



EUROFINS PRODUCT SERVICE GMBH



# RF-EXPOSURE ASSESSMENT

FCC 47 CFR 2.1091  
IC RSS-102

**WLAN Access Point (2.4 GHz only)**

**W1002n**

**FCC ID: SPT-W1002N-080211**

**REPORT NUMBER: G0M-1106-1223-C-1**



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## 1 General Information

### 1.1 Notes

The results of this test report relate exclusively to the item tested as specified in chapter "Description of test item" and are not transferable to any other test items.

Eurofins Product Service GmbH is not responsible for any generalisations and conclusions drawn from this report. Any modification of the test item can lead to invalidity of test results and this test report may therefore be not applicable to the modified test item.

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#### Operator:

30.08.2011

C. Weber



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Date

Eurofins-Lab.

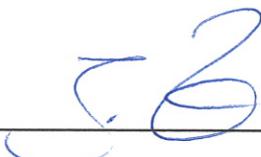
Name

Signature

#### Technical responsibility for area of testing:

30.08.2011

J. Zimmermann



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Date

Eurofins

Name

Signature

## 1.2 Testing laboratory

EUROFINS PRODUCT SERVICE GMBH  
Storkower Strasse 38c  
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Germany  
Telefon : +49 33631 888 00  
Telefax : +49 33631 888 660

**DAKKS ACCREDITED TESTING LABORATORY**  
DAKKS-REGISTRATION NUMBER: D-PL-12092-01-01

**RECOGNIZED NOTIFIED BODY EMC**  
REGISTRATION NUMBER: BNetzA-bS EMV-07/61

**RECOGNIZED NOTIFIED BODY R&TTE**  
REGISTRATION NUMBER: BNetzA-bS-02/51-53

**FCC FILED TEST LABORATORY**  
REG.-No. 96970

**A2LA ACCREDITED TESTING LABORATORY**  
CERTIFICATE NO. 1983.01

**BLUETOOTH QUALIFICATION TEST FACILITY (BQTF)**  
ACCREDITED BY BLUETOOTH QUALIFICATION REVIEW BOARD

**INDUSTRY CANADA FILED TEST LABORATORY**  
REG. NO. IC 3470

### Test location, where different:

Name	: ./.
Street	: ./.
Town	: ./.
Country	: ./.
Telephone	: ./.
Fax	: ./.

### 1.3 Details of approval holder

Name : Funkwerk Enterprise Communications GmbH  
Street : Alt-Moabit 96c  
Town : 10559 Berlin  
Country : Germany  
Telephone : +49 30 399 88 443  
Fax : +49 30 392 28 36

Contact : Herr Uwe Unterberger  
Telephone : +49 30 399 88 443

**Manufacturer:**  
(if applicable)

Name : Funkwerk Enterprise Communications GmbH  
Street : Suedwestpark 94  
Town : 90449 Nuremberg  
Country : Germany

### 1.4 Application details

Date of receipt of application : 04.07.2011  
Date of receipt of test item : 04.07.2011  
Date of assessment : 30.08.2011

### 1.5 Acronyms and abbreviations

EUT : Equipment under Test  
TX : Transmission  
RX : Reception  
RBW : Measurement Resolution Bandwidth  
Pol : Measurement Polarization  
N/A : Not applicable

## 1.6 Reference standards

Technical standards

: FCC 47 CFR 1.1310  
FCC 47 CFR 2.1091  
FCC 47 CFR 2.1093

**OET Bulletin 65 : " Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" 1997**

**RSS-102 Issue 4 : "Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", 2010**

**Safety Code 6: "Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz", 2009**

**IEEE C95.3 : "IEEE Recommended Practice for Measurements and Computations of Radio Frequency Electromagnetic Fields With Respect to Human Exposure to Such Fields, 100 kHz–300 GHz", 2002**

**Health Canada : "Technical Guide for Interpretation and Compliance Assessment of Health Canada's Radiofrequency Exposure Guidelines", 2009**

## 1.7 Test item

Description of test item : WLAN Access Point (2.4 GHz only)  
Type identification : W1002n  
Serial Number : W1NABH011230111  
Hardware version : -i  
Software version : 7.9. Rev. 6 Patch 7  
Radiation sources included : WLAN IEEE 802.11b/g/n  
Equipment type : End product  
Exposure Category : Uncontrolled / General public  
Device type : Mobile

## 1.8 Referenced documents

FCC/IC WLAN test report : G0M-1106-1223-P-15  
Eurofins Product Service GmbH

## 1.9 Additional information

None

## 2 Exposure Assessment

### 2.1 Device Types

#### Fixed

A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.

#### Mobile

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. (47 CFR 2.1091)

#### Portable

A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user. (47 CFR 2.1093)

## 2.2 Exposure Categories

### Occupational / Controlled Exposure

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on methods to minimize such exposure risks.

### General Public / Uncontrolled Exposure

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices.

## 2.3 MPE Limits

IC Limits for maximum permissible exposure (MPE)				
Frequency range [MHz]	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [W/m <sup>2</sup> ]	Averaging time [min]
<b>Limits for Occupational / Controlled Exposure</b>				
0.003 – 1.0	600	4.9		6
1 – 10	600/f	4.9/f		6
10 – 30	60	4.9/f		6
30 – 300	60	0.163	10.0*	6
300 – 1500	3.54·f <sup>0.5</sup>	0.0094·f <sup>0.5</sup>	f/30	6
1500 – 15000	137	0.364	50	6
15000 – 150000	137	0.364	50	616000/f <sup>0.5</sup>
150000 – 300000	0.354·f <sup>0.5</sup>	9.4·10 <sup>-4</sup> ·f <sup>0.5</sup>	3.33·10 <sup>-4</sup> ·f	616000/f <sup>0.5</sup>
<b>Limits for General Population / Uncontrolled Exposure</b>				
0.003 – 1.0	280	2.19		6
1 – 10	280/f	2.19/f		6
10 – 30	28	2.19/f		6
30 – 300	28	0.073	2.0*	6
300 – 1500	1.585·f <sup>0.5</sup>	0.0042·f <sup>0.5</sup>	f/150	6
1500 – 15000	61.4	0.163	10	6
15000 – 150000	61.4	0.163	10	616000/f <sup>0.5</sup>
150000 – 300000	0.158·f <sup>0.5</sup>	4.21·10 <sup>-4</sup> ·f <sup>0.5</sup>	6.67·10 <sup>-5</sup> ·f	616000/f <sup>0.5</sup>

\* = Power density is applicable at frequencies greater than 100MHz  
f in MHz

FCC Limits for maximum permissible exposure (MPE)				
Frequency range [MHz]	Electric field strength [V/m]	Magnetic field strength [A/m]	Power density [mW/cm <sup>2</sup> ]	Averaging time [min]
<b>Limits for Occupational / Controlled Exposure</b>				
0.3 – 3.0	614	1.63	(100)*	6
3.0 – 30	1842/f	4.89/f	(900/f <sup>2</sup> )*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500			f/300	6
1500 – 100000			5.0	6
<b>Limits for General Population / Uncontrolled Exposure</b>				
0.3 – 1.34	614	1.63	(100)*	30
1.34 – 30	842/f	2.19/f	(180/f <sup>2</sup> )*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500			f/1500	30
1500 – 100000			1.0	30

\* = Plane-wave equivalent power density

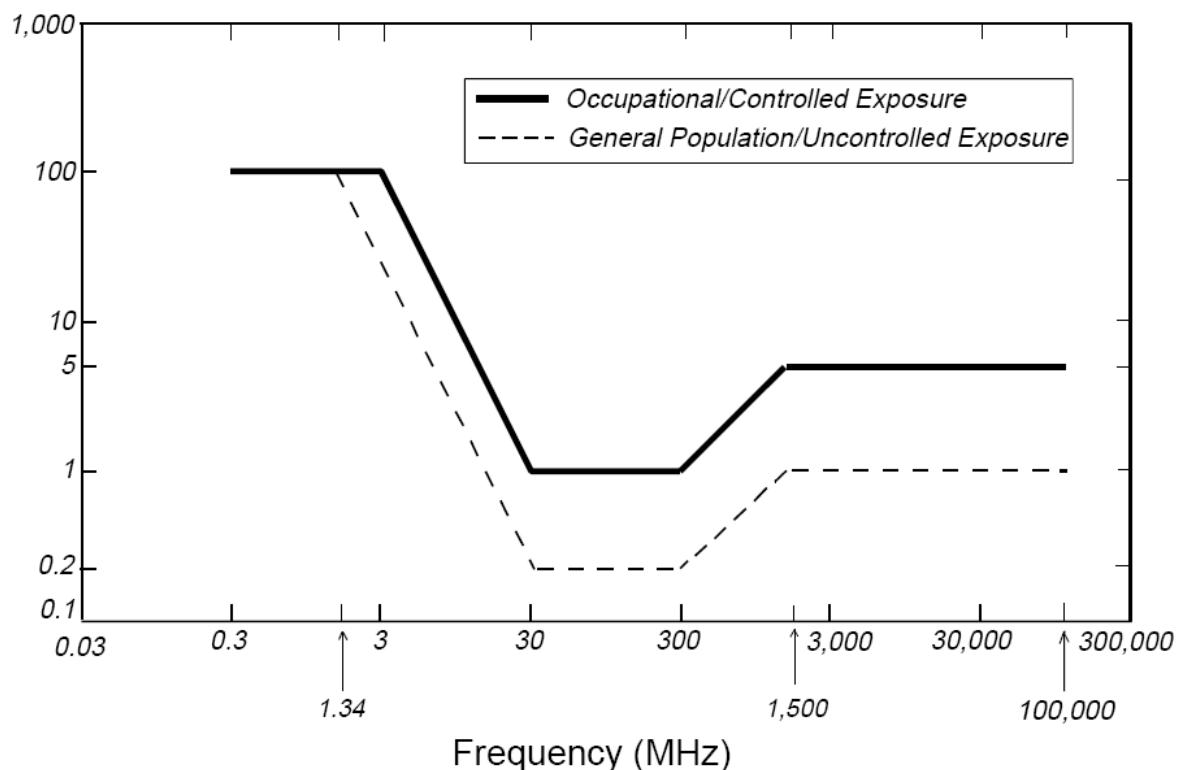
f in MHz

47 CFR 1.1310

**Occupational/controlled** limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

**General population/uncontrolled** exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

Figure 1. FCC Limits for Maximum Permissible Exposure (MPE)  
Plane-wave Equivalent Power Density



## 2.4 Transmission modes

UPCS	
<b>TX frequency range</b>	2400 - 2483.5
<b>Channels</b>	13 (20MHz) / 9 (40MHz)
<b>Transmission modes</b>	20MHz - DSSS, 20MHz – OFDM, 20MHz – HT20, 40MHz – HT40
<b>Modulation</b>	BPSK, QPSK, 16-QAM, 64-QAM
<b>Maximum duty cycle used</b>	100%
<b>Radiated power</b>	20.7 (20MHz - DSSS), 24.6 (20MHz – OFDM) 24.6 (20MHz – HT20), 24.5 (40MHz – HT40)
<b>Antenna type</b>	External dedicated rubber band antenna
<b>Antenna gain</b>	1.7dBi
<b>Antenna diameter</b>	10cm

## 2.5 Exposure assessment

IEEE 802.11b		
<b>Transmission mode</b>		
Exposure Category	General Public	
TX frequency range [MHz]	2412-2462MHz	
Assessment frequency	2462.00MHz	
Duty cycle	100.0%	
Conducted power	20.70dBm	
Radiated power	22.40dBm	
Antenna gain	1.70dBi	
Antenna diameter	10.00cm	
<b>Far-field distance</b>		
Wavelength	0.122m	12.19cm
Antenna far-field distance	0.164m	16.41cm
<b>Power Evaluation</b>		
Conducted power	117.49mW	20.70dBm
Antenna gain	1.48	1.70dBi
Calculated radiated power	173.78mW	22.40dBm
Measured radiated power	173.78mW	22.40dBm
<b>Source averaged power</b>		
Duty cycle	100.0%	
Duty cycle correction	1	0.00dB
Maximum radiated power	173.78mW	22.40dBm
Averaged radiated power	173.78mW	22.40dBm
<b>Power density</b>		
Compliance power density limit	1.000mW/cm <sup>2</sup>	10.00W/m <sup>2</sup>
Power density @ far-field distance	0.051mW/cm <sup>2</sup>	0.513W/m <sup>2</sup>
Power density @ 20cm	0.035mW/cm <sup>2</sup>	0.346W/m <sup>2</sup>
Distance for compliance power density	0.037m	3.72cm
<b>Verdict</b>	The power density of the EUT at 20cm is below the FCC/IC MPE limit	

<b>IEEE 802.11g</b>		
<b>Transmission mode</b>		
Exposure Category	General Public	
TX frequency range [MHz]	2412-2462MHz	
Assessment frequency	2462.00MHz	
Duty cycle	100.0%	
Conducted power	24.60dBm	
Radiated power	26.30dBm	
Antenna gain	1.70dBi	
Antenna diameter	10.00cm	
<b>Far-field distance</b>		
Wavelength	0.122m	12.19cm
Antenna far-field distance	0.164m	16.41cm
<b>Power Evaluation</b>		
Conducted power	288.40mW	24.60dBm
Antenna gain	1.48	1.70dBi
Calculated radiated power	426.58mW	26.30dBm
Measured radiated power	426.58mW	26.30dBm
<b>Source averaged power</b>		
Duty cycle	100.0%	
Duty cycle correction	1	0.00dB
Maximum radiated power	426.58mW	26.30dBm
Averaged radiated power	426.58mW	26.30dBm
<b>Power density</b>		
Compliance power density limit	1.000mW/cm <sup>2</sup>	10.00W/m <sup>2</sup>
Power density @ far-field distance	0.126mW/cm <sup>2</sup>	1.260W/m <sup>2</sup>
Power density @ 20cm	0.085mW/cm <sup>2</sup>	0.849W/m <sup>2</sup>
Distance for compliance power density	0.058m	5.83cm
<b>Verdict</b>	The power density of the EUT at 20cm is below the FCC/IC MPE limit	

<b>IEEE 802.11n (HT20)</b>		
<b>Transmission mode</b>		
Exposure Category	General Public	
TX frequency range [MHz]	2412-2462MHz	
Assessment frequency	2462.00MHz	
Duty cycle	100.0%	
Conducted power	24.60dBm	
Radiated power	26.30dBm	
Antenna gain	1.70dBi	
Antenna diameter	10.00cm	
<b>Far-field distance</b>		
Wavelength	0.122m	12.19cm
Antenna far-field distance	0.164m	16.41cm
<b>Power Evaluation</b>		
Conducted power	288.40mW	24.60dBm
Antenna gain	1.48	1.70dBi
Calculated radiated power	426.58mW	26.30dBm
Measured radiated power	426.58mW	26.30dBm
<b>Source averaged power</b>		
Duty cycle	100.0%	
Duty cycle correction	1	0.00dB
Maximum radiated power	426.58mW	26.30dBm
Averaged radiated power	426.58mW	26.30dBm
<b>Power density</b>		
Compliance power density limit	1.000mW/cm <sup>2</sup>	10.00W/m <sup>2</sup>
Power density @ far-field distance	0.126mW/cm <sup>2</sup>	1.260W/m <sup>2</sup>
Power density @ 20cm	0.085mW/cm <sup>2</sup>	0.849W/m <sup>2</sup>
Distance for compliance power density	0.058m	5.83cm
<b>Verdict</b>	The power density of the EUT at 20cm is below the FCC/IC MPE limit	

<b>IEEE 802.11n (HT40)</b>		
<b>Transmission mode</b>		
Exposure Category	General Public	
TX frequency range [MHz]	2422-2452MHz	
Assessment frequency	2452.00MHz	
Duty cycle	100.0%	
Conducted power	24.50dBm	
Radiated power	26.20dBm	
Antenna gain	1.70dBi	
Antenna diameter	10.00cm	
<b>Far-field distance</b>		
Wavelength	0.122m	12.23cm
Antenna far-field distance	0.163m	16.35cm
<b>Power Evaluation</b>		
Conducted power	281.84mW	24.50dBm
Antenna gain	1.48	1.70dBi
Calculated radiated power	416.87mW	26.20dBm
Measured radiated power	416.87mW	26.20dBm
<b>Source averaged power</b>		
Duty cycle	100.0%	
Duty cycle correction	1	0.00dB
Maximum radiated power	416.87mW	26.20dBm
Averaged radiated power	416.87mW	26.20dBm
<b>Power density</b>		
Compliance power density limit	1.000mW/cm <sup>2</sup>	10.00W/m <sup>2</sup>
Power density @ far-field distance	0.124mW/cm <sup>2</sup>	1.241W/m <sup>2</sup>
Power density @ 20cm	0.083mW/cm <sup>2</sup>	0.829W/m <sup>2</sup>
Distance for compliance power density	0.058m	5.76cm
<b>Verdict</b>	The power density of the EUT at 20cm is below the FCC/IC MPE limit	