FRIB PAC2 Webinar

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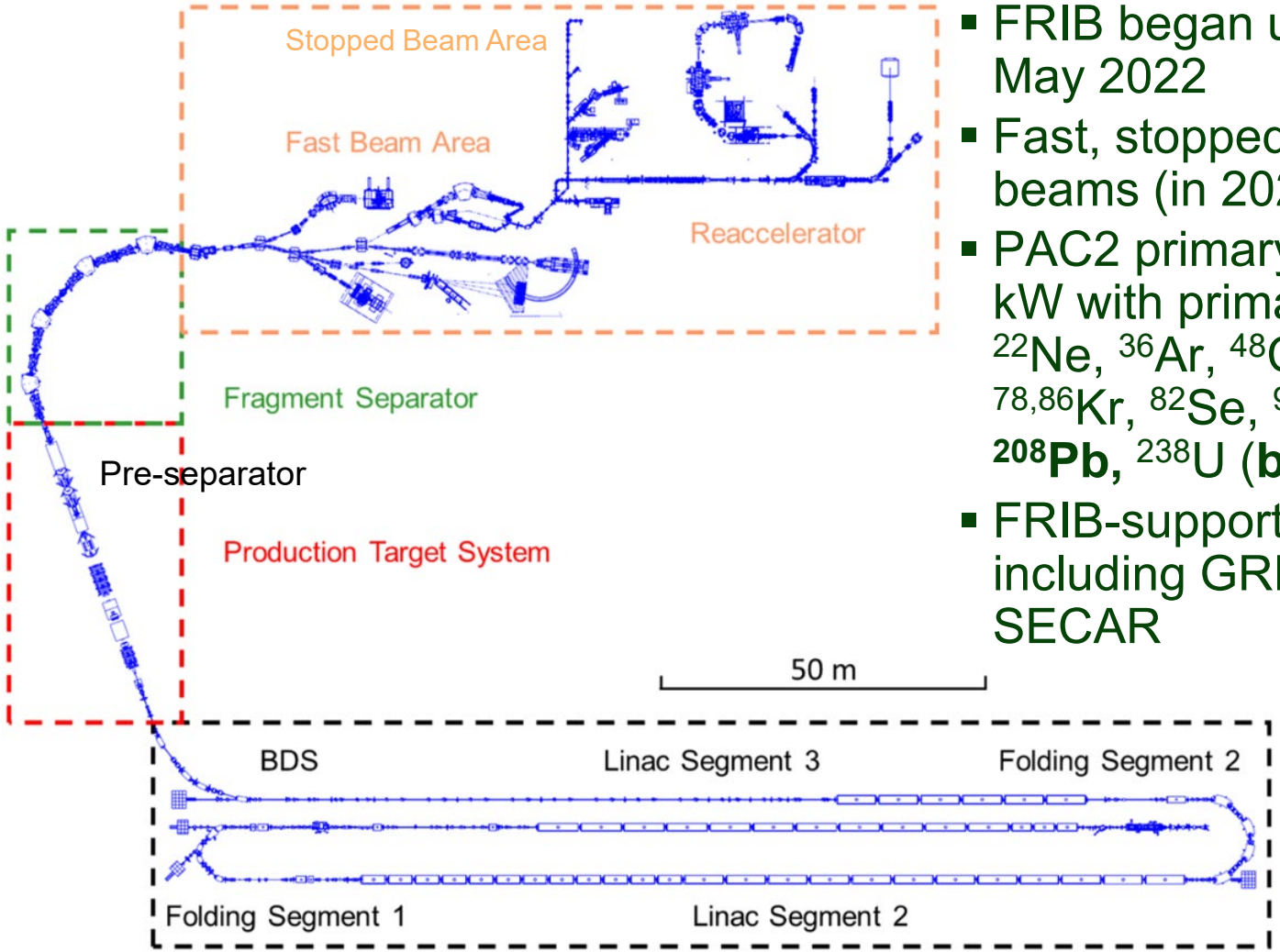
Outline – PAC2 Webinar

- Brief introduction to FRIB
- New for PAC2
- PAC2 Details
- PAC2 Beams
- Summary

Following this presentation, Daniel Phillips will make a short presentation on the FRIB-TA and opportunities for collaboration.

We will finish everything by 3:30 pm EST.

Schematic Overview of the FRIB Facility



- FRIB began user operation in May 2022
- Fast, stopped and reaccelerated beams (in 2023) available
- PAC2 primary beam power of 10 kW with primary beams: ^{18}O, ^{22}Ne, ^{36}Ar, ^{48}Ca ^{58,}**^{64}Ni**, **^{70}Zn,** ^{78,86}Kr, ^{82}Se, ^{92}Mo, ^{124}Xe **^{198}Pt, ^{208}Pb,** ^{238}U (**bold** new PAC2)
- FRIB-supported instruments including GRETINA, S800, SECAR

PAC2 Details

- FRIB PAC2 call for proposals was issued on October 28th. FRIB PAC2 will consider proposals for experiments using fast, stopped and reaccelerated rare-isotope beams
- See the FRIB Areas and instruments in Operations Page for available instruments
- Newly offered for PAC2:
  - Consideration of proposals for stand-alone stopped and reaccelerated beams (where FRIB has a unique capability)
  - Additional primary beams from the FRIB LINAC (see the FRIB beams page)
  - An additional experimental area, the S1 vault, which is the new, permanent location of the FRIB Decay Station Initiator (FDSi)
- Timeline for FRIB PAC2
  - 2 January 2023 - Last date for rare isotope beam rate requests
  - 23 January 2023 - Proposals submitted online by 11 p.m. EST
  - 1-3 March 2023 - PAC2 Meeting
  - 10 March 2023 - List of approved experiments posted to the FRIB website and spokespersons notified
- Updates to the User Portal (based on feedback) will make submission easier
- Researchers are expected to abide by the FRIB Research Code of Conduct

Research Code of Conduct

- Access to FRIB is conditioned on comportment with Research Code of Conduct, details are at https://frib.msu.edu/users/pac/conduct.html
- FRIB users are expected to communicate and publish the results of their research in a timely manner. During this process, conduct of research should be in accordance with the highest scientific, professional, and ethical standards
- Guidelines in the Code of Conduct for
  - Proposal preparation
  - Conduct of research
  - Publication of results
- We expect that people at FRIB, staff and users, comport themselves in a manner so that everyone can do their best work in a supportive environment

PAC2 New Proposal Fields – Collaboration Agreement

- Collaboration Agreement: The proposal form includes a requirement for a brief statement on the organization of the experimental collaboration. This section should address the following collaboration policies:
  - Responsibilities of participants
  - How conflicts will be resolved
  - How the collaboration will interface with FRIB
  - The PAC will use this information to assess how likely the collaboration will be able to carry out the proposed work
  - Examples of what could be used for this section are available on the Collaboration Organization Guidelines Page

PAC2 New Proposal Fields – Training/DEI

- Workforce Training: List anticipated outcomes from the proposed work to support workforce training
- Diversity, Equity, and Inclusion (DEI): List anticipated outcomes from the proposed work to support DEI efforts

PAC Proposal Evaluation

- The PAC evaluation is based on:
  - **The full scientific value of the results (multiple outcomes are desired)**
  - The technical feasibility of the proposal
  - The ability and past record of the collaboration to successfully conduct the proposed experiment, including the status of previously approved experiments at FRIB
  - The ability and past record of the collaboration to publish the results in a timely manner
- A first and second specialist reviewer will be assigned to each proposal. There will be no oral presentations, but at the latest one week prior to the PAC2 meeting, the reviewers will submit questions to the spokesperson if they have any.
- Based on its evaluation, the PAC will recommend allocation of beam to the FRIB Laboratory Director. The FRIB Laboratory Director will decide what beam time is granted.
- Approved proposals will be valid for a two-year period

FRIB Beam Rate Estimation

Google FRIB Rates - https://groups.nscl.msu.edu/frib/rates/fribrates.html

Select the PAC number or ultimate yield

- (•) PAC Two
- ( ) Ultimate FRIB yields

Enter values for A and Z

A		
Z		
N		
$T_{1/2}$		sec
	Lookup Estimate	

Beam

AZ		
Energy		MeV/u

Fragment

Target thickness		mg/cm^2
B_ρ (Q=Z)		Tm
Fast beam rate		pps
Stopped beam rate		pps
Reaccelerated beam rate		pps

FRIB

FRIB Estimated Rates Version 2.10
10/14/2022

O. Tarasov et al.

Estimation of Rare Isotope Beam Rates

- Use the on-line estimator to get an idea of possible experiments
- Once you have decided on an isotope of interest **for a proposal**, please contact Jill Berryman, Manager for User Relations (useroffice@frib.msu.edu), to be assigned a rare isotope scientist. The contact will help you with the detailed calculation of the beam(s).
- Please use the estimator to determine experiment feasibility and only request assistance for what you intend to include in a proposal
- If you wish to explore on your own, FRIB separator examples are provided in LISEcute++ package. A tutorial is available. Please keep in mind
  - Beam separation is complicated at FRIB
  - High primary beam power must be properly handled
  - High secondary fragment power must be properly collected
  - The separator has three stages of separation, multiple wedge/slit locations
- FRIB beam physicists will need to validate any estimated rare isotope beam rates prior to proposal submission
- The deadline for making your request is January 2, 2023. FRIB beam physicists strive for a two-week response time for requests

Summary FRIB PAC2

- Introduction to FRIB
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Questions are welcome.

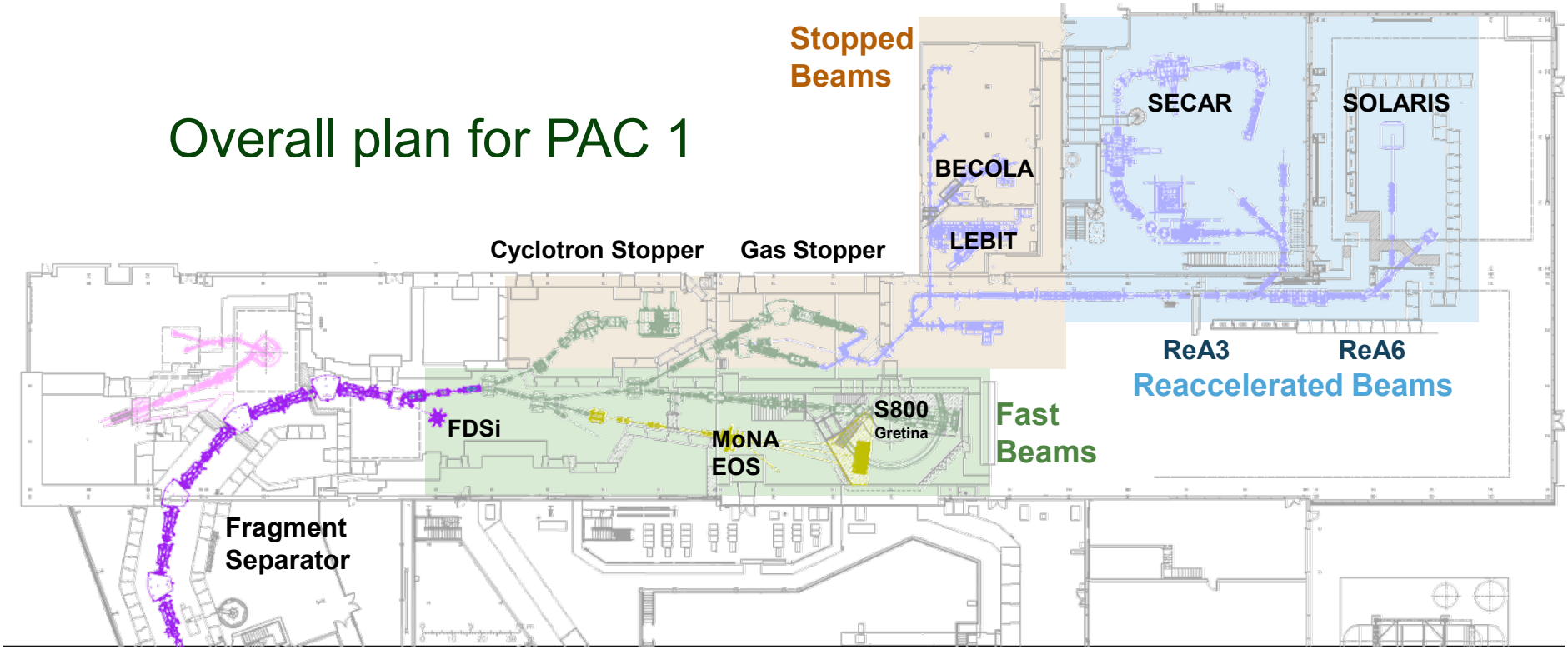
Backup Material

Stopped and Reaccelerated Beams

Stopped beam rate = FRIB rate × ε_{stop} × $\varepsilon_{extract}$

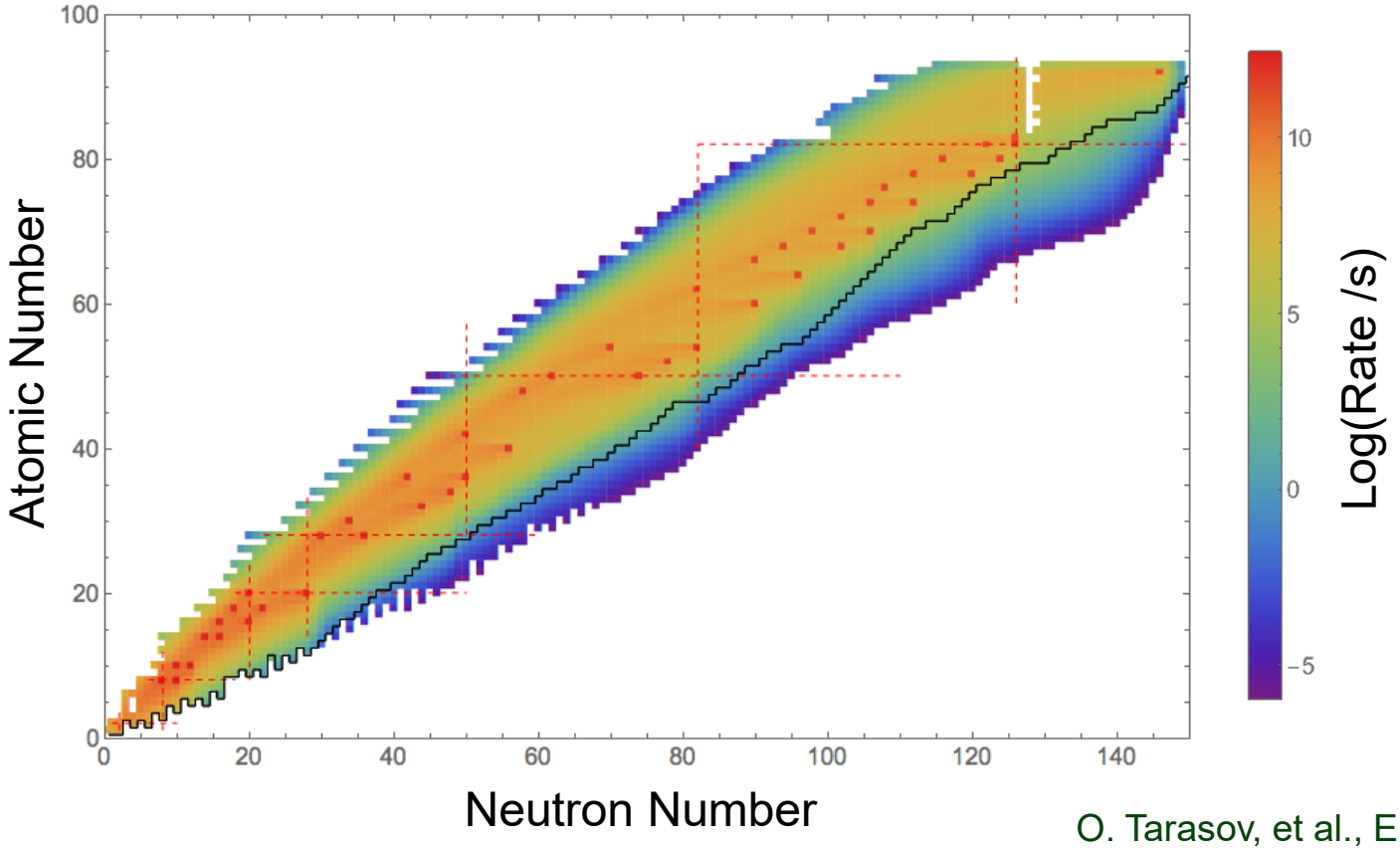
Reaccelerated rate = stopped rate × $\varepsilon_{EBIT\ inject}$ × $\varepsilon_{charge\ breeding}$ × $\varepsilon_{acceleration}$ × $\varepsilon_{beam\ transport}$

Overall plan for PAC 1



Beams Available at FRIB With Full Operations

- Fast beam rates
- Reaccelerated beams will have reduced intensity



O. Tarasov, et al., EPAX 2.15

Fast Beam Emittance (Approximate) and PID

- Beam spots will be approximately 5 mm x 10 mm (could be larger, e.g. at the β-decay station 20 mm x 20 mm) – tell us what you need
- Beam emittance is 40π mm-mr horizontal and 120 π mm-mr vertical
- Beam momentum spread will be approximately ±1.5% corresponding to an energy spread of ±3%
- Emittance and energy spread could be made smaller with a loss of intensity
- We will work with users to provide magnetic rigidity (brho) and TOF signal if desired
- We will work with users to provide an ion-by-ion PID if desired (needs development)
- For any given experiment, work with a member of the rare isotope group will be necessary to determine expected beam characteristics