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The string-junction picture of multiquark states

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We start with a discussion of hadronic duality recalling why in the presence of baryons one needs to introduce the notion of string-junction J, to complement the conventional classification of hadrons based just on their quark-antiquark constituents. In this picture single hadronic states are associated with "irreducible" gauge-invariant operators consisting of Wilson lines (visualized as strings of color flux tubes) that may either end on a quark or an antiquark, or annihilate in triplets at a junction Jor an anti-junction Jbar. For the junction-free sector (ordinary q qbar mesons and glueballs) the picture is supported by large-N (number of colors) considerations as well as by a (lattice) strong-coupling expansion. Both imply the famous OZI rule suppressing quark-antiquark annihilation diagrams. The same expansions support the existence of states with more than one junction, e.g. two for tetraquarks, and three for pentaquarks (baryonium states), as well as a generalization of the OZI rule (the JOZI rule) providing a suppression of J-Jbar annihilation diagrams. The JOZI rule implies that baryonium states are "mesophobic" and thus unusually narrow if they are below threshold for decaying into as many baryons as their total number of junctions.

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