4pi Revolution® Release v1.6
EDX/Imaging Software Package

Revolution is 4pi's software application for Windows® XP Pro and Macintosh® OS X. Revolution acquires digital image and x-ray microanalysis data using 4pi EDX and Imaging Systems that incorporate the Universal Spectral Engine® electronics. An Intel® Core2 Duo, G5 or better processor is required.

The software is fully multi-tasking with easy-to-use point-and-click screen tools. A single toolbar interface sets a new standard for power and ease of use–collect and analyze x-ray spectra, electron and spectrum images in a single GUI interface. Purchases include free software upgrades via download from 4pi's web site.

EDX Spectrum Acquisition, Display and Analysis

- status display (input, output count rate, deadtime) with realtime, livetime during collection
- adjustable preset acquisition (realtime, livetime) with selectable pulse processor time constant
- adjustable channel display and collection (up to 4096)
- intelligent labeling for spectrum energy axis (x-axis)
- multiple catalogs with catalogs containing multiple spectra
- qualitative/quantitative
  - auto or manual, with or without standards, and mixed
  - right-click add/remove elements for easy manual element selection
  - auto peak id using full deconvolution for elemental peak-overlap detection
  - live qualitative/quantitative results during collection
  - bulk (SEM) and thin film (TEM/STEM) routines using ZAF, Cliff-Lorimer, Hall.
  - element by difference and stoichiometry
  - results include weight, atomic or oxide percent, standard deviation, cations, intensity, FWHM.
- spectrum tools
  - klm markers with the ability to show/hide any x-ray marker with fixed height or scaled to peak heights with selectable text size for element symbols
  - spectrum scaling (auto, linear/log), zoom, and color control
  - spectrum math
  - spectrum overlay
  - text annotation
  - line plotting of spectra as well as original histogram style
  - copy/paste spectra between catalogs and to clipboard for paste to other applications
- file i/o
  - cross-platform read of mbd (Revolution native data) files
  - export to MSA 1.0, MSA 1.0 (XY), JPEG, PICT (Mac), BMP (Windows), ASCII
  - export qualitative and quantitative results to Excel

EDX Programmed Beam Acquisition, Display and Analysis

- Event-Streamed Spectrum Imaging™ Analysis and Display (patent pending) –saves full spectrum at every pixel
  - Ultra-fast x-ray mapping–collect spectrum images at digital imaging speeds with an adjustable x-ray dwell time of 1us to 1000 seconds
  - user-definable ROIs for grayscale or color x-ray image generation, up to 96 (92 pre-defined elements, 4 arbitrary backgrounds) with selectable background subtraction
  - spectral extraction from live or saved spectrum images using Objects or Masks with livetime correction
  - color phase map from ROI generated x-ray images
- Dynamic Element Mapping - allows real-time selection or editing of elements and processing parameters during spectrum image collection
- Dynamic Dwell Modulation™ Spectrum Image Collection – EDX dwell time can be dynamically modulated during spectrum image collection to spend more time over areas of interest (cells, particles, etc) and less time over background resulting in decreased collection time
- Spatial Frame Lock™ Drift Correction (patent pending) – advanced real-time during multi-frame spectrum image collection
- Maximum Pixel Spectrum – enables detection of rare elemental features in spectrum images and linescans.
- MultiProbe smart spectral point and line scan collection – collect and analyze x-ray spectra using one-click single point, multiple points, selected areas, and line scans from live survey or captured images. Smart probe queuing allows the addition of new collection areas without waiting resulting in greater productivity.

Digital Image Acquisition, Display and Analysis

- Spatial Frame Lock™ Drift Correction – advanced real-time during multi-frame spectrum image collection
- parallel acquisition of 16-bit digital images up to 16k x 16k in resolution
- independent survey and capture settings (resolution, dwell, input channels, etc)
- acquire status display (x, y, frame, estimated time-to-completion)
- info tab below image for inclusion of facility, instrument, and comments
- live color line-profile display
- scanning control
  - selectable single scan/multi-frame scanning with true integration of image frames
  - left-right or up-down scanning
  - independent adjustable horizontal/vertical retrace delay (0-100 ms)
  - adjustable pixel-stepping delay (0-800 ms)
  - variable image aspect ratio
  - line-sync (50 and 60 Hz)
- input channel control
  - 2 selectable analog input channels standard for digital imaging of any external analog signal; suitable for: backscattered electron, secondary electron, absorbed current, cathodoluminescence, EBIC (system may be ordered with additional channels)
  - 4 selectable TTL digital input channels capable of < 1 cps to 500,000 cps for WDS mapping
  - selectable 8-, 16-bit pixel-depth
  - adjustable dwell time: 1-1600 μs, sub-μs capability
- micron marker tool
  - calibrated micron marker on or below image
  - user-defined magnification selector menu
  - global and individual calibration factors
  - optional transparency, reverse video, marker frame, and marker size override
  - font size and style selection
- image tools
  - image operators (invert, low-pass, hi-pass, median, unsharp mask)
  - histogram scaling for brightness/contrast adjustments with selectable auto scaling (full, max-min linear, log, square root)
  - text annotation
  - adjustable zoom and pan
  - click-and-drag measurements (density, length, area, angle, line profile, area profile)
  - multiple Object overlay (point, line, rectangle, circle, polygon)
  - multiple Mask overlay with selectable color and translucency
  - Mask operators (erode, dilate, median, fill holes, copy, invert, draw)
  - histogram segmentation into mask overlay
  - area fraction using histogram segmented masks
  - particle sizing using euclidean distance measurement with edge inclusion/exclusion
  - particle measurement (area, perimeter, shape factor, density, etc)
  - cut/copy/paste objects and masks between images of same or different sizes
- file i/o
  - autoname, autosave to disk feature with overwrite control
  - selectable file formats: JPEG, BMP (Windows), TIFF-PC, TIFF-Mac, PICT (Mac)
  - cross-platform read of mbd (Revolution native data) files
  - cross-platform read of 8- and 16-bit grayscale TIFFs
  - cross-platform read/write of color TIFFs (RGB 8 bit)
- EM Client – automatically monitors microscope's operating voltage and magnification (EM must have external computer interface allowing access to kV and magnification)