Sandia National Laboratories

Additive Manufacturing (AM) for MITLs and Convolutes

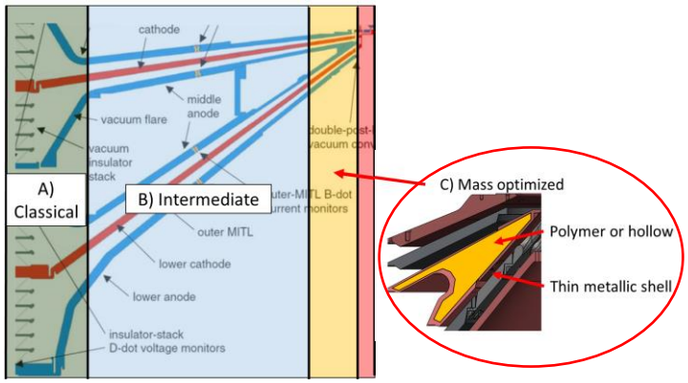
PI: Charles Rose, Shaun Whetten
Student: Ellen Meyer

Stockpile stewardship requires accurate and predictive models of high energy and density environments. NGPP requires >50 MA operation and arguably hinges on our ability to design and manufacture hardware that minimizes post shot damage.

Impetus and Concept

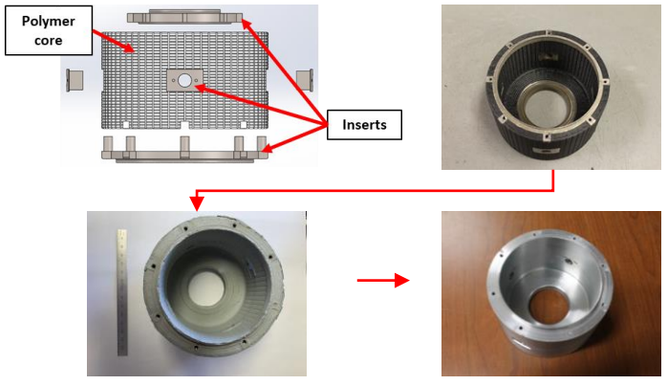
Next generation pulsed power (>50MA) requires modern hardware approaches.

Our group has been investigating our **hybrid-metalized polymer core concept (HMPC)** wherein a polymer core is outfitted with various inserts, transducers, components etc. and metalized. **This concept is scalable, manufacturable, and <u>extremely</u> optimizable given our additive approach.** For example, if we can **minimize the mass** of the center section of Z while still delivering current and maintaining mechanical support, we can **reduce post shot damage.**

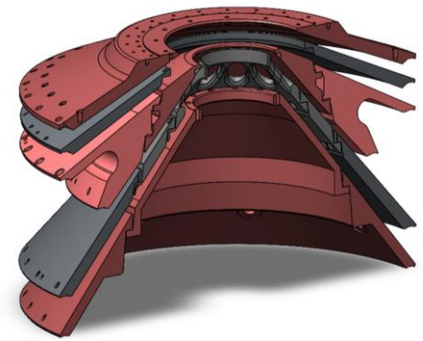


Progress to date

- Design, prototype, manufacture, and field current return can for Mykonos accelerator.
  - Intended to be clad in 304L, but due to critical machine failure only clad in ~ 1 mm zinc!
  - Component was reusable accomplished 6 shots
  - **Final shot > 500 KA delivered.**

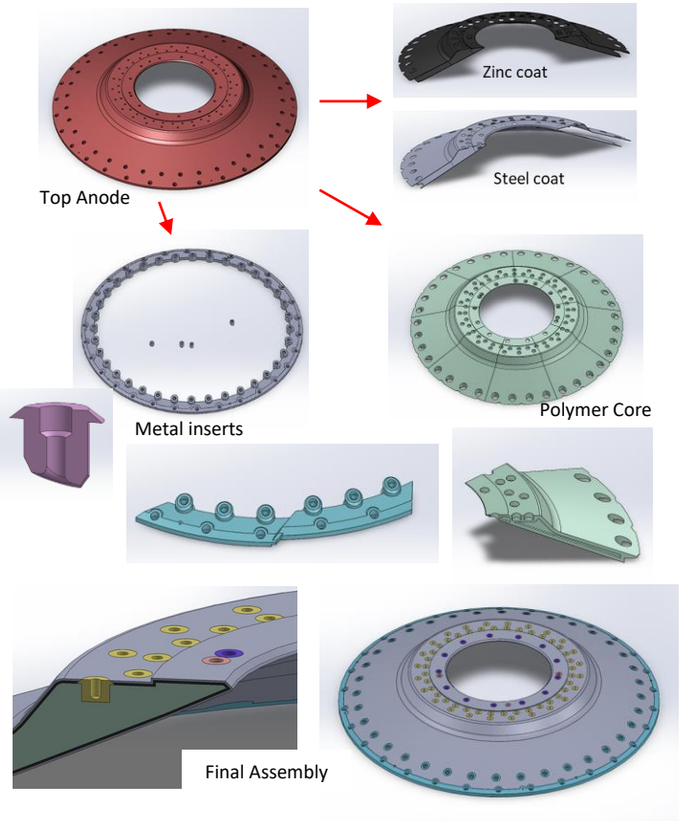


- Extend this concept to the Z center section. Intent is to convert convolute stack to be manufactured using our HMPC process.



Current and Future work

- Conversion of top anode to HMPC topology.



- Conduct design review.
- Begin prototyping.
- Test the metalized polymer core idea on Mykonos cathode, and observe results in the region that emulates the current densities present in Z.

Sandia National Laboratories is a multimission laboratory managed and operated by National Technology & Engineering Solutions of Sandia, LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.
SAND No SAND2022-10326 C