Abstract Submitted
for the GEC06 Meeting of
The American Physical Society

MHD Flow Control and Power Generation in Low-Temperature Supersonic Flows IGOR ADAMOVICH, MUNETAKE NISHIHARA, Ohio State University — The paper presents results of cold MHD flow deceleration and MHD power generation experiments using repetitively pulsed, short pulse duration, high voltage discharge to produce ionization in M=3 nitrogen and air flows. MHD effect on the flow is detected from the flow static pressure measurements. Retarding Lorentz force applied to the flow produces a static pressure increase of up to 17-20%, while accelerating force of the same magnitude results in static pressure increase of up to 5-7%. No discharge polarity effect on the static pressure was detected in the absence of the magnetic field. The fraction of the discharge input power going into Joule heat in nitrogen and dry air, inferred from the present experiments, is low, α=0.1, primarily because energy remains frozen in the vibrational energy mode of nitrogen. Comparison of the experimental results with the modeling calculations shows that the retarding Lorentz force increases the static pressure rise produced by Joule heating of the flow, while the accelerating Lorentz force reduces the pressure rise. This result provides first direct evidence of cold supersonic flow deceleration by Lorentz force.

Igor Adamovich
OSU

Date submitted: 13 Jun 2006 Electronic form version 1.4