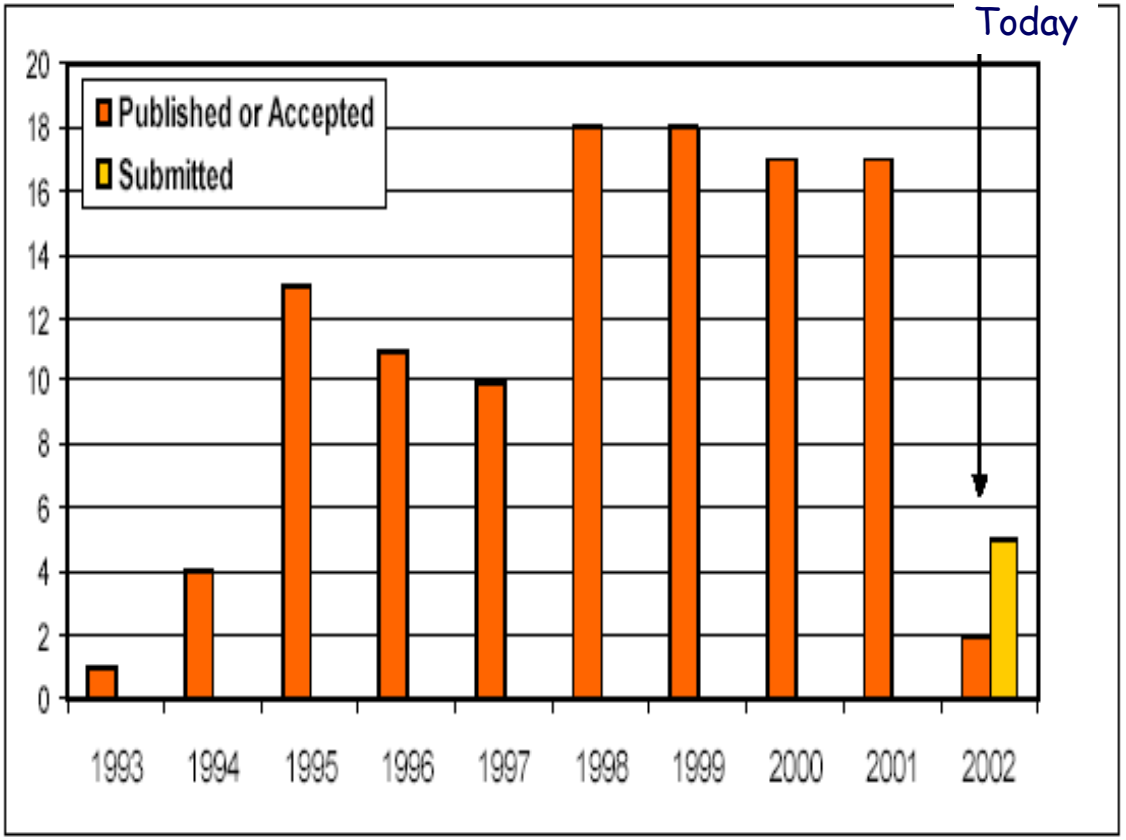
Run 1 Results

Publications & Graduations

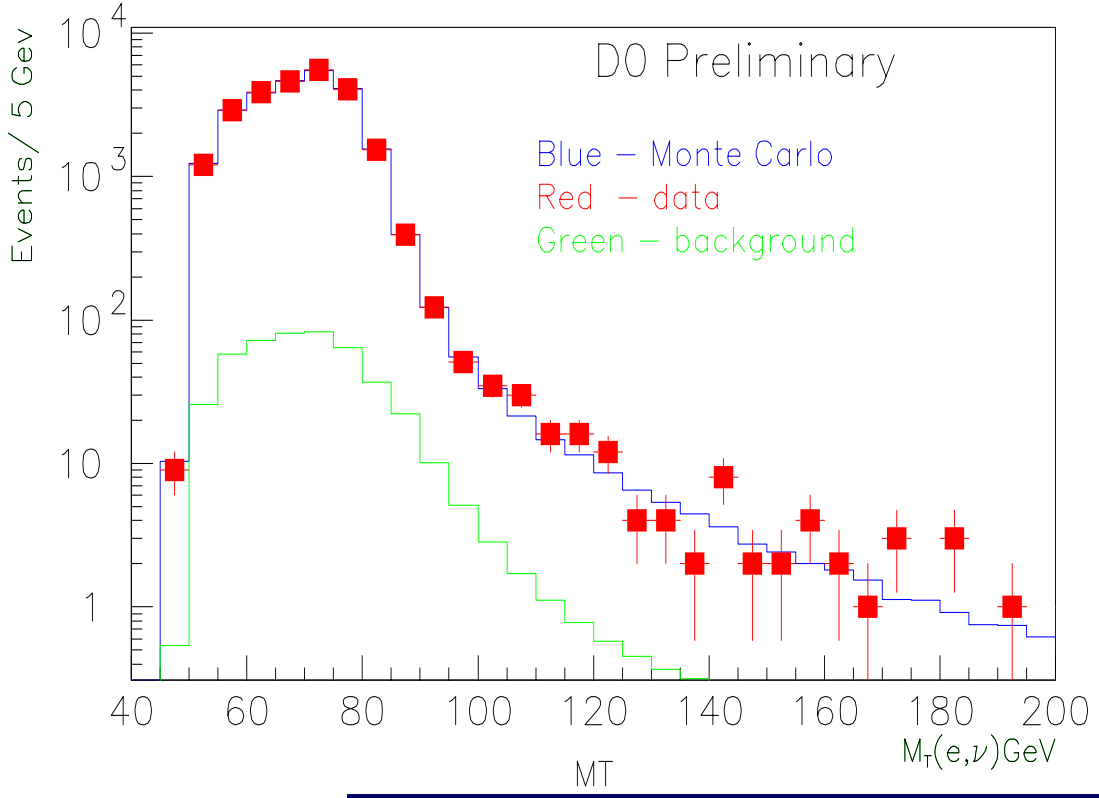
DØ Run 1 Publications



Since the first DØ thesis was completed in December 1987, 139 students from 43 universities in 8 countries on 4 continents have received doctorates using DØ data. Even as Run 2 work begins, analysis of the Run 1 data continues, with several more students expected to earn degrees this spring.

Recent Run 1 Results

Direct Measurement of W Width



The tail region of $M_T(W)$ is sensitive to $\Gamma(W)$ and can be used to extract $\Gamma(W)$.

- Avoids using theoretical inputs.
- Explores the region above W pole where new physics could appear

$\Gamma(W) = 2.231\ ^{+0.145}_{-0.138}$ (stat) ± 0.092 (syst) GeV

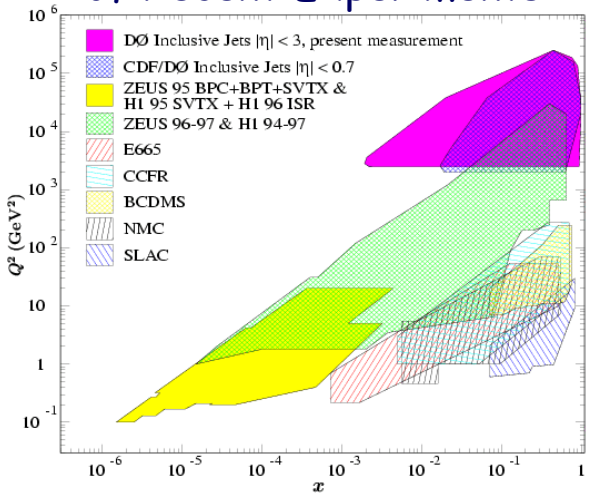
SM prediction: $\Gamma(W)=2.0937 \pm 0.0025$ GeV

Recent Run 1 Results

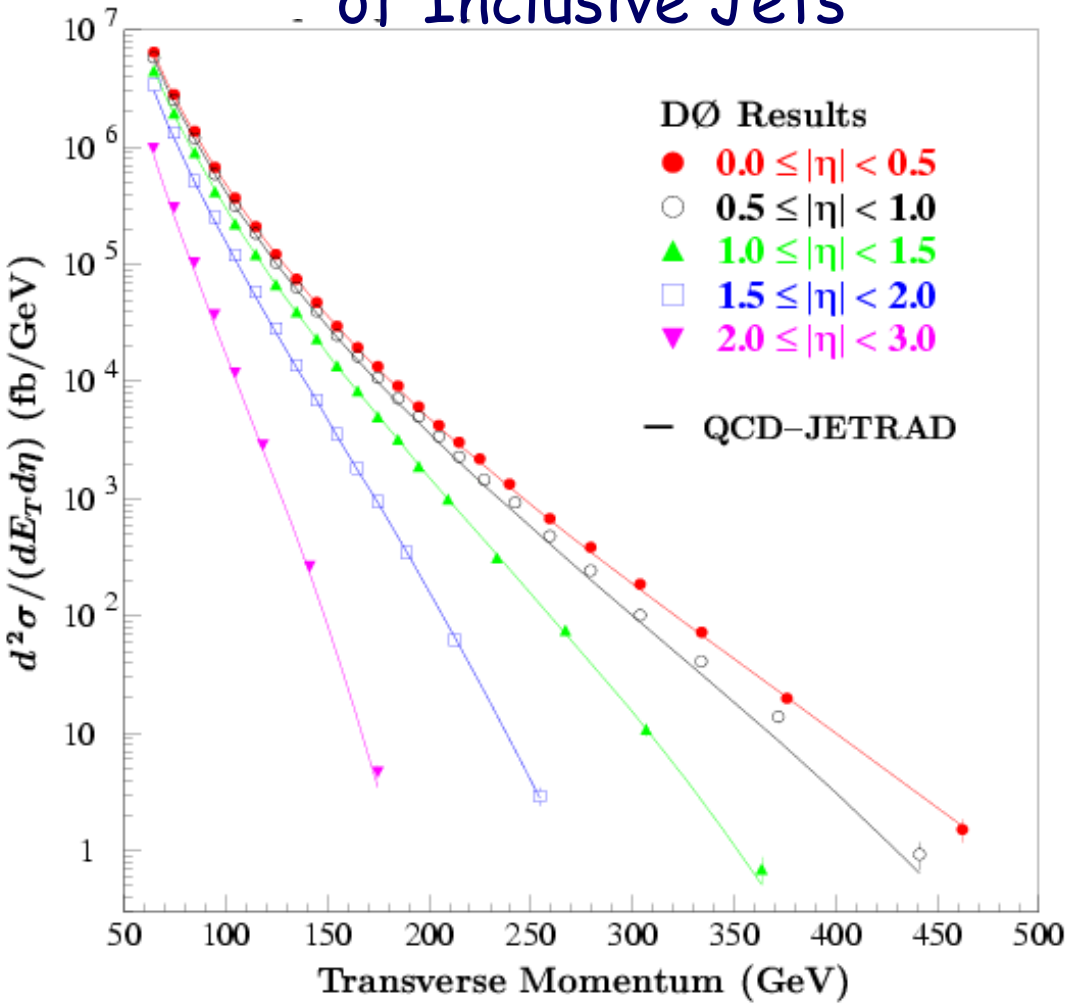
Rapidity Dependence of Jets

The measurement of the rapidity dependence of jet momenta has a strong influence on determination of parton distribution functions that are necessary ingredients for most Tevatron physics processes.

Kinematic Range of Recent Experiments



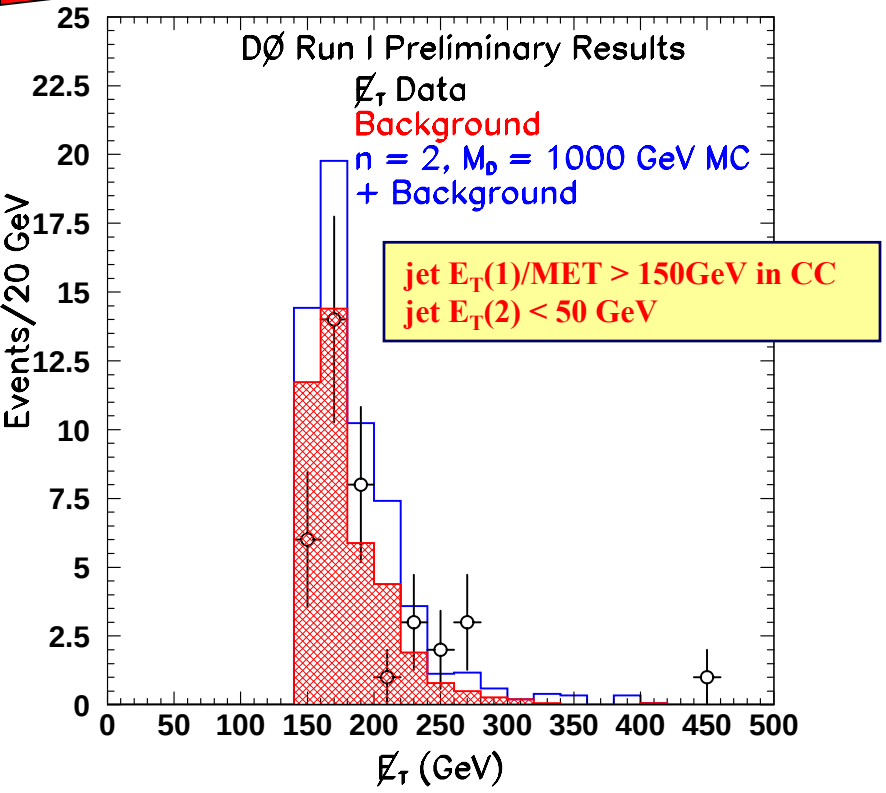
Rapidity Dependence of Inclusive Jets



Recent Run 1 Results

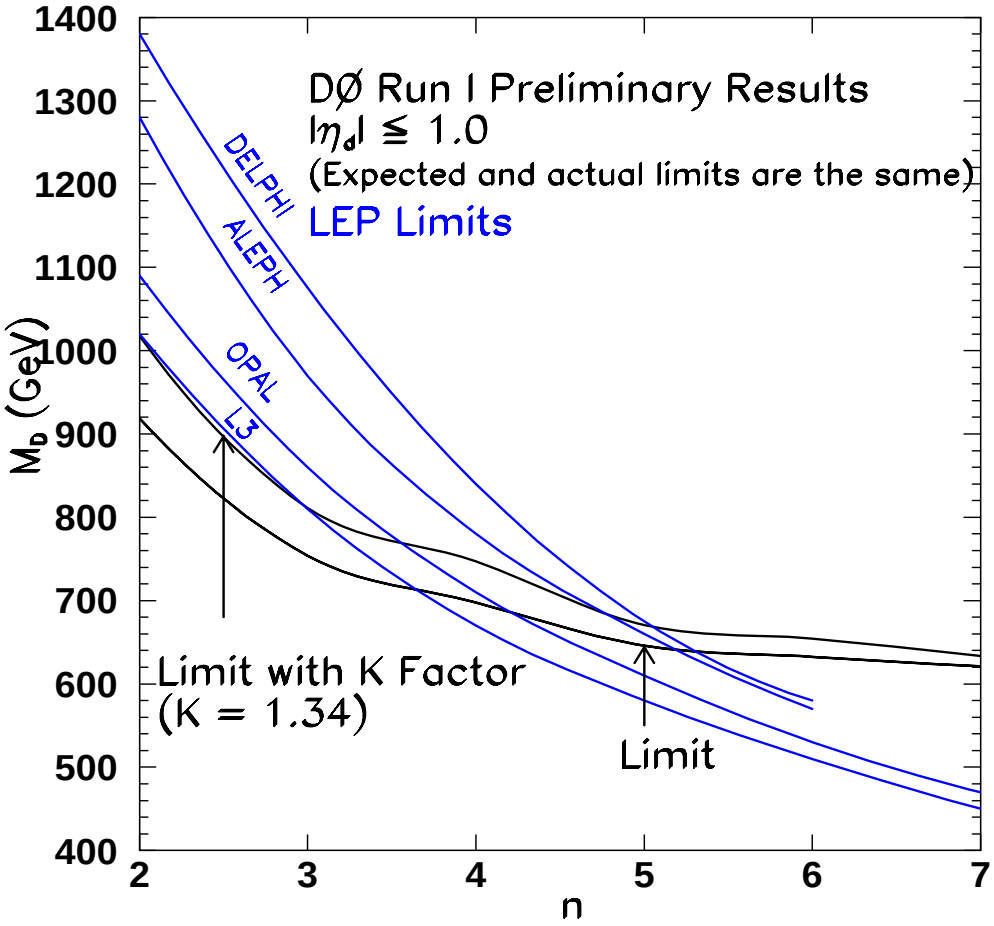
Large Extra Dimensions

Jets + $\not\!\!E_T$



- Luminosity: 78.8 pb^{-1}
- W/Z background: 38.0±8.2
- $N_{QCD/Cosmics}$: 7.8±7.1

Limit



DØ Run I preliminary limits complement LEP results at higher η

Recent Run 1 Results

Quaero

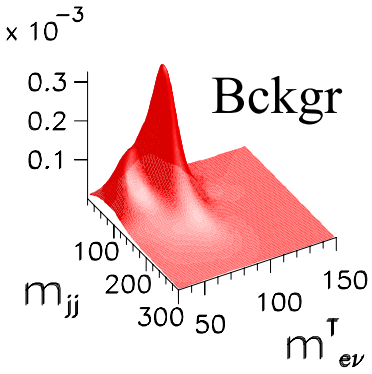
"*Quaero*" = Latin for "*I seek*"

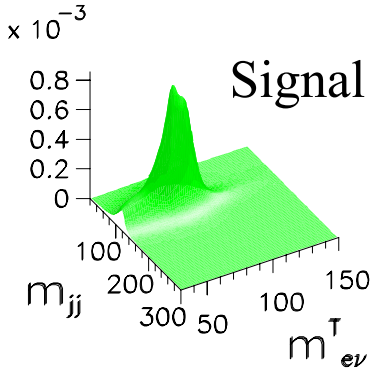
Public access to DØ Run 1 data

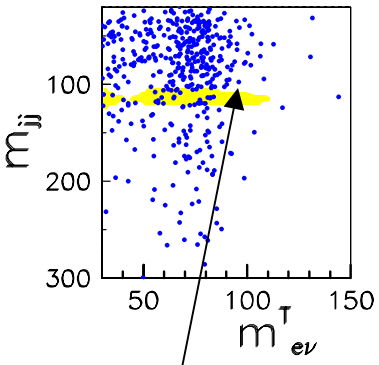
QUAERO automatically optimizes a search for a particular signature provided by the user, using DØ data sets and SM backgrounds. QUAERO was demonstrated in eleven separate searches, including a search for W'→WZ that is the first of its kind.

http://quaero.fnal.gov/quaero/

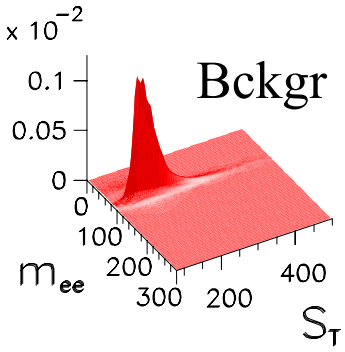
Example: Wh →eνjj, w/kinematic fit to W

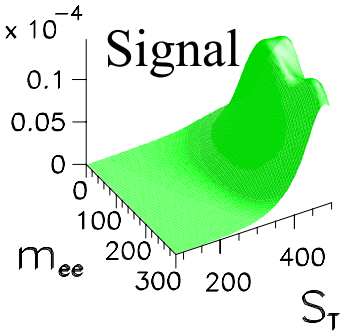


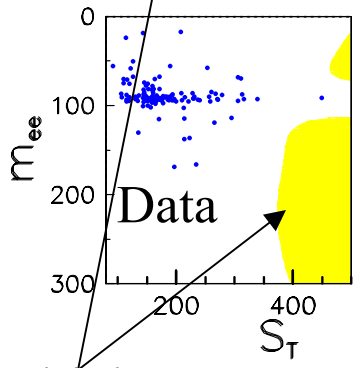




Example: Leptoquarks →eejj





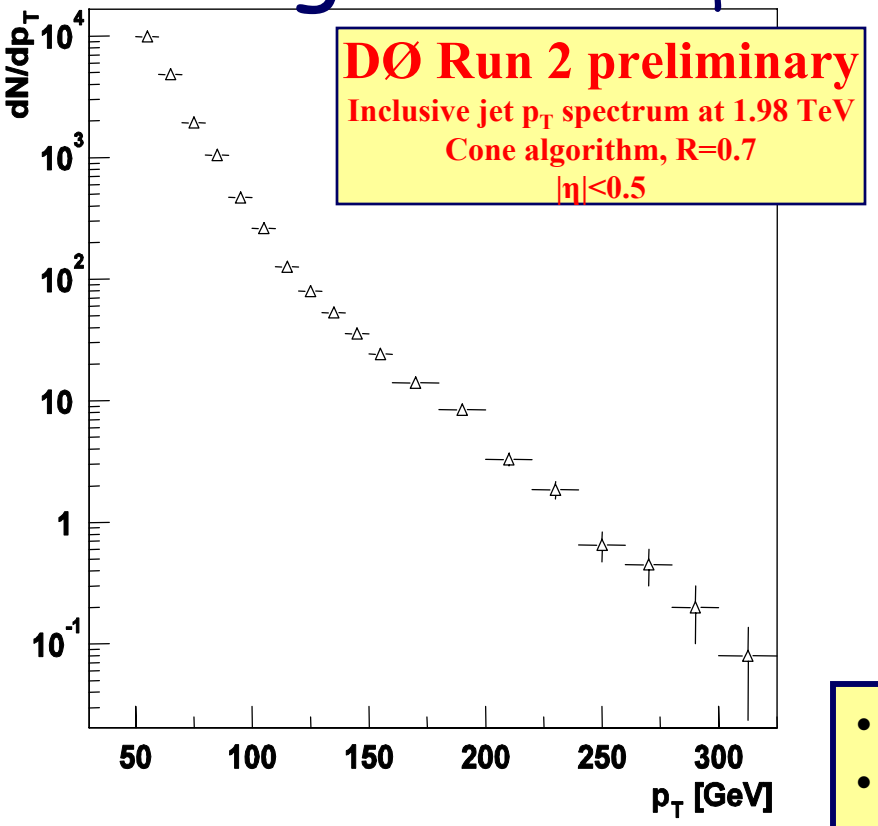


Region of max sensitivity

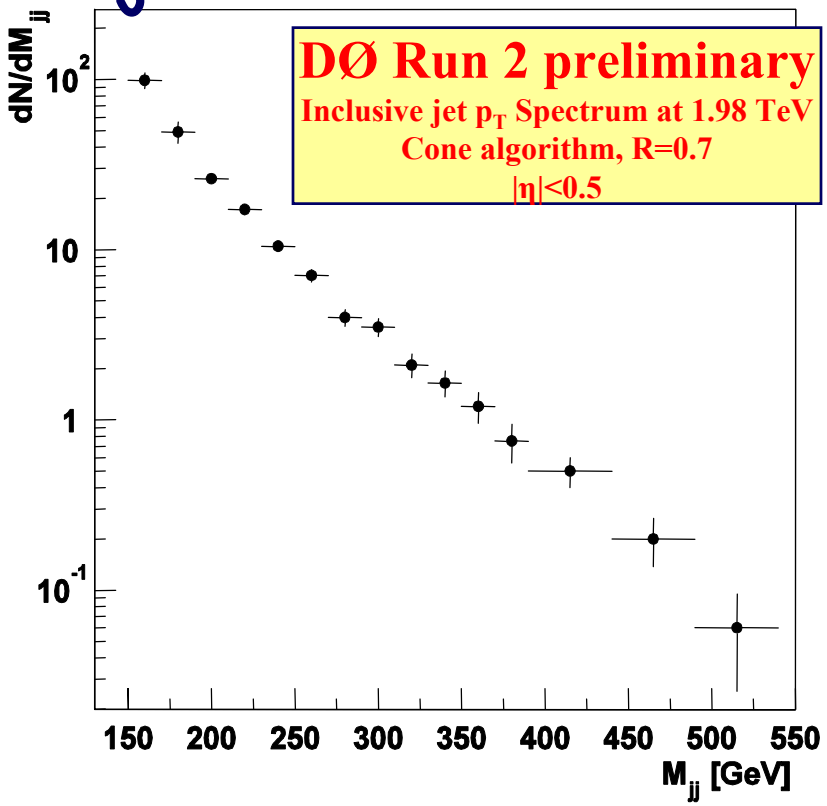
Toward QCD Physics

Jet Distributions

Single Jet P_T



Dijet Invariant Mass



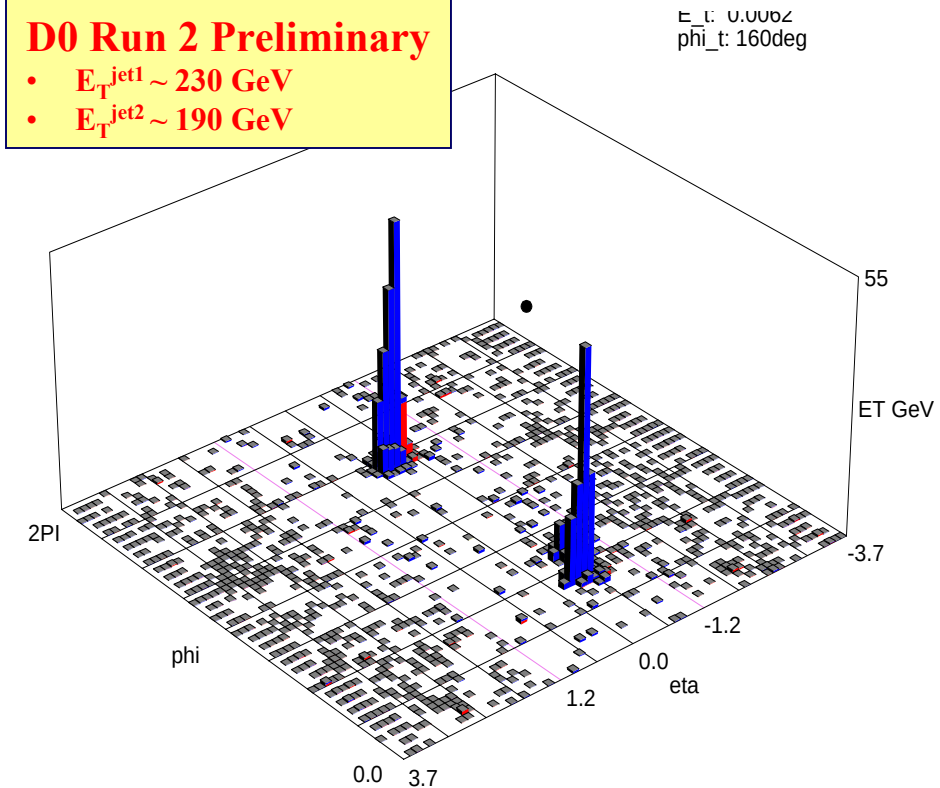
- Plots obtained with < 1 pb^{-1} (not normalized with L)
- No trigger efficiency correction applied
- Preliminary (v1) energy corrections

Toward QCD Physics

High E_T Jet Events

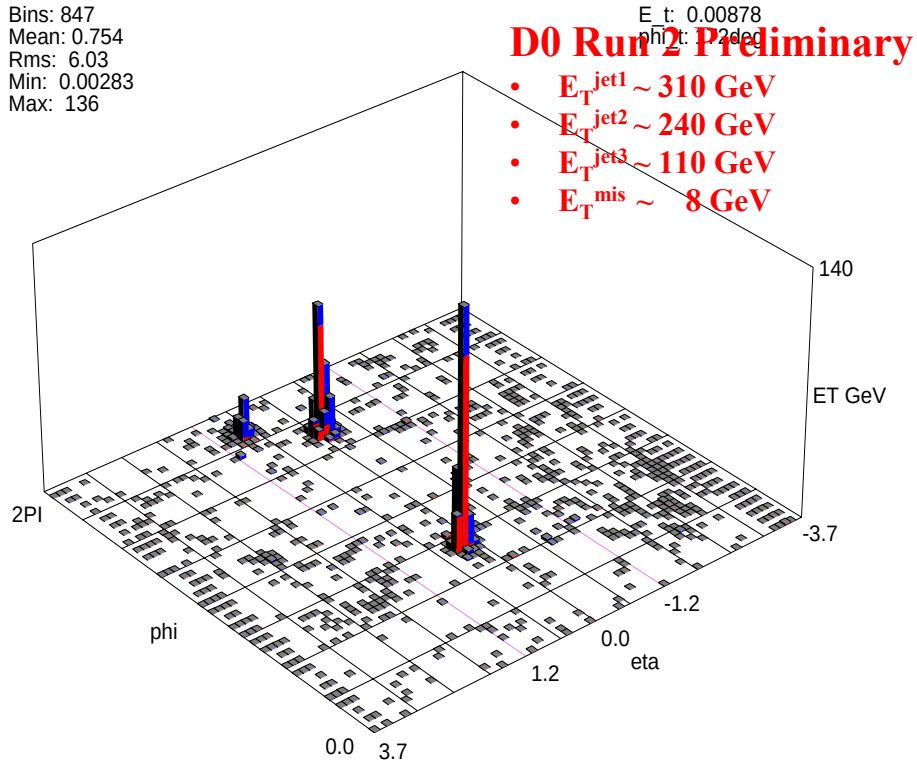
2-jet Event

D0 Run 2 Preliminary
- $E_T^{jet1} \sim 230$ GeV
- $E_T^{jet2} \sim 190$ GeV



3-jet Event

D0 Run 2 Preliminary
- $E_T^{jet1} \sim 310$ GeV
- $E_T^{jet2} \sim 240$ GeV
- $E_T^{jet3} \sim 110$ GeV
- $E_T^{mis} \sim 8$ GeV

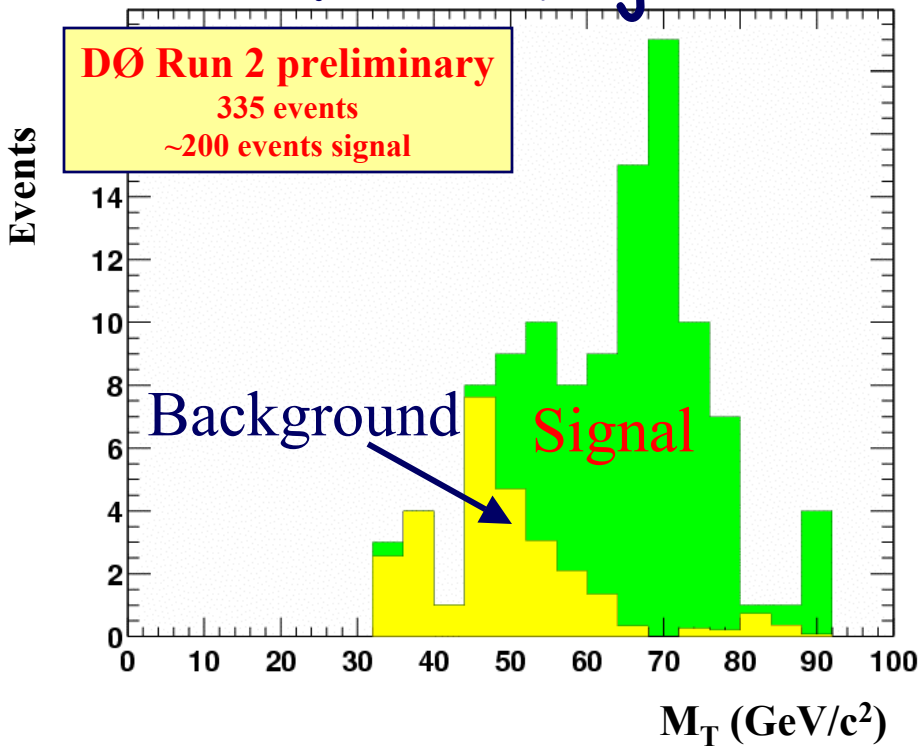


Toward W/Top/Higgs Physics

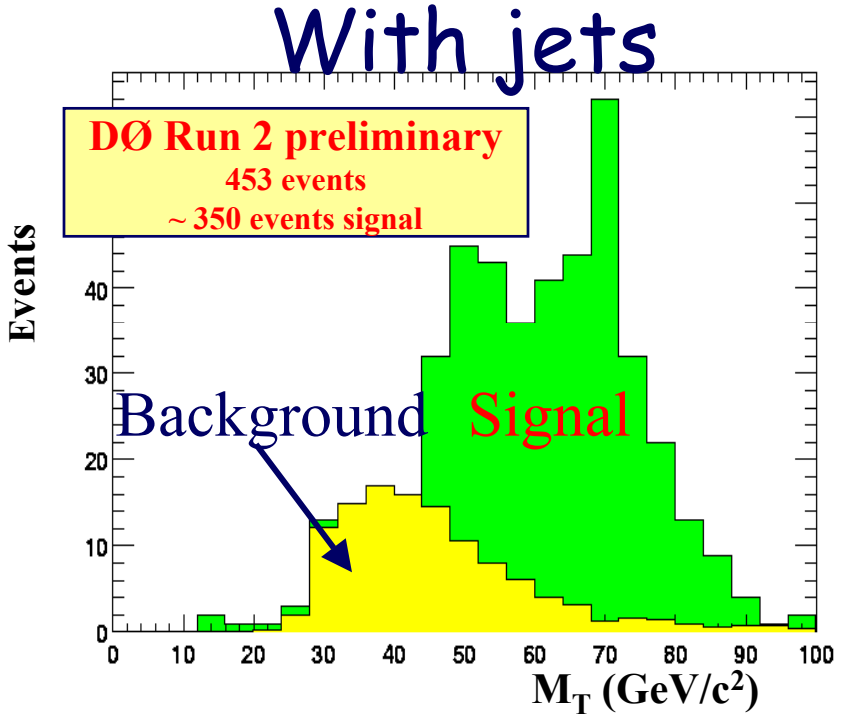
$W \rightarrow e\nu$

When events with a jet acoplanar to the electron is included, the sample is enriched about 40%.

Without jets

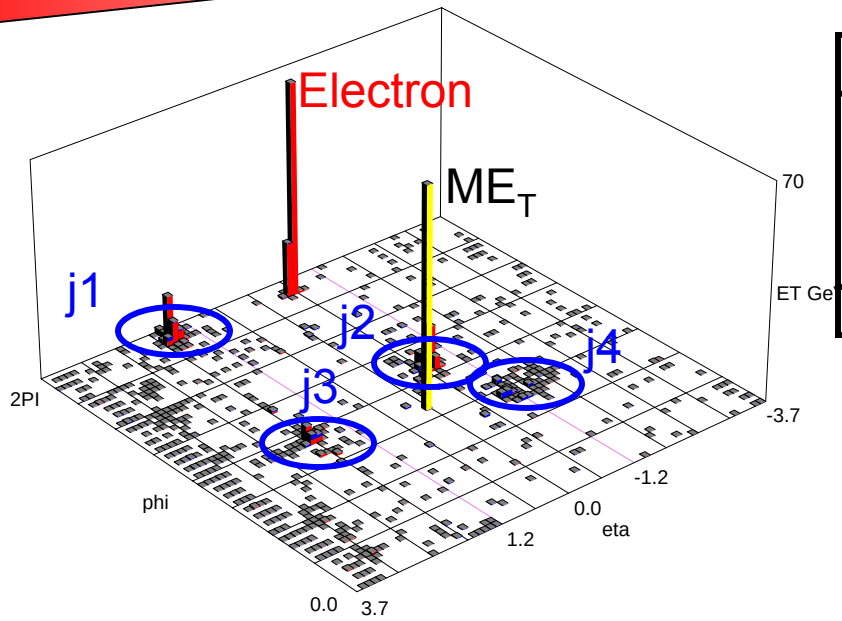


With jets

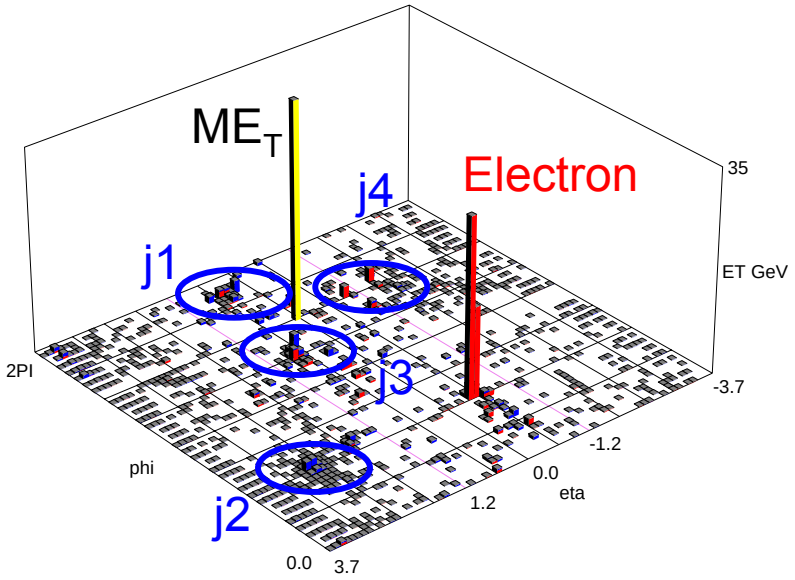


Toward W/Top/Higgs Physics

W+4 jets Candidates



e1	j1	j2	j3	j4
E_T = 52 GeV η = -0.51 φ = 1.63 Low-p_T track match	E_T = 28 GeV η = 0.73 φ = 3.82	E_T = 24 GeV η = 2.41 φ = 1.62	E_T = 21 GeV η = 0.52 φ = 5.80	E_T = 20 GeV η = -1.43 φ = 4.60
ME_T = 30 GeV, M_T(EM-ME_T) = 79 GeV				



e1	j1	j2	j3	j4
E_T = 99 GeV η = -0.53 φ = 5.94 Low-p_T track match	E_T = 68 GeV η = 1.62 φ = 6.03	E_T = 57 GeV η = 0.69 φ = 3.38	E_T = 35 GeV η = 1.27 φ = 2.29	E_T = 26 GeV η = 1.83 φ = 2.90
ME_T = 62 GeV, M_T(EM-ME_T) = 156 GeV				

D0 Run 2 Preliminary

Toward B Physics

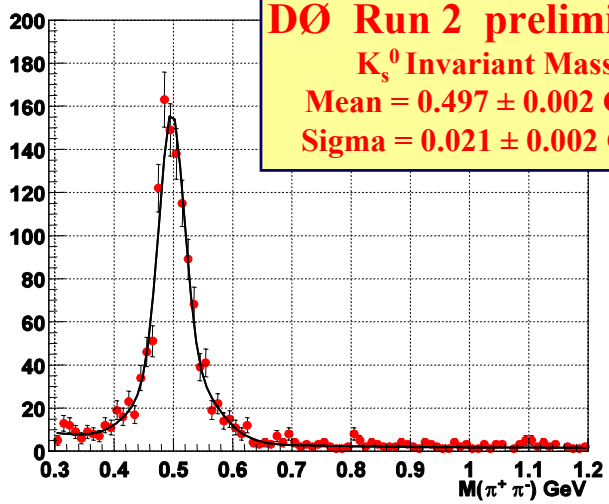
Track Resolution

Secondary Vertex Finding:

- Select primary vertices
- Find all 2 tracks combs
- Select K_s sec. vertices

$K_s \rightarrow \pi^+\pi^-$

SMT only Tracking

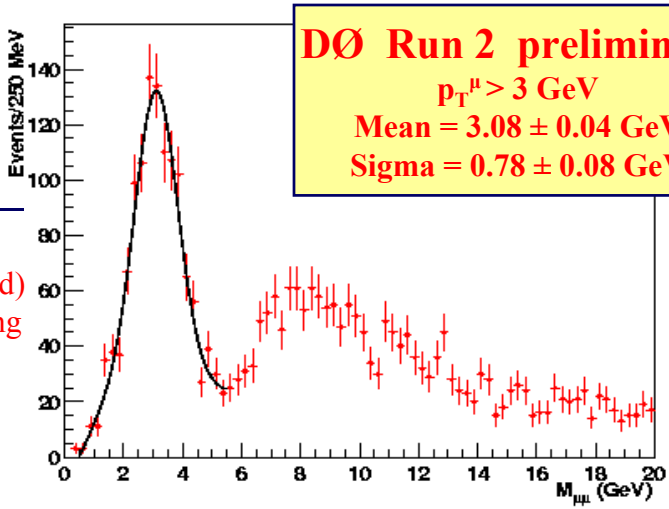


Being able to identify and measure K_s and J/Ψ is the first step toward being able to study CP violation in B mesons.

$J/\psi \rightarrow \mu^+\mu^-$

μ triggers (Central+Forward)

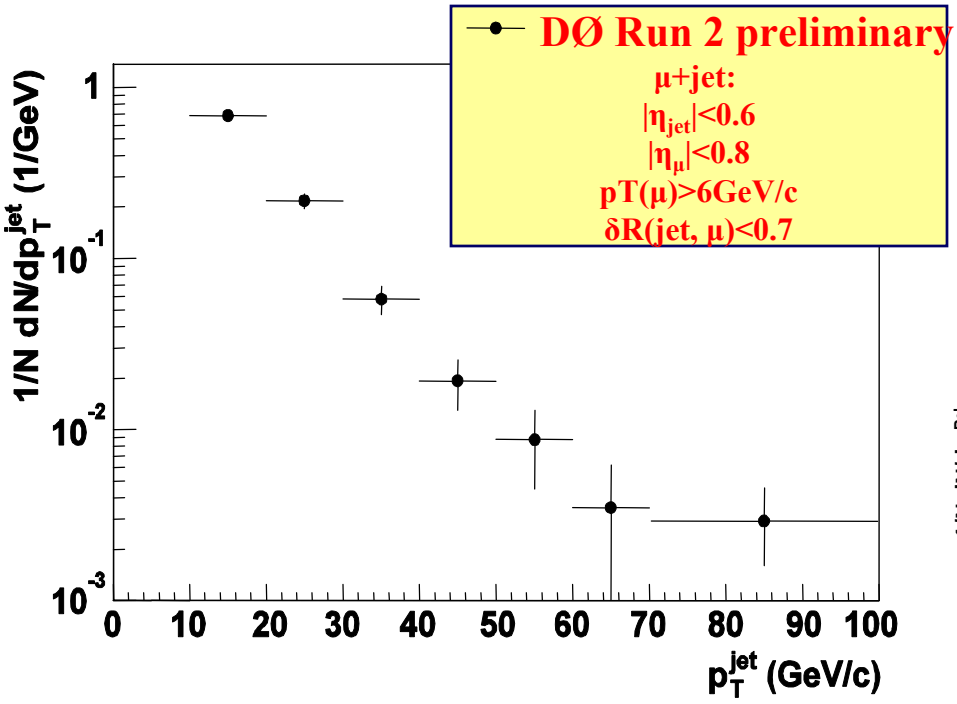
Muon System only Tracking



Toward B Physics

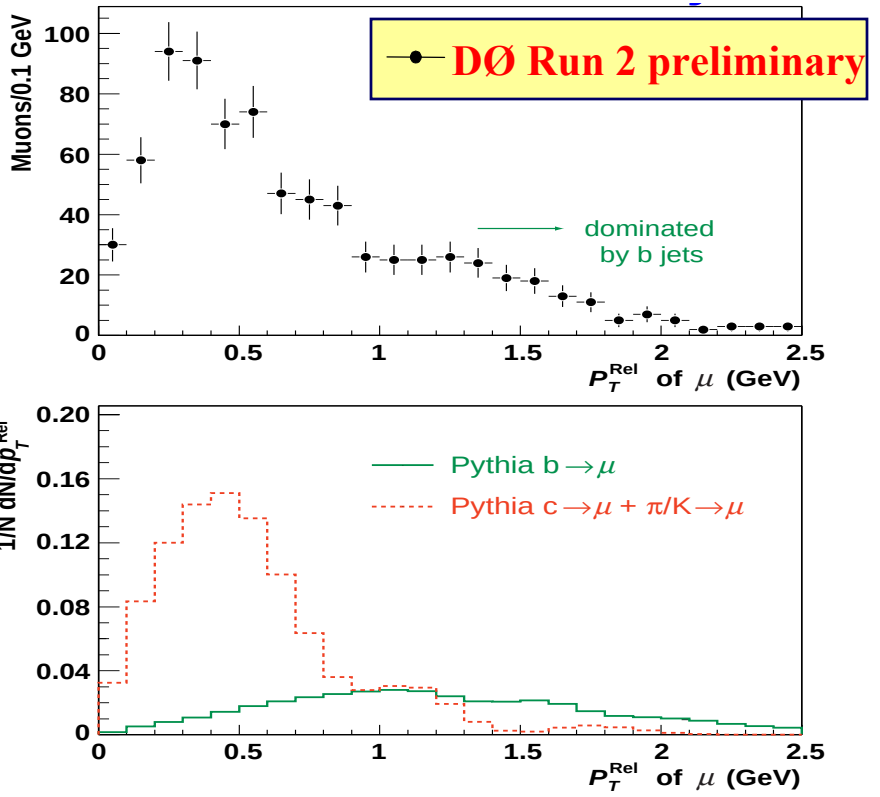
μ in jets

Cross Section



P_T rel distribution

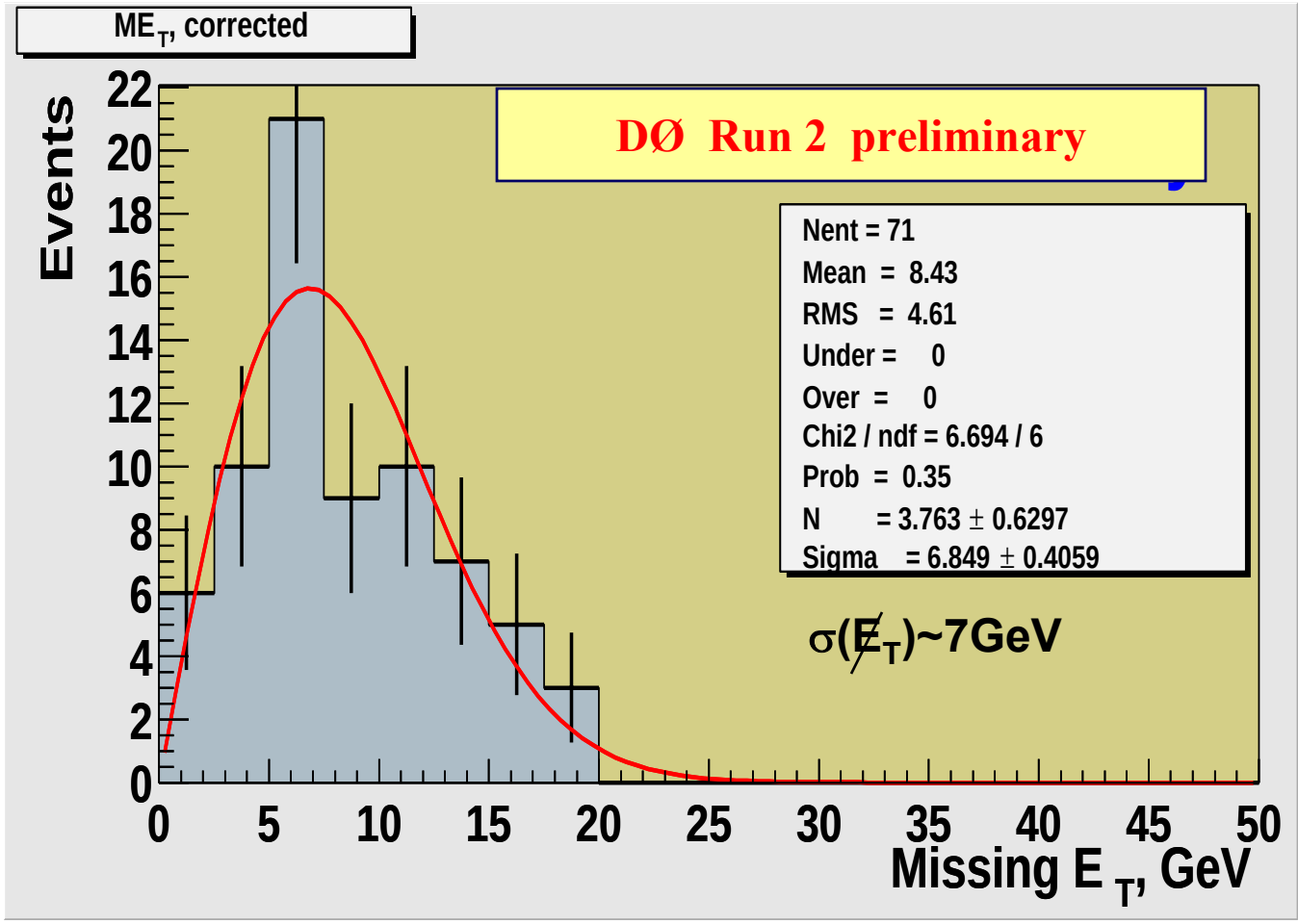
p_T^{rel} dist. consistent with Run 1 data



Toward New Phenomena Physics

diEM+$\not\!\!E_T$ Channel

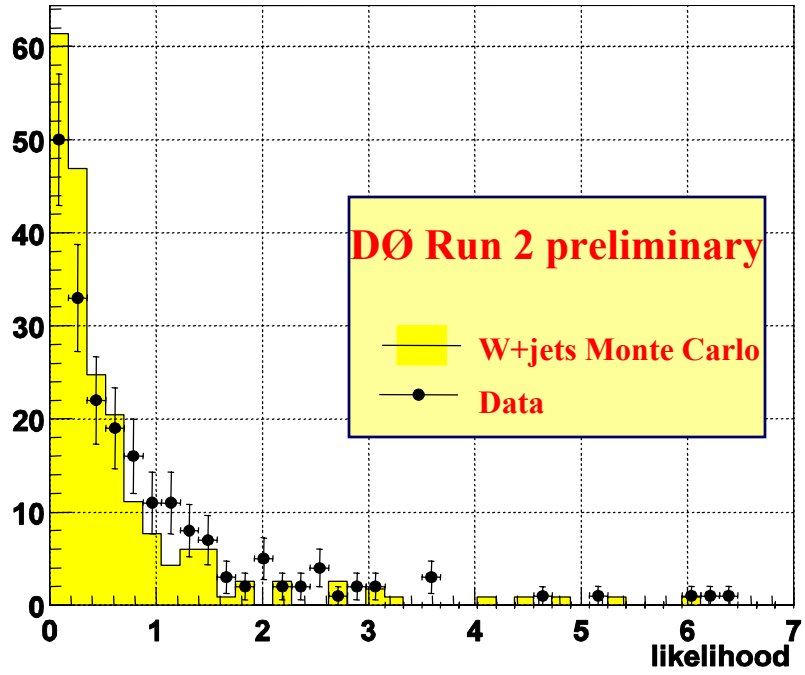
- diEM +$\not\!\!E_T$ is an important channel for new physics searches (SUSY, radiative neutralino decays, extra dimensions, etc)
- The key is a good $\not\!\!E_T$ resolution and small non-Gaussian tails



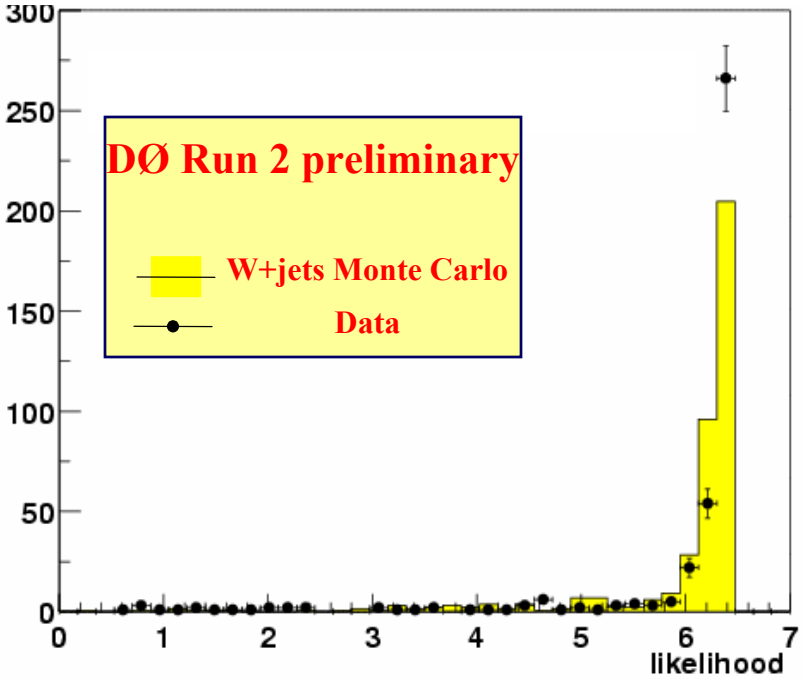
Toward New Phenomena Physics

ME_T Significance

diEM Sample



W Sample



Using a likelihood quantity, the "MET significance" improves S/B by taking into account event topology, found vertices, and resolutions

Toward New Phenomena Physics

Leptoquarks

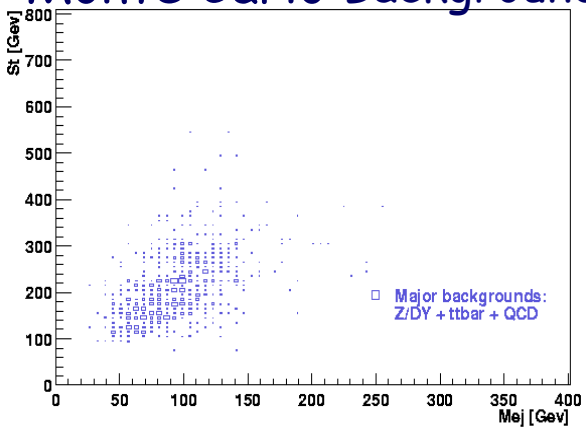
Signal = 2 jets + 2 electrons

Kinematic cuts: 2 EM objects with $E_T > 25$ GeV and more than 2 jets with $E_T > 20$ GeV

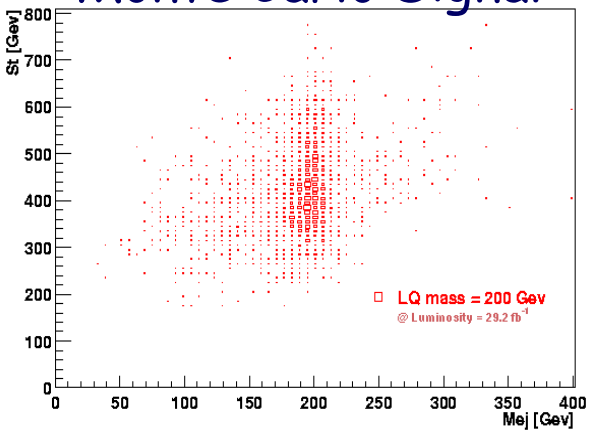
S_T = scalar sum of transverse energies of electrons and jets to separate signal and background

Most energetic event has $S_T = 315$ GeV

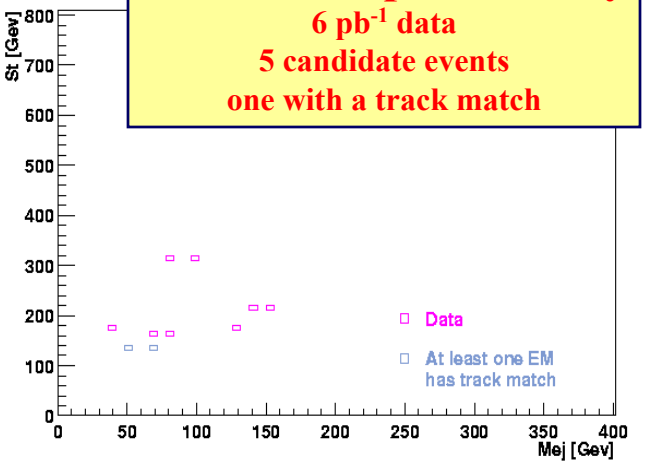
Monte Carlo Background

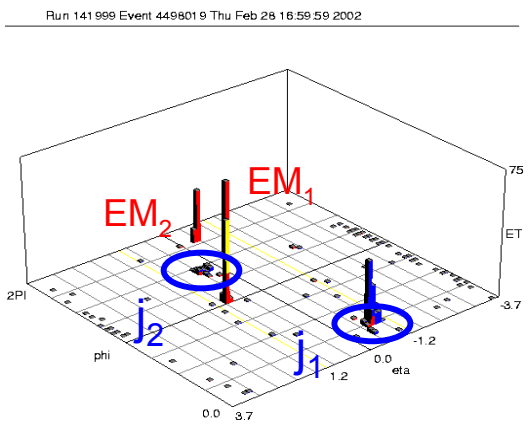


Monte Carlo Signal



DØ Run 2 preliminary
6 pb^{-1} data
5 candidate events
one with a track match

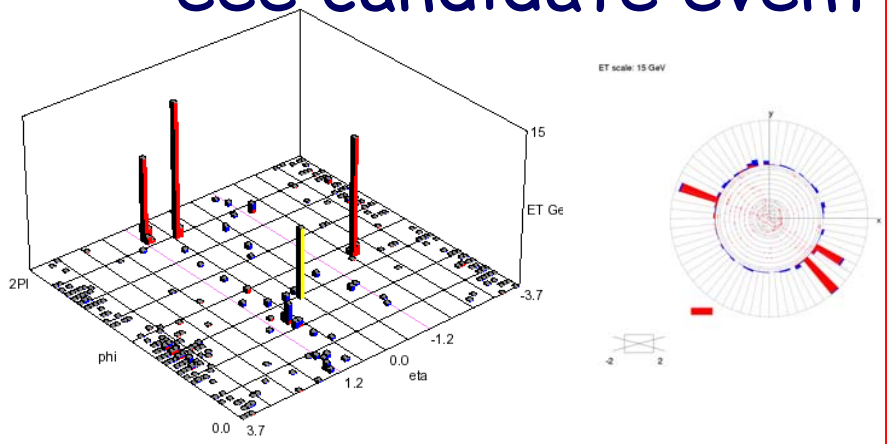




Toward New Phenomena Physics

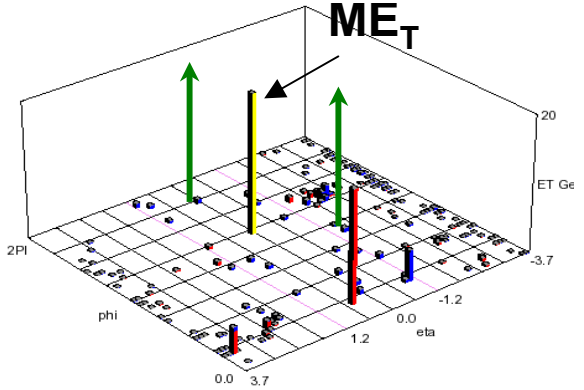
SUSY:trilepton search

eee candidate event



e1	e2	e3
p_T(cal) = 17.9G p_T(CFT) = 0.52 η = 0.43 φ = 5.42 charge = +1	p_T (cal) = 13.9 p_T (SMT) = 10.9 η = -1.94 φ = 2.8 charge = +1	p_T (cal) = 13.2 p_T (CFT) = 15.1 η = 1.06 φ = 5.72 charge = -1
m_{e1e2} = 55.7	m_{e1e3} = 10.8	m_{e2e3} = 63.5
m_{e1e2e3} = 85.2 GeV		ME_T =10.9 GeV

eμμ candidate event



e	μ1	μ2
E_T = 28.2 η = 0.40 φ = 0.63	p_T = 28.2 η = -0.10 φ = 6.20 charge = -1	p_T = 9.82 η = -1.48 φ = 2.88 charge = 1
	$m_{\mu\mu}$ = 41.5 GeV	
ME_T =31.8 GeV		

D0 Run 2 Preliminary