

Peter Sorensen for the LBL dark matter direct detection group

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	/ho?	
LBL Group		
Kevin Lesko (Senior Scientist, Group Leader, LZ spokesperson, LZ Subsystem Manager)		
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Andrew Cole (Engineering Associate, BLBF)	Junsong Lin (Postdoc) Quentin Riffard (Postdoc)	
+ numerous engineers/technicians	Reed Watson (Graduate Student) Vetri Velan (Graduate Student) Andy Biekert (Graduate Student) Ryan Smith (Graduate Student) Roger Romani (Graduate Student)	
+ Mike Witherell (LBL Laboratory Director :)		

## What?



Observe the scattering of dark matter particles in LUX (left) and LZ (right)

LUX ceased ops in 2016 Publications from LUX continue to roll off to the Physical Review

**LZ is now under construction** (below, first 7 field rings) and expects to commission in 2020







# Why?



## How?

Build the world's most sensitive detector of keV particle interactions: LZ



# Building LZ

















## Where?

The Black Hills of South Dakota: Sanford Underground Research Facility







(Two flights down) LZ water tank shield

# Cone mile down, the Davis Campus Image: Cone mile down, t

# Yesterday, PI day (snowed in, in Lead SD)



But! Loads of work happens locally, too





# LUX: Final Analyses (+more to come)



## Daily commute to SURF via Deadwood



PRL Featured in Physics

**Editors' Suggestion** 

## Results from a Search for Dark Matter in the Complete LUX Exposure

D. S. Akerib *et al.* (LUX Collaboration) Phys. Rev. Lett. **118**, 021303 (2017) - Published 11 January 2017

#### PRL

## First Searches for Axions and Axionlike Particles with the LUX Experiment

D. S. Akerib *et al.* (LUX Collaboration) Phys. Rev. Lett. **118**, 261301 (2017) - Published 29 June 2017 Show Abstract **+** 

#### PRD

### <sup>83m</sup>Kr calibration of the 2013 LUX dark matter search

D. S. Akerib *et al.* (LUX Collaboration) Phys. Rev. D **96**, 112009 (2017) - Published 26 December 2017 Show Abstract +

#### PRD

## Signal yields, energy resolution, and recombination fluctuations in liquid xenon

D. S. Akerib *et al.* (LUX Collaboration) Phys. Rev. D **95**, 012008 (2017) - Published 19 January 2017 Show Abstract +

#### 3D modeling of electric fields in the LUX detector

D.S. Akerib, S. Alsum, H.M. Araújo, X. Bai, A.J. Bailey, J. Balajthy, P. Beltrame, E.P. Bernard, A. E 2017 *J. Inst.* **12** P11022 https://doi.org/10.1088/1748-0221/12/11/P11022

## Local R&D

sample Measure/model Teflon reflectivity to Xe scintillation light as a function of angle • Informs Xe-based dark matter searches like LZ:  $\theta_I$ Teflon reflectors collect light Collimator 10<sup>2</sup> 30° incidence 60° 10<sup>1</sup> 75° 100 10-1 HEATHER PROPERTY AND A DESCRIPTION OF A 10-2 10 0 10 20 30 40



B70A 2263 (Liquid Xenon Lab)

## Local R&D

## Measure delayed electron noise in liquid Xe TPC (a mini-LZ) as a function of applied electric field

- Informs analysis of small S2 signals, especially in the absence of S1
- First results just published in JINST 13 P02032





## B70A 2263 (Liquid Xenon Lab)

## Local R&D

## Measure effects of very high electric field ad breakdown in in liquid Xe

 scaling laws Inform behavior and performance of operating detectors

 $10^{3}$ 







# Local R&D



B77 High Bay Lab

## Local R&D

- Test mechanical functions and performance of photroneutron calibration source deployment
- Source will inform low-energy performance of LZ in an energy range where we expect to detect solar 8B neutrinos





down the corridor from the Davis Campus\*

## **BLBF**



 Measure the radio purity of every last component that we will use to build LZ

- Informs shape and normalization of the "material" histogram with respect to the signals we are chasing
- Plot from LZ sensitivity paper



\* started by AI Smith @ LBL 1960, moved to Oroville Dam 1985

## When?

Now's the time! Commissioning starts in a little over one year!

