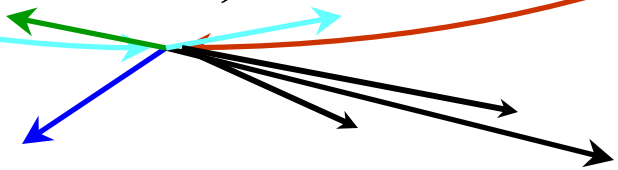
DØ Results for Moriond

Boaz Klima

Fermilab

All Experimenters Meeting

Mar. 11, 2002



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- **CPS** D. Alton
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  - **Event Generators** (S. Protopopescu)
  - **D0gstar** S. Kunori
  - **Fast simulation** S. Eno

Bottom Line

Results from Run 2 shown for the first time at conferences

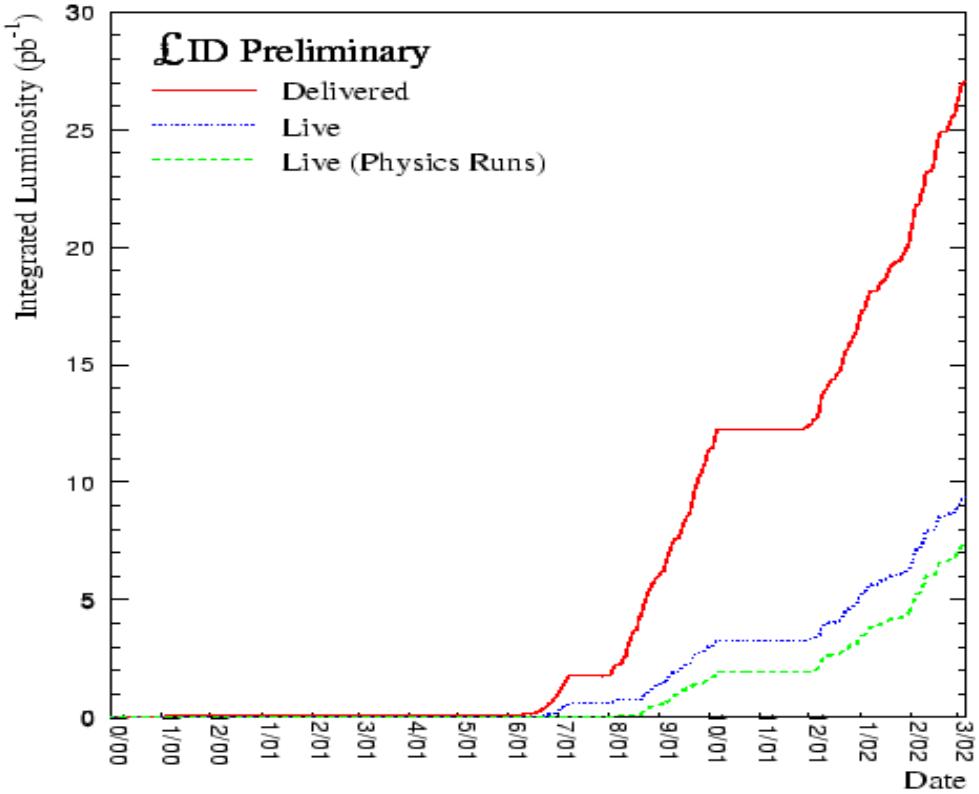
- Almost all detectors are operational
- Most of those produce data as (or close to what's) expected
- In most cases we understand what needs to be studied/done/developed to get us to the "promised land"

Everything is (really!) Preliminary

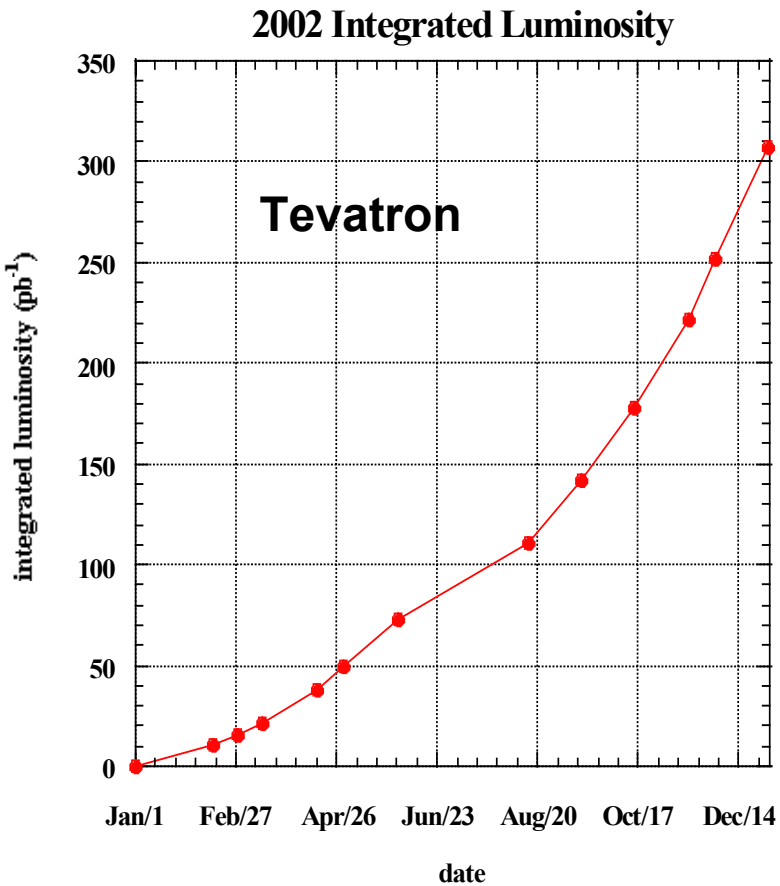
We are on the way to producing exciting physics

Luminosity

Luminosity to-date

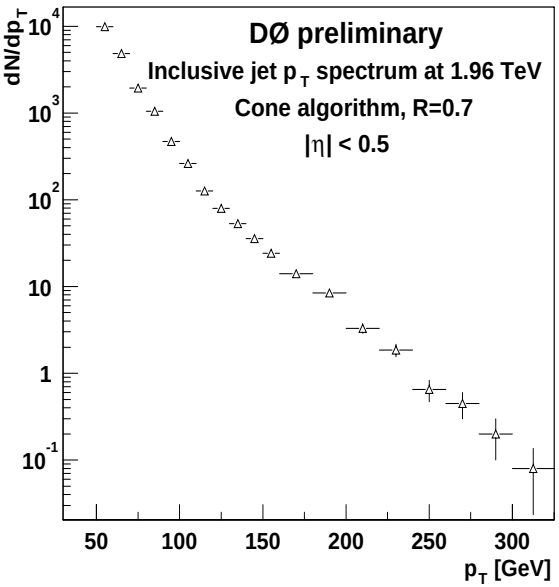


Projected luminosity

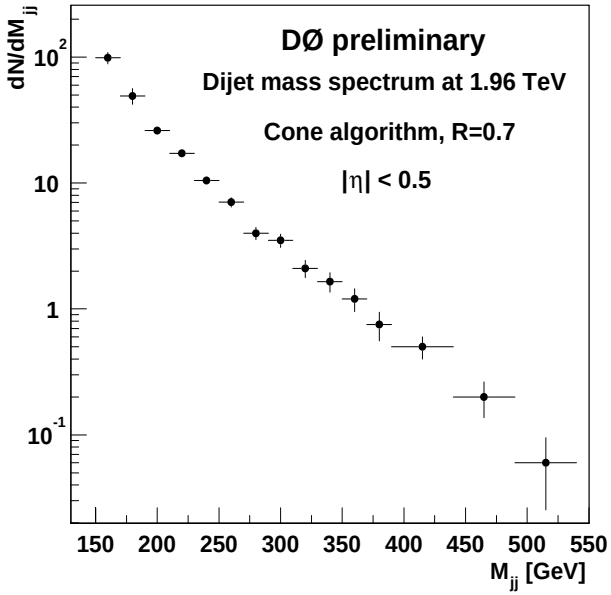


On the way to QCD physics

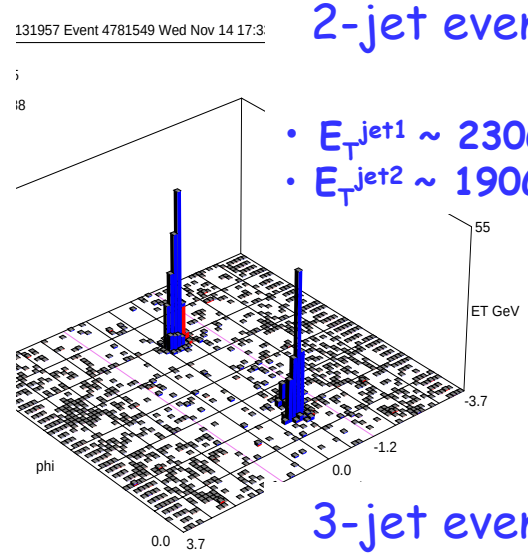
Single Jet P_T



Dijet Invariant Mass

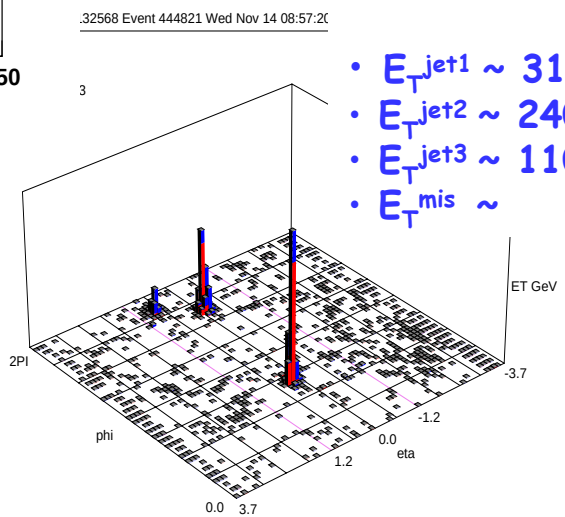


2-jet event



- $E_T^{jet1} \sim 230$GeV
- $E_T^{jet2} \sim 190$GeV

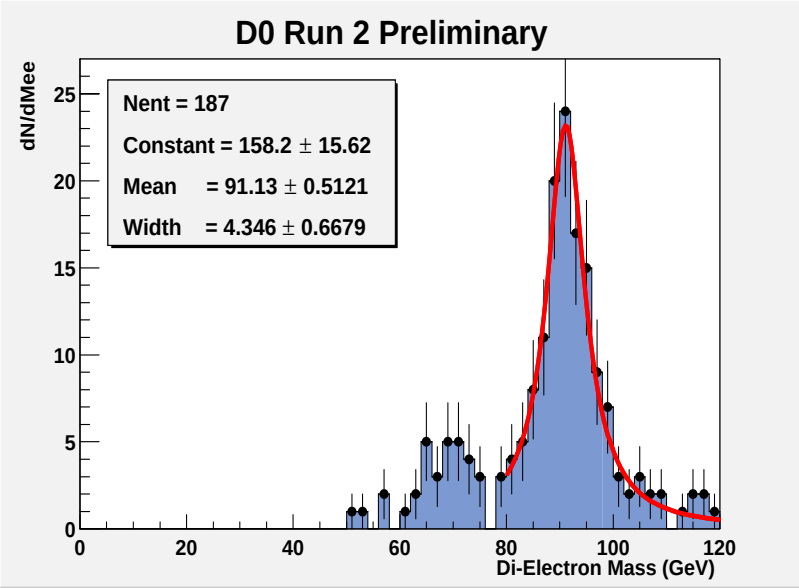
3-jet event



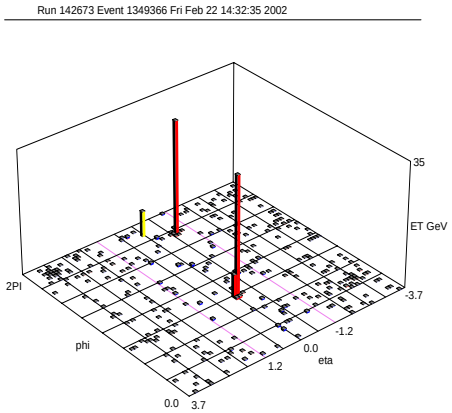
- $E_T^{jet1} \sim 310$ GeV
- $E_T^{jet2} \sim 240$ GeV
- $E_T^{jet3} \sim 110$ GeV
- $E_T^{mis} \sim 8$ GeV

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

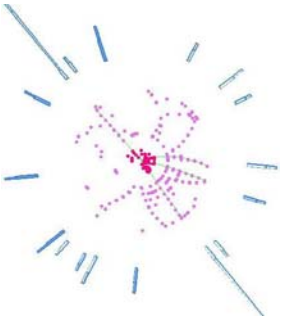
On the way to W/Z/Top/Higgs physics

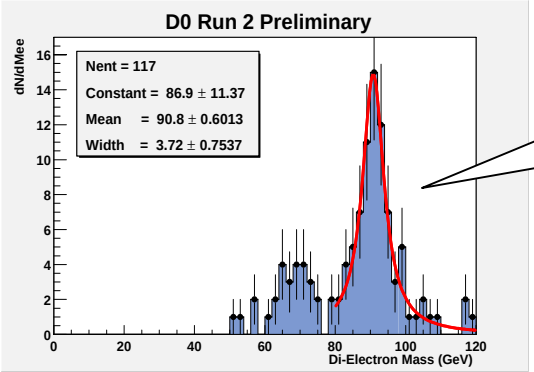


$Z \rightarrow e^+e^-$

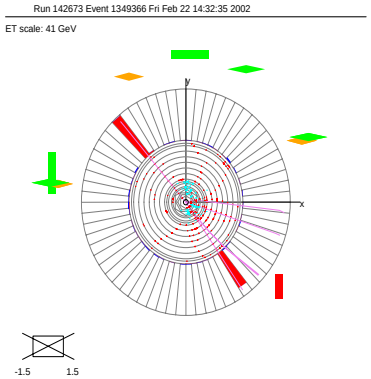


Mee=93.2 GeV
Each electron has calorimeter energy and global track (SMT+CFT)



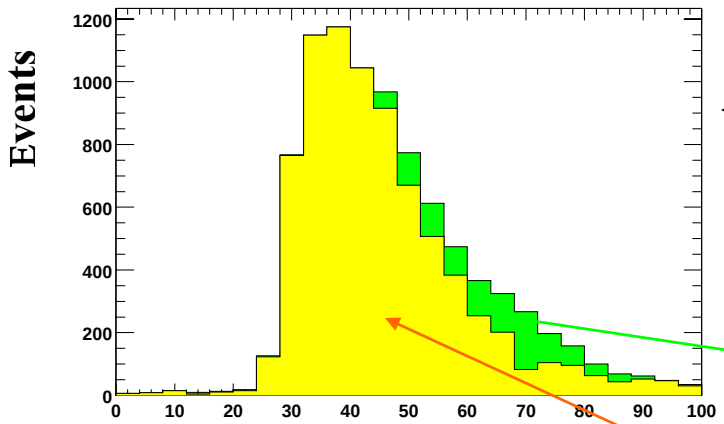


Only Central Calorimeter electrons



On the way to W/Top/Higgs physics

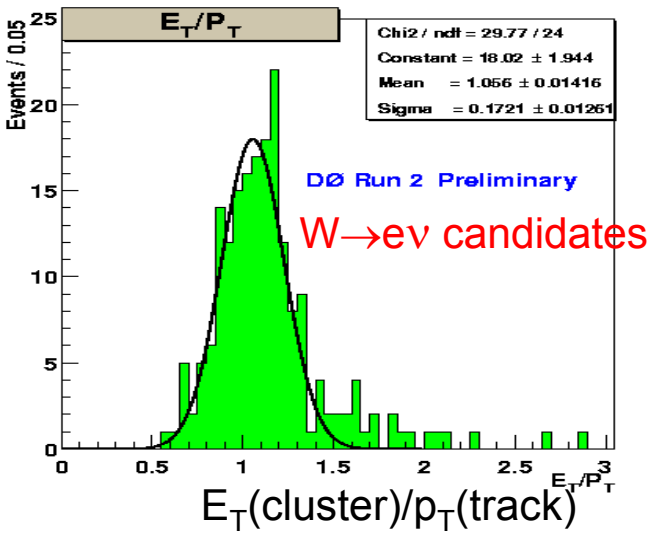
$W \rightarrow e\nu$

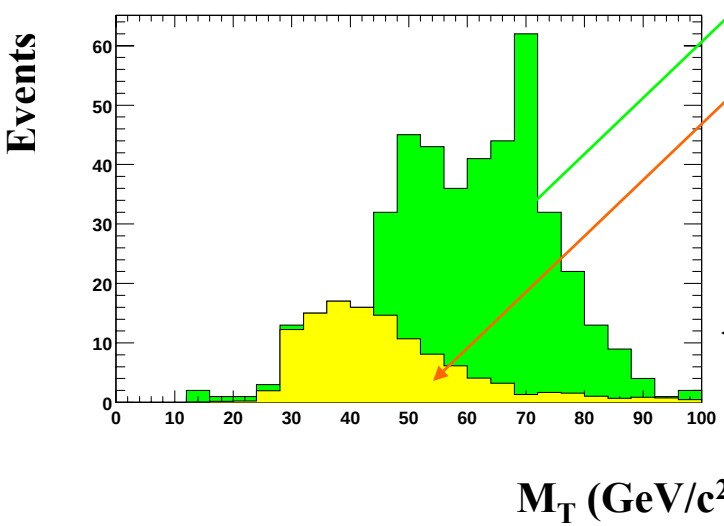


Without track matching
Purity ~ 25 % (~900 signal events)

Signal

background

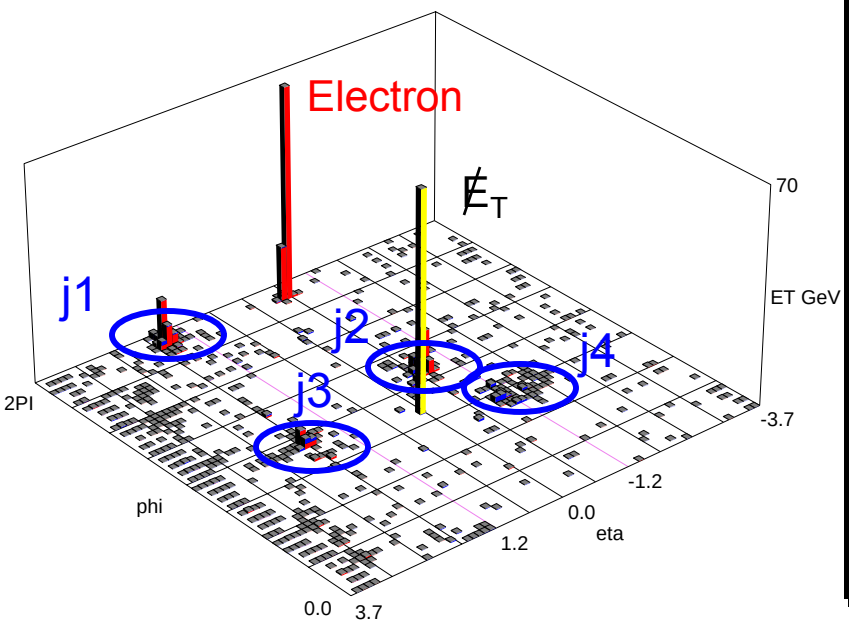




With matching of track and cal cluster
Purity ~ 90 % (~350 signal events)

W+4 jets Candidates

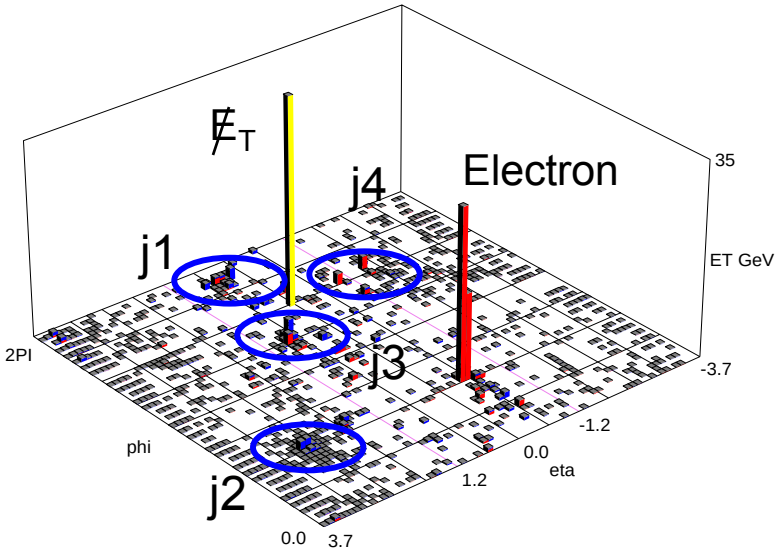
Run 141155 Event 154798 Thu Feb 28 01:44:52 2002



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, $M_T(EM\text{-}ME_T)$ = 156 GeV				

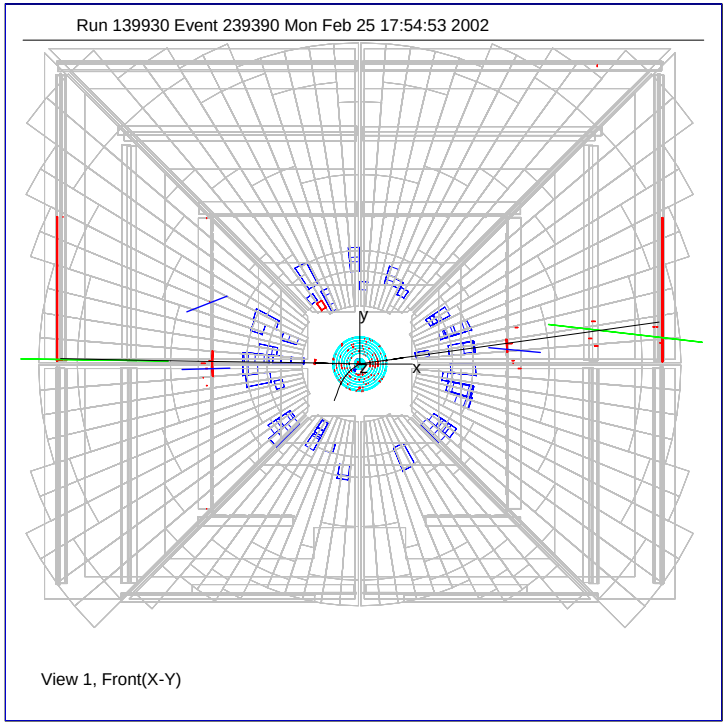
e1	j1	j2	j3	j4
E_T = 52 GeV η = -0.51 φ = 1.63 Low-p_T track match	E_T = 28 GeV η = 0.73 φ = 3.82	E_T = 24 GeV η = 2.41 φ = 1.62	E_T = 21 GeV η = 0.52 φ = 5.80	E_T = 20 GeV η = -1.43 φ = 4.60
ME_T = 30 GeV, $M_T(EM\text{-}ME_T)$ = 79 GeV				

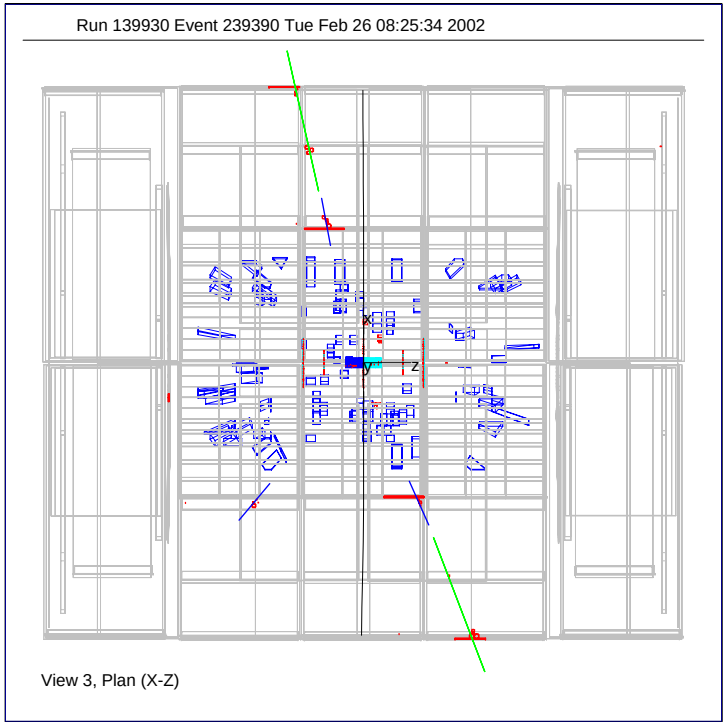
Run 142344 Event 1669603 Thu Feb 28 01:42:39 2002



$Z \longrightarrow \mu\mu$ Candidate Event

$$Z \rightarrow \mu^+\mu^-$$

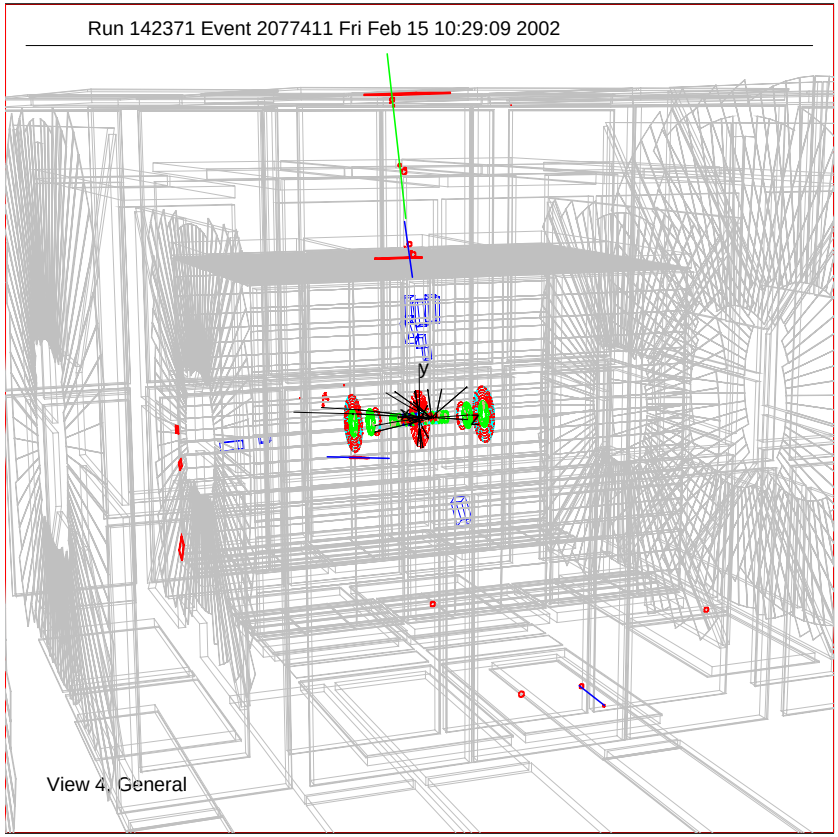




2 matched tracks (CTF only); Invariant Mass = 103GeV

$W \rightarrow \mu\nu$ Candidate Event

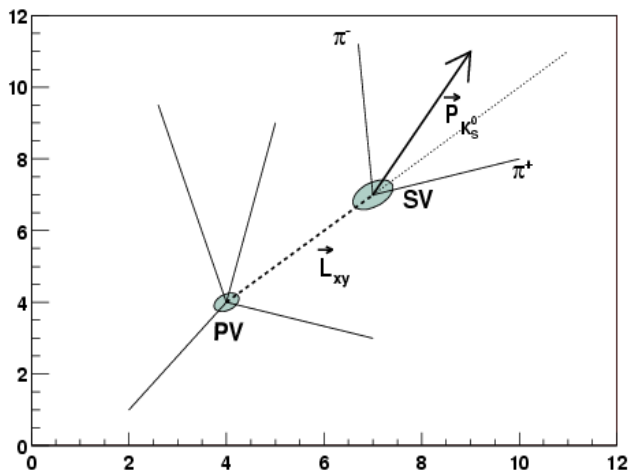
$W^- \rightarrow \mu^-\nu$



- P_T^{μ}=37 GeV
- Charge = -1
- No reconstructed jet in Cal
- Cal confirmation 3x3 = 2.6GeV
- 11 hit SMT+CFT global track
- DCA = 50 microns
- Transverse Mass = 78 GeV

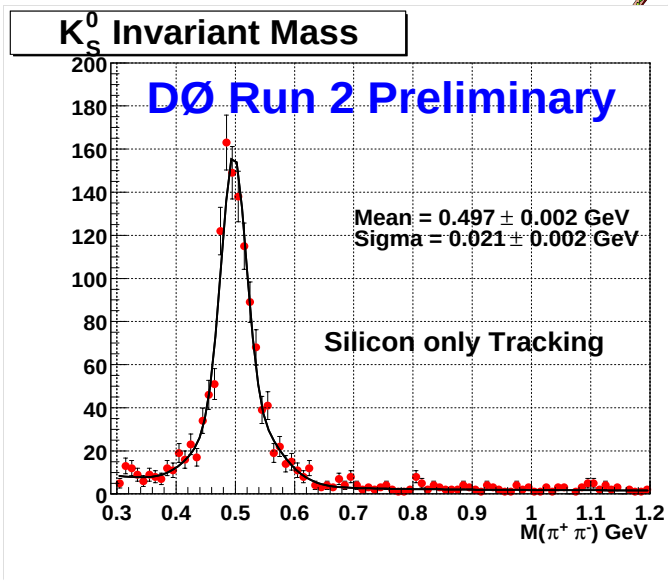
On the way to B physics …

Displaced vertices



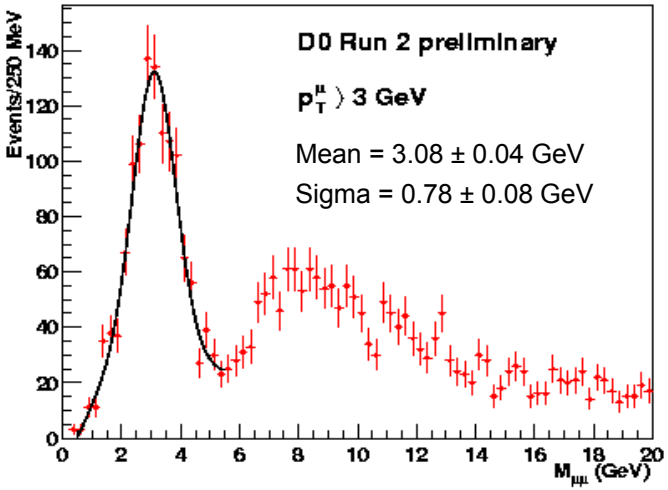
$Ks \rightarrow \pi^+\pi^-$

SMT only Tracking



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

μ triggers (Central+Forward)
Muon System only Tracking



<u>Method:</u>

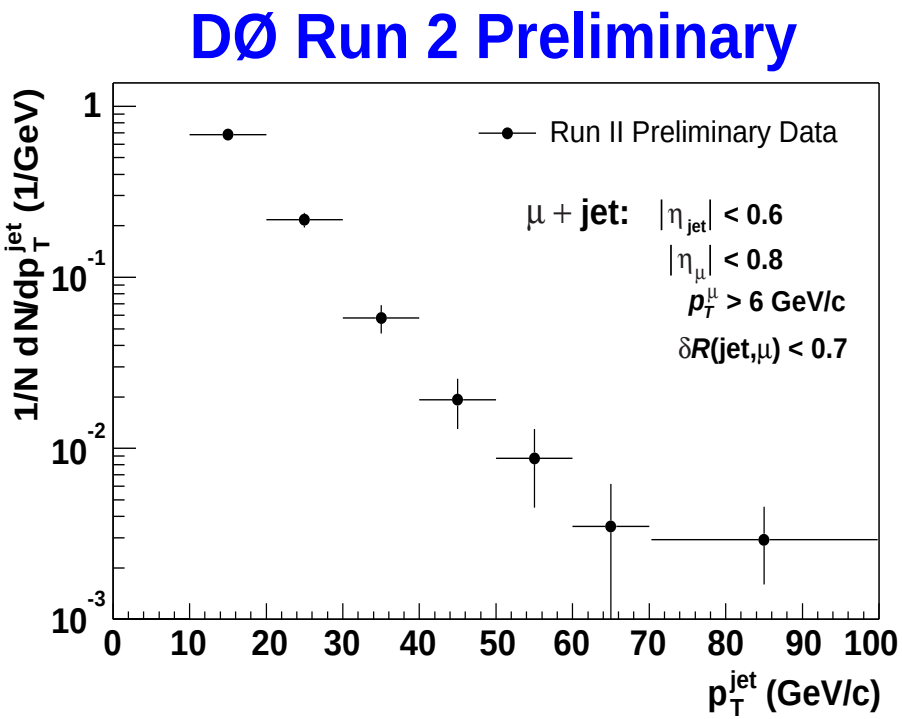
- Select primary vertices
- Find all 2 tracks combs
- Select Ks sec. vertices

(SMT only tracking)

On the way to B physics

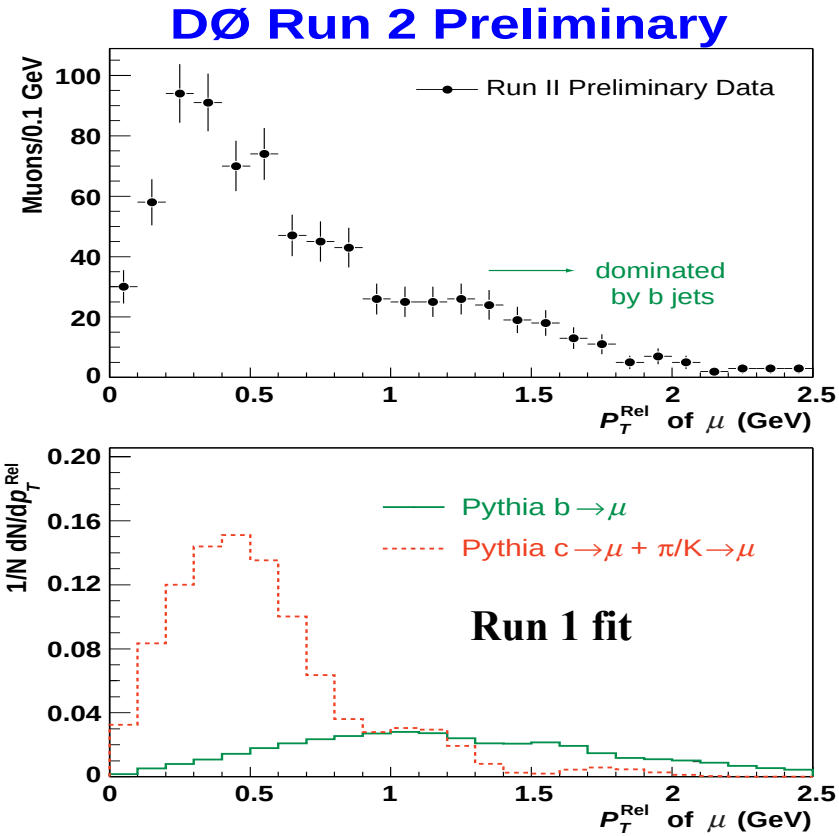
μ in jets

Cross Section



P_T rel distribution

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

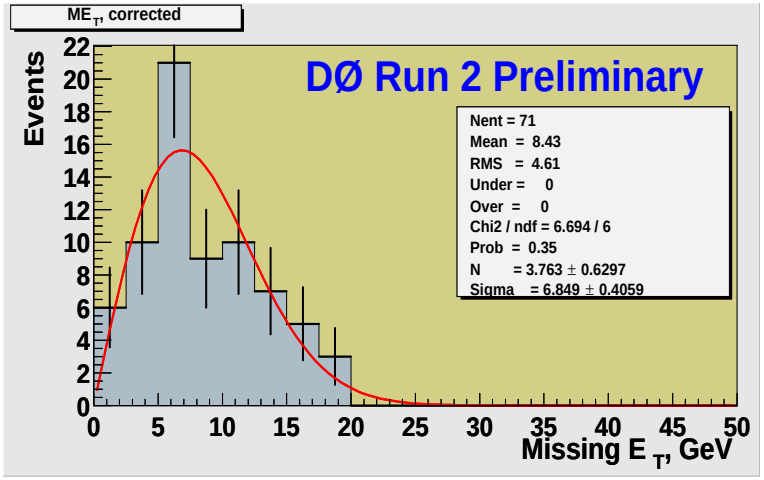


On the way to New Phenomena physics

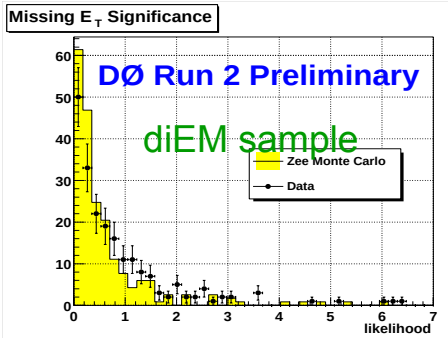
$\gamma\gamma+\not{E}_T$ Channel

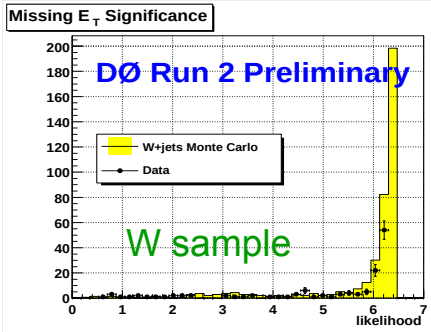
- $\gamma\gamma+\not{E}_T$ is an important channel for new physics searches (GMSB SUSY, radiative neutralino decays, extra dimensions, etc)
- The key is a good $\not{E}_T$ resolution and small non-Gaussian tails

$\sigma(\not{E}_T)$~7GeV



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

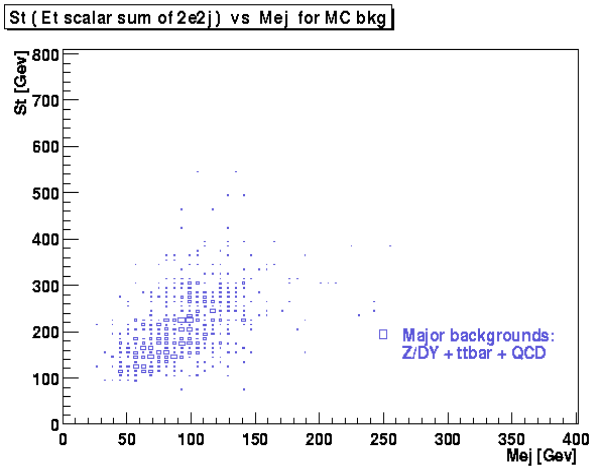




On the way to New Phenomena physics

First generation LQ

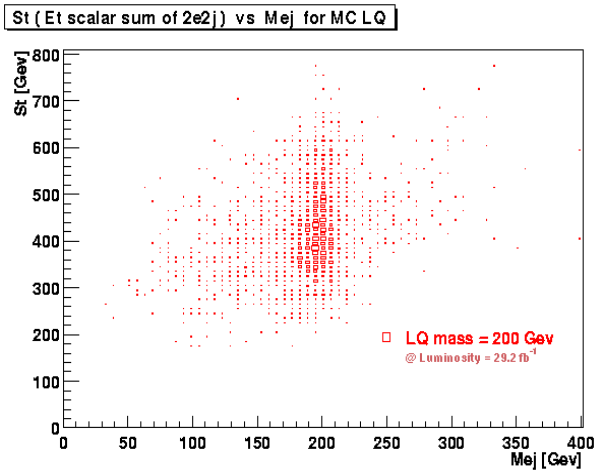
(2 electrons + 2 jets)

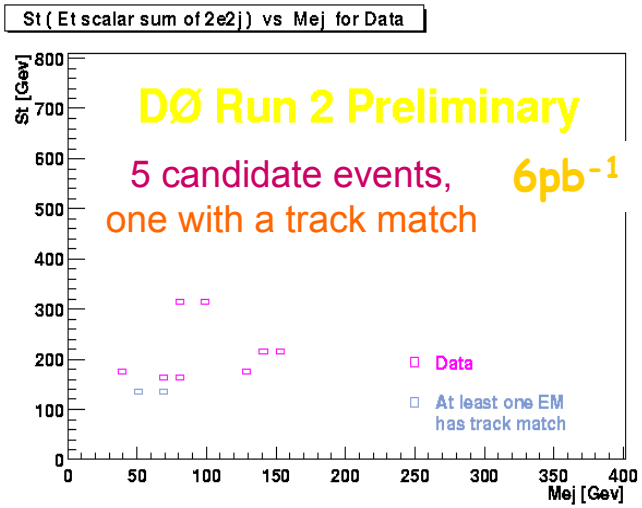


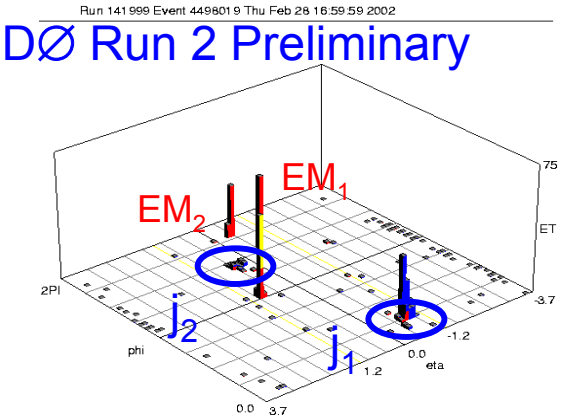
Kinematic cuts: 2 EM objects with E_T > 25 GeV and more than 2 jets with E_T > 20 GeV

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

Most energetic event has S_T = 315 GeV



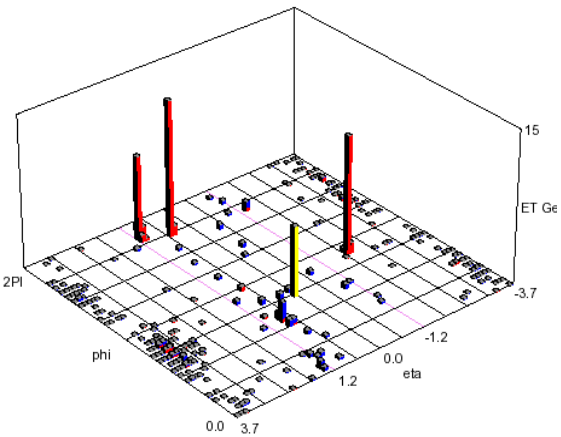


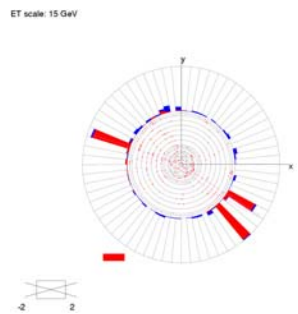


On the way to New Phenomena physics

SUSY
(Trilepton search)

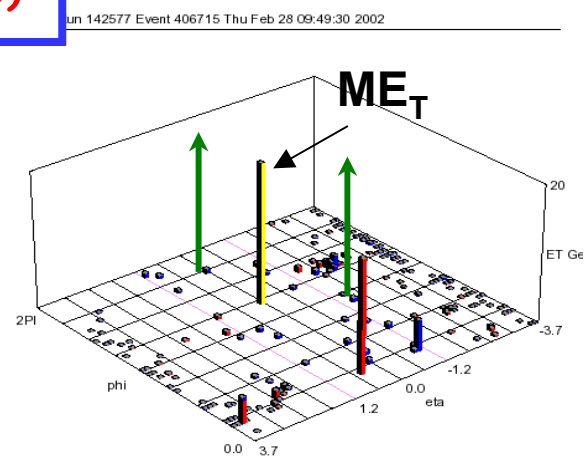
eee candidate event





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		

Outlook

- The Tevatron Run 2 started in March 2001, offering one of the most exciting physics programs for the next decade.
- Enormous progress made over the course of the last year in terms of detector commissioning. Entering physics results phase.
- Integrated luminosity delivered so far ~20 pb^{-1}.
  Expect ~300 pb^{-1} by the end of 2002.
- Preliminary performance results are encouraging and indicate that the upgraded DØ detector will be able to fully exploit the available physics opportunities.
- First physics results already emerging: J/Ψ, W, Z, jet distributions, etc.
  It will get even better:
  - optimization of detector, trigger and DAQ performances, calibration,alignment,…
  - improved selection and reconstruction procedures,...
  - and lots of integrated luminosity!

Expect a lot more for the Summer Conferences!!!