Dark Matter Studies in Accelerator Physics

Report dei Contributi

https://agenda.infn.it/e/32756

ID contributo: **1** Tipo: **non specificato**

Closed session: DMnet internal assembly

martedì 26 settembre 2023 10:30 (1O 30m)

ID contributo: **2** Tipo: **non specificato**

Introduction of Dark Matter

martedì 26 settembre 2023 14:10 (40 minuti)

Relatore: MOROI, Takeo (Tokyo)

ID contributo: **3** Tipo: **non specificato**

Cosmological overview

martedì 26 settembre 2023 17:20 (40 minuti)

Relatore: POULIN, Vivian (LUPM)

ID contributo: **4** Tipo: **non specificato**

Overview of direct DM detection

martedì 26 settembre 2023 14:50 (40 minuti)

Relatore: ITOW, Yoshitaka (STEL/KMI Nagoya University)

ID contributo: **5** Tipo: **non specificato**

Higgsino / Wino search

mercoledì 27 settembre 2023 09:00 (30 minuti)

Abstract for a poster

Relatore: SHIRAI, Satoshi

ID contributo: **6** Tipo: **non specificato**

Muon g-2 in MSSM

mercoledì 27 settembre 2023 09:30 (30 minuti)

Relatore: KITAHARA, Teppei (Karlsruhe Institute of Technology)

ID contributo: **7** Tipo: **non specificato**

Sub-GeV DM @ beam damp

mercoledì 27 settembre 2023 10:00 (30 minuti)

Relatore: UEDA, Daiki

ID contributo: **8** Tipo: **non specificato**

Dark matter and flavor

mercoledì 27 settembre 2023 10:50 (30 minuti)

Relatore: REDIGOLO, Diego (Istituto Nazionale di Fisica Nucleare)

ID contributo: **9** Tipo: **non specificato**

Light Dark Sectors (dark photon EFT, hidden valley)

mercoledì 27 settembre 2023 11:20 (30 minuti)

Relatore: GRILLI DI CORTONA, Giovanni (Istituto Nazionale di Fisica Nucleare)

ID contributo: **10** Tipo: **non specificato**

Non-standard dark matter freeze-out

mercoledì 27 settembre 2023 11:50 (30 minuti)

Abstract for a poster

Relatore: HRYCZUK, andrzej (National Centre for Nuclear Research, Poland)

ID contributo: **11** Tipo: **non specificato**

Jet or collider physics related to DM

Relatore: KITAHARA, Teppei (Karlsruhe Institute of Technology)

ID contributo: **12** Tipo: **non specificato**

Overview indirect detection

mercoledì 27 settembre 2023 14:00 (40 minuti)

Relatore: DORO, Michele (University of Padova)

ID contributo: **13** Tipo: **non specificato**

Overview g-2 results

mercoledì 27 settembre 2023 14:40 (40 minuti)

Relatore: DRIUTTI, Anna

ID contributo: **14** Tipo: **non specificato**

BSM and DM result summary at LHC

giovedì 28 settembre 2023 10:20 (30 minuti)

Relatore: MONTEJO BERLINGEN, Javier (IFAE)

ID contributo: **15** Tipo: **non specificato**

New directions of BSM searches at HL-LHC

giovedì 28 settembre 2023 09:00 (30 minuti)

Abstract for a poster

Relatore: DOGLIONI, Caterina (Universite de Geneve)

ID contributo: **16** Tipo: **non specificato**

Future circular collider (FCC) physics prospects

giovedì 28 settembre 2023 14:00 (25 minuti)

Relatore: AZZI, Patrizia (Istituto Nazionale di Fisica Nucleare)

ID contributo: **17** Tipo: **non specificato**

Future muon collider (MUCOL) physics prospects

giovedì 28 settembre 2023 14:25 (25 minuti)

Relatore: LUCCHESI, Donatella (Istituto Nazionale di Fisica Nucleare)

ID contributo: **18** Tipo: **non specificato**

FASER experiment in general + Future Forward Facility

giovedì 28 settembre 2023 11:10 (30 minuti)

Abstract for a poster

Relatore: ARIGA, Akitaka (University of Bern)

ID contributo: **19** Tipo: **non specificato**

EW SUSY searches

giovedì 28 settembre 2023 11:40 (25 minuti)

Abstract for a poster

Relatore: MINO, Yuya (Kyoto University)

ID contributo: **20** Tipo: **non specificato**

Anomaly detection for BSM searches

giovedì 28 settembre 2023 12:05 (25 minuti)

Relatore: CURRAN, Jennifer (University Edinburgh)

ID contributo: **21** Tipo: **non specificato**

BSM & DM result summary in CMS

Relatore: TBA

ID contributo: **22** Tipo: **non specificato**

BSM & DM result summary in LHCb

giovedì 28 settembre 2023 14:50 (30 minuti)

Relatore: REDI, Federico Leo (CERN)

ID contributo: **23** Tipo: **non specificato**

Dark matter and low multiplicity seaches at Belle II

giovedì 28 settembre 2023 09:30 (30 minuti)

Relatore: GRAZIANI, Enrico (Istituto Nazionale di Fisica Nucleare)

ID contributo: **24** Tipo: **non specificato**

Belle II physics results

giovedì 28 settembre 2023 15:40 (30 minuti)

Relatore: ROBERTSON, Steven (IPP/McGill University)

ID contributo: **25** Tipo: **non specificato**

PADME physics results

giovedì 28 settembre 2023 16:30 (30 minuti)

Relatore: RAGGI, Mauro (Istituto Nazionale di Fisica Nucleare)

ID contributo: **26** Tipo: **non specificato**

Dark matter search at Belle

giovedì 28 settembre 2023 16:10 (20 minuti)

Autore principale: CZANK, Thomas (Tokyo Metropolitan University)

Relatore: CZANK, Thomas (Tokyo Metropolitan University)

ID contributo: **27** Tipo: **non specificato**

Belle II DM specific analysis 1

giovedì 28 settembre 2023 10:00 (20 minuti)

Relatore: ZANI, Laura (Istituto Nazionale di Fisica Nucleare)

ID contributo: **28** Tipo: **non specificato**

Belle II DM specific analysis 2

giovedì 28 settembre 2023 17:00 (20 minuti)

Abstract for a poster

Relatore: LAURENZA, Martina

ID contributo: **29** Tipo: **non specificato**

Closing remarks

giovedì 28 settembre 2023 17:20 (10 minuti)

Relatore: HISANO, Junji (KMI, Nagoya Univ.)

ID contributo: **30** Tipo: **non specificato**

Opening and Welcome

martedì 26 settembre 2023 14:00 (10 minuti)

Welcom message from the Head of the Department of Physics and Astrophysics of the Padua University

Relatore: SENO, Flavio (dipartimento di fisica e astronomia ”g. galilei” - Universitá di Padova)

ID contributo: **35** Tipo: **Abstract for a Poster**

Novel loop-diagrammatic approach to QCD θ parameter and application to the left-right model

martedì 26 settembre 2023 15:30 (20 minuti)

When the QCD axion is absent in full theory, the strong CP problem has to be explained by an additional mechanism, e.g., the left-right symmetry. Even though tree-level QCD $\bar{\theta}$ parameter is restricted by the mechanism, radiative corrections to $\bar{\theta}$ are mostly generated, which leads to a dangerous neutron electric dipole moment (EDM). The ordinary method for calculating the radiative $\bar{\theta}$ utilizes an equation $\bar{\theta} = -\arg \det m_{\rm loop}$ based on the q chiral rotations of complex quark masses. In this paper, we point out that when full theory includes extra heavy quarks, the ordinary method is unsettled for the extra quark contributions and does not contain its full radiative corrections. We formulate a novel method to calculate the radiative corrections to $\bar{\theta}$ through a direct loop-diagrammatic approach, which should be more robust than the ordinary one. As an application, we investigate the radiative $\bar{\theta}$ in the minimal left-right symmetric model. We first confirm a seminal result that two-loop level radiative $\bar{\theta}$ completely vanishes (corresponding to one- loop corrections to the quark mass matrices). Furthermore, we estimate the size of a non- vanishing radiative $\bar{\theta}$ at three-loop level. It is found that the resultant induced neutron EDM is comparable to the current experimental bound, and the expected size is restricted by the perturbative unitarity bound in the minimal left-right model.

Abstract for a poster

all program topics can be contemplated

Autori principali: Dr. YAMADA, Atsuyuki (Nagoya); HISANO, Junji (KMI, Nagoya Univ.); OSAMURA, Naohiro (Nagoya); KITAHARA, Teppei (Nagoya University)

Relatore: OSAMURA, Naohiro (Nagoya)

Classifica Sessioni: Poster session

ID contributo: **36** Tipo: **Abstract for a Poster**

Performance evaluation and electronics development of a new inner-station TGC detector for the ATLAS experiment at HL-LHC

This poster presents the performance evaluation and electronics development of a new inner-station Thin Gap Chamber (TGC) detector for the ATLAS experiment at HL-LHC. The ATLAS experiment at HL-LHC aims to obtain up to 4000 fb^-1 of proton collision data to improve the sensitivity for the search of new particles, including candidates for dark matter. To select interesting events from the vast amount of data, upgrades for detectors and trigger systems are being developed. The TGC detectors located inside the magnetic field region will be changed from 2 layers to 3 layers to suppress low-momentum muons and charged particles not directly originating from proton-proton collisions. The first module of the new TGC detectors has been assembled, and the performance was evaluated with a DAQ system based on SoC devices. The noise level and detection efficiency have been obtained. In addition, the coincidence logic for the new TGC detectors has been developed and validated using simulation with straight tracks.

Abstract for a poster

all program topics can be contemplated

Autore principale: WADA, Arisa (Nagoya university)

Relatore: WADA, Arisa (Nagoya university)

ID contributo: **37** Tipo: **Abstract for a Poster**

Excited bound states and their role in dark matter production

[hep-ph/2308.01336]
We explore the impact of highly excited bound states on the evolution of number densities of new physics particles, specifically dark matter, in the early Universe. Focusing on dipole transitions within perturbative, unbroken gauge theories, we develop an efficient method for including around a million bound state formation and bound-to-bound transition processes. This enables us to examine partial-wave unitarity and accurately describe the freeze-out dynamics down to very low temperatures. In the non-Abelian case, we find that highly excited states can prevent the particles from freezing out, supporting a continuous depletion in the regime consistent with perturbativity and unitarity. We apply our formalism to a simplified dark matter model featuring a colored and electrically charged t-channel mediator. Our focus is on the regime of superWIMP production which is commonly characterized by a mediator freeze-out followed by its late decay into dark matter. In contrast, we find that excited states render mediator depletion efficient all the way until its decay, introducing a dependence of the dark matter density on the mediator lifetime as a novel feature. The impact on the viable dark matter mass can amount to an order of magnitude, relaxing constraints from Lyman-α observations.

Abstract for a poster

all program topics can be contemplated

Autori principali: Dr. HEISIG, Jan; Dr. URBAN, Kai; Dr. GARNY, Mathias; LEDERER, Stefan (Technische Universität München); Dr. BINDER, Tobias

Relatore: LEDERER, Stefan (Technische Universität München)

ID contributo: **38** Tipo: **Abstract for a Poster**

Precise estimate of chargino decay

The neutralinos are well-motivated dark matter candidates and have been studied extensively. If the mass difference between the neutralino and chargino is relatively small, then they can be detected as, for example, disappearing charged tracks or soft pions in collider experiments. The constraint on the chargino mass by those experiments strongly depends on the chargino lifetime and branching fractions. Hence, it is important to evaluate the decay rate precisely for a given mass difference.
We will discuss the up-to-date estimation of the decay branching and decay rate of the chargino including electroweak radiative corrections and expected errors. We will also mention the experimental implications provided by our results.

Abstract for a poster

all program topics can be contemplated

Autori principali: Prof. IBE, Masahiro (ICRR, University of Tokyo); Dr. SHIRAI, Satoshi (Kavli IPMU); NAKAYAMA, Yuhei (University of Tokyo)

Relatore: NAKAYAMA, Yuhei (University of Tokyo)

ID contributo: **39** Tipo: **Abstract for a Poster**

Constraints on the axion-like particles with Perseus data of MAGIC

We present constraints on Axion-Like Particles using very-high-energy gamma-ray data from the MAGIC telescopes in the direction of the Perseus Galaxy Cluster. Axion is envisioned and theorized as a solution to the Strong CP problem of the Standard Model. As a generalization of the axion, axion-like particles are introduced. Depending on the specifics of their production mechanisms in the Early Universe, their properties make them viable candidates for Dark Matter particles. Traveling through the astrophysical environments embedded in magnetic fields, axion-like particles can interact with high-energy gamma rays. Depending on their coupling and mass, this would leave a distinctive signature in their spectra in the form of hardening, softening, or spectral distortions. Using the MAGIC dataset of two sources located in the Perseus cluster, we set constraints on the ALPs mass, reaching several hundred neV and improving the current limits on the strength of their coupling to photons.

Abstract for a poster

all program topics can be contemplated

Autori principali: D'AMICO, Giacomo (R); BATKOVIC, Ivana (Istituto Nazionale di Fisica Nucleare); Dr. MANGANARO, Marina; DORO, Michele (University of Padova)

Relatore: BATKOVIC, Ivana (Istituto Nazionale di Fisica Nucleare)

ID contributo: **40** Tipo: **Abstract for a Poster**

Pseudodyons from dark topological defects

We discuss a dark photon model with the successive symmetry breaking $\mathrm{SU}(2)_\mathrm{D} \to \mathrm{U}(1)_\mathrm{D} \to \mathbb{Z}_2$ in the dark sector. Various dark topological defects appear, such as monopoles, dyons, strings and beads. They are shown to induce QED electromagnetic fields through kinetic and magnetic mixing between $\mathrm{U}(1)_\mathrm{QED}$ and $\mathrm{U}(1)_\mathrm{D}$. In particular, dark beads appear from a distance to be particles with magnetic and electric charge, which we call pseudodyons.

Based on: Phys. Rev. D **108**, 035044

Abstract for a poster

all program topics can be contemplated

Autori principali: CHITOSE, Akifumi (ICRR, University of Tokyo); IBE, Masahiro (ICRR, University of Tokyo)

Relatore: CHITOSE, Akifumi (ICRR, University of Tokyo)

ID contributo: **41** Tipo: **Abstract for a Poster**

Searching for dark matter with GERDA and beyond

The GERmanium Detector Array (GERDA) experiment at the Laboratori Nazionali del Gran Sasso (LNGS, Italy) searched for the lepton-number-violating neutrinoless double-beta ($0\nu\beta\beta$) decay of ^{76}Ge. The potential discovery of such a phenomenon would have significant implications in cosmology and particle physics, helping unrevealing the Majorana nature of neutrinos.

The main feature of the GERDA experimental design consisted of operating an array of bare germanium diodes enriched in ^{76}Ge in an active liquid argon shield. Starting in December 2015, Phase II physics run reached an unprecedentedly low background index of 5.2×10^{-4} counts/(keV kg yr) in the $0\nu\beta\beta$ signal region, collecting an exposure of 103.7 kg yr while being in a background-free regime.
The shielded environment and the excellent energy resolution of the operated Ge detectors made the experiment suitable for searching for others beyond the standard model processes. GERDA is sensitive to light exotic fermions, including sterile neutrinos in the mass range 100-900 keV/c^2. Here, the most stringent limits obtained with ^{76}Ge were set to date. Additionally, data collected by GERDA are ideal for probing the interaction of pseudoscalar and vector bosonic keV-scale dark matter candidates. Photoelectric absorptions and Compton scatterings of these candidates were included in the final interaction rate, leading to the most stringent coupling constraints in the mass region from 140 keV/c^2 to twice the mass of the electron.

This contribution will review the dark matter searches performed at GERDA, providing on top of that an overview of the broader dark matter program of the next LEGEND (Large Enriched Germanium Detector for Neutrinoless $\beta\beta$ Decay) experiment project.

Abstract for a poster

all program topics can be contemplated

Autore principale: CALGARO, Sofia (Istituto Nazionale di Fisica Nucleare)

Relatore: CALGARO, Sofia (Istituto Nazionale di Fisica Nucleare)