Phase diagram of strongly coupled 2-color QCD in the chiral limit

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Abstract: We have studied the phase diagram of strongly coupled 2-color QCD in the chiral limit using a novel directed path algorithm. We find that in three spatial dimensions the finite temperature transition from a chirally broken phase to the symmetric phase is a weak fluctuation driven transition. On the other hand the zero temperature (quantum) phase transition as a function of the baryon chemical potential is a mean field transition. We further find that the low energy physics close to the finite temperature transition can be described very well with an effective field theory with a small number of low energy constants. In addition, the low energy physics close to the the quantum phase transition at finite chemical potential is described well by mean field theory with a one-loop correction.