1 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.1 Standard Applicable

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S=PG/4\pi R^2$

Where: S = Power density

P = Power input to antenna

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna

802.11a Max. output power (Worst Case)

802.11n_HT20_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1			
36	5180	MCS8	12.82	12.69	**15.99**	23.98	PASS
44	5220	MCS8	12.79	12.66	15.96	23.98	PASS
48	5240	MCS8	12.78	12.64	15.94	23.98	PASS
52	5260	MCS8	12.74	12.6	**15.90**	23.98 or 11+10log(B) = 22.74	PASS
60	5300	MCS8	12.65	12.53	15.82	23.98 or 11+10log(B) = 22.74	PASS
64	5320	MCS8	12.63	12.49	15.79	23.98 or 11+10log(B) = 22.74	PASS
100	5500	MCS8	12.75	12.61	15.91	23.98 or 11+10log(B) = 22.34	PASS
116	5580	MCS8	12.74	12.58	15.90	23.98 or 11+10log(B) = 22.34	PASS
140	5700	MCS8	12.82	12.67	**15.98**	23.98 or 11+10log(B) = 22.34	PASS
149	5745	MCS8	12.83	12.68	**15.99**	30	PASS
157	5785	MCS8	12.82	12.68	15.98	30	PASS
165	5825	MCS8	12.81	12.67	15.97	30	PASS

MPE Prediction (802.11a 5725~5850MHz)

Average output power at antenna input terminal:	15.99	(dBm)
Average output power at antenna input terminal:	39.719155	(mW)
Duty cycle:	97.34	(%)
Maximum Pav :	38.662625	(mW)
Peak Antenna gain (Maximum):	4.3	(dBi)
Peak Antenna gain (linear):	2.6915348	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm2)
Power density at predication frequency at 20 (cm) distance	0.021	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.021 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 5745MHz.

802.11n_HT40 Max. output power (Worst Case)

802.11n_HT40_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)	RESULT
			CH 0	CH 1			
38	5190	MCS8	12.59	12.37	**15.92**	23.98	PASS
46	5230	MCS8	12.54	12.32	15.87	23.98	PASS
54	5270	MCS8	12.63	12.44	15.98	23.98 or 11+10log(B) = 25.95	PASS
62	5310	MCS8	12.65	12.45	**15.99**	23.98 or 11+10log(B) = 25.95	PASS
102	5510	MCS8	12.66	12.43	**15.99**	23.98 or 11+10log(B) = 25.58	PASS
110	5550	MCS8	12.62	12.39	15.95	23.98 or 11+10log(B) = 25.58	PASS
134	5670	MCS8	12.64	12.41	15.97	23.98 or 11+10log(B) = 25.58	PASS
151	5755	MCS8	12.62	12.34	15.92	30	PASS
159	5795	MCS8	12.63	12.42	**15.97**	30	PASS

MPE Prediction (802.11n_HT40 5250~5350MHz)

Average output power at antenna input terminal:	15.99	(dBm)
Average output power at antenna input terminal:	39.719155	(mW)
Duty cycle:	90.56	(%)
Maximum Pav :	35.969667	(mW)
Peak Antenna gain (Maximum):	4.4	(dBi)
Peak Antenna gain (linear):	2.7542287	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5510	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm2)
Power density at predication frequency at 20 (cm) distance	0.020	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.02 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 5510MHz.

802.11ac_VHT80 Max. output power (Worst Case)

802.11ac_VHT80_MIMO

CH	Frequency (MHz)	Data Rate	Avg. POWER (dBm)		TOTAL POWER (dBm)	REQUIRED LIMIT (dBm)			RESULT
			CH 0	CH 1					
42	5210	MCS8	12.64	12.39	**15.99**	23.98			PASS
58	5290	MCS8	12.44	12.23	**15.81**	23.98	or 11+10log(B) =	29.07	PASS
106	5530	MCS8	12.56	12.3	15.91	23.98	or 11+10log(B) =	28.65	PASS
122	5610	MCS8	12.65	12.38	**15.99**	23.98	or 11+10log(B) =	28.72	PASS
155	5775	MCS8	12.64	12.36	**15.98**	30			PASS

MPE Prediction (802.11ac_VHT80 5725~5850MHz)

Average output power at antenna input terminal:	15.99	(dBm)
Average output power at antenna input terminal:	39.719155	(mW)
Duty cycle:	89.88	(%)
Maximum Pav :	35.699576	(mW)
Peak Antenna gain (Maximum):	4.4	(dBi)
Peak Antenna gain (linear):	2.7542287	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5610	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	1	(mW/cm2)
Power density at predication frequency at 20 (cm) distance	0.020	(mW/cm2)

Measurement Result

The predicted power density level at 20 cm is 0.02 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 5610MHz.