Abstract

Holography inspired stringy hadrons (HISH) is a set of models that describe hadrons. Mesons, baryons, and exotic hadrons are described as open strings with massive endpoint particles and glueballs as closed strings. The models are based on a "map" from stringy hadrons of holographic confining backgrounds to strings in d=4 flat space-time. I will briefly review the "derivation" of the models.

I will determine the massive modified Regge trajectories for mesons as strings between a quark and anti-quark and for baryons as strings between a quark and a di-quark. In particular I will introduce a novel concept of quark mass which is the " string endpoint mass". I will compare the theoretical results with the experimental data and extract the best fits for a universal string tension, quark masses and quantum intercepts. I will write down certain predictions for yet unobserved higher excited mesons and baryons.

The differences between the spectra of open string and closed string which describe glueballs will be clarified. Based on that I will suggest a simple method to identify glueballs by searching for flavorless states on trajectories with a slope which half the one of the stringy mesons and baryons. I will describe several predictions for the corresponding masses of excited glueballs.

I will suggest to use the state $Y(4630)$, which decays predominantly to $\Lambda_c\overline{\Lambda}_c$, as a window to the landscape of tetra-quarks. I will propose a simple criterion to decide whether a state is a stringy exotic hadron - a tetra-quark - or a "molecule". If it is the former it should be on a (modified) Regge trajectory. I will present the predictions for the mass and width of the higher excited states on the $Y(4630)$ trajectory. We argue that there should exist an analogous Y_b state that decays to $\Lambda_b\overline{\Lambda}_b$ and describe its trajectory. I will briefly discuss the zoo of other exotic stringy hadrons.

I will further present the predictions for the hadrons strong decay widths and their comparison to the experimental observations. The main decay mechanism is that of a string splitting into two strings. The corresponding total decay width behaves as $\Gamma = \frac{\pi}{2}ATL$ where T and L are the tension and length of the string and A is a dimensionless universal constant. The partial width of a given decay mode is given by $\Gamma_i/\Gamma = \Phi_i \exp(-2\pi C m_{sep}^2/T)$ where Φ_i is a phase space factor, m_{sep} is the mass of the "quark" and "antiquark" created at the splitting point, and C is a dimensionless coefficient close to unity.

I will describe the fits to experimental decay widths. I will discuss the relation to string fragmentation and jet formation. I will extract the quark-

diquark structure of baryons from their decays. A stringy mechanism for Zweig suppressed decays of quarkonia will be proposed and will be shown to reproduce the decay width of Υ states. I will further apply this model to the decays of glueballs and exotic hadrons.