

Physics issues on triggering

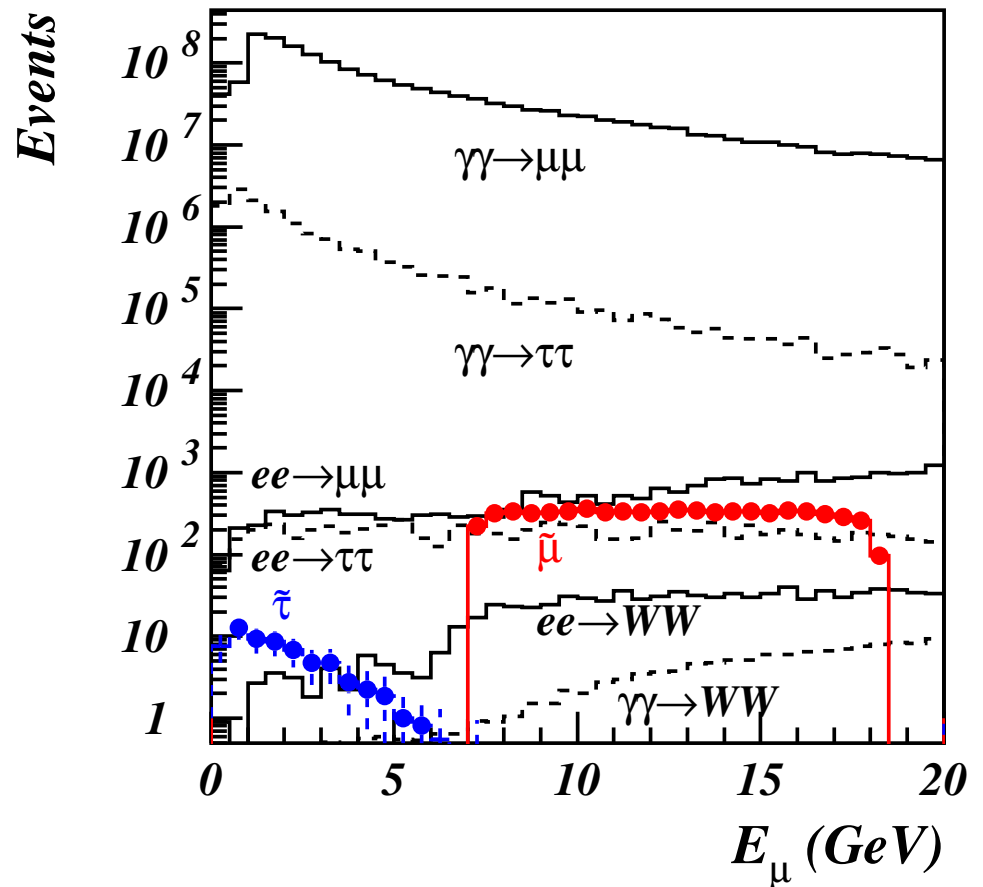
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Physics requirements

- The ILC should be “triggerless” \Rightarrow All events can be analysed offline
- Event rates:
 - “high Q^2 ” (WW, $q\bar{q}$...): 0.1/train
 - Bhabha: 4/train
 - $\gamma\gamma \rightarrow \ell^+\ell^-$: 15/train
 - $\gamma\gamma \rightarrow q\bar{q}$: 200/train
- All events are potentially interesting, e.g. $\gamma\gamma$ and low ΔM SUSY are difficult to distinguish
- VTX and TPC integrate over ~ 100 bunch crossings
 - \Rightarrow a naive trigger would keep all data if $\gamma\gamma$ events are kept
- Can we write everything?
 - TESLA TDR: 1 GByte/s \Rightarrow 10 PByte/a $\sim 10\times$ LHC rate
 - Seems a bit too much

Example low ΔM SUSY

- Signal: $e^+e^- \rightarrow \tilde{\tau}^+\tilde{\tau}^- \rightarrow \tau^+\tau^-2\tilde{\chi}_1^0$
- Because of small $\tilde{\tau} - \tilde{\chi}_1^0$ mass difference the τ have very little energy
- Background: $\gamma\gamma \rightarrow \ell^+\ell^-$ events
($\gamma\gamma \rightarrow q\bar{q}$ background relatively easy to reject)
- Signal selection: Missing p_t (topology) and no electron in beamcal
- Could we dare to run part of the analysis on the trigger farm?



How can we reduce the data size?

- Data volume (TESLA TDR):
 - 50% TPC
 - 40% ECAL
 - 5% VTX
 - 5% rest
- Most of the data volume is background
- For Bhabha events may delete TPC, VTX and ECAL
- ECAL and most of rest:
 - time stamping to one bunch crossing possible
 - can reduce by factor 10 by “event trigger”
 - further reduction would require selection of “interesting region”

- TPC:
 - tracks drift as a whole through the detector
 - can reject tracks by z impact parameter and maybe dE/dx (low momentum electrons)
 - also here a factor 10 may be possible
- VTX:
 - don't see any unbiased way to reduce data volume
 - only possibility would be to select “interesting regions”
- In total a factor 5-10 maybe possible without bias
- Total data volume similar to LHC in this case
- Further reduction requires cut into $\gamma\gamma$ events