

# **TEST REPORT**

FCC Standards : FCC 47 CFR part 15 subpart C

Test Report No.	:	CTK-2017-00298	
Date of Issue	:	2017-02-14	
FCC ID	:	V2R-BT390	
Model/Type No.	:	BT 390	
Kind of Product	:	Wireless Compact Headphones	5
Applicant	:	Cresyn Co., Ltd.	
Applicant Address	:	5 Gangnam-dearo 107-gil, Sec	ocho-gu, Seoul, Korea
Manufacturer	:	Cresyn Co., Ltd.	
Manufacturer Address	:	5 Gangnam-dearo 107-gil, Seocho-gu, Seoul, Korea	
Contact Person	:	TaeHo Kim / Research Enginee	r
Telephone	:	+81-2-2041-2630	
Received Date	:	2017-01-24	
Test period	:	Start : 2017-01-26	End: 2017-02-08
Test Results	:	🛛 In Compliance	Not in Compliance

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

Tested by

Reviewed by

Won-Jae, Hwang **Test Engineer** Date: 2017-02-14

J. Pork

Young-Joon, Park **Technical Manager** Date: 2017-02-14

Page 1 of 51

This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)



## **REPORT REVISION HISTORY**

Date	Revision	Page No
2017-02-14	Issued (CTK-2017-00298)	All

This report shall not be reproduced except in full, without the written approval of CTK Co., Ltd. This document may be altered or revised by CTK Co., Ltd. personnel only, and shall be noted in the revision section of the document. Any alteration of this document not carried out by CTK Co., Ltd. will constitute fraud and shall nullify the document.



www.e-ctk.com

## **TABLE OF CONTENTS**

REPORT	REVISION HISTORY	2
1.0	General Product Description	
1.1	Tested Frequency	4
1.2	Tested Mode	4
1.3	EUT Operation Test Setup	5
1.4	EUT Exercise of Software	5
1.5	Device Modifications	5
1.6	Peripheral Devices	
1.7	Configuration of System under Test	5
1.8	Calibration Details of Equipment Used for Measurement	6
1.9	Test Facility	
1.10	Laboratory Accreditations and Listings	6
2.0	Summary of tests	7
2.1	Transmitter Requirements	8
2.1.		
2.1.	2 Number of Hopping Frequencies	10
2.1.	3 20 dB bandwidth	13
2.1.	4 Time of Occupancy (Dwell Time)	19
2.1.	5 Maximum peak Conducted Output Power	25
2.1.	6 Band-edge	30
2.1.	7 Field Strength of Emissions	41
2.1.		
APPEND	IX A – Test Equipment Used For Tests	51



## 1.0 General Product Description

Basic Model/Type No.	BT 390
Serial number	Prototype
EUT condition	Pre-production, not damaged
Antenna type	Chip antenna Gain 3.061 dBi
Frequency Range	2402 MHz - 2480 MHz
RF power	-1.615 dBm Peak Conducted (GFSK) 1.440 dBm Peak Conducted (8-DPSK)
Number of channels	79
Channel Spacing	1 MHz
Channel Access Protocol	Frequency Hopping
Type of Modulation	GFSK(1 Mbps), DQPSK(2 Mbps), 8-DPSK(3 Mbps)
Power Source	DC 3.7 V
Hardware Rev	Rev 1.0
Software Rev	Rev 1.0
Firmware Rev	Rev 1.0

### 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.
- 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	DH 5
Low, Mid, High	FHSS	8-DPSK	3DH 5



# 1.3 EUT Operation Test Setup

For Bluetooth function, the engineering test program was provided and enabled to make EUT continuous transmit/receive.

### 1.4 EUT Exercise of Software

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. The software is using the android system to internal memory.

### 1.5 Device Modifications

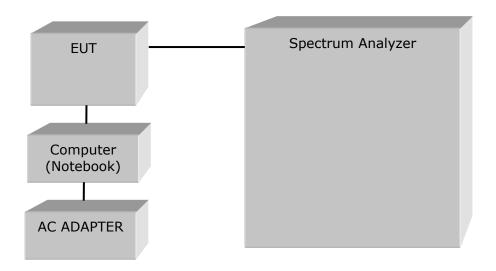
The following modifications was applied by the applicant:

Not applicable

### 1.6 Peripheral Devices

Device	Manufacturer	Model No.	Serial No.
Note Computer	Samsung Electronics Co., Ltd.	NT-R540	ZW3B93AZ900402F
AC ADAPTER	Tech-Power Electric Co.,Ltd.	NT01	-

### 1.7 Configuration of System under Test





### **1.8 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.

### 1.9 Test Facility

The measurement facility is located at (Ho-dong), 113, Yejik-ro, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea. The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

### **1.10 Laboratory Accreditations and Listings**

Country	Agency	Scope of Accreditation	Registration Number	Logo
USA	FCC	FCC Part 15 & 18 EMI (Electromagnetic Interference / Emission)	805871	FC
JAPAN	VCCI	VCCI V-3 EMI (Electromagnetic Interference / Emission)	C-986 T-1843 R-3627 G-387	<b>V</b> ©I
KOREA	MSIP	EMI (Electromagnetic Interference / Emission) EMS (Electromagnetic Susceptibility / Immunity)	KR0025	



# 2.0 Summary of tests

FCC Part Section(s)	Parameter	Test Condition	Status (note 1)
15.247(a)	Carrier Frequency Separation		С
15.247(a)	Number of Hopping Frequencies		С
15.247(a)	20 dB Bandwidth		С
15.247	Dwell Time	Conducted	С
15.247(b)	Transmitter Output Power		С
15.247(d)	Conducted Spurious emission		С
15.247(d)	Band Edge		С
15.209	Field Strength of Harmonics	Radiated	С
15.207	AC Conducted Emissions	Line Conducted	С

The sample was tested according to the following specification:

- FCC Part 15.247

The tests were performed according to the method of measurements prescribed in DA 00-705 and ANSI C63.10-2013.



### 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 (Start with the RBW set to approximately 30% of the channel spacing; adjust as necessary to best identify the center of each individual channel)

 VBW = 30 kHz (≥ RBW)
 Sweep = auto

 Detector function = peak
 Trace = max hold

 EUT
 Coax cable

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)

	Adjacent Hopping	Two-third of 20dB	Minimum		l
Channel	Channel Separation	bandwidth	Bandwidth	Result	ł
	(kHz)	(kHz)	(kHz)		
2441MHz	985	632.4	25	Complies	
	Channel	Adjacent Hopping Channel Channel Separation (kHz)	Adjacent HoppingTwo-third of 20dBChannelChannel Separation (kHz)bandwidth (kHz)	Channel Channel Separation bandwidth Bandwidth (kHz) (kHz) (kHz)	Adjacent HoppingTwo-third of 20dBMinimumChannelChannel SeparationbandwidthBandwidth(kHz)(kHz)(kHz)

#### 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	1010	843.3	25	Complies

See next pages for actual measured spectrum plots.

Page 8 of 51



### 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

#### **Carrier Frequency Separation**



#### Data Rate : GFSK

#### Data Rate : 8-DPSK



Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 9 of 51

This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)



### 2.1.2 Number of Hopping Frequencies

Test Location RF Test Room

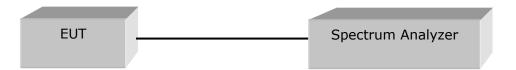
#### **Test Procedures**

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 = 30 kHz (To identify clearly the individual channels, set the RBW to less than30% of the channel spacing or the 20 dB bandwidth, whichever is smaller)VBW = 30 kHz ( $\geq \text{ RBW}$ )Sweep = autoDetector function = peakTrace = 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.

Test Report No.: CTK-2017-00298 Page 10 of 51 Date: 2017-02-14 This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)



#### 11:19:20 AM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWWW DET P P P P P SENSE:INT Peak Search Avg Type: Log-Pwr Avg|Hold:>100/100 Ext Gain: -0.50 dB Marker 1 37.005000000 MHz PNO: Fast Trig: Free Run IFGain:Low #Atten: 20 dB Next Peak ΔMkr1 37.005 0 MHz 1.521 dB 10 dB/div Log Ref 10.00 dBm 1<u>4</u>2 Next Pk Right Next Pk Left Marker Delta Mkr→CF holomore for war Mkr→RefLvl More 1 of 2 Start 2.39000 GHz #Res BW 300 kHz Stop 2.43950 GHz Sweep 1.000 ms (1001 pts) #VBW 300 kHz STATUS

#### Number of Hopping Frequencies(GFSK)

Peak Search	4 Jan 26, 2017 E <b>1 2 3 4 5 6</b> FE <b>M WARKEN</b>	TRAC	Pwr D0	ALIGN AU : Log-P' >100/10	g Type g Hold:	A			g:Fre		st 🕞	NO: Ez	MHz	2 A	alyzer - S 50 95000	RF	U RL
Next Peal	95 MHz 469 dB	kr1 39.	_	-0.50 dE	t Gain:	E		0 dB	ten: 2	#At		Gain:L	IF	dBr	f 10.00	v Re	0 dB/c
Next Pk Righ		1 <u>42</u>	ጠሉ	ለሰл	กกก	۲. ۱۳۱۲	ഹവ	in n	<u>ገ ሰገ ጦ</u>	កក	ากก	<u>00</u>	\ M M M M	7~1	ากกก	אממ	X
Next Pk Lef						¶ ¥			ĬĬ	Ĭ	ĬĬ		₩₩¥ ₩₩	ĬĬ			10.0
Marker Delta																	30.0 - 40.0 -
Mkr→Ci	ለአለማሪ																50.0
Mkr→RefLv	(បជឃមូ)	<u> </u>															70.0 —
<b>Mor</b> 1 of 2	8950 GHz 1001 pts)	Stop 2.48 000 ms (	p 1.	Sweep					kHz	300	VBW	#				43950 W 300	
			TATUS														SG SG



(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

#### Swept SA 01:42:52 PM Jan 26, 2017 TRACE 1 2 3 4 5 6 Peak Search Avg Type: Log-Pwr Avg|Hold>100/100 Ext Gain: -0.50 dB Marker 1 37.203000000 MHz PNO: Fast Free Run IFGain:Low #Atten: 20 dB TYPE **Next Peak** ΔMkr1 37.203 0 MHz 1.318 dB Ref 10.00 dBm 10 dB/div Log 1Δ2 Next Pk Right W X avry Next Pk Left Marker Delta Mkr→CF Munde the second d Mkr→RefLvi More Start 2.39000 GHz #Res BW 300 kHz 1 of 2 Stop 2.43950 GHz Sweep 1.000 ms (1001 pts) #VBW 300 kHz

Number of Hopping Frequencies(8-DPSK)





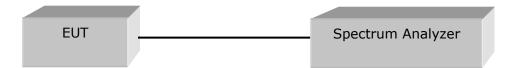
#### 2.1.3 20 dB bandwidth

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 channelsSpan = 3 MHz (between 2 times and 5 times the OBW)RBW = 30 kHz (1% to 5% of the OBW)Sweep = autoVBW = 91 kHz (approximately 3 times RBW)Detector function = peakTrace = max hold



#### Limit

Limit : N/A



#### Test Results (20 dB bandwidth)

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

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	0.946	Complies
2441	39	0.948	Complies
2480	78	0.947	Complies

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

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	1.268	Complies
2441	39	1.265	Complies
2480	78	1.256	Complies

#### Test Results (Occupied Bandwidth)

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

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	0.860	Complies
2441	39	0.853	Complies
2480	78	0.855	Complies

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

Frequency (MHz)	Channel Number.	Measured Bandwidth (MHz)	Result
2402	0	1.161	Complies
2441	39	1.162	Complies
2480	78	1.155	Complies

See next pages for actual measured spectrum plots.



#### 20 dB Bandwidth, Occupied Bandwidth (GFSK)

RL 11:01:03 AM Jan 26, 2017 ALIGN AUTO Frequency Center Freq 2.402000000 GHz Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hold: 10/10 #Atten: 20 dB Ext Gain: -0.50 dB Radio Std: None #IEGain:Low Radio Device: BTS Ref 10.00 dBm 0 dB/div .og **Center Freq** 2.402000000 GHz Center 2.402 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.2 ms CF Step 300.000 kHz #VBW 91 kHz Man Auto **Occupied Bandwidth Total Power** 4.27 dBm 860.51 kHz Freq Offset Transmit Freq Error 8.733 kHz **OBW Power** 99.00 % 0 Hz x dB Bandwidth 946.5 kHz x dB -20.00 dB STATUS





(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





### 20 dB Bandwidth, Occupied Bandwidth (8-DPSK)

11:21:41 AM Jan 26, 2017 Radio Std: None RL ALIGN AUTO Frequency Center Freq 2.402000000 GHz Center Freq: 2.402000000 GHz Trig: Free Run Avg|Hold: 10/10 #Atten: 20 dB Ext Gain: -0.50 dB Radio Device: BTS #IFGain:Low Ref 10.00 dBm 10 dB/div Log 0.00 **Center Freq** Δ 2.402000000 GHz Center 2.402 GHz #Res BW 30 kHz Span 3 MHz Sweep 3.2 ms CF Step 300.000 kHz #VBW 91 kHz Man <u>Auto</u> 5.68 dBm **Occupied Bandwidth Total Power** 1.1615 MHz Freq Offset Transmit Freq Error 2.871 kHz **OBW Power** 99.00 % 0 Hz x dB Bandwidth 1.268 MHz x dB -20.00 dB STATUS

Agilent Spectrum Analyzer - Occupi LXI RL RF 50 Ω #		SENSE:INT	ALIGNAUTO	11:24:12 AM Jan 26, 2017	Francisco
Center Freq 2.4410000	000 GHz #IFGain:Low	Center Freq: 2.4410 Trig: Free Run #Atten: 20 dB	00000 GHz Avg Hold: 10/10 Ext Gain: -0.50 dB	Radio Std: None Radio Device: BTS	Frequency
10 dB/div Ref 10.00 c	IBm				
Log 0.00 -10.0		- Martin			Center Freq 2.441000000 GHz
-30.0					
-50.0				un and a second	
-70.0					
Center 2.441 GHz #Res BW 30 kHz		#VBW 91 ki	Hz	Span 3 MHz Sweep   3.2 ms	CF Step 300.000 kHz
Occupied Bandw		Total P	ower 6.9	3 dBm	<u>Auto</u> Man
	1.1625 MI	Ηz			Freq Offset
Transmit Freq Error	-10.512	kHz OBW F	ower 9	9.00 %	0 Hz
x dB Bandwidth	1.265 N	NHz xdB	-20	.00 dB	
MSG			STATU	JS	



(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





### 2.1.4 Time of Occupancy (Dwell Time)

Test Location RF Test Room

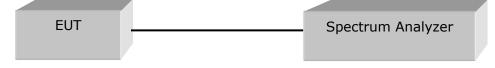
#### Test Procedures

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 BT 390 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 ( $\leq$  channel spacing) VBW = 1 MHz ( $\geq$  RBW) 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  $\times$  hop rate  $\div$  number of hop per channel  $\times$  31.6

Test mode : GFSK	Test	mode	•	GESK
------------------	------	------	---	------

Channel	Length of		Test Results		
Frequency (MHz)	Packet Type	Transmission Time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Result	
	DH 1	0.426	136.3	Complies	
2441	DH 3	1.681	269.0	Complies	
	DH 5	2.941	313.7	Complies	

DH1 Dwell time =  $0.426 \text{ ms} \times (1600 \div 2) \div 79 \times 31.6 = 136.3 \text{ms}$ DH3 Dwell time =  $1.681 \text{ ms} \times (1600 \div 4) \div 79 \times 31.6 = 269.0 \text{ ms}$ DH5 Dwell time =  $2.941 \text{ ms} \times (1600 \div 6) \div 79 \times 31.6 = 313.7 \text{ ms}$ 

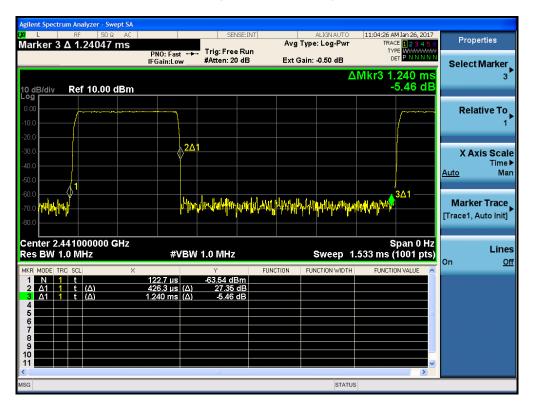
#### Test mode : 8-DPSK

Channel		Length of	Test Results		
Frequency (MHz)	Packet Type	Transmission Time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Result	
	3DH 1	0.440	140.8	Complies	
2441	3DH 3	1.691	270.6	Complies	
	3DH 5	2.936	313.2	Complies	
30H1 I	Dwall time - 0/	$\frac{1}{140} \text{ ms} \times (1600 \text{ ms})$	-2) - 79 × 31 6 = 140	8 ms	

3DH1 Dwell time =  $0.440 \text{ ms} \times (1600 \div 2) \div 79 \times 31.6 = 140.8 \text{ ms}$ 3DH3 Dwell time =  $1.691 \text{ ms} \times (1600 \div 4) \div 79 \times 31.6 = 270.6 \text{ ms}$ 3DH5 Dwell time =  $2.936 \text{ ms} \times (1600 \div 6) \div 79 \times 31.6 = 313.2 \text{ ms}$ 

See next pages for actual measured spectrum plots.





#### Time of Occupancy for PACKET Type DH1(GFSK)

Time of Occupancy for PACKET Type DH3(GFSK)

L	RF 50 Ω AC		SENSE:INT	ALIGN AUTO	11:05:32 AM Jan 26, 2017	Marker
larker 3	Δ 3.73047 ms	PNO: Fast ↔ IEGain:Low	⊢ Trig: Free Run #Atten: 20 dB	Avg Type: Log-Pwr Ext Gain: -0.50 dB	TRACE 123456 TYPE WWWWWWW DET PINNNN	
0.10216	Ref 10.00 dBm	IFGain:Low	#Atten: 20 db		Mkr3 3.730 ms -15.10 dB	Select Marker
0 dB/div .og	Rei 10.00 dBill					
0.00			-			Norm
10.0						NOTIN
20.0			2Δ1			
30.0			¥			
40.0	<u></u>					Del
50.0	∲ <sup>•</sup>					
60.0 <b></b>			A distant also intelle as	Later and a still some start the	3∆1	
70.0 MT 100			MANY MANY MUT AND A COMPANY	heterogeneralleregisteretigentlekker	μ <mark>γγ</mark>	Fixed
80.0						
Contor 2 /	441000000 GHz				Span 0 Hz	
les BW 1		#VB\	V 1.0 MHz	Sweep 5	.000 ms (1001 pts)	c
MKR MODE TR	RC SCL X		Y FL	INCTION FUNCTION WIDTH	FUNCTION VALUE	
1 N 1	t	347.7 µs	-52.94 dBm			
2 Δ1 1 3 Δ1 1		1.681 ms (Δ) 3.730 ms (Δ)	21.51 dB -15.10 dB			
						Properties
4						
4 5 6						
4 5						Ма
4 5 6 7 8 9						
4 5 5 6 7 8 9 10					×	
4 5 6 7 8				STATUS		<b>Мо</b> 1 о

Test Report No.: CTK-2017-00298 Date: 2017-02-14

This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)

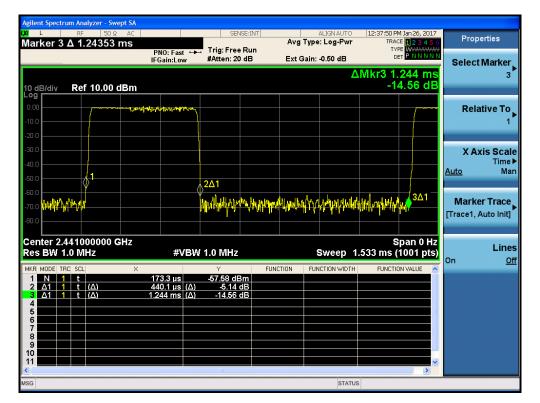


#### 11:06:27 AM Jan 26, 2017 TRACE 123456 TYPE DET PNNNNN SENSE:INT Marker Marker 3 Δ 6.24047 ms Avg Type: Log-Pwr PNO: Fast ↔ Trig: Free Run IFGain:Low #Atten: 20 dB Ext Gain: -0.50 dB Select Marker ΔMkr3 6.240 ms -11.72 dB 3 Ref 10.00 dBm 10 dB/div Normal Delta $2\Delta 1$ <u>3∆1</u> enutriquenter participant and NUMBER **Fixed** Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 10.00 ms (1001 pts) #VBW 1.0 MHz Off FUNCTION FUNCTION WIDTH 677.7 μs 2.941 ms (Δ) 6.240 ms (Δ) 55.2 -6.67 dB -11.72 dB Δ1 t (Δ) **Properties**► More 1 of 2 STATUS

#### Time of Occupancy for PACKET Type DH5(GFSK)

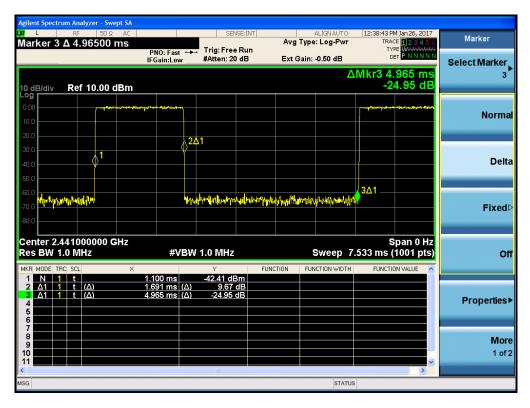


www.e-ctk.com



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

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





#### 12:39:57 PM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE DET P N N N N N SENSE:INT Marker Marker 3 Δ 12.4650 ms Avg Type: Log-Pwr Trig: Free Run #Atten: 20 dB PNO: Fast ↔→→ IFGain:Low Ext Gain: -0.50 dB Select Marker ΔMkr3 12.46 ms -10.70 dB 3 Ref 10.00 dBm 0 dB/div ∆<mark>2∆1</mark> Normal Delta 3∆1 the with the state of the state WWW NUMMIN **Fixed** Center 2.441000000 GHz Res BW 1.0 MHz Span 0 Hz Sweep 15.00 ms (1001 pts) #VBW 1.0 MHz Off FUNCTION FUNCTION WIDTH FUNCTION VALUE 2.936 ms (∆) 12.46 ms (∆) 52.44 dB -10.70 dB Δ1 t (Δ) **Properties**► More 1 of 2 STATUS

#### 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 channelsSpan = 5 MHz (approximately 5 times of the 20 dB bandwidth)RBW = 3 MHz (greater than the 20 dB bandwidth of the emission being measured)VBW = 3 MHz ( $\geq$  RBW)Detector function = peakTrace = max holdSweep = auto



#### Limit

§5.247(b)(1) The Maximum Peak Output Power Measurement is 1 Watts for frequency hopping system operating in 2400-2483.5 MHz employing at least 75 non-overlapping 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	-2.962	0.970	Complies
2441	39	-1.615	1.393	Complies
2480	78	-2.096	1.388	Complies

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

<u> </u>							
Frequency (MHz)	Channel No.	Peak output power(dBm)	Peak output power(mW)	Result			
2402	0	-0.133	0.970	Complies			
2441	39	1.440	1.393	Complies			
2480	78	1.423	1.388	Complies			

See next pages for actual measured spectrum plots.



www.e-ctk.com

RL RF 50Ω AC Center Freq 2.402000000		e Run Av	ALIGNAUTO /g Type: Log-Pwr g Hold:>10/10 t Gain: -0.50 dB	11:00:55 AM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE M	Frequency
0 dB/div Ref 10.00 dBm			Mkr1	2.402 055 GHz -3.093 dBm	Auto Tun
0.00		<b>↓</b> 1			<b>Center Fre</b> 2.402000000 GH
20.0					Start Fre 2.399500000 G⊦
10.0					<b>Stop Fre</b> 2.404500000 GH
					CF Ste 500.000 ki <u>Auto</u> M:
					Freq Offs 0 I
800 Center 2.402000 GHz Res BW 3.0 MHz	#VBW 3.0 MH			Span 5.000 MHz 000 ms (1001 pts)	

#### Maximum peak Conducted Output Power - GFSK

RL RI	50 Ω AC 2.441000000		SENSE:		ALIGNAUTO	11:03:10 AM Jan 26, 2017 TRACE 1 2 3 4 5 6	Frequency
enter Freq	2.44100000	PNO: Fast IFGain:Low	Trig: Free R #Atten: 20 dl	un Avg H	old:>10/10 tin: -0.50 dB		
0 dB/div Re	f 10.00 dBm				Mkr1	2.440 710 GHz -1.496 dBm	Auto Tun
0.00			<b>∳</b> <sup>1</sup>				Center Fre 2.441000000 G⊦
20.0							<b>Start Fre</b> 2.438500000 GH
10.0							<b>Stop Fro</b> 2.443500000 Gi
0.0							CF Ste 500.000 k <u>Auto</u> M
0.0							Freq Offs 0
0.0							
enter 2.4410 Res BW 3.0		#VBW	3.0 MHz		Sweep 1	Span 5.000 MHz .000 ms (1001 pts)	



www.e-ctk.com

	RF 50 Ω A		SENSE:INT	ALIGN AUTO	11:08:46 AM Jan 26, 2017	Frequency
enter Fred	2.4800000 p	00 GHz PNO: Fast IFGain:Low	Trig: Free Run #Atten: 20 dB	Avg Type: Log-Pwr Avg Hold:>10/10 Ext Gain: -0.50 dB	TRACE 123456 TYPE M WWWWW DET P P P P P P	
0 dB/div R	ef 10.00 dBn	n		Mkr1	2.479 770 GHz -1.995 dBm	Auto Tur
			▲1			Center Fre
).00						2.480000000 GI
0.0						Start Fre
0.0						2.477500000 G
0.0						Stop Fr
0.0						2.482500000 G
						CF Ste
0.0						500.000 k Auto M
D.O						
0.0						Freq Offs 0
0.0						
					0	
enter 2.480 Res BW 3.0		#VBW	3.0 MHz	Sweep 1	Span 5.000 MHz .000 ms (1001 pts)	



Maximum peak Conducted Output Power – 8-DPSK

Swept SA alvzer ALIGN AUTO Avg Type: Log-Pwr Avg|Hold>10/10 Ext Gain: -0.50 dB 11:21:34 AM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P P RL SENSE:INT Frequency Center Freq 2.402000000 GHz GHZ PNO: Fast Free Run IFGain:Low #Atten: 20 dB Auto Tune Mkr1 2.401 925 GHz -0.133 dBm Ref 10.00 dBm 10 dB/div Log 1 **Center Freq** 2.402000000 GHz Start Freq 2.399500000 GHz Stop Freq 2.404500000 GHz CF Step 500.000 kHz Auto Man Freq Offset 0 Hz Center 2.402000 GHz #Res BW 3.0 MHz Span 5.000 MHz Sweep 1.000 ms (1001 pts) #VBW 3.0 MHz

XI RL	rum Analyzer - Swept SA RF 50 Ω AC req 2.441000000	GHz	SENSE:INT	ALIGN AUTO Avg Type: Log-Pwr Avg Hold:>10/10	11:24:04 AM Jan 26, 2017 TRACE 12 3 4 5 6 TYPE MWWWWW	Frequency
			en: 20 dB	Ext Gain: -0.50 dB	DET PPPPPP 1 2.440 945 GHz	Auto Tune
10 dB/div Log	Ref 10.00 dBm				1.440 dBm	
0.00			<sup>1</sup>			Center Free 2.441000000 GH
-10.0						<b>Start Fre</b> 2.438500000 GH
30.0						<b>Stop Fre</b> 2.443500000 G⊦
50.0						CF Ste 500.000 kH <u>Auto</u> Ma
70.0						Freq Offs 0 H
-80.0						
Center 2.4 #Res BW	441000 GHz 3.0 MHz	#VBW 3.01	VIHz	Sweep	Span 5.000 MHz 1.000 ms (1001 pts)	
ısg 🗼 Aligr	nment Completed			STATU	JS	



www.e-ctk.com

<sup>a</sup> RL Center F	RF 50 Ω AC req 2.48000000	0 GHz PNO: Fast	Trig: Free Run #Atten: 20 dB	ALIGNAUTO Avg Type: Log-Pwr Avg Hold>10/10 Ext Gain: -0.50 dB	12:43:06 PM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P	Frequency
0 dB/div	Ref 10.00 dBm	II COMILLOW		Mkr1	2.479 845 GHz 1.423 dBm	Auto Tun
0.00			<b>1</b>			<b>Center Fre</b> 2.480000000 GH
20.0						<b>Start Fre</b> 2.477500000 GH
10.0 10.0						<b>Stop Fro</b> 2.482500000 GI
i0.0						<b>CF St</b> e 500.000 ki <u>Auto</u> M
i0.0 '0.0						Freq Offs
and	480000 GHz				Span 5.000 MHz	
	3.0 MHz	#VBV	/ 3.0 MHz	Sweep 1	.000 ms (1001 pts)	



#### 2.1.6 Band-edge

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 channelsRBW = 100 kHzVBW = 300 kHz (\geq RBW)Span = 10 MHzTrace = max holdEUTEUTSpectrum Analyzer
```

#### 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.





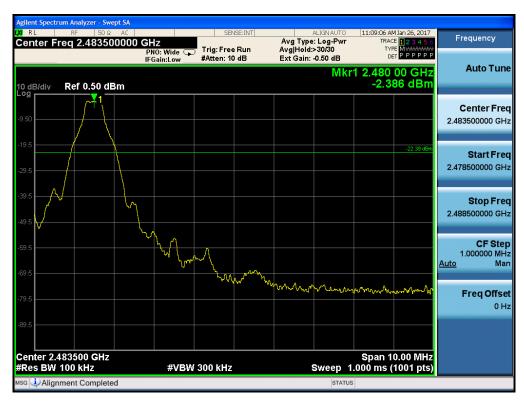
#### Band - edge (with Hopping) - GFSK





Center Freq 2.400000000 GHz PNO: Wide IFGain:Low 11:01:16 AM Jan 26, 2017 TRACE **1 2 3 4 5 6** TYPE MWWWWW DET P P P P P SENSE:INT Frequency Avg Type: Log-Pwr Avg|Hold:>30/30 Trig: Free Run #Atten: 10 dB Ext Gain: -0.50 dB Auto Tune Mkr1 2.402 01 GHz -3.319 dBm 10 dB/div Ref 0.50 dBm **Center Freq** 2.40000000 GHz Start Freq 2.395000000 GHz Stop Freq 2.405000000 GHz CF Step 1.000000 MHz Man <u>Auto</u> A. A. wow Freq Offset 0 Hz Center 2.400000 GHz #Res BW 100 kHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 300 kHz STATUS

#### Band – edge (without Hopping) - GFSK





01:18:02 PM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE MWWWW DET P P P P P SENSE:INT B I Trace/Detector Avg Type: Log-Pwr Avg|Hold:>30/30 Ext Gain: -0.50 dB Ref Level 4.50 dBm PNO: Wide Trig: Free Run IFGain:Low #Atten: 14 dB Select Trace Mkr1 2.403 01 GHz -1.577 dBm 10 dB/div Ref 4.50 dBm **Clear Write Trace Average** Max Hold Min Hold ΛŇ mantent man View Blank Trace On More 1 of 3 Center 2.400000 GHz #Res BW 100 kHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 300 kHz STATUS

#### Band – edge (with Hopping) – 8-DPSK





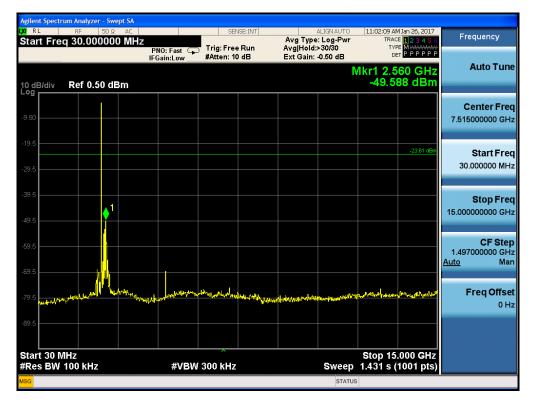
V RL RF 50 Ω AC Center Freq 2.400000000 GHz PN0: Wide IFGain:Low #Atten: 10 dB 11:21:59 AM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE M WWWWW DET P P P P P SENSE:INT Frequency Avg Type: Log-Pwr Avg|Hold:>30/30 Ext Gain: -0.50 dB Auto Tune Mkr1 2.402 17 GHz -1.956 dBm 10 dB/div Ref 0.50 dBm M1 **Center Freq** 2.40000000 GHz Start Freq 2.395000000 GHz Stop Freq 2.405000000 GHz CF Step 1.000000 MHz M Man <u>Auto</u> mar mm Freq Offset 0 Hz Center 2.400000 GHz #Res BW 100 kHz Span 10.00 MHz Sweep 1.000 ms (1001 pts) #VBW 300 kHz STATUS

#### Band – edge (without Hopping) – 8-DPSK





#### Band – edge (at 20 dB blow) – Low channel Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic (GFSK : Worst-Case)



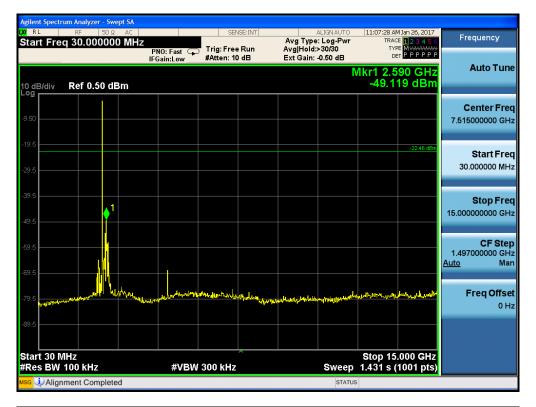
tart Fre	RF 50Ω AC q 15.00000000		SENSE:INT Trig: Free Run #Atten: 10 dB	ALIGNAUTO Avg Type: Log-Pwr Avg Hold>30/30 Ext Gain: -0.50 dB	11:02:49 AM Jan 26, 2017 TRACE 1 2 3 4 5 6 TYPE M	Frequency
0 dB/div	Ref 0.50 dBm			I	/lkr1 24.95 GHz -69.478 dBm	Auto Tur
9.50						Center Fre 20.000000000 GR
29.5					-23.61 dBm	<b>Start Fr</b> 15.000000000 G
9.5						<b>Stop Fr</b> 25.000000000 G
9.5					1 and have seen of an and have not	CF St 1.000000000 G Auto M
9.5 <b>HANN</b>	and a second second second second second	n-destront, established	lenn minter and a second s	ordansteelinesteelinetteelinetteelinettee	of the second	Freq Off 0
tart 15.0	000 GHz 100 kHz	# <u>VB</u> V	V 300 kHz	Sweep	Stôp 25.000 GHz 955.7 ms (1001 pts)	

Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 35 of 51

This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)



#### Band – edge (at 20 dB blow) – Mid channel Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic (GFSK : Worst-Case)





Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 36 of 51

This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)



#### Band – edge (at 20 dB blow) – High channel Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic (GFSK : Worst-Case)

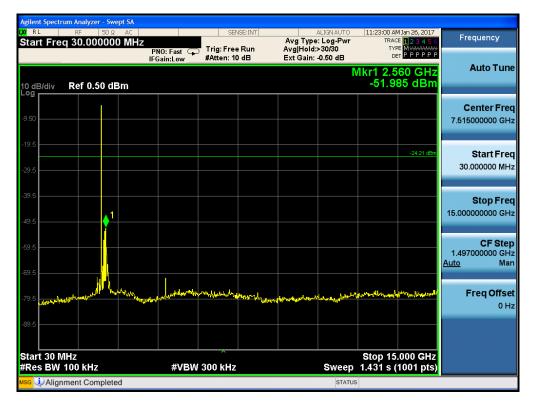




Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 37 of 51



#### Band – edge (at 20 dB blow) – Low channel Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic (8-DPSK : Worst-Case)

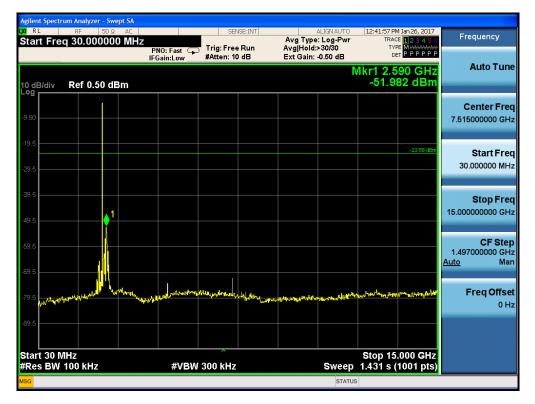




Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 38 of 51



#### Band – edge (at 20 dB blow) – Mid channel Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic (8-DPSK : Worst-Case)



tart Fre	RF 50 Ω AC		SENSE:INT	Avg Type:		TRACI	I Jan 26, 2017 E <mark>1 2 3 4 5 6</mark> E M <del>WWWWW</del>	Frequency
			ig:FreeRun Maten:10dB	Avg Hold> Ext Gain: -0	.50 dB	DE	т <mark>РРРРР</mark>	Auto Tur
0 dB/div	Ref 0.50 dBm				N	1kr1 24. -69.64	97 GHz 19 dBm	Auto Tu
9.50								<b>Center Fr</b> 20.000000000 GI
29.5							-23.58 dBm	<b>Start Fr</b> 15.000000000 G
9.5								<b>Stop Fr</b> 25.000000000 G
9.5								CF St 1.00000000 G <u>Auto</u> N
9.5	and and the state of the state	redultinguantemanthilu	holysylpuly-relided, <sup>fra</sup> ncistar-side	wilderheiten an	ahliteen ahay)	or all and the second second	hulana <sup>n</sup> ahulanan <sup>an</sup>	Freq Off
9.5 tart 15.0						Stop 25.	000 GHz	
	100 kHz <krc.png> saved</krc.png>	#VBW 30	0 kHz	S	weep 9	55.7 ms ('	1001 pts)	

Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 39 of 51



#### Band – edge (at 20 dB blow) – High channel Frequency Range = 30 MHz ~ 10<sup>th</sup> harmonic (8-DPSK : Worst-Case)





Test Report No.: CTK-2017-00298 Date: 2017-02-14 Page 40 of 51



# 2.1.7 Field Strength of Emissions

#### **Test Location**

 $\boxtimes$  10 m SAC (test distance :  $\square$  10 m,  $\boxtimes$  3 m)

 $\boxtimes$  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  $\geq$  1 GHz, 100 kHz for f < 1 GHz, 9 kHz for f < 30 MHz VBW  $\geq$  RBW Sweep = auto

#### Limit

- 15.209(a)			
Frequency(MHz)	Field Strength	Field Strength	Deasurement
	uV/m@3m	dBuV/m@3m	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

#### - 15 209(a)

\*\* 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 :

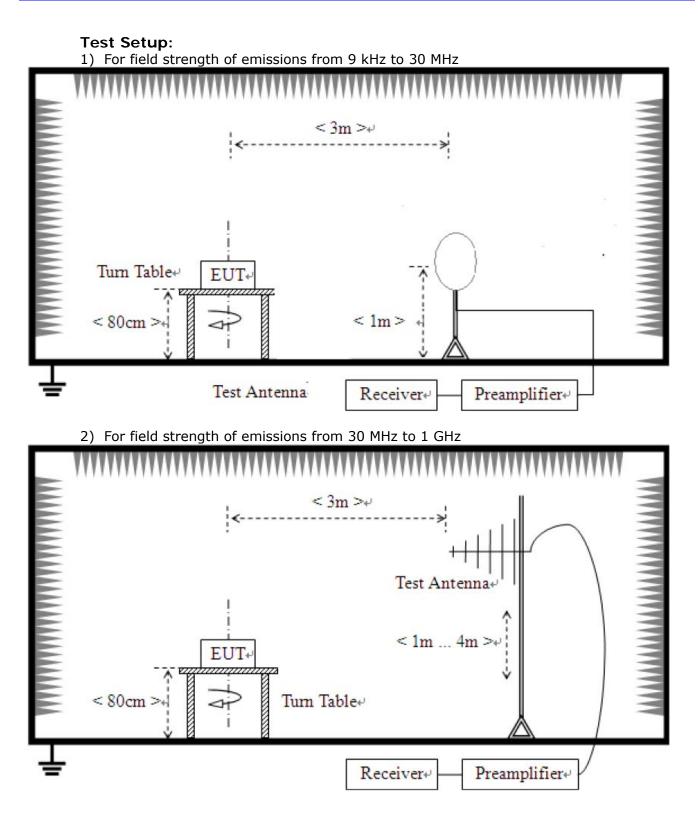
- 1) For above 1 GHz, the emission limit in this paragraph is based on measurement instrumentation employing an average detector, measurement using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit.
- 2) For above 1 GHz, limit field strength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



#### 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

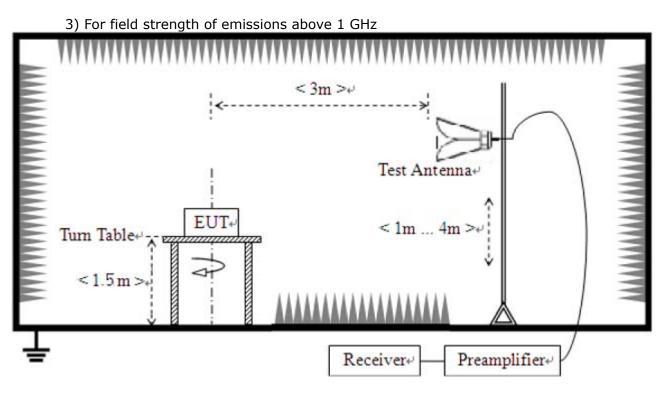




CTK Co., Ltd.

(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

www.e-ctk.com



#### **Test Results**

#### 1) 9 kHz to 30 MHz

#### Test mode : GFSK, CFG PKT Packet Type : 15 Packet Size : 339(DH5) Test mode : 8-DPSK, CFG PKT Packet Type : 31 Packet Size : 1021(3DH5)

EUT	Bluetooth Headset	Measurement Detail			
Model	BT 390	Frequency Range	9 kHz – 30 MHz		
Test mode	GFSK, 8-DPSK	Detector function	Quasi-Peak		

The requirements are:

Complies

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

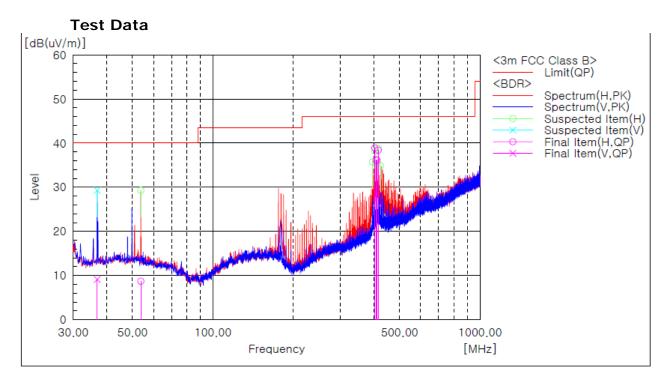


### 2) 30 MHz to 1 GHz

EUT	Bluetooth Headset	Measurement Detail			
Model	BT 390	Frequency Range	Below 1000MHz		
Test mode	GFSK Hopping	Detector function	Quasi-Peak / Peak		

The requirements are:

Complies			
Frequency	Measured Data	Margin	Remark
(MHz)	(dBuV/m)	(dB)	Remark
403.935	38.9	7.1	Quasi-Peak



Final Result

No.	Frequency	(P)	Reading QP	c.f	Result QP	Limit QP	Margin QP	Height	Angle
	[MHz]		[dB(uV)]	[dB(1/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[cm]	[deg]
1	36.911	V	22.0	-12.9	9.1	40.0	30.9	295.0	308.0
2	53.765	Н	21.4	-12.7	8.7	40.0	31.3	305.0	89.0
3	403.935	Н	43.5	-4.6	38.9	46.0	7.1	100.0	88.0
4	407.936	Н	40.7	-4.5	36.2	46.0	9.8	100.0	273.0
5	412.059	Н	40.5	-4.4	36.1	46.0	9.9	100.0	273.0
6	415.939	Н	42.6	-4.2	38.4	46.0	7.6	100.0	273.0

#### Remark :

1. The field strength of spurious emission was measured in the following position: EUT standup position(Z axis), lie-down position(X,Y axis). The worst emission was found in lie-down position(X axis) and the worst case was recorded.

Test Report No.: CTK-2017-00298 Date: 2017-02-14 This Report shall not be reproduced e



#### 3) above 1 GHz

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

EUT	Bluetooth Headset	Measurement Detail			
Model	PT 200	Frequency Range	1-25GHz		
	BT 390	Detector function	Average / Peak		

#### Remarks

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

The requirements are:

 $\boxtimes$  Complies

Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
4882.00	41.77	12.24	Average

#### Test Data

Ch.0(Low Channel)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
2558.00	Н	54.00	74.00	36.58	48.13	17.42	25.87
2558.00	V	54.00	74.00	39.25	51.80	14.75	22.21
4804.00	Н	54.00	74.00	39.52	50.83	14.48	23.17
4804.00	V	54.00	74.00	39.27	50.75	14.73	23.25

#### Ch.39(Mid Channel)

Frequency	(P)	Limit AV	Limit PK	Level AV	Level PK	Margin AV	Margin PK
[MHz]		[dB(uV/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB(uV/m)]	[dB]	[dB]
2570.00	Н	54.00	74.00	34.32	45.64	19.68	28.36
2570.00	V	54.00	74.00	37.02	48.84	16.98	25.17
4882.00	Н	54.00	74.00	40.38	51.79	13.62	22.21
4882.00	V	54.00	74.00	41.77	53.21	12.24	20.79
7323.00	Н	54.00	74.00	40.87	53.80	13.13	20.20
7323.00	V	54.00	74.00	40.38	53.55	13.62	20.45



www.e-ctk.com

#### Ch.78(High Channel)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
2584.00	Н	54.00	74.00	33.48	44.38	20.53	29.63
2584.00	V	54.00	74.00	36.30	47.83	17.70	26.17
4960.00	Н	54.00	74.00	40.66	51.51	13.34	22.49
4960.00	V	54.00	74.00	41.03	52.77	12.97	21.23
7440.00	Н	54.00	74.00	40.24	53.16	13.76	20.84
7440.00	V	54.00	74.00	39.93	53.20	14.08	20.80



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

EUT	Bluetooth Headset	Measurement Detail			
Model	RT 200	Frequency Range	1-25GHz		
Model	BT 390	Detector function	Average / Peak		

#### Remarks

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

The requirements are:

Complies

Frequency (MHz)	1 ,		Remark	
4882.00	37.88	16.12	Peak	

#### Test Data

#### Ch.0(Low Channel)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
2558.00	V	54.00	74.00	34.41	52.17	19.59	21.83
4804.00	Н	54.00	74.00	36.01	50.44	17.99	23.56
4804.00	V	54.00	74.00	36.31	51.45	17.69	22.55

#### Ch.39(Mid Channel)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
4882.00	Н	54.00	74.00	36.67	51.37	17.33	22.63
4882.00	V	54.00	74.00	37.88	55.19	16.12	18.81

#### Ch.78(High Channel)

Frequency [MHz]	(P)	Limit AV [dB(uV/m)]	Limit PK [dB(uV/m)]	Level AV [dB(uV/m)]	Level PK [dB(uV/m)]	Margin AV [dB]	Margin PK [dB]
4960.00	Н	54.00	74.00	36.83	51.76	17.17	22.25
4960.00	V	54.00	74.00	37.53	53.76	16.47	20.24



### 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	Conducted Limit (dBuV)				
(MHz)	Quasi-peak	Average			
0.15 ~ 0.5	66 to 56*	56 to 46*			
0.5 ~ 5	56	46			
5 ~ 30	60	50			

\* Decreases with the logarithm of the frequency.

#### **Test Results**

The requirements are:

 $\boxtimes$  Complies

#### Test mode : USB Charge

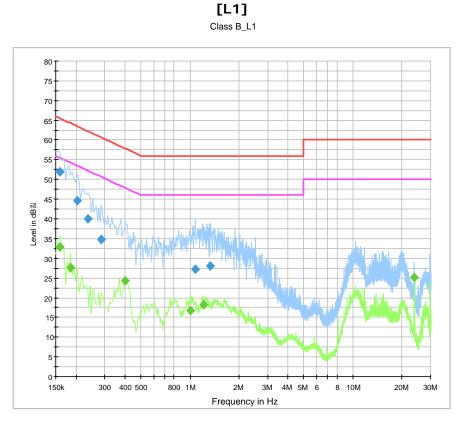
Frequency (MHz)	Measured Data (dBuV/m)	Margin (dB)	Remark
0.159 000	51.8	13.7	Quasi-peak



#### (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 Data**



## **Final Result 1**

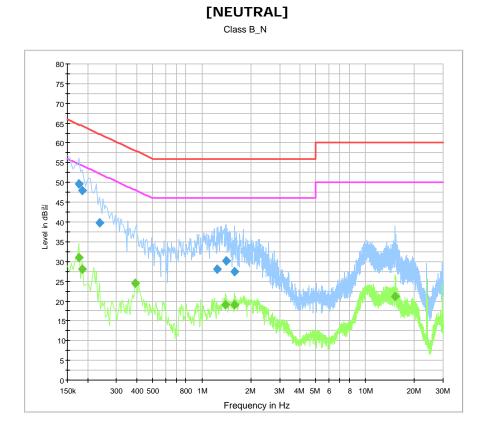
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	51.8	1000.0	9.000	On	L1	9.8	13.7	65.5
0.204000	44.5	1000.0	9.000	On	L1	9.8	18.9	63.4
0.235500	39.9	1000.0	9.000	On	L1	9.7	22.3	62.3
0.285000	34.7	1000.0	9.000	On	L1	9.7	26.0	60.7
1.077000	27.3	1000.0	9.000	On	L1	9.7	28.7	56.0
1.333500	28.0	1000.0	9.000	On	L1	9.7	28.0	56.0

# **Final Result 2**

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.159000	32.9	1000.0	9.000	On	L1	9.8	22.6	55.5
0.186000	27.7	1000.0	9.000	On	L1	9.8	26.5	54.2
0.402000	24.3	1000.0	9.000	On	L1	9.9	23.5	47.8
1.000500	16.8	1000.0	9.000	On	L1	9.7	29.2	46.0
1.207500	18.3	1000.0	9.000	On	L1	9.7	27.7	46.0
23.869500	25.1	1000.0	9.000	On	L1	9.9	24.9	50.0

Test Report No.: CTK-2017-00298 Date: 2017-02-14 This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)





# **Final Result 1**

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.177000	49.5	1000.0	9.000	On	Ν	9.8	15.1	64.6
0.186000	47.9	1000.0	9.000	On	Ν	9.8	16.3	64.2
0.235500	39.8	1000.0	9.000	On	Ν	9.7	22.5	62.3
1.239000	28.1	1000.0	9.000	On	Ν	9.7	27.9	56.0
1.405500	30.1	1000.0	9.000	On	Ν	9.7	25.9	56.0
1.585500	27.3	1000.0	9.000	On	Ν	9.7	28.7	56.0

# **Final Result 2**

Frequency (MHz)	CAverage (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.177000	31.0	1000.0	9.000	On	Ν	9.8	23.7	54.6
0.186000	28.2	1000.0	9.000	On	Ν	9.8	26.1	54.2
0.388500	24.4	1000.0	9.000	On	Ν	9.9	23.7	48.1
1.392000	19.0	1000.0	9.000	On	Ν	9.7	27.0	46.0
1.585500	19.1	1000.0	9.000	On	Ν	9.7	26.9	46.0
15.324000	21.1	1000.0	9.000	On	Ν	9.9	28.9	50.0

Test Report No.: CTK-2017-00298 Date: 2017-02-14 This Report shall not be reproduced except in full without the written approval of CTK Form No.: CTK-D151-06-R102(Rev.0)



# **APPENDIX A – Test Equipment Used For Tests**

	Name of Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Signal Analyzer	Agilent	N9020A	MY50510324	2017-02-03	2018-02-03
2	Signal Generator	Rohde & Schwarz	SMB100A	175528	2016-11-01	2017-11-01
3	EMI Test Receiver	Rohde & Schwarz	ESCI7	100816	2016-10-31	2017-10-31
4	LISN	Rohde & Schwarz	ENV216	101760	2017-02-03	2018-02-03
5	EMI Test Receiver	Rohde & Schwarz	ESCI7	100814	2016-11-01	2017-11-01
6	Bilog Antenna	Schaffner	CBL6111C	2551	2016-05-13	2017-05-13
7	Active Loop Antenna	SCHWARZBECK	FMZB 1513	1513-126	2016-05-25	2018-05-25
8	6dB Attenuator	R&S	DNF	272.4110.50-2	2016-11-01	2017-11-01
9	6dB Attenuator	R&S	DNF	272.4110.50-1	2017-02-03	2018-02-03
10	AMPLIFIER	SONOMA	310	291721	2017-02-02	2018-02-02
11	EMI Test Receiver	Rohde & Schwarz	ESU40	100336	2015-05-14	2017-05-14
12	Preamplifier	Agilent	8449B	3008A02011	2016-12-01	2017-12-01
13	Horn Antenna	ETS-Lindgren	3115	00078894	2015-09-02	2017-09-02
14	Horn Antenna	ETS-Lindgren	3116	00062504	2015-09-04	2017-09-04
15	Horn Antenna	ETS-Lindgren	3116	00062916	2015-04-30	2017-04-30
16	Horn Antenna	ETS-Lindgren	3117	00154525	2015-09-02	2017-09-02