
The 320 EeV Fly's Eye event: a key messenger or a statistical oddity?

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The Fly's Eye event

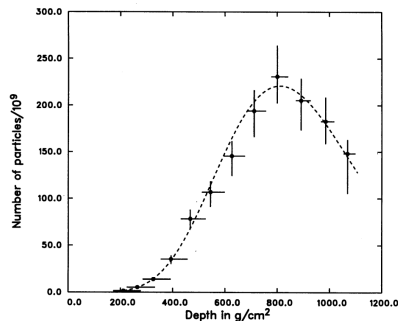
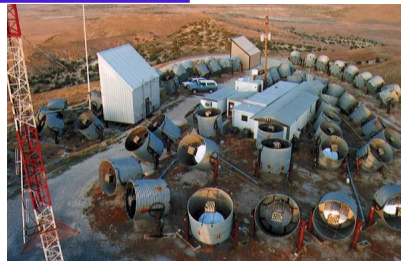
In 1991 ...

- ▶ The most energetic cosmic ray ever observed
- ▶ $320 (+92 / -94)$ EeV
- ▶ RA: $85.2 \pm 0.48^\circ$
DEC: $48 \pm 6^\circ$
- ▶ gal. lat.: 9.6°
gal. long.: 163.4°
- ▶ Nature : H, C, Fe ? (γ ?)

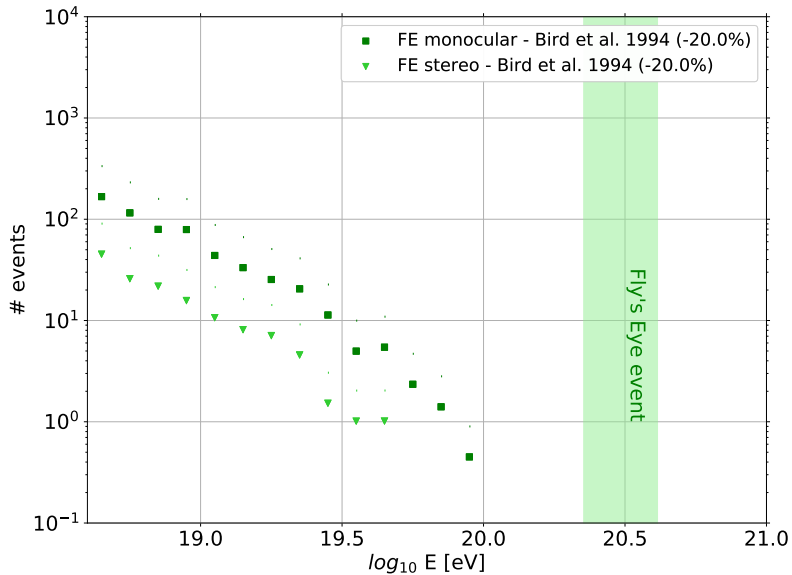
Bird et al 1995 (APJ 441, 144)

Risse et al 2004 (Astropart. Phys. 21, 479-490),

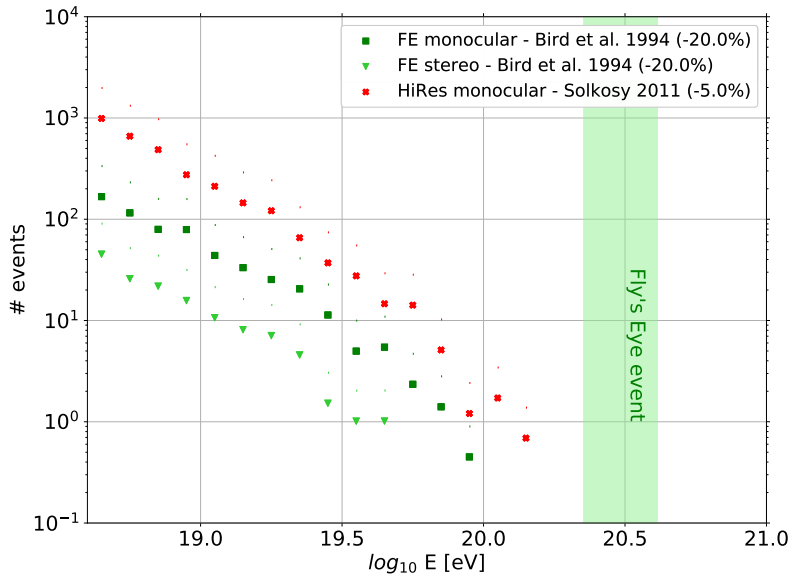
Risse et al 2006 (Nuclear Phys. B Proc. Sup. 151, 96-98)



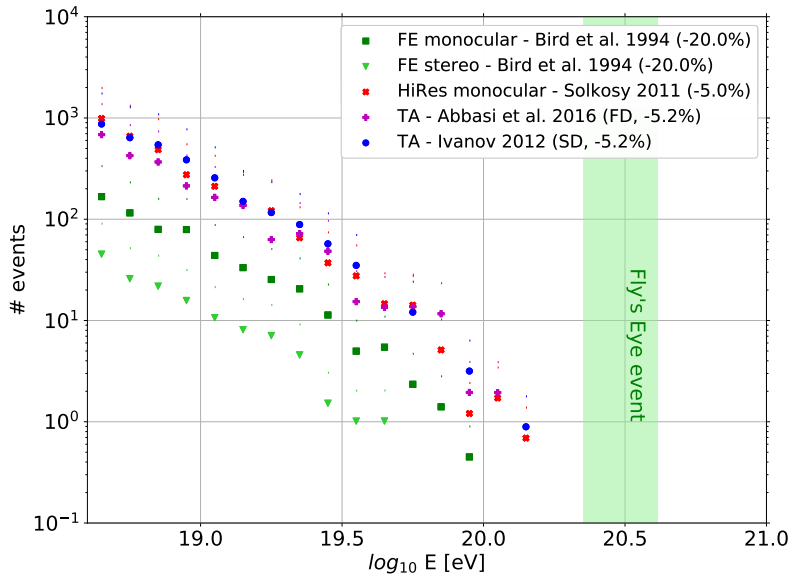
The other observatories



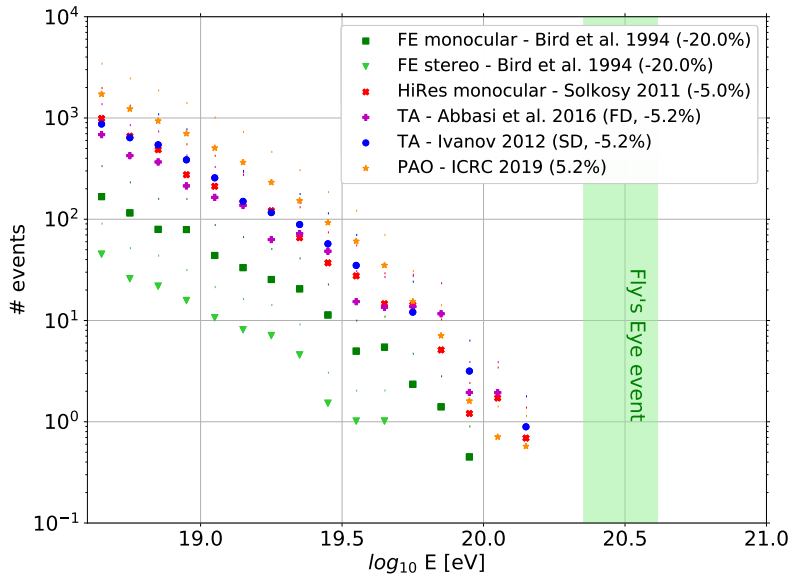
The other observatories



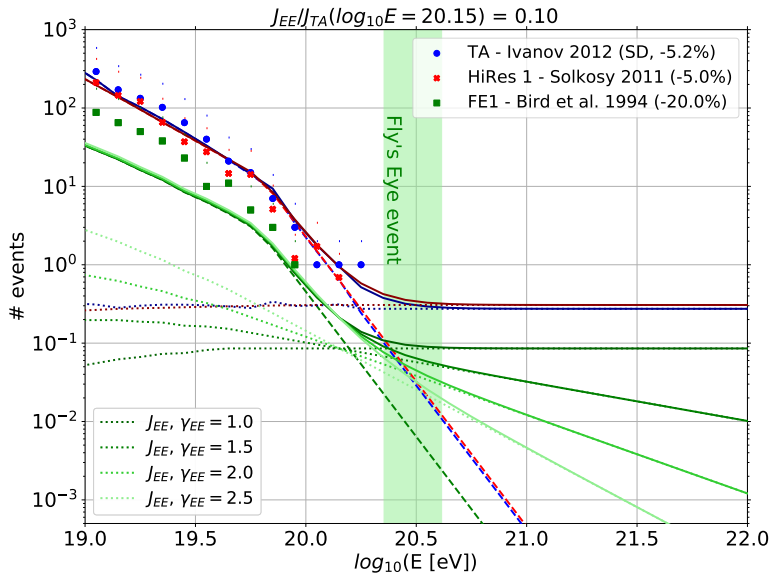
The other observatories



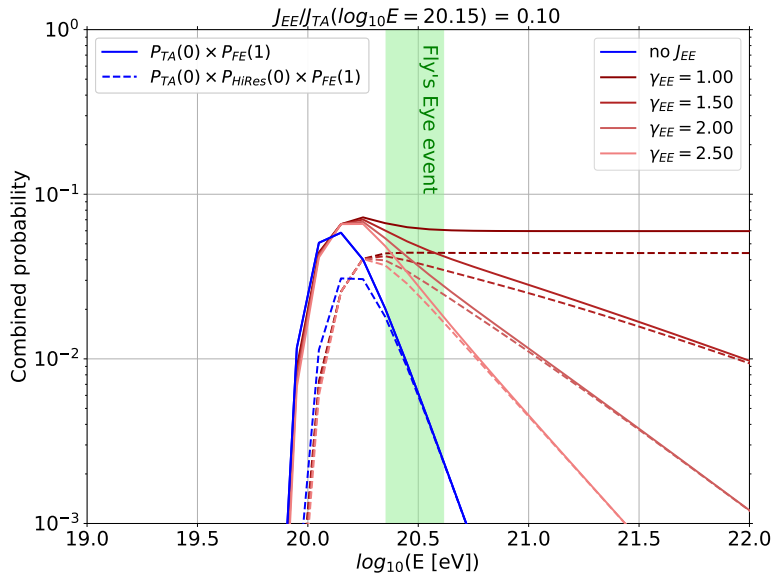
The other observatories



Simple model of a secondary source with background



Simple model of a secondary source with background



Fluctuation in the distance of interaction

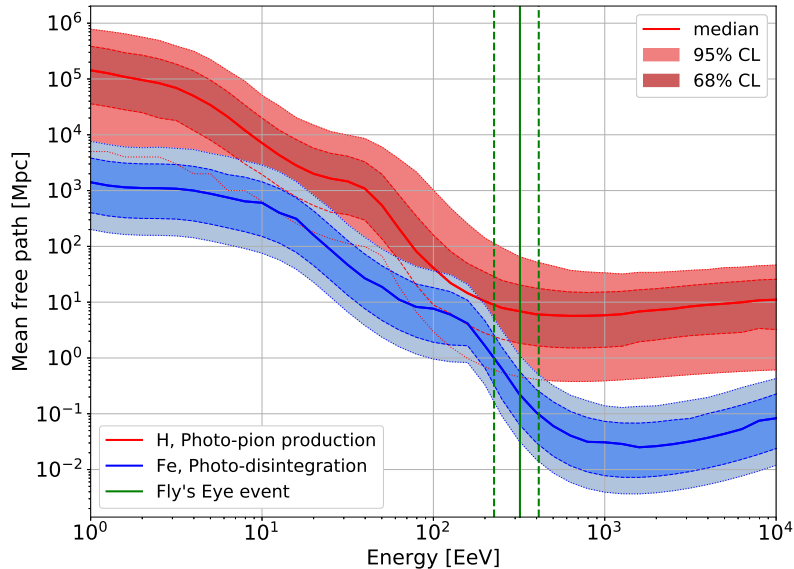


Photo-disintegration of Fe

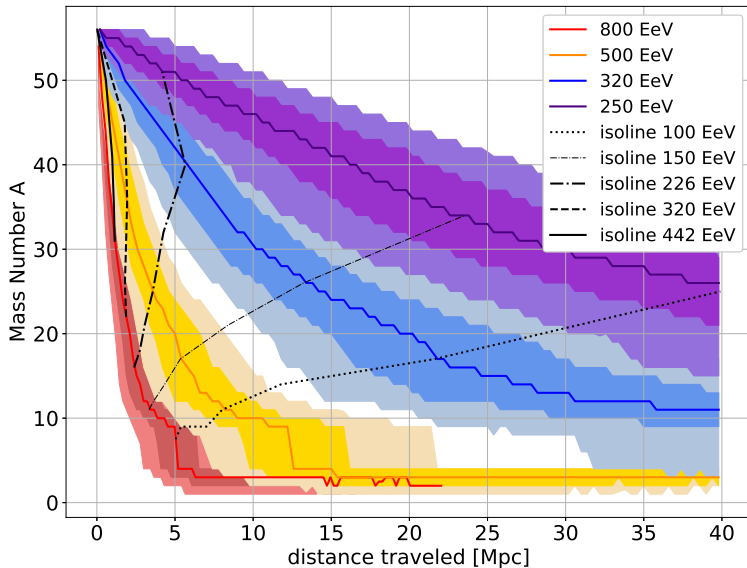
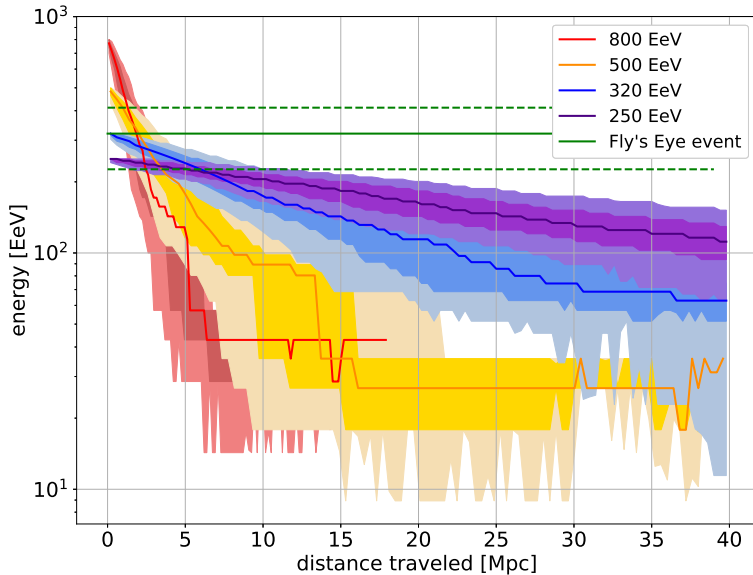
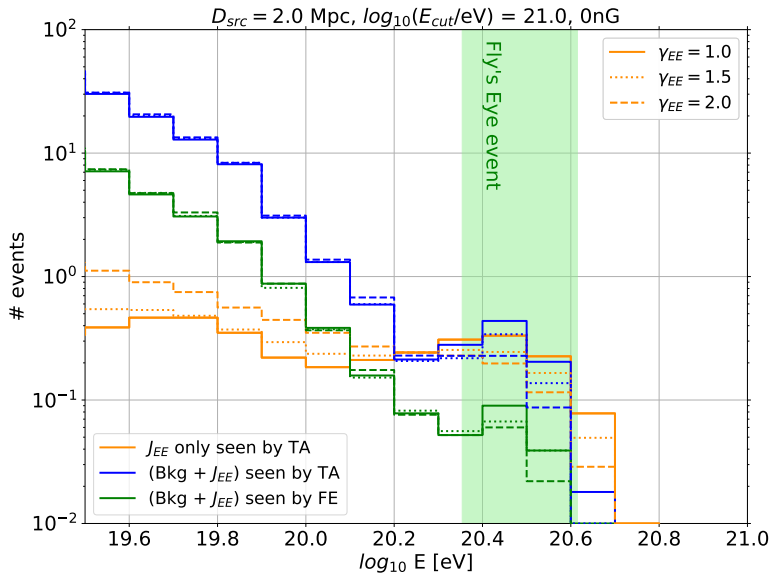


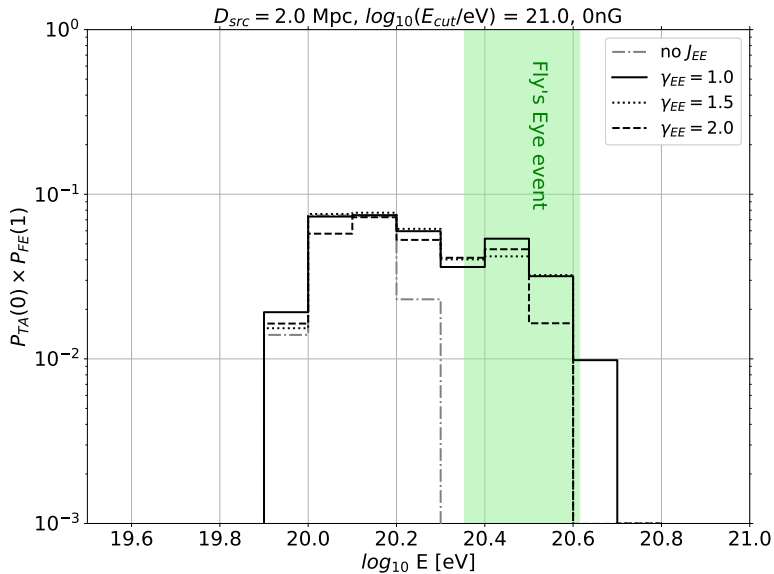
Photo-disintegration of Fe



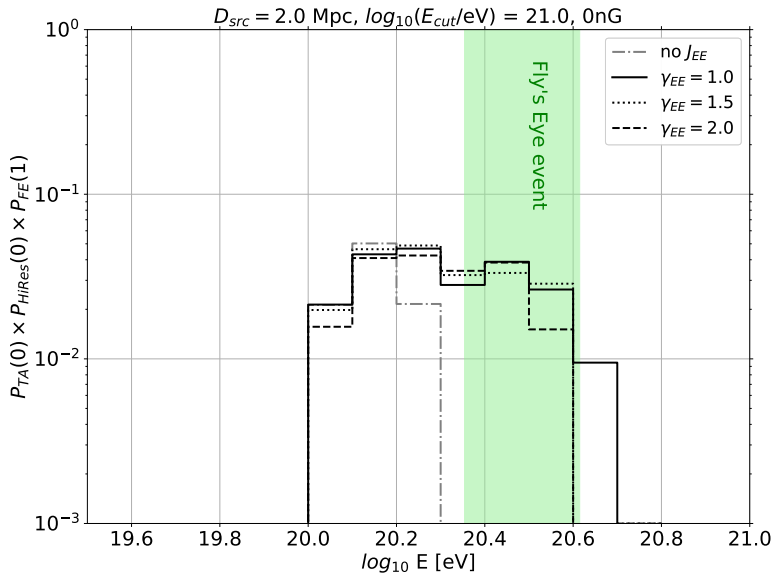
Source of Fe



Source of Fe



Source of Fe



Conclusions

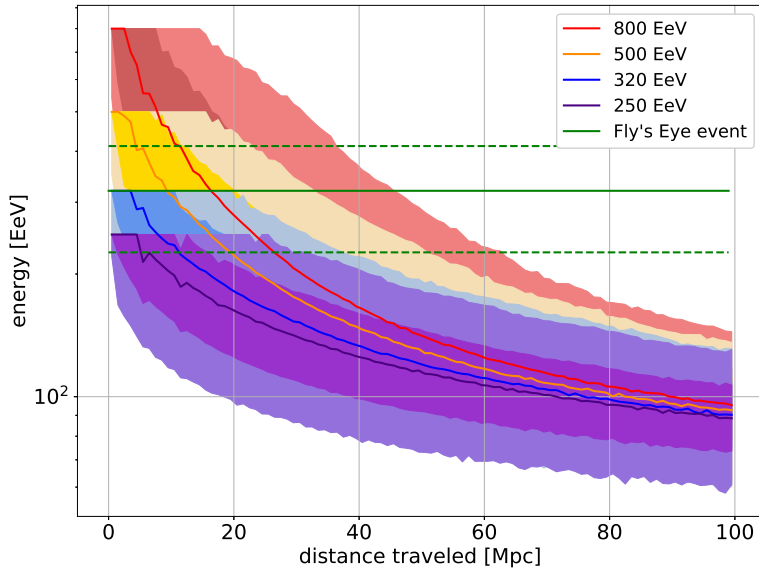
Source of Fe

- ▶ Pill-up effect at 320 EeV for a source at 2 - 3 Mpc
- ▶ Imply a bursting source (because not visible)
- ▶ Need a hard spectrum $\Gamma \sim -1$
- ▶ Source should be in a reduce area of space
- ▶ No known source in that area ...

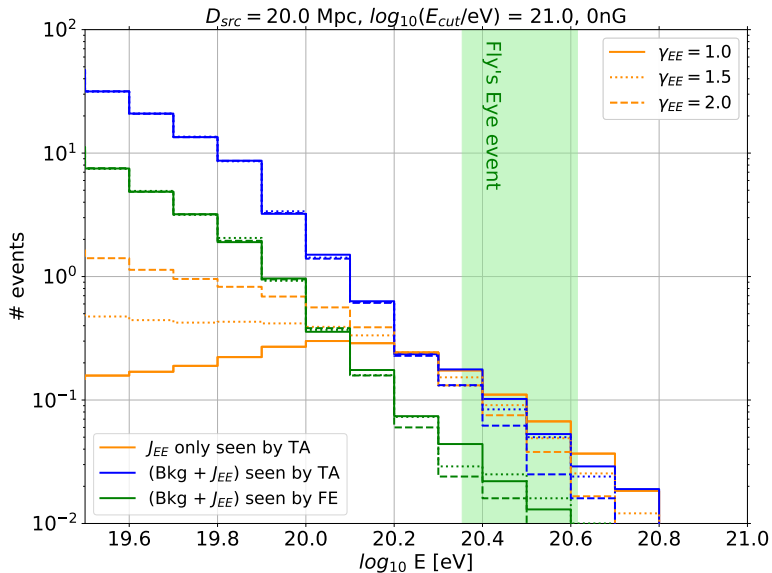
Source of proton (Not presented)

- ▶ No specific pattern like for Fe to explain the observation
- ▶ More complicate to put constraint
- ▶ A steady source (DM) seems more logical ...

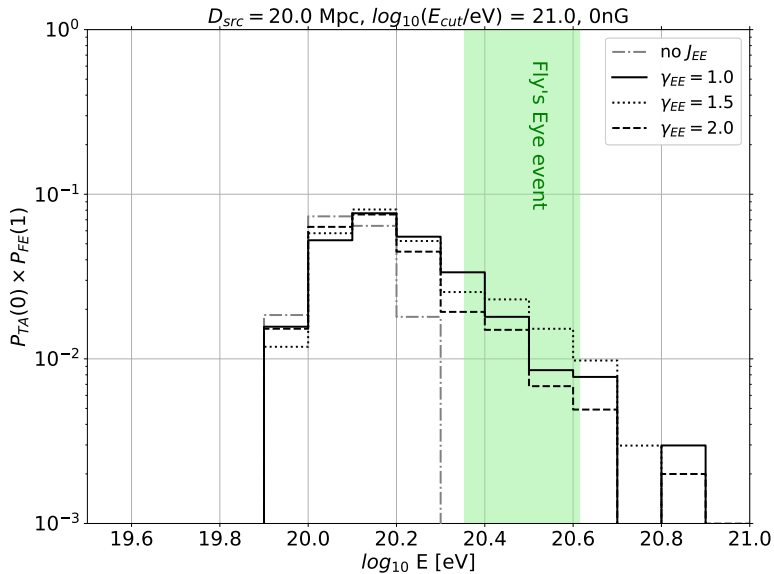
Photo-pion production of proton



Source of protons



Source of protons



Source of protons

