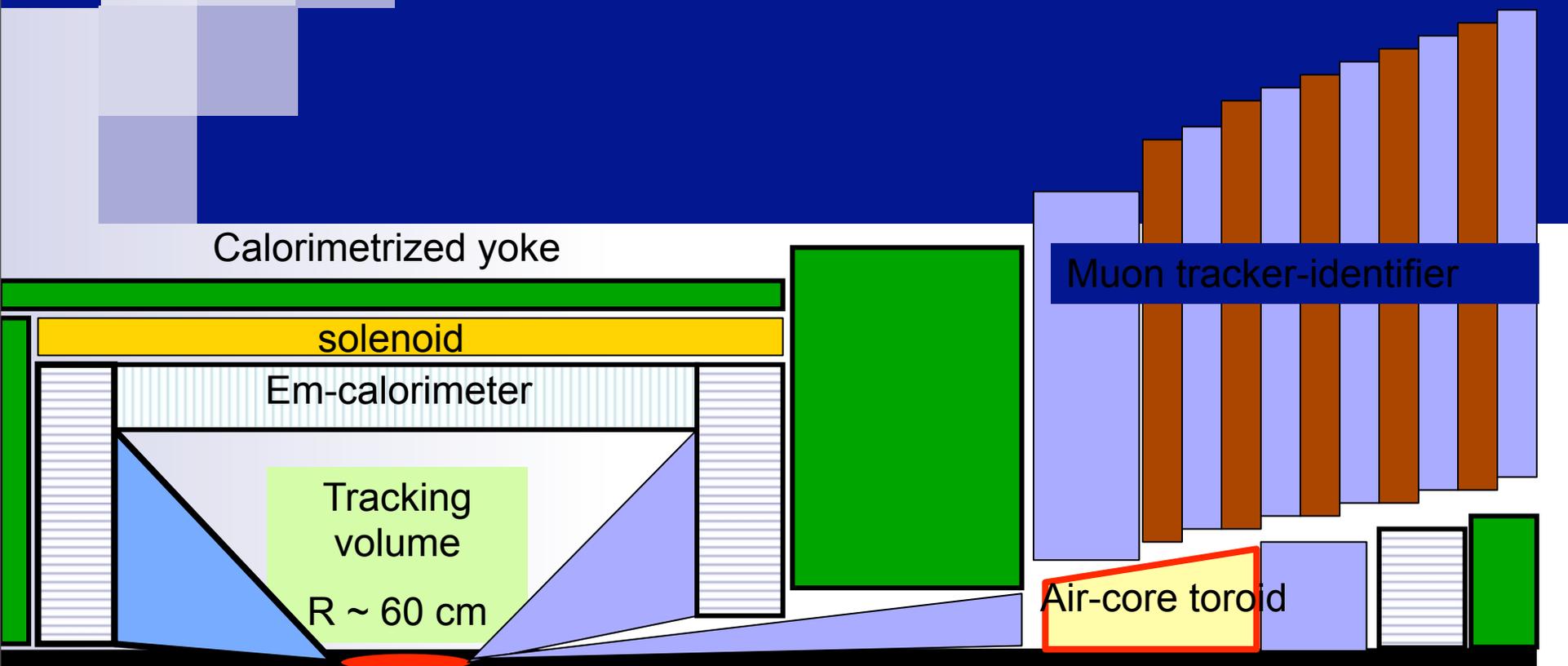
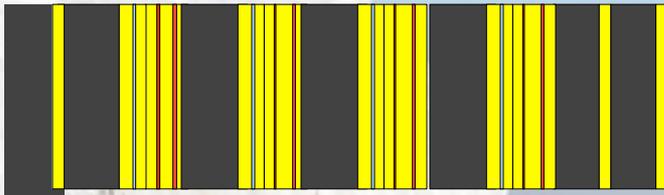


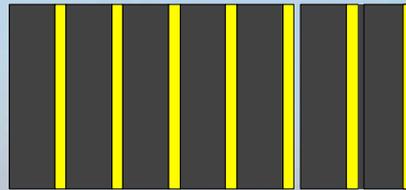
Hybrid (StriPad) silicon sensors for eRHIC W-Si EM calorimeters



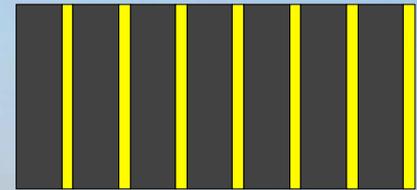
Segment - 0



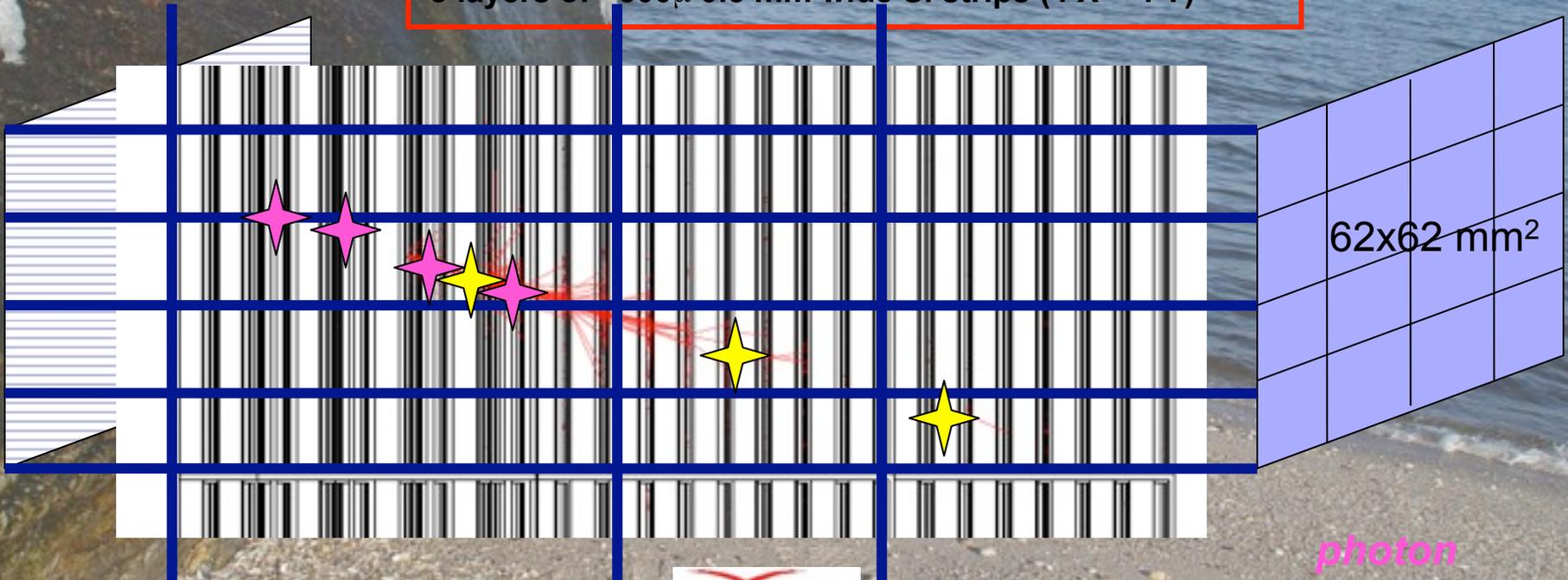
Segment - 1



Segment - 2



4 mm W plates, $\sim 21 X_0$;
21 layer of $\sim 500\mu$ Si pads $15 \times 15 \text{ mm}^2$
8 layers of $\sim 300\mu$ 0.5 mm wide Si strips (4 X + 4 Y)



photon

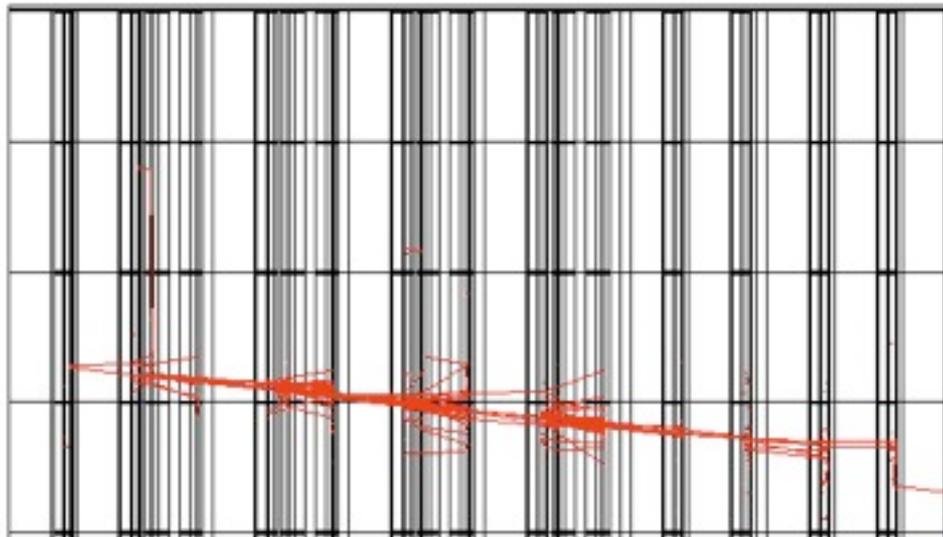
2

04/10/2009



E. Kistenev 12/10/2008

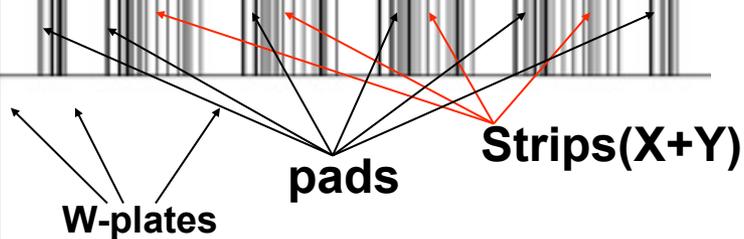
Multiple scattering in W and shower size



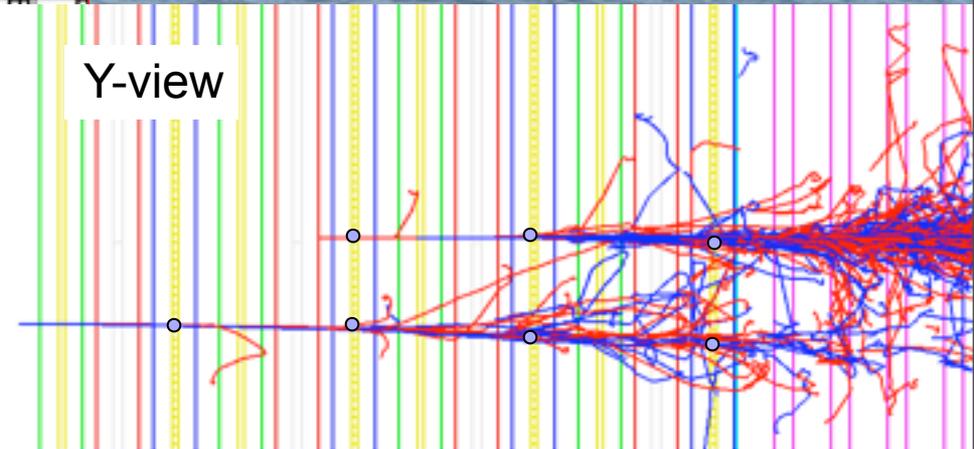
W both cleans and regenerate background e's which propagate freely in the large readout gaps;

Early in the shower hit counts in strips is only vaguely correlated with shower energy;

At a shower max showers are long merged

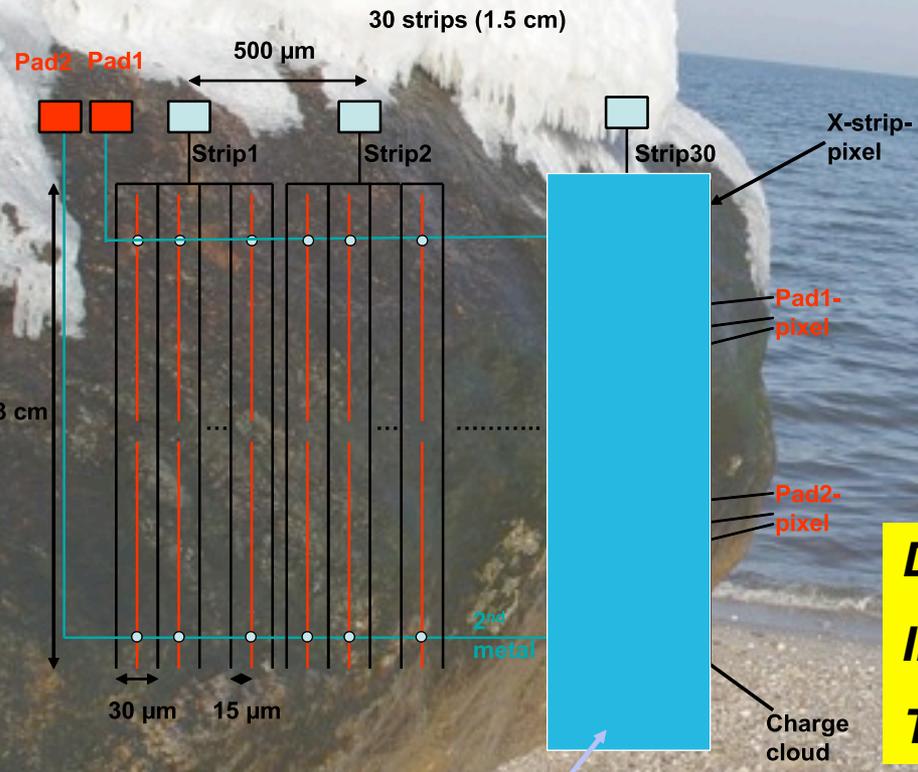


Y-view



Calorimeter separates showers down to $\sim 3\text{mm}$ distance but efficiency is limited by shower expansion inside "empty" gaps.

LDRD Subject: Hybrid (StriPads) sensors with single- or double-sided readout:



- high resistivity (> 10 k-cm) n-type Si wafers, with $600 \mu\text{m}$ thickness. The detector will be made in p+/n/n+ configuration with the segmented side being the p+.

Design: Physics+Instrumentation
Implementation: Instrumentation
Testing: Physics+Instrumentation

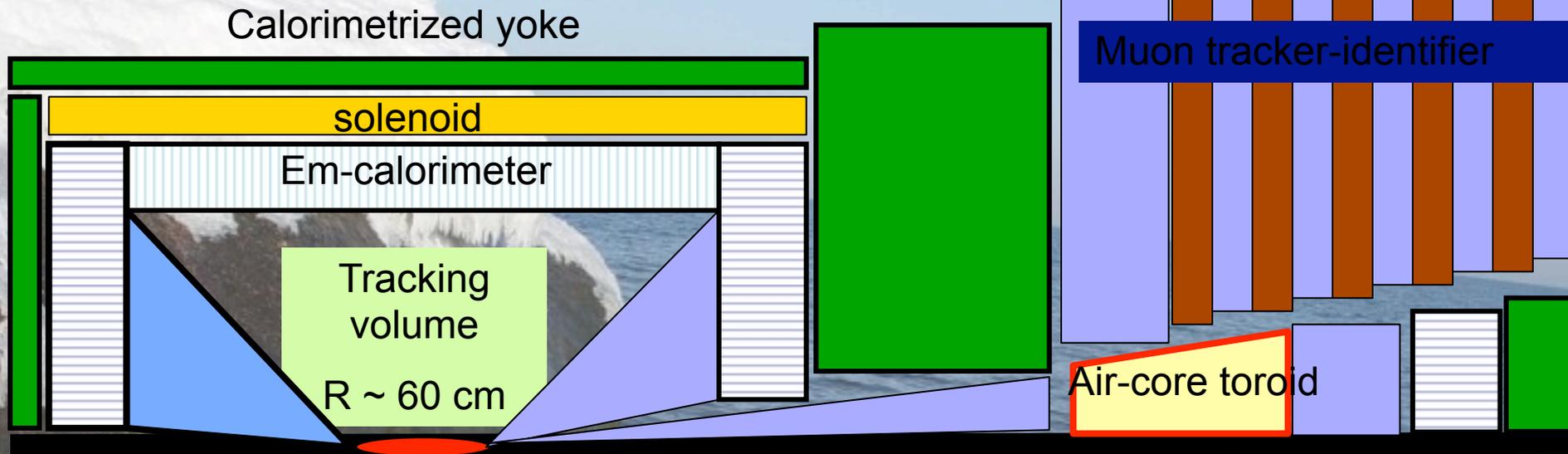
(2) double sided

Summary & proposal

New kind of silicon sensors which would allow to avoid shower spreading inside γ - π^0 separator and significantly improve calorimeter resolving power is proposed;

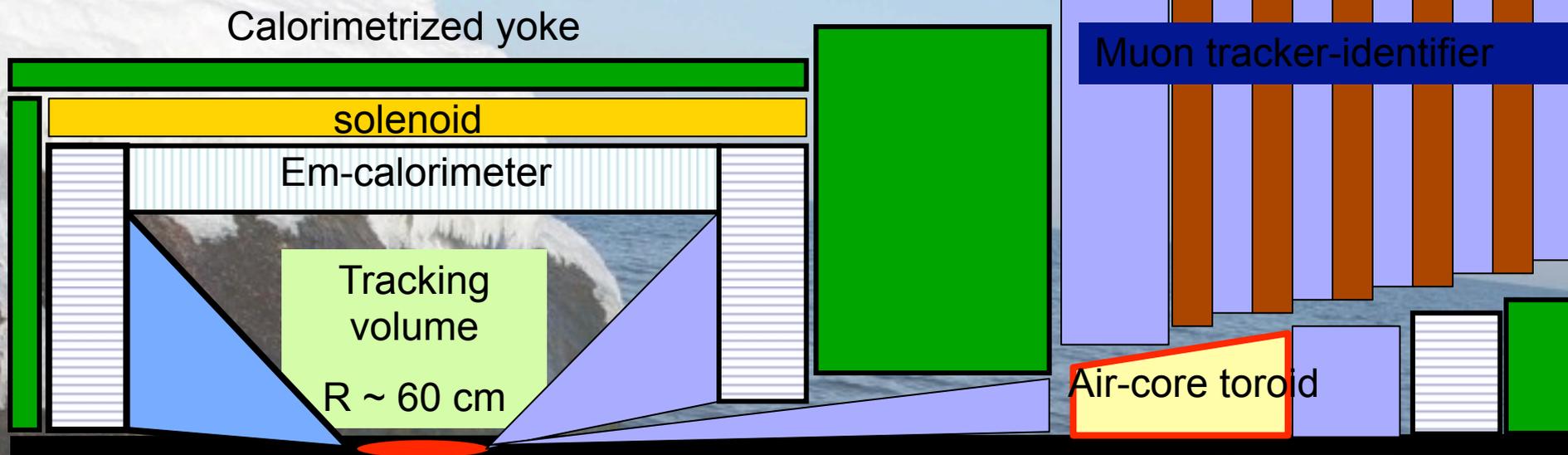
Two options (pixilated single sided and double sided) will be prototyped using BNL Instrumentation facilities and studied by PHENIX group;

Detector concept



- Silicon vertex tracker for jet flavor identification. Bonus: low momentum charged particle identification by dE/dx .
- Nonprojective tracking electromagnetic calorimetry inside magnet. Detailed shower shape measurements to insure lepton identification in the low p_T domain. **Driver for detector size. ToF upfront;**
- Solenoidal magnet inside of thin calorimetrized return yoke (leakage tagger) complemented by air-core toroid close to beam pipe forward;

Detector concept



- Full Si tracking;
- PID due dE/dx in silicon, shower shape in calorimeters tracking-calorimeters E/p matching and ToF (10ps!!);
- Muon identification is prioritized towards high p_T ;
- Space along the beam line ~ 5 m, central detector yoke diameter ~ 2.5 m.