

Produkte  
Products

**Prüfbericht - Nr.: 14023377 001**

Test Report No.:

Seite 1 von 15

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**Auftraggeber:** Armour Home Electronics Ltd.  
*Client:* Kingswey Busniess Park  
Forsyth Road, Woking  
Surrey, GU21 5SA  
United Kingdom

**Gegenstand der Prüfung:** WirelessLAN Internet Radio  
*Test Item:*

**Bezeichnung:** Q2 Tip & Tilt Radio **Serien-Nr.:** Engineering sample  
*Identification:* *Serial No.:*

**Wareneingangs-Nr.:** 00100225068-002 **Eingangsdatum:** 25.02.2010  
*Receipt No.:* *Date of Receipt:*

**Prüfort:** TÜV Rheinland Hong Kong Ltd.  
*Testing Location:* 8/F, Niche Centre, 14 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong  
TÜV Rheinland (Guangdong) Ltd. EMC Laboratory  
Guangzhou Auto Market, Yuan Gang Section of Guangshan Road, Guangzhou, 510650, P.R. China

**Prüfgrundlage:** FCC Part 15 Subpart C  
*Test Specification:* ANSI C63.4-2003  
CISPR 22:1997

**Prüfergebnis:** Das vorstehend beschriebene Gerät wurde geprüft und entspricht oben  
*Test Results:* genannter Prüfgrundlage.  
The above mentioned product was tested and **passed**.

**Prüflaboratorium:** TÜV Rheinland Hong Kong Ltd.  
*Testing Laboratory:* 9-10/F., Emperor International Square, 7 Wang Tai Road, Kowloon Bay, Kowloon, Hong Kong

**geprüft/ tested by:**

**kontrolliert/ reviewed by:**

26.06.2010 Mika Chan  
Project Engineer

26.06.2010 Sharon Li  
Project Manager

**Datum** **Name/Stellung** **Unterschrift**  
*Date* *Name/Position* *Signature*

**Datum** **Name/Stellung** **Unterschrift**  
*Date* *Name/Position* *Signature*

**Sonstiges:** FCCID: YGM001001  
**Other Aspects**

**Abkürzungen:** P(ass) = entspricht Prüfgrundlage  
F(ail) = entspricht nicht Prüfgrundlage  
N/A = nicht anwendbar  
N/T = nicht getestet

**Abbreviations:** P(ass) = passed  
F(ail) = failed  
N/A = not applicable  
N/T = not tested

**Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.**  
*This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.*

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## Product information

### Manufacturers declarations

Items	Description
Power Type	3.7V from Li-ion Polymer battery
Modulation	DSSS for IEEE 802.11b; OFDM for IEEE 802.11g
Number of antenna assemblies	4 (identical antenna). The antenna is selected according to orientation of the EUT (uppermost antenna selected, when the accelerometer decides there is a change of side)
Antenna gain (dBi)	0.7
Data Modulation	DSSS (DBPSK / DQPSK / CCK); OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	DSSS (1/2/5.5/11); OFDM (6/9/12/18/24/36/48/54)
Frequency Range	2400 ~ 2483.5MHz
Channel Number	11b/g: 11
Channel Band Width (99%)	11b: 12MHz; 11g:17.8MHz;
Conducted Output Power	11b:15.7dBm; 11g: 14.5dBm;
Ad Hoc Mode	No Supported

## Product function and intended use

The EUT is a wireless LAN enabled internet radio. It has four preset stations which are selected by rotating the EUT to change the face it is resting on. To change the volume, the EUT is tilted up or down.

The four preset stations are set using a PC application that connects via a USB connector on the back. This application can also set the details of the wireless LAN networks that the EUT can connect to.

## Submitted documents

Circuit Diagram  
Block Diagram  
Bill of material  
User manual

NOTE: The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

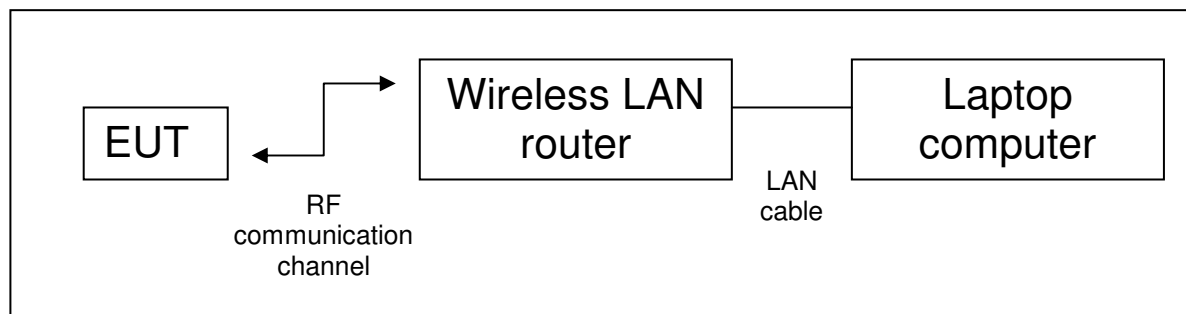
## Remark

### DESCRIPTION OF TEST MODES

Eleven channels are provided in this EUT

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

The following setup was used during the AC power conducted emissions



Details of the accessories during test

- 1) AC adaptor (EUT charger)  
Brand: Q2  
Model: KSD10-050-0500  
Input rating: 100-240V ~ 50-60Hz 300mA  
Output rating: DC5V, 500mA

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2) Wireless LAN router

Product name: Wireless-G Broadband Router with 4-Port Switch

Manufacturer: LINKSYS

Model: WRT54G v 5

S/N: CDFB0F2D1246

AC adaptor

Manufacturer: NETGEAR

Model: DV-1280-3UK

Input rating: AC 240V ~ 50Hz 100mA

Output rating: DC12V, 1A

3) Laptop computer

Brand: SONY

Model: PCG-622P

S/N: 28331170 7201049

AC adaptor

Brand: SONY

Model: PCGA-AC19V1

Input rating: 100-240V ~ 1.6A, 50/60Hz

Output rating: 19.5V, 3A

## List of Test and Measurement Instruments

	Equipment used	Manufacturer	Model No.	S/N	Due Date
<input checked="" type="checkbox"/>	Semi-anechoic Chamber	Albatross Projects GmbH	Nil	9460000.9	16-Mar-11
<input checked="" type="checkbox"/>	EMI Test Receiver	R & S	ESCI	100216	16-Mar-11
<input checked="" type="checkbox"/>	Trilog-Broadband Antenna	Schwarzbeck	VULB9168	209	21-Aug-11
<input checked="" type="checkbox"/>	Double-Ridged Waveguide Horn Antenna	R & S	HF 906	100407	16-Mar-11
<input checked="" type="checkbox"/>	Pre-Amplifier	MITEQ	AFS42-00101800-25S-42	1101599	16-Mar-11
<input checked="" type="checkbox"/>	Pre-Amplifier	MITEQ	AFS42-00101800-25S-44	1108282	16-Mar-11
<input checked="" type="checkbox"/>	Band Reject Filter	Micro-Tronics	BRM50702	023	16-Mar-11
<input checked="" type="checkbox"/>	Horn Antenna	EMCO	3160-09	21642	26-Jun-14
<input checked="" type="checkbox"/>	FSP 30 Spectrum Analyser	R & S	FSP 30	100286	16-Mar-11
<input checked="" type="checkbox"/>	EMI Test Receiver	R & S	ESCS 30	100316	16-Mar-11
<input checked="" type="checkbox"/>	Artificial Mains Network	R & S	ESH3-Z5	100114	16-Mar-11
<input checked="" type="checkbox"/>	Pulse Limiter	R & S	ESH3-Z2	100701	16-Mar-11
<input checked="" type="checkbox"/>	Loop Antenna	R & S	HFH2-Z2	9107-2651	16-Mar-11
<input checked="" type="checkbox"/>	Power Meter	R & S	NRVS	836333/062	03-Nov-10

## Results FCC Part 15 – Subpart C

Subclause 15.203 – Antenna Information		Pass
<b>Requirement:</b>	No antenna other than that furnished by the responsible party shall be used with the device	
<b>Results:</b>	Permanent attached antenna	
<b>Verdict:</b>	Pass	

Subclause 15.204 – Antenna Information		Pass
<b>Requirement:</b>	Provide information for every antenna proposed for the use with the EUT	
<b>Results:</b>	a) Antenna type: Integral b) Manufacturer and model no: N.A. c) Gain with reference to an isotropic radiator: 0.7 dBi	
<b>Verdict:</b>	Pass	

Subclause 15.207 – Disturbance Voltage on AC Mains						Pass
Test Port: AC mains input port of the charger Applied voltage: 100VAC Applicable only to equipment designed to be connected to the public utility power line. Adaptor Model: KSD10-050-0500 1) Mode of operation: music playing through wireless LAN and charging at the same time						
<b>Results:</b> The radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150kHz to 30MHz does not exceed the limits. For test Results plots refer to Appendix 1, page 2-3.						
Live measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.186	46.2	30.4	66 - 56	56 - 46	Pass
	0.252	41.3	26.2	66 - 56	56 - 46	Pass
	0.372	36.1	26.0	66 - 56	56 - 46	Pass
> 0,5 - 5	-	-	-	56	46	Pass
> 5 - 30	-	-	-	60	50	Pass
Neutral measurement						
Frequency range (MHz)	Frequency (MHz)	Quasi-peak dBµV	Average dBµV	Limit QP (dBµV)	Limit AV (dBµV)	Verdict
0,15 – 0,5	0.186	42.4	17.4	66 - 56	56 - 46	Pass
	0.240	38.4	15.5	66 - 56	56 - 46	Pass
	0.432	36.4	19.9	66 - 56	56 - 46	Pass
> 0,5 - 5	-	-	-	56	46	Pass
> 5 - 30	-	-	-	60	50	Pass

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> 5 - 30	-	-	-	60	50	Pass
<b>Verdict:</b> Pass						

<b>Subclause 15.247 (a)(2) – 6dB Bandwidth Measurement</b>				<b>Pass</b>
<b>Requirement:</b> Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6dB bandwidth shall be at least 500kHz.				
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode, DSSS Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 100 kHz Supply voltage : 5.0VDC from DC power supply Temperature : 23°C Humidity : 50%				
<b>Results:</b> For test protocols please refer to Appendix 1, page 4-9.				
<b>Mode: 802.11b</b>				
Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Verdict
1	2412	12	≥500KHz	Pass
6	2437	12	≥500KHz	Pass
11	2462	12	≥500KHz	Pass
<b>Mode: 802.11g</b>				
Channel	Channel frequency (MHz)	6dB Bandwidth (MHz)	Limit (MHz)	Verdict
1	2412	17.8	≥500KHz	Pass
6	2437	17.6	≥500KHz	Pass
11	2462	17.6	≥500KHz	Pass
<b>Verdict:</b> Pass				

<b>Subclause 15.247 (b)(3) – Maximum Peak Output Power</b>				<b>Pass</b>
<b>Requirement:</b> For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850MHz bands: 1 Watt (30dBm)				
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode, DSSS Port of testing : Temporary antenna port Supply voltage : 5.0VDC from DC power supply				



Temperature : 23°C Humidity : 50%				
<b>Results:</b>				
<b>Mode: 802.11b</b>				
Channel	Channel frequency (MHz)	Peak Power Output (dBm)	Limit (dBm)	Verdict
1	2412	15.134	30	Pass
6	2437	15.237	30	Pass
11	2462	15.675	30	Pass
<b>Mode: 802.11g</b>				
Channel	Channel frequency (MHz)	Peak Power Output (dBm)	Limit (dBm)	Verdict
1	2412	14.227	30	Pass
6	2437	14.395	30	Pass
11	2462	14.473	30	Pass
<b>Verdict:</b> Pass				

<b>Subclause 15.247 (d) – Spurious Conducted Emissions</b>					<b>Pass</b>
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (2412MHz, 2437MHz, 2462MHz), DSSS Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 100 kHz / 300 kHz Supply voltage : 5VDC from DC power supply Temperature : 23 °C Humidity : 50 %					
<b>Requirement:</b> In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.					
<b>Results:</b> There is no peak found outside any 100kHz bandwidth of the operating frequency band in the three transmit frequency. All three transmit frequency modes comply with the limit stated in subclause 15.247(d). For test protocols refer to Appendix 1, page 10-15.					
<b>Mode: 802.11b</b>					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	653.28	-39.00	1.36	40.36	Pass
	9638.9	-52.77	1.36	54.13	Pass

2437	653.28	-38.24	2.29	40.53	Pass
	9742.7	-51.35	2.29	53.64	Pass
2462	705.22	-40.88	2.47	43.35	Pass
	9846.6	-55.65	2.47	58.12	Pass
<b>Mode: 802.11g</b>					
Operating frequency (MHz)	Spurious frequency (MHz)	Spurious Level (dBm)	Reference value (dBm)	Delta (dB)	Verdict
2412	653.28	-47.73	2.81	50.54	Pass
2437	653.28	-48.11	2.87	50.98	Pass
2462	705.22	-49.55	3.80	53.35	Pass

**Subclause 15.247 (d) – Spurious Radiated Emissions**
**Pass**

Test Specification : ANSI C63.4 – 2003  
 Mode of operation : Tx mode (2412MHz, 2437MHz, 2462MHz), DSSS  
 Port of testing : Enclosure  
 Detector : Peak  
 RBW/VBW : 100 kHz / 300 kHz for  $f < 1$  GHz  
                   1 MHz / 1 MHz for  $f > 1$  GHz  
 Supply voltage : internal batteries has been activated  
 Temperature : 23°C  
 Humidity : 50%

**Requirement:** In any 100kHz bandwidth outside the frequency band at least 20dB below the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands, as defined in section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a).

**Results:** Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations and packet types.  
  
 All three transmit frequency modes comply with the field strength within the restricted bands. There is no spurious found below 30MHz.

**Mode: 802.11b**

Tx frequency 2412MHz                      Vertical Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
192.000	25.3	43.5/ QP
224.000	27.1	46/ QP
256.000	26.7	46/ QP
544.000	35.5	46/ QP
4824.000	55.6	74.0 / P
4824.000	44.1	54.0 / A
9648.000	57.0	74.0 / P
9648.000	46.7	54.0 / A

Tx frequency 2412MHz                      Horizontal Polarization

Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
160.000	20.8	43.5/ QP

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262.400	22.1	46/ QP
300.800	23.2	46/ QP
612.900	19.6	46/ QP
9648.000	58.9	74.0 / P
9648.000	49.8	54.0 / A
12059.000	50.8	74.0 / P
12059.000	38.5	54.0 / A
Tx frequency 2437MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
185.600	26.1	43.5/ QP
192.000	26.7	43.5/ QP
224.000	27.5	46/ QP
537.600	32.6	46/ QP
4874.000	50.9	74.0 / P
4874.000	39.2	54.0 / A
9748.500	55.2	74.0 / P
9748.500	41.7	54.0 / A
Tx frequency 2437MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
166.400	21.6	43.5/ QP
256.000	20.8	46/ QP
300.800	25.0	46/ QP
728.800	21.4	46/ QP
4874.000	45.4	74.0 / P
4874.000	35.8	54.0 / A
9748.500	60.3	74.0 / P
9748.500	43.6	54.0 / A
Tx frequency 2462MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
192.000	26.7	43.5/ QP
216.000	27.4	46/ QP
400.000	29.2	46/ QP
576.000	36.6	46/ QP
4925.000	46.1	74.0 / P
4925.000	35.8	54.0 / A
9848.500	51.2	74.0 / P
9848.500	39.3	54.0 / A
Tx frequency 2462MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
166.400	21.1	43.5/ QP
262.300	21.8	46/ QP
294.300	24.2	46/ QP
501.100	26.3	46/ QP
4925.000	45.6	74.0 / P
4925.000	31.5	54.0 / A
9523.500	49.2	74.0 / P
9523.500	35.7	54.0 / A

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<b>Mode: 802.11g</b>		
Tx frequency 2412MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
160.000	24.2	43.5/ QP
192.000	26.4	43.5/ QP
224.000	26.5	46/ QP
537.600	32.7	46/ QP
4824.000	48.7	74.0 / P
4824.000	35.9	54.0 / A
9648.000	54.1	74.0 / P
9648.000	41.3	54.0 / A
Tx frequency 2412MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
130.200	16.8	43.5/ QP
192.000	18.2	43.5/ QP
294.400	25.8	46/ QP
752.400	30.2	46/ QP
4824.000	43.7	74.0 / P
4824.000	31.3	54.0 / A
9648.000	54.7	74.0 / P
9648.000	38.4	54.0 / A
Tx frequency 2437MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
192.000	25.8	43.5/ QP
217.600	26.2	46/ QP
224.100	26.2	46/ QP
544.000	31.7	46/ QP
4874.000	45.8	74.0 / P
4874.000	33.0	54.0 / A
9748.000	50.6	74.0 / P
9748.000	38.4	54.0 / A
Tx frequency 2437MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
149.900	15.7	43.5/ QP
198.300	20.1	43.5/ QP
294.400	22.3	46/ QP
678.100	26.6	46/ QP
4874.000	42.4	74.0 / P
4874.000	29.3	54.0 / A
9748.000	54.0	74.0 / P
9748.000	41.7	54.0 / A
Tx frequency 2462MHz Vertical Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
192.000	23.8	43.5/ QP

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224.000	25.8	46/ QP
544.000	31.5	46/ QP
576.000	32.7	46/ QP
4925.000	46.1	74.0 / P
4925.000	34.0	54.0 / A
9849.000	50.6	74.0 / P
9849.000	35.7	54.0 / A
Tx frequency 2462MHz Horizontal Polarization		
Freq MHz	Level dBuV/m	Limit/ Detector dBuV/m
198.400	21.3	43.5/ QP
224.000	21.7	46/ QP
296.000	25.0	46/ QP
717.800	21.2	46/ QP
4925.000	42.5	74.0 / P
4925.000	28.8	54.0 / A
9849.000	50.2	74.0 / P
9849.000	36.8	54.0 / A

#### Subclause 15.247 (d) – Band Edge Emissions

**Pass**

Test Specification : FCC Part 15 Subpart A – Subclause 15.31  
Mode of operation : Tx mode (2412MHz, 2462MHz), DSSS  
Port of testing : Temporary antenna port  
Detector : Peak  
RBW/VBW : 100 kHz / 300 kHz  
Supply voltage : 5.0VDC from DC power supply  
Temperature : 23°C  
Humidity : 50%

**Requirement:** In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.

**Results:** There is no peak found outside any 100 kHz bandwidth of the operating frequency band. For test protocols refer to Appendix 1, page 16-27.

<b>Subclause 15.247 (e) – Power Spectral Density</b>				<b>Pass</b>
<b>Requirement:</b> For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.				
Test Specification : FCC Part 15 Subpart A – Subclause 15.31 Mode of operation : Tx mode (hopping on), DSSS Port of testing : Temporary antenna port Detector : Peak RBW/VBW : 3 KHz / 10 KHz Supply voltage : 5.0VDC from DC power supply Temperature : 23°C Humidity : 50%				
<b>Results:</b> For test protocols please refer to Appendix 1, page 28-33.				
<b>Mode: 802.11b</b>				
Channel	Channel frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
1	2412	-12.49	8.0	Pass
6	2437	-11.40	8.0	Pass
11	2462	-11.33	8.0	Pass
<b>Mode: 802.11b</b>				
Channel	Channel frequency (MHz)	Power density (dBm)	Limit (dBm)	Verdict
1	2412	-9.66	8.0	Pass
6	2437	-8.38	8.0	Pass
11	2462	-7.90	8.0	Pass
<b>Verdict:</b> Pass				

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Subclause 1.1310 – Maximum Permissive Exposure						Pass
Requirement: According to 1.1310 of the FCC rules, the power density limit for General Population/Uncontrolled Exposure is 1.0mW/cm <sup>2</sup> .						
$S = (10^{((P+G)/10)})/(4 \cdot \pi \cdot d^2)$ <p>Where,</p> <p>D = MPE distance in cm</p> <p>P = Power in dBm</p> <p>G = Antenna Gain in dBi</p> <p>S = Power Density Limit in mW/cm<sup>2</sup></p>						
Results:						
Mode	Frequency	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
802.11b	2462	20	15.675	0.7	0.009	1