# IPEM recommendations on small field MV photon dosimetry: a forthcoming report

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## Introduction

The purpose of this report is to give recommendations on how to accurately measure dosimetric parameters in small MV photon beams.

## Material and Methods

Treatment using small photon fields has been an established practice in stereotactic radiotherapy for many years. Technological improvements in conventional linear accelerators have lead to better mechanical accuracy, stability and dosimetric control. At the same time there has been an increasing availability in the clinic of standard-, mini- and micro- multi-leaf collimators (MLCs) on conventional linear accelerators as well as the introduction of new treatment units specifically designed for stereotaxy (Gamma Knife, CyberKnife) or intensity modulated treatments (IMRT) (TomoTherapy). These technical improvements implicitly encourage the use of treatment field sizes, which previously would have been the preserve of the stereotactic community.

There are a number of interdependent problems in the use of small fields. First the normal field size definition (FWHM) breaks down. The accurate measurement of standard dosimetric quantities in narrow collimated fields strongly depends on the size of the detector with respect to the field dimensions and the changes in detector response at small beams as opposed to larger fields. Some of the standard dosimetric quantities are difficult to measure and planning systems' definitions of data may differ from the local clinic's definition. Some of these problems could cause local differences between measurement, prediction and actual dose of the order of 10%.

In intensity modulated radiotherapy (IMRT), individual small segments may not contribute a significant dose alone but an IMRT treatment field may comprise of many small segments. Dosimetric errors in small segments could therefore cause a significant dosimetric error in the whole IMRT treatment. However, because IMRT fields are likely to extend over a much larger area, quality control testing can benefit from averaging and problems with small segments may not be apparent or significant. This is not the case in small individual fields. Small fields used to treat small patient volumes may contribute a significant proportion of the prescribed dose to the patient. Any dosimetric errors in these small fields could therefore cause a significant error in overall delivery of prescribed dose.

## Results

The report:

- Summarises the problems with small photon beams, their dosimetry and modelling by treatment planning systems.
- Reviews suitable detector systems and methods for the determination of small field dosimetric parameters, as well as quality assurance issues relevant to the use of narrow collimated fields.
- Provides clear guidance of good practice for the measurement of dosimetric parameters in narrow collimated MV beams.

## Conclusion

Currently there is no guidance provided to clinical radiotherapy physicists on accurate small field MV dosimetry. This report is unique and its aimed readership will be clinical radiotherapy physicists and dosimetrists.