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Experimental study of hyperon resonances below the KbarN thresold at J-PARC

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Lambda(1405) is a well-known hyperon resonance with the spin/parity of 1/2-.
According to PDG, its mass and width are 1405.1(+1.3-1.0) MeV and 50 MeV [1],
Its light mass, located at 27 MeV below the KbarN mass threshold, arises a basic
idea of possible deeply bound kaonic nuclear states [2].
On the other hand, there is a longstanding argument if Lambda(1405) has
a so-called double-pole structure, comprizes pi-Sigma and KbarN states [3,4,5].
In particular, a chiral unitary model calculation claims that
the pole coupled to the KbarN state is located at about 1426 MeV [4],
much closer to the KbarN mass threshold.
In order to confirm the pole structure, it is desired to measure
the S-wave KbarN scattering amplitude in the isospin equal to 0 channel
below the KbarN threshold.
We therefore proposed an experiment via the (K-,n) reaction on deuteron at the K1.8BR beam line
of J-PARC [6]. In the reaction, an incident negative kaon of 1 GeV/c knocks out a neutron at
a forward angle and a recoilled kaon reacts with a residual nucleon.
The d(K-,n) reaction is expected to enhance the S-wave KbarN scattering even
below the KbarN threshold due to a small momentum transfer of about 200 MeV/c.
Missing mass spectra of pi+-Sigma-+,pi0Sigma0, and pi-Sigma0 in the d(K-,n) and d(K^-,p)
reactions were measured.
We will discuss the line shapes of the measured spectra to deduce information
on a resonance coupled to the KbarN channel below the KbarN thresold.

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