

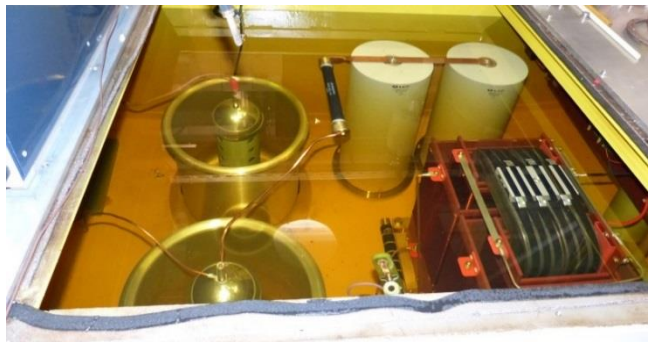
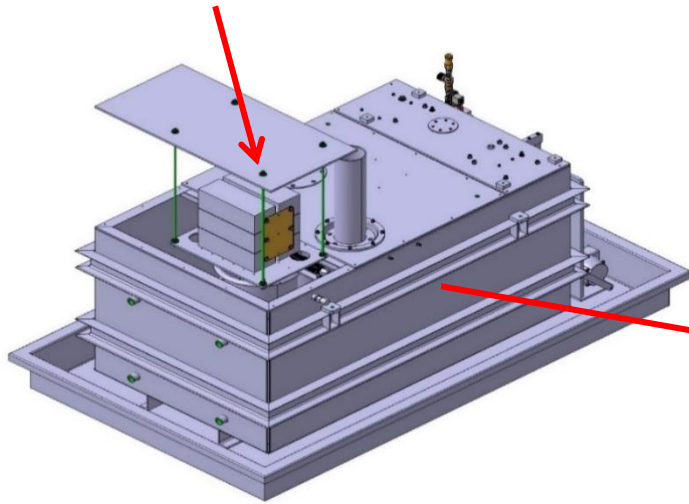
ISOLDE Technical and physics update: INTC 58

Richard Catherall/Sebastian Rothe/Karl Johnston

Power supply consolidation

- GPS + REX Power converter replacement
 - Consolidation of the following GPS and REX converters:
RPSEV.197.YGPS.SEP70, XSEP.RB.1000, XL9GP.RCV.0400 and XL9GP.RCH.0400.
- 60kV HT power supply and modulator
 - To be used mainly for the HRS
 - Includes new controls so will have 2 separate control applications for the different HT power supplies.
 - Depending on operational experience, 2nd new PS and modulator to be installed in 2021/2022 shutdown

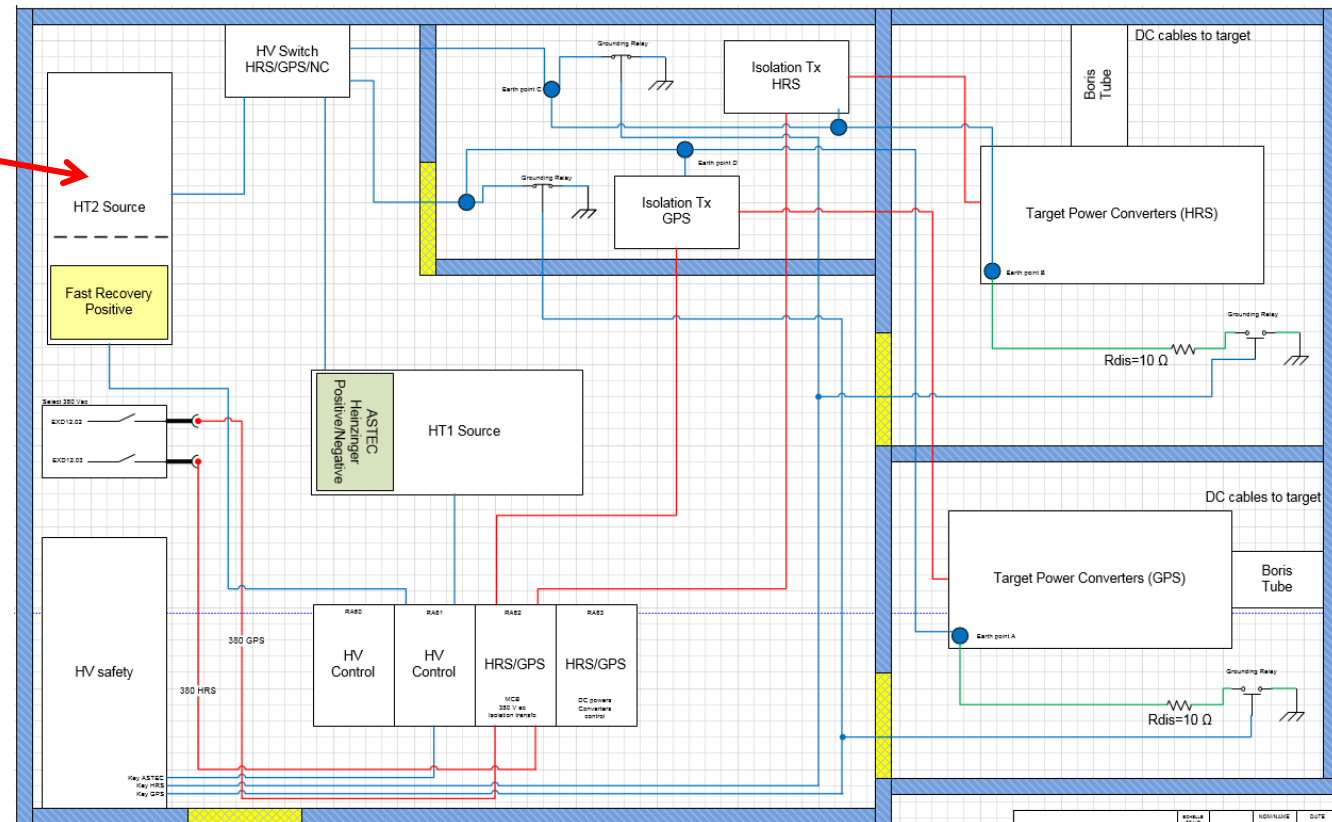
New device sits
in existing housing



Re-use of the ROSS dividers

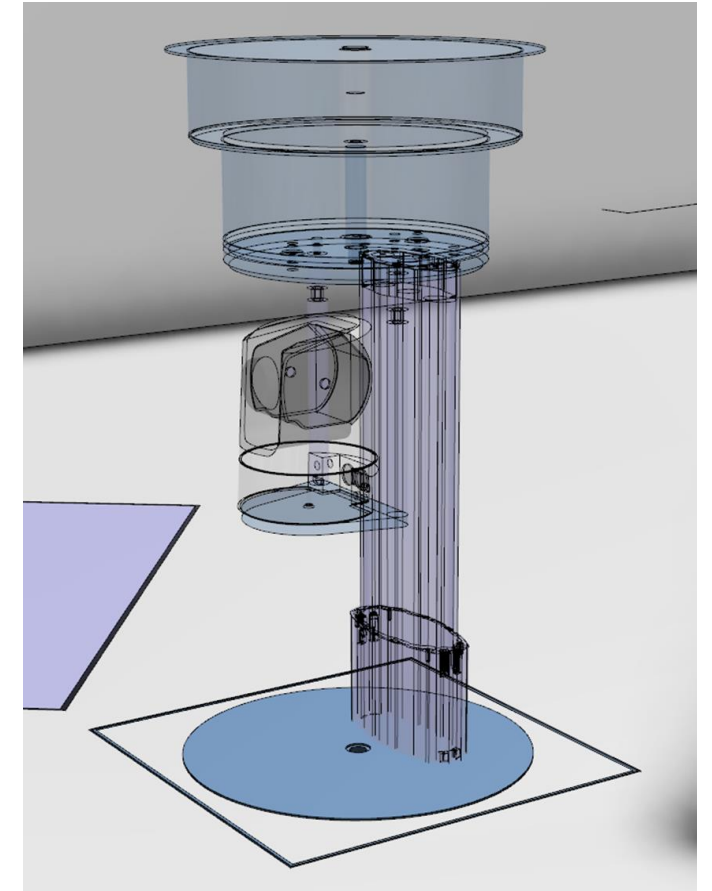
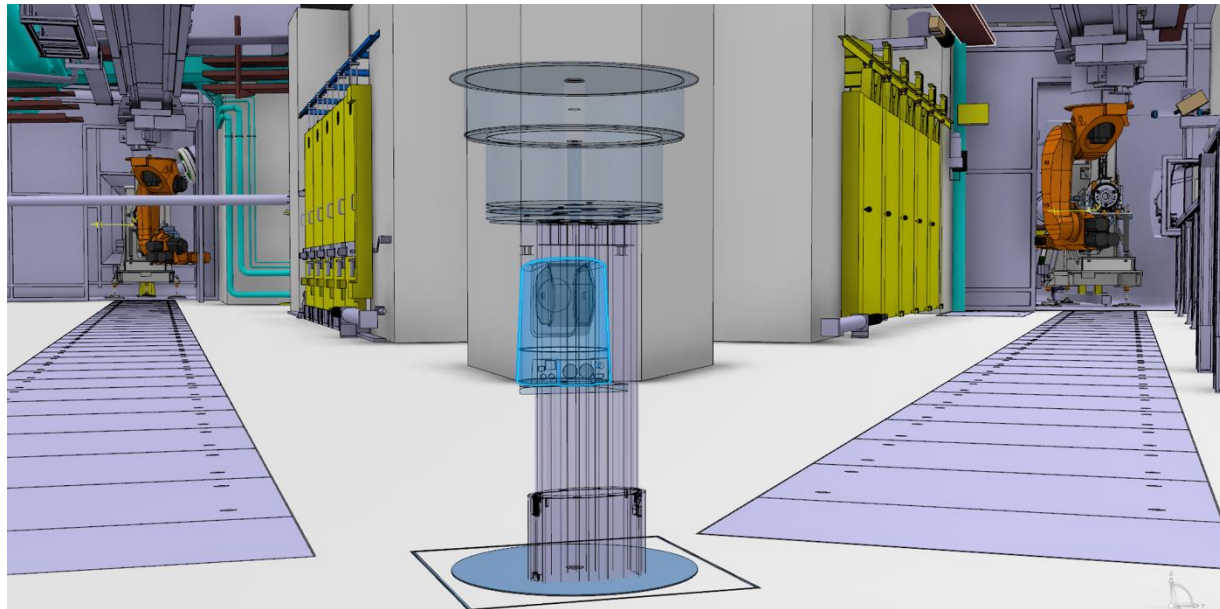
- ❑ Install the fast recovery system only on HT2 during YETS 2017/2018
- ❑ Easy reversal to present configuration system in case of major problems
- ❑ **As a negative solution is not yet available**, better to keep HT1 unchanged
- ❑ Full consolidation of both modulator during LS2 with positive and negative HT

ISOLDE HT room - Building 170



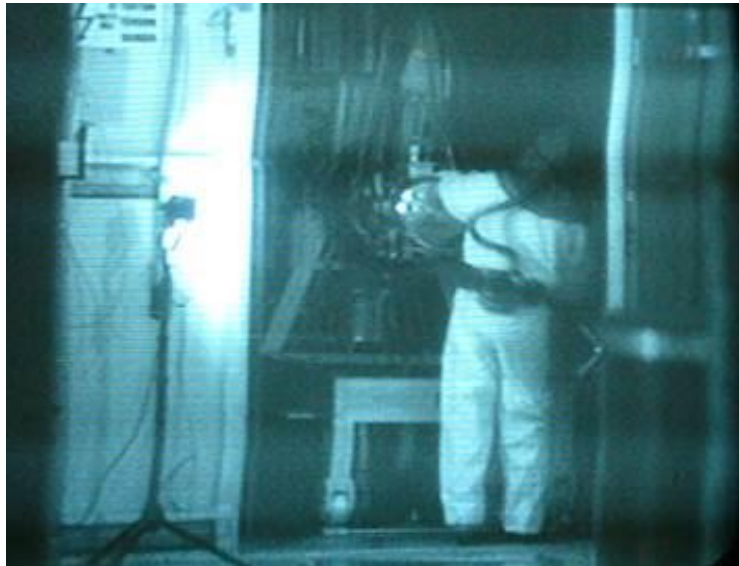
A telescopic camera for the target area

- To provide an overall view of the target area (in the absence of protons)
- Visualize target changes over internet
- Screens to be placed in target entrance
- Partially eliminates the need to call upon the Telemax robot in the event of a failure – quicker diagnostics



As presented in 2017

Telescopic camera in images



Existing camera
← images

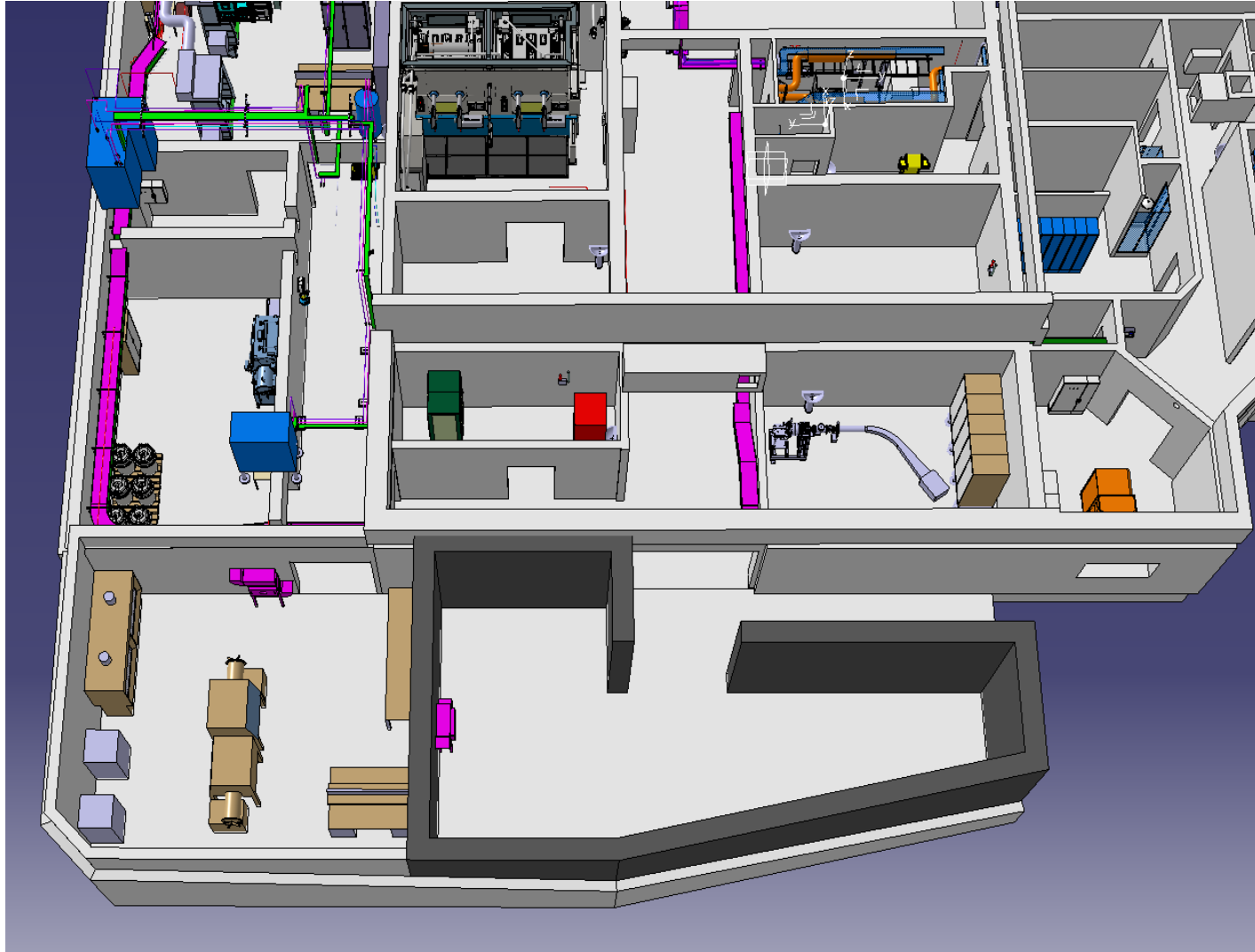


Telescopic camera
in position →



Zoom →

Nano lab



Nano Lab

- Finalisation of IPP document for end of February
 - Cost analysis, functional specs, risk analysis
 - Combines nano, pyrophoric, radiological and chemical risks
- Start construction ~ September 2018
 - Conflict with access to Class A labs and MEDICIS
- Civil engineering ends June 2019
- 3 months required for ventilation coupling and minor civil engineering work during the last quarter of 2020

RILIS YETS equipment / upgrades

RILIS Pump lasers



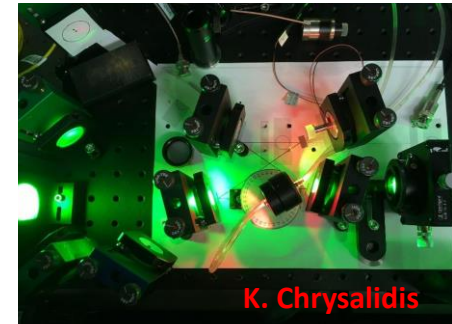
Ti:Sapphire pump laser failure
To be repaired/ replaced ASAP



RILIS tunable lasers

Ready before on-line period

Injection-seeded
NB Ring Tisa



RILIS Air quality issue:

Proposal by CV to improve fresh air
exchange and reduce dust

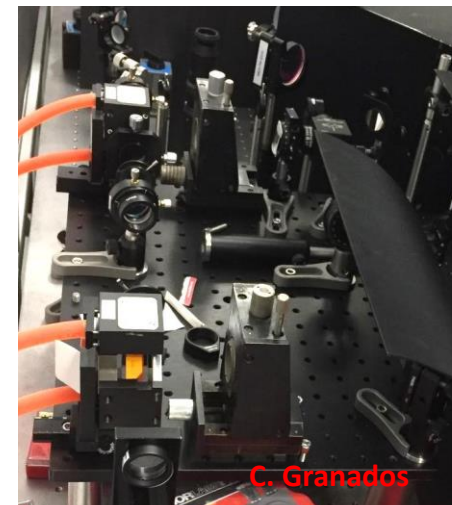
Important for laser performance reliability

Estimated cost 20 kCHF - save for LS2?



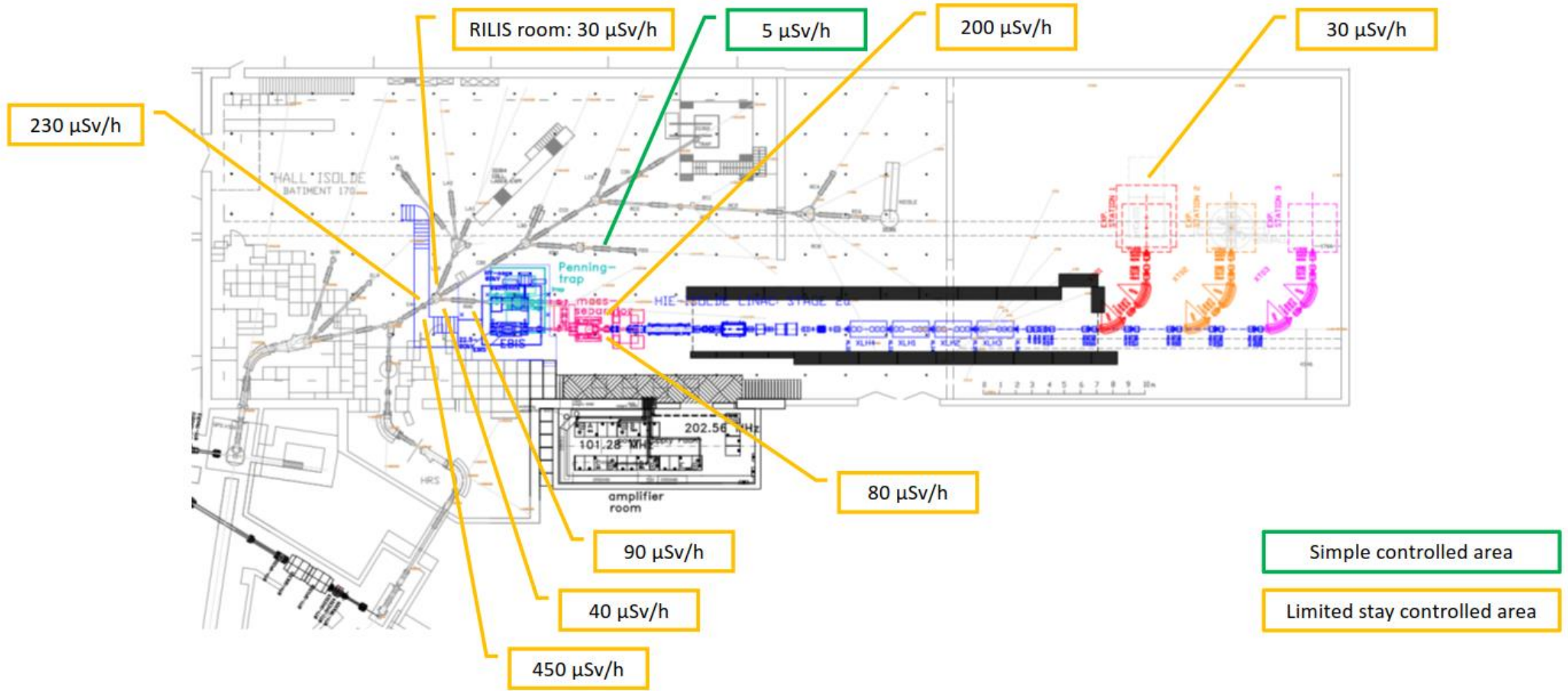
- annual window changes on separators, plus HRS
alignment and power transmission checks with power-
meter target.

Pulsed dye amplifier



Radiation survey on 14/09/17, proton beam intensity : $2 \mu\text{A}$

Ambient dose rates $H^*(10) \sim$ at 40cm from the beam lines



A. Dorsival, E. Aubert, M. Deschamps

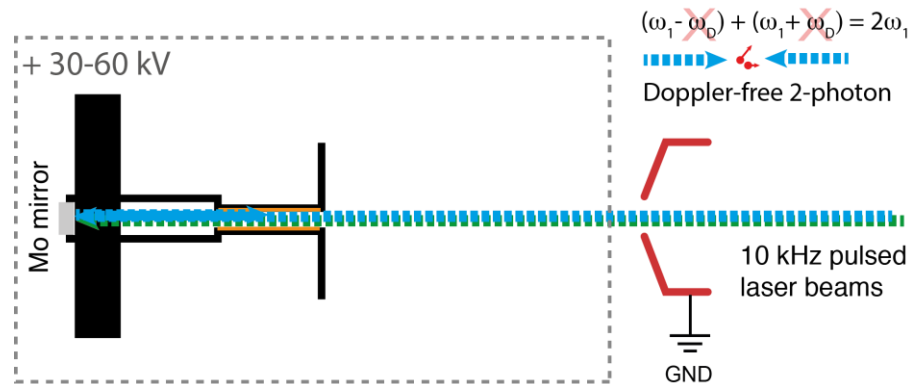
IS572: 94Rb @ 6.5 MeV/u

Operations -94Rb Issue

- After an initial working group meeting to explore the possibilities, the following action plan has been outlined
- Proposition
 - Identify and flag high intensity RIB during TAC and schedule
 - Inform ISOLDE community that hall will become a Limited Stay Controlled Area for the duration of the experiment
 - Change panels and monitoring thresholds the day before the experiment starts
 - Put in place mobile alarms (balise) at entrances to hall
 - Do a visual inspection to:
 - Inform occupants that the lab has changed classification
 - Identify “hot spots” along the beam line
- Proposition to be refined and presented to the PS-CSAP

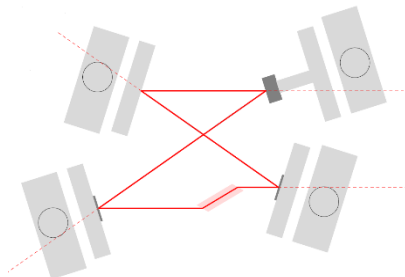
RILIS Developments before 2018 physics:

1) 2-photon spectroscopy of stable Si and Rb.

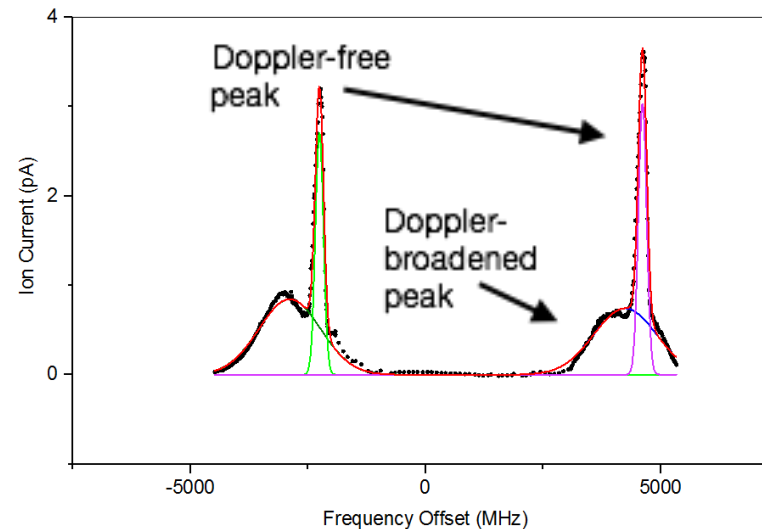


PhD project: Katerina Chrysalidis

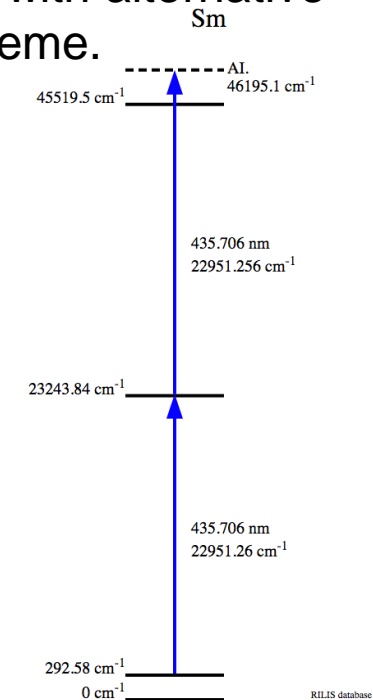
Injection-seeded NB Ring Ti:Sa



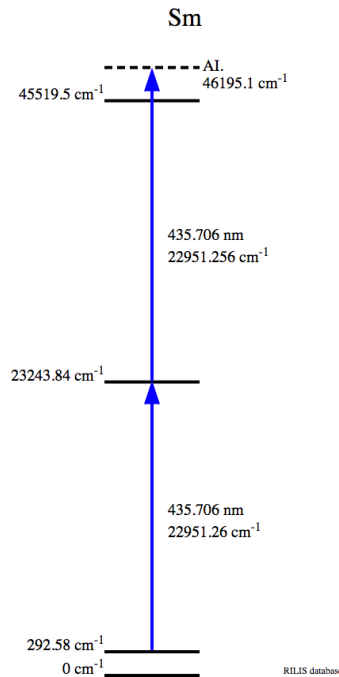
Tests planned in March



2) Samarium Efficiency measurement with alternative Blue-Blue scheme.



RILIS @ Offline 1



1 laser, blue-blue TiSa scheme for Sm will be prepared.

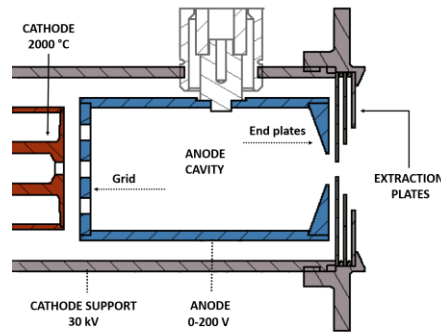
- Pump laser will be a demo unit from INNOLAS – arrival **March 2018**
- This doubles as a trial for **RILIS@MEDICIS** and possible RILIS Ti:Sa pump laser replacement



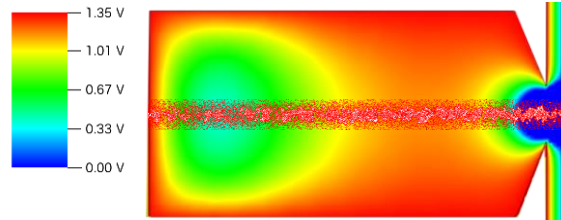
RILIS Fellow: Shane Wilkins will perform these tests

- **CERN LIST tests** will be carried out with Reinhard Heinke
- Further tests of **VADLIS** and **laser-induced molecular break-up** are foreseen (a loan of a high-energy ps laser from Edgewave has been agreed).
- Ongoing work on **high-resistance LIS cavities** (SIGRADUR)

Ongoing VADLIS development



$V_{\text{extraction}} = 0 \text{ V}$

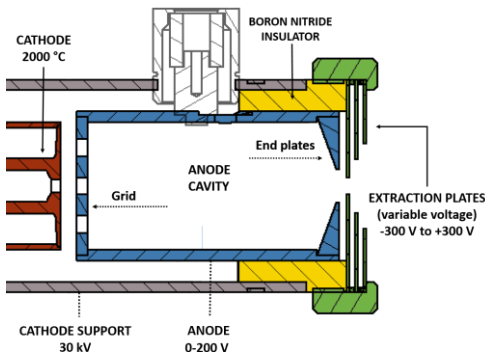


PhD work: Yisel Martinez

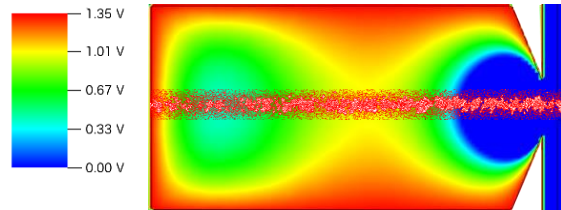
Standard VADIS

=

FEBIAD MK5 (but with Mo anode)



$V_{\text{extraction}} = -100 \text{ V}$



Prototype tested for Ga at
OFFLINE 1

At least 2 X efficiency
improvement

Tested at ISOLDE for Hg, Mo, Mg

Factor of >2 improvement in RILIS-mode efficiency for all cases

Proposal For 2018:

More VADIS sources equipped with adjustable extractor?

Ongoing investigation at offline (inverted polarity cathode, further optimization of construction of anode holder)

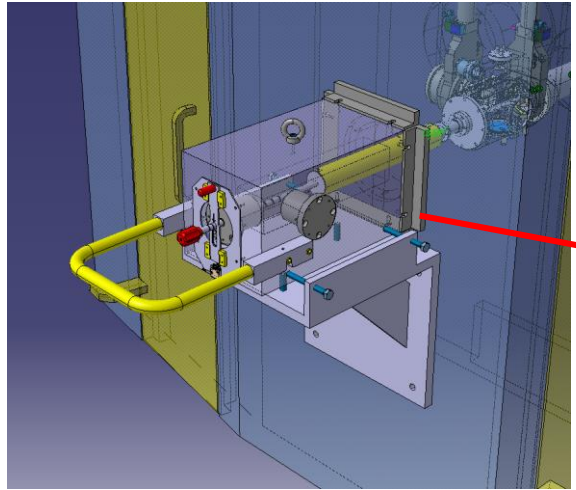
Use VSIM to optimize geometry for RILIS-mode operation (VSIM workshop in Leuven next week)

*Continued work of PhD student
David Leimbach*

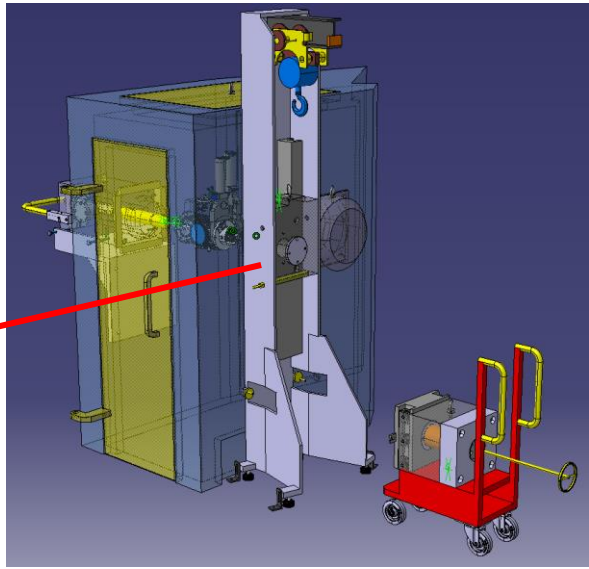
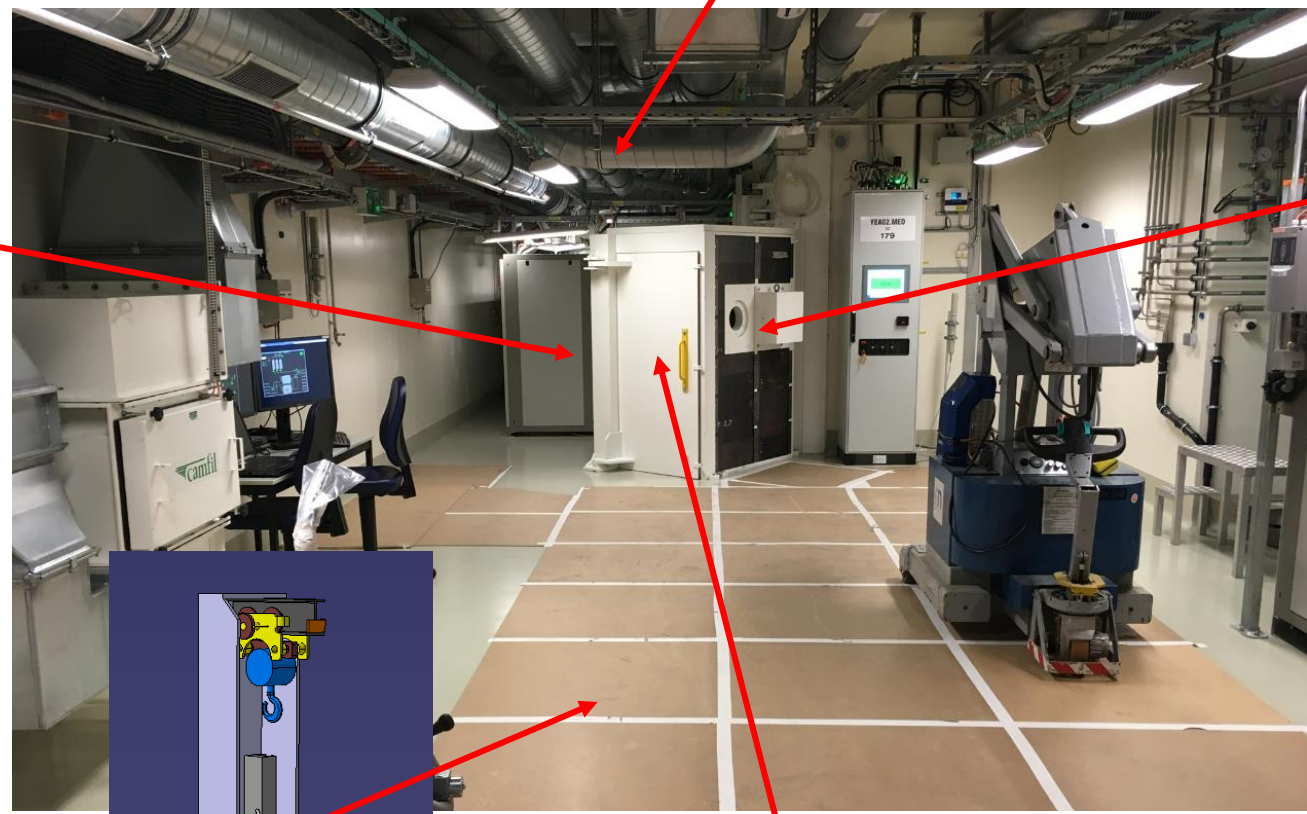
Bruce Marsh

Yets 2017-2018 main works in MEDICIS

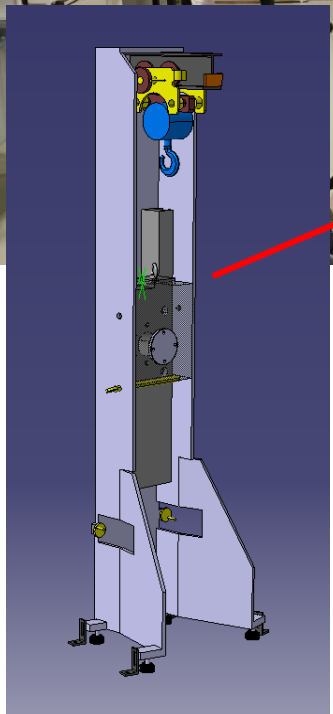
Ventilation process
dismount and upgrade



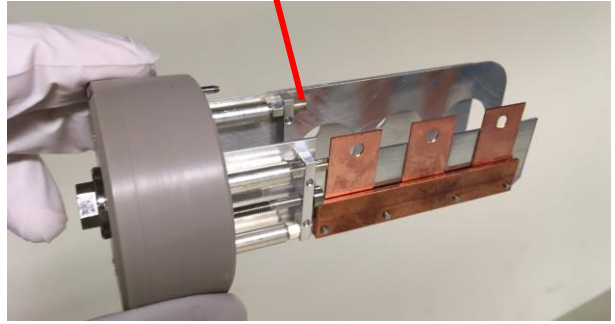
Collection box **movement control** alignment and completion



First transfer port and shielded **trolley** delivery, alignment and installation. **Slits motorization** and control completion



Second transfer port delivery and installation

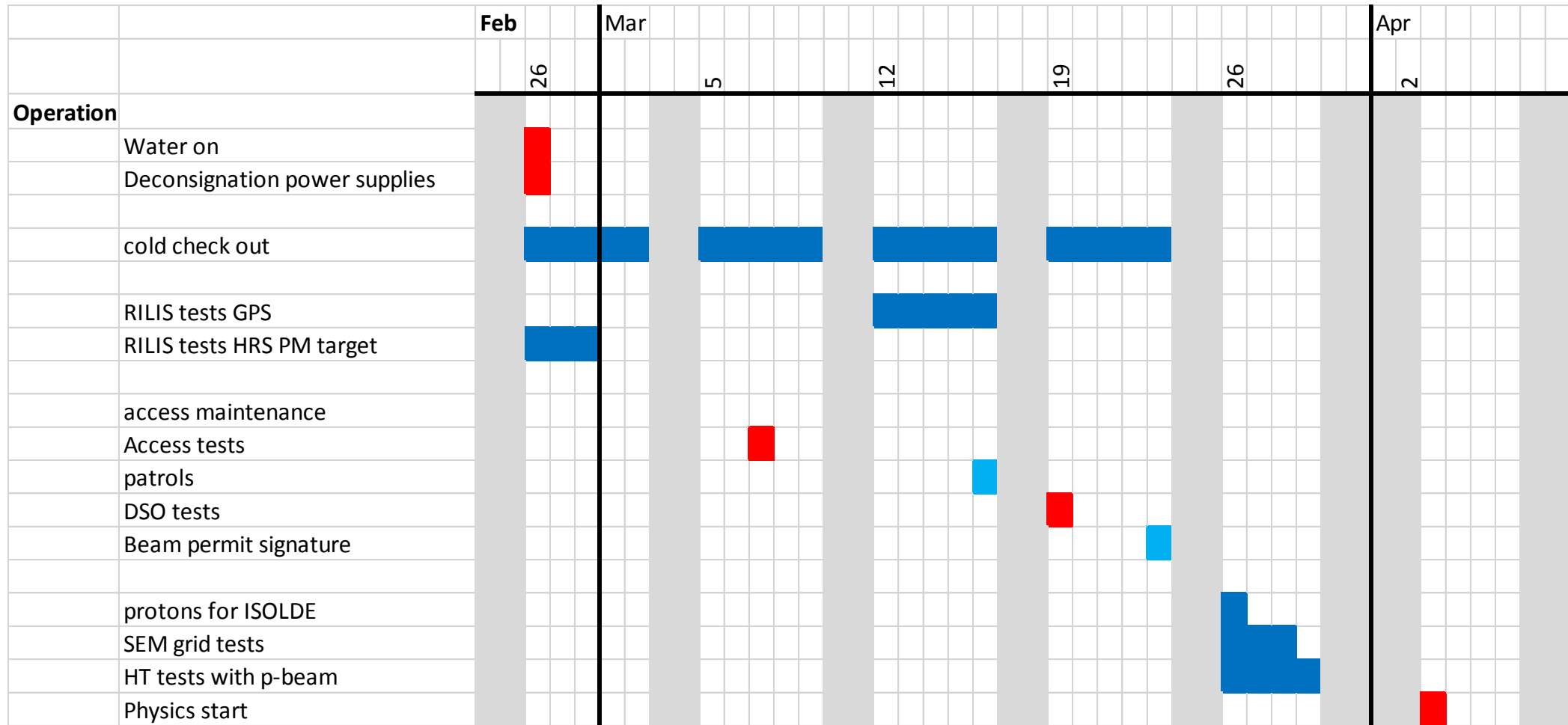


Outgazing **vacuum and collection sample** design optimization



RCS Montrac upgrades and tests completion

Start up planning



LIST v 2.0

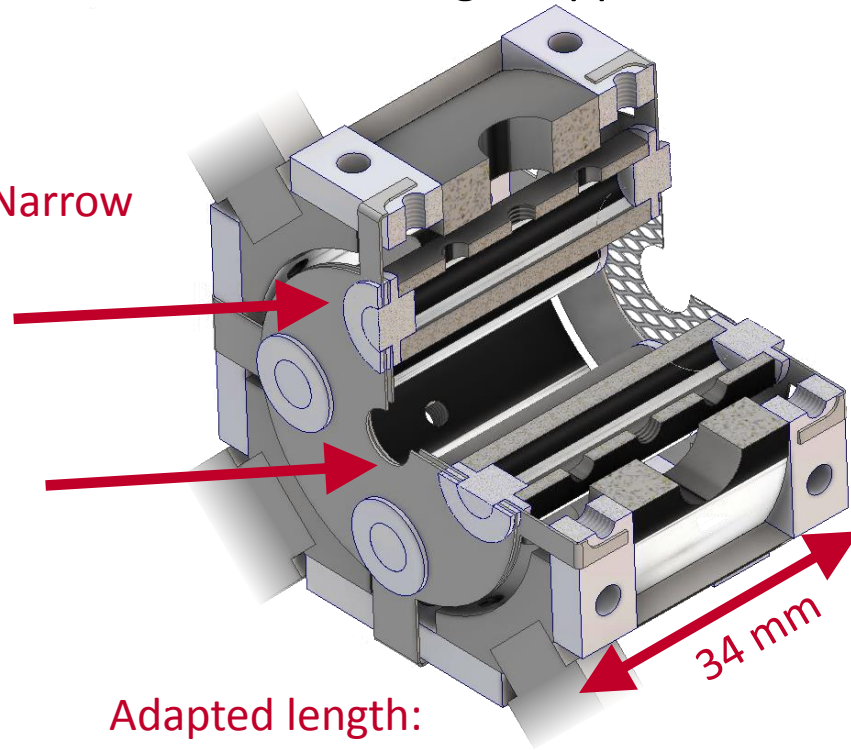
Upgraded 2018 LIST laser ion source for

INTC-P-459: Measurement of the super-allowed branching ratio of ^{22}Mg

➤ Laser ionization of Mg - suppression of surface ionized Na contamination

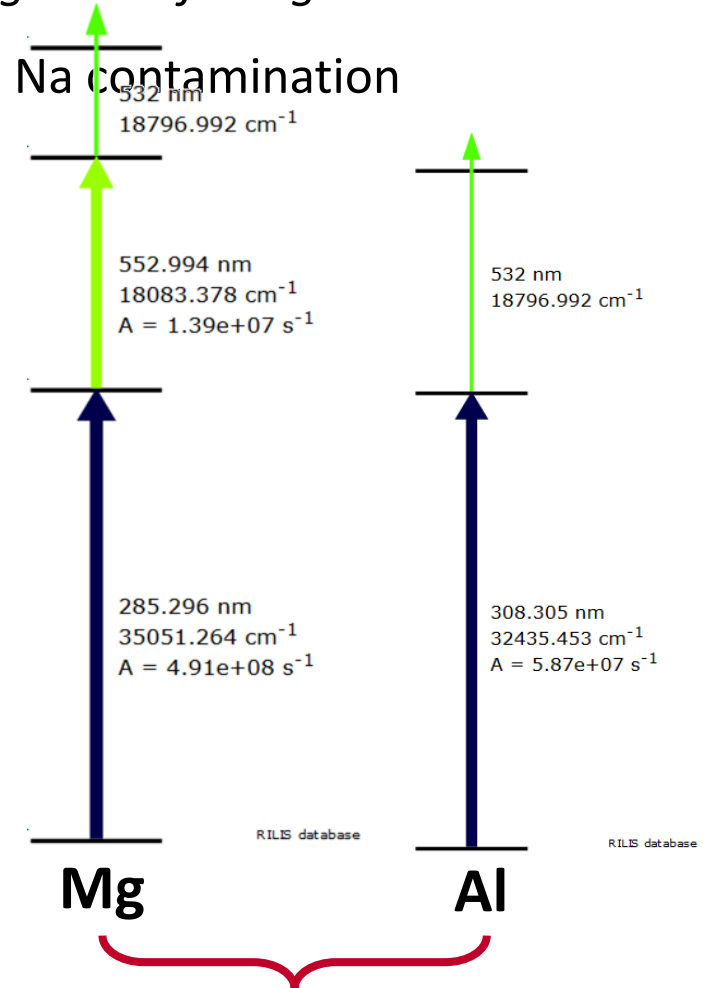
Compact isolator design: Narrow spacing to atomizer

Dual repeller: Ion and electron suppression



Adapted length:
Reduced deposition and compatibility to additional purification techniques

- Operation analog to 2012
- 1 unit available, 2 more machined at JGU workshop right now
- Robot handling tests with mock up unit in shutdown



Ideal opportunity for Al yield checks

Neutron deficient SeCO beams

Principle:



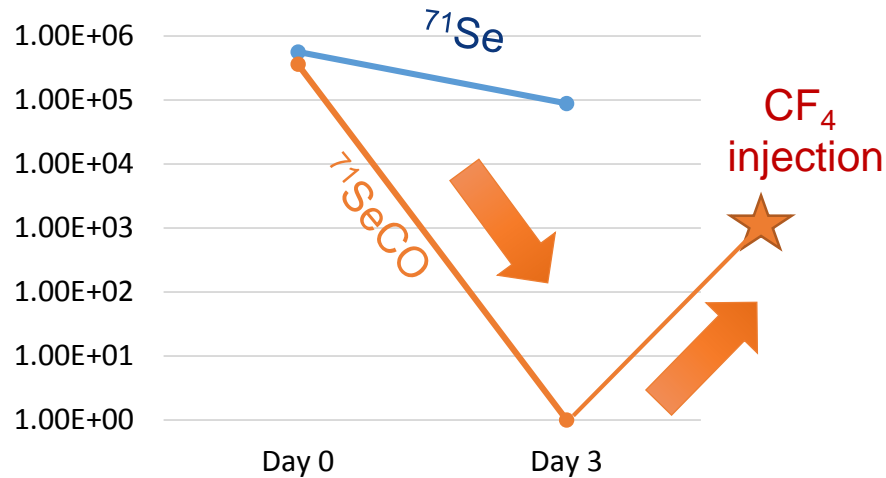
Target #605 and #612

Zirconia fibers, stabilized with ca. 10% Ytria

Shifting the mass to get pure beams

Beam available since many years.

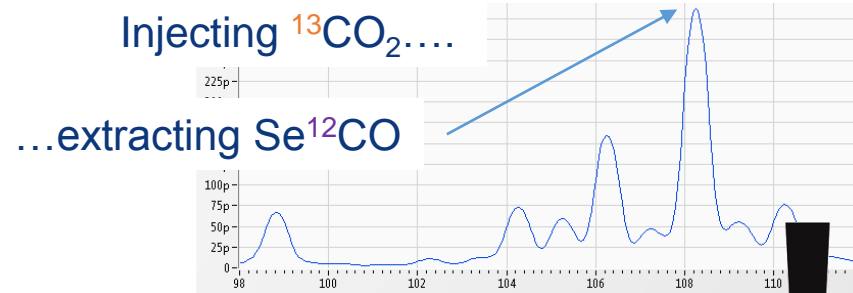
but....



- SeCO gone after a few days
- Atomic Se still released after days

➡ Indications, that CF_4 gas might serve as carbon source. Work in progress.

Why does SeCO disappear, even if we inject CO_2 ?



Injected CO_2 gas does not promote SeCO formation!

What's the source of carbon?

Carbon from the ion source?

-> Placed graphite grid, but still depleting

Carbon from the target material?

-> EDS (preliminary) shows no carbon in ZrO fibers

Studying molecular beam formation

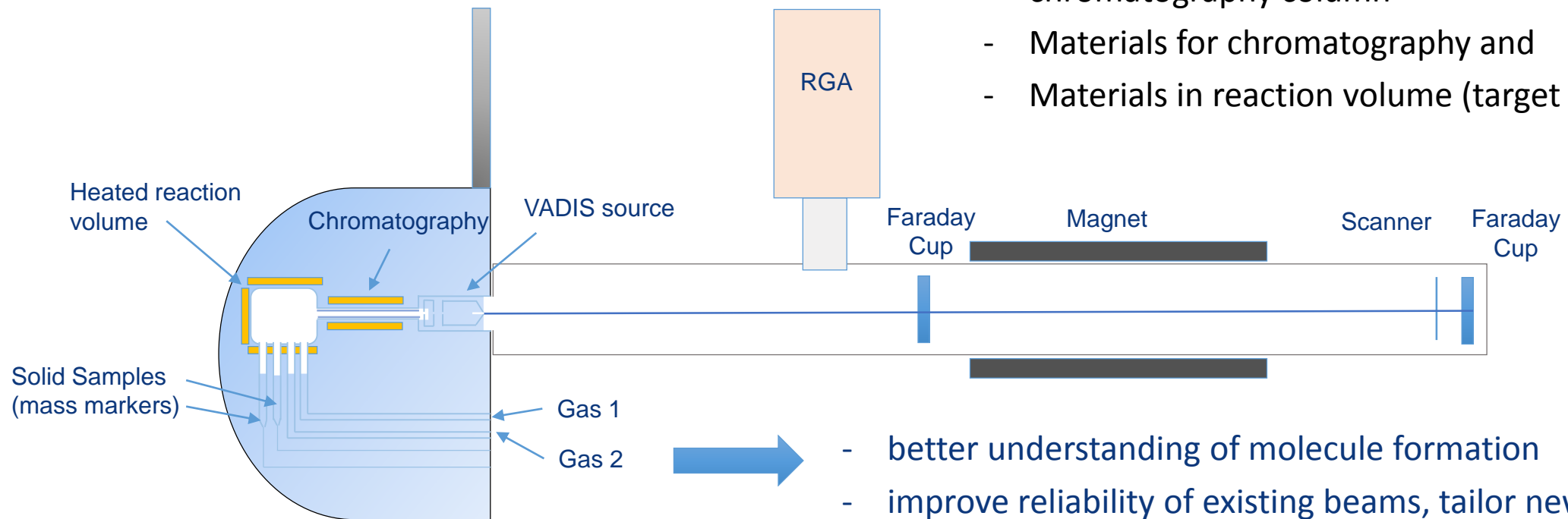
Concept for a dedicated development unit for molecular beams

Study chemical reactions

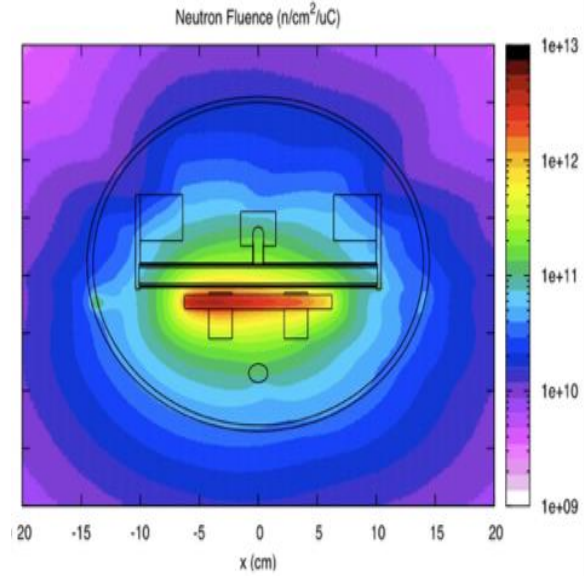
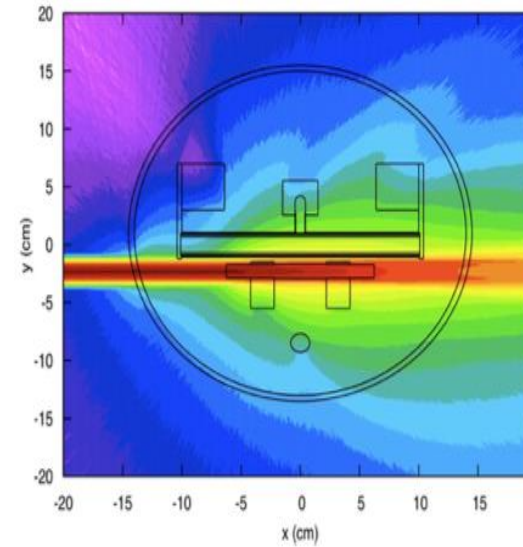
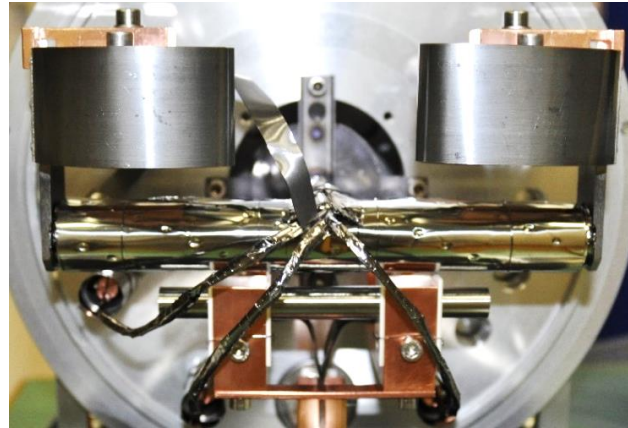
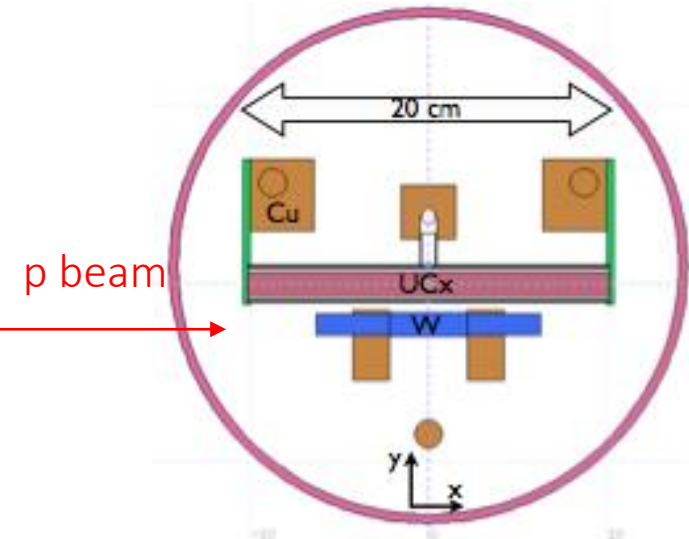
- Injection of gases and vapor of solid samples into reaction volume
- Suppression by quartz and other materials

Parameters

- 2 gases, controllable flow rates
- 2 mass markers
- Controllable temperatures in reaction volume and chromatography column
- Materials for chromatography and
- Materials in reaction volume (target matrix)



p2n-converter 1.0



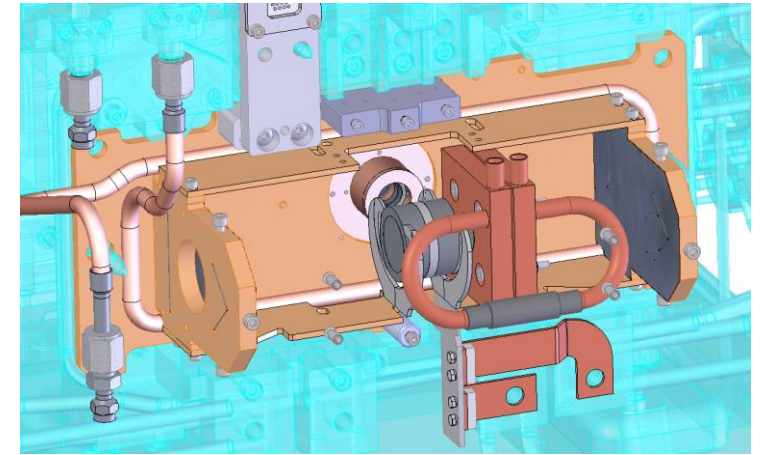
Brings high purity neutron-induced fission fragments



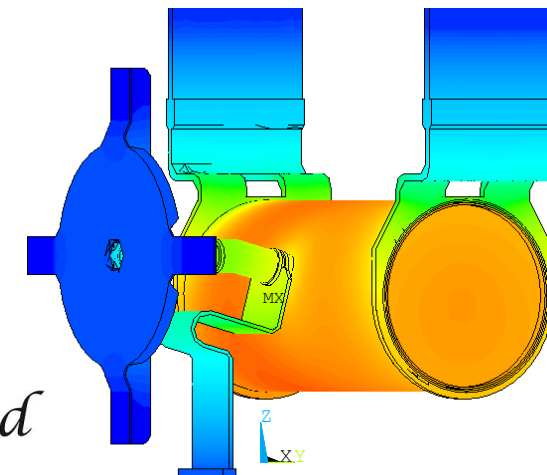
500 MeV	1.4 GeV	2.0 GeV
100 μ A	2 μ A	6 μ A
cw	<u>pulsed</u>	<u>pulsed</u>
50 kW	2.8 kW	12 kW

Collaboration started to design two p2n-converters:

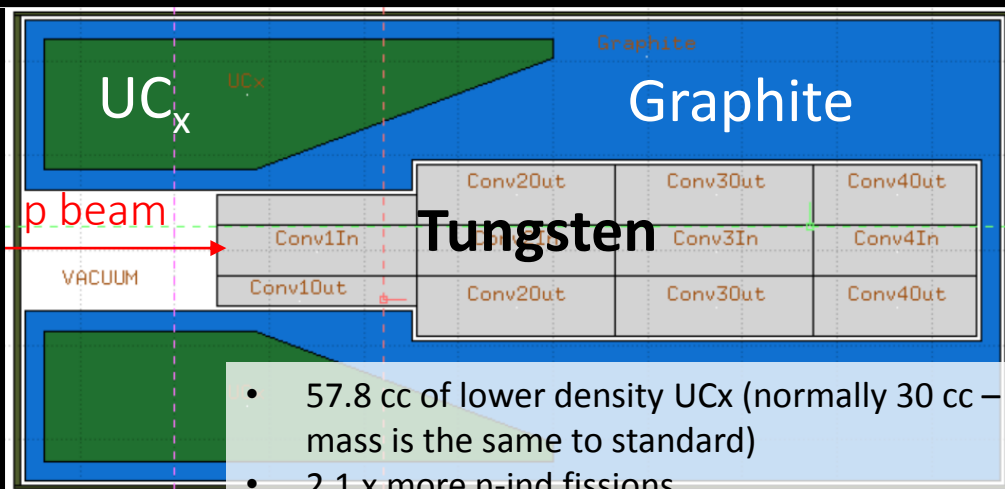
- Improve the one of ISOLDE
- Design one for TRIUMF ISAC



L. Egoriti, et al. (TRIUMF)



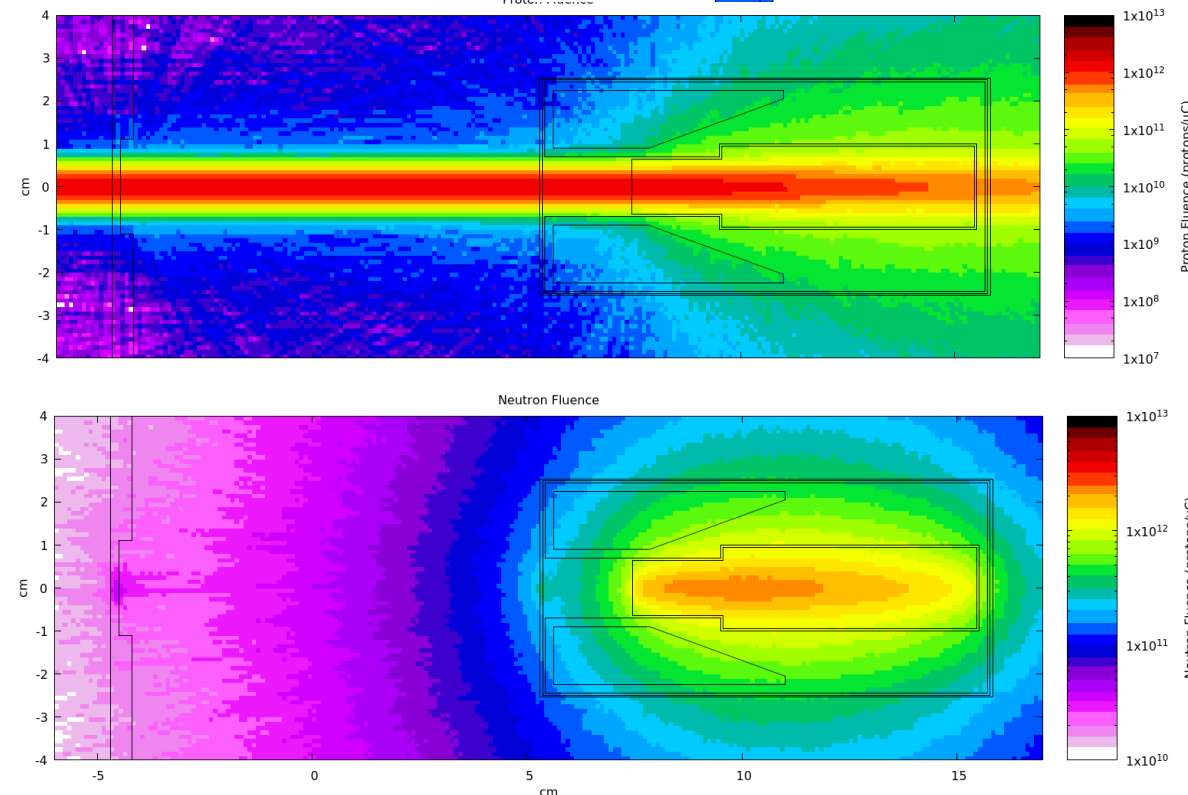
MediGis
Promed



- 57.8 cc of lower density UCx (normally 30 cc – mass is the same to standard)
- 2.1 x more n-ind fissions
- 2.4x less %p-ind fissions

- Normal shielding – several metal foils stacked
- **New shielding: Sigratherm material – 1 cm thick**

Converter will act as internal heat source



ISOLDE Schedule 2017: weeks 16 - 48

GPS	April				May				June				July				August				September				October				November				Dec					
Wk	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49				
Mo	17	24	1	8	15	#513 MWNC	22	29	5	12	19	26	3	10	17	24	31	7	#534 Sn VD5 14	#613 CaO 21	28	IS528*	#569(?) Ta - Ta 4	11	18	25	2	9	#615 Ta - Ta 16	23	30	#622 ZrO2 6	13	20	27	4		
TU			(IS611)																																			
WE	SEMgrid				#599 Ti foils		Tech stop																															
TH																																						
FR	#595 UC - n																																					
SA																																						
SU																																						
	In RILIS	In RILIS	98Kr/48Ar	Mg RILIS	8B			Mn RILIS	In RILIS	Bi RILIS		Se (mol) beam	BaF beams	BaF beams		Sm RILIS	Cd beams	15C	15C	Dy RILIS	Rb beams																	

ISOLTRAP: Cd/Kr/Ar/Cs/development
 IDS: In/Bi/B
 VITO: Ar/Na
 COLLAPS: Al/Ni/Sn
 CRIS: In/K/Ga

SSP: Mn/In/Cd/Hg/Cu
 Biophysics: Tb/Cd/Hg
 Medical: Tb

- Miniball
- 108Sn
- IS562
- 140Nd; 142Sm
- IS546
- 140Sm
- IS558
- 144Ba; 142Ba
- IS553
- 206Hg
- IS547
- 70Se → 66Ge
- IS569
- 72Se
- IS597
- 94Rb
- IS572
- 28Mg
- IS628

- Scattering Chamber
- 15C beams to XT03
- IS619
- 9Li
- IS561
- 59Cu for Edinburgh chamber
- IS607

HRS	April				May				June				July				August				September				October				November				Dec					
Wk	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49				
Mo	17	24	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	35	4	11	18	25	2	9	16	23	30	6	13	20	27	4			
TU	#596 CaO	IS601			CPIS	TISD	Tech stop																															
WE																																						
TH																																						
FR																																						
SA																																						
SU																																						
	35Ar	In RILIS	In RILIS																																			



Target change

CERN holiday

Setting up/proton scan/yield

Physics GPS

Physics HRS

Overview of HIE ISOLDE runs 2017

Liberalily borrowed from Liam Gaffney's talk to the ISOLDE workshop

Reactions:

- $^{94}\text{Rb}(^{208}\text{Pb})$ MNT (Legnaro/Zagreb)
- $^{15}\text{C}(^{208}\text{Pb})$ Elastic (Huelva)
- $^9\text{Li}(t,p)$ (Aarhus)
- $^{59}\text{Cu}(p,\alpha)$ (Edinburgh)

Commissioning:

- ^{14}N to ISS

Coulomb excitation:

- ^{72}Se (Surrey)
- $^{70}\text{Se}/^{66}\text{Ge}$ (Western Cape)
- $^{142,144}\text{Ba}$ (Paisley/Liverpool)
- ^{140}Sm (Oslo)
- ^{140}Nd (Darmstadt/Sofia)
- ^{108}Sn (Lund)
- ^{206}Hg (Surrey)

Moments:

- ^{28}Mg g-factor (Orsay)

12 Experiments
scheduled (and
mostly possible)
from 7th July till 4th
Dec

Miniball



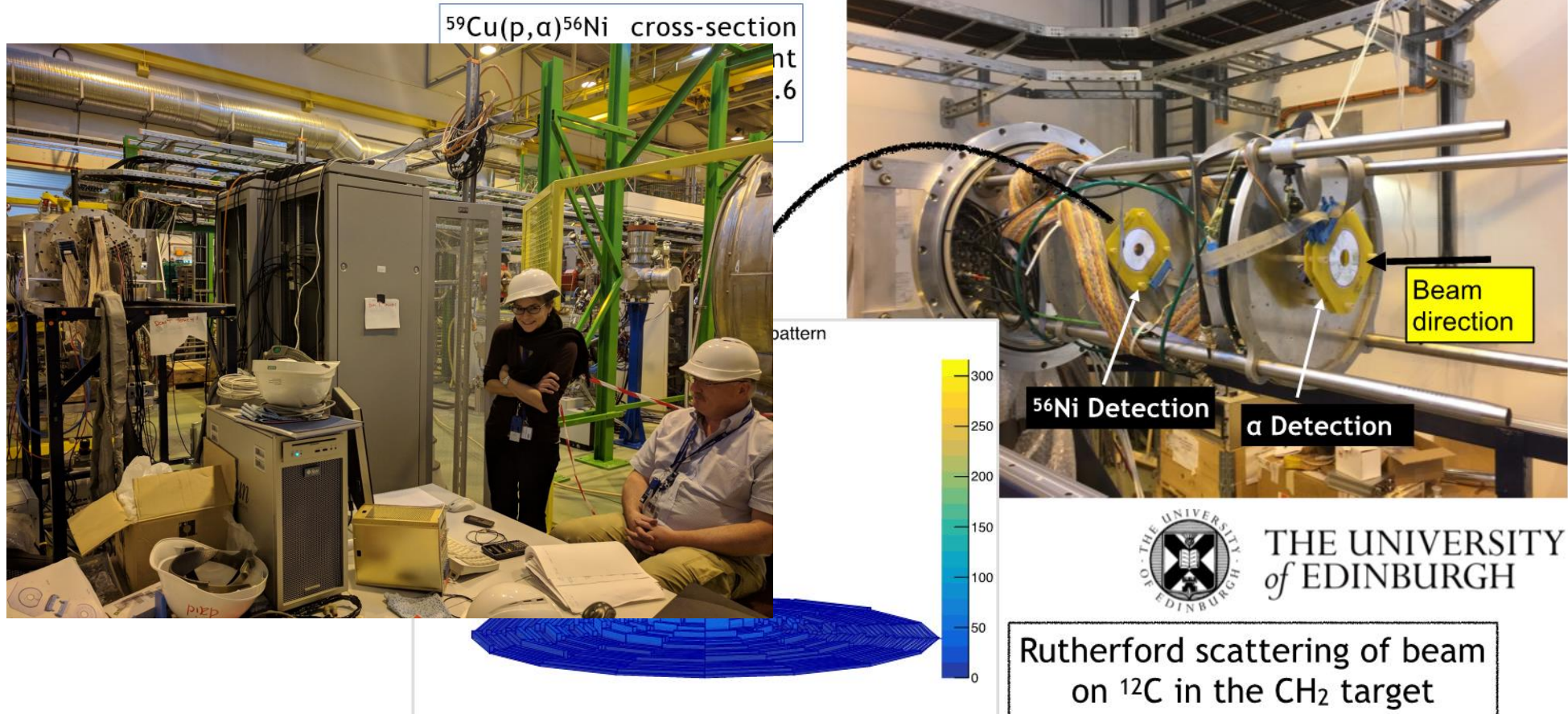
Moveable
Setups (SEC)



Nuclear astrophysics – IS607

- $^{59}\text{Cu}(p, \alpha)$ – Implications for nucleosynthesis in core collapse supernovae

Experimental Setup

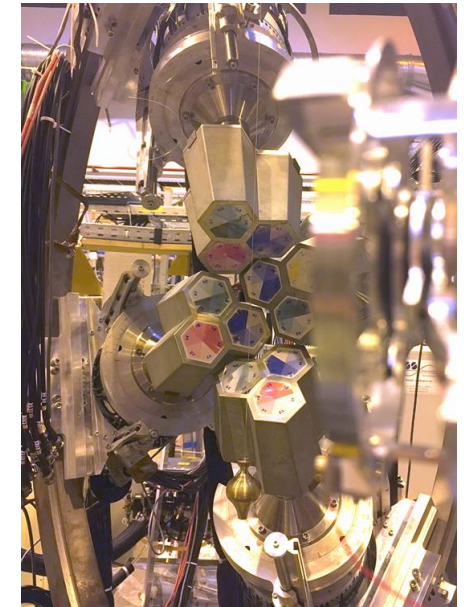
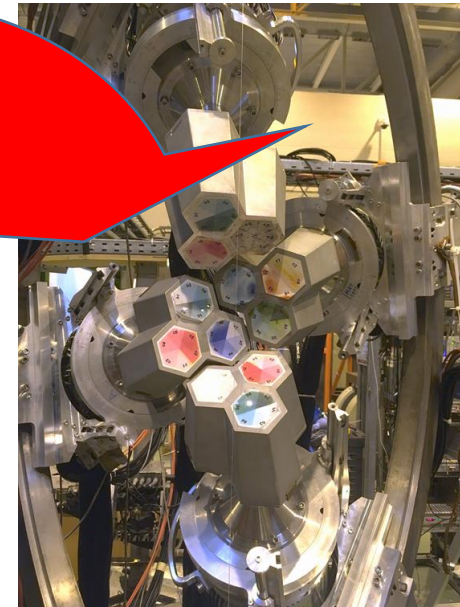
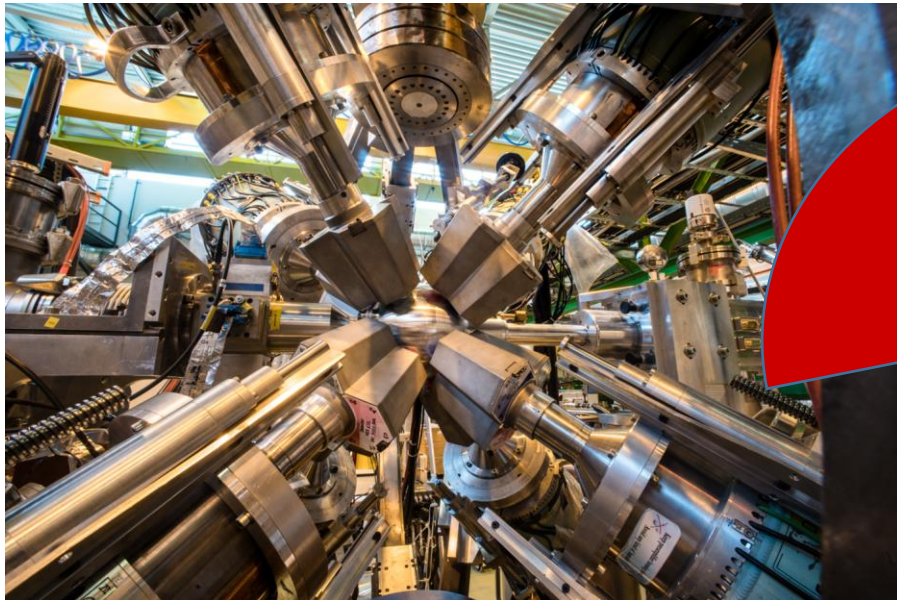
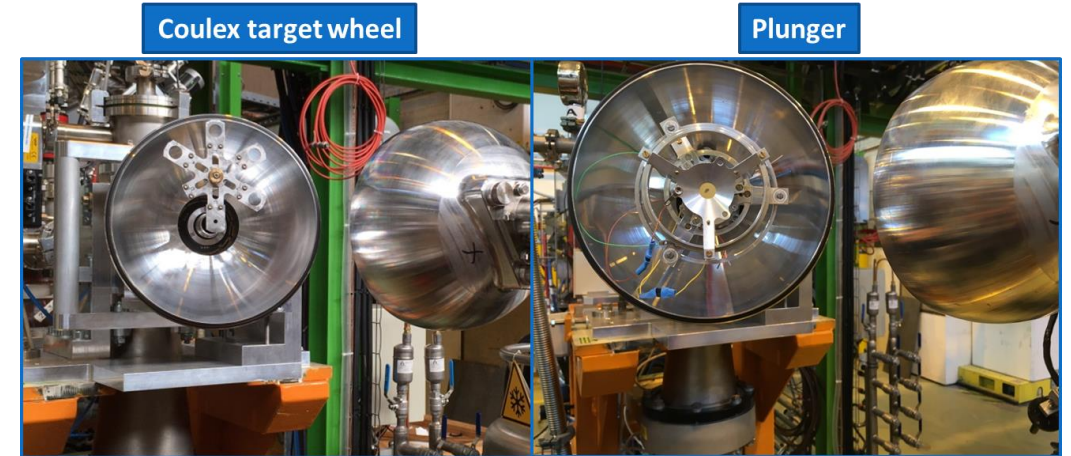


Thanks to Claudia Lederer-Woods
and Ruchi Garg

IS628: plunger measurements on ^{28}Mg

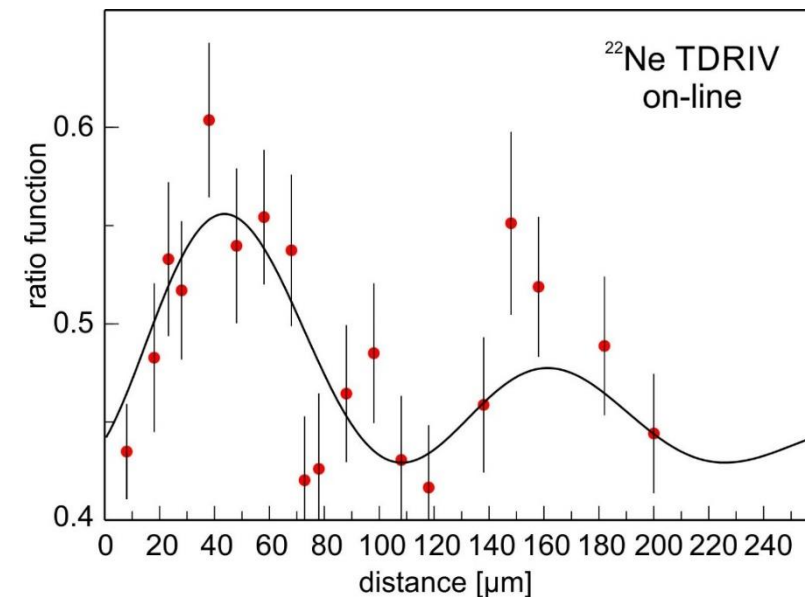
- ^{22}Ne stable beam from EBIS @ 5.5 MeV/u:
 - TDRIV \rightarrow Zero-point calibration of target-degrader (*plunger*)
 - $(d,n) \rightarrow$ Angles of Ge detectors from Doppler shift (*target wheel*).
 - Required a week of stable beam....

- New plunger chamber installed for 2017.
- Developed at IKP Köln.
- Excited-state lifetime measurements, g-factors, etc.



IS628 TDRIV on ^{28}Mg – on-line results

- First Miniball plunger experiment
- Calibration run with ^{22}Ne beam
 - known g factor
 - observed expected frequency
- **(Very) High intensity ^{28}Mg beam – 5×10^6 pps/ μCu**
- Some difficulties with RIB scattered in the chamber
- **Very promising results for ^{28}Mg TDRIV** – presently under analysis



ISOLDE Solenoidal Spectrometer

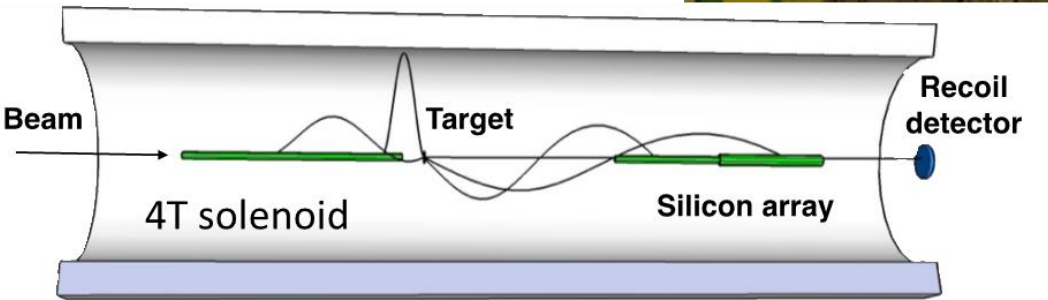


● Tight schedule over last 2 months.

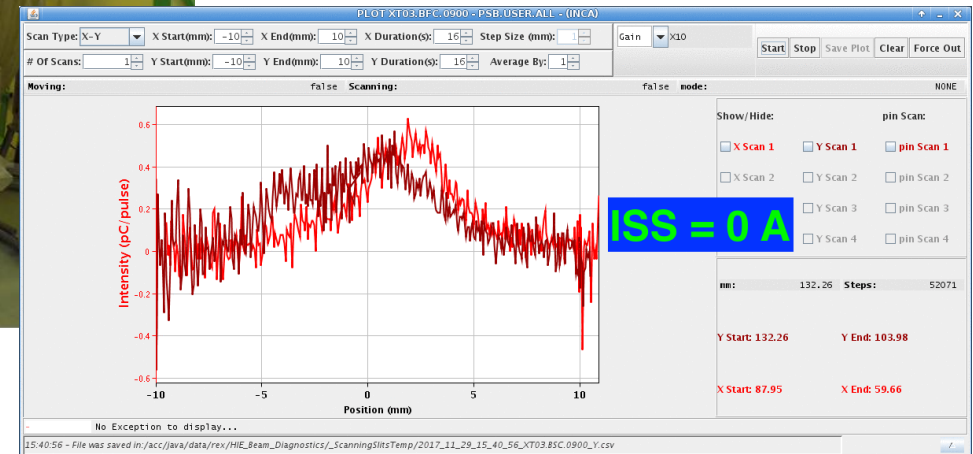
- Shielding
- Energising to 2.5 T (x2)
- Field mapping
- Vacuum
- Beam tests

● Ready for **RIB in 2018!!**

- $^{206}\text{Hg}(d,p)$
- $^{28}\text{Mg}(d,p)$

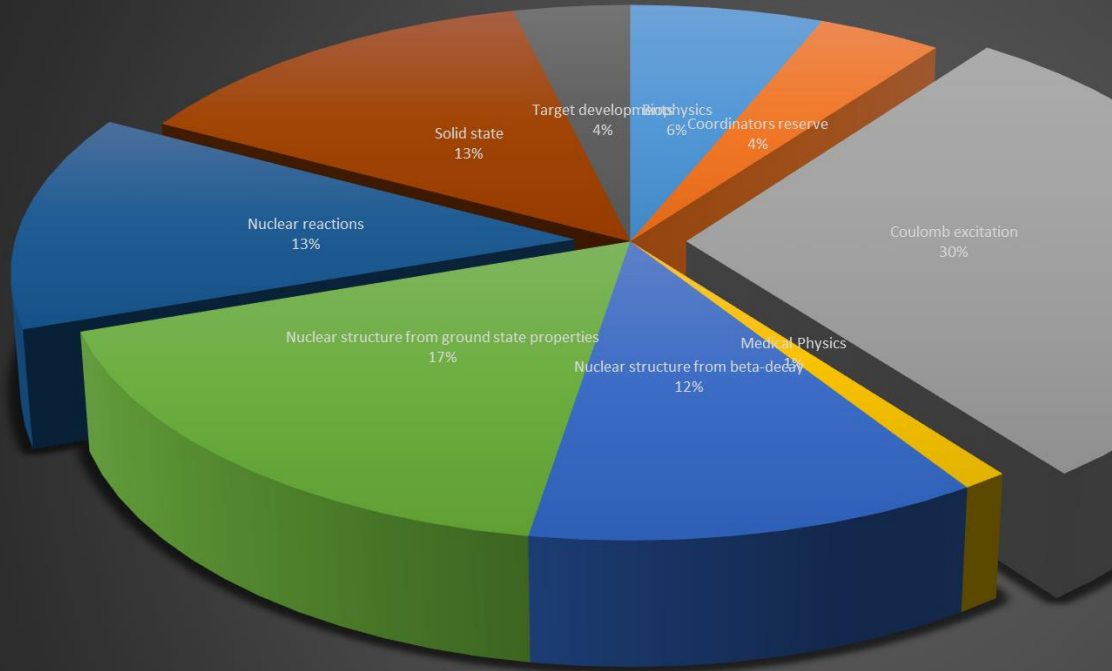


Helical orbit spectrometer principle 35



Sum of Delivered shifts

Shift counting 2017



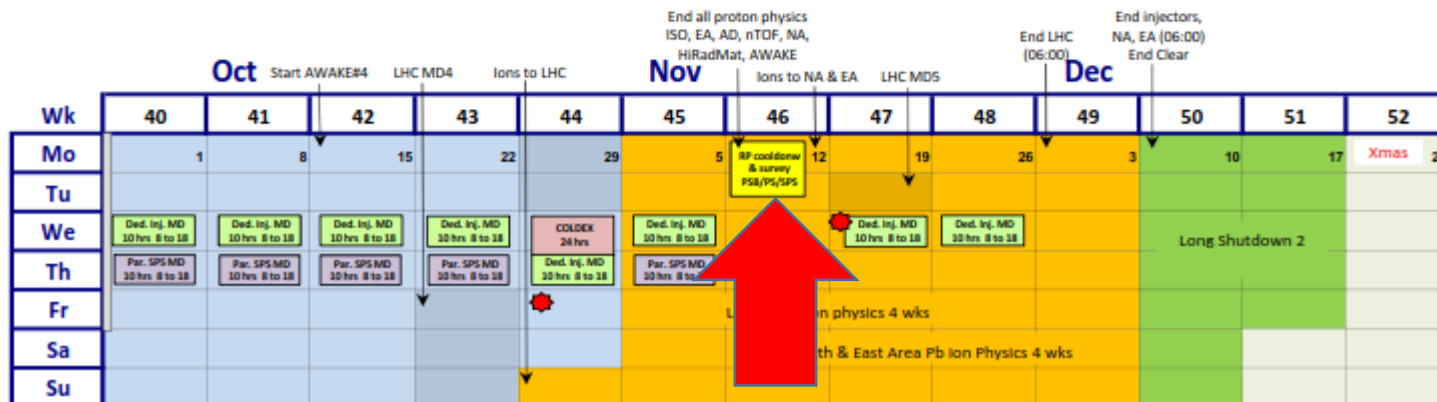
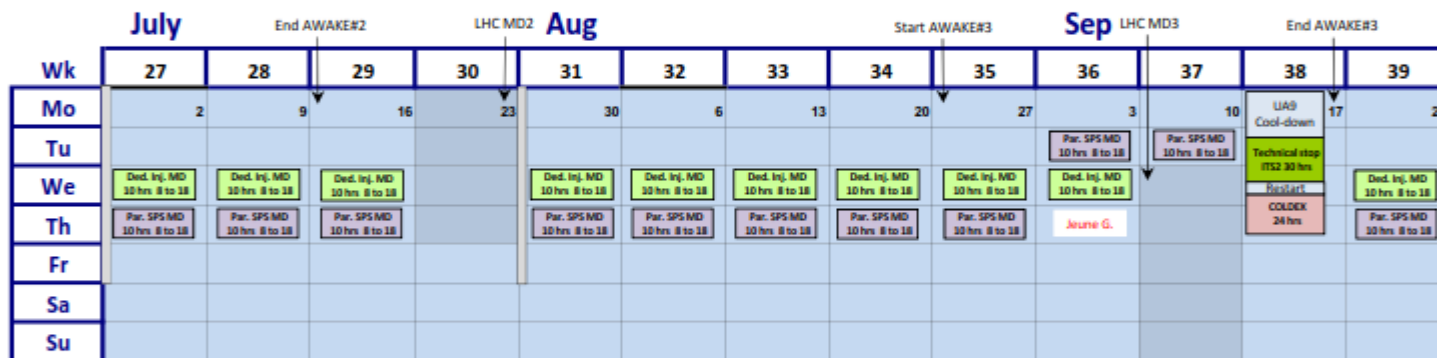
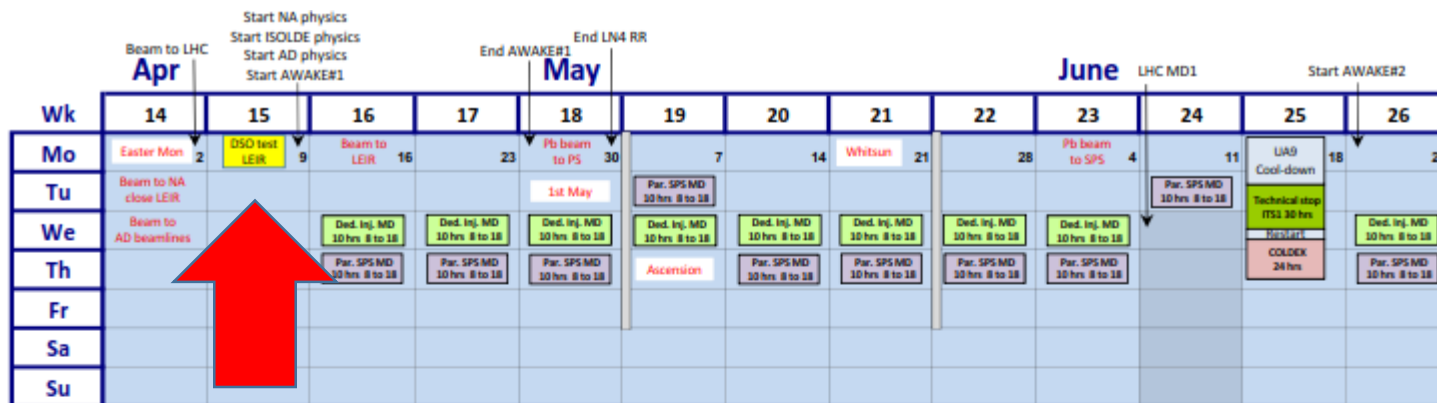
- Nuclear structure from beta-decay
- Nuclear structure from ground state properties
- Nuclear reactions
- Solid state
- Target developments

Delivered	2017	2016	2015	2014	2012	2011
Protons	8.00E+19	7.80E+19	9.40E+19	5.50E+19	1.15E+20	8.05E+19
Shifts for IS exp	394	343	263	208.5	416	313.5
Shifts for LOIs	5	10	4	6.5	15.5	16
HIE/REX shifts (IS +LOI)	182	95	Special	-	221.5	190.5
Average IS shifts/day	1.76	1.65	1.4	1.55	1.61	1.55

Row Labels	Count of Experiment
Biophysics	3
COLLAPS	3
CRIS	3
HIE	11
IDS	2
ISOLTRAP	3
Medical	1
SSP	14
TISD	1
VITO	2
Windmill	1
Coord reserve	1
HIE	1
Grand Total	46

In total 427 RIB shifts delivered in 2017

CERN accelerator schedule 2018



Protons available for physics to ISOLDE from 9th April – 12th November 2018.

217 days for physics (compared to 224 in 2017)

HIE ISOLDE expected to start similarly to 2017 i.e. ~ July 9. this leads to ~ 126 days available for HIE ISOLDE, compared to 150 in 2017.

Dedicated low energy block from 9th April: ~ 90 days for LE.

Interleave HIE and LE runs as in 2017.

LIEBE postponed in 2017; end of 2018?

Strategy for HIE: 4CMS so optimized for reactions. Starting with CE then switch to T-Rex; XT03 and ISS to be accommodated.

Preparation of Schedule 2018

Beam requests received yesterday. Currently being compiled. In addition to usual suspects, LIST beams and negative ion requests....

- Draft of low energy runs till ~ mid-June by late Feb- early March.
- Mid-June – end of September released around early May
- Rest of year in mid-July

Schedule will be discussed at a technical advisory panel (similar to what's done for INTC proposals) to avoid any surprises in terms of targets, ion sources, machine parameters and recent developments. In addition, safety aspects can be addressed. Also involving user input....

Hostel reserves 10 over the Summer period rooms 1 month in advance of experiments running.

ENSAR2 funding forms sent around upon release of schedule.

Safety and training etc

Required training for **ISOHALL**

Online:

- Safety at CERN
- RP supervised
- Basic electrical awareness
- Radiation Protection - Controlled area (refreseher...new)

Hands-on:

- Electrical awareness
- RP handling

Every Tuesday @ 1300 – 1700), training centre Preveessin.

External trainer: Recent cancellations have been a problem. Discussions underway to mitigate this.

Required training ranks

Code ↑	Description
10010	Safety at CERN
10750	ISOLDE - Experimental Hall - Radiation Protection - Handling
10860	ISOLDE - Experimental Hall - Electrical Safety - Handling

ISOLDE webpage a little unclear: to be re-freshed soon