T 142: Neutrinos, Dark Matter XI

Time: Thursday 17:30–19:00 Location: POT/0361

T 142.1 Thu 17:30 POT/0361

The finestructure in the reactor antineutrino spectrum and its implications on the JUNO NMO sensitivity — •Tobias Heinz, Lukas Bieger, Marc Breisch, Jessica Eck, Benedict Kaiser, Tobias Lachenmaier, and Tobias Sterr — Eberhard Karls Universität Tübingen, Physikalisches Institut

To determine the neutrino mass ordering (NMO) with the Jiangmen Underground Neutrino Observatory (JUNO) a precise knowledge of the antineutrino spectrum emitted by nuclear reactors is crucial. New model predictions of the reactor antineutrino spectra show the possible existence of a finestructure in the spectrum that has not been measured yet which can have an impact on the sensitivity of the NMO determination using a detector of unprecedented energy resolution of 3% @ 1 MeV like JUNO. This talk will focus on the study of those implications on the NMO sensitivity of JUNO as well as on the possibility to reduce this impact by measuring an unoscillated reactor antineutrino spectrum with high energy resolution by JUNO's satellite detector TAO as a reference.

This work is supported by the Deutsche Forschungsgemeinschaft.

T 142.2 Thu 17:45 POT/0361

Investigating atmospheric neutrino-antineutrino separation in JUNO — •Achilleas Patsias[1,2], Aachim Stahl[1], and Thilo Birkenfeld[1] for the JUNO-Collaboration — [1]III. Physikalisches Institut B, RWTH Aachen University — [2]Physikalisches Institut, University of Bonn

The CP-violating nature of neutrinos has drawn a lot of attention after the discovery of neutrino oscillations. Atmospheric neutrinos appear in a broad energy range and with high flux of neutrinos and anti-neutrinos which makes them suitable candidates for the study of their CP properties. The Jiangmen Underground Neutrino Observatory (JUNO) will provide atmospheric neutrino data with high statistics and excellent energy resolution. In this study we investigate the required separation accuracy for neutrinos and anti-neutrinos to measure CP-violation with the JUNO detector.

T 142.3 Thu 18:00 POT/0361

UV-complete Dark-Matter models and the ATLAS missing-energy-plus-jets measurement — •Martin Habedank and Priscilla Pani — Deutsches Elektronensynchrotron (DESY) Zeuthen

In the Standard Model, the final state of missing energy and at least one jet (MET+jets) at colliders can be mostly attributed to the production of vector bosons in association with jets. Events with Dark Matter in the final state would however also contribute to this channel. It offers therefore a powerful handle in observing or constraining Dark-Matter models.

Traditionally, mostly simplified Dark-Matter models have been used to interpret the MET+jets final state at the LHC. UV-complete models like the two-Higgs-doublet-model with a pseudoscalar mediator to Dark Matter (2HDM+a) provide however a more complex phenomenology, offering many processes that can contribute to the MET+jets final state.

In this talk, insights into the ATLAS measurement of the MET+jets final state in 139 fb^{-1} of proton–proton collision at 13 TeV are given. Unfolding the measurement allows for direct comparisons to predictions of Standard-Model and beyond without having to take into account detector effects. This is demonstrated in interpreting the measurement with respect to the 2HDM+a and setting stringent parameter constraints on the latter.

T 142.4 Thu 18:15 POT/0361

Constraining the dark matter distribution of galaxy clusters — •Lukas Nickel — TU Dortmund University

Dark matter remains one of the unsolved mysteries of modern astrophysics. Many phenomena can only be explained under the assumption of an additional matter component, yet - despite searches in all channels - no clear detection was made so far.

One way dark matter could be found, is to look for an excess in gamma-rays from regions with high concentrations of dark matter. Assuming that the unknown particle(s) decay/annihilate into standard-model particles, they would produce gamma-rays even without direct electromagnetic interaction.

To estimate the expected signal, the distribution of dark-matter in an astrophysical object needs to be determined first. This talk will focus on constraining the dark-matter content of nearby galaxy clusters using the CLUMPY software package, presenting current results and discussing implications for gamma-ray observations.

T 142.5 Thu 18:30 POT/0361

Dark Matter Annihilation in NGC 1068 — •Alexandra Scholz and Li Ruohan — TU München

If Dark Matter (DM) is of particle nature, the Weakly Interacting Massive Particle (WIMP), with an expected mass in the range of some GeV to TeV, detectable by the IceCube telescope, would be a possible candidate. For the barred spiral galaxy NGC 1068 we calculated the neutrino flux from the spike of the super massive black hole (SMBH), and the disk, induced from DM self-annihilation into Standard Model (SM) particles. The calculation was performed for the DM masses 100 GeV, 1 TeV, and 10 TeV, and different Navarro-Frenk-White (NFW) density profile parameters. The annihilation branch ratios and neutrino energy spectra were simulated with the softwares Pythia and MadDM. Comparing IceCube data from NGC 1068 with the results for those three masses, the TeV Dark Matter annihilation scenario has no conflict with the spectrum shape from NGC 1068. Therefore, DM can be a potential explanation for the neutrino flux from NGC 1068.

T 142.6 Thu 18:45 POT/0361

multi-particle dark matter: how to get the hint — subhaditya bhattacharya[1], purusottam ghosh[2], •jayita lahiri[3], and biswarup mukhopadhyaya[4] — [1]Indian Institute of Technology, Guwahati, India — [2]Indian Association for the Cultivation of Science, Kolkata, India — [3]II. Institut für Theoretische Physik, Universität Hamburg, 22761 Hamburg, Germany — [4]Indian Institute of Science Education and Research Kolkata, Mohanpur, India

We investigate ways of identifying two kinds of dark matter component particles at high-energy colliders. The strategy is to notice and distinguish double-peaks(humps) in some final state observable. We carried out our analysis in various popular event topologies for dark matter search, such as mono-X and n-leptons+n-jets final state along with missing energy/transverse momenta. It turns out that an e^+e^- collider is suitable for such analyses. The observables which are best-suited for this purpose have been identified, based on the event topology. The implication of beam-polarization is also explored in detail. Lastly, a quantitative measure of the distinguishability of the two peaks has been established in terms of a few newly-constructed interesting variables.