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On the ratio between scalar and tensor glueball masses in Yang-Mills theories

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We suggest that in Yang-Mills theories the ratio R of the mass of the tensor glueball over the mass of the scalar glueball is a universal quantity that depends only on the dimensionality of the space. To support this conjecture, we compute numerically R for Sp(2N) gauge theories for N = 1, 2, 3, 4 in d=4 Euclidean dimensions on a lattice and we analyse our results together with previous lattice studies of other Yang-Mills theories, in both d=4 and d=3. We then compare our findings to various analytic models in which R can be computed explicitly in the large N limit.. Finally, we show that a constant R might emerge in a context in which scale invariance is broken, giving rise to a light dilaton state that can be interpreted as the lowest-lying scalar glueball. Our results provide further insights towards our understanding of confinement in QCD

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