

# Partial wave analysis of meson resonances that decay $K^* \bar{K}$ using data from the GlueX experiment

Sebastian Cole

Arizona State University

August 4, 2021

What meson states contribute to the 1400 MeV mass region has been a topic of debate in the particle physics community since the 1960s. It began with conflicting evidence of a pseudoscalar or axial vector meson with a mass of  $\sim 1420$  MeV, an issue that became known as the  $E/\iota$  puzzle. By the late 1990s, it was generally accepted that this was in fact two states, the  $f_1(1420)$  and  $\eta(1405)$ , respectively. However, the controversy did not end with resolution to this problem. Currently, it is a topic of debate as to whether two pseudoscalar mesons exist in the 1400 MeV mass region, specifically the  $\eta(1405)$  and  $\eta(1475)$ . The GlueX experiment can assist in settling this debate by further establishing the nonet for the first radially excited pseudoscalar mesons and the nonet for the axial vector mesons. To contribute to this effort, a partial wave analysis of  $K^* \bar{K}$  has been conducted to determine what meson states exist in this mass region. Furthermore, this work lays a foundation to search for the  $\eta'_1$  hybrid meson candidate in the  $\gamma p \rightarrow p K^+ K^- \gamma \gamma$  reaction topology.