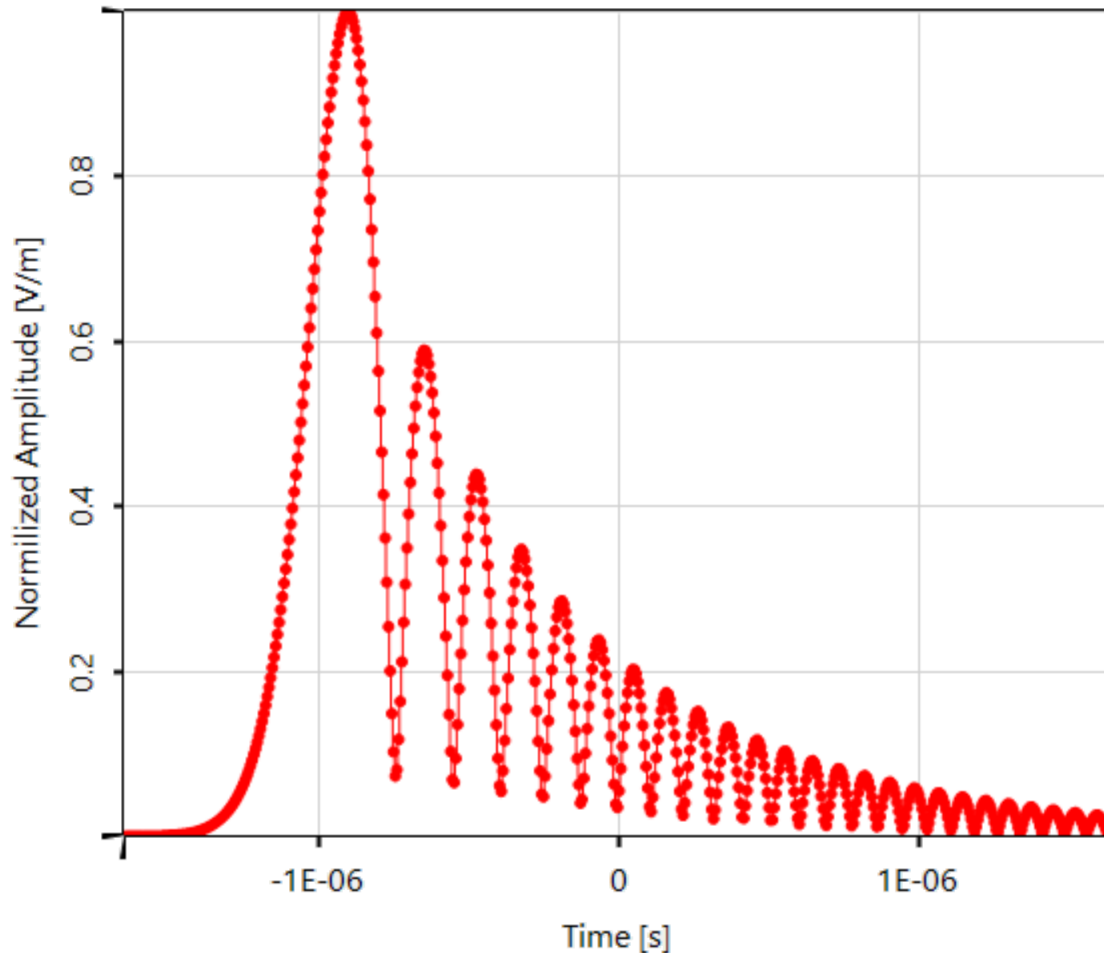


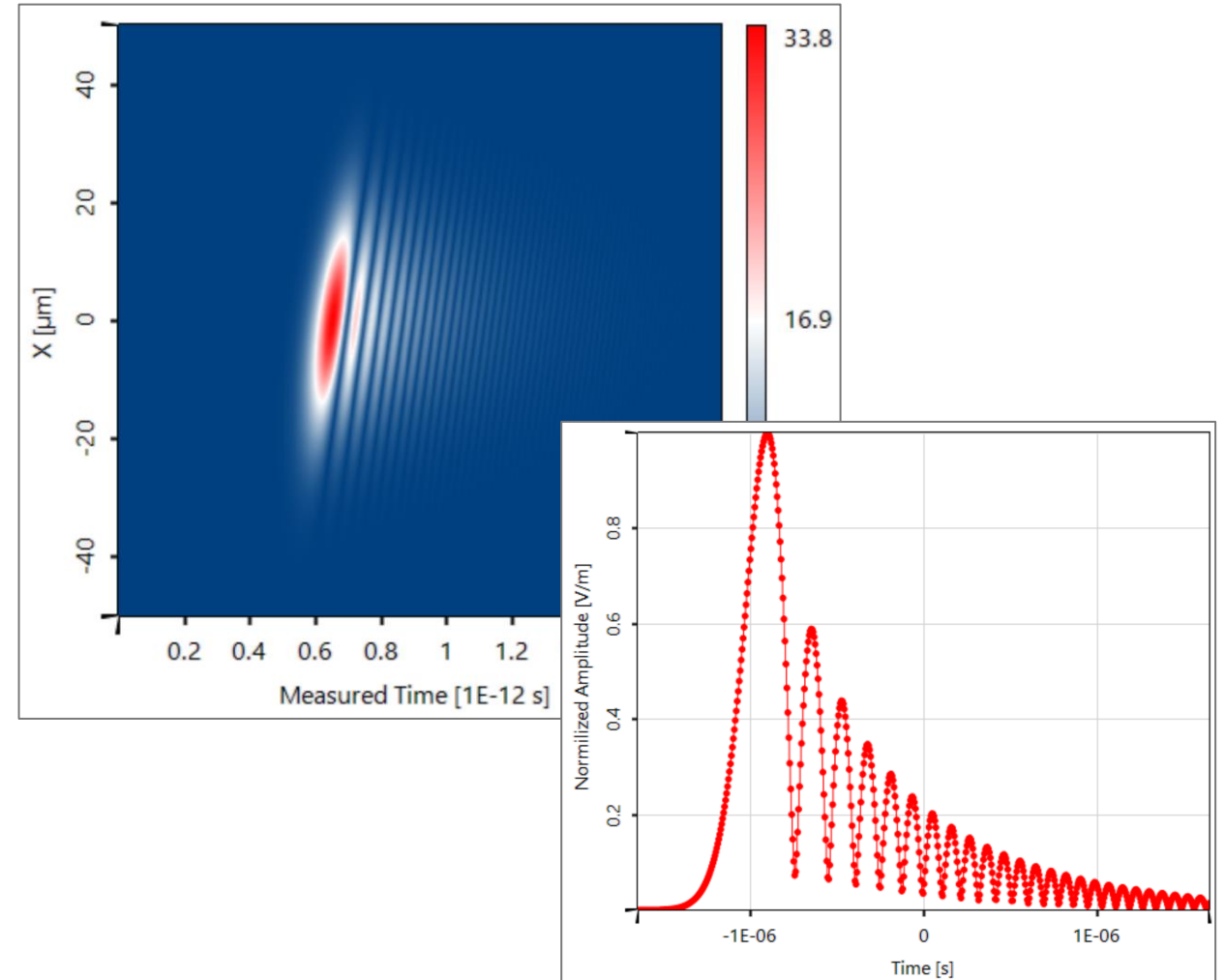
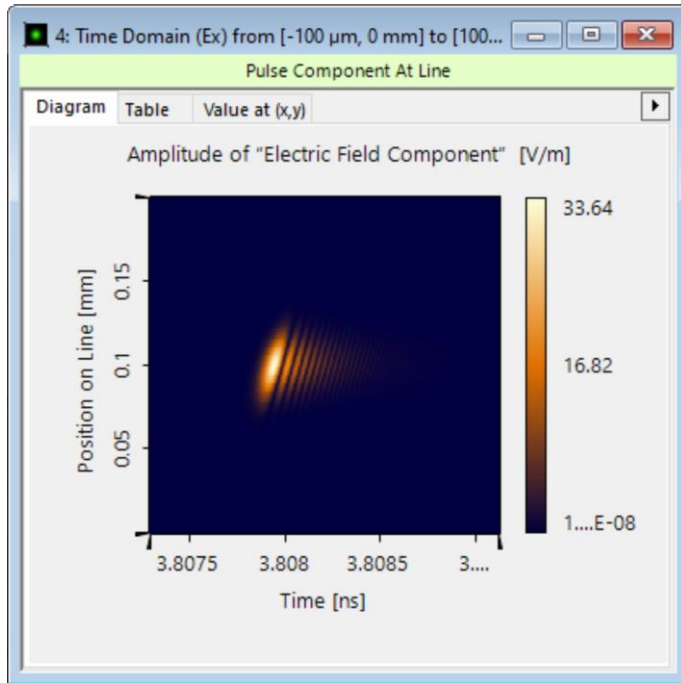
How to Format VirtualLab Fusion Results

Abstract



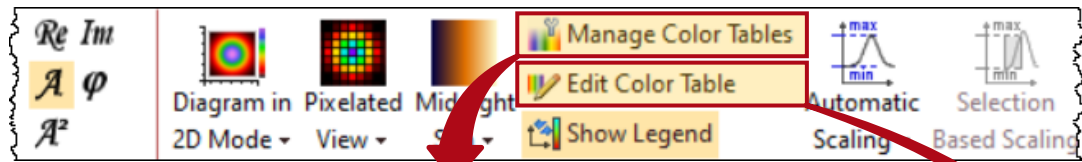
While providing handy tools to obtain fast and accurate results for a desired optical task is the main purpose of any optical simulation software, the value of a versatile post processing should not be underestimated. The adaption of the appearance of the resulting data enables to either fit specific requirements for a publication in a journal or reports, but moreover to emphasize and highlight interesting aspects of the results. In this Use Case different options for the customization of detector results in VirtualLab Fusion are demonstrated. These tools can be utilized for usual 2D field representations, but also for 1D cross-sectional data and multi-graphs.

This Use Case Shows

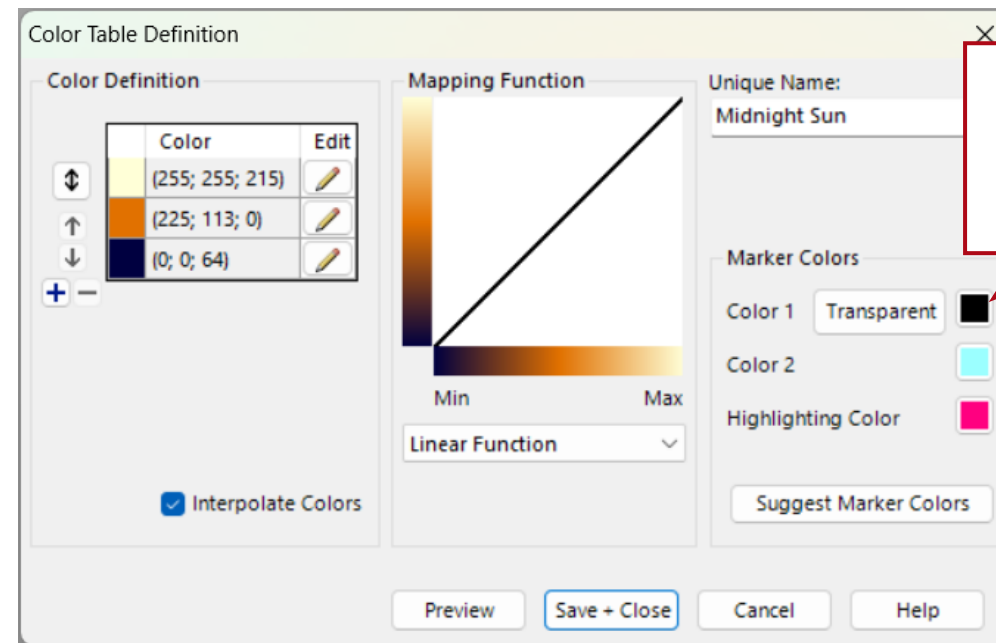
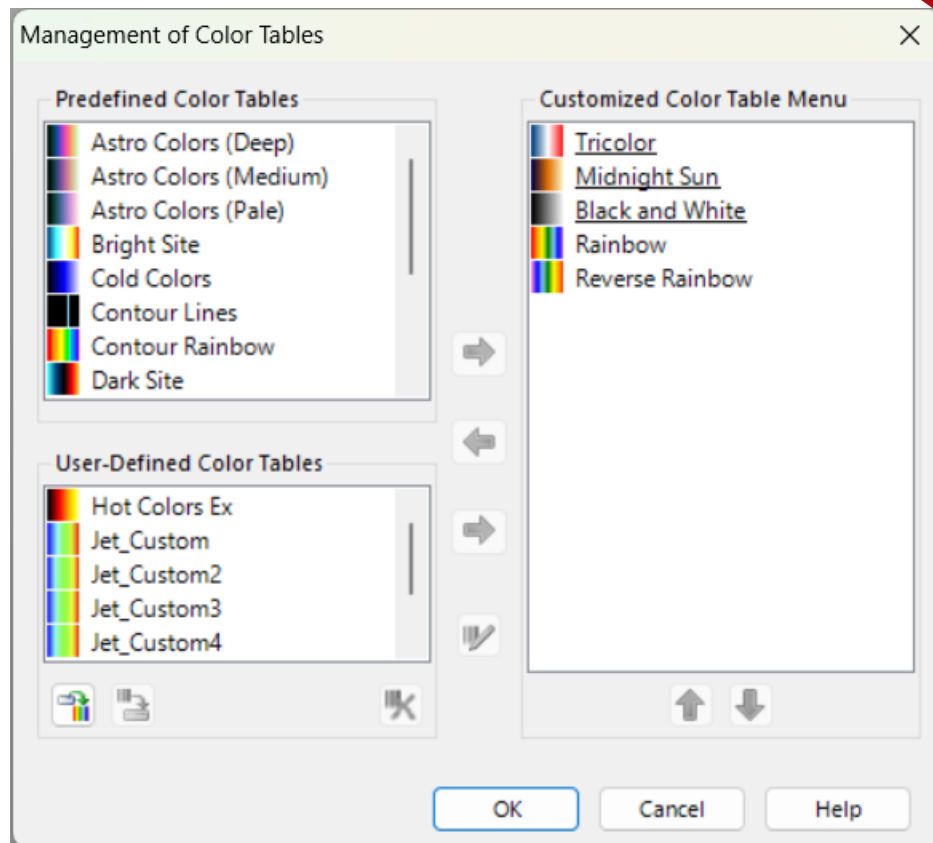


How to customize 1D and 2D figures in VirtualLab Fusion.

Color Schemes

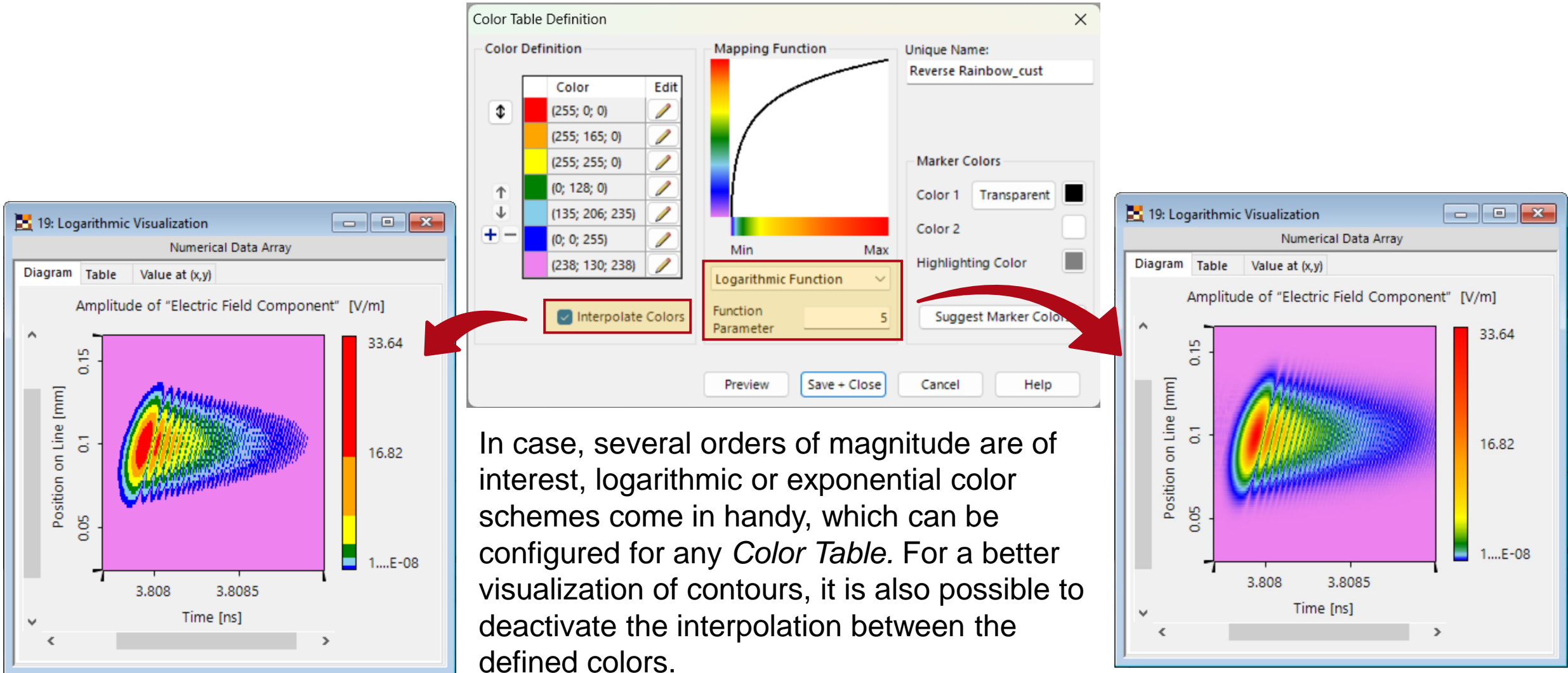


In the tab *Manipulations* of the menu ribbon, the user can choose from a selection of different color schemes for the depiction of 2D data. It is also possible to adapt the existing schemes or to define a customized ones.



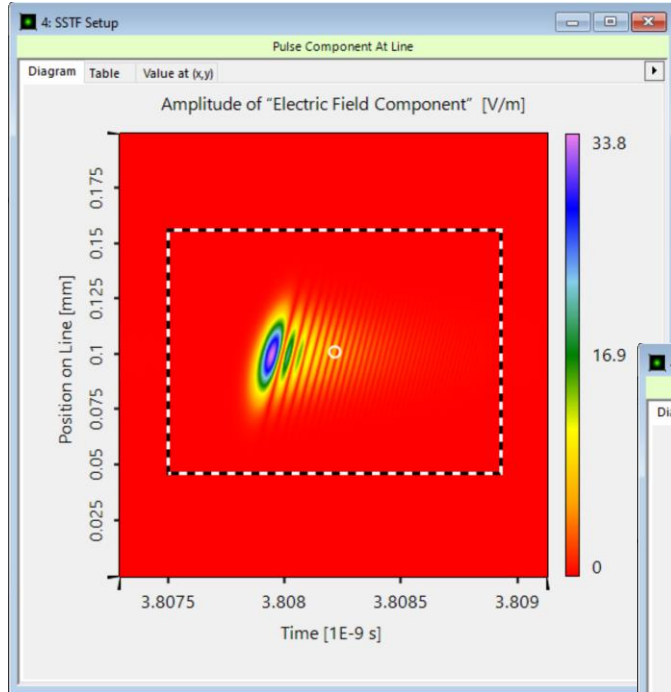
Marker Colors can also be defined per color table.

Logarithmic & Exponential Color Tables

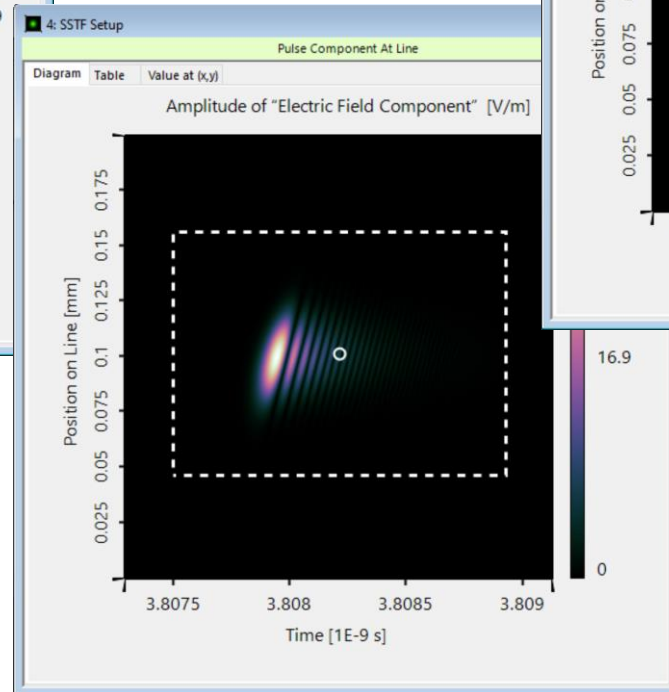


In case, several orders of magnitude are of interest, logarithmic or exponential color schemes come in handy, which can be configured for any *Color Table*. For a better visualization of contours, it is also possible to deactivate the interpolation between the defined colors.

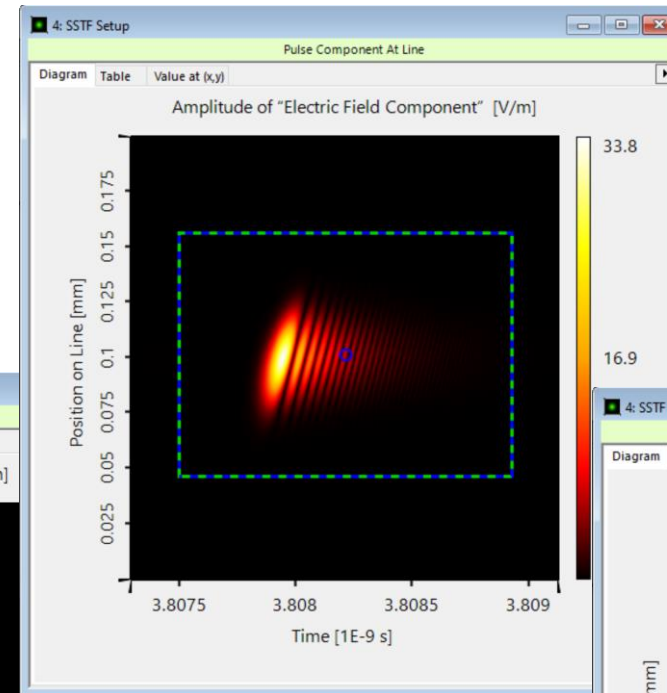
Examples for Color Schemes



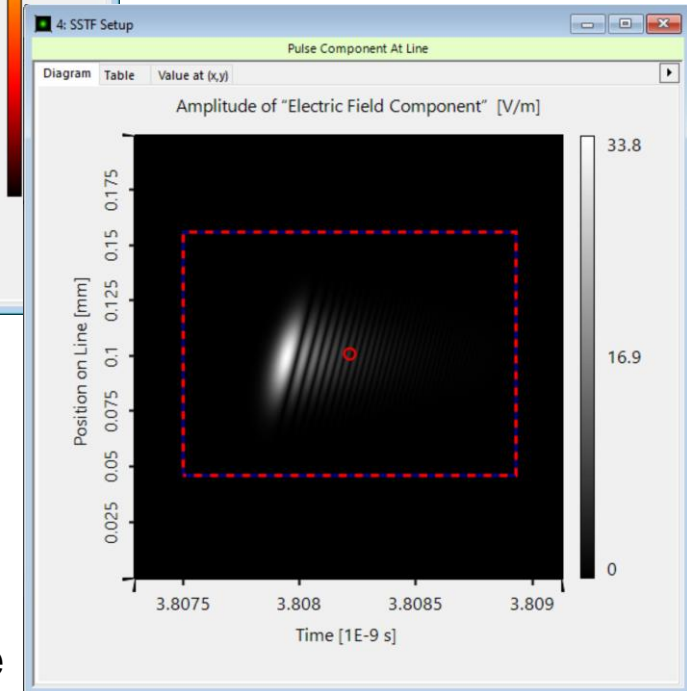
Reverse Rainbow



Astro Colors

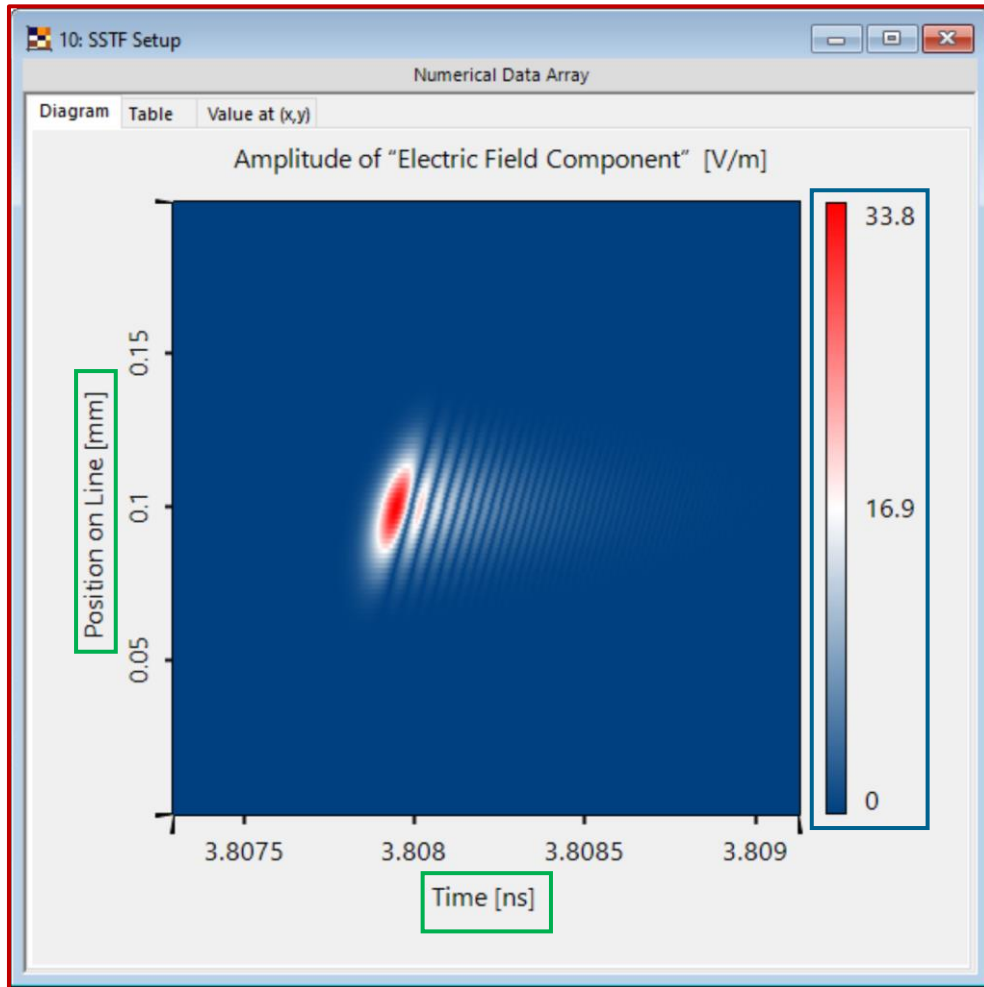


Hot Colors



Black & White

Scaling and Axis Configuration



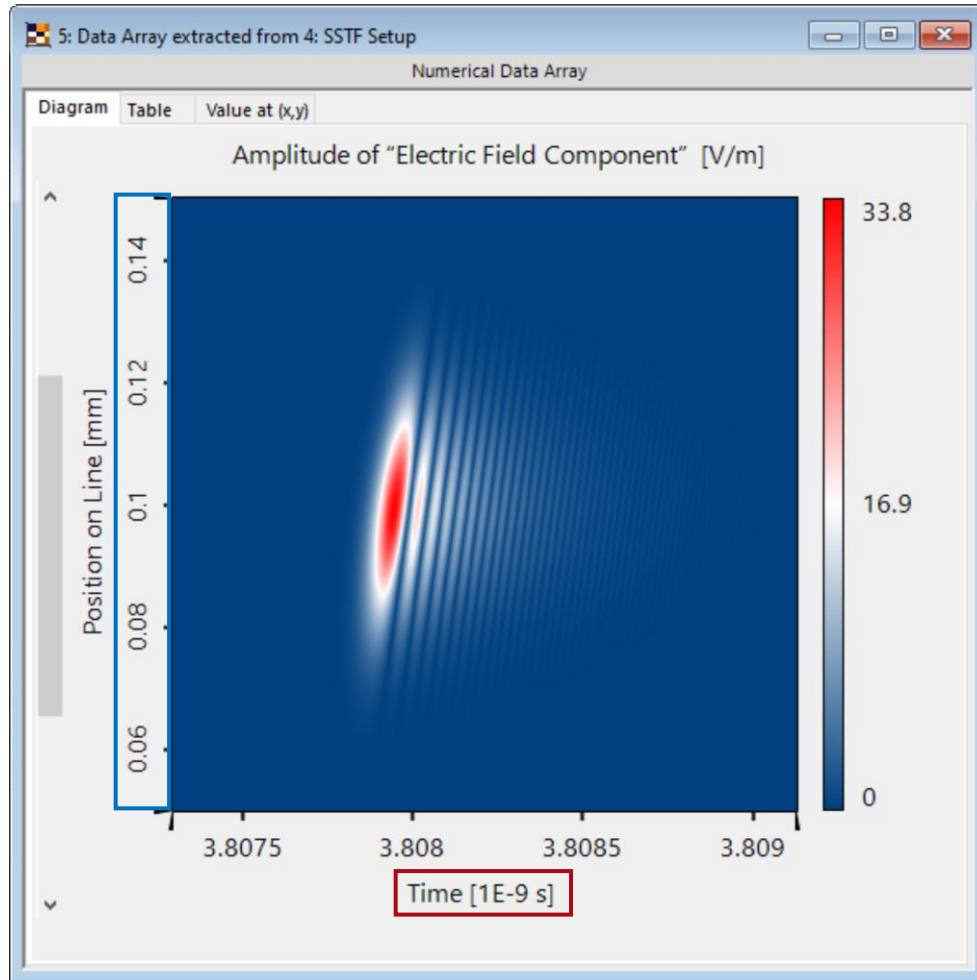
The Property Browser shows the following settings for the selected object:

- General**
 - Window Size (Width, Height): 600, 600
 - Data Restricted Zoom:
 - Zoom Factor: (214.69 px/ps, 1.935 px/μm)
- Colors**
 - Color Table: Tricolor
- Data**
 - Field Quantity: Amplitude
 - Format of Color Scale: Engineering
 - Auto Scaling of Data:
 - Displayed Data Range: [0.019317 μV/m; 33.74 V/m]
 - View Interpolation: Pixelated View
- Labels**
 - Font Size of Axis Labels: 10
 - Font Size of Title: 10
- Selection (General)**
 - Selection Mode: Rectangle or Ellipse
- Selection (Line)**
 - Display Line Marker:
- Selection (Point)**
 - Display Point Marker:
- Selection (Region)**
 - Show Rectangle or Ellipse...:
- View Mode**
 - 3D Mode:

In the *Property Browser* the user can configure various parameter like the size of the overall window and the used fonts. Moreover, the displayed data range of the color scheme can be adjusted here.

All these parameters can be pre-set in the *Global Options*.

Configuration of Axes



Selection (General)
Selection Mode: Rectangle or Ellipse

Selection (Line)
Display Line Marker:

Selection (Point)
Display Point Marker:

Selection (Region)
Show Rectangle or Ellipse...:

View Mode
3D Mode:

X-Axis
Description: Time
x-Axis Range: [3.8073 ns; 3.8091 ns]
Minimum Number of Ticks: 2
Format of x-Axis: Engineering

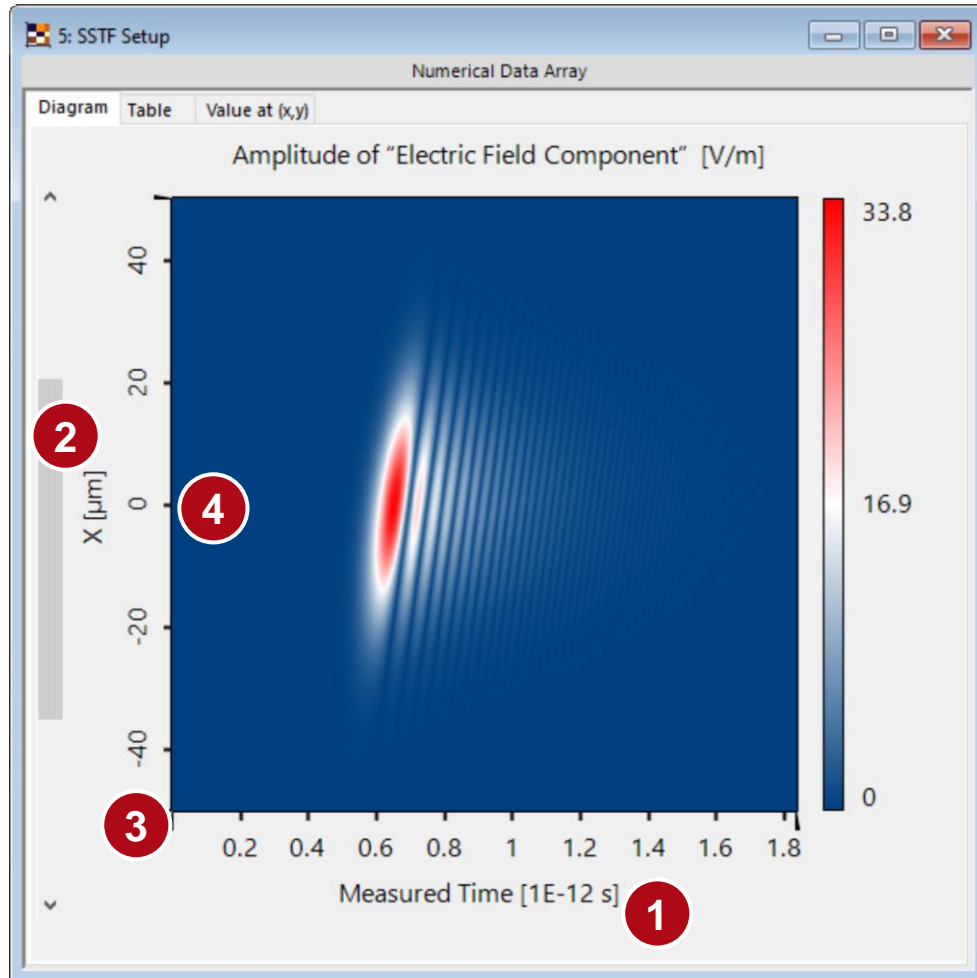
Y-Axis
Description: Position on Line
y-Axis Range: [-632.91 nm; 199.37 μm]
Minimum Number of Ticks: 2
Format of y-Axis: Engineering

Property Browser VirtualLab Explo... Assistant Distributed Co...

Furthermore, parameters like the format of the axes and the minimum number of displayed ticks can be adapted. For the format of the axes, three different options are available:

- *Standard*: The numbers are shown as usual.
- *Scientific*: Powers of ten are used to make to highlight the magnitude and to reduce the number shown zeros.
- *Engineering*: SI prefixes are used to reduce the displayed zeros.

Coordinate and Interpolation Settings



Edit Coordinate and Interpolation Settings

x-Axis 1

Description Measured Time

Physical Property Time

Interpolation Method Cubic 4 Point

Dimensions

Sampling Distance 1.5712 fs

Positioning

Start Coordinate 3.8073 ns 3

y-Axis 2

Description X

Physical Property Length

Interpolation Method Cubic 4 Point

Dimensions

Sampling Distance 1.2658 μm

Positioning

Start Coordinate 0 mm 4

Coordinate and Interpolation Settings

Edit Subsets

Array - Array Operations

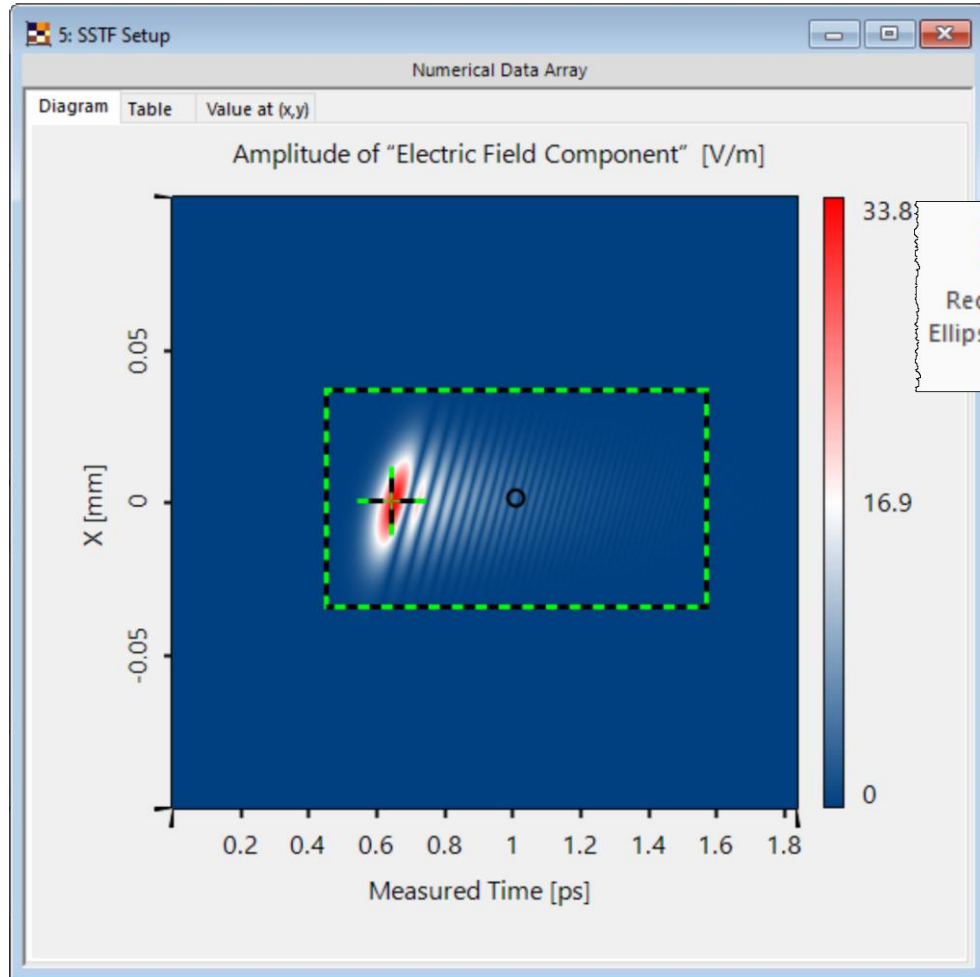
Extrapolation Mode: Zero

Outside Values are Zero

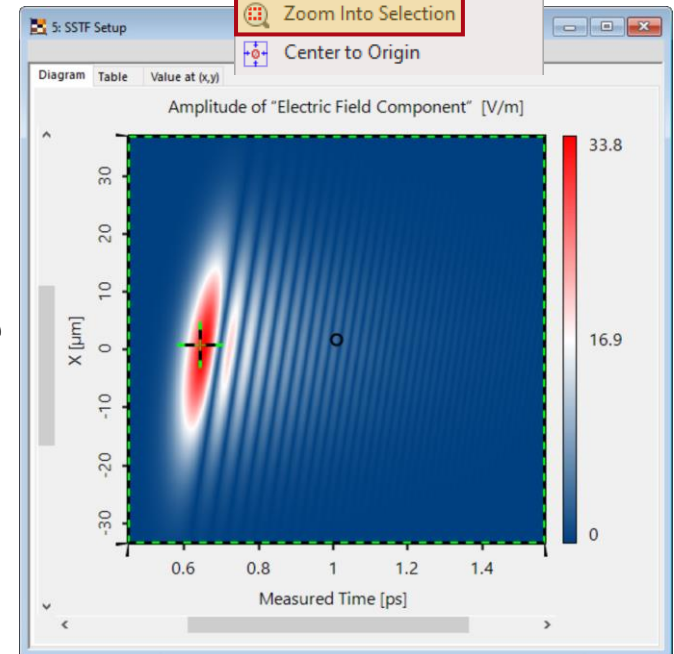
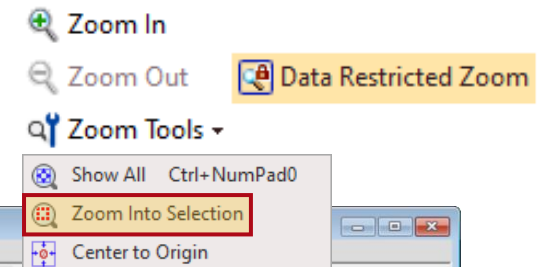
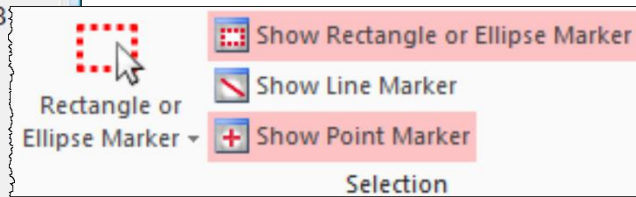
OK Cancel Help

More advanced options for the control of the axes are provided by the *Coordinate and Interpolation Settings*, which can be found in the *Manipulations* menu. Here, the user can rename the axes, change the physical unit and adjust the sampling according to the requirements.

Point and Rectangle Markers

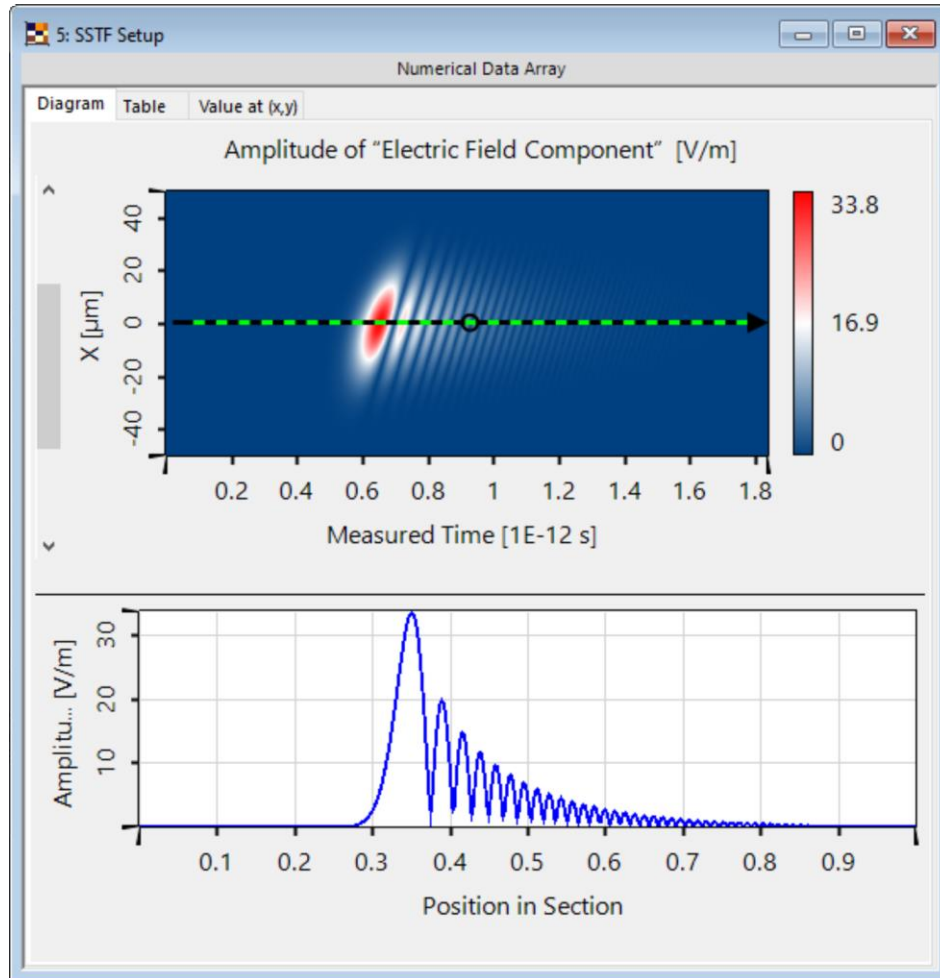


Point, Line and Rectangle or Ellipse Markers can be found in the *View* tab to select specific parts of the result data for further investigation.



If e.g. a *Rectangle Marker* is applied, new options will appear like the ability to zoom directly into the selected area.

1D Cross-Sectional Selection / Line scan



The screenshot shows the 'Settings for the Line Extraction' dialog box and the 'Selection Related Operations' menu. The dialog box has the following settings:

- No. of Data Points to Extract: 1161
- Interpolation Method for Extraction: Method of Source Array, Nearest Neighbor / Constant Interval
- Parameters of Result: Try to Keep Coordinate and Interpolation Settings
- New Axis Description: Position in Section
- New Physical Property of Axis: No Unit
- New Coordinate Positioning: Center Around Zero
- New Interpolation Method: Cubic 4 Point

The 'Selection Related Operations' menu is open, showing the following options:

- Fill Rectangular Selection
- Clear Rectangular Selection
- Clear Inverse of Rectangular Selection
- Extract Rectangular Selection
- Extract Equidistant 1D Data Along Selected Line
- Extract Subset Data at One Point
- Extract Cross Profile at Point
- Normalize According to Rectangular Selection
- Remove Phase Dislocations in Rectangular Selection

A red arrow points to the 'Extract Equidistant 1D Data Along Selected Line' option in the menu.

If a *Line Marker* is applied, the corresponding 1D array will be displayed right below the initial document. With the option *Extract Equidistant 1D Data Along Selected Line* an individual document can be created.

Lines and Symbols of 1D Graphs

Property Browser

27: Extracted 1D Data Array (26)

View Object Selections

General

- Transposed View
- Window Size (Width,...) 601, 600
- Data Restricted Zoom
- Zoom Factor 4.0019e+08 px/unity

Data

- Field Quantity Amplitude
- View Interpolation Pixelated View

Labels

- Font Size 10

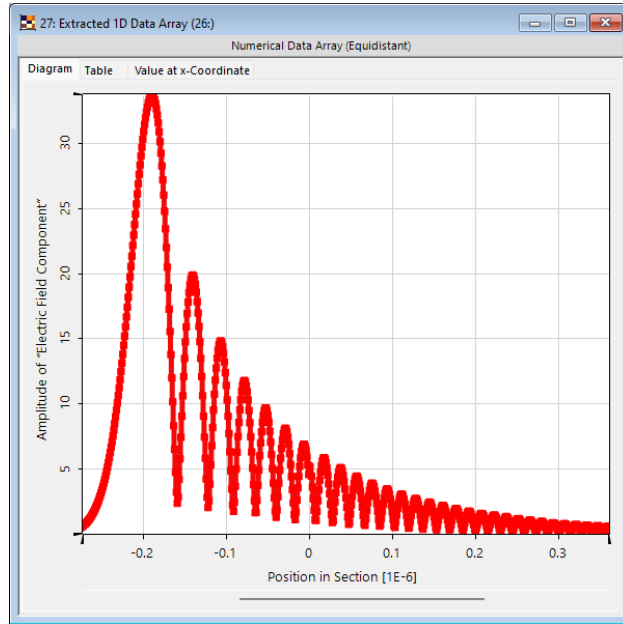
Lines and Symbols

- Line Color Blue
- Line Thickness 2
- Use Smoothed Graphics
- Symbol Shape <No Symbol>

Selection (General)

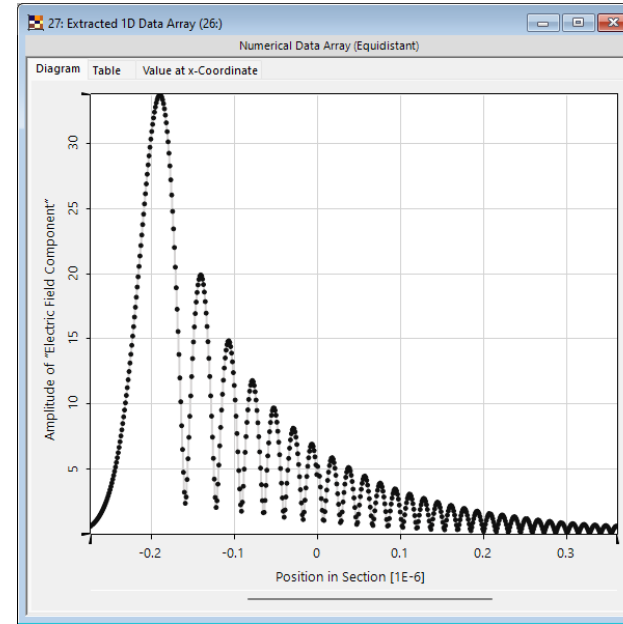
- Selection Mode Range

Selection (Point)



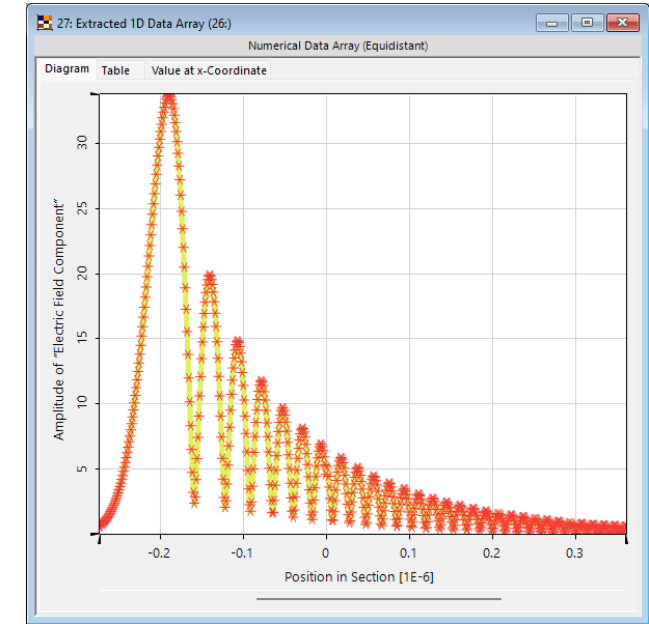
Lines and Symbols

- Line Color Red
- Line Thickness 5
- Use Smoothed Graphics
- Symbol Shape Filled Square
- Symbol Color Red
- Symbol Scaling Factor 1.5



Lines and Symbols

- Line Color Light Gray
- Line Thickness 2
- Use Smoothed Graphics
- Symbol Shape Dot
- Symbol Color Black
- Symbol Scaling Factor 1

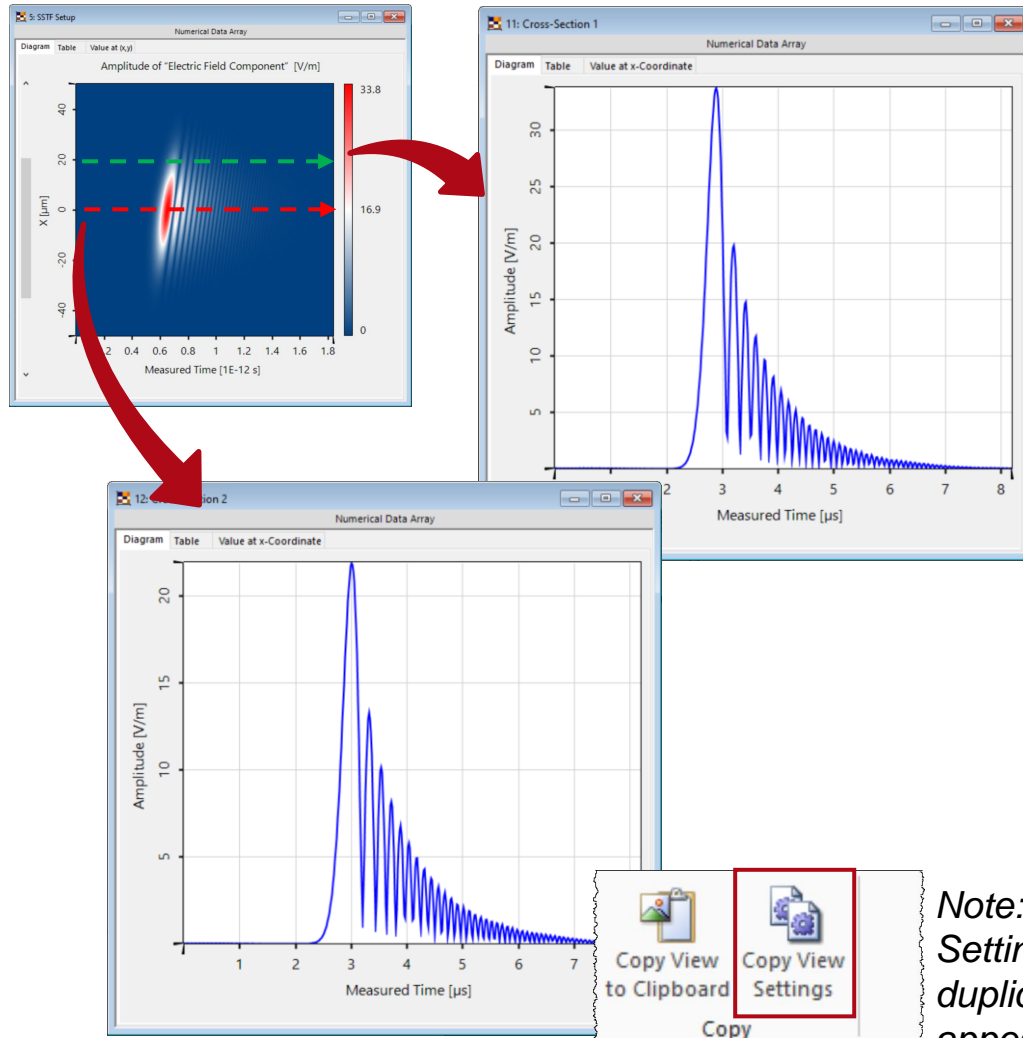


Lines and Symbols

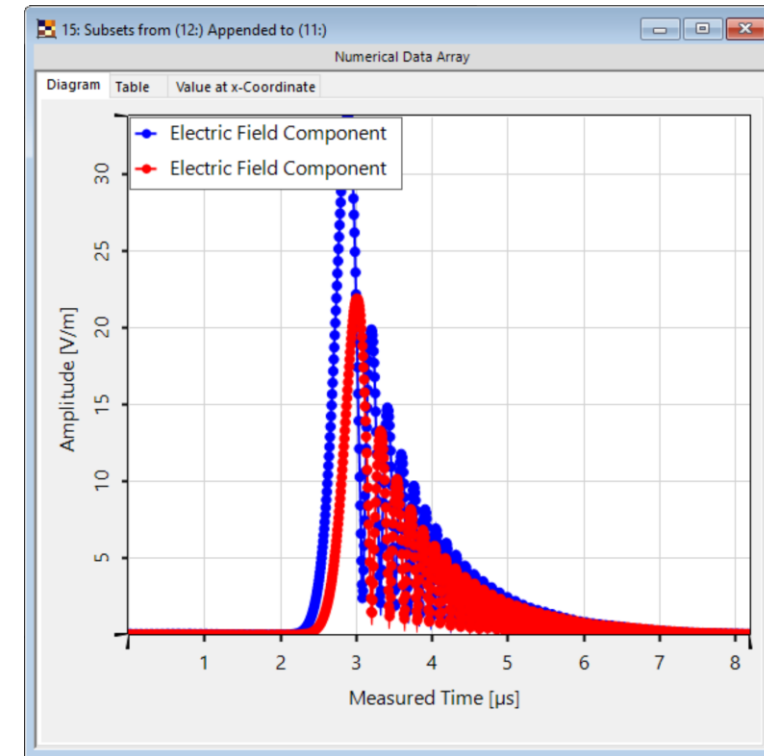
- Line Color Khaki
- Line Thickness 5
- Use Smoothed Graphics
- Symbol Shape Star
- Symbol Color Crimson
- Symbol Scaling Factor 2

In case of 1D data, it is possible to utilize symbols to indicate the actual sampling points in the curve. Their appearance can be adjusted in the *Property Browser*.

Generation of a Multigraph Document



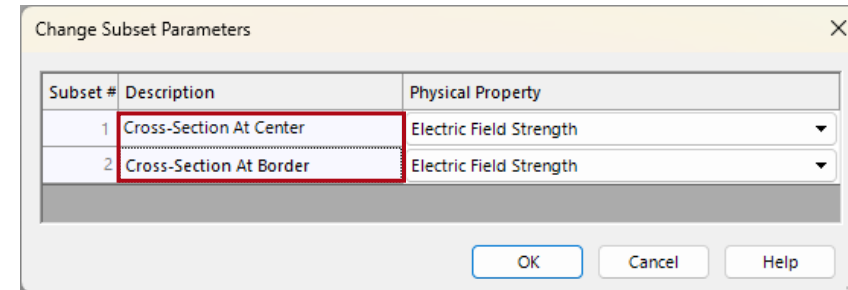
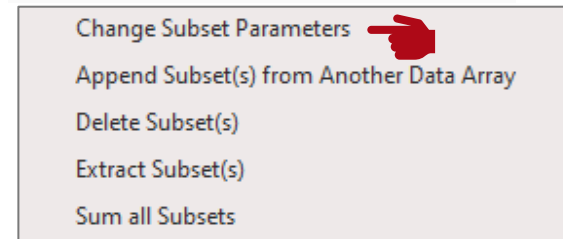
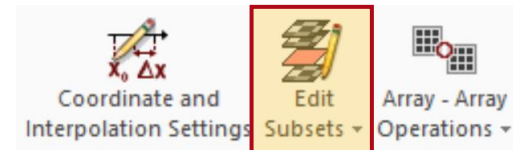
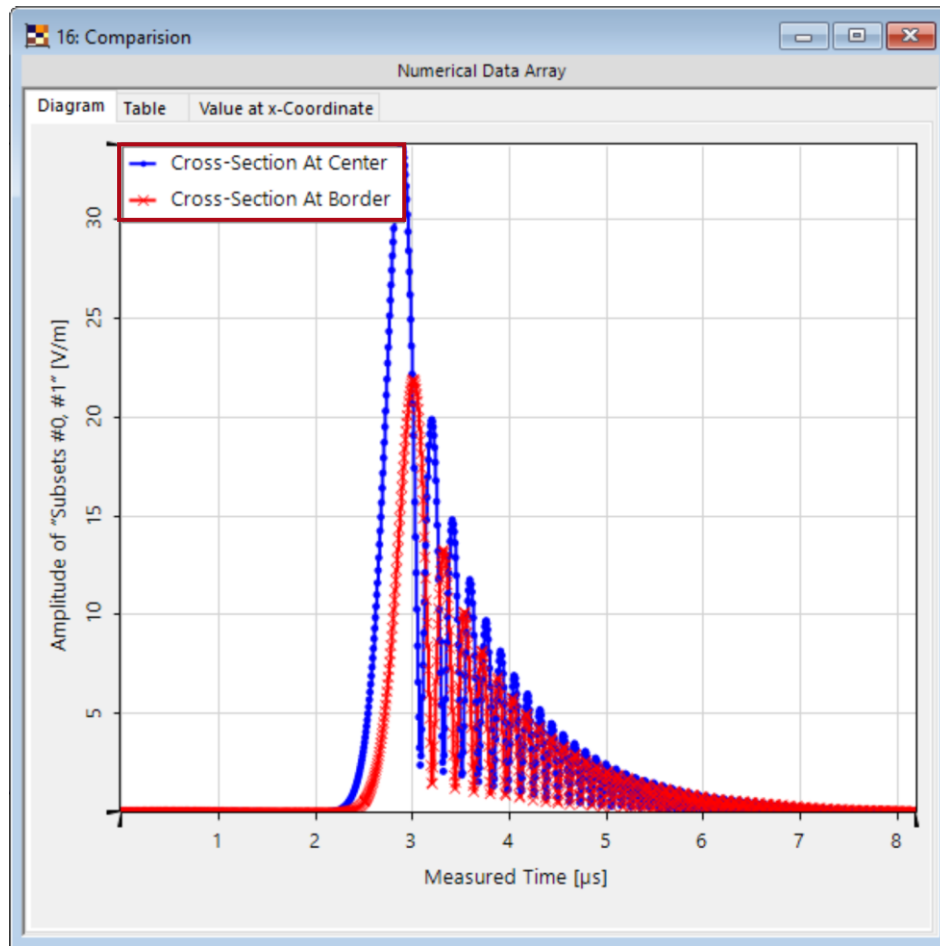
Multiple *1D Cross-Sections* can be combined to one document in the *Manipulations* tab:



Note: *Multigraph Mode* needs to be active to see both results simultaneously

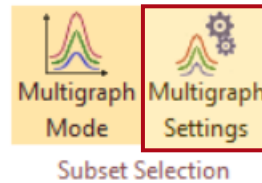
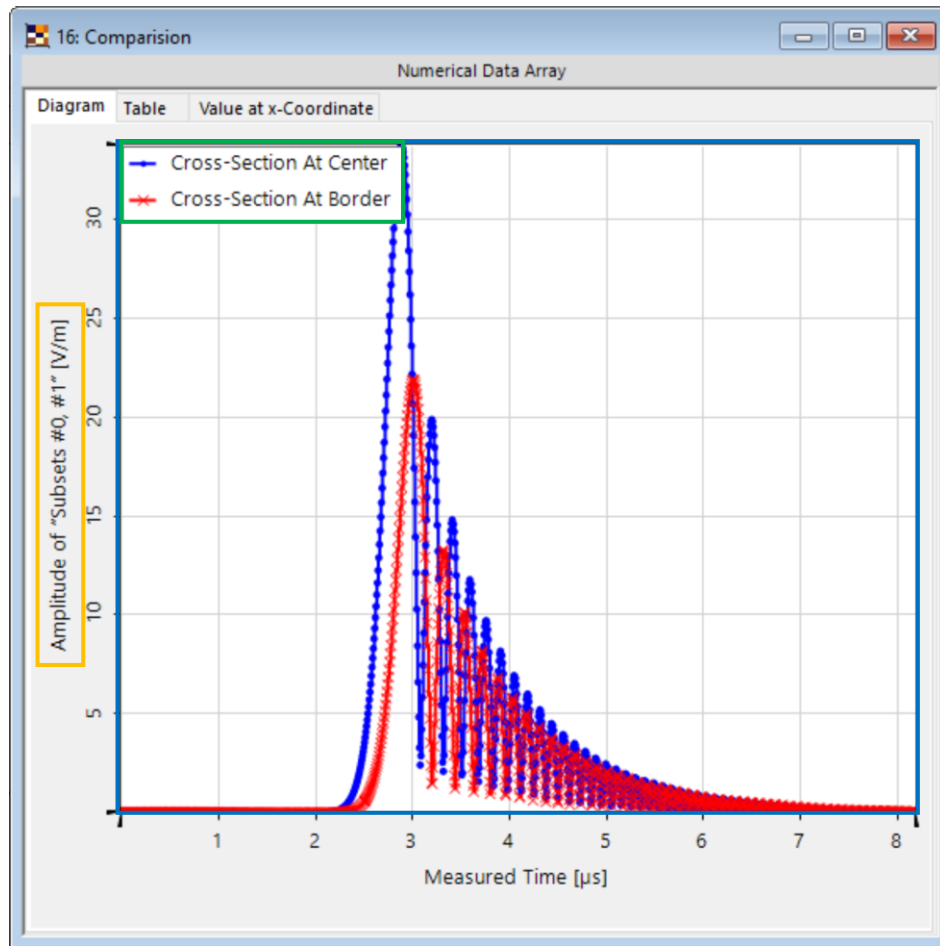
Note: The option *Copy View Settings* allows for an easy duplication of the appearance of two windows.

Formatting of a Multi-Graph Document



With *Change Subset Parameters* in the *Manipulations* tab the basic properties of each individual subsets (such as the name and displayed physical quantity) can be set.

Formatting of a Multi-Graph Document



Configuration of the Subset Graphs per y-Axis

| Subset | Description | Physical Property | Ordinate | Color | Symbol | Dash Pattern |
|--------|-------------------------|-------------------------|-----------|-------|--------|--------------|
| 1 | Cross-Section At Center | Electric Field Strength | Left-Hand | Blue | • | Solid |
| 2 | Cross-Section At Border | Electric Field Strength | Left-Hand | Red | × | Solid |

Ordinates

| Ordinate | Visible | Rename? | Description |
|------------|---------|---------|-----------------------------------------|
| Left Axis | ✓ | | Amplitude of "Electric Field Component" |
| Right Axis | ✗ | | |

Legend

Visible

Opacity: 100%

Alignment: Left Center Right

Validity: ✓

OK Cancel Help

When the *Multigraph Mode* is active, a new option will appear next to it in the *View* tab . The *Multigraph Settings* allow for a customized visualization (like e.g. color of the graphs and position of the legends).

Document Information

| | |
|------------------|-----------------------------------------|
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| document version | 1.1 |
| software edition | VirtualLab Fusion Basic |
| software version | 2024.1 (Build 1.134) |
| category | Feature Use Case |
| further reading | |