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# Linear and Sliding-Mode Control Design for Matrix Converter-Based Unified Power Flow Controllers — Source link

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# Linear and Sliding Mode Control Design for Matrix Converter Based Unified Power Flow Controllers

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***Abstract*— This paper presents the design and compares the performance of linear, decoupled and direct power controllers for three-phase matrix converters operating as Unified Power Flow Controllers (UPFC).**

**A simplified steady-state model of the matrix converter based UPFC (MC-UPFC) fitted with a modified Venturini high frequency PWM modulator is first used to design the linear controllers for the transmission line active (P) and reactive (Q) power. In order to minimize the resulting cross-coupling between P and Q power control, decoupled linear controllers (DLC) are synthesized using inverse dynamics linearization. Direct power controllers (DPC) are then developed using sliding mode control techniques, in order to guarantee both robustness and decoupled control.**

**The designed P and Q power controllers are compared using simulations and experimental results. Linear controllers show acceptable steady-state behavior but still exhibit coupling between P and Q powers in transient operation. DLC are free from cross-coupling but are parameter sensitive. Results obtained by DPC show decoupled power control with zero error tracking and guarantee faster responses with no overshoot and no steady-state error. All the designed controllers were implemented using the same digital signal processing (DSP) hardware.**

***Index Terms*— Unified Power Flow Controllers (UPFC)**