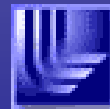


Overview, X Ray Transport, Optics, and Diagnostics

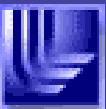
WBS 1.05, WBS 2.05

This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract No. W-7405-Eng-48.

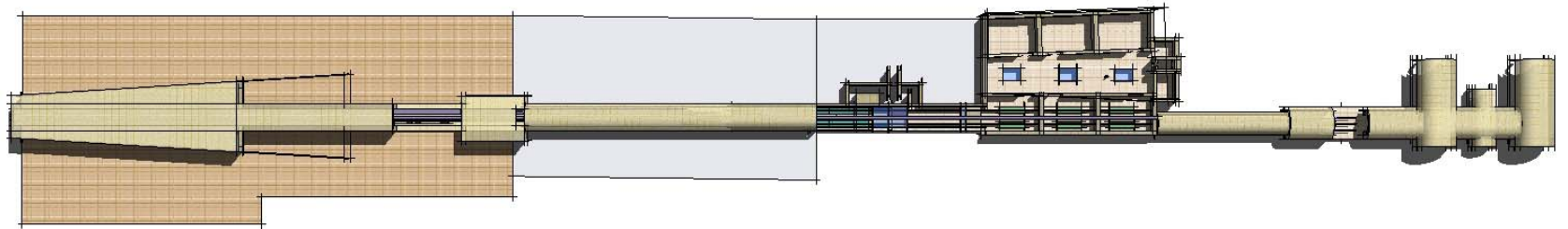
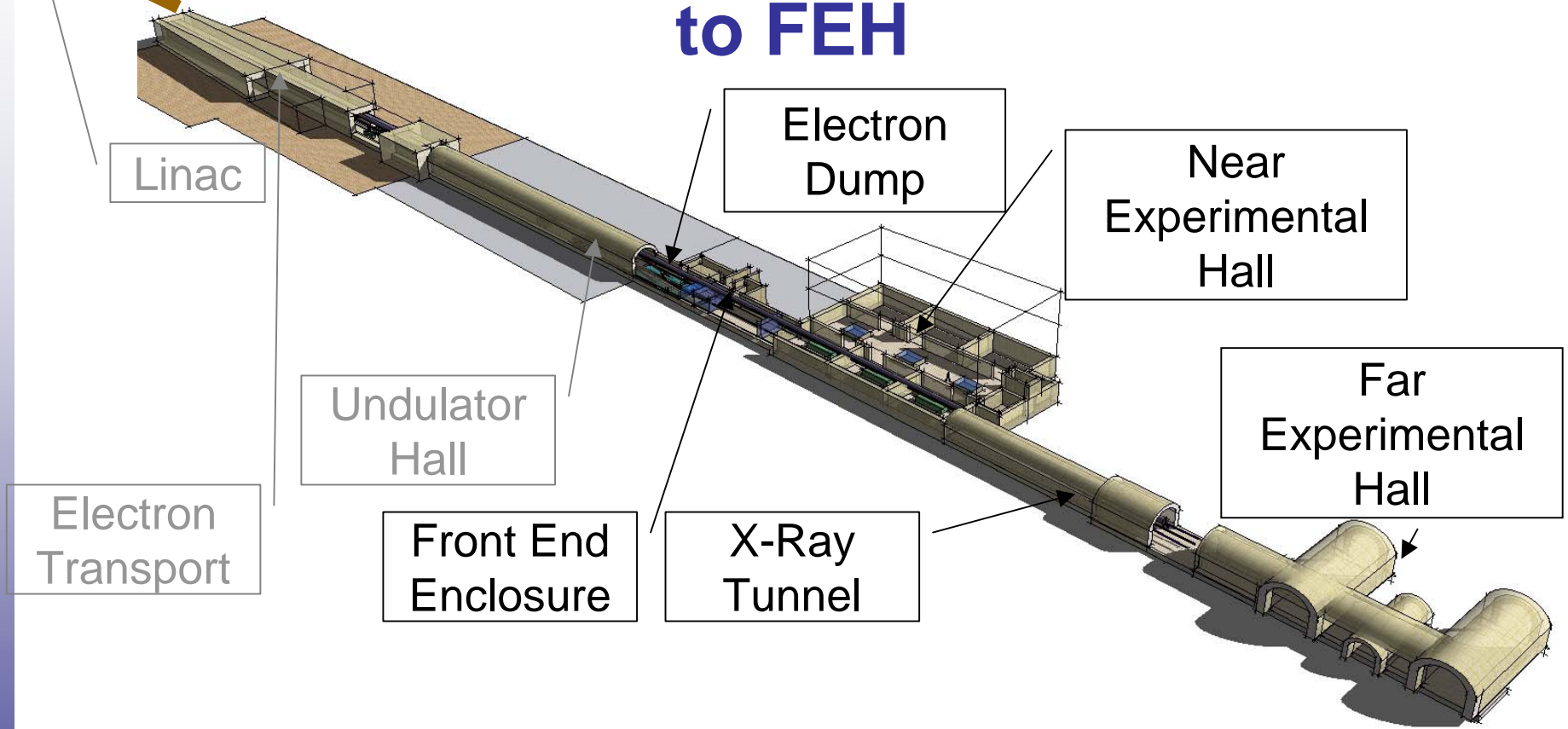


Outline

- Overall Scope
- General Goals
- Technical Progress
- BCWS
- Major Risks
- Near-term plans

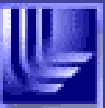
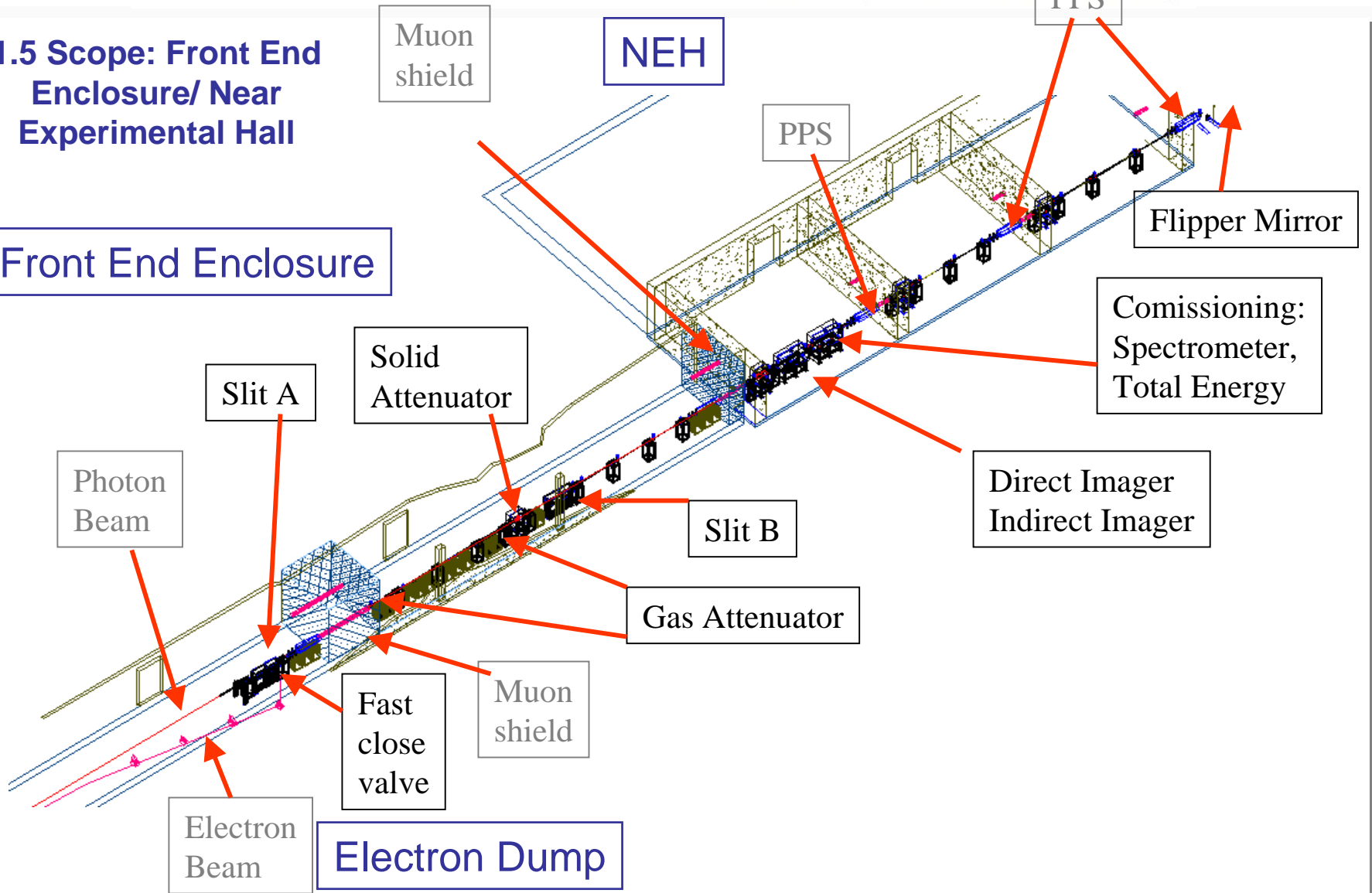


XTOD Transports Photons from e⁻ Dump to FEH

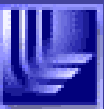
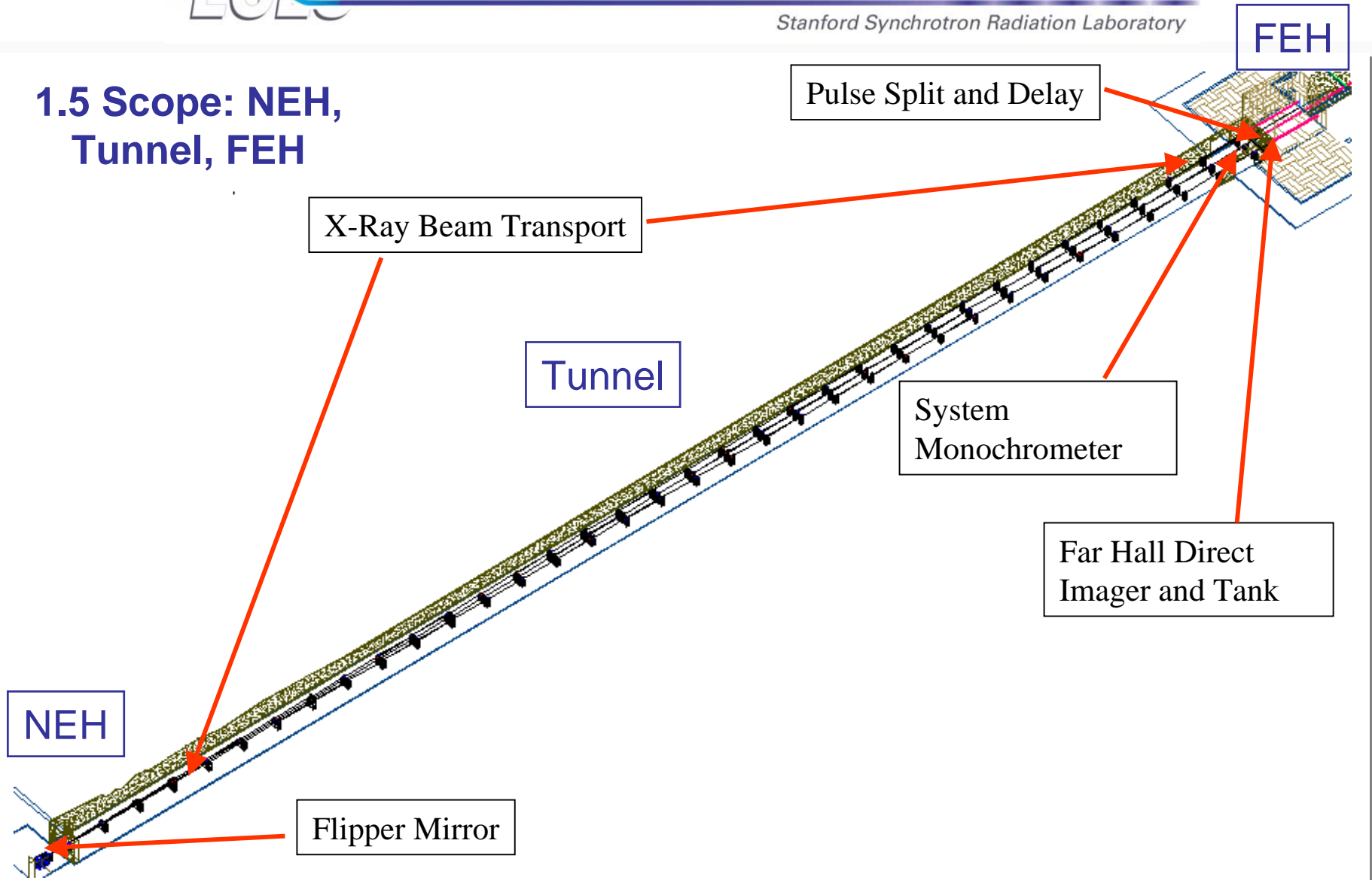


1.5 Scope: Front End Enclosure/ Near Experimental Hall

Front End Enclosure

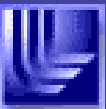


1.5 Scope: NEH, Tunnel, FEH

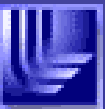
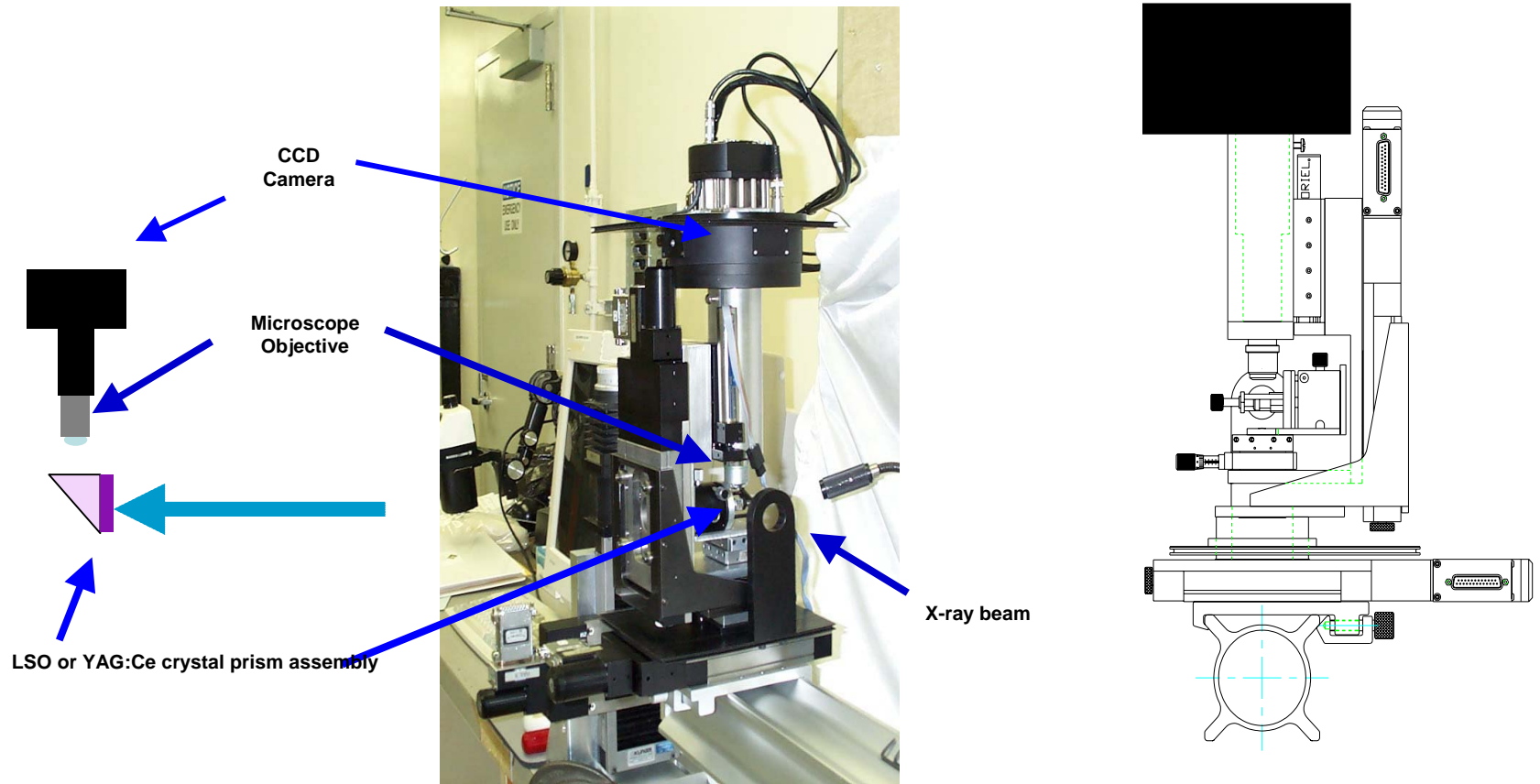


XTOD Goals

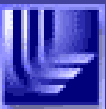
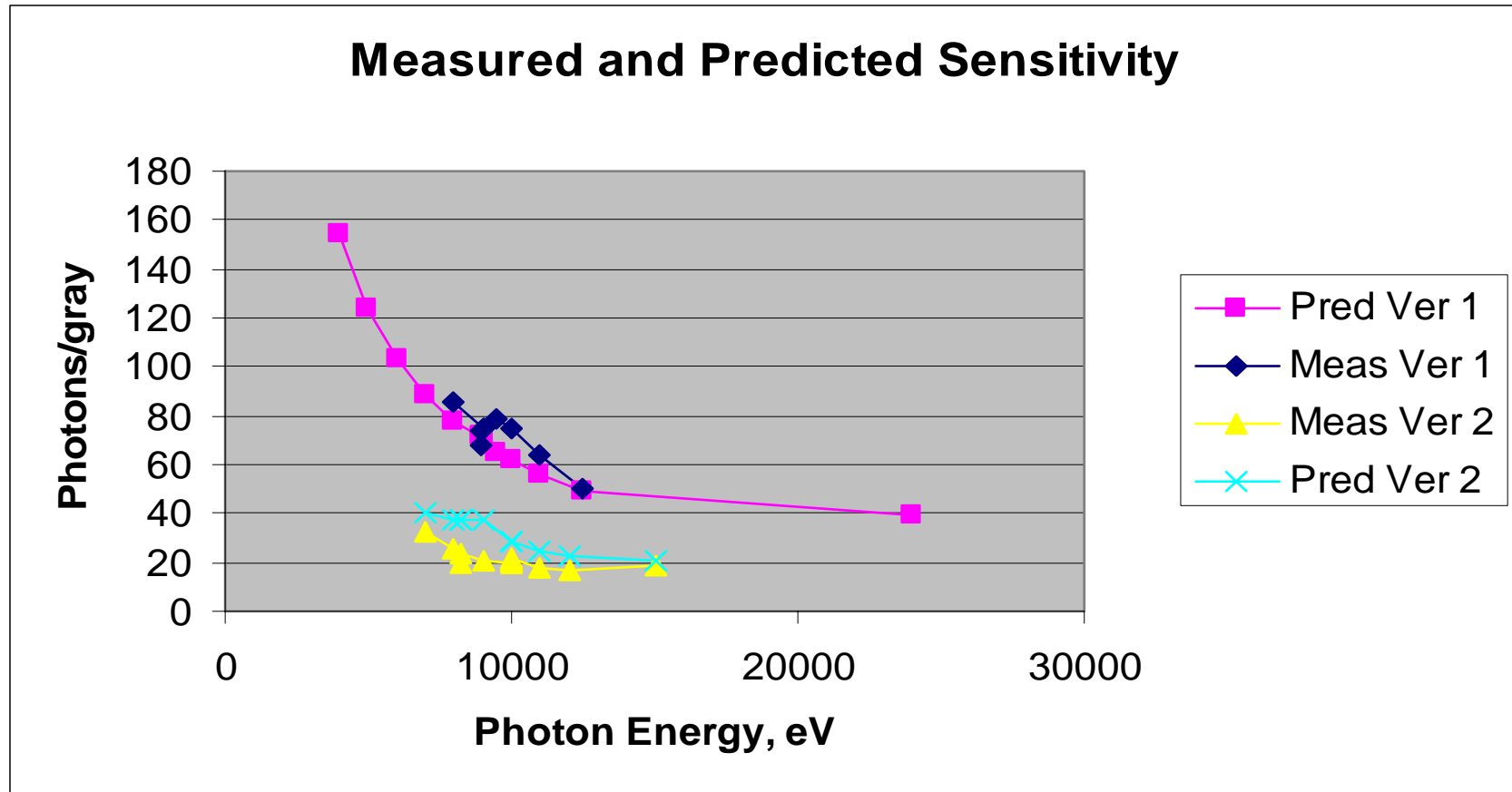
- Provide vacuum path from end of undulator to hutches in Far Hall with capability of attenuating beam to synchrotron levels.
- Provide necessary diagnostics to commission the LCLS and monitor its performance.
- Detect X-Ray Photons in Far Hall.
- Demonstrate detection and optical techniques that would be useful to users.



We have developed and tested a prototype of the main Imager

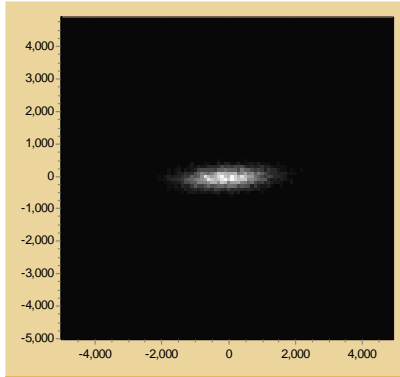


Prototype measured and predicted sensitivities in fair agreement



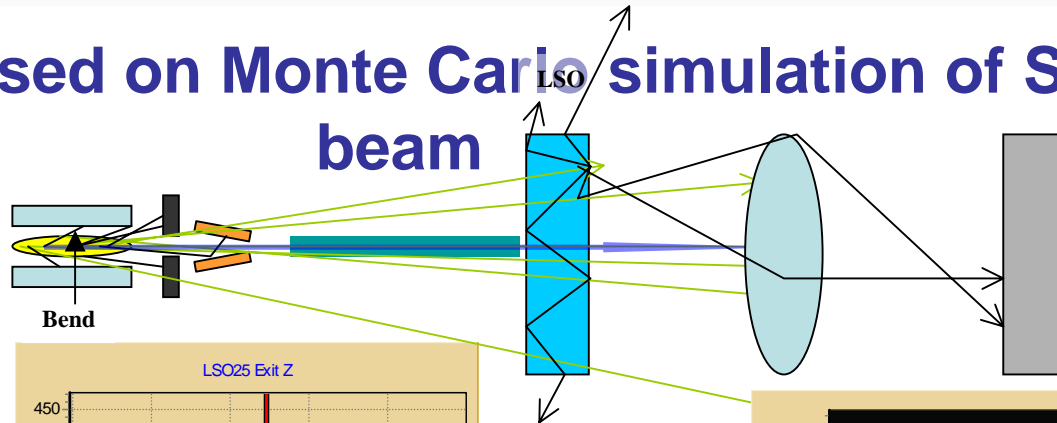
Predictions based on Monte Carlo simulation of SPEAR beam

Y, microns



X, microns

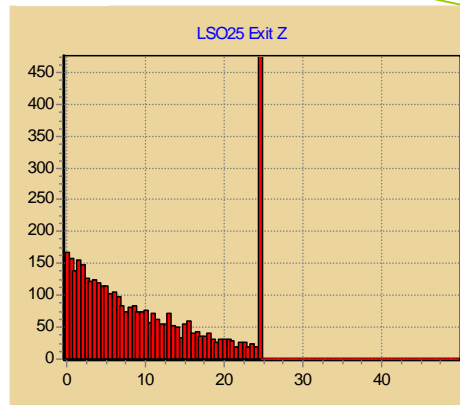
SPEAR source simulation



beam

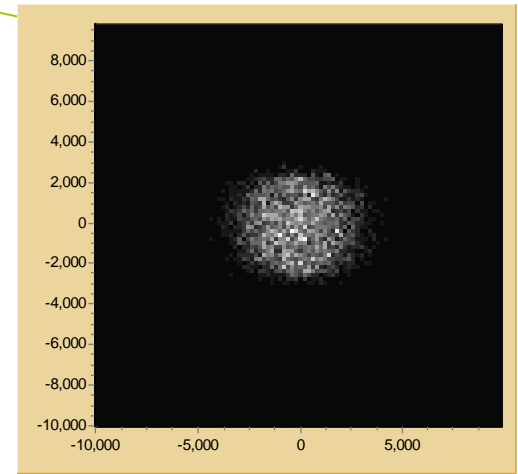
LSO

Bend



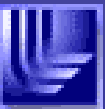
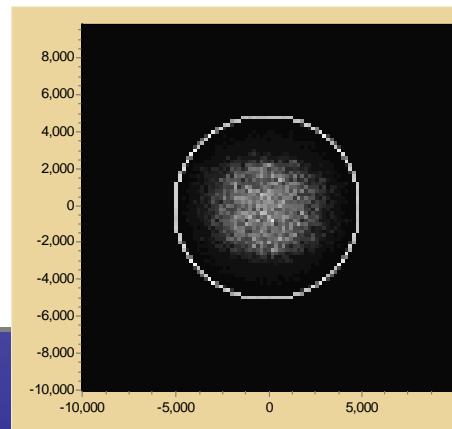
Interaction depth, microns

X Ray Photons
interacting in
scintillator



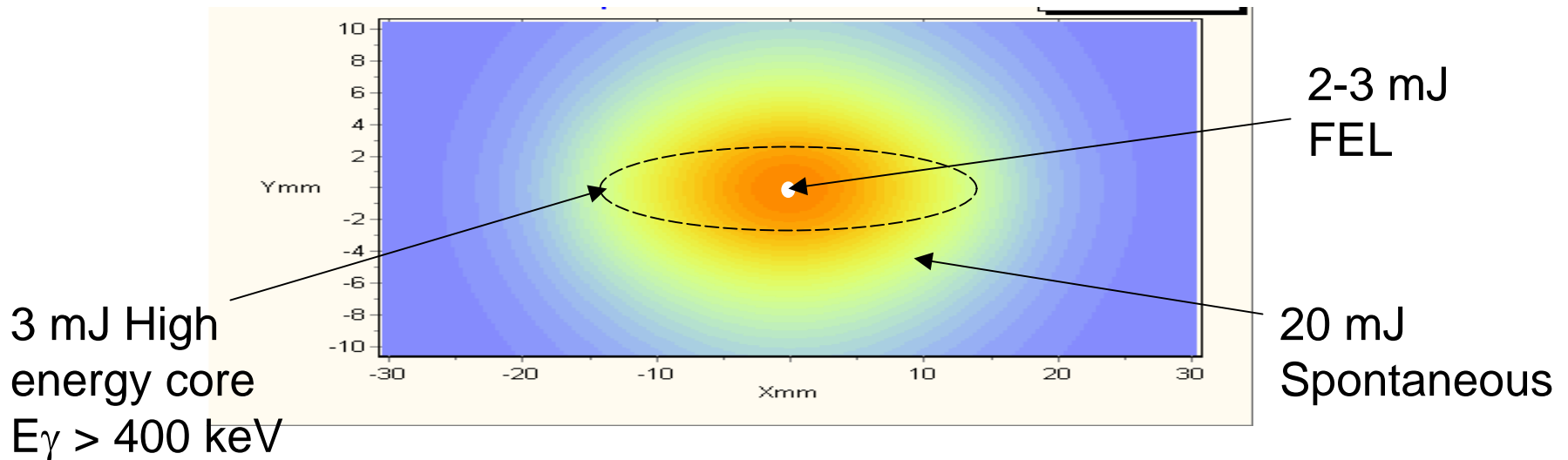
Transverse position,
microns

Visible photons
detected by CCD

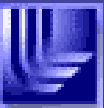


Currently adding LCLS source to simulation

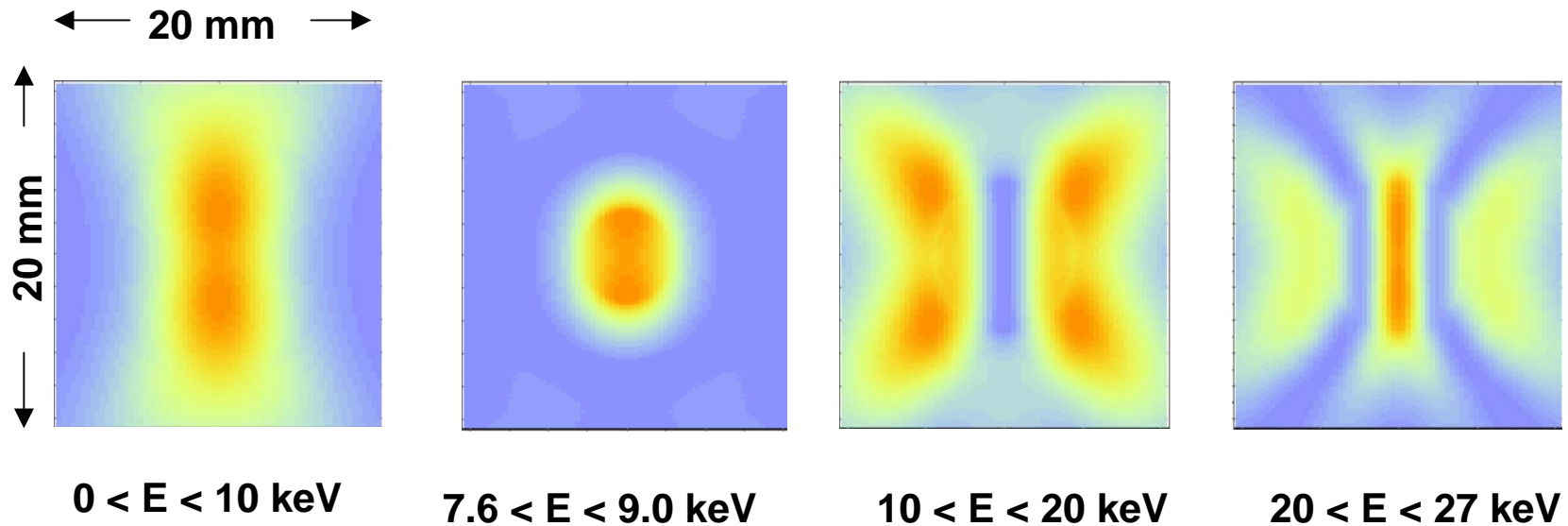
Expected LCLS beam profile contains FEL and Spontaneous halo



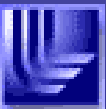
At entrance to NEH, FEL tuned to 8261 eV Fundamental



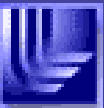
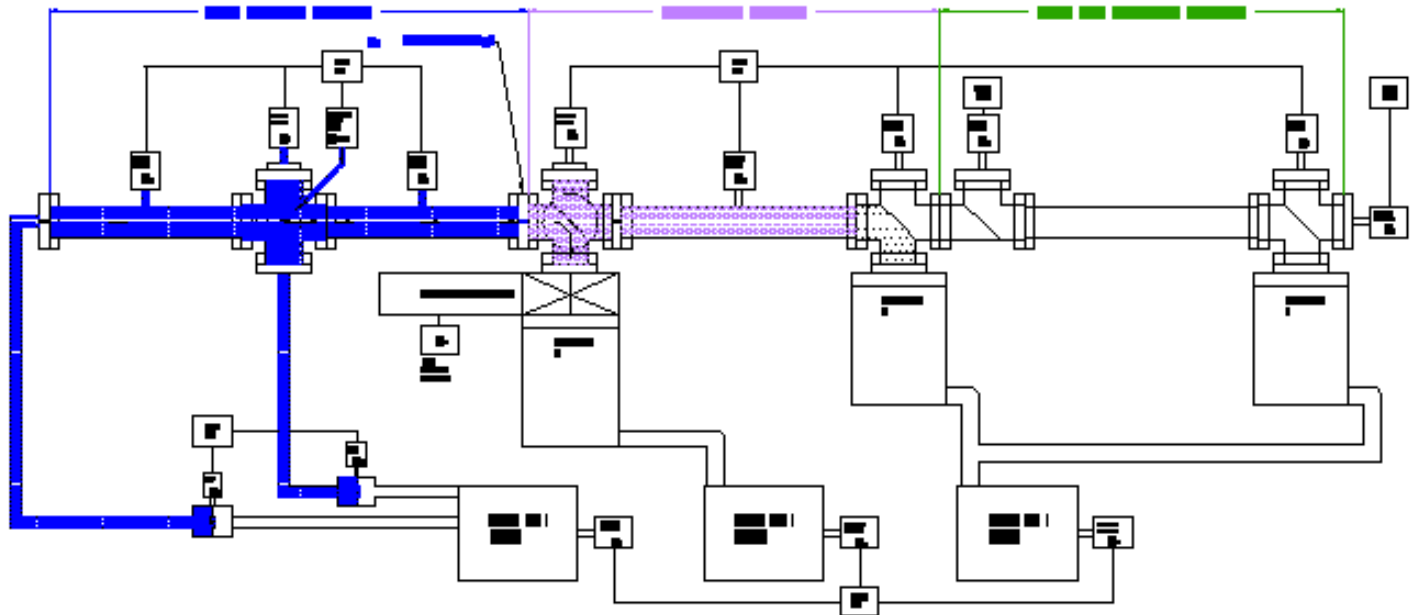
Detailed calculations of halo along beamline are underway



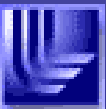
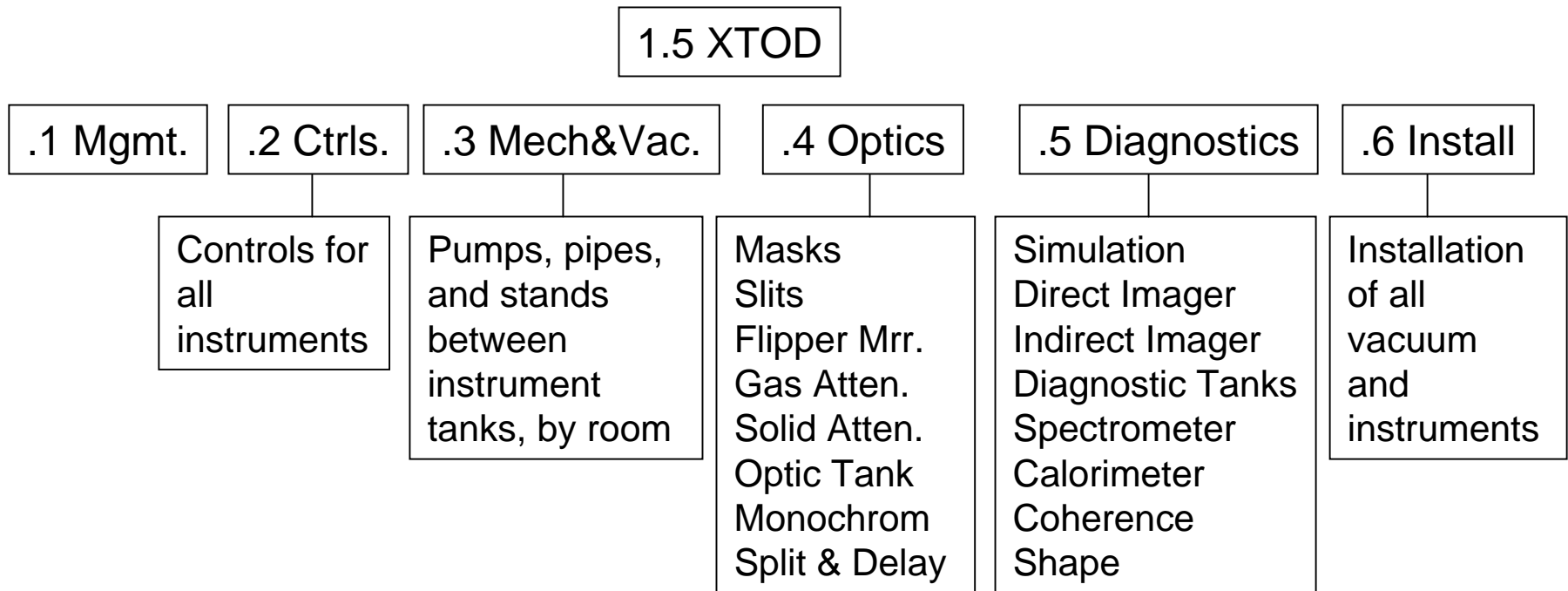
Near-Field Spontaneous Radiation Patterns in FEE, at position of gas attenuator (88 m from End-of-Undulator)



Gas Attenuator Prototype Design

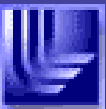


XTOD WBS Organized by Function

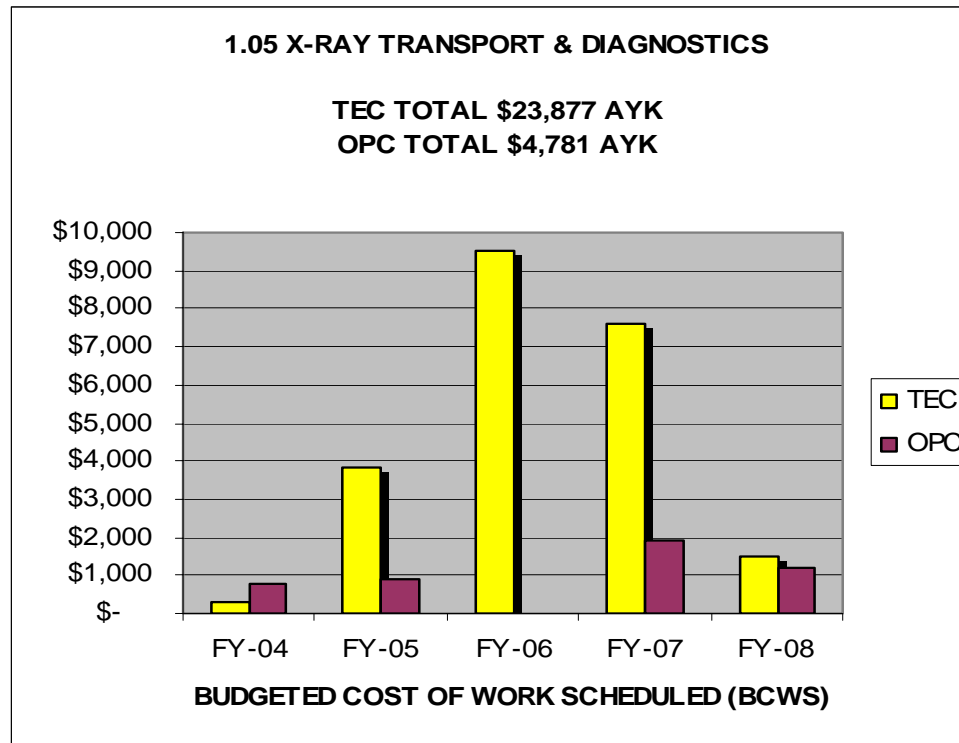


Schedule emphasizes early completion of vacuum system and diagnostics needed for commissioning

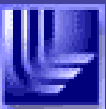
	FY04	FY05	FY06	FY07	FY08
Controls					
Mechanical and Vacuum					
Front End Enclosure(FEE)					
Near Experimental Hall					
Tunnel					
Far Experimental Hall					
Facility Optical Systems					
Fixed Mask FEE					
Slits/Collimator A FEE					
Slits/Collimator B FEE					
Gas Attenuator FEE					
Solid Attenuator FEE					
Crystals and Gratings					
Crystal Monochromator FEH					
Pulse Split and delay FEH					
Diagnostics					
Modeling and Simulation					
Direct Scintillator Imager					
Indirect Imager					
Imaging Diagnostic Tank					
Comissioning Diagnostic Tank					
Total Energy Measurement					
Spectrometer					



Budgeted Cost of Work Scheduled (BCWS)



OPC supports R&D in FY04-05 and commissioning in FY07-08



Major XTOD risks listed in registry

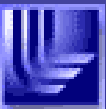
■ Gas Attenuator Performance

- if...fails to achieve .. pressure with an opening large enough to pass the required beam footprint, then, at low photon energies ... problems calibrating and imaging

■ Solid Attenuator Survival and FEL Distortion

■ Imager Noise Levels

- If ... levels are too high due to high radiation backgrounds, EMP, or high readout rates.. Then we will be limited in our abilities to measure the FEL at low intensities during commissioning



Near term activities planned

■ Mechanical & Vacuum

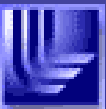
- Gas Attenuator Calculations and Prototype
- Beam Line Layout / Standardization / Detailed Specifications

■ Modeling and Simulation

- Spontaneous / FEL simulation
- Calculate Beam sizes at Gas Attenuator, Cameras, etc
- Simulations of Camera response to mix of Spontaneous and FEL

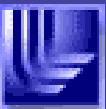
■ Component R&D

- Spectrometer
- Total Energy
- Damage



Technical Activities in FY05

- Detailed Design in preparation for construction in FY06
 - Mech. & Vac. through Near Hall
 - Slit
 - Gas attenuator
 - Direct Imager
- R&D & Prototype
 - Total Energy
 - Spectrometer
 - Indirect Imager



Summary

- No XTOD Long-Lead Procurements
- XTOD Risks identified
- XTOD Baseline Set
- XTOD Ready for serious R&D and Engineering effort to begin in FY05 in preparation for procurement and fabrication in FY06

