Contribution ID: **7** Type: **poster**

Probing interacting dark sector models with future weak lensing-informed galaxy cluster abundance constraints from SPT-3G and CMB-S4

We forecast the sensitivity of ongoing and future galaxy cluster abundance measurements to detect deviations from the cold dark matter (CDM) paradigm. Concretely, we consider a class of dark sector models that feature an interaction between dark matter and a dark radiation species (IDM-DR). This setup can be naturally realized by a non-Abelian gauge symmetry and has the potential to explain S_8 tensions arising within ΛCDM.
We create mock catalogs of the ongoing SPT-3G as well as the future CMB-S4 surveys of galaxy clusters selected via the thermal Sunyaev-Zeldovich effect (tSZE). Both datasets are complemented with cluster mass calibration from next-generation weak gravitational lensing data (ngWL) like those expected from the Euclid mission and the Vera C. Rubin Observatory. We consider an IDM-DR scenario with parameters chosen to be in agreement with Planck 2018 data and that also leads to a low value of S_8 as indicated by some local structure formation analyses.
Accounting for systematic and stochastic uncertainties in the mass determination and the cluster tSZE selection, we find that both SPT-3G$\times$ngWL and CMB-S4$\times$ngWL cluster data will be able to discriminate this IDM-DR model from ΛCDM, and thus test whether dark matter - dark radiation interactions are responsible for lowering S_8. Assuming IDM-DR, we forecast that the temperature of the dark radiation
can be determined to about 40% (10%) with SPT-3G$\times$ngWL (CMB-S4$\times$ngWL), considering 68% credibility, while S_8 can be recovered with percent-level accuracy. Furthermore, we show that IDM-DR can be discriminated from massive neutrinos, and that cluster counts will be able to constrain the dark radiation temperature to be below ~ 10

Would you be interested in presenting a poster? (this will not impact the decision on your talk)

yes

Primary author: MAZOUN, Asmaa

Co-authors: Dr RUBIRA, Henrique (TUM); Prof. MOHR, Joseph (LMU); Dr GARNY, Mathias (TUM); Dr BOCQUET, Sebastian (LMU); Mrs VOGT, Sophie (LMU)

Presenter: MAZOUN, Asmaa

Session Classification: Reception and Poster Session