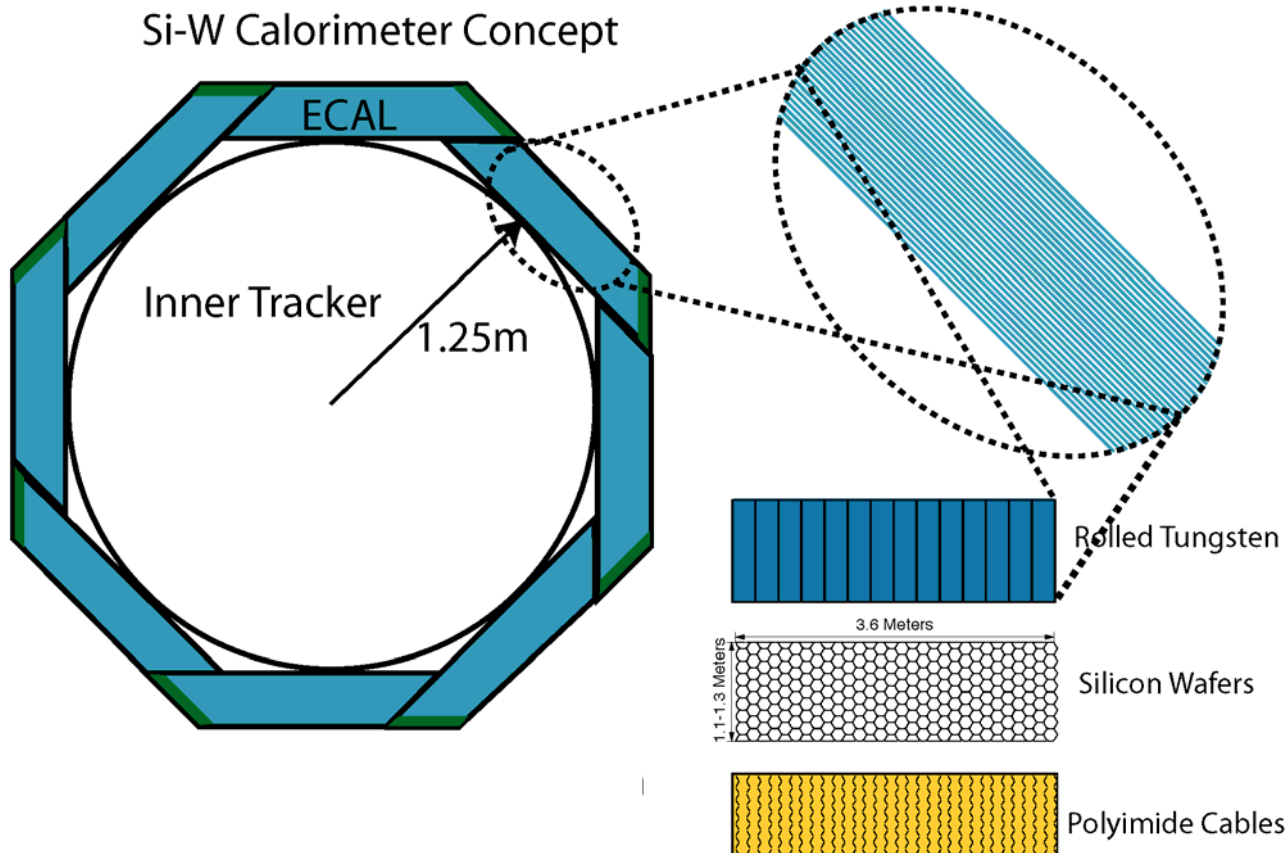


SiD Silicon-Tungsten ECal Update

Si-W Calorimeter Concept



See David Strom's talk on Weds

Baseline (SiD01) configuration:

- transverse seg.: 12 mm² pixels
- 1 mm readout gaps
- longitudinal: (20 x 25mm W) + (10 x 50 mm W) ; 25.5 X₀ total
- EM resolution: ~17% /sqrt(E)

Notes:

- 93% W alloy (DENS 24)
- 0th layer: Si only

Si/W ECal R&D Collaboration

M. Breidenbach, D. Freytag, N. Graf, R. Herbst, G. Haller, J. Jaros, T. Nelson
Stanford Linear Accelerator Center

J. Brau, R. Frey, D. Strom, A. Tubman
U. Oregon

V. Radeka
Brookhaven National Lab

B. Holbrook, R. Lander, M. Tripathi
UC Davis

- KPiX readout chip
- downstream readout
- detector, cable development
- mechanical design and integration
- detector development
- readout electronics
- readout electronics
- cable development
- bump bonding
- mechanical design and integration

Status/News

- KPiX readout chip (64 chan prototypes)
 - v4 prototype is still being evaluated
 - Adaptable to ECal, tracker, GEM DHCAL
 - Preparing for v5
 - v1024 ?
- v2 silicon detector design submitted to Hamamatsu
 - Is compatible with KPiX-1024
 - Need the LCDRD supplement to proceed
- Flex readout cable progress (Davis)
- Preparing first bump-bonding trials (Davis)

ECal R&D Plan (Outline)

status

1 st round prototype detector dev. and testing	2004-6	Oregon	✓
KPiX prototypes chip design mods and bench testing	2006-7	SLAC, Oregon	v4, under test
Develop and fab kapton readout cable	2006-7	UC Davis	✓ dev
B. bond KPiX-v2 to v1 detectors and flex cables – test in lab and in electron beam	2006-7	UC Davis, Oregon	Beams at SLAC ????
Design and order v2 detectors (40) for full-depth ECal module	2006-7	Oregon	on track
Develop concentrator boards	2007	SLAC	
Full mechanical design for prototype	2007	??	??
Mechanical and magnetic field tests	2006-7	All	
Order full 1024 channel KPiX	early 2007	SLAC	LATER
Bump bond KPiX-v1024 to Si-v2	2007	UC Davis	Non-trivial
Fab. ECal module; test in electron beam: determine EM response	2007 ?	All	delayed: KPiX-1024 and \$\$
ECal module + HCal module in hadron beam (presume FNAL) – G4 validation	2008 ??	All	

Some needed studies...

- Longitudinal structure (baseline is a motivated guess)
 - What EM resolution is *required* ?
 - Particle flow (photon E res. shouldn't contribute)
 - id of tau final states
 - π^0 reconstruction (eg G. Wilson)? High energy?
 - Depth (containment) and numbers of layers (money, E resolution, pattern recognition of EM)
 - Don't yet know how well HCal can help with EM resolution (!) ←
- Segmentation
 - gamma-gamma and h^\pm -gamma separability
 - Can use fast MC to evaluate effects (leftover project from last summer)
 - Clustering algorithms
 - EM shower id !!
 - Good progress with H-Matrix (Norman Graf, Graham Wilson+student)
 - Not yet using 3-d shower profiles ←
- Raison d'être studies
 - jet/pflow processes
 - Without beam constraint (eg invisible decays)
 - Jet combinatorics in complicated final states
 - Tau id and final-state reconstruction (pol)
 - Photon tracking; heavy quark id (eg electrons in jets, neutrino recon)