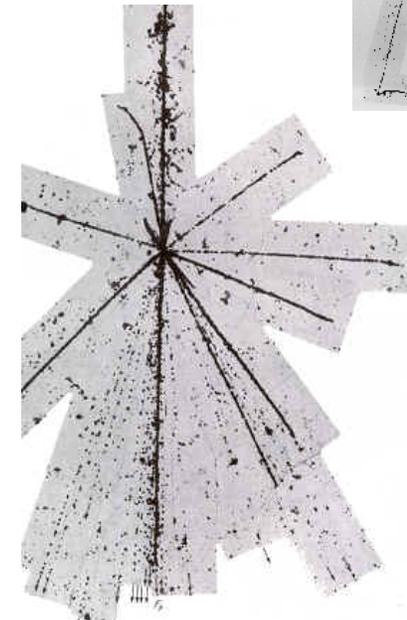
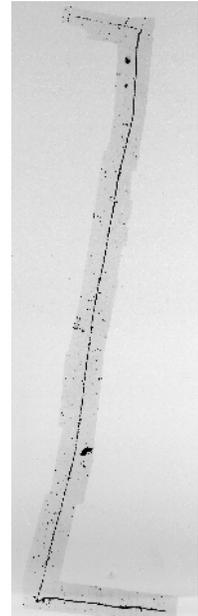
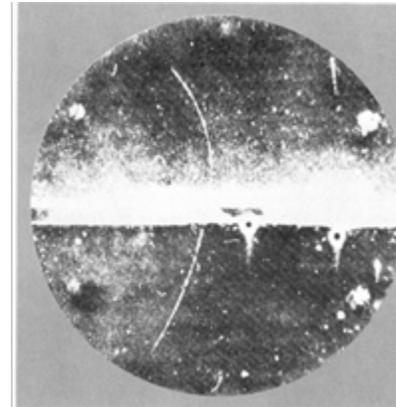
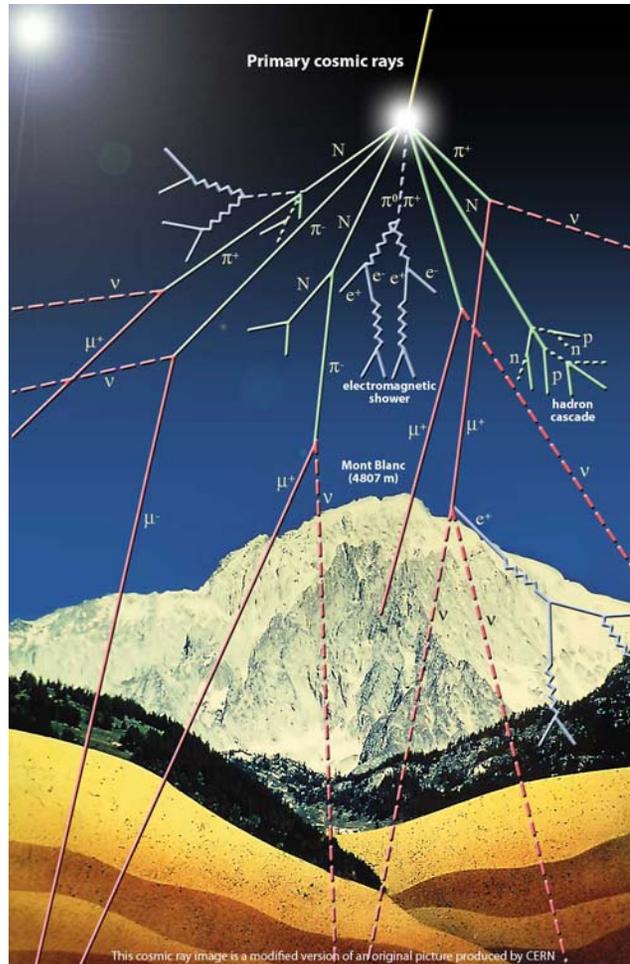
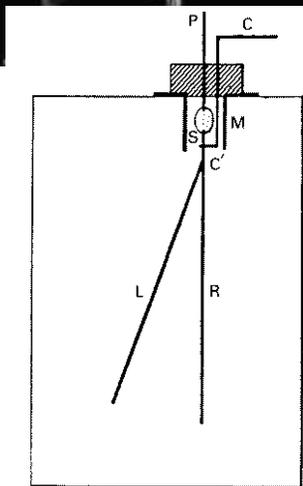
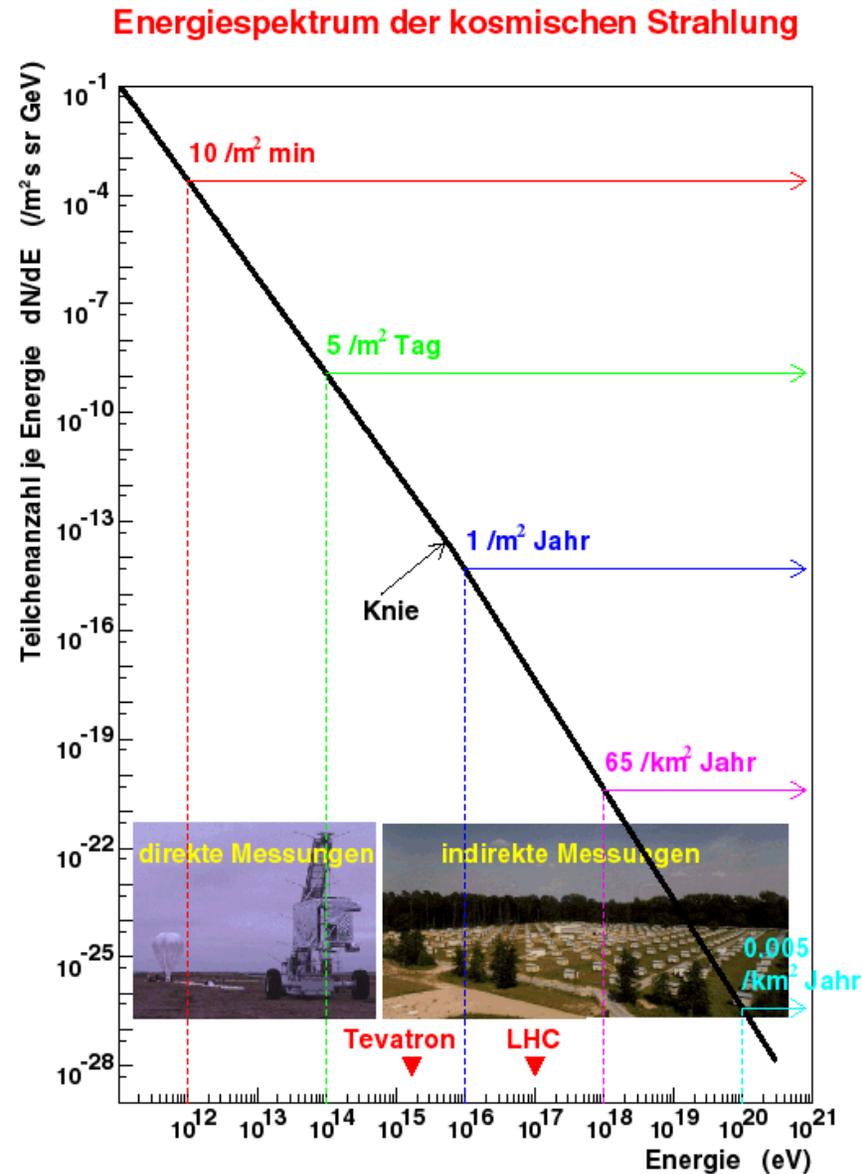


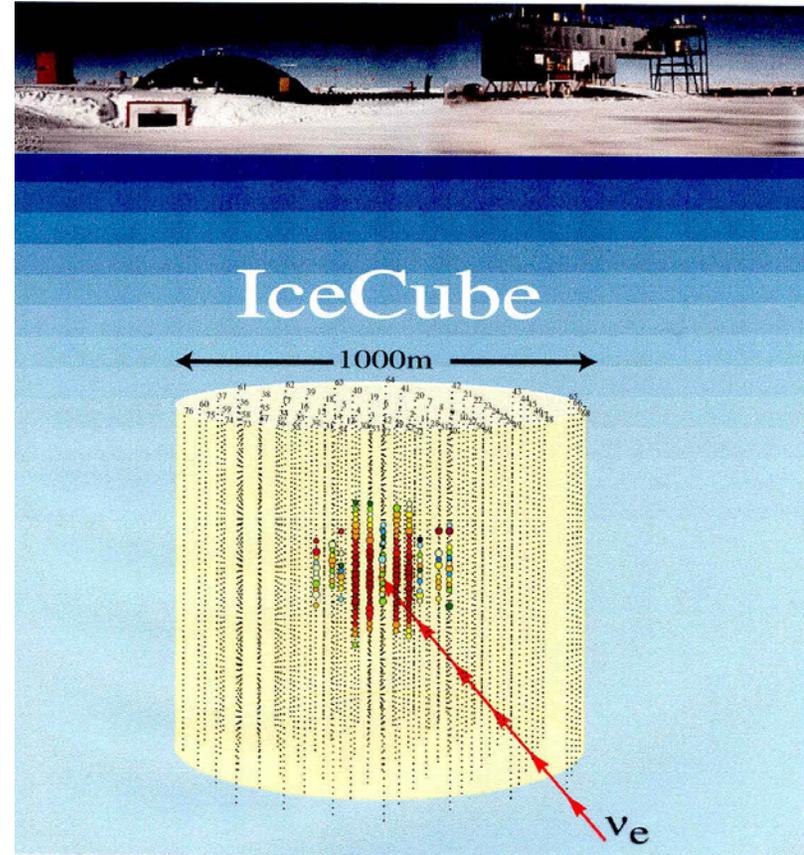
3. Kosmische Strahlung



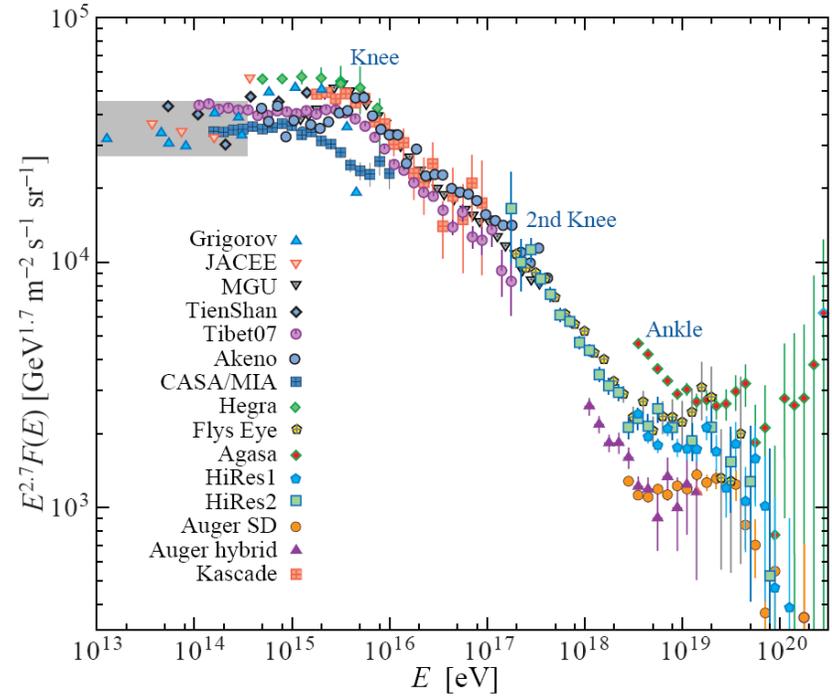
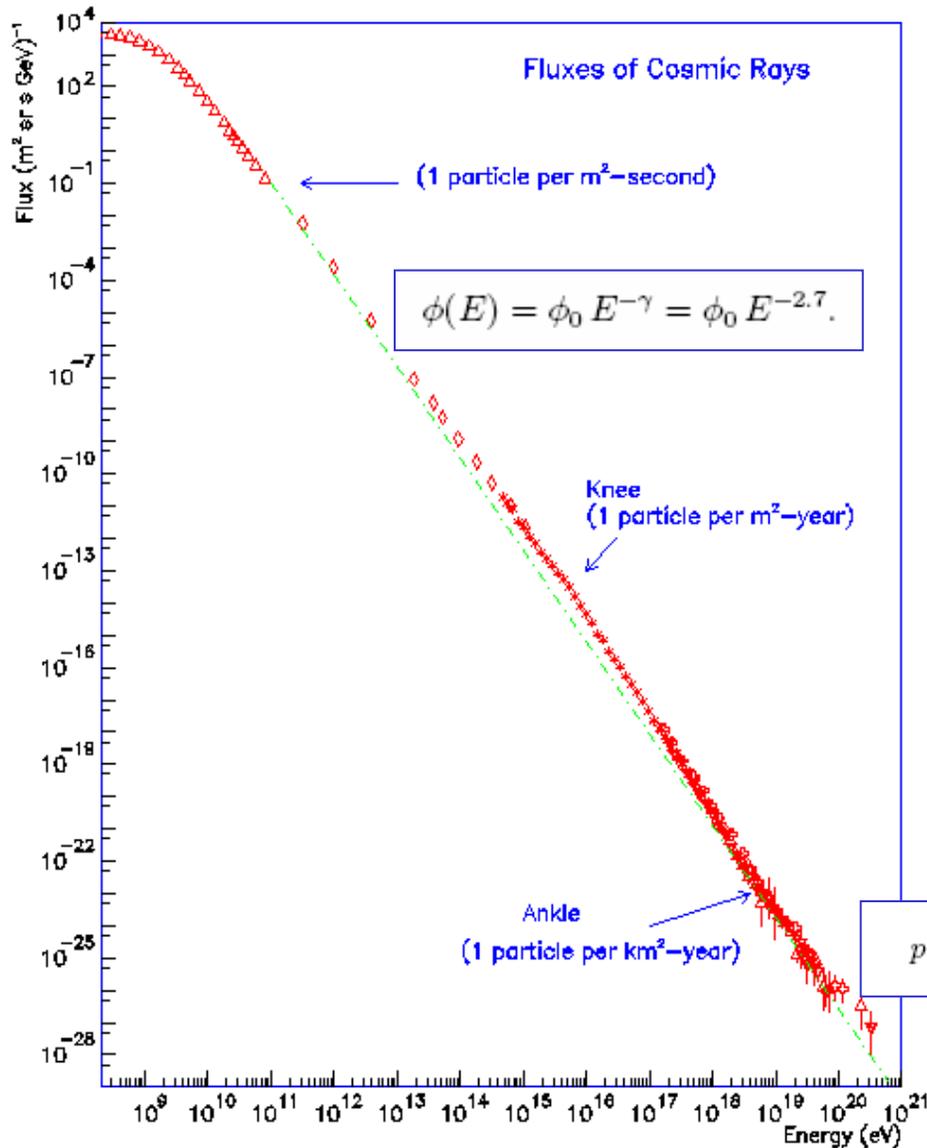
Energiespektrum und Nachweismethoden



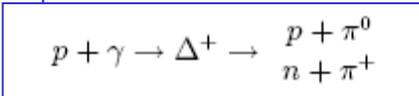
Geladene Teilchen, Photonen, Neutrinos



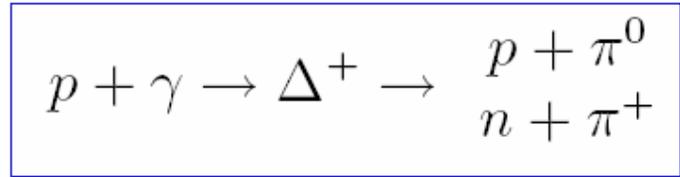
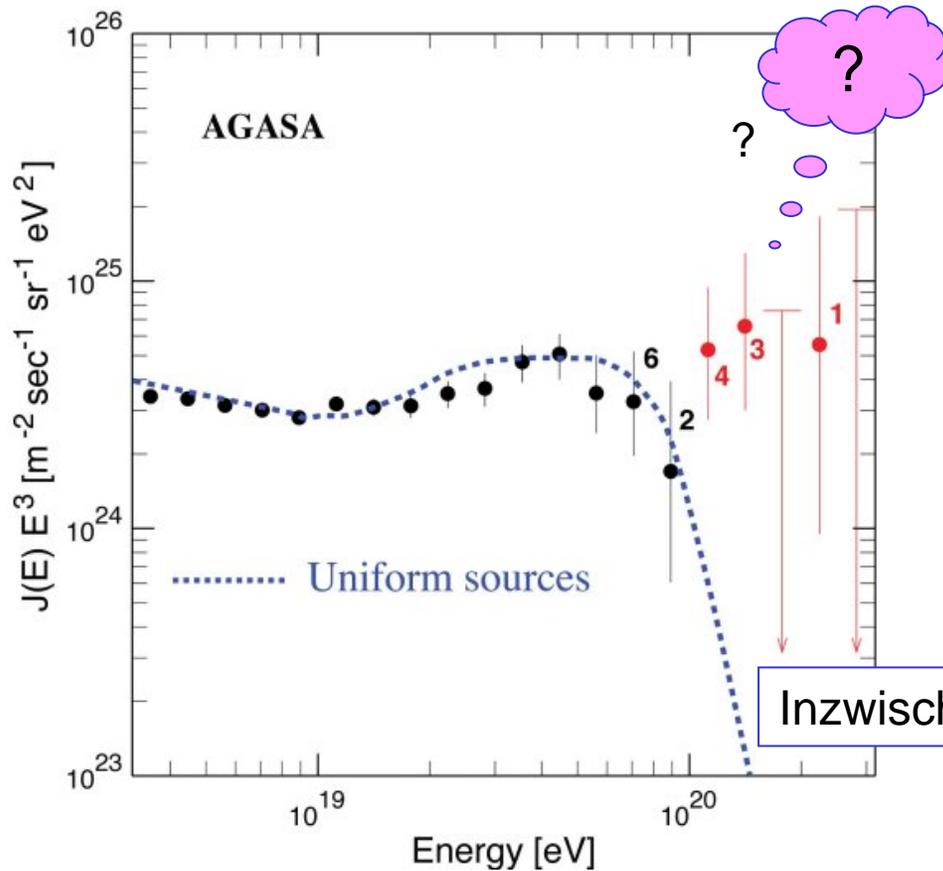
Energiespektrum



$$\phi(E) \approx 1.8 \cdot 10^4 (E/\text{GeV})^{-2.7} \frac{\text{Nukleonen}}{\text{m}^2 \text{ s sr GeV}}$$

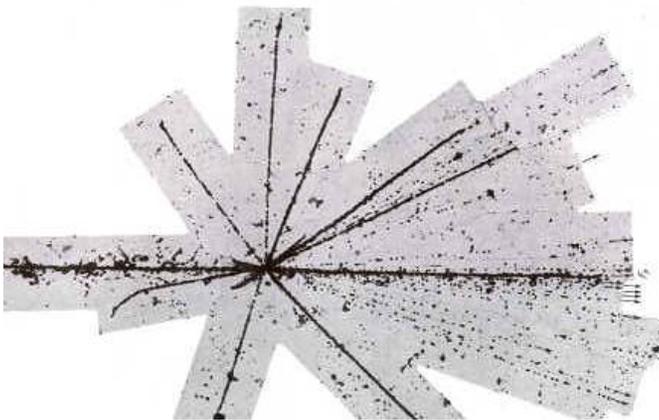
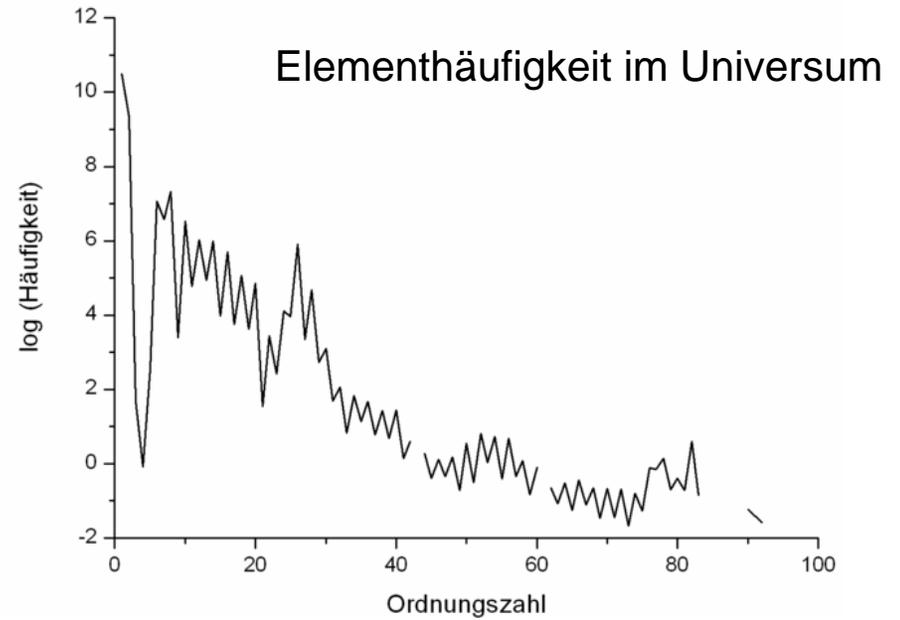
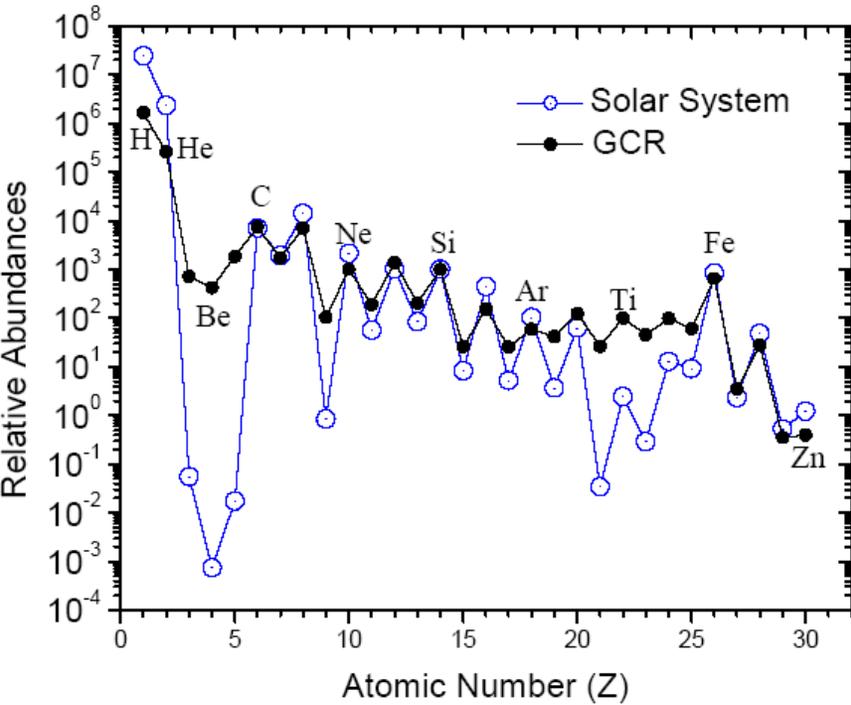


GZK Cutoff

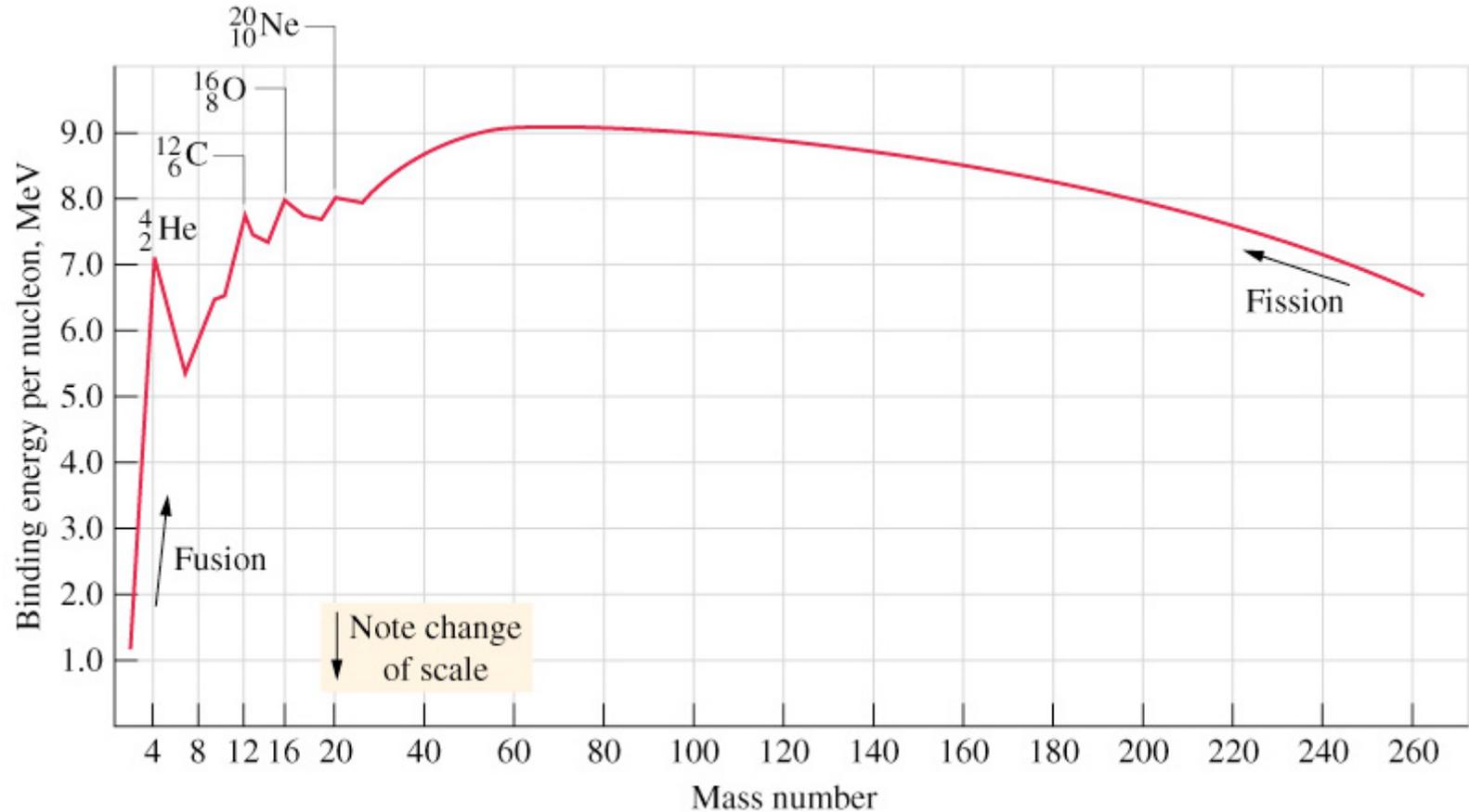


Inzwischen bessere Daten von AUGER

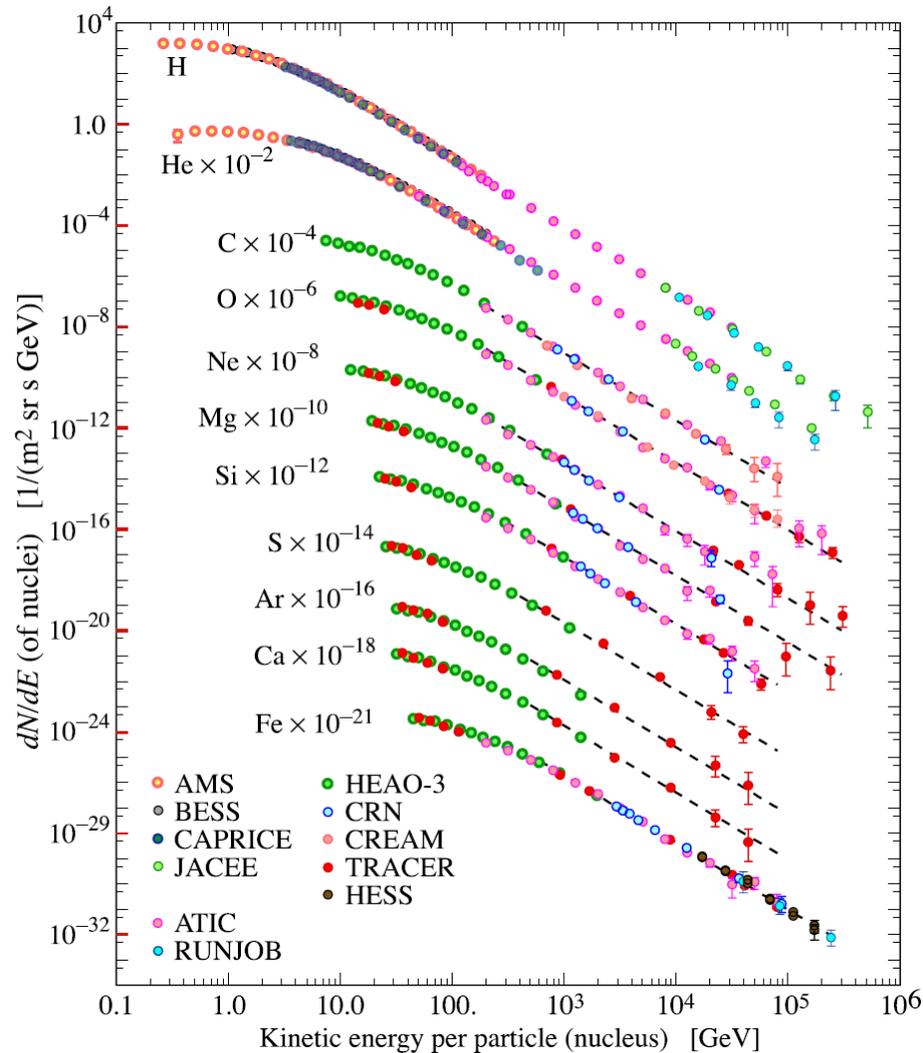
Zusammensetzung



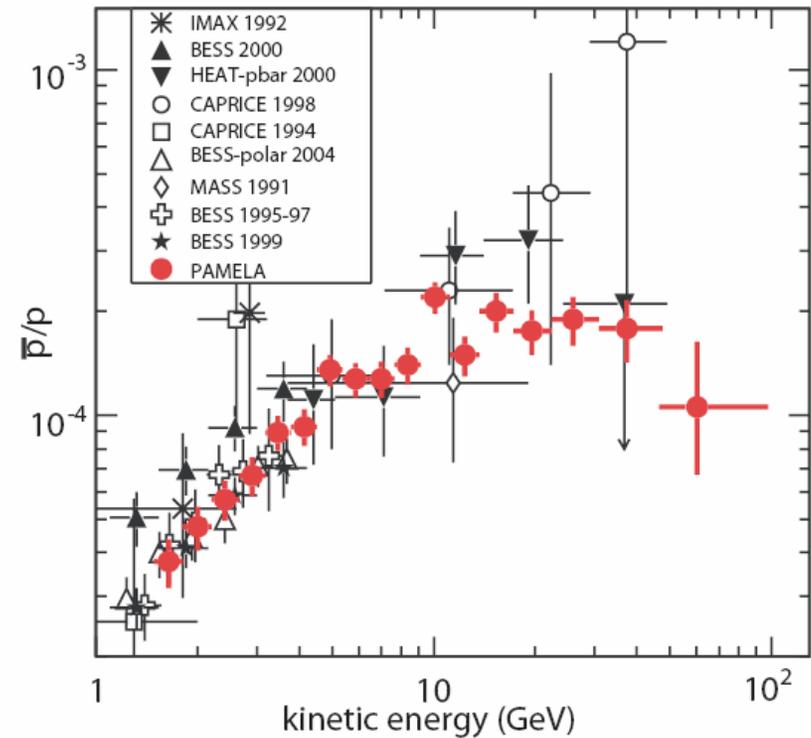
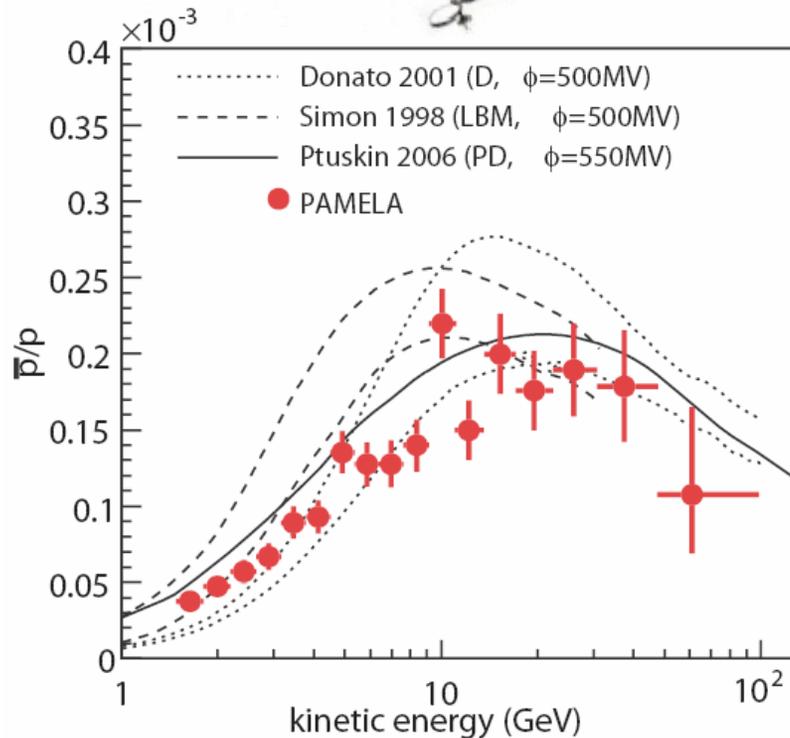
Bindungsenergie pro Nukleon



Spektren für CR-Komponenten



Wenig Anti-Materie in der Kosm.Strahlung



Magnetfelder

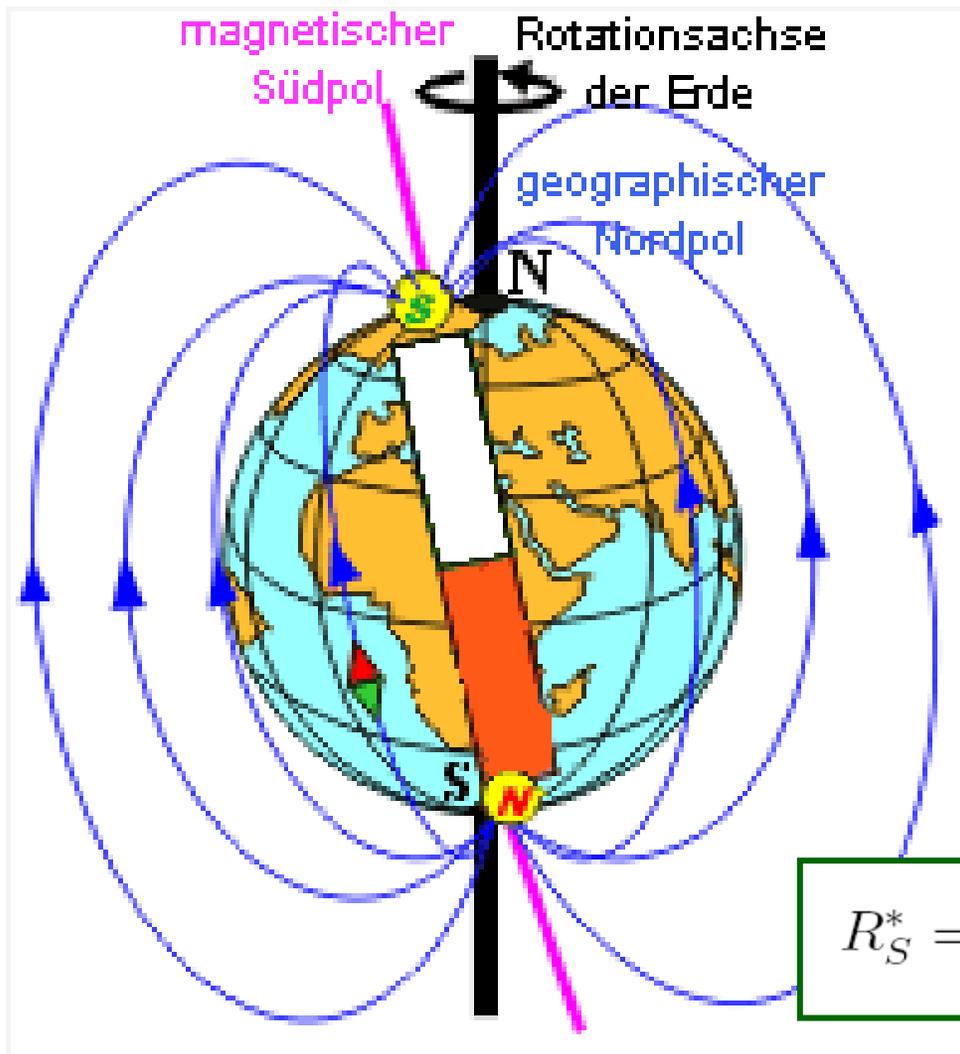
Gyroradius

$$\rho = \frac{pc}{zeB} = \frac{p}{z \cdot 0.3 \cdot B}$$

‘magnetische Steifigkeit’ (‘magnetic rigidity’)

$$R = \frac{pc}{ze} = \rho \cdot B$$

Erdmagnetfeld



approx. Dipolfeld:

$$B = \frac{\mu_0 p_m}{4\pi r^3}$$

$$p_m \approx 8.1 \cdot 10^{22} \text{ A m}^2$$

$$\mu_0/4\pi = 10^{-7} \text{ T m A}^{-1}$$

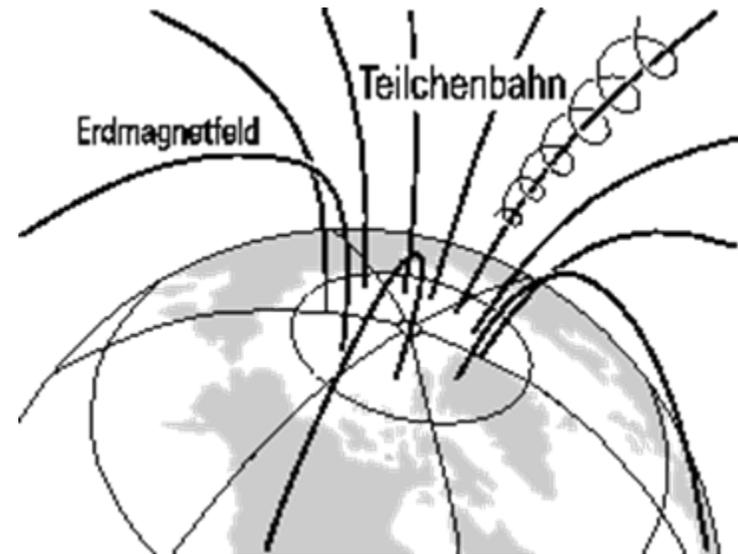
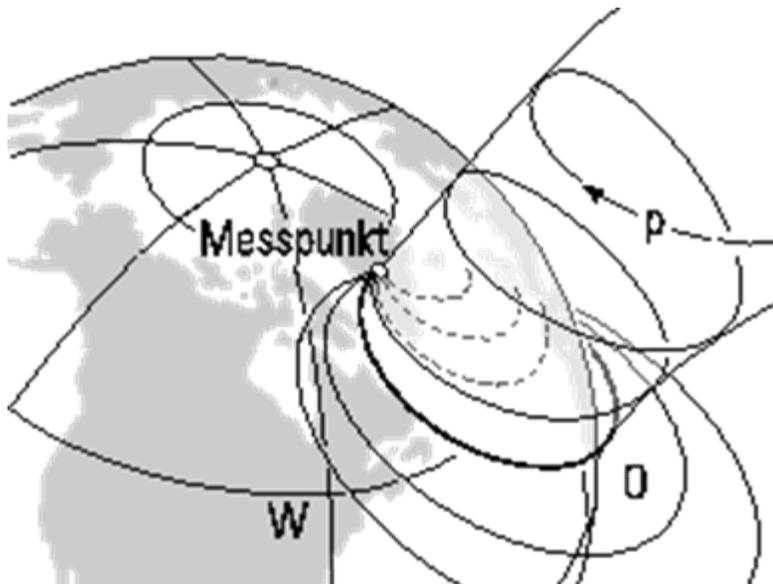
$$R_S^* = \frac{pc}{ze} = \frac{\mu_0 p_m c}{4\pi r_E^2} = 59.6 \text{ GV}$$

Ablenkung im Erdmagnetfeld

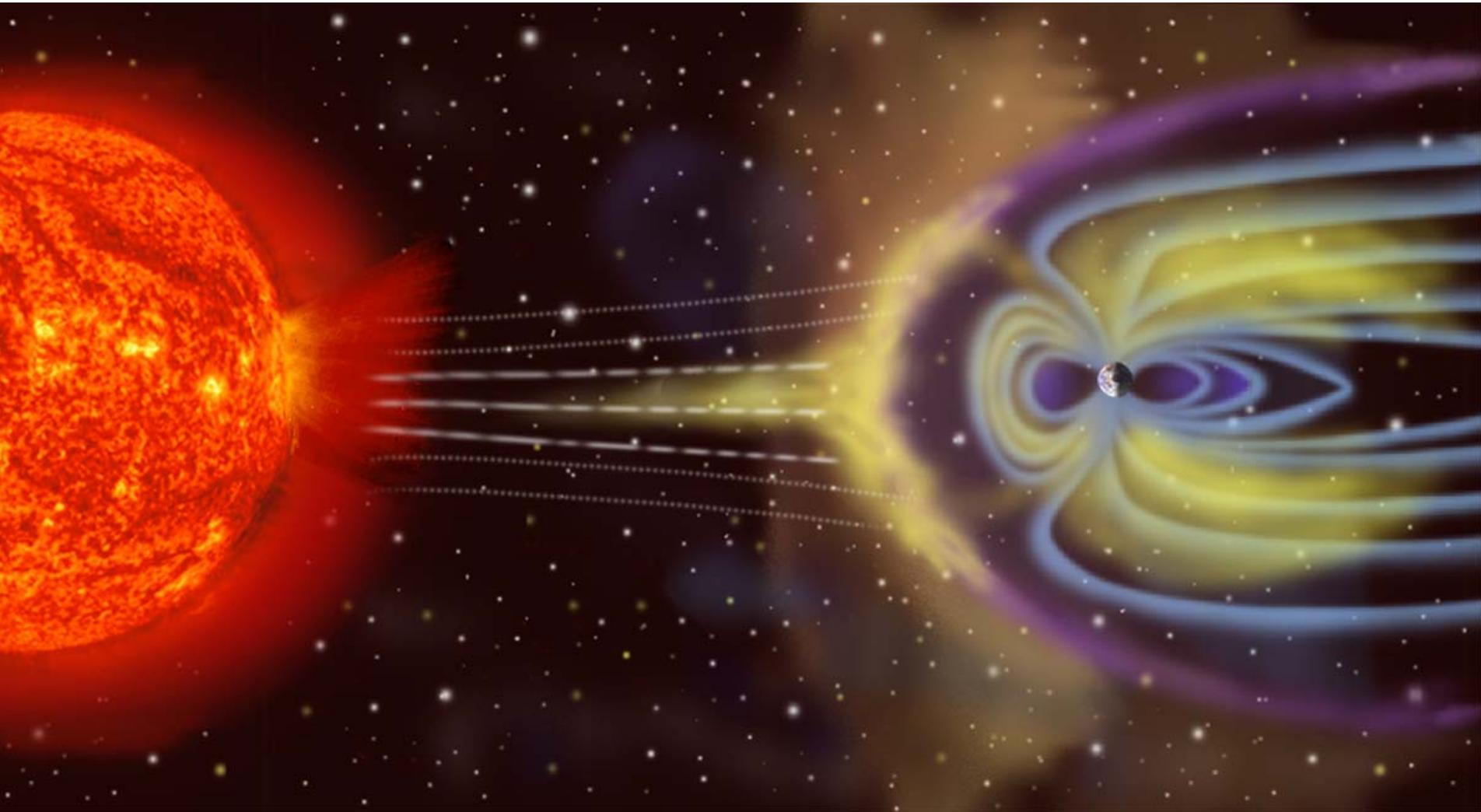
$$R_S(r, \lambda, \theta, \phi) = R_S^* \frac{r_E^2}{r^2} \frac{\cos^4 \lambda}{(1 + \sqrt{1 - \cos^3 \lambda \sin \theta \sin \phi})^2}$$

$$R_S(r_E, 0^\circ, 90^\circ, 270^\circ) = R_S^* \frac{1}{(1 + \sqrt{2})^2} = 10.2 \text{ GV}$$

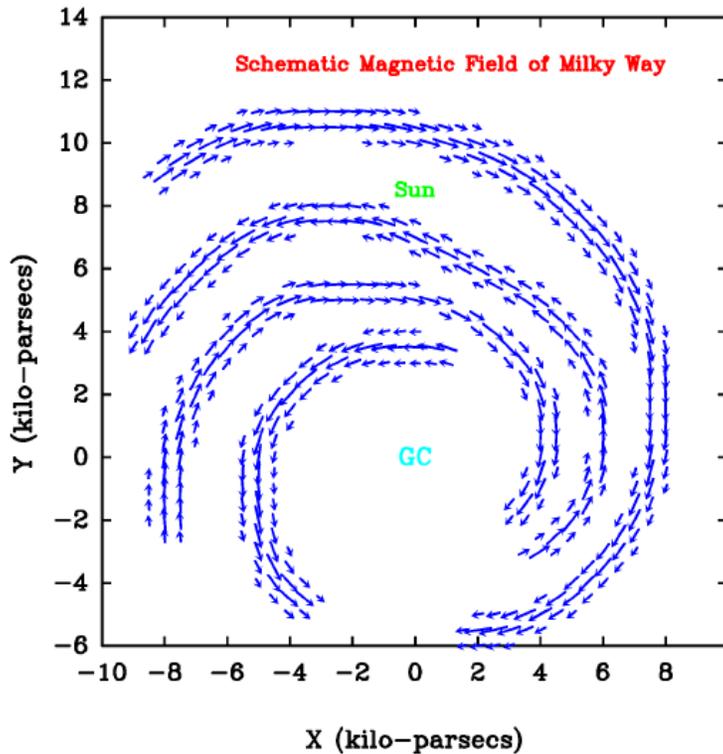
$$R_S(r_E, 0^\circ, 0^\circ, -) = R_S^* \frac{1}{4} = 14.9 \text{ GV}$$



Erdmagnetfeld: Sonnenwind



Galaktische Magnetfelder



$$3 \cdot 10^{-10} \text{ T} = 3 \mu\text{G}$$



Beitrag	[MeV/m ³]
Sternlicht (optisch)	0.6
Kosmische Strahlung	1
Mikrowellenhintergrund	0.26
galaktisches Magnetfeld	0.25

Typical magnet fields in nature

Neutron star	10^8 T
White dwarfs	10^4 T
Internal exchange fields of ferromagnets	10^1 to 10^3 T
Surface of ferromagnets	10^{-1} to 10^1 T
Sunspots	10^{-1} T
Earth	10^{-5} to 10^{-4} T
Technical scattering fields "urban noise"	10^{-12} to 10^{-5} T
Field in galaxies	10^{-10} T
Fields in galaxy accumulations	10^{-10} to 10^{-13} T
Intergalactic magnetic field	10^{-13} T
Magnetic fields in biology	10^{-15} to 10^{-9} T

<http://www.fz-rossendorf.de/pls/rois/Cms?pNid=404>

Zusammensetzung nach dem Knie (?)

