

Prüfbericht - Nr.: 14018762 001
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Test Report No.:
Auftraggeber: ModeLabs Technologies Ltd.
Client: 31/F., China Online Centre
 333 Lockhart Road
 Wanchai
 Hong Kong

Gegenstand der Prüfung: Bluetooth Headset
Test Item:
Bezeichnung: BLUETREK metal
Identification:
Serien-Nr.: Engineering sample
Serial No.:
Wareneingangs-Nr.: 080523002-13
Receipt No.:
Eingangsdatum: 23.05.2008
Date of Receipt:
Prüfort: TÜV Rheinland Hong Kong Ltd.
Testing Location: 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: FCC Part 15 Subpart C
Test Specification: ANSI C63.4-2003
 CISPR 22:1997

Prüfergebnis: Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben
Test Results: genannter Prüfgrundlage.
 The above mentioned product was tested and **passed**.

Prüflaboratorium: TÜV Rheinland Hong Kong Ltd.
Testing Laboratory: 9th Floor, Oriental News Building, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

geprüft/ tested by:
kontrolliert/ reviewed by:

 23.06.2008 Mika Chan
 Engineer

 23.06.2008 Thomas Berns
 Manager

Datum
Date
Name/Stellung
Name/Position
Unterschrift
Signature
Datum
Date
Name/Stellung
Name/Position
Unterschrift
Signature
Sonstiges: FCCID: QITBT4N
Other Aspects
Abkürzungen: P(ass) = entspricht Prüfgrundlage
 F(ail) = entspricht nicht Prüfgrundlage
 N/A = nicht anwendbar
 N/T = nicht getestet

Abbreviations: P(ass) = passed
 F(ail) = failed
 N/A = not applicable
 N/T = not tested

Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.
This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.

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Product information

Manufacturers declarations

	Transceiver
Operating frequency range	2402 - 2480 MHz
Type of modulation	FHSS modulation
Number of channels	79
Channel separation	1 MHz
Type of antenna	Integrated 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 _{nom} : 3.8 V
Independent Operation Modes	Page scan Inquiry scan Connection state - ACL Link Connection state - SCO Link

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Product function and intended use

The test item is a Bluetooth 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 μ s, where each slot corresponds to different RF hop frequencies. The nominal hop rate is 1600 hops/s.

Submitted documents

Circuit Diagram

Block Diagram

Bill of material

User manual

List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model No.	S/N	Due Date
<input checked="" type="checkbox"/>	Semi-anechoic Chamber	Frankonia	Nil	Nil	28-Mar-09
<input checked="" type="checkbox"/>	Test Receiver	R & S	ESU26	100050	06-Aug-08
<input checked="" type="checkbox"/>	Bi-conical Antenna	R & S	HK116	841489/015	08-Mar-09
<input checked="" type="checkbox"/>	Log Periodic Antenna	R & S	HL223	841516/017	28-Feb-09
<input checked="" type="checkbox"/>	Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 002	15-May-09
<input checked="" type="checkbox"/>	Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	01-Oct-08
<input checked="" type="checkbox"/>	High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	31-Oct-08
<input checked="" type="checkbox"/>	Bass Pass Filter (2.4GHz)	Micro-Tronic	BRM130 26	1	31-Oct-08
<input checked="" type="checkbox"/>	Horn Antenna	EMCO	3115	9002-3351	27-Feb-10
<input checked="" type="checkbox"/>	Spectrum Analyser	R & S	FSP 30	100416	08-Jun-09
<input checked="" type="checkbox"/>	Active Loop Antenna	EMCO	6502	9107-2651	20-Dec-09
<input checked="" type="checkbox"/>	Test Receiver	R & S	ESCS 30	100201	14-Dec-08
<input checked="" type="checkbox"/>	Artificial Mains Network	R & S	ESH3-Z5	100230	10-Dec-08
<input checked="" type="checkbox"/>	Pulse Limiter	R & S	ESH3-Z2	100161	10-Dec-08

Results FCC Part 15 – Subpart C

Subclause 15.203 – Antenna Information		Pass
Requirement:	No antenna other than that furnished by the responsible party shall be used with the device	
Results:	Permanent attached antenna	
Verdict:	Pass	

Subclause 15.204 – Antenna Information		Pass
Requirement:	Provide information for every antenna proposed for the use with the EUT	
Results:	a) Antenna type:	Permanent attached antenna
	b) Manufacturer and model no:	N.A.
	c) Gain with reference to an isotropic radiator:	0 dBi
Verdict:	Pass	

Subclause 15.207 – Disturbance Voltage on AC Mains		N.A.
The device is not functioning (no. RF radiations) during charging.		

Subclause 15.247 (a)(1) – Carrier Frequency Separation		Pass
Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), (GFSK) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%		
Results:	The centre frequencies of the hopping channels are separated by more than the 2/3*20dB bandwidth. For test Results plots refer to Appendix 1, page 2.	
Verdict:	Pass	

Subclause 15.247 (a)(1)(iii) – Number of hopping channels		Pass
Requirement:	Frequency hopping systems operating in the 2400MHz-2483.5MHz bands shall use at least 15 hopping frequencies.	
Test Specification	: FCC Part 15 Subpart A – Subclause 15.31	
Mode of operation	: Tx mode (hopping on), (GFSK)	
Port of testing	: Temporary antenna port	
Detector	: Peak	
RBW/VBW	: 1 MHz / 3 MHz	
Supply voltage	: 3.8VDC from DC power supply	
Temperature	: 23°C	
Humidity	: 50%	
Results:	The total number of hopping frequencies is more than 15. For test Results plots refer to Appendix 1, page 3.	
Verdict:	Pass	

Subclause 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)		Pass
Requirement:	Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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 Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), DH5 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%		
Results: Time period calculation = 0.4 x 79 = 31.6s Dwell time = 64 x 2.928 x 10 ⁻³ = 187.4 x 10 ⁻³ <= 400 x 10 ⁻³ s For test protocols please refer to Appendix 1, page 4-5.		
Verdict:	Pass	

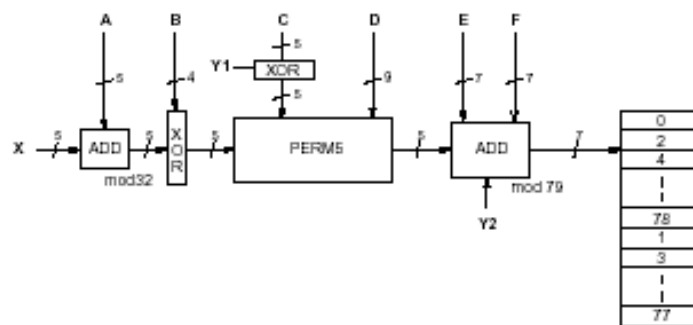
Subclause 15.247 (a) – 20 dB Bandwidth		Pass	
Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, whichever is greater.		
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), (GFSK) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 30 kHz / 100 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%			
Results: For test protocols refer to Appendix 1, page 6-7.			
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.448	0.392	0.840
2441	0.440	0.392	0.832
2480	0.396	0.388	0.784

Subclause 15.247 (a) – Hopping Sequence
Pass

Requirement: The hopping sequence is generated and provided with an example.

Hopping sequence

The channel is represented by a pseudo-random hopping sequence hopping through the 79 RF channels. The hopping sequence is unique for the piconet and is determined by the Bluetooth device address of the master. The X input determines the phase in the 32-hop segment, whereas Y1 and Y2 selects between master-to-slave and slave-to-master transmission. The inputs A to D determine the ordering within the segment, the inputs E and F determine the mapping onto the hop frequencies.



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Example data:

Hop sequence {k} for CONNECTION STATE:

CLK start: 0x0000010

ULAP: 0x00000000

#ticks: 00 02 | 04 06 | 08 0a | 0c 0e | 10 12 | 14 16 | 18 1a | 1c 1e |

```

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: 56 11 | 58 15 | 60 43 | 62 47 | 32 17 | 36 19 | 34 49 | 38 51 |
0x0000090: 40 21 | 44 23 | 42 53 | 46 55 | 48 33 | 52 35 | 50 65 | 54 67 |
0x00000b0: 56 37 | 60 39 | 58 69 | 62 71 | 64 25 | 68 27 | 66 57 | 70 59 |
0x00000d0: 72 29 | 76 31 | 74 61 | 78 63 | 01 41 | 05 43 | 03 73 | 07 75 |
0x00000f0: 09 45 | 13 47 | 11 77 | 15 00 | 64 49 | 66 53 | 68 02 | 70 06 |
0x0000110: 01 51 | 03 55 | 05 04 | 07 08 | 72 57 | 74 61 | 76 10 | 78 14 |
0x0000130: 09 59 | 11 63 | 13 12 | 15 16 | 17 65 | 19 69 | 21 18 | 23 22 |
0x0000150: 33 67 | 35 71 | 37 20 | 39 24 | 25 73 | 27 77 | 29 26 | 31 30 |
0x0000170: 41 75 | 43 00 | 45 28 | 47 32 | 17 02 | 21 04 | 19 34 | 23 36 |
0x0000190: 33 06 | 37 08 | 35 38 | 39 40 | 25 10 | 29 12 | 27 42 | 31 44 |
0x00001b0: 41 14 | 45 16 | 43 46 | 47 48 | 49 18 | 53 20 | 51 50 | 55 52 |
0x00001d0: 65 22 | 69 24 | 67 54 | 71 56 | 57 26 | 61 28 | 59 58 | 63 60 |
0x00001f0: 73 30 | 77 32 | 75 62 | 00 64 | 49 34 | 51 42 | 57 66 | 59 74 |
0x0000210: 53 36 | 55 44 | 61 68 | 63 76 | 65 50 | 67 58 | 73 03 | 75 11 |
0x0000230: 69 52 | 71 60 | 77 05 | 00 13 | 02 38 | 04 46 | 10 70 | 12 78 |
0x0000250: 06 40 | 08 48 | 14 72 | 16 01 | 18 54 | 20 62 | 26 07 | 28 15 |
0x0000270: 22 56 | 24 64 | 30 09 | 32 17 | 02 66 | 06 74 | 10 19 | 14 27 |
0x0000290: 04 70 | 08 78 | 12 23 | 16 31 | 18 03 | 22 11 | 26 35 | 30 43 |
0x00002b0: 20 07 | 24 15 | 28 39 | 32 47 | 34 68 | 38 76 | 42 21 | 46 29 |
0x00002d0: 36 72 | 40 01 | 44 25 | 48 33 | 50 05 | 54 13 | 58 37 | 62 45 |
0x00002f0: 52 09 | 56 17 | 60 41 | 64 49 | 34 19 | 36 35 | 50 51 | 52 67 |
0x0000310: 38 21 | 40 37 | 54 53 | 56 69 | 42 27 | 44 43 | 58 59 | 60 75 |
0x0000330: 46 29 | 48 45 | 62 61 | 64 77 | 66 23 | 68 39 | 03 55 | 05 71 |
0x0000350: 70 25 | 72 41 | 07 57 | 09 73 | 74 31 | 76 47 | 11 63 | 13 00 |
0x0000370: 78 33 | 01 49 | 15 65 | 17 02 | 66 51 | 70 67 | 03 04 | 07 20 |
0x0000390: 68 55 | 72 71 | 05 08 | 09 24 | 74 59 | 78 75 | 11 12 | 15 28 |
0x00003b0: 76 63 | 01 00 | 13 16 | 17 32 | 19 53 | 23 69 | 35 06 | 39 22 |
0x00003d0: 21 57 | 25 73 | 37 10 | 41 26 | 27 61 | 31 77 | 43 14 | 47 30 |
0x00003f0: 29 65 | 33 02 | 45 18 | 49 34 | 19 04 | 21 08 | 23 20 | 25 24 |

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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.	

Subclause 15.247 (a) – Receiver Hopping Capability	Pass
Requirement:	The associated receiver has the ability to shift frequencies in synchronisation with the transmitted signals.
Receiver hopping Capability The EUT complies with the Bluetooth RF specifications. For details refer to the Bluetooth standard.	

Subclause 15.247 (b)(1) – Peak Output Power		Pass			
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), (GFSK) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 3 MHz / 10 MHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%					
Requirement:	For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 Watt. For all other frequency hopping systems in the 2400 – 2483.5 MHz band: 0.125 Watts.				
Results:	For test protocols please refer to Appendix 1, page 8-9.				
GFSK Modulation					
Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	0.59	3.52	4.11	1 / 30.0	Pass
2441	0.50	3.65	4.15	1 / 30.0	Pass
2480	-0.02	3.60	3.58	1 / 30.0	Pass

Subclause 15.247 (d) – Band edge compliance of conducted emissions		Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2480MHz), (GFSK) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%		
Requirement:	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.	
Results:	There is no peak found outside any 100 kHz bandwidth of the operating frequency band. For test protocols refer to Appendix 1, page 10-11.	

Subclause 15.205 – Band edge compliance of radiated emissions		Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2480MHz), (GFSK) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 1 MHz / 3 MHz Supply voltage : 3.8VDC from DC power supply Temperature : 23°C Humidity : 50%		
Requirement:	Radiated emissions which fall in the restricted bands, as defined in 15.205 (a), must also comply with the radiated emission limits specified in 15.209(a).	
Results:	There is no peak found in the restricted bands. For test protocols refer to Appendix 1, page 12-15.	

Subclause 15.247 (d) – Spurious Conducted Emissions					Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), (GFSK) Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 3.8VDC from DC power supply Temperature : 23 °C Humidity : 50 %					
Requirement: 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.					
Results: There is no peak found outside any 100kHz 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(d). For test protocols refer to Appendix 1, page 16-17.					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	no peak found	-	-	-	Pass
2441	no peak found	-	-	-	Pass
2480	no peak found	-	-	-	Pass

Subclause 15.247 (c) – Spurious Radiated Emissions					Pass
Test Specification : ANSI C63.4 – 2003 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), (GFSK) Port of testing : Enclosure Detector : Peak RBW/VBW : 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz Supply voltage : internal batteries has been activated Temperature : 23°C Humidity : 50%					
Requirement: In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).					
Results: All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.					
Tx frequency 2402MHz			Vertical Polarization		
Freq MHz	Level dBuV/m		Limit/ Detector dBuV/m		

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4804.108	56.67	74.0 / P
4804.028	37.18	54.0 / A
Tx frequency 2402MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
1600.625	46.92	74.0 / P
1600.673	44.59	54.0 / A
4804.087	56.18	74.0 / P
4804.006	37.16	54.0 / A
Tx frequency 2441MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4882.035	55.82	74.0 / P
4882.035	37.82	54.0 / A
Tx frequency 2441MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4882.112	53.74	74.0 / P
4882.080	36.90	54.0 / A
1626.554	47.35	74.0 / P
1626.667	45.04	54.0 / A
Tx frequency 2480MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
4960.125	56.26	74.0 / P
4960.045	37.75	54.0 / A
Tx frequency 2480MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
1652.724	47.74	74.0 / P
1652.676	45.26	54.0 / A
4960.497	52.46	74.0 / P
4960.048	36.46	54.0 / A