

## **Accurate Magnetic Sensor System Integrated Design**

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Abstract:

Inductive measurement of magnetic fields is a diagnostic technique widely used in several scientific fields, such as magnetically confined fusion, plasma thrusters and particle accelerators, where real time control and detailed characterization of physics phenomena are required. The accuracy of the measured data strongly influences the machine controllability and the scientific results. In the framework of the assembly modifications of the RFX-mod experiment, a complete renew and improvement of the magnetic diagnostic system, from the probes moved inside the vacuum vessel to the integrator modules, has been carried out. In this paper, the whole system making up the magnetic diagnostics is described, following the acquisition chain from the probe to the streamed data and illustrating the requirements and conflicting limitations which affect the different components, in order to provide a comprehensive overview useful for an integrated design of any new systems. The characterization of a prototypical implementation of the whole acquisition chain is presented, focusing on the flexible ADC architecture adopted for providing a purely numerical signal integration, highlighting the advantages that this technology offers in terms of flexibility, compactness and cost effectiveness, along with the limitations found in existing implementation in terms of ADC noise characteristics and their possible solutions.