

Evidence of a dibaryon spectrum in coherent $\pi^0\pi^0d$ photoproduction at forward deuteron angles

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The BGOOD photoproduction experiment at the ELSA facility is uniquely designed to explore kinematics where a charged particle is identified in a forward spectrometer and a recoiling hadronic system is reconstructed in the central calorimeter at low momentum transfer. Typically used to study strangeness photoproduction at low t , the setup also enables studies of coherent reactions off the deuteron where the deuteron takes the majority of the beam momentum.

The reaction, $\gamma d \rightarrow \pi^0\pi^0d$ was studied from threshold to a centre-of-mass energy of 2850 MeV. A full kinematic reconstruction was made, with final state deuterons identified in the forward spectrometer and π^0 decays in the central BGO Rugby Ball. The strength of the differential cross section exceeds what can be described by models of coherent photoproduction and instead supports the three isoscalar dibaryon candidates reported by the ELPH collaboration at 2.38, 2.47 and 2.63 GeV/c². A low mass enhancement in the $\pi^0\pi^0$ invariant mass is also observed at the d^* (2380) centre-of-mass energy which is consistent with the ABC effect. At higher centre-of-mass energies, a narrow peak in the π^0d invariant mass at 2114 MeV/c² with a width of 20 MeV/c² supports a sequential two-dibaryon decay mechanism.

Preliminary results for the $\pi^0\eta d$ and $3\pi^0d$ coherent reaction channels will also be presented.

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