


REPORT: FCC / IC Radio Frequency (RF) test report

PRODUCT:

Test item description:	Team2 Base Station
Trade Mark:	Polar
Model/Type reference:	Team2 Base Station Pro
Serial number:	F836N80400003
Customer:	Polar Electro Oy Professorintie 5 90440 Kemple FINLAND
Contact person:	Kari Parkkisenniemi
Manufacturer:	Polar Electro Oy Professorintie 5 90440 Kempele FINLAND

DATE: 19.2.2009

TESTED BY: 
Simo Ojanen ; Test engineer

APPROVED BY: 
Tuomo Hahl ; Test engineer

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1 LABORATORY INFORMATION

Test Laboratory	Intertek ETL Semko OY EMC Laboratory Koneenkatu 12 / K17 05830 Hyvinkää FINLAND Tel: +358 10 424 6200 Fax: +358 10 424 6201 e-mail: firstname.surname@intertek.com
FCC registration number: IC file number:	910391 (January 27, 2003) IC 2042C-1 (May 14, 2003)

2 SUMMARY OF TEST RESULTS

Transmitter measurements

Section in CFR 47	Section in RSS-210	Test	Result
15.247, a 1	A8.1 (2)	Carrier frequency separation	-
15.247, a 1 iii	A8.1 (4)	Number of hopping frequencies	-
15.247, a 1 iii	A8.1 (4)	Time of occupancy	-
15.247, a	A8.1 (1)	20dB bandwidth	-
15.247, b 1	A8.4 (2)	Peak output power	-
15.247, d	A8.5	Band-edge compliance of RF emissions	-
15.247, d	A8.5	Spurious RF conducted emissions	-
15.247, d	A8.5	Spurious radiated emissions	PASS
	RSS-GEN 4.4.1	99% bandwidth	-
15.207	RSS-GEN 7.2.2	Conducted emissions to AC-power lines	PASS

PASS Pass
 FAIL Fail
 X Measured, but there is no applicable performance criteria
 - Not done

3 EUT INFORMATION

The EUT and accessories used in the tests are listed below. Later in this report only EUT numbers are used as reference.

	Device	Type	S/N	EUT number
EUT	Team2 Base Station Pro	Base Station	F836N80400003	13501
Accessories	Switching power Adapter	PSC30R-180-R	Rev01, Date 2007/12/10, Engineering sample	13502

Notes:

3.1 EUT description

The EUT is a part of Team2 system. The EUT is a stand alone unit which is used to measure heart rate and send the data with two different wireless technologies. EUT uses Bluetooth-technology to connect Heart monitor and WLAN-technology to connect to computer.

EUT uses frequency range of 2400 – 2483,5 MHz

EUT contains 4 pcs certified WT11 Bluetooth module. FCC ID: QOQWT11 and one certified WL1100C-CF WLAN module FCC ID: NI3-IS20V35

The EUT was not modified during the tests.

4 EUT TEST SETUPS

For each test the EUT was exercised to find out the worst case of operation modes and device configuration.

The test setup photographs are in the document referenced in last section.

5 APPLICABLE STANDARDS

The tests were performed in guidance of:

CFR 47 Part:

§15.107
§15.109
§15.209
§15.247
ANSI C63.4 (2003)

IC standard:

RSS-GEN, Issue 1
RSS-210, Issue 7
CISPR 22, 2002

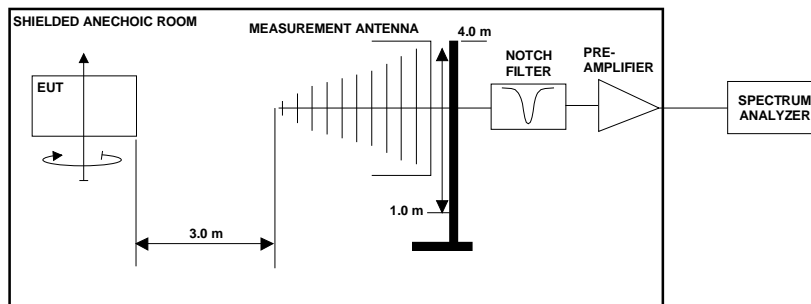
Deviations, modifications or clarifications (if any) to above mentioned documents are written in each section under "Test method" for each test case.

6 RADIATED SPURIOUS EMISSIONS

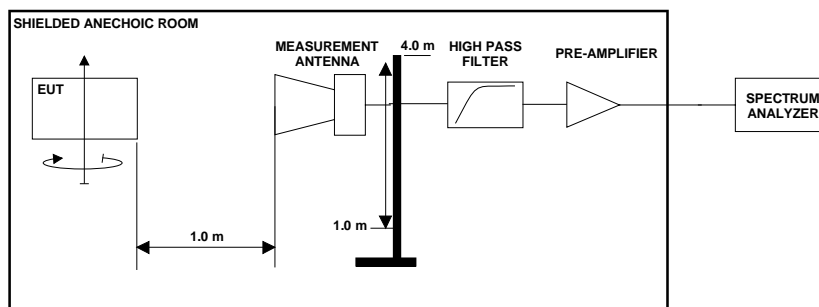
EUT	13501		
Accessories	13502		
Temp, Humidity, Air Pressure	20 °C	12 %RH	1007 hPa
Date of measurement	February 16 – February 17, 2009		
FCC rule part	15.247, d		
RSS-210 section	A8.5		
Measured by	Simo Ojanen		

6.1 Test setup

The test was done using an automated test system, where a computer controlled the measurement equipment.



Picture 1: Test setup for radiated spurious emissions measurement
30 MHz - 3 GHz frequencies



Picture 2: Test setup for radiated spurious emissions measurement
3 GHz – 26 GHz frequencies

6.2 Test method

1. The emissions were searched and maximized by moving the turntable, changing the measuring antenna polarization and height and manipulating the EUT.
2. Levels of suspicious signals and levels of EUT transmitter harmonics were recorded.
3. The recorded levels were corrected in the automated test system with the measurement antenna factor, cable attenuations and filter attenuation.
4. The corrected values, giving the EUT radiated spurious emission levels as dB μ V/m at 3 m distance, are reported.

6.3 EUT operation mode

BT

EUT operation mode	Continuous transmission
EUT channel	0 ,39 and 78
EUT TX power level	14 dBm

WLAN

EUT operation mode	Continuous transmission
EUT channel	1, 6 and 11
EUT TX power level	13 dBm

6.4 Limit

Table 1: Radiated spurious emission limits at measurement distance 3m

Frequency band (MHz)	3m Limit (μV/m)	3m Limit (dBμV/m)	Detector
30 – 88	100	40	QP
88 -216	150	43,5	QP
216 - 960	200	46	QP
960 - 1000	500	54,0	QP
1000 - 25000	500	54,0	AVG
1000 - 25000	5000	74,0	PEAK

As default, all emissions were compared against the general limits. If any emission exceeded that limit, it was further checked, if it was outside the restricted band thus complying with the -20dBc requirement.

6.5 Results

Measurement system noise level was at least 15 dB below the spurious emission limit. Only levels of suspicious signals and transmitter harmonic frequencies, which were above the measurement system noise, are reported.

Table 2: Emission levels PEAK (QP) detector, BT channel 0, WLAN channel 1

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
500,0	39,23	-2,08	37,2	-8,8	Pos 1	Hor	1,8
599,0	27,27	-0,29	27,0	-19,0	Pos 1	Ver	1,0
778,6	28,85	2,64	31,5	-14,5	Pos 1	Hor	1,0
838,7	23,51	3,60	27,1	-18,8	Pos 1	Hor	1,9
4804	88,32	-15,89	72,4	-1,5	Pos 1	Ver	1,0
7206	60,60	-5,82	54,7	-19,2	Pos 1	Ver	1,2
9608	57,83	-5,74	52,0	-21,9	Pos 1	Ver	1,5
12010	60,13	0,43	60,5	-13,4	Pos 1	Ver	1,2

Table 3: Emission levels PEAK (QP) detector, BT channel 39, WLAN channel 6

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
500,0	35,32	-2,08	33,2	-12,7	Pos 1	Hor	1,7
599,2	26,65	-0,29	26,3	-19,6	Pos 1	Hor	1,3
778,7	24,73	2,64	27,3	-18,6	Pos 1	Hor	1,0
4882	83,26	-15,68	67,5	-6,4	Pos 1	Ver	1,2
5695,5	58,47	-14,92	43,5	-30,4	Pos 1	Ver	1,0
7323	57,51	-5,60	51,9	-22,0	Pos 1	Ver	1,1
9764	52,93	-5,48	47,4	-26,5	Pos 1	Hor	1,1
12205	53,03	0,30	53,3	-20,6	Pos 1	Ver	1,1

Table 4: Emission levels PEAK (QP) detector, BT channel 78, WLAN channel 11

Freq MHz	Measured Value dBuV	Correction Factor dB	Result dBuV/m	Marginal dB	EUT Position	Ant Pol.	Ant height
500,0	35,58	-2,08	33,5	-12,5	Pos 1	Hor	1,6
718,9	27,05	1,46	28,5	-17,4	Pos 1	Ver	1,6
4960	84,76	-15,47	69,2	-4,71	Pos 1	Ver	1,1
5786,5	59,59	-14,42	45,1	-28,8	Pos 1	Ver	1,1
7440	58,60	-5,10	53,5	-20,5	Pos 1	Ver	1,1
9920	51,25	-5,01	46,2	-27,7	Pos 1	Hor	1,0
12400	51,56	-0,21	51,3	-22,6	Pos 1	Ver	1,0

Since the measurements are made with sample that is modified to continuous transmission, average results are calculated from peak results using duty cycle.

$$\text{Average level} \leq \text{Peak level} - 20 \log (\text{duty cycle}).$$

The peak levels that are above AV limit are produced by Bluetooth transmitters. According to test report of certified WT11 Bluetooth module (FCC ID: QQQWT11) the burst time is 2,925 ms and the transmitter is ON 347,3ms in 31,6s period time.

Therefore,

$$\text{Average level} \leq \text{Peak level} - 20 \log ((100 \text{ ms} - 2,925\text{ms}) / 2,925\text{ms})$$

$$\text{Average level} \leq \text{Peak level} - \mathbf{30,4 \text{ dB}}$$

7 CONDUCTED EMISSIONS TO AC-MAINS

EUT	13501		
Accessories	13502		
Temp, Humidity, Air Pressure	20 °C	13 %RH	1010 hPa
Date of measurement	February 17, 2009		
FCC rule part	§15.207		
RSS-GEN section	7.2.2		
ICES-003 section	5.3		
Measured by	Simo Ojanen		

7.1 Test setup

Switching power Adapter was connected to line impedance stabilization network and conducted emissions to AC-mains were measured using measurement receiver.

7.2 EUT operation mode

EUT was transmitting at WLAN ch 6 and BT ch 39.

7.3 Limits

Frequency of emission [MHz]	FCC / IC	
	Limit [dBµV] Quasi peak	Limit [dBµV] Average
0,15 – 0,50	66 – 56*	56 – 46*
0,50 – 5	56	46
5 – 30	60	50

* The limit decreases linearly with the logarithm of the frequency

7.4 Results

The measured interference values using peak and average detectors are shown in the pictures below. All signals closer than 6 dB to the limit have been measured using quasi peak and average detectors and reported in next tables.

Table 5: Quasi peak detector measurement results, AC live

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
N/A			

Table 6: Average detector measurement results, AC live

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
N/A			

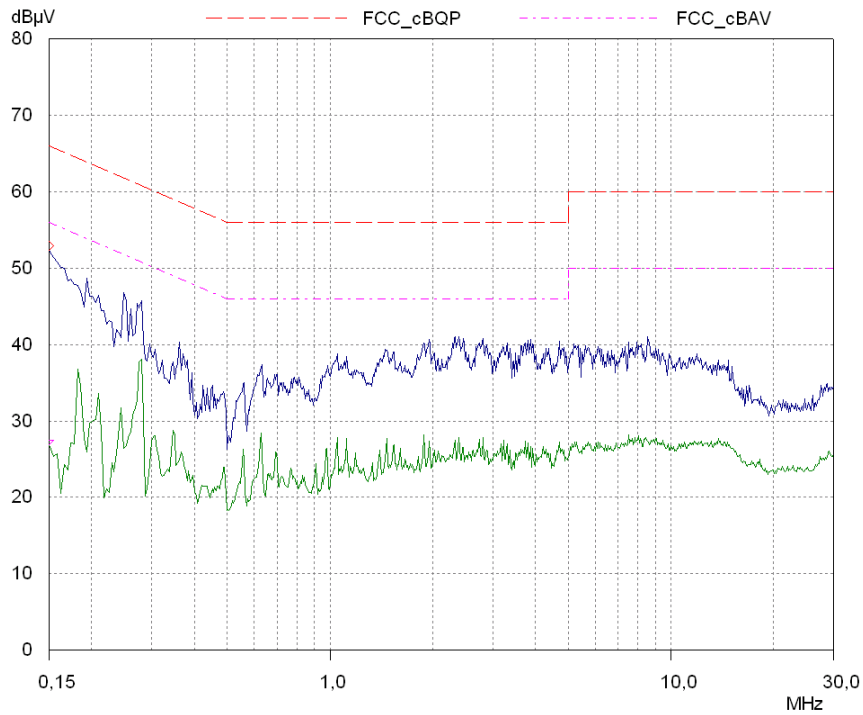
Table 7: Quasi peak detector measurement results, AC neutral

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
N/A			

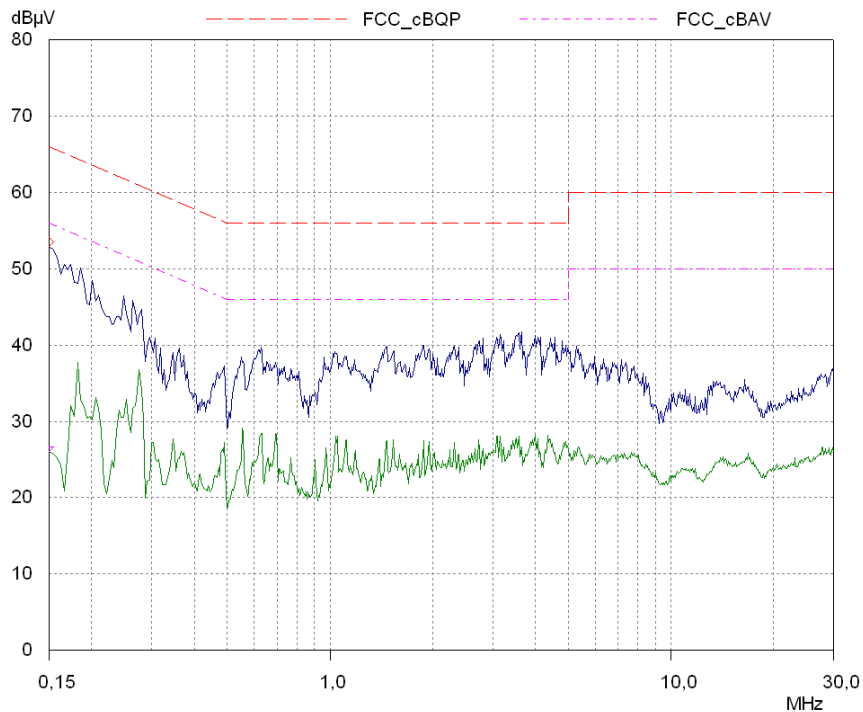
Table 8: Average detector measurement results, AC neutral

Frequency [MHz]	Measured value [dB μ V]	Limit [dB μ V]	Margin to limit [dB]
N/A			

7.5 Screen shots



Picture 3: AC-mains conducted emission measurement results, AC live



Picture 4: AC-mains conducted emission measurement results, AC neutral

8 TEST EQUIPMENT

All testing and measurement equipment has been calibrated once a year, except the antennas which are calibrated every two years.

8.1 Conducted measurements

Equipment	Manufacturer	Model
Measurement receiver	Rohde & Schwarz	ESCS 30
Transient limiter / 10 dB attenuator	Chase	CFL 9206
Line Impedance Stabilization Network (LISN)	Rohde & Schwarz	ESH 3-Z5

8.2 Radiated measurements

Equipment	Manufacturer	Model
Spectrum Analyzer	Agilent	E7405A
Antenna	Chase	CBL 6141
Antenna	Schwarzbeck	BBHA 9120D
Antenna	Schwarzbeck	BBHA 9170
Band reject filter	Wainwright Instruments	WRCT2400/2483
High pass filter	Wainwright Instruments	WHK3.0/18GST
Pre-amplifier	Agilent	87405B
Pre-amplifier	JCA	118-400
Pre-amplifier	Miteq	AMF-6F-18002650-25-10P
Turn table / antenna mast controller	EMCO	2090
Antenna mast	EMCO	2075-2

9 TEST SETUP PHOTOGRAPHS

Test setup photograph can be found in a separate document

T09-135A-RF_PHOTOS.doc