Contribution ID: **36** Type: **Talk**

Cosmological constraints on decaying axion-like particles: a global analysis

Thursday 11 August 2022 15:40 (30 minutes)

Future cosmological probes promise significant progress in probing the dark universe and the related fundamental particles. Their impact is most powerful when we combine cosmological data with astrophysical observations and laboratory experiments. While computational tools are available for such studies, the large number of model parameters and ensuring consistency between data sets can present difficult challenges.
In this talk, I will show how the global-fitting framework GAMBIT can be used to constrain non-thermal axion-like particles (ALPs) with keV-to-MeV masses that decay into photons \[arXiv:2205.13549\]. For the first time we combine various cosmological and astrophysical constraints in a joint likelihood approach. This ensures the consistency of assumptions and allows us to investigate the entire multi-dimensional parameter space instead of fixing some parameters to benchmark values.
Leaving the ALP abundance and reheating temperature as free parameters, we identify and re-open still viable ALP parameter space ndash; even slightly improving BBN observables compared to standard cosmology. In this context, I will comment on the additional constraining power from future spectral distortion missions. Our findings demonstrate the important complementarity of astrophysical and cosmological data and encourage the extension of our analysis to models with ALP-matter couplings.

Primary authors: BALÁZS, Csaba; BLOOR, Sanjay; GONZALO, Tomás E.; HANDLEY, Will; HOOF, Sebastian (Georg-August-Universität Göttingen); KAHLHOEFER, Felix; LECROQ, Marie; MARSH, David (King's College London); RENK, Janina; SCOTT, Pat; STÖCKER, Patrick

Presenter: HOOF, Sebastian (Georg-August-Universität Göttingen)

Session Classification: Long talk