Brian Fehring

M.S. Student

Mechanical Engineering

Room: ERB 133/138 MFVAL

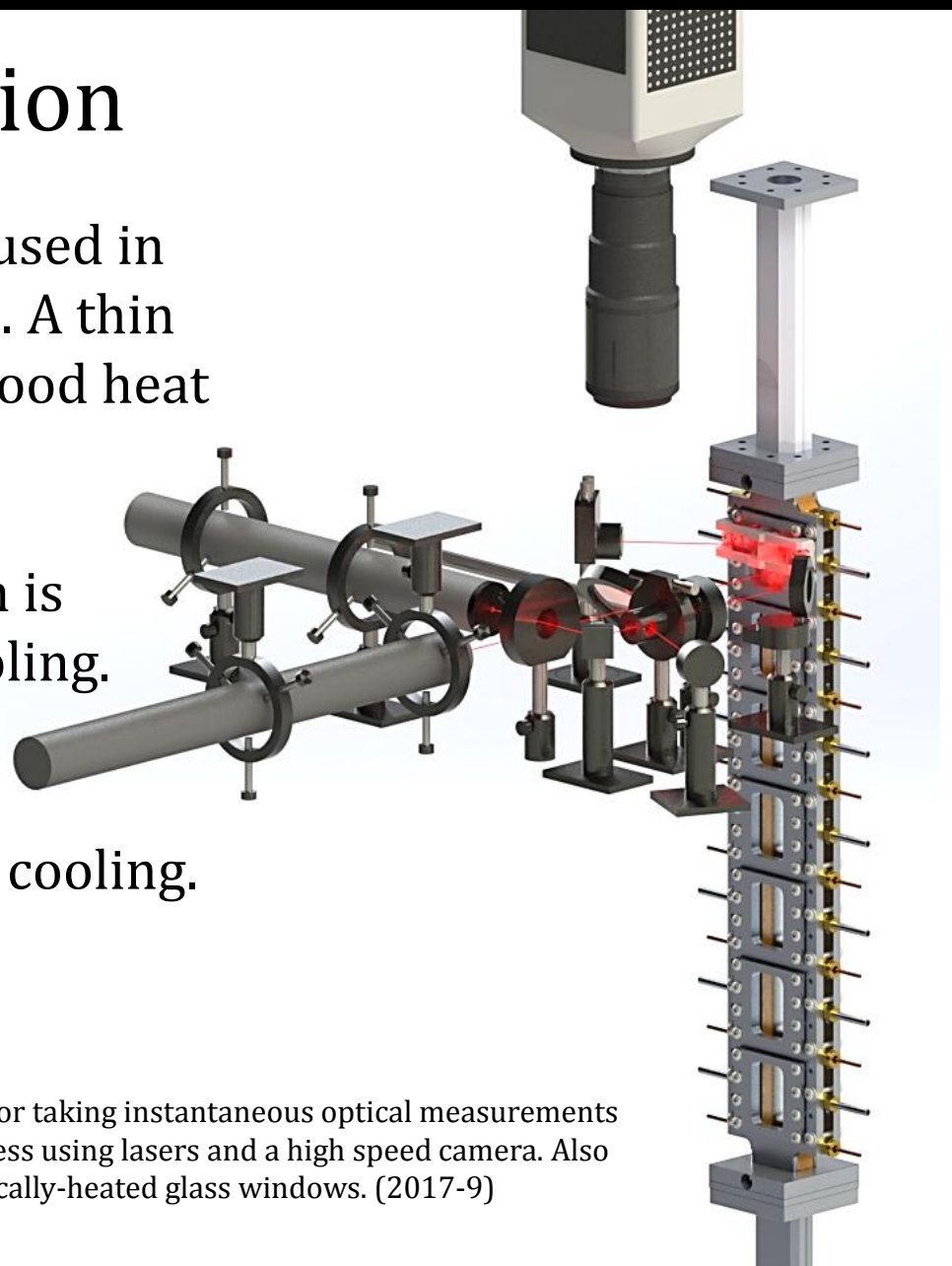
Email: bfehring@wisc.edu

Hometown: West Bend, WI

Thesis: Instantaneous Optical Wall-Temperature and Film Thickness of Vertical Two-Phase Annular and Pulsed Flow

Motivation

- Vertical, two-phase annular flow is used in some high-capacity cooling systems. A thin liquid film on the duct wall allows good heat transfer to the flow.
- Preventing dry-out of the liquid film is critical in maintaining sufficient cooling.
- Therefore, understanding dry-out conditions is vital to prevent loss of cooling.



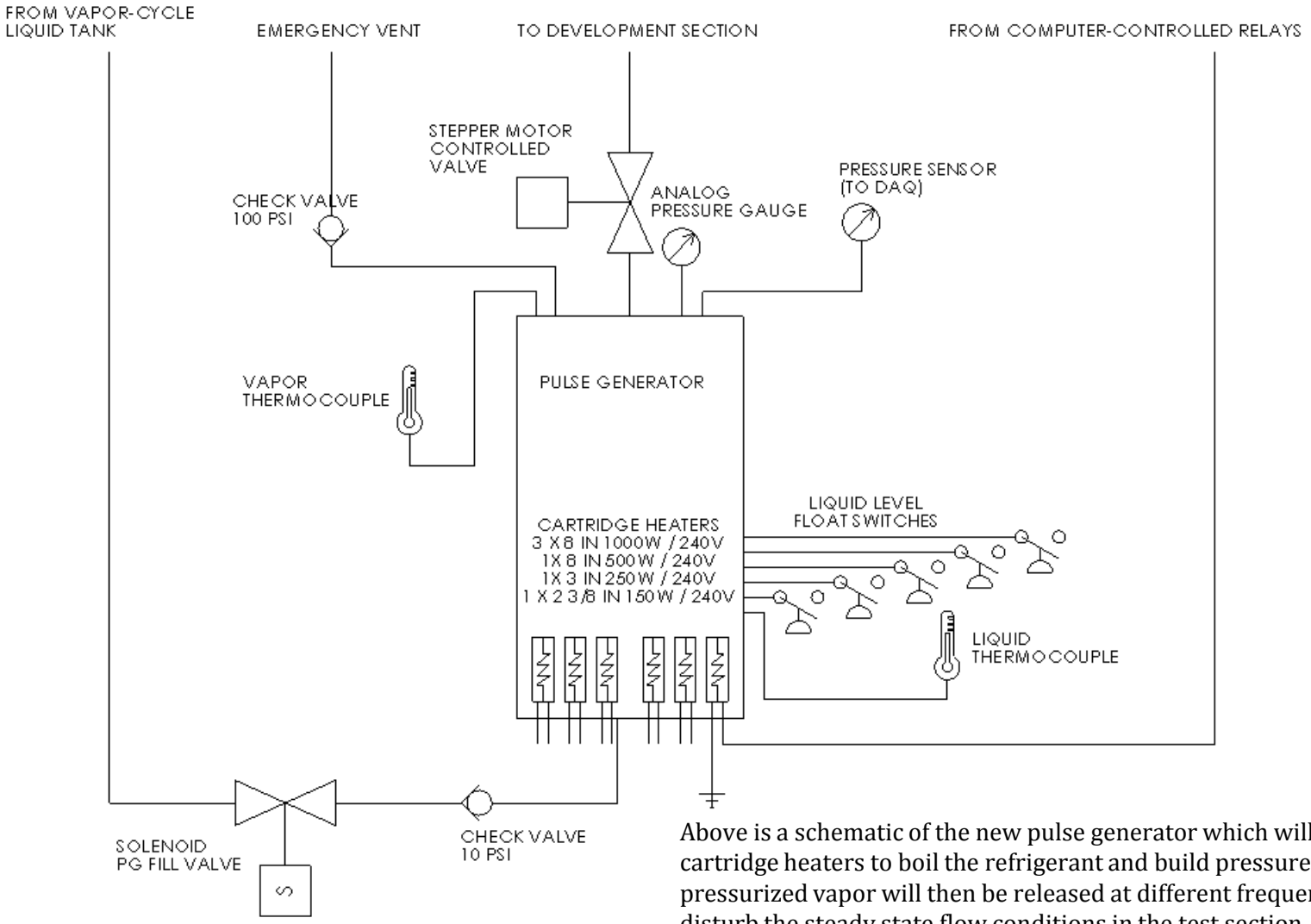
Shown to the right is the current setup for taking instantaneous optical measurements of the wall-temperature and film thickness using lasers and a high speed camera. Also shown is the test section with 14 electrically-heated glass windows. (2017-9)

Project Goals

- Construct and install a new pulse generator capable of a sufficient range of pressures, pulsing frequencies, and pulsing runtime.
- Obtain data with pulses between 1-5 Hz and intermittent film dry-out
- Calculate the heat transfer coefficient between the duct wall and the flow

Shown to the right is a section view of the pulse generator. At the base of the tank, finned cartridge heater sleeves allow better heat transfer to the liquid and prevent critical heat flux when boiling the liquid.

Pulse Generator Schematic



Above is a schematic of the new pulse generator which will utilize cartridge heaters to boil the refrigerant and build pressure. The pressurized vapor will then be released at different frequencies to disturb the steady state flow conditions in the test section.