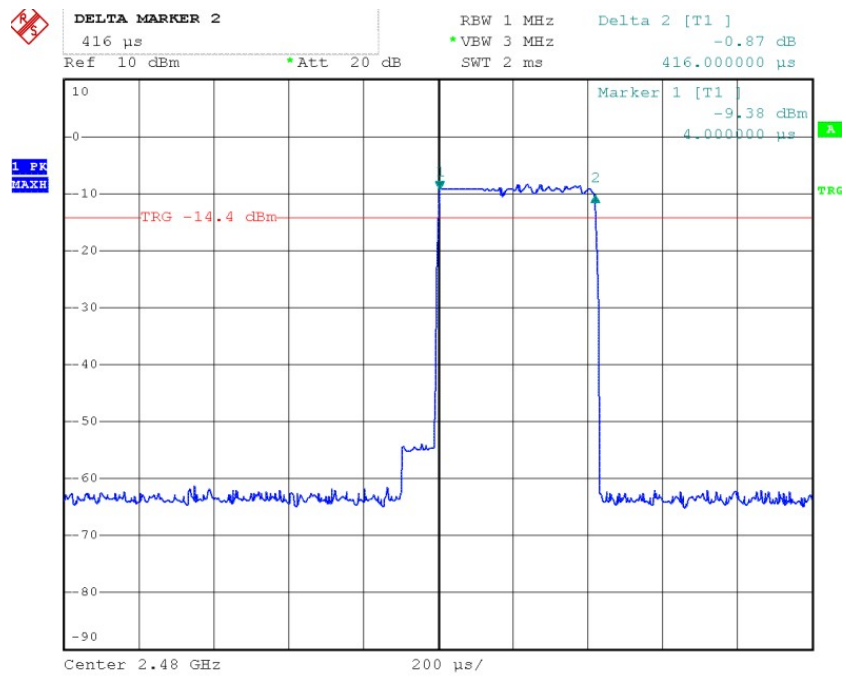
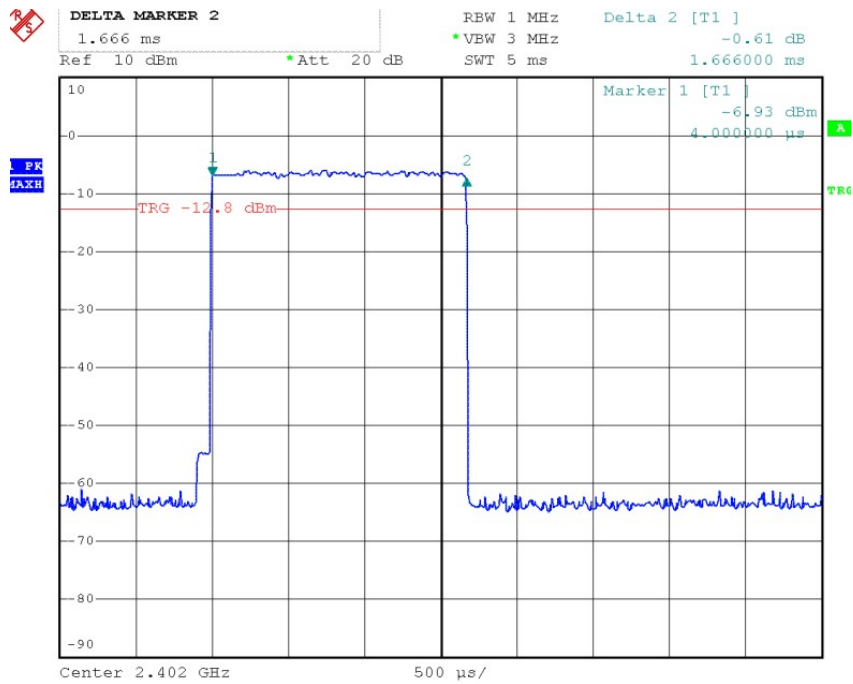


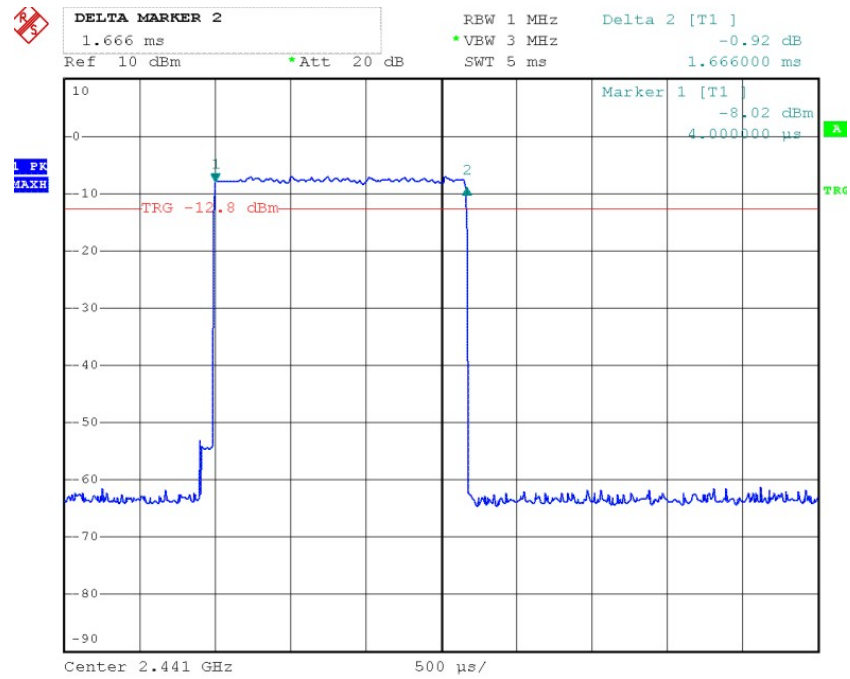
## Channel High



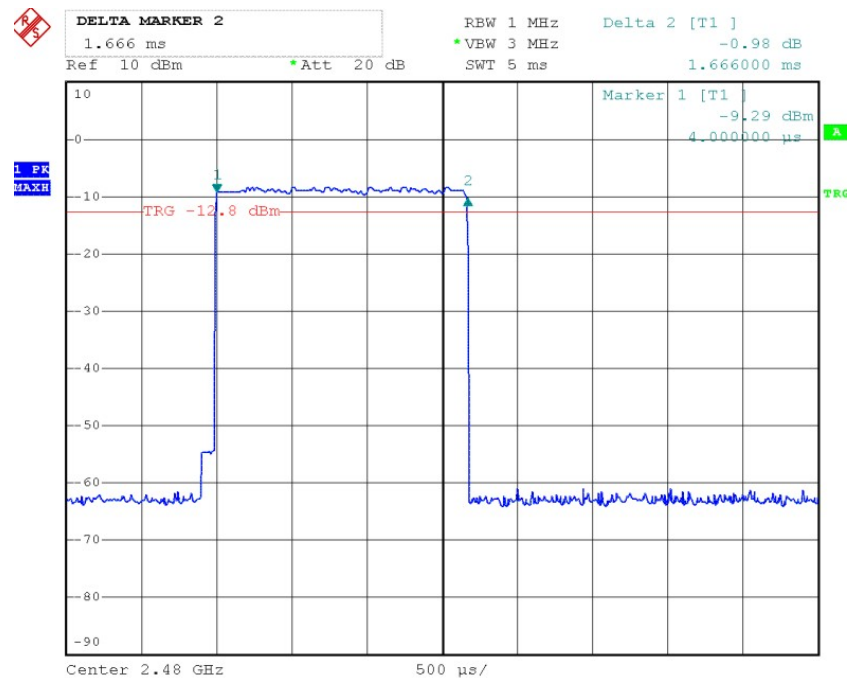
## EDR 3M 3DH3 Channel Low



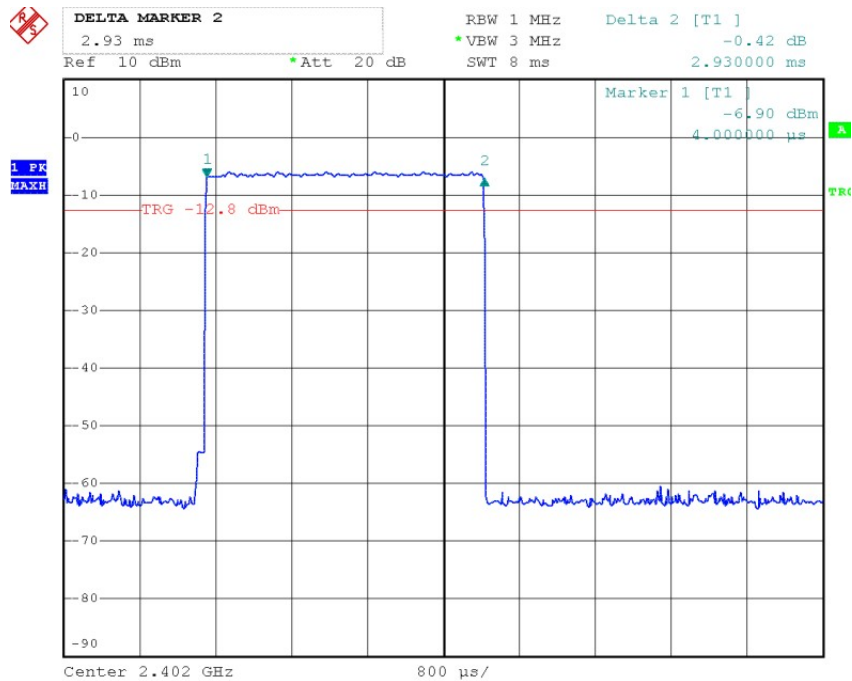
Channel Middle



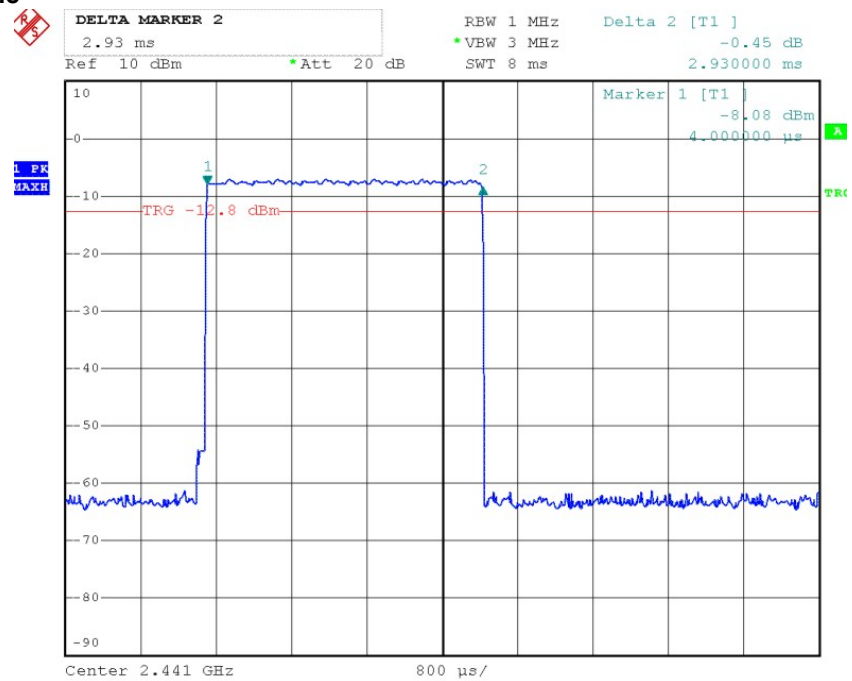
Channel High



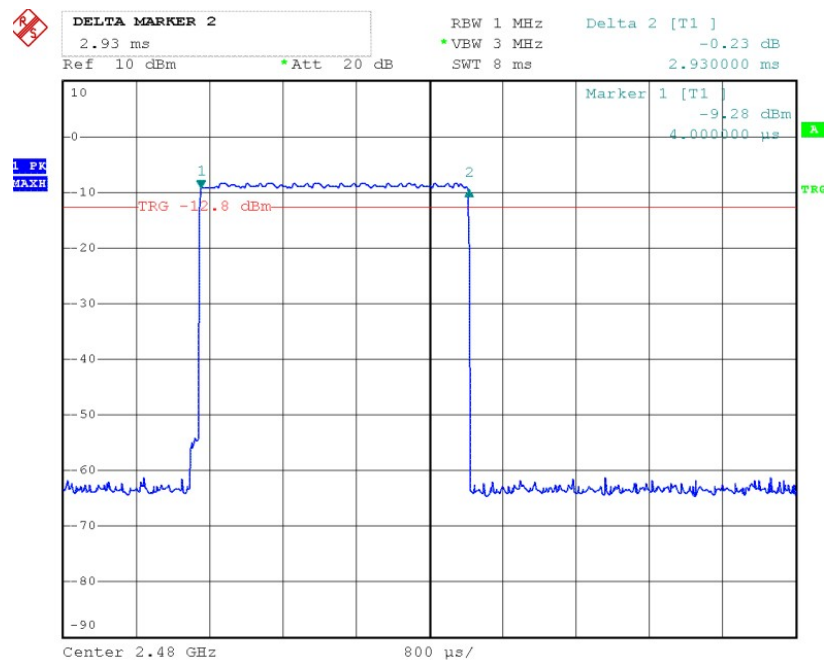
# EDR 3M 3DH5 Channel Low



# Channel Middle



Channel High

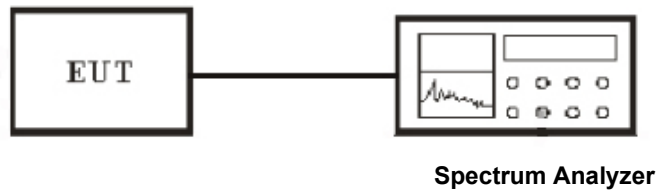


## 9. Test of Maximum Peak Output Power

### 9.1 Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and The maximum peak output power shall not exceed 1 watt. For all other frequency hopping systems in this frequency band, The maximum peak output power shall not exceed 0.125 watt.

### 9.2 EUT Setup



### 9.3 Test Equipment List and Details

See section 2.5.

### 9.4 Test Procedure

1. The transmitter output was connected to the peak power meter and recorded the peak value.
2. Peak power meter parameter set to auto attenuator and filter is the same as.
3. Repeated the 1 for the middle and highest channel of the EUT.

## 9.5 Test Result

Temperature ( °C ) : 22~23	EUT: Wave
Humidity (%RH ) : 50~54	M/N: W1
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

### BDR 1M

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
GFSK	Low	2402.00	-1.66	21	-24.49
GFSK	Middle	2441.00	-0.91	21	-24.89
GFSK	High	2480.00	-2.71	21	-25.89

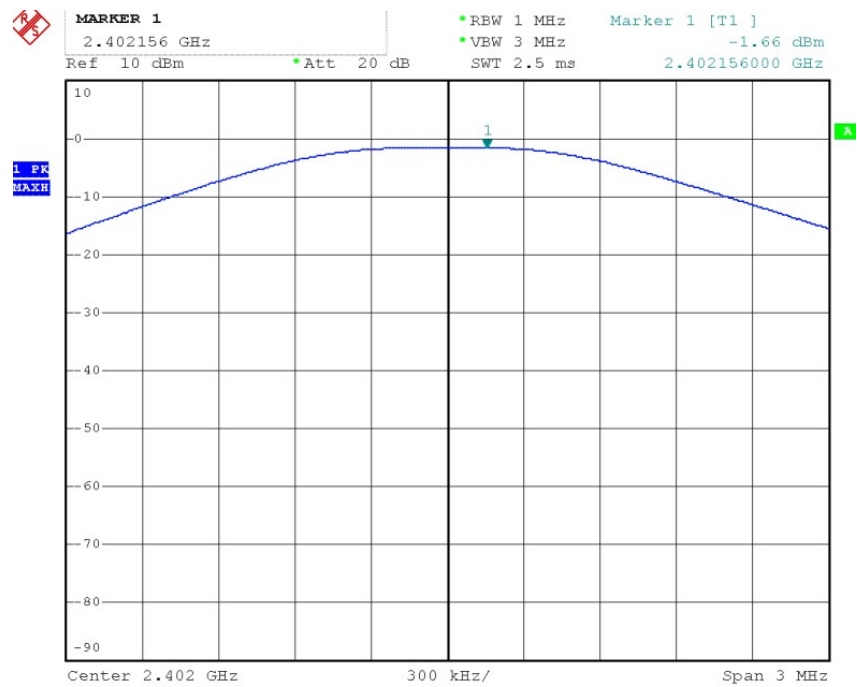
### EDR 2M

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
Pi/4 DAPSK	Low	2402.00	-1.59	21	-25.41
Pi/4 DAPSK	Middle	2441.00	-0.86	21	-25.66
Pi/4 DAPSK	High	2480.00	-2.64	21	-26.63

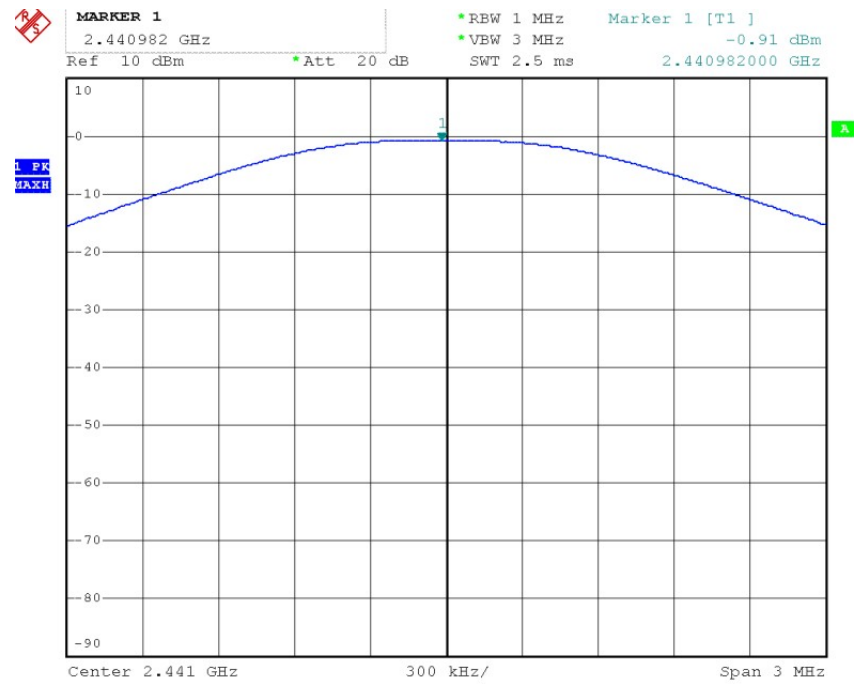
### EDR 3M

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
8-DPSK	Low	2402.00	-2.83	21	-24.46
8-DPSK	Middle	2441.00	-2.09	21	-24.90
8-DPSK	High	2480.00	-4.04	21	-25.92

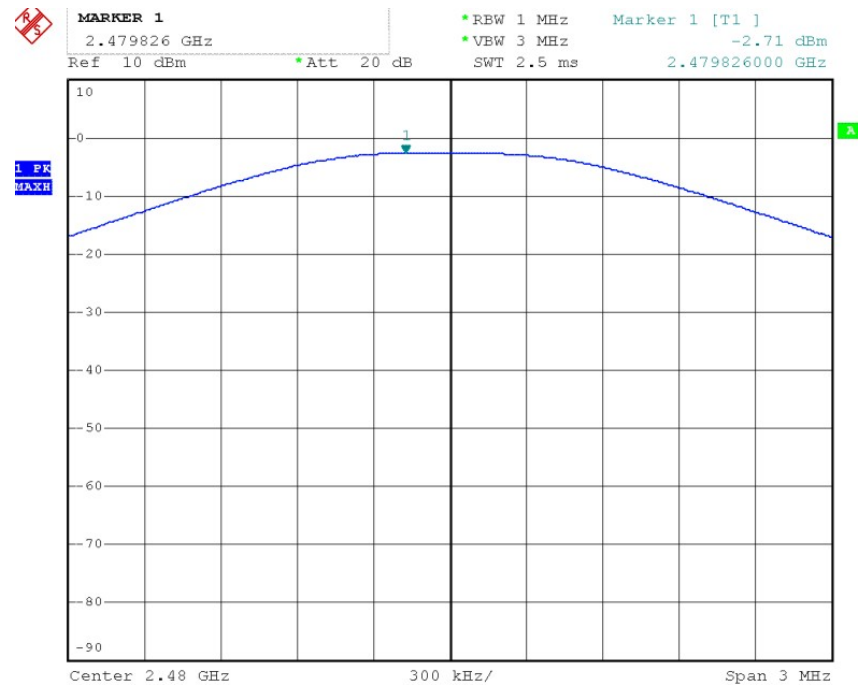
BDR 1M  
Channel Low



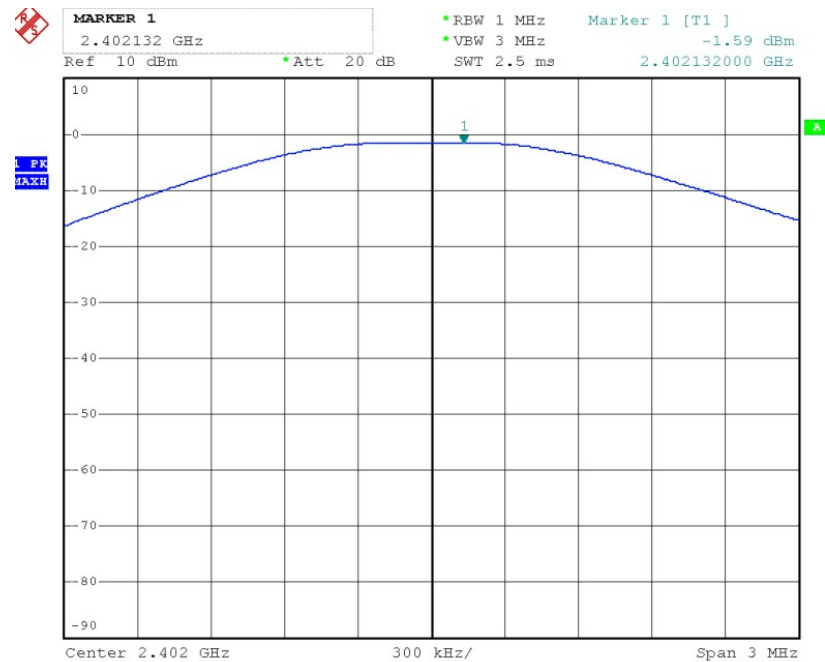
Channel Middle



Channel High

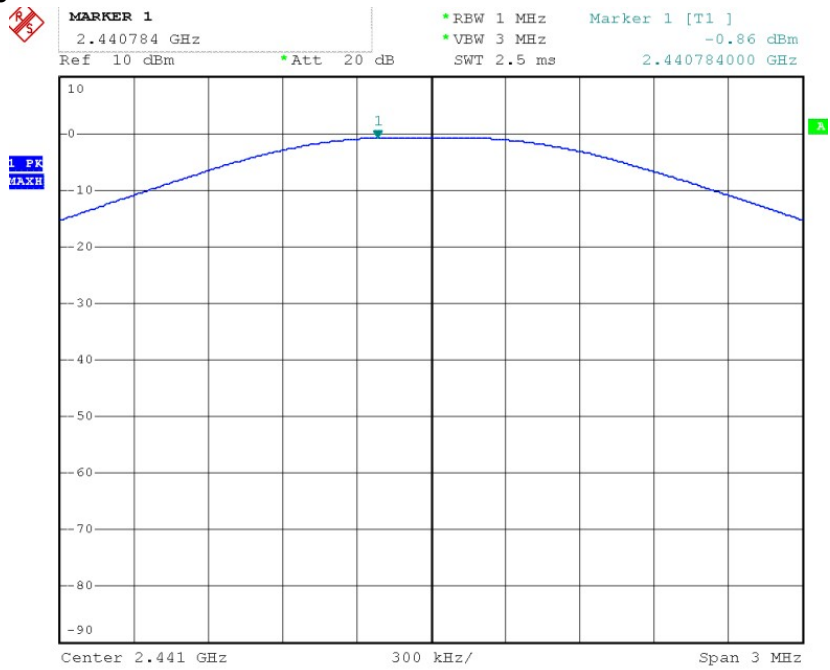


EDR 2M  
Channel Low

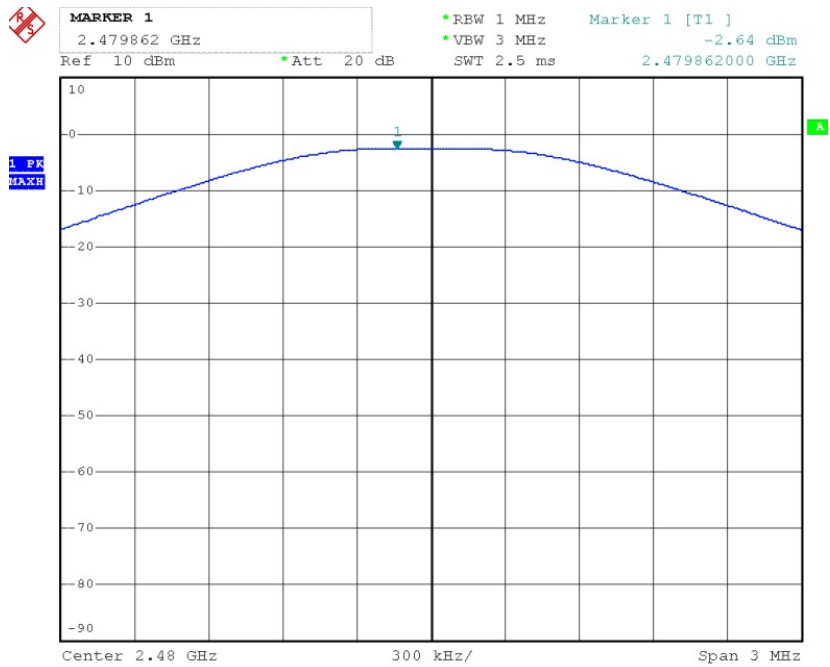




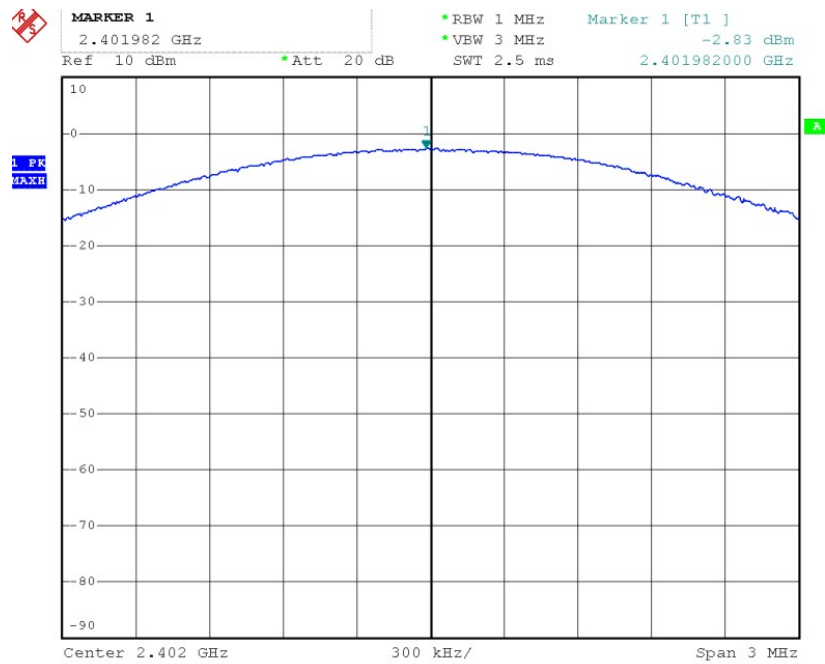
Channel Middle



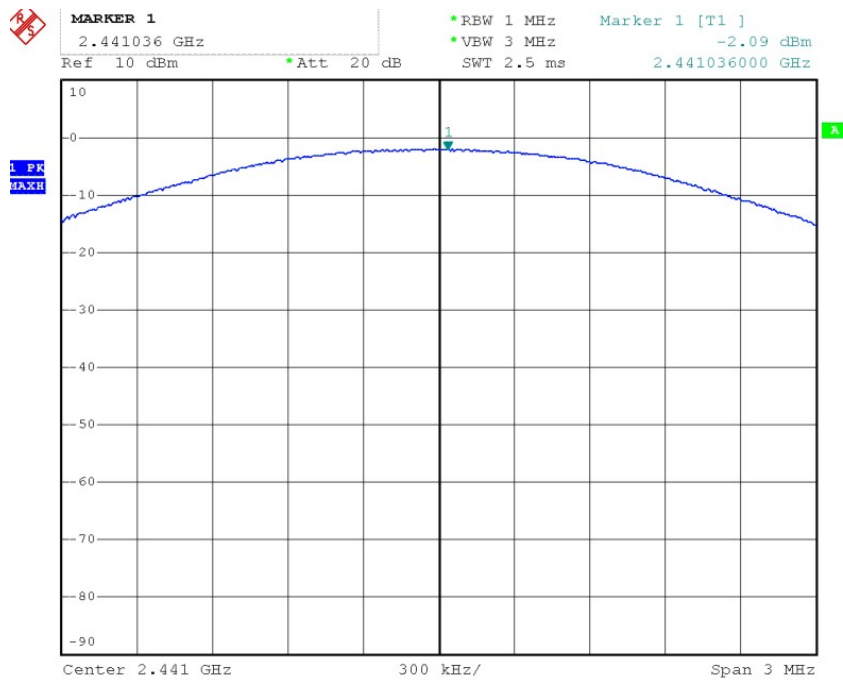
Channel High



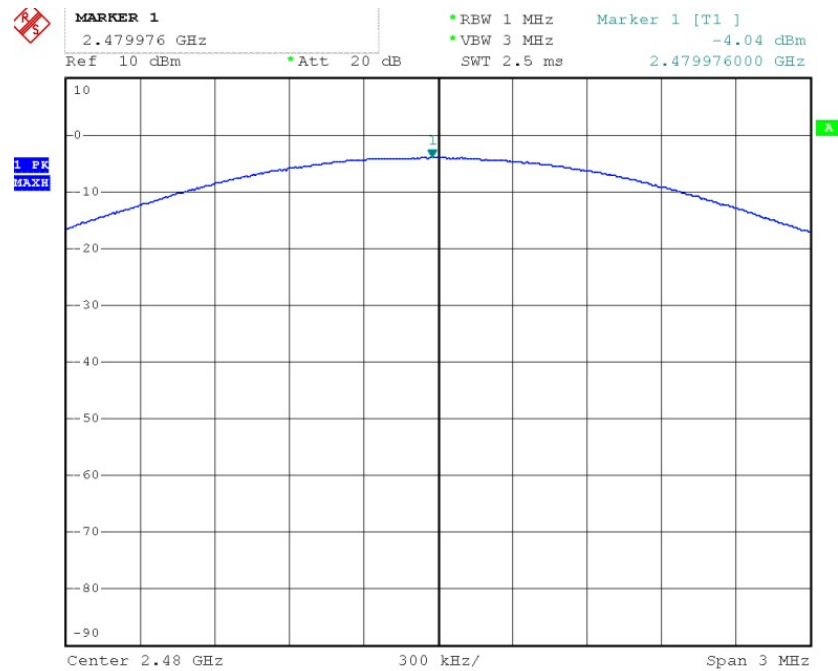
## EDR 3M Channel Low



## Channel Middle



Channel High



## 10. Test of Band Edges Emission

### 10.1 Applicable Standard

Section 15.247(d): 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

### 10.2 EUT Setup

#### Radiated Measurement Setup

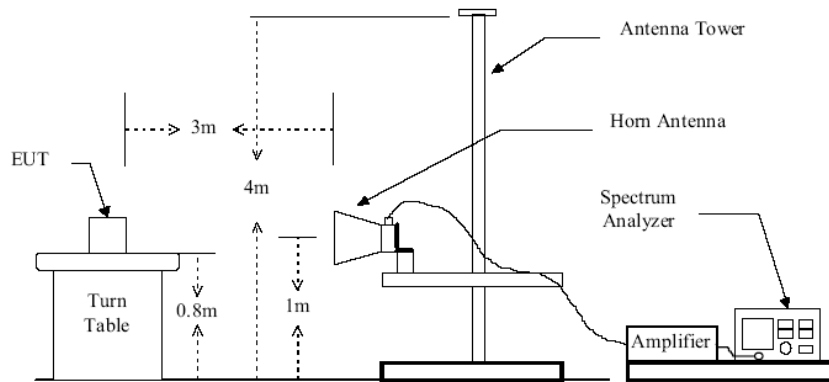
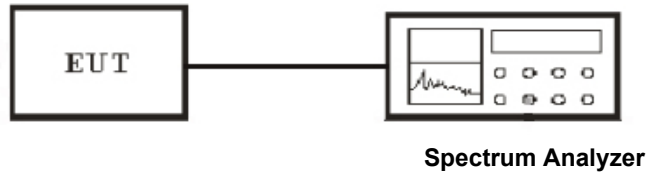


Figure 2 : Frequencies measured above 1 GHz configuration

#### Conducted Measurement Setup



### 10.3 Test Equipment List and Details

See section 2.5.

### 10.4 Test Procedure

#### Conducted Measurement

1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.

3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

#### Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2003
2. 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 emission field strength of both horizontal and vertical polarization.
4. For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For band edge emission, use 1MHz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

#### 10.5 Test Result

Temperature ( °C ) : 22~23	EUT: Wave
Humidity (%RH ) : 50~54	M/N: W1
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Tx Mode

#### Radiated Test Result

##### Worst Case BDR 1M

Frequency (MHz)	Antenna Polarization	Emission Read Value (dBμV/m)	Limits (dBμV/m)
<2400	H	36.24	54
>2483.5	H	35.88	54

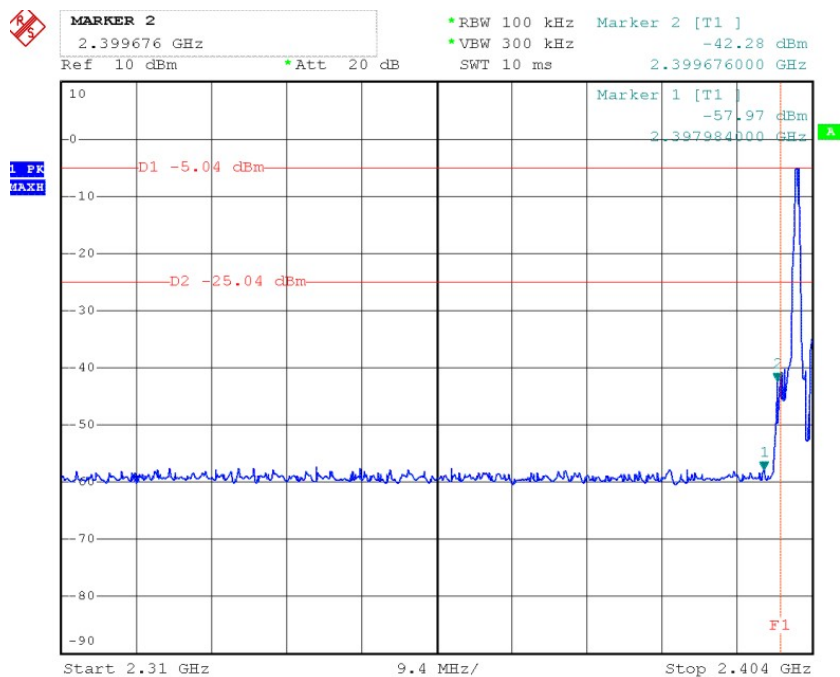
##### Worst Case EDR 2M

Frequency (MHz)	Antenna Polarization	Emission Read Value (dBμV/m)	Limits (dBμV/m)
<2400	H	35.45	54
>2483.5	H	34.87	54

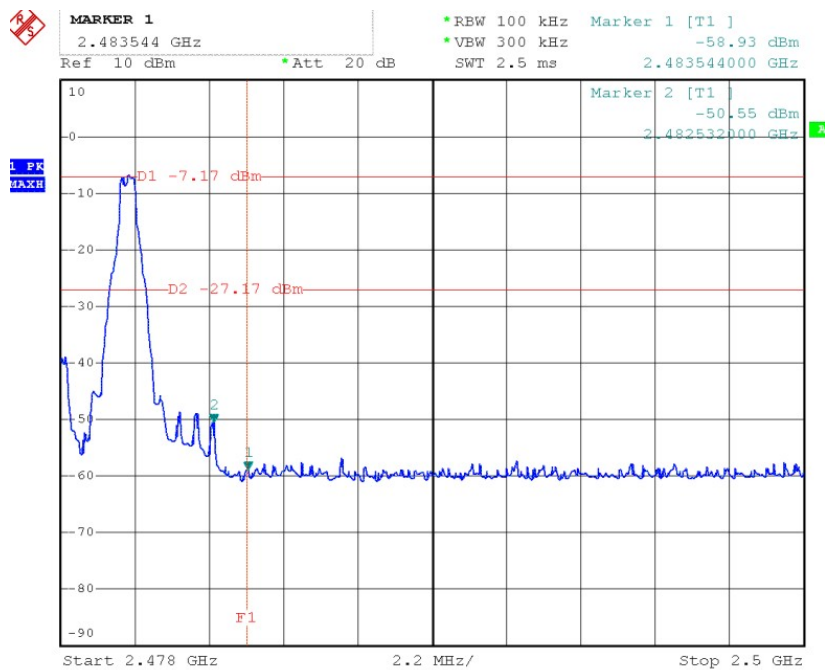
##### Worst Case EDR 3M

Frequency (MHz)	Antenna Polarization	Emission Read Value (dBμV/m)	Limits (dBμV/m)
<2400	H	34.22	54
>2483.5	H	34.43	54

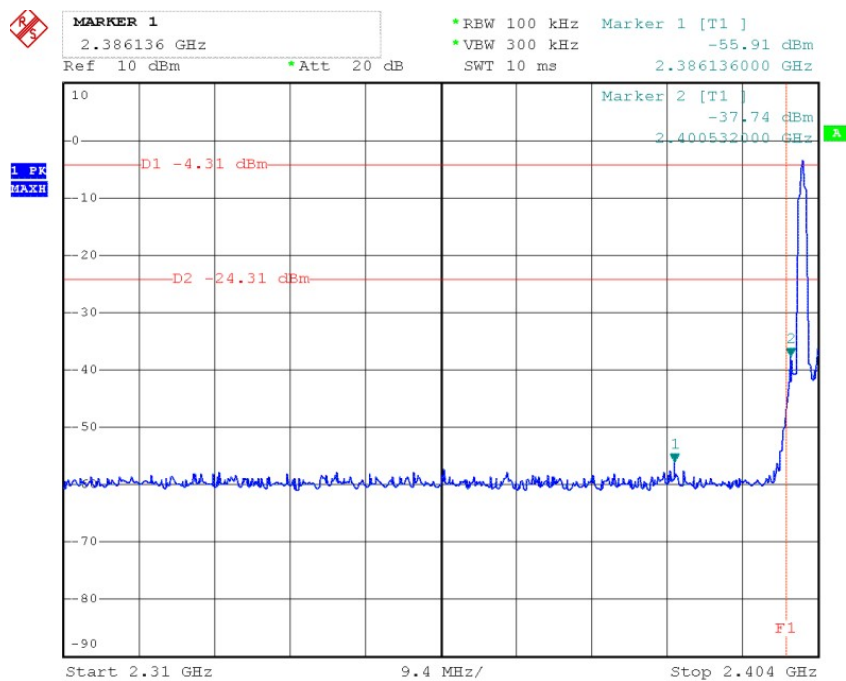
## BDR 1M Low Channel



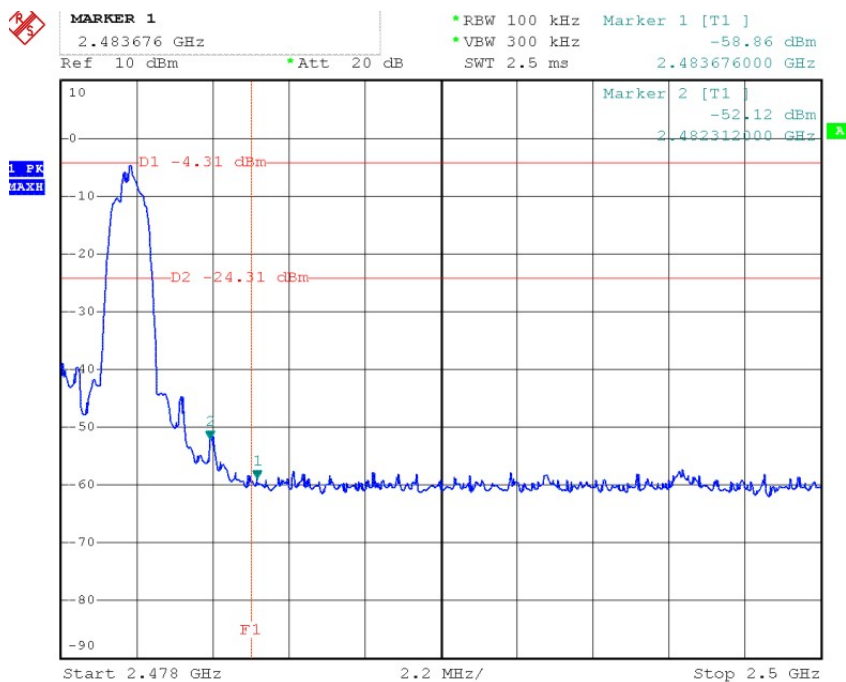
## High Channel



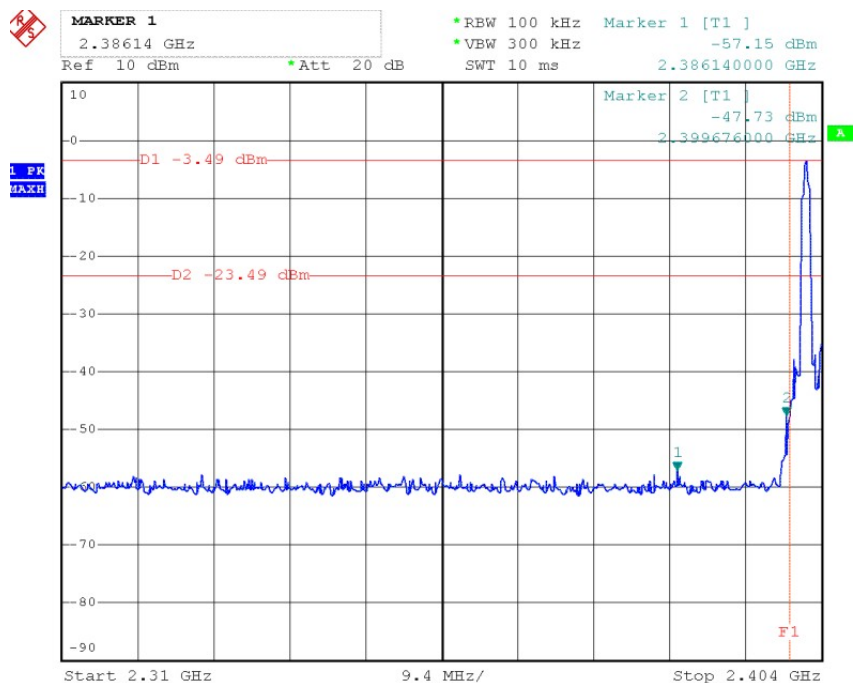
## EDR 2M Low Channel



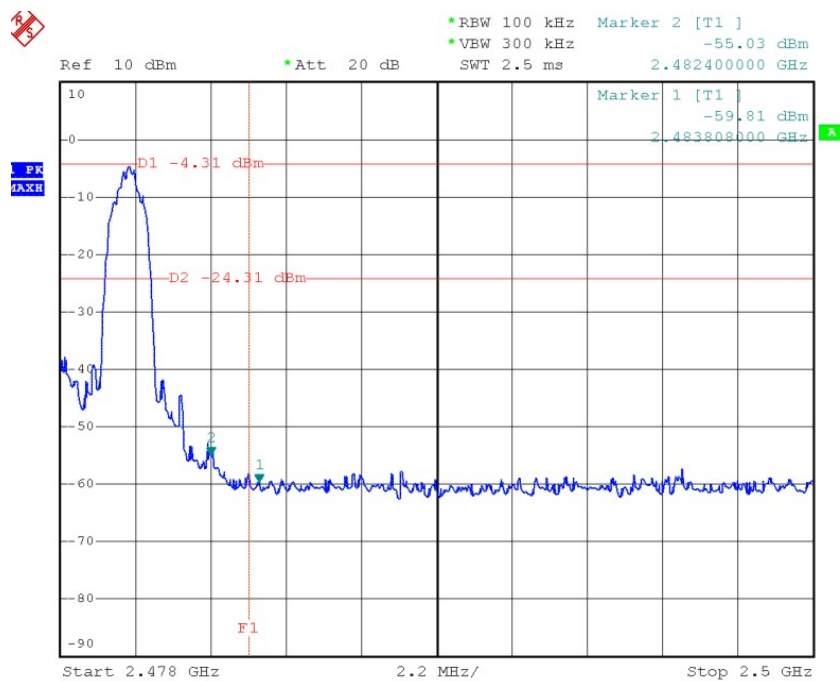
## High Channel



## EDR 3M Low Channel



## High Channel





## 11. Test of Spurious Radiated Emission

### 11.1 Applicable Standard

Section 15.247(d): 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. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

### 11.2 EUT Setup

#### Radiated Measurement Setup

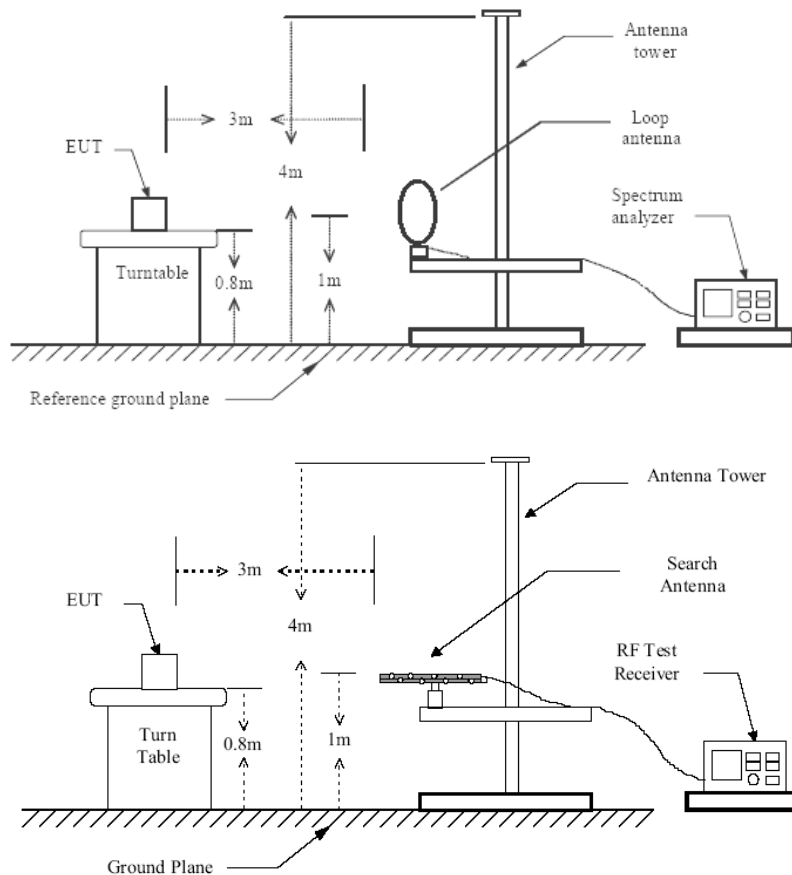


Figure 1 : Frequencies measured below 1 GHz configuration

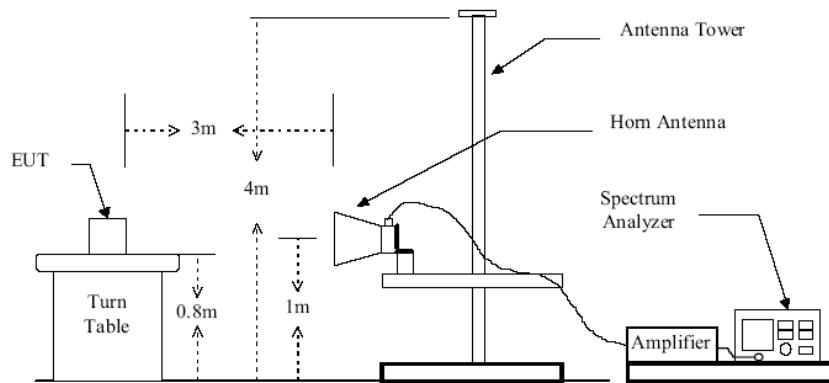
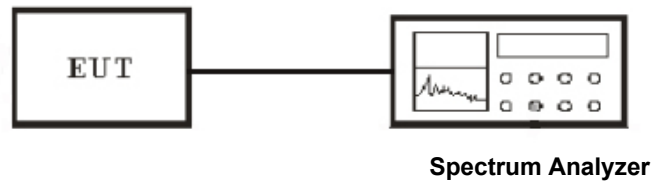


Figure 2 : Frequencies measured above 1 GHz configuration

### Conducted Measurement Setup



## 11.3 Test Equipment List and Details

See **section 2.5**.

## 11.4 Test Procedure

### Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2009
2. The EUT was placed on the top of the turntable 0.8 meter above ground.
3. 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.
4. Power on the EUT and all the supporting units.
5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. According to the characteristic of the EUT crystals, the range of frequencies was investigated from 9KHz to 30MHz, 30MHz to 1GHz and 1GHz to 26GHz.
9. For emission below 1GHz, Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

10. For emission above 1GHz, Set the RBW=1MHz,VBW=3MHz for Peak Detector while the RBW=1MHz, VBW=10Hz for Average Detector, Readings are both peak and average values.

11. The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos. The worst case data is recorded in the report. All emission not reported are much lower than the prescribed limits.

### Conducted Measurement

1. For emission above 1GHz to 26G,conducted measurement method is used.
2. The transmitter is set to the lowest channel.
3. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
4. Set RBW to 1 MHz and VBW to 3 MHz, Then detector set to peak and max hold this trace.
5. The lowest band edges emission was measured and recorded.
6. The transmitter set to the highest channel and repeated 2~4.

### 11.5 Test Result

Temperature ( °C ) : 22~23	EUT: Wave
Humidity (%RH ) : 50~54	M/N: W1
Barometric Pressure ( mbar ) : 950~1000	Operation Condition: Charging, playing

Note: In this testing, the EUT was respectively tested in three different orientations. That is:

1. EUT was lie vertically, and then its Antenna oriented upward
2. EUT was lie vertically, and then its Antenna oriented downward
3. EUT was lie flatwise, and then its Antenna oriented to the receiving antenna

The worst test data see following pages

When the EUT was lie flatwise, and its Antenna oriented to the receiving antenna, the worst test data was got as following table.

### Worst case Spurious Emission (9k~30MHz)

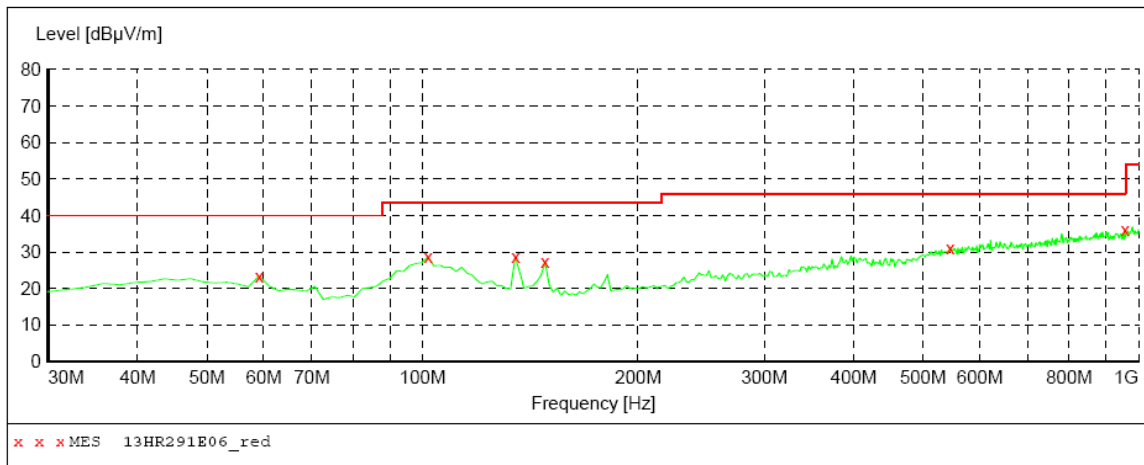
Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Levels	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dB μV/M)	(dB)	PK/QP
0.45	23.59	7.81	1.03	30.37	67	-36.63	QP
14.36	21.54	8.21	1.19	28.56	49.5	-20.94	QP
16.78	23.65	8.63	1.08	31.2	49.5	-18.3	QP
22.59	23.67	7.71	1.66	29.72	49.5	-19.78	QP

**Worst case BDR 1M  
Spurious Emission (30~1000MHz)**

EUT: Wave  
M/N: W1  
Operating Condition: Tx On  
Test Site: 3m CHAMBER  
Operator: Chen  
Test Specification: AC 120V60Hz for PC  
Comment: Polarization: Horizontal  
Tem:25°C Hum:50%

***SWEEP TABLE: "test (30M-1G)"***

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency				
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



***MEASUREMENT RESULT: "13HR291E06\_red"***

9/7/2013 16:42

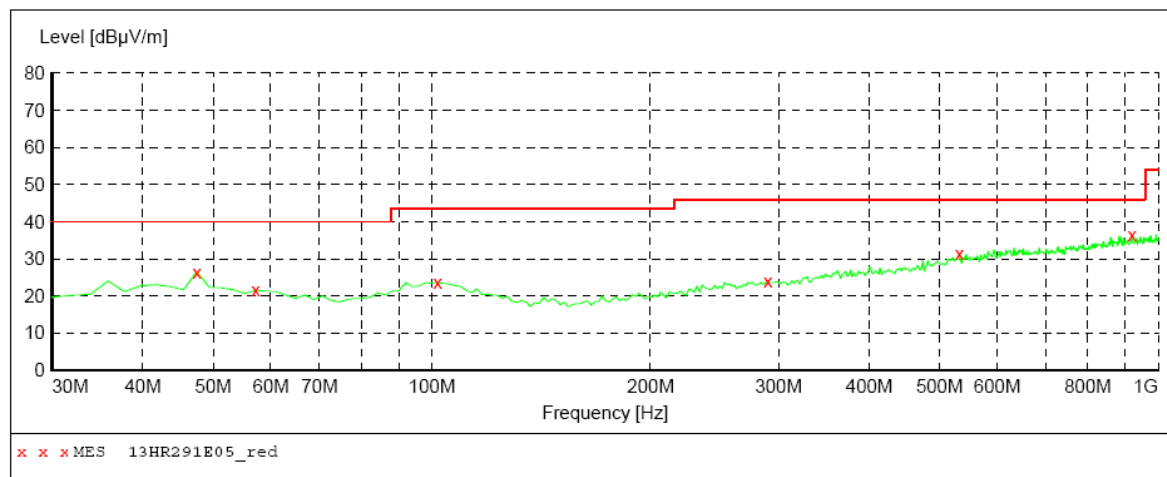
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
59.100000	23.40	14.6	40.0	16.6	QP	100.0	0.00	HORIZONTAL
101.780000	28.80	17.3	43.5	14.7	QP	100.0	0.00	HORIZONTAL
134.760000	28.80	12.7	43.5	14.7	QP	100.0	0.00	HORIZONTAL
148.340000	27.30	12.3	43.5	16.2	QP	100.0	0.00	HORIZONTAL
546.040000	31.20	24.9	46.0	14.8	QP	100.0	0.00	HORIZONTAL
957.320000	36.00	29.6	46.0	10.0	QP	100.0	0.00	HORIZONTAL

## Spurious Emission (30~1000MHz)

EUT: Wave  
M/N: W1  
Operating Condition: Tx On  
Test Site: 3m CHAMBER  
Operator: Chen  
Test Specification: AC 120V60Hz for PC  
Comment: Polarization: Vertical  
Tem:25°C Hum:50%

### ***SWEEP TABLE: "test (30M-1G)"***

Short Description:		Field Strength			
Start	Stop	Detector	Meas. Time	IF Bandw.	Transducer
Frequency	Frequency				
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



### ***MEASUREMENT RESULT: "13HR291E05\_red"***

9/7/2013 16:41

Frequency MHz	Level dBuV/m	Transd dB	Limit dBuV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
47.460000	26.60	15.8	40.0	13.4	QP	100.0	0.00	VERTICAL
57.160000	21.50	15.1	40.0	18.5	QP	100.0	0.00	VERTICAL
101.780000	23.60	17.3	43.5	19.9	QP	100.0	0.00	VERTICAL
289.960000	24.00	18.4	46.0	22.0	QP	100.0	0.00	VERTICAL
532.460000	31.50	24.6	46.0	14.5	QP	100.0	0.00	VERTICAL
920.460000	36.50	29.3	46.0	9.5	QP	100.0	0.00	VERTICAL

**Worst case BDR 1M**  
**Spurious Emission test data above 1G**

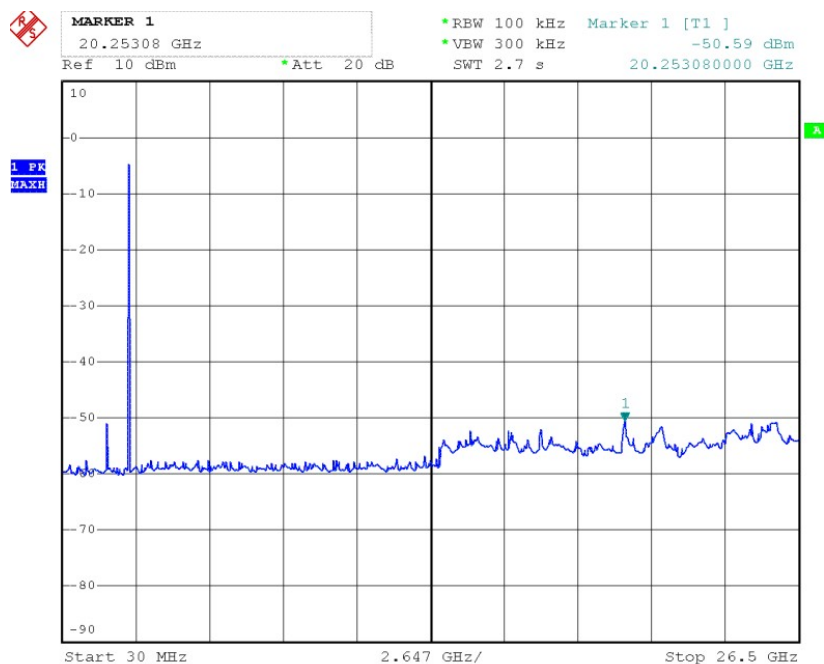
Channel Low								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBμV/m)	Margin (dBμV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBμV	Transd	Result dBμV/m			
2356	H	1	45.01	-2.92	42.09	74	-31.91	P
			41.05	<b>-2.92</b>	38.13	54	-15.87	A
2356	V	1	44.5	-2.92	41.58	74	-32.42	P
			41.26	<b>-2.92</b>	38.34	54	-15.66	A
2402	H	1	82.69	-6.61	76.08	---	---	P
			78.43	-6.61	71.82	---	---	A
2402	V	1	78.97	-6.61	72.36	---	---	P
			79.24	-6.61	72.63	---	---	A
4804	H	1	43.54	-0.67	42.87	74	-31.13	P
			39.42	-0.67	38.75	54	-15.25	A
4804	V	1	43.22	-0.67	42.55	74	-31.45	P
			40.1	-0.67	39.43	54	-14.57	A
7206	H	1	44.19	1.35	45.54	74	-28.46	P
			40.07	1.35	41.42	54	-12.58	A
7206	V	1	43.7	1.35	45.05	74	-28.95	P
			39.41	1.35	40.76	54	-13.24	A
9608	H	1	43.48	2.73	46.21	74	-27.79	P
			39.5	2.73	42.23	54	-11.77	A
9608	V	1	43.3	2.73	46.03	74	-27.97	P
			39.2	2.73	41.93	54	-12.07	A
12010.07	---		---	---	---	---	---	
14412.08	---		---	---	---	---	---	
16814.09	---		---	---	---	---	---	
19216.11	---		---	---	---	---	---	
21618.12	---		---	---	---	---	---	
24020.13	---		---	---	---	---	---	
Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier Margin = Level-Limit Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value 2. 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. 3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz. 4. The test limit distance is 3m limit								

Channel Mid								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBμV/m)	Margin (dBμV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBμV	Transd	Result dBμV/m			
2441	H	1	79.63	-6.37	73.26	---	---	P
			80.21	-6.37	73.84	---	---	A
2441	V	1	77.6	-6.37	71.23	---	---	P
			74.24	-6.37	67.87	---	---	A
4882	H	1	45.83	-2.92	42.91	74	-31.09	P
			40.45	-2.92	37.53	54	-16.47	A
4882	V	1	46.2	-2.92	43.28	74	-30.72	P
			41.27	-2.92	38.35	54	-15.65	A
7323	H	1	44.95	0.52	45.47	74	-28.53	P
			40.47	0.52	40.99	54	-13.01	A
7323	V	1	44.99	0.52	45.51	74	-28.49	P
			41.66	0.52	42.18	54	-11.82	A
9764	H	1	43.52	1.48	45	74	-29	P
			39.65	1.48	41.13	54	-12.87	A
9764	V	1	45.69	1.48	47.17	74	-26.83	P
			41.2	1.48	42.68	54	-11.32	A
12205	---		---	---	---	---	---	
14646	---		---	---	---	---	---	
17087.14	---		---	---	---	---	---	
19528.16	---		---	---	---	---	---	
21969.2	---		---	---	---	---	---	
24410.21	---		---	---	---	---	---	
Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier Margin = Level-Limit Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value 2. 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. 3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz. 4. The test limit distance is 3m limit								

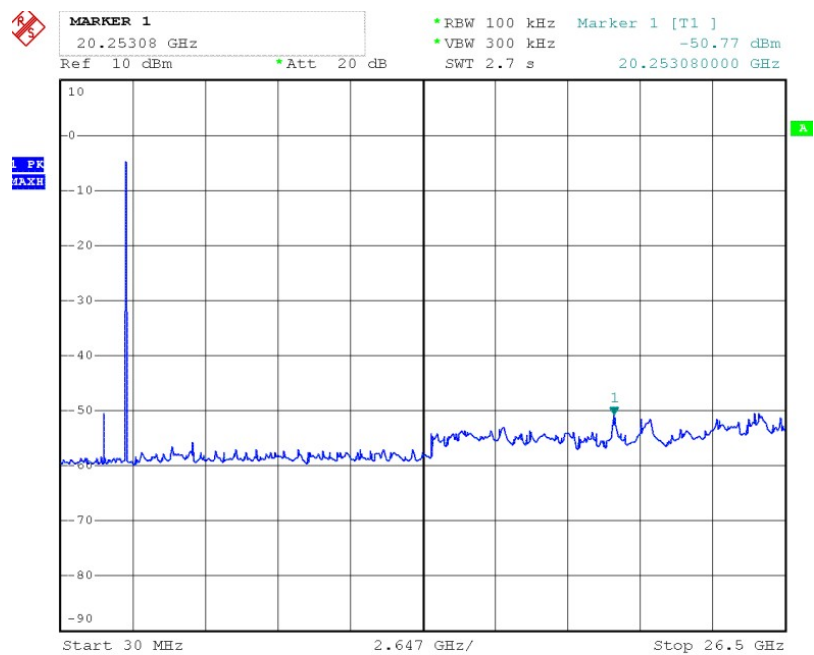


Channel High								
Maximum Frequency (MHz)	Polarity and Level					Limit (dBμV/m)	Margin (dBμV/m)	Mark (P/Q/A)
	Polarity	Height (m)	Reading dBμV	Transd	Result dBμV/m			
2480	H	1	76.49	-6.28	70.21	---	---	P
			71.41	-6.28	65.13	---	---	A
2480	V	1	79.32	-6.28	73.04	---	---	P
			74.55	-6.28	68.27	---	---	A
2500	H	1	44.24	-2.5	41.74	74	-32.26	P
			39.82	-2.5	37.32	54	-16.68	A
2500	V	1	45.93	-2.5	43.43	74	-30.57	P
			41.55	-2.5	39.05	54	-14.95	A
4960.02	H	1	44.02	1.17	45.19	74	-28.81	P
			39.34	1.17	40.51	54	-13.49	A
4960.02	V	1	43.39	1.17	44.56	74	-29.44	P
			39	1.17	40.17	54	-13.83	A
7440.03	H	1	44.69	2.25	46.94	74	-27.06	P
			39.54	2.25	41.79	54	-12.21	A
7440.03	V	1	43.95	2.25	46.2	74	-27.8	P
			39.44	2.25	41.69	54	-12.31	A
9920.04	H	1	46.72	4.53	51.25	74	-22.75	P
			42.14	4.53	46.67	54	-7.33	A
9920.04	V	1	47.53	4.53	52.06	74	-21.94	P
			43.16	4.53	47.69	54	-6.31	A
12400.05	---		---	---	---	---	---	
14880.06	---		---	---	---	---	---	
17360.07	---		---	---	---	---	---	
19840.08	---		---	---	---	---	---	
22320.09	---		---	---	---	---	---	
24800.1	---		---	---	---	---	---	
Remark: 1. Transd.=Antenna Factor+Cable Loss-Pre-amplifier Margin = Level-Limit Mark: P means Peak Value, Q means Quasi Peak Value, A means Average Value 2. 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. 3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz. 4. The test limit distance is 3m limit								

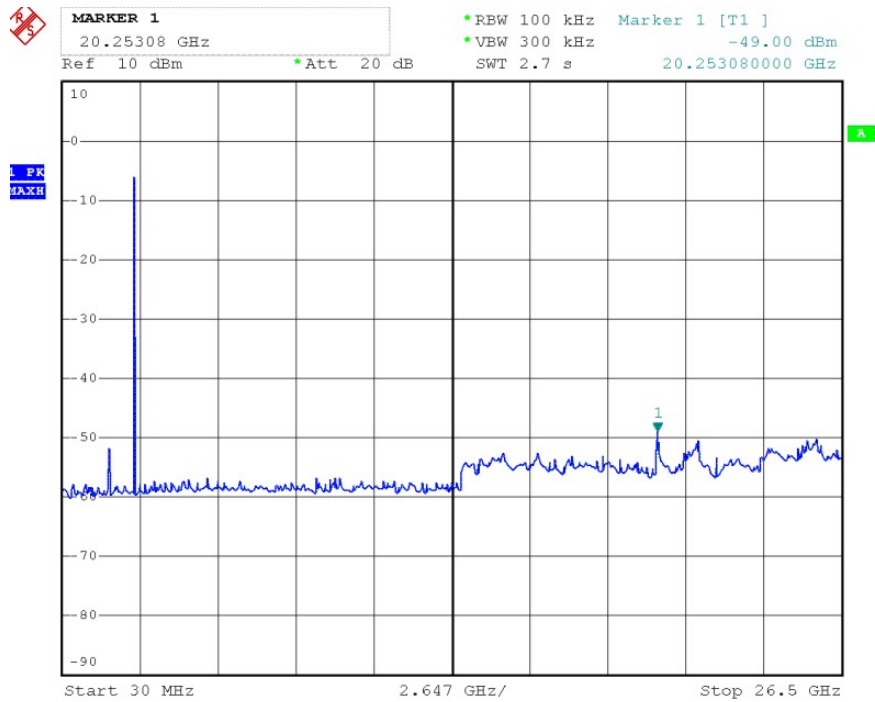
**Conducted Spurious Emission**  
**BDR 1M**  
**Channel Low**



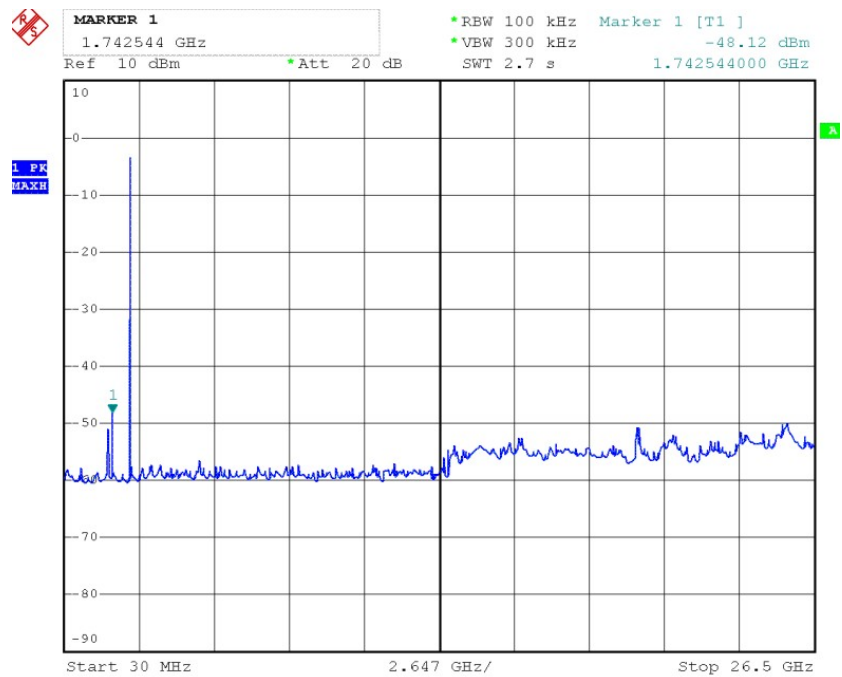
**Channel Mid**



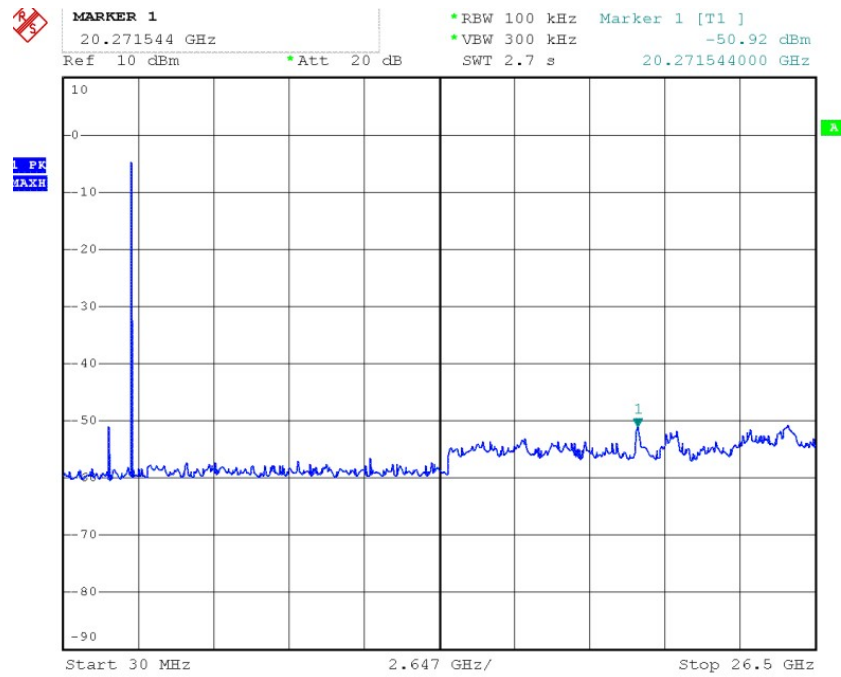
## Channel High



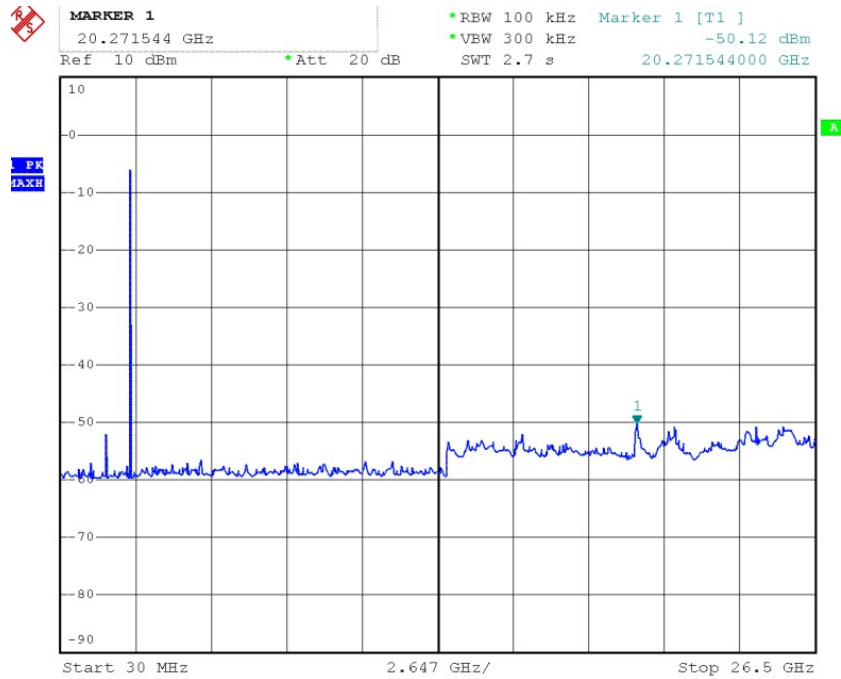
## BDR 2M Channel Low



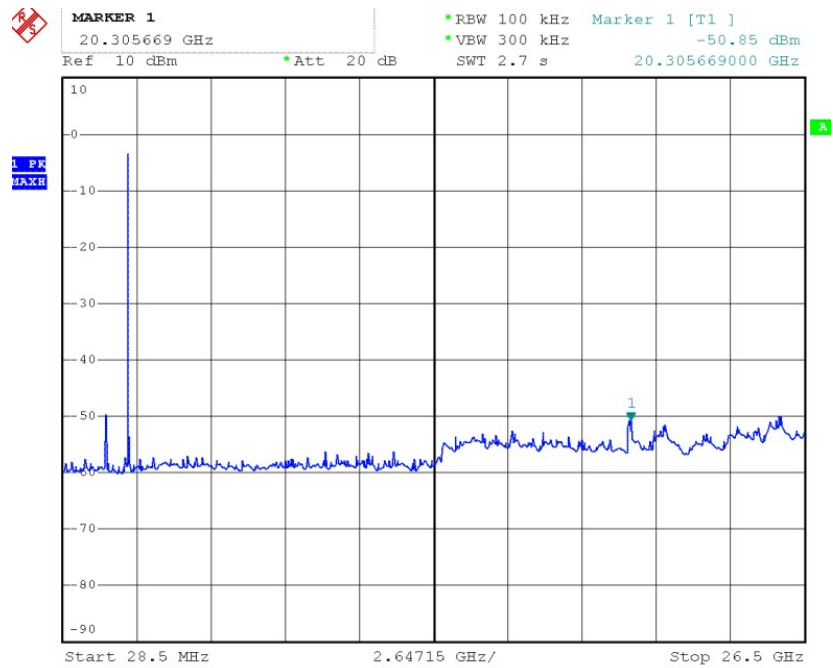
Channel Middle



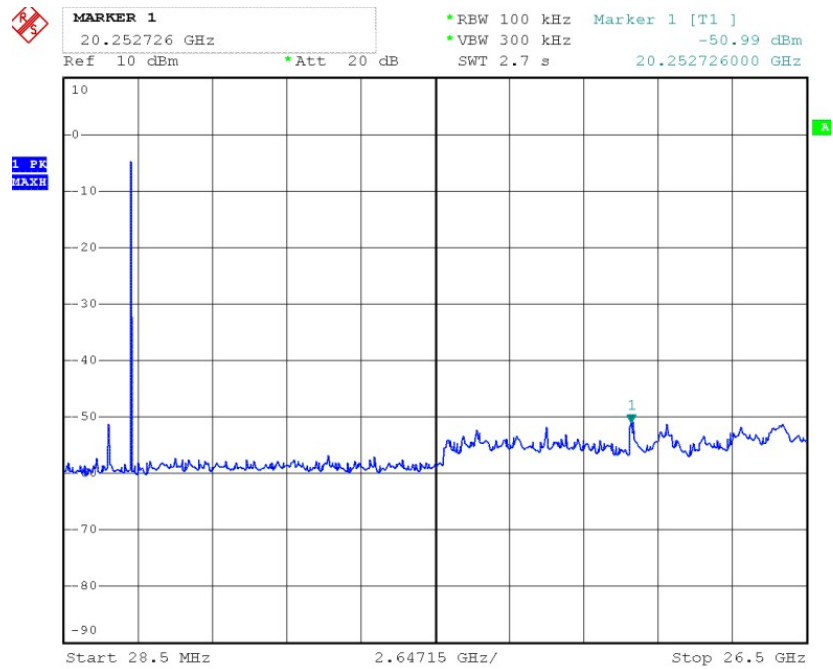
Channel High



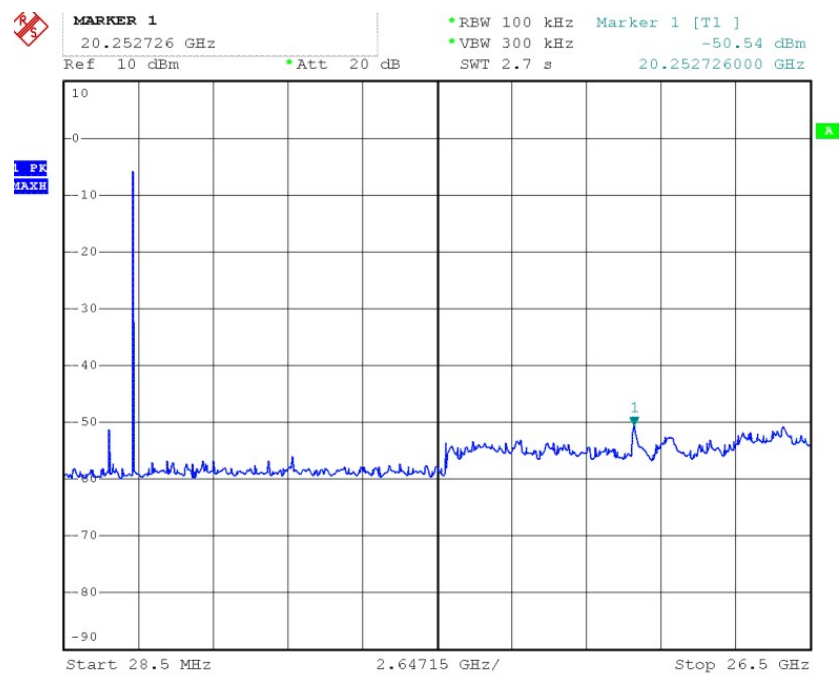
**BDR 3M**  
**Channel Low**



**Channel Middle**



Channel High



## **12. ANTENNA REQUIREMENT**

### **12.1 Standard Applicable**

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Section 15.247(b)/(c):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

### **12.2 Antenna Connected Construction**

The antenna is designed with permanent attachment and no consideration of replacement. The antenna used in this product is complied with Standard. The maximum Gain of the antenna lower than 6.0dBi and have the definite antenna Specification.