K 221 - MÖSSBAUER-effect

Basics of resonance absorption

- natural linewidth

$\Gamma \cdot \tau = \hbar$

- DOPPLER broadening: LORENTZ-profile convoluted with GAUSSIAN = GAUSSIAN

DOPPLER-width $\gg$ natural width

MÖSSBAUER effect: recoilless resonance absorption ; for free atoms → line shape shifted by recoil

↳ in the lattice

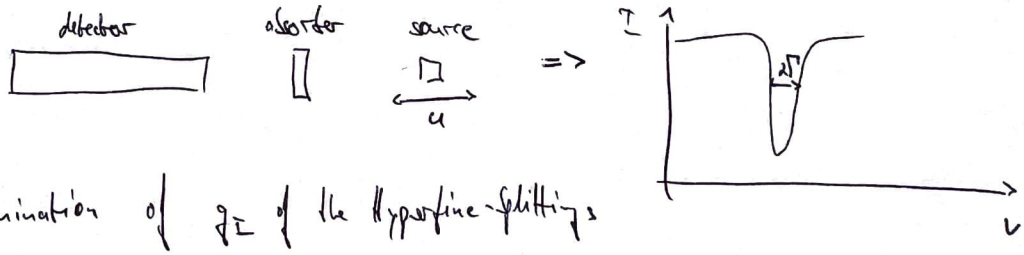
DEBYE-WALLER-factor $f = \exp(-k^2 \langle x^2 \rangle_T)$

↳ gives "Probability" of Mößbauer effect happening

decreases with increasing E_γ

decreases with Temperature

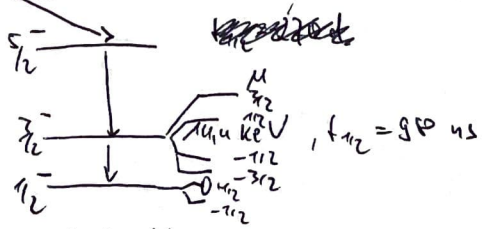
Application of the MÖSSBAUER effect



→ determination of g_I of the Hyperfine-Splittings

Decay scheme of ^{57}Co

- ^{57}Co $\frac{7^-}{2}$ $t_{1/2} = 270\,d$ EC



- isomeric shift: emission and absorption ↳ 6 lines in the spectrum
energy differ slightly due to HFS → resonance dip at $\nu \neq 0$