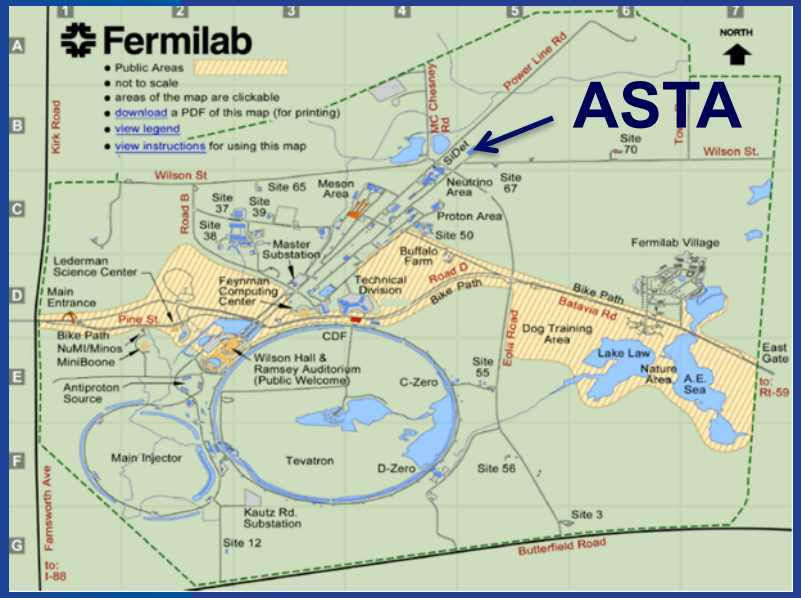
ASTA Installation and Infrastructure

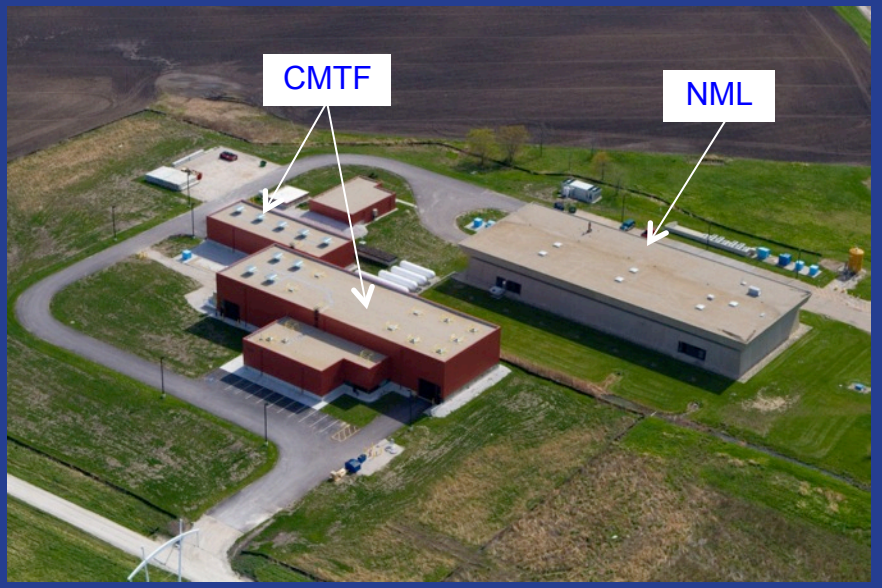
Jerry Leibfritz
ASTA User's Meeting
June 9-10, 2014

Outline

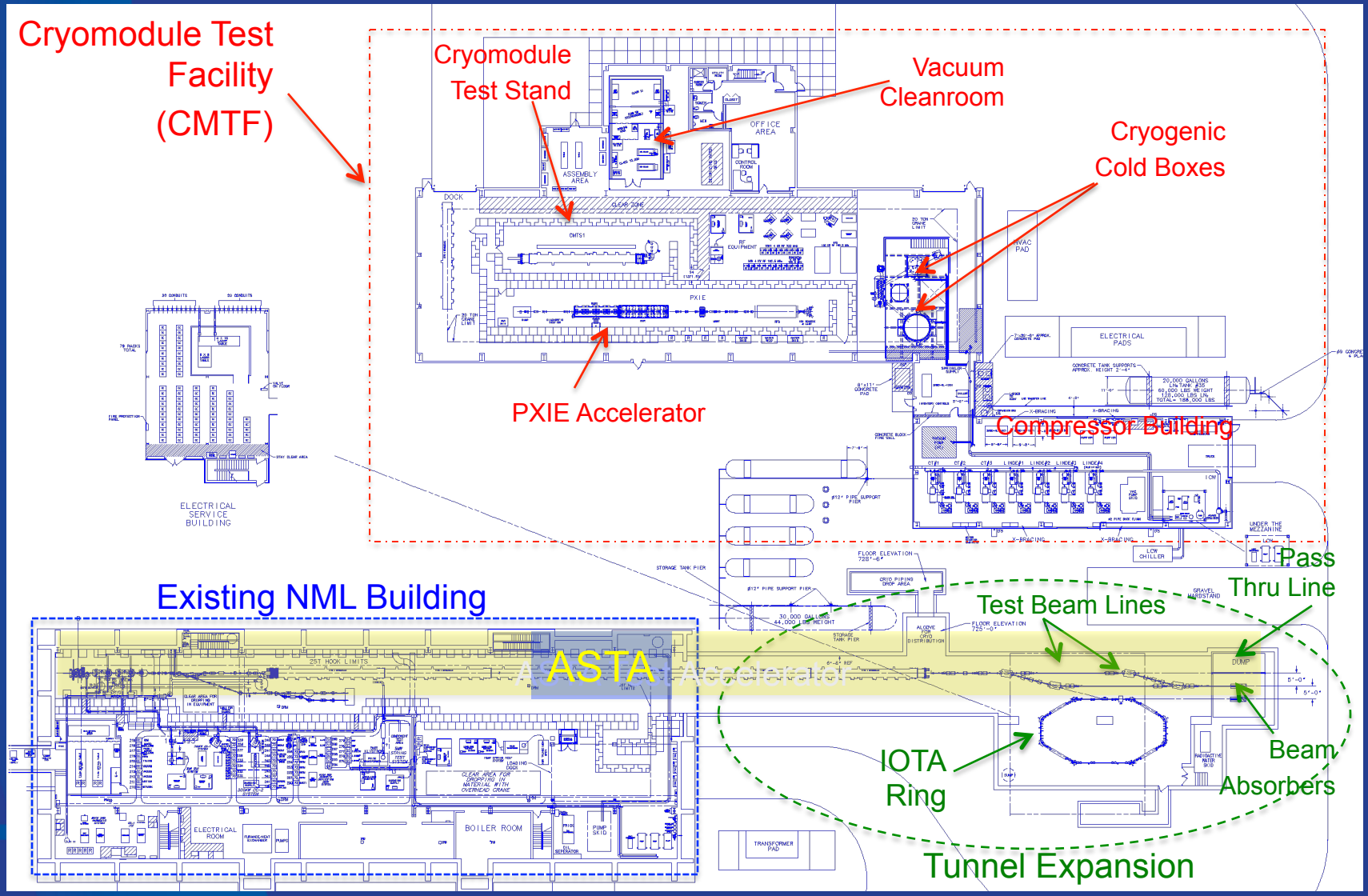
- NML/ASTA Facility Overview and Layout
- ASTA Stages
- Current Status and Infrastructure
- Operations Plan
- Schedule

ASTA Overview





SRF Test Facility Complex



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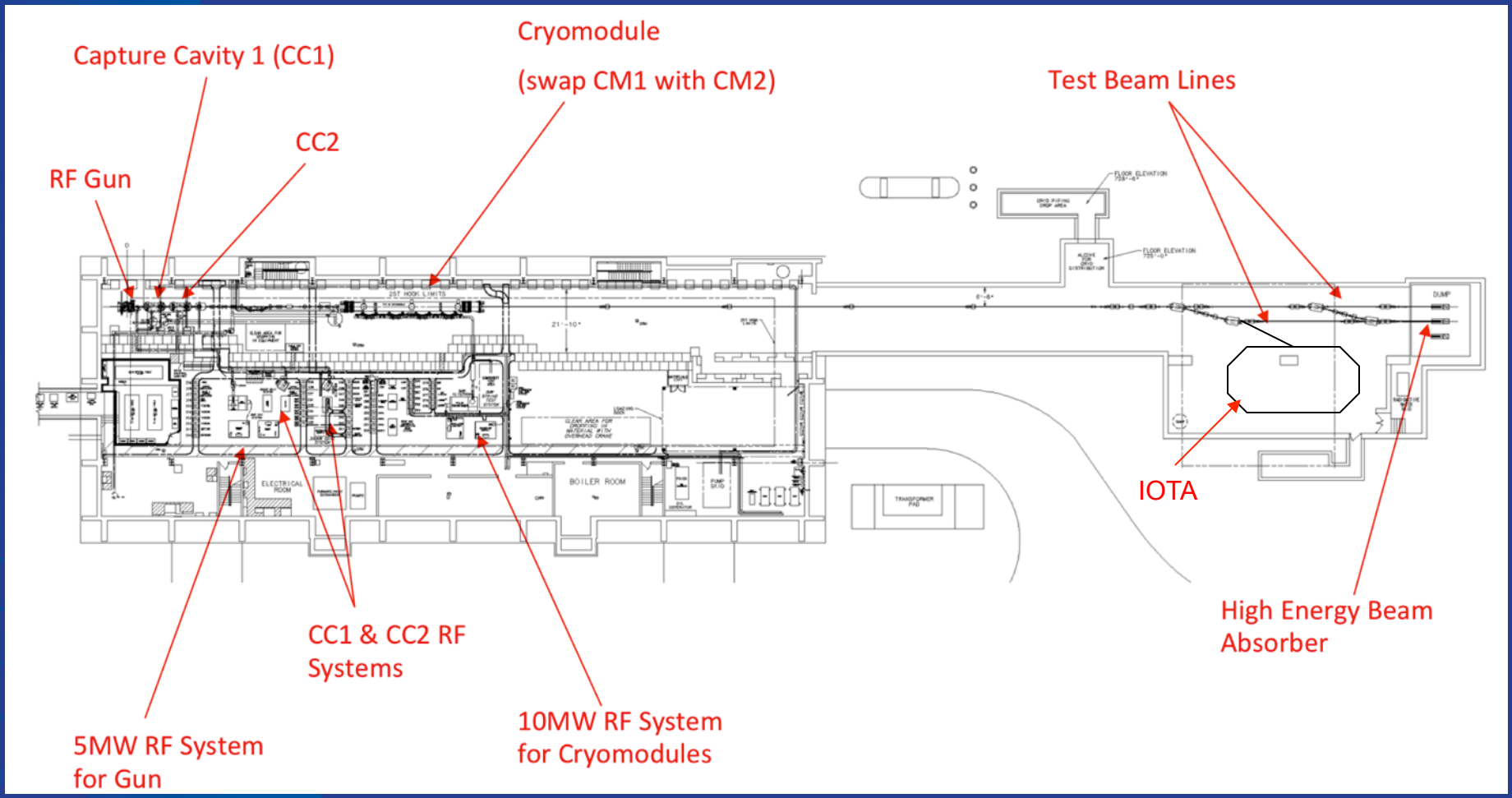
ASTA Accelerator Layout – (Piot Talk)



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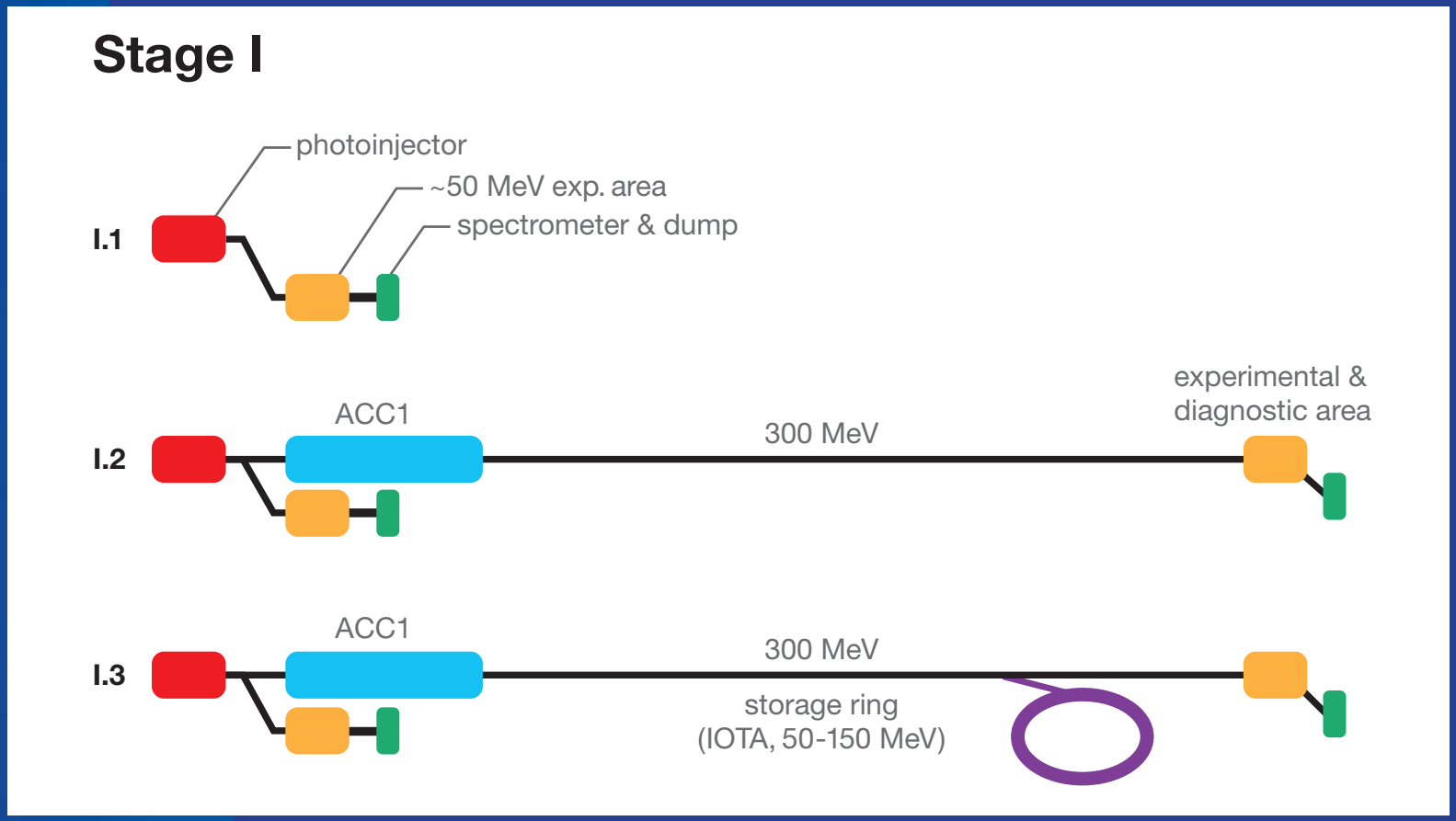
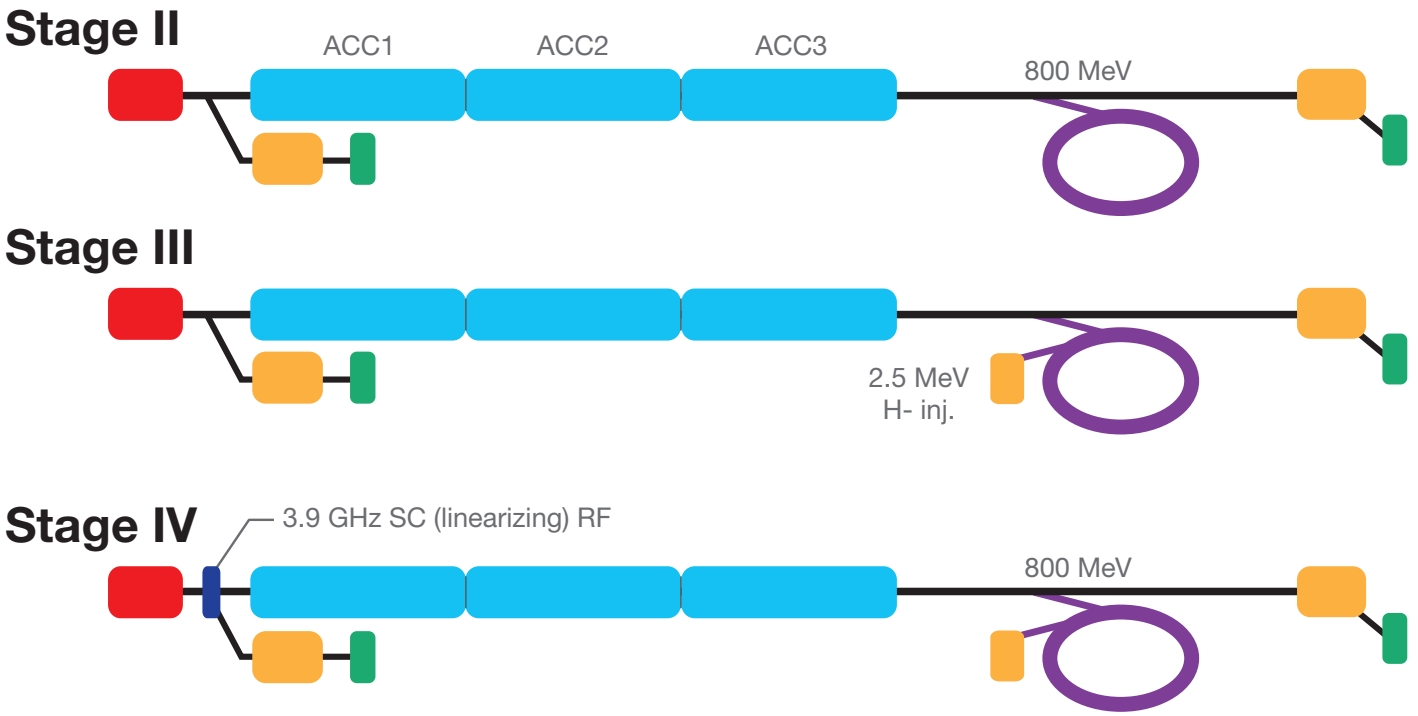
ASTA Stages

ASTA Proposal - Submitted to DOE Contained Several Stages: Stage I

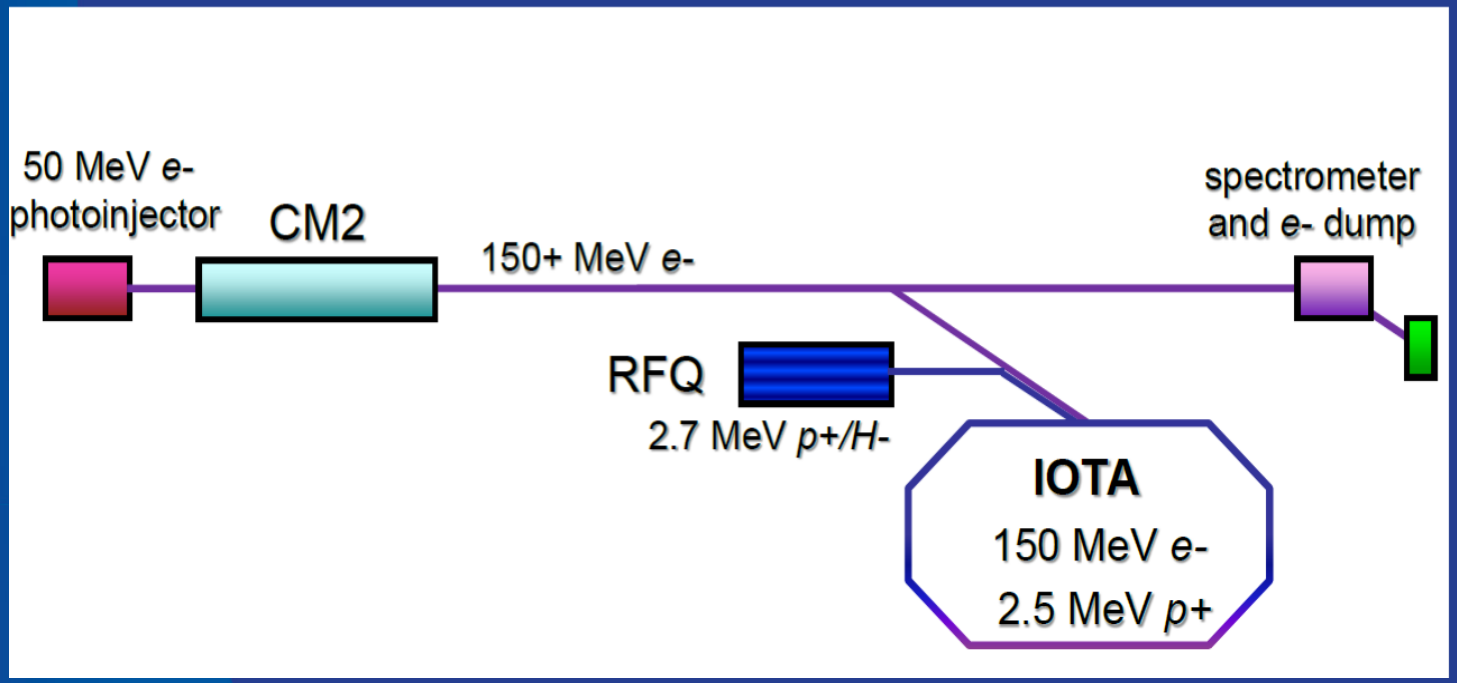


ASTA Proposal: Stages II, III, IV



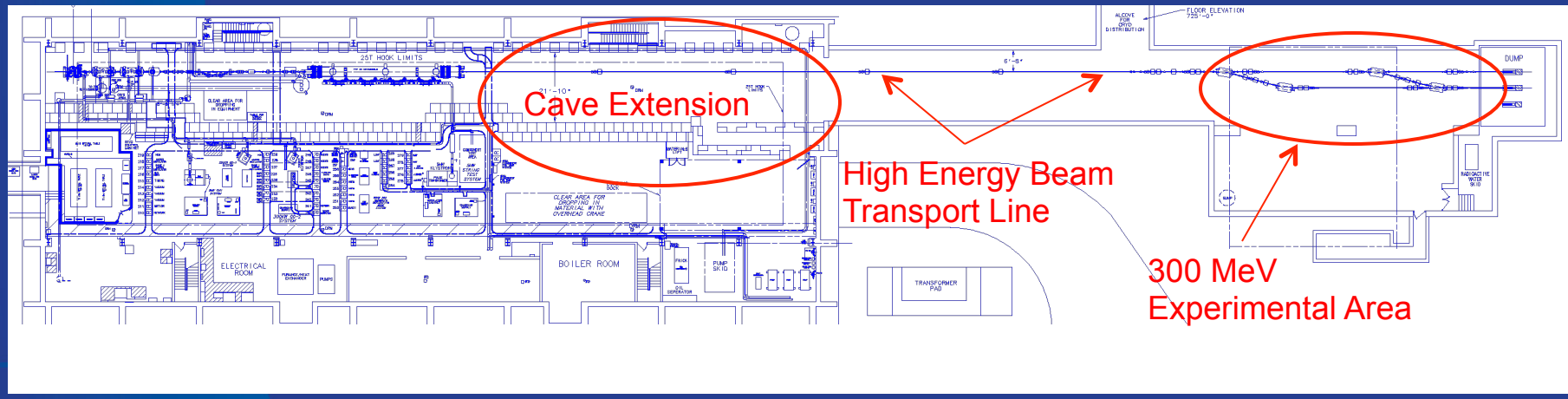
DOE Guidance is to Move Forward with Stages I.2, I.3, and III

- 300 MeV Experimental Area
- IOTA Storage Ring
- Protons into IOTA



Stage I.2: 300 MeV Experimental Area

- Assembly of shielding cave extension
- Beam through a single cryomodule
- Installation of high-energy (300 MeV) Experimental Area



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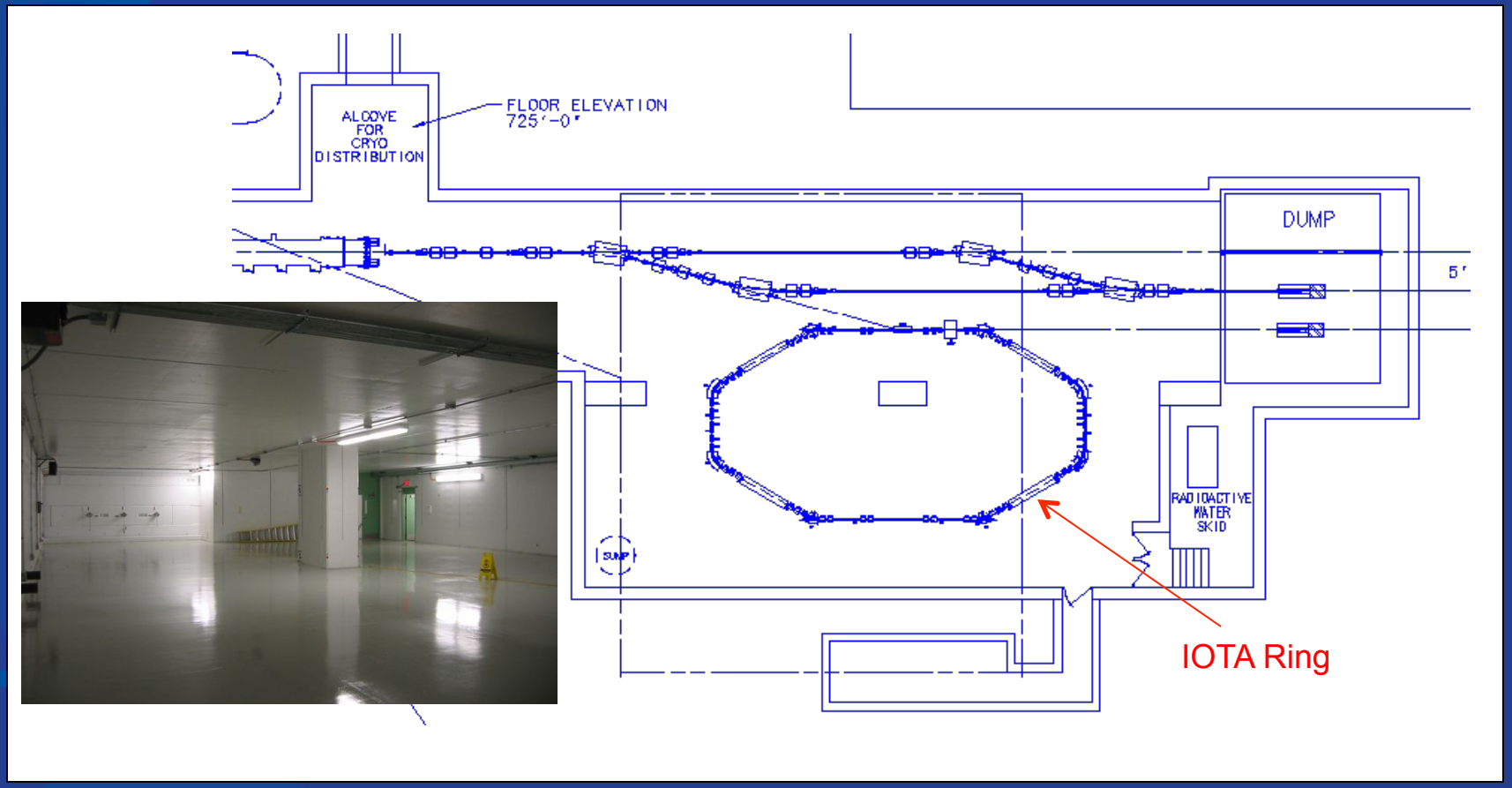
Stage I.3: Construction and Installation of IOTA

- Integrable Optics Test Accelerator (IOTA)- (Session IV Talks)
  - 30-meter circumference storage ring that will study non-linear accelerator optics (at 150-300 MeV)



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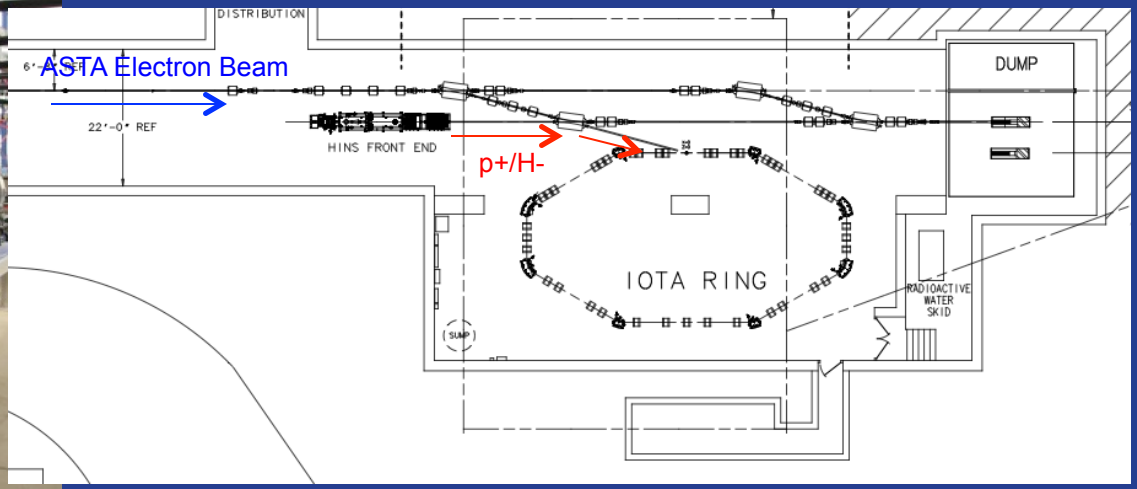
Stage III: Installation of Existing HINS Proton/H- Injector into IOTA – (Prebys Talk)

- Relocate HINS accelerator and RF system
  - HINS is a pulsed 325 MHz, 2.5 MeV H-/p+ RFQ, source, klystron & modulator



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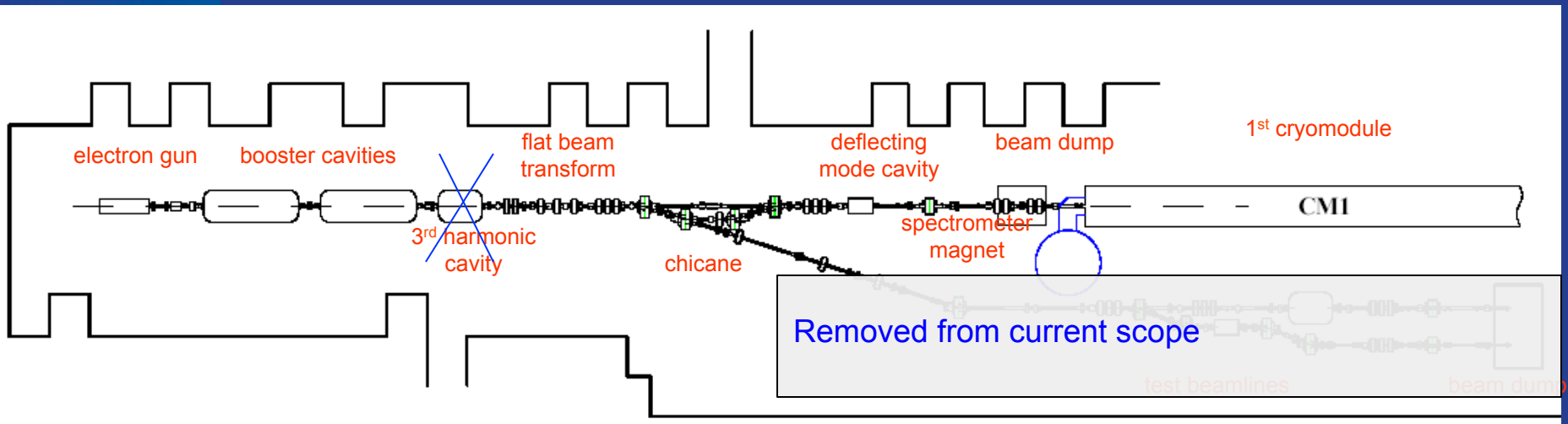
Current Status & Infrastructure

Current Effort



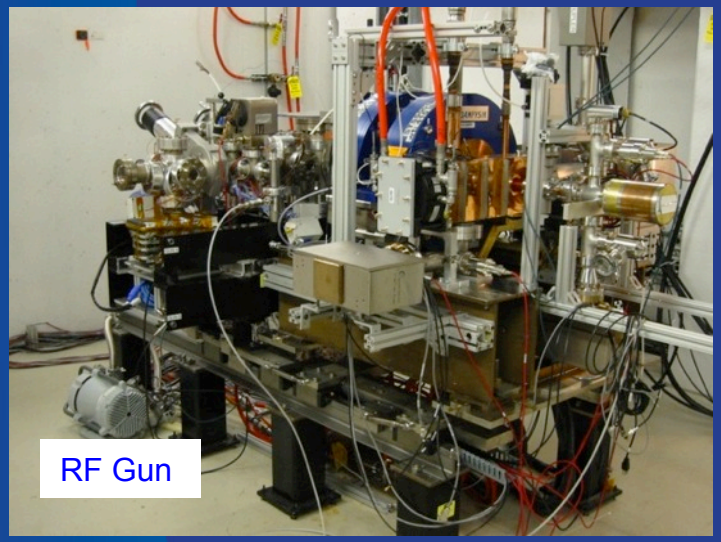
- Installation and Commissioning of Injector - (Baffes Talk)
  - RF gun
  - CC1, CC2 and injector beamline
  - Low-energy dump
- Operation of Cryomodule-2 (CM2) – (Harms Talk)

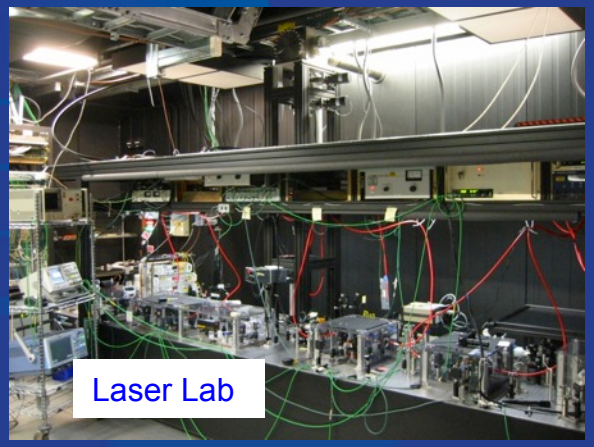
Substantial Investment in infrastructure & hardware has already been made at ASTA

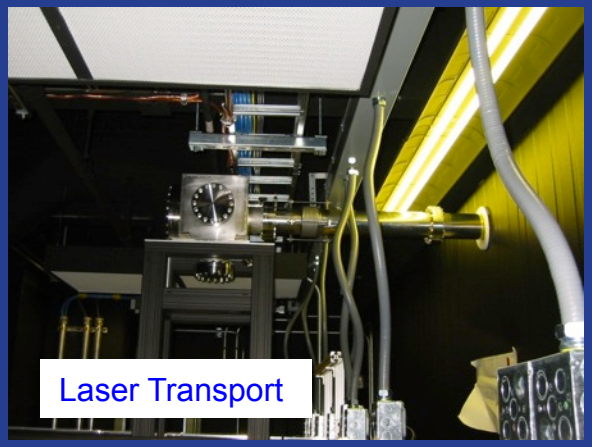
Many aspects of the facility are fully operational and have been in use for years. In addition, many of the technical components and systems needed to complete the ASTA facility have either already been procured or are in operation

To date, an investment of $90M has been made, including $18M of ARRA funding

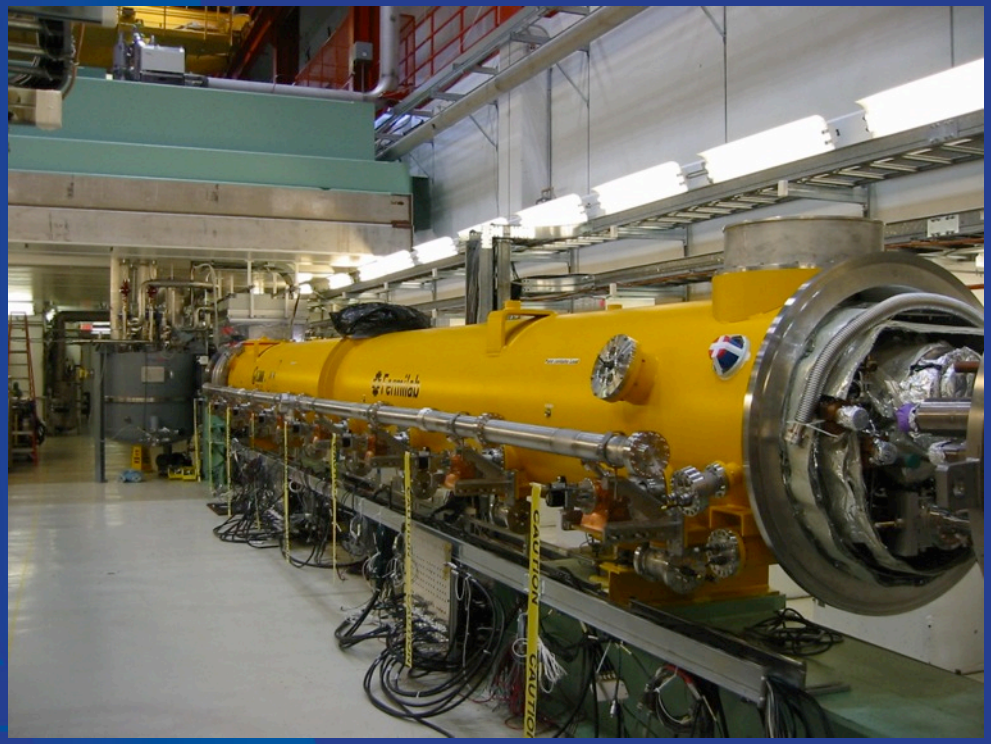
RF Gun, Injector and Laser Capable of Providing the 50 MeV Beam - (Stancari & Ruan Talks)







Cryomodules Needed to Complete the ASTA Accelerator – (Harms)



RF Power and Distribution Systems for ASTA


5 MW Klystron


10 MW MBK Klystron

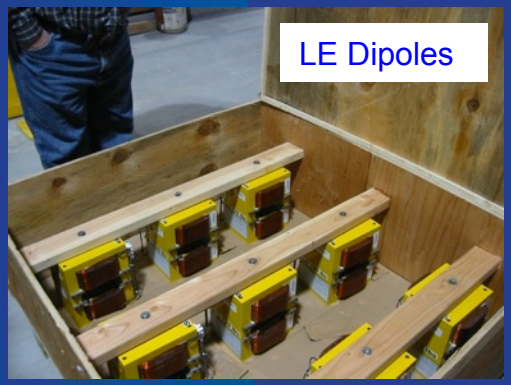

RF Distribution-1


RF Distribution-2


CM 5MW RF System


300 KW RF System

Magnets, Power Supplies, and Vacuum Equipment for Beam Lines


LE Dipoles


HE Dipoles


Crates of Magnets


P.S.'s


P.S.'s


LE P.S. Racks

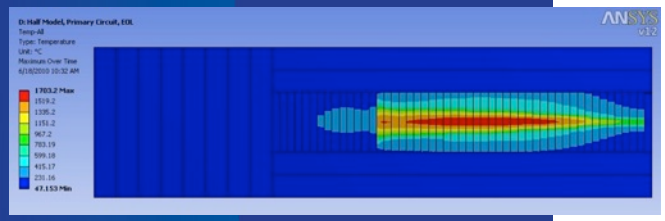

Vac. Equip.

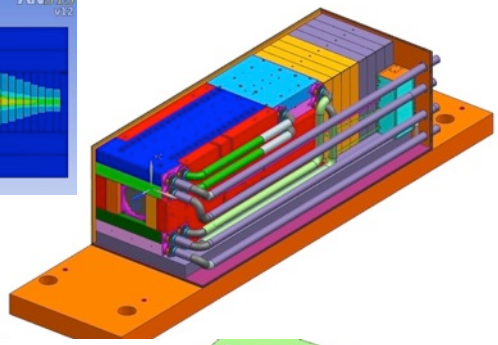

Cleanroom & Vac. Cart

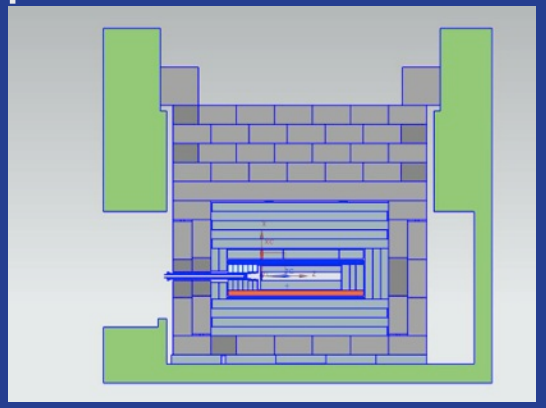
Beam Instrumentation – (Keup Talk)

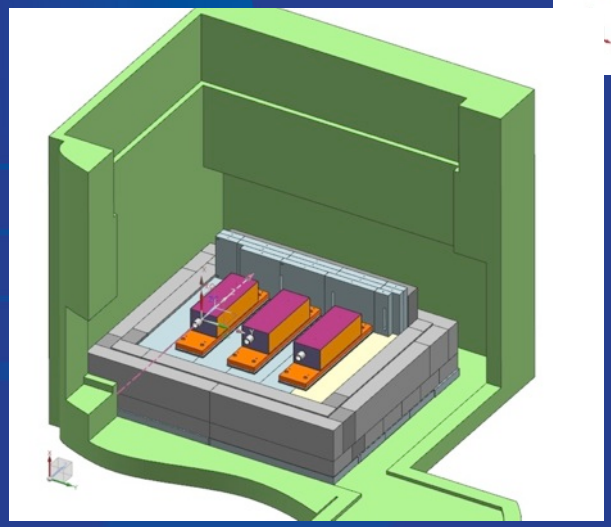
Beam Absorbers/Dump

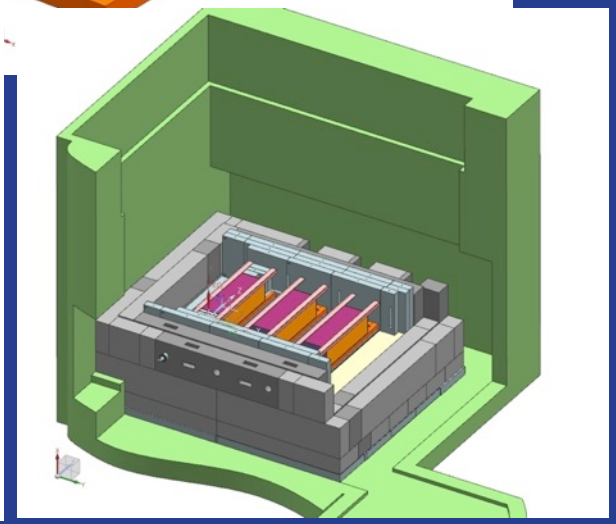
- Three high power (75 kW) beam absorbers
- 1200 tons of steel and concrete
- One not installed to allow for future expansion

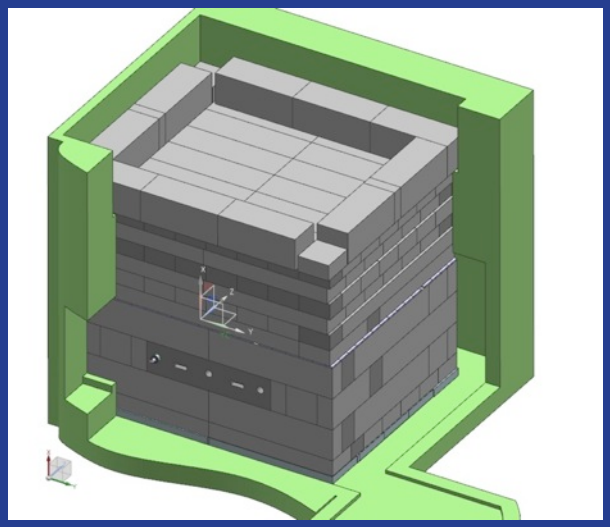












Beam Absorbers, Dumps and Water Cooling Systems


HE Beam Absorber


LE RAW Skid


Beam Dump


Beam Dump


HE RAW Skid


Dump Cooling


LE Beam Dump

NML Cryogenic System

- Repurposed Tevatron satellite refrigerators (2) in NML
- 1250W @ 4.5K (120W @ 2K)


Refrigerator Room

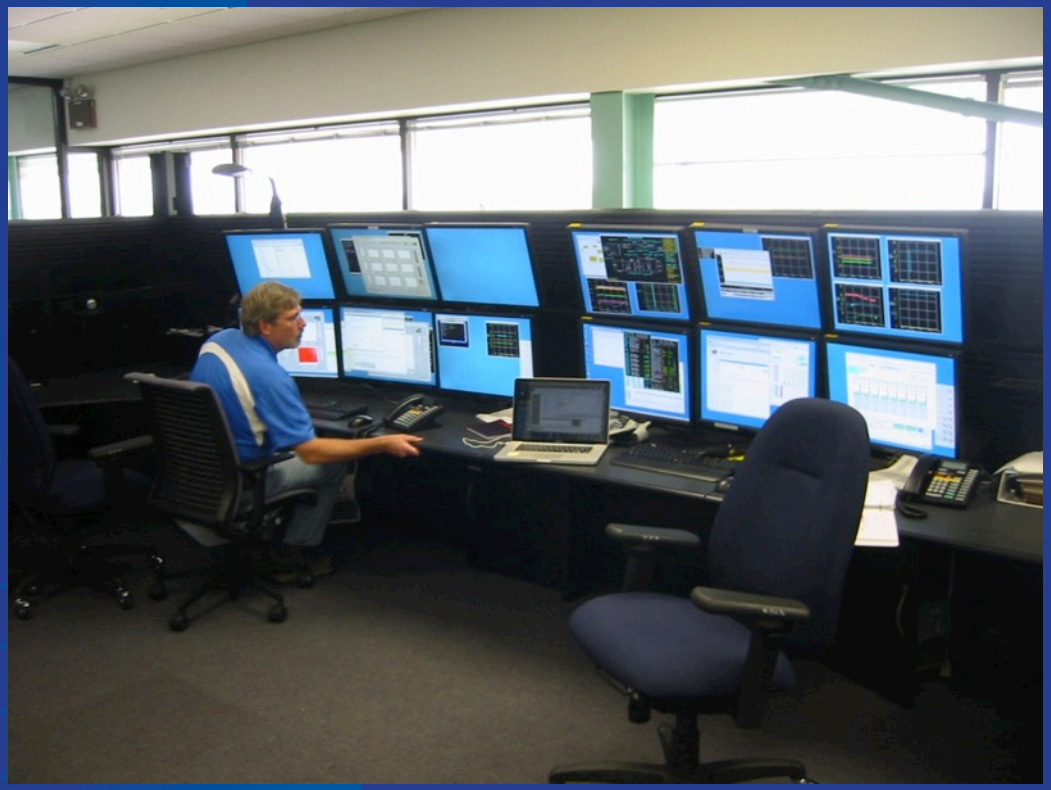

Feedbox/Feedcap


Satellite Refrigerators


Cryo Vacuum Pump

Electrical, Water Cooling, HVAC and Compressed Air Systems Capable of Supporting the ASTA Facility

Control Room and Office Space



In-Kind Contributions and Reused/Recycled Equipment from other Experiments and Labs


Helium Tanks (Tevatron)


Cryo Compressors (Tev)


IOTA Stands (MIT)


Shield Blocks


Transformers (Tevatron)


Coldbox (SLAC)


Vac. Pumps (JLAB & SNS)

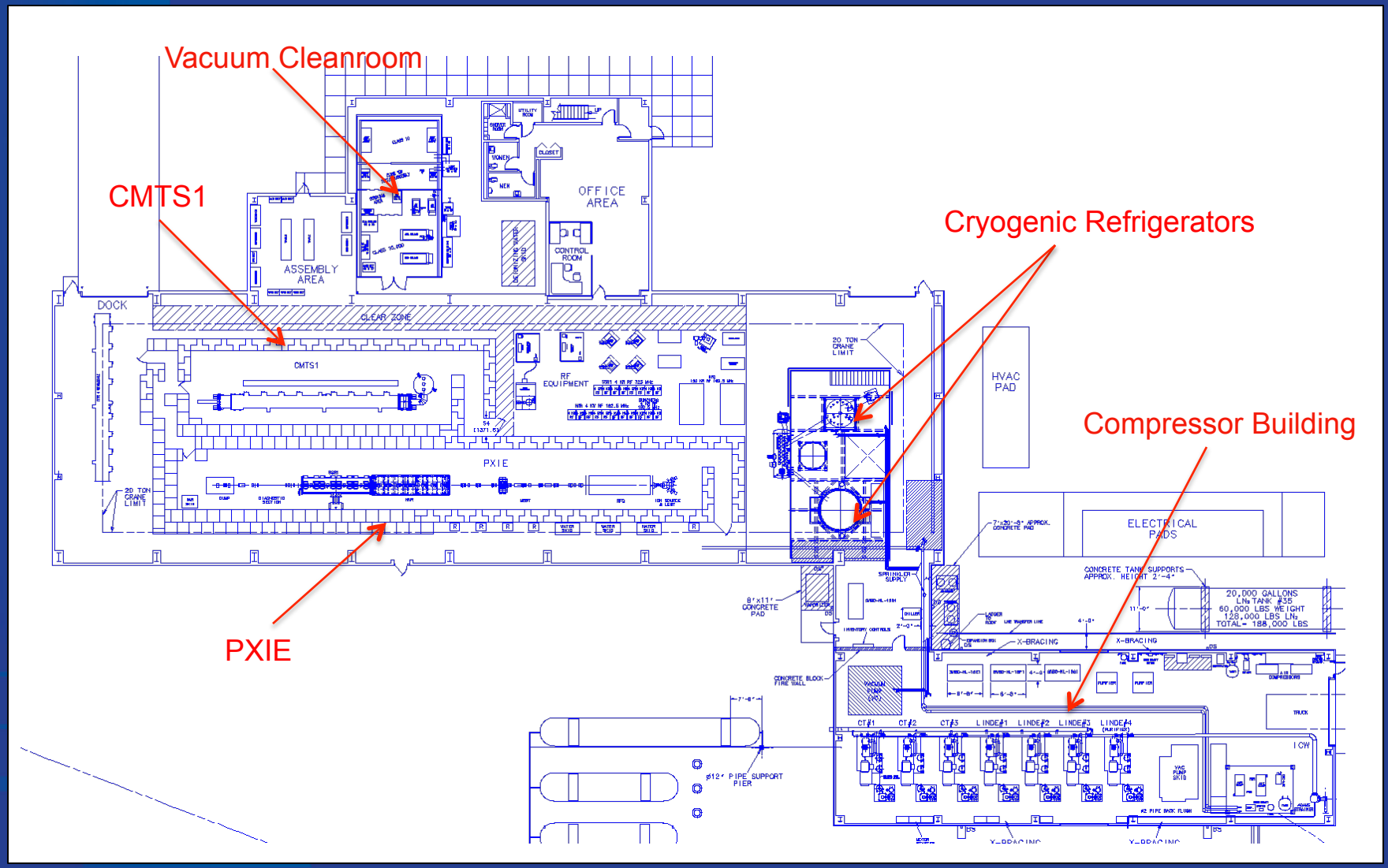

Steel/Concrete (FNAL)

Recently Completed Tunnel Extension and Service Building Designed to Support IOTA and an AARD Program

CryoModule Test Facility (CMTF)

- CMTF is a new set of buildings (adjacent to NML) originally designed to house two helium cryoplants and two cryomodule test stands. Now being repurposed to house PXIE

CMTF Building Layout



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CMTF Cryogenic System

- Helium Cryoplants in CMTF (nominal capacities)
  - New Superfluid Refrigerator (40K, 4.5K, 2K, using cold compressors)
    ~ 250W @ 1.8K or 500W @ 2K
  - Repurposed SLAC CTI-4000 Refrigerator - supplies LHe to NML/ ASTA (liquefier using turbine expanders)
    ~ 1500W @ 4.5K

ASTA Operations

Operations Plan

- After Infrastructure construction is complete, the plan is to have a full-time operations support staff of ~ 13 FTE's
- ASTA Operations department consists of operators, engineering physicists, scientists and technical specialists whose principle responsibility is to manage the daily activities of the facility and operate the ASTA accelerator and its 3 integrated experimental areas (50 MeV, 300 MeV, and IOTA)
- ASTA will also be supported by various specialists (engineers, technicians, programmers, etc.) from various support departments that will provide the needed support to maintain the various systems of the ASTA facility
- It is assumed that the experimental groups will provide funding for all experimental equipment and that ASTA will provide only ancillary support such as standard instrumentation, beamline modifications, vacuum connections, infrastructure modifications, and other upgrades to accommodate new experiments

Vacuum

ASTA will provide the following vacuum equipment & services:

- Particle-Free/UHV technicians
- Class-10 Level cleanroom for component assembly and certification
- Particle free component cleaning infrastructure
- Portable cleanrooms for installation in ASTA accelerator
- Expert consultation and specifications required for components to be installed in ASTA vacuum system

The Experiment is expected to:

- Design and build experimental devices to meet ASTA particle-free and vacuum requirements and specification (see earlier slides)
- Consult with ASTA technical experts early in design/planning stage to discuss interfaces and specification requirements
  - ASTA Project Engineer – Jerry Leibfritz
  - ASTA Lead Vacuum Engineer – Lucy Nobrega
  - ASTA Engineering Physicist – Kermit Carlson

Mechanical & Electrical

ASTA can/will provide the following mechanical and electrical equipment & services:

- Fabrication and installation of basic supports stands (floor to device)
- Installation of experimental device(s) and alignment
- Particle-Free/Ultra High Vacuum infrastructure and technicians
- LCW cooling system, hoses and connection to system
- Basic cabling, cable termination, rack space, and power
- Controls system, standard instrumentation and basic infrastructure modifications

The Experiment is expected to provide the following:

- Any required specialty adjusters (motorized or mechanical)
- Any experiment specific water chillers, etc. required beyond LCW system in place at ASTA
- Experiment specific power supplies, controllers, unique/expensive cabling
- Experiment specific instrumentation
- Devices designed to meet the ASTA vacuum specifications

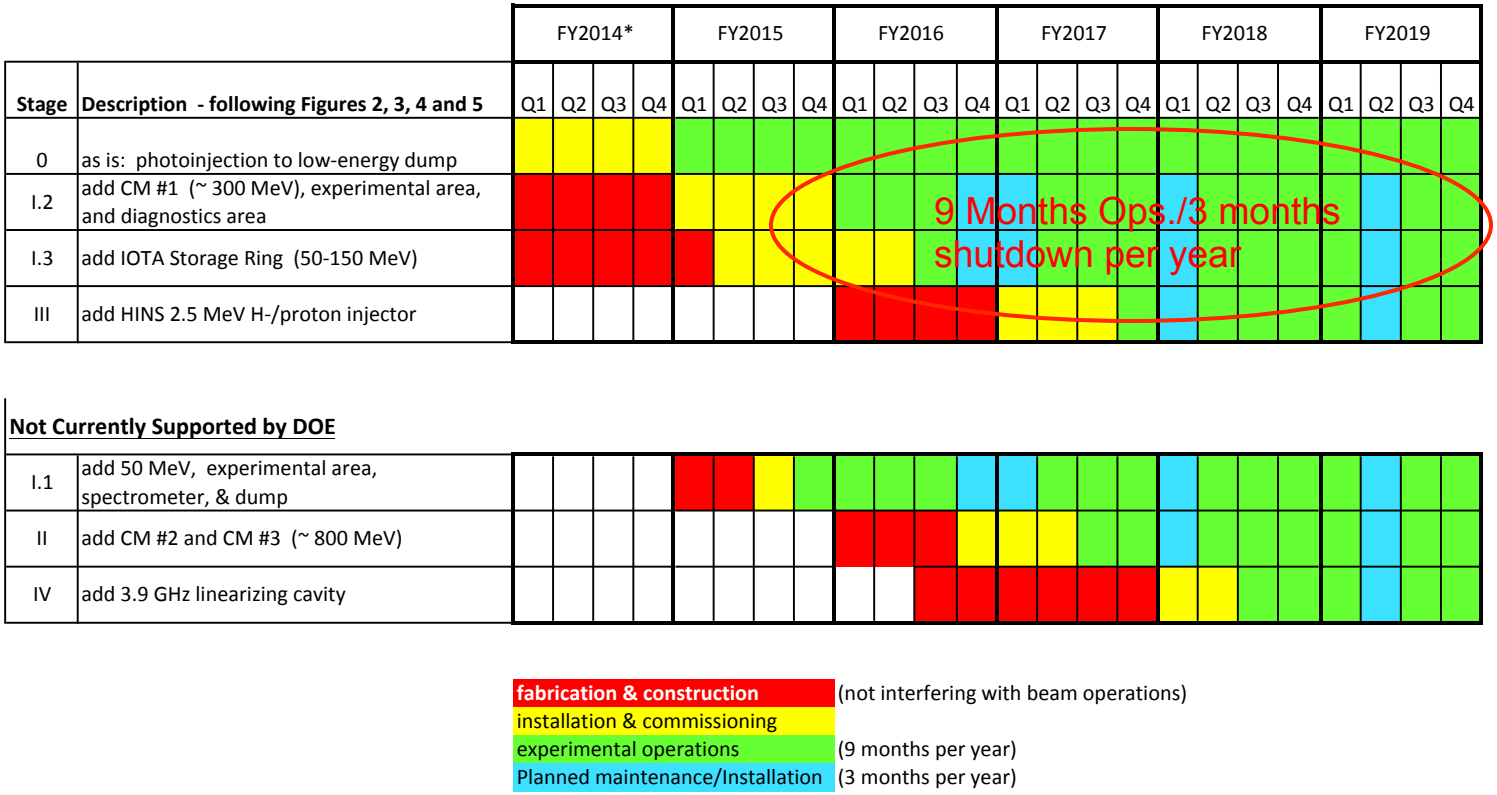
ASTA Schedule

ASTA Goals and Future Plans

- 2014 Goals
  - Complete installation of injector
  - Beam through injector – (20 MeV initially, then 50MeV)
  - 1st low-energy ASTA experiments
  - Complete CM2 conditioning
- FY2015 Plans
  - Complete installation of 300 MeV line
  - Possibly 300 MeV beam through CM?? (funding dependent)
  - Begin Installation of IOTA
- FY2016 Plans
  - Operate 300 MeV beamline (1st high-energy experiments)
  - Complete IOTA installation

Schedule

- Installation and commissioning schedule by stage
- Operations schedule (9 months operations/year)
- Assumes funding begins in FY 2015??



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A Team Effort

Thanks to the Entire ASTA/NML Team!