



1. Title:	Line edge roughness and cross sectional characterization of sub-50 nm structures using CD-SAXS
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### 3. Abstract body:

Critical dimension small angle x-ray scattering (CD-SAXS) is a metrology platform with the potential capability of measuring the average cross section and line edge roughness in patterns ranging from (10 to 500) nm in width with sub-nm precision. CD-SAXS measures the diffraction of a collimated X-ray beam with sub-Angstrom wavelength from a periodic pattern, such as those found in light scatterometry targets, to determine pattern cross section. The capability of CD-SAXS for LER characterization is tested through the measurement of patterns with sub-50 nm linewidths fabricated with EUV lithography and designed with controlled roughness amplitude and frequency. For these patterns, CD-SAXS provides high precision data on cross section dimension, including sidewall angle, CD, and pitch, while also providing the amplitude of line edge roughness. In limited cases, both the amplitude and the frequency of line edge and line width roughness are obtained. Ongoing efforts to compare CD-SAXS measurements of pattern cross section with optical critical dimension (OCD) and top-down scanning electron microscopy (SEM) will be discussed. Comparisons of line edge and line width roughness measurements will also be discussed between CD-SAXS and SEM.