

CENTRO DE TECNOLOGÍA DE LAS COMUNICACIONES, S.A.

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FCC LISTED. REGISTRATION **NUMBER: 905266**

IC LISTED REGISTRATION **NUMBER IC 4621**

TEST REPORT

Report No.: 24407RET.101

TEST NAME: FCC PART 15.247 RADIATED TESTING FOR BLUETOOTH RADIO **DEVICE**

Product

BLUETOOTH ACCESS SERVER

Trade Mark

: BLUEGIGA TECHNOLOGIES INC.

Model/type Ref.

WRAP ACCESS SERVER

Manufacturer

BLUEGIGA TECHNOLOGIES INC.

Requested by

BLUEGIGA TECHNOLOGIES INC.

Other identification of the product:

FCC ID: QOQWRAPAS229X

IC: 5123A-AS229X

Prototype

Standard(s)

: USA FCC Part 15.247, 15.205, 15.209, 15.109, 15.207

CANADA RSS-210

This test report includes 3 annexes and therefore the total number of pages is 39

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Test operator

Revised by: Date: 01.12.0-6 Approved by:

A. Llamas

J. C. Soler Consultant

Date: 01.12.06 A Rodrigo

echnical Director

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Date: 2006-11-30

FDT08_04

Centro de Tecnologia de las Comunicaciones.

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1. COMPETENCE AND GUARANTEES

Centro de Tecnología de las Comunicaciones (AT4 WIRELESS), S.A. is a laboratory with a measurement facility in compliance with the requirements of Section 2.948 of the FCC rules and has been added to the list of facilities whose measurements data will be accepted in conjuction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Registration Number: 905266.

Centro de Tecnología de las Comunicaciones (AT4 WIRELESS), S.A. is a laboratory with a measurement site in compliance with the requirements of RSS 212, Issue 1 (Provisional) and has been added to the list of filed sites of the Canadian Certification and Engineering Bureau. Reference File Number: IC 4621.

In order to assure the traceability to other national and international laboratories, AT4 WIRELESS has a calibration and maintenance programme for its measuring equipment.

AT4 WIRELESS guarantees the reliability of the data presented in this report, which is the result of measurements and tests performed to the item under test on the date and under the conditions stated on the report and is based on the knowledge and technical facilities available at AT4 WIRELESS at the time of execution of the test.

AT4 WIRELESS is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the item under test and the results of the test.

2. GENERAL CONDITIONS

- 1. This report only refers to the item that has undergone the test.
- 2. This report does not constitute or imply by its own an approval of the product by the Certification Bodies or competent Authorities.
- 3. This document is only valid if complete; no partial reproduction can be made without written approval of AT4 WIRELESS.
- 4. This test report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of AT4 WIRELESS and the Accreditation Bodies.

3. CHARACTERISTICS OF THE TEST

3.1 TEST REQUESTED

- 1. Radiated measurements (Transmitter power, Emission limitations for transmitter and radiated emissions limits for receiver) for frequency hopping spread spectrum equipment (Bluetooth) operating in the 2400 MHz -2483.5 MHz band, according to FCC Part 15.247.
- 2. Continuous conducted emission, power leads:

Standard: FCC Rules and Regulations 47 CFR Part 15

Limit: Class B

Method: FCC Rules and Regulations 47 CFR Part 15, Subpart C

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3.2 REQUIREMENTS AND METHOD

1. FCC parts 15.33, 15.35, 15.247, 15.207, 15.205, 15.209, 15.109 and the document DA 00-705: "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems".

The testing was performed according to the procedure in ANSI C63.4: 2003. Radiated testing was performed in AT4 WIRELESS's semi-anechoic chamber. This site has been fully described in a report submitted to the FCC and was accepted in a letter dated July 25, 2002.

2. FCC Rules and Regulations 47 CFR Part 15, Subpart C: Limits and methods of measurements for radio frequency devices. Intentional radiators.

The instrumentation used to perform the testing is listed below:

- 1. Semianechoic Absorber Lined Chamber IR 11. BS.
- 2. Control Chamber IR 12.BC.
- 3. Antenna mast EM 1072 NMT.
- 4. Rotating table EM 1084-4. ON.
- 5. Multi device controller ETS 2090.
- 6. Bilog antenna CHASE CBL6111.
- 7. Antenna tripod EMCO 11968C.
- 8. Double-ridge Guide Horn antenna 1-18 GHz HP 11966E.
- 9. Double-ridge Guide Horn antenna 18-40 GHz Agilent 119665J.
- 10. RF pre-amplifier Miteq AFS5-04001300-15-10P-6.
- 11. RF pre-amplifier Miteq JS4-12002600-30-5A.
- 12 RF pr-eamplifierr Schaffner CPA 9231.
- 13. Spectrum analyzer R&S ESIB 26.
- 14. Spectrum analyzer R&S FSM.
- 15. Transient limiter. HP 11947A.
- 16. Line Impedance Stabilization Network (L.I.S.N.) R&S. ESH2-Z5.

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4. IDENTIFICATION DATA SUPPLIED BY THE APPLICANT

Identification data in this section has been supplied by the client.

4.1 APPLICANT

Name or Company: BLUEGIGA TECHNOLOGIES INC.

V.A.T.: FI 09342381

Address: Sinikalliontie, 11 **City:** Espoo

Postal code: 02631 Country: FINLAND

4.2 REPRESENTATIVE

Name: Mikael Björkas

Samples undergoing test have been selected by: the client.

4.3 IDENTIFICATION OF ITEM/ITEMS TESTED

Product: BLUETOOTH ACCESS SERVER

Trade mark: BLUEGIGA TECHNOLOGIES INC. **Model:** WRAP ACCESS SERVER **Other identification of the product:** FCC ID: QOQWRAPAS229X, IC: 5123A-AS229X

Manufacturer: BLUEGIGA TECHNOLOGIES INC.

Country of manufacture: FINLAND Manufacture site: Data not available.

Description: WRAP Access Server is a cutting edge Bluetooth server supporting up to 21 simultaneous full speed Bluetooth EDR connections and multiple other communication standards included Ethernet, Wi-

Fi and GSM/GPRS.

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5. USAGE OF SAMPLES, PERIOD OF TESTING AND ENVIRONMENTAL CONDITIONS

5.1 USAGE OF SAMPLES

Sample M/01 is formed by the following elements:

Control No.	Description	<u>Model</u>	Serial No.	Date of reception
24407/05	Bluetooth access server	WRAP access server	Prototype	06/06/06
24407/08	AC Adaptor	PSM11R-120	P54901640A1	06/06/06

Sample S/01 is composed of the following elements:

Control No.	<u>Description</u>	<u>Model</u>	Serial No.	Date of reception
24407/09	Bluetooth access server	WRAP access server	Prototype	06/09/06
24407/10	AC Adaptor	PSM11R-120	P54900053A1	06/09/06

During the tests were used next ancillary equipments:

Control No.	<u>Description</u>	<u>Model</u>	<u>Serial No.</u>	Date of reception
	Bluetooth USB dongle TDK			
	Portable PC	ACER TravelMate 4502LCi	LXT510610744408ADFEM01	
	Portable PC	Toshiba PS610E- NGYSC-SP	13123012G	

1. Sample M/01 has undergone following test(s).

All tests indicated in annex A.

2. Sample S/01 has undergone to the following test(s):

Continuous conducted emission, power leads, in Annex B.

5.2 PERIOD OF TESTING

The performed test started on 2006-09-29 and finished on 2006-10-04.

The tests as detailed in this report have been performed at AT4 WIRELESS.

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5.3 ENVIROMENTAL CONDITIONS



In the control chamber the following limits were not exceeded during the test:

Temperature	Min. = 25 °C
	$Max. = 26 ^{\circ}C$
Relative humidity	Min. = 51 %
	Max. = 51 %
Shielding effectiveness	> 100 dB
Electric insulation	$> 10 \text{ k}\Omega$
Reference resistance to earth	< 0,5 Ω

In the semianechoic chamber (21 meters x 11 meters x 8 meters) the following limits were no exceeded during the test.

Temperature	Min. = 25 °C
	$Max. = 25 ^{\circ}C$
Relative humidity	Min. = 53 %
	Max. = 53 %
Air pressure	Min. = 1020 mbar
	Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	$> 10 \text{ k}\Omega$
Reference resistance to earth	< 0,5 Ω
Normal site attenuation (NSA)	< ±4 dB at 10 m distance between item
	under test and receiver antenna, (30
	MHz to 1000 MHz)
Field homogenousity	More than 75% of illuminated surface
	is between 0 and 6 dB (26 MHz to 1000
	MHz).

In the chamber for conducted measurements the following limits were not exceeded during the test

Temperature	Min. = 22 °C
	$Max. = 23 ^{\circ}C$
Relative humidity	Min. = 50 %
·	Max. = 50 %
Air pressure	Min. = 1020 mbar
	Max. = 1020 mbar
Shielding effectiveness	> 100 dB
Electric insulation	$> 10 \text{ k}\Omega$
Reference resistance to earth	$<$ 0,5 Ω

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6. TEST RESULTS

Abbreviations used in the VERDICT column of the following tables are:

P Pass

F Fail

NA not applicable

NM not measured

FCC PART 15 PARAGRAPH		VERDICT		
	NA	P	F	NM
15.247 Subclause (a) (1). 20 dB Bandwidth and Carrier frequency separation				NM^1
15.247 Subclause (a) (1) (iii). Number of hopping channels				NM^1
15.247 Subclause (a) (1) (iii). Time of occupancy (Dwell Time)				NM^1
15.247 Subclause (b). Maximum peak output power		P		
15.247 Subclause (c). Band-edge of conducted emissions (Transmitter)				NM^1
15.247 Subclause (c). Emission limitations conducted (Transmitter)				NM^1
15.247 Subclause (c). Emission limitations radiated (Transmitter)		P		
15.109. Radiated emission limits for receiver		P		
15.207. Conducted limits		P	·	

^{1:} See point 7: "Remarks and comments."

7. REMARKS AND COMMENTS

1: Test not requested (see point 3.1. "Test requested").

8. SUMMARY

Based on the results of the performed test, stated in annex A the item under test is **IN COMPLIANCE** with the specifications listed in section 3.1 "TEST REQUESTED".

NOTE: The results presented in this Test Report apply only to the particular item under test declared in section 4.4 "IDENTIFICATION OF ITEM/ITEMS TESTED" of this document, as presented for test on the date(s) declared in section 5, "USAGE OF SAMPLES, PERIOD OF TESTING AND ENVIRONMENTAL CONDITIONS".

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ANNEX A TEST RESULTS

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TEST CONDITIONS

Power supply (V):

 $V_{nominal} = 230 \text{ Vac}$

Type of power supply = AC Adaptor

Type of antenna = Integral antenna

The test set-up was made in accordance to the general provisions of ANSI C63.4: 2003.

RADIATED MEASUREMENTS

All radiated tests were performed in a semi-anechoic chamber. The measurement antenna is situated at a distance of 3 m for the frequency range 30 MHz-1000 MHz (30 MHz-1000 MHz Bilog antenna) and at a distance of 1m for the frequency range 1 GHz-25 GHz (1 GHz-18 GHz Double ridge horn antenna and 18 GHz-40 GHz horn antenna).

For radiated emissions in the range 1 GHz-25 GHz that is performed at a distance closer than the specified distance, an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

The equipment under test was set up on a non-conductive (wooden) platform one meter above the ground plane and the situation and orientation was varied to find the maximum radiated emission. It was also rotated 360° and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission.

Measurements were made in both horizontal and vertical planes of polarization.

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Section 15.247 Subclause (b). Maximum peak output power (radiated)

SPECIFICATION

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1 watt (30 dBm).

RESULTS

MAXIMUM PEAK OUTPUT POWER (RADIATED).

	Lowest frequency	Middle frequency	Highest frequency
	2402 MHz	2441 MHz	2480 MHz
Correction Factor (dB)	35.0	35.1	35.2
Maximum EIRP peak power (dBm)	12.43	12.12	11.60
Measurement uncertainty (dB)		+1.98 / -1.75	

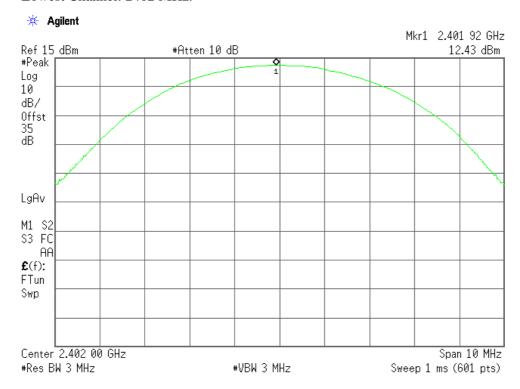
Verdict: PASS

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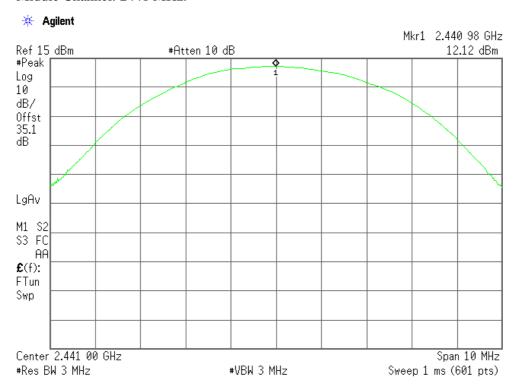
PEAK OUTPUT POWER (RADIATED).

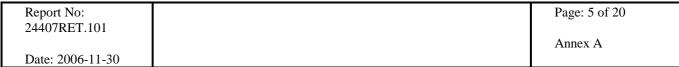
Lowest Channel: 2402 MHz.



PEAK OUTPUT POWER (RADIATED).

Middle Channel: 2441 MHz.

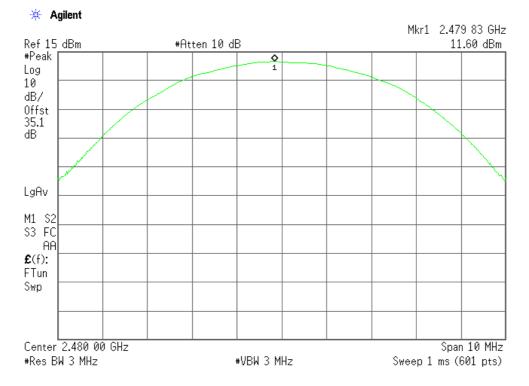






PEAK OUTPUT POWER (RADIATED).

Highest Channel: 2480 MHz.



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Section 15.247 Subclause (c). Emission limitations radiated (Transmitter)

SPECIFICATION

Radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)):

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and preamplifiers gain.

The equipment transmits continuously in the selected channel so it is not necessary a duty cycle correction factor.

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Frequency range 30 MHz-1000 MHz.

Note: The spurious emissions below 1 GHz do not depend on the operating channel selected in the EUT.

Spurious levels operating (radiated) closest to limit.

Spurious levels operating (radiated) closest to mint.					
Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)	
37.7755	V	Quasi-peak	35.49	±3.8	
78.5972	V	Quasi-peak	31.15	±3.8	
348.7976	Н	Quasi-peak	26.59	±3.8	
358.5170	V	Quasi-peak	26.61	±3.8	
418.7776	Н	Quasi-peak	32.78	±3.8	
550.9619	Н	Quasi-peak	33.25	±3.8	
599.5590	Н	Quasi-peak	31.18	±3.8	
751.1824	Н	Quasi-peak	32.60	±3.8	

Frequency range 1 GHz-25 GHz

1. CHANNEL: LOWEST (2402 MHz).

Spurious levels (radiated).

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
4804.236	V	Peak	44.21	± 4.0
4804.236	V	Average	39.42	± 4.0

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

2. CHANNEL: MIDDLE (2441 MHz).

No spurious signals were found in all the range.

Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz, and at the harmonic frequencies.

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3. CHANNEL: HIGHEST (2480 MHz). No spurious signals were found in all the range.

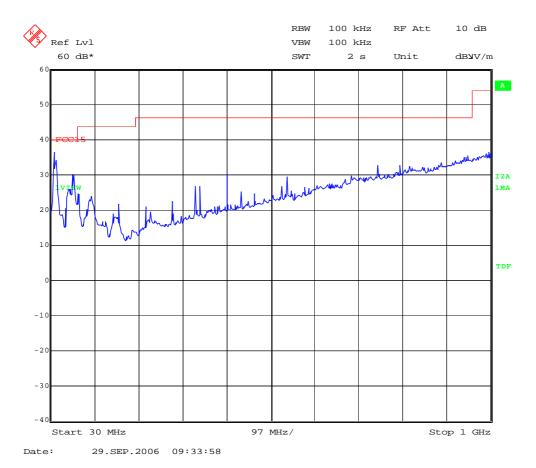
Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz, and at the harmonic frequencies.

Verdict: PASS

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FREQUENCY RANGE 30 MHz-1000 MHz.



(This plot is valid for all three channels).

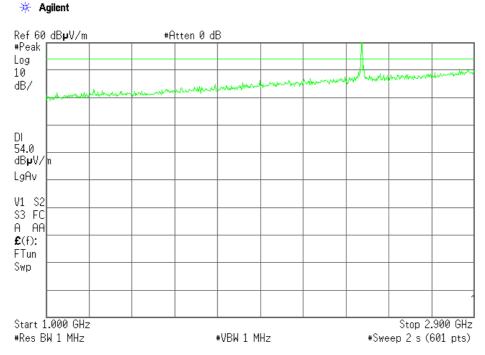
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FREQUENCY RANGE 1 GHz to 2.9 GHz.

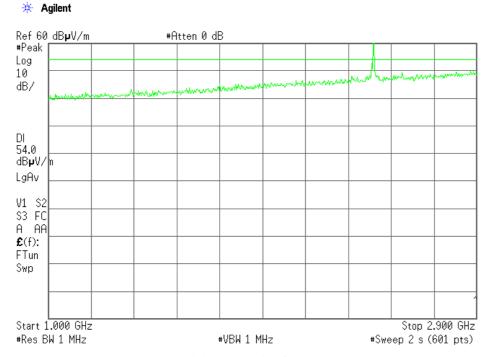
CHANNEL: Lowest (2402 MHz).





Note: The peak above the limit is the carrier frequency.

CHANNEL: Middle (2441 MHz).

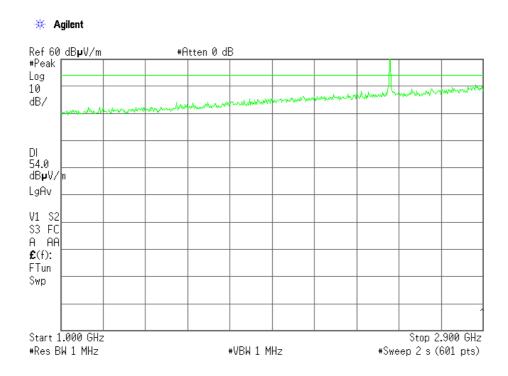


Note: The peak above the limit is the carrier frequency.

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CHANNEL: Highest (2480 MHz).



Note: The peak above the limit is the carrier frequency.

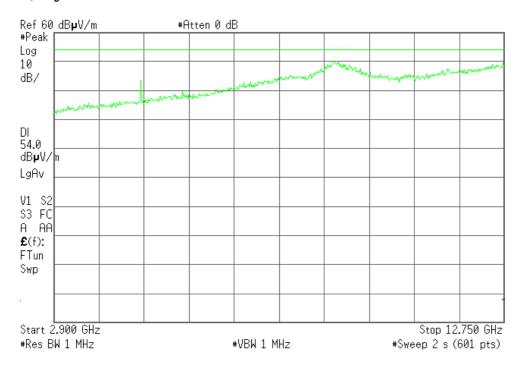
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FREQUENCY RANGE 2.9 GHz to 12.75 GHz.

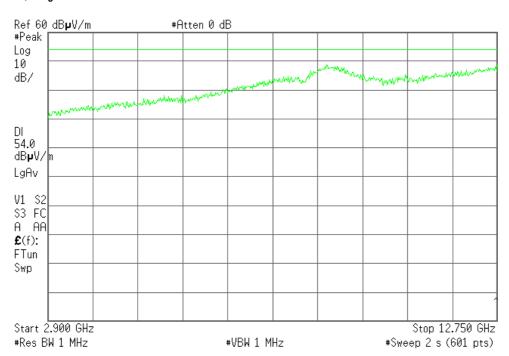
CHANNEL: Lowest (2402 MHz).

🔅 Agilent



CHANNEL: Middle (2441 MHz).

🔅 Agilent

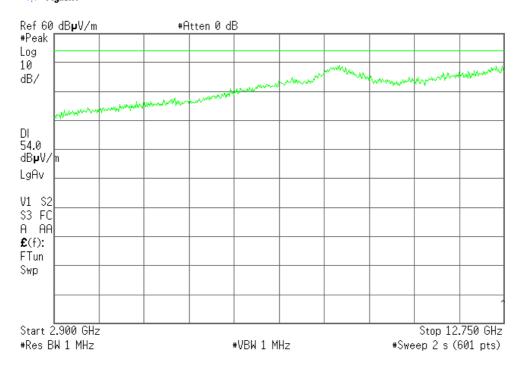


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CHANNEL: Highest (2480 MHz).

🔅 Agilent

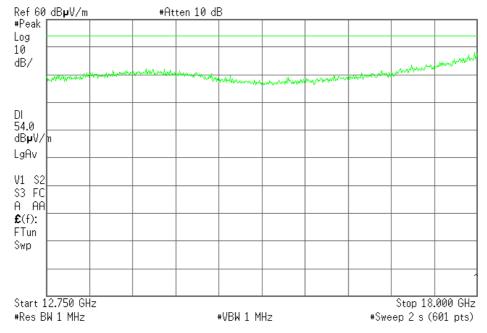


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FREQUENCY RANGE 12.75 GHz to 18 GHz.

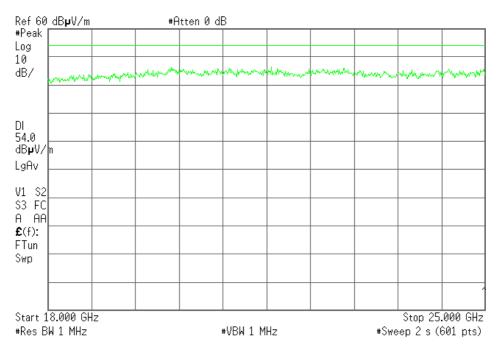




(This plot is valid for all three channels).

FREQUENCY RANGE 18 GHz to 25 GHz.

* Agilent



(This plot is valid for all three channels).

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Section 15.109. Receiver spurious radiation

SPECIFICATION

The field strength shall not exceed the following values:

Frequency Range (MHz)	Field strength (µV/m)	Field strength (dBµV/m)	Measurement distance (m)
0.009-0.490	2400/F(kHz)	-	300
0.490-1.705	24000/F(kHz)	-	300
1.705 - 30.0	30	-	30
30 - 88	100	40	3
88 - 216	150	43.5	3
216 - 960	200	46	3
960 - 25000	500	54	3

The emission limits shown in the above table are based on measurements employing CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.

For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

RESULTS:

The field strength is calculated by adding correction factor to the measured level from the spectrum analyser. This correction factor includes antenna factor, cable loss and preamplifiers gain.

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It is not possible to select individual receiving channels in the equipment under test. The equipment under test is set in a mode with the receiver open and scanning through receiving channels.

Frequency range 30 MHz-1000 MHz.

Spurious levels (radiated) closest to limit.

Spurious frequency (MHz)	Polarization	Detector	Emission Level (dBµV/m)	Measurement Uncertainty (dB)
37.7755	V	Quasi-peak	32.28	±3.8
348.7976	Н	Quasi-peak	26.67	±3.8
418.7776	Н	Quasi-peak	33.03	±3.8
550.9619	Н	Quasi-peak	34.04	±3.8
599.5590	Н	Quasi-peak	32.07	±3.8
650.1002	Н	Quasi-peak	31.67	±3.8
751.1824	Н	Quasi-peak	34.74	±3.8

Frequency range 1 GHz-25 GHz.

No spurious signals found.

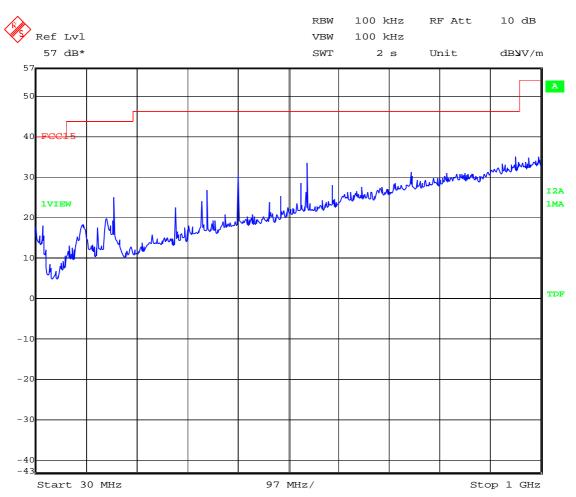
Additionally, no spurious signals were found inside the restricted bands 2310-2390 MHz and 2483.5-2500 MHz.

Verdict: PASS

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FREQUENCY RANGE 30 MHz-1000 MHz.



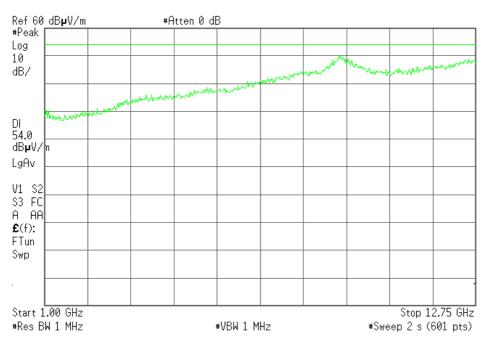
Date: 19.SEP.2006 08:28:12

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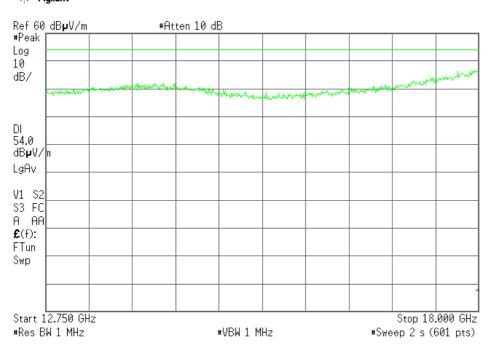
FREQUENCY RANGE 1 GHz-12.75 GHz.





FREQUENCY RANGE 12.75 GHz-18 GHz.

💥 Agilent

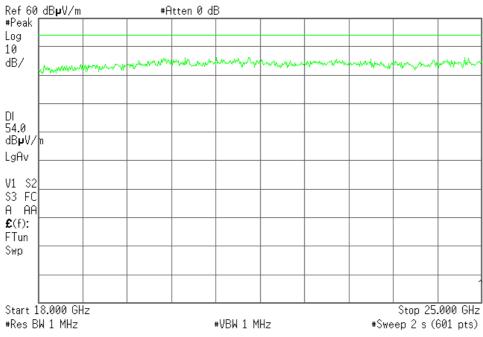


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FREQUENCY RANGE 18 GHz-25 GHz.





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ANNEX B MEASURING RESULTS FOR ELECTROMAGNETIC EMISSION

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For the sample under test, named S/01, and that was formed by the elements described in the clause "Identification of the tested item/items" of this test report.

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1. - CONTINUOUS CONDUCTED EMISSION, POWER LEADS ON THE SAMPLE S/01

LIMITS OF INTERFERENCE

The applied limit for continuous conducted emissions in power leads, according with the requirements of FCC Rules and Regulations 47 CFR Part 15, Subpart B in the frequency range 0,15 to 30 MHz, for Class B equipment was:

Frequency range	Limit (dBµV)		
(MHz)	Quasi-peak	Average	
0,15 to 0,5	66-56	56-46	
0,5 to 5	56	46	
5 to 30	60	50	

TEST METHOD

According to Part 15, Subpart B of FCC Rules.

OPERATING MODES OF EUT

Different tested operating modes (OM)

- OM#02: EUT ON. Normal mode. Linked bluetooth.

TEST RESULTS

CCmmnnxx: CC, Conduction condition; mm: sample number; nn: operation mode; xx: wire.

- OM#02.

CDmmnnxx	Description	Result
CC03020N	Interference voltage on Neutral wire	PASS
CC0302L1	Interference voltage on phase wire	PASS

2. - GRAPH RESULTS

See next pages.

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Continuous conducted emission: CC03020N (Peak and Average)

EMC32 Report

Test Information

Proyecto: 24407Biem.001

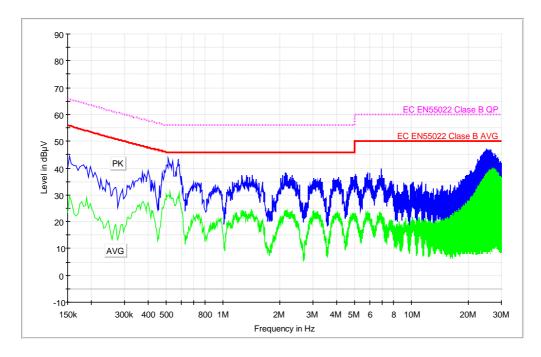
Empresa: BLUEGIGA TECHNOLOGIES

Muestra: M/03 Modo operacion: MO#02

Fecha: 2006-10-04 15:10 Setup: EMI conducted

Mode: EBP ON. Modo Comunicacion. Ruido en el Neutro.

EC EMI 55022 Clase B ESIB26 CC



Max PK-AVG

Frequency (MHz)	MaxPeak- MaxHold (dBµV)	Average- MaxHold (dBµV)	Comment
24.334000	46.2	37.0	
24.762000	46.4	37.6	
25.066000	47.3	38.2	
25.190000	46.8	37.8	
25.250000	46.1	37.7	
25.310000	46.6	38.5	
25.370000	46.8	37.6	
25.434000	46.5	38.3	
25.494000	46.5	38.8	
25.798000	46.5	38.0	
25.922000	46.6	39.6	
26.226000	46.8	39.4	
26.350000	46.8	39.5	
26.410000	46.5	38.7	

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Continuous conducted emission: CC0302L1 (Peak and Average)

EMC32 Report

Test Information

Proyecto: 24407Biem.001

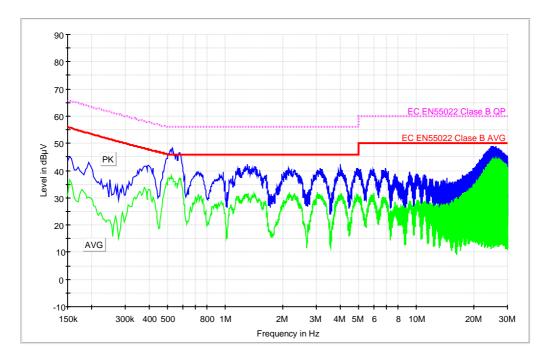
Empresa: BLUEGIGA TECHNOLOGIES

Muestra: M/03 Modo operacion: MO#02

Fecha: 2006-10-04 15:15 Setup: EMI conducted

Mode: EBP ON. Modo Comunicacion. Ruido en Fase.

EC EMI 55022 Clase B ESIB26 CC



Max PK-AVG

Frequency (MHz)	MaxPeak- MaxHold (dBµV)	Average- MaxHold (dBµV)	Comment
24.578000	49.0	43.1	
24.822000	48.9	44.3	
25.006000	49.1	44.0	
25.066000	48.6	44.2	
25.250000	49.2	44.8	
25.310000	48.9	44.1	
25.434000	48.5	43.7	
25.494000	48.5	43.9	
25.554000	48.6	44.3	
25.738000	48.5	43.9	
25.982000	48.6	44.5	
26.166000	48.9	45.0	
26.226000	48.4	44.1	
26.350000	48.4	44.0	

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ANNEX C

PHOTOGRAPHS

(Number of photographs: 5)

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FET18_00.DOC



1. Equipment (front view)



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FET18_00.DOC

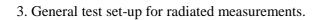


2. Equipment (back view).

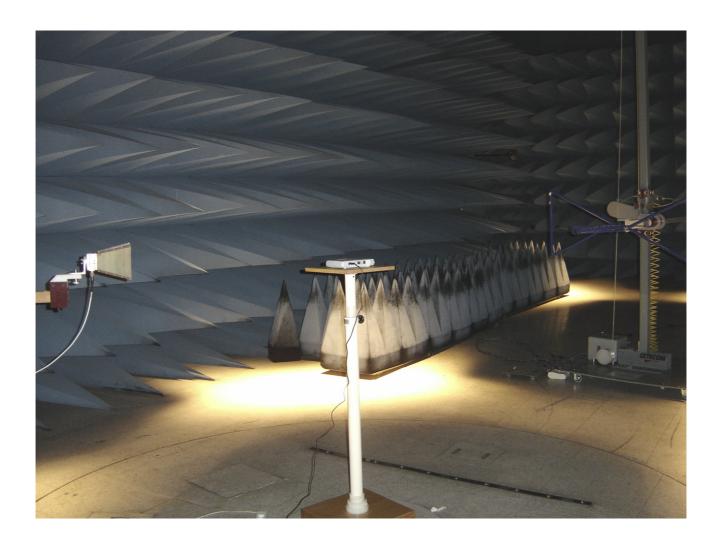


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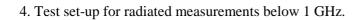
FET18_00.DOC



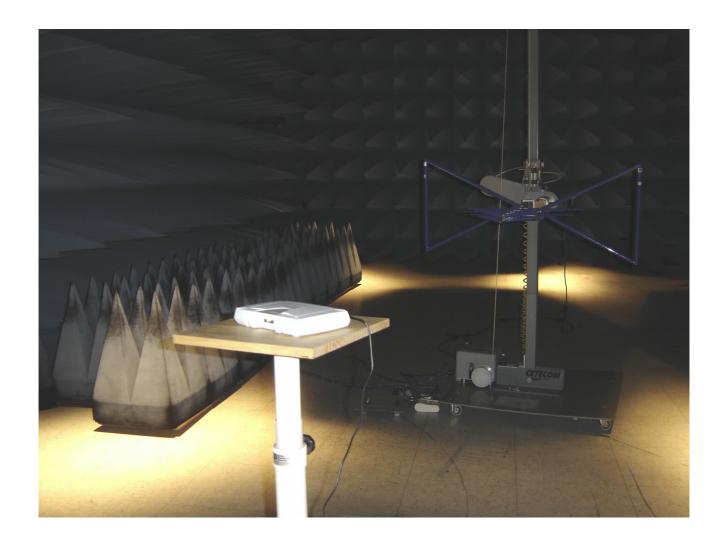




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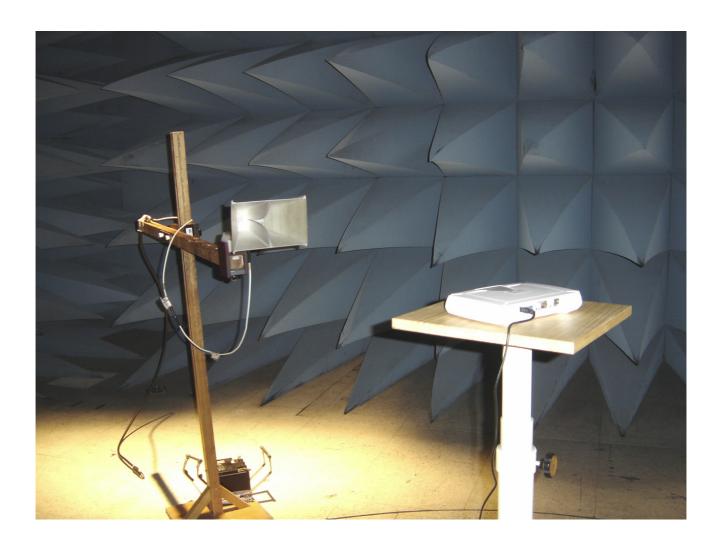






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