Contribution ID: **17** Type: **not specified**

Cosmological implications of photon-flux upper limits at ultra-high energies in scenarios of Planckian-interacting massive particles for dark matter

Tuesday, December 6, 2022 2:00 PM (45 minutes)

Instantons can give rise to decay of particles otherwise forbidden. Using data collected at the Pierre Auger Observatory, we present a search for signatures of such instanton-induced decay processes that could be at work for super-heavy particles produced sufficiently during the post-inflationary epoch to match the relic abundance of dark matter inferred today. The non-observation of these signatures allows us to derive a bound on the reduced coupling constant of gauge interactions in the dark sector: $\alpha_X \leq 0.09$, for $10^9 \leq M_X/\mathrm{GeV} < 10^{19}$. Conversely, we obtain that, for instance, a reduced coupling constant $\alpha_X = 0.09$ excludes masses $M_X \geq 3 \times 10^{13}$ GeV. In the context of dark matter production from gravitational interactions alone, we illustrate how these bounds are complementary to those obtained on the Hubble rate at the end of inflation from the non-observation of tensor modes in the cosmological microwave background.

Primary author: DELIGNY, Olivier (CNRS/IN2P3 – IJCLab)

Presenter: DELIGNY, Olivier (CNRS/IN2P3 – IJCLab)