

# SMASH model and atmospheric neutrino mass splitting

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Five fundamental problems - neutrino oscillations, baryogenesis, dark matter, inflation, strong CP problem - are solved at one stroke in a model, dubbed as “SM-A-S-H” (Standard Model-Axion-Seesaw-Higgs portal inflation) by Andreas Ringwald et. al. The Standard Model (SM) particle content is extended by three right-handed SM-singlet neutrinos  $N_i$ , a vector-like color triplet quark  $Q$ , a complex SM-singlet scalar field  $\sigma$  that stabilises the Higgs potential, all of them being charged under a global lepton number (hyper-charge) and Peccei-Quinn (PQ)  $U(1)$  symmetry, the vacuum expectation value  $v_\sigma \sim 10^{11}$  GeV breaks the lepton number and the Peccei-Quinn symmetry simultaneously. We found that numerically SMASH model not only solves five fundamental problems but also the sixth problem “Vacuum Metastability” through the extended scalar sector and can predict approximately correct atmospheric neutrino mass splitting around 0.05 eV.

**Primary author(s) :** Dr. DAS, Chitta Ranjan (Bogoliubov Laboratory of Theoretical Physics)

**Co-author(s) :** Prof. HUITU, Katri (Helsinki Institute of Physics); Dr. KÄRKKÄINEN, Timo (Department of Physics)

**Presenter(s) :** Dr. DAS, Chitta Ranjan (Bogoliubov Laboratory of Theoretical Physics)

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