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Discriminating the spin of $P_c(4440\&4457)$ with compositness criterion

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With the description that for a pure molecule state the effective range r_0 should satisfy the condition of $r_0 > 0$ and the fact that r_0 could be matched with the couplings related to momentum term in contact field theory, we can fit the low energy couplings up to NLO in the contact effective theory describing the 3 P_c pentaquarks observed by LHCb in 2019 and finally get the effective range r_0. By comparing the sign of r_0, the spin of $P_c(4440)$ and $P_c(4457)$ could be distinguished, providing the conclusion that under the molecule picture, it's more natural to take $P_c(4440)$ as the $J^P = \frac{1}{2}^-$ $D^*\Sigma_c$ molecule and $P_c(4457)$ the $J^P = \frac{3}{2}^-$ one.

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