

Nuclear structure studies with the PRISMA/CLARA setup

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A program on nuclear structure studies in nuclei populated by multi-nucleon transfer and deep-inelastic collisions is being carried on at LNL with the PRISMA/CLARA setup. In each single experiment, due to the large acceptance of the spectrometer, nuclear species produced over a wide mass and Z range can be detected with PRISMA[1] placed near the grazing angle. Prompt gamma rays following the de-excitation of these nuclei can be observed with the CLARA array[2]. The high granularity of CLARA, combined with velocity vector measured with PRISMA, allows precise Doppler correction for the gamma rays emitted by in-flight recoils. Typical gamma-ray energy resolution obtained after Doppler correction is below 1% for recoil velocities $v/c \sim 10\%$. Having high efficiency and good resolving power, PRISMA/CLARA is an ideal tool for reaction mechanisms studies and for gamma spectroscopy of the nuclei produced in multi-nucleon transfer reactions or deep-inelastic collisions. Following a recent campaign dedicated to the study of medium-mass neutron-rich nuclei, significant experimental information has been obtained, concerning topics as the “island of inversion” around $N=20$, the onset of deformation on Cr-Fe region around $N=40$, and the stability of $N=50$ spherical shell-closure for $28 < Z < 40$.

References

- [1] A.M. Stefanini et al., Nucl. Phys. A 701, 217c (2002)
- [2] A. Gadea et al. Eur. Phys. J. A 20 193 (2004)