

Kopplung des Axions und des Photons: Primakoff Kopplung/Primakoff Konversion

Über Primakoff Konversion
berechnetes Axionenspektrum
aus der Sonne

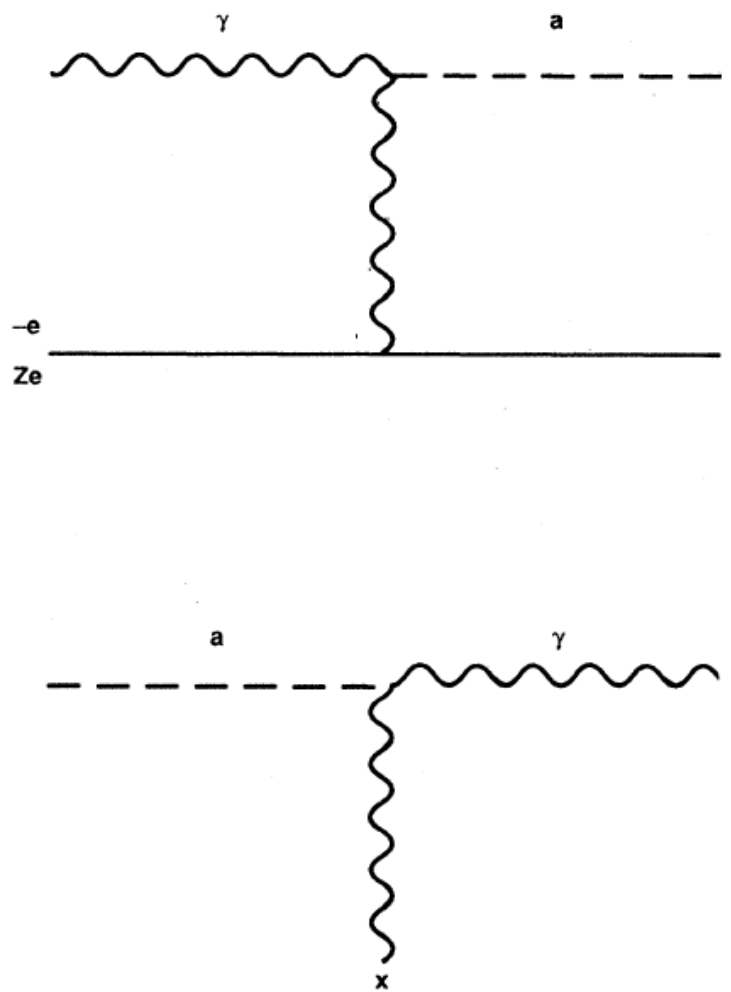


FIG. 1. Feynman diagram for the Primakoff production of axions by the interaction of a photon with an electron or nucleus (top), and (bottom) axion-photon conversion in the electric or magnetic field of an external source denoted by a cross (\times).

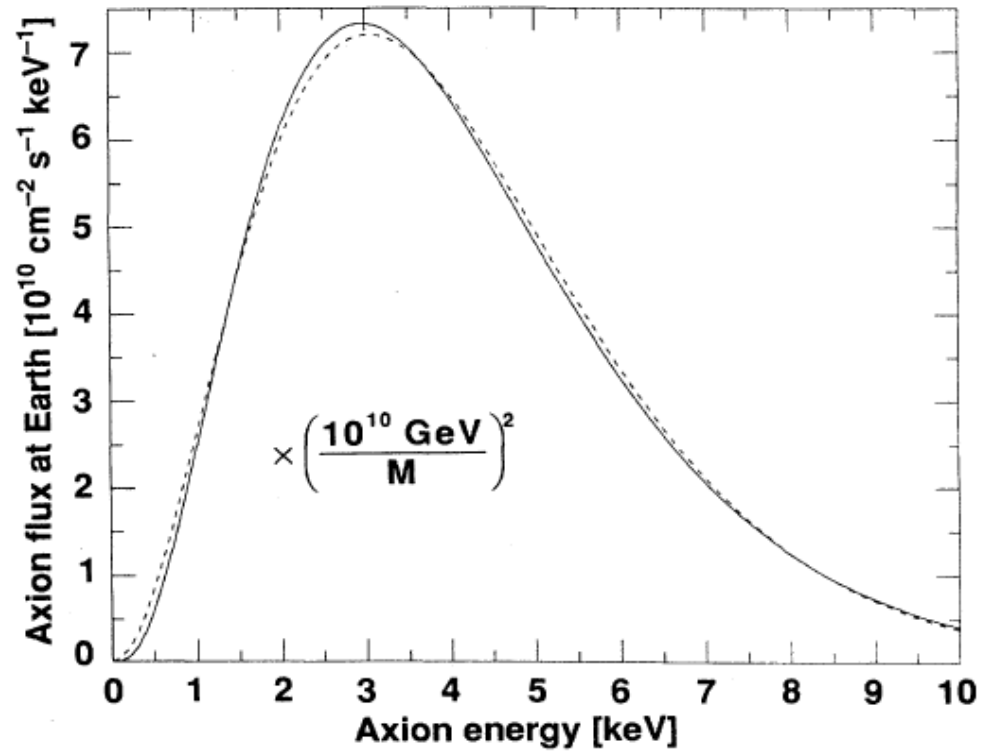
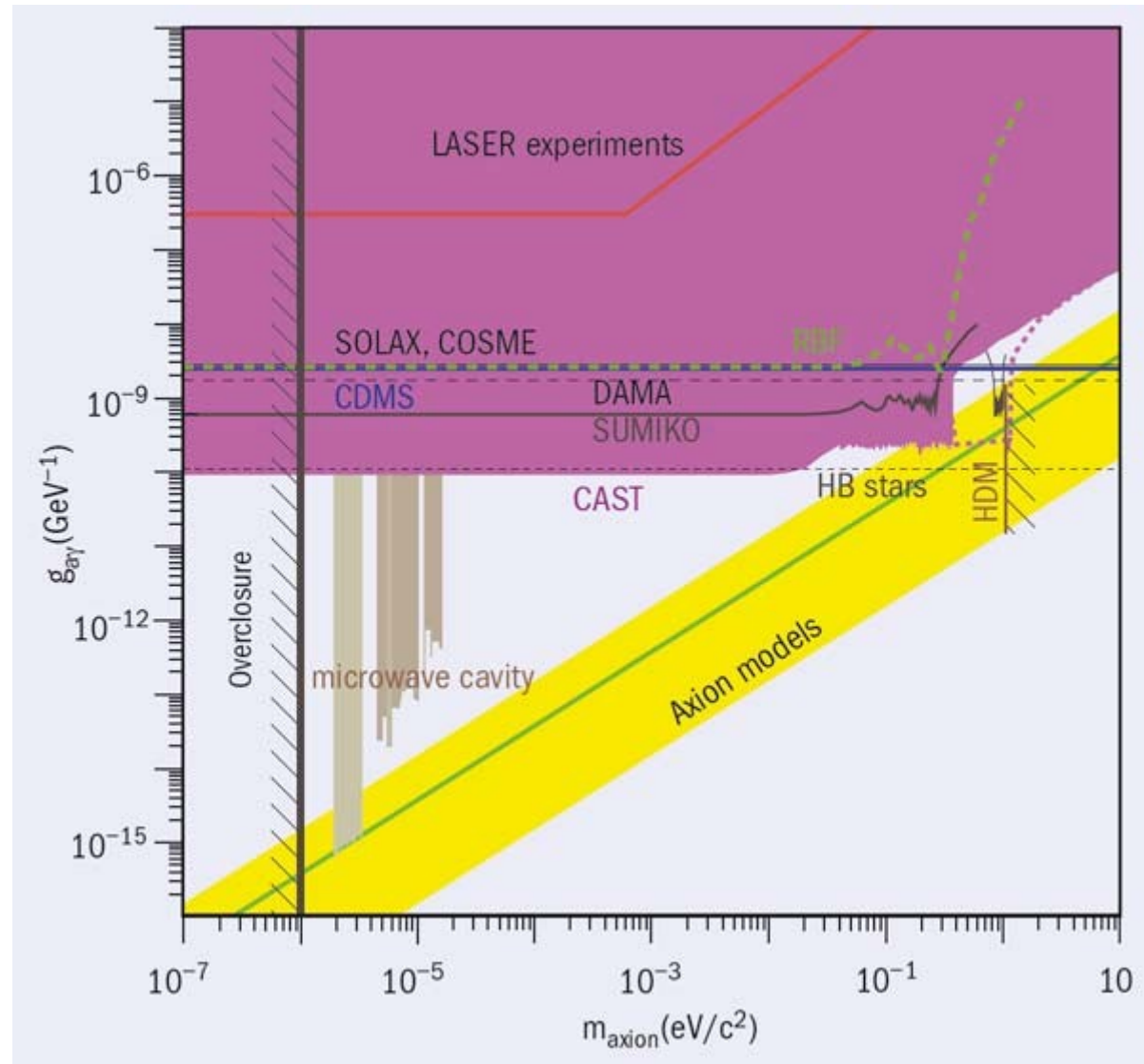
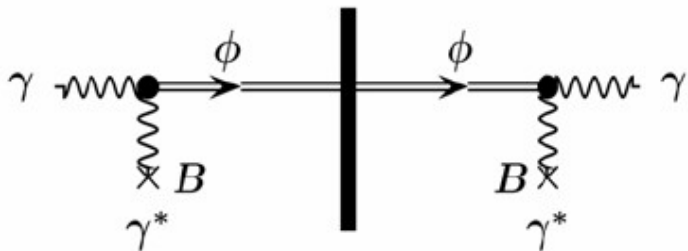


FIG. 2. Differential solar axion flux at the Earth. We assume that axions are only produced by the Primakoff conversion of blackbody photons in the solar interior (“hadronic axions”), and we assume a standard solar model (Ref. 26). The axion-photon coupling strength M is defined in Eq. (3). The solid line arises from a numerical integration over the Sun, the dashed line is an analytical approximation to this result as given in Eq. (9).

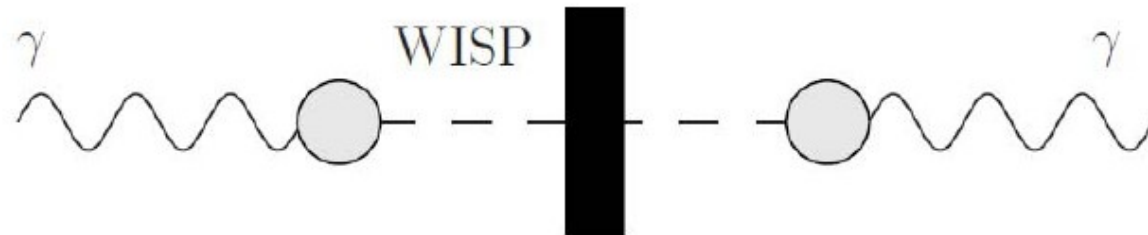
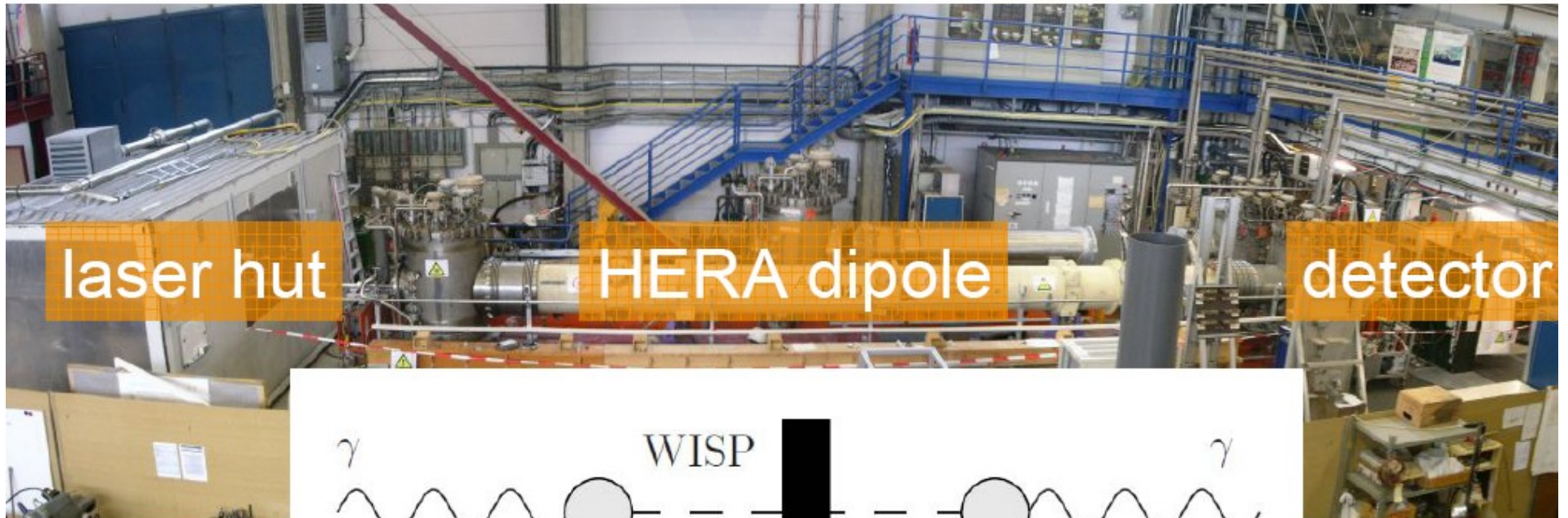
Das CAST Helioskop: CERN Axion Solar Telescope



Licht-durch-die-Wand Aufbau



Any Light Particle Search @ DESY



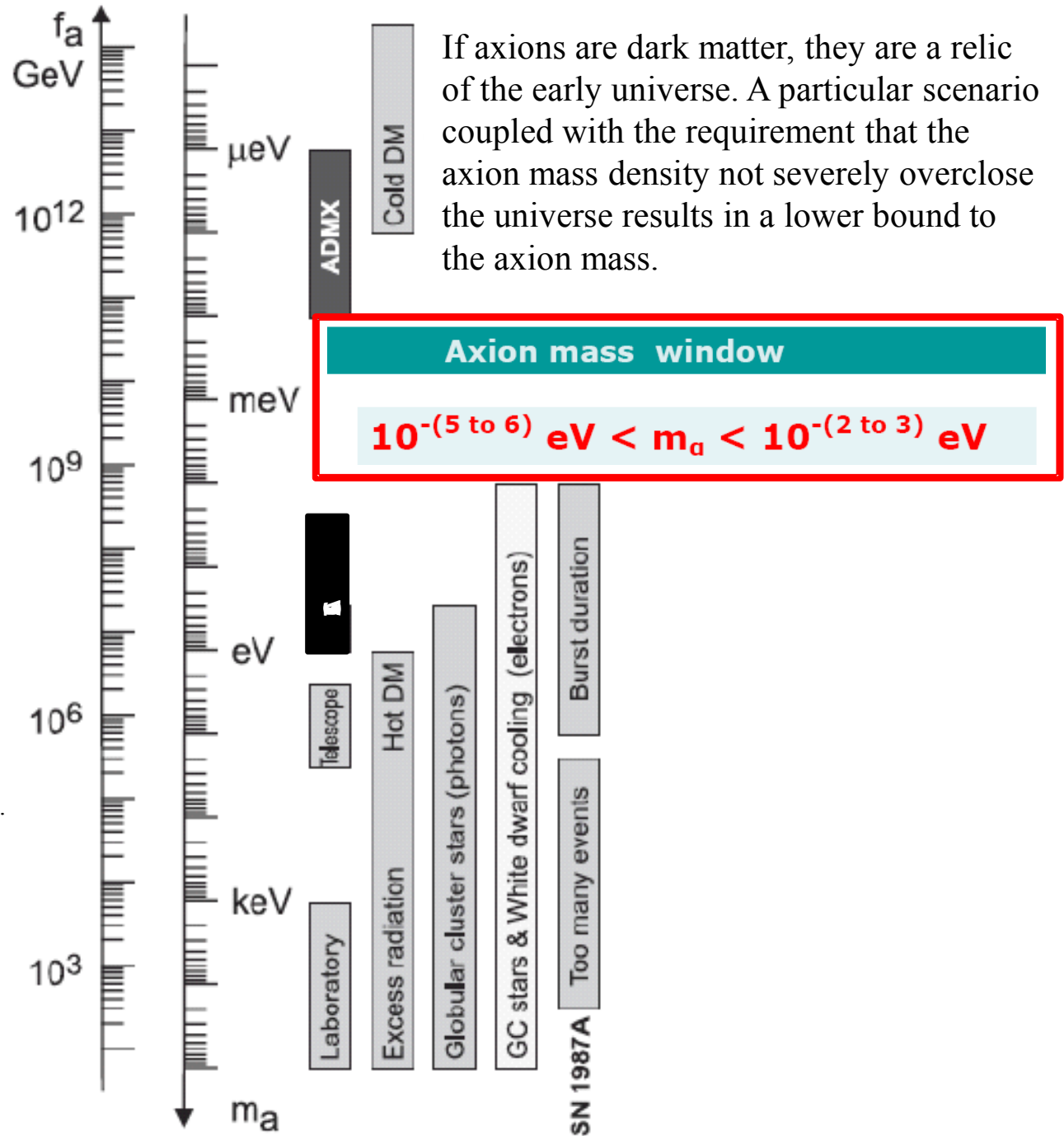
A "light-shining-through-a-wall" experiment

THE CURRENT BOUNDS

C. Hagmann, H. Murayama, G.G. Raffelt, L.J. Rosenberger, and K. van Bibber
 2008 Rev. Part. Physics.
 Phys. Lett. B 667,1 (2008).

Current Axion Search Experiments

- Solar Axion Telescope – „CAST“
- Dark Matter Axion Search – „ADMX“
- Vacuum Optical Properties –“PVLAS“ etc.
- Photon Disappearance Experiments
- New Force Search – Torsion Pendulums, etc.



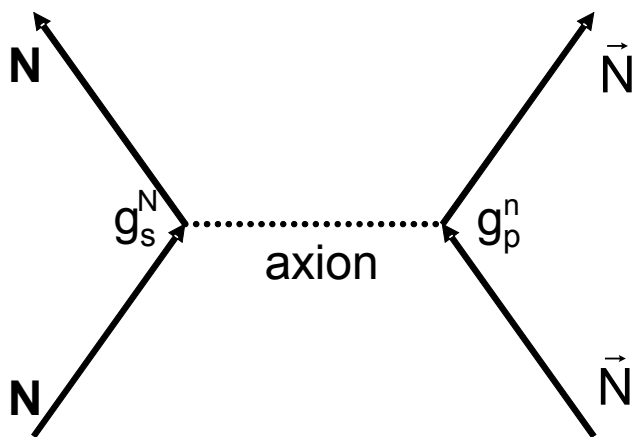
Short range interaction of the axion

Yukawa-type potential with monopole-dipole coupling:

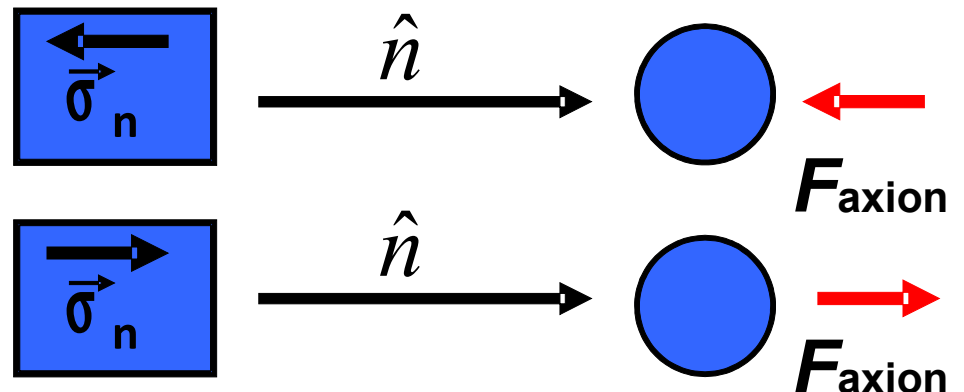
$$V(r) = \kappa \hat{n} \cdot \vec{\sigma} \left(\frac{1}{\lambda r} + \frac{1}{r^2} \right) e^{-r/\lambda}$$

(Moody and Wilczek PRD 30 130 (1984))

with: $\kappa = \frac{\hbar^2 g_s g_p}{8\pi m_n}$, $\lambda = \frac{\hbar}{m_a c}$ $\left(\begin{array}{l} 10^{-6} \text{eV} < m_a < 10^{-2} \text{eV} \\ 10^{-5} \text{m} < \lambda < 10^{-1} \text{m} \end{array} \right)$



polarized matter \vec{n}



Exclusion Plot for new spin-dependent forces

