

## **New developments in the ISAC-I experimental hall:**

This meeting was focused on new developments in the ISAC-I experimental hall including: 1) relocation of GPS and the status of GRIFFIN, 2) relocation of the laser hut that is presently under the TITAN platform, 3) status and plans for the Francium trapping program, 4) new yield station status/plans 5) location the chilled water system evaporator for the new ISAC target conditioning station. This first meeting was a general discussion of the status and requirements of each group with limited discussion on each topic

### GPS/GRIFFIN:

- Gordon Ball gave an update on the status of GRIFFIN and the planned move of GPS. In early January, 2011 the GPS fast tape transport system and associated beam line hardware must be moved to a new location in preparation for the Francium Trapping Facility to be installed under the TITAN platform. The proposed location for the GPS facility is shown in figure 141-rev32 stua sept09. It is expected that the GPS will be relocated and ready for experiments by fall 2011. The GRIFFIN spectrometer has still not been approved by CFI because \$2M in matching funding from the province of Ontario has not been secured. A de-scoped proposal has been submitted to CFI for consideration. A decision from CFI is expected in late December 2010.

### Relocation of laser hut:

- Matt Pearson gave an update on the plan to relocate the laser hut presently located under the TITAN platform, in preparation for the installation of the Francium Trapping Facility. The lasers located in this hut are required for the collinear laser spectroscopy program. Initially the laser hut was placed here to be in close proximity to the polarizer beam line to allow for the laser beams to be transported in air to the beam line. However, with the recent development in optical fibers this requirement can be significantly relaxed. After considering several possible locations the one chosen is in the north east corner of the ISAC-I experimental hall (see figure xxx). The room construction would be similar to the BMNR "clean room". However it would have to comply with laser regulation standards, most notably this would include solid, opaque walls as well as temperature and humidity control.

### Status/plans for Francium trapping program:

- John Behr reported on the status and plans for the installation of the Francium Trapping facility. This facility has now received funding from the DOE and the principal investigator Luis Orozco is planning to spend part of his sabbatical year at TRIUMF beginning in August 2011 to work on the installation and commissioning of the new facility. Details of the facility and the schedule for

installation were given in a presentation by John Behr. (see francium\_status\_jb\_27Oct2010 and francium\_schedule\_jb\_27Oct2010).

Status of the new yield station:

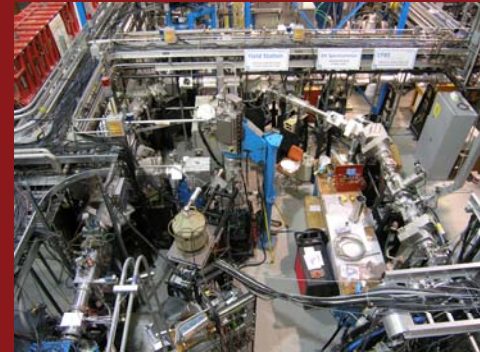
- Peter Kuntz gave an update on the schedule for the installation and commissioning of the new yield station (see Yieldstation\_status\_pk\_27Oct2010 for details). The plan calls for installation to begin in early January with commissioning to follow. It is expected that the new station will be available for yield measurements in April 2011 when it should also be controlled remotely from the new ISAC control room.

Location of the chilled water system evaporator for the new target conditioning station:

- Curtis Ballard gave a brief presentation on the proposal to locate a chilled water system evaporator in the ISAC-I experimental hall. The evaporator is part of the chilled water system that will be required for the north hot cell conditioning station. The condenser will be an air-cooled rooftop unit but the evaporator, 2 pumps, a heat exchanger, resin can and surge tank will be located in the ISAC-I experimental hall. The location for the evaporator is in the ISAC I Experimental Hall against the south wall near the loading bay door. The attached photos (chiller1\_location\_cb\_27Oct2010 and chiller2\_location\_cb\_27Oct2010) show the proposed location. This location is optimal as it is directly above the north hot cell area and provides the shortest access for the chilled water.

# Yield Station Upgrade

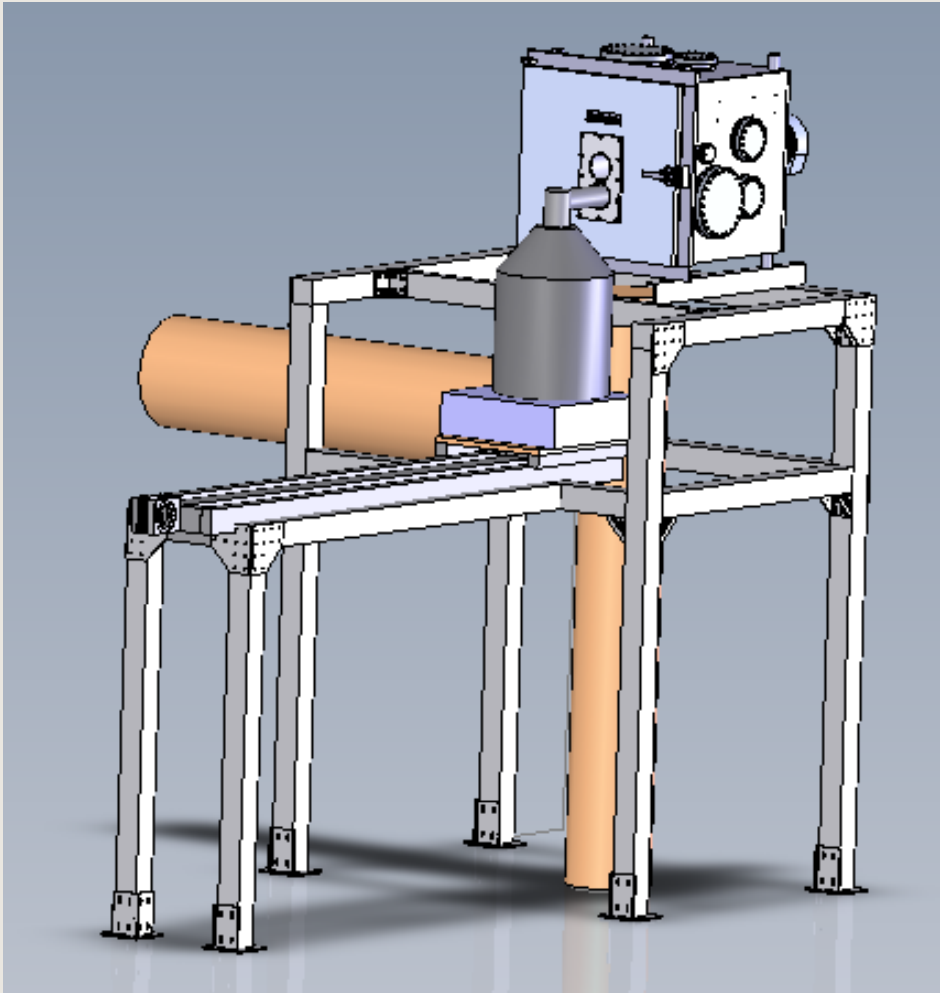
**Support Frame**  
**Vacuum Box Chamber Assembly**  
**Detector RailSystem**  
**Control/Data Acquisition Hardware**  
**Control/Data Acquisition Software**  
**EPICS Controls**



# New Yield Station Design

- Modular design enables parallel setup, while existing yield station is still in operation
- Partial integration possible (e.g. new detector rail system and data acquisition in combination with existing yield station)
- Does not interfere with existing beamline
- Event-by-Event DAQ (VME, MIDAS)
- Provides basic yield measurement capability, but also room for future extensions

# Box Chamber installation



## **Box Chamber:**

Total weight: 450 kg

+ max. 200 kg lead shielding

(for safety factor calculations this was rounded up to  $F = 10000N$ )

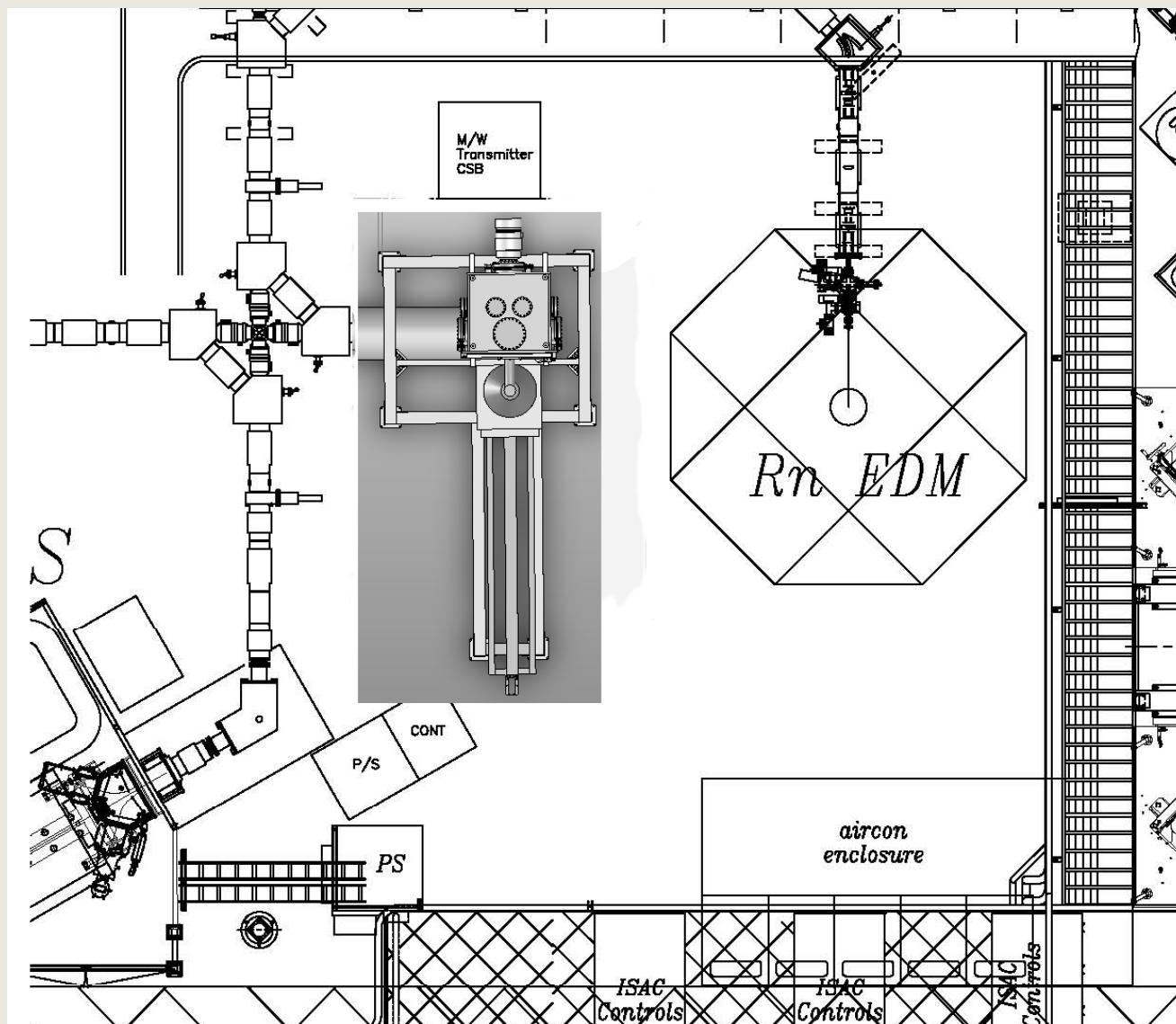
## **Frame construction:**

Bosch Aluminium Profiles

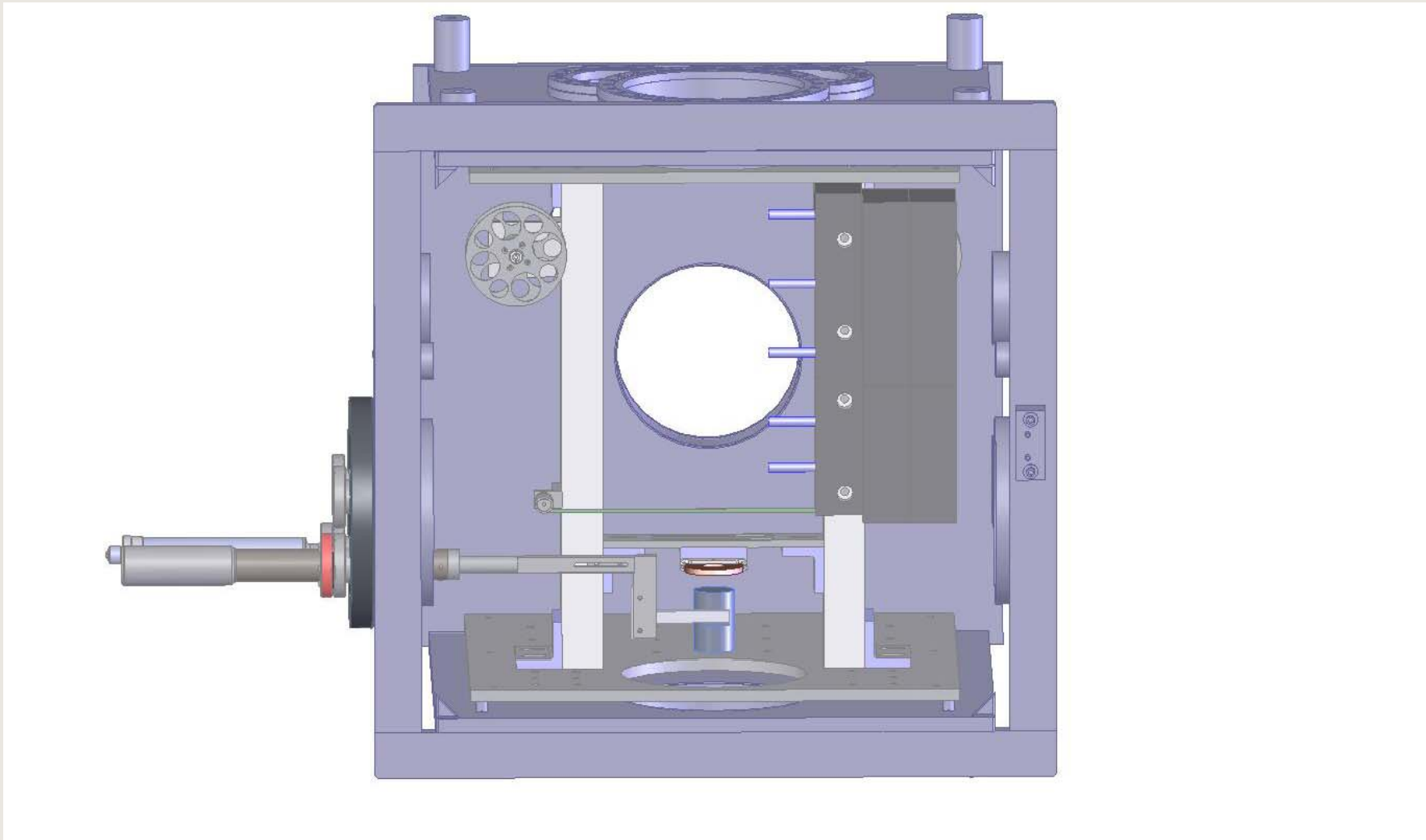
90x90 for vertical sections

90x90H for load carrying components

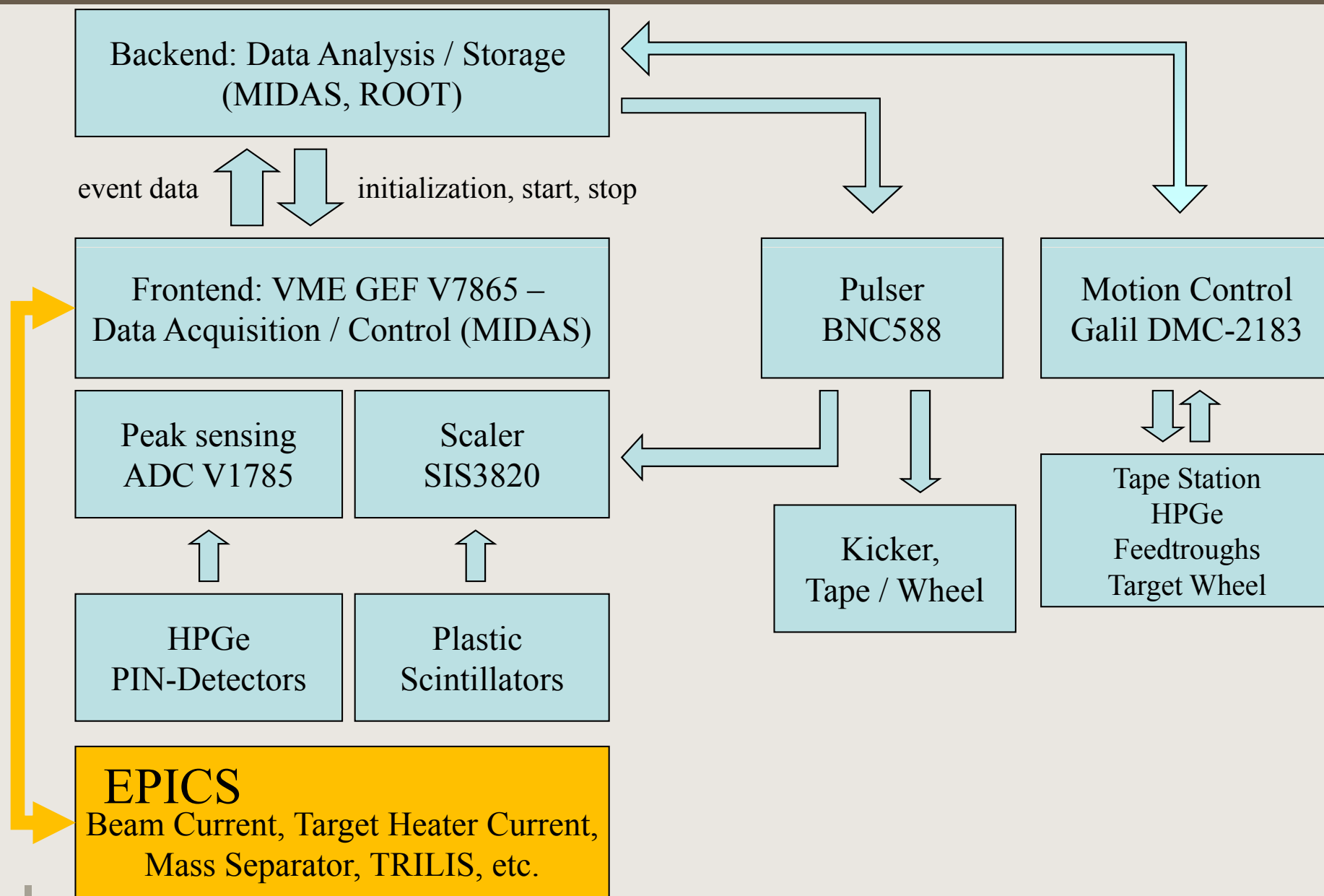
# Footprint



# Internal Assembly



# Yield Station Data Acquisition





# Future Applications

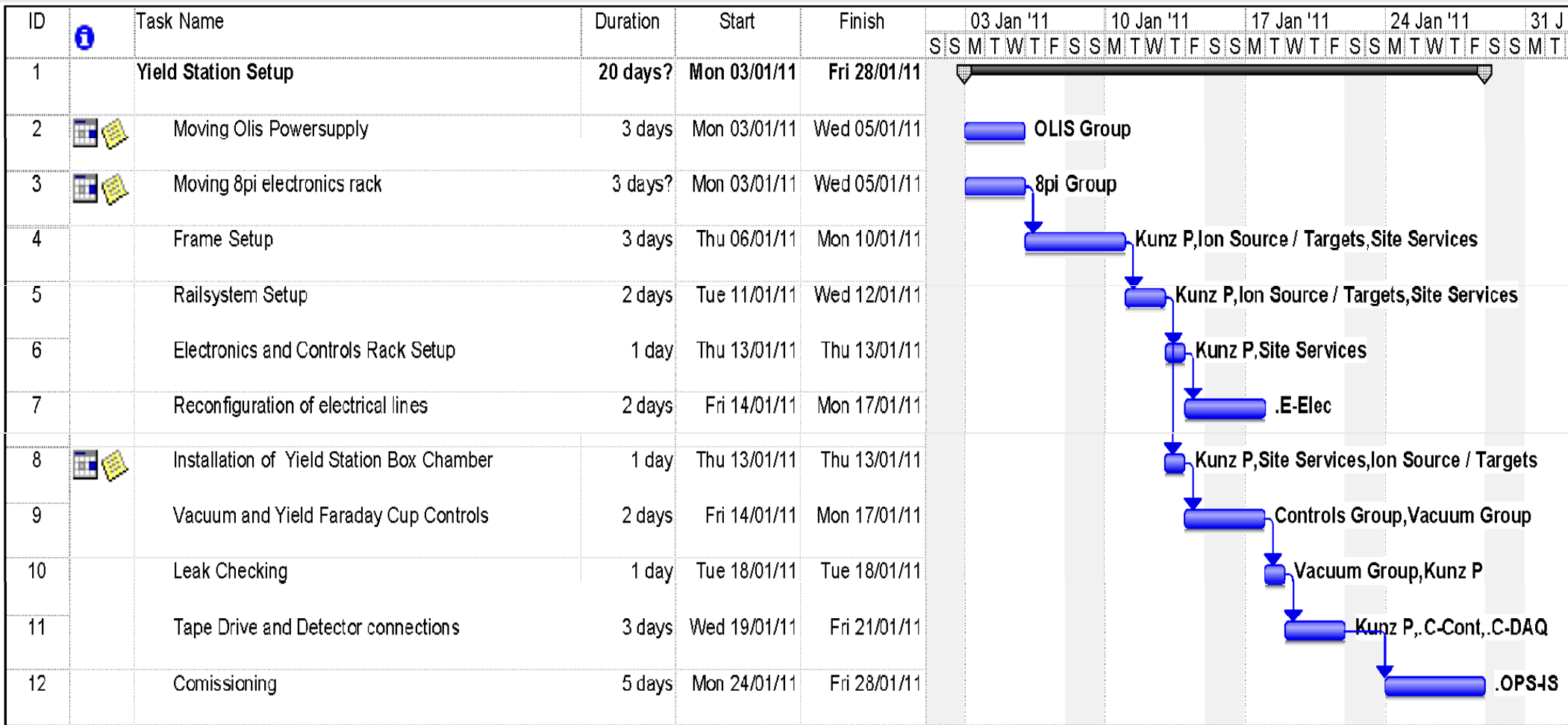
- $\alpha, \gamma$  – spectroscopy and  $\beta$ -counting with tape station (routine yield measurements)
- Target Wheel: Fast  $\alpha$ - and/or  $\beta$ -decay detection with nearly 100% efficiency
- Delayed Neutron Detection
- Laser Spectroscopy in combination with TRILIS
- Low Energy Transitions (through thin window, or with LEGe directly in vacuum)
- $\alpha, \beta, \gamma, n$  coincidence measurements
- Desorption and trapping of ions
- half-live measurements with high precision



# Actions

<b>Actions</b>	<b>Date</b>
Move OLIS Magnet Power Supply	
Move 8pi LN2, Kicker Controls	
Move Yield Station Electronics & Kicker electronics	
Setup of yield station support frame	
Setup of yield station vacuum chamber , connection to beamline, testing, commisioning	<b>Begin: January - March 2011</b>

# Upgrade Timeline





# Status and plans for Francium program

- **Experiments and timelines**
- **Electromagnetically Shielded Room  
Safety**
- **Beamline**
- **$^{225}\text{Ra} \rightarrow ^{221}\text{Fr}$  source**

# FrPNC experiments

**The FrPNC collaboration is starting a program of Fr spectroscopy at TRIUMF**

**S1218 Towards an optical parity violation experiment in Fr (Gwinner, spokesman)**

**S1065 Weak nucleon-nucleon interaction from nuclear anapole moment (Orozco, spokesman)**

**S1010 Hyperfine anomaly and spatial distribution of nuclear magnetism (Pearson, spokesman)**

**All need a trap (part of S1010 is collinear laser)**

## FrPNC collaboration

### Manitoba

G. Gwinner

R. Collister

C. Oliveira

### Maryland

L. Orozco

D. Sheng

J. Zhang

J. Hood

S. Lynam

### San Luis Potosi

E. Gomez Garcia

William & Mary

S. Aubin

New South Wales

V. Flambaum

### TRIUMF

M. Pearson

J. Behr

Texas A& M

D. Melconian

Stony Brook

G. Sprouse

Supported by NSF and DOE USA, NSERC and NRC Canada, CONACYT Mexico.

DOE \$ for the room came through at the end of September

# Experimental timelines

**Dec 1: U.S. collaborators to complete room specs  
must be OK'd by TRIUMF**

**First 2 weeks of December: Technical review at  
TRIUMF**

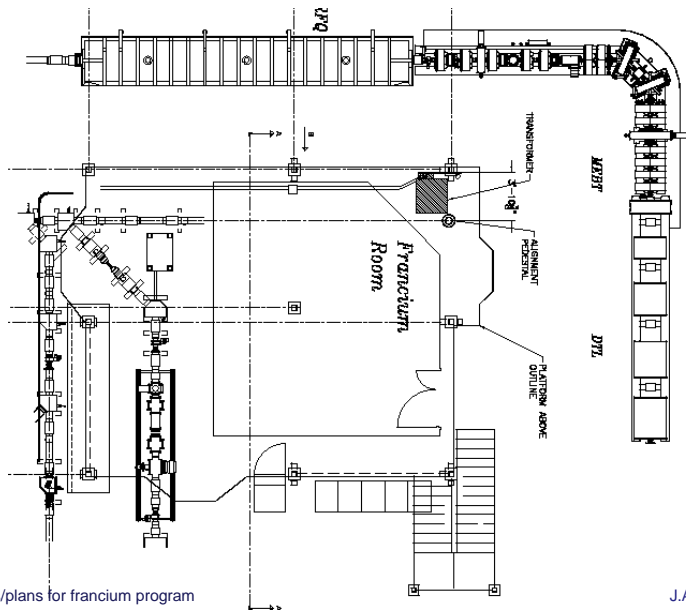
**Jan 1: Room order in U.S. finalized**

**Outer boundary:**

**Orozco sabbatical Aug-Dec 2011**

**Must be ready for beamtime**

# Room location





## Room location issues

**Alignment pillar near laser hut**

**South wall location cleared with Phil Levy**

**We plan to leave TITAN transformer and AC power feeding it where it is (the 60Hz has to be somewhere)**

**Put Francium transformer on top of it**

**Air conditioning chiller on top? (chilled liquid going in, saves penetrations, circulating fan inside)**

**U. Maryland is providing design engineering.**

**Penetrations through electromagnetic shielding: electrical, some cooling water, compressed air.**

**There is an electronics blue rack at the southeast corner that we want to move (8 feet to the east)**

**At U. Maryland, one person assembled their room in one day. Do they need crane access?**

# Fire and other room safety

**Walls from 'metal-clad wood'.**

**1 ft gap from transformer, assuming this is flammable.**

**Do we need more than 1 door?**

**Sprinklers?**

**We want the particulate sensor monitor Does this remove need for sprinklers?**

**DOE asks if we need oxygen deficiency sensors.**

## Radiation Safety

- **‘metal-clad wood’: TSG suggests rad safety OK from decon standpoint.**
- **$\gamma$ -ray safety during experiments, based on TRINAT, can be managed by flagging**
- **$\alpha$  emitter safety. Although we plan to open vacuum extremely rarely, this needs careful checks:**

**Many Fr chains terminate in relatively safe isotopes. Some terminate in long-lived Po, which is volatile.**

**Main roughing through turbos, down to a few mTorr, to the experimental hall monitored exhaust.**

**(Remaining roughing: local LN2 sorption pumps.)**

**We are looking into the making the neutralizer foil (see below) more reliable and simply replaceable**

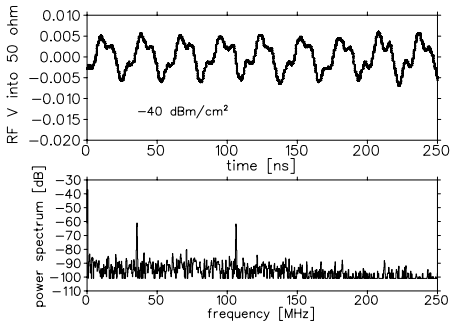
**Air circulation rate will partly determine ALI's: need to coordinate this with temperature stability and clean**

# Noise: RF, 60Hz, Acoustic, Temperature

Specs from U. Maryland to U.S. company Dec 1

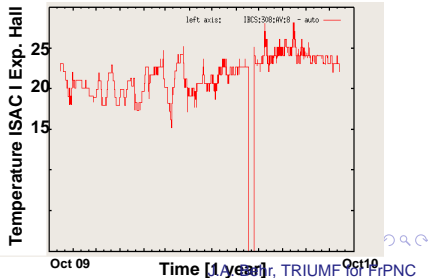
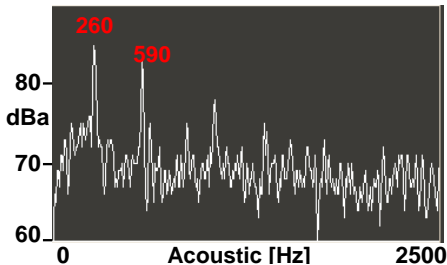
**Need approval from TRIUMF tech. review 1st 2 weeks Dec.**

RF, loop +BNC cable into 50 ohm, ISAC I floor

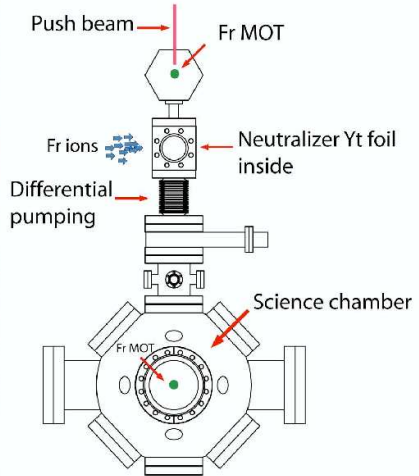
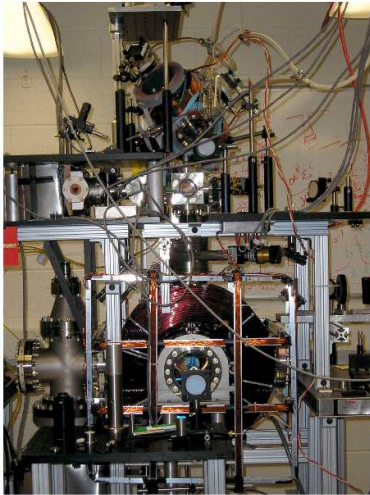


**60Hz: 0.2G p-p 25 cm, 0.1G p-p 50 cm from TITAN transformer**  
 Need  $< 10^{-4}$  G at experiment  
 U. Maryland: **Active feedback with 200 Hz bandwidth**

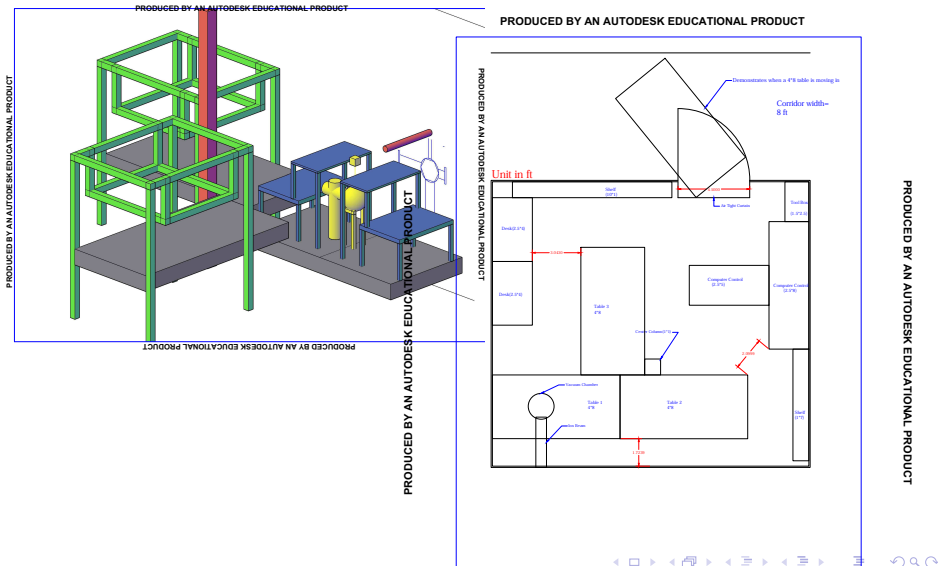
Status/plans for francium program



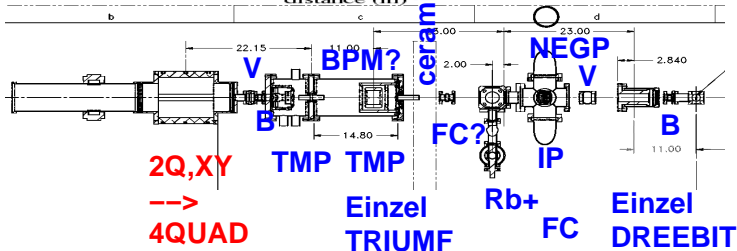
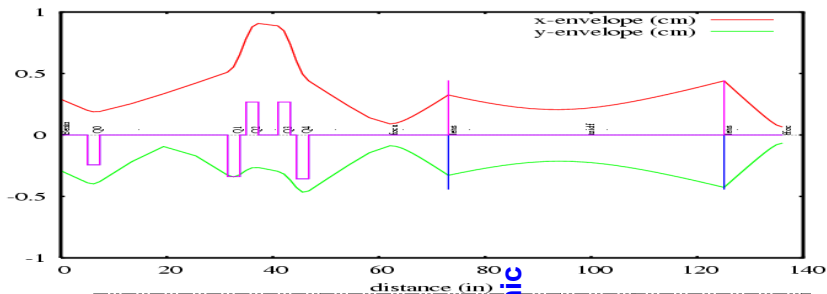
# U. Maryland two-trap setup to move here Aug 2011



# Room is same size as TRINAT at TISOL



# Beamline optics



# Beamline design considerations

**Following polarizer/betaNQR: two 550 l/sec turbos for differential pumping,**

**25-30 kV decel Einzel lenses for UHV**

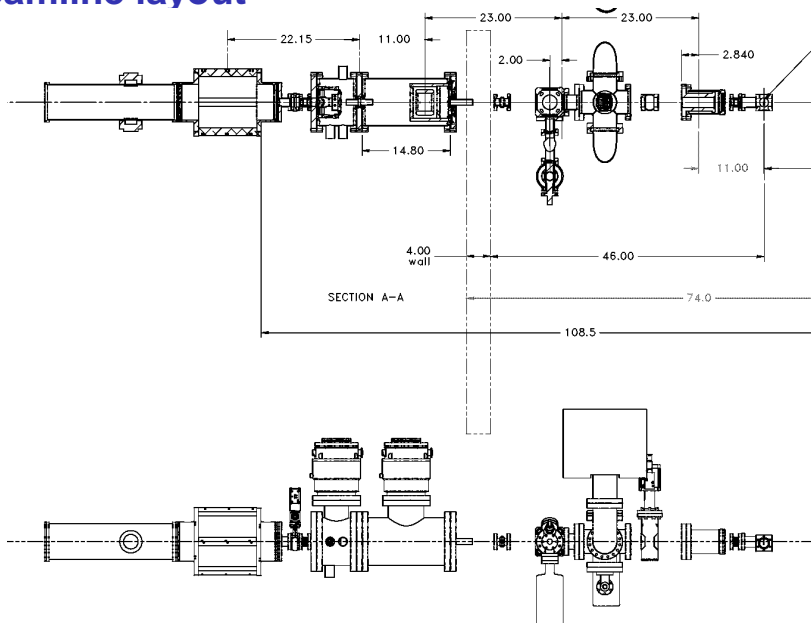
**Ceramic break in the wall to isolate grounds**

**TRIUMF Einzel lens outside; commercial DREEBIT lens is more compact near the trap**

**ion pumps and non-evaporable getter pumps inside the room to avoid vibrations and noise**



# Beamline layout



## $^{225}\text{Ra}$ source $\rightarrow$ $^{221}\text{Fr}$

No heating, no radiochemistry, 2 week halflife

**Implant  $^{225}\text{Ra}$  at TRIUMF or ISOLDE**

**place source 3mm from Yt catcher**

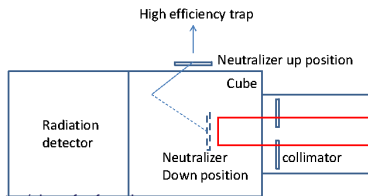
**$\alpha$  decay of  $^{225}\text{Ac}$  ejects 100 keV**

**$^{221}\text{Fr}$  into 1 cm spot**

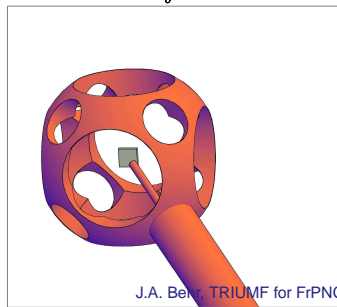
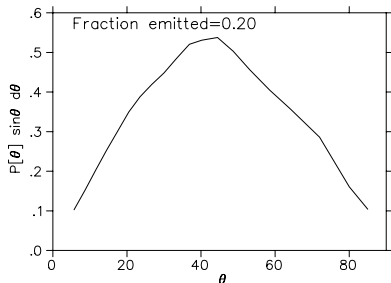
**remove source**

**move Yt to trap, heat, trap**

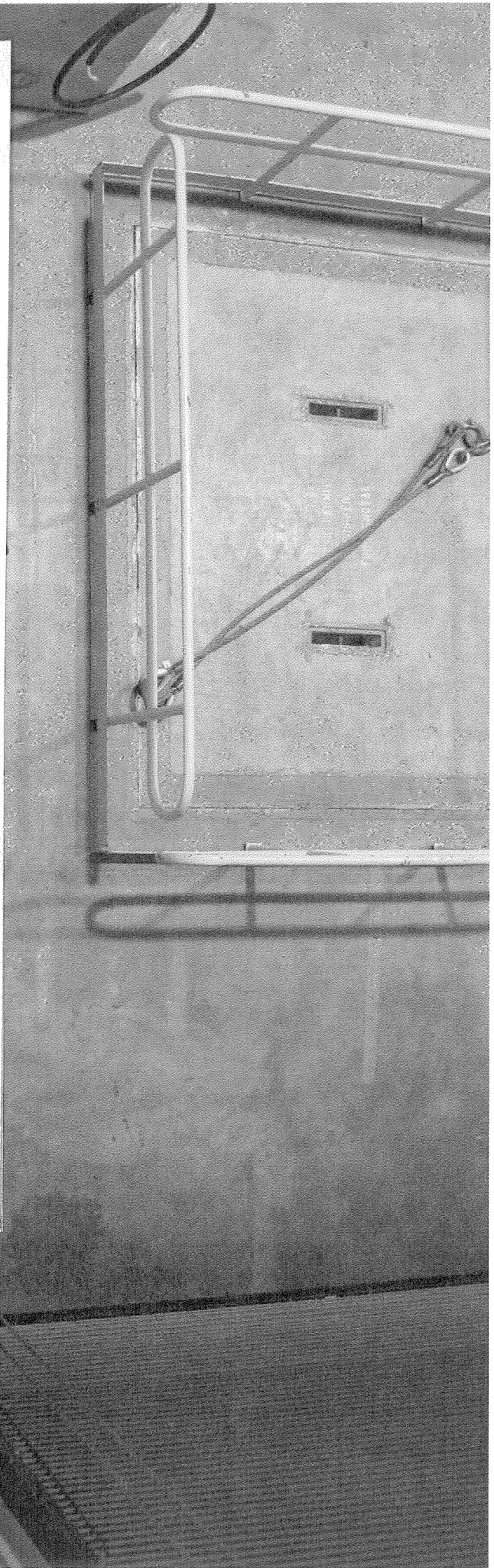
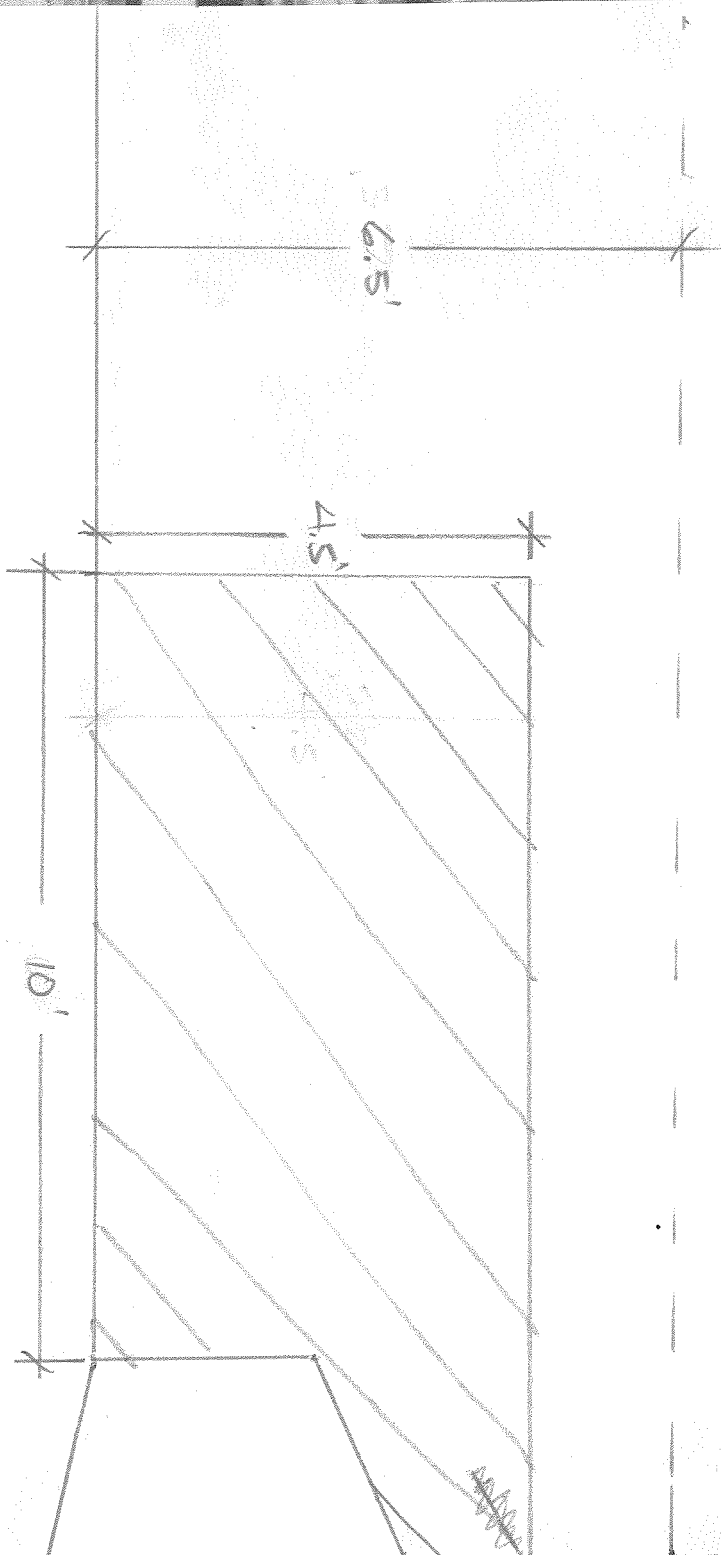
**heating Yt has been by direct current: CO2 laser?**



Status/plans for francium program

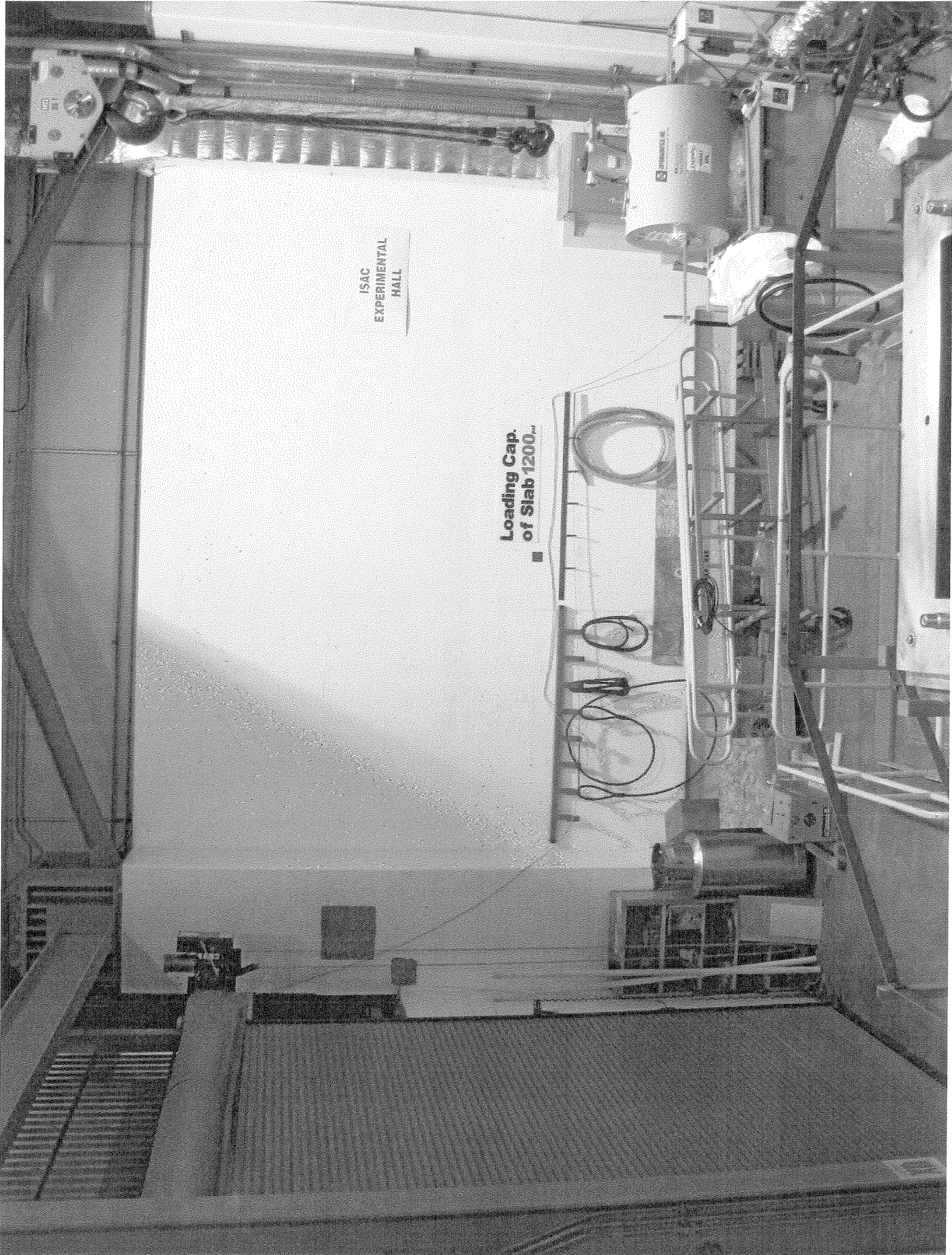


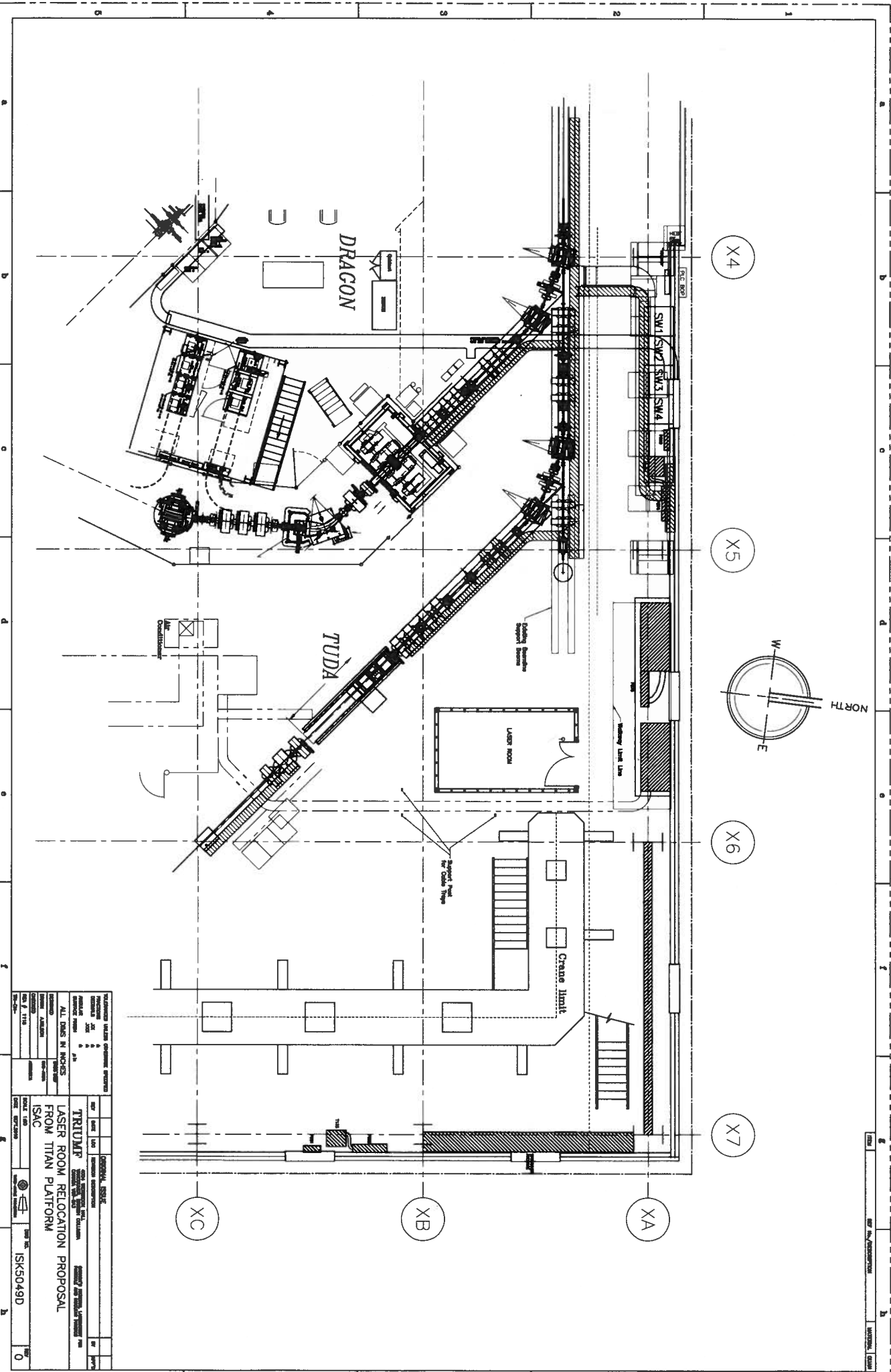
J.A. Behr, TRIUMF for FrPNC



ISAC  
EXPERIMENTAL  
HALL

Loading Cap.  
of Slab 1200...

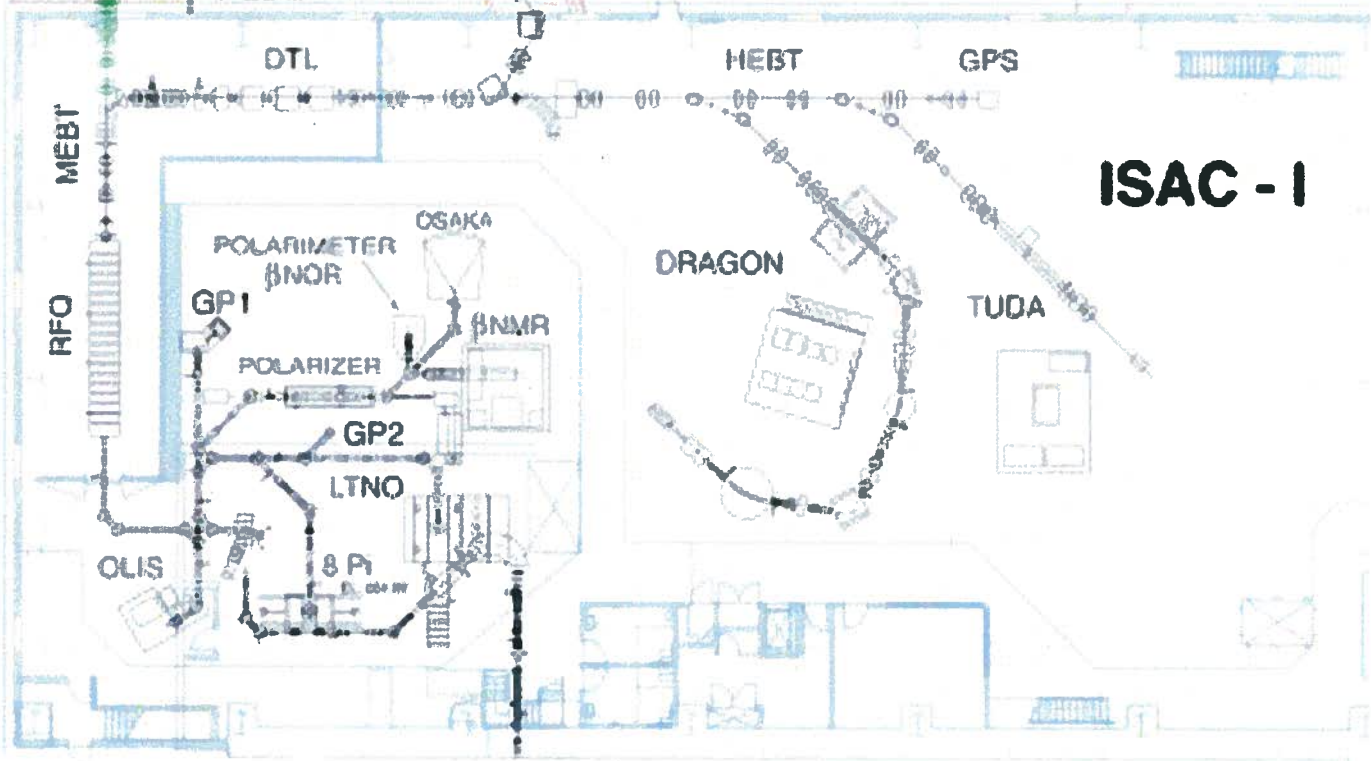
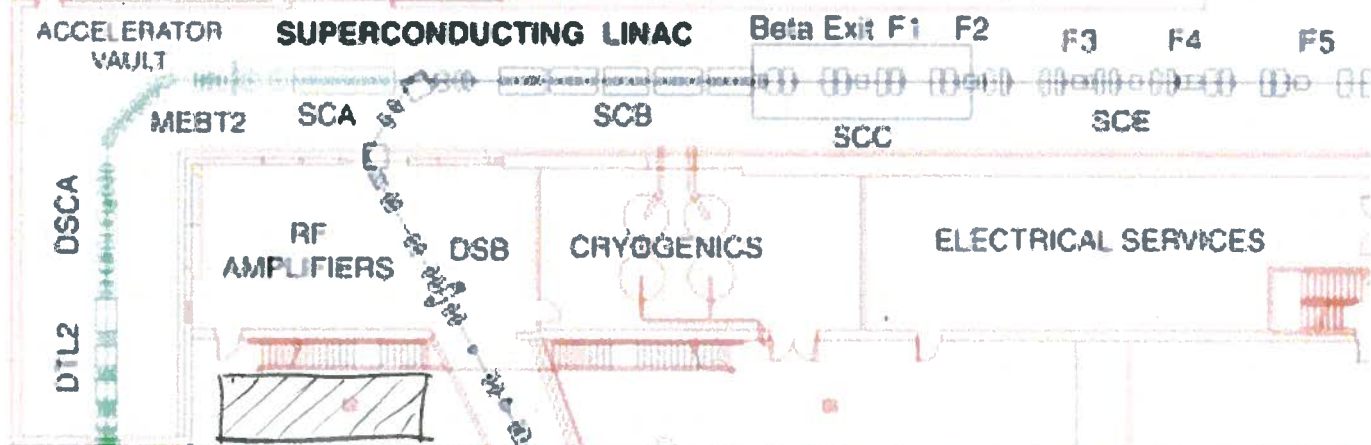
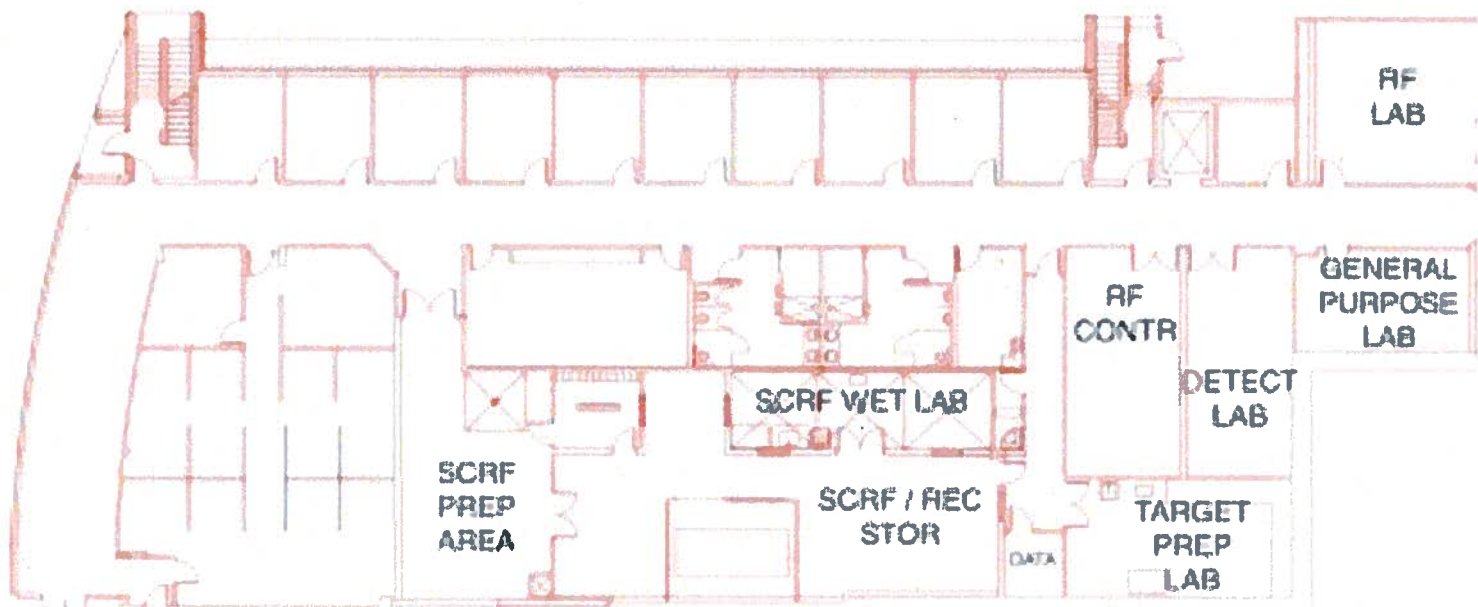




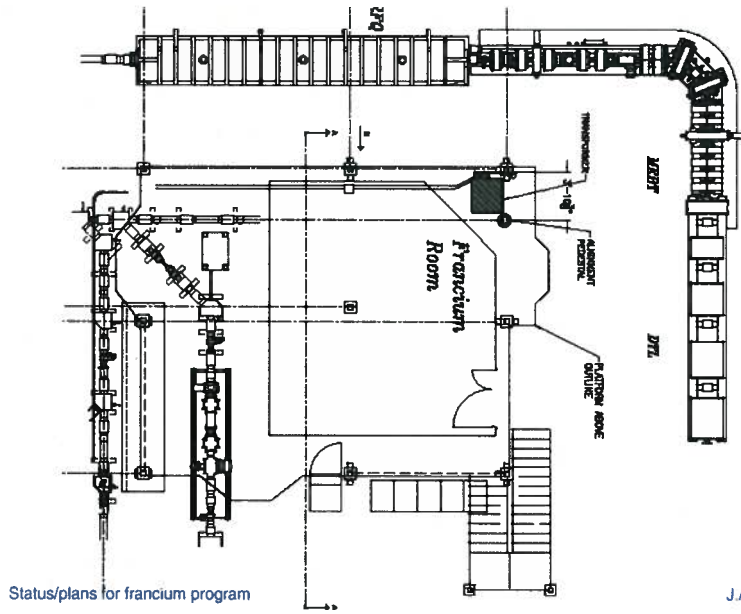
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3	TRIMUP LASER ROOM RELOCATION PROPOSAL				
4	TRIMUP LASER ROOM RELOCATION PROPOSAL				
5	TRIMUP LASER ROOM RELOCATION PROPOSAL				

PROJECT NO.	ISK5049D
PROJECT NAME	TRIMUP LASER ROOM RELOCATION PROPOSAL
PROJECT LOCATION	TRIMUP LASER ROOM RELOCATION PROPOSAL
PROJECT OWNER	ISAC
PROJECT MANAGER	
PROJECT ENGINEER	
PROJECT ARCHITECT	
PROJECT CONTRACTOR	
PROJECT SUBMITTER	
PROJECT DATE	
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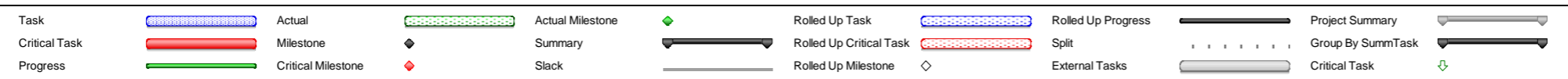
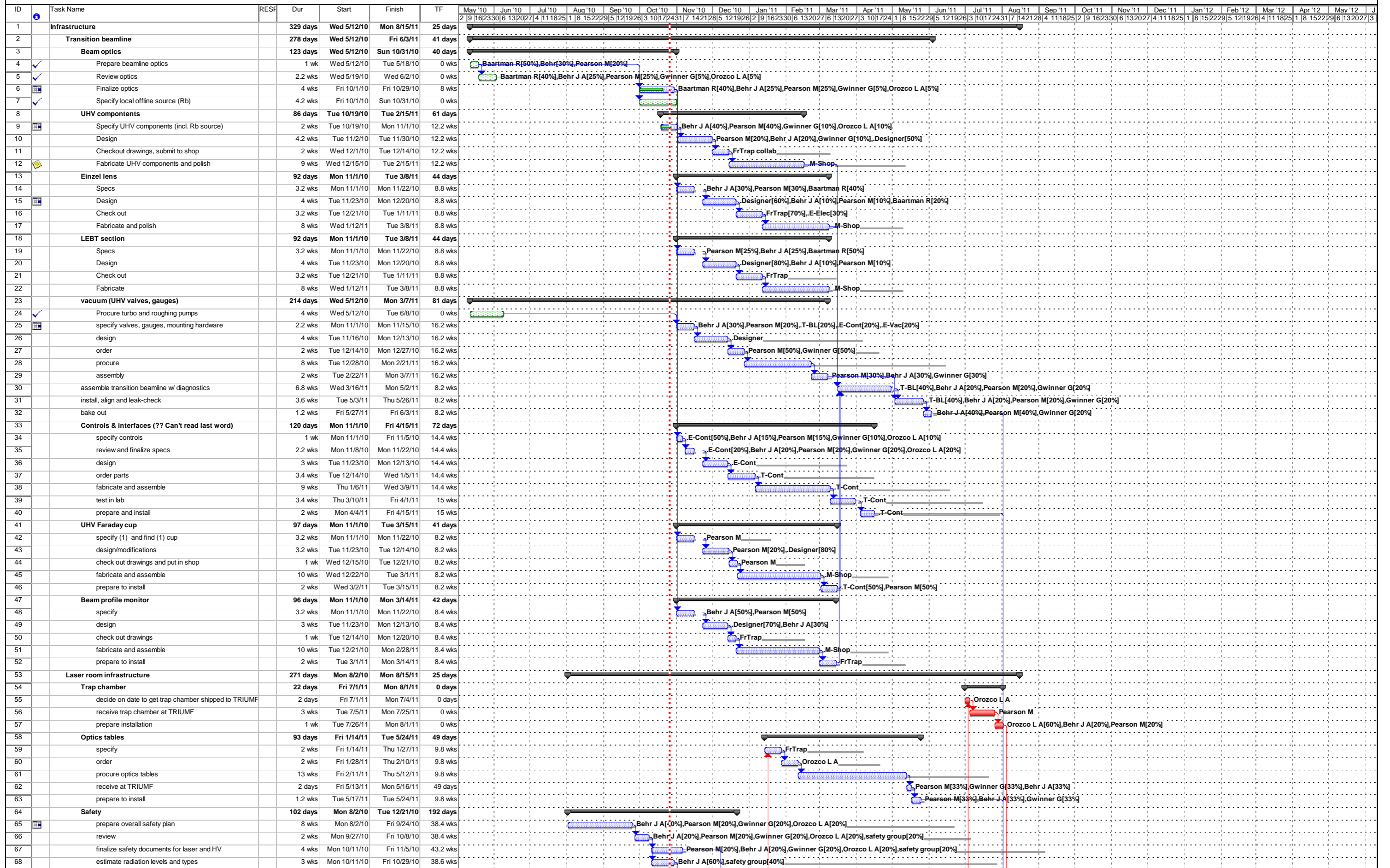
# Room location



Status/plans for francium program

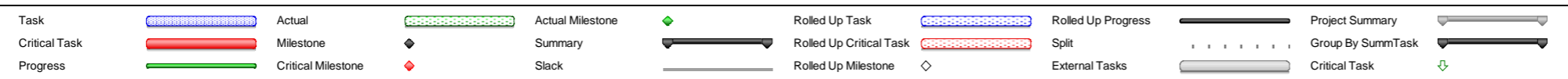
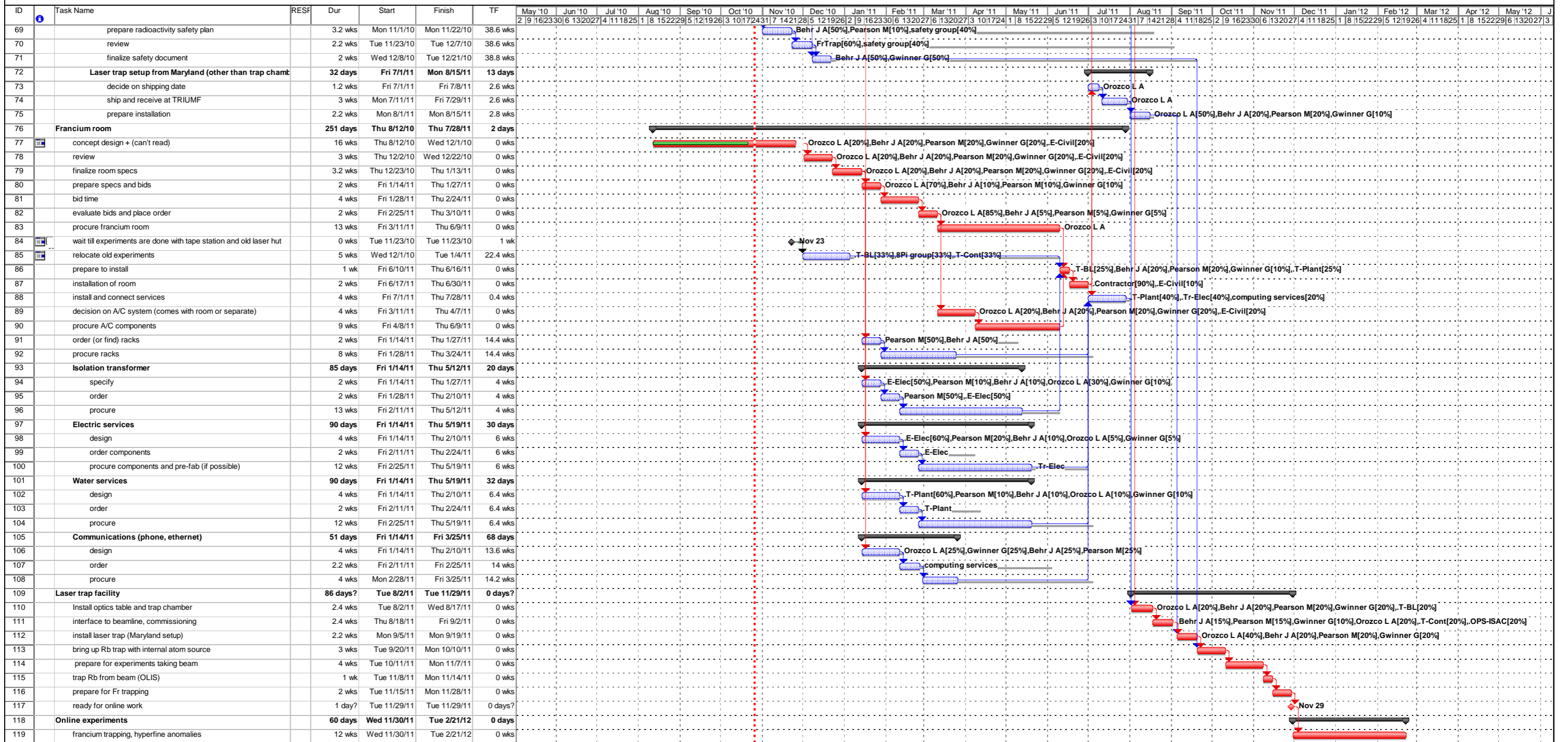
J.A. Behr, TRIUMF for FrPNC

# Francium beamline / laser clean room at ISAC





# Francium beamline / laser clean room at ISAC



Francium Room

18' x 20' x 12'h

OSAKA

RIMS

GPS

GRIFFIN

YIELD

Rn EDM

aircon enclosure

Mezzanine

ISAC Controls

ISAC Controls

ISAC CONTROLS

S

P/S

PS

CONT

M/W Transmitter CSB

ISAC Controls

UP

