Scaling STI's *Sapphire* Cryocooler for Applications Requiring Higher Heat Loads

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Superconductor Technologies Inc. (STI) developed the *Sapphire* Cryocooler specifically for the SuperLink® product; a high performance superconducting Radio Frequency (RF) front-end receiver used by wireless carriers such as Verizon Wireless and AT&T to improve network capacity, cell coverage and data speeds. STI has built and deployed over 6,000 systems operating 24 hours a day, 7 days a week in the field since 1999. *Sapphire* is an integrated Free Piston Stirling Cycle Cryocooler with a cooling capacity of 5 Watts at 77 Kelvin with less than 100 Watts input power. It has a field-proven Mean Time Between Failure (MTBF) of well over 1 million hours, requires zero maintenance and has logged over 250 million cumulative runtime hours.

The *Sapphire* cooler is built on a scalable technology platform, enabling the design of machines with cooling capacities greater than 1 kilowatt. This scalable platform also extends the same outstanding attributes as the *Sapphire* cooler, namely high reliability, zero maintenance, and compact size - all at a competitive cost. This paper will discuss emerging applications requiring higher heat loads and these attributes, describe *Sapphire*, and show a preliminary concept of a scaled machine with a 100 W cooling capacity.