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Weak Alfvén wave collisions in relativistic plasma turbulence JASON TENBARGE, Princeton University, BART RIPPERDA, Center for Computational Astrophysics, Flatiron Institute / Department of Astrophysical Sciences, Princeton University, AMITAVA BHATTACHARJEE, Princeton University, JAMES JUNO, University of Maryland, ALEXANDER CHERNOGLAZOV, University of New Hampshire, ELIAS MOST, Institut fr Theoretische Physik, Goethe-Universitt, ALEXANDER PHILIPPOV, Center for Computational Astrophysics, Flatiron Institute — It is well established that Alfvén waves are the primary building blocks of the non-relativistic turbulence that permeates the heliosphere and low to moderate energy astrophysical systems. However, many astrophysical systems such as gamma-ray bursts, pulsar and magnetar magnetospheres, and active galactic nuclei have relativistic flows or energy densities. To better understand these high energy systems, we examine asymptotically weak Alfvénic turbulence through third order in both relativistic magnetohydrodynamics (RMHD) and force-free MHD. We compare both numerical and analytical asymptotic solutions to demonstrate that many of the findings from non-relativistic weak turbulence carry-over to the relativistic system, but an important distinction in the relativistic limit is finite coupling to the compressible fast mode. Since fast modes can propagate across field lines, this mechanism provides a route for energy to escape strongly magnetized systems, e.g., magnetar magnetospheres.

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