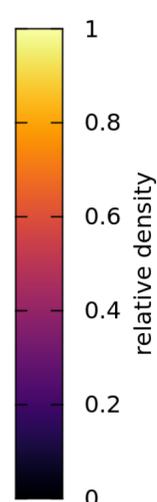
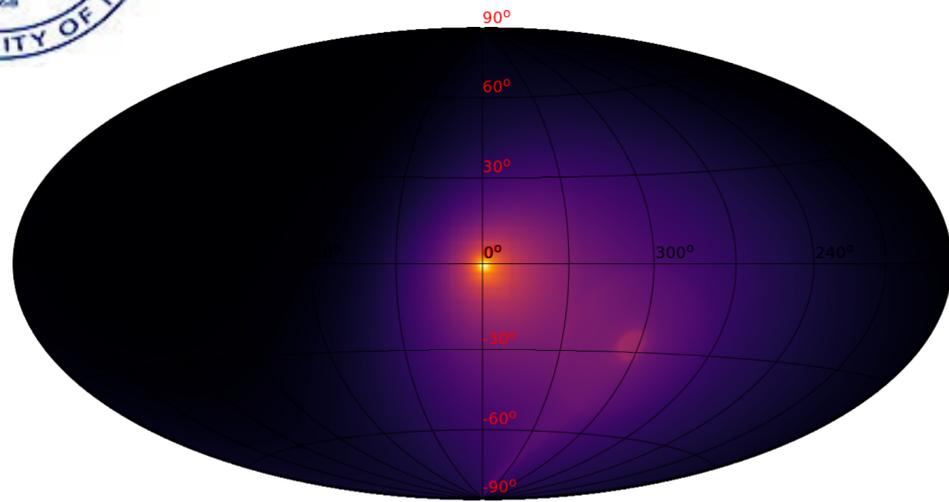




Searches for beyond-the-Standard-Model physics

Search for super-heavy dark matter decaying in the Galactic halo

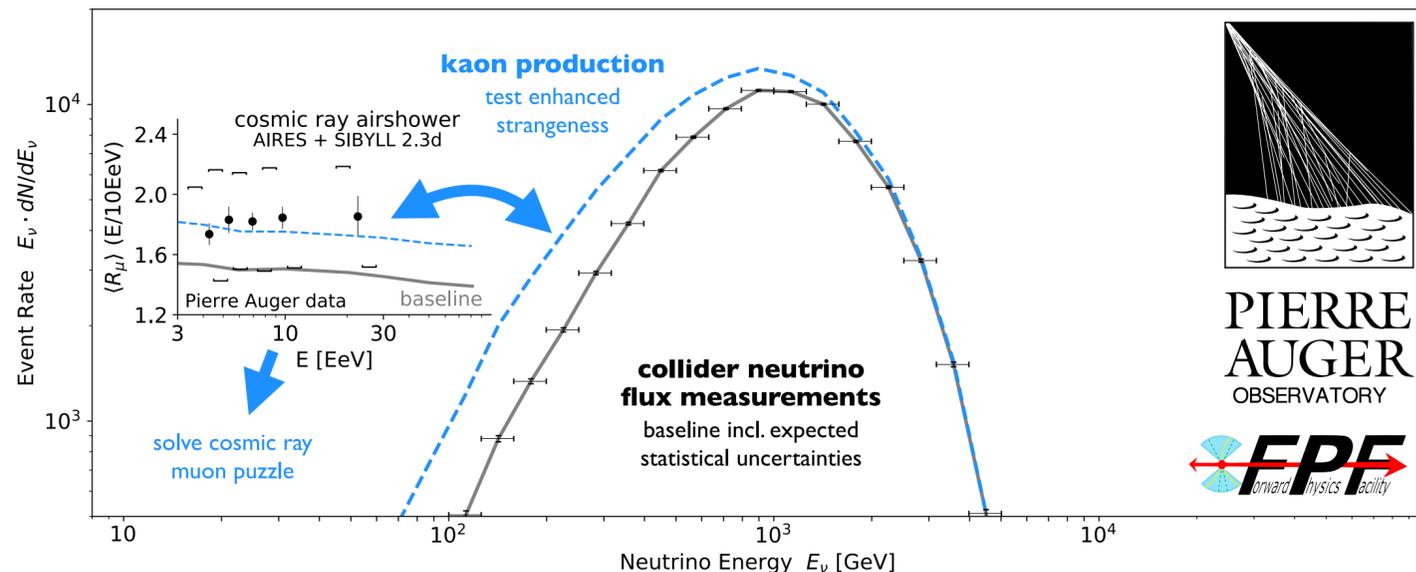


Null results → bounds on

- Gauge coupling in the dark sector
PRL 130 (2023) 061001
- Early universe cosmology
PRD 107 (2023) 042002
- SHDM coupling to sterile neutrinos
PRD 109 (2024) L081101

Since mass scale of SHDM is $O(\text{GUT})$ → Auger is unique background free dark matter indirect detection experiment (clear detection of extreme energy photon would be momentous discovery)

EAS physics can have significant implications in search for BSM @LHC



Cosmic ray muon puzzle signal of:

- Strangeness enhancement
PRL 117 (2016) 192001
- Lorentz invariance violation
PRL 126 (2021) 152002
- IR/UV mixing and tower of species
PRD 109 (2024) 102001

LHC experiments provide laboratory for measurements relevant to understand subtleties of EAS physics: e.g. neutrino flux is a proxy for charged kaon to pion production rate → test of strangeness enhancement