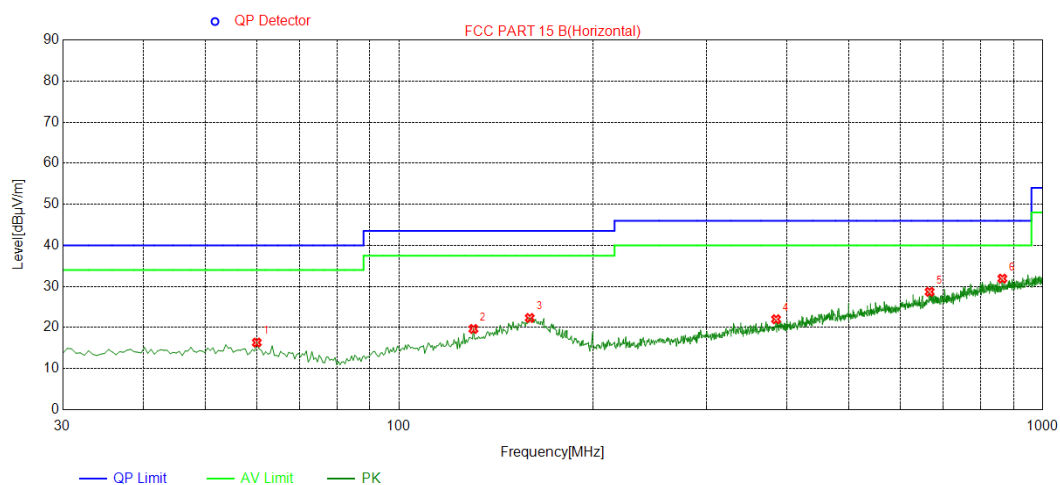
##### For 30MHz-1GHz

All the test modes completed for test. The worst case of Radiated Emission (BLE Transmitting Low Channel-2402MHz (worst case) ); the test data of this mode was reported.



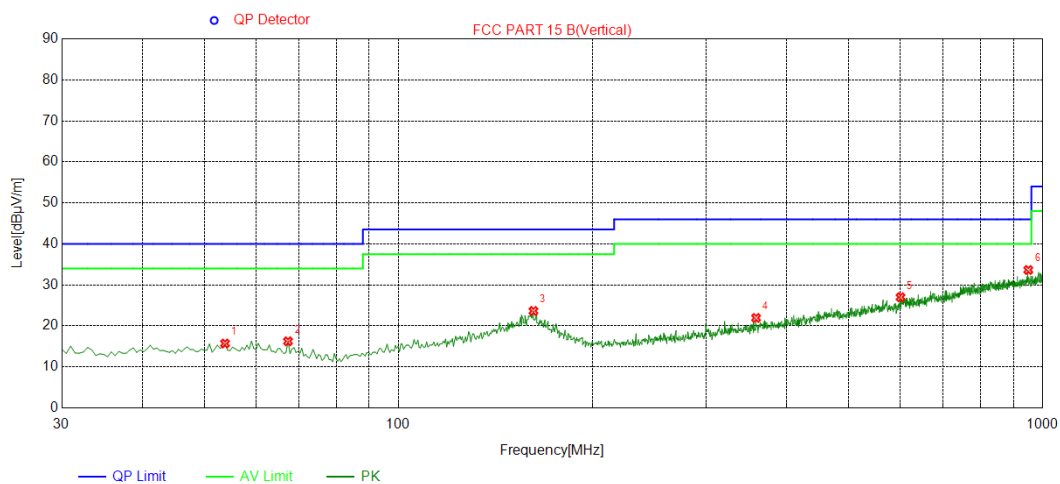
Power supply:	DC 3.0V From Battery	Temperature	25 °C
		Humidity	55%

## Horizontal



NO.	Freq. [MHz]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	60.0700	16.31	-16.27	40.00	23.69	Qp	100	69	Horizontal
2	130.3950	19.62	-13.77	43.50	23.88	Qp	100	310	Horizontal
3	159.4950	22.31	-9.22	43.50	21.19	Qp	100	2	Horizontal
4	385.0200	21.99	-10.97	46.00	24.01	Qp	100	25	Horizontal
5	666.8050	28.68	-4.36	46.00	17.32	Qp	100	54	Horizontal
6	865.1700	31.90	-1.45	46.00	14.10	Qp	100	266	Horizontal

## Vertical



NO.	Freq. [MHz]	Level [dBuV/m]	Factor [dB]	Limit [dBuV/m]	Margin [dB]	Trace	Height [cm]	Angle [°]	Polarity
1	53.7650	15.67	-16.50	40.00	24.33	Qp	100	293	Vertical
2	67.3450	16.21	-17.37	40.00	23.79	Qp	100	178	Vertical
3	161.9200	23.63	-9.46	43.50	19.87	Qp	100	351	Vertical
4	358.8300	21.92	-11.67	46.00	24.08	Qp	100	340	Vertical
5	601.3300	26.98	-6.03	46.00	19.02	Qp	100	10	Vertical
6	949.5600	33.63	-0.15	46.00	12.37	Qp	100	95	Vertical



## Above 1 GHz Test Results:

LOW CH0: 2402MHz

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	56.43	-3.64	52.79	74	-21.21	peak
4804	46.62	-3.64	42.98	54	-11.02	AVG
7206	55.85	-0.95	54.9	74	-19.1	peak
7206	42.86	-0.95	41.91	54	-12.09	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804	56.75	-3.64	53.11	74	-20.89	peak
4804	45.36	-3.64	41.72	54	-12.28	AVG
7206	52.49	-0.95	51.54	74	-22.46	peak
7206	42.63	-0.95	41.68	54	-12.32	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



MID CH19:2440MHz  
Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4880	55.52	-3.51	52.01	74	-21.99	peak
4880	45.37	-3.51	41.86	54	-12.14	AVG
7320	52.61	-0.82	51.79	74	-22.21	peak
7320	41.36	-0.82	40.54	54	-13.46	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4880	57.21	-3.51	53.7	74	-20.3	peak
4880	45.39	-3.51	41.88	54	-12.12	AVG
7320	54.02	-0.82	53.2	74	-20.8	peak
7320	40.62	-0.82	39.8	54	-14.2	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



HIGH CH39: 2480MHz

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	57.35	-3.43	53.92	74	-20.08	peak
4960	44.32	-3.43	40.89	54	-13.11	AVG
7440	53.68	-0.75	52.93	74	-21.07	peak
7440	39.17	-0.75	38.42	54	-15.58	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4960	56.18	-3.43	52.75	74	-21.25	peak
4960	43.26	-3.43	39.83	54	-14.17	AVG
7440	52.09	-0.75	51.34	74	-22.66	peak
7440	38.75	-0.75	38	54	-16	AVG
---	---	---	---	---	---	---
---	---	---	---	---	---	---

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) \* denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) Data of measurement within this frequency range shown "----" in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.







Operation Mode: High CH39: 2480MHz  
Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	55.52	-5.65	49.87	74	-24.13	peak
2483.5	45.16	-5.65	39.51	54	-14.49	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	53.96	-5.65	48.31	74	-25.69	peak
2483.5	45.63	-5.65	39.98	54	-14.02	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.



For Conducted Bandedge Measurement

GFSK			
Frequency (MHz)	Delta Peak to Band emission (dBc)	Limit (dBc)	Verdict
2400.00	-52.814	-20	PASS
2483.50	-55.130	-20	PASS

2402

2480



## 6 6dB Bandwidth

### 6.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

### 6.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=100 KHz and VBW=300KHz. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB. According to KDB558074 for one of the following procedures may be used to determine the modulated DTS device signal bandwidth.

1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW)  $\geq 3$  RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 6.3 Test Result

**PASS**

Type	Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
GFSK	00	0.7068	$\geq 500$	Pass
	19	0.7028		
	39	0.7049		



## GFSK



## CH00



## CH19

## CH39



## 7 POWER SPECTRAL DENSITY TEST

### 7.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

### 7.2 Test Procedure

According to KDB 558074 D01 Method PKPSD (peak PSD) This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance, and is optional if the maximum conducted (average) output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
4. Set the VBW  $\geq 3 \text{ RBW}$ .
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat

### 7.3 Test Result

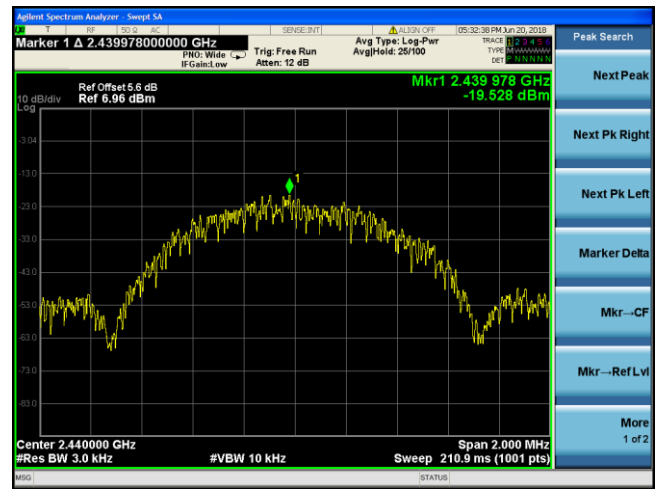
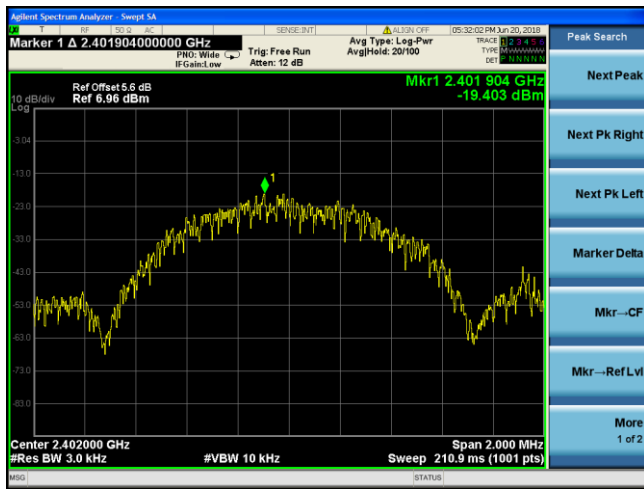
**PASS**

All the test modes completed for test.

Type	Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
GFSK	00	-19.403	8.00	Pass
	19	-19.528		
	39	-19.665		



## GFSK



## CH00



## CH19

## CH39



## 8 PEAK OUTPUT POWER TEST

### 8.1 Test Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

### 8.2 Test Procedure

According to KDB558074 D01 DTS Measurement Guidance Section 9.1 Maximum peak conducted output power, 9.1.2. and Average conducted output power, 9.2.3.1.

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple detector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the DTS bandwidth and shall utilize a fast-responding diode detector.

### 8.3 Test Result

**PASS**





Type	Channel	Output power PK (dBm)	Output power AV (dBm)	Limit (dBm)	Result
GFSK	00	-3.81	-4.36	30.00	Pass
	19	-3.79	-4.18		
	39	-4.22	-4.63		

Note: 1.The test results including the cable lose.

Duty cycle used in all test items: 100%



## 9 OUT OF BAND EMISSIONS TEST

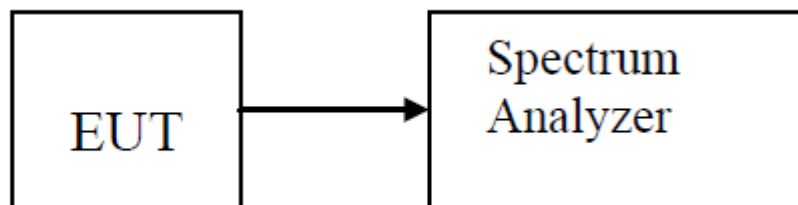
### 9.1 Test Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB

### 9.2 Test Procedure

The Spurious RF conducted emissions compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10-2013, For 30MHz-25GHz ,Set RBW=100kHz and VBW= 300KHz in order to measure the peak field strength, and measure frequency range from 30MHz to 25GHz.

### 9.3 Test Setup



### 7.4 Test Result

**PASS**

All the test modes completed for test.

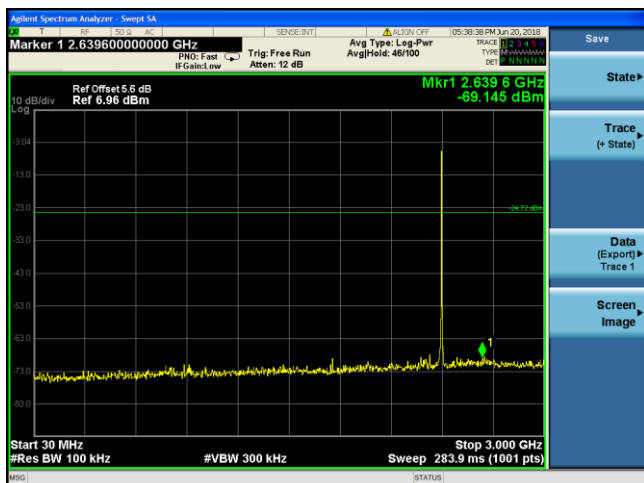


Test Mode:

GFSK CH 00



2402



30MHz~3GHz



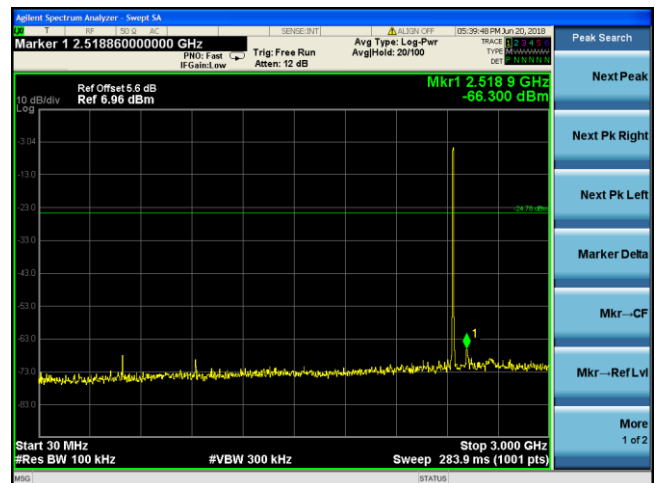
3GHz~25GHz

Test Mode:

GFSK CH 19



2440



30MHz~3GHz



3GHz~25GHz

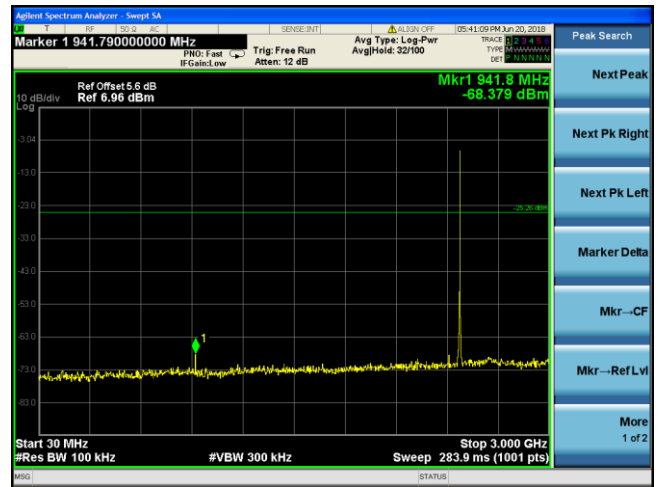


Test Mode:

GFSK CH 39



2480



30MHz~3GHz



3GHz~25GHz

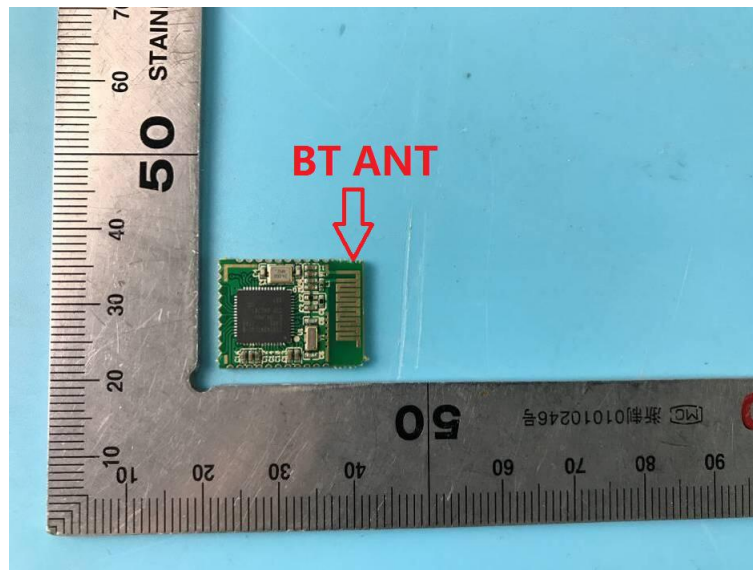
## 10 ANTENNA REQUIREMENT

### Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, 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. And according to FCC 47 CFR Section 15.249, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### Antenna Information

The antenna is layout on PCB board, the directional gains of antenna used for transmitting is 4.0dBi.



## 11 PHOTOGRAPH OF TEST

### 11.1 Radiated Emission

