

Footprints of strong electroweak breaking in the sky



DENNIS D. DIETRICH
Goethe-Universität, Frankfurt am Main

arXiv:1206.????

DDD

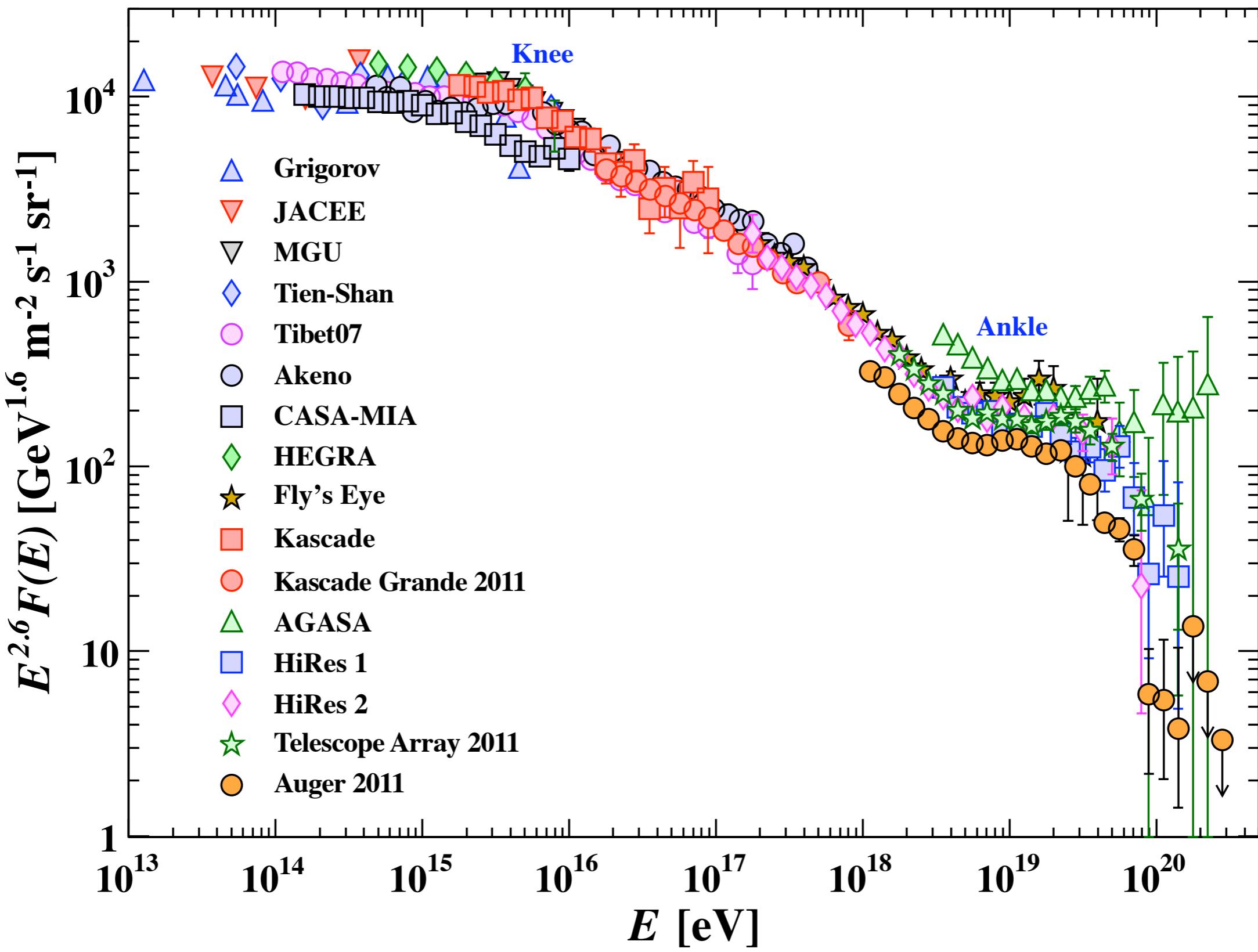
Outline/Motivation

- DEWSB mechanism hard to catch
 - e.g., energy frontier
 - UHECR $s > (100\text{TeV})^2$
 - air showers
 - explain structure in spectrum ?

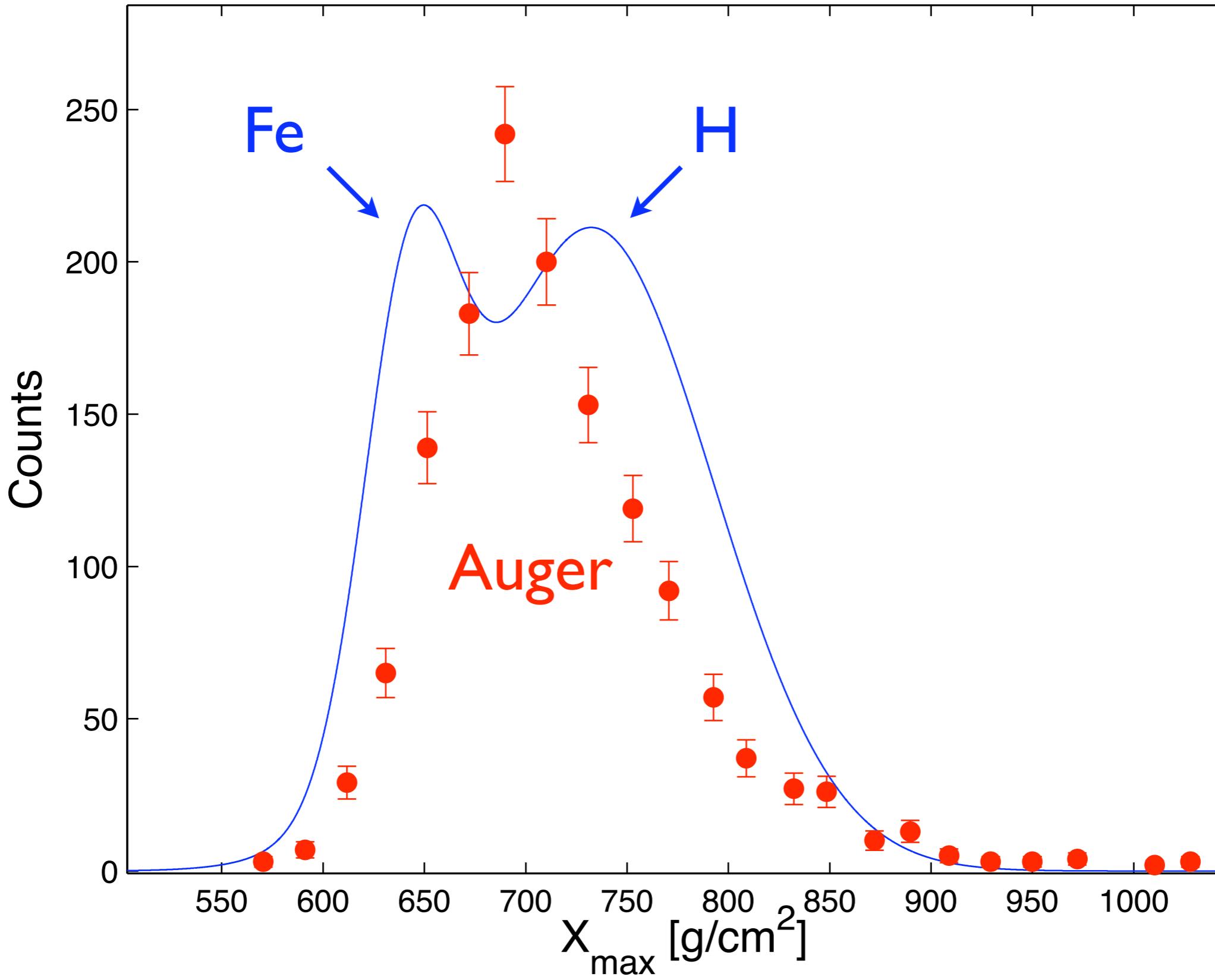
Air showers



Spectrum (all particles)



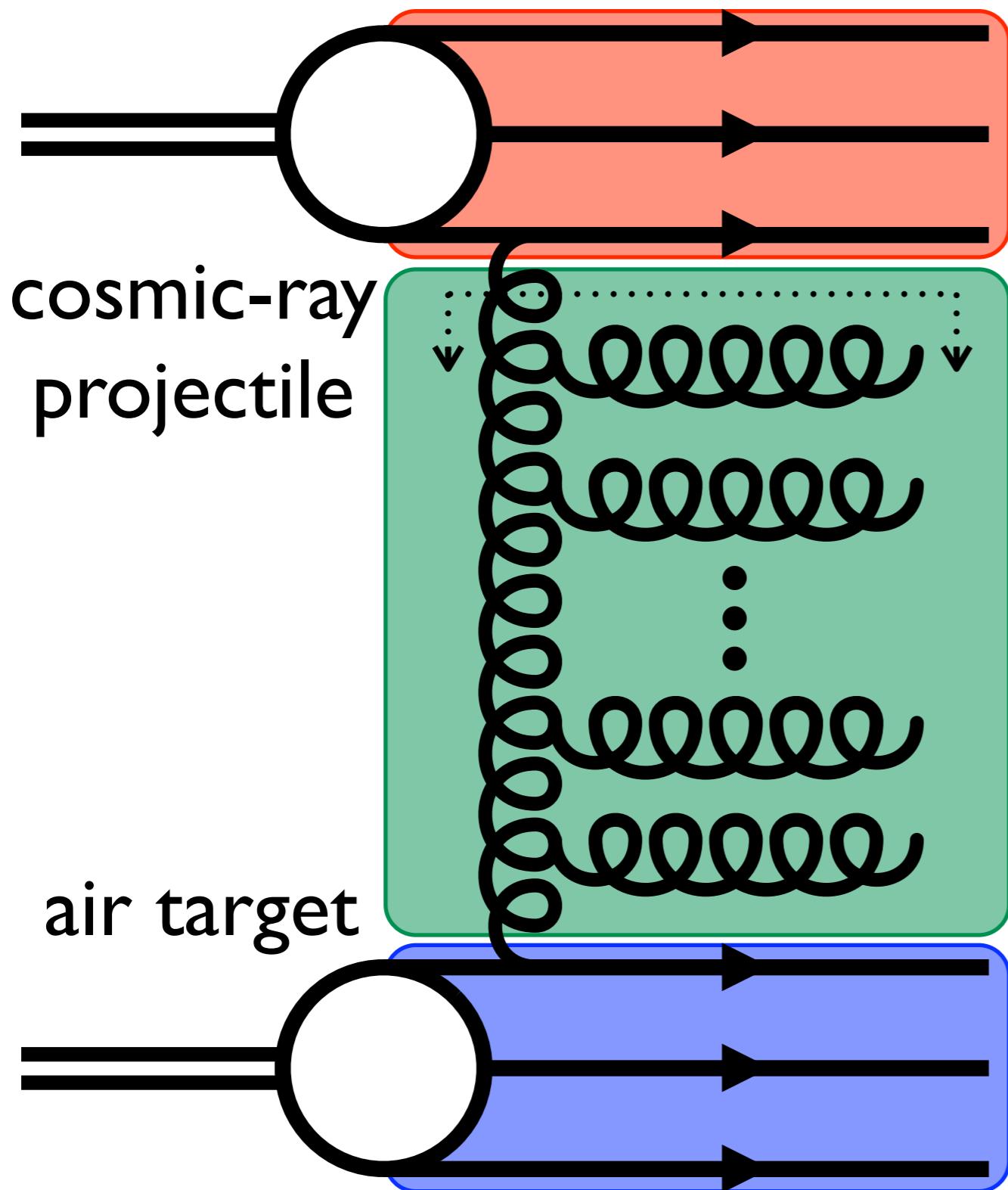
Composition ?



adapted from Shaham & Piran arXiv:1204.1488

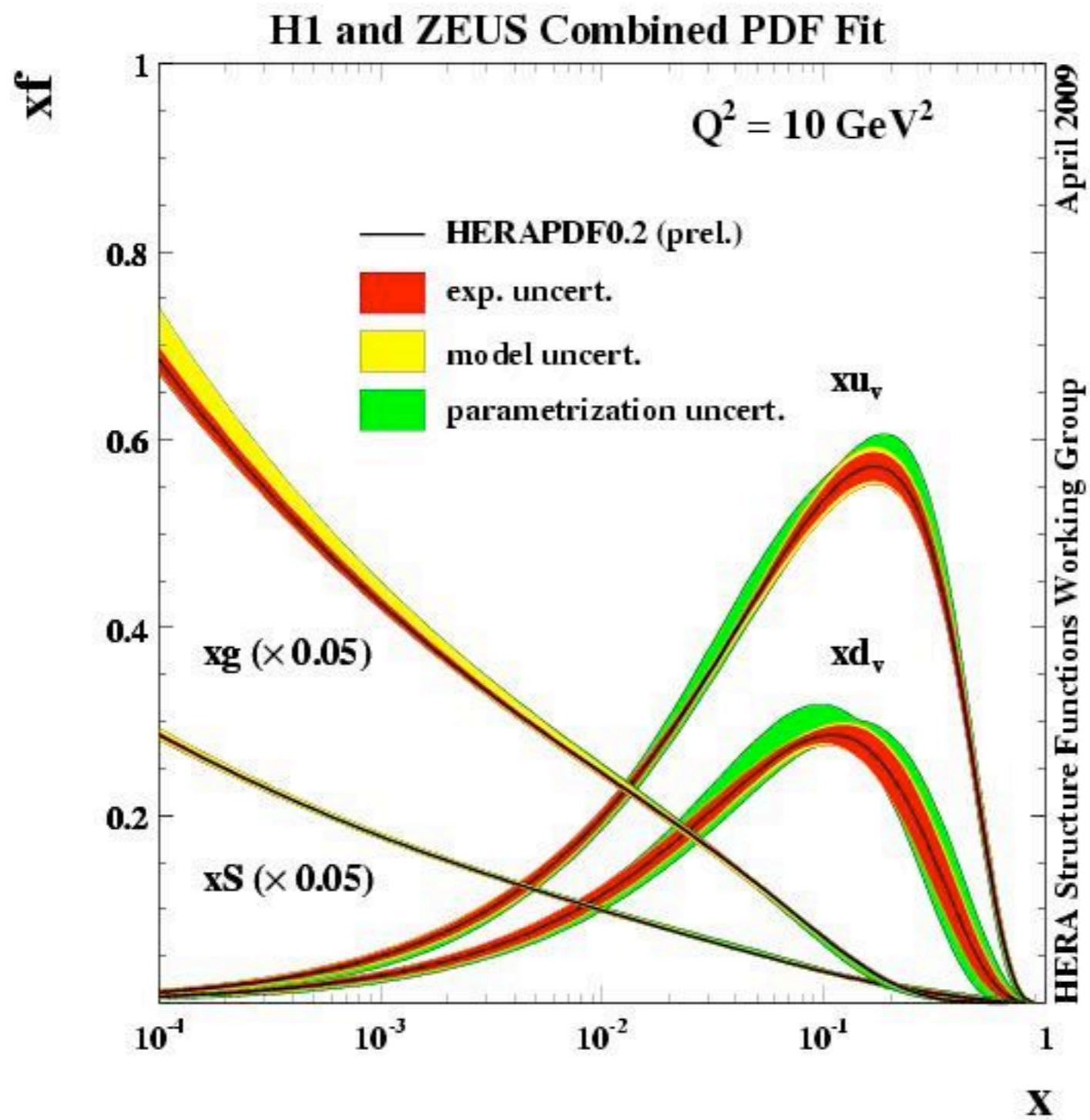
DDD

Benchmark: QCD

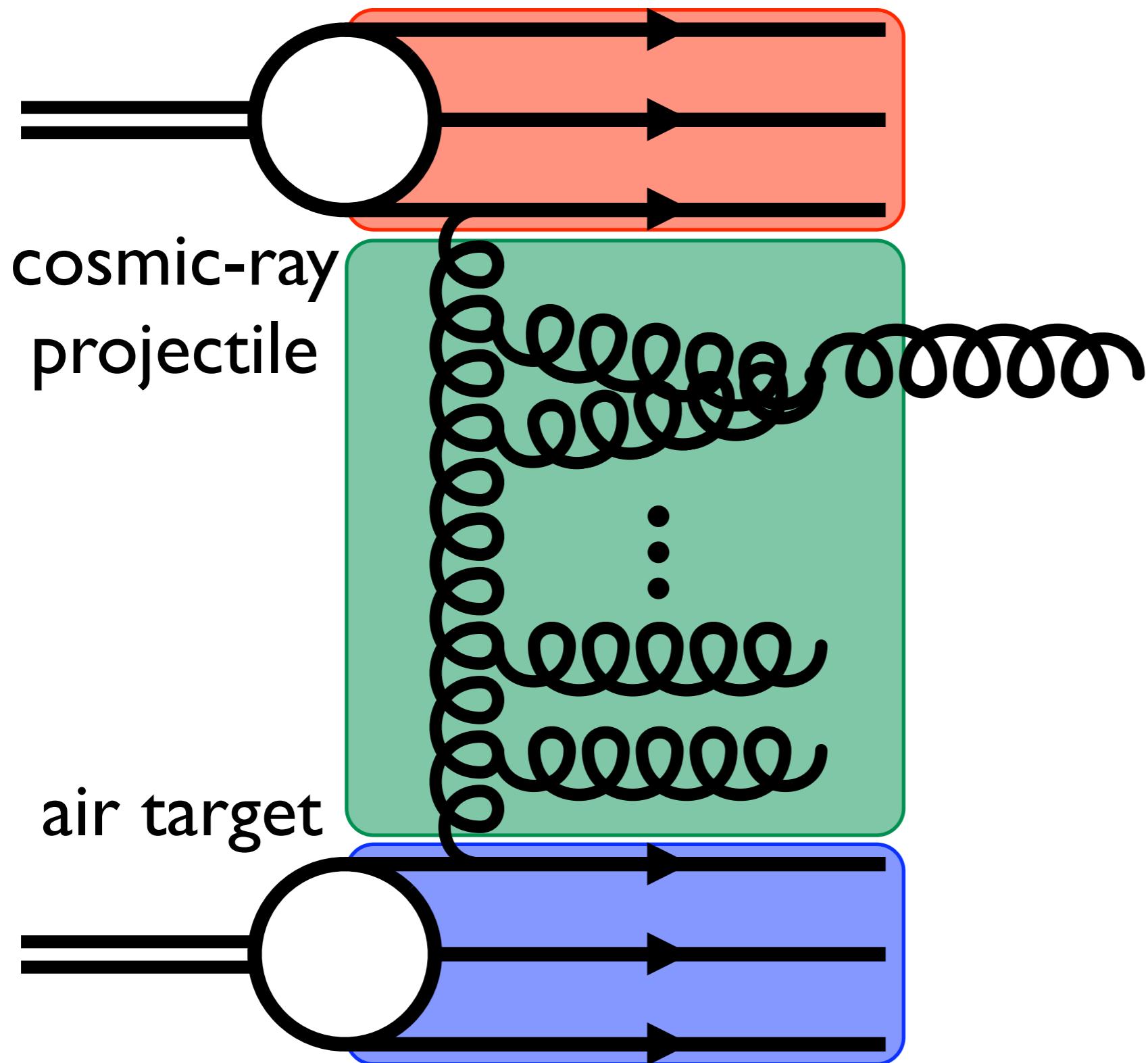


DDD

HERA



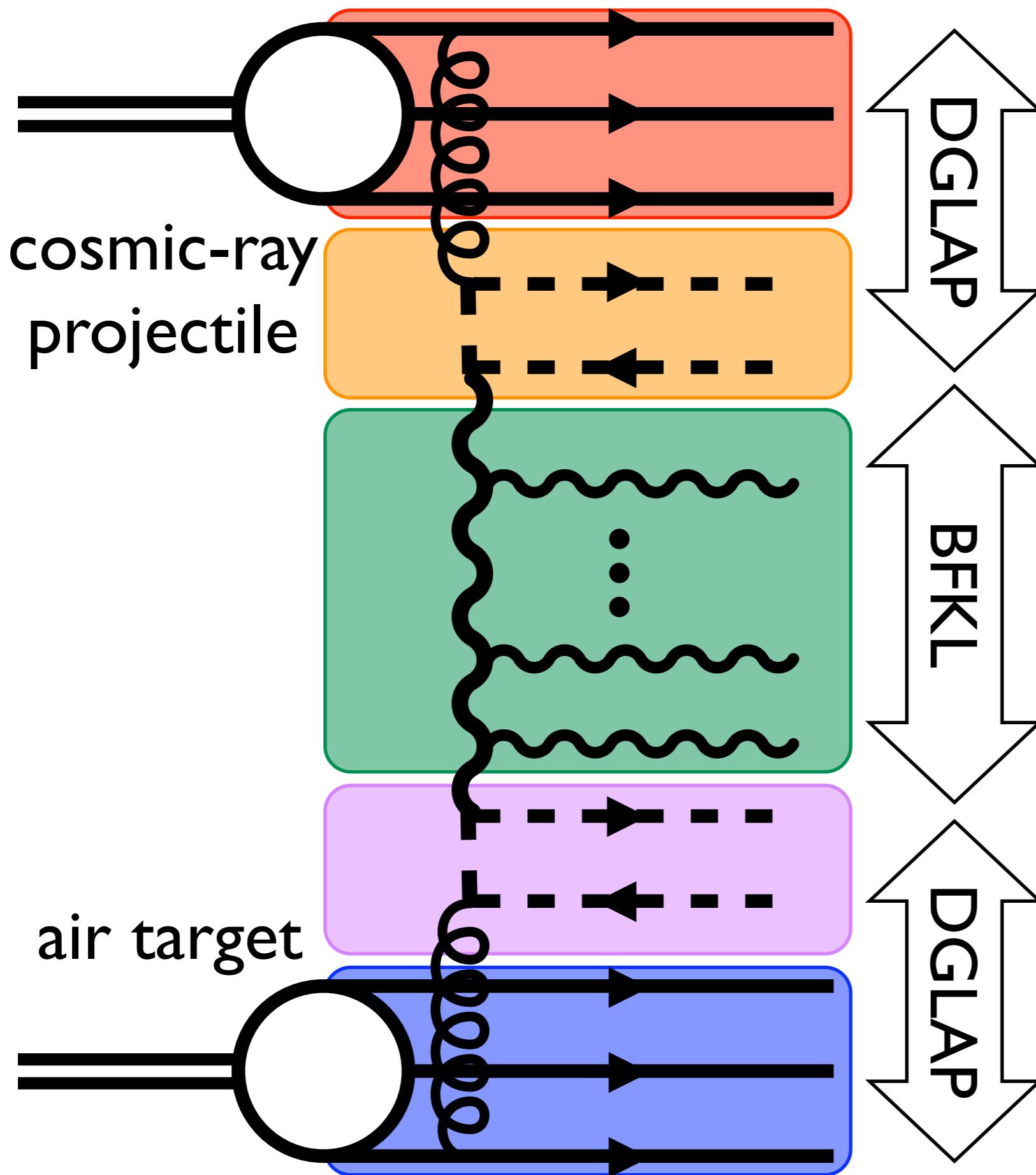
Saturation



see, e.g., Drescher, Dumitru & Strikman, PRL 94 (2005) 231801

DDD

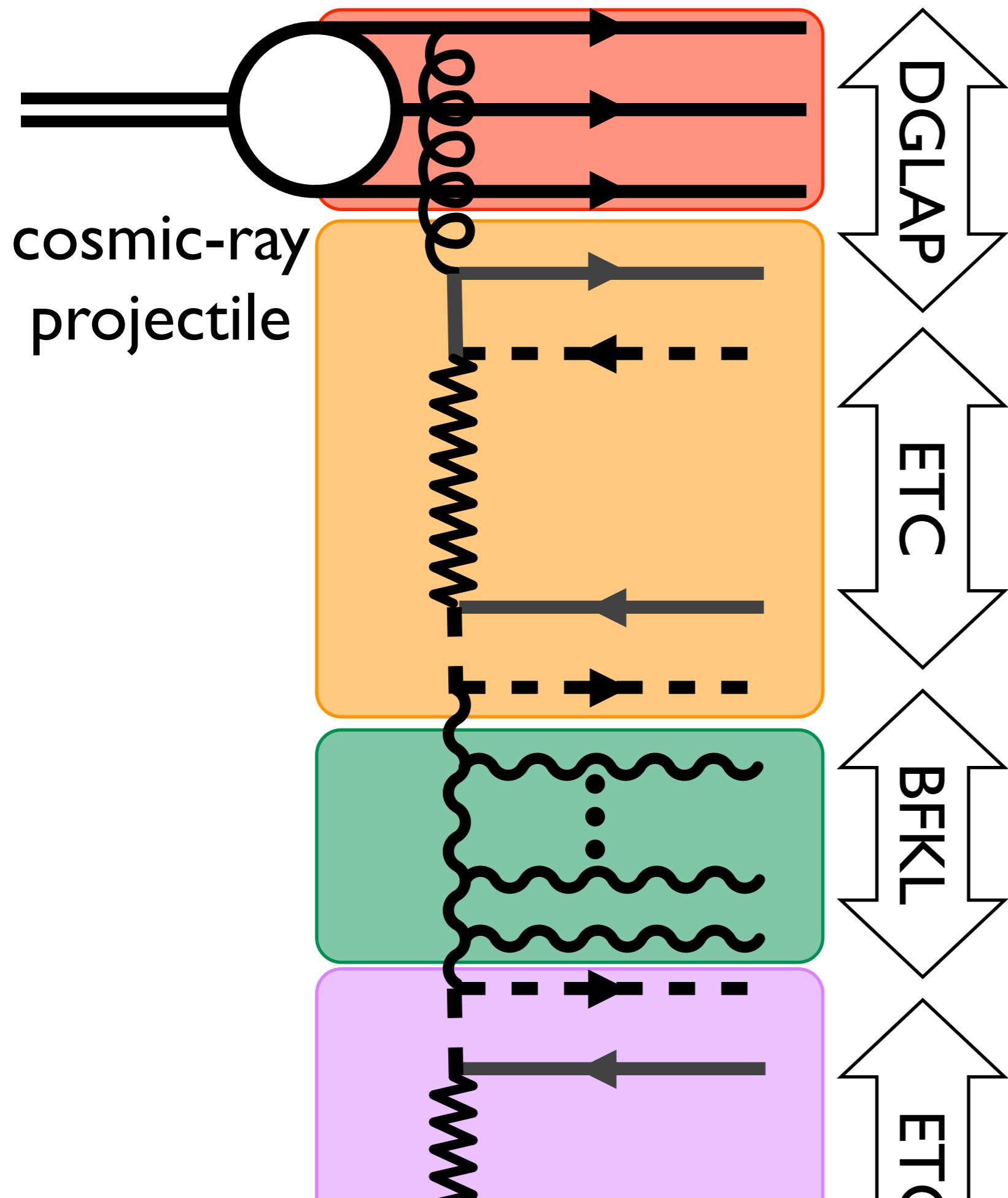
Techni-colour



$$\frac{\sigma_{\text{tot}}^{\text{TC}}}{\sigma_{\text{tot}}^{\text{QCD}}} \approx O(10^{-3})$$

$$\frac{\sigma_{\text{tot}}^{\text{TC}}}{\sigma_{\text{tot}}^{\text{QCD}}} \frac{\Lambda_{\text{TC}}}{\Lambda_{\text{QCD}}} \approx O(1)$$

DDD



Techni-colour 2

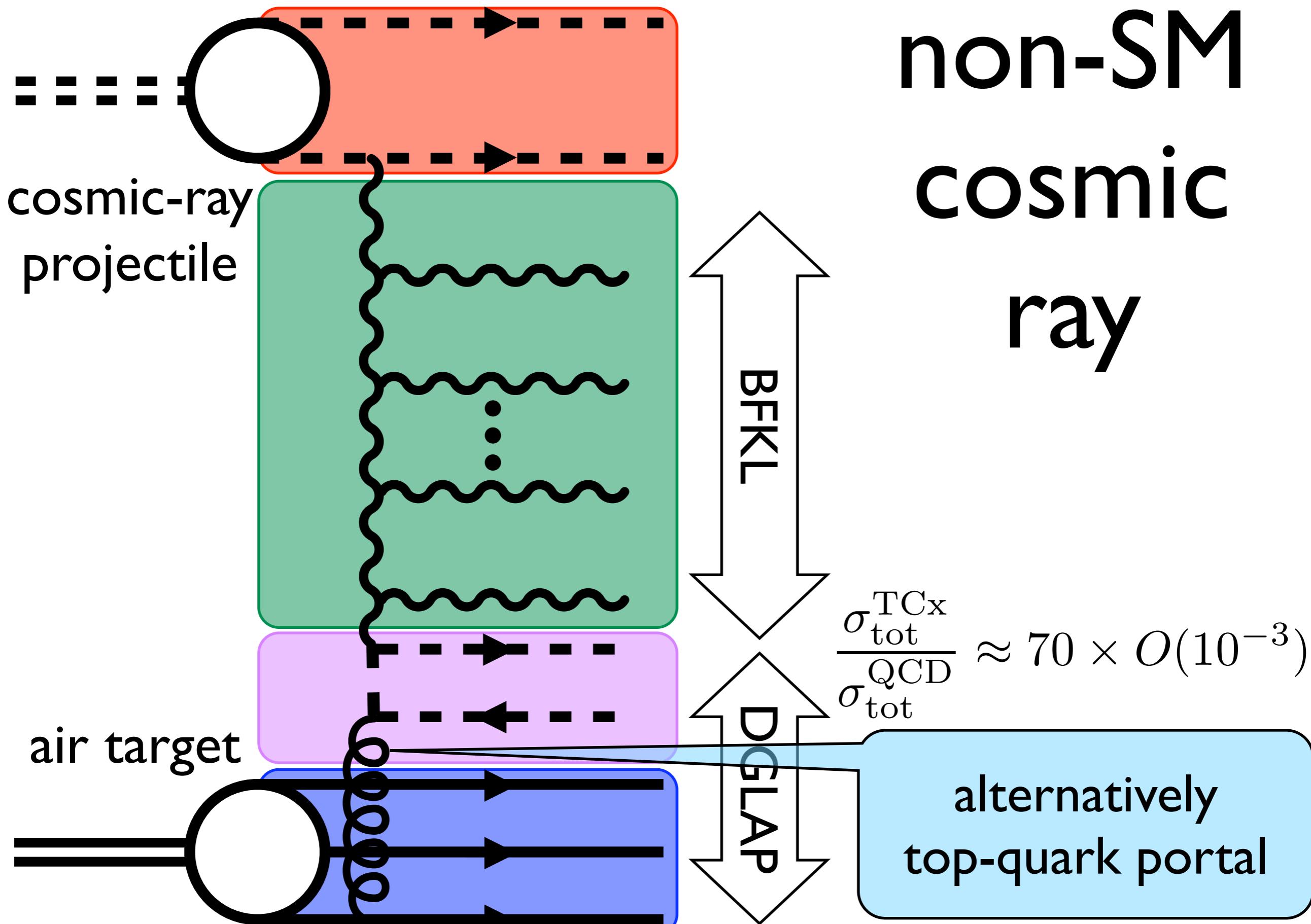
$$\frac{\sigma_{\text{tot}}^{\text{TC}}}{\sigma_{\text{tot}}^{\text{QCD}}} \approx O(10^{-3})$$

$$\frac{\sigma_{\text{tot}}^{\text{TC}}}{\sigma_{\text{tot}}^{\text{QCD}}} \frac{\Lambda_{\text{TC}}}{\Lambda_{\text{QCD}}} \approx O(1)$$

DDD

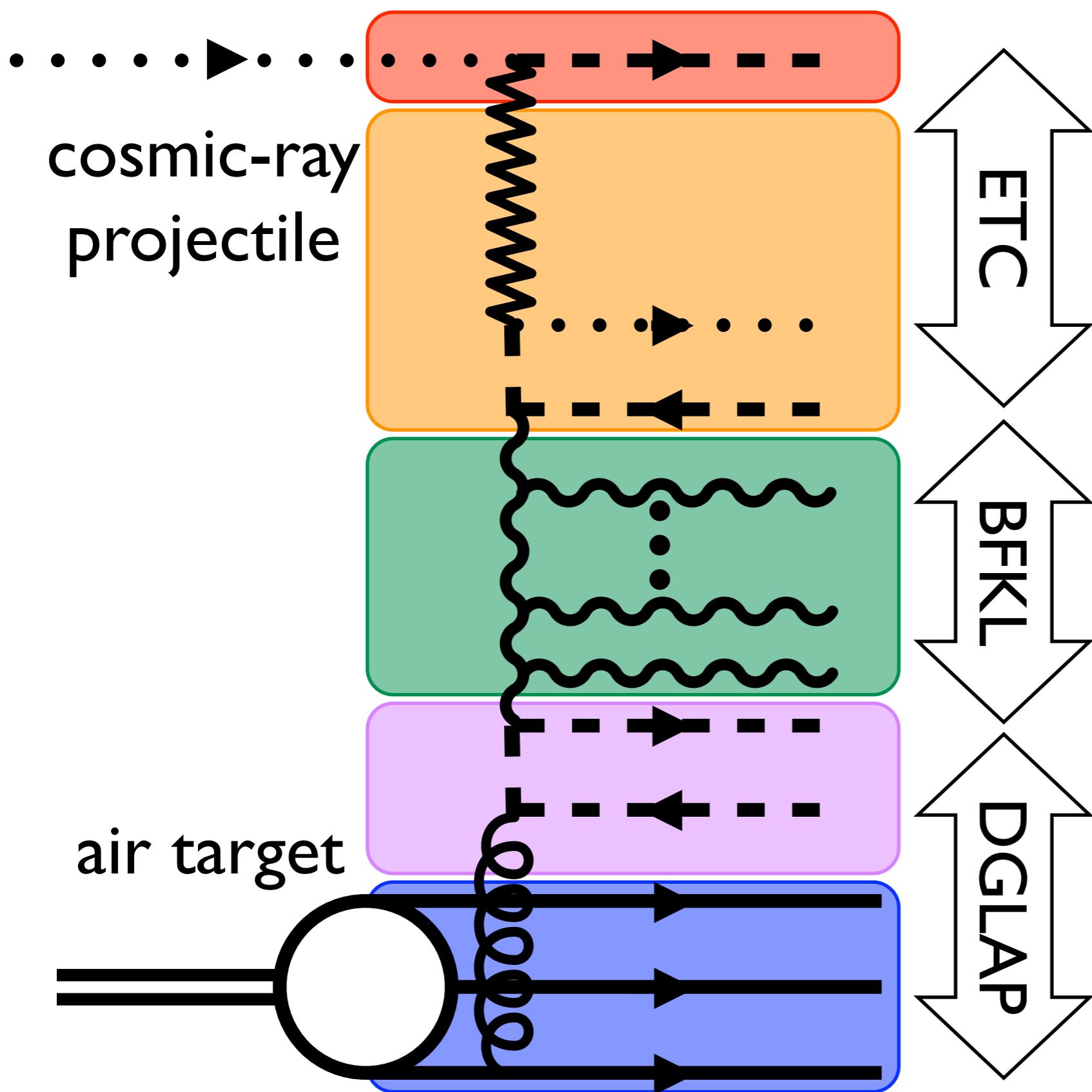
Candidates

- Technicolour
- 3rd generation ETC gauge bosons
- Topcolour (low scale)
- Composite Higgs $\xi = (v/f)^2 \approx 1$
- Little Higgs - heavy gauge bosons
- $SU(2)_L$ - coupling to weak



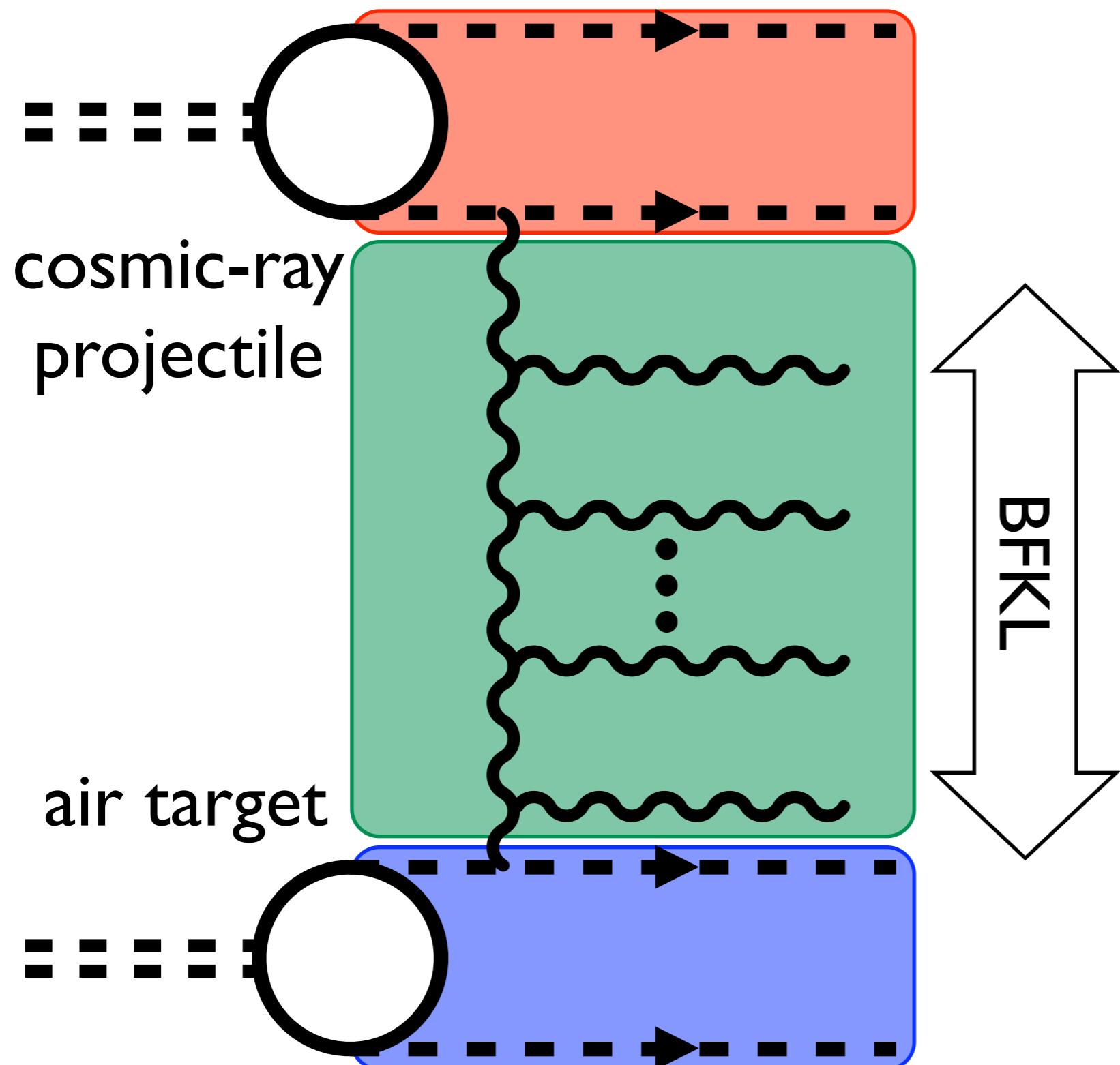
DDD

Heavy
lepton
(e.g. ν)



$$\frac{\sigma_{\text{tot}}^{\text{TC}\nu}}{\sigma_{\text{tot}}^{\text{QCD}}} \approx 15 \times O(10^{-3})$$

DDD



+ non-SM
target

cosmic-ray
projectile

air target

similarly: heavy neutrino

Summary

- ankle structure where (low-scale) DEWSB would modify cross section
- composition: larger amount of produced p_t
 $X_{\max} \searrow$ lateral spread \nearrow
- @ GZK: DEWSB bound states & associated heavy leptons do not see cutoff
- required: more data on growth of cross section from colliders ($pA@LHC$)

Dziękuję za uwagę!