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Pole-Skipping and Chaos in Too MUCH Hot QCD

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In this conference, I will discuss the question we have addressed whether the thermal QCD is chaotic or not. In our recent results, we have found that QCD is unusually chaotic above de-confinement temperature using its M-theory dual up to $O(R^4)$ corrections. The gauge invariant combination $Z_s(r)$ of scalar metric perturbation is found to possess an irregular singular point at the horizon radius. Via using Pole skipping techniques we have computed the chaos characteristics i.e., Lyapunov exponent (λ_L) and Butterfly velocity (v_b) from a specific value of imaginary frequency and momentum, this makes the the horizon as regular singular point. The imaginary frequency and momentum can be read off via truncating the incoming modes of $Z_s(r)$ as a power series near r_h, gives a missing pole satisfying the condition $C_{n,n+1} = 0, detM^{(n)} = 0'', n\epsilon Z^+$, for our case it is satisfied for a single $n \geq 3$ depending on the values of the string coupling g_s, number of (fractional) $D3$ branes $(M)N$ and flavor $D7$-branes N_f in the parent type IIB setup, e.g., for the QCD(EW-scale)-inspired $N = 100, M = N_f = 3, g_s = 0.1$, and found the missing pole at $n = 3$. Preventing the isotropy along R^3 the $Z_s(r)$ receives no higher order correction, which makes the $_L$, v_b unrenormalized up to $O(R^4)$ in M theory.

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