

Clustering Analysis of Fast Ion Driven Instabilities

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**Abstract**

Beam ions often drive Alfvén eigenmodes and other instabilities unstable in DIII-D. Many of these modes have been unambiguously identified but some frequently occurring features have been neglected. In this work, datamining analysis techniques1 that successfully analyzed magnetics data from the H-1NF Heliac are applied to arrays of magnetic and electron cyclotron emission (ECE) data from DIII-D. The techniques group instabilities with similar magnetic or ECE features into clusters. Once the clusters are found, a database of plasma parameters will facilitate mode identification. Summarize some of the results later.

**Introduction**

What is a plasma?

What is fusion? Why is it important?

Advantages of a tokamak vs. other fusion vessels? (spherical vs mirror vs tok.)

What are fast ions? What are alfevn waves?

**Bibliography**

1. Haskey, S. R., Blackwell, B. D. & Pretty, D. G. Clustering of periodic multichannel timeseries data with application to plasma fluctuations. *Comput. Phys. Commun.* **185,** 1669–1680 (2014).