

Set-Up for Semi-Visible Jets with Leptons

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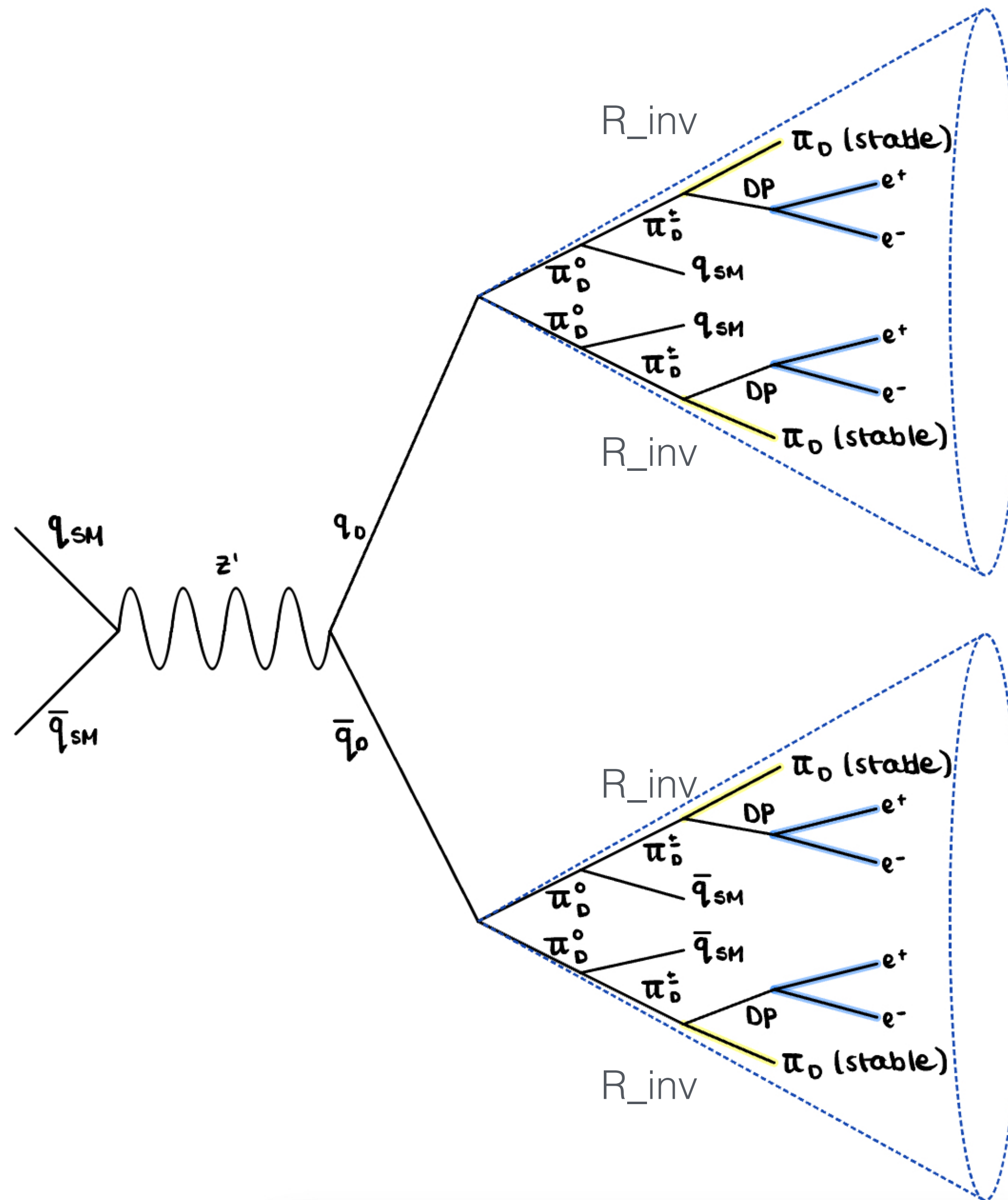
Supervisor: Prof Deepak Kar



First things first

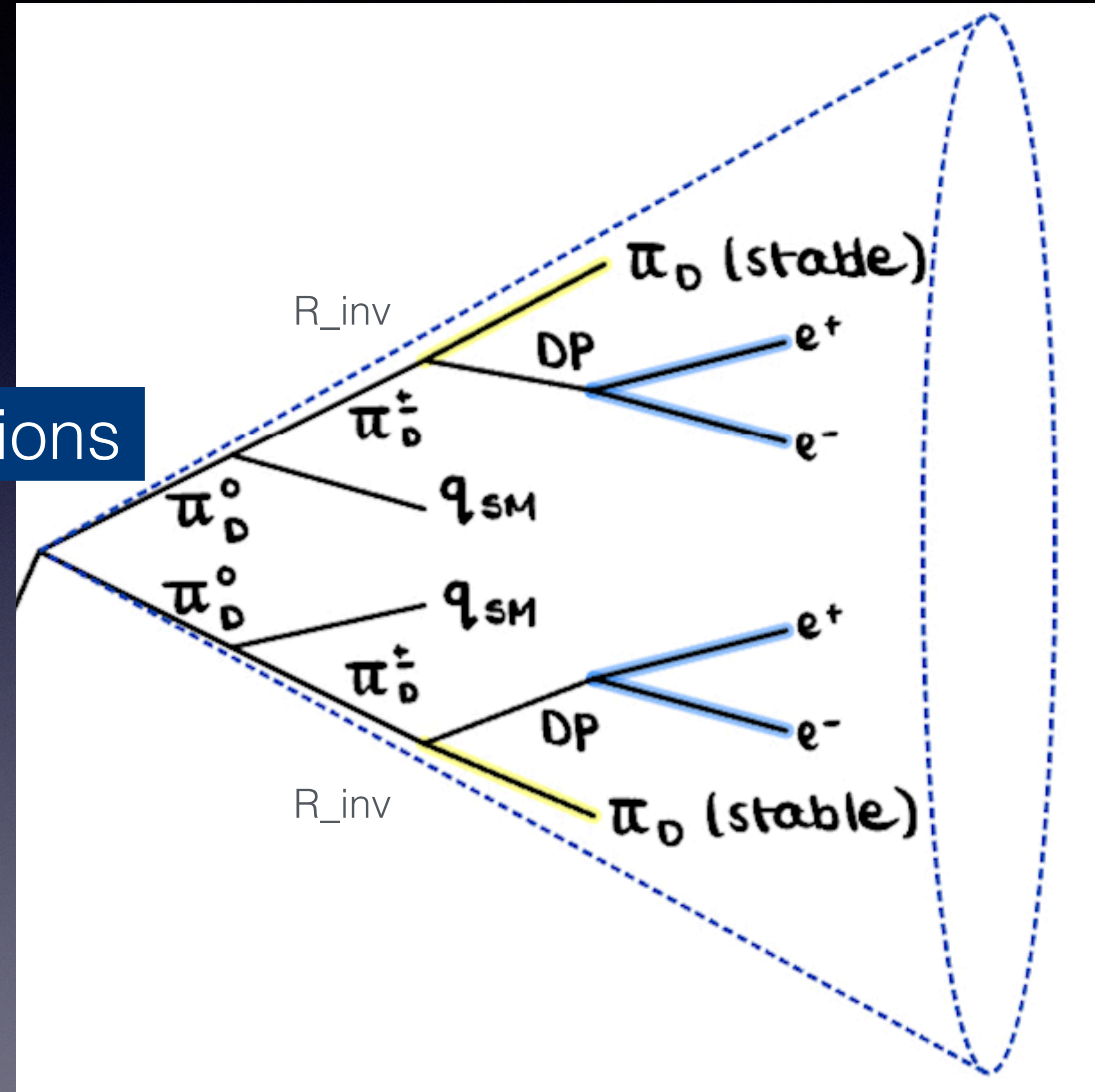
- Big thank you to **Nishita Desai** for the implementation of the model
- Leptons lurking in SVJs at the LHC
 - Cesare Cazzaniga and Annapaola de Cosa
 - [arXiv:2206.03909](https://arxiv.org/abs/2206.03909)
- Can we make a simpler model?

Our Set-Up



Our Model

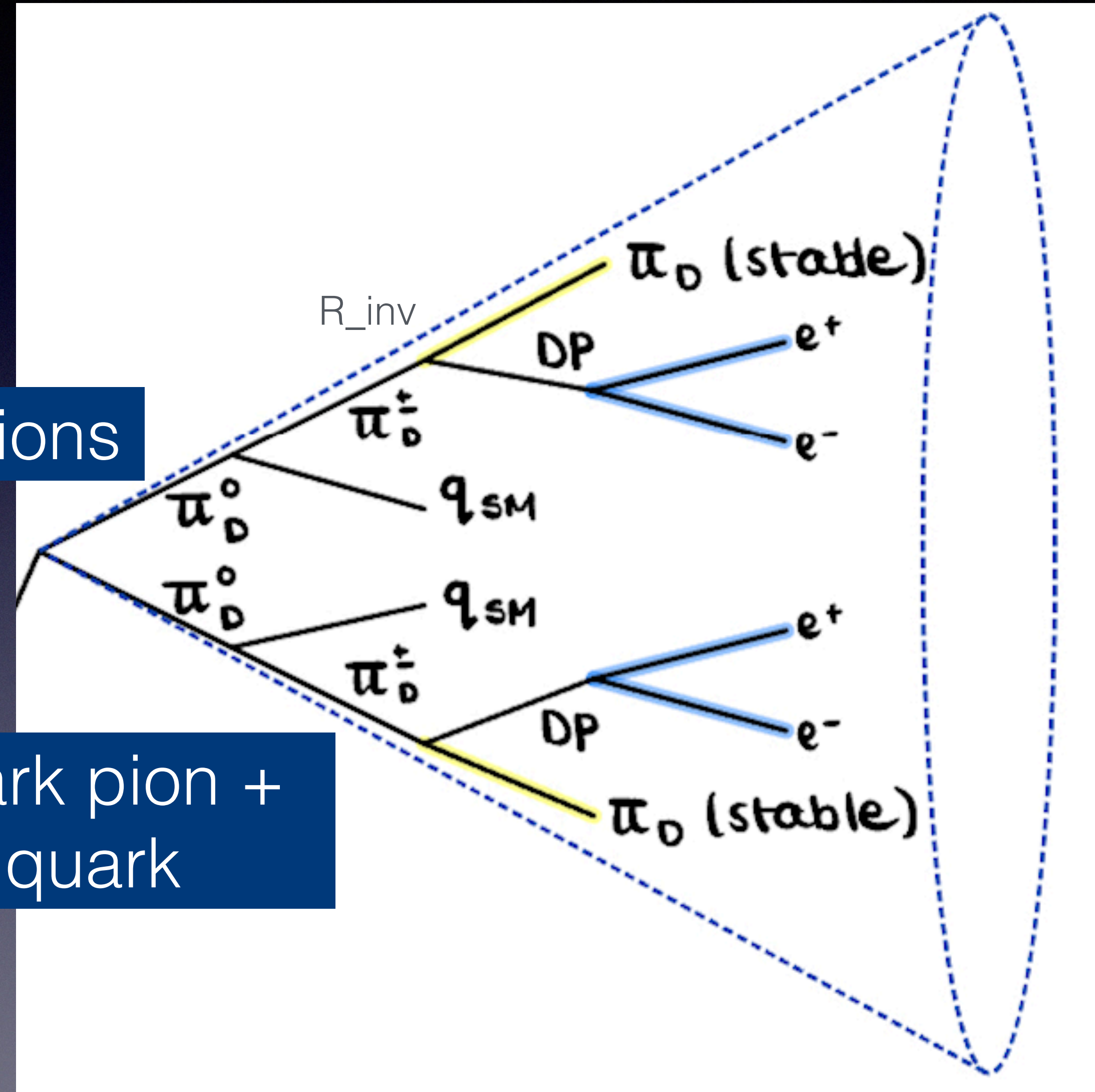
neutral dark pions



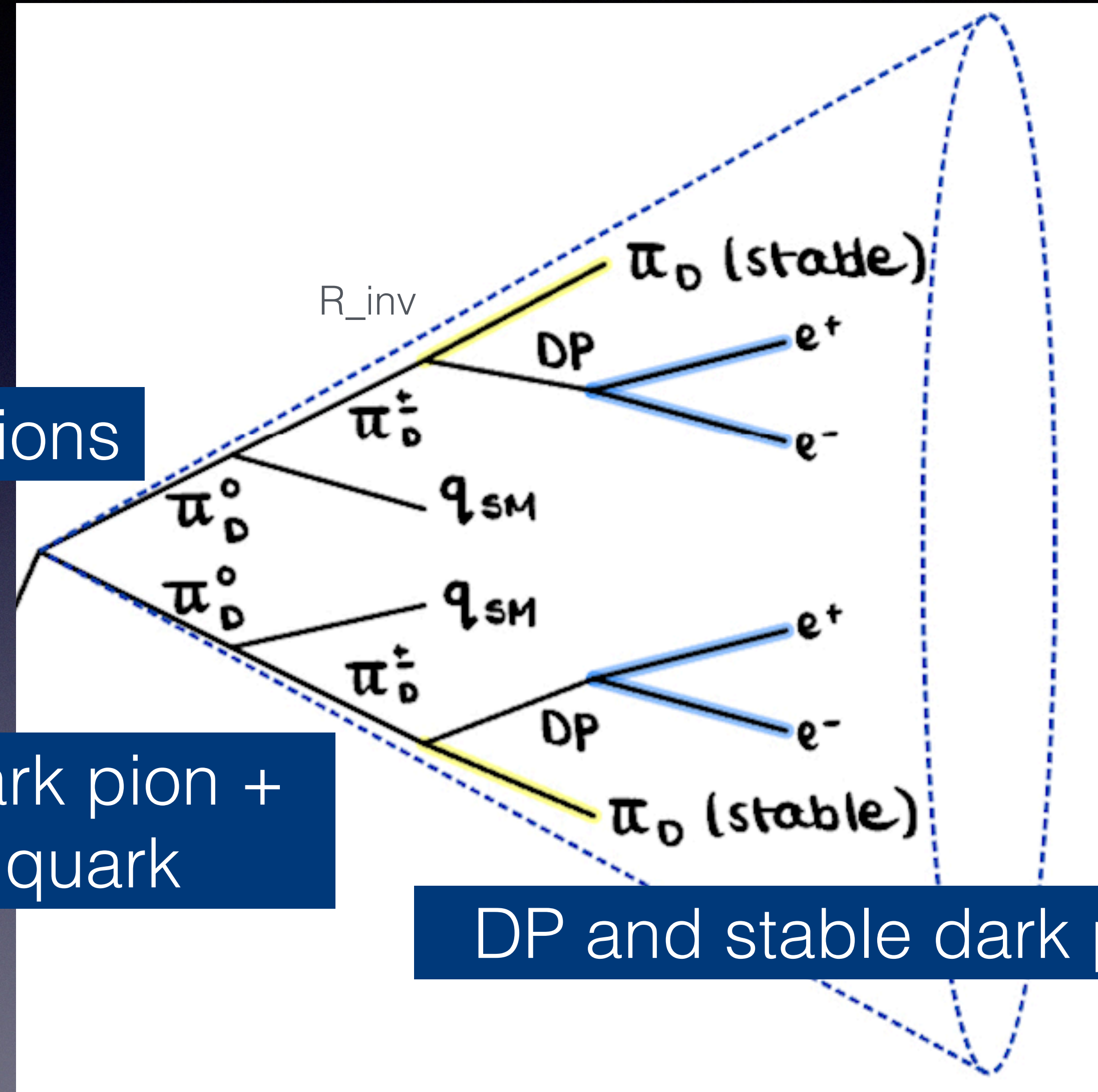
Our Model

neutral dark pions

charged dark pion +
strange quark



Our Model

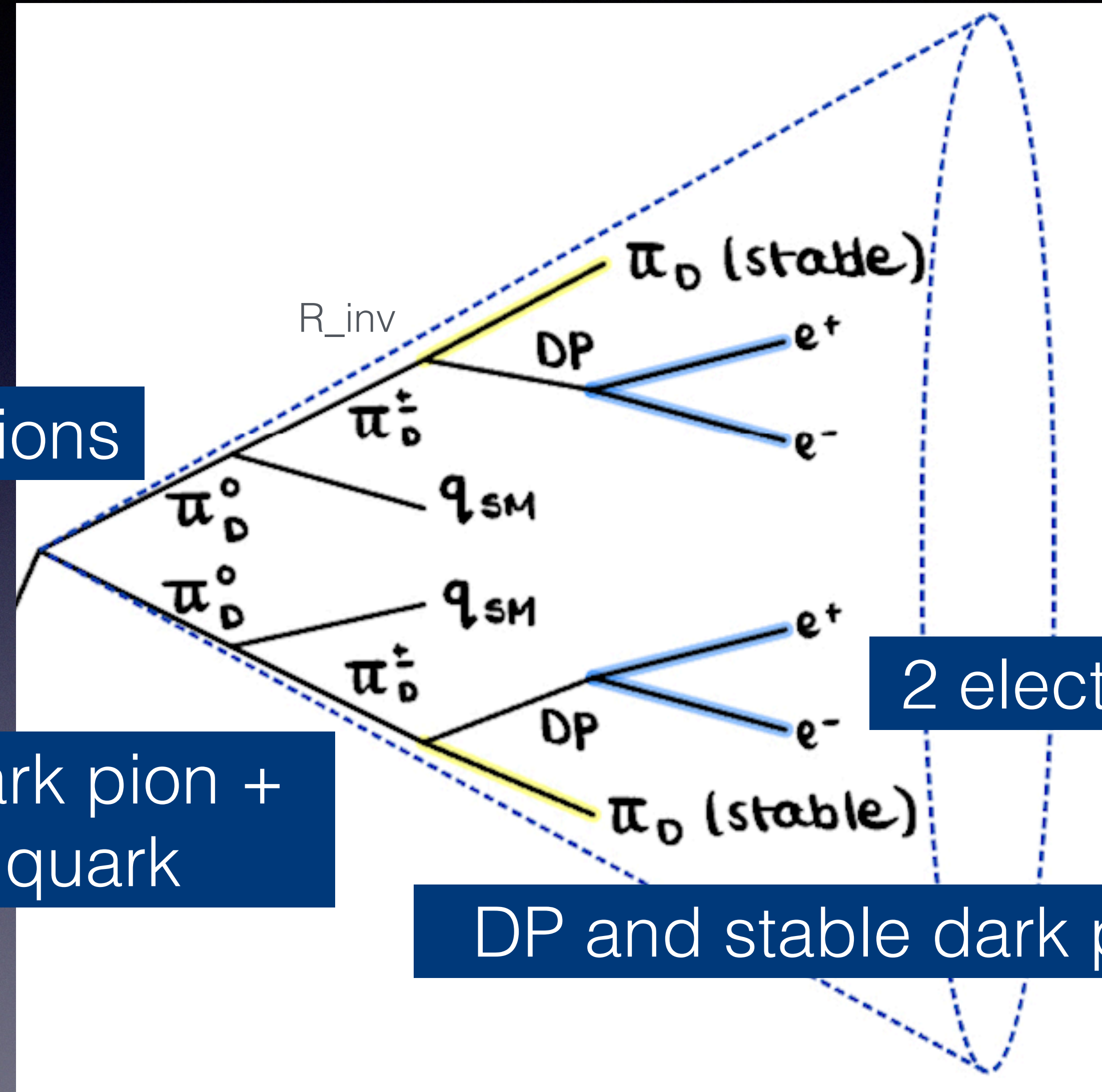


neutral dark pions

charged dark pion +
strange quark

DP and stable dark pion

Our Model



neutral dark pions

charged dark pion +
strange quark

2 electrons

DP and stable dark pion

Pythia HV Runcard

```
# id:all = name antiName spinType chargeType colType m0 mWidth mMin mMax tau0
4900555:all = dhstable dhstable 0 0 0 5.0 0.5 6.0 8.0 0 # Dark sector stable
4900556:all = dphoton dphoton 0 0 0 1.0 0.1 1.2 2.0 0 # Dark photon

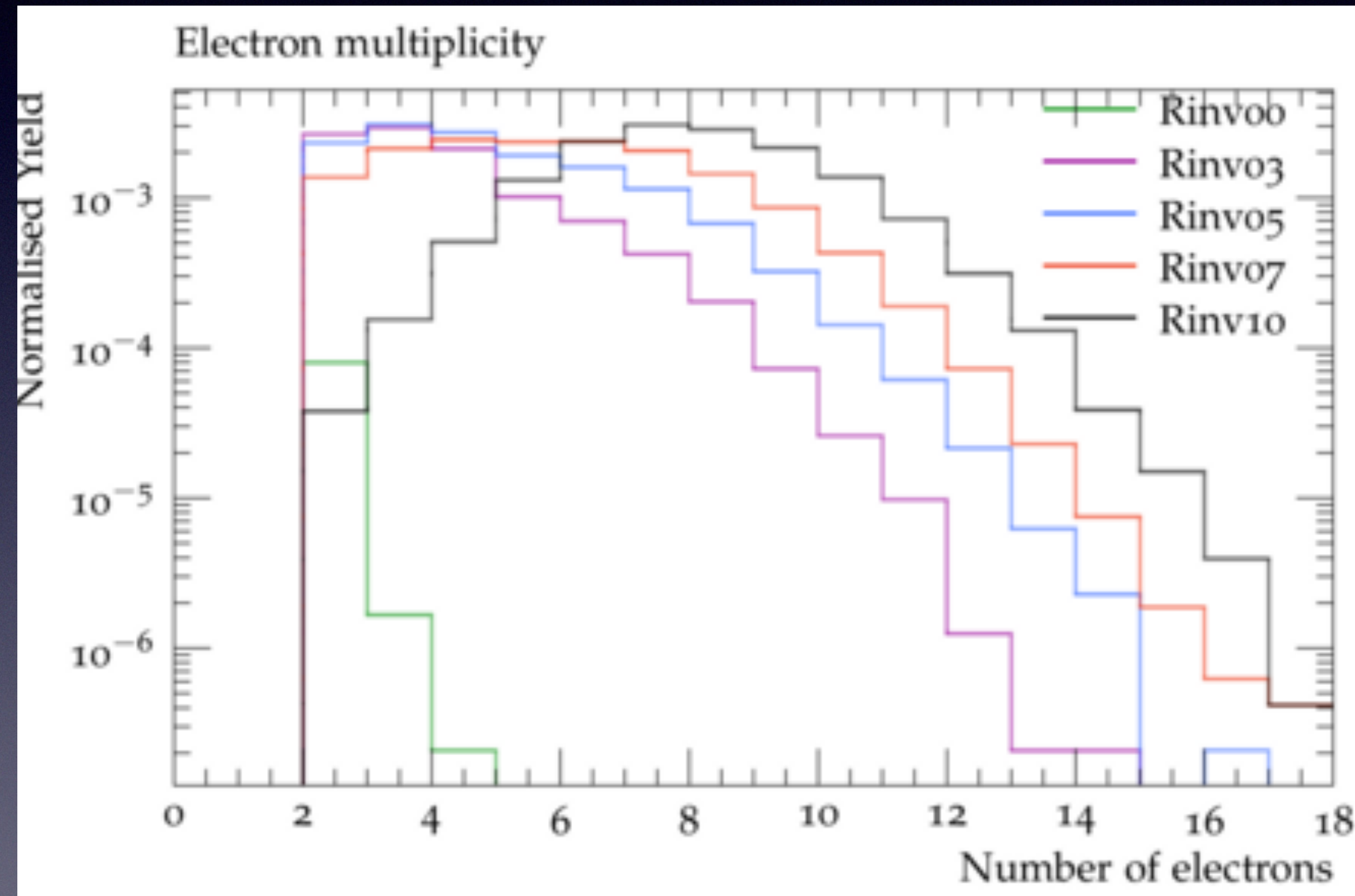
4900111:m0 = 20.0 ! Dark Diagonal Pion Mass
4900113:m0 = 20.0 ! Dark Diagonal Rho Mass
4900211:m0 = 9.99 ! Dark Off-Diagonal Pion Mass
4900213:m0 = 9.99 ! Dark Off-Diagonal Rho Mass
4900211:mayDecay = on
4900213:mayDecay = off

4900555:mayDecay = off
4900556:mayDecay = on
4900111:mayDecay = on

#This is for Rinv 0.7, for other values, simply change following the formula on the right
4900111:onechannel = 1 1.0 91 -3 3 # 1 + to_st(1.0-inv) + 91 -3 3
4900111:addchannel = 1 0.0 0 4900211 -4900211 # 1 + to_st(inv) + 0 4900211 -4900211

4900211:onechannel = 1 1.0 100 4900555 4900556 # Dark photon + stable
4900556:onechannel = 1 1.0 100 11 -11
```


Preliminary Results



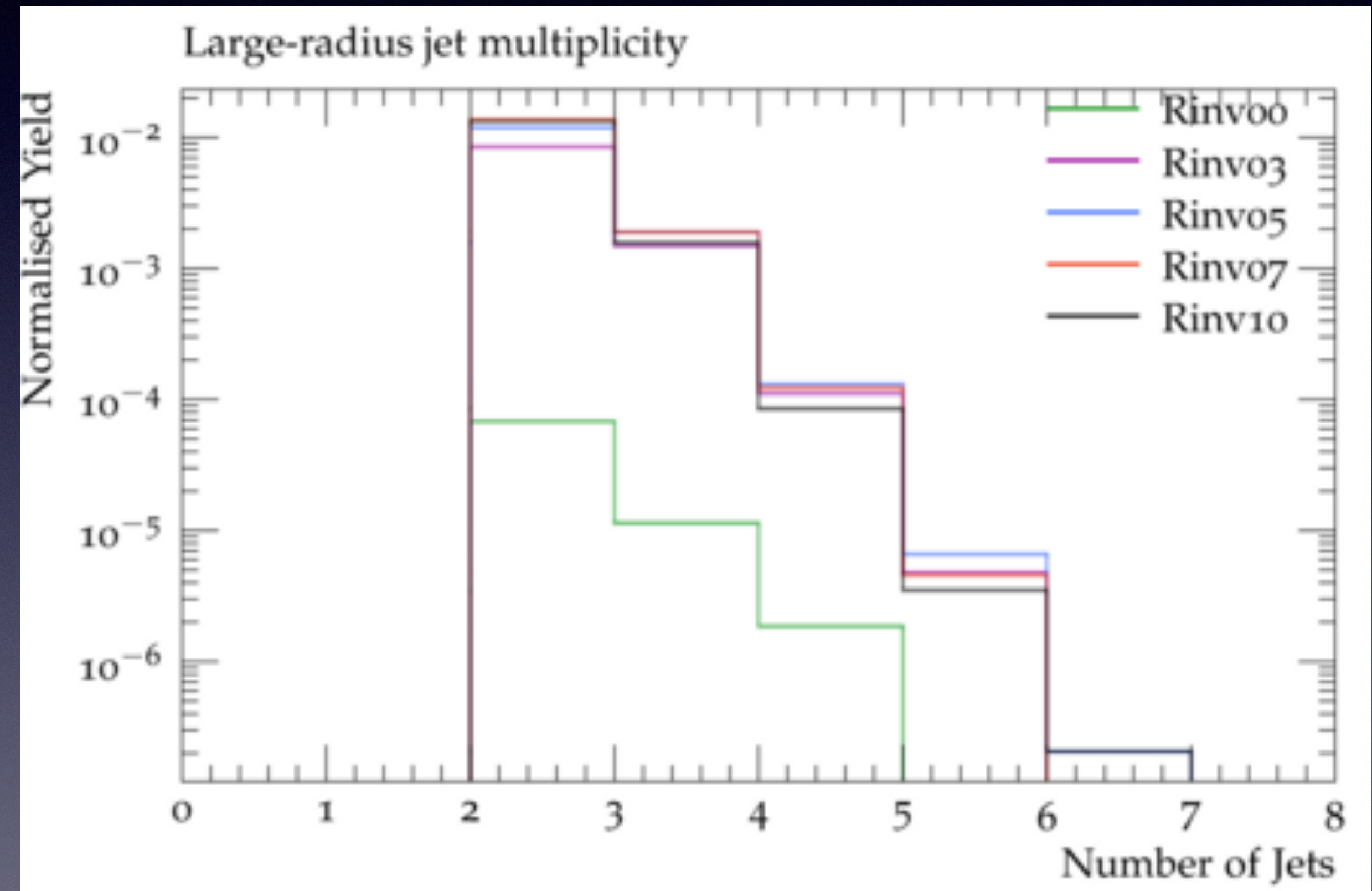
Electron multiplicity

- Peaks at around 3 or 4 electrons for the middle R_inv values
- Fewer DPs are produced for lower R_inv

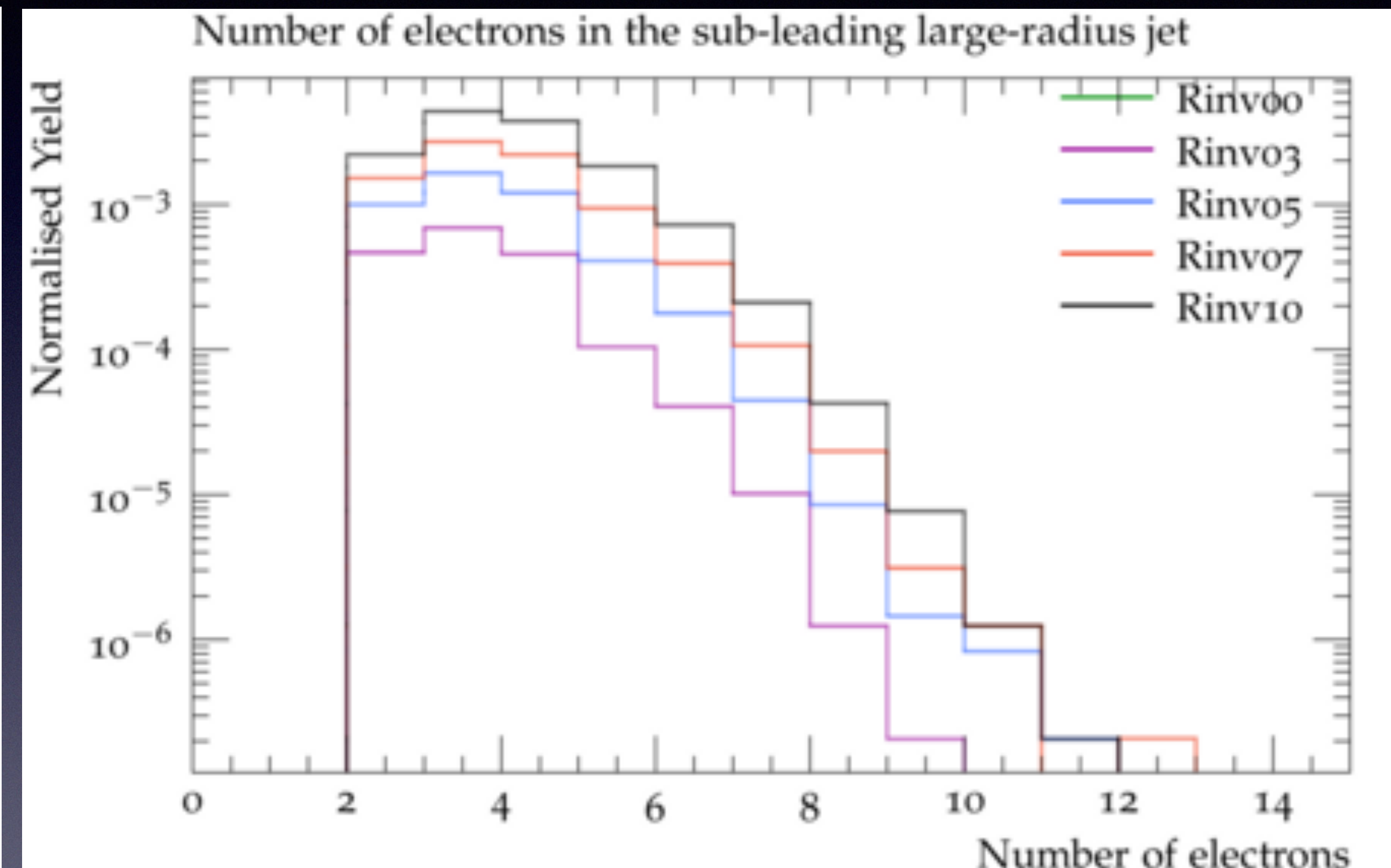
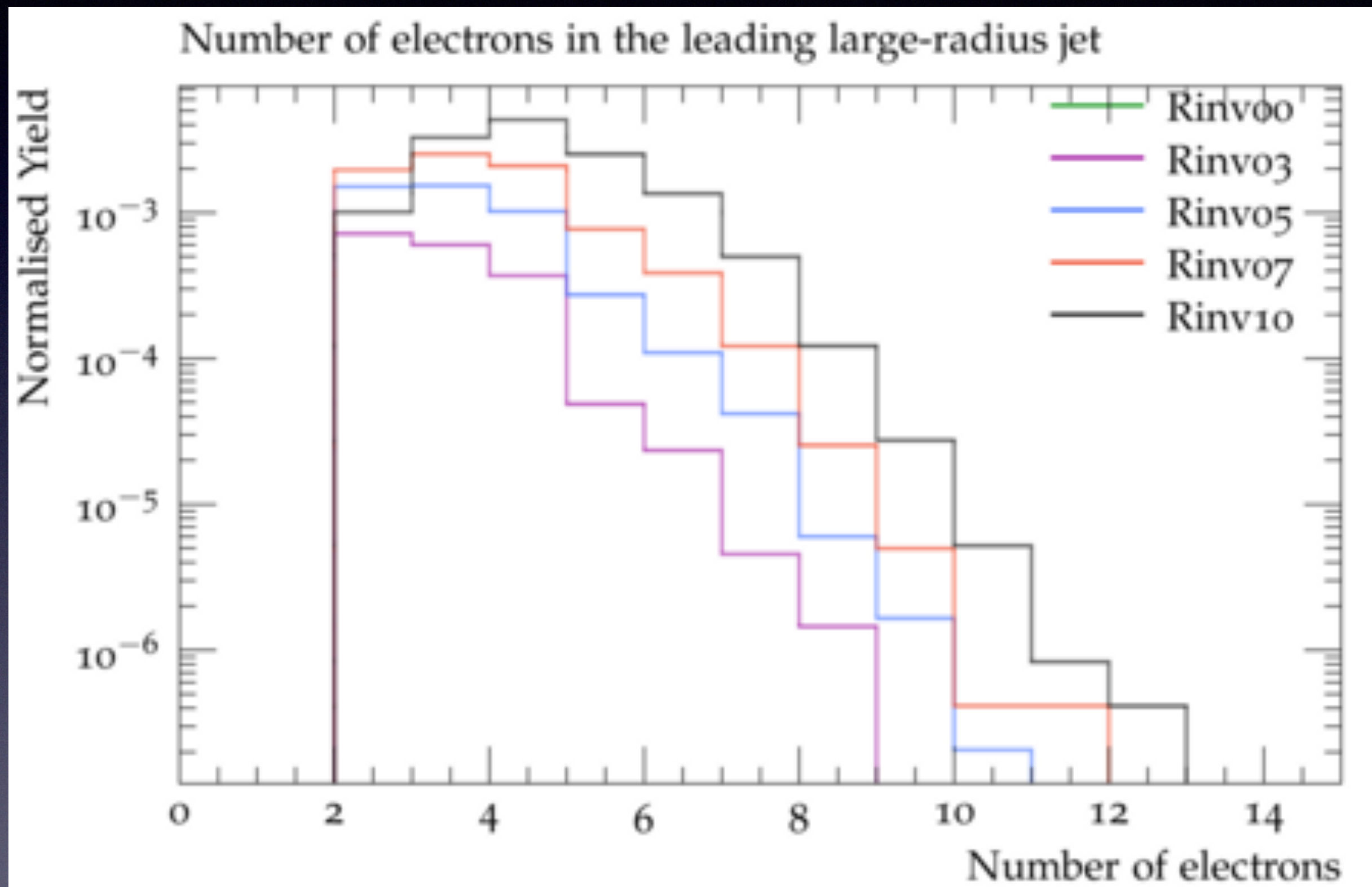
Preliminary Results

Large-radius jet multiplicity

- Peaks at 2 for all values of R_{inv} , as expected

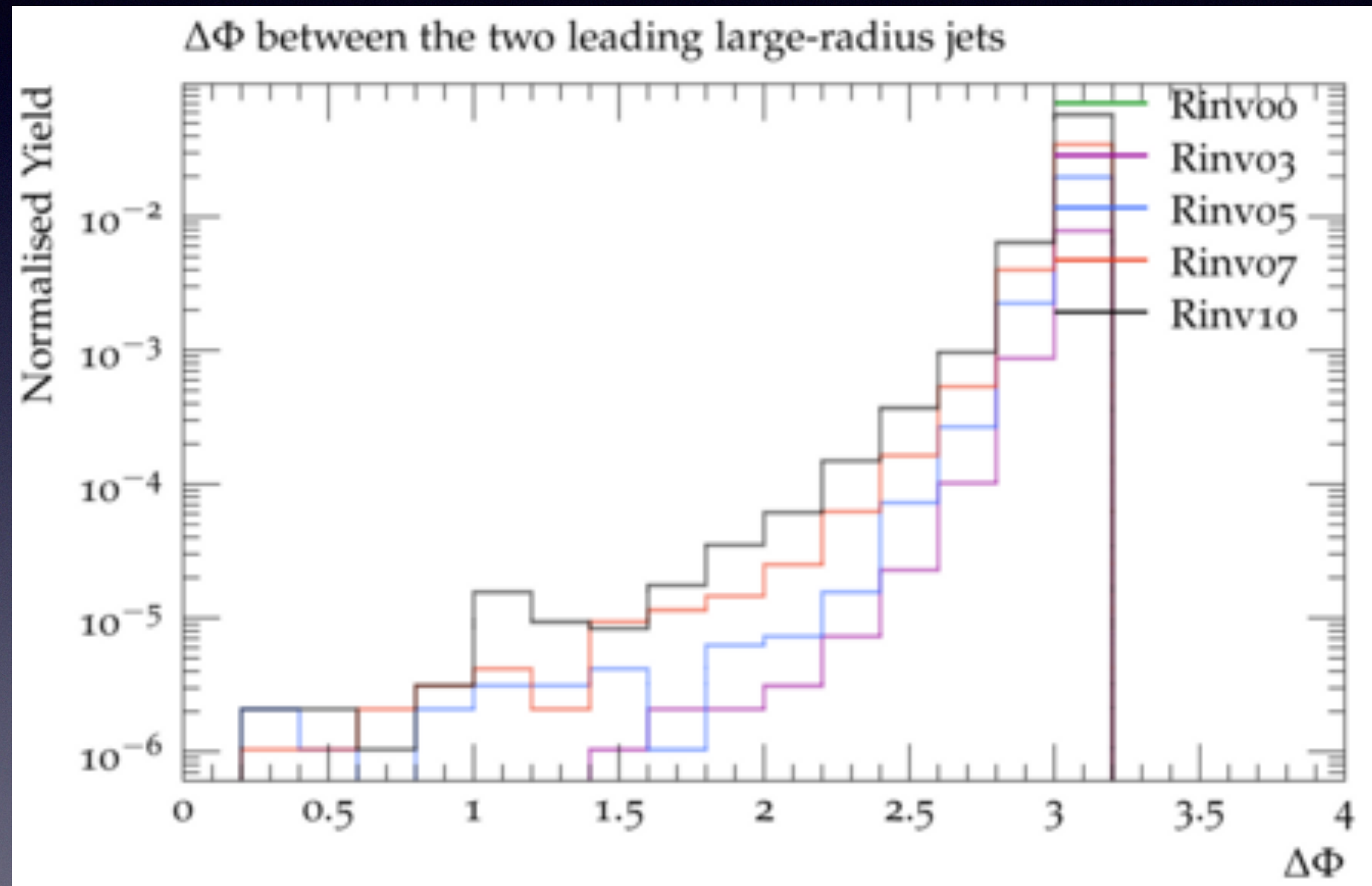


Preliminary Results



- Number of electrons in the LRJs
- Peaks at 3 or 4 for for the higher R_inv values

Preliminary Results



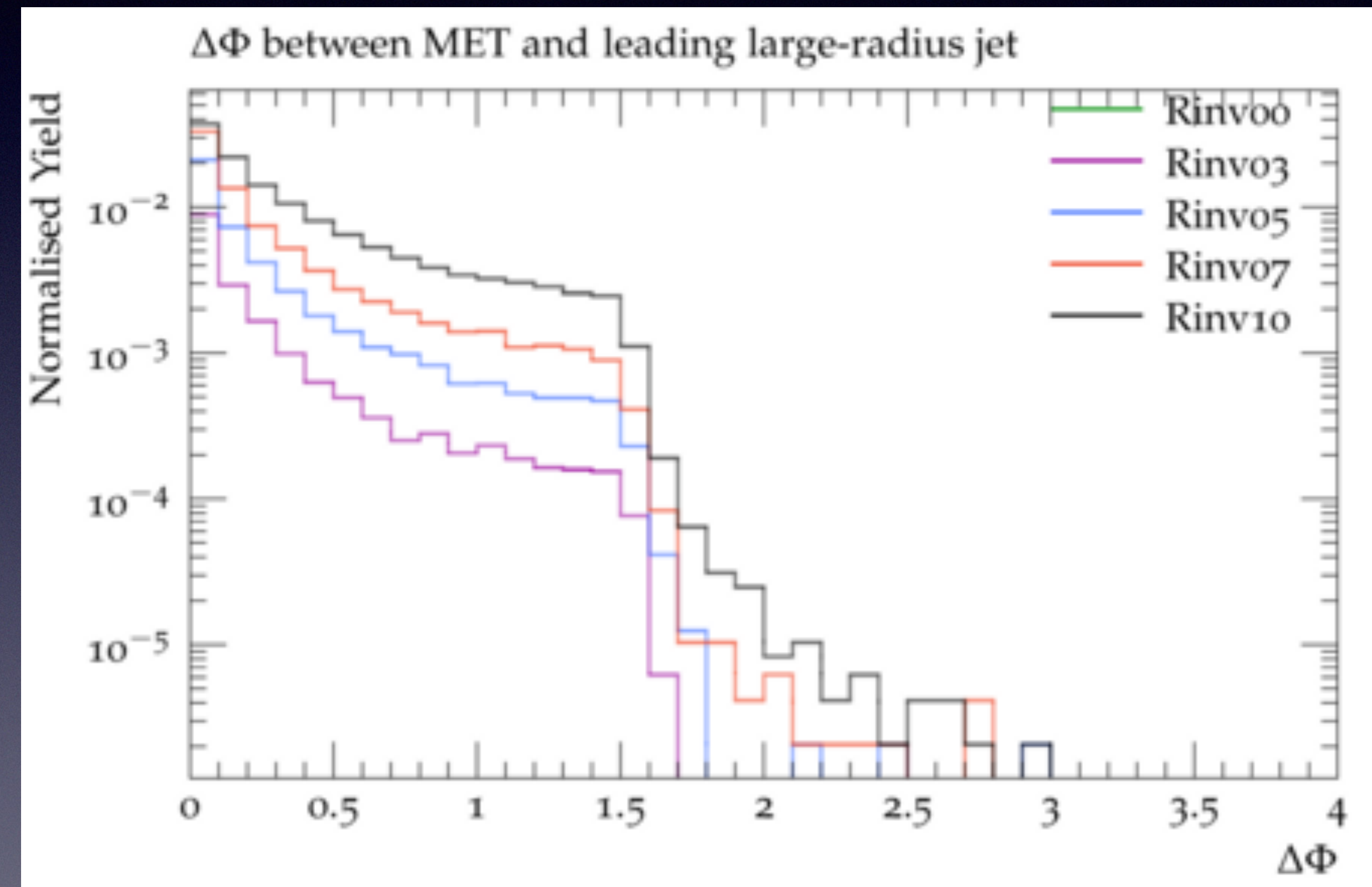
Delta Phi between the two leading large-radius jets

- LRJs are clearly produced back-to-back, as expected

Preliminary Results

Delta Phi between MET and leading LRJ

- MET is somewhat aligned with the leading LRJ
- “Steep” fall-off at around 1.5 rad



What next?

- What's the simplest model we can make?
- What's the actual signature we can study?