Supplementary Material

Appendix 2 - Measurement of the total standard uncertainty of the area bounded by the contour of the model.

The combined standard uncertainty of each edge length measurement of the model contour is calculated as follows (eqn. A5):

$$u_c(\bar{L}_x) = \sqrt{u^2(\bar{L}_x) + \left(\frac{U_s}{2}\right)^2 + \left(\frac{\Delta_r}{\sqrt{6}}\right)^2} \tag{A5}$$

where $u(\bar{L}_x)$ is calculated as the standard deviation of the average length of the model contour edge; which is equal to $\sqrt{\sum_{i=1}^{5} \frac{(L_{xi}-\bar{L}_x)^2}{20}}$, m; U_s is the expanded uncertainty of the standard length, presented in the calibration certificate; and is calculated using the coverage factor k=2, m; Δ_r is the error of the ruler reading (resolution), m. The covariance between the measurements of the lengths of edges a and b of the model contour is calculated according to the following (eqn. A6):

$$u_{cov\_ab} = \frac{1}{20}\sum_{i=1}^{5}(L_{ai} - \bar{L}_a)(L_{bi} - \bar{L}_b). \tag{A6}$$

The covariance between edges c and d is calculated analogously to the covariance between edges a and b (eqn. A7):

$$u_{cov\_cd} = \frac{1}{20}\sum_{i=1}^{5}(L_{ci} - \bar{L}_c)(L_{di} - \bar{L}_d). \tag{A7}$$

The covariance between d and f is calculated analogously using (eqn. A8):

$$u_{cov\_df} = \frac{1}{20}\sum_{i=1}^{5}(L_{di} - \bar{L}_d)(L_{fi} - \bar{L}_f). \tag{A8}$$

The combined standard uncertainty of the area bounded by the rectangular contour is calculated using (eqn. A9):

$$u_c(A_{rect}) = \sqrt{\bar{L}_b^2 \cdot u_c^2(\bar{L}_a) + \bar{L}_a^2 \cdot u_c^2(\bar{L}_b) + 2 \cdot \bar{L}_a \cdot \bar{L}_b \cdot u_{cov\_ab}}\,. \tag{A9}$$

The combined standard uncertainty of the area bounded by the contour of a polygonal model is calculated as follows (eqn. A10):

$$u_c(A_{poly}) = \sqrt{\begin{array}{c}\left(\bar{L}_d + \bar{L}_c/_2\right)^2 \cdot u_c^2(\bar{L}_f) + (\bar{L}_f)^2 \cdot u_c^2(\bar{L}_d) + \left(\bar{L}_f/_2\right)^2 \cdot u_c^2(\bar{L}_c) + \\ +\bar{L}_f^2 \cdot u_{cov\_cd} + 2 \cdot \bar{L}_f\left(\bar{L}_d + \bar{L}_c/_2\right) \cdot u_{cov\_df}\end{array}}\,. \tag{A10}$$