Calculating the combined standard uncertainty of the Quality Assurance Procedure Solution

\[ CV_{\text{COA}}^2 = \left( \frac{\text{Control uncertainty as \%}/1000}{0.100} \right)^2 \]

\[ CV_{\text{QAP Solution}}^2 = \left( \frac{QAP\ solution_{\text{SD}}/\sqrt{15}}{QAP\ solution_{\text{Mean}}} \right)^2 \]

\[ CV_{\text{Control}}^2 = \left( \frac{\text{Control}_{\text{SD}}/\sqrt{3}}{\text{Control}_{\text{Mean}}} \right)^2 \]

\[ CV_{\text{Bias}}^2 = \left( \frac{\text{Maximum control bias}/\sqrt{3}}{0.100} \right)^2 \]

\[ CV_{\text{Part Coef}}^2 = \left( \frac{0.0124}{1.23} \right)^2 \]

The combined standard uncertainty for an individual Quality Assurance Procedure Solution is calculated using the following formula:

\[ u_{\text{QAP Sol}} = \text{Equiv Vapor Conc} \times \sqrt{CV_{\text{COA}}^2 + CV_{\text{QAP Solution}}^2 + CV_{\text{Control}}^2 + CV_{\text{Bias}}^2 + CV_{\text{Part Coef}}^2} \]

Calculating the 99% confidence interval of subject breath results

Mean BrAC:

\[ BrAC_{\text{Mean}} = (BrAC_1 + BrAC_2)/2 \]

Bias corrected BrAC:

\[ BrAC_{\text{corr}} = BrAC_{\text{Mean}}/1 + (\text{Bias} \times 0.01) \]

Biological-Sampling uncertainty:

\[ u_{\text{Bio Sampl}} = (0.0249 \times BrAC_{\text{corr}}) + 0.00173 \]

Combined uncertainty:

\[ u = BrAC_{\text{corr}} \times \sqrt{\left( \frac{DM_{\text{SD}}/\sqrt{10}}{DM_{\text{Mean}}} \right)^2 + \left( \frac{u_{\text{QAP Sol}}}{\text{Equiv Vapor Conc}} \right)^2 + \left( \frac{u_{\text{Bio Sampl}}/\sqrt{2}}{BrAC_{\text{corr}}} \right)^2} \]

99% Confidence Interval:

\[ BrAC_{\text{corr}} \pm (2.576 \times u) \]
The Toxicology Laboratory Division has attempted to identify all of the components of uncertainty and make a reasonable estimation based on knowledge of the method. The components contributing to the estimation of measurement uncertainty include, traceability \( CV_{COA}, u_{QAP\,Sol} \), instrumentation \( \left( \frac{DM_{SP}}{\sqrt{10}} \right) \), the simulator \( CV_{Part\,Coeff}^2 \), accounting for bias \( CV_{Bias}^2, BrAC_{corr}, Bias \), the QAP solution’s reference value \( CV_{QAP\,Solution}^2, CV_{Control}^2 \), and the biological sampling uncertainty \( u_{Bio\,Sample} \).