

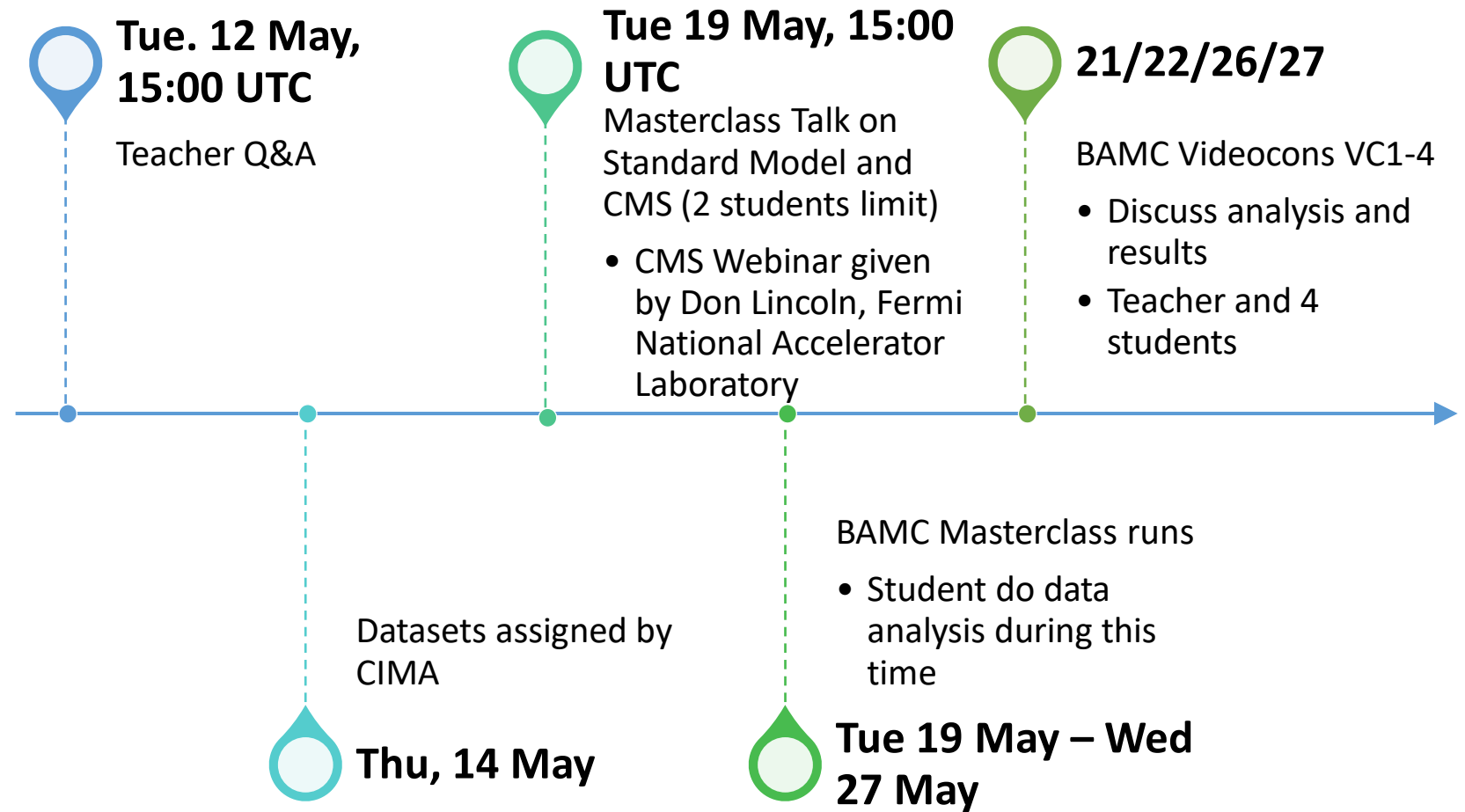


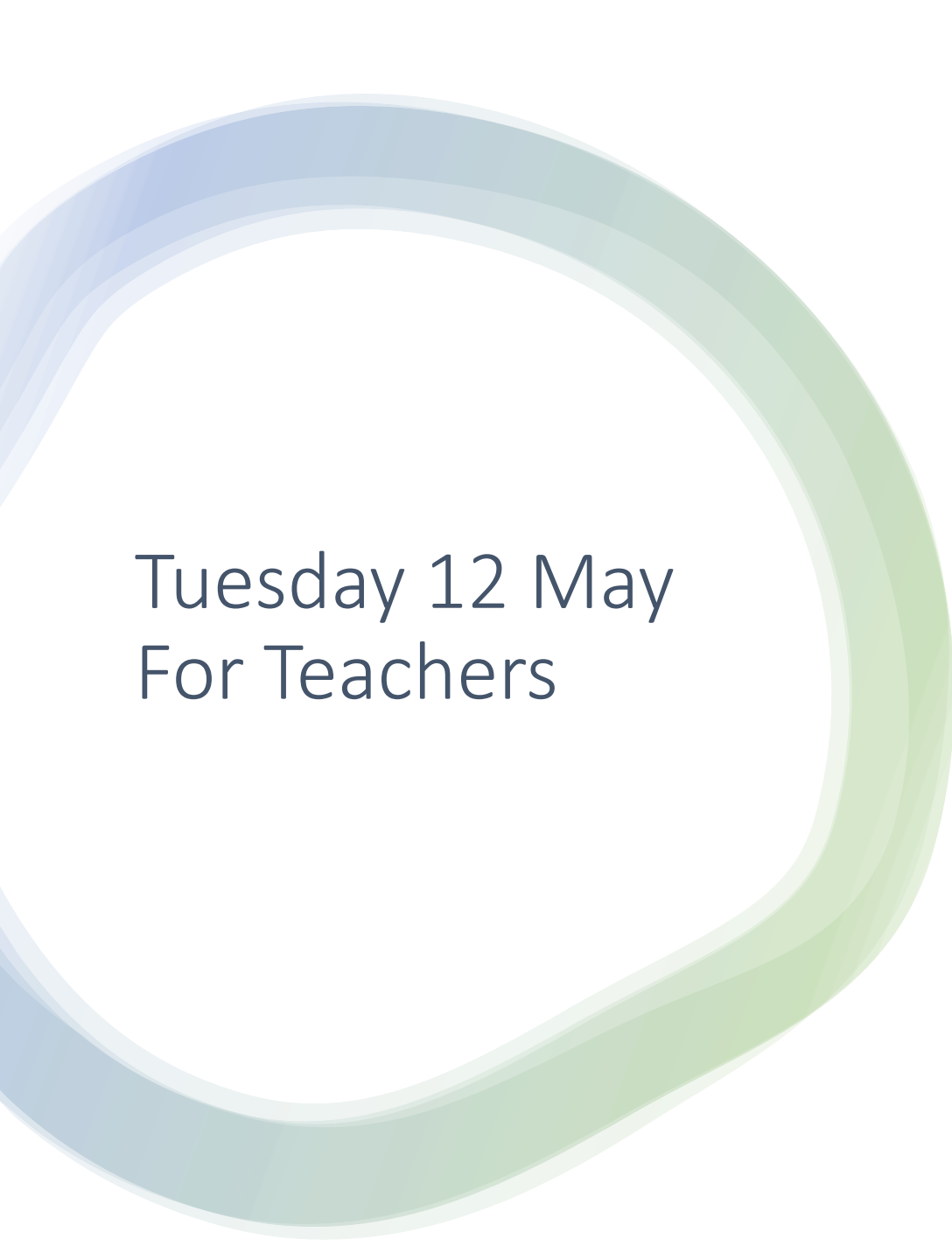
# Big Analysis of Muons in CMS (BAMC)

Masterclass May 2020

Vandna Luthra, Gargi College, New Delhi


# Timeline of Events






Tuesday 12 May  
For Teachers

- Q&A Videoconference on the BAMC Zoom Channel
- Recording at <http://cern.ch/go/s7zs>.



Tuesday 12 May and  
Wednesday 13 May

- Registration for Final Videoconference
  - Teachers with students register in Doodle poll at <https://doodle.com/poll/3664bms8um2yisfz> (teacher *only* registers)
  - Individual adults register in Doodle poll at <https://doodle.com/poll/8g6szqp5v8pkzi9h>.
- Must register to be assigned data.



From Thursday 14  
May – Tuesday 19  
May

- Assign datasets in CIMA
- Tell students about Student Prep activities
- Have a videoconference with your students to explain the process/expectations and to answer any questions.
- Students should also watch all the screencasts before the masterclass so they are familiar with everything

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# Student Prep Activities

## Recommended:

- Rolling with Rutherford
- The Particle Adventure

## Others:

- Histograms: The Basics
- Dice, Histograms and Probability
- Calculate the Z Mass

# Rolling with Rutherford



Main link: <https://quarknet.org/data-portfolio/activity/rolling-rutherford>



How to prepare at home:

<https://quarknet.org/content/comments-adapting-data-activities-teaching-online#rwr>



Teacher's notes:

[https://quarknet.org/sites/default/files/RwRTeacherNotes\\_31oct2019.pdf](https://quarknet.org/sites/default/files/RwRTeacherNotes_31oct2019.pdf)



Paper template:

[https://quarknet.org/sites/default/files/rwr\\_template\\_4target\\_0.pdf](https://quarknet.org/sites/default/files/rwr_template_4target_0.pdf)

**THE PARTICLE ADVENTURE**  
THE FUNDAMENTALS OF MATTER AND FORCE

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the DOE and NSF

LANGUAGES MIRROR SITES

Android App Available now | Apple App Available now

An **award-winning** interactive tour of quarks, neutrinos, antimatter, extra dimensions, dark matter, accelerators and particle detectors from the **Particle Data Group** of **Lawrence Berkeley National Laboratory**.

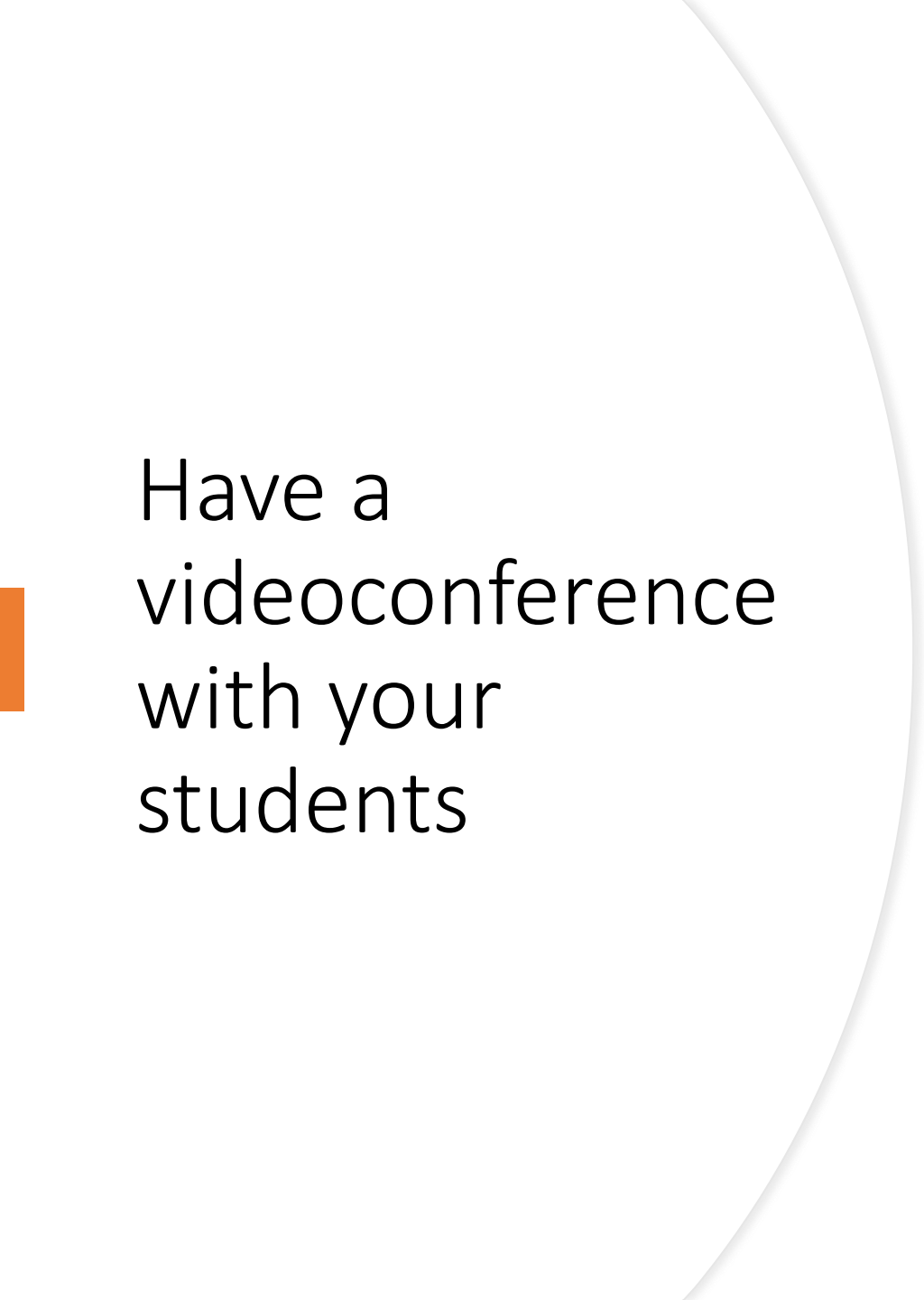
# The Particle Adventure

<https://particleadventure.org/>



# Assign datasets in CIMA

- Assign a dataset to every pair of students
- These will be on CIMA under BAMC-XXMay2020, where XX=date of your videocon
- Assign these when they come out (Around 14 May)
- Collaborate online and work together on the analysis
- Both students look at iSpy to determine Final and Initial states etc.
- One student fills in CIMA with other watching

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# Have a videoconference with your students

- Point out the Student Prep activities
- All students should watch the screencasts on the Student Launch page to understand how to do the measurement
- Ideally make sure they are able to access the links, websites and iSpy and CIMA before the masterclass



Tuesday 19 May

- Talk on Standard Model and CMS – more information coming
- 2 students can join along with a teacher
- This talk will be recorded for the students who are not able to participate live.

Tuesday 19 May – last  
videoconference

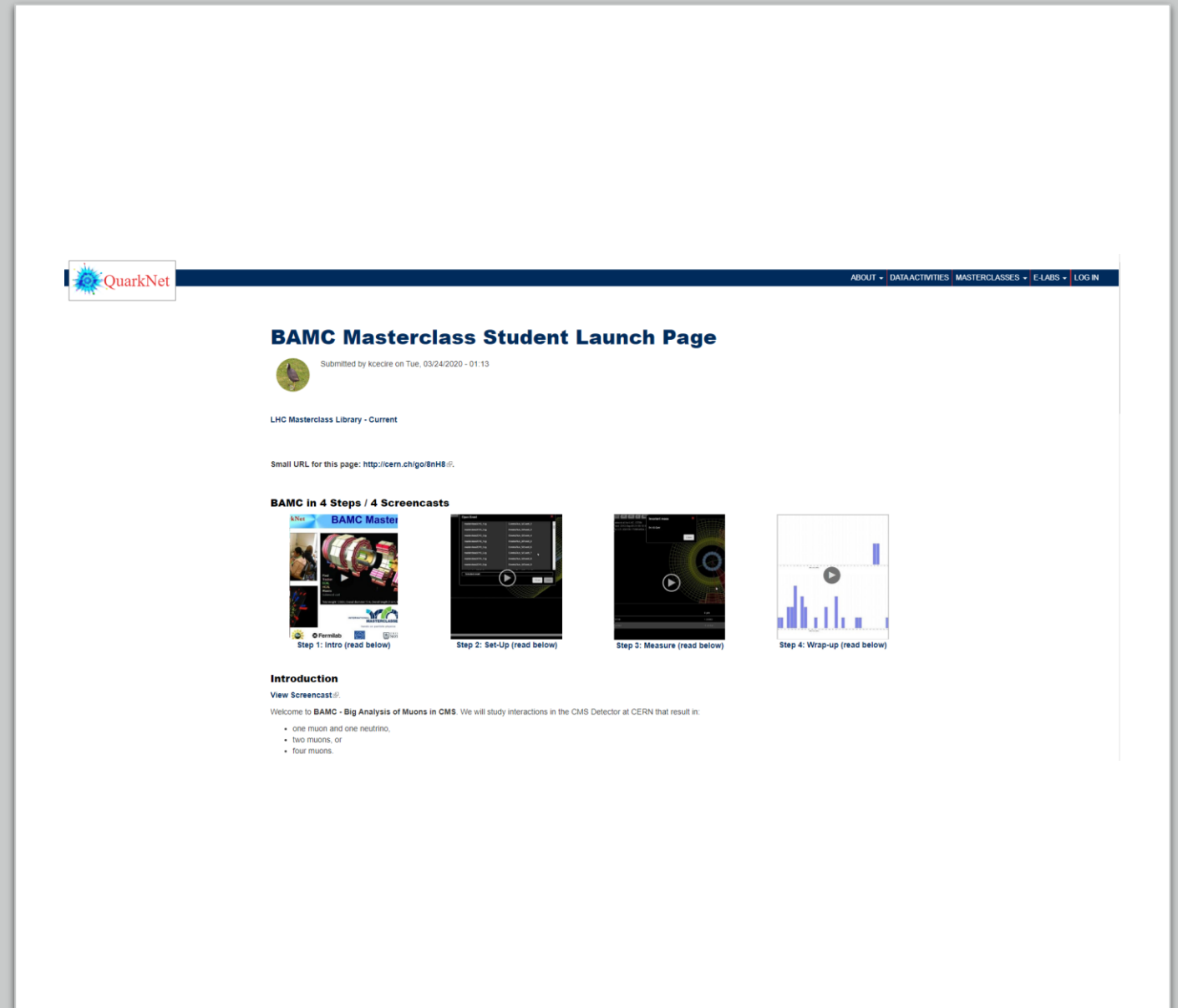
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**Masterclass runs**

(but you can start early if your students are ready).

# BAMC Masterclass Student Launch Page

- Follow the steps and instructions given on the website:
  - Introduction
  - Set –Up
  - Measure
  - Wrap-Up



The screenshot shows the 'BAMC Masterclass Student Launch Page' on the QuarkNet website. The page features a navigation bar with links for 'ABOUT', 'DATA ACTIVITIES', 'MASTERCLASSES', 'E-LABS', and 'LOG IN'. The main content area includes a title, a submission date, a user profile, and a list of four screencast steps: 'Step 1: Intro', 'Step 2: Set-Up', 'Step 3: Measure', and 'Step 4: Wrap-up'. An 'Introduction' section provides a brief overview of the masterclass topic.

**QuarkNet**

ABOUT | DATA ACTIVITIES | MASTERCLASSES | E-LABS | LOG IN



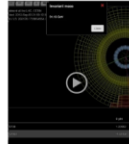
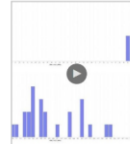
## BAMC Masterclass Student Launch Page

Submitted by keecire on Tue, 03/24/2020 - 01:13

LHC Masterclass Library - Current

Small URL for this page: <http://cern.ch/go/8nH8>

### BAMC in 4 Steps / 4 Screencasts

-  Step 1: Intro (read below)
-  Step 2: Set-Up (read below)
-  Step 3: Measure (read below)
-  Step 4: Wrap-up (read below)

### Introduction

View Screencast:

Welcome to **BAMC - Big Analysis of Muons in CMS**. We will study interactions in the CMS Detector at CERN that result in:

- one muon and one neutrino,
- two muons, or
- four muons.



# 1. Introduction

- This masterclass will study interactions in the CMS Detector at CERN that result in:
  - One muon and one neutrino
  - Two muons, or
  - Four muons
- All other interactions are considered background.
- Purposes:
  - Find the ratio of  $W^+$  to  $W^-$  events (from one muon and one neutrino)
  - Find the masses of parent particles – the particles that transform into 2 muons or 4 muons



# 1. Introduction

- What you should do:
  - Watch the Screencast:  
<https://screencast-o-matic.com/watch/cYeZjuytrO>
  - Read the Slides:  
[https://quarknet.org/sites/default/files/bamc\\_analysis\\_24mar2020.pdf](https://quarknet.org/sites/default/files/bamc_analysis_24mar2020.pdf)



## 2. Set-up iSpy and CIMA online

- Make sure you have the datafile that was assigned to you
- Watch the Screencast:  
<https://drive.google.com/file/d/1ZlnRcm8XJK3ZbpdK1c3RLcEAZaIO9IEK/view>
- Read the instructions on the Student Launch page to set up iSpy and CIMA





### 3. Do the Measurements

- Watch the screencast:  
[https://drive.google.com/file/d/10\\_PFLAE77s4PZoHsoDCdMBGc1cbyKgr5/view](https://drive.google.com/file/d/10_PFLAE77s4PZoHsoDCdMBGc1cbyKgr5/view)
- Make sure you open each measurement on both iSpy and CIMA
- Start with Event 1 and work through as many as you can (There are 100 in total)



## 4. Wrap-Up

- Watch the screencast: <https://screencast-o-matic.com/watch/cYeTbNykCy>
- Discuss the Mass Histograms and Results in combination of all schools and students in your BAMC Masterclass Videoconference



Videoconferences  
21/22/26/27 May

- Masterclass Videoconference
  - 4 students
  - Discuss analysis of schools and other students
  - Recorded for other students to watch afterwards

The image features a decorative graphic on the left side consisting of two overlapping, thick, wavy lines. The top line is a light blue color, and the bottom line is a light green color. They overlap in the center, creating a darker shade of blue-green. The lines are smooth and have a slight gradient. The text "Thank You" is centered within the white space of the top loop of the blue line.

Thank You