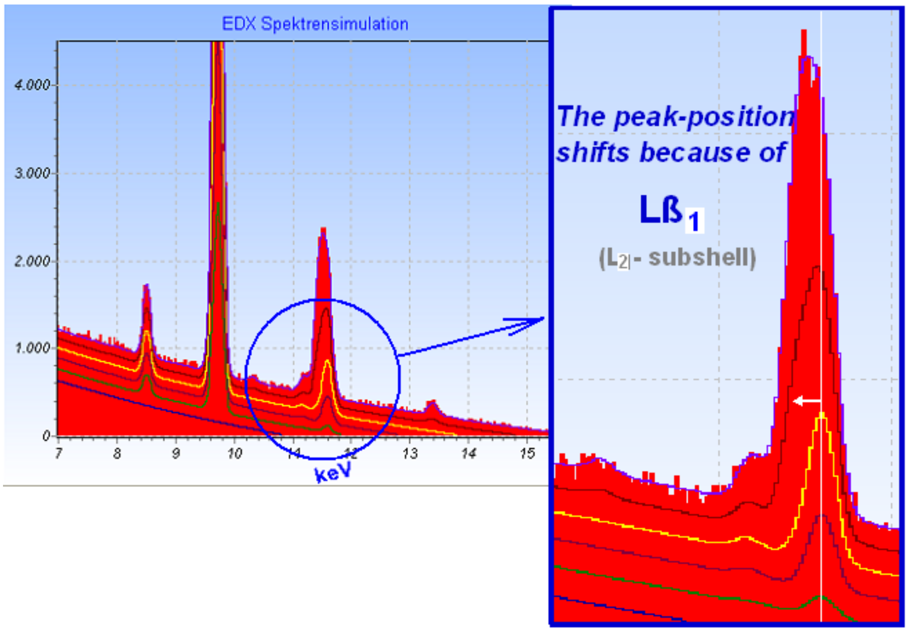
Correction

EGGERT, F. Microchimica Acta 155 (2006) 129-136
and Poster Presentation EMAS 2005

There is a mistake in poster and original paper, which is corrected with this figure:



The peak-position shifts because of

Lß$_1$

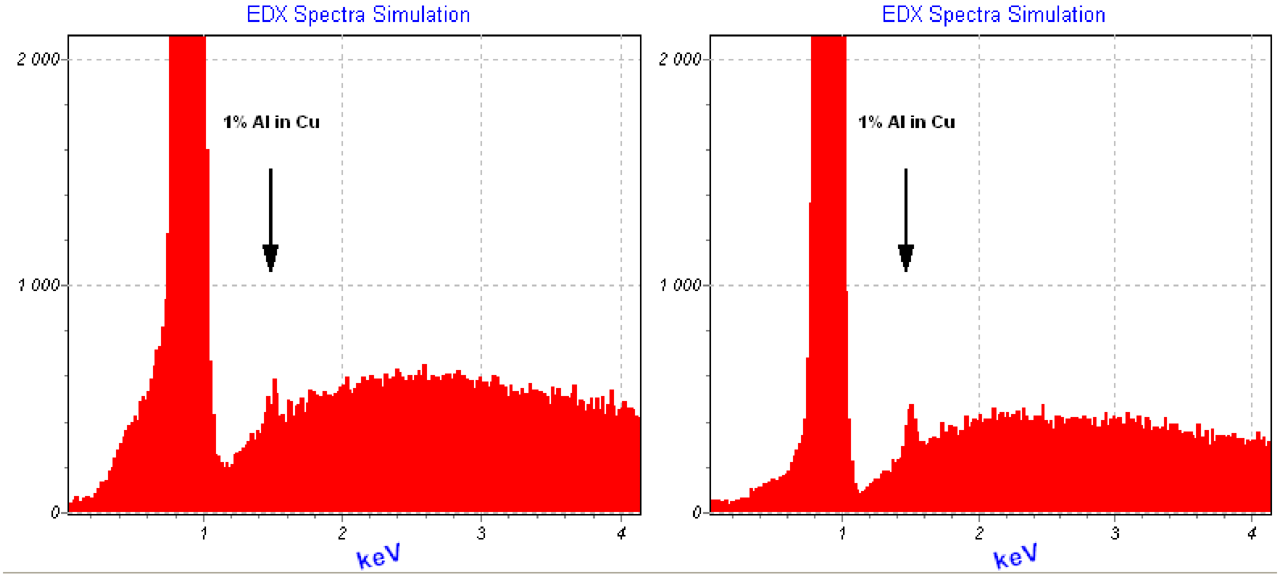
(L$_{2}$- subshell)

Microchimica Acta, Fig.3

In original work the responsibility of Lß$_3$ from sub-shell L_1 for peak shift was wrong given.

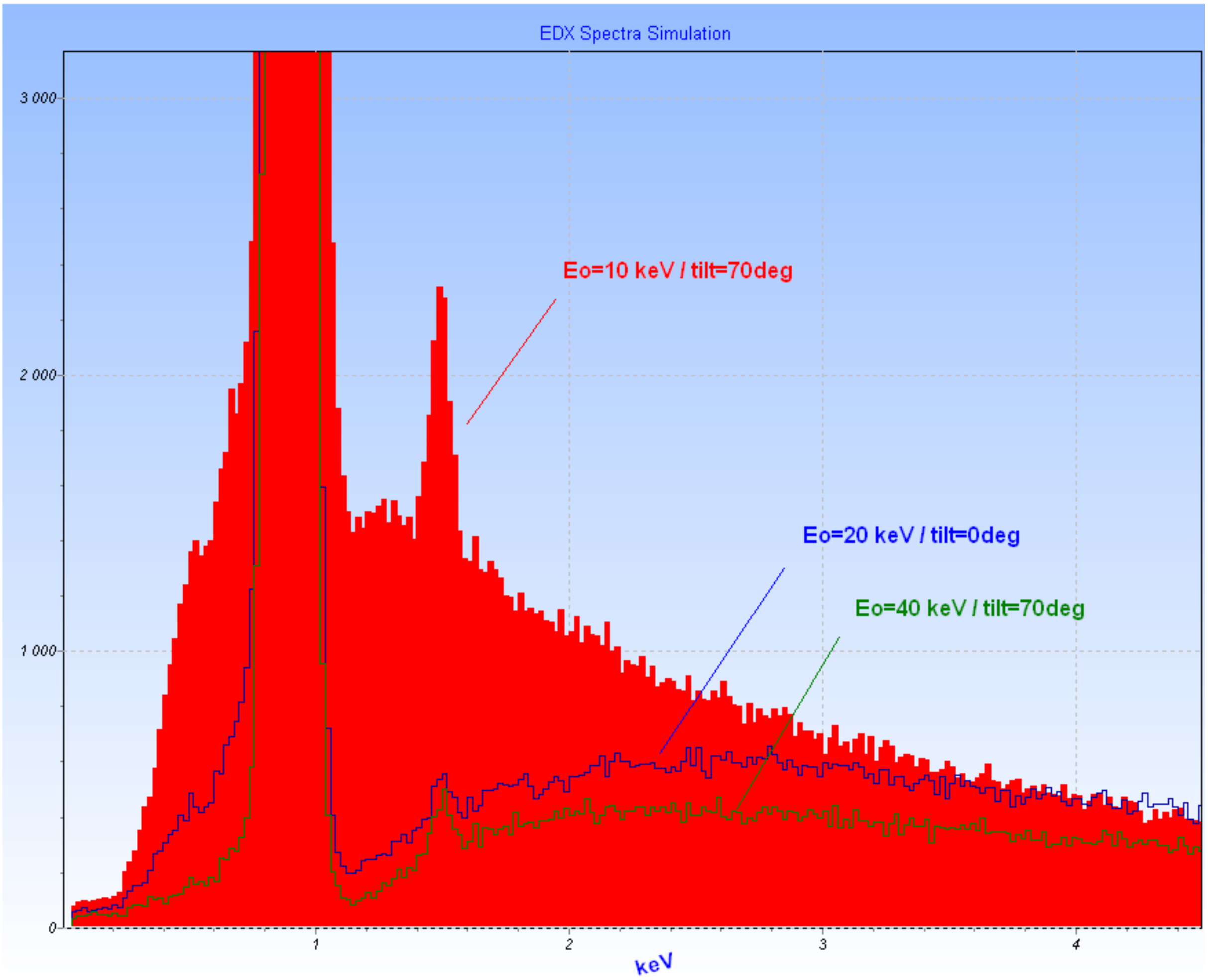
Thanks to Michael Wendt, who gave the hint.

The paper and the poster suggest improvements in detection limits with tilted specimens and high exciting electron energies. This is correct in principle, but recent improvement in simulation model gives changes in results for the used example (1% Al in Cu). The absorption of Al-K at high-energy side of Cu-L absorption jump with 40 kV in a case of high-tilts was underestimated. The calculated detection limit with simulation is now 0.25% (not 0.1% like in paper). The gain (improvement) is only with a factor of 2 (not with 5, like reported).



Microchimica Acta, Fig.7

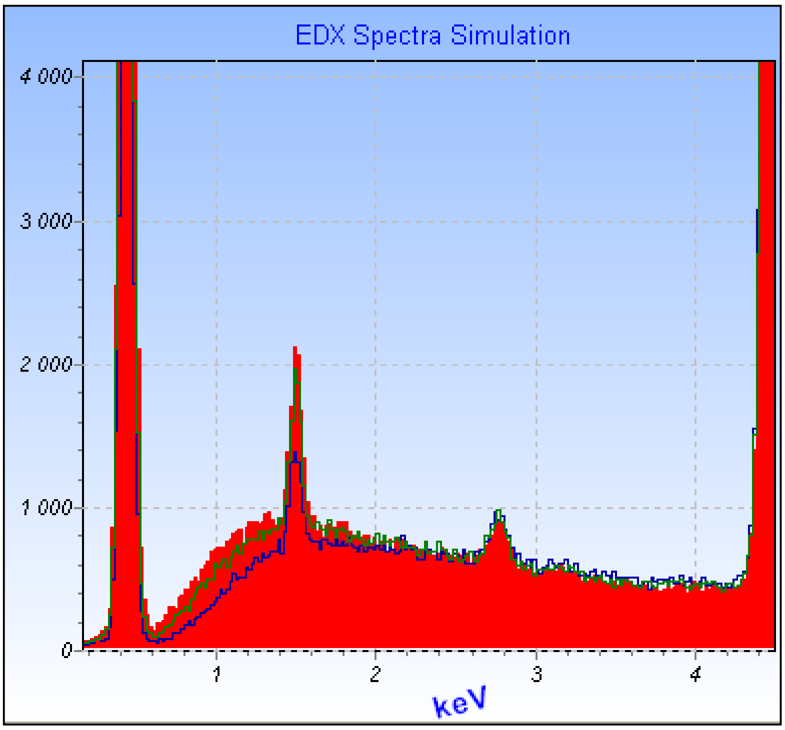
The same example specimen with more different conditions gave a bad MDL for the situation with 10kV and 70 degree tilt (only in poster). This is not correct. Recent improvements in calculation model (and a software bug) change the results:



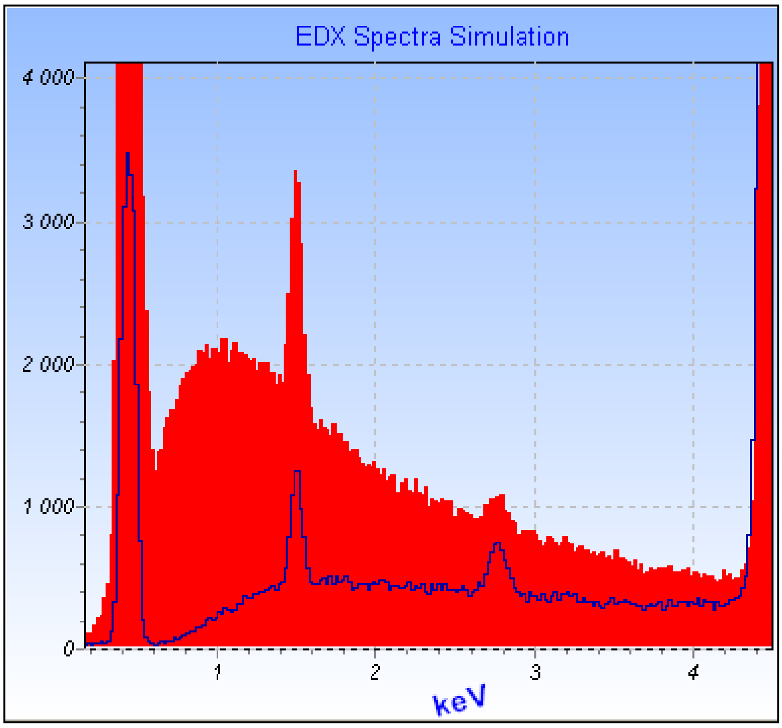
5 minutes acquisition time, 2000 cps
E_o=20 keV tilt=0^o detection limit: 0.5%
E_o=40 keV tilt=70^o detection limit: 0.25%
E_o=10 keV tilt=70^o detection limit: 0.12%

1% Al in Ti could be a more general example to demonstrate the MDL calculations (than given in poster) with absence of strong absorptions behind a strong jump (see next pages).

New example: 1% Al in Ti



1% Al in Ti
E_o=20keV
Tilt=0 MDL$_{Al}$: 0.11%
Tilt=30 MDL$_{Al}$: 0.09%
Tilt=70 MDL$_{Al}$: 0.08%



1% Al in Ti
Tilt=70
E_o=10keV (red) MDL$_{Al}$: 0.07%
E_o=40keV (blue) MDL$_{Al}$: 0.07%

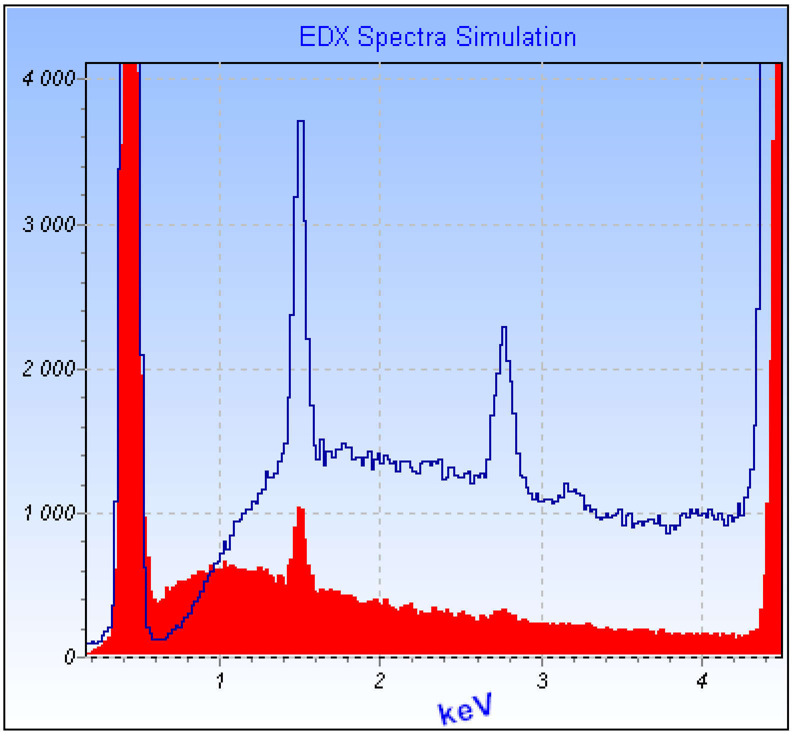
5 minutes acquisition time, 2000 cps

Both spectra are with same MDL. The worse P/B-ratio of 10keV excitation was compensated with higher count rate (because high energy photons are not in spectrum, the 2000 cps capacity of the detector was better used for lower energies).

Always the MDL is a result of balance between P/B improvements with higher E_o against lower count rate in region of interest (because more X-rays of higher energies are excited).

The last example was calculated for constant used count rates. That means, the change from 40kV to 10 kV needs also a gain of electron current to reach equal counts per second (always to use a maximum of possible cps with given EDX setting).

But if a change (gain) of electron current is not possible or not wished (e.g. to avoid specimen charging), the situation changes completely. Now the calculation is for a constant (given) electron current and with changed counts per seconds (the used EDX setting should be able to handle a broader cps range):



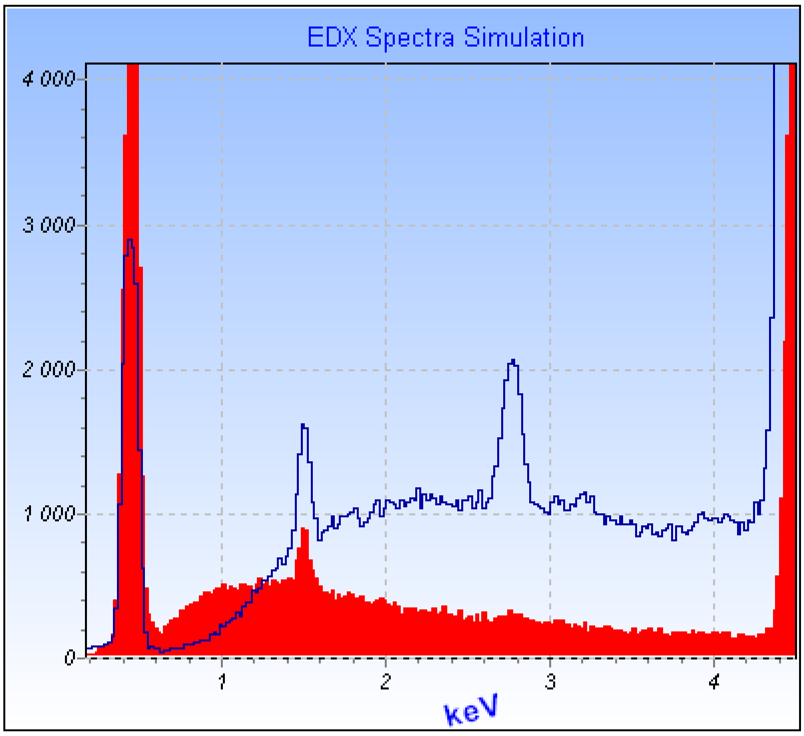
1% Al in Ti
Tilt=70
E_o=10keV (red) MDL_{Al}: 0.13%
E_o=40keV (blue) MDL_{Al}: 0.04%

5 minutes
E_o=10keV: 590 cps
E_o=40keV: 6000 cps

The difference in MDL is with factor 3 and more. The reason is the 10 times difference in resulting EDX count rate with given electron current (but different electron energy).

For this case really the use of high voltages are better for detection limits. One should consider a tilt of the specimen to compensate higher self absorptions with higher E_o.

If no specimen tilt is used, the improvement is quite less (same beam current estimated):



1% Al in Ti
Tilt=0
E_o=10keV (red) MDL_{Al}: 0.15%
E_o=40keV (blue) MDL_{Al}: 0.10%

5 minutes
E_o=10keV: 540 cps
E_o=40keV: 5600 cps