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TROPIC: A Python Program for Calculating Reduced Transition Probabilities

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Measurements of level lifetimes and the extracted transition probabilities are one of the cornerstones of nuclear structure physics. The reduced transition probabilities, B(πλ; $J_i \rightarrow J_f$) yield information about the structure, wavefunctions, and matrix elements of excited states connected by electromagnetic transitions in a given nucleus. The techniques for measuring lifetimes have expanded and includes a range from microseconds to femtoseconds and shorter. While lifetime measurement techniques vary, the extraction of transition probabilities is the same. We have developed the TROPIC program to provide a modern and efficient way to extract transition probabilities B(πλ). TROPIC (TRansitiOn ProbabIlity Calculator) is a program for calculating B(πλ) values written in Python 3 with the NumPy and SciPy libraries. Several design decisions were implemented to provide a streamlined process for the user and mitigate drawbacks that were present in other programs. The results from TROPIC have been compared with two other programs, TRANSNUCLEAR and RULER. The answers are as expected identical, but the investment of input to output time is reduced. Details about the design decisions behind TROPIC and its features will be presented.

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