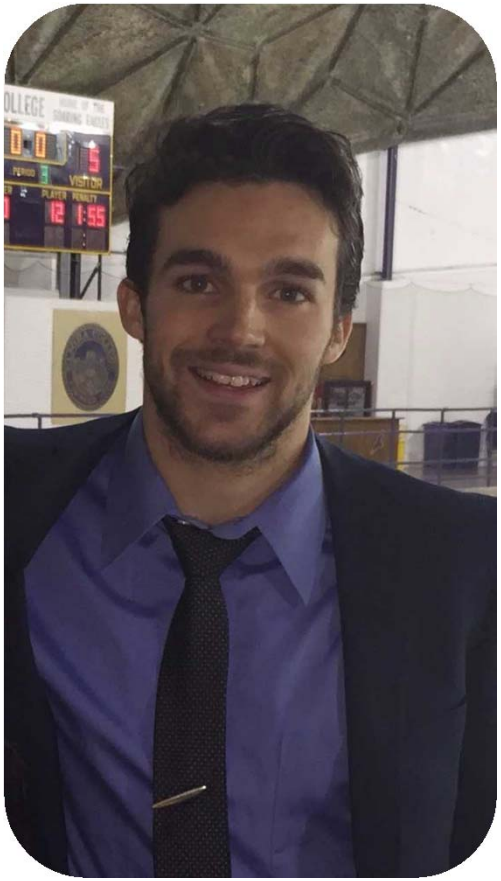
Tyler Hanzlik



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Research Project:
Superconducting Current Lead Propagation under Pulsed Conditions

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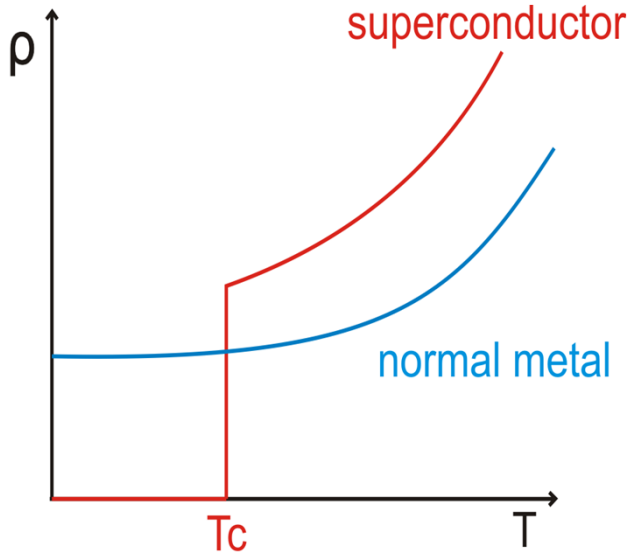
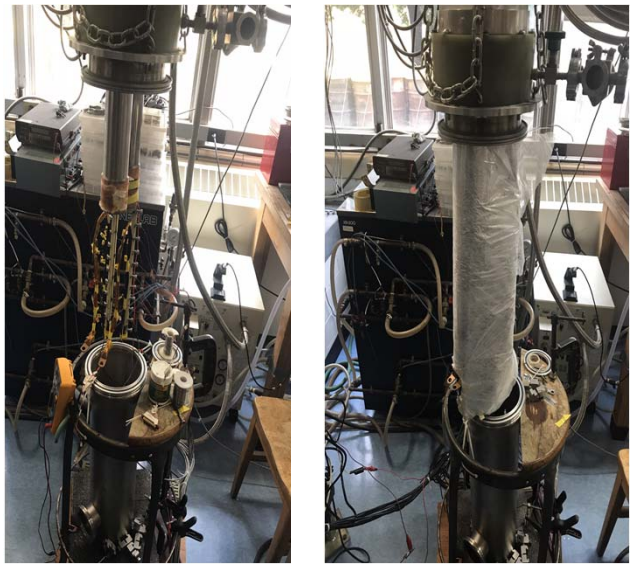
Background



- Superconductivity is a phenomena which results in certain materials to exhibit zero electrical resistance when below a certain Tc "critical temperature".
- Superconducting applications such as energy storage devices and electric machines made with superconducting wire must be cooled below a Tc and require the ability to transmit electric current from ambient to cryogenic temperatures.
- Current leads are used to provide the link between the ambient power supply and the cryogenically operating apparatus.
- Because most of the heat leaking into the cryogenic device is due to conduction through the current leads, it is crucial to minimize the joule heating of the leads.
- Recently, superconducting current leads have been developed to minimize ohmic dissipation in the region of the leads below the superconducting Tc.



Superconducting current lead experimental setup

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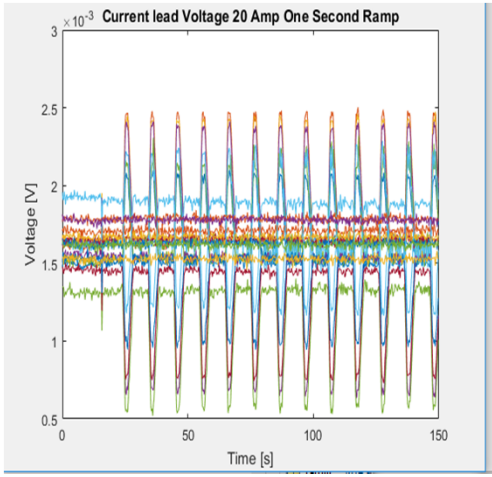
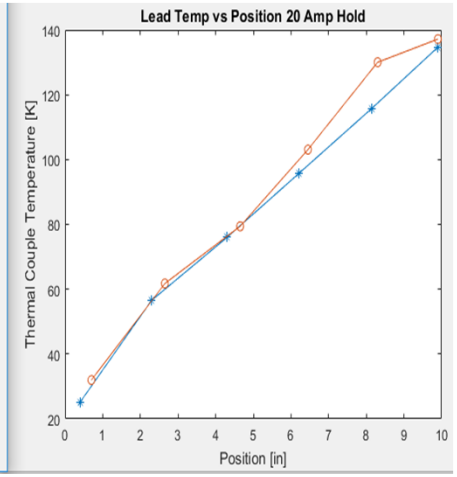
Motivation and Set-Up

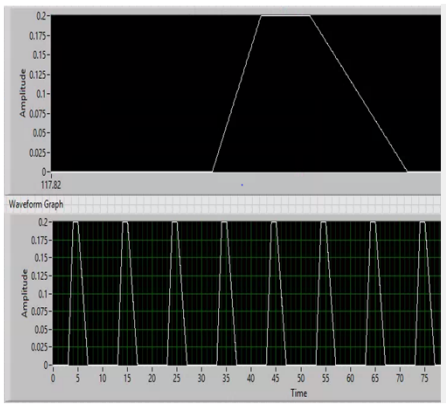
- This study will focus on the thermal and electric behavior of superconducting current leads while they are transmitting high magnitudes of pulsed current.
- It is expected that propagation of the current leads will be observable using temperature and voltage instrumentation in nodal positions.
- The experimental results will be analyzed and compared to a numerical computer model of the behavior in hopes to develop new understandings of the behavior of the superconducting current leads under pulsed conditions.
- By developing a greater understanding of the behavior of current leads under these conditions, hopeful advancements in monitoring and controlling the thermal heat leak into cryogenic devices could potentially be made.



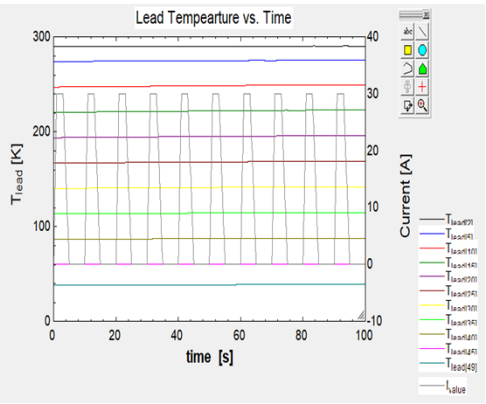
Experimentally measured nodal voltages.



Experimentally measured temperature distribution



Current pulse signal generation



Modeled Current pulse and temperature distribution.

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