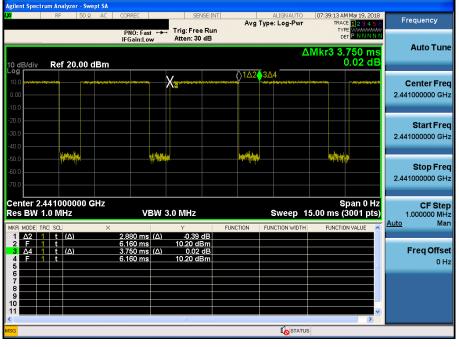


Hopping mode : Enable & 3-DH5

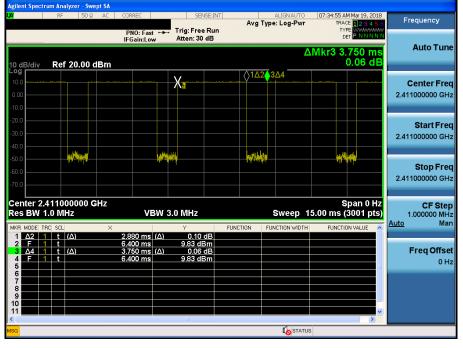
Time of Occupancy (FH)





Hopping mode : Enable & DH5

Time of Occupancy (AFH)



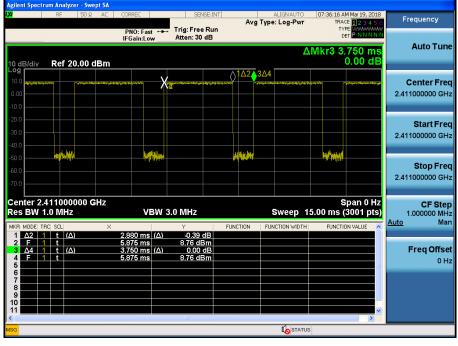
Time of Occupancy (AFH)

Hopping mode : Enable & 2-DH5 Frequency Avg Type: Log-Pwr Trig: Free Run Atten: 30 dB PNO: Fast +++ TYPE DE1 Auto Tune ΔMkr3 3.750 ms -0.01 dE Ref 20.00 dBm B/div X **Center Freq** 2.411000000 GHz Start Freq 2.411000000 GHz N. A. Wolfe **WARTER** Stop Freq 2.411000000 GHz Center 2.411000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 15.00 ms (3001 pts) CF Step 1.000000 MHz Man VBW 3.0 MHz Auto FUNCTION $\Delta 2$ 1 t (Δ) 1 2 8. 8.77 dBm -0.01 dB 8.77 dBm Freq Offset (A) 0 Hz **I**STATUS



Hopping mode : Enable & 3-DH5

Time of Occupancy (AFH)





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: The radiated spurious emission was tested with below settings.

- Frequencies less than or equal to 1000 MHz The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
- Frequencies above 1000 MHz
 The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1 GHz.
 The result of Average measurement is calculated using PK result and duty correction factor.



🛈 Dt&C

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 : 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)
2384.18	Н	Х	PK	53.80	2.67	N/A	N/A	56.47	74.00	17.53
2384.18	Н	Х	AV	53.80	2.67	-24.79	N/A	31.68	54.00	22.32
4803.66	Н	Z	PK	50.26	1.44	N/A	N/A	51.70	74.00	22.30
4803.66	Н	Z	AV	50.26	1.44	-24.79	N/A	26.91	54.00	27.09

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)
4881.63	Н	Z	PK	51.27	1.63	N/A	N/A	52.90	74.00	21.10
4881.63	Н	Z	AV	51.27	1.63	-24.79	N/A	28.11	54.00	25.89

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)
2485.08	Н	Х	PK	60.49	3.10	N/A	N/A	63.59	74.00	10.41
2485.08	Н	Х	AV	60.49	3.10	-24.79	N/A	38.80	54.00	15.20
4960.24	Н	Z	PK	51.77	1.87	N/A	N/A	53.64	74.00	20.36
4960.24	Н	Z	AV	51.77	1.87	-24.79	N/A	28.85	54.00	25.15

Note.

1. The radiated emissions were investigated up to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

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

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)
2385.88	Н	Х	PK	53.67	2.68	N/A	N/A	56.35	74.00	17.65
2385.88	Н	Х	AV	53.67	2.68	-24.79	N/A	31.56	54.00	22.44
4803.72	Н	Z	PK	50.13	1.44	N/A	N/A	51.57	74.00	22.43
4803.72	Н	Z	AV	50.13	1.44	-24.79	N/A	26.78	54.00	27.22

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)
4882.09	Н	Z	PK	50.11	1.63	N/A	N/A	51.74	74.00	22.26
4882.09	Н	Z	AV	50.11	1.63	-24.79	N/A	26.95	54.00	27.05

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)
2483.94	Н	Х	PK	60.98	3.10	N/A	N/A	64.08	74.00	9.92
2483.94	Н	Х	AV	60.98	3.10	-24.79	N/A	39.29	54.00	14.71
4959.84	Н	Z	PK	50.38	1.87	N/A	N/A	52.25	74.00	21.75
4959.84	Н	Z	AV	50.38	1.87	-24.79	N/A	27.46	54.00	26.54

Note.

1. The radiated emissions were investigated up to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

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

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)
2386.93	Н	Х	PK	53.90	2.68	N/A	N/A	56.58	74.00	17.42
2386.93	Н	Х	AV	53.90	2.68	-24.79	N/A	31.79	54.00	22.21
4803.57	Н	Z	PK	50.37	1.44	N/A	N/A	51.81	74.00	22.19
4803.57	Н	Z	AV	50.37	1.44	-24.79	N/A	27.02	54.00	26.98

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)
4882.16	Н	Z	PK	50.83	1.63	N/A	N/A	52.46	74.00	21.54
4882.16	Н	Z	AV	50.83	1.63	-24.79	N/A	27.67	54.00	26.33

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)
2484.27	Н	Х	PK	59.15	3.10	N/A	N/A	62.25	74.00	11.75
2484.27	Н	Х	AV	59.15	3.10	-24.79	N/A	37.46	54.00	16.54
4959.97	Н	Z	PK	50.16	1.87	N/A	N/A	52.03	74.00	21.97
4959.97	Н	Z	AV	50.16	1.87	-24.79	N/A	27.24	54.00	26.76

Note.

1. The radiated emissions were investigated up to 25GHz. And no other spurious and harmonic emissions were found above listed frequencies.

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.

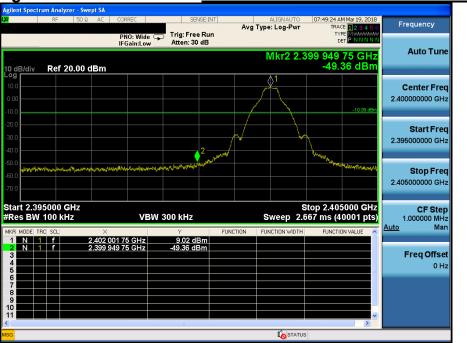
Margin = Limit - Result / Result = Reading + T.F + D.C.F / T.F = AF + CL - AG

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





Low Band-edge



Lowest Channel & Modulation : GFSK

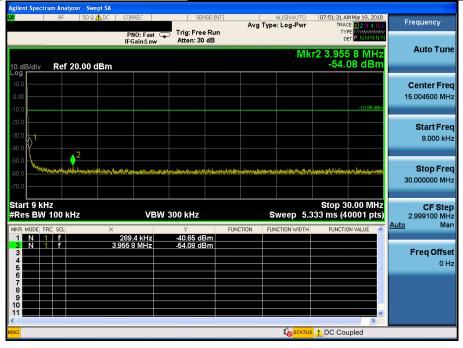
Low Band-edge

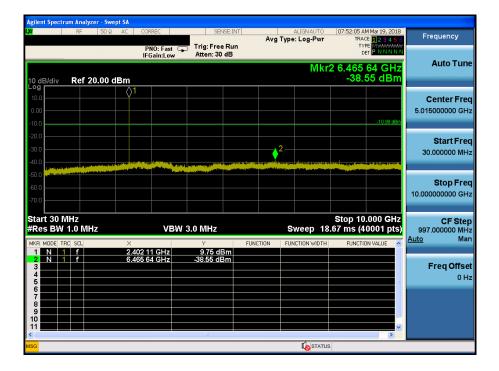
Hopping mode & Modulation : GFSK





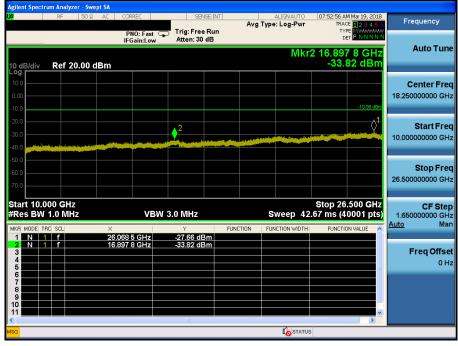
Lowest Channel & Modulation : GFSK







Lowest Channel & Modulation : GFSK



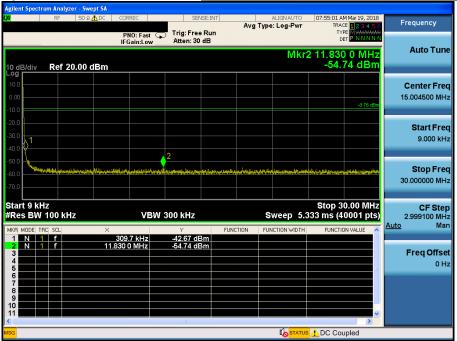


Reference for limit



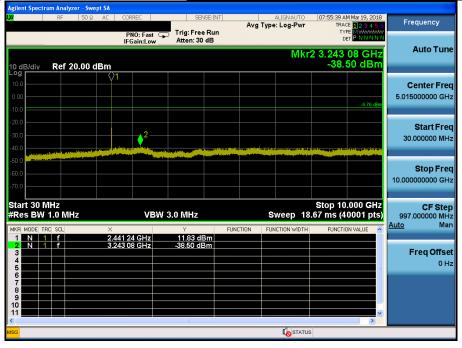
Middle Channel & Modulation : GFSK







Middle Channel & Modulation : GFSK

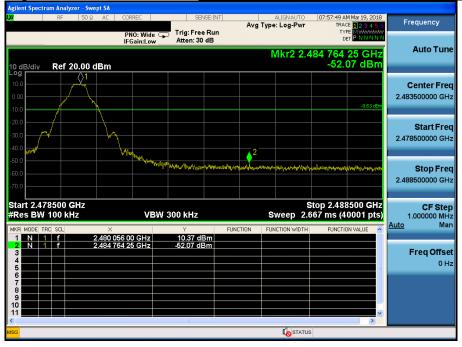


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High Band-edge

Highest Channel & Modulation : GFSK



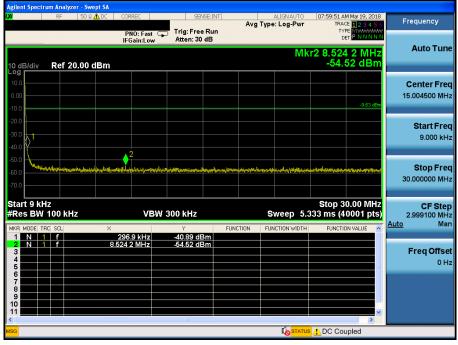
High Band-edge

Hopping mode & Modulation : GFSK



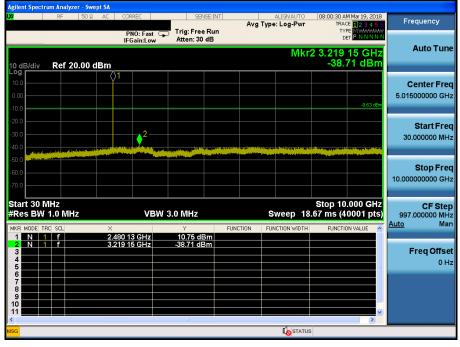


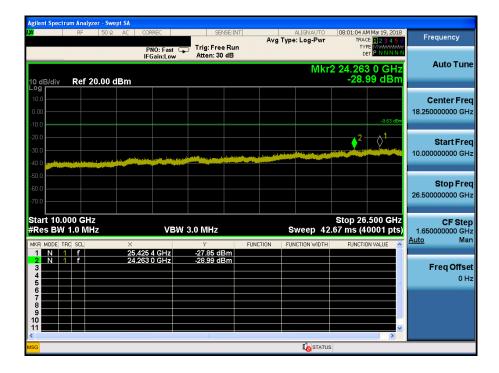
Highest Channel & Modulation : GFSK





Highest Channel & Modulation : GFSK

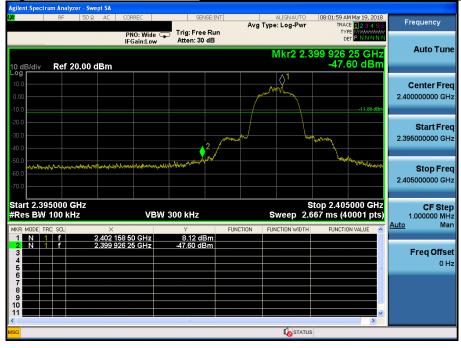






Low Band-edge

Lowest Channel & Modulation : π/4DQPSK



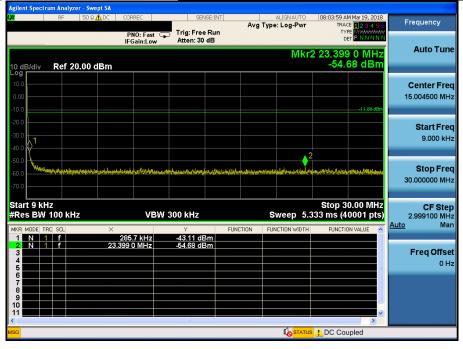
Low Band-edge

Hopping mode & Modulation : π/4DQPSK





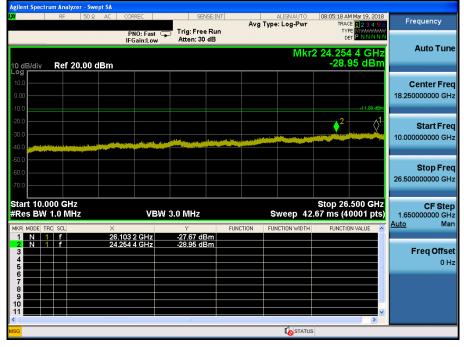
Lowest Channel & Modulation : π/4DQPSK



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Lowest Channel & Modulation : π/4DQPSK



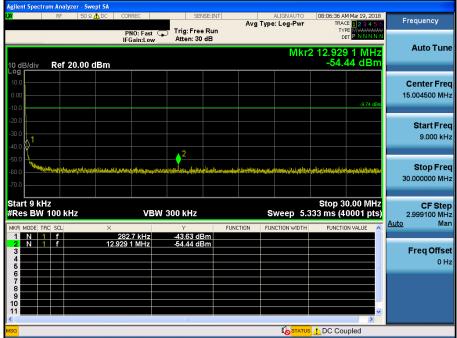


Reference for limit

Middle Channel & Modulation : π/4DQPSK

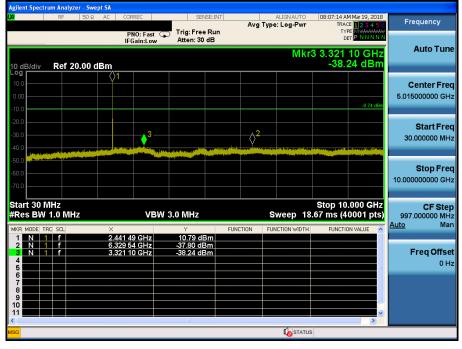


Conducted Spurious Emissions <u>Middle Channel & Modulation : π/4DQPSK</u>





Middle Channel & Modulation : π/4DQPSK

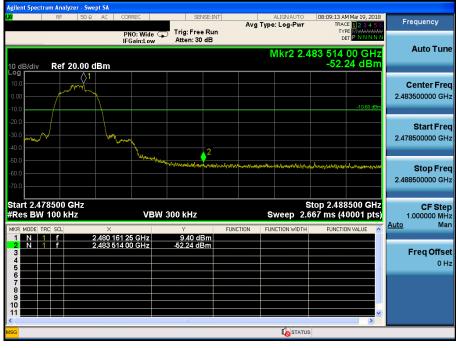


Agilent Spect	um Analyz	zer - Swep	ot SA									
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				IFGair	n:Low	Atten: 30	dB			DI	et e in n'n n'n n	Auto Tune
	Mkr2 21.735 2 GHz										Auto Tune	
10 dB/div	Ref 2	0.00 d	Bm							-31.1	13 dBm	
Log 10.0												Conton From
0.00												Center Free 18.25000000 GH;
											-9.74 dBm	18.250000000 GH2
-10.0												
-20.0									2		\diamond	Start Fred
-30.0						auth	ور بار	الالتعاديم أمريه	The second se	the second s	And a second	10.00000000 GH
-40.0					The second second				na data da			
-50.0												
-60.0												Stop Fred
-70.0												26.50000000 GHz
Start 10.0										Stop 26	.500 GHz	CF Step
#Res BW	1.0 MIF	IZ			VBW	3.0 MHz			Sweep 42	.67 ms (4	0001 pts)	1.650000000 GHz Auto Mar
MKR MODE T			×			Y		UNCTION	FUNCTION WIDTH	FUNCTIO	IN VALUE 🔼	Auto
1 N 1 2 N 1	f		26.0	197 0 G 35 2 G	iHz iHz	-27.68 df -31.13 df						
3												Freq Offse
4 5												0 H:
6												
8												
9					_		_					
11											~	
<									-1			
MSG										6		



High Band-edge

Highest Channel & Modulation : π/4DQPSK



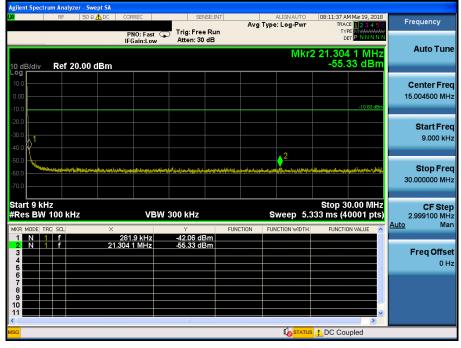
High Band-edge

Hopping mode & Modulation : π/4DQPSK





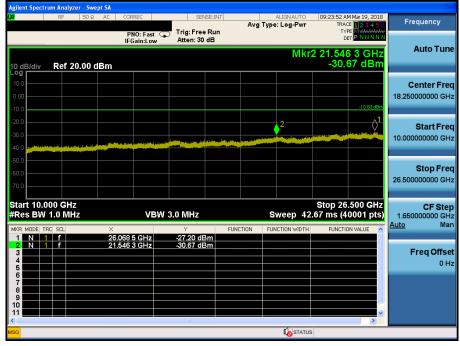
Highest Channel & Modulation : π/4DQPSK



Agilent Spectrum Anal										
l,XI RF	50 Ω AC CORREC	SENSE:IN		ALIGNAUTO e: Log-Pwr	09:23:03 AM Mar 19, 2018 TRACE 1 2 3 4 5					
	PNO: Fas	Trig: Free Rur		TYPE MINANANAN DET P N N N N N						
1	IFGail.LUW FROM OF US									
		Mkr	Mkr2 6.431 74 GHz Auto							
10 dB/div Ref	20.00 dBm				-38.59 dBm					
10.0	Q1					Center Freq				
0.00						5.015000000 GHz				
-10.0					-10.60 dBn	0.01000000000112				
-20.0										
						Start Freq				
-30.0			↓ 2			30.000000 MHz				
-40.0					and the second sec					
-50.0						Stop Freq				
-60.0						10.000000000 GHz				
-70.0										
Start 30 MHz					Stop 10.000 GHz	CF Step				
#Res BW 1.0 M	Hz VI	3W 3.0 MHz	s	weep 18	.67 ms (40001 pts	997.000000 MHz				
MKR MODE TRC SCL	×	Y	FUNCTION FUI	NCTION WIDTH	FUNCTION VALUE	Auto Man				
1 N 1 f	2.480 13 GHz	10.07 dBm								
2 N 1 f	6.431 74 GHz	-38.59 dBm				Freq Offset				
4						0 Hz				
6										
8										
9										
10					~					
<					>					
MSG										



Highest Channel & Modulation : π/4DQPSK





Low Band-edge

Lowest Channel & Modulation : 8DPSK



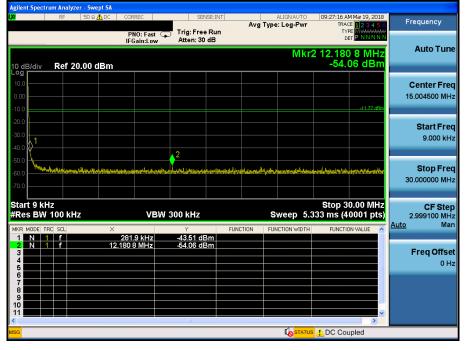
Low Band-edge

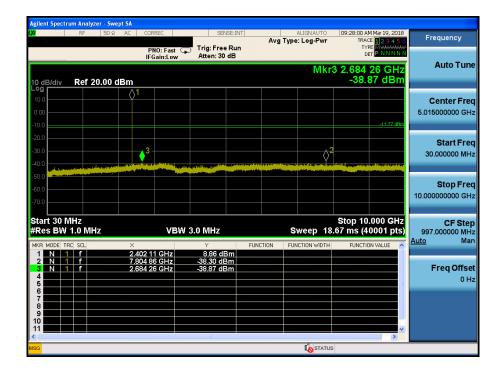
Hopping mode & Modulation : 8DPSK





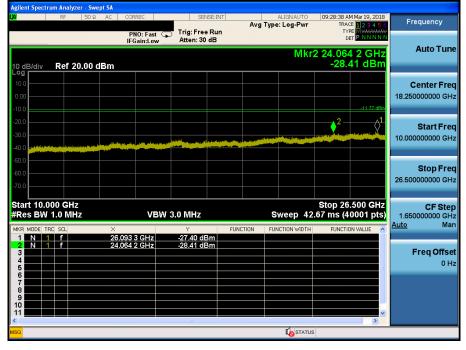
Lowest Channel & Modulation : 8DPSK







Lowest Channel & Modulation : 8DPSK



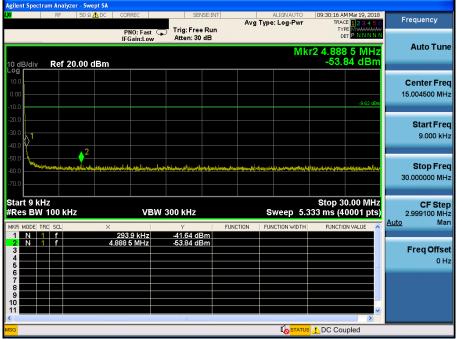


Reference for limit

Middle Channel & Modulation : 8DPSK

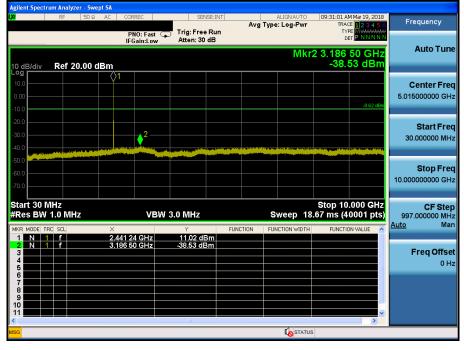


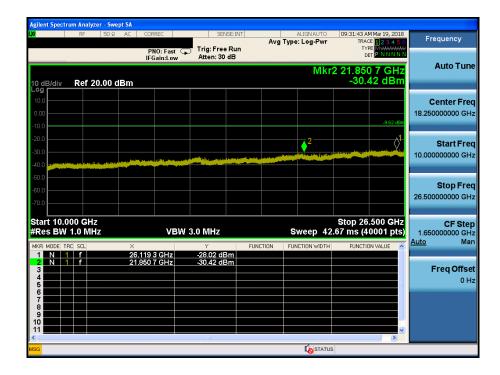






Middle Channel & Modulation : 8DPSK

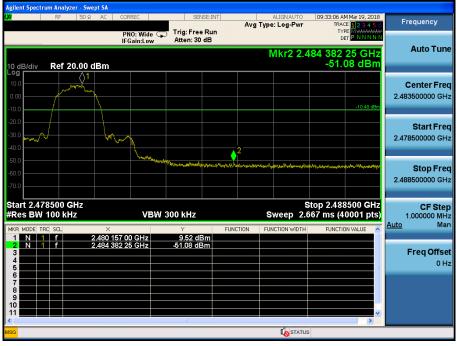






High Band-edge

Highest Channel & Modulation : 8DPSK



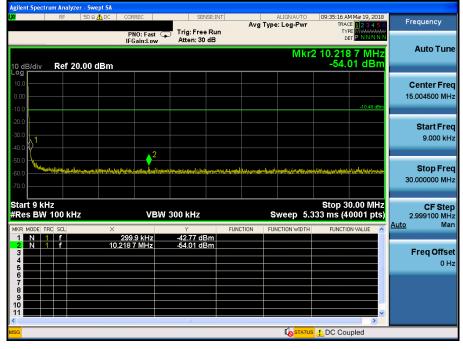
High Band-edge

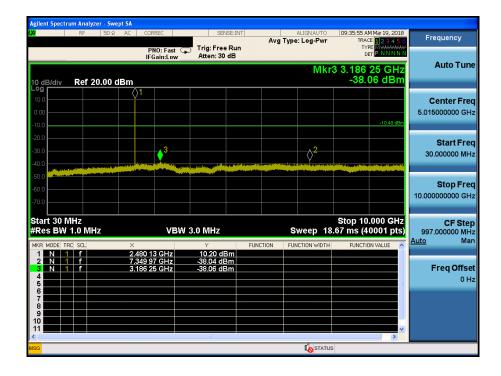
Hopping mode & Modulation : 8DPSK





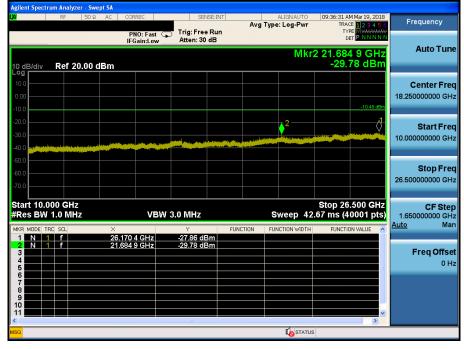
Highest Channel & Modulation : 8DPSK







Highest Channel & Modulation : 8DPSK



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

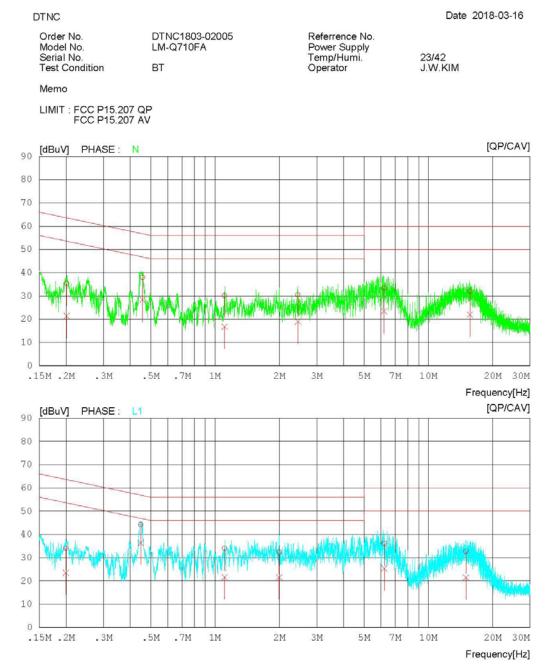
Conducted emissions from the EUT were measured according to the ANSI C63.10.

- 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>

Results of Conducted Emission



DTNC

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

Results of Conducted Emission

Date 2018-03-16

	Order No. Model No. Serial No. Test Condition		DTNC1 LM-Q71 BT	803-02005 IOFA	F	Referrence Power Suj Femp/Hur Operator	oply	23/42 J.W.KIM			
	Memo	D									
	LIMIT	FCC P15 FCC P15									
	NO	FREQ [MHz]	READING QP CAV [dBuV][dBuV]	C.FACTOR	RESULT QP CAV [dBuV] [dBuV	QP	MIT CAV][dBuV]	MARGIN QP CAV [dBuV][dBuV	PHASE]		
_	1	0.20123	25.43 11.53	9.94	35.37 21.47	63.56	53.56	28.19 32.09	N	_	
	2	0.45683	28.01 18.35	9.98	37.99 28.33	56.75	46.75	18.7618.42	N		
	3	1.10820	20.09 6.73	10.00	30.09 16.73	56.00	46.00	25.91 29.27	N		
	4	2.44440	20.43 8.94	10.05	30.48 18.99	56.00	46.00	25.52 27.01	N		
	5	6.20300	23.27 13.34	10.12	33.39 23.46	60.00	50.00	26.6126.54	N		
	6		21.7611.68	10.32	32.08 22.00	60.00	50.00	27.9228.00	N		
	7	0.19976	24.0913.53	9.94	34.03 23.47	63.62	53.62	29.59 30.15	L1		
	8	0.44838	34.23 26.44	9.98	44.21 36.42	56.91	46.91	12.70 10.49	L1		
	9	1.10880	24.0211.64	10.00	34.02 21.64	56.00	46.00	21.9824.36	L1		
	10		22.34 11.52	10.04	32.38 21.56	56.00	46.00	23.6224.44	L1		
	11	6.21800	25.9215.27	10.12	36.04 25.39	60.00	50.00	23.9624.61	L1		
	12	15.01580	22.4211.20	10.31	32.73 21.51	60.00	50.00	27.27 28.49	L1		

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 attached on the device by means of unique coupling method (Spring Tension). Therefore this E.U.T Complies with the requirement of §15.203

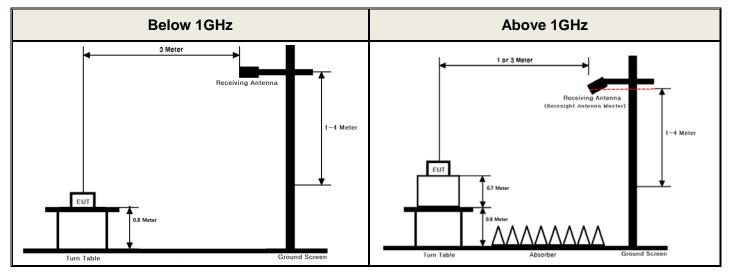
- Minimum Standard :

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.

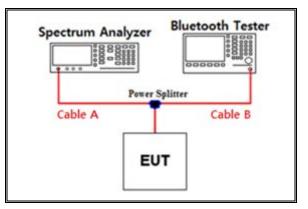
APPENDIX I

Test set up diagrams

Radiated Measurement



Conducted Measurement



Path loss information

Frequency (GHz)	Path Loss (dB)	Frequency (GHz)	Path Loss (dB)
0.03	6.57	15	8.70
1	6.87	20	9.02
2.402 & 2.441 & 2.480	7.09	25	9.03
5	7.40	-	-
10	7.76	-	-

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

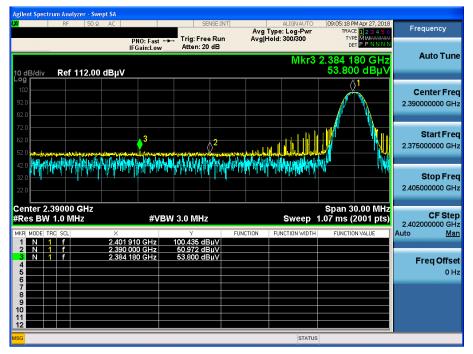


Detector Mode : PK

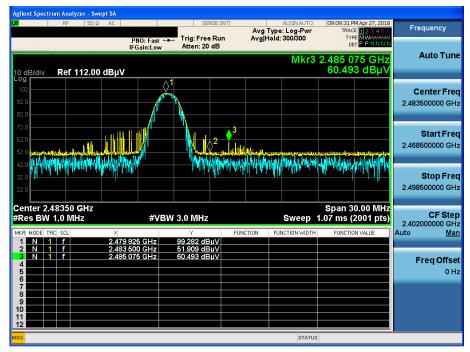
APPENDIX II

Unwanted Emissions (Radiated) Test Plot

GFSK & Lowest & X & Hor



GFSK & Highest & X & Hor



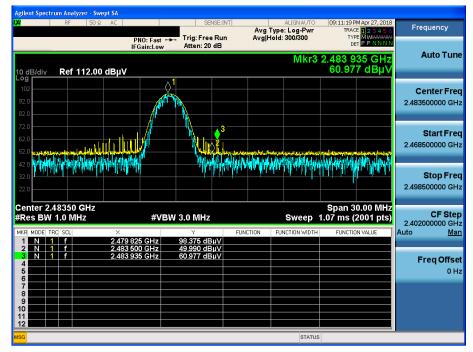
Detector Mode : PK



π /4DQPSK & Lowest & X & Hor

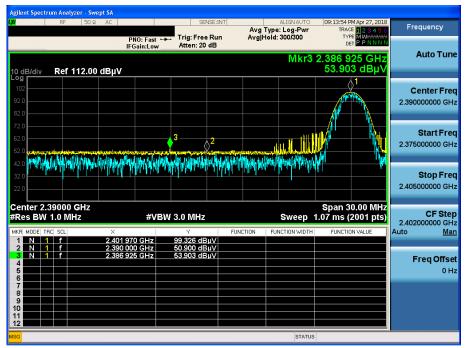
Agilent Spe												
L)U	RF	50 Ω	AC		SE	VSE:INT	Ava Tvp	ALIGN AUTO e: Log-Pwr		Apr 27, 2018	Frequency	
				PNO: Fast	Atten: 20			1: 300/300	TYPE	MW AMAN PPNNNN		
	_		_	IFGain:Low	Atten. 20	ab		Mkr2			Auto Tu	ne
10 dB/div	Bo	F 442 00	dBu)/					WIKIS	2.385 87	2 dBµV		
	Re	f 112.00	авна							1		
102											Center Fr	eq
92.0											2.390000000 G	Hz
82.0										- M		
72.0										- M	Start Fr	-
62.0					3	2		un din d		N	2.375000000 G	
52.0	and an experiment	and a start of the		and the second		-					2.0700000000000	
42.0	144 y M	WHIN WAY	an fa	Manadati	n waard a state of the state of	i an	HAN MANY	an the second		114		
32.0	46.64				1 16.0						Stop Fr	
22.0											2.40500000 G	Hz
Center :	2 3000	0 GHz							Snan 3(.00 MHz		
#Res B				#V	BW 3.0 MHz			Sweep	1.07 ms (2	001 pts)	CF Ste	
MKR MODE	TRC SCL		Х		Y	FUN	ICTION FI	JNCTION WIDTH	FUNCTION		2.402000000 G Auto M	Hz Ian
1 N	1 f		2.401	970 GHz	99.320 dB	μV						
2 N 3 N	1 f 1 f		2.390	000 GHz 875 GHz	51.125 dB 53.672 dB	uV uV					Ener Offe	
4											Freq Offs	Hz
6											0	Π2
7 8												
9												
10												
12												
MSG								STATUS				

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

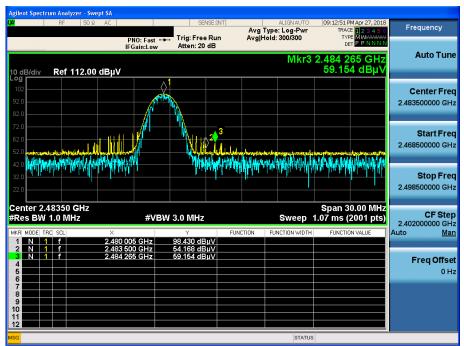




8DPSK & Lowest & X & Hor



8DPSK & Highest & X & Hor

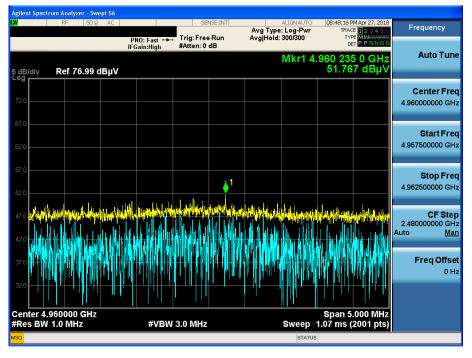


Detector Mode : PK

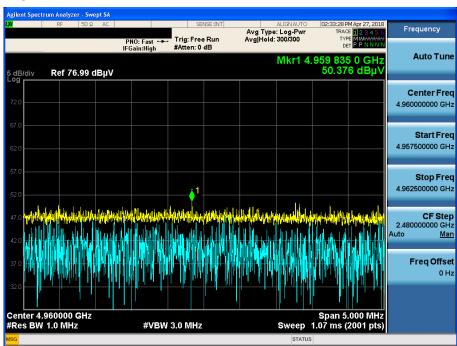
Detector Mode : PK



GFSK & Highest & Z & Hor



π/4DQPSK & Highest & Z & Hor





8DPSK & Middle & Z & Hor

