AFRL High Heat Flux Testbed

Faculty Advisors: John LaRue, Khalid Rafique

Background

As technology continues to develop, electronic components continue to produce higher power densities. This becomes a present challenge that needs to be dealt with. New cooling solutions needs to be devised and to test these solutions a dedicated test bed is a necessity which is why we are making the high heat flux testbed.
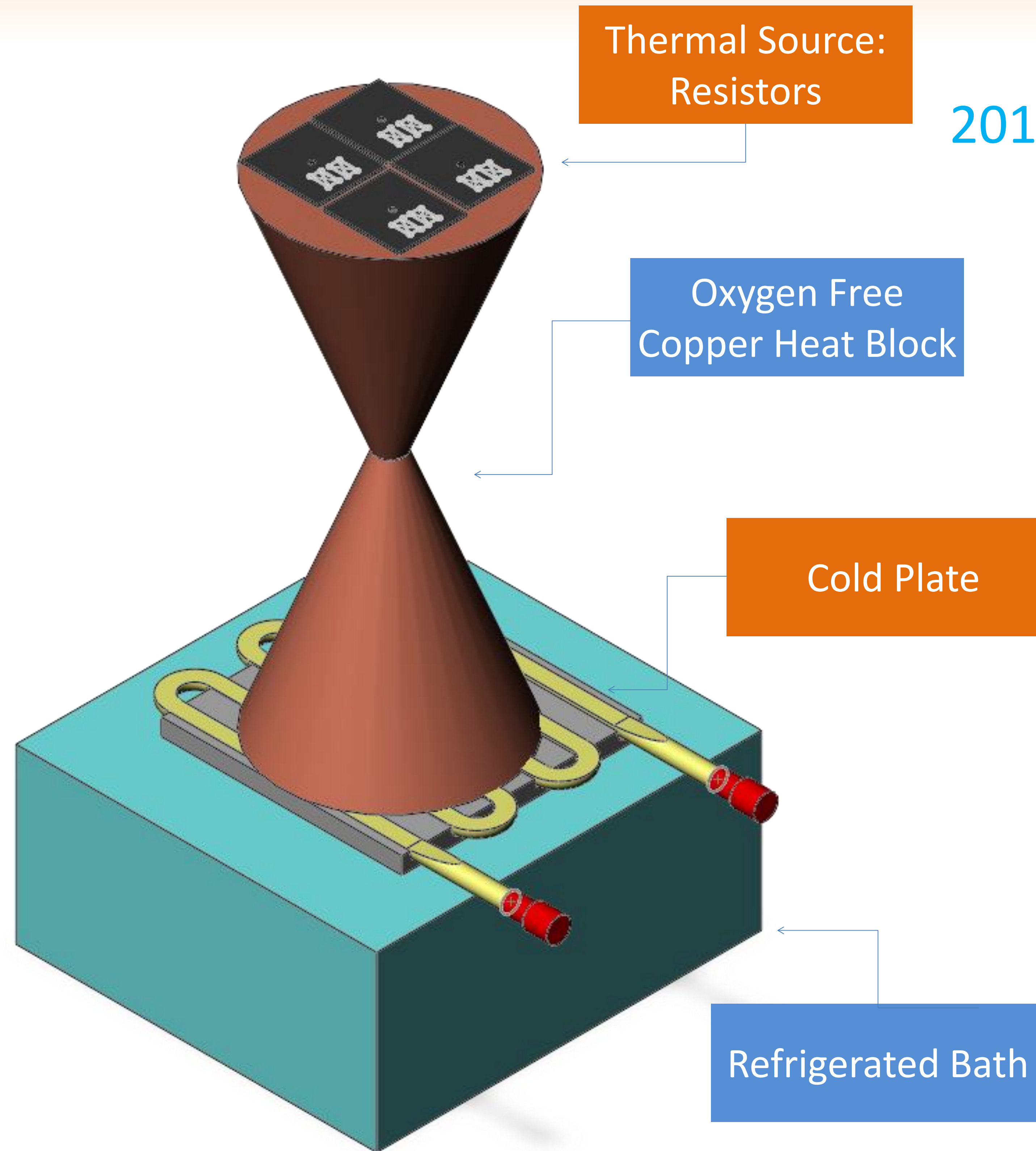
Goals & Objective

Objective 1 – *design, develop, and construct a testbed capable of producing and dissipating high heat fluxes/loads.*

The goal is to create a flux of 500-2000 W/cm^2 and have the flux concentrate onto a small area of $1\ cm^2$. The cooling system will then dissipate the heat and allow the system to maintain safe temperatures; in particular, the concentrated area will be kept at room temperature.
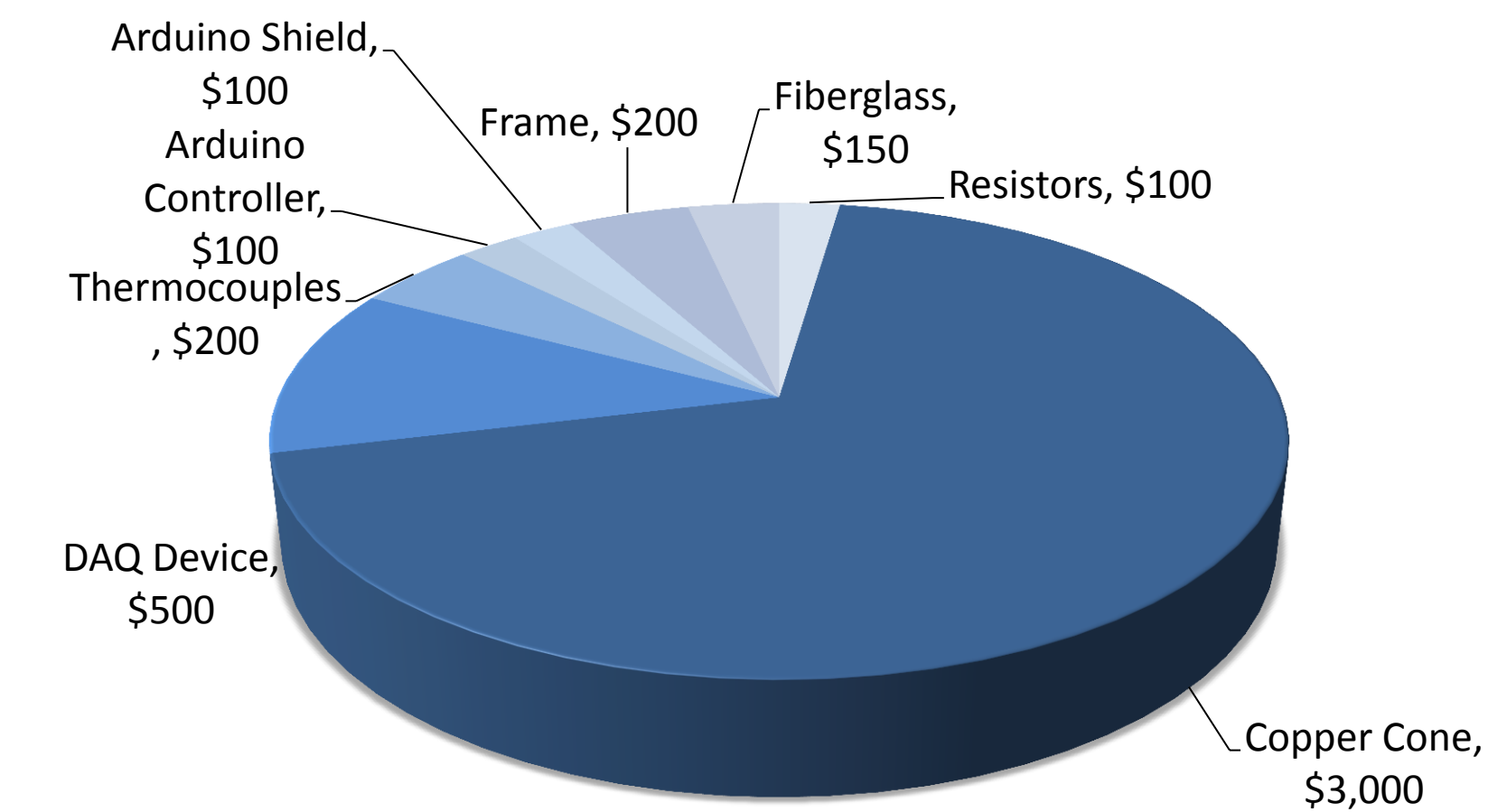
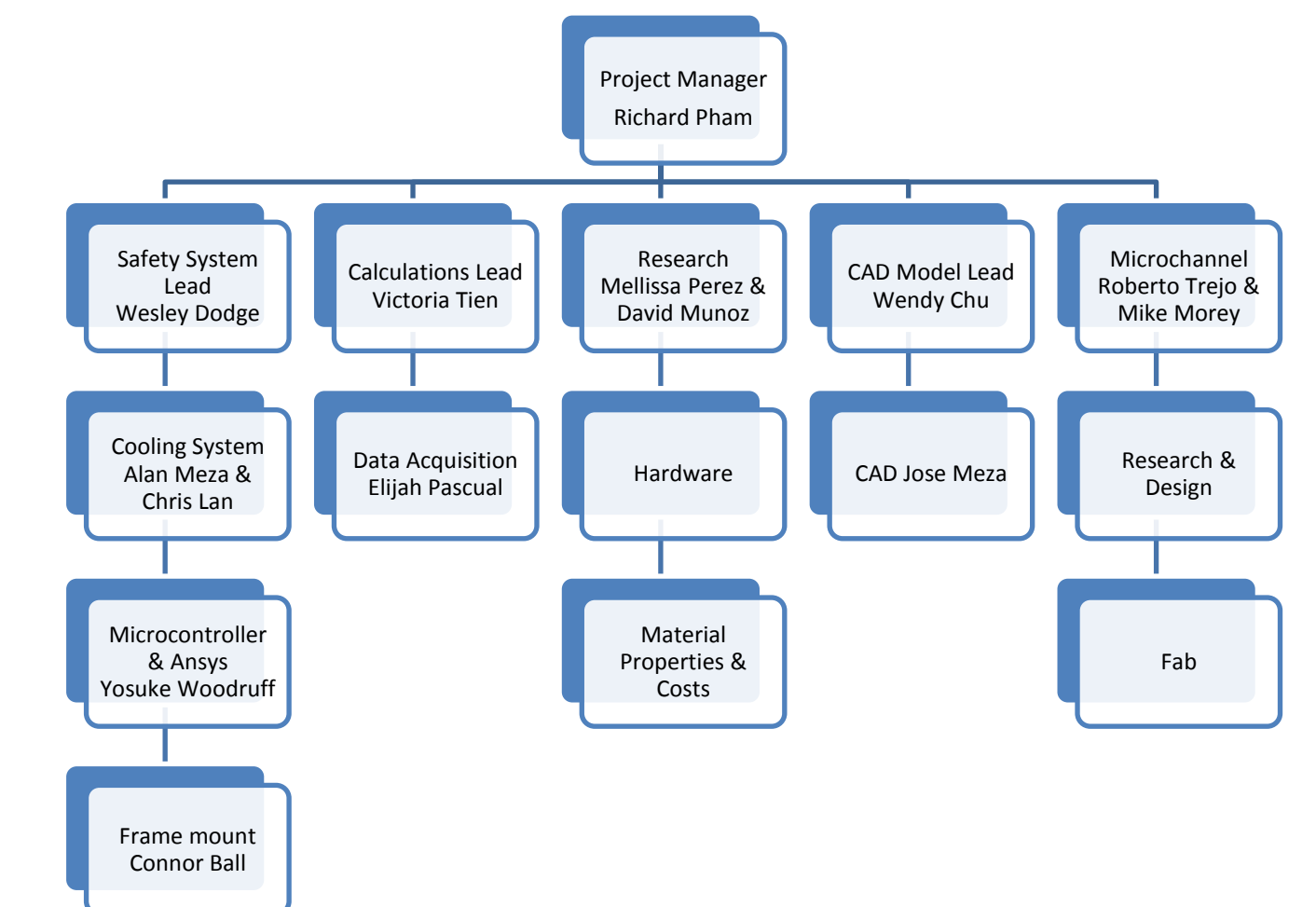Objective 2- Create Test Plan and perform test sequence for data

Specifications

- Vacuum compatible components
- Produce 2000 W/cm^2
- Implement Safety Shutdown System
- Insulate entire system
- Heating area $1\ cm^2$

Thermal Source: Resistors

Oxygen Free Copper Heat Block

Cold Plate

Refrigerated Bath

2015-2016 Budget & Spending

- Arduino Shield, $100
- Frame, $200
- Fiberglass, $150
- Resistors, $100
- Arduino Controller, $100
- Thermocouples, $200
- DAQ Device, $500
- Copper Cone, $3,000

Team Structure

- Project Manager Richard Pham
- Safety System Lead Wesley Dodge
- Cooling System Alan Meza & Chris Lan
- Microcontroller & Ansys Yosuke Woodruff
- Frame mount Connor Ball
- Calculations Lead Victoria Tien
- Data Acquisition Elijah Pascual
- Research Mellissa Perez & David Munoz
- Hardware
- Material Properties & Costs
- CAD Model Lead Wendy Chu
- CAD Jose Meza
- Microchannel Roberto Trejo & Mike Morey
- Research & Design
- Fab

Fall Timeline

Week 1-3
Summarize project details and list design options

Week 4-5
Schedule and hold PDR

Week 6-8
Detail calculations and Ansys simulation

Week 9
Hardware Research

Week 10
Complete 1st cut detail design

Team Members

Richard Pham	Wendy Chu	Yosuke Woodruff
Victoria Tien	Chris Lan	Roberto Trejo
Wesley Dodge	Connor Ball	Mike Morey
David Munoz	Alan Meza	Elijah Pascual
Melissa Perez	Jose Meza	Said Gonzalez
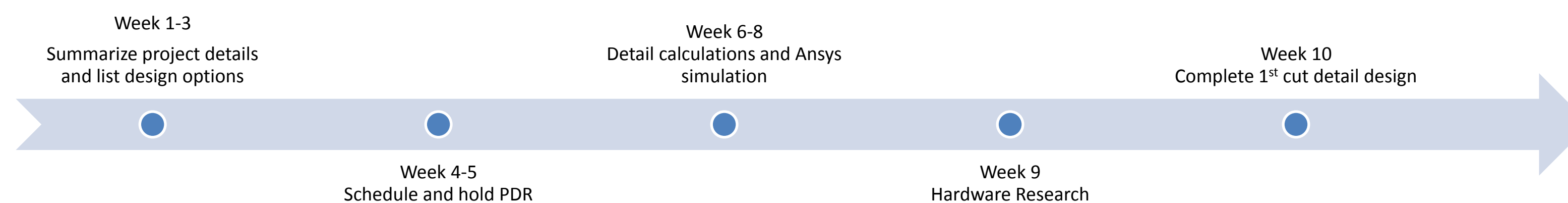
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