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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 ¹¹B 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 ¹¹B, are either not known or poorly constrained. With the intention of clarifying such an entangled situation, we performed an experiment to investigate the ¹¹B structure at high excitation energy through the ¹⁰B(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

Primary authors: AYYAD, Yassid (University of Santiago de Compostela); Dr KAY, Ben (Argonne National Laboratory); MITTIG, Wolfgang (MSU-NSCL); BAZIN, Daniel (NSCL); BECEIRO-NOVO, Saul (MSU); CHEN, Jie (Southern University of Science and Technology); OLAIZOLA, Bruno (CERN)

Presenter: Dr KAY, Ben (Argonne National Laboratory)

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