Dark Ghosts - 3rd GNN Workshop on Indirect Dark Matter Searches with Neutrino Telescopes

Report of Contributions

https://indico.cern.ch/e/1075227

Contribution ID: **1** Type: **not specified**

Dark Matter Decay and Annihilation to Neutrinos

Dark matter particles are predicted to decay or annihilate into Standard Model particles which would produce signals of neutrinos, gamma-rays, and other secondary particles. As no such signal has yet been detected, we turn to the least constrained channel where neutrinos provide an avenue to probe astrophysical sources of dark matter particles. We review the decay and annihilation of dark matter into neutrinos over a range of dark matter masses from MeV/c2 to ZeV/c2. We examine the expected contributions to the neutrino flux at current and upcoming neutrino and gamma-ray experiments, such as Hyper-Kamiokande, DUNE, CTA, TAMBO, and IceCube Gen-2. We consider galactic and extragalactic signals of s, p, and d-wave annihilation and decay processes into neutrino pairs, yielding constraints on the dark matter self-annihilation cross-section to neutrinos $\langle\sigma v\rangle$ and dark matter decay lifetime τ.

Primary authors: ARGÜELLES-DELGADO, Carlos A. (Harvard University); DELGADO LOPEZ, Diyaselis (Harvard University (US))

Presenter: DELGADO LOPEZ, Diyaselis (Harvard University (US))

Contribution ID: **2** Type: **not specified**

Charon: A Tool for Neutrino Flux Generation from WIMPs

Indirect searches for signatures of corpuscular dark matter have been performed using all cosmic messengers: gamma rays, cosmic rays, and neutrinos. The search for dark matter from neutrinos is of particular importance since they are the only courier that can reach detectors from dark matter processes in dense environments, such as the core of the Sun or Earth, or from the edge of the observable Universe. In this contribution, I will introduce χαρον, a package for generating and propagating neutrino yields from dark matter annihilation and decay.

Primary author: LAZAR, Jeffrey (University of Wisconsin-Madison)

Presenter: LAZAR, Jeffrey (University of Wisconsin-Madison)

Contribution ID: **3** Type: **not specified**

Constraining EeV-Scale Dark Matter with Neutrino Observatories Using Tau Regeneration

In 2016 and 2018, the ANITA collaboration reported the observation of two anomalous events, with polarizations consistent with up-going neutrinos, but coming from too far below the horizon to have traversed Earth given their energies. While all Standard Model (SM) explanations of these events have been ruled out, explanations from beyond Standard Model scenarios have been put forth in the literature, including scenarios in which these events arise from heavy dark matter decay to SM particles. In this contribution, we use tau neutrino regeneration to constrain one such explanation. Using ANTARES and IceCube public data, we look for an excess of neutrinos coming from this dark matter decaying in the Galactic Center and the Sun. Furthermore, we show the first accurate simulation of tau neutrino regeneration in the Sun.

Primary author: LAZAR, Jeffrey (University of Wisconsin-Madison)

Presenter: LAZAR, Jeffrey (University of Wisconsin-Madison)

Contribution ID: **4** Type: **not specified**

Decaying Dark Matter at IceCube and its Signature in High-Energy Gamma-Ray Experiments

The measurement of ultra-high energy starting event neutrinos in the TeV-PeV range in IceCube has afforded us with the possibility of answering questions through multimessenger efforts in astroparticle physics. However, the origin and nature of these astrophysical neutrinos is still largely unresolved. Among existing tensions, for example, is the excess of neutrinos observed in the energy range of 40-200 TeV, a contribution that could come from heavy dark matter decay. The dark matter decay hypothesis has been studied extensively through comparisons with gamma-ray data, due to the fact that a coincident gamma-ray flux is expected to accompany the neutrino flux that IceCube observes. Diffuse gamma-ray data has placed strong constraints that rule out the dark matter hypothesis for IceCube's observations. However, gamma-rays become heavily suppressed for sources dominating in particular energy ranges. This is due to properties of the traversed medium, which generally consists of extragalactic background light (EBL), the cosmic microwave background (CMB), and the intergalactic magnetic field, the first of which, in particular, is very difficult to measure and thus involves many uncertainties. In this work, we elaborate on previous dark matter decay results by considering the impact that the EBL could have on predicted gamma-ray spectra for dark matter. We present limits on galactic and extragalactic dark matter decay by comparing our calculations to Tibet 2021 data and Fermi-LAT diffuse data, featuring uncertainties among different EBL models that could have implications for existing limits.

Primary author: SKRZYPEK, Barbara

Co-authors: ARGÜELLES-DELGADO, Carlos A. (Harvard University); CHIANESE, Marco (University of Naples "Federico II")

Presenter: SKRZYPEK, Barbara

Contribution ID: **5** Type: **not specified**

Limits for Dark Matter annihilation in the Sun with ANTARES neutrino telescope

One of the most popular candidate of Dark Matter (DM) particle are the Weakly Interacting Massive Particles (WIMPs). These, once gravitationally captured in massive celestial objects and annihilating between them into Standard Model particles, can be indirectly detected. The centre of those massive objects is, therefore, a place where to look for a possible neutrino excess from DM annihilations using neutrino telescopes. The closest of such potential astrophysical DM sources is the Sun.
The ANTARES deep-sea neutrino telescope, located in the Mediterranean Sea, best
performs in indirect searches for neutrino signals from DM annihilation in the 100 GeV to 1 TeV energy range. In this work the results from the search for WIMPs towards the Sun direction, using 13 years of data collected by ANTARES telescope are presented.
Upper limits on the WIMP –nucleon cross section are obtained for DM mass in the range from 50 GeV/c^2 to 3 TeV/c^2 , improving the results of the last ANTARES publication by more than a factor of two.

Primary author: POIRÈ, Chiara (UPV)

Presenter: POIRÈ, Chiara (UPV)

Contribution ID: **6** Type: **not specified**

DM searches with ANTARES/KM3NeT

Thursday, 31 March 2022 10:00 (20 minutes)

Presenter: GOZZINI, Sara Rebecca

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **7** Type: **not specified**

DM searches with IceCube

Thursday, 31 March 2022 10:20 (20 minutes)

Presenter: MEIGHEN-BERGER, Stephan (Technical University of Munich (TUM))

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **8** Type: **not specified**

DM searches with GVD

Thursday, 31 March 2022 10:40 (20 minutes)

Presenter: SUVOROVA, Olga

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **9** Type: **not specified**

In memoriam Tom Gaisser

Thursday, 31 March 2022 11:00 (15 minutes)

Presenter: AGUILAR SANCHEZ, Juan Antonio (Université Libre de Bruxelles)

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **10** Type: **not specified**

Multi-messenger lifetime constraints on heavy decaying dark matter

Thursday, 31 March 2022 11:55 (20 minutes)

Presenter: Mr HAJJAR, Rasmi (IFIC (CSIC-UV))

Session Classification: Dark matter phenomenology

Contribution ID: **11** Type: **not specified**

Neutrino lines in DM searches

Thursday, 31 March 2022 12:15 (20 minutes)

Presenter: AGUILAR SANCHEZ, Juan Antonio (Université Libre de Bruxelles)

Session Classification: Dark matter phenomenology

Contribution ID: **12** Type: **not specified**

Why secluded DM at neutrino telescopes?

Thursday, 31 March 2022 12:35 (20 minutes)

Presenter: SALA, Filippo (CNRS and Sorbonne University)

Session Classification: Dark matter phenomenology

Contribution ID: **13** Type: **not specified**

Dark Matter Decay and Annihilation to Neutrinos

Thursday, 31 March 2022 12:55 (20 minutes)

Presenter: DELGADO LOPEZ, Diyaselis (Harvard University (US))

Session Classification: Dark matter phenomenology

Contribution ID: **14** Type: **not specified**

Constraining EeV-Scale Dark Matter with Neutrino Observatories Using Tau Regeneration

Thursday, 31 March 2022 14:45 (20 minutes)

Presenter: LAZAR, Jeffrey (University of Wisconsin-Madison)

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **15** Type: **not specified**

DM searches in the Galactic Centre with IceCube

Thursday, 31 March 2022 15:05 (20 minutes)

Presenter: Dr IOVINE, Nadege (Université libre de Bruxelles (ULB))

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **16** Type: **not specified**

Dark matter evaporation from celestial bodies

Thursday, 31 March 2022 15:25 (20 minutes)

Presenter: PALOMARES-RUIZ, Sergio (IFIC-Valencia)

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **17** Type: **not specified**

Limits for Dark Matter annihilation in the Sun with ANTARES neutrino telescope

Thursday, 31 March 2022 15:45 (20 minutes)

Presenter: POIRÈ, Chiara (UPV)

Session Classification: Indirect searches for DM with neutrinos

Contribution ID: **18** Type: **not specified**

PPPC4

Thursday, 31 March 2022 16:35 (20 minutes)

Presenter: CIRELLI, Marco (CNRS LPTHE Jussieu)

Session Classification: Dark matter phenomenology

Contribution ID: **19** Type: **not specified**

Higgs portals to DM

Thursday, 31 March 2022 17:15 (20 minutes)

Presenter: DJOUADI, Abdelhak (University of Granada)

Session Classification: Dark matter phenomenology

Contribution ID: **20** Type: **not specified**

Warm dark matter searches from the Galactic halo

Thursday, 31 March 2022 16:55 (20 minutes)

Presenter: DEKKER, Ariane (University of Amsterdam)

Session Classification: Dark matter phenomenology

Contribution ID: **21** Type: **not specified**

Searches with gamma-rays

Friday, 1 April 2022 10:00 (20 minutes)

Presenter: RICO, Javier (IFAE)

Session Classification: Experimental results on DM

Contribution ID: **22** Type: **not specified**

Future dark matter searches

Friday, 1 April 2022 10:20 (20 minutes)

Presenter: KAVANAGH, Bradley

Session Classification: Experimental results on DM

Contribution ID: **23** Type: **not specified**

Direct searches of dark matter

Friday, 1 April 2022 10:40 (20 minutes)

Presenter: MARTINEZ, Maria (Universidad de Zaragoza)

Session Classification: Experimental results on DM

Contribution ID: **24** Type: **not specified**

Decaying Dark Matter at IceCube and its Signature in High-Energy Gamma-Ray Experiments

Friday, 1 April 2022 11:00 (20 minutes)

Presenter: SKRZYPEK, Barbara

Session Classification: Experimental results on DM

Contribution ID: **25** Type: **not specified**

Solar atmospheric neutrinos with ANTARES

Friday, 1 April 2022 11:50 (20 minutes)

Presenter: LOPEZ-COTO, Daniel (ANTARES, KM3NeT, Universidad de Granada)

Session Classification: Neutrino analyses and their backgrounds

Contribution ID: **26** Type: **not specified**

Dark ghosts from the solar disk

Friday, 1 April 2022 12:10 (20 minutes)

Presenter: MASIP, Manuel (Universidad de Granada)

Session Classification: Neutrino analyses and their backgrounds

Contribution ID: **27** Type: **not specified**

DM from the center of the Earth with IceCube

Friday, 1 April 2022 12:30 (20 minutes)

Presenter: RENZI, Giovanni

Session Classification: Neutrino analyses and their backgrounds

Contribution ID: **28** Type: **not specified**

Gambit

Friday, 1 April 2022 14:30 (20 minutes)

Presenter: VINCENT, Aaron (Durham University)

Session Classification: Simulations and Software Tools

Contribution ID: **29** Type: **not specified**

Charon: A Tool for Neutrino Flux Generation from WIMPs

Friday, 1 April 2022 14:50 (20 minutes)

Presenter: LAZAR, Jeffrey (University of Wisconsin-Madison)

Session Classification: Simulations and Software Tools

Contribution ID: **30** Type: **not specified**

Simplified DM models, Application of DD & collider experiments

Friday, 1 April 2022 15:10 (20 minutes)

Presenter: HEINEMEYER, Sven (CSIC (Madrid, ES))

Session Classification: Dark matter at colliders