



SUCCESS STORY

Cryo Attenuators for Quantum Computing

Helping solve the problems of thermal noise in cryogenic chambers

Spectrum Control is working to customize and optimize fixed attenuators for use in cryogenic cooling systems to support quantum computing. Quantum computing will revolutionize our understanding of the world by analyzing datasets that today's most powerful supercomputers can't handle. Instead of bits, quantum computers use quantum bits (qubits) which can only be detected at extremely small energy levels -- and at temperatures close to absolute zero. This requires cryogenic refrigeration systems with multiple stages of cooling and numerous RF cables of significant length, all of which introduces thermal noise, harming the integrity of the qubit. Spectrum Control's coaxial cryo-attenuators, mounted at different temperature stages of the cryo chamber, help solve this problem.

Ensuring Integrity of the Qubit

To be 'read' a qubit must be isolated from even the most minute amount of interference. The cryogenic chambers needed for this function can reach temperatures down to 4mK (milli-Kelvin). This can require thousands of coaxial attenuators able to function in this environment. Spectrum Control's attenuators, designed for mK operation to avoid self-heating, are reliable at temperatures these cryo installations require.

Spectrum Control cryo attenuators tested to 4mK

Eliminating thermal noise in a quantum computing installation demands a high degree of innovation and reliability. Spectrum Control's experience delivering custom components for use in harsh environments and high reliability requirements, like space, is the foundation supporting our work in cryogenic technology.



Quantum Computer

Using our in-house resistor fabrication processes and materials, Spectrum Control is able to optimize the resistor material, substrate and fabrication processes as well as the mechanical design needed to offer a "thermally quiet" attenuator solution at mK temperatures.

Innovation & Customization

For over 60 years, Spectrum Control has been the world's leading innovator and supplier of passive coaxial and RF components. Features of the attenuators used in these cryo environments include:

- Gold plated beryllium copper conductors
- DC - 40 GHz (2.92mm connector)
- DC - 18 GHz (SMA and SMPM connectors)
- Available dB values of 0, 3, 6, 10, 20 dB
- Proprietary thin film resistor material
- Operating temperature down to 20mK



*DC-40 GHz cryo attenuator with
2.92mm connector (Model 9104)*