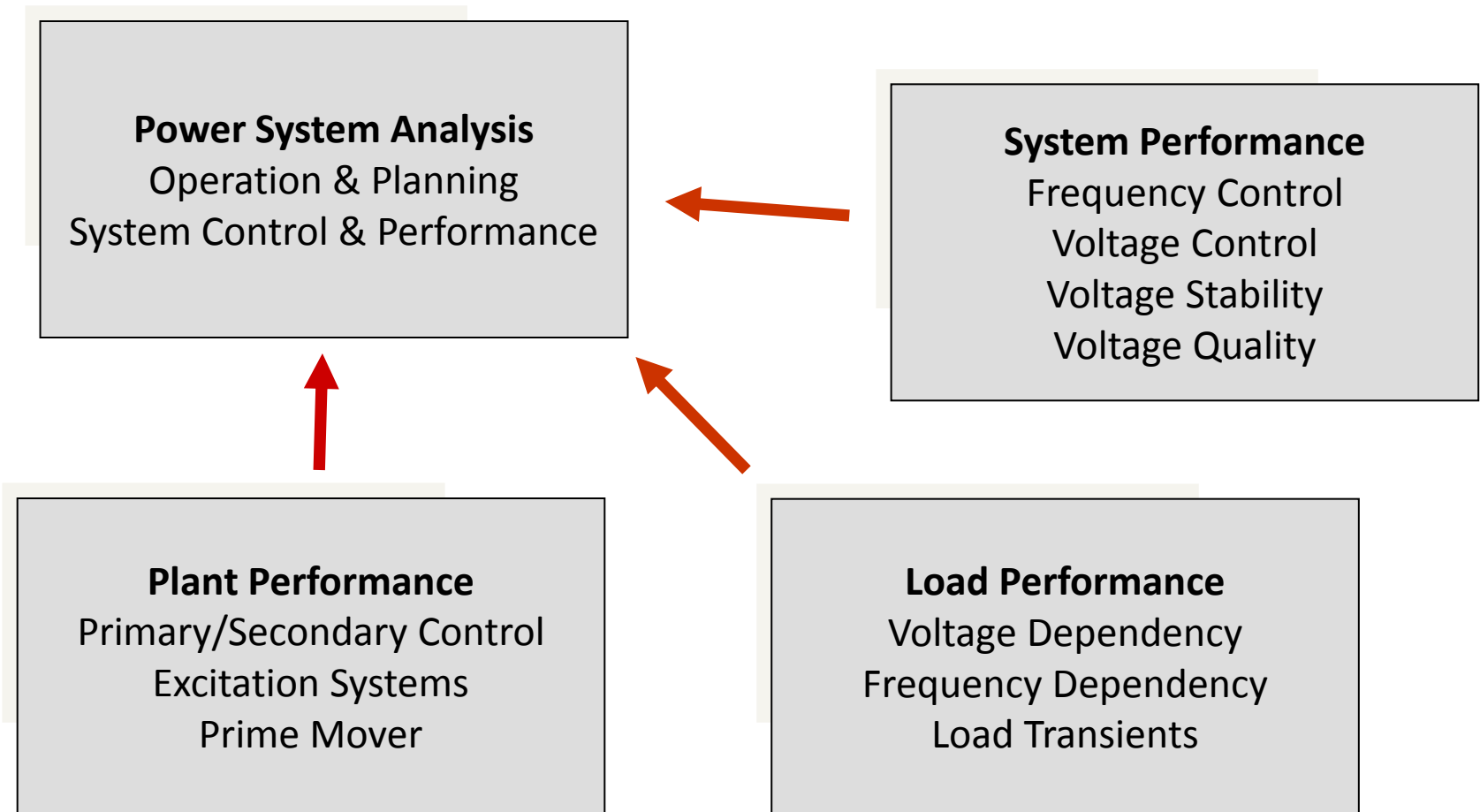


PFM/DSM – Background & History

Specific DSM Requirements



Utility Needs for PFM/DSM

Fault Recording

Fault Current Detection
Transient Overvoltages
Protection Response Check

Pre-fault time: 50ms – 5s
Fault time: 100ms – 5s
Post-fault time: 100ms -1s
Sampling rate: 1-20 kHz
Inst. Values

SCADA Systems

“Steady State” Recording
Steady State Supervision
Trending Analysis / Statistics

Permanent Recording
Sampling rate: 0.2-0.5 Hz
RMS Values

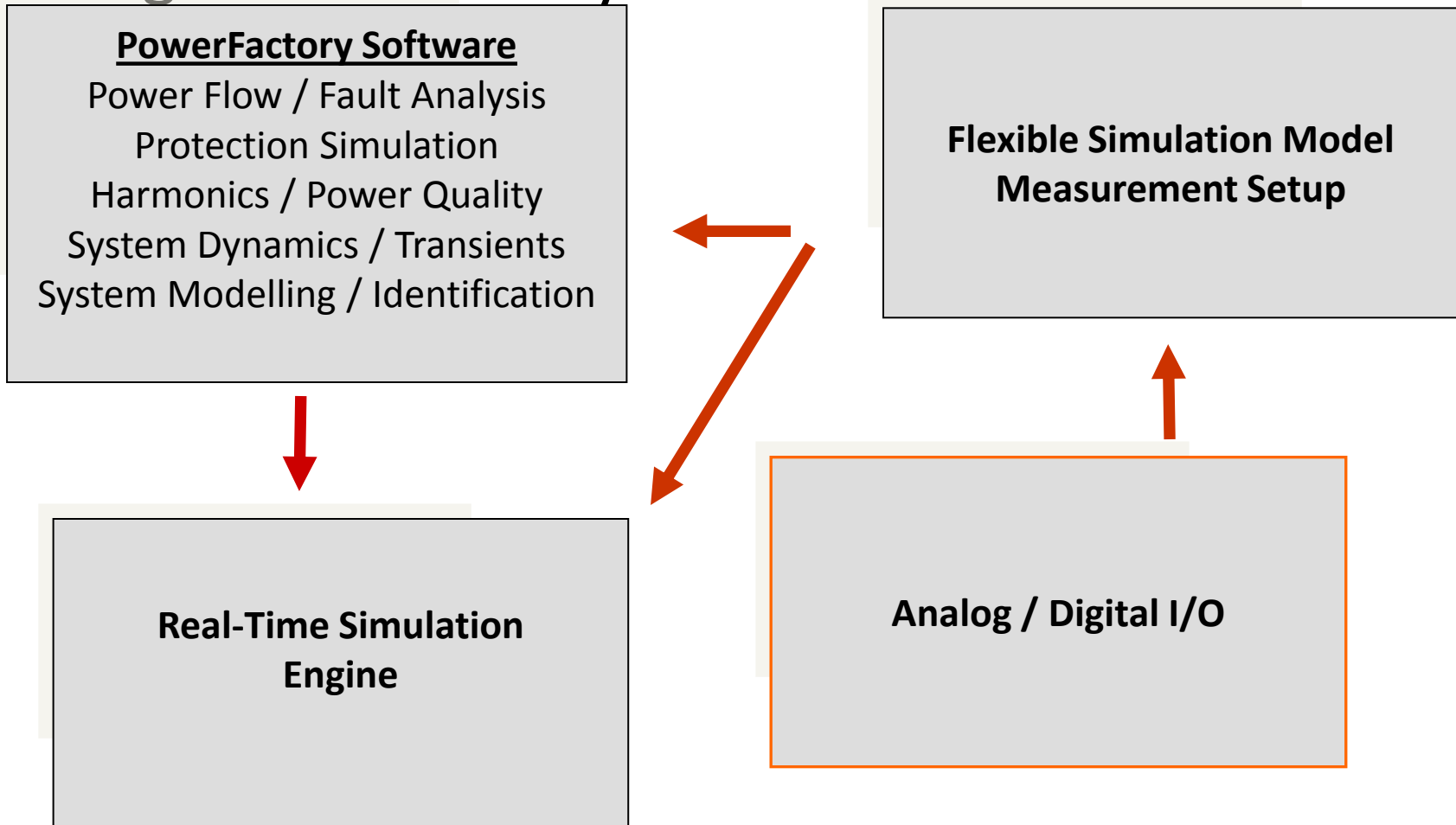
PFM/DSM Applications

Fault Recorder and Monitoring System....and more...

- Generation Outage, Load Rejection, Frequency Response
- Voltage Stability Monitoring / Voltage Recovery Capability
- Supervision of Connection Conditions (AVR / Prime Mover)
- Power Oscillation Detection and Analysis (Load / Generator)
- Generator, Motor and Load Parameter Measurement
- Power Plant Measurement and Identification
 - (Governor, AVR, PSS etc.).
- Power Quality Metering: Voltage Dips/Harmonics

PFM/DSM – General Concept

Integrated Power System Software & DSM



PFM/DSM – General Concept

Integrated Power System Software & DSM

PF Components to build PFM/DSM Functionality

- Project Organization and Database
- Object Handling & Definitions
- Flexible Measurement Project Setup
- Graphic Desktop Capabilities
- Definition of synthesized Signals
- Flexible Definition of Trigger Conditions
- Utilisation of Virtual Instruments (VIs)
- Online Views & Remote Access
- Automated Post processing via DPL Scripts
- Direct interaction with modelling & system identification
- Direct integration of simulation models

General Concept

Express Tour on PFM/DSM

Hardware

Software

Application

Configurations

Substation
Power Plant



VT
CT
Transducer
20 mA / 10 V / 5A



19" Cabinet Rack Mounted

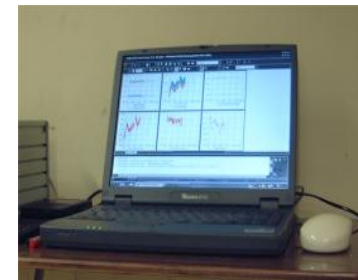


Portable Version

Portable Signal and
Data Acquisition Unit



USB Port



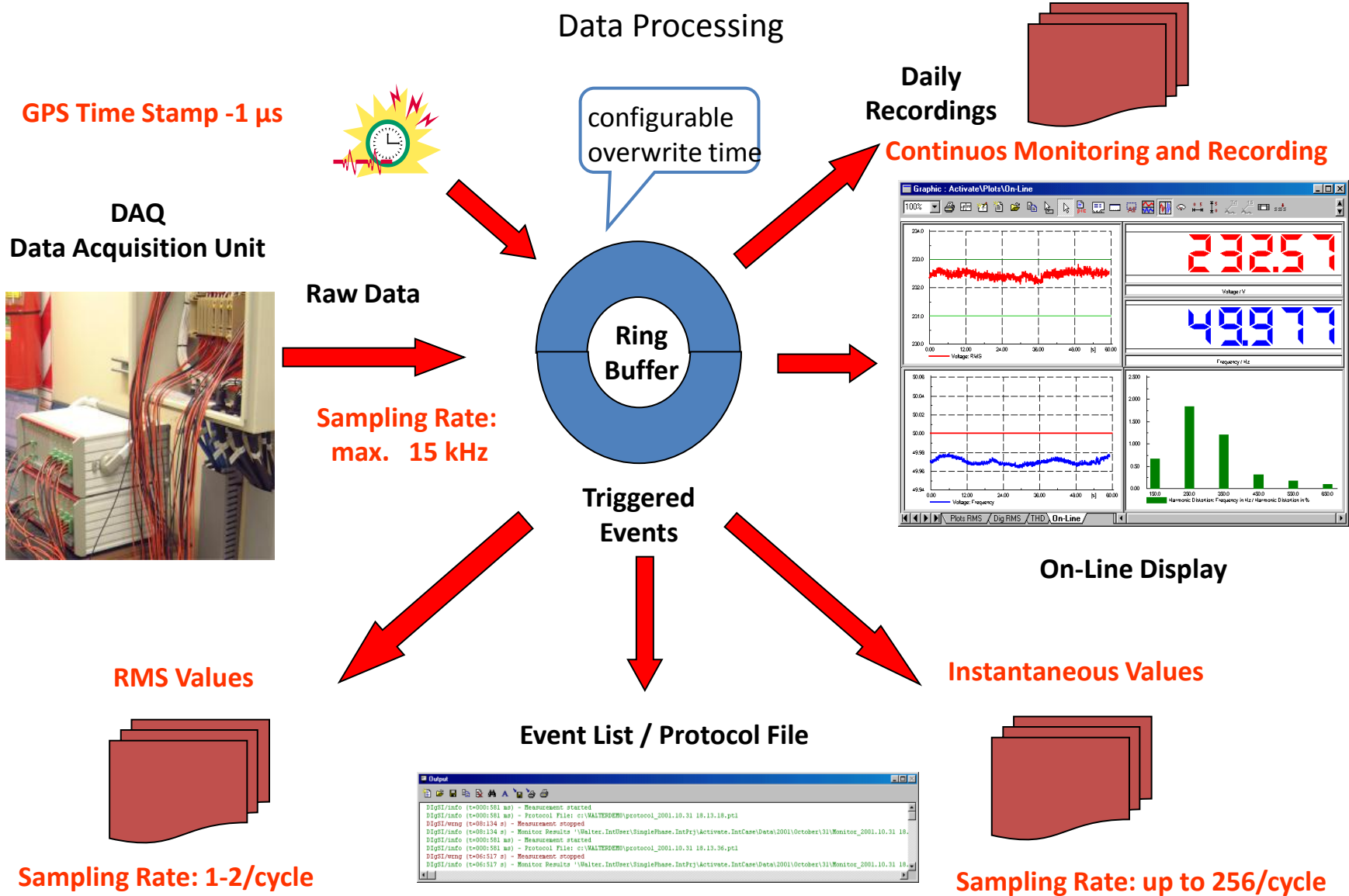
USB Driver
PowerFactory

Mode of Operation - Features

Data Acquisition and Data Processing

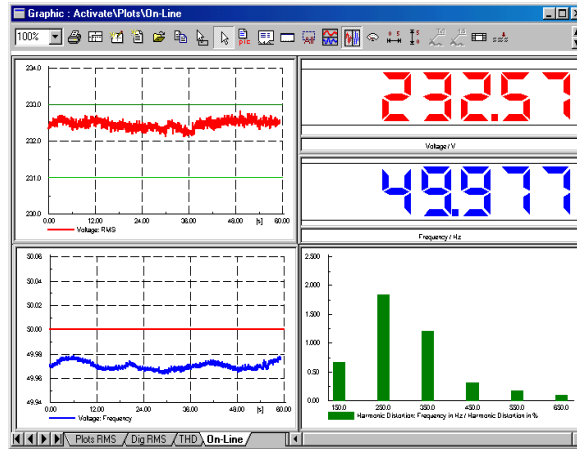
- Full Integration within the PowerFactory Software
- Data Processing and Evaluation is done within PowerFactory
- Configurable Ring Buffer (Number of Channels, Overwrite Time)
- Graphical Set-up of Measuring Configuration, Configurable Channels
- Various Automatic Trigger Conditions, Precise GPS Time Stamp
- On-line Display of Measurements (Digital, RMS Time Plots)
- Analysis of Recordings (Instantaneous Values, RMS Values)
- Accurate Determination of the System Frequency
- User-friendly Range Scaling
- Remote Set-up, Operation and Monitoring of Measuring Process

Principle of Operation



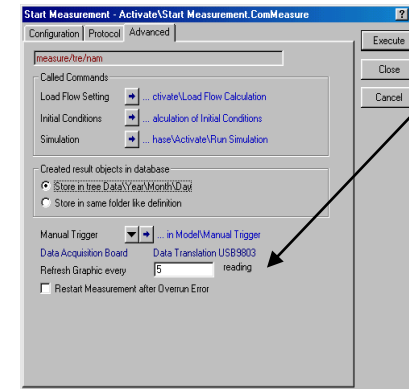
Continuous Monitoring

User-Defined Monitor Layout with the Help of Scalable and Movable Virtual Instruments

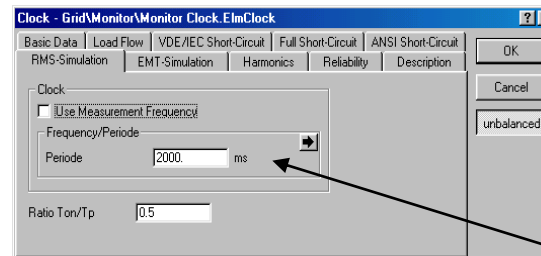
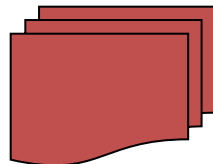


Digital Display of Any Measured or Calculated Quantity

Configurable Refresh Rate



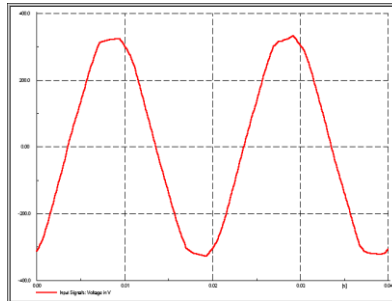
Daily Recordings and Database Storage



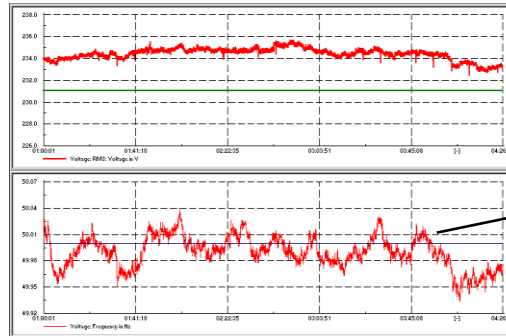
Adjustable Sampling Rate

Representation of Triggered Events

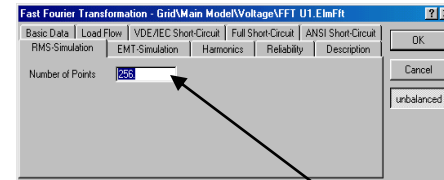
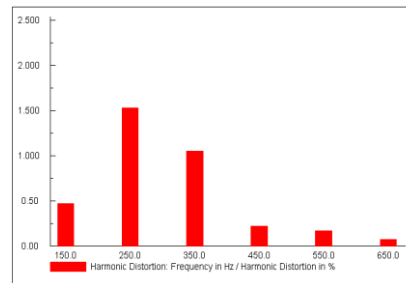
Instantaneous Value Representation



RMS Representation



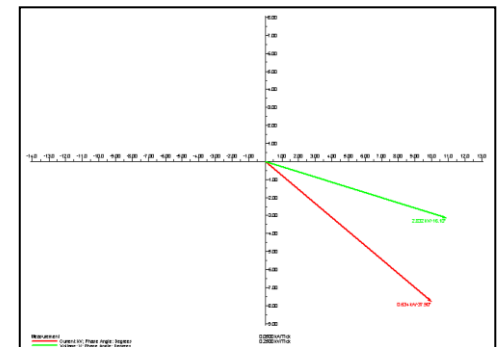
Harmonic Distortion Representation



Variable Sampling Rate of Recordings

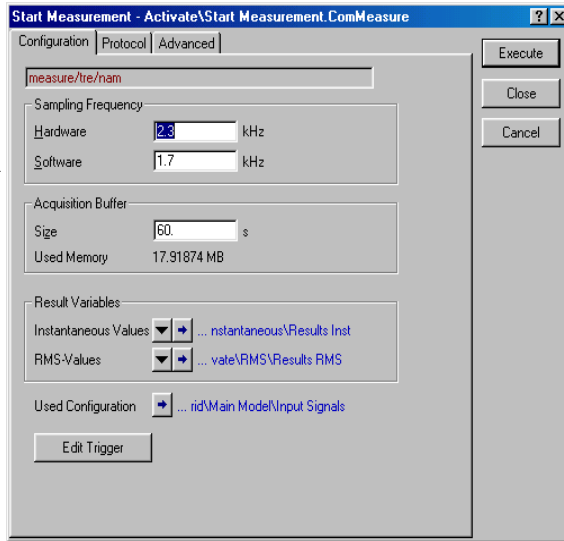
0.1 mHz Accuracy for Power System Frequency

Phasor Representation



Measurement Configuration

Variable
Sampling
Rate



Variable
Ring
Buffer
Size

Adjustable Size of Measurement Files

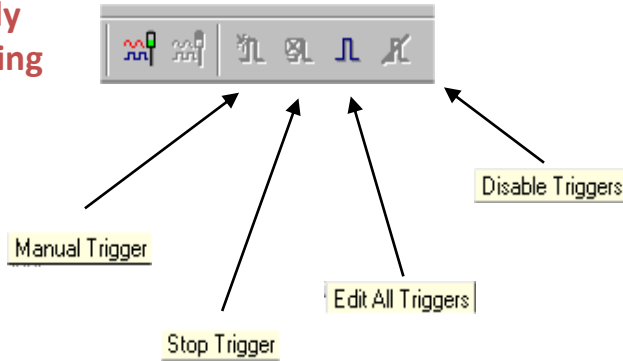
- Free Selection of Measured and Calculated Signals
- Definition of Pre-Trigger, Post-Trigger and Re-Trigger Time Frame

Comfortable User-Defined Trigger Conditions

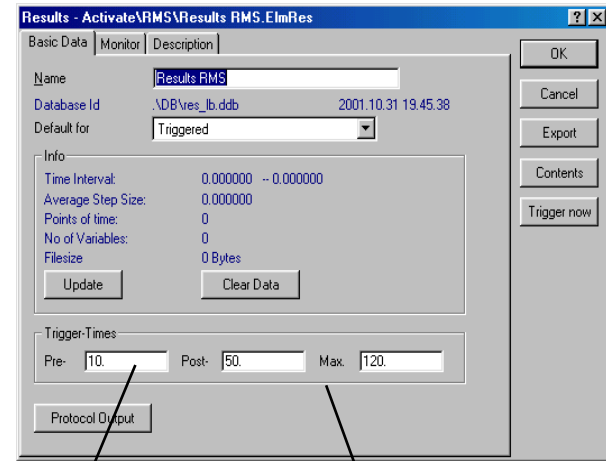
- Trigger Condition Applicable for Each Quantity
 - Voltages, Currents, Powers
 - Frequency, Harmonic Indices
- Pre-Defined Trigger User Dialogues:
 - Maximum / Minimum Value
 - Number of Measurement Points for Set / Reset Condition
 - Gradient Evaluation
- Pre-Defined Date / Time Triggering
- Programmable Trigger Settings by Using the DigSILENT Simulation Language (DSL)

Trigger Configuration

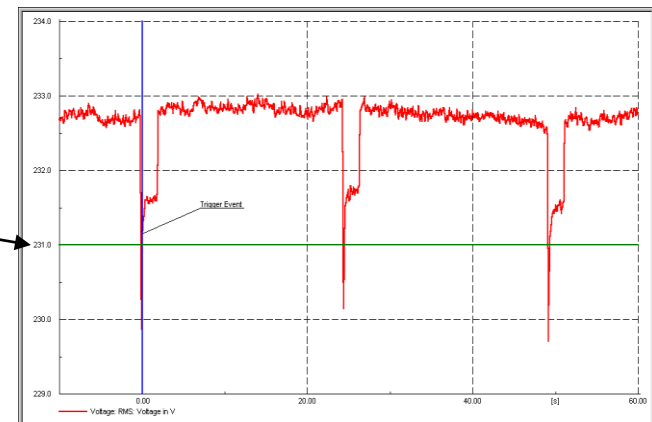
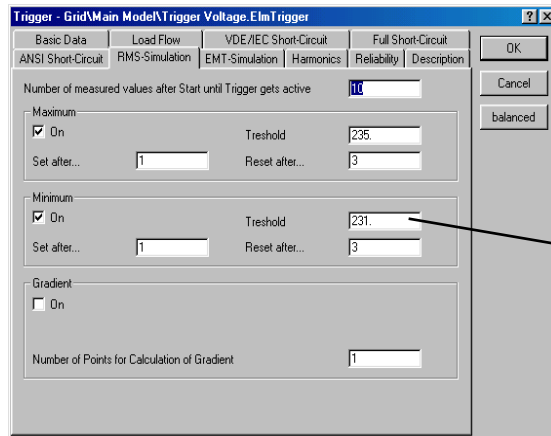
User-Friendly
Trigger Handling



Configurable Pre, Post and Re Trigger Times



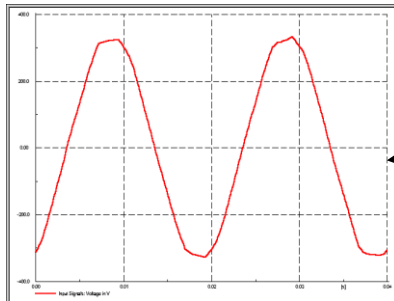
Adjustable
Trigger
Conditions



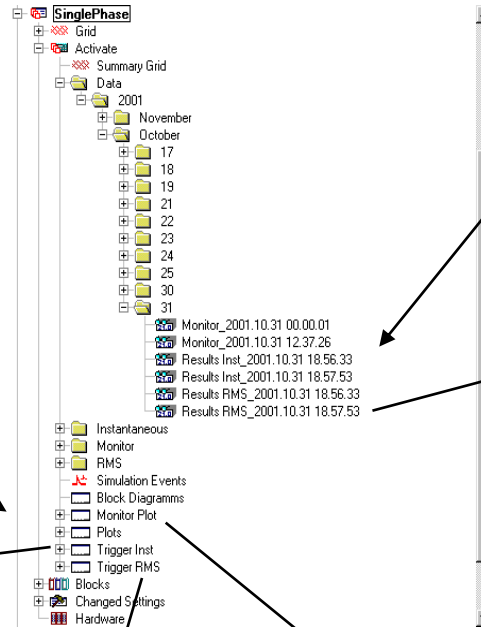
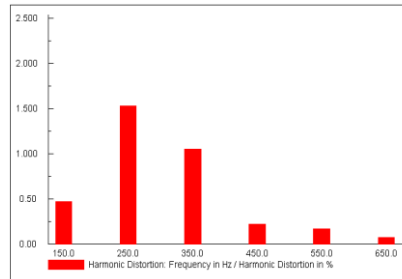
Storage of Measurement Data

Saving of Measurements in a Hierarchical Database

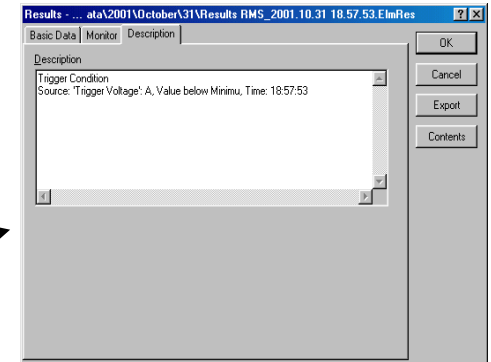
Definition of Measurement File Contents



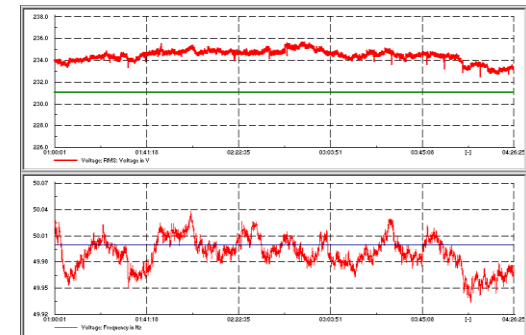
Data Analysis Based on the Full Range of PowerFactory Graphic Display Tools



Precise GPS Time Stamp

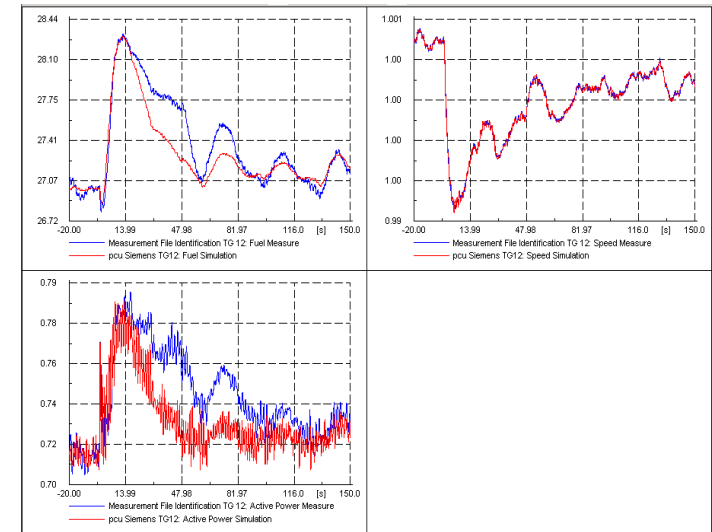
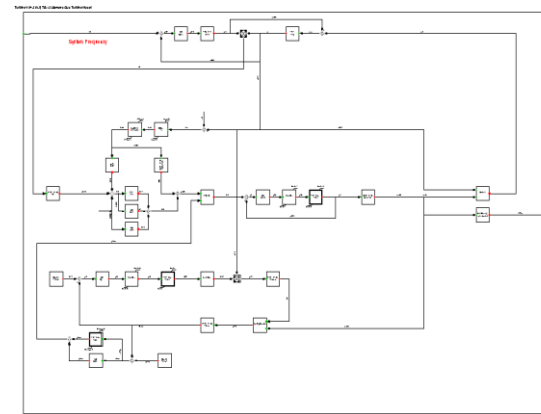


Accurate Documentation of Measurement Contents

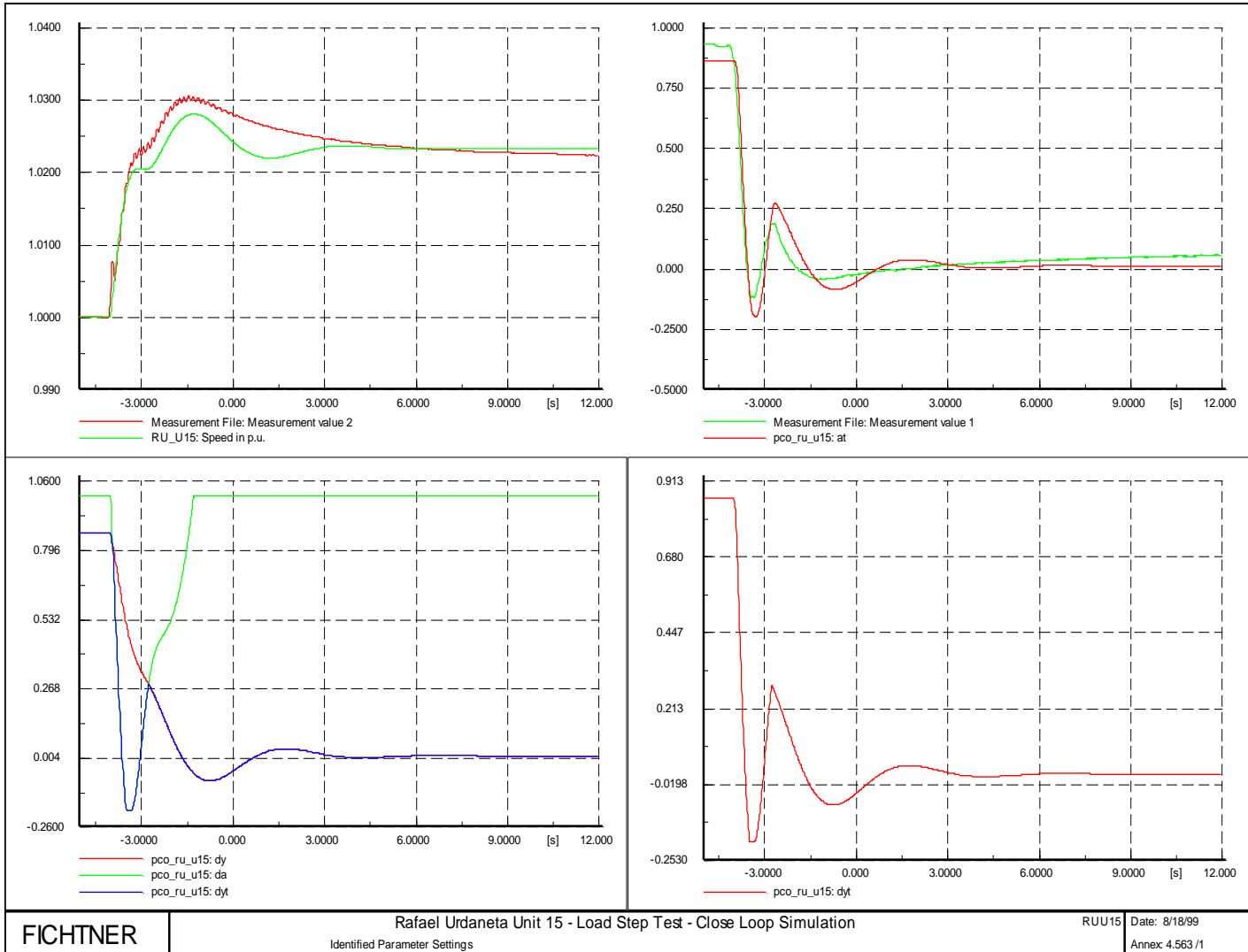


Application Example

Determination of Power Plant Dynamics



Gas Turbine Verification



General Concept

Full Scale Tour on PFM/DSM

PFM/DSM Hardware

PFM Software

PFM/DSM Integration

General Concept

Typical PFM/DSM Layout



← Inverter, AC/DC Redundant Power Supply (opt.)

← Control Unit: IPC with 2-XEON CPU

← 15" XGA TFT Screen (opt.)

← Mouse / Keyboard (opt.)

← Signal Units for A/D I/O 16bit 15kHz /channel