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## Sensitivity study towards a search for the $N(1720)$ double resonance in pion-proton collisions with HADES

The latest analysis of  $\pi^+\pi^-p$  electroproduction and photoproduction data taken by the CLAS collaboration hints to the existence of an additional  $N'(1720)3/2^+$  resonance. This hint is based on the comparison of the fits of the electroproduction and photoproduction data which shows a large deviation by a factor four for the branching fraction of the  $N(1720)$  into the  $\rho p$  final state. This discrepancy can be resolved by including an additional  $N'(1720)$  resonance [1]. To provide evidence for the existence of the  $N'(1720)$ , complementary data are necessary. In the near future, this may be provided by the HADES collaboration using the pion-beam facility at SIS18.

To demonstrate the feasibility for HADES to identify the production of the  $N'(1720)$ , a detailed sensitivity study have been performed. This study uses the Bonn-Gatchina (BoGa) Partial Wave Analysis framework [2]. Monte Carlo data with the physical model from the latest fit of the CLAS collaboration have been generated and analysed. In particular, the effect of different branching ratios, the effect of the ratio of  $N(1720)$  to  $N'(1720)$  and the amount of data were investigated within  $4\pi$  and within the HADES detector acceptance. Moreover, the different MC were fitted with the BoGa framework.

[1] Mokeev, V. I., et al. "Evidence for the  $N'(1720) 3/2^+$  nucleon resonance from combined studies of CLAS  $\pi^+\pi^-p$  photo- and electroproduction data." *Physics Letters B* 805 (2020): 135457.

[2] Bonn-Gatchina Partial Wave Analysis Web- page: <https://pwa.hiskp.uni-bonn.de>.

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