

ELASTIC AND INELASTIC SCATTERING (GIANT RESONANCES)
OF 120 MeV/A ALPHA PARTICLES

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Elastic and inelastic scattering of intermediate energy alpha particles is an interesting introduction to the future heavy-ion interaction studies planned for the Saturne (LNS) accelerator. In the energy range of 50-200 MeV/A one expects the transition region where the interaction changes from the one of two nuclei as a whole to that of quasi independent nucleons. Both transparency properties of the optical potential and the collective modes of giant resonances are points of interest.

We have carried out measurements of elastic and inelastic scattering of 480 MeV alpha particles on ^{208}Pb , ^{116}Sn and ^{58}Ni , and 340 MeV alpha particles on ^{208}Pb . We used the Saturne accelerator and the SPES I spectrometer followed by a position sensitive detection in the focal plane. The system covered simultaneously an excitation energy range of 28 MeV with a resolution of 300 keV.

Fig. 1 shows the elastic scattering angular distributions on ^{208}Pb for 480 MeV and 340 MeV incident energies (the curves drawn are only eyeguides). From the spacing of minima we extracted an interaction radius and calculated the total cross sections. They correspond to 80 % and 75 % of the geometrical cross section¹⁾ at 340 and 480 MeV, respectively. A detailed study of optical potential fits to our data is in progress.

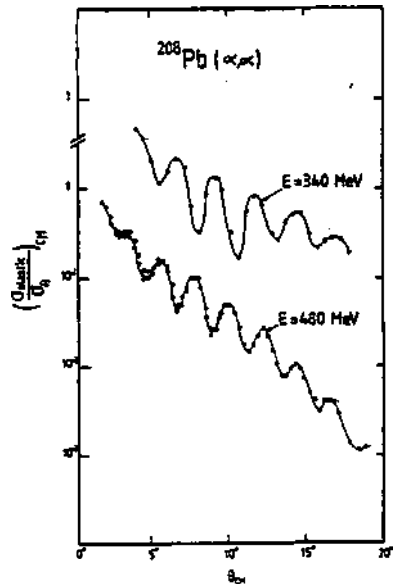


Fig. 1

Three giant resonances, the isovector dipole and the isoscalar quadrupole and monopole are well established experimentally. Several other giant resonances have been predicted^{2,3}), but their existence is still controversial^{4,5}). The quadrupole giant resonances in ^{208}Pb and ^{116}Sn are strongly populated and the monopole giant resonance is well separated in ^{208}Pb (Fig. 2).

Some structure in the form of broad peaks on top of large backgrounds is seen at higher energies both in ^{208}Pb and ^{116}Sn , requiring careful background subtraction. The inelastic cross sections are higher than those measured at lower energy⁵). Angular distributions in the region of the broad structure centered around 20 MeV in ^{208}Pb , which seems to have at least two components, are roughly in opposition of phase with the GQR angular distribution, indicating dominant presence of odd parities. Further studies of the multipolarity composition of the observed peaks are in progress.

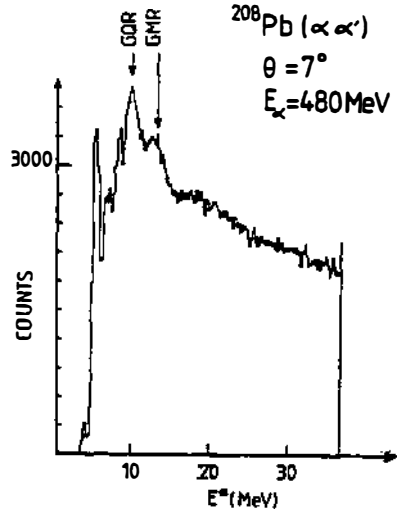


Fig. 2

References

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