

# **Cluster observations showing the indication of the formation of a modified-two-stream instability in the geomagnetic tail.**

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This study presents several observations of the Cluster spacecraft on September 24, 2003 around 15:10 UT, which show necessary prerequisites and consequences for the formation of the so-called modified-two-stream instability (MTSI). Theoretical studies suggest that the plasma is MTSI unstable if (1) a relative drift of electrons and ions is present, which exceeds the Alfvén speed, and (2) this relative drift or current is in the cross-field direction. As consequences of the formation of a MTSI one expects to observe (1) a field-aligned electron beam, (2) heating of the plasma, and (3) an enhancement in the B-wave spectrum at frequencies in the range of the lower-hybrid-frequency (LHF). In this study we use prime parameter data of the CIS and PEACE instruments onboard the cluster spacecraft to verify the drift velocities of ions and electrons, FGM data to calculate the expected LHF and Alfvén velocity, and the direction of the current. The B-wave spectrum is recorded by the STAFF instrument of Cluster. Finally, a field aligned beam of electrons is observed by 3D measurements of the IES instrument of the RAPID unit. Observations are verified using a theoretical model showing the build-up of a MTSI under the given circumstances.