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Revealing the nature of near-threshold narrow resonances in 11B with the HELIOS spectrometer.

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The large branching ratio observed in the β-delayed proton emission of ^{11}Be was explained with the existence of a narrow near-threshold proton emitting resonance in ^{11}B. The direct measurement of this process raised a heated debate around the properties of this resonance and the unusually large β-decay branching ratio populating it. Since then, there were several experiments that reported the observation of such an elusive resonance. While there is a widespread agreement on the existence of this resonance, from both theoretical and experimental stand points, there are still many open questions around its nature. One of the main challenges lies in the description of the complex structure of ^{11}B and the role of the continuum coupling with four different particle emission thresholds in about 2 MeV of excitation energy. Moreover, the properties of the states in the vicinity of these thresholds, critical to understand the structure of ^{11}B, are either not known or poorly constrained. With the intention of clarifying such an entangled situation, we performed an experiment to investigate the ^{11}B structure at high excitation energy through the ^{10}B(d,p) reaction in inverse kinematics using the HELIOS spectrometer. The detection of the protons in coincidence with heavy recoils in inverse kinematics enabled the determination of low-probability branching ratios of several states around particle emission threshold and their widths. The much debated near-proton-threshold resonance at 11.4 MeV was observed thanks to the high-quality recoil identification.

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Collaboration

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