Search for Deconfined Hadronic Matter

hadrons:

- color neutral $q\bar{q}$ or qqq systems bound by gluons
- finite size, radius < 0.8 fm

at extreme particle density ($> 1 fm^{-3}$) , confinement expected to disappear due to overlap

$\Longrightarrow$ colored quarks and gluons can move freely
quark-gluon-plasma (QGP)

neutron stars:

- density $\rho > 8\rho_0$, may contain cold QGP,$T \sim 0$
- conversion could cause spin-up (Glendenning)

early universe:

- expanding QGP of high temperature and nearly vanishing net baryon density ($\mu_B \sim 0$)
- transition to hadrons at , $T \sim 150 MeV$, $t = 10 \mu s$, R = 10 Km
- quark nuggets may remain, DM candidates (Witten)

ultrarelativistic nucleus-nucleus collisions:

- produce transient QGP from collision energy
- lifetime few fm/c, volume of Pb nucleus