



INVITATION

for a

VERA – SEMINAR

with

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Taming neutrons for nuclear astrophysics

Neutrons play a crucial role in the synthesis of elements heavier than iron in stars and stellar explosions via the slow (s), intermediate (i), and rapid (r) neutron capture processes. The neutrons for these astrophysical processes are produced either in-situ by alpha-induced reactions (in the s- and i-process) or available in copious amounts from the neutron-rich astrophysical environment (r process).

In all three processes, the fine balance between neutron capture and beta-decay rates under the given astrophysical conditions defines how long a nucleus can accumulate material before decaying into the next isotopic chain. Due to the location of these processes on the chart of nuclei, the availability of experimental data greatly differs. In the past decades we have come a long way to better understand these astrophysical processes by measuring nuclear physics properties of more and more exotic nuclei. While masses and beta-decay half-lives are well measured for the majority of the presently known ~3300 nuclei, neutron capture reactions have predominantly been measured at and close to stability in the past 50 years [1], with satisfying precision for most astrophysical modelling. However, the direct measurement of neutron cross sections with shorter half-lives (half-life <1 year) requires the use of radioactive beams in inverse kinematics and the development of new methods.

I will introduce a new proposal for the direct measurement of neutron capture cross sections of shorter-lived nuclei. So far only indirect methods have been used. I will describe a path towards a pioneering facility consisting of a heavy-ion storage ring connected to our ISAC radioactive beam facility at TRIUMF where some of these reactions could be measured directly, with a moderated neutron target [1].

[1] I. Dillmann, O. Kester, et al., Eur. Phys. J. A59 (2023) 105

Thursday, 18. April 2024, 16:30 o'clock

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R. Golser

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