



Advanced Grid Monitoring & Control System

By CT LAB

We want to monitor our power systems

Several Decades Ago : SCADA



Data became the foundation of Energy Management Systems

Around 1980s: Synchrophasor data emerged



Wide Area Monitoring Systems (WAMS) were established

Lately synchronized voltage and current waveforms became a reality.



Waveforms present the most authentic and granular data of power system behavior



Trends driving the need for waveform data.

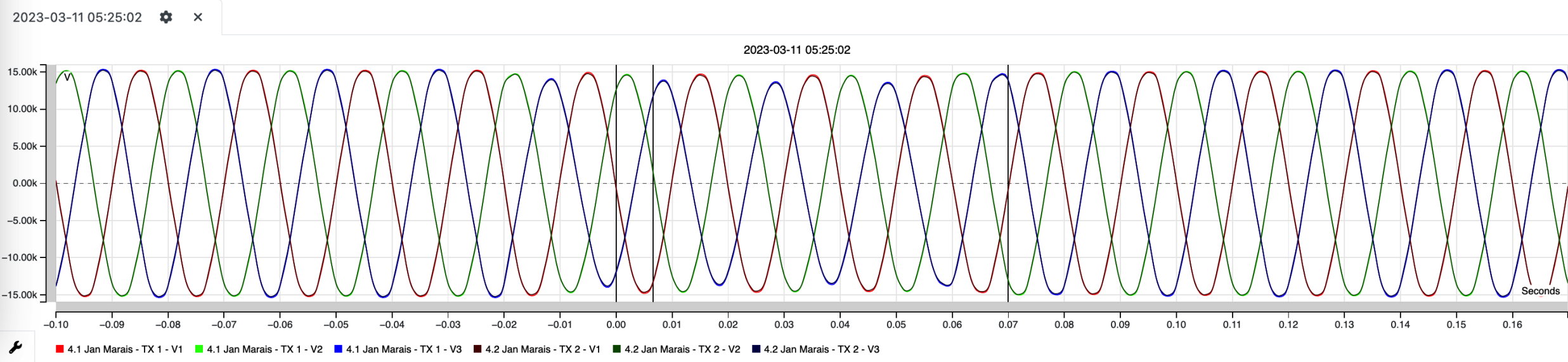
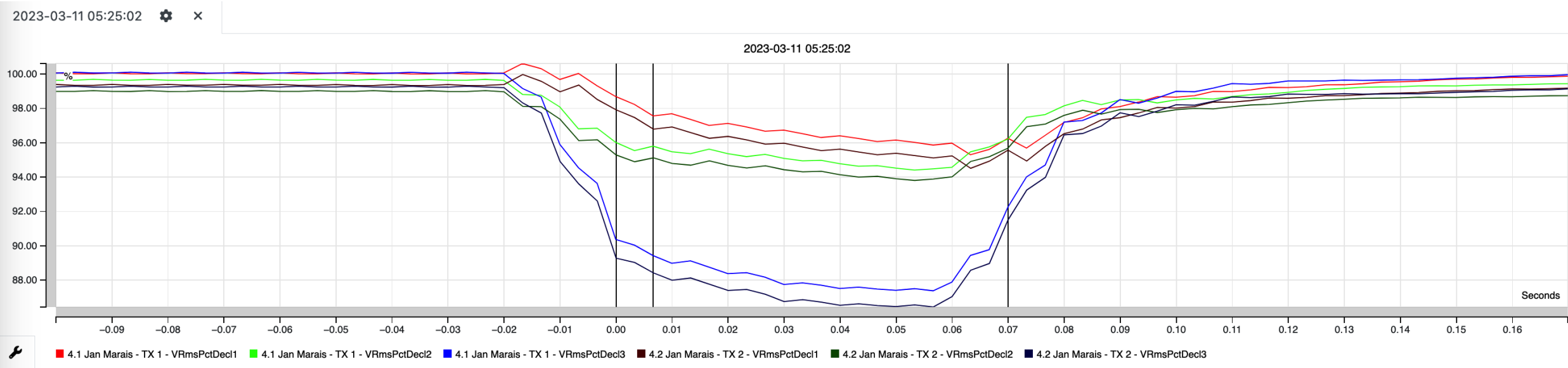
- Increased adoption of power electronic devices
- Modern power systems possess more complex dynamic responses
- Online condition monitoring of power apparatuses is gaining significant attention



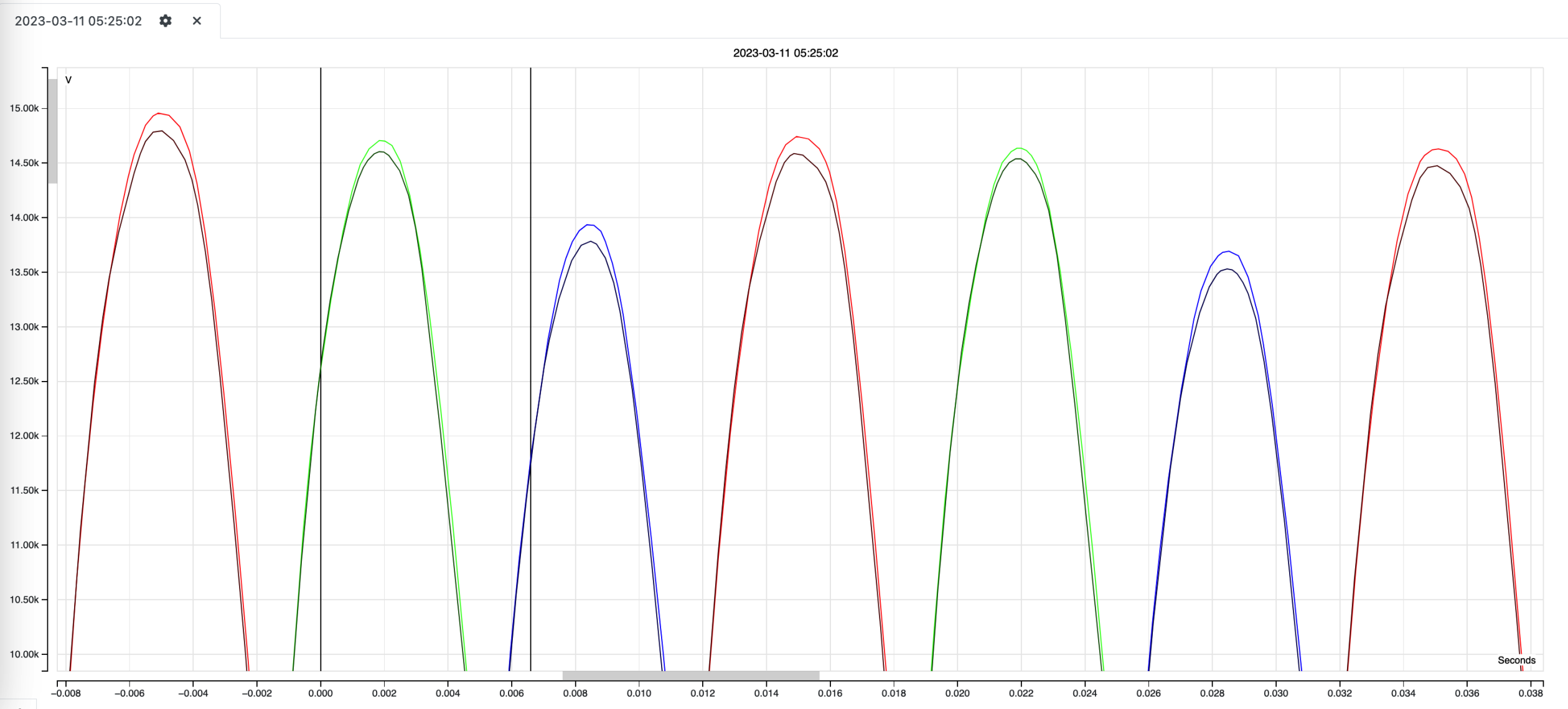
Waveform Data

- Waveform data are often collected from multiple locations within a system.
- Fortunately, devices that can record waveforms with precision timestamps are already available.
- Thus, synchronized analysis of multiple waveforms over a wide area is within our reach.

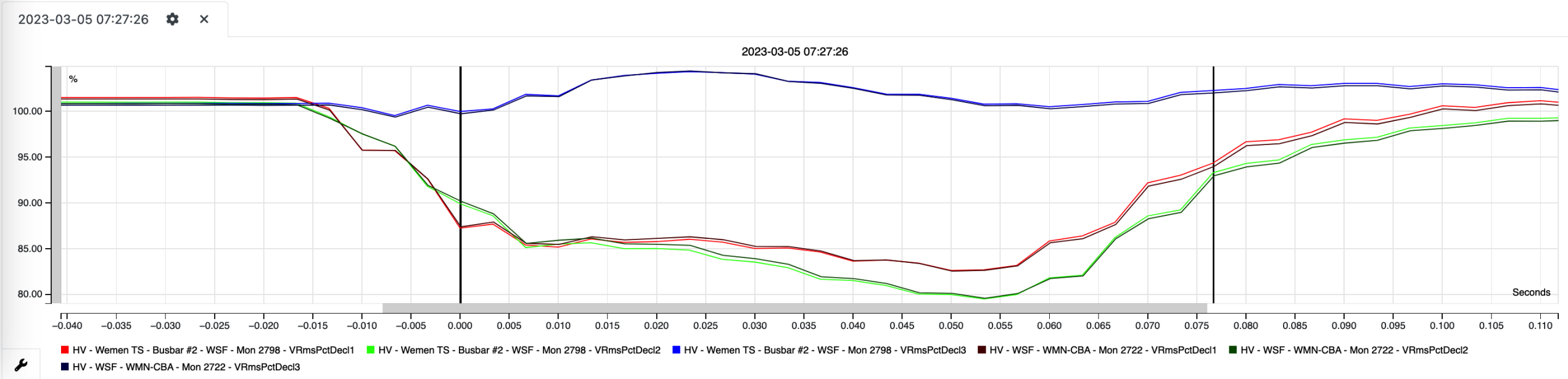
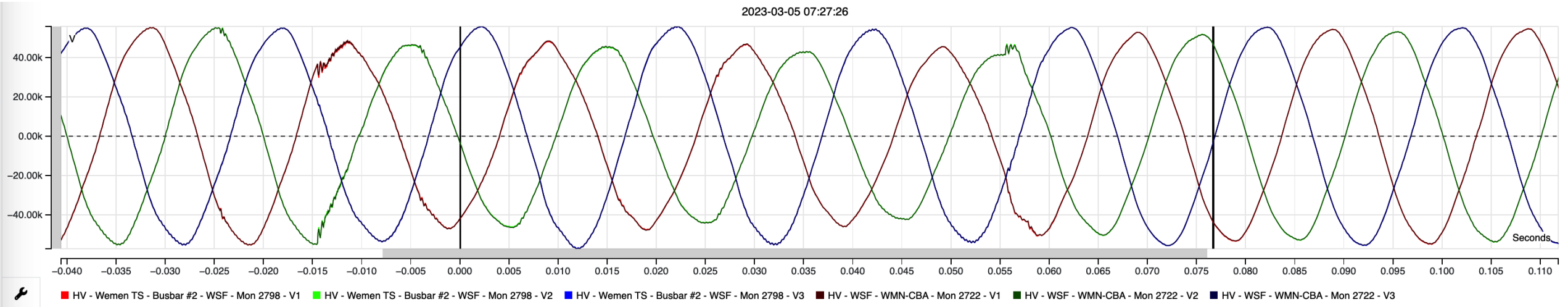
SynchroWaves



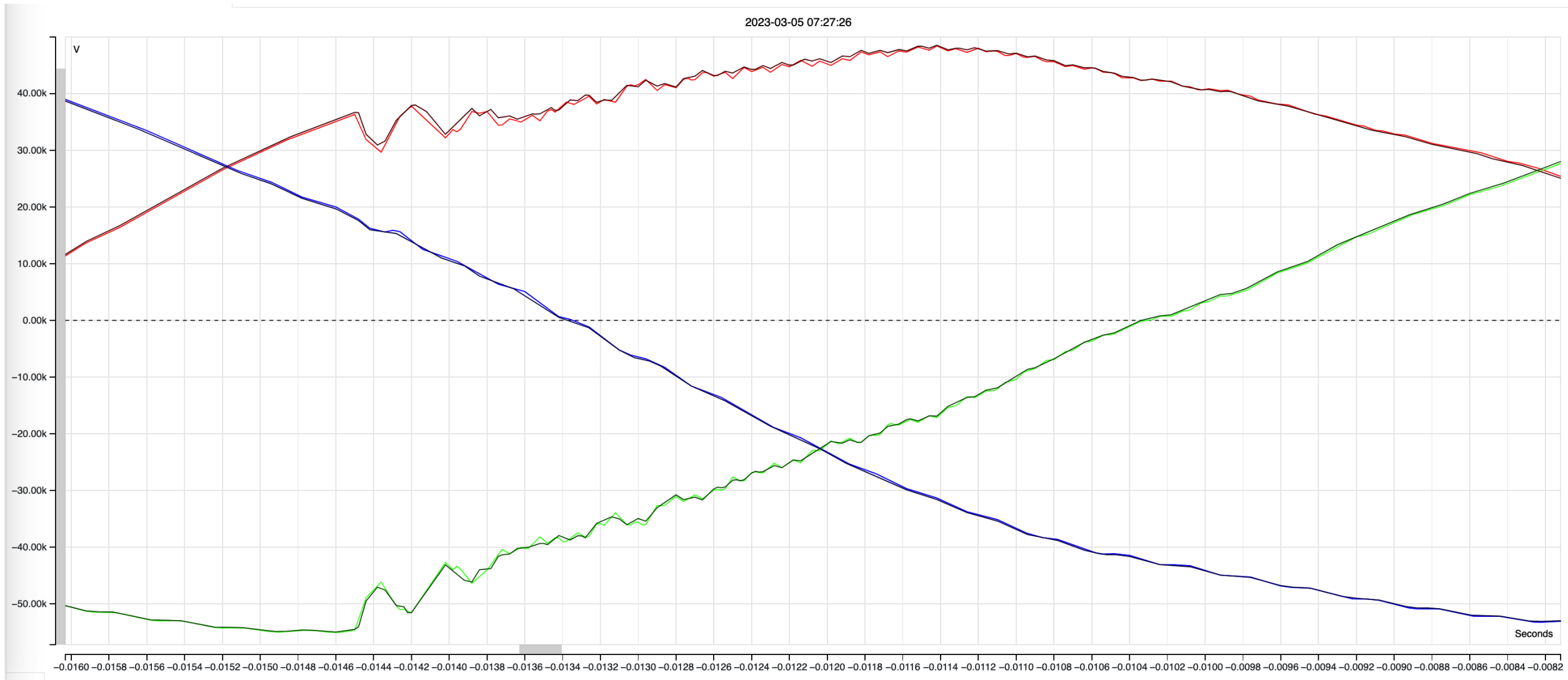
SynchroWaves



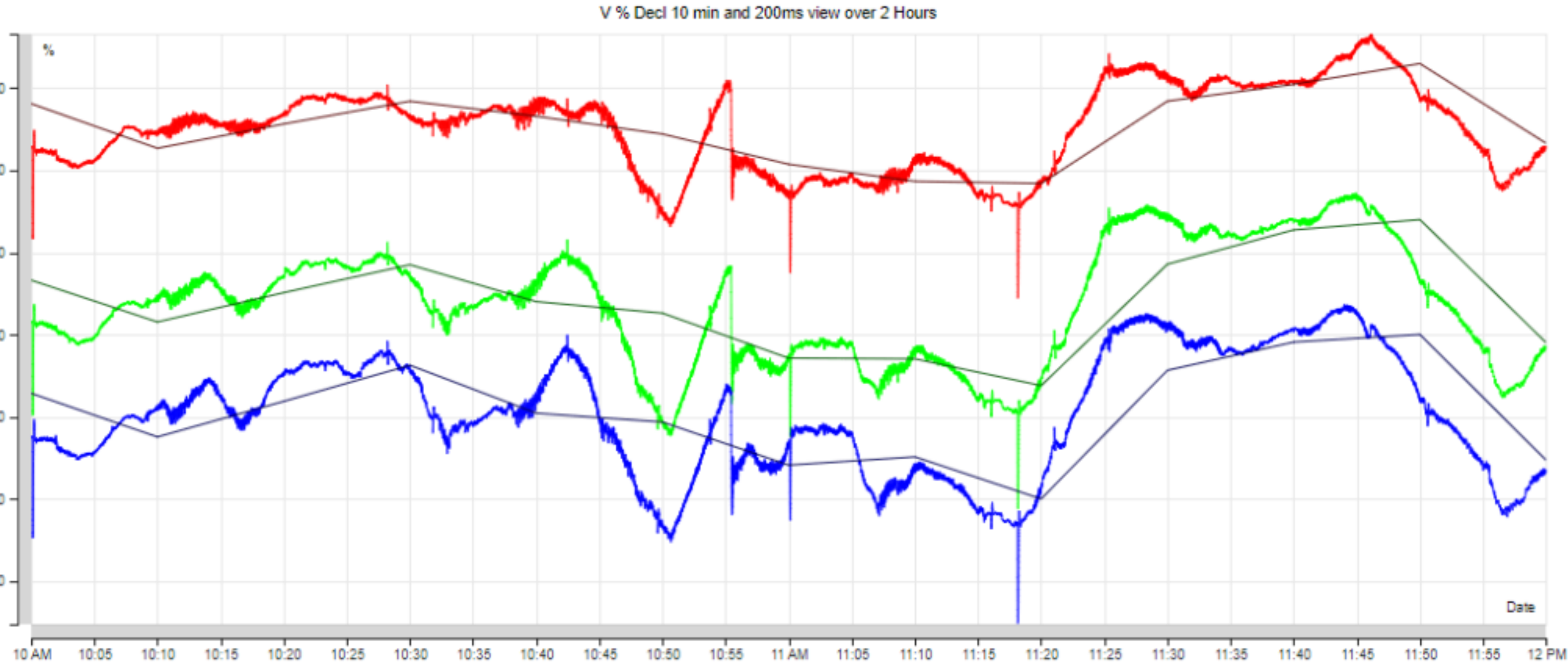
SynchroWaves



SynchroWaves



Higher Speed Data



VECTO 3

- Up to thousands of devices over the network
- Edge computer
- GPS clock synced
- Various communication possibilities



VECTO GRID OS

- Fault Tolerant Big Data Platform
- Permanently Online
 - Data is accessible in near real-time
- Accurate Clock
 - Within $\pm 100\text{ns}$ from absolute synchronized time
- Support data from 3rd party devices

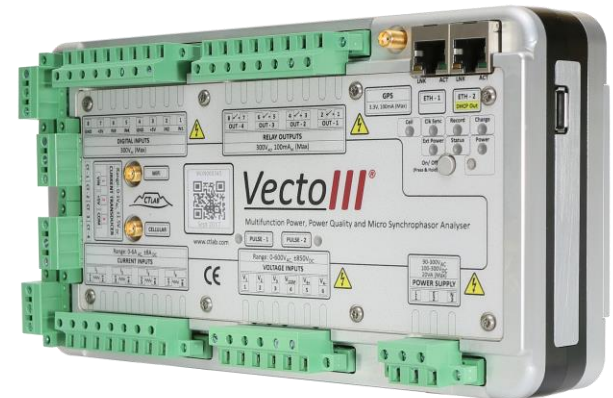


VECTO GRID OS

High Availability System | Encrypted
Communication | Cyber-secure | Exploits EDGE
Computing

Scope of VECTO 3

- Network Automation & Control
 - PMU Data Streaming
 - SCADA Protocols
 - Digital IO
 - On-Board Edge Computing
- Network Stability
 - Sub- & Super-Harmonic Spectrum
- Power Freq Load Profile & Billing
- Power Quality
 - Higher Harmonics
 - Prevailing Phasors
 - Supra Harmonics
 - Hyperwaves (< 5MHz)



Scope of



Core Functionalities

- Event & Trend Browsers
- Alarming & Notifications
- Measurement Campaigns
- Grouping of events
- Fleet Management
- Reporting & Dashboards
- Combined Billing
- TOU Tariffs ...

Current & Future Applications

- Frequency Control Ancillary Services (Australian)
- Virtual Power Station
- Network Model Development & Verification
- Grid Compliance Assessments
- Breaker condition Monitoring
- Distance to Fault

The VECTO System was built on SynchroWaves.

The system supports the complete spectrum of grid monitoring, grid stability, automation & control applications.

With more than a decade of experience in synchronised recording, VECTO System is pioneering the way towards a stable transformed grid.