Abstract Submitted
for the SES19 Meeting of
The American Physical Society

Modeling Transition Histories from Inflaton to Radiation Domination JORDAN SHEELY, UNC Chapel Hill — The period of accelerated expansion in the early Universe known as inflation provides compelling solutions to the horizon and flatness problems, the homogeneity of the Universe, and the source of density fluctuations that go on to seed structure formation. It is widely taken to be driven by a slowly evolving scalar field, the inflaton, that dominated the Universe during inflation. The field then decays into a radiation bath, reheating the Universe. There is little understanding of the Universe's transition from inflaton to radiation domination; in order to learn more about inflation, we need to know information about this transition to link observations back to inflaton dynamics. We explore the mechanics of inflation and reheating in the limit of perturbative decay, and test possible transition histories from inflaton to radiation domination. In the standard picture of inflation, the inflaton experiences decaying oscillations about its minimum, losing all its energy. We examine the possibility of decay so rapid that the inflaton never reaches an oscillatory state, and find that it is mathematically possible. We then find reheating histories for various ratios of the inflaton decay rate Γ to its mass m with two fixed reheating temperatures (10^{10} and 10^{15} GeV).

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Date submitted: 30 Sep 2019 Electronic form version 1.4