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Trajectory analysis of the 4-D Langevin model using principal component analysis/主成分分析による 4 次元ランジュバンの軌道解析

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The four-dimensional Langevin model [1,2,3] is a nuclear physics model that allows for the independent treatment of each fission fragment and accurately reproduces the total kinetic energy (TKE). However, due to the multidimensional nature of the model, it is challenging to quantitatively determine which physical quantities exhibit a strong correlation with nuclear fission. In this study, we applied Principal Component Analysis (PCA) [4] to project the fission trajectory data obtained from the four-dimensional Langevin model onto a space defined by principal component vectors, aiming to identify the most significant physical quantities. Specifically, we used 1000 events for each of the standard and super-short fission modes of ^{258}Fm to obtain the variance for the PCA analysis. Based on these findings, our results indicate that contributions from components different from those typically assumed became more prominent.

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Primary author: MUKOBARA/向原, Yuta/悠太 (Institute of Science Tokyo/東京科学大学)

Co-authors: ISHIZUKA/石塚, Chikako/知香子 (Institute of Science Tokyo/東京科学大学); CHIBA/千葉, Satoshi/敏 (NAT Corporation); KATABUCHI/片渕, Tatsuya/竜也 (Institute of Science Tokyo)

Presenter: MUKOBARA/向原, Yuta/悠太 (Institute of Science Tokyo/東京科学大学)

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