Technical Report

Richard Catherall EN-STI

ISOLDE Technical Coordinator

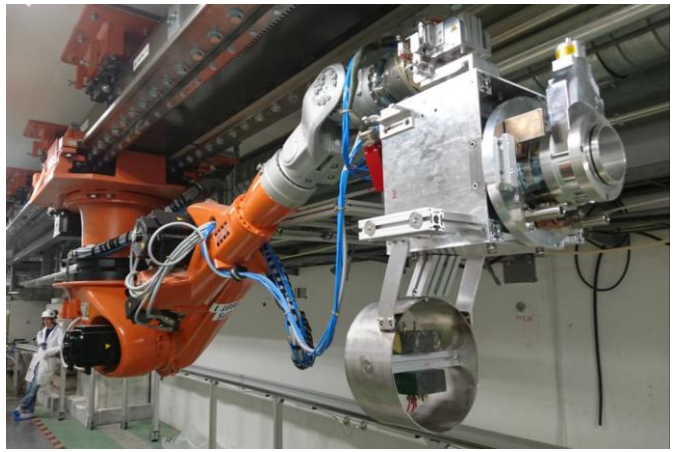
INTC meeting 29th June 2016

Outline

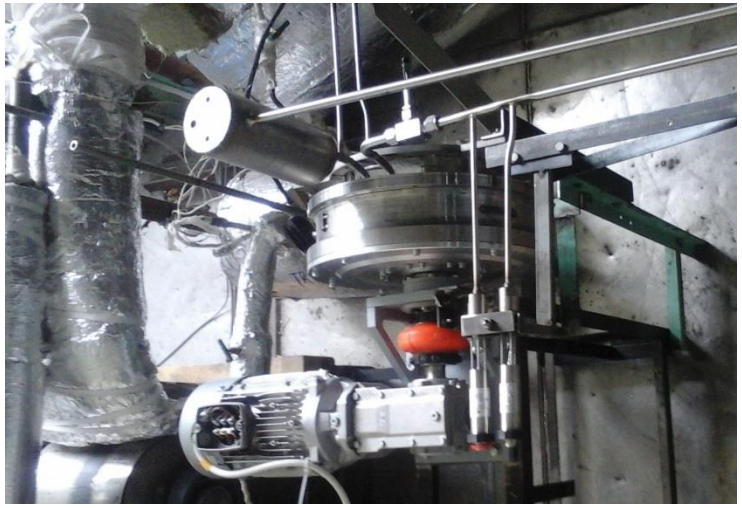
- Target developments
- RILIS developments
- MEDICIS
- HT tests

The LIEBE project: toward short lived isotopes

- Preparation of LIEBE tests in spring 2016:
  - Installation of 100+ cables in the target area
  - Full installation sequence tested with the Kuka robot



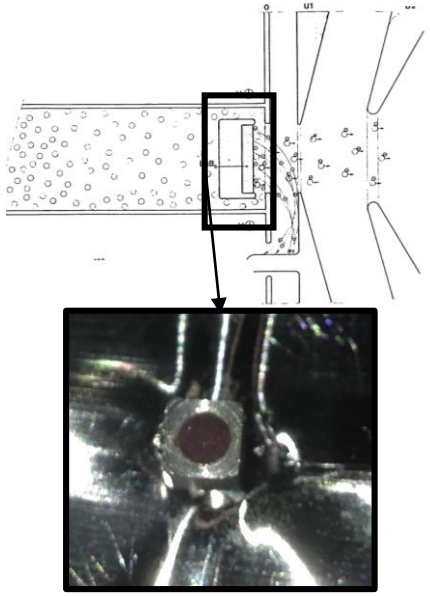
- Production of target on-going:
  - All parts produced,
  - First sub-assembly done, heating elements installed & tested,
  - Test of the pump on-going at IPUL laboratory.



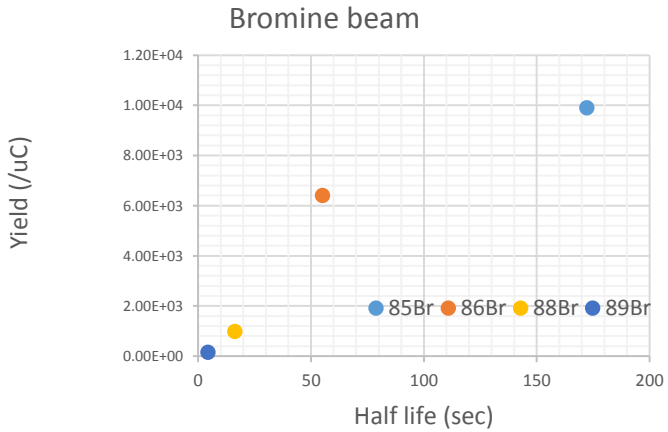
M. Delonca et al.

Negative beams @ PSB : Target tests Th/Ta-MK4 576

- TISD + negative At beams delivered to Lol148 in June 2016
  - Mixed Th/Ta target charge

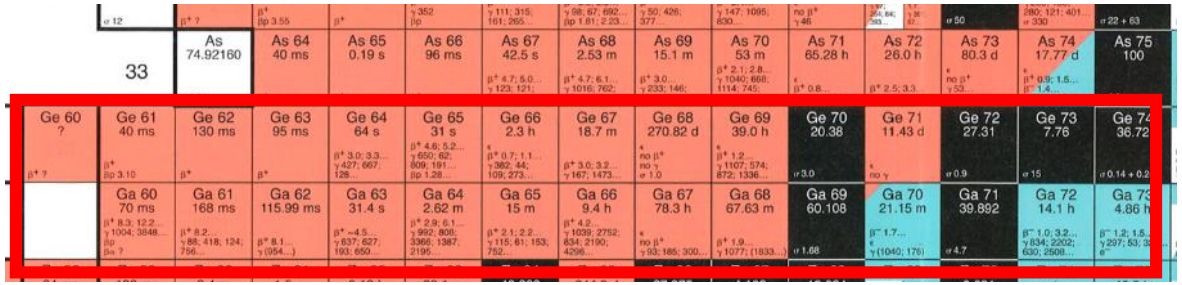


  - MK4 (LaB6 pellet) : Ionization Efficiency: **10%** on Br : very stable ion source operation
  - Slow release and good **stability** of production over time (5 days of operation)
- Measured beam on-line:
  - At- beams : not available elsewhere?
    - 204At (9.2min) ≈ 9e3/uC →5e3 /uC after 5 days
    - 206At (29.4min)≈ 6e3 /uC
  - I:
    - 122I (3.6min) ≈ 6e5 /uC
    - 128I (25min)≈ 9e5 /uC
    - 137I (24.2sec) ≈ 9e4 /uC
    - 138I (6.4sec) ≈ 9e4 /uC
  - Cl:
    - 38Cl (37.18min) ≈ 1e5 /uC
    - 40Cl (1.35min) ≈ 9e4 /uC
    - 41Cl (38.4sec) ≈ 3.5e2 /uC
    - 42Cl (6.9sec) ≈ 1.4e1 /uC



TISD team, Target production team, offline testing team

Neutron-defficient germanium sulfide beams



Database yields (ions / uC)

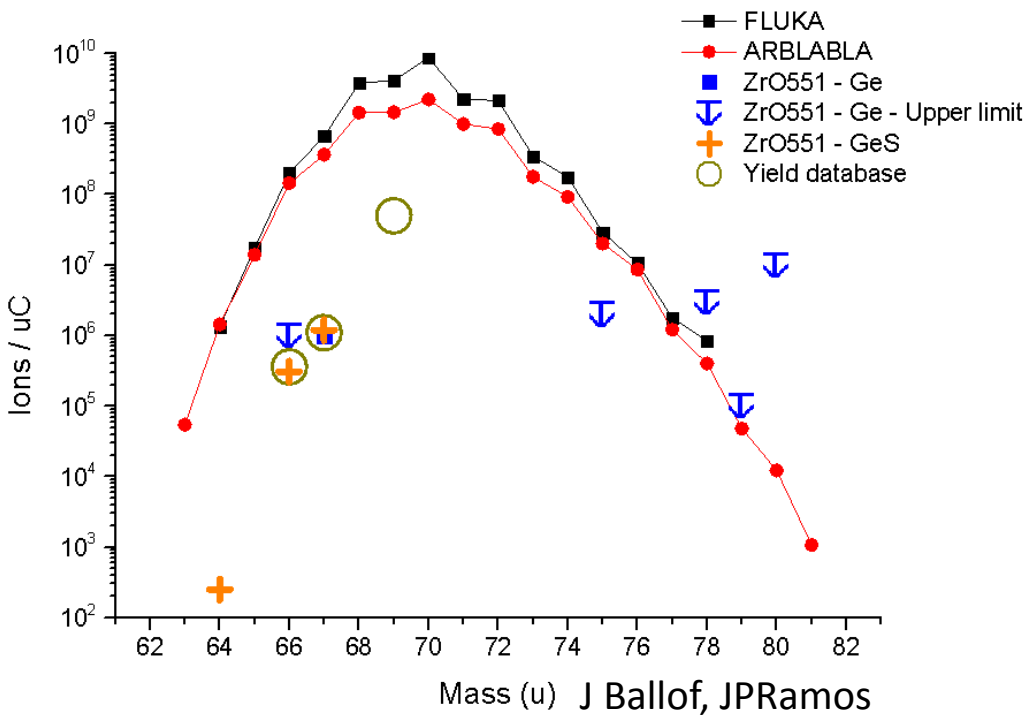
Mass	Ge	Ga
66	3.6E+05	4.4E+08
67	1.1E+06	8.0E+08
68	5.0E+07	6.1E+08

Atomic Ge beams come with strong **isobaric contaminations** of Ga, AlCl and others

Solution:
Shift to other mass region

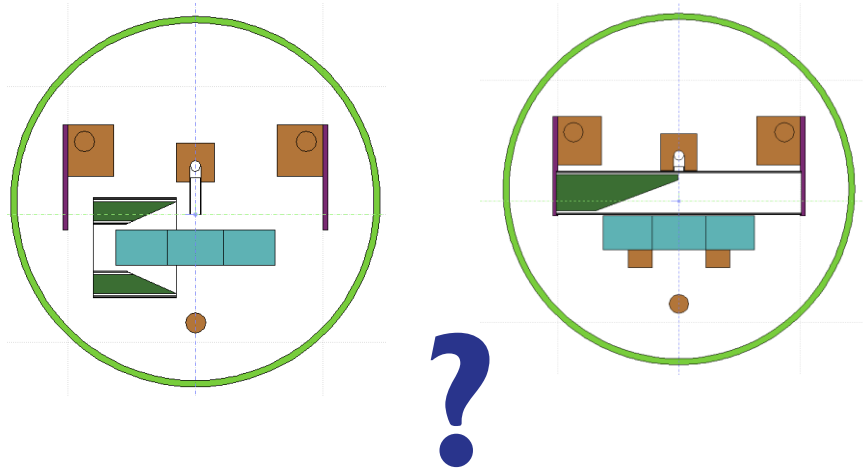
$Ge + S \rightarrow GeS$

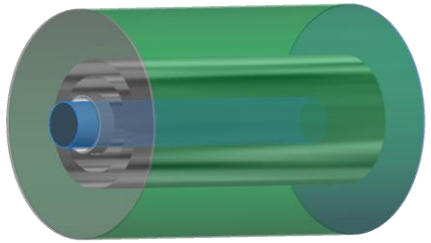
- Sulfur supplied by mass marker
- Database yields can be obtained
  Ratio ^{67}Ge / $^{67}Ge^{32}S$ = 1 / 1
- Significantly lower contaminations

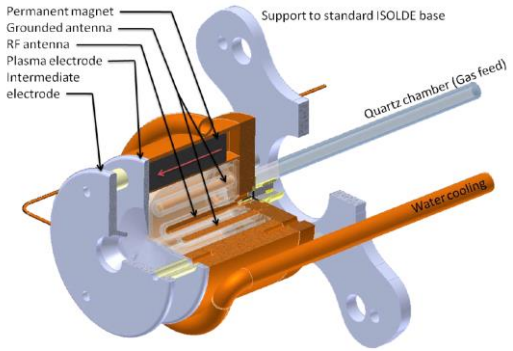


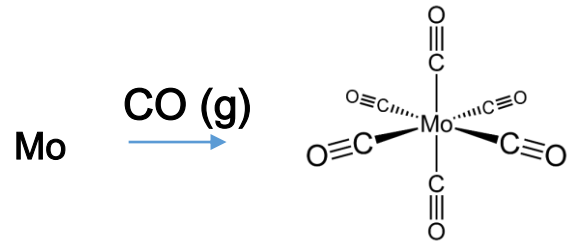
Neutron Converter and molecular beams within ENSAR 2 – BeamLab

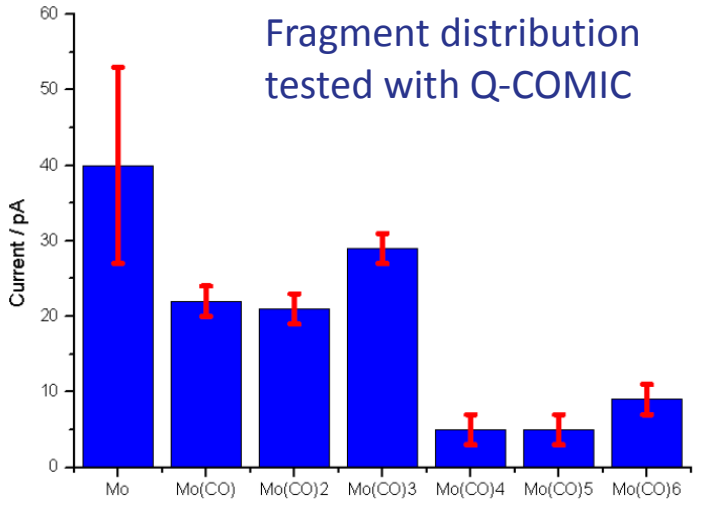
- Build the optimized converter for ISOLDE
  - Collaboration with TRIUMF and SCK.CEN
  - Cope with higher beam powers 50kW
  - Different target and ion source systems
  - Eg Molecular beams of MCOx











Fragment distribution tested with Q-COMIC

JPRamos, J Ballof

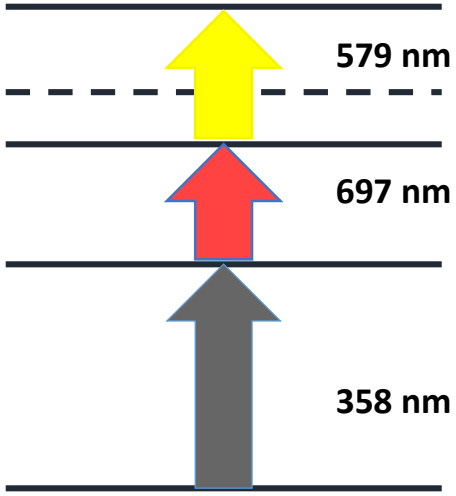
Outline

- Target developments
- RILIS developments
- MEDICIS
- HT tests

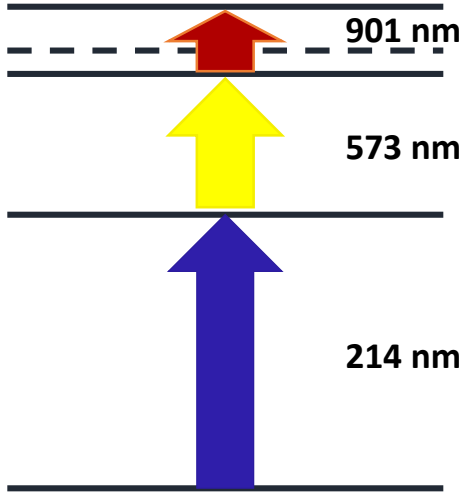
RILIS ionization scheme development milestones in April 2016

Performed during the ISOLDE startup period and the first physics run of 2016

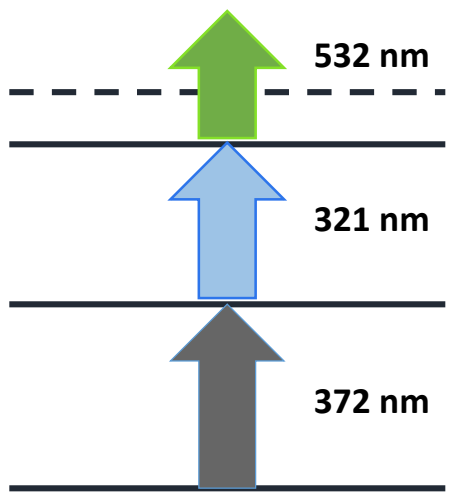
Cr (first on-line run)

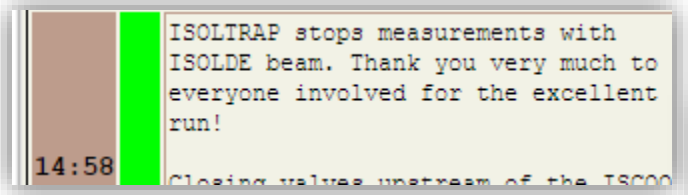


Te (efficiency verification)



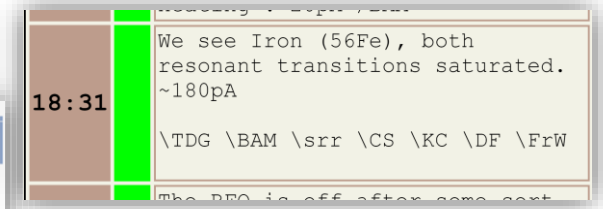
Fe (initial demonstration)



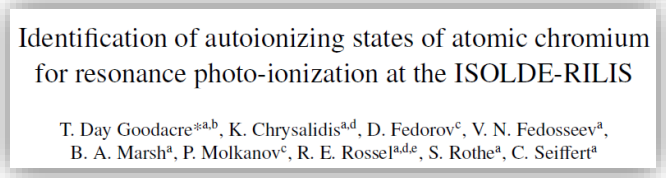


ISOLDE HRS logbook 18/4/2016

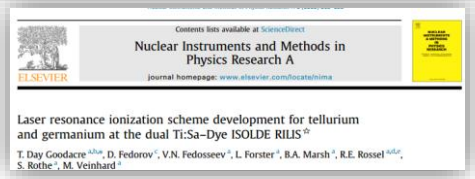
18%



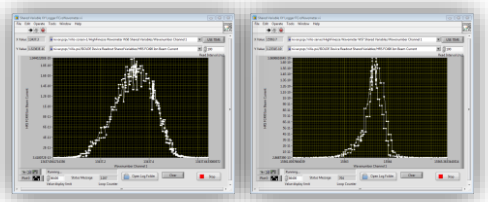
ISOLDE HRS logbook 19/4/2016



http://arxiv.org/abs/1512.07875v1



http://dx.doi.org/10.1016/j.nima.2015.10.066

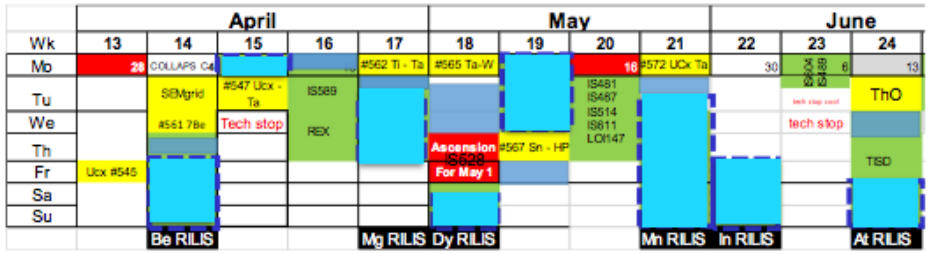


B. Marsh

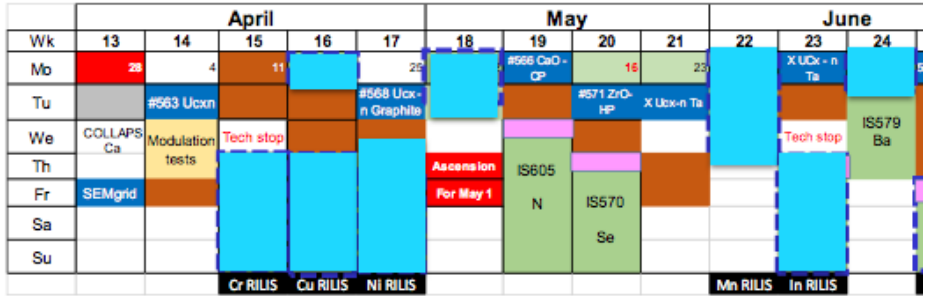
RILIS operation @ ISOLDE *in 2016*

- 9 RILIS runs so far in 2016: *Cr, Cu, Cu, Mg, Ni, Dy, Mn, Mn,In*

GPS (Weeks 13-32)

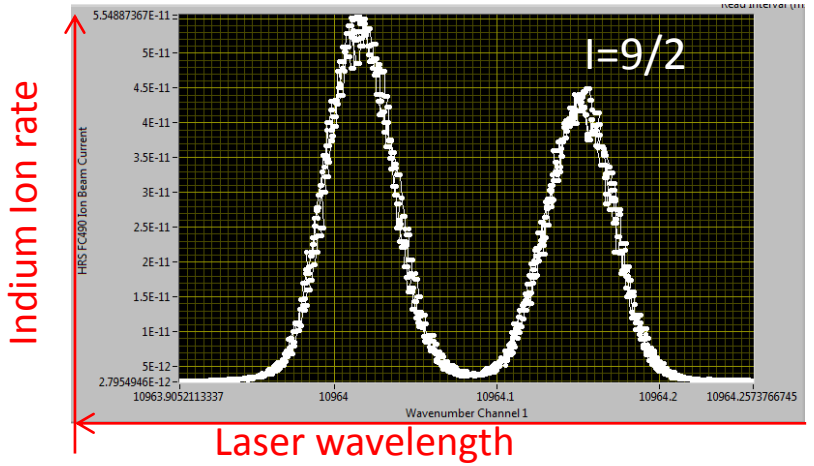


HRS



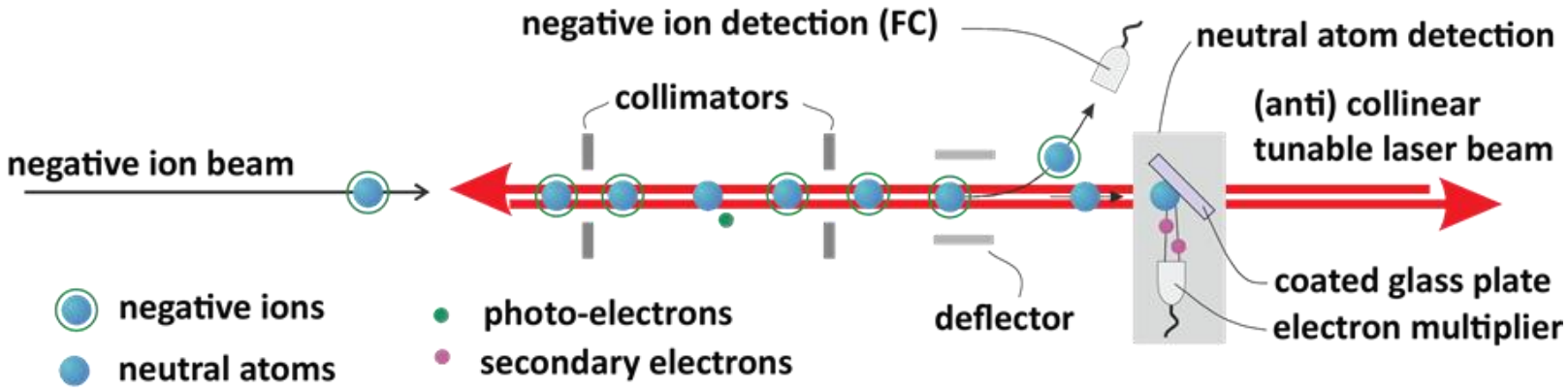
- RILIS-ionized **Beryllium-7** sample preparation for n-TOF

- First isomer-selectively RILIS-ionized **indium** beams

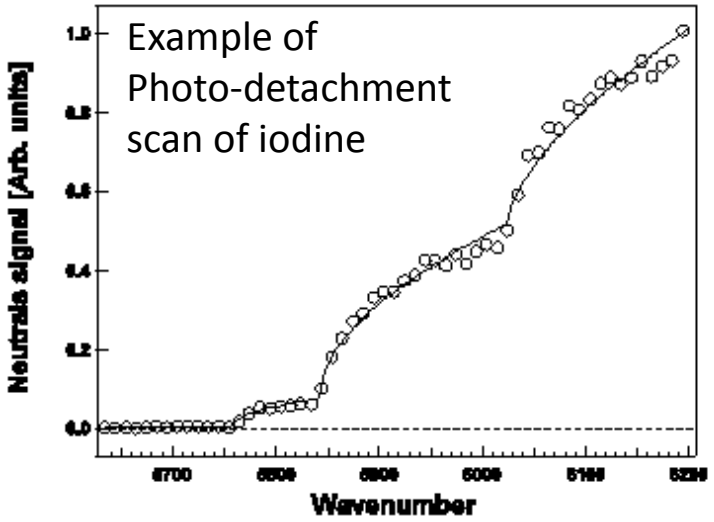


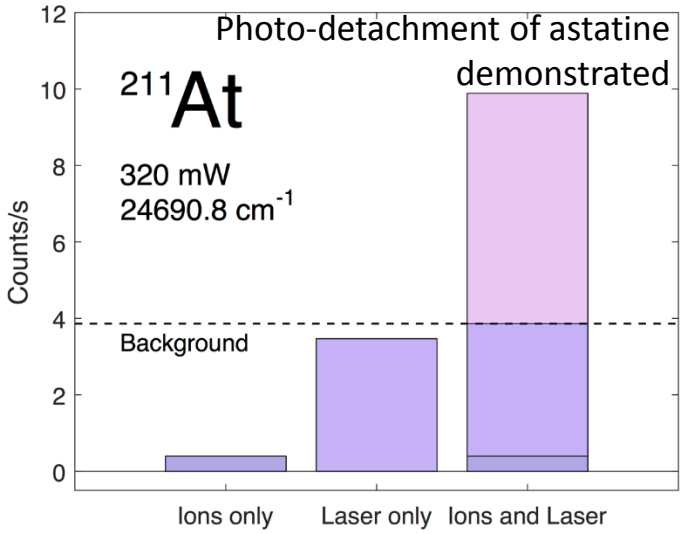
B. Marsh

Photo-detachment of negative **astatine** ions



Possibly the world's first demonstration of a photo-detachment of a radioactive ion beam!





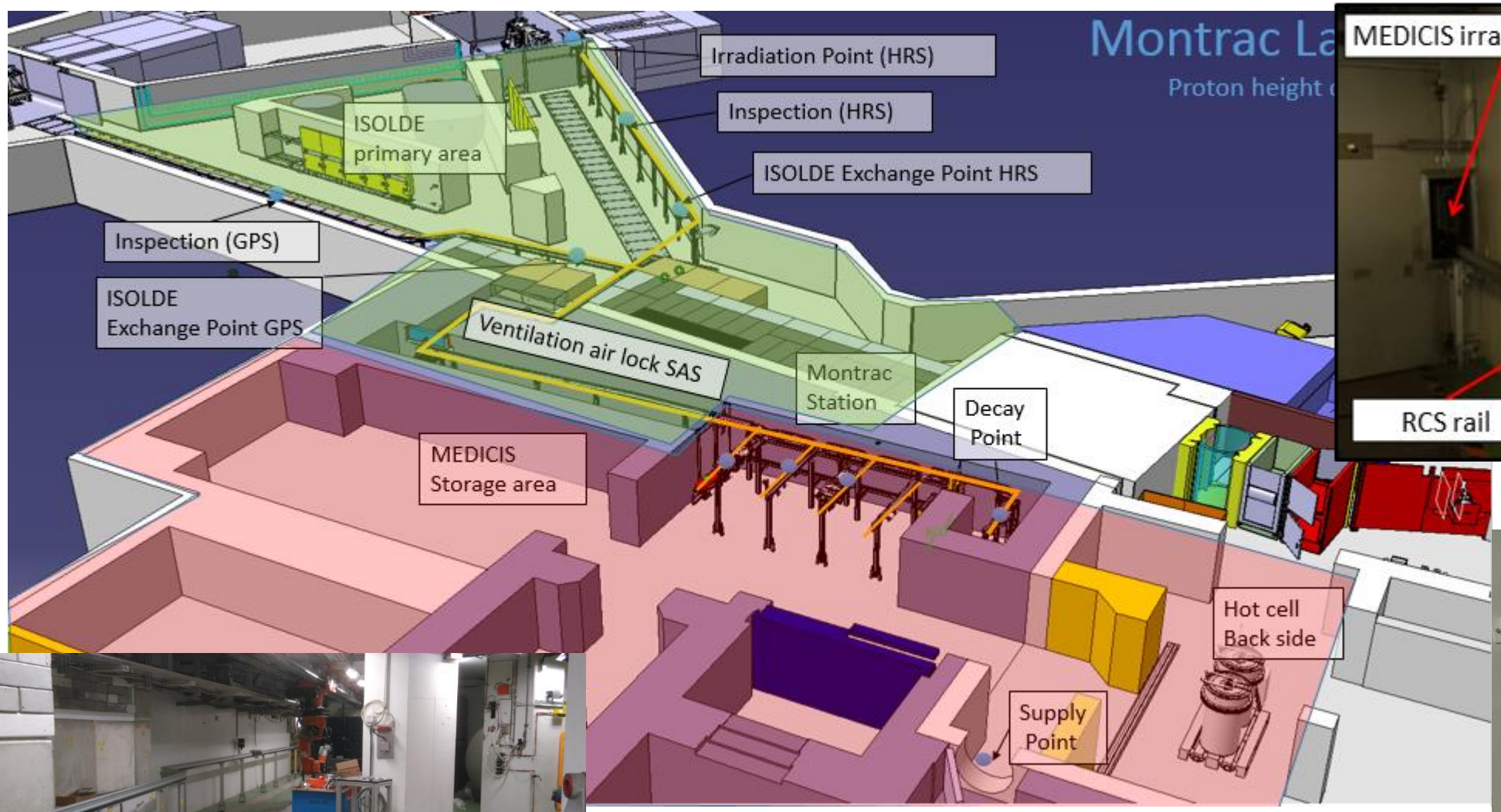
Successful completion of LOI **I-148**, now ready for data-taking for experiment **IS-615**

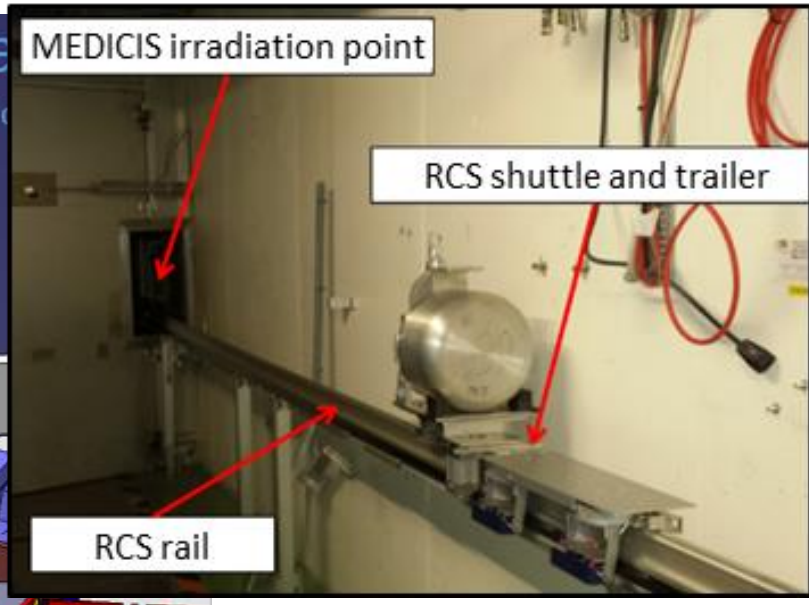
S.Rothe (spokesperson), J. Sundberg (PhD work)

Outline

- Target developments
- RILIS developments
- MEDICIS
- HT tests

CERN-MEDICIS





Installation is progressing
Reviews of cost to completion, operation and safety done
MoU in pipeline in collaboration with legal service

MEDICIS project team,

Outline

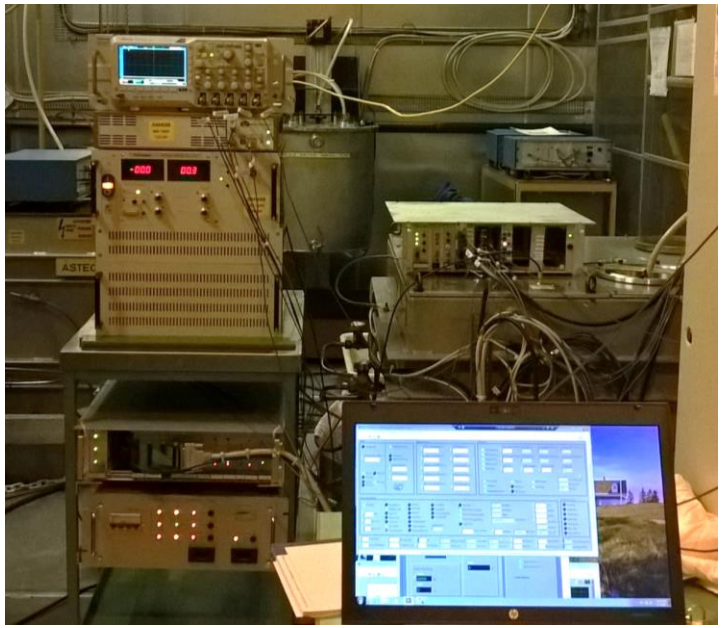
- Target developments
- RILIS developments
- MEDICIS
- HT tests

A new 60kV modulator for ISOLDE

The new modulator has been tested in operation at the ISOLDE facility during a dedicated MD.

The new set-up was installed in the HT room running in pulse mode with the ISOLDE target load installed and with proton beam.

https://edms.cern.ch/document/1620992/1



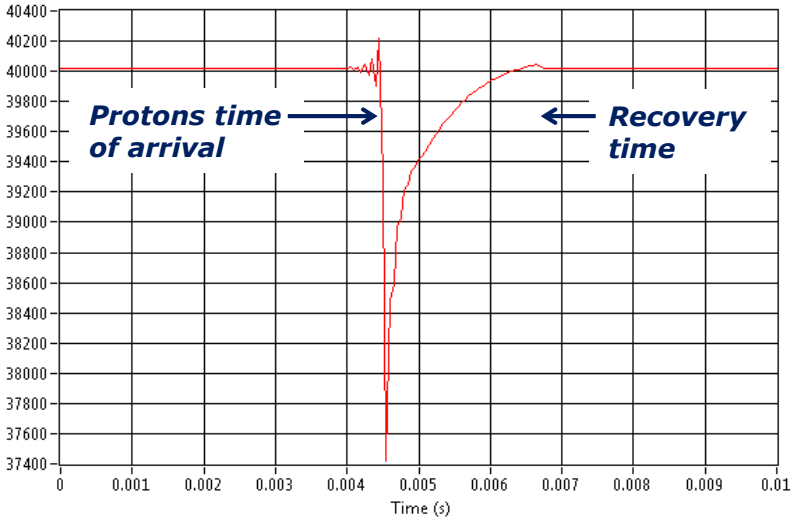
Prototype installation in ASTEC tank (ISOLDE HT room)

MD test results

The validation tests of the new device has been realized with the *most severe beam induced leakage current* target up to the maximum proton pulse intensity.

Testing conditions :*

The operational voltage range for the test was limited to 30kV due to the replacement of a broken HV amplifier. The global recovery loop gain was also reduced, resulting in a slower transient response.

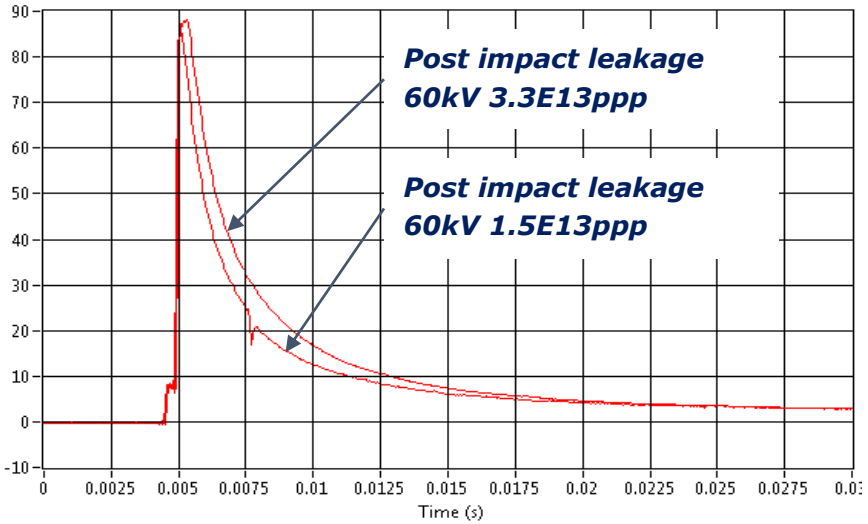


HV recovery signal (V) : 3.3E13ppp at 1.4Gev – HV = 40kV

A substantial gain in terms of recovery time over the actual modulator was achieved.

	30 kv	40 kv	50 kv*	60 kv*
1.5E13 ppp	1.2 ms	1.6 ms	2 ms	-
3.3E13 ppp	1.6 ms	2.5 ms	-	-

Based on these results an upgrade of the prototype is envisaged to adapt it to the measured loading. As a first approximation, the post impact induced leakage is proportional to $N^{0.5}$, N being the burst intensity.



Beam induced leakage current (mA) : 3.3E13ppp at 1.4Gev

T. Gharsa, J. Schipper

- Thank you for your attention