

Produkte

Prod	ucts
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Prüfbericht - Nr.: Test Report No.:	14020900 002		Seite 1 von 16 Page 1 of 16
Auftraggeber: Client:	GN Netcom A/S Lautrupbjerg 7 DK-2750 Ballerup Denmark		
Gegenstand der Prüfung: Test Item:	Bluetooth Headset		
Bezeichnung: Identification:	Jabra EasyGo	Serien-Nr.: Serial No.:	Engineering sample
Wareneingangs-Nr.: Receipt No.:	00100811172-006	Eingangsdatum: Date of Receipt:	11.08.2010
Prüfort: Testing Location:	TÜV Rheinland Hong Kor 8/F., Niche Centre, 14 Wang Tai Hong Kong Productivity HKPC Building, 78 Tat Chee Ave	Road, Kowloon Bay, Kowloon, ⊦ Council	long Kong
Prüfgrundlage: Test Specification:	FCC Part 15 Subpart C ANSI C63.4-2003 CISPR 22:1997		
Prüfergebnis: Test Results:	Das vorstehend beschrie genannter Prüfgrundlage The above mentioned produ	9.	
Prüflaboratorium: Testing Laboratory:	TÜV Rheinland Hong Kor 9-10/F., Emperor International Sc	ng Ltd. uare , 7 Wang Tai Road, Kowloo	on Bay, Kowloon, Hong Kong
geprüft/ tested by:	kontro	olliert/ reviewed by:	
Mika Chan 26.08.2010 Project Engineer	india	Thomas Berns 08.2010 Manager	Noras Berns
DatumName/StellungDateName/Position	Unterschrift Datum Signature Date	Name/Stellung Name/Position	Unterschrift Signature
F(ail) = entsprid	is issued for the variant of the 020900 001. For details, plea ht Prüfgrundlage ht nicht Prüfgrundlage	ase refer to "Remark" on pa Abbreviations: P(ass) = F(ail) =	age 5.
<i>N/T</i> = <i>nicht ge</i> Dieser Prüfbericht bezieht si auszugsweise vervielfältig		N/A = N/T = er und darf ohne Genehmig chtigt nicht zur Verwendur	ng eines Prüfzeichens.

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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	IFA
Antenna gain (dBi)	1
Power level	variable
Type of equipment	stand alone, plug-in radio device
Connection to public utility power line	No
Nominal voltage	V _{nor} : 3.7 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 2.4GHz. With the introduction of the enhanced data rate (EDR) feature, the data rates can be up to 3 Mb/s.

An increase in the peak data rate beyond the basic rate of 1 Mb/s is achieved by modulating the RF carrier using phase shift keying (PSK) techniques, resulting in an increase of two to three times the number of bits per symbol. The 2 Mb/s EDR packets use a Pi/4-DQPSK modulation and the 3 Mb/s EDR packets use 8DPSK modulation.

Submitted documents

Circuit Diagram Block Diagram Bill of material User manual

Remark

Detail of the changes on new variant are as follow.

-New mechanical enclosure.

-Larger battery

-Added Voice alert

- -New pin compatible chipset with DSP
- -New packaging artwork

To show compliance all testing were repeated on the revised sample.

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.

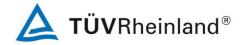
Special accessories and auxiliary equipment

N/A



List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model	S/N	Due Date
			No.		
\boxtimes	Semi-anechoic Chamber	Frankonia	Nil	Nil	27-Apr-11
\boxtimes	Test Receiver	R&S	ESU26	100050	25-May-11
\boxtimes	Bi-conical Antenna	R&S	HK116	100242	13-Apr-12
\boxtimes	Log Periodic Antenna	R & S	HL223	841516/020	13-Apr-12
\boxtimes			RTK081-		
			05S-05S-	LA2-001-10M /	
	Coaxial cable 50ohm	Rosenberger	10m	002	07-Dec-10
\boxtimes	Microwave amplifer 0.5-				
	26.5GHz, 25dB gain	HP	83017A	3950M00241	03-Oct-11
\boxtimes	High Pass Filter (cutoff				
	freq. =1000MHz)	Trilithic	23042	9829213	30-Oct-11
\boxtimes	Horn Antenna	EMCO	3115	9002-3351	16-Apr-12
\boxtimes	Spectrum Analyser	R & S	FSP 30	100286	16-Mar-11
\boxtimes	Active Loop Antenna	EMCO	6502	9107-2651	06-Feb-11
\square	Test Receiver	R & S	ESCS 30	847115/005	24-Aug-10
\square	Artificial Mains Network	R&S	ESH3-Z5	849876/027	24-Aug-10
\square	Pulse Limiter	R&S	ESH3-Z2	100161	04-Jun-11



Results FCC Part 15 – Subpart C

Subclause 15.20	3 – Antenna Information	Pass
Requirement:	No antenna other than that furnished by the resp device	onsible party shall be used with the
Results:	Permanent attached antenna	
Verdict:	Pass	
Subclause 15.20	4 – Antenna Information	Pass
	4 – Antenna Information Provide information for every antenna proposed f	
Requirement:	Provide information for every antenna proposed t	for the use with the EUT
Subclause 15.20 Requirement: Results:	Provide information for every antenna proposed t a) Antenna type:	for the use with the EUT
Requirement:	Provide information for every antenna proposed t	for the use with the EUT

Subclause 15.207 – Disturbance Voltage on AC Mains	N/A
EUT could not be operated during battery charging.	



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Subclause 15.247	' (a)(1) – Carrier Frequency Separation Pas	S S
Requirement:	Frequency hopping systems shall have hopping channel carrier frequencies by a minimum of 25kHz or the 2/3*20dB bandwidth of the hopping channel, y greater.	
Mode of operation Port of testing Detector	: FCC Part 15 Subpart A – Subclause 15.31 : Tx mode (hopping on), GFSK : Temporary antenna port : Peak : 100 kHz / 300 kHz : 3.7VDC from DC power supply : 23°C : 50%	
Results:	Pre-scan has been conduced to determine the worst-case mode from all po combinations between available modulations and packet types.	ssible
Verdict:	The centre frequencies of the hopping channels are separated by more than 2/3*20dB bandwidth. For test Results plots refer to Appendix 1, page 2. Pass	the

Subclause 15.247	' (a)(1)(iii) – Number of hopping channels Pa	ISS
Requirement:	Frequency hopping systems operating in the 2400MHz-2483.5MHz bands least 15 hopping frequencies.	shall use at
Mode of operation Port of testing Detector	: FCC Part 15 Subpart A – Subclause 15.31 : Tx mode (hopping on), GFSK : Temporary antenna port : Peak : 1 MHz / 3 MHz : 3.7VDC from DC power supply : 23°C : 50%	
Results:	The total number of hopping frequencies is more than 15. For test Results Appendix 1, page 3.	plots refer to
Verdict:	Pass	

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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 channels. The average time of occupancy on any channel shall not be seconds within a period of 0.4 seconds multiplied by the number of hop employed.	greater than 0.4
Mode of operation Port of testing Detector RBW/VBW Supply voltage		
Results: Time per Dwell tim	riod calculation = $0.4 \times 79 = 31.6s$ ne = $53 \times 2.904 \times 10^{-3} = 153.91 \times 10^{-3}$ <= $400 \times 10^{-3} s$	
For test protocols	please refer to Appendix 1, page 4-5.	
Verdict:	Pass	

Subclause 15.247 (a) – 20 dB BandwidthPass			Pass
Requirement:	Frequency hopping systems sh by a minimum of 25kHz or the 2 greater.		
Mode of operation Port of testing Detector RBW/VBW Supply voltage Temperature	: FCC Part 15 Subpart A – Subcl : Tx mode (2402MHz, 2441MHz, : Temporary antenna port : Peak : 30 kHz / 100 kHz : 3.7VDC from DC power supply : 23°C : 50%	2480MHz)	
Results:	Pre-scan has been conduced to combinations between available		
	For test protocols refer to Appe	ndix 1, page 6-8.	
8 DPSK Modulatio	on		
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.726	0.720	1.446
2441	0.714	0.726	1.440
	0.726	0.714	1.440



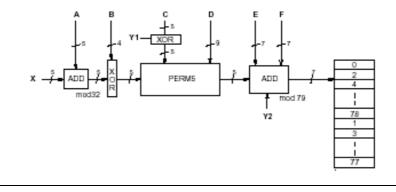
Frequency (MHz)	20 dB left (MHz)	20 dB right (MHz)	20dB bandwidth (MHz)
2402	0.462	0.486	0.948
2441	0.570	0.570	1.140
2480	0.558	0.570	1.128

Subclause 15.247 (a) – Hopping SequencePass

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 o	lata:							
Hop sequen CLK start: 0 ULAP: 0x00	x00000	10	NECTIO	ON STA	TE:			
#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:								
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

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.

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Subclause 15.247 (a) – Receiver Input Bandwidth

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

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.

	n : FCC Part 15 Subpa n : Tx mode (2402MH) : Temporary antenna : Peak : 3 MHz / 10 MHz : 3.7VDC from DC po : 23°C : 50%	z, 2441MHz, 2480I a port				
Requirement:	least 75 hopping ch	nannels, and all free	ting in the 2400-2483. quency hopping syster nopping systems in the	ms in the 5725-58	50 MHz	
Results:	For test protocols please refer to Appendix 1, page 9-13.					
GFSK Modulatio	on					
Frequency	Maximum peak	Cable	Output power	Limit	Verdict	
(MHz)	output power	attenuation	(dBm)	(W/dBm)		
	(dBm)	(dB)				
2402	-0.69	3.52	2.830	1 / 30.0	Pass	
2441	-0.97	3.65	2.680	1 / 30.0	Pass	
2480	-1.76	3.60	1.840	1 / 30.0	Pass	
Pi/4 DQPSK Mo	dulation					
Frequency	Maximum peak	Cable	Output power	Limit	Verdict	
(MHz)	-	attenuation	(dBm)	(W/dBm)		
	output power	allenuation	(abiii)	(11/08/11)		
	(dBm)	(dB)	(ubiii)	(11/4211)		
2402			1.240	1 / 30.0	Pass	



Pass

Pass

Pass



2480	-2.83	3.60	0.770	1 / 30.0	Pass
8 DPSK Modulat	ion				
Frequency (MHz)	Maximum peak output power (dBm)	Cable attenuation (dB)	Output power (dBm)	Limit (W/dBm)	Verdict
2402	-1.88	3.52	1.640	1 / 30.0	Pass
2441	-2.46	3.65	1.190	1 / 30.0	Pass
2480	-2.83	3.60	0.770	1 / 30.0	Pass

Subclause 15.247	' (d) – Band edge compliance of conducted emissions Pass
Mode of operation Port of testing Detector RBW/VBW Supply voltage	: FCC Part 15 Subpart A – Subclause 15.31 : Tx mode (2402MHz, 2480MHz), 8DPSK : Temporary antenna port : Peak : 100 kHz / 300 kHz : 3.7VDC from DC power supply : 23°C : 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:	Pre-scan has been conduced to determine the worst-case mode from all possible combinations between available modulations and packet types. There is no peak found outside any 100 kHz bandwidth of the operating frequency band. For test protocols refer to Appendix 1, page 14-15.

Subclause 15.20	5 – Band edge compliance of radiated emissions	Pass
	: FCC Part 15 Subpart A – Subclause 15.31 : Tx mode (2402MHz, 2480MHz), 8DPSK : Temporary antenna port : Peak : 1 MHz / 3 MHz : 3.7VDC from DC power supply : 23°C : 50%	
Requirement:	Radiated emissions which fall in the restricted bans, as define comply with the radiated emission limits specified in 15.209(a)	
Results:	There is no peak found in the restricted bands. For test protoc page 16-19.	cols refer to Appendix 1,



Subclause 15.247	(d) – Spurious Cor	nducted Emissions	3	Pass	
Mode of operation Port of testing Detector RBW/VBW Supply voltage	: FCC Part 15 Subp : Tx mode (2402MH : Temporary antenn : Peak : 100 kHz / 300 kHz : 3.7VDC from DC p : 23 °C : 50 %	lz, 2441MHz, 2480M a port			
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:	Pre-scan has been conduced to determine the worst-case mode from all possible combinations between available modulations and packet types. 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 20-21.				
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 Rad	liated Emissions	Pass			
Mode of operation Port of testing	: Enclosure : Peak	lz, 2441MHz, 2480MHz), 8DPSI	<			
	: 100 kHz / 300 kHz for f < 1 GHz 1 MHz / 3 MHz for f > 1 GHz					
Supply voltage	: internal batteries has been activated					
	: 23ºC					
Humidity	: 50%					
Requirement:	In any 100kHz bandwidth outside the frequency band at least 20dB below the highes level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).					
Results:		n conduced to determine the wor reen available modulations and p				
	All three transmit fr bands. There is no	requency modes comply with the spurious found below 30MHz.	e field strength within the restricted			
Tx frequency 2402	MHz	Vertical Polarization				
Free MH:		Level dBuV/m	Limit/ Detector dBuV/m			
No peak	found	-	46 / QP			
4803.9		56.22	74.0 / P			
4803.9)58	38.60	54.0 / A			
Tx frequency 2402	MHz	Horizontal Polarization				
Free	7	Level	Limit/ Detector			
MH	Z	dBuV/m	dBuV/m			
No peak			46 / QP			
1601.8		45.58	74.0 / P			
1601.9		42.07	54.0 / A			
4804.1		51.99	74.0 / P			
4803.9		36.63	54.0 / A			
Tx frequency 2441	I	Vertical Polarization				
Free MH:		Level dBuV/m	Limit/ Detector			
		dBuV/m	dBuV/m 46 / QP			
<u>No peak found</u> 4881.794		58.73	46/QP 74.0/P			
	4882.003 39.47		54.0 / A			
Tx frequency 2441	·	Horizontal Polarization				
		Level	Limit/ Detector			
Free						
Free MH:		dBuV/m	dBuV/m			
	Z					
MH	z found		dBuV/m			



Tx frequency 2480MHz	Vertical Polarization	
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
No peak found	-	46 / QP
4960.160	54.74	74.0 / P
4959.160	38.02	54.0 / A
Tx frequency 2480MHz	Horizontal Polarization	
Freq	Level	Limit/ Detector
MHz	dBuV/m	dBuV/m
No peak found	-	46 / QP
1652.500	43.64	74.0 / P
1653.974	34.38	54.0 / A