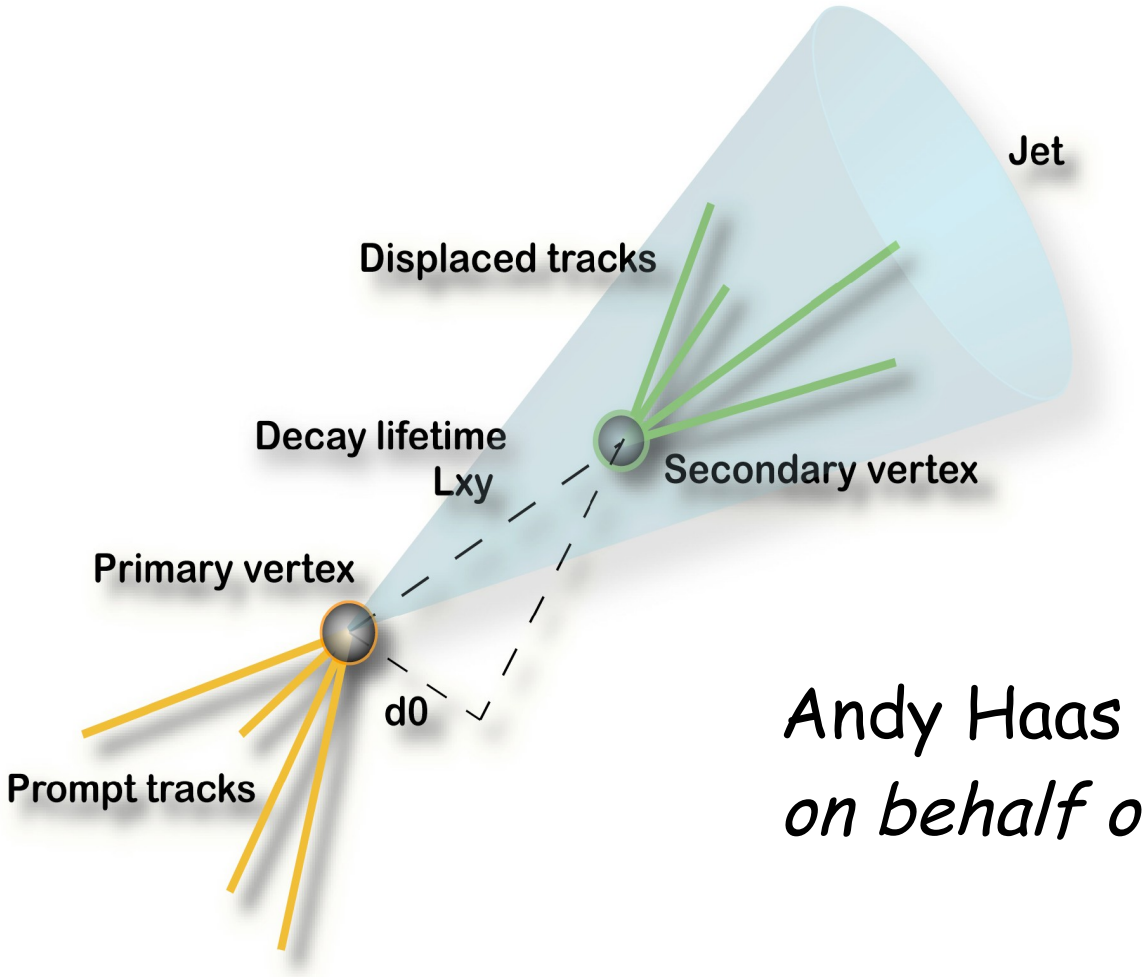
b-ID Status

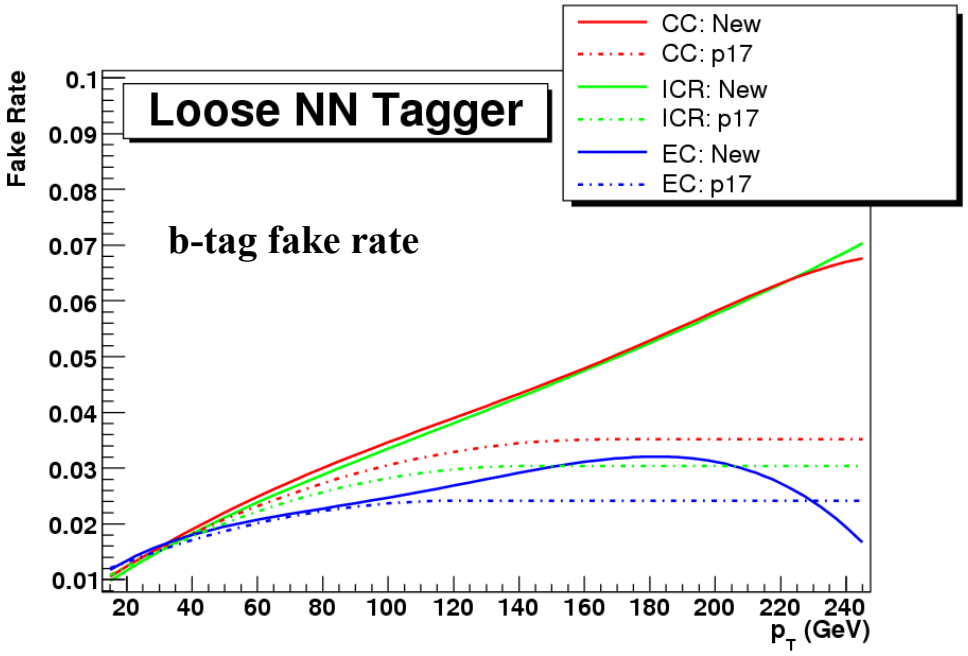


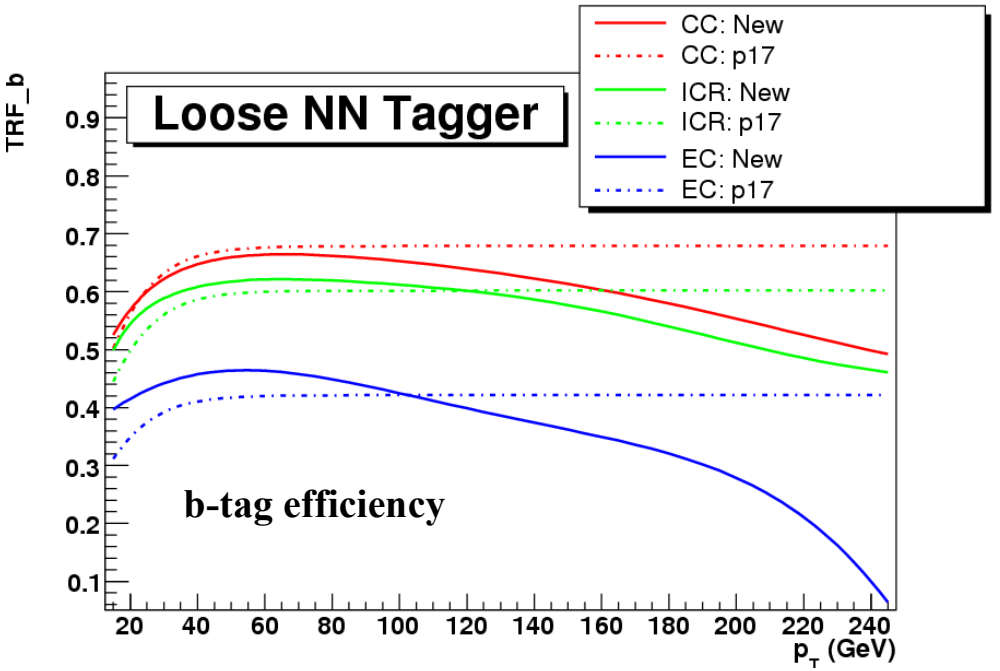
Andy Haas - Columbia University
on behalf of the b-ID group

Convener's Meeting
May 25, 2007

New TRFs

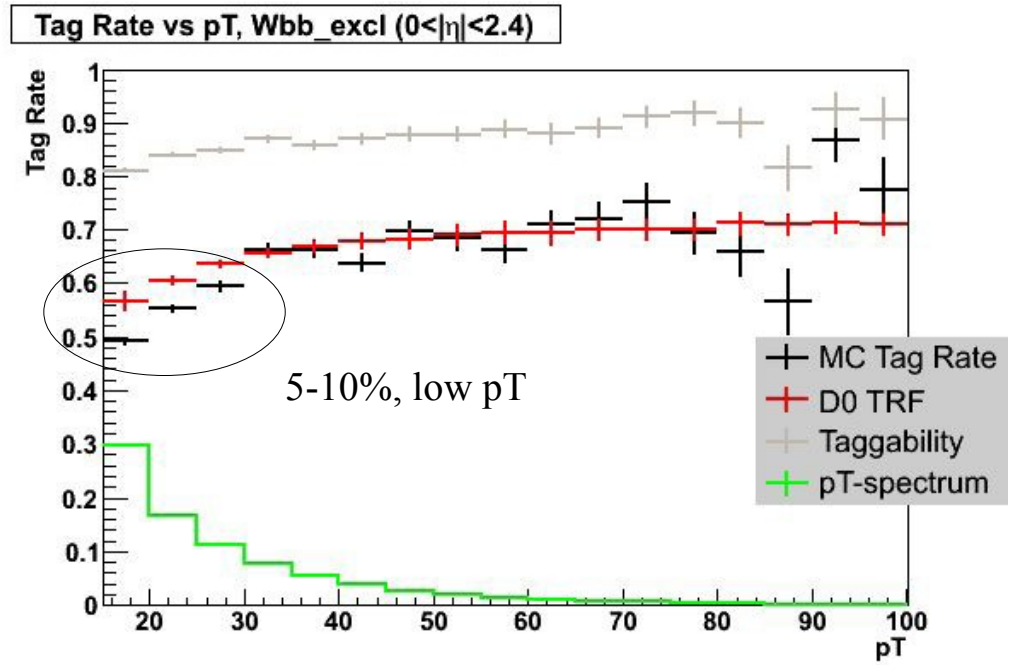
- **Tim Scanlon** has made new TRFs for p17 JLIP and NN
  - Extends to higher pT
  - Separate pT parameterization for each |eta| bin, so smaller systematic uncertainties
- Will be added to (p17) btags_cert soon, so can be used in CAFe
- We can use the updated nn_cert for p20 certification
- *Did not affect the bbbbump*

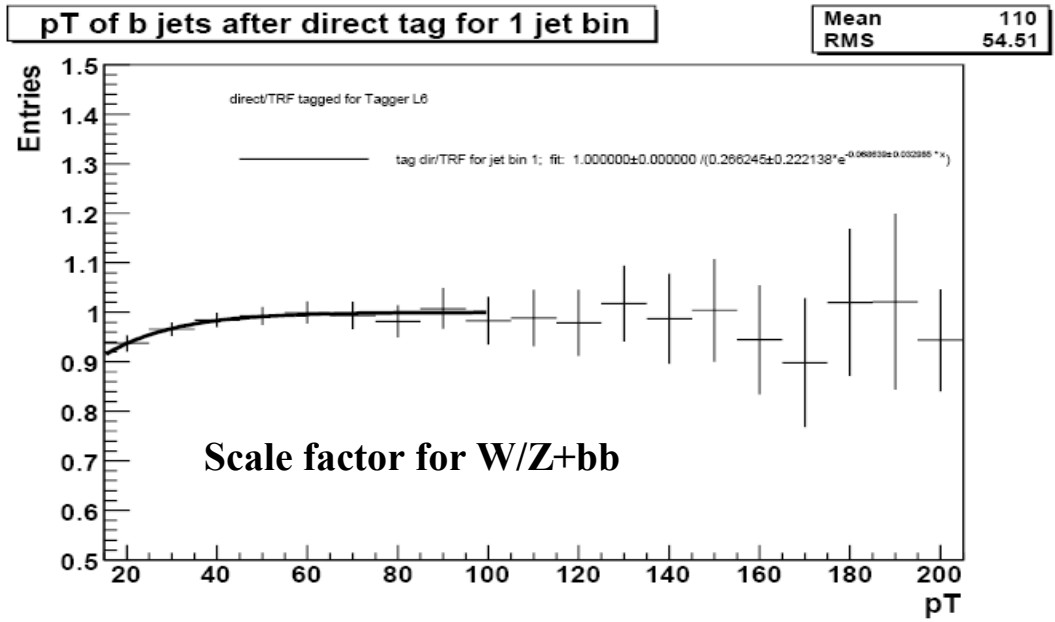




TRF W/Z+bb Discrepancies

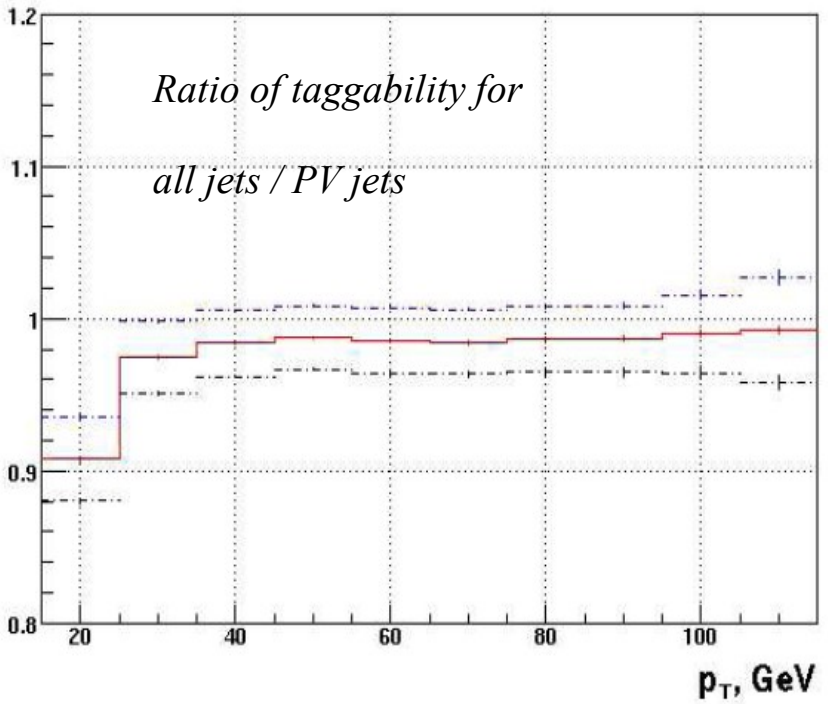
- Studied TRFs for *gluon-splitting* samples, like W+bb, Z+bb
  - Observe a 5-10% *overestimate* of the TRF, compared to actual tagging in MC at low pT
  - Due to lower b-quark momentum (as a fraction of the jet momentum) in these samples
- **Yvonne** has measured a correction for this
  - Will be put into BTagProcessor...
  - You will tell it that you're running on W/Z+bb and the TRF will be corrected

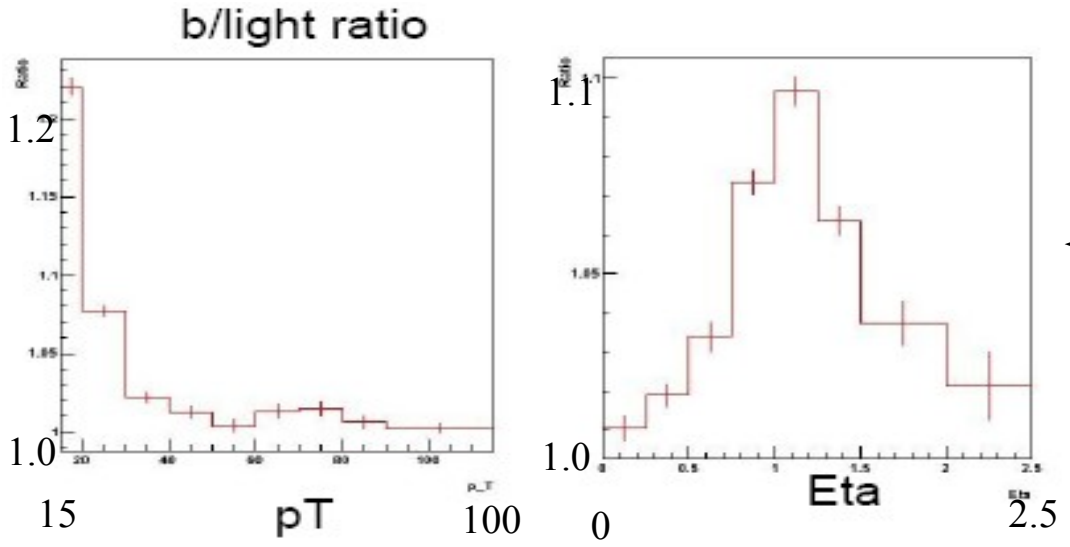




Taggability Issues

- **Thorsten** works on the taggability processor
  - Checked into CVS: btags_cert_caf
  - BTagProcessor is able to apply parameterized taggability
  - We are *underestimating* the taggability for jets from the PV at low pT by 5-10% and 2% at high pT
    - Will be fixed in new processor?
- Has made progress on the *flavor dependence...*
  - Also may study *tau* dependence...
- Will be done in time for p20 analyses (i.e. within ~1 month)





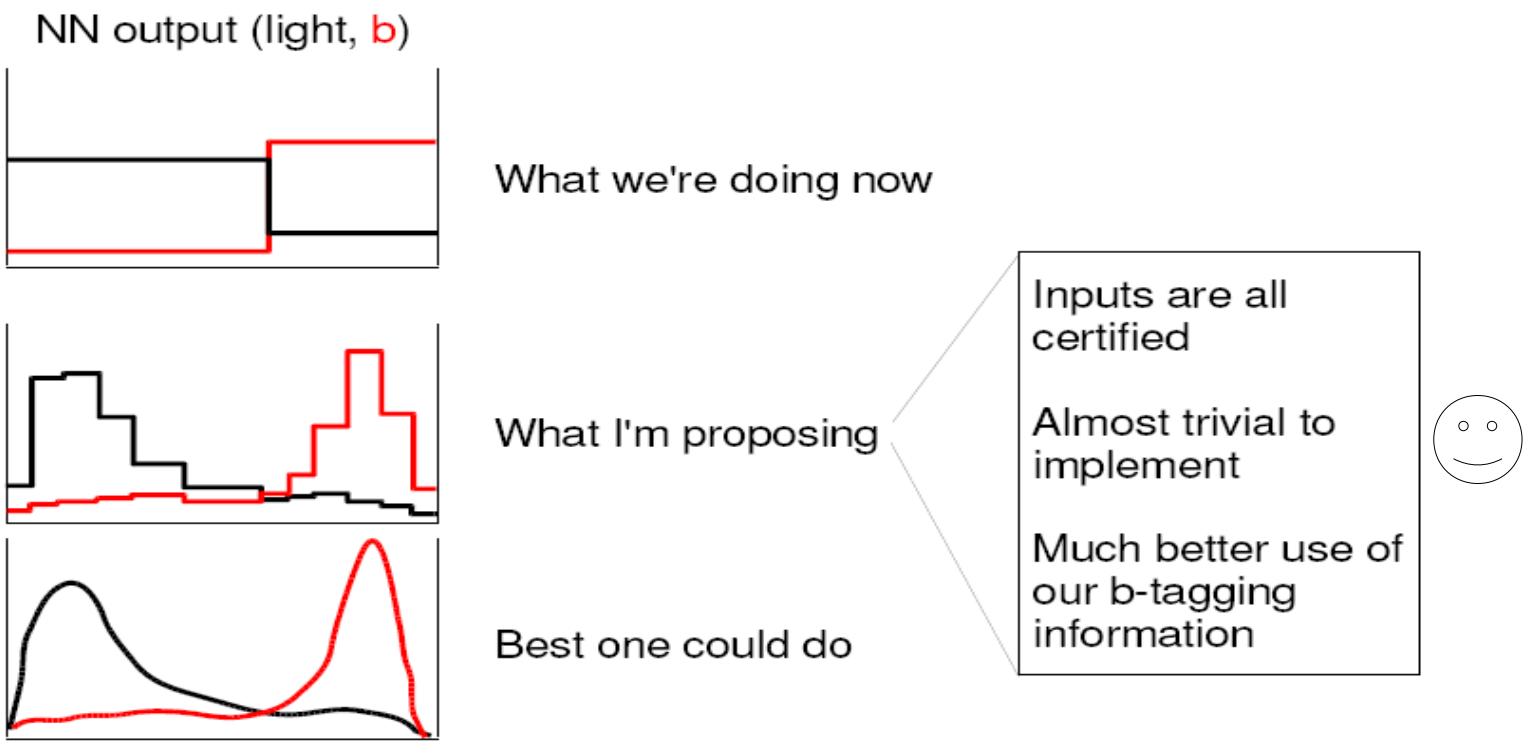
Taggability for b/c's goes up!
20% at 15 GeV
10% in ICR

To do...

- **A couple big holes (in addition to the projects “underway”)**
  - 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)
  - No light-jet data/MC scale factor!
    - Can not do a “direct tagging” analysis involving light jets

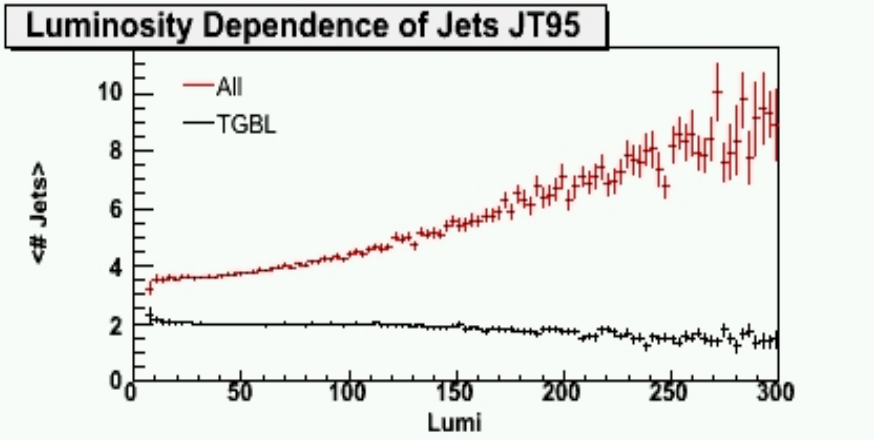
“Continuous” NN Output

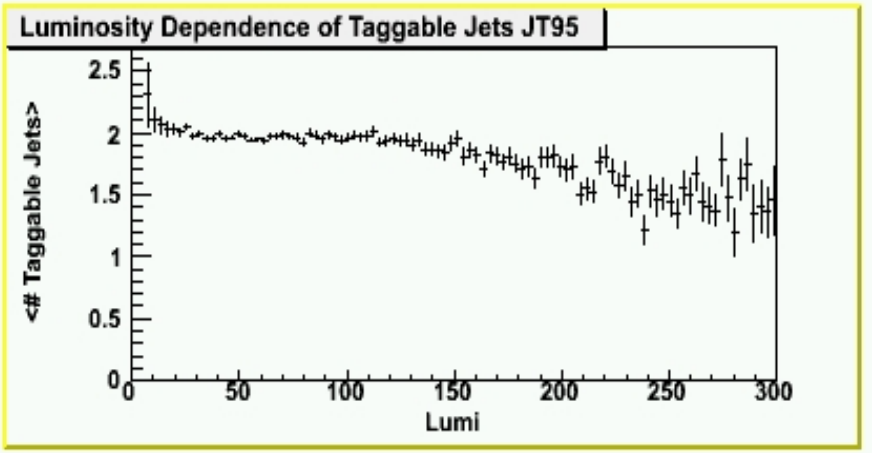
- Several people have expressed interest in using the continuous b-ID NN output as a variable for *input* to a NN event selection
- Not an easy thing to do right!
  - MC and data do not give the same NN output shape!
  - There are several plausible methods for correcting the shape
- **Alan Magerkurth** has devised a way to use all 12 NN operating points
- **Mike Mulhearn** will investigate correcting the full output distribution

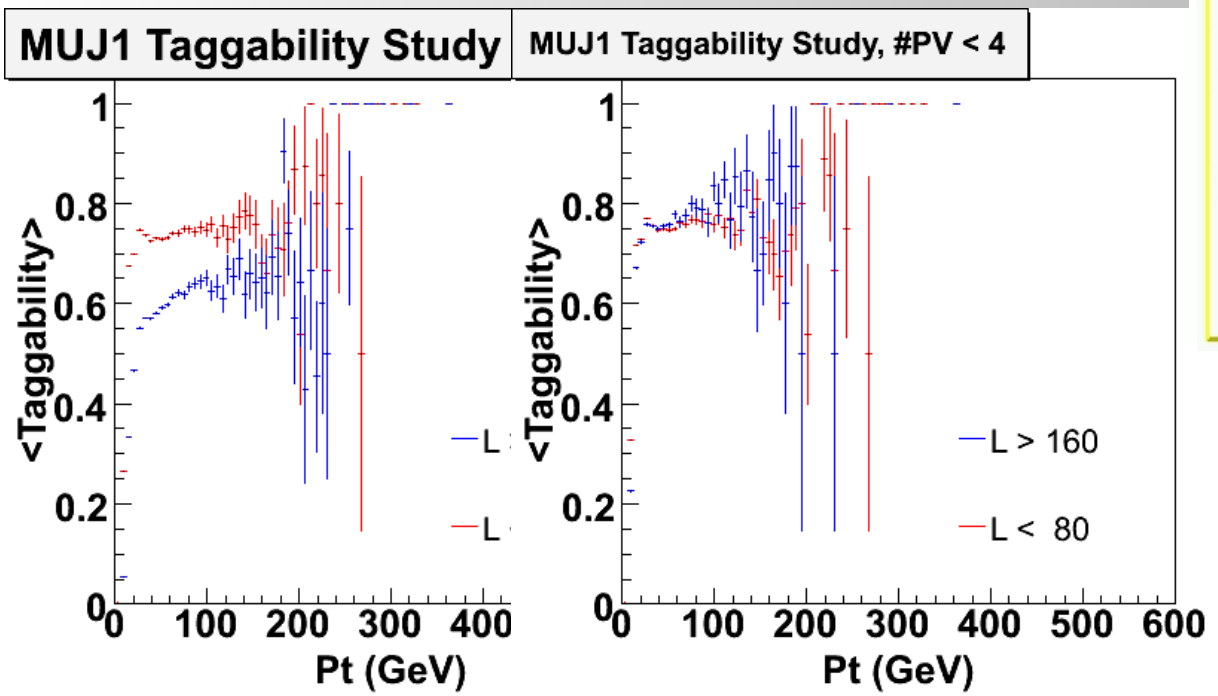


Inst. Luminosity Dependence

- **Suneel Dutt**
- Showed before that NN inputs / outputs are not sensitive to inst. lum.
- Taggability on average decreases with increasing inst. lum.
  - But taggability for “clean” events with <4 PV does not suffer at higher inst. lum.
- Can see average number of taggable jets start to fall off around ~150e30

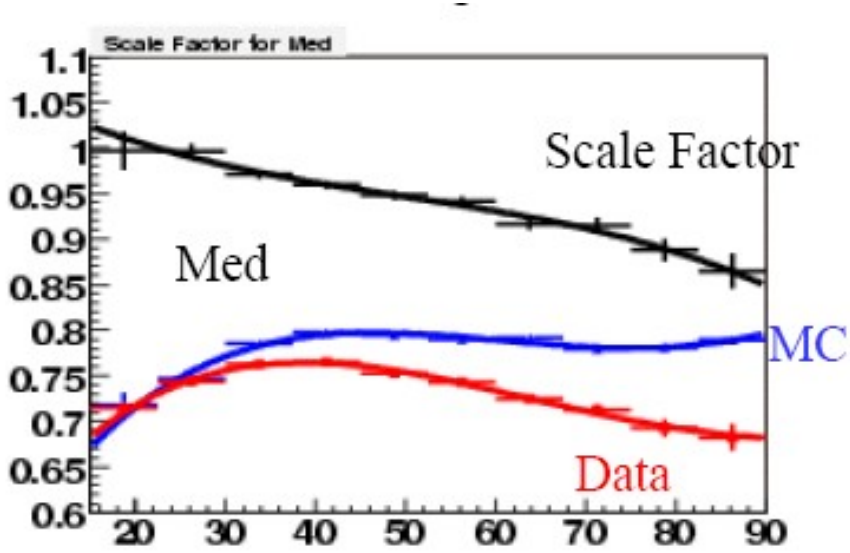


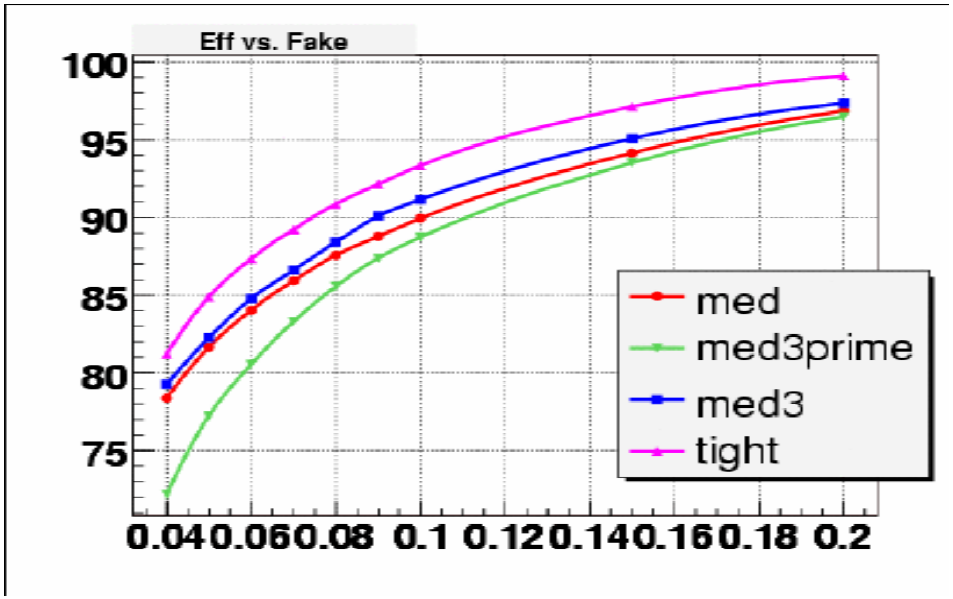


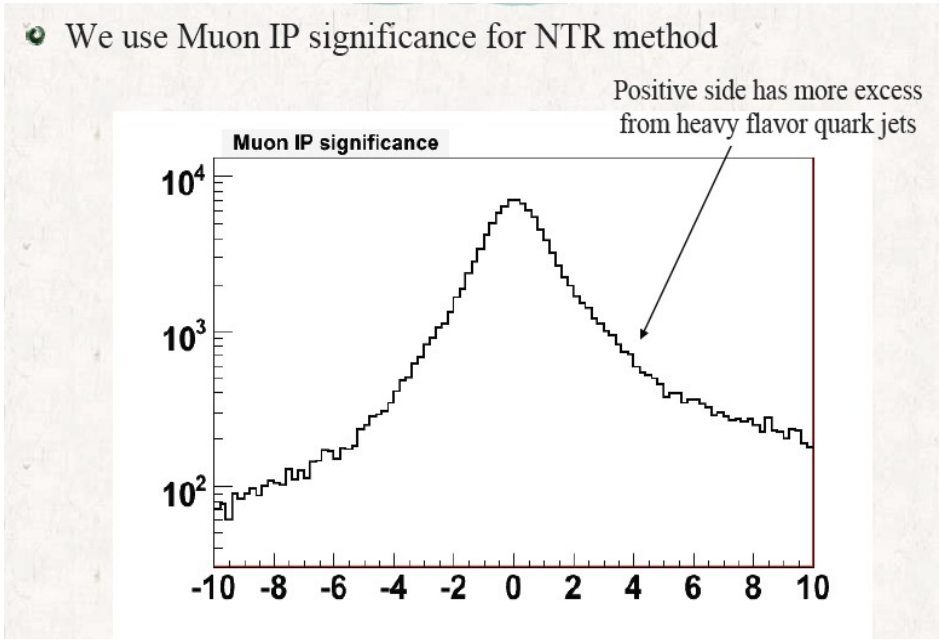


Muon Soft-lepton Tagger (NN)

- **Hwidong**
  - Adds ~5% efficiency to b-ID / negligible extra fake rate
  - Have measured the tagging efficiency in data and MC!
    - Modified System8 method used
  - Now working on measuring fake-tag-rate
    - Using Negative Tag Rate method based on muon IP significance
  - Next hurdle is the data/MC scale factors for the *muon* efficiency and fake rate in the jet

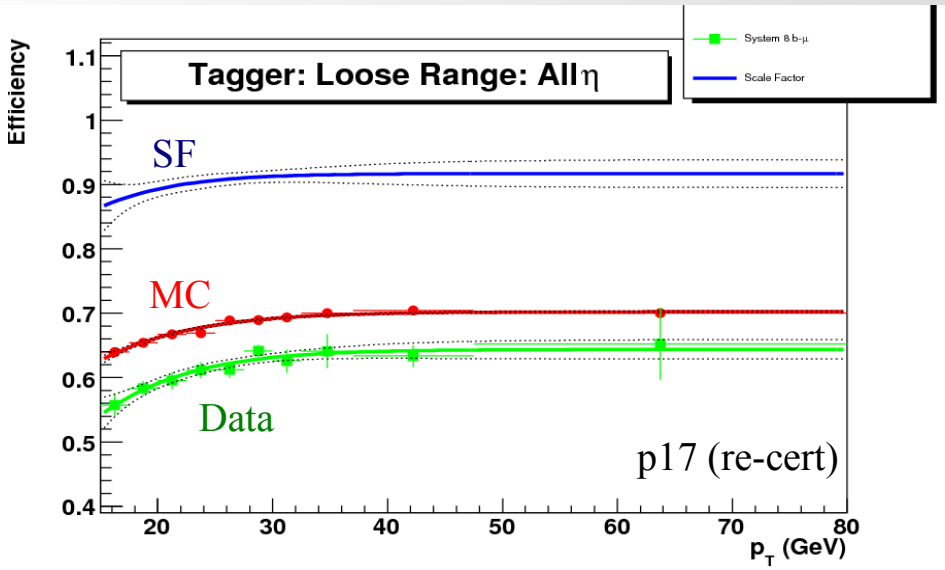


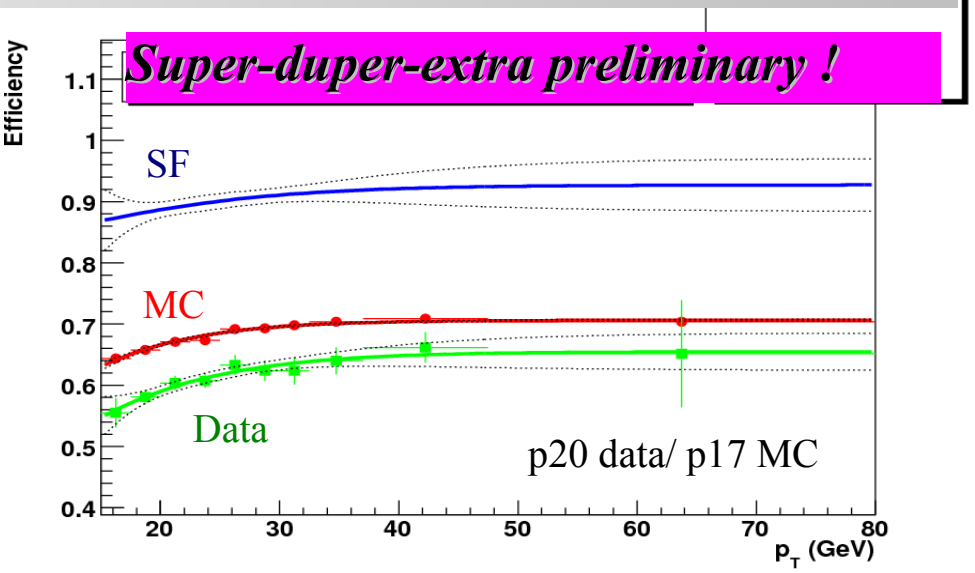




p20 NN Certification

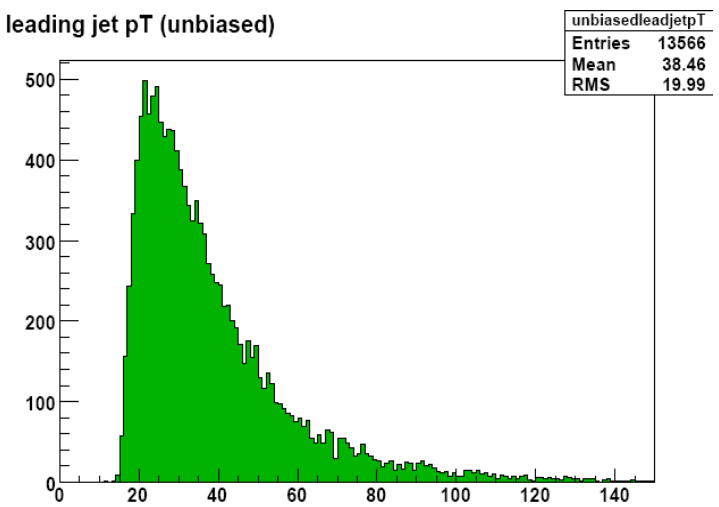
- **Sarah Schlobohm + Andy Haas + Dale Johnston**
  - Have run several “certifications” so far:
    - Re-cert p17 data / MC (to cross-check with old p17 certification)
    - p20 pass1 data / p17 MC
  - Now running on pass2 data – *will be done next week*
    - There were some technical problems switching to pass2 (needed to switch to p21.05.00, new JLIP package)
  - Currently running with the (preliminary) p17 JES
    - Testing the p20 preliminary JES (currently have some error messages)
    - Will switch to p20 JES next time we process the data
- **Still on schedule for preliminary p20 TRFs by end of June**

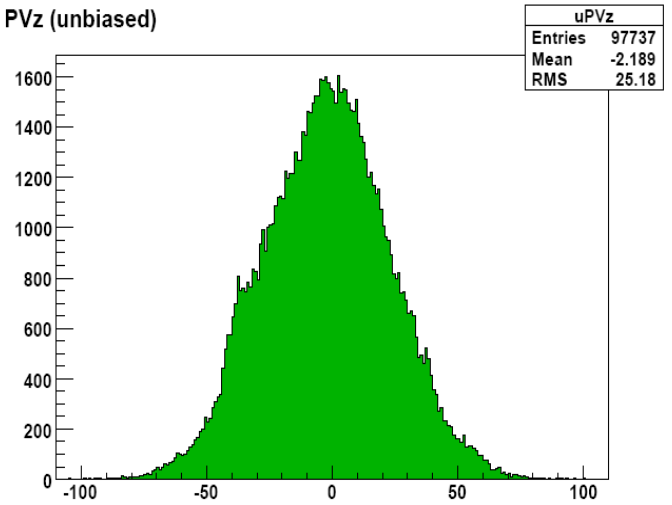




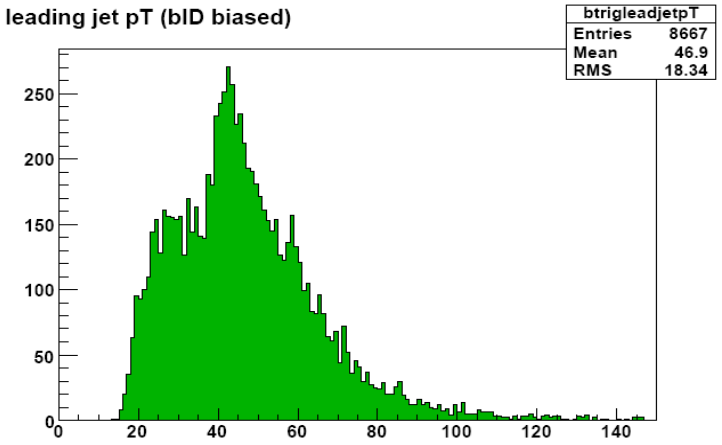
p20 NN Certification

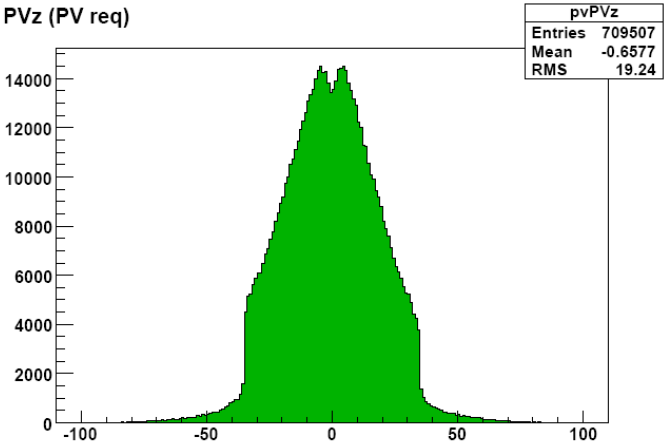
- **Dale** studies the p20 data samples and understands “biased”/”unbiased” triggers
  - We must reject events which were triggered *only* on triggers with PVZ or L3IP terms
  - Also not using triggers like DiMU, EMMU, tau, etc.





Unbiased





Biased

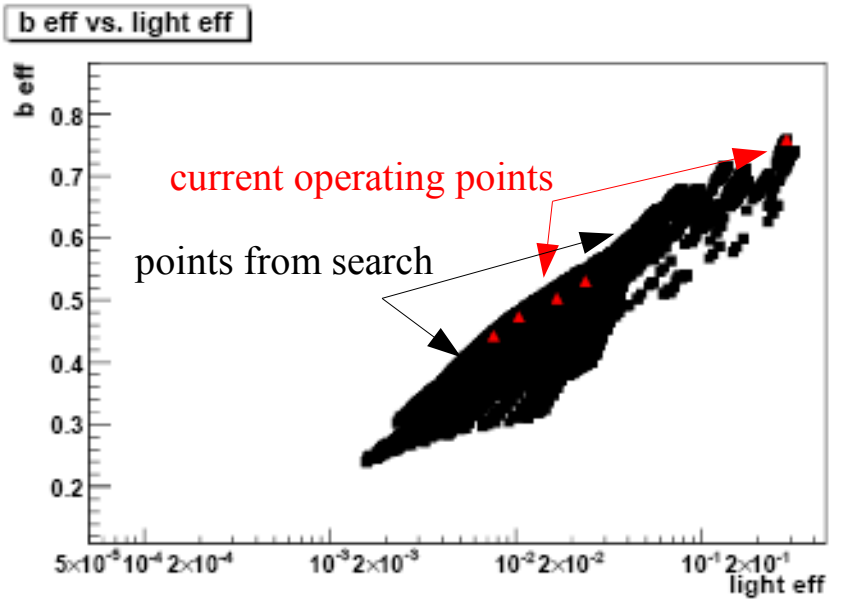
b-ID Status

- Many improvements worked on lately, will be available soon:
  - New TRFs with higher pT range and smaller uncertainties
  - A correction for W/Z+bb TRFs
  - A taggability processor, with corrections for b,c,*tau* jet flavors, nPV cut
- Several studies underway:
  - Use of continuous NN output
  - Inst. luminosity dependence
- Muon soft-lepton tagger is maturing, fake-rate being measured in data
- p20 certification on schedule for preliminary (pass2) TRFs by end of June
  - Will use p17 MC!
  - Will (likely) use p17 JES

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



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