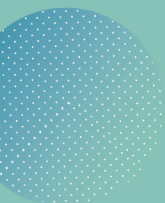




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Glueball interactions from the colour Van der Waals potential

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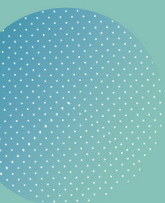
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Abstract

We examine pure Yang-Mills theory glueball-glueball interactions in constituent-gluon approaches. Because of the large mass gap, Van der Waals interactions are relatively more significant than in light-quark QCD hadrons where the pion gives rise to strong Yukawa exchanges.

We find that the colour Van der Waals potential, computed along the traditional lines of the quantum London-Eisenschitz-Wang force, is a relevant interaction at distances between about 0.66 fm (when the glueballs are in contact) to 1.9 fm (when the virtual string tension among the colour-polarized glueballs in the intermediate state breaks down). In employing a Cornell potential as the microscopic one among colour charges, we find that the Van der Waals interaction derived from the linear potential part closely cancels that of the Coulomb one for the ground state glueballs. This means that the interaction, while sizeable and capable of saturating the lattice data depending on parameters, is far weaker than the London force derived from the Coulombic part alone.

(This suggests that one should move effective theories for glueballs beyond dilaton-type approaches and perhaps deploy some variant of Van der Waals Effective Field Theory.)

