

**For 1GHz to 25GHz**

CH Low (2402MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804.00	56.47	-3.65	52.82	74.00	-21.18	peak
4804.00	47.55	-3.65	43.90	54.00	-10.10	AVG
7206.00	57.68	-0.95	56.73	74.00	-17.27	peak
7206.00	43.73	-0.95	42.78	54.00	-11.22	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4804.00	57.49	-3.65	53.84	74.00	-20.16	peak
4804.00	46.29	-3.65	42.64	54.00	-11.36	AVG
7206.00	56.32	-0.95	55.37	74.00	-18.63	peak
7206.00	42.43	-0.95	41.48	54.00	-12.52	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						



CH Middle (2441MHz)

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882.00	57.33	-3.54	53.79	74.00	-20.21	peak
4882.00	48.59	-3.54	45.05	54.00	-8.95	AVG
7323.00	56.29	-0.81	55.48	74.00	-18.52	peak
7323.00	43.74	-0.81	42.93	54.00	-11.07	AVG

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

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4882.00	57.65	-3.54	54.11	74.00	-19.89	peak
4882.00	46.37	-3.54	42.83	54.00	-11.17	AVG
7323.00	55.46	-0.81	54.65	74.00	-19.35	peak
7323.00	42.72	-0.81	41.91	54.00	-12.09	AVG

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



CH High (2480MHz)
Horizontal:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960.00	55.47	-3.43	52.04	74.00	-21.96	peak
4960.00	46.63	-3.43	43.20	54.00	-10.80	AVG
7440.00	56.28	-0.77	55.51	74.00	-18.49	peak
7440.00	41.77	-0.77	41.00	54.00	-13.00	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
4960.00	56.32	-3.43	52.89	74.00	-21.11	peak
4960.00	46.58	-3.43	43.15	54.00	-10.85	AVG
7440.00	56.69	-0.77	55.92	74.00	-18.08	peak
7440.00	42.44	-0.77	41.67	54.00	-12.33	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Remark :

- (1) Measuring frequencies from 1 GHz to the 25 GHz .
- (2) "F" denotes fundamental frequency; "H" denotes spurious frequency. "E" denotes band edge frequency.
- (3) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (4) The emissions are attenuated more than 20dB below the permissible limits are not recorded in the report.
- (5) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- (6) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.
- (7) All modes of operation were investigated and the worst-case emissions are reported.

**Radiated Band Edge Test:****Hopping****Horizontal (Worst case)**

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	57.29	-5.81	51.48	74	-22.52	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	55.67	-5.84	49.83	74	-24.17	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	56.47	-5.81	50.66	74	-23.34	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	55.77	-5.84	49.93	74	-24.07	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						



Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	57.43	-5.81	51.62	74	-22.38	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	55.67	-6.06	49.61	74	-24.39	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	56.73	-5.81	50.92	74	-23.08	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	54.29	-6.06	48.23	74	-25.77	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						



NO hopping

Operation Mode: TX CH Low (2402MHz)

Horizontal (Worst case)

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	55.43	-5.81	49.62	74	-24.38	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	54.47	-5.84	48.63	74	-25.37	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2310.00	56.49	-5.81	50.68	74	-23.32	peak
2310.00	/	-5.81	/	54	/	AVG
2390.00	55.47	-5.84	49.63	74	-24.37	peak
2390.00	/	-5.84	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						



Operation Mode: TX CH High (2480MHz)
Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	57.63	-5.81	51.82	74	-22.18	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	54.31	-6.06	48.25	74	-25.75	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2483.50	56.74	-5.81	50.93	74	-23.07	peak
2483.50	/	-5.81	/	54	/	AVG
2500.00	54.72	-6.06	48.66	74	-25.34	peak
2500.00	/	-6.06	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						



3.3. Maximum Peak Conducted Output Power

Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. 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. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

Type	Channel	Output power (dBm)	Limit (dBm)	Result
GFSK	00	-8.506	21.00	Pass
	39	-9.871		
	78	-9.847		
$\pi/4$ DQPSK	00	-9.253	21.00	Pass
	39	-9.816		
	78	-10.043		
8DPSK	00	-9.712	21.00	Pass
	39	-10.879		
	78	-10.623		

Note: 1.The test results including the cable lose.



3.4. 20dB Bandwidth

Limit

For frequency hopping systems operating in the 2400MHz-2483.5MHz no limit for 20dB bandwidth.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 30 KHz RBW and 100 KHz VBW.

The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

The occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers are each equal to 0.5% of the total mean power of the given emission. The following procedure shall be used for measuring 99% power bandwidth:

RBW=1% to 5% of the OBW

VBW=approximately 3 X RBW

Detector=Peak

Trace Mode: Max Hold

Use the 99% power bandwidth function of the instrument to measure the Occupied Bandwidth and recorded.

Test Configuration



Test Results

Modulation	Channel	20dB bandwidth (MHz)	Result
GFSK	CH00	1.002	Pass
	CH39	1.017	
	CH78	0.9804	
$\pi/4$ DQPSK	CH00	1.365	
	CH39	1.363	
	CH78	1.359	
8DPSK	CH00	1.328	
	CH39	1.325	
	CH78	1.329	

Test plot as follows:

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20dB bandwidth

GFSK Modulation



CH00



CH39



CH78

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$\pi/4$ DQPSK Modulation



CH00



CH39



CH78

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8DPSK Modulation



CH00



CH39



CH78

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3.5. Frequency Separation

LIMIT

Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 300 KHz RBW and 1000 KHz VBW.

TEST CONFIGURATION



TEST RESULTS

Modulation	Channel	Channel Separation (MHz)	Limit(MHz)	Result
GFSK	Middle Channel	1.002	$2/3 \times 20\text{dB}$ bandwidth	Pass
$\pi/4\text{DQPSK}$	Middle Channel	1.002	$2/3 \times 20\text{dB}$ bandwidth	Pass
8DPSK	Middle Channel	1.000	$2/3 \times 20\text{dB}$ bandwidth	Pass

Note: We have tested all mode at high, middle and low channel, and recorded worst case at middle

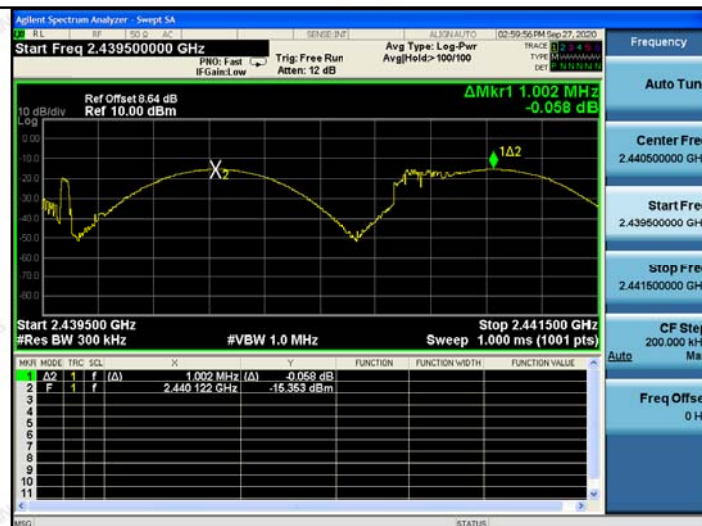
Test plot as follows:



Frequency Separation



GFSK

 $\pi/4$ DQPSK

8DPSK

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3.6. Number of hopping frequency

Limit

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. Set spectrum analyzer start 2400MHz to 2483.5MHz.

Test Configuration



Test Results

Modulation	Number of Hopping Channel	Limit	Result
GFSK	79	≥15	Pass
$\pi/4$ DQPSK	79		
8DPSK	79		

Test plot as follows: