MAXIMUM PERMISSIBLE EXPOSURE (MPE)(FCC)

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 §2.1093 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

Maximum Permissible Exposure (MPE) Evaluation

CH	Frequency (MHz)	Max. output power including tune-up tolerance (dBm)	Required Limit
1	2412	14.95	1 Watt = 30 dBm
6	2437	14.94	1 Watt = 30 dBm
11	2462	14.93	1 Watt = 30 dBm

MPE Prediction (802.11b 2412~2462)

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

Max. output power including tune-up tolerancel:	14.95	(dBm)
Max. output power including tune-up tolerancel:	31.260794	(mW)
Duty cycle:	100	(%)
Maximum Pav :	31.260794	(mW)
Peak Antenna gain (Maximum):	2.14	(dBi)
Peak Antenna gain (linear):	1.6368165	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.010	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.01 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2412MHz.

CH	Frequency (MHz)	Max. output power including tune-up tolerance (dBm)	Required Limit
1	2412	14.98	1 Watt = 30 dBm
6	2437	14.95	1 Watt = 30 dBm
11	2462	14.85	1 Watt = 30 dBm

MPE Prediction (802.11g 2412~2462)

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

Max. output power including tune-up tolerancel:	14.98	(dBm)
Max. output power including tune-up tolerancel:	31.477483	(mW)
Duty cycle:	100	(%)
Maximum Pav :	31.477483	(mW)
Peak Antenna gain (Maximum):	2.14	(dBi)
Peak Antenna gain (linear):	1.6368165	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2412	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.010	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.01 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2412MHz.

CH	Frequency (MHz)	Max. output power including tune-up tolerance (dBm)	Required Limit
1	2412	14.92	1 Watt = 30 dBm
6	2437	14.94	1 Watt = 30 dBm
11	2462	14.82	1 Watt = 30 dBm

MPE Prediction (802.11n_20M 2412~2462)

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

Max. output power including tune-up tolerancel:	14.94	(dBm)
Max. output power including tune-up tolerancel:	31.188896	(mW)
Duty cycle:	100	(%)
Maximum Pav :	31.188896	(mW)
Peak Antenna gain (Maximum):	2.14	(dBi)
Peak Antenna gain (linear):	1.6368165	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.010	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.01 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2437MHz.

CH	Frequency (MHz)	Max. output power including tune-up tolerance (dBm)	Required Limit
3	2422	14.98	1 Watt = 30 dBm
6	2437	14.93	1 Watt = 30 dBm
9	2452	13.65	1 Watt = 30 dBm

MPE Prediction (802.11n_40M 2422~2452)

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

Max. output power including tune-up tolerancel:	14.98	(dBm)
Max. output power including tune-up tolerancel:	31.477483	(mW)
Duty cycle:	100	(%)
Maximum Pav :	31.477483	(mW)
Peak Antenna gain (Maximum):	2.14	(dBi)
Peak Antenna gain (linear):	1.6368165	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2422	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.010	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.01 mW/cm2.

This is below the uncontrolled exposure limit of 1 mW/cm2 at 2422MHz.

MAXIMUM PERMISSIBLE EXPOSURE (MPE)(IC)

Standard Applicable:

According to RSS 102 March 19,2015 issue 5 §2.5.2 RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $22.48/f^{0.5}$W (adjusted for tune-up tolerance), where f is in MHz;

at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

This is a Mobile device, at which separation distance between the user and the device's antenna is 20cm. Therefore, section 2.5.2 shall be complied with

Maximum Permissible Exposure (MPE) Evaluation

802.11 b:

Max. output power including tune-up tolerance:	14.95	(dBm)
Max. output power including tune-up tolerance:	31.260794	(mW)
Antenna gain (Peak):	2.14	(dBi)
Maximum antenna gain:	1.6368165	(numeric)
Frenquency	2412	MHz
Limit	**2.6840**	W

Evaluation Result

The radiated power is 14.95 + 2.14 = 17.09 dBm(EIRP) =51.168mW =0.051168W that is less than or equal to 2.684W. Hence, following section 2.5.2 of RSS102 issue 5 RF exposure evaluation is no longer required.

802.11 g:

Max. output power including tune-up tolerance:	14.98	(dBm)
Max. output power including tune-up tolerance:	31.477483	(mW)
Antenna gain (Peak):	2.14	(dBi)
Maximum antenna gain:	1.6368165	(numeric)
Frenquency	2412	MHz
Limit	**2.6840**	W

Evaluation Result

The radiated power is 14.98 + 2.14 = 17.12 dBm(EIRP) =51.523mW =0.051523W that is less than or equal to 2.684W. Hence, following section 2.5.2 of RSS102 issue 5 RF exposure evaluation is no longer required.

802.11n_HT20:

Max. output power including tune-up tolerance:	14.94	(dBm)
Max. output power including tune-up tolerance:	31.188896	(mW)
Antenna gain (Peak):	2.14	(dBi)
Maximum antenna gain:	1.6368165	(numeric)
Frenquency	2437	MHz
Limit	**2.7030**	W

Evaluation Result

The radiated power is 14.94 + 2.14 = 17.08 dBm(EIRP) =51.05mW =0.05105W that is less than or equal to 2.703W. Hence, following section 2.5.2 of RSS102 issue 5 RF exposure evaluation is no longer required.

802.11n HT40:

Max. output power including tune-up tolerance:	14.98	(dBm)
Max. output power including tune-up tolerance:	31.477483	(mW)
Antenna gain (Peak):	2.14	(dBi)
Maximum antenna gain:	1.6368165	(numeric)
Frenquency	2422	MHz
Limit	**2.6916**	W

Evaluation Result

The radiated power is 14.98 + 2.14 = 17.12 dBm(EIRP) =51.523mW =0.051523W that is less than or equal to 2.692W. Hence, following section 2.5.2 of RSS102 issue 5 RF exposure evaluation is no longer required.