

TITLE: Search for  $\pi_1$  (1600) exotic meson via partial-wave analyses of  $\eta' \pi^0$  system in GLUEX

NAME: Mariana Khachatryan

EMAIL: mkhachat@fiu.edu

AFFIL: Florida International University (FIU)

NAME: Werner Boeglin

EMAIL: boeglinw@fiu.edu

AFFIL: Florida International University (FIU)

ABSTRACT: For conventional mesons composed of quark-antiquark pairs certain  $J^{PC}$  quantum numbers are not allowed and are called exotic, where  $J$  is the total angular momentum of the system and  $P$  and  $C$  correspond to parity and charge conjugation. Our understanding on how quarks form mesons has evolved within quantum chromodynamics (QCD) and we expect richer spectrum of mesons. This spectrum includes hybrid mesons that are quark-antiquark pairs coupled to valence gluon that can have both exotic and non-exotic  $J^{PC}$  quantum numbers. There are experimental hints for  $\pi_1$  hybrid meson with exotic  $J^{PC} = 1^{-+}$ .

Primary motivation of Jefferson Lab GLUEX experiment, that uses linearly polarized photon beam with energy  $E_\gamma \sim 9$  GeV incident on liquid hydrogen target, is the search for light hybrid mesons. The goal of this studies is the search for  $\pi_1$  (1600) exotic meson via partial-wave analyses of  $\eta' \pi^0$  system in GLUEX, with the decays  $\eta' \rightarrow \pi^+ \pi^- \eta$  ( $\eta \rightarrow \gamma\gamma$ ) and  $\pi^0 \rightarrow \gamma\gamma$ . We have done partial wave analyses studies of  $\eta' \pi^0$  system using generated data sample for linearly polarized photon beam incident on proton target in order to study and develop analysis strategy for partial-wave analysis of GLUEX data.