TÜVRheinland®

Produkte
Products

Prüfbericht - Nr.: *Test Report No.:*	**14026758 002**	**Seite 1 von 11** *Page 1 of 11*
Auftraggeber: *Client:*	**AvantWave Limited** **3 Rd. Floor, Photonics centre** **No. 2 Science Park Avenue East** **Hong Kong Science Park** **Shatin Hong Kong**	
Gegenstand der Prüfung: *Test Item:*	**Bluetooth Module**	
Bezeichnung: *Identification:*	**BTR602**	**Serien-Nr.:** *Serial No.:* **Engineering sample**
Wareneingangs-Nr.: *Receipt No.:*	**00120213099-001**	**Eingangsdatum:** *Date of Receipt:* **13.02.2012**
Prüfort: *Testing Location:*	**Hong Kong Productivity Council** HKPC Building, 78 Tat Chee Avenue, Kowloon, Hong Kong **TÜV Rheinland Hong Kong Ltd.** 8/F., First Group Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong	
Prüfgrundlage: *Test Specification:*	**FCC Part 15 Subpart C** **ANSI C63.4-2003** **CISPR 22:1997**	
Prüfergebnis: *Test Results:*	**Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben genannter Prüfgrundlage.** The above mentioned product was tested and **passed**.	
Prüflaboratorium: *Testing Laboratory:*	**TÜV Rheinland Hong Kong Ltd.** 8-10/F., Goldin Financial Global Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong	

geprüft/ *tested by:*			**kontrolliert/** *reviewed by:*		
15.03.2012	Mika Chan Senior Project Engineer		15.03.2012	Sharon Li Assistant Manager	
Datum *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*	**Datum** *Date*	**Name/Stellung** *Name/Position*	**Unterschrift** *Signature*

Sonstiges/ Other Aspects: **FCCID: XQN-BTR60X**

This test report is issued for "Class II permissive change" of the previously tested EUT of AvantWave model BTR60X in test report number 14026758 001. For details, please refer to "Remark" on page 5.

Abkürzungen:				*Abbreviations:*			
	P(ass)	=	*entspricht Prüfgrundlage*		*P(ass)*	=	*passed*
	F(ail)	=	*entspricht nicht Prüfgrundlage*		*F(ail)*	=	*failed*
	N/A	=	*nicht anwendbar*		*N/A*	=	*not applicable*
	N/T	=	*nicht getestet*		*N/T*	=	*not tested*

Table of Content

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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 gain (dBi)	-2
Power level	fix
Type of equipment	stand alone radio device
Connection to public utility power line	No
Nominal voltage	V_{nor}: 3.3 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 Module 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
Label Artwork

Remark

Change as follow:

- PCB length (new version from 32mm shorten to 28.2mm)

To show compliance Radiated Spurious Emission was 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

Additional accessory used for testing

The product has been tested together with the following additional accessory:

1. AC/DC Power adaptor
   Model number: PSM02R-055
   Input: 100-240VAC, 50-60Hz, 0.1A
   Output: 5.5VDC 0.35A

2. LPT cable provided by client

List of Test and Measurement Instruments

Hong Kong Productivity Council (Registration number: 90656)

Radiated Emission

Equipment	Manufacturer	Type	S/N	Due Date
Semi-anechoic Chamber	Frankonia	Nil	Nil	25-May-12
Test Receiver	R & S	ESU40	100190	26-May-12
Bi-conical Antenna	R & S	HK116	100241	05-May-13
Log Periodic Antenna	R & S	HL223	841516/020	06-May-13
Coaxial cable 50ohm	Rosenberger	RTK081-05S-05S-10m	LA2-001-10M / 001	15-Nov-13
Microwave amplifer 0.5-26.5GHz, 25dB gain	HP	83017A	3950M00241	03-Oct-13
High Pass Filter (cutoff freq. =1000MHz)	Trilithic	23042	9829213	28-Oct-13
Horn Antenna	EMCO	3115	9002-3351	11-May-13
Active Loop Antenna	EMCO	6502	9107-2651	19-Apr-12
FSP 30 Spectrum Analyser	R & S	FSP 30	100007	16-Sep-12

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Conducted Emission

Equipment	Manufacturer	Type	S/N	Due Date
Test Receiver	Rohde & Schwarz	ESCS30	100201	13 Feb 13
LISN	Rohde & Schwarz	ESH3-Z5	100230	13 Feb 13

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:	Integral
	b) Manufacturer and model no:	N.A.
	c) Gain with reference to an isotropic radiator:	-2 dBi
Verdict:	Pass	

Subclause 15.207 – Disturbance Voltage on AC Mains	**Pass**
Remark: Test result refers to test report 14026758 001.	

Subclause 15.247 (a)(1) – Carrier Frequency Separation	**Pass**
Remark: Test result refers to test report 14026758 001.	

Subclause 15.247 (a)(1)(iii) – Number of hopping channels	**Pass**
Remark: Test result refers to test report 14026758 001.	

Subclause 15.247 (a)(1)(iii) – Time of Occupancy (Dwell Time)	**Pass**
Remark: Test result refers to test report 14026758 001.	

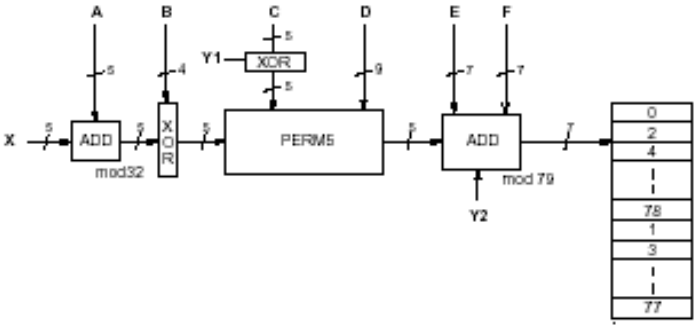
Subclause 15.247 (a) – 20 dB Bandwidth	**Pass**
Remark: Test result refers to test report 14026758 001.	

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.



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

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**
Remark: Test result refers to test report 14026758 001.	

Subclause 15.247 (d) – Band edge compliance of conducted emissions	**Pass**
Remark: Test result refers to test report 14026758 001.	

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), 8DPSK
Port of testing : Temporary antenna port
Detector : Peak
RBW/VBW : 1 MHz / 3 MHz
Supply voltage : 3.3VDC from DC power supply
Temperature : 23ºC
Humidity : 50%

Requirement:	Radiated emissions which fall in the restricted bans, 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 2-5.

Subclause 15.247 (d) – Spurious Conducted Emissions	**Pass**

Remark: Test result refers to test report 14026758 001.

Subclause 15.247 (c) – Spurious Radiated Emissions	**Pass**

Test Specification : ANSI C63.4 – 2003
Mode of operation : Tx mode (2402MHz, 2441MHz, 2480MHz), 8DPSK
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 : 3.3VDC from DC power supply
Temperature : 23ºC
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 section15.205(a), must also comply with the radiated emission limits specified in section 15.205(c).
Results:	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 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**
48.000	21.5	40.0 / QP
4803.958	71.68	74.0 / PK
4803.999	44.80	54.0 / AV

Tx frequency 2402MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
1602.028	52.93	74.0 / PK
1601.995	51.31	54.0 / AV
4804.358	66.65	74.0 / PK
4804.022	43.01	54.0 / AV
Tx frequency 2441MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
55.460	16.3	40.0 / QP
4881.698	71.52	74.0 / PK
4881.955	44.61	54.0 / AV
Tx frequency 2441MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
1626.634	52.90	74.0 / PK
1626.667	50.60	54.0 / AV
4881.158	65.28	74.0 / PK
4881.983	42.56	54.0 / AV
Tx frequency 2480MHz	Vertical Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
48.000	21.40	40.0 / QP
4959.964	70.80	74.0 / PK
4959.964	44.60	54.0 / AV
Tx frequency 2480MHz	Horizontal Polarization	
Freq MHz	**Level dBuV/m**	**Limit/ Detector dBuV/m**
1652.673	51.97	74.0 / PK
1652.657	49.79	54.0 / AV
4960.016	67.87	74.0 / PK
4960.000	43.58	54.0 / AV