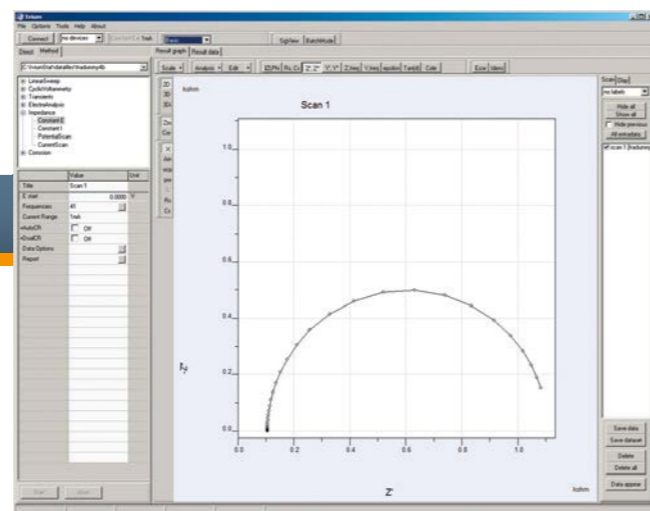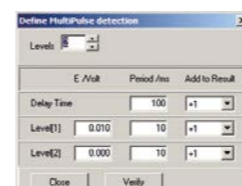## Electroanalysis

- Amperometric detection
- Differential pulse
- Square wave
- AC voltammetry
- Potentiometric stripping
- AC detection
- Normal Pulse voltammetry
- Voltammetric Pulse Builder:
  Build your own pulse technique

Impedance measurements

- Single sine/multi sine
- Combined frequency and potential scans: Mott-Schottky plots
- Up to 255 frequencies per scan
- Dual 16 bit ADC with $1\text{-}10^4$ postgain amplifiers
- Automatically tuned filters
- DC subtraction: analog or 16 bit offset-DACs
- Integrated data analysis
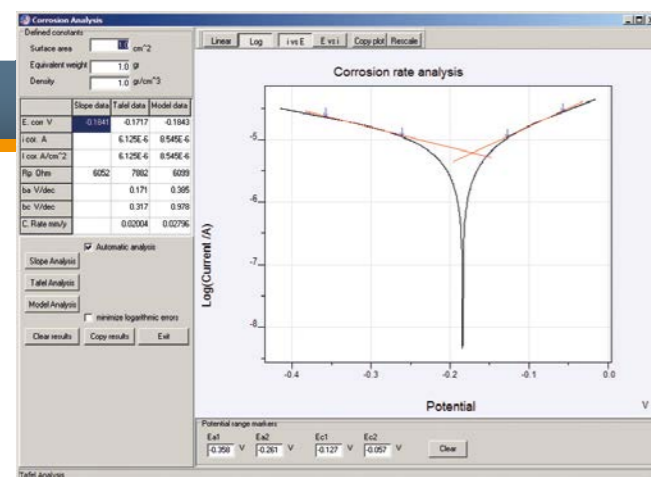
Corrosion techniques

- E oc monitor
- Polarisation Resistance
- Tafel Plot
- Potentiodynamic
- Cyclic Polarisation
- Galvanic Corrosion
- Corrosion Rate Monitor

Software to match every research application

IviumSoft: One software to control all Ivium instruments
- Free: included with all Ivium instruments • Unlimited number of installs • All applications
- All standard electrochemical techniques • Complete data analysis options • Advanced data archiving
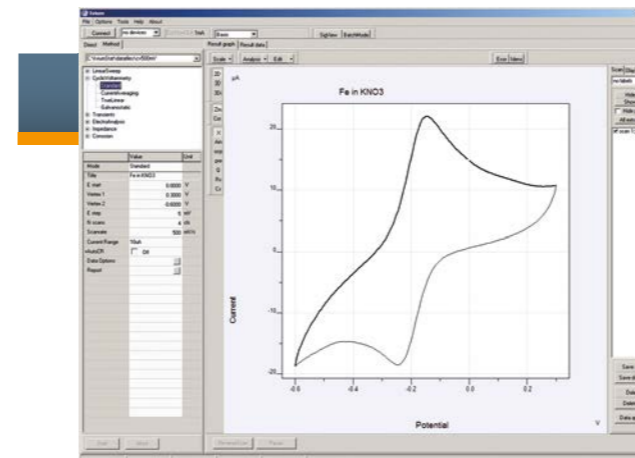
Sweep techniques

- Linear sweep & cyclic voltammetry
- Potentiostatic or galvanostatic
- Staircase or Current Averaging
- True Linear Scan (optional)
- Scan rate: 1µV/s to 10,000 V/s
- Ohmic drop correction
- Simultaneous recording of WE2 (Bipotentiostat optional)
- Simultaneous data acquisition from peripheral port
- Alpha: control of digital step sample point
- Dynamic vertexes

Transients

CHRONOAMPEROMETRY & CHRONOPOTENTIOMETRY
- 1 to 255 levels definable at 0.125 µs resolution
- Minimum interval time 10 µs
- Ohmic drop correction
- Simultaneous recording WE2 (Bipotentiostat optional)
- Simultaneous acquisition from peripheral port
- Dynamic level-switching at definable potential values
- Sequences may be repeated up to 65535 cycles or unlimited

MIXED MODE:
- Sequences up to 255 stages can be applied with definable
  electrical modes:
  +Potential step/sweep   +Open cell
  +Current step/sweep   +Z control
- Real time Impedance measurements 10Hz-8MHz: Resistance and
  Capacity can be monitored during all step and sweep stages,
  simultaneous with E and I measurements.
- The start potential of a stage may be defined as an absolute potential or
  relative to the last potential of the previous level
- Sample interval: 0.002s
- User definable level termination criteria, incl.: E>, E<, I>, I<, dE/dt>,
  dE/dt<, dI/dt>, dIdt<, An1>, I_fraction<, |Q|, etc.
- Sequence repetition up to 65535 cycles or continuously
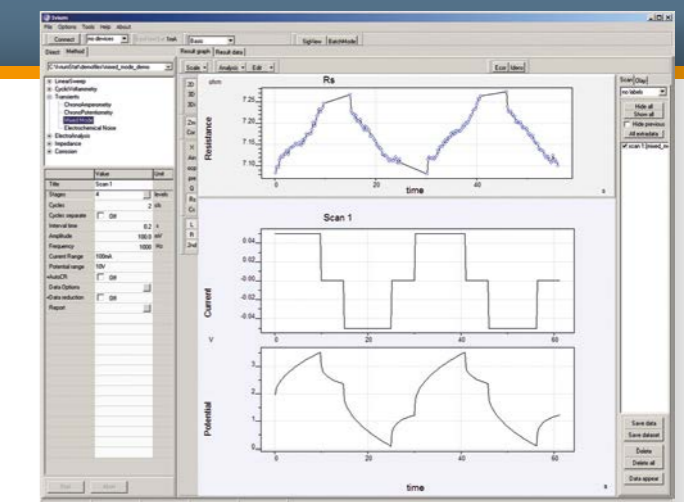
ECN: ELECTROCHEMICAL NOISE
Noise measurements are performed with 2 identical working electrodes and a
reference electrode.

- ECN option is standard, no extra hardware required.
- Potential and current are recorded up to 500 pts/s.

Integrated Corrosion analysis software will calculate the relevant parameters
automatically:
- Time domain analysis: corrosion current, pitting/localization index, corrosion
  resistance.
- FFT Frequency analysis: Fourier current and potential spectra, impedance
  spectra and corrosion resistance.
- MEM Frequency analysis: Maximum Entropy Method with definable number
  of model coefficients

6 window functions & baseline subtraction available
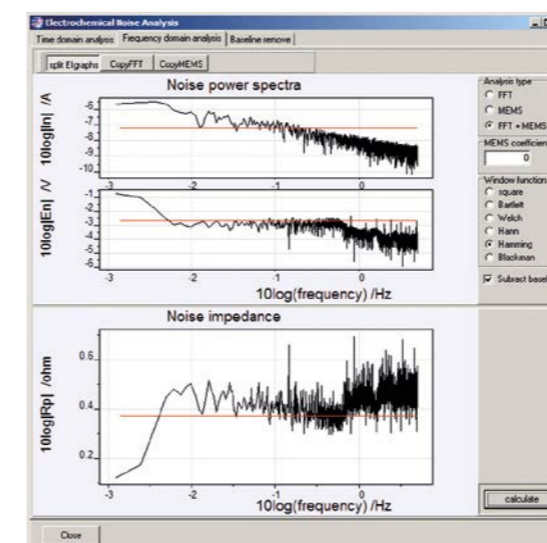
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innovative solutions for electrochemical research

IVIUM
TECHNOLOGIES

Analysis

- GRAPHICAL EQUIVALENT CIRCUIT EDITOR FOR FITTING IMPEDANCE DATA
- CORROSION RATE
- ELECTROCHEMICAL NOISE
- ELECTROLYSIS REPORT
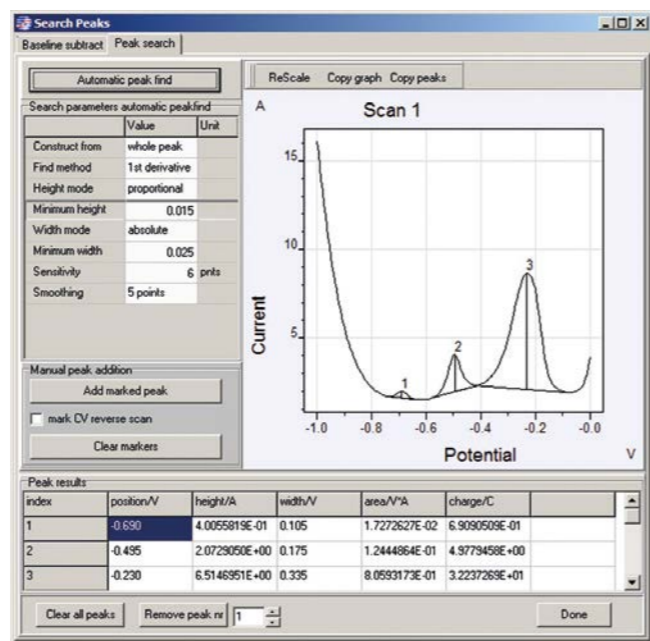- SOLAR CELL REPORT
- PEAKFIND
- FIND LEVELS
- CURVE FIT
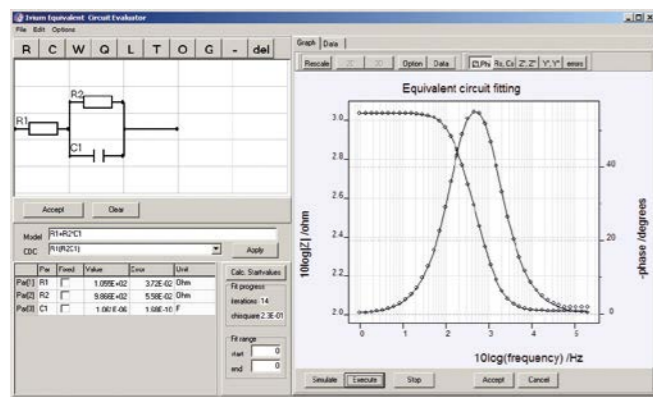
GRAPHICAL EQUIVALENT CIRCUIT EDITOR FOR IMPEDANCE DATA
- Any element from the top toolbar can be selected and dropped on the circuit grid: R,C,L,W,Q,T,O,G.
- Alternatively, a CDC equation can be entered, manually or from a predefined list.
- Start values may be entered by operator or can be calculated automatically.
- Fit parameters manual override.
- The software will calculate the best fitting set of parameters with the Levenberg-Marquardt technique.
- Fitting can be optimized by selection of source data (Z'/Z''/Zabs/phase), assigning error weight and/or fit parameter constraints.

PEAKFIND AND BASELINE SUBTRACTION
- Fully automatic search, or user-assisted by mouse-clicks.
- Construct whole peaks, or front or rear flanks.
- Peakfinding method using 1st or 2nd derivative function.
- Definable minimum peak height and peak width.
- Adjustable peakfinding sensitivity.
- Integrated variable smoothing.
- Automatic baseline subtraction.
- Manually assisted baseline subtraction with 9th degree polynomial or exponential fitted baseline curves.
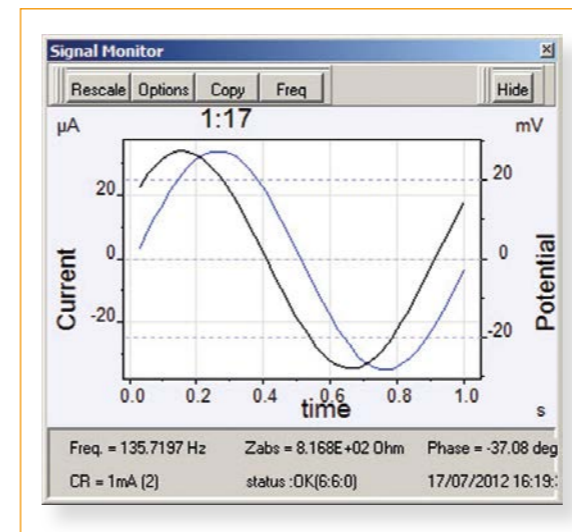

SOLAR CELL REPORT
- Automatic solar cell evaluation.
- Basic/Advanced model.
- All relevant solar cell parameters, incl. Isc, Jsc, Eoc, E/Pmax, Rs, Rp.
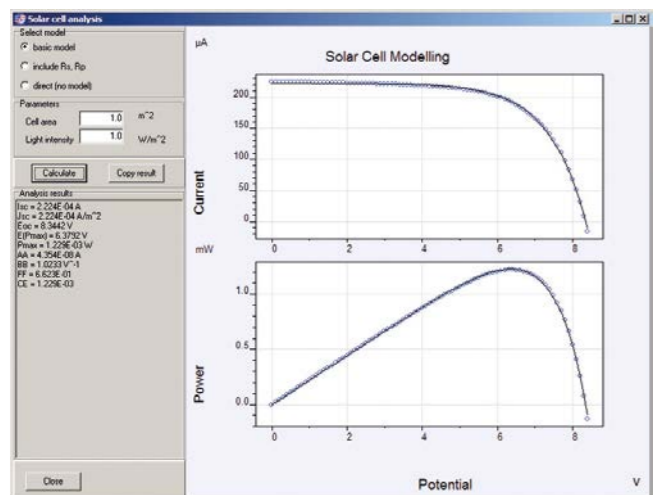
Special functions

- Automatic current ranging: the instrument will automatically select the optimal current range setting.
- Pretreatment: up to 5 levels may be defined to condition the electrode before the actual measurement starts. The E/I values during "Pretreatment" are recorded and stored with the primary data.
- Apply wrt OCP: The measurement potentials are defined relative to "Open Cell Potential". Before the measurement starts, the OCP is determined in a zero-current configuration. The OCP monitor transient is recorded and stored with primary data.
- Ohmic drop compensation: the applied potential is corrected by current feedback.
- Analog inputs: the 8 analog inputs from the peripheral port may be recorded simultaneously with the primary results. The results are visualized graphically, and stored with the primary data.
- SignalView: the current and potential transients are shown in an oscilloscope type screen. Under dc-conditions, the E/I signals can be inspected for the presence of specific noise elements. During ac-techniques, the quality of the perturbing and resulting sine-waves is visualized. For each data point these traces are stored with the primary data and can be (re)viewed after completion of the experiment.
- Pulse generator: a continuously repeating pulse can be applied to the cell with variable period and duty cycle; intended as a tool to treat the electrode, without data being measured.
- Current interrupt: the current of a running experiment is interrupted instantly and the response of the cell potential is measured. The momentary drop of the cell potential, representing the IR-drop of the electrochemical system, is then shown in a graph of the potential vs. time. To operate this technique, a Current Interrupt Module (CIM) needs to be purchased separately.
- Software development driver: The user can develop their own software to control Ivium instruments. The supplied driver allows integration of the functionality in their own program, but maintains the convenience of the IviumSoft software: to program specific tasks with a few program lines in the desired language: VB, Delphi, C, Labview, etc.


GRAPHIC PRESENTATION & TOOLS
- User definable: colors, linestyles, datasymbols, autoscale/manual scaling, axis grids.
- 3D option: datasets with 3 variables may be plotted in a 3-dimensional projection.
- Zooming in on details by mouse-click&drag.
- 2nd vertical axis for simultaneous display of WE2 current, phase angle or other parameters.
- Optional 2nd graph, instead of 2nd vertical axis.
- Numerical data plotted in graph.
- Individual scans selectable for operations.
- Previously stored scans can be overlaid.
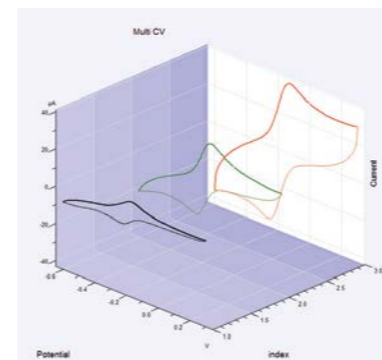
MEASURING SMALL SIGNALS AT HIGH SENSITIVITY
- Sub-femto ampere resolution
- Automatic E-ranging
- Programmable potentiostat bandwidth
- Programmable signal filters
- Automatic offset subtraction
- Galvanic isolation
- Digital and numerical filtering
- Oversampling & sample averaging
- Savitzky Golay smoothing
- Fourier based noise removal
- Automated/manual spike removal
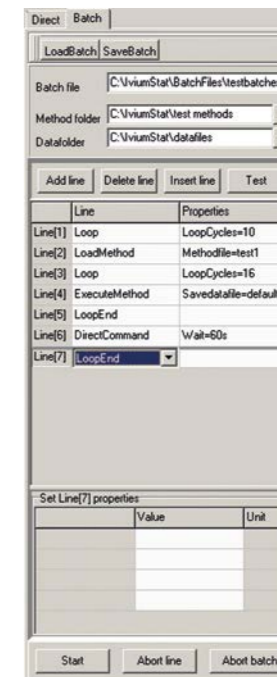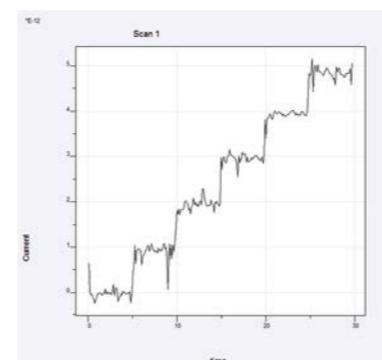
BATCH MODE FOR AUTOMATED SEQUENCES
The operator can automate complex measurement sequences, and interface to external equipment for process automation:
- Automate loading and execution of method files
- Create loops for repetitive tasks, loops may be nested
- Modify selected parameters at each pass inside a loop
- Switch the multiplexer to fixed channels or to the loop index variable
- Set the digital and analog outputs
- Wait for a HI or LO level on the digital input
- Set delays & scheduling tasks

The BatchEditor has a graphical user interface, that allows quick and easy sequence generation.