THOUGHTS ON TRACKER ALIGNMENT

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SiD Optimisation Meeting

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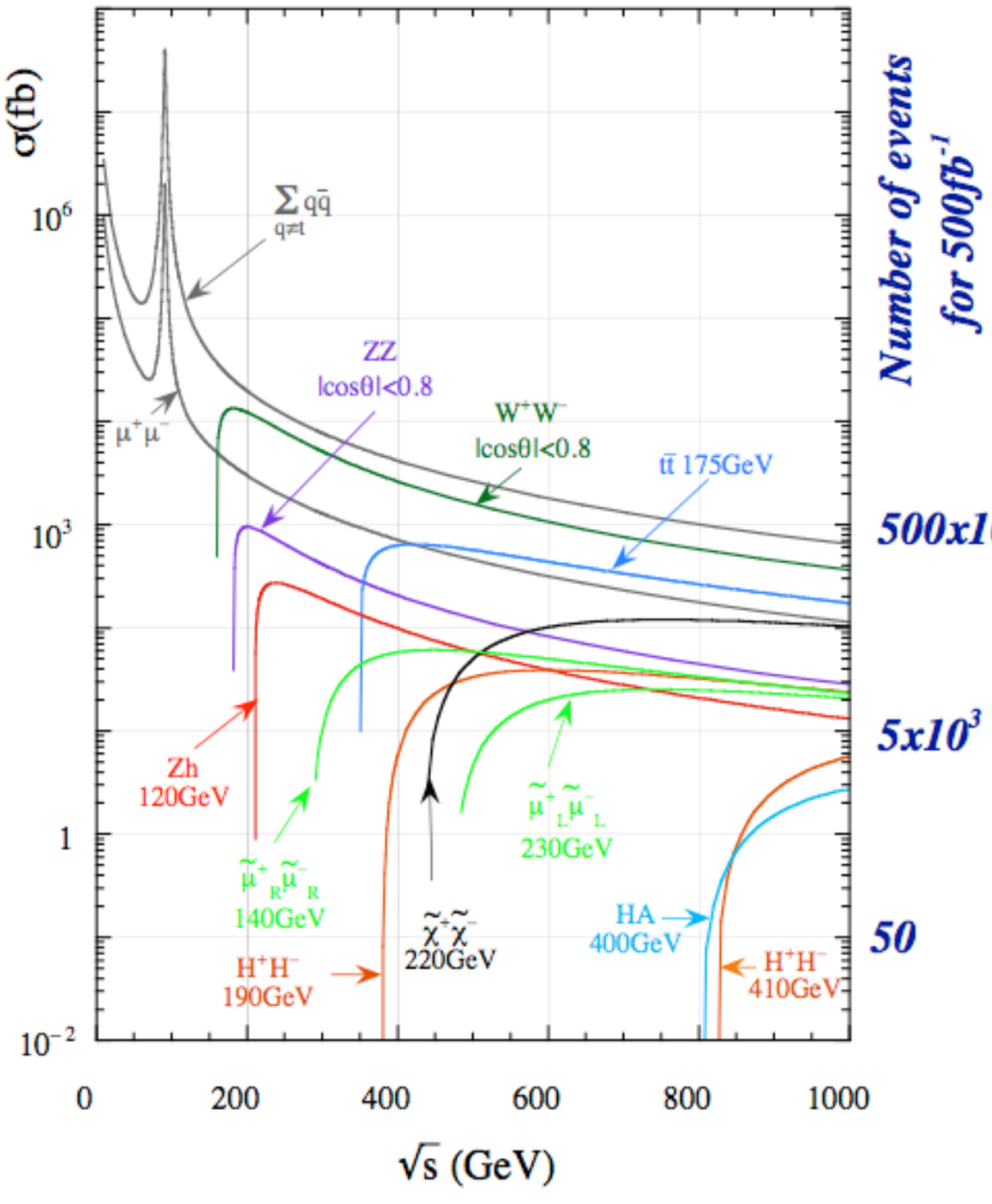
The Issue

- Tracking elements need to be aligned to < resolution
  - Few μm for vertex detector
  - 10-20 μm for tracker
- Alignment inputs:
  - Survey of individual modules
  - Real-time monitoring systems
  - Track-based methods over stable periods
- What conditions do we need for collecting tracks?
- DBD: 1 month ≈ 10^4 high-pT tracks sufficient for OT

Z-Pole or not?



- Cross section ~300x higher than at 250 GeV
- Luminosity ~ 75x lower
- High-pT multiplicity lower(?)
- Back-to-back muons useful
- Could use cosmics???
- ☑ 1 day at Z ≈ 3 days physics
- ☑ 1 day at Z ≈ 4 days muons

CMS

* 2011 data - doi:10.1088/1748-0221/9/06/P06009
* 200,000 parameters including module deformations
* Achieve < 10μm over almost all of the detector
  * 15 million muons
  * 3 million min-bias tracks
  * 375,000 Z->μμ
  * 3.6 million cosmic rays
* Known resonances (Z) especially useful for "weak modes"

To Be Done

- Detailed study of full alignment procedure impractical
  - Can't say exactly how many tracks we need for given physics
  - Any back-of-envelope ideas?
- Estimates of required precision (?)
- Estimate rates of cosmics
- Check number of high-pT tracks from physics
- …