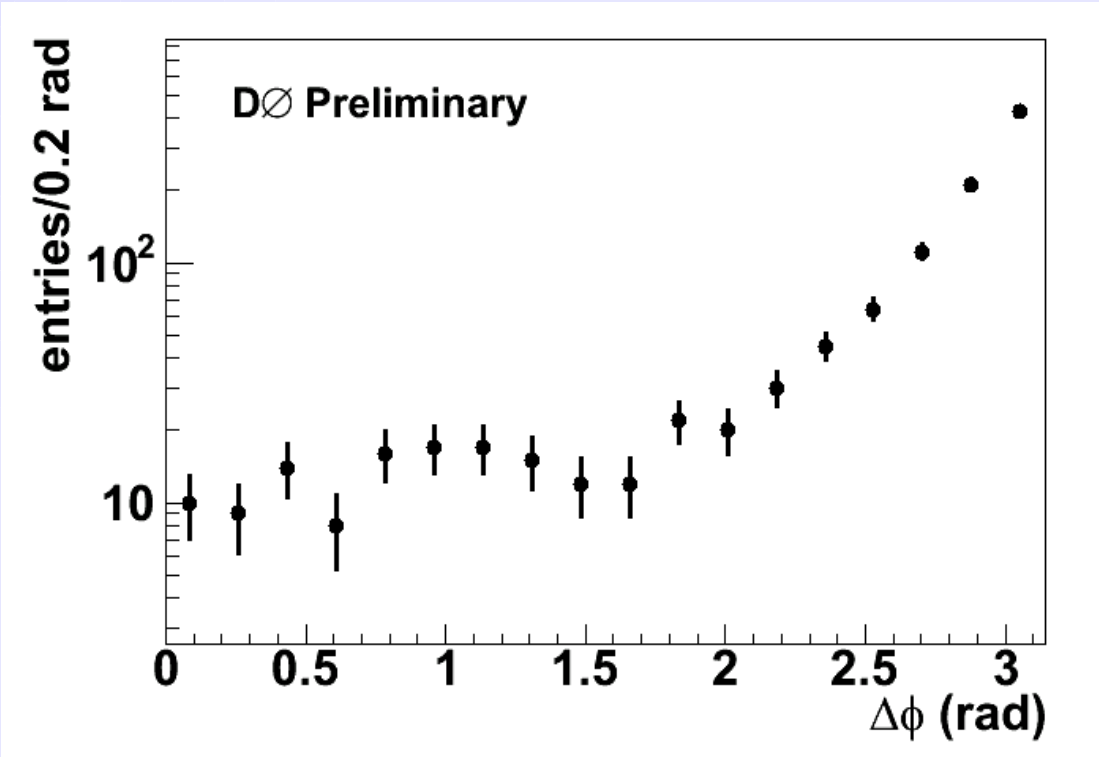
Angular correlations between *b* jets at DØ

- $\Delta\phi$ correlation between *b* jets sensitive to NLO contributions
- Compare data to Monte Carlo distributions



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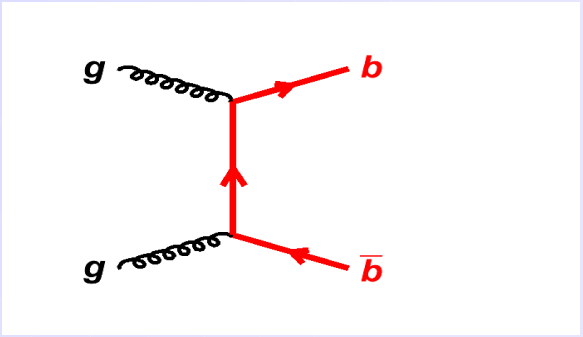
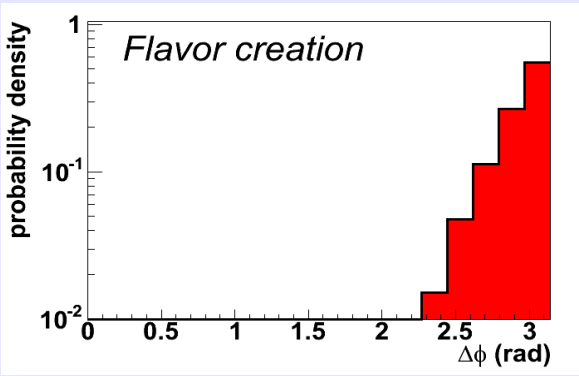
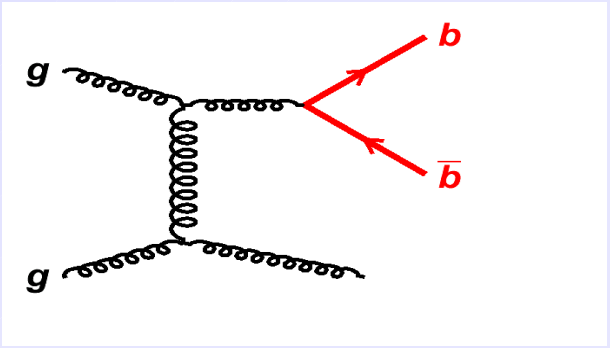
$b\bar{b}$ production processes

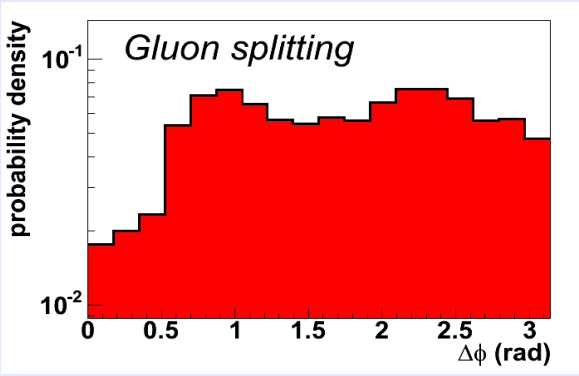
- Flavour creation
  LO, back-to-back in $\Delta\phi$
  PYTHIA: 0.47±0.05



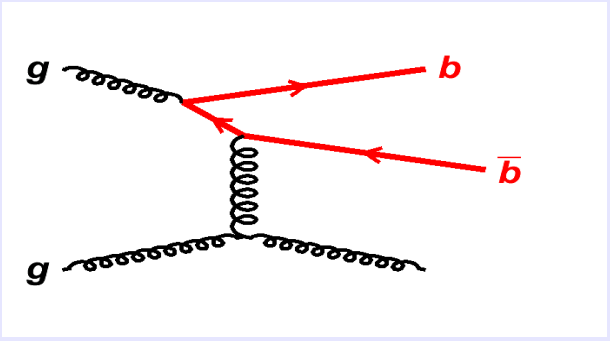


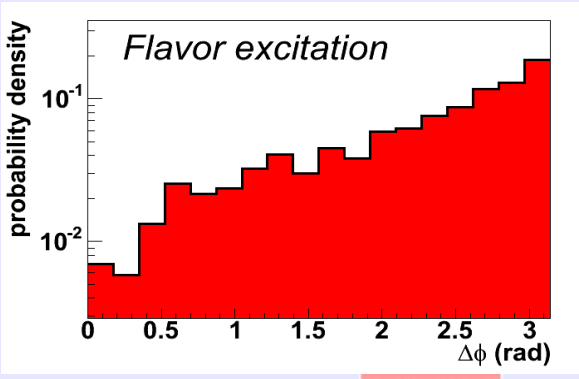
- Gluon splitting
  NLO, close in phase space
  PYTHIA: 0.43±0.05





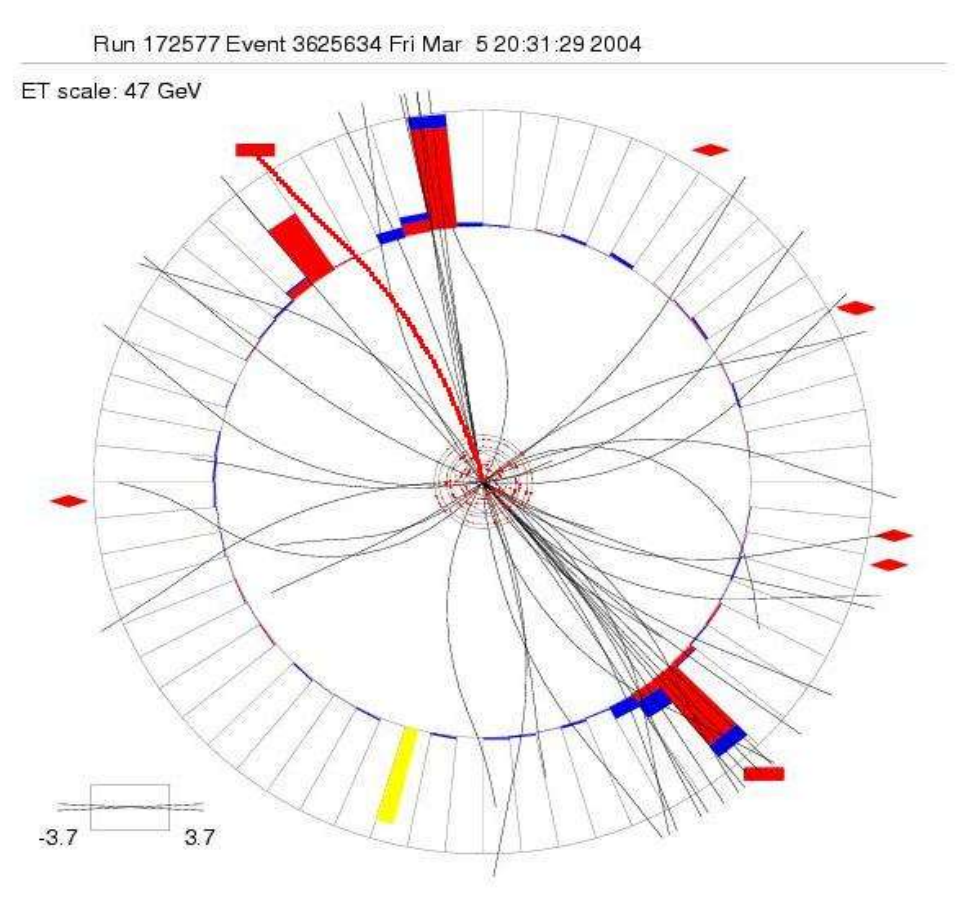
- Flavour excitation
  NLO, forward
  PYTHIA: 0.10±0.03





Data selection

- Using 8 pb^{-1} of 2002 data
- Select events with two or more jets E_T>15 GeV, |η|<1
- At least one jet with a muon within $\Delta R < 0.7$ p_T>6 GeV/*c*



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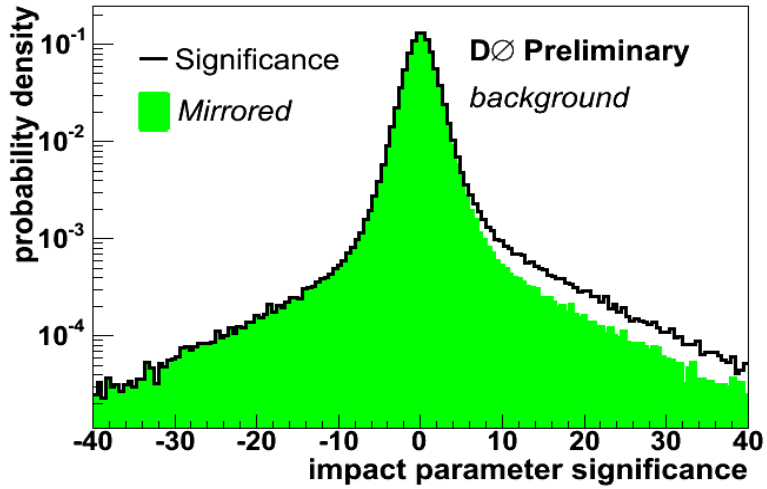
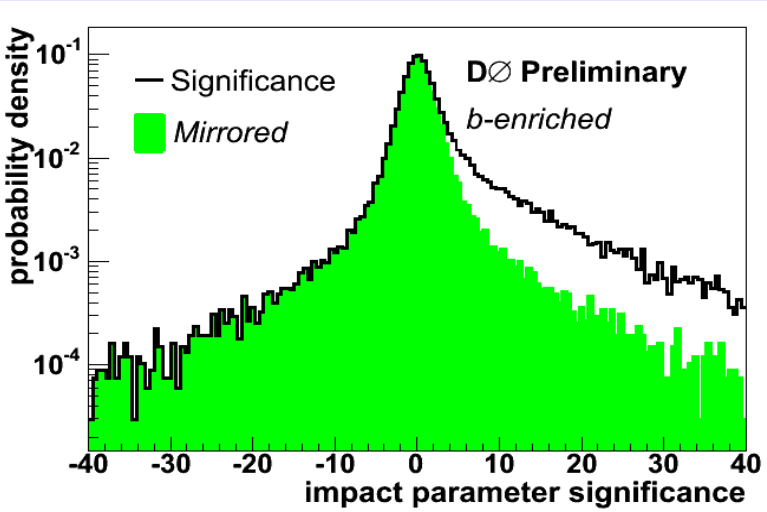
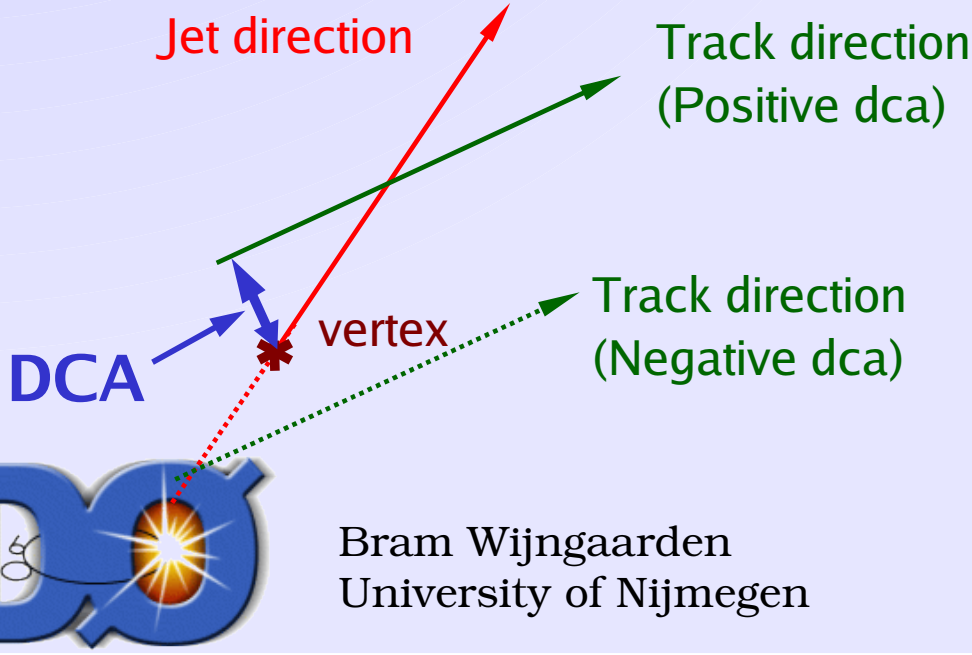
Tag non-muon jet with lifetime tag

- Use track-based tag
- Significance = DCA/σ_{DCA}
- Compute "zero lifetime" track probability from significance
- Cut on jet probability derived from track probabilities







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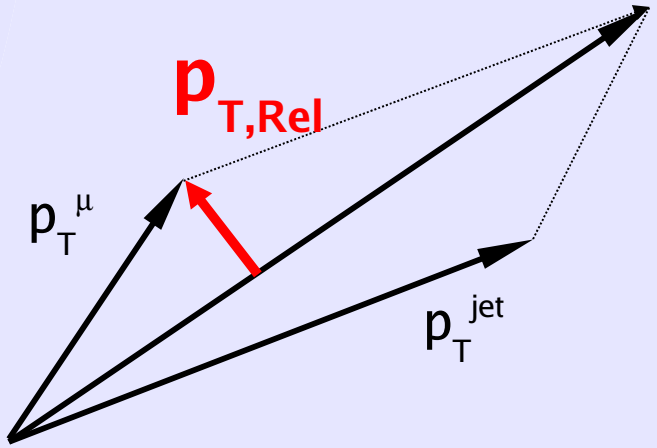
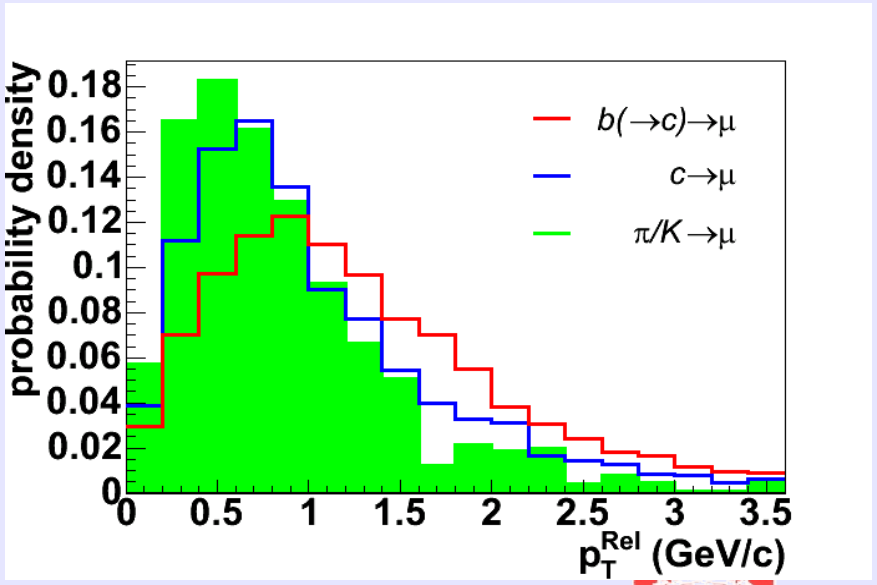
Strategy

- $p_{T,Rel}$ of muon with respect to jet gives means to fit background
- Simultaneous fit of $p_{T,Rel}$ and $\Delta\phi$ to extract all contributions





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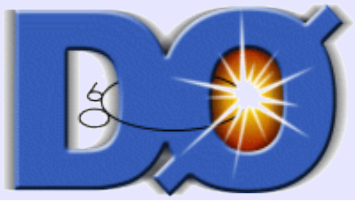
Fake tag background

- Possible configurations:

Muon jet	Away jet	Result
B	B	In fit
Non-b	Fake tag	In fit
B	Fake tag	Estimate in data
Non-b	B	In fit

- Non-*b*+*b* is seen as background by fit
- Correct signal fit result for *b*+fake



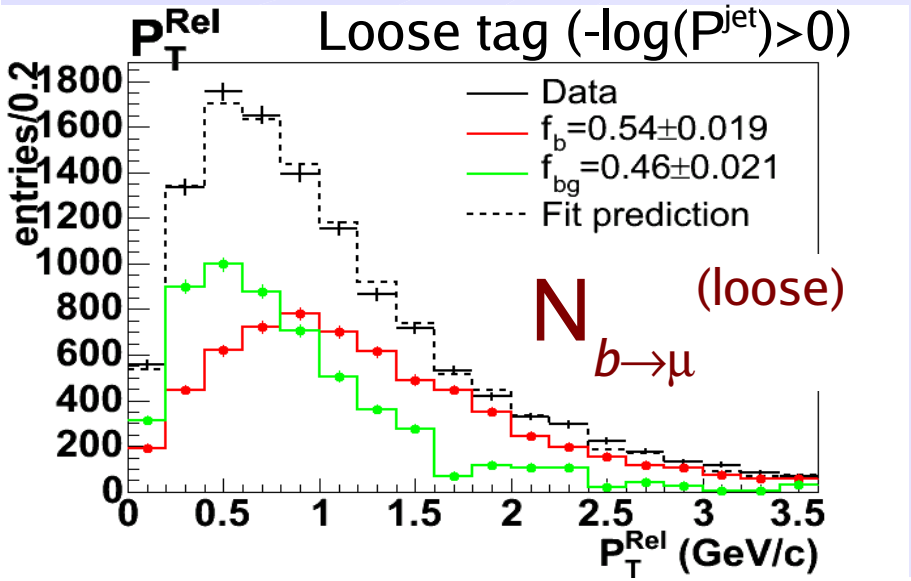
Matrix method

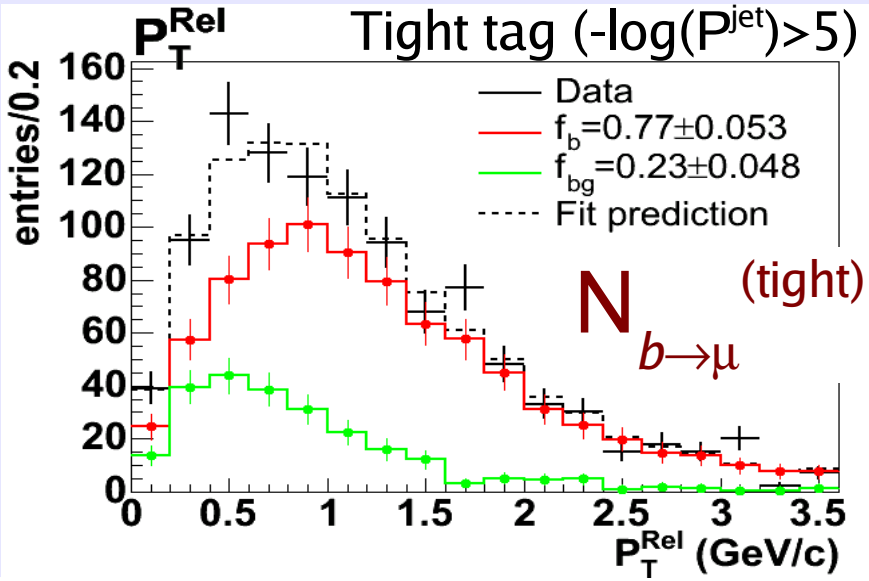
- Given known efficiencies, estimate *b*+fake using:

$$N_{b\to\mu}^{(loose)} = \varepsilon_b^{(loose)} \times N_{b\bar{b}} + \varepsilon_{fake}^{(loose)} \times N_{b+fake}$$

$$N_{b\to\mu}^{(tight)} = \varepsilon_b^{(tight)} \times N_{b\bar{b}} + \varepsilon_{fake}^{(tight)} \times N_{b+fake}$$

- $N_{b\to\mu}$ determined using $p_{T,Rel}$ fit
- *b*+fake fraction: 3.0±0.8%





2D Fit Result

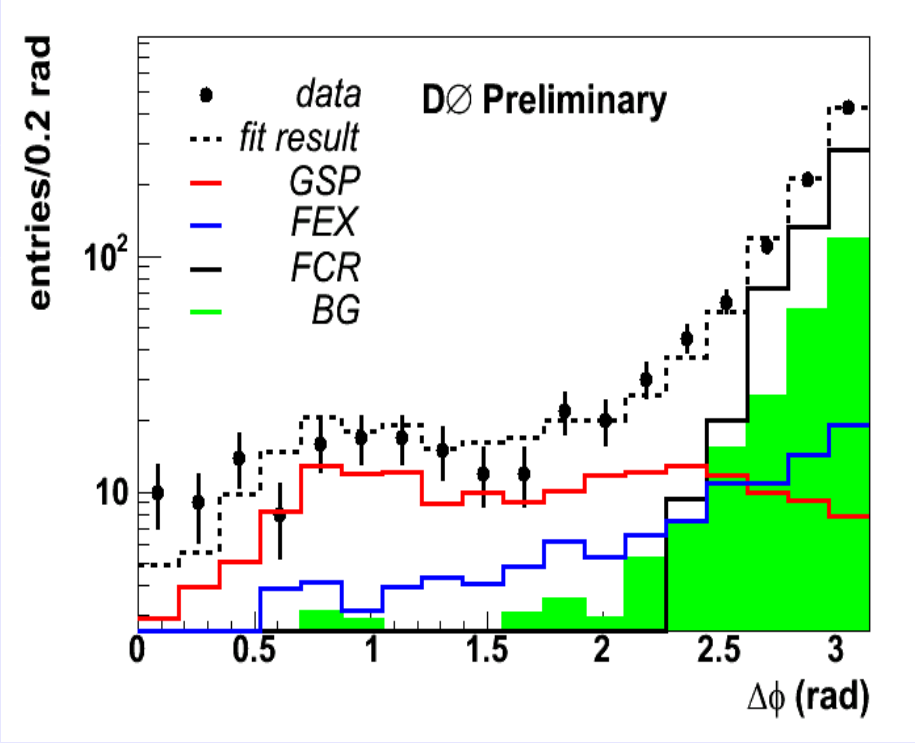
- Simultaneous fit of $p_{T,Rel}$ and $\Delta\phi$
- Fit results:

  Flavor creation: 47±4%

  Gluon splitting: 17±3%

  Flavor excitation: 11±4%

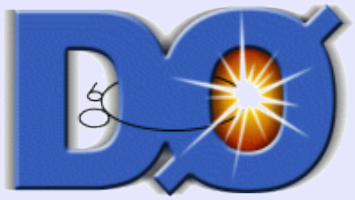
  Background: 25±4%



- Fit uncertainty does not include MC statistics

Systematics still under study

- Sources of systematic uncertainties:
  - *b*+fake correction
  - Charm versus light background template
  - Jet energy scale
  - Fit uncertainty due to Monte Carlo statistics
  - Generation of Monte Carlo distributions:
    - trigger efficiency
    - *b* tagging
    - Monte Carlo event modeling
    - *b* quark fragmentation functions

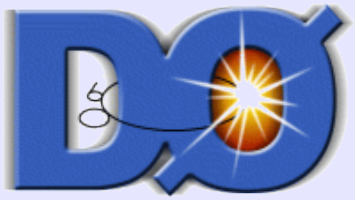


Results for $b\bar{b}$ production

- Relative contributions in events with 2 separate *b* jets (not corrected for acceptance!):

	PYTHIA	Data
Flavor creation	0.47 ± 0.05	0.63 ± 0.04 (stat)
Gluon splitting	0.43 ± 0.05	0.23 ± 0.04 (stat)
Flavor excitation	0.10 ± 0.03	0.14 ± 0.05 (stat)

- Statistical uncertainty is for data statistics only
- PYTHIA 6.158 (default settings)



Conclusions and outlook

- No reason to doubt PYTHIA, as systematic uncertainties still under study
- Now have ~400 pb^{-1} on tape with improved reconstruction software
- Full analysis will reduce statistical *and* systematic uncertainties to very low levels, and clear understanding of $b\bar{b}$ production and event generation