Maximum Permissible Exposure (MPE)

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.

RSS 102 issue 5.

This is a Mobile device, the MPE is required.

FCC: 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

Tune-Up Power and Tolerance:

RF power setting in TEST SoftWare	B1 a mode : 7.5 n20 mode: 4.5 n40 mode : 7 ac mode : 7 B4 a mode : 15 n20 mode: 12 n40 mode : 13 ac mode : 13

Power Tolerance: +/- 1 dB

Measured Power Level for FCC

Wi-Fi	Frequency Range (MHz)	Channels	Peak / Average Rated Power	Modulation Technology
802.11a	5180 – 5240(NII)	4	6.57dBm (AV)	OFDM
	5745 – 5825(NII)	5	13.01dBm (AV)	
802.11n(5G)	HT20, 5180 – 5240(NII)	4	7.11dBm (AV)	
	HT20, 5745 – 5825(NII)	5	12.77 dBm (AV)	
	HT40, 5190 – 5230(NII)	3	8.73dBm (AV)	
	HT40, 5755 – 5815(NII)	4	13.06dBm (AV)	
802.11ac	HT80, 5210(NII)	1	8.07dBm (AV)	
	HT80, 5775(NII)	1	12.34dBm (AV)	
Modulation type		CCK, DQPSK, DBPSK for DSSS 256QAM.64QAM. 16QAM, QPSK, BPSK for OFDM		
Antenna Designation		Patch array antenna Antenna WiFi 5G Antenna : 16.5 dBi		

The EUT is compliance with IEEE 802.11 a/n/ac Standard.

5150MHz – 5250MHz Mode:

Power measurement:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

Mode	Freq(MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)	Result
		Chain A	chain B			
N HT40	5190	5.28	6.11	8.73	30	Pass
	5210	5.57	5.45	8.52	30	Pass
	5230	5.43	5.32	8.39	30	Pass

Power Tolerance: +/- 1 dBm

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

Maximum output power at antenna input terminal:	8.73	(dBm)
Maximum output power at antenna input terminal:	7.464487584	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	9.397233106	(mW)
Antenna gain (typical):	16.5	(dBi)
Maximum antenna gain:	44.66835922	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.0835508	(mW/cm^2)

Result:

The predicted power density level at 20 cm is 0.08355 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

5725MHz – 5850MHz Mode:

Power measurement:

The worst case of Average power a mode: refer to FCC test report for detail measurement date.

	Freq(MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)	Result
		Chain A	chain B			
N HT40	5755	9.94	9.83	12.90	30	Pass
	5775	9.91	9.87	12.90	30	Pass
	5815	9.98	10.12	13.06	30	Pass

Power Tolerance: +/- 1 dBm

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

Maximum output power at antenna input terminal:	13.06	(dBm)
Maximum output power at antenna input terminal:	20.23019179	(mW)
Tune-Up power Tolerance:	1	dB
Duty cycle:	100	(%)
Maximum Pav :	25.46830253	(mW)
Antenna gain (typical):	16.5	(dBi)
Maximum antenna gain:	44.66835922	(numeric)
Prediction distance:	20	(cm)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm^2)
Power density at predication frequency at 20 (cm)	0.2264386	(mW/cm^2)

Result:

The predicted power density level at 20 cm is 0.22644mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2.

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