Agenda for 10-4-7

- Recap – conclusions from the UCN workshop.
- Collaboration building, funding options, and timetable.
- Main purpose of this meeting: technical issues for TRIUMF.

1. UCN Workshop Summary

- A resounding “yes” from the international UCN community.

Comments on Spallation He-II UCN Source

- Unique source concept that is feasible.
- This should be pursued somewhere.
- TRIUMF would be an ideal place.
- Technical issues and costing should be pursued.
- Need to identify clear physics goal. Optimize source-experiment coupling.
- Relationship to JPARC should be solidified.

Comments on Flagship UCN Experiment

- High UCN densities are a very good thing.
- For TRIUMF concept, important to focus on expts where density important, as opposed to production rate.
  - Gravity – great chance to make big impact.
  - Lifetime – LANL effort – can we make use of this? (most likely candidate for LOI, IMHO)
  - RIB-UCN interactions – great concept!
  - nnbar – subsequent to meeting, email from A. Young which was very positive, but required 400 uA.
  - EDM – tough
  - Angular correlations – competition with CN experiments particularly difficult, systematics must be carefully argued.
  - Solid state physics – important! Need applications, further R&D. Apparatus is very cost effective.

Comments on Flagship UCN Expt

- gravity – currently limited by UCN density, a real chance to make an impact.
- neutron lifetime – tough business, but new magnetic traps are in infancy. still time to contribute.
- EDM – tough business, large collaboration required, cost, but possible to make headway given high UCN density.
- nnbar – UCN production rate, can He-II compete with SD2? may have niche with UCN, cheaper than beam expts which cost $100M
- RIB-UCN interactions should be pursued with high priority! unique to TRIUMF

General Comments

- What kind of cost levels are you talking about?
  - $2M+outside contributions (scale of TWIST). Japanese contributions. For bigger expts, TRIUMF would draw outsiders by availability of high UCN density.
- How much current can you take?
  - 40 uA pk, 10 uA avg.
  - cooling, shielding, remote handling req'd.
  - have to be careful of gamma heating
- Manpower
  - better to concentrate manpower than having many small groups.

2. Collaboration, funding, timetable

- Bob Golub very enthusiastic about TRIUMF UCN project (he literally “wrote the book” on UCN)
  - He-sources superior to SD2 sources due to no absorption, simplicity of concept.
  - spallation sources superior to reactor sources in the ability to optimize CN flux.
- Gobub interested in collaborating on developments toward He-II UCN source.

Collaboration

- 2007, Masuda intends make funding request to Japanese sources for UCN source upgrade. Golub, Martin, all Canadian collaborators ... invited to support this effort. (not sure exactly what Masuda requires – letters of support? signatures?)
- 2008, Canadian request

Collaboration – as presented to TRIUMF board

- strong KEK group who have already created a world-class facility (Masuda et al)
- strong interest from Canadian SAP community
- well-attended working group at August TRIUMF townhall meeting
- big event: UCN workshop at TRIUMF Sept. 13-14, 2007
  - world experts in attendance
- Interest in submitting a CFI proposal for UCN source in 2008 from Canadian groups

Schedule

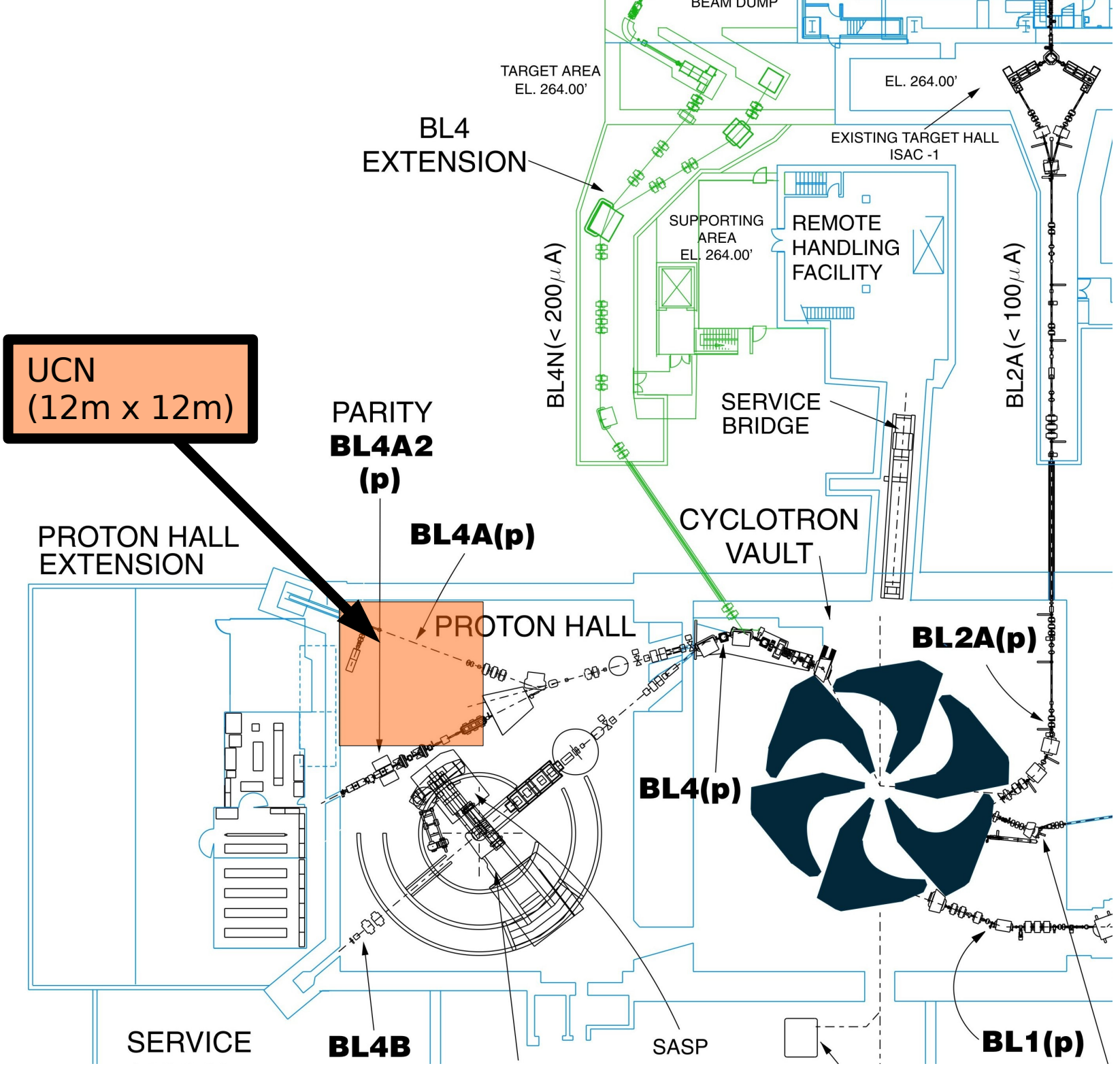
- Prior to 2010, pursue development of new UCN cryostat for TRIUMF at RCNP, Osaka.
  - This would allow us to demonstrate all the gain factors from horizontal extraction, better UCN guides. (aside from beam power)
- After 2010, begin construction of UCN source at TRIUMF (2010 = coincident with major reconstruction for ISAC 3).

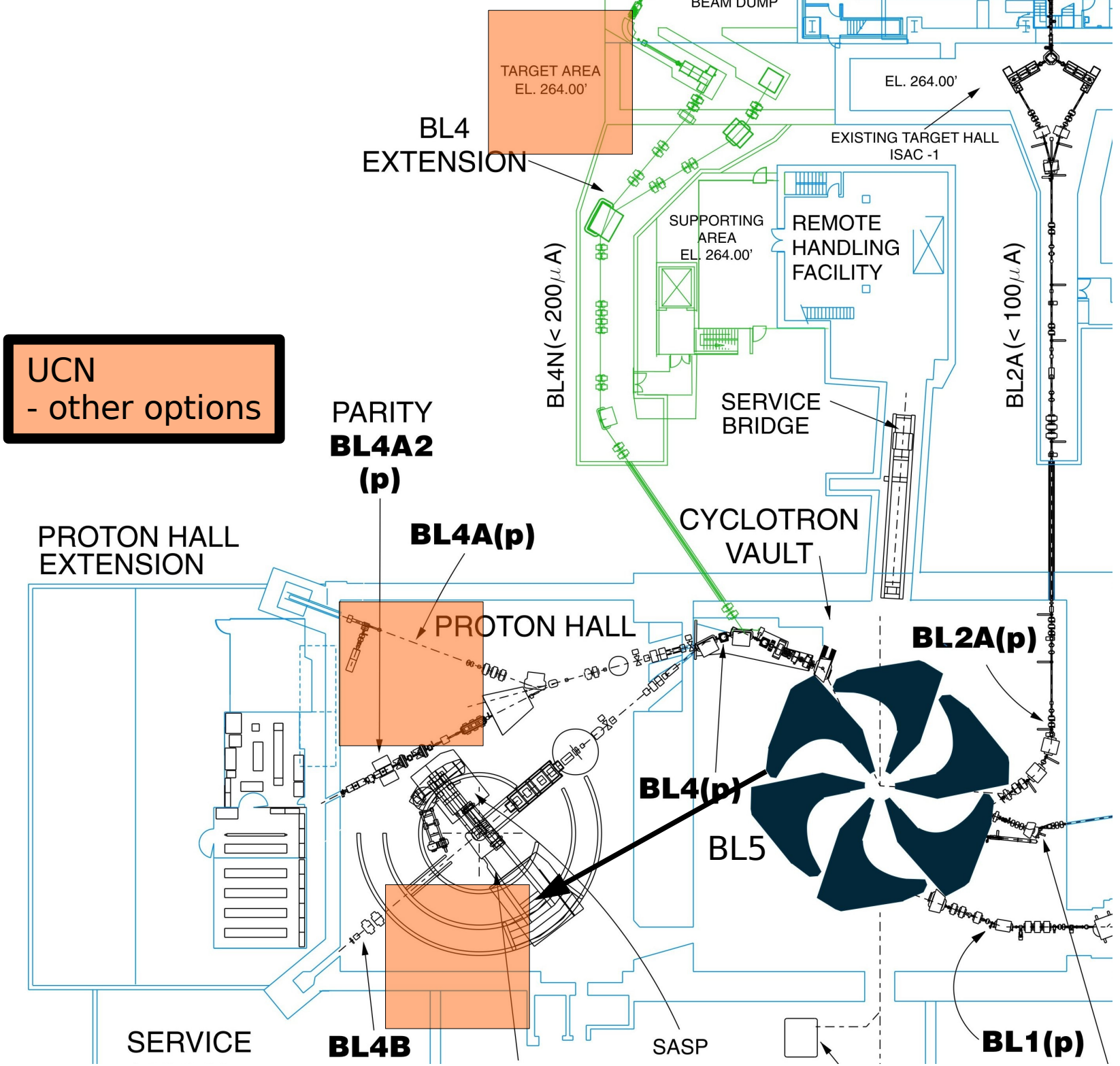
Cost

- Cryostat, LHe cooling costs very well-understood (1.4 M$ CAD)
- Shielding, remote handling yet to be estimated. Base on experience from TRIUMF, LANL, and RCNP. (Prior to shielding simulations.)

3. Technical Issues for UCN

- Location.
- Beam sharing (dependent on location).
- Space (dependent on location).
- To carry out precision experiments, it is highly advantageous to pulse the UCN source. E.g. RCNP uses 1 min beam on, 3 mins beam off. During beam off, UCN can be counted (or their decays, etc.)
  - pulsing at ion source incompatible with ISAC.
  - achieve pulsing by diverting beam to well-shielded dump using kicker.


BEAM DUMP
TARGET AREA
EL. 264.00'
EL. 264.00'
EXISTING TARGET HALL
ISAC -1
BL4
EXTENSION
SUPPORTING
AREA
EL. 264.00'
REMOTE
HANDLING
FACILITY
BL4N(< 200μA)
BL2A(< 100μA)
UCN
(12m x 12m)
PARITY
BL4A2
(p)
BL4A(p)
SERVICE
BRIDGE
CYCLOTRON
VAULT
PROTON HALL
EXTENSION
PROTON HALL
BL2A(p)
BL4(p)
SERVICE
BL4B
SASP
BL1(p)


UCN
- other options
BEAM DUMP
TARGET AREA
EL. 264.00'
BL4
EXTENSION
EL. 264.00'
EXISTING TARGET HALL
ISAC -1
SUPPORTING
AREA
EL. 264.00'
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(p)
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CYCLOTRON
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EXTENSION
PROTON HALL
BL2A(p)
BL4(p)
BL5
BL4B
SASP
BL1(p)
SERVICE

Solutions Discussed for Technical Issues (thanks, accel group!)

- Location: BL4A area
  - UCN source viewed as an ISAC-3 target station, located in Proton Hall
  - Advantages:
    - UCN fully integrated into ISAC-3 program in terms of physics (fundamental symmetries) and facility (another ISAC-3 target station).
    - simultaneous operation with ISAC-3 by decoupling on kHz scale with kicker/ion source manipulation. Advantageous for ISAC-3: run all three targets simultaneously.
    - use another kicker to divert beam to dump in ISAC-3 area to achieve UCN pulsing (1 min on / 3 mins off).
    - recent designs of ISAC-3 BL4N take the beam further into Proton Hall (towards UCN). And more shielding already required in that area.
  - Disadvantages:
    - space in Proton Hall getting tight.
    - coupled to ISAC-3.
- Location: ISAC-3 target hall.
- Location: BL5 port (new port)

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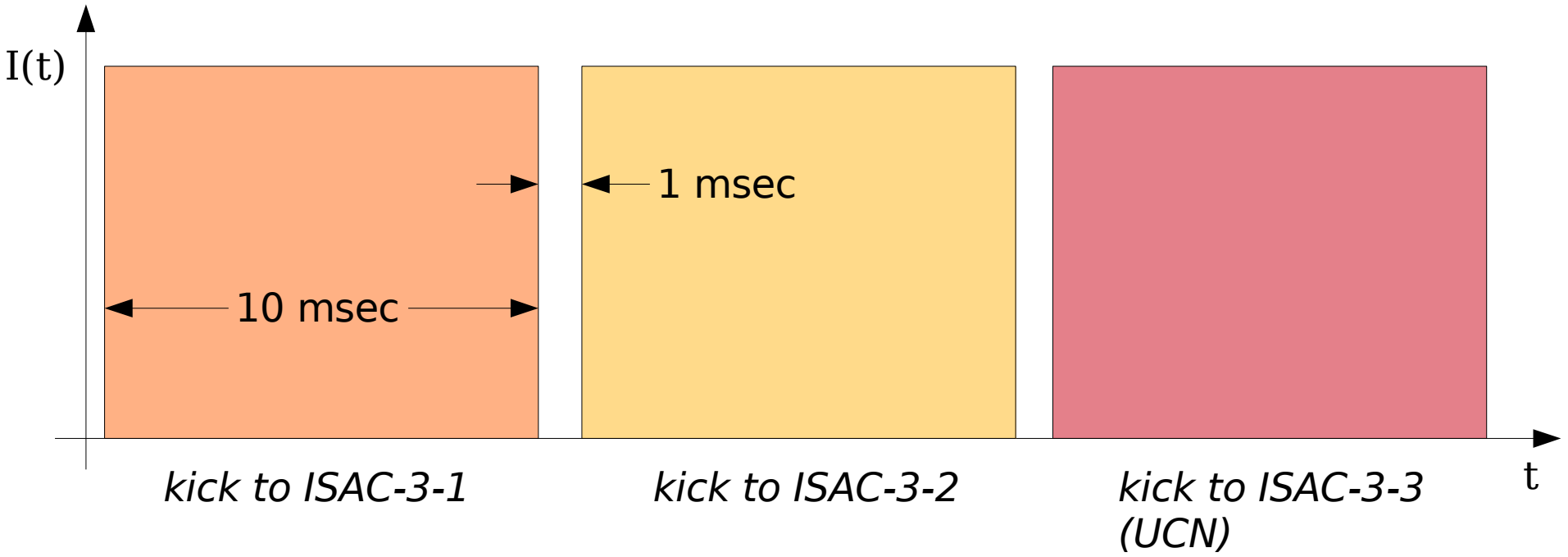
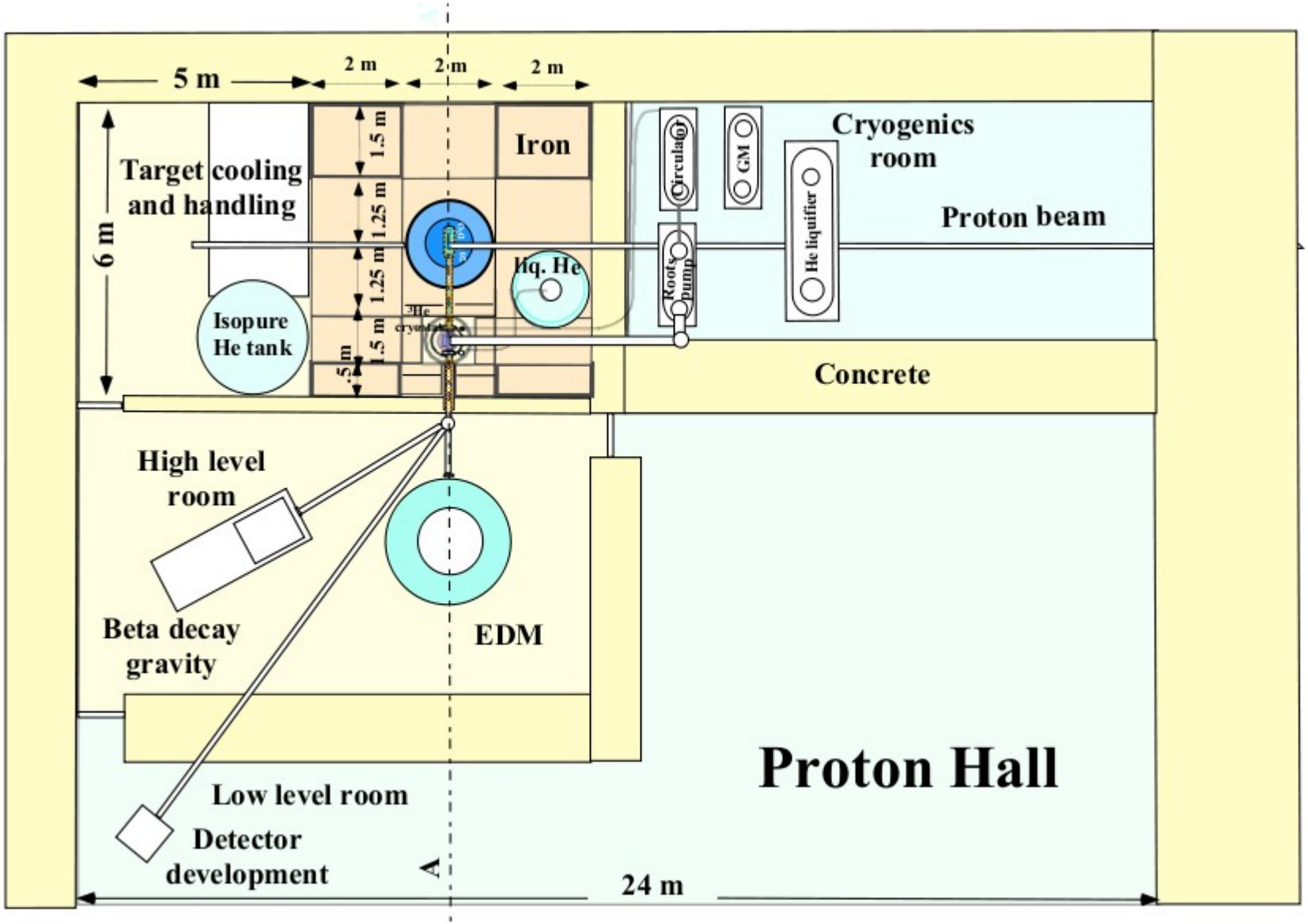
ion source current vs. time



Solutions Discussed for Technical Issues

- Location:
  - BL5 area
    - Advantages:
      - decoupled from ISAC 3.
    - Disadvantages:
      - new beam port must be constructed
      - beam line must not conflict with cyclotron probe extraction point
      - high-power dump required to achieve pulsing with kicker.
      - space in Proton Hall tighter – likely requires excavation for dump.

Potential Layout in Proton Hall (rev. 9/6/07)



layout still needs some work... cryogenics location, shielding, remote handling