# WE MechLoad Viewer

## The Complete User Manual

### Chapter 3: The Main Interface - A Guided Tour

Now that you know how to load data, let's take a closer look at the main user interface components. Understanding what each part does will help you navigate the application efficiently.

#### 3.1 The "Single Data" Tab: Focusing on One Channel

This is the default tab and likely the one you'll use most often. Its purpose is to let you investigate **one single data channel** at a time.

**Analogy:** If your dataset is a giant spreadsheet of sensor readings, this tab is like picking one single column to plot and analyze in detail.

**Key Controls and How to Use Them:**

1. **Column Selector (Dropdown Menu):** This is your main control. Click it to see a list of all the data columns (channels) available from your file. Selecting a channel from this list will immediately update the plot below to display its data.
2. **Main Plot (Top Plot):** This shows the magnitude of the selected channel.
    - For **Time Data**, it will be Magnitude vs. Time.
    - For **Frequency Data**, it will be Magnitude vs. Frequency.
3. **Phase Plot (Bottom Plot - Frequency Data Only):** If you've loaded frequency-domain data, a second plot will appear below the main one. This shows the **phase angle** of the signal at each frequency. Phase is critical for understanding the timing relationships in a vibration signal.

**Advanced Features (Time Data Only):**

When you load time-domain data, two checkboxes for advanced analysis will appear:

4. **Show Spectrum Plot Checkbox:**
    - **What it does:** A spectrum plot (or spectrogram) is a powerful tool that shows you how the frequency content of your signal changes over time. It helps you answer questions like, "At what moments did the high-frequency vibrations occur?"
    - **How to use it:** Check the box. A new plot will appear at the bottom. This plot has Time on the horizontal axis, Frequency on the vertical axis, and uses color to show the intensity of a frequency at a particular time.
    - We'll cover the different types of spectrum plots (Heatmap, Surface, Waterfall) in a dedicated section later.
5. **Apply Low-Pass Filter Checkbox:**

- **What it does:** Sometimes, your signal can be contaminated with high-frequency "noise" that you want to remove to see the underlying trend more clearly. A low-pass filter does exactly that—it lets the low frequencies "pass" through while blocking the high frequencies.
- **How to use it:**
    1. Check the box.
    2. **Cutoff Freq [Hz]:** Enter the frequency above which you want to filter everything out. For example, if you enter 100, all frequency components above 100 Hz will be removed from the signal.
    3. **Order:** This controls how sharp the "cutoff" is. A higher order creates a steeper filter. A value of 2-4 is usually a good starting point.
- When you apply the filter, the main plot will instantly update to show the smoothed, filtered signal.

### 3.2 The "Interface Data" Tab: The Big Picture for a Connection

Often, loads are defined at a connection point or "interface" (like a bolt or a weld) and have multiple components (forces and moments in X, Y, and Z directions). This tab is designed to show you all of them at once.

**Analogy:** Instead of looking at just the "Fx" column, this tab finds and plots all columns that belong to the "I1" interface (I1 Fx, I1 Fy, I1 Fz, etc.) on a single graph.

**How to Use It:**

1. **Interface Selector (Dropdown Menu):** The application automatically groups your data columns by their interface prefix (e.g., I1, I2, I3a). Select the interface you're interested in from this dropdown.
2. **Plot Window:** The plot will immediately update to show all the load components for that interface, each with its own colored line. This gives you a complete picture of what's happening at that specific connection point.

### 3.3 The "Part Loads" Tab: Grouping by Component or Side

This tab is similar to "Interface Data," but offers more flexibility. It allows you to group data channels based on a common name or "side" within their description. This is perfect for analyzing loads on a larger component.

**Example Use Case:** Imagine you have channels named LHS Shock Fz and LHS Wishbone Fz. This tab lets you filter by "Side" = LHS and "Component" = Fz to see and compare the vertical forces on both the shock and the wishbone of the left-hand-side suspension.

**How to Use It:**

1. **Side Filter Selector:** Select the common group or side you want to investigate (e.g., LHS, Engine Mount).
2. **Component Filter Selector:** Select the specific load component you're interested in

(e.g., Fx, Mz).

3. **Plot Window:** The plot will show all the channels that match both your Side and Component filters.

**Advanced Features and Exporting:**

This tab also contains powerful data processing and export tools:

4. **Apply Data Section (Time Data Only):** Check this box to focus on a specific slice of time. Enter the Min Time and Max Time to zoom the analysis into that specific event.
5. **Apply Tukey Window (Time Data Only):** A Tukey window is a data processing technique that tapers the start and end of your time signal down to zero. This is an essential step before performing certain types of frequency analysis (like an FFT) to get accurate results. You can adjust the Alpha value to control the amount of tapering.
6. **Export to Ansys Button:** This is a key feature. After you've filtered and processed your data on this tab, clicking this button will generate the necessary files to use these loads in an Ansys Mechanical simulation. We will cover this process in detail in its own chapter.