

Effect of Glueball scattering on the GRG

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(in collaboration with Shahriyar Jafarzade and Francesco Giacosa)

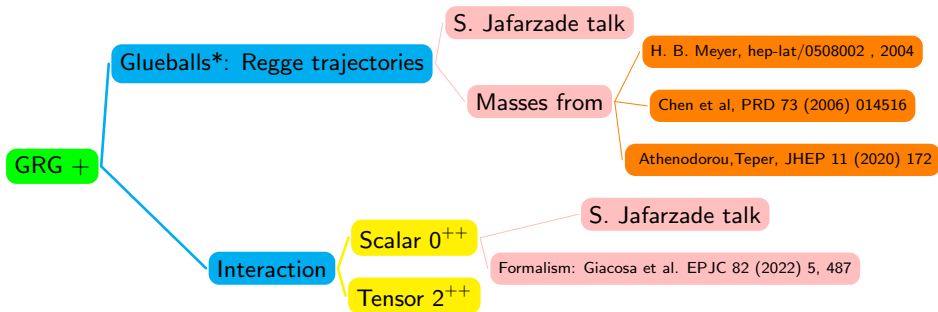
Poster based on: E. Trotti, S. Jafarzade, F. Giacosa, Thermodynamics of the GRG, arXiv:2212.03272 .

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- Glueball Resonance Gas (GRG): gas of glueballs \rightarrow thermal properties of YM ($T < T_C$): *pressure, entropy & trace anomaly*
- In YM, the low-mass glueballs are stable.



$$p_{JPC}^{\text{int}} = -T \sum_J (2J + 1) \sum_{l=0}^{\infty} \int_0^{\infty} dx \frac{2l + 1}{\pi} \frac{d\delta_l^J(x^2)}{dx} \int \frac{d^3k}{(2\pi)^3} \ln \left(1 - e^{-\beta \sqrt{\frac{k^2 + x^2}{T}}} \right)$$

Scalar interaction

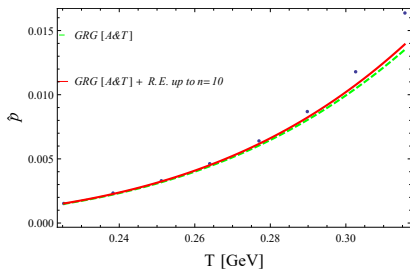
$$|J, m\rangle \longrightarrow J = 0, m = 0$$

1 amplitude \rightarrow 1 phase shift \rightarrow 1 pressure contribution

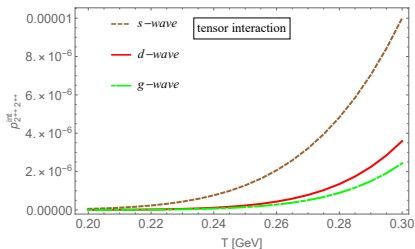
Tensor interaction

$$|J, m\rangle \longrightarrow J = 2, m \in [-2, 2]$$

625 amplitudes \rightarrow 25 non-zero amplitudes \rightarrow 25 phase shifts \rightarrow 25 pressure contributions
(detailed calculation during poster session)



Point data from Borsányi et al. (2012) JHEP, 07, 056



- Free glueball gas with 10-15 lightest state: sufficient for TMD description of LQCD results for pure YM.
- The critical temperature in YM turns out to be $T_C = 323 \pm 18$ MeV.
- Effect of excited glueballs via Regge trajectories and effect of interaction are very small.
- GRG works well with the masses of Athenodorou & Teper \rightarrow those masses are favoured.