

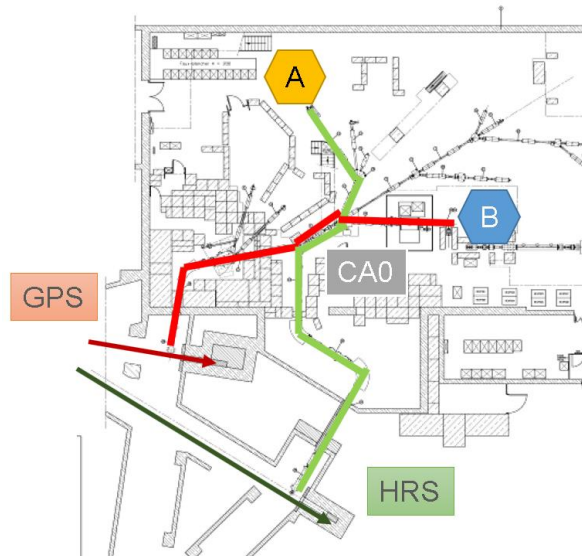
Alternating and shared operation of HRS and GPS

Sebastian ROTHE

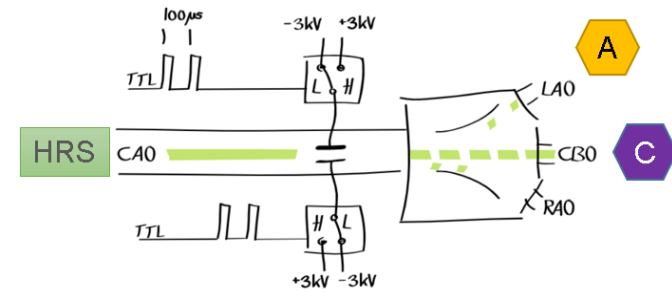


Overview

Alternating mode

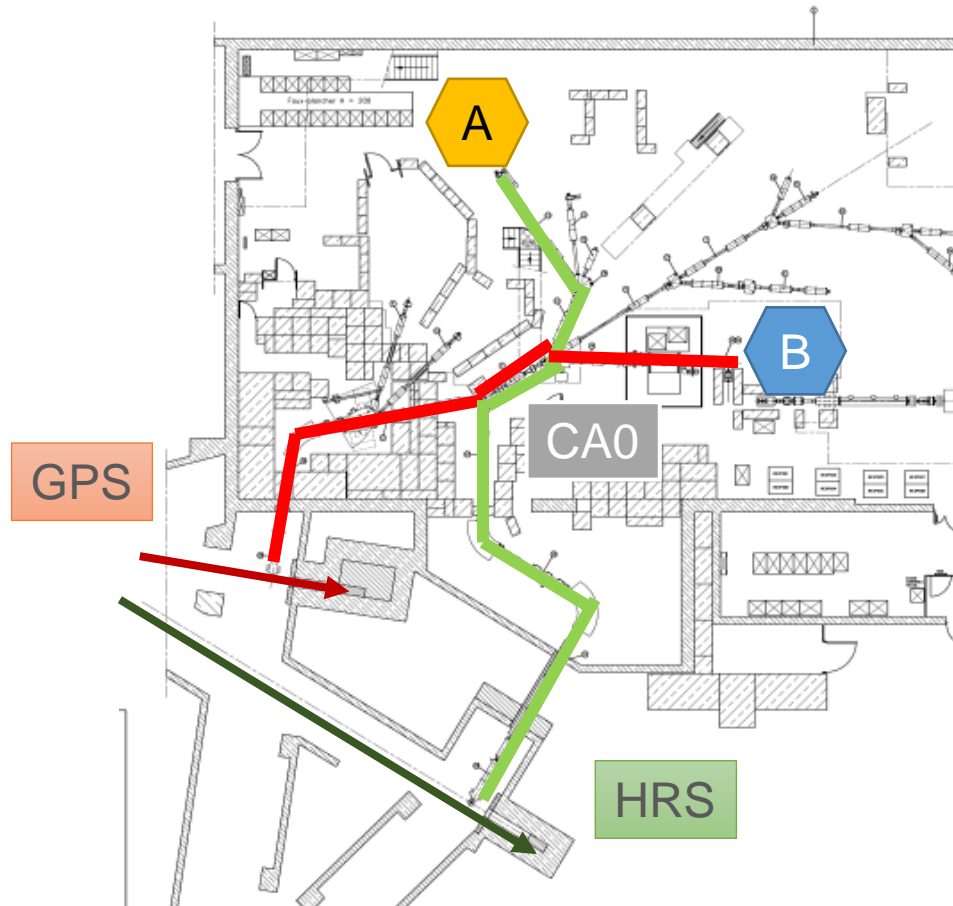


Sharing mode



- Possible solutions
- Issues
- Applications

Alternating mode



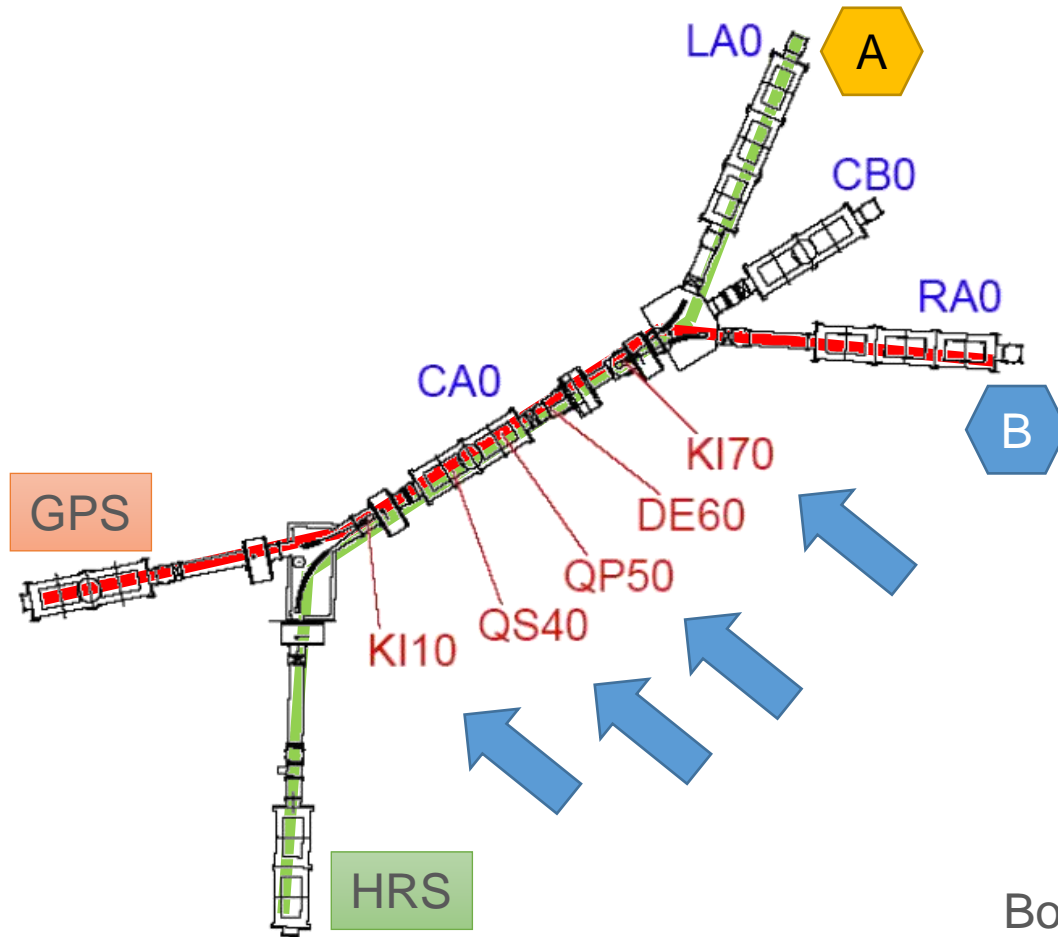
- PSB can alternate between HRS and GPS irradiation each 1.2 s
- Parallel operation currently only GLM/GHM + HRS
- GPS at CA0 prohibits HRS operation
 - -> creating so called “**CA0 Bottleneck**”
- Possible solutions
 1. new switchyard design / additional beamline
 2. Alternating between HRS tune and GPS tune in sync with PSB
 - Constraint: Beam parameters are different for HRS, GPS -> **different tune required.**

2 is preferred/cheaper solution

[TG06]

Alternating mode

Both FE deliver beam to multiple beamlines



Solution 2.a: (**software**) [TG06]

- Change settings each 1.2 s according to super cycle
- Possible if power supplies, controls are fast enough
 - > can be safety issue if setpoints are not matched
 - > ~cheap

Solution 2.b: (**hardware**)

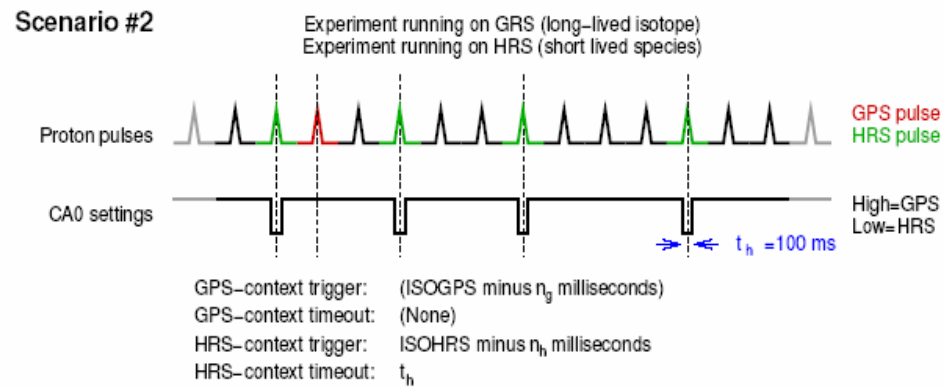
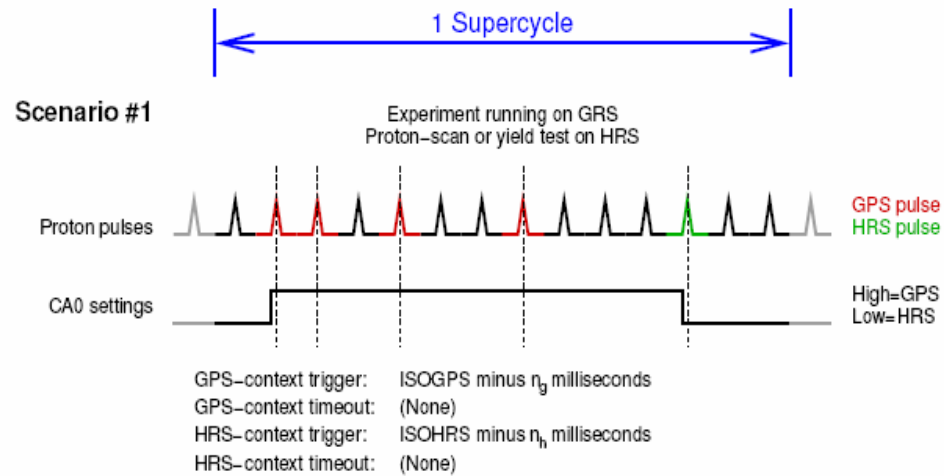
[JAR]

- Double the set of HT supplies.
- Tune CA0 individually for HRS/GPS, fix settings
- Use HT relays to alternate between the two supplies
 - > very robust
 - > more expensive
 - > programmatically simple (control via TTL)
 - > simpler to link to beam gate switches

Both require **sync with beam gates** (not shown) and **User interface** to configure TTL delay generator

Fig.:adapted from [TG06]

Alternating mode



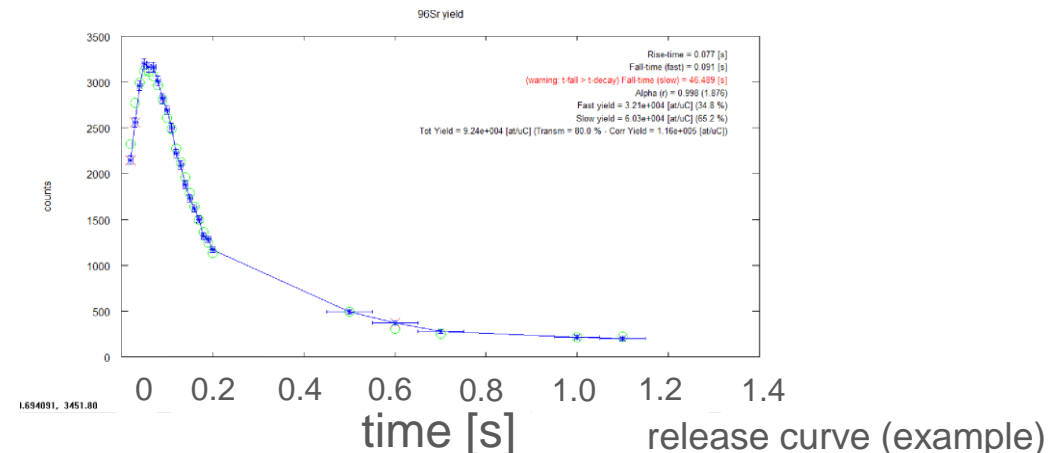
[TG06]

(Minimally) Invasive:

- Independent from isotope lifetimes
- E.g. 1 pulse per SC for certain time to a different setup (yield measurement, target optimization, proton scan, calibration)
- Max 50% loss of yield

Optimized:

- Exploits short half-lives and release times
- Requires careful scheduling

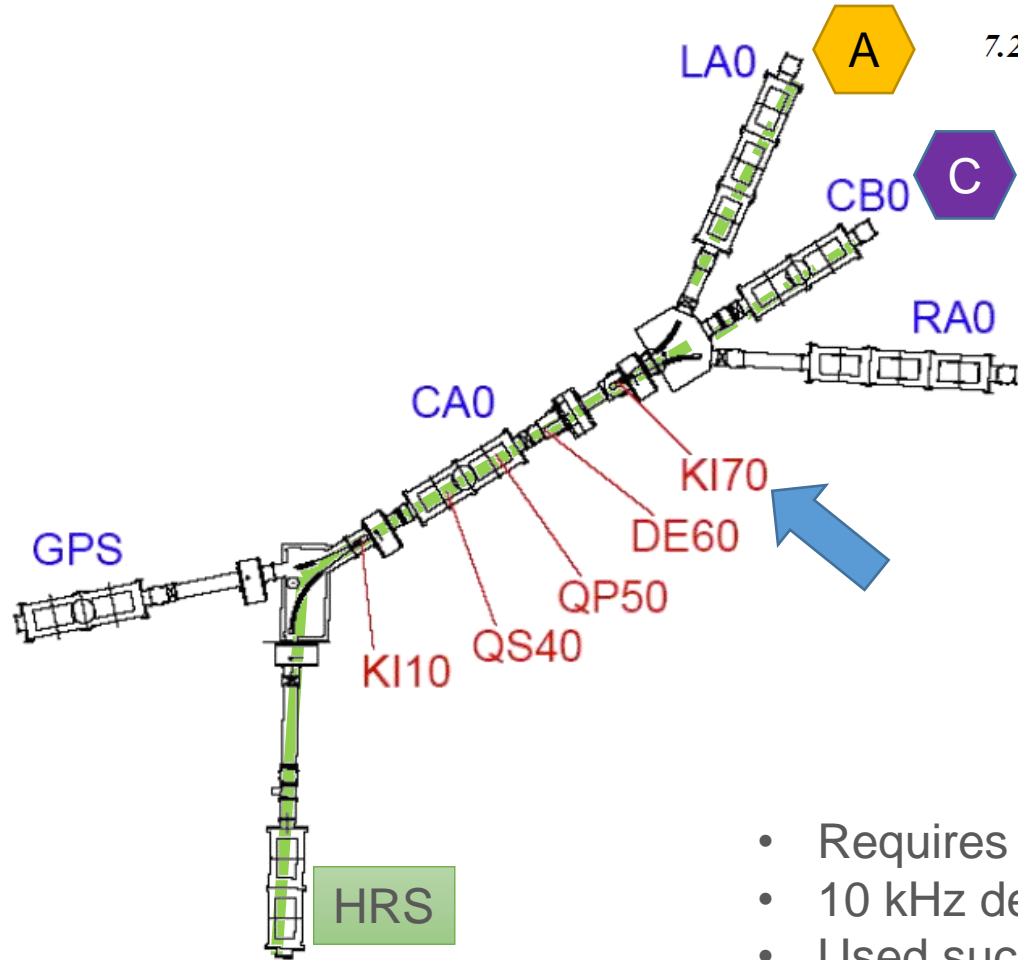


Alternating mode : Applications

- fast swapping separators as simple as opening the BG
- HIE ISOLDE tune while users still run on other FE
 - Beam diagnostics need to be synchronized
- Beam to tape station from other FE (1 pulse per SC)
 - Requires adding switch for DE60, adaptation of tape control software
- Stable beam for users while other experiments run
- Low priority radioactive beam for detector tests or LOIs and MD
- Simultaneous operation of fast released species
- ... ?

Sharing mode

One FE delivers beam to multiple beamlines



7.2.2 Limitations

- Cannot share a single separator between two experiments (if required, this could be achieved at the expense of more complicated controls).

[TG06]

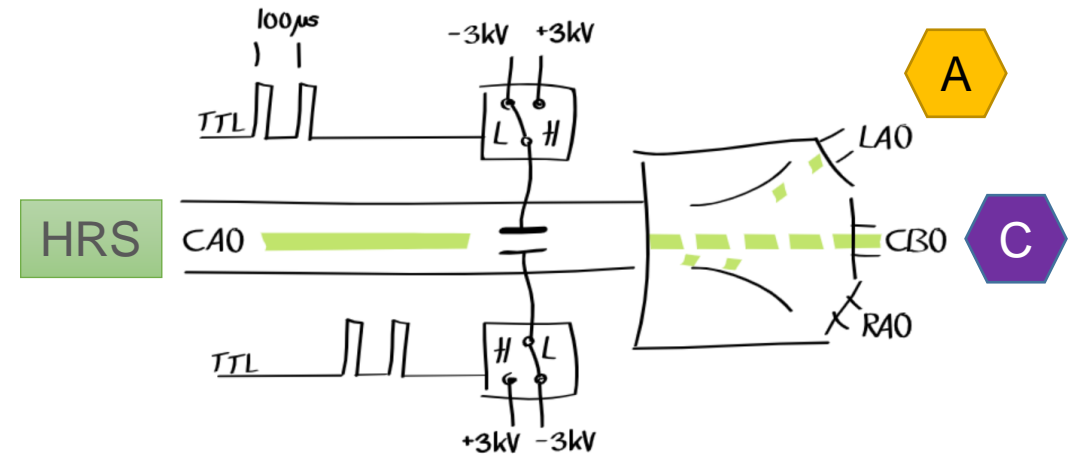
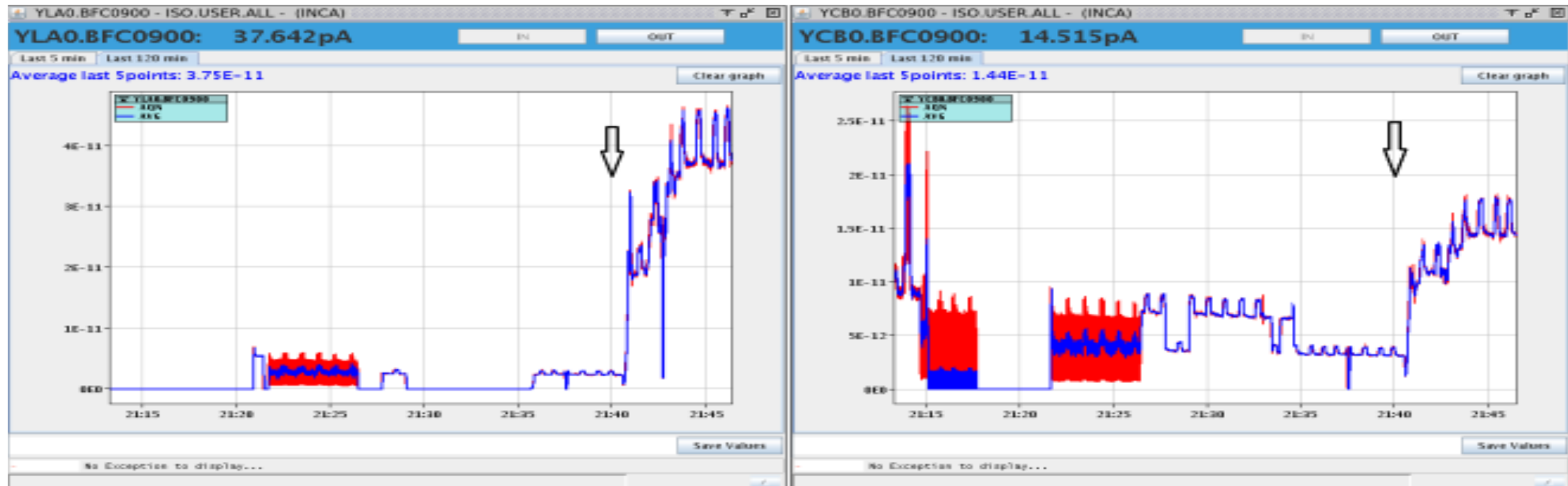


Fig. 7. Two fast high voltage switches control the voltage of the kicker plates of a switch-yard. Depending on the on-time the beam is fed into the three possible beam lines.

- Requires fast switching KI70 or any kicker of a switchyard
- 10 kHz demonstrated (compatible to RILIS)
- Used successfully for experiments already 2006 [BB07]

[srr16a,b]

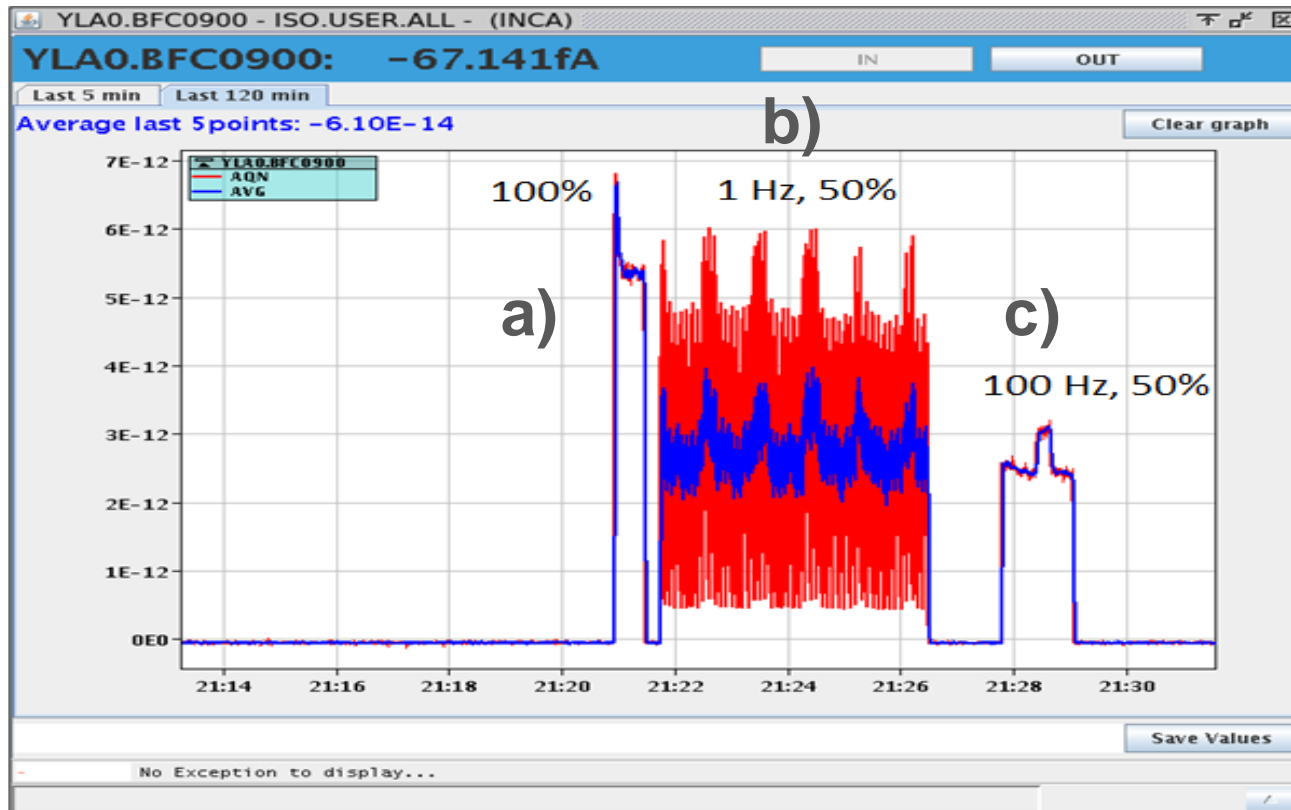
Sharing mode (results)



Simultaneous tuning on LA0 and CB0 Faraday cups

[srr16a]

Sharing mode (results)



- a) No switching
- b) 50% duty factor @ 1Hz
- c) 50% duty factor @ 100Hz

[srr16a]

Sharing mode : Applications

- Variable beam attenuator, pulser
 - Reference measurement with same conditions as less produced isotope
 - ! deflected beam to be directed to a dedicated location
- Fast beam-gate for RILIS
 - RILIS pulse could be chopped out and delivered to experiment
 - ! might be better earlier with BG or even earlier
- Simultaneous beam delivery to two experiments
- Permanent Target Performance Monitoring
 - Beam to tape station, controlling DE60, sample ~ 4x /h (done already in run2 – no one noticed ☺)
- Minimal-invasive beam intensity monitor
 - Sample fraction of the beam on an ion detector. Allows live optimization (target, lasers/ionsource, tune? others?) while delivery to users
- Link to autotune software (tune on two FC)
 - requires mod of the software or virtual devices (SIG= SUM[FC1 , FC2])

[srr16a]

References

- [TG06] [M. Lindroos and T. Nilsson, “HIE-ISOLDE: the technical options,” CERN-2006-003, \(2006\).](#) (Chapter 7 by T. Giles)
- [BB07] B.Blank “Precision measurement of the half-life and Q-value of the superallowed $0^+ \rightarrow 0^+ \beta^-$ decay of ^{38}Ca ” , [CERN-INTC-2005-013](#); [CERN-INTC-2007-004](#)(p4)., (thx D.Lunney, L.Fraile)
- [srr16a] S.Rothe, “Proposal - Introducing Fast Beam Multiplexing at ISOLDE”, [EDMS1509964](#)
- [srr16b] S.Rothe et al., “Advances in surface ion suppression from RILIS: Towards the Time-of-Flight Laser Ion Source (ToF-LIS)” [NIMB, 376 \(2016\) 86-90](#)
- [JAR] Proposal Jose Alberto Rodriguez

THX to:
J.A. Rodriguez
E. Siesling
M. Bissell
J. Cederkall
R. Ruber
L. Fraile
D. Lunney



ENGINEERING
DEPARTMENT