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The Primordial Lithium Problem : Can We Avoid New Physics ?

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The primordial abundances of light elements form an important evidence of the Big Bang Model of the universe. With precise measurements of the baryon-to-photon ratio, η from WMAP, these final abundances, which are functions of η alone in general, are fixed and must be consistent. As a result, any discrepancy between the theoretical and observational abundances of these elements, as exists for lithium, may be due to inadequacies in the Big Bang Nucleosynthesis Model which is based on the Standard Model of particle physics and cosmology. This could potentially point to new physics beyond the Standard Model such as decaying dark matter, or incompleteness of the nuclear reaction network. The theoretical 7 Li abundance is 3-4 times more than the observational values at ηWMAP. In order that the former matches the latter, 7 Li destruction needs to be enhanced as the production channels are more constrained. This could be achieved within the Standard Mo!
del via missed resonant nuclear reactions, which is the possibility we explore. We find some potential candidate resonances which can solve the lithium problem if the radii of the resonant channels are large (> 10 fm). These resonance properties need experimental verification. If experiment rules them out, then we may be compelled to invoke new physics to solve the lithium problem and potentially constrain dark matter models.

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