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Moldauer's sum rule as a test of the consistency of transmission coefficients in Hauser Feshbach theory[1] DAVID BROWN, GUSTAVO NOBRE, MICHAL HERMAN, Brookhaven National Laboratory — For neutron induced reactions below 20 MeV incident energy, the Unresolved Resonance Region (URR) connects the fast neutron region with the Resolved Resonance Region (RRR). The URR is problematic since resonances are not resolvable experimentally yet the fluctuations in the neutron cross sections play a discernible and technologically important role – the URR in a typical nucleus is in the 100 keV – 2 MeV window where the typical fission spectrum peaks. The URR also represents the transition between R-matrix theory used to describe isolated resonances and Hauser-Feshbach theory which accurately describes the average cross sections. In practice, only average or systematic features of the resonances in the URR are known and are tabulated in evaluations in a nuclear data library such as ENDF/B-VII.1. Here we apply Moldauer's "sum rule for resonance reactions" to compute the effective transmission coefficients for reactions in the RRR and URR regions. We compare these to the transmission coefficients used in the fast region in the EMPIRE Hauser-Feshbach code, demonstrating the consistency (or lack thereof) between these different physical regimes. This work suggests a better approach to evaluating the URR average parameters using the results from the fast region modeling.

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