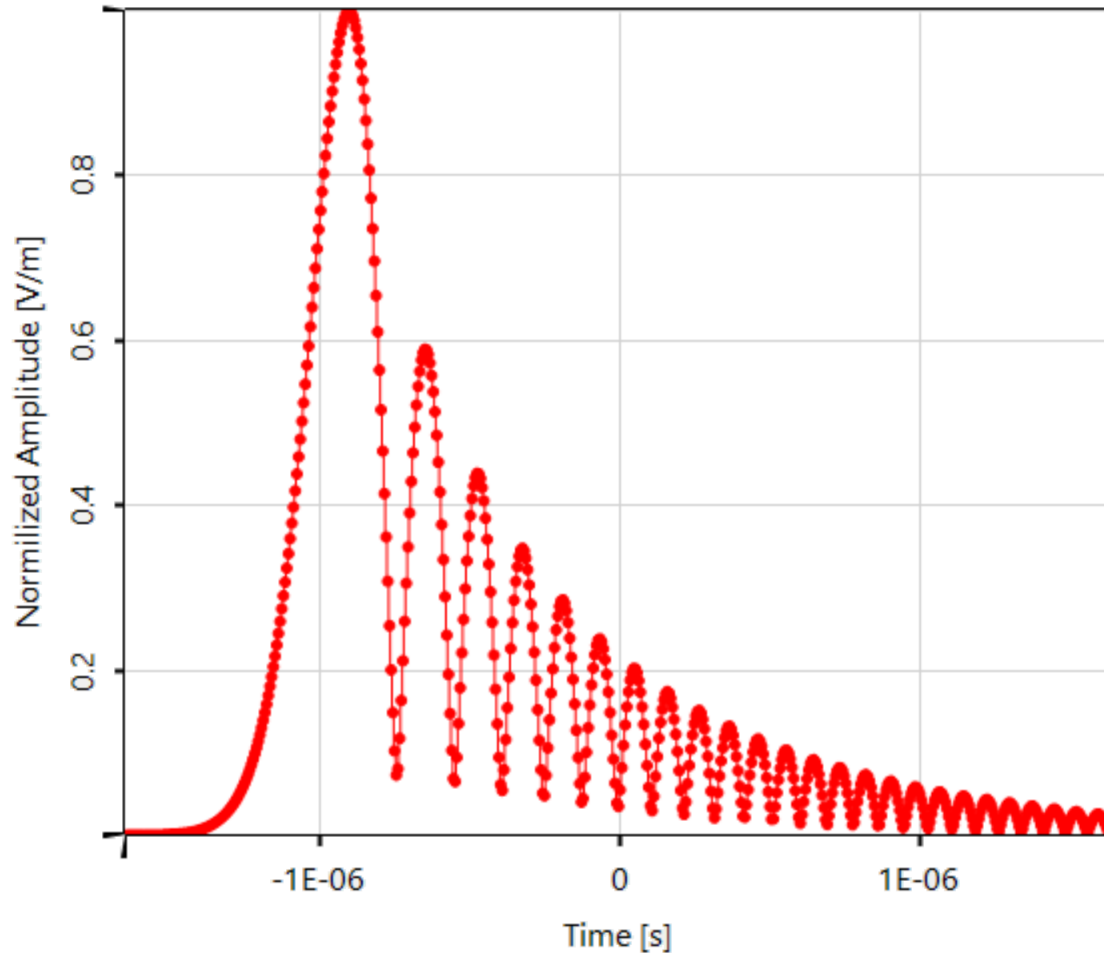


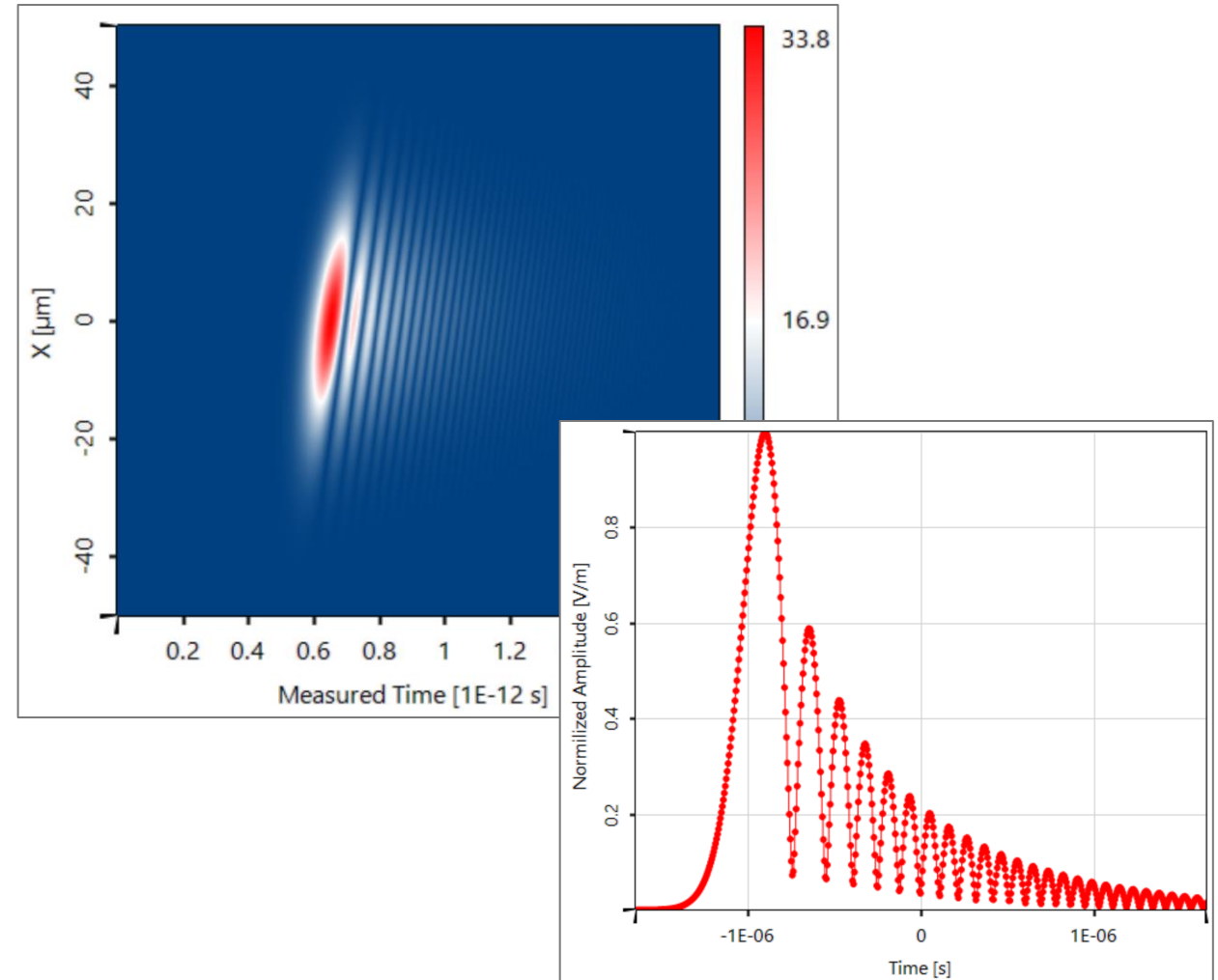
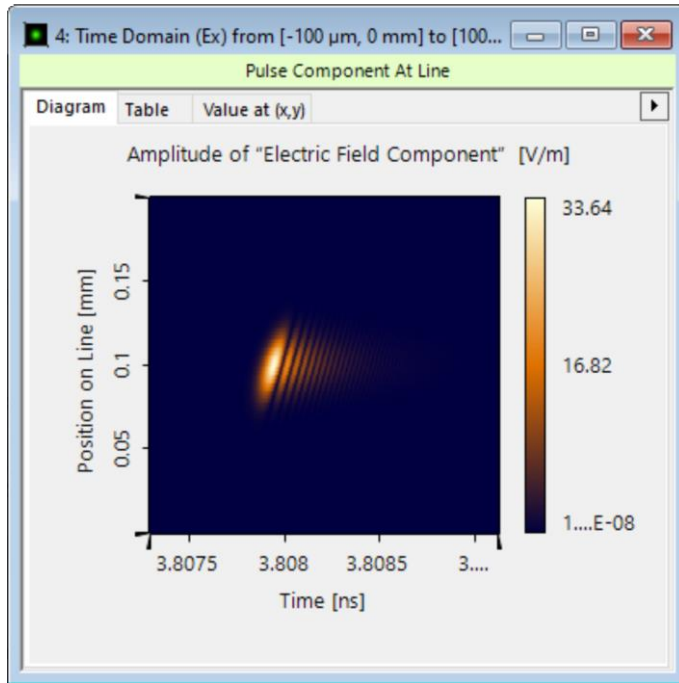
## How to Format VirtualLab Fusion Results

# Abstract



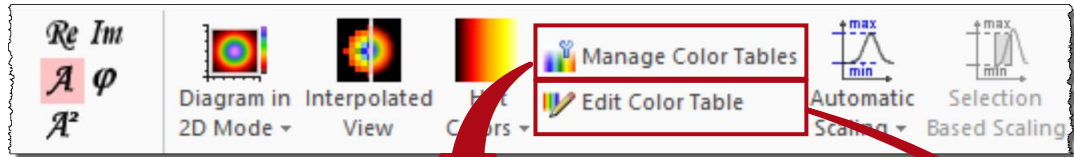
While providing handy tools to obtain fast and accurate results for a desired optical task is the main purpose of any optical simulation software, the value of a versatile post processing should not be underestimated. The adaption of the appearance of the resulting data enables to either fit specific 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 ....

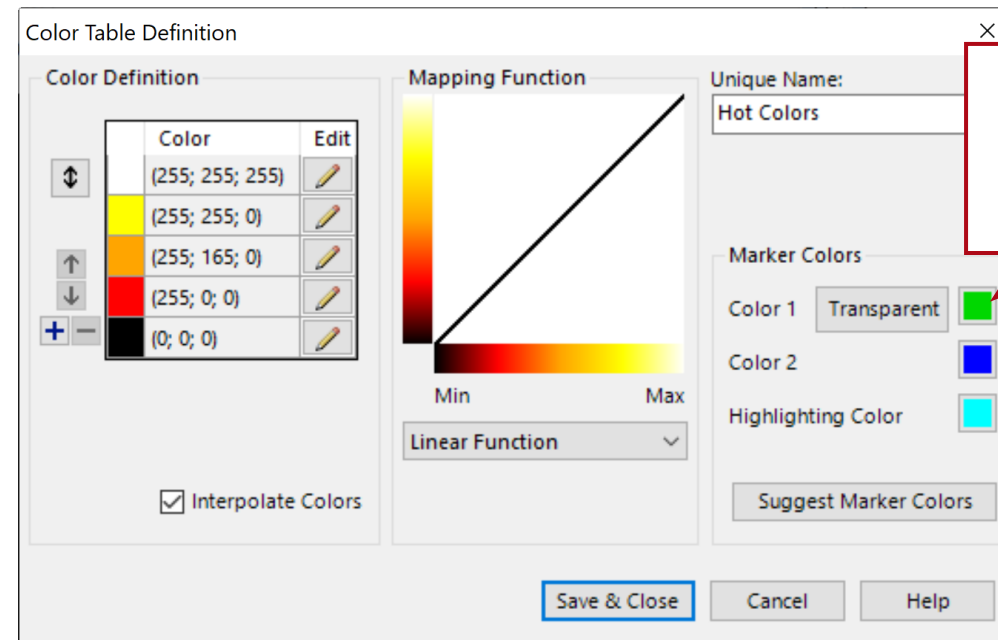
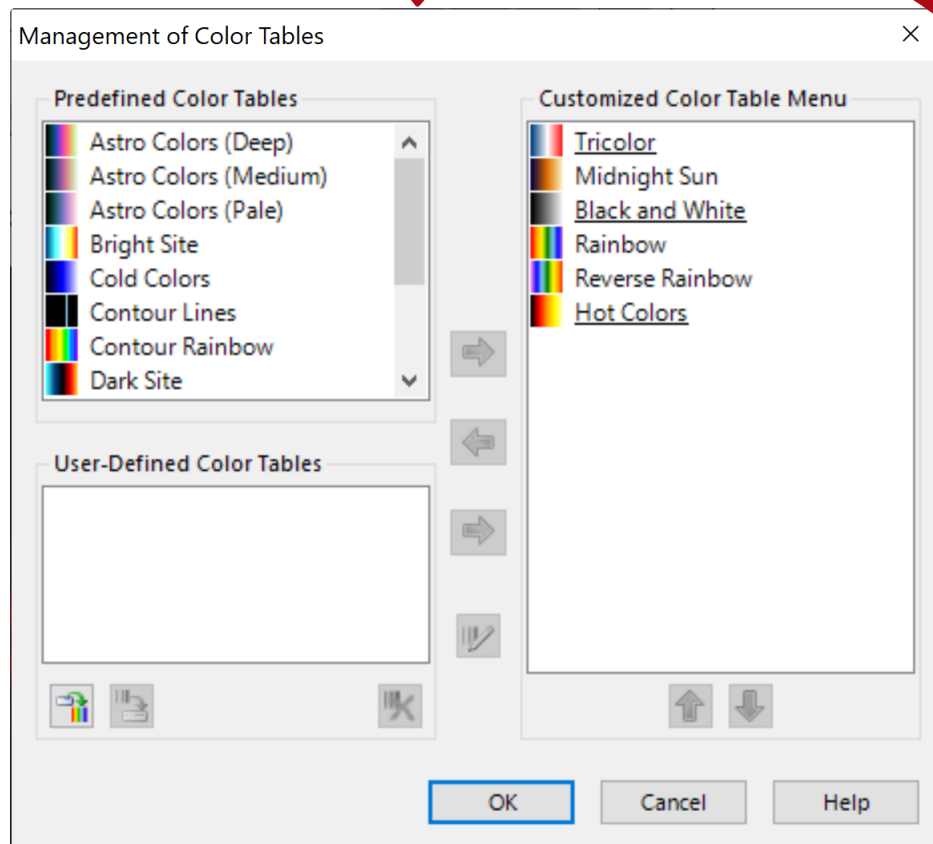


How to customize 1D and 2D figures in VirtualLab Fusion.

# Color Schemes

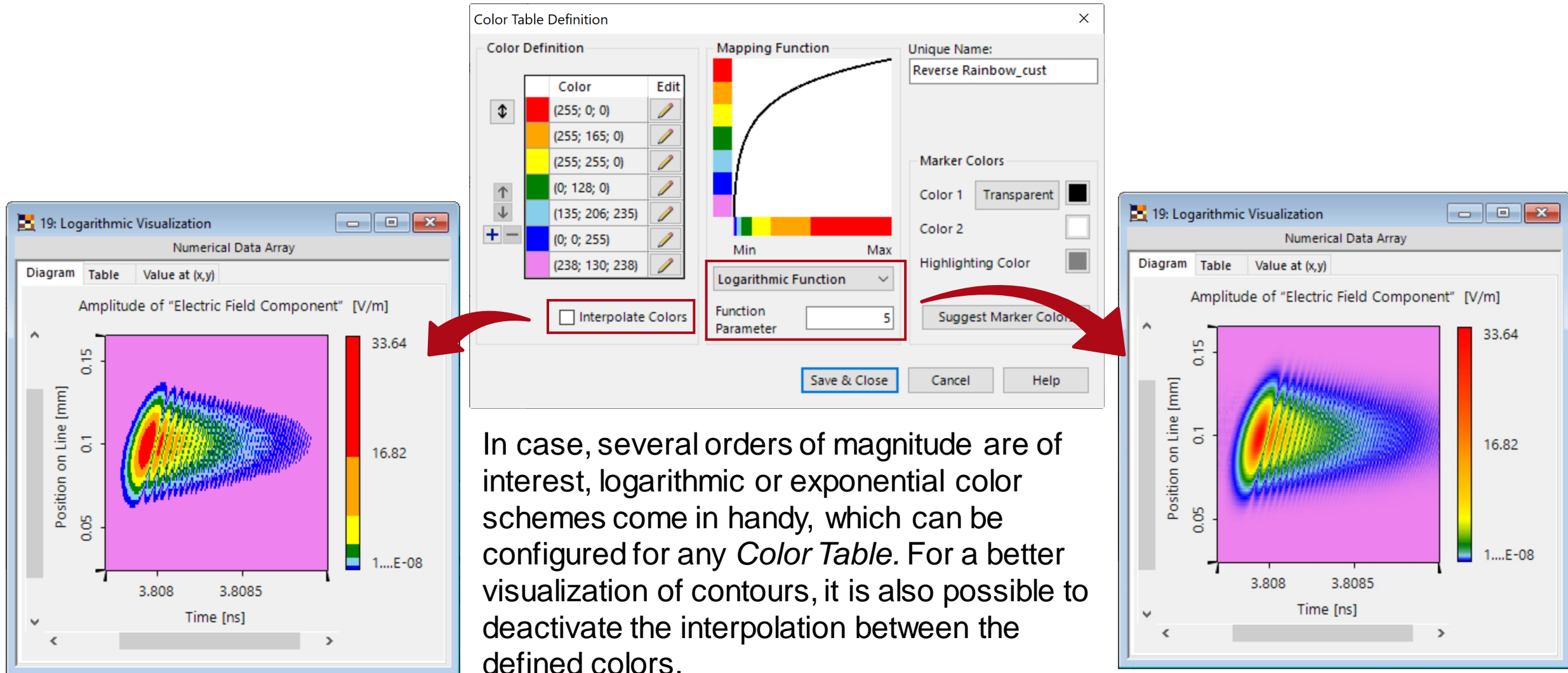


In the tab *Manipulations* of the menu ribbon, the user can choose from a selection of different color schemes for the depiction of 2D data. It is also possible to adapt the existing schemes or to define a customized ones.



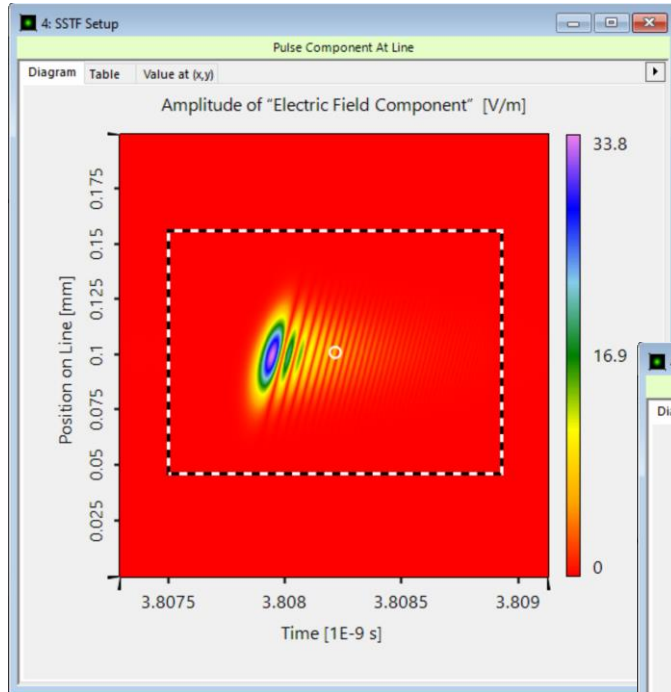
Marker Colors can also be defined per color table.

# Logarithmic & Exponential Color Tables

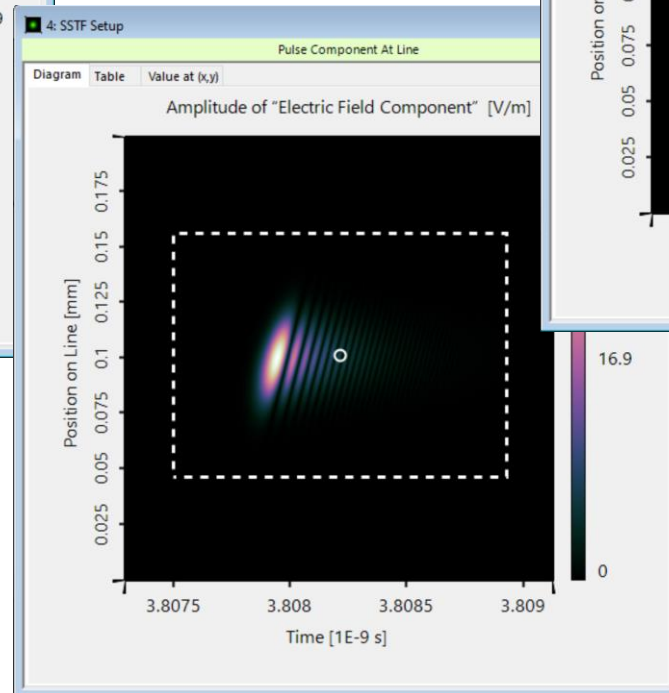


In case, several orders of magnitude are of interest, logarithmic or exponential color schemes come in handy, which can be configured for any *Color Table*. For a better visualization of contours, it is also possible to deactivate the interpolation between the defined colors.

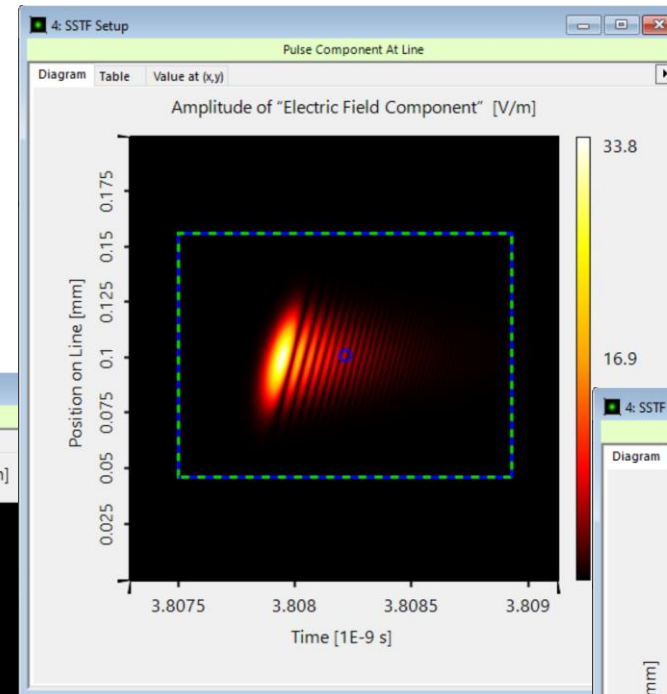
# Examples for Color Schemes



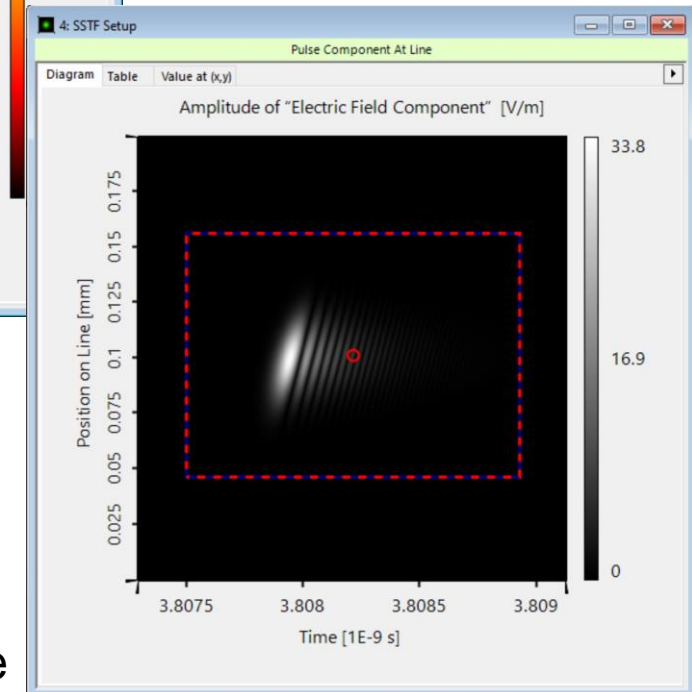
Reverse Rainbow



Astro Colors

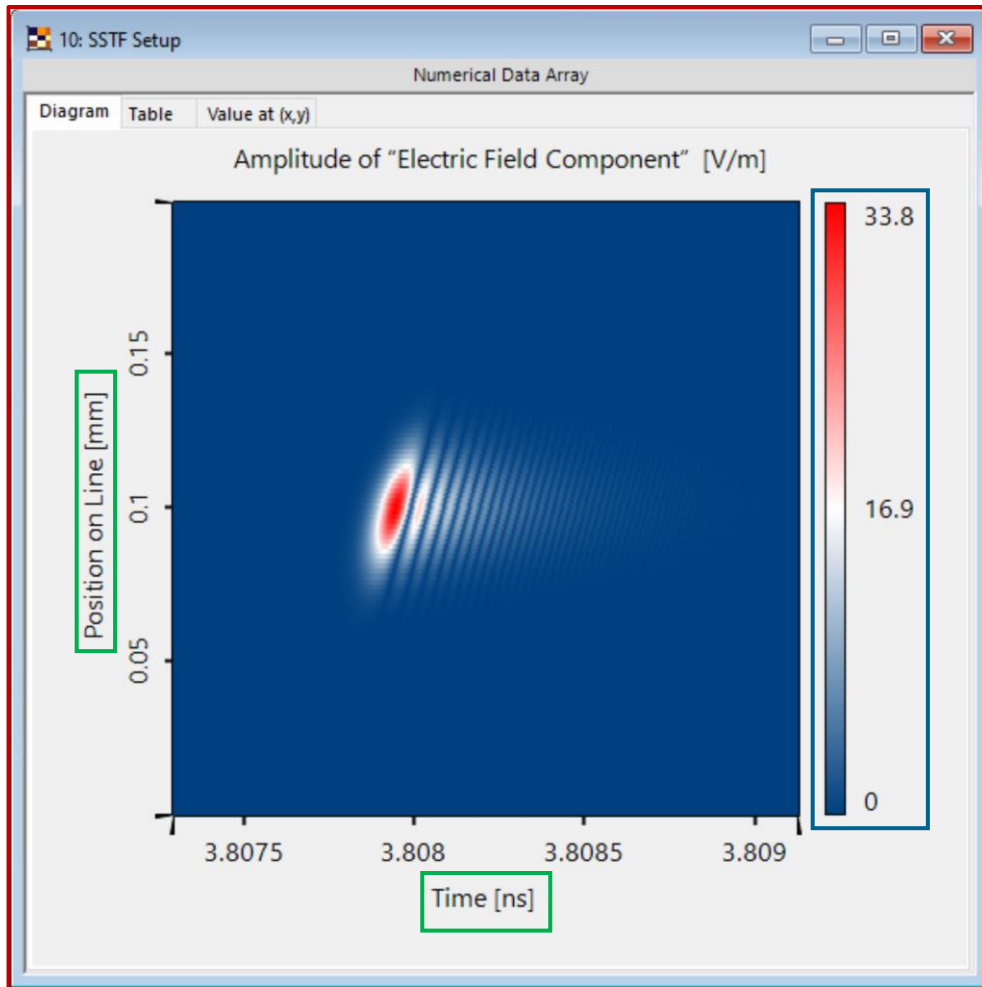


Hot Colors



Black & White

# Scaling and Axis Configuration



Property Browser

4: SSTF Setup

View Object Selections

- General
  - Window Size **600, 600**
  - Zoom Factor **(2.0816E+05; 1875)**
  - Zoom Factor Unit X 1 px / [1 ns]
  - Zoom Factor Unit Y 1 px / [1 mm]
- Colors
  - Color Table Tricolor
- Data
  - Auto Scaling of Data **False**
  - Displayed Data Range **[0 V/m; 33.8 V/m]**
  - Field Quantity **Amplitude**
  - Format of color scale **Engineering**
  - Interpolated View **True**
- Labels
  - Font Size of Axis Labels **12**
  - Font Size of Title **12**
- Selection (General)
  - Selection Mode **Rectangle or Ellipse**
- Selection (Line)
  - Display Line Marker **False**
- Selection (Point)
  - Display Point Marker **False**
- Selection (Region)
  - Show Rectangle or Ellip **False**
- View Mode
  - 3D Mode **False**

Format of y-Axis

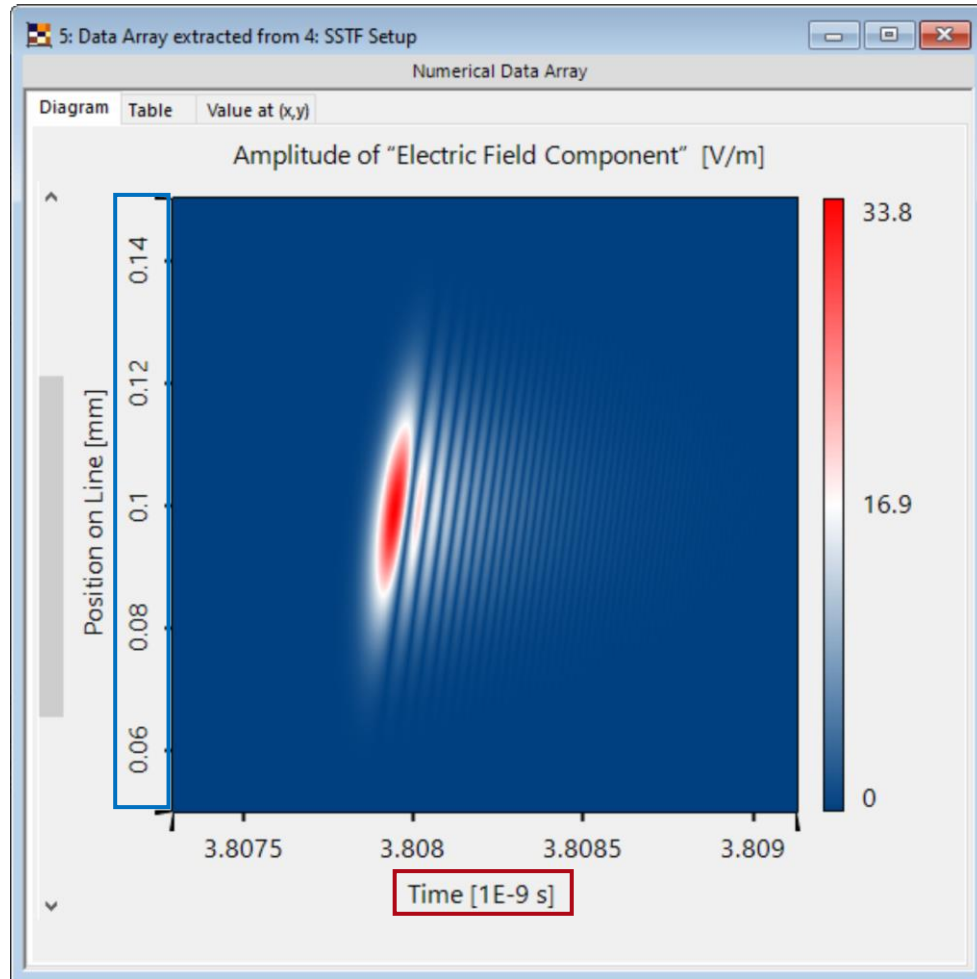
Format of the y-Axis values

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



Property Browser

4: SSTF Setup

View Object Selections

Format of color scale	Engineering
Interpolated View	True
Labels	
Font Size of Axis Label	12
Font Size of Title	12
Selection (General)	
Selection Mode	Rectangle or Ellipse
Selection (Line)	
Display Line Marker	False
Selection (Point)	
Display Point Marker	False
Selection (Region)	
Show Rectangle or Ellipse	False
View Mode	
3D Mode	False
X-Axis	
Description	Time
Format of x-Axis	Scientific
Minimum Number of 1	4
x-Axis Range	[3.8073 ns; 3.8091 ns]
Y-Axis	
Description	Position on Line
Format of y-Axis	Standard
Minimum Number of 1	6
y-Axis Range	[50 $\mu$ m; 150 $\mu$ m]

Font Size of Title

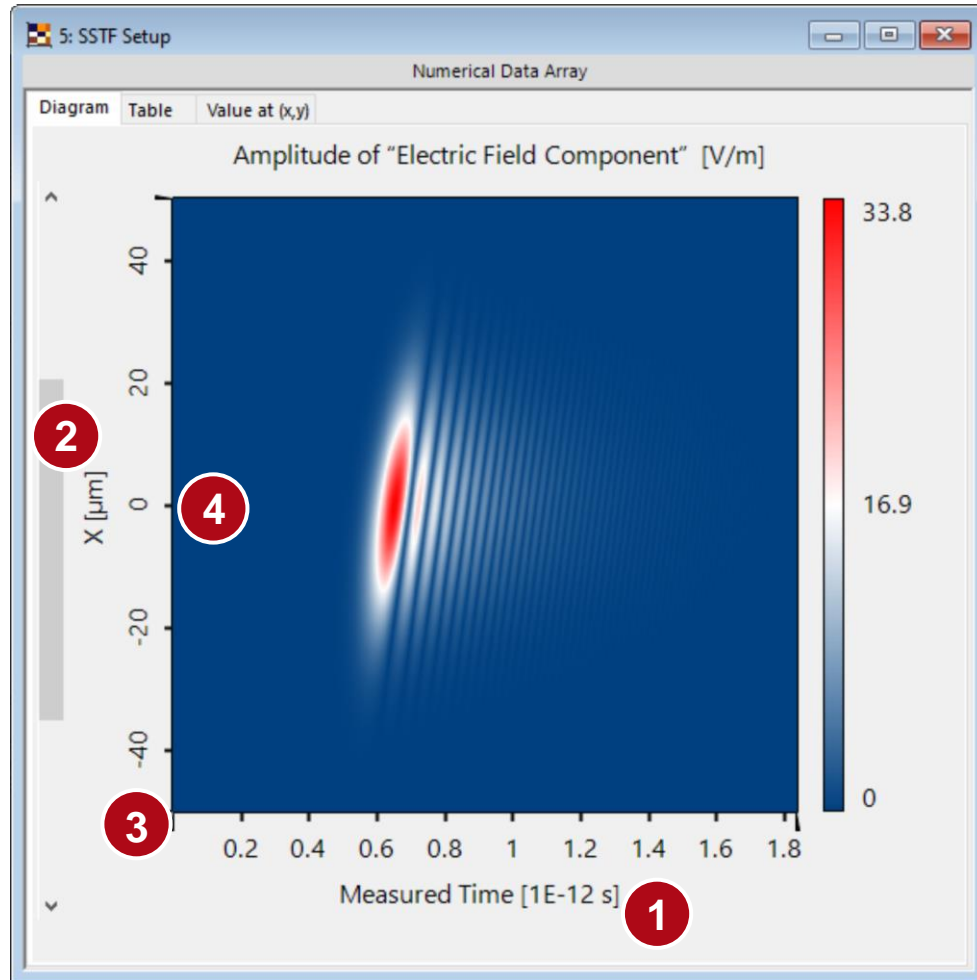
The font size of the diagram title.

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 0 s

y-Axis

2

Description X

Physical Property Length

Interpolation Method Cubic 4 Point

Dimensions

Sampling Distance 1.6393 μm

Positioning

Center Around Zero

4

3

Coordinate and Interpolation Settings

Edit Subsets Array - Array Operations

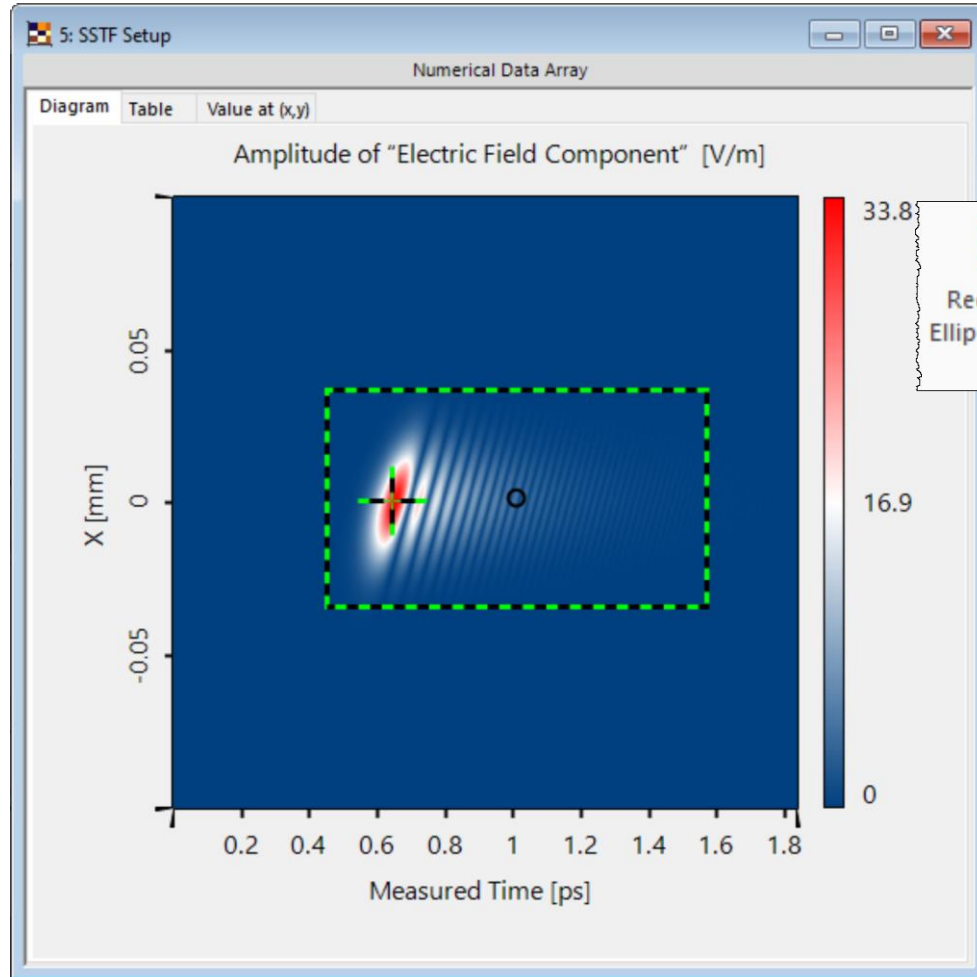
Extrapolation Mode: Zero

Outside Values are Zero

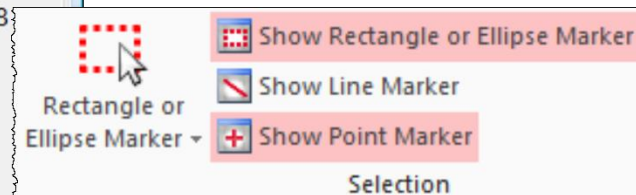
OK Cancel Help

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.

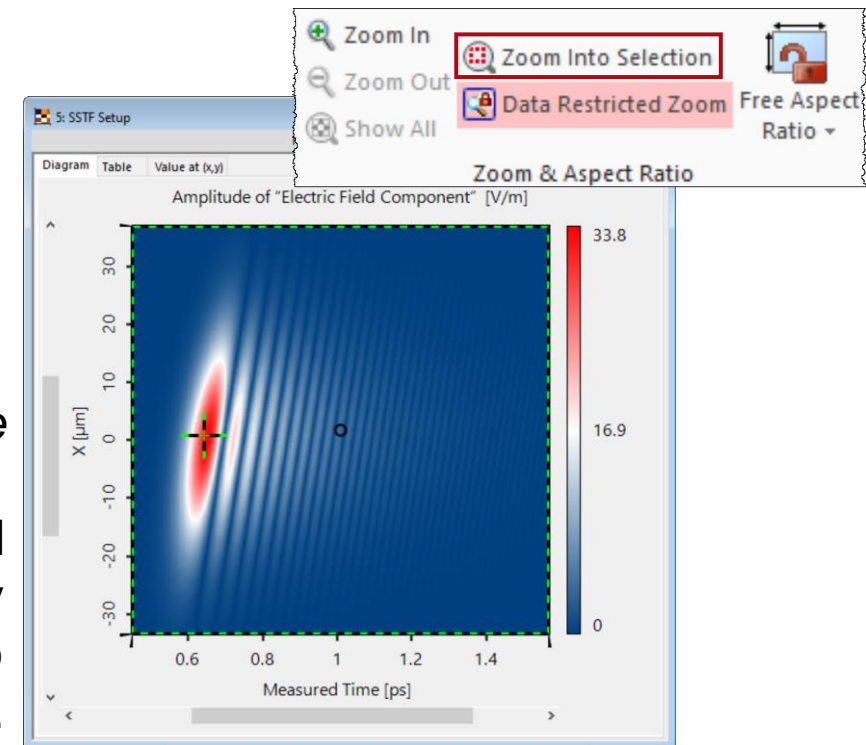
# Point and Rectangle Markers



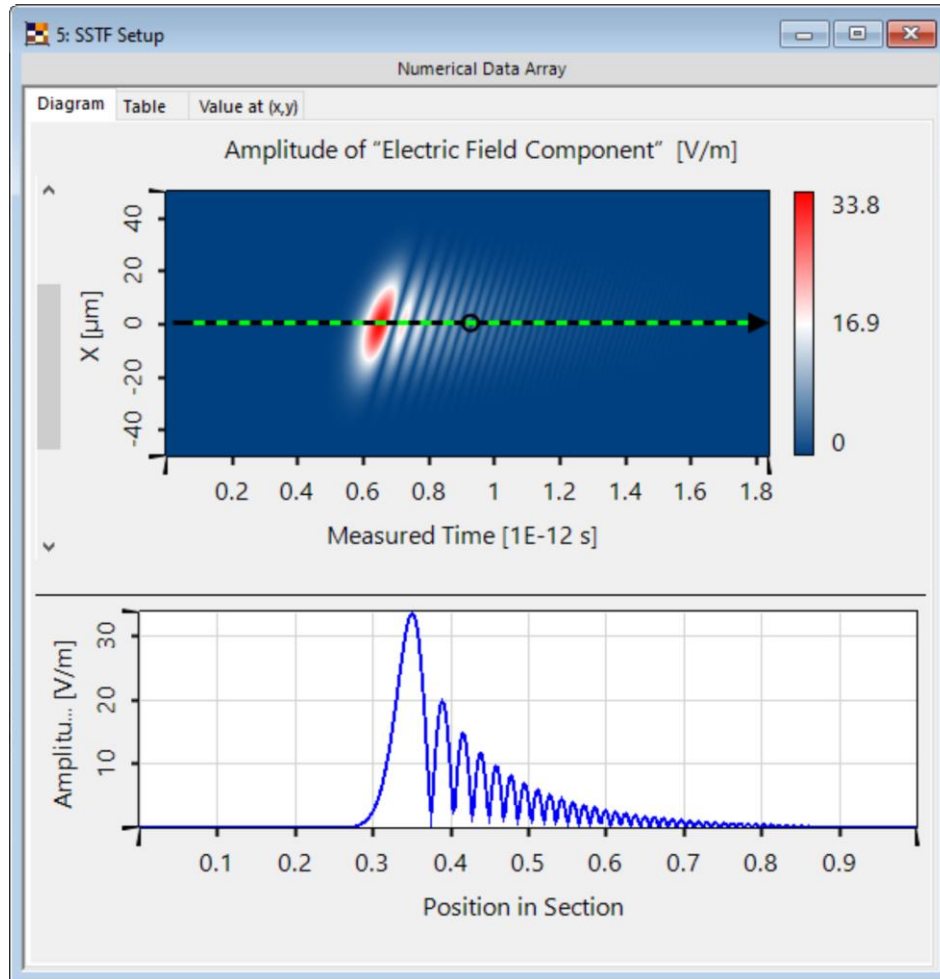
*Point, Line and Rectangle or Ellipse Markers* can be found in the *View* tab to select specific parts of the result data for further investigation.



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: 1170
- Interpolation Method for Extraction: ☒ Method of Source Array, ☐ Nearest Neighbor / Constant Interval
- Parameters of Result:
  - New Axis Description: Time
  - New Physical Property of Axis: Time
  - New Interpolation Method: Cubic 4 Point
- New Coordinate Positioning: Center Around Zero

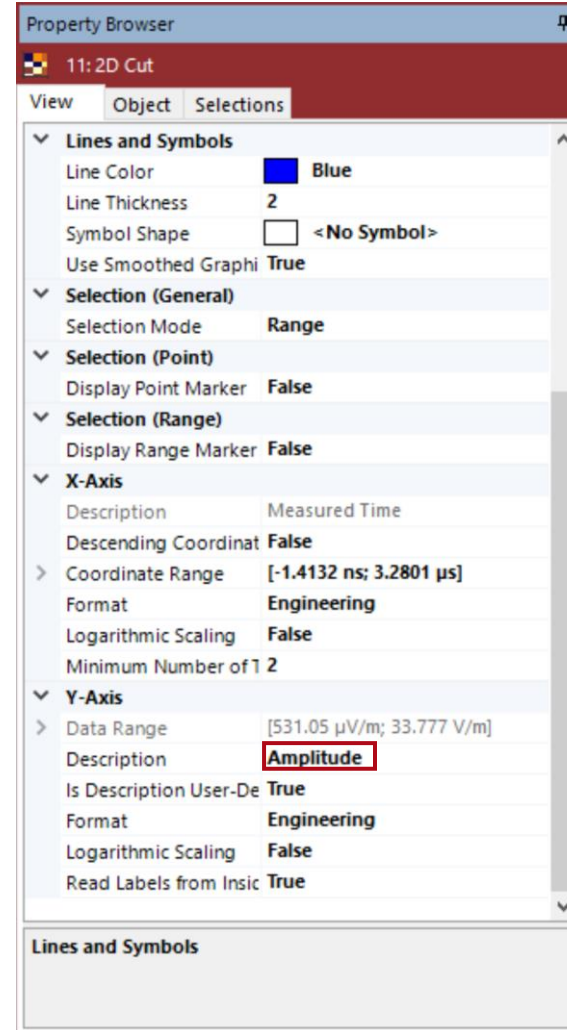
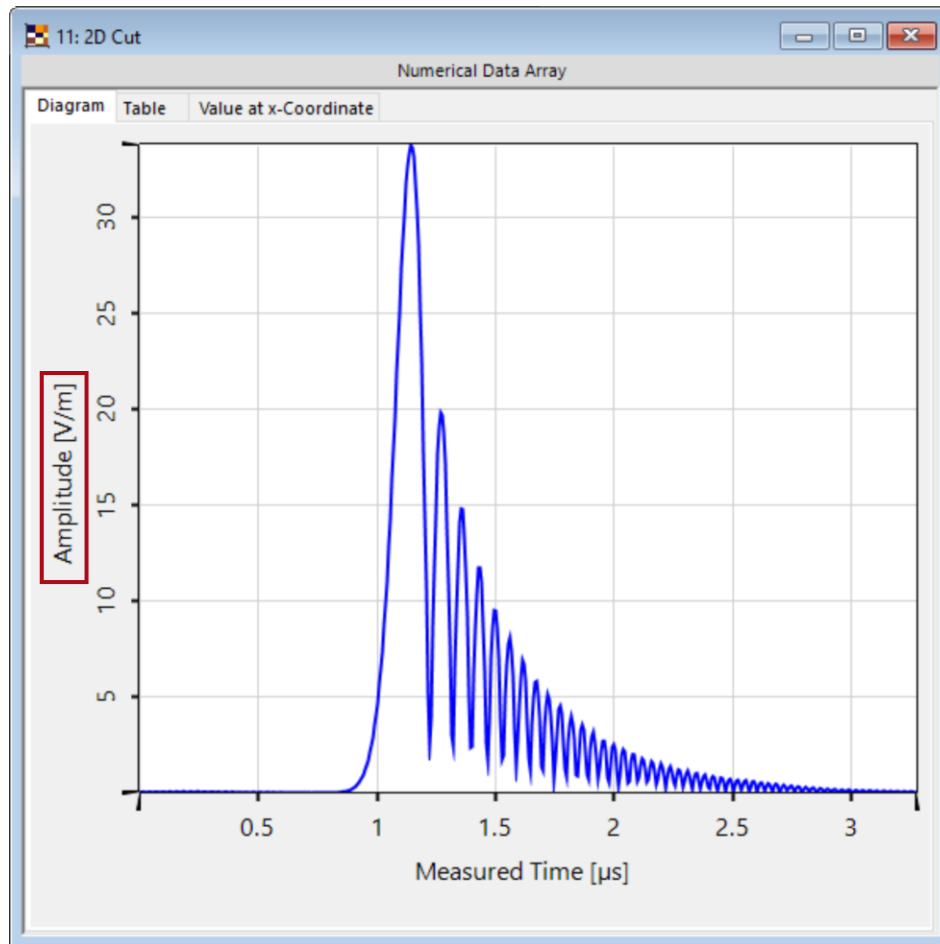
The 'Selection Related Operations' menu is open, showing the following options:

- 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 displayed right below the initial document. With the option *Extract Equidistant 1D Data Along Selected Line* an individual document can be created.

# 1D Cross-Section Visualization Options



In case of 1D data, the *Property Browser* provides similar options as for 2D data. The option *Is Description User-Defined* enables the user to define a custom description of the y-axis.

# Lines and Symbols of 1D Graphs

Property Browser

11: 2D Cut

View Object Selections

**Lines and Symbols**

Line Color ■ Blue

Line Thickness 2

Symbol Shape  <No Symbol>

Use Smoothed Graphs True

**Selection (General)**

Selection Mode Range

**Selection (Point)**

Display Point Marker False

**Selection (Range)**

Display Range Marker False

**X-Axis**

Description Measured Time

Descending Coordinate False

Coordinate Range [-1.4132 ns; 3.2801  $\mu$ s]

Format Engineering

Logarithmic Scaling False

Minimum Number of 1 2

**Y-Axis**

Data Range [531.05  $\mu$ V/m; 33.777 V/m]

Description Amplitude

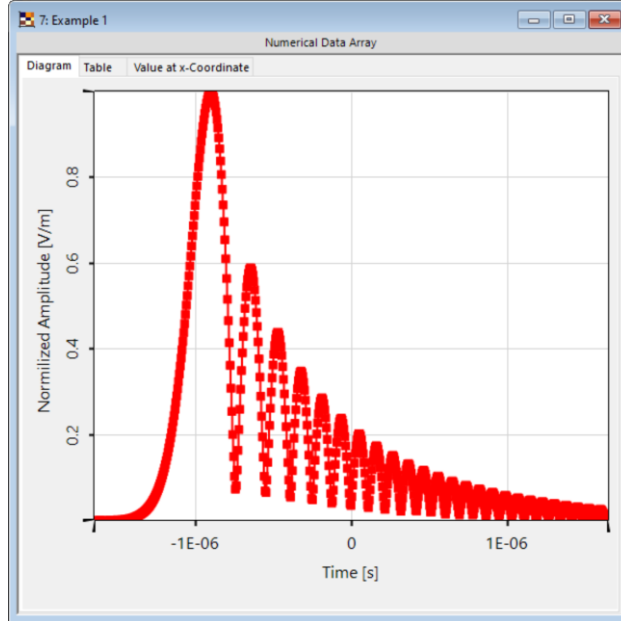
Is Description User-Def True

Format Engineering

Logarithmic Scaling False

Read Labels from Inside True

**Lines and Symbols**



**Lines and Symbols**

Line Color ■ Red

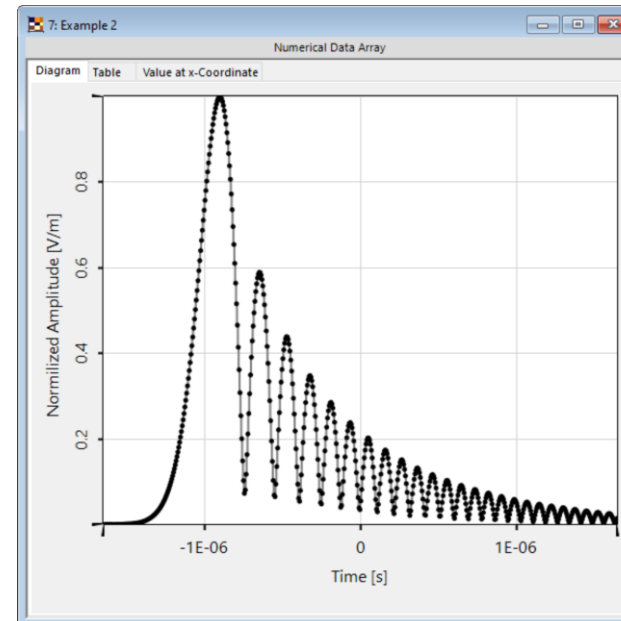
Line Thickness 5

Symbol Color ■ Red

Symbol Scaling Factor 1.5

Symbol Shape  Filled Square

Use Smoothed Graphics True



**Lines and Symbols**

Line Color ■ Gray

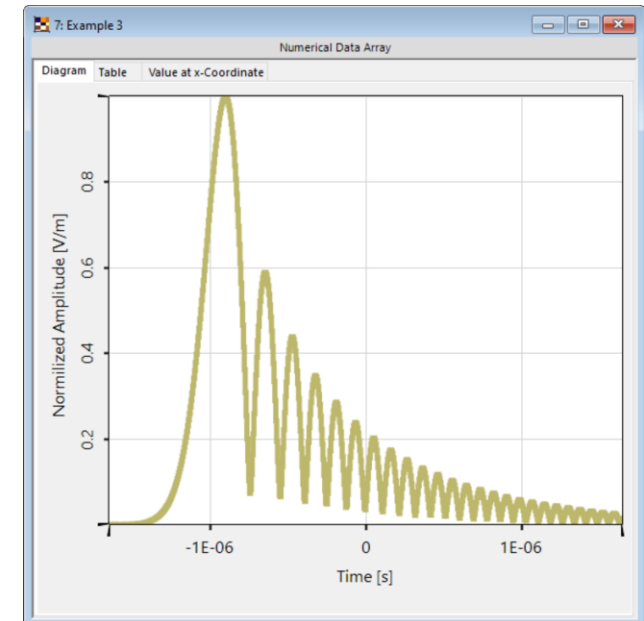
Line Thickness 2

Symbol Color ■ Black

Symbol Scaling Factor 1

Symbol Shape  Dot

Use Smoothed Graphics True



**Lines and Symbols**

Line Color ■ DarkKhaki

Line Thickness 5

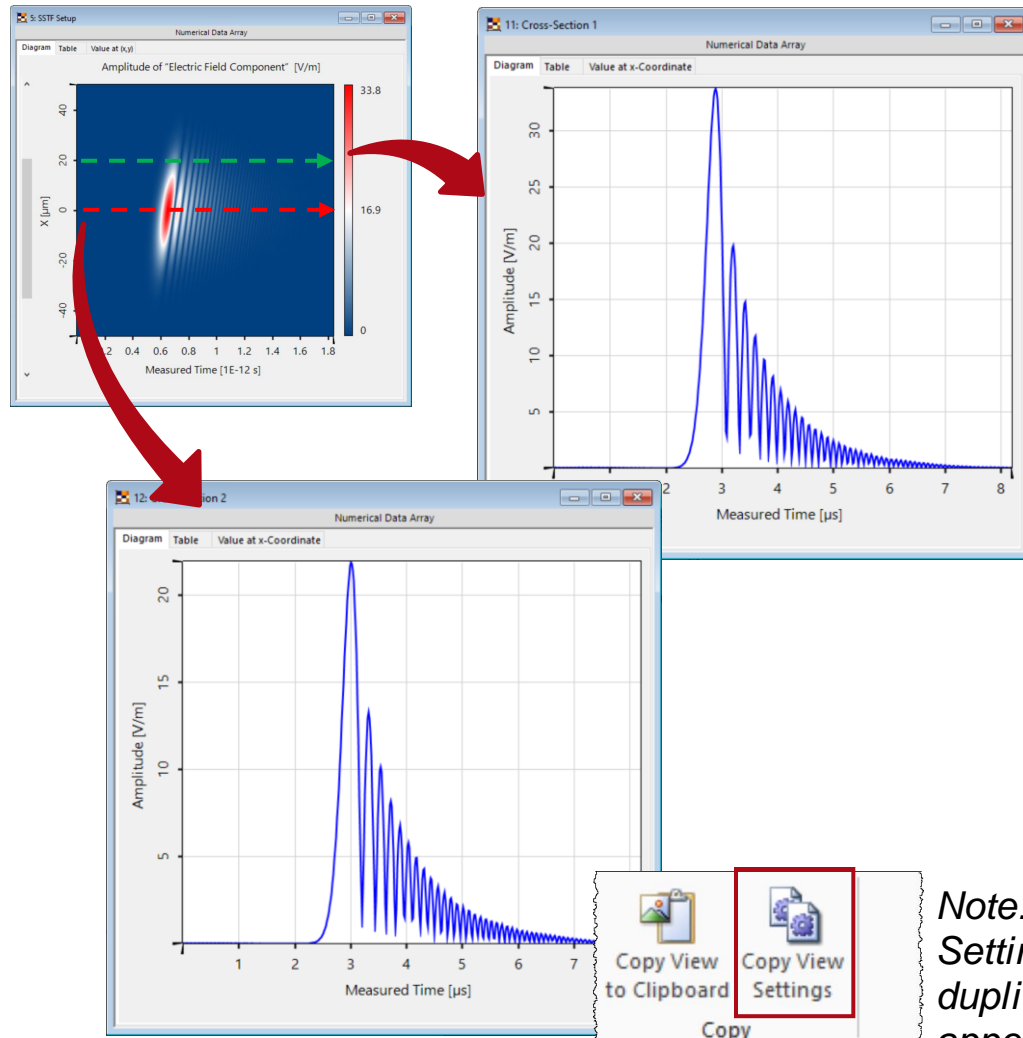
Symbol Shape  <No Symbol>

Use Smoothed Graphics True

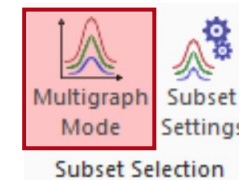
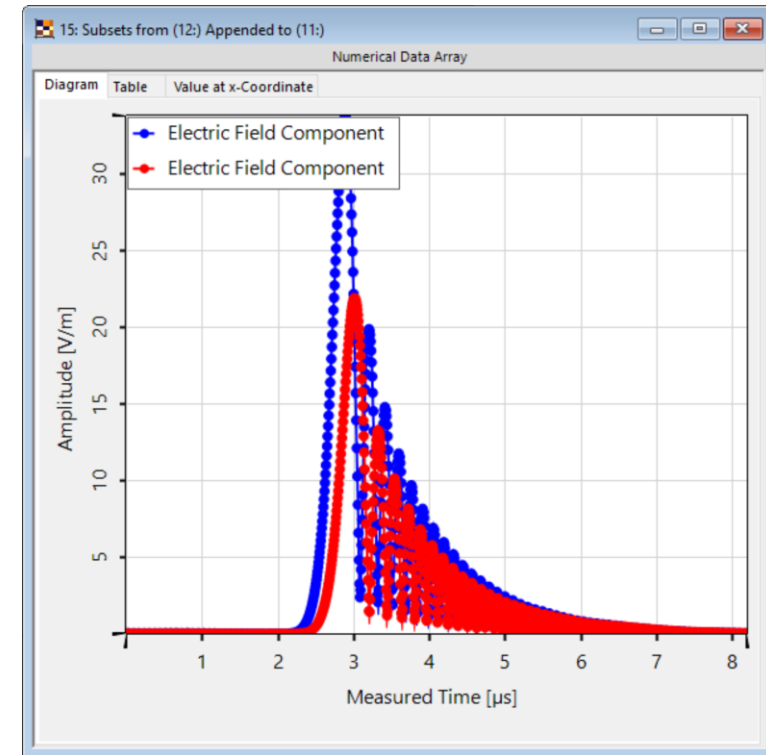
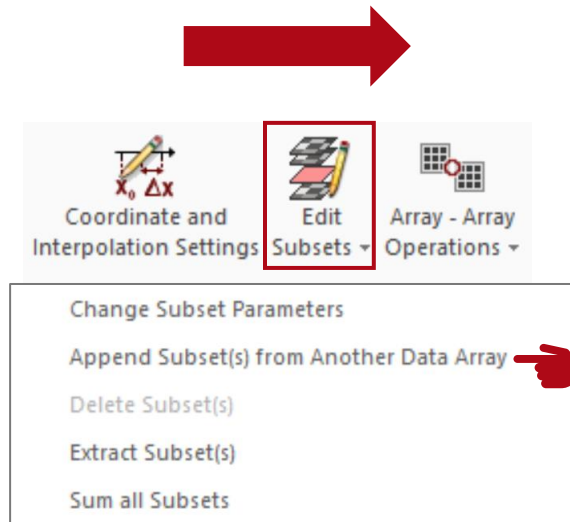
In case of 1D data, it is possible to utilize symbols to indicate the actual sampling points in the curve. Their appearance can be adjusted in the *Property Browser*.



# Generation of a Multigraph Document



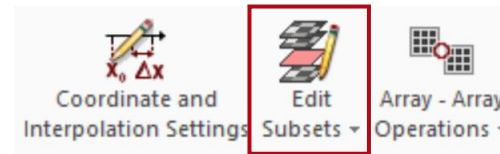
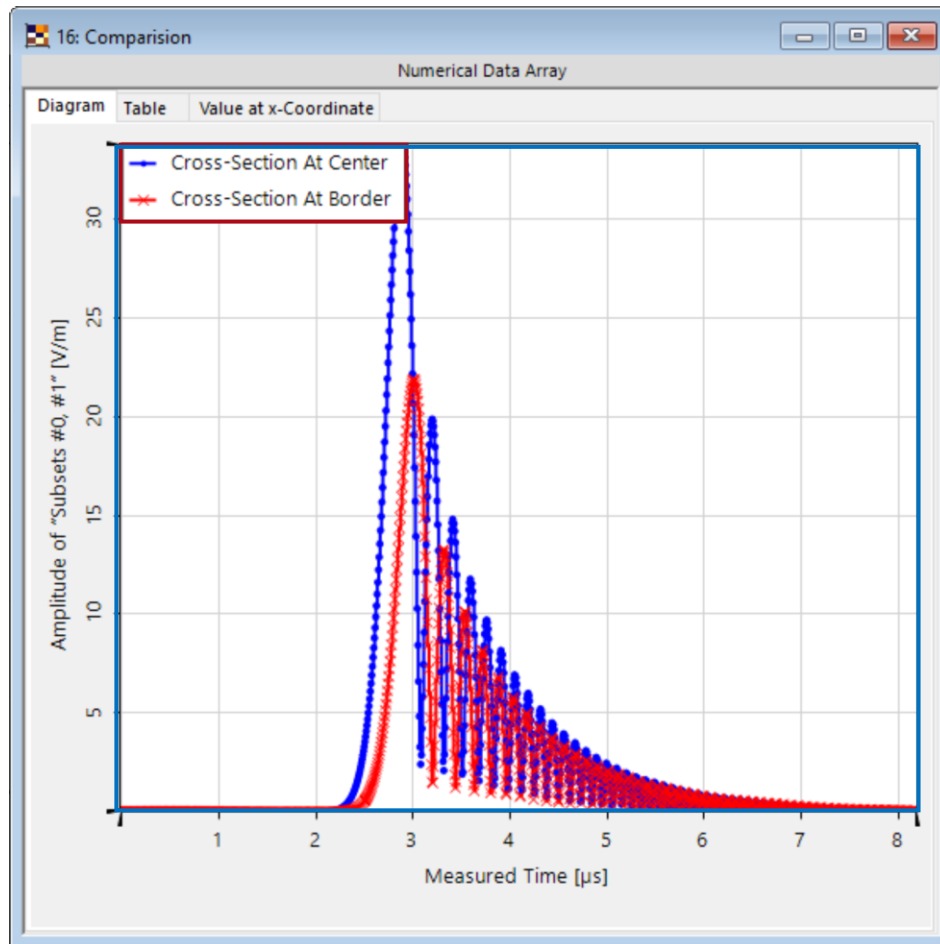
Multiple 1D Cross-Sections can be combined to one document in the *Manipulations* tab:



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



# Formatting of a Multi-Graph Document



Change Subset Parameters

Append Subset(s) from Another Data Array

Delete Subset(s)

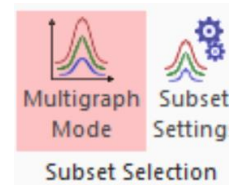
Extract Subset(s)

Sum all Subsets

Change Subset Parameters

Subset #	Description	Physical Property	Precision
1	Cross-Section At Center	Electric Field Strength	Double Precision
2	Cross-Section At Border	Electric Field Strength	Double Precision

OK Cancel Help



Configuration of the Subset Graphs per y-Axis

Subset #	Description	Physical Property	Ordinate	Color	Symbol
1	Cross-Section At Center	Electric Field Strength	Left-Hand	Blue	•
2	Cross-Section At Border	Electric Field Strength	Left-Hand	Red	x

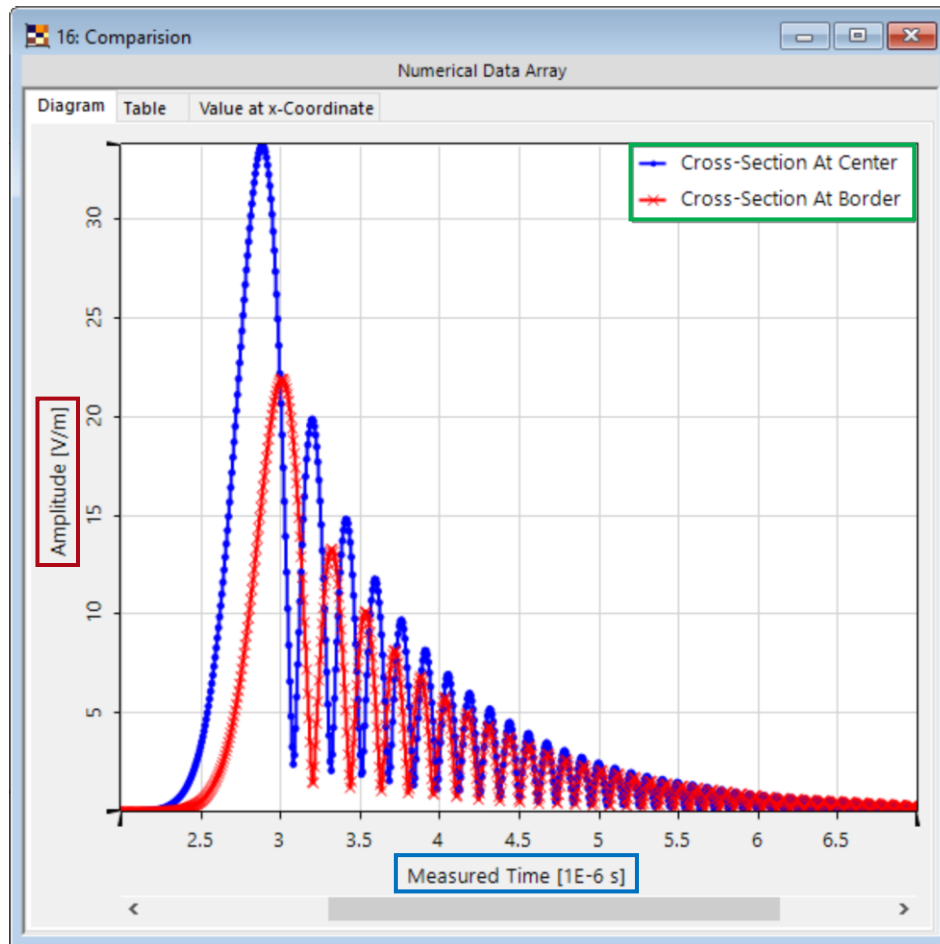
☐ Synchronize Settings

The configuration is valid.

OK Cancel Help

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, while *Subset Settings* in the *View* tab allows for a customized visualization (like e.g. color).

# Formatting of a Multi-Graph Document



Property Browser

16: Comparison

View Object Selections

Use Smoothed Graph **True**

▼ **Multigraph Options**

Multigraph Mode **True**

Legend Visible **True**

Legend Alignment **Top Right**

▼ **Selection (General)**

Selection Mode **Range**

▼ **Selection (Point)**

Display Point Marker **False**

▼ **Selection (Range)**

Display Range Marker **False**

▼ **X-Axis**

Descending Coordinate **False**

Coordinate Range **[2  $\mu$ s; 7  $\mu$ s]**

Format **Scientific**

Logarithmic Scaling **False**

Minimum Number of 2

▼ **Y-Axis Left-Hand**

Data Range **[958.93  $\mu$ V/m; 33.751 V/m]**

Description **Amplitude**

Is Label User-Defined **True**

Color **Black**

Format **Engineering**

Logarithmic Scaling **False**

Read Labels from Ins **True**

**Legend Alignment**

Where shall the legend be positioned?

Similar to the previous cases, the *Property Browser* allows for certain adjustments. In this case, however, it is also possible to adjust the visibility and position of the legend.

# Document Information

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further reading	