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 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 descope 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 Rail System
Control/Data Acquisition Hardware
Control/Data Acquisition Software
EPICS Controls

Owned and operated as a joint venture by a consortium of Canadian universities via a contribution through the National Research Council Canada

Propriété d’un consortium d’universités canadiennes, géré en co-entreprise à partir d’une contribution administrée par le Conseil national de recherches Canada
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
Yield Station Data Acquisition

Backend: Data Analysis / Storage (MIDAS, ROOT)

Frontend: VME GEF V7865 – Data Acquisition / Control (MIDAS)

- Peak sensing ADC V1785
- Scaler SIS3820
- HPGe PIN-Detectors
- Plastic Scintillators

EPICS
Beam Current, Target Heater Current, Mass Separator, TRILIS, etc.

Pulser BNC588

Motion Control Galil DMC-2183

Tape Station HPGe Feedtroughs Target Wheel

Event data initialization, start, stop
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)

• $\alpha$, $\beta$, $\gamma$, $\nu$ coincidence measurements

• Desorption and trapping of ions

• half-live measurements with high precision
<table>
<thead>
<tr>
<th>Actions</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move OLIS Magnet Power Supply</td>
<td></td>
</tr>
<tr>
<td>Move 8pi LN2, Kicker Controls</td>
<td></td>
</tr>
<tr>
<td>Move Yield Station Electronics &amp; Kicker electronics</td>
<td></td>
</tr>
<tr>
<td>Setup of yield station support frame</td>
<td></td>
</tr>
<tr>
<td>Setup of yield station vacuum chamber, connection to beamline, testing,</td>
<td>Begin: January - March 2011</td>
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<tr>
<td>commissioning</td>
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# Upgrade Timeline

<table>
<thead>
<tr>
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<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
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<tbody>
<tr>
<td>1</td>
<td>Yield Station Setup</td>
<td>20 days?</td>
<td>Mon 3/01/11</td>
<td>Fri 28/01/11</td>
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<td>2</td>
<td>Moving OLIS Power Supply</td>
<td>3 days</td>
<td>Mon 3/01/11</td>
<td>Wed 05/01/11</td>
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<td>3</td>
<td>Moving 8pi electronics rack</td>
<td>3 days?</td>
<td>Mon 3/01/11</td>
<td>Wed 05/01/11</td>
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<tr>
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<td>Frame Setup</td>
<td>3 days</td>
<td>Thu 06/01/11</td>
<td>Mon 10/01/11</td>
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<tr>
<td>5</td>
<td>Rail System Setup</td>
<td>2 days</td>
<td>Tue 11/01/11</td>
<td>Wed 12/01/11</td>
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<td>6</td>
<td>Electronics and Controls Rack Setup</td>
<td>1 day</td>
<td>Thu 13/01/11</td>
<td>Thu 13/01/11</td>
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<tr>
<td>7</td>
<td>Reconfiguration of electrical lines</td>
<td>2 days</td>
<td>Fri 14/01/11</td>
<td>Mon 17/01/11</td>
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<tr>
<td>8</td>
<td>Installation of Yield Station Box Chamber</td>
<td>1 day</td>
<td>Thu 13/01/11</td>
<td>Thu 13/01/11</td>
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<tr>
<td>9</td>
<td>Vacuum and Yield Faraday Cup Controls</td>
<td>2 days</td>
<td>Fri 14/01/11</td>
<td>Mon 17/01/11</td>
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<tr>
<td>10</td>
<td>Leak Checking</td>
<td>1 day</td>
<td>Tue 18/01/11</td>
<td>Tue 18/01/11</td>
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<tr>
<td>11</td>
<td>Tape Drive and Detector connections</td>
<td>3 days</td>
<td>Wed 19/01/11</td>
<td>Fri 21/01/11</td>
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<td>12</td>
<td>Commissioning</td>
<td>5 days</td>
<td>Mon 24/01/11</td>
<td>Fri 28/01/11</td>
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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
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

Status/plans for francium program

J.A. Behr, TRIUMF for FrPNC
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.

● γ-ray safety during experiments, based on TRINAT, can be managed by flagging

● α 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 room requirements.
**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.

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

Status/plans for francium program

J.A. Behr, TRIUMF for FrPNC
Room is same size as TRINAT at TISOL
Beamline optics

Status/plans for francium program

J.A. Behr, TRIUMF for FrPNC
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
225Ra source $\rightarrow$ 221Fr

No heating, no radiochemistry, 2 week halflife

Implant 225Ra at TRIUMF or ISOLDE
place source 3mm from Yt catcher

$\alpha$ decay of 225Ac ejects 100 keV
221Fr 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
Room location