

A detailed wireframe rendering of a particle accelerator complex, showing a large oval-shaped ring structure in the foreground and a more complex, multi-structured facility in the background.

# **SOS for HADES Pion run**

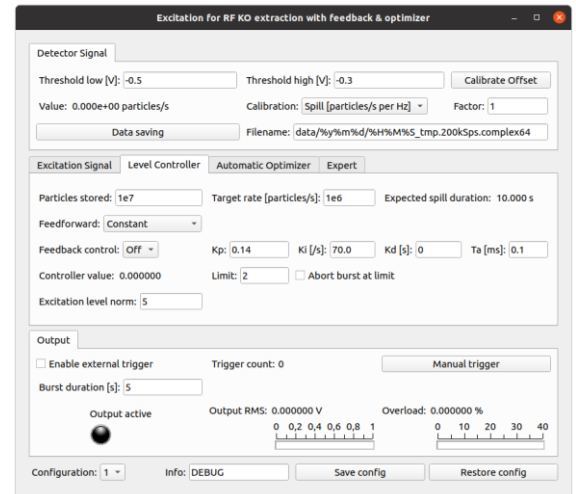
## **28.4. – 5.5.2025**

Machine Meeting 8.10.2024  
Philipp Niedermayer, Rahul Singh

# SOS for HADES Pion run 28.4. – 5.5.2025

- HADES Pion run [1]
  - Primary beam: Nitrogen  $^{14}\text{N}^{7+}$  at 2 GeV/u  
Maximum intensity ( $7 \cdot 10^{10}$  ions per spill)  
Maximum rigidity (18 T m)
- Topics for Spill Optimisation System (SOS)
  - Microspill quality
  - Machine safety
  - Macrospill shape
  - Operation

[1] Beamtime proposal G-22-00141 “Baryon couplings to mesons and virtual photons in the third resonance region: vacuum and cold matter studies – Pion induced reactions on CH<sub>2</sub> and C, Ag targets”, the HADES Collaboration, 2020.



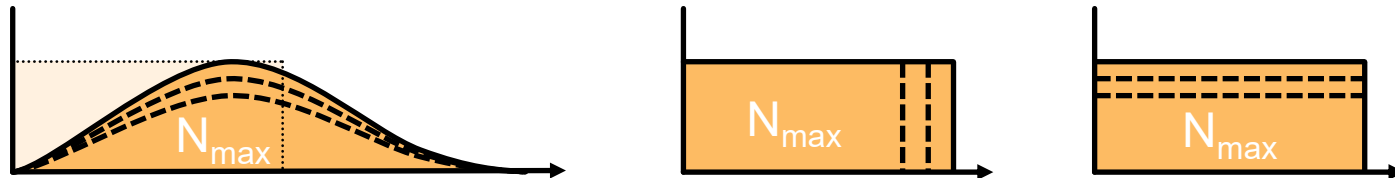
## Microspill quality

- Spill smoothing by secondary Poisson process with low cross section
  - Low secondary rate: no pile-up issues
  - Can use noise excitation, bunched extraction
  - Low power demand
  - Full extraction possible



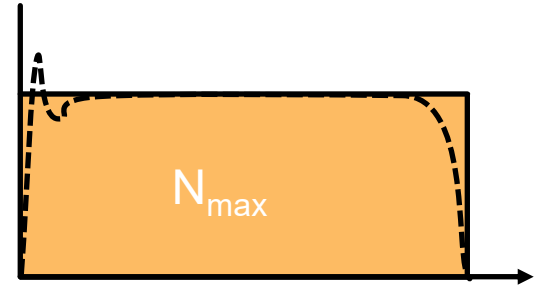
## Machine Safety

- Full extraction
    - ~~Dynamic extraction time~~
    - Combination with quad driven extraction (leads to drift of beam on target)
    - Combination with fast extraction to dump (for safety & beam abort scenario)
    - Fixed cycle time
      - Fixed rate, spill may be shorter
      - Fixed length, rate may be lower (implementation pending)
- Statistics gain: geometric factor (duty cycle)
- } same  $N_{\text{total}} \leq N_{\text{max}}$



## Macrospill shape

- Steep rise & minimal overshoot desired
  - Optimal SIS optics setup important
    - Correct chromaticity, smallest separatrix, etc.
      - Operator training for KO extraction?
  - Fine-tuning of feedback parameters
  - New option to define rise-time was implemented
- Sharp end of spill desired
  - With full extraction: fall-time expected
- Feedback signal options
  - HADES detector (pion beam);  
Ring intensity (DCCT); Beam loss monitor near septum



# SOS for HADES Pion run 28.4. – 5.5.2025

## Operation

- Spill Optimisation System provided as-is
  - No limitations with multiplexed operation
  - Full control system integration in work...
- Setup by PN & RS
- Daily operation by
  - HADES experimentalist? (as previously)
  - Control room crew? (training required)
- No on-call duty
- Documentation online  
[git.gsi.de/p.niedermayer/exciter/-/wikis/Site%20setup/SIS18KO](https://git.gsi.de/p.niedermayer/exciter/-/wikis/Site%20setup/SIS18KO)

APR	Fri	Sat	Sun	Mon	Tue	Wed	MAY	Thu	Fri	Sat	Sun	Mon
2025 v10	25	26	27	28	29	30	2025 v10	1	2	3	4	5
IS N	14-N						IS N	14-N				
SIS				141, HAD, 14-N			SIS	141, HAD, 14-N				Du HTI
ESR				172, ESR, 14-N			ESR	172, ESR, 14-N				
CRY							CRY					