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Spectrum and decays of the light 1^{-+} hybrid nonet

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The nonrelativistic quark models predict the existence of one light hybrid nonet in the mass range 1.7 – 2.2 GeV. As a validation of this prediction, the PDG lists an isovector state dubbed $\pi_1(1600)$ with quantum numbers 1^{-+} . However, the observation of two such isovector with closely lying masses - $\pi_1(1400)$ and $\pi_1(1600)$ raised curiosity in the community, in part because of the complementarity of the decay channels. It is now believed that the two isovector are in fact the same and possible background effects distort the measurements in the $\eta\pi$ channel leading to a lower mass. An addition to this nonet was recently observed by the BESIII collaboration in the $J/\psi \rightarrow \gamma\eta\eta'$ decays. The BESIII reported an isoscalar resonance, dubbed the $\eta_1(1855)$ having quantum numbers 1^{-+} with a mass of $1855 \pm 9_{-1}^{+6}$ MeV and a width of $188 \pm 18_{-8}^{+3}$ MeV. Here I report the results of our recent analysis of the nonet comprising these states.

Primary author: SHASTRY, Vanamali (Jan Kochanowski University)

Co-authors: Prof. FISCHER, Christian (University of Giessen, Germany); Prof. GIACOSA, Francesco (Kielce University)

Presenter: SHASTRY, Vanamali (Jan Kochanowski University)

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