2025 年紫金山暗物质研讨会

Friday, 17 October 2025 - Tuesday, 21 October 2025

烟台东山宾馆

Book of Abstracts

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太阳邻域的暗物质粒子速度分布及其对暗物质粒子探测实验的影响

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前人的工作大多默认太阳邻域暗物质的速度服从麦克斯韦-玻尔兹曼分布，而近些年来对银河系早期主并合事件的研究表明，真实的速度分布会一定程度偏离标准暗晕模型，这对暗物质直接探测实验中的年度调制效应和排除曲线有一定的影响，从而影响对实验结果的解读。

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First Direct Observation of Migdal Effect in Neutral Projectiles

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The Migdal effect, a phenomenon in which a nucleus emits an electron following a perturbation, is considered one of the most sensitive methods for detecting sub-GeV dark matter to date. However, for over 80 years, direct observational evidence has been lacking. This presentation will showcase the gas pixel detector we designed for the direct observation of the Migdal effect, along with the experiments and results obtained using neutron beams. We will report the first direct observation of the Migdal effect in neutral beam collisions, as well as the measurement of its cross-section.

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talk title

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Dark Photon Dark Matter Detection with Radio Telescopes

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Probing Dark Matter with Gravitational-Wave Laser Interferometers in Space

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Gravitational wave spectrums arising from dark matters

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Novel Light Dark Matter Detection with Quantum Parity Detector Using Qubit Arrays

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Supernova Constraints on Lepton Flavor Violating Axions

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Probing nonthermal dark matter through large-scale structure observations

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Searching for long-lived particles at Belle II

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Searching for long-lived particles (LLPs) has emerged as an important research direction in the quest for physics beyond the Standard Model. Such searches can be performed at various terrestrial facilities including colliders, beam-dump experiments, and neutrino experiments. In this talk, I will focus on the ongoing Belle II experiment at the SuperKEKB collider in Tsukuba, Japan. I will present a series of phenomenological studies on light LLPs at Belle II, illustrating the experiment's discovery potential. Different theoretical models, production mechanisms, and experimental signatures will be discussed, along with the projected sensitivities.

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Searching for ALP DM in Alkali-Noble-Gas Haloscopes

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talk title

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Constraints on Strongly-Interacting Dark Matter from the James Webb Space Telescope

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Direct detection searches for dark matter are insensitive to dark matter particles that have large interactions with ordinary matter, which are stopped in the atmosphere or the Earth's crust before reaching terrestrial detectors. We use "dark"calibration images from the James Webb Space Telescope to derive novel constraints on sub-GeV dark matter candidates that scatter off electrons. In this talk, I will show that for a 0.4% subcomponent of dark matter that interacts with an ultralight dark photon, we disfavor all previously allowed parameter space at high cross sections, and constrain some parameter regions for subcomponent fractions as low as ~0.01%.

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Axion dark matter from topological defects

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Axion Star Tidal Effects and Bosenova

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Detection of ALPs with black hole superradiance

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Glueball Dark Matter

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We explore a generic class of composite dark matter candidates arising from confining dark sectors, where phase transitions—especially deconfinement-confinement and chiral symmetry breaking—can generate stochastic gravitational waves. Using a combination of lattice results and effective field theory approaches such as the Polyakov Loop and PNJL models, we analyze the dynamics of these phase transitions and demonstrate that the resulting gravitational wave signals are highly sensitive to the fermionic content and representation in the dark sector. These signals are significantly enhanced near conformal symmetry and may be detectable by upcoming experiments such as DECIGO and the Big Bang Observer.

As a concrete realization, we focus on glueball dark matter arising from a pure Yang-Mills sector, where glueballs develop axion-like couplings to photons through radiative effects induced by heavy fermion portals. These glueball ALPs (GALPs) feature a coupling-mass relation determined by two fundamental scales: the dark fermion mass and the confinement scale. Without requiring fine-tuning or large mass assumptions, GALPs naturally populate previously unexplored ALP parameter space with suppressed electromagnetic interactions. Importantly, our framework yields a robust prediction for the GALP relic abundance—an order of magnitude below previous estimates—providing a new benchmark for both cosmological modeling and future detection strategies.

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Unconventional axion theory and detection

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超重暗物质的产生新机制及其引力波信号

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Heating effects of fuzzy dark matter in galaxies

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Unexpected clustering pattern in dwarf galaxies challenges formation models

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Mapping Dark Matter in the Milky Way

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Dynamical evolutions in globular clusters and dwarf galaxies

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We present a new two-fluid conduction scheme to simulate the evolution of an isolated, self-gravitating, equilibrium cluster of stars and collisionless dark matter on secular (gravothermal) timescales. We integrate the equations in Lagrangian coordinates via a second-order, semi-implicit algorithm, which is unconditionally stable when the mass of the lighter species is much less than that of the heavier species. The method can be straightforwardly generalized to handle a multispecies system with a population of stars or components beyond collisionless dark matter and stars. We apply the method to simulate the dynamical evolution of stellar-dark matter systems, exploring the consequences of mass segregation and gravothermal core collapse, and assessing those effects for observed globular clusters and dwarf galaxies in the Local Volume.

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Dilution Effect on Freeze-in Dark Matter from a Phase Transition

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PandaX 实验进展

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PandaX 实验

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Recent status and prospects of CDEX @CJPL

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RECODE program for reactor neutrino CEvNS detection and Dark Matter

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TBD

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Dark matter searches with low-energy cosmic antinuclei

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