

A STUDY OF THE $\eta\eta$ SYSTEM PRODUCED IN THE REACTION

$\pi^- p \rightarrow \eta\eta n$ AT 18 GeV/c

Abstract

by

Sydney Anthony Taegar

This analysis is an investigation of the isoscalar mesons in the 1.1 to 1.9 GeV/c² region which decay to $\eta\eta$, using data collected in the 1994 run of Brookhaven experiment 852. The events studied are of the type $\pi^- p \rightarrow \eta\eta n$ where both η 's decay to two photons, and were produced using an 18 GeV/c π^- beam incident on a 30 cm liquid-hydrogen target.

A partial-wave analysis was performed on 1644 kinematically-identified $\eta\eta n$ events. A mass-dependent fit to the results of the partial-wave analysis provides clear evidence for two isoscalar scalar states decaying to $\eta\eta$: one with a mass of 1.202 ± 0.030 GeV/c² and width of 0.191 ± 0.059 GeV/c², and the other with a mass of 1.516 ± 0.029 GeV/c² and width of 0.137 ± 0.097 GeV/c². We identify the first state with the $f_0(1370)$, for which the Particle Data Group quotes a mass of 1.2–1.5 GeV/c² and width of 0.3–0.5 GeV/c². The second state is consistent with the $f_0(1500)$ state ($M = 1.505 \pm 0.015$ GeV/c², $\Gamma = 0.120 \pm 0.030$ GeV/c²) recently reported by the Crystal Barrel collaboration and suggested as a glueball candidate. No evidence is found for the $f_J(1710)$ state.