

Inter**Lab**[®]

Radio Test Report

Test Report Reference: 4_TENOV_0102_BQB_RADc

Date of Report: 2004-06-24

on

**Bluetooth[®] Transceiver
Blue Voice L**

according to:

ETSI EN 300 328-2 V1.2.1 (2001-12)

Electromagnetic compatibility and Radio spectrum Matters (ERM);
Wideband Transmission systems; data transmission equipment operating
in the 2,4 GHz ISM band and using spread spectrum modulation techniques;
Part 2: Harmonized EN covering essential requirements under article 3.2
of the R&TTE Directive



TTI-P-G 178/99

Testing Laboratory:

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Note :

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the testing laboratory



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

Administrative Data:

Testing Laboratory

Company Name: 7 layers AG
Address: Borsigstrasse 11
40880 Ratingen
Germany
Laboratory accreditation no: DAR – Registration no. TTI-P-G 178/99
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Report Template Version: 2004-03-23

Project Data

Responsible for testing and report: Dipl.-Ing. Robert Machulec
Date of Report: 2004-06-24

Applicant Data

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Manufacturer Data

Company Name: see applicant
Address: see applicant
Contact Person: see applicant

Test object Data

General Description of Radio Device

Kind of Device product description	Bluetooth® Transceiver operating in the 2,4 GHz ISM band using Frequency Hopping Spread Spectrum (FHSS) modulation.
Product designation	Bluetooth® CTP phone
Type designation	Blue Voice L
Voltage Type	DC
Voltage level (nominal)	3.1 V
antenna	Integrated
Antenna gain	0 dBi
Duty cycle	0,377
RF power adjustable	YES

Tested Radio Devices (Test Samples)

Description	HW	SW	S/N	Comment
Sample with temporary antenna connector (internal antenna deactivated)	300-49.9907.0267	1.35.0 built 1647	Test sample 1	Used for conducted measurements
Sample with antenna active	300-49.9907.0267	1.35.0 built 1874	Test sample 2	Used for radiated measurements

General Description of auxiliary equipment

Device	Details (manufacturer, Type, HW, SW, S/N)	Reason for using
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LIST OF MEASUREMENTS

The list of measured parameters called for in EN 300 328-2 is given below.

Clause	Transmitter parameters	Result	Page number
5.3.1	Effective (Isotropically) Radiated Power (EIRP)	passed (3)	5
5.3.2	Peak power density – for FHSS equipment	passed	6
5.3.2	Peak power density – for DSSS equipment	N/A (1)	--
5.3.3	Frequency range of equipment using FHSS modulation	passed (3)	7
5.3.3	Frequency range of equipment using other forms of modulation	N/A (1)	--
5.3.4	Spurious emissions conducted - transmitter operating <i>- transmitter operated at the lowest output power</i>	passed	8
5.3.4	Spurious emissions conducted - transmitter operating <i>- transmitter operated at the highest output power</i>	passed	9
5.3.4	Spurious emissions conducted - transmitter standby	passed	10
5.3.4	Spurious emissions radiated- transmitter operating <i>- transmitter operated at the lowest output power</i>	passed	11
5.3.4	Spurious emissions radiated- transmitter operating <i>- transmitter operated at the highest output power</i>	passed	12
5.3.4	Spurious emissions radiated - transmitter standby	passed	13

Clause	Receiver parameters	Result	Page number
5.3.5	Spurious emissions conducted - receiver operating	passed	14
5.3.5	Spurious emissions radiated - receiver operating	passed	15

- N/A not applicable
- N/P not performed
- (1) Test not applicable because EUT is using FHSS modulation.
- (2) Test not applicable because output power is fixed.
- (3) Only tested under nominal conditions on customer demand.

This report replaces the report 4_TENOV_0102_BQB_RADb



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

Transmitter Effective Isotropically Radiated Power (EIRP) **CLAUSE 5.3.1**

Ambient temperature: 22°C Relative humidity: 33%

T_{nom}: +23 °C

T_{min}: -- °C

T_{max}: -- °C

V_{nom}: 3.1 V

V_{min}: -- V

V_{max}: -- V

Antenna assembly gain: 0 dBi

TEST CONDITIONS		TRANSMITTER POWER (dBm) (including antenna gain)			
		detector	lowest frequency 2402 MHz	middle frequency 2441 MHz	highest frequency 2480 MHz
T _{nom}	V _{nom}	AV	15.58	15.45	15.08
		PK	15.66	15.56	15.19
T _{min}	V _{min}	AV	N/P	N/P	N/P
	V _{max}	PK	N/P	N/P	N/P
T _{max}	V _{min}	AV	N/P	N/P	N/P
	V _{max}	PK	N/P	N/P	N/P
Measurement uncertainty		± 1.2 dB			
Note: AV = Average Power; PK = Peak Power					

COMMENTS:

- N/P: not performed

LIMITS (clause 4.2.1.2) under all test conditions	AV: +20 dBm (= -10 dBW) PK: +23 dBm (= -7 dBW)
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TEST EQUIPMENT USED: 2.1 – 2.11



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER POWER DENSITY - FHSS modulation

CLAUSE: 5.3.2

Ambient temperature: 22°C Relative humidity: 33%

T_{nom}: +23 °C

V_{nom}: 3.1 V

Antenna assembly gain: 0 dBi

TESTS	Measured Power Density (including antenna gain)
Measured power density	15.69 dBm per 100 kHz at 2427.8302 MHz
Measurement uncertainty	± 1.2 dB

COMMENTS:

- Transmitter Power Density has been measured over all 79 channels.
- The maximum value of power density with the relating frequency is listed above.

LIMITS (clause 4.2.2.2) under normal test conditions only	+20 dBm per 100 kHz (=-10 dBW per 100 kHz)
--	---

Is TX on Time < 10 microseconds: No

TEST EQUIPMENT USED: 2.1 – 2.11

TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER FREQUENCY RANGE - FHSS equipment

CLAUSE 5.3.3

Ambient temperature: 22°C Relative humidity: 33%

T_{nom}: +23 °C

T_{min}: -- °C

T_{max}: -- °C

V_{nom}: 3.1 V

V_{min}: -- V

V_{max}: -- V

TEST CONDITIONS		FREQUENCY (MHz) at which -80 dBm/Hz occurs	
		lowest	highest
T _{nom}	V _{nom}	2400.860	2481.120
T _{min}	V _{min}	N/P	N/P
	V _{max}	N/P	N/P
T _{max}	V _{min}	N/P	N/P
	V _{max}	N/P	N/P
Measured frequencies (lowest and highest)		f _L = 2400.860 MHz	f _H = 2481.120 MHz
Measurement uncertainty		Level: ± 1.2 dB Frequency: ± 1 · 10 ⁻⁵	

COMMENTS:

- N/P: not performed

LIMITS: (clause 4.2.3.2) under all test conditions	f_L > 2400.0 MHz f_H < 2483.5 MHz
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TEST EQUIPMENT USED: 2.1 – 2.11



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

CLAUSE 5.3.4

Ambient temperature: 23°C Relative humidity: 33%

T_{nom}: +23 °C

V_{nom}: 3.1 V

Transmitter operating at lowest output power

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
--	--	--
Measurement uncertainty	± 2.1 dB	

COMMENTS:

- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- such values have not been found.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -36dBm or -86dBm/Hz >1GHz : -30dBm or -80dBm/Hz 1.8 - 1.9GHz : -47dBm or -97dBm/Hz 5.15-5.3GHz : -47dBm or - 97dBm/Hz

TEST EQUIPMENT USED: 2.1 - 2.11



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

CLAUSE 5.3.4

Ambient temperature: 23°C Relative humidity: 33%

T_{nom}: +23 °C

V_{nom}: 3.1 V

Transmitter operating at highest output power

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
--	--	--
Measurement uncertainty	± 2.1 dB	

COMMENTS:

- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- such values have not been found.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -36dBm or -86dBm/Hz >1GHz : -30dBm or -80dBm/Hz 1.8 - 1.9GHz : -47dBm or -97dBm/Hz 5.15-5.3GHz : -47dBm or - 97dBm/Hz

TEST EQUIPMENT USED: 2.1 - 2.11

TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

CLAUSE 5.3.4

Ambient temperature: 23°C Relative humidity: 33%

T_{nom}: +23 °C

V_{nom}: 3.1 V

Transmitter on standby

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
--	--	--
Measurement uncertainty	± 2.1 dB	

COMMENTS:

- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- such values have not been found.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -57dBm or -107dBm/Hz >1GHz : -47dBm or -97dBm/Hz

TEST EQUIPMENT USED: 2.1 – 2.11



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

CLAUSE 5.3.4

Ambient temperature: 24⁰C Relative humidity: 32%

T_{nom}: +24 °C

V_{nom}: 3.1 V

Transmitter operating at lowest output power

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
--	--	--
Measurement uncertainty	± 2.8 dB	

COMMENTS:

- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- such values have not been found.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -36dBm or -86dBm/Hz >1GHz : -30dBm or -80dBm/Hz 1.8 - 1.9GHz : -47dBm or -97dBm/Hz 5.15-5.3GHz : -47dBm or - 97dBm/Hz

TEST EQUIPMENT USED: 1.1 - 1.15



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

CLAUSE 5.3.4

Ambient temperature: 24⁰C Relative humidity: 32%

T_{nom}: +24 °C

V_{nom}: 3.1 V

Transmitter operating at highest output power

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
2400	100	-42.67
4804	100	-33.47
4960	100	-39.54
7206	100	-37.94
9608	100	-41.9
12010	100	-41.85
Measurement uncertainty	± 2.8 dB	

COMMENTS:

- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -36dBm or -86dBm/Hz >1GHz : -30dBm or -80dBm/Hz 1.8 - 1.9GHz : -47dBm or -97dBm/Hz 5.15-5.3GHz : -47dBm or - 97dBm/Hz

TEST EQUIPMENT USED: 1.1 - 1.15



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TRANSMITTER SPURIOUS EMISSIONS (RADIATED)

CLAUSE 5.3.4

Ambient temperature: 24⁰C Relative humidity: 32%

T_{nom}: +24 °C

V_{nom}: 3.1 V

Transmitter on standby

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
640	100	-66.28
705	100	-65.78
Measurement uncertainty	± 2.8 dB	

COMMENTS:

- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -57dBm or -107dBm/Hz >1GHz : -47dBm or -97dBm/Hz

TEST EQUIPMENT USED: 1.1 - 1.15



TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

RECEIVER SPURIOUS RADIATIONS (CONDUCTED)

CLAUSE 5.3.5

Ambient temperature: 23°C Relative humidity: 33%

T_{nom}: +23 °C

V_{nom}: 3.1 V

Receiver operating, Transmitter off or on standby

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
--	--	--
Measurement uncertainty	± 2.1 dB	

COMMENTS:

- For Bluetooth devices this test corresponds to the test: TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED), Transmitter in standby.
- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.
- such values have not been found.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -57dBm or -107dBm/Hz >1GHz : -47dBm or -97dBm/Hz

TEST EQUIPMENT USED: 1.1 - 1.15

TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

RECEIVER SPURIOUS RADIATIONS (RADIATED)

CLAUSE 5.3.5

Ambient temperature: 24⁰C Relative humidity: 32%

T_{nom}: +24 °C

V_{nom}: 3.1 V

Receiver operating, Transmitter off or on standby

FREQUENCY (MHz)	MEASUREMENT BANDWIDTH (kHz)	SPURIOUS EMISSION LEVEL (dBm)
640	100	-66.28
705	100	-65.78
Measurement uncertainty	± 2.8 dB	

COMMENTS:

- For Bluetooth devices this test corresponds to the test: TRANSMITTER SPURIOUS EMISSIONS (RADIATED), Transmitter in standby.
- at least spurious emission that exceed the limit values given in the table below or that come within 6 dB below these values are listed in the table above.

Frequency Range	30 MHz to 12.75 GHz
LIMITS (clause 4.2.4.2)	30MHz-1GHz : -57dBm or -107dBm/Hz >1GHz : -47dBm or -97dBm/Hz

TEST EQUIPMENT USED: 1.1 - 1.15

TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment and ancillaries such as cables are identified (numbered) by the Test Laboratory.

Ref. No.	Instrument/Ancillary	Type	Manufacturer	Serial No.
1.1	EMI Analyzer	ESI 26	Rohde & Schwarz	830482/004
1.2	Signal Generator	SMR 20	Rohde & Schwarz	846934/008
1.3	Antenna Mast 4m	MA 240	HD GmbH	240/492
1.4	Ultra Broadband Antenna	HL 562	Rohde & Schwarz	830547/003
1.5	Cable "ESI to Horn Antenna"	RTK 081	Rosenberger	W18.04+3599/001
1.6	Cable "ESI to EMI Antenna"	RTK 081 +Aircell7	Huber & Suhner	W18.01+W38.0 1a
1.7	High Pass Filter	5HC3500/12750 -1.2-KK	Trilithic	200035008
1.8	Broadband Amplifier	JS4-00101800-35-5P	Miteq	896037
1.9	Double-ridged horn	HF906	Rohde & Schwarz	357357/001
1.10	Biconical dipole	VUBA 9117	Schwarzbeck	9117108
1.11	Double-ridged horn	HF906	Rohde & Schwarz	357357/002
1.12	Turntable	DS 420S	HD GmbH	420/573/90
1.13	Fully/Semi Anechoic Chamber	10,6x6,4x6	Frankonia	-
1.14	Loop Antenna	HFH2-Z2	Rohde & Schwarz	829324/006
1.15	Frequency Normal	MFS	Efratom	2

TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

Ref. No.	Instrument/Ancillary	Type	Manufacturer	Serial No.
2.1	Frequency Normal	MFS	Efratom	2
2.2	RF Step Attenuator	RSP	Rohde & Schwarz	833695/001
2.3	Signal Switching and Conditioning Unit	SSCU	Rohde & Schwarz	338826/005
2.4	Signal Generator	SMP 03	Rohde & Schwarz	833680/003
2.5	Power Meter	NRVD	Rohde & Schwarz	832025/059
2.6	Signal Generator	SMIQ03B	Rohde & Schwarz	832870/017
2.7	Signal Analyser	FSIQ26	Rohde & Schwarz	832695/007
2.8	Signal Generator	SMIQ03B	Rohde & Schwarz	834344/002
2.9	System Controller	PSM12	Rohde & Schwarz	829323/008
2.10	Power Sensor	NRV-Z1	Rohde & Schwarz	832279/015
2.11	Power Sensor	NRV-Z1	Rohde & Schwarz	832279/013

TEST REPORT REFERENCE:

4_TENOV_0102_BQB_RADc

FOTO REPORT:

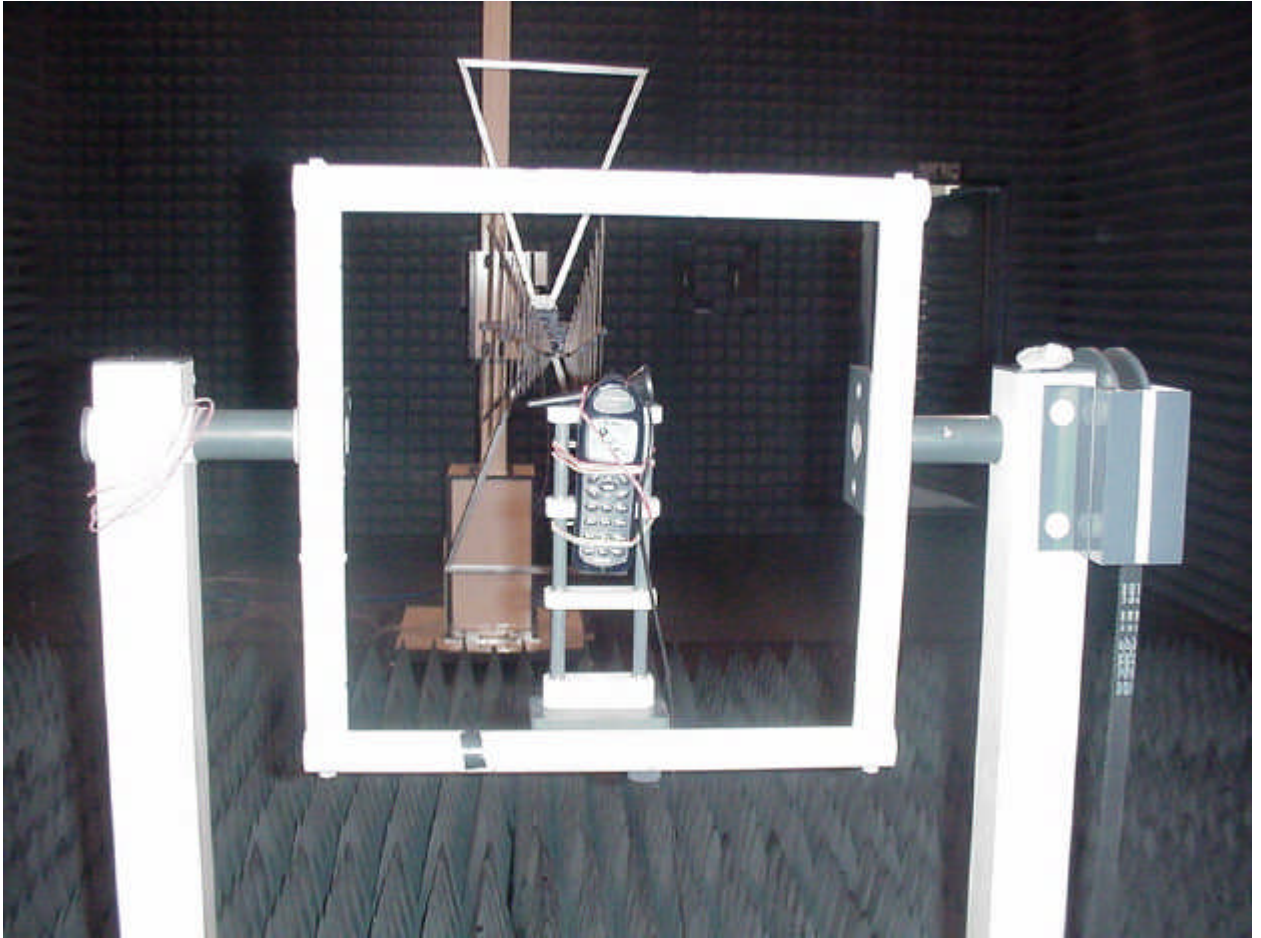


FOTO No. 1: EUT is integrated in the phone