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Holographic radial spectrum of mesons from higher dimensional QCD operators

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Within the framework of AdS/QCD models, the spectra of radially excited hadrons
are identified with towers of Kaluza-Klein (KK) states in a putative dual theory.
It is known, however, that the KK modes of dual theory must be qualitatively different
from the QCD excited states. We propose a possible solution for this discrepancy.
The idea is to describe excited hadrons as "would be" ground states in a particular dual model.
In our scheme, the higher radial excitations are interpolated by some higher dimensional QCD
operators. This dictates different 5D masses in a dual model. The excited hadrons are described
by zero KK mode of some five-dimensional fields while the higher KK modes
corresponding to the same 5D mass are interpreted as lying beyond the applicability of
holographic model under consideration. As a result the radial states with growing mass are enumerated
by growing dimension of interpolating QCD operators.
The idea is successfully tested in the Soft Wall and Hard
Wall holographic models in the sector of light mesons. The given approach in particular
leads to a much better phenomenological spectrum of vector radial excitations in
the Hard Wall model than the traditional KK description. Basing on a recent result by Fichet,
we also discuss a possible interpretation for quadratic dilaton background in the Soft Wall holographic
model: The introduction of this background may represent just a phenomenological way for taking
into account the one-loop interactions in the AdS bulk with gravitons and other fields.

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