CPS4KLF: Design Modifications and Future Plans

Sean Dobbs
Florida State U.

CPS Collaboration Meeting
February 4th, 2020

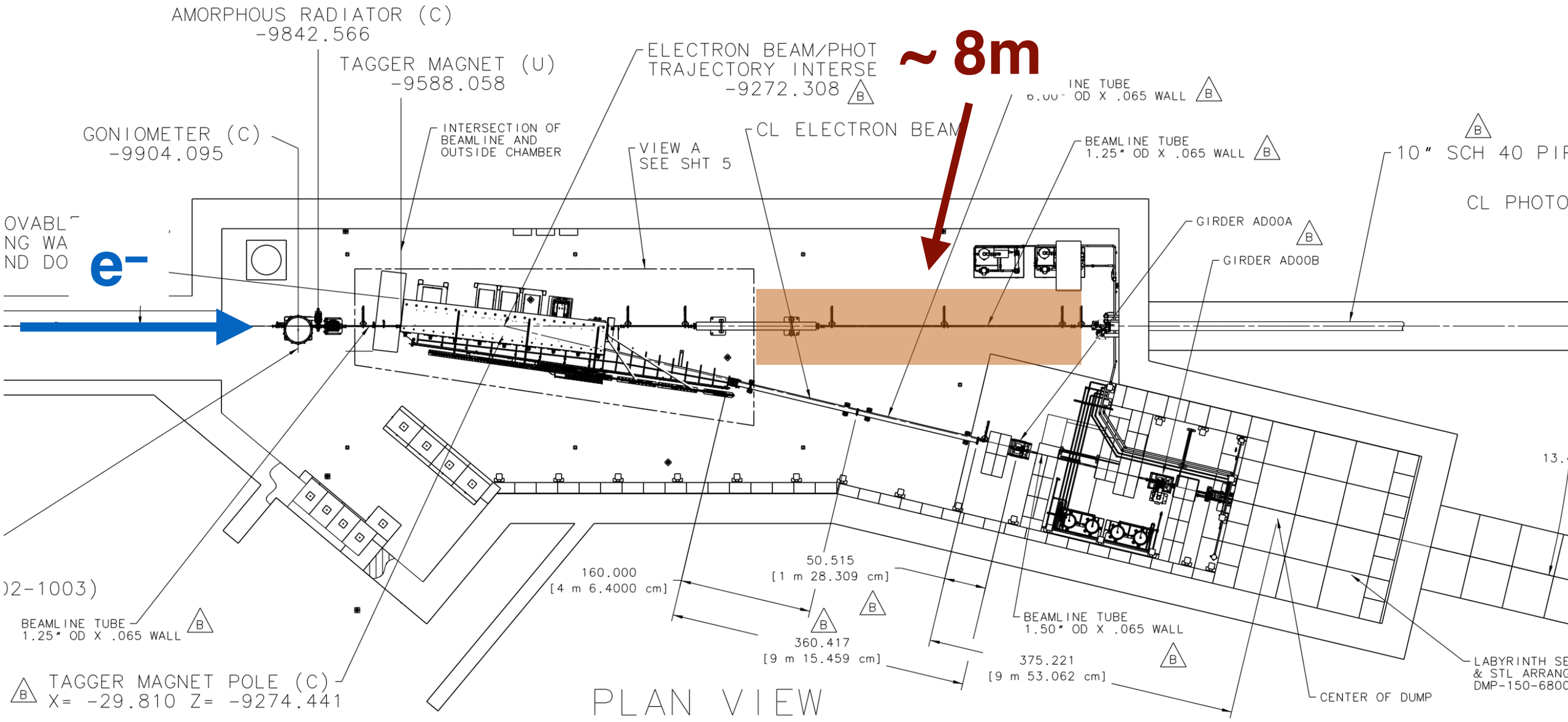
Introduction

- KLF in Hall D requires an intense photon beam to generate the tertiary K_L beam
  - The CPS concept fits this requirement well
- Some modifications will be needed to the base CPS design
  - Fewer physical restrictions in Hall D Tagger Hall
    - Operation must not affect other Hall equipment
  - Higher average beam power
  - Photon beam must travel longer distance

KLF Electron & Photon Beam Requirements

- KLF Electron Beam parameters:
  - 12 GeV e^- @ 5 uA → 60kW power (x2 CPS)
  - Low repetition rate for K_L TOF: 64 ns bunch spacing
  - Raster: 1 x 1 mm, 2 x 2 mm, 5 x 5 mm?
  - Further coordination with APEL
- Distance from CPS radiator to Be target: around 55 m
  - Beampipe radius: 12.4 cm
  - Be target radius: 3 cm
  - Target radius (extra 20 m d.s.): 3 cm

Hall D: Tagger Hall



PLAN VIEW

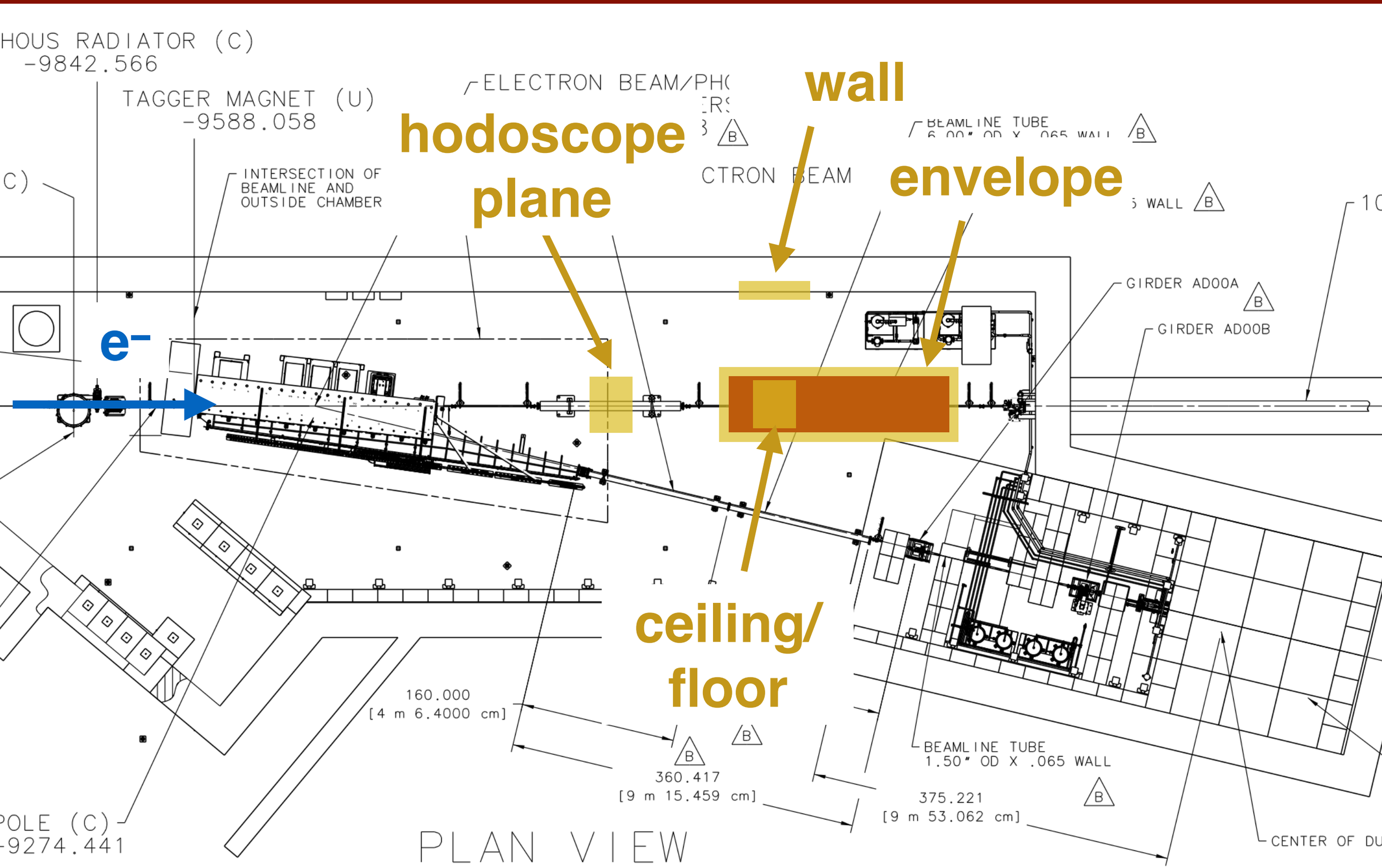
Suggested Modifications

- Keep similar inner design
  - 10% R.L. Cu radiator+Magnet+W/Cu insert+Cu absorber
  - 2x power → 2x longer magnet
    - Larger raster reduces required magnet length
- Replace outer tungsten shielding with lead
  - Length increases to roughly 6m
  - Optimize size & composition to reduce weight
- Optimize collimation/exit opening for desired beam properties
- Use existing 60 kW dump cooling

Simulation Plans

- Optimize electron beam raster + collimation
- Confirm power density deposition
- Optimize radiation shielding, measuring radiation levels at:
  - Tagger Hall walls, ceiling, floor
  - 1ft envelope around CPS
  - Tagger hodoscope plane
  - Eventually:
    - Tagger ramp door
    - Site boundary

Hall D: Tagger Hall



Summary

- CPS concept provides ideal photon source for KLF
  - Simple modifications to handle double the beam power with looser physical constraints
  - Must keep beam on GlueX target over long distance
- Next steps are simulations to optimize design
  - Photon beam properties
  - Shielding
- Iterate beam simulations with target geometries
- Longer term thoughts:
  - Stability with respect to mechanical changes

CPS at the Hall D Tagger Area