

## T 21: Invited Overview Talks II

Time: Tuesday 11:00–12:30

Location: AudiMax

### Invited Overview Talk

T 21.1 Tue 11:00 AudiMax

**Three Decades of Dark Matter Annual Modulation Searches: Overview and Current Status** — •KAROLINE SCHAEFFNER — Max-Planck-Institut für Physik, München, Germany — Technische Universität München, München, Germany

A powerful method to discriminate potential dark matter signals from detector backgrounds is to search for an annual modulation in the event rate, induced by the seasonal variation of the Earth's velocity with respect to the Sun and, consequently, to the galactic dark matter halo.

The DAMA/LIBRA experiment pioneered this approach using sodium iodide (NaI(Tl)) detectors and has reported the observation of an annual modulation signal with very high statistical significance, exhibiting a period and phase consistent with expectations for dark matter interactions. The DAMA/LIBRA results remain in strong tension with the null results reported by most other direct dark matter detection experiments. Despite extensive experimental and theoretical efforts, a model-independent verification capable of resolving this long-standing discrepancy is still lacking.

In this talk, I will present an overview of the worldwide experimental program based on NaI detectors, summarize the current status of these experiments, discuss the key experimental challenges, and outline the open questions that continue to keep this enduring puzzle unresolved.

### Invited Overview Talk

T 21.2 Tue 11:30 AudiMax

**Status and meaning of current tensions in cosmology** — •JULIEN LESGOURGUES — RWTH Aachen University

After a decade of consensus around the standard cosmological model,

LambdaCDM, more precise data have triggered the emergence of multiple tensions in cosmology. Tensions can hint either at misunderstood systematics or new physics. I will review the current status of the main ones: the Hubble tension, the lack of evidence for massive neutrinos, and recent indications for dynamical dark energy. I will also comment on the difficulty to find a working and plausible theoretical solution to these problems, at least according to our current understanding.

### Invited Overview Talk

T 21.3 Tue 12:00 AudiMax

**In search of the unknown: Pushing the boundaries in searches for new physics at the LHC** — •DANYER PEREZ ADAN — RWTH Aachen University, Sommerfeldstrasse 16, 52074 Aachen, Germany

Several fundamental aspects of particle physics lie beyond the predictive power of the Standard Model (SM), providing strong motivation for the search for new physics at the Large Hadron Collider (LHC). This presentation reviews the current landscape and prospects of searches for physics beyond the Standard Model (BSM) at the LHC experiments. Covered topics include investigations focused on well-motivated scenarios, such as supersymmetric and exotic particles, dark matter, heavy resonances, and extended Higgs sectors, as well as signature-driven strategies that transcend model specificity. Emphasis is placed on the relevance of balancing innovative exploration paradigms and the continued refinement of established methodologies. The growing effort of the experimental collaborations to expand the reach of BSM probes across multiple dimensions—including kinematic coverage, object topologies, and analysis approaches—is also highlighted.