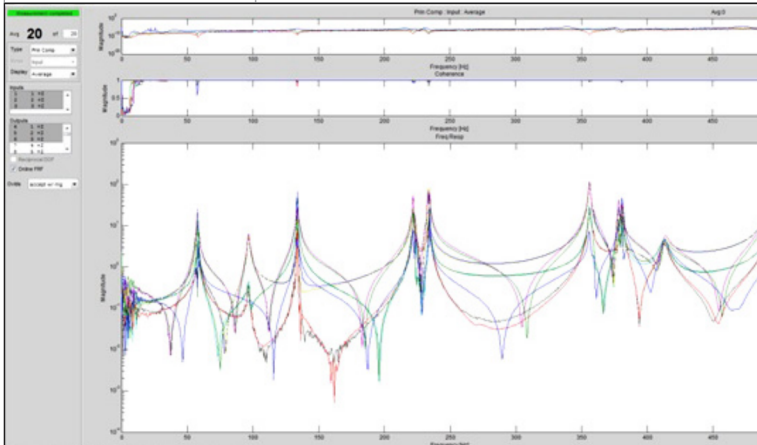


DATA SHEET



X-Modal III

MODAL ANALYSIS SOFTWARE WITH
EMBEDDED DATA ACQUISITION

FEATURES

SOFTWARE FUNCTIONALITY

- Autonomous Modal Parameter Estimation Procedure
- Multiple Live Parameter Estimation Windows
- Task Oriented, Easy-To-Use Interface
- Logical Operation Always "One-Click" away
- Simplified "Copy & Paste" Data Management
- Simplified Units Unification Tool
- Based on MATLAB® Computational Engine Environment
- Universal File Format (UFF) Data Access
- Individual Data Channel Calibration

APPLICATIONS

- Modal Analysis
- Ground Vibration Testing (GVT)
- MIMO Shaker Testing
- Multi-Reference Impact Testing
- Problem analysis and Troubleshooting



www.vtiinstruments.com

RELIABLE DATA FIRST TIME EVERY TIME

OVERVIEW

X-Modal III is a comprehensive modal analysis package featuring intuitive, task oriented user interfaces, extensive modal parameter estimation algorithms, parallel display capabilities, flexible data management, and embedded data acquisition capabilities.

Developed by one of the leading research universities in modal analysis and structural dynamics, and supported by leading structural testing groups in aerospace, defense and automotive industries, X-Modal III is used for the most complicated modal test applications in the world.

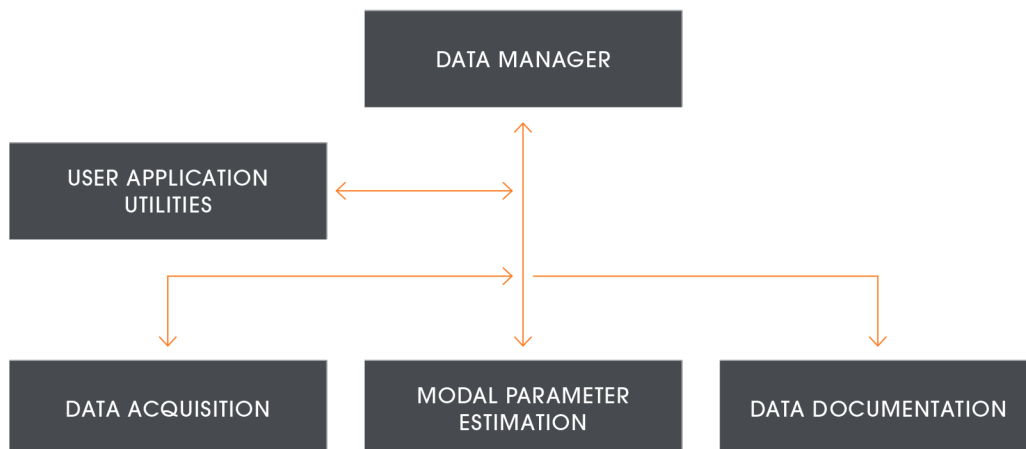
X-Modal III fully supports the SentinelEX Series of Smart Dynamic Signal Analyzers (DSA's), as well as VTI's VT143x family.

Open-source Programming Environment

One of the most unique modal test solutions in the market, X-Modal III is based on MATLAB®, an open-source programming environment, and offers the user the ability to take advantage of leading edge technology for modal testing. MATLAB® offers several advantages:

- General familiarity in industry, organizations and Universities
- Convenient for customization/enhancement at multiple levels
- Gives complete visibility of algorithms and techniques
- Excellent math capability and engineering/science graphic visualization options
- Easy automation using scripts

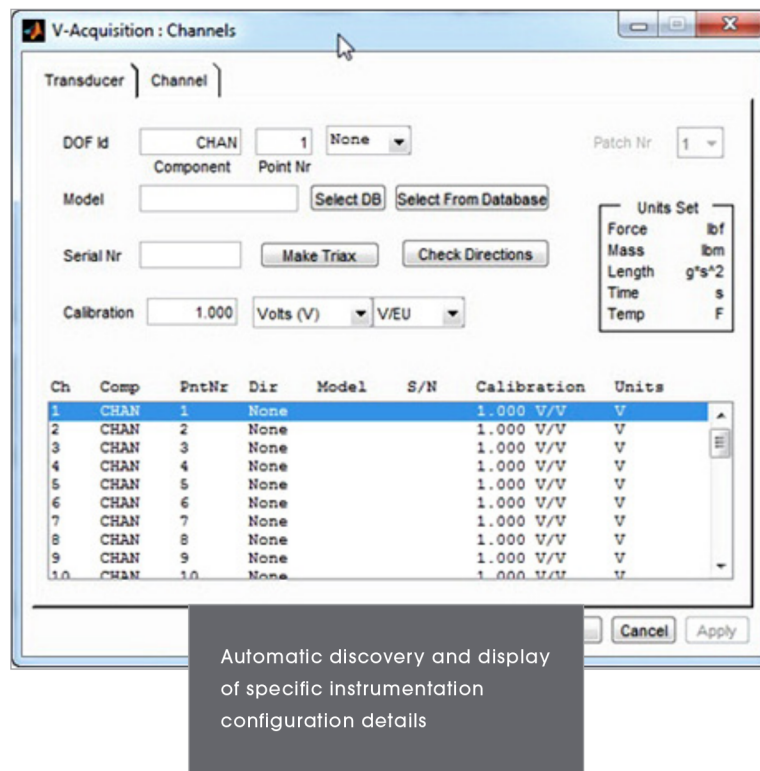
X-Modal is also not captive to data formats like traditional modal analysis tools. Data can be exported in multiple common file formats to like Universal file format, Excel, MATLAB®, Quicktime movie, or JPG. This ensures that the user is not bound to using proprietary software with expensive maintenance fees in order to access stored data.



Simplified set-up and usage

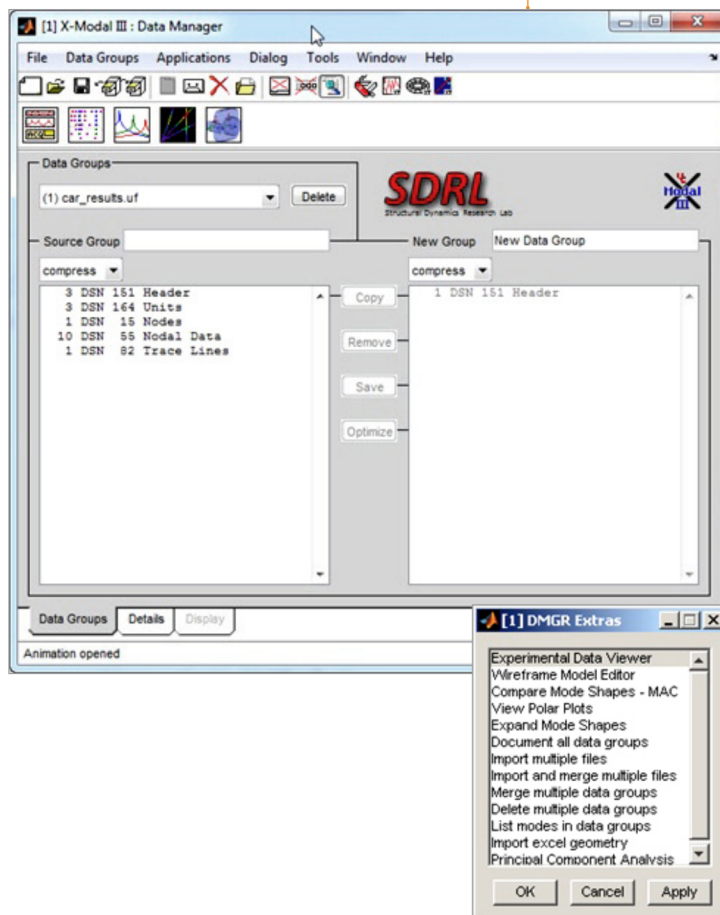
Time saving functionality like easy to use wizards, task oriented user interfaces always with “one-click” away functionality, simplified “copy & paste” data management, a units unification tool, and the ability to display multiple, live parameter estimation windows in parallel truly differentiates X-Modal III and make it very intuitive and simple to use. Instruments are automatically identified and instrument configuration is simplified using built-in modules.

- Bubble help on all icons
- Written theory documentation available (locally or online)
- Video tutorials for getting started (locally or online)
- Build-in full featured modules and wizards to simplify usage



Data Manager

The **Data Manager** within X-Modal organizes acquired data into data groups for further processing by application modules like Modal Parameter Estimation. This can be data that's collected by the Data Acquisition module within X-Modal, or collected from another software package like EXLab and imported into X-Modal. While the Universal File Format (UFF), both ASCII and binary versions are the primary open standard data format utilized by X-Modal other non-proprietary formats can be supported via user applications (CSV, Excel, MATLAB® file, etc.)



User applications may be added through Swiss Army Knife Functions

Data can be imported/exported in Universal File Format, the only file format recognized by all vendors

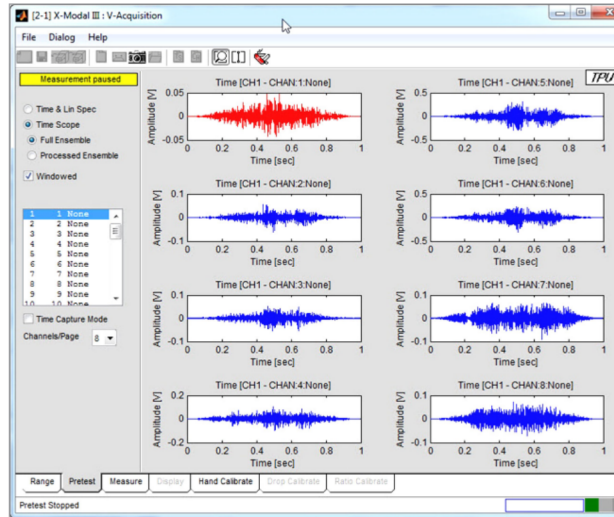
Multiple data groups available

Data Acquisition

X-Modal III offers a wide range of capabilities providing virtually every toolset required for performing complex structural tests.

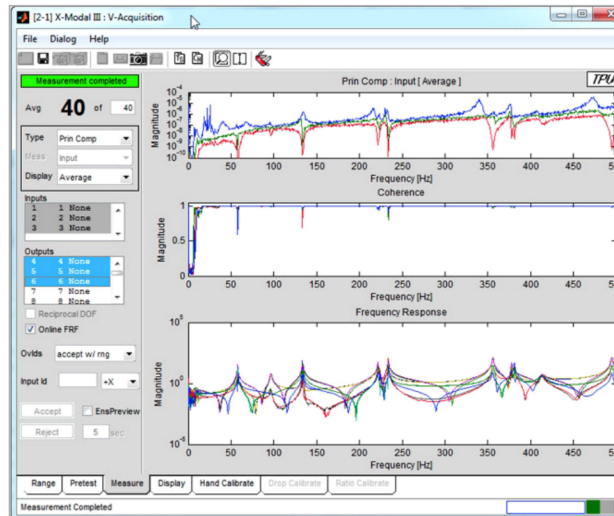
Data Acquisition Modes

- MIMO FRF Estimation
- Multiple Reference Impact Testing (MRIT)
- General Auto/Cross Power Spectra Matrix
- Block Time Domain
- Sensor calibration modules



Data Signal Processing

- General Windowing Support
- RMS and cyclic averaging
- H1, H2, Hv FRF Algorithms
- Pre and post trigger
- Units support
- Multiple source control for MIMO



Modal Parameter Estimation (MPE)

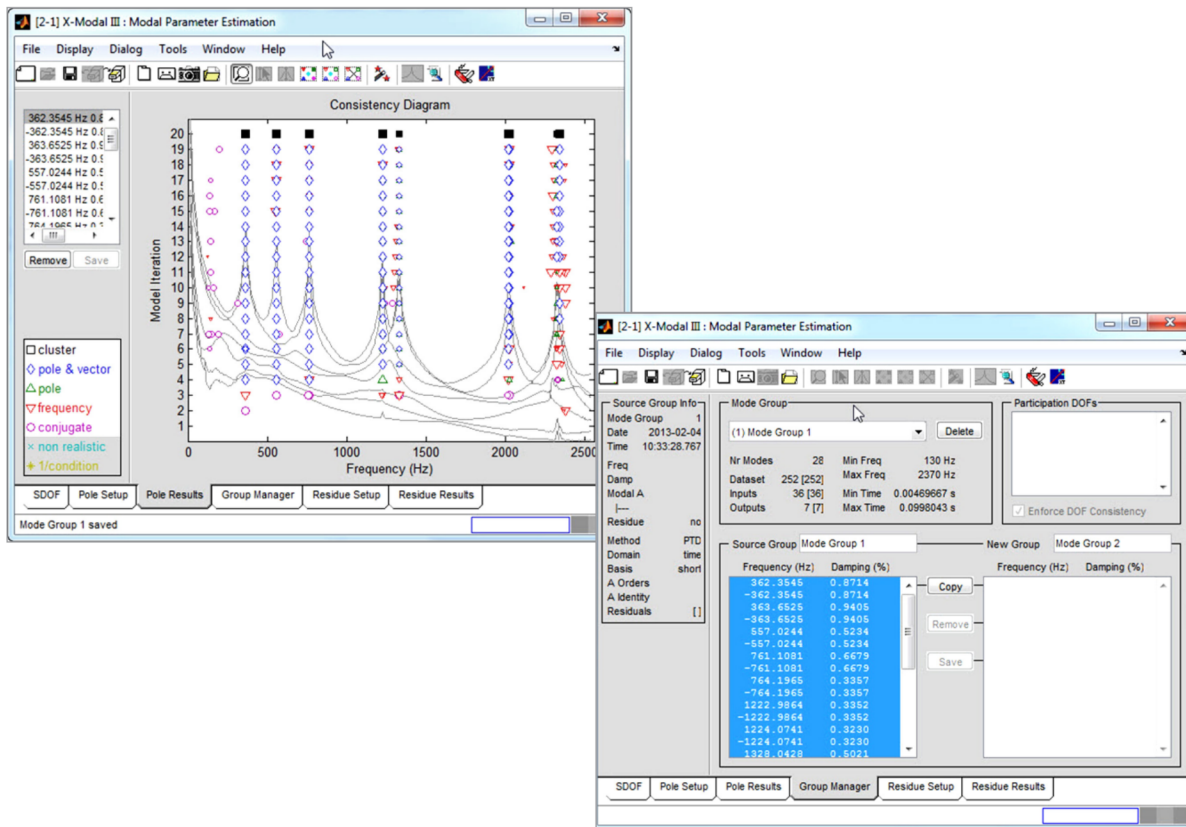
X-Modal supports all commercial MIMO (Multiple Input Multiple Output) MDOF (Multiple Degrees of Freedom) algorithms plus many research options:

- Time Domain: Polyreference Time Domain (PTD), Eigensystem Realization Algorithm (ERA)
- Frequency Domain: Rational Fraction Polynomial (RFP), Polyreference Frequency Domain (PFD), RFP with complex Z mapping (RFP-Z), PFD with complex Z mapping (PFD-Z)
- Unified Matrix coefficient Polynomial Algorithm (UMPA) Method in both time and frequency domains

Autonomous modal parameter estimation procedures are available with all MDOF methods, with statistical mean and standard deviation information available for all modal parameters.

Many SDOF methods are also included.

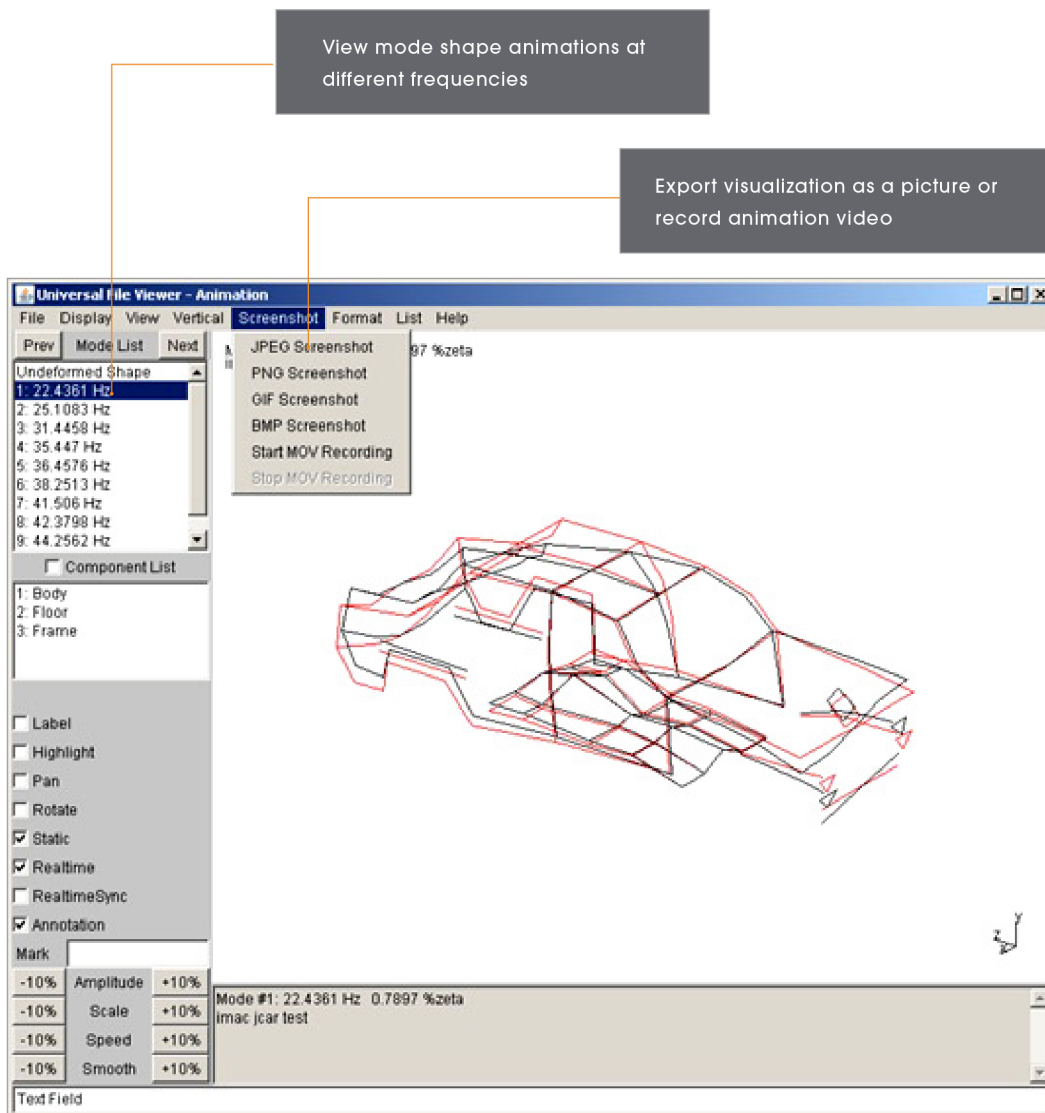
- Least squares finite difference (local and global)
- Least squares partial fraction (local and global)
- Complex mode indicator function method



Data Documentation

X-Modal makes it very easy for users to export data for documentation.

- Data plots can be exported in most electronic file forms or Matlab figure files
- All plots can be pulled from the graphic user interfaces (GUIs) as “tear-away plots”
- Animated visualization of mode shapes can be viewed and exported as video or static images
- Data can also be exported as text outputs, tabular lists and Excel file formats
- Plots and screenshots can be exported to electronic file formats or sent directly to the printer



General Specifications

USER INTERFACE

FUNCTIONALITY

Task oriented
 Logical “one-click” away design
 Intuitive mouse driven graphical user interfaces
 Function driven icons with parallel drop down menus
 Interactive, cursor driven bubble help
 On-Line Technical Help (PDF References)
 On-line video tutorials

HARDWARE CONNECTIVITY

INSTRUMENT SUPPORT

EMX-4350 “Smart” Dynamic Signal Analyzer, 4 Chan
 EMX-4251 “Smart” Dynamic Signal Analyzer, 8 Chan
 EMX-1434 Arbitrary Waveform Source with Dual Tach
 VT1432B Dynamic Signal Analyzer
 VT1435 Dynamic Signal Analyzer
 VT1436 Dynamic Signal Analyzer
 VT1434A Arbitrary Waveform Source

INSTRUMENT DISCOVERY

Automatic discovery and display of specific instrumentation configuration details

INSTRUMENT CONFIGURATION

Automatic configuration of base hardware
 Channel slot and clock frequency reconfiguration

DAQ AND DSP MODES

ACQUISITION MODES

MIMO FRF Estimation
 Multiple Reference Impact Testing (MRIT)
 General Cross Power Spectra Matrix
 Block Time Domain
 Post-Processing of Time Data Files (SDF, UFF, MAT)

CAPABILITIES

DIGITAL SIGNAL PROCESSING

Windowing
 Averaging, Triggering
 Cyclic Averaging (Digital Comb Filtering)
 MIMO Source Control (with Random, Burst Random, Periodic Random, Pseudo-Random)

STRUCTURAL AND OPERATIONAL MEASUREMENTS

Power Spectra
 FRF (H1, H2, Hv)
 Single/Multiple Input
 Coherence (Ordinary/Multiple)
 Uncertainty Quantification
 MIMO Transmissibility
 Principal Gain Evaluation (SVD)

EXCITATION TECHNIQUES

Shaker Testing
 Optimum Input Evaluation (Virtual Forces)
 Impact Testing

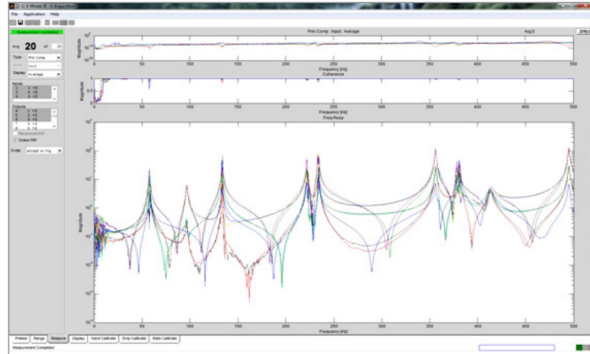
General Specifications

CAPABILITIES

MODAL PARAMETER ESTIMATION

ROTATIONAL ANALYSIS MEASUREMENTS (POST PROCESSING)

- Cepstrum, Quefrency
- Time Spectral Map (Color Spectrogram)
- RPM Spectral Map (Color Spectrogram)
- Time Cepstral Map (Color Spectrogram)
- RPM Cepstral Map (Color Spectrogram)



GENERAL EXPERIMENTAL MODAL ANALYSIS CAPABILITIES

RESPONSE ONLY MODAL ANALYSIS (VIA POWER SPECTRA)

REPEATED ROOT DETECTION AND SOLUTION

MODAL PARAMETER ALGORITHMS

- Numerous SDOF Methods
- Numerous MDOF Single/Multiple Reference Methods
- Time Domain Methods
 - Polyreference Time Domain (PTD)
 - Eigensystem Realization Algorithm (ERA)
- Frequency Domain Methods
 - Rational Fraction Polynomial (RFP)
 - Polyreference Frequency Domain (PFD)
 - RFP with complex Z mapping (RFP-Z)
 - (LS Complex Frequency implementation like LMS Polymax®)
 - PFD with complex Z mapping(PFD-Z)

AUTONOMOUS MODAL PARAMETER ESTIMATION PROCEDURES

MODAL PARAMETER VALIDATION

- Modal Assurance Criterion (MAC)
- Mode Indication Functions (MvMIF, CMIF)
- Synthesis Correlation - Error Evaluation
 - Modal Assurance Criterion (MAC)
 - Mode Indication Functions (MvMIF, CMIF)
 - Synthesis Correlation - Error Evaluation

Specifications

DATA MANAGEMENT AND VISUALIZATION MANAGEMENT

AIMPORT/EXPORT FORMATS

PROGRAMMING ENVIRONMENT MATLAB®-BASED APPLICATION

Multiple mode groups and data groups Cut/Paste/Edit/Save capability

Universal File Formats (UFF)

MATLAB file format

Excel Import

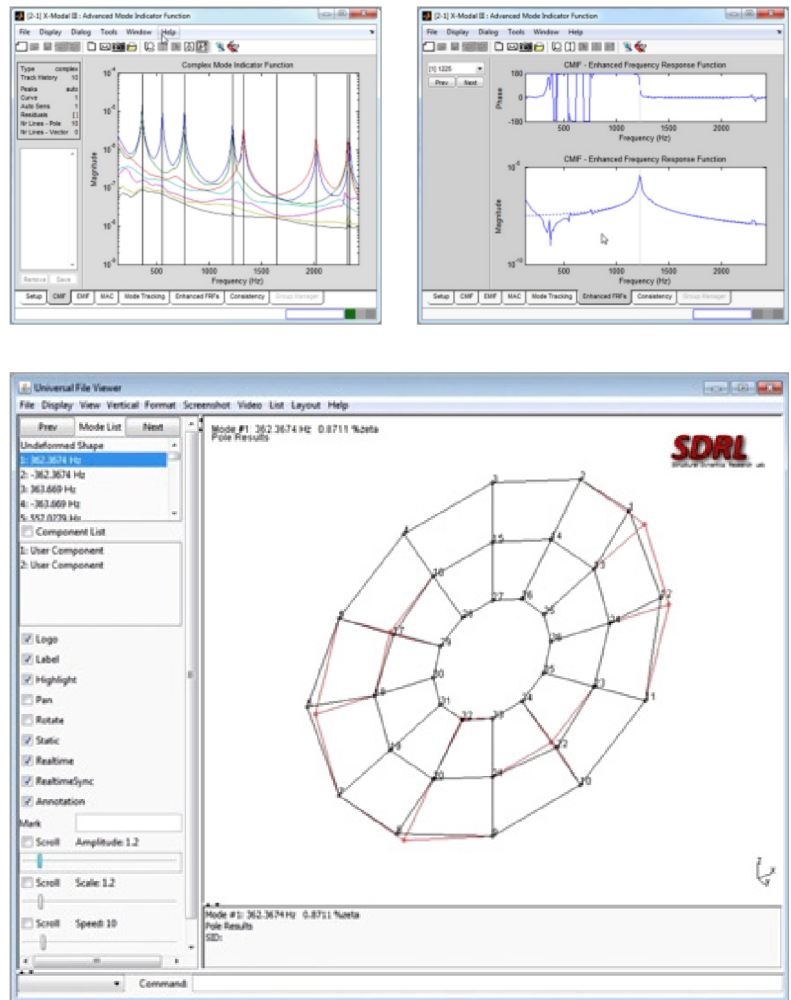
Animation plotting in 2-Dimension (wire frame)

QuickTime movie export

Extensive electronic data capture (text, JPG, BMP)

Personalized organization logos on all graphic output formats

Computational engine environment. Access to full programming environment (p-code or full source) available with license and/or Consortium membership.



Ordering Information

| X-MODAL III SERIES | |
|--------------------------------------|--|
| X-Modal III Single User | Single user license. Comprehensive Modal Analysis software package supporting unlimited channels, extensive modal parameter estimation algorithms, flexible data management capability, based on the MATLAB computational engine. See Note 1 for details |
| X-Modal III Multiple User | 10 user license. Comprehensive Modal Analysis software package supporting unlimited channels, extensive modal parameter estimation algorithms, flexible data management capability, based on the MATLAB computational engine. See Notes 1 and 2 for details. |
| X-Modal III Site | User site license. Comprehensive Modal Analysis software package supporting unlimited channels, extensive modal parameter estimation algorithms, flexible data management capability, based on the MATLAB computational engine. See Notes 1 and 2 for details. |
| X-Modal III Education | Educational user site license. Comprehensive Modal Analysis software package supporting unlimited channels, extensive modal parameter estimation algorithms, flexible data management capability, based on the MATLAB computational engine. See Notes 1 and 2 for details. |
| X-Modal III Maintenance | Annual Maintenance/Distribution Fee for X-Modal III. Includes periodic feature set enhancements and updates. First year required with all licenses to receive initial software; subsequent maintenance optional. |

Notes:

- Software includes Matlab Computational Engine plus X-Modal III in an execute only configuration. Programmable version using p-code with user supplied Matlab license available as an option. Full source availability is available through Consortium membership. For further details, please visit: <http://www.sdrl.uc.edu/Consortium>.
- Multiple User, Site and Educational licenses require signed paper execution of the license.

RELATED PRODUCTS

| | |
|----------|---|
| EMX-4350 | 4-Channel, 625k Sa/s DSA Digitizer with IEPE support |
| EMX-4380 | 4-Channel, 625k Sa/s DSA Digitizer with Charge and IEPE support |
| EMX-4250 | 16-Channel, 204k Sa/s DSA Digitizer |
| EMX-4016 | 16-Channel Break-out-box for EMX-4250 |
| EMX-4251 | 8-Channel, 204k Sa/s DSA Digitizer |
| EMX-4008 | 8-Channel Break-out-box for EMX-4251 |
| EMX-1434 | 4-Channel, 204 kSa/s Arbitrary Waveform Source with Dual Tach |
| EMX09 | 9-Slot Gigabit Ethernet LXI Data Acquisition Mainframe |
| EMX18 | 18-Slot Gigabit Ethernet LXI Data Acquisition Mainframe |

Specifications contained within this document are subject to change without notice