

# Status of KLF Project

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# New Equipment for KLF

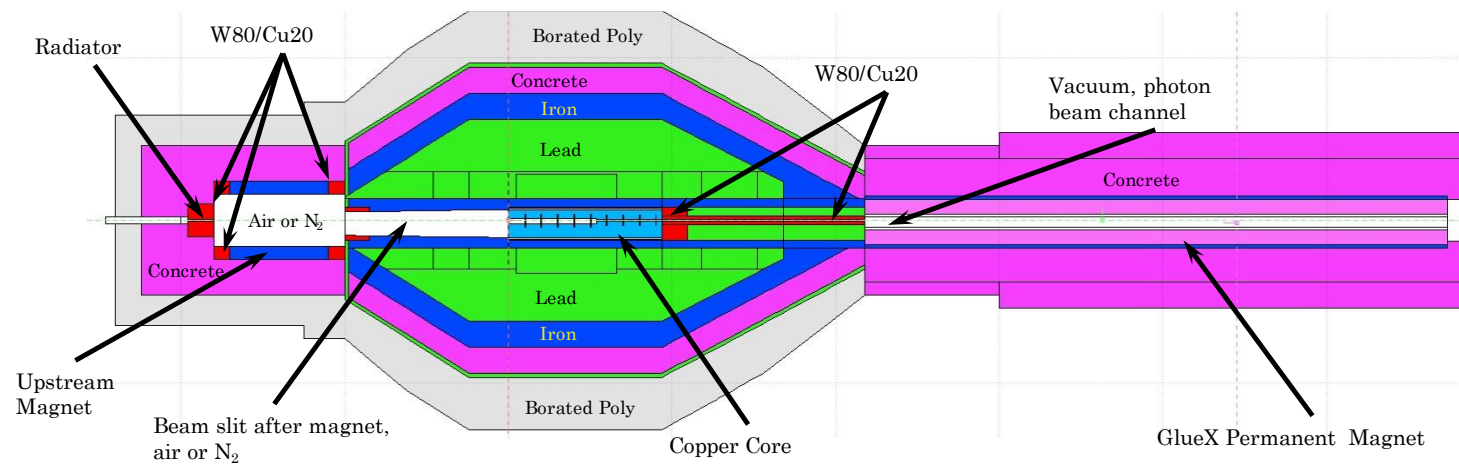
- Compact Photon Source (CPS)
  - Jefferson Lab & ODU
- Kaon Production Target (KPT)
  - GWU, ODU, & Jefferson Lab
- Kaon Flux Monitor (KFM)
  - University of York & Jefferson Lab
- Cryo-target
  - Jefferson Lab
- Electron Beam Instrumentation
  - Jefferson Lab & ODU

# Compact Photon Source

- Conceptual design exists.
  - Working on optimizations.
- Sufficient shielding to satisfy RadCon and Hall D requirements.
- Temperature in the copper core is significantly lower than in Hall C design,  $T_{\max} = 230^{\circ}\text{C}$  with nominal beam conditions.
  - Stresses and deformations are being studied.
- CPS will be moveable to restore GlueX photon beamline.
- Engineering design will start after this review.
  - Engineering design and procurement are expected to take  $\sim 21$  months after ERR-1 approval.
- Current cost estimate for CPS is  $\sim \$1\text{M}$ .
- Expected installation duration is  $\sim 7.5$  months.
- Details in talks by H.E. and Tim Whitlatch.

## Specifications

- Work with 12GeV electron beam
- Photon flux of  $\Phi_{\gamma} > 10^{12}$  photons per second with  $1.5 \text{ GeV} < E_{\gamma} < 12 \text{ GeV}$ 
  - $5\mu\text{A}$  nominal beam current
  - 10% nominal production radiator
- Spot size at KPT with  $2 \cdot \text{FWHM} < 6\text{cm}$
- Radiation environment in and around the Tagger Hall similar to GlueX at  $5\mu\text{A}$  and diamond radiator.

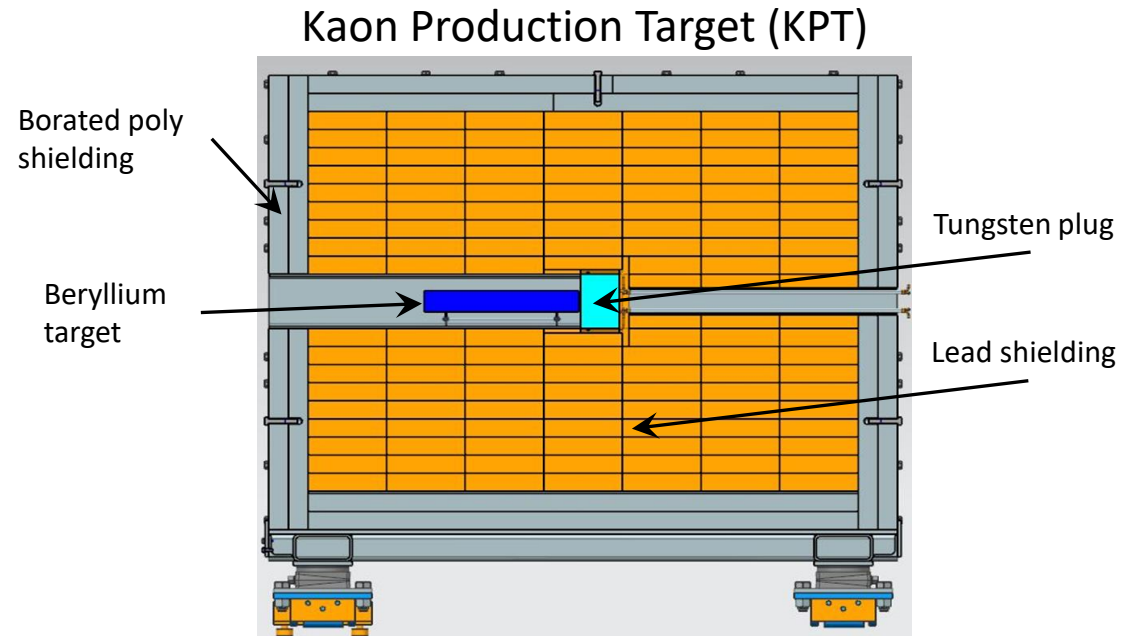


# Kaon Production Target

- Conceptual design is complete.
- Radiation environment in the collimator cave and the main hall are evaluated.
  - No significant impact on the equipment lifetime in Hall D is expected.
  - Meets requirements of RadCon.
  - Special care will need to be taken before accessing Collimator Cave, based on the activation rates.
- Engineering design is also complete.
  - Including cooling system for the target and tungsten plug.
- Preparing for procurement of KPT components.
  - Total estimated cost is ~\$230K.
  - Procurements are expected to take ~9 months after ERR-1 approval.
  - Installation length is ~4.3 months.
- Details in presentations by Igor Strakovsky and Tim Whitlatch.

## Specifications

- $K_L$ -flux of 10KHz at the cryo-target with 5 $\mu$ A e-beam on 10% RL radiator.
- Photon beam power to the KPT assembly of 5.5 kW.
- Target diameter of 6 cm for kaon production.
- Low neutron flux to the main hall not to damage electronics.
- Prompt dose rate <1 mrem/h at the ceiling of the main hall.
- Activation dose rate <1 mrem/h in the main hall.

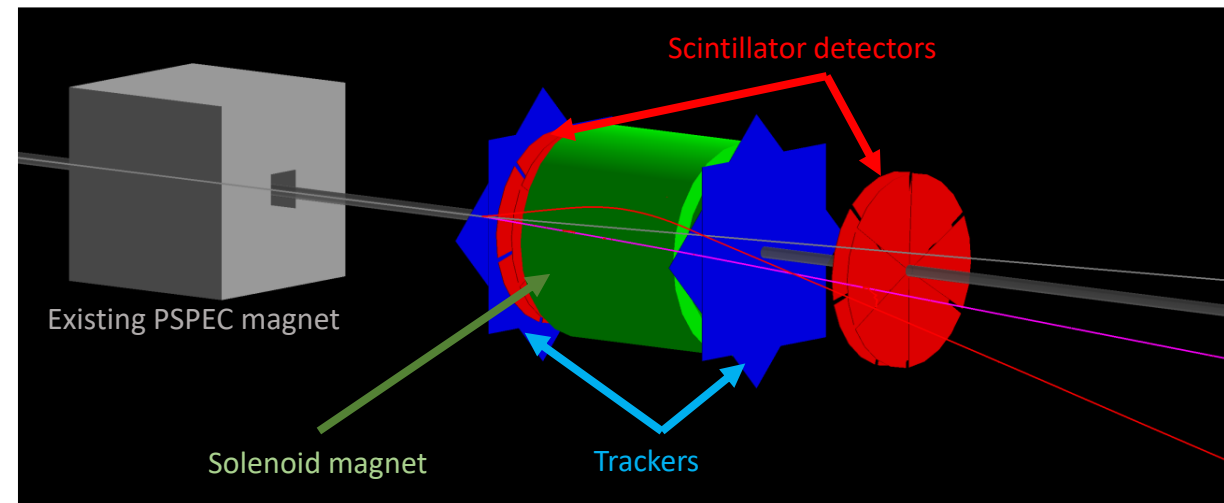


# Kaon Flux Monitor

- All components will be designed, procured, and constructed by University of York, UK.
  - Waiting for funding approval from UK funding agencies.
  - Decision should be known by the end of the summer.
- Four possible scenarios are being considered based on the funding approval.
  - Completely new detectors, plus an MRI magnet.
  - WASA FPC tracking and TOF detectors reused.
  - No magnet, with WASA FPC and TOF.
  - No magnet, no FPC-s, scintillator hodoscopes only.
- In either case, KLF will have a kaon flux monitor.
- Performance of the flux monitor depends on which scenario is implemented.
- The scope of the installations in the hall depends on the selected option.
  - Procurement, delivery, and installations of the MRI magnet and its controls will be closely coordinated with Hall D engineering group.
- More details in Mikhail's presentation.

## Specifications

- Measure  $K_L$ -flux with accuracy of  $<5\%$  versus  $K_L$ -momentum .
  - Preferably, provide radial position dependent flux for each momentum bin.
- $K_L$ -momentum range from 1 GeV to 10 GeV.
- Fit in the space between PSPEC magnet and the target cart.
- Provide online information on the  $K_L$ -flux distribution.
  - KFM is expected to see rates of  $\sim 1$  KHz.

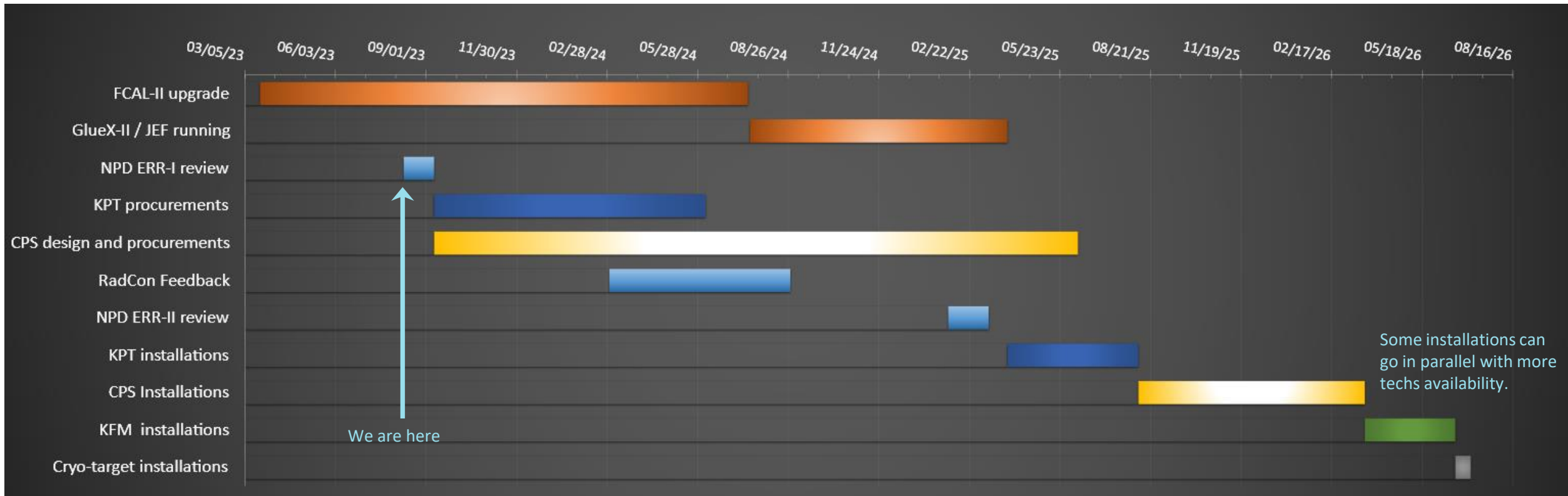


# Electron Beam

- Electron beam requirements for CPS operations are defined and conveyed to CASA and OPS.
  - No showstoppers are identified.
  - May need some new equipment in the tagger hall and the main hall.
  - See the talk by Edith Nissen.
- Beam bunching of 64ns and 128ns are being studied.
  - A special laser to support high charge density has been purchased.
- There are concerns about compatibility of KLF with MOLLER experiment.
  - Compatibility with MOLLER is currently under investigation.
  - Beam tests will need to be performed to answer related questions.
- More details regarding beam time structure and injector are in the presentations by Geoffrey Krafft and Riad Suleiman.

# Timeline

- The timeline is based on the current design and preliminary estimates.
- Total cost estimate to Hall D ~\$2.3M.
  - KFM expenses are covered by University of York.
- We need to start engineering design of CPS this fall.
- We would like to start procurements for KPT this fall.



# Summary

- Conceptual design for CPS exists.
  - Thermal analysis is ongoing.
  - Needs more optimization studies to save weight and cost, as well as some space.
- Engineering design for KPT exists.
  - Ready for procurements.
- The choice of the KFM design will be finalized this summer.
  - Waiting of funding decision in UK.
- Questions of compatibility with MOLLER experiment will be answered after beam tests.
- No major R&D is anticipated for any of the KLF components.
- Current timeline will allow us to be ready to start running in July of 2026.