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Equipment Authorization measurements on 902.4 MHz Transceiver unit with digital modulation and no FHSS with FCC ID: WUP-BEST-7611

(6 appendices)

Test object

Proactive Receiver Best-7611 "No:2".

The test object is a portable unit powered by a battery.

Summary

See appendix 1 for general information and appendix 6 for photo.
Emission measurements as specified below have been performed.

Standard	Compliant	Appendix	Remarks
FCC 47 CFR Part 15 C (07-10-08)			
§15.249 Operation within the band 902 - 928 MHz	Yes		
§15.249 (a) Field strength of fundamental	Yes	2	
§15.249 (d) Band edge	Yes	3	
§15.249 (d, e) Emission outside the frequency band	Yes	4	
§15.215 (c) 20 dB bandwidth	Yes	5	

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FCC ID: WUP-BEST-7611

Appendix 1

Performance test and requirements

The tests were performed to verify that the electromagnetic compatibility of the test object meets the requirements of FCC 47 CFR part 15 C.

Test facility

The used test site (SP 504 114) is compliant with the requirements of section 2.948 of the FCC rules and listed, registration number 96866, as a facility accepted for certification under parts 15 and 18. The site complies with RSS-Gen, Issue 2 and is accepted by Industry Canada for the performance of radiated measurements, file no: IC 3482A-2.

Test object

Transceiver:	Proactive Receiver Best-9616
Antenna	Integral
Frequency band:	902-928 MHz
Frequency range:	902.4 MHz (one frequency)
Frequency used during test:	902.4 MHz
Modulation:	Gaussian Frequency Shift Keying (GFSK)
Duty cycle:	4/40 ms
Supply voltage:	Internal battery

Operational test mode

The tests were performed with the integral antenna, continuous transmission with the highest possible duty cycle and with modulation activated at maximum output power. All measurements were performed with a new battery.

Uncertainties

Measurement and test instrument uncertainties are described in the quality assurance documentation "EL-QD 8.3".

Reservation

The test results in this report apply only to the particular test object as declared in the report.

Delivery of test object

The client delivered the test object at the date of the test.

Test engineer

Stefan Larsson and Jonas Bremholt

Maximum radiated output power measurements according to FCC 47 CFR part 15.249 (a)

Date 2008-10-17	Temperature 22 °C ± 3 °C	Humidity 38 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4-2003.

The test was performed with the integral antenna, continuous transmission with the highest possible duty cycle and with modulation activated at maximum output power.

The maximum output power was measured with the test object positioned in three orthogonal directions (X, Y and Z).

The radiated maximum radiated output power measurements were performed in the semi-anechoic chamber.

The fundamental was scanned with PEAK-detector with the antenna height 1-4 m and the turntable was varied between 0-360 degrees for maximum response. The output power was then measured with the Quasi-Peak detector activated. The antenna distance during the measurements was 3.0 m

Test set-up during the test can be found in appendix 6.

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Edison	2009-04	504 114
Spectrum analyzer R&S ESI 26	2009-07	503 885
Antenna Schaffner CBL 6143	2010-03	504 079
Control computer, Fujitsu Siemens	-	-
Software: R&S EMC32, ver. 6.10.10	-	503 745
Temperature and humidity meter Testo 625	2009-08	504 117

Measurement uncertainty: 5.1 dB

**Results**

	Max output power Quasi-Peak
	902.4 MHz
Antenna height	1.00 m
Azimuth	130 deg
Polarization	Horizontal
RBW	120 kHz
Maximum Output power	75.4 dBuV

Note: The orthogonal direction X was found to be the position for the highest output power.

Limits

47CFR 15.249(a), The field strength of fundamental emissions from intentional radiators operated in the frequency band 902 to 928 MHz shall not exceed 50 mV/m (94 dBuV/m).

Complies?	Yes
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Band edge measurements according to 47CFR 15.249 (d)

Date 2008-10-17	Temperature 22 °C ± 3 °C	Humidity 26 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4-2003 and the Marker-delta method.

The test was performed with the integral antenna, continuous transmission with the highest possible duty cycle and with modulation activated at maximum output power.

The radiated measurements were performed in a semi anechoic chamber. The measurements were performed with the antenna at the position and polarization and the turntable with the highest level of the fundamental The antenna distance was 3.0 m.

Test set-up during the test can be found in appendix 6.

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Edison	2009-04	504 114
Spectrum analyzer R&S ESI 26	2009-07	503 885
Antenna Schaffner CBL 6143	2010-03	504 079
Control computer, Fujitsu Siemens	-	-
Software: R&S EMC32, ver. 6.10.10	-	503 745
Temperature and humidity meter Testo 625	2009-08	504 117

Measurement uncertainty: 5.1 dB

Results

The diagram can be found in the appendix 3.1.

Diagram 1 902.4 MHz Marker-delta method, step 1:
Peak level at fundamental =75.6 dBμV/m

Step 2:
Delta between fundamental and 902 MHz = 42.4 dB.

Step 3:
Decrease the measured peak level in step 1: 75.6-42.4 =
33.2 dBμV/m @ 902 MHz

Limits

47CFR 15.249(d)

Emissions radiated outside the specified frequency band , except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

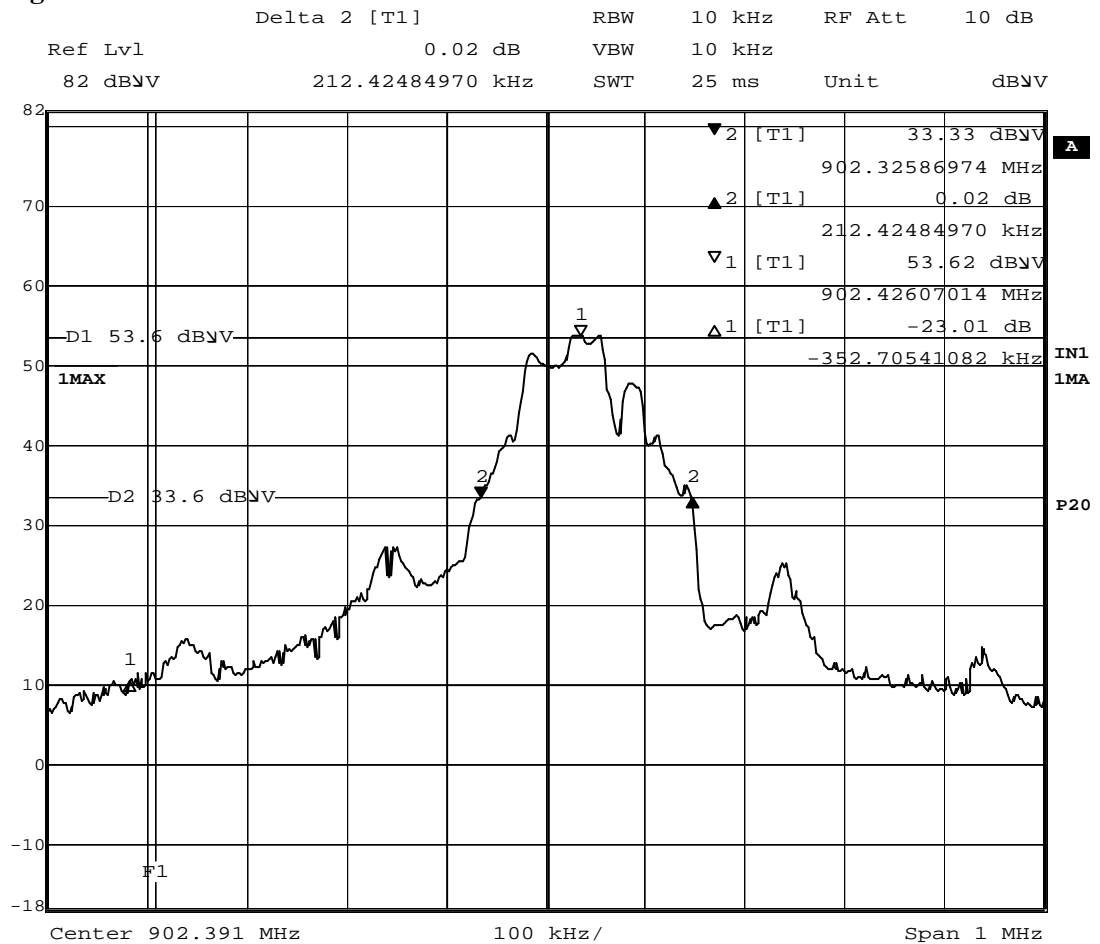
Complies?	Yes
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Appendix 3.1

Diagram 1



Date: 17.OCT.2008 10:14:18

Emissions radiated outside the specified band, measurements according to FCC 47 CFR part 15.249 (d, e)

Date 2008-10-17	Temperature 22 °C ± 3 °C	Humidity 26 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4-2003.

The test of radiated emission was performed in a semi anechoic chamber. The measurements were performed with both horizontal and vertical polarizations of the antenna. The antenna distance was 3 m.

The measurement procedure is as the following:

1. A pre-measurement is performed with peak detector. The test object is measured in eight directions with the antenna at three heights, 1.0 m, 1.5 m and 2.0 m.
2. If the emission is close or above the limit during the pre-measurement, the test object is scanned 360 degrees and the antenna height scanned from 1 to 4 m for maximum response. Then the emission is measured with the quasi-peak detector on frequencies below 1 GHz and with the average detector above 1 GHz. The used resolution band width is 120 kHz below 1 GHz and 1 MHz above 1 GHz.

Test set-up during the test can be found in appendix 6.

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Edison	2009-04	504 114
Spectrum analyzer R&S ESI 26	2009-07	503 885
Antenna Schaffner CBL 6143	2010-03	504 079
Horn antenna EMCO 3115	2011-01	502 175
Miteq Low Noise Amplifier	2009-08	504 160
High pass filter	2010-06	502 758
Control computer, Fujitsu Siemens	-	-
Software: R&S EMC32, ver. 6.10.10	-	503 745
Temperature and humidity meter Testo 625	2009-08	504 117

Measurement uncertainty: 5.1 dB



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Appendix 4

Results

The highest detected levels in the frequency range 30 MHz-10 GHz are listed in the table below.

902.4 MHz

Frequency (MHz)	QP level (dB μ V/m)	AV level (dB μ V/m)	Peak level (dB μ V/m)	Limit (dB μ V/m)	Height (m)	Azimuth (deg)	Polarization
2707.224449	N/A	38.4	57.0	53.9/ 73.9	1.20	60	Horizontal

All other emission > 20 dB below limit.

Limits

47CFR 15.249(d)

Emissions radiated outside the specified frequency band , except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in section 15.209, whichever is the lesser attenuation.

Complies?	Yes
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20 dB bandwidth measurements according to 47CFR 15.215 (c)

Date 2008-10-17	Temperature 22 °C ± 3 °C	Humidity 26 % ± 5 %
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Test set-up and procedure

The measurements were performed according to ANSI C63.4-2003.

The test was performed with the integral antenna, continuous transmission with the highest possible duty cycle and with modulation activated at maximum output power.

The radiated measurements were performed in a semi anechoic chamber. The measurements were performed with the antenna at the position and polarization and the turntable with the highest level of the fundamental. The antenna distance was 3.0 m.

Test set-up during the test can be found in appendix 6.

Measurement equipment	Calibration Due	SP number
Semi anechoic chamber, Edison	2009-04	504 114
Spectrum analyzer R&S ESI 26	2009-07	503 885
Antenna Schaffner CBL 6143	2010-03	504 079
Temperature and humidity meter Testo 625	2009-08	504 117

Measurement uncertainty: 2.6 %

Results

The diagram can be found in the appendix 5.1.

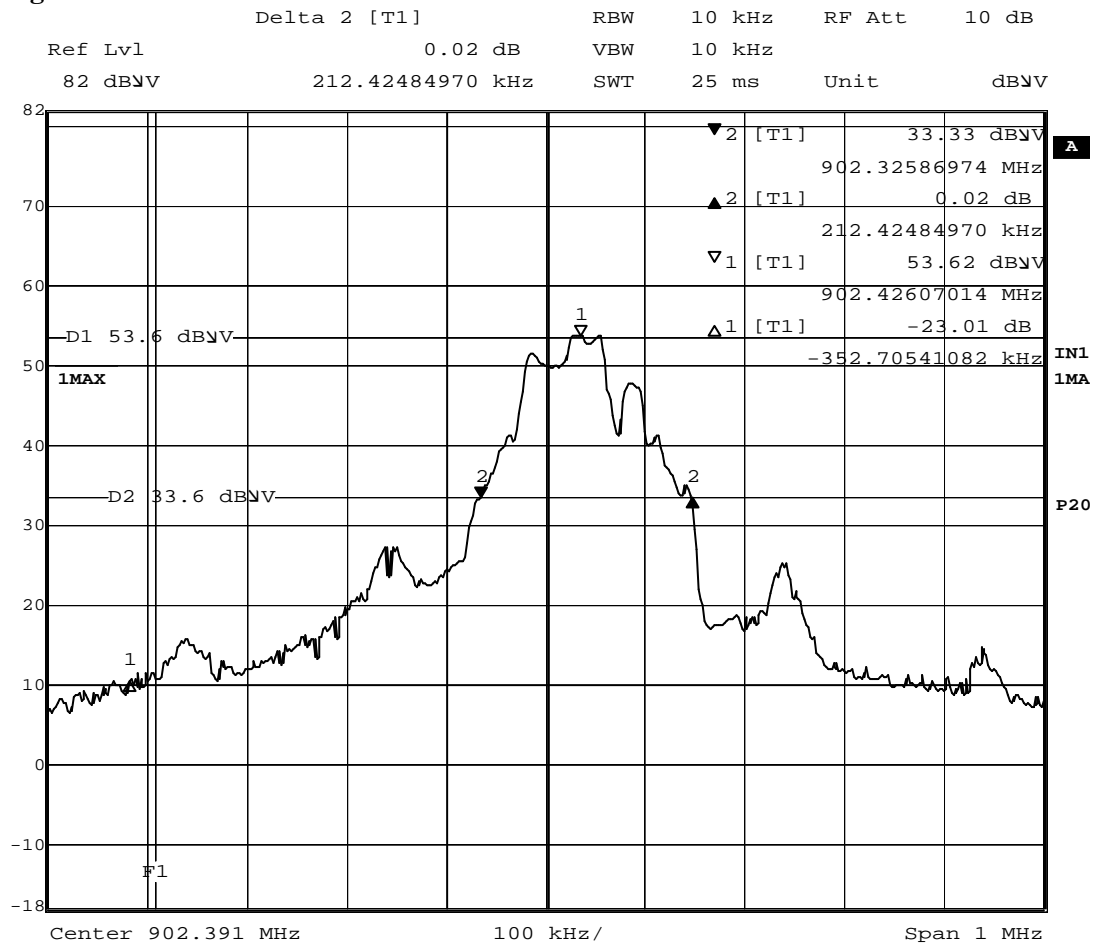
Diagram 1 902.4 MHz 212 kHz



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Appendix 5.1

Diagram 1



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Appendix 6

Photo

The test set-up during all the radiated tests can be seen in the picture below.

