Tokamak GOLEM for IAEA JE 2014

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on behalf of the tokamak GOLEM team

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2014 Topics

- Experiments with High Temperature Superconductor winding on the GOLEM tokamak - testing of the quench protection system designed by Tokamak Energy, UK.
- Electron cyclotron resonance wave assisted plasma start-up

Outline

1. Experiments with High Temperature Superconductor winding on the GOLEM tokamak - testing of the quench protection system designed by Tokamak Energy, UK.

2. Electron cyclotron resonance wave assisted plasma start-up

Comparison of the quench characteristics of HTS with and without plasma

- The quench protection is very important for safe operations of HTS magnets in Fusion devices.
- Under the neutron irradiation, local heating of superconductor may cause loss of superconductivity and creation of hot spots.
- Cu and silver layers of the HTS tape play stabilising role that helps to prevent or smooth local overheating and reduce the increment of a quench.
- However, the plasma itself may also play a similar stabilising/smoothing role.

The goal

To address the role of the plasma as a stabilising aspect to the quench events in the HTS tape.

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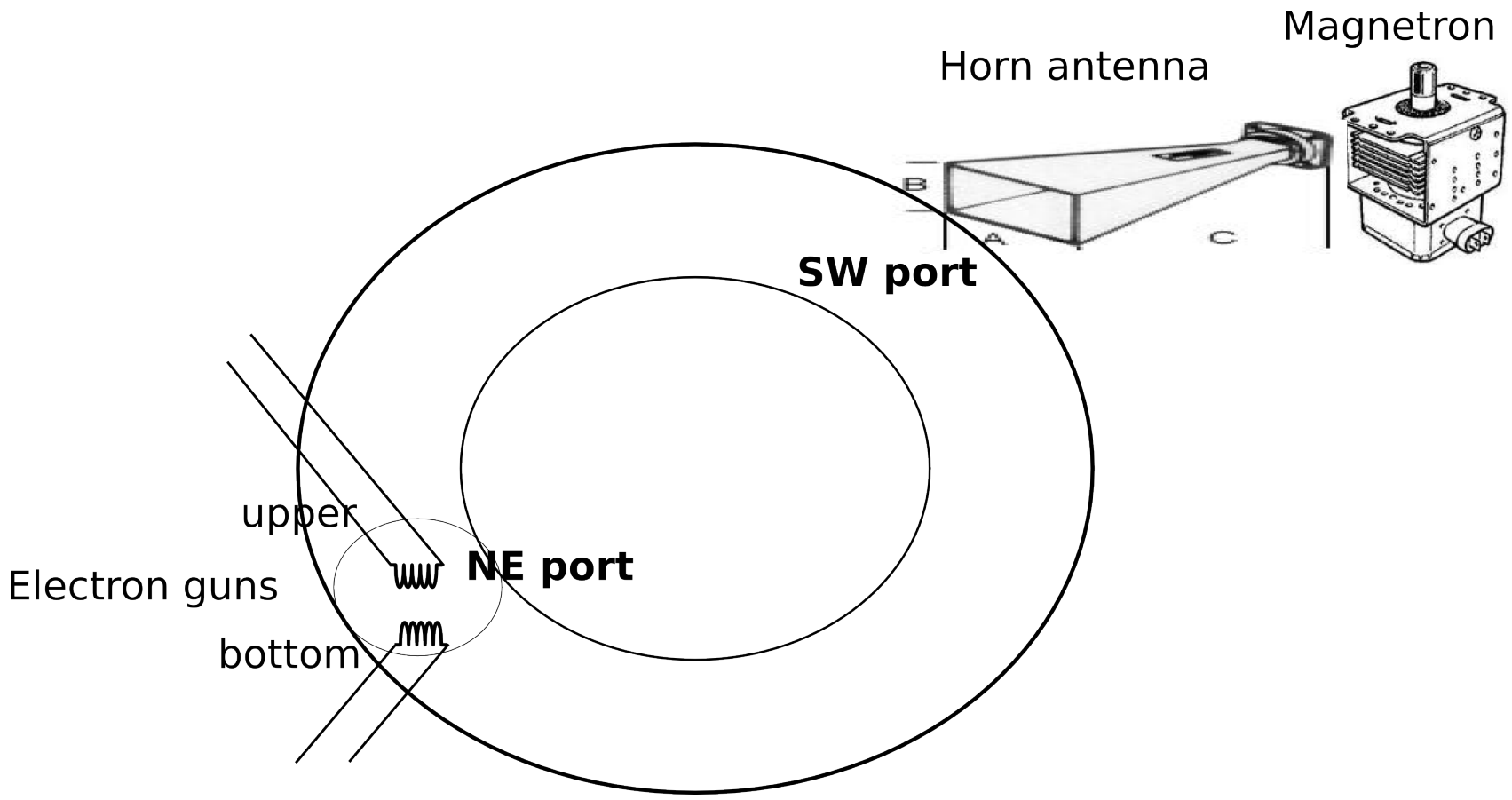
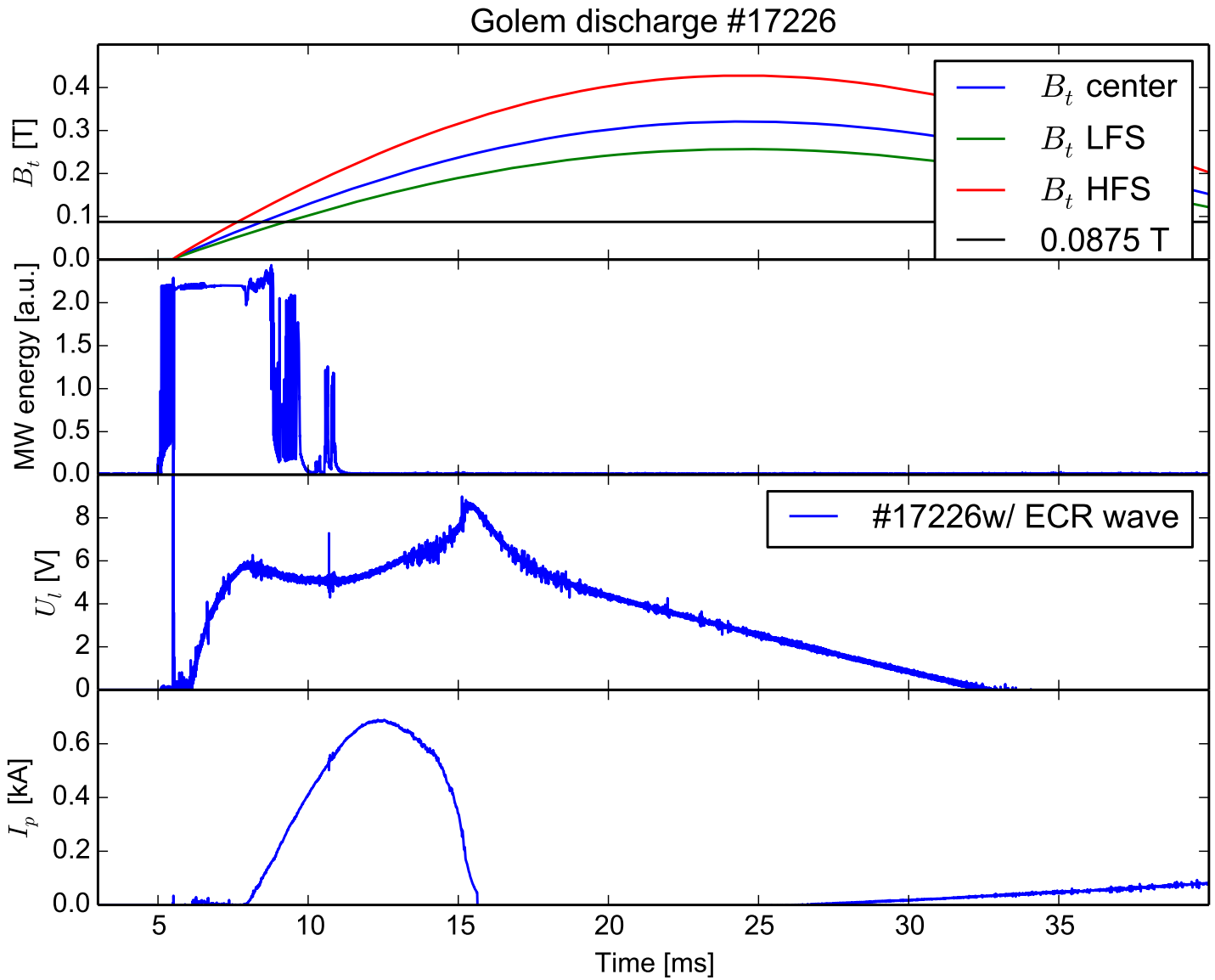
ECR wave assisted preionization @ GOLEM

Experimental setup



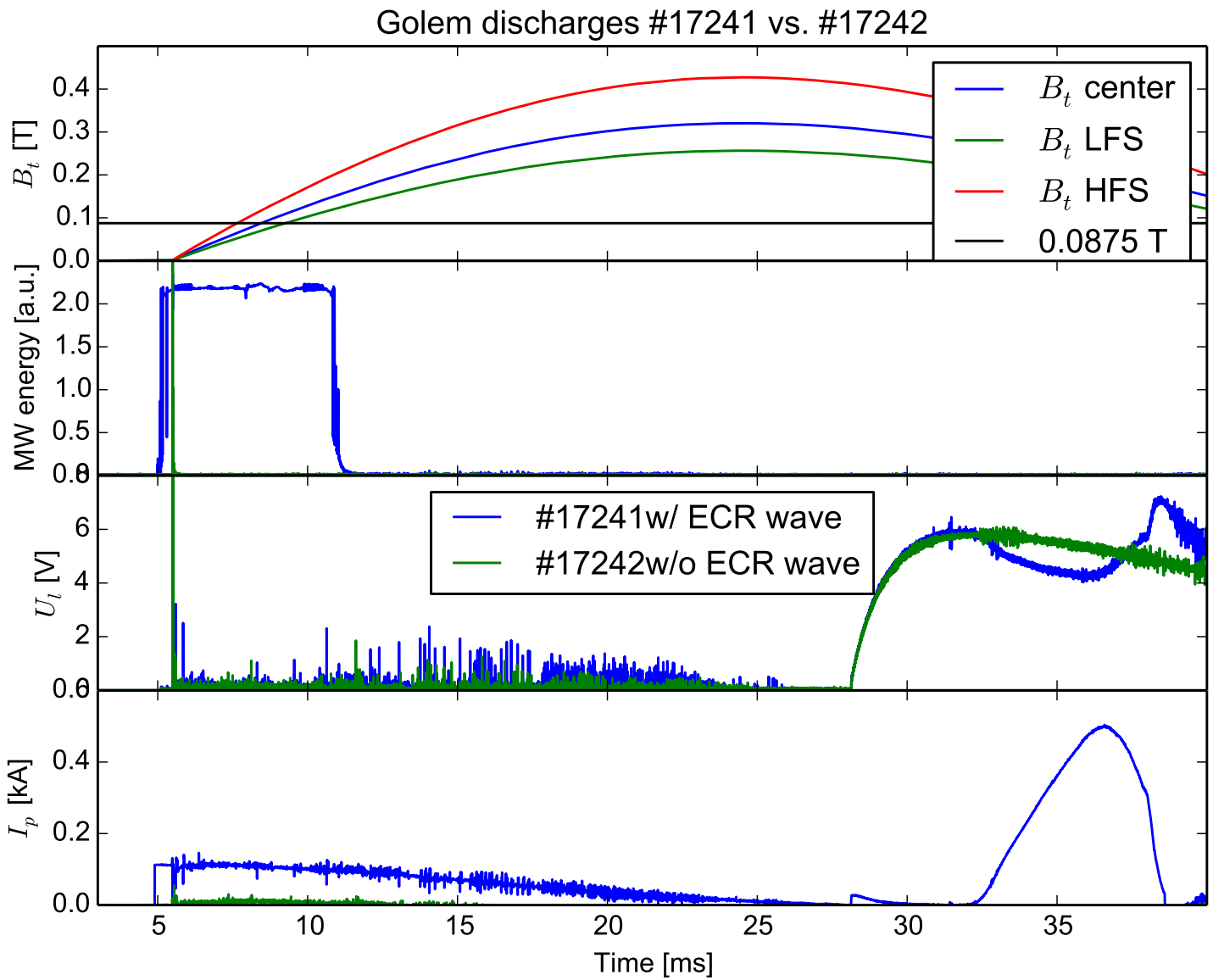
ECR wave assisted preionization @ GOLEM

A standard ECR wave assisted breakdown

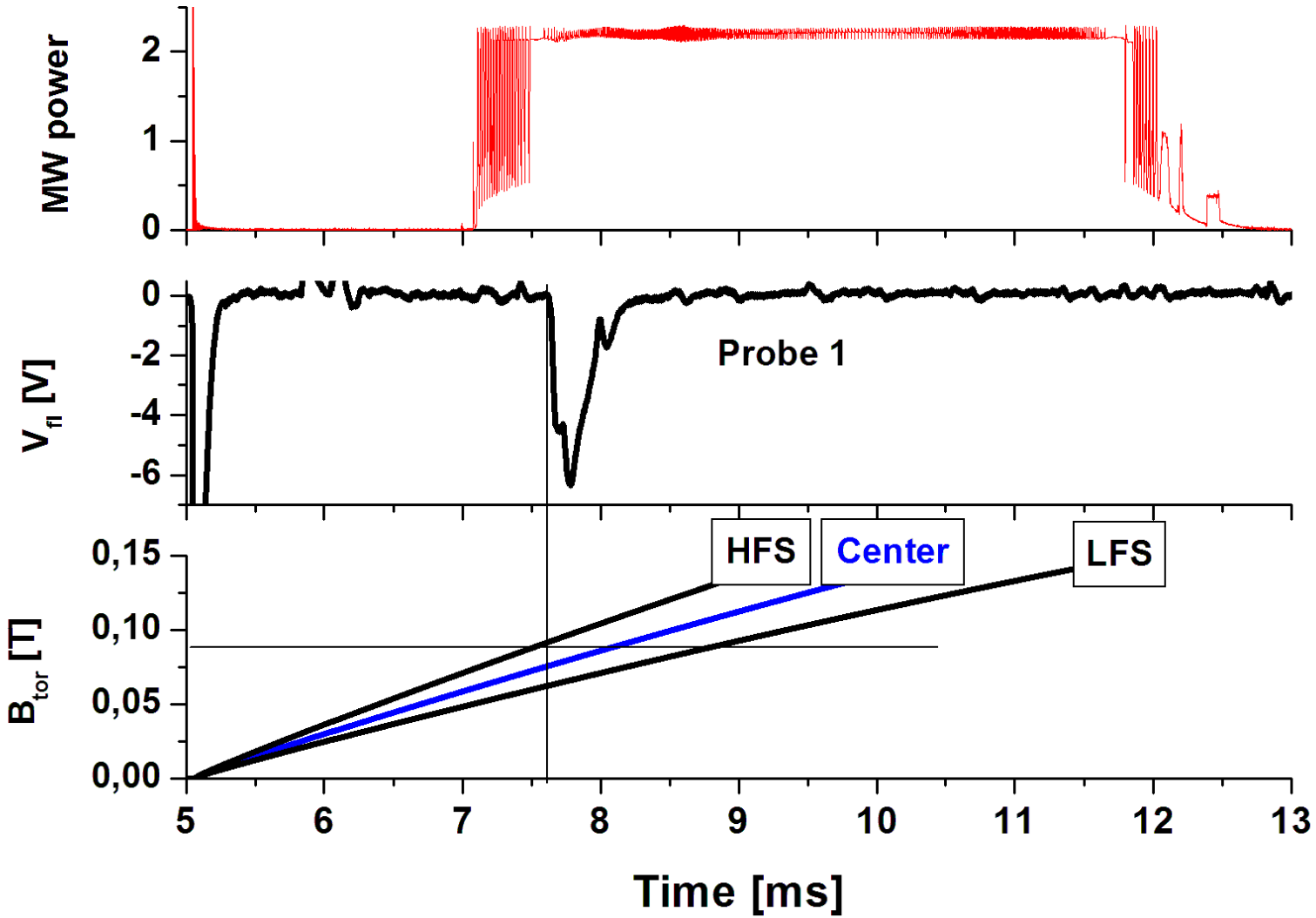


ECR wave assisted preionization @ GOLEM

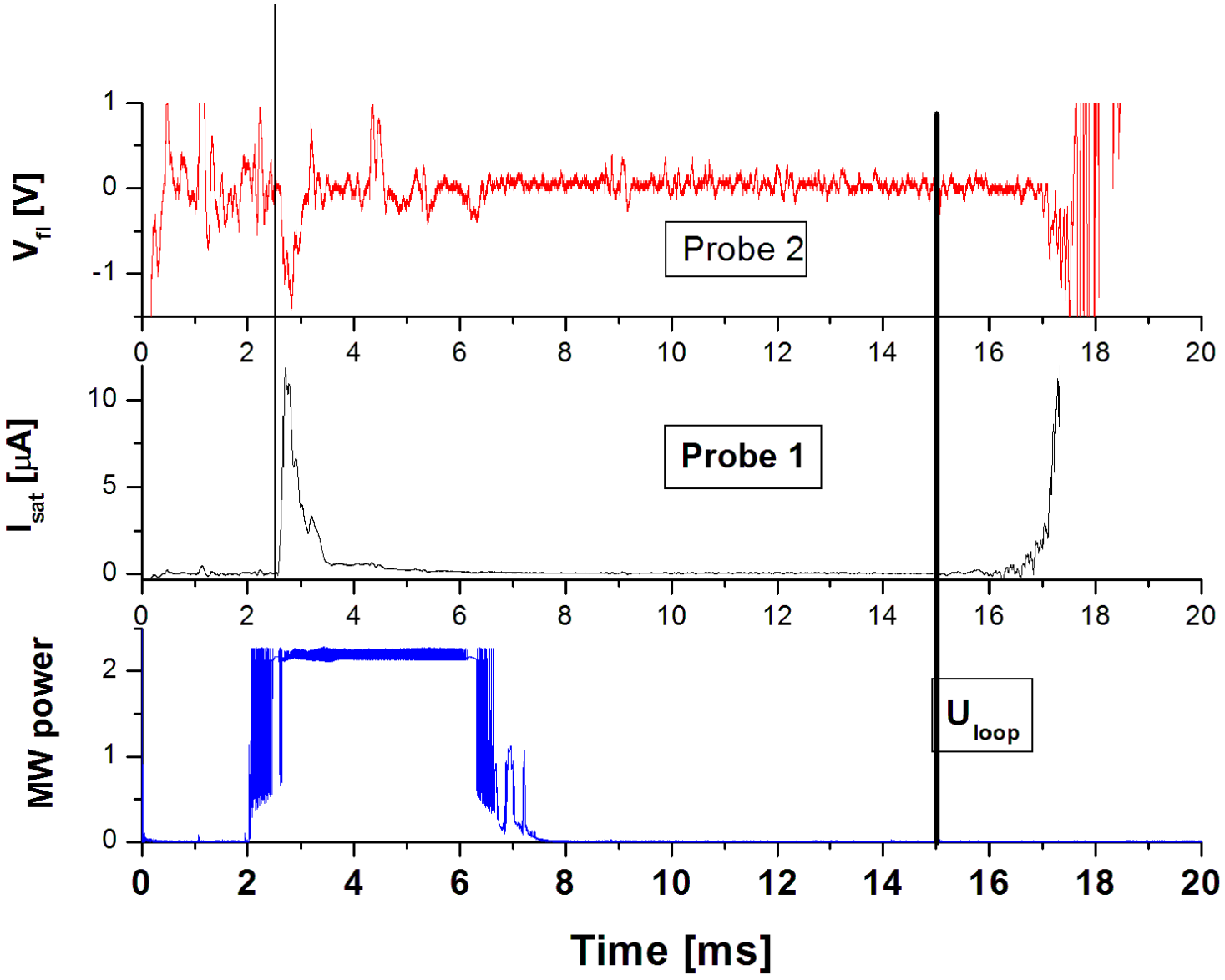
An unexpected ECR wave assisted breakdown



Radiofrequency Plasma detection with Langmuir probe diagnostics



Low density plasma detection with Langmuir probe I_{sat} diagnostics



Proposal

- We propose to measure the IV characteristics of the MW plasma during the JEs.
- However, the standard technique using sweeping voltage can not be exploited because of a huge pick up signal on the probe current (already confirmed experimentally).
- The only way it the change the probe voltage on the shot to shot bases, and construct the temporal evolution of IV characteristics with a sufficient resolution.