

Prüfbericht - Nr.: 14017025 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: Wideband Transmission System - Bluetooth Headset
Test Item:
Bezeichnung: Bluetrek SENSE **Serien-Nr.:** Engineering sample
Identification: **Serial No.:**
Wareneingangs-Nr.: 071009013 **Eingangsdatum:** 09.10.2007
Receipt No.: **Date of Receipt:**
Prüfört: 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 Result: genannter Prüfgrundlage.
 The above mentioned product was tested and **passed**.

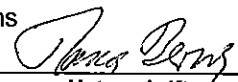
Prüflaboratorium: TÜV Rheinland Hong Kong Ltd.
Testing Laboratory: 9th Floor, Oriental News Building, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

geprüft/ tested by:
kontrolliert/ checked by:

 18.12.2007 Sharon Li
 Project Engineer



 18.12.2007 Thomas Berns
 Manager


Datum **Name/Stellung** **Unterschrift**
Date **Name/Position** **Signature**
Datum **Name/Stellung** **Unterschrift**
Date **Name/Position** **Signature**
Sonstiges: FCCID: QITBT3N
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	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 _{nom} : 3.8 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 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 µs, 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.

Submitted documents

Circuit Diagram
Block Diagram
Bill of material
User manual

List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model No.	S/N	Cal. Date	Due Date
☒	Semi-anechoic Chamber	Frankonia	Nil	Nil	28-Mar-07	28-Mar-08
☒	Test Receiver	R & S	ESVS30	842807/009	06-Aug-07	06-Aug-08
☒	Bi-conical Antenna	R & S	HK116	841489/016	08-Feb-06	08-Feb-08
☒	Log Periodic Antenna	R & S	HL223	841516/020	03-Feb-06	03-Feb-08
☒	Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 002	15-May-07	15-May-08
☒	Microwave amplifier 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	Nil	Nil
☒	High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	Nil	Nil
☒	Horn Antenna	EMCO	3115	9002-3347	02-Feb-06	02-Feb-08
☒	Spectrum Analyser	R & S	FSP 30	100416	08-Jun-07	08-Jun-08
☒	Loop Antenna	EMCO	6502	9107-2651	16-Nov-05	16-Nov-07
☒	EMI Test receiver	R & S	ESCS 30	100201	05-Dec-06	05-Dec-07
☐	Artificial Mains Network	R & S	ESH3-Z5	100230	05-Dec-06	05-Dec-07
☐	Pulse Limiter	R & S	ESH3-Z2	100161	06-Dec-06	06-Dec-07
☐	Spectrum Analyzer	R & S	FSP 30	100007	13-Feb-06	12-Feb-08

Result 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	
Result:	Permanent attached antenna	
Verdict:	Pass	

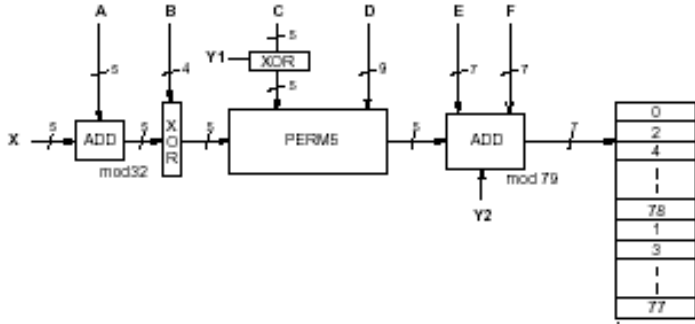
Subclause 15.204 – Antenna Information		Pass
Requirement:	Provide information for every antenna proposed for the use with the EUT	
Result:	a) Antenna type: Permanent attached antenna b) Manufacturer and model no: N.A. c) Gain with reference to an isotropic radiator: 0 dBi	
Verdict:	Pass	

Subclause 15.207 – Disturbance Voltage on AC Mains						Pass
Test Port: AC mains input port of the charger Applied voltage: 110VAC Applicable only to equipment designed to be connected to the public utility power line. 1) Mode of operation: Charging only						
Live measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.282	42.7	32.2	66 - 56	56 - 46	Pass
> 0,5 - 5	1.782	33.0	21.6	56	46	Pass
> 5 - 30	---	---	---	60	50	Pass
Neutral measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.282	40.1	37.2	66 - 56	56 - 46	Pass
> 0,5 - 5	1.722	30.3	25.6	56	46	Pass
> 5 - 30	---	---	---	60	50	Pass
Result: The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits.						

Subclause 15.247 (a) – Carrier Frequency Separation		Pass
Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies separated by 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 (hopping on), DH1 packet 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%		
Result: 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 band shall use at least 15 non-overlapping 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%	
Result: The screenshot in Appendix 1 page 4 shows the occurrence of a channel in a 31.6 s time period. In normal hopping mode Bluetooth is using 79 hopping channels only. The frequency was used 64 times. The dwell time for the longest supported packet type is about 3 ms. As a result the average time of occupancy will not be greater than 400 ms. i.e. Time period calculation: $0.4 \times 79 = 31.6\text{s}$ Limit calculation: $64 \times 2.936 \times 10^{-3} = 187.9 \times 10^{-3}$ $\leq 400 \times 10^{-3} \text{ s}$ For test protocols please refer to Appendix 1, page 3. 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 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), DH5 packet 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 4-5.			
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.448	0.468	0.916
2441	0.448	0.460	0.908
2480	0.452	0.460	0.912

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) – Peak Output Power				Pass	
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 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%					
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.					
Result 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	2.49	3.52	6.01	1 / 30.0	Pass
2441	1.83	3.65	5.48	1 / 30.0	Pass
2480	1.38	3.60	4.98	1 / 30.0	Pass

Subclause 15.247 (b) – Band edge compliance		Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 300 kHz / 1 MHz 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.		
Result 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 15.247 (c) – Spurious Conducted Emissions					Pass
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), DH1 packet 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.					
Result 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(c). For test protocols refer to Appendix 1, page 13-.					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2402	3200.460	-47.68	2.37	-50.05	Pass
2441	No peak found	-	-	-	Pass
2480	No peak found	-	-	-	Pass

Tx frequency 2441MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	-	43.5 / QP
1626.65	42.97	74.0 / P
1626.57	41.36	54.0 / A
4881.99	55.52	74.0 / P
4882.00	51.88	54.0 / A
Tx frequency 2441MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	-	43.5 / QP
1626.62	50.02	74.0 / P
1626.59	49.20	54.0 / A
4881.97	54.91	74.0 / P
4881.89	50.83	54.0 / A
Tx frequency 2480MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	-	43.5 / QP
1652.60	43.61	74.0 / P
1652.71	42.16	54.0 / A
4959.97	55.00	74.0 / P
4959.95	51.83	54.0 / A
Tx frequency 2480MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	-	43.5 / QP
1652.63	52.19	74.0 / P
1652.58	51.58	54.0 / A
4960.19	51.95	74.0 / P
4959.98	49.73	54.0 / A