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## **$d^{*}(2380)$ hexaquark: from Photoproduction to Neutron Stars**

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A resonance like structure observed in double-pionic fusion to the deuteron, at  $M=2.38$  GeV with  $\Gamma=70$  MeV and  $I(J^P)=0(3^+)$  has been consistently observed in a wealth of reaction channels, supporting the existence of a resonant hexaquark state - the  $d^{*}(2380)$ . It was recently indicated that this new particle may set a limit on achievable neutron star masses, play a key role in the dynamics of neutron star merger events (including resultant gravitational wave emission) and has the potential to be an important intermediate step in the nuclear to quark-gluon plasma transition.

The talk will present the first results on *d* photoproduction, obtained with the Crystal Ball at MAMI. The new analysis indicated that the  $d(2380)$  is likely to be excited predominantly through an  $M3$  transition rather than an  $E2$  transition, which is consistent with its proposed compact nature. The  $d^{*}(2380)$  is likely to be the first genuine hexaquark. Further possible astrophysical implications will also be outlined.

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