ICALEPCS 2019

"PLC Based System" Workshop

The Use of PLC in SLAC

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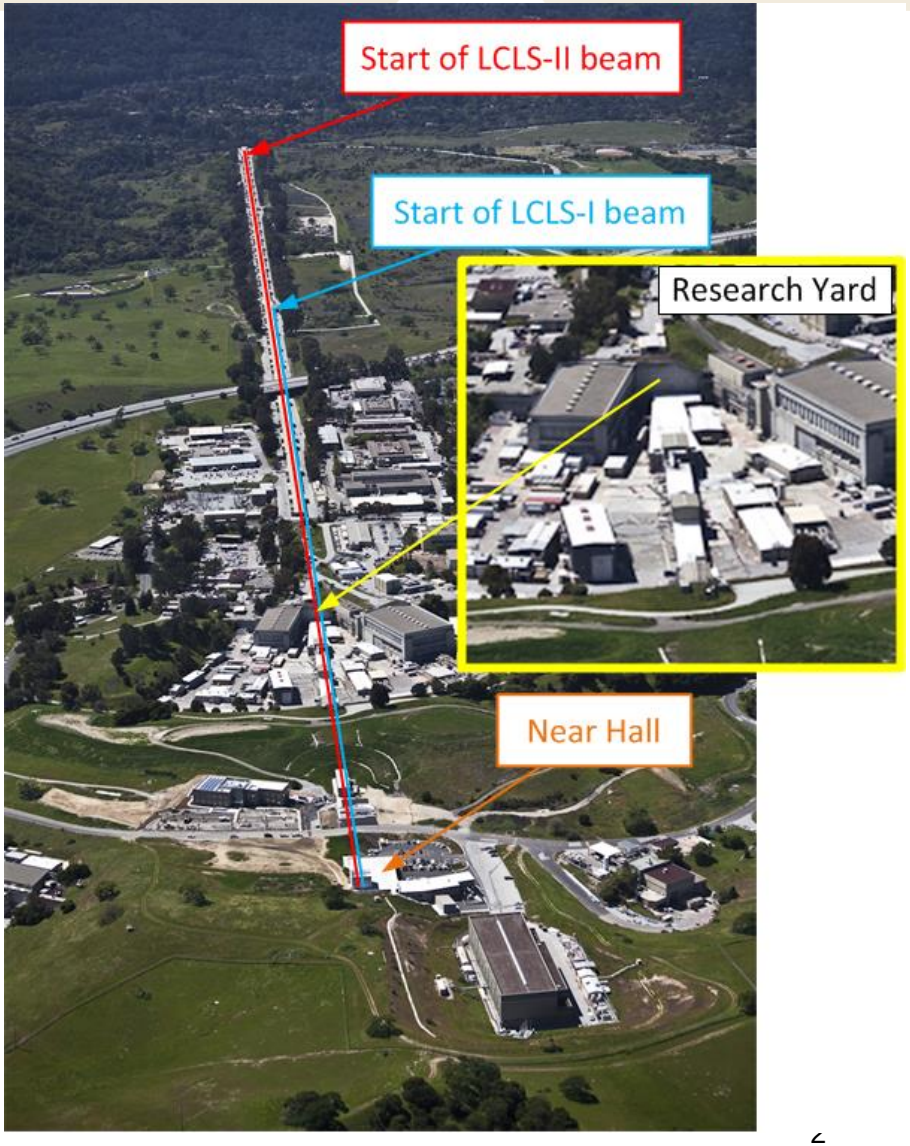
U.S. DEPARTMENT OF ENERGY
Office of Science

SLAC NATIONAL ACCELERATOR LABORATORY

SLAC National Accelerator Laboratory -Introduction

SLAC starts as a premier accelerator laboratory, and has been grown into a premier photon science laboratory:

- SSRL: Stanford synchrotron radiation lightsource (32 stations)
- LCLS: world's first hard x-ray free-electron laser, 120Hz, 5kW , 2009 (2 SXR hutches, 5 HXR hutches)
- LCLS-II: under construction, 1MHz, 1MW, superconducting machine, expected to complete in 2020
- FACET-II: advanced accelerator science research, Stage 1 expected to complete by end of 2019



Major Users and PLC Used

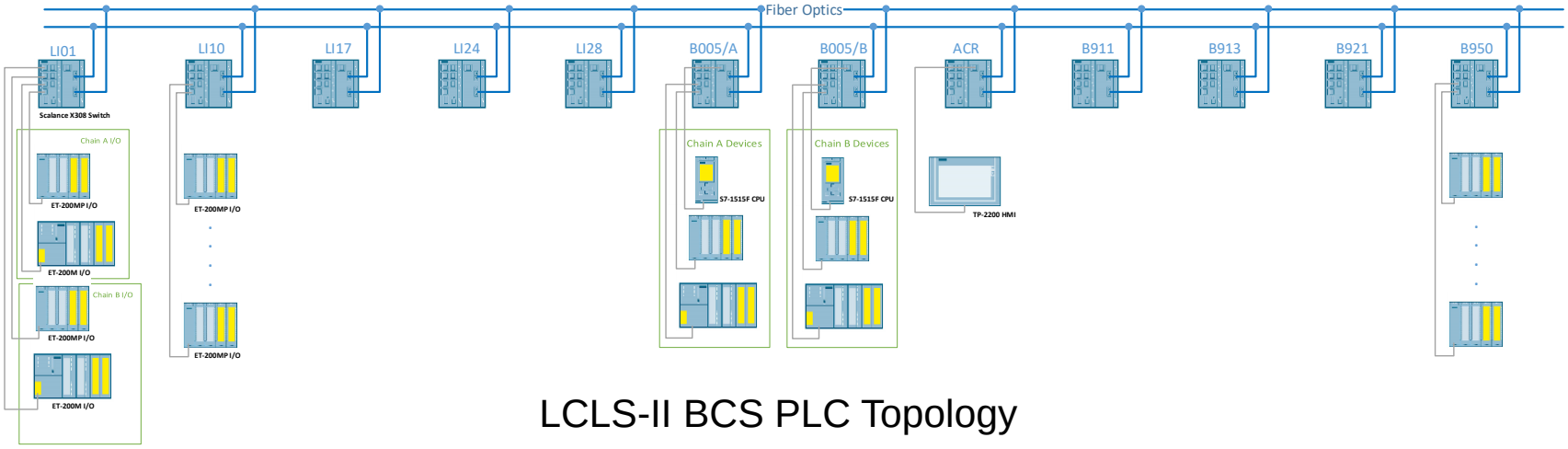
- Accelerator Directorate: safety/non-safety applications
  - Safety systems
    - Personnel Protection System (PPS): ControlLogix/S7-315F + Pliz PNOZMulti
    - Beam Containment System: Siemens S7-1515F with distributed I/O
    - Master Beam Control: Siemens mobile HMI and PLC for SS alarm/operation
  - Non-safety systems
    - Vacuum, temperature, RF power supply, …
    - Majority Allen-Bradley: ControlLogix, CompactLogix,
    - Beckhoff I/O coupler is very common to transport signals between EPICS
- SSRL: experimental station control, laser safety control
  - Siemens S7-1200 for non-safety, Pilz PNOZMulti for safety
- LCLS Directorate: photon control systems
  - Beckhoff EtherCAT PLC for vacuum, MPS, facilities
- Facilities: temperature, flow, gas, …
  - Allen-Bradley PLCs: SLC, ControlLogix, MicroLogix
- Other:
  - AutomationDirect products: low cost modular PLC/HMI for laser control

Application I – Radiation Safety Systems

FACET-II Injector Vault PPS

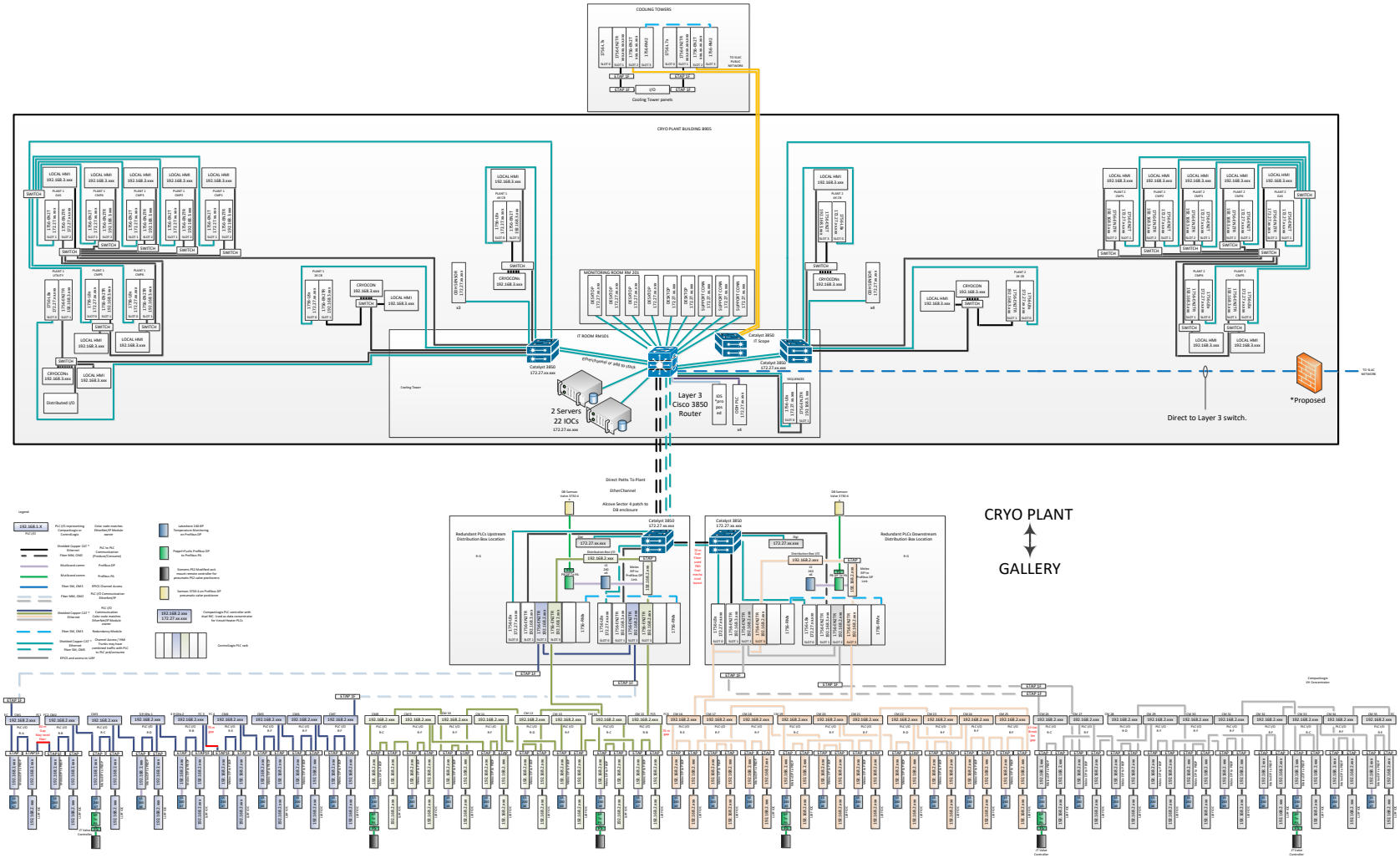
Stopper Control Chassis

Master Beam Control



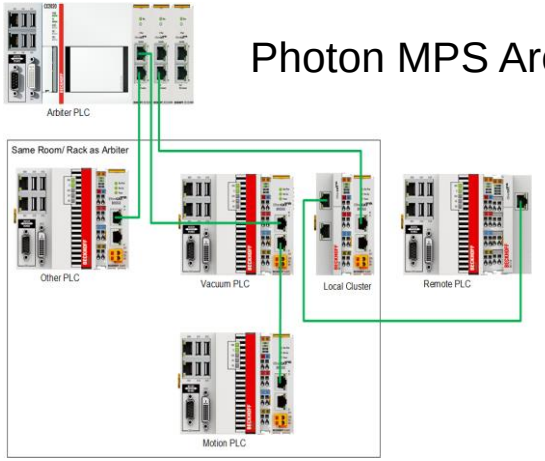
LCLS-II BCS PLC Topology

Application II - Cryocontrols



Application III - Photon Controls

SLAC



Photon MPS Architecture

EtherCAT Fieldbus Systems: EP and EL modules

Photon Control Stack