light CP-odd A_0: implications for LHC/TeV and b-physics
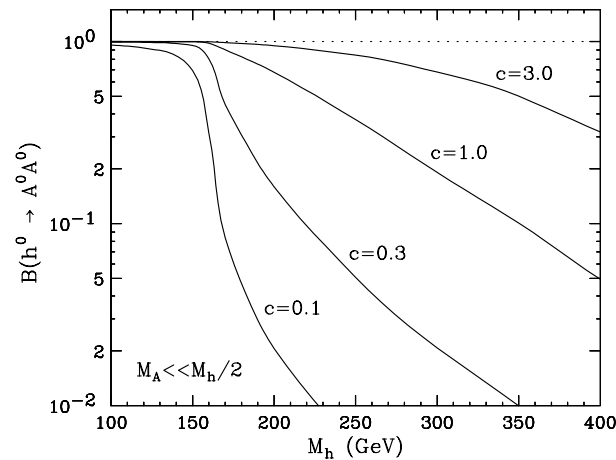
direct searches: $h_0 \to A_0 A_0$ open if $2 m_{A_0} < m_{h_0}$

can be VERY important for $\mathcal{O}(1)$ $h_0 A_0 A_0$-coupling c hep-ph/0005308

decay modes: $A_0 \to b\bar{b}, \tau\tau, 3\pi$ or higher hadronic, $\mu\mu, ee, \gamma\gamma$
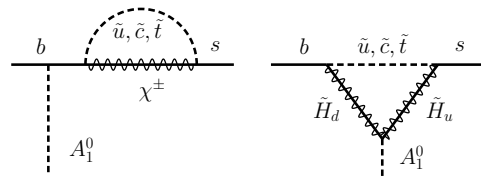
if A_0 very light and weakly coupled, it becomes missing energy

bounds from Υ-decays, beam dump, astro physics $m_{A_0} \gtrsim \mathcal{O}(100\text{MeV})$ ok
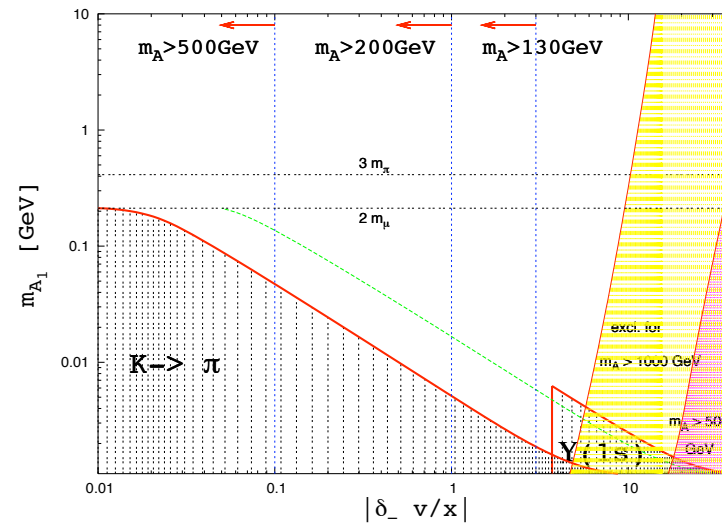
constraints from indirect signals: K, B-decays

framework: NMSSM=MSSM + 1 gauge singlet (see also talks on Friday)

at large $\tan\beta$: naturally light A_1^0, rad. stable $\qquad b \to sA_1^0$ transitions

bounds from $B \to KA_1^0, K \to \pi A_1^0, \Upsilon(1s) \to \gamma A_1^0$ decays, see Fig.

A_1^0 masses as low as $\mathcal{O}(10\text{MeV})$ viable hep-ph/0404220

further tests from b-physics

- improve bounds from radiative Υ-decays or $B \to K+$ missing energy

- for $m_{\psi'} < m_{A_1^0} \lesssim m_B$: search for A_1^0 in $b \to s\tau^+\tau^-$ processes, sensitivity e.g. $\mathcal{B}(B \to X_s\tau^+\tau^-) \sim 10^{-3}$

- $B_s - \bar{B}_s$ mixing and $B_s \to \mu^+\mu^-$ CDF: $\mathcal{B}(B_s \to \mu^+\mu^-) < 5.3 \cdot 10^{-7}$
  in MSSM correlated see Fig hep-ph/0207241
  in NMSSM: SM-like Δm_s (the A_1^0 contrib. is constrained by Δm_d), but not correlated with $\mathcal{B}(B_s \to \mu^+\mu^-)$ hep-ph/0404220