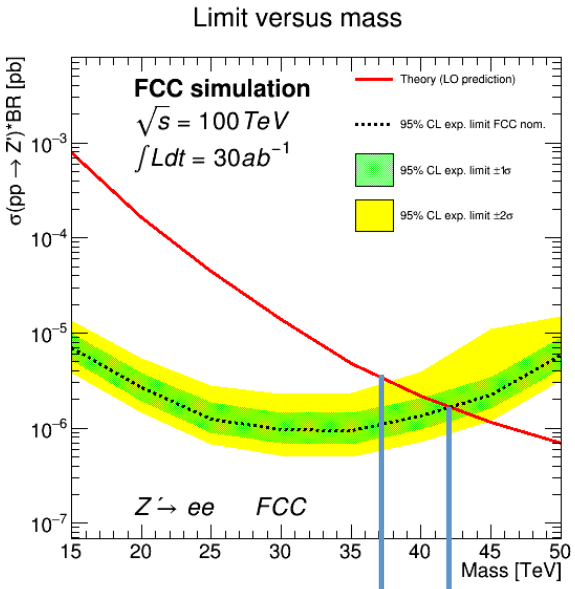
Heavy resonances at 100TeV

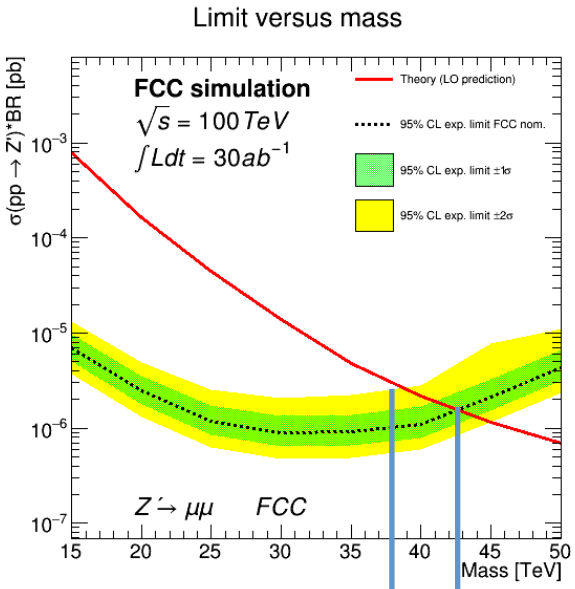
Clement Helsens CERN-EP
Michele Selvaggi CERN-EP
David Jamin Taiwain

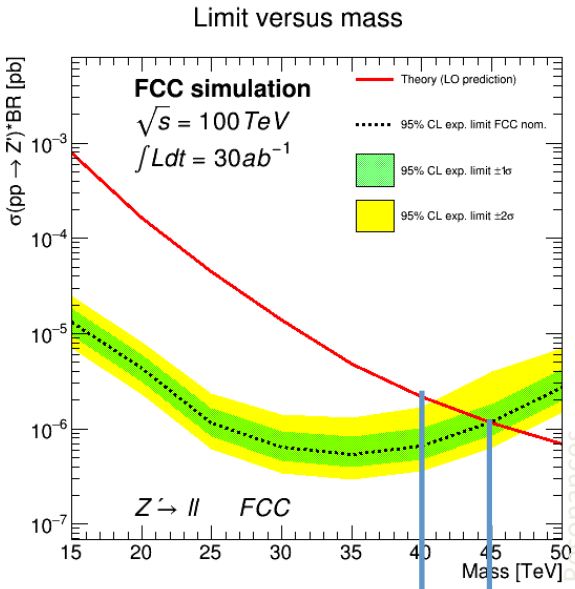
Outline

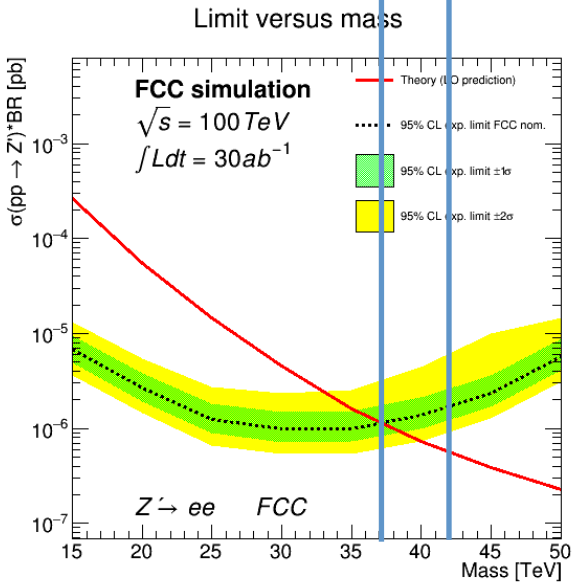
- Almost final results for the resonances
  - Z'-> ll
    - Small bug identified in the limits for the theory cross section, limits a bit degraded. Was using the cross section of Z'-> all lepton flavor instead of 1

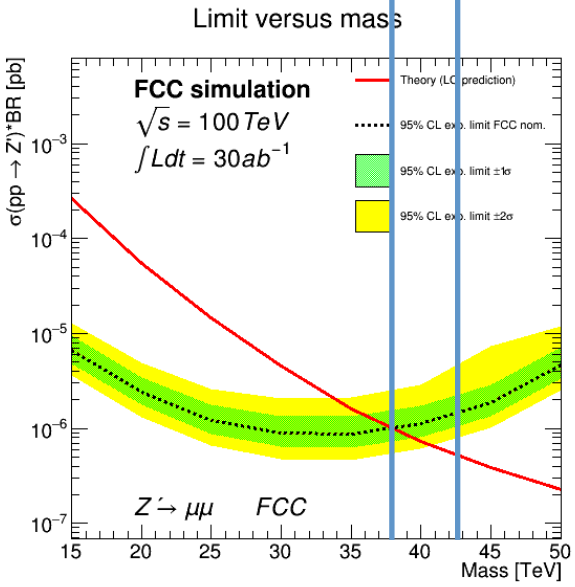
Z' ->ll limits

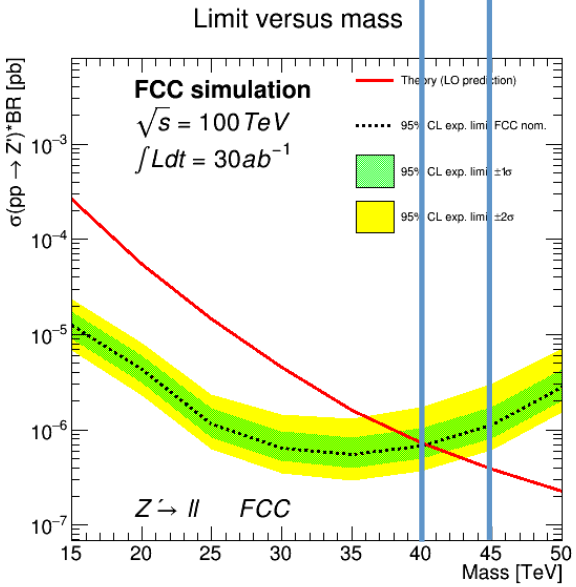












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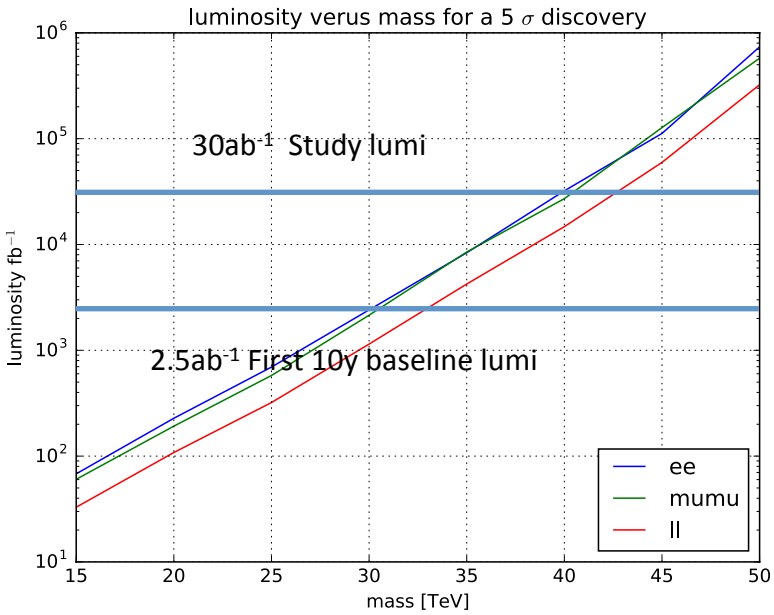
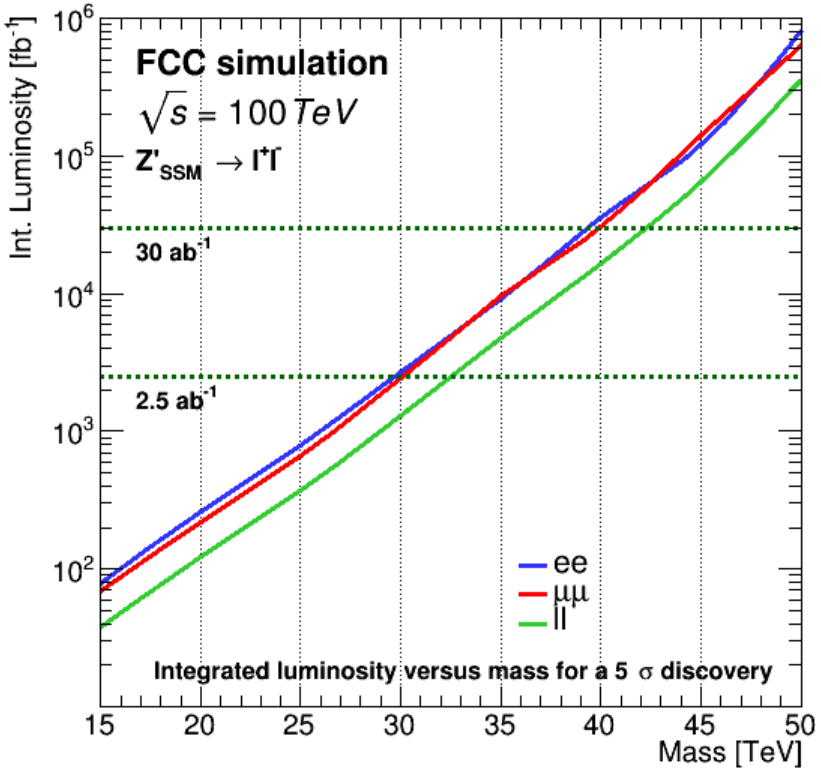
Z'->ll Significance





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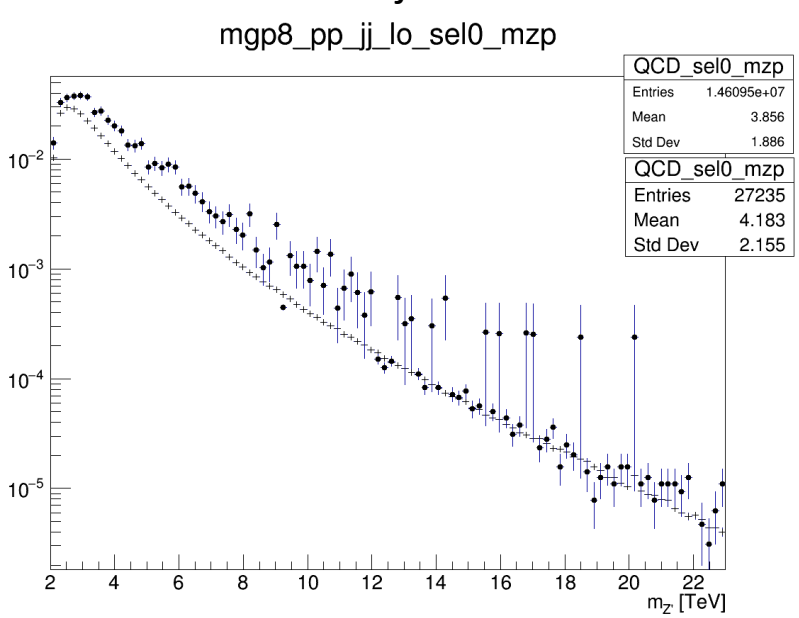
    - Thinking of trying an other benchmark model like ψ/χ
  - tau tau
    - Produced more di-jet events pT>2.5TeV of 50M events and 20M <2.5TeV
    - Added Tagging Rate Function instead of direct cuts

TRF

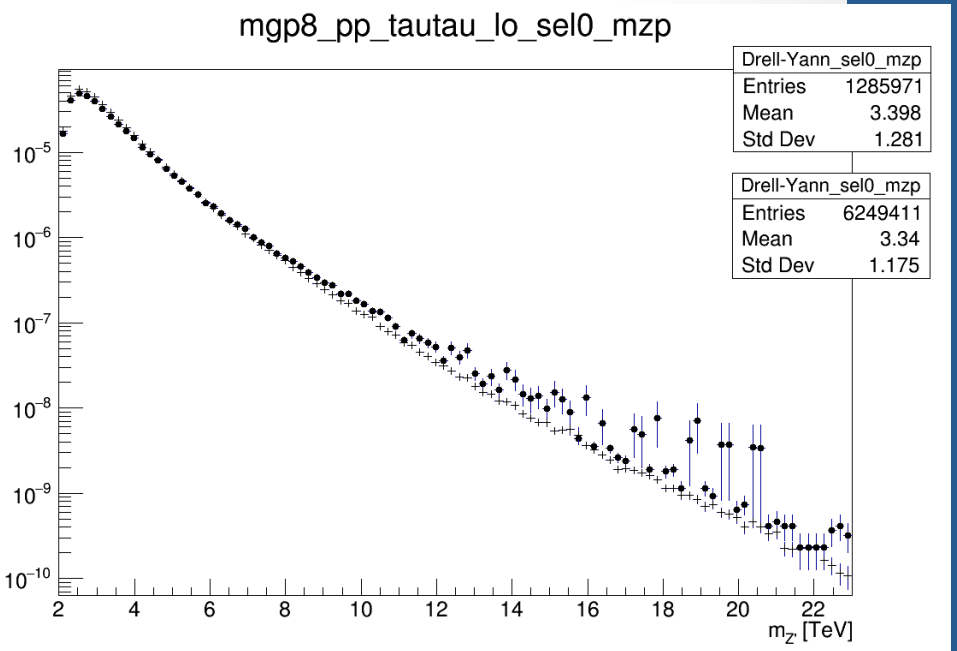
- Instead of directly cutting on the tagging variable, estimate a tagging weight per event
- To calculate this weight we need to know the truth flavour of each jet and the tagging probability
  - The truth flavour is found by associating a parton to a jet
  - The association is done given the priority to a given flavour wrt another
- For example, in an event with light 2 jets, the TRF weight for 2 tag is:
  - W_2tagex=eff1*(1-eff2) + eff2*(1-eff1) eff1/2 = mistag rate for light jets at given pT and eta

TRF

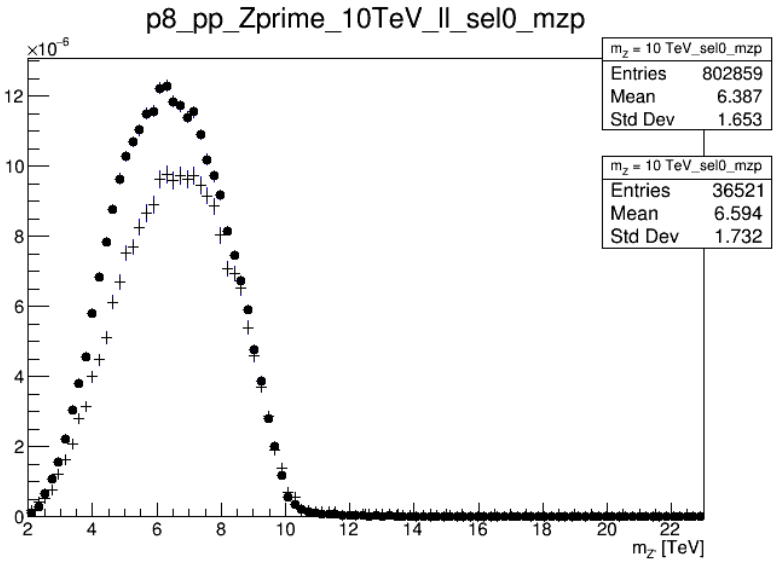
Di-jet



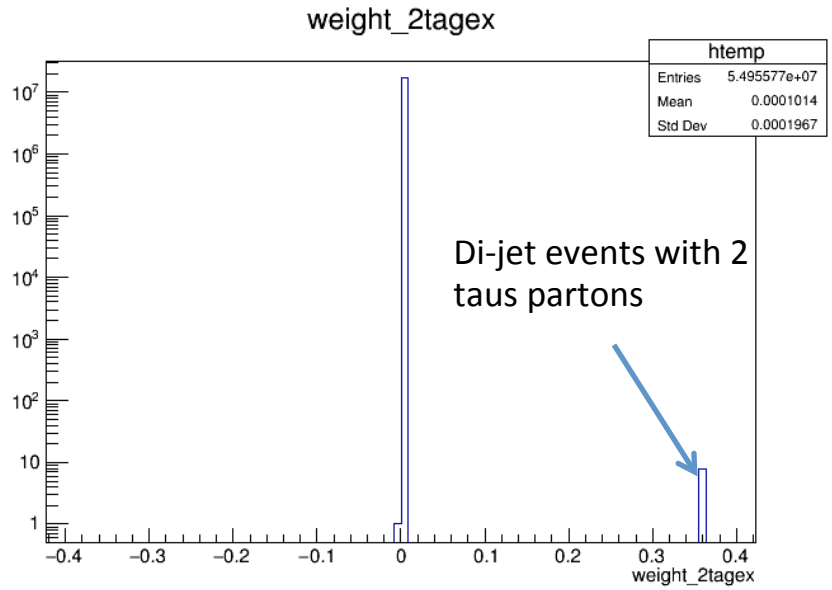
Drell-Yann Di-tau

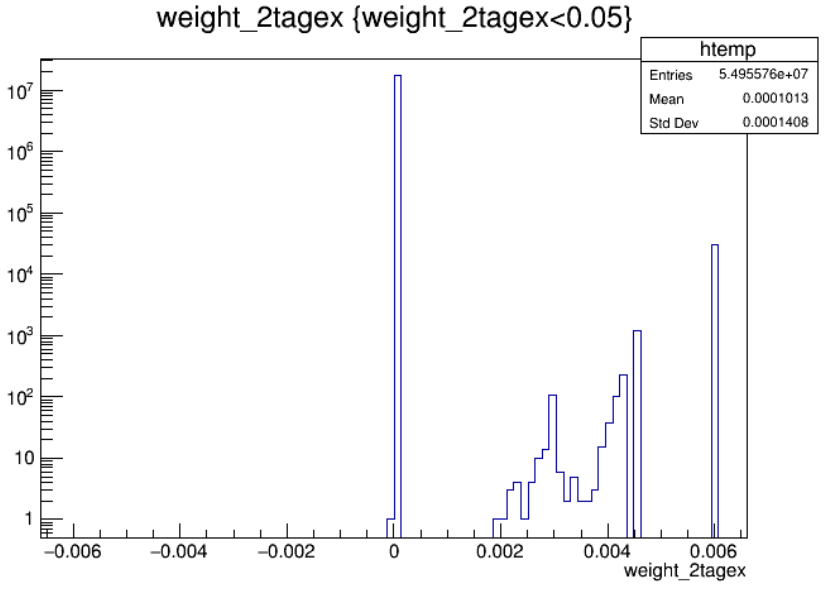


10TeV signal

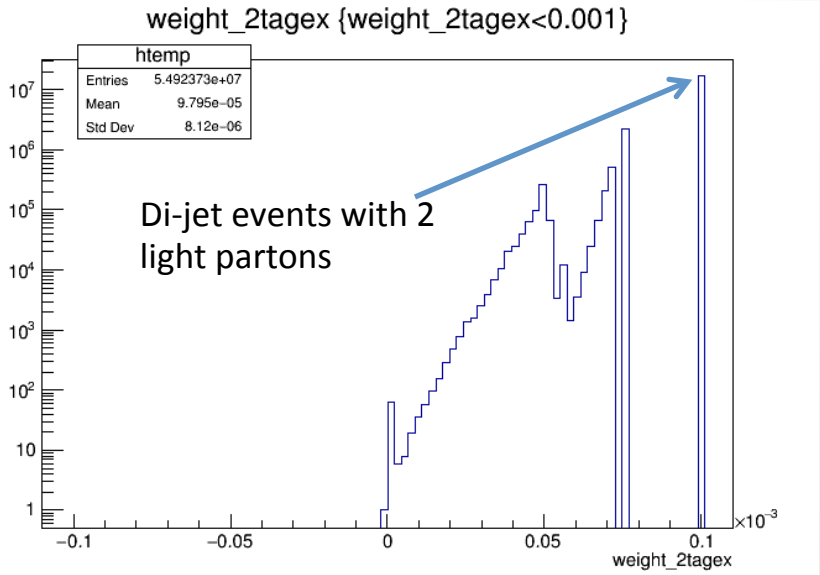


TRF weight in dijet events





- eta < 2.5
  - pt > 10 pt < 5000 -> 0.01
  - pt > 5000 pt < 34000 -> 0.01*(8./9. – pt/30000.)
  - pt > 34000 -> 0.
- eta > 2.5, eta < 4.0
  - pt > 10 pt < 5000 -> 0.0075
  - pt > 5000 pt < 34000 -> 0.0075*(8./9. – pt/30000.)
  - pt > 34000 -> 0.
- eta > 4.0 -> 0.



Z'->tau tau

Few things to understand, but seems a promising approach to avoid large statistical fluctuations after tagging

CUT ALL EVENTS

selection: Jet1_pf04_pt > 1000. && Jet2_pf04_pt > 1000. && ntau>1

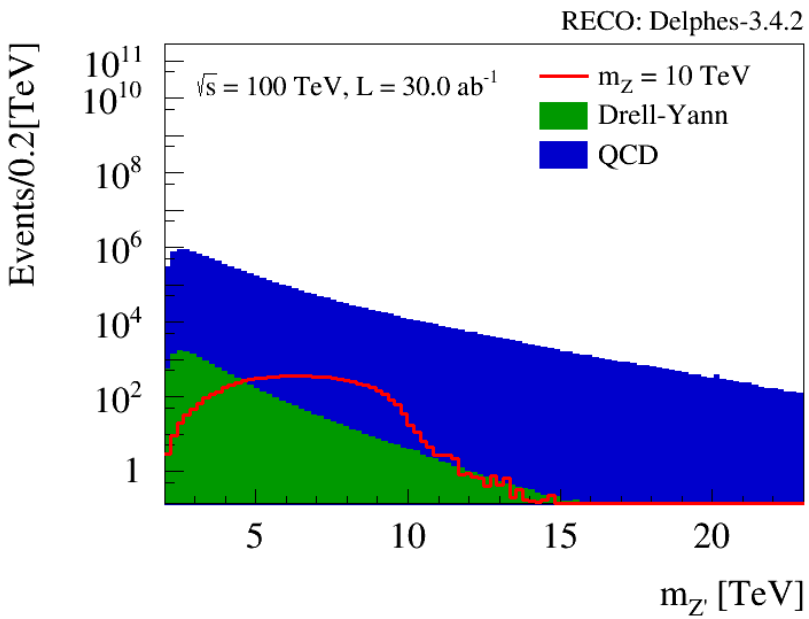
process	yield (30.0 ab-1)	stat. error	raw
m_{Z} = 10 TeV	6545.0	34.2	36521
Drell-Yann	11355.0	29.3	1285971
QCD	13823882.5	292898.6	27235

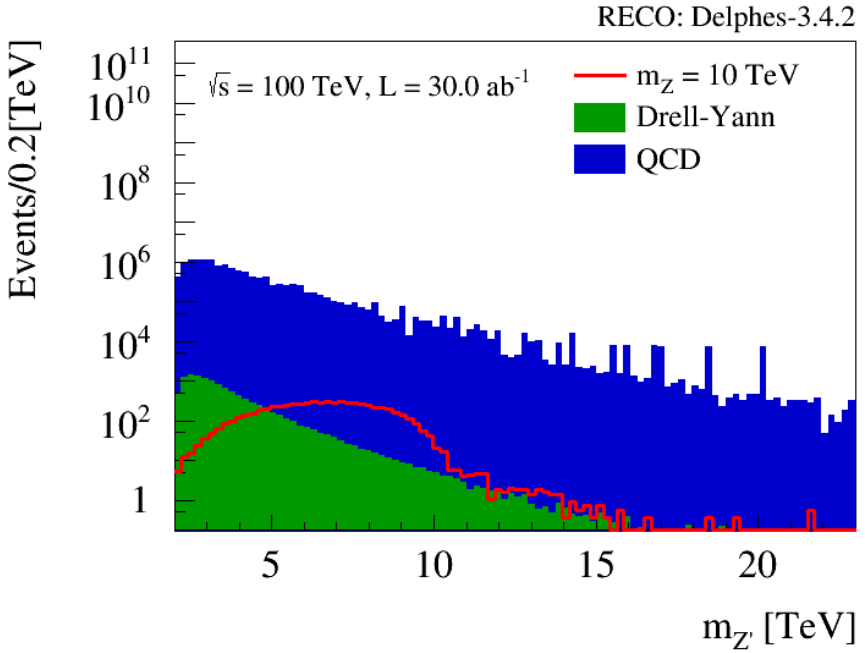
TRF 10M events

selection: weight_2tagex**Jet1_pf04_pt > 1000. && Jet2_pf04_pt > 1000.

process	yield (30.0 ab-1)	stat. error	raw
m_{Z} = 10 TeV	8020.8	22.6	802859
Drell-Yann	12435.0	17.9	6249411
QCD	8620186.2	10802.2	14609504
signal	8020.809	4.749	
background	8632621.209	10802.257	

Z'->tau tau


RECO: Delphes-3.4.2
√s = 100 TeV, L = 30.0 ab-1
mZ = 10 TeV
Drell-Yann
QCD
Events/0.2[TeV]
mZ' [TeV]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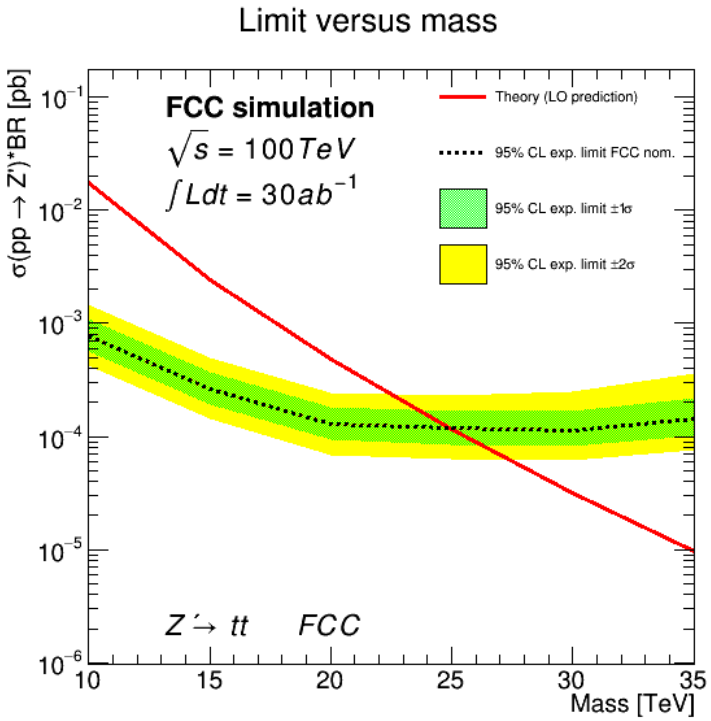
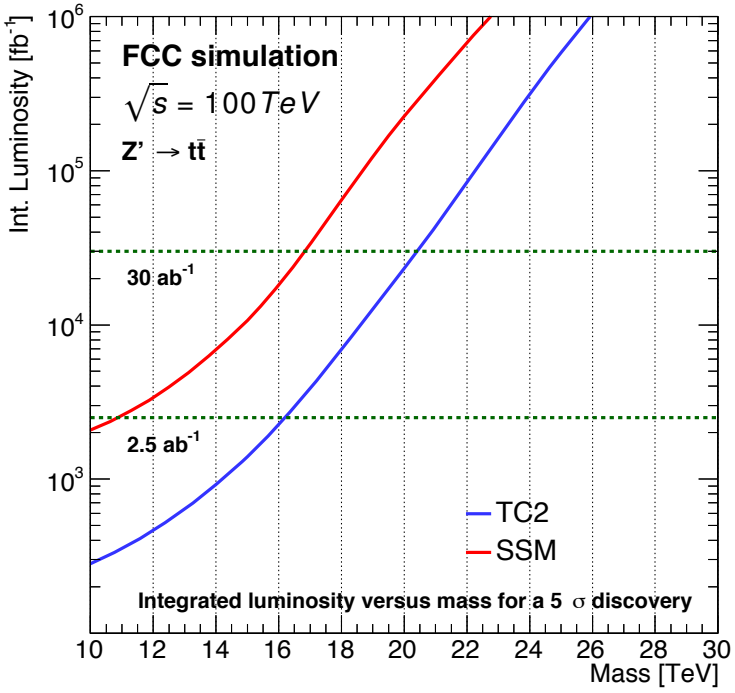
    - Added Tagging Rate Function instead of direct cuts
  - tt
    - Ran over large di-jet samples pT>2.5TeV of 50M events
    - Included the TRF
    - Discovery reach also made for Z' SSM model (coupling universality)

Z'->ttbar

- Discovery reach (and limits soon) for two models
  - Same generator used Pythia8





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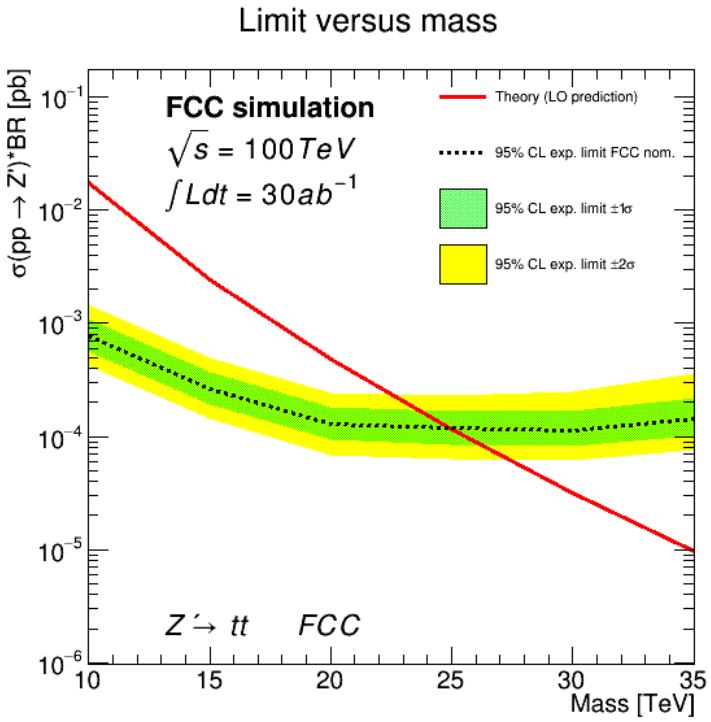

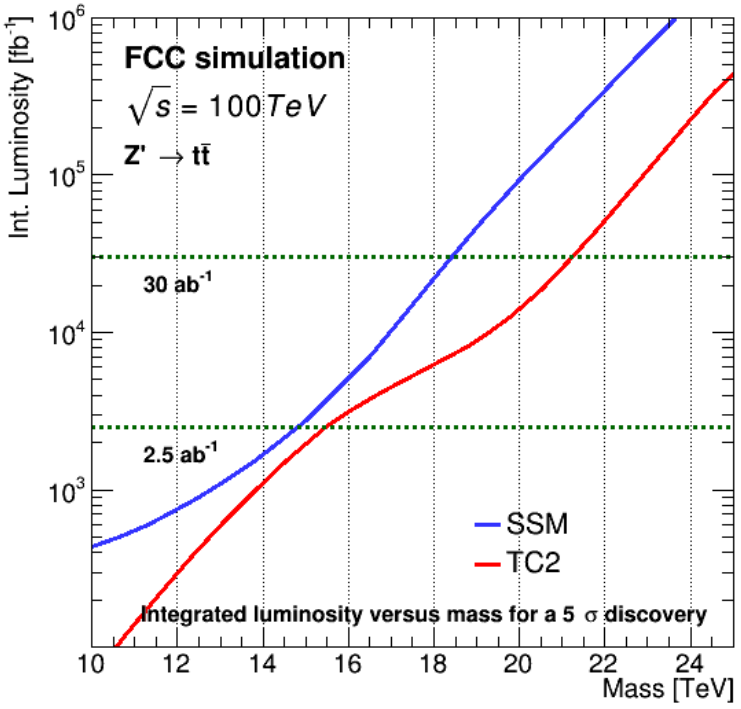

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  - Di-boson, Di-jet
    - Thinking about new benchmarks