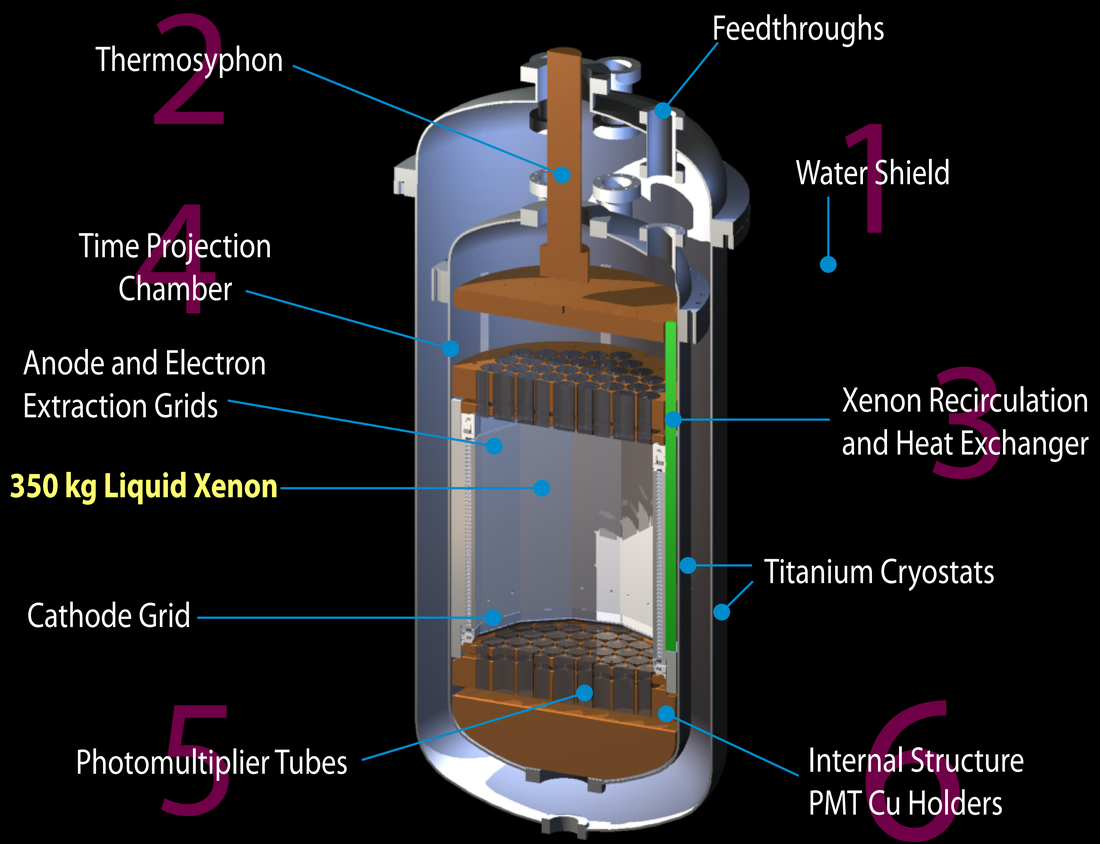
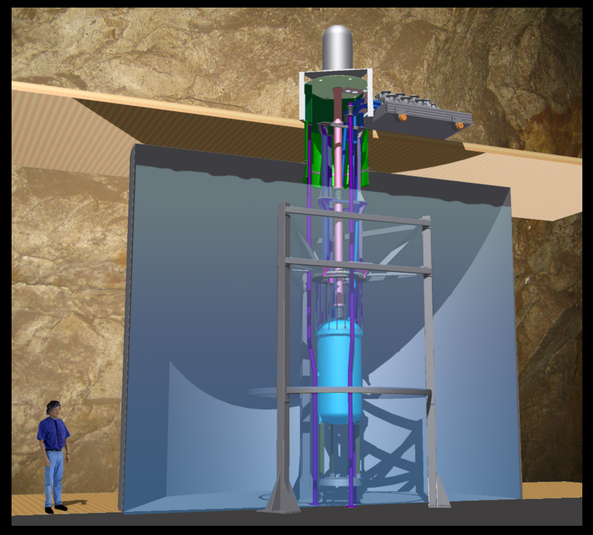
LUX Anatomy

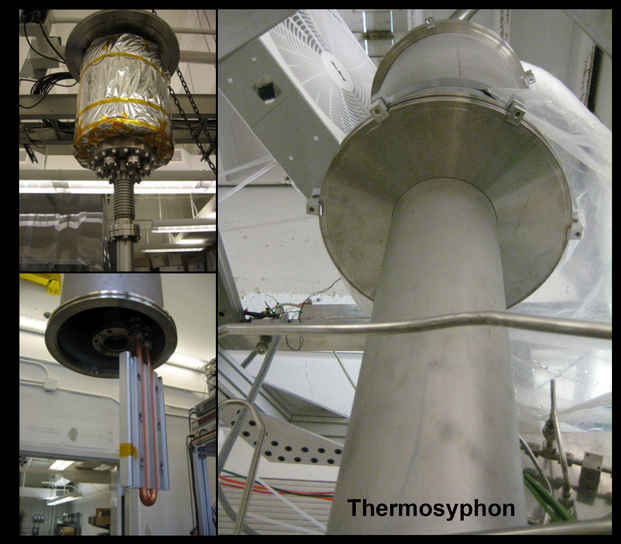
Brown University, Case Western Reserve University, Harvard University, Lawrence Berkeley National Laboratory, Lawrence Livermore National Laboratory, South Dakota School of Mines & Technology, Texas A&M University, University of California Davis, University of Maryland, University of Rochester, University of South Dakota, Yale University





Water Shield

1 In addition to liquid xenon's self-shielding, the 8-meter diameter by 6-meter height water tank reduces gamma background by 7 orders of magnitude.

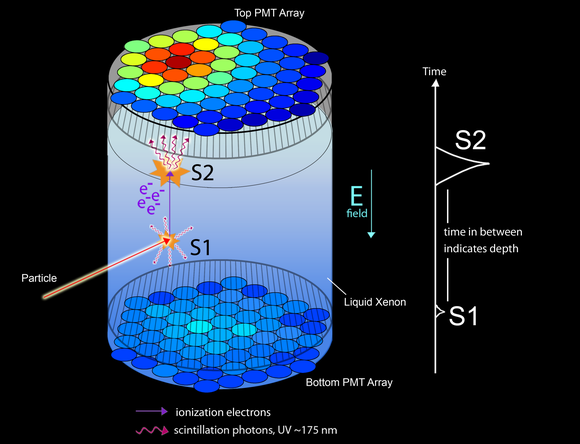


Thermosyphon

2 Closed loop of liquid nitrogen condensation/evaporation. Provides 1 kW cooling power to the detector.

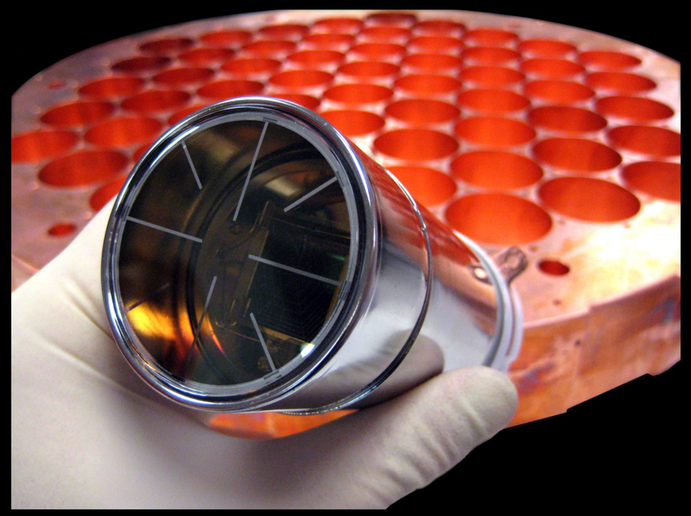
Xenon Recirculation and Heat Exchanger

3 Xenon is constantly being recirculated in and out of the detector for purification (gas panel for recirculation shown above, with the xenon-purifying getter on the right). Inside the detector, the heat exchanger transfers the heat load from the incoming hot xenon to the outgoing cold xenon from the detector.



Time Projection Chamber

4 The PMT hit pattern provides x-y localization of an event, while the time between primary (S1) and secondary (S2) scintillation signals provides z-localization.



5 Photomultiplier Tubes (PMTs)

Detect scintillation and ionization light of events inside the detector. They are sensitive to xenon 175 nm (UV) light and are able to detect single photons. They have a typical Quantum Efficiency (QE) of 33%. There are 122 PMTs (61 top and 61 bottom) in the detector.

6 Internal Structure

The internal supporting frame, shown on the right, is composed of two PMT copper holder plates (for the top and bottom PMT arrays) and Titanium straps. The materials for these components were chosen for their low radioactivity. Teflon reflectos are placed on the circumference to increase light collection. Grids and field-shaping rings are placed in this structure to make a uniform electric field for drifting and extracting the electrons generated by particle interactions in the xenon space.