AQR: Uncertainty of Measurements

Introduction
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The following describes elements of the estimations of uncertainties for measurements that matter for the laboratory.

Definitions

The following definitions are used throughout this procedure:

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- **Critical measurement -** Any measurement where traceability is required whose results will affect the prosecution of a criminal trial in terms of penalty enhancements. Examples would be results that would change a misdemeanor to a felony or affect the length of incarceration.
- **Measurement uncertainty[1] -** (uncertainty of measurement or uncertainty) Non-negative parameter characterizing the dispersion of the quantity values being attributed to a measurand, based on the information used.

Measurement traceability

All standards used to estimate any uncertainty shall be traceable. Refer to *AQR: Measurement Traceability* in this manual for additional information.

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[1] "ASCLD/LAB Guidance on the Estimation of Measurement Uncertainty – Overview," AL-PD-3061-Ver 1.0, May 22, 2013

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Application

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An uncertainty will be estimated for those instruments and procedures used for performing critical measurements. These are identified as follows:

- Balances
  - Refer to *AQR: Uncertainty of Measurement – Balances* in this manual for additional information.
- Length
  - The determination of barrel length and overall length in firearms examinations. Refer to *CE: Uncertainty of Measurement – Length* in the Comparative Evidence Manual for additional information.
- Quantitative analyses in the Blood Alcohol and the Toxicology sections
  - Refer to *BA: Uncertainty of Measurement* and *TX: Uncertainty of Measurement* for additional information.
- Drug chemistry
  - Refer to *CH: Reporting Estimated Uncertainties* in the Chemistry Manual for additional information.

Method

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Refer to *AQR: Process of Estimating Uncertainty* in this manual for the general method for estimating uncertainty.

Refer to the individual section procedures manuals for the specific method of estimating any applicable uncertainties for critical measurement in that unit. These methods will also contain the current reportable value for the estimated uncertainty.

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Coverage factor   The results of the uncertainty estimations are expressed as a "coverage factor" or "level of confidence".

- For a coverage factor (k) of **1**, the level of confidence is 68.27% that the true value lies between the measured value and plus or minus the estimated uncertainty.
- For a coverage factor (k) of **2**, the level of confidence is 95.45% that the true value lies between the measured value and plus or minus <u>2 times</u> the estimated uncertainty.
- For a coverage factor (k) of **3**, the level of confidence is 99.73% that the true value lies between the measured value and plus or minus <u>3 times</u> the estimated uncertainty.

Unless otherwise stated, the estimated uncertainties will be reported with a k factor of 2 (approximately 95% confidence).

Scheduled updates   The uncertainty budget and estimation will be updated annually and whenever there is a substantive change in:

- procedure
- personnel
  - a reassigned analyst's contribution can be removed or left in calculation
  - a newly assigned analyst's contribution should be included after competency is completed
- equipment

NOTE: After evaluating the data annually, the laboratory may keep the current uncertainty as long as the new estimation is at or below the current estimation.

Records

5.10.3.1.c   Records are to be kept in logs in the appropriate technical section laboratory area. The logs should contain an uncertainty chart, an uncertainty budget, the method of data collection, and data used for the estimation.

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Oversight and implementation

The Laboratory Directory may designate a laboratory staff member to direct the oversight and implementation of the Uncertainty of Measurement program.

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