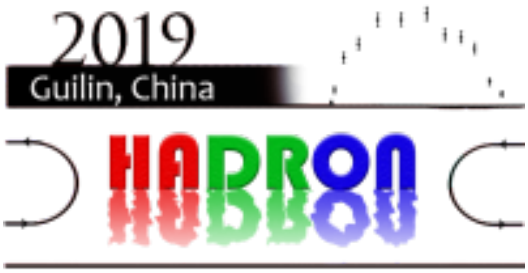

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Quark model explanation of Upsilon(10860)

Sunday, 18 August 2019 14:25 (20 minutes)

The explanation of the large $e^+e^- \to \pi^+\pi^-\Upsilon\,(ns)$ $(n=1,2,3)$ widths at
$\sqrt{s} = 10.866 \pm 0.002$ GeV near the $\Upsilon\,(10860)$
peak [1], about two orders of magnitude larger than those for $\Upsilon\,(ns) \to \pi^+\pi^-\Upsilon\,(1s)$
$(n=2,3,4)$, has been in recent years a
theoretical challenge (see for example [2]) despite the quite natural
(according to its mass) asignment of
$\Upsilon\,(10860)$ to the
standard $\Upsilon\,(5s)$ quark model state. Moreover, the
experimental production rates of
$\Upsilon\,(10860) \to \pi^+\pi^- h_b\,(np)$
$(n=1,2)$ and
$\Upsilon\,(10860) \to \pi^+\pi^-\Upsilon\,(ns)$ are of the same order of magnitude whereas the calculated
$\Upsilon\,(5s) \to \pi^+\pi^- h_b\,(np)$ rates are suppressed
against
$\Upsilon\,(5s) \to \pi^+\pi^-\Upsilon\,(ns)$ ones by Heavy Quark Spin Symmetry.

We show that a good quantitative description of the
$\Upsilon\,(10860)$ mass, its
e^+e^- leptonic width and its
$\pi^+\pi^-\Upsilon\,(ns)$ production rates, as well as a qualitative
understanding of its
$\pi^+\pi^- h_b\,(np)$ production rates can be obtained under the assumption that
$\Upsilon\,(10860)$ is a mixture of the conventional
$\Upsilon\,(5s)$ quark model state with a small proportion of the lowest
1^{--} hybrid state [3].

[1] M. Tanabashi et al. (Particle Data Group (PDG)), Phys. Rev. D98, 030001 (2018).

[2] L. Olsen, T. Skwarnicki, and D. Zieminska, Rev.Mod.Phys.90,015003 (2018).

[3] R. Bruschini and P. Gonzalez, Pys. Lett. B791,409 (2019).

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