some features of accelerated plasma flows in the tail region of the earth magnetosphere and in laboratory current sheets [[1]](#footnote-1)\*)

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High-speed plasma flows are regularly registered and investigated in the Earth magnetosphere using various satellites. Observations with multispacecraft missions (Cluster, THEMIS, MMS) resulted in significant progress in this research.

Plasma flows which propagate from the region of magnetic reconnection at the tail of the magnetosphere toward the Earth constitute discrete relatively short streams (Bursty Bulk Flows – BBFs) with durations, as a rule, shorter than 10 ÷ 5 sec [1,2]. What factors might be responsible for such short duration of BBFs? These questions are discussed in many papers, in which the results of spacecraft observations are analyzed.

Experiments carried out in laboratory conditions with the CS-3D device (IOF RAN) also demonstrate that plasma flows, which are accelerated in the current sheets, are limited both in time and in length. These flows are moving along the width of the current sheet, from the central sheet region towards its both side edges. It should be pointed out that the acceleration process itself is not limited in time, but at certain moment the velocities of plasma flows are sharply reduced.

The correlation between changing the structure of magnetic fields, currents and electro-dynamic forces in the current sheets, on the one hand, and the dynamics of accelerated plasma flows, on the other hand, allowed to establish that a fundamental role in limiting the time of flows’ existence play excitation of reversed currents near the side edges of the current sheet. The reversed currents bring about the emergence of electro-dynamic forces that should slow down plasma flows, which were previously accelerated in the current sheet [3-5].

In its turn, just a motion of fast plasma flows in the transverse magnetic field induces an excitation of inductive electric fields and corresponding currents, which are directed oppositely relative to the main current in the most part of the current sheet. In other words, the reversed currents, that appeared in current sheets due to the motion of accelerated plasma flows, then induced braking these flows or even their termination.

In general case the effect of braking plasma flows caused by generation of reversed currents should manifest itself under introducing fast plasma flows into the regions with strong transverse magnetic fields, including situations when plasma flows accelerated at the magnetosphere tail region are rushing towards the Earth.

References

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1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/L/Lt/ru/EF-Frank.docx) [↑](#footnote-ref-1)