The Importance of the Measurand in Health Physics
(HPS Continuing Education Lecture)

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When making a measurement for radiation protection or regulatory compliance, what is “the quantity intended to be measured?” That phrase is the definition of “measurand” that appears in the latest version of the International Vocabulary of Metrology (the VIM). For example, one may conduct a counting experiment to determine the amount of activity in a sample or the amount of activity in a lake. These two different measurands come with differing assumptions, although they may be based on the same measurement result. Another example is the distinction between the result of a measurement in counts per second and the measurand in Becquerels (or cpm versus dpm). Alas, most US writing, such as ANSI standards, regulations, MARLAP, and MARSSIM, ignores the concept of the measurand, making it very difficult to convey concepts such as minimum detectable amount, a terribly misleading name for the smallest usually detectable measurand (SUDM). The concept of measurand gives clearer meaning to the notions of population parameter (a measurand) and sample parameter (one or more measurement results or inferences based on those results). When the concepts of variability, uncertainty, bias, error and blunder are combined with models used to make inferences about measurands, or probabilistic statements about measurands using Bayes’s theorem, the distinction between measurement results and measurands is key. While the measurand has sometimes been called the “true value,” those words are not adequate in understanding metrology. All health physicists need to be able to state what the measurand is for every measurement result they make or use.

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