

Tutorial 337 (2.0)

Introduction to the Data Array Import

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Requirements: VirtualLab™ 5.5.0 – all but Diffractive Optics
Toolbox

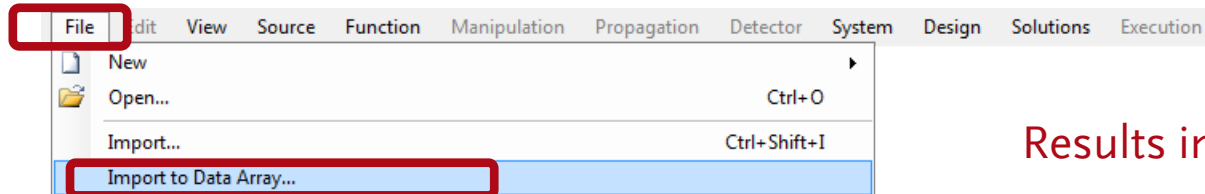
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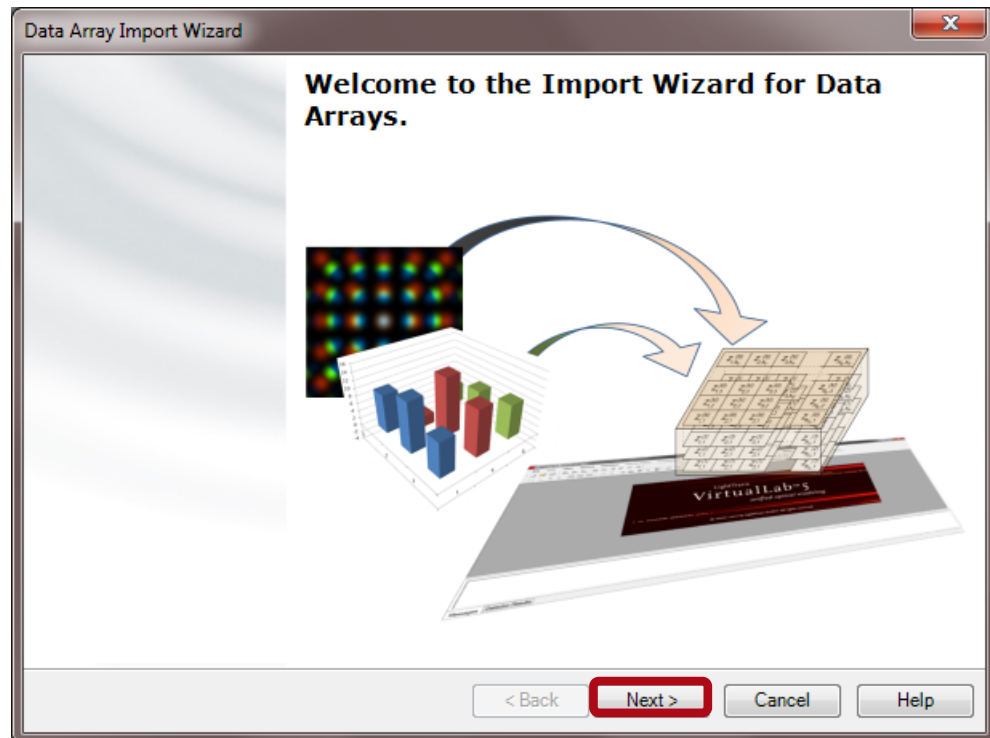
Data Arrays in VirtualLab™

- For a lot a purposes, it is necessary to import text data or image data, originating from various sources, into VirtualLab™.
- A very flexible object to be filled with that data is the so called Numerical Data Array.
- This tutorial explains how to import text and image data (which has to be in a pixelated / bitmap format) into such a Numerical Data Array.
- The user is guided through the whole process by a wizard dialog which is described in the following pages.

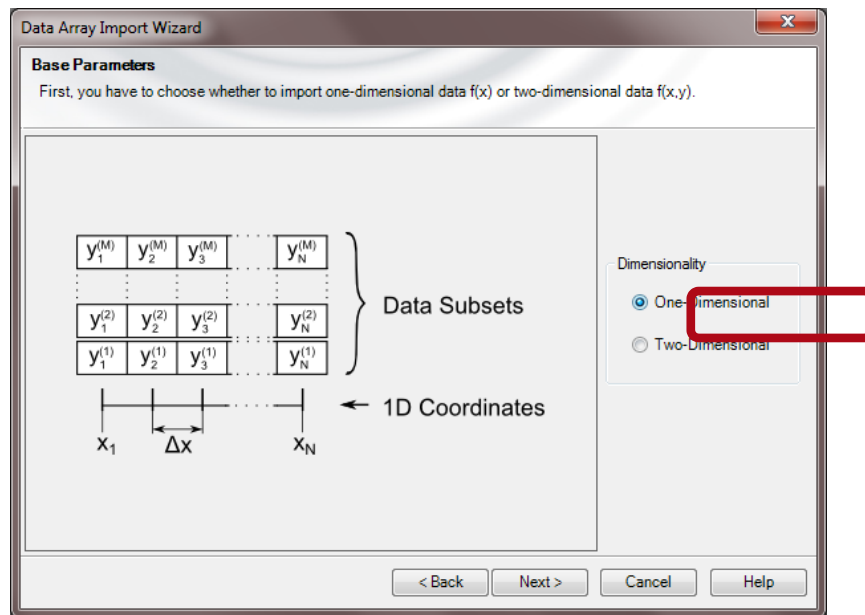
Start Data Array Import



Results in

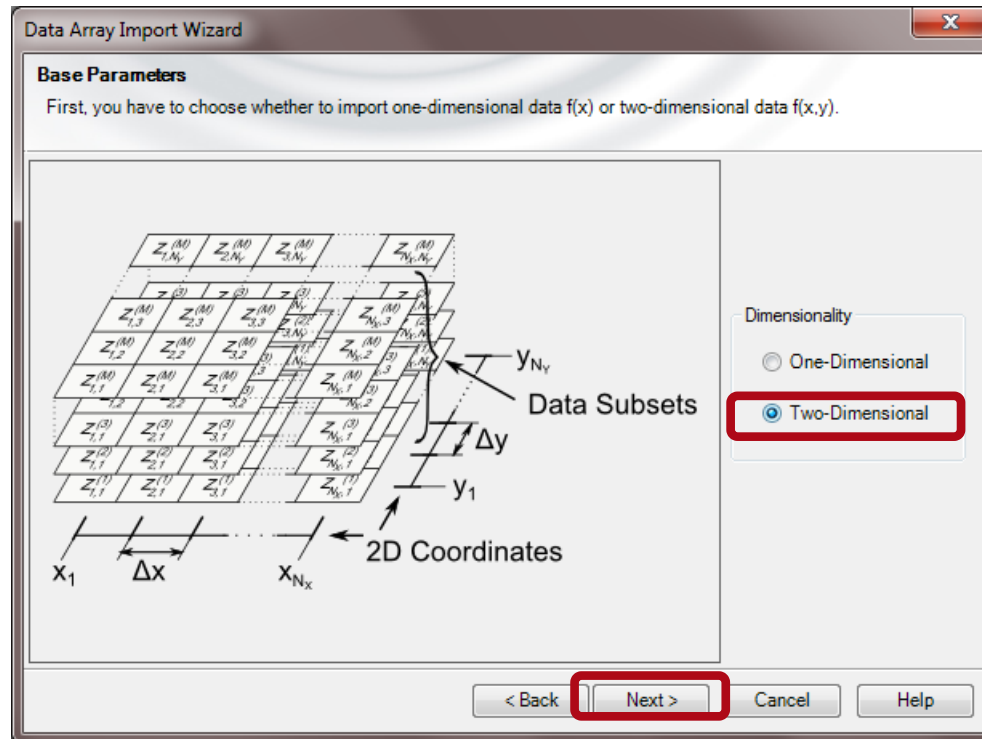


Select Data Array Type



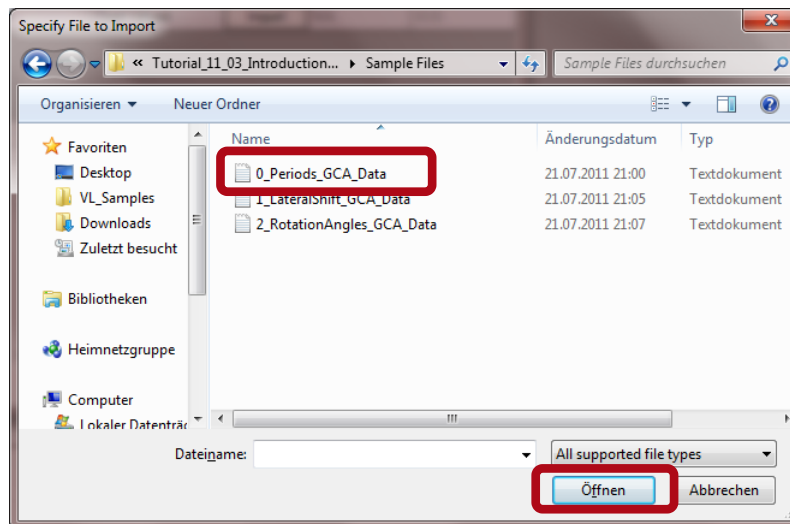
- The first page can be used to configure whether 1D or 2D data array shall be imported.
- The data array can contain several subsets over a common list of coordinates.

Select Data Array Type



Select File for First Data Subset

- The data which are stored in a file have to be selected for the import now.
- The following file formats are available:
 - txt, csv, ... (text files)
 - jpg, bmp, ... (bitmap files)

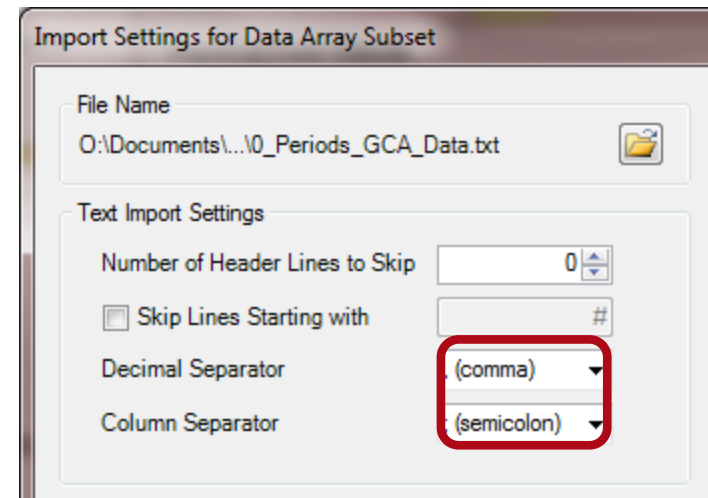


Results in



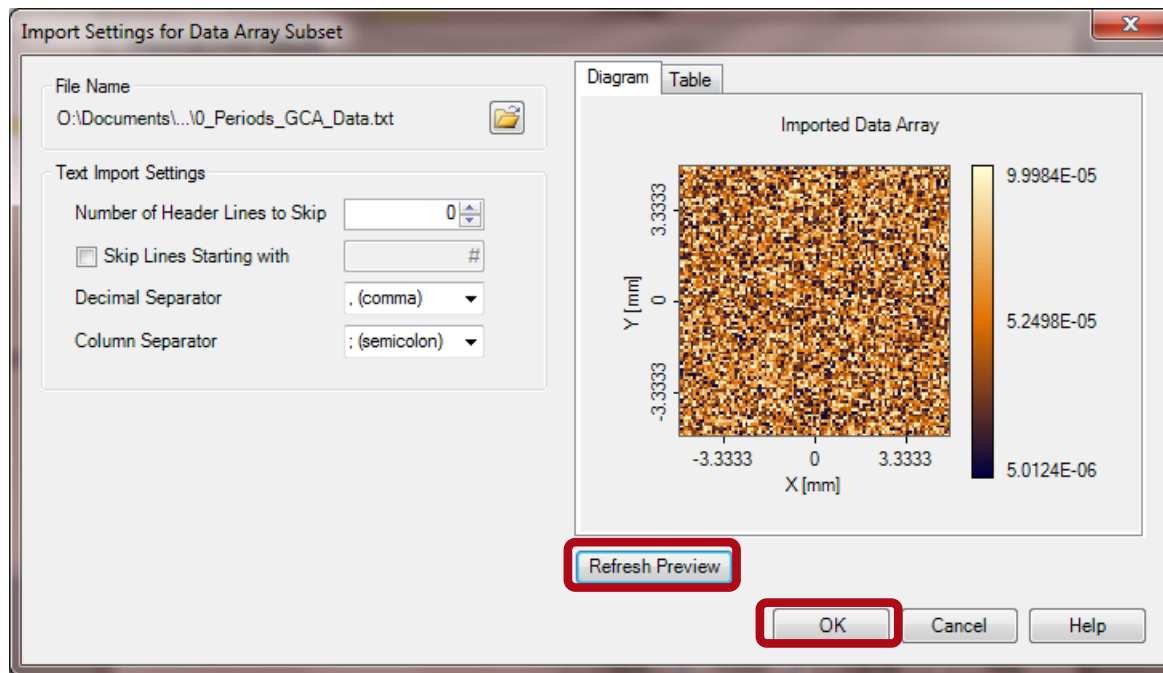
Text File Import Options

- After selecting a file, the import parameters can be specified.
- For text files, these parameters are:
 - a number of header lines,
 - whether to skip header lines,
 - the decimal separator,
 - the column separator



Import Dialog: Preview

- After specifying the import parameters the user can trigger a preview of the imported data.

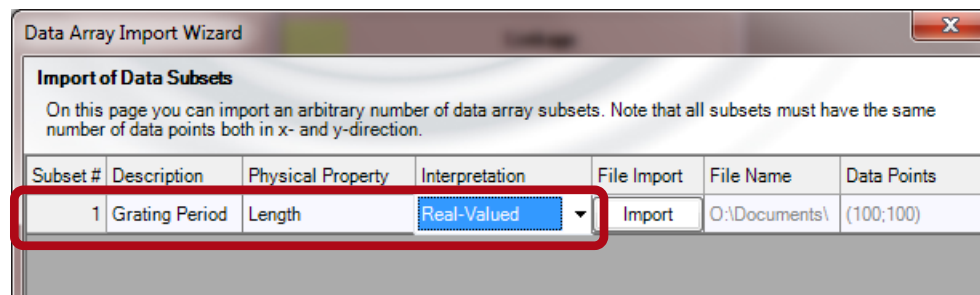


Results in



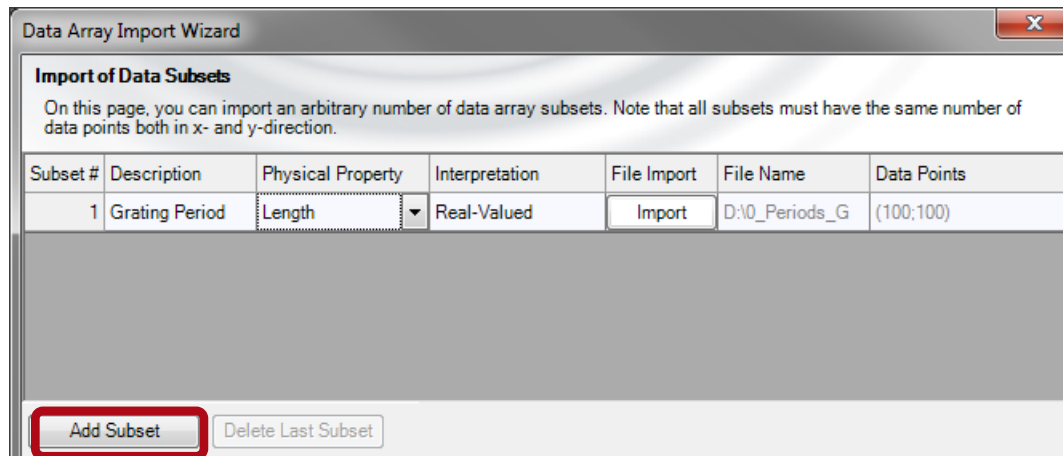
Import Wizard: Data Subsets

- The import wizard allows to define the following additional parameters for each data subset:
 - Description – this will be the subset's name-
 - Physical Property – this will set the physical interpretation of the imported data
 - The numerical interpretation of the data. It can be set to Real-Valued or to one of the complex value options (in this case two different files for input need to be specified).



Add Data Subsets

- By pressing the Add Subset button, a new subset can be added.
- The user has to select the import file for the next data subset and to specify the import parameters.
- The last subset can be deleted, respectively.



Data Array Import Wizard

Import of Data Subsets

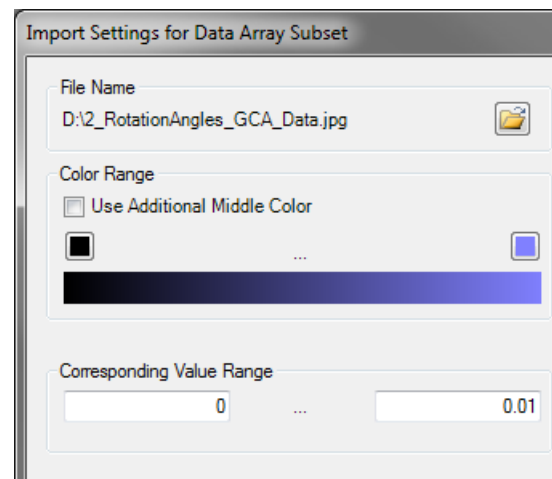
On this page, you can import an arbitrary number of data array subsets. Note that all subsets must have the same number of data points both in x- and y-direction.

Subset #	Description	Physical Property	Interpretation	File Import	File Name	Data Points
1	Grating Period	Length	Real-Valued	Import	D:\0_Periods_G	(100;100)

Add Subset **Delete Last Subset**

Bitmap File Import Options

- After selecting a jpeg file, import parameters have to be specified again.
- For bitmap files, these parameters are:
 - a color range which maps the image's pixel values to floating point values
 - whether this range uses an additional middle color
 - the floating point range the colors are mapped to



Subset Parameters, again

- For the new subset, the parameters have to be set too.
- After importing all file data, proceed with Next.

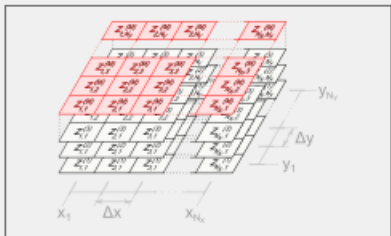
Data Array Import Wizard

Import of Data Subsets

On this page, you can import an arbitrary number of data array subsets. Note that all subsets must have the same number of data points both in x- and y-direction.

Subset #	Description	Physical Property	Interpretation	File Import	File Name	Data Points
1	Grating Period	Length	Real-Valued	Import	D:\0_Periods_G	(100;100)
2	Rotation Angle	Angle (Deg)	Real-Valued	Real-Valued	D:\2_RotationAn	(100;100)

Add Subset Delete Last Subset



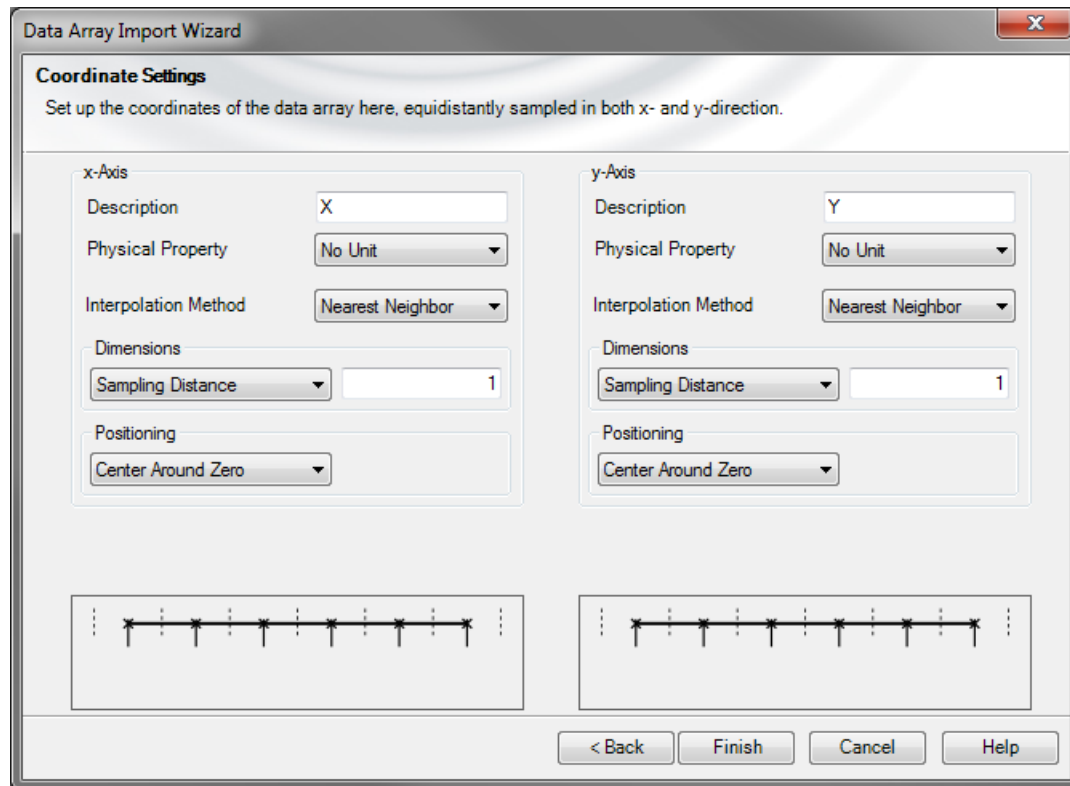
< Back **Next >** Cancel Help

Results in



Coordinate Setup

- The coordinates have to be configured now.
- For two dimensional data arrays the coordinates for x and y axis can be configured separately.



The image shows a software dialog box titled "Data Array Import Wizard" with a close button (X) in the top right corner. The main section is titled "Coordinate Settings" and contains the instruction: "Set up the coordinates of the data array here, equidistantly sampled in both x- and y-direction."

The settings are organized into two columns for the x-axis and y-axis.

x-Axis Settings:

- Description: X
- Physical Property: No Unit
- Interpolation Method: Nearest Neighbor
- Dimensions: Sampling Distance (dropdown) and 1
- Positioning: Center Around Zero

y-Axis Settings:

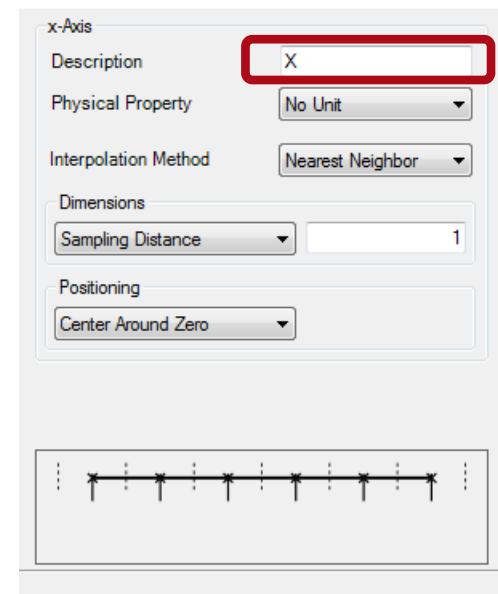
- Description: Y
- Physical Property: No Unit
- Interpolation Method: Nearest Neighbor
- Dimensions: Sampling Distance (dropdown) and 1
- Positioning: Center Around Zero

Below the settings, there are two visual representations of the coordinate axes. Each shows a horizontal line with vertical tick marks and arrows at both ends, indicating the range of the axis.

At the bottom of the dialog, there are four buttons: "< Back", "Finish", "Cancel", and "Help".

Coordinates: Description

- The user can specify the description of the axis.
- The description can be an arbitrary string that helps to give the coordinate axis a physical meaning.
- In this tutorial, **X** and **Y** are used as description of the axes.



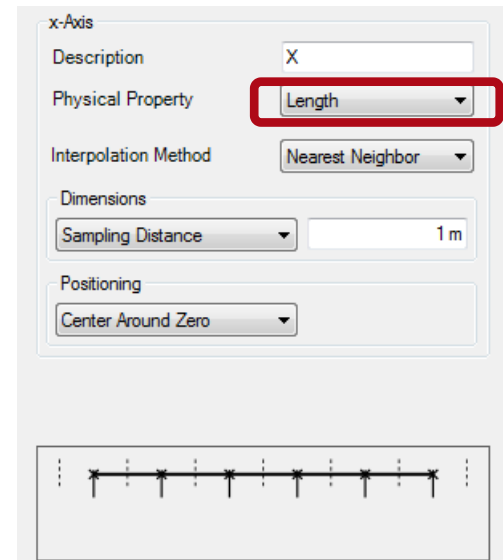
The image shows a configuration panel for an 'x-Axis'. The panel has a title 'x-Axis' at the top left. Below it are several settings:

- Description:** A text input field containing the letter 'X', which is highlighted with a red rectangular border.
- Physical Property:** A dropdown menu with 'No Unit' selected.
- Interpolation Method:** A dropdown menu with 'Nearest Neighbor' selected.
- Dimensions:** A section containing a 'Sampling Distance' dropdown menu and a text input field with the value '1'.
- Positioning:** A dropdown menu with 'Center Around Zero' selected.

At the bottom of the panel is a visual representation of the axis: a horizontal line with several tick marks and arrows at both ends, enclosed in a box.

Coordinates: Physical Property

- It is possible to specify a physical unit for each available axis.
- Typical properties are:
 - Length
 - No Unit
 - Angle (Deg)
 - ...
- For this tutorial, **Length** is used for both the x and y axis.



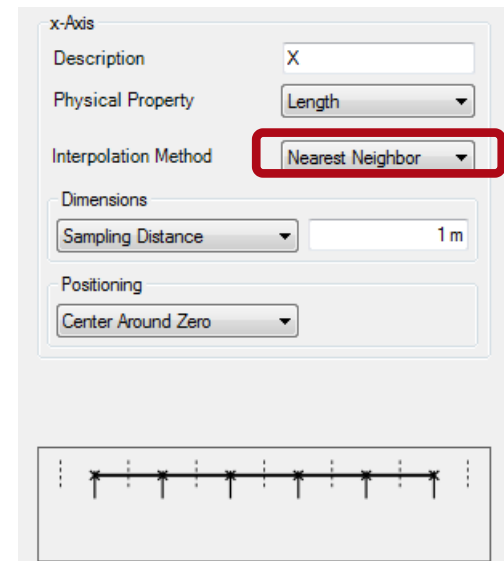
The image shows a configuration panel for the 'x-Axis'. It includes several settings:

- Description:** A text field containing 'X'.
- Physical Property:** A dropdown menu with 'Length' selected. This dropdown is highlighted with a red rectangular border.
- Interpolation Method:** A dropdown menu with 'Nearest Neighbor' selected.
- Dimensions:** A section containing a 'Sampling Distance' dropdown and a text field with '1 m'.
- Positioning:** A dropdown menu with 'Center Around Zero' selected.

At the bottom of the panel, there is a visual representation of the axis as a horizontal line with several tick marks and vertical dashed lines extending from the ends.

Coordinates: Interpolation Method

- The interpolation method for each axis of the data array can be configured.



The image shows a configuration panel for the x-Axis. It includes several settings: Description (X), Physical Property (Length), Interpolation Method (Nearest Neighbor, highlighted with a red box), Dimensions (Sampling Distance, 1 m), and Positioning (Center Around Zero). At the bottom, there is a visual representation of the axis with tick marks.

x-Axis

Description: X

Physical Property: Length

Interpolation Method: Nearest Neighbor

Dimensions

Sampling Distance: 1 m

Positioning

Center Around Zero

Coordinates: Sampling Distance

- At the moment, only equidistant data arrays are supported.
- The dimensions in one direction can be specified by either giving a sampling distance or an array size.

x-Axis

Description

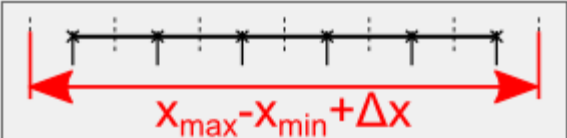
Physical Property

Interpolation Method

Dimensions

☒ Includes complete first and last interval

Positioning



The diagram illustrates a 1D coordinate system with a horizontal axis. It shows a series of vertical tick marks representing sampling points. A red double-headed arrow spans the distance from the first to the last tick mark, labeled with the formula $x_{\max} - x_{\min} + \Delta x$.

Coordinates: Start Coordinate

- The coordinate position of the Data Array can be specified either by giving a Start Coordinate or by defining the coordinate range as being centered around zero.

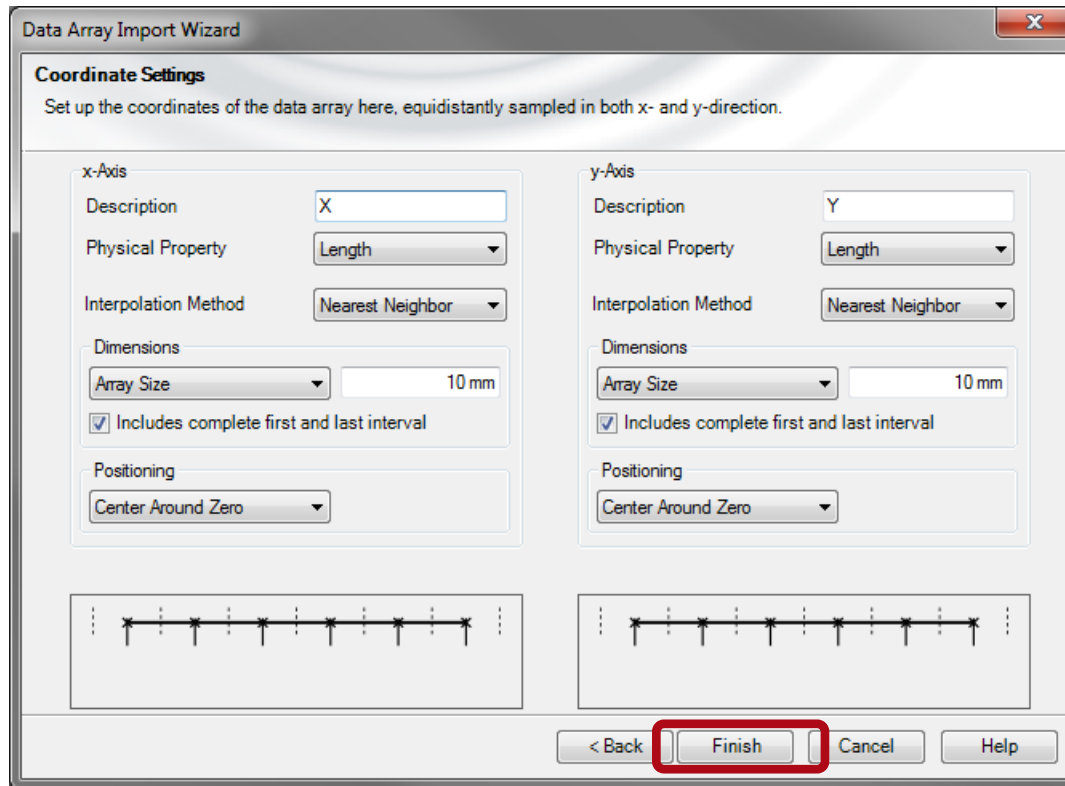
The image shows a software interface for configuring an x-axis. The panel is titled 'x-Axis' and contains several settings:

- Description:** A text field containing 'X'.
- Physical Property:** A dropdown menu set to 'Length'.
- Interpolation Method:** A dropdown menu set to 'Nearest Neighbor'.
- Dimensions:**
 - Array Size:** A dropdown menu and a text field showing '10 mm'.
 - ☒ Includes complete first and last interval
- Positioning:** A dropdown menu set to 'Center Around Zero', which is highlighted with a red rectangle.

Below the settings is a visual representation of the x-axis. It shows a horizontal line with tick marks. A red vertical line is drawn at the center of the axis, with a red '0' below it, indicating the center point.

Finalize Data Array Import

- After the definition of coordinate settings, the import process can be finished.



The image shows a 'Data Array Import Wizard' dialog box with a 'Coordinate Settings' tab. The dialog is divided into two columns for 'x-Axis' and 'y-Axis'. Each column contains the following settings: 'Description' (X for x-Axis, Y for y-Axis), 'Physical Property' (Length), 'Interpolation Method' (Nearest Neighbor), 'Dimensions' (Array Size set to 10 mm, with a checked box for 'Includes complete first and last interval'), and 'Positioning' (Center Around Zero). Below the settings are two visual representations of the data arrays as horizontal lines with tick marks. At the bottom, there are four buttons: '< Back', 'Finish' (highlighted with a red rectangle), 'Cancel', and 'Help'.

Results in



Result of Data Array Import

- The resulting Numerical Data Array will be displayed and can be processed with further VirtualLab™ operations.

