

## Analyzing Beryllium with SEM/EDS and LoMAX X-Ray Optic

Ulrich Gernert, Technical University of Berlin. [ulrich.gernert@tu-berlin.de](mailto:ulrich.gernert@tu-berlin.de) April 6, 2009

### Introduction

Light elements can be detected in the SEM using EDS, but sensitivity to low energies below 1000eV is relatively weak, which results in limited detection limits and analysis for light elements in this region (Be, B, C, N, O). Be (Ka 110eV) is especially limited and often electronic noise in the Be region of interest further complicates the analysis and detection of this element.

LoMAX is an attachable grazing incidence x-ray optic that slides over the end of the EDS detector and gathers additional soft x-rays to the detector by increasing the solid collection angle for energies under 1000eV. Gains typically up to 10X for the lowest energy are achievable.

For this test, a LoMAX optical assembly was installed over the EDS electron trap. Normally, the electron trap on the EDS is removed and replaced by the LoMAX electron trap / optic assembly. Since the electron trap was not removable on this EDS, the magnets were unscrewed from the LoMAX electron trap, and the entire assembly was mounted at the end of the EDS and aligned. Gains of almost 10X were observed for Be. Results follow.



**Fig. 1.** From top: LoMAX optic, electron trap (with magnets removed), ring clamp, and clamp adaptor.



**Fig. 2.** EDS e2v SDD detector from SAMx with electron trap



**Fig. 3.** LoMAX assembly mounted on EDS Detector, provided by remX GmbH

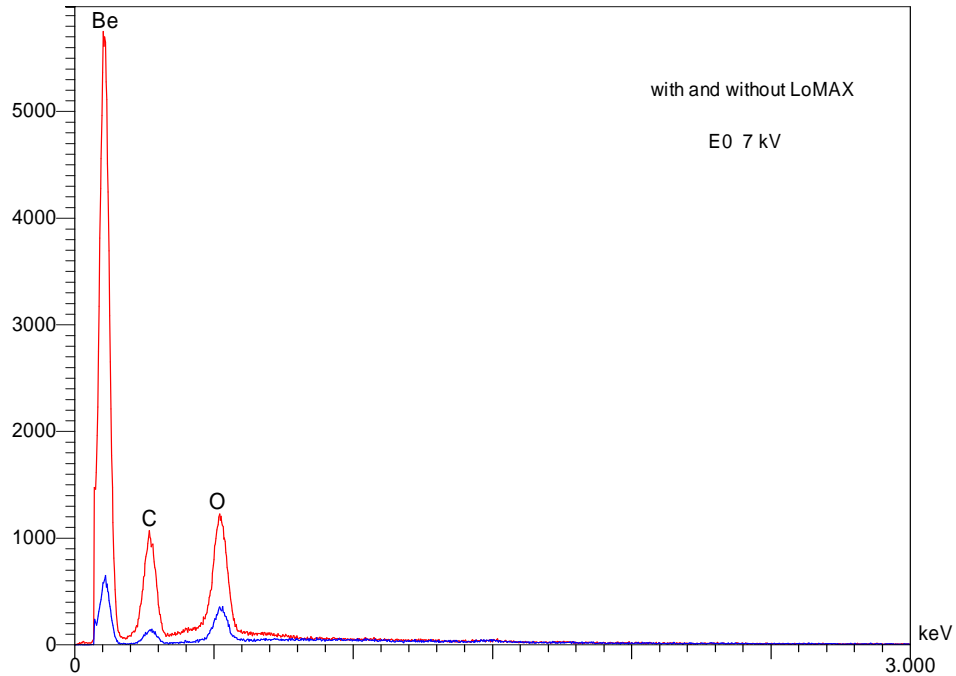


**Fig. 4.** LoMAX mounted on EDS in ZEISS SEM chamber

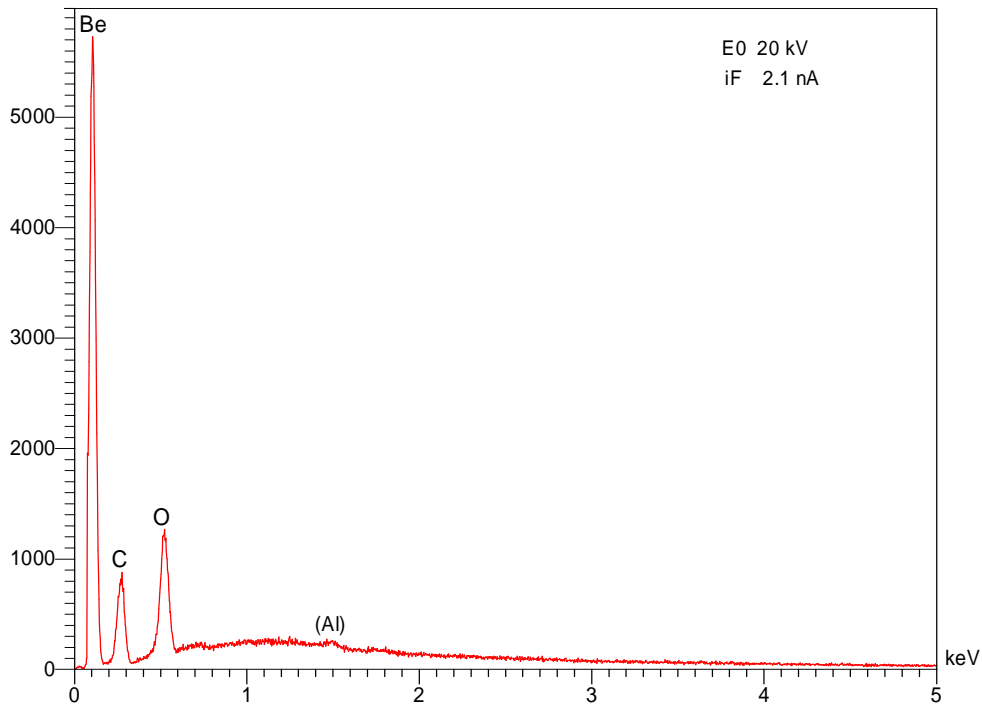
**Sample:** Oxidized Beryllium foil.

**SEM:** ZEISS DSM 982 GEMINI with Schottky source.

**EDS system:** e2v 10mm<sup>2</sup> SDD with Moxtek AP3.3 window; XIA LLC digital pulse processor; SAMx EDS software



**Fig. 5, above.** Oxidized Be foil measured at 7kV with LoMAX (red, higher spectrum) and without LoMAX (blue, lower spectrum). Gain for Be is about 9X. **Fig. 6, below.** With LoMAX x-ray optic. 20kV and 2.1nA



Parallax Research, Inc. [www.parallaxray.com](http://www.parallaxray.com)  
 Sales & Marketing 1.866.581.XRAY. +1.714.897.9779