

Ministry of Science and Higher Education

Republic of Poland

Contribution ID: 36

Type: Oral presentation (preferred)

Formation of the first molecules in early Universe beyond the Λ CDM model

Monday 25 September 2017 15:50 (20 minutes)

We study the formation of first molecules H_2 and HD, negative Hydrogen ions H^- , molecular ions H_2^+ and HeH⁺ in the pre-reionization Universe. The cosmological recombination is described within the framework of modified model of the effective 3-level atom [Seager, Sasselov & Scott, 1999; Wong, Moss & Scott, 2008], while for the kinetics of chemical reactions we restrict consideration to the minimal model of [Galli & Palla, 1998] for Hydrogen, Deuterium and Helium. It is found that the uncertainties of molecular abundances caused by the inaccuracies in description of cosmological recombination are about 2-3%, comparable to those caused by the uncertainties of parameters of the Λ CDM model (up to 2.3%). We investigate the effect of deviations from Λ CDM (minimally and non-minimally coupled dynamical dark energy, decaying dark matter) on the evolution of abundances of the first molecules.

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