Hadron Production in Photon-Photon Processes and BSM signatures with small mass differences

Sw-Ana ILD Meeting

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HELMHOLTZ ASSOCIATION

DESY

Higgsinos and $\gamma\gamma \rightarrow$ low pt hadron overlay

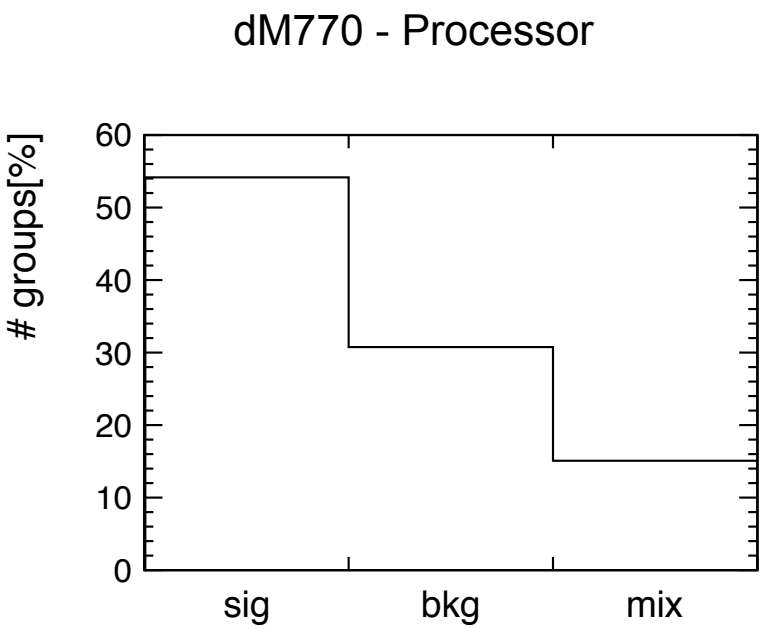
- Light higgsinos $\tilde{\chi}_1^0$, $\tilde{\chi}_2^0$ and $\tilde{\chi}_1^{\pm}$ study by Hale continued - DESY-THESIS-2016-001
- The case studied at two benchmark scenarios

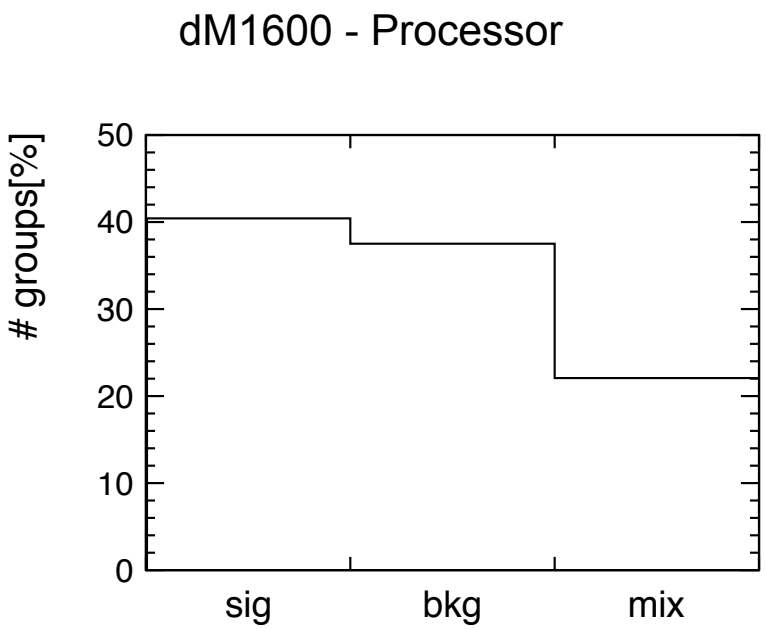
  $\Delta M(\tilde{X}_1^{\pm}, \tilde{X}_1^0) = 770$ MeV => dM770

  $\Delta M(\tilde{X}_1^{\pm}, \tilde{X}_1^0) = 1.6$ GeV => dM1600
- $\gamma\gamma$ overlay and pair backgrounds included in the study
- Vertices of signal and overlay displaced
- New track grouping algorithm was developed to group tracks based on their z0 position
- The algorithm is transferred to a processor named “TrackZGrouping” and results reproduced

Algorithm Performance for dM770

- The processor could very well separate signal and overlay background



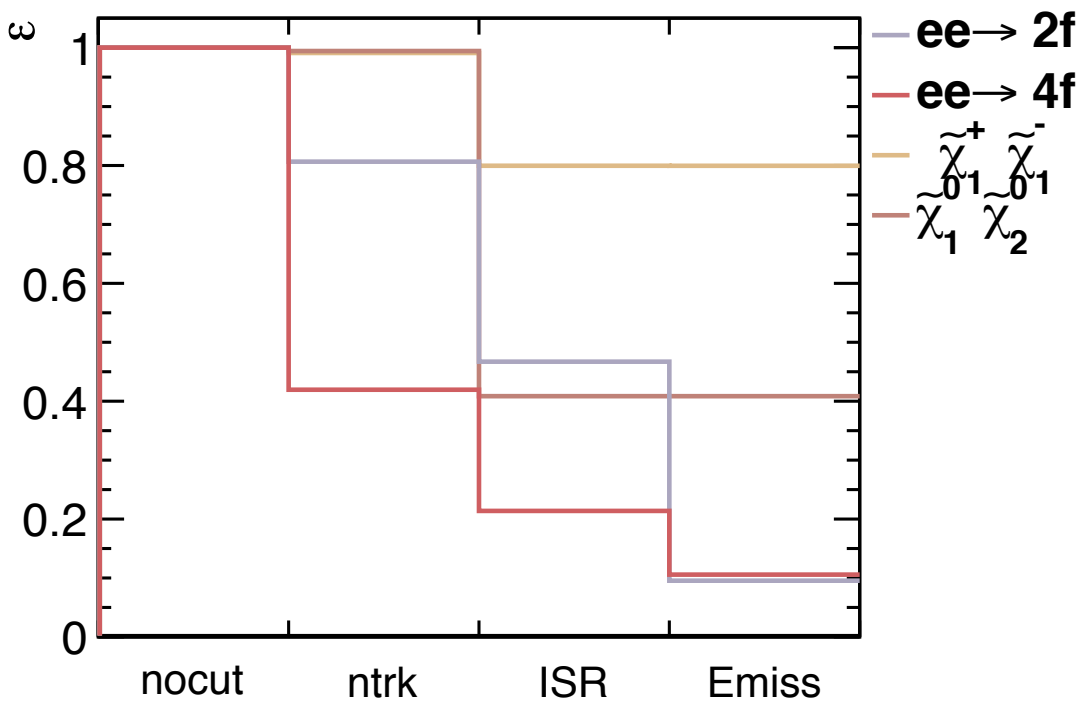


Preliminary cuts for the analysis

- Preliminary cuts applied to remove Standard Model Background (before they are run through algorithm)
- The cut values are taken from previous study with subtle changes (was done on SGV samples)
- Cuts:
  - Number of tracks in an event < 13
  - One ISR photon required (PID == 22, Energy > 10 GeV, angle > 7 degree)
  - Missing energy > 280 GeV
  - One track with highest d_0/σ_{d_0} value is separated
- More stronger cuts maybe applied once the sample passes through the algorithm

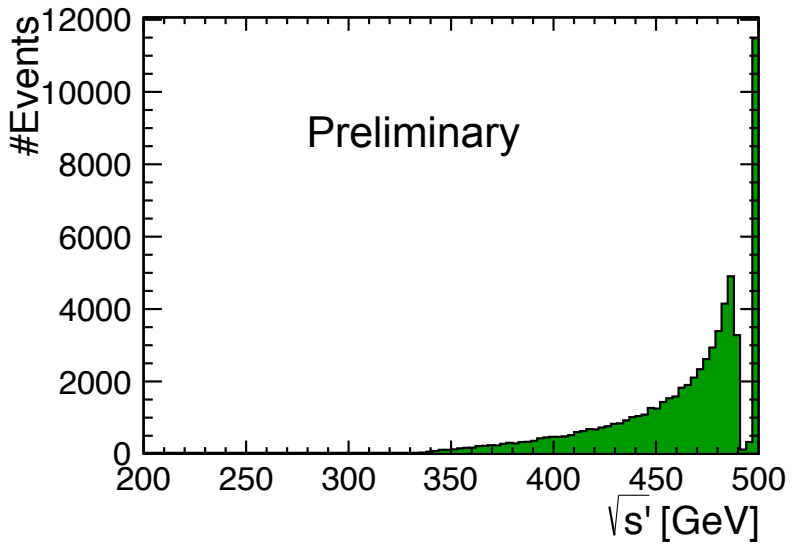
Cut Flow Plot

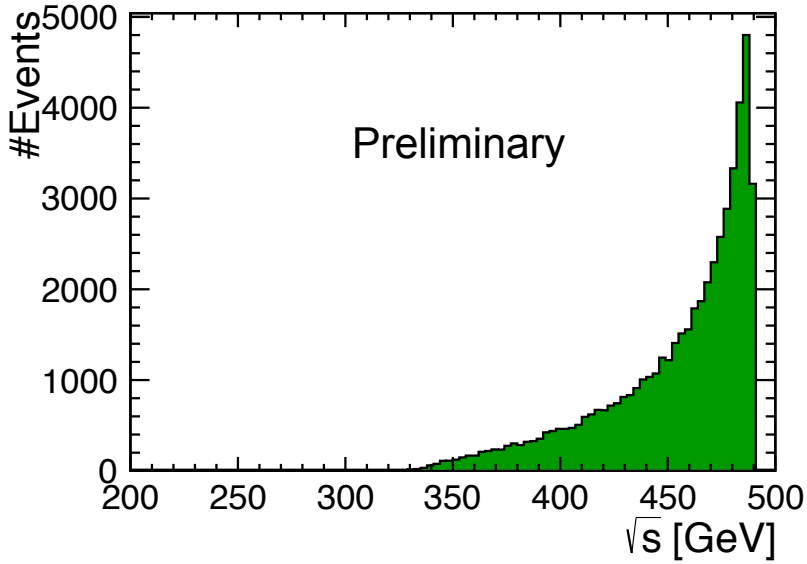
- The Cut flow efficiency is plotted
- All standard model backgrounds not included
- The cut flow efficiency for Charginos better than for other standard model backgrounds



Mass Reconstruction plot for charginos

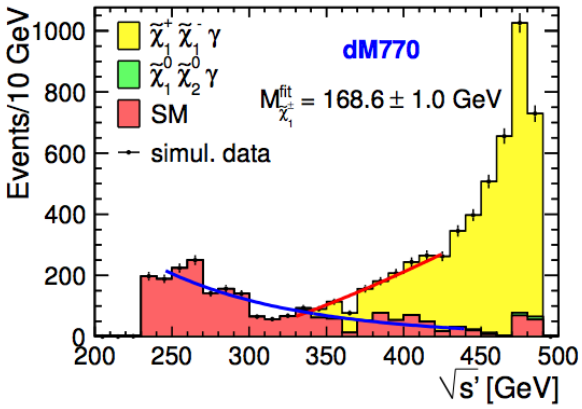
- Recoil mass against the ISR photon is plotted
- Comparison between plots before application of cuts and after cuts are shown
- Events without ISR photon have peak at 500 GeV

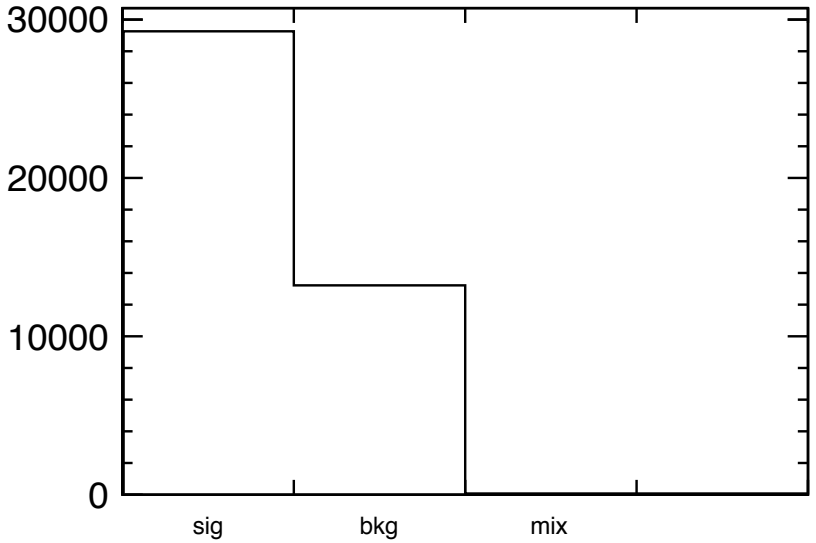


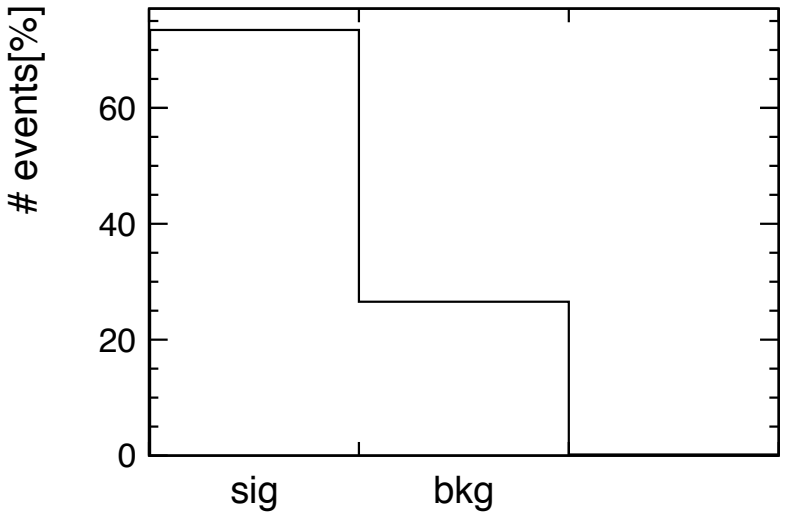


Selection of Chargino events

- Chargino events with $\gamma\gamma$ overlay are taken into account
- Standard Model background not considered in todays results
- Algorithm groups with 1 single track in it are mostly signal groups
- PID's of separated track and groups with single track groups checked to be semi-leptonic







Production in p

Conclusion

- Cuts from the previous study has been applied and a good cut efficiency has been achieved
- The final event selections are in progress
- The mass reconstruction for charginos along with all the Standard Model backgrounds will be done
- Whole new set of results along with candidates for IDR will be shown in next meeting