Implementation of Fast Model Predictive Control at EXTRAP T2R Reversed-Field Pinch

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Introduction

Active feedback control has been a crucial tool in suppressing MHD instabilities in fusion plasma. In EXTRAP T2R, the performance of the active feedback control had been shown to be able to suppress the undesired modes such as RWMs[1]. This poster presents an alternative control method which offers better performance and reliability in handling complex multiple-input multiple-output (MIMO) system.

A model predictive control (MPC) is an optimal controller that generates its actuation based on prediction of the system. Furthermore, MPC is known to be able to handle complex MIMO systems directly and explicit constraints on the system. Moreover, MPC is able to handle constraints on states and inputs optimally.

EXTRAP T2R

System Identification

Model Predictive Control

Control Scheme

Model Predictive Control

Comparison with Mode Control: Proportional Integral Derivative controller, similar to that of Revised Intelligent Shell [1], excluding the asymmetric part:

Reference