Scalar Glueball Mass Reduction at Finite Temperature in SU(3) Anisotropic Lattice QCD

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We study the glueball properties at finite temperatures below the critical temperature T_c of the deconfinement phase transition using SU(3) anisotropic lattice QCD with $\beta = 6.25$, the renormalized anisotropy $\xi \equiv a_s/a_t = 4$ and $20^3 \times N_t$ (N_t=35,36,37,38,40,43,45,50,72) at the quenched level [1, 2]. We use 5,000–9,900 gauge configurations at each temperature. By adopting the improved glueball operator with the smearing method, we construct the temporal glueball correlator at each temperature T. We then extract the pole-mass of the thermal glueball at each temperature from the temporal glueball correlator. We observe about 20 % pole-mass reduction for the lowest scalar glueball as $m_G(T) = 1250 \pm 50$MeV for $0.8T_c < T < T_c$ in comparison with $m_G \simeq 1500$–1700MeV at $T \simeq 0$. The pole-mass reduction of about 250MeV is rather large. Therefore, the thermal pole-mass shift of the scalar glueball may become observable in the future experiment in RHIC.
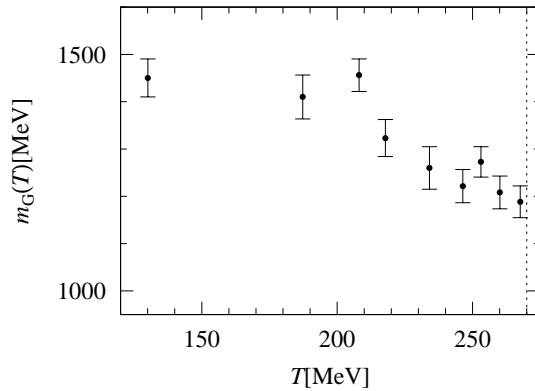
Figure 1: The pole-mass of the lowest scalar glueball plotted against the temperature T. The vertical dotted line indicates $T_c \simeq 270$MeV.

Acknowledgement

References

[1] N. Ishii, H. Suganuma and H. Matsufuru, Proc. of *Lepton Scattering, Hadrons and QCD*, edited by W. Melnitchouk et al., (World Scientific, 2001) 252.

[2] N. Ishii, H. Suganuma and H. Matsufuru, Nucl. Phys. **B** (Proc. Suppl.) **106** (2002) 516.