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Searching for the low-energy enhancement in 91-Zr

The nuclear level density (NLD) and
-ray strength function (
SF) are quantities that give
essential information about the behaviour of a nucleus at high excitation energy. NLD is dened
as the number of levels per unit of excitation energy.
SF is dened as a measure of the average
reduced
decay probability of a nucleus. These concepts are useful at high excitation energies
where the spacing between the levels is small and gives information on degrees of freedom
and underlying nuclear dynamics. The evidence of the low-energy enhancement in the
SF for
energies less than 4 MeV has been discovered in several nuclei. Recently, a strong enhancement
of M1 transitions in 90Zr has been predicted for
-ray energies below 2 MeV in shell model
calculations. In this work we explored the existence of the low-energy enhancement in the
neighbouring 91Zr isotope with the assumption that neigbouring isotopes have similar
SF and
hence provided rst experimental NLD and
SF for this nucleus. The experiment 90Zr(d,p)91Zr
was conducted at the Oslo Cyclotron Laboratory (OCL). The SiRi (silicon telescope) array was
used to detect charged ejectiles from the reaction. The CACTUS (NaI(Tl) detectors) array
was utilized to detect
rays that were in coincidence with charged particles. The nuclear
level density and
SF were extracted with the Oslo method. The existence of the LEE was
observed, which agrees with the shell model calculations in 90Zr. The NLD and
SF quantities
were used to calculate (n,
) cross sections with the Talys reaction codes. These were compared
with experimental data from direct measurement to test the reliability of the approach used in
this work.

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