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Observation of Toroidal Acoustic Mode in a Current-less Toroidal Plasma UMESH KUMAR, RAJARAMAN GANESH, SATHYANARAYANA KRISHNAMACHARI, YOGESH C SAXENA, Institute for Plasma Research — Geodesic Acoustic Mode (GAM) is the pressure oscillations supported by plasma compressibility in a toroidal magnetic geometry where average geodesic curvature provides a restoring force. GAMs exhibit top bottom antisymmetry in the density fluctuations and the potential fluctuations are nearly independent of the poloidal angle. In the present work, we report a simple yet surprising experimental demonstration of the existence of a Toroidal Acoustic Mode (TAM) in a nearly collisionless, currentless toroidal device (CTD), BETA, for the first time. A CTD, unlike Tokamak, does not have a zeroth order toroidal current. The observed TAM mode in our experiments is a global, discrete frequency mode with n=0, m=1, for density fluctuation and n=0, m¿=0, for potential fluctuations. The real frequency of the observed TAM mode is fTAM=32cs/(2R), where cs=(Te/Mi); Te is the local electron temperature and Mi is the ion mass. The mode is found to be driven by the non-linear interaction of a finite frequency interchange-like mode with itself. The observed frequency of both TAM mode and driver mode are found to scale linearly with 1/(Mi), where Mi is the ion mass, but with their slopes different by a factor of 2. This mode is found to have characteristics similar to GAMs often found in Tokamak.

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