Summer Particle Astrophysics Workshop 2023 (EIEIOO)



Report of Contributions

https://indico.global/e/528

Introduction

Contribution ID: 1

Type: not specified

Introduction

Tuesday 2 May 2023 12:00 (30 minutes)

Presenter: BAIOCCHI, Melissa

Introduction to Particle Physics

Contribution ID: 2

Type: not specified

Introduction to Particle Physics

Tuesday 2 May 2023 12:30 (1 hour)

"It's a dangerous business, Frodo, going out your door. You step onto the road, and if you don't keep your feet, there's no knowing where you might be swept off to."

In-Person (Stirling Rm 501)

Presenter: TAM, Benjamin (Queen's University)

Particle Astrophysics Overview

Contribution ID: 3

Type: not specified

Particle Astrophysics Overview

Tuesday 2 May 2023 14:00 (1 hour)

Particle astrophysics lies at the rich interface between astrophysics, cosmology and fundamental physics. It aims to find answers for the most fundamental questions about our universe, its origin and evolution, using the complementary information provided by the cosmic messengers that arrive to us: cosmic rays, neutrinos, photons and gravitational waves.

This lecture aims at telling the story of the origins of astroparticle physics, the current puzzles that need to be solved, while presenting the different cosmic messengers from a very experimental perspective.

Virtual

Presenter: INACIO, Ana Sofia

Intro to Unix Command Line Inte ...

Contribution ID: 4

Type: not specified

Intro to Unix Command Line Interface (CLI) and Tools for Scientific Computing

Tuesday 2 May 2023 16:00 (2 hours)

Virtual

Author: GALLACHER, David

Presenter: GALLACHER, David

Astronomy Overview

Contribution ID: 5

Type: not specified

Astronomy Overview

Wednesday 3 May 2023 12:30 (1 hour)

In-Person (Stirling Rm 501)

Presenter: COURTEAU, Stéphane

Accelerator Physics

Contribution ID: 6

Type: not specified

Accelerator Physics

Wednesday 3 May 2023 15:00 (1 hour)

Virtual

Presenter: VACHON, Brigitte (McGill University, (CA))

ATLAS

Contribution ID: 7

Type: not specified

ATLAS

Wednesday 3 May 2023 17:00 (30 minutes)

The ATLAS detector is one of the two general-purpose experiments at the CERN Large Hadron Collider that discovered the Higgs boson. It performs precision measurements of the properties and interactions of Higgs bosons, top quarks, W and Z bosons, and (nearly) all the other particles in the Standard Model. But how do we design an experimental apparatus to measure particles whose existence is so fleeting that they decay instantly, in the vacuum of the beam pipe, without ever reaching the detector? The talk will be a lightning introduction to both the ATLAS detector and the collaboration of thousands of scientists who built and operate it and sift through the wealth of data it provides.

Virtual

Presenter: TRIGGER, Isabel (TRIUMF (CA))

BELLE II

Contribution ID: 8

Type: not specified

BELLE II

Wednesday 3 May 2023 17:30 (30 minutes)

The Belle II detector is a general-purpose detector located at the SuperKEKB particle collider (the highest luminosity collider ever). It is the successor experiment to Belle and BaBar, whose experimental confirmation of B-meson CP violation predicted by the Kobayashi-Masakawa theory led to the 2008 Nobel Prize in Physics.

This intro talk will give you a quick walkthrough of how the highest precision collider experiment in the world is built and operated by over a thousand scientists and what kind of Physics it seeks to achieve.

Virtual

Presenter: BEAUBIEN, Alexandre

Direct and In-Direct Detection

Contribution ID: 9

Type: not specified

Direct and In-Direct Detection

Thursday 4 May 2023 12:00 (1 hour)

This talk will cover two ways of searching for dark matter: direct and indirect detection. Direct detection uses sensitive particle detectors to search for dark matter colliding with nuclei or electrons in the lab, allowing us to measure or constrain its scattering cross section. In indirect detection, we search for astronomical signals—such as photons and cosmic rays—which could have been produced by dark matter decay or annihilation. I will briefly discuss evidence for dark matter, and the argument for the popular WIMP (Weakly Interacting Massive Particle) model of dark matter. I will then cover techniques used for indirect detection. We will discuss several observed excesses, unexplained astrophysical signals that could be caused by dark matter, and see how different observations and background modeling can challenge or constrain the dark matter interpretation of these signals. We will then cover the history of direct detection, and the basics of computing detection rates. We will end by looking at how different types of direct detection experiment are optimized to search for different models of dark matter, motivating a wide variety of different techniques and technologies.

In-Person (Stirling Rm 501)

Author: CAPPIELLO, Christopher

Presenter: CAPPIELLO, Christopher

Neutrino Overview

Contribution ID: 10

Type: not specified

Neutrino Overview

Thursday 4 May 2023 14:00 (1 hour)

In-Person (Stirling Rm 501)

Presenter: MCDONALD, Arthur

SNO+

Contribution ID: 11

Type: not specified

SNO+

Thursday 4 May 2023 15:00 (30 minutes)

In-Person (Stirling Rm 501)

Presenter: WRIGHT, Alex (IPP/Queen's University)

Super-Kamiokande

Contribution ID: 12

Type: not specified

Super-Kamiokande

Thursday 4 May 2023 16:30 (30 minutes)

Virtual

Author: AJMI, Ali

Presenters: AJMI, Ali; ALLEGA, Anthony (Queen's University)

nEXO

Contribution ID: 13

Type: not specified

nEXO

Thursday 4 May 2023 17:00 (30 minutes)

Virtual

Author: BRUNNER, Thomas (McGill University)

Presenters: ALLEGA, Anthony (Queen's University); BRUNNER, Thomas (McGill University)

IceCube

Contribution ID: 14

Type: not specified

IceCube

Thursday 4 May 2023 17:30 (30 minutes)

In-Person (Stirling Rm 501)

Author: HATCH, Patrick (Queen's University)

Presenters: ALLEGA, Anthony (Queen's University); HATCH, Patrick (Queen's University)

Pacific Ocean Neutrino Experime

Contribution ID: 15

Type: not specified

Pacific Ocean Neutrino Experiment (P-ONE)

Thursday 4 May 2023 18:00 (30 minutes)

The Pacific Ocean Neutrino Experiment is a new neutrino telescope in the Pacific Ocean. Consisting of 70 instrumented mooring lines, P-ONE aims to detect neutrinos with energies ranging from TeV to PeV, and will cover areas of the sky that are yet uncovered by the other existing neutrino telescopes.

Following two successful pathfinder missions, the P-ONE collaboration is now developing the first mooring line of P-ONE. This mooring line is expected to be deployed in 2024 and will demonstrate the feasibility of a larger installation.

The presentation will give a short overview of the pathfinder missions and the current status of P-ONE.

Virtual

Author: GAERTNER, Andreas

Presenters: GAERTNER, Andreas; ALLEGA, Anthony (Queen's University)

Dark Matter Overview

Contribution ID: 16

Type: not specified

Dark Matter Overview

Friday 5 May 2023 12:30 (1 hour)

Virtual

Author: MOHLABENG, Gopolang (University of California, Irvine)

Presenters: MOHLABENG, Gopolang (University of California, Irvine); BLEAU, Katarina (Queen's University)

Dark Matter Modulation and CO $\,\cdots\,$

Contribution ID: 17

Type: not specified

Dark Matter Modulation and COSINUS

Friday 5 May 2023 14:00 (30 minutes)

Virtual

Author: STUKEL, Matthew Jake (Gran Sasso Science Institute)

Presenters: BLEAU, Katarina (Queen's University); STUKEL, Matthew Jake (Gran Sasso Science Institute)

Darkside

Contribution ID: 18

Type: not specified

Darkside

Friday 5 May 2023 14:30 (30 minutes)

Virtual

Author: MANECKI, Szymon (Queen's University)

Presenters: BLEAU, Katarina (Queen's University); MANECKI, Szymon (Queen's University)

Git

Contribution ID: 19

Type: not specified

Git

Friday 5 May 2023 16:00 (2 hours)

Virtual

Author: RHEA, Carter (Université de Montreal)

Presenters: RHEA, Carter (Université de Montreal); YE, Tianai (Queen's University)

Statistics and Error Analysis

Contribution ID: 20

Type: not specified

Statistics and Error Analysis

Monday 8 May 2023 16:00 (2 hours)

In this whirlwind review of elementary statistics, I will cram half a semester's worth of material into the bare minimum necessary to make use of popular statistical techniques like fitting, chi-squared estimation, and Bayesian analysis. I will probably fail. \square

Virtual

Author: OSER, Scott

Presenter: OSER, Scott

PMTs

Contribution ID: 21

Type: not specified

PMTs

Thursday 4 May 2023 13:15 (30 minutes)

In-Person (Stirling Rm 501)

Author: SKENSVED, Peter

Presenters: SKENSVED, Peter; BOUKHTOUCHEN, Yilda (Queen's University)

Balloon Physics

Contribution ID: 22

Type: not specified

Balloon Physics

Monday 8 May 2023 12:30 (1 hour)

In-Person (Stirling Rm 501)

Presenter: FISSEL, Laura (Queen's University)

Academic Presentations

Contribution ID: 24

Type: not specified

Academic Presentations

Tuesday 9 May 2023 12:30 (1 hour)

Presenters: FLYNN, Blaire (SNOLAB); DELOYE, Juliette (SNOLAB)

Superallowed Beta Decays

Contribution ID: 25

Type: not specified

Superallowed Beta Decays

Tuesday 9 May 2023 14:30 (30 minutes)

Superallowed Fermi β Decay: The precision frontier of nuclear physics

Dr. Gwen Grinyer (she/her) Department of Physics, University of Regina, Regina, SK S4S 0A2, Canada

High precision measurements of the ft values for superallowed Fermi β decays provide fundamental data with which to constrain the conserved vector current (CVC) hypothesis, set limits on the Standard Model description of electroweak interactions, and test unitarity of the Cabibbo-Kobayashi-Maskawa (CKM) quark mixing matrix. In this lecture, I will present the status of the world data on the superallowed Fermi β emitters and explain how we go from state-of-the-art measurements in the lab to extracting fundamental physics at the precision frontier.

Virtual

Presenter: Prof. GRINYER, Gwen

Python

Contribution ID: 26

Type: not specified

Python

Tuesday 9 May 2023 16:00 (2 hours)

Introduction to Python!

Power point : https://docs.google.com/presentation/d/1nXaZIDt4WC83qW3L7TKHp3KK1Rmdxzjh/edit?usp=sharing&ouid Colab notebook: https://colab.research.google.com/drive/1VVvvl8rD05QmJgt6LaOmXOdy7PN60XeO?usp=sharing *Virtual*

Author: FRONENBERG, Hannah (McGill University)

Presenters: ALLEGA, Anthony (Queen's University); FRONENBERG, Hannah (McGill University)

C++

Contribution ID: 27

Type: not specified

C++

Wednesday 10 May 2023 12:30 (2 hours)

In-Person (Stirling Rm 501)

Author: HUCKER, Jonathan

Presenter: HUCKER, Jonathan

SBC

Contribution ID: 28

Type: not specified

SBC

Wednesday 10 May 2023 15:30 (30 minutes)

Virtual

Author: PIRO, Marie Cecile (Rensselaer Polytechnic Institute (RPI))

Presenters: PIRO, Marie Cecile (Rensselaer Polytechnic Institute (RPI)); SWIDINSKY, Nicholas (Queen's University)

PICO

Contribution ID: 29

Type: not specified

PICO

Wednesday 10 May 2023 16:00 (30 minutes)

Author: MOORE, Colin

Presenters: MOORE, Colin; SWIDINSKY, Nicholas (Queen's University)

NEWS-G

Contribution ID: 30

Type: not specified

NEWS-G

Wednesday 10 May 2023 16:30 (30 minutes)

Virtual

Author: Mr DURNFORD, Daniel (University of Alberta)

Presenters: Mr DURNFORD, Daniel (University of Alberta); SWIDINSKY, Nicholas (Queen's University)

SuperCDMS

Contribution ID: 31

Type: not specified

SuperCDMS

Wednesday 10 May 2023 17:00 (30 minutes)

The Super Cryogenic Dark Matter Search (SuperCDMS) Collaboration uses cryogenic semiconductor detectors to look for evidence of dark matter interactions with ordinary matter. The current generation of the experiment is under construction at the SNOLAB underground facility in Sudbury, Canada. Two complimentary detector designs, interleaved Z-sensitivity Ionization and Phonon (iZIP) detectors and High Voltage (HV) detectors, made of Germanium or Silicon will be used to probe low mass dark matter parameter space. This talk will provide an overview of the experiment and detector technology and present the expected sensitivity of SuperCDMS SNOLAB to different detection channels.

Virtual

Author: FASCIONE, Eleanor (TRIUMF/Queen's University)

Presenters: FASCIONE, Eleanor (TRIUMF/Queen's University); SWIDINSKY, Nicholas (Queen's University)

Medical Physics

Contribution ID: 32

Type: not specified

Medical Physics

Tuesday 9 May 2023 14:00 (30 minutes)

Virtual

Presenter: FLETCHER, Liz (Carleton University)

Multi-Messenger Astrophysics

Contribution ID: 33

Type: not specified

Multi-Messenger Astrophysics

Wednesday 3 May 2023 13:45 (1 hour)

In-Person (Stirling Rm 501)

Presenter: PARK, Nahee

HELIX

Contribution ID: 34

Type: not specified

HELIX

Monday 8 May 2023 14:30 (30 minutes)

Virtual

Presenter: PARK, Nahee

CCAT

Contribution ID: 35

Type: not specified

CCAT

Monday 8 May 2023 14:00 (30 minutes)

In-Person (Stirling Rm 501)

Presenter: BAGCHI, Mayukh (Queen's University)

Closing

Contribution ID: 36

Type: not specified

Closing

Thursday 11 May 2023 17:45 (30 minutes)

Presenters: BAIOCCHI, Melissa; BAI, Minya (Queen's University)

Mandatory Fun

Contribution ID: 37

Type: not specified

Mandatory Fun

Thursday 11 May 2023 18:15 (1 hour)

ROOT

Contribution ID: 38

Type: not specified

ROOT

Thursday 11 May 2023 12:30 (2 hours)

A tutorial on programming with ROOT!

There will be a small project to work through in the second half of the session. To be able to work along through it you will need to have ROOT installed. As this can take some time, it will be better to try and install ROOT beforehand. As everyone will have different machinery setups, it's difficult to give exact instructions, but hopefully this can get you started. But if you are unable to get ROOT installed, the instructor will work though the examples live, and you can watch along and in that way still be able to take part in the tutorial.

ROOT install instructions:

There are many ways to get ROOT. There are lots more details here https://root.cern/install/, so if the below doesn't work for you check out the info there. It will be quicker to get the pre-compiled binaries, but if that doesn't work for whatever reason you can try building from source.

The first thing to do is make sure you have all the things ROOT depends on. A list of these, with instructions for different operating systems, can be found here: https://root.cern/install/dependencies/

MacOS:

Install homebrew https://brew.sh Install XCode from the App Store In a terminal, type: brew install root cd root source /usr/local/Cellar/root/6.26.06_2/bin/thisroot.sh (maybe the version and/or location are different)

Unix:

Get the precompiled binaries for your system from here:https://root.cern/releases/release-62802/ tar xvf root_v6.28.02.Linux-centos8-x86_64-gcc8.5.tar source root/bin/thisroot.sh More detailed walk through https://www.youtube.com/watch?v=QItrmchEQWE (he builds from source but you can do this with the precompiled tar files)

Windows:

I think you should have access to Windows Subsystem for Linux or similar It will probably be easiest to use the above Unix instructions within that Then install XMing https://sourceforge.net/projects/xming/ type: export DISPLAY="localhost:0" More detailed walk through https://www.youtube.com/watch?v=pmfM4Zq6OQU (he builds from source but you can do this with the precompiled tar files)

(Alternative) Building from Source:

Once you have the dependencies, get the source file here https://root.cern/releases/release-62802/ cd root

./configure –disable-castor –disable-rfio –disable-x11 –disable-gfal –disable-ldap (these disabled options are all things I've found problems with on various systems, and we won't need them for the simple examples/project)

make

source bin/thisroot.sh

ROOT

To check it's worked, type root. The terminal prompt should now be root [0]. If so, it seems root is installed ok! Now try TCanvas c1, if a blank window pops up, the graphics are all working too and you are good to go :)

If that all sounds like gobbledigook, please do not worry!! In the tutorial we will try and go through the installation process. (It can take time though so ideally we want to get as far through the process as possible beforehand.) But if you can't get it installed in time, you can just watch the tutorial without working along with it and that will be fine!

If you're having problems but are keen, there are many resources you can use online. https://root.cern/install/ is the place to start but there are countless guides, videos, and forums online. Someone will have encountered your problem before, it's working out what to google which can be tricky! Hopefully this is enough to get you started and point you in the direction of where to find info for your specific setup.

Good luck! And to reiterate, if you can't get root installed, it won't completely preclude you from taking part in the tutorial

In-Person (Stirling Rm 501)

Presenter: PARKER, William

Machine Learning

Contribution ID: 39

Type: not specified

Machine Learning

Thursday 11 May 2023 15:30 (2 hours)

In-Person (Stirling Rm 501)

Presenters: COQUILLAT, Jean-Marie; ANDERSON, Mark; ROWE, Noah

CASST 2023

Contribution ID: 40

Type: not specified

CASST 2023

SNOLAB and the McDonald Institute invite you to the

2023 CASST COMPETITION

AUGUST 17-18, 2023

VIRTUAL / LAURENTIAN

UNIVERSITY

This event is for undergraduate students to show their work and will include networking opportunities. Participation in person or virtually is welcomed. Prizes will be awarded for best talks.

The Canadian Astroparticle physics Summer Student Talk Competition is an annual event for undergraduate students.

Presenter: KRAUS, Christine