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Statistical gamma decay and pygmy resonance in ^{204}Tl measured at DANCE

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Electromagnetic response of the nucleus is characterized by level density and photon strength functions – two key ingredients for modeling statistical gamma decay. Knowledge of these quantities is crucial for our understanding of neutron capture reactions occurring in stars, responsible for nucleosynthesis of heavy elements. The so-called pygmy resonance in photon strength function has emerged as a critical component for description of neutron-rich nuclei, interpreted as a neutron-skin oscillation outside the nuclear core. Yet, there still remain questions about its nature and systematic properties \1. One of the regions where pygmy resonance has been observed are nuclei with mass number $A \approx 200$, such as gold or thallium \2.

Detector for Advanced Neutron Capture Experiments (DANCE) \3, located at the Los Alamos Neutron Science Center \4, has been used to measure neutron capture cross sections for a broad range of nuclei, reaching from nickel \5 to actinides \[6,7]. Due to its high efficiency and high granularity, DANCE is an ideal instrument to detect complete gamma cascades, which presents unique capability to study level density and photon strength functions.

This work is focused on studying statistical gamma decay in ^{204}Tl –an isotope of particular interest in nuclear astrophysics, as ^{204}Tl is a branching point in the *s*-process reaction chain. The experimental coincident gamma-ray spectra were compared with their simulated counterparts using Monte-Carlo tool DICEBOX \8. This allowed us to test different models of level density and photon strength functions, with an emphasis on studying properties of the pygmy resonance. Our findings can help to accurately model neutron capture cross sections using Hauser-Feshbach theory, as the pygmy resonance is usually not reflected in the widely used photon strength functions models.

\1[E.G. Lanza *et al.*, J. Phys.: Conf. Ser. **2586**, 012084 (2023)]1

\2[E. D. Earl *et al.*, Can. J. Phys. **52**, 989 (1974)]2

\3[M. Heil *et al.*, Nucl. Instrum. Methods A **459**, 229 (2001)]3

\4[S. F. Nowicki *et al.*, Physics Procedia **90**, 374 (2017)]4

\5[A. M. Alpizar-Vicente *et al.*, Phys. Rev. C **77**, 015806 (2008)]5

\6[M. Jandel *et al.*, Phys. Rev. C **78**, 034609 (2008)}]6

\7[J. L. Ullmann *et al.*, Phys. Rev. C **89**, 034603 (2014)]7

\8[F. Bečvář, Nucl. Instr. Methods A **417**, 434 (1998)]8

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