Quirks!
Can we see them?

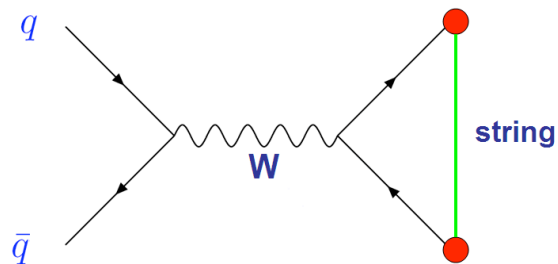Questions following yesterdays discussion

during Z. Chacko's talk

M.Luty
-'connected' particles
-unusual ionization
-annihilation

The LHC era
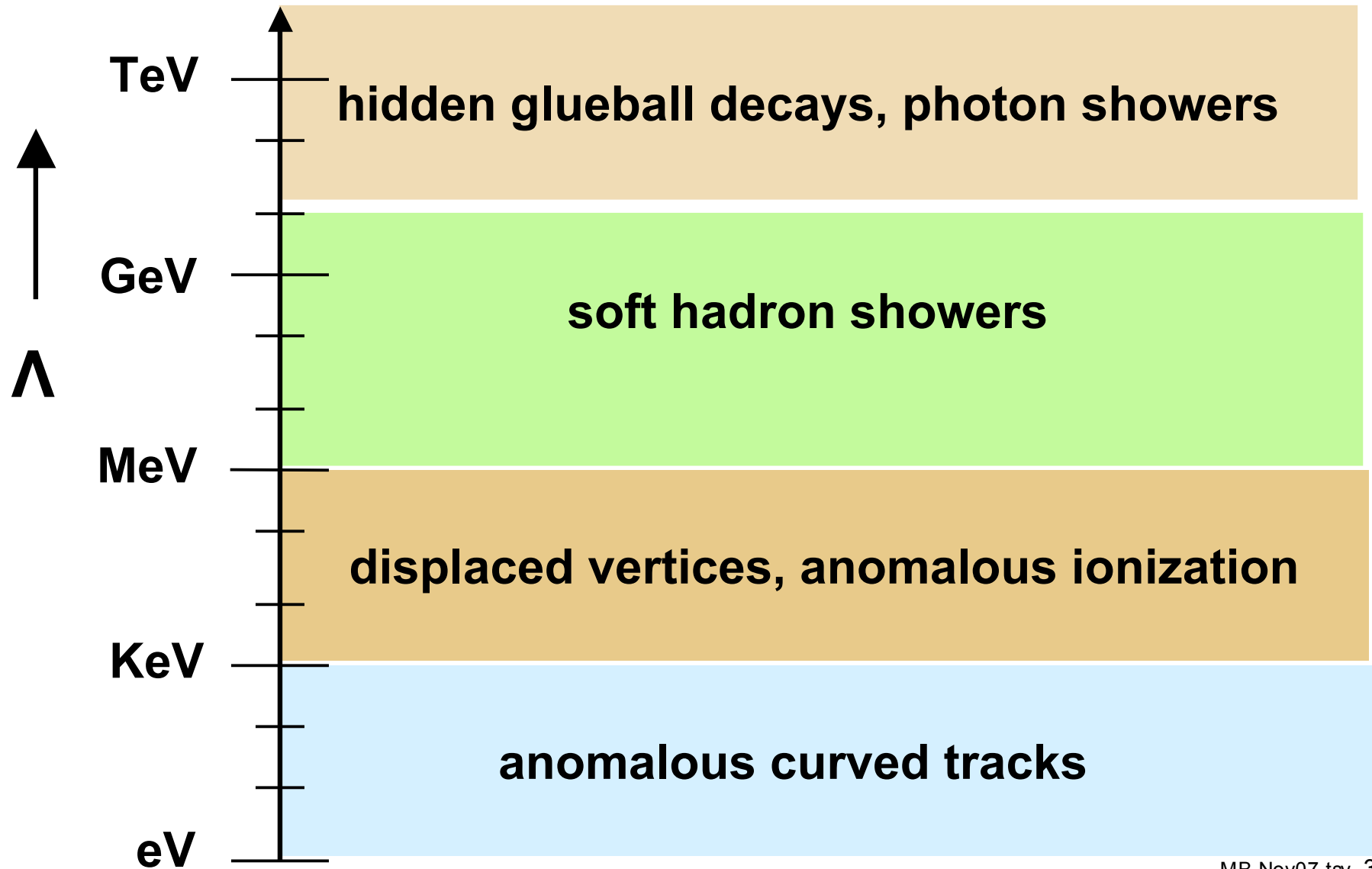could be even
more exciting
than we thought!

Summary of Weird Signatures

hidden glueball decays, photon showers

soft hadron showers

displaced vertices, anomalous ionization

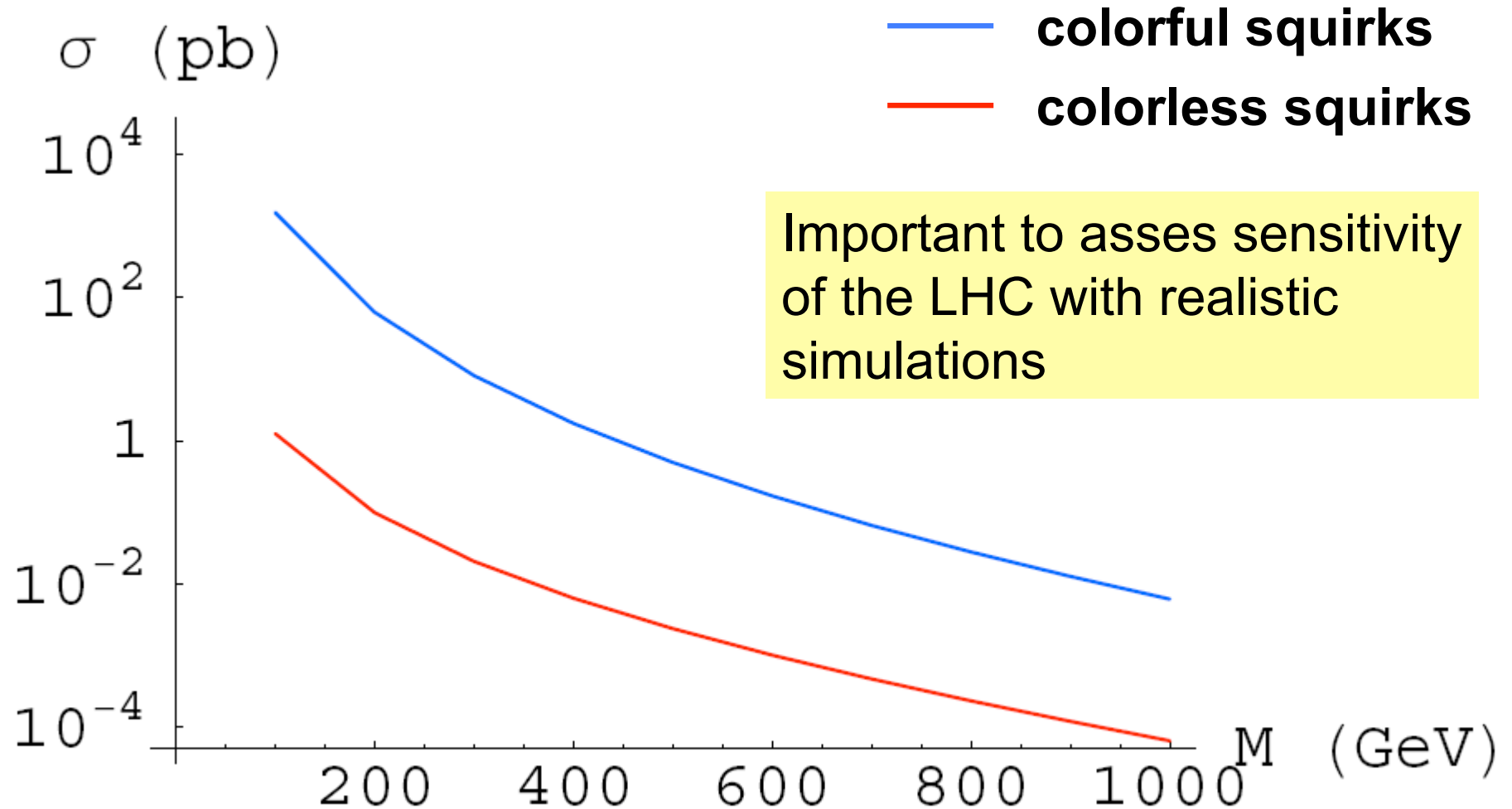anomalous curved tracks

TeV
GeV
MeV
KeV
eV

Λ

Davis 2007

- **Signatures Catalogue: How do we see that there is something unusual in the event?**
    - Quirks emitting photons
    - Quirks emitting hadrons
    - Quirks emitting glueballs. Decay into photons or hadrons. Resonance structures? Fireball?
    - Quirks loosing energy in the detector (like R-Hardons?)
    - Quirks with strange curvature in the B-field of the detectors
    - Quirks causing displaced vertices
    - Quirk pairs causing unusual ionization
    - Quirk annihilation. Special effects/channels to look at?
    - Timing of the signals?
- **What else?**
- **Which one of these signatures can we exploit at the LHC? ? Begs for realistic simulation**

colorful squirks
colorless squirks

Important to asses sensitivity of the LHC with realistic simulations

Similarly: energy spectrum of the photons, hadrons etc.

Experimental Issues

- **Trigger**
  - **THE single most important component to worry about right now!**
    - Most special signatures not usable for present (L1) trigger; needs a high p_T annihilation signature
    - Dedicated High Level trigger selection required?
- **What are the production rates, # photons, energy spectrum?**
  - **Ballpark numbers are sufficient at this time.**
- **Signals realistic for distinguishing from SM tails?**
  - **Eg multi soft photon final state**
    - Min bias events ~ 60 photons/event within ECAL range
    - $2.10^{33} \Rightarrow 4$ events/bx $\Rightarrow$ few hundred photons
  - **Backgrounds in general**
- **Event generation/simulation**
  - **A quirk generator? Preferably not private patches**
  - **Include special signatures in Geant4? Eg quirks interacting with detector**
    - R-Hadron code has been included (combined ATLAS & CMS effort)
  - **Special reconstruction will be needed for some signatures (long strings)**
- **Common signatures with other "unexpected" signals?**
  - **Helps to make a case eg. for trigger tables/analysis streams etc.**