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On the Validity of High-Temperature, Quasi-Periodic Solutions in AdS_4 (G)*

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The stability of asymptotically AdS_{d+1} spacetime under arbitrarily small perturbations of a minimally coupled scalar field has been examined via dual lines of inquiry. The first, undertaken by Bizon and Rostworowski in 2011, was concerned with numerical solutions to the fully nonlinear system. This and subsequent work led to the determination that AdS was generically unstable to Gaussian initial data. The other line of inquiry was through the perturbative description of the linearized system. The perturbative description illuminated the method that led to gravitational collapse in the full system: the weakly turbulent cascade of energy to short length scales. Development in both the numerical and perturbative theories has uncovered a class of initial data, known as islands of stability, that resist gravitational collapse.

The development of the Two-Time Formalism (TTF) by Balasubramanian *et al.* provides a description of the leading nonlinear perturbative effects, and establishes the existence of inverse energy cascades which allow for stability islands. Following the development of quasi-periodic (QP) solutions to the truncated TTF system —also by Balasubramanian *et al.* —a further class of (perturbatively) stable solutions was conjectured that were connected to known QP solutions. These solutions, called high-temperature QP solutions due to their large value of the ratio of the conserved quantities $E/N = T$, are found from successive energy perturbations of known QP solutions.

In this talk, we discuss the process of verifying that a QP solution to the truncated theory can be extended to the full TTF theory. In particular, we test the persistence of solutions in the limit of a large number of eigenmodes; furthermore, we present evidence that high-temperature solutions can be sensitive to the choice of truncation value. We then use the TTF theory to examine the direct and inverse energy cascades in truncated QP solutions. Finally, we investigate if these QP solutions can be extended to solutions of the fully nonlinear scalar-metric system.

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