

# ISOLDE Technical Report

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ISOLDE Technical Coordinator

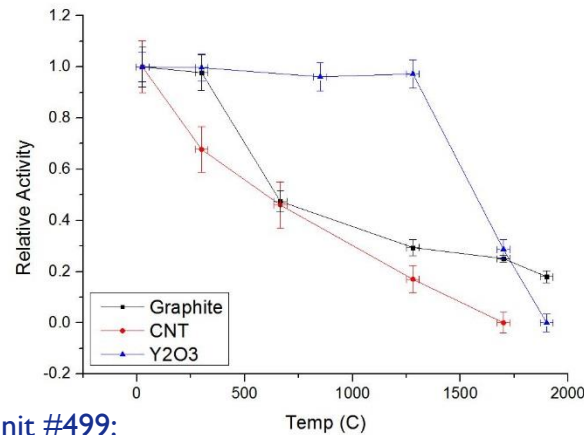
50<sup>th</sup> INTC meeting 1<sup>st</sup> July 2015

# Outline

- Target developments
- REX Linac
- RILIS
- Ion Source and Beam Manipulation Development Team
- Automatic Beam Tuning
- Fast Tape Station

# Target Developments: Recent results

- 8B beams



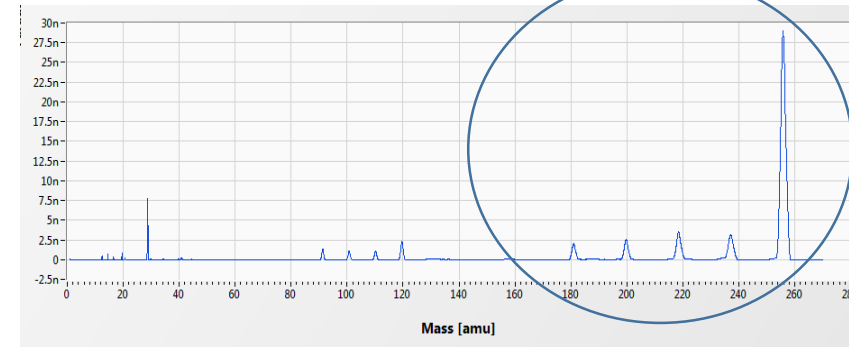
Target unit #499:

- Target material: Carbon nanotubes (MWNCT),  $\rho=0,43 \text{ g/cm}^3$
- Standard Ta container, cold transfer line, VADIS ion source
- $\text{SF}_6$  in container,  $(0,37 \cdot 10^{-4} \text{ mbar} \cdot \text{l/s}, p(\text{SF}_6) \sim 1\text{-}2 \text{ bar})$

Release of  $^8\text{B}$  & ISOLTRAP's MR-ToF:

- No  $^8\text{BF}_n^+$  ( $n=1,2,3$ ) or Oxyfluorines detected
- Positron activity on  $A=8$  corresponds to  $3 \cdot 10^2 \text{ I/uC}$
- Proof that activity originates from  $^8\text{B}$  still pending

TaFx<sup>+</sup> ion beams



Target unit #513 : (Same characteristics as #499, higher  $\text{SF}_6$  injection)

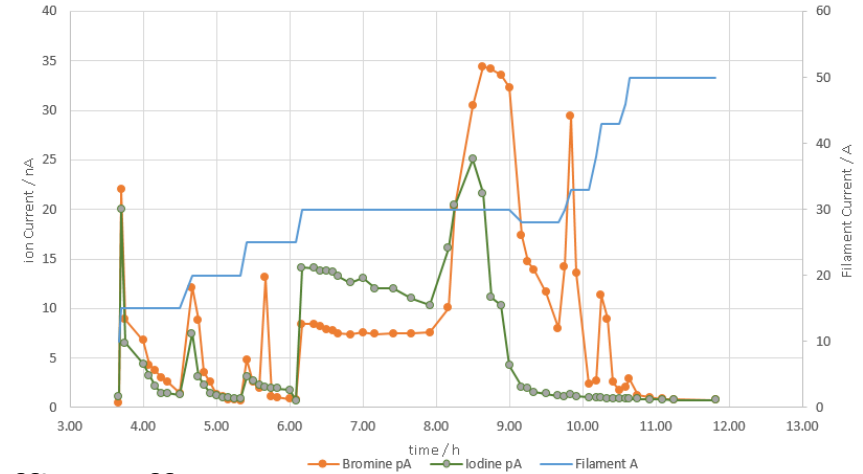
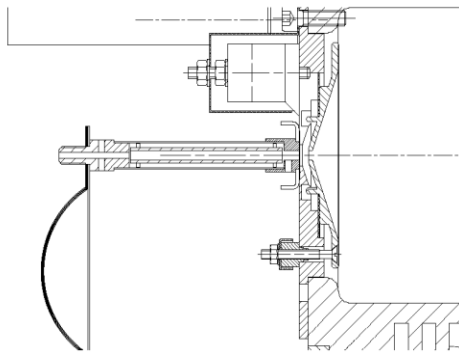
Release of  $^8\text{B}$  & LAI (Tengblad et al.):

- $^8\text{BF}_3^+$  ( $n=1,2,3$ ) detected this time !
- Positron activity on  $A=46$  corresponds to  $3 \cdot 10^4\text{-}10^5/\text{uC}$  ( **$\sim 1 \text{ nA}$  stable contaminant also detected**)

Ch. Seiffert, J. Balof, et al.

# Target Developments: Recent results

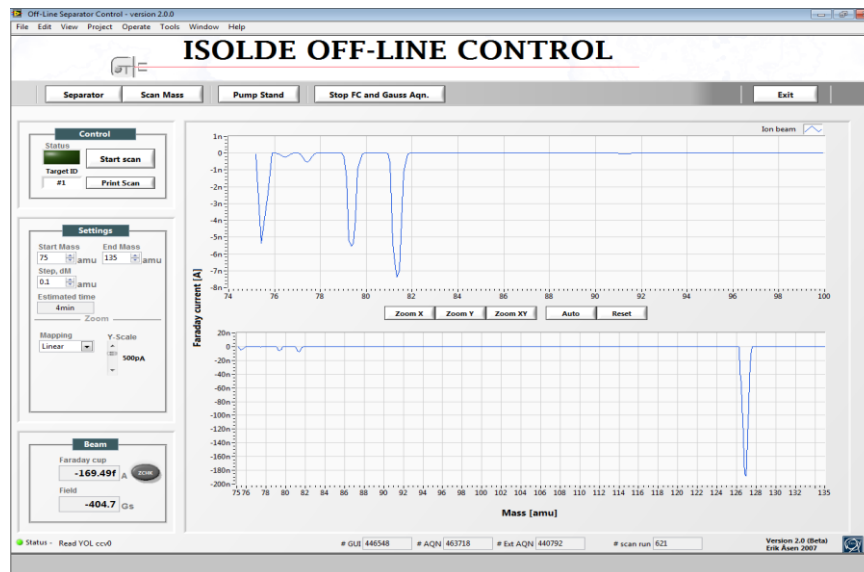
- Negative beams :
  - Negative ion source prototype (GdB<sub>6</sub> tube ion. Menna et al. NIMB. 266(2008) 4391)



Offline efficiencies 2015:  
 $\epsilon (\text{Br}^-, \text{I}^-) = 17\% @1700\text{C}$   
 with some questions remaining

Online TISD with Nb #535  
 and ThO #540 targets, starting this week

Y. Martinez, J. Ballof, T. Mendonca



# Status of the refurbishment of the REX linac:

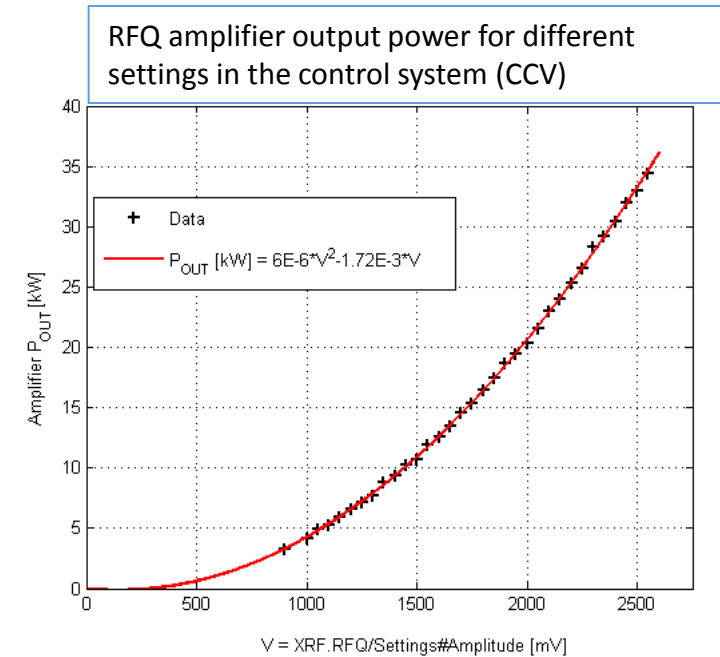


## Power converters and magnets ready for beam:

- ✓ New power converters for quads (19 units) fully functional
- ✓ New cooling water circuits for all the quads operational
- ✓ Electrical short in last triplet repaired and triplet refurbished
- ✓ Additional tests and measurements in other quadrupoles completed (thermal switches characterized, temperature rise measured...)

## RF systems:

- ✓ Maintenance and refurbishment of amplifiers for RFQ, IH structure, buncher and 7 gap structures completed
- ✓ RFQ recalibrated and stable at 10 Hz, 1 ms / 40 kW pulses
- ✓ Buncher stable at 10 Hz, 1 ms / 1.4 kW pulses
- ✓ **Temporary 9gap amplifier stable at 1Hz, 300 us, 45 kW**
- ✓ RF power in 7 gap structures for a short period of time
- ✓ Connections to HIE-ISOLDE RF reference completed
  - Power in the IH structure / long RF tests for the other cavities delayed to week 27
  - Recalibration of rest of the cavities delayed to week 28
  - Ramp up in duty cycle delayed to week 28
  - **Final 9gap amplifier schedule to arrive in week 31.** Commissioning completed by week 35

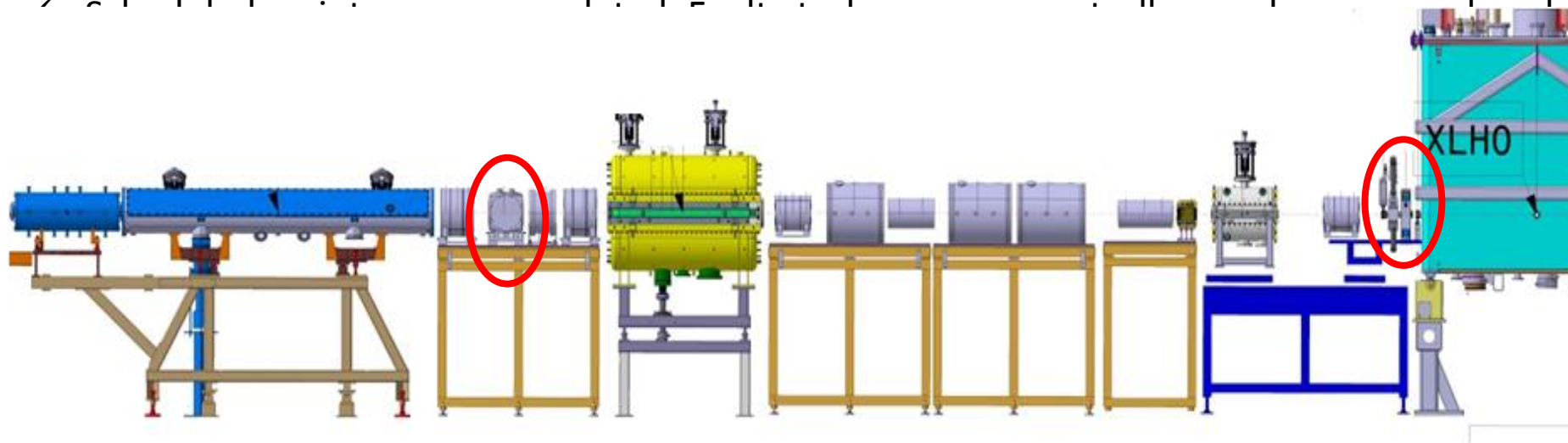


Courtesy of J. A. Rodriguez Rodriguez

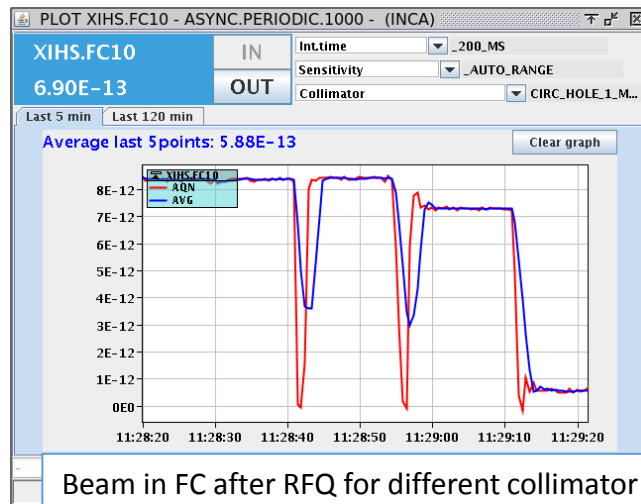
# Status of the refurbishment of the REX linac



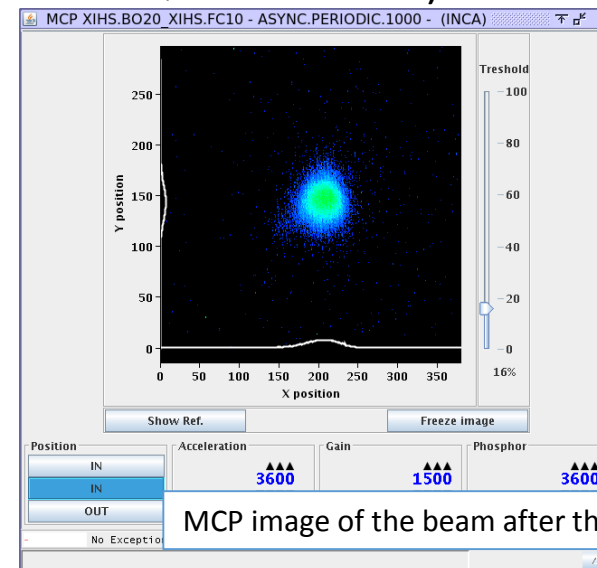
## Vacuum systems:



- ✓ Beam down to first diagnostics box (between RFQ and buncher)



Beam in FC after RFQ for different collimator aperture sizes (15, 5, 3 and 1 mm)

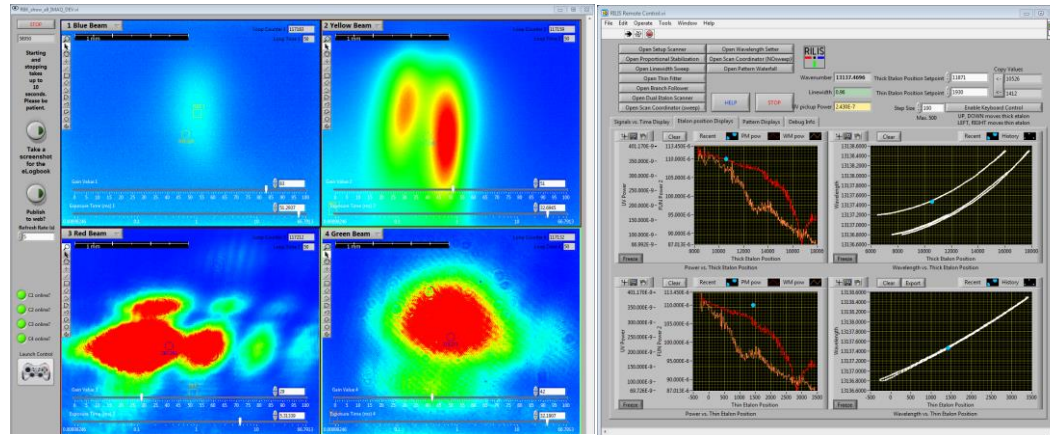


MCP image of the beam after the RFQ

Courtesy of  
J. A. Rodriguez Rodriguez



# New RILIS Remote Control Room



NB:Tisa

[doi:10.1016/j.nimb.2013.08.058](https://doi.org/10.1016/j.nimb.2013.08.058)

Improved scanning software & DAQ

<https://cds.cern.ch/record/2014923>

Hg (April '15, IS598)

Au (May '15, IS534)

**'On-call' for most RILIS runs.**

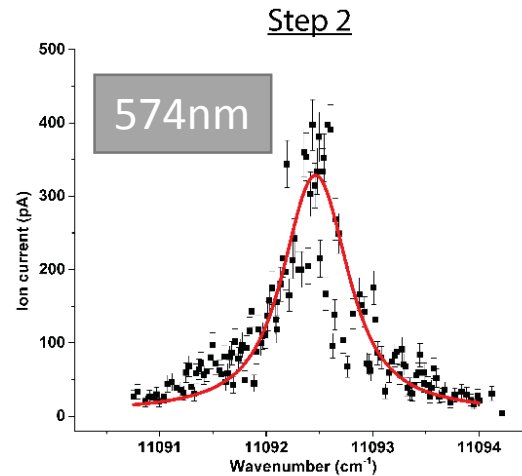
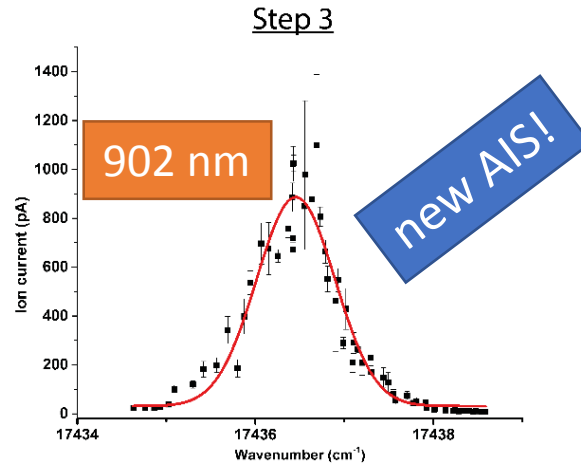
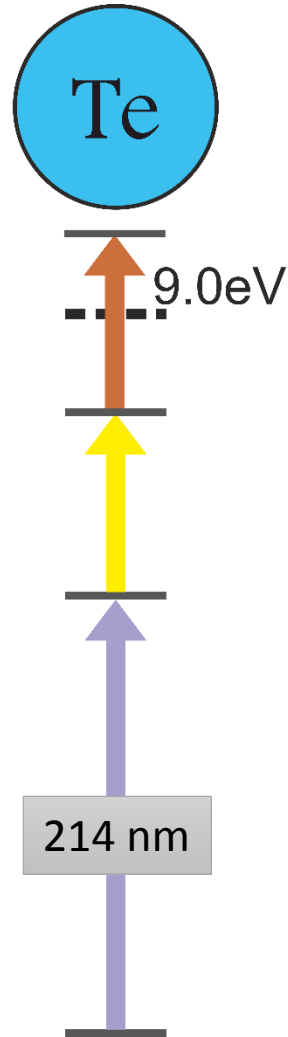


**M.Sc. Thesis of R.E. Rossel**

RILIS Equipment Acquisition Control Tool (REACT) is being developed by **Ralf Rossel**.

Courtesy of B. Marsh

# New ionization scheme for Te



New possibility of clean tellurium beams at ISOLDE

**For:**  
**HIE-ISOLDE**  
**116+118 Te**

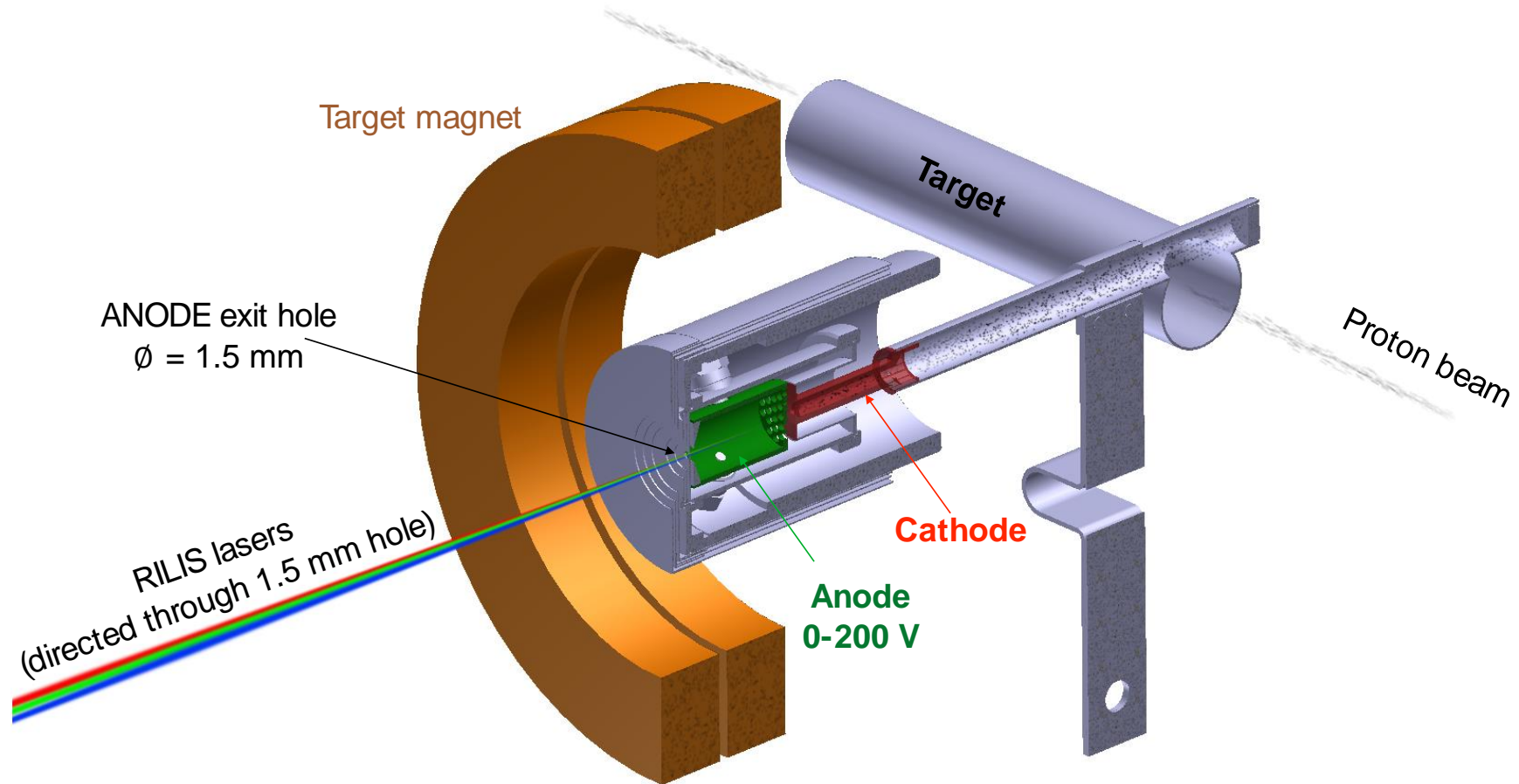
**Coulomb excitation**

<http://cds.cern.ch/record/1319097/files/INTC-P-296.pdf>

**+ others**

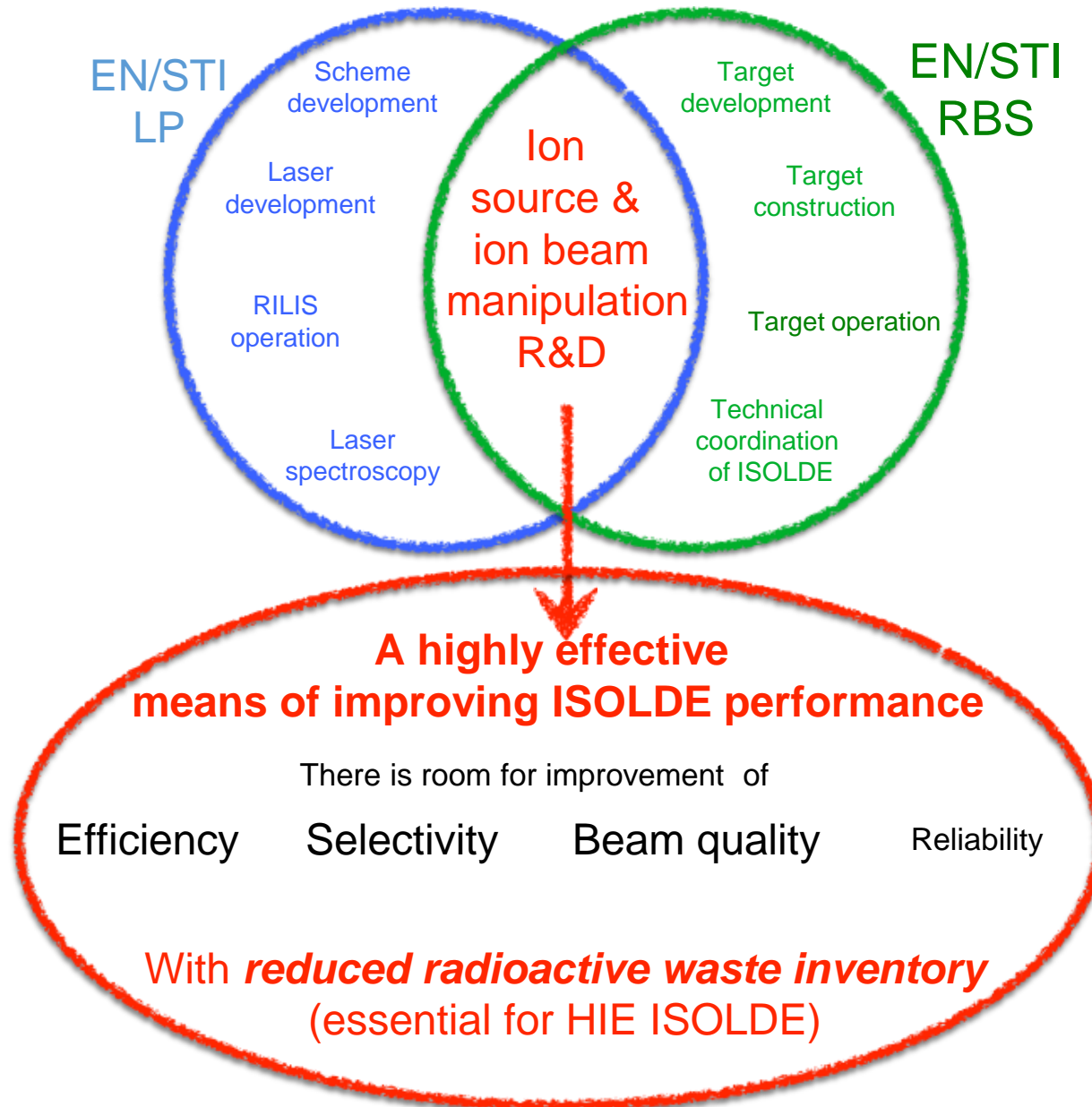
PhD work: **T. Day Goodacre**





- First on-line **RILIS ion beams from liquid targets** (Cd from Sn and Hg from Pb)
- Up to 2x **efficiency improvement** observed for Hg and Cd (compared to VADIS only)
- **Higher purity** Ba beams compared to Surface + RILIS source

# New Ion Source (and beam manipulation) Development Team



To tackle subjects such as

HRS upgrade

ToFLIS

FEBIAD optimization

VADLIS

LIST

ISCOOL upgrades

Fast beam gating

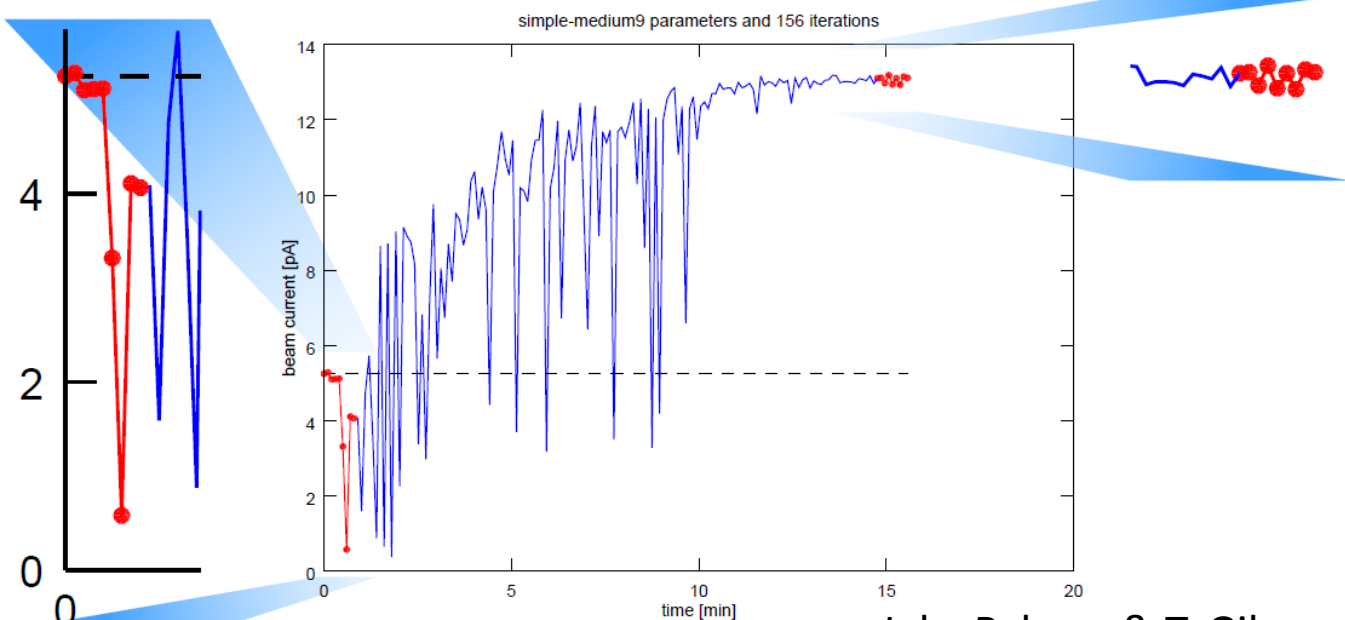
RILIS selectivity

Ion beam multiplexing

Optical pumping

# Automatic Beam Tuning

- Nelder-Mead simplex algorithm applied directly to the hardware
- An automatic robust optimisation program for tuning the beam through complex systems.
- Faster and less tedious for the operator



Jake Palmer & T. Giles

Optimiser

Sequencer: HRS RFQ CA0\_FROMHRS CB0 CC0 RC0 RC2 RC4 RC4\_MINSTEER

Separator: HRS To: RC4

Normal Expert

Start at: CB0

Filename	Start	End	Began
HRS	-	-	-
RFQ	-	-	-
CA0_FROMHRS	-	-	-
CB0	-	-	-
CC0	-	-	-
RC0	-	-	-
RC2	-	-	-
RC4	-	-	-
RC4_MINSTEER	-	-	-

OPTIMISE STOP

```

Optimiser
YRC0.QS50-V/Setting#ccvF
YRC0.QS50-V/Setting#ccvH
YRC0.QS50-V/Setting#ccvW
YCC0.KI70-V/Setting#ccv
YRC0.BE10-V/Setting#ccv

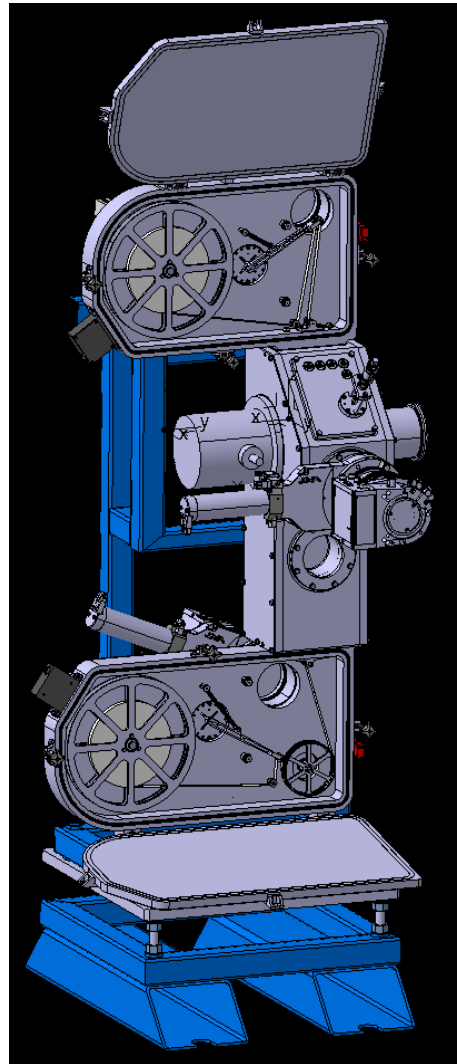
Prerequisites:
YCC0.KI70-V/Setting#ccv <- 1636.0
YRC0.BE10-V/Setting#ccv <- 1925.0
YRC0.KI70-V/Setting#ccv <- 0.0

-----STEP 6-----

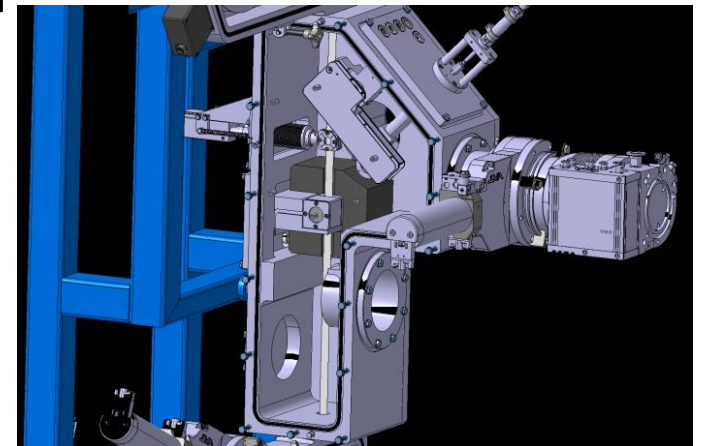
Optimising on:
YRC2.BFC0900/Acquisition#lastAqn

Tuning parameters:
YRC0.QS50-V/Setting#ccvF
YRC0.QS50-V/Setting#ccvH
YRC0.QS50-V/Setting#ccvW
YRC2.QR20-V/Setting#ccv
    
```

# Fast Tape Station



- A final design is now in place and production drawings in progress
- Procurement of parts already started
- Construction and detector development this autumn
- On-line commissioning (at LA2?) as from 2016
- Final installation 2016/2017 shutdown
- A spare tape station to be built
- Excellent support throughout EN



- Thank you for your attention