Current regularized least square method in the RICH mirror alignment:

$$\sum_{p,s\in\text{subset}} \Big[(\Theta^y_{p,s} - A^y_{p,s}\alpha^y_p - B^y_{p,s}\beta^y_s - a^y_{p,s}\alpha^z_p - b^y_{p,s}\beta^z_s)^2 + (\Theta^z_{p,s} - A^z_{p,s}\alpha^z_p - B^z_{p,s}\beta^z_s - a^z_{p,s}\alpha^y_p - b^z_{p,s}\beta^y_s)^2 + (\overline{A^y}\alpha^y_p)^2 + (\overline{A^z}\alpha^z_p)^2 + (\overline{B^y}\beta^y_s)^2 + (\overline{B^z}\beta^z_s)^2 \Big].$$

"Normal" least square

Regularization term

Mirror tilts

(major) magnification coefficients
(translate the mirror tilt into effect seen on the detector plane)

Tikhonov regularization/ ridge regression:

$$\|A\mathbf{x} - \mathbf{b}\|^2 + \|\Gamma\mathbf{x}\|^2$$

for some suitably chosen **Tikhonov matrix**, Γ

In many cases, this matrix is chosen as a multiple of the identity matrix, giving preference to solutions with smaller norms; this is known as L2 regularization.