tracks

muons

jets

Primary vertex

B-Identification status

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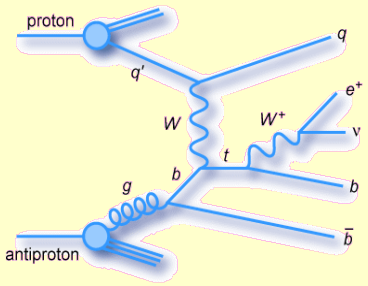
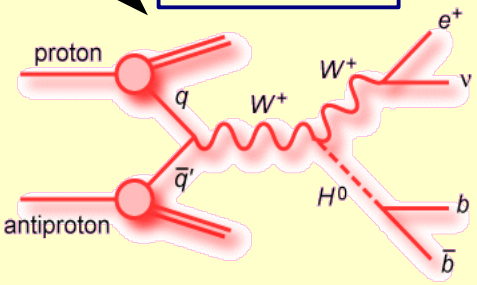
Higgs

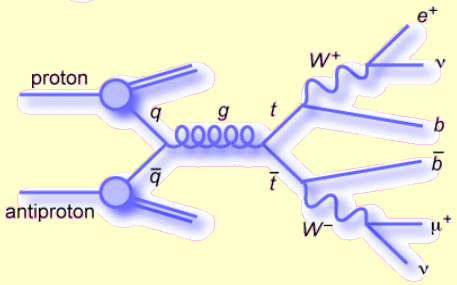
Top

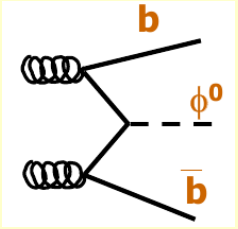
BSM

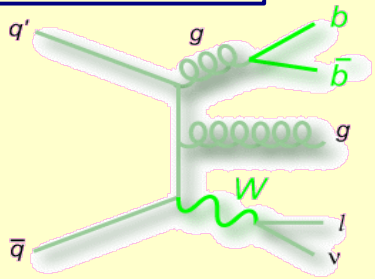
SM/BSM backgrounds











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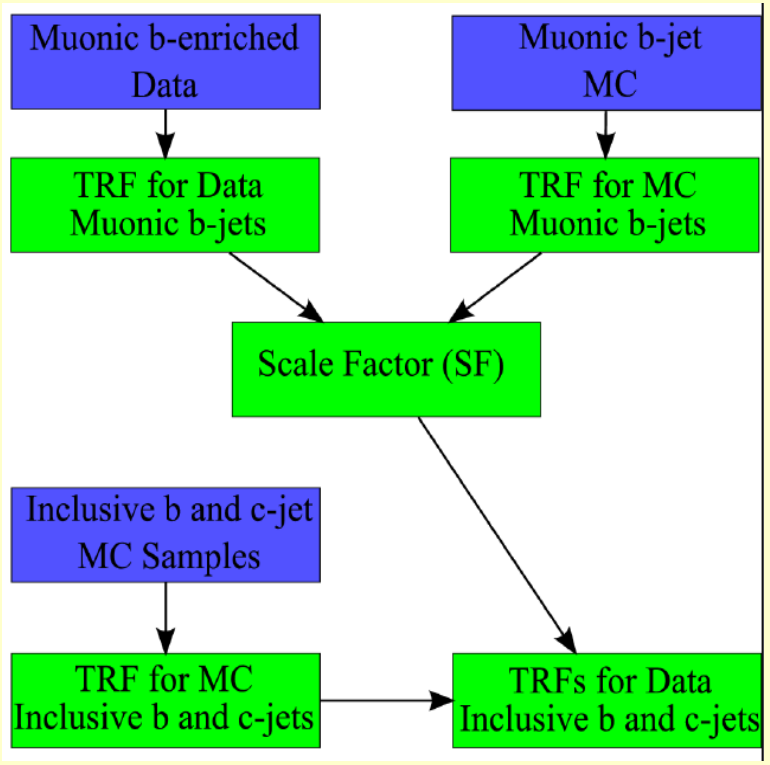
b-efficiency

Goal

- Estimate of b (& c efficiencies)

Measured in *data*

- MUInclusive skim
- System8 with b2b jet / Muon-in-jets presel.
- *Muonic b*-TRFs in data/MC in f(pT,eta)
- *Muonic* data/MC **b-Scale Factor (SF_b)**:



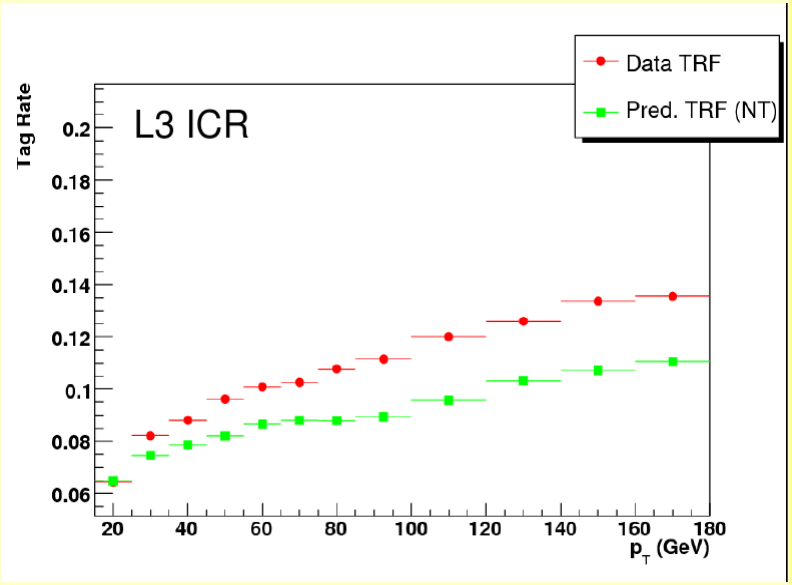
$$\varepsilon_b^{\text{data}} = \frac{\varepsilon_{b\to\mu X}^{\text{data}} \cdot \varepsilon_b^{\text{MC}}}{\varepsilon_{b\to\mu X}^{\text{MC}}} = \text{SF}_b \cdot \varepsilon_b^{\text{MC}}$$

- Apply SF to **inclusive** b & c TRFs to get data efficiencies

Fake rate

Goal

- Estimate ε_{light} where light = u, d, s and gluon



"Old" method:

- estimated from *negative tags*
- + *corrections from simulation*

"New"

- less MC dependent,
- uses System8 heavy flavour (b & c) rates as inputs
- Requires constrains on flavour composition in sample (multijet trigger)

Parameterisation

- F(p_T,η(CC,ICR,EC))

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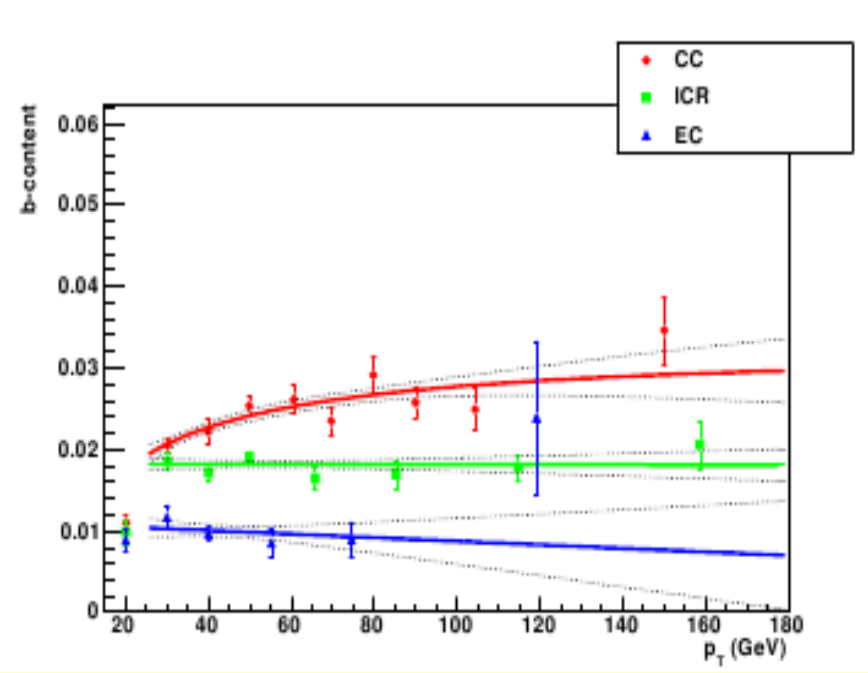
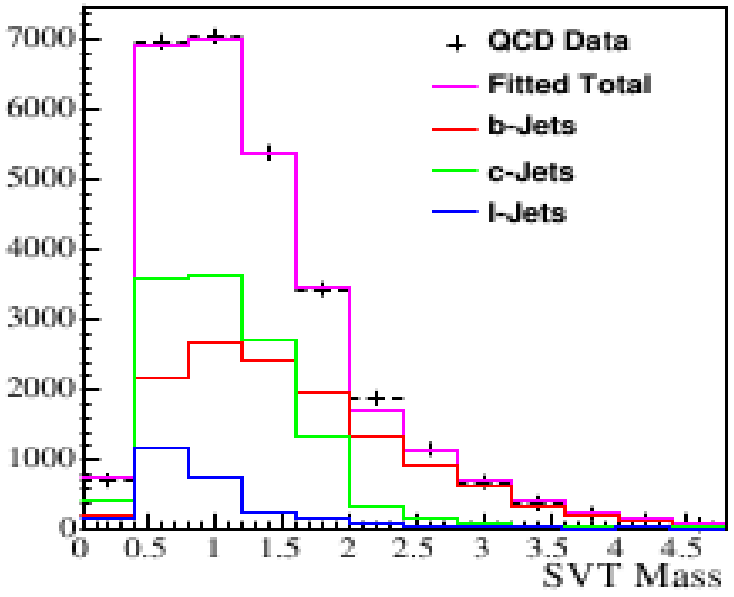
Fake rate

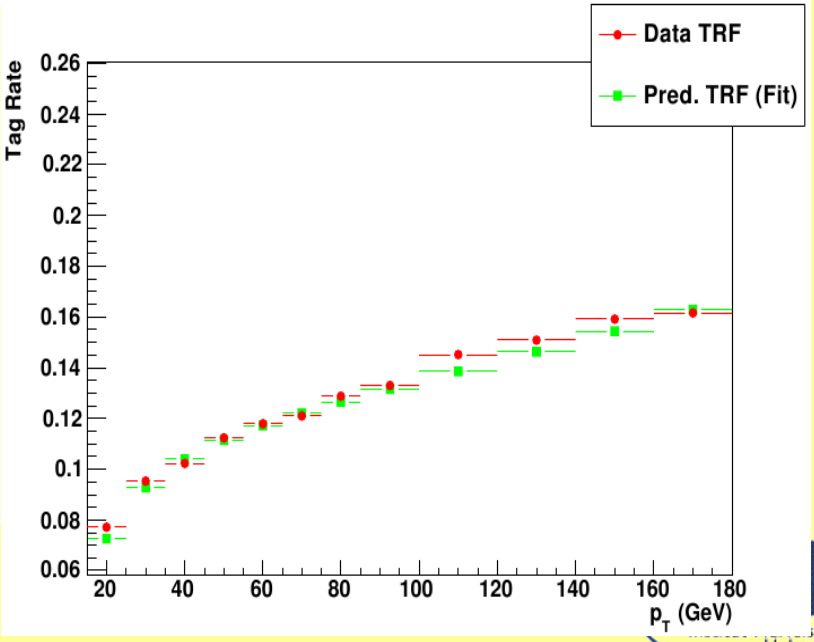
Requires constrains on flavour composition

- Use NN tight + secondary vertex mass
- Fit data in jet pT/eta bins





- Consistent tag rate:



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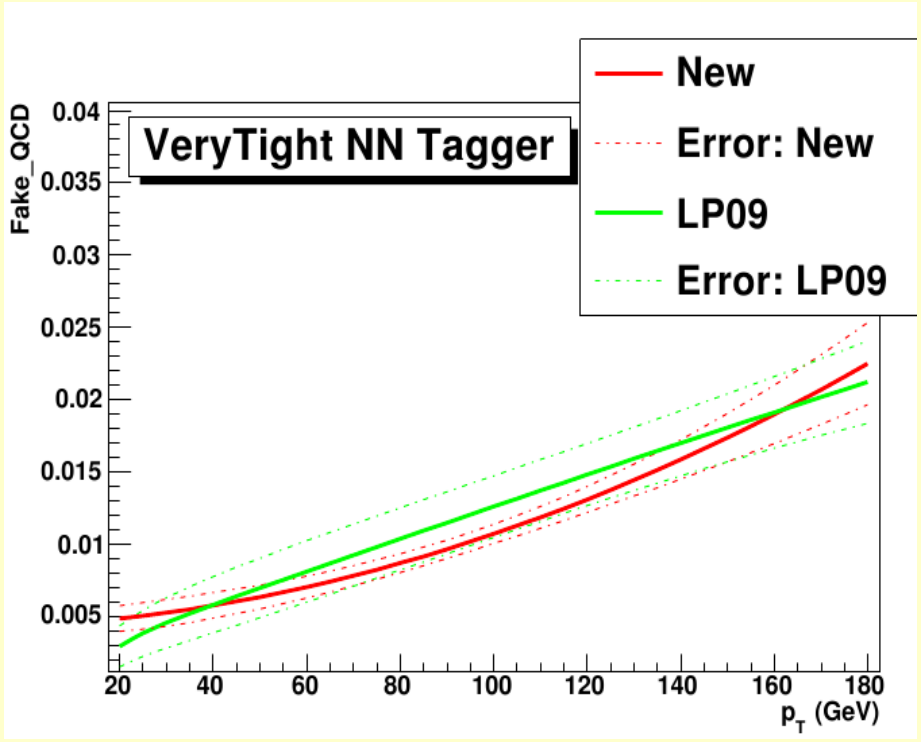
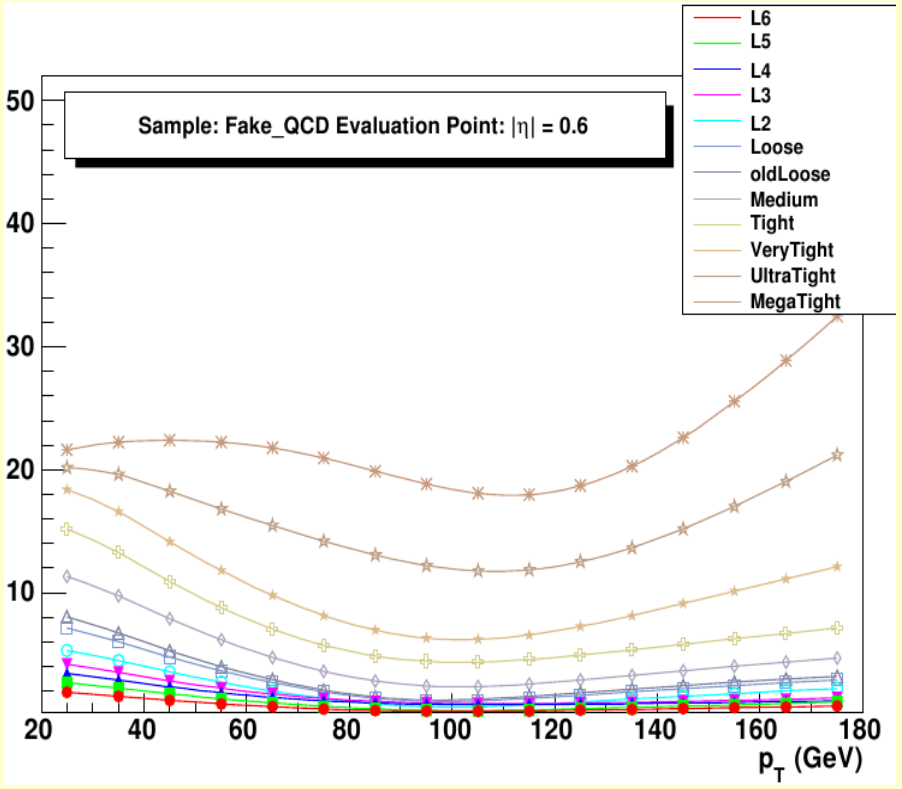
Fake rate

Total errors

- < 30% (rel.) for tightest OP
- Good agreement with prelim. L09
- **Systematics:** b-shape, NT in data, TRF errors, ...





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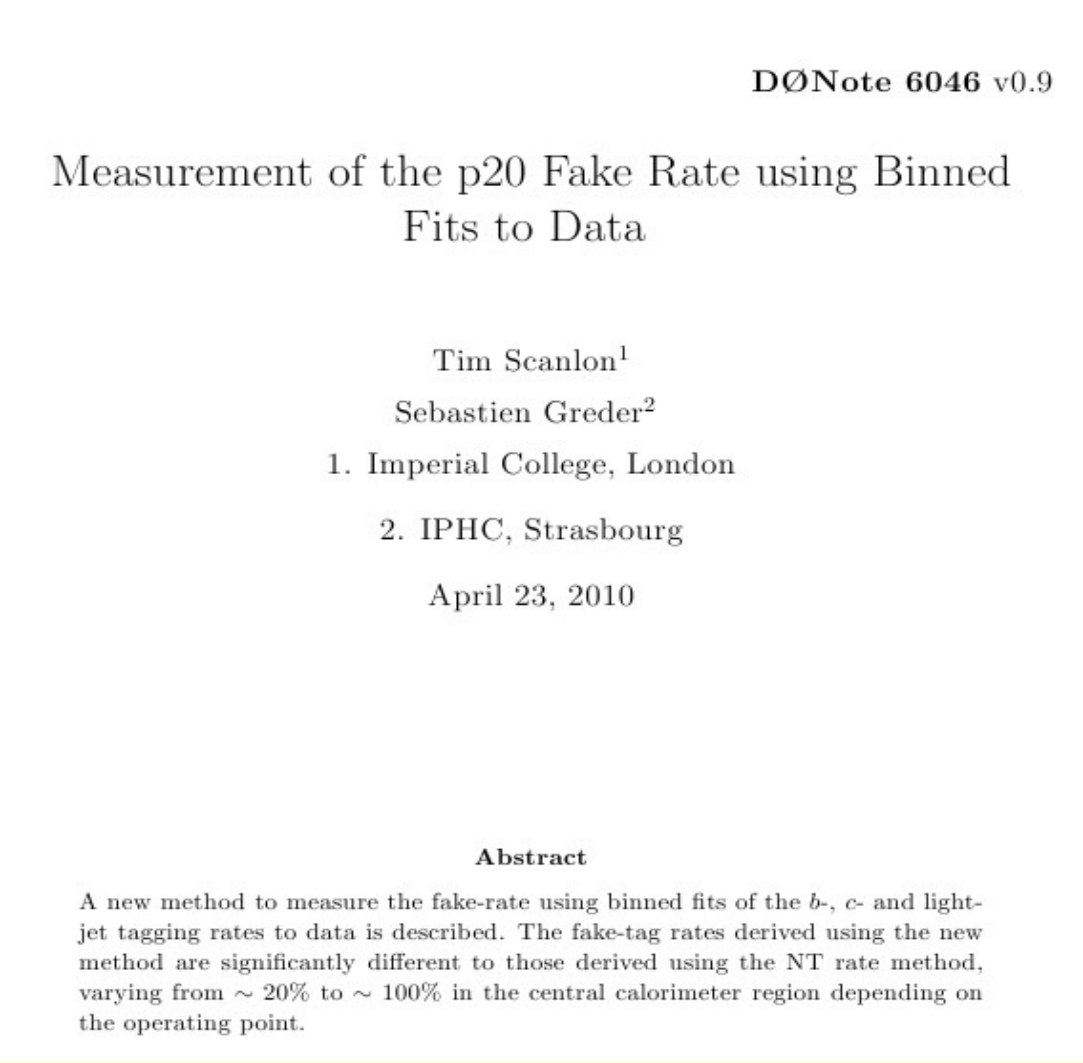
Fake rate

All information available from:

- **B-ID Editorial Board**
- Certified p20 NN !
- Updating p17 NN
- Updating MVA BL



DØNote 6046 v0.9

Measurement of the p20 Fake Rate using Binned Fits to Data

Tim Scanlon[1]
Sebastien Greder[2]
1. Imperial College, London
2. IPHC, Strasbourg

April 23, 2010

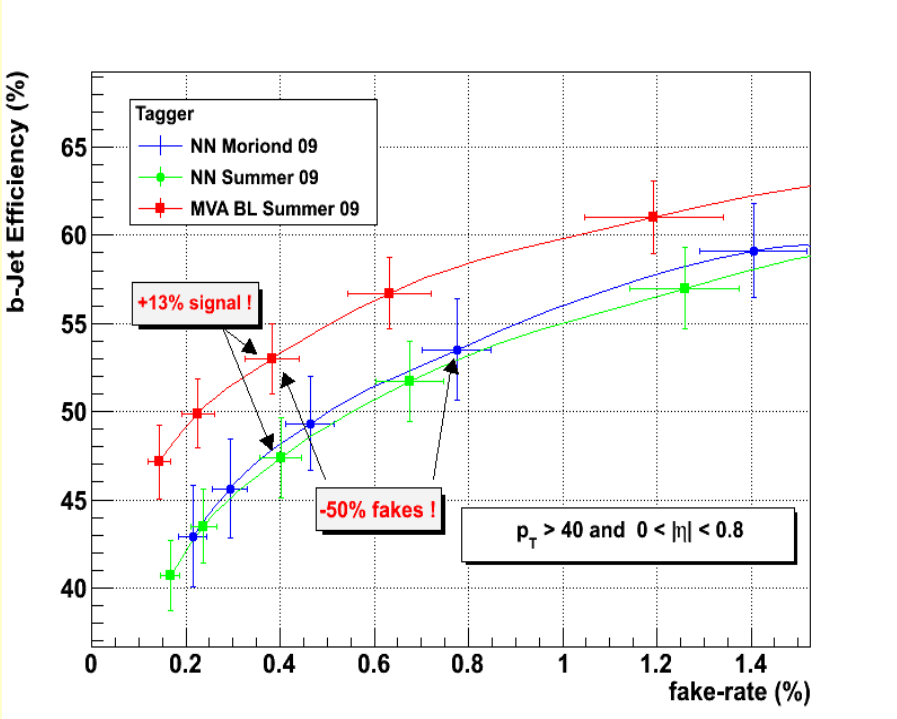
Abstract

A new method to measure the fake-rate using binned fits of the *b*-, *c*- and light-jet tagging rates to data is described. The fake-tag rates derived using the new method are significantly different to those derived using the NT rate method, varying from ~ 20% to ~ 100% in the central calorimeter region depending on the operating point.

MVA taggers

BL: Improved performance w.r.t NN

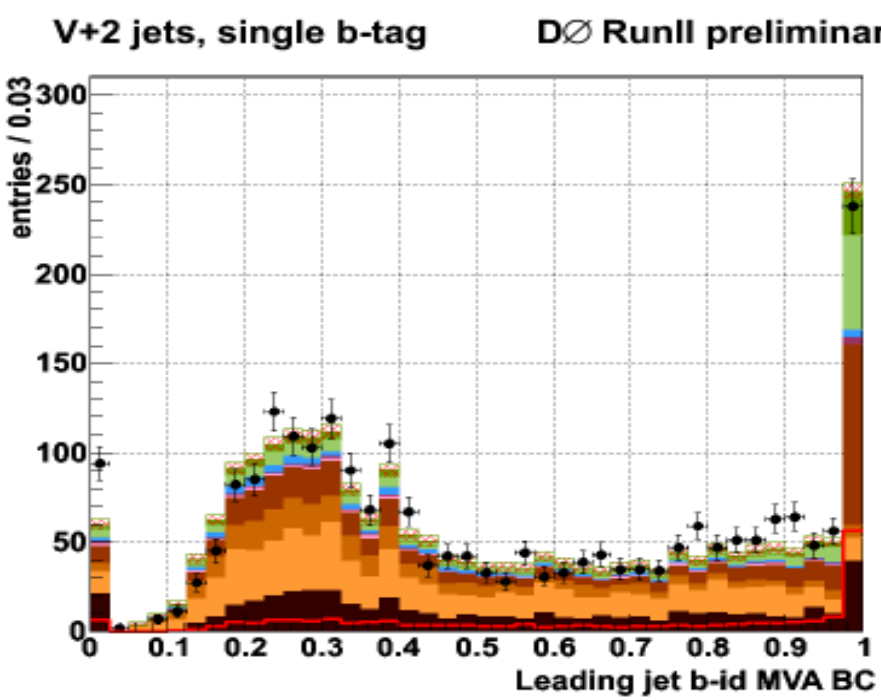
- **+20% signal** in hb->bbb !
- Tested in low-mass Higgs searches
- Improved s/sqrt(b) observed in WH and ZH (nunubb)
- Gain not straightforward, tuning of b-id operating points, multi-variate discriminants needed

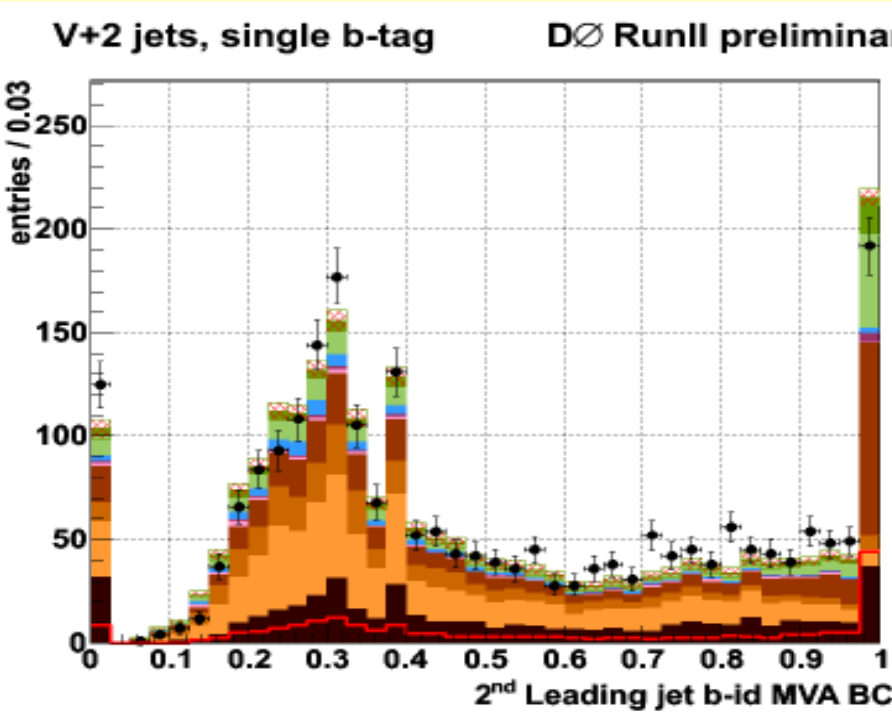


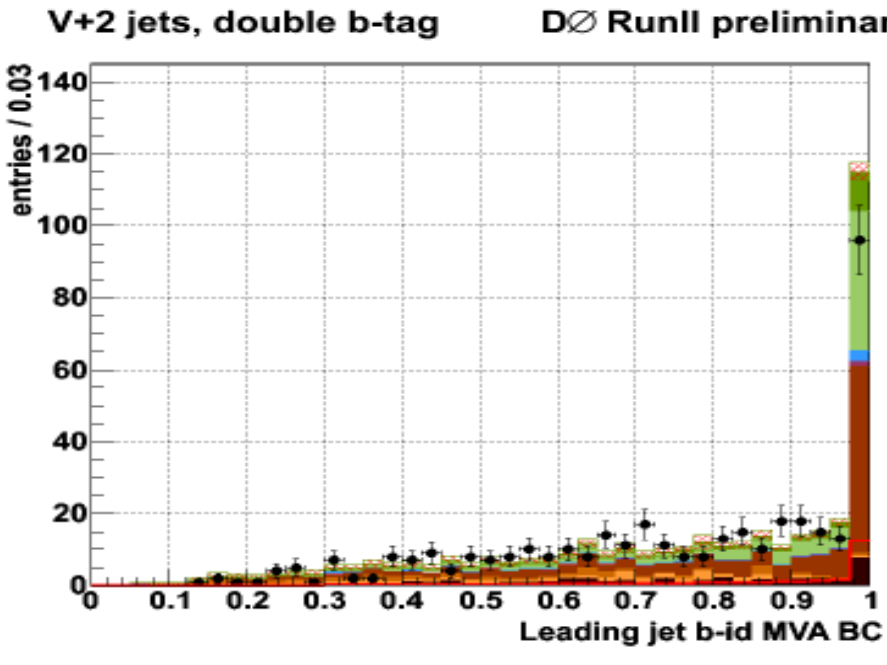
BC: specialized b/c discriminant

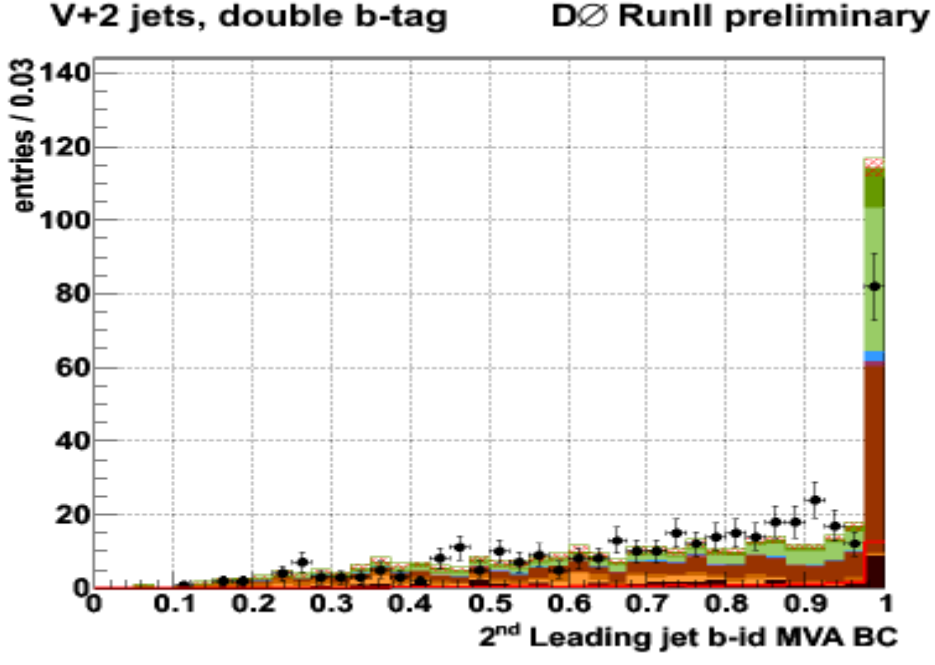
BB: b / (bb) discriminant (i.e Higgs/Top vs. V+hf)

MVA BC in WH search

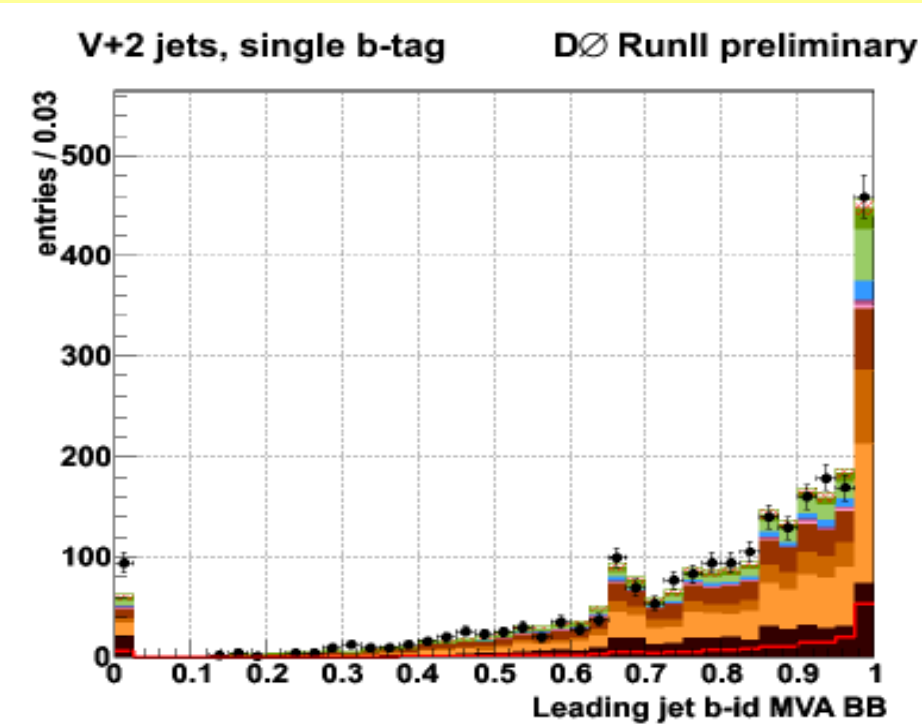


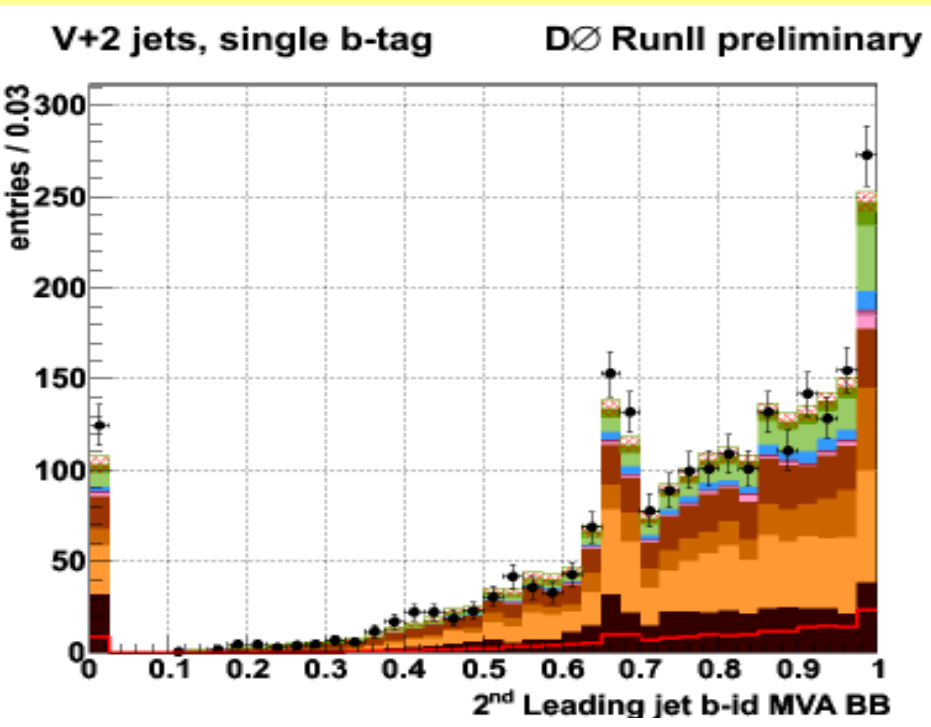


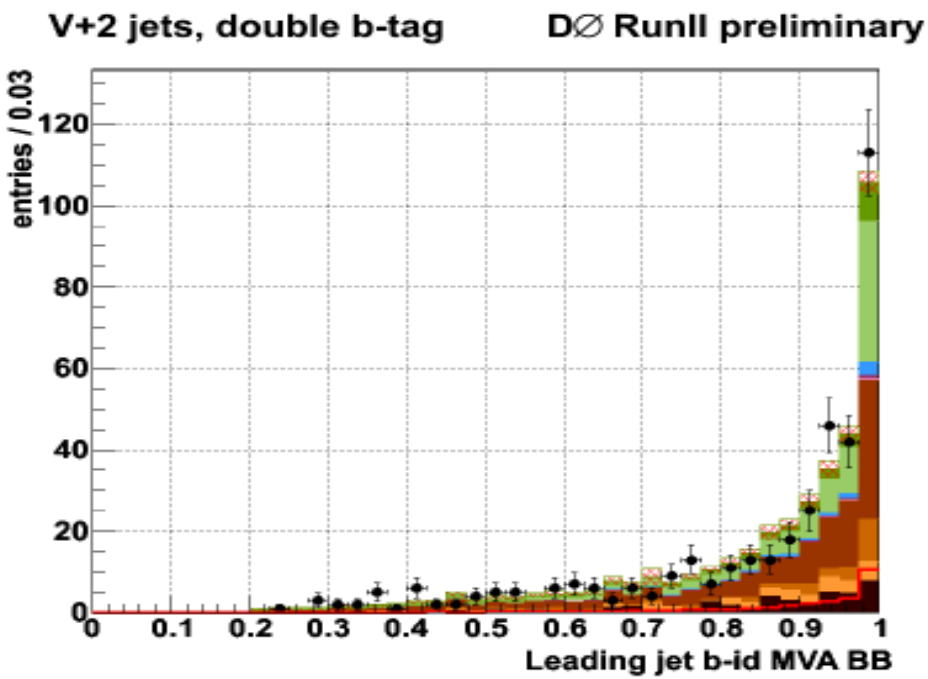


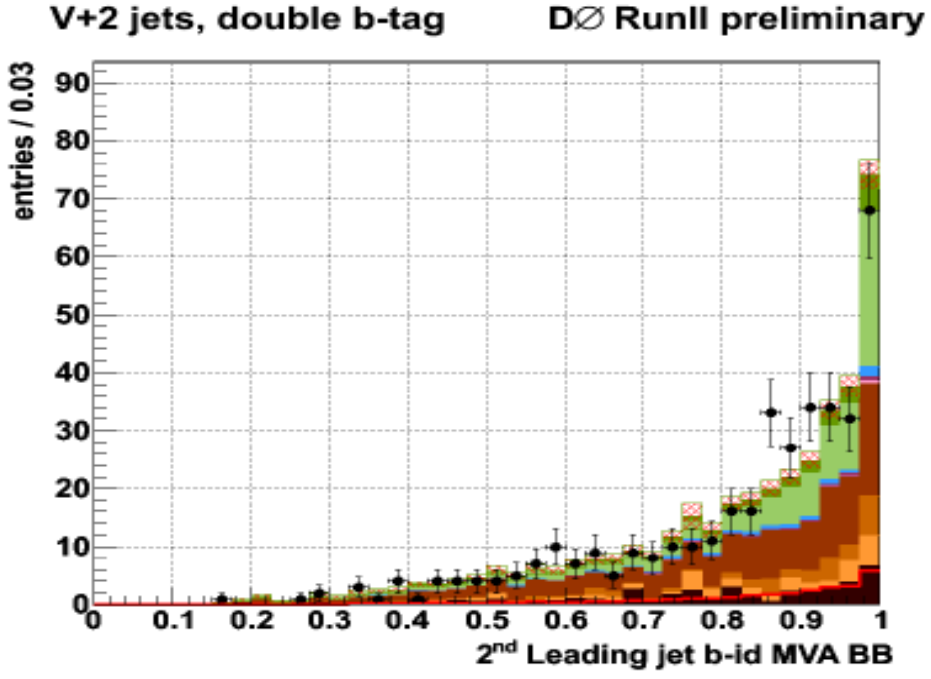


MVA BB in WH search



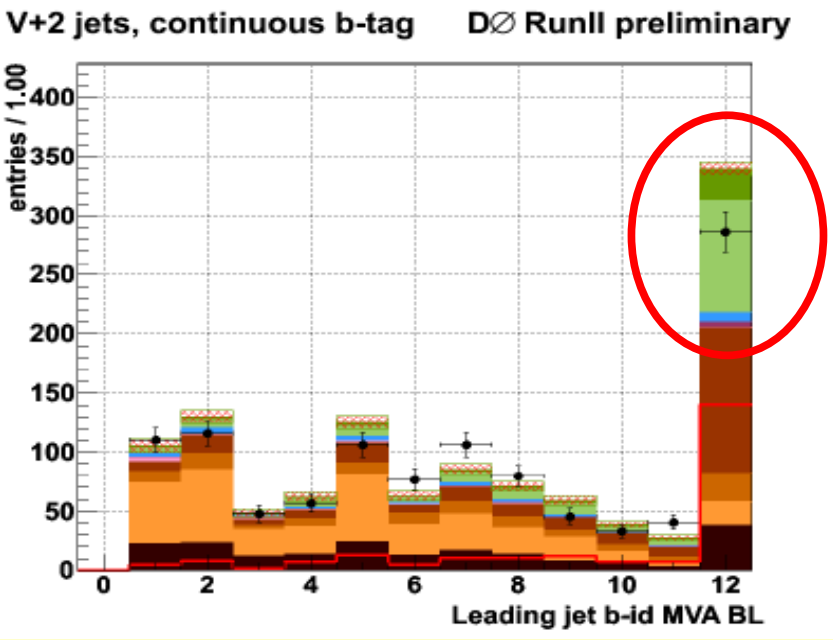


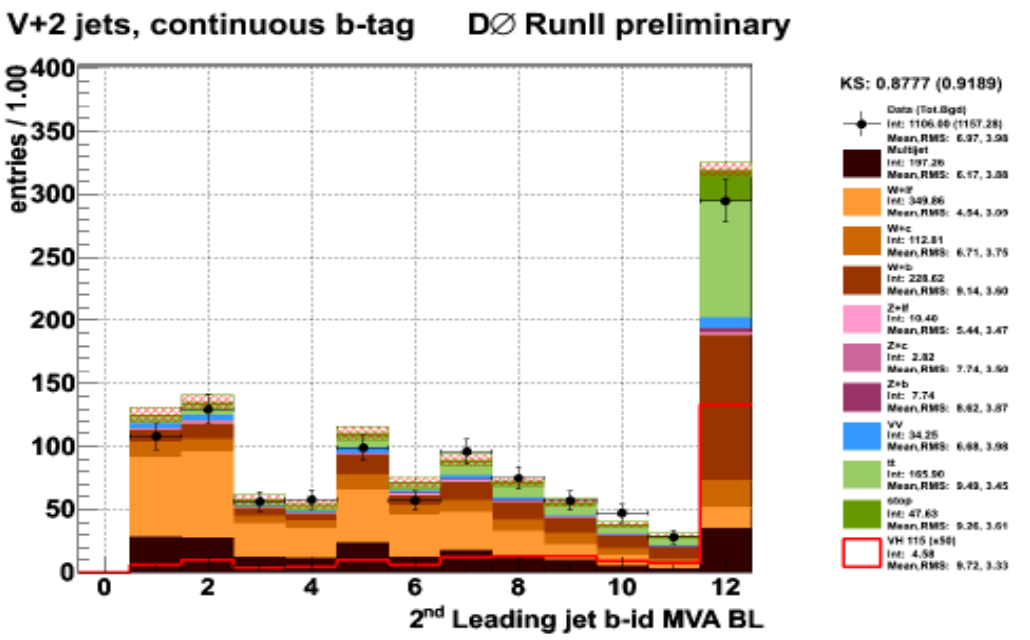


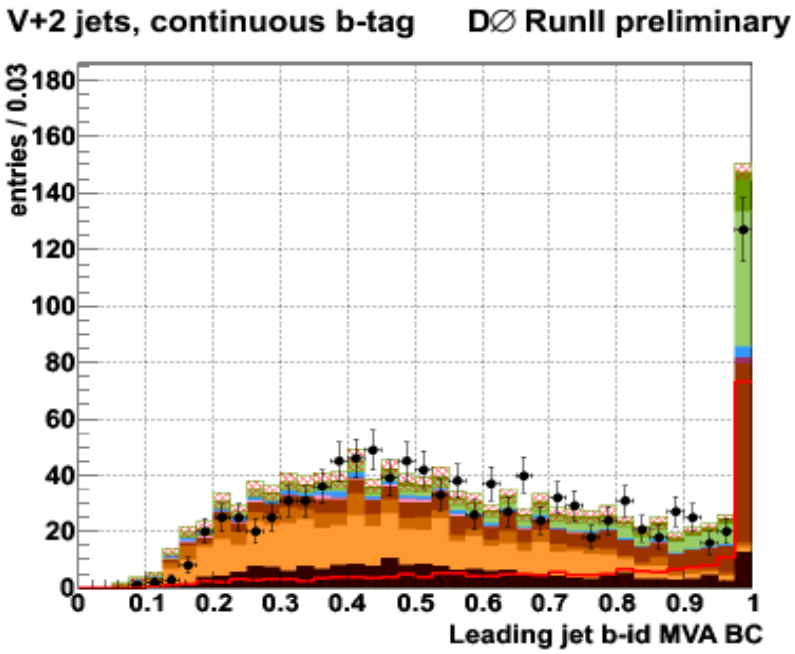


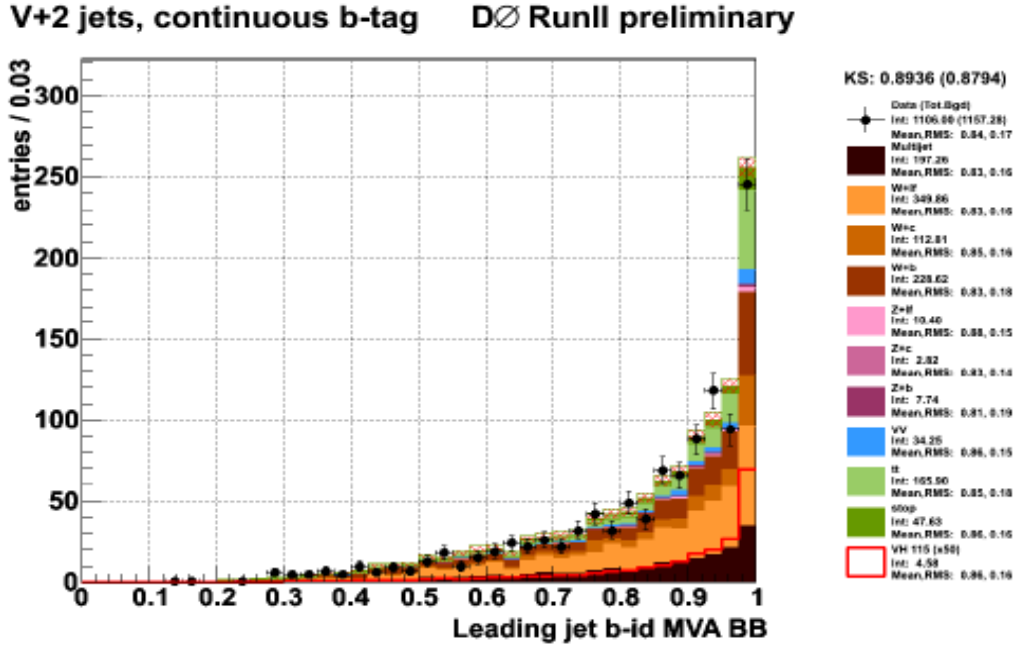
Sébo

Continuous tagging





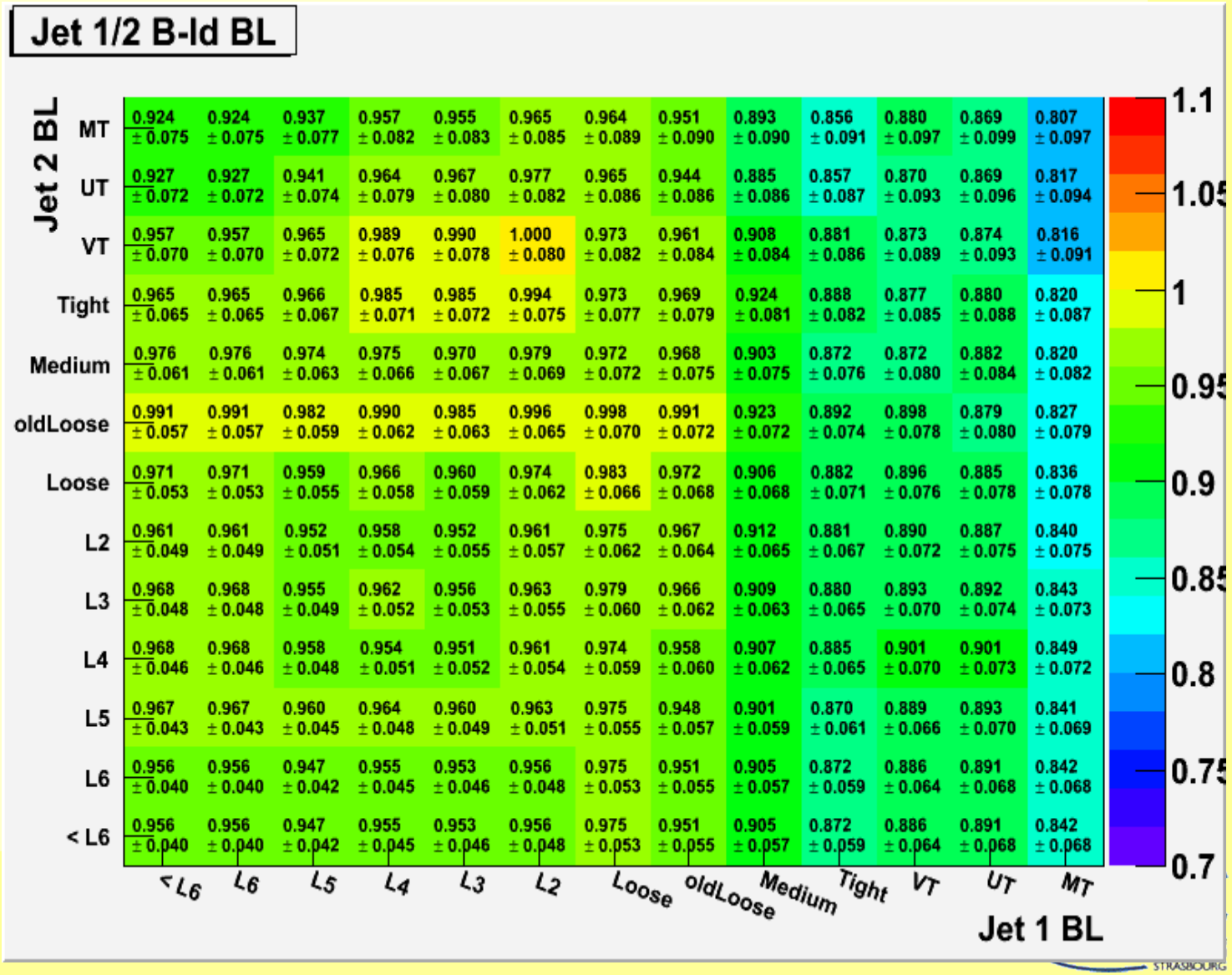




Cumulated Data/MC vs OP(1,2), 2 Jets

Consistency check: ratio of cumulated data/backgrounds # of events

- Expect ~1 but observed data deficit at high OP (same trend seen in ZH topologies)
- + asymmetric jet behaviour !

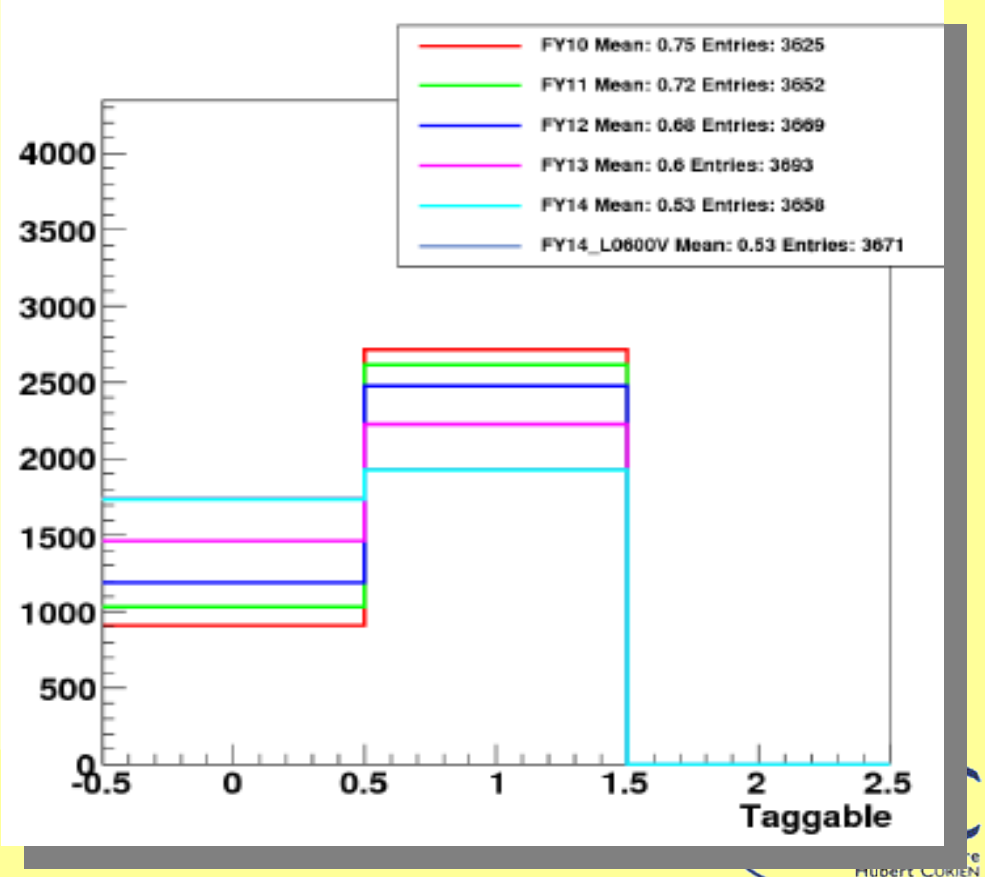


Beyond 2011 Task Force

Goal

- Estimate impact on b-id tools performance due to detector aging
- (see, e.g: http://www-d0.hef.kun.nl///fullAgenda.php?ida=a10804#2010-04-29)
- Huge impact due to less reco. Tracks
- Eff. Loss: vertex conf. (20%), taggability (10%)
- Total b-eff strongly degraded

Scenario	Single Tagged	Eff	Double Tagged	Eff
FY10	241	45%	66	25%
FY11	210	40%	46	17%
FY12	170	32%	29	11%
FY13	148	28%	20	8%
FY14	123	23%	17	6%
FY14 L0 600v	126	24%	14	5%



Conclusions / Plans

Certification

- p20 finally certified ! p17 to be updated soon
- + MVA BL

Improved techniques

- BC/BB taggers do have good agreement in both ST/DT events (for both NN and MVA BL) for both 2 and 3 jets events without additional dedicated corrections
- Continuous tagging seems ok in 1D but issues at high jet1/2 OP

Attend b-id meetings: fruitful discussions, sharing experience across analyses, ...

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Conclusions / Plans

Future

- Bjoern Penning is going to take over b-id convenership next summer
  - first time "non-expert": massive cleaning/documenting of b-id framework (almost 100% done)
  - Started to work on run2b3 data and new p21.15.04 MC
- Given manpower, several areas for new studies:
  - Fake track killer
  - Use negative tags, ...
  - Performances' luminosity dependences
- Beyond 2011 Task Force
  - B-id performance severely affected by aging of tracker

Back-up