

FCC ID: LYHMPCIE1V1

5.8 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part **CPC 3**.

5.8.1 Description of the test location

Test location: AREA4

5.8.2 Applicable standard

According to FCC Part 15, Section 15.247(i):

Systems operating under the provisions of this section shall be operated in a manner that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines.

The test methods used comply with ANSI/IEEE C95.1, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

This test report shows the compliance with the limits for Maximum Permissible Exposure (MPE) specified in FCC Part 1, Section 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in FCC Part 1, Section 1.1307(b).

5.8.3 Description of Measurement

The maximum total power input to the Antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, the known maximum gain of the Antenna and the maximum power, can be calculated the MPE in a defined distance away from the product.

Friis transmission formula:

$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density (mW/cm²)

P_{out} = output power to Antenna (mW)

G = gain of Antenna (linear scale)

r = distance between Antenna and observation point (cm)

According to FCC Rules 47CFR 2.1093(b) the EUT is not a portable device. The EUT is designed to be used that radiating structures are 20 cm outside of the body of the user. ($r = 20$ cm)

5.8.4 Test result

WLAN Standard 802.11g, 6 Mbps, 1 TX chain

Channel No.	Power	A (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)
1	P20	17.7	6.0	58.75	3.98	0.2339	0.0465	1.0
6	P20	18.5	6.0	70.63	3.98	0.2812	0.0559	1.0
11	P20	18.5	6.0	71.12	3.98	0.2831	0.0563	1.0

WLAN Standard 802.11n, HT20, MCS8, 2 TX chains

Channel No.	Power	A1 + A2 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)
1	P20	19.2	6.0	82.42	3.98	0.3281	0.0653	1.0
6	P20	19.7	6.0	92.90	3.98	0.3699	0.0736	1.0
11	P20	19.6	6.0	90.26	3.98	0.3593	0.0715	1.0
149	P20	17.2	6.0	53.06	3.98	0.2112	0.0420	1.0
157	P20	17.4	6.0	55.57	3.98	0.2212	0.0440	1.0
165	P20	17.0	6.0	50.22	3.98	0.1999	0.0398	1.0

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WLAN Standard 802.11n, HT40, MCS16, 3 TX chains

Channel No.	Power	A 1+2+3 (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)
1up	P20	19.0	6.0	79.57	3.98	0.3168	0.0630	1.0
4up	P20	19.3	6.0	84.37	3.98	0.3359	0.0668	1.0
7up	P20	19.3	6.0	84.27	3.98	0.3355	0.0667	1.0
149up	P20	18.3	6.0	67.29	3.98	0.2679	0.0533	1.0
157up	P20	18.2	6.0	65.99	3.98	0.2627	0.0523	1.0

WLAN Standard 802.11a, 6 Mbps, 1 TX chain

Channel No.	Power	A (dBm)	Antgain (dBi)	A (mW)	G linear	P (W)	S (mW/cm ²)	Limit S _{eq} (mW/cm ²)
149	P20	14.3	6.0	26.98	3.98	0.1074	0.0214	1.0
157	P20	14.1	6.0	25.76	3.98	0.1026	0.0204	1.0
165	P20	13.9	6.0	24.66	3.98	0.0982	0.0195	1.0

Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/f	2.19/f	180/f ²	30
30 – 300	27.5	0.073	0.2	30
300-1500	---	---	f/1500	30
1500-100000	---	---	1.0	30

f = Frequency in MHz

The requirements are **FULFILLED**.

Remarks:

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According to FCC Part 15, Subpart E, Section 15.407 (g):

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Operating frequency range limit	
(MHz)	(MHz)
5150	5250

The requirements are **FULFILLED**.

Remarks:

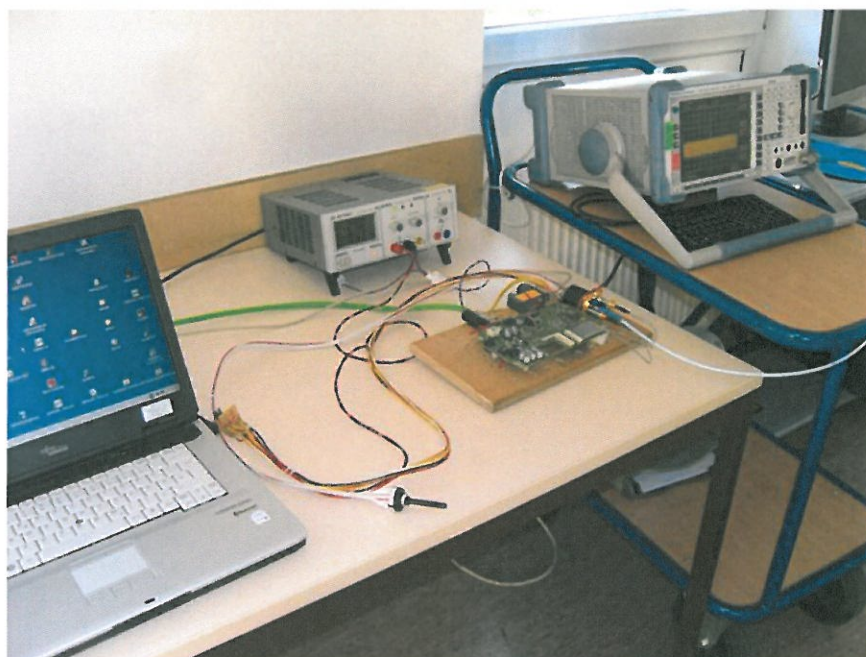
5.11 Maximum permissible exposure (MPE)

For test instruments and accessories used see section 6 Part CPC 3.

5.11.1 Description of the test location

Test location: AREA4

5.11.2 Photo documentation of the test set-up



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5.11.3 Applicable standard

According to FCC Part 15, Section 15.407(f):

U-NII devices are subject to the radio frequency radiation exposure requirements specified in Section 1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. The test methods used comply with ANSI/IEEE C95.1-2005, "IEEE Standard for Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz".

5.11.4 Description of Measurement

The maximum total power input to the antenna has been measured conducted as described in clause 5.3 of this document. Through the Friis transmission formula, which is a far field assumption and the known maximum gain of the antenna, the maximum MPE at a defined distance away from the product, can be calculated.

Friis transmission formula:

$$P_d = \frac{P_{out} * G}{4 * \pi * r^2}$$

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna (linear scale)

r = distance between antenna and observation point (cm)

For fixed equipment the distance $r = 20$ cm;

5.11.5 Test result

WLAN Standard 802.11n, HT20, 2 TX chains, highest power level:

Channel	Power setting	A1+A2	Antgain	A	G	P	S	Limit S _{eq}
No.		(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm ²)	(mW/cm ²)
36	P17	15.5	6.0	35.53	3.98	0.1414	0.0281	1.0
40	P17	15.6	6.0	36.39	3.98	0.1449	0.0288	1.0
48	P17	15.1	6.0	32.31	3.98	0.1286	0.0256	1.0

WLAN Standard 802.11n, HT40, 3 TX chains, highest power level:

Channel	Power setting	A1+A2+A3	Antgain	A	G	P	S	Limit S _{eq}
No.		(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm ²)	(mW/cm ²)
36up	P17	16.0	6.0	40.09	3.98	0.1596	0.0318	1.0
44up	P17	16.1	6.0	41.09	3.98	0.1636	0.0325	1.0

WLAN Standard 802.11a, Legacy, 1 TX chain, highest power level:

Channel	Power setting	A	Antgain	A	G	P	S	Limit S _{eq}
No.		(dBm)	(dBi)	(mW)	linear	(W)	(mW/cm ²)	(mW/cm ²)
36	P17	14.7	6.0	29.58	3.98	0.1178	0.0234	1.0
40	P17	14.9	6.0	30.90	3.98	0.1230	0.0245	1.0
48	P17	14.7	6.0	29.65	3.98	0.1180	0.0235	1.0

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Limits for maximum permissible exposure (MPE):

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(B) Limits for General Population / Uncontrolled Exposure				
0.3 – 3.0	614	1.63	100	30
3.0 – 30	824/f	2.19/f	180/ f ²	30
30 - 300	27.5	0.073	0.2	30
300-1500	---	---	f/1500	30
1500-100000	---	---	1.0	30

f = Frequency (MHz)

The requirements are **FULFILLED**.

Remarks: This test shows the compliance with the limits for maximum permissible exposure (MPE) specified in FCC 1.1310 and the criteria to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in FCC 1.1307(b).