

IMPLANTATION AND TESTING OF PHOTONUCLEAR CHANNEL IN CODE EMPIRE II

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Photonuclear reaction is one of the most important processes to study nuclear reaction mechanisms and to investigate giant multipole resonance properties.

In this work the improvements and extensions of the EMPIRE II code [1] are made to include the photonuclear channel. The code is also adapted to calculate isomer ratios, spin distributions and mean angular momenta of fission products. Different models for description of the dipole radiative strength function (RSF) are incorporated, namely, standard Lorentzian (SLO) [2], enhanced generalized Lorentzian (EGLO)[2,3], generalized Fermi liquid model (GFL) [2,4], modified Lorentzian approach (MLO) [2,5].

Photoabsorption cross-sections are calculated for medium and heavy nuclei. They are compared with experimental data to test both the RSF models and different sets of giant dipole resonance parameters.

The results of the calculations within all approaches are in close agreement in region of the giant dipole resonance. However they are rather distinct in energy regions far from photoabsorption peak. In particular, calculations within the EGLO model underestimate experimental values of photoabsorption cross-sections in the energy range close to neutron separation energy and the SLO model overestimate the data. Calculations within the GFL and MLO models provide good overall description of the photoabsorption cross-sections in the gamma-ray energy range till ≤ 20 MeV. They are recommended for theoretical estimation of the photoabsorption cross-sections in the middle and heavy nuclei.

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1.M.Herman, R.Capote-Noy, P.Oblozinsky, A.Trkov, V.Zerkin. J.Nucl.Sci.Technol.,Suppl.2, 2002, V1,116; <http://www-nds.iaea.org/empire/>.

2.M.Herman, V.A.Plujko, "Gamma-ray strength functions". In: Reference Input Parameter Library RIPL-2. Handbook for calculations of nuclear reaction data. IAEA-TEDOC, 2002; <http://www-nds.iaea.or.at/ripl2/>.

3.J.Kopecky, M.Uhl, R.E.Chrien.Phys.Rev., 1993, C47, 312.

4.S.F.Mughaghab, C.L.Dunford.Phys.Lett., 2000, B487, 155.

5.V.A.Plujko.Nucl.Phys.,1999, A649, 209c; V.A.Plujko et al.J.Nucl.Sci.Technol.,Suppl.2, 2002, V2, 811.