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

PRODUCT:

Test item description:	Sporting watch with GPS and 2.4 GHz transceiver
Trade Mark:	Suunto
Model/Type reference:	Suunto Ambit
Serial number:	-
Customer:	Suunto Oy Valimotie7, FI-01510 Vantaa FINLAND
Contact person:	Heiki Puuri
Manufacturer:	Suunto Oy Valimotie7, FI-01510 Vantaa FINLAND

DATE: **November 5th.2012**

TESTED BY:

Matti Virkki; Test engineer

APPROVED BY:

Tuomo Hahl; Test engineer

CONTENTS

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1 LABORATORY INFORMATION

Test Laboratory	Intertek ETL Semko OY Koneenkatu 12 / K1 05801 Hyvinkää FINLAND
FCC registration number: **IC file number:**	910391 (January 27, 2003) IC 2042C-1 (May 14, 2003)

2 SUMMARY OF TEST RESULTS

The tests listed in this report have been done to demonstrate compliance to the FCC rules section §15.249, §15.209 and IC standard RSS-GEN and RSS-210.

Transmitter measurements

Section in CFR 47	Section in RSS-210	Test	Result
§ 15.249 (a)	A2.9 (1)	Field strength of fundamental	Passed
§ 15.249 (a) (d)	2.7, A2.9 (2)	Transmitter spurious emissions	Passed
§ 15.249 (c)		20 dB bandwidth	Passed
	RSS-GEN 4.4.1	99% bandwidth	Passed

PASS Pass
FAIL Fail
X Measured, but there is no applicable performance criterion
Na Not applicable

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3 EUT INFORMATION

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

	Device	S/N	EUT number
EUT	SUUNTO AMBIT	CW3	1
	SUUNTO AMBIT	TX	2
AE	USB shielded cable	-	-

3.1 EUT description

EUT is transmitter that sends data to other devices.
Radio link operates at 2,457 GHz frequency band and uses GFSK modulation.

The EUT was not modified during the tests.

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3.2 EUT TEST SETUPS

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

Two different test setups were used: one for conducted measurements, another for radiated measurements. Conducted measurements EUT number 2 was equipped with an external antenna connector by customer.

4 APPLICABLE STANDARDS

The tests were performed in guidance of CFR 47 Part 15.249, 15.209, ANSI C63.4 (2003), ICES-003 and RSS-GEN / RSS-210

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

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5 FIELD STRENGTH OF FUNDAMENTAL

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	19 ºC	33 %RH	988 hPa
Date of measurement	October 31st 2012		
FCC rule part	§15.249		
RSS-210 section	A2.9 (1)		
Measured by	Matti Virkki		

5.1 Test setup and measurement method

The EUT was set on a non-conductive turntable in a semi-anechoic chamber. The EUT was set at 0,8m height. Measuring antenna was scanned 1 – 4 m in height.
The measurements were repeated in three EUT orientations and two antenna polarizations.
The measured signal was routed from the measuring antenna to the spectrum analyzer.
The measurement was made using 1 MHz resolution bandwidth and 3 MHz video bandwidth and maximum hold function to record the maximum peak output power.

5.2 EUT operation mode

EUT operation mode	Continuous transmission
EUT frequency	2457 MHz
EUT TX power level	0 dBm (Maximum power)

5.3 Limit

Table 1: Field strength of fundamental

Frequency (MHz)	mV/m (@3m)	dBµV/m (@3m)
2400-2483,5	50 (Avg)	94 (Avg) 114 (Peak)

5.4 Results

Table 2: Maximum field strength of fundamental (Peak value)

Freq MHz	Analyzer reading dBµV	Correction Factor dB	Result dBµV/m	EUT orientation	Antenna Pol.	Antenna height	Turntable angle
2457	95,0	-14,3	80,7	Pos 1	Ver	1,0	168
2457	90,3	-14,3	76,0	Pos 2	Hor	1,0	356

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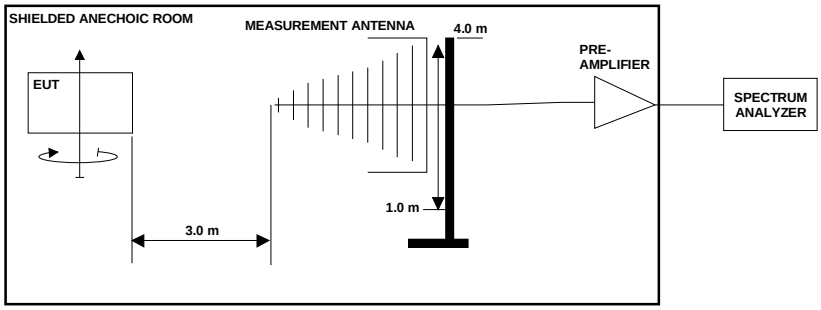
6 TRANSMITTER RADIATED SPURIOUS EMISSIONS

EUT	1		
Accessories	-		
Temp, Humidity, Air Pressure	19 ºC	33 %RH	988 hPa
Date of measurement	October 31st 2012		
FCC rule part	§15.249 (a) (d)		
RSS-210 section	2.7, A2.9 (2)		
Measured by	Matti Virkki		

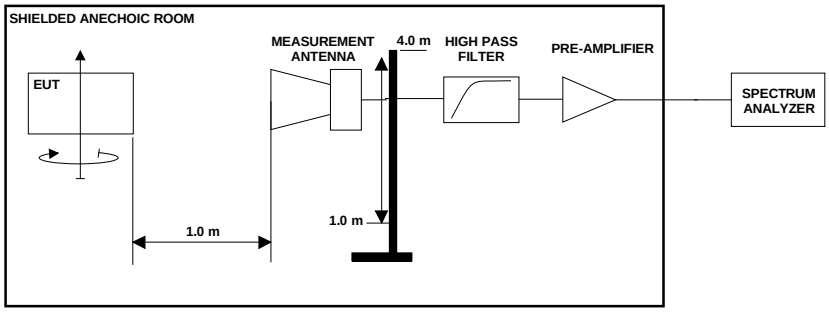
6.1 Test setup

EUT was modified to send constant carrier at nominal frequency.

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



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



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

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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 dBµV/m at 3 m distance, are reported.

6.3 EUT operation mode

EUT operation mode	Continuous transmission
EUT frequency	2457 MHz
EUT TX power level	0 dBm (Maximum power)

6.4 Limit

Table 3: Radiated spurious emission limits at measurement distance of 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, that it complies with the -50dBc requirement.

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6.5 Results

Measurement system noise level was least 20 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 4: Emission levels PEAK detector

Frequency (MHz)	MaxPeak (dBµV/m)	EUT Pos.	Bandwidth (kHz)	Height (cm)	Pol.	Azimuth (deg)	Corr. (dB)	Margin (dB)	Limit Avg (dBµV/m)
4913,96	46,2	1	1000	100,0	V	254,0	-8,1	27,7	53,9
7370,81	49,2	1	1000	150,0	H	130,0	0,4	24,7	53,9
4914,09	47,1	2	1000	125,0	H	106,0	-8,1	26,8	53,9
7370,77	49,6	2	1000	150,0	V	315,0	0,4	24,3	53,9

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7 20 dB BANDWIDTH

EUT	2		
Accessories	-		
Temp, Humidity, Air Pressure	17 ºC	55 %RH	1002 hPa
Date of measurement	October 18th 2012		
FCC rule part	§15.215 (c)		
RSS-210 section	-		
Measured by	Matti Virkki		

7.1 Test setup and measurement method

The 20dB bandwidth was measured using 3 kHz resolution bandwidth and maximum hold function of the spectrum analyzer. 20dB bandwidth was defined by measuring the maximum level on the measured channel and by placing display line 20 dB below this value and by reading the bandwidth from the intersection of the measured trace and display line.

7.2 EUT operation mode

EUT operation mode	Normal modulation
EUT frequency	2457 MHz
EUT TX power level	0 dBm (Maximum power)

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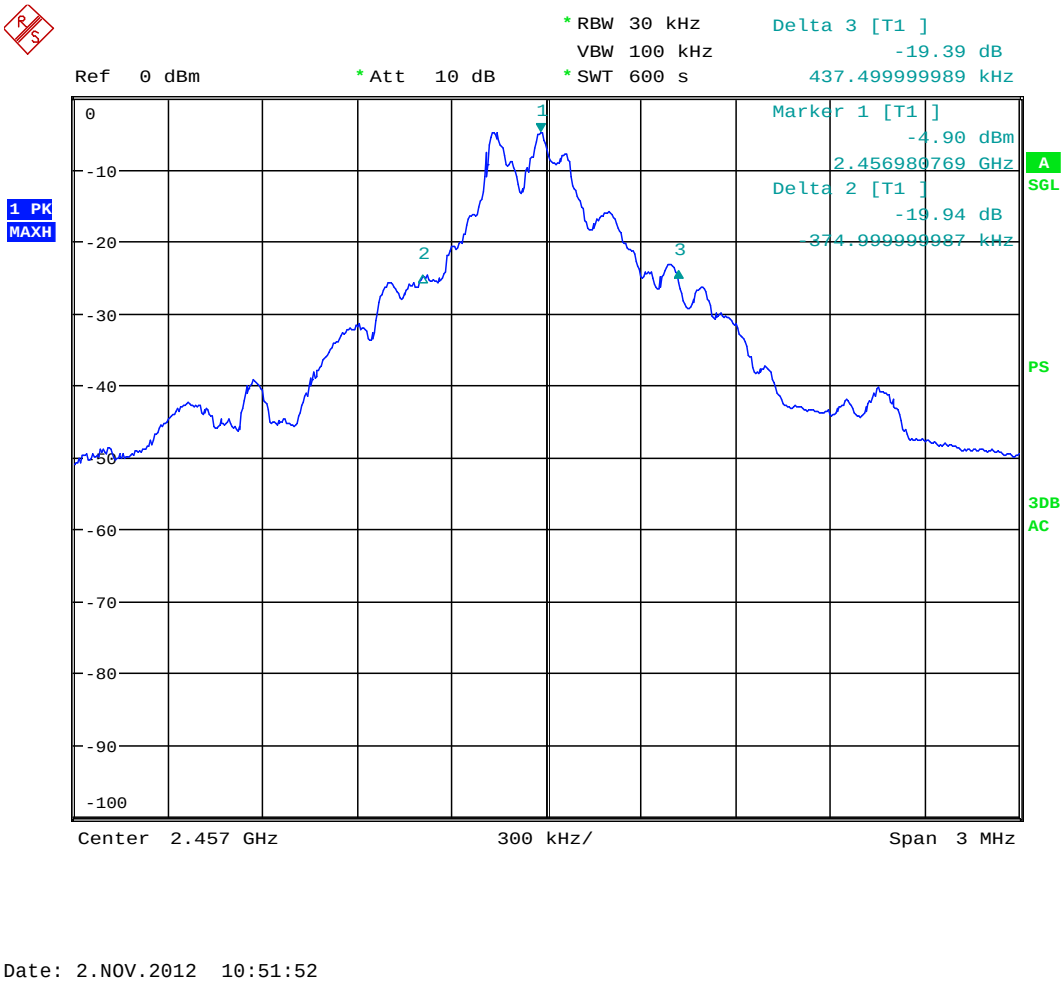
7.3 Results

Table 5: 20dB bandwidth measurement results

EUT Frequency MHz	Limit MHz	Measured value MHz
2457	-	0,812

7.4 Screen shots

Picture 3: 20dB Bandwidth measurement result



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8 99 % BANDWIDTH

EUT	2		
Accessories	-		
Temp, Humidity, Air Pressure	17 ºC	55 %RH	1002 hPa
Date of measurement	October 18th 2012		
FCC rule part			
RSS-GEN section	4.4.1		
Measured by	Matti Virkki		

8.1 Test setup and measurement method

The 99% occupied bandwidth was measured with spectrum analyzer occupied bandwidth measurement function.

8.2 EUT operation mode

EUT operation mode	Normal modulation
EUT frequency	2457 MHz
EUT TX power level	0 dBm (Maximum power)

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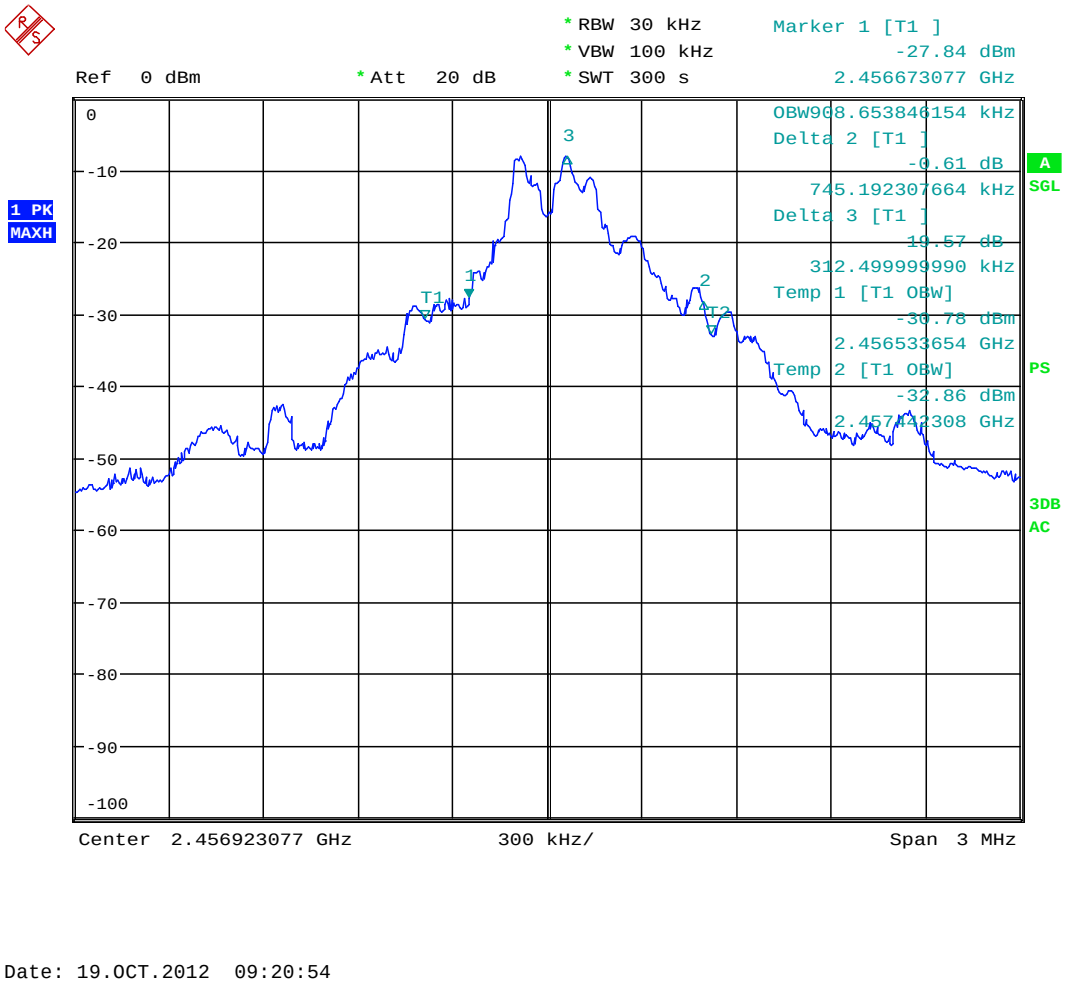
8.3 Results

Table 6: 99% bandwidth measurement results

EUT Frequency MHz	Limit MHz	Measured value MHz
2457	-	0,908

8.4 Screen shots

Picture 4: 99% Bandwidth measurement result



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9 TEST EQUIPMENT

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

9.1 Conducted measurements

DEVICE	MANUFACTURER	SPKTT	SERIAL
Spectrum analyser	Rohde & Schwarz ESU 26	219	100173

9.2 Radiated measurements

DEVICE	MANUFACTURER	SPKTT	SERIAL
Spectrum analyser	Rohde & Schwarz ESU26	219	100173
Horn Antenna	Schwarzbeck BBHA9120D	138	365
X-wing BiLog antenna	Teseq CBL6143A	221	29611
Horn Antenna	Schwarzbeck BBHA9170	194	313
3 dB attenuator	Huber+Suhner 3dB/2W	214	-
Pre-amplifier	Agilent 87405B	143	MY39500154
Pre-amplifier	JCA 118-400	142	-
Pre-amplifier	Miteq AMF-6F-18002650-2	191	1128879
High pass filter	Wainwright Instruments WHK3.0/18GST	141	3
3m Semi-anechoic chamber	ETS Euroshield	081	-
Measuring software	R&S EMC32	-	Ver 8.53.0

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10 TEST SETUP PHOTOGRAPHS

Test setup photograph can be found in a separate document

200711B-RF_PHOTOS.pdf

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