Dilepton Rates - Role of Baryons

- Dilepton Rates

  $$\boxed{\frac{dN_{l^+l^-}}{d^4x d^4q} = \frac{dR}{d^4q} = L_{\mu\nu}(q) W^{\mu\nu}(q)}$$

  Lepton tensor: $L_{\mu\nu} = -\frac{\alpha^2}{6\pi^3 M^2}(g_{\mu\nu} - \frac{q_\mu q_\nu}{M^2})$

  Hadron tensor: $W^{\mu\nu}(q) = \int d^4x e^{-iqx} \langle\langle j_\mu^{em} j_\nu^{em} \rangle\rangle$

  Electromagnetic current: $j_\mu^{em} = j_\mu^{(\rho)} + j_\mu^{(\omega)} + j_\mu^{(\phi)}$

  $$\boxed{\frac{dR_{l^+l^-}}{dq^4} = -\frac{\alpha^2}{\pi^3 M^2} f^B(q_0; T) Im\Pi_{em}(q_0, \vec{q})}$$

- Vector-Dominance Model: $Im\Pi_{em}(q) = \Sigma_V \frac{ImD_V(q)}{g_V^2}$
- Rapp/Wambach; Renk/Schneider/Weise: All resonances are broadened. The medium modification of the ρ-meson properties are described by the self energy which contains all interactions with the surrounding matter.
  $D_\rho(M, q; T) = [M^2 - m_\rho^{(0)^2} - \Sigma_{\rho\pi\pi} - \Sigma_{\rho B} - \Sigma_{\rho M}]^{-1}$
- Brown/Rho: 'Dropping mass'
  $\frac{m_\rho^*}{m_\rho} = (1 - C\frac{\rho}{\rho_0})(1 - (T/T_c^\chi)^2)^\alpha;$

Present theoretical conclusion:

Baryons play the dominant role in the medium modifications of the ρ meson