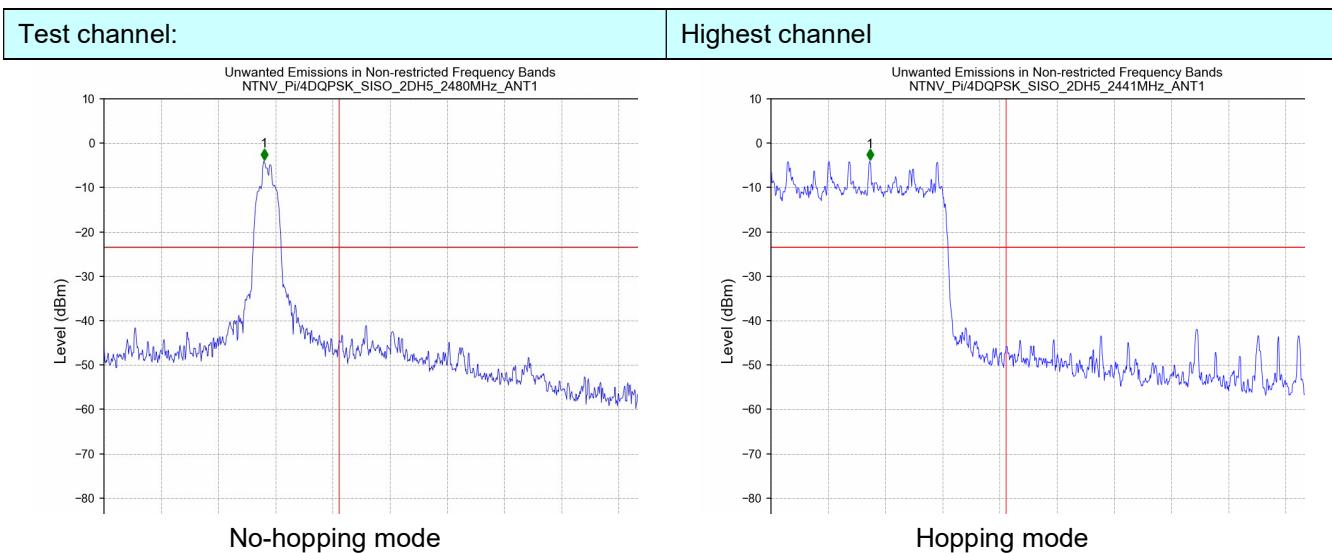
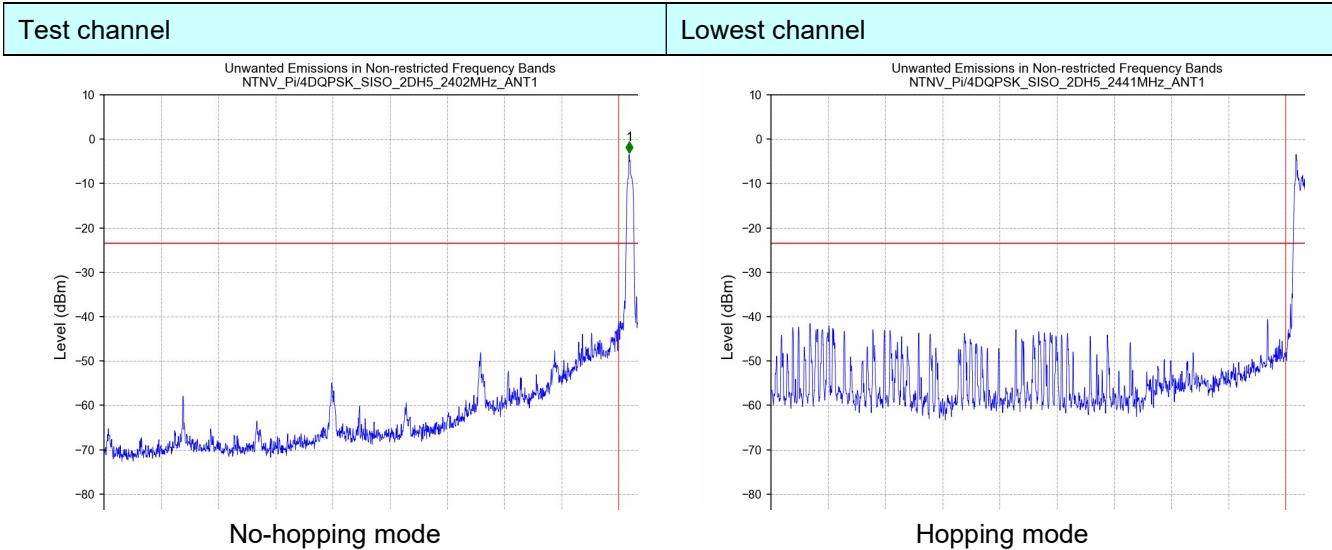
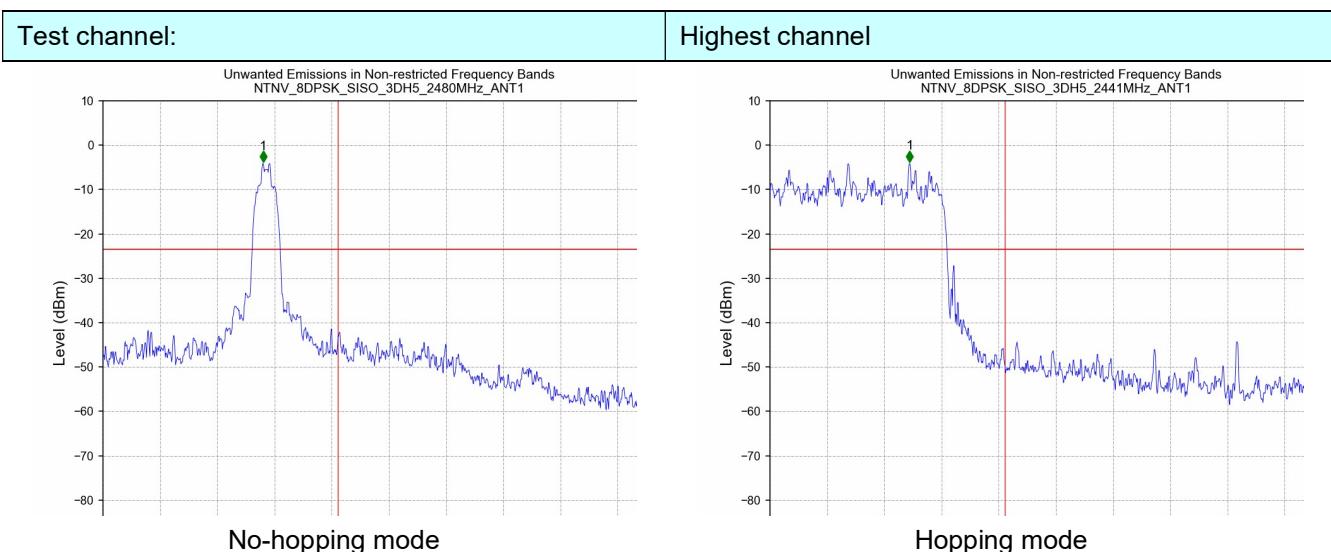
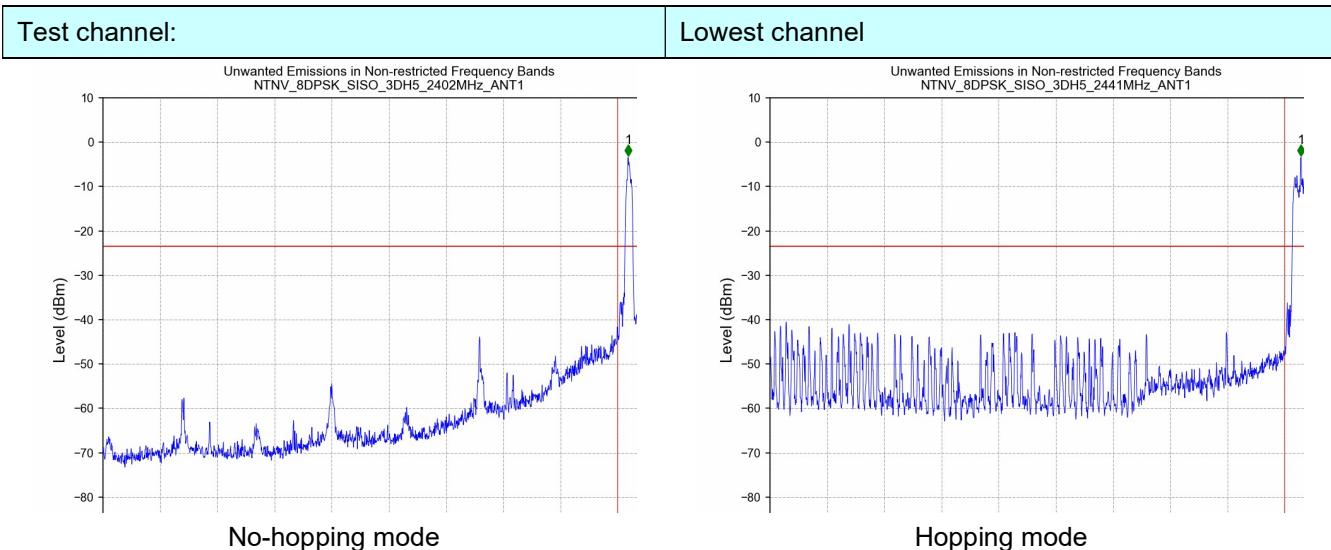
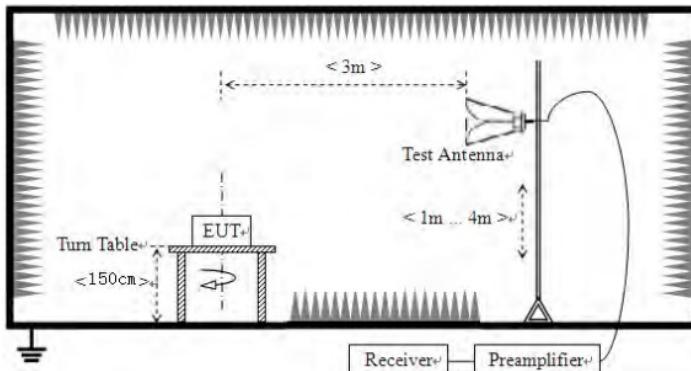


π/4-DQPSK Mode:


8-DPSK Mode:


6.7.2. Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205								
Test Method:	ANSI C63.10:2013								
Test Frequency Range:	All of the restrict bands were tested, only the worst band's (2310MHz to 2500MHz) data was showed.								
Test site:	Measurement Distance: 3m								
Receiver setup:	Frequency	Detector	RBW	VBW	Remark				
	Above 1GHz	Peak	1MHz	3MHz	Peak Value				
Limit:	Frequency	Limit (dBuV/m @3m)		Remark					
	Above 1GHz	54.00		Average Value					
Test setup:									
Test Procedure:	<ol style="list-style-type: none"> The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 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. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet. 								
Test Instruments:	Refer to section 6.0 for details								
Test mode:	Refer to section 5.2 for details								
Test results:	Pass								
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar			



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Measurement Data

Remark: GFSK, Pi/4 DQPSK,8-DPSK all have been tested, only worse case GFSK is reported.

Operation Mode: GFSK TX Low channel(2402MHz)

Horizontal (Worst case)

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2390	59.30	26.20	5.72	33.30	57.92	74.00	-16.08	peak
2390	43.22	26.20	5.72	33.30	41.84	54.00	-12.16	AVG

Vertical:

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2390	57.45	26.20	5.72	33.30	56.07	74.00	-17.93	peak
2390	46.21	26.20	5.72	33.30	44.83	54.00	-9.17	AVG

Operation Mode: GFSK TX High channel (2480MHz)

Horizontal (Worst case)

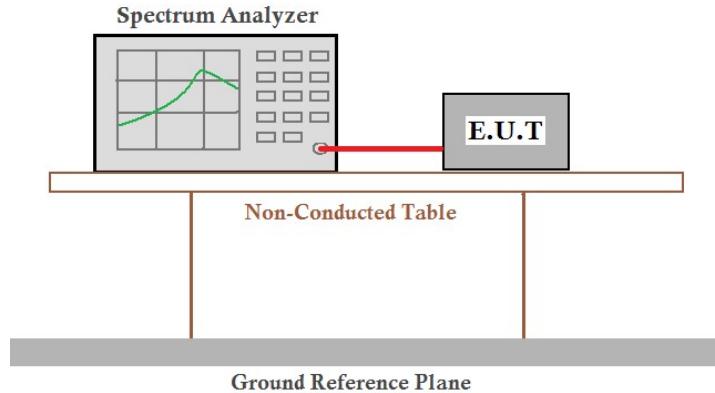
Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	55.26	28.60	6.97	32.70	58.13	74.00	-15.87	peak
2483.5	42.16	28.60	6.97	32.70	45.03	54.00	-8.97	AVG

Vertical:

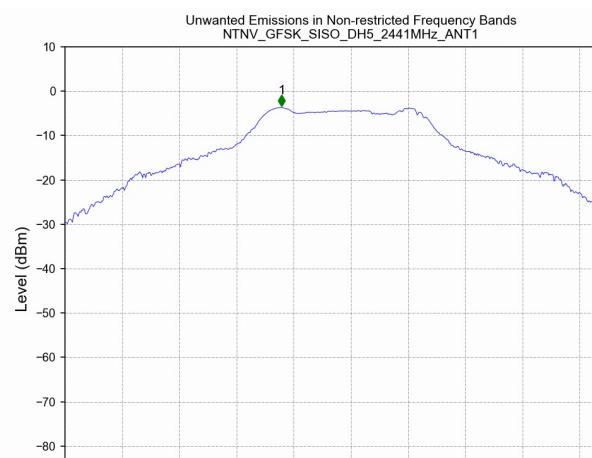
Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
2483.5	54.93	28.60	6.97	32.70	57.80	74.00	-16.20	peak
2483.5	41.33	28.60	6.97	32.70	44.20	54.00	-9.80	AVG

6.8. Spurious Emission

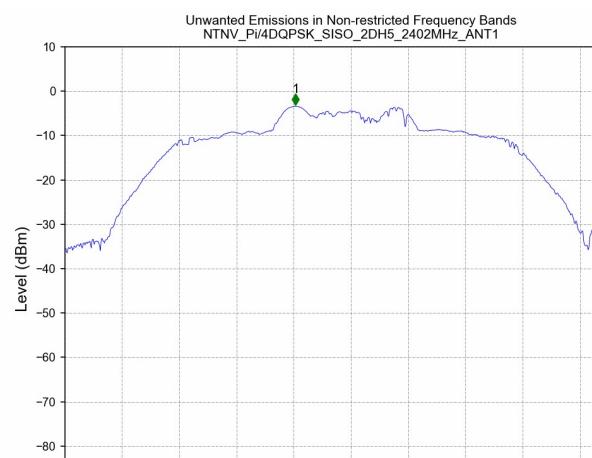
6.8.1. Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)					
Test Method:	ANSI C63.10:2013					
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum 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.					
Test setup:						
Test Instruments:	Refer to section 6.0 for details					
Test mode:	Refer to section 5.2 for details					
Test results:	Pass					
Test environment:	Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar

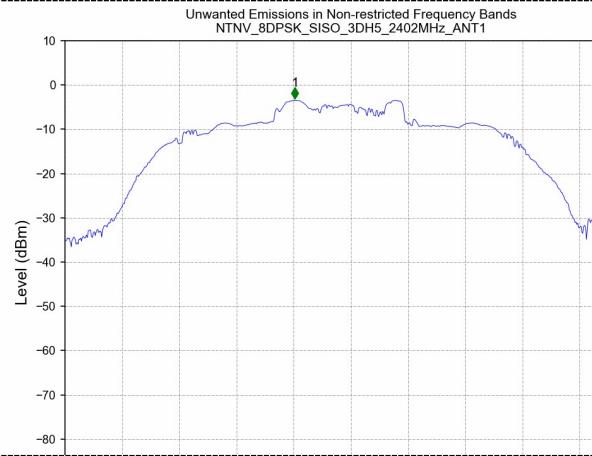
Reference



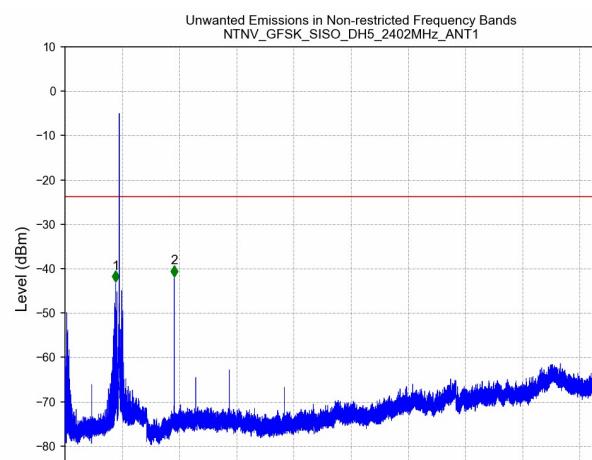
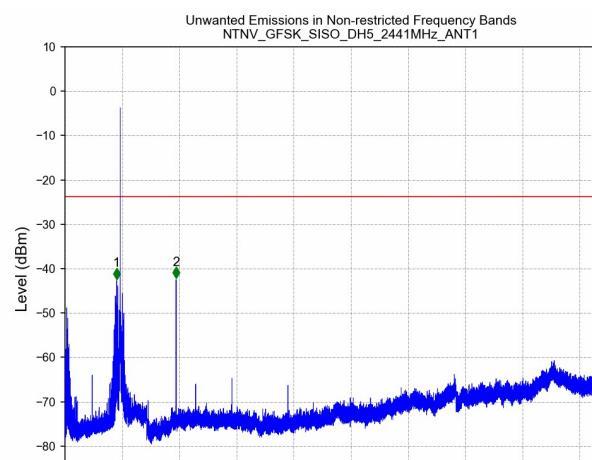
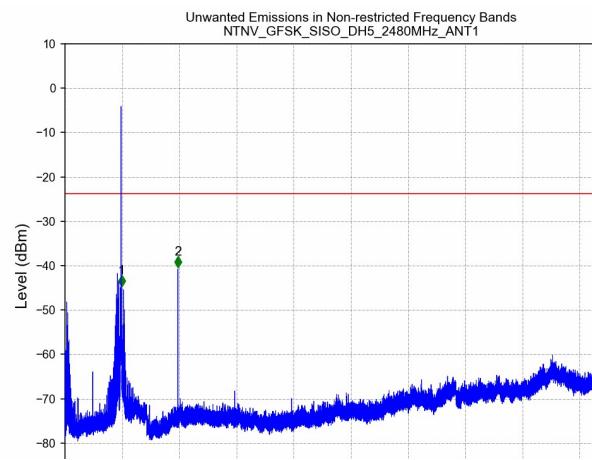
GFSK

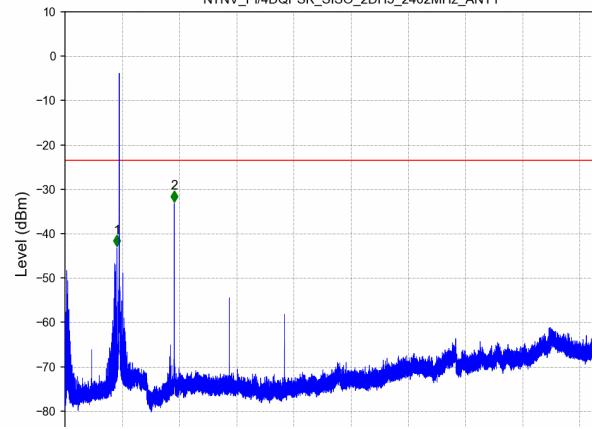
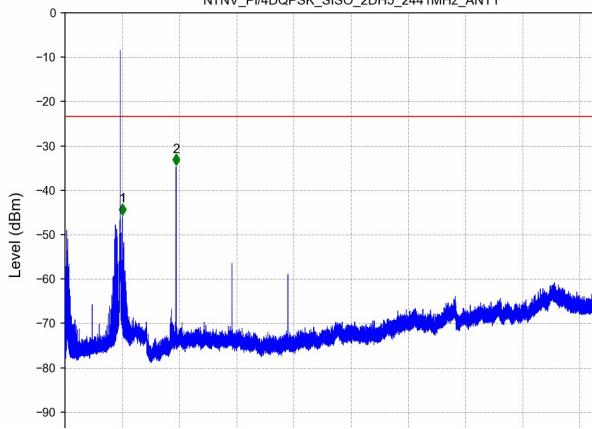
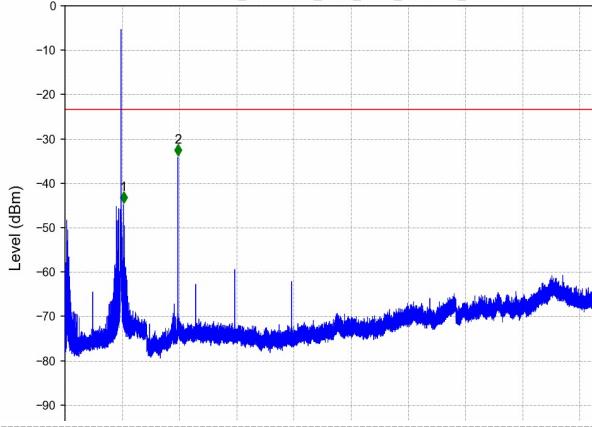


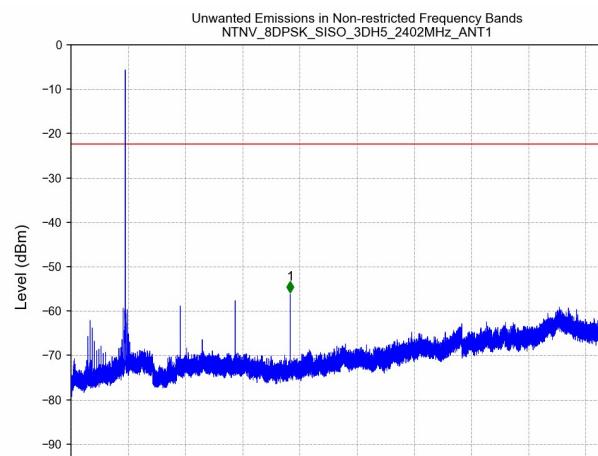
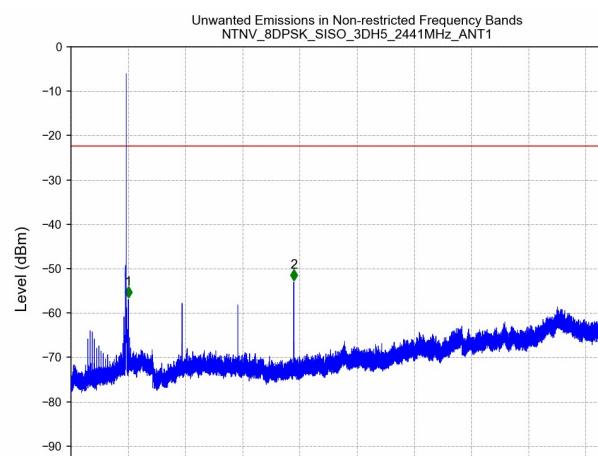
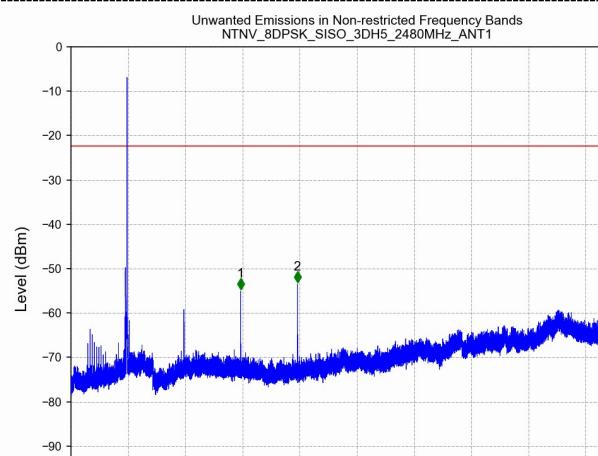
$\pi/4$ DQPSK



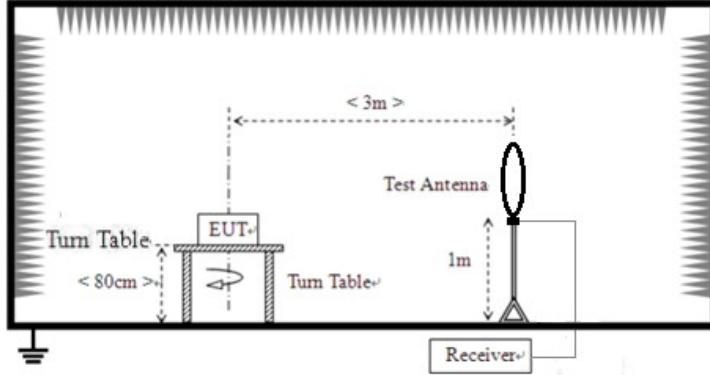
8-DPSK

GFSK**CH00****CH39****CH78**

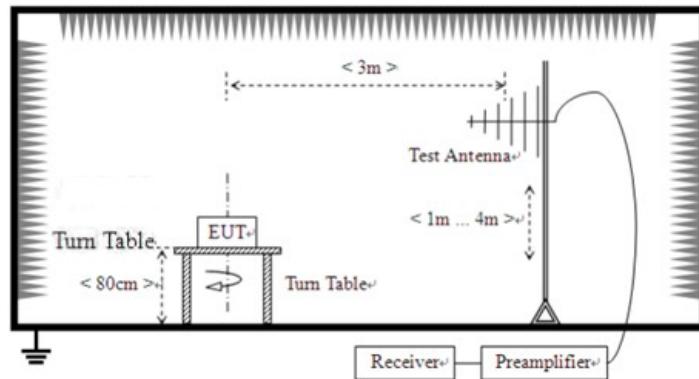
$\pi/4$ DQPSKUnwanted Emissions in Non-restricted Frequency Bands
NTNV_Pi/4DQPSK_SISO_2DH5_2402MHz_ANT1**CH00**Unwanted Emissions in Non-restricted Frequency Bands
NTNV_Pi/4DQPSK_SISO_2DH5_2441MHz_ANT1**CH39**Unwanted Emissions in Non-restricted Frequency Bands
NTNV_Pi/4DQPSK_SISO_2DH5_2480MHz_ANT1**CH78**

8-DPSK**CH00****CH39****CH78**

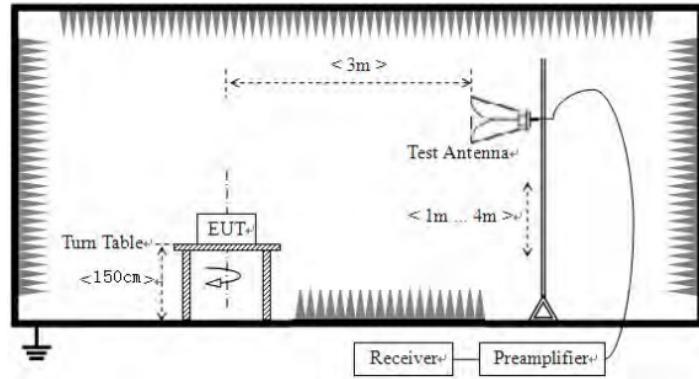
6.8.2. Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209						
Test Method:	ANSI C63.10:2013						
Test Frequency Range:	9kHz to 25GHz						
Test site:	Measurement Distance: 3m						
Receiver setup:	Frequency	Detector	RBW	VBW	Value		
	9KHz-150KHz	Quasi-peak	200Hz	600Hz	Quasi-peak		
	150KHz-30MHz	Quasi-peak	9KHz	30KHz	Quasi-peak		
	30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak		
	Above 1GHz	Peak	1MHz	3MHz	Peak		
		Peak	1MHz	10Hz	Average		
Limit:	Frequency	Limit (uV/m)	Value	Measurement Distance 3m			
	0.009MHz-0.490MHz	2400/F(KHz)	QP				
	0.490MHz-1.705MHz	24000/F(KHz)	QP				
	1.705MHz-30MHz	30	QP				
	30MHz-88MHz	100	QP				
	88MHz-216MHz	150	QP				
	216MHz-960MHz	200	QP				
	960MHz-1GHz	500	QP				
	Above 1GHz	500	Average				
		5000	Peak				
Test setup:	For radiated emissions from 9kHz to 30MHz						
							

For radiated emissions from 30MHz to1GHz



For radiated emissions above 1GHz



Test Procedure:

1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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 rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Test Instruments:

Refer to section 6.0 for details

Test mode:

Refer to section 5.2 for details

Test environment:

Temp.:	25 °C	Humid.:	52%	Press.:	1012mbar
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Test voltage:	AC 120V, 60Hz
Test results:	Pass

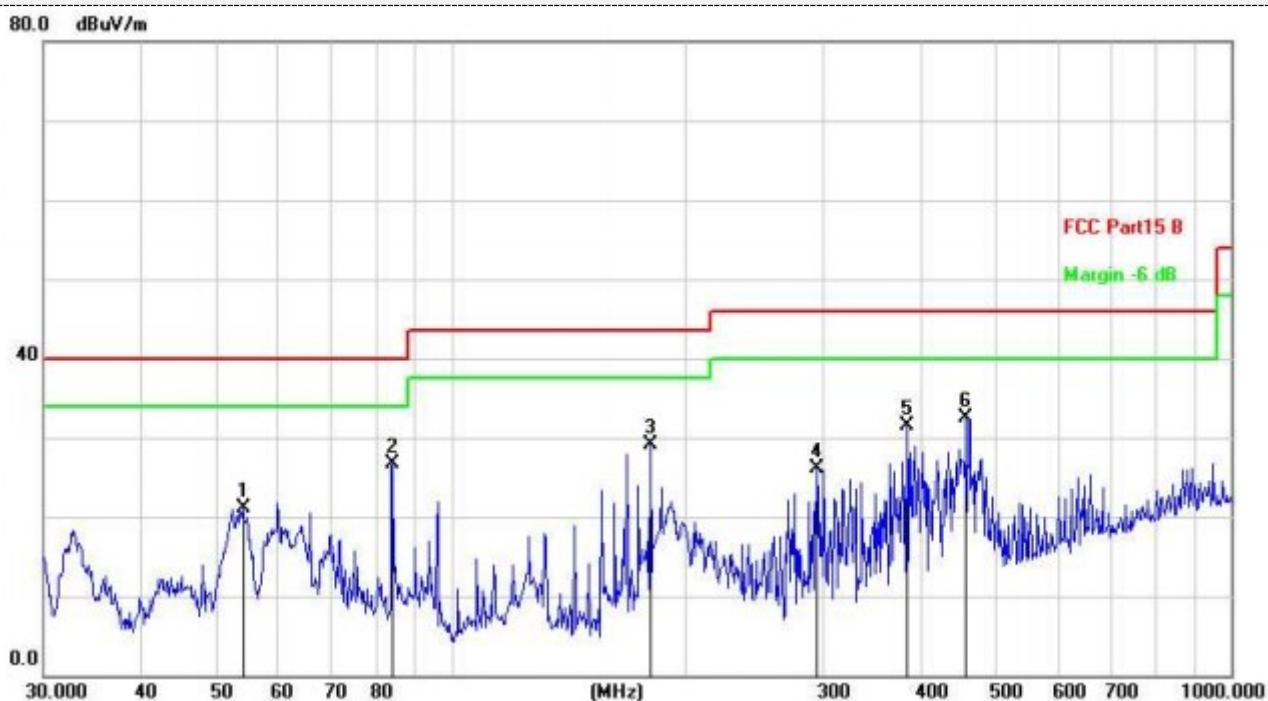
Measurement data:

Remarks:

1. *During the test, pre-scan the GFSK, $\pi/4$ -DQPSK, 8-DPSK modulation, and found the GFSK modulation which it is worse case.*
2. *Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case.*

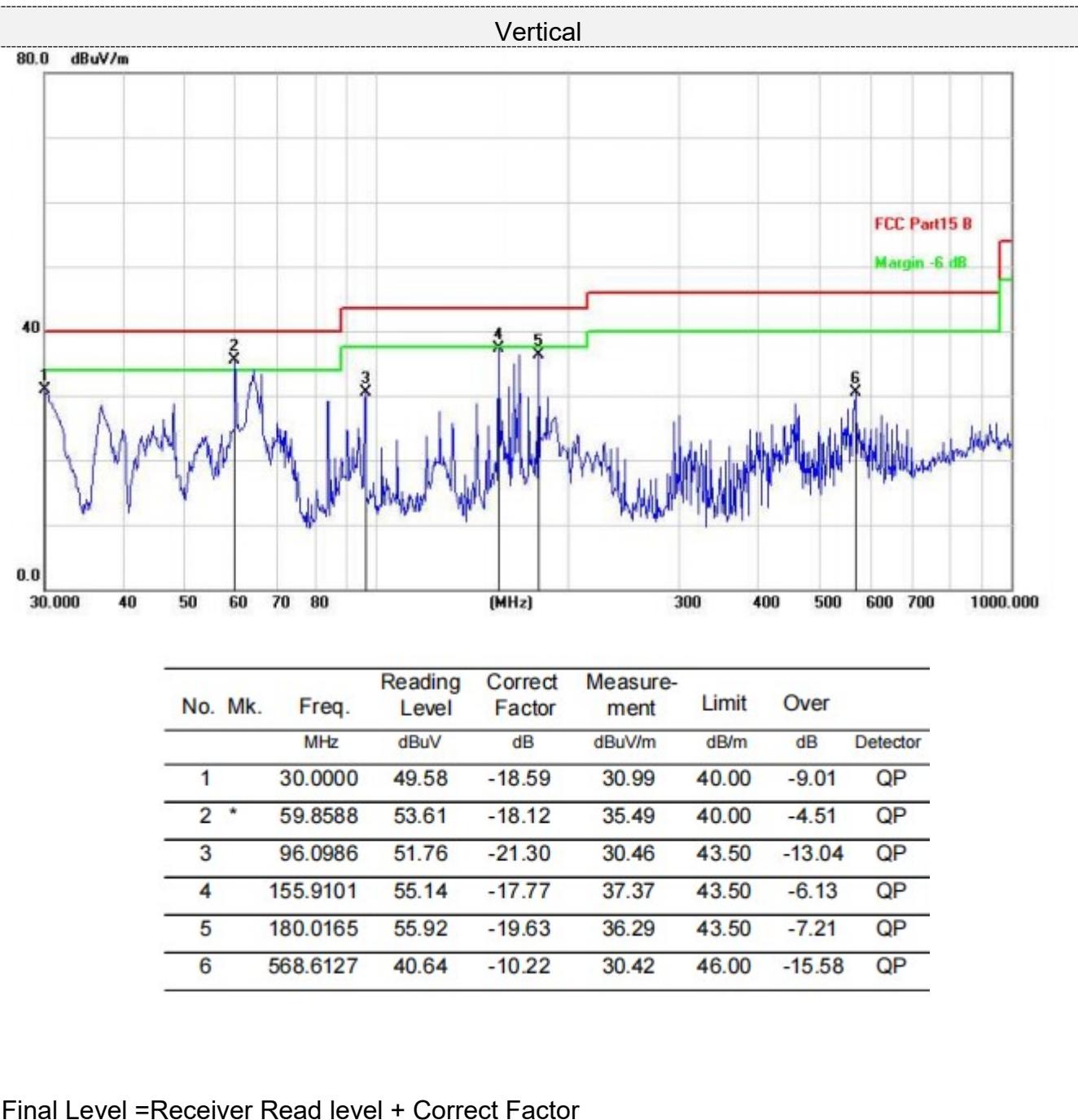
■ 9kHz~30MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

For 30MHz-1GHz
Horizontal


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		54.0711	38.76	-17.57	21.19	40.00	-18.81	QP
2	*	84.1100	48.67	-21.97	26.70	40.00	-13.30	QP
3		180.0165	48.61	-19.43	29.18	43.50	-14.32	QP
4		294.1136	43.45	-17.35	26.10	46.00	-19.90	QP
5		383.9318	48.19	-16.75	31.44	46.00	-14.56	QP
6		457.5073	46.50	-14.05	32.45	46.00	-13.55	QP

Final Level =Receiver Read level + Correct Factor



**For 1GHz to 25GHz**

Remark: For test above 1GHz GFSK,Pi/4 DQPSK and 8-DPSK were test at Low, Middle, and High channel; only the worst result of GFSK was reported as below:

CH Low (2402MHz)**Horizontal:**

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4804	51.26	31.40	8.18	31.50	59.34	74.00	-14.66	peak
4804	37.15	31.40	8.18	31.50	45.23	54.00	-8.77	AVG
7206	45.11	35.80	10.83	31.40	60.34	74.00	-13.66	peak
7206	30.51	35.80	10.83	31.40	45.74	54.00	-8.26	AVG
--	--			--	--	--	--	--
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.

Vertical:

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4804	50.88	31.40	8.18	31.50	58.96	74.00	-15.04	peak
4804	35.15	31.40	8.18	31.50	43.23	54.00	-10.77	AVG
7206	42.16	35.80	10.83	31.40	57.39	74.00	-16.61	peak
7206	30.66	35.80	10.83	31.40	45.89	54.00	-8.11	AVG
--	--			--	--	--	--	--
--	--			--	--	--	--	--

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



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CH Middle (2441MHz)

Horizontal:

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4880	51.26	31.40	9.17	32.10	59.73	74.00	-14.27	peak
4880	37.15	31.40	9.17	32.10	45.62	54.00	-8.38	AVG
7320	42.98	35.80	10.83	31.40	58.21	74.00	-15.79	peak
7320	28.45	35.80	10.83	31.40	43.68	54.00	-10.32	AVG
---	---			---	---	---	---	---
---	---			---	---	---	---	---

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

Vertical:

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4880	51.88	31.40	9.17	32.10	60.35	74.00	-13.65	peak
4880	34.15	31.40	9.17	32.10	42.62	54.00	-11.38	AVG
7320	42.66	35.80	10.83	31.40	57.89	74.00	-16.11	peak
7320	28.77	35.80	10.83	31.40	44.00	54.00	-10.00	AVG
---	---			---	---	---	---	---
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Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.



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CH High (2480MHz)

Horizontal:

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4960	51.26	31.40	9.17	32.10	59.73	74.00	-14.27	peak
4960	35.12	31.40	9.17	32.10	43.59	54.00	-10.41	AVG
7440	44.67	35.80	10.83	31.40	59.90	74.00	-14.10	peak
7440	27.16	35.80	10.83	31.40	42.39	54.00	-11.61	AVG
--	--			--	--	--	--	--
--	--			--	--	--	--	--

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

Vertical:

Frequency (MHz)	Meter Reading (dB μ V)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
4960	52.01	31.40	9.17	32.10	60.48	74.00	-13.52	peak
4960	37.55	31.40	9.17	32.10	46.02	54.00	-7.98	AVG
7440	43.51	35.80	10.83	31.40	58.74	74.00	-15.26	peak
7440	28.77	35.80	10.83	31.40	44.00	54.00	-10.00	AVG
--	--			--	--	--	--	--
--	--			--	--	--	--	--

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

Remark:

- (1) 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.
- (2) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed.



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7. Test Setup Photo

Reference to the **appendix I** for details.

8. EUT Constructional Details

Reference to the **appendix II** for details.

-----End-----