

Higgs Physics Group: Status Report

- ◇ Main S.M. Channels
 - Verify SHWG
 - Triggers
 - data
- ◇ Additional Channels
- ◇ Wait for $>2 \text{ fb}^{-1}$?
- ◇ Organization/News

**Names shown are subset: See web for all*

1st Step: Checking SHWG

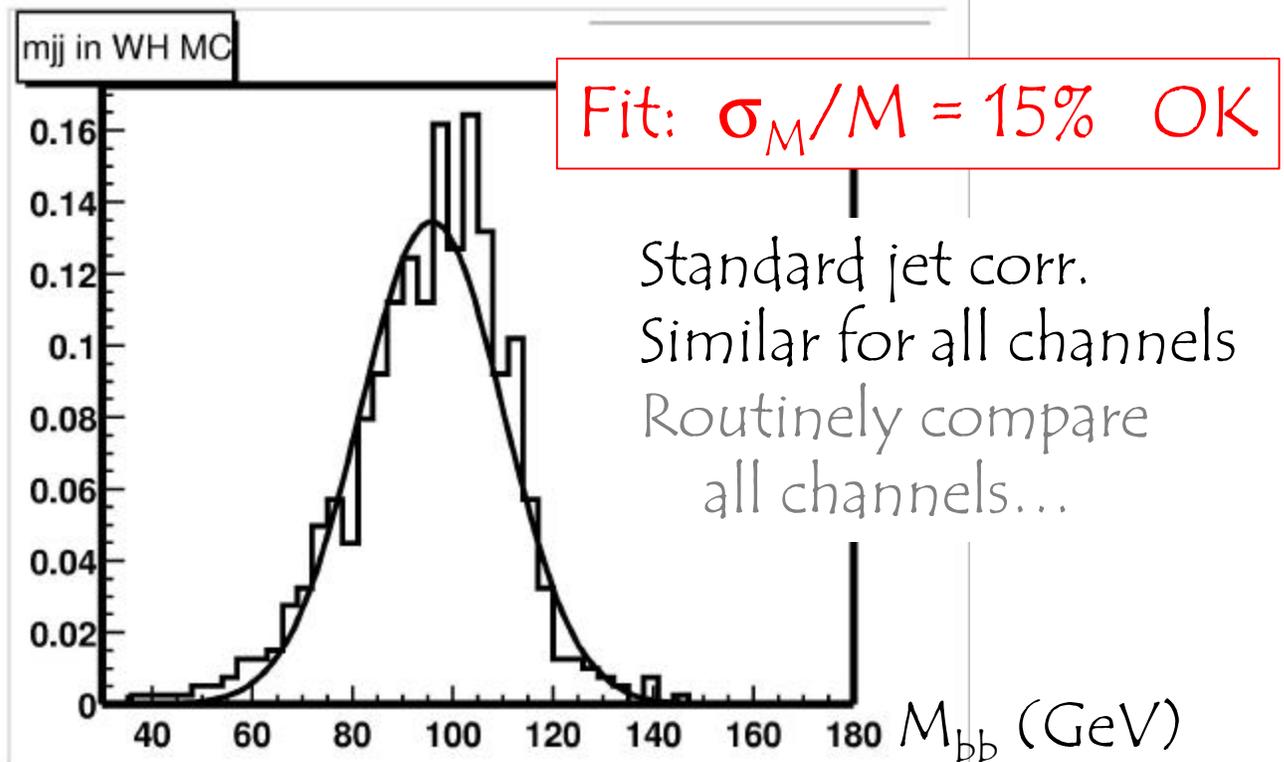
- ◇ Standard Model, low mass channels
 - Now (finally) have analysts for all major associated production final states, WH & ZH (e, μ, ν)
- ◇ SHWG, fast Monte Carlo. Check this with dOgstar
 - Assume dOgstar is what data will look like...
- ◇ Square cuts (ala SHWG)
 - Ignore differences like energy scale (SHWG, 15 GeV = DO, 15 GeV)
Some ambiguity because of this

1st Step: con't

- ◇ SHWG Comparison: **examples**
 - WH → **evbb** (Scott Snyder)
Significance: **S/B = 0.4, SHWG = 0.4**,
but major caveats: MC bugs?, σ ?
1st try optimization also
 - ZH → **$\mu\mu$ bb** (Yildirim Mutaf)
Signal **acceptance 8% = SHWG**
 - ZH → **$\nu\nu$ bb** (Makoto Tomoto)
All final states, cross talk
Acceptance low: Problem is in jets?
(inconsistent w/others?)
- ◇ Other channels, similar...
- ◇ Much additional work: not shown

1st Step: con't

- ◇ bb Mass : Is the baseline OK?



- ◇ Tagging: Is the baseline OK?

– b-ID (Schwartzman & Mutaf)

b, c: yes

Light flavors, 2-3x over SHWG

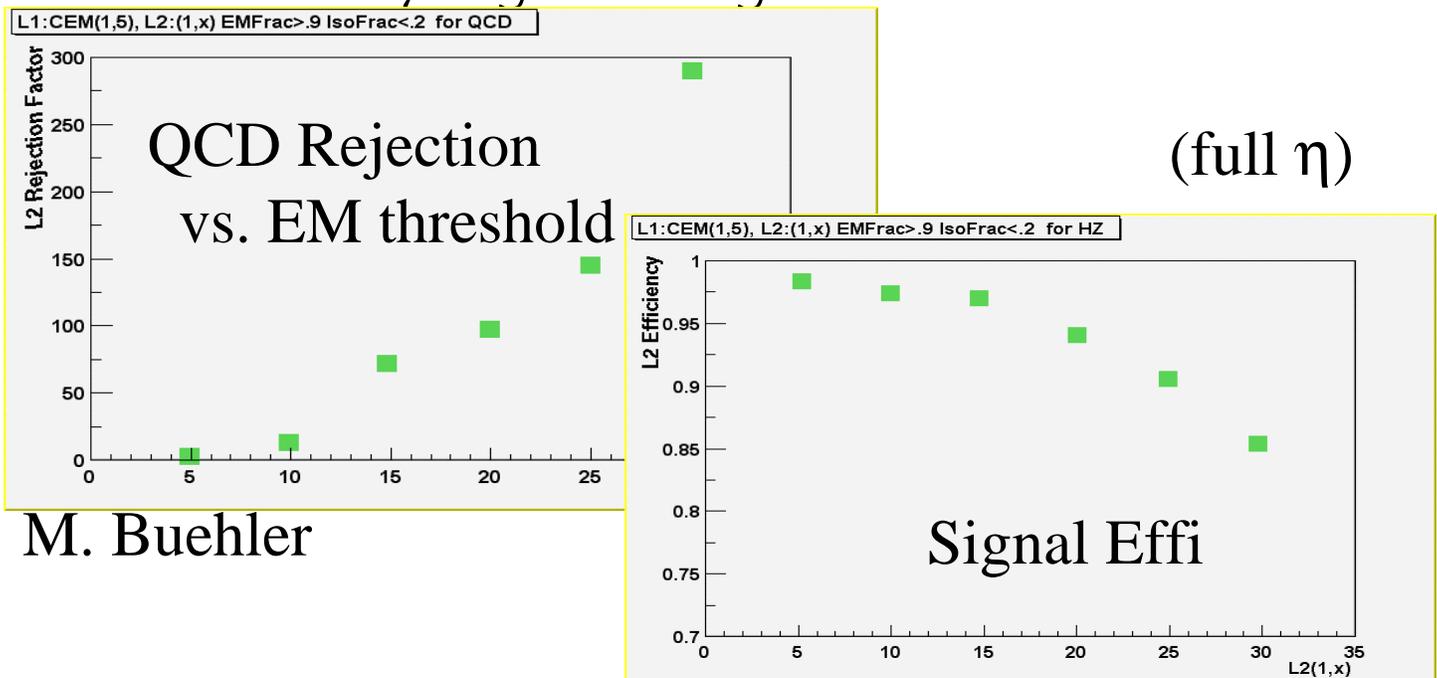
(horizontal axes in SHWG is quark p_T)

1st Step: con't

- ◇ Mixed results thus far
 - Acceptances lower by 20-40%
 - Backgrounds also lower...
 - Teething pains
 - Cross sections...
 - Reliable MC...
 - Light flavor tagging a problem?
- ◇ Jury is still out, but we should know more soon...

Toward Real Analyses: triggers

- ◇ Triggers in place for most, major standard channels (L1, L3)
 - Studying L2 (e.g. ZH \rightarrow eebb)



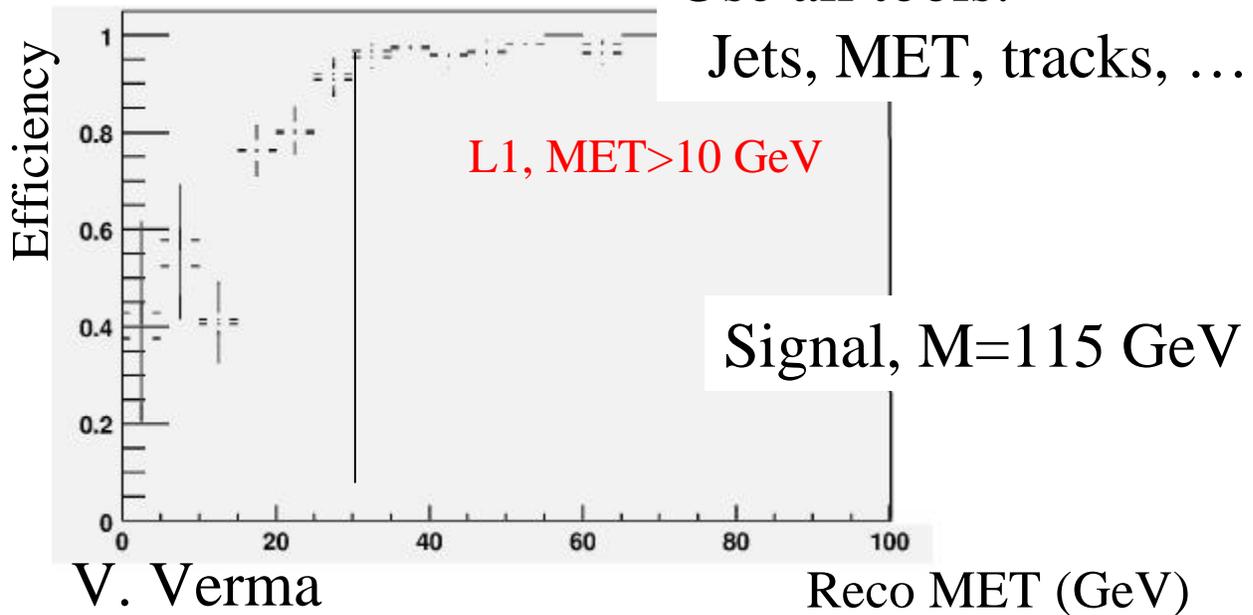
M. Buehler

- ◇ ZH \rightarrow $\nu\nu b\bar{b}$?
 - Difficult trigger, start now
 - Crucial to searches

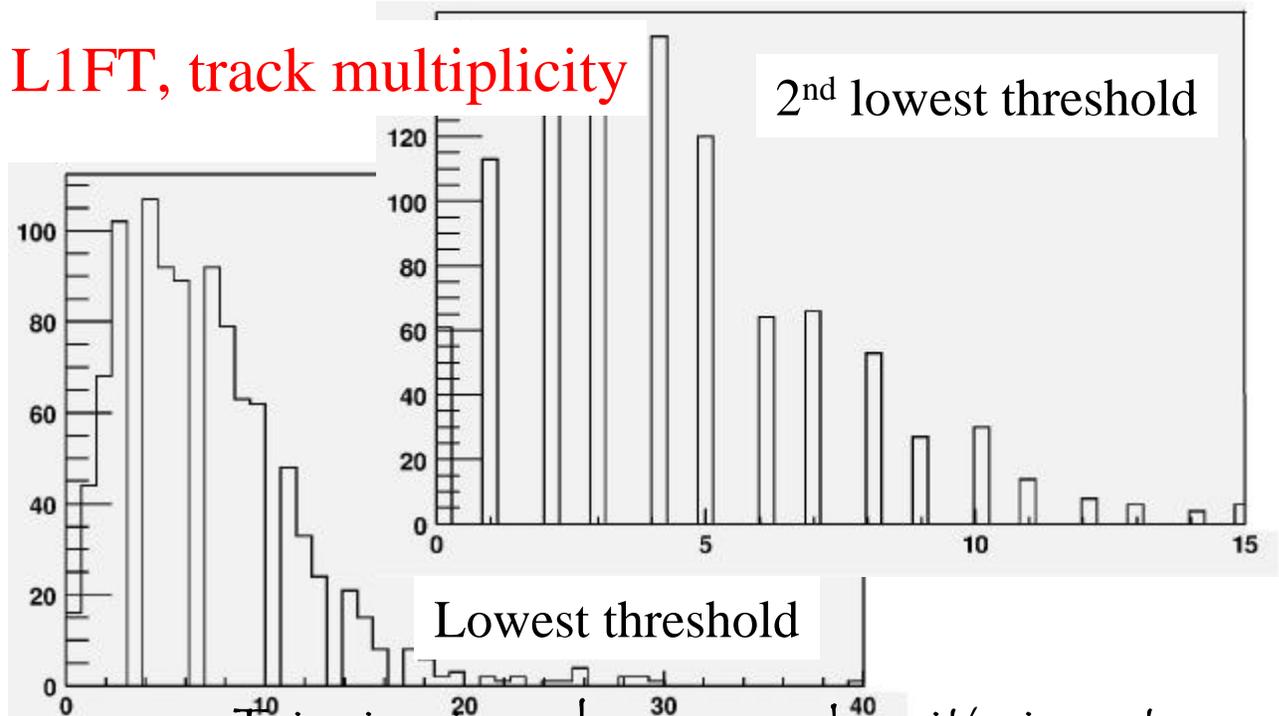
ZH \rightarrow $\nu\nu b\bar{b}$: L1 Trigger planning

Use all tools:

Jets, MET, tracks, ...



L1FT, track multiplicity



Trigsim is only as good as it's inputs,
a starting point.

Toward Real Analyses: Data

- ◇ Streaming for single- and di-lepton channels
 - Suyong + top group (Markus)
- ◇ Significant effort pre-Moriond
 - Next update, 10 days...

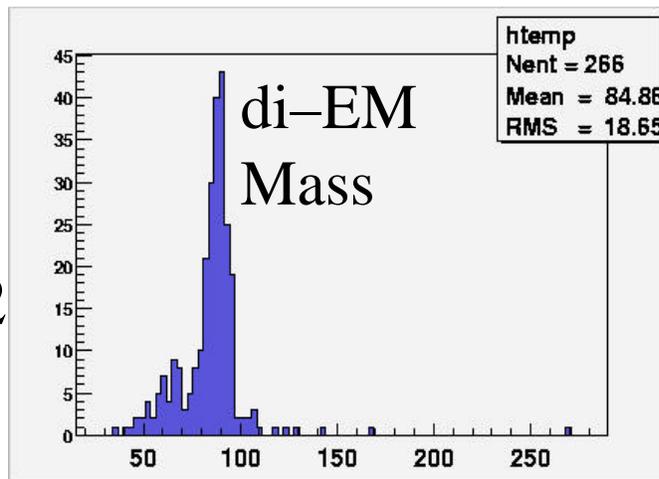
Additional Channels

- ◇ 3 areas active:
 - SUSY $h+bb$
 - $H \rightarrow \gamma\gamma$
 - $H \rightarrow WW$
- ◇ $h+bb$ (Avto & Levan)
 - $\tan \beta$ enhanced channel
 - CDF: results from run I
 - Work in a number of areas:
 - SHWG cross-check
 - Trigger studies
 - How to estimate the background?
 - special runs and MC tuning?

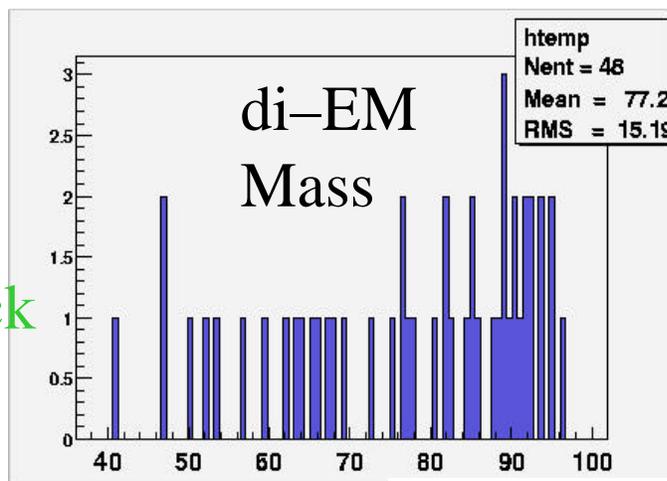
Additional Channels

- ◇ $H \rightarrow \gamma\gamma$ (Alex Melnitchouk)
 - Run I, 78.5 GeV (DO), 82 (CDF)
 - LEP, 114.1 GeV (again...)

EMID
certified
iso/emf + χ^2



EMID
certified
iso/emf + χ^2
+ NO track



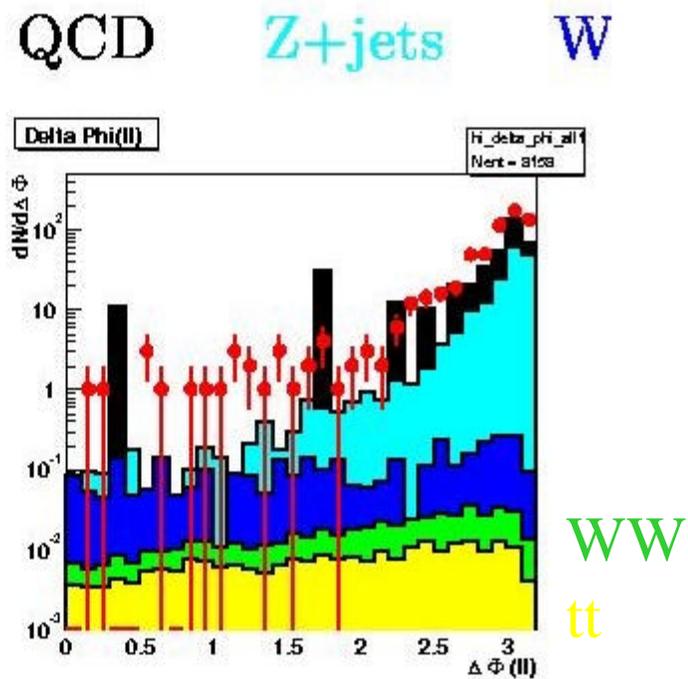
“No” Z’s: good
QCD next...

Additional Channels

- ◇ $H \rightarrow WW$ (Marc Hohlfeld)
 - Same starting sample as $\gamma\gamma$
 - Tracking data vs. MC as cuts are applied
 - Limited QCD bkg. statistics

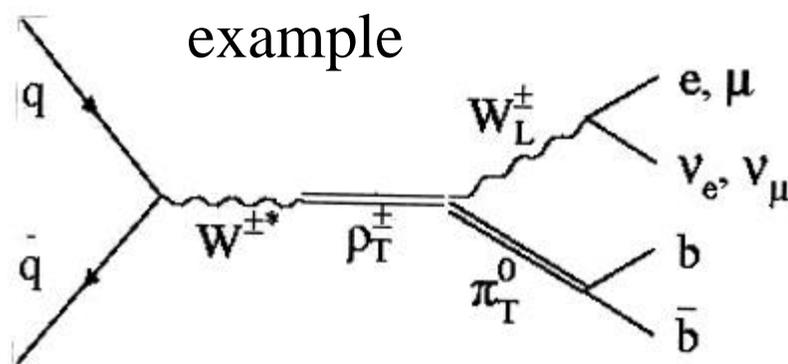
$\Delta\phi(l\bar{l})$

ID and kinematic cuts



How long can we wait?

- ◇ With low luminosity, Higgs moves further away
 - Alternatives allowing physics?
- ◇ Technicolor ($\sigma = O(\text{pb})$)



- ◇ Higgs-like final states (and other non-Higgs-like, too)

Technicolor

- ◇ Sensitivity?
 - CDF published from run I
 - DO, low tag efficiency, 3x worse
 - New DO study (Lorenzo Feligioni)
 - Single channel: $W\pi_T e\nu b\bar{b}$
 - $p_T = 220 \text{ GeV}$, $\pi_T = 110 \text{ GeV}$
 - **3σ significance in 200 pb^{-1} !**
 - (usual detector assumptions...)
- ◇ Encouraging those who need early results and are interested in Higgs to work on these...

Organization/News

- ◇ DO Higgs Workshop
 - May 6/7 at FNAL
 - See Higgs group web page
 - Agenda forthcoming
 - Goals:
 - Complete initial MC analyses
 - essentially done, but MC reliable?
 - Technicolor signal as part of routine
 - Revisit data
 - Begin mass resolution studies

Organization/News

- ◇ Working groups formed (Mar.)
 - WH: Parashar, Snyder
 - ZH: Goussiou, Towers
 - SUSY: Babukhadia, Kharchilava
 - Mass Reconstruction: Elvira
 - e-ID: Varelas (web!)
 - μ -ID: Soldner-Rembold
 - b ID: Narain
 - MET: Hobbs (temporary)
- ◇ Others continuing
 - MC: Li
 - ORB: Parashar
 - TB: Choi (+Hays)

Plans

- ◇ Finish SHWG comparison
 - Workshop (+missing MC)
- ◇ Technicolor sensitivities across the board
- ◇ Begin next stages:
 - Focus on data again
 - W + 2 jets, (Z + 2jets), triggers
 - MC techniques for M.V. and mass resolution
- ◇ If there are enough for above, then taus....

Plans, con't

◇ ICHEP

- Obviously, no physics.
- WH/ZH Data: at best collection of $W + 2$ jets and b-tagging plots
- Probably can show $H \gamma\gamma$ and $H WW$ data and background.
- Will certainly have MC sensitivity/comparisons ready.
Do we really want to show these?

Summary

- ◇ Revisited sensitivity
 - 10–30% reduction w/rt SHWG?
 - No extreme problems
 - Obviously, lots to be done
- ◇ Moving toward optimization
 - Grid search done in evbb
 - Mass resolution group
- ◇ Data: triggers, streamed sample.
 - Must emphasize data more
- ◇ Low luminosity: results for $h+bb$, technicolor, $H \rightarrow \gamma\gamma$
- ◇ Workshop in two weeks...