

## Abstract

We propose an inflationary scenario, M-flation, in which inflation is driven by three  $N \times N$  hermitian matrices  $\Phi_i, i = 1, 2, 3$ . The inflation potential of our model, which is strongly motivated from string theory, is constructed from  $\Phi_i$  and their commutators. We show that one can consistently restrict the classical dynamics to a sector in which the  $\Phi_i$  are proportional to the  $N \times N$  irreducible representations of  $SU(2)$ . In this sector our model effectively behaves as an N-flation model with  $3N^2$  number of fields and the effective inflaton field has a super-Planckian field value. Furthermore, the fine-tunings associated with unnaturally small couplings in the chaotic type inflationary scenarios are removed. Due to the matrix nature of the inflaton fields there are  $3N^2 - 1$  extra scalar fields in the dynamics. These have the observational effects such as production of iso-curvature perturbations on cosmic microwave background. Moreover, the existence of these extra scalars provides us with a natural preheating mechanism and exit from inflation. As the effective inflaton field can traverse super-Planckian distances in the field space, the model is capable of producing a considerable amount of gravity waves that can be probed by future CMB polarization experiments such as PLANCK, QUIET and CMBPOL.