Amir E. Jahromi
Ph.D. Graduate Student
Mechanical Engineering

Room: 1335 ERB
Lab: 1324 ERB

Email: amir@cae.wisc.edu

Hometown: Brooklyn, NY

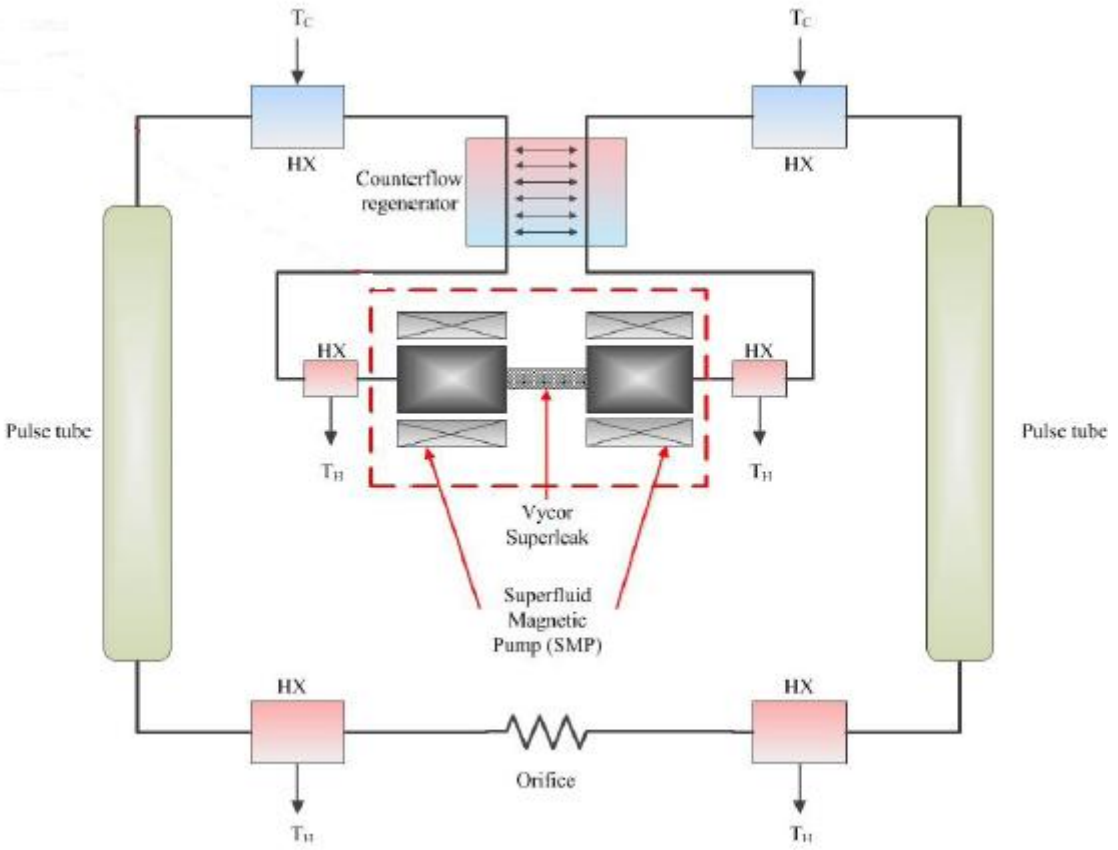
Thesis: *Modeling and development of a Superfluid Pulse Tube Refrigerator (SPTR) for sub Kelvin cooling of space detectors*

Motivation

- Sub Kelvin refrigeration systems are a key device in current and future x-ray and astrophysics missions.
- The objective of x-ray astrophysics missions are to explore the origin and structure of the universe.
- Space explorations are enabled by low temperature space detectors such as Transition Edge Sensor (TES) or micro-calorimeters.
- The lower the temperature of these detectors, the higher the sensitivity.
- Less moving parts in space science sub Kelvin coolers mean higher reliability.
- Space sub Kelvin coolers need to operate continuously.
- The newly proposed Superfluid Pulse Tube Refrigerator (SPTR) runs continuously and utilizes a novel non-moving part Superfluid Magnetic Pump (SMP) to compress He^3 in a He^3-He^4 mixture.

Project: SPTR

- The SPTR consist of six heat exchangers (2 heat sinks, 2 precooler/heater, and 2 coolers), an orifice, two pulse tubes, 2 SMP, a counter flow regenerator, and a vycor glass superleak.
- The entire system has been experimentally verified in the past with bellows compressors instead of the SMP.



Objectives

- The SMP will be experimentally verified against results from the numerical model.
- Modeling will be carried out in order to predict the performance of the SPTR.
- Parts of the SPTR will be fabricated and assembled to experimentally verify the performance of the entire system.
- The 1 K facility will be used as the heat sink for the entire refrigeration system.
- Experimental deviation from the theoretical results will be analyzed.