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Scissors Strength in the Quasi-Continuum of Actinides

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The orbital *M1-scissors* resonance has been measured for the first time in the quasi-continuum of actinides [1]. Particle-γ coincidences are recorded with deuteron and ^{3}He induced reactions on ^{232}Th at the Oslo cyclotron laboratory. The outgoing charge particles were measured in backward angles with the SiRi particle-telescope system. The γ-ray spectra were recorded for various excitation energies with the CACTUS system consisting of 28 5" x 5" NaI detectors.

The residual nuclei ^{231,232,233}Th and ^{232,233}Pa show an unexpectedly strong integrated γ-ray strength of $B(M1)$ = 11-15 μ^2 in the 1.0 - 3.5 MeV γ-ray energy region. The results are comparable with maximum sum-rule estimates of about $B(M1)$ = 15-17 μ^2 [2]. Figure 1 shows the scissors resonance for different excitation regions in ^{233}Th.

The presence of the strong scissors resonance has significant impact on (n, γ) cross sections. These cross sections have impact on fuel-cycle simulations of fast nuclear reactors and nucleosynthesis in explosive stellar environments.

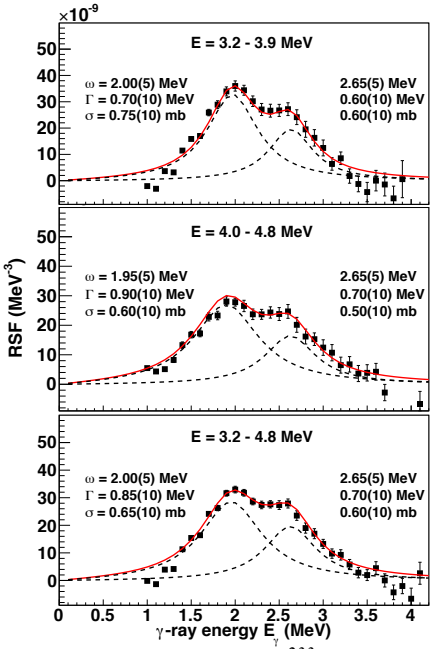

Figure 1: *The radiative strength functions (RSF) for ^{233}Th measured at different initial excitation energies. The data of the two upper panels are based on statistically independent data sets.*

[1] M. Guttormsen et al., Phys. Rev. Lett, **109**, 024606 (2002).
[2] K. Heyde et al., Rev. Mod. Phys. **82**, 2365 (2010).