

RADIO TEST REPORT

No. 200672R1

EQUIPMENT UNDER TEST

Equipment: **BLUESPOON**
Type / model: **V 3.0**
Manufacturer: **NEXTLINK.TO A/S**
Tested by request of: **NEXTLINK.TO A/S**

SUMMARY

The equipment complies with the requirements of the following standard:

FCC part 15.247 and 15.249, sub-part C (2001)
FCC part 15, sub-part B (2001)

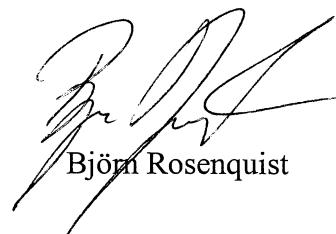
Date of issue: August 27, 2002

Tested by:



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Approved by:



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1. CLIENT INFORMATION

The EUT has been tested by request of

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DENMARK
Name of contact: Jon Hein-Magnussen
Phone : + 45 45 96 20 13
E-mail: jon.magnussen@nextlink.to

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT

Equipment: BLUESPOON
Type/Model: V 3.0
Serial Number -
Brand name: Bluespoon
Manufacturer: NEXTLINK.TO A/S
Rating: 3,6 V DC (2,7 ... 5,5 V DC)
Rating RF output power: Power class 2
Operating temperature range: -10 to +55 °C
Frequency range: 2400 – 2483,5 MHz

2.2 Additional hardware information about the EUT

The EUT consists of the following units:

Unit	Type and version	Serial number
BLUESPOON	V 3.0	-

2.3 Additional software information about the EUT

During the tests the EUT supported the following software:

Software	Version	Comment
BC2_HCISStack 1.1	14.3	Firmware
BlueTest	-	To control the frequencies

2.4 Peripheral equipment

Peripheral equipment is defined as equipment needed for correct operation of the EUT, but not included as a part of the testing and evaluation of the EUT.

Equipment	Manufacturer / Type	Serial number
CASIRA Bluetooth development kit	Cambridge Silicon Radio	3275 15 08 00
AC/DC adapter	AES20US05; 100-240 V, +5 V DC	ZCXV2535
Laptop PC	Hewlett Packard (Omnibook XE3)	TW20602203
USB / Serial adapter	Hewlett Packard	2001/Q4

The EUT was tested using the following cable:

Cable	Type	Length
Serial PC cable	Standard	2,5 m

3. TEST SPECIFICATIONS

3.1 Standards

FCC Subpart C – Intentional Radiators (2001): §15.247 for frequency hopping systems operating in the 2400 – 2483.5 MHz and 5725 – 5850 MHz, §15.249 for operating in the 902-928 MHz, 2400-2483.5 MHz, 5725-5875 MHz and 24.0-24.25 GHz, §15.205 for restricted bands, §15.207 for conducted limits and §15.209 for radiated limits.

3.2 Additions, deviations and exclusions from standards and accreditation

No additions, deviations or exclusions have been made from standards and accreditation.

3.3 Mode of operation during the test

Measurement set-up for the out-of-band spurious emissions test is described in Section 12.3.1. During the other tests the EUT was connected to the spectrum analyzer FSIQ 40 (SEMKO No. 9192) by the EUT cable CSY-SMSM-54-004-MS (SEMKO No. 9252). Spectrum analyzer and the EUT settings are specified in the corresponding sections.

3.4 Operating environment

Temperature: 23 °C
Relative Humidity: 42 %

4. TEST SUMMARY

The results in this report apply only to the sample tested:

	Test	Result	Note
15.249	Fundamental field strength	Pass	
15.247	TX Output Spectrum – 20 dB Bandwidth	Pass	
15.247	Carrier frequency separation	Pass	
15.247	Number of hopping frequencies (channels)	Pass	
15.247	Time of occupancy (dwell time)	Pass	
15.249	Band edge compliance	Pass	
15.247	Peak power density	Pass	
15.249	Out of band spurious emissions, radiated	Pass	

5. FUNDAMENTAL FIELD STRENGTH

5.1 Test protocol

Date of test: June 20, 2002

The EUT was set to the TX mode and hopping off.
Measured at 3.0 m test distance.

Field strength (dB μ V/m)			
$F_{\min} = 2402$ MHz	$F_{\text{mid}} = 2441$ MHz	$F_{\max} = 2480$ MHz	Limit (dB μ V/m)
89.2	88.9	85.7	94.0

Limit according to 15.249.

6. TX OUTPUT SPECTRUM – 20 dB BANDWIDTH

6.1 Test protocol

Date of test: June 23, 2002

The EUT was set to the TX mode and hopping off.

Spectrum analyzer settings:

Span: 1,5 MHz

RBW: 30 kHz

VBW: 30 kHz

Sweep time: 5 ms

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range (kHz)			
	$F_{\min} = 2402$ MHz	$F_{\text{mid}} = 2441$ MHz	$F_{\max} = 2480$ MHz	Limit (kHz)
$V_{\text{nom}} = 4,1$ V	809	839	845	<1000

Measurement plots are given in Appendix I.

7. CARRIER FREQUENCY SEPARATION

7.1 Test protocol

Date of test: June 23, 2002

The EUT was set to the TX mode and hopping on.

Spectrum analyzer settings:

Span: 8 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 20 ms

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range (kHz)			
	$F_{\min} = 2402$ MHz	$F_{\text{mid}} = 2441$ MHz	$F_{\max} = 2480$ MHz	Limit (kHz)
$V_{\text{nom}} = 4,1$ V	994	986	1002	> 845

8. NUMBER OF HOPPING CHANNELS

8.1 Test protocol

Date of test: June 26, 2002

The EUT was set to the TX mode and hopping on.

Spectrum analyzer settings:

Span: 101 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 26 ms

Detector: Peak

Trace: Max Hold

Test conditions	Frequency range	
	No. of channels	Limit (No. of channels)
$V_{\text{nom}} = 4,1 \text{ V}$	79	> 75

Measurement plots are given in Appendix I.

9. BAND EDGE COMPLIANCE

9.1 Test protocol

Date of test: June 23, 2002

The EUT was set to TX mode and hopping off.

Spectrum analyzer settings:

Span: 5-9 MHz

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 5 ms

Detector: Peak

Trace: Max Hold

Test conditions	Band edge compliance		
	$F_{\min} = 2400$ MHz	$F_{\max} = 2483,5$ MHz	Limit (dBc)
Hopping off	-39,0 dBc	-40,0 dBc	< -20

Measurement plots are given in Appendix I.

10. TIME OF OCCUPANCY (DWELL TIME)

10.1 Test protocol

Date of test: June 23, 2002

The EUT was set to the TX mode, channel 1 and hopping on.

Spectrum analyzer settings:

Span: 0 Hz

RBW: 1 MHz

VBW: 1 MHz

Sweep time: 1,05 ms

Detector: Peak

Trace: Clear/Write

Single sweep

Transmit time: $T = 119,9 \mu\text{s}$

RBW: 100 kHz

VBW: 100 kHz

Sweep time: 500 ms

Number of times that channel 1 occurred in 30 s: $n = 50 * 30 / 0,5 = 3000$

Time for channel 1 to be active in 30 s: $S = T * n = 119,9 \mu\text{s} * 3000 = 0,36 \text{ s}$

Limit: < 0,4 s

Measurement plots are given in Appendix I.

11. PEAK POWER DENSITY

11.1 Test protocol

Date of test: August 27, 2002

The EUT was set to the TX mode, hopping on and maximum data rate.

Spectrum analyzer settings:

Span: 1MHz

RBW: 3 kHz

VBW: 10 kHz

Frequency (MHz)	Calculated power density e.i.r.p. (dBm)	Limit (dBm)
2402	-16.7	8
2441	-17.3	8
2480	-20.7	8

Measurement plots are given in Appendix I.

12. RADIATED SPURIOUS EMISSIONS

12.1 Operating environment

Temperature: 23 °C (15 - 35 °C)
Relative Humidity: 42 % (20 - 75 %)

12.2 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
Software:	R&S	ES-K1, V1.60	
<i>Test site: Semi-anechoic shielded chamber, 10 x 20 x 8,5 m (W x L x H)</i>			
Spectrum analyser/ Measurement receiver:	R&S	ESAI	2973/2974
Antenna amplifier:	SEMKO		7992/7993
Antenna, bilog:	Chase	CBL6111B	12474
<i>Test site: Bluetooth anechoic shielded chamber, 3,68 x 6,98 x 2,35 m (W x L x H)</i>			
Signal analyser:	R&S	FSIQ 40	9192
Preamplifier:	HP	8449B	6685
Antenna: Double Ridge Guide Horn:	EMCO	3115	4936
Horn antenna:	EMCO	3160-08	30099
Horn antenna:	EMCO	3160-09	30101

R&S = Rohde & Schwarz

HP = Hewlett Packard

12.3 Measurement set-up

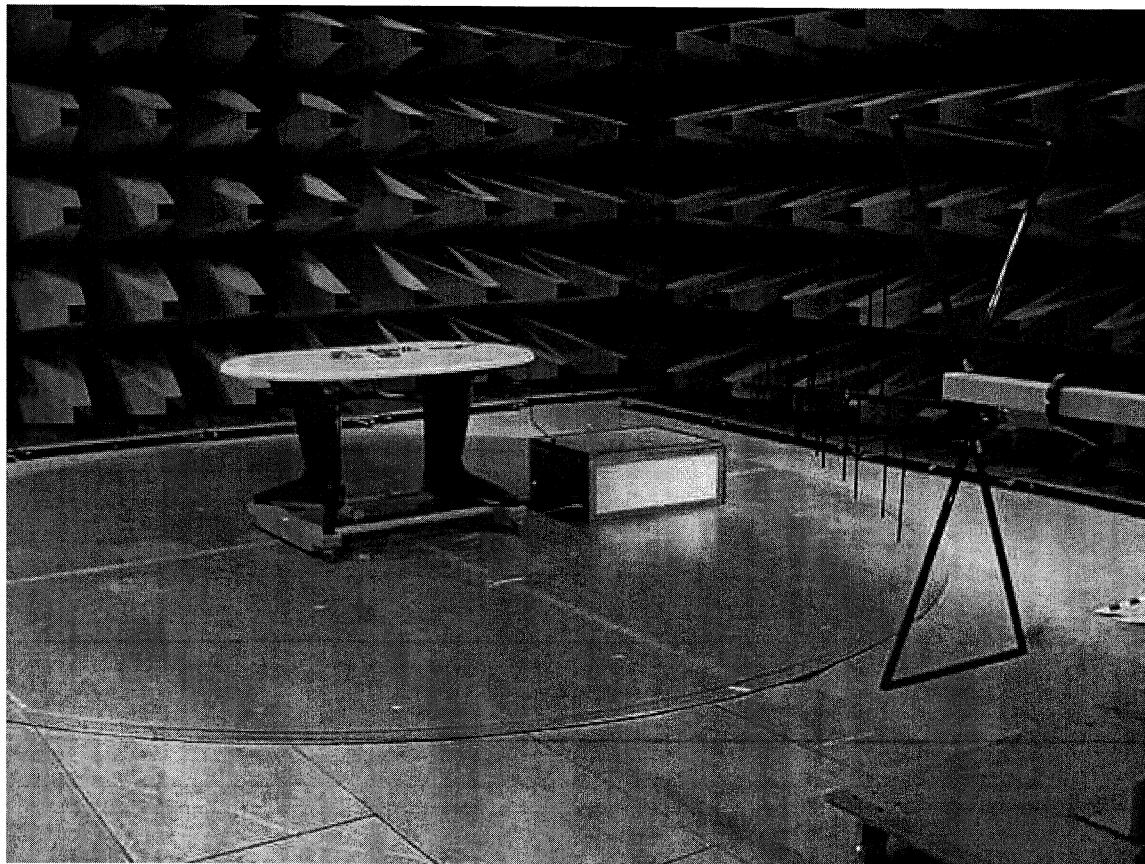
12.3.1 Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

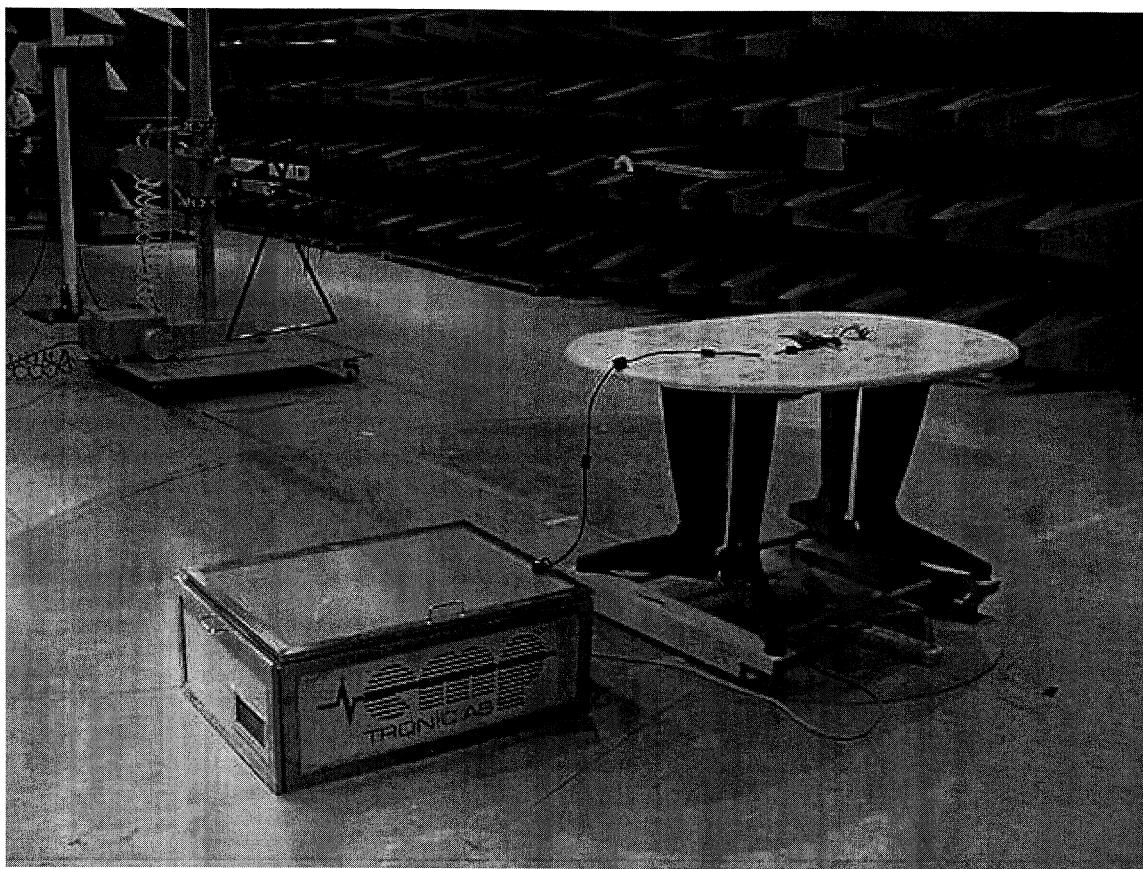
The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photos are given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. The peak overview sweeps are found in section 11.5.

For frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration quasi-peak measurements were carried out.

Test set-up in the semi-anechoic shielded chamber





12.3.2 Test site: Bluetooth anechoic shielded chamber (1-26 GHz)

In the Bluetooth anechoic chamber the EUT was placed on a non-metallic table, 1,4 m above the floor. The radiated disturbance electric field intensity was measured at a distance of 3 m. The specified test mode was enabled.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,4 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps. If necessary, the sweep was repeated with average detection.

The peak overview sweeps are found in section 11.5.