CTK Co., Ltd.
(Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Tel: +82-31-339-9970 Fax: +82-31-624-9501
www.e-ctk.com

TEST REPORT For FCC

FCC Standards : FCC 47CFR part 15 subpart C

Test Report No.	:	CTK-2016-00806
Date of Issue	:	2016-06-27
FCC ID	:	U5MLABEL-X420
Basic Model/Type No.	:	SLP-DX42*xy
Kind of Product	:	THERMAL LABEL PRINTER
Applicant	:	BIXOLON Co., Ltd.
Applicant Address	:	7th-8th FL, Miraeasset Venture Tower, 20, Pangyoyeok-ro 241beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Manufacturer	:	BIXOLON Co., Ltd.
Manufacturer Address	:	7th-8th FL, Miraeasset Venture Tower, 20, Pangyoyeok-ro 241beon-gil, Bundang-gu, Seongnam-si, Gyeonggi-do, Korea
Contact Person	:	Shin Ji Sung / Assistant Manager
Telephone	:	+82–31-218-5582
Received Date	:	2016-06-02
Test period	:	Start : 2016-06-08 End : 2016-06-24
Test Results	:	☒ In Compliance ☐ Not in Compliance

The test results presented in this report relate only to the object tested.

Tested by

Y. T. Lee

Young-taek Lee
Test Engineer
Date: 2016-06-27

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: 2016-06-27

REPORT REVISION HISTORY

Date	Revision	Page No
2016-06-27	Issued (CTK-2016-00806)	All

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1.0 General Product Description

Kind of product	THERMAL LABEL PRINTER
Model name	SLP-DX42*xy
Serial number	Prototype
EUT condition	Pre-production, not damaged
Antenna type	Chip antenna
Antenna Gain	0 dBi
Frequency Range	2402 MHz - 2480 MHz
RF power	9.73 dBm Peak Conducted (GFSK) 9.85 dBm Peak Conducted (π/4 DQPSK) 9.46 dBm Peak Conducted (8-DPSK)
Type of Modulation	Frequency Hopping Spread Spectrum
Number of channels	79
Channel Spacing	1 MHz
Channel Access Protocol	Frequency Hopping
Type of Modulation	GFSK(1Mbps), DQPSK(2Mbps), 8-DPSK(3Mbps)
Power Source	DC 24 V

1.1 Tested Frequency

	LOW	MID	HIGH
Frequency (MHz)	2402	2441	2480

1.2 Tested Mode

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

- Following channel(s) was (were) selected for the final test as listed below.

Tested Ch	Modulation Technology	Modulation Type	Packet Type
Low, Mid, High	FHSS	GFSK	DH5
Low, Mid, High	FHSS	8-DPSK	3-DH5

1.3 Model Differences

Remark : SLP-DX42*xy

'*' can be alphanumeric.
'x' can be blank or alphanumeric.
'y' can be blank or alphanumeric.

1.4 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.5 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	HP	HP ProBook 650 G1	5CG5114KD2
AC/DC ADAPTER	HP	PPP012D-S	WCNXF0AAR7S2 XX

1.6 Calibration Details of Equipment Used for Measurement

Test equipment and test accessories are calibrated on regular basis. The maximum time between calibrations is one year or what is recommended by the manufacturer, whichever is less. All test equipment calibrations are traceable to the Korea Research Institute of Standards and Science (KRISS), therefore, all test data recorded in this report is traceable to KRISS.

1.7 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	**FCC**	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	
CANADA	**IC**	IC EMI (3/10m test site)	8737A-2	
JAPAN	**VCCI**	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	
KOREA	**MSIP**	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	

2.0 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)
15.247(a)	Carrier Frequency Separation	> 25 kHz	Conducted	C
15.247(a)	Number of Hopping Frequencies	> 15 hops		C
15.247(a)	20 dB Bandwidth	NA		C
15.247(a)	Dwell Time	< 0.4 seconds		C
15.247(b)	Transmitter Output Power	< 0.125 Watts		C
15.247(d)	Conducted Spurious emission	> 20 dBc		C
15.247(d)	Band Edge	> 20 dBc		C
15.209	Field Strength of Harmonics	15.209(a)	Radiated	C
15.207	AC Conducted Emissions	15.207(a)	Line Conducted	C

The sample was tested according to the following specification:
- FCC Part 15.247, ANSI C63.10-2013

The tests were performed according to the method of measurements prescribed in DA 00-705.

2.1 Transmitter Requirements

2.1.1 Carrier Frequency Separation

Test Location
RF Test Room

Test Procedures

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function enabled.
After the trace being stable, the reading value between the peaks of the adjacent channels using the marker-delta function was recorded as the measurement results.

The spectrum analyzer is set to:
Span = 5 MHz (wide enough to capture the peaks of two adjacent channels)
RBW = 30 kHz (≥ 1% of the span) Sweep = auto
VBW = 100 kHz (≥ RBW) Detector function = peak
Trace = max hold

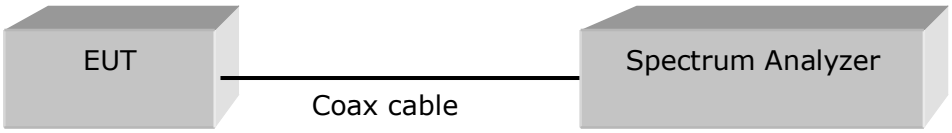


Figure 1 : Measurement setup for the carrier frequency separation

Limit
§15.247(a)(1) Frequency hopping system operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-third of 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Channel	Adjacent Hopping Channel Separation (kHz)	Two-third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
2441MHz	995.0	554.0	25	Complies

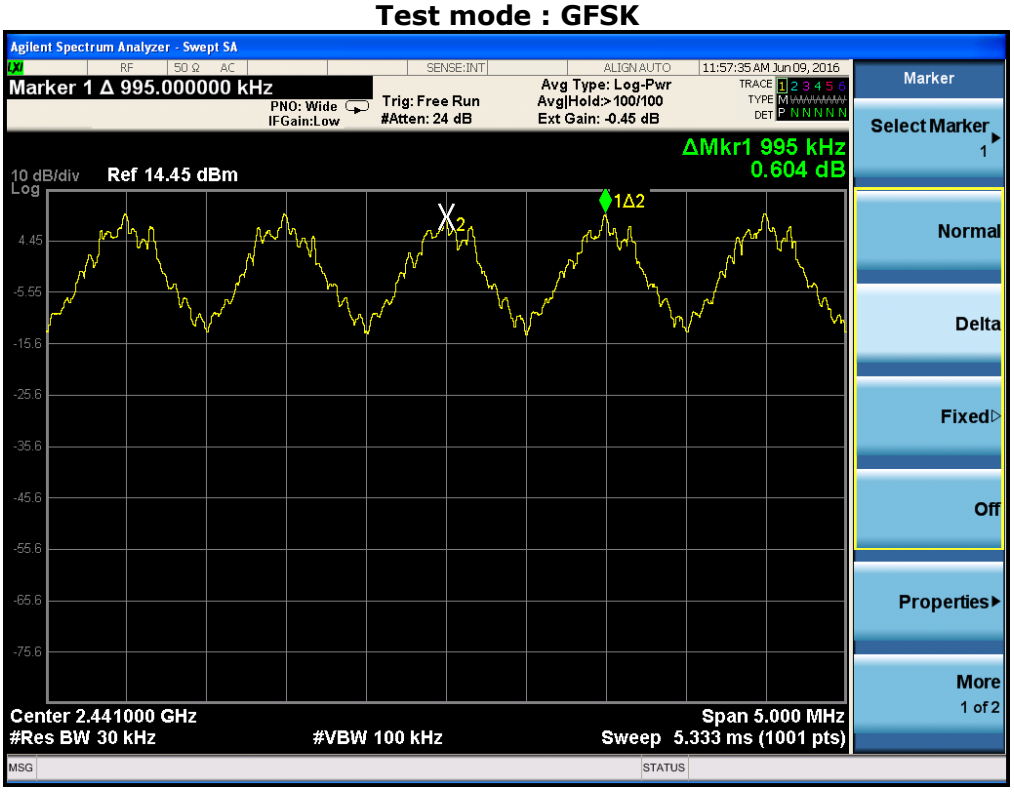
Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Channel	Adjacent Hopping Channel Separation (kHz)	Two-third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
2441MHz	995.0	829.0	25	Complies

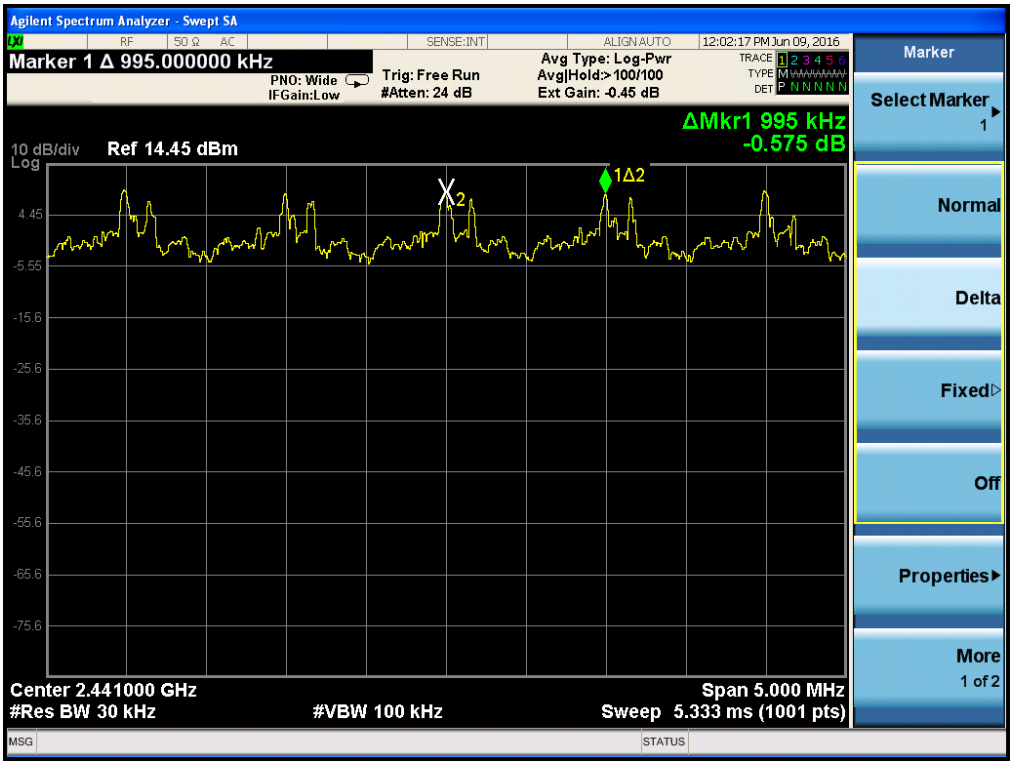
See next pages for actual measured spectrum plots.

Carrier Frequency Separation

Test mode : GFSK



Test mode : 8-DPSK



2.1.2 Number of Hopping Frequencies

Test Location
RF Test Room

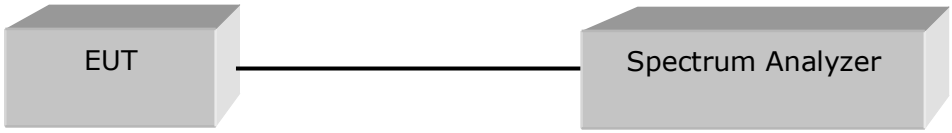
Test Procedures

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

The spectrum analyzer is set to:

Frequency range 1: Start = 2389.5 MHz, Stop = 2439.5 MHz
2: Start = 2439.5 MHz, Stop = 2489.5 MHz

RBW = 300 kHz (≥ 1% of the span) Sweep = auto
VBW = 300 kHz (≥ RBW) Detector function = peak
Trace = max hold



Limit

§15.247(a)(1)(iii) For frequency hopping system operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies.

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

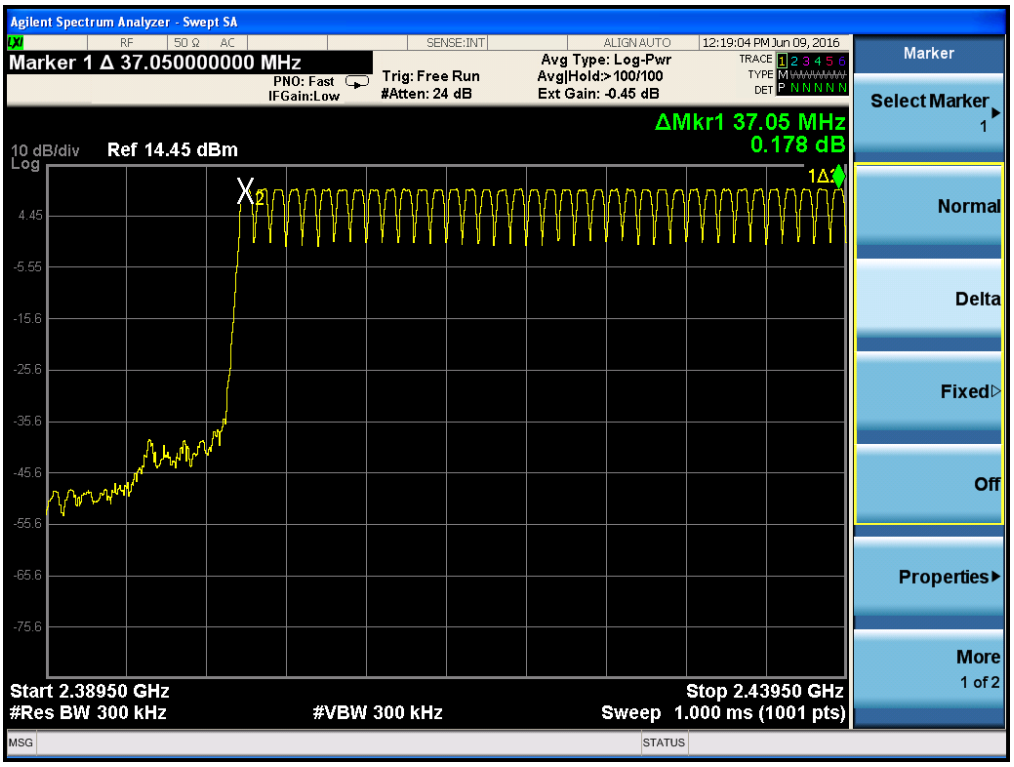
Total number of Hopping Channels	Result
79	Complies

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

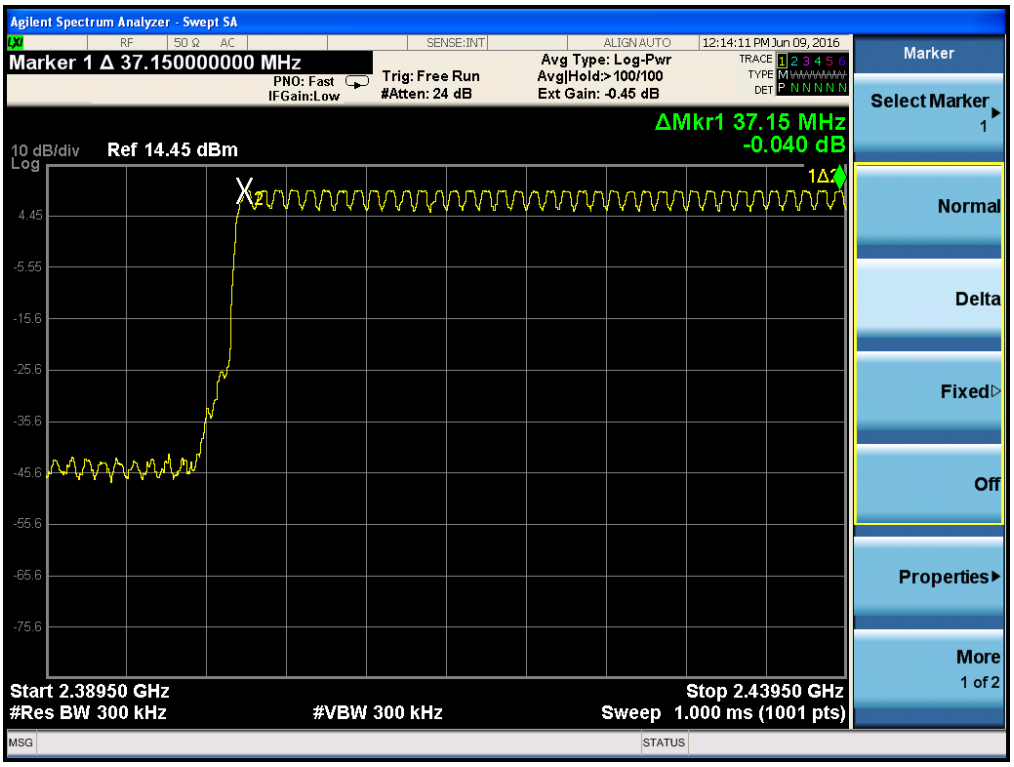
Total number of Hopping Channels	Result
79	Complies

See next pages for actual measured spectrum plots.

Number of Hopping Frequencies(GFSK)



Number of Hopping Frequencies(8-DPSK)



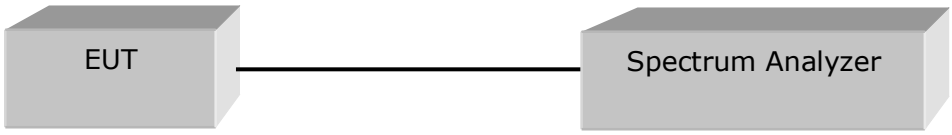
2.1.3 20 dB bandwidth

Test Location
RF Test Room

Test Procedures

The bandwidth at 20 dB below the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT had its hopping function disabled at the highest, middle and the lowest available channels.
After the trace being stable, Use the marker-to peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission.

The spectrum analyzer is set to:
Center frequency = the highest, middle and the lowest channels
Span = approximately 2 or 3 times of the 20 dB bandwidth
RBW = 30 kHz (≥ 1% of the 20 dB bandwidth) Sweep = auto
VBW = 30 kHz (≥ RBW) Detector function = peak
Trace = max hold



Limit

Limit : N/A

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

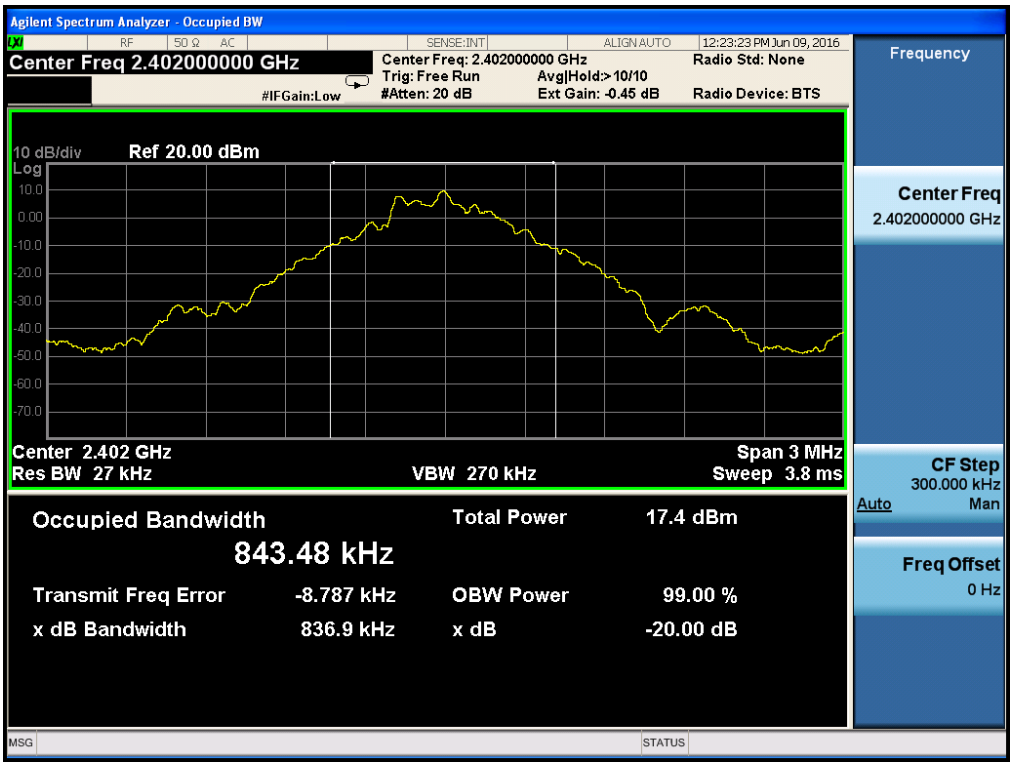
Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	0.837	Complies
2441	39	0.831	Complies
2480	78	0.831	Complies

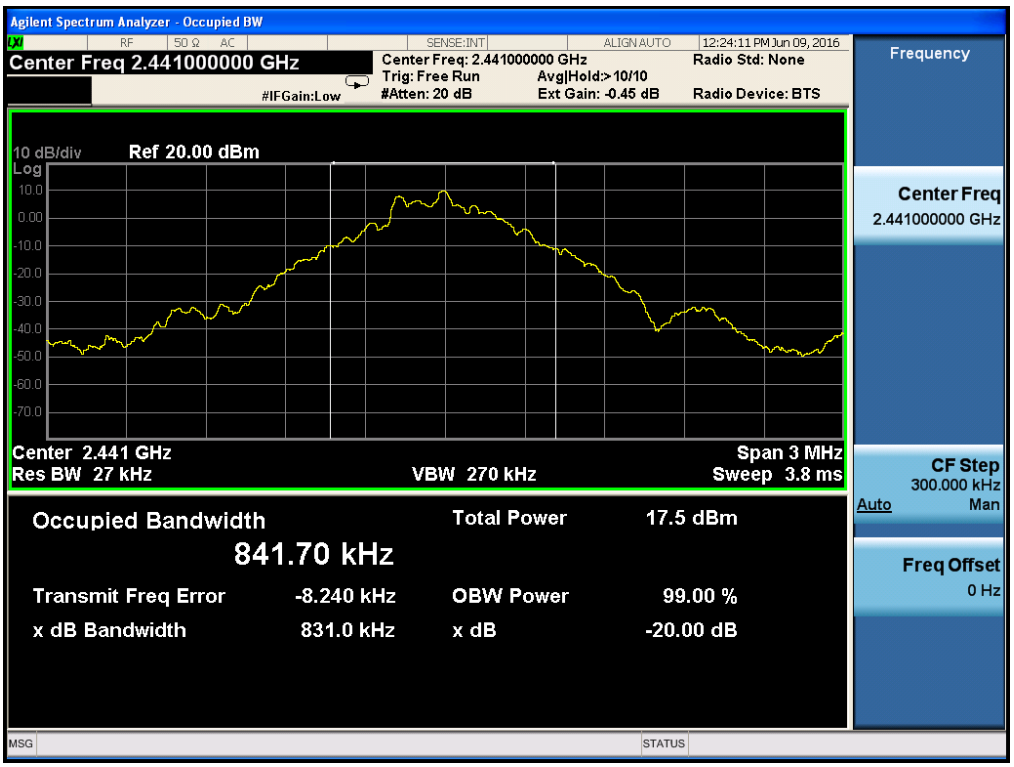
Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

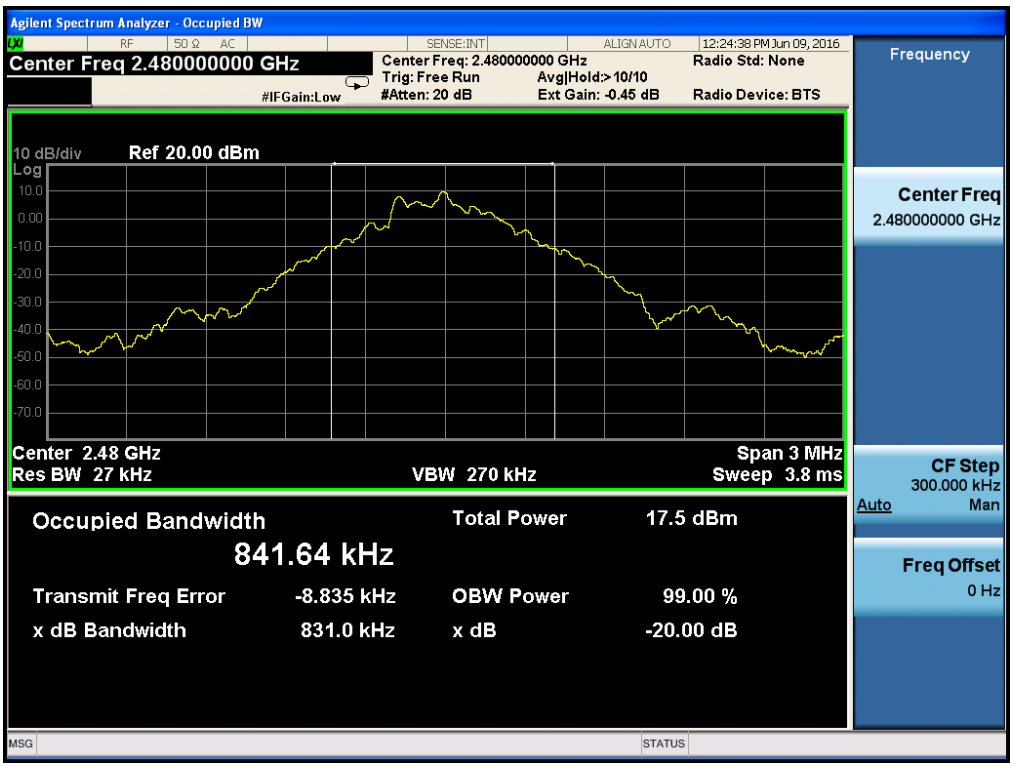
Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	1.243	Complies
2441	39	1.244	Complies
2480	78	1.248	Complies

See next pages for actual measured spectrum plots.

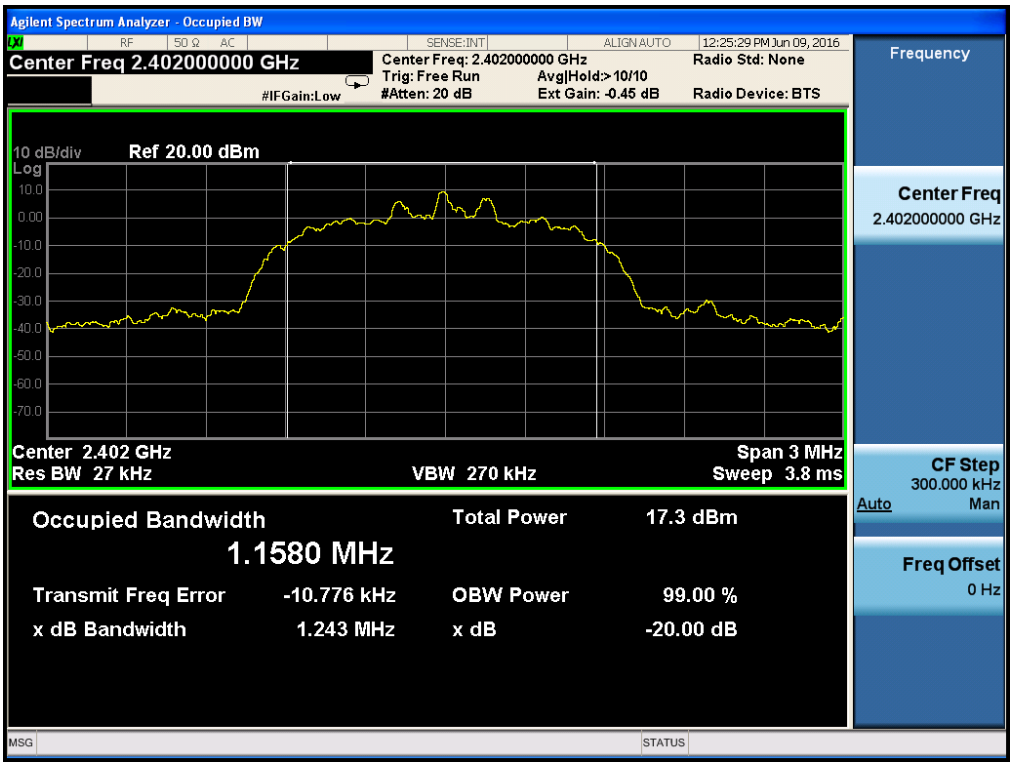
20 dB Bandwidth - GFSK

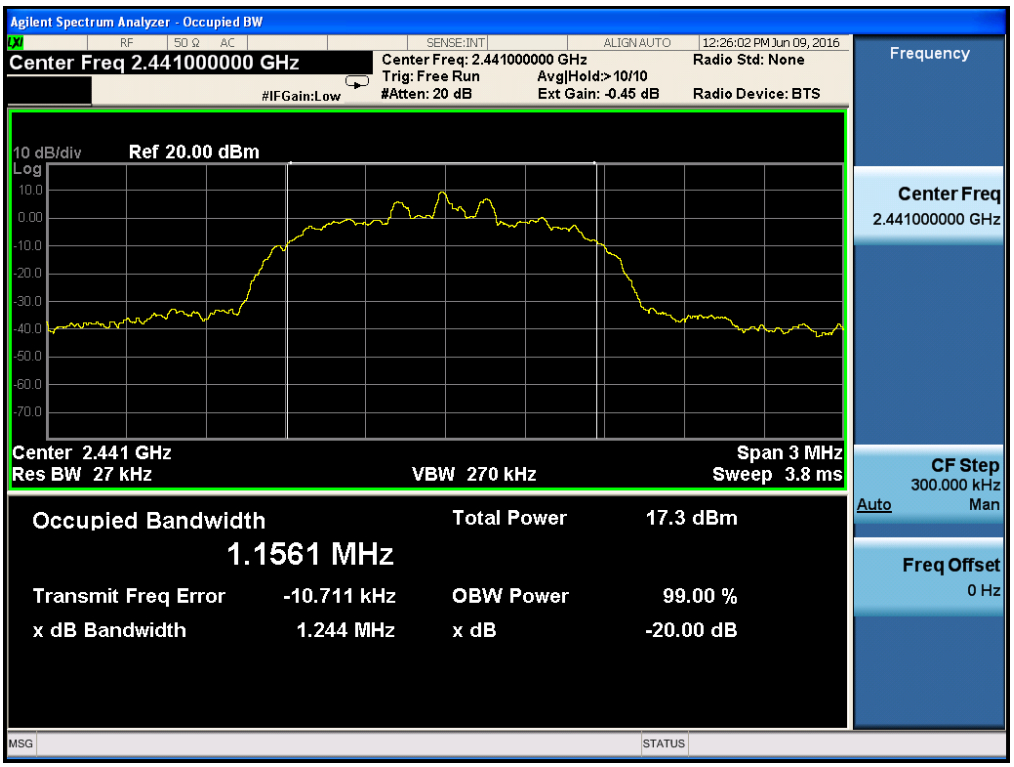


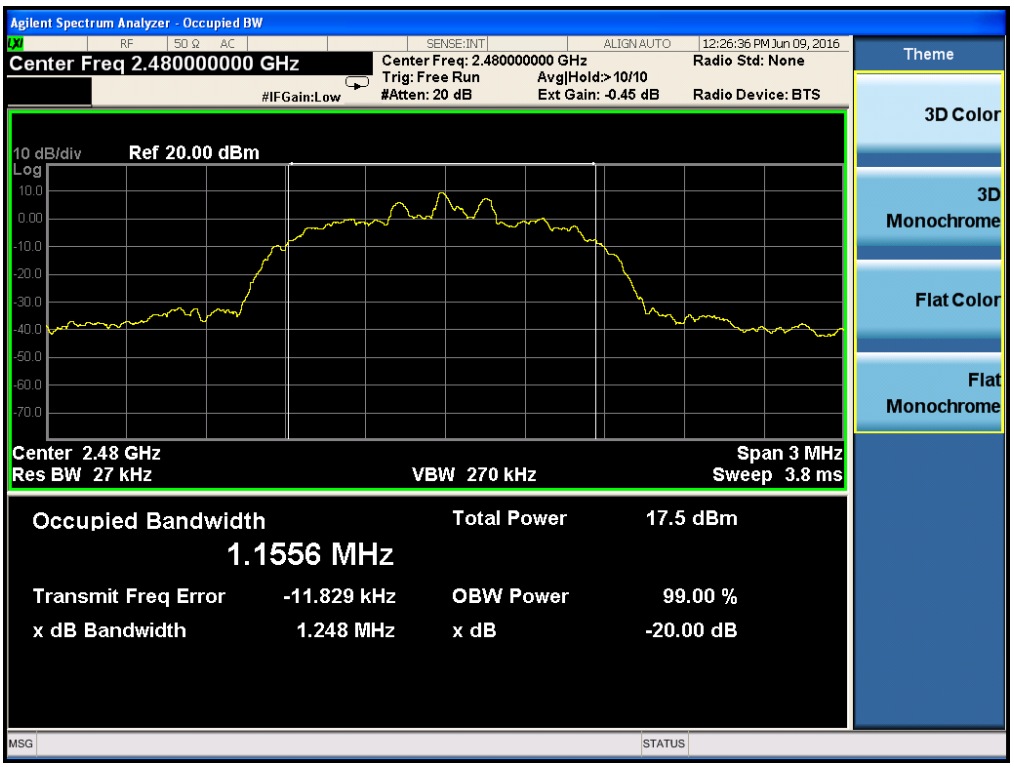




20 dB Bandwidth - 8-DPSK







2.1.4 Time of Occupancy (Dwell Time)

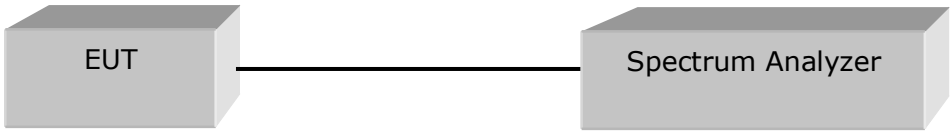
Test Location
RF Test Room

Test Procedures

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

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on any frequency be measured and set spectrum analyzer to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.
6. The SLP-DX22*z has 3 type of payload, DH1, DH3, DH5. The hopping rate is 1600 per second.

The spectrum analyzer is set to:
Center frequency = the highest, middle, and the lowest channels
Span = zero
RBW = 1 MHz Trace = max hold
VBW = 1 MHz (≥ RBW) Detector function = peak
Sweep = as necessary to capture the entire dwell time per hopping channel



Limit

§15.247(a)(1)(iii) For frequency hopping system operating in 2400-2483.5 MHz band, the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Test Results

Time of occupancy on the TX channel in 31.6 sec = time domain slot length × hop rate ÷ number of hop per channel × 31.6

Test mode : GFSK

Channel Frequency (MHz)	Packet Type	Dwell Time (ms)	Test Results	
			Time of occupancy on the TX channel in 31.6sec (ms)	Result
2402	DH 1	0.420	134.4	Complies
	DH 3	1.680	268.8	Complies
	DH 5	2.910	310.4	Complies

DH1 Dwell time = 0.420 ms × (1600÷2) ÷ 79 × 31.6 = 134.4 ms
DH3 Dwell time = 1.680 ms × (1600÷4) ÷ 79 × 31.6 = 268.8 ms
DH5 Dwell time = 2.910 ms × (1600÷6) ÷ 79 × 31.6 = 310.4 ms

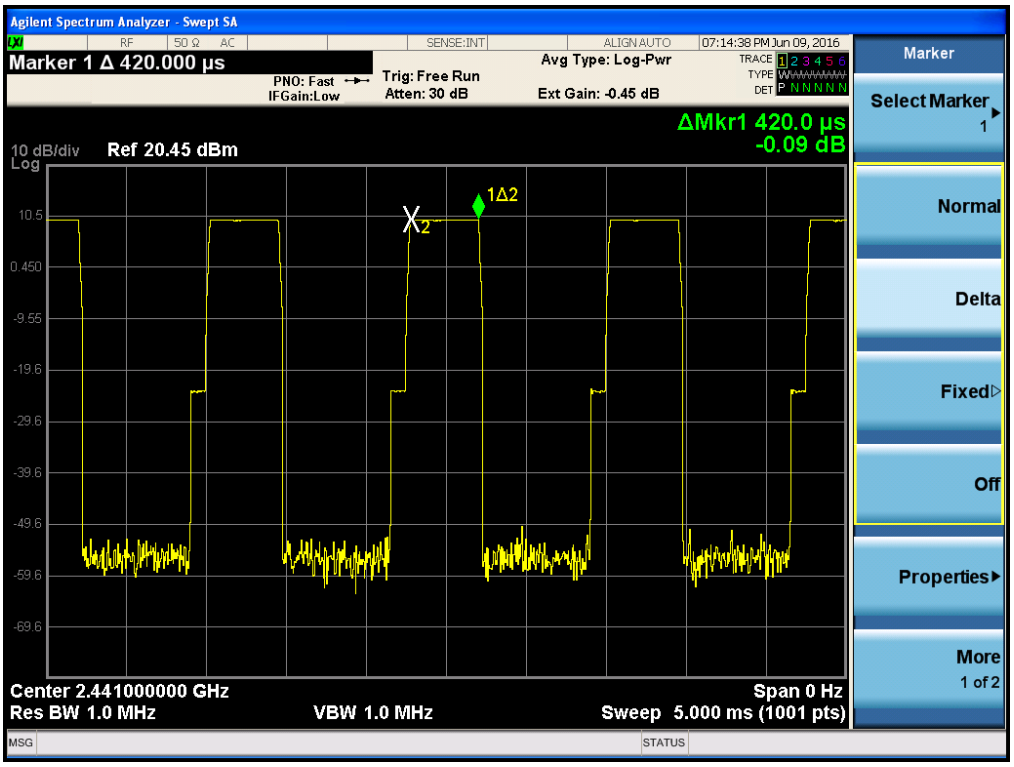
Test mode : 8-DPSK

Channel Frequency (MHz)	Packet Type	Dwell Time (ms)	Test Results	
			Time of occupancy on the TX channel in 31.6sec (ms)	Result
2480	3DH 1	0.420	134.4	Complies
	3DH 3	1.650	264.0	Complies
	3DH 5	2.910	310.4	Complies

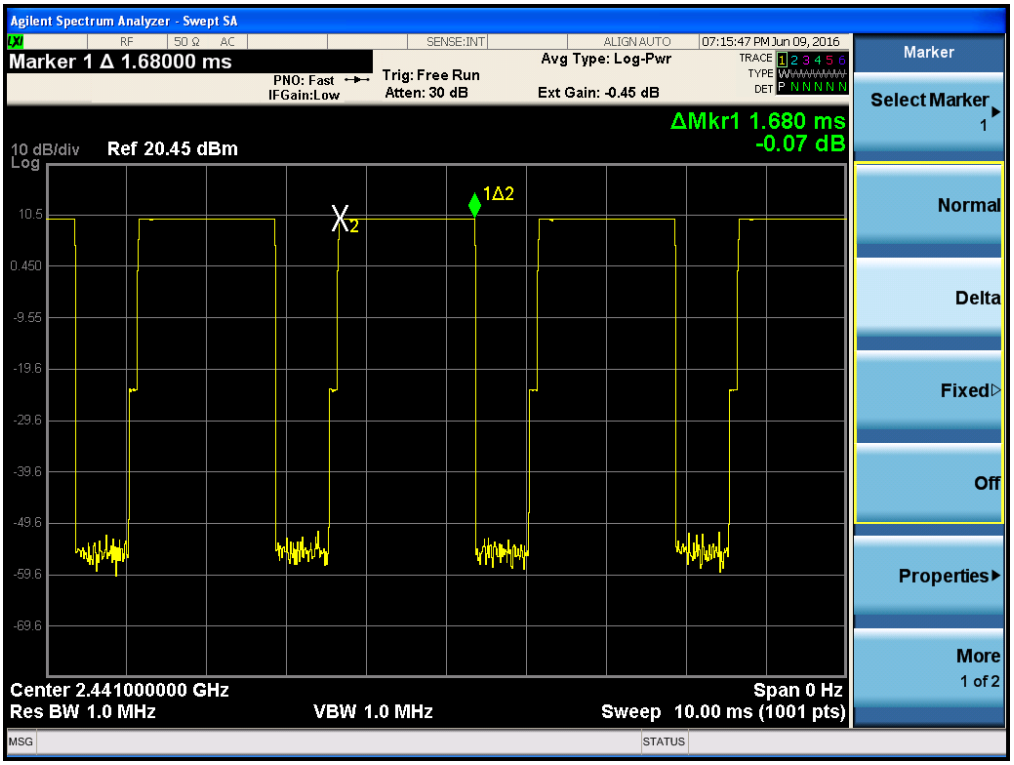
DH1 Dwell time = 0.420 ms × (1600÷2) ÷ 79 × 31.6 = 134.4 ms
DH3 Dwell time = 1.650 ms × (1600÷4) ÷ 79 × 31.6 = 264.0 ms
DH5 Dwell time = 2.910 ms × (1600÷6) ÷ 79 × 31.6 = 310.4 ms

See next pages for actual measured spectrum plots.

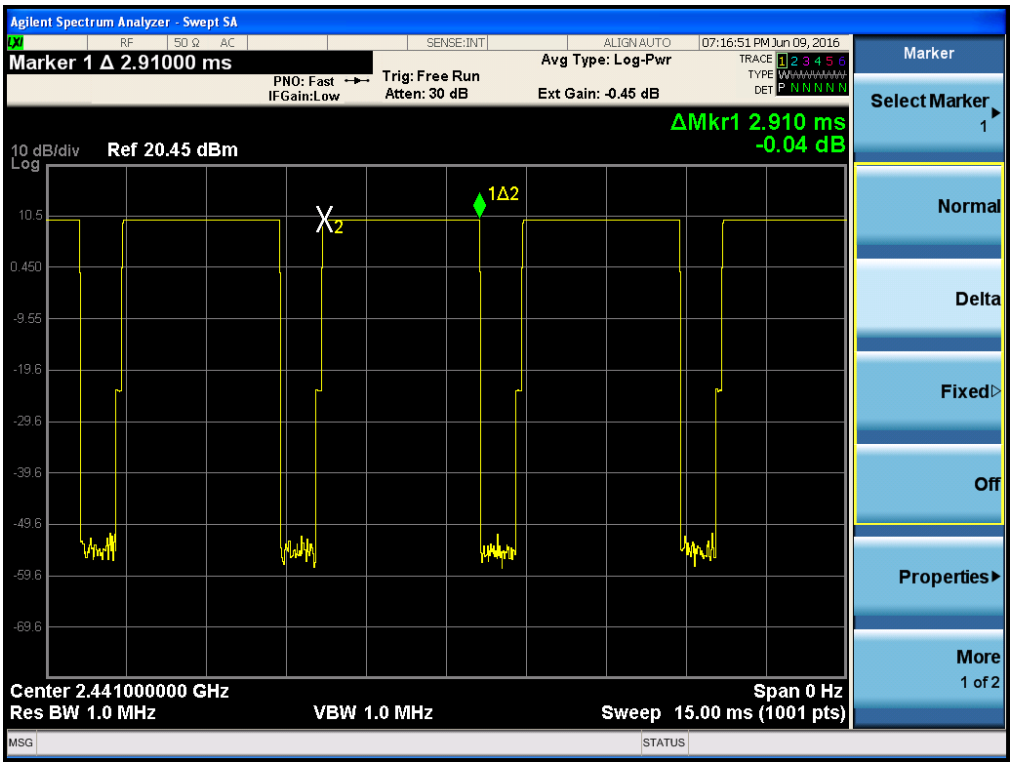
Time of Occupancy for PACKET Type DH1(GFSK)



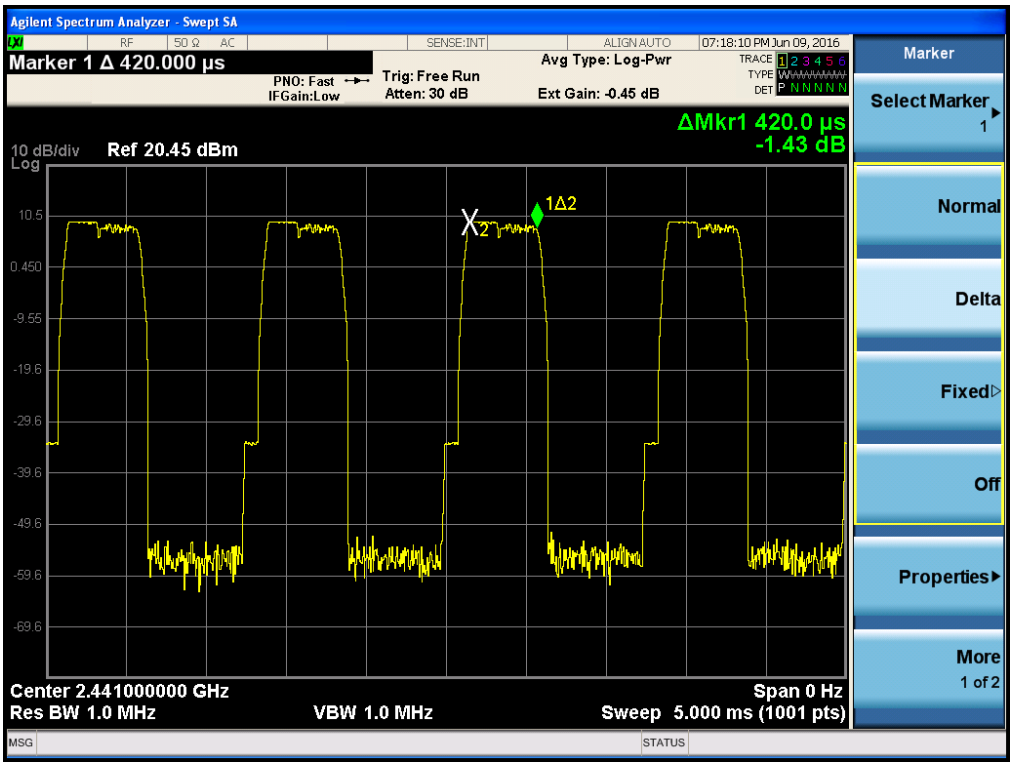
Time of Occupancy for PACKET Type DH3(GFSK)



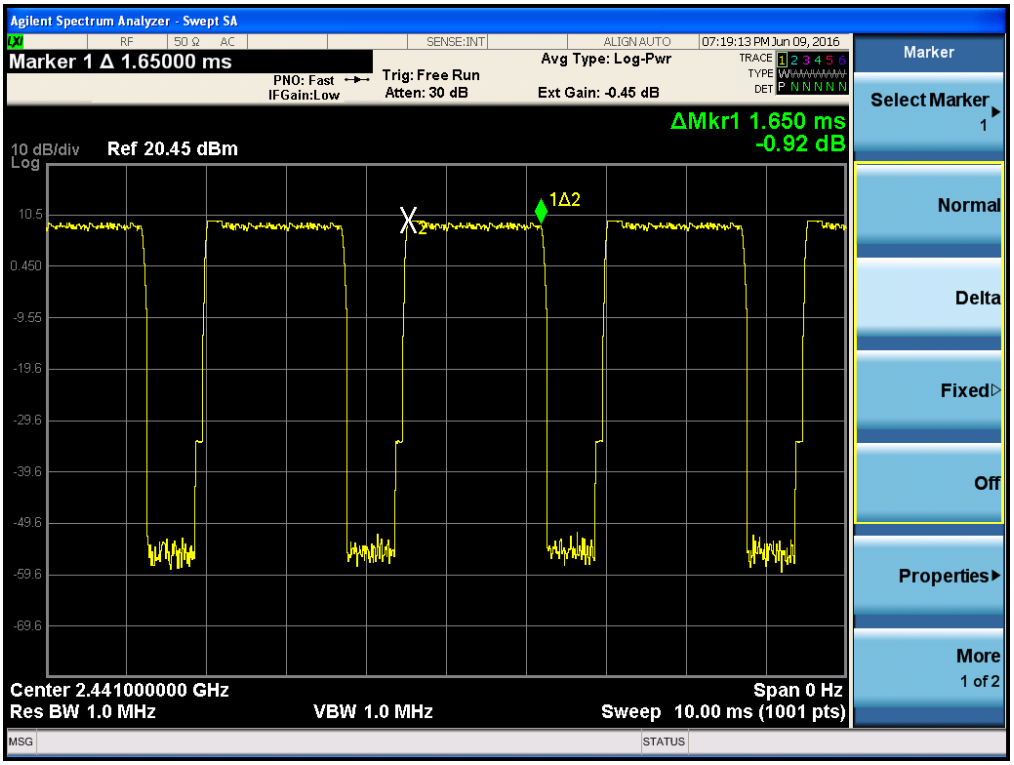
Time of Occupancy for PACKET Type DH5(GFSK)



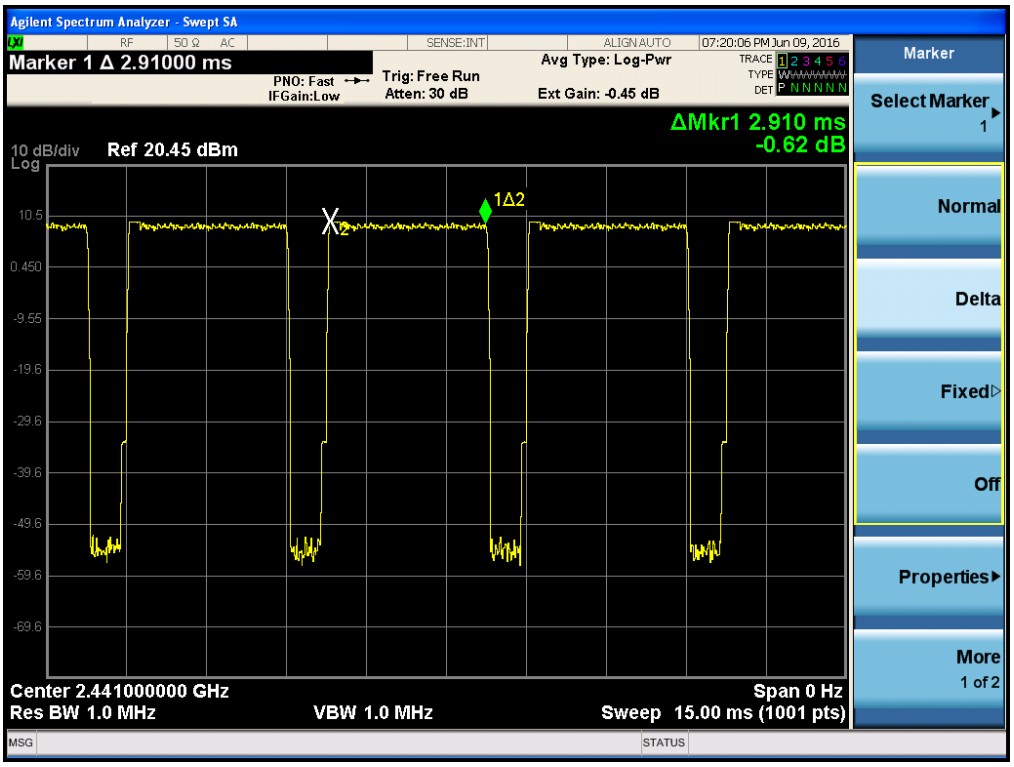
Time of Occupancy for PACKET Type 3DH1(8-DPSK)



Time of Occupancy for PACKET Type 3DH3(8-DPSK)



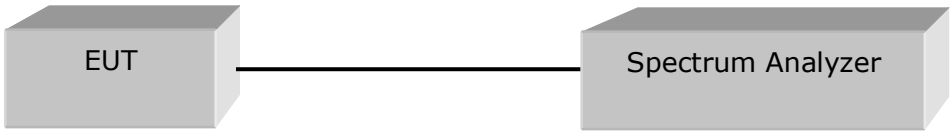
Time of Occupancy for PACKET Type 3DH5(8-DPSK)



2.1.5 Maximum peak Conducted Output Power

Test Location
RF Test Room

Test Procedures
The maximum peak conducted output power was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.
The spectrum analyzer is set to:
Center frequency = the highest, middle, and the lowest channels
Span = approximately 5 times of the 20 dB bandwidth
RBW = 1 MHz (greater than the 20 dB bandwidth of the emission being measured)
VBW = 1 MHz (≥ RBW) Detector function = peak
Trace = max hold Sweep = auto



Note:
The testing follows FCC Public Notice DA 00-705 Measurement Guidelines.
The RF output of EUT was connected to the spectrum analyzer by low loss cable.

Limit

§5.247(b)(1) The Maximum Peak Output Power Measurement is 0.125 Watts for frequency hopping system operating in 2400-2483.5 MHz employing at least 15 Hopping channels.

Test Results

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	9.510	8.933	Complies
2441	39	9.683	9.296	Complies
2480	78	9.727	9.391	Complies

Test mode : π/4 DQPSK, CFG PKT Packet Type : 30 Packet Size : 679(2DH5)

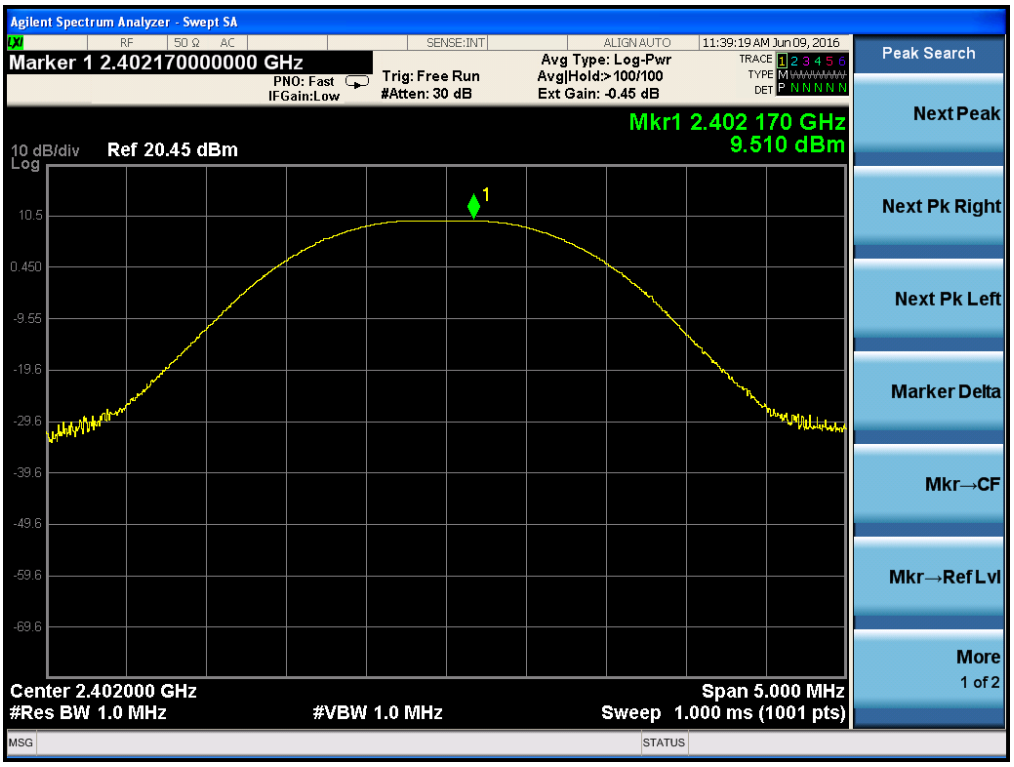
Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	9.478	8.867	Complies
2441	39	9.720	9.376	Complies
2480	78	9.846	9.652	Complies

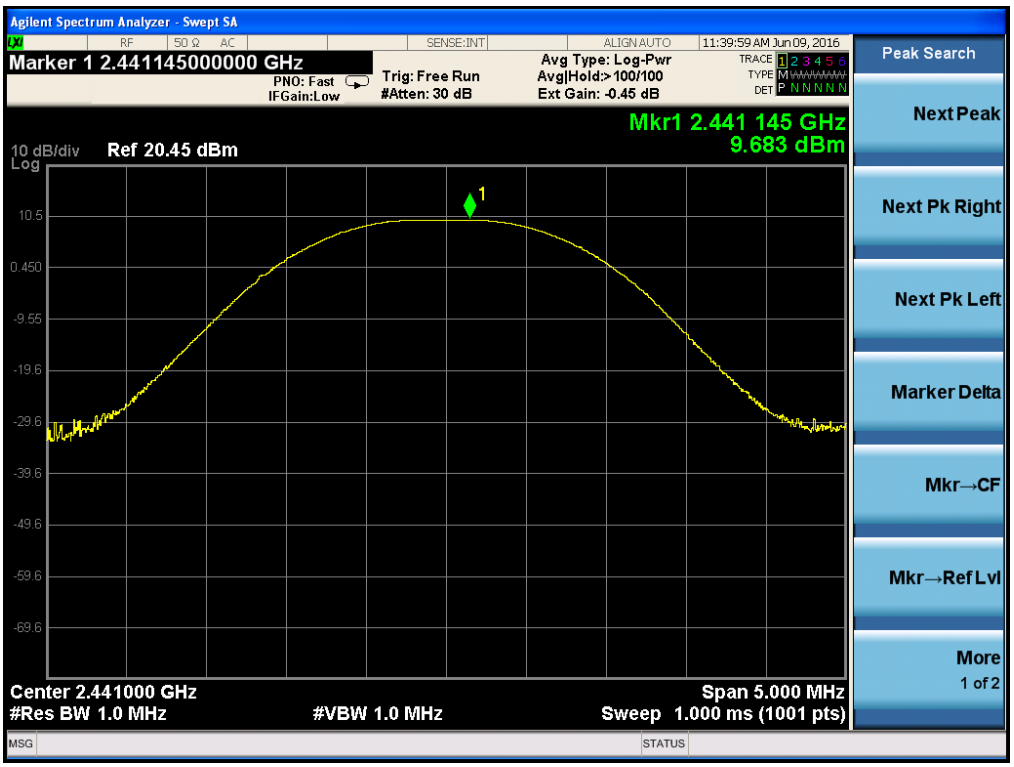
Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

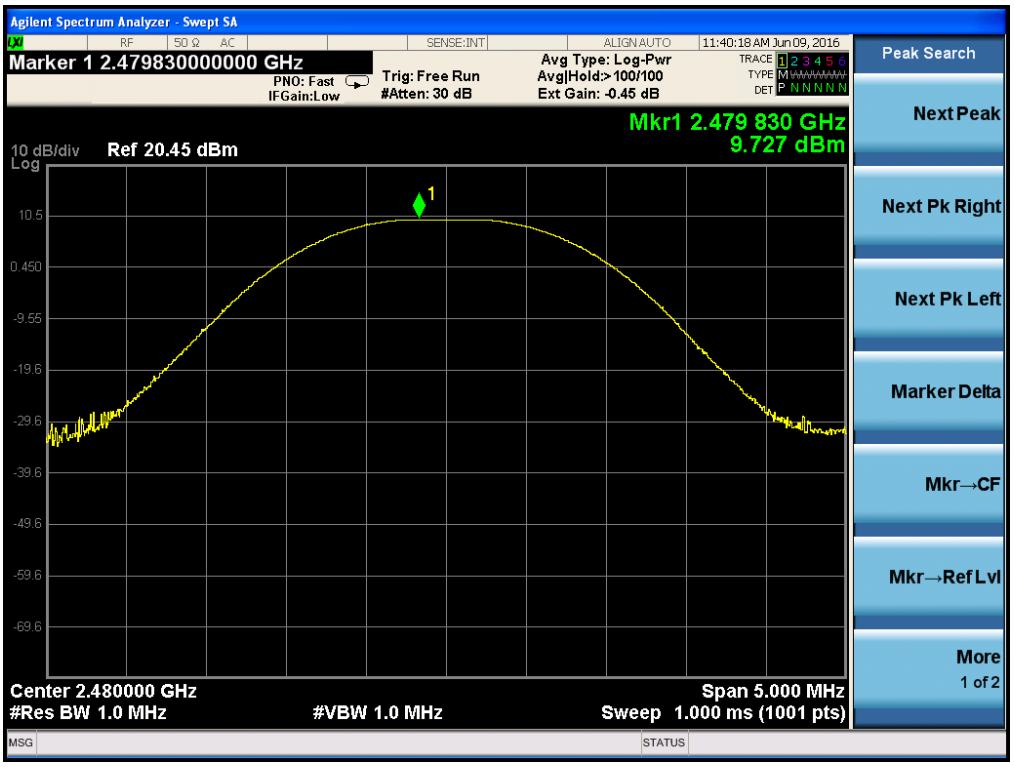
Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	9.421	8.752	Complies
2441	39	9.384	8.678	Complies
2480	78	9.463	8.837	Complies

See next pages for actual measured spectrum plots.

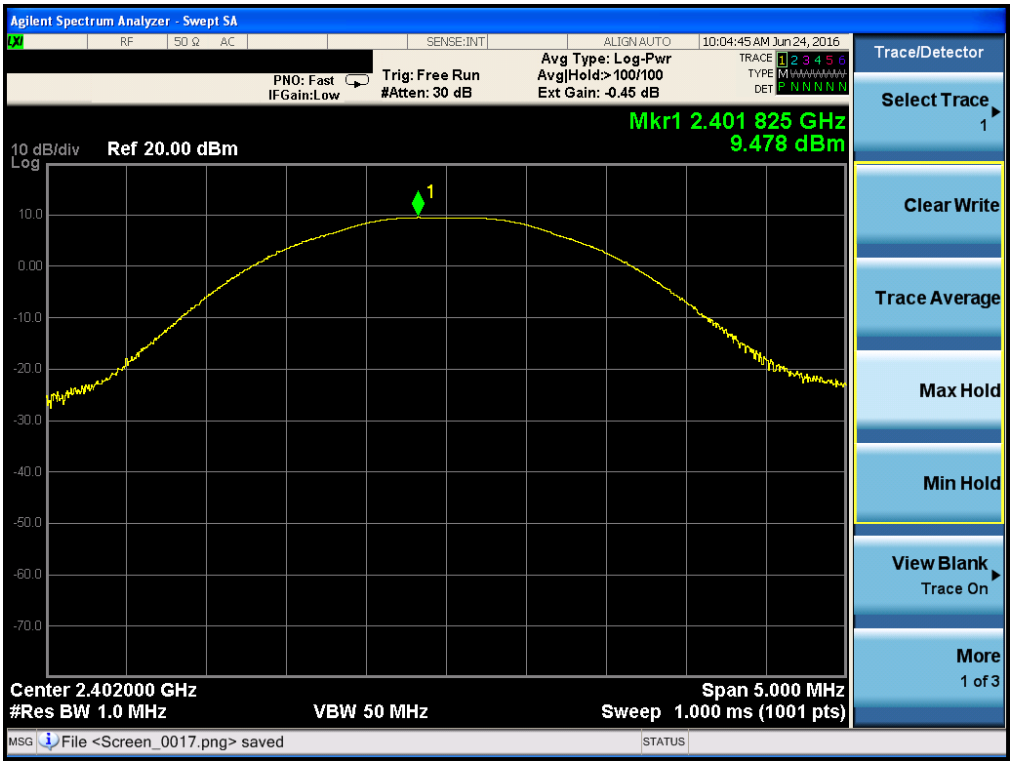
Maximum peak Conducted Output Power - GFSK

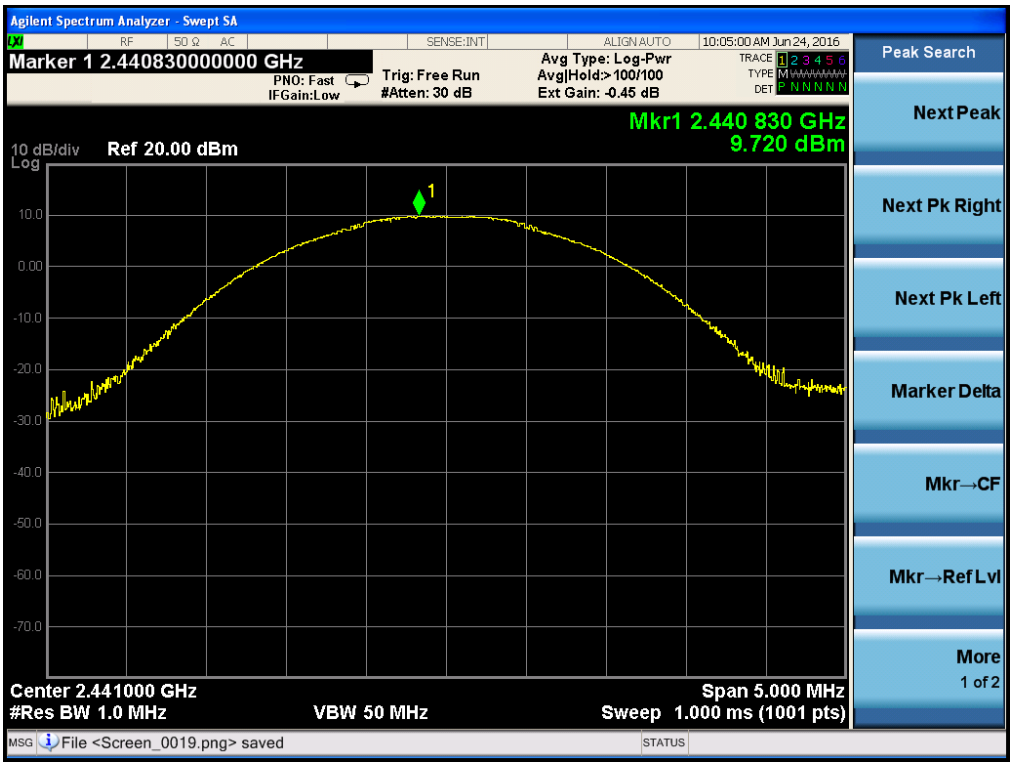


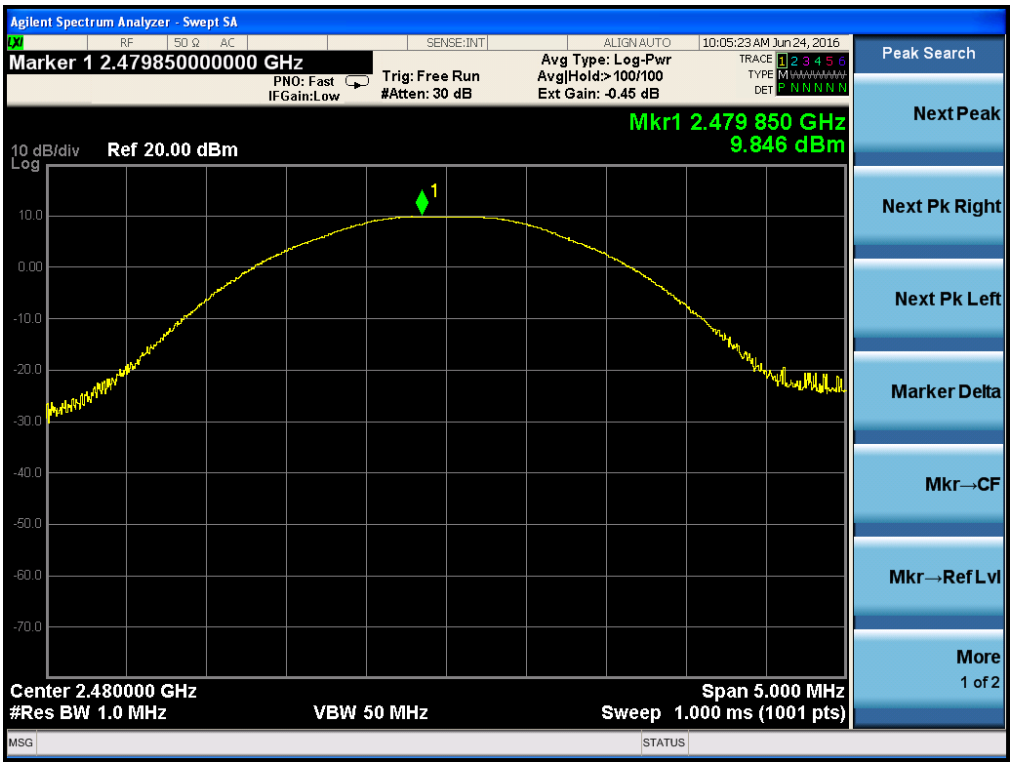




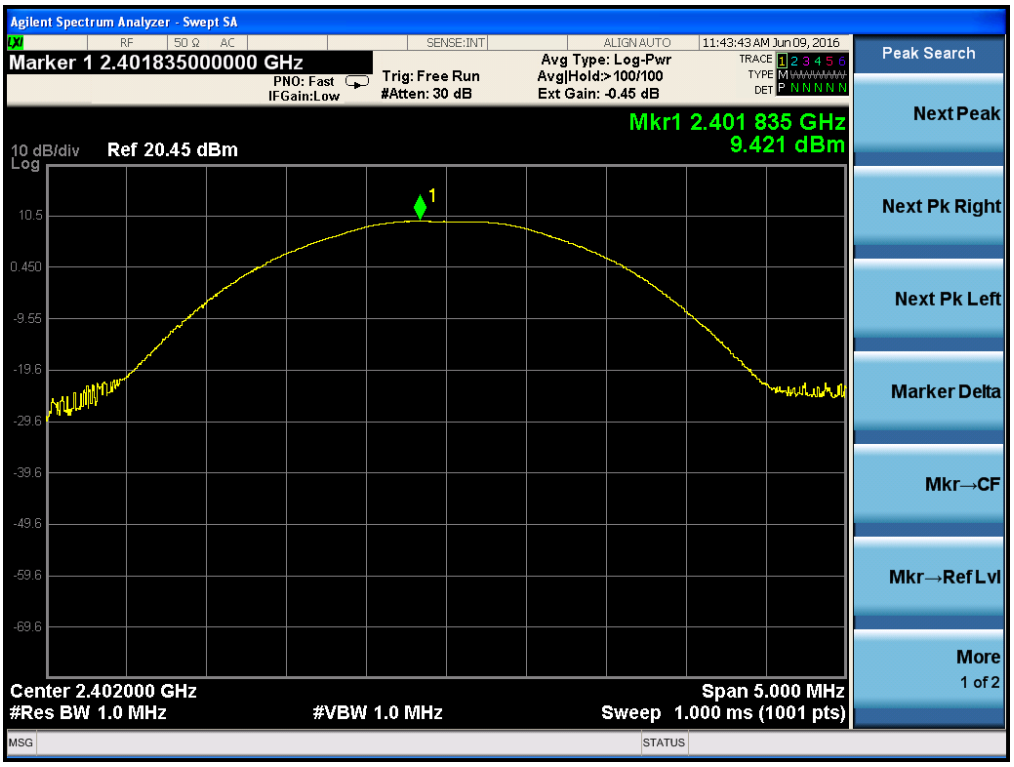
Maximum peak Conducted Output Power - π/4 DQPSK

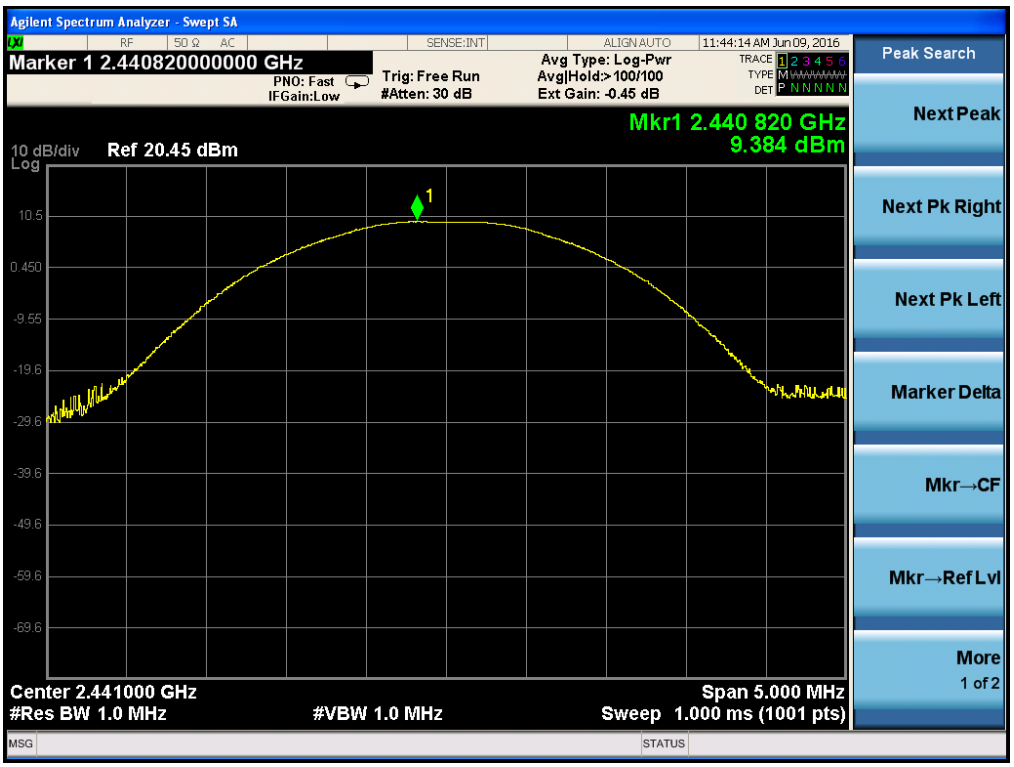


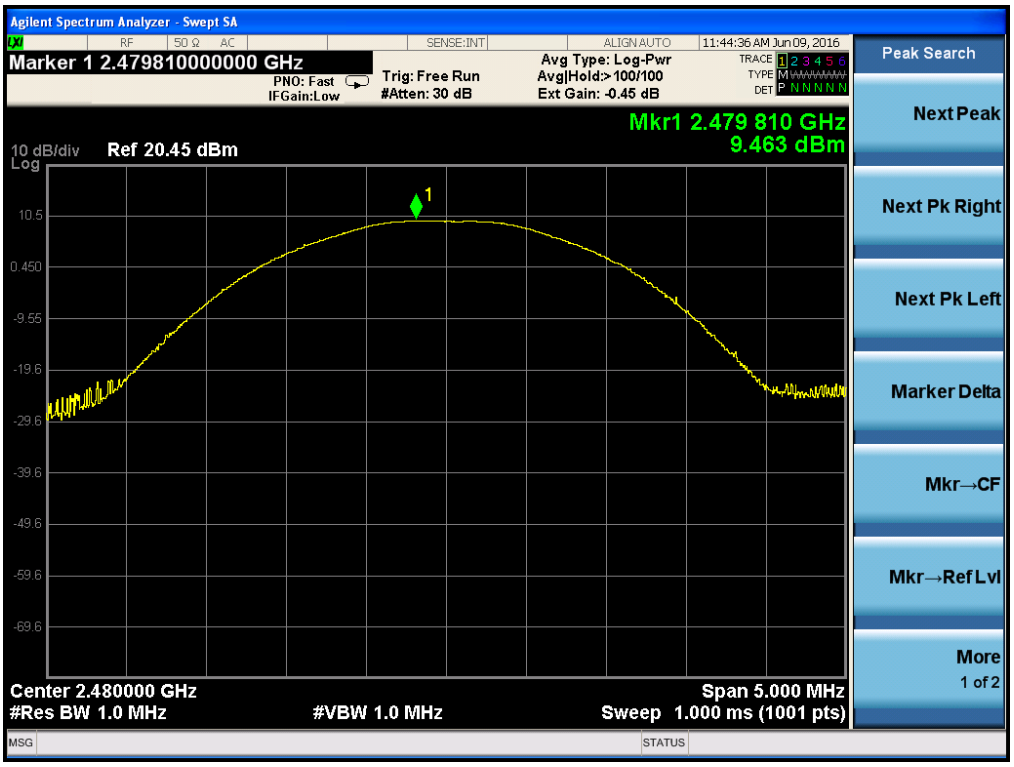




Maximum peak Conducted Output Power - 8-DPSK







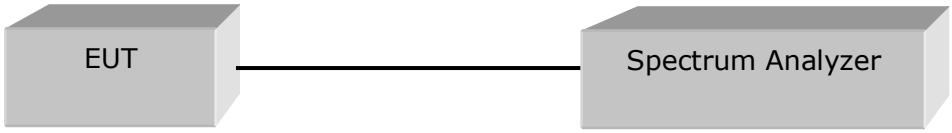
2.1.6 RF Conducted Emissions

Test Location
RF Test Room

Test Procedures

The bandwidth at 20 dB down from the highest inband spectral density was measured with a spectrum analyzer connected to the antenna terminal, while EUT has its hopping function disabled at the highest, middle and the lowest available channels.

The spectrum analyzer is set to:
Center frequency = the highest, middle, and the lowest channels
RBW = 100 kHz
VBW = 100 kHz (≥ RBW)
Span = 10 MHz
Trace = max hold
Detector function = peak
Sweep = auto



Limit

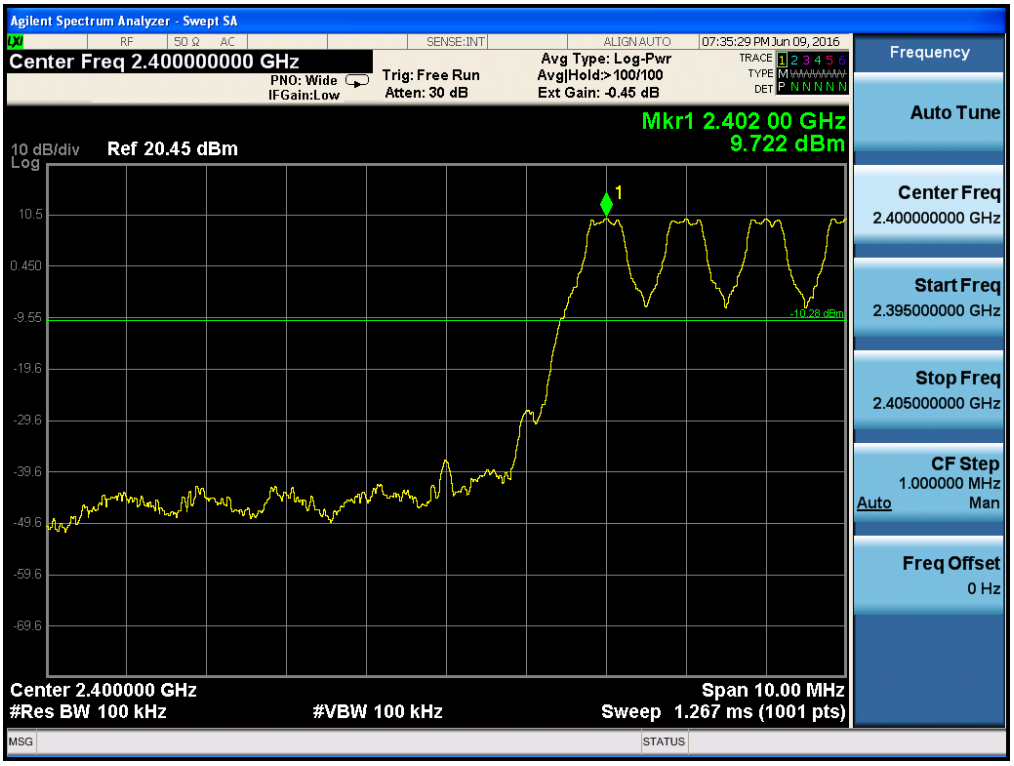
> 20 dBc

Test Results

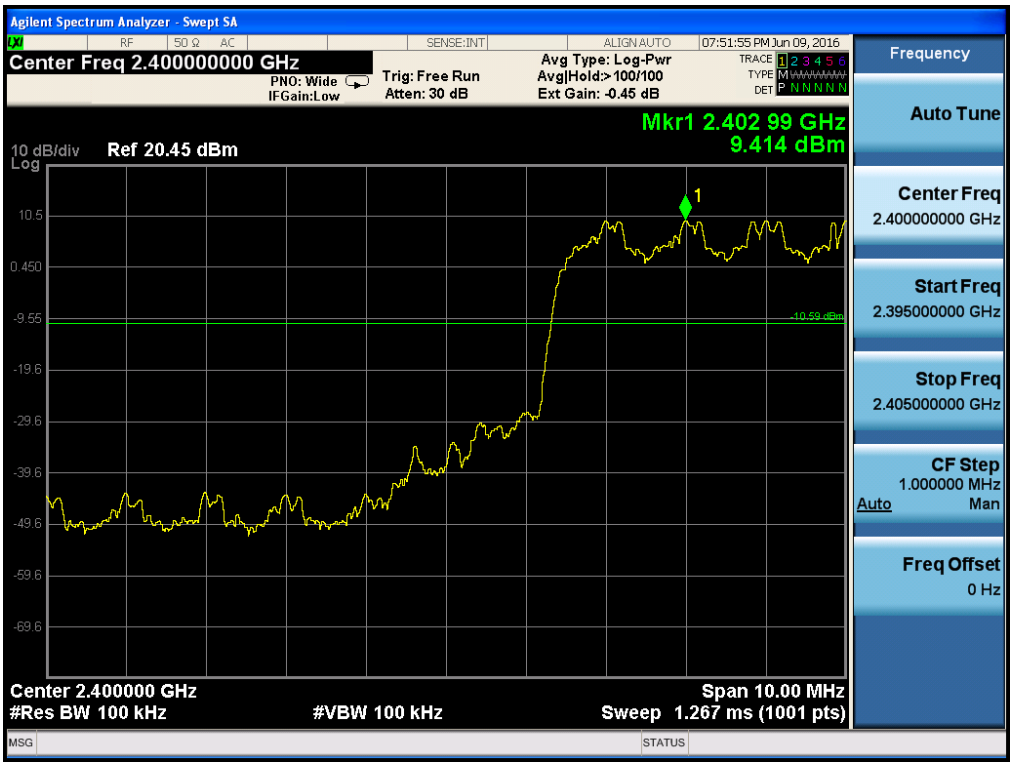
All conducted emission in any 100 kHz bandwidth outside of the spectrum band was at least 20 dB lower than the highest level of the inband spectral density.
Therefore the applying equipment meets the requirement.

See next pages for actual measured spectrum plots.

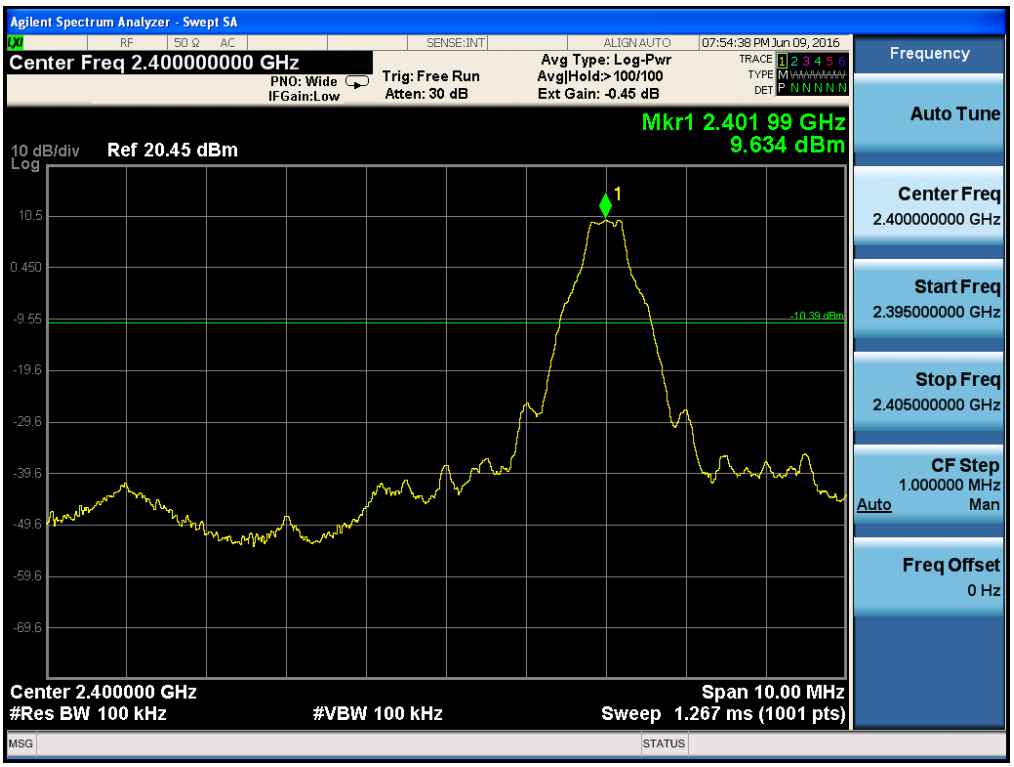
Band – edge (Hopping mode) - GFSK



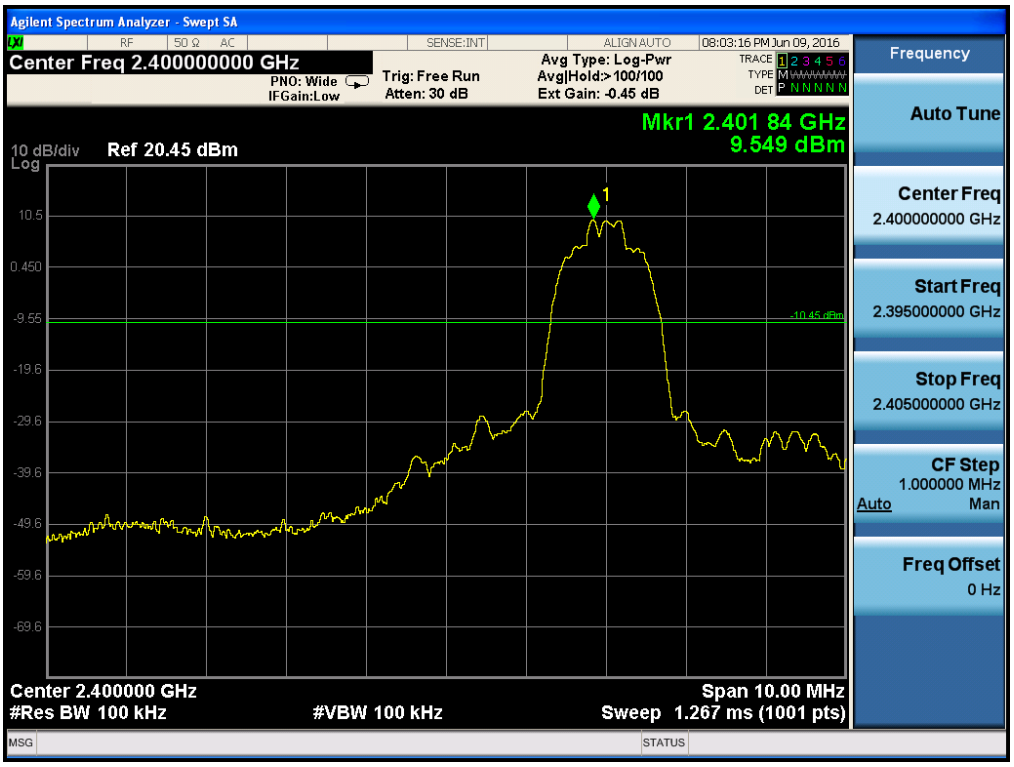
Band – edge (Hopping mode) - 8-DPSK



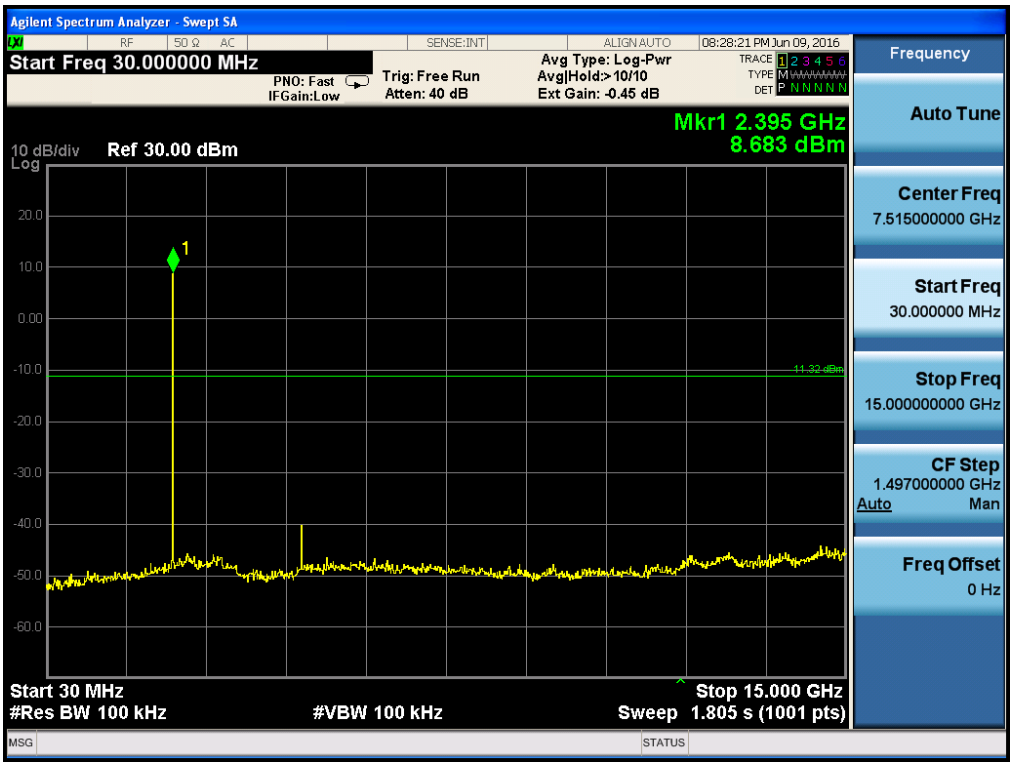
Band – edge (Non-Hopping mode) - GFSK



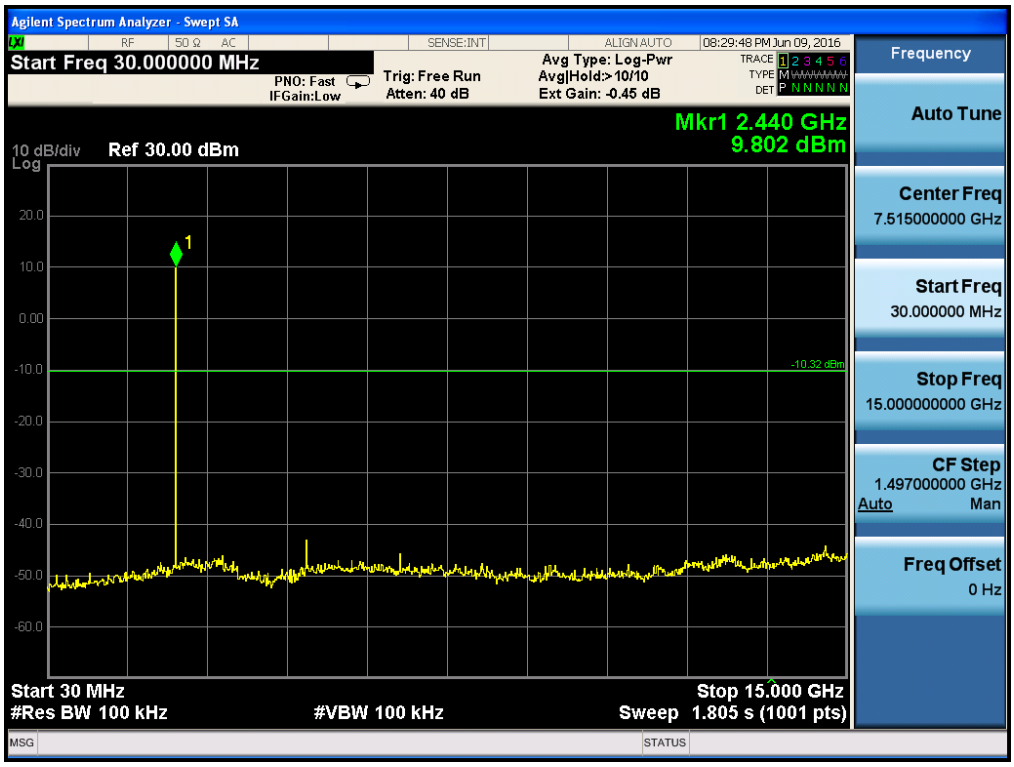
Band – edge (Non-Hopping mode) - 8-DPSK



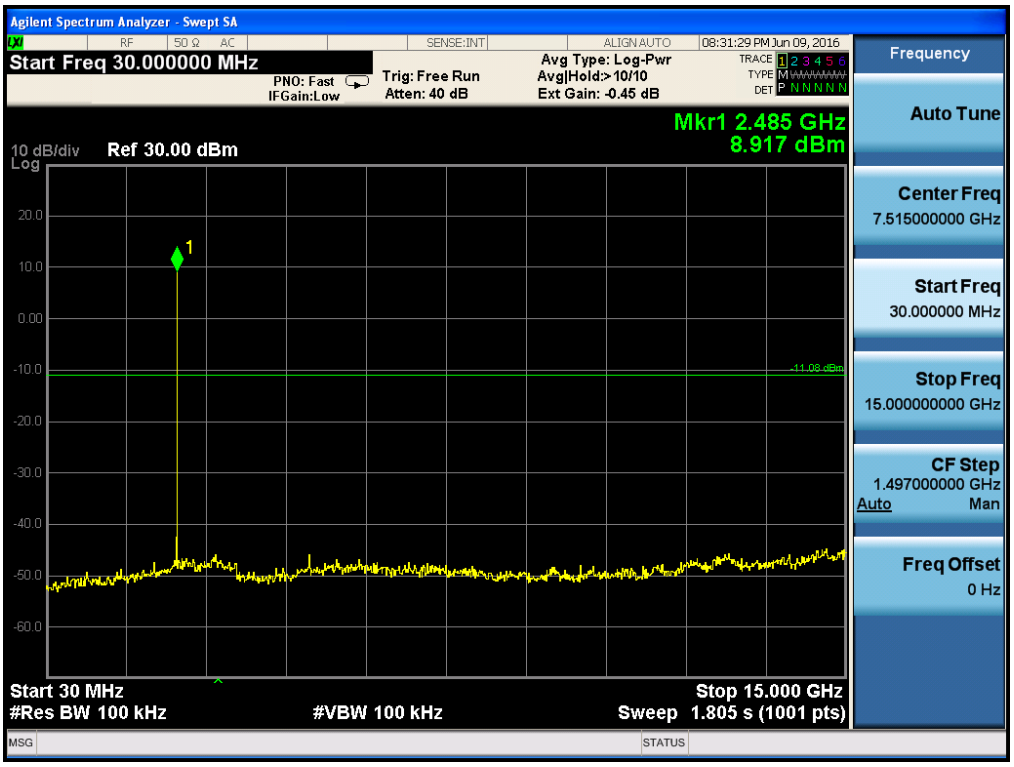
Spurious (at 20 dB blow) – Low channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : GFSK)



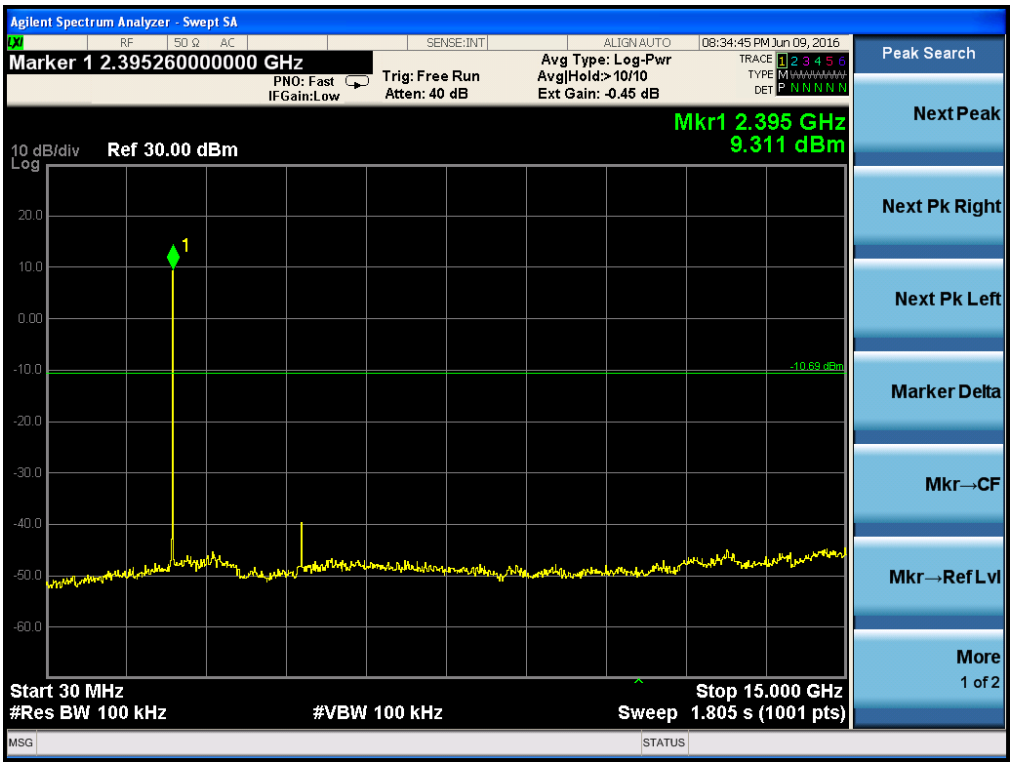
Spurious (at 20 dB blow) – Mid channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : GFSK)



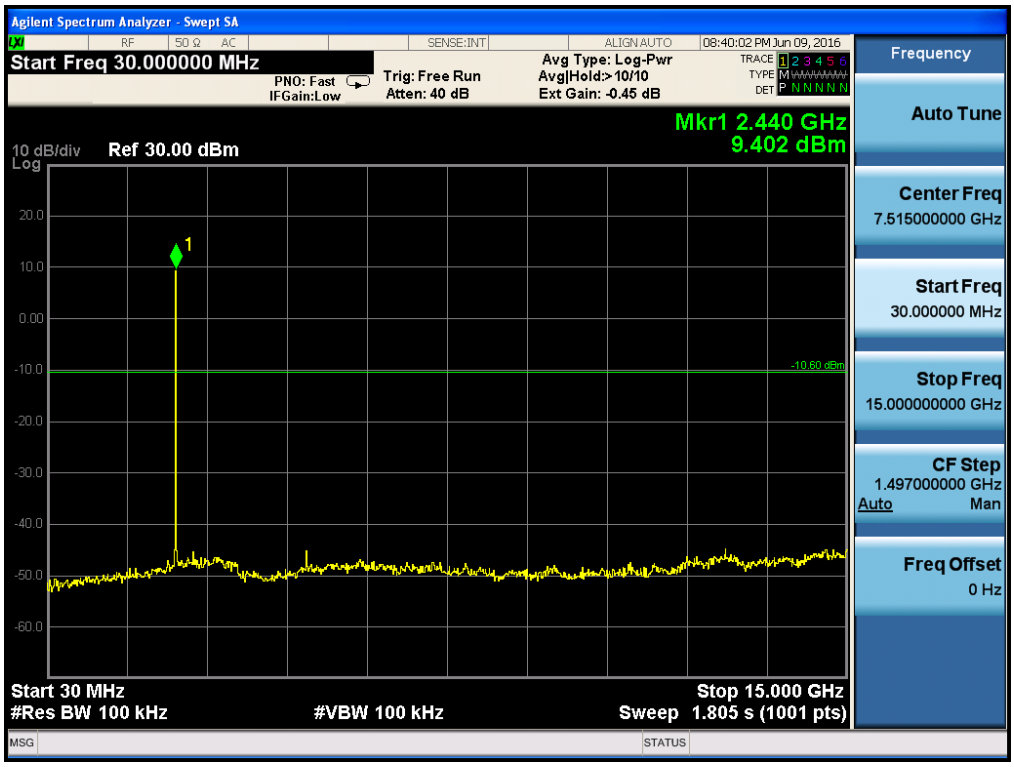
Spurious (at 20 dB blow) – High channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : GFSK)



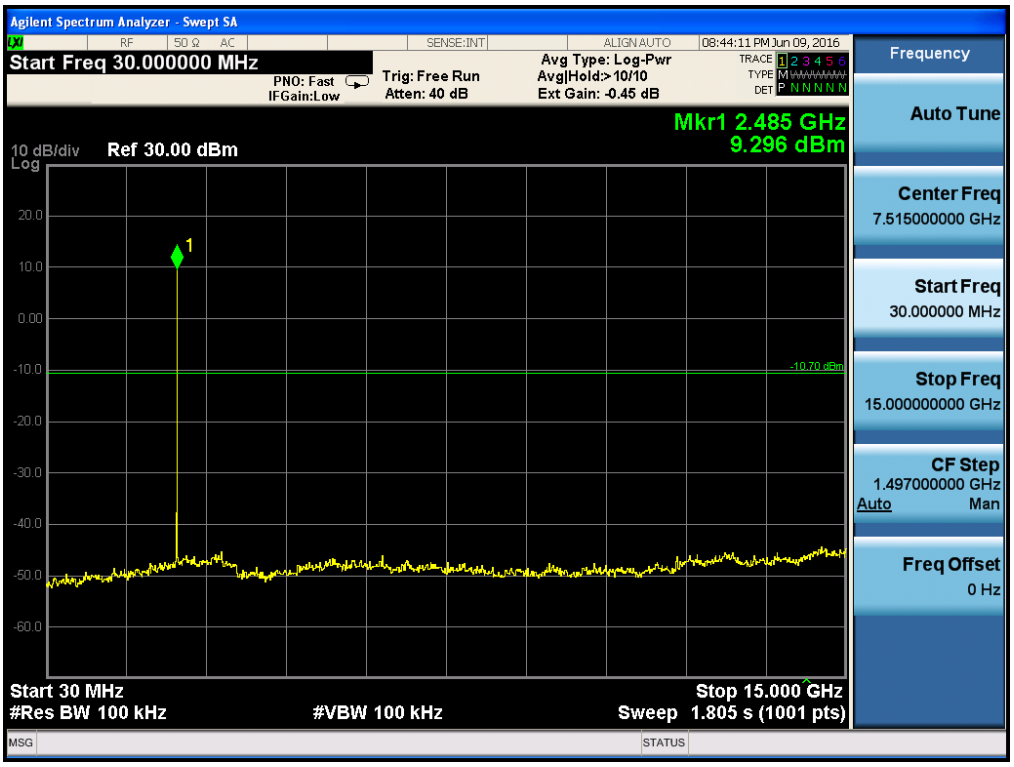
Spurious (at 20 dB blow) – Low channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : 8-DPSK)



Spurious (at 20 dB blow) – Mid channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : 8-DPSK)



Spurious (at 20 dB blow) – High channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : 8-DPSK)



2.1.7 Field Strength of Emissions

Test Location

☒ 10 m SAC (test distance : ☐ 10 m, ☒ 3 m)
☒ 3 m SAC (test distance : 3 m)

Test Procedures

1) In the frequency range of 9 kHz to 30 MHz, magnetic field is measured with Loop Antenna. The Test Antenna is positioned with its plane vertical at 1m distance from the EUT. The center of the Loop Test Antenna is 1m above the ground. During the measurement the Loop Test Antenna rotates about its vertical axis for maximum response at each azimuth about the EUT.
2) In the frequency rage above 30 MHz, Bi-Log Test Antenna(30 MHz to 1 GHz) and Horn Test Antenna(above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is carried from 1m to 4m above the ground to determine the maximum value of the field strength. The emissions levels at both horizontal and vertical polarizations should be tested.

The spectrum analyzer is set to:

Frequency Range = 9 kHz ~ 25 GHz (2.4 GHz 10^{th} harmonic)
RBW = 1 MHz for f ≥ 1 GHz, 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz
VBW ≥ RBW
Sweep = auto

Limit

§ 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	MHz	MHz	GHz
0.09-0.11	8.37626-8.38675	73-74.6	399.9-410	2690-2900	10.6-12.7
[1]0.495-0.505	8.41425-8.41475	74.8-75.2	608-614	3260-3267	13.25-13.4
2.1735-2.1905	12.29-12.293	108-121.94	960-1240	3332-3339	14.47-14.5
4.125-4.128	12.51975-12.52025	123-138	1300-1427	3345.8-3358	15.35-16.2
4.17725-4.17775	12.57675-12.57725	149.9-150.05	1435-1626.5	3600-4400	17.7-21.4
4.20725-4.20775	13.36-13.41	156.52475-156.52525	1645.5-1646.5	4500-5150	22.01-23.12
6.215-6.218	16.42-16.423	156.7-156.9	1660-1710	5350-5460	23.6-24
6.26775-6.26825	16.69475-16.69525	162.0125-167.17	1718.8-1722.2	7250-7750	31.2-31.8
6.31175-6.31225	16.80425-16.80475	167.72-173.2	2200-2300	8025-8500	36.43-36.5
8.291-8.294	25.5-25.67	240-285	2310-2390	9000-9200	[2]Above 38.6
8.362-8.366	37.5-38.25	322-335.4	2483.5-2500	9300-9500	

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

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

§ 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 :

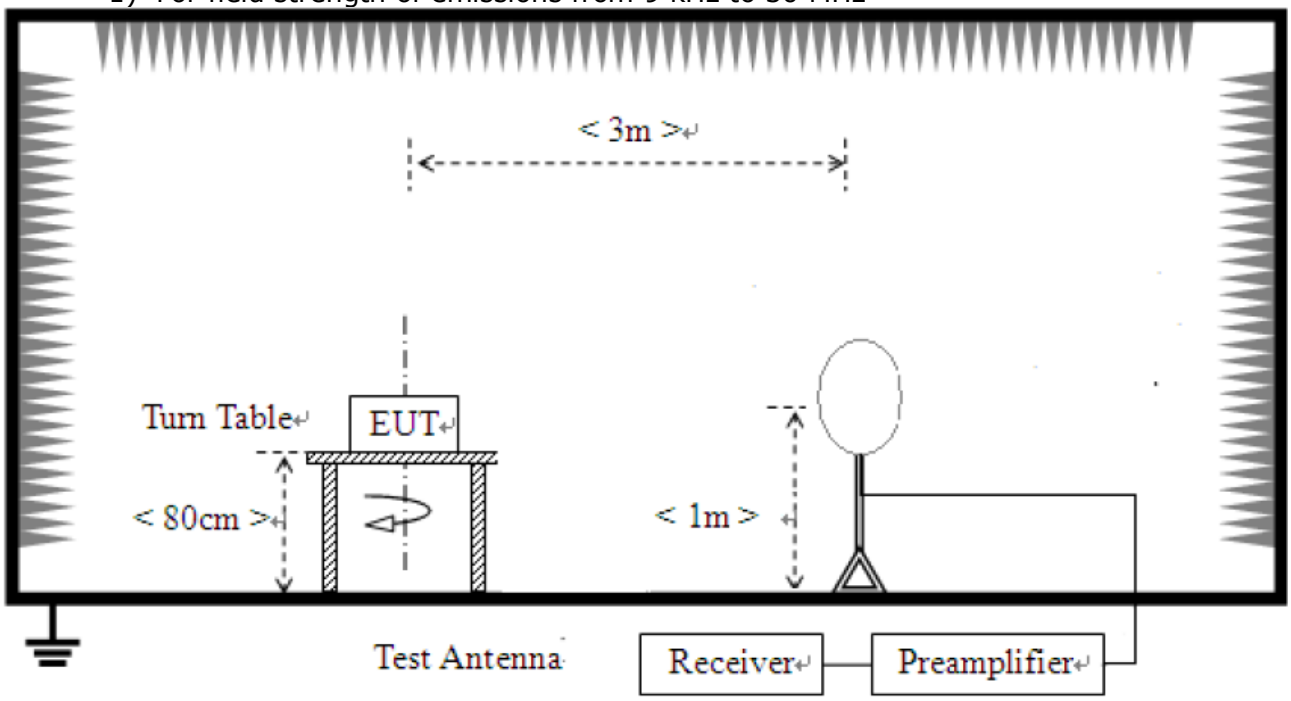
Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Deasurement Distance (meters)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	30
1.705-30	30	-	30
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

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

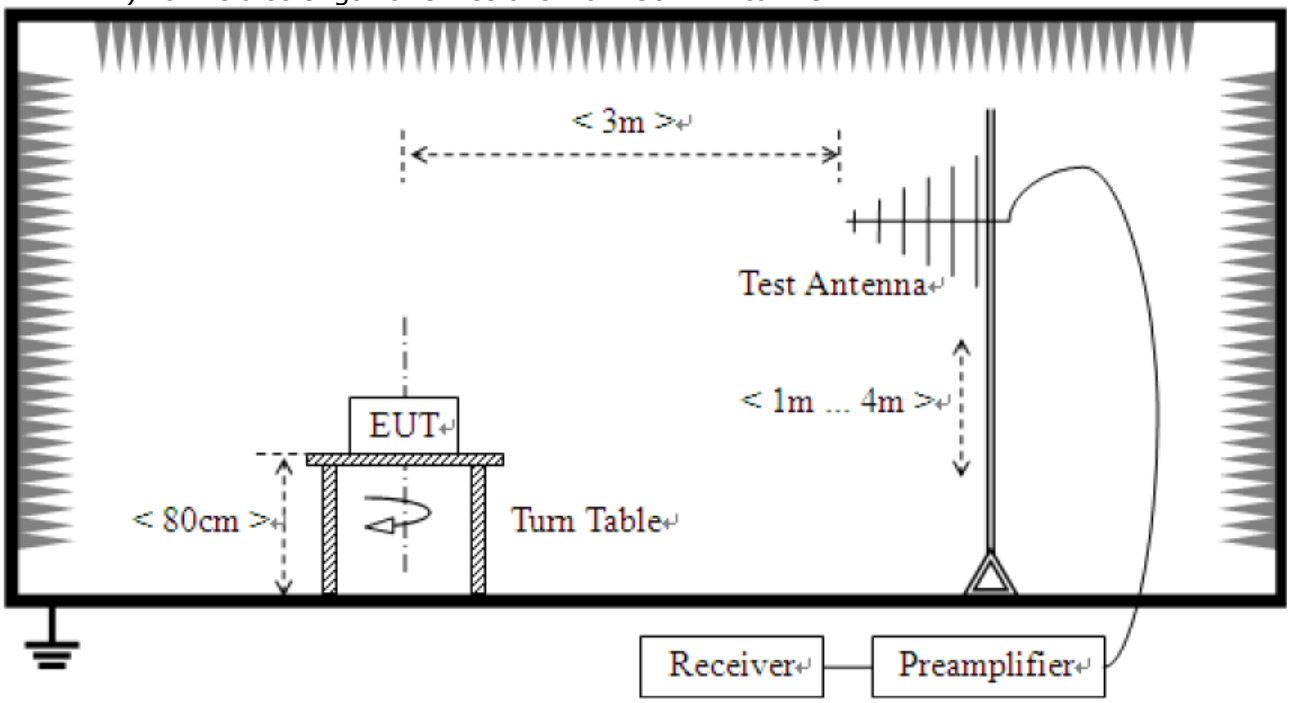
Note :
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength of harmonics : 54 dBuV/m@3m (AV) and 74 dBuV/m@3m (PK)
3) For measurement above 1GHz, the resolution bandwidth is set to 1 MHz and video bandwidth is set to 1 MHz for peak measurement and 10 Hz for average measurement.

Test Setup:

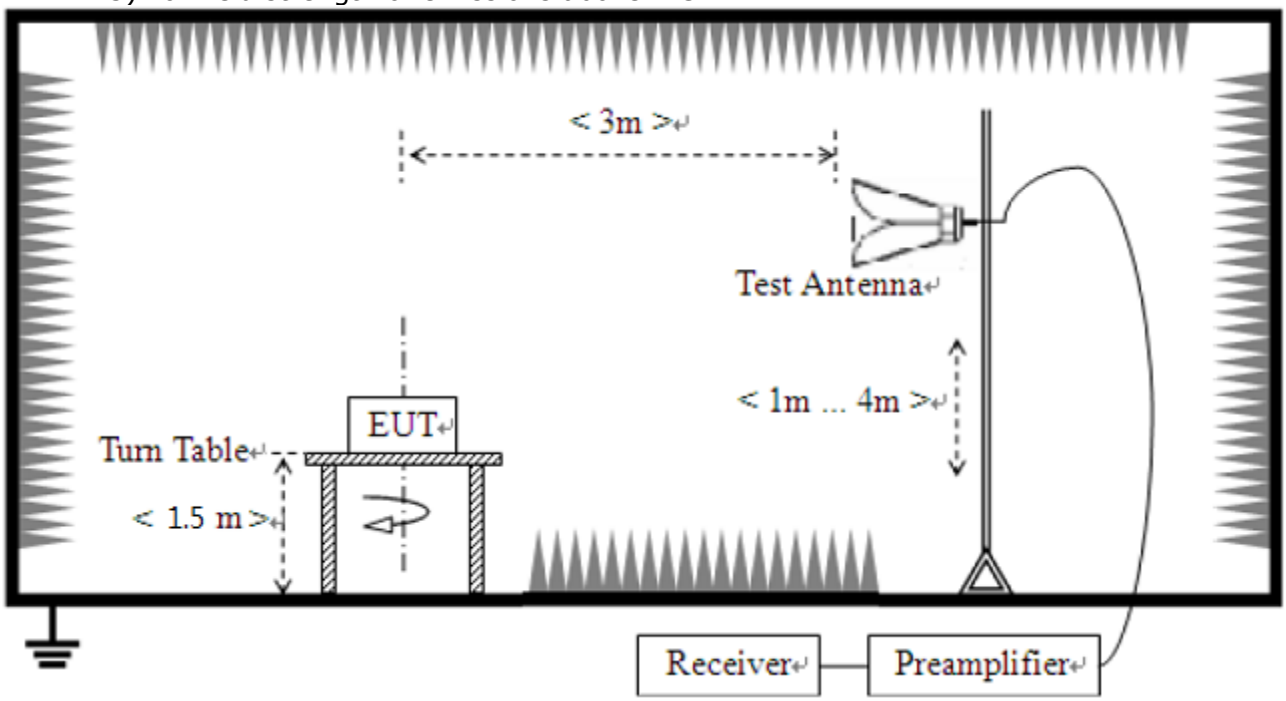
1) For field strength of emissions from 9 kHz to 30 MHz



2) For field strength of emissions from 30 MHz to 1 GHz



3) For field strength of emissions above 1 GHz



Test Results
1) 9 kHz to 30 MHz

EUT	THERMAL LABEL PRINTER
Frequency Range	9 kHz – 30 MHz
Test mode	Worst case
Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
-	-	-	See note

Note :
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB)

2) 30 MHz to 1 GHz

Test mode : Hopping(8-DPSK), CFG PKT Packet Type : 31, Packet Size : 1021(3DH5)

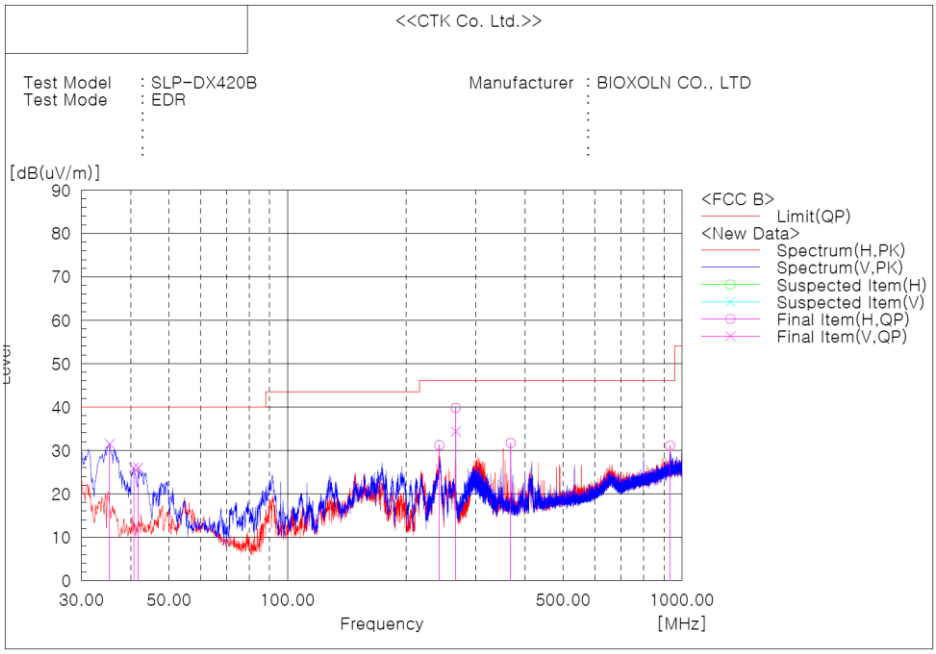
EUT	THERMAL LABEL PRINTER
Frequency Range	Below 1000 MHz
Test mode	8-DPSK(Worst case)
Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
266.68	39.8	6.2	Quasi-Peak

Test Data



Final Result

No.	Frequency [MHz]	(P)	Reading QP [dB(uV)]	c.f [dB(1/m)]	Result QP [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Angle [deg]
1	35.335	V	47.4	-15.9	31.5	40.0	8.5	205.9
2	40.670	V	41.0	-15.0	26.0	40.0	14.0	35.1
3	41.761	V	40.9	-14.9	26.0	40.0	14.0	166.0
4	242.551	H	45.1	-13.9	31.2	46.0	14.8	161.7
5	266.680	H	53.3	-13.5	39.8	46.0	6.2	310.4
6	266.680	V	47.9	-13.5	34.4	46.0	11.6	60.8
7	368.045	H	42.8	-11.1	31.7	46.0	14.3	42.5
8	933.312	H	32.7	-1.6	31.1	46.0	14.9	240.1

Remark :
1. The field strength of spurious emission was measured in the following position: EUT stand-up position(Z axis), lie-down position(X,Y axis). The worst emission was found in stand-up position(Z axis) and the worst case was recorded.
2. Result = Reading + Correction factor
3. Correction factor = Antenna factor + Cable loss + 6 dB attenuator - Amp Gain

3) above 1 GHz

EUT	THERMAL LABEL PRINTER	Measurement Detail	
Model	SLP-DX42*xy	Frequency Range	1-25GHz
Channel	Channel 0	Detector function	Average

Remarks
We have tested three mode (X, Y, Z). The worst mode (Z axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4804	52.7	1.3	Average

Test Data

Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
4804.00	46.4	60.1	V	1.5	3.7	54.0	74.0	50.1	63.8	3.9	10.2

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
4804.00	49.0	58.6	V	1.5	3.7	54.0	74.0	52.7	62.3	1.3	11.7

Restricted band edge test data

Measured frequency range : 1435-1626.5MHz, 2310-2390 MHz, 2483.5-2500 MHz

Test mode : GPSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
1601.64	54.9	56.8	V	1.5	-4.9	54.0	74.0	50.0	51.9	4.0	22.1

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak		Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
1601.60	55.1	56.8	V	1.5	-4.9	54.0	74.0	50.2	51.9	3.8	22.1

EUT	THERMAL LABEL PRINTER	Measurement Detail	
Model	SLP-DX42*xy	Frequency Range	1-25GHz
Channel	Channel 39	Detector function	Average

Remarks
We have tested three mode (X, Y, Z). The worst mode (Z axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4882	52.4	1.6	Average

Test Data

Test mode : GPSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
4882.00	48.7 / 56.4	V	1.5	3.7	54.0 / 74.0	52.4 / 60.1	1.6 / 13.9

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
4882.00	47.6 / 59.0	V	1.5	3.7	54.0 / 74.0	51.3 / 62.7	2.7 / 11.3

Restricted band edge test data

Measured frequency range : 1435-1626.5MHz, 2310-2390 MHz, 2483.5-2500 MHz

Test mode : GPSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
1627.59	55.1 / 57.0	V	1.5	-4.9	54.0 / 74.0	50.2 / 52.1	3.8 / 21.9

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak	Result [dBuV/m] AV / Peak	Margin [dB] AV / Peak
1627.80	54.9 / 56.6	V	1.5	-4.9	54.0 / 74.0	50.0 / 51.7	4.0 / 22.3

EUT	THERMAL LABEL PRINTER	Measurement Detail	
Model	SLP-DX42*xy	Frequency Range	1-25GHz
Channel	Channel 78	Detector function	Peak

Remarks
We have tested three mode (X, Y, Z). The worst mode (Z axis) for final test.

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4960	52.0	2.0	Average

Test Data

Test mode : GPSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
4960.00	48.2	55.8	V	1.5	3.8	54.0	74.0	52.0	59.6	2.0	14.4

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
4960.00	47.7	58.7	V	1.5	3.8	54.0	74.0	51.5	62.5	2.5	11.5

Restricted band edge test data

Measured frequency range : 1435-1626.5MHz, 2310-2390 MHz, 2483.5-2500 MHz

Test mode : GPSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
1653.61	54.9	56.9	V	1.5	-4.9	54.0	74.0	50.0	52.0	4.0	22.0
2483.50	43.8	63.9	V	1.5	-2.5	54.0	74.0	41.3	61.4	12.7	12.6

Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Frequency [MHz]	Reading [dBuV/m] AV / Peak	Pol.	Height [m]	Correction Factor Antenna + Amp. Gain + Cable	Limits [dBuV/m] AV / Peak		Result [dBuV/m] AV / Peak		Margin [dB] AV / Peak	
1653.60	55.5	57.3	V	1.5	-4.9	54.0	74.0	50.6	52.4	3.4	21.6
2483.50	51.6	70.8	V	1.5	-2.5	54.0	74.0	49.1	68.3	4.9	5.7

2.1.8 AC Conducted Emissions

Test Location
Shielded Room

Frequency Range of Measurement
150 kHz to 30 MHz

Instrument Settings
IF Band Width: 9 kHz

Test Procedures
The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m.
Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit
- **15.207(a)**

Frequency (MHz)	Conducted Limit (dBuV)	
	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.

Test Results
The requirements are:

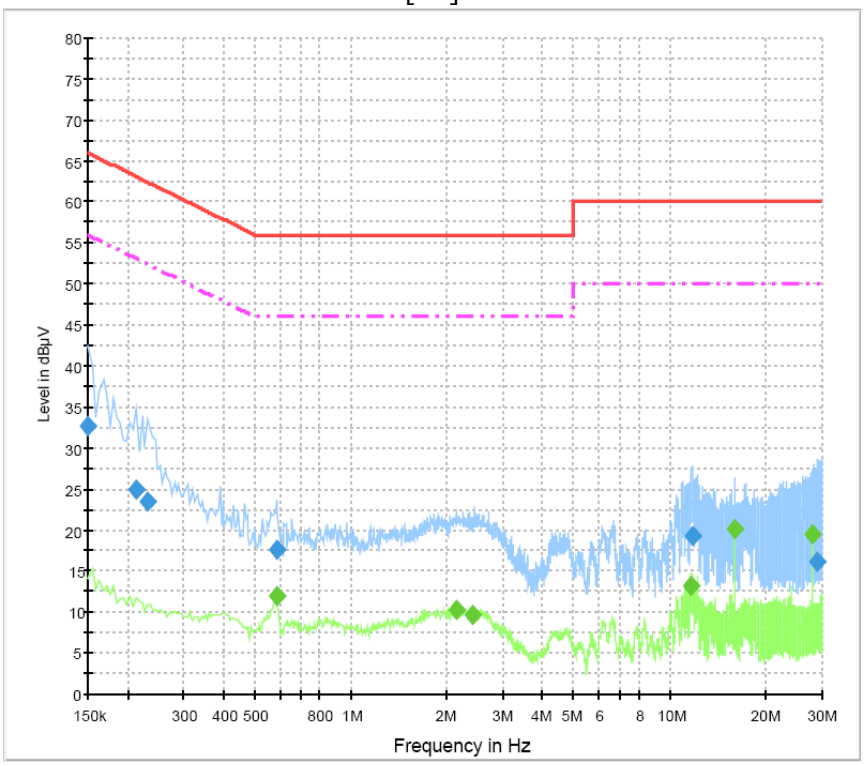
☒ Complies

Test mode : Hopping, GFSK(Worst case),
CFG PKT Packet Type : 15, Packet Size : 339(DH5)

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
15.999	20.3	29.7	Average

Test Data

[L1]



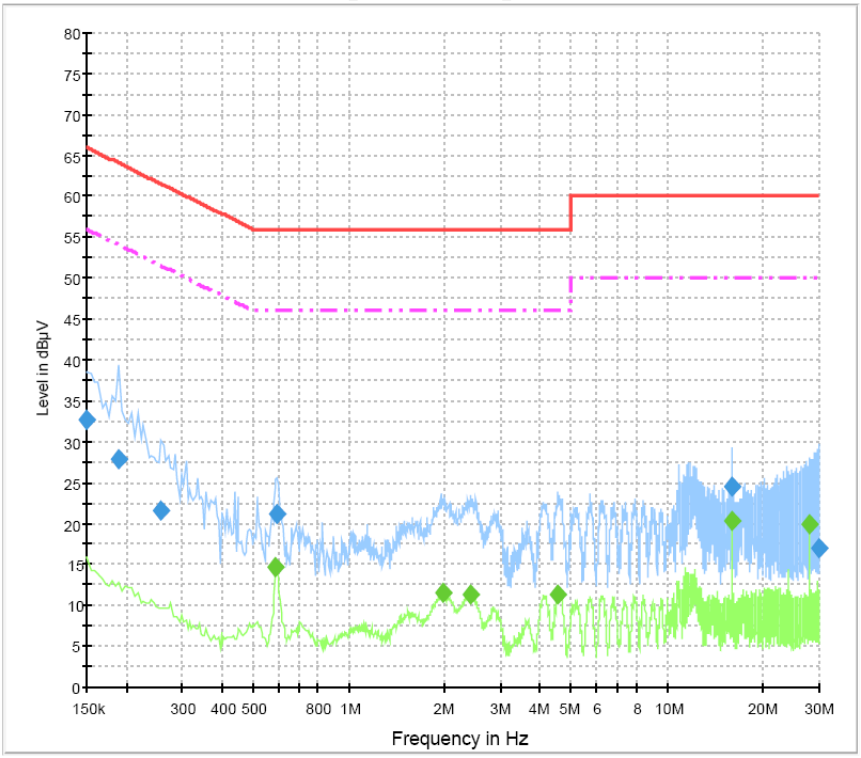
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	32.8	1000.0	9.000	On	L1	9.7	33.2	66.0
0.213000	25.0	1000.0	9.000	On	L1	9.8	38.1	63.1
0.231000	23.4	1000.0	9.000	On	L1	9.7	39.0	62.4
0.586500	17.7	1000.0	9.000	On	L1	9.9	38.3	56.0
11.742000	19.3	1000.0	9.000	On	L1	9.8	40.7	60.0
29.103000	16.2	1000.0	9.000	On	L1	9.9	43.8	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.586500	11.9	1000.0	9.000	On	L1	9.9	34.1	46.0
2.134500	10.2	1000.0	9.000	On	L1	9.7	35.8	46.0
2.422500	9.7	1000.0	9.000	On	L1	9.7	36.3	46.0
11.638500	13.1	1000.0	9.000	On	L1	9.8	36.9	50.0
15.999000	20.1	1000.0	9.000	On	L1	9.9	29.9	50.0
28.000500	19.5	1000.0	9.000	On	L1	9.9	30.5	50.0

[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	32.6	1000.0	9.000	On	N	9.7	33.4	66.0
0.190500	27.8	1000.0	9.000	On	N	9.8	36.2	64.0
0.258000	21.5	1000.0	9.000	On	N	9.6	40.0	61.5
0.595500	21.1	1000.0	9.000	On	N	9.9	34.9	56.0
15.999000	24.5	1000.0	9.000	On	N	9.9	35.5	60.0
29.850000	16.9	1000.0	9.000	On	N	10.1	43.1	60.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.591000	14.6	1000.0	9.000	On	N	9.9	31.4	46.0
1.968000	11.5	1000.0	9.000	On	N	9.7	34.5	46.0
2.413500	11.2	1000.0	9.000	On	N	9.7	34.8	46.0
4.551000	11.2	1000.0	9.000	On	N	9.7	34.8	46.0
15.999000	20.3	1000.0	9.000	On	N	9.9	29.7	50.0
28.000500	19.9	1000.0	9.000	On	N	10.0	30.1	50.0

2.1.9 Frequency Hopping System Requirements

Standard Applicable

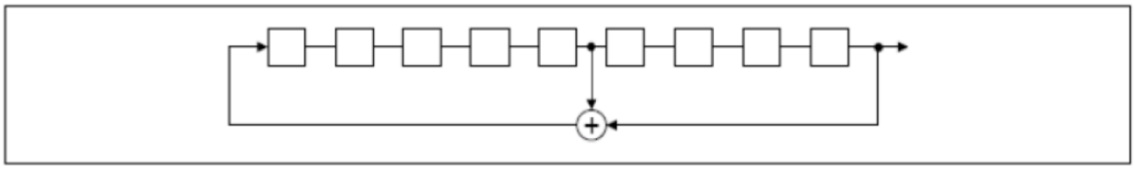
According to FCC Part 15.247(a)(1), The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudo randomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

(g) Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

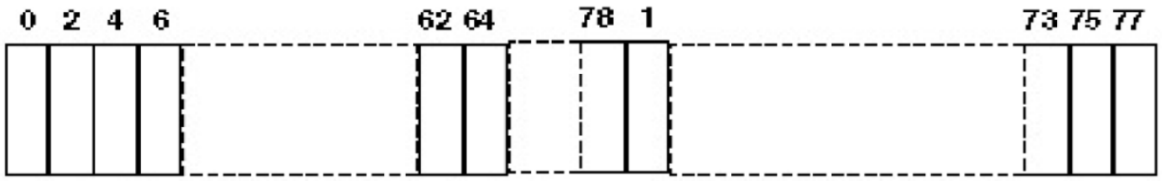
(h) The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hopsets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

EUT Pseudorandom Frequency Hopping Sequence

The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage, and the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones. Number of shift register stages: 9 Length of pseudo-random sequence: 29-1 = 511 bits Longest sequence of zeros: 8 (non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence



Each frequency used equally on the average by each transmitter. The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

Frequency Hopping System

This transmitter device is frequency hopping device, and complies with FCC part 15.247 rule. This device uses Bluetooth radio which operates in 2400-2483.5 MHz band. Bluetooth uses a radio technology called frequency-hopping spread spectrum, which chops up the data being sent and transmits chunks of it on up to 79 bands (1 MHz each; centred from 2402 to 2480 MHz) in the range 2,400-2,483.5 MHz. The transmitter switches hop frequencies 1,600 times per second to assure a high degree of data security. All Bluetooth devices participating in a given piconet are synchronized to the frequency-hopping channel for the piconet. The frequency hopping sequence is determined by the master's device address and the phase of the hopping sequence (the frequency to hop at a specific time) is determined by the master's internal clock. Therefore, all slaves in a piconet must know the master's device address and must synchronize their clocks with the master's clock.

Adaptive Frequency Hopping (AFH) was introduced in the Bluetooth specification to provide an effective way for a Bluetooth radio to counteract normal interference. AFH identifies "bad" channels, where either other wireless devices are interfering with the Bluetooth signal or the Bluetooth signal is interfering with another device. The AFH-enabled Bluetooth device will then communicate with other devices within its piconet to share details of any identified bad channels. The devices will then switch to alternative available "good" channels, away from the areas of interference, thus having no impact on the bandwidth used.

*Example for a Bluetooth device using channel numbers would be :
Ch 44, 35, 78, 03, 15, 21, 76, 40, 56, 13, 02, 19, 67, 39, 78, 20, 21, 64, 75 etc.

2.1.10 RF Exposure evaluation

Requirement

This device belongs to Mobile device. The definition of the category as following:

Mobile Derives:
CFR Title 47 §2.1091(b)
(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

Limits

According to FCC Part 1.1307, systems operating under the provisions of this section shall be operated in a manner the ensures that the public is not exposed to radio frequency energy level in excess of the commission's guidelines.

Limits for General Population/Uncontrolled Exposure			
Frequency range (MHz)	**Electric field strength (V/m)**	**Magnetic field strength (A/m)**	**Power density (mW/cm^2)**
0.3-1.34	614	1.63	*100
1.34-30	824/f	2.19/f	$*180/f^2$
30-300	27.5	0.073	0.2
300-1,500			f/1500
1,500-100,000			**1.0**

f = frequency in MHz, * = Plane-wave equivalent power density

MPE Calculation formula

$$S=PG / 4\pi R^2$$

S = Power density
P = Output Power(W)
G = Power gain of the antenna in the direction of interest relative to an isotropic radiator
R = Separation distance between radiator and human body(m)

Result

Maximum peak output power at antenna input terminal(dBm): 9.846
Maximum peak output power at antenna input terminal(mW): 9.652
Prediction distance(cm): 20
Predication frequency(MHz): 2480
Antenna Gain (typical) (dBi): 0
Power density at predication frequency at 20 cm(mW/cm^2): **0.002**
MPE limit for RF exposure at prediction frequency(mW/cm^2): 1

APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	MXA Signal Analyzer	Agilent	N9020A	MY50510324	2016-03-11	2017-03-11
2	Spectrum Analyzer	Rohde & Schwarz	FSP	100401	2016-05-13	2017-05-13
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2015-11-02	2016-11-02
4	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2015-11-02	2016-11-02
5	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2016-05-14	2017-05-14
6	Bilog Antenna	Schaffner	CBL6111C	2551	2015-04-24	2017-04-24
7	Double Ridged Guide Antenna	ETS-Lindgren	3116	00062916	2015-09-04	2017-09-04
8	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-05-25	2018-05-25
9	Attenuator	Rohde & Schwarz	DNF	272.4110.50-2	2015-11-03	2016-11-03
10	PREAMPLIFIER	Agilent	8449B	3008A02307	2015-10-01	2016-10-01
11	AMPLIFIER	Sonoma Instrument Co.	310	291721	2016-02-11	2017-02-11
12	Band Reject Filter	Wainwright Instruments GmbH	WRCGV 2400/2483-2375/2505-50/10EE	2	2016-05-13	2017-05-13
13	Signal Generator	Rohde & Schwarz	SMB100A	175528	2016-01-20	2017-01-20
14	LISN	Rohde & Schwarz	ENV216	101760	2016-02-05	2017-02-05
15	DC Power Supply	Agilent	E3632A	MY40011638	2015-11-02	2016-11-02