Per FCC §1.1310

MPE Evaluation Formula: $P_d = (P_r) / (4\pi r^2)$

Where,

P_d = Power Density (mW/cm^2)

P_r = Output Power in EIRP (mW) = $1*10^{((P_{out}+G)/10)}$

     P_{out} = Conducted output power (dBm)

     G = gain of antenna (dBi)

π = 3.141592654

r = distance between observation point and center of the radiator (cm)

				FCC 47 CFR 1.1310 MPE Exclusion Calculation					
				Maximum Peak Output Power					
Antenna	Antenna Type	Tx	Frequency (MHz)	dBm	mW	Separation Distance (cm)	Worst Case (mW/cm^2)	Threshold (mW/cm^2)	Result
1	Dipole	U-NII 1	5220	23.89	244.71	300	0.01	1.0	**Pass by Exclusion; Threshold Value is less than 1.0.**
2	Dipole	U-NII 1	5220						
1	Horn	U-NII 1	5220	7.05	5.07	300	0.01	1.0	**Pass by Exclusion; Threshold Value is less than 1.0.**
2	Horn	U-NII 1	5220						
1	Dipole	U-NII 3	5745	25.38	345.16	300	0.01	1.0	**Pass by Exclusion; Threshold Value is less than 1.0.**
2	Dipole	U-NII 3	5745						
1	Horn	U-NII 3	5745	7.29	5.36	300	0.01	1.0	**Pass by Exclusion; Threshold Value is less than 1.0.**
2	Horn	U-NII 3	5745						

*Results are rounded to nearest 0.01

RSS-102 SAR exemption calculation

Summary:

Minimum typical separation distance between the antenna and the user = 3 Meters = 300 centimeters

Exemption limit from RSS-102 for routine evaluation based on frequency and separation distance for ≥

300MHz ≤ 6GHz = **4.5491W** @ 5.22GHz & **4.857W** @ 5.745GHz (see Appendix A)

EUT's EIRP with Dipole Antenna @ 5.22GHz= 0.8091 W (see EIRP calculation below)

EUT's EIRP with Horn Antenna @ 5.22Gz= 0.1366 W (see EIRP calculation below)

EUT's EIRP with Dipole Antenna @ 5.745GHz= 0.9863 W (see EIRP calculation below)

EUT's EIRP with Horn Antenna @ 5.745GHz= 0.1443 W (see EIRP calculation below)

0.8091W < 4.5491W, 0.1366W < 4.5491W, 0.9863W < 4.857W, and 0.1443W < 4.857W, therefore the

EUT is exempt from routine SAR evaluation.

EIRP Limit calculation:

@5.22GHz = $1.31*10^{-2}(5220^{0.6834})$ = 4.5491 W

@5.745GHz = $1.31*10^{-2}(5745^{0.6834})$ =4.857 W

EIRP calculation:

Dipole Antenna @5.22GHz

23.89dBm peak conducted RF output power as measured using a method compliant with RSS-210

5.19 dBi peak antenna gain

EIRP = peak conducted RF power + peak antenna gain = 23.89dBm + 5.19 dBi = 29.08dBm = 0.8091W

Horn Antenna @5.22GHz

7.05 dBm peak conducted RF output power as measured using a method compliant with RSS-210

14.3 dBi peak antenna gain

EIRP = peak conducted RF power + peak antenna gain = 7.05dBm + 14.3dBi = 21.35dBm = 0.1366W

Dipole Antenna @5.745GHz

25.38dBm peak conducted RF output power as measured using a method compliant with RSS-210

4.56dBi peak antenna gain

EIRP = peak conducted RF power + peak antenna gain = 25.38dBm + 4.56 dBi = 29.94dBm = 0.9863W

Horn Antenna @5.745GHz

7.29 dBm peak conducted RF output power as measured using a method compliant with RSS-210

14.3 dBi dBi peak antenna gain

EIRP = peak conducted RF power + peak antenna gain = 7.29dBm + 14.3dBi = 21.59dBm = 0.1443 W

Conclusion:

For our EUT transmitting at 5220 MHz with the dipole antenna, if we evaluate the EUT against the exemption limits at a distance of 3m (typical use case), the power at this distance must be below 4.5491W. 4.5491W – 0.8091W = 3.7400W of margin (pass).

For our EUT transmitting at 5220 MHz with the horn antenna, if we evaluate the EUT against the exemption limits at a distance of 3m (typical use case), the power at this distance must be below 4.5491W. 4.5491W – 0.1366W = 4.4125W of margin (pass).

For our EUT transmitting at 5745 MHz with the dipole antenna, if we evaluate the EUT against the exemption limits at a distance of 3m (typical use case), the power at this distance must be below 4.857W. 4.857W – 0.9863W = 3.5628W of margin (pass).

For our EUT transmitting at 5745 MHz with the Horn antenna, if we evaluate the EUT against the exemption limits at a distance of 3m (typical use case), the power at this distance must be below 4.857W. 4.857W – 0.1443W = 4.7127W of margin (pass).

Appendix A:

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: the criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b).

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm²)	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	…	…	f/300	6
1500-100,000	…	…	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	…	…	f/1500	30
1500-100,000	…	…	1.0	30

Table 1-1. Limits for Maximum Permissible Exposure (MPE)

From RSS-102

2.5.2 Exemption Limits for Routine Evaluation — 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;

- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.