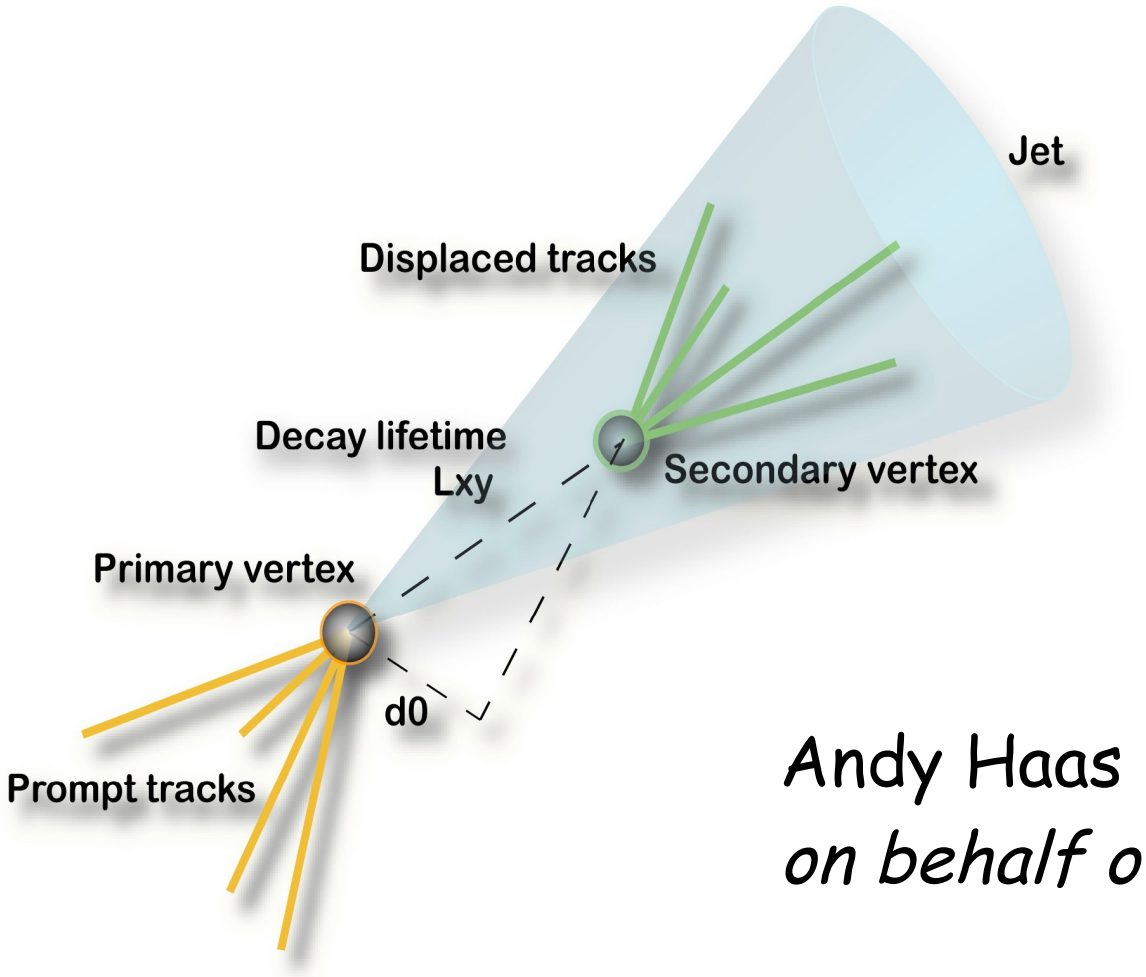
b-ID Status

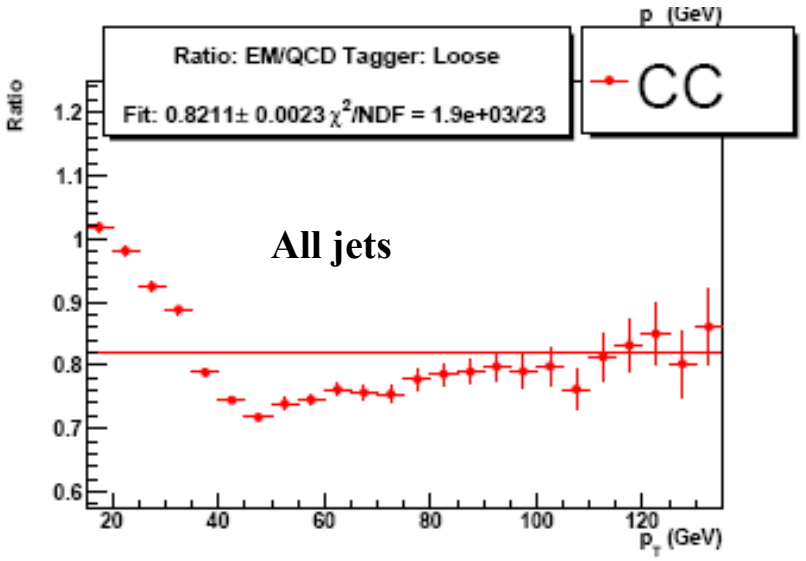


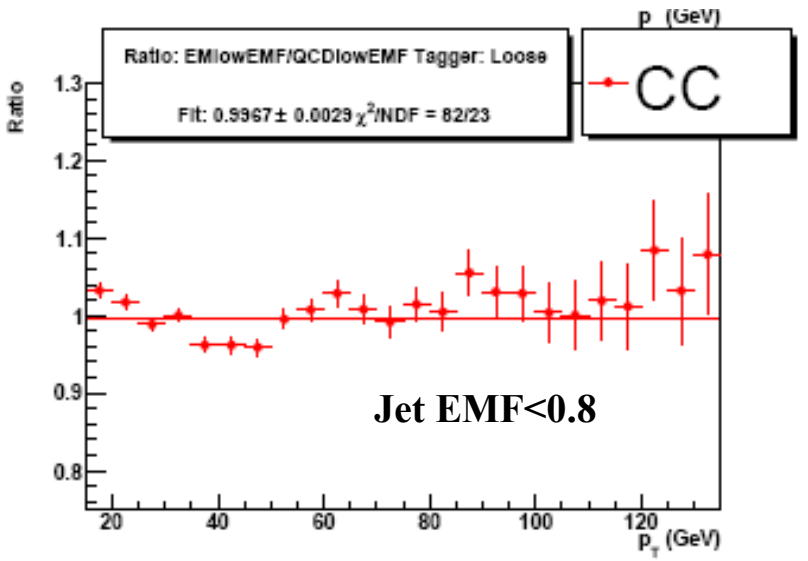
Andy Haas - Columbia University
on behalf of the b-ID group

Higgs Workshop
April 12, 2007

Certified p17 NN TRFs

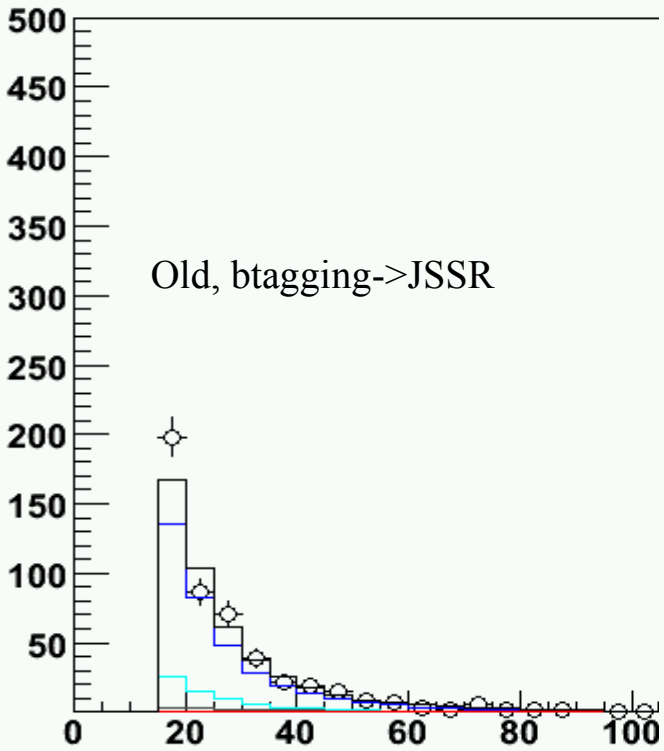
- **p17 NN – v1.2** (Tim, Miruna, Stephen)
  - ***CERTIFIED*** by the certification board – updated D0Note
- **Main worry was the fake-tag-rate (FTR) – have now changed the procedure:**
  - Negative tag rate now determined using the COMB skim with !isEM cut applied
  - Systematic error includes the difference between the QCD and EM skims and the difference between the QCD skim with and without the !isEM cut
- ***Analyzers should use certified TRFs on light-jet MC for p17 publications!***
  - https://plone4.fnal.gov/P1/D0Wiki/object-id/bid/bidnnp17cert

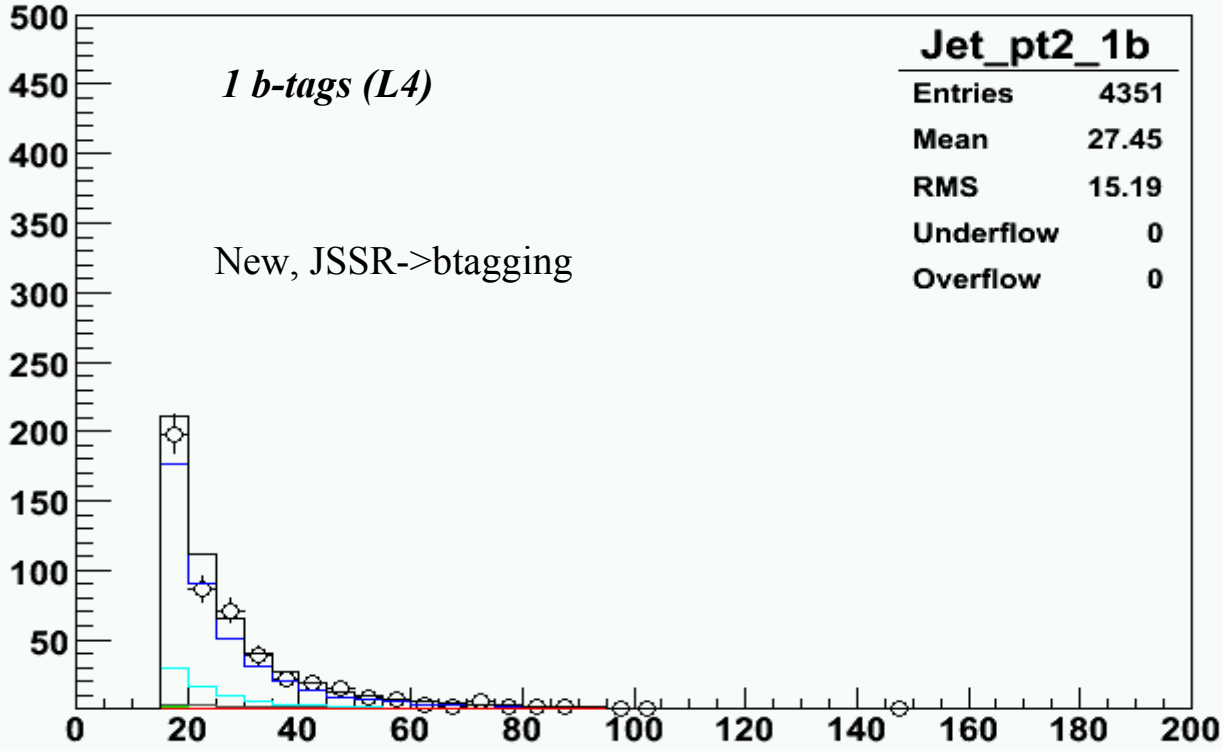




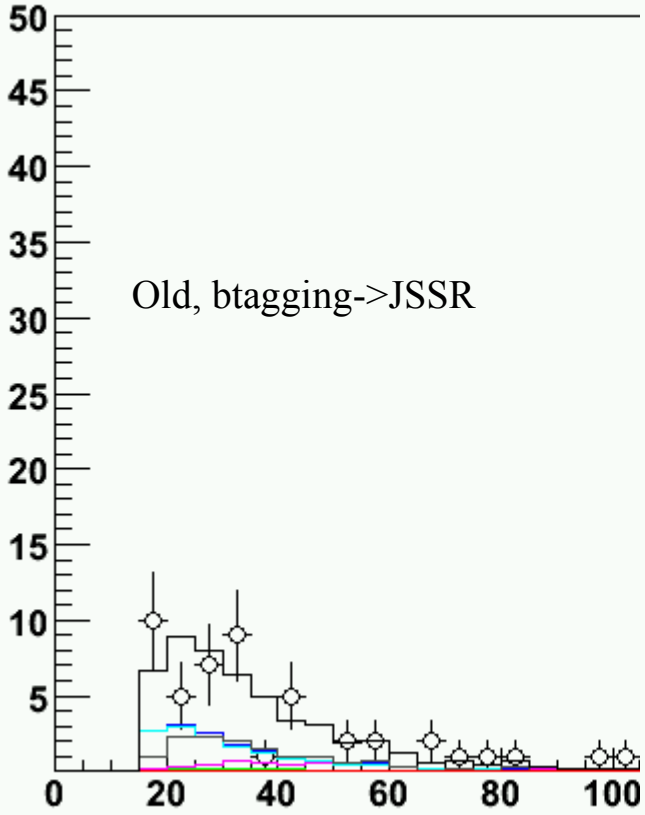
TRFs and JSSR

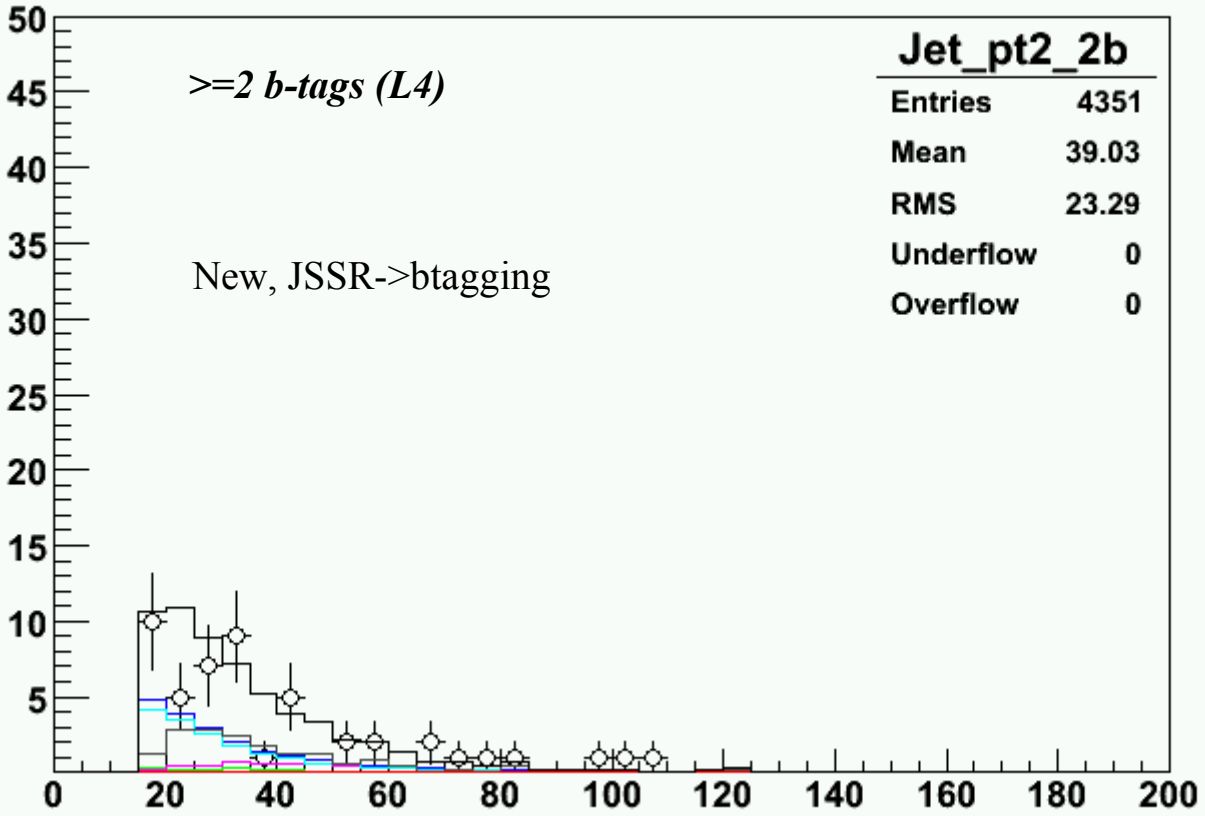
- Fabrice pointed out that it's important to run BTagProcessor *after* JSSR
  - Otherwise pT>15 for taggability has different meaning in data vs. MC
- Result is to enhance the number of taggable jets at low pT
- ***Is now the certified procedure for p17 (and p20) publications!***
  - https://plone4.fnal.gov/P1/D0Wiki/object-id/bid/bidjssr





Better agreement (at low pT) when tagging *smeared* MC jets...



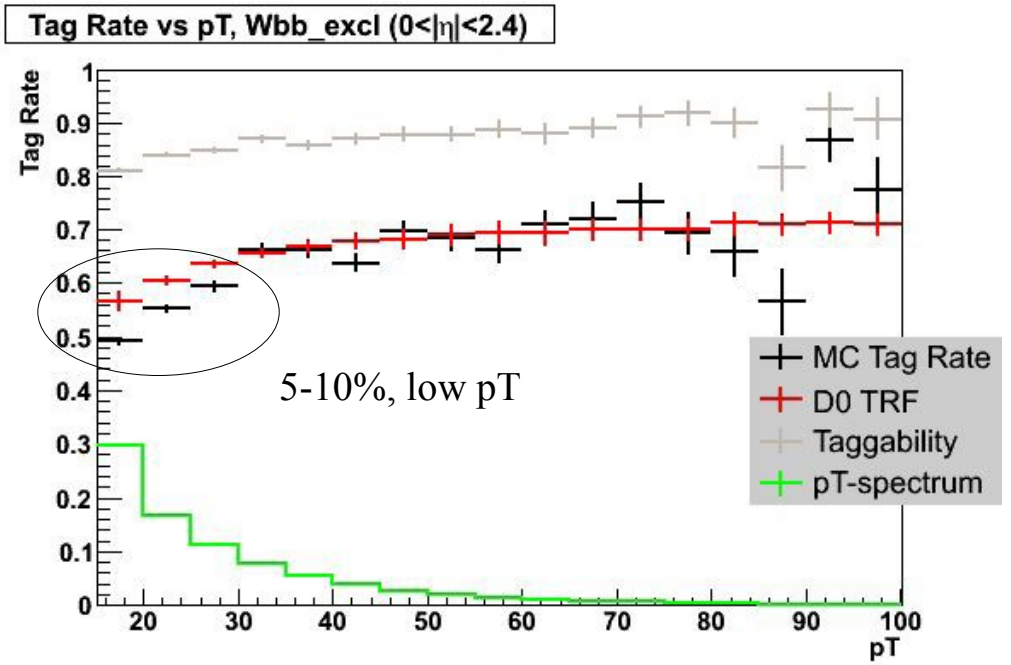


pT of *second-leading* jet (GeV)

b-ID Issues

- **TRF discrepancies**
  - studied TRFs for *gluon-splitting* samples, like Wbb, Zbb
  - Observes a 5-10% *overestimate* of the TRF, compared to actual tagging in MC
  - Finds that it is due to lower b-quark momentum (as a fraction of the jet momentum) in these samples
  - Need a fix for this..
    - Use direct MC tagging + scale factor for these samples?
    - Use different TRFs for these samples?

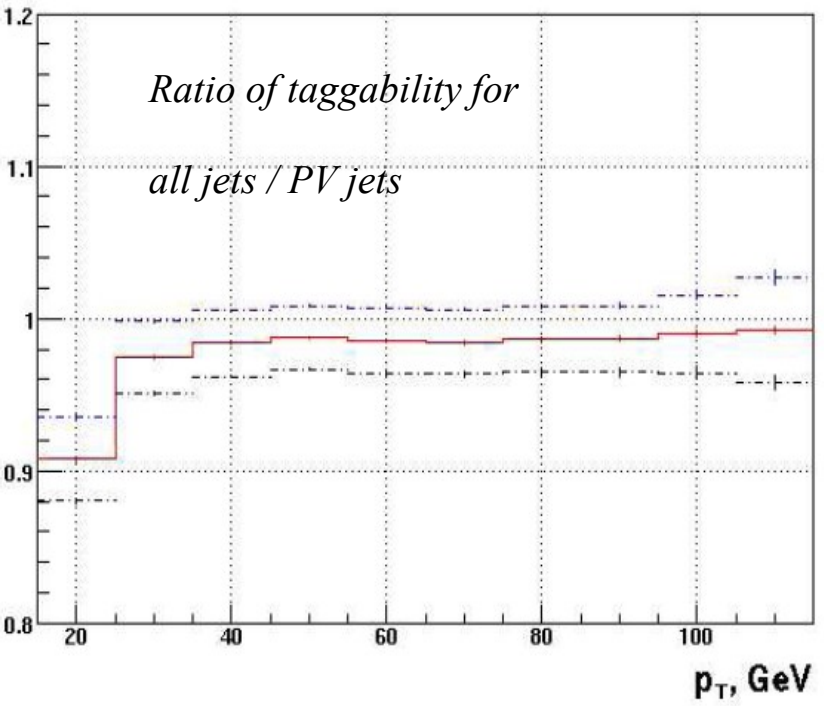
- **Taus**
  - No TRF has been measured for taus!
    - Just using the light-jet fake rate
    - We know this is wrong. Taus are tagged about as often as charm (after taggability)



Taggability Issues

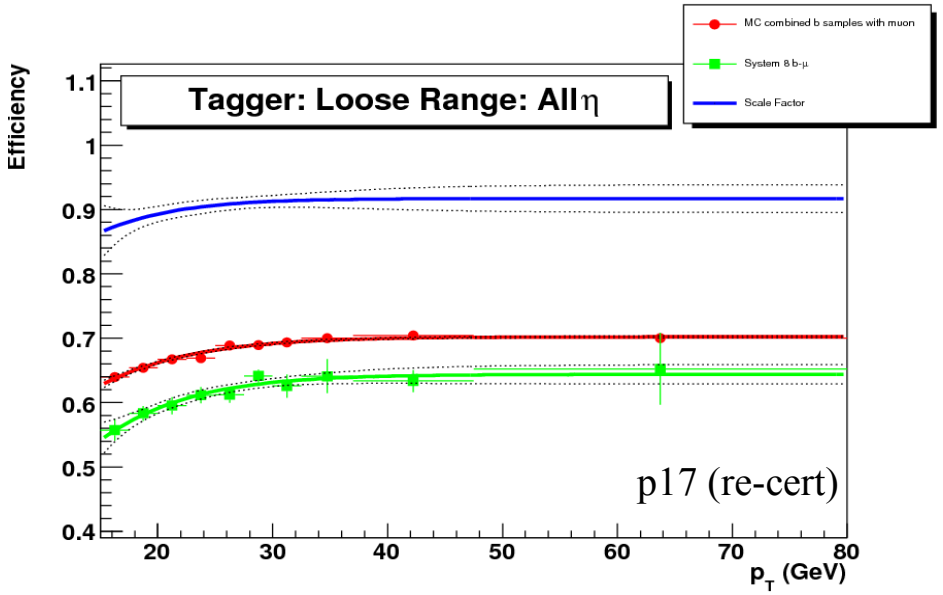
- **Taggability (Thorsten)**
  - Taggability parameterizer processor
    - Checked into CVS: btags_cert_caf
    - Needs to be tested / improved
  - We are *underestimating* the taggability for jets from the PV at low pT by 5-10% and 2% at high pT
  - BTagProcessor is able to apply parameterized taggability
    - We need to account for different taggability of b,c,tau,light jets

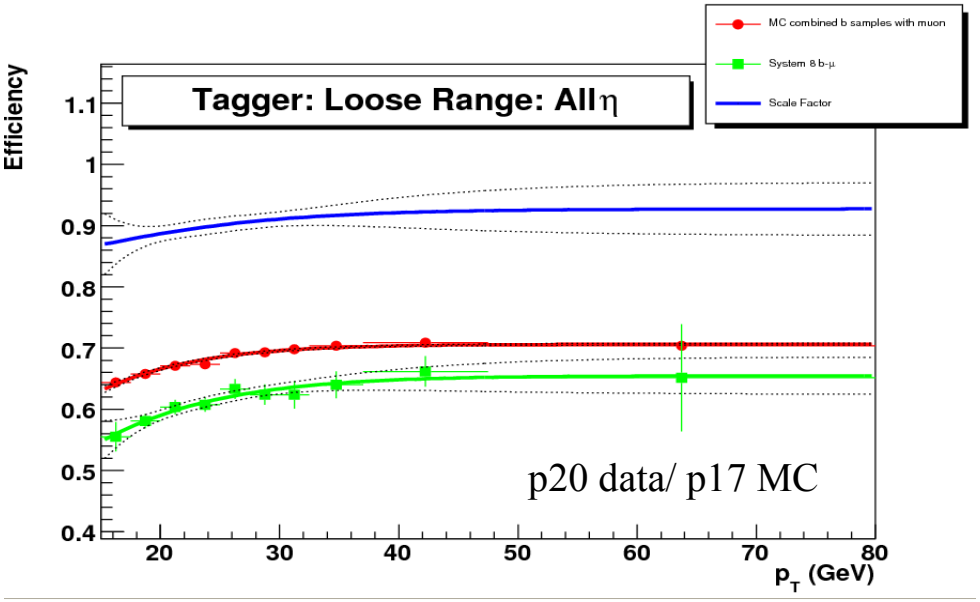
- **Will be done in time for p20 analyses (i.e. within ~1 month)**



p20 NN Certification

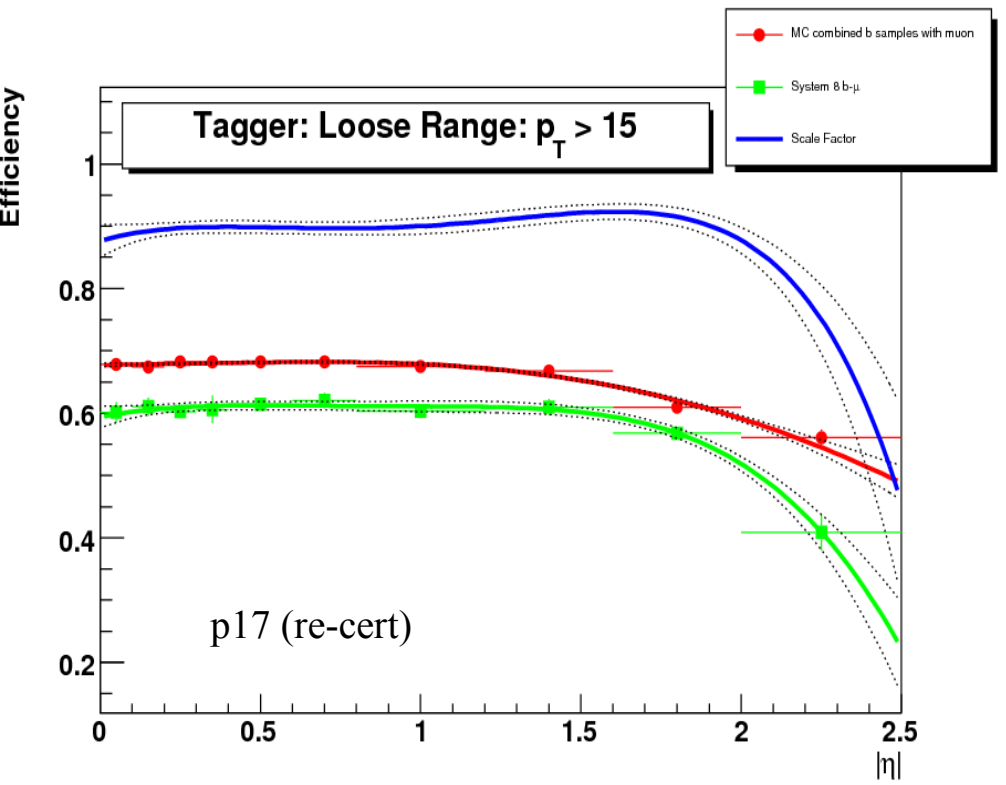
- **p20 NN certification** (**Sarah Schlobohm** + Andy Haas + Dale Johnston)
  - Need to make sure we understand how to run the certification macros (nn_cert)
  - Compare:
    - Certified p17 NN plots (from p17 team = Tim/Stephen/Miruna)
    - Re-cert p17 data / MC certification plots (by p20 team)
    - New p20 data / p17 MC certification plots (by p20 team)
  - *Will take only ~1 week to run p20 data/MC certification once samples are available!*
  - We expect that the initial p20 certification will use the (final) p17 JES
    - Hopefully the p20 JES will not be significantly different (otherwise, corrections could be made in CAFe)

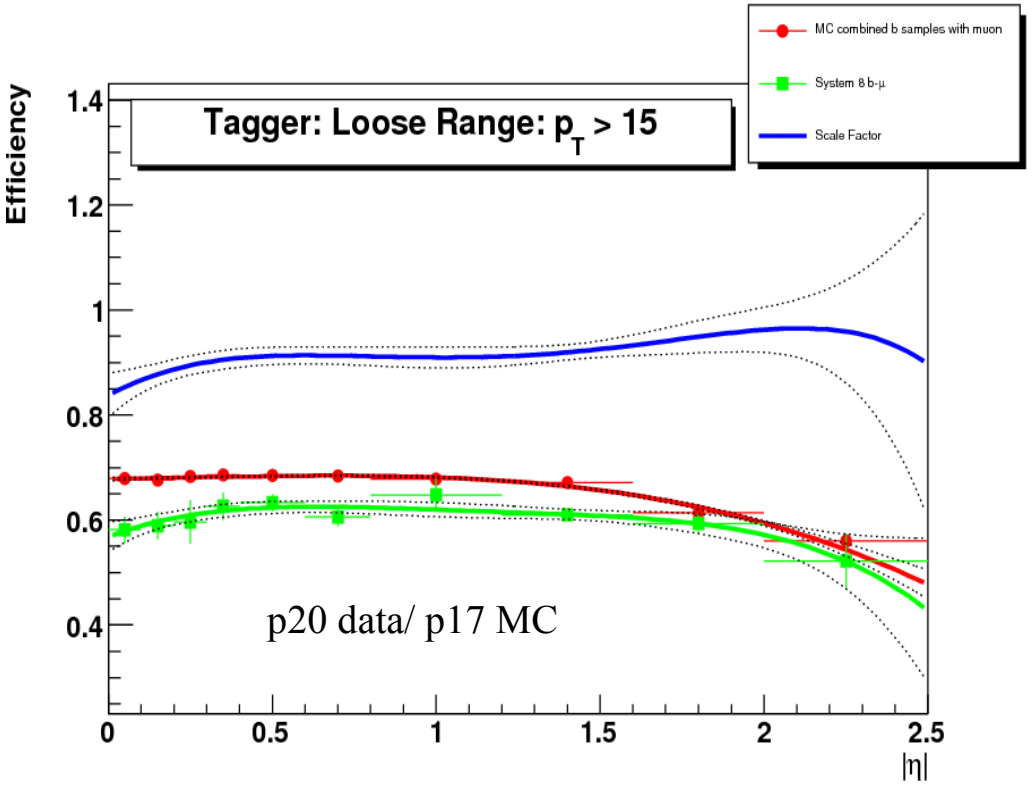




p20 NN Certification

Super-duper-extra preliminary !

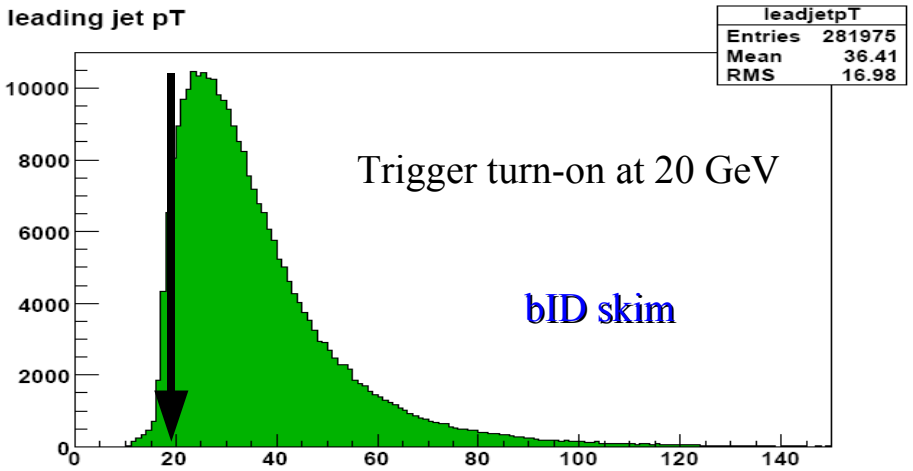


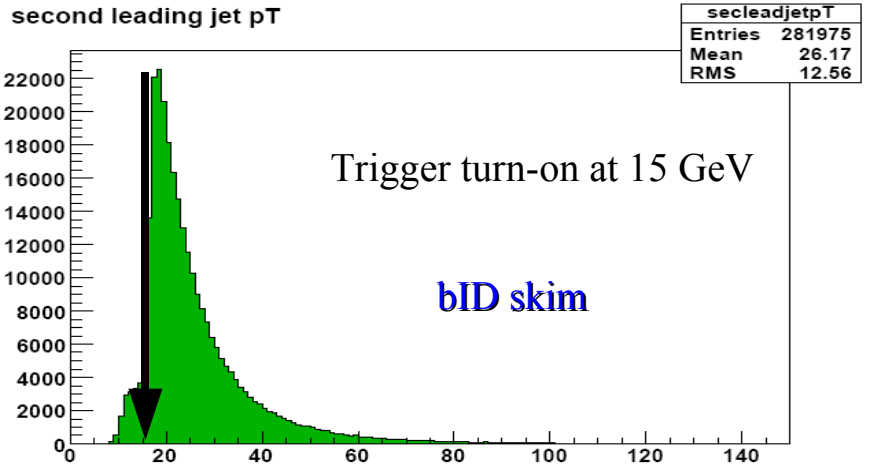


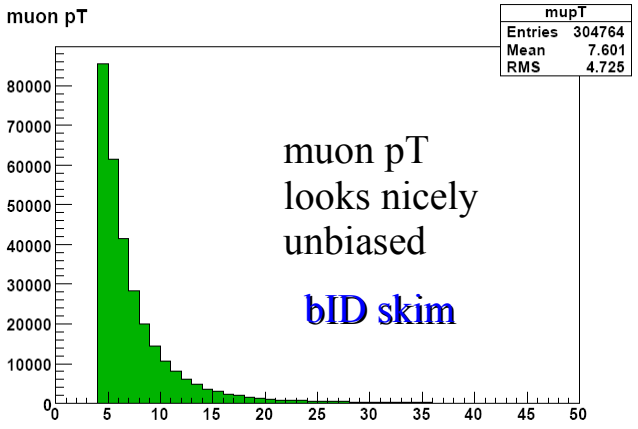
- Things look OK, certification "works"
- Need re-processed data before we see a higher efficiency in data?
  - Also competing with SMT aging and tracking luminosity effects...
- *Next step: include vertexing improvements from Yvonne, and compare (see backup slide...)*

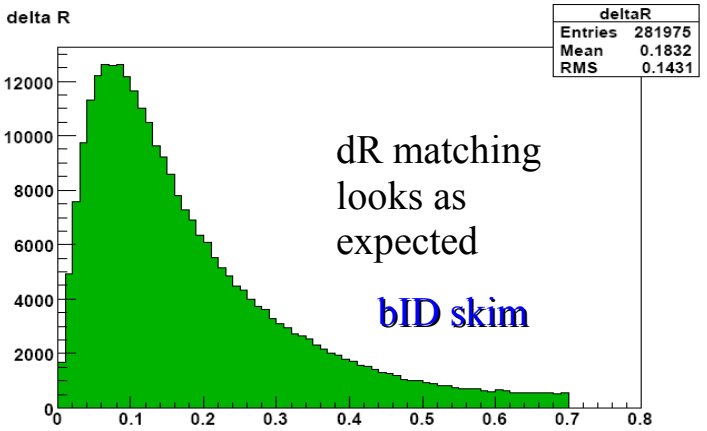
p20 NN Certification

- **p20 NN certification** (Sarah Schlobohm + Andy Haas + **Dale Johnston**)
  - In the meantime, study p20 data *(and MC – not shown in this talk)*
    - Important to properly account for new v15 trigger biases
  - >=2 jets with pT>10 GeV (skim, uncorrected pT)
    >=1 jet matched in dR<0.7 to medium muon with pT>4 GeV



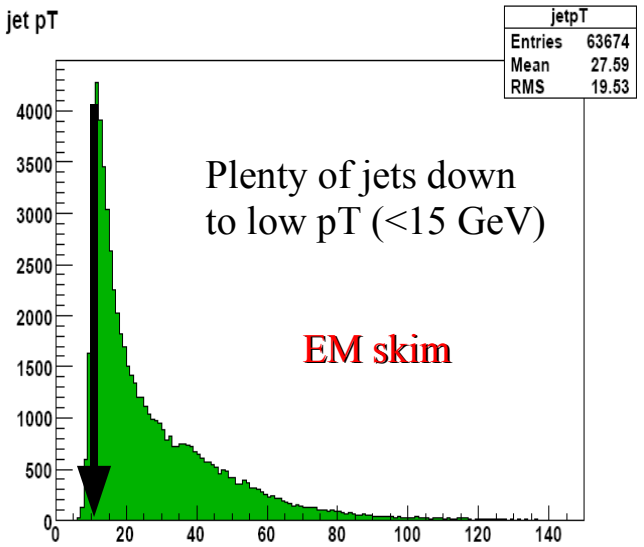


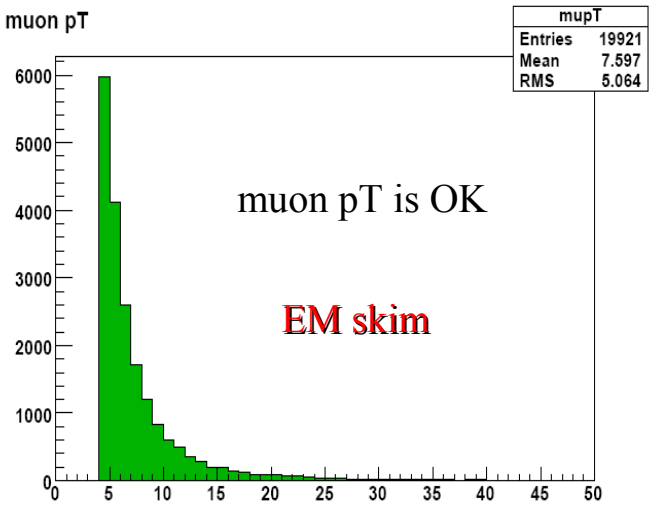


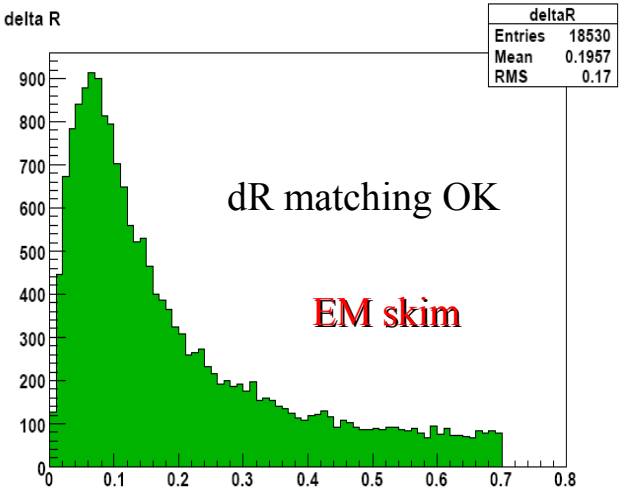


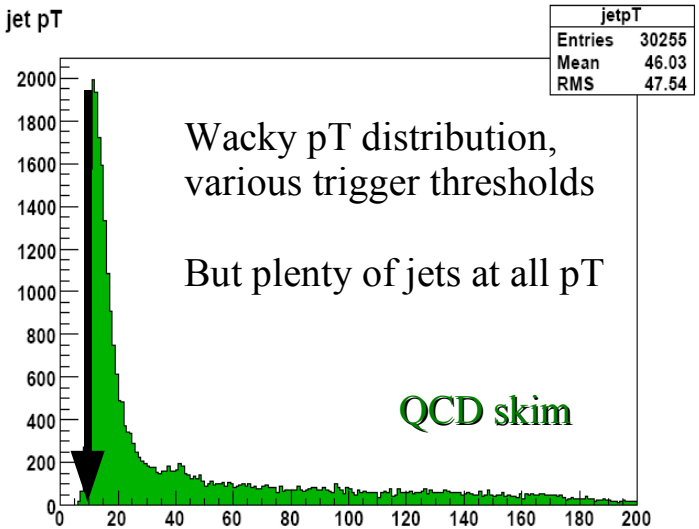
p20 NN Certification

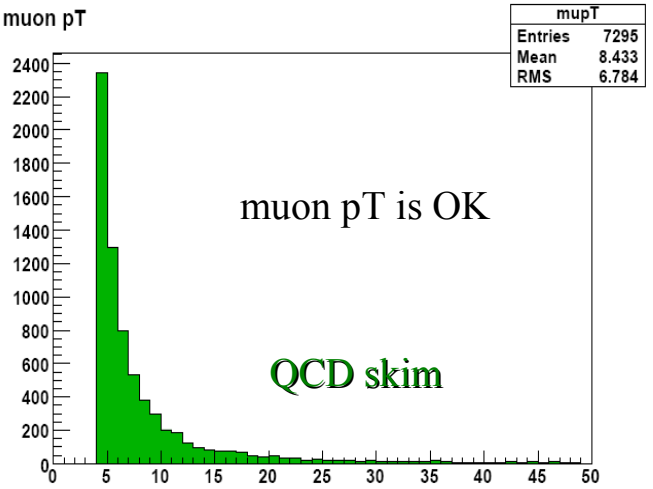
- And look at “fake tag” samples -> **QCD** and **EM** skims
- *Have also studied DQ, jet/muon eta, phi, etc. for all these samples*

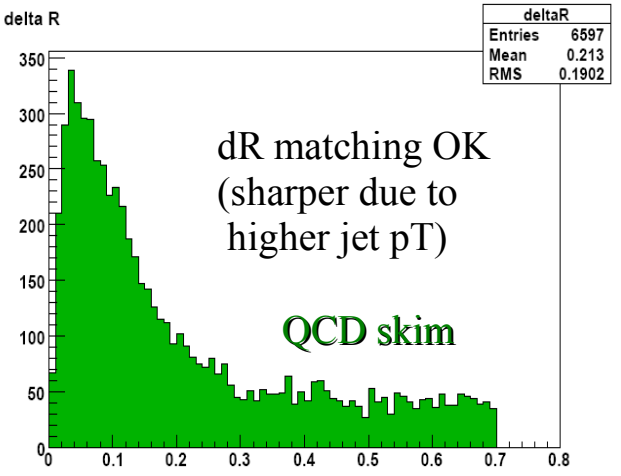






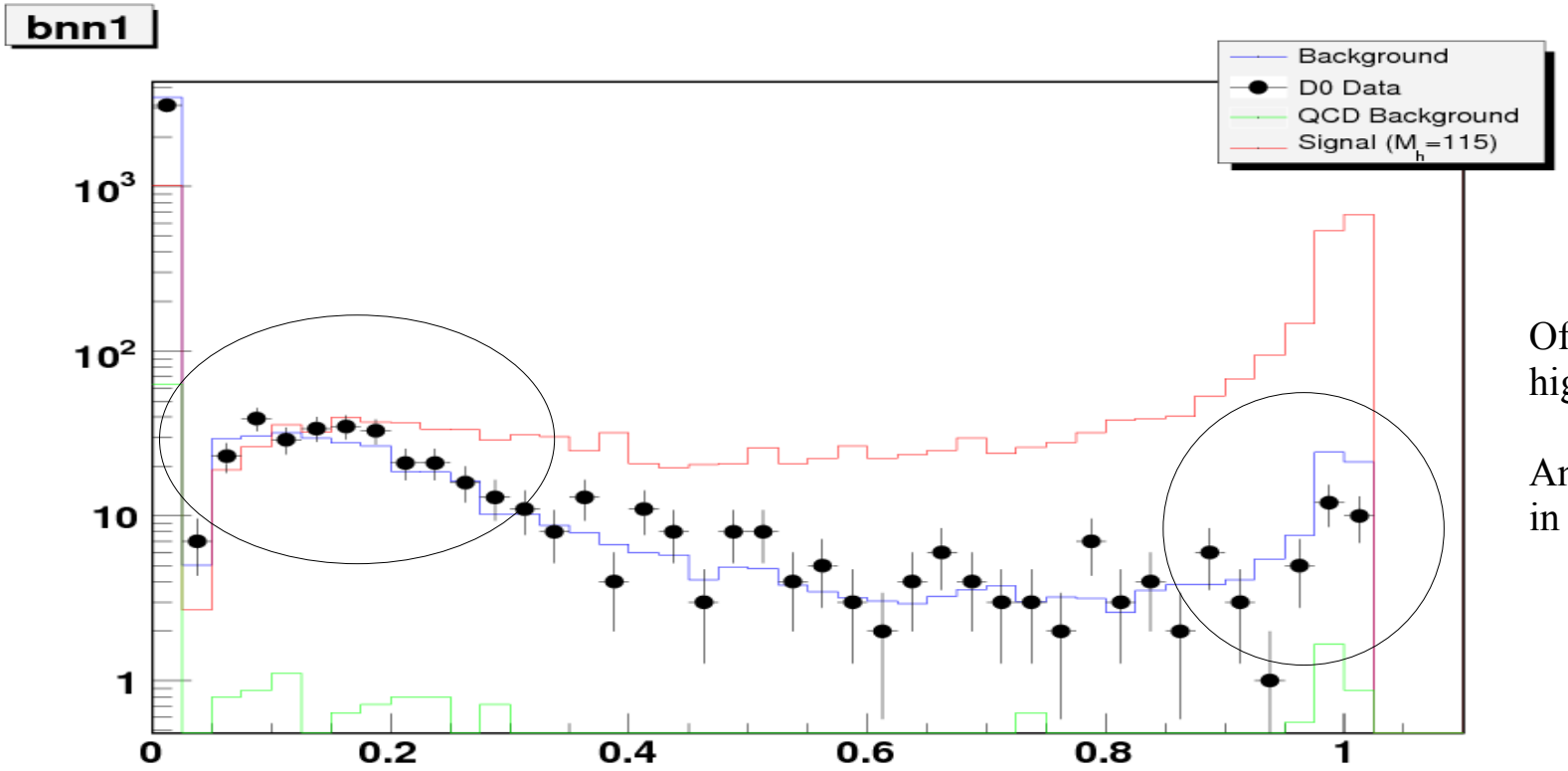






Continuous NN Output

- Several people have expressed interest in using the continuous b-ID NN output as a variable for *input* to a NN event selection
- Not an easy thing to do right!
  - MC and data do not give the same NN output shape!
  - There are several plausible methods for correcting the shape
- **We would be happy to coordinate these efforts through the b-ID group!**
  - ***Please email if interested in working on this -> (haas@fnal.gov)***



Off by a factor of 2 at high NN output

And there's more fakes in data at low NN output

b-ID Status

- Things are in *pretty good* shape
  - In p17 we're fixing and understanding many 5-10% uncertainties / biases
- *Lots of other recent work I haven't mentioned!!!*
  - *Luminosity / time dependence, high-luminosity studies, p20 MC, etc.*
- Need more involvement from people in physics groups...
  - Many small issues that can be solved with ~1 month of work each (tau TRFs, for example)
    Will improve the quality of your analysis!
- Significant work has gone into improving tagging performance.... will see benefits in p20
  - Optimized / improved vertexing, NN muon-jet tagger, JLIP L0 usage, etc.
- p20 certification work has started, and things are going relatively smoothly
  - **Schedule will be driven by (reprocessed) data and (good) MC availability**
  - **All efforts are being made to reduce the time needed from the day samples are available to *preliminary* certification**

Backup / Details

b-ID Improvements

- **SVT Optimization** (Yvonne)
  - ***Done***! D0Note 5265.
  - Random grid search of taggability and secondary-vertexing parameters
  - Fix old feature of re-using tracks on vertices
    - More realistic number of secondaries
    - Important – input to NN tagger!
  - Revive the 2-pass vertexing algorithm
    - Look for a tight vertex first, then a loose one if no tight was found
    - Better vertex parameters
      - Input to NN tagger!
    - Slightly higher efficiency
- **muon NN tagger for p17?** (Hwidong)
  - Adds ~5% efficiency to b-ID / negligible extra fake rate
  - ***Major milestone – have measured the tagging efficiency in data and MC!***
  - Now working on measuring fake-tag-rate
    - Will use a similar NTR approach?