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Non-intrusive plasma state detection using machine learning

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In this paper we present the methodology used to acquire the data needed to obtain and train a neural network that will be used in an ECR source to infer the state of the plasma. All the data is the combination of the control signals and a set of non-intrusive measurements that can be accessed during normal operation.
For this purpose, machine learning techniques are explored. First, a set of characterisation experiments are carried out in which the state of the plasma is detected for different operating conditions that are fed to a clustering algorithm. Second, a supervised learning paradigm is adopted to train a neural network that is capable of determining the state of the plasma at different working states. The variables that are controlled are: the input RF power and gas flow, the non-intrusive measurements that are acquired are: transmitted and reflected RF power and a ccd camera is used to measure the relative luminosity of the plasma. Based on these variables the state of the plasma is determined. This methodology has been applied to the low-power ECR source in which low-density hydrogen plasmas are generated at the IZPILab laboratory of the University of the Basque Country.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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