Maximum Permissible Exposure (MPE) Requirement

Applicant: Recon Dyanmics
FCC ID: YQN-B0-0003

According to §1.1307 (b)(1) and §2.1091, systems operating under the provisions of these sections shall be operated in a manner that ensures the public is not exposed to RF energy level in excess of the communication guidelines.

Limits for General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm2)**	**Averaging Time (Minutes)**
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500	--	--	f/1500	30
1500-100,000	--	--	1.0	30

f = frequency in MHz; * = Plane-wave equivalent power density

This document was prepared using data collected during testing and information provided by the applicant. Calculations were made and compared to the limits of 47 CFR §1.1310(e) Table 1. The power density is calculated using the following equation.

$$P_d = \frac{P_t\, G^{*}}{4\pi r^2}$$

P_d = power density in watts
P_t = transmit power in milliwatts
G = numeric antenna gain
r = distance between body and transmitter in centimeters
* $P_t\, G$ = EIRP

The calculated power density for each of the transmitters included in the EUT listed in this application is calculated below.

Primary 2400 – 2483.5 MHz Transceiver

This transceiver may use one of 4 different antennas. The maximum gain of any of the antennas is 15 dBi and is used in these calculations.

F (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Duty Cycle (%)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
2405	16.71	15.0	31.71	1482.52	100	0.2949	1.00	0.7051
2440	16.43	15.0	31.43	1389.95	100	0.2765	1.00	0.7235
2475	15.14	15.0	30.14	1032.76	100	0.2055	1.00	0.7945

Secondary 2400 – 2483.5 MHz Transceiver

The maximum gain of the antenna is 3.75 dBi and is used for all calculations for this transceiver.

F (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Duty Cycle (%)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
2405	18.08	3.75	21.83	152.41	100	0.0303	1.00	0.9697
2440	17.47	3.75	21.22	132.43	100	0.0263	1.00	0.9737
2475	17.27	3.75	21.02	126.47	100	0.0252	1.00	0.9748

Cell Modules

FCC ID PKRNVWMC551

The maximum gain of the antenna for the associated frequency is used for calculations.

F (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Duty Cycle (%)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
782	24.00	3.99	27.99	629.51	100	0.1252	0.5213	0.3961
835	24.49	3.99	28.48	704.69	100	0.1402	0.5567	0.4165
1900	23.97	2.54	26.51	447.71	100	0.0891	1.0	0.9109

FCC ID PKRNVWMC760

The maximum gain of the antenna for the associated frequency is used for calculations.

F (MHz)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (mW)	Duty Cycle (%)	Power Density (mW/cm^2)	Limit (mW/cm^2)	Margin (mW/cm^2)
835	24.89	3.99	28.88	772.68	100	0.1537	0.5567	0.4030
1900	24.46	2.54	27.00	501.19	100	0.0997	1.0	0.9003

As the transceivers may transmit at the same time. The maximum power densities calculated for the primary and secondary transceivers are added to the cell module power densities and the results are compared to the lowest limit for exposure in order to demonstrate compliance as shown in the tables below.

Case #1

Primary transceiver, secondary transceiver and FCC ID PKRNVWMC551 transmitting at 782 MHz.

Transceiver	Power Density (mW/cm2)	Lowest Limit (mW/cm2)	Margin (mW/cm^2)
Primary Transceiver Worst-case Power Density	0.2949	--	
Secondary Transceiver Worst-case Power Density	0.0303	--	
PKRNVWMC551 at 782 MHz	0.1252	--	
Summed Power Density	0.4504	0.5213	0.0709

Case #2

Primary transceiver, secondary transceiver and FCC ID PKRNVWMC551 transmitting at 835 MHz.

Transceiver	Power Density (mW/cm2)	Lowest Limit (mW/cm2)	Margin (mW/cm^2)
Primary Transceiver Worst-case Power Density	0.2949	--	
Secondary Transceiver Worst-case Power Density	0.0303	--	
PKRNVWMC551 at 835 MHz	0.1402	--	
Summed Power Density	0.4654	0.5567	0.0913

Case #3

Primary transceiver, secondary transceiver and FCC ID PKRNVWMC551 transmitting at 1900 MHz.

Transceiver	Power Density (mW/cm2)	Lowest Limit (mW/cm2)	Margin (mW/cm^2)
Primary Transceiver Worst-case Power Density	0.2949	--	
Secondary Transceiver Worst-case Power Density	0.0303	--	
PKRNVWMC551 at 1900 MHz	0.0891	--	
Summed Power Density	0.4143	1.0	0.5857

Case #4

Primary transceiver, secondary transceiver and FCC ID PKRNVWMC760 transmitting at 835 MHz.

Transceiver	Power Density (mW/cm2)	Lowest Limit (mW/cm2)	Margin (mW/cm^2)
Primary Transceiver Worst-case Power Density	0.2949	--	
Secondary Transceiver Worst-case Power Density	0.0303	--	
PKRNVWMC760 at 835 MHz	0.1537	--	
Summed Power Density	0.4789	0.5567	0.0778

Case #5

Primary transceiver, secondary transceiver and FCC ID PKRNVWMC760 transmitting at 1900 MHz.

Transceiver	Power Density (mW/cm2)	Lowest Limit (mW/cm2)	Margin (mW/cm^2)
Primary Transceiver Worst-case Power Density	0.2949	--	
Secondary Transceiver Worst-case Power Density	0.0303	--	
PKRNVWMC760 at 1900 MHz	0.0997	--	
Summed Power Density	0.4249	1.0	0.5751

Result

The EUT complies with the exposure limits for a separation distance of 20 cm or more for the general population in all transmitting conditions.

Signed: 10/23/2018
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