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Solving the Puzzle of the Cosmochronometer ^{92}Nb Production Sites

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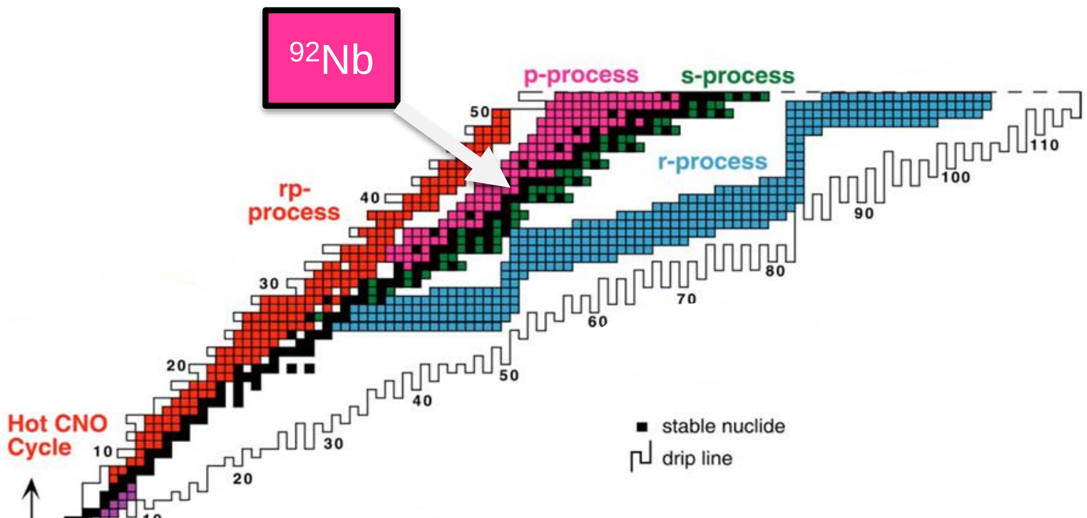
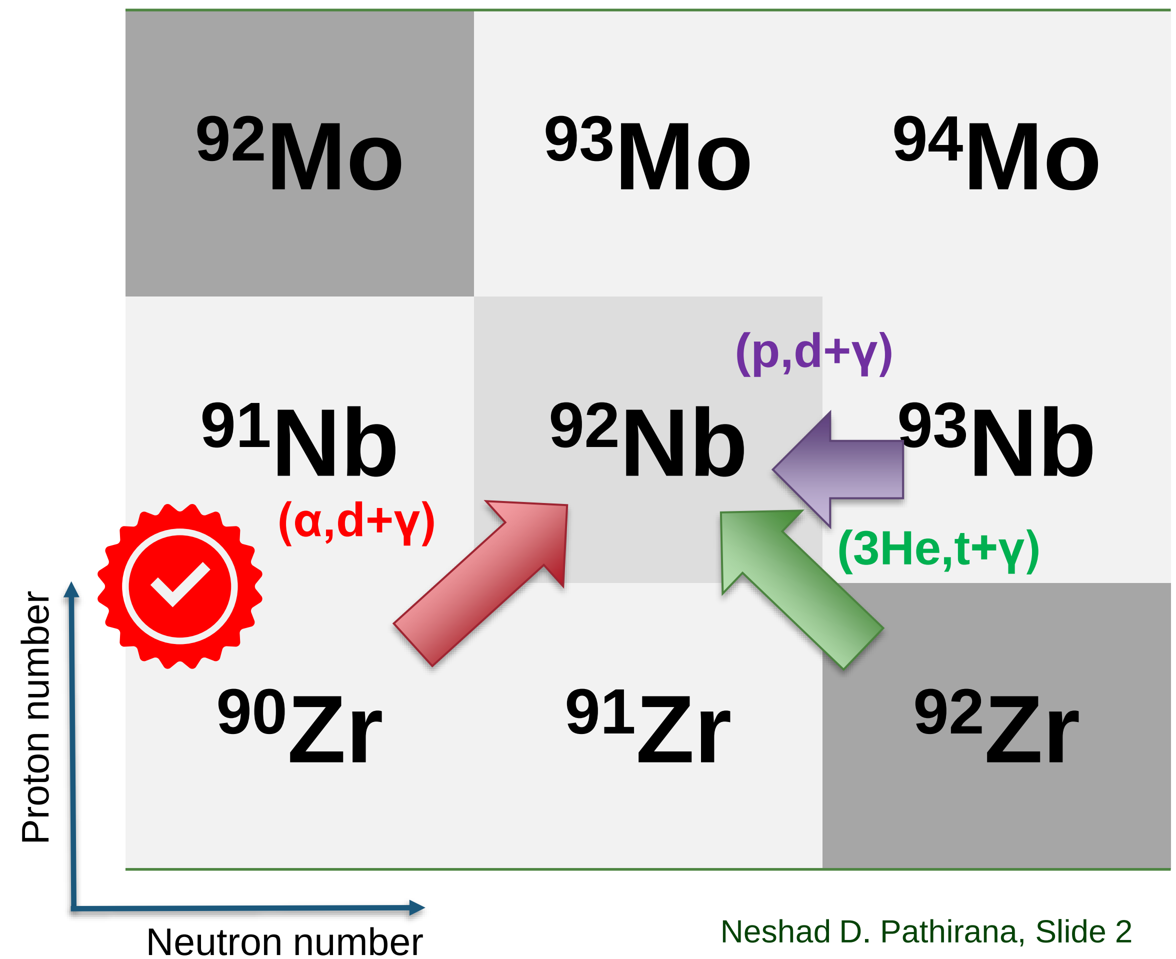
Why Focus on ^{92}Nb?



https://groups.nscl.msu.edu/SuN/

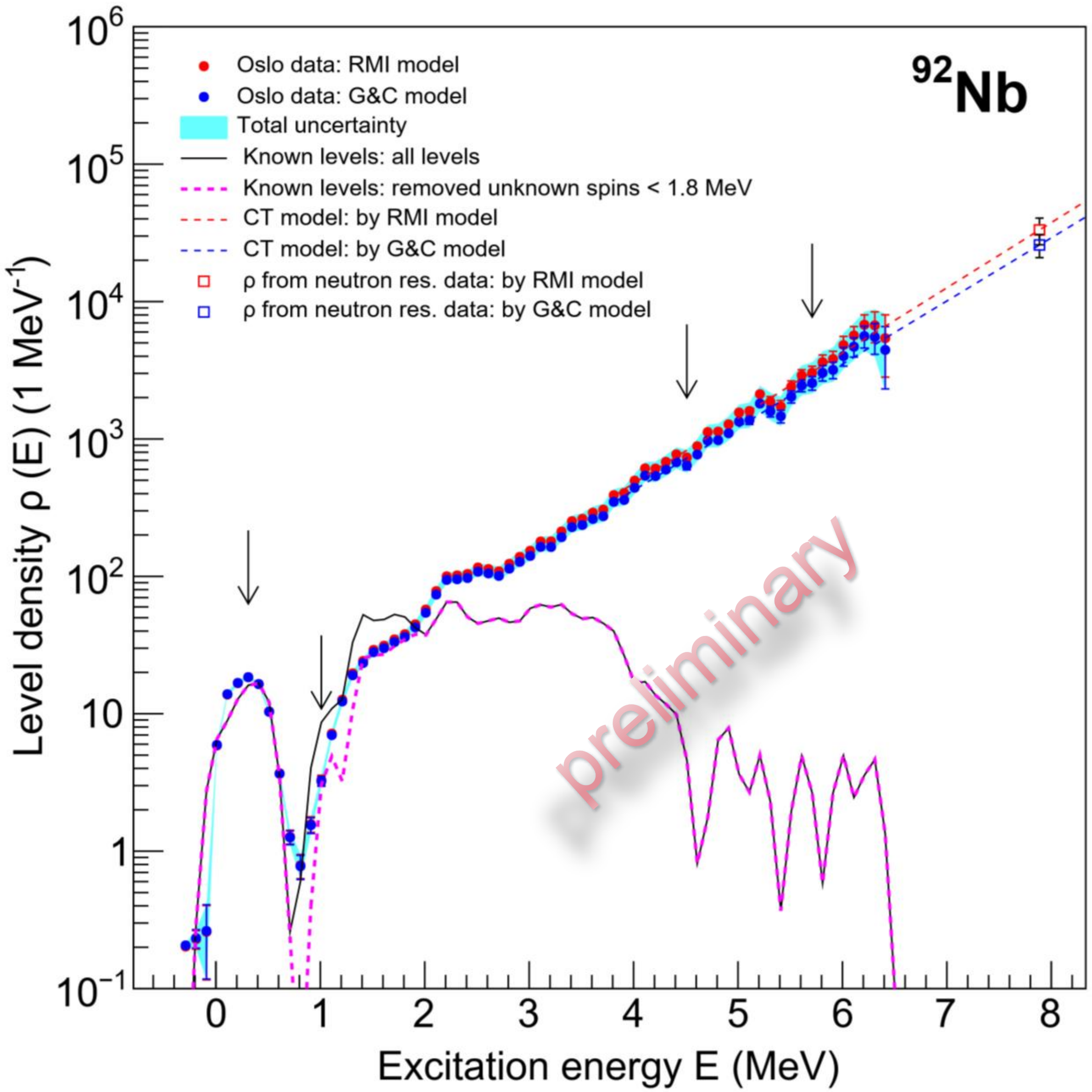
Cosmochronometer : Long-lived radionuclide produced in stellar events with a half life comparable to astronomical timescales

- The production sites of ^{92}Nb are still poorly understood
- It cannot be produced via EC/β-decay of ^{92}Zr and ^{92}Mo, which are both stable
- Different nucleosynthesis sites have been proposed:
    - ν-process in core-collapse supernova
    - γ-process in type Ia supernova
- Discrepancies still exist in the production of ^{92}Nb relative to ^{92}Mo between simulations and observed ratios

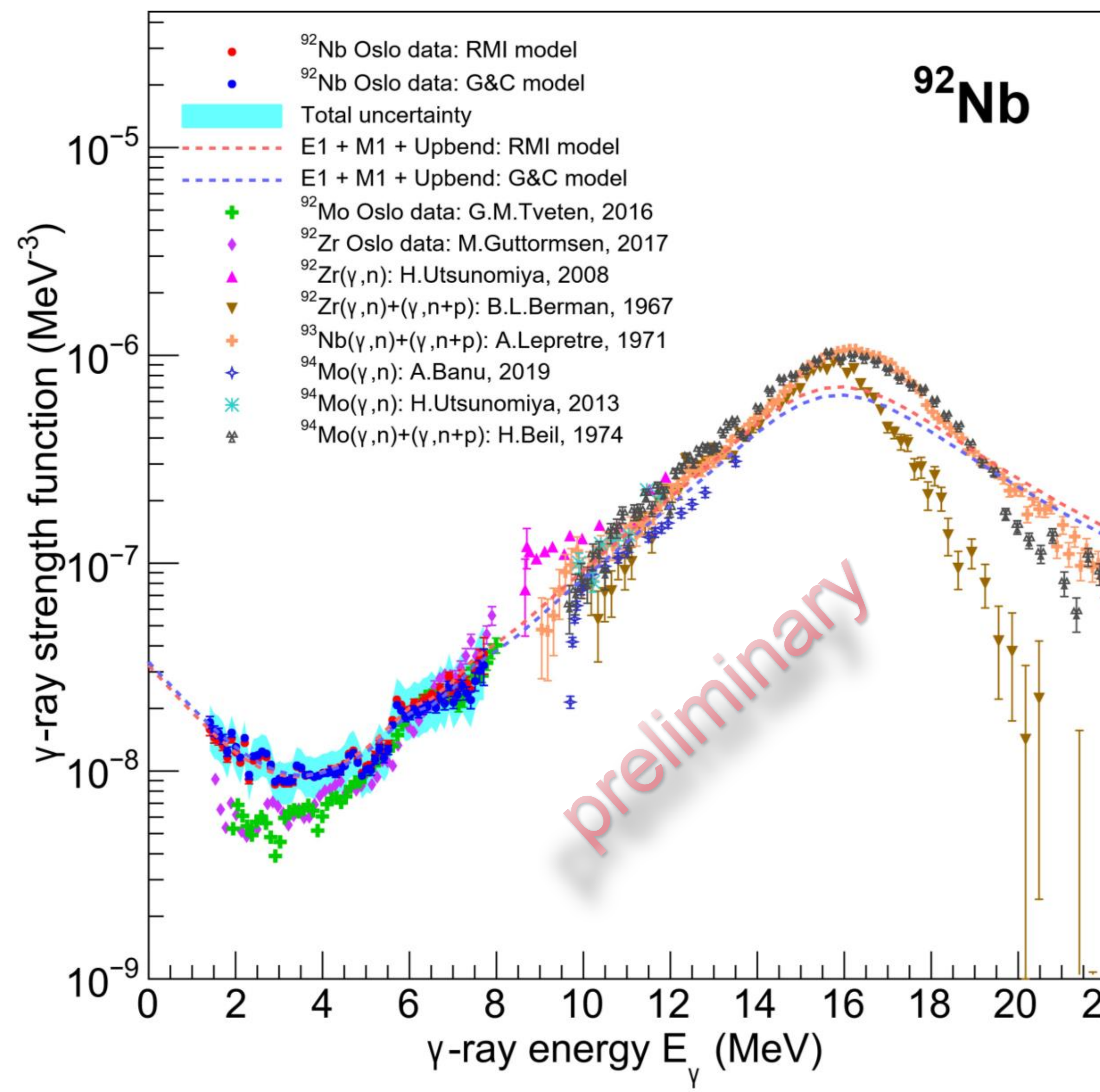


Nuclear Level Density and γ-ray Strength Function of ^{92}Nb

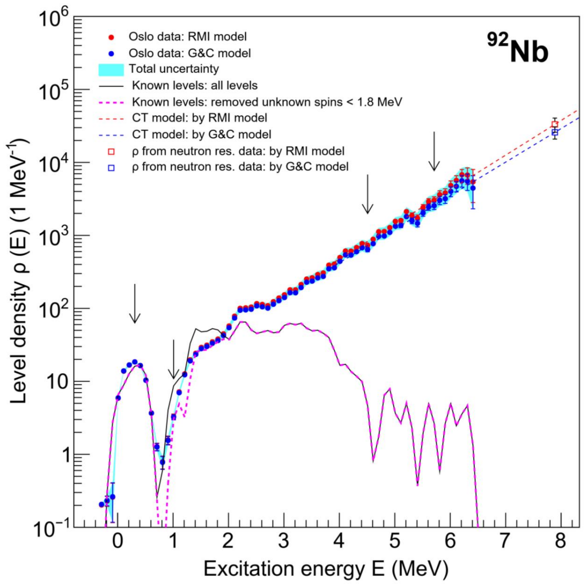
Nuclear Level Density of ^{92}Nb

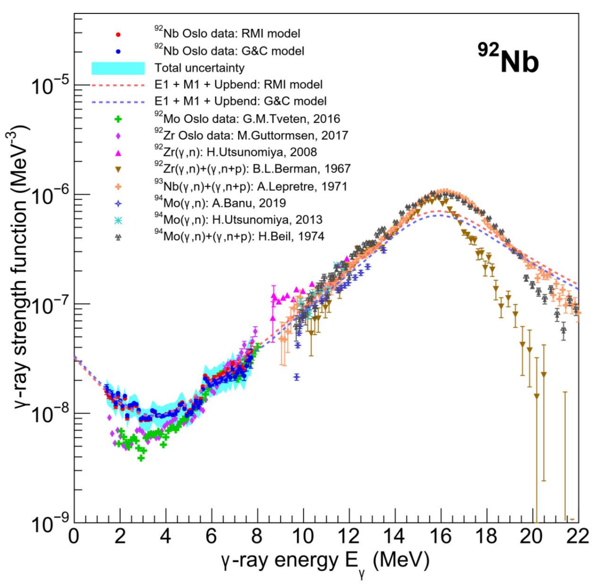


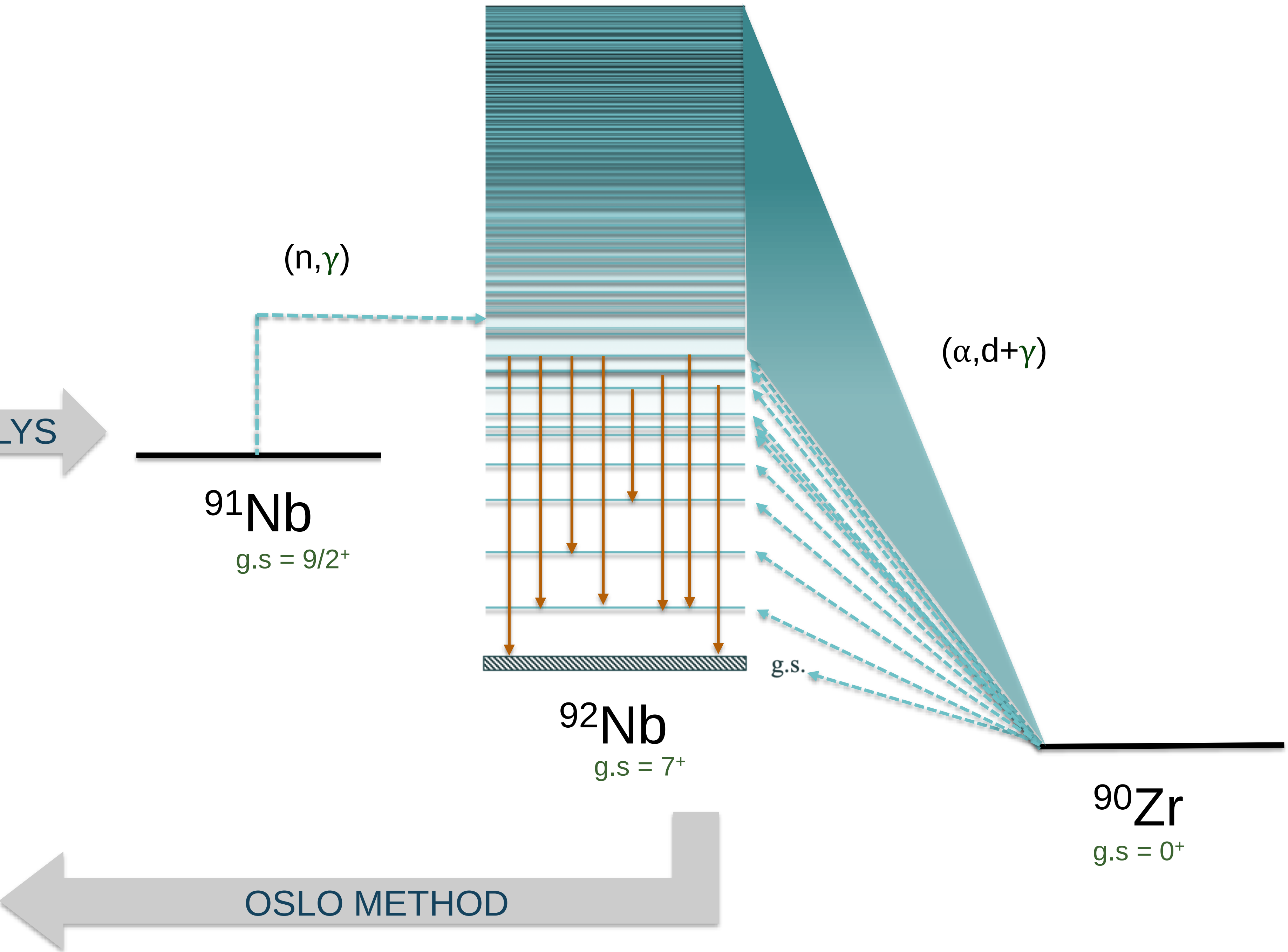
γ-ray Strength Function of ^{92}Nb



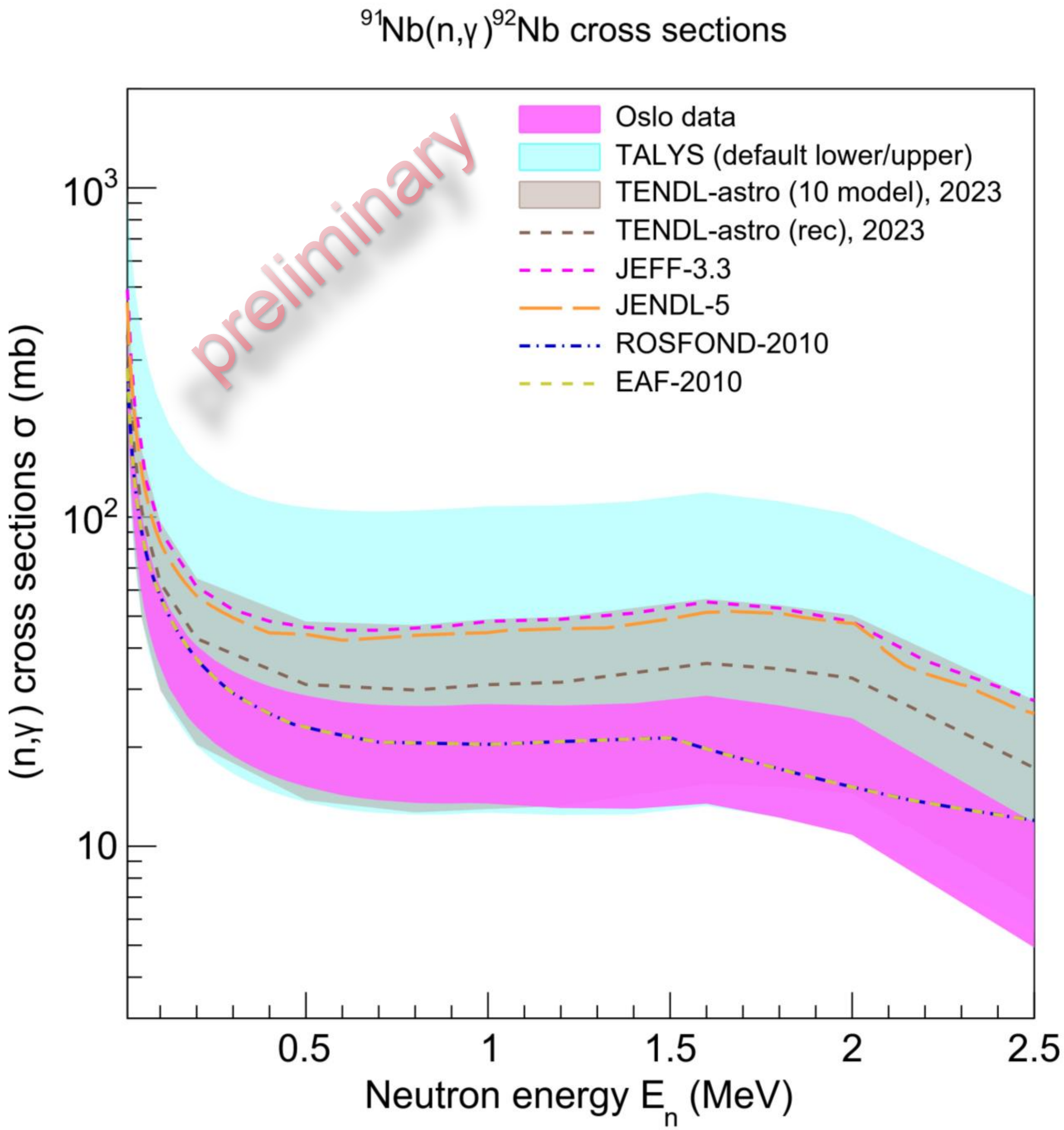
Combining the Oslo Method and TALYS

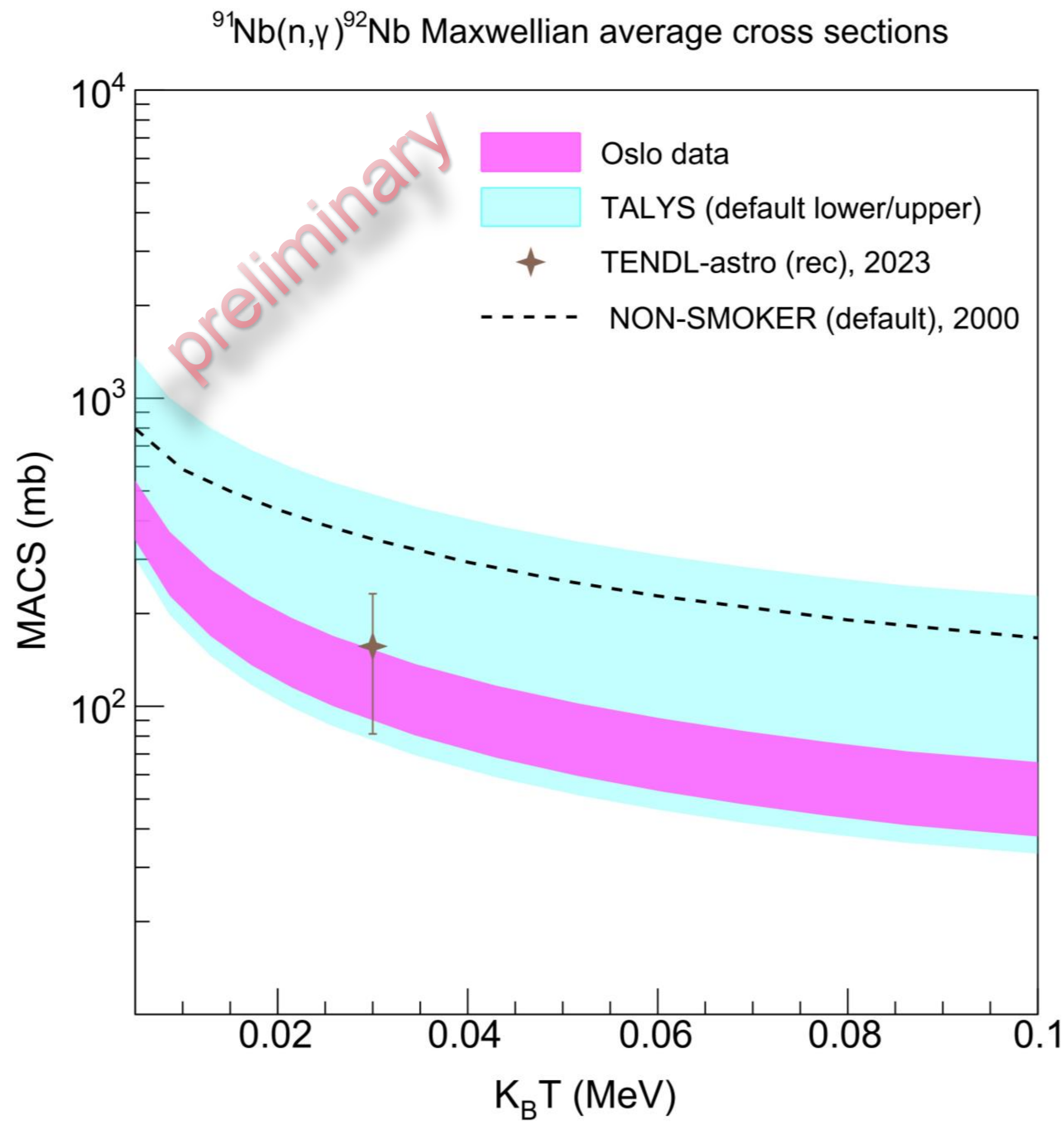




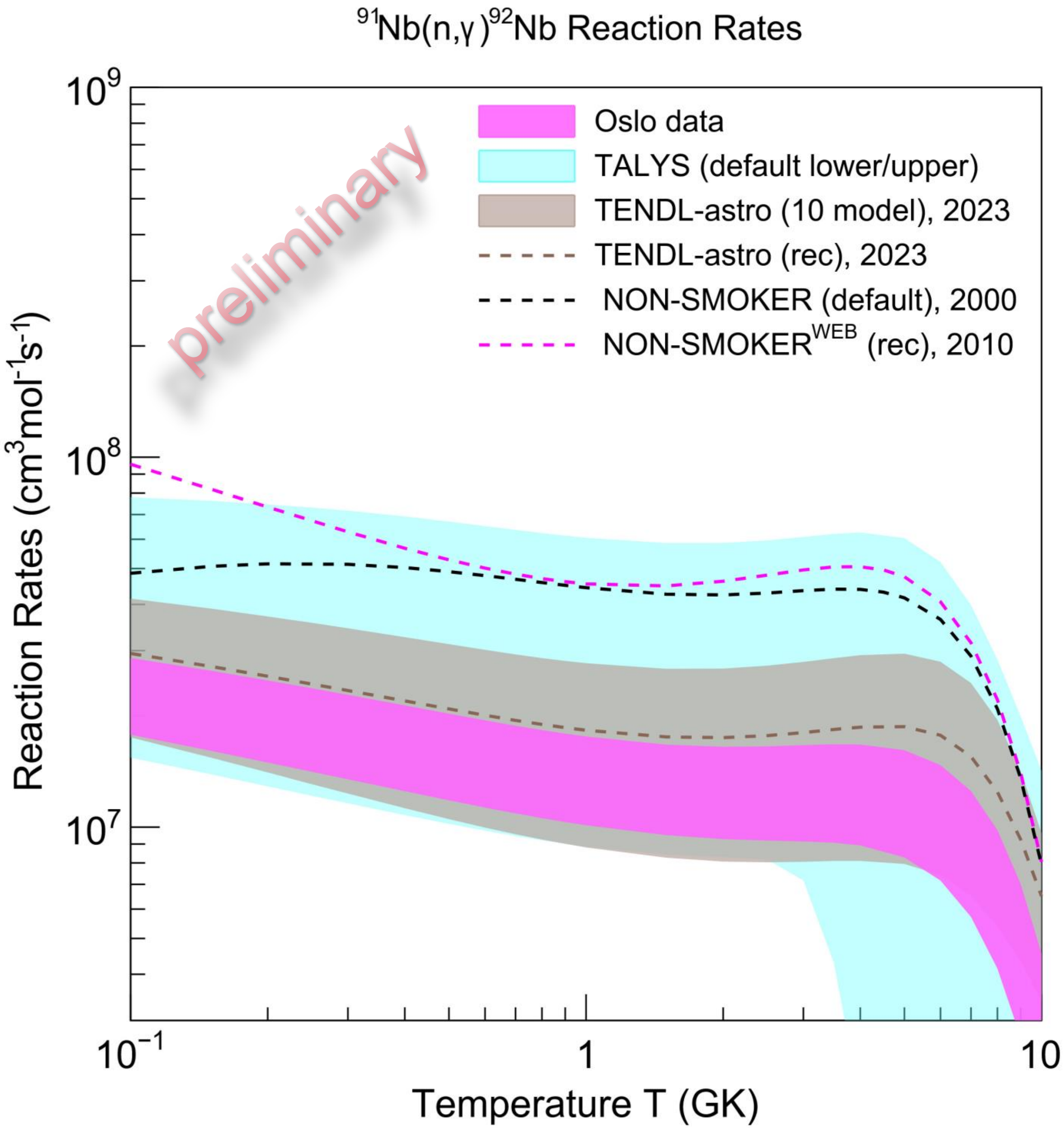


$^{91}Nb(n,\gamma)^{92}Nb$ Cross Sections and MACS





$^{91}Nb(n,\gamma)^{92}Nb$ Reaction Rates



- The experimentally extracted $^{91}Nb(n,\gamma)^{92}Nb$ reaction rates are 2-3 times lower than the recommended NON-SMOKER values
- However, the extracted rates are comparable to the most recent calculation, TENDL-astro 2023, which provides the best model predictions from TALYS

Thank You!

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