Faculty of Physics

WARSAW UNIVERSITY OF TECHNOLOGY

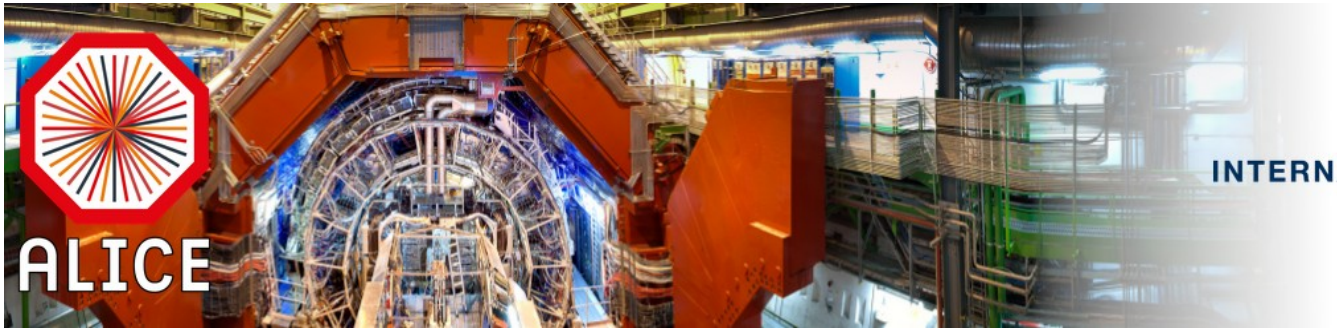
Faculty of Electronics and Information Technology

WARSAW UNIVERSITY OF TECHNOLOGY

New version of ALICE MasterClasses

Łukasz Graczykowski, Piotr Nowakowski

IPPOG Meeting
CERN, Geneva, Switzerland
November 29, 2019



INTERNATIONAL MASTERCLASSES

hands on particle physics

ALICE MasterClasses

ALICE MasterClass is a part of MatPhysChemWUT project which is partially funded by the European Union through the European Social Fund

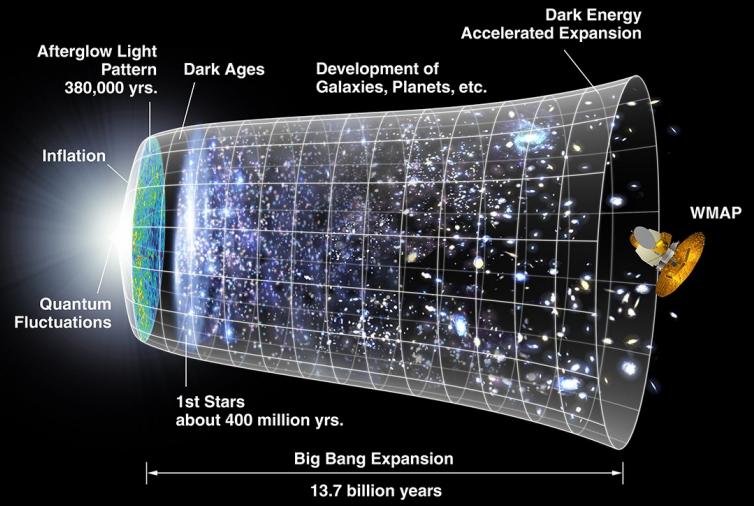
European Funds
Knowledge Education Development

Republic of Poland

European Union
European Social Fund

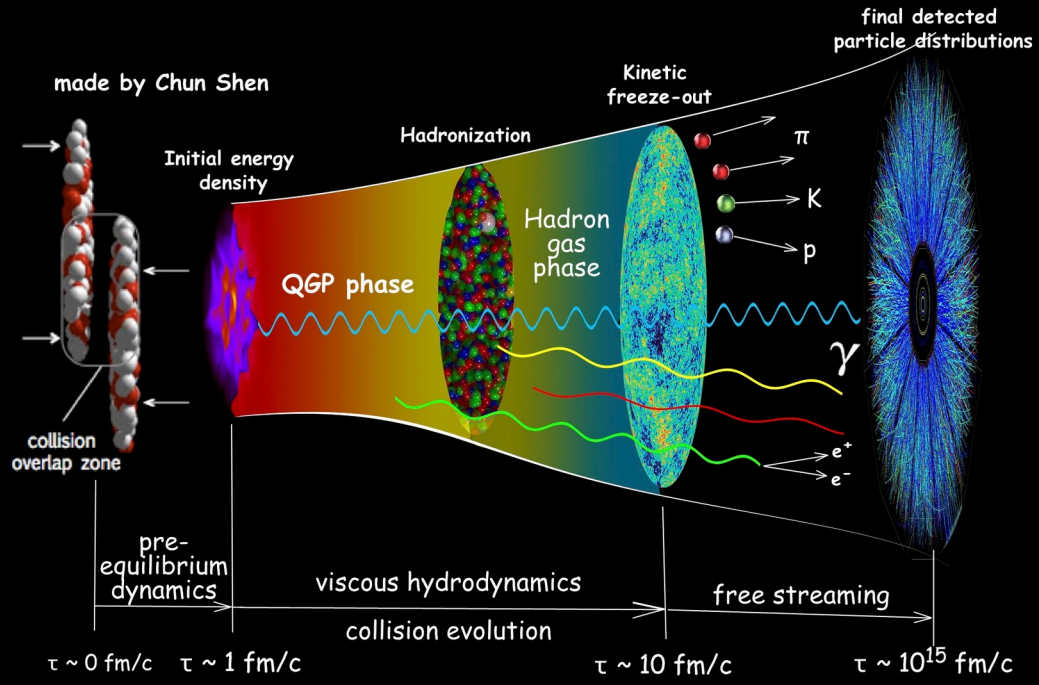
Big and Little Bang

Similar to the QGP in the early universe



Credit: NASA

our Universe

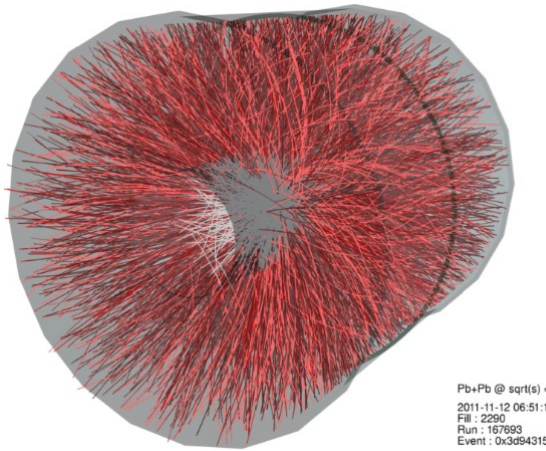


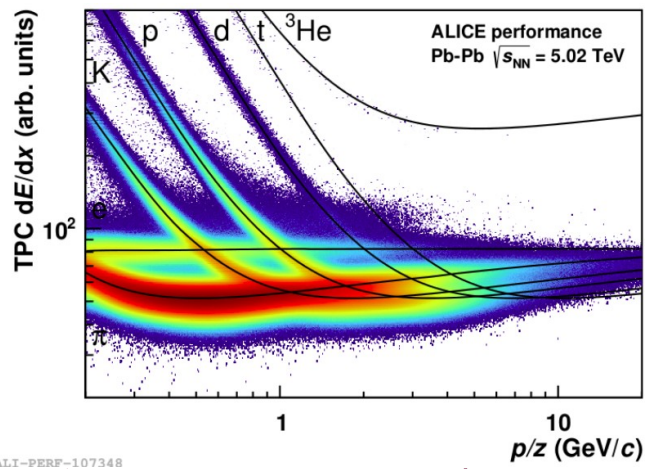
Credits: Paul Sorensen, Chen Shen

a heavy-ion collision

ALICE & Heavy-ion collisions

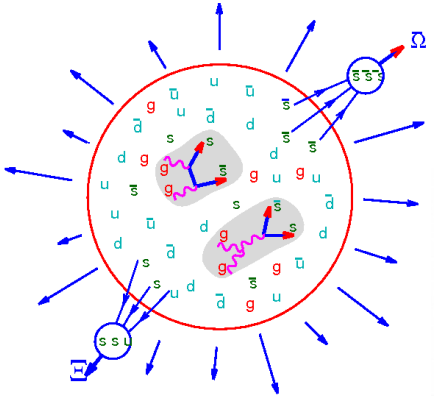
- ALICE – the heavy-ion dedicated experiment at LHC
  - study matter at extreme conditions using multiple observables
- Main technical aspects:
  - challenging tracking (high multiplicities, low momenta)
  - **particle identification (PID) using practically all known techniques**
  - TPC – heart of ALICE tracking and and dE/dx

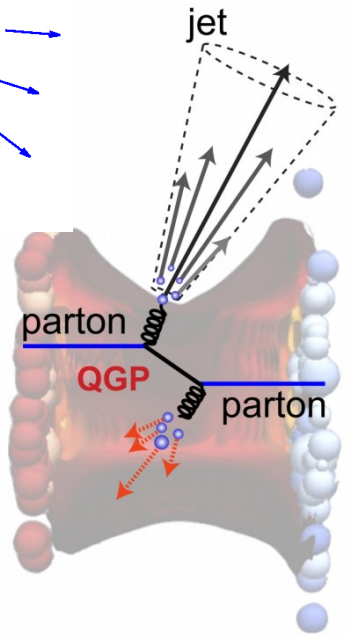


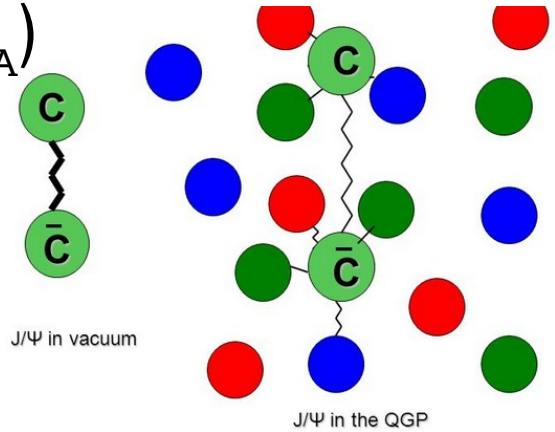


ALICE MasterClass – measurements

- **Three measurements**
  signatures of QGP
  - 1) *Strangeness enhancement* → decays of strange hadrons
  - 2) *Jet quenching* → nuclear modification factor (R_{AA})
  - 3) J/Ψ *suppression* (work in progress)

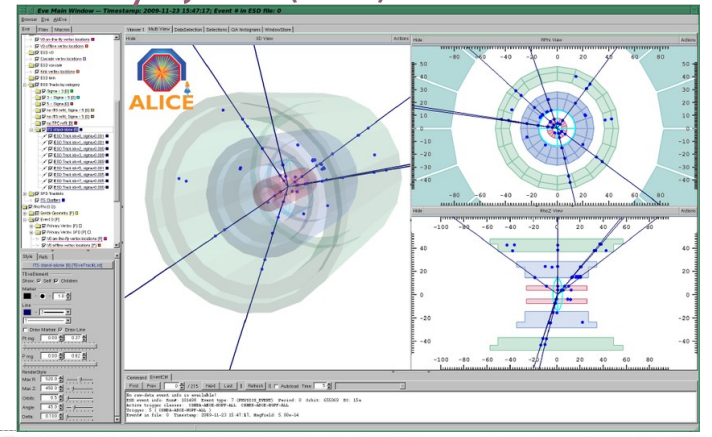




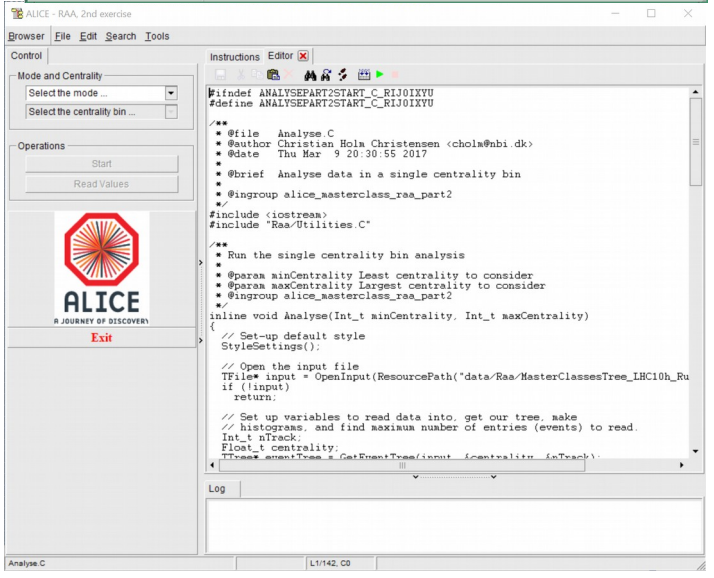


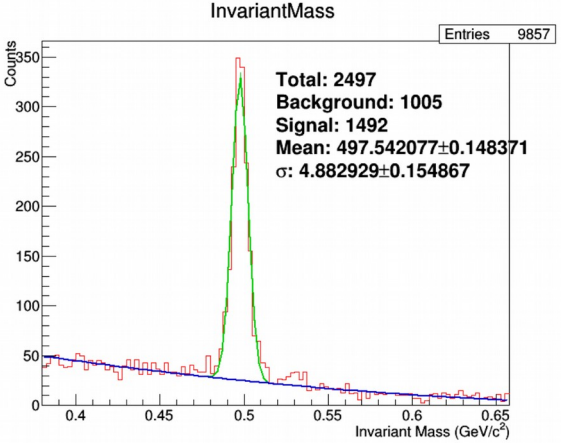
ALICE MasterClass

first pp event seen by ALICE
Eur. Phys. J. C65 (2010) 111-125



- Based on ROOT (EVE):
  - simplified **event display**, close to the one used in the control room
  - visual analysis of small sample of events (~50)
  - statistical analysis of larger samples (fitting, background parameterization)
  - "writing code"

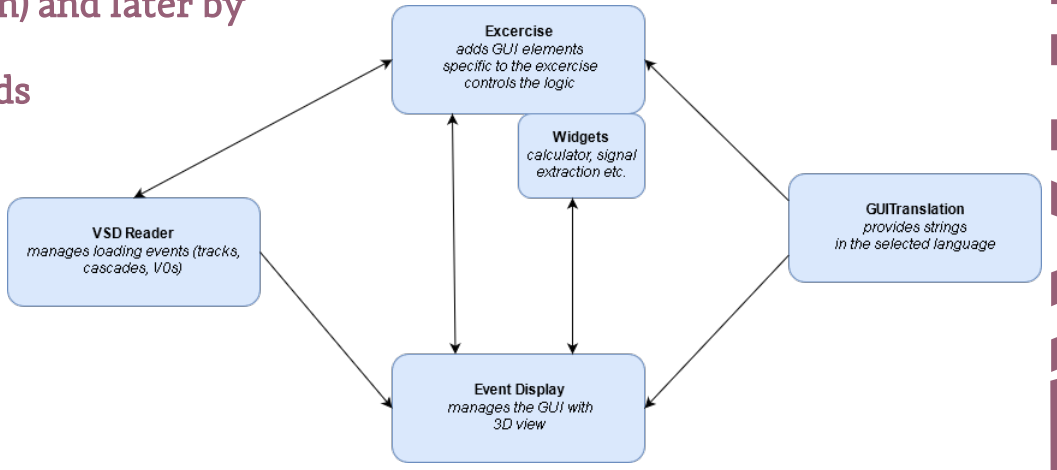




New developments

Initial work by Christian Christensen (Copenhagen) and later by CERN Summer Student (Jonas Toth) in 2018

Taken over by Piotr Nowakowski (WUT) afterwards



- **Macros → standalone app**
- **Common framework**
  - all exercises share core classes
- **Source code on CERN GitLab:** https://gitlab.cern.ch/pinowako/masterclass-continued
- **CMake build system**
- **Available versions:**
  - **Linux** (AppImage binary, clickable, **ROOT embedded!**)
  - **Windows** (Visual Studio compiled, installer, clickable, **ROOT embedded!**) – **first time provided!**
  - **Virtual Box** machine (pre-configured Ubuntu)

Windows 10

ubuntu

Piotr Nowakowski › masterclass-continued › Details

M **masterclass-continued**

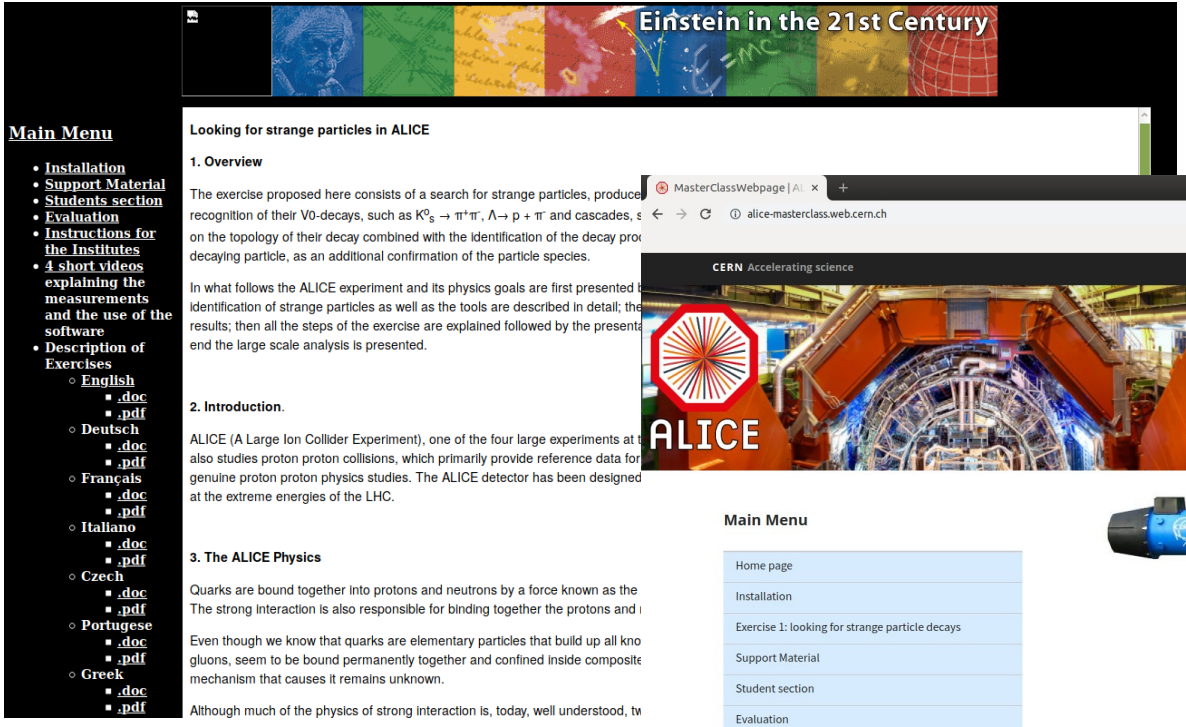
Project ID: 71281

GNU GPLv3 **752** Commits **2** Branches **4** Tags **759.1 MB** Files

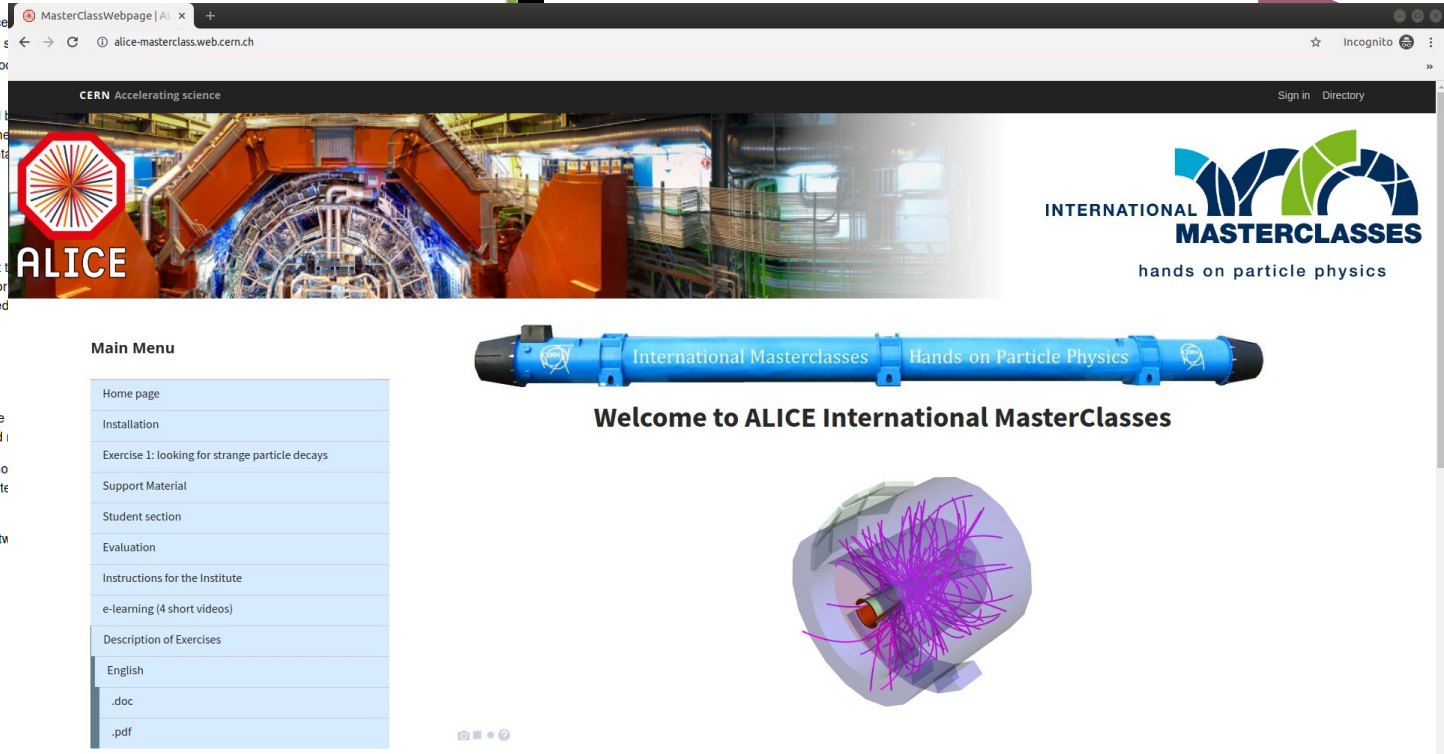
Continuation of the ROOT-based MasterClass refactor.

Webpage

OLD page



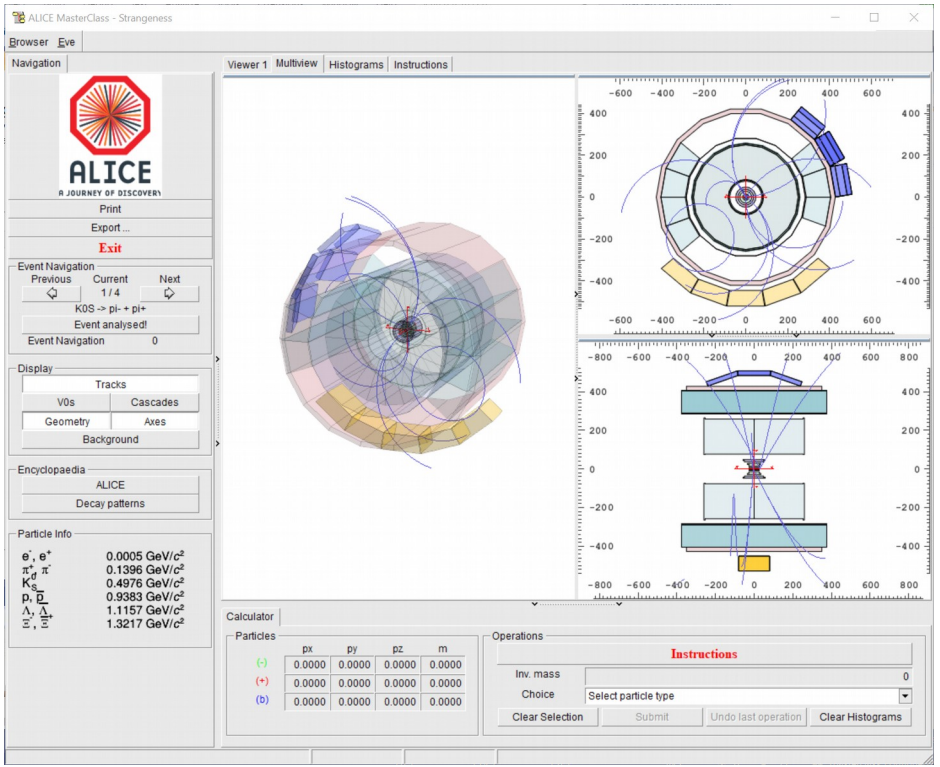
NEW page (Drupal)
...work in progress...
https://alice-masterclass.web.cern.ch/



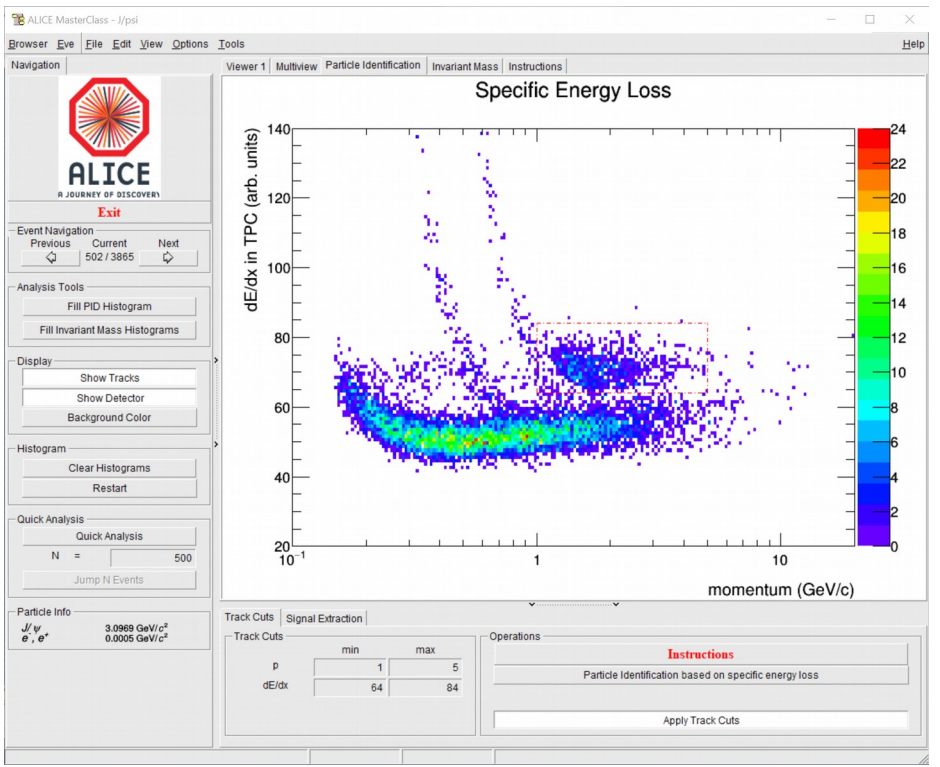
Plan to use the new Drupal template from the new IMC page, when ready

How does it look like?

Looking for strange particles
visual analysis

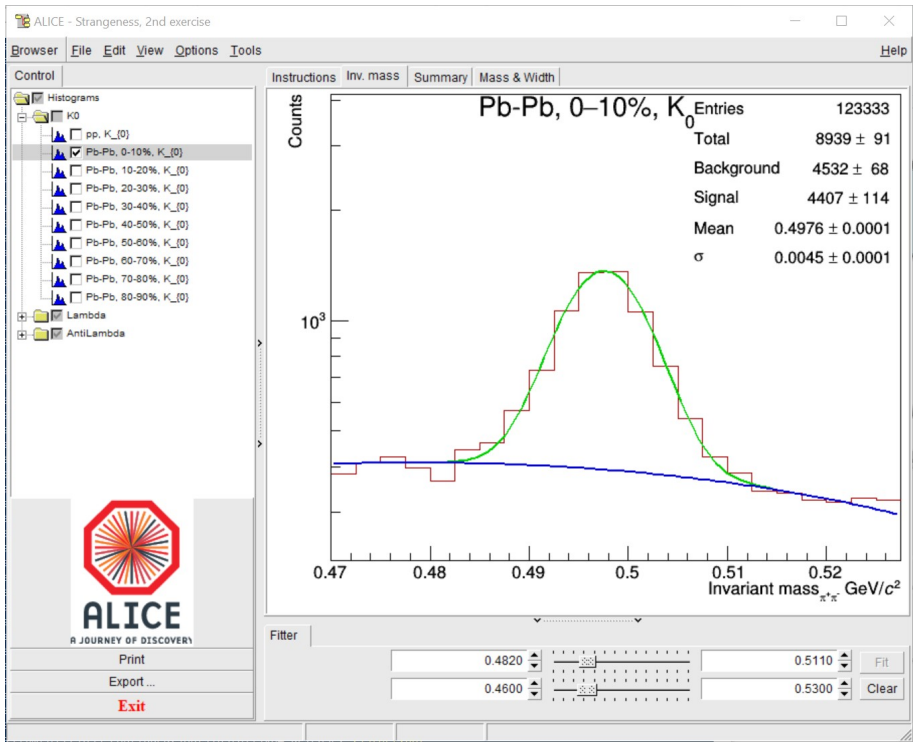


J/Ψ suppression
electron PID

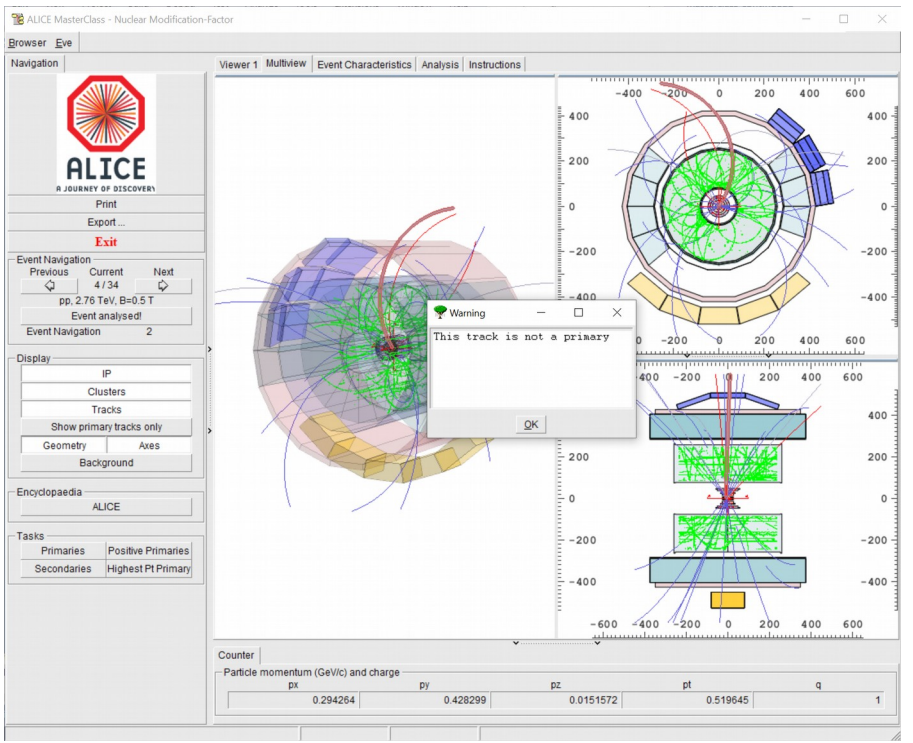


How does it look like?

Looking for strange particles
invariant mass fits



Nuclear modification factor (R_{AA})
selecting primary tracks



Limitations & further plans

- Limitations of ROOT 6:
  - EVE and GUI in ROOT to become deprecated in ROOT 7
  - no support for modern high-res. Screens (i.e. Retina)

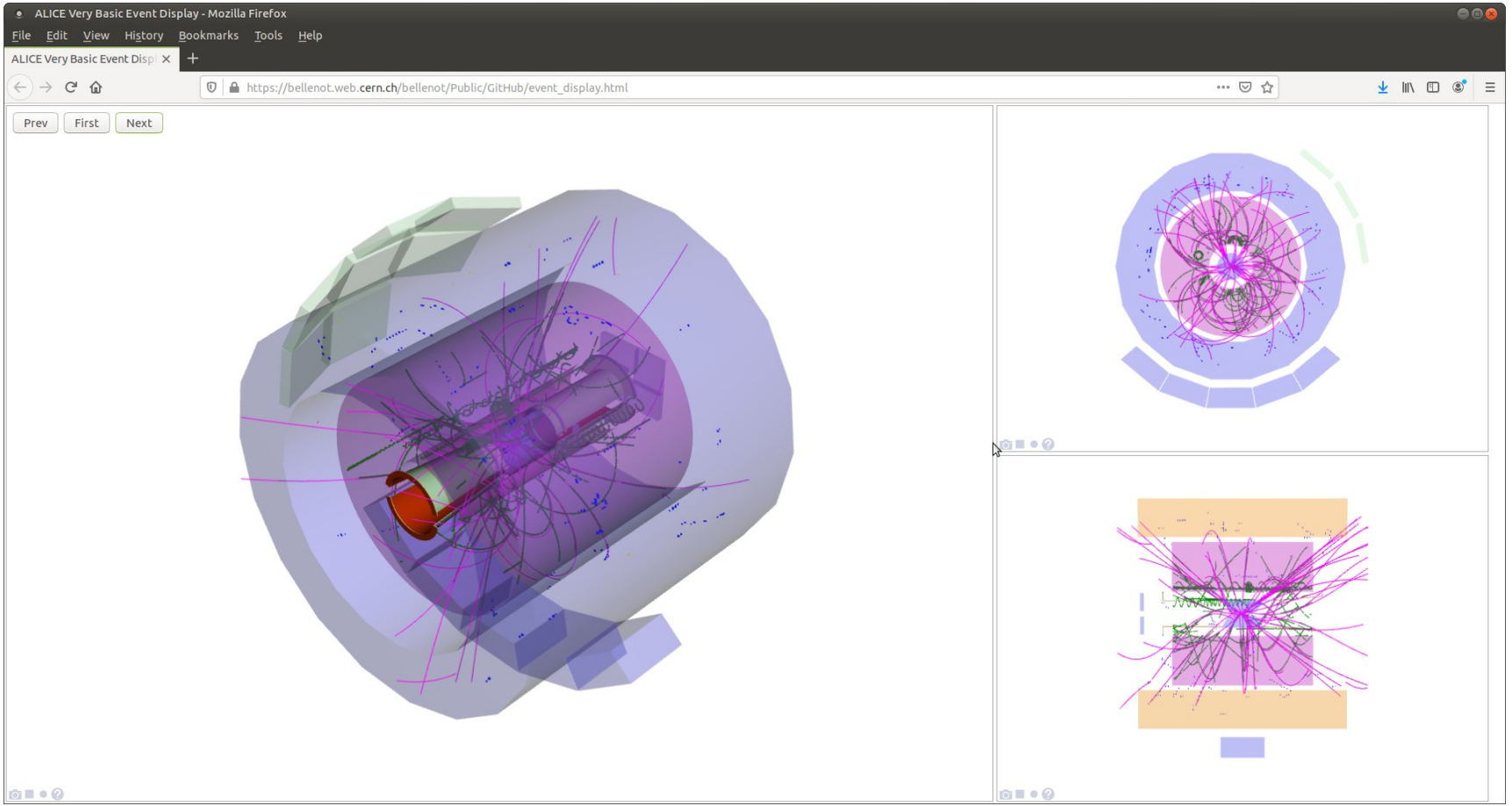
- Solution → towards a fully web based application
- Our (own) requirements:
  - keep the app as close to the current one as possible
  - read directly ROOT data files and ROOT geometry (no data/geometry conversion)
  - most of calculations done on the client side/in the browser (avoid server overloads)
- Technology choice (28 Nov. meeting ROOT Team):
  - do not use ROOT on the server side → will quickly overload
  - use JSROOT to display geometry and histograms
  - use OpenUI5 for GUI (OUI5 to be used in ROOT 7)
  - use JavaScript instead of ROOT for simple fits and “code writing”

JSROOT

OpenUI5

Web version – proof of concept

- JSROOT visualization of ALICE as implemented by ROOT Team



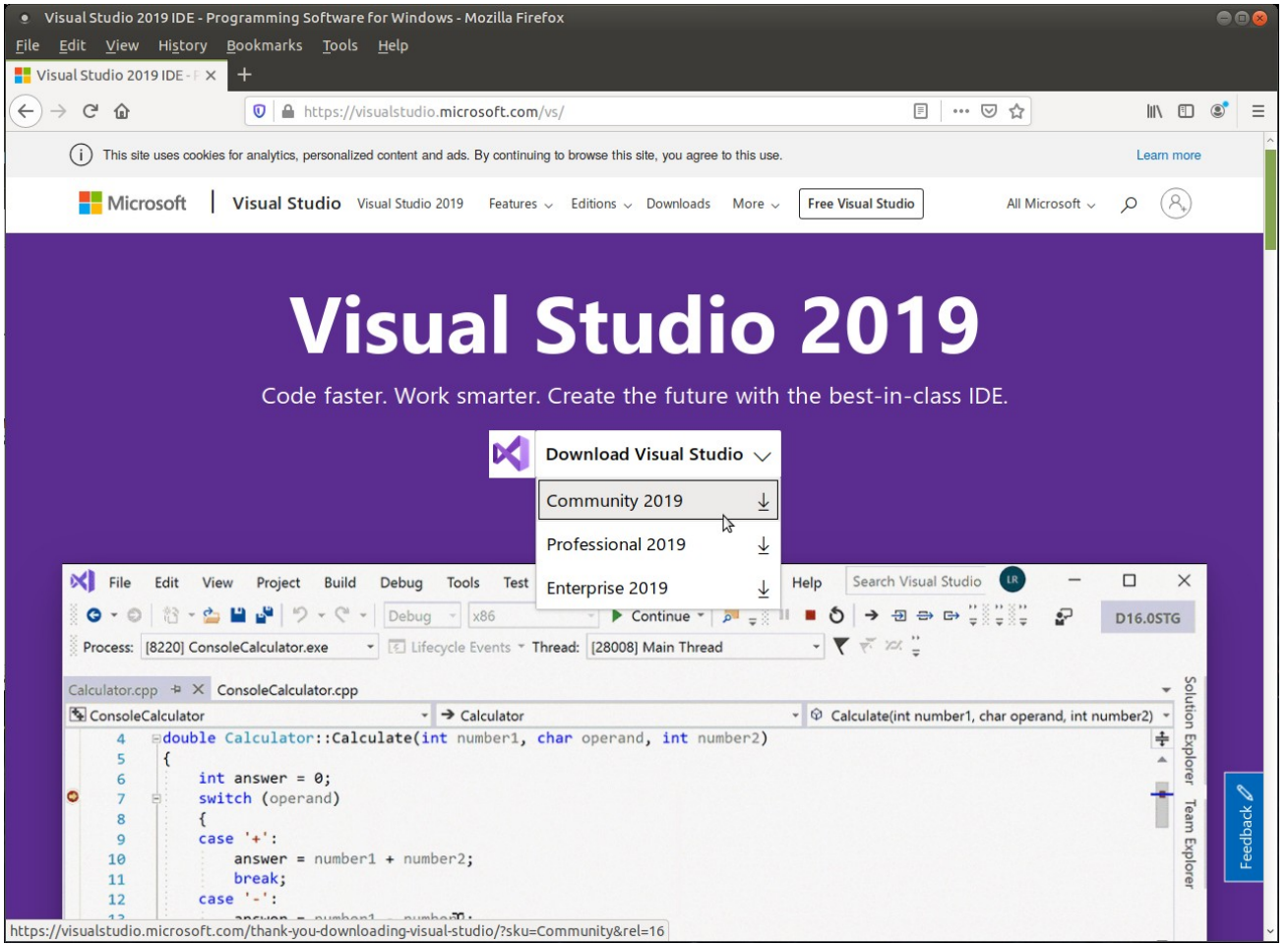
Instead of a Summary

LIVE DEMO

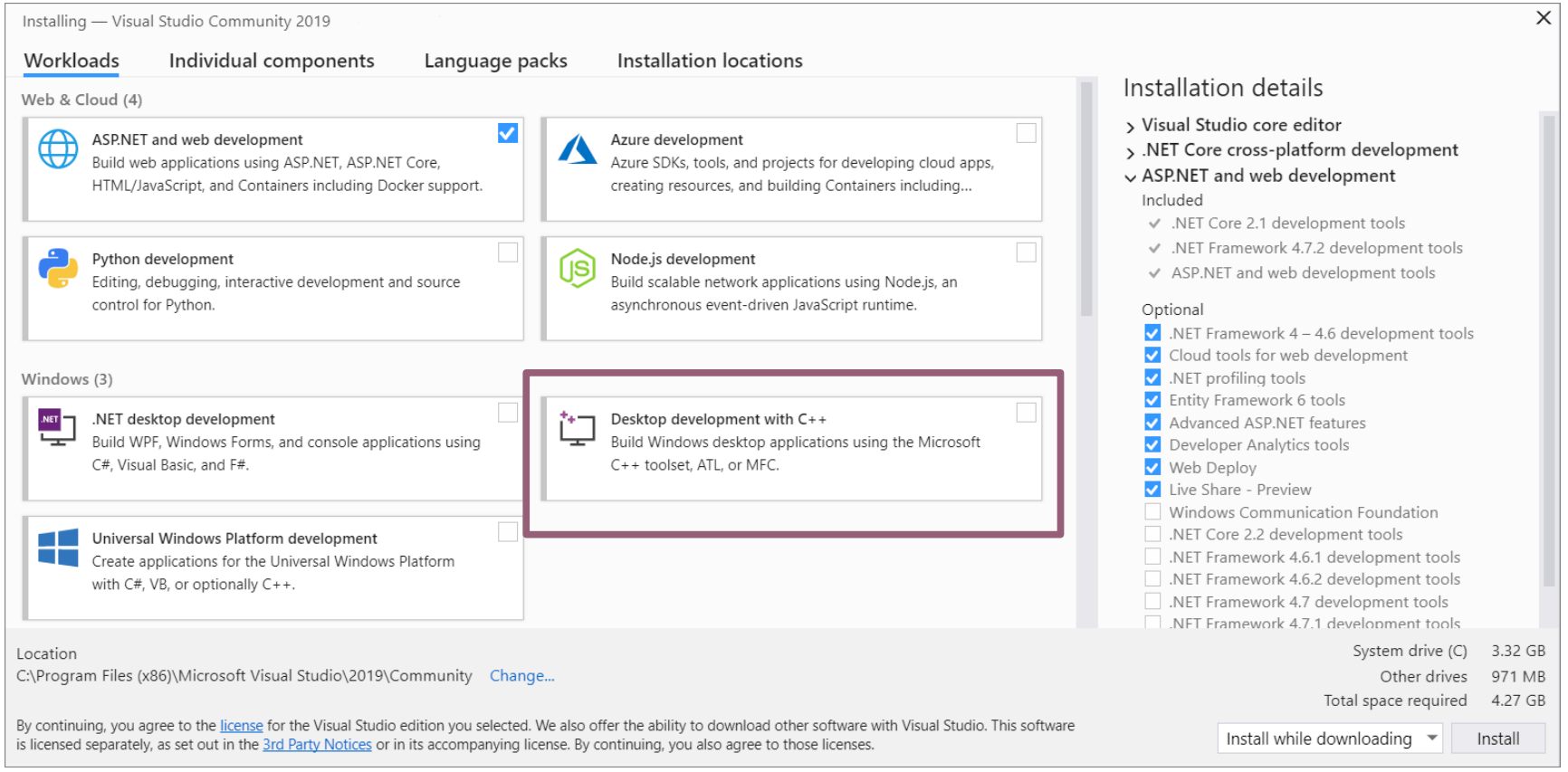
Comments, suggestions, bug reports, etc.:

alice-masterclass-dev@cern.ch

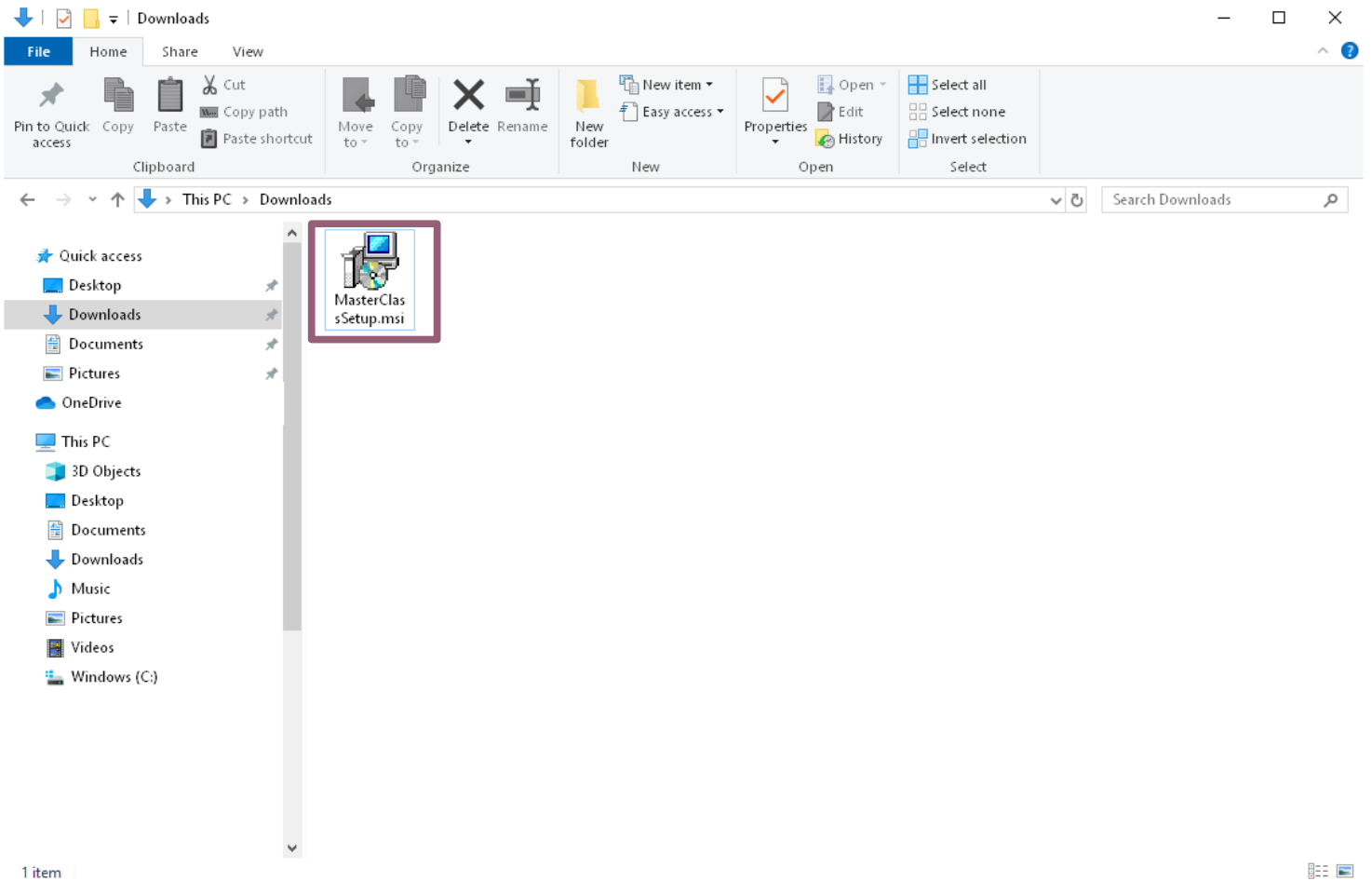
Installation – step 1 ➞ Visual Studio



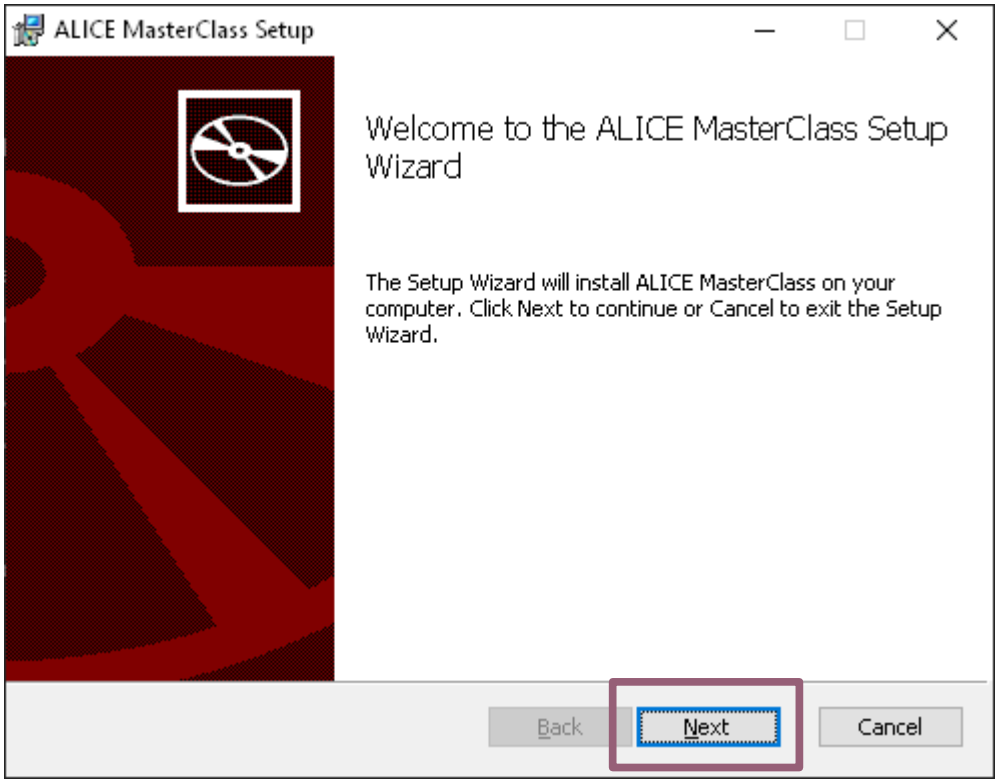
Installation – step 2 ➞ VS C++ IDE



Installation – step 3 → MasterClass



Installation – step 4 ➜ MasterClass



Launch MasterClass