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# The ψ(1S) and ψ(2S) Mesons in a Double Pole QCD Sum Rule

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In 1977, Shifman, Vainshtein, Zakharov, Novikov, Okun and Voloshin created the successful method of QCD sum rules (QCDSR), which is widely used nowadays. With this method, we can calculate many hadron parameters such as: mass of the hadron, decay constant, coupling constant and form factors in terms of the QCD parameters as for example: quark masses, the strong coupling and nonperturbative parameters like quark condensate and gluon condensate. The main point of this method is that the quantum numbers and content of quarks in hadron are represented by an interpolating current, where the correlation function of this current is introduced in the framework of the operator product expansion (OPE). To determine the mass and the decay constant of the ground state of the hadron, we use the two-point correlation function. On the QCD side, the correlation function can be written in terms of a dispersion relation and on the phenomenological side can be written in terms of the ground state and several excited states. The usual QCDSR method uses an ansatz that the phenomenological spectral density can be represented by a form pole plus continuum, where it is assumed that the phenomenological and QCD spectral density coincides with each other above the continuum threshold. In this work we use the method of double pole QCD sum rule, which is basically a fit with two exponentials of the correlation function, where we can extract the mass and decay constant of mesons as a function of the Borel mass. We apply this method to study the mesons: ψ(1S) and ψ(2S).

## Apply to be<br> considered for a student <br>   award (Yes / No)?

no

## Level for award<br> (Hons, MSc, <br>   PhD, N/A)?

N/A

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