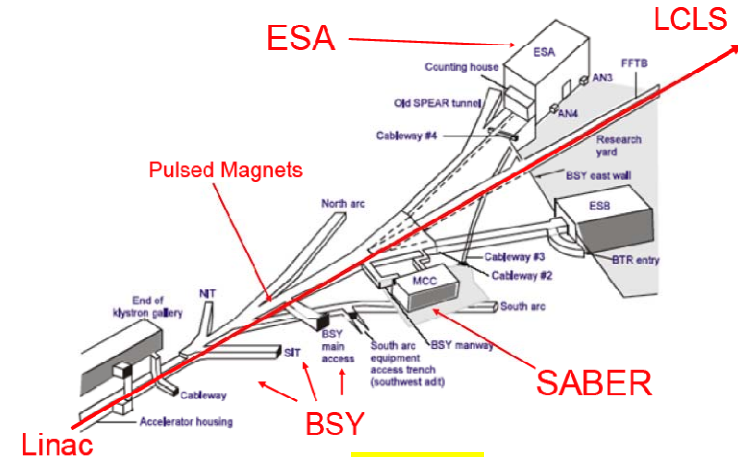


SLAC End Station A Test Beam Proposal

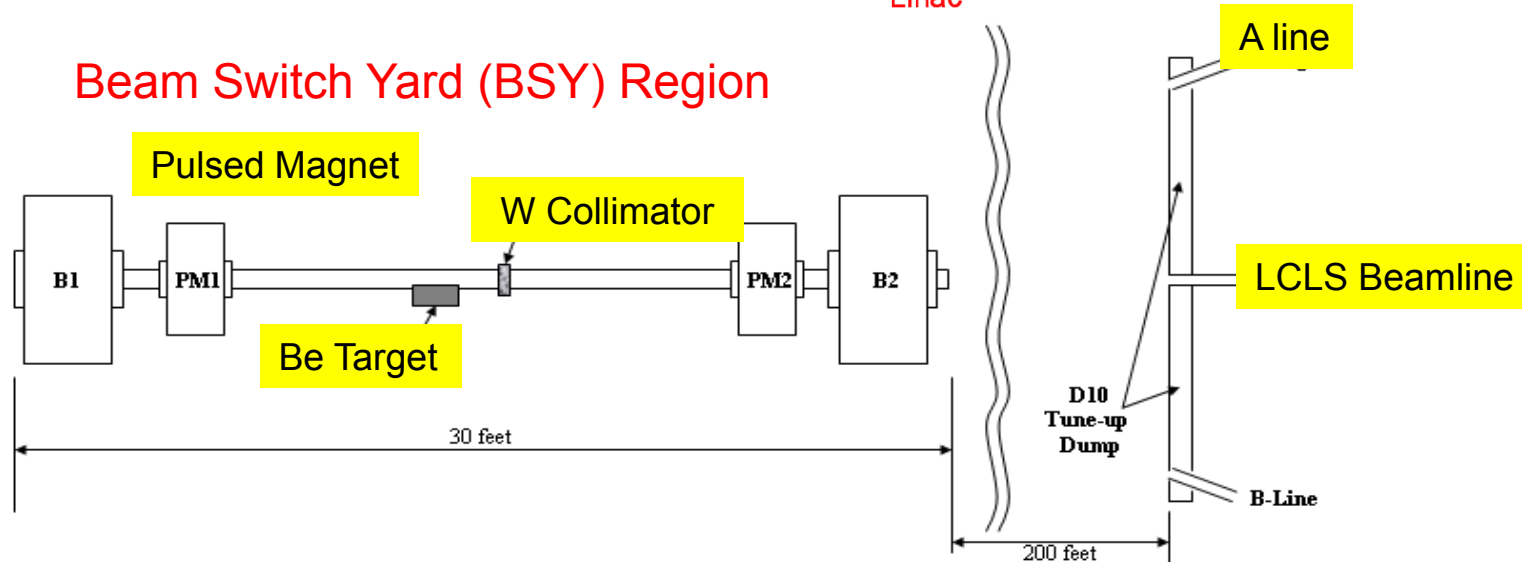
Electron and Pion beams up to 14 GeV

Test Beam Options

1. LCLS beam halo on W Collimator (*parasitic*)
~1 e⁻/bunch, 2-6 GeV
2. Kick 14 GeV LCLS beam to A line (~1 Hz)
1 – 1.0 x 10¹⁰ e⁻/bunch, p ≤ 14 GeV
3. Kick 14 GeV LCLS beam to Be Target (~1Hz)
~1/bunch, 2-12 GeV e⁺ or 2-10 GeV π⁺



Beam Switch Yard (BSY) Region



SLAC End Station A Test Beam Proposal

- ❖ Interest in both primary and secondary beams
- ❖ Primary beam: LCLS 14 GeV low emittance beam
- ❖ Secondary beam: electrons and pions
- ❖ Experiments can use a broad range of intensities: single particle/bunch, full intensity electrons, + variety of intermediate intensities

Primary beam uses

- Beam instrumentation and accelerator physics studies, e.g. ILC
- Beam dump tests: Activation, residual dose rates and materials damage studies;
can use thin or thick targets, with a range of bunch lengths
- Particle astrophysics detectors and techniques
- ✓ unique resource for the community, especially Linear Collider

Secondary beam uses

- Detector R&D for HEP, including particle astrophysics,
e.g. silicon and pixel detectors,
GEM and RPCs,
precision time-of-flight and photon detection systems,
calorimetry
- ✓ very clean electrons up to 14 GeV; known pulse arrival time--perfect for ILC electronics

Phased Approach to Future ESA Test Beams

Phase 1: 2010-2013 Low Rep Rate or Parasitic, Cost ~1M\$

- * Modernize the ESA PPS System,
 - * Develop kicker magnets and negotiate for shared beam use with LCLS
- Small investment for PPS and magnets + leverage availability of new LCLS beam, gives U.S. a second and very cost effective test beam for hep and other fields
- * Also, explore using LCLS beam halo hitting collimators as a parasitic source; beam test soon to measure amount of halo; high rate possible
- *Plan to submit proposal in December*

Phase 2: 2014 onwards? Full Beam Available

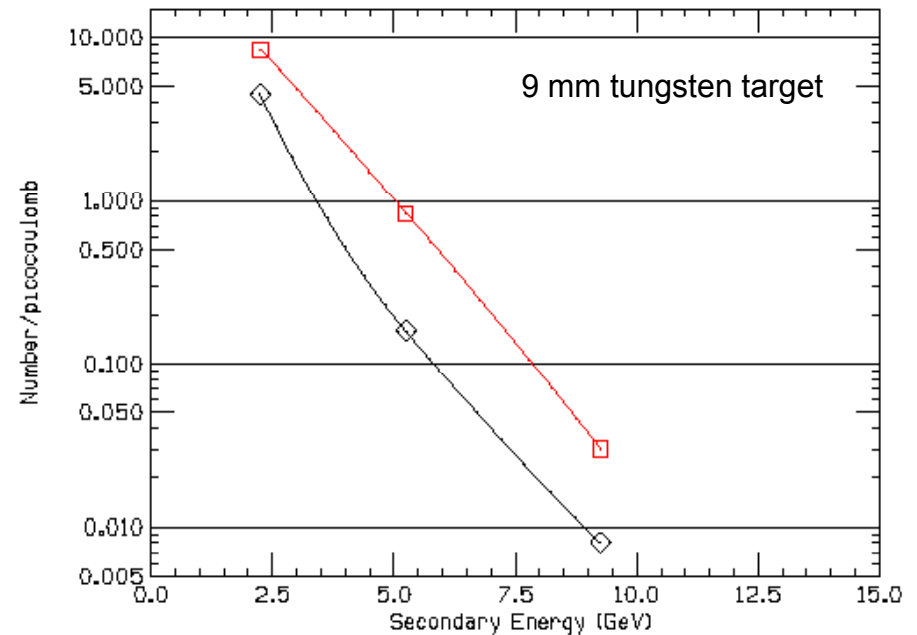
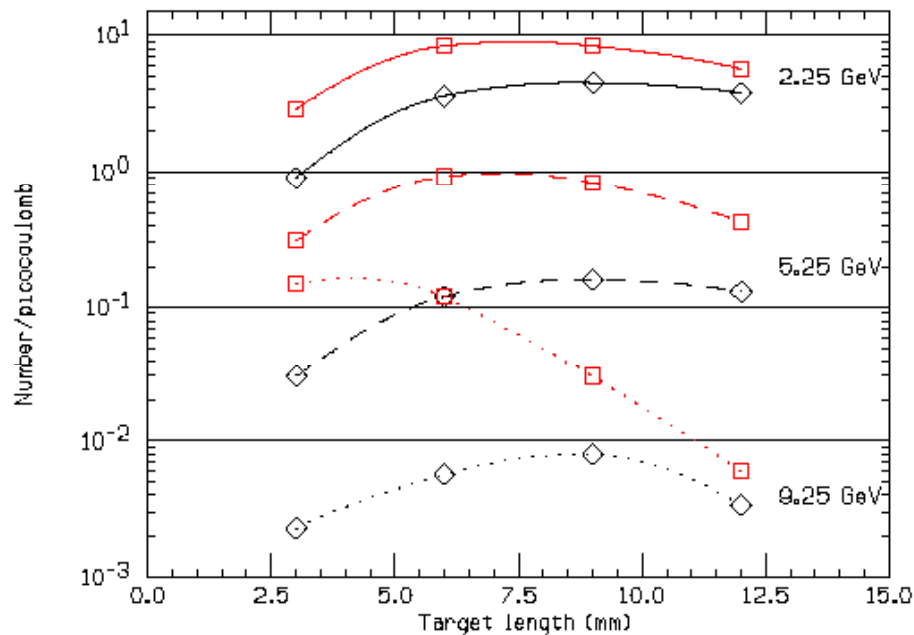
- * Task force looking at option to modify A-line optics to preserve low emittance beam and install 2nd undulator, LCLS-U2. Kickers in Beam Switch Yard would give high rep rate primary beam to undulator for photon science. Achromat following undulator would allow spent beam to be available for HEP test beam
- * Would plan to add target and secondary beamline in ESA, to give capability for secondary test beams as well as low emittance, primary test beam

Secondary Electron and Positron Yields in ESA

EGS4 results for yields per pC halo incident on W target in Beam Switch Yard

- 14.1 GeV primary beam energy
- 0.5-deg production angle
- Acceptance: $0.14 \mu\text{sr}$, $\Delta E/E = 0.02$

LCLS bunch charge is 1 nC ($6 \cdot 10^9$ electrons)



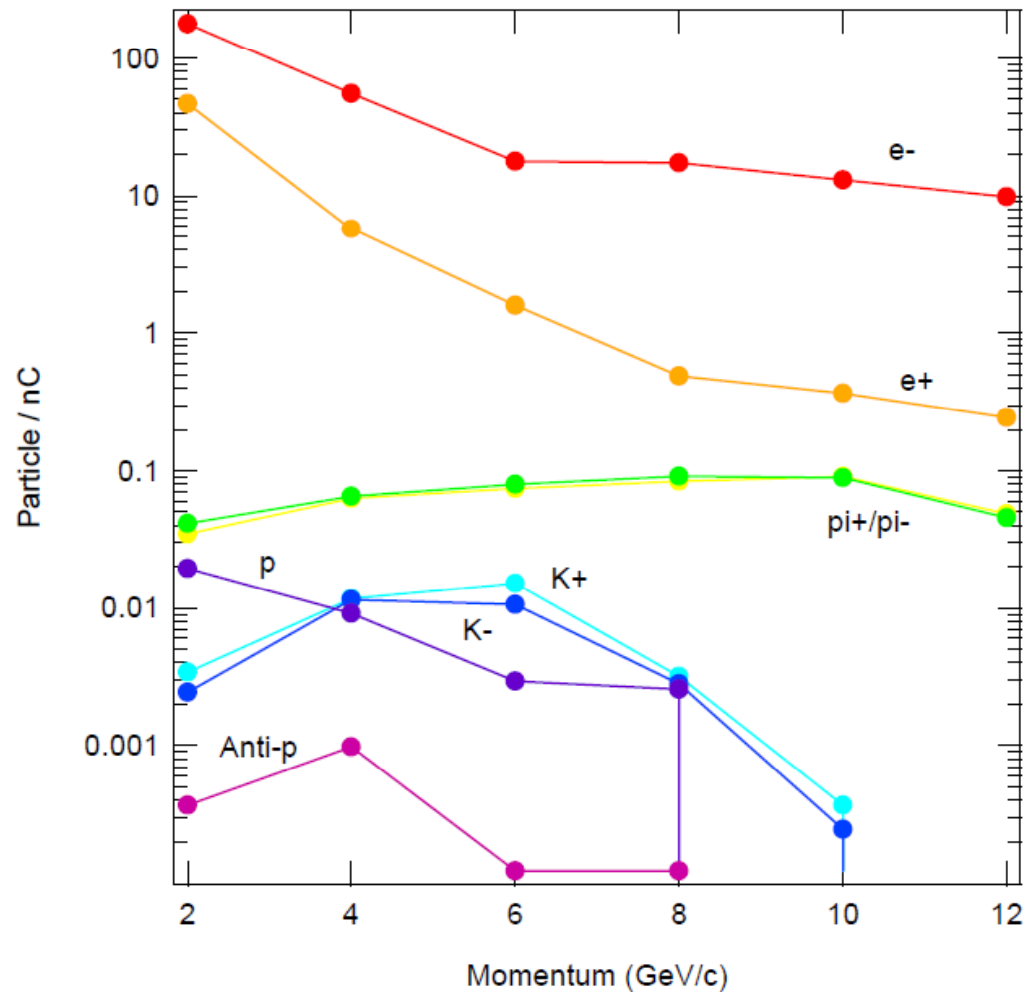
— electrons
— positrons

SLAC

Results from EGS4 simulation by L. Keller,
FLUKA simulation by T. Maruyama gives similar results



Secondary Hadron Yields



0.87 r.l. Be target*
0.75-degree production angle
13.6 GeV primary electron beam
Expect ~1nC primary beam
incident on Be target, using
new pulsed magnets

*investigating possibility for
longer targets; also for W filter
to improve π^+/e^+ ratio