H->WW* search:

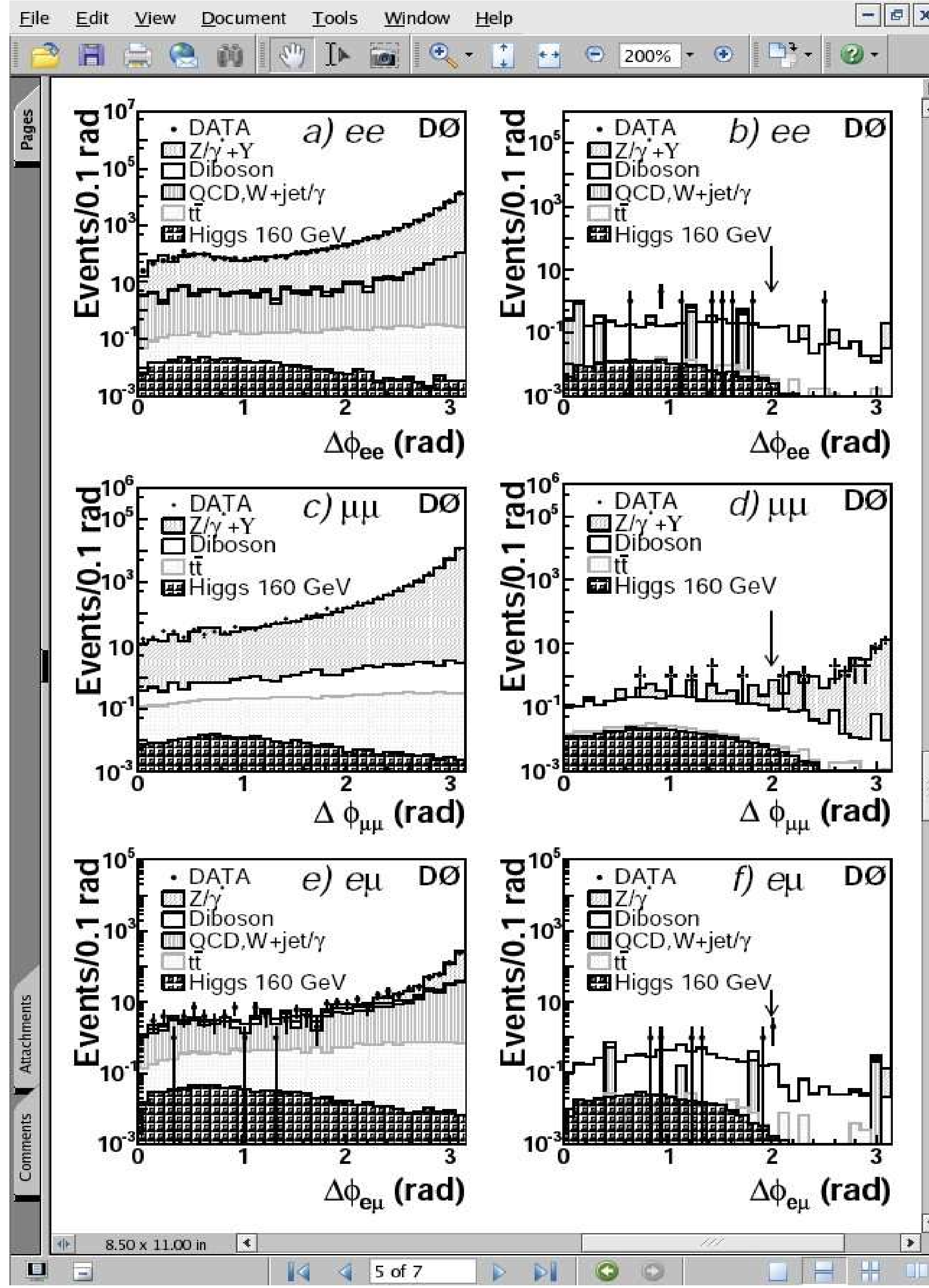
Basic concept:
Look at SM WW production and look for:
- Excess of WW events
- Shift in d-phi(l1,l2) distribution from scalar decay vs. spin-1 decay

Data:
p14 PASS2 , ~300/pb
2EM, 2MU, and EMMU skims

ID:
Mostly standard. Scaled MET is kind of new. Also using forward electrons!

Cuts:
1) p_t^{l1}, p_t^{l2} > 15,10
2) met>20
3) scaled met>15
4) m(l1,l2) > 20 (mumu) <80(ee), and $<m_h/2$
5) $p_t^{l1}+p_t^{l2}$+met > $m_h/2$+10(20) $<m_h$
6) $m_t < m_h-10 > m_h/2$
7) H_t<100
8) dphi(l1,l2)<2

*cuts vary slightly for different mh and amongst the final states



Results:
Observe decent agreement with SM. Too few events at low and high mh.

Limits may soon rule out 4th generation models for some mh. Still an order-of-magnitude away from the SM Higgs. Need a x2 better sensitivity to exclude any SM Higgs->WW in Run II.

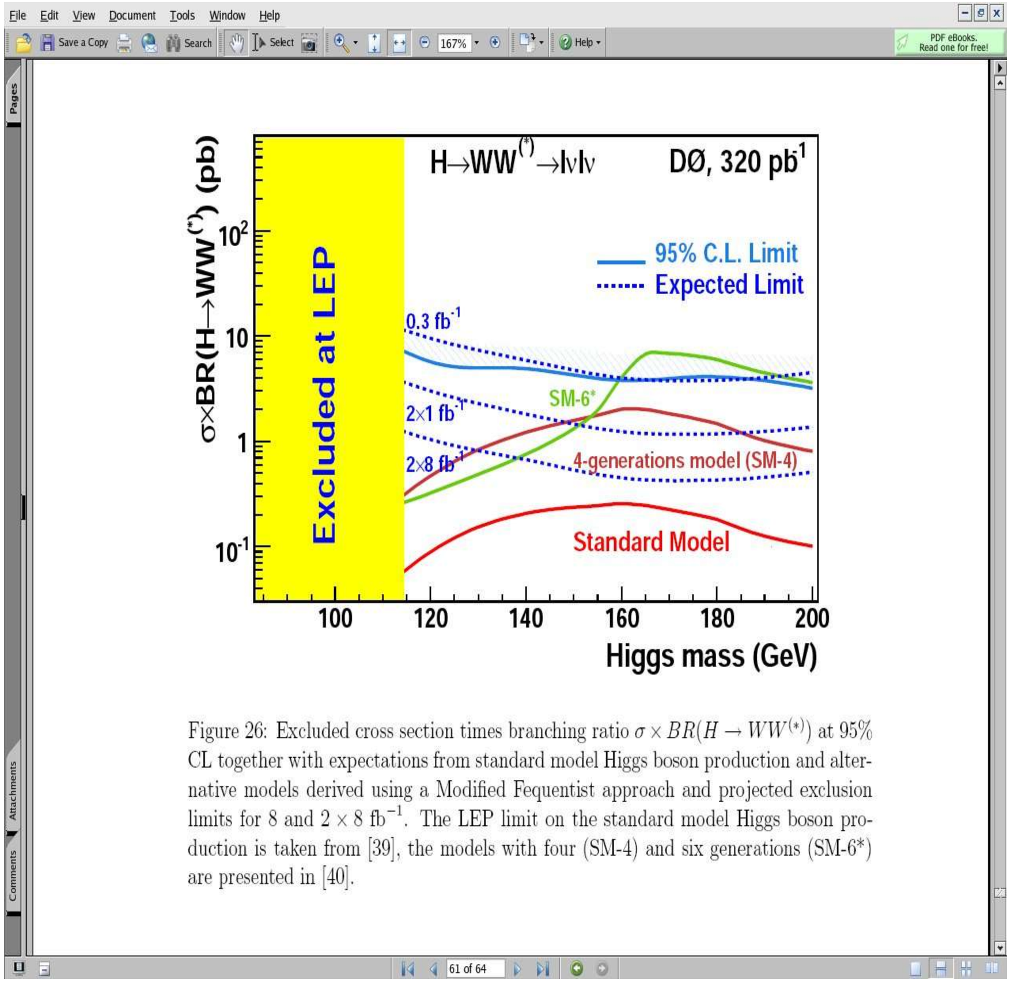
Comments:

from me:
- for mT, what is “$p_T^{ll'}$”? is it $|pt^l+pt^{l'}|$? what is $phi^{ll'}$? please define in the text.

from Gustaaf:
- paragraph 8: in the selection of isolated muons, the scalar sum of track pT's is required to be < 4 GeV. It's hard to understand what that means since no muon pT requirement has been made yet.
I think this is clear… the criteria is fixed, regardless of the muon pT…

*par 9, first sentence: I suppose they mean "The decay of a Higgs boson into two W bosons into...", or "The decay of two oppositely charged W bosons...".

*par 11, 4th sentence: "The opening angle \Delta(jet, MET) between this projected energy fluctuation and ... " is a strange sentence. Obviously, the projected energy fluctuation has the same phi as the jet, and maybe that's what they're trying to convey?
Yes, this scaled MET is not described clearly and is complicated by ambiguous symbols like “sin theta jet”



*par 11, just after formula 1: "As discussed below, the charged lepton system and the neutrinos are emitted back-to-back,...". Aside from the suggestion of a structural problem in the text (forward reference), this is not discussed anywhere below as far as I can tell. There is this reference at the end of the paragraph "This is not the case for Higgs boson decays because of the spin correlations in the decay." That's not really a "discussion".

I agree. It's also not really what they mean to say, since it's really the W and W* that's back to back, no the charged leptons being back-to-back with the neutrino sum. And it's also a non-trivial leap of logic to go from this back-to-back topology to the application of a mT cut.

*Fig 1: it's impossible to distinguish diboson and QCD in a black-and-white print.

This looks fine to me...

*Fig 1: how did they manage to get more events in 0 < DPhi < 2 in figure d) than c) for the higgs contribution? Something must be very wrong here.

Yeah, good point! What the &*^%#@?

*par 12: "..an additional constrained fit is performed to reject events compatible with Z boson production." What is fitted?

*table 2: the data are systematically low, and appear to be significantly low at 120 and 200 GeV in particular. Does the CLS method deal with this situation correctly?

Cls does fine with this. But I think a comment should be added noting the discrepancy and providing some disclaimer or explanation...

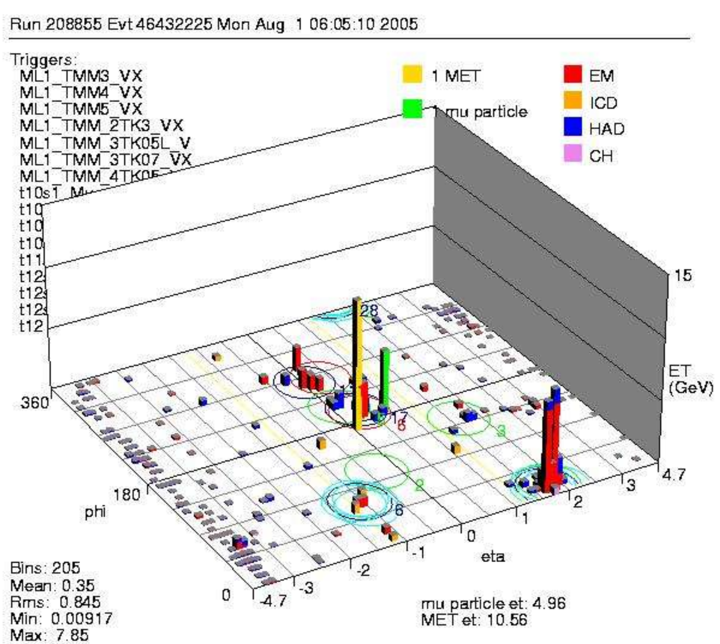
My Status Report:

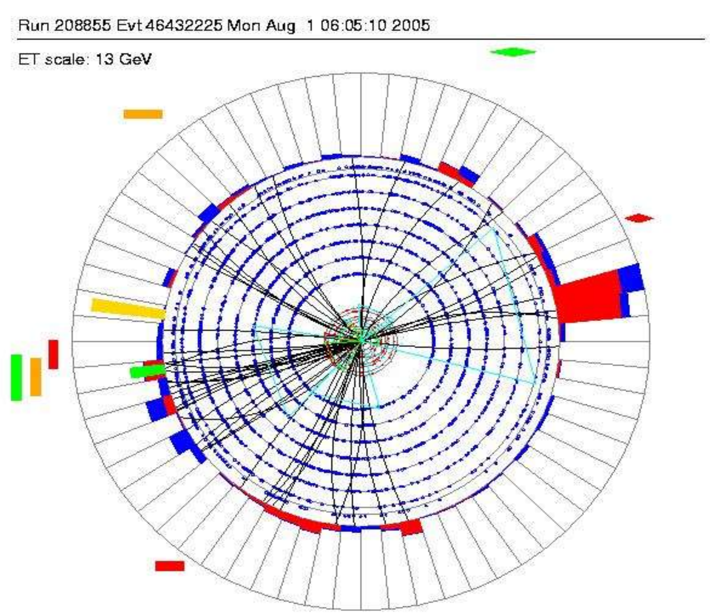
bbh(->bb) paper accepted by PRL, issues with CDF resolved

Final hadronic calorimeter calibration constants for p17 data are finished and in d0reco

- Many minor details and cross-checks were completed
- Jet energy resolution improves by ~5-10%

Latest p17 d0ve event display now running down in the CR





>medium muons

jets (with errors)

primary track-jets
secondary track-jets

corrected MET

Long-lived Gluino Search

Split-SUSY predicts a long-lived (~1 second) gluino, due to suppression from a heavy (10^9 GeV) squark loop.
This was a major topic of interest at SUSY'05.

One prediction is that after they hadronize, some get stuck in the detector, and later decay to jets+MET - (hep-ph/0506242).

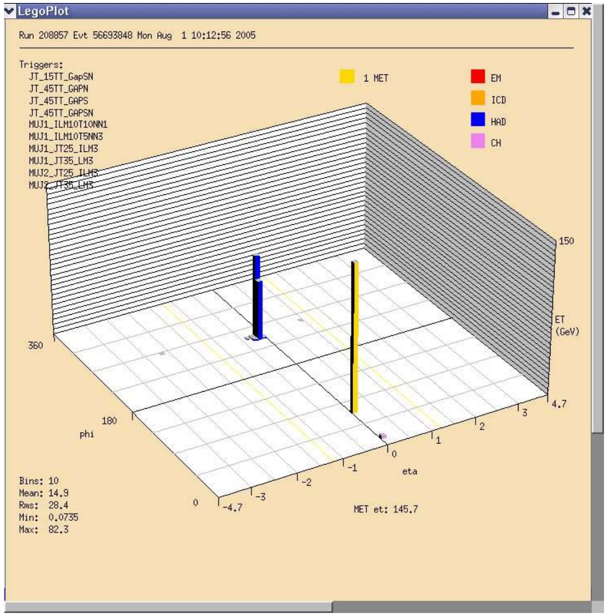
Look for big jets (E>~100 GeV), on just one side of the calorimeter, long after (>396ns) any p-pbar interaction.

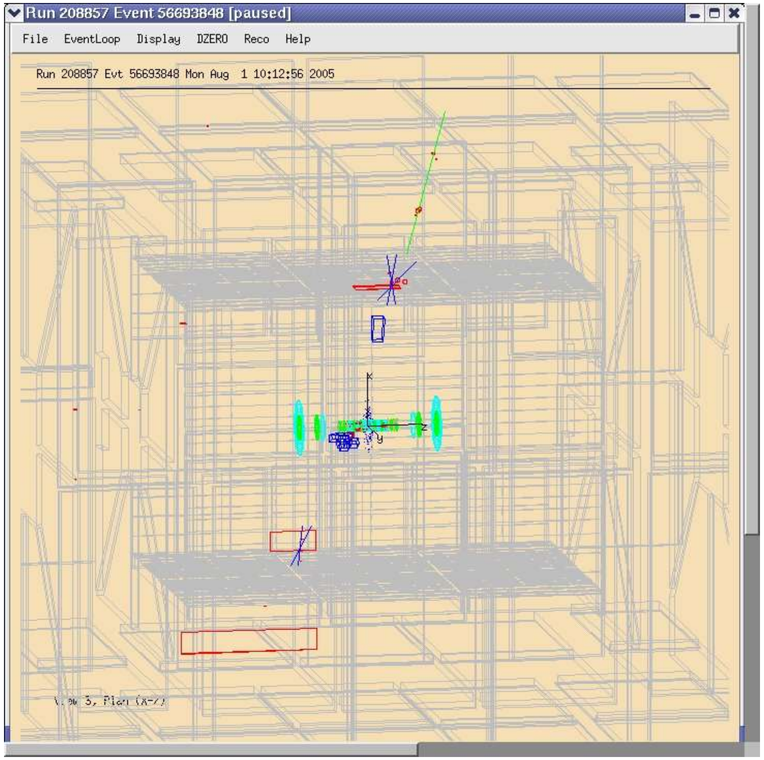
There are millions of events like this recorded from Run II!
There are 3 major sources (other than gluinos):
- Cosmic muons, which Brem a hard photon shower
- Beam muons, which Brem a hard photon shower
- Detector issues

I understand each of these pretty well now, and can eliminate nearly all events from them.
- Muons can be rejected by requiring no muon segments.
  Plus, the muon-induced showers are narrower than hadronic jets and have a MIP trail.
- Beam muons have a characteristic phi-dependence from accelerator geometry.
- Detector issues are in specific runs and areas of the calorimeter.

I am left with ~10 events / 100 pb^{-1}, consistent with gluino decays! :)
Most likely, these are remaining cosmic muons, which are in the tails of distributions. Could also be cosmic neutrons, which are making it into the Fine Hadronic calorimeter.

There are still a number of tricks which can be used to tell these types of background events from real gluino decays.
- Time correlation (get two stopped gluinos from the same p-pbar!)
- Di-jet signature (gluino-> q q chi0)

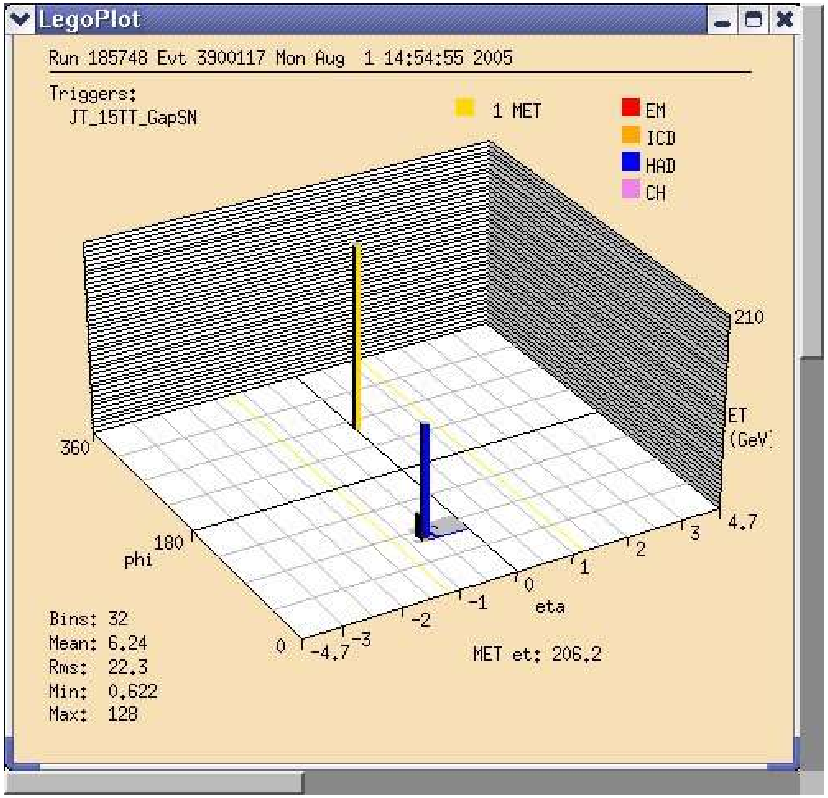




Gluino detection efficiency is a difficult function of the calorimeter's response to out-of-time energy deposits. Have to convolute with the sampling shape and account for BLS.
- This will be hard to do right. I have a parameterized model. I have tested it against muon showers, using the scintiallator timing from the muons. So far so good, but the muon scints only go from -20 to +80ns.

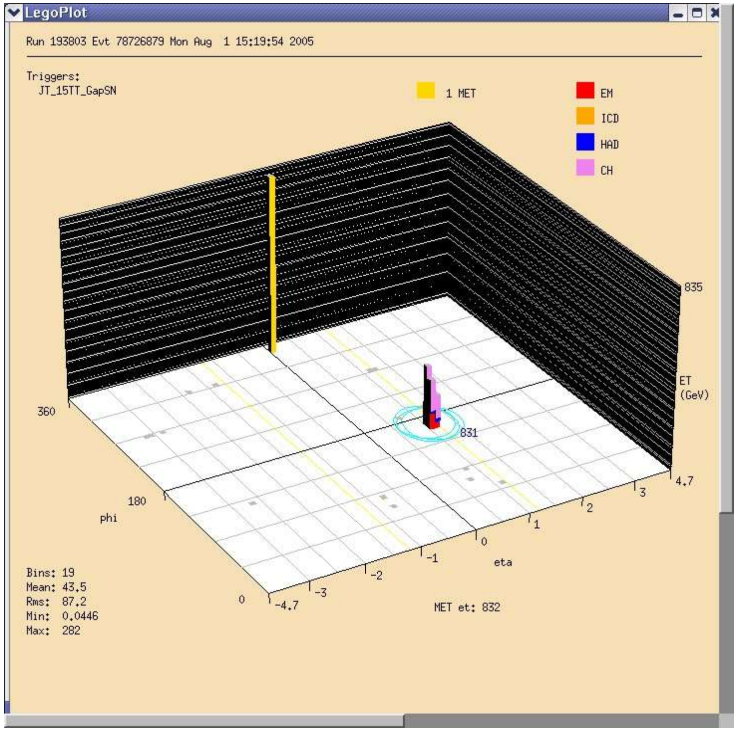
Here are some pictures of a couple weird detector effects (?):

I've contacted the NP conveners about presenting next week...



There are ~100 of these events with a “jet” at eta=~.7 and phi=~1.35

Not a known detector effect...
Not in any isolated set of runs...



Run 193803 has lots of events like this...