10



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Dates of Tests: Aug 10~21, 2009 Test Report S/N: LR500190908G

Test Site: LTA CO., LTD.

CERTIFICATION OF COMPLIANCE

FCC ID.

TT2JABRACRUISER

APPLICANT

ENUSTECH.,INC.

Equipment Class : Part 15 Spread Spectrum Transmitter (DSS)

Manufacturing Description : Wireless Bluetooth Carkit

Manufacturer:ENUSTECH.,INC.Model name:Jabra CRUISER

Variant Model name BHF1400

Test Device Serial No.: : Identical prototype

Rule Part(s) : FCC Part 15.247 Subpart C; ANSI C-63.4-2003

RSS-210 and ISSUE No.: 7 Date: 2007

Frequency Range : 2402 ~ 2480MHz

RF power : Max 4.09dBm - Conducted

Data of issue : August 24, 2009

This test report is issued under the authority of:

The test was supervised by:

Dong –Min JUNG, Technical Manager

Kyung-Taek LEE, Test Engineer

This test result only responds to the tested sample. It is not allowed to copy this report even partly without the allowance of the test laboratory. This report must not be used by the applicant to claim product endorsement by any agency.



NVLAP LAB Code.: 200723-0

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1. General information's

1-1 Test Performed

Company name : LTA Co., Ltd.

Address : 243, Jubug-ri, Yangji-Myeon, Youngin-Si, Kyunggi-Do, Korea. 449-822

Web site : http://www.ltalab.com
E-mail : chahn@ltalab.com
Telephone : +82-31-323-6008
Facsimile +82-31-323-6010

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competents of calibration and testing laboratory".

1-2 Accredited agencies

LTA Co., Ltd. is approved to perform EMC testing by the following agencies:

Agency	Country	Accreditation No.	Validity	Reference
NVLAP	U.S.A	200723-0	2009-09-30	ECT accredited Lab.
RRL	KOREA	KR0049	2011-06-20	EMC accredited Lab.
FCC	U.S.A	610755	2011-04-22	FCC filing
VCCI	JAPAN	R2133, C2307	2011-06-21	VCCI registration
IC	CANADA	IC5799	2010-05-03	IC filing

2. Information's about test item

2-1 Client & Manufacturer

Company name : ENUSTECH.,INC.

Address : Dui Bldg, 5FL, 1196-2 Gaepo-4dong, Gangnam-gu,

: Seoul 135-240, Korea

Telephone / Facsimile +82-2-565-0785 / +82-2-565-0785

2-2 Equipment Under Test (EUT)

Trade name : Wireless Bluetooth Carkit

FCC ID : TT2JABRACRUISER

Model name : Jabra CRUISER

Variant Model name : BHF1400

Serial number : Identical prototype

Date of receipt : August 07, 2009

EUT condition : Pre-production, not damaged

Antenna type : Pattern Antenna Max Gain 3.847dBi

Frequency Range : 2402 ~ 2480MHz

RF output power : Max. 4.09dBm - Conducted

Number of channels : 79

Duty cycle : 81.05 % Channel spacing : 1MHz

Channel Access Protocol : Frequency Hopping Spread Spectrum (FHSS)

Type of Modulation : Basic Mode(GFSK), EDR Mode(Pi/4 DQPSK, 8DPSK)

Power Source : Battery Pack: 3.7V (Li-Ion Polymer Battery)

2-3 Tested frequency

	LOW	MID	HIGH
Frequency (MHz)	2402	2441	2480

2-4 Ancillary Equipment

Equipment Model No.		Serial No.	Manufacturer
DC Power Supply	DC Power Supply E3615A		HP

3. Test Report

3.1 Summary of tests

FCC Part Section(s)	Parameter	Limit	Test Condition	Status (note 1)		
15.247(a)	Carrier Frequency Separation	> 25 kHz		С		
15.247(a)	Number of Hopping Frequencies	> 15 hops		С		
15.247(a)	20 dB Bandwidth 99% Bandwidth	> 1.5 MHz		С		
15.247	Dwell Time	< 0.4 seconds	Conducted	С		
15.247(b)	Transmitter Output Power	< 250 mWatt		С		
15.247(d)	Conducted Spurious emission	> 20 dBc		С		
15.247(d)	Band Edge	> 20 dBc		С		
15.249 / 15.209	Field Strength of Harmonics	< 54 dBuV (at 3m)	D. V.	С		
15.109	Field Strength	-	- Radiated	С		
15.207 /15.107	AC Conducted Emissions	EN 55022	Line Conducted	С		
15.203	Antenna requirement	-	-	С		
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.

Note 1: Antenna Requirement

→ The ENUSTECH.,INC. Jabra CRUISER unit complies with the requirement of §15.203.

The antenna is PCB Pattern antenna.

Note 2: The sample was tested according to the following specification:

FCC Parts 15.247; ANSI C-63.4-2003 RSS-210 and ISSUE No.: 7 Date: 2007

3.2 Transmitter requirements

3.2.1 Carrier Frequency Separation

Procedure:

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal, while EUT had 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 = 10 kHz (1% of the span or more) Sweep = auto

VBW = 10 kHz Detector function = peak

Trace = max hold

Measurement Data:

Test Results			
Carrier Frequency Separation (MHz) Result			
1.0014	Complies		

- See next pages for actual measured spectrum plots.

Minimum Standard:

The EUT shall have hopping channel carrier frequencies separated by a minimum of 25kHz or two-thirds of 20dB bandwidth of the hopping channel, whichever is greater.

Measurement Setup

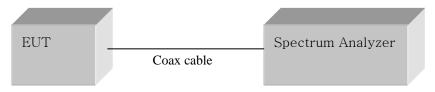
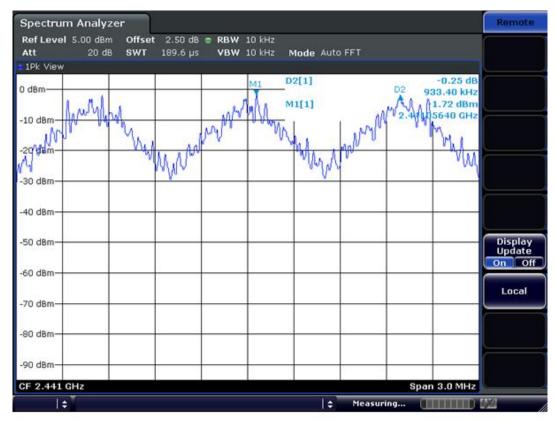


Figure 1: Measurement setup for the carrier frequency separation

<u>Carrier Frequency Separation</u> <u>Basic Mode</u>



EDR Mode



3.2.2 Number of Hopping Frequencies

Procedure:

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

To get higher resolution, four frequency ranges within the 2400 ~ 2483.5 MHz FH band were examined.

The spectrum analyzer is set to:

Frequency range 1: Start = 2400.0MHz, Stop = 2441.5 MHz

2: Start = 2441.5MHz, Stop = 2483.5 MHz

RBW = 100 kHz (1% of the span or more) Sweep = auto

 $VBW = 100 \text{ kHz} (VBW \ge RBW)$ Detector function = peak

Trace = $\max \text{ hold}$ Span > 40MHz

Measurement Data: Complies

Total number of Hopping Channels	79
----------------------------------	----

- See next pages for actual measured spectrum plots.

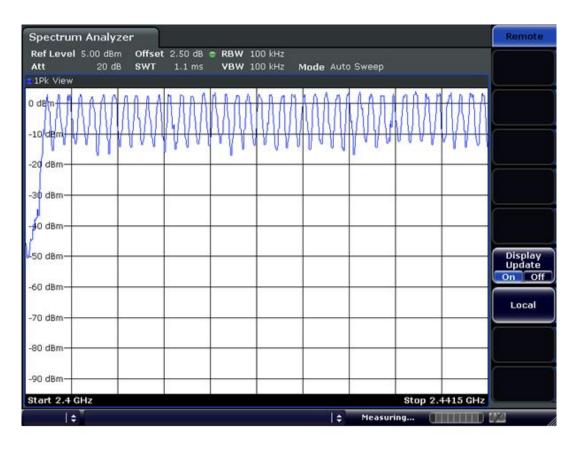
Minimum Standard:

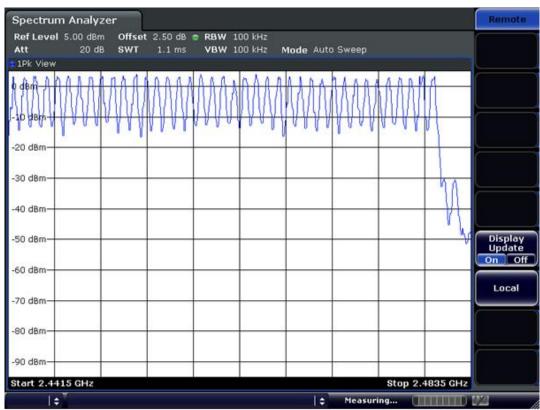
At least 15 hopes

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Number of Hopping Frequencies





3.2.3 20 dB Bandwidth

Procedure:

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 20dB 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 = 3 MHz (approximately 2 or 3 times of the 20 dB bandwidth)

RBW = 30 kHz Sweep = auto

 $VBW = 30 \text{ kHz} (VBW \ge RBW)$ Detector function = peak

Trace = max hold

Measurement Data: Basic Mode

Frequency	Channel No.	Test Results(MHz)		
(MHz)	Chainlei No.	20dB Bandwidth	99% Bandwidth	
2402	0	0.825	0.864	
2441	39	0.821	0.864	
2480	78	0.821	0.864	

Measurement Data: EDR Mode

Frequency	Channel No.	Test Results(MHz)		
(MHz)	Chamler No.	20dB Bandwidth	99% Bandwidth	
2402	0	1.242	1.177	
2441	39	1.224	1.177	
2480	78	1.237	1.168	

⁻ See next pages for actual measured spectrum plots.

Minimum Standard:

N/A

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

<u>Channel 1 of basic mode</u> <u>20 dB Bandwidth</u>





Channel 2 of basic mode 20 dB Bandwidth





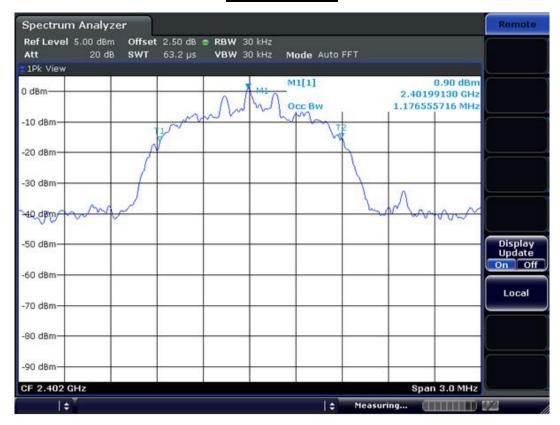
Channel 3 of basic mode 20 dB Bandwidth



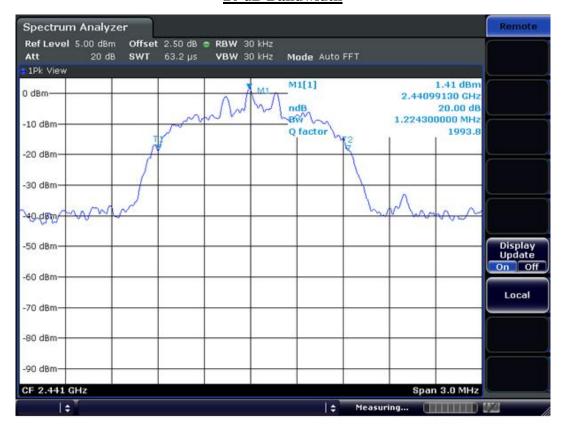


Channel 1 at EDR mode 20 dB Bandwidth



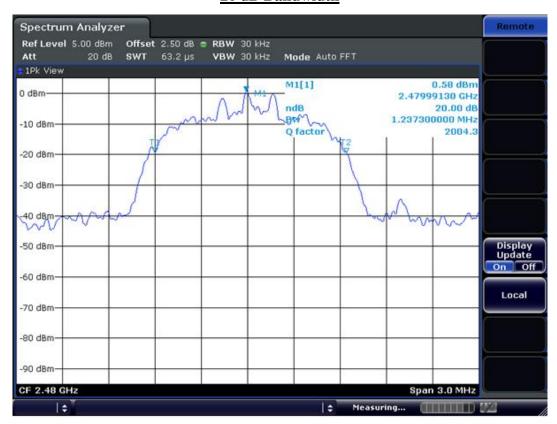


Channel 2 at EDR mode 20 dB Bandwidth





Channel 3 at EDR mode 20 dB Bandwidth





3.2.4 Time of Occupancy (Dwell Time)

Procedure:

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

The spectrum analyzer is set to:

Center frequency = 2441 MHz Span = zero

RBW = 1 MHz $VBW = 1 MHz (VBW \ge RBW)$

Trace = max hold Detector function = peak

Measurement Data:

Mode	Number of transmission ina 31.6s (79Hopping*0.4)	Length of Transmission Time (msec)	Result (msec)	Limit (msec)
DH1	31(Times / 3sec) *10.533 = 326.52	0.528	172.4	400
DH3	15(Times / 3sec) *10.533 = 158.00	1.759	277.9	400
DH5	10(Times / 3sec) *10.533 = 105.33	3.042	320.4	400
EDR 3Mbps DH5	10(Times / 3sec) *10.533 = 105.33	3.051	321.4	400

- See next pages for actual measured spectrum plots.
- dwell time = $\{(\text{number of hopping per second / number of slot}) \times \text{duration time per channel}\} \times 0.4 \text{ ms}$

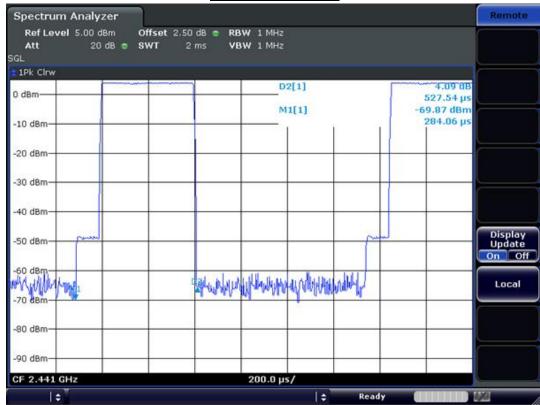
Minimum Standard:

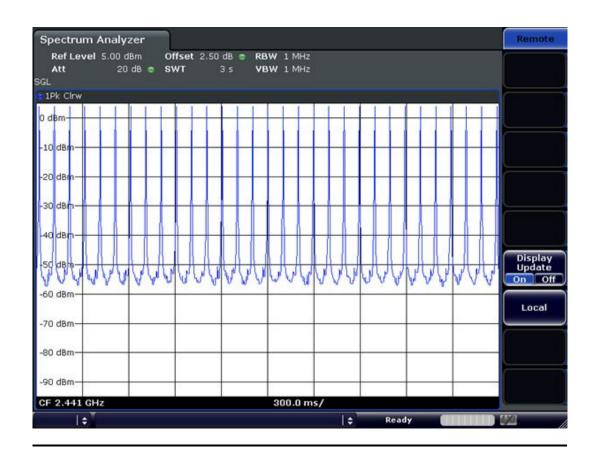
0.4 seconds within a 30 second period per any frequency

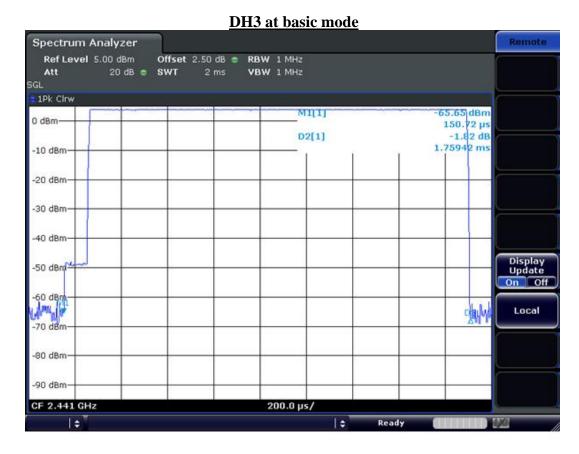
Measurement Setup

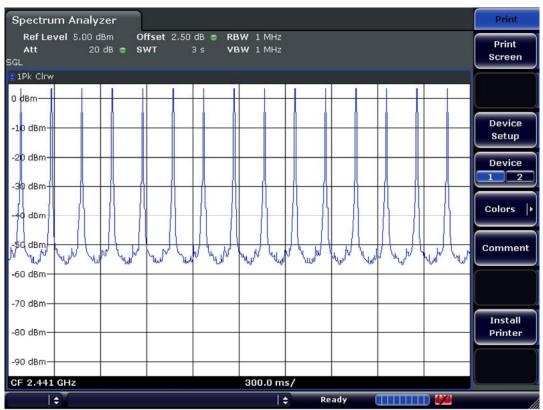
Same as the Chapter 3.2.1 (Figure 1)

DH1 at basic mode



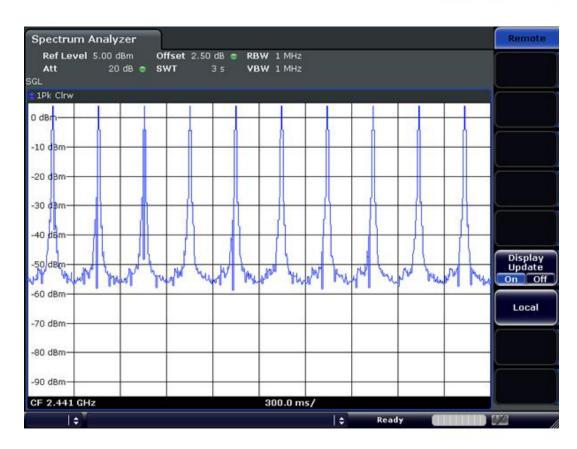






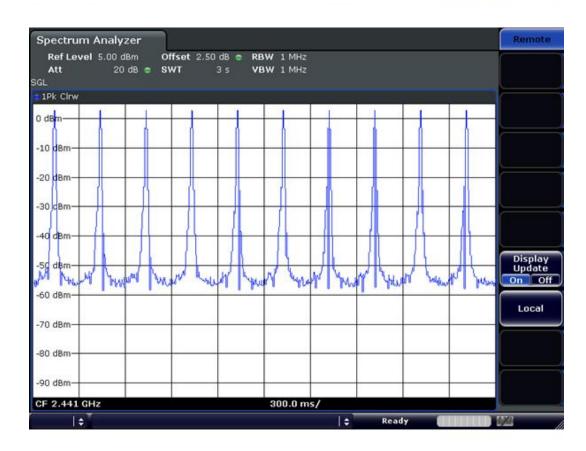
DH5 at basic mode





DH5 at EDR mode with 3Mbps





3.2.5 Transmitter Output Power

Procedure:

The peak output power 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. The indicated level is the peak output power.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

Span = 10 MHz (approximately 5 times of the 20 dB bandwidth)

RBW = 3 MHz (greater than the 20dB bandwidth of the emission being measured)

 $VBW = 3 \text{ MHz} (VBW \ge RBW)$ Detector function = peak

Trace = $\max \text{ hold}$ Sweep = auto

Measurement Data: Basic Mode

Frequency	Ch.	Test Results		
(MHz)	CII.	dBm	mW	Result
2402	0	3.54	2.26	Complies
2441	39	4.09	2.56	Complies
2480	78	3.35	2.16	Complies

Measurement Data: EDR Mode

Frequency	Ch.	Test Results			
(MHz)	CII.	dBm	mW	Result	
2402	0	2.83	1.92	Complies	
2441	39	3.23	2.10	Complies	
2480	78	2.57	1.80	Complies	

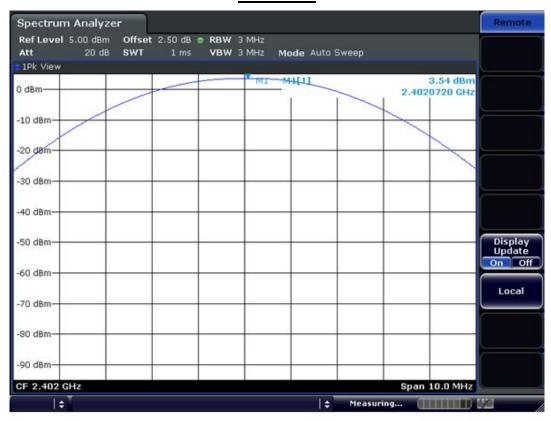
⁻ See next pages for actual measured spectrum plots.

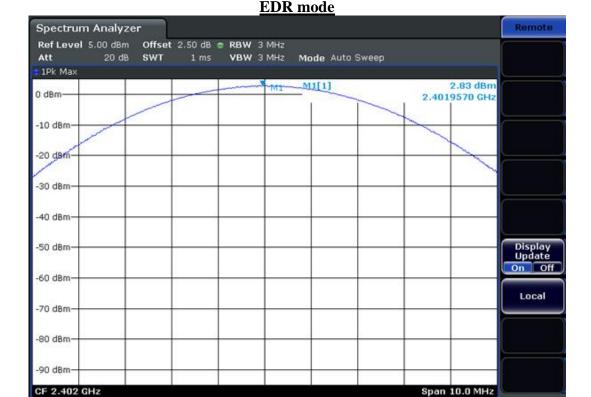
Minimum Standard:	< 250 mW

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Channel 1 Basic mode



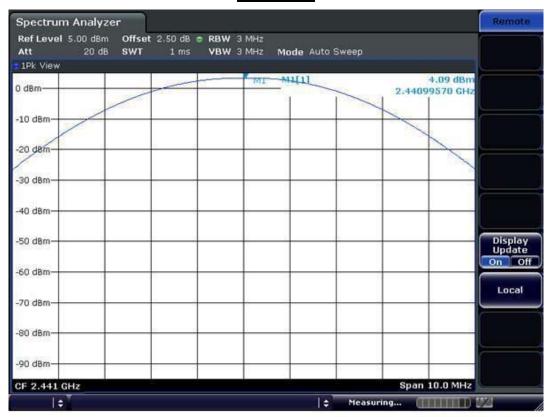


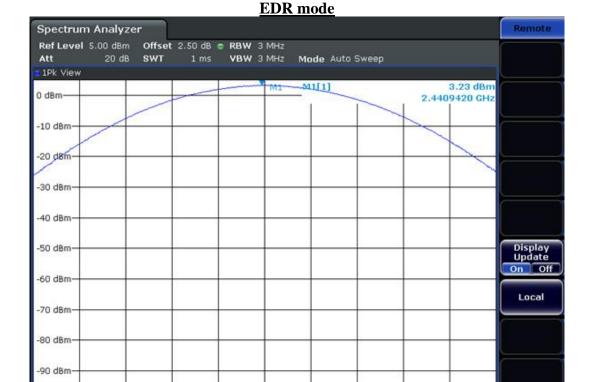
10

1 0

Measuring...

Channel 2 Basic mode





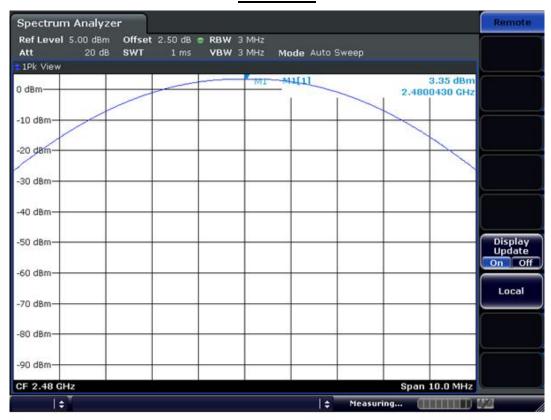
10

Measuring...

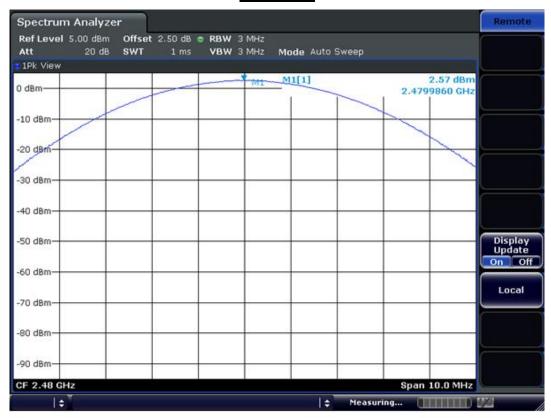
CF 2.441 GHz

Span 10.0 MHz

Channel 3 Basic mode



EDR mode



3.2.6 Band Edge

Procedure:

The bandwidth at 20dB down from the highest inband spectral density is 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 measure 20 dB down both sides of the intentional emission.

The spectrum analyzer is set to:

Center frequency = the highest, middle and the lowest channels

RBW = 100 kHz VBW = 100 kHz

Span = 10 MHz Detector function = peak

Trace = \max hold Sweep = auto

Measurement Data: Complies

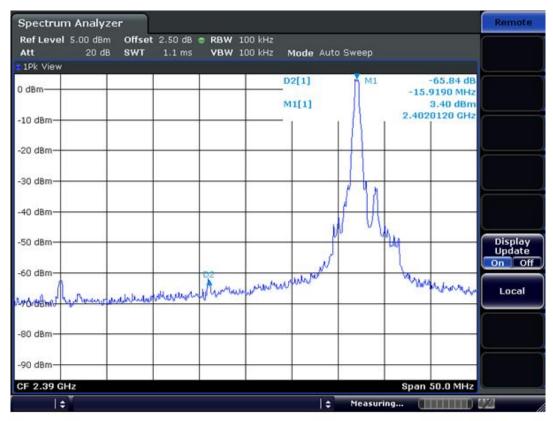
- All conducted emission in any 100kHz bandwidth outside of the spread spectrum band was at least 20dB lower than the highest inband spectral density. Therefore the applying equipment meets the requirement.
- See next pages for actual measured spectrum plots.

Minimum Standard:	> 20 dBc

Measurement Setup

Same as the Chapter 3.2.1 (Figure 1)

Band – edge of Basic Mode Lower edge



Upper edge



Band-edges in the restricted band 2483.5 ~ 2500 MHz measurement

- Document DA 00-705 Marker Delta Method

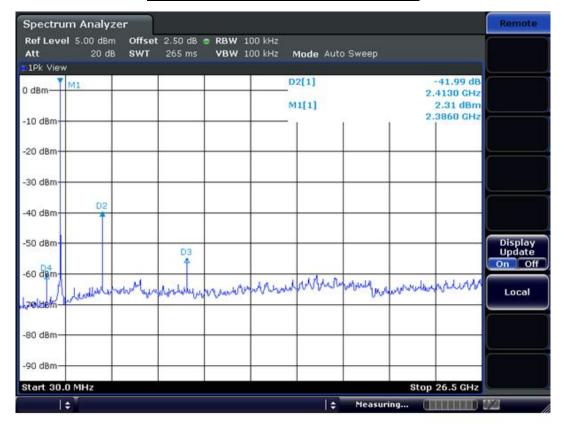
Frequency (MHz)	Detect mode	Pol.	Reading (dBuV/m)	T.F (dB)	Step 1 Data	delta	Step 3 Data	Limit	
2483.5	PK	Н	96.58	1.1	97.68	51.39	46.29	74	
	AV	Н	84.31	1.1	85.41	51.39	34.02	54	

Note) Step 1 = Reading + T.F

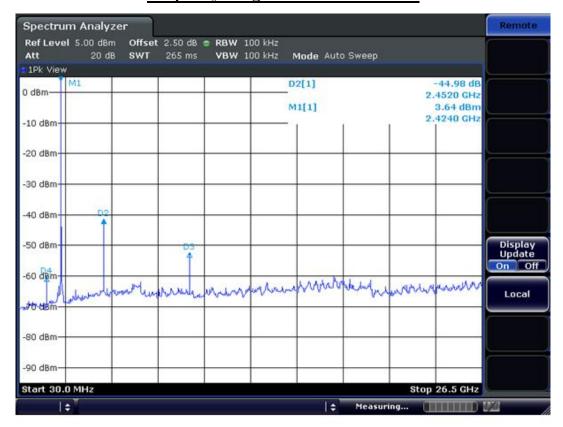
(T.F = Ant.F + Cable loss - PreAmp Gain)

Step 3 = Step 1 - Delta Value

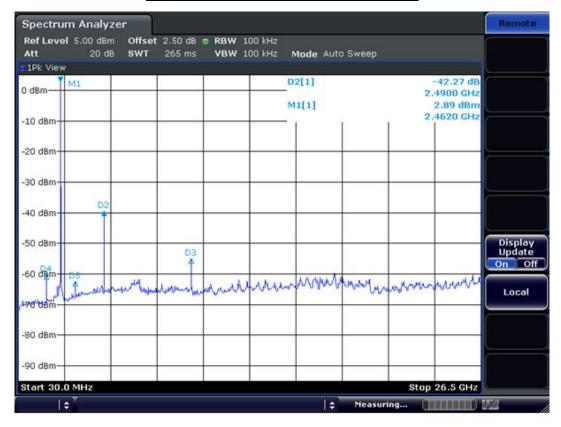
<u>Unwanted Emission – Low channel</u> Frequency Range = 30 MHz ~ 26.5 GHz



<u>Unwanted Emission – Middle channel</u> Frequency Range = 30 MHz ~ 26.5 GHz



<u>Unwanted Emission – High channel</u> Frequency Range = 30 MHz ~ 26.5 GHz



3.2.7 Field Strength of Harmonics

Procedure:

The EUT was placed on a 0.8m high wooden table inside a shielded enclosure. An antenna was placed near the EUT and measurements of frequencies and amplitudes of field strengths were recorded for reference during final measurements. For final radiated testing, measurements were performed in OATS. Measurements were performed with the EUT oriented in 3 orthogonal axis and rotated 360 degrees to determine worst-case orientation for maximum emissions.

The spectrum analyzer is set to:

Center frequency = the worst channel

Frequency Range = $30 \text{ MHz} \sim 10^{\text{th}} \text{ harmonic.}$

 $RBW = 100 \text{ kHz} (30MHz \sim 1 \text{ GHz})$ Peak: $VBW \geq RBW$

= 1 MHz (1 GHz ~ 10th harmonic) Average:VBW=10Hz

Span = 100 MHz Detector function = Peak and Average

Trace = \max hold Sweep = auto

Measurement Data: Complies

- Refer to the next page.
- No other emissions were detected at a level greater than 10dB below limit.
- The three antennas were used with this EUT during the Testing.

Minimum Standard: FCC Part 15.209(a)

Frequency (MHz)	Limit (uV/m) @ 3m
30 ~ 88	100 **
88 ~ 216	150 **
216 ~ 960	200 **
Above 960	500

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

Measurement Data:

Frequency	Reading [dBuV/m]		Pol.	Correction Factor		Limits [dBuV/m]		Result [dBuV/m]		Margin [dB]		
[MHz]				Antenna Amp.Gain Cable		AV / Peak		AV / Peak		AV / Peak		
4804.00	38.2	45.4	Н	31.4	34.6	8.7	54.0	74.0	43.7	50.9	10.4	23.2
Frequency	Reading			Correction			Limits		Result		Margin	
. 3	[dBuV/m]		Pol.	Factor			[dBuV/m]		[dBuV/m]		[dB]	
[MHz]	z] AV / Peak			Antenna Amp.Gain Cable		AV / Peak		AV / Peak		AV / Peak		
4882.00	39.3	46.5	Н	31.4	34.6	8.7	54.0	74.0	44.8	52.0	9.3	22.1
Frequency	Reading			Correction			Lin	nits	Res	sult	Mar	gin
rrequeries	[dBuV/m]		Pol.	Factor		[dBuV/m]		[dBuV/m]		[dB]		
[MHz]	AV / Peak			Antenna	Amp.Gain	Cable	AV / Peak		AV / Peak		AV / Peak	
4960.00	38.5	45.8	Н	31.4	34.6	8.7	54.0	74.0	44.0	51.3	10.1	22.8

No other emissions were detected at a level greater than 20dB below limit.

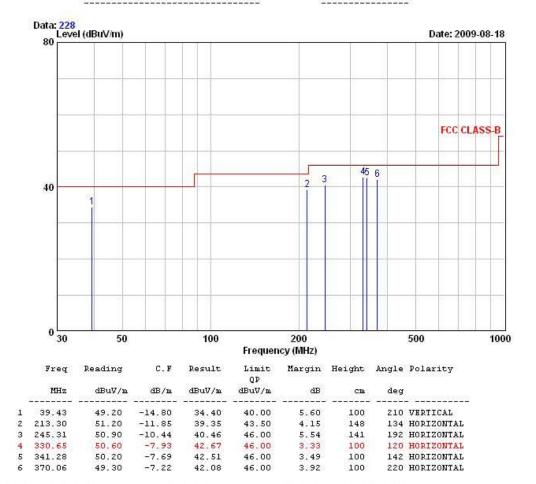
Radiated Emissions - BT+ FMT



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EUT/Model No.: Jabra CRUISER TEST MODE: BT + FMT(mid) mode

Temp Humi : 28 / 56 Tested by: KIM.K.I



Remarks: C.F (Correction Factor) = Antenna factor + Cable loss - Preamp gain

3.2.8 AC Conducted Emissions

Procedure:

The conducted emissions are measured in the shielded room with a spectrum analyzer in peak hold. While the measurement, EUT had its hopping function disabled at the middle channels in line with Section 15.31(m). Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation and Exerciser operation. The highest emissions relative to the limit are listed.

Measurement Data: Complies

- See next pages for actual measured spectrum plots.
- No emissions were detected at a level greater than 10dB below limit.

Minimum Standard: FCC Part 15.207(a)/EN 55022

Frequency Range	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

AC Conducted Emissions - BT + FMT - Line

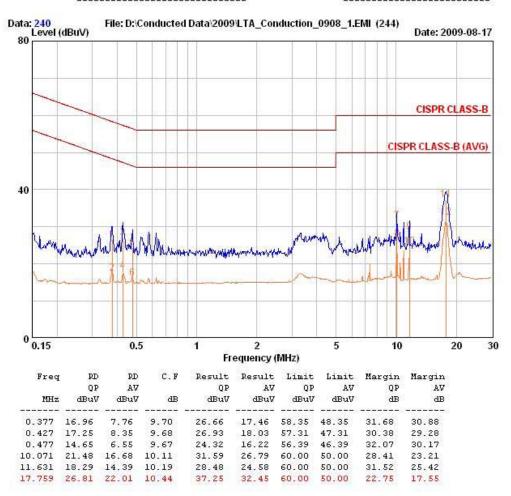


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EUT / Model No. : Jabra CRUISER Phase : LINE

Test Mode : BT + FMT(mid) mode Test Power : 120 / 60

Temp./Humi. : 25 / 54 Test Engineer : KIM.K.I



Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

AC Conducted Emissions – BT+FMT – Neutral

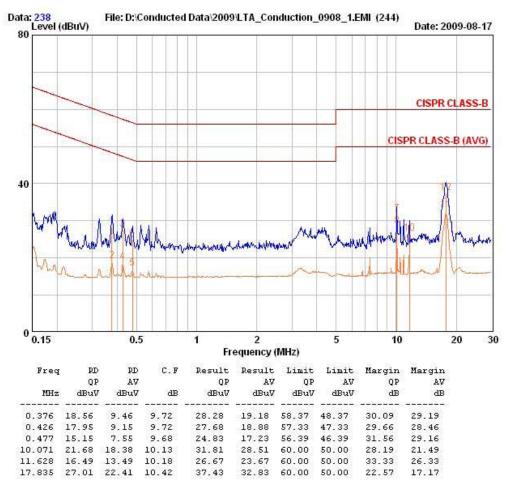


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EUT / Model No. : Jabra CRUISER Phase : NEUTRAL

Test Mode : BT + FMT(mid) mode Test Power : 120 / 60

Temp./Humi. : 25 / 54 Test Engineer : KIM.K.I



Remarks: C.F (Correction Factor) = Insertion loss + Cable loss

APPENDIX

TEST EQUIPMENT USED FOR TESTS

	Description	Model No.	Serial No.	Manufacturer	Next Cal. Date
1	Spectrum Analyzer	FSV-30	100757	R&S	Feb-10
2	Spectrum Analyzer	8563E	3425A02505	НР	Apr-10
3	Spectrum Analyzer	8594E	3710A04074	HP	Oct-09
4	Signal Generator	8648C	3623A02597	НР	Apr-10
5	Signal Generator	83711B	US34490456	НР	Apr-10
6	Attenuator (3dB)	8491A	37822	НР	Oct-09
7	Attenuator (10dB)	8491A	63196	НР	Oct-09
8	Attenuator (30dB)	8498A	1801A06689	НР	Oct-09
9	EMI Test Receiver	ESVD	843748/001	R&S	Apr-10
10	Horn Antenna(18 ~ 40GHz)	SAS-574	154	Schwarzbeck	Nov-10
11	Horn Antenna(18 ~ 40GHz)	SAS-574	155	Schwarzbeck	Nov-10
12	RF Amplifier	8447D	2949A02670	НР	Oct-10
13	RF Amplifier	8449B	3008A02126	НР	Apr-10
14	Test Receiver	ESHS10	828404/009	R&S	Apr-10
15	TRILOG Antenna	VULB 9160	9160-3212	SCHWARZBECK	Apr-11
16	LogPer. Antenna	VULP 9118	9118 A 401	SCHWARZBECK	Apr-11
17	Biconical Antenna	BBA 9106	VHA 9103-2315	SCHWARZBECK	Apr-11
18	Horn Antenna	3115	00055005	ETS LINDGREN	Mar-11
19	Horn Antenna	BBHA 9120D	9120D122	SCHWARZBECK	Dec-11
20	Dipole Antenna	VHA9103	2116	SCHWARZBECK	Nov-09
21	Dipole Antenna	VHA9103	2117	SCHWARZBECK	Nov-09
22	Dipole Antenna	VHA9105	2261	SCHWARZBECK	Nov-09
23	Dipole Antenna	VHA9105	2262	SCHWARZBECK	Nov-09
24	Hygro-Thermograph	THB-36	0041557-01	ISUZU	Apr-10
25	Splitter (SMA)	ZFSC-2-2500	SF617800326	Mini-Circuits	-
26	RF Switch	MP59B	6200414971	ANRITSU	-
27	Power Divider	11636A	6243	HP	Oct-09
28	DC Power Supply	6622A	3448A03079	HP	Oct-09
29	Frequency Counter	5342A	2826A12411	HP	Apr-10
30	Power Meter	EPM-441A	GB32481702	HP	Apr-10
31	Power Sensor	8481A	2702A64048	HP	Apr-10
32	Audio Analyzer	8903B	3729A18901	HP	Oct-09
33	Modulation Analyzer	8901B	3749A05878	HP	Oct-09
34	TEMP & HUMIDITY Chamber	YJ-500	LTAS06041	JinYoung Tech	Oct-09
35	LOOP-ANTENNA	FMZB 1516	151602/94	SCHWARZBECK	Mar-11
36	Stop Watch	HS-3	601Q09R	CASIO	Apr-10
37	LISN	ENV216	100408	R&S	Oct-09