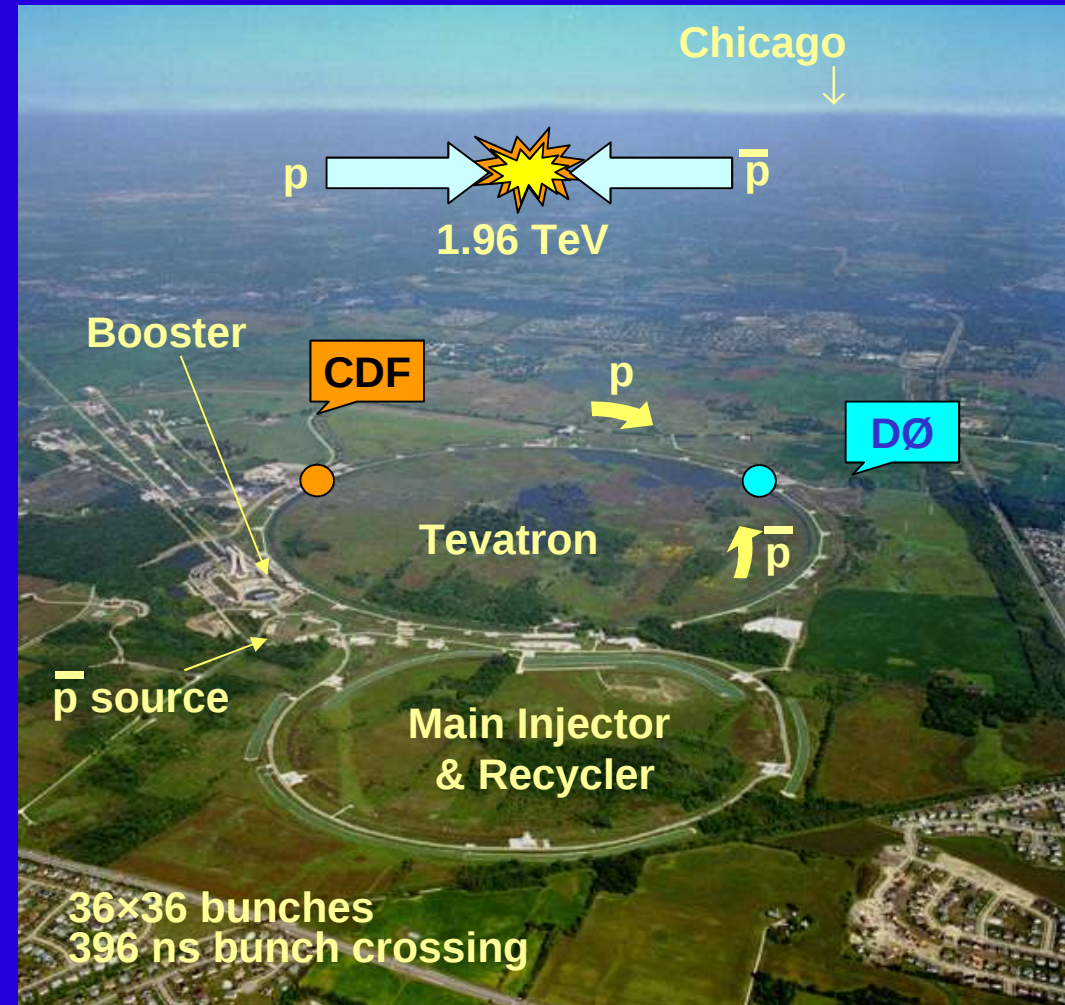


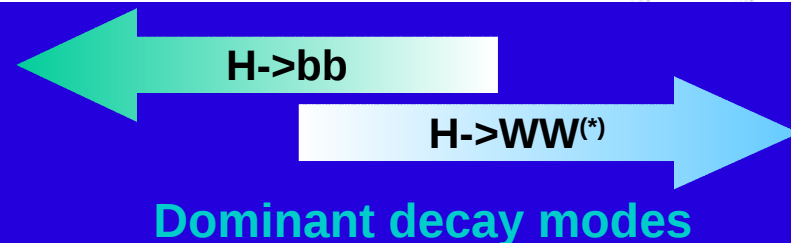
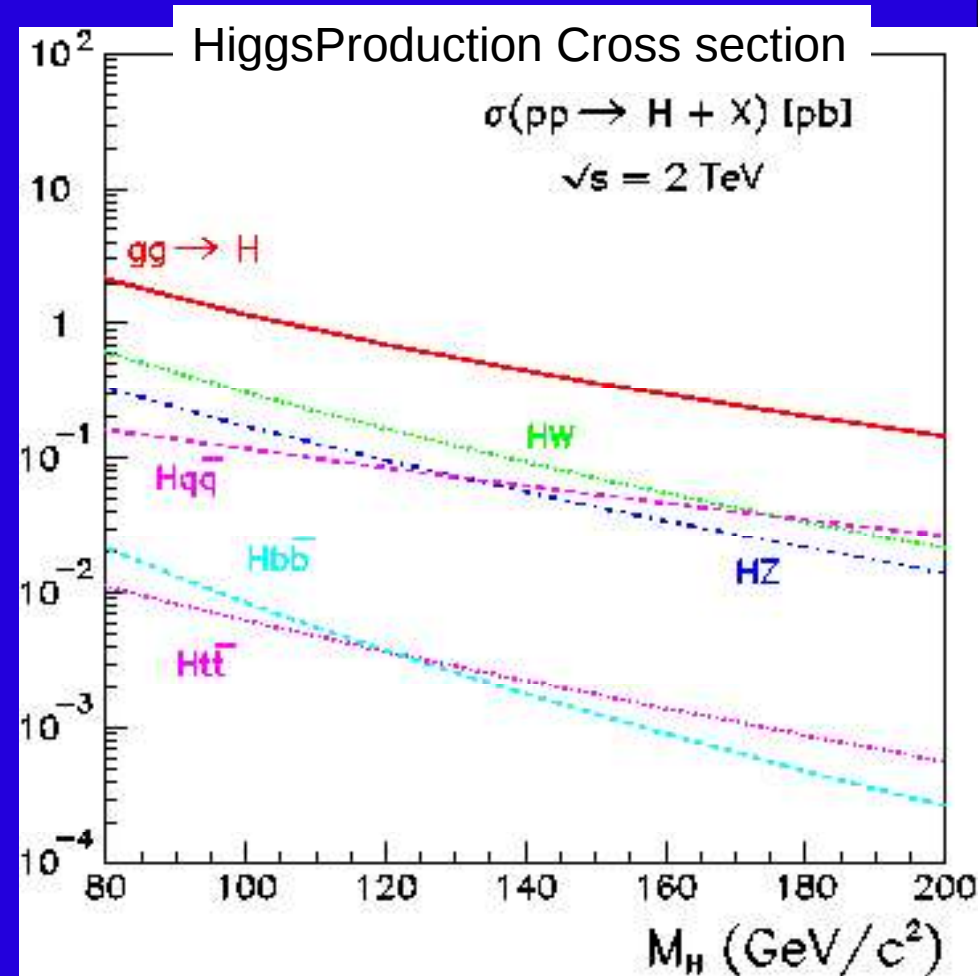
Measurement of the Wbb Production Cross Section and Search for the Higgs in WH Associated Production at D0

- Standard Model Higgs
- b -tagging and event selection
- Limits on Wbb production
- Limits on WH production
- Summary



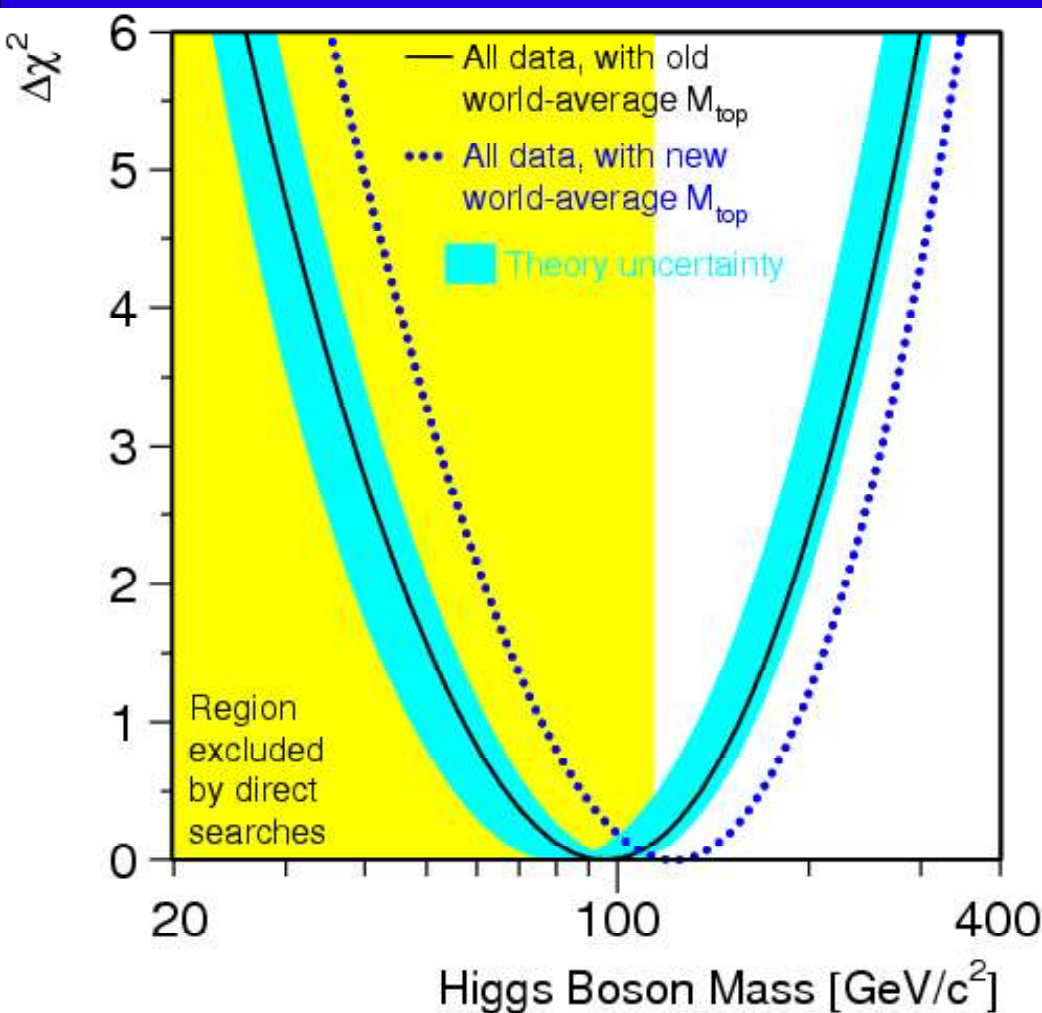
Standard Model Higgs

- Production cross sections are small
0.1 - 1 pb depending on m_H
- $M_H < 135 \text{ GeV}$
 $gg \rightarrow H \rightarrow b\bar{b}$ dominated by QCD background
- searches can be performed in
 W/Z associated production
to handle backgrounds
- $M_H > 135 \text{ GeV}$
 $gg \rightarrow H \rightarrow WW^{(*)} \rightarrow l^+l^-$ final states
can be explored at higher masses



New EW constraint

Constraint on m_H in the Standard Model



Old Top mass combination

$$M_{top} = 174.3 \pm 5.1 \text{ GeV}$$

$$\log M_H = 1.98^{+0.21}_{-0.22}$$

$$M_H = 96^{+60}_{-38} \text{ GeV}$$

$$\text{or } < 219 \text{ GeV (95\% CL)}$$

New Top mass combination using new DØ run I measurement

$$M_{top} = 178.0 \pm 4.3 \text{ GeV}$$

$$\log M_H = 2.07^{+0.20}_{-0.21}$$

$$M_H = 117^{+67}_{-45} \text{ GeV}$$

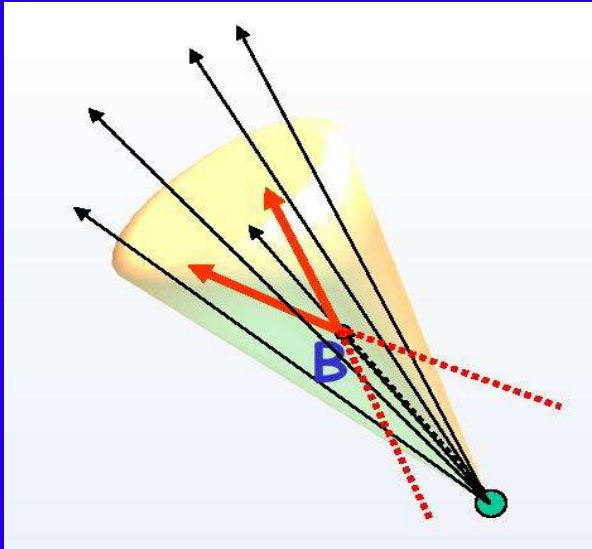
$$\text{or } < 251 \text{ GeV (95\% CL)}$$

(Procedure as in hep-ex/0312023!)

Direct searches at LEP2:
 $m_H > 114.4 \text{ GeV @95\%CL}$

b-jet tagging

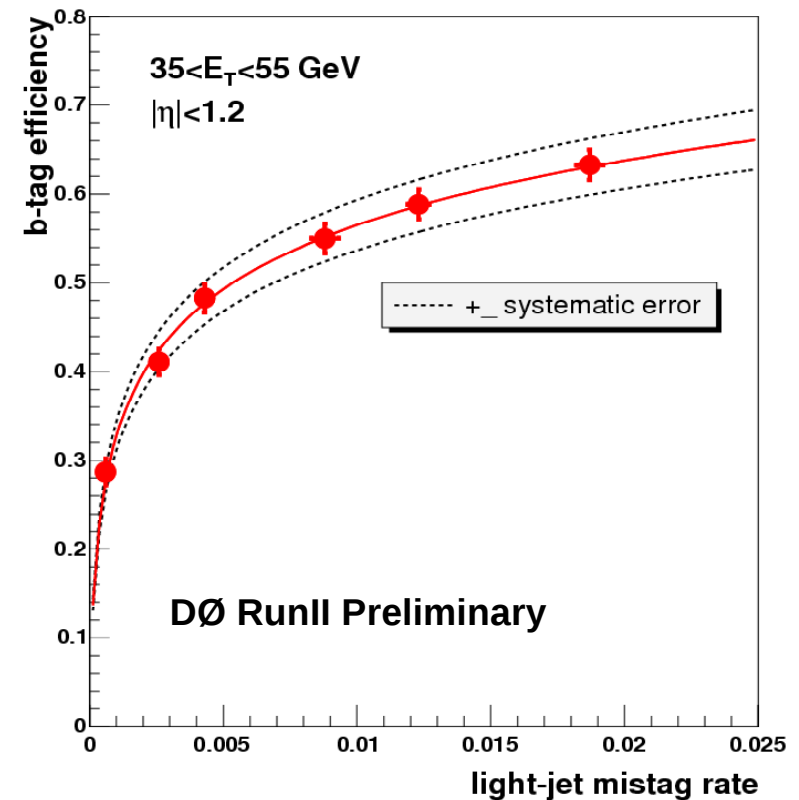
- Essential for $H \rightarrow b\bar{b}$ searches



- Can make use of the track impact parameter (IP) measurements or secondary vertex (SVX) reconstruction

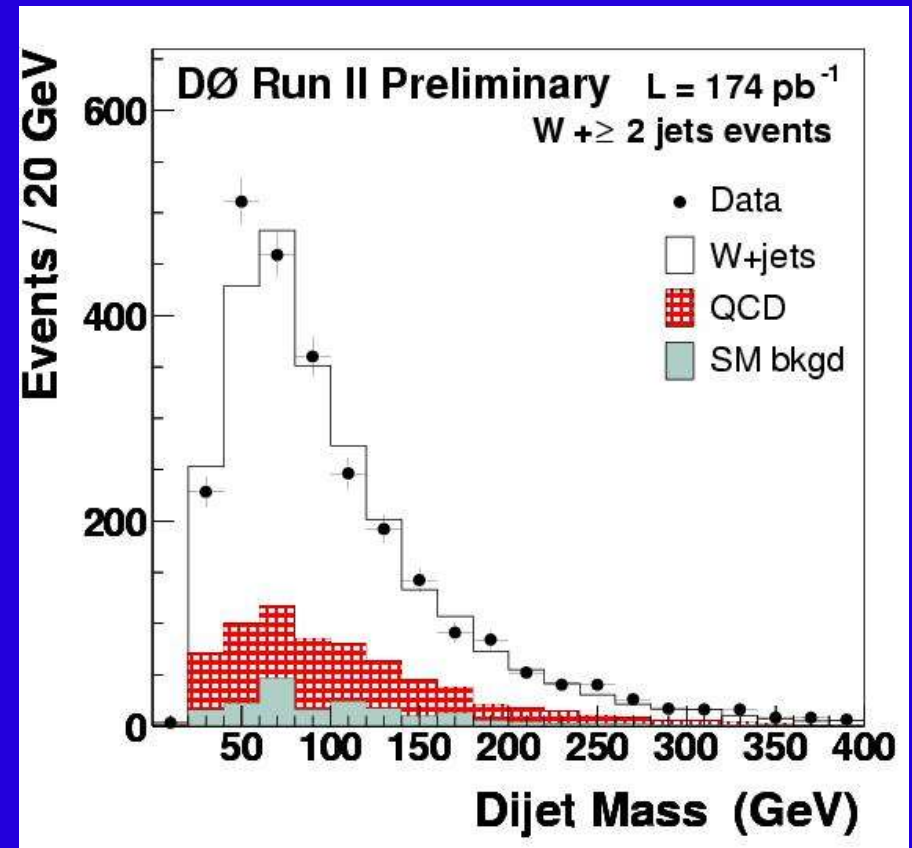
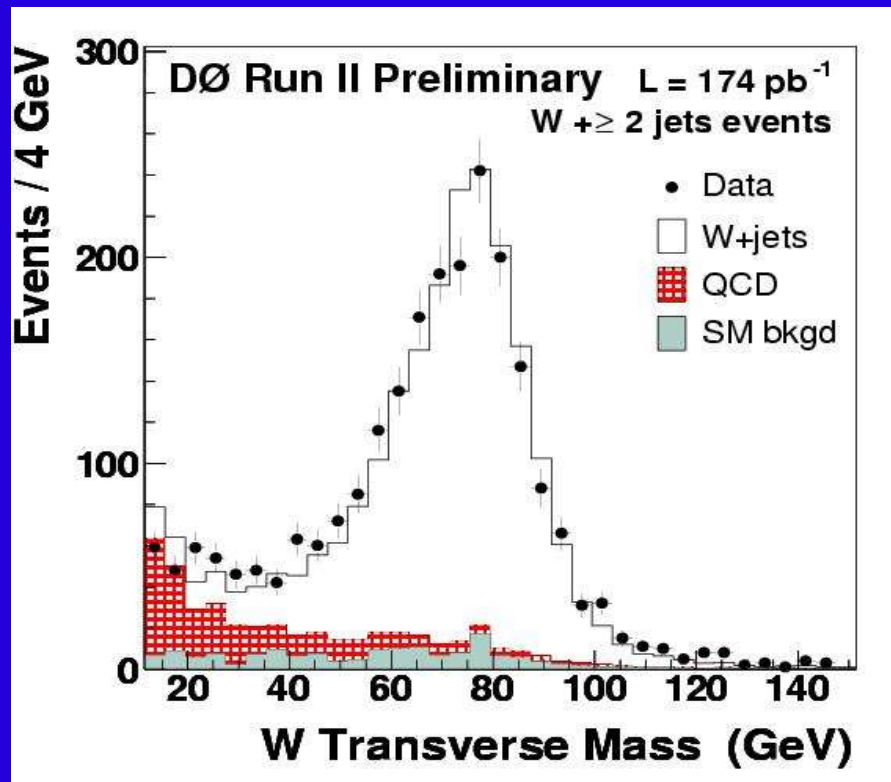
DØ in Run II is able to b-tag
up to $|\eta| < 2.5$

**b-tagging efficiency vs light
quark mis-tag rate**



DØ: $W(->e\nu)b\bar{b}$ production (1)

- Motivation:
 - Background to WH production
 - Event selection
 - Central isolated electron, $p_T(e) > 20$ GeV
 - Missing $E_T > 25$ GeV
 - $\geq$ two jets: $E_T(\text{jet}) > 20$ GeV, $|\eta| < 2.5$
- 2587 events in $L_{\text{int}} = 174 \text{ pb}^{-1}$ of data



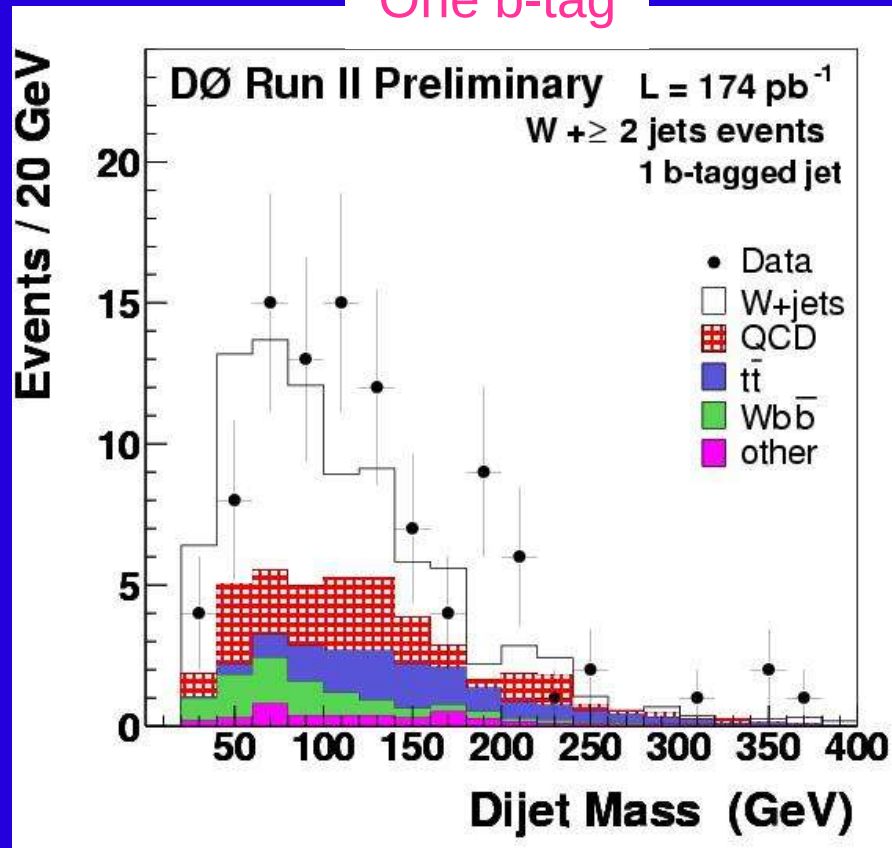
- Simulations with Alpgen plus Pythia through detailed detector response
- Cross sections normalized to MCFM NLO calculations

Good understanding of data

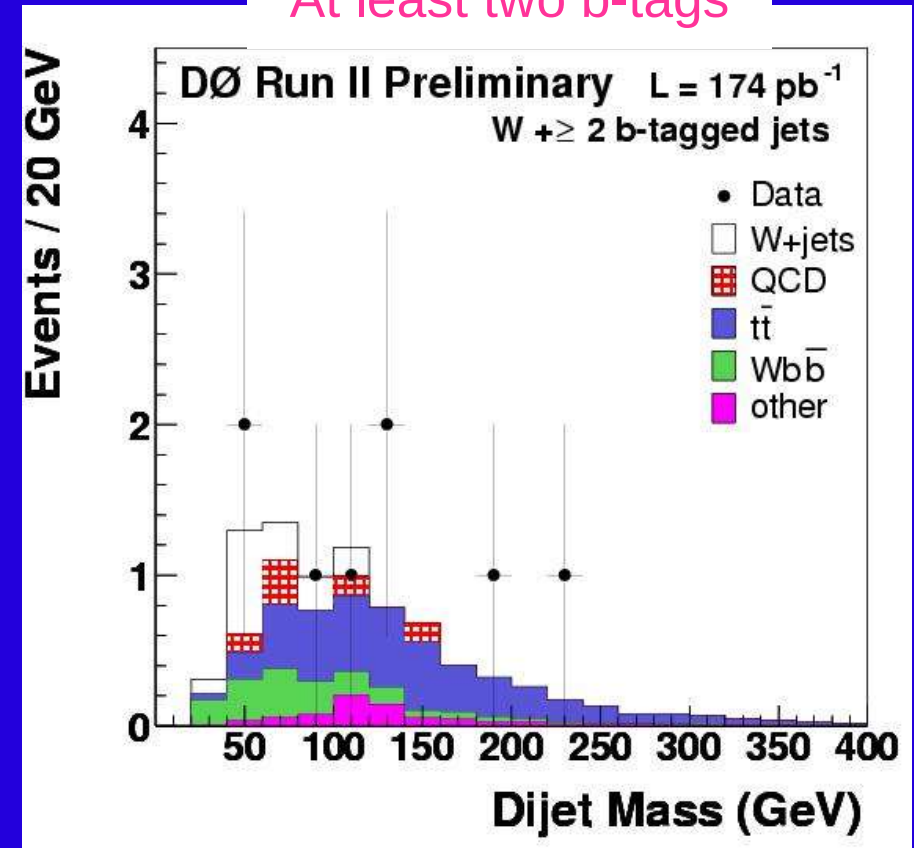
DØ: $W(->e\nu)b\bar{b}$ production (2)

Require jets to be b-tagged, consistent result with different b-tagging algorithms

One b-tag



At least two b-tags

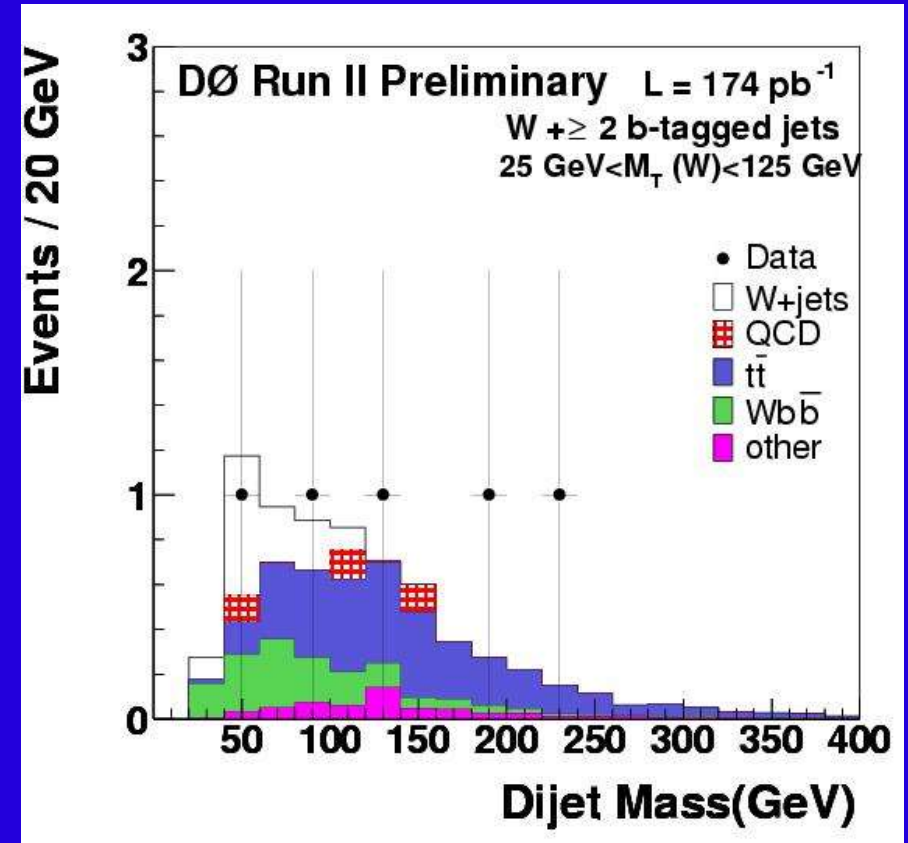
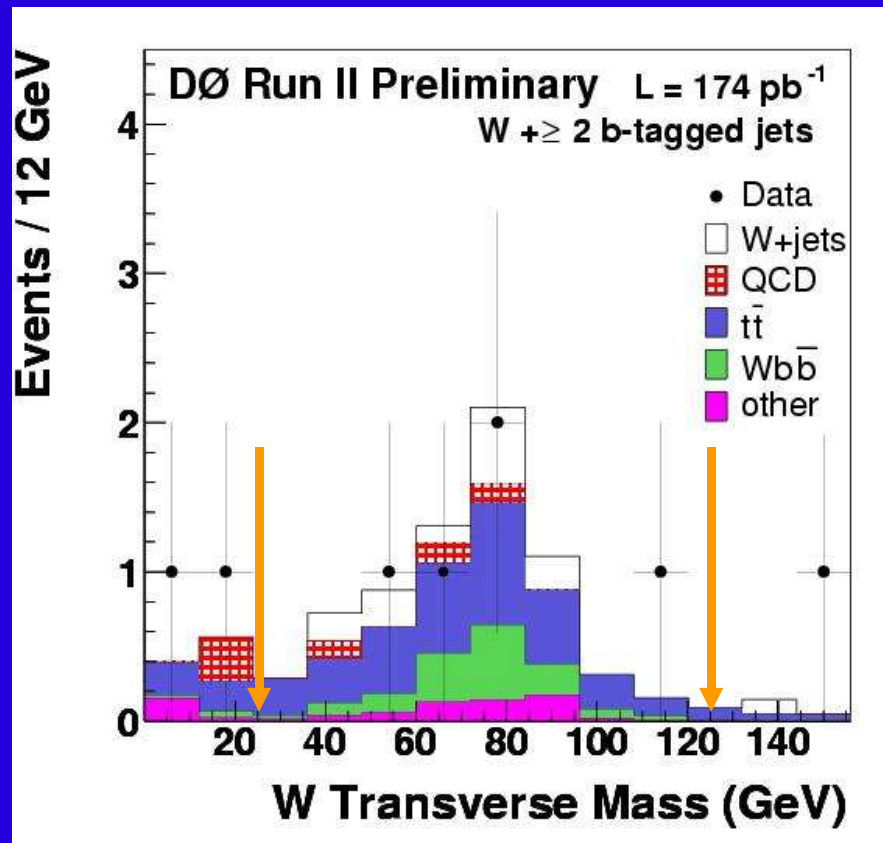


- Observe 8, expect 8.3 ± 2.2
- Background dominated by top events

Good agreement between data and MC in both cases

DØ: $W(->e\nu)b\bar{b}$ production (3)

- W Transverse mass of 2 Tagged events, keep event with $25 \text{ GeV} < M_T(W) < 125 \text{ GeV}$



We observe 5 events, expect 6.9 ± 1.8 events

Set limits on production of $\sigma(Wb\bar{b}) < 20.3 \text{ pb}$ at 95% CL

DØ: $W(->e\nu)b\bar{b}$ production (4)

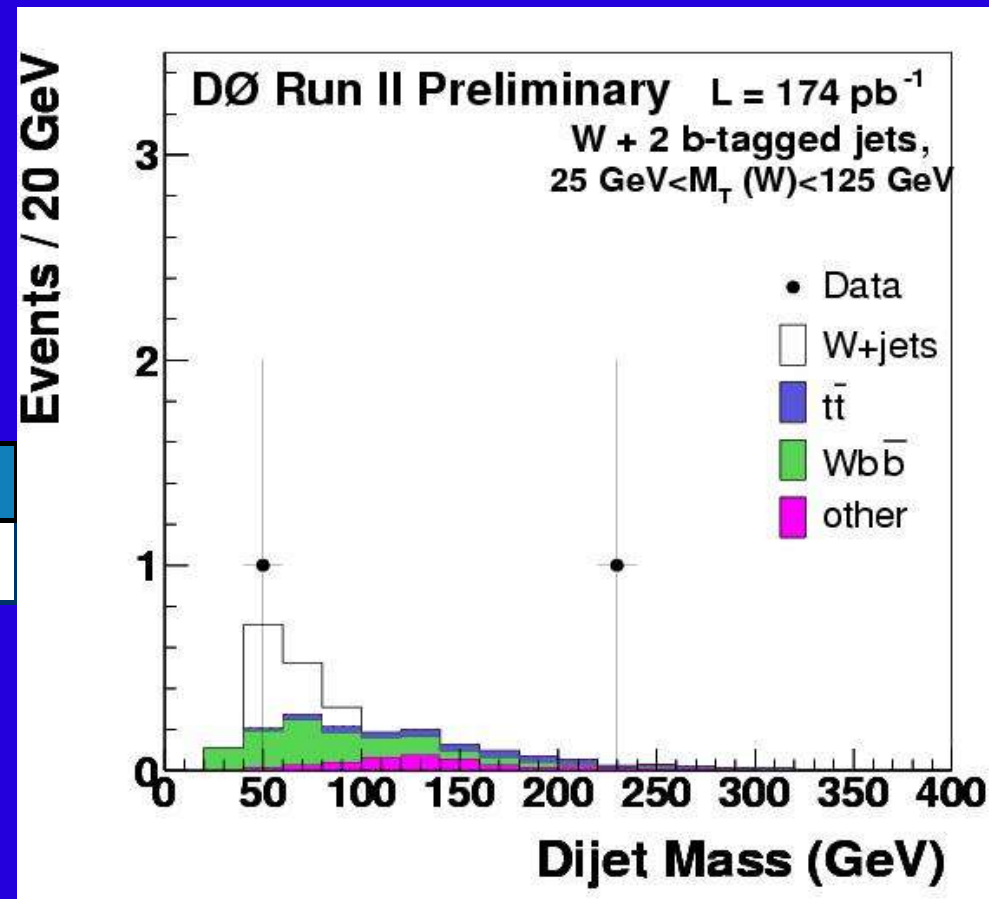
- Optimize $Wb\bar{b}$ signal by suppressing the top production by requiring **exactly two jets**
- Observe **2** events, expect **2.5 ± 0.5**

Sample composition:

$Wb\bar{b}$	$Wc(c)$	Wjj	$t\bar{t}+t$	Other
1.4 ± 0.4	0.3 ± 0.1	0.1 ± 0.03	0.6 ± 0.2	0.1 ± 0.03

- Requiring all jets to be b-tagged by all **3 b-tagging algorithms** of DØ to reduce the background

- Observe 2 evts., expect 0.3 ± 0.1 (Bckd) + 0.6 ± 0.2 $Wb\bar{b}$ (Signal)



Probability(B)=0.04 ; Probability(S+B)=0.23

Standard Model without $Wb\bar{b}$ disfavored at 2σ level

DØ: $W(->ev)$ $H(->b\bar{b})$ production

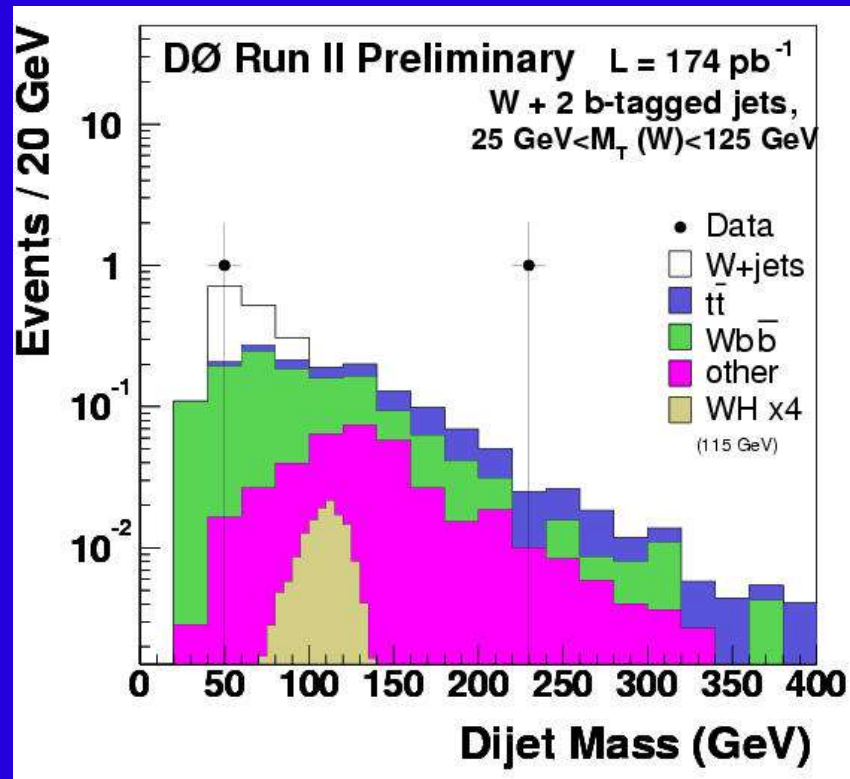
Observe **2** events, expect **2.5 ± 0.5**

In mass window [85GeV-135GeV] we observe:

0 events

0.54 ± 0.14 expect background

0.03 ± 0.01 WH



Systematics studies:

Source	Uncertainty(%)
Jet energy scale	14
Jet ID	7
b-tagging	11
Trigger & e ID	5
EM scale	5
MC simulations	15
Total	26

Set limits on production of
 $\sigma(WH) \times B(H \rightarrow b\bar{b}) < 12.4 \text{ pb}$
for $M_H = 115 \text{ GeV}$ at 95% C.L.

Summary

- Events for Wbb and WH search have been selected in $L_{\text{int}} = 174 \text{ pb}^{-1}$
- Data and simulation well understood
- Limits are:
 - $\sigma(\text{Wbb}) < 20.3 \text{ pb}$ at 95% CL
 - $\sigma(\text{WH}) < 12.4 \text{ pb}$ at 95% CL for $m_{\text{H}} = 115 \text{ GeV}$