

6. Time of Occupancy (Dwell Time)

6.1 Test Setup

Refer to the APPENDIX I.

6.2 Limit

The maximum permissible time of occupancy is 400 ms within a period of 400 ms multiplied by the number of hopping channels employed.

6.3 Test Procedure

The dwell time was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function enabled.

The spectrum analyzer is set to :

 Center frequency = 2441 MHz
 Span = zero

 RBW = 1 MHz (RBW shall be ≤ channel spacing and where possible RBW should be set >> 1 / T, where T is the expected dwell time per channel)

 VBW ≥ RBW
 Detector function = peak

 Trace = max hold

6.4 Test Results

FH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
	DH 5	79	2.880	3.750	0.307
Enable	2 DH 5	79	2.880	3.750	0.307
	3 DH 5	79	2.880	3.750	0.307

AFH mode

Hopping mode	Packet Type	Number of hopping Channels	Burst On Time (ms)	Period (ms)	Test Result (sec)
	DH 5	20	2.880	3.750	0.154
Enable	2 DH 5	20	2.880	3.750	0.154
	3 DH 5	20	2.880	3.750	0.154

Note 1 : Dwell Time = 0.4 × Hopping channel × Burst ON time ×

((Hopping rate ÷ Time slots) ÷ Hopping channel)

- Time slots for DH5 = 6 slots (TX = 5 slot / RX = 1 slot)

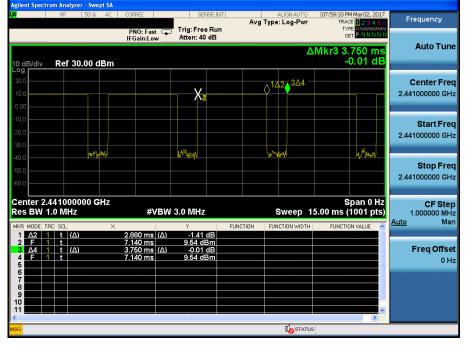
- Hopping Rate = 1600 for FH mode & 800 for AFH mode

Note 2 : See next pages for actual measured spectrum plots.



Hopping mode : Enable & DH5

Time of Occupancy (FH)



Time of Occupancy (FH)

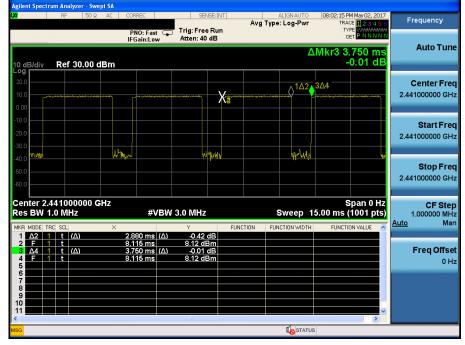
Hopping mode : Enable & 2-DH5





Time of Occupancy (FH)

Hopping mode : Enable & 3-DH5

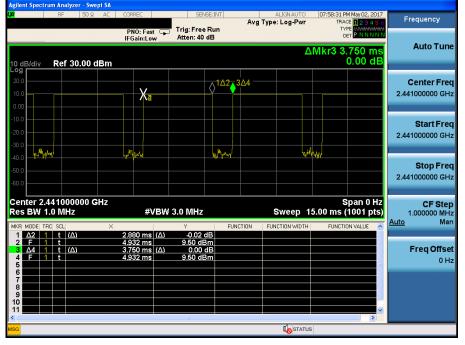




Hopping mode : Enable & DH5

Hopping mode : Enable & 2-DH5

Time of Occupancy (AFH)



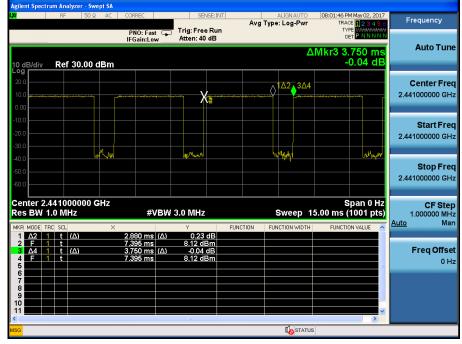
Time of Occupancy (AFH)

Frequency Avg Type: Log-Pwr PNO: Fast Trig: Free Run TYPE DE Auto Tune ΔMkr3 3.750 ms 0.01 dE Ref 30.00 dBm B/div **Center Freq** ∧1<u>∆2</u>3∆4 2.441000000 GHz X Start Freq 2.441000000 GHz w Www Mund Stop Freq 2.441000000 GHz Center 2.441000000 GHz Res BW 1.0 MHz CF Step 1.000000 MHz Man Span 0 Hz Sweep 15.00 ms (1001 pts) #VBW 3.0 MHz <u>Auto</u> FUNCTION FUNCTION WIDTH 8.11 dBm 0.01 dB 8.11 dBm Freq Offset s (Δ) 3.750 r 7.770 r 0 Hz **STATUS**



Time of Occupancy (AFH)

Hopping mode : Enable & 3-DH5





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 :

MHz	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.

7.4. Test Results

7.4.1. Radiated Emissions

9 kHz ~ 25 GHz Data (Modulation : <u>GFSK</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)
2388.62	Н	Х	PK	48.20	0.77	N/A	N/A	48.97	74.00	25.03
2388.62	Н	Х	AV	48.20	0.77	-24.79	N/A	24.18	54.00	29.82
4803.73	Н	Х	PK	44.40	7.63	N/A	N/A	52.03	74.00	21.97
4803.73	Н	Х	AV	44.40	7.63	-24.79	N/A	27.24	54.00	26.76

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)
4881.70	Н	Х	PK	44.84	7.30	N/A	N/A	52.14	74.00	21.86
4881.70	Н	Х	AV	44.84	7.30	-24.79	N/A	27.35	54.00	26.65

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	50.22	1.10	N/A	N/A	51.32	74.00	22.68
2483.53	Н	Х	AV	50.22	1.10	-24.79	N/A	26.53	54.00	27.47
4959.71	Н	Х	PK	45.19	7.48	N/A	N/A	52.67	74.00	21.33
4959.71	Н	Х	AV	45.19	7.48	-24.79	N/A	27.88	54.00	26.12

<u>Note.</u>

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 = 2.88 ms

- 100 ms / Δ t [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.88 X 20) = 1.74 = 2

- The Worst Case Dwell Time = T [ms] x H' = 2.88 ms X 2 = 5.76 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.76 / 100) = -24.79 dB

4. Sample Calculation.

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

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain.



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)
2386.46	Н	Х	PK	48.74	0.77	N/A	N/A	49.51	74.00	24.49
2386.46	Н	Х	AV	48.74	0.77	-24.79	N/A	24.72	54.00	29.28
4803.45	Н	Х	PK	43.69	7.63	N/A	N/A	51.32	74.00	22.68
4803.45	Н	Х	AV	48.69	7.63	-24.79	N/A	31.53	54.00	22.47

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)
4881.76	Н	Х	PK	44.81	7.30	N/A	N/A	52.11	74.00	21.89
4881.76	Н	Х	AV	44.81	7.30	-24.79	N/A	27.32	54.00	26.68

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	49.70	1.10	N/A	N/A	50.80	74.00	23.20
2483.56	Н	Х	AV	49.70	1.10	-24.79	N/A	26.01	54.00	27.99
4960.66	Н	Х	PK	44.12	7.48	N/A	N/A	51.60	74.00	22.40
4960.66	Н	Х	AV	44.12	7.48	-24.79	N/A	26.81	54.00	27.19

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 = **2.88 ms**

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.88 X 20) = 1.74 \approx 2

- The Worst Case Dwell Time = T [ms] x H' = 2.88 ms X 2 = 5.76 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.76 / 100) = -24.79 dB

4. Sample Calculation.

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

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain.



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)
2383.09	Н	X	PK	50.78	0.77	N/A	N/A	51.55	74.00	22.45
2383.09	Н	Х	AV	50.78	0.77	-24.79	N/A	26.76	54.00	27.24
4804.12	Н	Х	PK	43.90	7.63	N/A	N/A	51.53	74.00	22.47
4804.12	Н	Х	AV	43.90	7.63	-24.79	N/A	26.74	54.00	27.26

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)
4882.76	Н	Х	PK	43.64	7.30	N/A	N/A	50.94	74.00	23.06
4882.76	Н	Х	AV	43.64	7.30	-24.79	N/A	26.15	54.00	27.85

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)
2483.55	Н	Х	PK	49.66	1.10	N/A	N/A	50.76	74.00	23.24
2483.56	Н	Х	AV	49.66	1.10	-24.79	N/A	25.97	54.00	28.03
4959.47	Н	Х	PK	44.70	7.48	N/A	N/A	52.18	74.00	21.82
4959.47	Н	Х	AV	44.70	7.48	-24.79	N/A	27.39	54.00	26.61

<u>Note.</u>

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 = **2.88 ms**

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.88 X 20) = 1.74 \approx 2

- The Worst Case Dwell Time = T [ms] x H' = 2.88 ms X 2 = 5.76 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.76 / 100) = -24.79 dB

4. Sample Calculation.

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

Where, T.F = Total Factor, AF = Antenna Factor, CL = Cable Loss, AG = Amplifier Gain.

Band Edge 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)
2385.24	Н	Х	PK	51.13	0.77	N/A	N/A	51.90	74.00	22.10
2385.24	Н	Х	AV	51.13	0.77	-24.79	N/A	27.11	54.00	26.89
2483.68	Н	Х	PK	49.99	1.10	N/A	N/A	51.09	74.00	22.91
2483.68	Н	Х	AV	49.99	1.10	-24.79	N/A	26.30	54.00	27.70

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)
2385.24	Н	Х	PK	50.20	0.77	N/A	N/A	50.97	74.00	23.03
2385.24	Н	Х	AV	50.20	0.77	-24.79	N/A	26.18	54.00	27.82
2483.54	Н	Х	PK	49.15	1.10	N/A	N/A	50.25	74.00	23.75
2483.54	Н	Х	AV	49.15	1.10	-24.79	N/A	25.46	54.00	28.54

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)
2384.73	Н	Х	PK	49.41	0.77	N/A	N/A	50.18	74.00	23.82
2484.73	Н	Х	AV	49.41	0.77	-24.79	N/A	25.39	54.00	28.61
2483.53	Н	Х	PK	50.49	1.10	N/A	N/A	51.59	74.00	22.41
2483.53	Н	Х	AV	50.49	1.10	-24.79	N/A	26.80	54.00	27.20

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 = 2.88 ms

- 100 ms / Δt [ms] = H -> Round up to next highest integer, to account for worst case, H' = 100 / (2.88 X 20) = 1.74 = 2

- The Worst Case Dwell Time = T [ms] x H' = 2.88 ms X 2 = 5.76 ms

- D.C.F = 20 Log(The Worst Case Dwell Time / 100 ms) dB = 20 log(5.76 / 100) = -24.79 dB

4. Sample Calculation.

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

 $\label{eq:Where, T.F = Total Factor, \quad AF = Antenna \ Factor, \quad CL = Cable \ Loss, \quad AG = Amplifier \ Gain.$



Low Band-edge



Low Band-edge

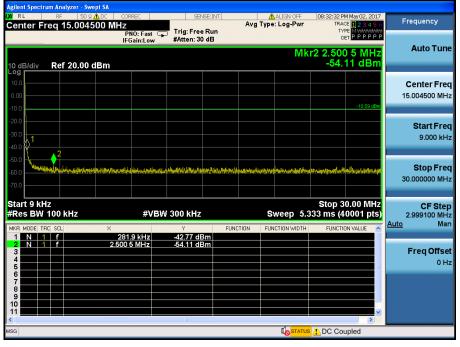
Hopping mode & Modulation : GFSK

Lowest Channel & Modulation : GFSK





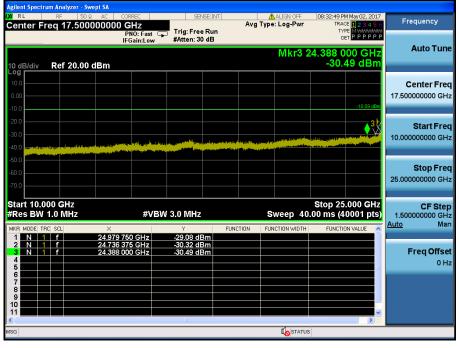
Lowest Channel & Modulation : GFSK



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Center Freq 5.015000	PNO: Fast G	Trig: Free Run	Avg Ty	oe: Log-Pwr	TRACE 12345 C TYPE MWWWWW DET PPPPP	
10 dB/div Ref 20.00 dE	IFGain:Low	#Atten: 30 dB		Mkr	5 3.381 42 GHz -39.27 dBm	Auto Tune
Log 10.0 -10.0	↓1				-10.59 dBm	Center Freq 5.015000000 GHz
-20.0				4		Start Freq 30.000000 MHz
-50.0 -60.0 -70.0						Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBV	V 3.0 MHz		Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Man
MKR MODE TRC SCL	× 2.402 36 GHz	ү 9.54 dBm	FUNCTION F	UNCTION WIDTH	FUNCTION VALUE	Auto Man
2 N 1 F 3 N 1 F 4 N 1 F 5 N 1 F 6	6.550 63 GHz 5.894 85 GHz 7.099 73 GHz 3.381 42 GHz	-38.91 dBm -39.21 dBm -39.23 dBm -39.27 dBm				Freq Offset 0 Hz
7						
MSG		10		I STATUS	×	



Lowest Channel & Modulation : GFSK



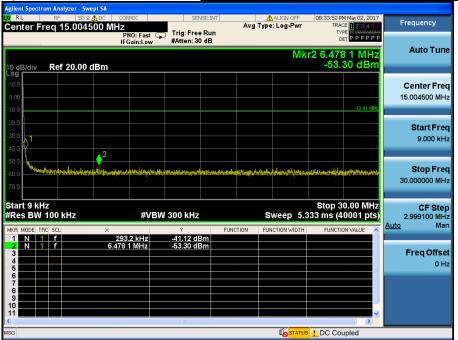


Reference for limit



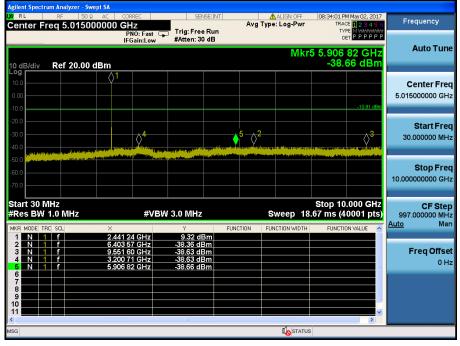


Conducted Spurious Emissions <u>Middle Channel & Modulation : GFSK</u>





Middle Channel & Modulation : GFSK

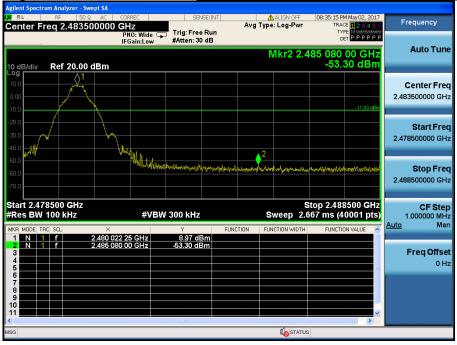


Agilent Spectrum Anal									
	50 Ω AC CORRI 7.500000000 GH		ISE:INT Avg	ALIGN OFF	08:34:09 PM May 02, 201 TRACE 1 2 3 4 5	Frequency			
oontor mog n	PNO	: Fast 😱 Trig: Free in:Low #Atten: 30			TYPE MINAMANA DET PPPP	P			
	IFGa	In:Low WAttern of		Mkr2 2	4.178 750 GH	Auto Tune			
10 dB/div Ref	20.00 dBm			WIKIS 2	-30.63 dBm				
Log									
10.0						Center Freq			
0.00					-10.91 dBr	17.500000000 GHz			
-10.0					-10.91 dBr				
-20.0					3 ³ ₹	Start Freq			
-30.0		to a statistico de la companya de la	many and constant of the last sta	A CONTRACTOR OF THE OWNER		10.00000000 GHz			
-40.0				and a little state of the second s	A STREET, STREE				
-50.0						Stop Freq			
-60.0						25.000000000 GHz			
-70.0									
Start 10.000 GI	H7				Stop 25.000 GHz	CF Step			
#Res BW 1.0 M		#VBW 3.0 MHz		Sweep 40	.00 ms (40001 pts				
MKR MODE TRC SCL	×	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Man			
1 N 1 f 2 N 1 f	24.919 375 24.819 250								
3 N 1 f	24.819 230		3m			Freq Offset			
4 5						0 Hz			
6									
8									
9									
11					· · · · · · · · · · · · · · · · · · ·				
MSG				STATUS					
	uto status								



High Band-edge

Highest Channel & Modulation : GFSK



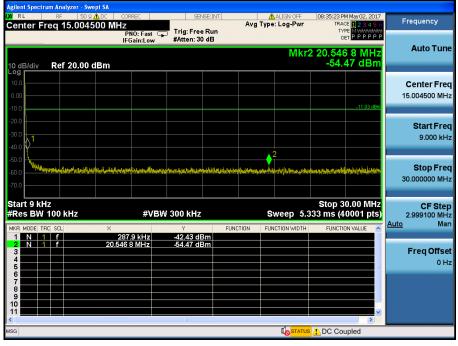
High Band-edge

Hopping mode & Modulation : GFSK





Highest Channel & Modulation : GFSK



Agilent Spectrum Analyzer - Swe LXI RL RF 50Ω	AC CORREC	SENSE:IN	T	ALIGN OFF	08:35:32 PM May 02,	2017	
Center Freq 5.01500			Avg T	ype: Log-Pwr	TRACE 123 TYPE MWW	456	Frequency
	IFGain:Low	#Atten: 30 dB			DET PPP	_	Auto Tune
10 dB/div Ref 20.00 d	dBm			Mkr	5 6.655 07 G -39.00 dl		Auto Tune
10.0	↓ \ 1						Center Freq
0.00							5.015000000 GHz
-10.0					-11.0	3 dBm	
-20.0				5 4 0			Start Freq
-30.0							30.000000 MHz
-50.0		en producetta entre accelta	na constituent automation		Children at a state of the local data	, status	
-60.0							Stop Freq 10.00000000 GHz
-70.0							10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#\/B	W 3.0 MHz		Sween 19	Stop 10.000 (.67 ms (40001		CF Step 997.000000 MHz
MKR MODE TRC SCL	×	Y 5.0 WITZ	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE		<u>Auto</u> Man
1 N 1 f	2.480 38 GHz 3.181 77 GHz	9.72 dBm -38.62 dBm					
3 N 1 F	7.583 02 GHz 7.076 80 GHz	-38.97 dBm -38.98 dBm					Freq Offset
5 N 1 f	6.655 07 GHz	-39.00 dBm				=	0 Hz
7							
9							
		ш				~	
MSG							

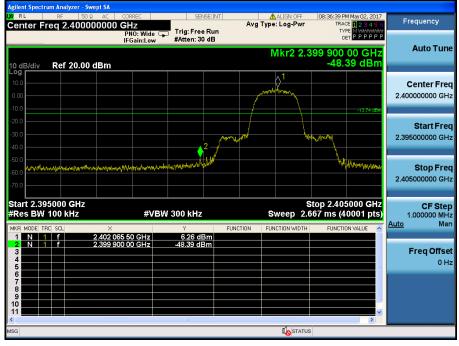
Highest Channel & Modulation : GFSK





Low Band-edge

Lowest Channel & Modulation : π/4DQPSK



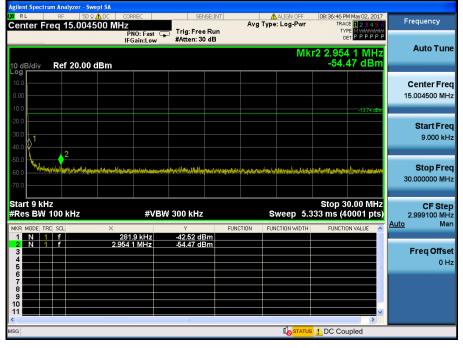
Low Band-edge

Hopping mode & Modulation : π/4DQPSK





Lowest Channel & Modulation : π/4DQPSK



Agilent Spectrum Analyzer - Sw LXI RL RF 50 ହ		SENSE:INT	🛕 ALIGN OFF	08:36:56 PM May 02, 2017	
Center Freq 5.01500	PNO: Fast G	Trig: Free Run #Atten: 30 dB	Avg Type: Log-Pwr	TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P P	Frequency
10 dB/div Ref 20.00	IFGain:Low	#Atten: 50 dB	Mkr	5 6.204 92 GHz -38.47 dBm	Auto Tune
10.0 0.00 -10.0	1 			-13.74 dBm	Center Freq 5.015000000 GHz
-20.0 -30.0 -40.0		a na seconda por contractor	5 <u>4</u> 23	a page paint data ang ang ang ang ang ang ang ang ang an	Start Freq 30.000000 MHz
-50.0 -60.0 -70.0					Stop Freq 10.00000000 GHz
Start 30 MHz #Res BW 1.0 MHz	#VBV	V 3.0 MHz	Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz
MKR MODE TRC SCL	× 2.402 11 GHz	⊻ 8.68 dBm	FUNCTION FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f	7.110 94 GHz 7.243 05 GHz 6.527 95 GHz 6.204 92 GHz	-37.67 dBm -37.86 dBm -37.99 dBm -38.47 dBm			Freq Offset 0 Hz
6 7 8 9 10					
11 <		10		~	
MSG				3	

Lowest Channel & Modulation : π/4DQPSK



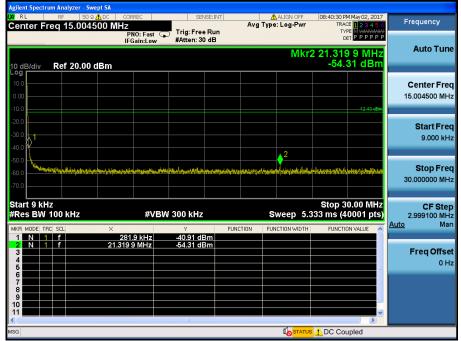
Reference for limit

Middle Channel & Modulation : π/4DQPSK

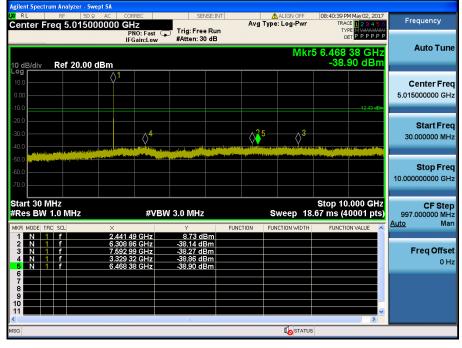


Conducted Spurious Emissions

Middle Channel & Modulation : π/4DQPSK



Middle Channel & Modulation : π/4DQPSK

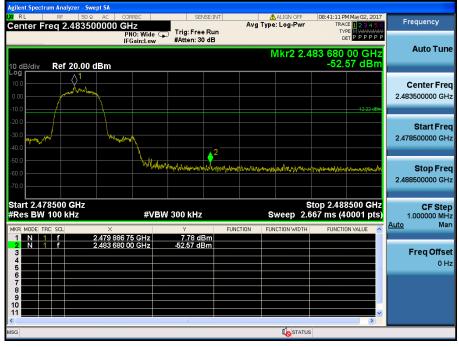


Agilent Spectrum An							
RL RF Center Freq '	50 Q AC		SENSE:I	Avg	ALIGN OFF	08:40:47 PM May 02, 2017 TRACE 1 2 3 4 5 1	Frequency
		PNO: Fast G	Trig: Free Ru #Atten: 30 dE				2
10 dB/div Rel	f 20.00 dBm				Mkr3 2	4.713 125 GHz -29.93 dBm	
10.0 0.00 -10.0							Center Fred 17.500000000 GH:
-20.0 -30.0 -40.0 ntsteenstering of	nymänytteksen nymet desta kilonteesen teksi						Start Fred 10.000000000 GH
-50.0							Stop Fred 25.000000000 GH
Start 10.000 G #Res BW 1.0 I		#VBV	V 3.0 MHz		Sweep 40	Stop 25.000 GHz .00 ms (40001 pts	1.500000000 GH
MKR MODE TRC SCL		000 GHz	∨ -29.37 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	Auto Ma
2 N 1 f 3 N 1 f 4 5	24.908	500 GHz 125 GHz	-29.73 dBm -29.93 dBm				Freq Offse 0 H
6 7 8 9 10							
11 			III			×	
ISG					I o status		



High Band-edge

Highest Channel & Modulation : π/4DQPSK



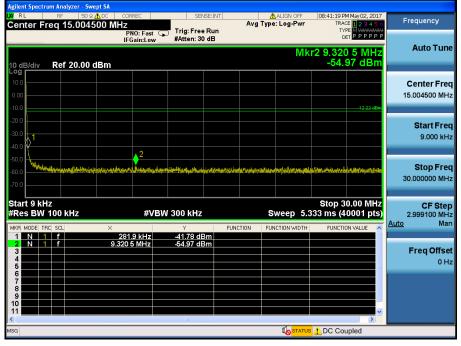
High Band-edge

Hopping mode & Modulation : π/4DQPSK





Highest Channel & Modulation : π/4DQPSK



	ım Analyzer - Sw						
Center Fr		2 AC CORREC 00000 GHz	SENSE:IN	Avg 1	ALIGN OFF	08:41:28 PM May 02, 2017 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast C IFGain:Low	Trig: Free Run #Atten: 30 dB				
		ii Gaineow			Mkr	5 5.840 77 GHz	Auto Tune
10 dB/div	Ref 20.00	dBm				-39.02 dBm	
Log 10.0		1					Contor From
0.00							Center Freq 5.015000000 GHz
-10.0						12.22 dBm	0.01000000000112
-20.0							
-30.0				 53	2		Start Freq
-40.0						drahalun - maktu solit - ta so- oraș natardata	30.000000 MHz
-50.0	A DAMA AND A	an and a second difficult of the little second s	and a second de la balance de santilités de second de			and firther want in the state of the state o	
-60.0							Stop Freq
-70.0							10.00000000 GHz
						04	
Start 30 M #Res BW		#VB	W 3.0 MHz		Sweep 18	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz
MKR MODE TRI	CI SCLI	×	Y	FUNCTION	FUNCTION WIDTH	FUNCTION VALUE	<u>Auto</u> Man
1 N 1	f	2.480 13 GHz	8.73 dBm -38.38 dBm				
3 N 1	f	6.402 33 GHz	-38.86 dBm				Freq Offset
4 N 1 5 N 1	f	6.465 88 GHz 5.840 77 GHz	-38.89 dBm -39.02 dBm			=	0 Hz
6 7							
8							
10							
11 <			ш			×	
MSG						3	

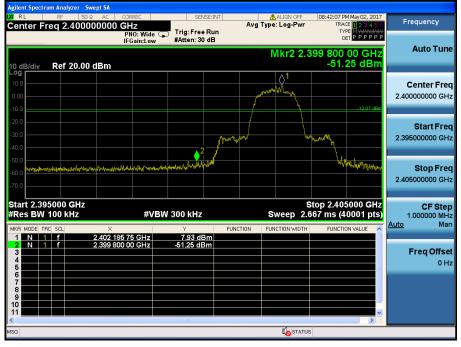
Highest Channel & Modulation : π/4DQPSK





Low Band-edge

Lowest Channel & Modulation : 8DPSK

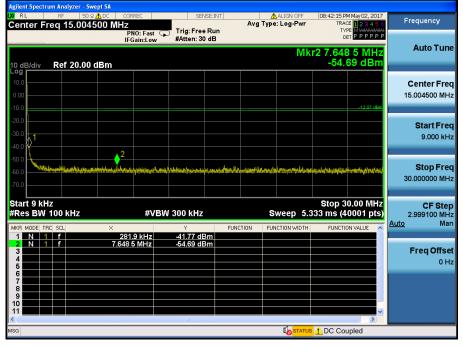


Low Band-edge

Hopping mode & Modulation : 8DPSK



Lowest Channel & Modulation : 8DPSK





Lowest Channel & Modulation : 8DPSK

Center Freq 17.5		SENSE:INT	Avg Type: L		32 PM May 02, 2017 TRACE 1 2 3 4 5 6 TYPE M MANAAAA	Frequency
10 dB/div Ref 20.	PNO: Fast IFGain:Low		Ν	/lkr3 23.99 -∹	DET PPPPP	Auto Tuno
10.0 .000					-12.07 dBm	Center Fre 17.500000000 GH
-20.0 -30.0 -40.0			Laken pur bilderingen generation	gan gan gan katalah sa gadi kata ang katalah sa	2731 1	Start Fre 10.000000000 GH
-50.0 						Stop Fre 25.000000000 GH
Start 10.000 GHz #Res BW 1.0 MHz	#V	BW 3.0 MHz		eep 40.00 m		CF Ste 1.500000000 GH <u>Auto</u> Ma
1 N 1 f 2 N 1 f 3 N 1 f 4 5	24.254 125 GHz 23.681 500 GHz 23.998 000 GHz	-29.95 dBm -30.85 dBm -31.12 dBm			=	Freq Offse 0 H
6 7 8 9 10						
sg		10				

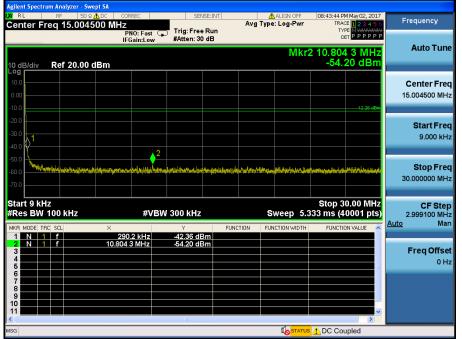


Reference for limit

Middle Channel & Modulation : 8DPSK



Conducted Spurious Emissions <u>Middle Channel & Modulation : 8DPSK</u>



Middle Channel & Modulation : 8DPSK



Agilent Spectr									
XIRL Center E		50 R AC 0		SENSE			08:44:02 PM TRACE	May 02, 2017	Frequency
Genter T	reg 17.5		PNO: Fast C FGain:Low	 Trig: Free R #Atten: 30 d 	lun	· ·), · · - · 3 · · ··	TYPE	PPPPP	
10 dB/div	Ref 20.	00 dBm				Mkr3 2	24.836 50 -30.2	00 GHz 4 dBm	Auto Tune
Log 10.0 0.00								12.26 dBm	Center Fred 17.500000000 GH:
-20.0 -30.0	a na jeze provi si jej ki ka		e fa fistefan yn Mile fan y		the last sector of the last sect		ال المراجع الم مراجع المراجع ال	Ø ¹² ?	Start Free 10.000000000 GH:
-50.0 -60.0 -70.0									Stop Free 25.000000000 GH
Start 10.0 #Res BW			#VB	W 3.0 MHz		Sweep 40	Stop 25. .00 ms (40	000 GHz 0001 pts)	CF Step 1.500000000 GH
MKR MODE TH	RC SCL	× 24.127 7	50 GHz	ץ -29.56 dBm	FUNCTION	FUNCTION WIDTH	FUNCTION	VALUE	<u>Auto</u> Ma
2 N 1 3 N 1 4 5	f	24.270 6 24.836 5		-29.65 dBm -30.24 dBm					Freq Offse 0 Hi
6 7 8 9									
11				ш				>	
MSG									



High Band-edge

Highest Channel & Modulation : 8DPSK

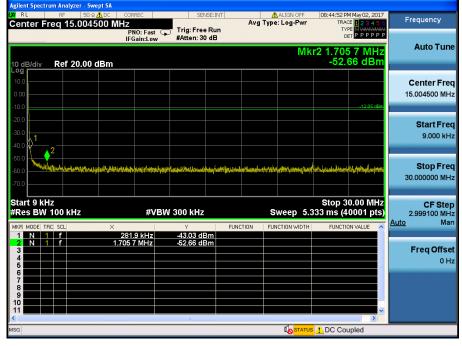


High Band-edge <u>Hopping mode & Modulation : 8DPSK</u>





Highest Channel & Modulation : 8DPSK



Agilent Spectrum Analyzer - Sv LXI RL RF 509 Center Freq 5.0150	2 AC CORREC	SENSE:INT	ALIGN OFF Avg Type: Log-Pwr	08:45:01 PM May 02, 2017 TRACE 2 2 4 5 6	Frequency
10 dB/div Ref 20.00	PNO: Fast G IFGain:Low	#Atten: 30 dB	Mkr	5 5.828 80 GHz -39.12 dBm	Auto Tune
10.0 0.00 -10.0	1 			-12.05 dBm	Center Freq 5.015000000 GHz
-20.0	and the second sec				Start Freq 30.000000 MHz
-50.0					Stop Freq 10.000000000 GHz
Start 30 MHz #Res BW 1.0 MHz		V 3.0 MHz	-	Stop 10.000 GHz .67 ms (40001 pts)	CF Step 997.000000 MHz Auto Mar
MKR, MODE, TRC, SCL 1 N 1 f 2 N 1 f 3 N 1 f 4 N 1 f 5 N 1 f 6	× 2.480 38 GHz 5.618 93 GHz 8.264 47 GHz 9.878 12 GHz 5.828 80 GHz	9.19 dBm -38.46 dBm -39.10 dBm -39.12 dBm -39.12 dBm	PUNCTION WIDTH	FUNCTION VALUE	Freq Offset 0 Hz
11		III	STATU	×	

Highest Channel & Modulation : 8DPSK

Agilent Spectrum Analyzer - S LX/ RL RE 50	wept SA Ω AC CORREC	SENSE:INT	ALIGN OFF	08:45:09 PM May 02, 2017	
Center Freq 17.500			Avg Type: Log-Pwr		Frequency
10 dB/div Ref 20.00	Auto Tune				
Log 10.0 0.00 -10.0				-12.05 dBm	Center Freq 17.50000000 GHz
-20.0 -30.0 -40.0		n ja sen ander fillen ander ander ander beiden.			Start Freq 10.000000000 GHz
-50.0 -60.0 -70.0					Stop Freq 25.000000000 GHz
Start 10.000 GHz #Res BW 1.0 MHz	#VB	N 3.0 MHz	Sweep 40	Stop 25.000 GHz .00 ms (40001 pts)	CF Step 1.50000000 GHz <u>Auto</u> Man
1 N 1 f 2 N 1 f 3 N 1 f 4 5	24.841 375 GHz 24.379 375 GHz 23.903 875 GHz	-29.89 dBm -30.24 dBm -31.49 dBm			Freq Offset 0 Hz
6 7 8 9 10					
MSG		Ш	10 STATU:	>	



8. Transmitter AC Power Line Conducted Emission

8.1 Test Setup

See test photographs for the actual connections between EUT and support equipment.

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.

	Conducted Limit (dBuV)			
Frequency Range (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

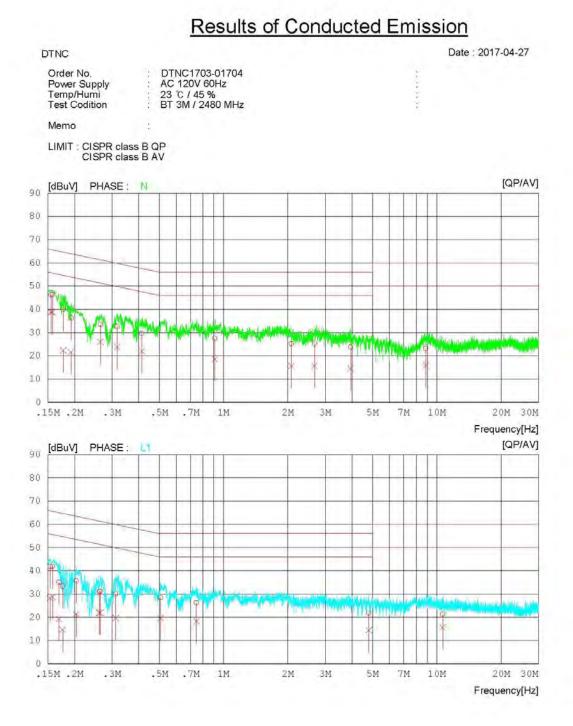
8.3 Test Procedures

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

- 1. 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>8DPSK</u>



AC Line Conducted Emissions (List) = Modulation : <u>8DPSK</u>

Results of Conducted Emission

Date : 2017-04-27

Order No. Power Supply Temp/Humi Test Codition DTNC1703-01704 AC 120V 60Hz 23 °C / 45 % BT 3M / 2480 MHz

Memo

DTNC

LIMIT : CISPR class B QP CISPR class B AV

NC	FREQ	READ QP [dBuV]	ING AV [dBuV]	C.FACTOR	QP	ULT AV [dBuV]	QP	MIT AV] (dBuV]	QP	RGIN AV][dBuV]	PHASE
1	0.15515	36.0	28.7	10.2	46.2	38.9	65.7	55.7	19.5	16.8	N
23	0.15750	36.1	28.6	10.2	46.3	38.8	65.6	55.6	19.3	16.8	N
3	0.17702	29.8	12.2	10.2	40.0	22.4	64.6	54.6	24.6	32.2	N
4	0.19261	26.1	11.5	10.2	36.3	21.7	63.9	53.9	27.6	32.2	N
5	0.26462	23.4	15.7	10.2	33.6	25.9	61.3	51.3	27.7	25.4	N
б	0.31723	22.4	13.6	10.2	32.6	23.8	59.8	49.8	27.2	26.0	N
7	0.41408	19.5	11.7	10.2	29.7	21.9	57.6	47.6	27.9	25.7	N
8	0.90984	17.3	8.3	10.Z	27.5	18.5	56.0	46.0	28.5	27.5	N
9	2.07760	14.9	5.4	10.3	25.2	15.7	56.0	46.0	30.8	30.3	N
10	2.66880	15.0	5.3	10.4	25.4	15.7	56.0	46.0	30.6	30.3	N
11	3.94240			10.4	23.7	14.6	56.0	46.0	32.3	31.4	N
12	8.86160	12.5	5.1	10.7	23.2	15.8	60.0	50.0	36.8	34.2	N
13	0.15348	31.8	18.1	10.1	41.9	28.2	65.8	55.8	23.9	27.6	1.1
14	0.15756	31.8	18.5	10.1	41.9	28.6	65.6	55.6	23.7	27.0	Ll
15	0.16895	24.9	9.2	10.1	35.0	19.3	65.0	55.0	30.0	35.7	Ll
16	0.17578	23.2	4.6	10.1	33.3	14.7	64.7	54.7	31.4	40.0	L1
17	0.20354	25.5	11.2	10.1	35.6	21.3	63.5	53.5	27.9	32.2	L1
18	0.26086	21.0	11.8	10.1	31.1	21.9	61.4	51.4	30.3	29.5	L1
19	0.26430	21.0	11.8	10.1	31.1	21.9	61.3	51.3	30.2	29.4	1.1
20	0.31197	19.7	9.5	10.2	29.9	19.7	59.9	49.9	30.0	30.2	1.1
21	0.50650	18.2	9.4	10.2	28.4	19.6	56.0	46.0	27.6	26.4	Li
22	0.74581	16.0	8.0		26.2	18.2	56.0	46.0	29.8	27.8	Ll
23	4.79900	11.4	3.9	10.4	21.8	14.3	56.0	46.0	34.2	31.7	Ll
24	10.66020	10.4	4.6	10.9	21.3	15.5	60.0	50.0	38.7	34.5	LL

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 internal antenna is attached on the main PCB using the special spring tension. (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.

10.1 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 × RBW.

Spectrum analyzer plots are included on the following pages.

10.4 Test Results

Modulation	Tested Channel	Test Results (MHz)
	Lowest	0.853
<u>GFSK</u>	Middle	0.853
	Highest	0.856
	Lowest	1.172
<u>π/4DQPSK</u>	Middle	1.171
	Highest	1.174
	Lowest	1.179
<u>8DPSK</u>	Middle	1.180
	Highest	1.178



Occupied Bandwidth (99 %)

Middle Channel & GFSK

Lowest Channel & GFSK



Highest Channel & GFSK

Occupied Bandwidth (99 %)



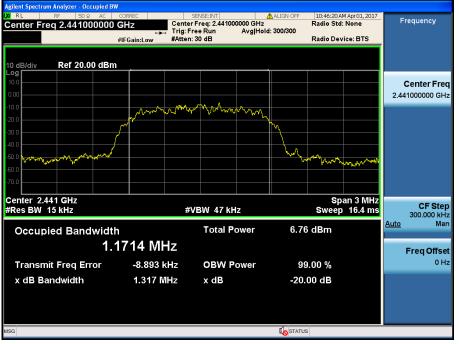
TRF-RF-237(04)170516

eilent Spe ctrum Ana SENSE:INTI ▲ ALIGN OF Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hold: 300/300 #Atten: 30 dB 10:44:09 AM Apr 01, 2017 Radio Std: None Frequency Center Freq 2.402000000 GHz Radio Device: BTS #IFGain:Low Ref 20.00 dBm **Center Freq** 2.402000000 GHz montand L.A.w mm Ann Center 2.402 GHz #Res BW 15 kHz Span 3 MHz Sweep 16.4 ms CF Step 300.000 kHz #VBW 47 kHz <u>Auto</u> Mar Total Power 6.51 dBm Occupied Bandwidth 1.1717 MHz Freq Offset 0 Hz Transmit Freq Error -10.392 kHz **OBW Power** 99.00 % x dB Bandwidth 1.308 MHz -20.00 dB x dB STATUS

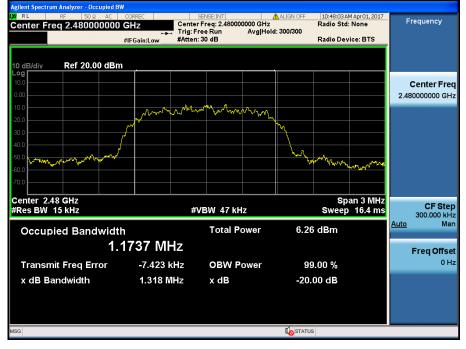
Occupied Bandwidth (99 %)

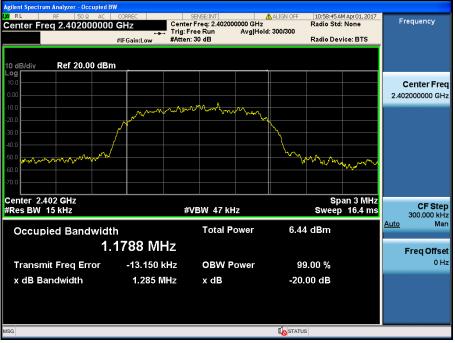
<u>Middle Channel & π/4 DQPSK</u>

Lowest Channel & π/4 DQPSK



Highest Channel & π/4 DQPSK

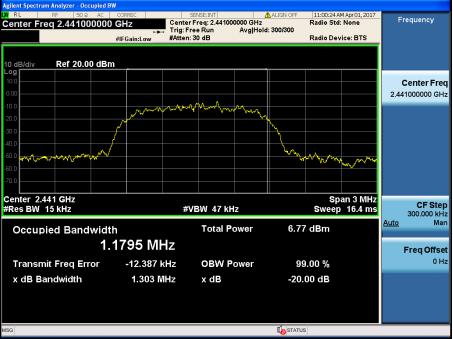




Occupied Bandwidth (99 %)

Middle Channel & 8DPSK

Lowest Channel & 8DPSK



Highest Channel & 8DPSK

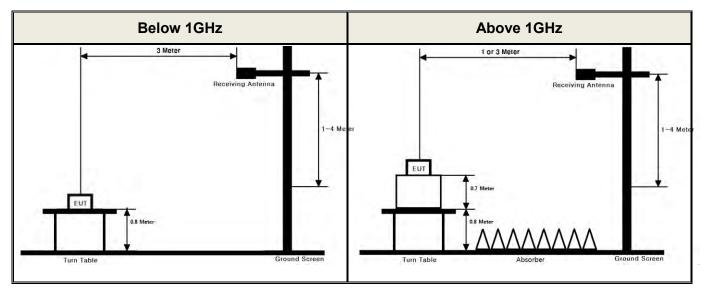
Occupied Bandwidth (99 %)



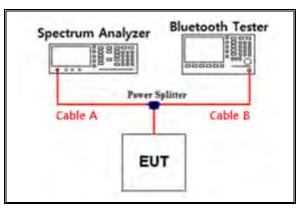
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	6.07	15	9.88
1	6.75	20	10.85
2.402 & 2.440 & 2.480	7.50	25	11.25
5	8.30	-	-
10	9.03	-	-

Note 1 : The path loss from EUT to Spectrum analyzer were measured and used for test.

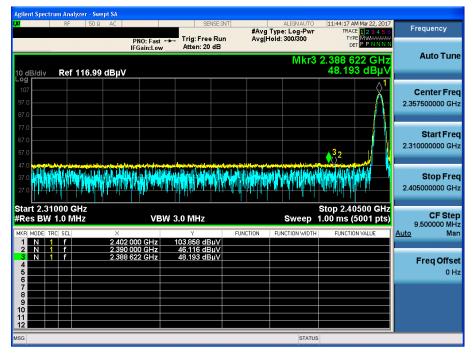
Path loss (S/A's Correction factor) = Cable A + Power splitter



APPENDIX II

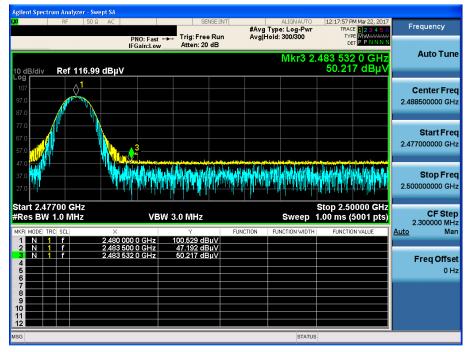
Unwanted Emissions (Radiated) Test Plot

GFSK & Lowest & X & Hor



Detector Mode : PK

GFSK & Highest & X & Hor



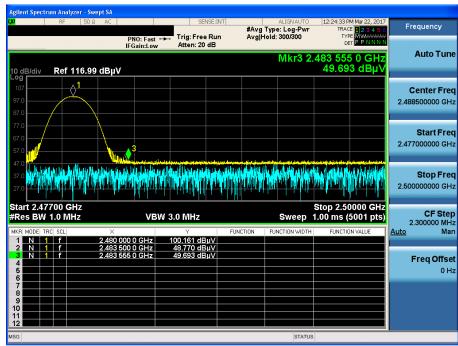


π /4DQPSK & Lowest & X & Hor

Agilent Spectrum Analyzer - Swept SA					
ιχμ RF 50.Ω AC			e: Log-Pwr TRA	AM Mar 22, 2017 CE 123456 PE MW	Frequency
10 dB/div Ref 116.99 dBµV	PNO: Fast Trig: Free IFGain:Low Atten: 20		Mkr3 2.386 4	et <mark>P P N N N N</mark>	Auto Tune
107 97.0 87.0					Center Freq 2.357500000 GHz
77.0 67.0 57.0 47.0 otto acco. Mith balance in orthogen		er of project of the office of	<mark>3 _⊘2</mark>		Start Freq 2.310000000 GHz
37.0 27. 0					Stop Freq 2.405000000 GHz
Start 2.31000 GHz #Res BW 1.0 MHz	VBW 3.0 MHz		Sweep 1.00 ms	0500 GHz (5001 pts)	CF Step 9.500000 MHz
MKR MODE TRC SCL X	۲ 000 GHz 102.833 dBi		NCTION WIDTH FUNCTI	ON VALUE	<u>Auto</u> Man
2 N 1 f 2.390 3 N 1 f 2.386 4 5 6 6	000 GHz 47.664 dBj 456 GHz 48.740 dBj	μV			Freq Offset 0 Hz
7 8 9 10 11 12					
MSG			STATUS		

Detector Mode : PK

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



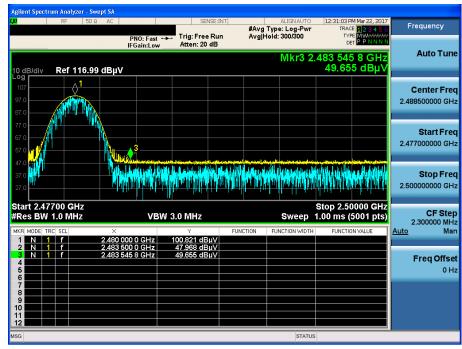


8DPSK & Lowest & X & Hor

Spectrum Analyzer - Sw Frequency #Avg Type: Log-Pwi Avg|Hold: 300/300 Trig: Free Run Atten: 20 dB PNO: Fast • IFGain:Low Auto Tune Mkr3 2.383 093 GH 50.777 dBµ Ref 116.99 dBµV **Center Freq** 2.357500000 GHz Start Freq 2.310000000 GHz \wedge^2 h **e hin ha ha** hind Stop Freq lahiti di kili 2.405000000 GHz Start 2.31000 GHz #Res BW 1.0 MHz Stop 2.40500 GHz 1.00 ms (5001 pts) CF Step 9.500000 MHz Man VBW 3.0 MHz Sweep Auto 46.222 dBµV 50.777 dBµV GHz Freq Offset 0 Hz

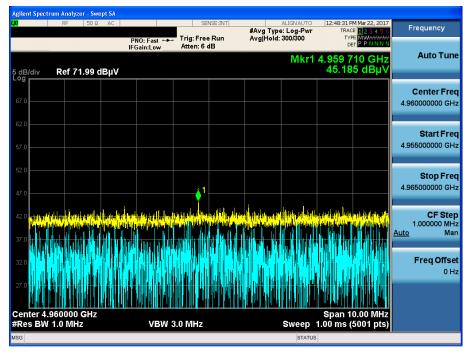
Detector Mode : PK

8DPSK & Highest & X & Hor





GFSK & Highest & X & Hor



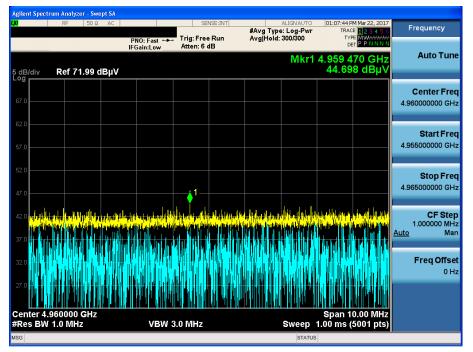
π/4DQPSK & Middle & X & Hor

Swept S Frequency #Avg Type: Log-Pwr Avg|Hold: 300/300 TRACE PNO: Fast Trig: Free Run Atten: 6 dB DET P P N N Auto Tune Mkr1 4.881 762 GHz 44.807 dBµV Ref 71.99 dBµV dB/div **Center Freq** 4.882000000 GHz Start Freq 4.877000000 GHz Stop Freq 4.887000000 GHz CF Step 1.000000 MHz uto Mar Freq Offset 0 Hz Center 4.882000 GHz #Res BW 1.0 MHz Span 10.00 MHz Sweep 1.00 ms (5001 pts) VBW 3.0 MHz

Detector Mode : PK

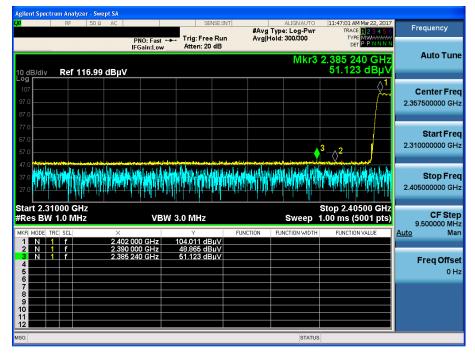


8DPSK & Highest & X & Hor





GFSK & Hopping mode & X & Hor



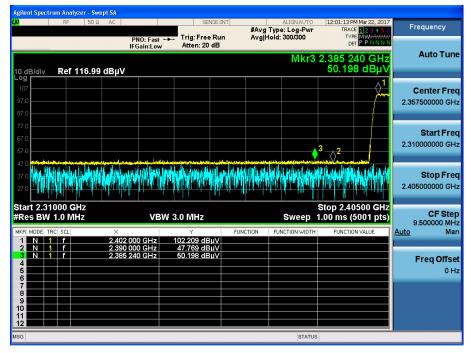
Detector Mode : PK

GFSK & Hopping mode & X & Hor

RF 50 Ω	AC	SENSE:II	TI	ALIGN AUTO	12:20:50 PM Mar 22, 20	017
	DNO F	Trig: Free Run		e: Log-Pwr 300/300	TRACE 12345 TYPE MW	ALLAL
	PNO: Fast IFGain:Low	Atten: 20 dB	n Arginola.	000/000	DET PPNN	NN
0 dB/div Ref 116.99	dBµV			Mkr3 2.	483 679 2 GH 49.988 dBµ	
• g 107 97.0 87.0						Center Fre 2.488500000 GH
77.0	3					Start Fre 2.477000000 GH
47.0 37 n hit littinilite liette kiltette	فيبابيك والشائية باليابي بباوان وابر	Martin Landa , interference in Associate	in disting the ball	tilate anated.	list a mean at maintain a sub talin ball	
27.0						2.500000000 GH
	VBI	N 3.0 MHz		Sweep 7	Stop 2.50000 GH 1.00 ms (5001 pt	2.500000000 GH
27.0 Start 2.47700 GHz Res BW 1.0 MHz	Х	Y		Sweep ~	Stop 2.50000 GH 1.00 ms (5001 pt FUNCTION VALUE	Stop Fre 2.500000000 GH 12 S) CF Stej 2.300000 MH Auto
27 0 Charles and the second se	× 2.480 000 0 GHz	۲ 100.446 dBµV		Sweep 7	1.00 ms (5001 pt	2.500000000 GH 12 5) CF Ste 2.300000 MH
27 0 ttart 2.47700 GHz Res BW 1.0 MHz KR MODE TRC ScL 1 N 1 f 2 N 1 f 3 N 1 f 4 5	Х	Y		Sweep 7	1.00 ms (5001 pt	2.500000000 GH 12 5) CF Ste 2.300000 MH
27.0 1	× 2.480 000 0 GHz 2.483 500 0 GHz	γ 100.446 dBμV 47.586 dBμV		Sweep 7	1.00 ms (5001 pt	2.50000000 GH 2 CF Ste 2.300000 MH Auto Ma
27 0 1.0 <td>× 2.480 000 0 GHz 2.483 500 0 GHz</td> <td>γ 100.446 dBμV 47.586 dBμV</td> <td></td> <td>Sweep 7</td> <td>1.00 ms (5001 pt</td> <td>2.50000000 GH 2 CF Ste 2.300000 MH Auto Ma</td>	× 2.480 000 0 GHz 2.483 500 0 GHz	γ 100.446 dBμV 47.586 dBμV		Sweep 7	1.00 ms (5001 pt	2.50000000 GH 2 CF Ste 2.300000 MH Auto Ma

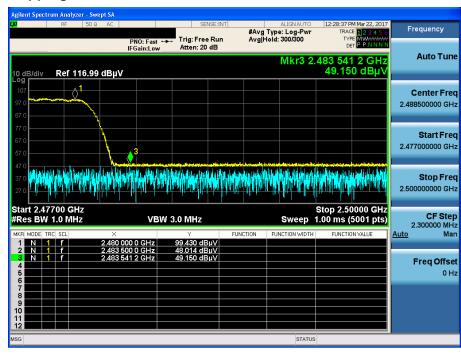


$\pi/4DQPSK$ & Hopping mode & X & Hor



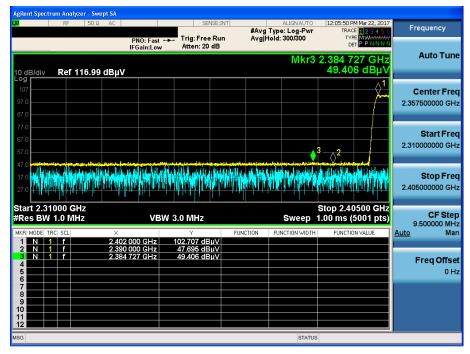
π /4DQPSK & Hopping mode & X & Hor

Detector Mode : PK





8DPSK & Hopping mode & X & Hor



8DPSK & Hopping mode & X & Hor

Detector Mode : PK

