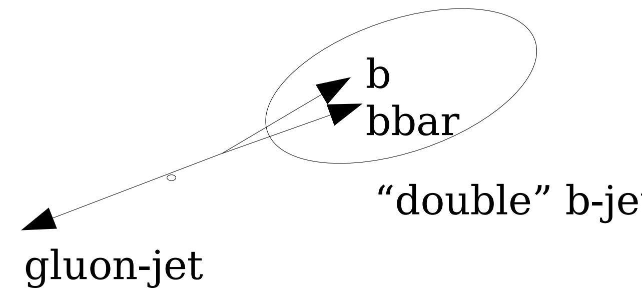
b-ID:

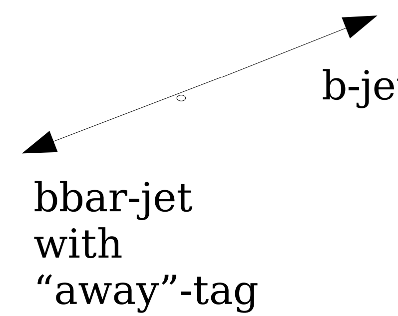
Pass2 – JES 5.3 certification:
NN – Has passed b-ID group review... now addressing questions from the CB.

p17:
The CAFe framework works and should be released in p18.04.00 ...
A first attempt has been made at re-tuning the NN for p17 data/MC. Results were as expected and no major technical hurdles were discovered!
A detailed comparison of p17 / p14 performance is stymied by a MC Lorentz drift bug in p17.

Issues:
There are quite a few outstanding places where our systematics may be underestimated and more studies need to be done for a full p17 certification, but here's a new potential nightmare I thought of last week:



Our data used to measure b-efficiency is “QCD” muon-in-jet data. Many of these events (1/2?) with a high ptrel muon are from gluon-splitting!
But once you require an “away”-tag, the events are mainly “direct” b-bbar.
System8 (method used to measure b-eff. in data) requires both the “unpure” sample above and the “away-tag” sample.



To first order you would like the b-eff. to be the same (for the near b-jet) in both samples. To second order, a correction is made for the fact that it is not. This correction is measured in MC... but up to now, Z->bb or tt or bb (direct) MC has been used for this!
But if “double” b-jets have a different eff. than “single” b-jets, the MC correction will not take this into account since Z->bb, tt, bb MC don't have gluon-splitting!

Solution is we need a sample of “QCD” MC, d0mess-selected to have at least one b and one mu and one jet > 20 GeV, and then measure the correlation there.

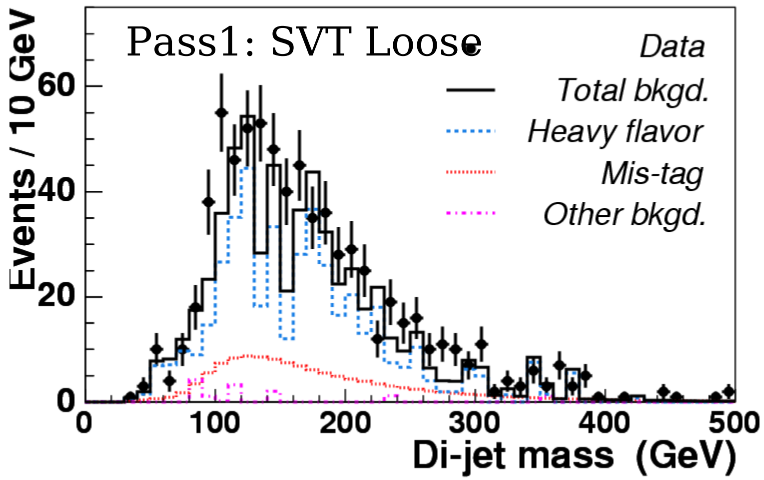
There are other consequences here too. The tagging eff. might be different for g->bb “double” b-jets than for single b-jets. So applying the b-jet TRF to MC “double” b-jets could be wrong! Some physics processes will have a higher fraction of g->bb jets, like W+jets, as opposed to ttbar.

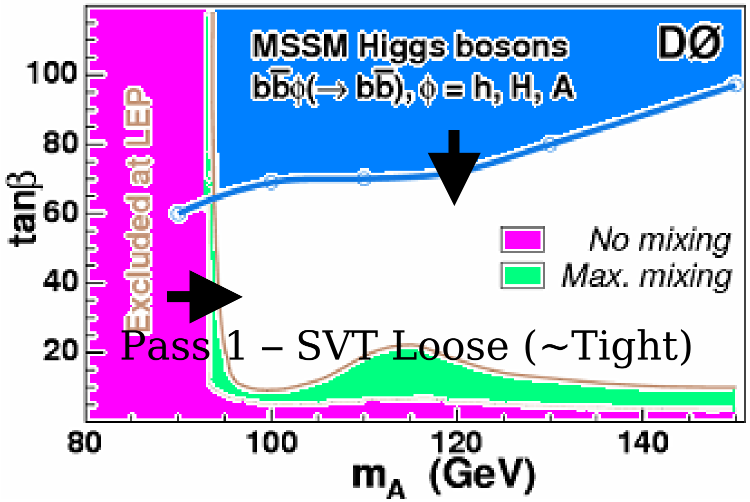
All of this is enough to keep a b-ID convenor up at night !!! :)

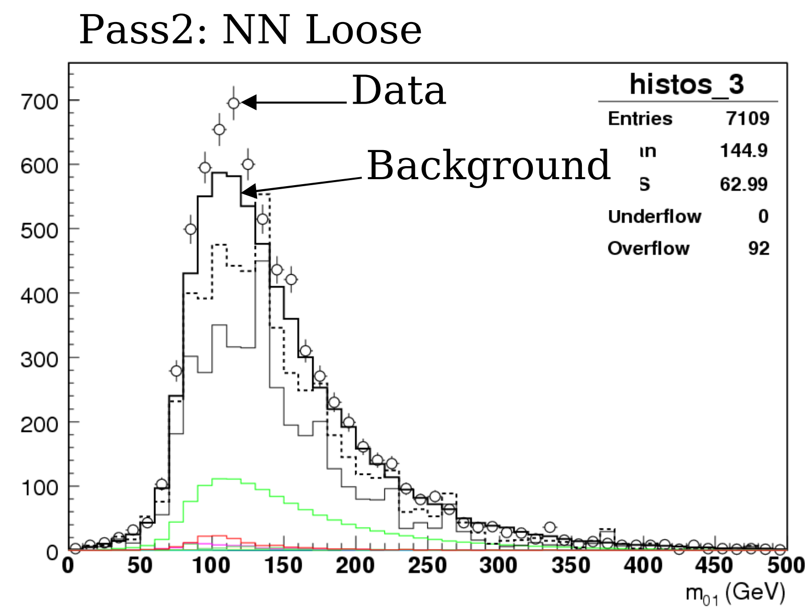
bbH:

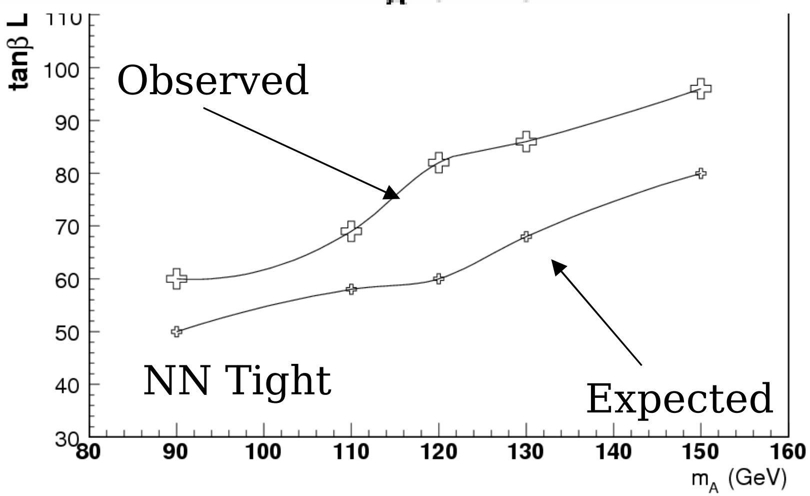
All issues have been settled on how to combine bbh(->bb) and h(->tautau) analyses (p14).
Soon we'll have a set of combined mA vs. tanB exclusion plots, to be included in the h->tautau paper.

Working with Tim Scanlon on a p14 Pass2 bbh(->bb) analysis (also 260/pb), but with his NN b-tagger.
Aim for a winter conference note (and a thesis for him).
Problem right now, he has signal, kind of. :) His background shape doesn't match the data very well. But it's not really a signal shape either...
He has had some problems with lm_access and data quality selection (essentially he's relied too much on other people's code doing what it says it should do... not a good sign for CAFe-style analysis!).
We'll see what things look like after more checks on DQ have been made.
Essentially the analysis is in good shape though, and the (expected!) limits are much better than before. (We've hit tanB=50!)





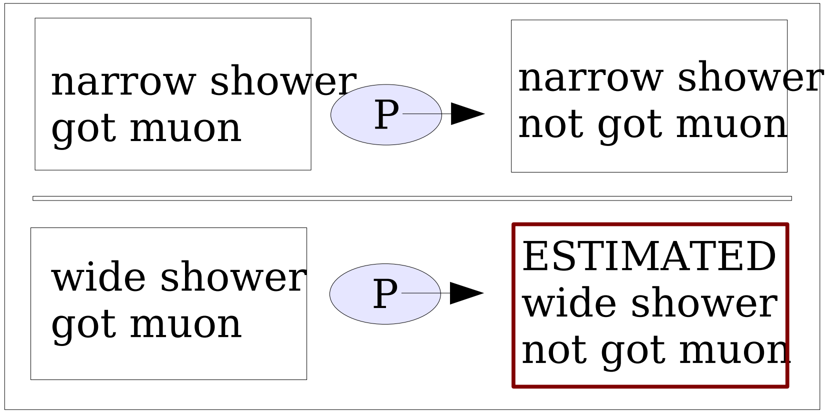




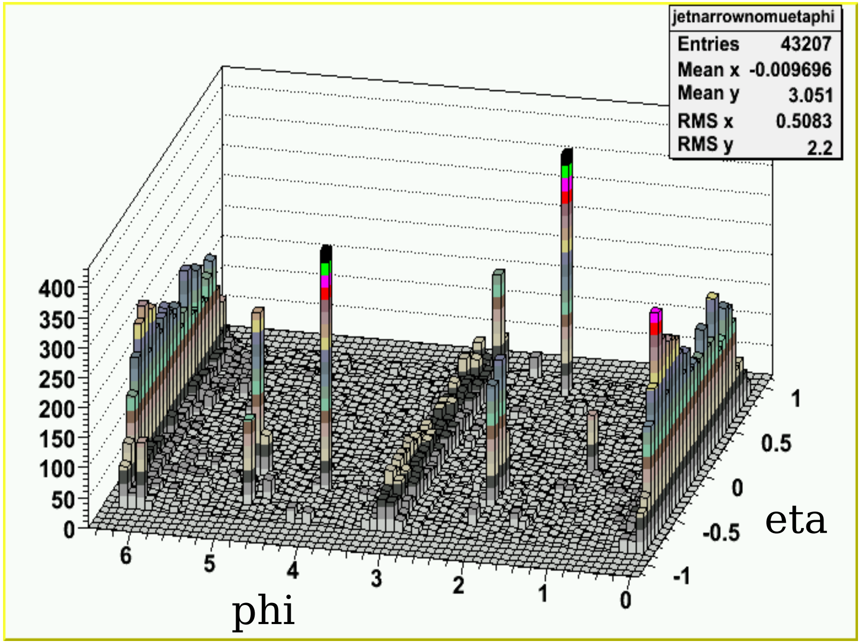
Stopped Gluinos:

- A basic assumption is that the probability to not reconstruct a muon in the muon system is independent of how that muon showers in the calorimeter

    1. measure P(no mu) in the narrow jet sample (etawidth and phiwidth < 0.08) - that we know are cosmics
    2. apply P(no mu) to the wide-shower sample (etawidth and phiwidth >0.08) containing muons - that we also know are cosmics - to obtain an estimate of the background: wide jets with no muons

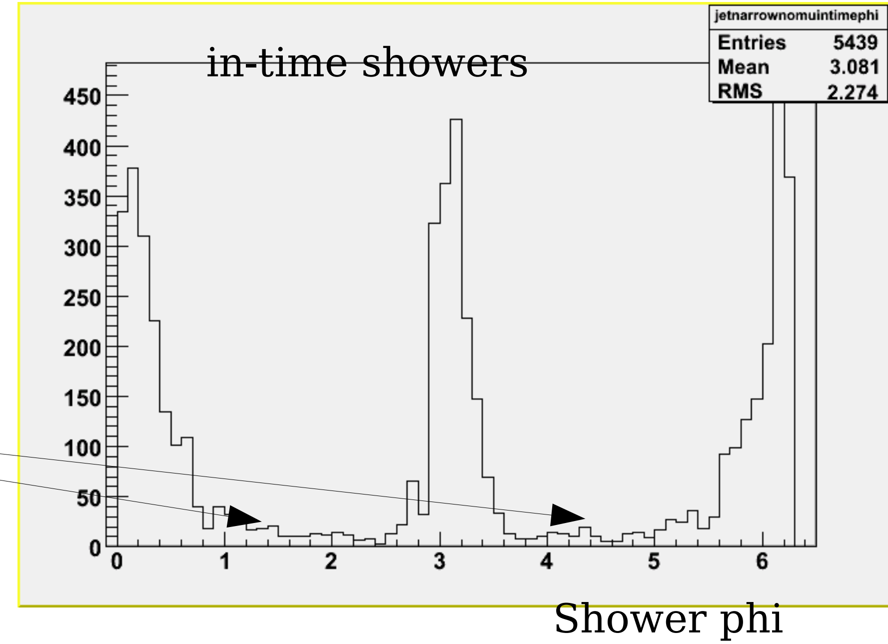


- Some tricky details:
    - The narrow shower sample has some detector effects (hot spots) not present in the wide jet sample
        - They must be removed by cutting regions with more than 50 counts in this plot...
    - The narrow jets contain a contribtuion from beam muons, which have a different energy spectrum, come into the detector at strange angles, and therefore have a different P(no mu)
        - Fortunately, we can study the properties of beam muons, and their difference from cosmics, by looking at "in time" vs. "out of time" muons!
        - They must be removed by requiring:
            - not in regions around phi = 0 or pi
            - looking at high energy showers (beam muons' energy falls off faster than cosmics)

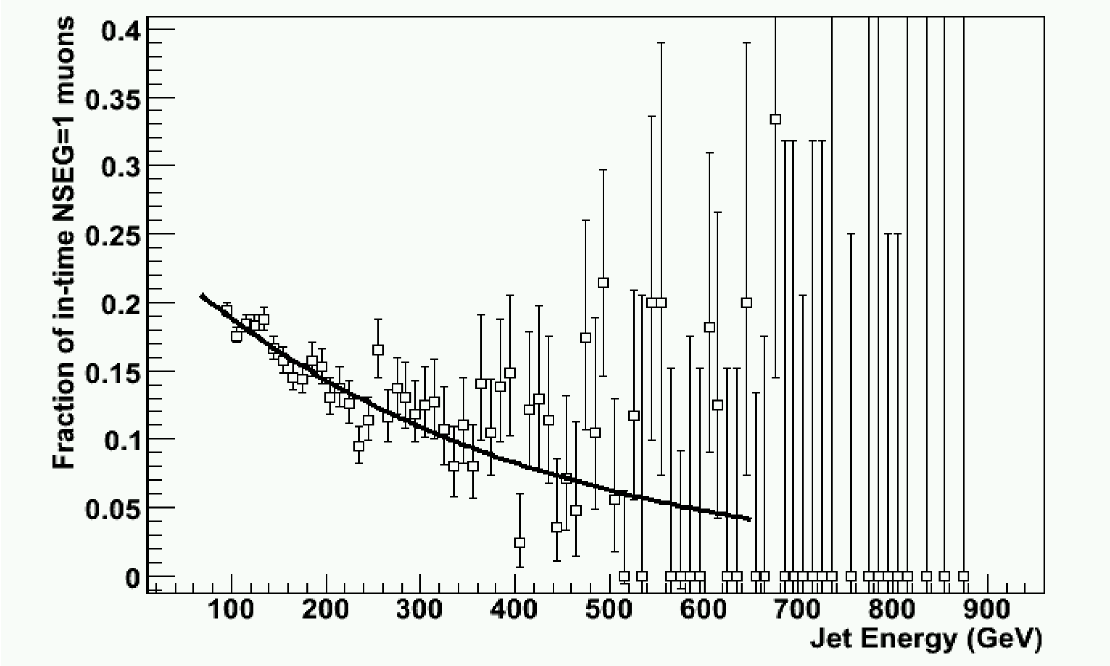


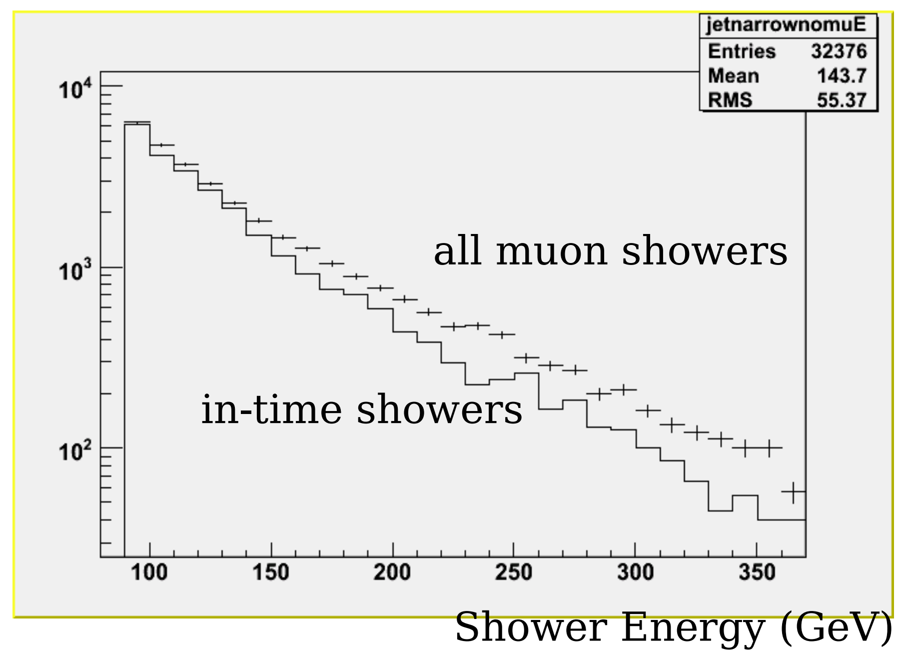
The “in-time” muons are largely the beam-muons, as shown by the phi distribution, which is in the plane of the beam
(and why else would they be in-time...?)

Now look at the energy spectrum of the in-time muons vs. out-of-time muons...
The in-time, beam, muons fall off faster with E.
So, at large E, we're left with a sample of pretty pure cosmics, especially if you're in the “phi-valleys” of the beam-muons...



Should approach eff*20/396 = ~3% for cosmics...



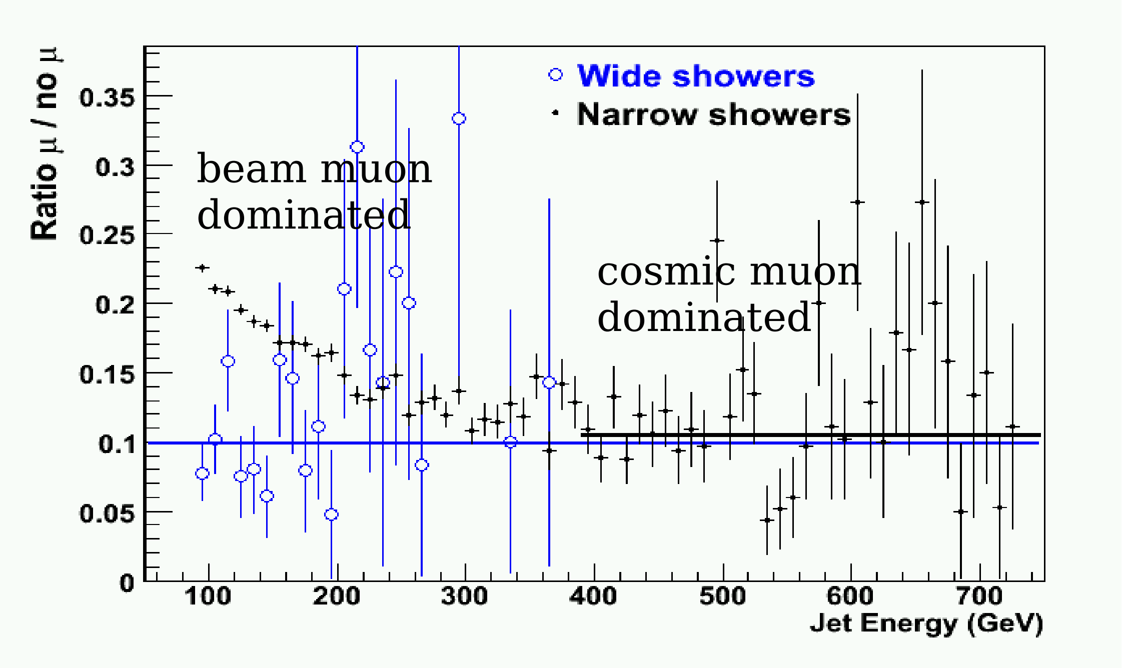


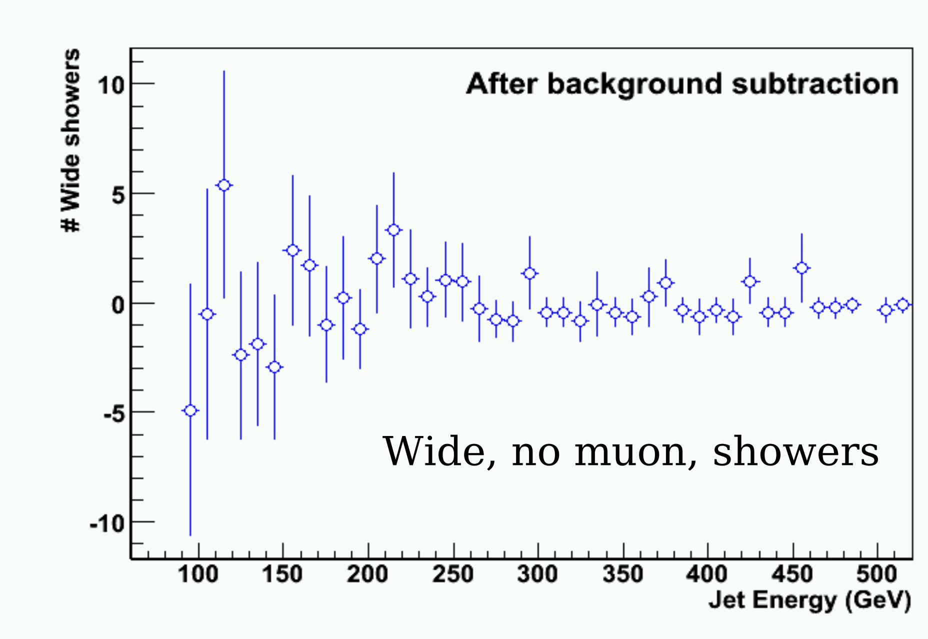
Now measure P(no mu) as a function of energy for narrow showers... and you see that it approaches 10% in the high E region, which is dominated by cosmics.

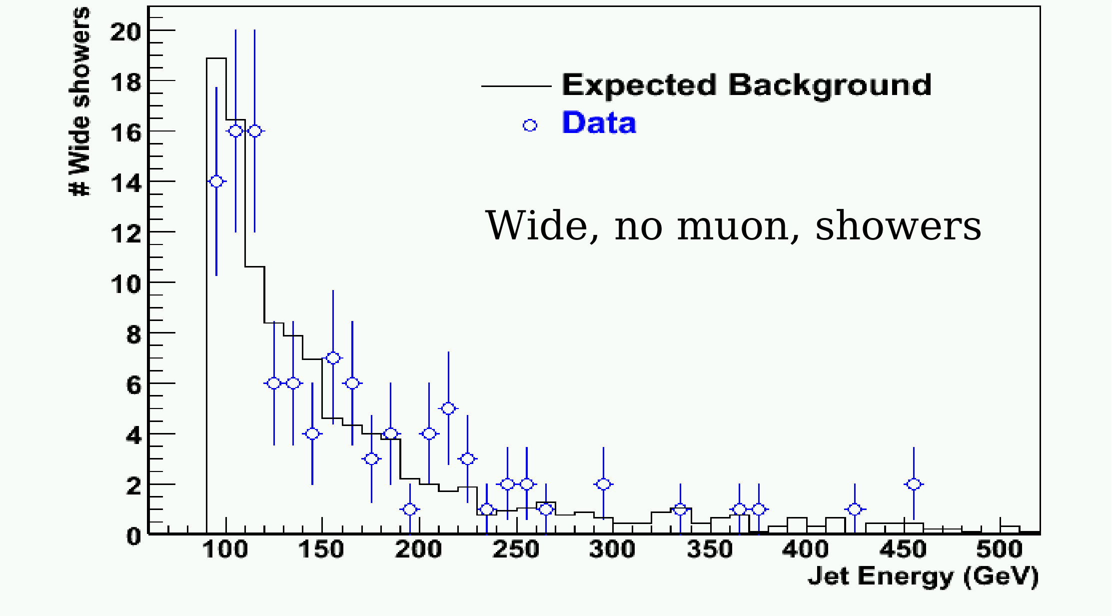
This 10% also happens to match the wide-shower P(no mu) fairly well (which is also dominated by cosmics, unless there's gluinos!).

Apply P(no mu) to the wide-shower with muon data sample, to predict the background...

Data matches background pretty well.No big bumps are observed after background subtraction. (:







Other issues:

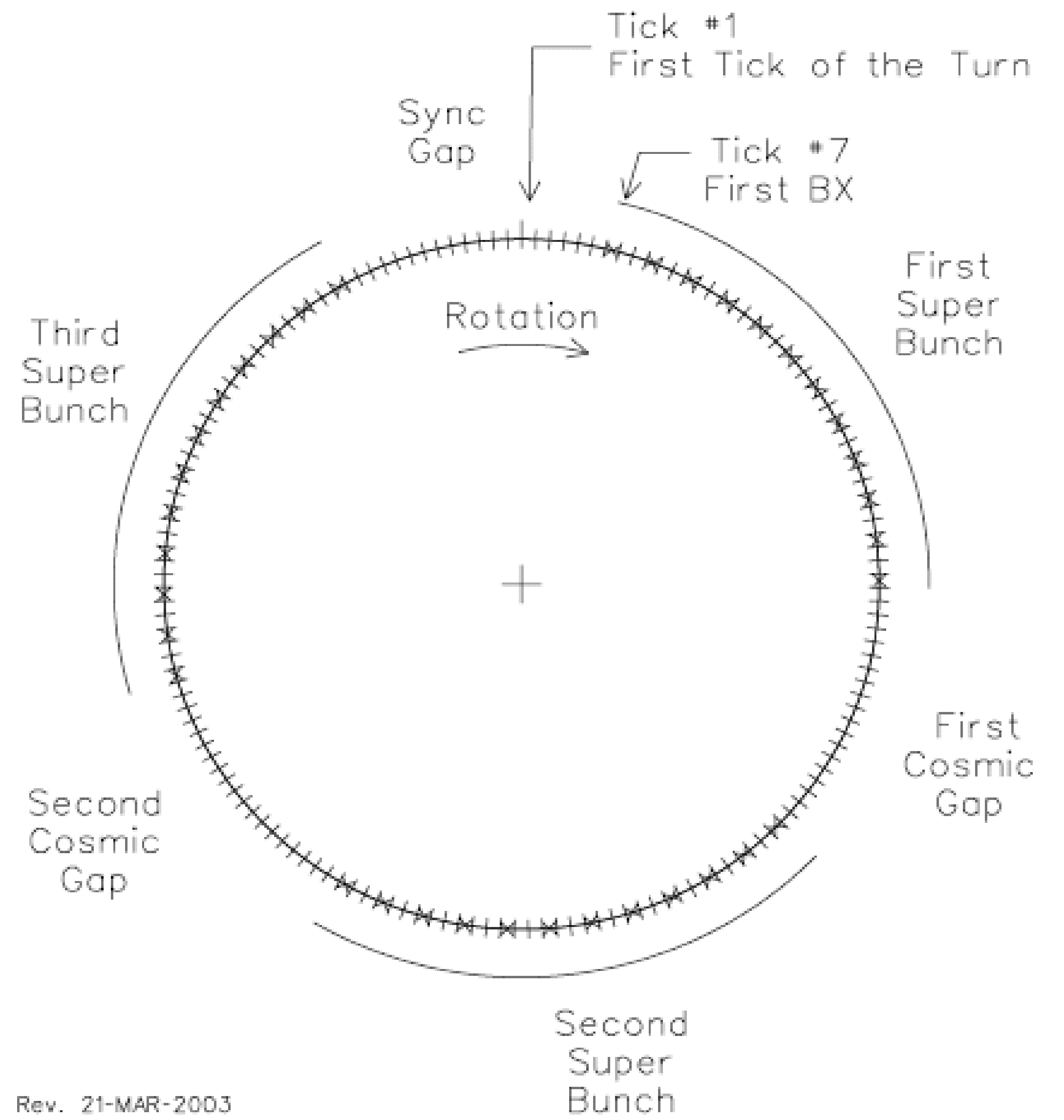
Measured the inefficiency of the GAPSN trigger requirement due to min-bias interactions overlapping with the event.
Used the QCD skim and the JT125_TT trigger, measured how often the GAPSN_JT65 trigger fired also.
Efficiency was 75% average over the PASS2 dataset, but is lower at higher instantaneous luminosity... need to convolute somehow... yuck!

Calculated the inefficiency due to the LiveBX trigger requirement. :)
It turns out (no pun intended) that only:
3*7*3*12/1113 = 68%
of “bunch-crossing time intervals” are live.

Dan Edmunds says it is possible to trigger during the two “cosmic gaps”, an additional 12 crossings per turn, or 21% of the turn time, but not during the “sync gap”, the remaining 11%, during which crates can perform “housekeeping” and are not required to be able to read-out.
I've put in a request to the TB and Marco for a new trigger:
L1: LiveCosmicBX + CJT(2,5)
L3: JT65_TT

No one has ever used the CosmicBX L1 term before, so who knows what will happen... D0 might catch on fire! :)

At high luminosity, or at the LHC (?), the cosmic gaps might be the main time during which backgrounds are low enough that gluinos could be seen.



Outlook:

Polishing up the MC simulation, and making more MC (sorry, wakefield!)

Given 20 events observed, 20+-5 expected, accepence of .37+-.1, and luminosity of .35+-.02: can exclude a 170 fb stopped gluino cross section for a mass of ~500 GeV...
predicted is only 2.5 fb.

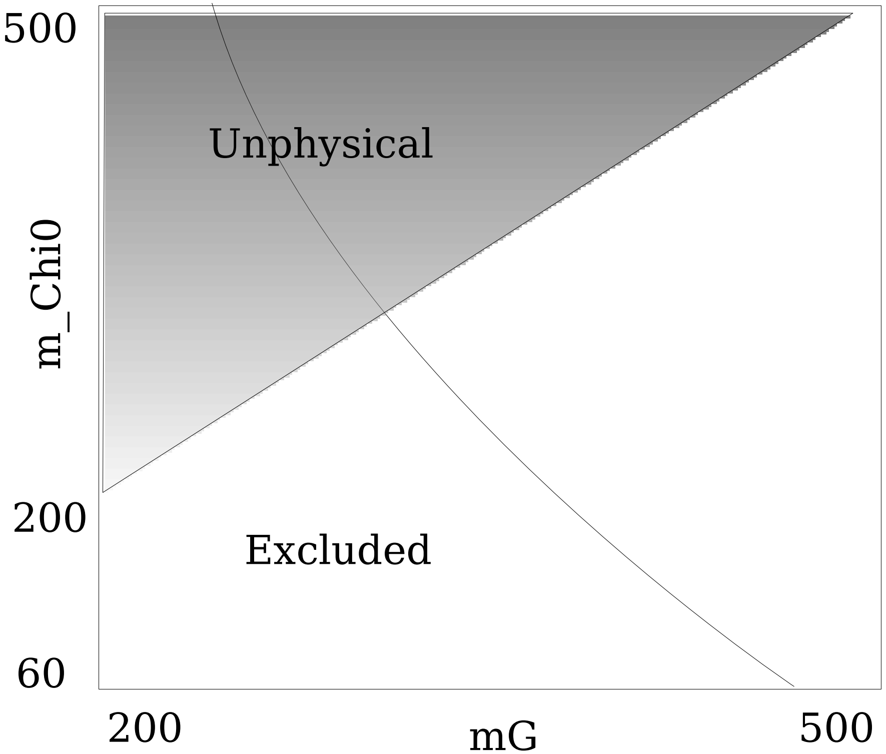
But at ~300 GeV, we can exclude 300 fb...
predicted is ~250 fb.

What really hurts the limits is that more than half of the decay energy goes into dark matter! :
jet energy = (mG^2 – mChi0^2) / (2 mG)

Also, currently investigating the Gulino decay G->jj'Chi0, i.e. the two-jet decays. The branching fraction to two jets is possibly as high as 50%, and may be a more distinct signiture. No two jet events with dphi<2 and jetpt>90GeV exist in the p14 PASS2 dataset on the GAPSN trigger with no PV.

Still aiming for a winter conference note.

My dream...



My nightmare! :)