



Big Bang Nucleosynthesis constraints on Supersymmetry

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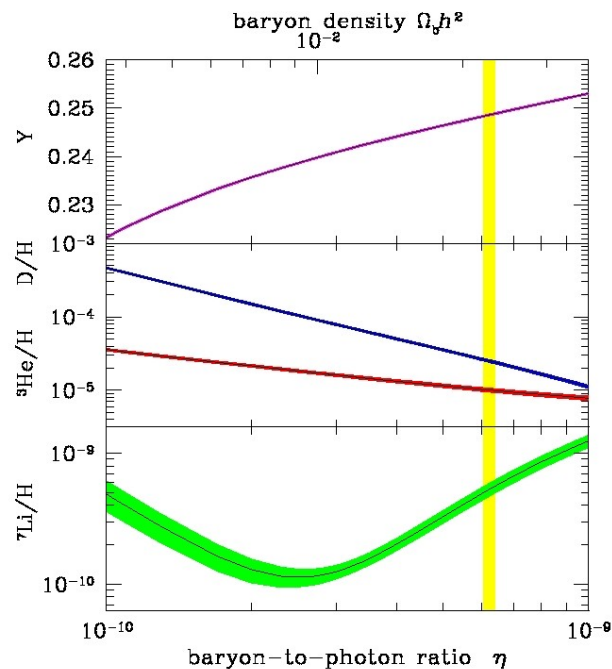
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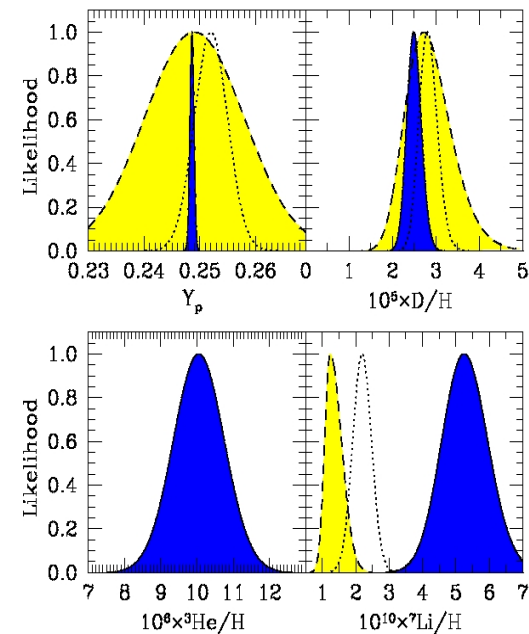
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Standard BBN Results

- BBN predictions



- Obs. comparison



Cyburt et al (2008)

Cyburt (2004)

Descouvemont et al (2004)

Serpico et al (2004)

How to fix the Li problem

- Observation
 - Unknown systematic?
- Stellar Evolution
 - Extra mixing?
 - Binary companion contamination?
- Exotic Physics (e.g. particle physics)

Exotic Particle Physics

- Test new physics with obs. comparison
- Simple ext. constrained as $N_{\nu, \text{eff}}$
- Dark matter and/or SUSY inspired
 - Long-lived heavy particles
 - Decay products change BBN predictions

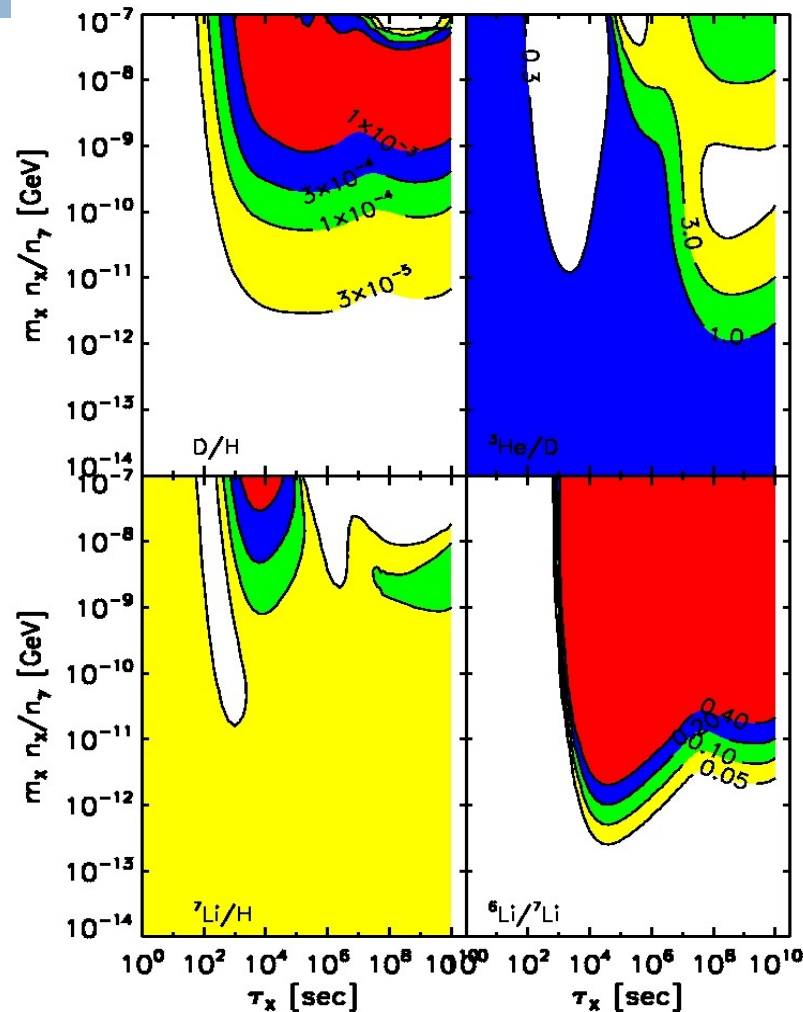
Decaying Particles

- Decay during or after BBN
- E/M and hadronic decays
- Injected particles are of high energy
 - Dominated by energy loss w/ bg
 - Erode existing nuclides into others
- Possible catalyzed fusion

Results for X decays

- No change in SBBN predictions
 - X-abun/injected energy too low
- Erode Li7 predictions to obs level
 - Keeping D & He4 agreement
- Destroy all agreement with obs

Results



Pospelov et al (2010)
 Cyburt et al (2009)
 Jedamzik et al (2006)
 Kohri et al (2005)

Conclusions

- Li problem remains
- New physics is likely explanation
 - Stellar evolution
 - Exotic physics (e.g. SUSY)
- BBN excludes large parameter space
- LHC is poised to obs. SUSY

Collaborators



- John Ellis (CERN)
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