Contribution ID: **63** Type: **Mini Oral and Poster**

Robust control design for multi-input multi-output plasma shape control on EAST tokamak using H∞ synthesis

Wednesday 14 October 2020 16:29 (1 minute)

Accurate plasma shape control is the basis of tokamak plasma experiments and physical research. Modeling of the linearized control response of plasma shape and position has been widely used for shape controller design in the last several years. But it usually contains much of the uncertainty, such as structured uncertainties and unmodeled dynamics. EAST tokamak plasma shape controller design is also based on a linear rigid plasma response model which integrated within a Matlab-based toolset known as TokSys. Meanwhile the PID control approach is currently used for EAST plasma shape control. This leads to strong coupling between different parameters describing the plasma shape. To handle these problems, a H∞ robust control scheme for EAST multi-input multi-output (MIMO) shape control has been proposed. First, the plasma is modeled as a distributed current source and linearized about a distribution defined by the GA Equilibrium Fitting code (EFIT). Then, the controller design technique is introduced with two main stages: 1) loop shaping is used to shape the nominal plant singular values to give desired open-loop properties at frequencies of high and low loop gain; 2) a normalized coprime factorization and H∞ technique is used to decouple the most relevant control channels and minimize the tracking errors. Finally, the simulation results show that the H∞ robust controller combines good robust stability margins, speed of response, dynamic tracking characteristics, and closed-loop decoupling for EAST plasma shape control.

Minioral

Yes

IEEE Member

No

Are you a student?

No

Author: Dr LIU, Lei (Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China)

Co-authors: Prof. XIAO, Bingjia (Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China); Dr GUO, Yong (Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China); Dr WANG, Yuehang (Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China)

Presenter: Dr LIU, Lei (Institute of Plasma Physics, Chinese Academy of Sciences, Hefei, China)

Session Classification: Poster session C-01

Track Classification: Control, Monitoring,Test and Real Time Diagnostics Systems