

## New insight into deuteron stripping to bound states and resonances

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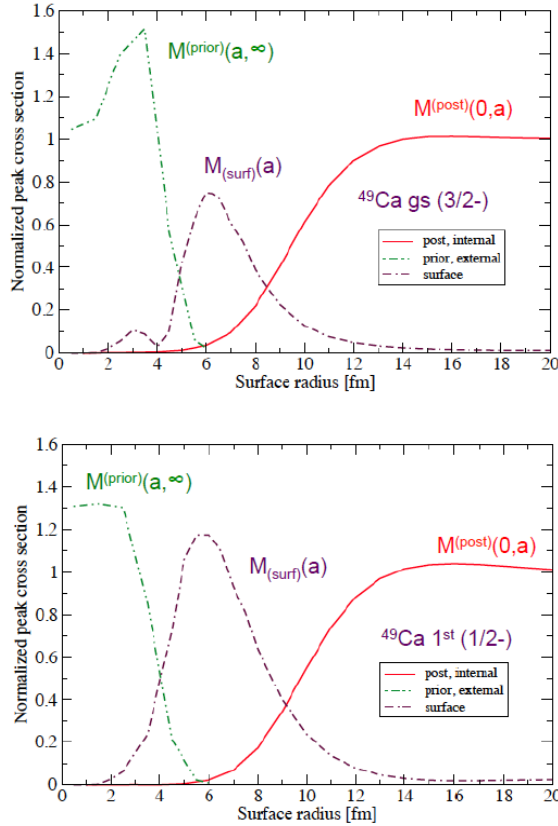
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Surface integral formalism and generalized R-matrix approach [1] applied to deuteron stripping reactions  $A(d,p)B$  provide a new insight into the physics of these reactions. In this approach both post and prior forms of the DWBA amplitude can be written as

$$M^{DW} = M_{\text{int}}^{DW(\text{post})}(0, a) + M_{\text{surf}}(a) + M_{\text{ext}}^{DW(\text{prior})}(a, \infty) \quad (1)$$

The first term is the internal post form amplitude, the second term is the surface integral and the last one is the external prior form. The dominant contribution comes from the surface term, while the internal and external terms are typically small. By proper using of the core-core ( $p$ - $A$ ) optical potential the internal

Peak cross section relative to full calculation



**FIG. 1.** Peak values of the differential cross sections for the deuteron stripping  $^{48}\text{Ca}(d,p)^{49}\text{Ca}$  to the ground bound state (upper panel) and first excited state (bottom panel) of  $^{49}\text{Ca}$  as a function of the channel radius. The green line is the prior external cross section, the blue line is the surface cross section and the red line is the post external cross section.

part can be significantly minimized. FRESKO code has been modified to take into account Eq. (1). The calculations have been done for different reactions including stripping to bound states and resonances.

In Fig. 1 we present the calculations of the  $^{48}\text{Ca}(d,p)^{49}\text{Ca}$  reaction populating the ground and the first excited state of  $^{49}\text{Ca}$  at the deuteron energy of 13 MeV. As we can see, if the channel radius is taken to be  $a = 6\text{fm}$ , the surface term is totally dominant and both internal and external terms can be neglected. Because the surface term is parameterized in terms of the ANC, only the ANC rather than the spectroscopic factor can be determined from the analysis of the deuteron stripping

[1] A.M. Mukhamedzhanov, Phys. Rev. C **84**, 044616 (2011).