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**Conserved quantities and dual turbulent cascades in Anti-de Sitter spacetime** STEPHEN GREEN, ALEX BUCHEL, LUIS LEHNER, Perimeter Inst for Theo Phys, STEVEN LIEBLING, Long Island University — We consider the dynamics of a spherically symmetric massless scalar field coupled to general relativity in Anti-de Sitter spacetime in the small-amplitude limit. Within the context of our previously developed two time framework (TTF) to study the leading self-gravitating effects, we demonstrate the existence of two new conserved quantities in addition to the known total energy  $E$  of the modes: The particle number  $N$  and Hamiltonian  $H$  of our TTF system.  $H$  represents the next-order contribution after  $E$  to the total ADM mass  $M$ . Simultaneous conservation of  $E$  and  $N$  implies that weak turbulent processes undergo dual cascades (direct cascade of  $E$  and inverse cascade of  $N$  or vice versa). This partially explains the observed dynamics of 2-mode initial data. In addition, conservation of  $E$  and  $N$  limits the region of phase space that can be explored within the TTF approximation and in particular rules out equipartition of energy among the modes for general initial data. Finally, we discuss possible effects of conservation of  $N$  and  $E$  on late time dynamics.

Stephen Green  
Perimeter Inst for Theo Phys

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