Introduction to Data Arrays
Data arrays are the most fundamental native data type in VirtualLab Fusion. Being a generic data type, they are among the most flexible when it comes to introducing physical attributes, re-sampling and interpolation. Array computing is made easy thanks to VirtualLab Fusion’s user-friendly GUI where users can perform operations without having to write for-loops. In this use case, we would like to introduce the basic tools to generate and configure Data Arrays. This includes the specific main menu ribbons (views, manipulations and detectors) as well as the settings of the property browser.
Data Arrays are the fundamental representation of physical data that most of VirtualLab Fusion’s results are based on, be they electromagnetic fields, phase transmission functions or Iterative Fourier Transform Algorithm (IFTA) results. Hence, most of these kind of documents can be transformed into a Data Array in one way or another.

In most cases there exists a Create Numerical Data Array option in the Manipulations tab.
Data Arrays can appear in the form of 2D documents or 1D documents. A banner highlighted in yellow will appear at the top of the main menu to indicate the currently selected document is a Data Array. This is important as, depending on the document class, different Manipulations and View settings are available.

In this use case we concentrate on 2D Data Arrays, but the overall functionality stays the same also in the 1D case. The specific windows will look slightly different as not all tools for 2D Data Arrays are useful when working with 1D Data Arrays.
Whenever a Data Array is selected, new options appear in the Main Menu and the Property Browser.

The three tabs Views, Manipulations and Detectors are only accessible when a Data Array is selected.
The View tab of the main menu allows for various adjustments regarding the visual style of the Data Array, including:

1. **Value Visualization**: Determine the Color Table of the Data Array as well as various scaling options.
2. **Selection**: This region contains the options regarding the markers and various tools to quickly find certain regions.
3. **Zoom & Aspect Ratio**: In this region the user finds buttons to zoom into (and out from) the data.
4. **Copy**: Allows the user to quickly copy view settings from one Data Array to another.

As this use case is only meant to provide a rough overview of the available options, for more information about view settings for Data Arrays, please see: [View Settings for 2D Data Arrays](#)
Value Visualization
Selection

Property Browser:
Note: To demonstrate this feature an asymmetrical Gaussian is shown!
reference
The **Manipulations** tab of the main menu allows for various adjustments regarding the actual data of the *Data Array*, including:

1. **General**: Lots of different customization options ranging from coordinate transformations over mathematical operations with single values or other arrays, to the sampling manipulations.
2. **Conversion**: Transform *Data Array* to other objects.
3. **Fourier Transform (Space)**: Apply Fourier Transform onto the *Data Array*.
4. **Graphics Add-ons**: Add additional information onto the *Data Array* as an overlay.

As this use case is only meant to provide a rough overview of the available options, for more information about manipulating *Data Arrays*, please see:

- General Manipulation Tools for Data Arrays
- Graphics Add-on
Conversion
Fourier Transform
Graphics Add-On

More information under: Graphics Add-Ons
The *Detectors* tab of the main menu offers several post-processing options for the *Data Array*, including:

1. **Add-ons**: *Detector Add-ons* calculate various physical quantities from the given data. See more information under: [Universal Detector](#).

2. **Selected Detectors**: This section incorporates different post-processing options of the given *Data Array*; depending on the detector, the result will either be displayed as an additional window or in the *Detector Result* tab at the bottom of the VirtualLab window.
In the *Property Browser*, the most important information about the selected *Data Array* is summarized. It consists of three tabs: *View*, *Object*, *Selections*.

The *View* tab contains all parameters that determine the overall look of the window (like size, scaling, axis, etc.) as well as the visualization of the actual data (color table, markers, smoothing, ...). Therefore, many of its parameters can also be found in the *View* tab of the main menu.

It can be used to drastically change the overall look of the results *VirtualLab Fusion* provides. For a deep dive on how to modify *Data Arrays* to fit certain visual requirements, please have a look on: [How to Format VirtualLab Fusion Results](#).
The Object tab incorporates numerical parameters like sampling points, physical units and coordinate settings. Unlike the View tab, this parameters cannot be changed inside the Property Browser.

The Selections tab summarizes parameters from any given marker, such as start- and end-point.
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| further reading        | - View Settings for 2D Data Arrays
- General Manipulation Tools for Data Arrays
- Graphics Add-ons
- Universal Detector |