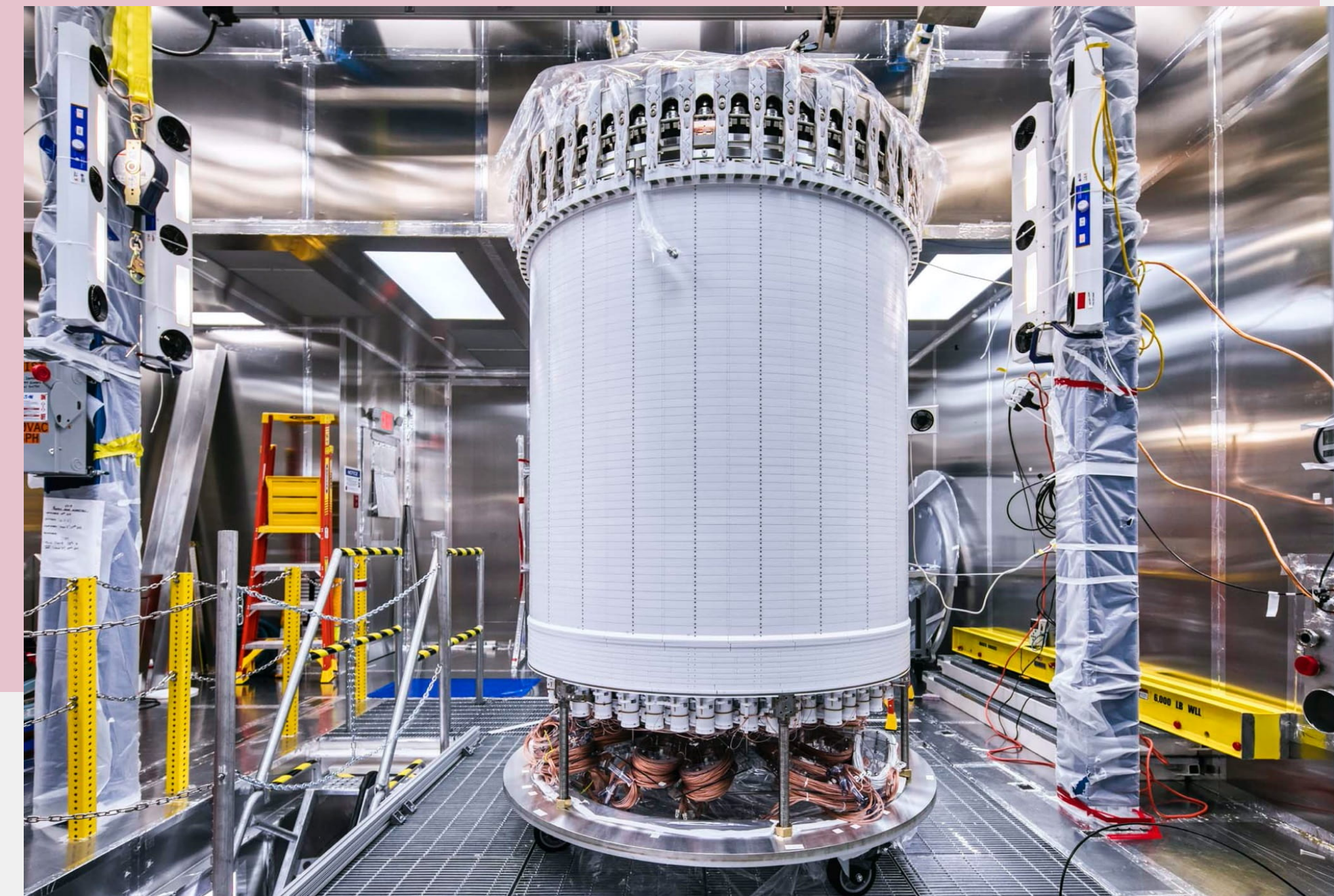


Abstract

Work is underway to make upgrades to the Crystallize experiment. The scope of this project is the design and verification of several physical components for the TPC assembly, including a molded PTFE test piece and a heatsink. All CAD and work was completed in Solidworks. The PTFE component is created using a 304 stainless steel mold, capable of withstanding the 4500 psi necessary for Teflon scintillation. The mold, assumed in three pieces, was validated using pressure load simulations. The second component designed was a copper and aluminum heatsink, designed to prevent room temperature components from boiling off the xenon in the TPC.

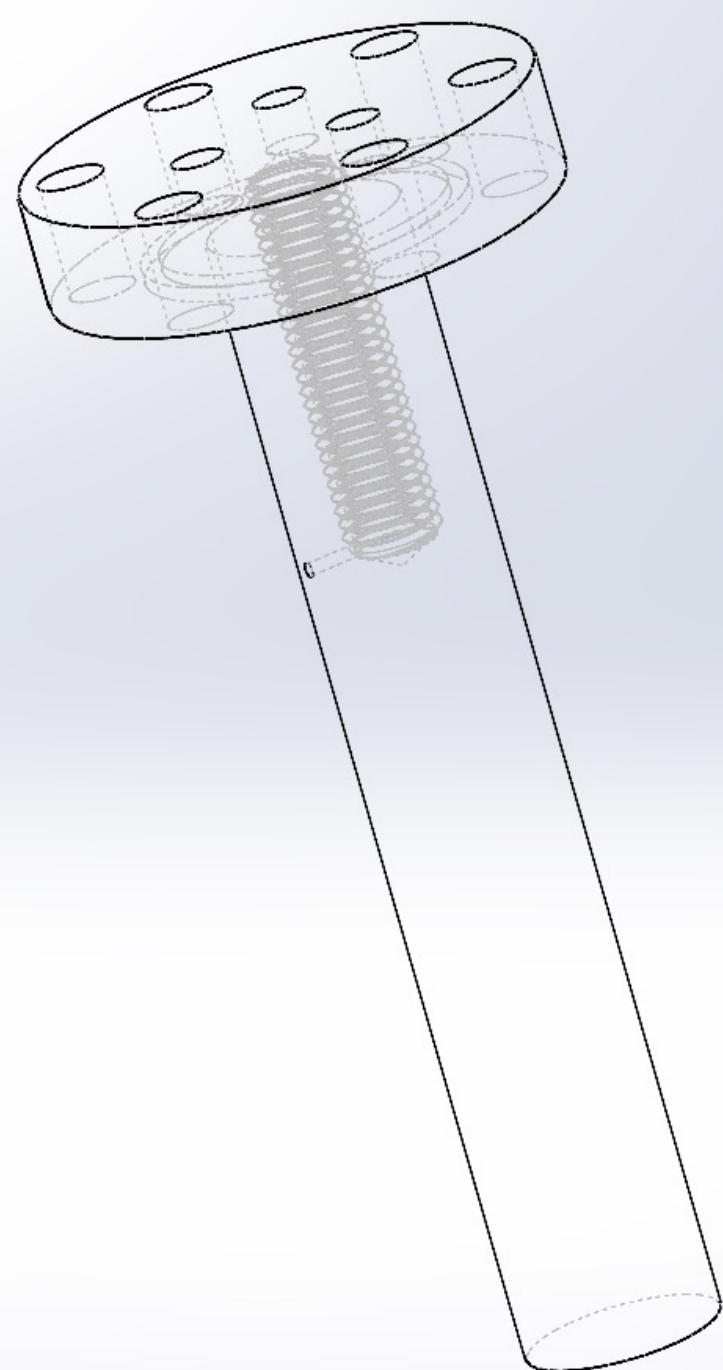


The LZ Experiment

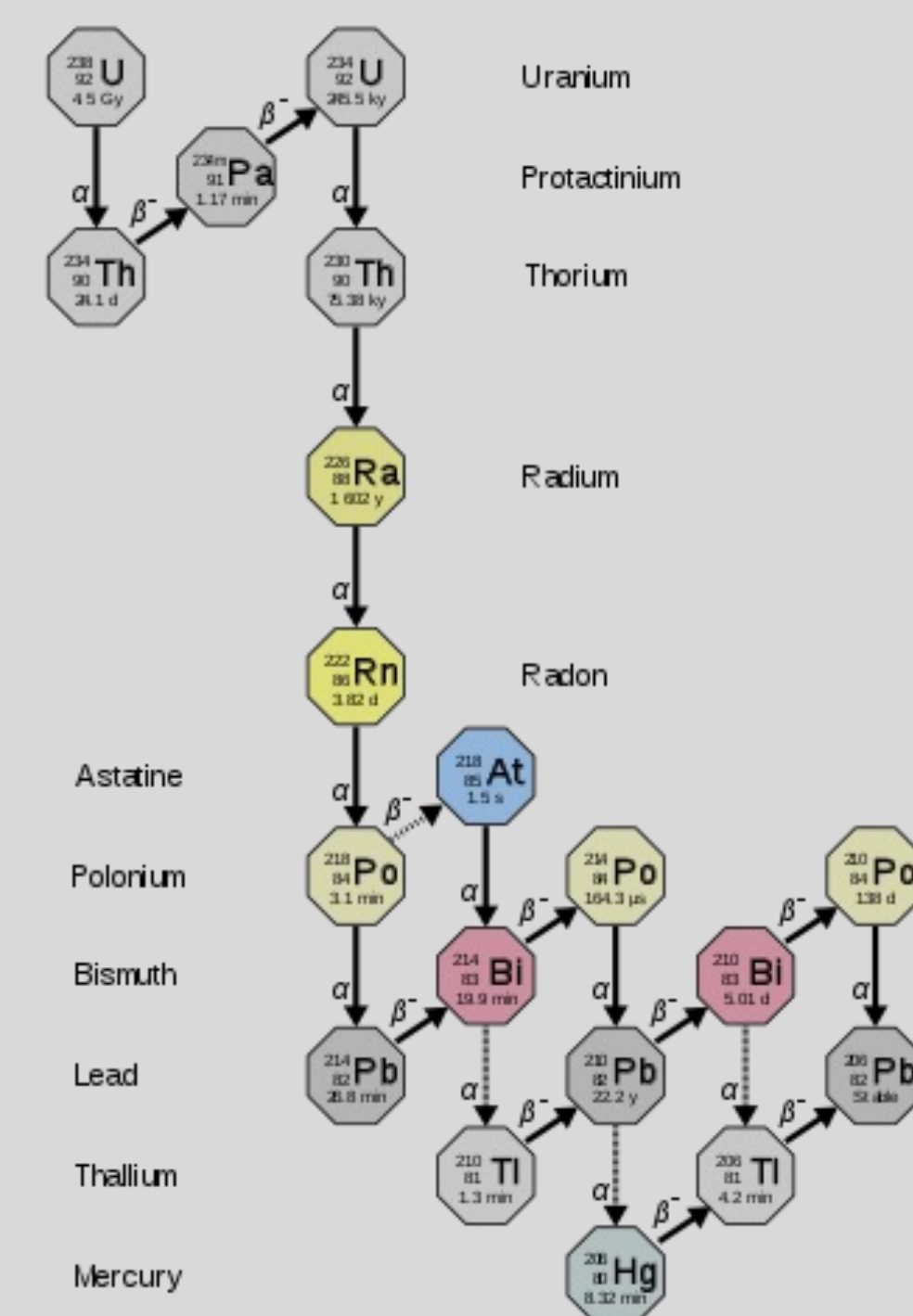
The LUX-ZEPLIN (LZ) experiment is designed to detect dark matter particles. The design of the experiment is heavily influenced by the LUX and ZEPLIN-III experiments, hence the name. Like the LZ experiment, the LUX and ZEPLIN-III experiments utilize xenon in the hopes of detecting a theorized elementary particle that would make up dark matter. This theorized particle would have a large mass and only interact with through the weak force and has been dubbed Weakly Interacting Massive Particle (WIMP). The LZ experiment is essentially a Russian doll of detectors, and its innermost mechanism is the Time-Projection Chamber (TPC), which contains 7 tonnes of active liquid xenon. Xenon is used because it is reliably stable, limiting internal radiation and is quite dense which prevents external radiation from penetrating to the center of the TPC.

Heat Sink Design

The heat sink is made up of three main parts: the machined mini CF-flange, a machined copper rod, and a 1/4-28 threaded aluminum rod. Ring terminals will be used to connect copper braids to the heat sink.



PTFE Mold Design



- PTFE requires 3000-4500 psi to form

- The formed PTFE piece must be removable from the mold

The PTFE mold is made up of three parts. The mold itself is split into two parts each forming two walls of the mold and the third piece is the plunger used to compress the PTFE powder.

References

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