



MPE Calculations

Systems operating under the provision of 47 CFR 1.1307(b)(1) shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the FCC guidelines.

The EUT will only be used with a separation of 20 centimeters or greater between the antenna and the body of the user or nearby persons and can therefore be considered a mobile transmitter per 47 CFR 2.1091(b). The MPE calculation for this exposure is shown below.

Using the Antennas with highest output power:

The peak radiated output power (EIRP) is calculated as follows:

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Power input to the antenna (P) (dBm)</i>	<i>Power gain of the antenna (G) (dBi)</i>	<i>EIRP (P+G) (dBm)</i>	<i>EIRP $\text{Log}^{-1}(\text{dBm}/10)$ (mW)</i>
ZRS Hitachi (Chain A)	2.4	23.83	1.00	24.83	304.09
ZRS Hitachi (Chain A)	5	20.91	3.80	24.71	295.80
ZRS Hitachi (Chain B)	2.4	23.63	1.00	24.63	290.40
ZRS Hitachi (Chain B)	5	20.61	3.80	24.41	276.06

$\text{EIRP} = P + G$

Where

P = Power input to the antenna (mW).

G = Power gain of the antenna (dBi)

The numeric gain (G) of the antenna with a gain specified in dB is determined by:

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Antenna Gain (G) (dBi)</i>	<i>Numeric Antenna Gain $\text{Log}^{-1}(\text{dBm}/10)$ (dB)</i>
ZRS Hitachi (Chain A)	2.4	1.00	1.26
ZRS Hitachi (Chain A)	5	3.80	2.40
ZRS Hitachi (Chain B)	2.4	1.00	1.26
ZRS Hitachi (Chain B)	5	3.80	2.40

$G = \text{Log}^{-1}(\text{dB antenna gain}/10)$



Power density at the specific separation:

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Power input to the antenna (P) (mW)</i>	<i>Numeric Power Gain of the Antenna (G) (dB)</i>	<i>Maximum Power Spectral Density $S=PG/(4R^2\pi)$ (mW/cm²)</i>	<i>Maximum Power Spectral Density Limit (mW/cm²)</i>
ZRS Hitachi (Chain A)	2.4	241.55	1.26	0.060	1.00
ZRS Hitachi (Chain A)	5	123.31	2.40	0.059	1.00
ZRS Hitachi (Chain B)	2.4	230.67	1.26	0.058	1.00
ZRS Hitachi (Chain B)	5	115.08	2.40	0.055	1.00

$$S = PG/(4R^2\pi)$$

Where

S = Maximum power density (mW/cm²)

P = Power input to the antenna (mW).

G = Numeric power gain of the antenna

R = Distance to the center of the radiation of the antenna (20cm = limit for MPE)

The maximum permissible exposure (MPE) for the general population is 1mW/cm².

The power density at 20cm does not exceed the 1mW/cm² limit. Therefore, the exposure condition is compliant with FCC rules.

Aggregate Maximum Power Spectral Density:

<i>Antenna</i>	<i>Frequency (GHz)</i>	<i>Maximum Power Spectral Density Chain A (dBi)</i>	<i>Maximum Power Spectral Density Chain B (dBi)</i>	<i>Maximum Power Spectral Density Aggregate Chain A & B (dBi)</i>	<i>Maximum Power Spectral Density Limit (mW/cm²)</i>
ZRS Hitachi	2.4	0.060	0.058	0.059	1.00
ZRS Hitachi	5	0.059	0.055	0.057	1.00