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# Quantum mechanical analysis of angular oscillations at scission point: Implications for fission fragment angular momentum generation

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Nuclear fission presents a striking phenomenon where the initial spin-zero spontaneously fissioning nucleus results in primary fission fragments with significant angular momenta (2-8 ¯h) [1]. Various theories have been proposed to explain the mechanism behind this phenomenon, differing in whether they attribute the generation of angular momentum to happen at scission point or at post-scission stages of fission process. In the previous studies, using the dinuclear system concept [2], we explored the role of angular oscillations at scission point in generating the angular momentum of primary fission fragments. The angular momenta of the fragments calculated as a function of the number of evaporated neutrons was found to be in a good agreement with available experimental data for 252Cf spontaneous fission. However, recent experiments [3] have shown no significant correlation between the spins of fragment partners, seemingly contradicting the idea that angular momentum is generated at the scission point. Here, we present a fully quantum-mechanical treatment of angular vibrations at the scission point, explaining the absence of correlation in fission fragments angular momenta and supporting the view that angular momentum is indeed generated at the scission point. We apply this model to recent experimental data for 252Cf spontaneous fission.

[1 ] G. M. Ter-Akopian et al., Phys. Rev. C 55, 1146, (1997).
[2 ] T. M. Shneidman, G. G. Adamian, N. V. Antonenko, S. P. Ivanova,
R. V. Jolos, and W. Scheid, Phys. Rev. C, 65, 064302.
[3 ] J. N. Wilson et al., Nature 590, 566, (2021).

## Section

Experimental and theoretical studies of nuclear reactions

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