



Z path Instruction



To start:

- in **ATLAS_11** or **ATLAS_12** start the program:
HYPATIA_7.4_Masterclass.jar

Loading the data:

- dataset number <number><letter> (for example **11 K**) is given in the form
- start loading the data in the window **Invariant Mass** → **File** → **Read Event Locally**
- the data are stored in **ATLAS_11/events/dir11** (or **ATLAS_12/events/dir12**)
- select the file with the appropriate letter, for example **groupK.zip**

Data analysis:

<p>transverse energy needs to be small, to reject events with energetic neutinos if ETMis is larger than 30 GeV count the event as background and continue with the next event</p>	
<p>consider tracks with relatively large transverse momentum (for example Pt > 5 GeV) to find individual leptons and then lepton pairs (e⁺e⁻ or μ⁺μ⁻)</p>	
e⁺e⁻	μ⁺μ⁻
electron track is visible in the Inner Detector	muon track is visible in the Inner Detector (if this track is selected "Muon track" appears in <i>Output display</i> tab)
track does not continue beyond Inner Detector	track continues to the Muon Detector
extrapolating the track to electromagnetic calorimeter some yellow energy deposit should be found, sometimes in <i>Physics Objects</i> tab an object with similar Pt , φ and θ can be found	brak depozytu energii w kalorymetrze elektromagnetycznym, a jeśli jakiś jest, to parametry obiektu Pt , φ lub θ w zakładce <i>Physics Objects</i> różnią się od tych dla śladu
in hadronic calorimeter no significant energy deposit can be found on extrapolation of the track	in hadronic calorimeter no significant energy deposit can be found on extrapolation of the track
<p>all selected tracks (lepton candidates) have to originate from the same vertex</p>	
<p>tracks have to be added always in pairs - two particles of the same type (ee or μμ), but with opposite sign of electric charge; more than one pair can be added</p>	
<p>according to the found lepton types the events are assigned to: Z → e⁺e⁻, Z → μ⁺μ⁻ or H → l⁺l⁻l⁺l⁻ categories (l denotes e or μ, like: H → e⁺e⁻μ⁺μ⁻)</p>	
<p>in the events without leptons, search also for the para photon pairs, it is two <i>Physics Objects</i> which are not associated with tracks; such events are assigned to H → γγ category</p>	
<p>an event without any lepton pair or photon pair belongs to background</p>	

Storing results and uploading them to the server:

- results of analysis can be stored in the window **Invariant Mass: File** → **Export Invariant Mass** This opens a window to save *Invariant_Masses.txt* file (save it to Desktop or any other place)
- In the Web browser open: <http://cernmasterclass.uio.no/>
- from the menu select "OPLOT", and in the opened page select "Student"
- log yourself as: **Username: ippog Password: imc**
- in the third page choose today's date, Krakow as the *Institution*, your *Group number* (11 or 12) and *Group letter*
- in the next page, on the right, use the file selection button and then submit button. After uploading the file histograms representing your results are displayed

In the case of any problems or doubts - ask the tutor