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# LIfetime meaSurement with AGATA for AstrophysiCs - 21Na (ISAAC-21)

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To assess the Universe chemical evolution a crucial ingredient is the cross section of nuclear reactions taking place in stars. Given its low value, pico- to femto-barn, at astrophysical energies, that prevents direct measurements and we still have to rely on extrapolation. The contribution of narrow or of large sub-threshold resonances, which may dominate the reaction rate, cannot be, however, accounted for by the extrapolation. In this scenario, accessing to low energy and sub-threshold resonance lifetime is of paramount importance to constrain the extrapolation and parameterize their contribution to the cross section at the energies of interest. The proposed measurement aims to measure the lifetime of a subthreshold resonance, at $E\textsubscript{r} = -6.7$~keV, of the $^{20}$Ne(p,$\gamma$)$^{21}$Na reaction, which has a key role in AGB star nucleosynthesis of isotopes up to A = 40. The corresponding excited level in $^{21}$Na, $E\textsubscript{x} = 2424$~keV ($J^{\pi}$ = $1/2^{+}$), will be populate via the $^{21}$Ne(p,n)$^{21}$Na channel in inverse kinematic. The 40~nm thick H implanted target will be irradiated by $^{21}$Ne beam, with E=8 AMeV and $I\textsubscript{b} = 2$~pnA.
Two substrates will be used for the implanted target: Si and Au, allowing, together with AGATA detection system, to exploit DSAM technique with high sensitivity and independent from simulations.

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