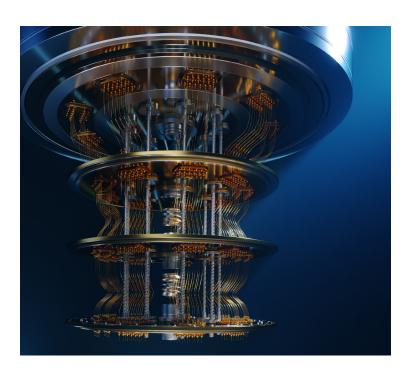


# RF Attenuators and Termination for Cryogenic Applications



Passive RF components are used extensively in low temperature applications including quantum computing, aerospace, and scientific research. Eliminating thermal noise in quantum computing set-ups or supporting any cryogenic application requires exceptional performance and reliability.

Most thick film resistors become insulators and turn attenuators into opens. Common thin-film resistors become super-conductive and turn attenuators into shorts. Spectrum Control's in-house cryogenic thin-film technology maintains resistance down to near absolute zero.

Spectrum Control's expertise in designing and building components for demanding environments includes our line of attenuators and terminations that provide temperature-stable operation up to 40 GHz at temperatures down to 4°mK.

### Coaxial Solutions

## **Cryo Attenuators**

Provide stable attenuation at temperatures down to 4 mK with low thermal noise characteristics

- · Stable attenuation over temperature
- Input power: 2 Watts avg. @ 25°C
- Low thermal noise characteristics
- Impedance: 50 Ohms
- Minimal self-heating achieves temperature faster
- Operating temperature range: 4°mK to +125°C
- Optimized non-magnetic material selection



#### Model 9102-CRYO

- Frequency range: DC to 18 GHz
- SMA connector type
- Standard dB values: 0, 3, 6, 10, & 20



#### Model 9104-CRYO

- Frequency range: DC to 40 GHz
- · 2.9mm connector type
- Standard dB values: 0, 3, 6, 10, 20, & 30





## **Cryo Termination**

Provide stable attenuation at temperatures down to 4 mK with low thermal noise characteristics

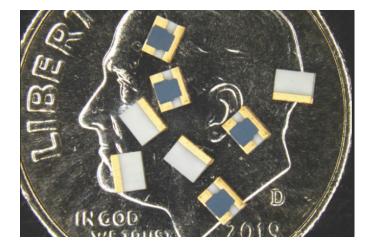
#### Model 3175-CRYO

- Stable Attenuation over temperature
- · Low thermal noise characteristics
- · Minimal self-heating achieves temperature faster
- · Optimized non-magnetic material selection
- SMA connector type
- Frequency range: DC to 18 GHz
- Input power: 2 Watts avg. @ 25°C
- · Impedance: 50 Ohms
- Operating temperature range: 4°mK to +125°C

## Powerfilm™ Surface Mount Solutions

# **Cryo SMT Chip Attenuators**

- Operating temperature range: 4°mK to +150°C
- Standard dB values: 0 to 20
- Impedance: 50 Ohms
- Gold, silver, tin-lead and lead-free solder finishes available
- Retain their electrical characteristics down to near absolute zero (0K) temperatures mounted circuit side up or down
- MIL-PRF-55342, MIL-PRF-55182, MIL-DTL-8833 testing available



#### **Model CCAAF**

- Frequency range: DC to 8 GHz
- Wrap around ground and terminal

#### Model CCAAW

- Frequency range: DC to 18 GHz
- · Wrap around ground

Approved for Public Release: May 2025 These cryo attenuator products are made in the USA and are controlled under the US Export Administration Regulations (EAR) - 15 CFR 730-774. This classification may require an authorization for export or re-export if they are used in the development or manufacture of quantum computers, cryocooling systems, or semiconductor equipment.

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