

5.4. RF EXPOSURE REQUIRMENTS [§§ 15.247(i), 1.1310 & 2.1091]

§ 1.1310: 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).

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) 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
1500-100,000			1.0	30

f = frequency in MHz

* = Plane-wave equivalent power density

Note 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

Note 2: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

5.4.1. Method of Measurements

Calculation Method of Power Density/RF Safety Distance:

$$S = \frac{PG}{4\pi \cdot r^2} = \frac{EIRP}{4\pi \cdot r^2}$$

Where,

P: power input to the antenna in mW

EIRP: Equivalent (effective) isotropic radiated power.

S: power density mW/cm²

G: numeric gain of antenna relative to isotropic radiator

r: distance to centre of radiation in cm

5.4.2. RF Evaluation

Pursuant to KDB 447498 D01 General RF Exposure Guidance v06, Section 7.2:

Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneously transmitting antennas incorporated in a host device is ≤ 1.0 , according to calculated/estimated, numerically modeled, or measured field strengths or power density.

The following table addresses the co-location of all simultaneous transmitters within the EUT at a minimum separation distance 35 cm

Transmitters	Frequency (MHz)	EUT EIRP (dBm)	EUT EIRP (mW)	Evaluation Distance (cm)	Power Density (mW/cm ²)	FCC MPE Limit (mW/cm ²)	MPE Ratio
Transmitters on EXB45 within EUT	0.125	--	--	35	--	--	--
	433.92	-5.79	0.264	35	0.00002	0.289	0.00007
Impinj, Inc. Speedway Revolution UHF RFID Reader FCC ID: TWYIPJREV IC: 6324A-IPJREV	902.0	--	4000	35	0.260	0.601	0.432
Digi International Inc ConnectCore for i.MX6UL FCC ID: MCQ- CCIMX6UL IC: 1846A-CCIMX6UL	2402	10.6	11.482	35	0.001	1.000	0.001
	2412	22.6	181.97	35	0.012	1.000	0.012
	5180	16.1	40.738	35	0.003	1.000	0.003
Sum of the MPE ratios for all simultaneously transmitting antennas incorporated within the EUT							0.445

Note: The worst-case configuration (maximum MPE ratio) for each radio module derived from the original radio MPE report was used in the computation. Refer to these reports for detail.

Conclusion: The sum of the MPE ratios is $0.445 \leq 1.0$, thus the EUT is in compliance with the RF exposure requirements