Appendix
Power Rating for Coaxial Connectors

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Average Power Ratings for Coaxial Connectors

The following graph summarizes industry acceptable average power rating for a variety of coaxial connector types. The key characteristic that determines average power handling capabilities for mated coaxial connectors is its ability to pass high current and keep heat-rise to a moderate temperature. This heating directly relates to contact resistance. Contact resistance is a function of contact surface area. Therefore properly formed center contacts are critical. If connectors are long, then conductor length resistance may start to dominate. The average power rating decreases with frequency because the resistive losses increase with frequency.

High power failure is caused by the generation of heat at the contacting surfaces. When the contact resistance approaches surface resistance including skin effect, the ultimate power handling level will be approached. Application results are affected by heat-sinking of the connector plus the connector's construction and use of higher-temperature materials. Another limiting factor is altitude because of the connector's increasing inability to dissipate heat as altitude increases. Power derating factors for temperature and altitude are provided on the following table.

Thus, determining the exact power of a connector is not an absolute as many factors contribute to the power rating. Average power handling is dependent on frequency, altitude, input load VSWR and ambient temperature. Additional results may vary from supplier-to-supplier due to design, materials and manufacturing latitudes taken. Therefore published power ratings are typically approximations.

Extended Power Super SMA
Southwest Microwave's "Extended Power Super SMA" connectors provide additional power handling capabilities above most standard SMA connectors, because they operate reliably at higher temperatures (165°C). The temperature rating as specified is the temperature that the connector will withstand and still meet the electrical specifications. As a basic guideline, the Extended Power Super SMA will handle an additional 100W average power above that which is represented in the following power chart for SMA. As an example, the recommended maximum power rating for Extended Power Super SMA connector is 250W CW at Ku-band (12.4–18.0 GHz), at 40°C at sea level.

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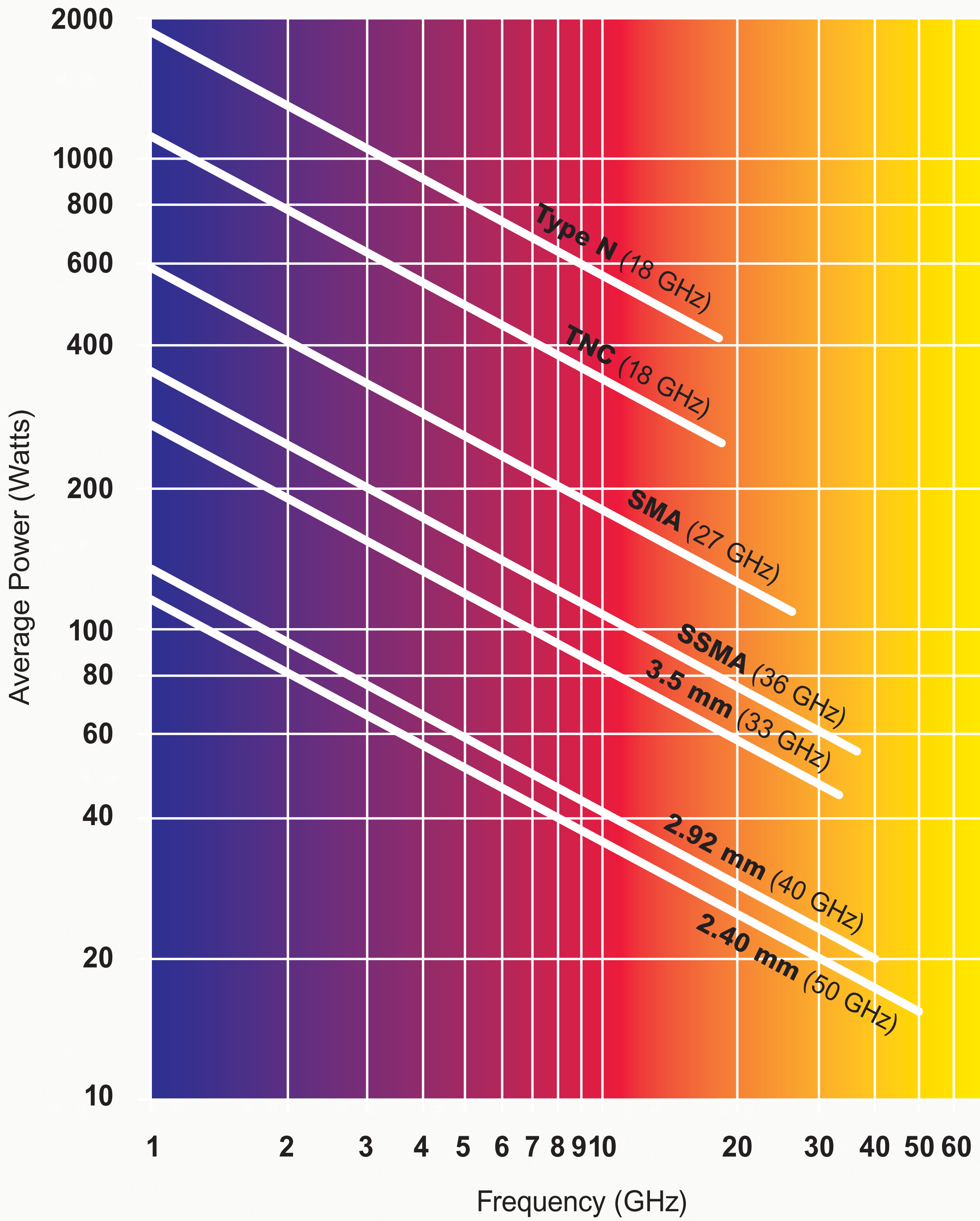
Coaxial Connector Average Power Handling Graph



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TYPICAL AVERAGE
POWER DERATING FACTORS

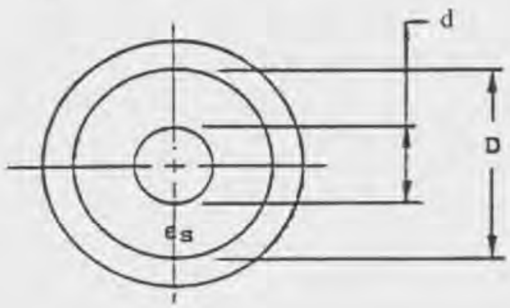
TEMP °C	DERATING FACTOR	ALTITUDE X 1000 FT	DERATING FACTOR
0	1.20	0	1.0
40	1.0	20	.80
80	.80	30	.70
120	.60	40	.60
160	.40	50	.50
200	.20	60	.40
240	.05	70	.30

Example Calculation:
At 120°C and 60,000 Ft:
Derate average power by .60 x .40
or average power x .24

Peak Power

Peak Power limitation is due to high voltage break down. This break down is directly dependent upon the dielectric strength of the total device. This break down typically takes place where a short air path may exist. The peak power rating is not frequency dependent.

A typical calculation example:



A. Voltage Breakdown 25°C at sea level

$$E_\delta = \frac{d}{2} \ln \left(\frac{D}{d} \right) \sim \varepsilon_s$$

ε_s = dielectric strength
= 25,000 volts/inch in air
= 300,000 volts/inch in TFE Fluorocarbon (Teflon)

B Peak Power

$$Pk\ P = \frac{(E\delta / \sqrt{2})^2}{Zo}$$ Perfect Load

$$Pk\ P = \frac{(E\delta / \sqrt{2})^2}{4Zo}$$ Short or Open Circuit

The above treatment covers situations for short duration pulses and is treated independently of corona initiation.