

Jupyter Notebooks with CMS Open Data

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CERN Open Data Portal

All open data is available through CERN Open Data Portal!

The screenshot shows the CERN Open Data Portal homepage. At the top, the browser address bar displays 'opendata.cern.ch'. The portal's header features the 'opendata CERN' logo and an 'About' dropdown menu. The main content area includes the text 'Explore more than 1 petabyte of open data from particle physics!'. Below this is a search bar with the placeholder 'Start typing...' and a blue 'Search' button. Search examples are listed: 'collision datasets', 'keywords: education', and 'energy: 7TeV'. To the left, under the heading 'Explore', are links for 'datasets', 'software', 'environments', and 'documentation'. To the right, under 'Focus on', are links for 'ATLAS', 'ALICE', 'CMS', and 'LHCb'. A decorative graphic on the right side consists of concentric circles and colored dots. At the bottom center, there is a 'Get started' button with a dropdown arrow on each side.

What you should know from Open Data

Open data for Research

- We have released $\approx 1/2$ of Run1 data, we will release up to 100%
- Users download a VM image, and work in a lxplus type environment with access to CMSSW and to the condition data through cvmfs
- Data can be accessed from eospublic through xrootd
- Several analysis examples and guides available (and more are coming)
- Open access fosters long-term availability and reusability of data

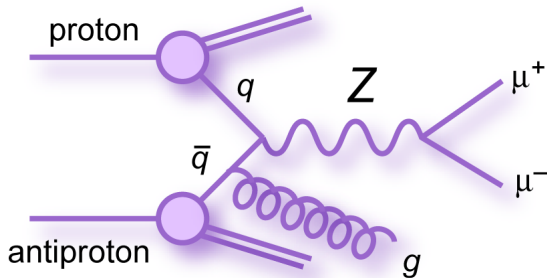
Education

- Event display is available on the open data portal, and first 25 events of each collision dataset are available in event display format
- Some samples of data have been prepared in csv format and can be used e.g. in jupyter notebooks (today's tutorial)

LET'S BEGIN

[Click Here](#)

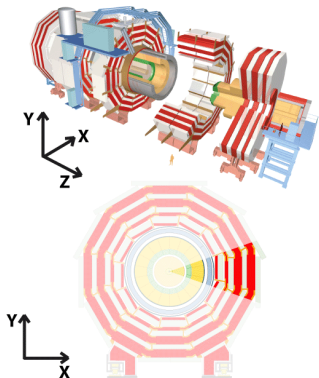
Invariant Mass in Dimuon Decay



Theorem (Invariant Mass Calculation)

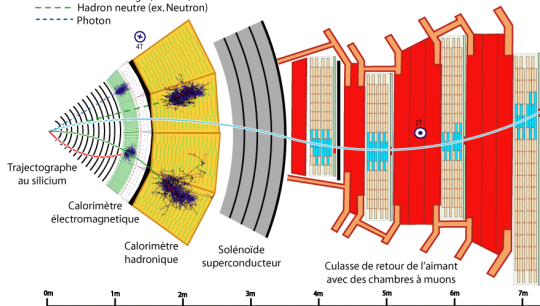
$$M^2 = (E_1 + E_2)^2 - \| \mathbf{p}_1 + \mathbf{p}_2 \|^2 = 2p_{T1}p_{T2}(\cosh(\eta_1 - \eta_2) - \cos(\phi_1 - \phi_2))$$

CMS Transverse Slice



Légende:

- Muon
- Électron
- Hadron chargé (ex. Pion)
- - - Hadron neutre (ex. Neutron)
- - - Photon



The End