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Canada's national laboratory
for particle and nuclear physics
and accelerator-based science

Accelerator Division Overview

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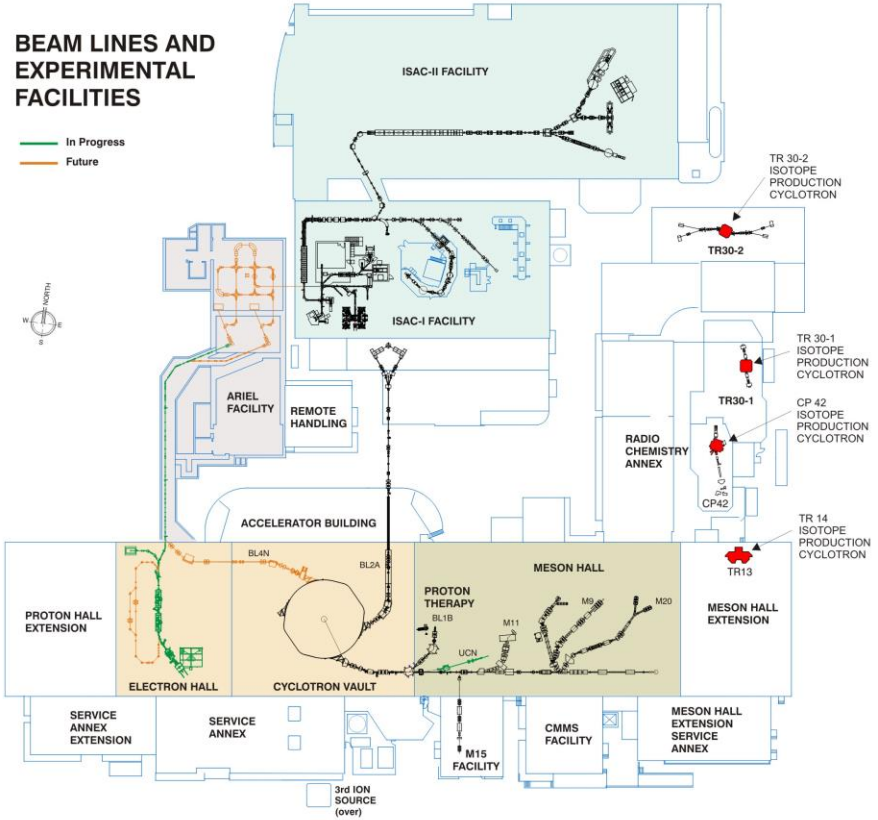
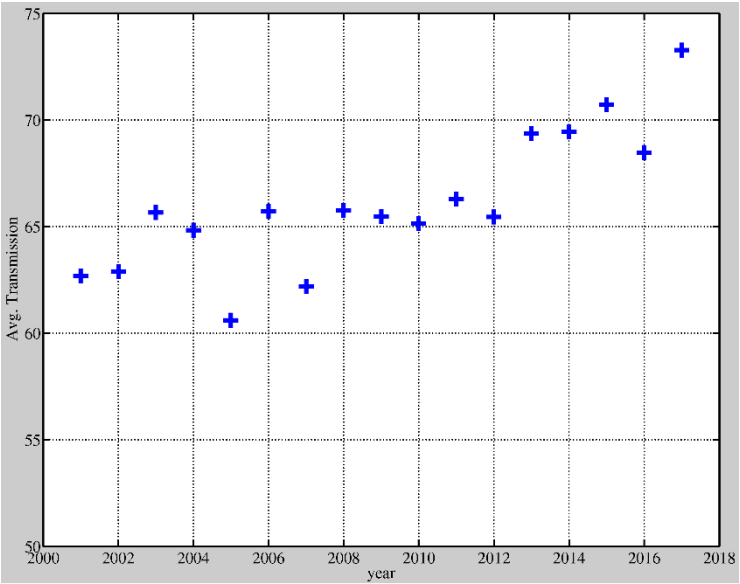
Outline

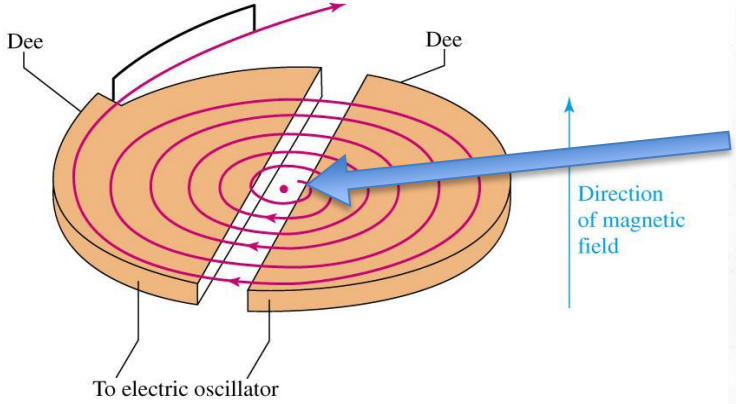
- Cyclotron performance improvement
- RIB beam delivery
- ARIEL update
- Accelerator division structure and goals



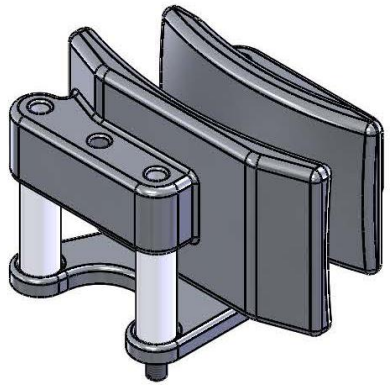
Cyclotron performance improvements

Cyclotron Transmission





Injection in the centre
– inflector

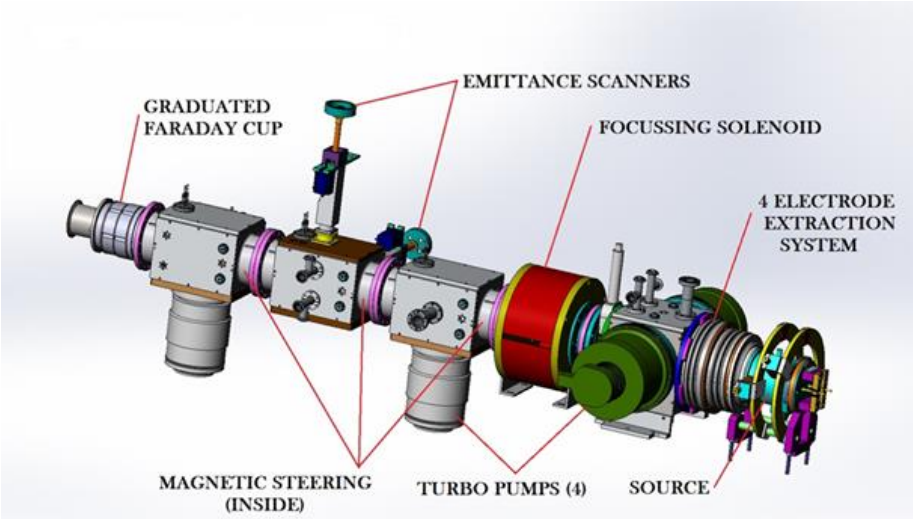


Cyclotron transmission is 70-75%; increased by ~10%:

- New 12 m section of injection line (better matching to cyclotron) in particular for higher beam intensity
- Curved electrostatic deflector at injection (added vertical focusing)

H- source advances

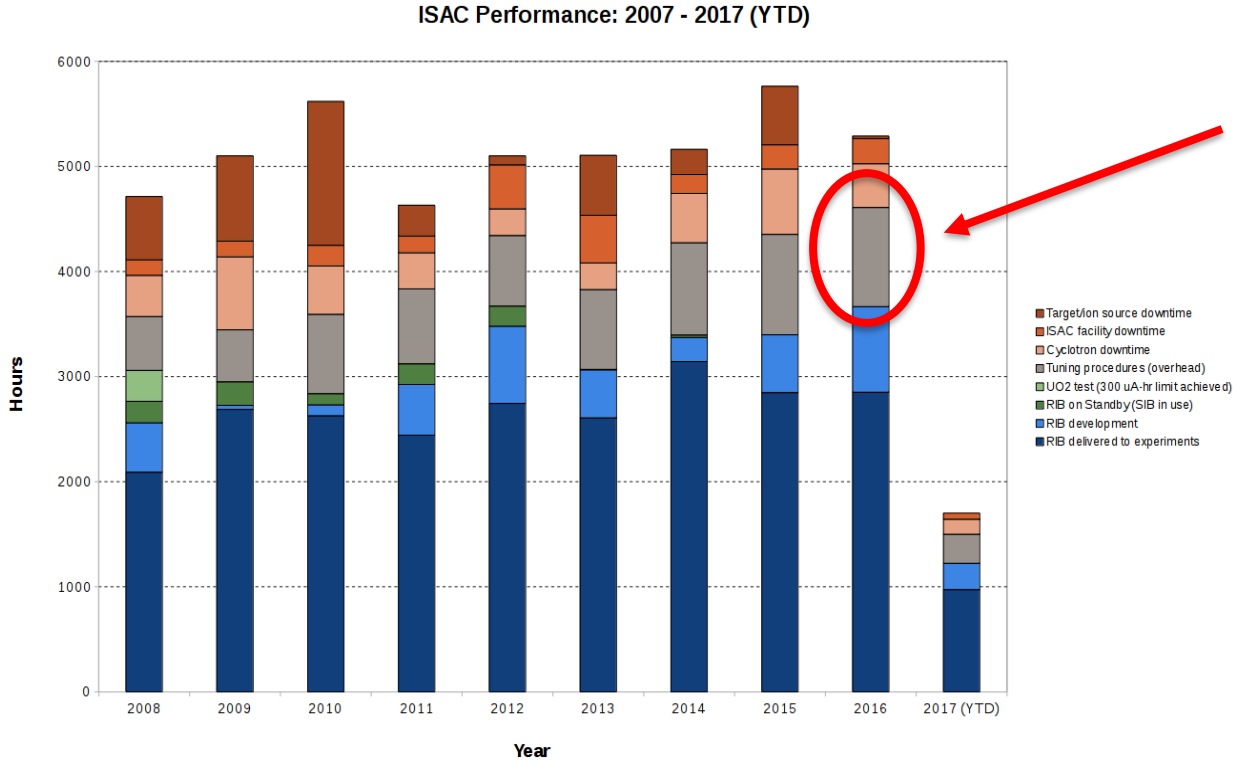
- Powerful and versatile H- source test stand established for hardware and beam studies:
  - Filament lifetime studies: 3 weeks => 4 months and longer
  - High performance demonstration: 30 mA cw, 20 kV in 60 mm mrad
- Future: High brightness source for the future high current operation



Source test stand components

RIB beam delivery

ISAC RIB delivery performance



- Up to 30% for tuning and procedures.
- With 3 beams available only 2 can be used in average by experiments under these conditions.
- High load on operators and system experts

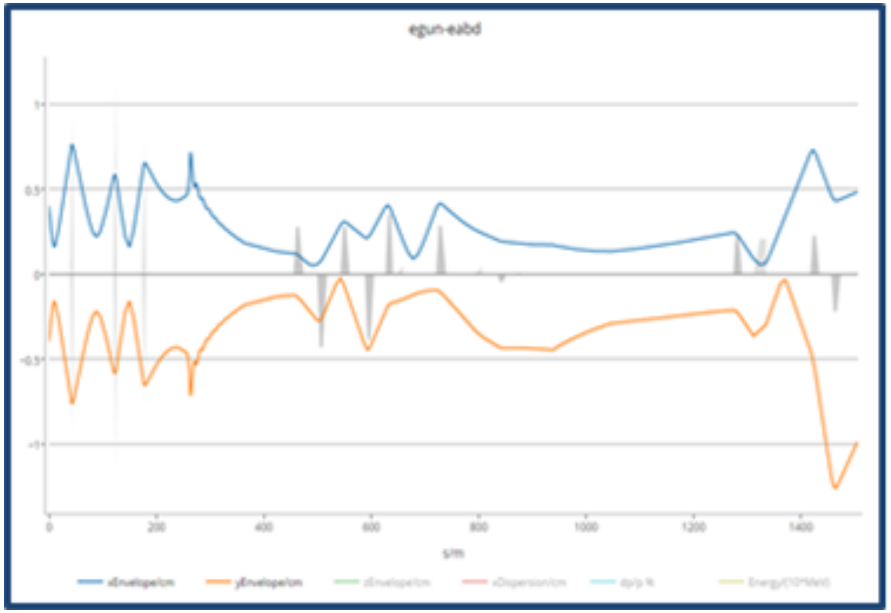
Reduction of tuning time

- Reduce downtime (improve reliability of all devices in the beam delivery chain)
- Reduce tuning and set-up time
- Provide better tools to operations (high level applications)
- Further develop understanding of
  - target ion sources
  - beam transport
  - accelerator chain

  by modelling

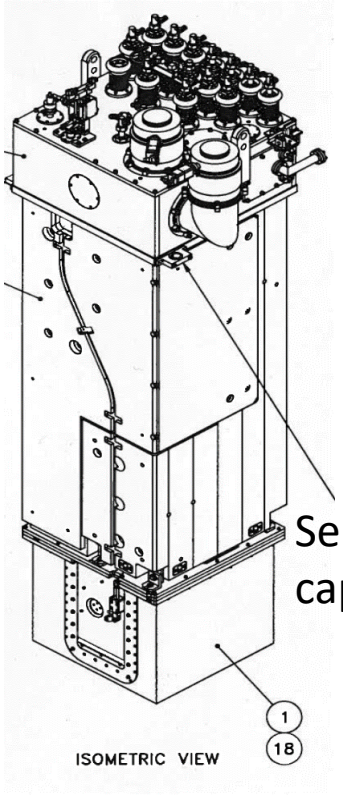
  → set values

  Envelope Code allows visualization of tune changes (quad strength, cavity amplitude etc.)



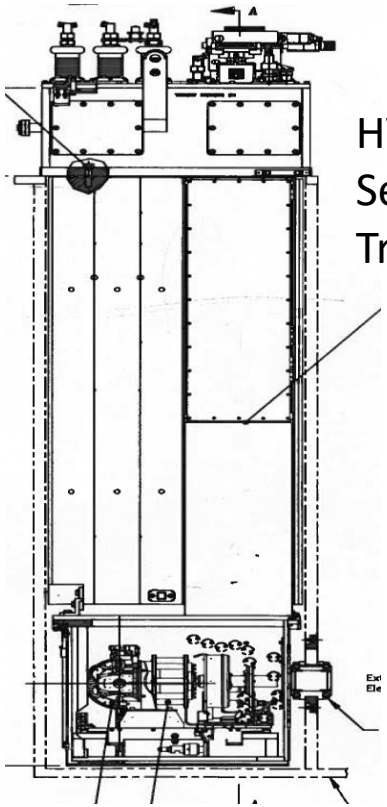
Beam envelope in e-linac calculated by TRANSOPTR (Rick Baartman)

TM3 - investigations



Service cap

Source Tray

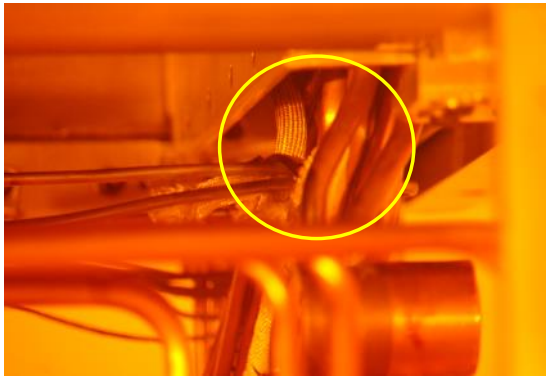


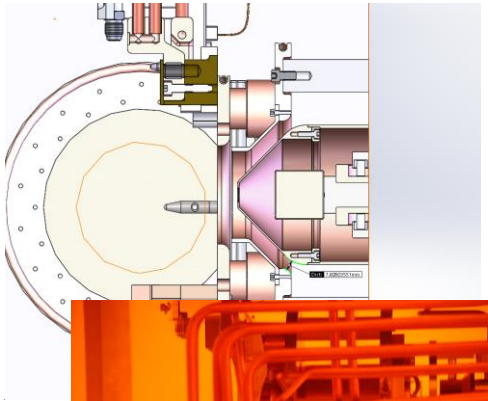
HV Service Tray

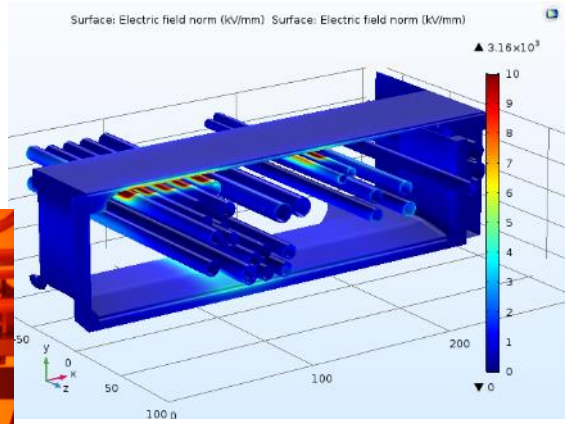
Towards an understanding of the TM issues.

Findings: Service tray and source tray

- Found fiber glass piece → misplaced and touching the HV and Ground Plate with sparks signs → confirmed by HV tests
- After fiber glass removal → under vacuum, TM3 (with no target/heat shield installed) was brought up to 65.5 kV
- E&M-simulations → E-Field strength above 10 kV/mm, EM Forces do not pose a structural problem for the conduits.
- HV sparks at the gap between the Extraction Electrode holder and the Ground Electrode -> important for future Source Tray re-design



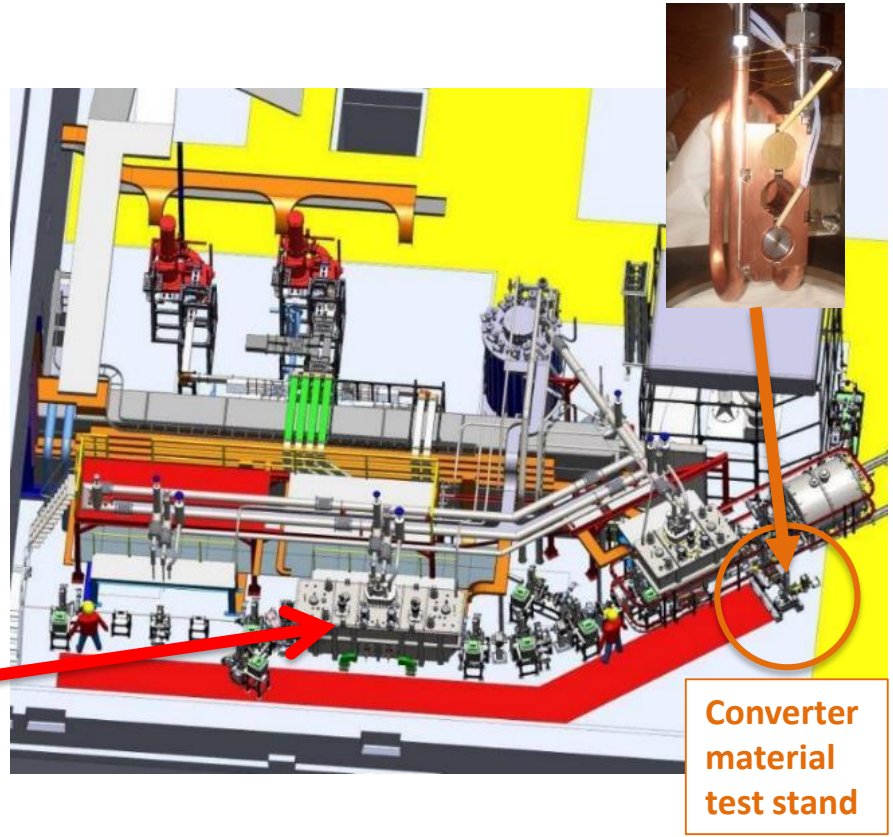




ARIEL update

The ARIEL electron linac

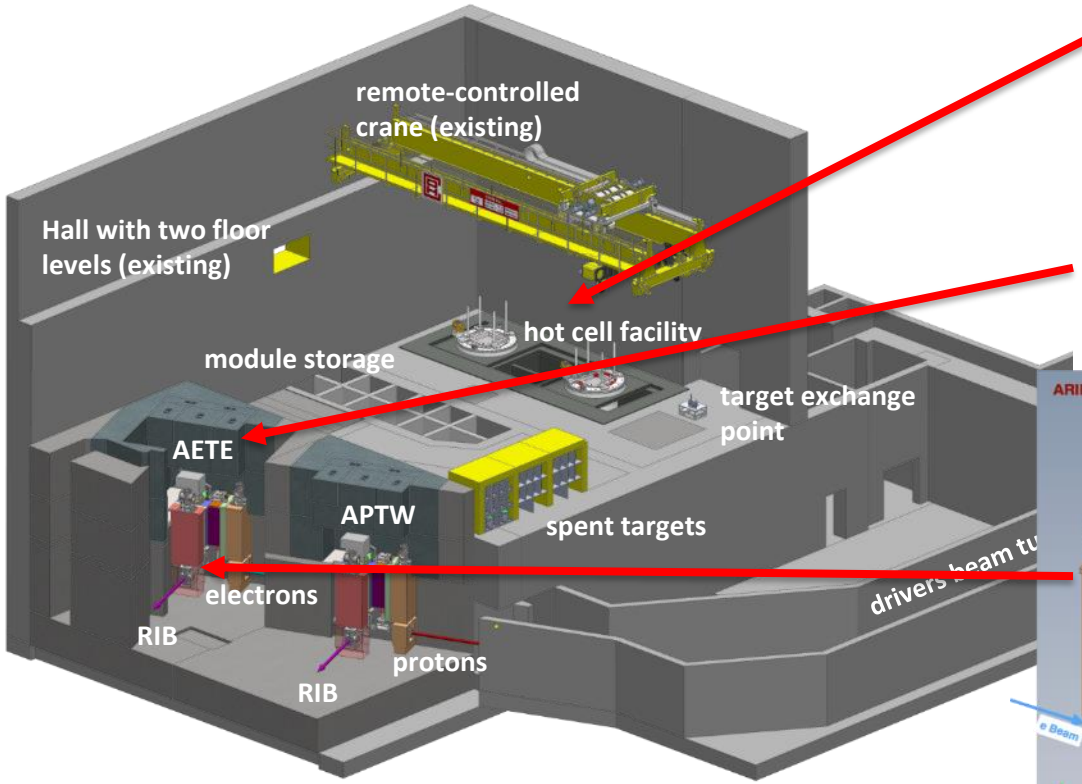
- Once fully commissioned - **highest beam power** in this energy range
- Beam at high power can destroy equipment in micro seconds
  → **machine protection system using beam loss monitors (M. Alcorta) and beam position monitors (V. Verzilov)**
  → Support from a specialized company OspreyDCS
- Ready for converter test stand operation
- **ACMuno** to **ACMduo** (20 MeV→30 MeV)



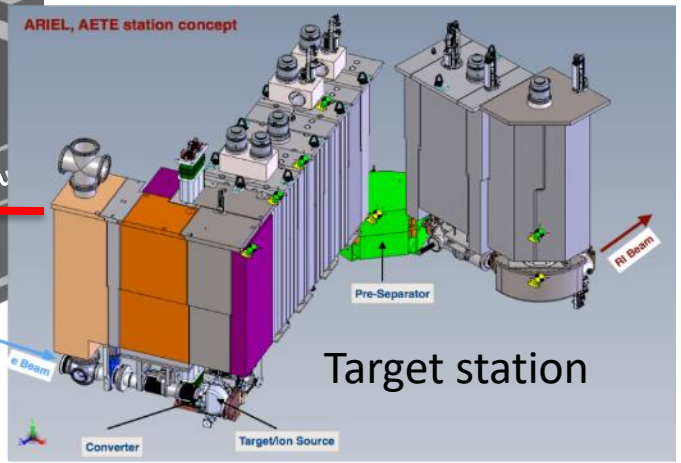
Charge to the committee was:

1. Is the present design approach reasonable and credible and does it support the technical performance requirements?
2. What are the key technical risks? Are they being adequately addressed? Is there any obvious analysis/prototyping missing
3. Make recommendations for improvements in the design leading to: better reliability, performance, manufacturability, assembly and/or operation.
4. Added question: Concerning the schedule slip - is a delay necessary or can we make up ground by down selecting and moving forward

→"We congratulate the ARIEL team for the quality of presentations, and for the great job which was done since the last review. The ARIEL project is definitely on a good track. " – Well done Alex, Pierre and team!

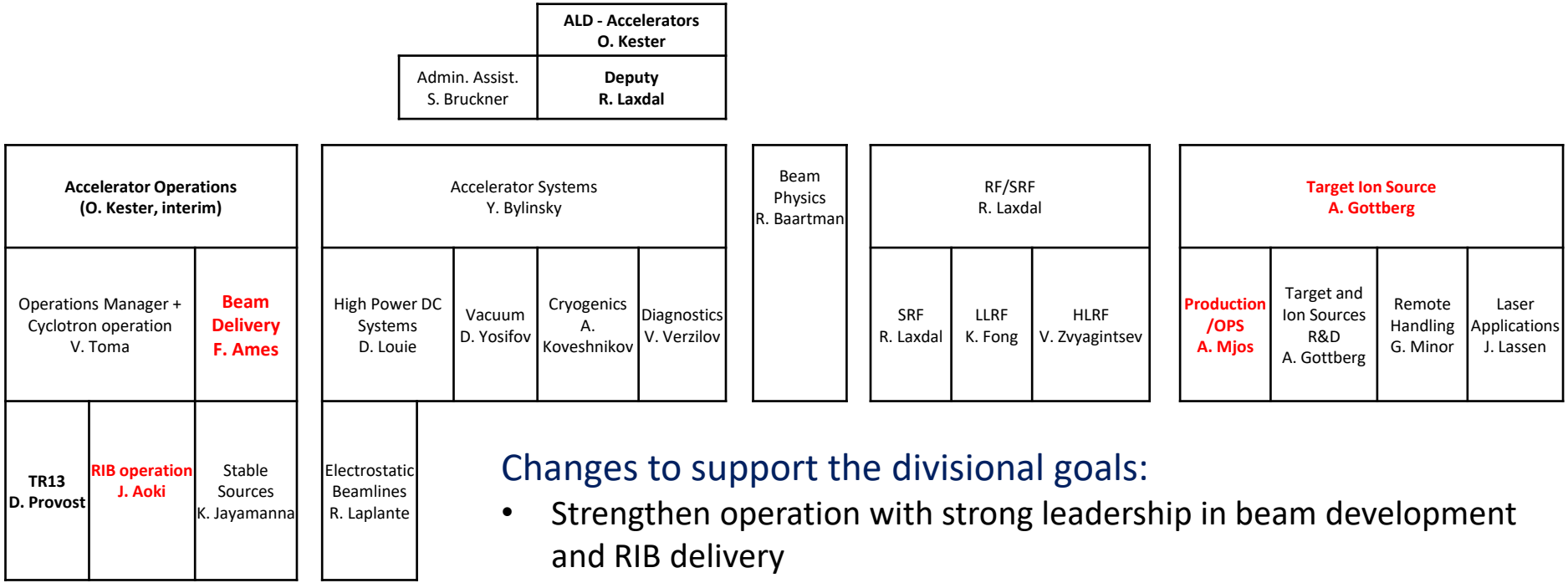


- Important element - Hot cell → Vendor for hot cell selected
- Target pit design
- Shielding concept established



Accelerator division structure and goals

People in the departments and groups

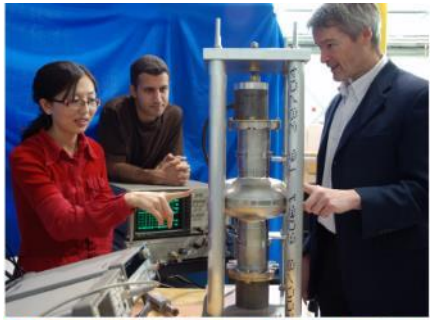


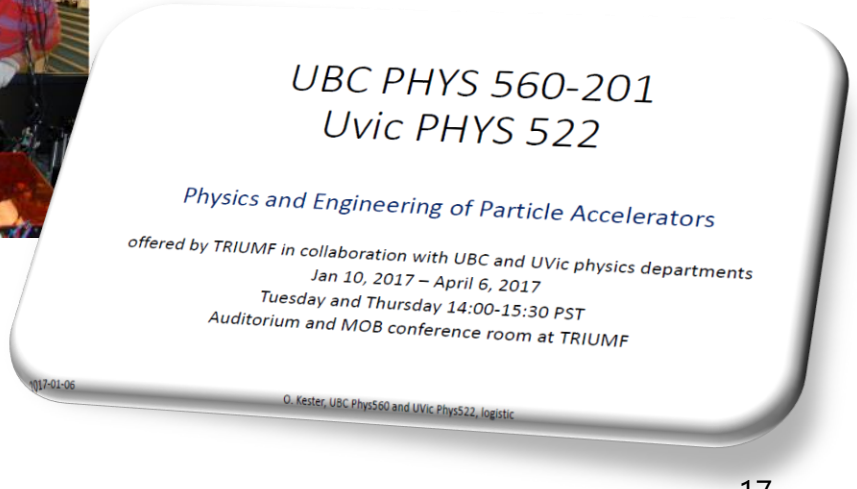
Changes to support the divisional goals:

- Strengthen operation with strong leadership in beam development and RIB delivery
- Strengthen the focus of the Targets and Ion source department on ARIEL target stations and ISAC target module strategy

Students in the Accelerator Physics Science Program

- Strengthened student education program (thesis research, Acc physics lecture, coop students)
- Student projects in
  - Particle Beam dynamics
  - Radio Frequency systems
  - Superconductivity
  - Particle sources
  - Laser technology
  - Target materials
- Accelerator physics course → accelerator physics education in Canada





Divisional Goals for 2017

- Exceed accelerator performance objectives in terms of safety, reliability, availability and beam delivery
- Strengthen the cyclotron and ISAC refurbishment programs keying on future reliability and availability
- Reach the planned ARIEL project milestones in FY 2017
- Perform cutting edge research projects and continue student education program (thesis research, lectures, coop students)
- Establish and exploit collaborations with other labs to the benefit of TRIUMF

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Thank you!
Merci!

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