MODELLING AND UNCERTAINTY EVALUATION FOR THE RADIATION QUALITY PARAMETERS USED IN METROLOGICAL MANAGEMENT OF DIAGNOSTIC RADIOLOGY DOSIMETERS

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Radiology for human health diagnosis is an important field for metrological research in ionizing radiation since it combines metrological analysis with improvement in health care quality. Diagnostic radiology methods require radiation detectors for quality control of X-ray radiation qualities, with the measurement procedure and the parameters to be determined in accordance with International Standard IEC 61267:2005. A mathematical approach and numerical method are given for obtaining these parameters. The GUM uncertainty framework is used to evaluate the measurement uncertainties associated with the resulting parameter estimates. Because the measurement model used is non-linear and implicitly defined, the results are compared with those from a Monte Carlo method. For all radiation qualities, IEC 61267:2005 gives admissible limits that are not supported by any rationale. Thus, a further motivation for this study is that knowledge of uncertainties associated with typical experimental data would be a useful contribution to a definition of defensible limits for these qualities, since they directly affect the success of the process following diagnosis.