Contribution ID: **68** Type: **Oral Presentation**

Relativistic electron-positron plasma screening in astrophysical environments

Tuesday, 27 June 2017 17:05 (25 minutes)

If an astrophysical environment is hot enough (greater than approximately 0.5 MeV or so), screening in the associated nuclear reactions can be modifed by the presence of a relativistic electron-positron plasma. For non-zero electron chemical potentials, the effect is compounded as the relativistic Debye length in a plasma can be much lower than the classical Debye length. The screening is then enhanced beyond the commonly used classical approximation. This can result in a further enhancement of nuclear reaction rates, and the reaction rate enhancement factor is studied in several relevant scenarios. For sub- or near-threshold resonances, this could potentially change the reaction rates by a significant amount as the reaction energy effectively shifts the resonance above or below threshold. Possible sites where relativistic plasma screening could have a significant effect on results include Big Bang Nucleosynthesis, alpha-rich freezout in the r-process, x-ray bursts, type Ia supernovae, and late-stage burning in massive stellar cores. Current results will be presented in which relativistic plasma effects in high-temperature and high-density environments have been studied. In addition, plasma screening is extended into the intermediate screening regime by exploring higher-order terms in the Poisson-Boltzmann equation.

Presenter: FAMIANO, Michael

Session Classification: Session 4 (Chair: P. Papakonstantinou)