LOAD FREQUENCY CONTROL

Objectives

- Simulate load frequency control of an isolated area power system to observe:
  - Change in frequency with primary control loop in case of free governor operation
  - Change in frequency with integral control
  - Effect of variation of governor loop in case of free governor operation
  - Effect of variation of integral controller gain

Simulation Tool

- MATLAB Simulink

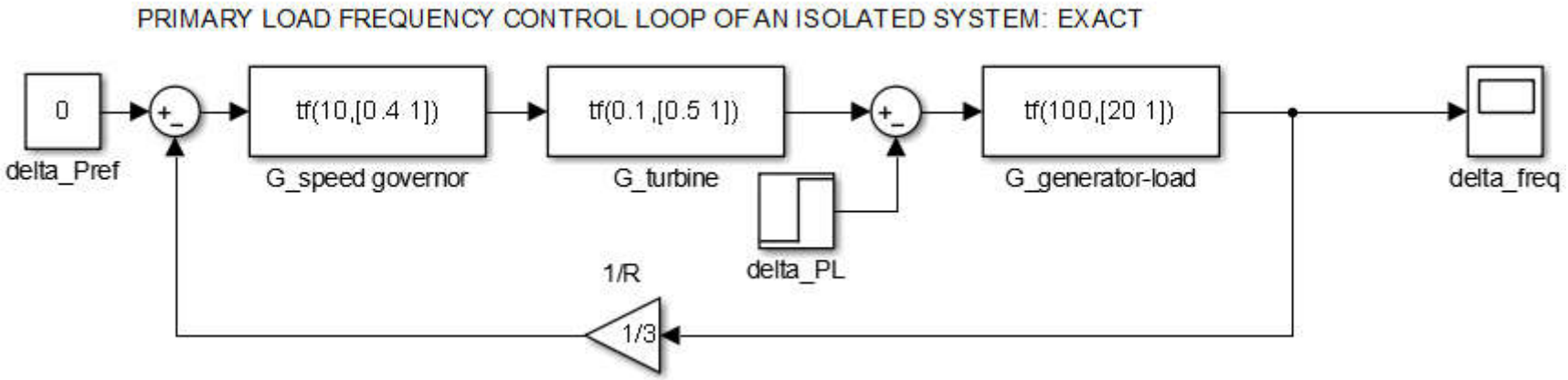
System Data

- Observe change in frequency versus time for exact and first order approximation response for the given isolated power system with free governor operation:

  - $R = 3\,{}^{Hz}/_{puMW}$, $\Delta P_L = 0.01 puMW$
  - $K_{SG} = 10\,{}^{Hz}/_{puMW}$, $T_{SG} = 0.4s$
  - $K_T = 0.1\,{}^{Hz}/_{puMW}$, $T_T = 0.5s$
  - $K_{PS} = 100\,{}^{Hz}/_{puMW}$, $T_{PS} = 20s$
  - $K_I = 0.09 puMW$

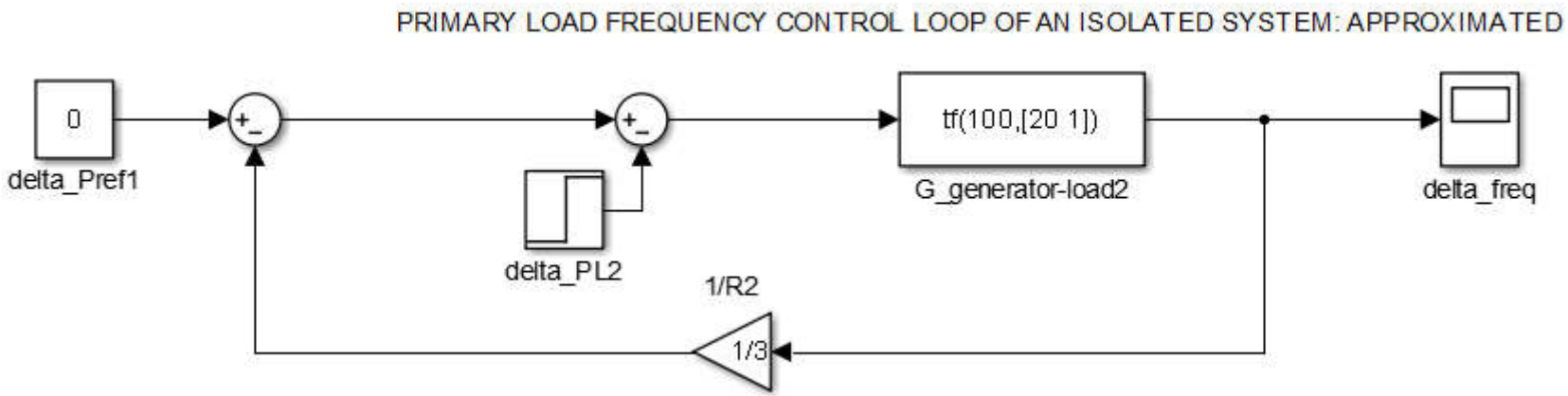
SIMULATIONS

LFC- Primary Loop



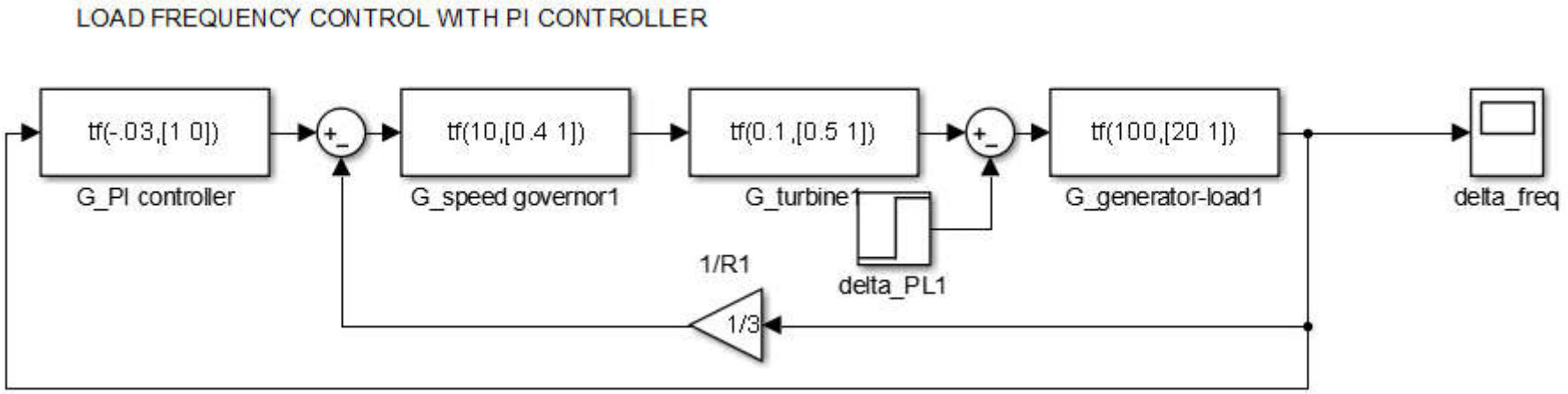
LFC- Primary Loop (Approximated)

$T_{SG} = T_T = 0, \qquad K_{SG}K_T = 1$



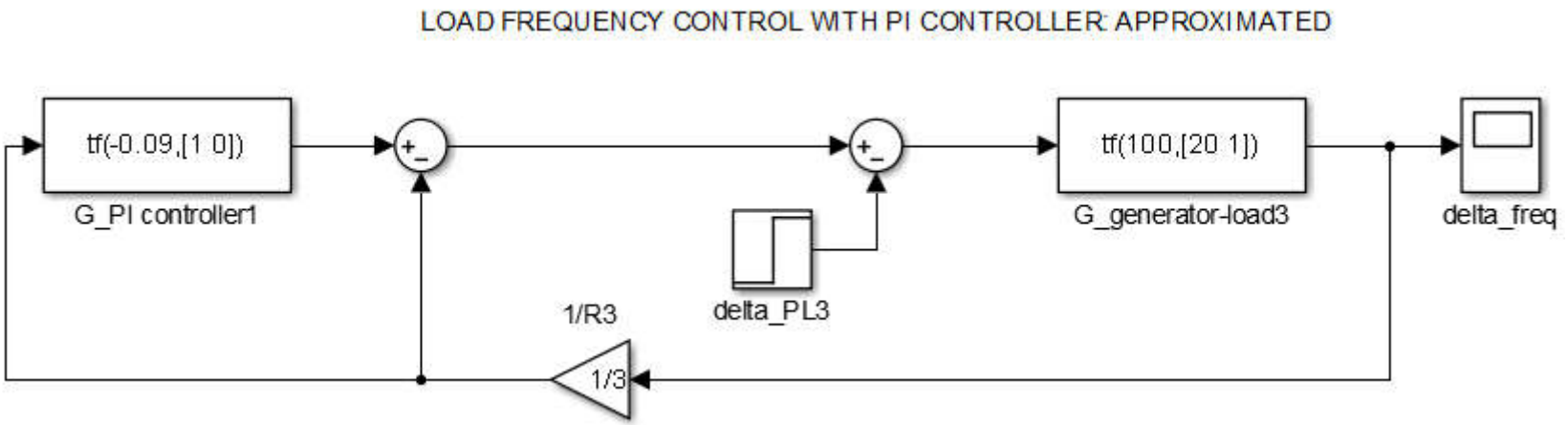
$$\Delta f_o = -\Delta P_L \frac{RK_{PS}}{R + K_{PS}}$$

LFC- With Integral Control



LFC- Integral Control (Approximated)

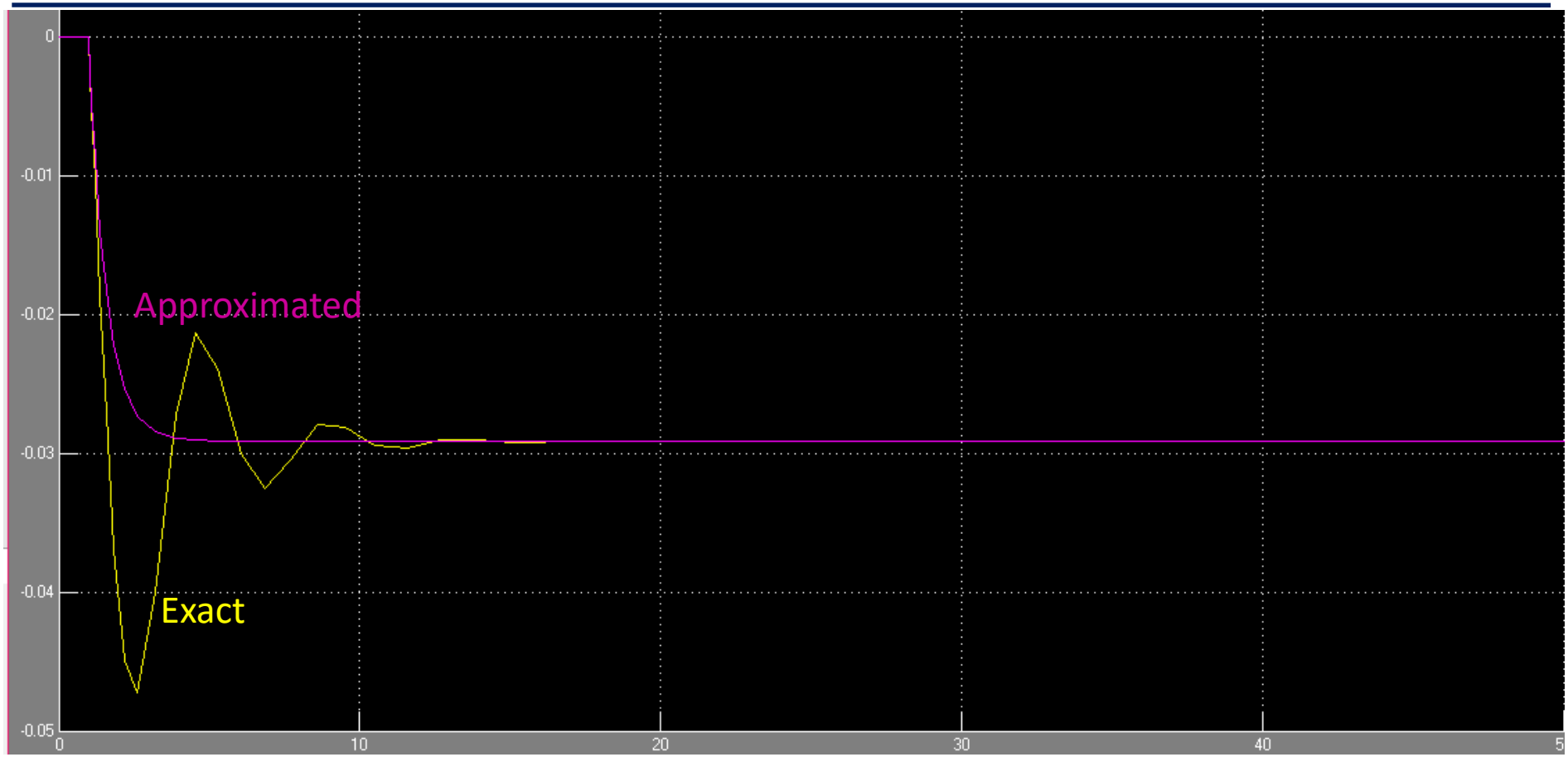
$T_{SG} = T_T = 0, \qquad K_{SG}K_T = 1$



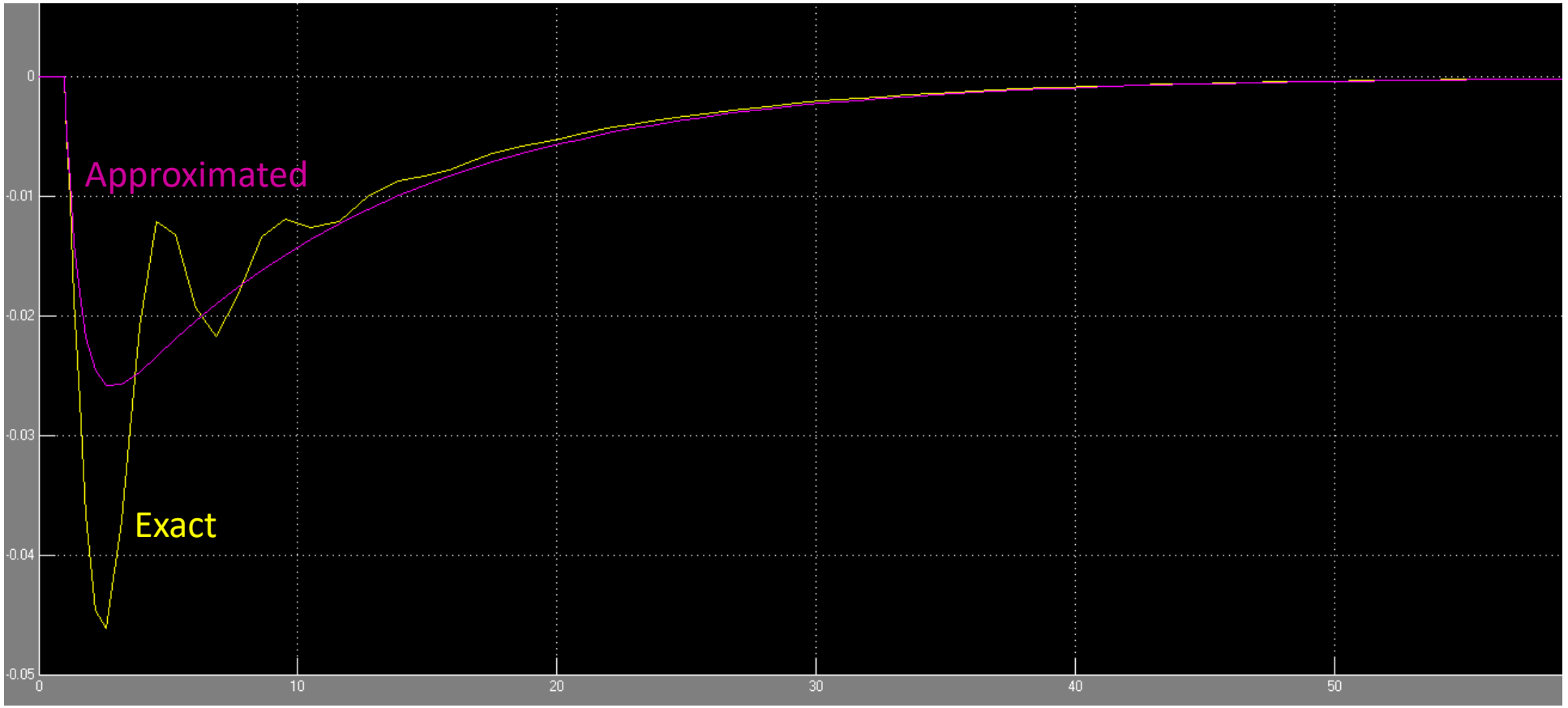
$$K_{I,crit} = \frac{K_{PS}}{4T_{PS}}\left[\frac{1}{R} + \frac{1}{K_{PS}}\right]^2$$

RESULTS

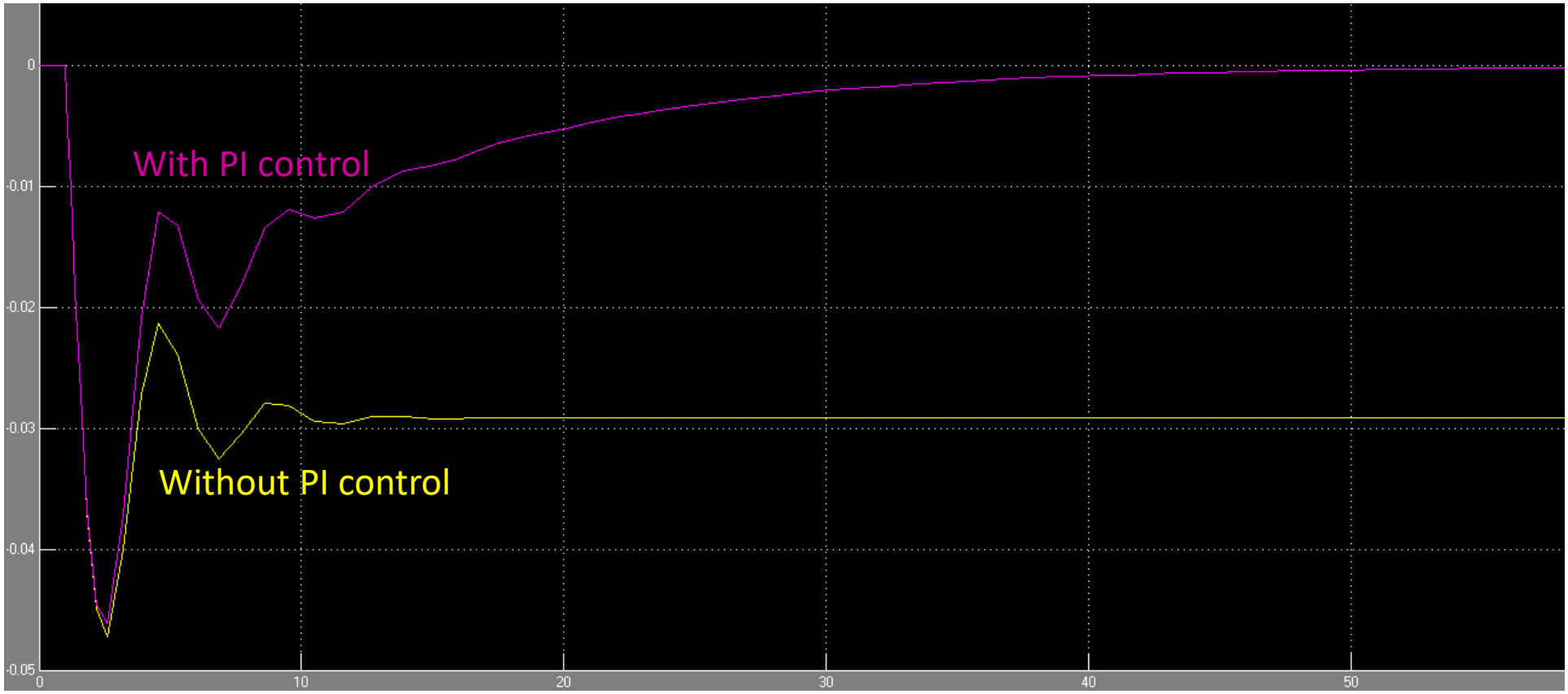
Primary LFC



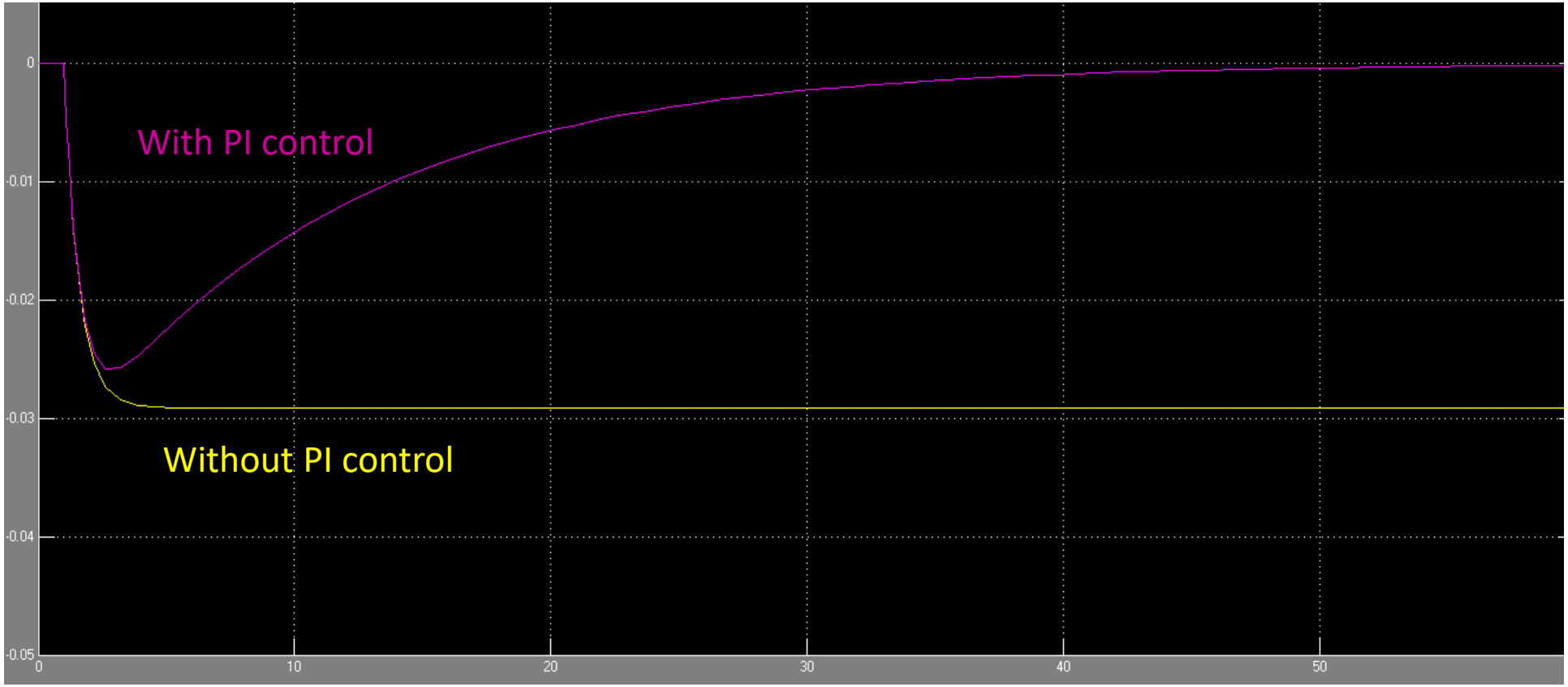
LFC With Integral Control



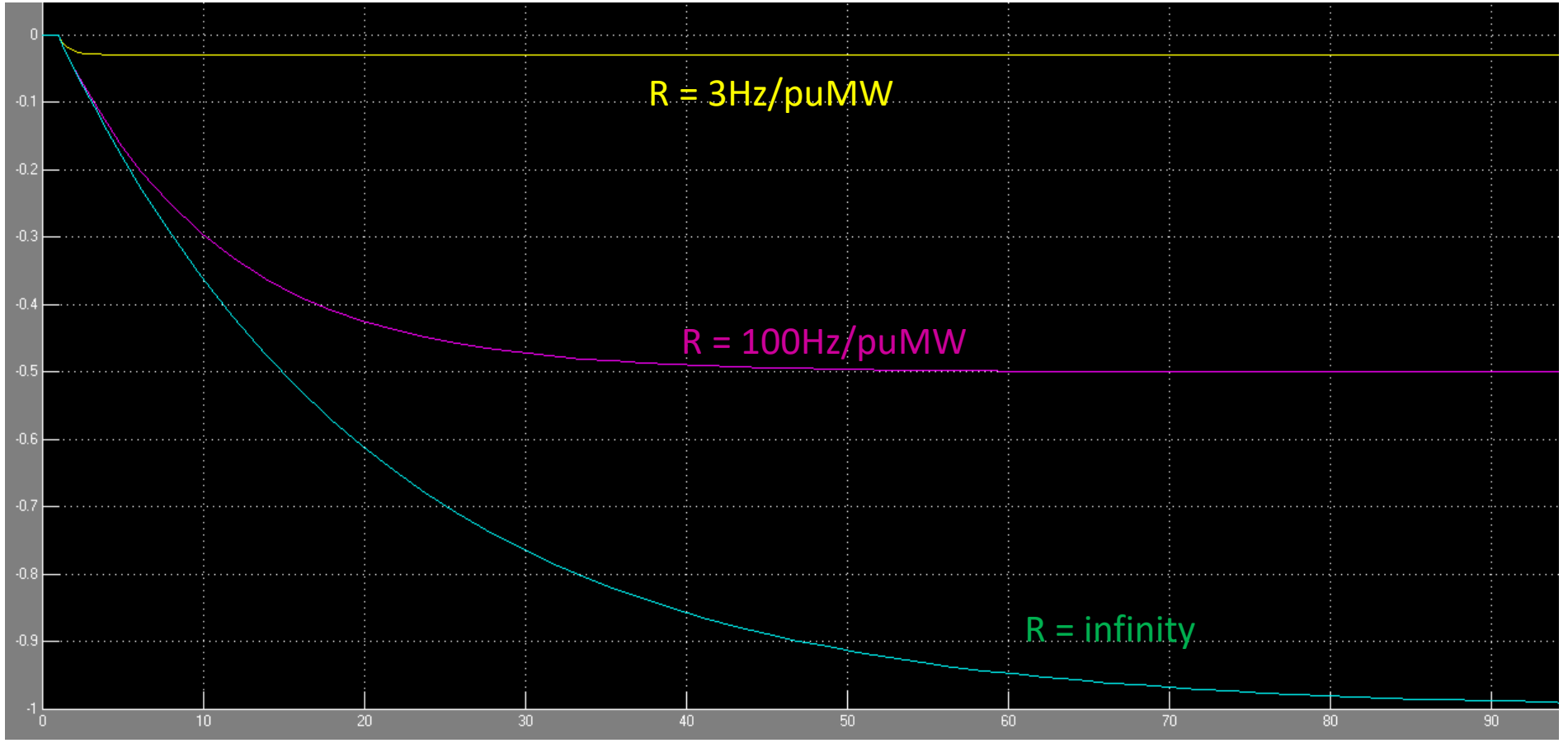
LFC of Isolated Area (Exact)



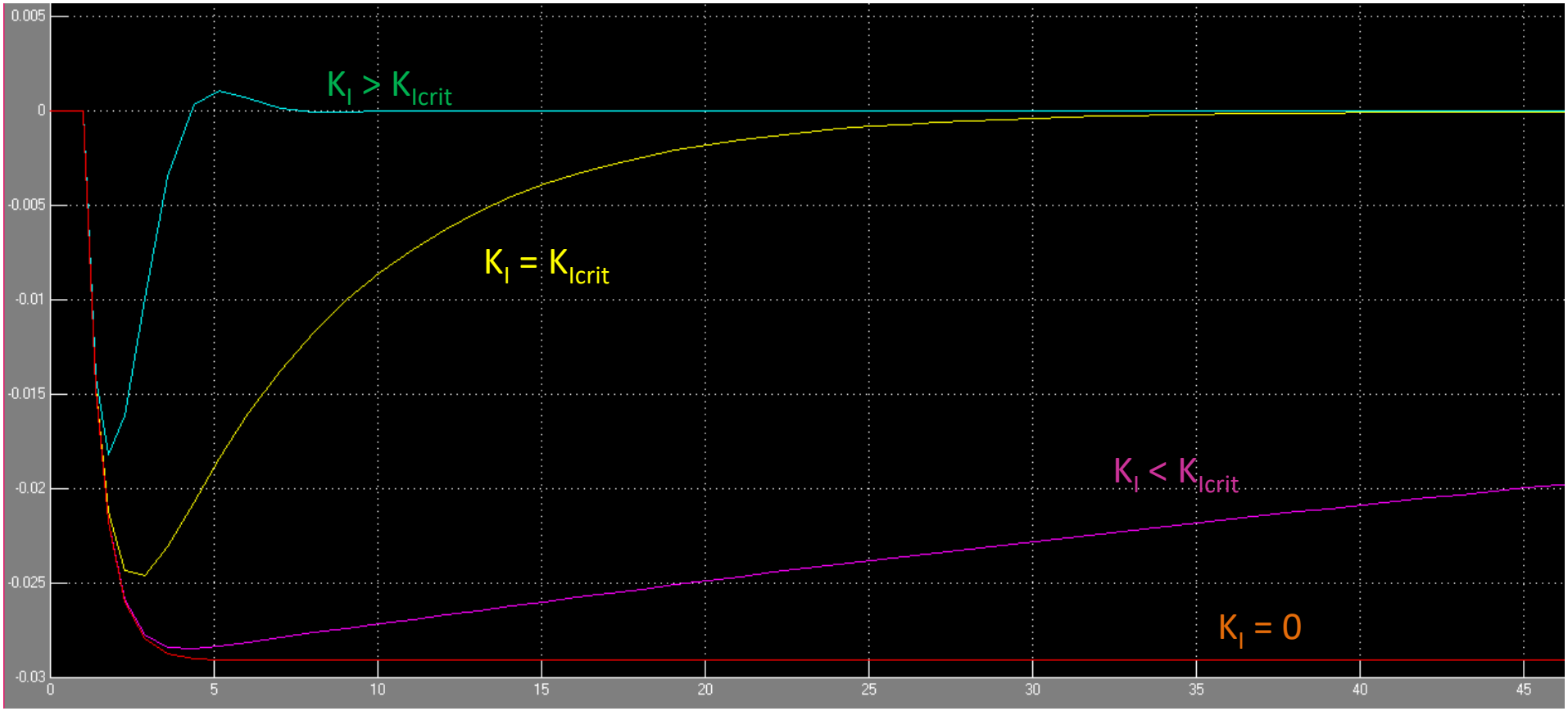
LFC of Isolated Area (Approximated)



Effect of variation of R



Effect of variation of K_I



THANK YOU