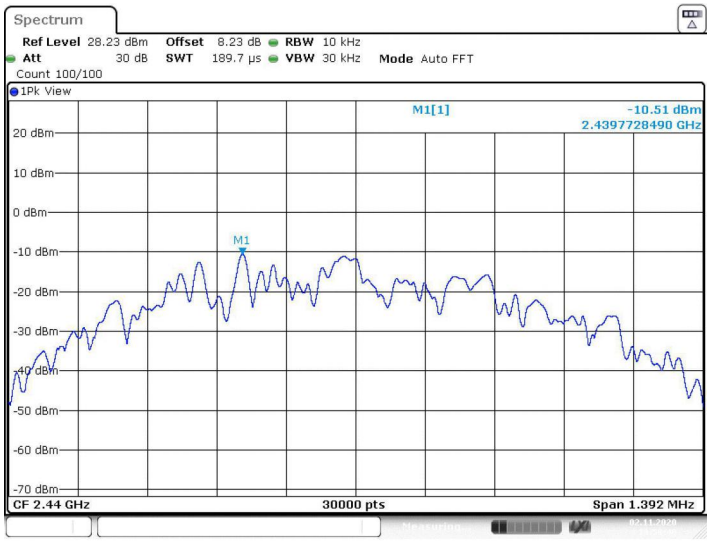
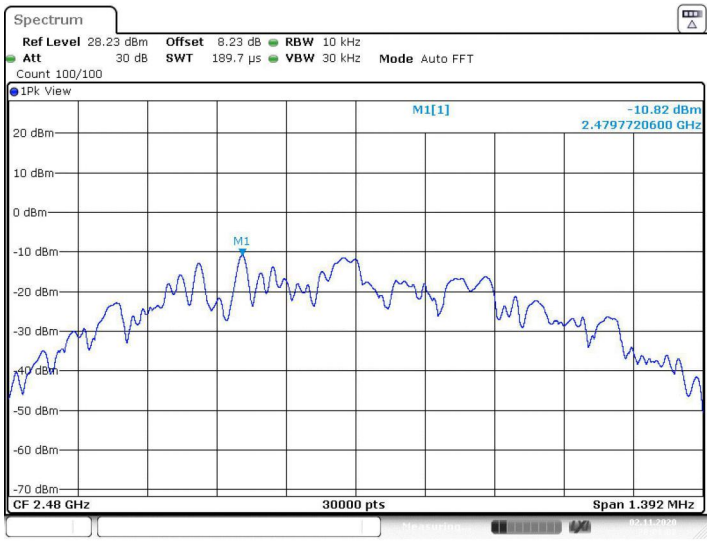
BLE Mode
2440 MHz

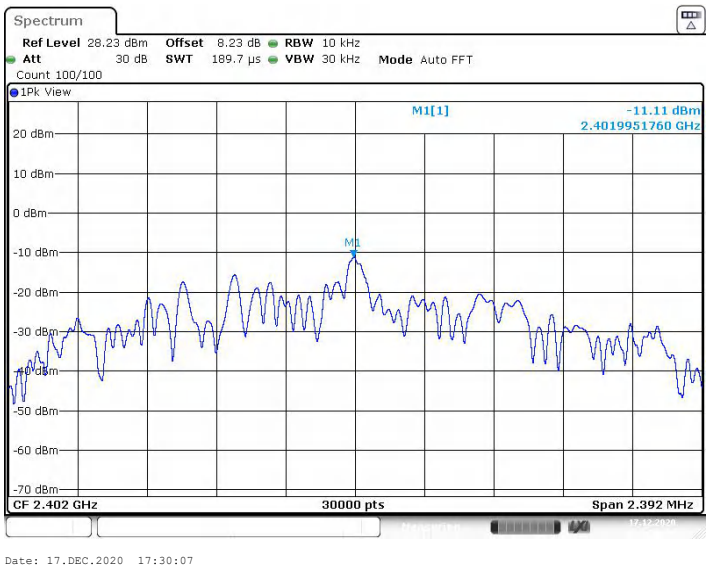


BLE Mode
2480 MHz

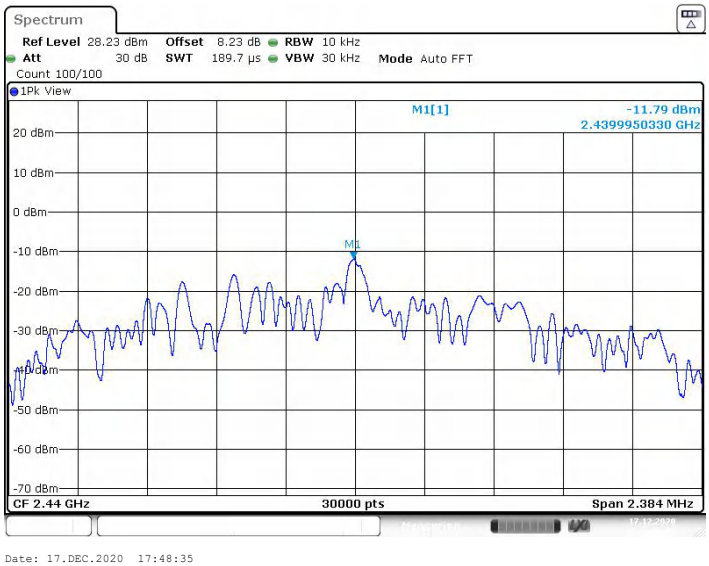


BLE_2M:

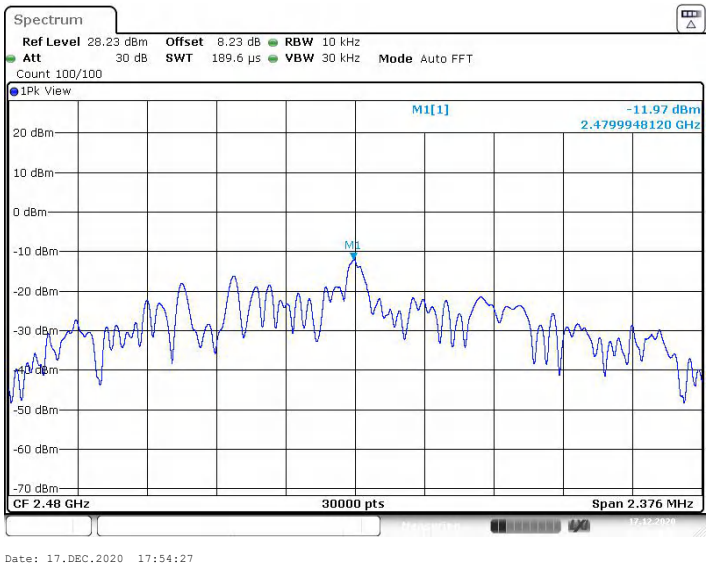
Test Mode:	BLE Mode		
Channel Frequency (MHz)	**Power Density (dBm/10kHz)**	**Power Density (dBm/3kHz)**	**Limit (dBm)**
2402	-11.11	-16.34	8dBm/3kHz
2440	-11.79	-17.02	
2480	-11.97	-17.20	
BLE Mode			
2402 MHz			



BLE Mode
2440 MHz



BLE Mode
2480 MHz

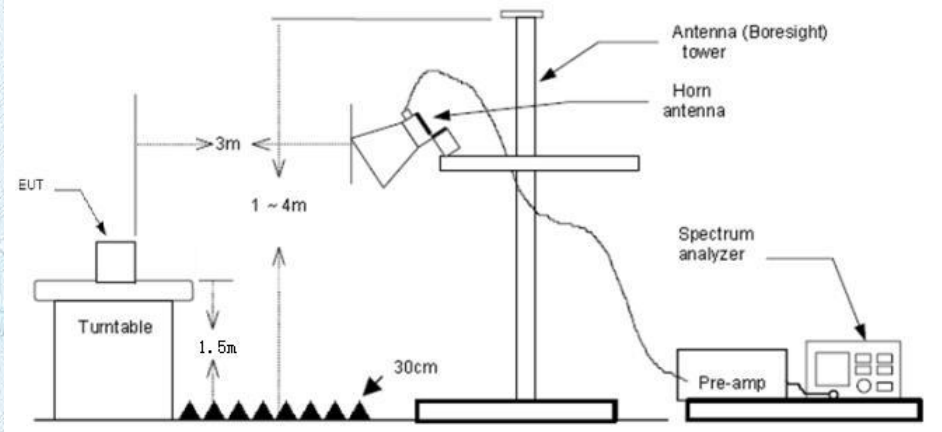


3.7. Band Edge Emissions(Radiated)

Limit

Restricted Frequency Band (MHz)	(dBuV/m)(at 3m)	
	Peak	Average
2310 ~2390	74	54
2483.5 ~2500	74	54
Note: All restriction bands have been tested, only the worst case is reported.		

Test Configuration



Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013 requirements.
2. The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.
4. The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10:2013 on radiated measurement.
5. The receiver set as follow:
   RBW=1MHz, VBW=3MHz PEAK detector for Peak value.
   RBW=1MHz, VBW=10Hz with PEAK Detector for Average Value.

Test Mode

Please refer to the clause 2.2.

Test Results

Note:

(1)Measurement = Reading level + Correct Factor

(2) Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor

(3)All modulation modes were tested, and only the worst data of GFSK_1M was recorded in the report.

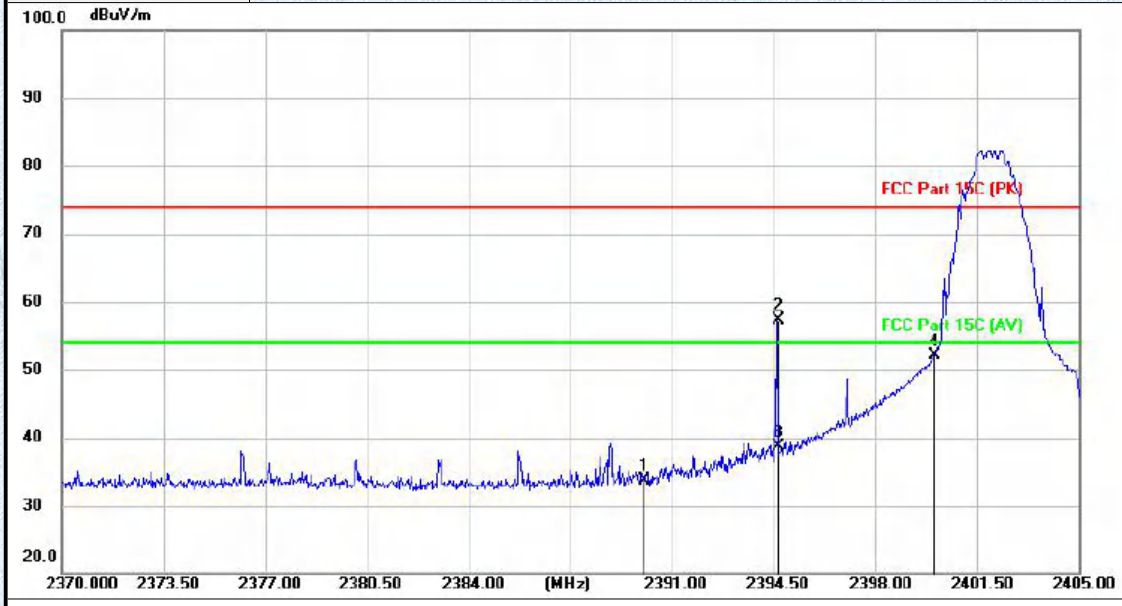
Test model：MK05A

Test Voltage:	DC 3.3V
Ant. Pol.:	Horizontal
Test Mode:	TX BLE Mode 2402MHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	50.11	-10.92	39.19	74.00	-34.81	peak
2	*	2396.912	64.05	-10.92	53.13	74.00	-20.87	peak
3		2400.000	62.89	-10.92	51.97	74.00	-22.03	peak

Emission Level= Read Level+ Correct Factor

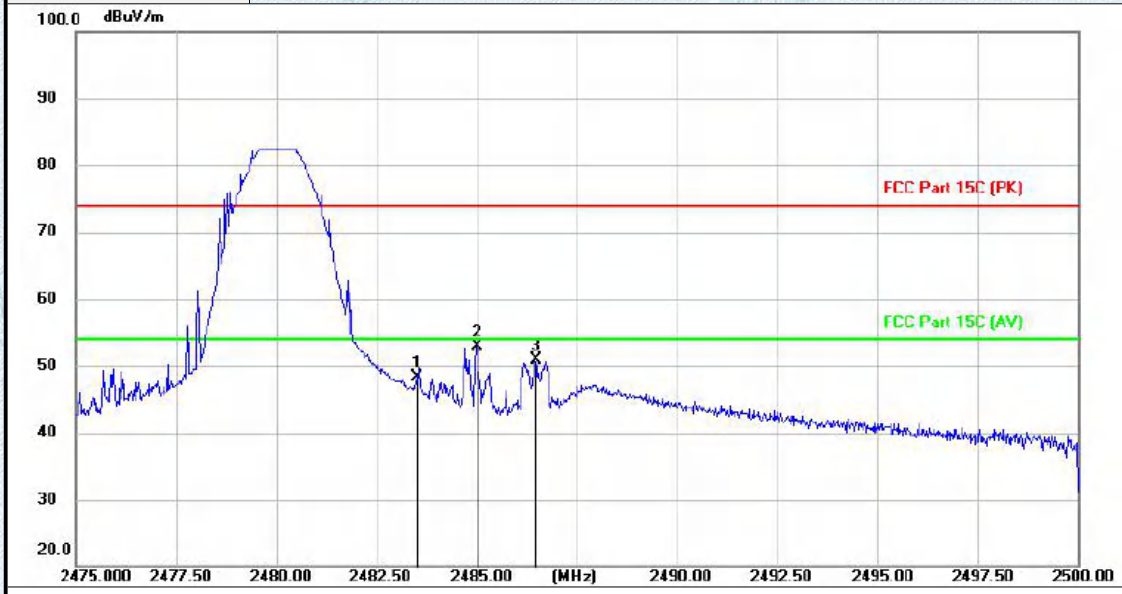
Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	44.71	-10.92	33.79	74.00	-40.21	peak
2		2394.608	68.12	-10.91	57.21	74.00	-16.79	peak
3	*	2394.608	49.57	-10.91	38.66	54.00	-15.34	AVG
4		2400.000	62.93	-10.92	52.01	74.00	-21.99	peak

Emission Level= Read Level+ Correct Factor

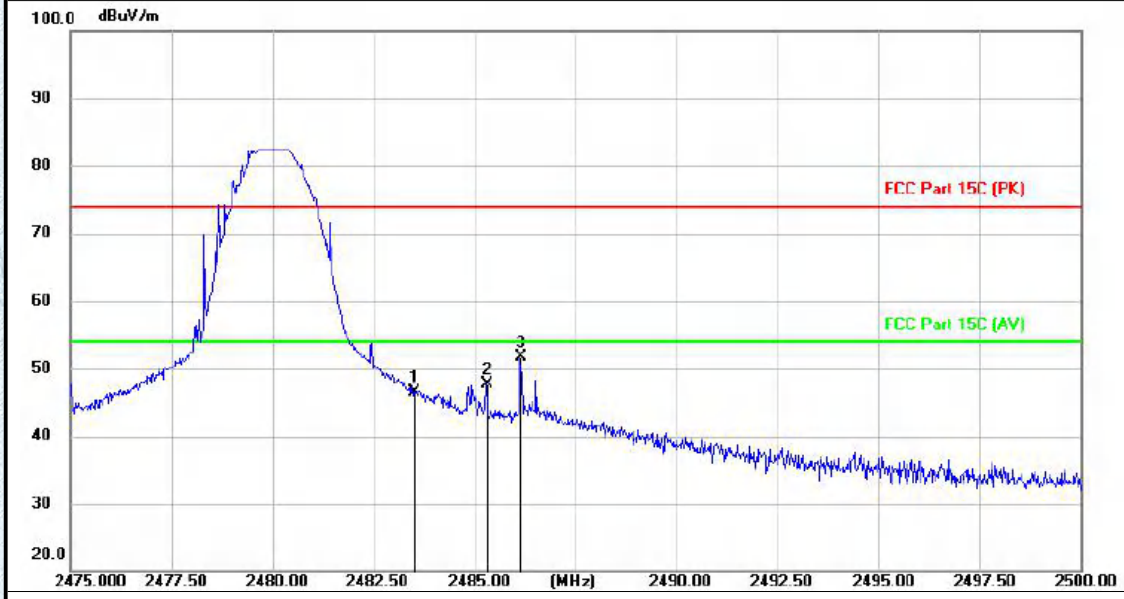
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2480 MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2483.500	59.21	-10.88	48.33	74.00	-25.67	peak
2	*	2484.997	63.86	-10.88	52.98	74.00	-21.02	peak
3		2486.452	61.73	-10.88	50.85	74.00	-23.15	peak

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2480 MHz

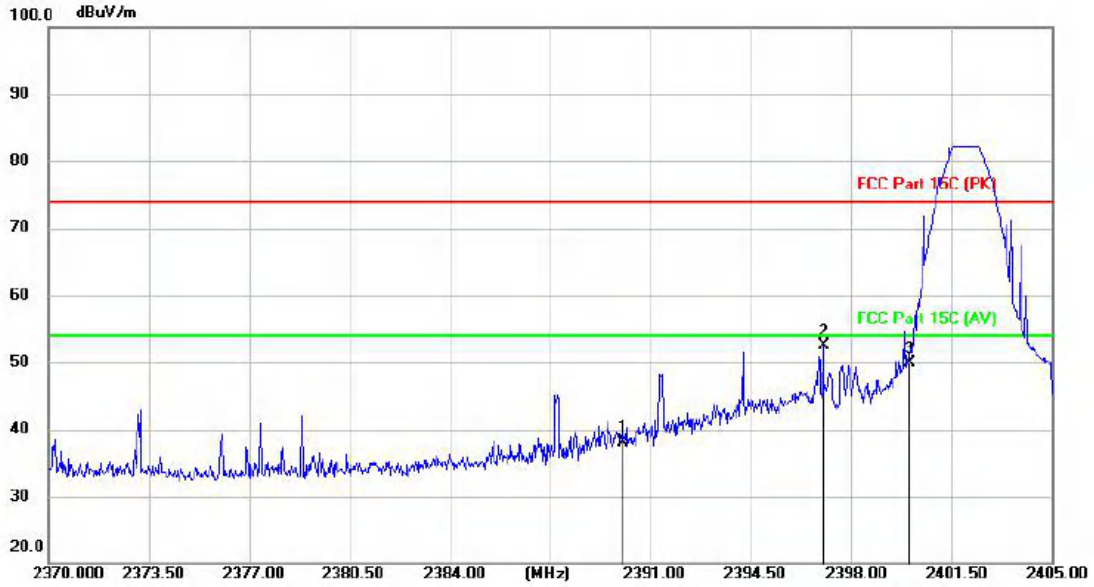


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2483.500	57.32	-10.88	46.44	74.00	-27.56	peak
2		2485.280	58.65	-10.88	47.77	74.00	-26.23	peak
3	*	2486.133	62.59	-10.88	51.71	74.00	-22.29	peak

Emission Level= Read Level+ Correct Factor

Test model：MK05B

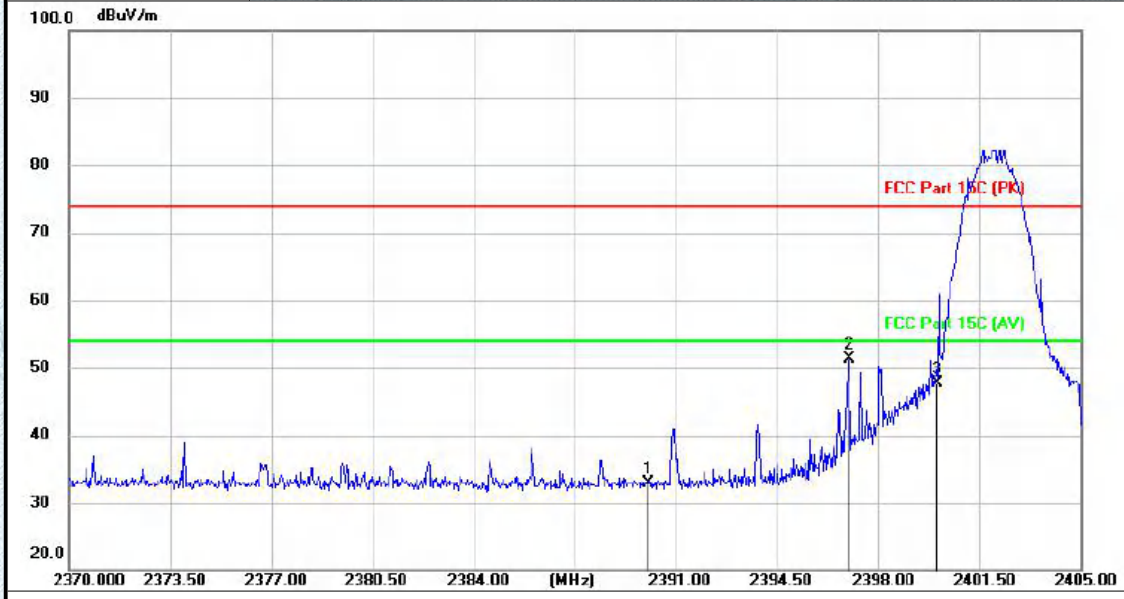
Test Voltage:	DC 3.3V
Ant. Pol.:	Horizontal
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	48.93	-10.92	38.01	74.00	-35.99	peak
2	*	2397.027	63.35	-10.92	52.43	74.00	-21.57	peak
3		2400.000	60.87	-10.92	49.95	74.00	-24.05	peak

Emission Level= Read Level+ Correct Factor

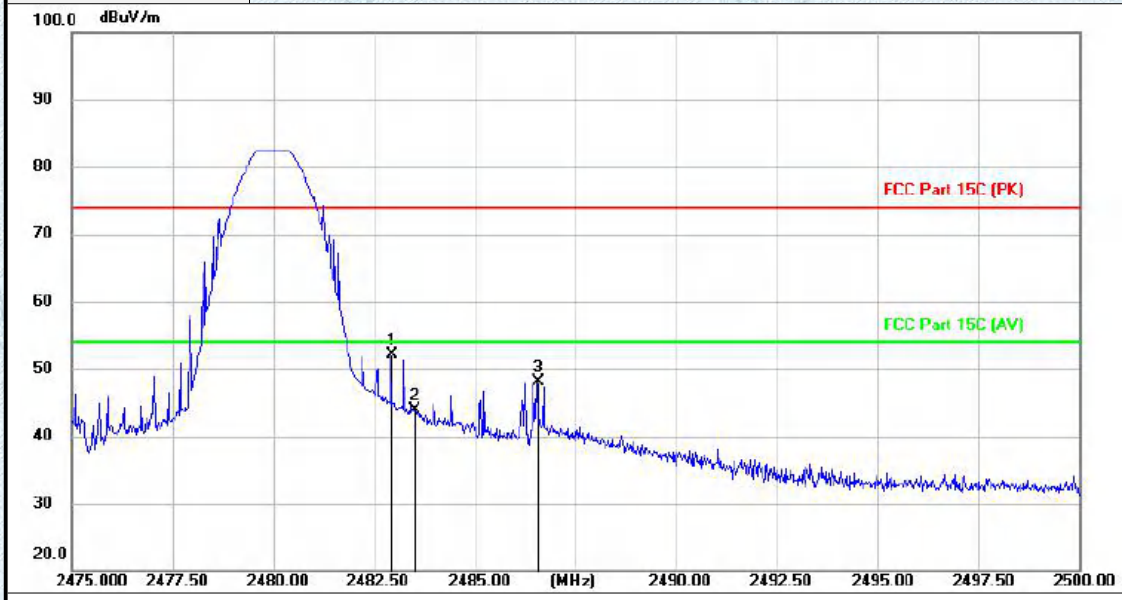
Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2390.000	43.90	-10.92	32.98	74.00	-41.02	peak
2	*	2396.964	62.20	-10.92	51.28	74.00	-22.72	peak
3		2400.000	58.70	-10.92	47.78	74.00	-26.22	peak

Emission Level= Read Level+ Correct Factor

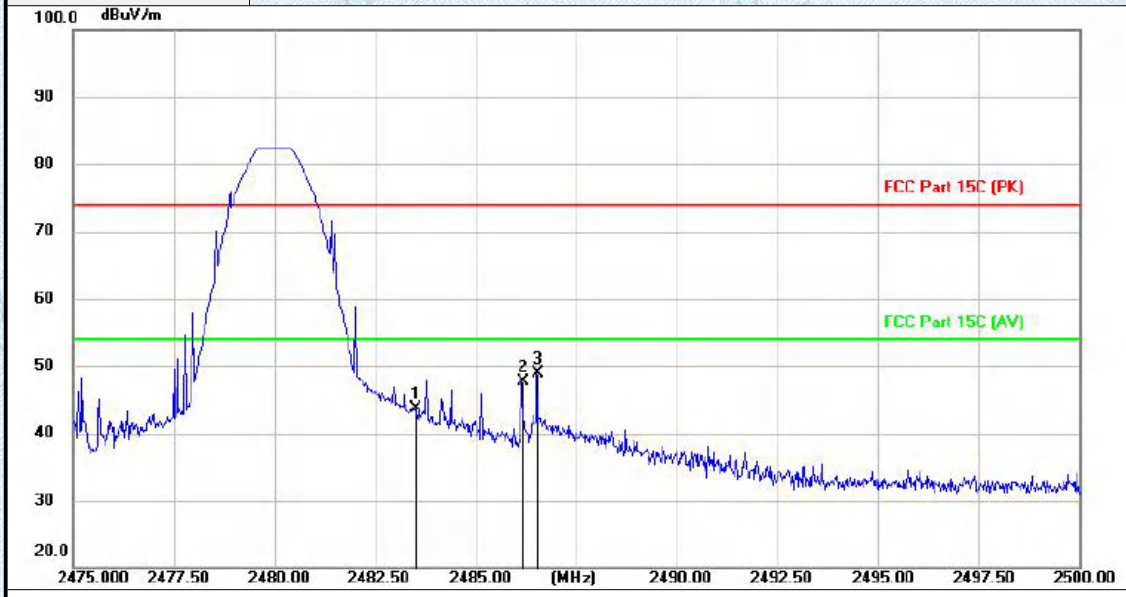
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2480 MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	2482.935	62.89	-10.88	52.01	74.00	-21.99	peak
2		2483.500	54.81	-10.88	43.93	74.00	-30.07	peak
3		2486.560	59.07	-10.88	48.19	74.00	-25.81	peak

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2480 MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		2483.500	54.64	-10.88	43.76	74.00	-30.24	peak
2		2486.153	58.66	-10.88	47.78	74.00	-26.22	peak
3	*	2486.528	59.73	-10.88	48.85	74.00	-25.15	peak

Emission Level= Read Level+ Correct Factor

3.8. Spurious Emission (Radiated)

Limit

Radiated Emission Limits (9 kHz~1000 MHz)

Frequency (MHz)	Field Strength (microvolt/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

Radiated Emission Limit (Above 1000MHz)

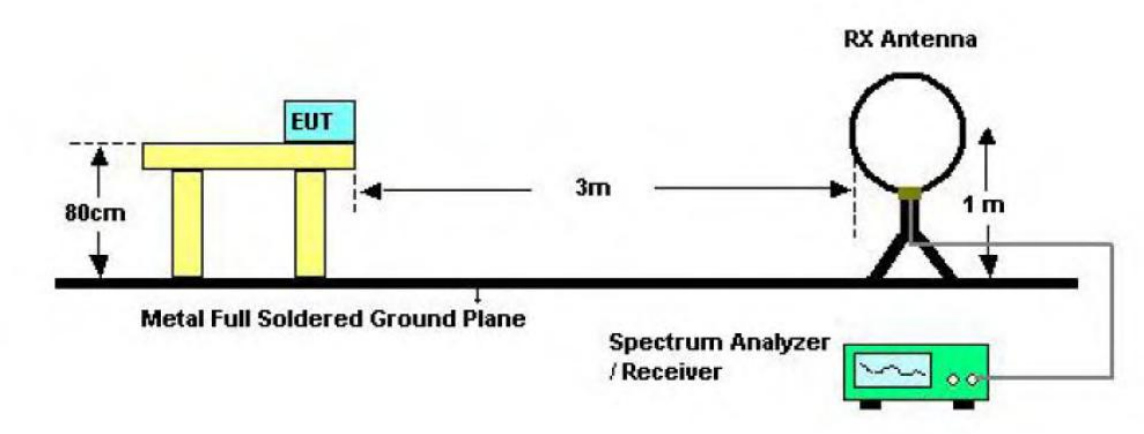
Frequency (MHz)	Distance Meters(at 3m)	
	Peak	Average
Above 1000	74	54

Note:

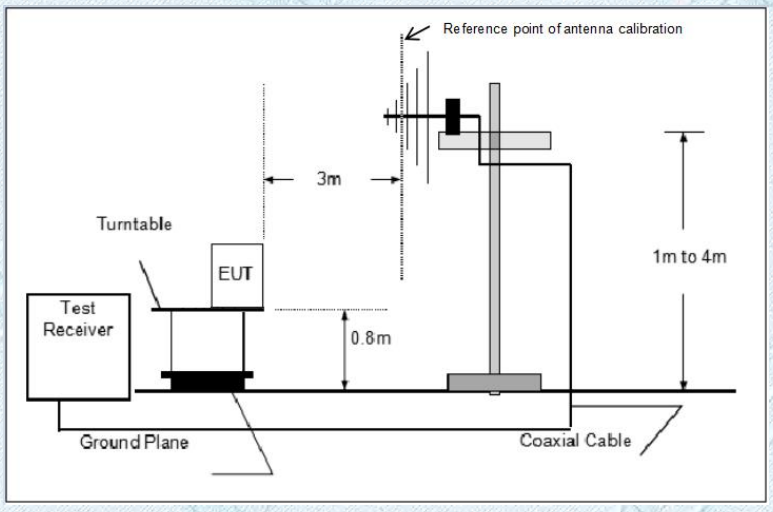
(1) The tighter limit applies at the band edges.

(2) Emission Level (dBuV/m)=20log Emission Level (uV/m).

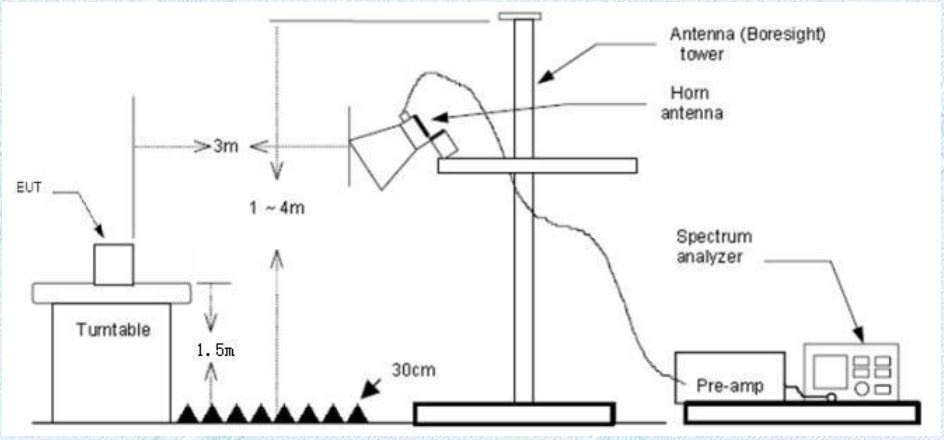
Test Configuration



Below 30MHz Test Setup



Below 1000MHz Test Setup



Above 1GHz Test Setup

Test Procedure

1. The EUT was setup and tested according to ANSI C63.10:2013
2. The EUT is placed on a turn table which is 0.8 meter above ground for below 1 GHz, and 1.5 m for above 1 GHz. The turn table is rotated 360 degrees to determine the position of the maximum emission level.
3. The EUT was set 3 meters from the receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Use the following spectrum analyzer settings

   (1) Span shall wide enough to fully capture the emission being measured;

   (2) Below 1 GHz:

   RBW=120 kHz, VBW=300 kHz, Sweep=auto, Detector function=peak, Trace=max hold;

   If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.

   (3) From 1 GHz to 10th harmonic:

   RBW=1MHz, VBW=3MHz Peak detector for Peak value.

   RBW=1MHz, VBW=10Hz Peak detector for Average value.

Test Mode

Please refer to the clause 2.3.

Test Result

9 KHz~30 MHz and 18GHz~25GHz

From 9 KHz~30 MHz and 18GHz~25GHz: Conclusion: PASS

Note:

1) Measurement = Reading level + Correct Factor
   Correct Factor=Antenna Factor + Cable Loss -Preamplifier Factor
2) The peak level is lower than average limit(54 dBuV/m), this data is the too weak instrument of signal is unable to test.
3) The emission levels of other frequencies are very lower than the limit and not show in test report.
4) The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.
5) Pre-scan CH00, CH19 and CH39 modulation, and found the GFSK_1M_ CH00 which it is worse case for 30MHz-1GHz , so only show the test data for worse case.

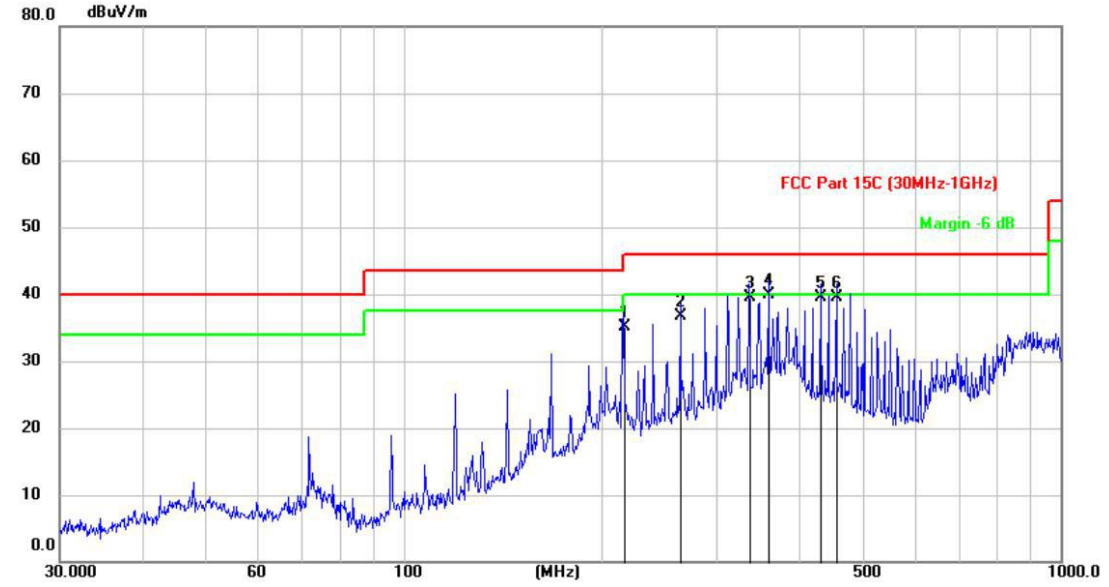
BELOW 30MHZ

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

30MHz-1GHz

Test model：MK05A

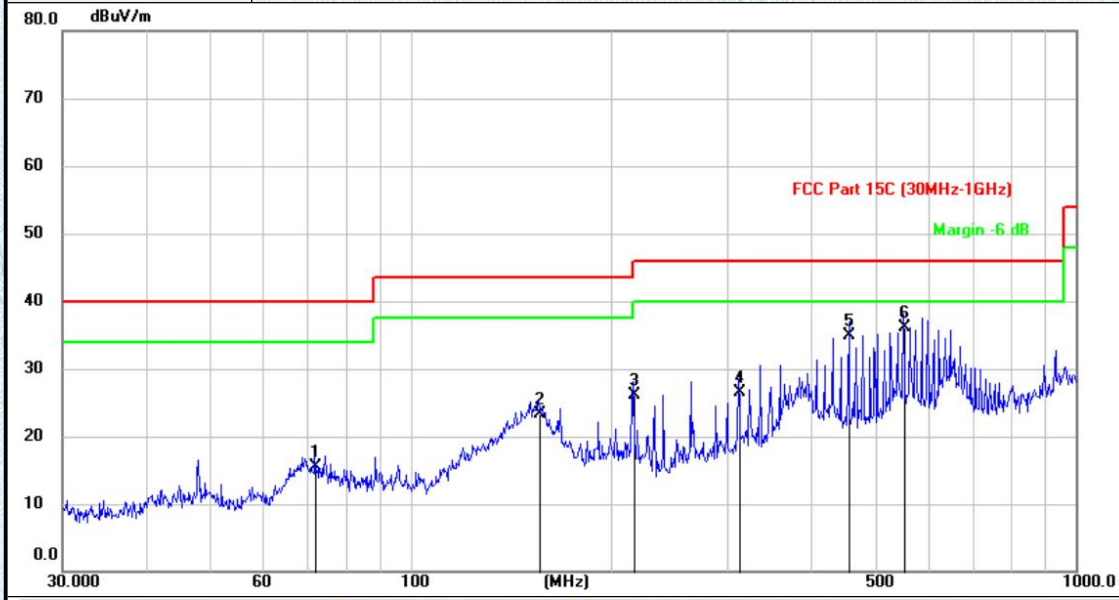
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		216.0240	52.48	-17.29	35.19	46.00	-10.81	QP
2		264.0041	52.23	-15.48	36.75	46.00	-9.25	QP
3		336.0352	52.57	-13.13	39.44	46.00	-6.56	QP
4	*	360.0687	52.14	-12.21	39.93	46.00	-6.07	QP
5		432.0909	50.08	-10.53	39.55	46.00	-6.45	QP
6		456.0657	49.79	-10.27	39.52	46.00	-6.48	QP

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical

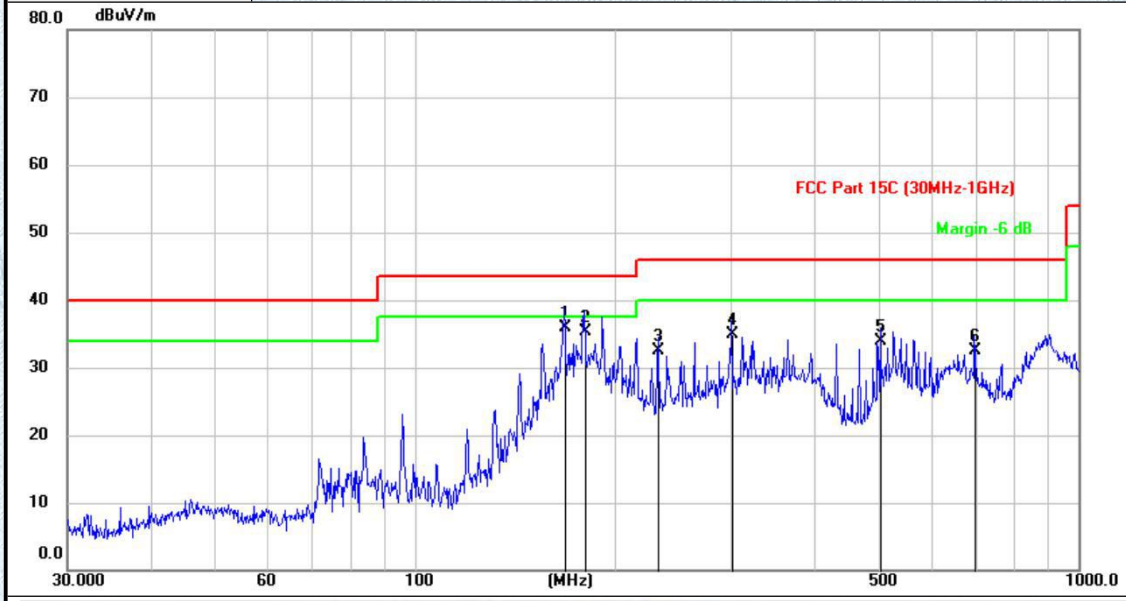


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		71.9833	35.36	-19.91	15.45	40.00	-24.55	QP
2		156.4028	44.45	-21.23	23.22	43.50	-20.28	QP
3		216.0240	43.41	-17.29	26.12	46.00	-19.88	QP
4		312.0700	40.66	-14.14	26.52	46.00	-19.48	QP
5		456.0657	45.27	-10.27	35.00	46.00	-11.00	QP
6	*	552.1084	45.03	-8.84	36.19	46.00	-9.81	QP

Emission Level= Read Level+ Correct Factor

Test model：MK05B

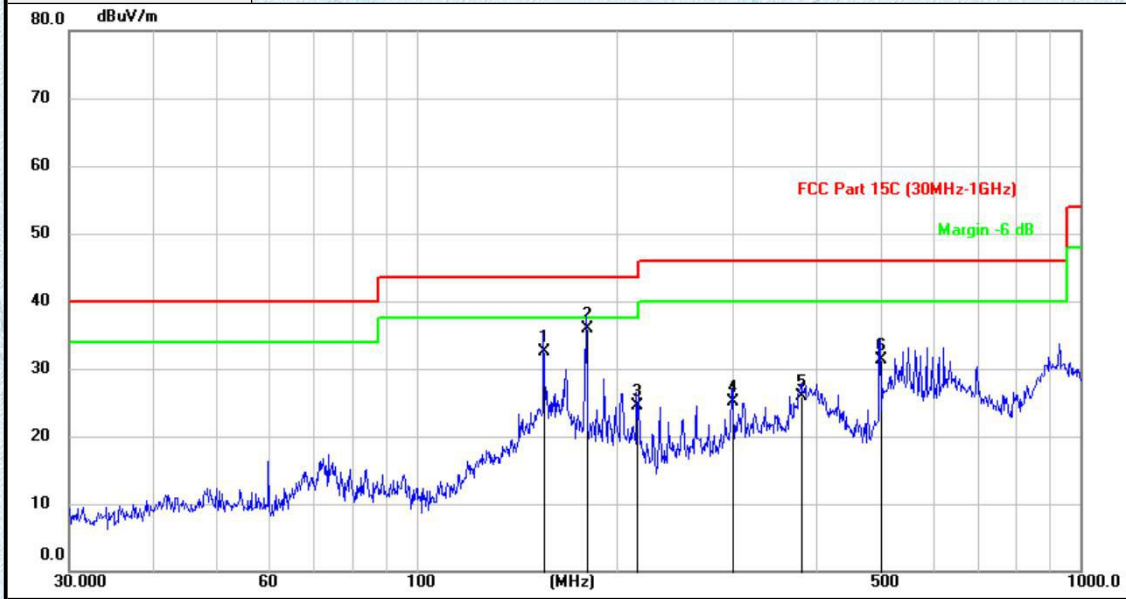
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	167.9420	56.57	-20.72	35.85	43.50	-7.65	QP
2		180.0165	54.28	-19.05	35.23	43.50	-8.27	QP
3		233.2669	48.92	-16.46	32.46	46.00	-13.54	QP
4		300.4726	49.52	-14.64	34.88	46.00	-11.12	QP
5		503.9988	43.80	-9.85	33.95	46.00	-12.05	QP
6		697.5902	39.65	-7.16	32.49	46.00	-13.51	QP

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical



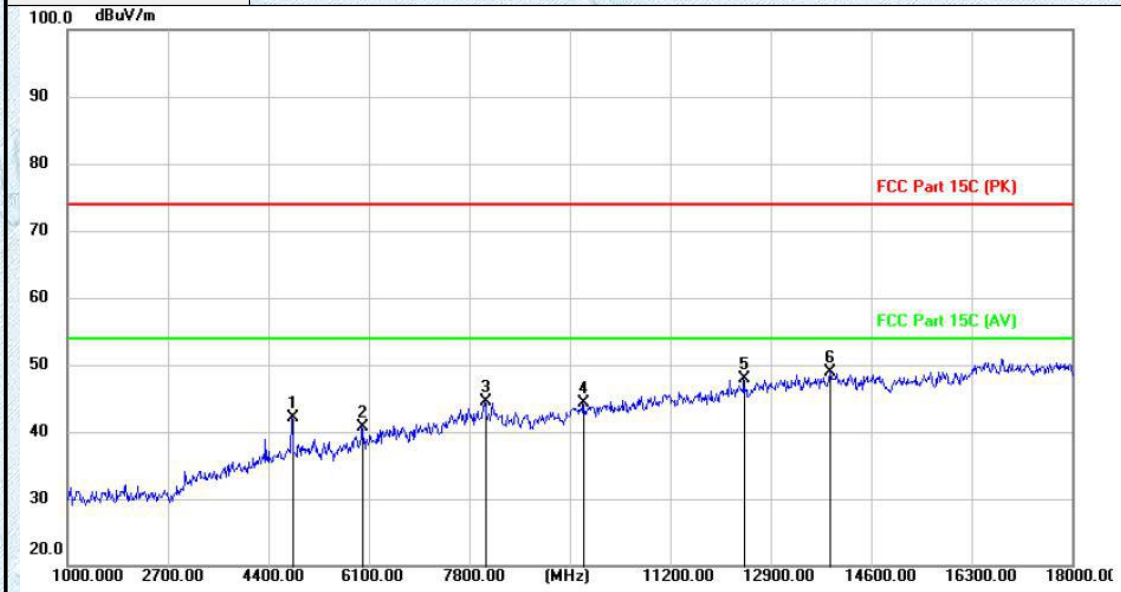
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		155.8553	53.69	-21.25	32.44	43.50	-11.06	QP
2	*	180.2060	54.94	-19.04	35.90	43.50	-7.60	QP
3		214.6648	41.84	-17.34	24.50	43.50	-19.00	QP
4		299.4208	39.75	-14.67	25.08	46.00	-20.92	QP
5		380.7143	37.42	-11.54	25.88	46.00	-20.12	QP
6		499.9503	41.27	-9.93	31.34	46.00	-14.66	QP

Emission Level= Read Level+ Correct Factor

Adobe 1GHz

Test model：MK05A

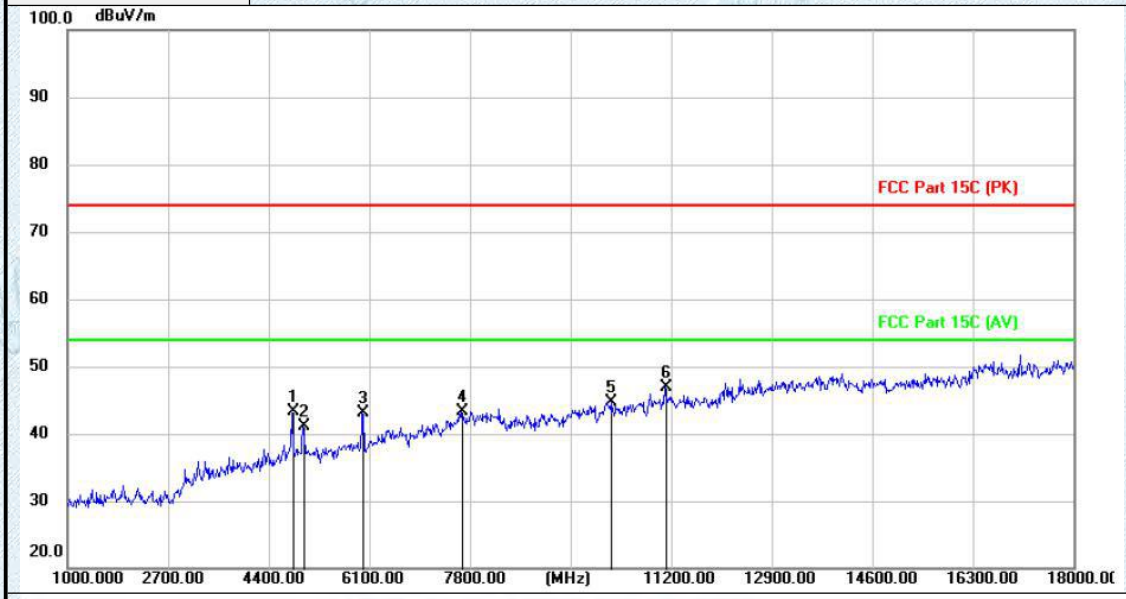
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		4804.600	48.09	-5.92	42.17	74.00	-31.83	peak
2		5984.400	44.64	-3.84	40.80	74.00	-33.20	peak
3		8060.100	42.36	2.06	44.42	74.00	-29.58	peak
4		9722.700	40.77	3.45	44.22	74.00	-29.78	peak
5		12449.500	39.01	8.85	47.86	74.00	-26.14	peak
6	*	13903.000	37.80	11.11	48.91	74.00	-25.09	peak

Emission Level= Read Level+ Correct Factor

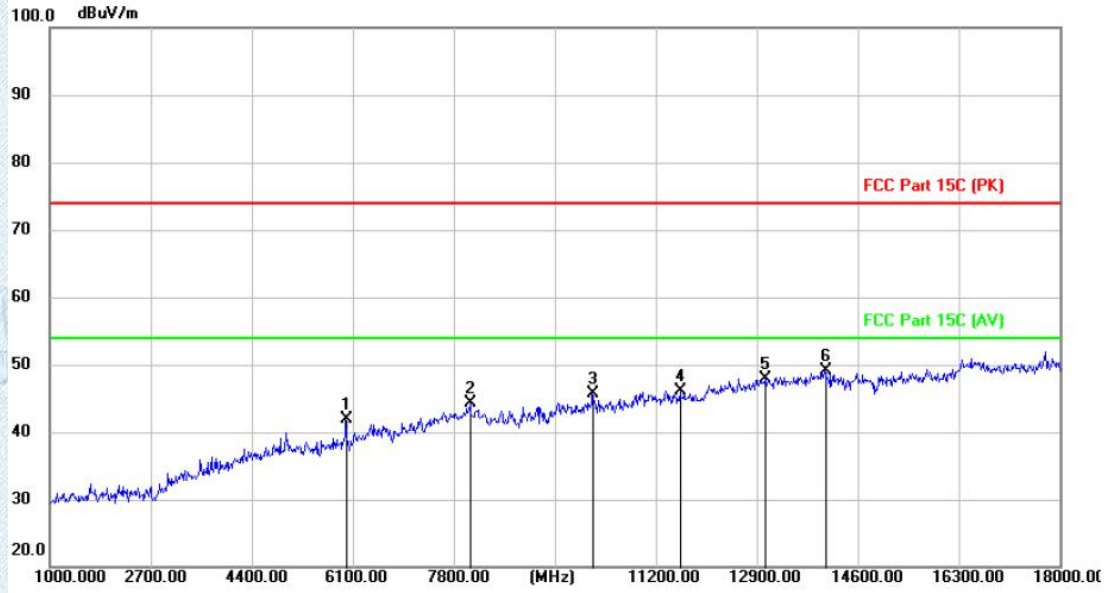
Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		4804.600	49.12	-5.92	43.20	74.00	-30.80	peak
2		4989.900	46.45	-5.42	41.03	74.00	-32.97	peak
3		5996.300	46.85	-3.81	43.04	74.00	-30.96	peak
4		7657.200	42.13	1.21	43.34	74.00	-30.66	peak
5		10183.400	40.30	4.38	44.68	74.00	-29.32	peak
6	*	11101.400	41.01	5.93	46.94	74.00	-27.06	peak

Emission Level= Read Level+ Correct Factor

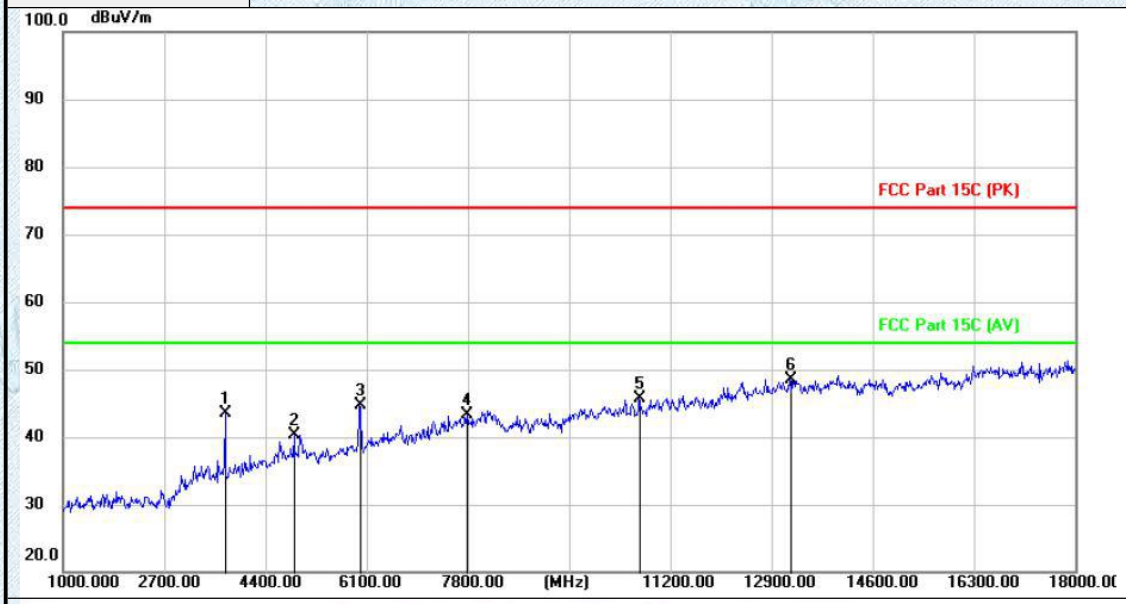
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2440MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		5994.600	45.66	-3.81	41.85	74.00	-32.15	peak
2		8078.800	42.16	2.05	44.21	74.00	-29.79	peak
3		10135.800	41.48	4.30	45.78	74.00	-28.22	peak
4		11611.400	39.01	7.09	46.10	74.00	-27.90	peak
5		13042.800	37.88	9.99	47.87	74.00	-26.13	peak
6	*	14044.100	37.96	11.17	49.13	74.00	-24.87	peak

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2440MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3726.800	52.59	-9.12	43.47	74.00	-30.53	peak
2		4879.400	46.07	-5.72	40.35	74.00	-33.65	peak
3		5991.200	48.44	-3.81	44.63	74.00	-29.37	peak
4		7783.000	41.75	1.53	43.28	74.00	-30.72	peak
5		10686.600	40.43	5.22	45.65	74.00	-28.35	peak
6	*	13207.700	38.26	10.21	48.47	74.00	-25.53	peak

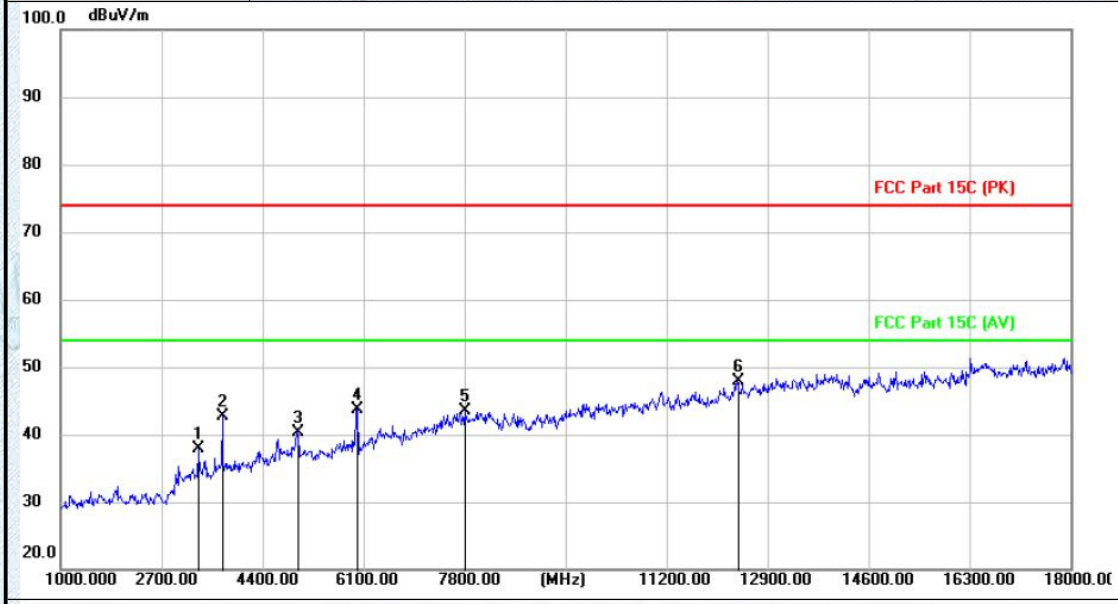
Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2480MHz

No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3726.800	46.53	-9.12	37.41	74.00	-36.59	peak
2		4959.300	46.07	-5.51	40.56	74.00	-33.44	peak
3		6419.600	44.73	-2.39	42.34	74.00	-31.66	peak
4		7371.600	43.14	0.43	43.57	74.00	-30.43	peak
5		9205.900	41.33	2.29	43.62	74.00	-30.38	peak
6	*	13506.900	39.40	10.62	50.02	74.00	-23.98	peak

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2480MHz

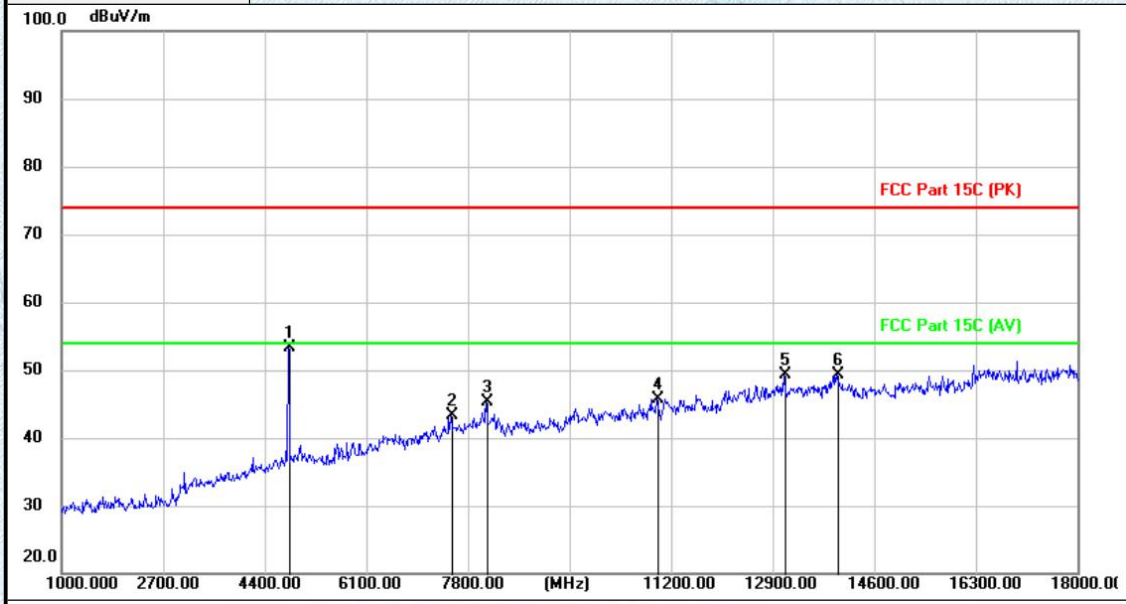


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3322.200	47.93	-10.01	37.92	74.00	-36.08	peak
2		3726.800	51.89	-9.12	42.77	74.00	-31.23	peak
3		4981.400	45.68	-5.44	40.24	74.00	-33.76	peak
4		5982.700	47.62	-3.84	43.78	74.00	-30.22	peak
5		7800.000	41.98	1.57	43.55	74.00	-30.45	peak
6	*	12393.400	39.13	8.75	47.88	74.00	-26.12	peak

Emission Level= Read Level+ Correct Factor

Test model：MK05B

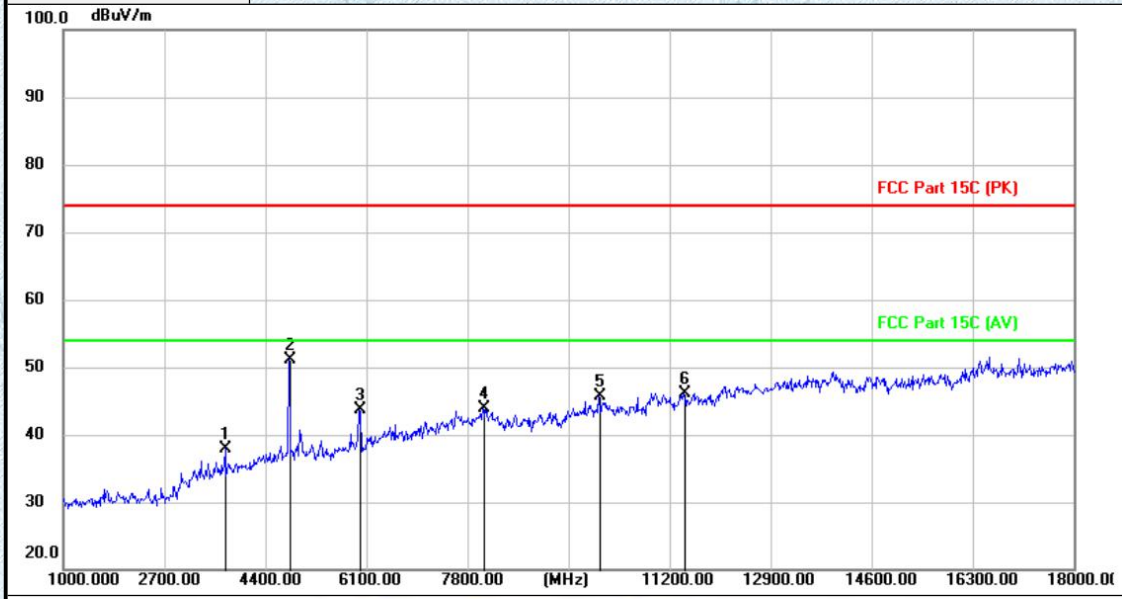
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1	*	4802.900	59.27	-5.92	53.35	74.00	-20.65	peak
2		7514.400	42.46	0.86	43.32	74.00	-30.68	peak
3		8119.600	43.34	2.03	45.37	74.00	-28.63	peak
4		10972.200	40.04	5.66	45.70	74.00	-28.30	peak
5		13093.800	39.22	10.06	49.28	74.00	-24.72	peak
6		13986.300	38.15	11.22	49.37	74.00	-24.63	peak

Emission Level= Read Level+ Correct Factor

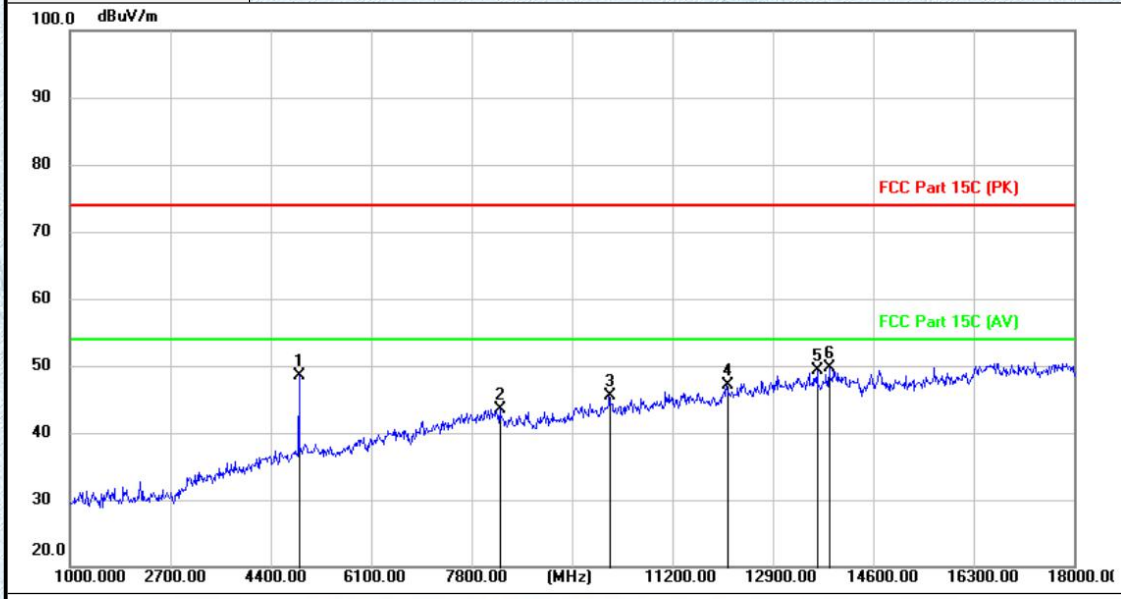
Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2402MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3730.200	46.99	-9.10	37.89	74.00	-36.11	peak
2	*	4802.900	56.95	-5.92	51.03	74.00	-22.97	peak
3		5986.100	47.58	-3.84	43.74	74.00	-30.26	peak
4		8058.400	41.92	2.06	43.98	74.00	-30.02	peak
5		10016.800	41.59	4.10	45.69	74.00	-28.31	peak
6		11449.900	39.40	6.74	46.14	74.00	-27.86	peak

Emission Level= Read Level+ Correct Factor

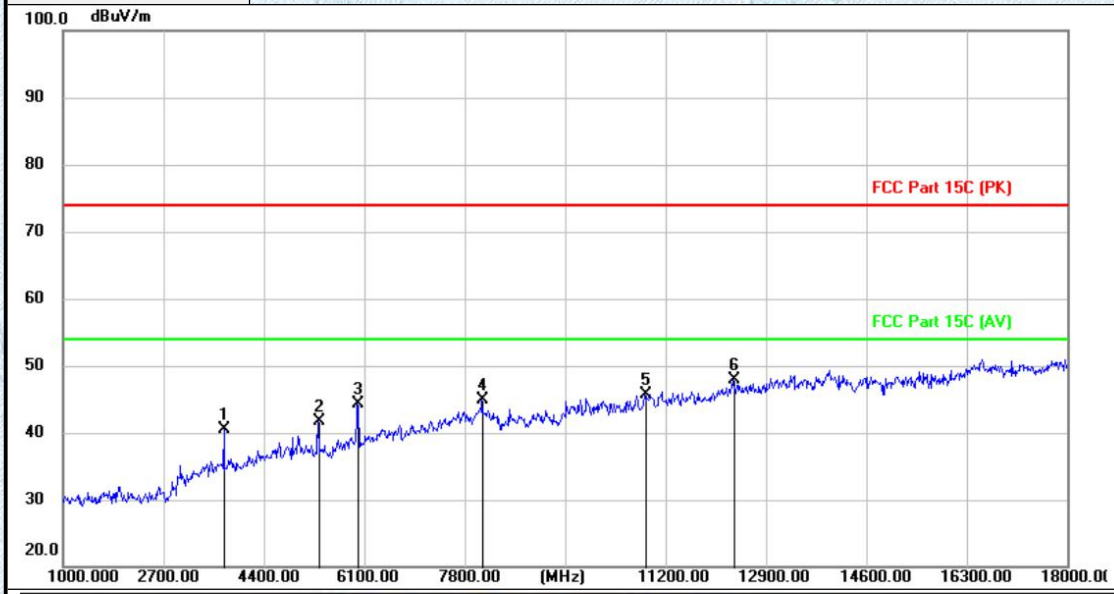
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2440MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		4879.400	54.16	-5.72	48.44	74.00	-25.56	peak
2		8281.100	41.53	1.99	43.52	74.00	-30.48	peak
3		10134.100	41.21	4.29	45.50	74.00	-28.50	peak
4		12131.600	38.95	8.16	47.11	74.00	-26.89	peak
5		13656.500	38.45	10.81	49.26	74.00	-24.74	peak
6	*	13863.900	38.62	11.06	49.68	74.00	-24.32	peak

Emission Level= Read Level+ Correct Factor

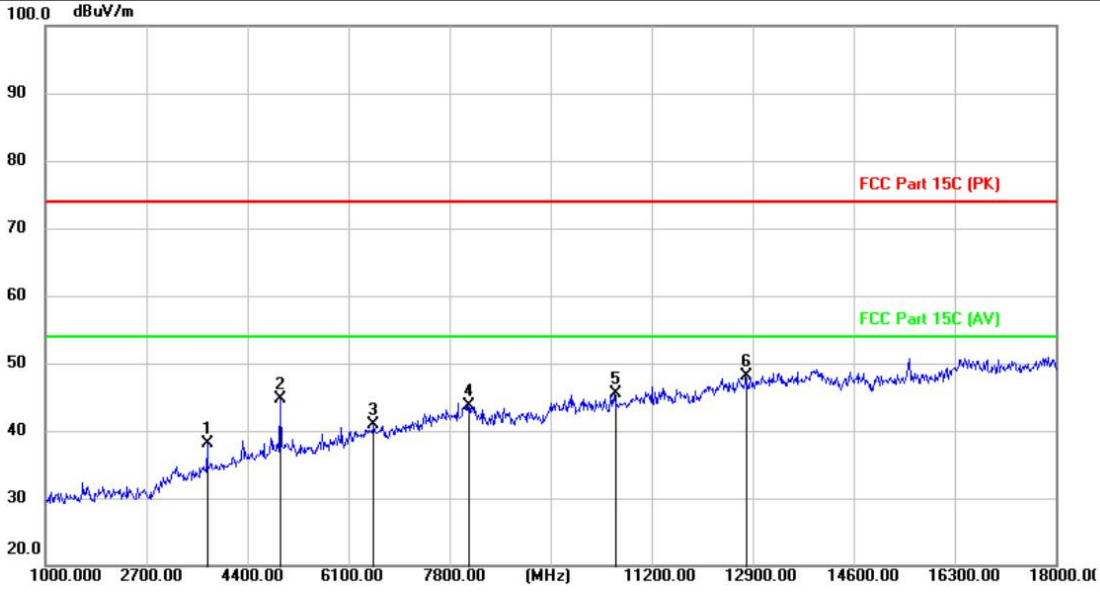
Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2440MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3731.900	49.50	-9.09	40.41	74.00	-33.59	peak
2		5319.700	46.86	-5.10	41.76	74.00	-32.24	peak
3		5991.200	48.05	-3.81	44.24	74.00	-29.76	peak
4		8100.900	42.85	2.04	44.89	74.00	-29.11	peak
5		10856.600	40.27	5.48	45.75	74.00	-28.25	peak
6	*	12342.400	39.31	8.63	47.94	74.00	-26.06	peak

Emission Level= Read Level+ Correct Factor

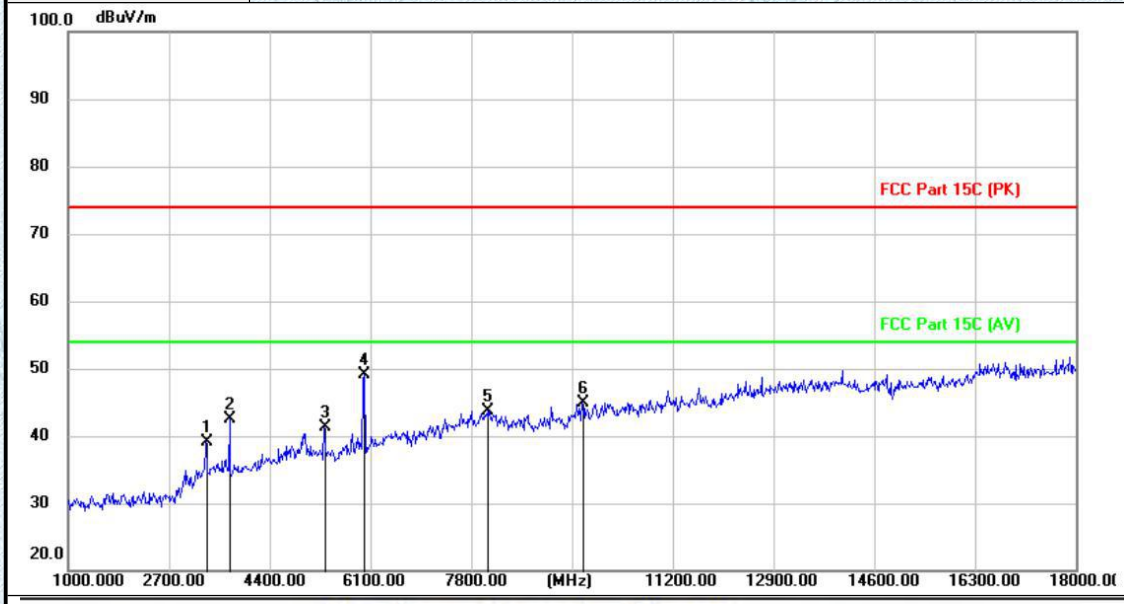
Test Voltage:	DC 3.3V
Ant. Pol.	Horizontal
Test Mode:	TX BLE Mode 2480MHz



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3726.800	47.15	-9.12	38.03	74.00	-35.97	peak
2		4959.300	50.15	-5.51	44.64	74.00	-29.36	peak
3		6525.000	43.02	-2.04	40.98	74.00	-33.02	peak
4		8121.300	41.64	2.03	43.67	74.00	-30.33	peak
5		10574.400	40.43	5.03	45.46	74.00	-28.54	peak
6	*	12789.500	38.57	9.52	48.09	74.00	-25.91	peak

Emission Level= Read Level+ Correct Factor

Test Voltage:	DC 3.3V
Ant. Pol.	Vertical
Test Mode:	TX BLE Mode 2480MHz



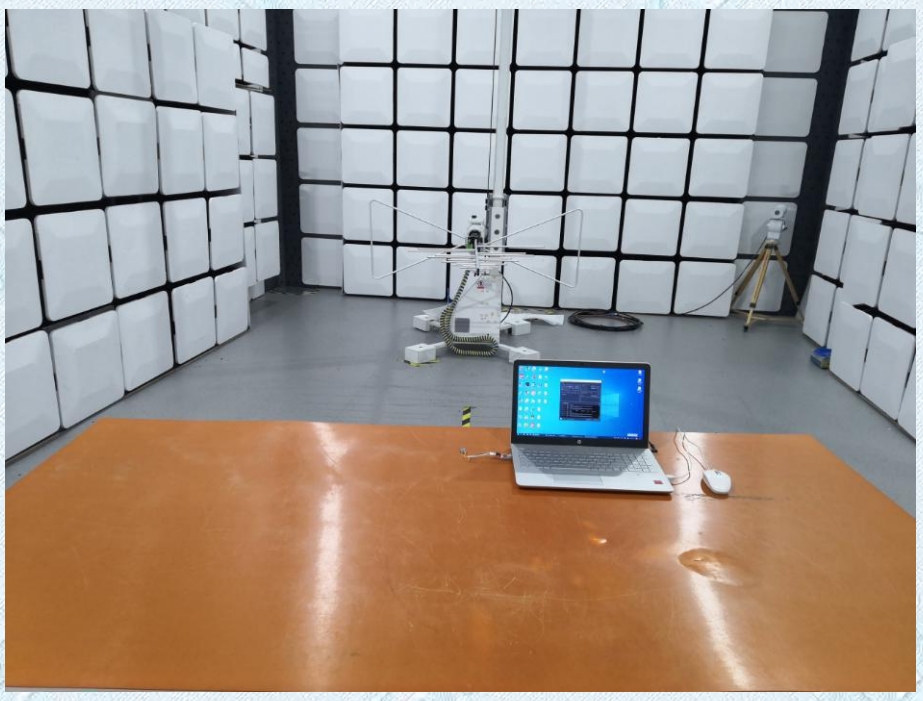
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	(dBuV)	(dB/m)	(dBuV/m)	(dBuV/m)	(dB)	Detector
1		3330.700	49.16	-9.98	39.18	74.00	-34.82	peak
2		3731.900	51.53	-9.09	42.44	74.00	-31.56	peak
3		5323.100	46.32	-5.09	41.23	74.00	-32.77	peak
4	*	5998.000	52.86	-3.81	49.05	74.00	-24.95	peak
5		8080.500	41.64	2.06	43.70	74.00	-30.30	peak
6		9681.900	41.48	3.37	44.85	74.00	-29.15	peak

Emission Level= Read Level+ Correct Factor

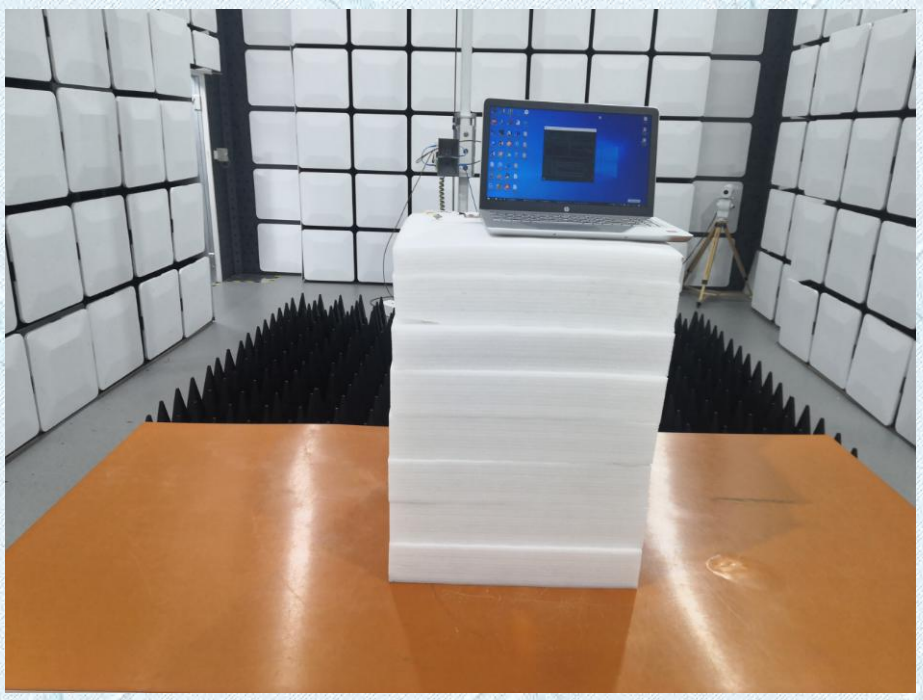
Note:All modulation modes were tested, and only the worst data of GFSK_1M was recorded in the report.

4.EUT TEST PHOTOS

Radiated Measurement (Below 1GHz)

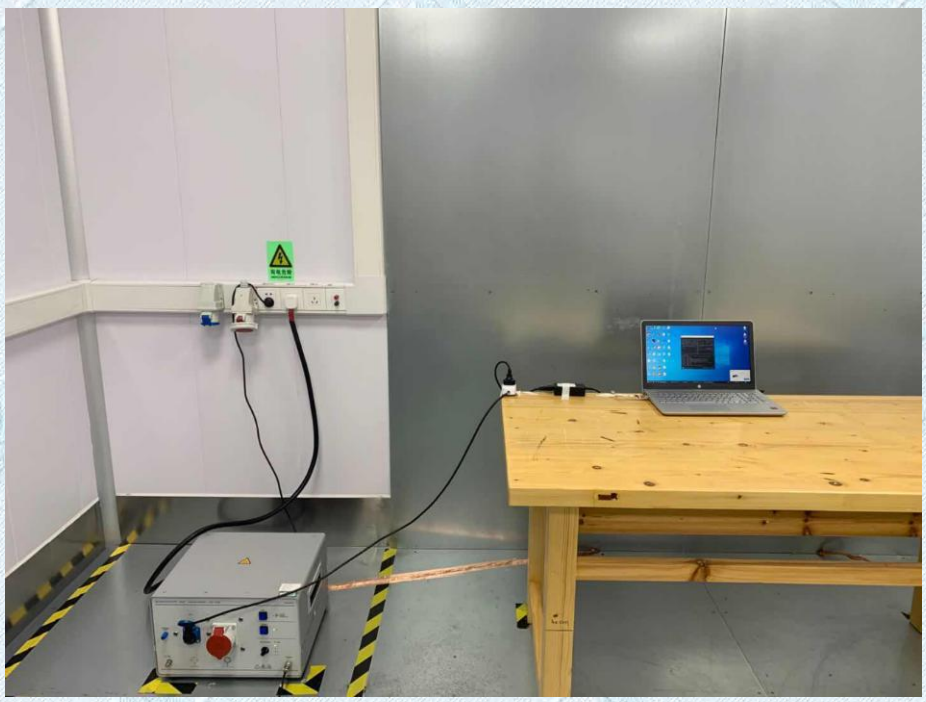


Radiated Measurement (Above 1GHz)



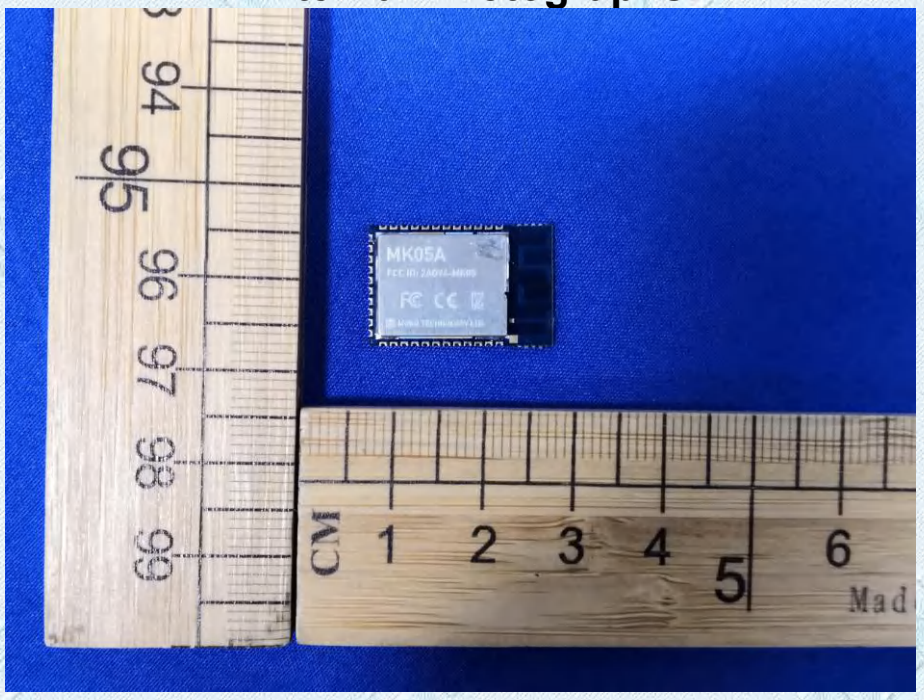
RF Conducted

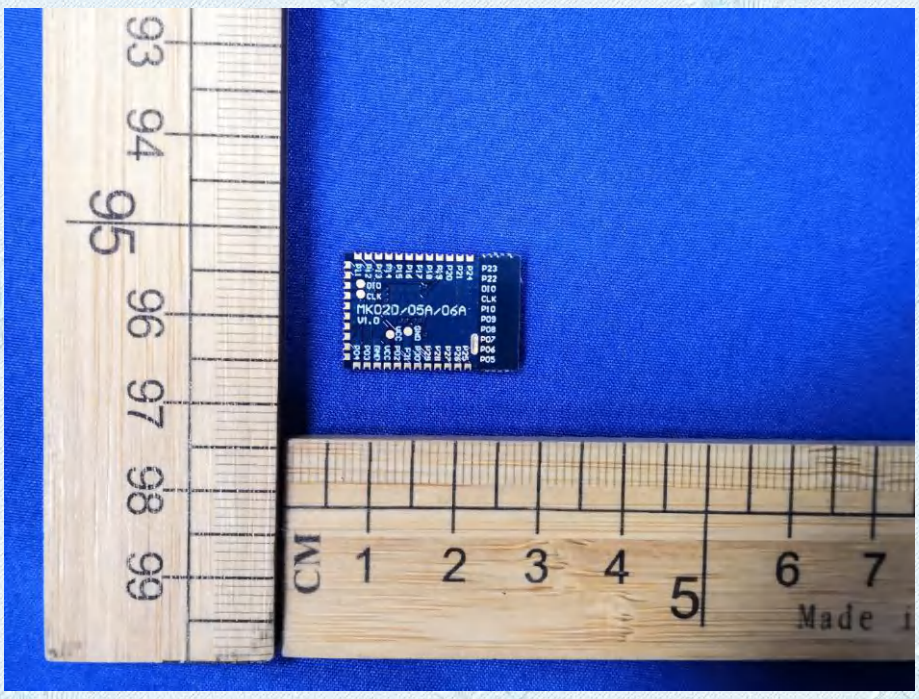
CONDUCTED EMISSION TEST SETUP

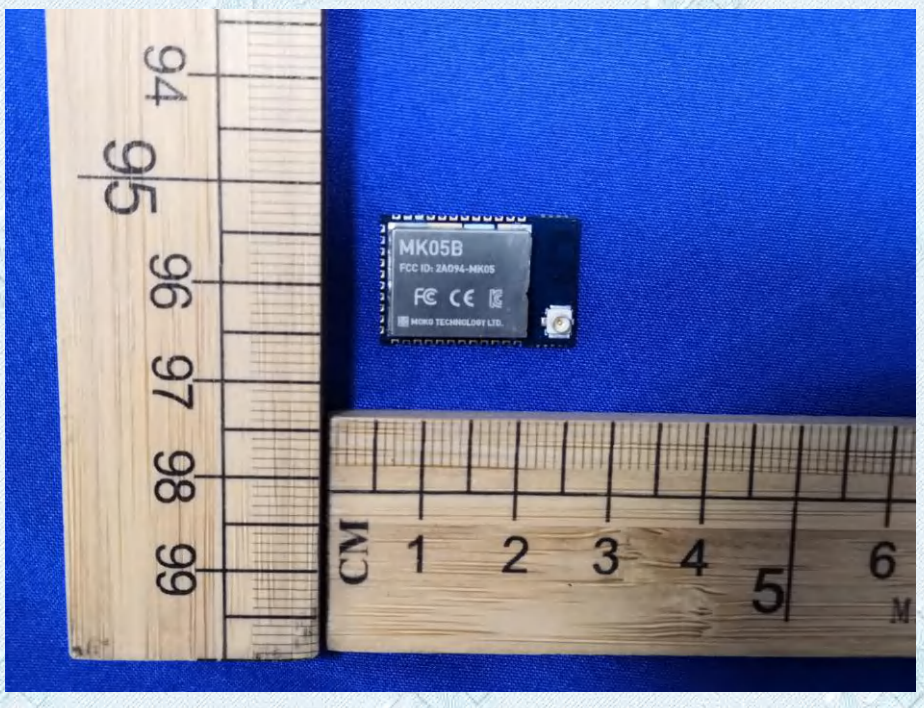


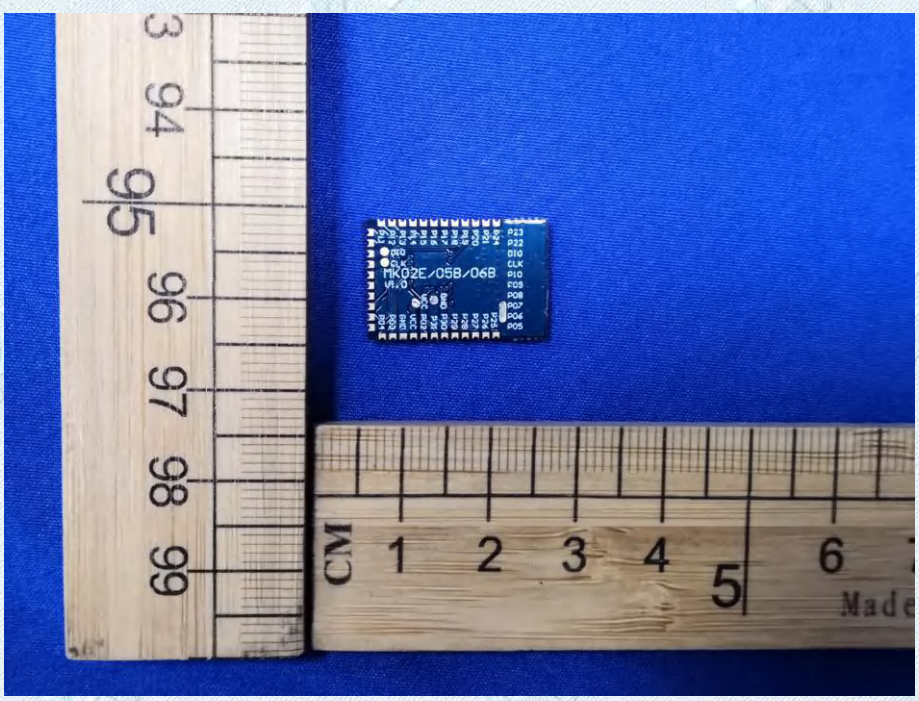
5.PHOTOGRAPHS OF EUT CONSTRUCTIONAL

External Photographs

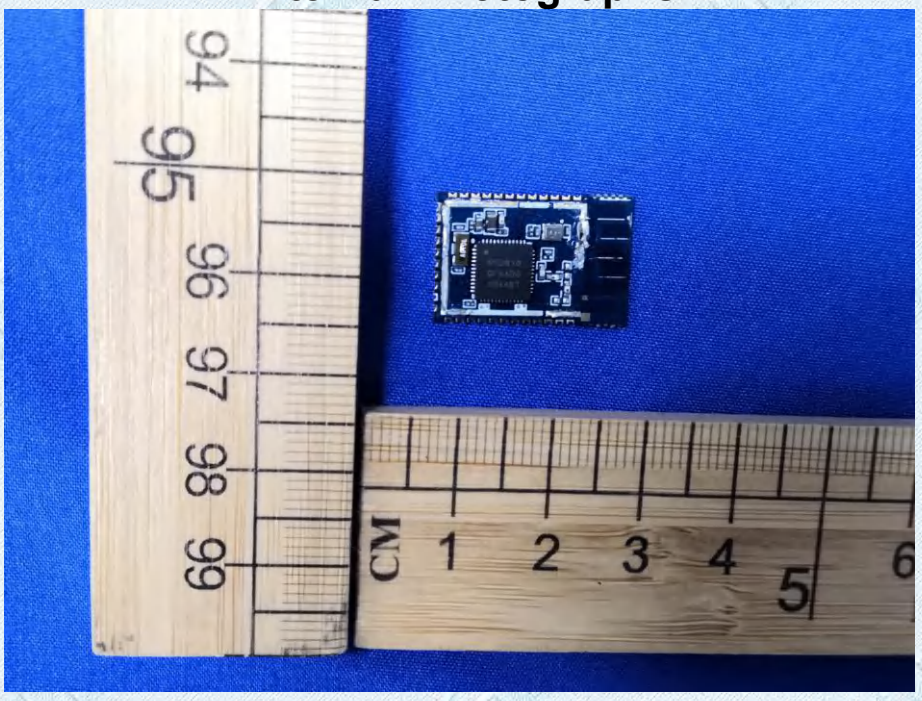


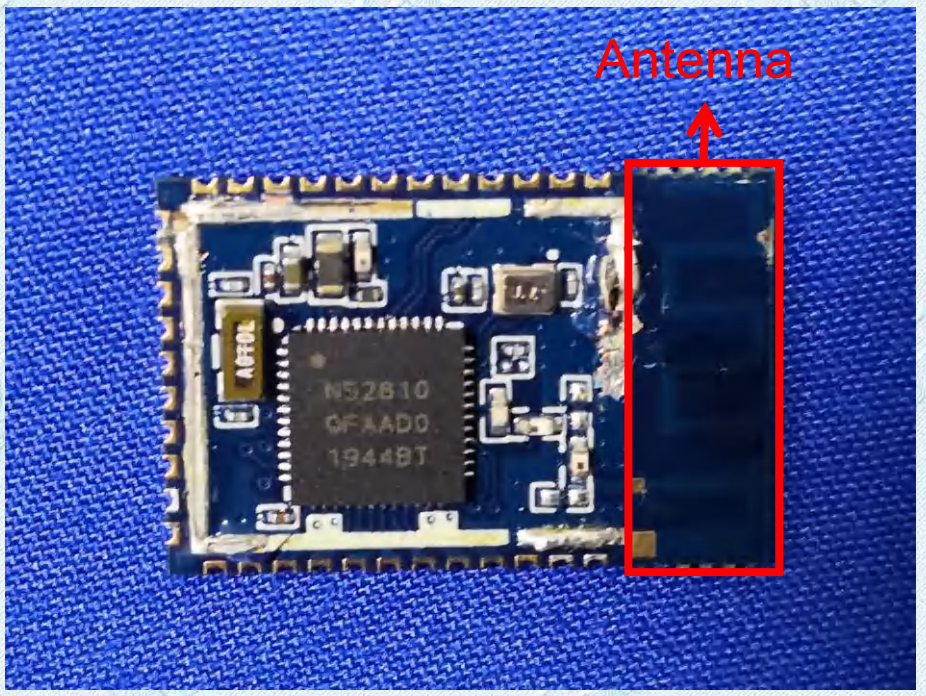


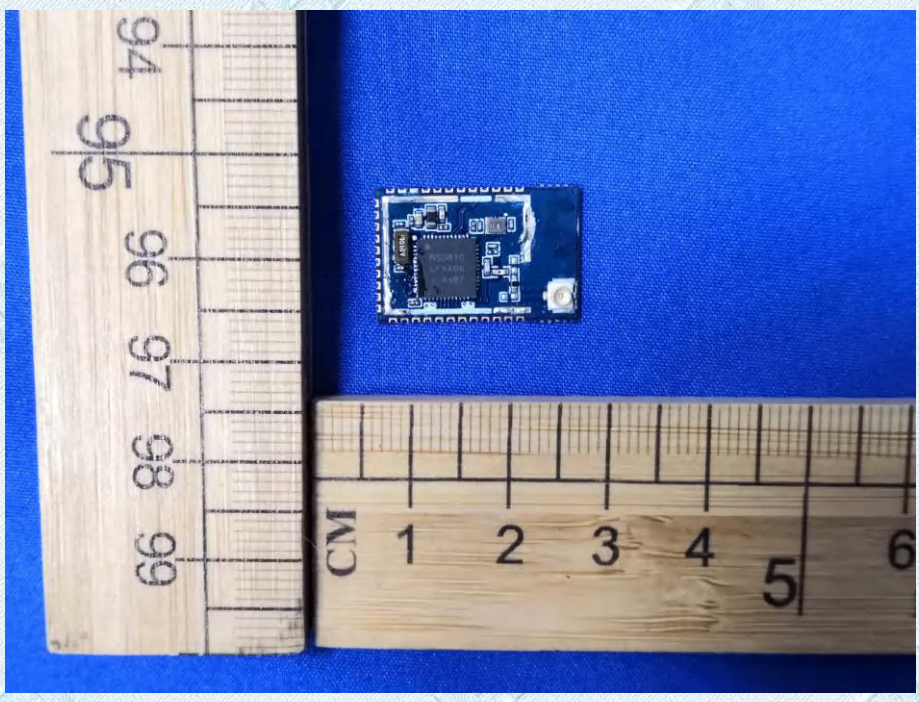

MK05B
FCC ID: 2AD94-MK05
CM
1
2
3
4
5
6

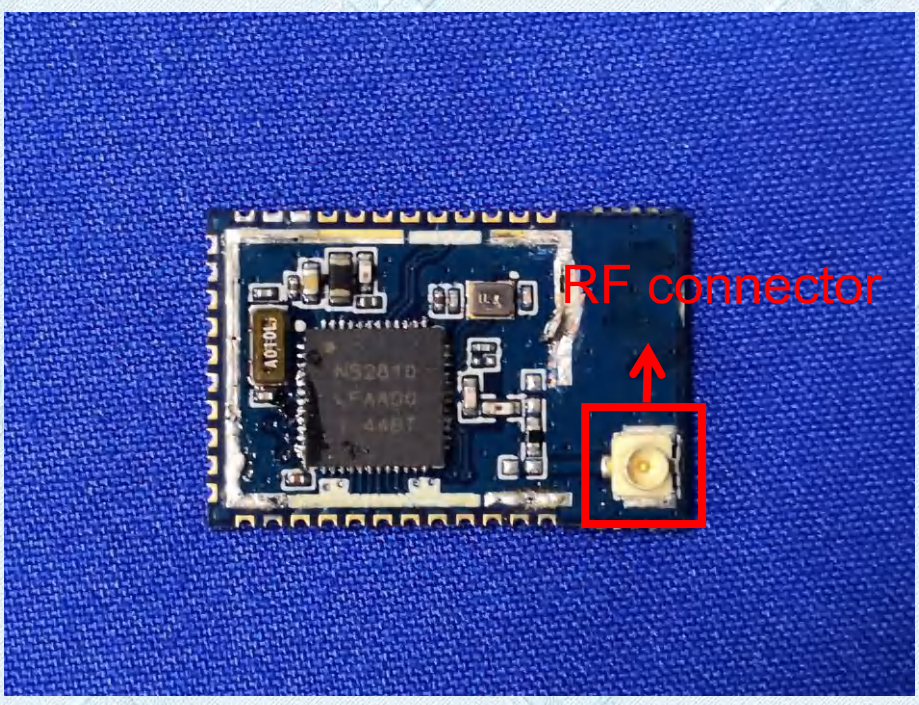

MK02E/05B/06B
CM
1
2
3
4
5
6

Internal Photographs









******THE END*****