LyX's detailed Figure, Table, Floats, Notes, Boxes and External Material manual

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1. Figures

1.1. Graphics Dialog

To insert an image into your document, place the cursor at the text position you want and click on the toolbar icon ▨ or use the menu Insert ▷ Graphics. Then a dialog will appear to choose the file to load. The image will appear in the output exactly at the position where it is in the text.

The graphics dialog can be called at any time by clicking on an image. This dialog has three tabs:

Graphics Here you can choose an image file and adjust its appearance in the output. The available units for the image size are explained in appendix A.

You can rotate images counter-clockwise by setting a rotation angle and a rotation origin. The image will also be rotated inside LyX.

Images can be scaled by using a percentage value or by setting the width and height explicitly. If you set only the width or only the height, the other size will be determined automatically. If you set both, then the image will be transformed to the given size, possibly distorting it. To prevent the image from distortion, use the option Maintain aspect ratio. The image will then be scaled so that its width and height don't exceed the specified dimensions.

Images can be opened in a program of your choice by right-clicking on it and choosing the entry Edit externally in the context menu. The program can be set for every image format in the file format settings in LyX's preferences.

Clipping Alternatively to the usage of scaling units it is possible to set image coordinates to adjust the height and width of the image in the output. The coordinates can also be calculated automatically by pressing the button Get from File. The option Clip to bounding box will only print the image region within the given coordinates. Normally you don't need to worry about image coordinates and can ignore this tab.

LaTeX and LyX options In this tab you can modify the appearance of the image within LyX and LaTeX experts can specify additional LaTeX options.

The option Draft mode makes the image appear in the output only as a frame with the size of the image.

In the section Graphics Group you can define or join an image settings group. Images within such a group share their settings, so adjusting one image of the group automatically also adjusts all other images of the group in the same way.

1. Figures

So you can for example change the size for a bunch of images without the need to manually change each of them. Joining an existing group can also be done using the context menu of the image by checking the name of the desired group.

This is an example image in PDF format[1] within a separate, horizontally centered paragraph:
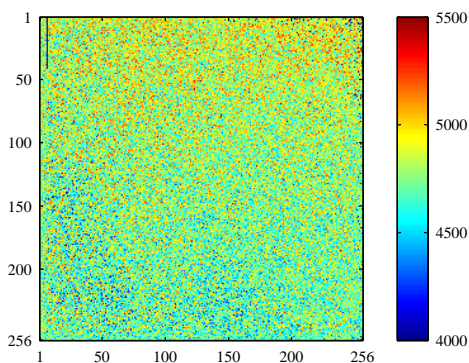
This is the same image like the one above but in draft mode:

8_ext_lyx_lyx-2_3_6_lib_doc_clipart_2D-intensity-plot.pdf

---
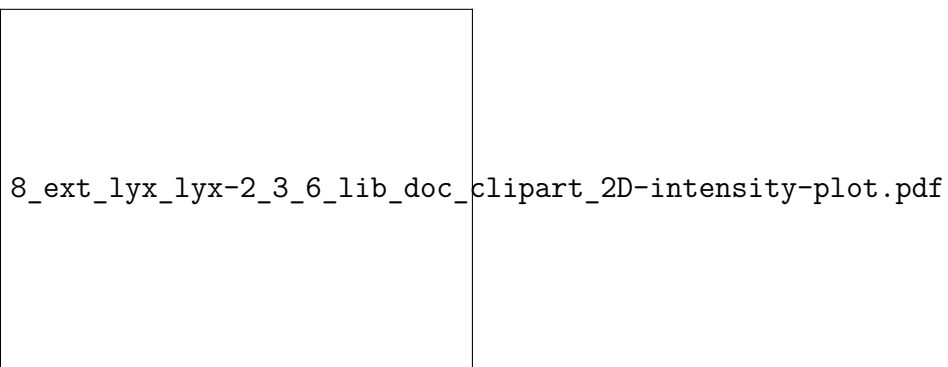
[1]Image formats are explained in section 1.3.

1.2. Figure Floats

For general explanations about floats, have a look at section 3.1.

The toolbar button ⬚ and the menu Insert ▷ Float ▷ Figure inserts a float with a caption that has the label "Figure #:" (# is the actual number). You can insert the image above the caption, like in Figure 1.1 or below the caption, like in Figure 1.2. More about caption placement is described in section 3.10.

Figure 1.1 and 1.2 are examples of referenced figures. Figures can be referenced in the text by referencing their label. To do this insert a label in the caption using the menu Insert ▷ Label or the toolbar button ✎. You can now refer to the label using the menu Insert ▷ Cross reference or the toolbar button ⬚. It is important to use references to floats, rather than using vague references like "the figure above", because LaTeX will reposition the floats in the final document and it might not be "above" at all. Referencing is explained in detail in section 3.4.

Normally only one image is inserted to a figure float, but sometimes you might want to use two images with separate subcaptions. This can be done by inserting image floats into existing image floats. Note that only the main caption of the float is added to the List of Figures. Figure 1.3 is an example of a figure float with two images set side by side. You can also set the images one below the other. Figure 1.3a and 1.3b are the subfigures.
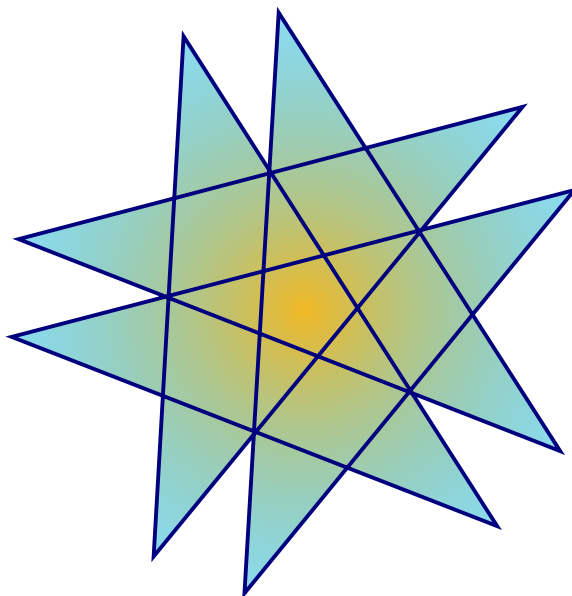
Figure 1.1.: A star in a float.

Figure 1.2.: A 3D object.
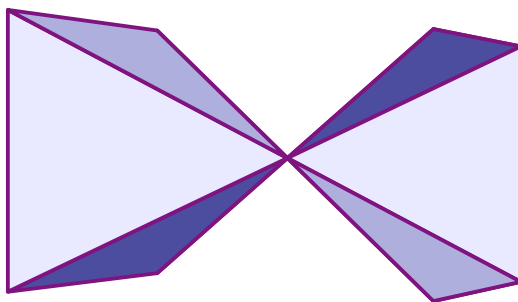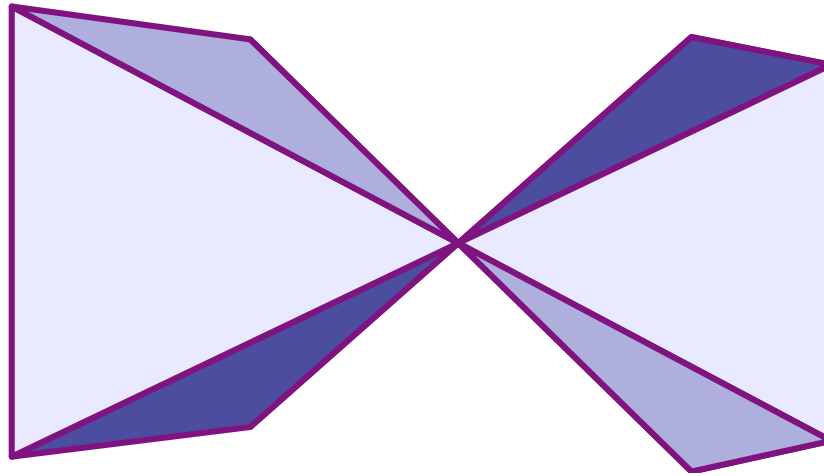
(a) Pink object.
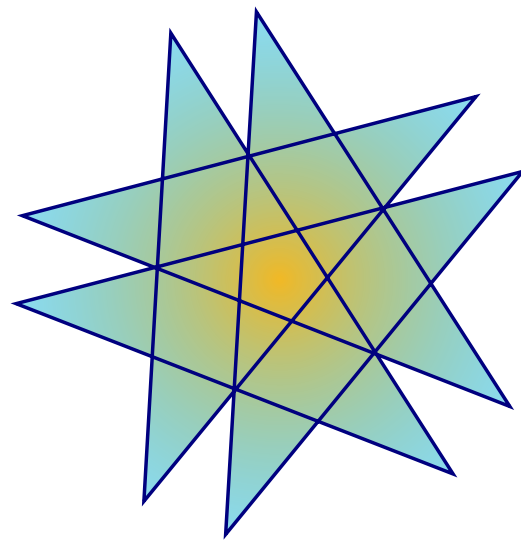
(b) A star.

Figure 1.3.: Two distorted images. Both images are in the image settings group named "distorted".

1.3. Image Formats

You can insert images in any known file format. But as explained in appendix B, each output document format allows only a few image formats. LyX uses therefore the program `ImageMagick` in the background to convert the images to the right format. To increase your work flow by avoiding these conversions in the background, you could choose to use only the image formats that can directly be embedded in the output file format. The output file formats are explained in appendix B.

Similar to fonts there are two types of image formats:

Bitmap images consist of pixel values, often in a compressed form. They are therefore not fully scalable and look pixelated in large zooms. Well-known bitmap image formats are "Graphics Interchange Format" (GIF, file extension ".`gif`"), "Portable Network Graphics" (PNG, file extension ".`png`"), and "Joint Photographic Experts Group" (JPG, file extension ".`jpg`" or ".`jpeg`").

Vector images consist of vectors and can therefore be scaled to any size without data loss. The scaling ability is necessary if you want to create presentations, because presentations are always scaled by the video projector. Scaling is also useful for online documents to let the user zoom into diagrams.
Well-known scalable image formats are "Scalable Vector Graphics" (SVG, file extension ".`svg`"), "Encapsulated PostScript" (EPS, file extension ".`eps`"), "Portable Document Format" (PDF, file extension ".`pdf`"), and "Windows Metafile" (WMF, file extension ".`wmf`"). We wrote "can be", because you can convert any bitmap image to a PDF or EPS-image and the result will still be a bitmap image. In such cases only a header with the image properties is added to the original image[2]. The PDF-files generated by `Adobe Photoshop` are for example bitmap images.

Normally it is not possible to convert a bitmap image into a scalable one, only vice versa. Only the image formats PDF and EPS can directly be embedded to PDF and PostScript output files, respectively. SVG and WMF-images are recalculated to bitmaps when the output file is generated because there is currently no adequate WMF/SVG→PDF/EPS converter available.

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[2]In the case of PDF, the original image is additionally compressed.

2. Tables

2.1. Introduction

You can insert a table using either the toolbar button ⊞ or the menu Insert ▷ Table. The toolbar button offers you a graphical selection: move the mouse to set the column/row number of the table that should be created and then press a mouse button. When you use the menu to create a table, a dialog will appear, asking you for the number of rows and columns.

The default table has lines around any cell and the first row appears separated from the rest of the table. This separation occurs due to a double line: The cells of the first row have a line below them and the cells of the second row have a line above them. Here is an example table:

	1	2	3
A			
B			
C			

2.2. Table Dialog

You can alter a table by clicking on it with the right mouse button, which brings up the context menu. Under the menu entry More you can adjust the settings of that cell and row/column respectively where the cursor is currently placed. The context menu More ▷ Settings opens the table dialog where you can adjust more things. Most of the dialog options also work on selections. This means if you select more cells, columns or rows, the action is done for the whole selection. Note that there is a difference between selecting the *contents* of the cell, and the cell itself.

With the dialog option Immediate Apply every change you make in the dialog is directly applied. If you move the cursor to another table cell the dialog will then also be updated with the parameters of the new cell. If you change length values in the dialog you must press Return to get the change applied.

You can alter tables with the following tabs of the table dialog:

Table Settings Here you can set the table width, and the horizontal alignment and the width of the current column. The alignment At Decimal Separator is described in section 2.14.2. When you have set a width you can also adjust the

vertical alignment of the current row. A given width will allow the cell to have line breaks and multiple paragraphs of text, see sec. 2.8.1. If you set no width, the column is as wide as the content of its widest cell.

Furthermore, you can mark one or multiple cells of one row as a multicolumn cell, see sec. 2.8.2 or the cells of one column as multirow cell, see sec. 2.8.3.

The rotate check boxes rotate the current cell, a selection, or the whole table counter-clockwise by 90°. The rotation is not shown within LyX, only in the output. For more information see sec. 2.12.

Note: Not all DVI-viewers are able to display rotations.

The table-wide vertical alignment is used for tables within text lines:

A line with tables with different alignments:

It is also possible to enter a LaTeX-argument which is needed for special table formattings, see sec. 2.8.2.2 and 2.11.

Borders In this tab you can add and delete border lines for the current row/column. Using the style option Formal will convert the table to a formal table as described in sec. 2.9.

You can also add space here to table rows as described in sec. 2.14.1.

Multi-page table This tab is to make a table a multi-page table that can run over several pages. Sections 2.6 and 2.7 describe the multi-page table features in detail.

2.3. Table Toolbar

The table toolbar is an alternative to the table dialog to be able to alter tables faster. It should normally appear at the bottom of LyX's main window when the cursor is inside a table. You can alternatively switch it on to appear always, by right-clicking in LyX's main menu bar.

The toolbar has the following icons:

adds a row below the current cell or selection

adds a column right beside the current cell or selection

deletes the current row or selection

deletes the current column or selection

moves the row up

moves the column to the left

moves the row down

moves the column to the right

adds a line at the top of the current cell / row or of a selection

adds a line at the bottom of the current cell / row or of a selection

adds a line at the left side of the current cell / row or of a selection

adds a line at the right side of the current cell / row or of a selection

adds lines around the current or selected cells - if the current cell is not a multicolumn cell this also affects the current row and column

deletes all lines of the current or selected cells - if the current cell is not a multicolumn cell this also affects the current row and column

left-aligns the content of the current cell / column

centers the content of the current cell / column horizontally

right-aligns the content of the current cell / column

aligns the content of the current column at a character

aligns the content of the current cell vertically to the top

centers the content of the current cell vertically

aligns the content of the current cell vertically to the bottom

rotates the current cell or selection counter-clockwise by 90°

rotates the whole table counter-clockwise by 90°

sets the current cell or selection as a multicolumn

sets the current cell or selection as a multirow

Note: For the output the vertical alignment of the first cell in a row is used for all following cells in the row.

2.4. Edit Table Menu

In addition to the table dialog and toolbar, the menu Edit ▷ Table allows you to add and delete border lines for the current row/column and to set the current selection as multicolumn. The menu is only available when the cursor is inside a table.

2.5. Table Floats

For general explanations about floats, have a look at section 3.1.

Table 2.1.: A table float.

1	2	3
Joe	Mary	Ted
$\int x^2 dx$	$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$	$1 + 1 = 2$

Table floats can be inserted using the menu Insert ▷ Float ▷ Table or the toolbar button 🖩.

The float appears as a collapsible box with a caption that has the label "Table #:" (# is the actual table number). You can insert tables in the float above or below the caption.

Table 2.1 is an example table within a table float.

Having the caption above the table is the common rule that is unfortunately not supported in LaTeX's standard classes. This means that, if you are using the document classes article, book, letter, or report, there will be no space between the caption and the table. To insert the needed space, add the following option to the load command of the LaTeX-package **caption** in your document preamble:[1]

tableposition=top

The package **caption**, which is described in section 3.9, is used to adjust the caption format.

Tables can be cross-referenced in the text by referencing their label. To do this insert a label in the caption using the menu Insert ▷ Label or the toolbar button 🏷. You can now refer to the label using the menu Insert ▷ Cross reference or the toolbar button ⮐.

Referencing is explained in detail in section 3.4.

2.6. Multi-page Tables

If the table is too long to fit on one page, you can use the option Use multi-page table in the tab Multi-page table of the table dialog to split the table automatically over more pages. Doing this enables the following options:

Header: The current row is defined to be a header row that appears on all pages of the multi-page table; except for the first page, if First header is defined. This is therefore called the main header.

First header: The current row is defined to be a header row that appears on the first page of the multi-page table.

---

[1]For more information have a look at section 3.10.

Footer: The current row is defined to be a footer row that appears on all pages of the multi-page table; except for the last page, if Last footer is defined.

Last footer: The current row is defined to be a footer row that appears on the last page of the multi-page table.

Caption: The current row contains the table caption. The row is reset as single column and a caption is inserted. More about multi-page table captions is explained in sec. 2.6.3.

You can also specify a row where the table is split. See the following multi-page table to see how it works:

Example Phone List (ignore the names)		
NAME		**TEL.**
Annovi	Silvia	111
Bertoli	Stefano	111
Bozzi	Walter	111
Cachia	Maria	111
Cachia	Maurizio	111
Cinquemani	Giusi	111
Colin	Bernard	111
Concli	Gianfranco	111
Dal Bosco	Carolina	111
Dalpiaz	Annamaria	111
Feliciello	Domenico	111
Focarelli	Paola	111
Galletti	Oreste	111
Gasparini	Franca	111
Rizzardi	Paola	111
Lassini	Giancarlo	111
Malfatti	Luciano	111
Malfatti	Valeriano	111
Meneguzzo	Roberto	111
Mezzadra	Roberto	111
Pirpamer	Erich	111
Pochiesa	Paolo	111, 222
Radina	Claudio	111
Stuffer	Oskar	111
Tacchelli	Ugo	111
Tezzele	Margit	111

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Example Phone List		
NAME		TEL.
Unterkalmsteiner	Frieda	111
Vieider	Hilde	111
Vigna	Jürgen	111
Weber	Maurizio	111
Winkler	Franz	111
Annovi	Silvia	555
Bertoli	Stefano	555
Bozzi	Walter	555
Cachia	Maria	555
Cachia	Maurizio	555
Cinquemani	Giusi	555
Colin	Bernard	555
Concli	Gianfranco	555
Dal Bosco	Carolina	555
Dalpiaz	Annamaria	555
Feliciello	Domenico	555
Focarelli	Paola	555
Galletti	Oreste	555
Gasparini	Franca	555
Rizzardi	Paola	555
Lassini	Giancarlo	555
Malfatti	Luciano	555
Malfatti	Valeriano	555
Meneguzzo	Roberto	555
Mezzadra	Roberto	555
Pirpamer	Erich	555
Pochiesa	Paolo	555, 222
Radina	Claudio	555
Stuffer	Oskar	555
Tacchelli	Ugo	555
Tezzele	Margit	555
Unterkalmsteiner	Frieda	555
Vieider	Hilde	555
Vigna	Jürgen	999

Example Phone List		
NAME		TEL.
Weber	Maurizio	555
Winkler	Franz	555

end

2.6.1. Footnotes in Multi-page tables

Footnotes can be inserted to every Multi-page table cell. They appear at the bottom of the page where the table cell with the footnote appears. Table 2.6 has for example a footnote.

2.6.2. Multi-page Table Alignment

The horizontal alignment of multi-page tables can be set in the table settings dialog. For left- and right-alignment the table will be directly at the page border. To add space between the table and the border one has to set the alignment to center and change the value of the LaTeX-lengths **\LTleft** or **\LTright** by inserting this line as TeX Code before the multi-page table:

\setlength{\LTleft}{value}

The value can have any of the units listed in Table A.1. **\LTleft** controls the horizontal distance from the left page border to the multi-page table, **\LTright** the distance from the right side. The default value for both lengths is **\fill**, which is in this case the same as an horizontal fill in LyX.

The following multi-page table was centered and **\LTleft** set to 0.1\columnwidth:

1	2	3	4	5
asd	s	s	s	asd
asd	s	s	s	asd
asd	s	s	s	asd
asd	asd	asd	asd	asd

2.6.3. Multi-page Table Captions

A multi-page table cannot be put into a table float because floats can only be on one page. But the caption environment of floats can also be used for multi-page tables

when you use the multi-page table option Caption as described in sec. 2.6. Only one table row should contain a caption, either a header or a footer row.

Here is a short multi-page table to see how it works:

Table 2.2.: Multi-page table with caption

1	2	3	4	5
asd	s	s	s	asd
asd	s	s	s	asd
asd	s	s	s	asd
asd	asd	asd	asd	asd

Note 1: The table number is increased for every multi-page table, even if you did not set a caption for it. For this reason you could have the case that e. g. Table 2.4 follows Table 2.1 in the list of tables if there are two multi-page tables without captions. To avoid this you can add the following command in TEX Code after every multi-page table without a caption:

\addtocounter{table}{-1}

This is not needed when none of your multi-page tables has a caption and you add the following code to the document preamble:

\let\myEnd\endlongtable
\renewcommand{\endlongtable}{\myEnd\addtocounter{table}{-1}}

Note 2: If you are using **hyperref** in the PDF Properties of the Document Settings dialog to link cross-references, the link to a multi-page table caption will always point to the beginning of the document.

2.6.3.1. References to multi-page tables

Table 2.3.: Referenced multi-page table

1	2	3	4	5
asd	s	s	s	asd
asd	s	s	s	asd
asd	s	s	s	asd
asd	sad	asd	asd	asd

To reference a multi-page table, insert a label into the caption.

This is a reference to Table 2.3.

The caption layout can be set together with all other captions of your document

using the LATEX-package **caption**, see section 3.9.

2.6.3.2. Caption Width

The maximal width of caption lines is defined by the length **\LTcapwidth**. Its default value is 4 in. To change it add the following command to your document preamble or as TEX Code into your document before the multi-page table that should be affected

\setlength{\LTcapwidth}{width}

where the width can have one of the units listed in appendix A.

The following tables show the difference:

Table 2.4.: Long full title with default width long full title with default width long full title with default width

1	2	3	4	5
asd	s	s	s	asd
asd	s	s	s	asd
asd	s	s	s	asd
asd	sad	asd	asd	asd

Table 2.5.: Long full title with width set to 5 cm long full title with width set to 5 cm long full title with width set to 5 cm

1	2	3	4	5
asd	s	s	s	asd
asd	s	s	s	asd
asd	s	s	s	asd
asd	sad	asd	asd	asd

Note: When the LATEX-package **caption** is used, as in this document, the full page width is used for the caption when you use the default value of 4 in for **\LTcapwidth**. To get in this case exactly a 4 in wide caption, you can either use a value slightly different from 4.0 in, e. g. 3.99 in, or the LATEX-command **\captionsetup{width=value}**

that is provided by the **caption**-package.

2.6.3.3. Different Captions for Table Pages

When the table captions for the following pages should differ from the one of the first table page, mark a empty row as header which contains a caption. Then right-click on the caption and select in the context menu Caption (Unnumbered). Table 2.6 is an example of a multi-page table with different heading where the second caption does not include the table number.

Table 2.6.: Example Phone List

Example Phone List (ignore the names)		
NAME		TEL.
Annovi	Silvia	111
Bertoli	Stefano	111
Bozzi	Walter	111
Cachia	Maria	111
Cachia	Maurizio	111
Cinquemani	Giusi	111
Colin	Bernard	111
Concli	Gianfranco	111
Dal Bosco	Carolina	111
Dalpiaz	Annamaria	111
Feliciello	Domenico	111
Focarelli	Paola	111
Galletti	Oreste	111
Gasparini	Franca	111
Rizzardi[2]	Paola	111
Lassini	Giancarlo	111
Malfatti	Luciano	111
Malfatti	Valeriano	111
Meneguzzo	Roberto	111
Mezzadra	Roberto	111
Pirpamer	Erich	111
Pochiesa	Paolo	111, 222
Radina	Claudio	111

---

[2]Example footnote

Continued Example Phone List

Example Phone List		
NAME		TEL.
Stuffer	Oskar	111
Tacchelli	Ugo	111
Tezzele	Margit	111
Unterkalmsteiner	Frieda	111
Vieider	Hilde	111
Vigna	Jürgen	111
Weber	Maurizio	111
Winkler	Franz	111
Annovi	Silvia	555
Bertoli	Stefano	555
Bozzi	Walter	555
Cachia	Maria	555
Cachia	Maurizio	555
Cinquemani	Giusi	555
Colin	Bernard	555
Concli	Gianfranco	555
Dal Bosco	Carolina	555
Dalpiaz	Annamaria	555
Feliciello	Domenico	555
Focarelli	Paola	555
Galletti	Oreste	555
Gasparini	Franca	555
Rizzardi	Paola	555
Lassini	Giancarlo	555
Malfatti	Luciano	555
Malfatti	Valeriano	555
Meneguzzo	Roberto	555
Mezzadra	Roberto	555

2.7. Special Multi-page Table Issues

2.7.1. Multi-page Table Calculation

LaTeX calculates the height of table pages and their page breaks using so called chunks. Chunks are parts of tables that held at the same time in LaTeX's memory. The default value was historically set to only 20 table rows. If you are using multi-page tables with many pages this may slow down the creation of your document. You can safely increase the chunk size to values of 100 -- 1000 by adding this command line to your document preamble:

\setcounter{LTchunksize}{100}

2.7.2. Floats and Multi-page Tables

There might be problems when a float appears on the same page where a multi-page table starts. To avoid such a situation, insert a "clear page" (menu Insert ▷ Formatting ▷ Clear Page) before your multi-page table.

2.7.3. Forced Page Breaks

By default tables are only broken between rows. If you have a cell with multiples lines and want to have a page break within the cell, insert the new line command "\\" as TeX Code at the point of the cell where it can be broken. Before the \\ command you have to insert in TeX Code as many "&" characters as the number of the following table columns. The & is the character to separate table cells. Write in TeX Code after each & the content of the corresponding following cell and delete the content of these cells.
After the \\ command, insert as many & characters as the number of table columns before the current column. In Table 2.7 the cell that should be broken is in the second column followed by another column. Therefore the following command was inserted in the cell as TeX Code after "*Castelchiodato,*":

& 111\\ \newpage
&

The "111" in the third column of the row was deleted. **\newpage** is only needed when a page break should definitely occur at this position, otherwise it would be a conditional break. If your footer row of the multi-page table has for a certain reason no upper line but you would have a horizontal line where the cell is broken, use this command instead:

& 111
\hline &

When the cell to be broken is in the last column, the command

\setlength{\parfillskip}{0pt}

must be inserted as TEX Code at the beginning of the cell. This ensures that the part of the cell that will be displayed on the new page appears with the full width.

Table 2.7.: Table with forced page break in table cell

Example Phone List (ignore the names)		
NAME		TEL.
Annovi	Silvia	111
Bertoli	Stefano	111
Bozzi	Walter	111
Cachia	Maria	111
Cachia	Maurizio	111
Cinquemani	Giusi	111
Colin	Bernard	111
Concli	Gianfranco	111
Dal Bosco	Carolina	111
Dalpiaz	Annamaria	111
Feliciello	Domenico	111
Focarelli	Paola	111
Galletti	Oreste	111
Gasparini	Franca	111
Lassini	Giancarlo	111
Malfatti	Luciano	111
Malfatti	Valeriano	111
Meneguzzo	Roberto	111
Mezzadra	Roberto	111
Pirpamer	Erich	111
Pochiesa	Paolo	111, 222
Radina	Claudio	111

Continued Example Phone List

Example Phone List		
NAME		TEL.
Rizzardi	Paolo, 11. Fürst von Montecompatri, 11. Fürst von Sulmona und Vivaro, 10. Fürst von Rossano, 5. Herzog von Canemorte, 11. Herzog von Palombara, 5. Herzog von Castelchiodato,	111

Continued Example Phone List

Example Phone List		
NAME		**TEL.**
	11. Herzog von Poggionativo, 11. Markis von Mentana, Norma, Civitella, Pratica, Moricone und Percille, 11. Graf von Valinfreda, 11. Baron von Cropalati, 11. Herr von Scarpa, Edelmann von Rom, Patrizier von Venedig, Neapel und Genua	
Stuffer	Oskar	111
Tacchelli	Ugo	111
Tezzele	Margit	111
Unterkalmsteiner	Frieda	111
Vieider	Hilde	111
Vigna	Jürgen	111
Weber	Maurizio	111
Winkler	Franz	111

2.8. Multiple Lines, Columns and Rows

2.8.1. Multiple Lines in Table Cells

Table 2.8.: Table with multiple lines in cells

multiple lines	b	c
d	e	f
g	h	i

Setting a fixed width for a column enables you to enter text as a paragraph with multiple lines and hyphenation.

To produce Table 2.8, create a 3×3 table, mark the first cell and right-click on it. In the appearing table dialog we set a cell width of 2.5 cm and choose centered for the vertical and horizontal alignment. The vertical alignment is used for all cells of the row. As our text is smaller than 2.5 cm, only one line will appear. To get two lines, a justified line break (shortcut Ctrl+Maj+Retour) was added. If the text is wider than the set cell width, it will automatically be broken to several lines.

If you have a long word in a cell with a fixed width, it cannot be hyphenated by LATEX if it is the first entry. Therefore you need to insert something to prevent the word not being the first entry. So add a horizontal space of 0 pt before the word. As the space is zero, it doesn't change the output. Table 2.9 shows the effect.

Table 2.9.: Table with and without hyphenation

verylongtablecellword	b	c
d	e	f
g	h	i

very-longtablecell-word	b	c
d	e	f
g	h	i

2.8.2. Multicolumns

2.8.2.1. Multicolumn Basics

To merge cells over multiple columns, select as many cells within a row as you want to merge and use either the table-toolbar button ⊞, or the menu Edit ▷ Table ▷ Multicolumn, or right click on the marked cells and choose Multicolumn in the context menu.

Multicolumns have their own cell settings. That means changing cell borders, cell alignment, and the width only affects the multicolumn. Here is an example table with a multicolumn cell in the first row and one in the last row without the upper border:

abc	def ghi	jkl
A	B	C	D
1	2	3	4

2.8.2.2. Multicolumn Calculations

LyX supports multicolumns directly, but we have to take account of the cell width of the columns spanned by the multicolumn cell.

Table 2.10.: Table with centered multicolumn text above two columns that have exactly half the width of the multicolumn cell

multiple lines multicolumn		c
d	e	f
g	h	i

To create for example Table 2.10, mark the first two cells in the first row of a 3×3 table and right-click on them. Now choose for this cell *multicolumn*, *centered alignment* and a width of 2.5 cm in the table dialog. The merged columns should have exactly half the width of the multicolumn cell, so that you would set a width of 1.25 cm for the first column. The second column has then automatically a width of 1.25 cm (multicolumn width - width of first column). This was done for Table 2.11.

You can see that the first column is not half the width of the multicolumn cell, it is a bit bigger. The reason is that the specified width of a cell W_g is not its total width W_{tot} because a cell is always a bit larger than specified. Appendix D explains this in detail.

Table 2.11.: Table where the spanned table columns are not exactly half the width of the multicolumn cell

multiple lines multicolumn		c
d	e	f
g	h	i

The width $W_{g\,n}$ which the user needs to set when n columns are spanned can be calculated, so that each column has a total width of $W_{\text{tot multicolumn}}/n$:

$$W_{g\,n} = (W_{g\,\text{multicolumn}} + (1-n)\cdot(12.4\,\text{pt}))/n \tag{2.1}$$

In our case we have $n = 2$, $W_{g\,\text{multicolumn}} = 2.5\,\text{cm}$ and the default values for the lengths, so that equation 2.1 becomes

$$W_{g\,2} = 1.25\,\text{cm} - 6.2\,\text{pt} \tag{2.2}$$

To enable calculations in LaTeX, the LaTeX-package **calc** must be loaded with the document preamble line

\usepackage{calc}

LyX does not allow you to calculate lengths in the Width field of the table dialog. Therefore you have to format the column by inserting a LaTeX-argument in the dialog. Here is an overview about the arguments:

- **p{width}** creates cell with a fixed width, its text is vertically top-aligned
- **m{width}** creates cell with a fixed width, its text is vertically centered
- **b{width}** creates cell with a fixed width, its text is vertically bottom-aligned

By entering a LaTeX-argument, all cell settings set in the table dialog are overwritten.

Note: Due to a bug, LyX shows the overwritten settings anyway.

As the text should be horizontally centered, the command **\centering** is added. You can now enter the following LaTeX-argument for the first spanned column:

>{\centering}m{1.25cm-6.2pt}

The command **>{ }** means, that the commands inside the braces are applied before the cell is created.

Although we have chosen centered alignment for the text of the multicolumn cell, it is still left aligned. This is because LyX only applies the alignment to single columns. So for the multicolumn cell we have to use the LaTeX-argument

>{\centering}m{2.5cm}

2.8.3. Multirows

To merge cells over multiple rows, select as many cells within a column as you want to merge and use either the table-toolbar button , or the menu Edit ▷ Table ▷ Multirow, or right click on the marked cells and choose Multirow in the context menu.

Here is an example table with a multirow in the first column:

a long cell entry	b	c
multirow	e	f
	h	i

The width of multirow cells is set by setting the width and alignment for the whole column. The Vertical Offset shifts the content of the multirow up/down if the offset is positive/negative.

If the column of a multirow cell has no explicit width, the multirow cell inherits the alignment of the column. Otherwise it is by default left-aligned. To override the default, renew the command **\multirowsetup** with the command

\renewcommand{\multirowsetup}{\centering}

in the document preamble. Then all entries of multirow cells in the document are centered. If centering is only needed for several tables, you can renew the command in a TeX Code box just before the table instead of the preamble. If the text should be right-aligned, replace **\centering** by **\raggedleft**. To return to left-alignment **\raggedright** is used.

This is an example table with a right-aligned multirow cell that has a vertical offset of -4 mm and is in a 3 cm wide column:

a long cell entry	b	c
t	n	m
	e	f
multirow	h	i

To start a new line in a multirow you can use a forced line break (shortcut Ctrl+Retour) but this will not respect the cell lines as demonstrated in this table:

aaa	ccc
aaa	ddd
wrong cell bbb	eee

Therefore be careful with forced line breaks.

2.8.4. Cells with diagonal line(s)

To tell the reader what is meant by column and row headings in a table, it is helpful to split the first cell of the table by one or two diagonal lines. This can be achieved by loading the LaTeX package **diagbox** in the document preamble. The package provides the command **\diagbox** that is inserted as TeX Code and that can take 2 or 3 arguments:

\diagbox[options]{lower left}{upper right}

\diagbox[options]{lower left}{upper left}{upper right}

The first scheme divides the cell by a single diagonal line and the arguments are placed below and above this line. The second scheme divides the cell by 2 lines.

Here is an example table where **\diagbox** is used in the 2-argument scheme in the first cell:

Name ⟍ Parameter	Thickness in nm	Transparency in %	Hardness in MPa
Perfect Green	45	80	504
Dark Multi-P	60	72	982
Crystal Clear Pro	18	86	374

The 3-argument scheme is for example useful for cross-tables of sports leagues or distances:

Result ⟍ Team away / Team home	Tigers	Panthers	Falcons
Tigers	—	1:3	0:1
Panthers	3:1	—	0:0
Falcons	1:0	0:0	—

For larger cross-tables one might use split cells in 2 or every corner of the table like in this example:

Result ⟍ Team away / Team home	Tigers	Panthers	Falcons	Team home / Result ⟍ Team away
Tigers	—	1:3	0:1	Tigers
Panthers	3:1	—	0:0	Panthers
Falcons	1:0	0:0	—	Falcons
Team home / Result / Team away	Tigers	Panthers	Falcons	Team away / Team home ⟍ Result

To rotate the diagonal lines, the command option **dir=direction** is used. *direction* is either **NE**, **SE**, **SW** or **NW** and represent a point of a compass. **SW** is for example the south-west corner. Thus in the lower left cell of the above table the command

\diagbox[dir=SW]{Team home}{Result}{Team away}

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is used. If no direction is given, it will be NW.

The necessary width of split cells is automatically calculated. Thus if you set a fixed column width smaller than the calculated one, the cell's content will protrude the cell borders:

Parameter Name	Thickness in nm
Perfect Green	45

If you need a certain width for columns with a split cell, use the command option **width=3cm** (replace '3cm' by the width you need). In the following table the width of the first column is set to 4 cm. For **\diagbox** a width of 4 cm + 2 \tabcolsep is necessary because the overall width is the width for the text (in this case the 4 cm) plus two times the separation of the text and the cell border. The calculation of the width cannot be done in the command option of **\diagbox** so one needs to create a new length which can be used later. This is done with the TeX Code commands

\newlength{\diagtest}
\setlength{\diagtest}{4cm+2\tabcolsep}

To enable calculations in LaTeX one needs to load the package **calc** in the document preamble.

In this table you can now use the command

\diagbox[width=\diagtest]{A}{B}

in the first cell:

A \ B	Thickness in nm
Perfect Green	45

Note that the split cell needs to be the widest one in the column. Otherwise the length of the diagonal line cannot be calculated correctly like in this table:

A \ B	Thickness in nm
Perfect Green	45

In this case use the **width** option of the **\diagbox** command. It is then not necessary to add 2\tabcolsep because the cell width is now the width of the column. In this table a width of 3 cm is used:

A \ B	Thickness in nm
Perfect Green	45

For multiple text lines in split cells one needs some extra height to fit the text to the cell. This can be achieved with the **\diagbox** option **height=3cm** (replace '3cm' by the height you need). In the following table the command

\diagbox[width=3cm,height=1.4cm]{A\\B}{C\\D}

is used in the first cell. The command \\ creates hereby the line break.[3]

A C	Thickness in nm
B D	
Perfect Green	45

For more info about the LATEX-package **diagbox**, see its documentation, [7].

2.9. Formal Tables

Tables are often typeset in books similar to Table 2.12. This kind of tables is called "*formal*". To make a table a formal table use the option Formal in the Borders tab of the table dialog.

Table 2.12.: Example booktabs-table

System	Chip 1	Chip 2	
Detector thickness in µm	300	300	700
Edge angle in °	3.55	2.71	7.99
Spatial resolution in µm	4.26	10.17	10.56
MTF at $f_{\max}$	0.53	0.37	0.39
LSF-spatial resolution			
in µm	129.7	52.75	50.78
in % of pixel size	76.3	95.9	92.3

Spaces to table rows can be added using the Borders tab of the table dialog as described in section 2.14.1.

Unlike normal tables, formal tables have no vertical table lines. The horizontal table lines can be set as for normal tables but they appear with different widths in the output:

---

[3]Breaking lines with Ctrl+Return is only possible when the column has a fixed width.

The first and the last table line have a default width of 0.08 em while the other lines have a default width of 0.05 em.

The default widths can be changed with the following preamble lines

\let\mytoprule\toprule
\renewcommand{\toprule}{\mytoprule[width]}

This example is for the first line, the so called **toprule**. If you want to change the width for the last line, replace **toprule** by **bottomrule**. To change the width for the other lines replace **toprule** by **midrule**. You can use all units listed in appendix A to set the width.

Lines that do not span all table columns can be created by setting a table line for multicolumn cells. LyX will then internally use the command **\cmidrule** to create this line. Its full scheme is

\cmidrule[height](trim){startcol-endcol}

The options of **\cmidrule** are currently not supported by LyX so you have to use TeX Code to be able to use them. **\cmidrule**s can manually be created by inserting the command as TeX Code as the first cell entry of the first cell of a row. The line is then drawn in the output above the current row.

The default for the optional **height** is 0.03 em. **startcol** is the number of the column where the line starts and **endcol** the column number where the line ends. The **endcol** always needs to be specified, also when the line should span only one column. The optional parameter **trim** could either be *l{trimwidth}* or *r{trimwidth}* where the *trimwidth* is also optional. Using for example the parameter *l{2pt}* means that the line is trimmed from its left end by 2 pt. If you don't specify the *trimwidth* the line is trimmed by the default of 0.5 em.

Table 2.12 was created using the commands

\cmidrule(r){2-2}\cmidrule(l){3-4}

at the beginning of the second row and

\cmidrule[2pt](l{10pt}){1-1}

in the sixth row.

You might want to have overlapping **\cmidrule**s as in in Table 2.13. This can be achieved with the TeX Code command

\morecmidrules

The command that was used for the second row of Table 2.13 is

\cmidrule(r){2-2}\cmidrule(l){3-4}\morecmidrules\cmidrule{2-4}

The command for the sixth row is

\midrule\morecmidrules\cmidrule{3-4}

If you are in any way not satisfied with the border line spacing, you can use the following command to produce lines that span over all table columns:

\specialrule{width}{space above}{space below}

For more information about these features, refer to the manual of the LaTeX-package **booktabs** [5].

Table 2.13.: Special booktabs-table

System	Chip 1	Chip 2	
Detector thickness in µm	300	300	700
Edge angle in °	3.55	2.71	7.99
Spatial resolution in µm	4.26	10.17	10.56
MTF at $f_{\max}$	0.53	0.37	0.39
LSF-spatial resolution			
in µm	129.7	52.75	50.78
in % of pixel size	76.3	95.9	92.3

2.10. Vertical Table Alignment

To align tables vertically in a text line, the table must be inside a box. The box can then be vertically aligned as described in section 5.2.

In the following example the tables are inside a minipage[4] box that has a width of 15 col%:

- test

a	d	g
b	e	h
c	f	i

  test

a	d	g
b	e	h
c	f	i

- test

a	d	g
b	e	h
c	f	i

---

[4]Minipages are described in section 5.4.

a	d	g
b	e	h
c	f	i

• test

a	d	g
b	e	h
c	f	i

test

As you will see, the content of the first and last table row is not correctly aligned. To get this alignment, the minipage box must be set into a raisebox.[5] In the example above the second table in the first item is aligned using the TEX Code command

\raisebox{0.85\baselineskip}{

before the box. After the box the closing brace **}** is inserted as TEX Code. For the second table in the last item the command

\raisebox{-0.32\baselineskip}{

is used.

Note: The alignment of the table row content to the surrounding text line is not exact. The required value for the **\raisebox** command for this alignment depends on the document font, the font size, and the table line thickness.

2.11. Colored Tables

2.11.1. Colored Cells

Table 2.14.: Table colored without using the package **colortbl**

a	b	c
d	e	f
g	h	i

If you only need colored text, mark the cells and choose a color in the Text Style dialog (toolbar button ⬚). This was used to create Table 2.14. In any other case you have to use the LATEX-package **colortbl**.

To create colored tables, **colortbl** must be loaded in the preamble with the line

\usepackage{colortbl}

The color of a column is adjusted with the command

\columncolor{name of color}

inside the command **>{ }**. More about the command **>{}** is contained in section 2.8.2.2.

---

[5]Raiseboxes are described in section 5.6.2.

The following color names are predefined:

red, green, yellow, blue, cyan, magenta, black and white

If you add the option

dvipsnames

to the document class options in the document settings, you can additionally use further 61 colors. These colors are listed in appendix C. One of these colors, Maroon, is used as example in Table 2.15.

You can also define your own color with the command

\definecolor{color name}{color model}{color values}

The color model can be

cmyk: cyan, magenta, yellow, black

rgb: red, green blue

gray   gray

and the color values are comma separated numbers between 0 and 1 describing the factor for the corresponding color of the color model.

You can e. g. define the color "*darkgreen*" in the preamble with

\definecolor{darkgreen}{cmyk}{0.5, 0, 1, 0.5}

and the color "*lightgray*" with

\definecolor{lightgray}{gray}{0.8}

Lines are colored with the command

\rowcolor{name of color}

and cells are colored with the command

\cellcolor{name of color}

Both commands are inserted at the beginning of a cell as TEX Code.

To color characters in the table, mark the cells and use the Text Style dialog. If a cell contains TEX Code mark only the characters, otherwise the colored TEX Code will cause LATEX errors.

Note: Not all DVI-viewers are able to display self-defined colors.

To create Table 2.15 do the following: The color of the first column should be *darkgreen.* So insert

>{\columncolor{darkgreen}\centering}c

as LaTeX-argument for this column. The first row should be light blue, therefore the TeX Code command

\rowcolor{cyan}

is inserted to the first cell of this row. Note that this overwrites the column color for the first cell. The last cell of the last row is colored maroon by inserting the TeX Code command

\cellcolor{Maroon}

The characters could now be colored using the menu Edit ▷ Text Style.

Table 2.15.: Table colored using the package **colortbl**

2.11.2. Colored Rows

In case every second table row needs to be colored there is an alternative to the method described in the previous section: One loads the package **xcolor** in the document preamble with the command

\usepackage[table]{xcolor}

xcolor automatically loads also the package **colortbl**, so **colortbl** must be installed in your LaTeX-distribution, otherwise you get LaTeX-errors.

The table rows are colored with the command

\rowcolors[commands]{row number}{odd row color}{even row color}

that is either inserted in the document preamble or as TeX Code before the first table to be colored. row number is the number of the first row which should be colored according to the odd row color. commands can be additional commands that are executed before every table row. So for example the command

\rowcolors{1}{white}{lightgray}

leads to the coloring scheme of Table 2.16. The command

\rowcolors[\hline]{1}{lightgray}{cyan}

leads to the coloring scheme of Table 2.17. If odd row color and/or even row color are left empty, no color will be used so that the command

\rowcolors{1}{}{}

deletes all colors. **\rowcolors** affects all tables following that command.

Table 2.16.: Table where every second row is colored light gray.

X	Y	Z
1	2	3
4	5	6
7	8	9

Table 2.17.: Table where every second row is colored cyan and at which there is a line between each row.

X	Y	Z
1	2	3
4	5	6
7	8	9

2.11.3. Colored Lines

As described in section 2.14.4, the line thickness for all lines in a table can be adjusted with the length **\arrayrulewidth**. It is set to 1.5 pt for all tables of this section.

To color vertical lines for example with green, create the following column format in the document preamble, according to the description in section 2.14.3:

\newcolumntype{W}{!{\color{green}\vline}}

For Table 2.18 the LaTeX-argument **WcW** was used for the last column and **Wc** for the other columns.

If you want to have several colors, define more column formats.

Table 2.18.: Table with colored vertical lines

sd		
	sd	
		sd

To color all horizontal lines for example with red, as in Table 2.19, insert these commands in TeX code before the table or table float:

\let\myHlineC\hline
\renewcommand{\hline}
 {\arrayrulecolor{red}\myHlineC\arrayrulecolor{black}}

To return to the default line color black, insert this command in TeX code after the table or table float:

Table 2.19.: Table with colored horizontal lines

\renewcommand{\hline}{\myHlineC}

Table 2.20 is an example with colored vertical and horizontal lines.

Table 2.20.: Table with colored lines

To color only some of the table lines another strategy is necessary. To color all following horizontal lines, insert this command as TₑX code as last thing in the row that should be above the first colored line:

\\\arrayrulecolor{blue}%

To go back to black lines, add this command as first thing in the row that is above the black lines:

\arrayrulecolor{black}

With this one can color table lines like in Table 2.21. However, with this method it is not possible to color the line above the first row of a table.

To change the color of vertical lines within a row, like in Table 2.22, one needs to use multicolumns. At first one needs to remove all vertical lines that don't run along the whole column. Now one colors all lines using the command

\\\arrayrulecolor{blue}%

as above. Finally one inserts this command as TₑX code to every cell in the row where one needs a vertical line in a different color:

Table 2.21.: Table with different horizontal line colors.

Table 2.22.: Table with different vertical line colors in one row.

\multicolumn{1}{!{\color{green}\vline}c!{\color{red}\vline}}{

This adds a vertical line to both sides of the cell. The left one will be green, the right one red. If no color change is necessary one can omit the **\color** command in the above command. To get for example a black left line and a blue right line you can write:

\multicolumn{1}{!{\color{black}\vline}c|}{

because the color blue was already set for all lines. The | creates hereby the vertical line while **\vline** does this when **\color** is used. To set vertical lines without changing any color use

\multicolumn{1}{|c|}{

After this command insert the cell content the normal way and end the cell with a closing brace **}** in TeX code.

2.12. Rotated Table Cells

Note: Not all DVI-viewers are able to display rotations.

Table 2.23 is an example where 3 cells were rotated by 45 °.

Table 2.23.: Table with rotated cells in the first row.

cups	plates	saucers
45	33	21

Note: Line breaks (shortcut Ctrl+Retour) are not allowed in rotated cells.

If you want to rotate table cells containing line breaks, you have to put the cell content into a minipage or a parbox.[6] If you rotate this cell by 90 ° the width of the box is the height of the cell. To avoid to estimate a suitable box width one can use a minipage with a variable width. Such a box is inserted by loading the

---

[6]For more about these boxes see sec. 5.4 and 5.5.

Table 2.24.: Table with rotated multiline cell.

a	rotated cell with line break	e
b	c	d

module Variable-width Minipages in the document settings. Then one can use the menu Insert ▷ Custom Insets ▷ Minipage (Var. Width). Table 2.24 is an example for a rotated multiline cell where a variable width minipage is used.

2.13. Table Width Calculation

For wide tables it is sometimes difficult to assure that the table does not protrude over the page margin. Setting a fixed width for every column of the table is the solution, but what amount of space is needed for each column?

The table width W_{table} can be calculated: Every column has the width of the specified column width W_{column} (that the content of the column can consume) plus two times the separation between the column content and the column border (LaTeX length **\tabcolsep**, default 6 pt) plus the width of a border line (LaTeX length **\arrayrulewidth**, default 0.4 pt): So if all n columns have the same width, the table width is

$$W_{\text{table}} = n\,(W_{\text{column}} + 2\backslash\text{tabcolsep} + \backslash\text{arrayrulewidth}) + \backslash\text{arrayrulewidth} \qquad (2.3)$$

The available width for a table is the space between the page margins or the width of a text column (for a two-column document) (LaTeX length **\columnwidth**). If all table columns should have the same width and W_{table} should be 1 \columnwidth, W_{column} can easily be calculated.

To be able to perform calculations you need to load the LaTeX-package **calc** in the document preamble. To set the width in the table dialog you have to use the field LaTeX argument. The command scheme for this field is the same that is explained in section 2.8.2.2. For a table with 5 columns with an uniform width and centered text, enter there for each column the command

>{\centering}p{(1\columnwidth-62.4pt)/5}

For a table with 5 columns where 2 should have 0.75 times the width than the 3

others, the calculation is

$$\begin{aligned}\text{\textbackslash columnwidth} &= 3\,W_{\text{column}} + 2 \cdot 0.75\,W_{\text{column}} + \text{\textbackslash arrayrulewidth} \\ &\quad + 5\,(2\text{\textbackslash tabcolsep} + \text{\textbackslash arrayrulewidth}) \\ &= 4.5\,W_{\text{column}} + 62.4\,\text{pt} \\ W_{\text{column}} &= \frac{\text{\textbackslash columnwidth} - 62.4\,\text{pt}}{4.5}\end{aligned} \tag{2.4}$$

In the table therefore the command

>{\centering}p{(1\columnwidth-62.4pt)/\real{4.5}}

is used for the wider columns and

>{\centering}p{(1\columnwidth-62.4pt)/\real{4.5}*\real{0.75}}

for the smaller ones:

1	2	3	4	5
111111 1111111 111111 111111111 11111 11111 1111		2222 22222 222222 222222222 2222222 22 22222		333333 333333 333333 33333 3333333 333

2.14. Table Customization

2.14.1. Row Spacing

You can add vertical space to table rows in the Borders tab of the table dialog. You find there three possibilities:

Top of row will add space above the characters of the table row. If the table is a formal table[7] LyX will insert as default 0.5 em space. For normal tables the inserted space will unfortunately destroy the vertical table lines as in the following table:

A
3 mm space top of row
C

So inserting space in the top of row for normal tables is only useful when you don't have vertical lines.

---

[7]Formal tables are explained in section 2.9.

Bottom of row will add space below the characters of the table row. If the table is a formal table LyX will insert as default 0.5 em space, for normal tables the default size is 2 pt.

Between rows adds space between the current and the following row. If the table is a formal table LyX will insert as default 0.5 em space. For normal tables the inserted space will unfortunately destroy the vertical table lines as in the following table:

A
↓ 3 mm space between row ↓
↑ 3 mm space between row ↑

So inserting space between rows for normal tables is only useful when you don't have vertical lines.

When you want to add extra height to all cells of all tables, you can do this with the following preamble lines:

**\@ifundefined{extrarowheight}
{\usepackage{array}}{}
\setlength{\extrarowheight}{height}**

where the height can have one of the units listed in appendix A. But this has the disadvantage that the cell texts are no longer exactly vertically centered.

If you are using font sizes larger than the normal size, the table borders are often too close to the letters. This can be corrected by inserting the command **\strut** in TeX Code at the beginning of a table row. Table 2.25 illustrates the effect.

Table 2.25.: Vertical alignment of text with large font sizes.

(a) Normal table.

Normal, g
Large
Larger
Largest
Huge
Huger

(b) Table using the command **\strut**.

Normal, g
Large
Larger
Largest
Huge
Huger

2.14.2. Special Cell Alignment

Sometimes it looks better when the cell entries of a column are aligned with a special character, e. g. with the decimal separator as in Table 2.26. This alignment is achieved by setting the cursor into the column and then either pressing the toolbar button ⌗ or setting the alignment in the table settings to At Decimal Separator. The alignment character can be a character of your choice and is specified in the table settings.

Table 2.26.: Table cells of a column aligned with the decimal separator.

heading
12.6
0.68
-123.0

Table 2.27.: Table cells of a column aligned with the operators.

heading
$12 + 6$
$0 - 68$
$-123 / 0$

For alignments at characters in formulas this method does not work because the field to specify the alignment character does not allow formulas. In this case one need to use the method from Table 2.27. This table was created with a 4×2 table. The heading is a centered multicolumn. The first column is right-aligned and contains the first part including the operator. The second column is left aligned and contains the rest. A small space was added at the beginning of each cell of the second column to get the space that is usually around operators. To omit the space that is normally between two table columns, the following LaTeX-argument was used for the second column:

@{}l

Table 2.28 shows some example alignments. For the alignment with the relation sign, a small space was added like for the second column of Table 2.27.

Table 2.28.: Several table cell alignments.

units	exponents	relations
12×24 bottles	$10 \cdot 10^{-17}$	$\Gamma(t) \propto \Upsilon(t)$
1024×768 Pixels	$5.78 \cdot 10^{7}$	$A \neq B_{\text{red}}$
32×6 cm	$-33.5 \cdot 10^{4}$	$\sin(\alpha) \geq \sin(\beta)$

2.14.3. Customized Cell/Column Format

Calculating the required width for normal columns as described in section 2.13 or for spanned columns as described in section 2.8.2.2 is very annoying if you have several tables where a calculation is necessary. To make life easier, you can define a cell/column format in the preamble, that can be used in all tables of the document. The format is defined with the command

\newcolumntype{name of format}[number of arguments]{commands}

The format name may only consist of one letter. The letters *b*, *c*, *l*, *m*, *p* and *r* are predefined and cannot be used. But all letters are allowed as capitals.

For vertically and horizontally centered multicolumn cells with a fixed width you can define the cell format

\newcolumntype{M}[1]{>{\centering\hspace{0pt}}m{#1}}

where **\hspace{0pt}** avoids the problem of hyphenating the first word, as described in section 2.8.1. Now you can simply enter

M{width}

as LaTeX-argument in the table dialog to create a multicolumn.

For cells spanned by a multicolumn cell, you can define the format

\newcolumntype{S}[2]{>{\centering\hspace{0pt}}
$\qquad\qquad$**m{(#1+(2\tabcolsep+\arrayrulewidth)*(1-#2))/#2}}**

This format uses equation (2.1) to calculate the required width so that each spanned cell has the same width.

You can now enter

S{width of multicolumn cell}{number of spanned columns}

as LaTeX-argument of the column.

For colored columns, you can define

\newcolumntype{K}[1]{>{\columncolor{#1}\hspace{0pt}}c}

The "c" at the end creates a column with a flexible width whose text is horizontally centered. You can now enter

K{color name}

as LaTeX-argument.

To create Table 2.29 use the LaTeX-arguments

M{2.5cm}

for the first column and the multicolumn,

K{red}

for the last column, and

S{2.5cm}{2}

for the cells in the second column.

Table 2.29.: Table using user-defined table formats

very-longtablecell-word	multiple lines multicolumn		c
d	e	f	g
h	i	j	k

2.14.4. Line Thickness

The line thickness for all lines in a table can be adjusted with the length **\arrayrulewidth**. To set for example a line thickness of 1.5 pt, as in Table 2.30, insert the command

\setlength{\arrayrulewidth}{1.5pt}

in TEX Code before the table or table float. The changed thickness is valid for all subsequent tables. To use the default value again, set **\arrayrulewidth** to 0.4 pt in TEX Code after the table or table float.

To set the line thickness to 1.5 pt only for horizontal lines, as in Table 2.31, insert these commands in TEX Code before the table or table float:

\let\myHline\hline
\renewcommand{\hline}
{\noalign{\global\arrayrulewidth 1.5pt}
\myHline\noalign{\global\arrayrulewidth 0.4pt}}

To return to the default line thickness, insert this command in TEX Code after the table or table float:

Table 2.30.: Table with 1.5 pt thick lines

sd		
	sd	
		sd

Table 2.31.: Table with 1.5 pt thick horizontal lines

sd		
	sd	
		sd

Table 2.32.: Table with 1.5 pt thick vertical lines

sd		
	sd	
		sd

\renewcommand{\hline}{\myHline}

To set the line thickness to 1.5 pt only for vertical lines, create the following column format in the document preamble, according to the description in section 2.14.3:

\newcolumntype{V}{!{\vrule width 1.5pt}}

For Table 2.32 the LATEX-argument

VcV

was used for the last column and

Vc

for the other columns.

2.14.5. Dashed Lines

Table 2.33.: Table with dashed lines

a	b	c	d	e
f	g	h	i	j
k	l	m	n	o
p	q	r	s	
t	u	v	w	x

L\YX does not natively support dashed lines, so you have to use T\EX Code. As a prerequisite the LATEX package **arydshln** must be loaded in the document preamble with the command

\usepackage{arydshln}

To make a vertical line dashed, enter the colon ":" together with the character for the horizontal alignment as LATEX argument in the table cell dialog.

For a horizontal dashed line add the command

\hdashline

in TEX Code as first element of the first cell in the table row.

For dashed multicolumn lines use the command

\cdashline{line number}

in TEX Code as the first element of the first cell in the table row. If you have for example a multicolumn spanning columns 2 to 4 and you want to have a dashed line above, add the command

\cdashline{2-4}

as the first element of the first cell in the row of the multicolumn.

Table 2.33 was created using "**:c**" as LATEX argument of the third column. The TEX Code command **\hdashline** was inserted in the first cell of the third row and the TEX Code command
\cdashline{4-5} was inserted in the first cell of the fourth row.

Tables with dashed lines can also be colored as shown by Table 2.34.

Table 2.34.: Colored table with dashed lines

The coloring of lines, columns and lines works as decribed in section 2.11. Coloring horizontal lines works analogically as described there as well, one only needs to replace in the commands **\myHlineC** by **\myHdashline** and **\hline** by **\hdashline**; so one uses the command

\let\myHdashline\hdashline
\renewcommand{\hdashline}
{\arrayrulecolor{red}\myHdashline\arrayrulecolor{black}}

To color **\cdashline**, the command is

\let\myCdashline\cdashline
\renewcommand{\cdashline}[1]
{\arrayrulecolor{red}\myCdashline{#1}\arrayrulecolor{black}}

To get back the black line color, one needs to insert the following commands as TEX Code behind the table:

For **\hdashline**

\renewcommand{\hdashline}{\myHdashline}

and for **\cdashline**

\renewcommand{\cdashline}{\myCdashline}

To color the gaps between the dashes the command

\dashgapcolor{color}

can be used in front of a table as TEX Code. color is hereby the name of a defined color. The command

\nodashgapcolor

unsets the changes made by **\dashgapcolor**.

Note: If there are multiple commands in a cell, the command of **arydshln** needs to be the first one in the cell. Therefore in cell k of Table 2.34 the command **\hdashline** is before **\rowcolor**.

Note: The LATEX-package **arydshln** must be loaded in the document preamble before the LATEX-package **colortbl**.

For more information about dashed lines see the documentation of **arydshln**, [4].

3. Floats

3.1. Introduction

A float is a block of text associated with some sort of label, which doesn't have a fixed location. It can "float" forward or backward a page or two, to wherever it fits best. Footnotes and Margin Notes are also floats because they can float to the next page when there are too many notes on the page.

Floats allow a high quality layout. Images and tables can be spread evenly among the pages to avoid white space and pages without text. As the floating often destroys the context between the text and the image/table, every float can be referenced in the text. Floats are therefore numbered. Referencing is described in section 3.4.

To insert a float, use the menu Insert ▷ Float (toolbar button 🖼 or ▦). This inserts the Caption inset, a box with a label. The label will automatically be translated to the document language in the output. After the label you can insert the caption text. The image or table is inserted above or below the caption in a separate paragraph within the float. More about the caption placement is contained in section 3.10. To keep your LyX document readable, you can open and close the float box by left-clicking on the box label. A closed float box looks like this: float: Figure – a gray button with a red label.

It is recommended that you insert floats as separate standard paragraphs to avoid possible LaTeX-errors that can occur when the surrounding text is specially formatted.

Existing figures or tables can be put into a float by highlighting them and then pressing the corresponding toolbar button for a new float.

3.2. Float Types

Besides figure and table floats that are described in sections 1.2 and 2.5 respectively, LyX offers the float types Algorithm and Wrap. The latter are explained in sec. 6.1.

3.2.1. Algorithm Floats

This float type is inserted with the menu Insert ▷ Float ▷ Algorithm. It is used for program codes and descriptions of algorithms and can be seen as an alternative to

---

Algorithm 3.1 Example Algorithm float

```
for I in 1..N loop
 Sum:= Sum + A(I); /*comment*/
end loop
```

---

program code listings that are explained in chapter 8. A possible environment for algorithms is the LyX Code, described in LyX's *Userguide.* Algorithm 3.1 is an example of an algorithm float where -4 mm vertical space was added at the end of the float to have the bottom rule exactly below the last text line.

The float label is not automatically translated into the document language. If your document is not in English, you have to do this manually by adding the following line to the document preamble**:**

\floatname{algorithm}{your name}

where your name is the word "*algorithm*" in your language.

To insert the list of algorithms you can use the menu Insert ▷ List / TOC ▷ List of Algorithms when your document has the same language as LyX's menu names. In other cases use this command in TeX Code instead:

\listof{algorithm}{your name}

where your name is the word "*List of Algorithm*s" in your language.

Algorithm floats are not by default numbered in the scheme "chapter.algorithm" as is the case for table and figure floats in many document-classes. To number algorithm floats in the same scheme, add this command to your document preamble:

\numberwithin{algorithm}{chapter}

To be able to use the command **\numberwithin**, set in the tab Math Options in the document settings the option Use AMS math package.

3.3. Float Numbering

Floats are usually numbered either independently from the sections the floats are in, or in the scheme "chapter.number" or "section.number". This depends on the document class used.

To change section-independent numbering, you can use this command in the document preamble:

\renewcommand{\thetable}{\roman{table}}

\thetable is the command that prints the table number. For figure floats, the command would be **\thefigure**. **\roman** in the command above prints the table number as a small roman number.

To change the numbering scheme for example to "subsection.number", use this command in the preamble:

\numberwithin{table}{subsection}

To be able to use the command **\numberwithin**, set in the tab Math Options in the document settings the option Use AMS math package.

Please also have a look at section 4.2.1 for the details and important notes about the numbering commands.

3.4. Referencing Floats

To reference a float, insert a label into its caption using the menu Insert ▷ Label or the toolbar button ✎. A grey label box like this one: enu:Second-item will be inserted and the label window pops up asking for the label text. LyX offers as text the first words of the caption with a prefix. The prefix depends on the float type, e. g. for figure floats the prefix will be "fig:".

The label is used as anchor and name for the reference. You can refer to the label using the menu Insert ▷ Cross-reference or the toolbar button ⇥. The cross-reference window appears showing all labels of the document. If you have multiple LyX documents opened, choose the one you are working on from the drop-list at the top of the dialog. You can now sort the labels alphabetically and then choose one. A grey cross-reference box like this one: Ref: enu:Second-item will be inserted. At the position of the cross-reference box the float number will appear in the output.

It is recommended that you use a protected space between the cross-reference name and its number to avoid line breaks between them. If a cross-reference refers to a non-existing label, you will see two question marks in the output instead of the reference.

You can change labels at any time by clicking on the label box. References to the changed label will automatically update their links to the new label text.

The button Go to Label in the cross-reference window sets the cursor before the referred label. The button text changes then to Go Back and you can use it to set the cursor back to the cross-reference.

3.4.1. Cross-Reference Formats

There are six varieties of cross-references:

<reference>: prints the float number, this is the default: 1.3

(<reference>): prints the float number within two parentheses, this is the style normally used to reference formulas, especially when the reference name "Equation" is omitted: (2.1)

<page>: prints the page number: Page 4

on page <page>: prints the text "on page" and the page number: on page 4

<reference> on page <page>: prints the float number, the text "on page", and the page number: 1.3 on page 4

Formatted reference: prints a self-defined cross-reference format.
Note: This feature is only available when you have the LaTeX-package **prettyref** or **refstyle** installed.
You can select which LaTeX-package should be used for this feature by setting the option Use refstyle (not prettyref) for cross-references in the menu Document ▷ Settings ▷ Document Class. The format is specified by adding the command **\newrefformat** (prettyref) or **\newref** (refstyle) to the preamble of the document. For example redefining all references to figures (which have the label prefix "fig") can be done with this command
\newref{fig}{refcmd={Image on page \pageref{#1}}}
For more information about the format, have a look at the package documentations, [18, 20].
The options Plural and Capitalized are only available if you use the LaTeX-package **refstyle**. Plural adds an *s* to the name, e. g. "figures"; Capitalized outputs the name capitalized, e. g. "Figure". Both options can be combined to get e. g. "Figures".

Textual reference: prints the caption of the reference: Two distorted images. Both images are in the image settings group named "distorted".

Label only: prints only the LaTeX label for the reference: fig:Two-distorted-images
This allows to use the label for commands in TeX code. With the option No Prefix one can omit the prefix of the label name: Two-distorted-images

<page> will not print the page number if the label is on the previous, the same, or the next page. You will e. g. see the text "on this page" instead. The style <reference> on page <page> will not print anything about the page if the label is on the same page.

The number and current page of the part of the document referred to in the output is automatically calculated by LaTeX. The varieties are adjusted in the field Format of the cross-reference window that appears when you click on the cross-reference box.

Note: It is recommended to use the LaTeX-package **refstyle** because **prettyref** does not know all of LyX's possible label shortcuts[1] and is not internationalized.

---

[1]"fig:" is for example LyX's shortcut for labels in figure captions.

3.4.2. Automatic Reference Naming

The LaTeX-package **hyperref**, that is enabled in the PDF Properties of the Document Settings dialog, provides a very useful feature that cross-references automatically include the name of the referenced floats (or text parts like *section*). So you will save having to write e. g. the name "Figure" before every reference to a figure. To use this feature, enable **hyperref** and insert this line to the LaTeX preamble:

\AtBeginDocument{\renewcommand{\ref}[1]{\mbox{\autoref{#1}}}}

When you prefer other reference names than the default ones, for example you want instead of "section" the name "sec.", you can redefine the name by inserting this in the preamble:

\addto\extrasenglish{\renewcommand{\sectionautorefname} {sec.\negthinspace}}

When you are using another document language than English, replace **\extrasenglish** by **\extras*****, where *** is the name of the language used.

To get automatic names, but not for certain reference types, for example not for equations, use this preamble code:

\addto\extrasenglish{\renewcommand*{\equationautorefname}[1]{}}

More about this topic can be found in **hyperref**'s documentation [11].

Note: Automatic reference naming cannot be used when you use cross-references in the Formatted reference style, as described in section 3.4.1.

The *Math* manual is an example where automatic reference naming is used.

3.4.3. Reference Position

If you use **hyperref** in the PDF Properties of the Document Settings dialog to link cross-references in the output, you will see that clicking on an image float reference jumps to the image label. The caption will be the first text part on the screen, so that you cannot see the image without scrolling. This is because the reference link anchor is placed at the position of the label. With the use of the package **hypcap**, which is part of the LaTeX-package **oberdiek**, the link anchor is placed at the beginning of a float. To use this feature for figure floats, load **hypcap** in the document preamble with the line

\usepackage[figure]{hypcap}

You can also use **hypcap** for all float types but this is not recommended for stability reasons. For more information, have a look at **hypcap**'s manual [10].

Note: hypcap has no effect on references to subfigures.

3.5. Float Placement

Right-clicking on a float-box and clicking on Settings opens a dialog where you can alter the placement options that LaTeX uses for positioning the float.
The option Span columns is only useful for two-column documents: If you select it, the float will span both columns on the page instead of being confined to just one.
The option Rotate sideways is used to rotate floats, see section 3.6.

You can use one or more of the following options in the float dialog to set the placement for a particular float when you uncheck the option Use default placement:

Here if possible try to place the float on the position where it has been inserted

Top of page try to place the float at the top of the current page

Bottom of page try to place the float at the bottom of the current page

Page of floats try to place the float on its own page

The order of the above option is *always* used by LaTeX. That means, if you use the default placement, LaTeX will first try out Here if possible, then Top of page, and then the others. If you do not use the default, LaTeX will try only the checked options but in the same order. If none of the 4 placements is possible the procedure is internally repeated trying to put the float on the following page.

By default, each option has its own rules:

Top of page only floats occupying less than 70 % of the page can be placed at the top of a page (**\topfraction**)

Bottom of page: only floats occupying less than 30 % of the page can be placed at the bottom of a page. (**\bottomfraction**)

Page of floats: only if more than 50 % of the page is occupied by floats, several floats can be set together on a page. (**\floatpagefraction**)

If you don't like these rules, you can ignore them by using the additional option Ignore LaTeX rules.
You can also redefine the rules with LaTeX-commands that are given in parentheses after the rules description above. To increase for example the often too small default of the bottom-rule to 50 % of the page, add this line to your document preamble:

\renewcommand{\bottomfraction}{0.5}

Sometimes you might need, under all circumstances, a float to be placed exactly at the position where it is inserted. For this case you can use the option Here definitely. Use this option very rarely and only if the document is almost ready to be printed, because the float is then no longer able to "float" when you change your document and this will often destroy the page layout.

There are no placement options for text wrap floats, because they are always surrounded by the text of a certain paragraph.

Sometimes you have the problem that a float is placed at the top of a page while its corresponding section starts at the middle of the page, so that the reader could think the float is part of the previous section. To avoid this the LATEX-command **\suppressfloats** can be used. It suppresses a given float placement for the page where it is inserted and can therefore be used to avoid floats being set before a section starts. To get this, add these commands to your document preamble:

\let\mySection\section
\renewcommand{\section}{\suppressfloats[t]\mySection}

You can define the same for all section headings, like chapters and subsections. This definition is not recommended to be used for small text parts like subsubsections because LATEX may then have problems finding a suitable placement.

In some cases it is required to have all figures/tables at the end of the document. For this purpose the LATEX-package **endfloat** was developed. It puts all figure and table floats at the end of the document into their own sections. At the original float position a text hint like "[Figure 3.2 about here.]" is inserted. The endfloat-package is loaded in the preamble with the line

\usepackage[options]{endfloat}

There are various package options to format the created figure/table sections. For more information we refer you to the **endfloat** documentation [8].
Note: endfloat doesn't provide an automatic translation for the text hint, you have to do this manually, see section 4 in [8].
Note: There is currently a bug in **endfloat** when the caption contains a German "ß". Use in this case the command "**\ss**" in TEX Code instead of "ß".

For more details about float placements, have a look at LATEX books, [1, 2, 3].

3.6. Rotated Floats

Especially for wide tables you might have floats rotated. To rotate a whole float including the caption, right-click on the float-box and use the option Rotate sideways.

Rotated floats are always placed on a page of their own (or column of their own; in case you have a multi-column document). You can let them span several columns using the float settings option Span columns. Floats are rotated so that you can read them from the outside margin. To force a certain rotation direction for all pages, you can add either the option **figuresleft** or **figuresright** to the document class options.

Referencing rotated floats is the same as for normal floats, the caption format is also the same: Table 3.1 is an example of a rotated table float.

Note: Not all DVI-viewers are able to display rotated floats.

Table 3.1.: Rotated table

test	b	c	d	e

Table 3.2.: Two subtables placed side by side.

(a) This is subtable a.

test	b	c	d	e

(b) This is subtable b.

e	d	c	b	test

Table 3.3.: Two subtables placed one above the other. (a) table with 4 cells, (b) table with 5 cells.

(a)

test	test	test	test

(b)

a	b	c	d	e

3.7. Subfloats

Subfloats are for example used when a figure consists of several images. They are created by inserting a float into an existing float. The placement of the subfloats can be controlled in the same way as for paragraphs as shown in table 3.2 and 3.3.

Referencing subfloats works as for normal floats: Table 3.2a and 3.2b are subtables of table 3.2.

3.8. Floats Side by Side

To place floats side by side, as in Figures 3.1 and 3.2, only *one* float is used. In it two minipage boxes are inserted.[2] The width is set to 45-50 column% and the box alignment to Bottom for each minipage. The minipage boxes contain the image and the caption in the same way as they are in a float. The only difference is that the image unit Column Width % is now calculated according to the width of the minipage boxes.

An alternative and simpler solution is to use the module Variable-width Minipages, see sec. 5.4. Variable-width minipages adapt automatically to the width of the figures and tables. They do not require an explicit width to be given, and they improve the horizontal alignment of the figures. The LyX example file *varwidth-floats-side-by-side* gives examples of how to do this.
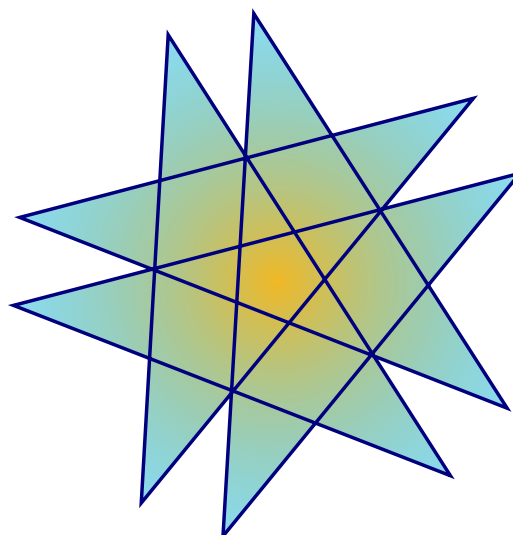
---

[2]Minipages are explained in section 5.4.
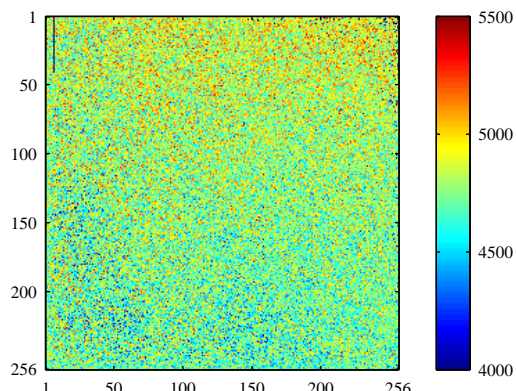
Figure 3.1.: Float on the left side.

Figure 3.2.: Float on the right side.

3.9. Caption Formatting

The Caption environment is the default paragraph environment for Floats. On the LyX screen captions appear as a label, e. g. "Figure #:" followed by the caption text. "#" is the actual reference number. By default the label and the number are in the same font as the caption text and a colon follows the number to divide the label from the text. This caption format is suitable for many but not all documents.

To change the default caption format, load the LaTeX-package **caption** in the document preamble with this line:

\usepackage[format definition]{caption}

To have for example the label and the number in sans-serif, bold font and the table captions always above the table as in this document, use the following command:

\usepackage[labelfont={bf,sf}, tableposition=top]{caption}

You can also define different caption formats for the different float types. In this case load the **caption** package without format specific options and define the different formats with the help of the command

\captionsetup[float type]{format definition}

in the document preamble. For example the caption formats of Figure 3.3 and Table 3.4 can be created using these commands in the document preamble:

\usepackage[tableposition=top]{caption}
\captionsetup[figure]{labelfont={tt}, textfont=it, indention=1cm,%
                    labelsep=period}
\captionsetup[table]{labelfont={bf,sf}}

Note: The option **tableposition=top** has no effect when a **KOMA-Script** document class is used. In this case the document class option **captions=tableheading** must be used.

For more information about the package **caption** we refer to its documentation [6].

To change the label name from e. g. "Figure" to "Image" use this preamble command:

\renewcommand{\fnum@figure}{Image~\thefigure}

where **\thefigure** inserts the figure number and "**~**" creates a protected space.

If you are using a **KOMA-Script** document class (article (KOMA-Script), book (KOMA-Script), letter (KOMA-Script), or report (KOMA-Script)), you can alternatively to the **caption** package use **KOMA-Script**'s built-in command **\setkomafont**. For example, to have the caption label in bold, add this command to your document preamble:

\setkomafont{captionlabel}{\bfseries}

For more information about **\setkomafont** we refer to the **KOMA-Script** documentation [12].

3.10. Caption Placement

The common caption placement rule is:

Figure: Caption is set below the figure

Table: Caption is set above the table

Having the caption above the table is unfortunately not supported in LATEX's standard classes. That means if you are using the document classes article, book, letter, or report there will be no space between the caption and the table. To insert the necessary space, load the LATEX-package **caption** in your document preamble with the option³

tableposition=top

If you are using a **KOMA-Script** document class (article (KOMA-Script), book (KOMA-Script), letter (KOMA-Script), or report (KOMA-Script)), you can alternatively to the **caption** package set the document class option⁴

captions=tableheading

In documents with a KOMA-Script document class you can also right-click on a caption and mark in the context menu if this should be a caption above or below the table/figure. This way you can override the document-wide caption placement for certain captions. Table 3.5 is an example where the caption is marked a being below the table while it is above. For comparison the caption in Table 3.6 is not marked.
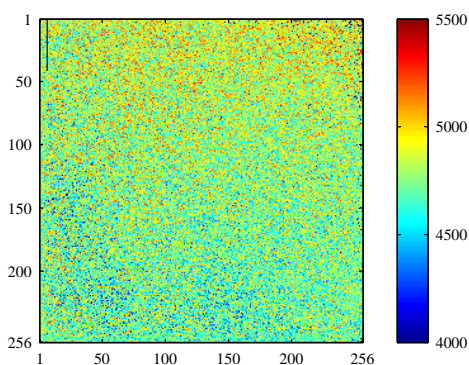
Figure 3.3.. *This is an example figure caption that is longer than one line to show the different caption format. Here a self-defined caption format is used.*

Table 3.4.: This is an example table caption that is longer than one line to show the different caption format. Here the standard caption format for tables in this document is used.

a	b	c	d	e

Table 3.5.: A caption marked as being below the table.

1	2	3
Joe	Mary	Ted
$\int x^2 dx$	$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$	$1 + 1 = 2$

Table 3.6.: A standard table caption.

1	2	3
Joe	Mary	Ted
$\int x^2 dx$	$\begin{bmatrix} a & b \\ c & d \end{bmatrix}$	$1 + 1 = 2$

It is also possible to set the caption beside a figure or table. To get this the LATEX-package **sidecap** has to be loaded in the document preamble with the line

\usepackage[option]{sidecap}

If you set no option, the caption is placed on the side of the outer page margin – to the right on odd pages, to the left on even pages. You can change the placement to inner margin with the option **innercaption**. To force the placement always to the right or left, use the option **rightcaption** or **leftcaption**, respectively.

To place in LYX the caption of a float on the side, it is necessary to add these commands to the document preamble:

\newcommand{\TabBesBeg}[1][1.0]{%
\let\MyTable\table
\let\MyEndtable\endtable
\renewenvironment{table}[1]{\begin{SCtable}[#1]##1}{\end{SCtable}}}

\newcommand{\TabBesEnd}{%
\let\table\MyTable
\let\endtable\MyEndtable

\newcommand{\FigBesBeg}[1][1.0]{%
\let\MyFigure\figure
\let\MyEndfigure\endfigure
\renewenvironment{figure}[1]{\begin{SCfigure}[#1]##1}{\end{SCfigure}}}

\newcommand{\FigBesEnd}{%
\let\figure\MyFigure
\let\endfigure\MyEndfigure}

The commands allow you to redefine the floats so that the caption is set on the side. For figure floats use the command

\FigBesBeg

in TEX Code before the float. And insert the command

\FigBesEnd

in TEX Code at the point where you want to get back to the original float definition.

For table floats use the corresponding commands

\TabBesBeg and **\TabBesEnd**

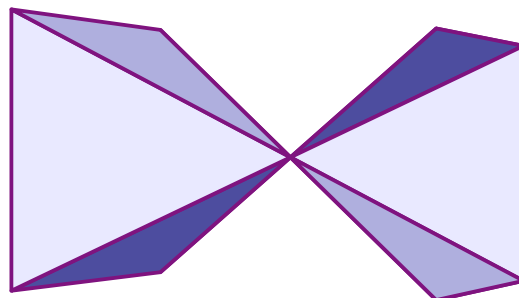Figure 3.4 and Table 3.7 are examples where the caption is set beside.

---

[3]See section 3.9 for more information of the package **caption**.

[4]That option is used in this document.

Figure 3.4: This is a caption beside a figure.

You can see in the examples that the caption text appears at the top of the floats for table floats and at the bottom for figure floats. To change this, you can use the command

\sidecaptionvpos{float type}{placement}

in the document preamble or in TeX Code before the float. The float type is either figure or table, the placement can be "t" for top, "c" for center, or "b" for bottom. To have for example the caption of figure floats vertically centered, use the command

\sidecaptionvpos{figure}{c}

This was used for Figure 3.5.

The default caption width is the width of the image/table. For thin image/tables, like in Table 3.7, this leads to captions that are too thin. You can increase the width by specifying a factor that will be multiplied with the image/table width to get the caption width. The caption width will automatically be recalculated in case it would protrude over the page or column margin due to the specified width. The *factor* can either be given as optional argument for **\FigBesBeg**:

\FigBesBeg[factor]

or in the definition of **\FigBesBeg** by replacing the **1.0** with another value. If you do the latter, your factor will be the default if **\FigBesBeg** is used without an argument. For Table 3.8 the factor 5 was used.

Note: For floats with captions set beside, you cannot use the float placement option Here definitely because it is not supported by **sidecap**.

For more information about the package **sidecap** we refer to its documentation [21].

Note: The LaTeX-package **hypcap**, described in section 3.4.3, has no effect on floats with the caption set beside.

3.11. Listings of Floats

Similar to the table of contents where the sections of the document are listed, there are listings for all float types, like the figures of the documents. You can insert them via the Insert ▷ List / TOC sub menus.

a		b		c
	d		e	
f		g		h
	i		j	

Table 3.7: This is a caption beside a table.
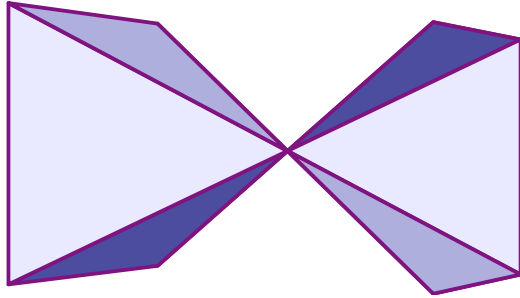
Figure 3.5: This is a vertically centered caption beside a figure.

The list entries are the float captions or its short title, the float number, and the page number where they appear in the document.

You can find the list of figures and tables at the end of this document.

a		b		c
	d		e	
f		g		h
	i		j	

Table 3.8: This caption is wider than the one in Table 3.7.

4. Notes

4.1. LᵧX Notes

Notes are inserted with the toolbar button ▱ or the menu Insert ▷ Note. There are three types of notes:

LᵧX Note This note type is for internal notes that won't appear in the output. Its note-box looks like this:

Note   This is text in a note box that does not appear in the output.

Comment This note also doesn't appear in the output but it appears as LᴬTᴇX-comment, when you export the document to LᴬTᴇX via the menu File ▷ Export ▷ LaTeX (pdflatex) / (plain). Its note-box looks like this:

Comment   This is text in a note box that only appears as comment in LᴬTᴇX files.

Greyed Out This note will appear in the output as grey text. Its note-box looks like this:

Greyedout   This is text of a comment that appears grey in the output.

This is text of a comment that appears grey in the output.

As you can see in the example, the first line of greyed out notes is a bit indented and greyed out notes can have footnotes.

When you use the toolbar button ▱ to insert notes, a LᵧX Note is inserted. You can switch between the three note types by right-clicking on the note-box. If you want to turn existing text into a note, mark it and click on the note toolbar button. To change a note to text, press the backspace key when the cursor is in the first position of a note, or press the delete key when the cursor is in the very last position of the note, respectively.

You can change the text color of the greyed out notes in the menu Document ▷ Settings ▷ Colors.

4.2. Footnotes

Footnotes can be inserted using the toolbar button ▤ or the menu Insert ▷ Footnote. You will then see the following footnote-box: foot 1 where you can enter the footnote text. If you want to turn existing text into a footnote, mark it and click on the footnote toolbar button. To change a footnote to text, press the Backspace key when the cursor is in the first position of a footnote, or press the Delete key when the cursor is in the very last position of the footnote, respectively.

Here is an example footnote:[1]

The footnote will appear in the output as a superscript number at the text position where the footnote box is placed. The footnote text is placed at the bottom of the current page. The footnote number is calculated by LaTeX; the numbers are consecutive. Whether the footnote number is reset for every chapter depends on your document class.

Footnotes can be referenced like floats: Insert a label into the footnote and cross-reference this label in the text as described in section 3.4.
This is a cross-reference of Footnote 1.

Footnotes in title environments are usually not numbered with symbols and they cannot contain several paragraphs. See for example the footnote in the titling of this document.

Footnotes in multi-page tables are described in section 2.6.1.

Footnotes in minipage boxes are printed, but inside the box and with a different numbering because a minipage box is like a page inside a page. (For more about minipages, see section 5.4.) To get a footnote in the minipage that is output at the bottom of the page like normal footnotes use this method: Instead of the footnote the command **\footnotemark{}** is inserted as TeX code. The text of the footnote is entered as an argument of the TeX code command **\footnotetext** after the minipage. This was done for the following minipage with the command

\footnotetext{Footnote outside the minipage.**}**

This an example text in a minipage.[a]
This an example text in a minipage.[2]

---
[a]Footnote in the minipage.

To refer to the same footnote several times without printing the footnote text every time, use the command **\footnotemark[number]** in TeX code.
As you do not know the number of the repeating footnote while you are writing the

---
[1]This is an example footnote.

[2]Footnote outside the minipage.

text, you have to store its number. For the following footnote mark example, these commands were inserted in TeX code after Footnote 1 to store the footnote number:

\newcounter{MyRepeatFoot}
\setcounter{MyRepeatFoot}{\thefootnote}

The footnote mark was then created with this command:

\footnotemark[\theMyRepeatFoot]

Here is a repeated footnote:[1]

If you want to repeat the previous footnote, you can omit the storage of the footnote number and just use this command instead:

\footnotemark[\thefootnote]

Here is another repeated footnote:[2]

4.2.1. Footnote Numbering

To reset the footnote number back to 1 after each section, add this command to your document preamble:

\@addtoreset{footnote}{section}

The following preamble command changes the footnote numbering style to small roman numerals:

\renewcommand{\thefootnote}{\roman{footnote}}

This is a footnote with roman numbering:[iii]

To change the numbering style to capital roman numerals replace in the command above **\roman** by **\Roman**. To "number" footnotes with capital or small Latin letters use **\Alph** or **\alph**, respectively. To "number" footnotes with symbols use **\fnsymbol**.

Note: You can only number 26 footnotes with Latin letters, because this numbering is limited to single letters.
Note: You can only number 9 footnotes with symbols.

To return to the default numbering style after you have changed to another one, use **\arabic** instead of **\roman** in the command above.

If you want to have footnotes numbered in the scheme "chapter.footnote", add the following command to your document preamble:

\numberwithin{footnote}{chapter}

[iii]This is an example footnote with roman numbering.

To be able to use the command **\numberwithin**, set in the tab Math Options in the document settings the option Use AMS math package.

This is another example footnote:[4.4]

Note: \numberwithin always prints out the footnote number as arabic number; previous redefinitions to get non-arabic numbers are overwritten.

So to get for example the scheme "chapter.\Roman{footnote}", use this command instead of **\numberwithin**:

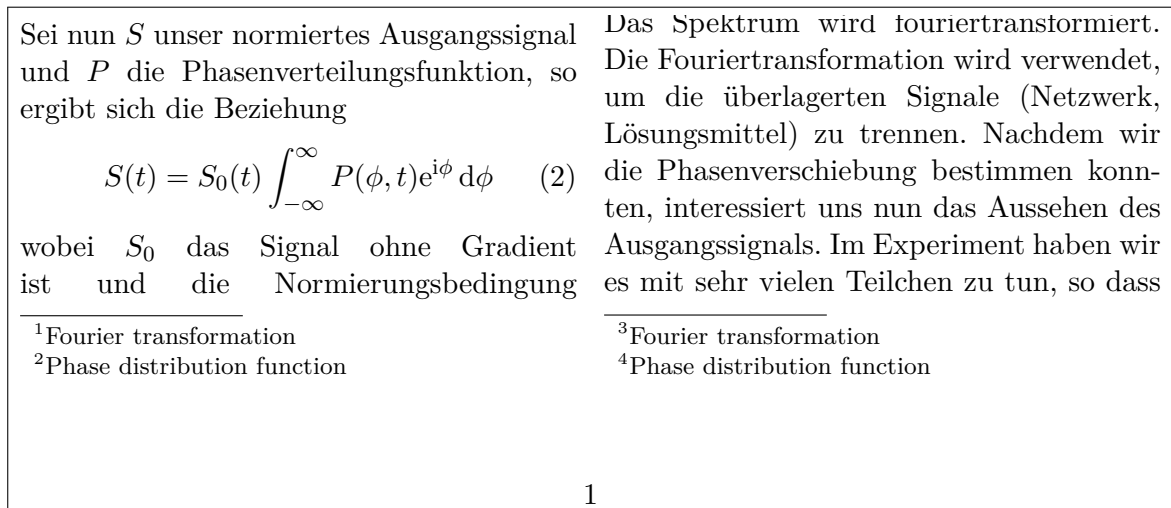**\renewcommand{\thefootnote}{\thechapter.\Roman{footnote}}**

4.2.2. Footnote Placement

If you have several footnotes in one page, they appear without vertical space between them at the bottom of the page. To make them more readable you can e. g. add $1.5\,$mm space with the following preamble command:

**\let\myFoot\footnote
\renewcommand{\footnote}[1]{\myFoot{#1\vspace{1.5mm}}}**

In a two-column document the footnotes appear at the bottom of every column, see Figure 4.1. If the footnotes should only appear at the bottom of the right column, as in Figure 4.2, use the LaTeX-package **ftnright** with this command in the document preamble:

\usepackage{ftnright}

Sei nun S unser normiertes Ausgangssignal und P die Phasenverteilungsfunktion, so ergibt sich die Beziehung

$$S(t) = S_0(t) \int_{-\infty}^{\infty} P(\phi,t) \mathrm{e}^{\mathrm{i}\phi}\,\mathrm{d}\phi \qquad (2)$$

wobei S_0 das Signal ohne Gradient ist und die Normierungsbedingung

Das Spektrum wird fouriertransformiert. Die Fouriertransformation wird verwendet, um die überlagerten Signale (Netzwerk, Lösungsmittel) zu trennen. Nachdem wir die Phasenverschiebung bestimmen konnten, interessiert uns nun das Aussehen des Ausgangssignals. Im Experiment haben wir es mit sehr vielen Teilchen zu tun, so dass

[1]Fourier transformation
[2]Phase distribution function

[3]Fourier transformation
[4]Phase distribution function

1

Figure 4.1.: Standard footnote placement in two-column documents.

[4.4]This is a footnote numbered in the scheme "chapter.footnote".

man über alle Phasen integrieren muss. Sei nun S unser normiertes Ausgangssignal und P die Phasenverteilungsfunktion, so ergibt sich die Beziehung

$$S(t) = S_0(t) \int_{-\infty}^{\infty} P(\phi, t) \mathrm{e}^{\mathrm{i}\phi} \, \mathrm{d}\phi \qquad (2)$$

wobei S_0 das Signal ohne Gradient ist und die Normierungsbedingung $\int_{-\infty}^{\infty} P(\phi, t) \, \mathrm{d}\phi = 1$ gilt. Nun dürfen

Das Spektrum wird fouriertransformiert. Die Fouriertransformation wird verwendet, um die überlagerten Signale (Netzwerk, Lösungsmittel) zu trennen. Nachdem wir die Phasenverschiebung bestimmen konnten, interessiert uns nun das Aussehen des

1. Fourier transformation
2. Phase distribution function
3. Fourier transformation
4. Phase distribution function

1

Figure 4.2.: Footnote placement in two-column documents when the LaTeX-package **ftnright** is used.

In some scientific literature it is usual to collect the footnotes and print them in a separate paragraph at the end of a section, as in Figure 4.3. They are then called "endnotes". To use endnotes instead of footnotes in your document, load in the menu Document ▷ Settings ▷ Modules the module Foot to End. To insert the collected footnotes, insert the command

\theendnotes

in TeX Code at the end of a section or chapter.

The paragraph heading for the endnotes isn't automatically translated into the document language, this must be done manually. The following preamble command translates the default English "Notes" into the German "Anmerkungen":

man über alle Phasen integrieren muss. Sei nun S unser normiertes Ausgangssignal und P die Phasenverteilungsfunktion, so ergibt sich die Beziehung

$$S(t) = S_0(t) \int_{-\infty}^{\infty} P(\phi, t) \mathrm{e}^{\mathrm{i}\phi} \, \mathrm{d}\phi \qquad (2)$$

wobei S_0 das Signal ohne Gradient ist und die Normierungsbedingung $\int_{-\infty}^{\infty} P(\phi, t) \, \mathrm{d}\phi = 1$ gilt. Nun dürfen

Notes

[1]Fourier transformation

[2]Phase distribution function

[3]Fourier transformation

[4]Phase distribution function

Figure 4.3.: Endnotes – footnotes are printed in a separate paragraph at the end of sections or chapters.

\renewcommand{\notesname}{Anmerkungen}

The numbering of endnotes can be changed like the footnote numbering as described in section 4.2.1; just replace the command **\thefootnote** by **\theendnote**. To reset the endnote number use the command **\@addtoreset** as described in section 4.2.1 and replace the command parameter **footnote** by **endnote**.

For endnotes there is the command **\endnotemark[number]** similar to the command **\footnotemark**, that is described in section 4.2.

Footnotes can also be placed in the page margin and the footnote text alignment can be changed, see the LaTeX-package **footmisc**, [9] for more information about this.

For various further footnote formatting issues have a look at LaTeX-books, [1, 2, 3]. If you are using a **KOMA-Script** document class, you can adjust all footnote settings using class-specific commands, see [12].

4.3. Margin Notes

Margin notes look and behave in LyX like footnotes. They are inserted via the menu Insert ▷ Marginal Note or the toolbar button ▤. A grey box with the red label "margin" appears where you can enter the text of the margin note.

This is a margin note.

At the side is an example margin note.

Margin notes appear at the right side in single-sided documents. In double-sided documents they appear in the outer margin – left on even pages, right on odd pages. The text of margin notes is aligned opposite to the outer margin – right-aligned when the note appears in the left margin. The first line of the margin note is placed at the position of the text line where it is inserted in the document.

To place the margin note in the inner margin, add the command

\reversemarginpar

in TeX Code before a margin note. The new placement is valid for all subsequent margin notes.

This is a margin not in the inner margin.

Note: There is often not enough space in the inner margin so that the notes are not correctly displayed in the output.

To return to the default placement insert the command

\normalmarginpar

in TeX Code.**Note:** The command is ignored when it is within a paragraph where also the command **\reversemarginpar** is inserted.

AVeryLong-MarginPar-Word that isn't hyphenated.

Similar to the case described in section 2.8.1, long words cannot be hyphenated when they are the first word in a margin note. To avoid this, insert 0 pt horizontal space before the word.

AVeryLong-MarginPar-Word that is hyphenated.

Note: Margin notes can normally not be used inside tables, floats, and footnotes.

This restriction can be evaded by using the LaTeX-package **marginnote**. By adding these two lines to your document preamble, the command used by LyX for margin notes is redefined to use the command provided by the **marginnote**-package:

\usepackage{marginnote}
\let\marginpar\marginnote

This is also used in this document because **marginnote** has another useful feature: You can set a vertical offset for the note. This is often needed when too many margin notes are too close together or for a better page layout. The offset is set in LyX as TeX Code directly after the margin note in the scheme

[**offset**]

where the offset is a length with one of the units listed in Table A.1. A negative value shifts the note up, a positive value shifts it down. For example the margin note beside this text line is shifted up 1.5 cm with the TeX Code command "[**-1.5cm**]"

This margin note is shifted up 1.5 cm from its original position.

With **marginnote** you can also change the alignment of the text in the margin note. For example the commands

\renewcommand*{\raggedleftmarginnote}{\centering}
\renewcommand*{\raggedrightmarginnote}{\centering}

set the alignment to centered. **\raggedleftmarginnote** denotes margin notes that appear at the left side. The default is

The text of this margin note is centered.

\renewcommand*{\raggedleftmarginnote}{\raggedleft}
\renewcommand*{\raggedrightmarginnote}{\raggedright}

For the other features of **marginnote** refer to its documentation [16].

You can adjust the layout of margin notes by changing its definition. To create for example a header for all margin notes with the underlined, sans-serif, and bold header text "**Attention!**", add this to your document preamble:

\let\myMarginpar\marginpar
\renewcommand{\marginpar}[1]{\myMarginpar{%
 \hspace{0pt}\textsf{\textbf{\underbar{Attention!}}}%
 \vspace{1.5mm}\\#1}}

Attention!
This is a margin note with a defined heading.

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5. Boxes

5.1. Introduction

Boxes are used to format a block of text. Boxes can be used to write documents with multiple languages, see section 5.4, to frame texts, see section 5.2.3, to prevent words from being hyphenated, see section 5.6.1, to align text, see section 5.6.2, or to set the background color of texts, see section 5.7.

Boxes can be inserted with the menu Insert ▷ Box or the toolbar button ▤. A grey box with the label Box (Minipage): Box (Minipage) will be inserted. The box type can be specified by right-clicking on the box and selecting Settings. The box dialog offers the Inner Box types Makebox, Parbox and Minipage. The type Minipage is the default for new boxes and is explained in section 5.4; the type Parbox is described in section 5.5 and the type Makebox in 5.6.1.

Boxes are not numbered and can therefore not be referenced like floats or footnotes.

Note: Boxes must not be the item in an Itemize or Description environment.

**Note:** For an unknown reason you can only set the Inner Box type to None when you use a framed box. Boxes without an Inner Box type and without frames are explained in section 5.6.1.

5.2. Box Dialog

5.2.1. Size

In the box dialog you can adjust the box geometry in the fields Width and Height. The available units for the geometry are explained in Table A.1. The field Height offers the following additional sizes:

Depth This is the plain text "height". It ignores the total depth when there are multiple text lines in the box:

Box
height set
to
1 Depth
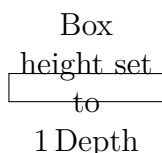
Height This is the height of the text that is inside the box. A value of e. g. 2 for this size will set the box height to 2 times the text height:

> Box height set
> to 2 Height

Total Height This is the Height + Depth:

> Box height set
> to 1 Total Height

Width This sets the width of the box as height:

> Box
> height set
> to
> 1 Width

5.2.2. Alignment

When you have chosen an Inner Box, the vertical box alignment can be:

Top This is an example text line.
> This box
> is top-
> aligned.

This is an example text line.

Middle This is an example text line.
> This box
> is middle-
> aligned.

This is an example text line.

Bottom This is an example text line.
> This box
> is
> bottom-
> aligned.

This is an example text line.

Note: The vertical box alignment can be lost in the output when you have two boxes in a line and one has e. g. a shadow and the other one not.

The horizontal box alignment can be set via LYX's paragraph dialog when you set the box into its own paragraph.

When you have chosen an Inner Box, the box content can be aligned vertically to:

top This is an example text line.
> This box
> text is
> top-
> aligned.

This is an example text line.

middle This is an example text line.

This box text is middle-aligned.

This is an example text line.

bottom This is an example text line.

This box text is bottom-aligned.

This is an example text line.

stretch This is an example text line.

This box

text is

stretched.

This is an example text line.
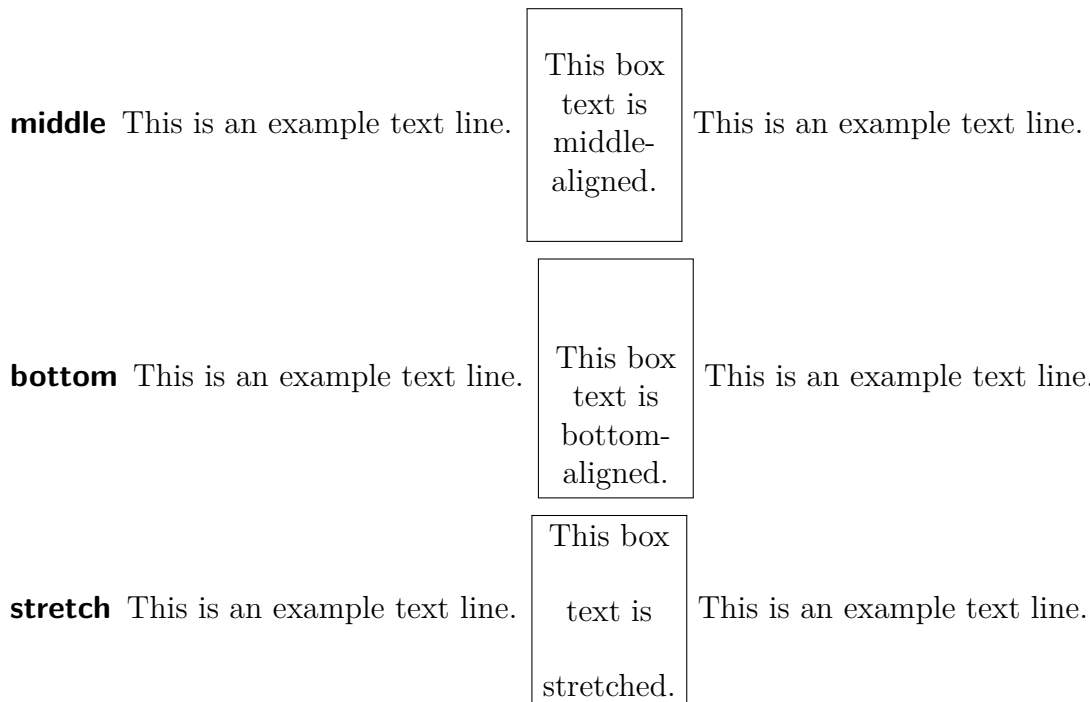
To stretch the box content, it must consist of more than one paragraph. In the example above every text line is in an own paragraph.

To align the box content horizontally you can use LyX's paragraph dialog when you have chosen an Inner Box.

This box

text is

stretched.
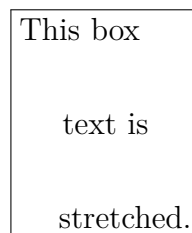
If you have not set an Inner Box, you can align the box content horizontally in the box dialog.

This   box   text   is   horizontally   stretched.
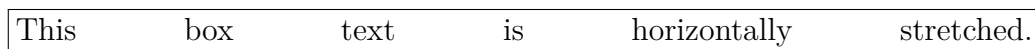
5.2.3. Decoration

The type of the box can be specified in the box dialog in the drop-down list Decoration. The following types are possible:

No frame Nothing is drawn.

Simple rectangular frame This draws a rectangular frame around the box. The frame line thickness can be specified. Rectangular box
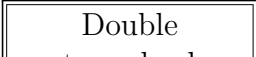
Oval box, thin This draws an oval frame around the box. The frame line thickness has the size 0.4 pt. ⌜ Oval box, thin ⌟

Oval box, thick This draws an oval frame around the box. The frame line thickness has the size 0.8 pt. ⌜ Oval box, thick ⌟

Drop shadow This draws a rectangular frame with a shadow around the box. The frame line thickness and the shadow can be specified. | Shadow box |

Shaded background This draws a box with a red background. Unlike colored boxes[1], it always uses the whole column width and the box is set as its own paragraph.

Shaded background box

Double rectangular frame This draws a double-line rectangular frame around the box. The line thickness of the inner frame is 0.75 line thickness, the thickness of the outer frame is 1.5 line thickness. The distance between the lines is 1.5 line thickness + 0.5 pt. | Double rectangular box |

L_YX's box label will reflect the different frame types. To be able to use all types, the LATEX-package **fancybox** must be installed.

When you use the decoration simple rectangular frame and no inner box, you can allow page breaks within a box. Note that then, unlike other framed boxes, the frame always uses the whole column width and the box is set as its own paragraph:

| Allow page break box |

5.3. Box Customization

The diameter of the round corners of the oval boxes can be set with the command **\cornersize**. The command

\cornersize*{1cm}

sets the diameter to 1 cm. The command

\cornersize{num}

sets the diameter to num × minimum(width and height of box). The default is **\cornersize{0.5}**.

---

[1]see sec. 5.7

Oval box with **\cor-nersize** = 1.5 cm

The default background color red of shaded background boxes can either be changed locally with the command **\definecolor{shadecolor}** or globally with the menu Tools ▷ Preferences ▷ Colors ▷ shaded box. The scheme of the **\definecolor** command is explained in section 2.11.[2] For example the appearance of the following shaded background box is set with the TeX Code command

\definecolor{shadecolor}{cmyk}{0.5,0,1,0.5}

This is yellow text in a shaded background box with dark green background.

Manually changed sizes and colors are valid for all boxes following the commands that change them.

5.4. Minipages

Minipages are treated by LaTeX as pages within pages and can therefore for example have their own footnotes.

Minipages are useful when you write documents with different languages.

Below are two example minipages side by side. Their width is set to 45 col% and they are separated by a horizontal fill, that was inserted via the menu Insert ▷ Special Formatting ▷ Horizontal Fill.

---

[2]Note that **\definecolor** requires the LaTeX-package **color** in the preamble, see section 5.7.

Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text. Dies ist ein deutscher Text[a]. Dies ist ein deutscher Text. Dies ist ein deutscher Text.

---
[a]Dies ist eine deutsche Fußnote.

This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text. This is an English Text.[a] This is an English Text.

---
[a]This is an English footnote.

The document-wide paragraph settings are ignored within minipages. That means that there will be no space between paragraphs in minipages although you set it to e. g. MedSkip in the document settings.

Minipages can also be used to set a background color for text parts, see section 5.7.

Note: You cannot have floats or margin notes inside minipages but minipages can be used inside tables, floats, and other boxes.

LyX has also basic support for minipages whose size is automatically determined by the width of their contents, via the module Variable-width Minipages. The LyX example file *varwidth-floats-side-by-side* gives examples of variable-width minipages used for placing two floats side-by-side.

5.5. Parboxes

Parboxes are very similar to minipages with the difference that they cannot have footnotes.

This a text within a parbox.
This a text within a parbox.
This footnote won't appear:[3]

5.6. Boxes for Words and Characters

5.6.1. Prevent Hyphenation

You can use the box type Makebox to prevent words or text from being hyphenated. Here is an example text:

This line is an example to show how you can prevent the hyphenation of "veryvery-longword".

To prevent the hyphenation of the word "veryverylongword", put the word into a box, set the Inner box to Makebox and use no explicit width.

This is the result:

This line is an example to show how you can prevent the hyphenation of "veryverylongword".

You can alternatively set the command "**\-**" as TeX Code directly before the word:

This line is an example to show how you can prevent the hyphenation of "veryverylongword".

Of course the word now protrudes over the side margin. To avoid this, add via the menu Insert ▷ Formatting ▷ Ragged Line Break (shortcut Ctrl+Retour) a line break before the word:

This line is an example to show how you can prevent the hyphenation of "veryverylongword".

5.6.2. Vertical Alignment

With the help of the command **\raisebox** you can align words, characters or other boxes vertically relative to the surrounding text. **\raisebox** is used with the following scheme:

\raisebox{lift}[height][depth]{box content}

The lift can be a positive value to raise the box or a negative value to lower the box.

To align for example the word "preventing" so that the bottom of the "deepest" character "p" is at the baseline, insert the command

\raisebox{\depth}{

in TeX Code before the word. After the word insert a closing brace "**}**" in TeX Code. This is the result:

This is a text line with the word "preventing" as a raised word.

When you raise or lower characters in a line, the line distance will be spread:

This is a text line with the word "preventing" as a lowered word.

This is a text line with the word "testing" as a raised word.

If you want to prevent this for a certain reason, set the box height to a zero value. For example use

\raisebox{-\depth}[0pt]{

This is a text line with the word "preventing" as a lowered word.

This is a text line with the word "testing" as a raised word.

5.7. Colored Boxes

To color the background of a box just select the color you like in the box dialog. This is for example a box with orange background: Box with orange background

If you use the decoration Simple rectangular frame you can set a frame color. In this case you must also specify a background color (LyX sets white as default). Here is an example: Box with teal frame color and yellow background color

Of course you can also have colored text inside a colored box:
This is colored text within a colored, framed box

If you need another color than the predefined ones, you can define your own color as described in section 2.11. To use your own color you must typeset the box by using TeX code:

Colored boxes without frame are created with the command **\colorbox**. It has the following scheme:

\colorbox{color}{box content}

The box content can also be a box and colored boxes can also be within other boxes. To have e. g. a darkgreen background for a word, insert the command

\colorbox{darkgreen}{

before the word in TEX Code. After the word insert a closing brace "**}**" in TEX Code. This is the result:

This is a line where the word "Attention!" has a darkgreen background.

Framed, colored boxes are created with the command **\fcolorbox**. It has the following scheme:

\fcolorbox{frame color}{box color}{box content}

5.8. Rotated and Scaled Boxes

To use the boxes described in this section, the module GraphicBoxes must be loaded in the document settings.

Note: Not all DVI viewers are able to display rotated or scaled material.

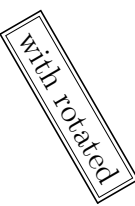**Note:** Floats are not allowed inside a rotated or scaled box.

5.8.1. Rotated Boxes

To rotate material, you can put it into a Rotatebox. Such a box is inserted via the menu Insert ▷ Custom Insets ▷ Rotatebox.

The rotation origin can be specified via the inset Origin (menu Insert ▷ Origin) in the form **origin=position**. The following positions are possible: c (center), l (left), r (right), b (bottom), t (top), along with meaningful combinations of the four base positions. For example lt means that the rotation origin is at the top left corner of the box. When no rotation origin is specified, the position l will be used. The rotation angle is a number that can be negative that specifies the angle in degrees. The rotation direction is counterclockwise.

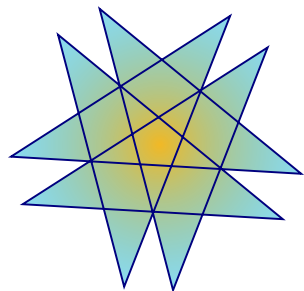In the following example **origin=c** was inserted to the Origin inset and **60** was inserted to the Angle inset.

This is a line   text.

The box content can also be another box or an inline formula:

This is a line   framed text $\int A \, \mathrm{d}x = B$ and a formula.

or an image or table:

This is a line   with a rotated image   and table.

Note: If the Angle inset is empty or contains other characters than numbers you will get LaTeX errors when viewing/exporting the document.

5.8.2. Scaled Boxes

To scale material put it into a Scalebox. Such a box is inserted via the menu Insert ▷ Custom Insets ▷ Scalebox.

The Scalebox inset has the mandatory inset H-Factor and the optional inset V-Factor (inserted via the menu Insert ▷ V-Factor). Input there the horizontal and vertical scale factor, respectively. If no V-Factor inset is used, the horizontal factor will also be used as the vertical one.

To get for example the double text size, compared to the document text size, insert **2** into the H-Factor inset. An example: Hello

2 as H-Factor and **1** as V-Factor distorts the Hello.

If the scaling factor is negative, the box content will be mirrored. Therefore **-1** as H-Factor and **1** as V-Factor can be used to create mirror writing: olleH

1 as H-Factor and **-1** as V-Factor reflects the Hello at the base line.

The Reflectbox (menu Insert ▷ Custom Insets ▷ Reflectbox) is equivalent to **-1** as H-Factor and **1** as V-Factor for a Scalebox.

Note: If the H-Factor inset is empty or contains other characters than numbers you will get LaTeX errors when viewing/exporting the document.

The Resizebox (menu Insert ▷ Custom Insets ▷ Resizebox) is used to scale the content to a defined width and height. The Resizebox inset has the mandatory inset Width and the optional inset Height (inserted via the menu Insert ▷ Height). Input there the width and height, respectively, as value with a unit. A.1 lists the possible units. If there is an exclamation mark **!** in of of the two insets, the size is set so that the aspect ratio of the box content is kept. If no Height inset is used an exclamation mark will internally be used for the height.

2cm as Width and **1cm** as Height produces: Hello

2cm as Width and **!** as Height (or no Height) produces: Hello

Note: If the Width inset is empty or contains an invalid unit you will get LaTeX errors when viewing/exporting the document.

The boxes can be combined in any order. As example a Reflectbox inside a Resizebox which is in turn inside a Rotatebox:

Images, tables, and inline formulas are allowed as box content:
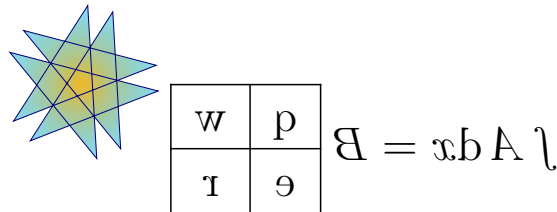
When the global formula style **fleqn** is used in the document[4], display style formulas can also be scaled.

---

[4]When "fleqn" is added to the document class options.

6. Objects Surrounded by Text

6.1. Wrap Floats
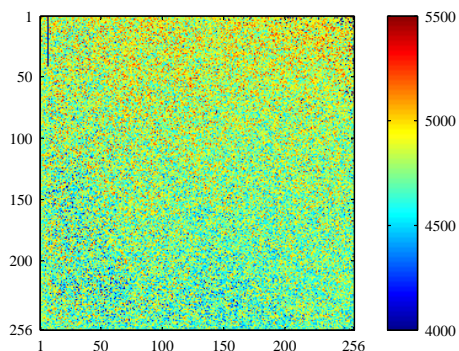
Figure 6.1.: This is a figure wrap float.

This float type is used if you want to wrap text around a figure or table so that it only occupies some fraction of the column width. It can be inserted using the menu Insert ▷ Floats ▷ Figure Wrap Float or Table Wrap Float if the LaTeX-package **wrapfig** is installed.[1] The settings of the float can be modified by right-clicking on the float box. The mandatory settings are the float Placement and its Width. Optional are the Overhang that specifies how much the float is set into the paragraph / page margin, and the Line span that specifies how many text lines the float will approximately need. The line span is often hard to approximate; so it is better only to use it when you encounter float placement problems. You can furthermore decide if LaTeX is allowed to let the float float within the paragraph or to surrounding paragraphs. Figure 6.1 is an example text wrap float with a width of 40 col%, 1 cm overhang, set to the left.

Note: Text wrap float floats are fragile! E. g. having a figure too close to the bottom of the page can mess things up in such a way that the float does not appear in the output or that it is placed over some other text.

In general, the following applies for wrap floats:

- They should not be placed in paragraphs that run over a page break. That means that wrap floats are better inserted in their exact place when the document is almost finished and you are able to estimate where page breaks will appear.

- They should either be placed in their own paragraph before the paragraph where they should wrap into or within a paragraph.

- In consecutive paragraphs they may cause troubles, so ensure that there is a text paragraph between them as separator.
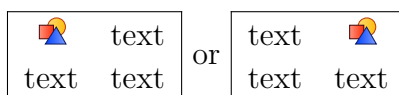

[1]Installing a LaTeX-package is explained it in the *LaTeX Configuration* manual.

- They are not allowed in section headings or tables.
- Their numbering and referencing works as described in chap. 3.

6.2. Surrounded Fixed Objects

The wrap floats described in sec. 6.1 have these positions in the paragraph:

To get an object exactly at the position where it is inserted, for example to get one of these positions:
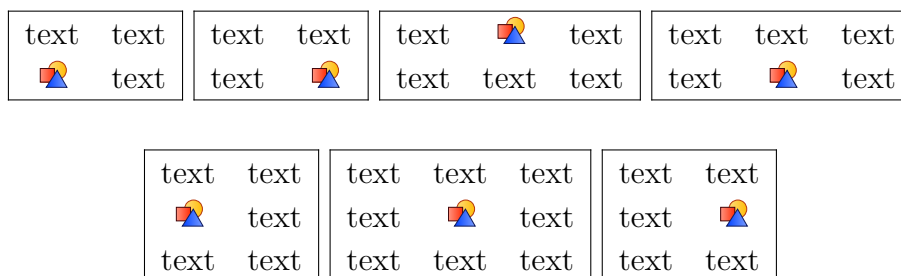
you can use the LaTeX-package **picinpar**. Here is an example:

It was in the spring of the year 1894 that all London was interested, and the fashionable world dismayed, by the murder of the Honourable Ronald Adair under most unusual and inexplicable cir- has already learned those which[2] came out in the good deal was suppressed the case for the prosecuingly strong that it was ward all the facts. Only ten years, am I allowed to which make up the whole

cumstances. The public particulars of the crime police investigation, but a upon that occasion, since tion was so overwhelmnot necessary to bring fornow, at the end of nearly supply those missing links of that remarkable chain.
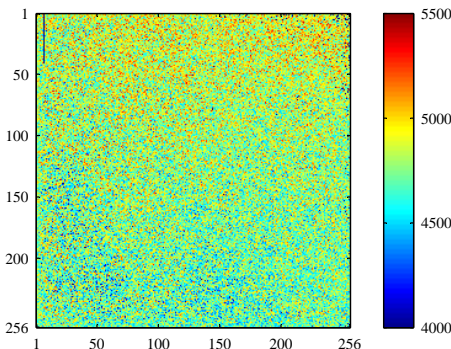
Surrounded fixed objects are used to let text float around them, at which the object's position in the paragraph can be determined by the number of lines above it. In contrary to floats is it not possible to have a numbered caption.

A fixed object is inserted by adding the command

\begin{window}[2,c,{

---

[2]Footnote of the paragraph with the fixed object.

as TeX Code at the beginning of the paragraph. The first parameter in the bracket, here '2', defines the number of lines above the object, the second, here 'c', the position of the object. The positions 'l', 'c' and 'r' (for left, center, right) are possible. Behind the command you insert the object. In this example an image with a width of 40 % of the text column width was inserted. The object can also be a table, a box or an equation. Behind the object the command

},description text]
{}

is inserted. Note that the "**{}**" is in the second line. The description text is optional. The text surrounding the object must be in the same paragraph as the object, so it must begin directly after the **{}**. At the end of the paragraph insert the command:

\end{window}

Within a paragraph with a fixed object, you cannot insert footnotes in the normal way. You have to use instead the command **\footnotemark** inside the paragraph and outside the command **\footnotetext** as described in sec. 4.2.

6.3. Initials

To use initials, you must have the LaTeX-package **lettrine** installed and use the module Initials in your document (menu Document ▷ Settings ▷ Modules). To insert an initial, use the style Initial. This style has a mandatory and two optional arguments. The arguments are inserted via the Insert menu. The mandatory argument Initial contains the letter(s) that is the initial, the argument Rest of Initial contains the rest of the word or text of the initial letter(s). The argument Options contains parameters to modify the initial. For more information about the possible parameters see the documentation of **lettrine**, [13]. The style itself contains the text that is surrounding the initial. The usual style is hereby that the word whose first letter is the initial, is printed with SMALL CAPS.

Here are some examples:

1. No optional argument, the initial is the letter 'I' in the math font 𝔉𝔯𝔞𝔨𝔱𝔲𝔯:

   𝔍T was in the spring of the year 1894 that all London was interested, and the fashionable world dismayed, by the murder of the Honourable Ronald Adair under most unusual and inexplicable circumstances. The public has already learned those particulars of the crime which came out in the police investigation, but a good deal was suppressed upon that occasion, since the case for the prosecution was so overwhelmingly strong that it was not necessary to bring forward all the facts.

2. Only one line is surrounding the initial, which is formed by two letters in standard font and no text is printed in small caps:

It was in the spring of the year 1894 that all London was interested, and the fashionable world dismayed, by the murder of the Honourable Ronald Adair under most unusual and inexplicable circumstances. The public has already learned those particulars of the crime which came out in the police investigation, but a good deal was suppressed upon that occasion, since the case for the prosecution was so overwhelmingly strong that it was not necessary to bring forward all the facts.

3. Magenta, hanging initial over 3 lines in the math font $\mathcal{CALLIGRAPHIC}$, the text "t was in the spring" is in SMALL CAPS; to color the initial, you must insert this command before the initial:

\renewcommand{\LettrineFontHook}{\color{color}}

where the second *color* can be "red", "blue", "green", "yellow", "cyan", "magenta", "black" or "white", and add this command to the document preamble:

\@ifundefined{textcolor}
{\usepackage{color}}{}

$\mathcal{I}$ T WAS IN THE SPRING of the year 1894 that all London was interested, and the fashionable world dismayed, by the murder of the Honourable Ronald Adair under most unusual and inexplicable circumstances. The public has already learned those particulars of the crime which came out in the police investigation, but a good deal was suppressed upon that occasion, since the case for the prosecution was so overwhelmingly strong that it was not necessary to bring forward all the facts.

7. External Document Parts

With the menu Insert ▷ File you can insert external material into your document. This can be:

LyX Document Another LyX document; its content is directly inserted to your document.

Plain Text A text document; each line is inserted in your document as a separate paragraph.

Plain Text, Join Lines A text document; text lines are inserted in your document continuously but an empty text line creates a new paragraph.

External Material Files in various formats.

Child Document LyX or LaTeX documents.

7.1. External Material

The external material feature allows you to insert files into your document without converting them to a format that can be read by the document output format. LyX takes care of the necessary conversions. This is similar to images that can be inserted in various image formats in LyX documents. When you have enabled Instant Preview in LyX's preferences under Look and feel ▷ Graphics, the external material types Dia and Xfig are directly shown in LyX.

External material can be inserted via the External Material dialog that is accessible with the menu Insert ▷ File ▷ External Material. Currently the following file types (Templates) are allowed:

Chess diagram This template supports chess position diagrams made with the program **XBoard**.

Dia diagram This template supports diagrams created with the program **Dia**.

Inkscape figure This template supports specific scalable images derived from scalable vector graphics (SVG), in which the contained text is replaced by a version typeset by LaTeX (and hence in the current document font). It relies on a feature of the program **Inkscape** which creates a special PDF or EPS and LaTeX file from a given SVG file (in INKSCAPE itself, the feature is available via the option Omit text in PDF and create LaTeX file when saving a drawing as PDF

or EPS). The benefit of such files is a uniform text style throughout the whole document.

The external template reads SVG files and uses a converter program to generate the respective PDF/EPS and LaTeX files (via Inkscape) on the fly, so you don't have to export those files yourself. If you prefer the latter and want use given `*.pdf` and `*.pdf_tex` or `*.eps` and `*.eps_tex` files instead, simply input the respective `*.pdf_tex` or `*.eps_tex` file via the Child Documents dialog (see sec. 7.2) rather than using this template.

You can use TeX code commands such as **\Large**, \small, etc. in the text of the SVG. The size of the font will be taken from the settings of the LyX document. Please refer to [22] for more information and examples.

Lilypond typeset music This template is used for music notation typeset with the program
[LilyPond](). For LyX's extended support for LilyPond have a look at LyX's example file *lilypond.lyx.*

PDF pages With this template you can insert PDF documents to your document. To specify the range of pages that should be included, use the option **pages** in the Option field in the LaTeX and LyX options tab. The argument of this option is a comma separated list, containing page numbers (insert as option **pages={3,5,6,8}**), ranges of page numbers (**pages={4-9}**) or any combination. To insert empty pages use {}. E. g. **pages={3,{},8-11,15}** will insert page 3, an empty page, and pages 8, 9, 10, 11 and 15. Page ranges are specified in the syntax *start-stop*. This selects all pages from *start* to *stop*. Omitting *start* defaults to the first page; omitting *stop* defaults to the last page of the document. The last page can also be selected with the keyword **last**. (This is only permitted in a page range.) So **pages=-** will insert all pages of the document and **pages=last-1** will insert all pages in reverse order. If the pages option is not specified, only the first page of the PDF is inserted.

The option **noautoscale** inserts the pages with their original size, if this option is not given, the pages will be resized to fith the width of the page of your document. In the tab Size and Rotation you can specify the width and height of the input pages and their rotation. If another width than 100 Scale% is used, the option **noautoscale** will be overwritten. For more info and possible options, have a look into the documentation of the LaTeX-package **pdfpages** [17].

To use this template in a Beamer presentation you need to first insert an End-Frame environment and in a subsequent paragraph a TeX Code box containing the command **\setbeamertemplate{background canvas}{}**. Then you can insert as many paragraphs containing the PDFPages template as you wish. Behind the included PDF pages you can resume the Beamer presentation by beginning a new frame or by starting a new section. To avoid stray blank pages prior to the PDF pages, make sure to use the Default alignment for the paragraph containing the template.

Here is an included PDF which is rotated by -5°:

Abstract

This is an abstract. As you can see, it is printed in a smaller font size than the other paragraph types.

Also several paragraphs are possible in the abstract.

This is a "Standard" paragraph to visualize the differences in the font size.

Raster image This can be used for bitmap images. The image can be treated in the External material dialog like the images that are usually included via the Graphics dialog as described in section 1.1. Here is an inserted raster image:
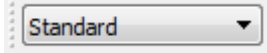
Spreadsheet With this template you can insert spreadsheets / tables in the format of **Gnumeric**, OpenDocument, Microsoft Office XML and Office Open XML. For this feature LyX must have found the program `ssconvert` during its configuration. This program is part of Gnumeric, so that you must have Gnumeric installed, also if you don't have tables in the Gnumeric format. For examples and possible limitations have a look at LyX's example file *spreadsheet.lyx.*

Vector graphics This can be used for vector graphics. The image can be treated in the External material dialog like the images that are usually included via the Graphics dialog as described in section 1.1. Here is an inserted vector graphics:
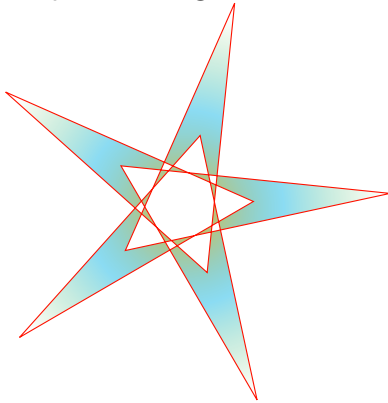
Xfig figure This template supports images created with the program Xfig.

When you use the option Draft in the File tab of the External Material dialog, only the path to the inserted file is shown in the output.

External material is displayed in LyX either as a box like this: Spreadsheet: Table.ods or as image, depending on the option Show in LyX in the LaTeX and LyX options tab of the dialog.

The *Customization* manual explains how you can define your own templates.

7.2. Child Documents

Child documents are used if you have a long document consisting of several larger parts or sections. For maintenance it is often useful and sometimes even required to split the document into several files that can be revised separately. The different documents are then the so called "child documents", and a master document connects them to print the full document or parts of it. A child document inherits elements

from its master, for example the LaTeX preamble, the bibliography, and labels for cross-references.

To be able to work on child documents without the need to open their master, specify in the child document the master in the menu Document ▷ Settings ▷ Document Class. This master document will then be used in the background by LyX when you edit the child document.

Included documents are displayed in LyX as a box like this: Include: DummyDocument1.lyx To include child documents in a master document use the menu Insert ▷ File ▷ Child Documents. A dialog pops up where you can choose between four include methods:

Include You can include LyX and LaTeX documents. When you press the Edit button in the Child Document dialog, the included document will be opened in LyX in a new file tab so that you can modify it.

Here is a child document inserted using Include:

7.2.1. External Subsection 1

This is a small dummy child document to show how files can be inserted into another document.

The section numbering includes the sections of the included files in the order they are inserted in the master document. The included example document has for example a subsection that is numbered as a subsection of this section. Labels of included documents can be referenced: Subsection 7.2.1.

The preamble of the child document is ignored; only the preamble of the master document is used. Branches in child documents will be ignored by the master document when the master document does not have a branch with the same name. Included documents are inserted starting on a new page and ending with a page break.

Note: If you have included a L<small>Y</small>X or L<small>A</small>T<small>E</small>X file, you are warned when you export/view the document in case the child document uses another document class than the master document as this will lead to unexpected outputs.

Input This method is very similar to the Include method. The differences are:

- Input files don't start with a new page and don't end with a page break.
- Input files can be previewed in L<small>Y</small>X when Instant Preview is enabled in L<small>Y</small>X's preferences under Look and feel ▷ Graphics.
- You cannot exclude Input files via the menu Document ▷ Settings ▷ Child Documents.

Here is a child document inserted using Input:

7.2.2. External Subsection 2

This is another small dummy child document to show how files can be inserted into a document.

Verbatim With this method any text file can be included. The file is shown in the output with its source code; no command used in the text is invoked. You can use the option Mark spaces in output that displays the character "␣" for every space character in the source code. The difference from the method via the menu Insert ▷ File ▷ Plain Text is that the document content is not shown in L<small>Y</small>X.

Here is a child document inserted as Verbatim:

```
This is a small dummy child text document to show how files can be inserted into a doc
```

Here is a child document inserted as Verbatim using the Mark spaces in output option:

```
This␣is␣a␣small␣dummy␣child␣text␣document␣to␣show␣how␣files␣can␣be␣inserted␣into␣a␣doc
```

Note: As you can see in the examples above, the text of the documents included as verbatim is not broken at the end of the document lines.

Listings This type is described in chapter 8.

Note: Including the same document twice in a document using different methods could cause LATEX-problems.

If you want to view/export only selected children of your master document, either because you want to save compiling time or because you want to distribute single chapters of the book you are just writing, you can exclude children from the output. This is done via the menu Document ▷ Settings ▷ Child Documents. You can exclude/ include children by double-clicking on the include to output column of the respective child document in the list (note that this only works for documents embedded via "Include", not with "Input"). If the option Maintain counters and references is enabled, LYX will assure that all page numbers, references etc. are correct as if the whole document was processed. This is useful if you want the selected sub-documents to look exactly as in the context of the whole document. However, LYX needs to process the whole document in the background for this feature. So if you want to save compile time and if counters and references do not need to be correct, disable this checkbox.

Alternatively, you can put each included file into a branch.[1] By enabling/disabling branches you can decide which included files will appear in the output. This has the advantage that it also works with Input'ed sub-documents. However, counters and references will not be maintained with this approach.

---

[1]Branches are described in section *Branches* of the LYX *Userguide.*

8. Program Code Listings

To include and typeset program code you can use the Listings inset that can be inserted via the menu Insert ▷ Program Listing. The LATEX-packages **listings** or **minted** provide a powerful and flexible way to insert program source code into your document. One can only use one of these packages in a document. **listings** is used by default.

Right-clicking on a listings inset opens the context menu containing where you can set the listings format.

By default, a listing starts a new paragraph in the output. The placement option Inline listing prints the listing inline like this: **int** a=5;
The option Float creates a listings float where you can specify the placement options "h", "t", "b", and "p" corresponding to the float placement options described in section 3.5. The placement options can be mixed and are inserted without any separation, e. g. "htbp". The option "h" has sometimes no effect, but you don't need to use the Float option in this case as also non-float listings can have captions and be referenced.

You can add captions to listings that are not inline with the menu Insert ▷ Caption. Listings can be referenced like floats: Listing 8.1. A list of listings which contains all listings with captions can be created via the menu Insert ▷ List / TOC ▷ List of Listings. The list entries are the listing caption and the listing number.

Listing 8.1: Example Listing float

```
# Example  listing  float
def  func(param):
     'this is a python function'
     pass
```

Note: The **listings** package places captions before the listing by default.
The **minted** package places them after the listing by default if it is floating. If it is not floating, caption will be typeset before the listing if it is inserted to its first line, otherwise it will be typeset after the listing. If you want to force the placement in every case before the listing, you have to add the following lines as last thing to the preamble:
\@ifundefined{newfloat}
 {\usepackage{float}}{}
\floatstyle{plaintop}

When you have set a programming language in the listings dialog, the keywords of this language will be recognized and specially typeset in the output. In the example listings the Python keyword "def" is recognized and printed bold in the output.

Note: If you don't get bold keywords when using typewriter fonts, your `typewriter` font probably doesn't provide a bold shape. In this case select a different one in the menu Document ▷ Settings ▷ Fonts. (The fonts *LuxiMono, BeraMono* and *Courier* provide bold shapes.)

In section Line numbering of the listings dialog you can specify the line numbering style. You can insert a number to specify which lines are numbered in the field Step. When you insert e. g. "3", only every 3rd line will be numbered.

You can furthermore specify a range of lines; only these will then appear in the output. The option Extended character table is only meaningful for the **listings** package and should be used when you use national characters like the German umlauts in the listing.

Here is an example listing with left line numbering, step "3", language "Python", options "Extended character table" and "Space as symbol", range lines 3 - 8:

```
        ␣␣␣␣pass
2   def␣func(param):
        'This␣is␣a␣German␣word:␣Tschüß'
        pass
5   def␣func(param):
        'this␣is␣a␣python␣function'
```

When you have tabulators in your listing, you can specify the number of characters that are spanned by a tabulator in the field Tabulator size.

Note: Due to a bug in the **listings** package the line numbering is shifted by a line by every previous listing. That's the reason why the lines 2 and 5 are numbered in the above listing and not the lines 3 and 6.

It is also possible to print lines from a file as listing. To do this, use the menu Insert ▷ File ▷ Child Document and choose the type Listings.[1] In the child document dialog you can specify the listing parameters in a text box. To show a list of all available parameters, type in a question mark "?" in the text box.

To reference child document listings, write a label text into the corresponding field of the child document dialog. The label can then be referenced using the menu Insert ▷ Cross-Reference.

Listing 8.2 is an example for a listing of a file; there the lines 10 - 15 of this L_{Y\}X file are listed.

---

[1]The other child document types are described in section 7.2.

Listing 8.2: Lines 10 - 15 of this LyX file

```
% to the beginning of the float and
% not to its caption
\usepackage[figure]{hypcap}

% the pages of the TOC are numbered roman
% and a PDF-bookmark for the TOC is added
```

Inserting a formula into a listing can be done the following way:

1. Open the listings dialog and add
   mathescape=true
   to the field of the Advanced tab.

2. Create a formula outside the listing

3. Copy the content of the formula (not the formula inset) to the clipboard (short-cut Ctrl+C)

4. In the listing write "$$" and copy from the clipboard between the dollar-signs (shortcut Ctrl+V)

Listing 8.3: Example Listing float containing a formula

```
# Example listing float
def func(param):
    # ∏∞n=1 1/x²
    pass
```

Global listings settings can be set in the Document ▷ Settings ▷ Listings dialog. To get there a list of available options, type in a question mark "?".

For more information about the **listings** and **minted** packages, we refer to their documentation [14, 15].

A. Units available in LYX

To understand the units described in this documentation, Table A.1 explains all units available in LYX.

Table A.1.: Units

unit	name/description	LaTeX command
bp	big point ($72\,\text{bp} = 1\,\text{in}$)	-
cc	cicero ($1\,\text{cc} = 12\,\text{dd}$)	-
cm	centimeter	-
dd	didot ($1\,\text{dd} \approx 0.376\,\text{mm}$)	-
em	width of letter M in current font	-
ex	height of letter x in current font	-
in	inch	-
mm	millimeter	-
mu	math unit ($1\,\text{mu} = 1/18\,\text{em}$)	-
pt	point ($72.27\,\text{pt} = 1\,\text{in}$)	-
pc	pica ($1\,\text{pc} = 12\,\text{pt}$)	-
sp	scaled point ($65536\,\text{sp} = 1\,\text{pt}$)	-
Column Width %	% of column width	\columnwidth
Line Distance %	% of height between baselines of two subsequent text lines	\baselineskip
Line Width %	% of line width	\linewidth
Page Height %	% of paper height	\paperheight
Page Width %	% of paper width	\paperwidth
Scale Graphics %	% of original image width	
Text Height %	% of text height	\textheight
Text Width %	% of text width	\textwidth

B. Output File Formats with Graphics

B.1. DVI

This file type has the extension ".`dvi`". It is called "device-independent" (DVI), because it is completely portable; you can move them from one machine to another without needing to do any sort of conversion. At the time when this file-format was developed, this was no matter of course. DVIs are used for quick previews and as pre-stage for other output formats, like PostScript.

Note: DVI-files do not contain images; they will only be a linked. So don't forget this, if you move your `.dvi` file to another computer. This property can also slow down your computer when you view the DVI, because the DVI-viewer has to convert the image in the background to make it visible when you scroll in the DVI. So it is recommended that you use PDF for files with many images.

You can export your document to DVI by using the menu File ▷ Export ▷ DVI. You can view your document as DVI via the View menu.

B.2. PostScript

This file type has the extension ".`ps`". PostScript was developed by the company `Adobe` as a printer language. The file therefore contains commands that the printer uses to print the file. PostScript can be seen as a "programming language"; you can calculate with it and draw diagrams and images.[1] Due to this ability, the files are often bigger than PDFs.

PostScript can only contain images in the format "Encapsulated PostScript" (EPS, file extension ".`eps`"). As LyX allows you to use any known image format in your document, it has to convert images in the background to EPS. If you have e.g. 50 images in your document, LyX has to do 50 conversions whenever you view or export your document. This will slow down your work flow with LyX drastically. So if you plan to use PostScript, you can insert your images directly as EPS to avoid this problem.

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[1]If you are interested to learn more about this, have a look at the LaTeX-package **PSTricks** [19].

You can export your document to PostScript using the menu File ▷ Export ▷ Postscript. You can view your document as PostScript via the View menu.

B.3. PDF

This file type has the extension ".`pdf`". The "Portable Document Format" (PDF) was developed by `Adobe` as a derivative of PostScript. It is more compressed and it uses fewer commands than PostScript. As the name "portable" implies, it can be processed at any computer system and the printed output looks exactly the same.

PDF can contain images in its own PDF format, in the format "Joint Photographic Experts Group" (JPG, file extension ".`jpg`" or ".`jpeg`"), and in the format "Portable Network Graphics" (PNG, file extension ".`png`"). Nevertheless you can use any other image format, because LyX converts them in the background to one of these formats. But as described in the section about PostScript, the image conversion will slow down your work flow. So it is recommended that you use images in one of the three mentioned formats.

You can export your document to PDF via the menu File ▷ Export in three different ways:

PDF (ps2pdf) This uses the program `ps2pdf` that creates a PDF from a PostScript-version of your file. The PostScript-version is produced by the program `dvips` which uses a DVI-version as intermediate step. So this export variant consists of three conversions.

PDF (dvipdfm) This uses the program `dvipdfm` that converts your file in the background to DVI and in a second step to PDF.

PDF (pdflatex) This uses the program `pdftex` that converts your file directly to PDF.

It is recommended that you use PDF (`pdflatex`) because `pdftex` supports all features of actual PDF-versions, is quick and works stable. The program `dvipdfm` is not under development and therefore a bit outdated.

You can view your document as PDF via the View menu or by using a toolbar button.

C. List of dvips color names

Color	Color name
	Apricot
	BlueViolet
	CadetBlue
	Dandelion
	Fuchsia
	JungleGreen
	Mahogany
	Mulberry
	OrangeRed
	PineGreen
	RawSienna
	RoyalBlue
	SeaGreen
	Tan
	Violet
	YellowOrange

Color	Color name
	Aquamarine
	BrickRed
	CarnationPink
	DarkOrchid
	Goldenrod
	Lavender
	Maroon
	NavyBlue
	Orchid
	Plum
	RedOrange
	RoyalPurple
	Sepia
	TealBlue
	VioletRed

Color	Color name
	Bittersweet
	Brown
	Cerulean
	Emerald
	Gray
	LimeGreen
	Melon
	OliveGreen
	Peach
	ProcessBlue
	RedViolet
	RubineRed
	SkyBlue
	Thistle
	WildStrawberry

Color	Color name
	BlueGreen
	BurntOrange
	CornflowerBlue
	ForestGreen
	GreenYellow
	Mahogany
	MidnightBlue
	Orange
	Periwinkle
	Purple
	Rhodamine
	Salmon
	SpringGreen
	Turquoise
	YellowGreen

D. Explanation of Equation (2.1)

We can calculate the total width of n table cells $W_{\mathrm{tot}\,n}$ as follows:

$$W_{\mathrm{tot}\,n} = n \cdot (W_{g\,n} + 2 \cdot \backslash\mathrm{tabcolsep}) + (n+1) \cdot \backslash\mathrm{arrayrulewidth} \qquad \text{(D.1)}$$

where $W_{g\,n}$ is the given width of all cells, **\tabcolsep** is the LaTeX-length between the cell text and the cell border (its default value is $6\,\mathrm{pt}$). **\arrayrulewidth** is the thickness of the cell border line, the default is $0.4\,\mathrm{pt}$.

Following equation (D.1), the total width of a multicolumn $W_{\mathrm{tot}\,\mathrm{mult}}$ is

$$W_{\mathrm{tot}\,\mathrm{mult}} = W_{g\,\mathrm{mult}} + 2 \cdot \backslash\mathrm{tabcolsep} + 2 \cdot \backslash\mathrm{arrayrulewidth} \qquad \text{(D.2)}$$

By setting equation (D.1) and (D.2) equal we can calculate the needed given width $W_{g\,n}$ when n columns are spanned, so that each column has a total width of $W_{\mathrm{tot}\,\mathrm{mult}}/n$:

$$W_{g\,n} = \frac{W_{g\,\mathrm{mult}} + (1-n) \cdot (2 \cdot \backslash\mathrm{tabcolsep} + \backslash\mathrm{arrayrulewidth})}{n} \qquad \text{(D.3)}$$

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[22] Documentation of the option Omit text in PDF of the program INKSCAPE

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