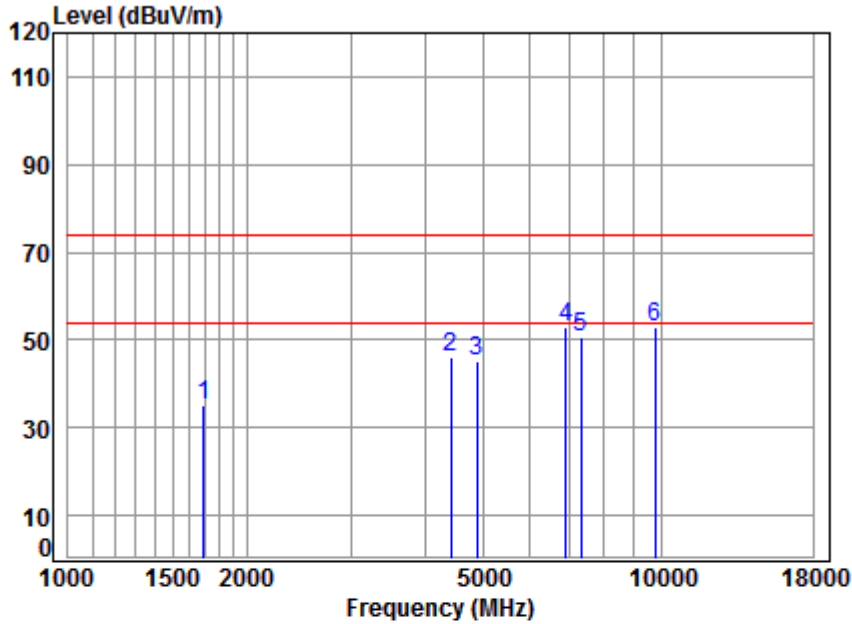


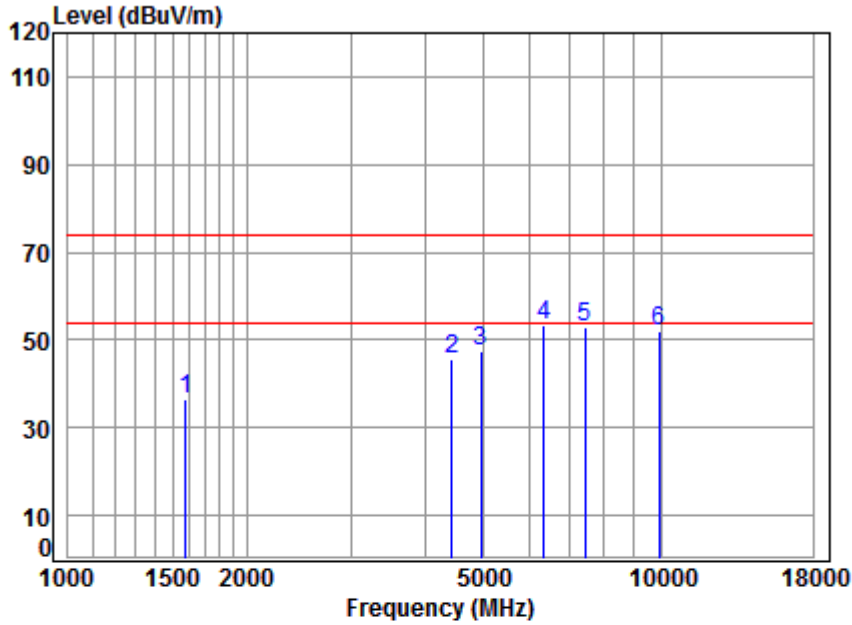
4.10.2.2 GFSK(DH5) _Middle Channel_ Peak _Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90032
 Mode : 2441 TX RSE
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1692.231	5.24	26.64	41.53	45.01	35.36	74.00	-38.64	peak
2	4417.841	7.47	33.46	42.40	47.34	45.87	74.00	-28.13	peak
3	4882.000	7.97	34.06	42.48	45.70	45.25	74.00	-28.75	peak
4	6914.763	10.36	35.85	40.91	47.73	53.03	74.00	-20.97	peak
5	7323.000	10.05	36.16	40.63	44.88	50.46	74.00	-23.54	peak
6	9764.000	10.82	37.76	37.52	41.91	52.97	74.00	-21.03	peak

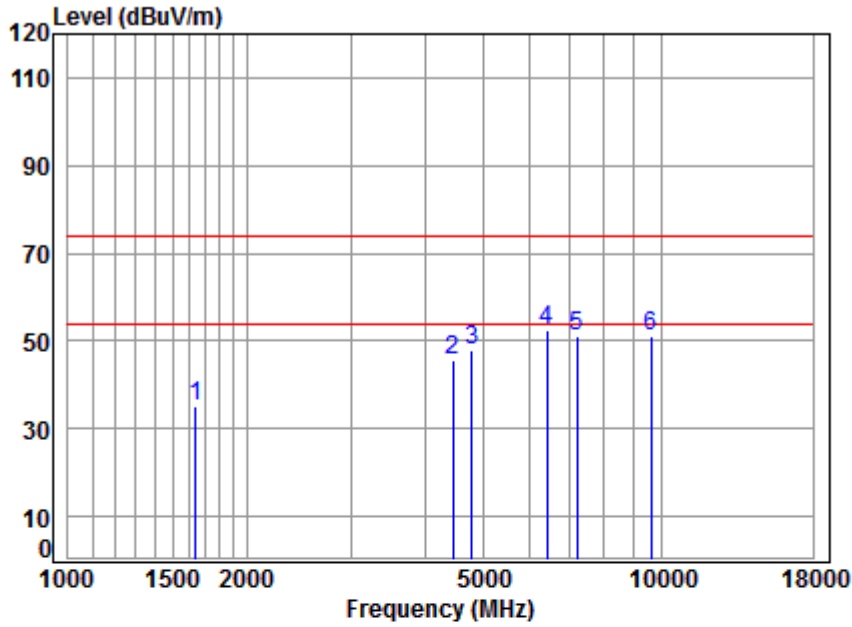
4.10.2.3 GFSK(DH5) _Highest Channel_ Peak _Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90032
 Mode : 2480 TX RSE
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	
1	1578.822	5.38	26.16	41.46	46.63	74.00	-37.29	peak
2	4443.453	7.50	33.50	42.41	47.20	74.00	-28.21	peak
3	4960.000	8.05	34.15	42.49	47.91	74.00	-26.38	peak
4	6340.436	11.24	35.44	41.34	48.06	74.00	-20.60	peak
5	7440.000	10.02	36.25	40.56	47.33	74.00	-20.96	peak
6	9920.000	10.90	37.85	37.31	40.71	74.00	-21.85	peak

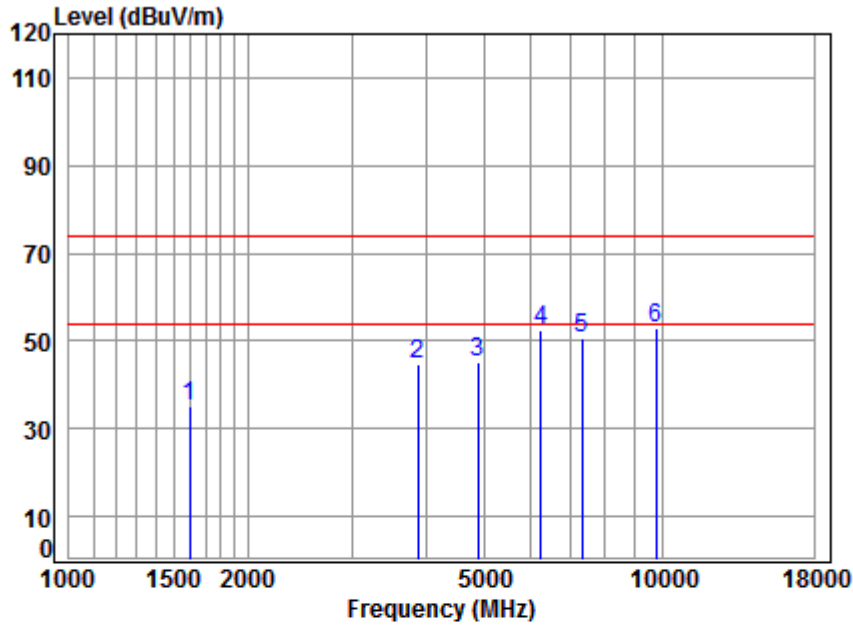
4.10.2.4 GFSK(DH5) _Lowest Channel_ Peak _Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90032
 Mode : 2402 TX RSE
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1639.274	5.30	26.42	41.49	44.98	35.21	74.00	-38.79	peak
2	4456.315	7.51	33.53	42.41	47.15	45.78	74.00	-28.22	peak
3	4804.000	7.89	33.97	42.47	48.56	47.95	74.00	-26.05	peak
4	6414.167	11.38	35.52	41.28	46.97	52.59	74.00	-21.41	peak
5	7206.000	10.08	36.07	40.71	45.47	50.91	74.00	-23.09	peak
6	9608.000	10.75	37.67	37.74	40.61	51.29	74.00	-22.71	peak

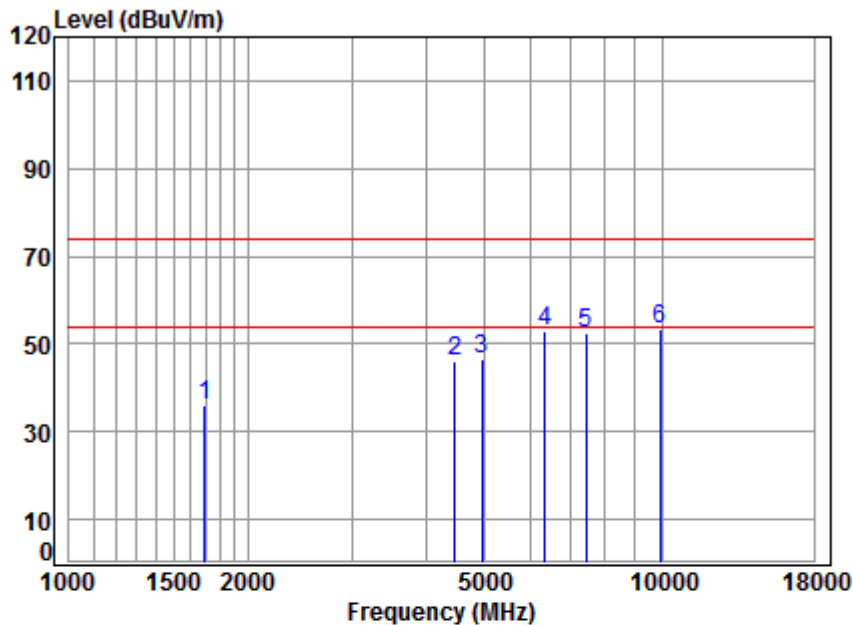
4.10.2.5 GFSK(DH5) _Middle Channel_ Peak _ Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90032
 Mode : 2441 TX RSE
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1597.181	5.35	26.24	41.47	45.13	35.25	74.00	-38.75	peak
2	3879.027	6.86	32.47	42.30	47.91	44.94	74.00	-29.06	peak
3	4882.000	7.97	34.06	42.48	45.71	45.26	74.00	-28.74	peak
4	6249.464	11.06	35.35	41.41	47.65	52.65	74.00	-21.35	peak
5	7323.000	10.05	36.16	40.63	45.11	50.69	74.00	-23.31	peak
6	9764.000	10.82	37.76	37.52	42.03	53.09	74.00	-20.91	peak

4.10.2.6 GFSK(DH5) _Highest Channel_ Peak _ Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90032
 Mode : 2480 TX RSE
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	1692.231	5.24	26.64	41.53	45.48	35.83	74.00	-38.17	peak
2	4469.214	7.53	33.55	42.41	47.61	46.28	74.00	-27.72	peak
3	4960.000	8.05	34.15	42.49	46.99	46.70	74.00	-27.30	peak
4	6340.436	11.24	35.44	41.34	47.68	53.02	74.00	-20.98	peak
5	7440.000	10.02	36.25	40.56	46.83	52.54	74.00	-21.46	peak
6	9920.000	10.90	37.85	37.31	41.83	53.27	74.00	-20.73	peak

Remark:

1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level = Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

2) Scan from 9kHz to 25GHz, the disturbance between 9KHz to 30MHz and 18GHz to 25GHz was very low, and the above harmonics were the highest point could be found when testing, The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported.

3) As shown in this section, for frequencies above 1GHz, the field strength limits are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation. So, only the peak measurements were shown in the report.

4) All Modes have been tested, but only the worst case data displayed in this report.

4.11 Restricted bands around fundamental frequency

Test Requirement:	47 CFR Part 15C Section 15.209 and 15.205		
Test Method:	ANSI C63.10: 2013		
Test Site:	Measurement Distance: 3m or 10m (Semi-Anechoic Chamber)		
Limit:	Frequency	Limit (dBuV/m @3m)	Remark
	30MHz-88MHz	40.0	Quasi-peak Value
	88MHz-216MHz	43.5	Quasi-peak Value
	216MHz-960MHz	46.0	Quasi-peak Value
	960MHz-1GHz	54.0	Quasi-peak Value
	Above 1GHz	54.0	Average Value
		74.0	Peak Value
Test Setup:			

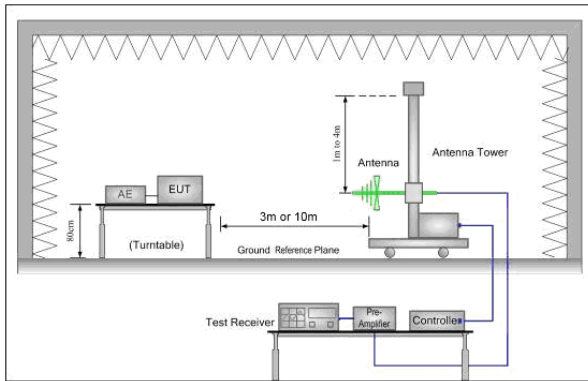


Figure 1. 30MHz to 1GHz

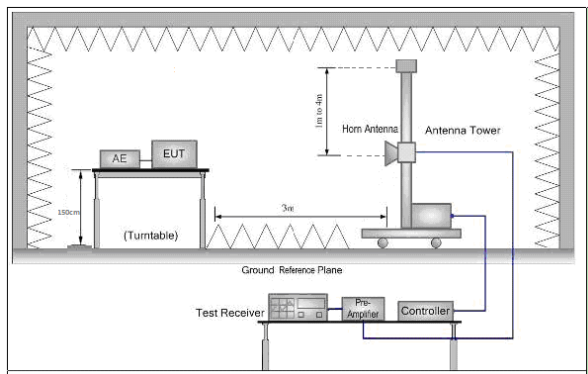
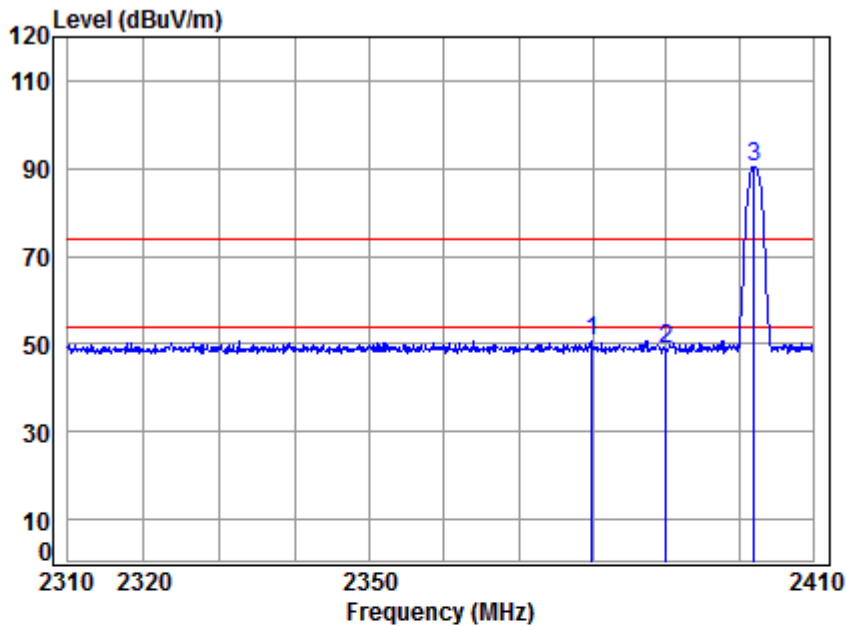


Figure 2. Above 1 GHz

<p>Test Procedure:</p>	<ol style="list-style-type: none"> a. For below 1GHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 or 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. b. For above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. c. The EUT was set 3 or 10 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. d. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement. e. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading. f. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. g. Place a marker at the end of the restricted band closest to the transmit frequency to show compliance. Also measure any emissions in the restricted bands. Save the spectrum analyzer plot. Repeat for each power and modulation for lowest and highest channel h. Test the EUT in the lowest channel , the Highest channel i. The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is the worst case. j. Repeat above procedures until all frequencies measured was complete.
<p>Exploratory Test Mode:</p>	<p>Non-hopping transmitting mode with all kind of modulation and all kind of data type Charge + Transmitting mode.</p>
<p>Final Test Mode:</p>	<p>Through Pre-scan, find the DH5 of data type and GFSK modulation is the worst case. Pretest the EUT at Charge + Transmitting mode, Only the worst case is recorded in the report.</p>
<p>Instruments Used:</p>	<p>Refer to section 5.10 for details</p>
<p>Test Results:</p>	<p>Pass</p>

4.11.1 Test plots

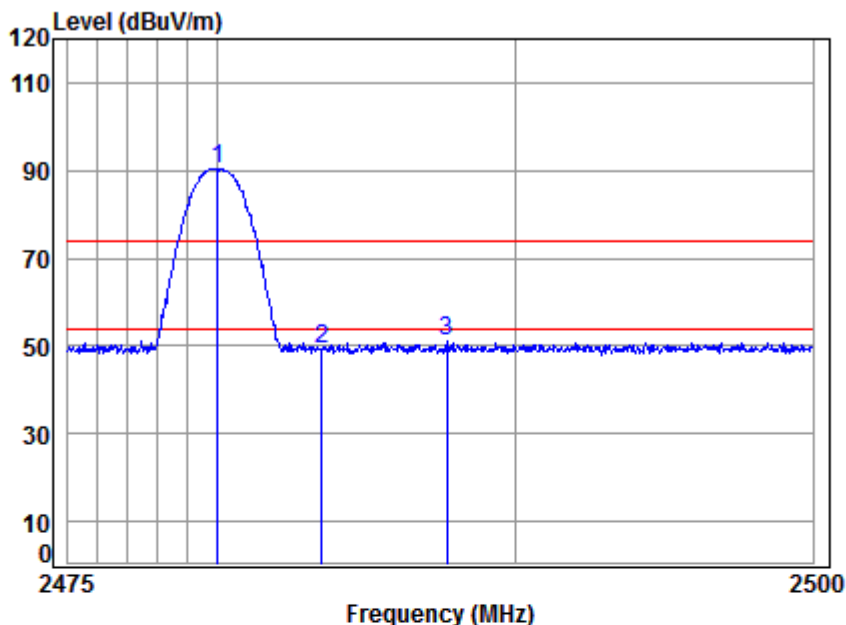
4.11.1.1 Worst Case Mode (GFSK(DH5)) _Lowest Channel_ Peak _Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90032
 Mode : 2402 Band edge
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Level	Limit Line	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1	2379.856	5.46	28.50	41.87	58.72	50.81	74.00	-23.19	peak
2	2390.000	5.47	28.52	41.87	56.74	48.86	74.00	-25.14	peak
3 *	2402.000	5.49	28.54	41.88	98.34	90.49	74.00	16.49	peak

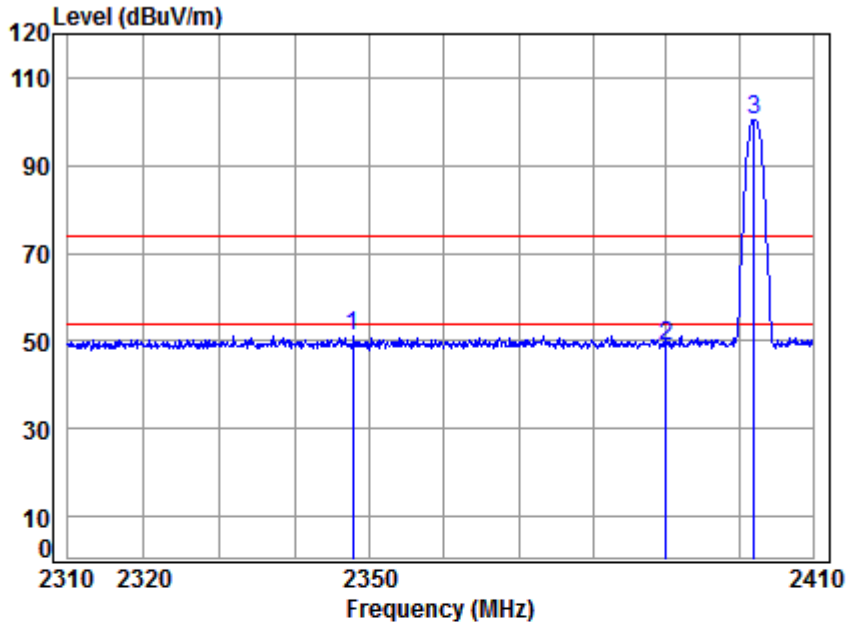
4.11.1.2 Worst Case Mode (GFSK(DH5)) _Highest Channel_ Peak _Vertical



Site : chamber
 Condition: 3m VERTICAL
 Job No : 90032
 Mode : 2480 Band edge
 Note : BT

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2480.000	5.59	28.67	41.91	98.03	90.38	74.00	16.38 peak
2	2483.500	5.60	28.67	41.91	57.06	49.42	74.00	-24.58 peak
3	2487.694	5.60	28.68	41.91	58.90	51.27	74.00	-22.73 peak

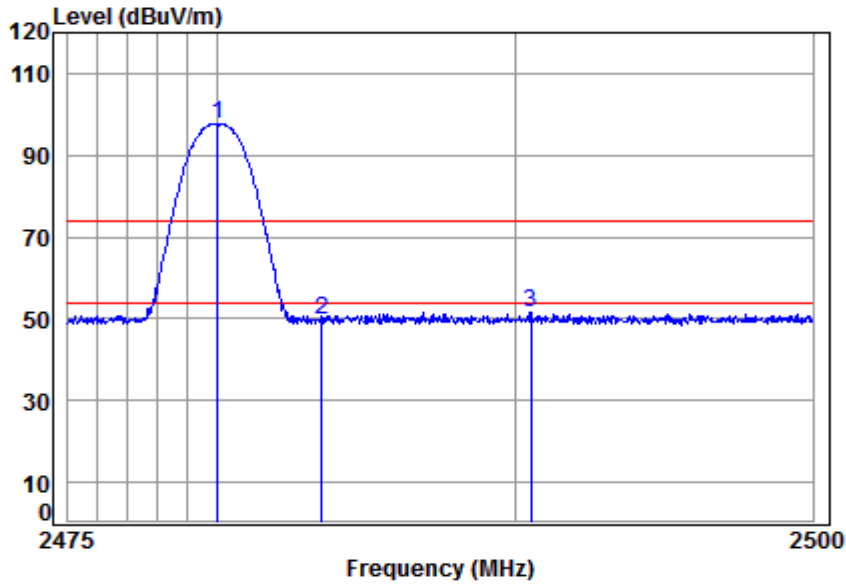
4.11.1.3 Worst Case Mode (GFSK(DH5)) _Lowest Channel_ Peak _Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90032
 Mode : 2402 Band edge
 Note : BT

	Freq	Cable Loss	Ant Factor	Preamp Factor	Read Level	Limit Level	Over Limit	Remark
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB
1	2347.800	5.42	28.45	41.85	59.30	51.32	74.00	-22.68 peak
2	2390.000	5.47	28.52	41.87	56.50	48.62	74.00	-25.38 peak
3 *	2402.000	5.49	28.54	41.88	108.34	100.49	74.00	26.49 peak

4.11.1.4 Worst Case Mode (GFSK(DH5)) _Highest Channel_ Peak _ Horizontal



Site : chamber
 Condition: 3m HORIZONTAL
 Job No : 90032
 Mode : 2480 Band edge
 Note : BT

	Cable	Ant	Preamp	Read	Limit	Over		
Freq	Loss	Factor	Factor	Level	Level	Line	Limit	Remark
MHz	dB	dB/m	dB	dBuV	dBuV/m	dBuV/m	dB	
1 *	2480.000	5.59	28.67	41.91	105.24	97.59	74.00	23.59 peak
2	2483.500	5.60	28.67	41.91	57.34	49.70	74.00	-24.30 peak
3	2490.495	5.61	28.68	41.91	59.38	51.76	74.00	-22.24 peak

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

$$\text{Final Test Level} = \text{Receiver Reading} + \text{Antenna Factor} + \text{Cable Factor} - \text{Preamplifier Factor}$$

All Modes have been tested, but only the worst case data displayed in this report.

5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Total RF power, conducted	±0.75dB
2	RF power density, conducted	±2.84dB
3	Spurious emissions, conducted	±0.75dB
4	Radiated Spurious emission test	±4.5dB (30MHz-1GHz)
		±4.8dB (1GHz-25GHz)
5	Conduct emission test	±3.12 dB(9KHz- 30MHz)
6	Temperature test	±1°C
7	Humidity test	±3%
8	DC and low frequency voltages	±0.5%

6 Equipment List

Conducted Emission					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
Shielding Room	ZhongYu Electron	GB-88	SEM001-06	2017/5/10	2020/5/9
LISN	Rohde & Schwarz	ENV216	SEM007-01	2018/9/2	2019/9/2
LISN	ETS-LINDGREN	Feb-16	SEM007-02	2018/4/2	2019/4/1
Measurement Software	AUDIX	e3 V5.4.1221d	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM024-01	2018/7/12	2019/7/11
2 Line ISN	Fischer Custom Communications Inc.	FCC-TLISN-T2-02	EMC0122	2018/2/14	2019/2/13
EMI Test Receiver	Rohde & Schwarz	ESCI	SEM004-02	2018/4/2	2019/4/1
RF conducted test					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
DC Power Supply	Agilent Technologies Inc	66311B	W009-09	2018/9/15	2019/9/15
Signal Analyzer	Rohde & Schwarz	FSV	W025-05	2018/3/13	2019/3/12
Coaxial Cable	SGS	N/A	SEM031-01	2018/7/13	2019/7/12
Attenuator	Weinschel Associates	WA41	SEM021-09	N/A	N/A
Signal Generator	KEYSIGHT	N5173B	SEM006-05	2018/9/2	2019/9/2
Power Meter	Rohde & Schwarz	NRVS	SEM014-02	2018/9/2	2019/9/2
RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEM001-01	2017/8/5	2020/8/4
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM025-01	2018/7/12	2019/7/11
MXE EMI Receiver (20Hz-8.4GHz)	Agilent Technologies	N9038A	SEM004-05	2018/9/2	2019/9/2
BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEM003-01	2017/6/27	2020/6/26
Pre-amplifier (0.1-1.3GHz)	Agilent Technologies	8447D	SEM005-01	2018/4/2	2019/4/1
RE in Chamber					
Test Equipment	Manufacturer	Model No.	Inventory No.	Cal. Date	Cal. Due date
				(yyyy-mm-dd)	(yyyy-mm-dd)
10m Semi-Anechoic Chamber	SAEMC	FSAC1018	SEM001-03	2018/3/31	2021/3/30
EMI Test Receiver (9k-7GHz)	Rohde & Schwarz	ESR	SEM004-03	2018/4/2	2019/4/1
Trilog-Broadband Antenna(25M-2GHz)	Schwarzbeck	VULB9168	SEM003-18	2016/6/29	2019/6/28
Pre-amplifier (9k-1GHz)	Sonoma	310N	SEM005-03	2018/4/13	2019/4/12
Loop Antenna (9kHz-30MHz)	ETS-Lindgren	6502	SEM003-08	2017/8/22	2020/8/21
Measurement Software	AUDIX	e3 V8.2014-6-27	N/A	N/A	N/A
Coaxial Cable	SGS	N/A	SEM029-01	2018/7/12	2019/7/11

7 Photographs - EUT Constructional Details

Refer to Appendix A - Photographs of EUT Constructional Details for ZR/2018/90032.

The End