

Digital Control in Power Electronics

Analysis and implementation of Multisampled PWM for high bandwidth and output frequency current control of electrical drives

Simulation results

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1 Our controller: UR=8 with MAF, IMC

Parameter $\alpha = 0.0636$ for our controller is set to obtain the same cross-over frequency as with UR=2 no MAF, $\alpha=0.25$. Open-loop Bode plots for two cases of interest are shown in Fig. 1-2. Corresponding step responses from simulation with dead-time at 270Hz output frequency are shown in Fig. 3-4. Comparison between analytical and simulated open and closed loop frequency response at 270Hz output frequency is shown in Fig. 5-6. Note that the frequency response analysis (FRA) in Simulink is done without dead-time. In order to examine closed loop performance of our controller in more details, magnitude of the frequency response zoomed around -3dB is shown in Fig. 7.

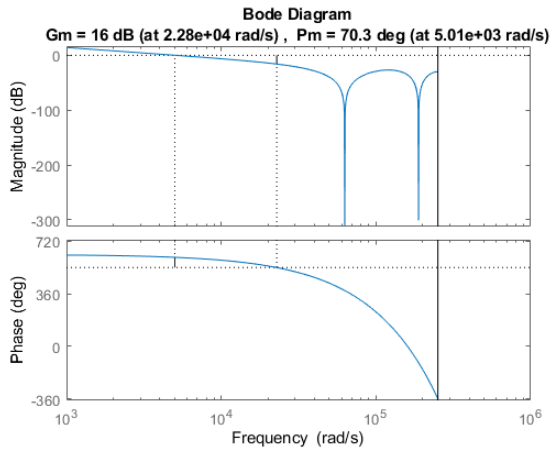


Fig. 1. Open-loop Bode plots: UR=8 with MAF $\alpha = 0.0636$.

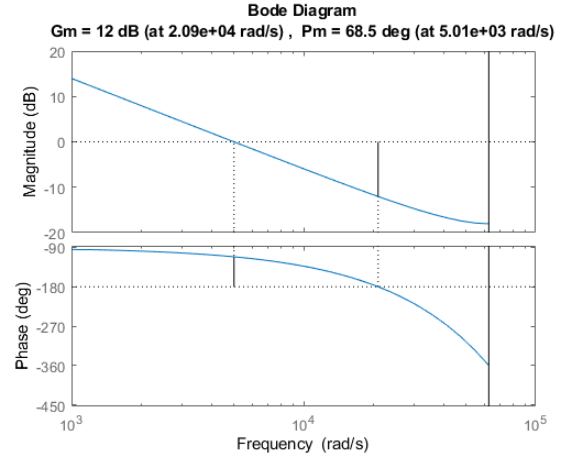


Fig. 2. Open-loop Bode plots: UR=2 no MAF $\alpha = 0.25$.

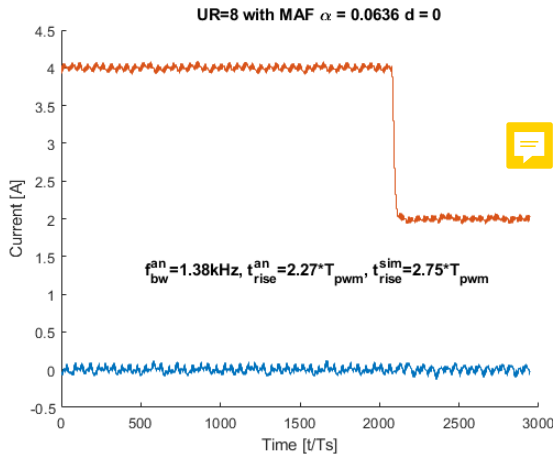


Fig. 3. Sim. step response: UR=8 with MAF $\alpha = 0.0636$.

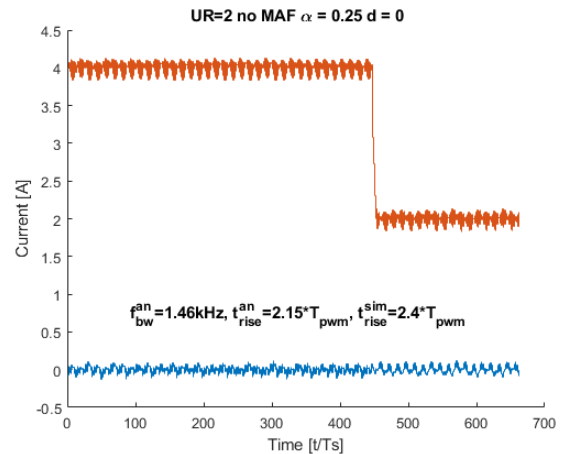


Fig. 4. Sim. step response: UR=2 no MAF $\alpha = 0.25$.

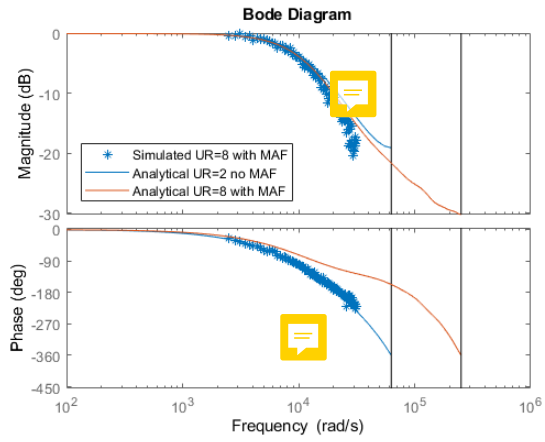


Fig. 5. Sim. closed-loop FRA: UR=8 with MAF $\alpha = 0.0636$.

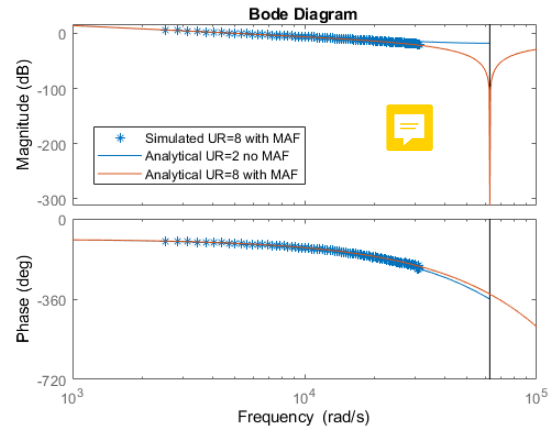


Fig. 6. Sim. open-loop FRA: UR=8 with MAF $\alpha = 0.0636$.

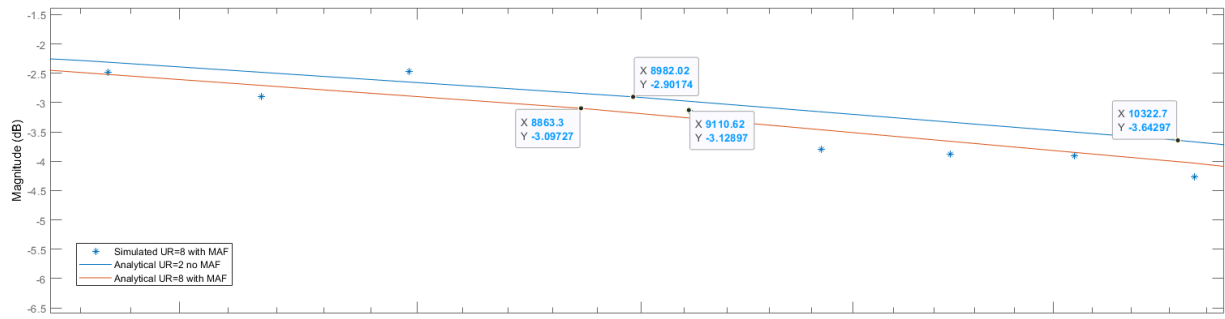


Fig. 7. Sim. closed-loop FRA (zoom): UR=8 with MAF $\alpha = 0.0636$.