

7. Transmitter Radiated Spurious Emissions and Conducted Spurious Emission

7.1 Test Setup

Refer to the APPENDIX I.

7.2 Limit

According to §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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph(b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in section §15.209(a) is not required. In addition, radiated emission which in the restricted band, as define in section §15.205(a), must also comply the radiated emission limits specified in section §15.205(c))

According to § 15.209(a), except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Limit (uV/m)	Measurement Distance (meter)
0.009 ~ 0.490	2400/F (kHz)	300
0.490 ~ 1705	24000/F (kHz)	30
1705 ~ 30.0	30	30
30 ~ 88	100 **	3
88 ~ 216	150 **	3
216 ~ 960	200 **	3
Above 960	500	3

** Except as provided in 15.209(g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 - 72 MHz, 76 - 88 MHz, 174 - 216 MHz or 470 - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g. 15.231 and 15.241.

According to § 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below :

1	MHz	MLI		MLI-	CH-	CH-
		MHz	MHz	MHz	GHz	GHz
	0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
	0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
	2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
	4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~ 156.52525	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
	4.17725 ~ 4.17775	13.36 ~ 13.41	156.7 ~ 156.9	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
	4.20725 ~ 4.20775	16.42 ~ 16.423	162.0125 ~ 167.17	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
	6.215 ~ 6.218	16.69475 ~ 16.69525	167.72 ~ 173.2	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
	6.26775 ~ 6.26825	16.80425 ~ 16.80475	240 ~ 285	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
	6.31175 ~ 6.31225	25.5 ~ 25.67	322 ~ 335.4	2655 ~ 2900		
	8.291 ~ 8.294	37.5 ~ 38.25	399.90 ~ 410	3260 ~ 3267		
	8.362 ~ 8.366	73 ~ 74.6	608 ~ 614	3332 ~ 3339		
	8.37625 ~ 8.38675	74.8 ~ 75.2	960 ~ 1240	3345.8 ~ 3358		
				3600 ~ 4400		

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.



7.3. Test Procedures

7.3.1. Test Procedures for Radiated Spurious Emissions

- 1. The EUT is placed on a non-conductive table. For emission measurements at or below 1 GHz, the table height is 80 cm. For emission measurements above 1 GHz, the table height is 1.5 m. The table was rotated 360 degrees to determine the position of the highest radiation.
- 2. During performing radiated emission below 1 GHz, the EUT was set 3 meters away from the interference receiving antenna, which was mounted on the top of a variable-height antenna tower. During performing radiated emission above 1 GHz, the EUT was set 1 or 3 meter away from the interference-receiving antenna.
- 3. For measurements above 1GHz absorbers are placed on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections. For measurements below 1 GHz, the absorbers are removed.
- 4. The antenna is a broadband antenna, and its 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.
- 5. 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 table was turned from 0 degrees to 360 degrees to find the maximum reading.
- 6. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- 7. If the emission level of the EUT in peak mode was 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.
- NOTE 1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- NOTE 2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
- NOTE 3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1 kHz for Average detection (AV) at frequency above 1 GHz.



7.3.2. Test Procedures for Conducted Spurious Emissions

- 1. The transmitter output was connected to the spectrum analyzer.
- 2. The **reference level** of the fundamental frequency was measured with the spectrum analyzer using RBW = 100 kHz, VBW = 300 kHz.
- 3. The conducted spurious emission was tested each ranges were set as below.

Frequency range : 9 kHz ~ 30 MHz RBW = 100 kHz, VBW = 300 kHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

Frequency range : 30 MHz ~ 10 GHz, 10 GHz ~ 25 GHz RBW = 1 MHz, VBW = 3 MHz, SWEEP TIME = AUTO, DETECTOR = PEAK, TRACE = MAX HOLD, SWEEP POINT : 40001

LIMIT LINE = 20 dB below of the reference level of above measurement procedure Step 2. (RBW = 100 kHz, VBW = 300 kHz)

If the emission level with above setting was close to the limit (ie, less than 3 dB margin) then zoom scan is required using RBW = 100 kHz, VBW = 300 kHz, SPAN = 100 MHz and BINS = 2001 to get accurate emission level within 100 kHz BW.

Also the path loss for conducted measurement setup was used as described on the Appendix I of this test report.

7.3.3. Test Plot

Refer to the APPENDIX II



7.4. Test Results

7.4.1. Radiated Emissions

9 kHz ~ 25 GHz Data (Modulation : GFSK)

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2385.59	н	Х	PK	56.61	0.78	N/A	N/A	57.39	74.00	16.61
2385.97	Н	Х	AV	50.06	0.78	-24.70	N/A	26.14	54.00	27.86
4804.02	V	Z	PK	46.07	7.63	N/A	N/A	53.70	74.00	20.30
4804.06	V	Z	AV	37.66	7.63	-24.70	N/A	20.59	54.00	33.41
7206.26	V	Z	PK	47.47	11.23	N/A	N/A	58.70	88.47	29.77

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882.02	V	Z	PK	47.24	7.30	N/A	N/A	54.54	74.00	19.46
4882.00	V	Z	AV	39.69	7.30	-24.70	N/A	22.29	54.00	31.71
7322.04	V	Z	PK	44.30	11.20	N/A	N/A	55.50	74.00	18.50
7322.78	V	Z	AV	31.55	11.20	-24.70	N/A	18.05	54.00	35.95

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.53	Н	Х	PK	64.05	1.16	N/A	N/A	65.21	74.00	8.79
2483.52	Н	Х	AV	45.43	1.16	-24.70	N/A	21.89	54.00	32.11
4960.30	۷	Z	PK	46.60	7.48	N/A	N/A	54.08	74.00	19.92
4960.05	۷	Z	AV	38.48	7.48	-24.70	N/A	21.26	54.00	32.74
7440.21	۷	Z	PK	46.02	11.34	N/A	N/A	57.36	74.00	16.64
7439.96	V	Z	AV	36.77	11.34	-24.70	N/A	23.41	54.00	30.59

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3m to 1m. In this case, the distance factor(-9.54dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. D.C.F Calculation. (D.C.F = Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels , where T = pulse width = 2.91 ms

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.91 X 20) = 1.718 \Rightarrow 2

- The Worst Case Dwell Time = T [ms] x H' = **2.91 ms X 2** = **5.82 ms**

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.82 / 100) = -24.70 dB

4. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG



9 kHz ~ 25 GHz Data (Modulation : π /4DQPSK)

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2385.78	Н	Х	PK	58.10	0.78	N/A	N/A	58.88	74.00	15.12
2385.97	н	Х	AV	51.90	0.78	-24.70	N/A	27.98	54.00	26.02
4804.09	V	Z	PK	47.10	7.63	N/A	N/A	54.73	74.00	19.27
4804.01	V	Z	AV	37.25	7.63	-24.70	N/A	20.18	54.00	33.82
7205.58	V	Z	PK	50.13	11.23	N/A	N/A	61.36	90.50	29.14

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882.53	V	Z	PK	48.38	7.30	N/A	N/A	55.68	74.00	18.32
4882.13	V	Z	AV	38.87	7.30	-24.70	N/A	21.47	54.00	32.53
7322.56	V	Z	PK	46.75	11.20	N/A	N/A	57.95	74.00	16.05
7323.17	V	Z	AV	34.47	11.20	-24.70	N/A	20.97	54.00	33.03

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.60	Н	Х	PK	63.75	1.16	N/A	N/A	64.91	74.00	9.09
2483.51	Н	Х	AV	49.92	1.16	-24.70	N/A	26.38	54.00	27.62
4960.30	V	Z	PK	48.68	7.48	N/A	N/A	56.16	74.00	17.84
4959.96	V	Z	AV	39.05	7.48	-24.70	N/A	21.83	54.00	32.17
7439.94	V	Z	PK	46.13	11.34	N/A	N/A	57.47	74.00	16.53
7440.10	V	Z	AV	35.10	11.34	-24.70	N/A	21.74	54.00	32.26

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3m to 1m. In this case, the distance factor(-9.54dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. D.C.F Calculation. (D.C.F = Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels , where T = pulse width = 2.91 ms

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.91 X 20) = 1.718 \approx 2

- The Worst Case Dwell Time = T [ms] x H' = 2.91 ms X 2 = 5.82 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.82 / 100) = -24.70 dB

4. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG



9 kHz ~ 25 GHz Data (Modulation : <u>8DPSK</u>)

Lowest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2386.03	Н	Х	PK	58.63	0.78	N/A	N/A	59.41	74.00	14.59
2386.10	н	Х	AV	51.77	0.78	-24.70	N/A	27.85	54.00	26.15
4804.00	V	Z	PK	47.10	7.63	N/A	N/A	54.73	74.00	19.27
4804.03	V	Z	AV	37.20	7.63	-24.70	N/A	20.13	54.00	33.87
7205.95	V	Z	PK	50.39	11.23	N/A	N/A	61.62	90.63	29.01

Middle Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
4882.23	V	Z	PK	48.22	7.30	N/A	N/A	55.52	74.00	18.48
4882.08	V	Z	AV	38.96	7.30	-24.70	N/A	21.56	54.00	32.44
7323.39	V	Z	PK	46.86	11.20	N/A	N/A	58.06	74.00	15.94
7323.07	V	Z	AV	34.78	11.20	-24.70	N/A	21.28	54.00	32.72

Highest Channel

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2483.56	Н	Х	PK	63.13	1.16	N/A	N/A	64.29	74.00	9.71
2483.51	Н	Х	AV	50.07	1.16	-24.70	N/A	26.53	54.00	27.47
4960.27	V	Z	PK	48.20	7.48	N/A	N/A	55.68	74.00	18.32
4960.02	V	Z	AV	38.81	7.48	-24.70	N/A	21.59	54.00	32.41
7439.64	V	Z	PK	46.89	11.34	N/A	N/A	58.23	74.00	15.77
7439.93	V	Z	AV	34.93	11.34	-24.70	N/A	21.57	54.00	32.43

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3m to 1m. In this case, the distance factor(-9.54dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. D.C.F Calculation. (D.C.F = Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels , where T = pulse width = 2.91 ms

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.91 X 20) = 1.718 \approx 2

- The Worst Case Dwell Time = T [ms] x H' = 2.91 ms X 2 = 5.82 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.82 / 100) = -24.70 dB

4. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG



9 kHz ~ 25 GHz Data (Hopping mode)

Modulation : GFSK

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2386.54	Н	х	PK	57.85	0.78	N/A	N/A	58.63	74.00	15.37
2386.00	Н	х	AV	50.22	0.78	-24.70	N/A	26.30	54.00	27.70
2483.92	Н	х	PK	57.87	1.16	N/A	N/A	59.03	74.00	14.97
2483.51	Н	Х	AV	44.65	1.16	-24.70	N/A	21.11	54.00	32.89

Modulation : π/4DQPSK

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor(dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2386.13	Н	х	PK	57.99	0.78	N/A	N/A	58.77	74.00	15.23
2386.00	Н	х	AV	51.92	0.78	-24.70	N/A	28.00	54.00	26.00
2483.56	Н	Х	PK	61.73	1.16	N/A	N/A	62.89	74.00	11.11
2483.51	Н	х	AV	48.68	1.16	-24.70	N/A	25.14	54.00	28.86

Modulation : 8DPSK

Frequency (MHz)	ANT Pol	The worst case EUT Position (Axis)	Detector Mode	Reading (dBuV)	T.F (dB/m)	D.C.F (dB)	Distance Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)
2385.66	Н	Х	PK	57.62	0.78	N/A	N/A	58.40	74.00	15.60
2386.06	Н	х	AV	51.32	0.78	-24.70	N/A	27.40	54.00	26.60
2483.53	Н	х	PK	60.88	1.16	N/A	N/A	62.04	74.00	11.96
2483.56	Н	Х	AV	48.50	1.16	-24.70	N/A	24.96	54.00	29.04

Note.

1. No other spurious and harmonic emissions were found greater than listed emissions on above table.

2. Information of Distance Factor

For finding emissions, the test distance might be reduced from 3m to 1m. In this case, the distance factor(-9.54dB) is applied to the result.

- Calculation of distance factor = 20 log(applied distance / required distance) = 20 log(1 m / 3 m) = -9.54 dB

When distance factor is "N/A", the distance is 3 m and distance factor is not applied.

3. D.C.F Calculation. (D.C.F = Duty Cycle Correction Factor)

- Time to cycle through all channels = Δt = T [ms] X 20 minimum hopping channels , where T = pulse width = 2.91 ms

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.91 X 20) = 1.718 \approx 2

- The Worst Case Dwell Time = T [ms] x H' = 2.91 ms X 2 = 5.82 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.82 / 100) = -24.70 dB

4. Sample Calculation.

Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG



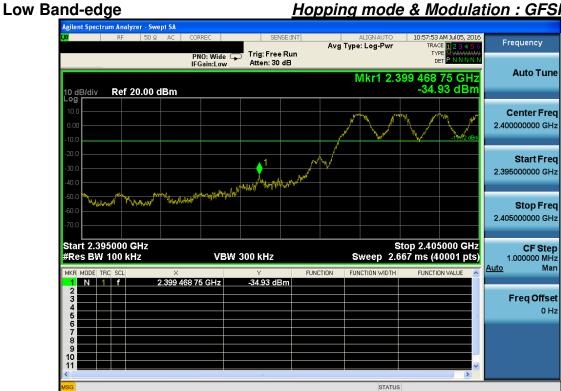
7.4.2. Conducted Spurious Emissions

Low Band-edge



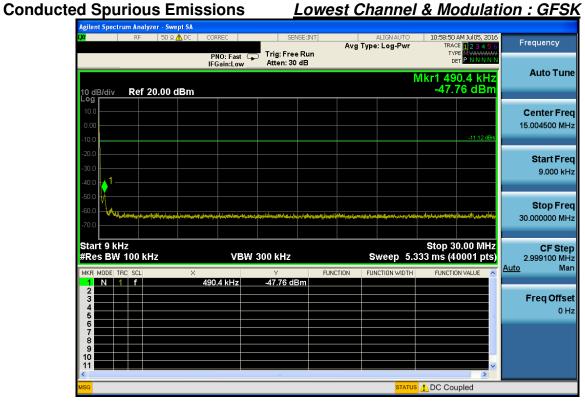
Lowest Channel & Modulation : GFSK

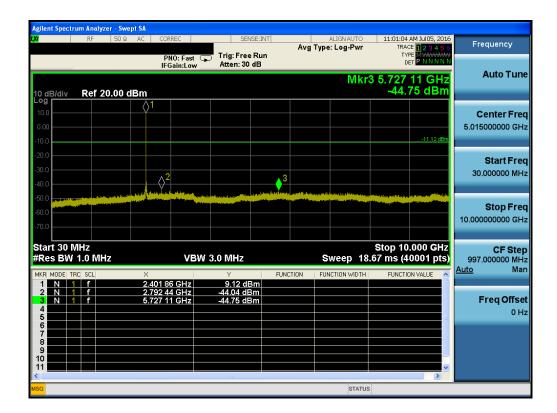
Hopping mode & Modulation : GFSK





Lowest Channel & Modulation : GFSK







Conducted Spurious Emissions

nt Spectrum Analyzer - Swept SA 11:02:27 AM Jul 05, 2016 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P N N N N Frequency Avg Type: Log-Pwr Trig: Free Run Atten: 30 dB PNO: Fast 😱 IFGain:Low Auto Tune Mkr1 24.715 000 GHz -34.50 dBm Ref 20.00 dBm 10 dB/div -og **Center Freq** 17.500000000 GHz Start Freq 10.00000000 GHz Stop Freq 25.00000000 GHz Start 10.000 GHz #Res BW 1.0 MHz Stop 25.000 GHz Sweep 40.00 ms (40001 pts) **CF Step** 1.500000000 GHz <u>uuto</u> Man VBW 3.0 MHz <u>Auto</u> FUNCTION FUNCTION WIDTH FUNCTION VALUE 24.715 000 GHz -34.50 dBm Ν <u>1 f</u> Freq Offset 0 Hz STATUS

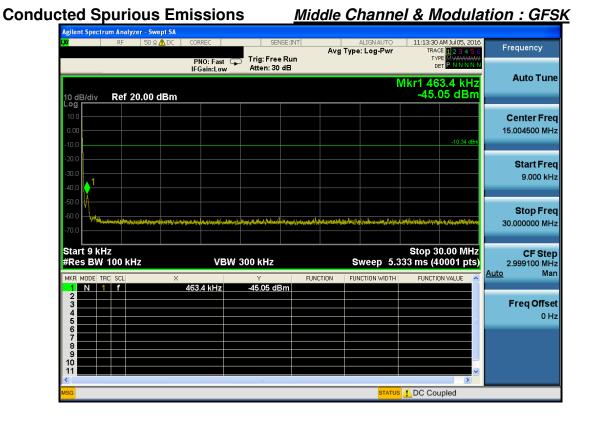
Lowest Channel & Modulation : GFSK



Reference for limit



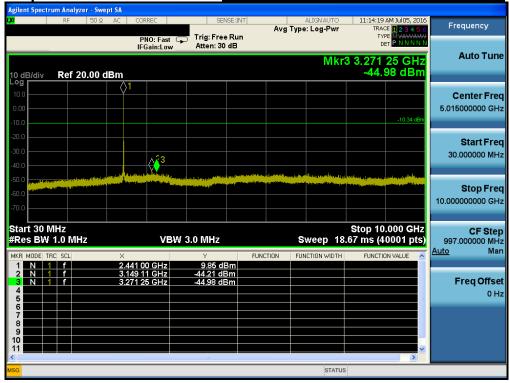
Middle Channel & Modulation : GFSK

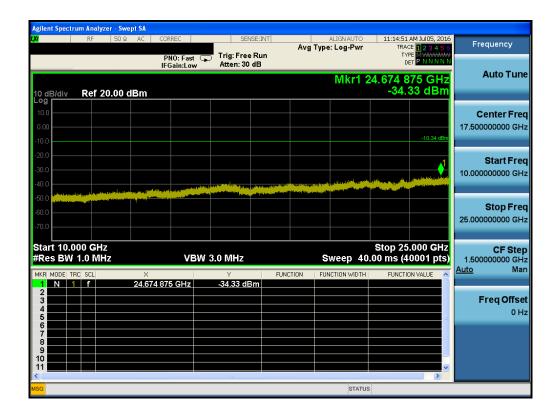




Middle Channel & Modulation : GFSK

Conducted Spurious Emissions







High Band-edge

gilent Spectrum Analyzer - Swept SA 11:03:59 AM Jul 05, 2016 Frequency Avg Type: Log-Pwr RACE Trig: Free Run Atten: 30 dB TYPE DET PNO: Wide 😱 IFGain:Low Auto Tune Mkr2 2.483 989 50 GHz -42.06 dBm 10 dB/div _og Ref 20.00 dBm ()1 **Center Freq** 2.483500000 GHz Start Freq 2.478500000 GHz 2 dest allows ANAMAN, www Stop Freq 2.488500000 GHz Start 2.478500 GHz #Res BW 100 kHz Stop 2.488500 GHz Sweep 2.667 ms (40001 pts) CF Step 1.000000 MHz VBW 300 kHz Man <u>Auto</u> FUNCTION FUNCTION N 1 f N 1 f 2.479 990 25 GHz 2.483 989 50 GHz 10.25 dBm -42.06 dBm **Freq Offset** 0 Hz STATUS

Highest Channel & Modulation : GFSK

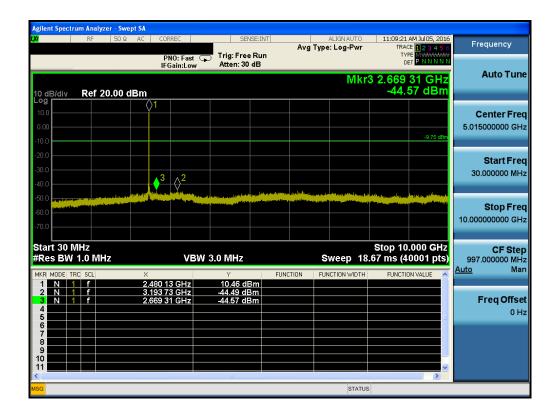


Hopping mode & Modulation : GFSK



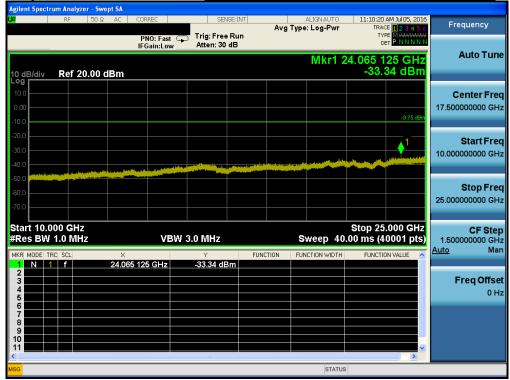
Conducted Spurious Emissions <u>Highest Channel & Modulation : GFSK</u>

gilent Spectrum Analyzer - !						
RF 50)Ω 🥂 DC 🔋 CORREC 📔	SENSE:II		ALIGNAUTO Type: Log-Pwr	11:07:00 AM Jul 05, 20	
	PNO: Fas	Trig: Free Ru		Type: Log-Pwr	TRACE 1 2 3 4 5 TYPE M WWWW	w
	IFGain:Lo	Atten: 30 dB			DET PNNNN	
					Mkr1 473.1 kH	Auto Tune
0 dB/div Ref 20.0	0 dBm				-47.13 dBr	n
- °g 10.0						O
						Center Freq
0.00					-9.75 dE	15.004500 MHz
10.0					-5.75 42	
20.0						Start Free
30.0						9.000 kHz
40.0 1						
50.0						
-60.0	والمراجع والمراجع والمراجع والمراجع والمراجع					Stop Freq
70.0		et i de handle figt fot dit deue sold gest in nation i traffe	a de la contra de la		n i fan nan an an i staat de s	30.000000 MHz
Start 9 kHz					Stop 30.00 MH	Z CF Step
Res BW 100 kHz	VI	300 kHz		Sweep 5.3	333 ms (40001 pts	
MKR MODE TRC SCL	Х	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Man
1 N 1 f	473.1 kHz	-47.13 dBm				
3						Freq Offset
4 5						0 Hz
6						
8						
9						
11						•
<		Ш				
<mark>//SG</mark>				STATUS	L DC Coupled	





Conducted Spurious Emissions <u>Highest Channel & Modulation : GFSK</u>





Low Band-edge

Low Band-edge

Lowest Channel & Modulation : π/4DQPSK



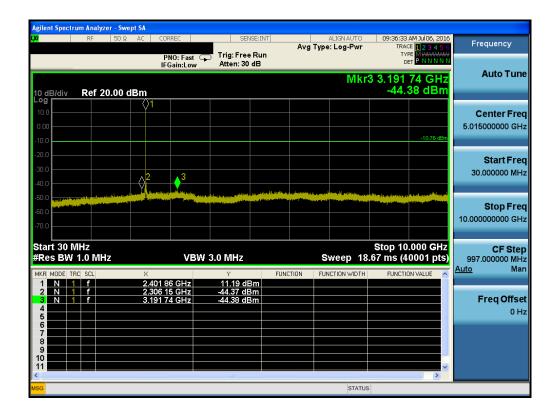
<u>Hopping mode & Modulation : π/4DQPSK</u>





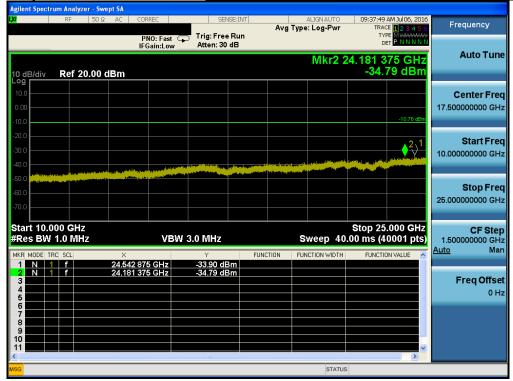
Conducted Spurious Emissions <u>Lowest Channel & Modulation : π/4DQPSK</u>

Agreent Spectrum Analy.	50 Ω 🔥 DC CORREC	SENSE:	TAIT	ALIGN AUTO	09:35:00 AM Jul 06, 2016	
V Nº	JU SZ ALDC CORREC		Avg	Type: Log-Pwr	TRACE 1 2 3 4 5 6	Frequency
	PNO: F IFGain:I	ast 🖵 Trig: Free Ru ow Atten: 30 dE			TYPE MUMMMM DET P N N N N N	
	ii Gaili.i	-04		A	/kr1 482.9 kHz	Auto Tune
10 dB/div Ref 2	20.00 dBm				-36.27 dBm	
Log						
10.0						Center Freq
0.00						15.004500 MHz
-10.0					-10.76 dBm	
-20.0						Start Freq
-30.0 🔶 1 ————						9.000 kHz
-40.0						
-50.0						
-60.0	unitantila (aqalassis mininationa) adama	adas latas nek astata es de dilita a	and a state of the	to design in which a section in a stability	tables to be added to the first state	Stop Freq 30.000000 MHz
-70.0			habled on blining datastical per	a little a little and feither a de ba		30.000000 WH2
Start 9 kHz					Stop 30.00 MHz	
#Res BW 100 kl	۲ ۲z	VBW 300 kHz		Sweep 5.3	33 ms (40001 pts)	CF Step 2.999100 MHz
MKR MODE TRC SCL	×	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f	482.9 kl	lz -36.27 dBm				
2						Freq Offset
4						0 Hz
6						
8						
9						
11					~	
<		Ш				
MSG				STATUS	1 DC Coupled	





Conducted Spurious Emissions <u>Lowest Channel & Modulation : π/4DQPSK</u>





Reference for limit

Middle Channel & Modulation : π/4DQPSK

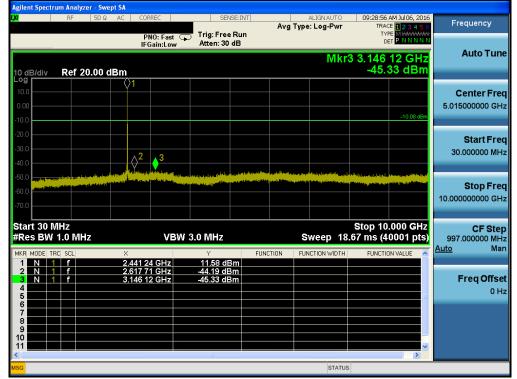


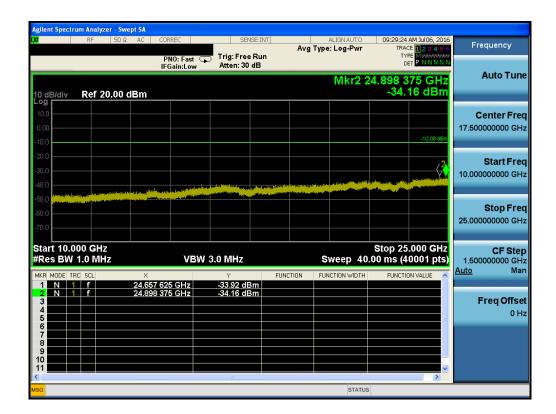
Middle Channel & Modulation : π/4DQPSK

Conducted Spurious Emissions gilent Spectrum Analyzer - Swept SA 09:28:07 AM Jul 06, 2016 Frequency Avg Type: Log-Pwr TRACE Trig: Free Run Atten: 30 dB TYPE DET PNO: Fast 🖵 IFGain:Low Auto Tune Mkr1 485.9 kHz -35.21 dBm Ref 20.00 dBm dB/div 10 d _og **Center Freq** 15.004500 MHz Start Freq 9.000 kHz Stop Freq 30.000000 MHz Start 9 kHz #Res BW 100 kHz Stop 30.00 MHz CF Step 2.999100 MHz VBW 300 kHz Sweep 5.333 ms (40001 pts) Man <u>Auto</u> FUNCTION FUNCTION WIDTH FUNCTION VALUE MKB M 485.9 kHz -35.21 dBm Freq Offset 0 Hz L DC Coupled



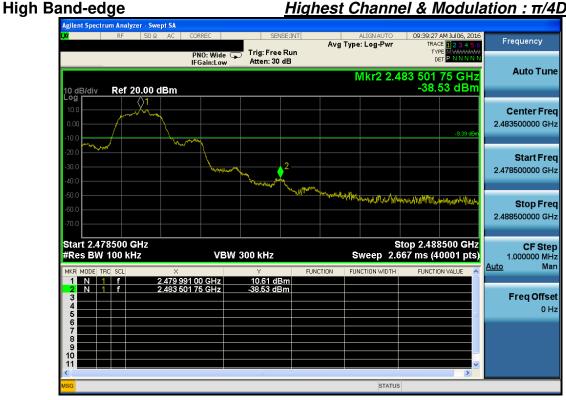
Conducted Spurious Emissions <u>Middle Channel & Modulation : π/4DQPSK</u>







Highest Channel & Modulation : π/4DQPSK



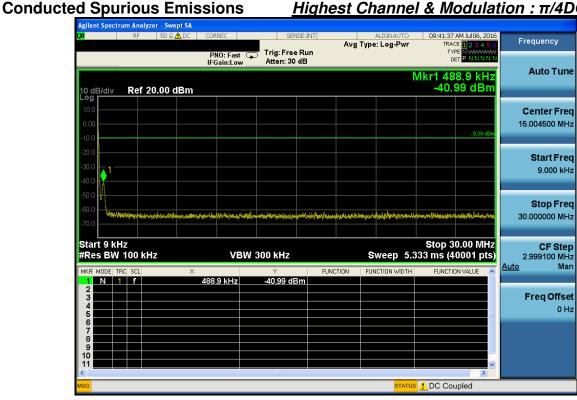
Hopping mode & Modulation : $\pi/4DQPSK$

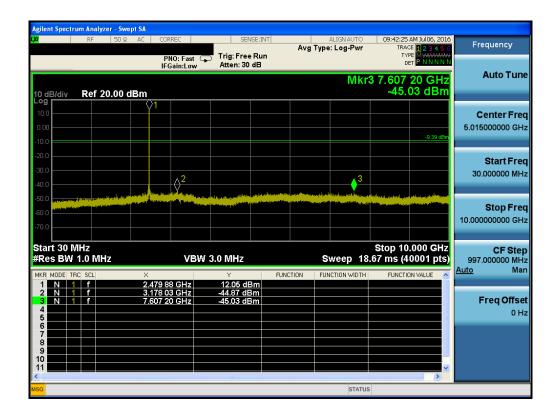






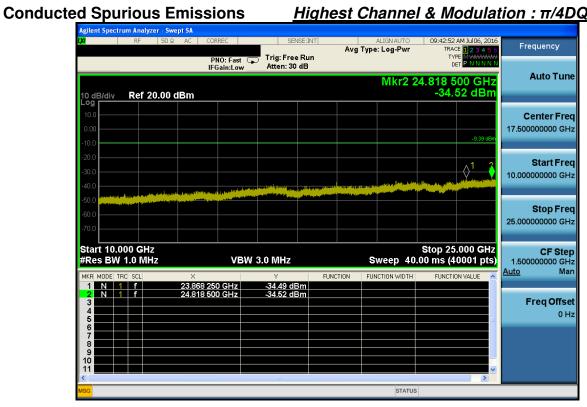
Highest Channel & Modulation : π/4DQPSK







Highest Channel & Modulation : π/4DQPSK





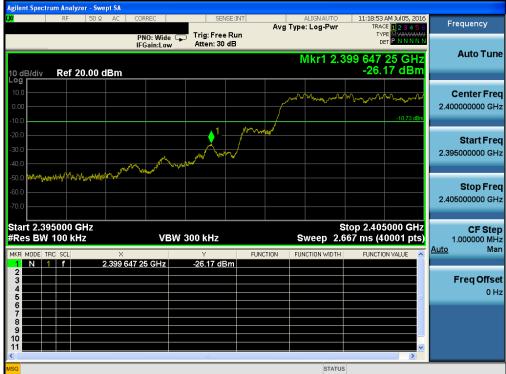
Low Band-edge

Low Band-edge

Lowest Channel & Modulation : 8DPSK



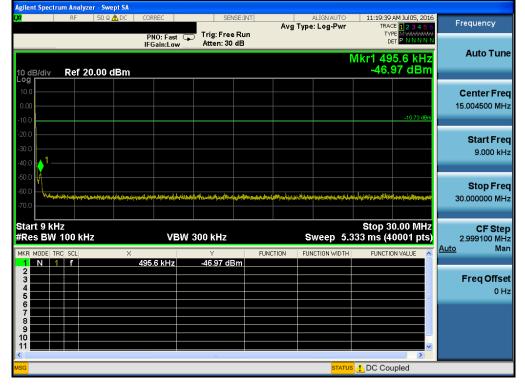
Hopping mode & Modulation : 8DPSK

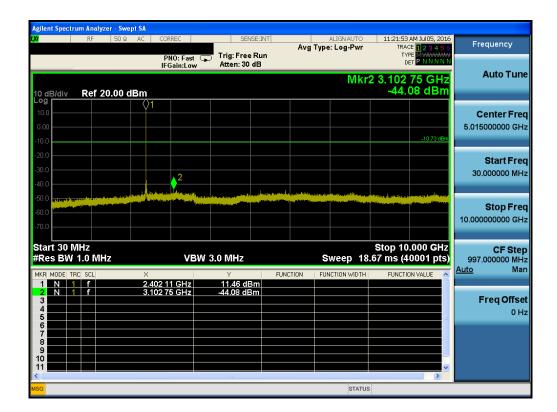




Lowest Channel & Modulation : 8DPSK

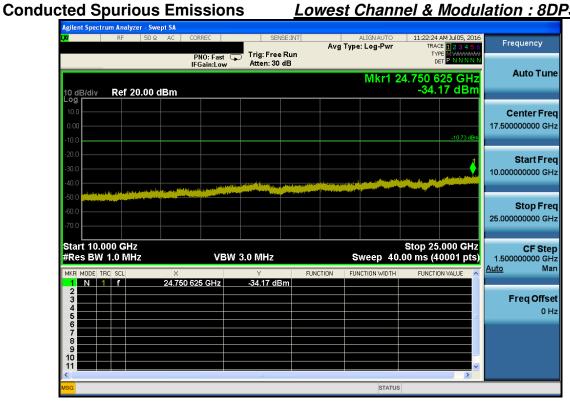
Conducted Spurious Emissions







Lowest Channel & Modulation : 8DPSK

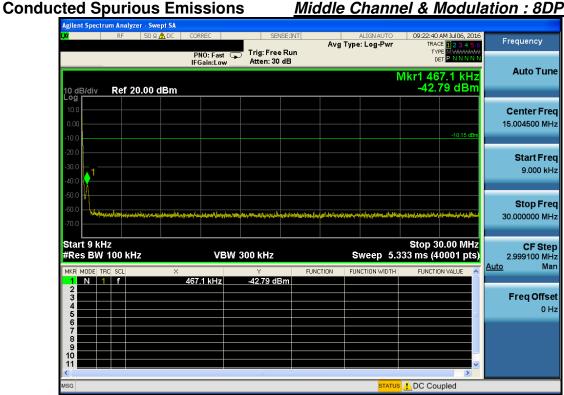




Reference for limit



Middle Channel & Modulation : 8DPSK

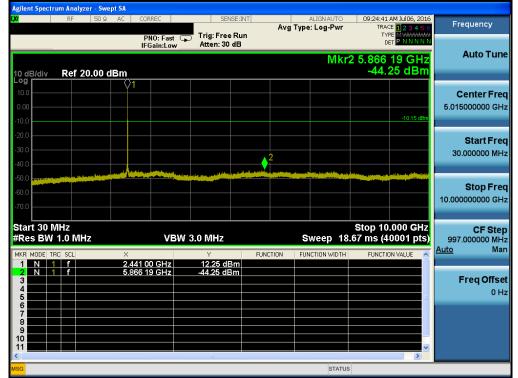


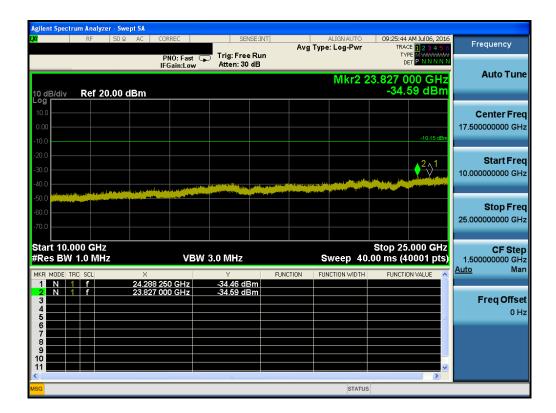
Middle Channel & Modulation : 8DPSK



Conducted Spurious Emissions

Middle Channel & Modulation : 8DPSK







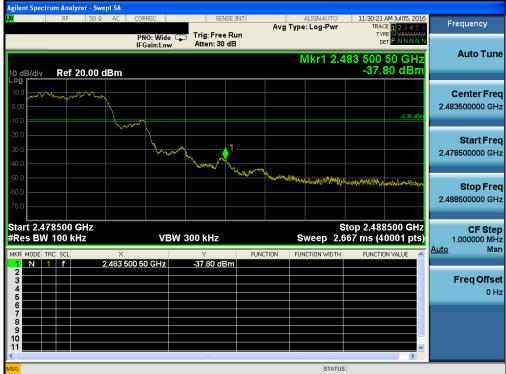
High Band-edge

High Band-edge

Highest Channel & Modulation : 8DPSK



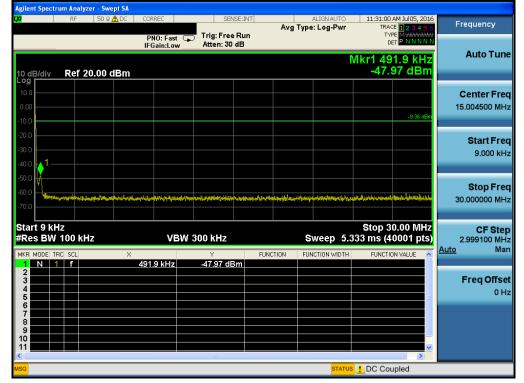
Hopping mode & Modulation : 8DPSK

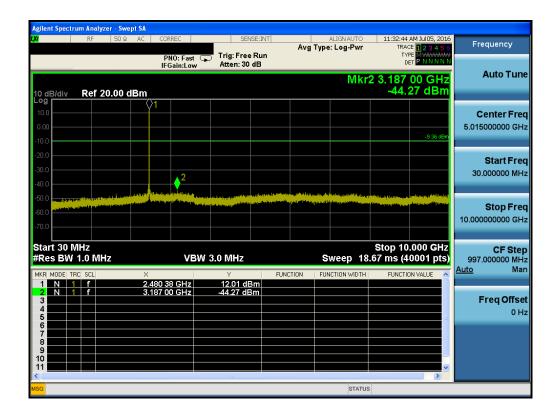




Conducted Spurious Emissions

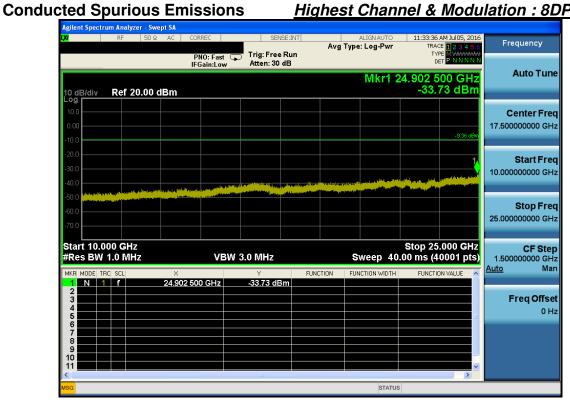
Highest Channel & Modulation : 8DPSK







Highest Channel & Modulation : 8DPSK





8. Transmitter AC Power Line Conducted Emission

8.1 Test Setup

Not Applicable

8.2 Limit

According to §15.207(a) for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 uH/50 ohm line impedance stabilization network (LISN).

Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequency ranges.

Frequency Range (MHz)	Conducted Limit (dBuV)					
Frequency hange (MHZ)	Quasi-Peak	Average				
0.15 ~ 0.5	66 to 56 *	56 to 46 *				
0.5 ~ 5	56	46				
5 ~ 30	60	50				

* Decreases with the logarithm of the frequency

8.3 Test Procedures

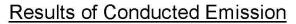
Conducted emissions from the EUT were measured according to the ANSI C63.10.

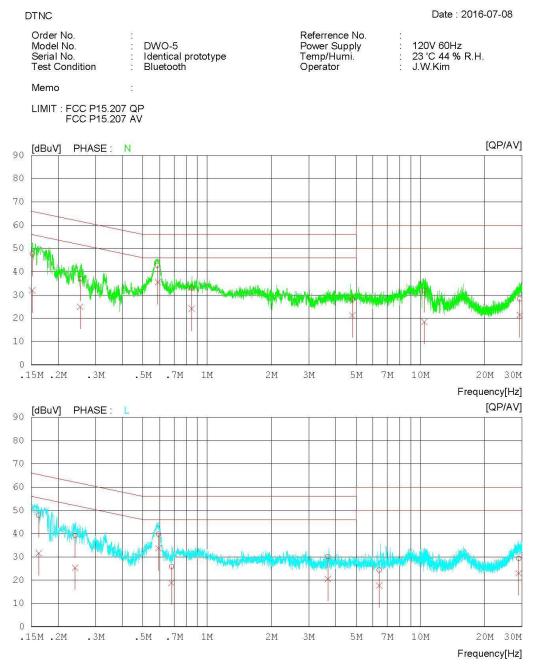
- The test procedure is performed in a 6.5 m × 3.5 m × 3.5 m (L × W × H) shielded room. The EUT along with its peripherals were placed on a 1.0 m (W) × 1.5 m (L) and 0.8 m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane.
- 2. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chassis ground was bounded to the horizontal ground plane of shielded room.
- 3. All peripherals were connected to the second LISN and the chassis ground also bounded to the horizontal ground plane of shielded room.
- 4. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.



8.4 Test Results

AC Line Conducted Emissions (Graph) = Modulation : <u>GFSK</u>





DTNC



AC Line Conducted Emissions (List) = Modulation : <u>GFSK</u>

Results of Conducted Emission

Date : 2016-07-08

TRF-RF-237(02)160407



9. Antenna Requirement

Describe how the EUT complies with the requirement that either its antenna is permanently attached, or that it employs a unique antenna connector, for every antenna proposed for use with the EUT.

Conclusion: Comply

The antenna is permanently attached. (Refer to Internal photo file.)

- Minimum Standard :

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.



10. Occupied Bandwidth (99 %)

10.1 Test Setup

Refer to the APPENDIX I.

10.2 Limit

Limit : Not Applicable

10.3 Test Procedure

The 99 % power bandwidth was measured with a calibrated spectrum analyzer.

The resolution bandwidth (RBW) shall be in the range of 1 % to 5 % of the occupied bandwidth (OBW) and video bandwidth (VBW) shall be approximately $3 \times RBW$.

Spectrum analyzer plots are included on the following pages.

10.4 Test Results

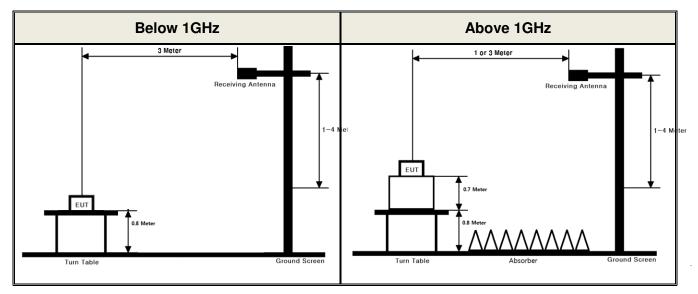
Not Applicable



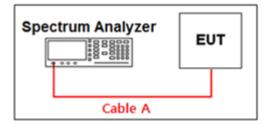
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	0.54	15	3.97
1	1.16	20	5.23
2.402 & 2.441 & 2.480	1.60	25	6.73
5	2.05	-	-
10	3.09	-	-

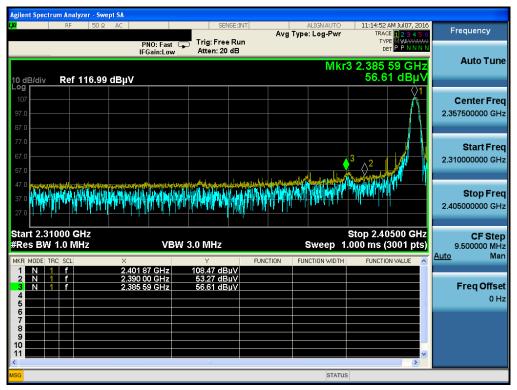
Note 1 : The path loss from EUT to Spectrum analyzer were measured and used for test. Path loss (S/A's Correction factor) = Cable A



APPENDIX II

Unwanted Emissions (Radiated) Test Plot

GFSK & Lowest & X & Hor



Detector Mode : AV

GFSK & Lowest & X & Hor

Agilent Spectrum	n Analyzer - Sv	wept SA						
L <mark>XI</mark>	RF 50 9	Ω AC		SENSE		ALIGN AUTO	11:12:09 AM Jul 07, 2016	
			PNO: Fast 🔸	Trig: Free F Atten: 20 d	lun Avg	g Type: Log-Pwr g Hold: 300/300	TRACE 123456 TYPE MWWWWWW DET PPNNNN	
10 dB/div	Ref 116.9	9 dBµV				Mkı	3 2.385 97 GHz 50.058 dBµV	Auto Tune
Log 107 97.0 87.0								Center Freq 2.357500000 GHz
77.0 67.0 57.0								Start Freq 2.310000000 GHz
47.0 37.0 27.0				<u></u>	~~~^^			Stop Freq 2.405000000 GHz
Start 2.310 #Res BW 1			#VBW	1.0 kHz		Sweep 7	Stop 2.40500 GHz 4.20 ms (3001 pts)	CF Step 9.500000 MHz
MKR MODE TRC	SCL f			ץ 108.050 dBµ		FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 N 1 3 N 1 4 5 6	f f			43.131 dBμ\ 50.058 dBμ\				Freq Offset 0 Hz
8 9 10								
11 <				Ш			>	
MSG						STATU	s	



GFSK & Highest & X & Hor

Agilent Spectrum Analyzer - Swept SA						
X RF 50Ω AC		SENSE:IN	Avg Type	ALIGN AUTO E: Log-Pwr	12:43:28 PM Jul 07, 2016 TRACE 1 2 3 4 5 6 TVPE MIMANANANA	Frequency
10 dB/div Ref 116.99 dBµV	PNO: Fast 🖵 IFGain:Low	Atten: 20 dB	1	Mkr3	2.483 525 GHz 64.05 dBµV	Auto Tune
107 97.0 87.0						Center Freq 2.487500000 GHz
77.0 67.0 57.0		Lililiu nu karam	N.J. al Miligial And same day	lision here the advertised	horstandy - Barketle, James James and Same	Start Freq 2.475000000 GHz
47.0 47.0 47.0 47.0 47.0 47.0 47.0 47.0			hter and a second s	***	hund Million Million Alland	Stop Freq 2.500000000 GHz
Start 2.47500 GHz #Res BW 1.0 MHz	VBW (3.0 MHz		Sweep 1.	Stop 2.50000 GHz .000 ms (3001 pts)	CF Step 2.500000 MHz Auto Man
2 N 1 f 2.483	9 817 GHz 3 500 GHz	Y 100.77 dBµV 56.68 dBµV 64.05 dBµV	FUNCTION FUN	ICTION WIDTH	FUNCTION VALUE	
3 N 1 f 2.483	3 525 GHz	64.05 dBµV				Freq Offset 0 Hz
6 7 8 9						
10 11 <					~	
MSG				STATUS		

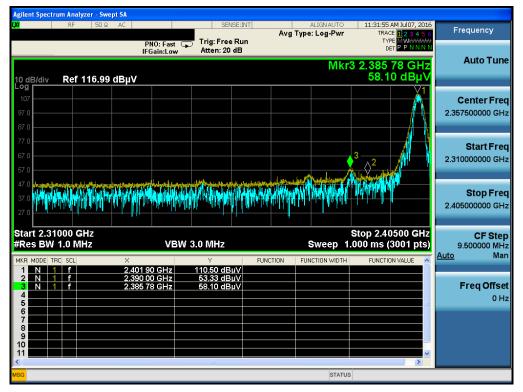
Detector Mode : AV

GFSK & Highest & X & Hor





π /4DQPSK & Lowest & X & Hor



Detector Mode : AV

π /4DQPSK & Lowest & X & Hor





$\pi/4DQPSK$ & Highest & X & Hor

Agilent Spectrum Analyzer - Swept SA							
ΙΧΊ RF 50 Ω AC		SENSE:		ALIGN AUTO	12:53:53 PM Jul 07, 3 TRACE 1 2 3 4		Frequency
	PNO: Fast 😱	Trig: Free Ru	un –	ype. Log-r wi	TYPE M WAA	www.	
	IFGain:Low	Atten: 20 dB	1		DET P N N		
				Mkr3	2.483 600 G	HZ	Auto Tune
10 dB/div Ref 116.99 dBµV					63.75 dBj	uV	
Log 1							
107							Center Freq
97.0							2.487500000 GHz
87.0	<u>\</u>						
77.0							Otherst Free a
67.0							Start Freq
57.0	and the second	The state of the second second					2.475000000 GHz
	William he he			A Chinese and the second	مراجعه المراجع المرجع المواجع المراجع المراجع		
47.0		والمرابع والاتا الألافة	Nalis, . Luzalis, eta	والأوريقة والترابين	Mailine Hay all in the she	line -	Stop Freq
37.0			a Analah at Unitab	nn nn str			2.500000000 GHz
27.0			<u></u>				
Start 2.47500 GHz					Oton 2 50000 C	1.1-1	
#Res BW 1.0 MHz	VBM	3.0 MHz		Sweep 1	Stop 2.50000 G .000 ms (3001 p		CF Step 2.500000 MHz
					· · ·		Auto Man
MKR MODE TRC SCL X	992 GHz	⊻ 103.539 dBµV	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u></u>	
2 N 1 f 2.483	500 GHz 600 GHz	63.74 dBµV					
3 N 1 f 2.483	600 GHz	63.75 dBµV					Freq Offset
5							0 Hz
6							
8							
9							
11						~	
<		ш				>	
MSG				STATU	5		

Detector Mode : AV

$\pi/4DQPSK$ & Highest & X & Hor







8DPSK & Lowest & X & Hor

Detector Mode : PK

gilent Spectrum Analyzer - Swept SA :16:40 AM Jul 07, 201 11 Frequency Avg Type: Log-Pwr TYPE MWAAAAAA DET P P N N N Trig: Free Run Atten: 20 dB PNO: Fast 😱 IFGain:Low Auto Tune Mkr3 2.386 03 GHz 58.63 dBµ∖ Ref 116.99 dBµV 10 dB/div Log **Center Freq** 2.357500000 GHz Start Freq 2.310000000 GHz a na Manara Mala na manana na m Stop Freq 2.405000000 GHz Stop 2.40500 GHz Sweep 1.000 ms (3001 pts) Start 2.31000 GHz #Res BW 1.0 MHz CF Step 9.500000 MHz Man VBW 3.0 MHz Auto 51.45 dBµ 58.63 dBu **Freq Offset** 0 Hz STATUS

Detector Mode : AV

8DPSK & Lowest & X & Hor



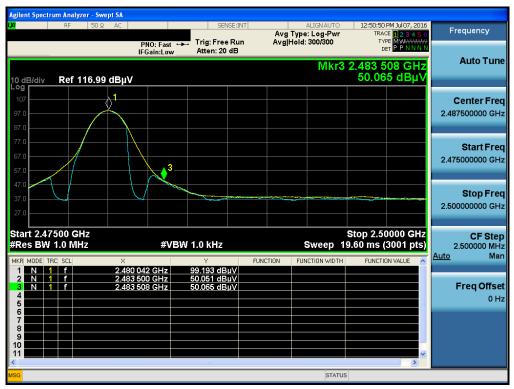


8DPSK & Highest & X & Hor

Agilent Spectrum Analyzer - Swept SA						
ΙΧΊ RF 50Ω AC		SENSE:I	Avg	ALIGN AUTO Type: Log-Pwr	12:52:12 PM Jul 07, 2016 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 😱 IFGain:Low	Trig: Free Ru Atten: 20 dB	n		TYPE MWWWWWW DET PPNNN	Auto Turo
10 dB/div Ref 116.99 dBµV				Mkr3	2.483 558 GHz 63.13 dBµV	Auto Tune
107 97.0 87.0						Center Freq 2.487500000 GHz
77.0 67.0 57.0			WANK ALL LA LADALLEL L	Har a Hillattanara	l Lette in Selanda, sin inc	Start Freq 2.475000000 GHz
47.0 47.0 47.		Marinaman	a an		harited to a post of the state	Stop Freq 2.500000000 GHz
Start 2.47500 GHz #Res BW 1.0 MHz	VBW 3	3.0 MHz		Sweep 1	Stop 2.50000 GHz .000 ms (3001 pts)	CF Step 2.500000 MHz Auto Man
MKR MODE TRC SCL X		Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Adto
1 N 1 f 2.479 2 N 1 f 2.483	992 GHz 500 GHz	103.55 dBµV 62.98 dBµV				
3 N 1 f 2.483 4 5 5	558 GHz	63.13 dBµV				Freq Offset 0 Hz
6 7 8 9						
10 11 <					×	
MSG				STATUS		

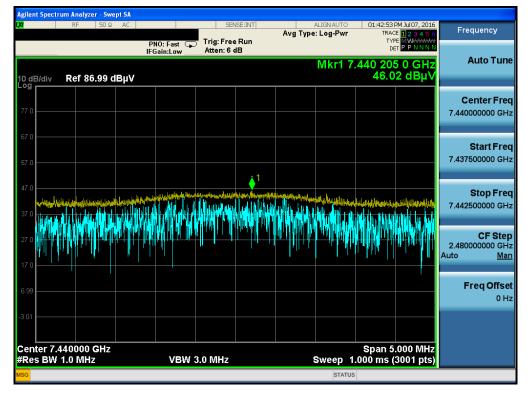
Detector Mode : AV

8DPSK & Highest & X & Hor





GFSK & Highest & Z & Ver

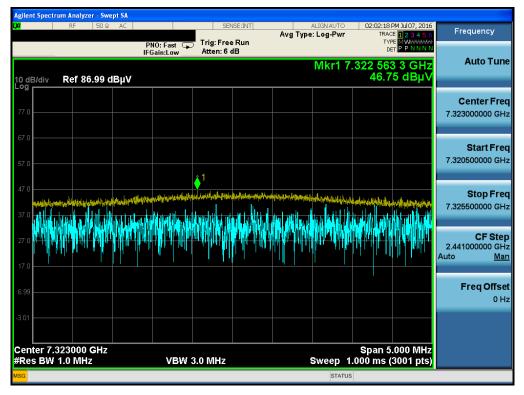


GFSK & Highest & Z & Ver

alyzer - Swept SA 01:42:25 PM Jul07, 2016 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P N N N N Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 Trig: Free Run PNO: Fast ↔ IFGain:Low Atten: 6 dB Auto Tune Mkr1 7.439 960 0 GHz 36.772 dBµV 10 dB/div Ref 86.99 dBµV **Center Freq** 7.440000000 GHz Start Freq 7.437500000 GHz Stop Freq <mark>1</mark> 7.442500000 GHz CF Step 2.48000000 GHz Auto Man **Freq Offset** 0 Hz Center 7.440000 GHz #Res BW 1.0 MHz Span 5.000 MHz Sweep 4.000 ms (3001 pts) #VBW 1.0 kHz STATUS



π /4DQPSK & Middle & Z & Ver

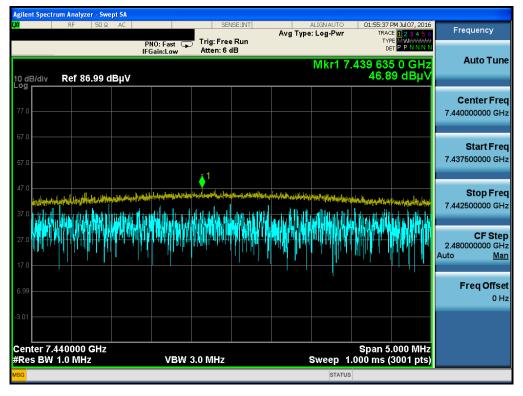


π /4DQPSK & Highest & Z & Ver





8DPSK & Highest & Z & Ver



8DPSK & Highest & Z & Ver

gilent Spectrum Analyzer - Swept SA 01:55:56 PM Jul 07, 2016 Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 TRACE Trig: Free Run Atten: 6 dB TYPE M DET P PNO: Fast IFGain:Low Auto Tune Mkr1 7.439 928 3 GHz 34.932 dBµV Ref 86.99 dBµV 10 dB/div **Center Freq** 7.440000000 GHz Start Freq 7.437500000 GHz Stop Freq 7.442500000 GHz CF Step 2.48000000 GHz Auto Man **Freq Offset** 0 Hz Center 7.440000 GHz #Res BW 1.0 MHz Span 5.000 MHz Sweep 4.000 ms (3001 pts) #VBW 1.0 kHz STATUS



GFSK & Hopping mode & X & Hor

Agilent Spectru			pt SA									
LXI	RF	50 Ω	AC		SE	NSE:INT		ALIGN AUTO		3 AM Jul 07, 201		E
							Avg Typ	e: Log-Pwr	TRA	.CE 1 2 3 4 5 (Frequency
				PNO: Fast	🖵 Trig: Fre				T		<i>t</i>	
				IFGain:Low	Atten: 20)dB			L	DET JE E IN IN IN	8	
								Miles	2 0 200	FA CIL	ĩ	Auto Tune
								IVIKI	3 2.380	54 GHz		
10 dB/div	Ref 1	16.99	dBuV						57.8	35 dBµ∨		
Log										01		
107										<u>∧∽</u>		Center Freq
												-
97.0										+ +	2.	357500000 GHz
87.0												
77.0										<u> </u>		Start Freq
67.0									2	1		
67.0									崎 . n	. ,//	2.	310000000 GHz
57.0									$\frac{1}{1}$			
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Start 2.31	000 GH	ΙZ							Stop 2.4	0500 GHz		CF Step
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								eneep	1000 1110	(oeer pro,	Auto	
MKR MODE TR	C SCL		×		Y	FU	NCTION FL	INCTION WIDTH	FUNCT	ON VALUE 🛛 🔺	Auto	<u>y</u> wan
1 N 1	f		2.40	2 12 GHz	108.47 dE							
2 N 1	f		2.39	0 00 GHz	52.32 dE							
3 N 1	f		2.38	6 54 GHz	57.85 dE	βµV						Freq Offset
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GFSK & Hopping mode & X & Hor

ctrum Analyzer Swept S/ 11:29:13 AM Jul07, 2016 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P N N N N Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 Trig: Free Run Atten: 20 dB PNO: Fast 🔸 Auto Tune Mkr3 2.386 00 GHz 50.222 dBµ∨ Ref 116.99 dBµV 10 dB/div Log **Center Freq** 2.357500000 GHz Start Freq 2.310000000 GHz 3_2 Stop Freq 2.405000000 GHz Stop 2.40500 GHz Sweep 74.20 ms (3001 pts) Start 2.31000 GHz #Res BW 1.0 MHz CF Step 9.500000 MHz Man #VBW 1.0 kHz <u>Auto</u> FUNCTION FUNCTION 108.148 dBμV 49.850 dBμV 50.222 dBμV Ν 2.402 06 GHz 2.390 00 GHz 2.386 00 GHz NN Freq Offset 0 Hz STATUS



GFSK & Hopping mode & X & Hor

RF SO Q. AC ERRECINT ALENANTO 12-48:11 M M07, 2016 PNO: Fast PNO: Fast Trig: Free Run Atten: 20 dB MKr3 2.483 917 GHz Frequency 10 dBJdiv Ref 116.99 dBµV MKr3 2.483 917 GHz Grad Auto Tune 10 dBJdiv Ref 116.99 dBµV Start Freq Center Freq 2.48750000 GHz 37.0 3 Auto Tune Start Freq 2.47500000 GHz Start Freq 27.0 Start 2.47500 GHz VBW 3.0 MHz Stop 2.50000 GHz Stop 7.500 GHz Stop Freq 2 N 1 f 2.493 917 GHz Y Function Function width Function value Man 1 N 1 f 2.493 917 GHz Stoo 81 Hz Stoo 91 Hz Man 1 N 1 f 2.493 917 GHz Stor 87 dBhV Stop 7.87 dBhV Man 1 N 1 f 2.493 917 GHz Stor 87 dBhV Stor 91 dBhV Man 1 N 1 f 2.493 917 GHz Stor 87 dBhV Stor 91 dBhV Man 1 N 1 f 2.493 917 GHz Stor 7.87 dBhV Stor 91 dBhV Man 1 N 1 f	Agilent Spectrum Analyzer - Swept SA							
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Auto Tune Mkr3 2.483 917 GHz 57.87 dBuV Center Freq 2.48750000 GHz Center Freq 2.487500000 GHz Start 2.47500 GHz Ker Mode Hz VBW 3.0 MHz Sweep 1.000 ms (3001 pts) Ker Mode Hz 2493 825 GHz 1 0 1 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 825 GHz 1 0 0 68 dBuV 2 1 N 1 1 2 2493 817 GHz 3 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 2 1 N 1 1 2 2493 817 GHz 5 7.87 dBuV 5 7.87 dBu		т.	in: Ene a Dun	Avg Type: L	_og-Pwr			ricqueriey
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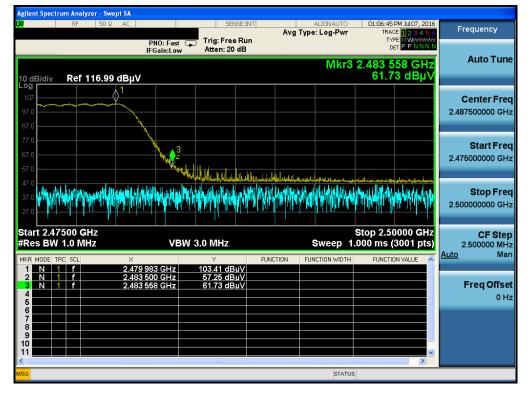
Agilent Spectrum Analyzer -	Swept SA					
KA RF 5	DΩ AC	SENSE:INT		ALIGN AUTO	11:33:57 AM Jul 07, 2016	Frequency
			Avg Type	e: Log-Pwr	TRACE 12345	
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MKR MODE TRC SCL	X	Y	FUNCTION FUI	NCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1 f	2.401 90 GHz	110.524 dBµV				
2 N 1 f	2.390 00 GHz	57.29 dBµV				
3 N 1 f	2.386 13 GHz	57.99 dBµV				Freq Offset
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π /4DQPSK & Hopping mode & X & Hor

gilent Spectrum Analyzer - Swept SA 11:37:22 AM Jul 07, 201 Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 TRACE 1 2 3 TYPE MWA DET P P N Trig: Free Run Atten: 20 dB PNO: Fast IFGain:Low Auto Tune Mkr3 2.386 00 GHz 51.916 dBµV Ref 116.99 dBµV 10 dB/div _og **Center Freq** 2.357500000 GHz Start Freq 2.310000000 GHz ³ ∂² Stop Freq 2.405000000 GHz Start 2.31000 GHz #Res BW 1.0 MHz Stop 2.40500 GHz Sweep 74.20 ms (3001 pts) CF Step 9.500000 MHz Man #VBW 1.0 kHz <u>Auto</u> FUNCTION FUNCTION VIDTH FUNCTION 107.020 dBµV 51.391 dBµV 51.916 dBµV NNN 2.402 02 GHz 2.390 00 GHz 2.386 00 GHz **Freq Offset** 0 Hz STATUS



$\pi/4DQPSK$ & Hopping mode & X & Hor



π /4DQPSK & Hopping mode & X & Hor

ctrum Analyzer - Swept S 01:01:37 PM Jul 07, 2016 TRACE 123456 TYPE MWWWWW DET PPNNNN Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 Tria: Free Run PNO: Fast +++ IFGain:Low Atten: 20 dB Auto Tune Mkr3 2.483 508 GHz 48.676 dBµ∨ Ref 116.99 dBµV 10 dB/div **Center Freq** 2.487500000 GHz Start Freq 2.475000000 GHz 13 Stop Freq 2.500000000 GHz Start 2.47500 GHz #Res BW 1.0 MHz Stop 2.50000 GHz Sweep 19.60 ms (3001 pts) CF Step 2.500000 MHz #VBW 1.0 kHz Man <u>Auto</u> FUNCTION FUNCTION 99.066 dBµV 48.657 dBµV 48.676 dBµV Ν 2.483 500 GHz 2.483 508 GHz N **Freq Offset** 0 Hz STATUS



8DPSK & Hopping mode & X & Hor

Agilent Spectrum Analyzer - Swept SA					
LXU RF 50Ω AC	SEM			:53 AM Jul 07, 2016	Frequency
	PNO: Fast IFGain:Low Atten: 20	Run			Auto Tune
10 dB/div Ref 116.99 dBµV	,		Mkr3 2.38 57	.62 dBμV	
107 97.0 87.0					Center Freq 2.357500000 GHz
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47.0 37.0 27.0	and the second of the second	(WARAND (WARAN)	n di nama kana kana kana kana kana kana kana	alitha gga a bhaile an	Stop Freq 2.405000000 GHz
Start 2.31000 GHz #Res BW 1.0 MHz	VBW 3.0 MHz		Sweep 1.000 m	<u> </u>	CF Step 9.500000 MHz Auto Man
MKR MODE TRC SCL X	7 01 99 GHz 110.70 dB		NCTION WIDTH FUN	ICTION VALUE	
2 N 1 f 2.39	90 00 GHz 56.56 dB 35 56 GHz 57.62 dB	μV			Freq Offset 0 Hz
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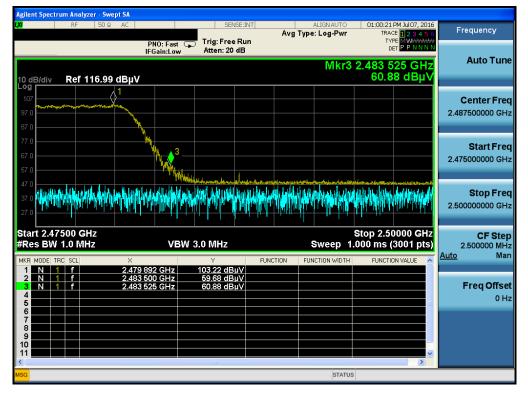
Detector Mode : AV

8DPSK & Hopping mode & X & Hor





8DPSK & Hopping mode & X & Hor



8DPSK & Hopping mode & X & Hor

gilent Spectrum Analyzer - Swept SA 1 Jul 07. 2016 Frequency Avg Type: Log-Pwr Avg|Hold: 300/300 **TRACE** Trig: Free Run Atten: 20 dB DET P P PNO: Fast IFGain:Low Auto Tune Mkr3 2.483 558 GHz 48.495 dBµV 10 dB/div Ref 116.99 dBµV **Center Freq** 2.487500000 GHz Start Freq 2.475000000 GHz 3 Stop Freq 2.50000000 GHz Start 2.47500 GHz #Res BW 1.0 MHz Stop 2.50000 GHz Sweep 19.60 ms (3001 pts) CF Step 2.500000 MHz #VBW 1.0 kHz Auto Man FUNCTION FUNCT /IDTH N N N 99.089 dBµV 48.286 dBµV 48.495 dBµV 2.483 500 GHz 2.483 558 GHz **Freq Offset** 0 Hz STATUS