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# Measurement of Nuclear Fragmentation Cross Sections with NA61/SHINE for a better understanding of the Propagation of Cosmic-Ray Nuclei in the Galaxy

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The NA61/SHINE facility is a multi-purpose experiment located at the H2 beam line of the CERN SPS North Area, with the aim of studying the properties of hadron production in nuclear collisions with fixed targets. Important goals are to measure hadron-nucleus interactions to improve cosmic-ray shower modeling and also to study light, secondary cosmic-ray nuclei production (Li, Be \& B) in the Galaxy. An analysis of the data taken during a pilot run in 2018 will be presented in this contribution. These data were taken with $^{12}$C projectiles at a beam momentum of 13.5 *A* GeV/c and two fixed targets, viz.polyethylene ($C_2H_4$) and graphite. The specific focus here is the measurement of total boron ($^{10}$B & $^{11}$B) production cross section in C+p interactions at 13.5 *A* GeV/c. The cosmic-ray nucleus $^{11}$C is termed a 'Ghost nucleus' on account of its short lifetime compared to the usual cosmic-ray diffusion time in the Galaxy and it ultimately decays to Boron as, $^{11}\text{C}\rightarrow{}^{11}\text{B} + \beta^{+}$. Therefore, precise knowledge of the production cross section of $^{11}$C is very relevant for the understanding of boron production in the Galaxy.

A new measurement of the fragmentation cross section of C+p $\rightarrow{}^{11}$C will be presented, which, together with our previously reported B-production cross section, provides a new constraint on boron production in the Galaxy in the high-energy range relevant for modern space based cosmic-ray experiments like AMS-02.

Moreover, the impact of our measurement on the interpretation of the B/C ratio and an outlook for future fragmentation measurements with NA61/SHINE will be briefly discussed.

## Keywords

fragmentation; cross-section; fixed target; B/C ratio; boron-to-carbon ratio; 10B; 11B; 11C; propagation; diffusion

## Collaboration

other (fill field below)

## other Collaboration

NA61/SHINE

## Subcategory

Experimental Results

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