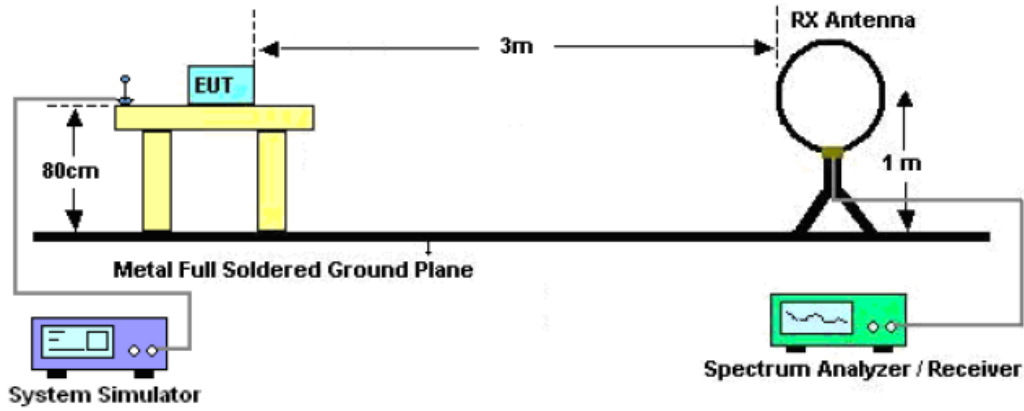
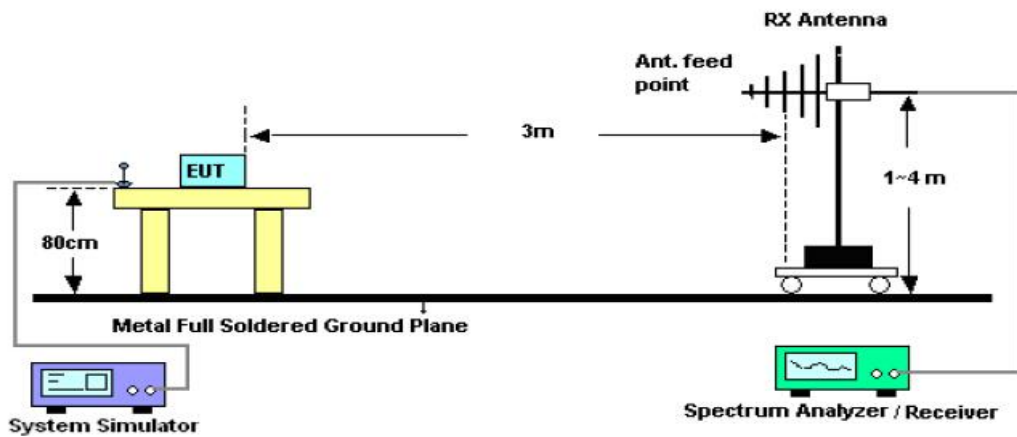


**10.2. TEST SETUP**

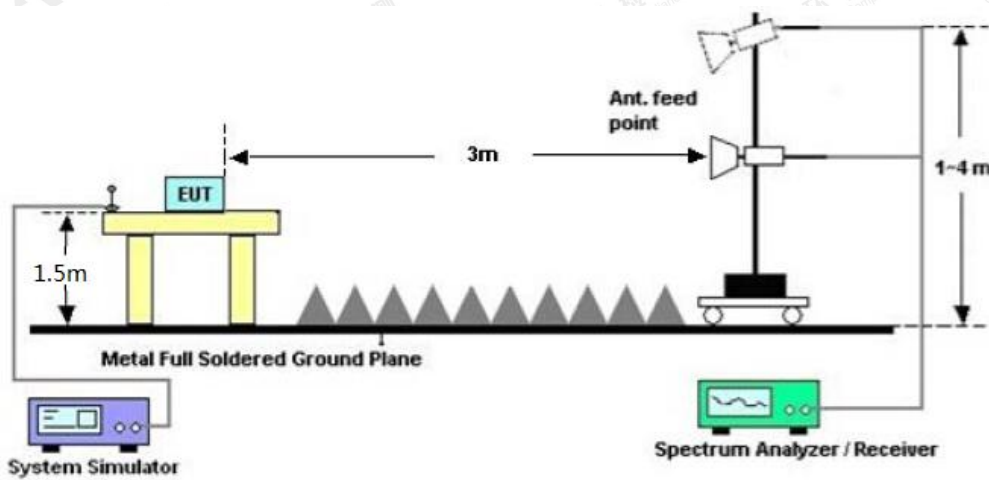
**RADIATED EMISSION TEST-SETUP FREQUENCY BELOW 30MHZ**



**RADIATED EMISSION TEST SETUP 30MHZ-1000MHZ**



**RADIATED EMISSION TEST SETUP ABOVE 1000MHZ**



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### 10.3. LIMITS AND MEASUREMENT RESULT

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

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

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**10.4. TEST RESULT**

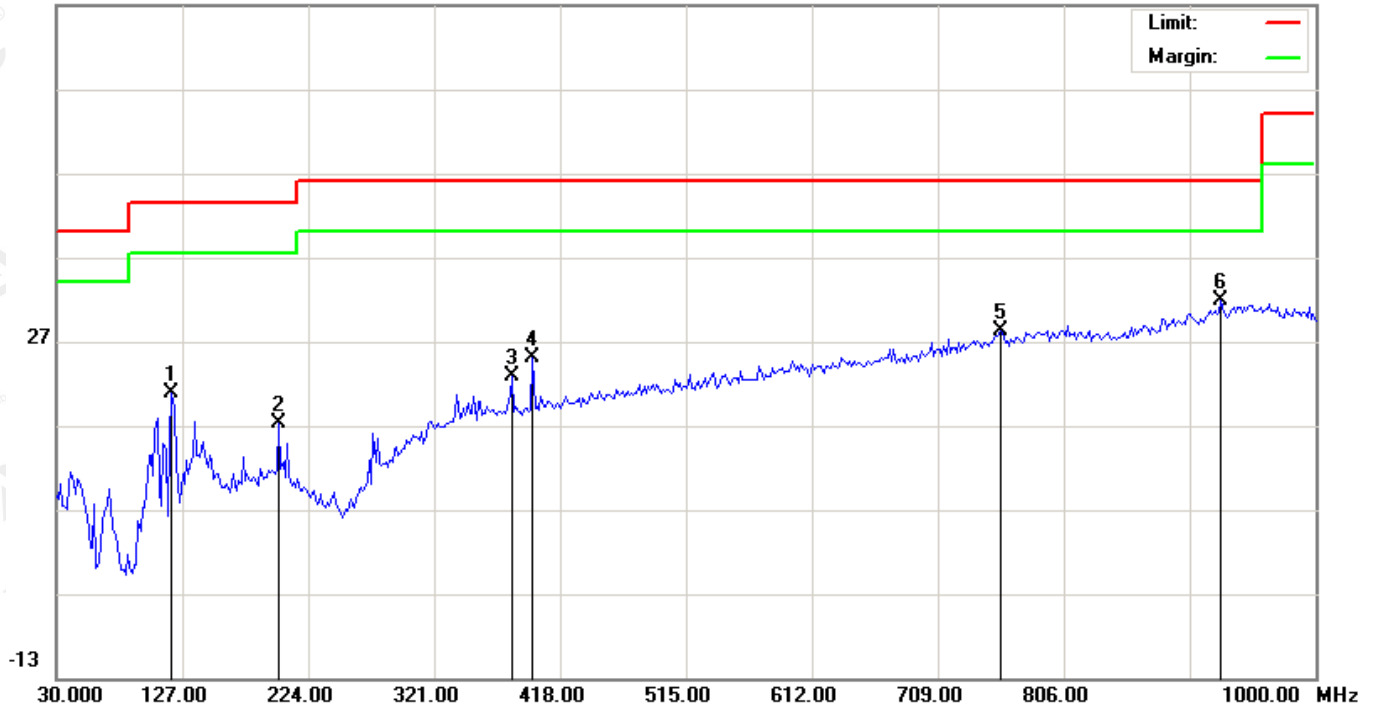
**RADIATED EMISSION BELOW 30MHZ**

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

**RADIATED EMISSION BELOW 1GHZ**

**RADIATED EMISSION TEST- (30MHZ-1GHZ) -HORIZONTAL**

66.9 dBuV/m



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		118.9167	14.78	6.11	20.89	43.50	-22.61	peak			
2		201.3667	5.40	11.86	17.26	43.50	-26.24	peak			
3		380.8167	3.88	18.94	22.82	46.00	-23.18	peak			
4		396.9833	5.95	19.05	25.00	46.00	-21.00	peak			
5		757.5000	1.42	26.73	28.15	46.00	-17.85	peak			
6	*	927.2500	2.38	29.37	31.75	46.00	-14.25	peak			

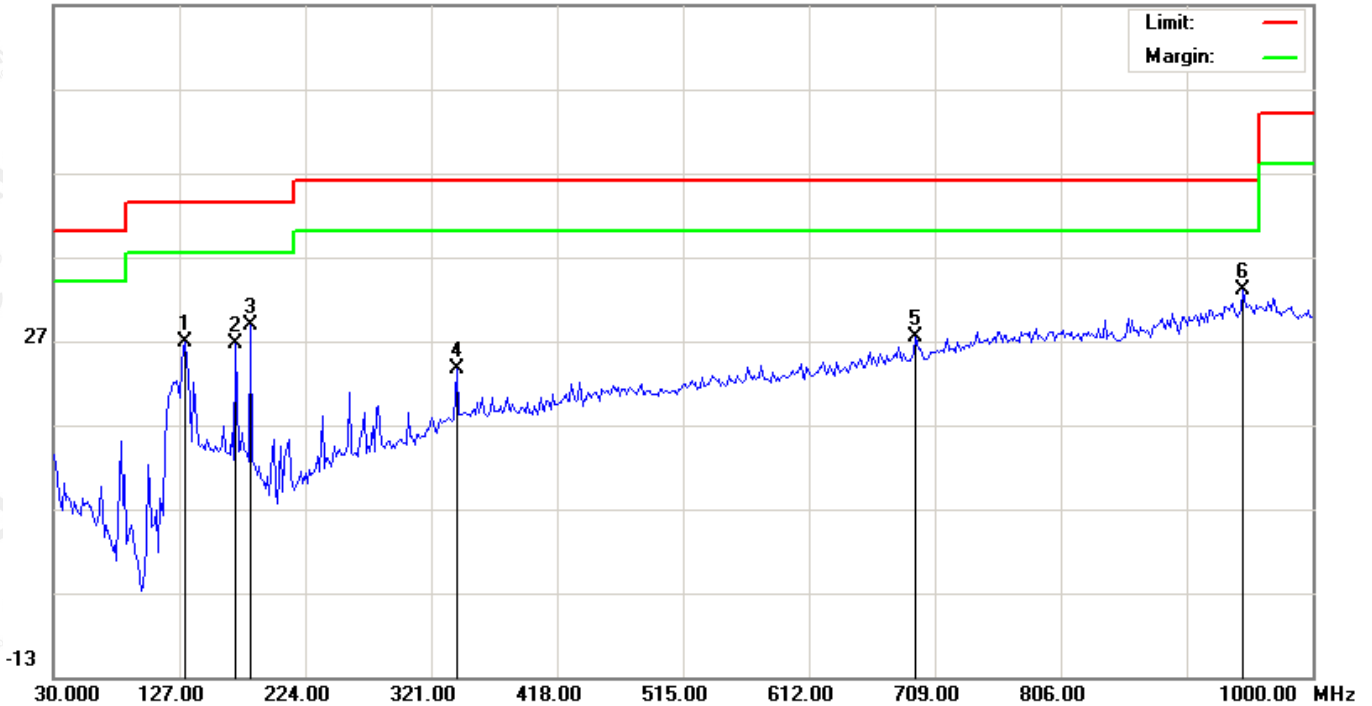
**RESULT: PASS**

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RADIATED EMISSION TEST- (30MHZ-1GHZ) -VERTICAL

66.9 dBuV/m



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		131.8500	15.03	11.80	26.83	43.50	-16.67	peak			
2		170.6500	11.97	14.66	26.63	43.50	-16.87	peak			
3		181.9667	15.28	13.57	28.85	43.50	-14.65	peak			
4		340.4000	5.42	18.10	23.52	46.00	-22.48	peak			
5		694.4500	2.29	25.04	27.33	46.00	-18.67	peak			
6	*	946.6500	3.15	29.91	33.06	46.00	-12.94	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 for different EUT are pre-tested. The low channel for GFSK mode is the worst case and recorded in the report.

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**RADIATED EMISSION TEST- (ABOVE 1GHZ)**

Frequency (MHz)	Emission Level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector Type	Comment
<b>Low Channel (2402 MHz)</b>					
4804	56.32	74	-17.68	Pk	Vertical
4804	41.33	54	-12.67	AV	Vertical
7206	55.06	74	-18.94	Pk	Vertical
7206	40.16	54	-13.84	AV	Vertical
4804	58.10	74	-15.90	Pk	Horizontal
4804	40.32	54	-13.68	AV	Horizontal
7206	57.44	74	-16.56	Pk	Vertical
7206	39.12	54	-14.88	AV	Vertical
<b>Mid Channel (2441 MHz)</b>					
4882	58.56	74	-15.44	Pk	Vertical
4882	40.73	54	-13.27	AV	Vertical
7323	56.49	74	-17.51	Pk	Vertical
7323	38.18	54	-15.82	AV	Vertical
4882	59.52	74	-14.48	Pk	Horizontal
4882	39.58	54	-14.42	AV	Horizontal
7323	58.12	74	-15.88	Pk	Horizontal
7323	38.25	54	-15.75	AV	Horizontal
<b>High Channel (2480 MHz)</b>					
4960	57.12	74	-16.88	Pk	Vertical
4960	41.36	54	-12.64	AV	Vertical
7440	56.46	74	-17.54	Pk	Vertical
7440	40.25	54	-13.75	AV	Vertical
4960	58.56	74	-15.44	Pk	Horizontal
4960	39.42	54	-14.58	AV	Horizontal
7440	57.44	74	-16.56	Pk	Horizontal
7440	38.41	54	-15.59	AV	Horizontal

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**RESULT: PASS**

**Note:**

1. 1GHz~25GHz:(Scan with GFSK,  $\pi/4$ -DQPSK,8DPSK, the worst case is GFSK Mode, No recording in the test report at least have 20dB margin)
2. Margin = Emission Level - Limit

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## 11. BAND EDGE EMISSION

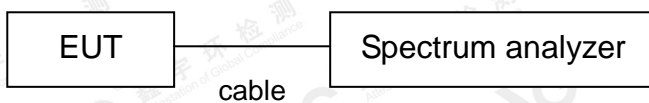
### 11.1. MEASUREMENT PROCEDURE

1. The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100kHz. The video bandwidth is set to 300kHz.
2. Transmitter set to the normal hopping mode at 2.4 and 2.4835 GHz.

### 11.2. TEST SET-UP

Radiated same as 10.2

Conducted set up



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**11.3. RADIATED TEST RESULT**

Frequency (MHz)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type	Comment
GFSK					
2399.9	48.86	74	-25.14	peak	Vertical
2399.9	41.15	54	-12.85	AVG	Vertical
2399.9	49.18	74	-24.82	peak	Horizontal
2399.9	41.10	54	-12.9	AVG	Horizontal
2483.6	49.13	74	-24.87	peak	Vertical
2483.6	42.00	54	-12	AVG	Vertical
2483.6	48.80	74	-25.2	peak	Horizontal
2483.6	40.79	54	-13.21	AVG	Horizontal
π/4-DQPSK					
2399.9	48.33	74	-25.67	peak	Vertical
2399.9	42.06	54	-11.94	AVG	Vertical
2399.9	48.16	74	-25.84	peak	Horizontal
2399.9	41.03	54	-12.97	AVG	Horizontal
2483.6	49.63	74	-24.37	peak	Vertical
2483.6	41.57	54	-12.43	AVG	Vertical
2483.6	48.41	74	-25.59	peak	Horizontal
2483.6	41.23	54	-12.77	AVG	Horizontal
8DPSK					
2399.9	48.23	74	-25.77	peak	Vertical
2399.9	42.84	54	-11.16	AVG	Vertical
2399.9	49.11	74	-24.89	peak	Horizontal
2399.9	42.03	54	-11.97	AVG	Horizontal
2483.6	48.04	74	-25.96	peak	Vertical
2483.6	42.11	54	-11.89	AVG	Vertical
2483.6	48.19	74	-25.81	peak	Horizontal
2483.6	42.18	54	-11.82	AVG	Horizontal

**RESULT: PASS**

**Note:** The other modes radiation emission have enough 20dB margin.

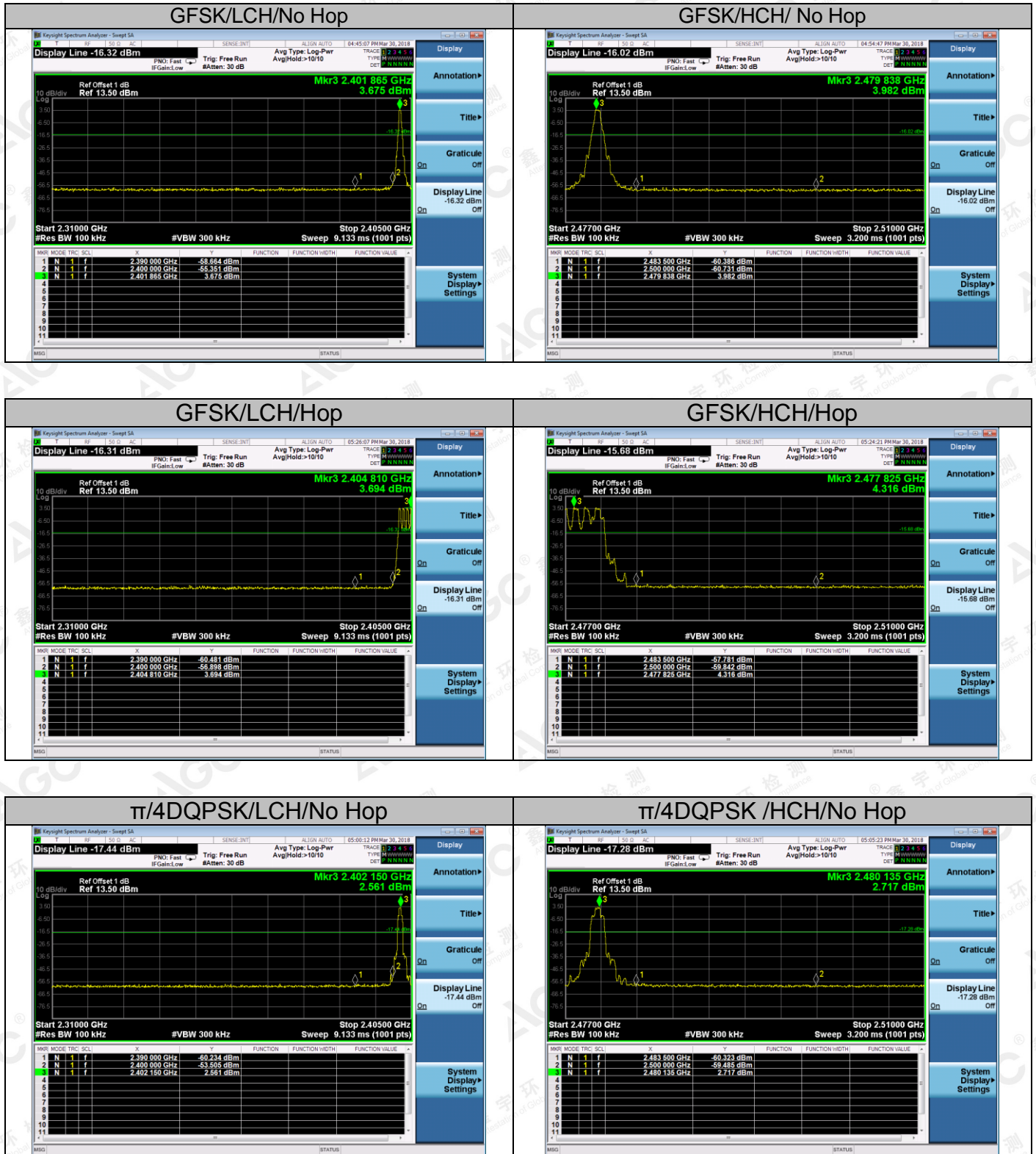
Margin = Emission Level – Limit

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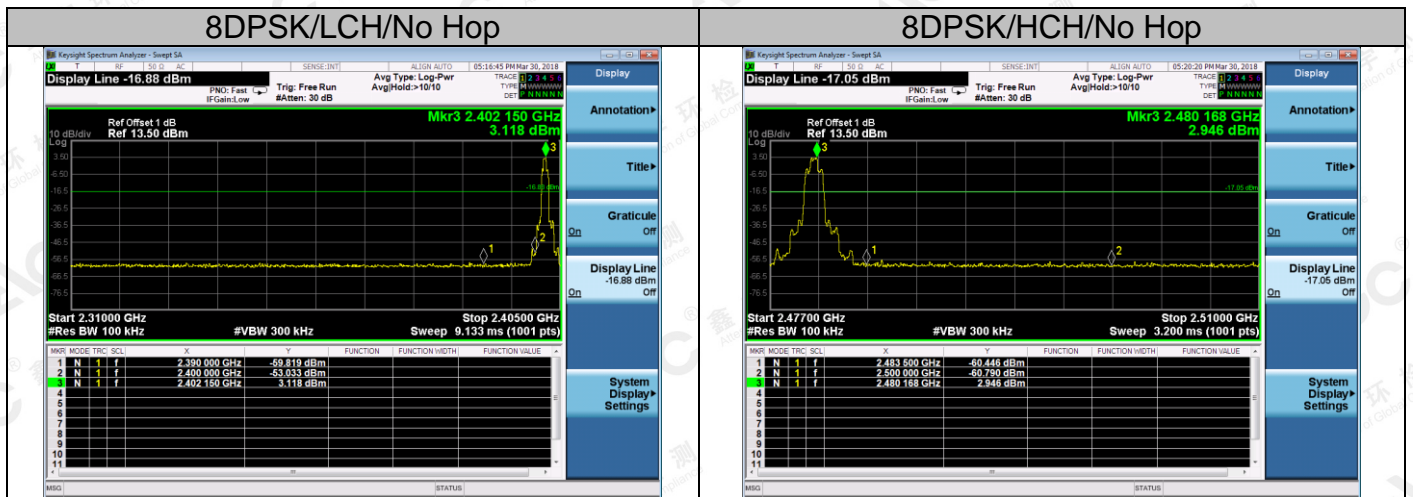


### 11.4 CONDUCTED TEST RESULT

#### Test Graph



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**Note:** All modes were tested, only the worst case record in the report.

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## 12. NUMBER OF HOPPING FREQUENCY

### 12.1. MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer Start = 2.4GHz Stop = 2.4835GHz
4. Set the Spectrum Analyzer as RBW>=1%span, VBW>=RBW.

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

Same as described in section 8.2

### 12.3. MEASUREMENT EQUIPMENT USED

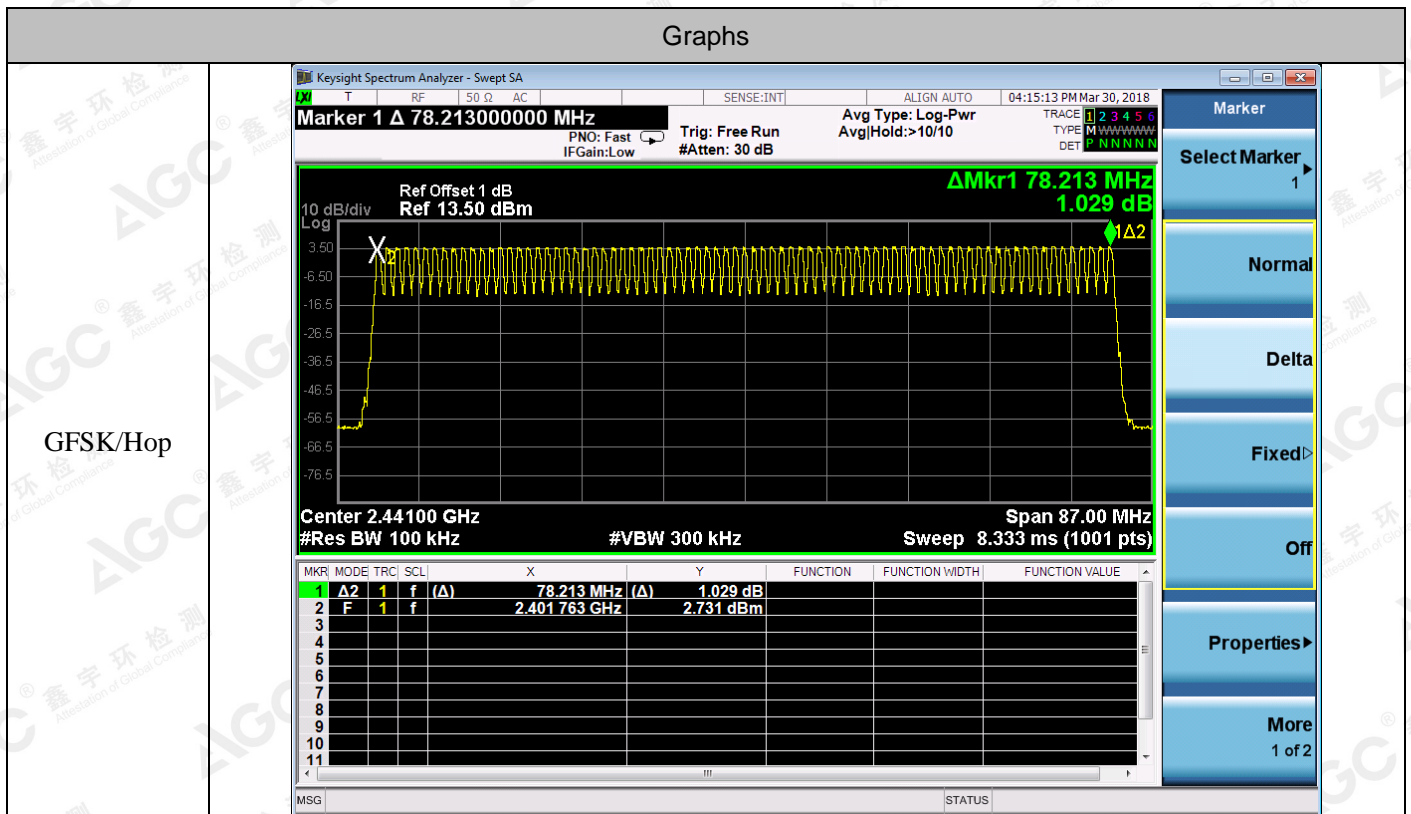
The same as described in section 6

### 12.4. LIMITS AND MEASUREMENT RESULT

Mode	Channel.	Number of Hopping Channel	Verdict
GFSK	Hop	79	PASS

Note: All modes were tested, only the worst case record in the report.

### Test Graph



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### 13. TIME OF OCCUPANCY (DWELL TIME)

#### 13.1. 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.
4. Detector function: Peak. Trace: Max hold.
5. Use the marker-delta function to determine the transmit time per hop.
6. Using the following equation:

The dwell time is calculated with the following formula:

$$\text{Dwell time} = t_{\text{pulse}} \times n_{\text{hops}} / \text{number of channels} \times 31.6 \text{ s}$$

Where:

$t_{\text{pulse}}$  is the measured pulse time (pls. refer the plots of the spectrum analyser above) [s],

$n_{\text{hops}}$  is the number of hops per second in the actual operating mode of the transmitter [1/s].

The hopping rate of the system is 1600 hops per second and the system uses 79 channels. For this reason one time slot has a length of 625  $\mu$ s.

With the used hopping mode (DH5) a packet need 5 timeslots for transmitting and the next timeslot for receiving. So the system makes in worst case 266,67 hops per second in transmit mode ( $n_{\text{hops}} = 266.667$  1/s)

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

Same as described in section 8.2

#### 13.3. MEASUREMENT EQUIPMENT USED

The same as described in section 6

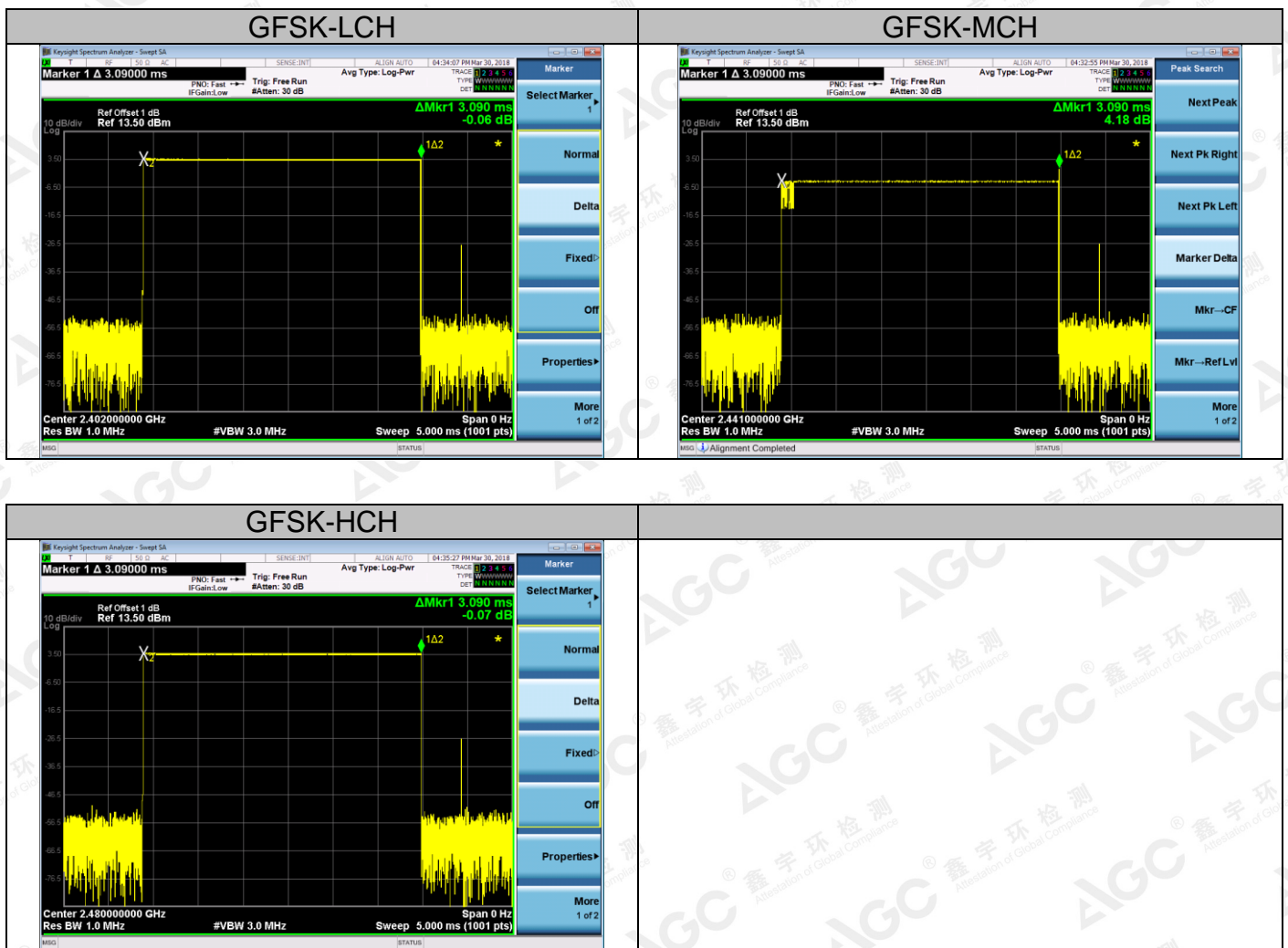
The results shown in this test report refer only to the sample(s) tested unless otherwise stated and the sample(s) are retained for 30 days only. The document is issued by AGC, this document cannot be reproduced except in full with our prior written permission. The more details and the authenticity of the report will be confirmed at <http://www.agc-cert.com>.

**13.4. LIMITS AND MEASUREMENT RESULT**

Channel.	Burst Width [ms/hop/ch]	Dwell Time[ms]	Verdict	Limit (ms)
LCH	3.090	329.6004	PASS	400
MCH	3.090	329.6004	PASS	400
HCH	3.090	329.6004	PASS	400

Note: The DH5 for GFSK modulation is the worst case and recorded in the report.

**Test Graph**



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## 14. FREQUENCY SEPARATION

### 14.1. MEASUREMENT PROCEDURE

1. Place the EUT on the table and set it in transmitting mode
2. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum analyzer
3. Set Span = wide enough to capture the peaks of two adjacent channels Resolution (or IF) Bandwidth (RBW)  $\geq$  1% of the span Video (or Average) Bandwidth (VBW)  $\geq$  RBW; Sweep = auto; Detector function = peak; Trace = max hold

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

Same as described in section 6.2

### 14.3. MEASUREMENT EQUIPMENT USED

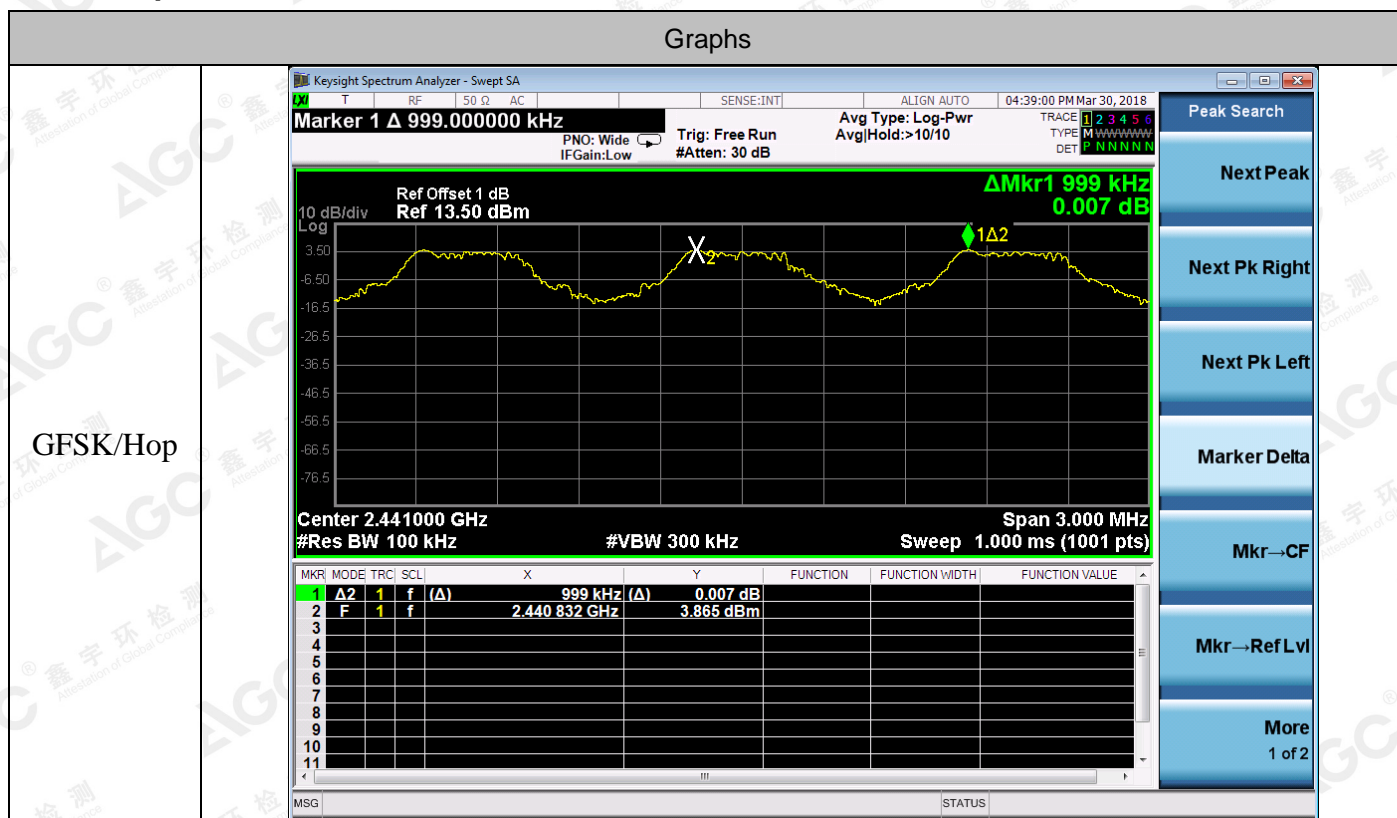
The same as described in section 6.3

### 14.4. LIMITS AND MEASUREMENT RESULT

Mode	Channel.	Carrier Frequency Separation [MHz]	Verdict
GFSK	Hop	0.999	PASS

Note: All modes were tested, only the worst case record in the report.

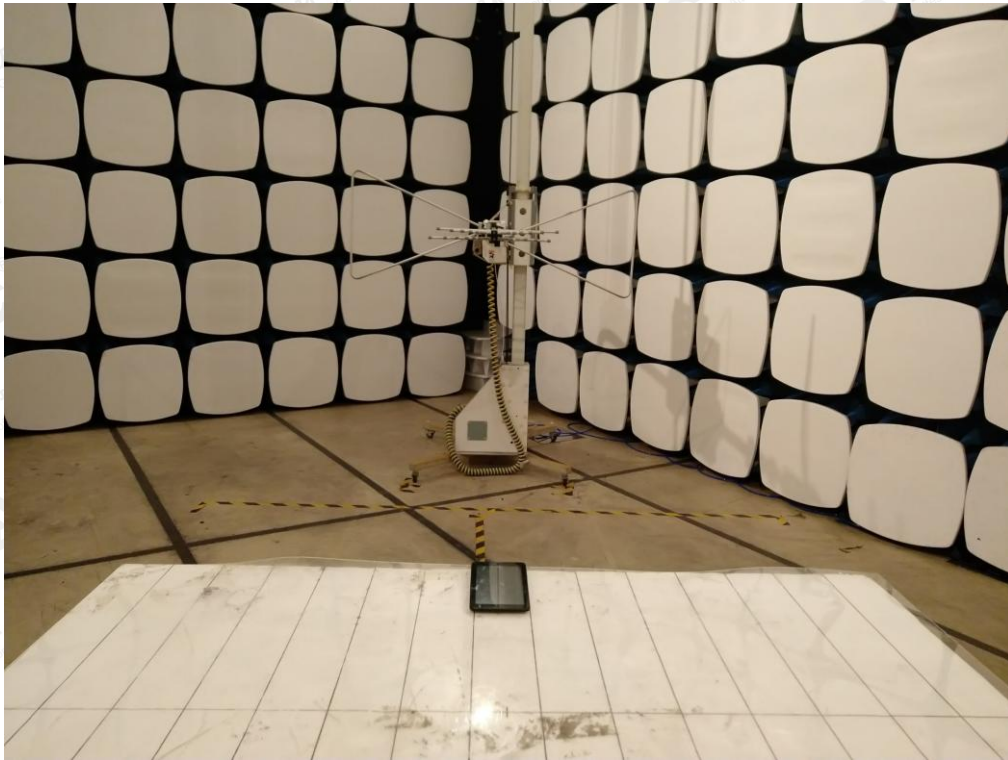
### Test Graph



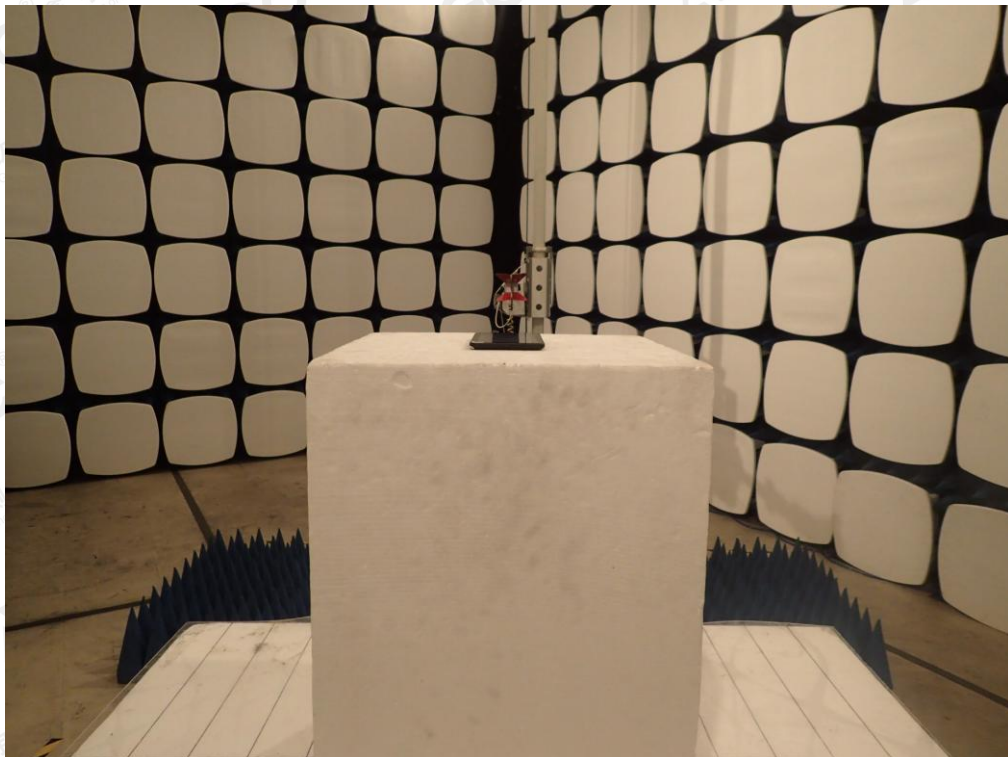
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**APPENDIX A: PHOTOGRAPHS OF TEST SETUP**  
**RADIATED EMISSION TEST SETUP**



**RADIATED EMISSION ABOVE 1G TEST SETUP**



**----END OF REPORT----**

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