



Journal Menu

- [Abstracting and Indexing](#)
- [Aims and Scope](#)
- [Article Processing Charges](#)
- [Articles in Press](#)
- [Author Guidelines](#)
- [Bibliographic Information](#)
- [Contact Information](#)
- [Editorial Board](#)
- [Editorial Workflow](#)
- [Reviewers Acknowledgment](#)
- [Subscription Information](#)

- [Open Special Issues](#)
- [Published Special Issues](#)
- [Special Issue Guidelines](#)

[Call for Proposals for Special Issues](#)

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Research Article

Frequency-Domain Robust Performance Condition for Controller Uncertainty in SISO LTI Systems: A Geometric Approach

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[Full-Text HTML](#)

[Linked References](#)

[How to Cite this Article](#)

Abstract

This paper deals with the robust performance problem of a linear time-invariant control system in the presence of robust controller uncertainty. Assuming that plant uncertainty is modeled as an additive perturbation, a geometrical approach is followed in order to find a necessary and sufficient condition for robust performance in the form of a bound on the magnitude of controller uncertainty. This frequency domain bound is derived by converting the problem into an optimization problem, whose solution is shown to be more time-efficient than a conventional structured singular value calculation. The bound on controller uncertainty can be used in controller order reduction and implementation problems.