New resonance d* from WASA-at-COSY

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 quark-antiquark and qqq systems.

A resonance like structure recently observed in double-pionic fusion to deuteron, at M = 2.38GeV with 70MeV width and $I(J_p) = 0(3_+)$ meanwhile proved to be the so-called inevitable dibaryon d*(2380). To investigate its structure we have measured its decay branches into the $d\pi^0\pi^0$, $d\pi^+\pi^-$, $pp\pi^-\pi^0$, $pn\pi^0\pi^0$ and pn channels by pd and dp collisions in the quasi-free reaction mode, utilizing the WASA detector setup at COSY.

The pn decay channel was measured by use of polarized deuterons in inverse kinematics. These new np analyzing power data exhibit a pronounced resonance effect in their energy dependence. The SAID partial-wave analysis with inclusion of these data reveals a pole in the complex plane of the 3D3-3G3 partial waves at (2380±10)MeV −i(40±5)MeV in accordance with the d* resonance hypothesis. Further investigations on the internal structure of the d* dibaryon, the SU(3) multiplet companions as well as the mirror partners are expected to be done in near future. First results in search for the d* mirror state with electric charge Z=+4 performed by Wasa collaboration will be presented. Other future dibaryon initiatives to be done at MAINZ, J-PARC and PANDA will be discussed.