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# FCC Test Report

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Report No.: AGC09648170402FE03

**FCC ID** : 2AL4B-PC01  
**APPLICATION PURPOSE** : Original Equipment  
**PRODUCT DESIGNATION** : Passive Coach  
**BRAND NAME** : N/A  
**MODEL NAME** : PC-01  
**CLIENT** : Keep the Space Inc.  
**DATE OF ISSUE** : May 31, 2017  
**STANDARD(S)** : FCC Part 15 Rules  
**REPORT VERSION** : V1.0

Attestation of Global Compliance (Shenzhen) Co., Ltd



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### Report Revise Record

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	May 31, 2017	Valid	Original Report

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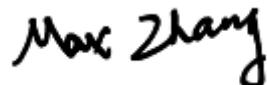
## 1. VERIFICATION OF CONFORMITY

<b>Applicant</b>	Keep the Space Inc.
<b>Address</b>	15650 Vineyard Blvd. Ste A Offc #159, Morgan Hill, CA 95037
<b>Manufacturer</b>	Shenzhen MZJ Technology Co., Limited
<b>Address</b>	Jie We Da 2 Floor, Shengyigao Industrial Park , Datang Road, Dashiukeng 2nd Village , Guanlan Town, Longhua District, Shenzhen City. China
<b>Product Designation</b>	Passive Coach
<b>Brand Name</b>	N/A
<b>Test Model</b>	PC-01
<b>Date of test</b>	May 22, 2017 to May 26, 2017
<b>Deviation</b>	None
<b>Condition of Test Sample</b>	Normal
<b>Test Result</b>	Pass
<b>Report Template</b>	AGCRT-US-BR/RF (2013-03-01)

We hereby certify that:

The above equipment was tested by Dongguan Precise Testing Service Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with radiated emission limits of FCC Rules Part 15.247.

Tested by



Max Zhang(Zhang Yi)

May 31, 2017

Reviewed by



Bart Xie(Xie Xiaobin)

May 31, 2017

Approved by



Solger Zhang(Zhang Hongyi)

May 31, 2017

Authorized Officer

## 2. GENERAL INFORMATION

### 2.1. PRODUCT DESCRIPTION

The EUT is “PASSIVE COACH” designed as a “Communication Device”. It is designed by way of utilizing the FHSS technology to achieve the system operation.

A major technical description of EUT is described as following

<b>Operation Frequency</b>	904.3 MHz to 926.7MHz
<b>RF Output Power</b>	9.774dBm(Max)
<b>Modulation</b>	GFSK
<b>Number of channels</b>	51
<b>Hardware Version</b>	2.1
<b>Software Version</b>	1.0
<b>Antenna Designation</b>	Integral antenna
<b>Antenna Gain</b>	2.5dBi
<b>Power Supply</b>	DC 3.7V by battery or DC 5V by USB port

Note: The USB port is only for charging.

### 2.2. TABLE OF CARRIER FREQUENCYS

Frequency Band	Channel Number	Frequency
902~928MHZ	1	904.300 MHZ
	2	904.748 MHZ
	:	:
	50	926.252 MHZ
	51	926.700 MHZ

Note: The channel spacing is 0.448MHz.

### **2.3. RECEIVER INPUT BANDWIDTH**

The input bandwidth of the receiver is 200kHz.

### **2.4. EXAMPLE OF A HOPPING SEQUENCE IN DATA MODE**

Our pseudo-random sequence is actually just direct sequence:

34, 18, 40, 32, 41, 50, 5, 38, 27, 45, 19, 26, 4, 28, 35, 0, 33, 15, 31, 23, 14, 36, 24, 43, 2, 8, 21, 47, 37, 30, 6, 22, 7, 25, 12, 3, 10, 29, 49, 20, 39, 17, 44, 16, 9, 13, 1, 48, 46, 42, 11

### **2.5. EQUALLY AVERAGE USE OF FREQUENCIES AND BEHAVIOUR**

The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter.

### **2.6. RELATED SUBMITTAL(S) / GRANT (S)**

This submittal(s) (test report) is intended for **FCC ID: 2AL4B-PC01** filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

### **2.7. TEST METHODOLOGY**

Both conducted and radiated testing was performed according to the procedures in ANSI C63.10 (2013).

Radiated testing was performed at an antenna to EUT distance 3 meters.

### **2.8. SPECIAL ACCESSORIES**

Refer to section 5.2.

### **2.9. EQUIPMENT MODIFICATIONS**

Not available for this EUT intended for grant.

### 3. MEASUREMENT UNCERTAINTY

Conducted measurement: +/- 3.18dB

Radiated measurement: +/- 3.91dB

### 4. DESCRIPTION OF TEST MODES

NO.	TEST MODE DESCRIPTION
1	Low channel TX
2	Middle channel TX
3	High channel TX

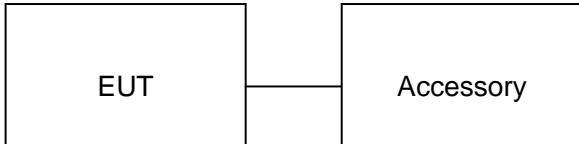
Note:

1. Only the result of the worst case was recorded in the report, if no other cases.
2. For Radiated Emission, 3axis were chosen for testing for each applicable mode.

## 5. SYSTEM TEST CONFIGURATION

### 5.1. CONFIGURATION OF EUT SYSTEM

Configure 1:



### 5.2. EQUIPMENT USED IN EUT SYSTEM

Item	Equipment	Model No.	ID or Specification	Remark
1	PASSIVE COACH	PC-01	2AL4B-PC01	EUT
2	Adapter	XCMS03-0510	DC5V/1A	Support

### 5.3. SUMMARY OF TEST RESULTS

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.247	Peak Output Power	Compliant
§15.247	20 dB Bandwidth	Compliant
§15.247	Spurious Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.207	Conduction Emission	Compliant
§15.247	Number of Hopping Frequency	Compliant
§15.247	Time of Occupancy	Compliant
§15.247	Frequency Separation	Compliant

## 6. TEST FACILITY

Site	Dongguan Precise Testing Service Co., Ltd.
Location	Building D, Baoding Technology Park, Guangming Road 2, Dongcheng District, Dongguan, Guangdong, China.
FCC Registration No.	371540
Description	The test site is constructed and calibrated to meet the FCC requirements in documents ANSI C63.4:2014.

### ALL TEST EQUIPMENT LIST

Radiated Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Trilog Broadband Antenna (25M-1GHz)	SCHWARZBECK	VULB9160	9160-3355	July 3, 2016	July 2, 2017
Signal Amplifier	SCHWARZBECK	BBV 9475	9745-0013	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96221	July 3, 2016	July 2, 2017
3m Anechoic Chamber	CHENGYU	966	PTS-001	June 3, 2016	June 2, 2017
MULTI-DEVICE Positioning Controller	Max-Full	MF-7802	MF780208339	N/A	N/A
Active loop antenna (9K-30MHz)	Schwarzbeck	FMZB1519	1519-038	June 3, 2016	June 2, 2017
Spectrum analyzer	Agilent	E4407B	MY46185649	June 3, 2016	June 2, 2017
Power Sensor	Agilent	U2021XA	MY55050474	June 3, 2016	June 2, 2017
Horn Antenna (1G-18GHz)	SCHWARZBECK	BBHA9120D	9120D-1246	June 3, 2016	June 2, 2017
Horn Ant (18G-40GHz)	Schwarzbeck	BBHA 9170	9170-181	June 3, 2016	June 2, 2017

Conducted Emission Test Site					
Name of Equipment	Manufacturer	Model Number	Serial Number	Last Calibration	Due Calibration
EMI Test Receiver	Rohde & Schwarz	ESCI	101417	July 3, 2016	July 2, 2017
Artificial Mains Network	Narda	L2-16B	000WX31025	July 3, 2016	July 2, 2017
Artificial Mains Network (AUX)	Narda	L2-16B	000WX31026	July 3, 2016	July 2, 2017
RF Cable	SCHWARZBECK	AK9515E	96222	July 3, 2016	July 2, 2017
Shielded Room	CHENGYU	843	PTS-002	June 3, 2016	June 2, 2017

## 7. PEAK OUTPUT POWER

### 7.1. MEASUREMENT PROCEDURE

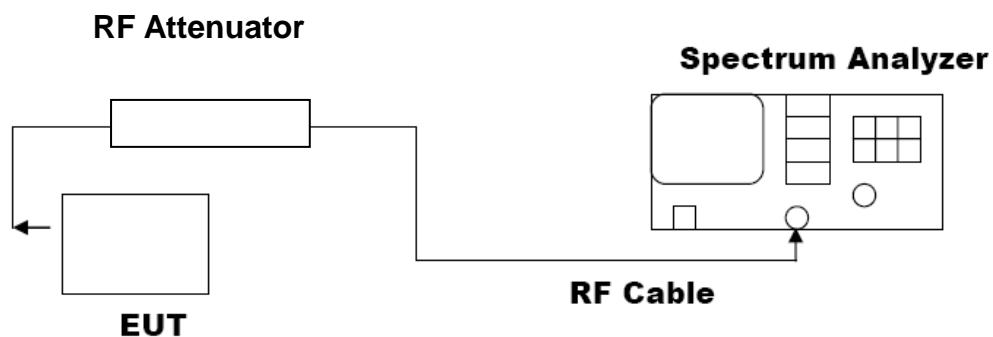
For peak power test:

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
3. RBW > 20 dB bandwidth of the emission being measured.
4. VBW  $\geq$  RBW.
5. Sweep: Auto.
6. Detector function: Peak.
7. Trace: Max hold.

Allow trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power, after any corrections for external attenuators and cables.

### 7.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

#### PEAK POWER TEST SETUP



### 7.3. LIMITS AND MEASUREMENT RESULT

PEAK OUTPUT POWER MEASUREMENT RESULT FOR GFSK MOUDULATION			
Frequency (MHz)	Peak Power (dBm)	Applicable Limits (dBm)	Pass or Fail
904.3	9.765	30	Pass
915.5	9.771	30	Pass
926.7	9.774	30	Pass

Low Channel



Middle Channel



High Channel



## 8. 20DB BANDWIDTH

### 8.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the middle and the bottom operation frequency individually.
3. Set Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a hopping channel  
The nominal IF filter bandwidth (3 dB RBW) shall be in the range of 1% to 5% of the OBW and video bandwidth (VBW) shall be approximately three times RBW; Sweep = auto; Detector function = peak
4. Set SPA Trace 1 Max hold, then View.

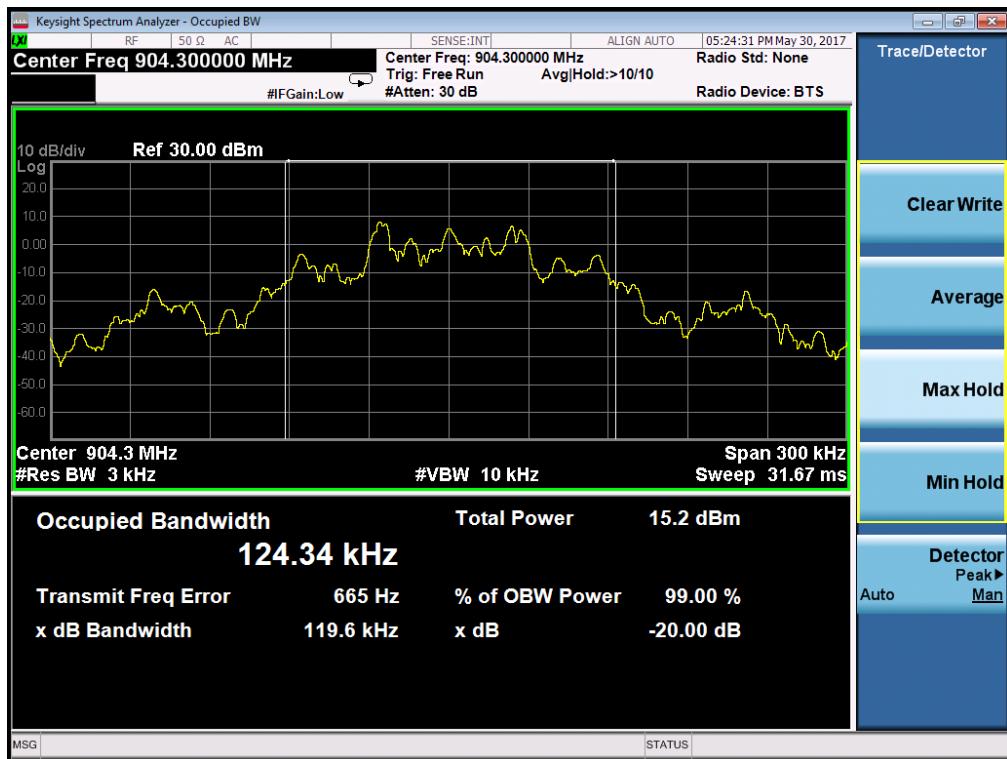
### 8.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 7.2.

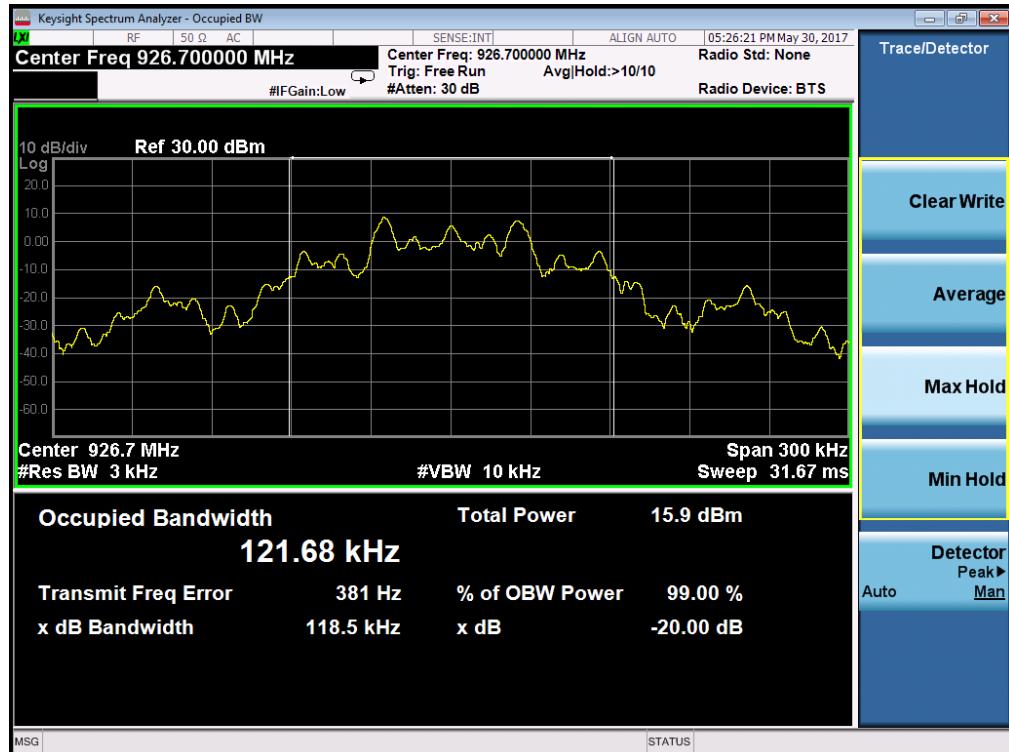
### 8.3. LIMITS AND MEASUREMENT RESULTS

MEASUREMENT RESULT FOR GFSK MOUDULATION			
Applicable Limits	Measurement Result		
	Test Data (kHz)	Criteria	
N/A	Low Channel	119.6	PASS
	Middle Channel	118.5	PASS
	High Channel	120.5	PASS

### TEST PLOT OF BANDWIDTH FOR LOW CHANNEL



### TEST PLOT OF BANDWIDTH FOR MIDDLE CHANNEL



### TEST PLOT OF BANDWIDTH FOR HIGH CHANNEL



## 9. CONDUCTED SPURIOUS EMISSION

### 9.1. MEASUREMENT PROCEDURE

1. Connect EUT RF output port to the Spectrum Analyzer through an RF attenuator
2. Set the EUT Work on the top, the Middle and the bottom operation frequency individually.
3. Set the Span = wide enough to capture the peak level of the in-band emission and all spurious emissions from the lowest frequency generated in the EUT up through the 10th harmonic.  
RBW = 100 kHz; VBW= 300 kHz; Sweep = auto; Detector function = peak.
4. Set SPA Trace 1 Max hold, then View.

### 9.2. TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)

The same as described in section 8.2

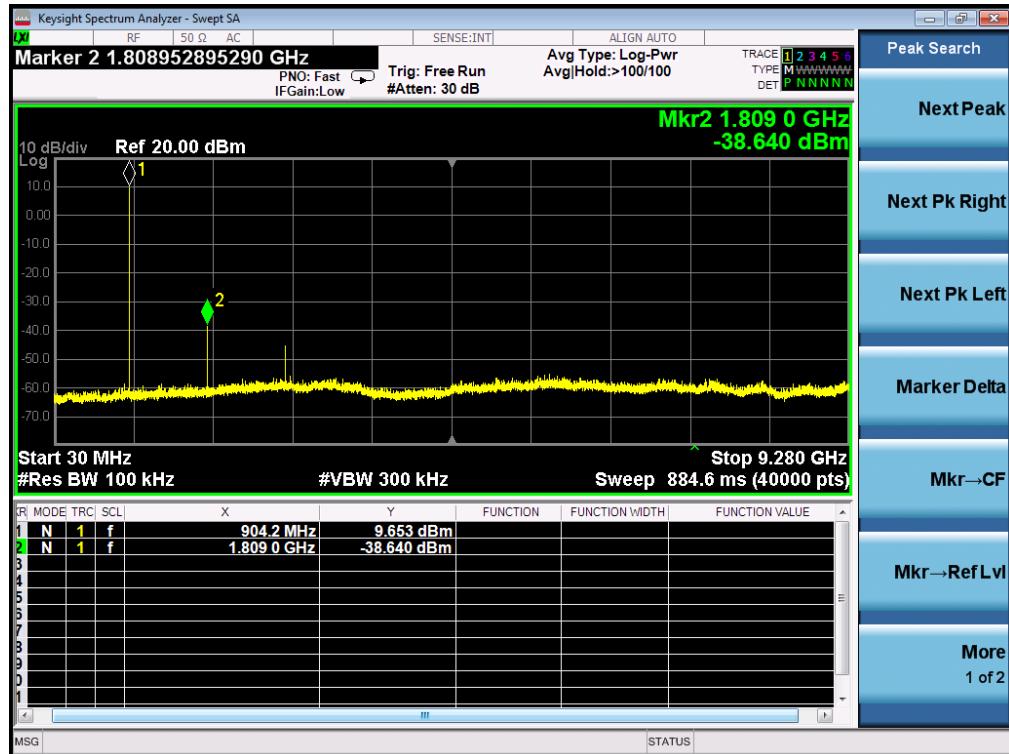
### 9.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

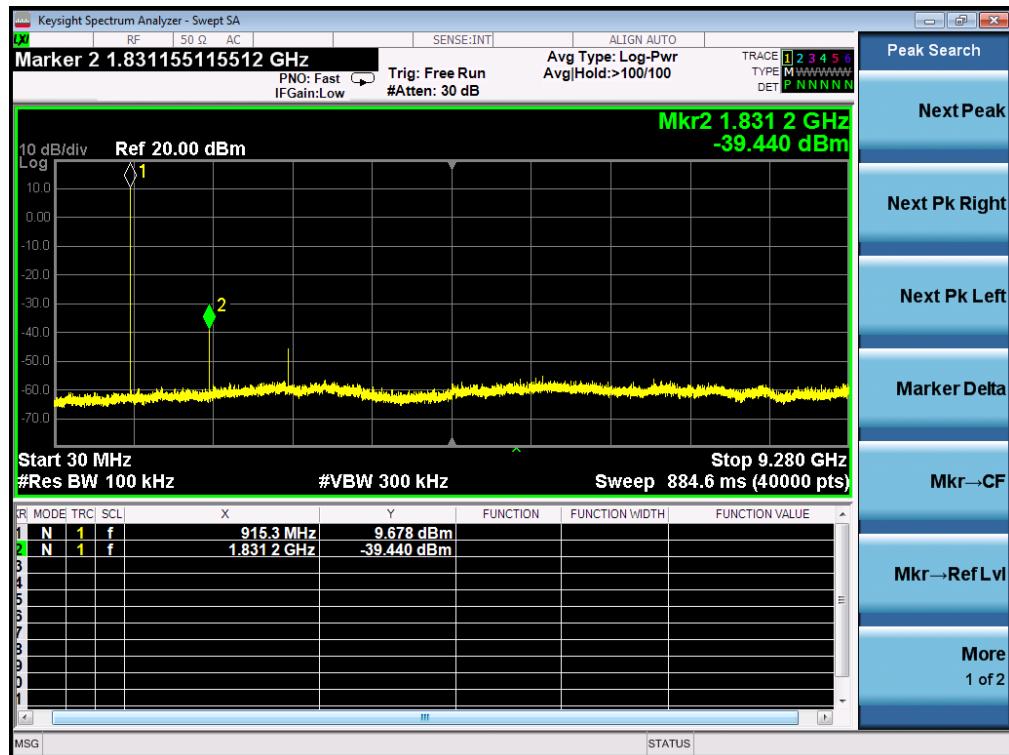
### 9.4. LIMITS AND MEASUREMENT RESULT

LIMITS AND MEASUREMENT RESULT		
Applicable Limits	Measurement Result	
	Test Data	Criteria
In any 100 KHz Bandwidth Outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produce by the intentional radiator shall be at least 20 dB below that in 100KHz bandwidth within the band that contains the highest level of the desired power. In addition, radiation emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in§15.209(a)	At least -20dBc than the limit Specified on the BOTTOM Channel	PASS
	At least -20dBc than the limit Specified on the TOP Channel	PASS

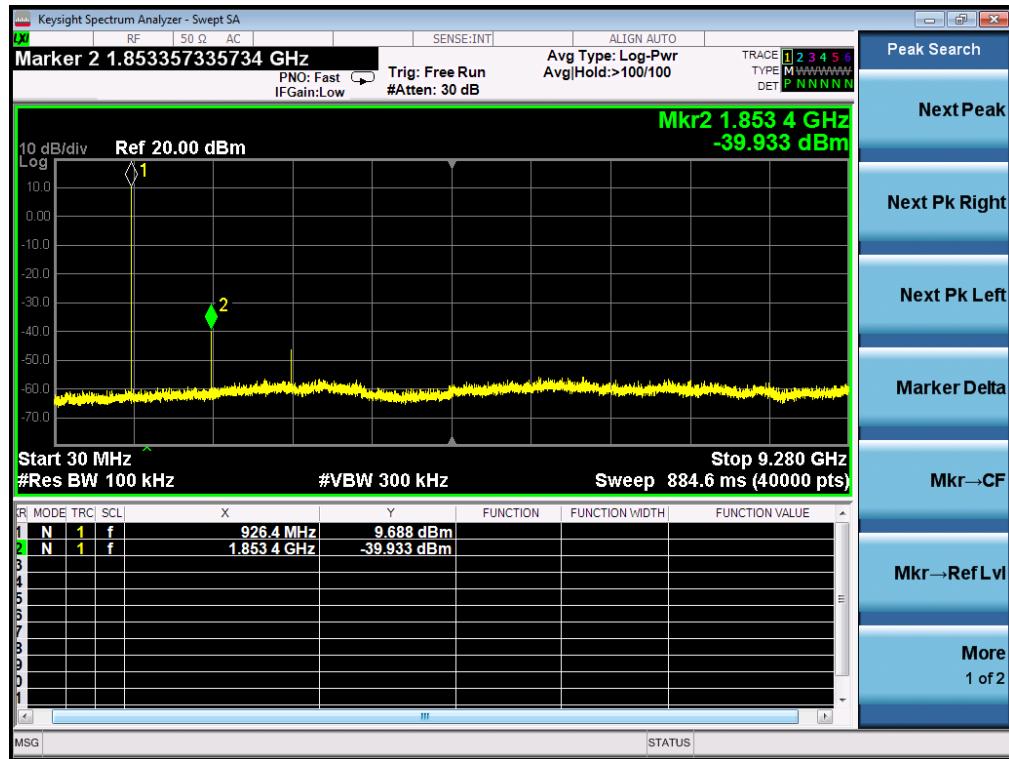
**TEST RESULT FOR ENTIRE FREQUENCY RANGE**  
**GFSK MODULATION IN LOW CHANNEL**



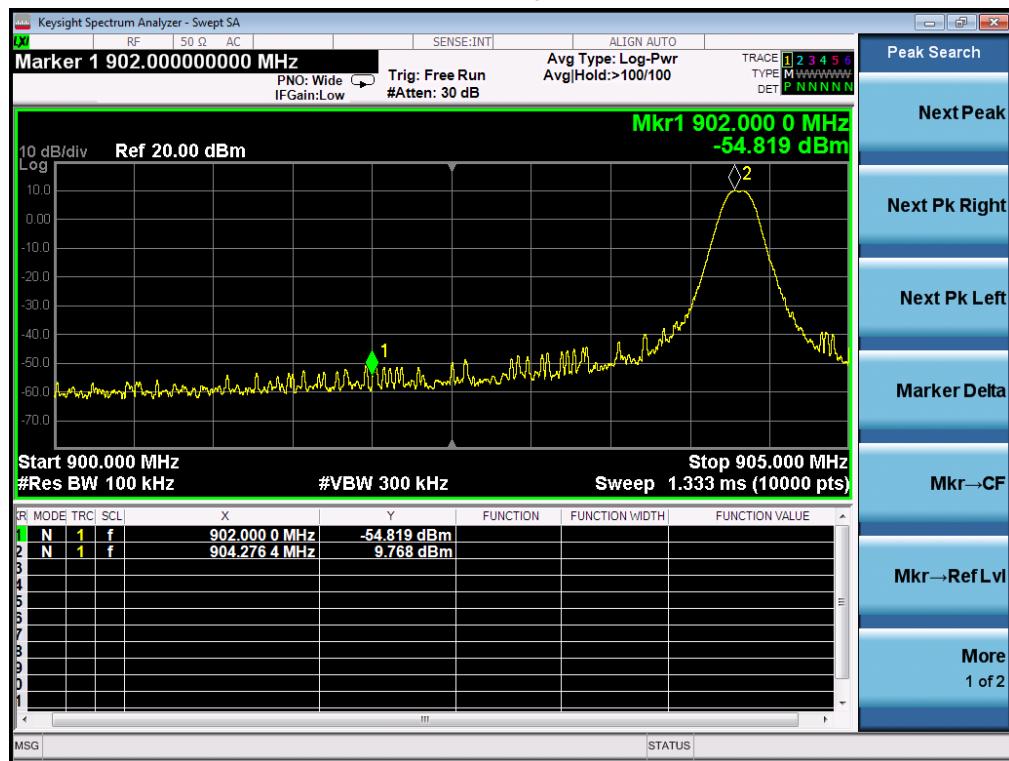
**GFSK MODULATION IN MIDDLE CHANNEL**



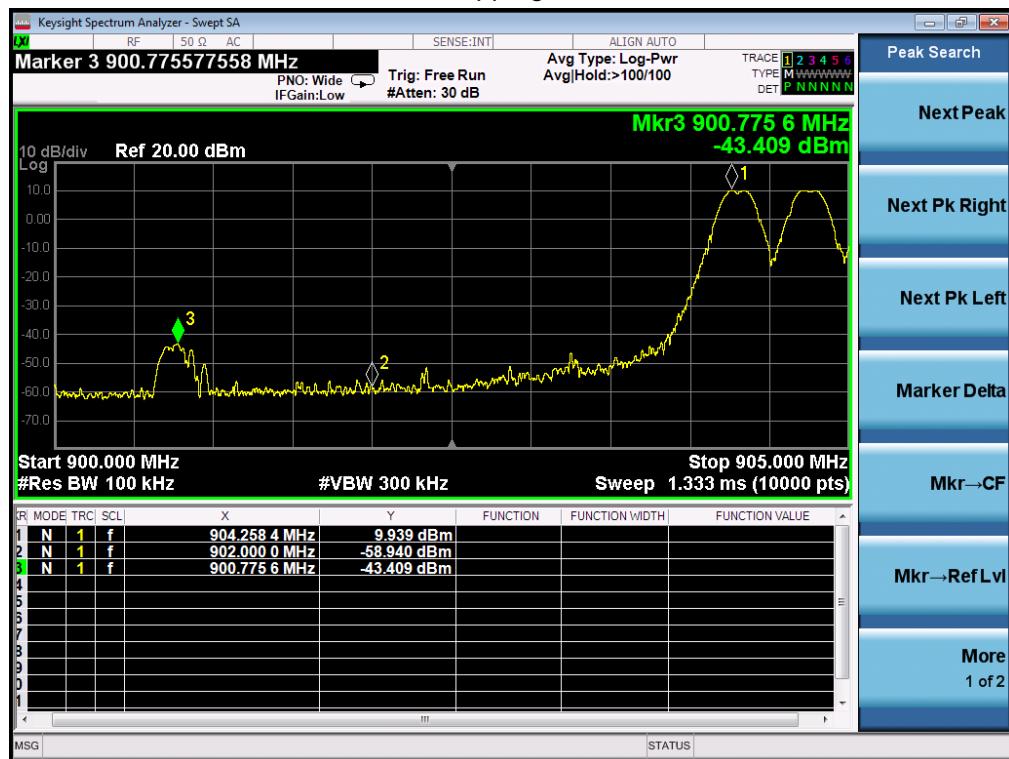
GFSK MODULATION IN HIGH CHANNEL



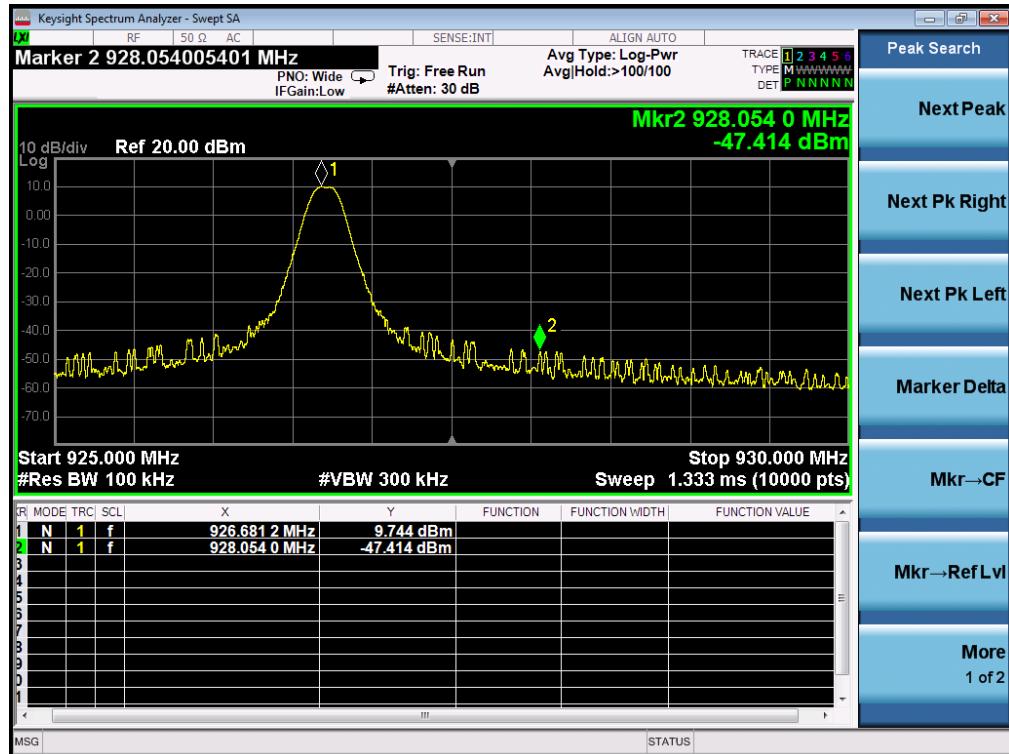
**TEST RESULT FOR BAND EDGE**  
**GFSK MODULATION IN LOW CHANNEL**  
**Hopping off**



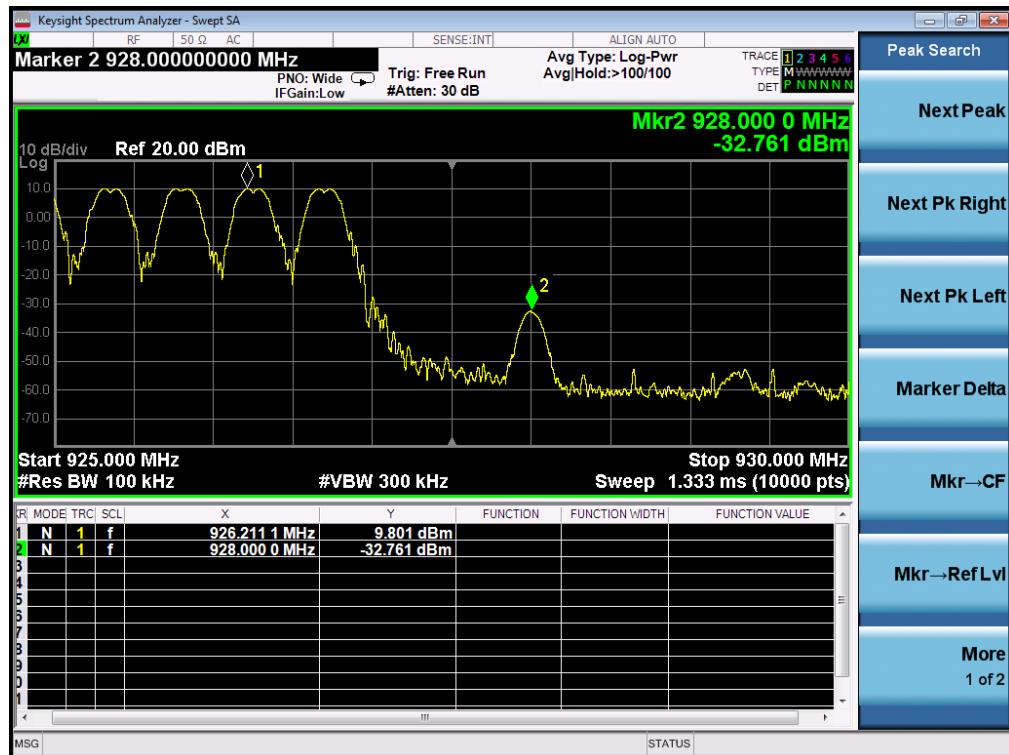
**Hopping on**



# GFSK MODULATION IN HIGH CHANNEL Hopping off



## Hopping on



## 10. RADIATED EMISSION

### 10.1. MEASUREMENT PROCEDURE

1. The EUT was placed on the top of the turntable 0.8 or 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer. Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum values.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High - Low scan is not required in this case.

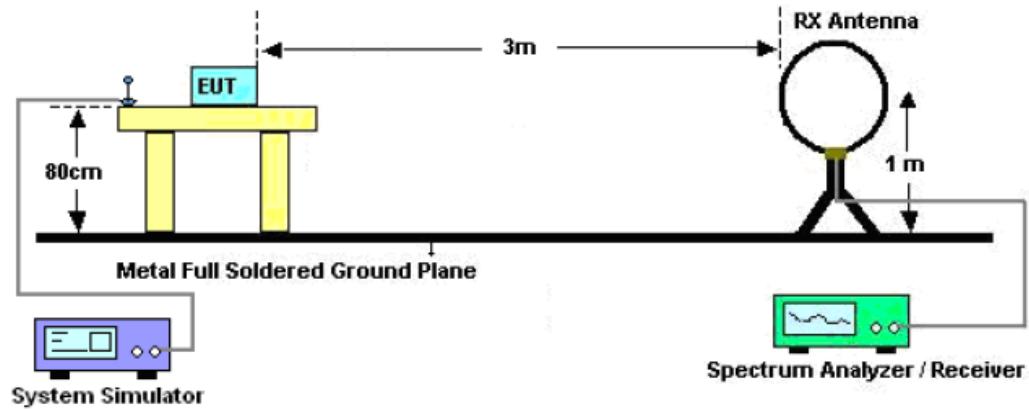
The following table is the setting of spectrum analyzer and receiver.

<b>Spectrum Parameter</b>	<b>Setting</b>
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP
Start ~Stop Frequency	1GHz~26.5GHz 1MHz/3MHz for Peak, 1MHz/10Hz for Average

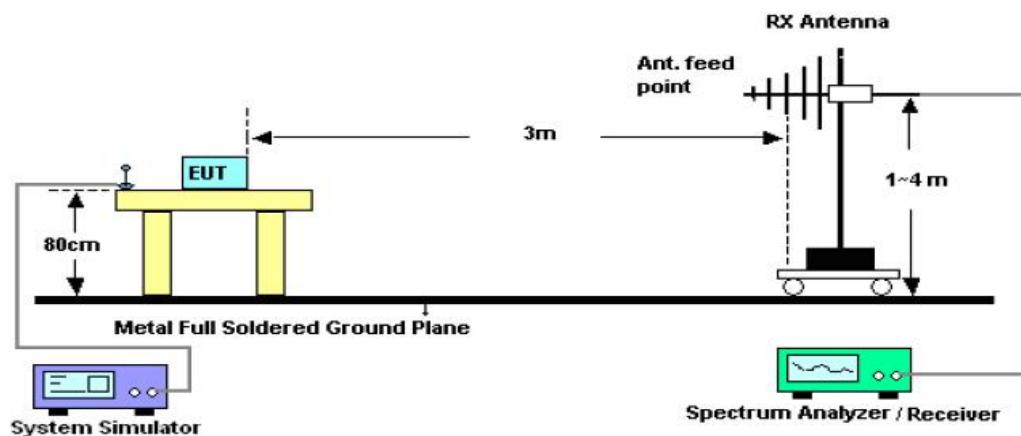
<b>Receiver Parameter</b>	<b>Setting</b>
Start ~Stop Frequency	9KHz~150KHz/RB 200Hz for QP
Start ~Stop Frequency	150KHz~30MHz/RB 9KHz for QP
Start ~Stop Frequency	30MHz~1000MHz/RB 120KHz for QP

## 10.2. TEST SETUP

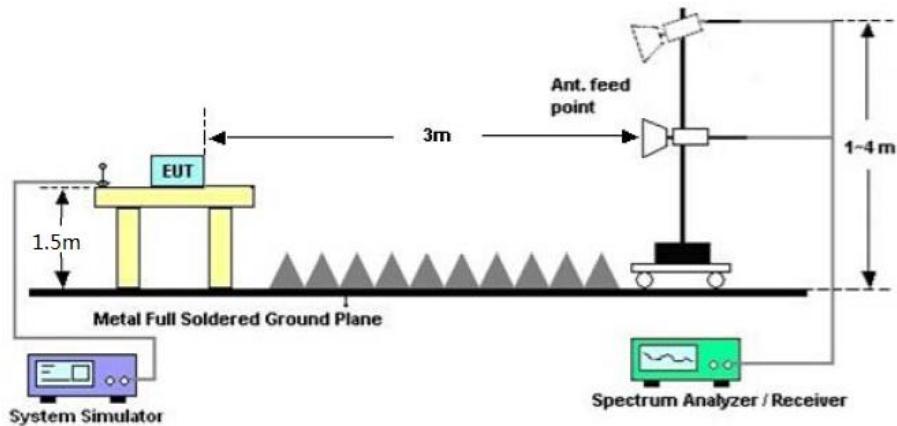
### Radiated Emission Test-Setup Frequency Below 30MHz



### RADIATED EMISSION TEST SETUP 30MHz-1000MHz



### RADIATED EMISSION TEST SETUP ABOVE 1000MHz



### 10.3. LIMITS AND MEASUREMENT RESULT

15.209(a) Limit in the below table has to be followed

<b>Frequencies (MHz)</b>	<b>Field Strength (micorvolts/meter)</b>	<b>Measurement Distance (meters)</b>
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

Note: All modes were tested For restricted band radiated emission,  
the test records reported below are the worst result compared to other modes.

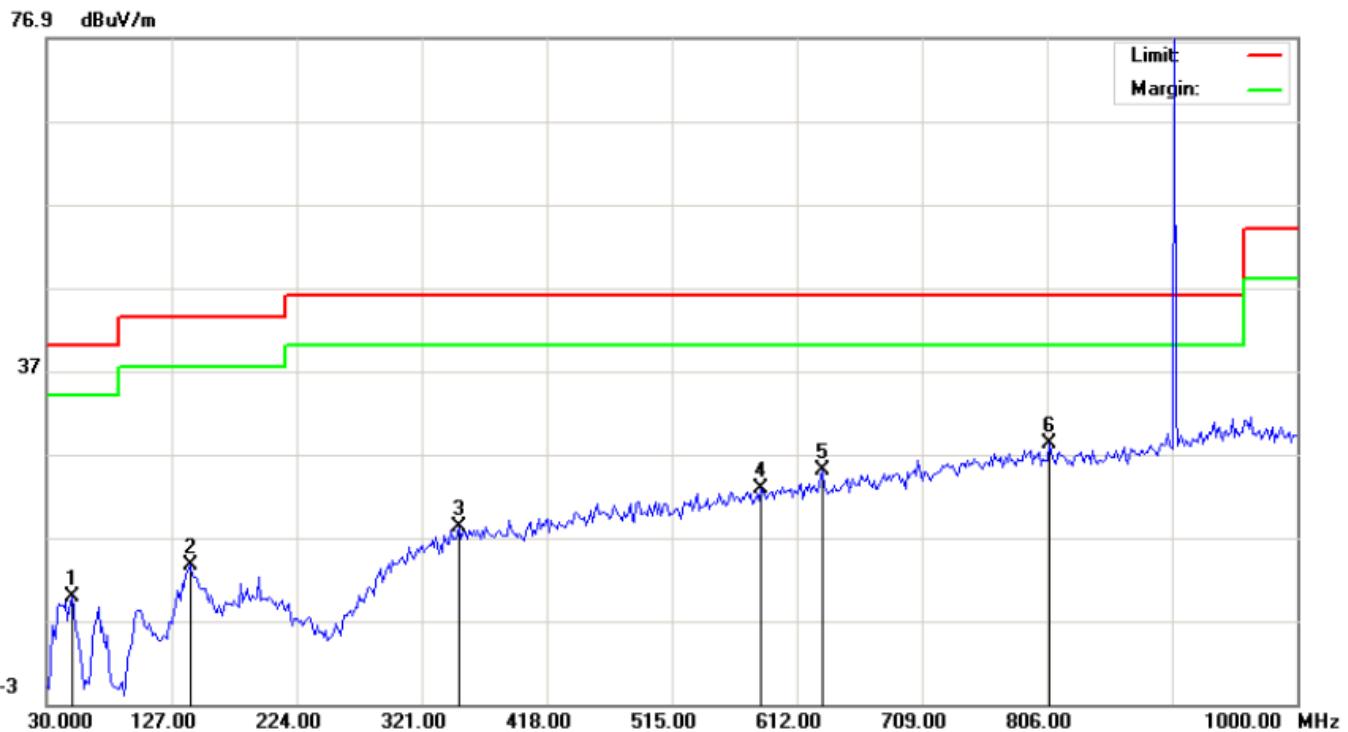
### 10.4. TEST RESULT

#### RADIATED EMISSION BELOW 30MHZ

No emission found between lowest internal used/generated frequencies to 30MHz.

RADIATED EMISSION BELOW 1GHZ

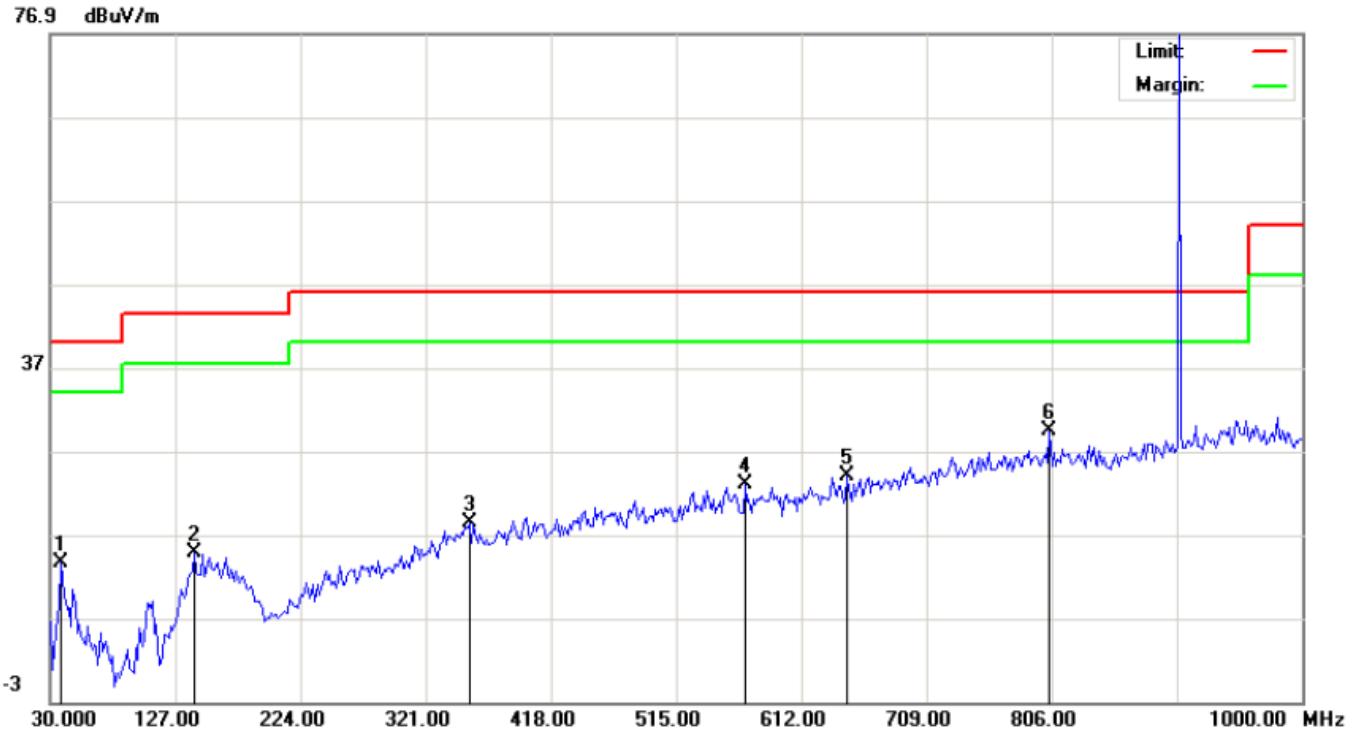
<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Horizontal



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		49.4000	-1.38	11.28	9.90	40.00	-30.10	peak			
2		141.5500	-1.23	14.82	13.59	43.50	-29.91	peak			
3		350.1000	-0.61	18.74	18.13	46.00	-27.87	peak			
4		584.5167	-0.63	23.34	22.71	46.00	-23.29	peak			
5		631.4000	1.24	23.81	25.05	46.00	-20.95	peak			
6	*	807.6167	0.95	27.32	28.27	46.00	-17.73	peak			

**RESULT: PASS**

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Vertical



No.	Mk	Freq.	Reading	Factor	Measurement	Limit	Over	Detector	Antenna Height	Table Degree	Comment
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB		cm	degree	
1		38.0833	7.31	6.39	13.70	40.00	-26.30	peak			
2		141.5500	-0.40	15.21	14.81	43.50	-28.69	peak			
3		354.9500	-0.43	18.77	18.34	46.00	-27.66	peak			
4		568.3500	0.35	22.57	22.92	46.00	-23.08	peak			
5		647.5667	0.23	23.80	24.03	46.00	-21.97	peak			
6	*	804.3833	2.13	27.32	29.45	46.00	-16.55	peak			

## RESULT: PASS

### Note:

1. Factor=Antenna Factor + Cable loss, Margin=Measurement-Limit.
2. The "Factor" value can be calculated automatically by software of measurement system.
3. All test modes had been pre-tested. The mode 1 is the worst case and recorded in the report.

**RADIATED EMISSION ABOVE 1GHZ**

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
1808.612	68.15	-12.18	55.97	74	-18.03	peak
1808.612	60.24	-12.18	48.06	54	-5.94	AVG
2712.918	60.16	-6.74	53.42	74	-20.58	peak
2712.918	52.44	-6.74	45.7	54	-8.3	AVG

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

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 1	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
1808.612	67.24	-12.18	55.06	74	-18.94	peak
1808.612	59.83	-12.18	47.65	54	-6.35	AVG
2712.918	59.75	-6.74	53.01	74	-20.99	peak
2712.918	51.66	-6.74	44.92	54	-9.08	AVG

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

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
1831.013	70.24	-12.04	58.2	74	-15.8	peak
1831.013	61.15	-12.04	49.11	54	-4.89	AVG
2746.518	60.68	-6.72	53.96	74	-20.04	peak
2746.518	51.74	-6.72	45.02	54	-8.98	AVG

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 2	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
1831.013	69.53	-12.04	57.49	74	-16.51	peak
1831.013	60.61	-12.04	48.57	54	-5.43	AVG
2746.518	58.84	-6.72	52.12	74	-21.88	peak
2746.518	49.95	-6.72	43.23	54	-10.77	AVG

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna</b>	Horizontal

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
1853.412	71.05	-11.96	59.09	74	-14.91	peak
1853.412	62.33	-11.96	50.37	54	-3.63	AVG
2780.116	63.39	-6.68	56.71	74	-17.29	peak
2780.116	54.42	-6.68	47.74	54	-6.26	AVG
<b>Remark:</b>						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

<b>EUT</b>	PASSIVE COACH	<b>Model Name</b>	PC-01
<b>Temperature</b>	25°C	<b>Relative Humidity</b>	55.4%
<b>Pressure</b>	960hPa	<b>Test Voltage</b>	Normal Voltage
<b>Test Mode</b>	Mode 3	<b>Antenna</b>	Vertical

Frequency (MHz)	Meter Reading (dB $\mu$ V)	Factor (dB)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Value Type
1853.412	70.04	-11.96	58.08	74	-15.92	peak
1853.412	61.56	-11.96	49.6	54	-4.4	AVG
2780.116	61.12	-6.68	54.44	74	-19.56	peak
2780.116	51.89	-6.68	45.21	54	-8.79	AVG
<b>Remark:</b>						
Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

## RESULT: PASS

### Note:

Other emissions from 1G to 10 GHz are considered as ambient noise. No recording in the test report.

Factor = Antenna Factor + Cable loss - Amplifier gain, Over=Measure-Limit.

The “Factor” value can be calculated automatically by software of measurement system.

All test modes had been pre-tested. The GFSK modulation is the worst case and recorded in the report.

## 11. NUMBER OF HOPPING FREQUENCY

### 11.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: The frequency band of operation. Depending on the number of channels the device supports, it may be necessary to divide the frequency range of operation across multiple spans, to allow the individual channels to be clearly seen.
2. RBW: To identify clearly the individual channels, set the RBW to less than 30% of the channel spacing or the 20 dB bandwidth, whichever is smaller.
3. VBW  $\geq$  RBW. Sweep: Auto. Detector function: Peak. Trace: Max hold.
4. Allow the trace to stabilize.

### 11.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

### 11.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

### 11.4. LIMITS AND MEASUREMENT RESULT

TOTAL NO. OF HOPPING CHANNEL	LIMIT (NO. OF CH)	MEASUREMENT (NO. OF CH)	RESULT
	>=50	51	PASS

TEST PLOT FOR NO. OF TOTAL CHANNELS



## 12. TIME OF OCCUPANCY (DWELL TIME)

### 12.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Zero span, centered on a hopping channel.
2. RBW shall be  $\leq$  channel spacing and where possible RBW should be set  $\gg 1 / T$ , where T is the expected dwell time per channel.
3. Sweep: As necessary to capture the entire dwell time per hopping channel; where possible use a video trigger and trigger delay so that the transmitted signal starts a little to the right of the start of the plot. The trigger level might need slight adjustment to prevent triggering when the system hops on an adjacent channel; a second plot might be needed with a longer sweep time to show two successive hops on a channel.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Repeat the measurement using a longer sweep time to determine the number of hops over the period specified in the requirements. The sweep time shall be equal to, or less than, the period specified in the requirements. Determine the number of hops over the sweep time and calculate the total number of hops in the period specified in the requirements, using the following equation:  
(Number of hops in the period specified in the requirements) = (number of hops on spectrum analyzer)  $\times$  (period specified in the requirements / analyzer sweep time)
7. The average time of occupancy is calculated from the transmit time per hop multiplied by the number of hops in the period specified in the requirements.

### 12.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 8.2

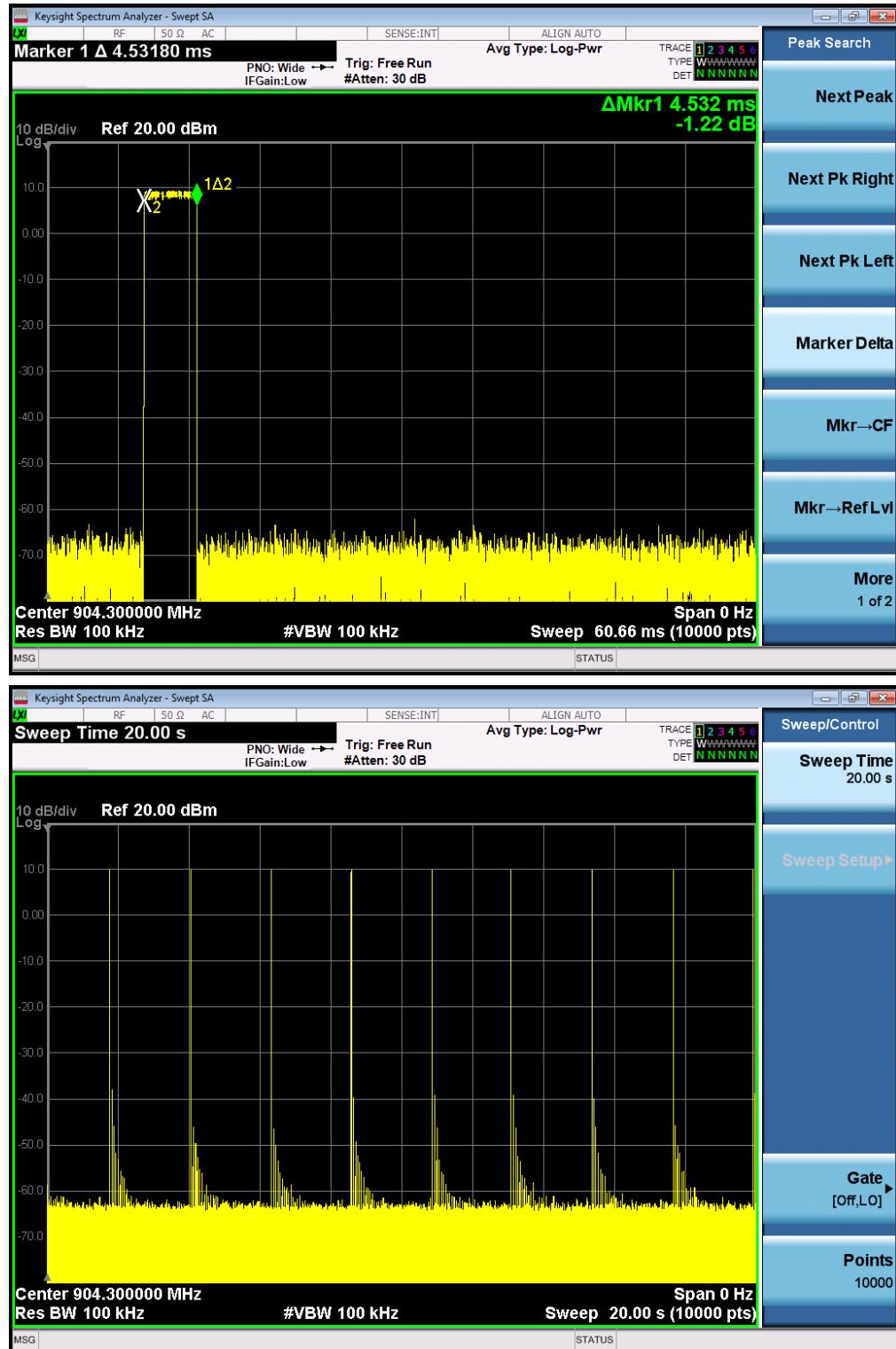
### 12.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

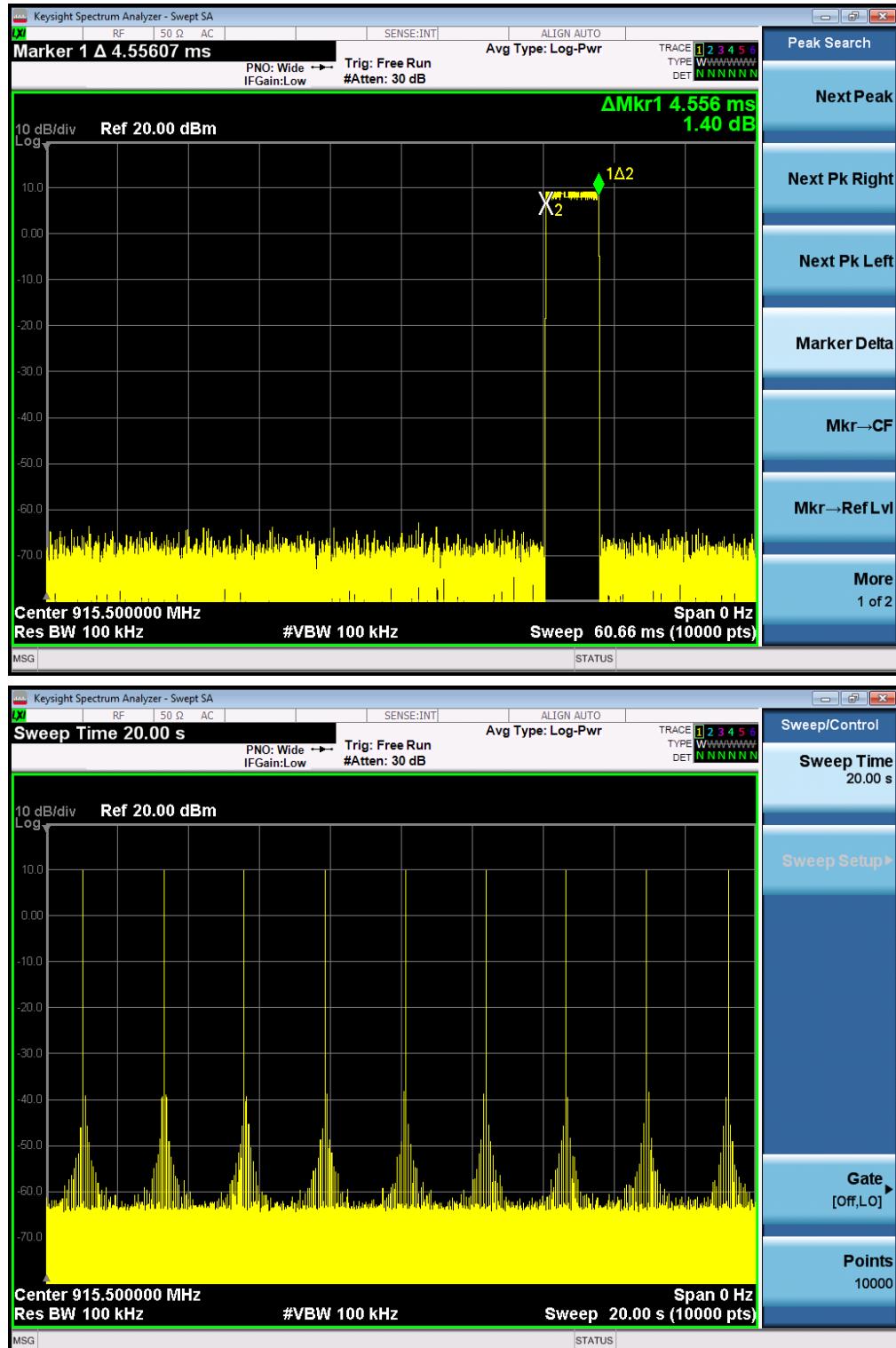
### 12.4. LIMITS AND MEASUREMENT RESULT

Channel	Time of Pulse (ms)	Number of hops in the period specified in the requirements	Sweep Time (ms)	Limit (ms)
Low	4.532	9	40.788	400
Middle	4.556	9	41.004	400
High	4.301	9	38.709	400

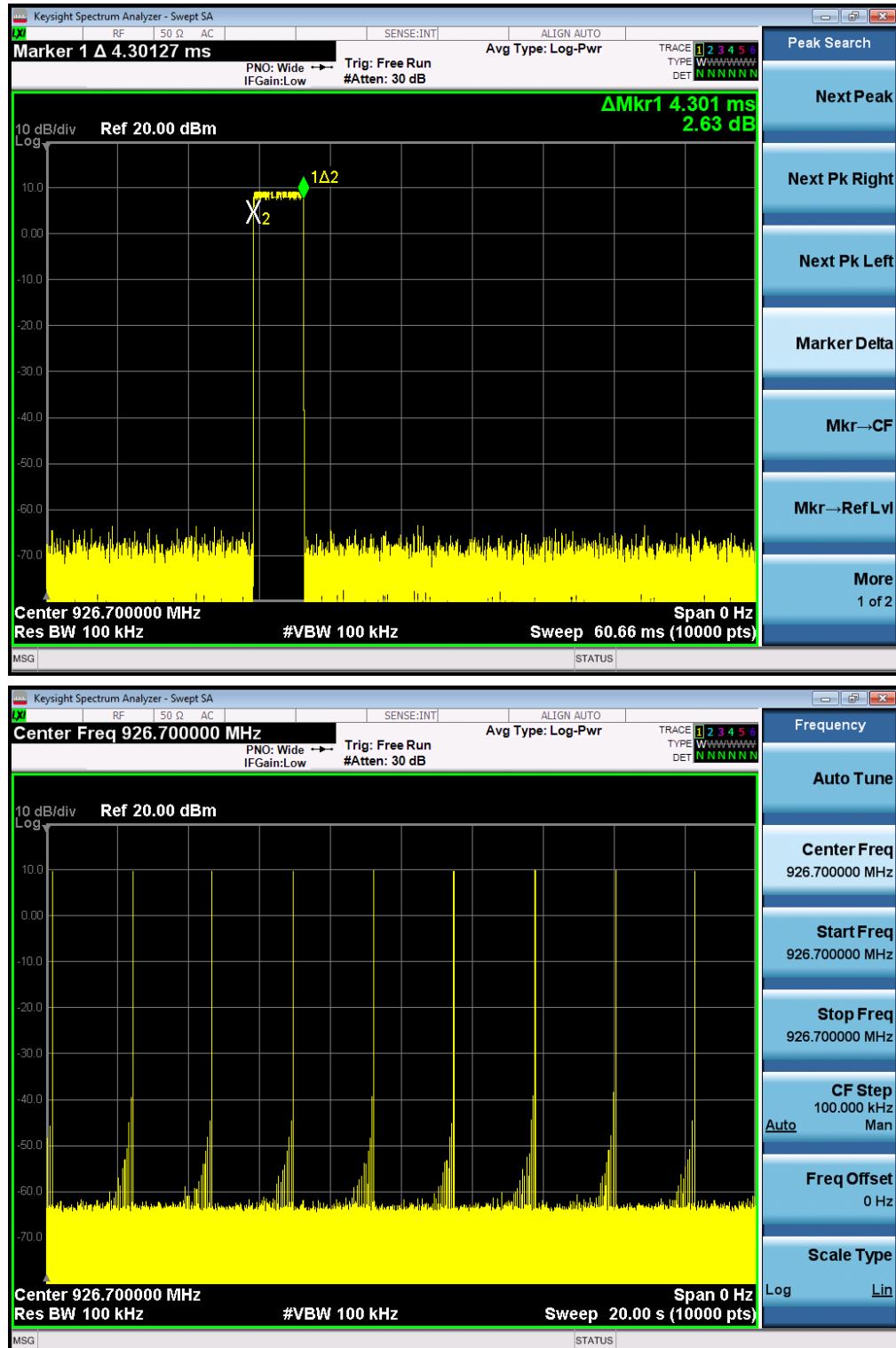
TEST PLOT OF LOW CHANNEL



TEST PLOT OF MIDDLE CHANNEL



TEST PLOT OF HIGH CHANNEL



## 13. FREQUENCY SEPARATION

### 13.1. MEASUREMENT PROCEDURE

The EUT shall have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span: Wide enough to capture the peaks of two adjacent channels.
2. RBW: Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel.
3. Video (or average) bandwidth (VBW)  $\geq$  RBW.
4. Sweep: Auto. e) Detector function: Peak. f) Trace: Max hold. g) Allow the trace to stabilize.

Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

### 13.2. TEST SETUP (BLOCK DIAGRAM OF CONFIGURATION)

Same as described in section 6.2

### 13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6.3

### 13.4. LIMITS AND MEASUREMENT RESULT

CHANNEL	CHANNEL SEPARATION	LIMIT	RESULT
	KHz	KHz	
CH01-CH02	448	$\geq 25$ KHz or 20 dB BW	Pass

TEST PLOT FOR FREQUENCY SEPARATION



## 14. FCC LINE CONDUCTED EMISSION TEST

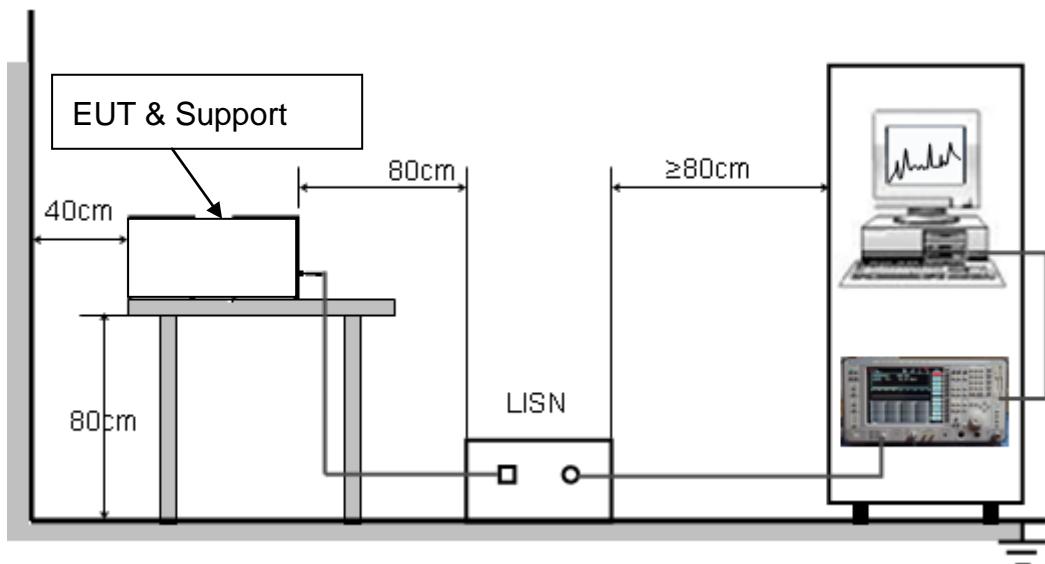
### 14.1. LIMITS OF LINE CONDUCTED EMISSION TEST

Frequency	Maximum RF Line Voltage	
	Q.P. (dBuV)	Average (dBuV)
150kHz~500kHz	66-56	56-46
500kHz~5MHz	56	46
5MHz~30MHz	60	50

Note:

1. The lower limit shall apply at the transition frequency.
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50MHz.

### 14.2. BLOCK DIAGRAM OF LINE CONDUCTED EMISSION TEST



#### **14.3. PRELIMINARY PROCEDURE OF LINE CONDUCTED EMISSION TEST**

1. The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. When 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 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor-standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.
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. All support equipments received AC120V/60Hz power from a LISN, if any.
5. The EUT received charging voltage by adapter which received 120V/60Hz power by a LISN..
6. The 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.
8. During the above scans, the emissions were maximized by cable manipulation.
9. The test mode(s) were scanned during the preliminary test.

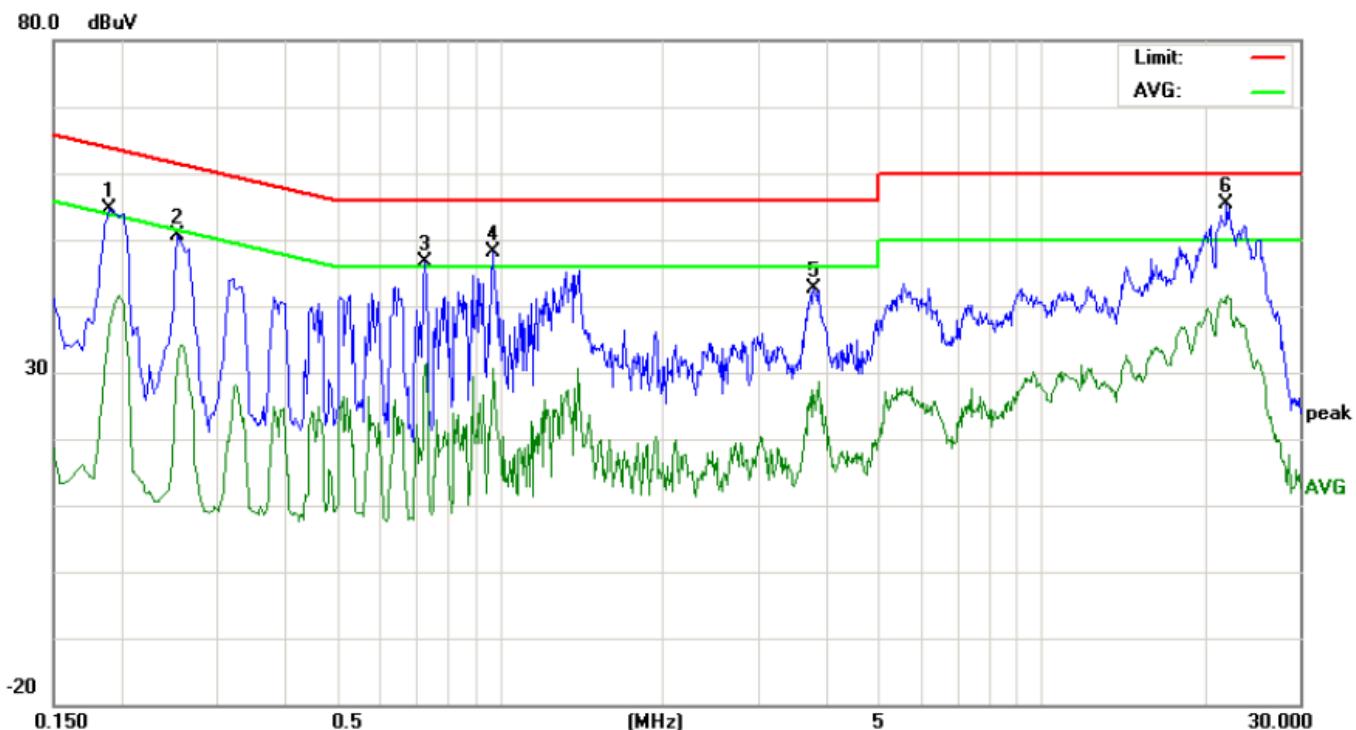
Then, the EUT configuration and cable configuration of the above highest emission level were recorded for reference of final testing.

#### **14.4. FINAL PROCEDURE OF LINE CONDUCTED EMISSION TEST**

1. EUT and support equipment was set up on the test bench as per step 2 of the preliminary test.
2. A scan was taken on both power lines, Line 1 and Line 2, recording at least the six highest emissions. Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit. If EUT emission level was less -2dB to the A.V. limit in Peak mode, then the emission signal was re-checked using Q.P and Average detector.
3. The test data of the worst case condition(s) was reported on the Summary Data page.

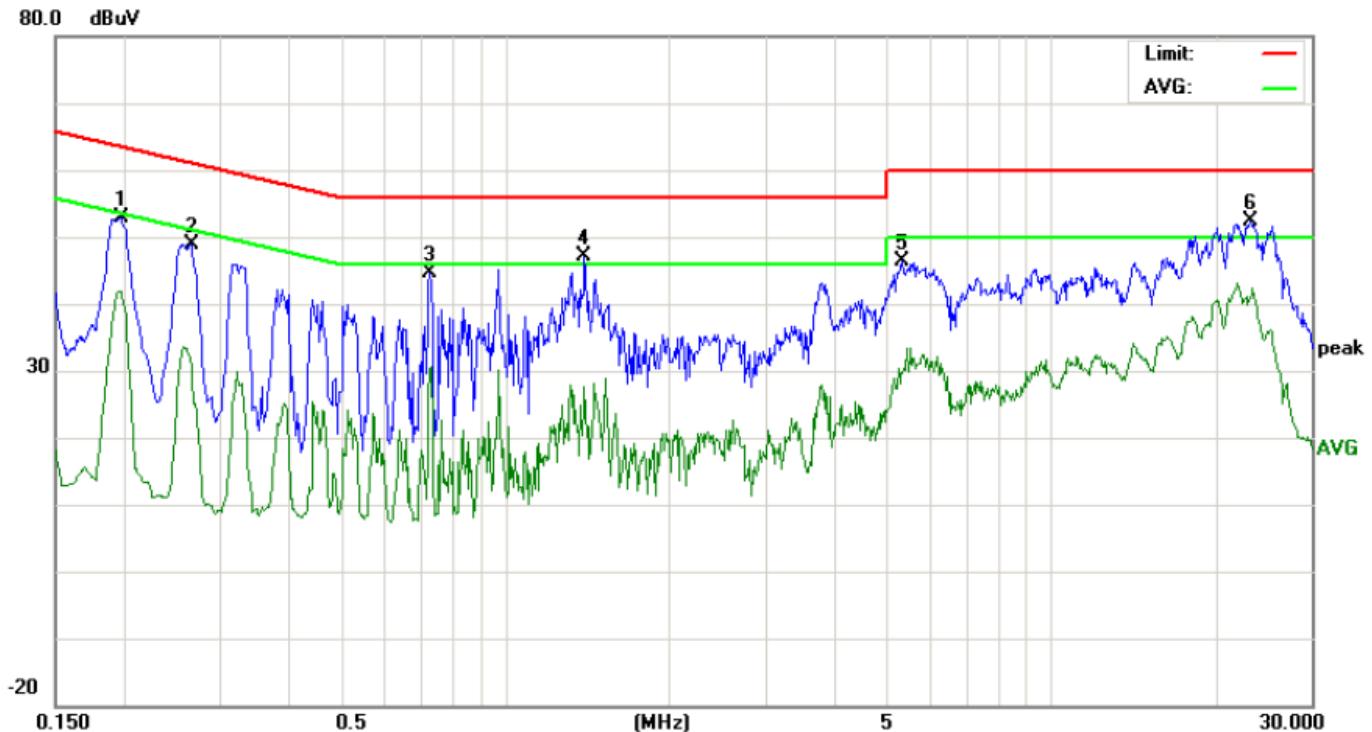
#### 14.5. TEST RESULT OF LINE CONDUCTED EMISSION TEST

##### LINE CONDUCTED EMISSION TEST-L



No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	AVG	QP	AVG	QP	AVG		
1	0.1900	44.32		26.65	10.20	54.52		36.85	64.03	54.03	-9.51	-17.18	P	
2	0.2540	40.39		21.69	10.27	50.66		31.96	61.62	51.62	-10.96	-19.66	P	
3	0.7299	36.21		20.89	10.33	46.54		31.22	56.00	46.00	-9.46	-14.78	P	
4	0.9739	37.67		20.22	10.38	48.05		30.60	56.00	46.00	-7.95	-15.40	P	
5	3.8140	32.23		15.92	10.46	42.69		26.38	56.00	46.00	-13.31	-19.62	P	
6	22.0339	45.23		31.09	10.12	55.35		41.21	60.00	50.00	-4.65	-8.79	P	

LINE CONDUCTED EMISSION TEST-N

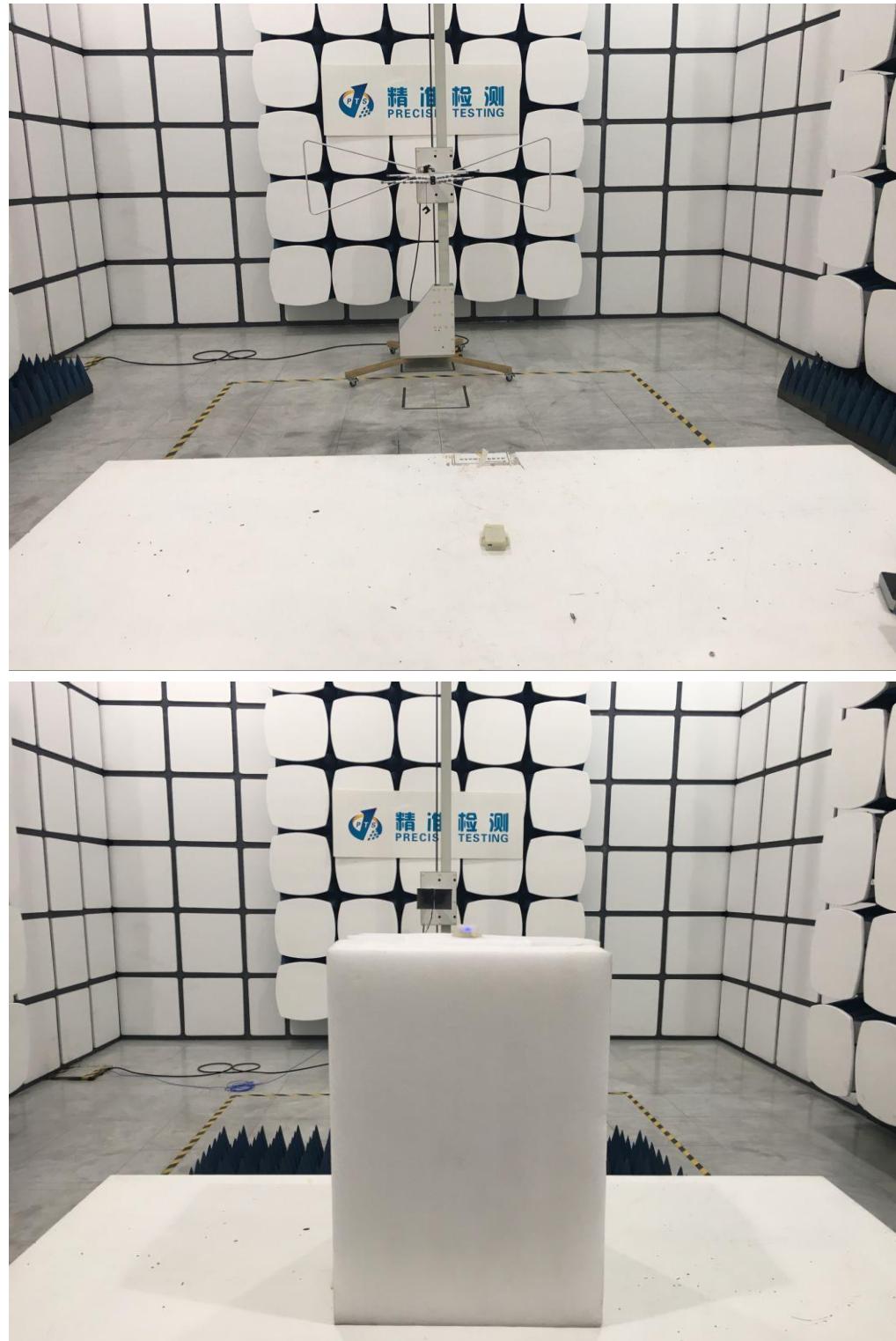


No.	Freq. (MHz)	Reading_Level (dBuV)			Correct Factor	Measurement (dBuV)			Limit (dBuV)		Margin (dB)		P/F	Comment
		Peak	QP	AVG		Peak	QP	Avg	QP	Avg	QP	Avg		
1	0.1980	42.73		31.62	10.21	52.94		41.83	63.69	53.69	-10.75	-11.86	P	
2	0.2660	38.63		20.57	10.28	48.91		30.85	61.24	51.24	-12.33	-20.39	P	
3	0.7299	34.22		20.05	10.33	44.55		30.38	56.00	46.00	-11.45	-15.62	P	
4	1.4019	36.67		17.30	10.38	47.05		27.68	56.00	46.00	-8.95	-18.32	P	
5	5.3578	36.13		19.34	10.25	46.38		29.59	60.00	50.00	-13.62	-20.41	P	
6	23.2139	42.21		30.68	10.11	52.32		40.79	60.00	50.00	-7.68	-9.21	P	

**RESULT: PASS**

Note: The mode 1 is the worst case, and only the data of the worst case recorded in this test report.

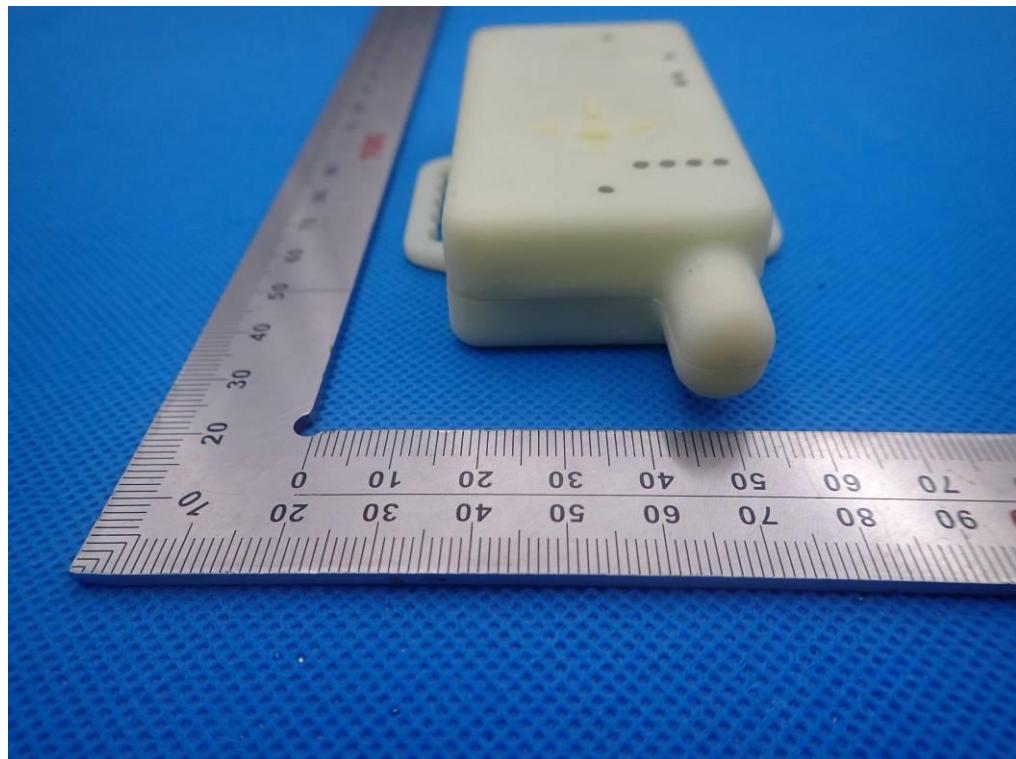
**APPENDIX A: PHOTOGRAPHS OF TEST SETUP**  
**FCC RADIATED EMISSION TEST SETUP**



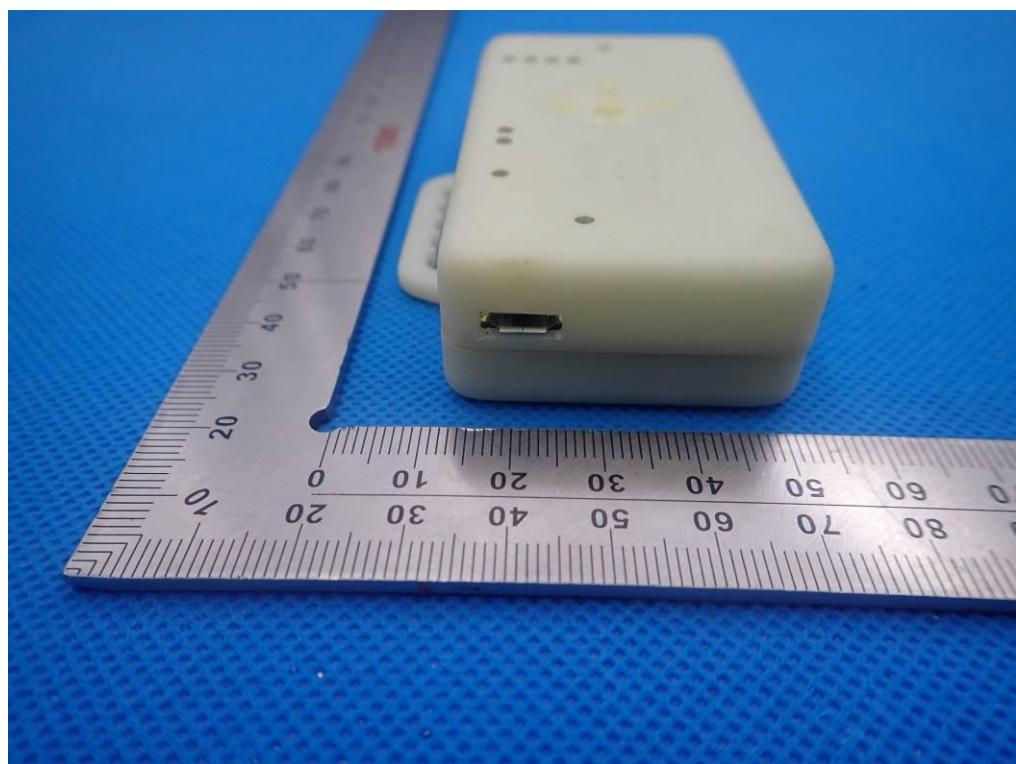
FCC CONDUCTED EMISSION TEST SETUP



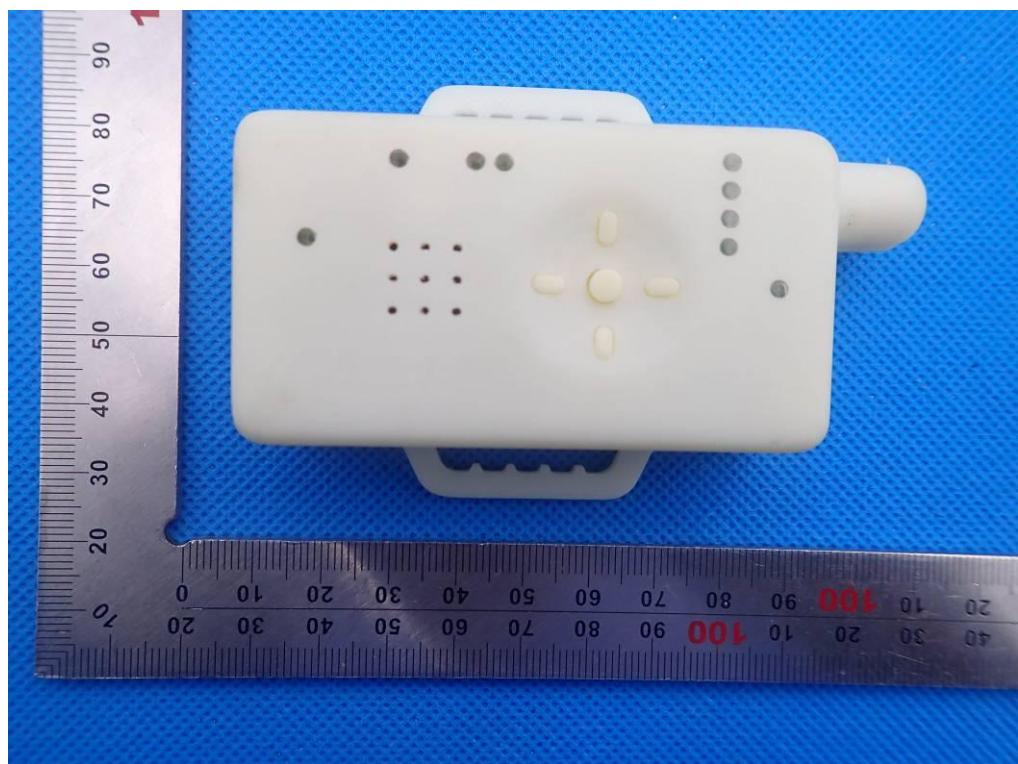
**APPENDIX B: PHOTOGRAPHS OF EUT**  
**TOP VIEW OF EUT**



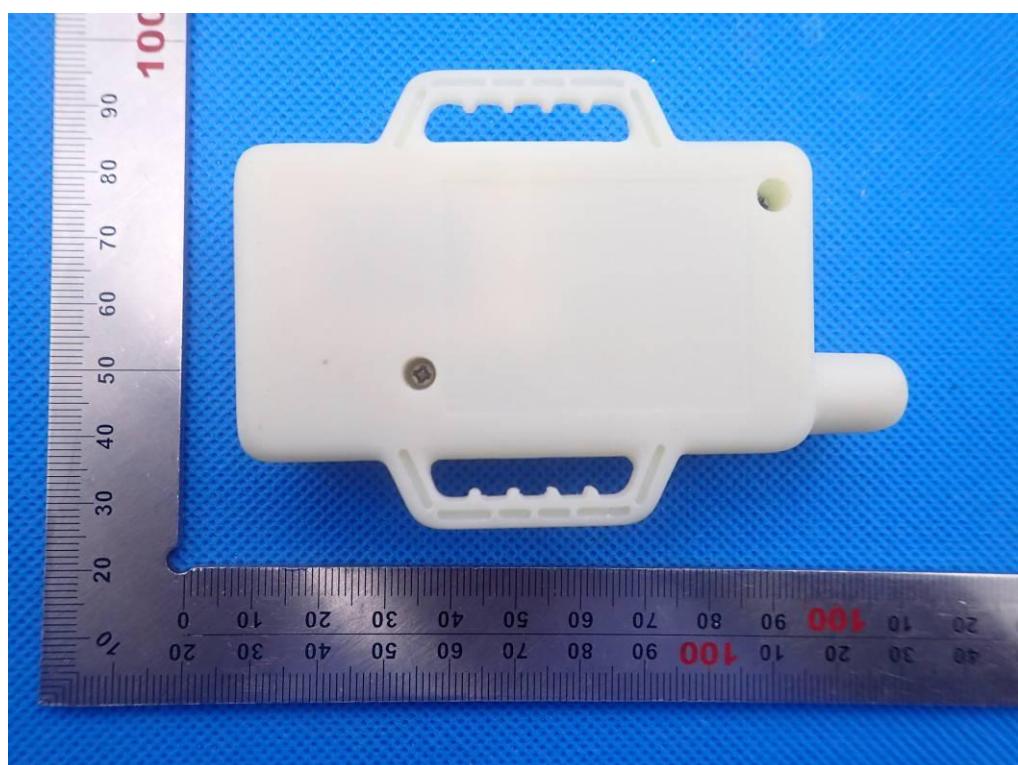
**BOTTOM VIEW OF EUT**



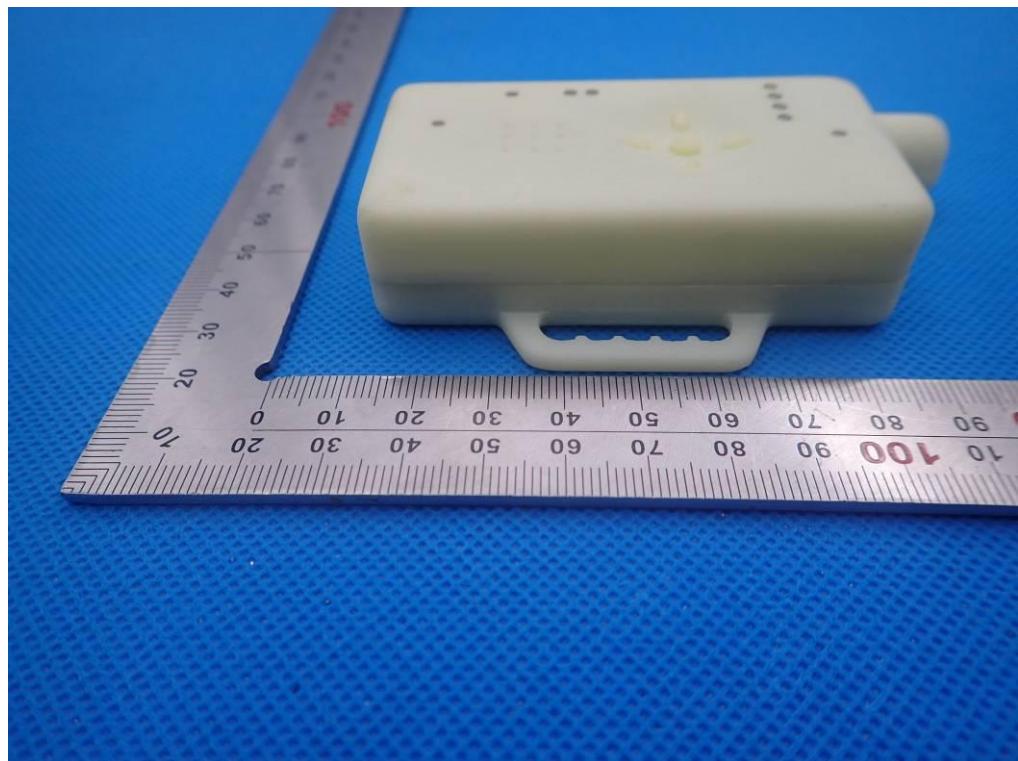
FRONT VIEW OF EUT



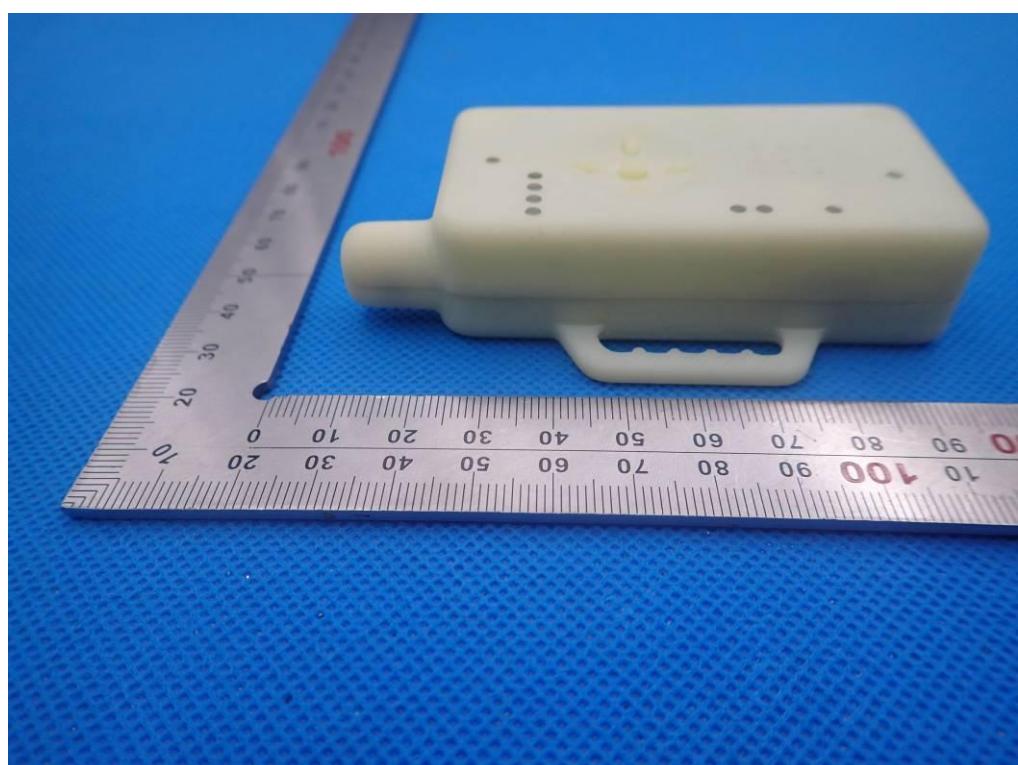
BACK VIEW OF EUT



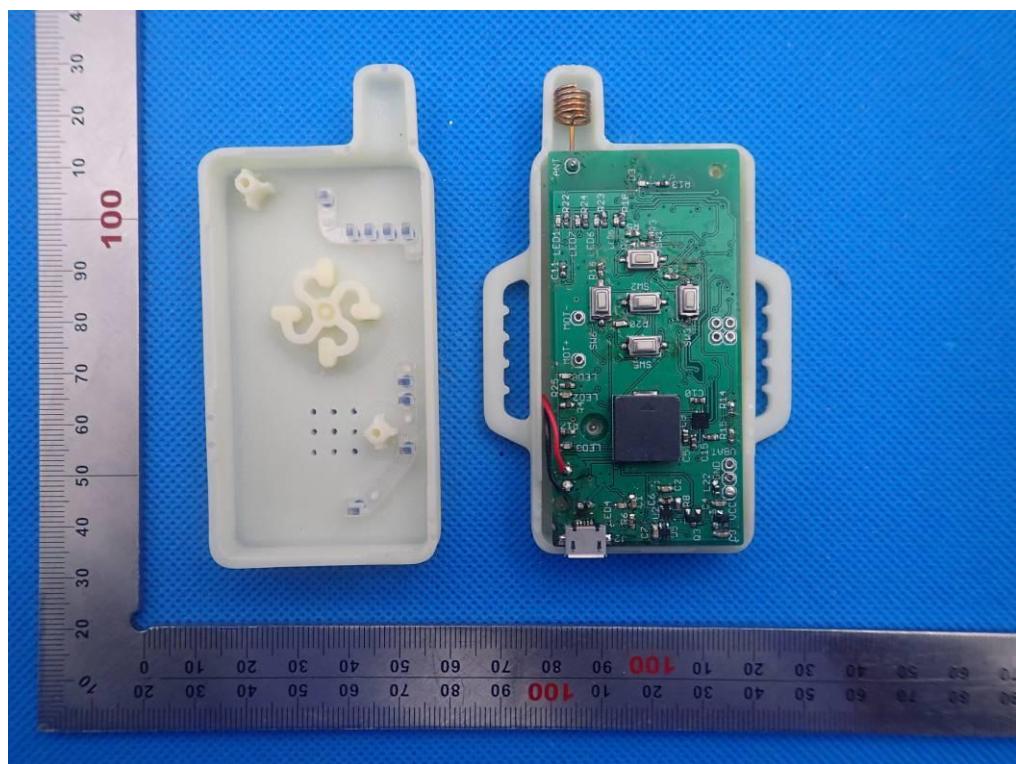
LEFT VIEW OF EUT



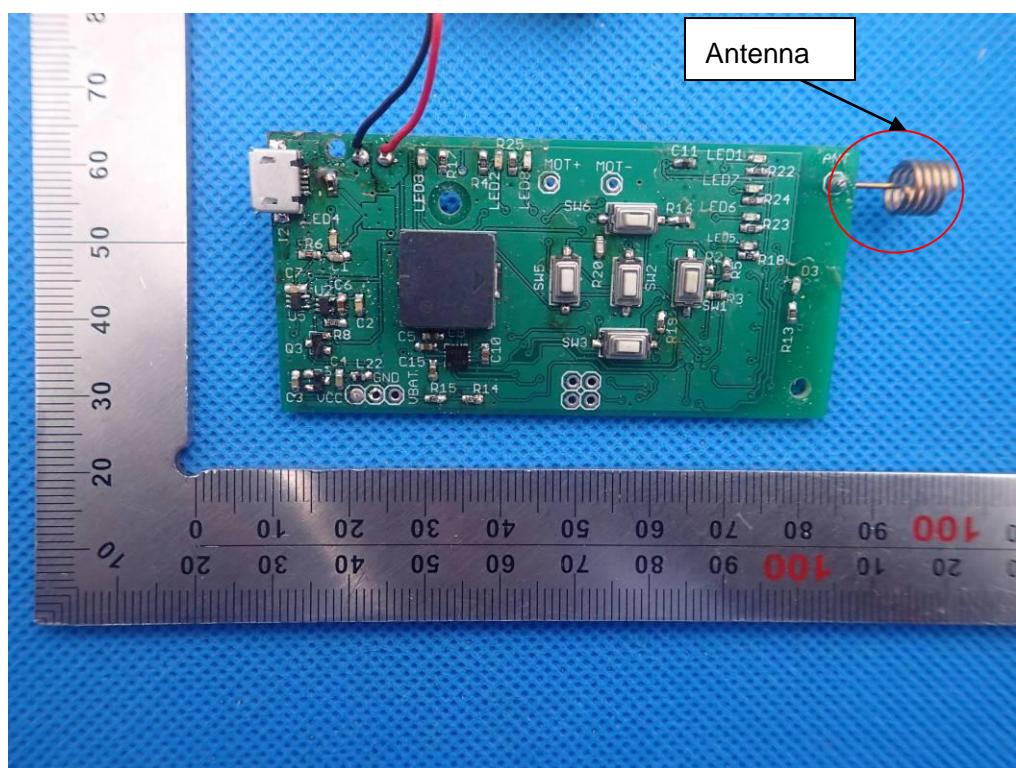
RIGHT VIEW OF EUT



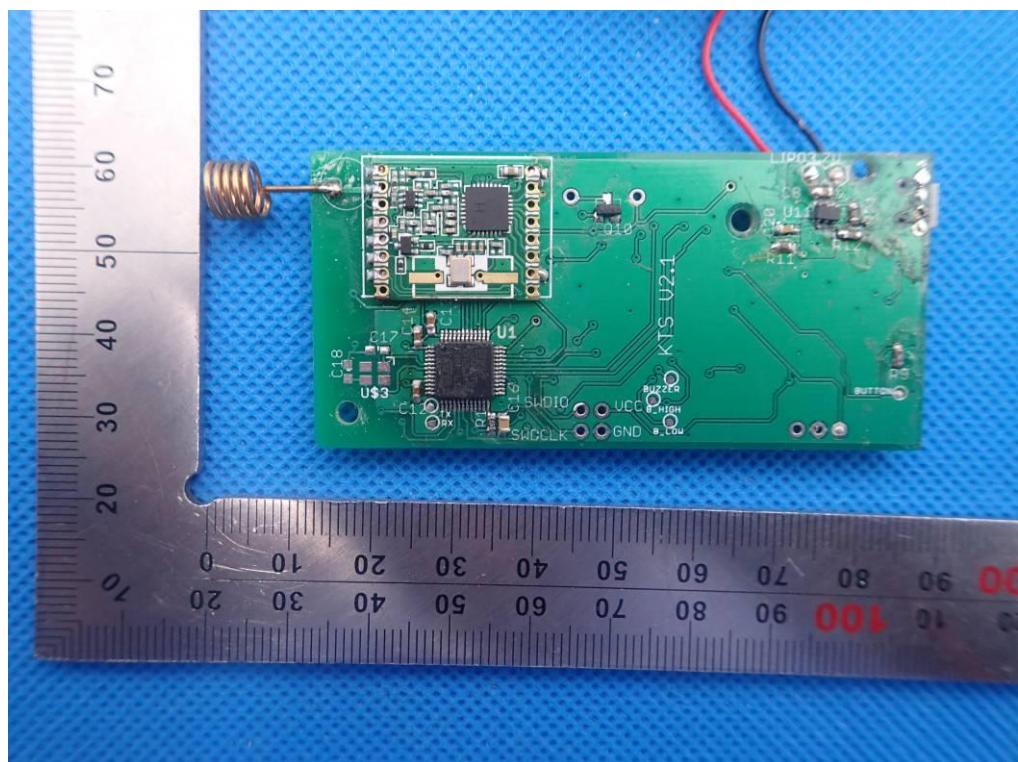
OPEN VIEW OF EUT



INTERNAL VIEW OF EUT-1



INTERNAL VIEW OF EUT-2



INTERNAL VIEW OF EUT-3



----END OF REPORT----