

FIG. 1. Distribution of topological NN output for signal and background in the $\psi'\text{-}\eta_c(2S)$ region. The training samples for signal and background are kaons from two-body B decays and kaons from secondary charm or multi-body B decays as signal and background, respectively.

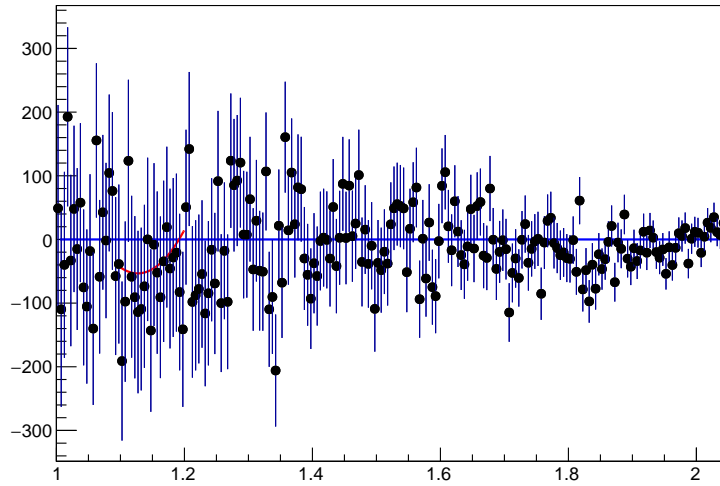


FIG. 2. Distribution as function of the kaon momentum in GeV/c of the residuals observed after the background subtraction, in the simulation sample. The red curve represents the correction which is applied to the data in the region between 1.1 and 1.2 GeV/c . The effect of this correction is taken into account when computing the $X(3872)$ significance.

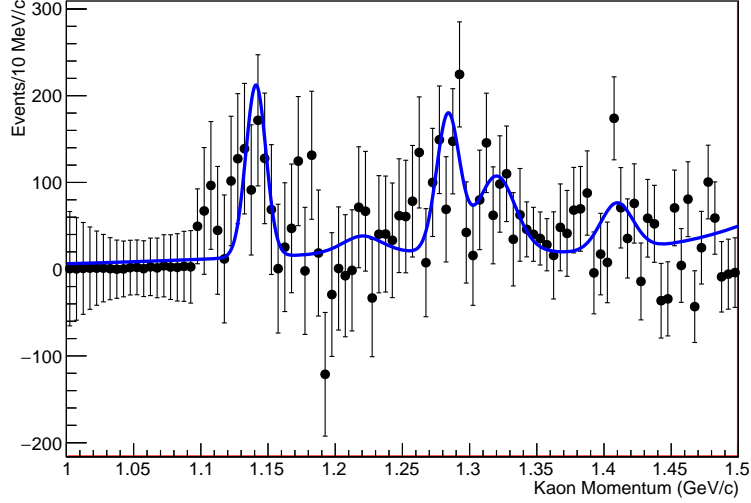


FIG. 3. Kaon momentum distribution in GeV/c , in the high mass region, with tighter cuts regarding B purity and background rejection. The efficiency is reduced by about a factor 2 but a better separation of the $\psi'-\eta_c(2S)$ doublet is observed. An $X(3872)$ signal is also clearly visible.

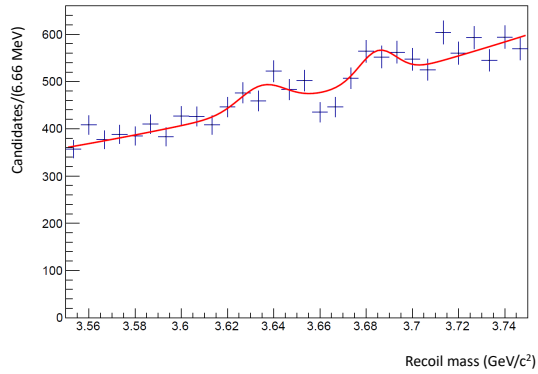


FIG. 4. Distribution of the mass of the system recoiling against the kaon in the B center-of-mass, in GeV/c^2 . The selection cuts are the same as above in Fig. 3. The purpose of this plot is to enable comparison between $BABAR$'s results and those of the $BELLE$ collaboration in the $\psi'-\eta_c(2S)$ region [Phys. Rev. D **97**, 012005 (2018)], which are displayed using the recoil mass variable and without background subtraction.