

# SUSY co-annihilation - a few updates for Morioka

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<sup>1</sup>DESY, Hamburg

ILD analysis phone meeting Nov 30, 2016



# News since "News since ICHEP" (ILDphone 161005)

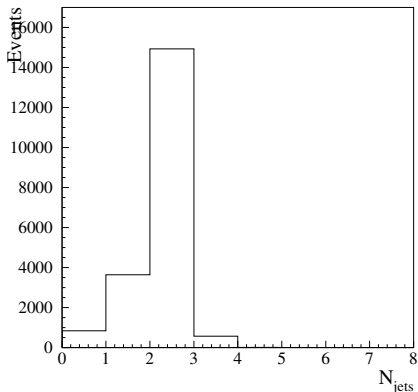
## SM background from FullSim

- **Technical**: Code to fill SGV structures from LCIO-DST.
- $\Rightarrow$  Can use **exactly the same code** to analyse SGV or FullSim.
- But: all main backgrounds ( $\gamma\gamma$  and  $e\gamma$ ) have **far too low stat in FullSim** to be useful.
- So it's mainly a **poof of principle** (FullSim analysed within SGV).
- However:  $WW \rightarrow l\nu l\nu$  is quit signal-like, so allows for studies of "signal" in FullSim (overlay!)  $\Rightarrow$  mod's to analysis due to this.
- Already produced **new ntups** with **overlay-mitigation** procedure.
- **Analysis just started**: Efficiency is un-changed, but need some work on (signal-like)  $\gamma\gamma$  background: Need not only **reject overlay-like part** of the event, but also look **at what was rejected**.
- **Also**: Further work on bosino-sector.

# SGV and FullSim for $WW/ZZ \rightarrow l\nu l\nu$

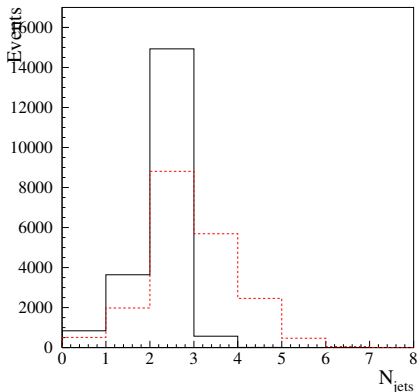
## Number of DELPHI $\tau$ -jets (after preselect)

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- Entirely due to overlay
- Mitigation:
  - Run DELPHI  $\tau$ -jet finder *twice*: First on the full event, then:
  - Reject charged tracks in all jets except the two most energetic.
  - Also reject tracks w/  $p_{\perp} < 750$  MeV.
  - Then run  $\tau$ -jet finder again.
  - Works.



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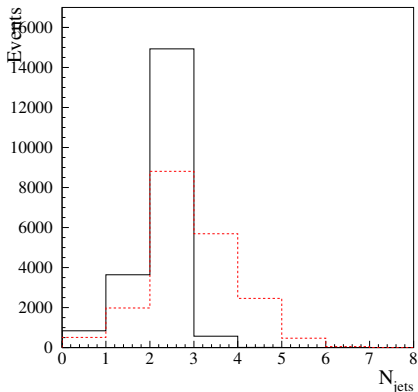
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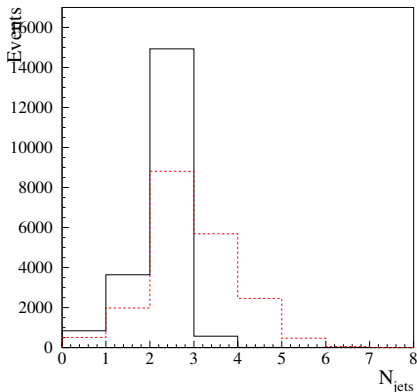
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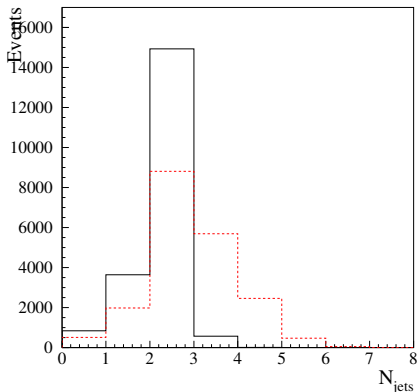
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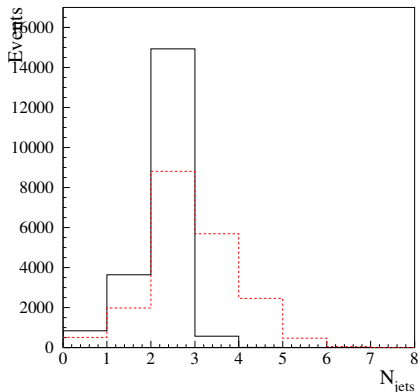
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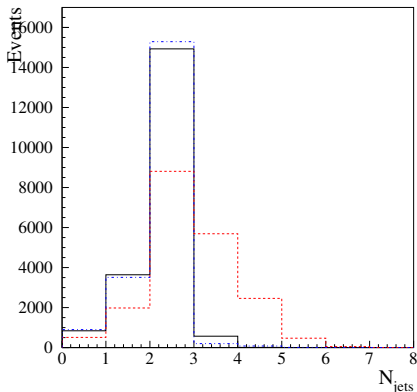
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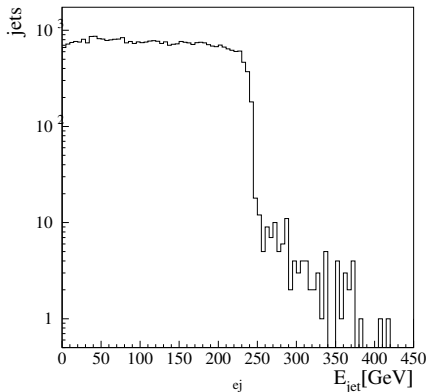
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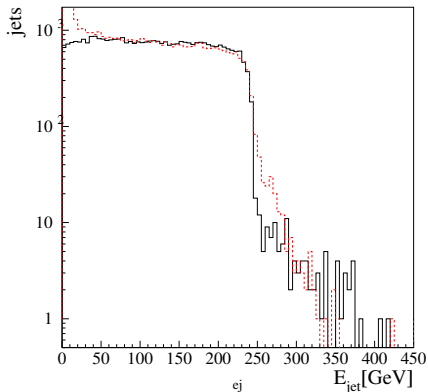
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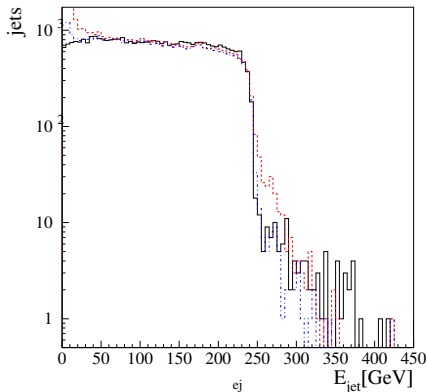
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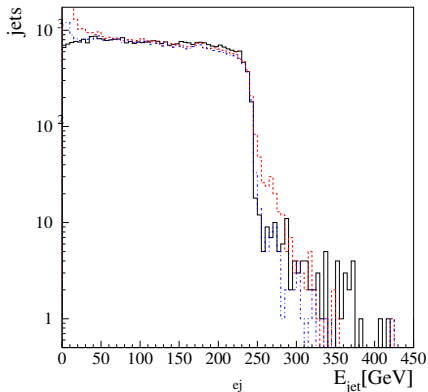
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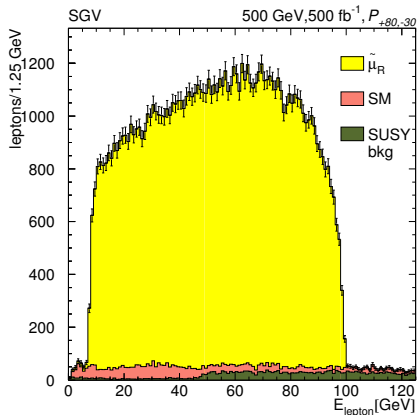
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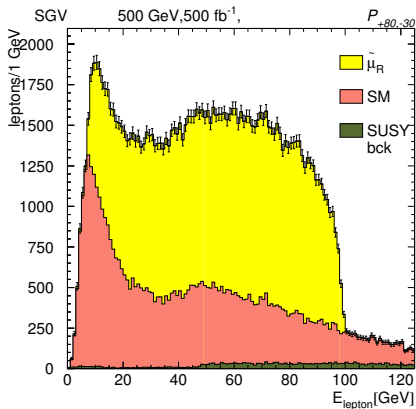
- In SGV, before overlay-removal modifications...
- and after  $\Rightarrow$  Need modifications to selections:
  - One new cut: Demand that the "Rest of event", ie. all not in a  $\tau$ -jet, contains at most 1 charged particle and has  $E < 80$  GeV.



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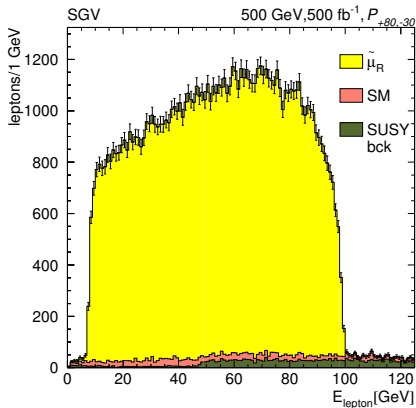
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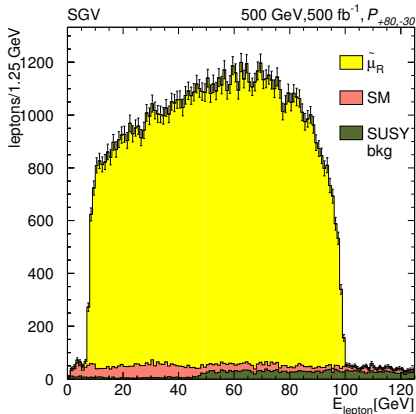




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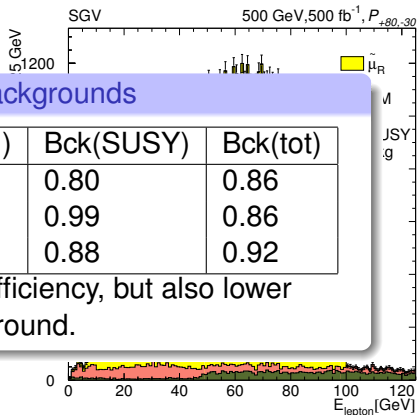
- In SGV, before overlay-removal modifications

- an
- mc

## Changes in Efficiencies & backgrounds

Channel	Eff	Bck(SM)	Bck(SUSY)	Bck(tot)
$\tilde{e}_R$	0.88	1.08	0.80	0.86
$\tilde{\mu}_R$	0.99	0.77	0.99	0.86
$\tilde{\tau}_1$	0.91	0.93	0.88	0.92

⇒ Slight decrease in efficiency, but also lower background.

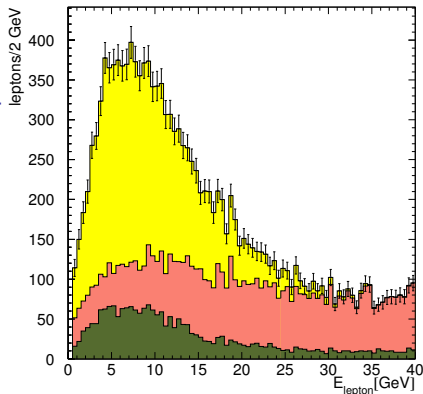


# STC4 bosinos @ 500 GeV: $\tilde{\chi}_1^0 \tilde{\chi}_2^0 \rightarrow \tilde{\tau}_1 \tau \tilde{\chi}_1^0$

- Signature : two  $\tau$ :s + nothing (like  $\tilde{\tau}$ -pairs)
- However: **Cascade decay**, meaning that the two  $\tau$ :s have **different spectra**  
 $\Rightarrow$  can often select first and second decay unambiguously
- The  $\tau$  from  $\tilde{\tau} \rightarrow \tau \tilde{\chi}_1^0$  decay ...
- ... and from  $\tilde{\chi}_2^0 \rightarrow \tilde{\tau}_1 \tau$
- Endpoint of first decay:  $175.0 \pm 1.6$  GeV (true value 174.4)  $\Rightarrow \Delta(M_{\tilde{\chi}_2^0}) =$  ??? MeV, assuming the error on  $M_{\tilde{\tau}_1}$  from the previous slide. **I hope to replace ??? by numbers by next week**

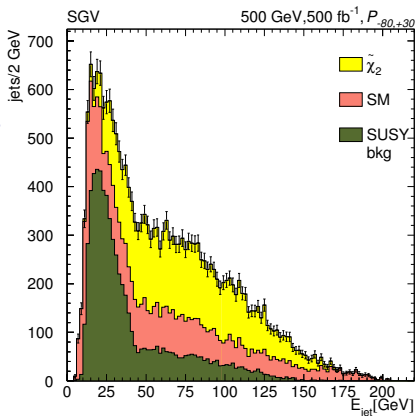
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