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# Robust pole location with experimental validation for three-phase grid-connected converters

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### Highlights

- â€¢ A simple model of the plant including parameter uncertainty, which proven to be suitable for robust control design.
- â€¢ Low numerical complexity of the proposed control design when compared to a similar robust control.
- â€¢ Experimental results show the capacity of tracking sinusoidal references and grid currents complying with an international standard.

## Abstract

This paper provides design and experimental validation of robust current controllers for three-phase grid-connected converters. The main objectives here are: (i) to show that a simple polytopic model can be used for designing robust controllers for predominately inductive grids; (ii) to help in the choice of the control design parameter, based on a trade-off between an upper bound of the transient settling times and the control gain sizes. Linear matrix inequality based conditions are used to design the robust control gains with lower numerical complexity than similar conditions on literature. It is shown that small values the radius of pole location lead to better bounds for the transient responses, at the price of higher control gains. Good tracking of references for the grid currents is also illustrated in practice, allowing the closed-loop system to inject active and reactive power into the grid. Simulation and experimental results prove that the system connected to the grid can provide three-phase currents complying with requirements of an important international standard.



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## Keywords

Grid-connected converters; Robust control; Linear matrix inequalities; LCL filter; Pole location

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