

Halo-induced large enhancement of soft dipole excitation of ^{11}Li observed via proton inelastic scattering

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Proton inelastic scattering off a neutron halo nucleus, ^{11}Li , has been studied in inverse kinematics at the IRIS facility at TRIUMF. The aim was to establish a soft dipole resonance and to obtain its dipole strength. Using a high quality 66 MeV ^{11}Li beam, a strongly populated excited state in ^{11}Li was observed at $E_x=0.80 \pm 0.02$ MeV with a width of $\Gamma = 1.15 \pm 0.06$ MeV. A DWBA (distorted-wave Born approximation) analysis of the measured differential cross section with isoscalar macroscopic form factors leads us to conclude that this observed state is excited in an electric dipole (E1) transition. Under the assumption of isoscalar E1 transitions, the strength is evaluated to be extremely large amounting to 30~296 Weisskopf units, exhausting 2.2%-21% of the isoscalar E1 energy-weighted sum rule (EWSR) value. The large observed strength originates from the halo and is consistent with the simple di-neutron model of ^{11}Li halo.

Summary

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