Quantum Gravity Constraints on Dark Matter and Inflation

Quantum gravity is often believed to have very little to do with observable physics. In this talk, we discuss how general properties of quantum gravity can impose non-trivial constraints on dark matter physics and on inflationary scenarios. First, we discuss how the existence of milli-charged dark matter particles squares with quantum gravity and string theory. Then, we propose a mechanism motivated by string theory, known as Stuckelberg portal, by which the dark matter particles can interact with the visible matter. Finally, we discuss how quantum gravity can impose a stringent upper bound on the axion field ranges (aka decay constants) and hence the gravitational wave signal generated by axion inflation.