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Mass spectra of strange double charm pentaquarks with strangeness S=-1

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The observation of the $T_{c\bar{s}}(2900)$ indicates the potential existence of strange double charm pentaquarks based on the heavy antidiquark symmetry. We systematically study the mass spectra of strange double charm pentaquarks with strangeness $S=-1$ in both molecular and compact structures for quantum numbers $J^P = 1/2^-$, $3/2^-$, $5/2^-$. By constructing the interpolating currents, the mass spectra can be extracted from the two-point correlation functions in the framework of QCD sum rule method. In the molecular picture, we find that the $\Xi_c^{'+}D^{*+}$, $\Xi_c^{*+}D^{*+}$, $\Xi_{cc}^{*++}\bar{K}^{*0}$ and $\Omega_{cc}^{*+}\rho^+$ may form molecular strange double charm pentaquarks. In both pictures, the masses of the $J^P = 1/2^-, 3/2^-$ pentaquarks locate within the $4.2-4.6$ GeV and $4.2-4.5$ GeV regions, respectively. As all of them are above the thresholds of their strong decay channels, they behave as a broad state, making them challenging to be detected in experiment. On the contrary, the strange double charm pentaquark with $J^P = 5/2^-$ lies below its strong decay channel, which may be a very narrow state and easy to be identified in experiment. The best observed channel is its semi-leptonic decay to double charm baryon. As the result, we strongly suggest experiments to search for $J^P = 5/2^-$ strange double charm pentaquarks as a first try.

Primary authors: YANG, Zi-Yan (South China Normal University); Prof. WANG, Qian (South China Normal University); Prof. CHEN, Wei (Sun Yat-sen University)

Presenter: YANG, Zi-Yan (South China Normal University)

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