Appendix B

Measurement definitions as used in the text

**Standard**: An accepted sample or procedure that is used for establishing a unit for the measurement of physical quantities.

**Measurement**: Highly controlled set of operations having the object of determining a value of a quantity, that is, the execution of a measurement procedure.

**Measurand**: Particular physical quantity subject to measurement.

**Result of measurement**: Value attributed to a measurand, obtained by following the measurement procedure.

**Uncorrected result**: Result of measurement before correction of systematic errors, that is, Type B errors.

**Corrected result**: Result of measurement after correction of Type B errors; only Type A errors remaining.

**Type A error**: Errors that can be evaluated by statistical methods.

**Type B error**: Errors that must be evaluated by other methods.

**Measurement trial**: Repeat of the measurement procedure.

**Measurement scale**: The graduations that, via ranking and comparison with a standard, allow ordinal measurement data to be quantified cardinally, giving the ratio relative to the standard in multiples of the resolution of the measurement. Also refers to the mapping to representational space which maps the values of the measurand to values in the image set, that is, the mapping the assigns the measurand to specific graduations on the physically realisable scale under the measurement procedure.

**Resolution**: Smallest interval on any measurement scale that can be discerned, often referred to as discrimination in disciplines other than electronics in which discrimination is a term usually reserved to describe the action of filters in rejecting input signals with specific spectral characteristics.

**Sensitivity**: Property of a system or part of a system that indicates how the system reacts to stimuli. It is a measure of the variation in the behaviour of the system caused by some change in the original value of one or more of the elements of the system.
For a measurement system the variation in the measurement result as the true value of the measurand varies.

**Precision**: Is a statement about the closeness of the agreement of the results of a set of identically performed trials, where it is presumed that the true value of the measurand remains constant over the period of the trials.

**Repeatability**: Closeness of the agreement between the results of successive measurement trials of the same measurand carried out using the same measurement procedure.

**Reproducibility**: Reserved for the same concept as repeatability, where the periods between trials is not small, but are instead spread over a period of days or years that is very much greater than the length of time required to perform the measurement.

**True value**: Value consistent with a definition of a given particular quantity.

**Measure**: True value of a measurand evaluated via a measurement procedure, that is, after correction, the limit in the measurement results as the number of measurement trials tends to infinity. In the absence of infinity many trials, it can only be defined as the maximum likelihood value with a confidence interval at a given level of significance.

**Confidence interval**: An interval in which, one can be confident, with a given level of probability that a parameter lies. In measurement theory the parameter is the measure of the measurand.

**Level of significance**: The quantified probability that defines the level of confidence that a value falls within an interval, for example, 5 per cent significance means that in 95 out of 100 trials the measurement result can be expected to fall within the interval. Specifically the level of significance of the outcome of any trial is the probability, on the null hypothesis of any result being out with a specified interval. *Note*: A more detailed definition can be found in Reference 1.

**Error source**: Any variable that can affect the highly controlled set of operations, that is, the measurement procedure and thus produce an error in the measurement result.

**Error (of measurement)**: Result of measurement minus a true value of the measurand, used to establish a level of confidence in the dispersion of measurement results around the measure.

**Measurement-true value = error**: Error/true value = relative error.

**Uncertainty in measurement**: Parameter associated with the result of any measurement trial that characterises the dispersion of the values that could reasonably be attributed to the measurand, that is, the result of the evaluation aimed at characterising the range within which the true value of a measurand is estimated to fall, with a given level of confidence.

**Standard uncertainty**: Uncertainty in the measurement derived from the error associated with the functional relationship between a single error source and the uncertainty parameter. For Type A errors a statistical correlation will have to be used in the absence of a functional relationship.
Combined uncertainty: Uncertainty in the measurement derived from the errors associated with the functional relationship between all the error sources and the uncertainty parameter. For Type A errors a statistical correlation will have to be used in the absence of a functional relationship.

Expanded uncertainty the definition of quoted uncertainty in the measure: The total uncertainty in the measure derived from all the errors associated with the functional relationships between all the error sources and the uncertainty parameter taking into account the distributions of the individual uncertainties and a coverage factor to define a confidence interval at a given level of significance.

Coverage factor: A factor included in the calculation of the expanded uncertainty in any measurement, assuming normally distributed errors $= 2$, to approximate a 95 per cent confidence interval in which the measurand could reasonably be attributed to occur.

Accuracy of measurement: Closeness of the agreement between a measurement result derived from following the measurement procedure to determine the true value of the measurand. In the absence of an infinity of trials and therefore a definite measure, the probability of proximity to and dispersion around the true value defined via the expanded uncertainty.

B.1 References