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A Test Material and a quick Procedure for the Performance Check of X-Ray Spectrometers attached to the SEM

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The test material EDS-TM001 (see Fig. 1) is provided by BAM [1]. All the measurements necessary for the performance check of an energy dispersive X-ray spectrometers (EDS) attached to a scanning electron microscope (SEM) in compliance with ISO 15632:2002 „Microbeam Analysis – Instrumental specification for energy dispersive X-ray spectrometers with semiconductor detectors“ can be carried out by means of this sample only. Following figures are possible:

- determination of the spectrometer energy resolution (FWHM) in dependence on the energy,
- check of the calibration of the energy scale, and
- check of the contamination state of the detector (L/K ratio).

Moreover, the X-ray spectra of the test material are sensitive to possible disturbances in the operation of an EDS.

The test material consists of an approx. 10 µm thick hard coating containing the elements C, Al, Mn, Cu und Zr, deposited on a steel or silicon substrate.

Some spectrometer manufacturers provide software for the evaluation of these measurements. Nevertheless, the evaluation can be readily performed with the software “EDS detector test” offered optionally by BAM. It calculates automatically the FWHM of C K and Mn Kα lines. Additionally, FWHM of Mn Lα, Cu Lα, Al K and Zr Lα are also included into a representative plot together with the expected (continuous) FWHM versus energy going out of the Mn Kα value (see Fig. 2 bottom left). The software checks for the calibration of the energy scale by plotting the peak shifts for line energies above (Fig. 2 bottom right). A ±10 eV range was defined as acceptable. The precondition for the application of the software is a detector with a thin film window.

The results of a periodical performance check of the spectrometers in our lab over long periods of time will be presented.

The test material can be efficiently used for the performance check of a wavelength dispersive spectrometer (WDS) attached to a SEM. X-ray lines covering all energy ranges of diffractors in commercial WDS can be excited in the test material and selected for the performance check.

References

[1] www.webshop.bam.de (“Reference materials” / “Test materials” / “EDS-TM001”).

FIG. 1. Test material EDS-TM001 [1].

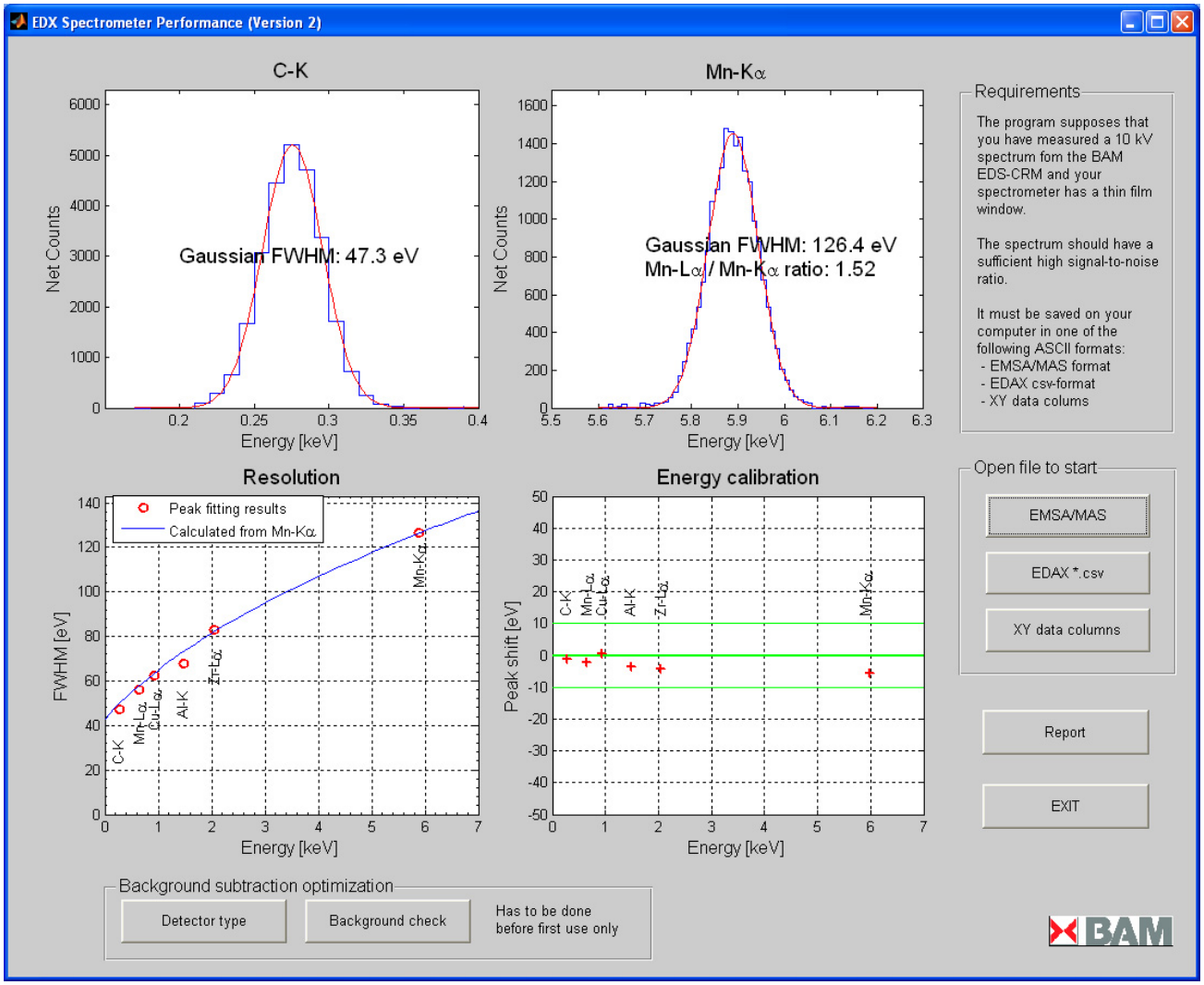

FIG. 2. Results of the performance check of an EDS spectrometer with the software “EDS detector test” [1].

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