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TEST REPORT For FCC

FCC Standards : FCC 47CFR part 15 subpart C

Test Report No.	:	CTK-2013-01301
Date of Issue	:	August 20, 2013
FCC ID	:	UZCGBC-1000
Basic Model/Type No.	:	GBC-1000
Variant Model/Type No.	:	GBC-2000
Kind of Product	:	Bluetooth Handsfree Car kit
Applicant	:	GT Telecom Co., Ltd.
Applicant Address	:	848-16 Gupyeong-Dong, Gumi-City, Gyeongbuk, Korea
Manufacturer	:	Mobisolution Co., Ltd.
Manufacturer Address	:	A-101, 848-16 Gupyeong-Dong, Gumi-City, Gyeongsanbuk-Do, Korea
Contact Person	:	Hodong Ryu / Senior Engineer
Telephone	:	+82–54-474-2220
Received Date	:	July 24, 2013
Test period	:	Start : August 08, 2013 End : August 13, 2013

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

Tested by

Y. T. Lee

Young-taek Lee
Test Engineer
Date: August 20, 2013

Reviewed by

Y. J. Park

Young-Joon, Park
Technical Manager
Date: August 20, 2013

REPORT REVISION HISTORY

Date	Revision	Page No
August 20, 2013	Issued (CTK-2013-01301)	All
August 30, 2013	Revision : RF Output power down by software	

TABLE OF CONTENTS

1.0 General Product Description

Equipment model name	GBC-2000
Serial number	Prototype
EUT condition	Pre-production, not damaged
Antenna type	PCB Pattern antenna Gain 0.218 dBi
Frequency Range	2402 MHz - 2480 MHz
RF power	2.743 dBm Peak Conducted (GFSK) 1.056 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	Lithium Polymer Battery(DC 3.7 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).

Pre-Scan Conducted Output Power (dBm)					
Frequency (MHz)	Modulation Type	Data rate (Mbps)	Packet		
			DH1	DH3	DH5
2441	GFSK	1	1.767	1.769	1.774
	DQPSK	2	0.049	0.089	0.066
	8-DPSK	3	0.260	0.223	0.269

- 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

- GBC-1000 is basic model.
- GBC-2000's appearance changed compared to basic model.
  And earphone jack was removed.

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	Samsung Electronics Co., Ltd.	SP20	H50191BW70025
AC/DC ADAPTER	FSP GROUP INC.	FSP090-DMAB1	H00000267
Notebook Computer	Samsung Electronics Co., Ltd.	NT-R60Y	Z9GJ93GS302109B
AC/DC ADAPTER	Suzhou Fordgood Electronic Co., Ltd.	LSE9901B1970	19118-A710

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 386-1, Ho-dong, Cheoin-gu, Yongin-si, Gyeonggi-do, 449-100, Korea.

1.8 Laboratory Accreditations and Listings

Country	Agency	Scope of Accreditation	Logo
USA	**FCC**	3 m & 10 m SAC and Conducted Test Site to perform FCC Part 15/18 measurements	805871
JAPAN	**VCCI**	3 m & 10 m SAC and Conducted Test Site	C-986, T-1843, R-3627, G-387
KOREA	**KCC**	EMI (3 m & 10 m SAC and Conducted Test Site) EMS (ESD, RS, EFT/Burst, Surge, CS, Magnetic, Dips and Interruptions)	No. 51, KR0025
International	**KOLAS**	EMC	

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	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

Note 1: C=Complies NC=Not Complies NT=Not Tested NA=Not Applicable

Note 2: The data in this test report are traceable to the national or international standards.

The sample was tested according to the following specification:
- FCC Part 15.247, ANSI C63.4-2003

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 = 3 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

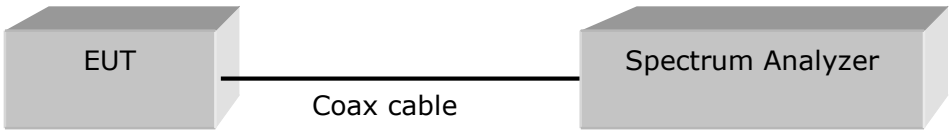


Figure 1 : Measurement setup for the carrier frequency separation

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	1000	514.67	25	Complies

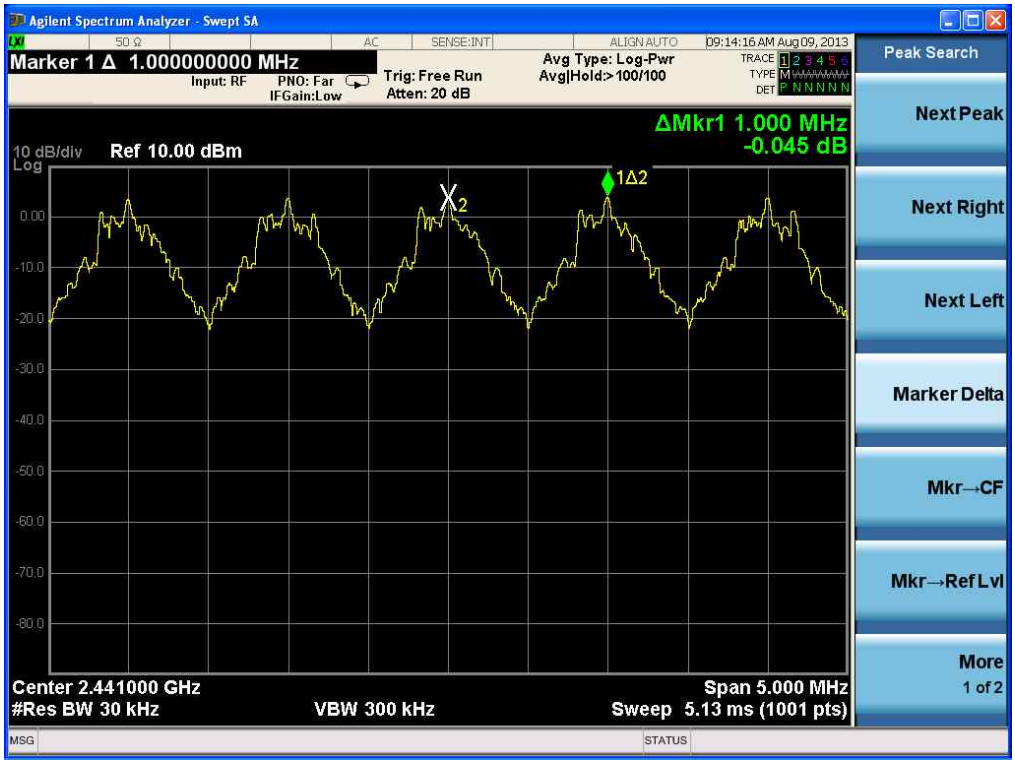
Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

Channel	Adjacent Hopping Channel Separation (kHz)	Two-third of 20dB bandwidth (kHz)	Minimum Bandwidth (kHz)	Result
2441MHz	1000	834.67	25	Complies

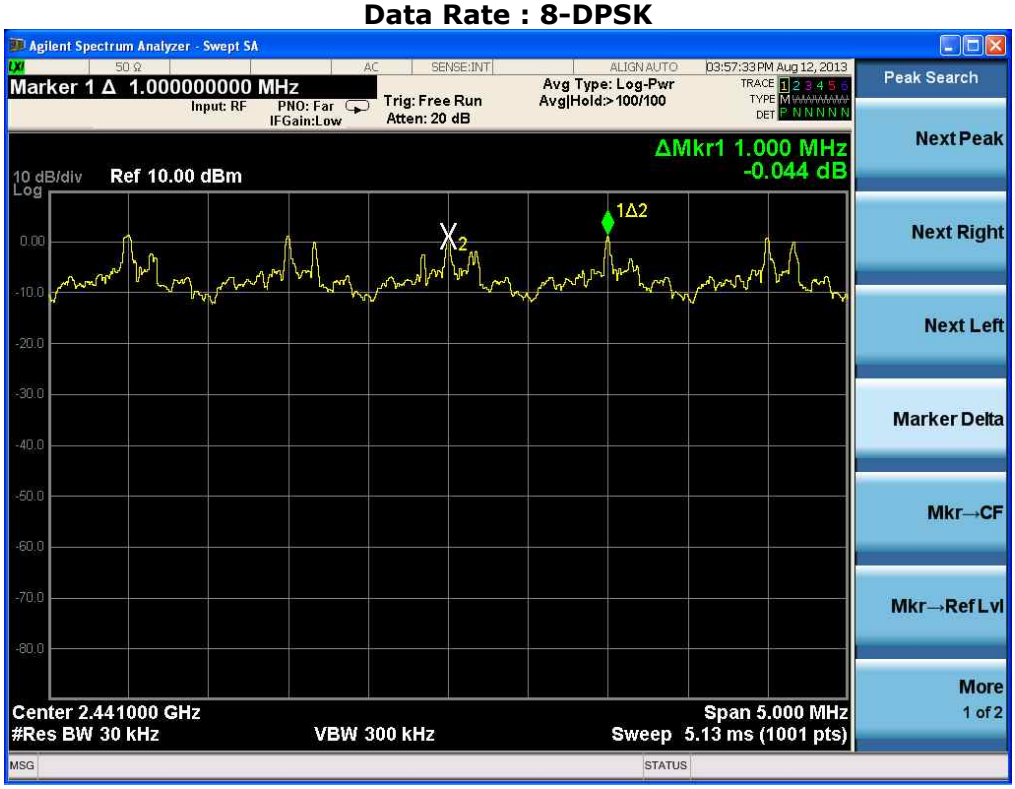
See next pages for actual measured spectrum plots.

Carrier Frequency Separation

Data Rate : GFSK



Data Rate : 8-DPSK



2.1.2 Number of Hopping Frequencies

Test Location

RF Test Room

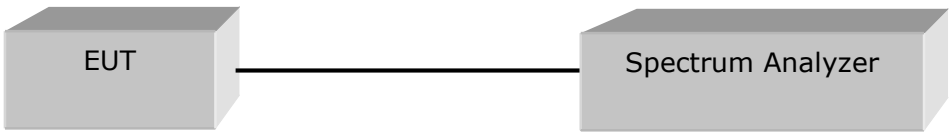
Test Procedures

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

Span = 50 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)

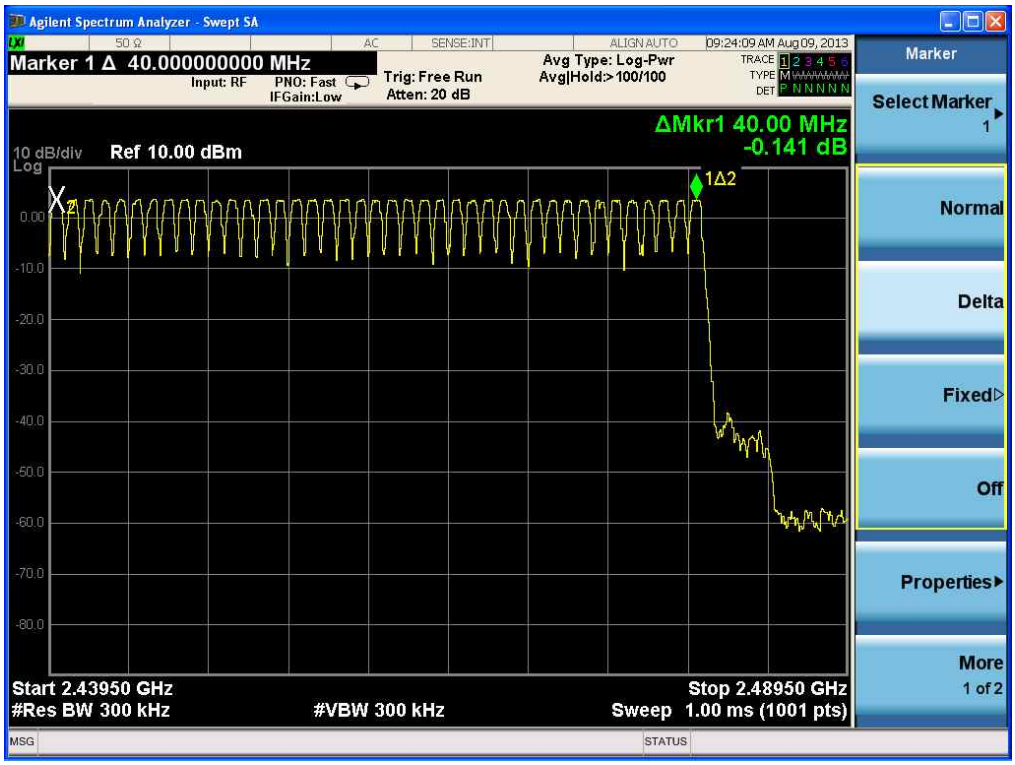
Total number of Hopping Channels	Result
79	Complies

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

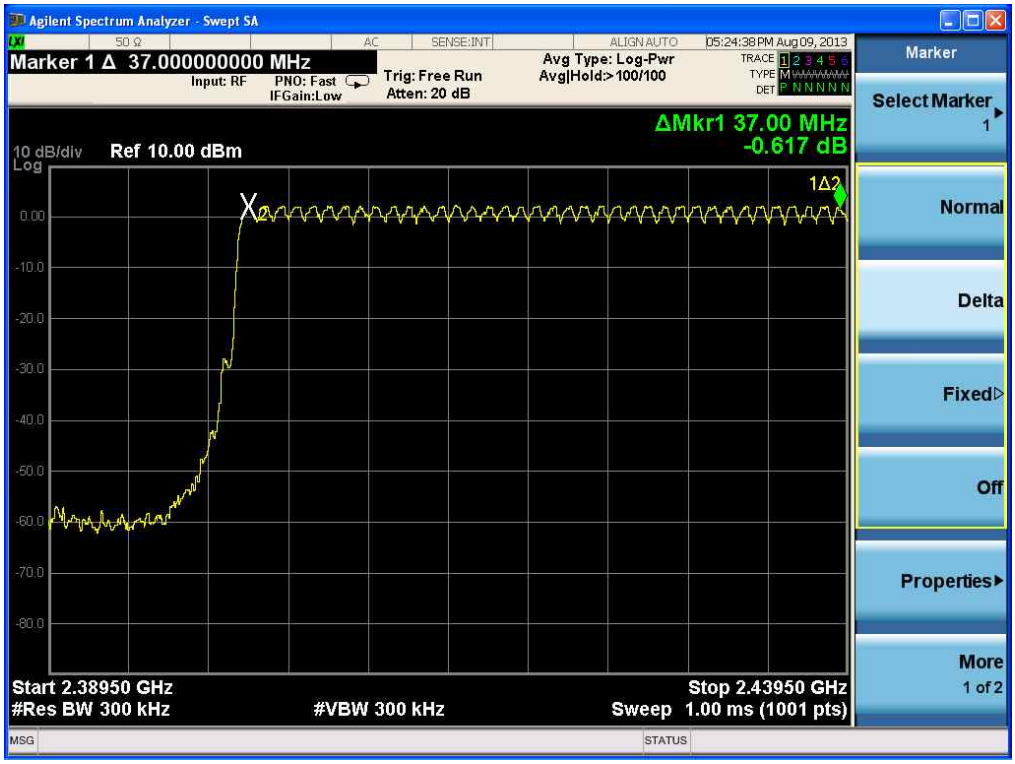
Total number of Hopping Channels	Result
79	Complies

See next pages for actual measured spectrum plots.

Number of Hopping Frequencies(GFSK)



Number of Hopping Frequencies(8-DPSK)



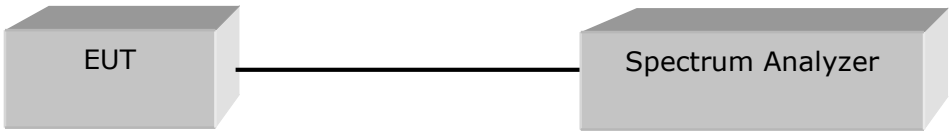
2.1.3 20 dB bandwidth

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 = 2 MHz (approximately 2 or 3 times of the 20 dB bandwidth)
RBW = 30 kHz (≥ 1% of the span) 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)

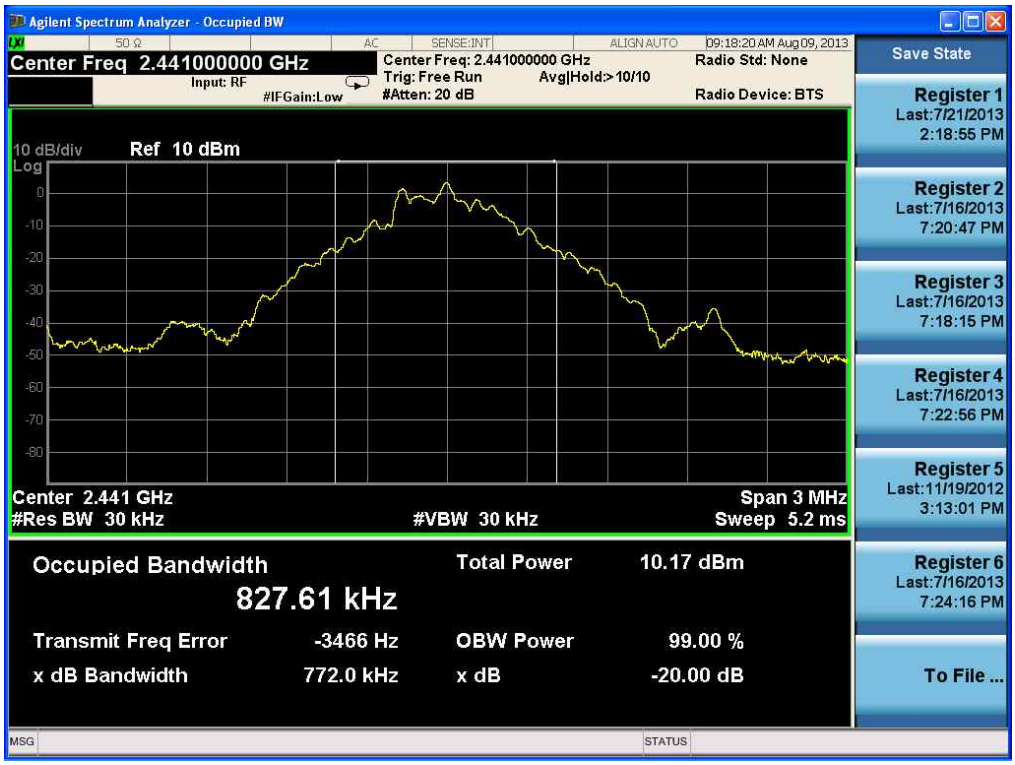
Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	0.779	Complies
2441	39	0.772	Complies
2480	78	0.780	Complies

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

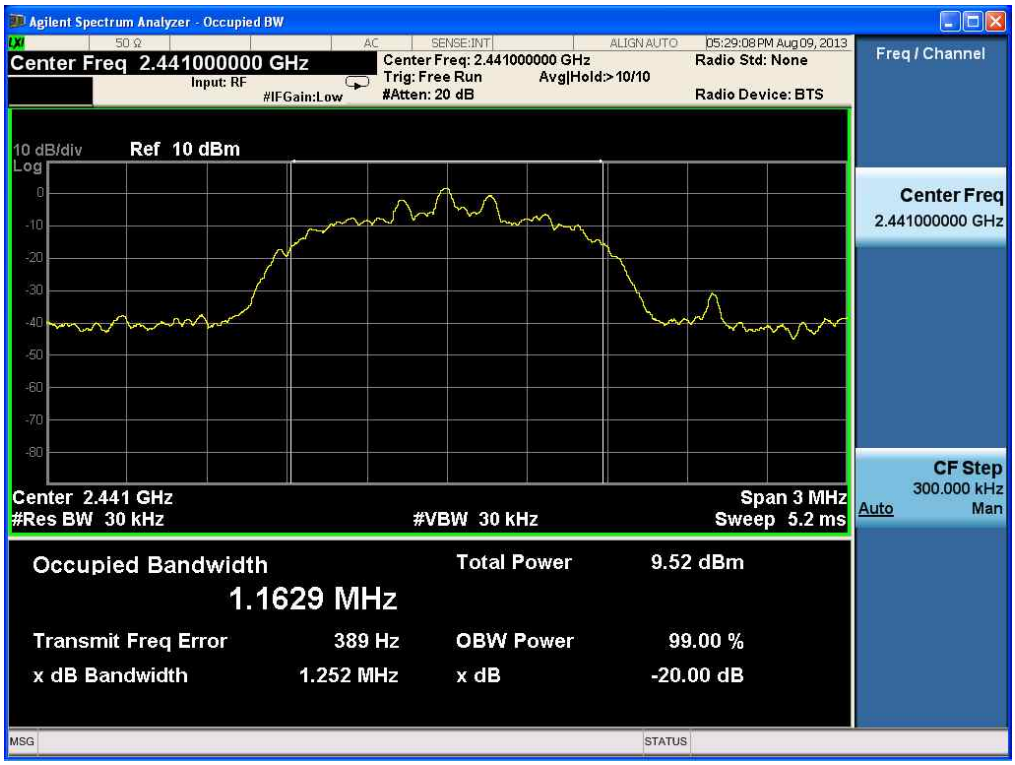
Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	1.252	Complies
2441	39	1.252	Complies
2480	78	1.252	Complies

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

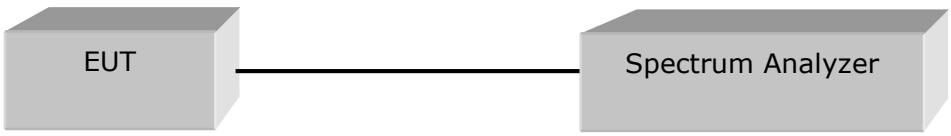
RF Test Room

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 GBC-2000 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
2441	DH 1	0.435	139.20	Complies
	DH 3	1.690	270.40	Complies
	DH 5	2.940	313.60	Complies

DH1 Dwell time = 0.435 ms × (1600÷2) ÷ 79 × 31.6 = 139.20 ms
DH3 Dwell time = 1.690 ms × (1600÷4) ÷ 79 × 31.6 = 270.40 ms
DH5 Dwell time = 2.940 ms × (1600÷6) ÷ 79 × 31.6 = 313.60 ms

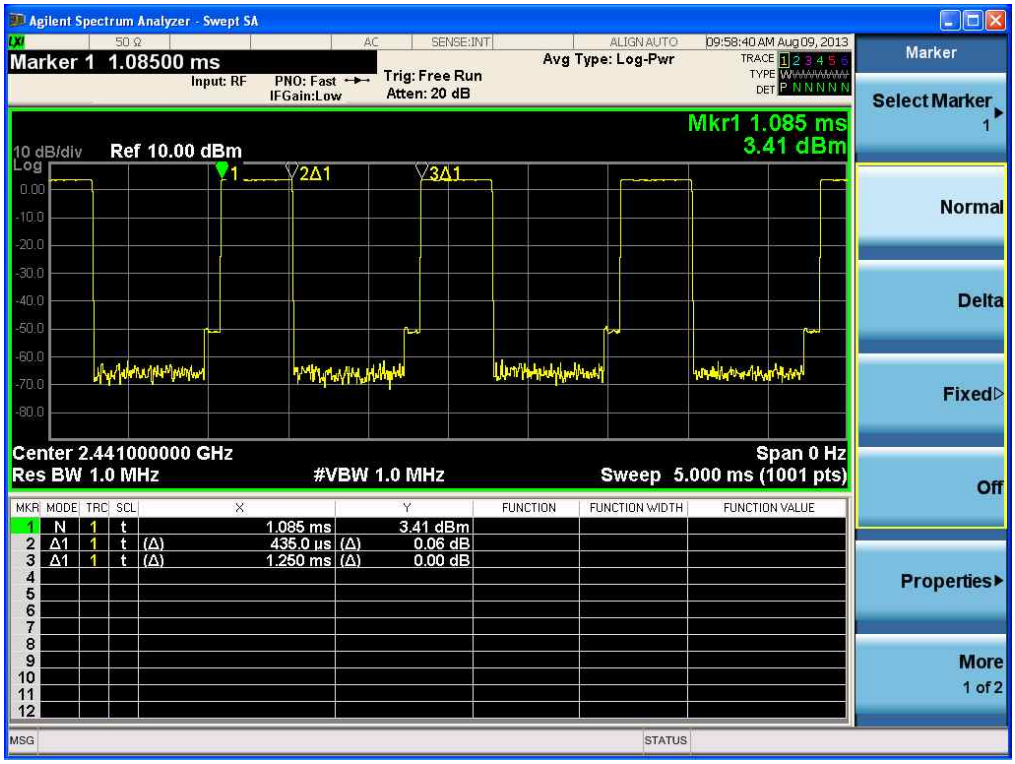
Test mode : 8-DPSK

Channel Frequency (MHz)	Packet Type	Dwell Time (ms)	Test Results	
			Time of occupancy on the TX channel in 31.6sec (ms)	Result
2441	3DH 1	0.455	145.60	Complies
	3DH 3	1.700	272.00	Complies
	3DH 5	2.940	313.60	Complies

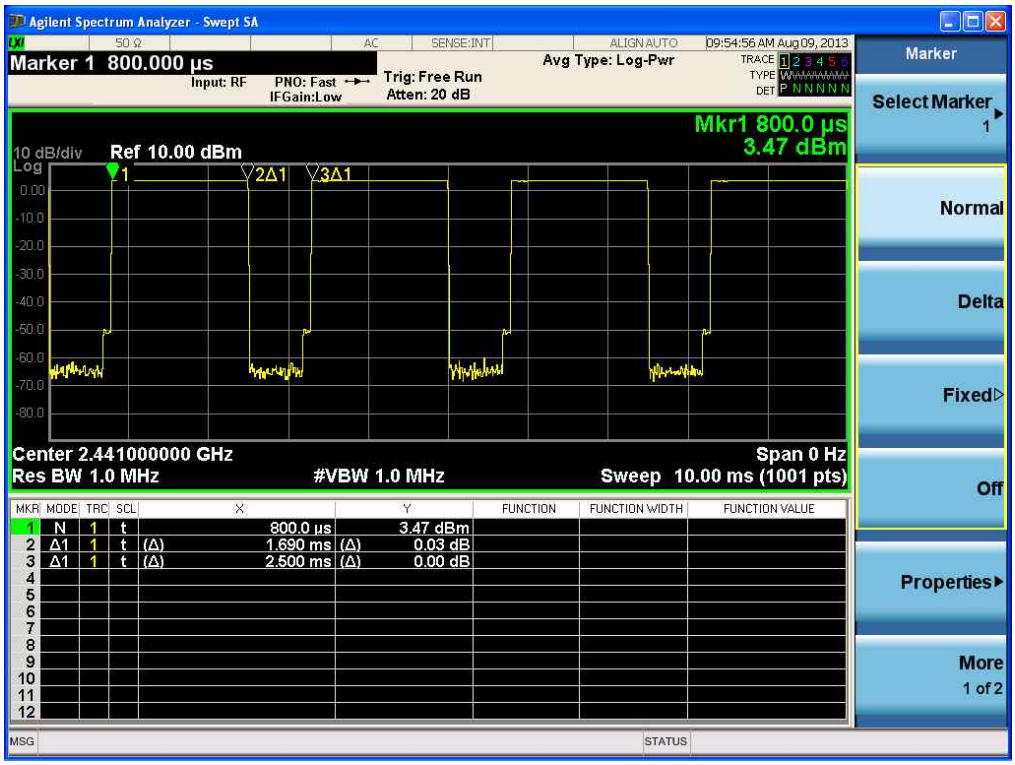
DH1 Dwell time = 0.455 ms × (1600÷2) ÷ 79 × 31.6 = 145.60 ms
DH3 Dwell time = 1.700 ms × (1600÷4) ÷ 79 × 31.6 = 272.00 ms
DH5 Dwell time = 2.940 ms × (1600÷6) ÷ 79 × 31.6 = 313.60 ms

See next pages for actual measured spectrum plots.

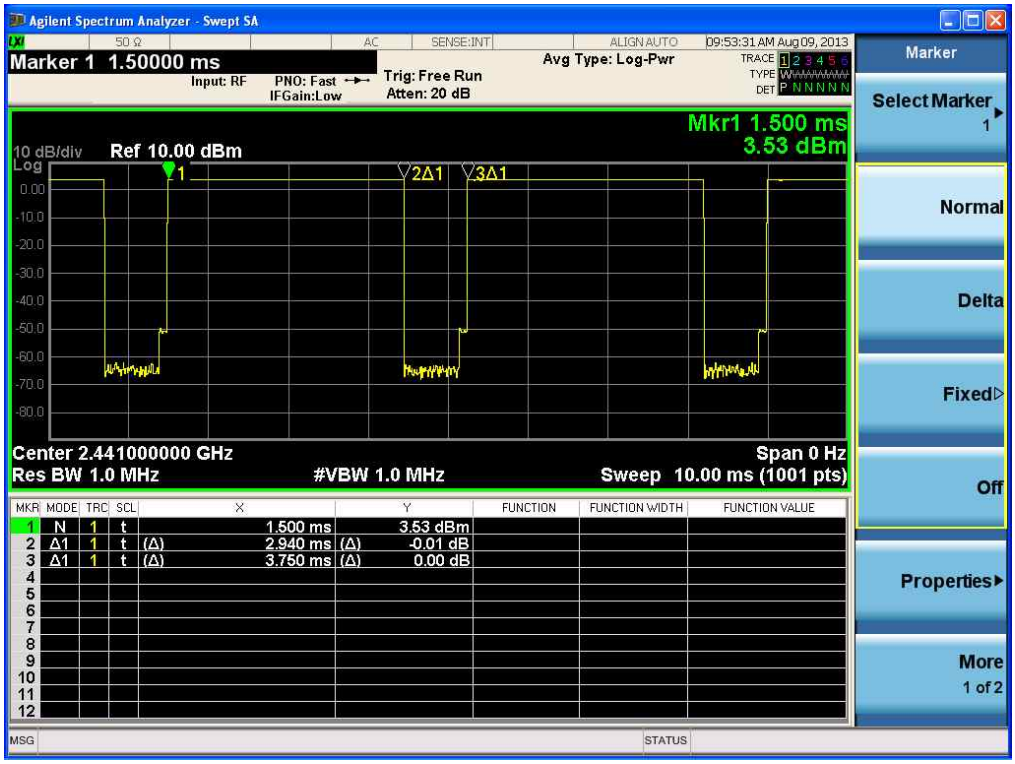
Time of Occupancy for PACKET Type DH1(GFSK)



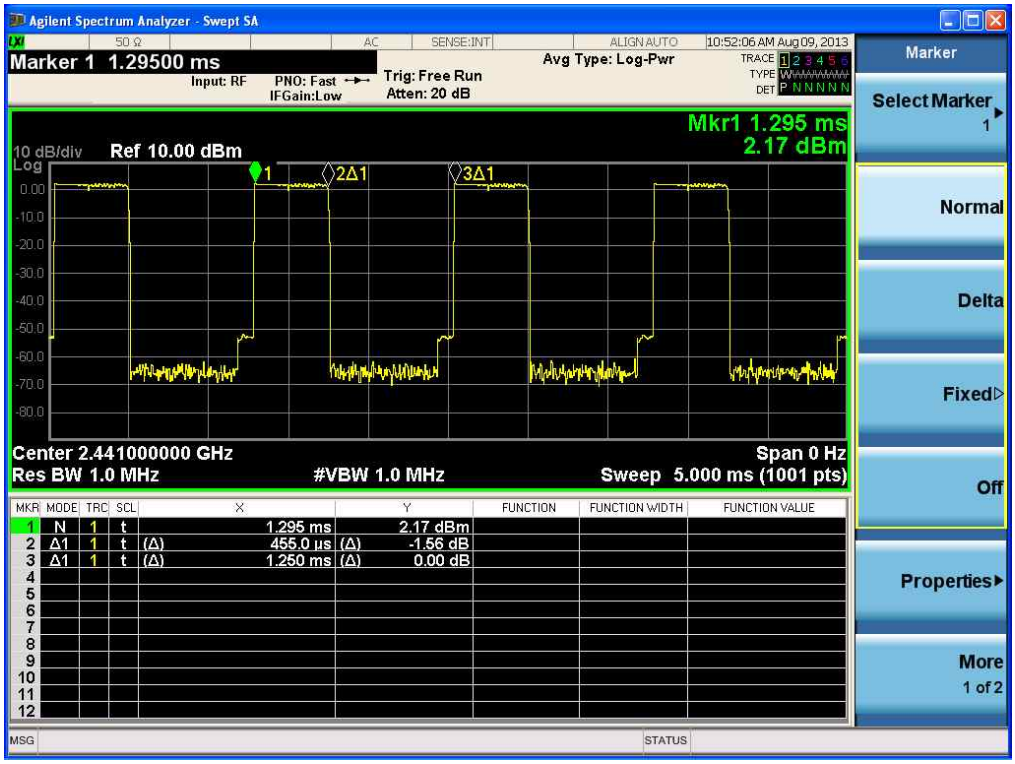
Time of Occupancy for PACKET Type DH3(GFSK)



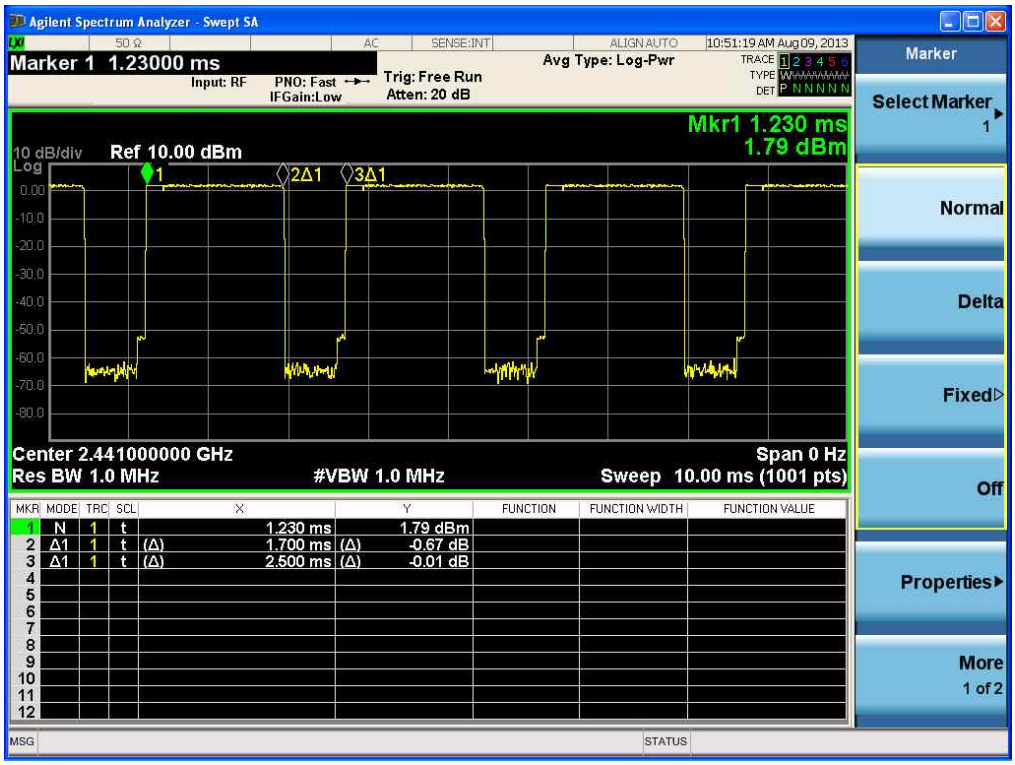
Time of Occupancy for PACKET Type DH5(GFSK)



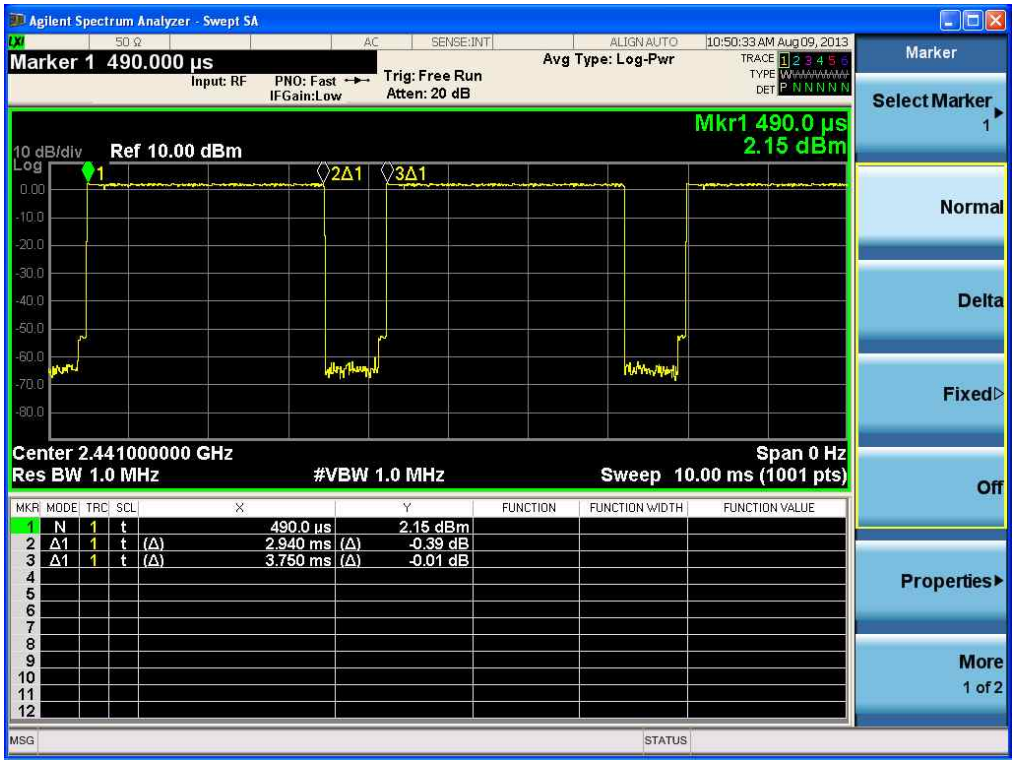
Time of Occupancy for PACKET Type 3DH1(8-DPSK)



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



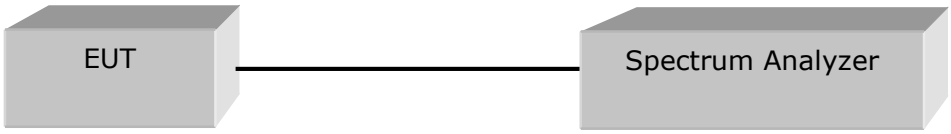
Time of Occupancy for PACKET Type 3DH5(8-DPSK)



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 = 5 MHz (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 : 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	1.992	1.582	Complies
2441	39	2.502	1.779	Complies
2480	78	2.743	1.881	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	0.425	1.103	Complies
2441	39	0.940	1.242	Complies
2480	78	1.056	1.275	Complies

See next pages for actual measured spectrum plots.

Maximum peak Conducted Output Power - GFSK

Maximum peak Conducted Output Power - 8-DPSK

2.1.6 RF Conducted Emissions

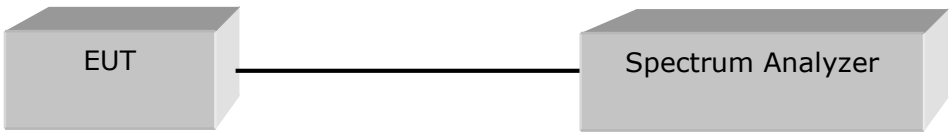
Test Location

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

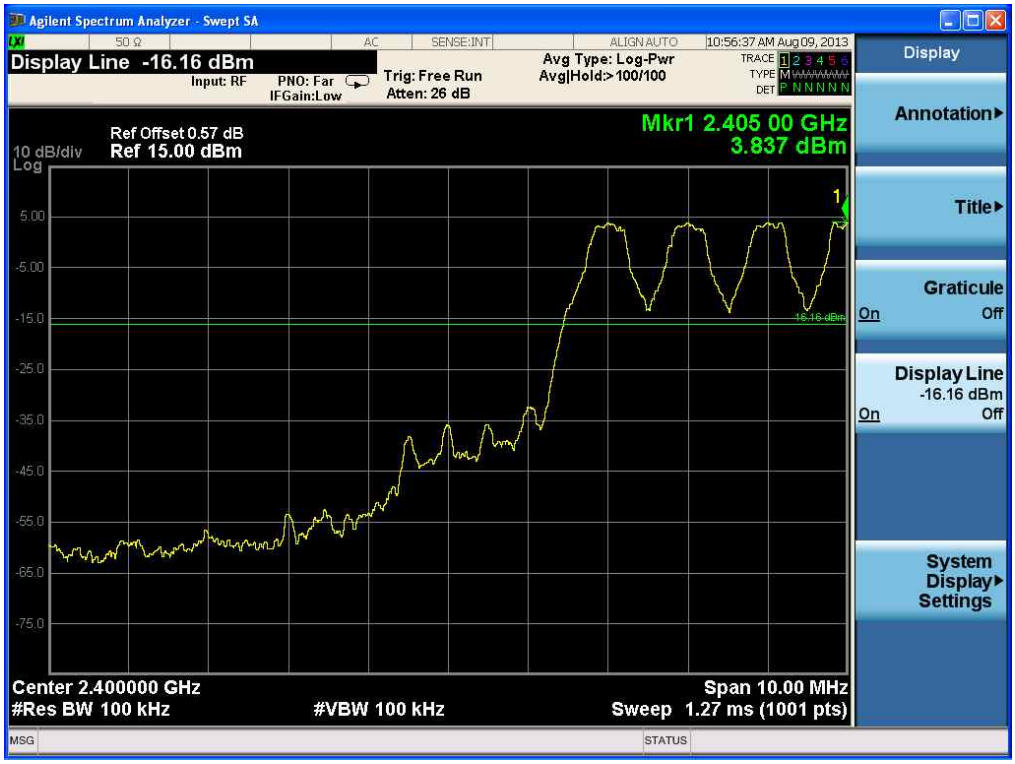
> 20 dBc

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.

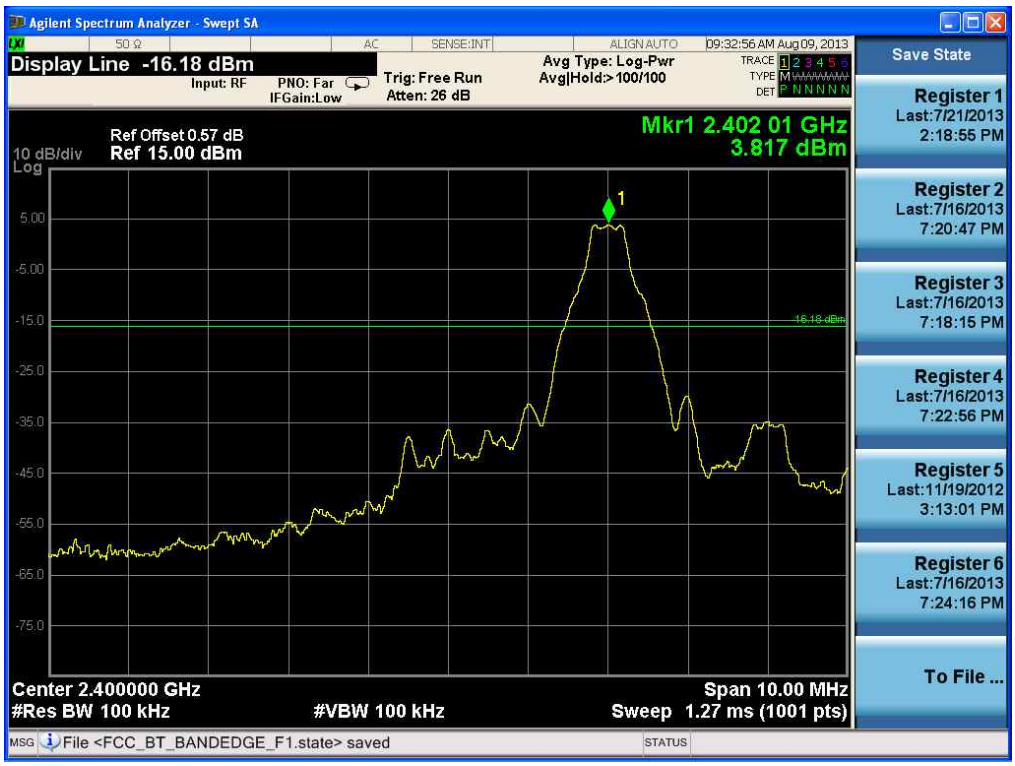
See next pages for actual measured spectrum plots.

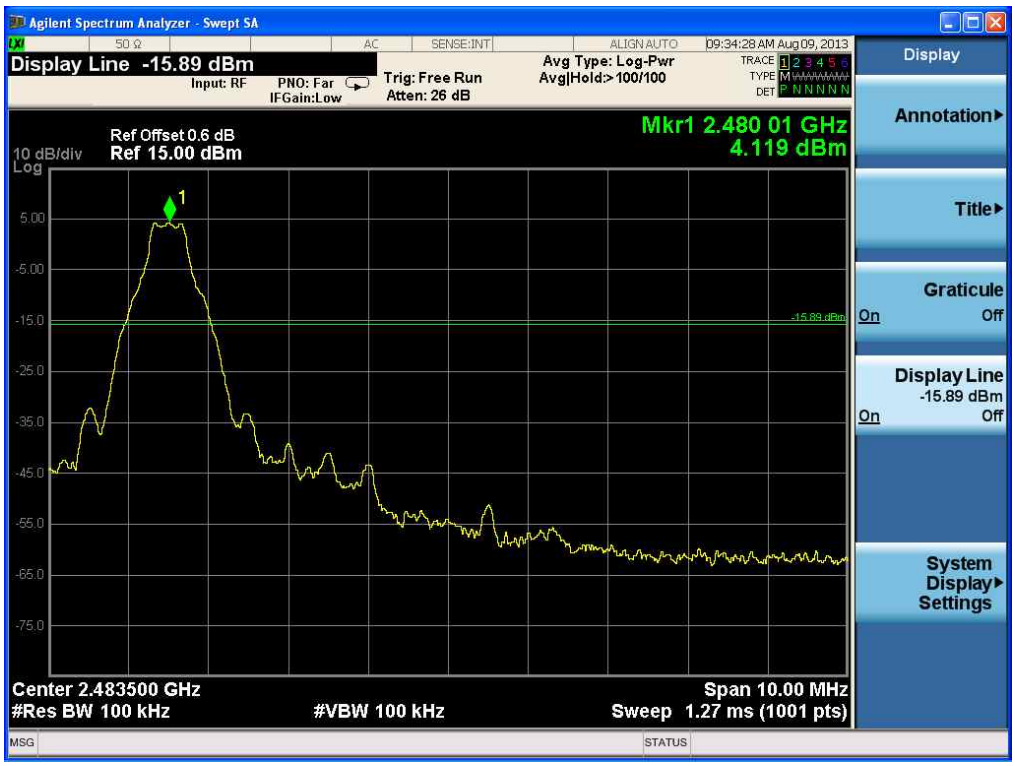
Band – edge (with Hopping) - GFSK



Band – edge (with Hopping) - 8-DPSK

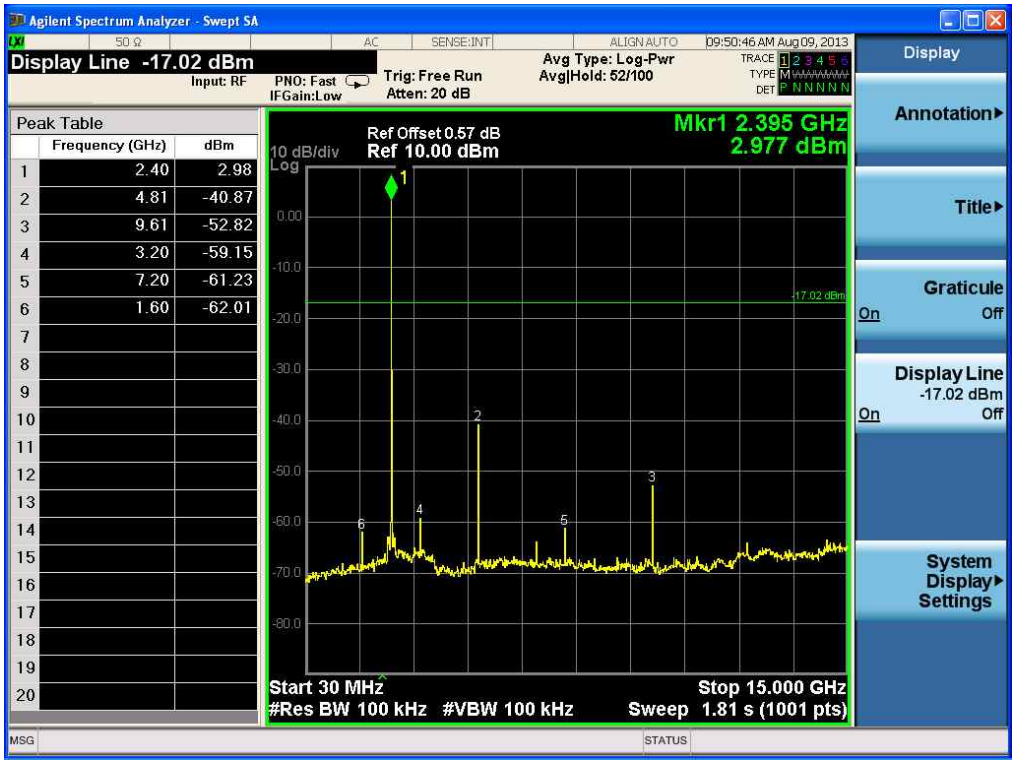
Band – edge (without Hopping) - GFSK





Band – edge (without Hopping) - 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)

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	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

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 :

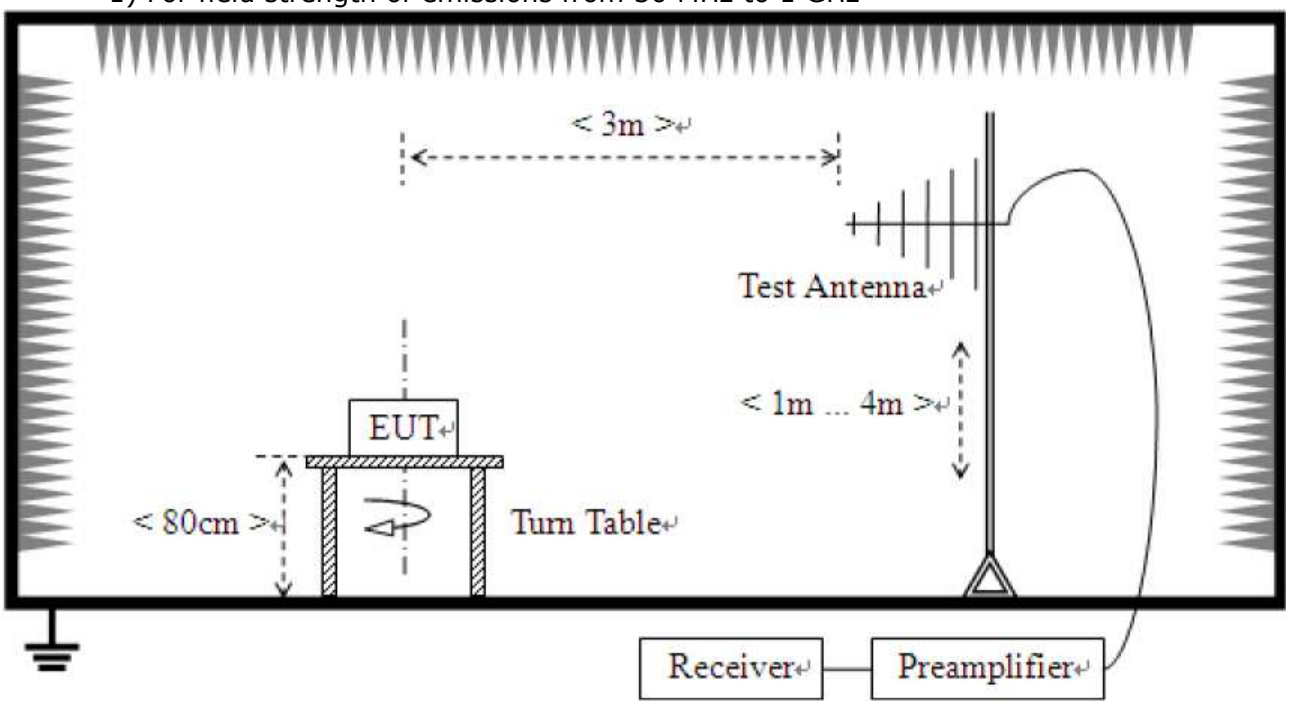
Frequency(MHz)	Field Strength uV/m@3m	Field Strength dBuV/m@3m	Deasurement Distance (meters)
30-88	100**	40	3
88-216	150**	43.5	3
216-960	200**	46	3
Above 960	500	54	3

** 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.

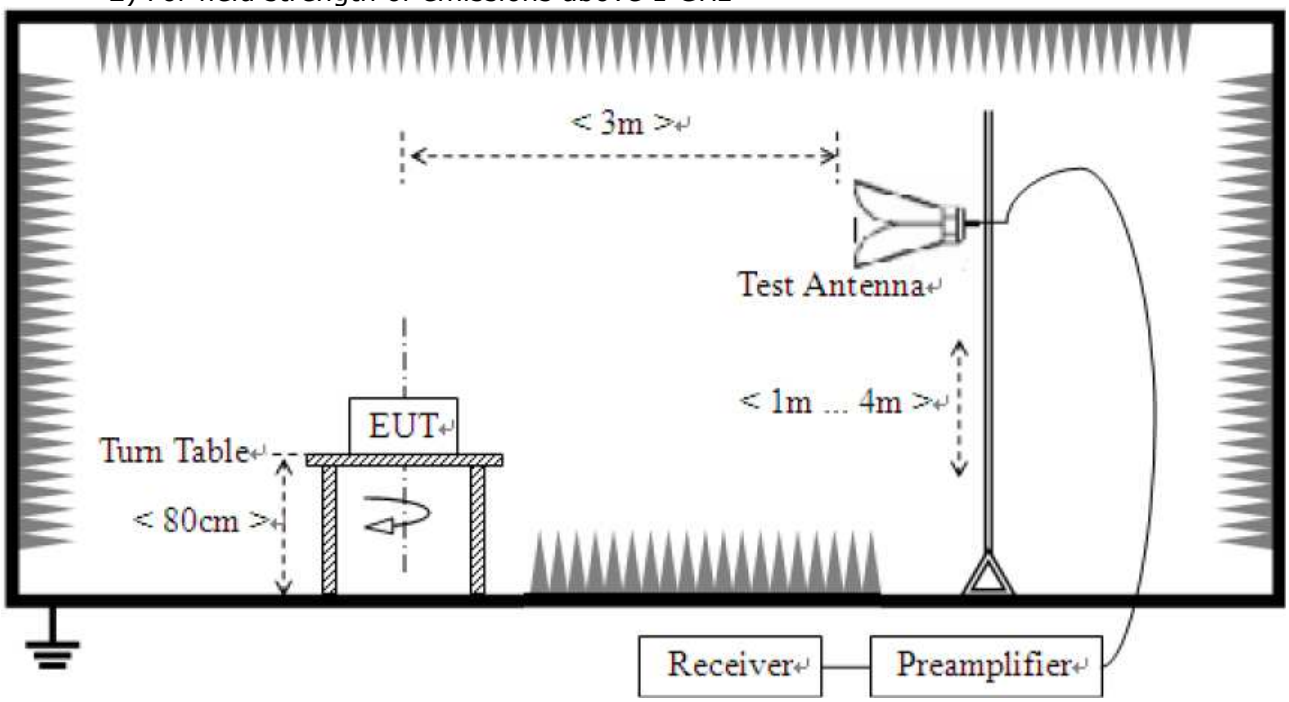
Note :
1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
2) For above 1 GHz, limit field strength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

Test Setup:

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



2) For field strength of emissions above 1 GHz



Test Results

1) 30 MHz to 1 GHz

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

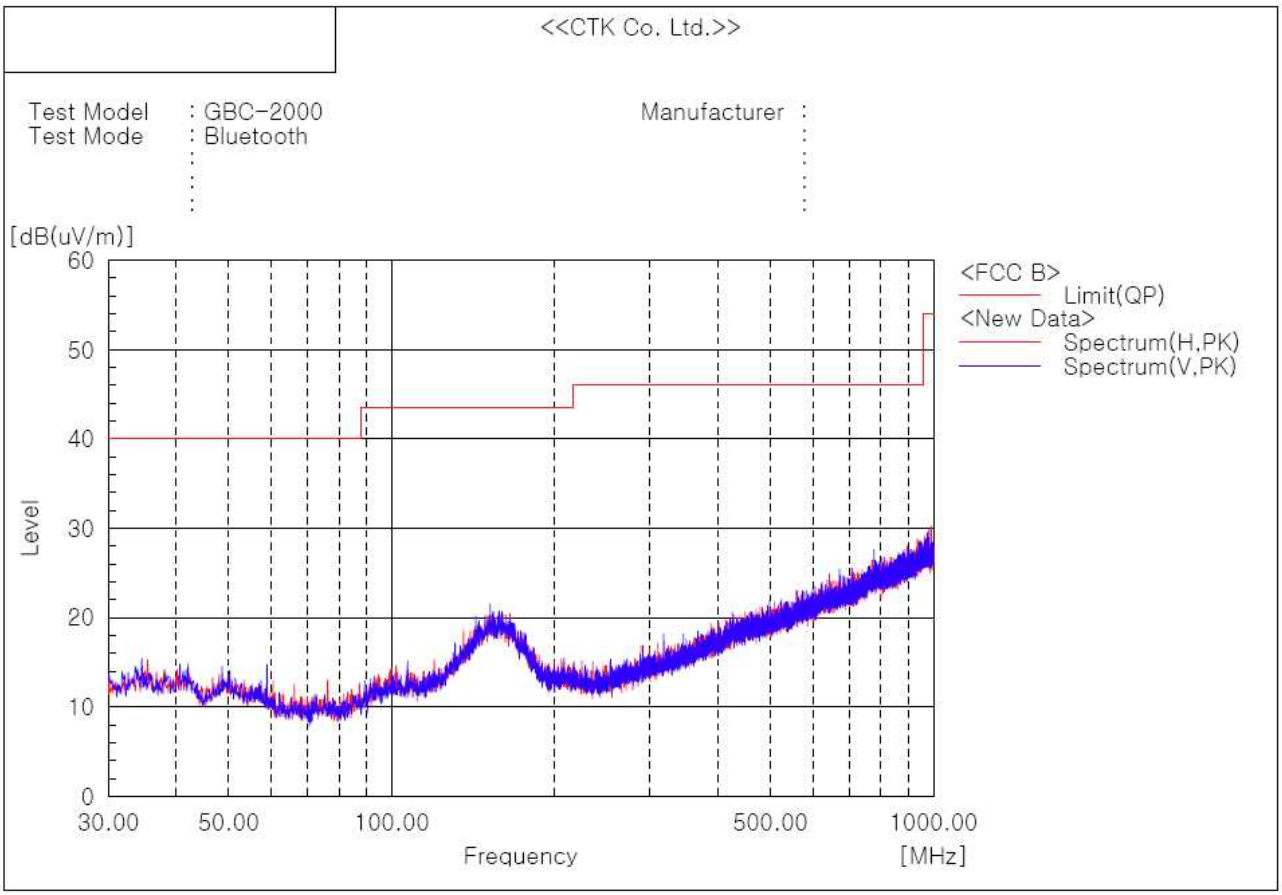
EUT	Bluetooth Handsfree Car kit	Measurement Detail	
Model	GBC-2000	Frequency Range	Below 1000MHz
Test mode	Bluetooth hopping mode	Detector function	Quasi-Peak

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



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) above 1 GHz

EUT	Bluetooth Handsfree Car kit	Measurement Detail	
Model	GBC-2000	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
4804	45.1 / 53.0	8.9 / 21.0	Average / Peak

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	
4804.00	32.4	40.3	V	1.0	12.7	54.0	74.0	45.1	53.0	8.9	21.0

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	27.5	38.8	V	1.0	12.7	54.0	74.0	40.2	51.5	13.8	22.5

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	15.6	27.7	V	1.0	5.1	54.0	74.0	20.7	32.8	33.3	41.2

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	
2390.00	29.4	48.5	V	1.0	5.1	54.0	74.0	34.5	53.6	19.5	20.4

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

EUT	Bluetooth Handsfree Car kit	Measurement Detail	
Model	GBC-2000	Frequency Range	1-25GHz
Channel	Channel 39	Detector function	Peak
Test Mode	GFSK		

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	38.4 / 50.3	15.6 / 23.7	Average / Peak

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	25.5 / 37.4	V	1.0	12.9	54.0 / 74.0	38.4 / 50.3	15.6 / 23.7

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	24.9 / 36.8	V	1.0	12.9	54.0 / 74.0	37.8 / 49.7	16.2 / 24.3

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			Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Amp. Gain	Cable			
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			Limits [dBuV/m]	Result [dBuV/m]	Margin [dB]
				Antenna	Amp. Gain	Cable			
No emissions were detected at a level greater than 20dB below limit.									

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

EUT	Bluetooth Handsfree Car kit	Measurement Detail	
Model	GBC-2000	Frequency Range	1-25GHz
Channel	Channel 78	Detector function	Peak
Test Mode	GFSK		

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	42.1 / 52.7	11.9 / 21.3	Average / Peak

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	24.0	36.6	V	1.0	13.1	54.0	74.0	37.1	49.7	16.9	24.3

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	22.9	36.3	V	1.0	13.1	54.0	74.0	36.0	49.4	18.0	24.6

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	36.7	47.3	V	1.0	5.4	54.0	74.0	42.1	52.7	11.9	21.3

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	32.7	47.7	V	1.0	5.4	54.0	74.0	38.1	53.1	15.9	20.9

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:

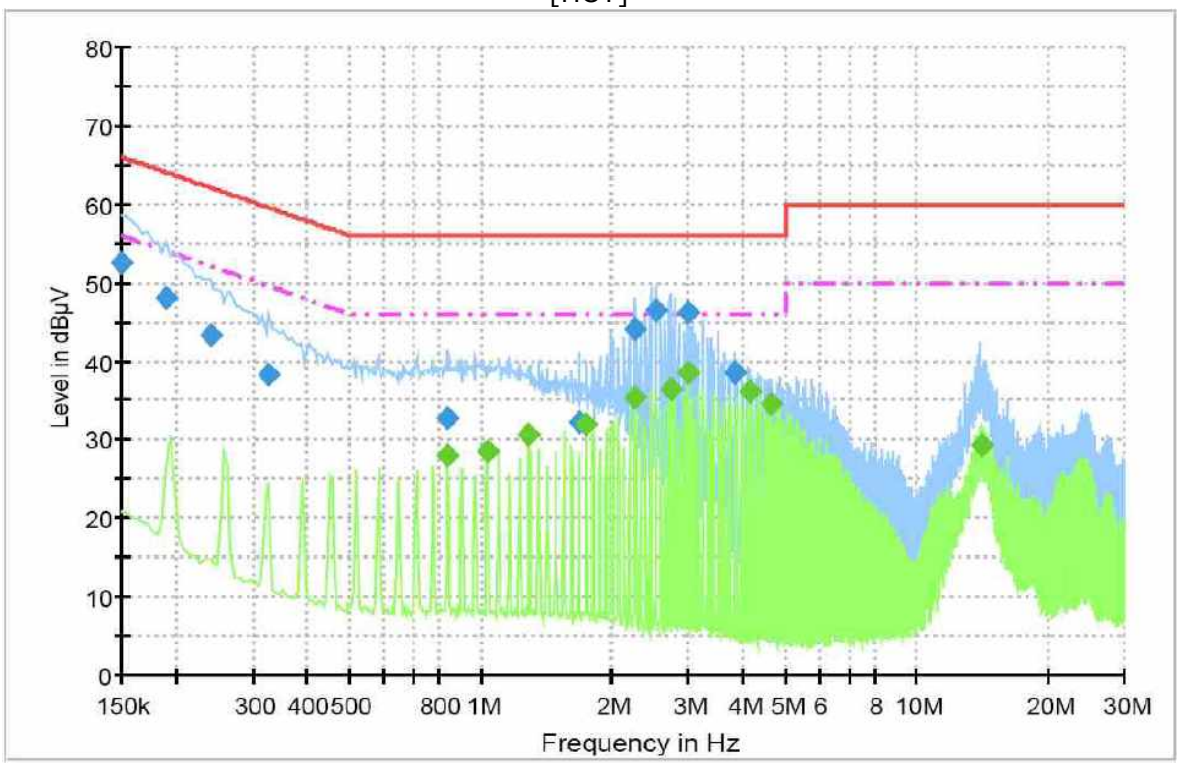
☒ Complies

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

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
2.976 000	38.5	7.5	Average

Test Data

[HOT]



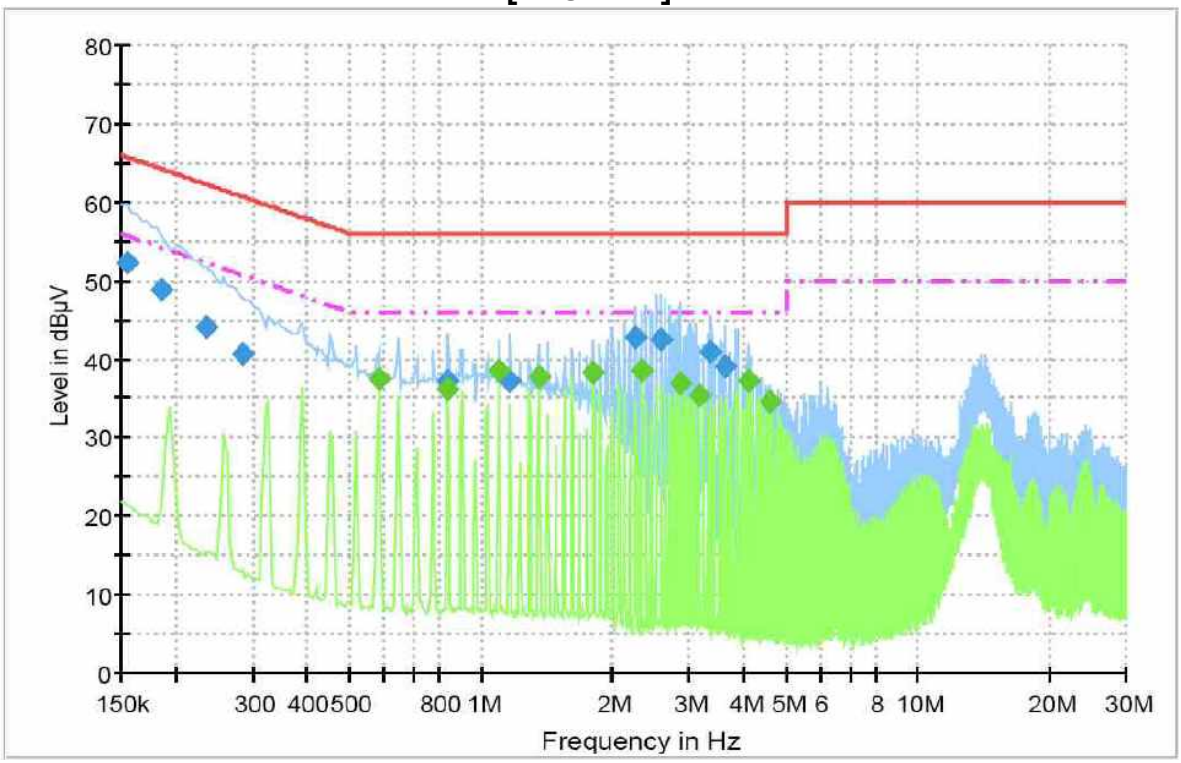
Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150000	52.4	1000.0	9.000	On	L1	9.8	13.6	66.0
0.190500	48.0	1000.0	9.000	On	L1	10.0	16.0	64.0
0.240000	43.3	1000.0	9.000	On	L1	10.0	18.7	62.1
0.325500	38.2	1000.0	9.000	On	L1	10.0	21.3	59.6
0.843000	32.7	1000.0	9.000	On	L1	10.0	23.3	56.0
1.684500	32.3	1000.0	9.000	On	L1	9.8	23.7	56.0
2.265000	44.0	1000.0	9.000	On	L1	9.8	12.0	56.0
2.521500	46.5	1000.0	9.000	On	L1	9.8	9.5	56.0
2.976000	46.1	1000.0	9.000	On	L1	9.7	9.9	56.0
3.817500	38.6	1000.0	9.000	On	L1	9.7	17.4	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.843000	27.9	1000.0	9.000	On	L1	10.0	18.1	46.0
1.036500	28.5	1000.0	9.000	On	L1	9.9	17.5	46.0
1.293000	30.7	1000.0	9.000	On	L1	9.8	15.3	46.0
1.747500	31.9	1000.0	9.000	On	L1	9.8	14.1	46.0
2.265000	35.3	1000.0	9.000	On	L1	9.8	10.7	46.0
2.719500	36.5	1000.0	9.000	On	L1	9.7	9.5	46.0
2.976000	38.5	1000.0	9.000	On	L1	9.7	7.5	46.0
4.141500	36.3	1000.0	9.000	On	L1	9.7	9.7	46.0
4.659000	34.6	1000.0	9.000	On	L1	9.7	11.4	46.0
14.104500	29.2	1000.0	9.000	On	L1	9.8	20.8	50.0

[NEUTRAL]



Final Result 1

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.154500	52.4	1000.0	9.000	On	N	9.9	13.4	65.8
0.186000	48.7	1000.0	9.000	On	N	10.0	15.5	64.2
0.235500	44.2	1000.0	9.000	On	N	10.0	18.0	62.3
0.285000	40.7	1000.0	9.000	On	N	10.0	20.0	60.7
0.843000	37.2	1000.0	9.000	On	N	10.0	18.8	56.0
1.162500	37.2	1000.0	9.000	On	N	9.9	18.8	56.0
2.260500	42.8	1000.0	9.000	On	N	9.8	13.2	56.0
2.589000	42.5	1000.0	9.000	On	N	9.8	13.5	56.0
3.363000	40.9	1000.0	9.000	On	N	9.7	15.1	56.0
3.624000	39.2	1000.0	9.000	On	N	9.7	16.8	56.0

Final Result 2

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.582000	37.4	1000.0	9.000	On	N	10.1	8.6	46.0
0.843000	36.2	1000.0	9.000	On	N	10.0	9.8	46.0
1.099500	38.4	1000.0	9.000	On	N	9.9	7.6	46.0
1.356000	37.8	1000.0	9.000	On	N	9.8	8.2	46.0
1.810500	38.4	1000.0	9.000	On	N	9.8	7.6	46.0
2.328000	38.5	1000.0	9.000	On	N	9.8	7.5	46.0
2.845500	37.0	1000.0	9.000	On	N	9.7	9.0	46.0
3.169500	35.4	1000.0	9.000	On	N	9.7	10.6	46.0
4.074000	37.1	1000.0	9.000	On	N	9.7	8.9	46.0
4.591500	34.6	1000.0	9.000	On	N	9.7	11.4	46.0

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	2012-11-08	2013-11-08
2	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2012-12-14	2013-12-14
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2012-12-14	2013-12-14
4	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2013-06-27	2014-06-27
5	Trilog Broadband Antenna	SCHWARZBECK	VULB 9161 SE	9161-4133	2012-06-11	2014-06-11
6	Horn Antenna	ETS-Lindgren	3115	00078895	2013-02-28	2015-02-28
7	DOUBLE RIDGE HORN ANTENNA	ETS-Lindgren	3116	00062916	2013-03-20	2015-03-20
8	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-125	2012-06-06	2014-06-06
9	Attenuator	Rohde & Schwarz	DNF	272.4110.50	2012-11-09	2013-11-09
10	PREAMPLIFIER	Agilent	8449B	3008A02307	2012-11-09	2013-11-09
11	AMPLIFIER	Sonoma Instrument Co.	310	291721	2013-03-21	2014-03-21
12	LISN	Rohde & Schwarz	ENV216	101235	2013-08-02	2014-08-02
13	LISN	Rohde & Schwarz	ENV216	101236	2013-08-02	2014-08-02
14	Band Reject Filter	Wainwright Instruments GmbH	WRCGV 2400/2483-2375/2505-50/10EE	2	2012-09-11	2013-09-11
15	Signal Generator	Rohde & Schwarz	SMB100A	175528	2012-10-08	2013-10-08