TEST REPORT For FCC

FCC Standards : FCC 47CFR part 15 subpart C

Test Report No.	:	CTK-2015-00538
Date of Issue	:	2015-05-10
FCC ID	:	2AAJPB100S
Basic Model/Type No.	:	B100S
Kind of Product	:	Bluetooth Speaker
Applicant	:	Hansol Technics Co., Ltd.
Applicant Address	:	55, Hansam-ro, Deoksan-myeon, Jincheon-gun, Chungcheongbuk-do, Korea
Manufacturer	:	Hansol Technics Co., Ltd.
Manufacturer Address	:	55, Hansam-ro, Deoksan-myeon, Jincheon-gun, Chungcheongbuk-do, Korea
Contact Person	:	Weon-Seo Lee / Senior Engineer
Telephone	:	+82–43-530-8554
Received Date	:	2015-03-27
Test period	:	Start : 2015-04-14 End : 2015-04-30
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: 2015-05-10

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: 2015-05-10

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REPORT REVISION HISTORY

Date	Revision	Page No
2015-05-10	Issued (CTK-2015-00538)	All

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1.0 General Product Description

Equipment model name	B100S
Serial number	Prototype
EUT condition	Pre-production, not damaged
Antenna type	Chip antenna Gain 3.4 dBi
Frequency Range	2402 MHz - 2480 MHz
RF power	-3.130 dBm Peak Conducted (GFSK) -3.318 dBm Peak Conducted (π/4 DQPSK) -2.872 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 3.7 V (Rechargeable Lithium Polymer Battery)

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 mode 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

Power Supply type	Remark
Battery only	Worst case
Battery & Wireless Charging	

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1.3 Model Differences

The following modifications were necessary for compliance:

Not applicable

1.4 Device Modifications

The following modifications were necessary for compliance:

Not applicable

1.5 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
BLUETOOTH TESTER	TESCOM	TC-3000C	3000C000377

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.

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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	
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	

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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 C63.4-2009

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

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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 = 30 kHz (≥ RBW) Detector function = peak
Trace = max hold

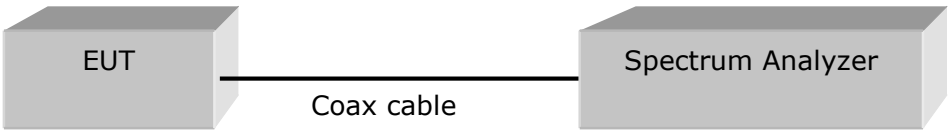

Figure 1 : Measurement setup for the carrier frequency separation

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	990.0	626.3	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	990.0	840.0	25	Complies

See next pages for actual measured spectrum plots.

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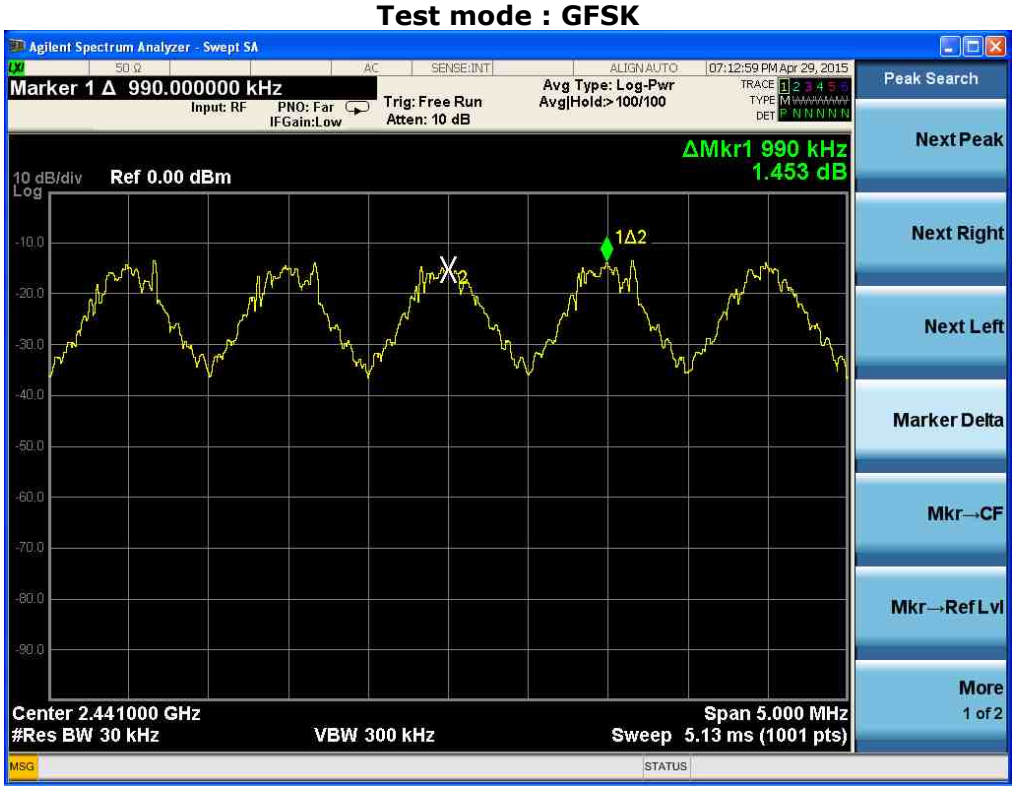
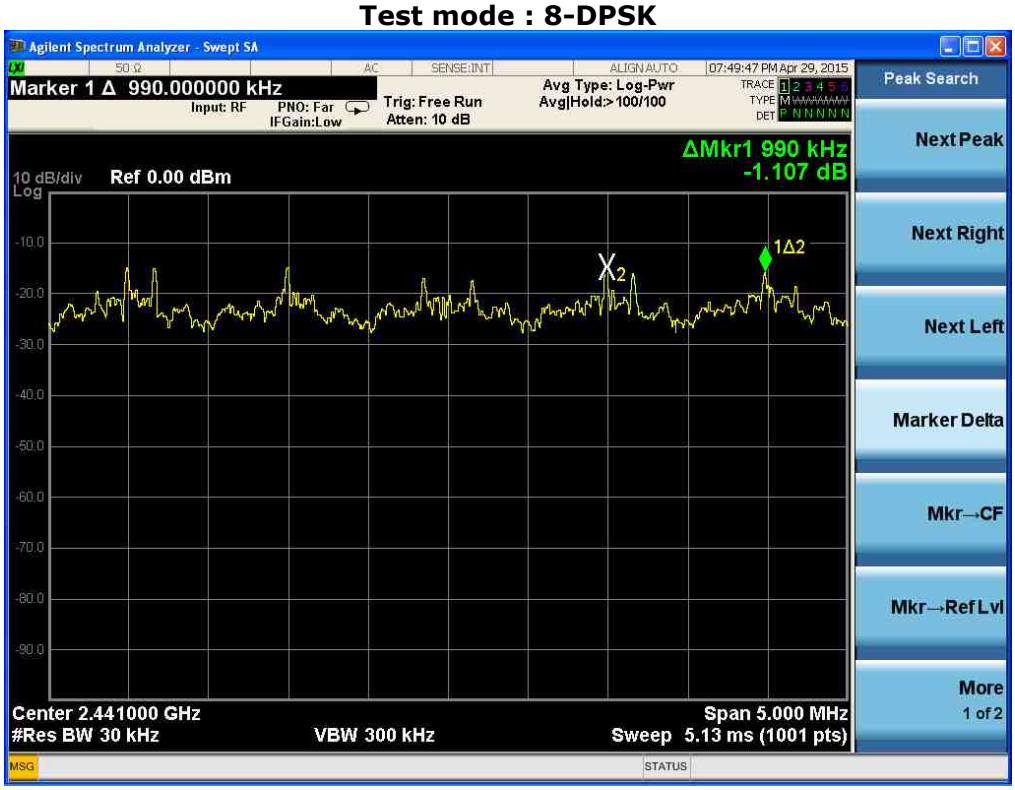
Carrier Frequency Separation

Test mode : GFSK



Test mode : 8-DPSK



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2.1.2 Number of Hopping Frequencies

Test Location

RF Test Room

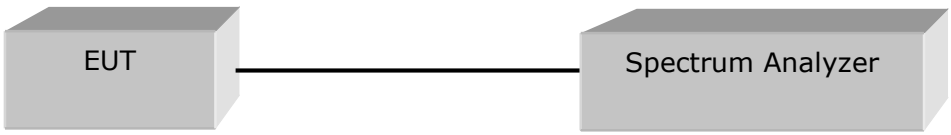
Test Procedures

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)
VBW = 300 kHz (≥ RBW)
Trace = max hold
Sweep = auto
Detector function = peak



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.

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Number of Hopping Frequencies(GFSK)

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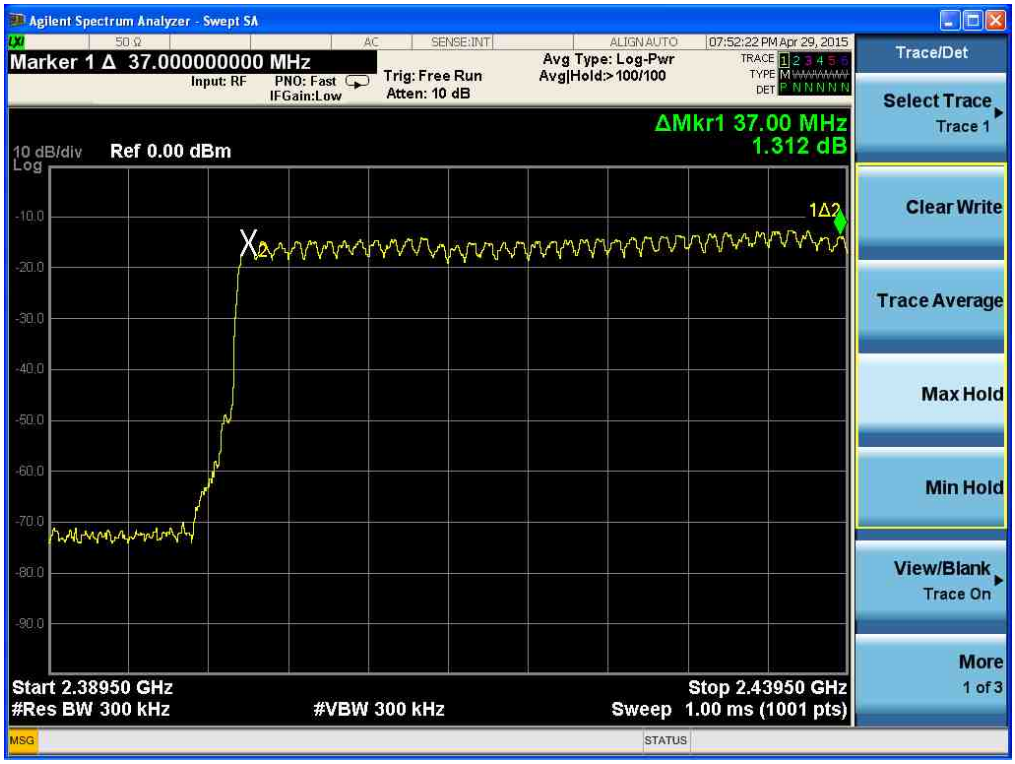
Number of Hopping Frequencies(8-DPSK)



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2.1.3 20 dB bandwidth

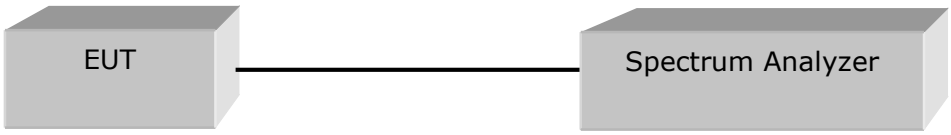
Test Location

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

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Test Results

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

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	0.948	Complies
2441	39	0.939	Complies
2480	78	0.937	Complies

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

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	1.261	Complies
2441	39	1.260	Complies
2480	78	1.261	Complies

See next pages for actual measured spectrum plots.

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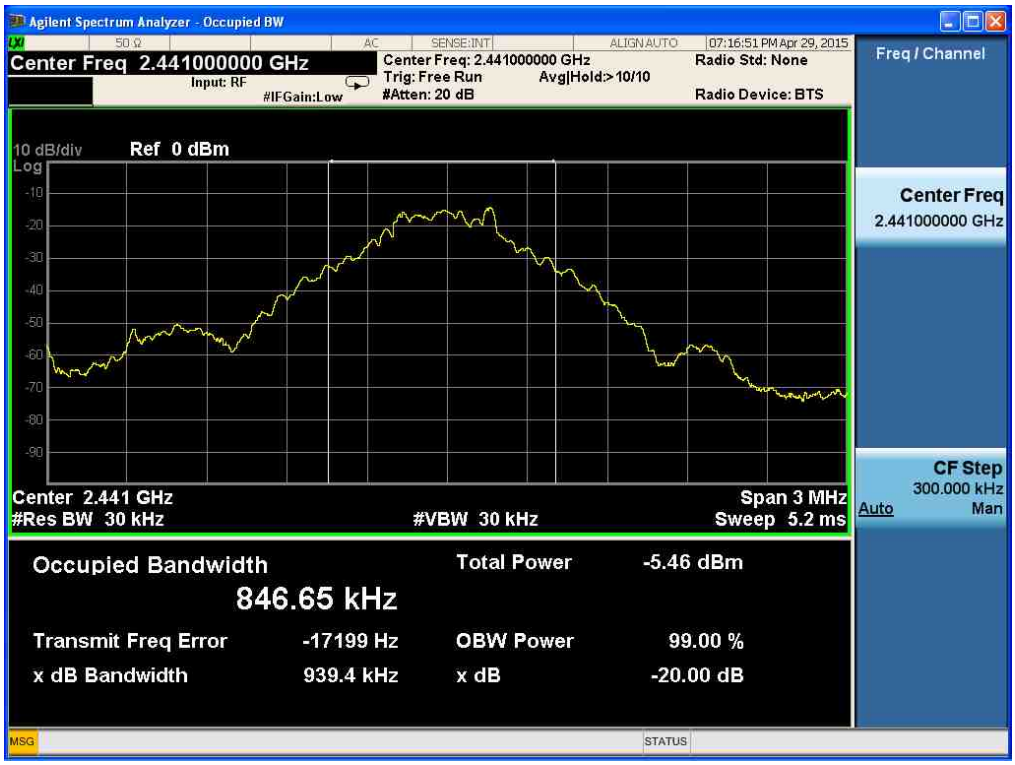
20 dB Bandwidth - GFSK



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20 dB Bandwidth - 8-DPSK

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2.1.4 Time of Occupancy (Dwell Time)

Test Location

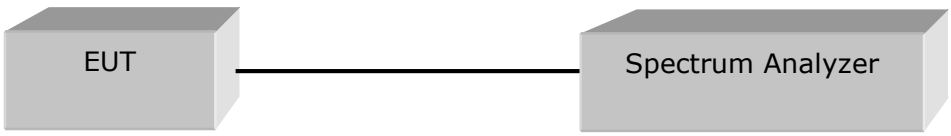
RF Test Room

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 B100S has 3 type of payload, DH1, DH3, DH5. The hopping rate is 1600 per second.

<u>The spectrum analyzer is set to:</u>
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.

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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	0.380	121.6	Complies
	DH 3	1.635	261.6	Complies
	DH 5	2.880	307.2	Complies

DH1 Dwell time = 0.380 ms × (1600÷2) ÷ 79 × 31.6 = 121.6 ms
DH3 Dwell time = 1.635 ms × (1600÷4) ÷ 79 × 31.6 = 261.6 ms
DH5 Dwell time = 2.880 ms × (1600÷6) ÷ 79 × 31.6 = 307.2 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	0.400	128.0	Complies
	3DH 3	1.650	264.0	Complies
	3DH 5	2.880	307.2	Complies

DH1 Dwell time = 0.400 ms × (1600÷2) ÷ 79 × 31.6 = 128.0 ms
DH3 Dwell time = 1.650 ms × (1600÷4) ÷ 79 × 31.6 = 264.0 ms
DH5 Dwell time = 2.880 ms × (1600÷6) ÷ 79 × 31.6 = 307.2 ms

See next pages for actual measured spectrum plots.

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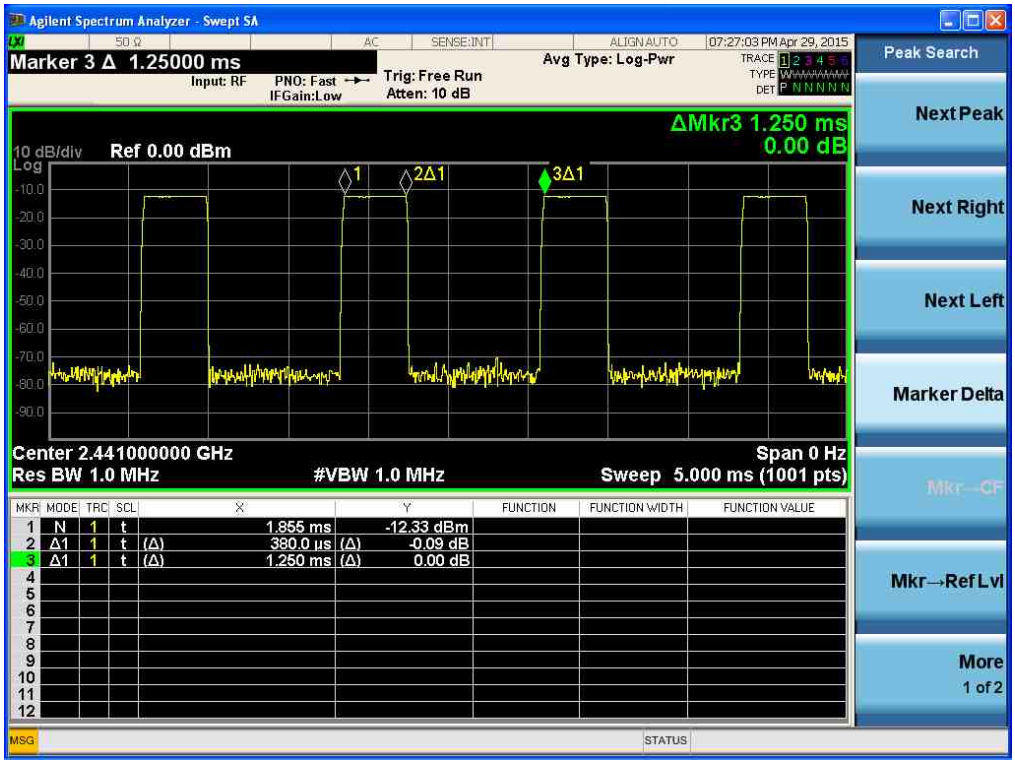
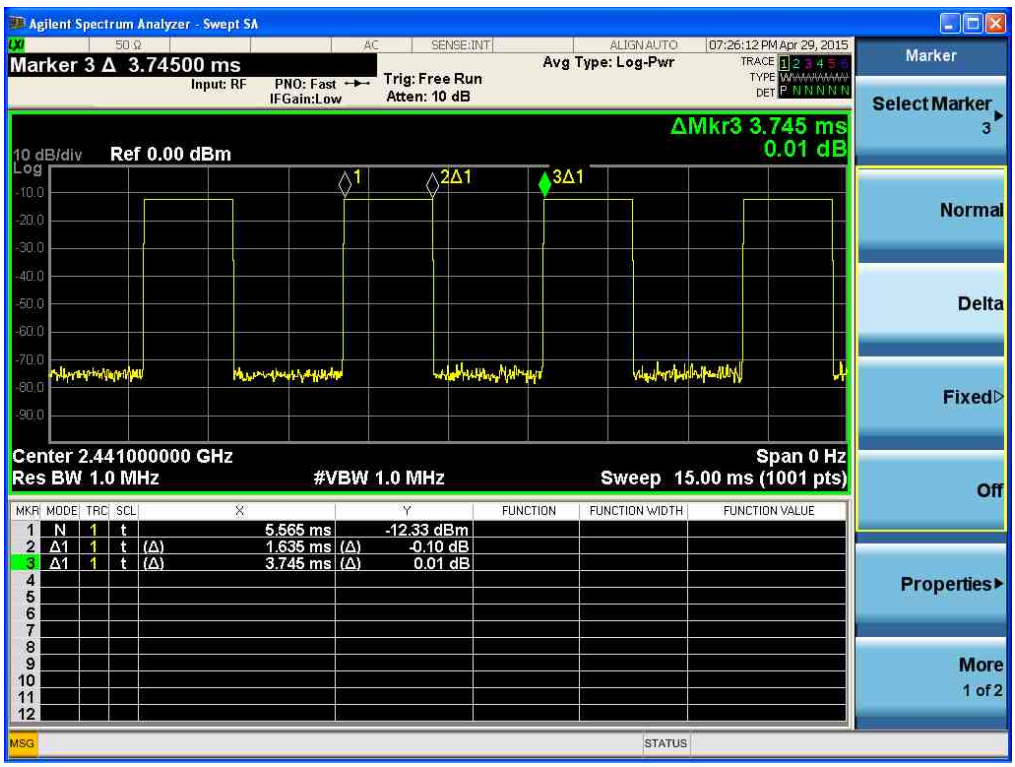
Time of Occupancy for PACKET Type DH1(GFSK)



Time of Occupancy for PACKET Type DH3(GFSK)



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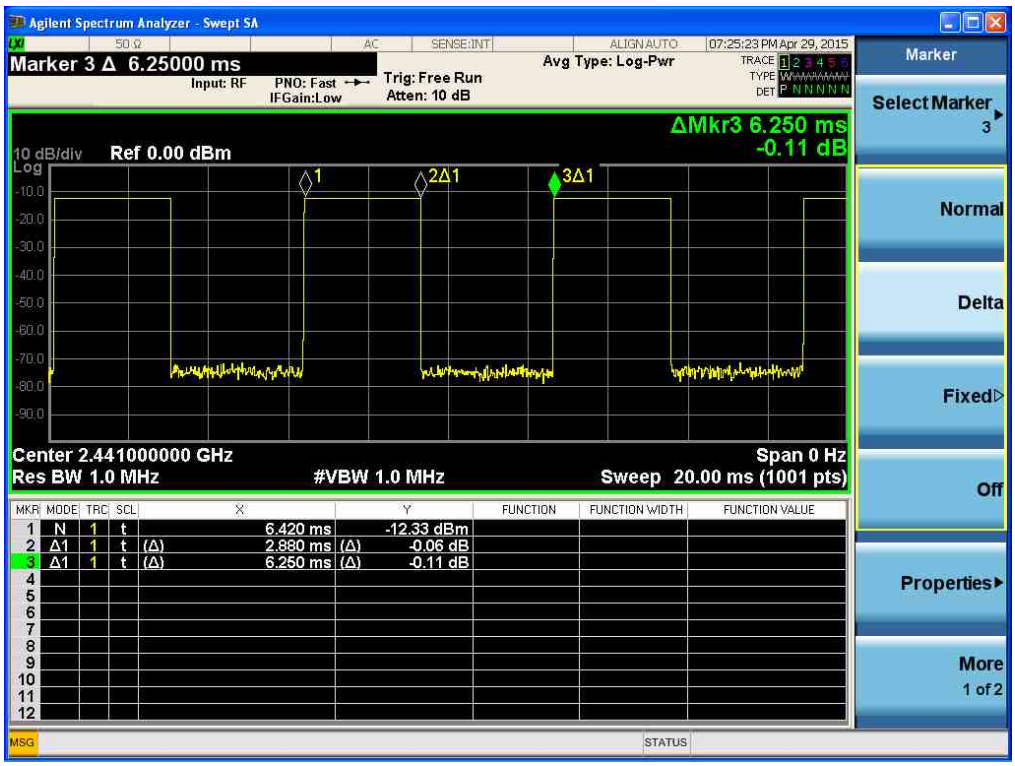
Time of Occupancy for PACKET Type DH5(GFSK)



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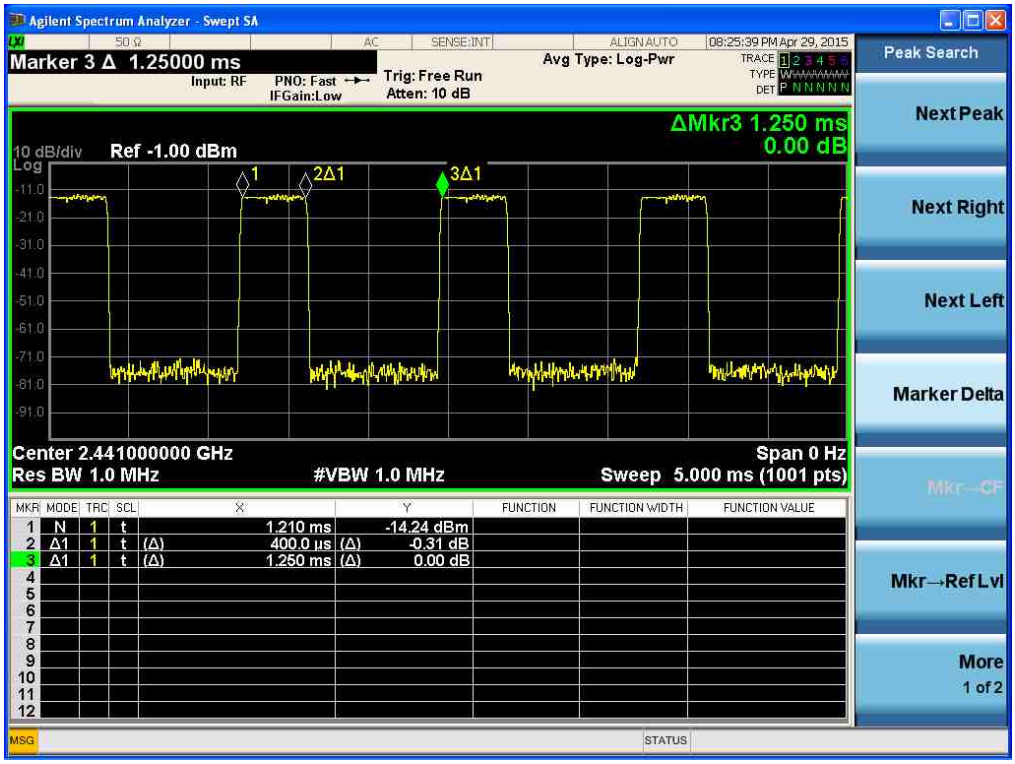
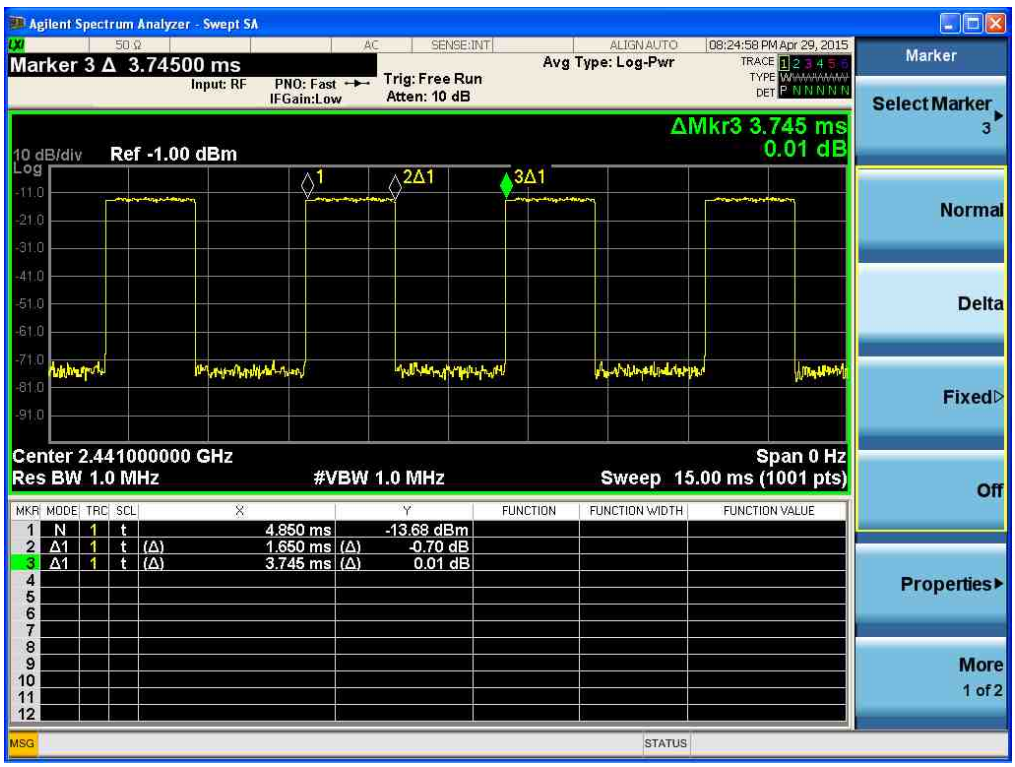
Time of Occupancy for PACKET Type 3DH1(8-DPSK)



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



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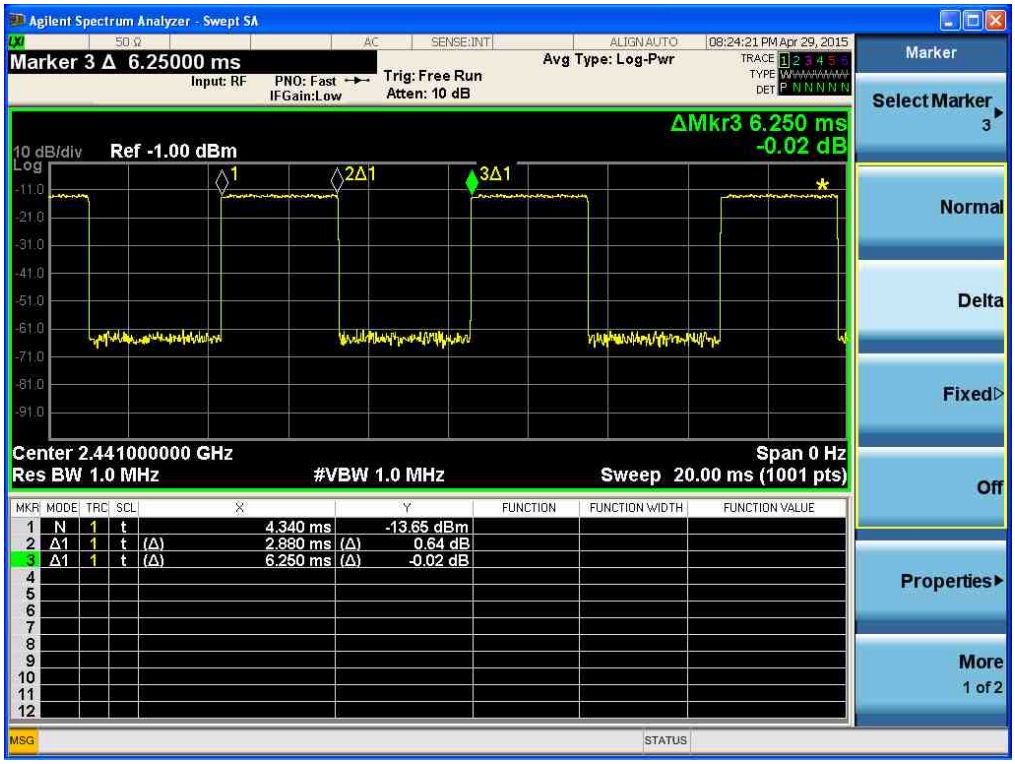
Time of Occupancy for PACKET Type 3DH5(8-DPSK)



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2.1.5 Maximum peak Conducted Output Power

Test Location

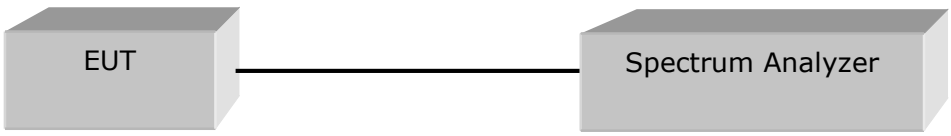
RF Test Room

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.

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Test Results

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

Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result
2402	0	-5.247	0.299	Complies
2441	39	-4.003	0.398	Complies
2480	78	-3.130	0.486	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	-5.678	0.271	Complies
2441	39	-4.218	0.379	Complies
2480	78	-3.318	0.466	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	-5.165	0.304	Complies
2441	39	-3.737	0.423	Complies
2480	78	-2.872	0.516	Complies

See next pages for actual measured spectrum plots.

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Maximum peak Conducted Output Power - GFSK

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Maximum peak Conducted Output Power - π/4 DQPSK

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Maximum peak Conducted Output Power - 8-DPSK

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2.1.6 RF Conducted Emissions

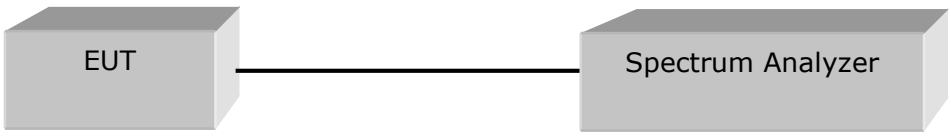
Test Location

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.

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Band – edge (Hopping mode) - GFSK

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Band – edge (Hopping mode) - 8-DPSK

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Band – edge (Non-Hopping mode) - GFSK

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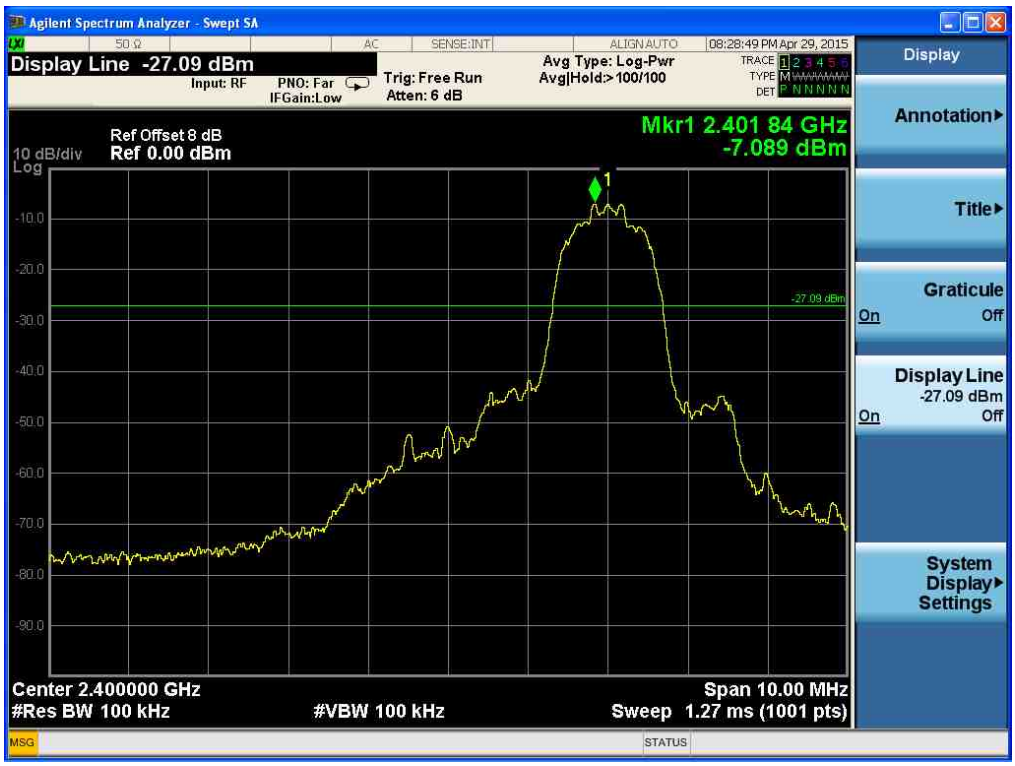
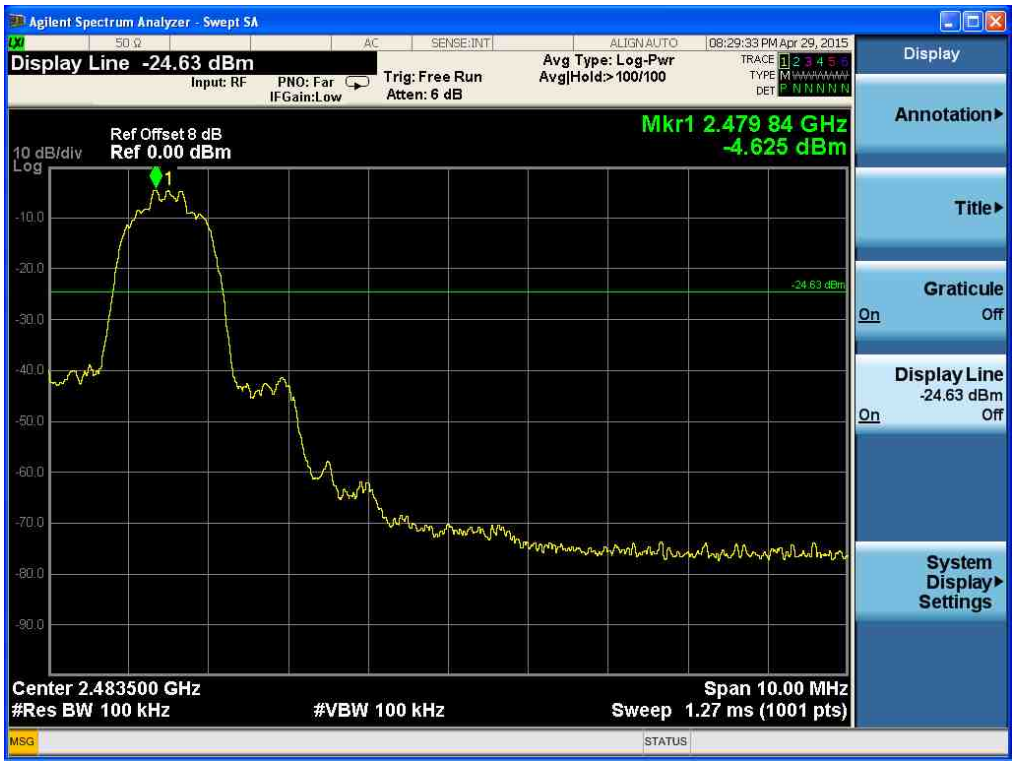
Band – edge (Non-Hopping mode) - 8-DPSK





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

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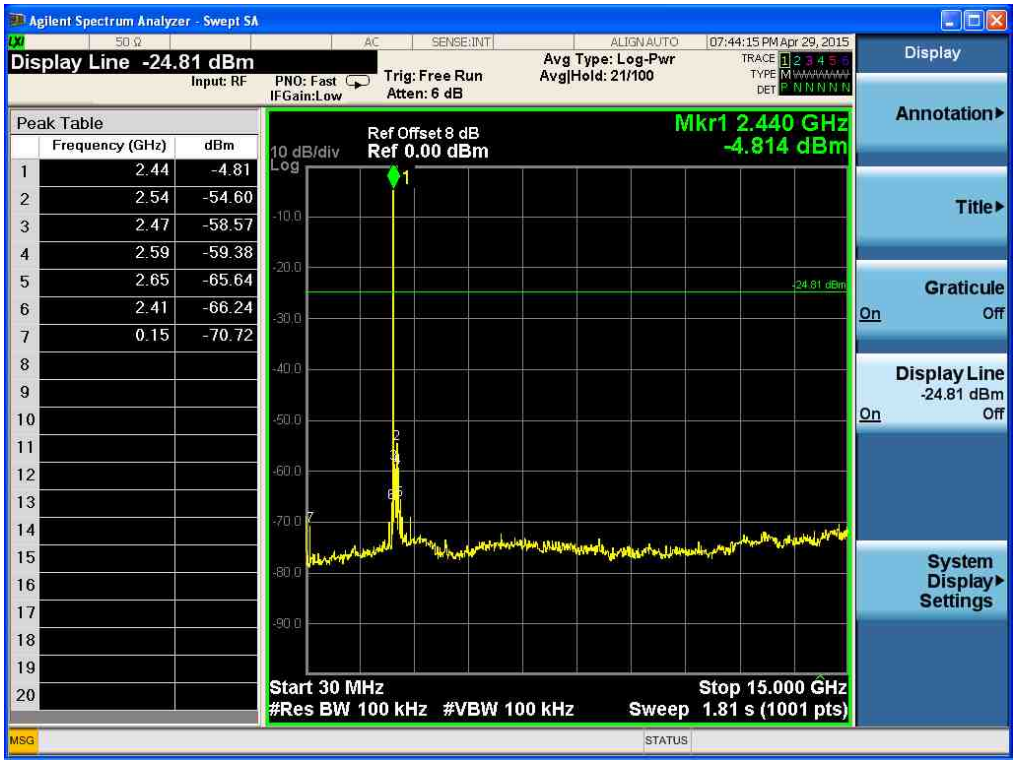
Spurious (at 20 dB blow) – Mid channel
Frequency Range = 30 MHz ~ 10th harmonic
(Test mode : GFSK)



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

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

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

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

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2.1.7 Other requirements Frequency Hopping Spread Spectrum System

Test Requirement :	47 CFR Part 15C Section 15.247 (a)(1), (h) requirement :

The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom 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 bandwidth of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

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.

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.

Example of a 79 hopping sequence in data mode:

20	62	46	77		7	64		8	73		16	75	1

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2.1.8 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.

<u>The spectrum analyzer is set to:</u>

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

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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.

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§ 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.

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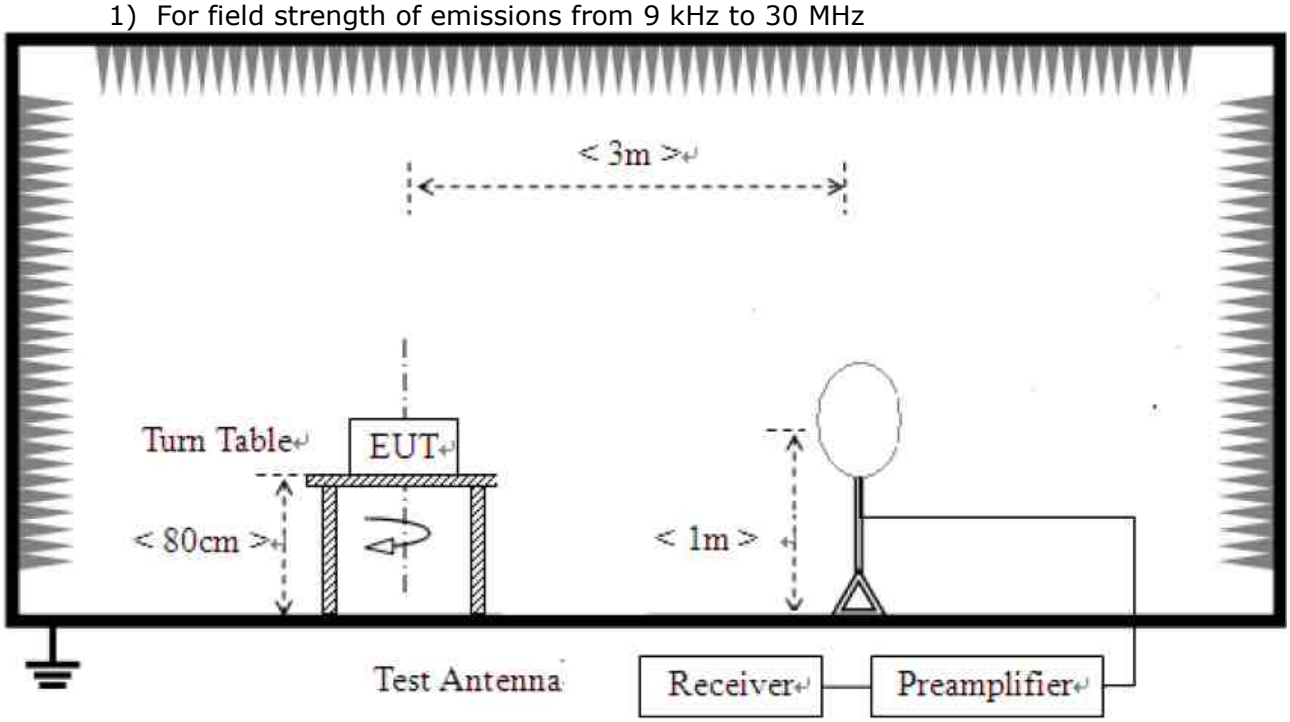
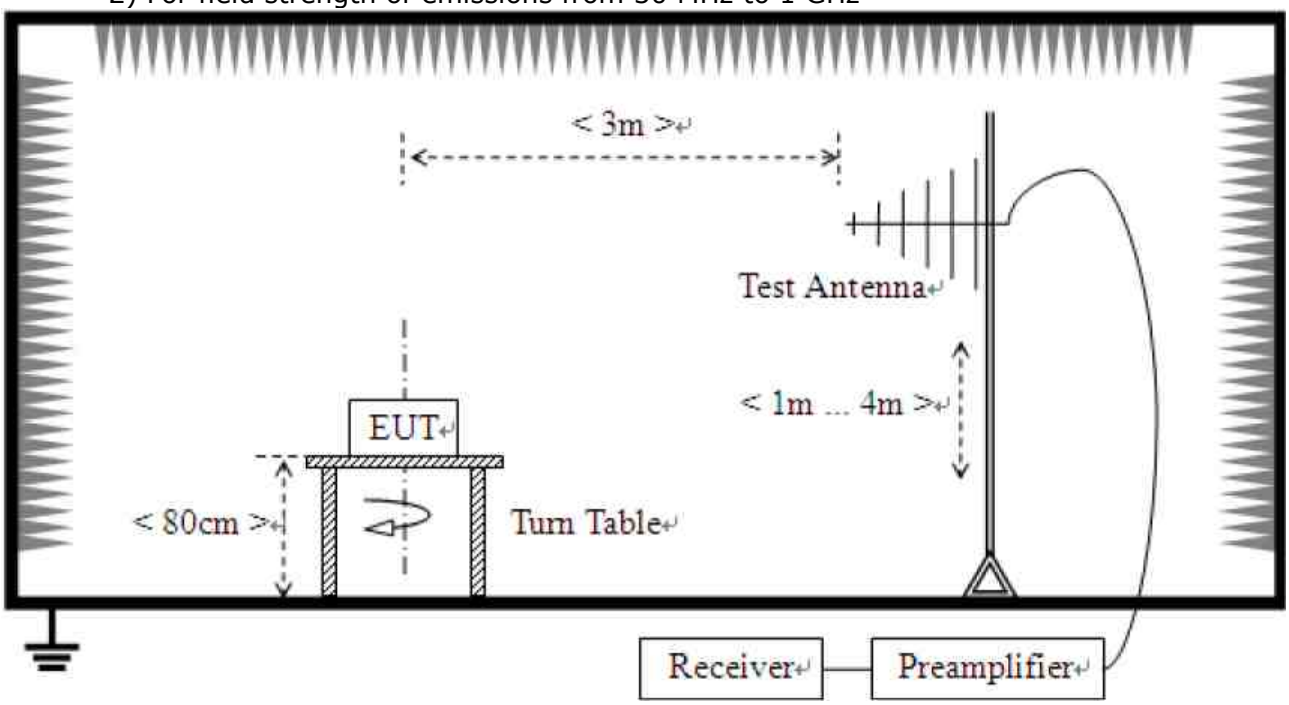
Test Setup:

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



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



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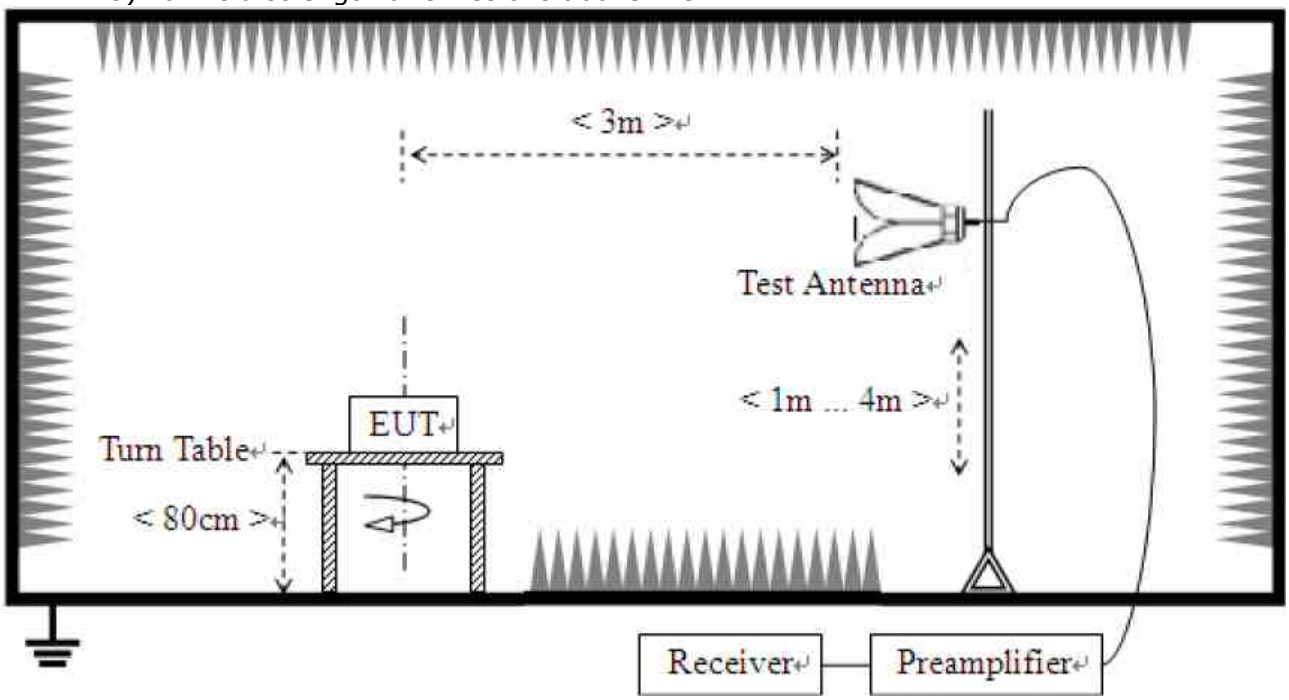
3) For field strength of emissions above 1 GHz



Test Results
1) 9 kHz to 30 MHz

EUT	Bluetooth Speaker	Measurement Detail	
Frequency Range		9 kHz – 30 MHz	
Test mode	8-DPSK (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)

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2) 30 MHz to 1 GHz

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

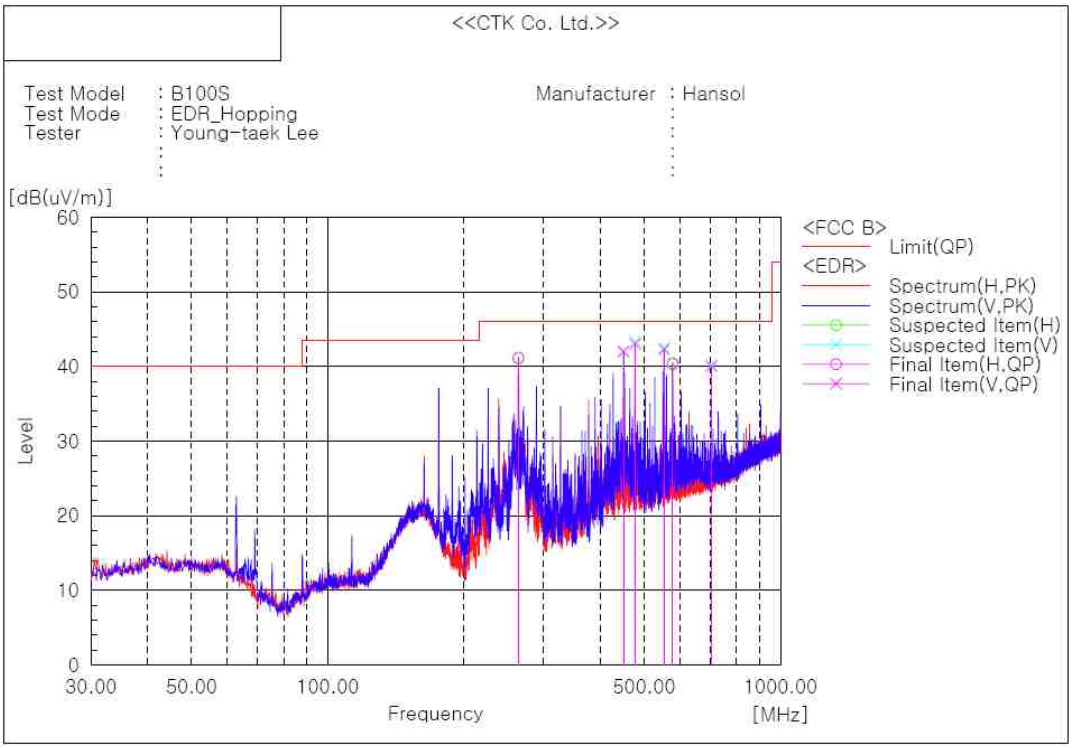
EUT	Bluetooth Speaker	Measurement Detail	
Frequency Range		Below 1000MHz	
Test mode	8-DPSK_Hopping(Worst case)	Detector function	Quasi-Peak

The requirements are:

☒ Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
477.655	43.0	3.0	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]	Height [cm]	Angle [deg]
1	263.891	H	51.7	-10.6	41.1	46.0	4.9	309.0	238.0
2	450.010	V	46.6	-4.6	42.0	46.0	4.0	100.0	235.0
3	477.655	V	46.8	-3.8	43.0	46.0	3.0	100.0	235.0
4	553.073	V	44.2	-1.9	42.3	46.0	3.7	100.0	235.0
5	578.171	H	41.6	-1.3	40.3	46.0	5.7	100.0	275.0
6	703.908	V	38.9	1.1	40.0	46.0	6.0	100.0	235.0

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

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3) above 1 GHz

EUT	Bluetooth Speaker	Measurement Detail	
Model	B100S	Frequency Range	1-25GHz
Channel	Channel 0	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
2390	31.8	22.2	Average

Test Data

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

Restricted band edge test data

Measured frequency range : 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	
2390.00	24.1	41.1	V	1.0	7.1	54.0	74.0	31.2	48.2	22.8	25.8

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	
2390.00	24.7	39.2	V	1.0	7.1	54.0	74.0	31.8	46.3	22.2	27.7

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

EUT	Bluetooth Speaker	Measurement Detail	
Model	B100S	Frequency Range	1-25GHz
Channel	Channel 39	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
No emissions were detected at a level greater than 20dB below limit.			

Test Data

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

Restricted band edge test data

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

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

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

EUT	Bluetooth Speaker	Measurement Detail	
Model	B100S	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
2483.5	43.8	10.2	Average

Test Data

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

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

Frequency [MHz]	Reading [dBuV/m]	Pol.	Height [m]	Correction Factor Antenna	Amp. Gain	Cable	Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
No emissions were detected at a level greater than 20dB below limit.									

Restricted band edge test data

Measured frequency range : 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	
2483.50	23.9	38.1	V	1.0	7.5	54.0	74.0	31.4	45.6	22.6	28.4

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	
2483.50	36.3	39.0	V	1.0	7.5	54.0	74.0	43.8	46.5	10.2	27.5

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2.1.9 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, DH5)

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.4425	33.8	13.2	Average

Test mode : Hopping(8-DPSK, 3DH5)

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.4425	33.0	14.1	Average

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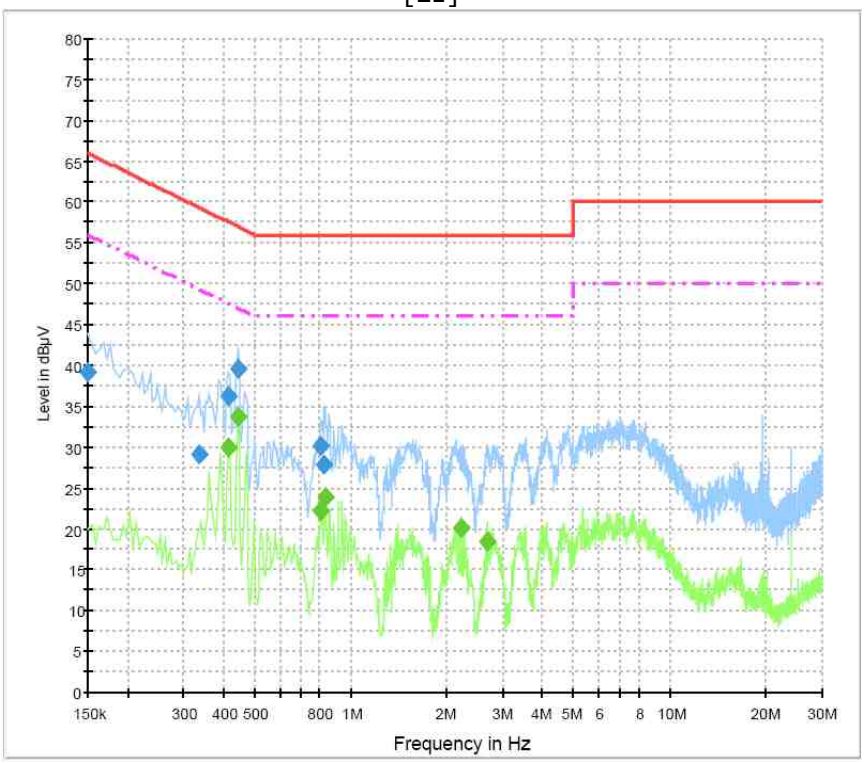
Test Data_Hopping(GFSK)

[L1]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	39.2	1000.0	9.000	On	L1	9.7	26.8	66.0
0.334500	29.1	1000.0	9.000	On	L1	9.8	30.2	59.3
0.415500	36.2	1000.0	9.000	On	L1	9.9	21.3	57.5
0.442500	39.6	1000.0	9.000	On	L1	9.9	17.5	57.0
0.807000	30.2	1000.0	9.000	On	L1	9.8	25.8	56.0
0.825000	27.9	1000.0	9.000	On	L1	9.8	28.1	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.415500	30.0	1000.0	9.000	On	L1	9.9	17.6	47.5
0.442500	33.8	1000.0	9.000	On	L1	9.9	13.2	47.0
0.807000	22.3	1000.0	9.000	On	L1	9.8	23.7	46.0
0.834000	23.8	1000.0	9.000	On	L1	9.8	22.2	46.0
2.220000	20.2	1000.0	9.000	On	L1	9.8	25.8	46.0
2.692500	18.5	1000.0	9.000	On	L1	9.8	27.5	46.0

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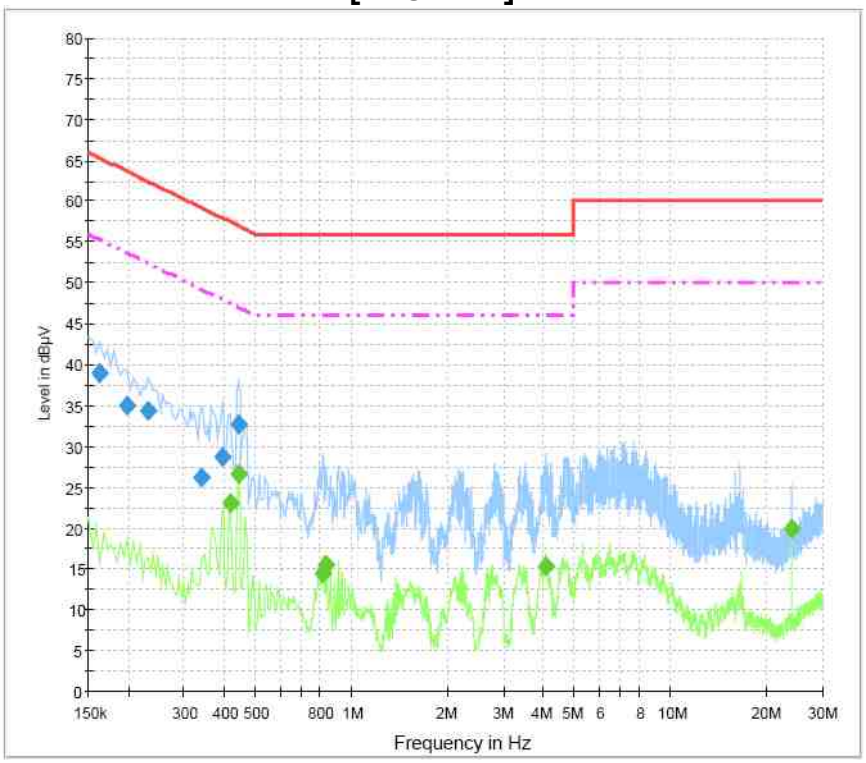
[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.163500	38.9	1000.0	9.000	On	N	9.7	26.4	65.3
0.199500	34.9	1000.0	9.000	On	N	9.8	28.7	63.6
0.231000	34.3	1000.0	9.000	On	N	9.7	28.1	62.4
0.339000	26.2	1000.0	9.000	On	N	9.8	33.1	59.2
0.393000	28.7	1000.0	9.000	On	N	9.9	29.3	58.0
0.442500	32.7	1000.0	9.000	On	N	9.9	24.3	57.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.420000	23.0	1000.0	9.000	On	N	9.9	24.4	47.4
0.442500	26.5	1000.0	9.000	On	N	9.9	20.5	47.0
0.811500	14.5	1000.0	9.000	On	N	9.8	31.5	46.0
0.838500	15.6	1000.0	9.000	On	N	9.8	30.4	46.0
4.092000	15.3	1000.0	9.000	On	N	9.7	30.7	46.0
24.121500	19.9	1000.0	9.000	On	N	10.1	30.1	50.0

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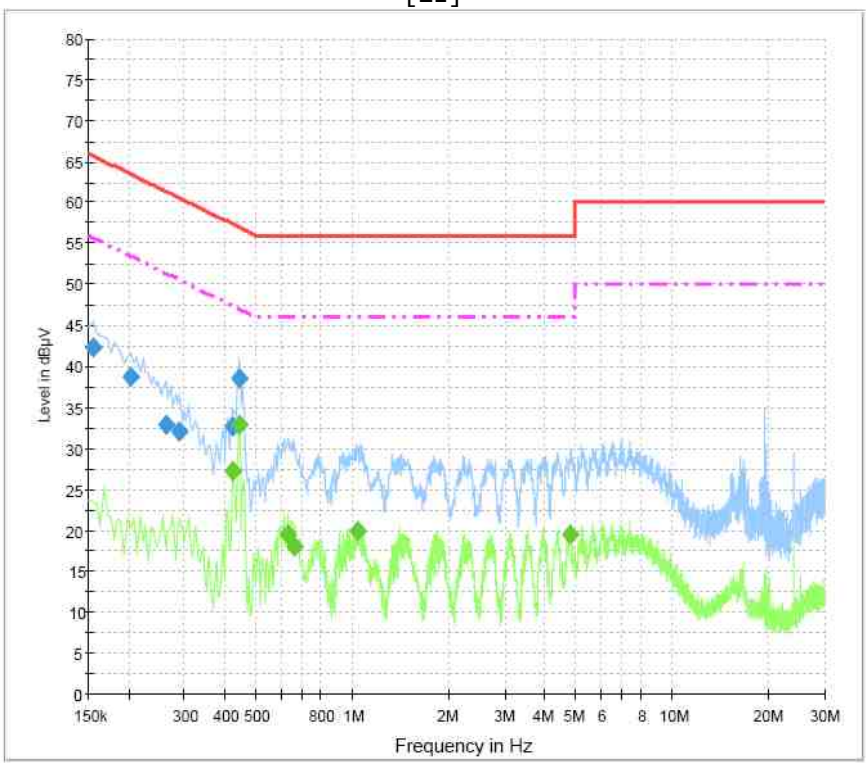
Test Data_Hopping(8-DPSK)

[L1]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	42.4	1000.0	9.000	On	L1	9.7	23.3	65.8
0.204000	38.7	1000.0	9.000	On	L1	9.8	24.8	63.4
0.262500	33.0	1000.0	9.000	On	L1	9.6	28.4	61.4
0.289500	32.1	1000.0	9.000	On	L1	9.7	28.5	60.5
0.424500	32.6	1000.0	9.000	On	L1	9.9	24.7	57.4
0.442500	38.6	1000.0	9.000	On	L1	9.9	18.5	57.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.424500	27.2	1000.0	9.000	On	L1	9.9	20.2	47.4
0.442500	33.0	1000.0	9.000	On	L1	9.9	14.1	47.0
0.631500	19.5	1000.0	9.000	On	L1	9.8	26.5	46.0
0.663000	18.1	1000.0	9.000	On	L1	9.8	27.9	46.0
1.036500	19.8	1000.0	9.000	On	L1	9.7	26.2	46.0
4.821000	19.4	1000.0	9.000	On	L1	9.8	26.6	46.0

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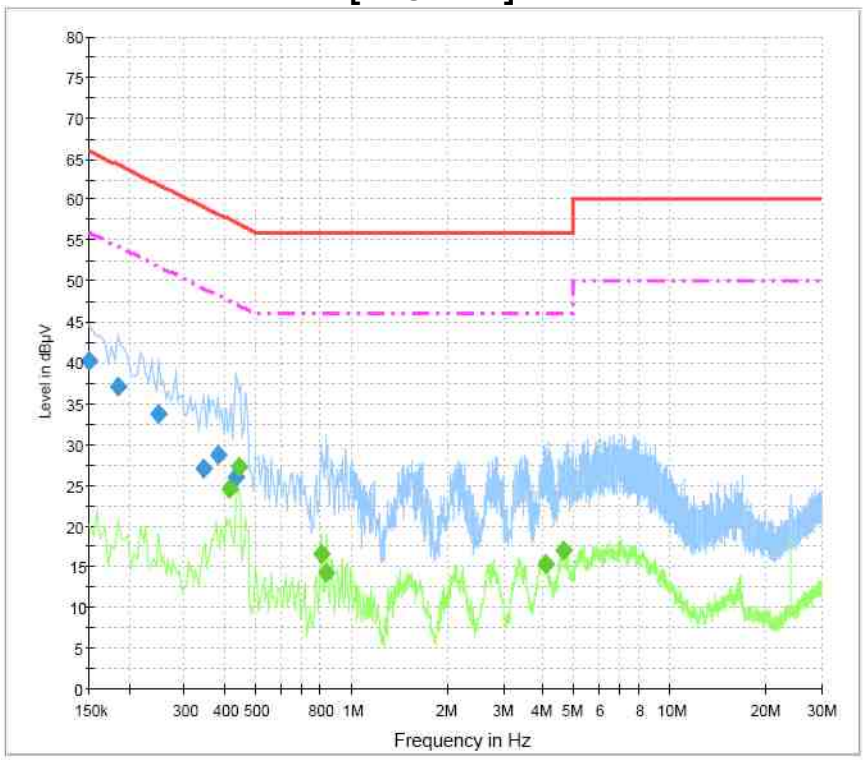
[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	40.3	1000.0	9.000	On	N	9.7	25.7	66.0
0.186000	37.2	1000.0	9.000	On	N	9.8	27.1	64.2
0.249000	33.8	1000.0	9.000	On	N	9.6	28.0	61.8
0.343500	27.0	1000.0	9.000	On	N	9.8	32.1	59.1
0.379500	28.6	1000.0	9.000	On	N	9.9	29.7	58.3
0.433500	26.0	1000.0	9.000	On	N	9.9	31.2	57.2

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.415500	24.4	1000.0	9.000	On	N	9.9	23.1	47.5
0.442500	27.2	1000.0	9.000	On	N	9.9	19.8	47.0
0.807000	16.6	1000.0	9.000	On	N	9.8	29.4	46.0
0.838500	14.3	1000.0	9.000	On	N	9.8	31.7	46.0
4.069500	15.4	1000.0	9.000	On	N	9.7	30.6	46.0
4.659000	16.9	1000.0	9.000	On	N	9.7	29.1	46.0

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APPENDIX A – Test Equipment Used For Tests

	Name of Equipment	Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date
1	Signal Analyzer	Agilent	N9020A	MY48011598	2014-11-07	2015-11-07
2	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2014-12-05	2015-12-05
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2014-12-05	2015-12-05
4	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2014-05-15	2015-05-15
5	Bilog Antenna	Schaffner	CBL6111C	2551	2014-05-08	2016-05-08
6	Double Ridged Guide Antenna	ETS-Lindgren	3117	00154525	2013-07-03	2015-07-03
7	Double Ridged Guide Antenna	ETS-Lindgren	3116	00062504	2014-05-27	2015-05-27
8	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2014-05-19	2016-05-19
9	Attenuator	Rohde & Schwarz	DNF	272.4110.50-2	2014-11-07	2015-11-07
10	PREAMPLIFIER	Agilent	8449B	3008A02307	2014-10-24	2015-10-24
11	AMPLIFIER	Sonoma Instrument Co.	310	291721	2015-02-02	2016-02-02
12	Band Reject Filter	Wainwright Instruments GmbH	WRCGV 2400/2483-2375/2505-50/10EE	2	2014-08-25	2015-08-25
13	Signal Generator	Rohde & Schwarz	SMB100A	175528	2015-01-19	2016-01-19
14	LISN	Rohde & Schwarz	ENV216	101236	2014-07-30	2015-07-30
15	LISN	Rohde & Schwarz	ENV216	101235	2014-07-30	2015-07-30
16	DC Power Supply	Topward Electric Instruments Co.,Ltd.	6303D	666421	2015-02-03	2016-02-03
17	DC Power Supply	Agilent	E3632A	MY40011638	2014-11-07	2015-11-07
18	BLUETOOTH TESTER	TESCOM	TC-3000C	3000C000377	2014-11-14	2015-11-14

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