Designation: D 6512 – 03

An American National Standard

Standard Practice for Interlaboratory Quantitation Estimate[1]

This standard is issued under the fixed designation D 6512; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice establishes a uniform standard for computing the interlaboratory quantitation estimate associated with Z % relative standard deviation (referred to herein as $IQE_{Z\,\%}$), and provides guidance concerning the appropriate use and application.

1.2 $IQE_{Z\,\%}$ is computed to be the lowest concentration for which a single measurement from a laboratory selected from the population of qualified laboratories represented in an interlaboratory study will have an estimated Z % relative standard deviation (Z % RSD, based on interlaboratory standard deviation), where Z is typically an integer multiple of 10, such as 10, 20, or 30, but Z can be less than 10. The $IQE_{10\,\%}$ is consistent with the quantitation approaches of Currie **(1)**[2] and Oppenheimer, et al **(2)**.

1.3 The fundamental assumption of the collaborative study is that the media tested, the concentrations tested, and the protocol followed in the study provide a representative and fair evaluation of the scope and applicability of the test method as written. Properly applied, the IQE procedure ensures that the IQE has the following properties:

1.3.1 *Routinely Achievable IQE Value*—Most laboratories are able to attain the IQE quantitation performance in routine analyses, using a standard measurement system, at reasonable cost. This property is needed for a quantitation limit to be feasible in practical situations. Representative laboratories must be included in the data to calculate the IQE.

1.3.2 *Accounting for Routine Sources of Error*—The IQE should realistically include sources of bias and variation that are common to the measurement process. These sources include, but are not limited to: intrinsic instrument noise, some "typical" amount of carryover error; plus differences in laboratories, analysts, sample preparation, and instruments.

1.3.3 *Avoidable Sources of Error Excluded*—The IQE should realistically exclude avoidable sources of bias and variation; that is, those sources that can reasonably be avoided in routine field measurements. Avoidable sources would include, but are not limited to: modifications to the sample; modifications to the measurement procedure; modifications to the measurement equipment of the validated method, and gross and easily discernible transcription errors, provided there was a way to detect and either correct or eliminate them.

1.4 The IQE applies to measurement methods for which calibration error is minor relative to other sources, such as when the dominant source of variation is one of the following:

1.4.1 *Sample Preparation*, and calibration standards do not have to go through sample preparation.

1.4.2 *Differences in Analysts*, and analysts have little opportunity to affect calibration results (as is the case with automated calibration).

1.4.3 *Differences in Laboratories* (for whatever reasons), perhaps difficult to identify and eliminate.

1.4.4 *Differences in Instruments* (measurement equipment), such as differences in manufacturer, model, hardware, electronics, sampling rate, chemical processing rate, integration time, software algorithms, internal signal processing and thresholds, effective sample volume, and contamination level.

1.5 *Data Quality Objectives*—Typically, one would compute the lowest % RSD possible for any given dataset for a particular method. Thus, if possible, $IQE_{10\,\%}$ would be computed. If the data indicated that the method was too noisy, one might have to compute instead $IQE_{20\,\%}$, or possibly $IQE_{30\,\%}$. In any case, an IQE with a higher % RSD level (such as $IQE_{50\,\%}$) would not be considered, though an IQE with RSD <10 % (such as $IQE_{1\,\%}$) would be acceptable. The appropriate level of % RSD may depend on the intended use of the IQE.

2. Referenced Documents

2.1 *ASTM Standards:*

D 2777 Practice for Determination of Precision and Bias of Applicable Test Methods of Committee D-19 on Water[3]

D 6091 Practice for 99 %/95 % Interlaboratory Detection Estimate (IDE) for Analytical Methods with Negligible Calibration Error[3]

E 1763 Guide for Interpretation and Use of Results from

[1] This practice is under the jurisdiction of ASTM Committee D19 onWater and is the direct responsibility of Subcommittee D19.02 on General Specifications, Technical Resources, and Statistical Methods.

Current edition approved March 10, 2003. Published May 2003. Originally approved in 2000. Last previous edition approved in 2000 as D6512–00.

[2] The boldface numbers in parentheses refer to the list of references at the end of this standard.

[3] *Annual Book of ASTM Standards*, Vol 11.01.

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