

## Leptohadron hypothesis

Leptohadron hypothesis involves the following key aspects.

1. The notion of quark color differs from that in QCD.
  - (a) Color is not spin-like quantum number as in QCD but corresponds to quantum number assignable to the ground states of the super-conformal representations characterized by imbedding space spinors and to the generators of superconformal algebras involved (super-symplectic algebra of  $\delta M_+^4 \times CP_2$  having structure of super-conformal algebra).
  - (b) The color of imbedding space spinors is analogous to orbital angular momentum and partonic 2-surface behaves like rigid body in  $CP_2$  degrees of freedom.
  - (c) The correlation between electroweak and color quantum numbers is quite not correct but colored generators of superconformal algebra carrying "vibrational" color allow to cure the situation.
  - (d) Prediction: also leptons can move in color partial waves. It is not at all obvious whether they allow light states. In principle p-adic mass calculations allow to conclude whether this is the case.
2. The most obvious theoretical objection against colored leptons can be circumvented in TGD framework.
  - (a) If light color excitations of leptons exist they should be seen in the decay widths of weak bosons.
  - (b) If color leptons are light only if they are dark in TGD sense, that is correspond to non-standard value of Planck constant  $h_{eff} = n \times h$ , this objection can be circumvented.
3. There exists some experimental evidence supporting the idea that color excitation of leptons might give rise to light color bound pion-like states.
  - (a) An anomalous production of electron-positron pairs was observed in heavy ion collisions already at seventies but the findings were forgotten.
  - (b) The production was explained in terms of formation of pseudo-scalar resonance with mass slightly above  $2m_e$ ,  $m_e$  electron mass. The production had some strange features. In particular, it was observed near Coulomb wall and the observed pairs were nearly at rest in velocity cm frame.
  - (c) TGD model assumes that a coherent state of electropions is formed in the magnetic and electric fields of colliding heavy ions. It is essential that magnetic field and electric field are not orthogonal since this guarantees the the pseudo-scalar "instanton density"  $E \cdot B$  to electro-pion is non-vanishing. This coupling can be deduced from anomaly considerations.
  - (d) The resulting production cross section is discussed in the chapter "Recent status of leptohadron hypothesis" of "Hyper-finite factors and dark matter hierarchy".
  - (e) Also monochromatic radiation from galactic center with energy very very near to  $m_e$  has been observed. The interpretation could be be in terms of decays of electro-pions created in collisions of heavy ions.
  - (f) There is also some evidence for the production of muo-pions and tau-pions.