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Dibaryons – a new state of matter?

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Collaboration

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Abstract content

Despite their long painful history dibaryon searches (where dibaryon means a baryon number $B = 2$ state independently on the internal structure: genuine six-quark state/baryonic-molecule) have recently received new interest, in particular by the recognition that there are more complex quark configurations than just the familiar $q\bar{q}$ and qqq systems. The "hidden color" aspect makes dibaryons a particularly interesting object in QCD. A resonance like structure recently observed in double-pionic fusion to deuteron, at $M = 2.38 GeV$ with $\Gamma = 70 MeV$ and $I(J^p) = 0(3^+)$ meanwhile proved to be the so called "inevitable dibaryon" $d^.To investigate its structure we have measured its decay branches into the d\pi^0\pi^0, d\pi^+\ ,pp\pi^-\pi^0, pn\pi^0\pi^0 and pn channels by pd and dp collisions in the quasi-free reaction mode, utilizing the WASA detector s wave analysis within clusion of these data reveal a pole in the complex plane of the ^3D_3 partial wave at (2380\pm 10) MeV-i(40\pm 5) MeV in accordance with the d^ resonance hypothesis. Since in the double-pionic fusion reactions to ^3He and ^4He at-Cosy results also the latest results in this field as well as the influence of dibaryons on other areas of physics, including heavyi ion collisions for invariant electron-positron masses in the range 0.15 GeV < M_{e^+e^-} < 0.6 GeV has recently been traced bac neutron(pn) collisions relative to pp collisions. Whereas the dilepton spectra from pp collisions are understood quantitatively, th in particular regarding the region M_{e^+e^-} > 0.3 GeV at beam energies below 2 GeV ("DLS Puzzle"). We show that the missing -production, which is dominated by t-channel \Delta\Delta excitation and the recently found isoscalar dibaryonic resonance d^ \approx$ 2.37 GeV.

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