Let $X_{jk} \sim \mathcal{N}_{jk}$ where $\mathcal{N}_{jk} = \mathcal{N}(\theta_k \mu_j, \theta_k^2 \sigma_j)$ and θ_k is a random variable with $E[\theta_k] = 1$. Let x_{ijk} be the i'th normalized F_{luc}/R_{luc} value of the j'th configuration from the k'th batch, drawn from X_{jk}.

We wish to test whether or not $\mu_0 = \mu_1$. To do this, we will first normalize out θ_k and then apply a t-test.

Since $E[\theta_k] = 1$ and $E[X_{jk}] = \theta_k \mu_j$, we can estimate μ_j as $\bar{\mu}_j \approx \frac{1}{N_i N_k} \sum_{i,k} x_{ijk}$. Then we let $\hat{x}_{ijk} = \eta_k x_{ijk}$ where η_k minimizes $\sum_{i,j} (\eta_k x_{ijk} - \bar{\mu}_j)^2$. Note that $\eta_k \theta_k \approx 1$. The values $\hat{x}_{ijk}$ then have distributon $\eta_k \mathcal{N}_{jk} \approx \mathcal{N}(\mu_j, \sigma_j)$. This means the hypothesis $\mu_0 = \mu_1$ can be tested using the populations $\hat{x}_{i0k}$ and $\hat{x}_{i1k}$.