

# PRISMA+ Colloquium

Dec. 6, 2017 at 1 p.m.  
Lorentz-Raum 05-127, Staudingerweg 7

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## **Calculation of the axion mass based on high-temperature lattice quantum chromodynamics**

We present a full result for the equation of state (EoS) in 2+1+1 (up/down, strange and charm quarks are present) flavour lattice QCD. We extend this analysis and give the equation of state in 2+1+1+1 flavour QCD. In order to describe the evolution of the universe from temperatures several hundreds of GeV to the MeV scale we also include the known effects of the electroweak theory and give the effective degree of freedoms. As another application of lattice QCD we calculate the topological susceptibility ( $\chi$ ) up to the few GeV temperature region. These two results, EoS and  $\chi$ , can be used to predict the dark matter axion's mass in the post-inflation scenario and/or give the relationship between the axion's mass and the universal axionic angle, which acts as a initial condition of our universe.