Produkte Products



Prüfbericht - N		14016342 001			Seite 1			
Test Report No					Page 1	of 12		
Auftraggeber:		GN A/S						
Applicant		Lautrupbjerg 7						
		DK-2750 Ballerup						
		Denmark						
<b>Gegenstand d</b> Test item	er Prüfung:	Bluetooth Mono Headse	≥t					
Bezeichnung: Identification		Jabra BT2040	Serien Serial N		Engineeri	ng sample		
Wareneingang Receipt No.	js-Nr.:	070509003-15		n <b>gsdatum:</b> f receipt	09.05.2007	,		
Prüfort: Testing location		TÜV Rheinland Hong Kong Ltd. 9th Floor, Oriental News Building, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong Hong Kong Productivity Council HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong						
Prüfgrundlage	<b>.</b>	FCC Part 15 Subpart C						
Test specificati		ANSI C63.4-2003						
		CISPR 22:1997						
Prüfergebnis: Test Result		Das vorstehend beschri genannter Prüfgrundlag The above mentioned pro	je.			pricht oben		
geprüft / te	ested by:		kontrolliert /	reviewed by				
<u>12.06.2007</u> Datum Date	<u>′Sharon Li</u> Name Name	Unterschrift Signature	12.06.2007 Datum	Thomas B <b>Name</b> Name	Unter	<u>us Berns</u> schrift		
			Date	name	Signa			
Sonstiges: Other Aspects	F	CCID: BCE-BT2040						
Abkürzungen:	OK, Pass, P Fail, F N/A NT	<ul> <li>= entspricht Prüfgrundlage</li> <li>= entspricht nicht Prüfgrund</li> <li>= nicht anwendbar</li> <li>= nicht getestet</li> </ul>	Abbrev dlage			= passed = failed = not applicable = not tested		
		sich nur auf das o.g. Prü rvielfältigt werden. Diese Prüfze			-	•		
		the a. m. test sample. With extracts. This test report do	out permission					
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## **Product information**

## **Manufacturers declarations**

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	GFSK, Pi/4 DQPSK, 8 DPSK
Number of channels	79
Channel separation	1 MHz
Type of antenna	Integral Antenna
Antenna gain (dBi)	0
Power level	fix
Type of equipment	stand alone, plug-in radio device
Connection to public utility power line	No
Nominal voltage	V <sub>nor</sub> : 1.5 V
Independent Operation Modes	Page scan
	Inquiry scan
	Connection state - ACL Link
	Connection state - SCO Link

### Product function and intended use

The test item is a Headset based on the Bluetooth technology.

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, 79 RF channels spaced 1 MHz apart are defined.

The channel is represented by a pseudo-random hopping sequence through the 79 channels. The channel is divided into time slots, with a nominal slot length of 625  $\mu$ s, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s. The symbol rate on the channel is 1 Ms/s.

## Remark

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases.



## **List of Test and Measurement Instruments**

	Kind of Equipment	Manufacturer	Туре	S/N
	Test Receiver	Rohde & Schwarz	ESH-3	890173/033
	L/I/S/N	Rohde & Schwarz	ESH 3-Z5	849876/026
	Oscilloscope	HP	54713B	US34510455
	Test Receiver	Rohde & Schwarz	ESVP	882402/033
	Absorbing Clamp	Rohde & Schwarz	MDS-21	979 3/4
	Test Receiver	Rohde & Schwarz	ESVS30	842807/009
	Biconical Antenna	Rohde & Schwarz	HK116	841489/015
	LogPeriodic Antenna	Rohde & Schwarz	HL223	841516/017
	Universal Power Analyzer	Voltech	PM3000A	9915
	Reference Impedance Network	Voltech	IEC 555 Standard	9946
	AC Power Source	California Instr.	4500L	HK51895
	Trip-Loop Antenna	Chase	LLA6142	1019
	Double Ridge Horn Antenna	EMCO	3115	9002-3351
$\boxtimes$	Double Ridge Horn Antenna	EMCO	3115	9002-3347
	RF Comms Test Set	HP	8920B	US36492628
	Spectrum Analyser + Tracking G.	HP	8596E	3639A00758
	Signal Generator	Rohde & Schwarz	SMY 01	844146/024
	Signal Generator	Rohde & Schwarz	SMY 01	844146/023
	BiLog Antenna	EMCO	3143	9607-1287
	Isotropic Field Probe	Holladay	HI-4422	90956
	Power Amplifier	Kalmus	757-LC	7620-1
	Power Amplifier	Kalmus	122-FC	7620-2
	Coupling Clamp	Schaffner	CDN 126	312
	Couple Device Network	Fischer	CDN-M2	9604
$\square$	Spectrum Analyzer	Rohde & Schwarz	FSP30	1093.4495K30
	Temperature Chamber	Binder	MK 240	9020-0028
	EFT, ESD, SURGE, DIPS tester	Schaffner	Best 96	IN3796-011
	Surge Generator	Schaffner	NSG650	280
$\boxtimes$	Active Loop Antenna	EMCO	6502	9107-2651



# **Result FCC Part 15 – Subpart C**

Subclause <sup>-</sup>	5.203 – Antenna Information	Pass
Requirement:	No antenna other than that furnished by the responsible par device	rty shall be used with the
Result:	Permanent attached antenna	
Verdict:	Pass	

Subclause 15.204 – Antenna In	mation Pass					
Requirement: Provide information for every antenna proposed for the use with the EUT						
Result: a) Antenna type:       Inverted F type antenna soldered to the circuit board         b) Manufacturer and model no:       N.A.         c) Gain with reference to an isotropic radiator:       0 dBi						
Verdict: Pass						
Subclause 15.207 – Disturbanc	oltage on AC Mains N.A.					

The IUT is battery operated.

Subclause	15.247 (a) – Carrier Frequency Separation	Pass
Requirement:	Frequency hopping systems shall have hopping channel carrie a minimum of 25kHz or the 20dB bandwidth of the hopping cha Alternatively, frequency hopping systems operating in the 2400 have hopping channel carrier frequencies that are separated b	annel, whichever is greater. )-2483.5 MHz band may
	20 dB bandwidth of hopping channel, whichever is greater, ;prowith an output power no greater than 125mW.	ovided the systems operate
	: Peak	



#### **Result:**

Pre-scan has been conduced to determine the worst-case mode from all possible combinations between available modulations and packet types.

The centre frequencies of the hopping channels are separated by more than the 20dB bandwidth. For test results plots refer to Appendix 1, page 2.

Verdict: Pass

Subclause	15.247 (a) – Time of Occupancy (Dwell Time)	Pass
Requirement:	Frequency hopping systems in the 2400 – 2483.5 MHz ban overlapping channels. The average time of occupancy on a than 0.4 seconds within a period of 0.4 seconds multiplied channels employed.	any channel shall not be greater
	: Peak : 1 MHz / 3 MHz : 1.5VDC from DC power supply	
In norn 112 tin	reenshot in Appendix 1 page 4 shows the occurrence of a ch nal hopping mode Bluetooth is using 79 hopping channels or nes. The dwell time for the longest supported packet type is a le time of occupancy will not be greater than 400 ms.	nly. The frequency was used
i.e. Time per 0.4 x 79	riod calculation: = 31.6s	
Limit cald 112 x 2.9	culation: $904 \times 10^{-3} = 325.25 \times 10^{-3}$ $<= 400 \times 10^{-3} s$	
For test protocols	s please refer to Appendix 1, page 3.	



#### Subclause 15.247 (a) - 20 dB Bandwidth

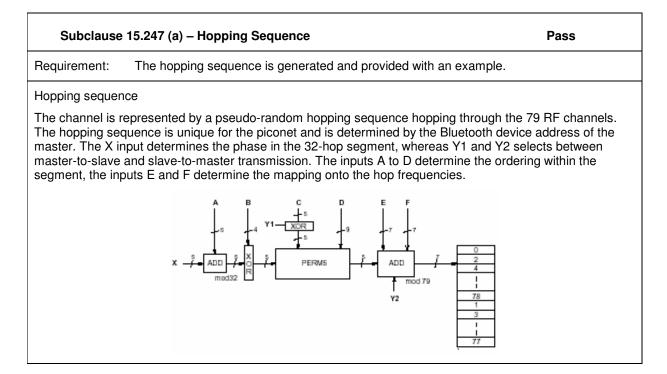
Pass

Frequency hopping systems shall have hopping channel carrier frequencies separated by Requirement: a minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Test Specification : FCC Part 15 Subpart A - Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), (8DPSK) : Temporary antenna port Port of testing Detector : Peak **RBW/VBW** : 30 kHz / 100 kHz Supply voltage : 1.5VDC from DC power supply Temperature : 23ºC Humidity : 50%

## Results

For test protocols refer to Appendix 1, page 4-5.

Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.648	0.620	1.268
2441	0.648	0.620	1.268
2480	0.648	0.624	1.272





Example d	ata:							
Hop sequence	ce {k} fo	or CON	NECTIO	ON STA	TE:			
CLK start: 0>	<00000	10						
ULAP: 0x000	000000							
#ticks:	00 02	04 06	08 0a	0c 0e	10 12	14 16	18 1a	1c1e
0x0000010:	08 66	10 70	12 19	14 23	16 01	18 05	20 33	22 37
0x0000030:	24 03	26 07	28 35	30 39	32 72	34 76	36 25	38 29
0x0000050:	40 74	42 78	44 27	46 31	48 09	50 13	52 41	54 45
0x0000070:								
0x0000090:								
0x00000b0:								
0x00000d0:								
0x00000f0:								
0x0000110:								
0x0000130:								
0x0000150:								
0x0000170:								
0x0000190:	33 06	37 08	35 38	39 40	25 10	29 12	27 42	i 31 44
0x00001b0:								
0x00001d0:	65 22	69 24	67 54	71 56	57 26	61 28	59 58	i 63 60
0x00001f0:	73 30	77 32	75 62	00 64	49 34	51 42	57 66	i 59 74
0x0000210:								
0x0000230:								
0x0000250:								
0x0000270:								
0x0000290:								
0x00002b0:								
0x00002d0:								
0x00002f0:								
0x0000310:								
0x0000330:								
0x0000350:								
0x0000370:								
0x0000390:								
0x00003b0:								
0x00003d0:								
0x00003f0:								

#### Subclause 15.247 (a) – Equal Hopping Frequency Use

Pass

Requirement: Each of the transmitter's hopping channels is used equally on average.

Equal hopping frequency use

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.



# Subclause 15.247 (a) – Receiver Input Bandwidth Pass

Requirement: The associated receiver(s) complies with the requirement that its input bandwidth matches the bandwidth of the transmitted signal.

Receiver input bandwidth

The receiver bandwidth is equal to the receiver bandwidth in the 79 hopping channel mode, which is 1 MHz. The receiver bandwidth was verified during Bluetooth RF conformance testing.

Desvicement. The approximated receiver has the shift is shift from a price in surplus tion with the	Subclause	15.247 (a) – Receiver Hopping Capability	Pass
transmitted signals.	Requirement:	The associated receiver has the ability to shift frequencies in transmitted signals.	synchronisation with the

**Receiver hopping Capability** 

The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.

Subclause	15.247 (b) – Peak Output Power	Pass
	n : FCC Part 15 Subpart A – Subclause 15.31 n : Tx mode (2402MHz, 2441MHz, 2480MHz), 8DPSK : Temporary antenna port : Peak : 3 MHz / 10 MHz : 1.5VDC from DC power supply : 23 <sup>o</sup> C : 50%	
Requirement:	For frequency hopping systems operating in the 2400-2483.5 MHz 75 hopping channels, and all frequency hopping systems in the 57 1 Watt. For all other frequency hopping systems in the $2400 - 248$ Watts.	725-5850 MHz band:
Recult		

#### Result

Pre-scan has been conduced to determine the worst-case mode from all possible combinations between available modulations and packet types.

All three transmit frequency modes comply with the maximum peak output power limit.

For test protocols please refer to Appendix 1, page 6-7.

Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	2.28	3.52	5.80	1 / 30.0	Pass
2441	2.58	3.65	6.23	1 / 30.0	Pass
2480	2.79	3.60	6.39	1 / 30.0	Pass



Subclause	15.247 (b) – Band edge compliance	Pass
Requirement:	In any 100 kHz bandwidth outside the frequency band in which digitally modulated intentional radiator is operating, the radio fre produced by the intentional radiator shall be at least 20 dB belo bandwidth within the band that contains the highest level of the either an RF conducted or a radiated measurement.	equency power that is w that in the 100 kHz
	en conduced to determine the worst-case mode from all possible	e combinations between
available modulat	ions and packet types.	

There is no peak found outside any 100 kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(c).

For test protocols refer to Appendix 1, page 8-12.

Subclause 1	5.247 (c) – Spurious	Conducted Emiss	ions	Pass	
	: Peak : 100 kHz / 300 kHz	lz, 2441MHz, 2480N a port			
	ement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.				
Result					
available modulati There is no peak frequency. All thre	n conduced to detern ons and packet types found outside any 100 e transmit frequency refer to Appendix 1, p	s. DkHz bandwidth of tl modes comply with	ne operating frequen	cy band in the three	
Operating	Spurious	Spurious Level	Reference value	Delta	Verdict



frequency (MHz)	frequency (MHz)	(dBm)	(dBm)	(dB)	
2402	4795.660	-37.65	2.20	-39.85	Pass
2441	4875.420	-39.59	2.53	-42.12	Pass
2480	4955.180	-41.76	2.77	-44.53	Pass

Subclause	: 15.247 (c) – Spuriou	us Radiated Emissions	Pass
	on : ANSI C63.4 - 200		
		IHz, 2441MHz, 2480MHz), 8DPSK	
Port of testing	: Enclosure		
Detector RBW/VBW	: Peak : 100 kHz / 300 kH	la for f , 1 CHa	
	1 MHz / 3 MHz fo		
Supply voltage		has been activated	
Temperature	: 23ºC		
Humidity	: 50%		
·	produced by the int bandwidth within th	intentional radiator is operating, th entional radiator shall be at least 2 e band that contains the highest le cted or a radiated measurement.	
Result			
available modula	ations and packet type	rmine the worst-case mode from a es. omply with the field strength within	
There is no spu	rious found under the	frequency below 30MHz.	
Tx frequency 24	02MHz	Vertical Polarization	
Freq		Level	Limit/ Detector
	MHz	dBuV/m	dBuV/m
No peak found			43.5 / QP
No peak found		-	74.0 / P
No pe	ak found	-	54.0 / A
			04.077
Tx frequency 24	102MHz	Horizontal Polarization	04.077
	i02MHz Freq	Horizontal Polarization	Limit/ Detector
F	1		
No pe	Freq MHz Pak found	Level	Limit/ Detector dBuV/m 43.5 / QP
F No pe No pe	Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m



Tx frequency 2441MHz	Vertical Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
No peak found	-	43.5 / QP
No peak found	-	74.0 / P
No peak found	-	54.0 / A
Tx frequency 2441MHz	Horizontal Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
No peak found	-	43.5 / QP
1627.98	39.31	74.0 / P
1627.94	37.50	54.0 / A
Tx frequency 2480MHz	Vertical Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
No peak found	-	43.5 / QP
No peak found	_	74.0 / P
No peak found	-	54.0 / A
Tx frequency 2480MHz	Horizontal Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
No peak found	-	43.5 / QP
1654.00	41.55	74.0 / P
1653.98	40.17	54.0 / A