



MPE Calculations

Systems operating under the provision of 47 CFR 1.1307(b)(1) shall be operated in a manor 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>
Greenland Hitachi (Chain A)	2.4	23.83	3.00	26.83	481.95
Greenland Hitachi (Chain A)	5	20.91	2.10	23.01	199.99
Greenland Hitachi (Chain B)	2.4	23.63	3.00	26.63	460.26
Greenland Hitachi (Chain B)	5	20.61	2.10	22.71	186.64

$\text{EIRP} = P + G$

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>
Greenland Hitachi (Chain A)	2.4	3.00	2.00
Greenland Hitachi (Chain A)	5	2.10	1.62
Greenland Hitachi (Chain B)	2.4	3.00	2.00
Greenland Hitachi (Chain B)	5	2.10	1.62

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



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>
Greenland Hitachi (Chain A)	2.4	241.55	2.00	0.096	1.00
Greenland Hitachi (Chain A)	5	123.31	1.62	0.040	1.00
Greenland Hitachi (Chain B)	2.4	230.67	2.00	0.092	1.00
Greenland Hitachi (Chain B)	5	115.08	1.62	0.037	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>
Greenland Hitachi	2.4	0.096	0.092	0.094	1.00
Greenland Hitachi	5	0.040	0.037	0.038	1.00