

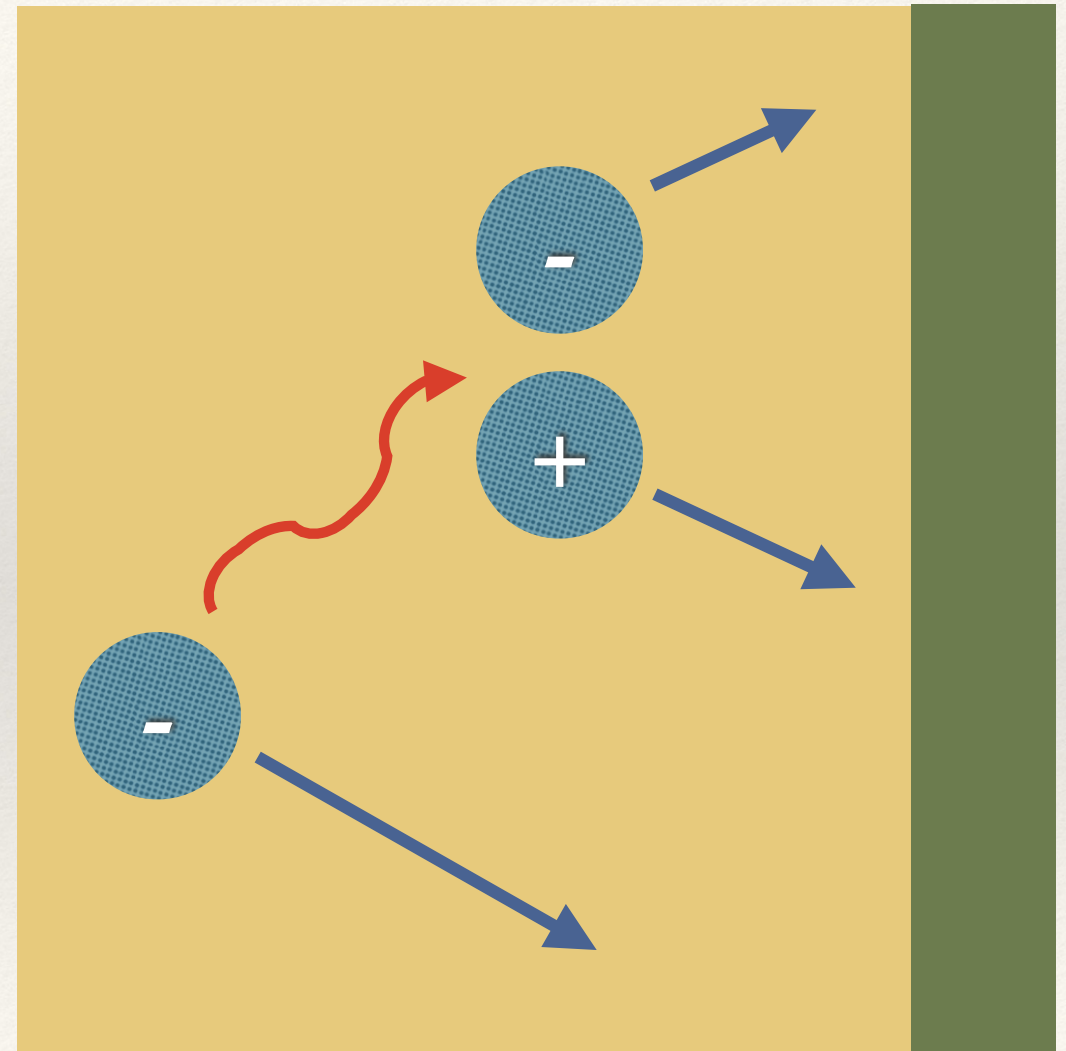
# Measuring the lepton charge misidentification rate for SUSY analysis

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2 July 2015  
For UM REU Presentations

# What is electron mis-identification?

- ❖ When an electron enters the detector, it may slow down due to the material and undergo bremsstrahlung
- ❖ The photon may then undergo pair production and produce an electron-positron pair
- ❖ Due to the limited resolution of the detector, the wrong electron/positron may be registered and thus result in charge misidentification



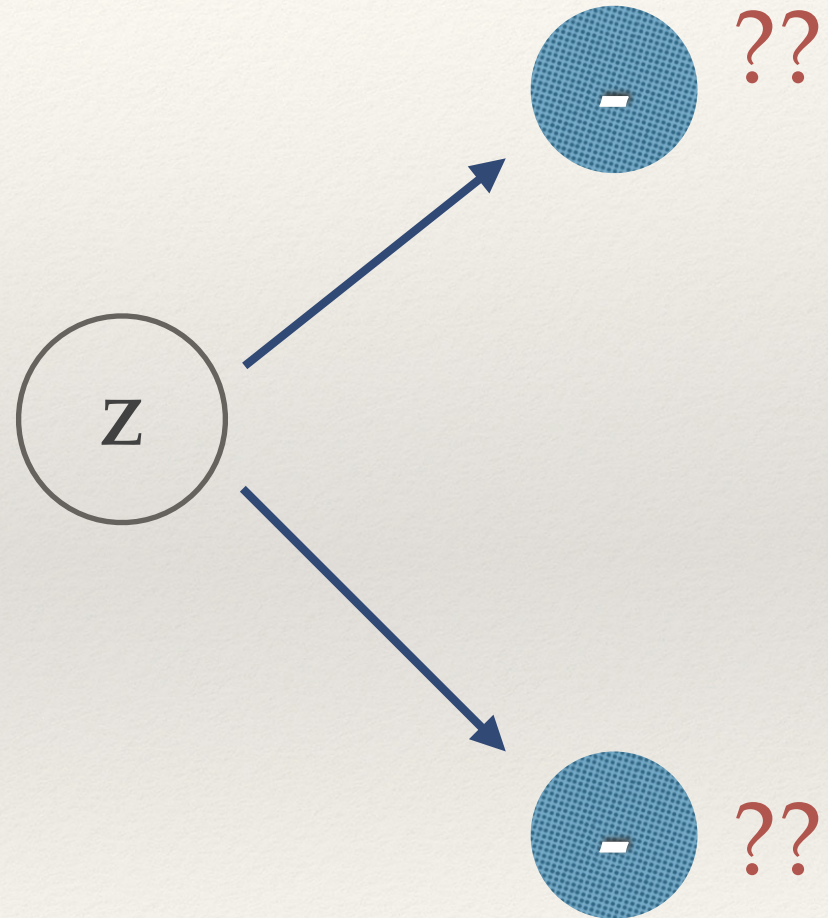


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# Determining the mis-ID rate

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- ❖ On  $Z \rightarrow e^+e^-$  events
  - ❖ Tag-and-probe
  - ❖ Likelihood method
- ❖ Measure  $\epsilon(\eta)$  and  $\epsilon(p_T)$



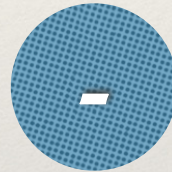


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# Tag-and-probe method

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Are you *really* an  
electron and not a  
positron?



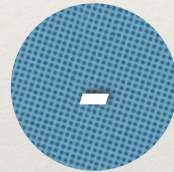


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# Tag-and-probe method

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Are you *really* an  
electron and not a  
positron?



Is there anything  
that can confirm  
your identity?



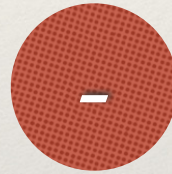


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# Tag-and-probe method

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Looks like everything's  
in order. You're legit!



Tag

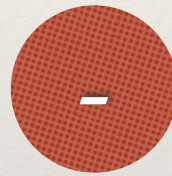




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# Tag-and-probe method

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Tag



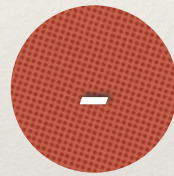
Probe



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# Tag-and-probe method

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Tag



Probe



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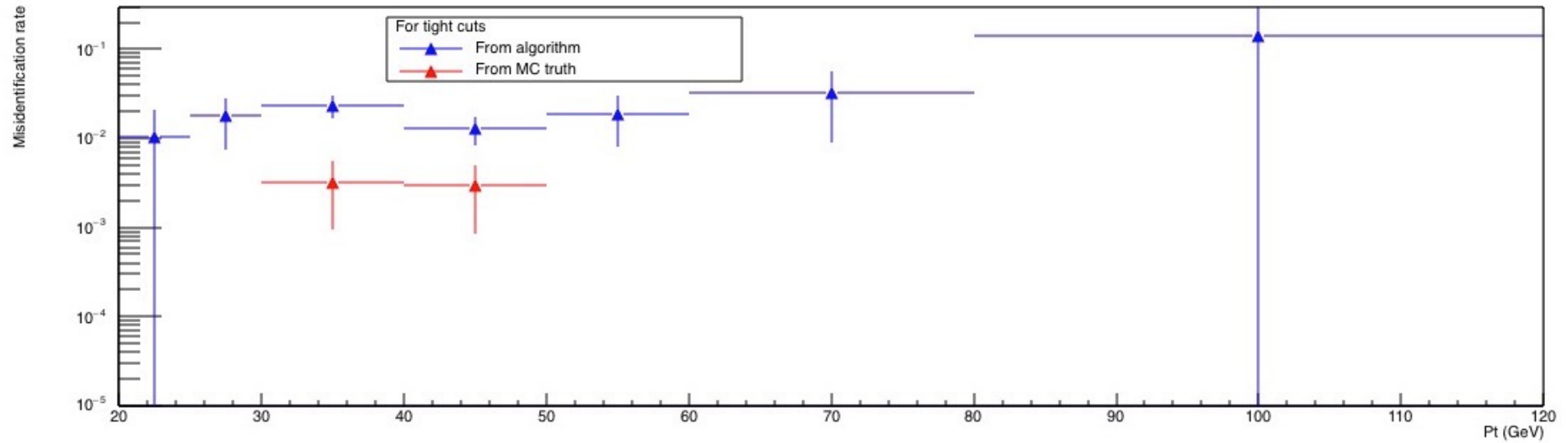
# Tag-and-probe method

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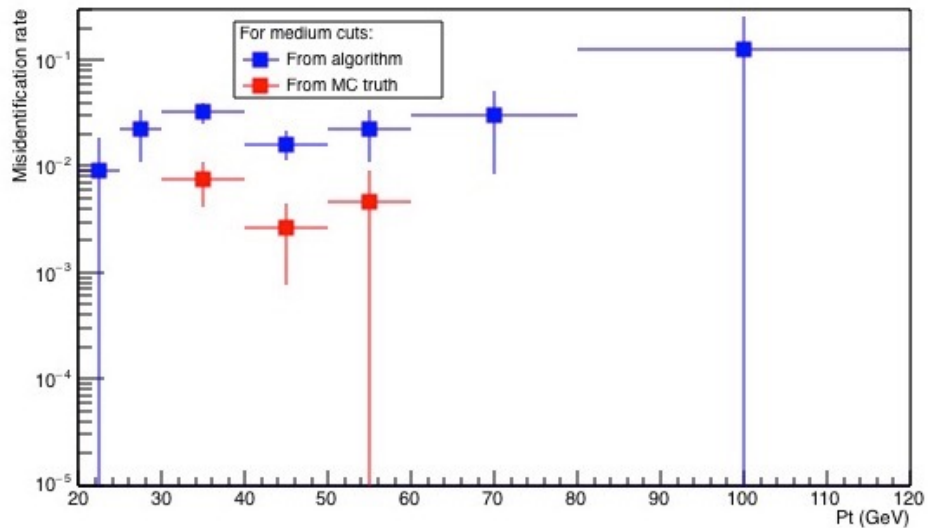
$$\epsilon = \frac{\textit{Number of same-sign probes}}{\textit{Total number of probes}}$$

# Results so far...

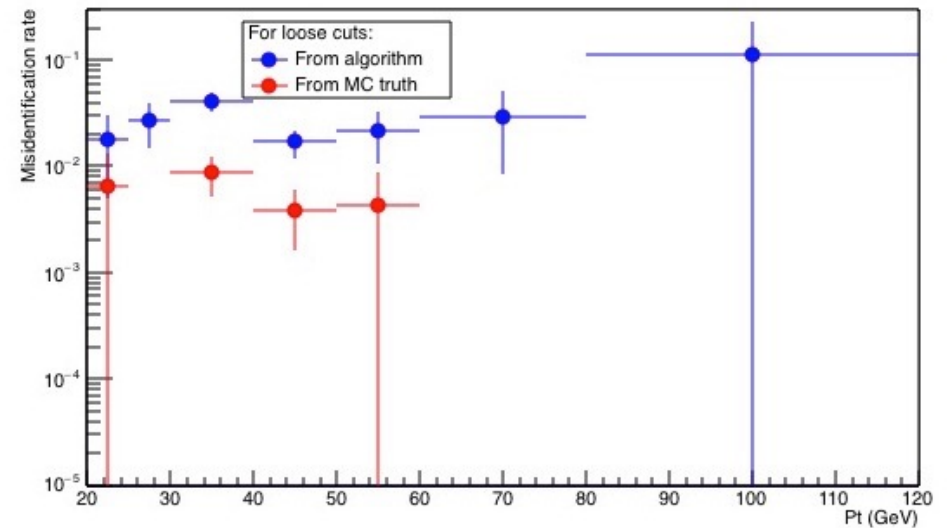
Charge misidentification as a function of pt



Charge misidentification as a function of pt



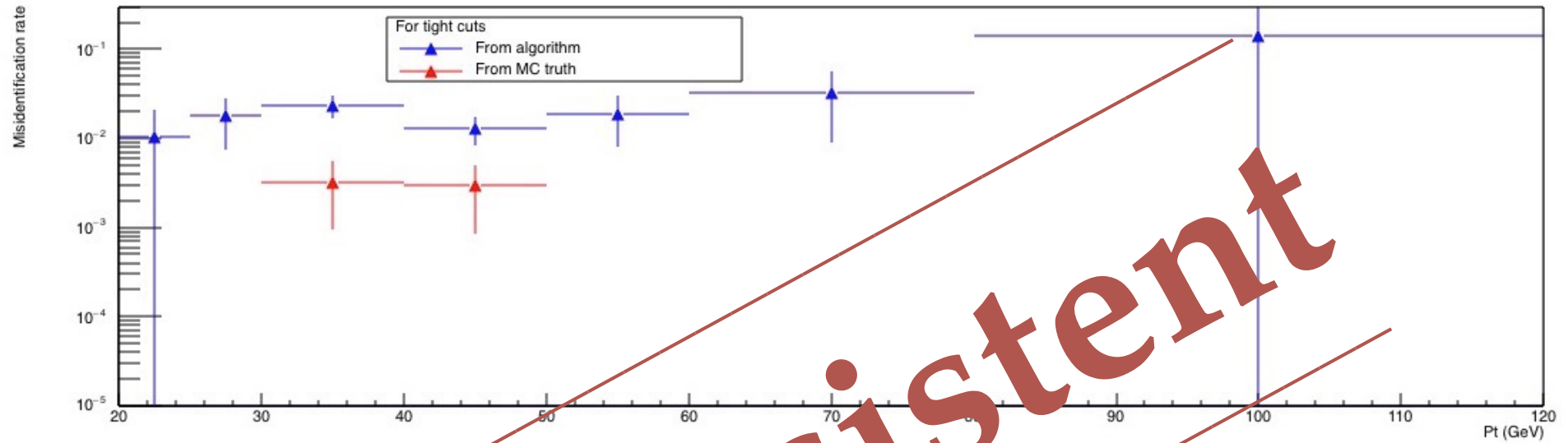
Charge misidentification as a function of pt



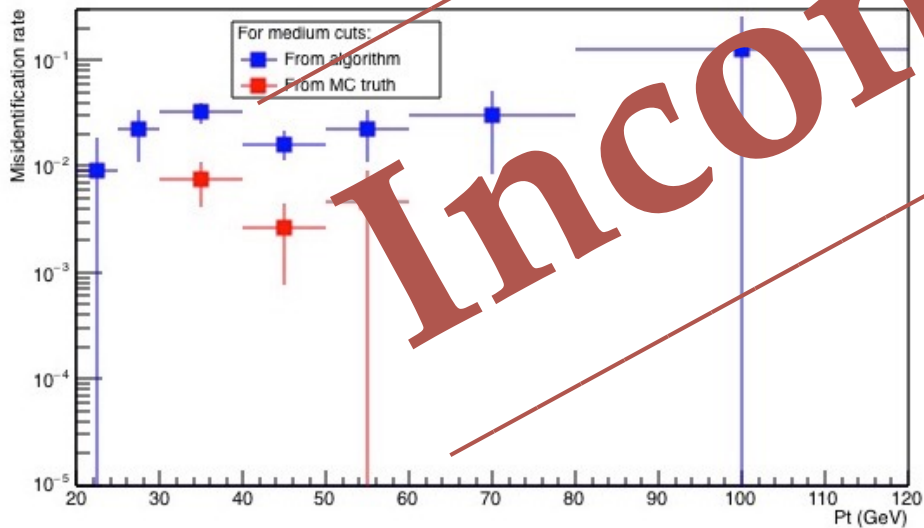


# Results so far...

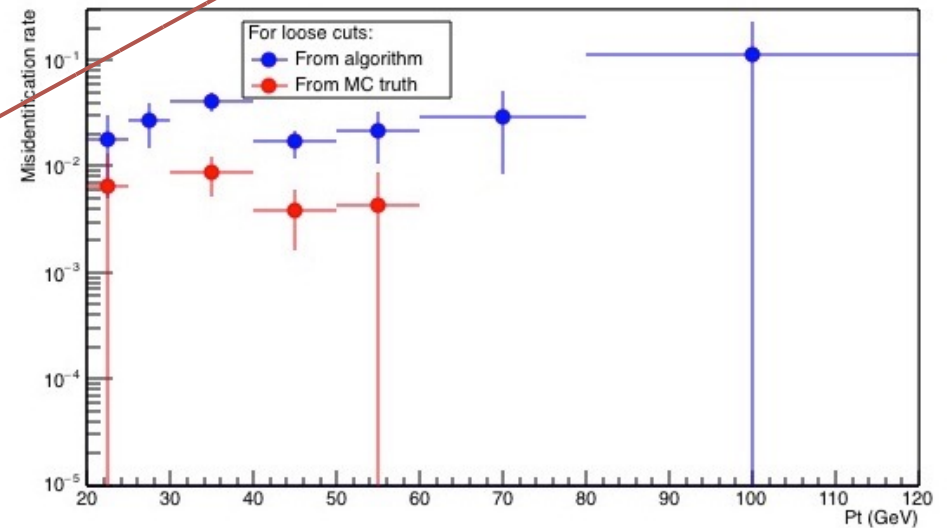
Charge misidentification as a function of pt



Charge misidentification as a function of pt



Charge misidentification as a function of pt



**Inconsistent**



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# Outside CERN

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# Outside CERN

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# Outside CERN

