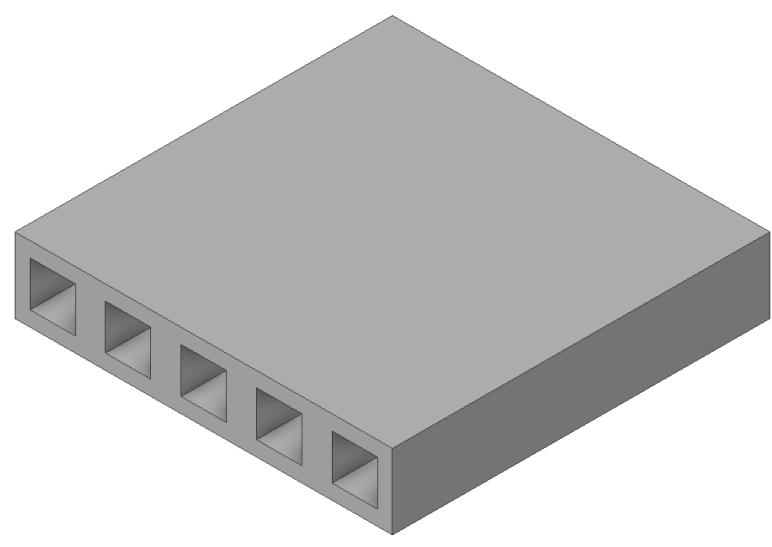


Bifacial Coldplates for High Power Servers

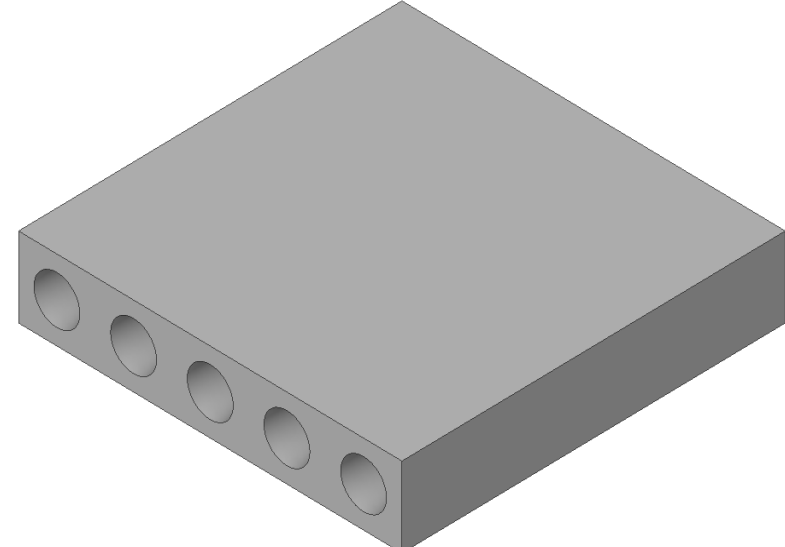
Project Description:

Our team will simulate, build, and test different designs of a new coldplate for the Microsoft high powered servers that will be used in a water-cooled system. The development of the new coldplate to keep the case operating temperature at **80°C (176°F)** due to the intense heat caused by the server chip input power of **1000W**. Other design necessities include corrosion resistance and ability to uphold electronics functions.

Design Options:

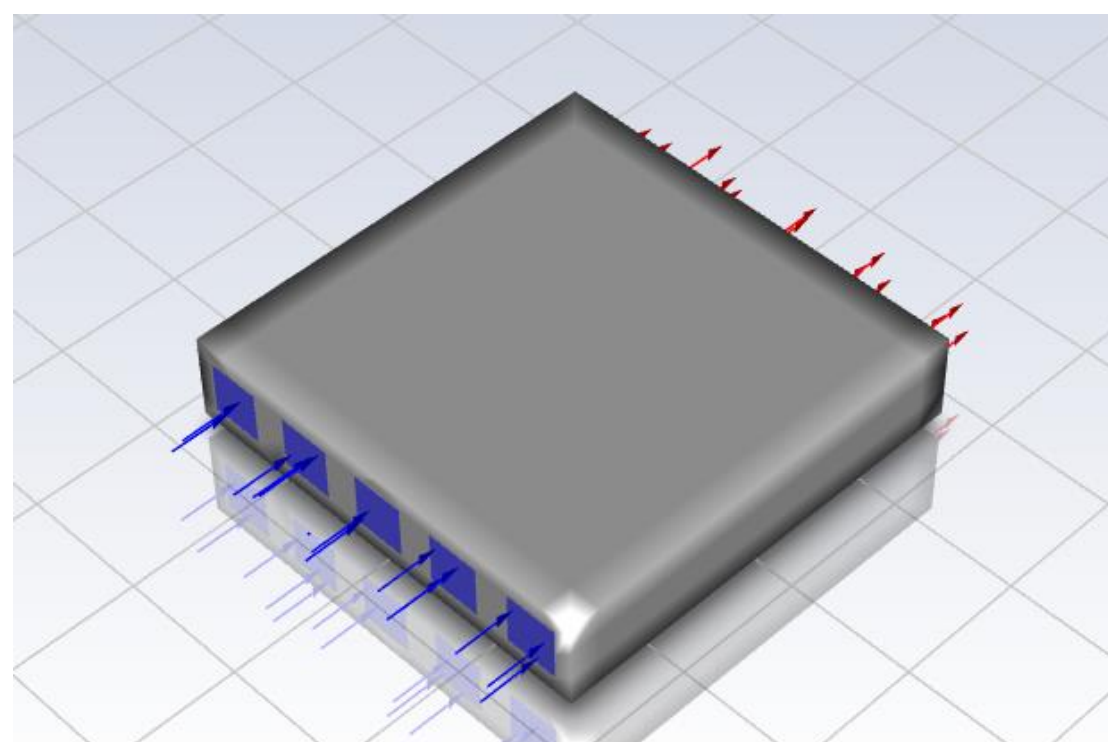


Design Option 1: Square Holes

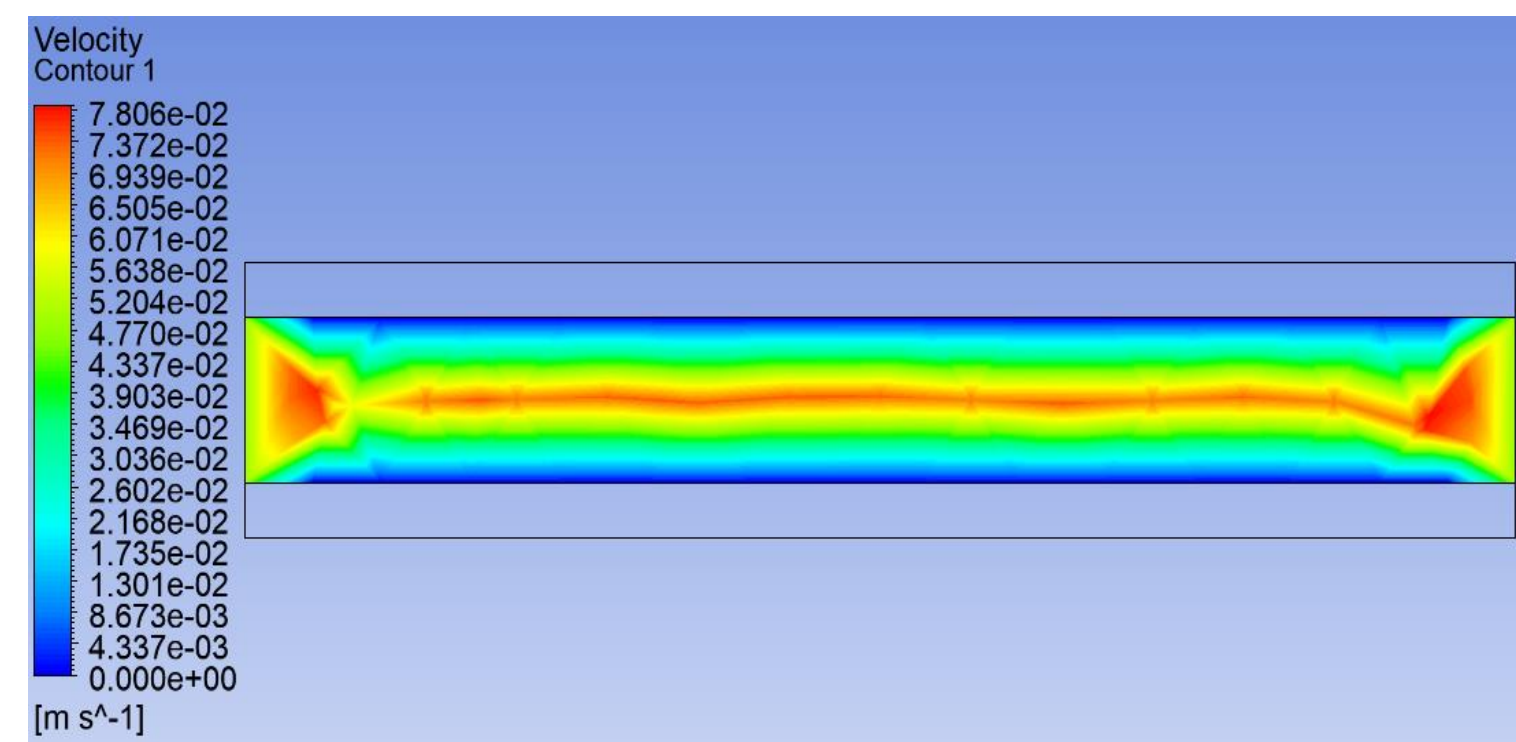


Design Option 2: Circular Holes

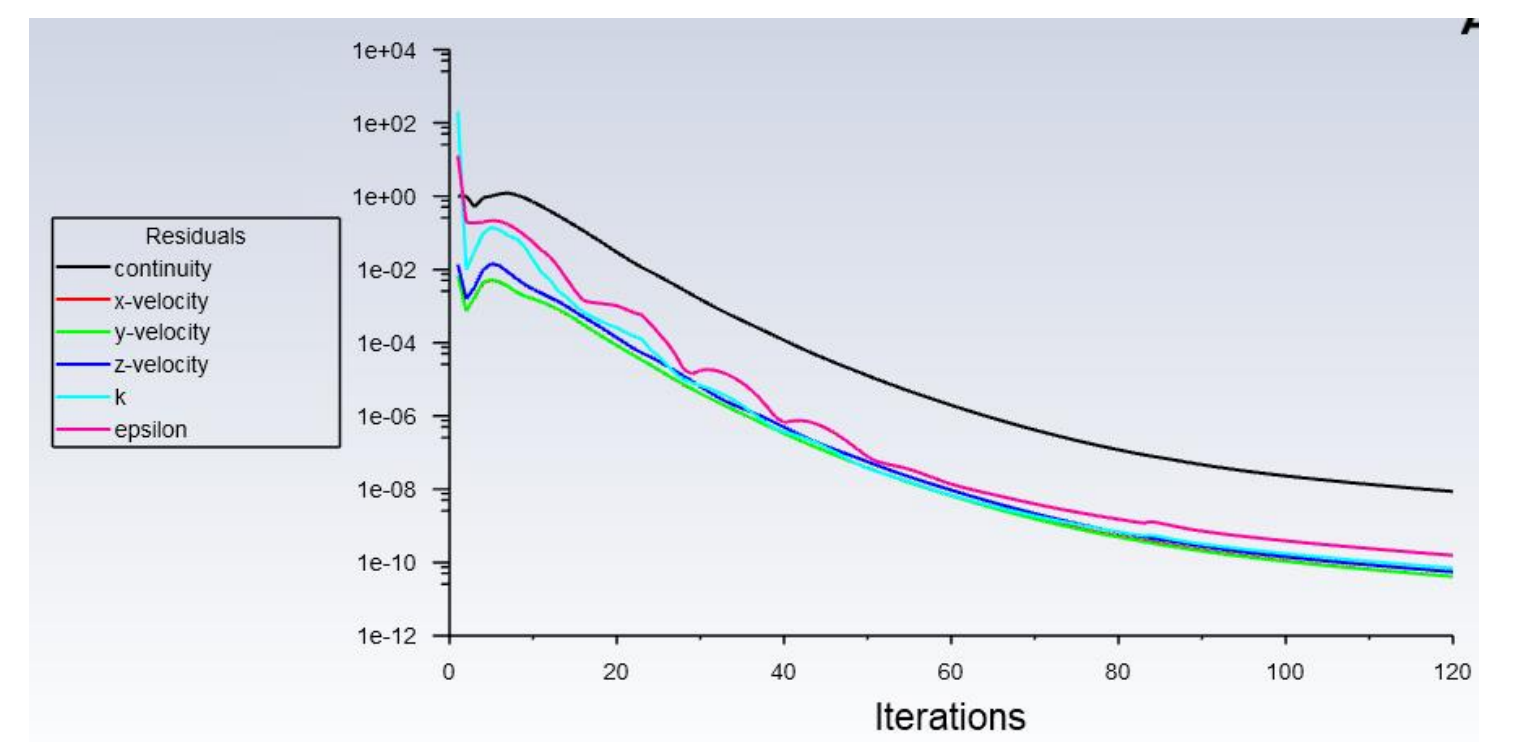
ANSYS Test Simulations:



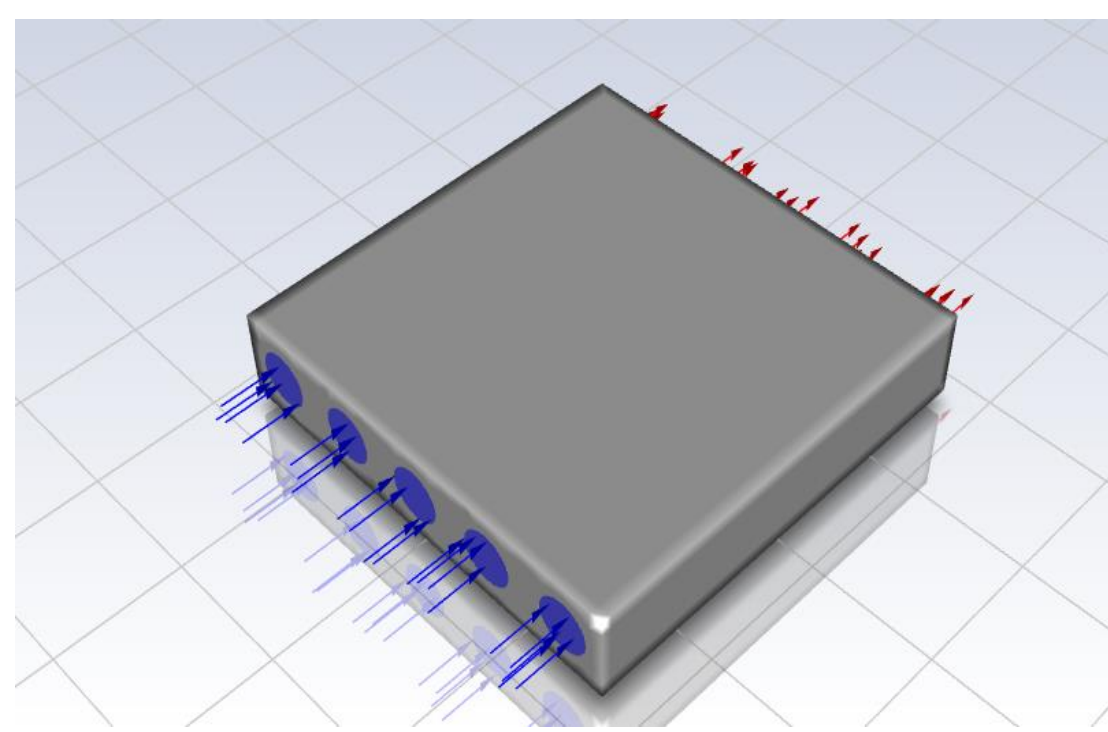
Water Flow for Square Holes



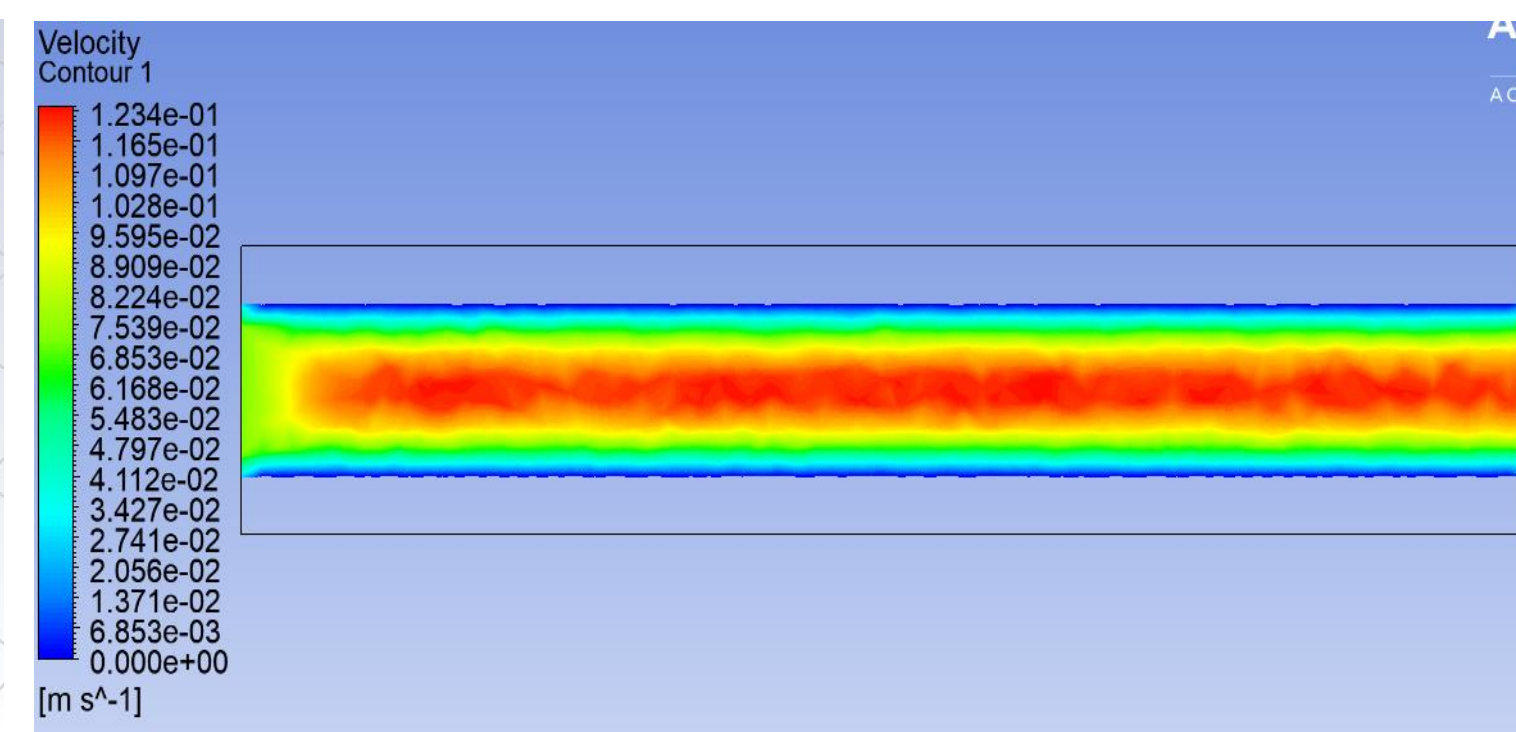
Velocity Contour of Square Holes



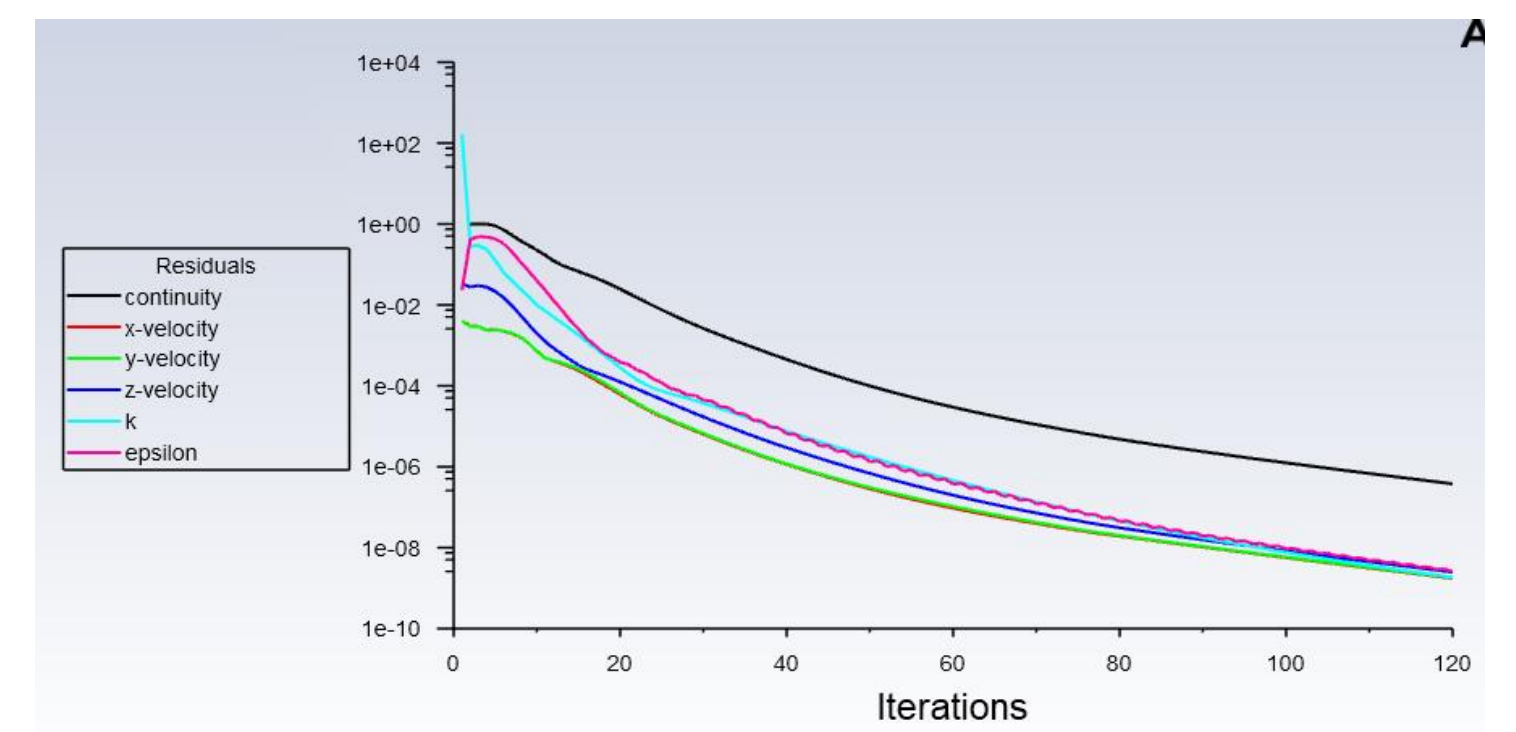
Velocity Graph of Square Holes



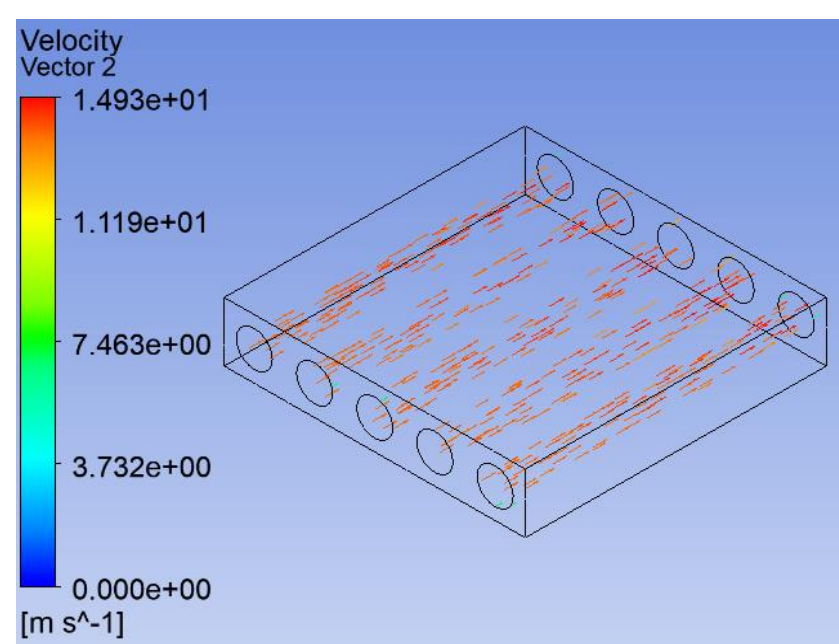
Water Flow for Circular Holes



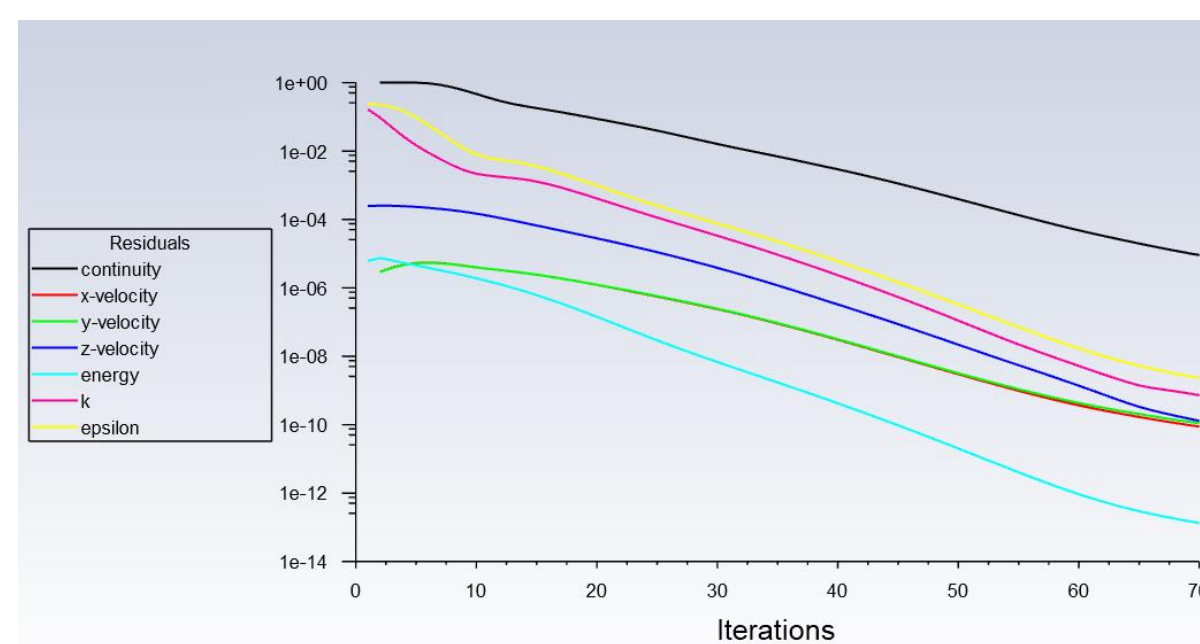
Velocity Contour of Circular Holes



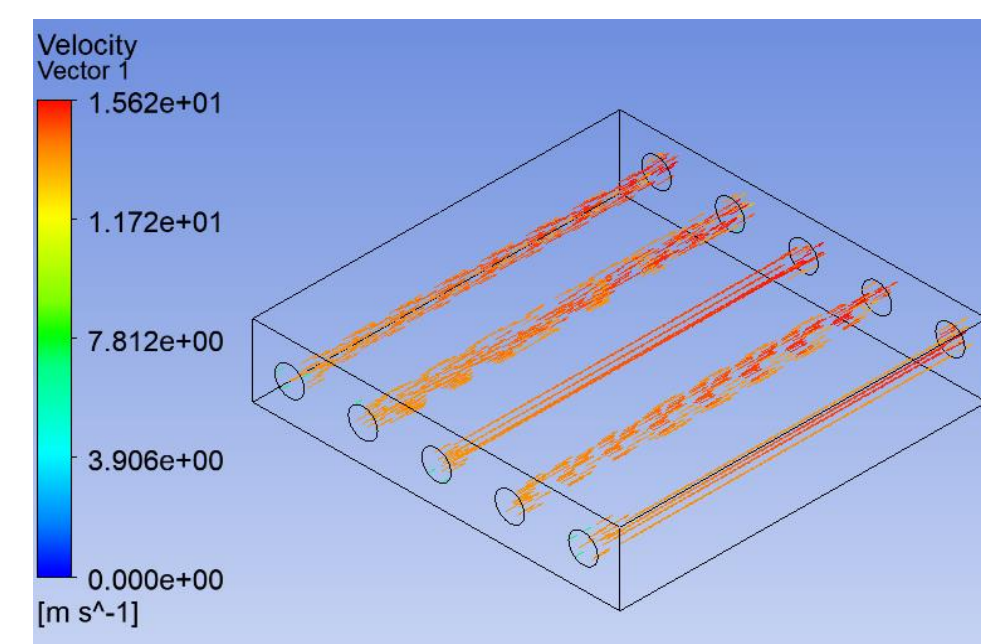
Velocity Graph of Circular Holes



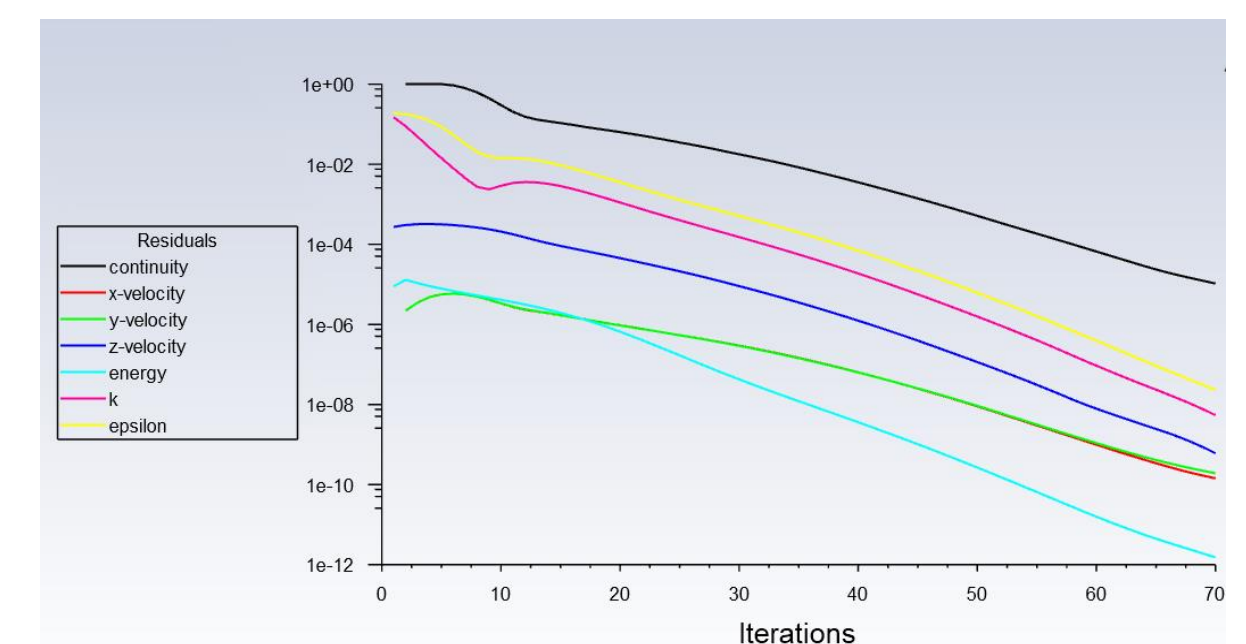
Heat Transfer Model (Standard Size)



Heat Transfer Graph (Standard Size)



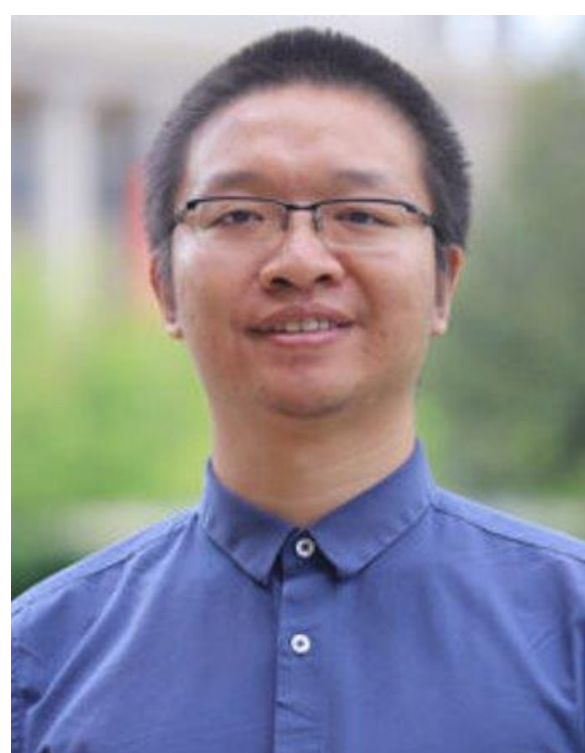
Heat Transfer Model (Smaller Size)



Heat Transfer Graph (Smaller Size)

Deliverables:

1. Models and simulations of server chip in water-cooled designs
2. Manufacturing of multiple iterations of prototypes
3. Prototype testing with assistance from Microsoft's testing facilities using chillers with pumps
4. Produce a cold plate that reduces case temperature to 80°C



Faculty Mentor: Dr. Aoyi Luo



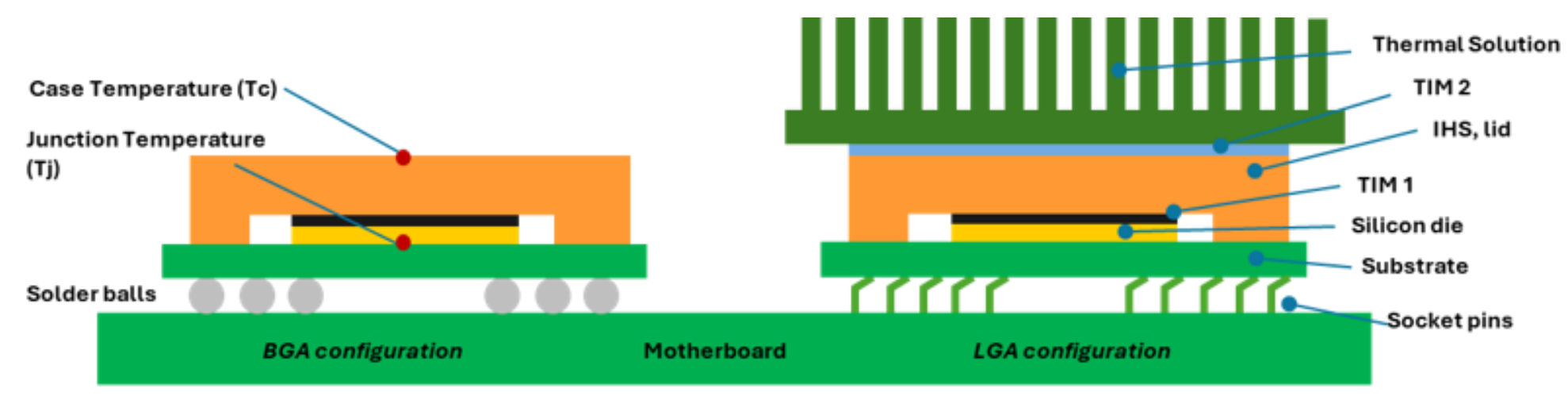
Jeremy Kang



Matthew MacFarlane



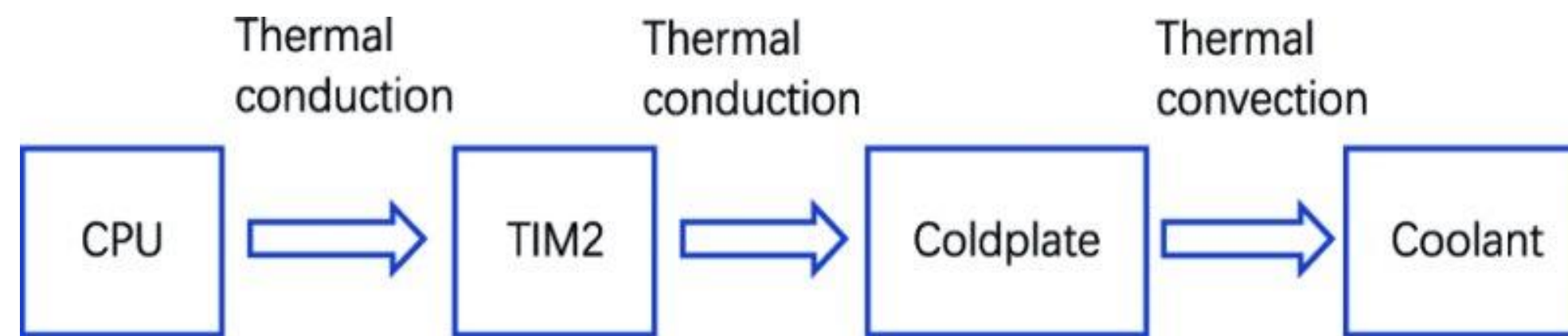
Evan Tulsy



This diagram is for naming convention only. Not to scale

IHS: Integrated Heat Spreader
TIM: Thermal Interface Material

Diagram of Server Chip



Path of Heat Transfer

Possible solutions-

1. Structure and Sizing
 - Material has not yet been decided as further testing is required
 - Server chip is 50mm x 50mm therefore the coldplate should be around those dimensions
 - Keep-out zone (KOZ) of 65mm x 65mm surrounding the server chip
2. Temperature
 - Inlet temperature of 40°C
 - Desired component case temperature of 80°
3. Water Flow
 - Inlet water velocity range of 1 – 2.5 lpm
 - Target of 1.5 lpm per kW