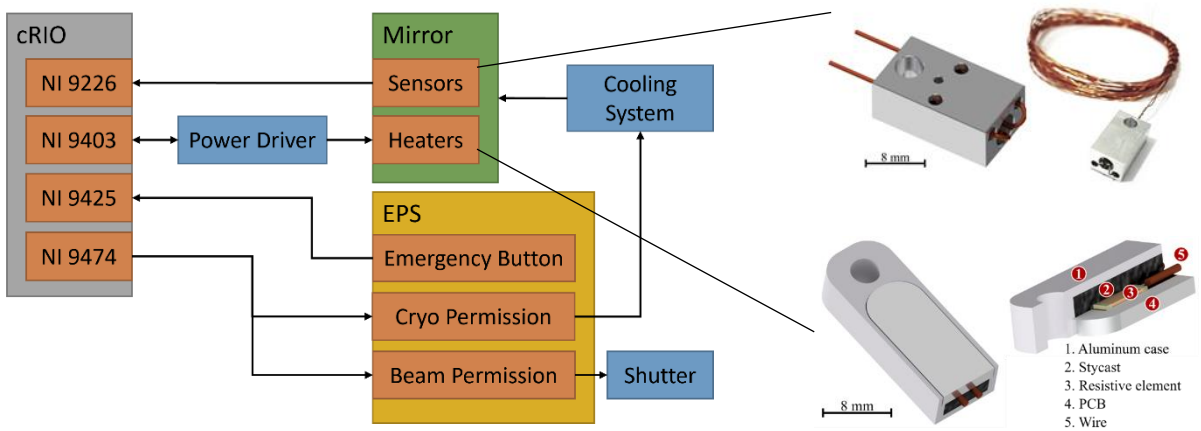
TEMPERATURE CONTROL FOR BEAMLINE PRECISION SYSTEMS OF SIRIUS/LNLS

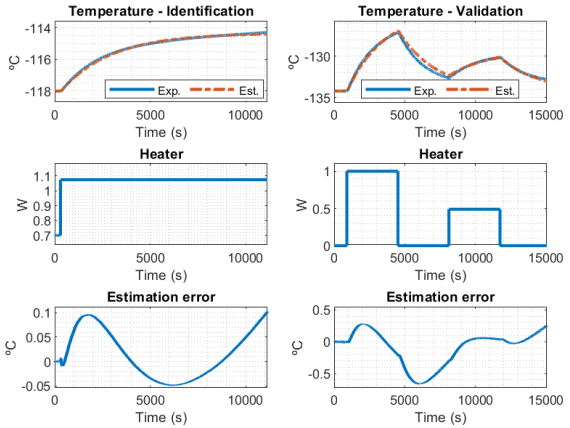
J.L.N. Brito, G. S. Baldon, F. R. Lena, M. A. L. Moraes, R. R. Geraldes, M. Saveri Silva,
L. M. Volpe, Brazilian Synchrotron Light Laboratory (LNLS), CNPEM, Campinas, Brazil

ICALEPCS 2021

Temperature control hardware architecture



Model identification and validation



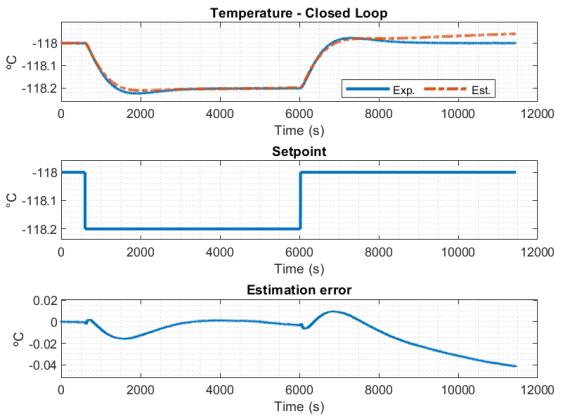
$$H(s) = \frac{k}{s - p}$$

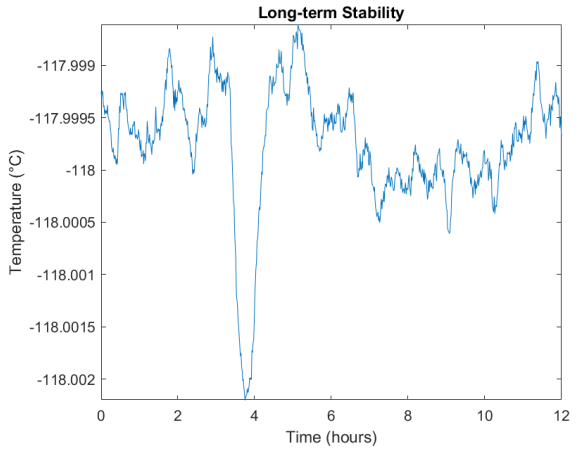
Derivative filter with anti-windup PID controller

$$\text{PID}(z) = \frac{U(z)}{E(z)} = k_p + \frac{k_i.T_s.z}{z-1} + \frac{k_d}{T_f + \frac{T_s.z}{z-1}}, U_{min} < U(z) < U_{max}$$

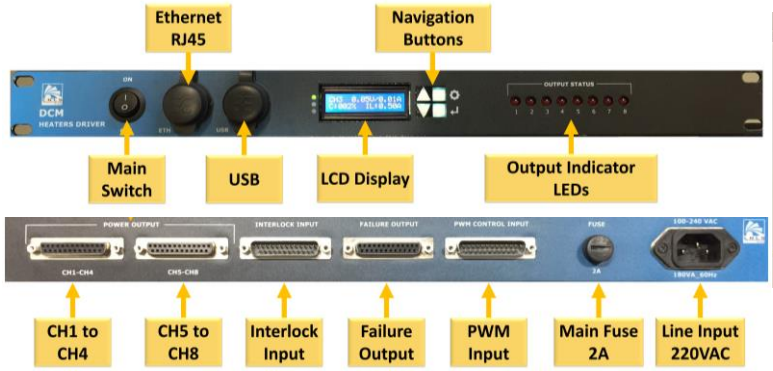
$$\text{PID}(z) = \frac{U(z)}{E(z)} = k_p + \frac{k_d}{T_f + \frac{T_s.z}{z-1}}, otherwise\ (anti - windup)$$

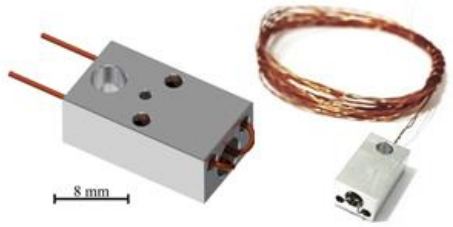
Closed-loop and long-term results

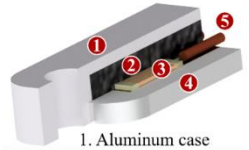


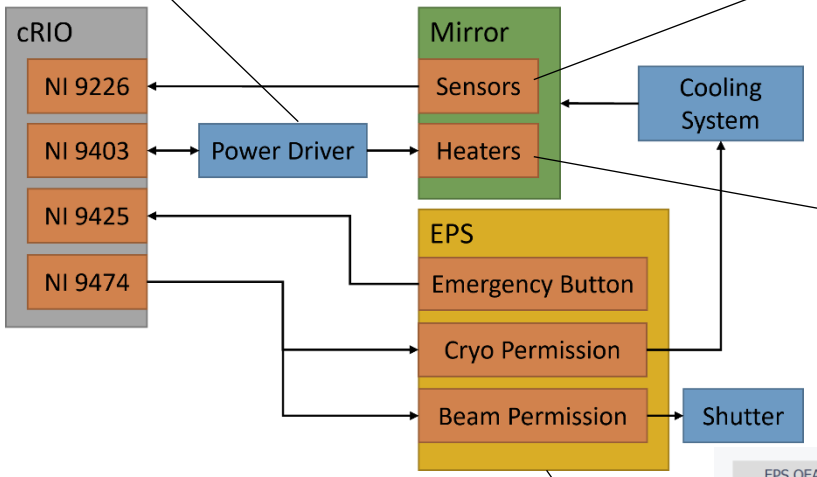


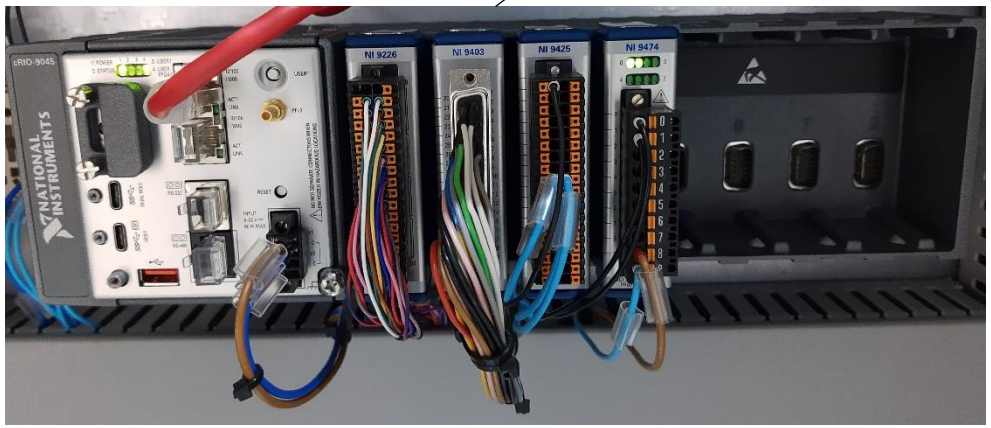
Temperature control hardware architecture

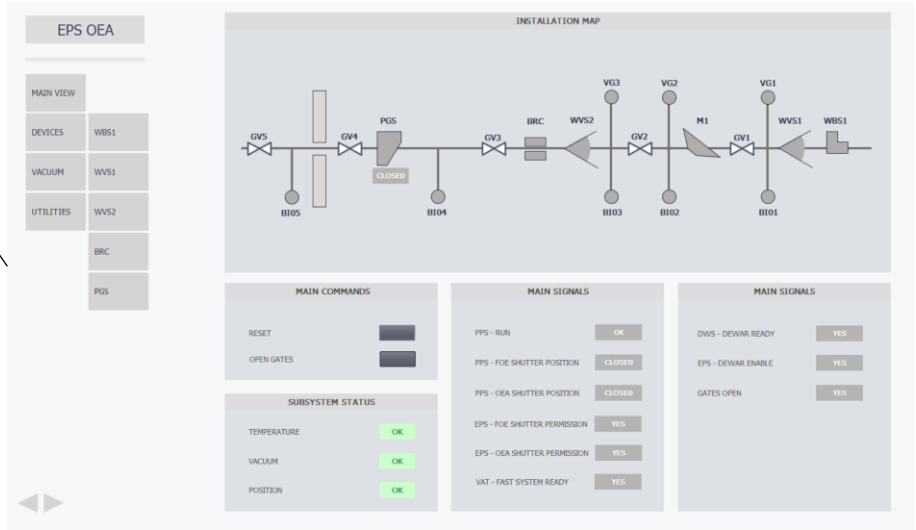








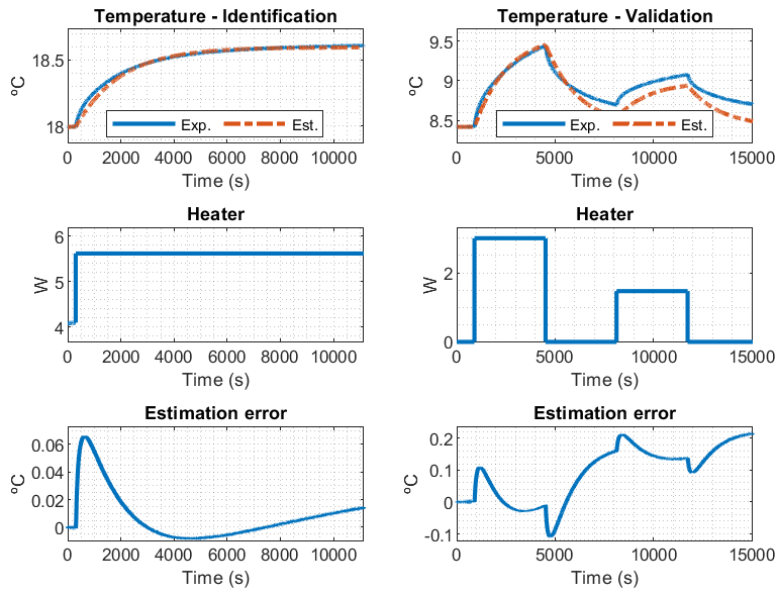




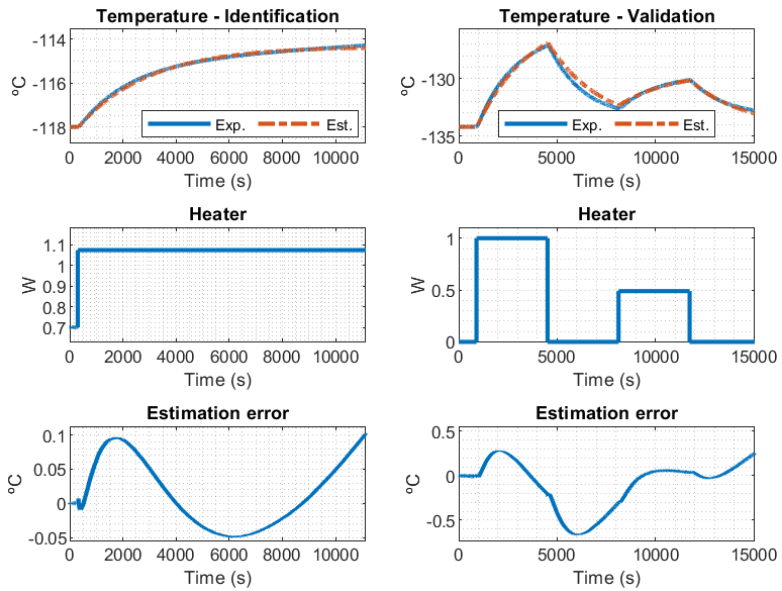
Model identification and validation

$$H(s) = \frac{k}{s - p}$$

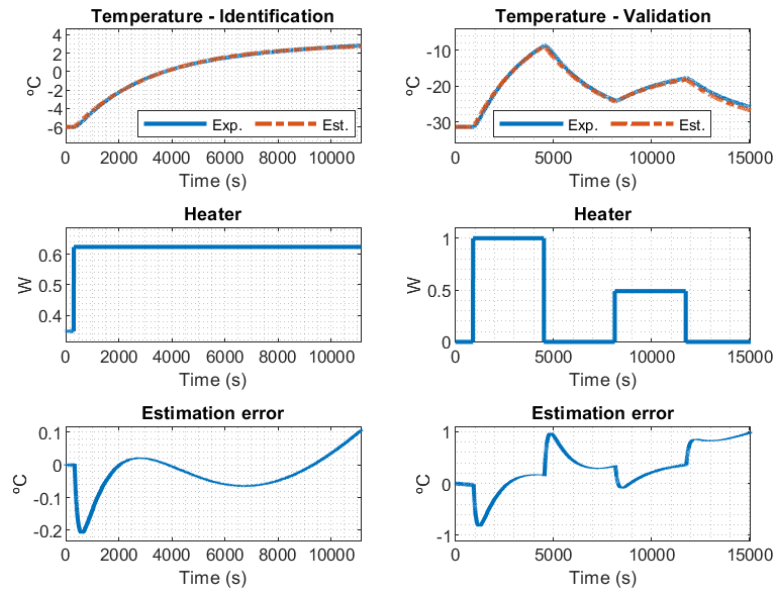
$$H(s) = \frac{2.345e-4}{s + 6.005e-4}$$



$$H(s) = \frac{3.683e-3}{s + 3.754e-4}$$



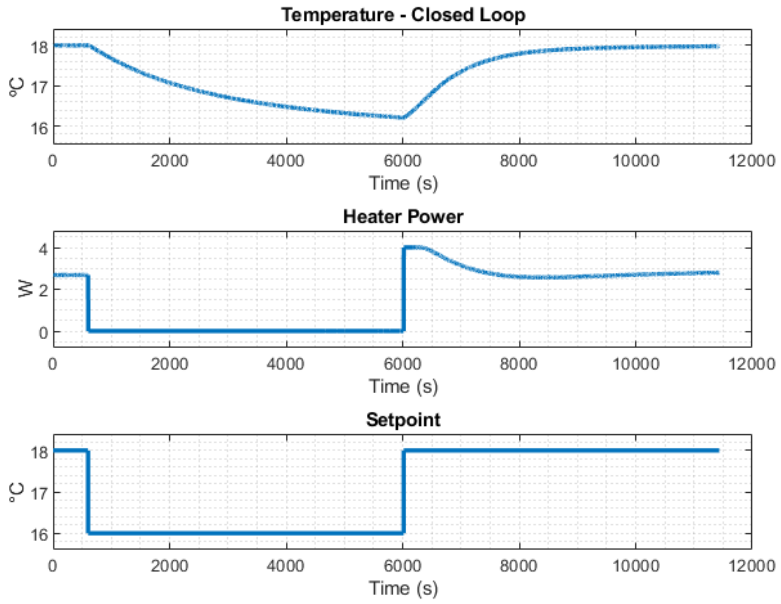
$$H(s) = \frac{1.045e-2}{s + 3.205e-4}$$

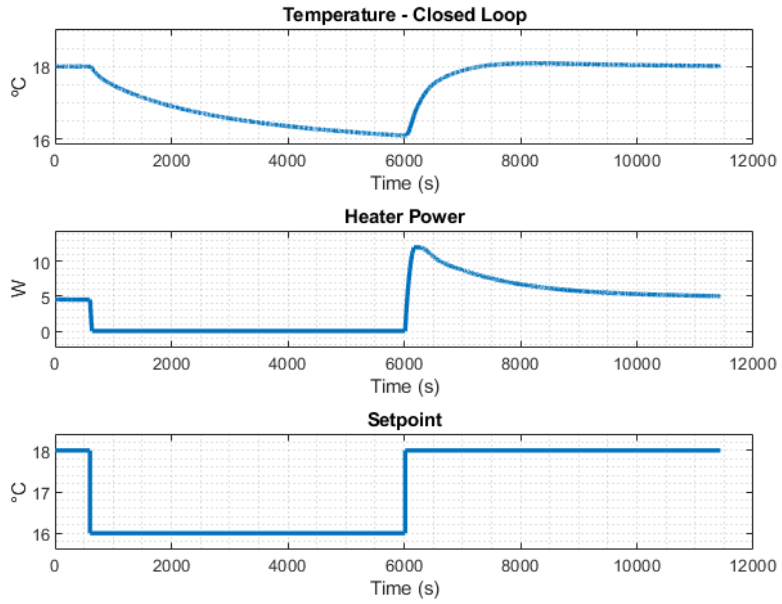


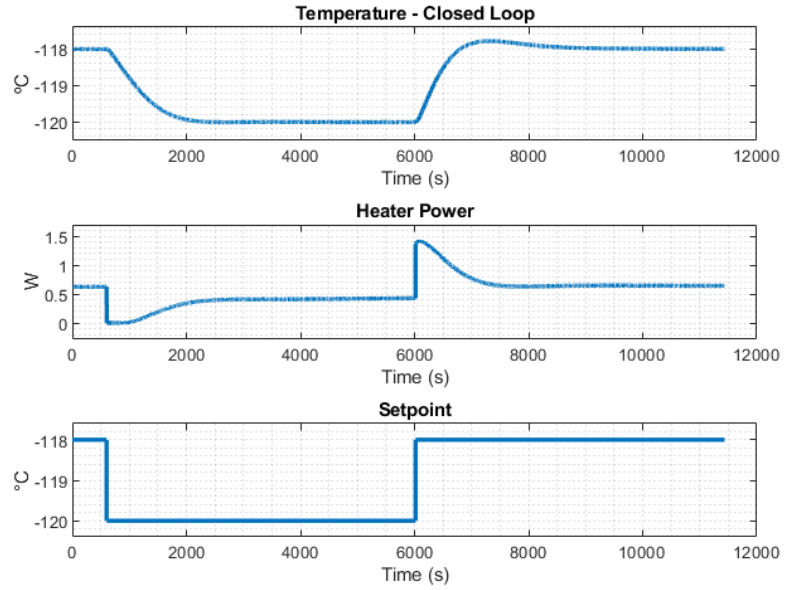
Derivative filter with anti-windup PID controller

$$\text{PID}(z) = \frac{U(z)}{E(z)} = k_p + \frac{k_i.T_s.z}{z-1} + \frac{k_d}{T_f + \frac{T_s.z}{z-1}}, U_{min} < U(z) < U_{max}$$

$$\text{PID}(z) = \frac{U(z)}{E(z)} = k_p + \frac{k_d}{T_f + \frac{T_s.z}{z-1}}, otherwise\ (anti - windup)$$







Closed-loop and long-term results