Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

Hydrodynamic ion sound instability in systems of a finite length
O. KOSHKAROV, O. CHAPURIN, A. SMOLYAKOV, University of Saskatchewan, Saskatoon SK, Canada, I. KAGANOVICH, Princeton Plasma Physics Laboratory, Princeton NJ, USA, V. ILGISONIS, National Research Centre Kurchatov Institute, Moscow, Russia — Plasmas permeated by an energetic ion beam is prone to the kinetic ion-sound instability that occurs as a result of the inverse Landau damping for ion velocity. It is shown here that in a finite length system there exists another type of the ion sound instability which occurs for $v_0^2 < c_s^2$ and is a result of the wave coupling mediated by reflections from the walls. Analytical theory is developed [1] and is compared with results of direct initial value numerical simulations. Formally analogous model is applicable for the excitation of the lower-hybrid waves in Hall thruster[2]. It is expected that this mechanism of ion sound and lower hybrid instabilities may be operative in $\mathbf{E} \times \mathbf{B}$ plasma discharges in which the ion beam is created by the application of the external voltage.
[1]Koshkarov O., Smolyakov A.I., Kaganovich I.D., Ilgisonis V.I. Ion sound instability driven by the ion flows. Physics of Plasmas **22,** 052113 (2015).
[2] Kapulkin A. and Behar E. Ion Beam Instability in Hall Thrusters. IEEE Transactions on Plasma Science **43,** 64-71 (2015)

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Date submitted: 10 Jun 2016 Electronic form version 1.4