

## **What are the Useful Quality Metrics for Miniature X-ray Tubes?**

**S. Cornaby<sup>1</sup>, N. Palmer<sup>1</sup>, K. Decker<sup>1</sup>, C. Jensen<sup>1</sup>, D.J. Caruso<sup>2</sup> and M. Dinsmore<sup>2</sup>**

**<sup>1</sup>Moxtek, Inc. Orem UT**

**<sup>2</sup>TWX, LLC. Concord MA**

There are a number of issues to consider when evaluating and comparing miniature x-ray tubes. A few of the standard metrics include spot size, output x-ray spectrum, and x-ray output stability and repeatability. The question is: “How should these metrics be measured and presented?” For example, what is the spot size? Is it the FWHM across the length or width of the spot, or is it the size of the area emitting some percentage of the total flux? They can be very different. In this paper, we will present options for standardizing quality metrics for spot-size, output flux, and x-ray output stability. We will give measurements for both Moxtek and TWX miniature x-ray tubes. We will give flux measurements in spectral brightness (photons/sec/0.1mA/mm<sup>2</sup>/mrad<sup>2</sup>/0.1% BW), flux density (photons/sec/0.1mA/mm<sup>2</sup>(aperture)/detector BW), total flux (photons/sec/0.1mA) and flux per steradian (photons/sec/0.1mA/steradian). We will give the stability and repeatability of the tubes in terms of the standard deviation in counts from the L x-ray fluorescent lines in a lead sample target. We will also discuss the usefulness of a metric for different x-ray techniques, such as XRF, XRD, and imaging.