# LCLS-II Accelerator & Dark Sector Experiments @ SLAC

* Three basic concepts for experiments at SLAC:
    * Beam Dump Search for light dark matter (high current)
    * Missing momentum experiment (very low current)
    * HPS-style experiment (~ $\mu$A)

* Question: Can LCLS-II be used to these approaches? How?

# Beam Dump Search for Dark Matter

* Beam requirements are minimal; the BSY dump with nominal current is good.

* Trickier question will be beam backgrounds ⇒ Clive is looking into this.

# Missing Momentum Search for Dark Matter

* Expect detector response timescale ~ 0.1–1 μs
* First-stage experiment: 1 e– per microsecond *or less*
* Final-stage experiment: 10-1000 e– per microsecond,
* spread out over ~(10 cm)$^2$ detector face (raster, defocus, … ?)

# Super-HPS

See Tim Nelson's Jan 8, 2016 NEXT talk

## Super HPS Beam Requirements

*Time structure / bunch charge*

- Selecting against backgrounds requires small bunches with high repetition rate. Studies assume HPS time resolution which results in 8 ns window for coincident hits. Therefore, no 8 ns time window should have significantly larger bunch charge than 1 $\mu A \times$ 8 ns.

*Beam size / stability*

- Angular resolutions in tracker imply that IP for an event should be known to approximately 0.25 mrad × 1.37 m = 400 $\mu$m to achieve best mass resolution.

*Beam instrumentation*

- Need a serious beam dump and radiation shielding.
- Hazard to detector is much lower than HPS: beam diagnostics and safeties can be relatively simple.

# Accelerator Questions

- Scheme for producing beam
  - Layout
  - Homework needed
  - Costs
- Talk at workshop

- What inputs from us are needed?
  - Beam requirements
  - Layout requirements
  - …
  - How should we communicate?  NEXT?