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# Practical implementation of ISO 11929: 2010

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## Content

The standard ISO 11929:2010, 'Determination of the characteristic limits (decision threshold, detection limit, and limits of the confidence interval) for ionising radiation measurements – Fundamentals and applications' provides the theoretical background and statistical methods for definition and calculation of 'characteristic limits' (decision threshold, detection limit and confidence limits) of an ionising radiation measurand via the standard measurement uncertainty of the measurand (called the 'standard uncertainty' in the following). The current issue of this standard replaces a previous multipart version that introduced Bayesian statistical analysis techniques as a means to determine these important quantities. As a current ISO standard that has been widely accepted by national bodies, it is expected that laboratories employ the principles and techniques outlined in the document as a basis for calculating decision threshold, detection limit and confidence limits in all forms of radioactivity measurement – particularly if laboratories are accredited to ISO 17025:2005 'General requirements for the competence of testing and calibration laboratories'. Although general formulæ and calculation methods are described in ISO 11929:2010, formulæ for specific measurement techniques, frequently employed by measurement laboratories are not given. In addition, although the formulæ for the calculation of the parameters of the confidence interval parameters omega [U+F077], p and q are given, practical techniques to calculate these terms, upon which the coverage factors kp and kq depend, are not outlined in the standard. The present paper reviews the new ISO approach and proposes exact formulæ for calculation of characteristic limits for integral counting and spectrometry measurements considering the blank and background contributions as well as other uncertainty components, and how commonly used spreadsheet software may be used to calculate aspects of the confidence limits in order to simplify all aspects of the relevant calculations. These formulæ are applied to a number of real cases taken from laboratory practise and characteristic limits are derived as examples. Results are then compared with those obtained from the classical Currie approach and deviations are discussed. Finally, the meaning of characteristic limits are discussed with reference to measurement reporting with the aim to standardise how such reporting is carried out – currently this is often done in a way that makes comparisons of data sets from different organisations difficult.

## About the Presenter

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