

# SO Analyzer

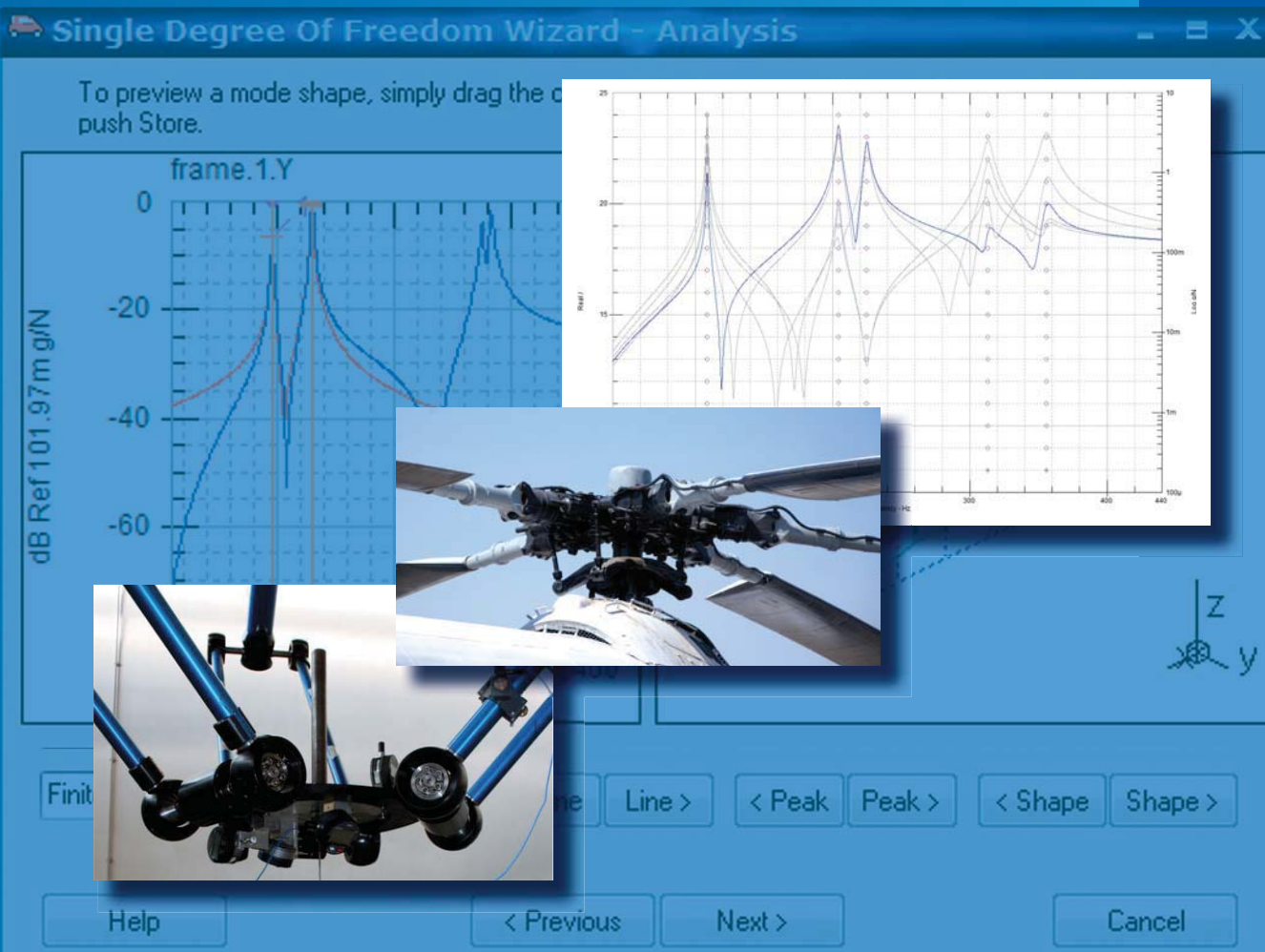
## Revision 4.2

**Update Note**

- p-LSCF and PTD+ Identification Algorithms for Modal Analysis
- New Mode Properties in MDOF
- FRF Validation in MDOF
- FRF Synthesis in SDOF
- Complex Mode Indicator Function (CMIF)
- Online Computed Functions Calculator

Single Degree Of Freedom Wizard - Analysis

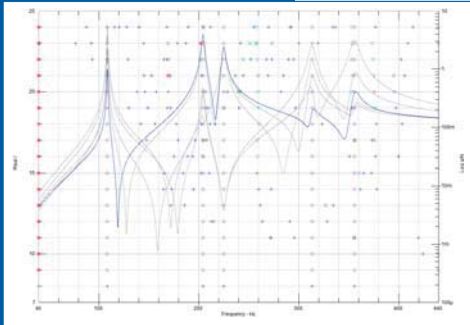
To preview a mode shape, simply drag the cursor over the peak and push Store.



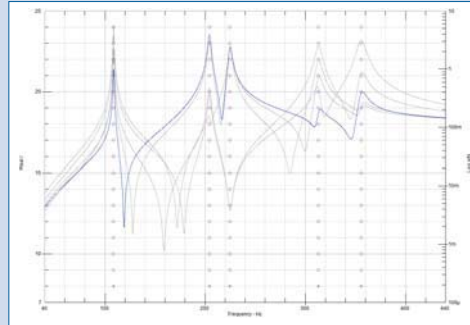
The screenshot displays the 'Single Degree Of Freedom Wizard - Analysis' window. It features a plot of 'dB Ref 101.97m g/N' versus frequency. The plot shows several peaks, with the highest peak at approximately 100 Hz. A mode shape visualization is overlaid on the plot, showing the displacement of various components of a mechanical system. The mode shape is a 3D model of a mechanical system with a central hub and four arms extending outwards. The displacement is shown as a blue and white color gradient. A coordinate system with x, y, and z axes is visible in the bottom right corner. The interface includes navigation buttons: 'Line >', '< Peak', 'Peak >', '< Shape', 'Shape >', 'Help', '< Previous', 'Next >', and 'Cancel'.

## p-LSCF and PTD+ Identification Algorithms in Modal Analysis

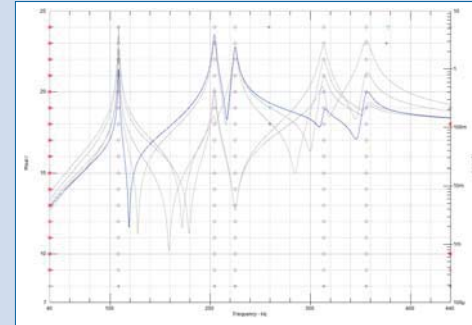
SO Analyzer Rev. 4.2 introduces the Polyreference Least-Squares Complex Frequency domain algorithm (p-LSCF/Polyfreq) which yields very clear stabilization diagrams even for high system orders (above 50) in highly damped structures. As mathematical poles resulting from measurement noise are identified with a negative damping ratio, they can be excluded before the diagram is created. Therefore it is easier to interpret the stabilization diagrams, especially for unpracticed users.



PTD stabilization diagram



p-LSCF stabilization diagram



PTD+ stabilization diagram

For the analysis of weakly damped structures the already implemented, widely-used PTD algorithm has been refined. The new algorithm is called Polyreference Least-Squares Complex Exponential Plus (PTD+/Polytime+). It is a time domain algorithm which produces self-evident stabilization diagrams, thus considerably improving the diagram interpretability.

## New Mode Properties in MDOF Wizard

New mode properties are computed in the MDOF wizard which enable you to verify the quality of your MDOF results and to distinguish real and complex mode shapes:

- Mean Phase Deviation (MPD): Standard deviation of the modal phase.
- Modal Phase Collinearity (MPC): Examines the collinearity of the modal phases, in terms of the correlation of real parts and imaginary parts.
- Mode Over-Complexity Value (MOV): The MOV explores the influence of mass addition to the different DOFs. Adding a mass to reasonable results should lead to decreasing eigenfrequencies. The MOV describes the portion of DOFs to which the above statement applies.
- Mode Indicator Function (MIF): The MIF value is high whenever the imaginary parts contain the information of a mode. It decreases with increasing influence of the real parts.

Mode Shapes							
	Save	Frequency [Hz]	Damping	MPD [deg]	MPC	MOV	MIF
1	<input checked="" type="checkbox"/>	56,628	5,574 %	4,77	97,82 %	100,00 %	95,86 %
2	<input checked="" type="checkbox"/>	561,533	0,908 %	7,03	98,98 %	100,00 %	93,54 %
3	<input checked="" type="checkbox"/>	1004,483	0,519 %	4,02	99,30 %	100,00 %	96,75 %

Mode properties in MDOF Wizard

## FRF Validation in MDOF Wizard

Two recently implemented functions help you to examine the quality of your synthesized Frequency Response Functions (FRFs):

- FRF Correlation: Deviation of measured and synthesized FRFs
- FRF Least Squares Error: Error of synthesized FRFs related to measured FRFs in percent

Synthesized FRF's					
	Save	Function Type	Name	Correlation	Least Square Error
1	<input checked="" type="checkbox"/>	FRF	FRF(NONE.10.Z,NONE.10.Z) Synthesized	98,033 %	3,310 %

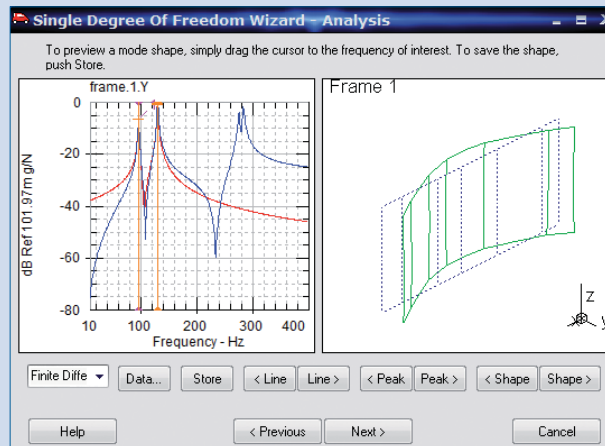
FRF validation in MDOF Wizard

**Update Note**

## FRF Synthesis in SDOF Wizard

The SDOF Wizard of SO Analyzer Rev. 4.2 enables the user to compare measured and synthesized Frequency Response Functions (FRFs) and to assess the quality of the results (eigenvector, eigenfrequency, modal damping) in an easy way.

The MDOF model validation algorithms Model Phase Collinearity (MPC), Mean Phase Deviation (MPD) and Mode Indicator Function (MIF) are also now available in the SDOF wizard.



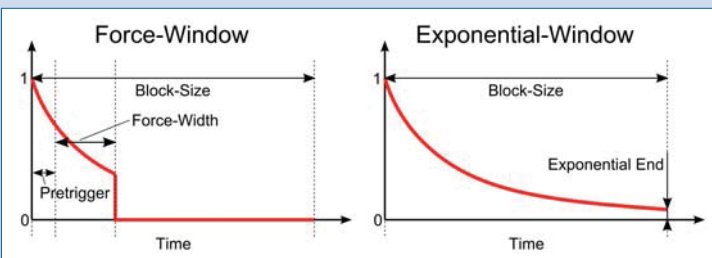
FRF synthesis in SDOF Wizard

## Complex Mode Indicator Function (CMIF)

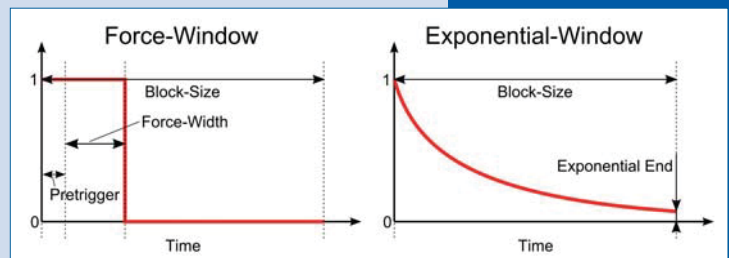
The MDOF wizard is enhanced with the Complex Mode Indicator Function (CMIF). A maximum of the Complex Mode Indicator Function indicates the existence of an eigenfrequency at this point.

## New Force Window

m+p international integrated a new Force window which is exponentially decaying, thus avoiding amplitude errors of FRF results in impact testing.



New Force window



Old Force window

## Additional National Instruments Card Support

SO Analyzer Rev. 4.2 supports the following National Instruments cards:

- NI PXI-4495: DAQ for high-channel-count sound and vibration applications, 204,8 kS/s/ch, 24-bit, 16 analog inputs
- NI PXI-6123: Simultaneous sampling multifunction DAQ, 500 kS/s/ch, 16-bit, 8 analog inputs
- NI PCI-6123: Simultaneous sampling multifunction DAQ, 500 kS/s/ch, 16-bit, 8 analog inputs
- NI PXIe-6368: Simultaneous data acquisition, 2 MS/s/ch, 16-bit, 16 simultaneous analog inputs
- NI PXI-6711: High-speed analog output board, 1 MS/s/ch, 12-bit, 4 analog outputs
- NI PCI-6711: High-speed analog output board, 1 MS/s/ch, 12-bit, 4 analog outputs
- NI 9235: Quarter-bridge strain gage module, 10 kS/s/ch, 24-bit, 8 analog inputs
- NI 9236: Quarter-bridge strain gage module, 10 kS/s/ch, 24-bit, 8 analog inputs

**Update Note**

## National Instruments Device Discovery

The SO Analyzer National Instruments device discovery option now uses the full active device list as provided directly by DAQmx hence removing the requirement for users to pre-configure the Measurement & Automation device list. This means that physical device configurations can now be simply changed by the user and SO Analyzer will automatically re-configure as required.

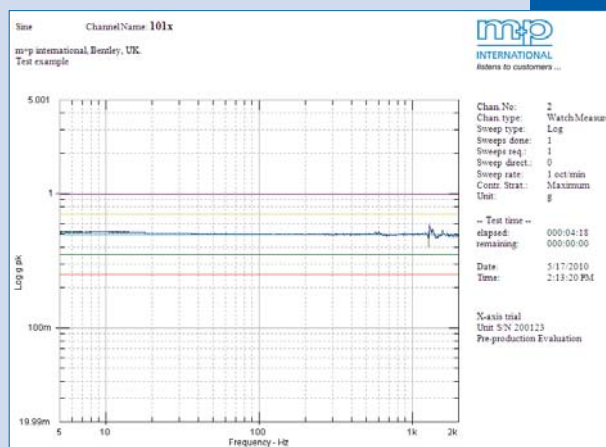
The device discovery option also fully supports the newer style National Instruments chassis device naming conventions for Ethernet and WLAN devices such as NI 9188/9184 as well as PXIe chassis.

## Online Computed Functions Calculator

The calculator functions have been extended to cover user-defined equations for special functions and cross channel calculations during measurement runs. This option is especially useful for applications such as averaging multiple channels in real-time, sonar arrays, rosette strain gauges, vector calculations on triax accelerometers, special linearizing equations etc.

## VibControl Style Reports

You can now create m+p's VibControl style report formats directly using the SO Analyzer reporting tools. New templates have been included in the VibControl style that show the standard layout, test headers, comments etc. as known from the standard VibControl reports. Users who work with both software systems now can create uniform reports regardless of the software they currently use.



VibControl style report

This Update Note provides you with an overview of the most significant product enhancements of SO Analyzer Revision 4.2. There are other new functions that make the SO Analyzer even more powerful and user-friendly.

The new software revision has resulted primarily from the close and valuable co-operation with you, our customers. We optimize the SO Analyzer continuously. Therefore, if you have any suggestions that could further improve our product offering for your application, please let us know.

**SO Analyzer 4.2** is available now with many new features and general improvements for even greater efficiency and ease of use. Please do not hesitate to contact us.

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# Update Note

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