ESCA 8.5
Release Notes

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This document describes the changes in ESCA between versions 8.4 and 8.5. See Joe Hughes' ESCA 8.4 Notes for differences since ESCA 8.31.

1. Sensitivity Factors

The "UPDATING SENSITIVITY FACTORS" message and delay are no longer encountered when analyzing data from different X-ray sources.

Sensitivity factors are adjusted using the sensitivity factor exponent to correct for instrumental and escape depth effects. The adjustment is a function of reference energy, which in turn is a function of X-ray source.

Originally, ESCA assumed that the source was always due to the Al K-alpha line and the entire table was adjusted at one time. Then, in a recent version of ESCA, support was added for different sources. This feature was poorly implemented, however, making it very difficult to switch back and forth between data collected with different sources. Every time data from a different source was analyzed, the Scofield Table was read from disk, and all 1300 entries were adjusted for the new reference energy. This would take a minimum of about 10 seconds, and could take minutes on an older computer with a full hard disk.

The software now applies the adjustment only as needed when sensitivity factors are used in the Composition Table or in profile or map analysis. A fully adjusted copy of the factors is used for Survey Analysis. When Survey Analysis is first used after starting the program, or when data from a different source is used, this copy of sensitivity factors is initialized using the the Scofield Table already in memory. No disk access is required.

2. Signature Correction

Previously, an extremely non-uniform signature could result in a loss of counts when the signature was applied. To correct this, a "conservation of counts" algorithm was added to the signature correction. This correction is applied at the end of a region or single scan, not during it. The current correction is still applied to displayed data during accumulation. Thus, and the end of a region, the counts may appear to dramatically increase.
The "conservation of counts" algorithm looks at the number of counts in the corrected and uncorrected spectra. It then takes the ratio of counts and applies it to each channel of data so that the total counts in the resulting spectrum is equal to the number of counts measured (i.e., the number of counts in the uncorrected spectrum).

3. High Count Rates/Maximum Counts

Accumulation is halted when the total uncorrected counts exceeds 900 million (9.0E9). Previously, the software could crash if the counts exceeded one billion (1.0E10), or, the displayed data would be scaled down to one million (1.0E6), resulting in a confusing display.

The software now checks at the end of every scan, or once a minute for unscanned data, whether the counts exceed 900 million. If they do, the region is considered done, a message is sent to the printer, and accumulation continues to the next region.

4. Satellite Removal

An additional satellite removal algorithm has been added which only applies the correction to photoelectron peaks. This is to prevent the application of the removal algorithm to Auger peaks. It is accessed by holding down the shift key when pressing [REMU SATELLIT] in the DATA REDUCTION menu. This softkey only appears for non-mono data.

A side-effect of this algorithm is that the Composition Table and Survey Analysis tables are cleared when it is used. This is not considered serious since the satellite removal will normally be done before any other data analysis.

The new algorithm uses the Find Peaks routine (in the Survey Analysis menu), then applies the satellite removal algorithm to the channels within the baseline of photoelectron peaks. An additional test is added for loss peaks, since they can be put in the same category as Auger peaks by the Find Peaks routine. To be considered a loss peak, a peak must have photoelectron peak of at least twice its height which is -10 to -28 eV away.

5. Aperture

The new aperture is supported. This aperture has two leaves. Aperture setting one moves the inner leaf into position. Aperture setting two moves both leaves into position. The software applies a one second delay whenever one of the leaves is moved. Each leaf is moved individually.
6. Ultraviolet Photoelectron Spectroscopy

A new option was added to the Spot setting in single scan setup and the element table. It is accessed by typing "UPS" for the Spot. When entered, the X-ray source will be turned off during accumulation, and UPS will be printed in printouts and plots. "UPS" may also be entered in lower case, or as just the first one or two characters. For example, "u" or "UP" will also be interpreted as the "UPS" source.

7. DIAGNOSE

Two changes were made:
   a. The dispersion constant for Res 1 is just set to half of that for Res 2. The partially developed algorithm which was erroneously shipped with the product has been removed.
   b. The instrument constants for the V1 curves are now determined by DIAGNOSE. A new softkey, [Calc V1 curves], appears on the top menu if the 8701B power supply is detected.

8. Composition Table Printout

The file description and collection date are now printed out on the long Composition Table printout. (No change was made to the short printout.)