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Hoyle Reloaded: A fix for the Cosmological Lithium Problem?[1]
RICHARD CYBURT, JINA/NSCL/MSU, MAXIM POSPELOV, University of Victoria/Perimeter Institute — There is a significant discrepancy between the current theoretical prediction of the cosmological lithium abundance, mostly produced as ^{7}Be during the Big Bang, and its observationally inferred value. We investigate whether the resonant enhancement of ^{7}Be burning reactions may alleviate this discrepancy. We identify one narrow nuclear level in ^{9}B, $E_{5/2^+} \simeq 16.7$ MeV that is not sufficiently studied experimentally, and being just ~ 200 keV above the ^{7}Be+d threshold, may lead to the resonant enhancement of $^7\mathrm{Be}(d,\gamma)^9\mathrm{B}$ and $^7\mathrm{Be}(d,p)\alpha\alpha$ reactions. We determine the relationship between the domain of resonant energies E_r and the deuterium separation width Γ_d that results in the significant depletion of the cosmological lithium abundance and find that $(E_r,\ \Gamma_d) \simeq (170-220,\ 10-40)$ keV can eliminate current discrepancy. Our results also imply that before dedicated nuclear experimental and theoretical work is done to clarify the role played by this resonance, the current conservative BBN prediction of lithium abundance should carry significantly larger error bars, $[^7\mathrm{Li/H}]_{\mathrm{BBN}} = (2.5-6)\times 10^{-10}$.

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Richard Cyburt
JINA/NSCL/MSU

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