Directional Correlation of γ-transitions in ^{76}Se

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The directional angular correlation of coincidence γ-transitions in ^{76}Se has been measured following the β^- decay of ^{76}Se using a HPGe spectrometer. The radioactive samples of ^{76}Se were obtained by neutron activation of 99.99% pure natural As, in metal form, in the IEA-R1 reactor at São Paulo. Approximately 5mg of As were irradiated in a flux of 10^{13} neutrons.cm^2.s^{-1} for three minutes. The $\gamma - \gamma$ spectrometer consisted of two hyperpure Ge detectors. The fixed and the movable detectors had volumes of 90cm^3 and 60cm^3 respectively. Each detector had a 1cm thick conical lead shield, in order to prevent true coincidences arising from compton-scattered γ-rays. The measurements were carried out at angles of 90^0, 120^0, 150^0 and 180^0. A conventional fast-slow coincidence circuit, with a time resolution of 11ns in the range from 200keV to 3.0MeV, has been used. Two equalized hardware gates were set on the timing spectrum, to tag the coincidence events either as true or chance. For each master gate three parameters, the energy of both detectors and the coincidence tag, were recorded with a CAMAC input register, assisted by a MBD-11 microprocessor, connected to a PDP-11/84 computer. The measurements were made on 15 direct and 4 skip cascades, for the first time. Based on the angular correlation results it was possible to determine the multipole mixing ratios for 10 transitions: $\delta(402) = -0.07\pm0.07$, $\delta(456)$=-0.06 ± 0.07, $\delta(472) = -0.79^{+0.42}_{-0.36}$, $\delta(571)$=0.75 ± 0.05, $\delta(575) = 1.79^{+0.46}_{-0.68}$, $\delta(695) = 0.40^{+0.84}_{-0.53}$, $\delta(809) = 0.57^{+0.48}_{-0.34}$, $\delta(980)$=-0.27 ± 0.02, $\delta(1232) = 1.48\pm0.23$ and $\delta(1956) = 0.66^{+0.45}_{-0.81}$. The present results show that a large number of γ transitions have considerable M1 admixtures which are difficult to explain in terms of simple vibrational model. More refined models which take in to account the interaction between collective and quasi-particle effects may be necessary to explain the level structure in this nucleus.