The $pp \to d\pi^+\pi^0$ Reaction - A Case of $\Delta\Delta$ Excitation without ABC-Effect

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The ABC effect – an intriguing low-mass enhancement in the $\pi\pi$ invariant mass spectrum – is known from inclusive measurements of two-pion production in nuclear fusion reactions. These measurements indicate that this phenomenon solely appears in case of the production of isoscalar pion pairs, but not in cases, when isovector pion pairs are produced. If true, then isovector $\pi\pi$ production may serve as an ideal control channel for the exclusion of detector artifacts as origin of observed ABC-like bumps and - equally important - for examining, whether the conventional theoretical treatment of $\Delta\Delta$ excitation works in cases, where the ABC effect is absent.

Hence in addition to the investigation of ABC-effect cases [1, 2] - see separate contribution to this conference - we also conducted at CELSIUS-WASA first exclusive experiments of the $pp \to d\pi^+\pi^0$ reaction as control channel. In this contribution first results will be presented from the measurements at $T_p = 1.1$ GeV, i. e. in the energy region, where the ABC-effect is supposed to be largest and the $\Delta\Delta$ excitation already should be the dominant process.

The $d\pi^+\pi^0$ data reveal that indeed the ABC-effect is absent in this reaction despite a strong $\Delta\Delta$ excitation, which is clearly seen in the $d\pi$ invariant mass spectra. The distribution of the $\pi^+\pi^0$ opening angle is consistent with a spinflip p-wave distribution. The results will be compared to those from the isoscalar double-pion production in the fusion reaction $pn \to d\pi^0\pi^0$, where a huge ABC-effect is observed.

The total cross section of the $d\pi^+\pi^0$ reaction also does not exhibit the peculiar resonance-like behavior of the $d\pi^0\pi^0$ channel. It rather agrees with a conventional $\Delta\Delta$ treatment without mutual interaction between the two Δ states.

[1] M. Bashkanov et al., Phys. Lett. **B637** (2006) 223
[2] H. Clement et al., Prog. Part. Nucl. Phys., in press; arXiv:0712.4125 [nucl-ex]

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