ATLAS Note

24th April 2024

Guide to formatting tables for ATLAS documents

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This document illustrates the preferred style for tables in ATLAS documents. It illustrates what the tables should look like and also provides guidelines on how to achieve this look.

This document was generated using version 15.3.0 of the ATLAS LaTeX package. The main class is 2023/07/07 v3.41 KOMA-Script. It uses the option atlasstyle, which implies that the standard ATLAS preprint style is used.

1 General guidelines

Tables should only contain as many lines as are needed for clarity. Table 1 shows a good example that has been taken from 'Rounding — ATLAS Recommendations' [1].

The `booktabs` package provides the macros `\toprule`, `\midrule`, `\bottomrule` which are to be preferred over `\hline`, as, among other things, they introduce some extra spacing around the lines, which is useful.

The `siunitx` package contains powerful macros for formatting tables and is highly recommended. Tables 2 and 3 show simple examples that make use of the table-format and table-number-alignment options. table-number-alignment is particularly useful if the column header is wider then the content. it is better to include space for the sign, if the numbers in the table are signed. Have a close look at 'Tabular material' section (Section 4.12 in the 2022 version of the `siunitx` manual) for more details on exactly what can be steered and how.

An example of a wider and somewhat more complicated table is shown in Table 4.

A typical table containing Monte Carlo samples is given in Table 5.

Table 6 shows the use of ± as the intercolumn character for alignment. An alternative, as shown in Table 7, is to use `\phantom` to put in extra space equal to the width of a number if you have different numbers of decimal places in the table.

2 LaTeX packages for tables

The LaTeX package `booktabs` gives a number of guidelines on how tables should be formatted. These are followed to a large extent in this document. The following packages related to tables are included by default when you load the package `atlaspackage`:

booktabs useful tools for formatting tables;

siunitx tools for rounding and also for helping to format and align numbers in tables;

Further packages related to the formatting of tables are:

multirow construction for table cells that span more than one row of the table;

longtable the most actively developed package that spread over more than one page;

xtab an alternative package for long tables;

supertabular yet another alternative package for long tables;

dcolumn can be used as an alternative to `siunitx` to align numbers in tables.

```
\sisetup{group-minimum-digits=4}
\caption{Example event yields spread over several orders of magnitude.}%
\label{tab:yield:2dig}
\centering
  \begin{tabular}{%
    l
    r@{\(\,\pm\,\)}r
  }
  \toprule
  {Channel} & \multicolumn{2}{c}{Selected events} \\
  \midrule
  \(WW, WZ, ZZ\)             & \numRF[3]{943.045}  & \numRF[2]{94.3045} \\
  QCD multijets              & \numRF[2]{2838.39}  & \numRF[2]{1419.19} \\
  \(Wc\bar{c}, Wb\bar{b}, Wc\) & \numRF[2]{31178  }  & \numRF[2]{13094.8} \\
  \(W\) + jets               & \numRF[3]{10584.5}  & \numRF[2]{4445.49} \\
  Single top \(Wt\)          & \numRF[3]{1699.75}  & \numRF[2]{152.977} \\
  \(Z\) + jets               & \numRF[2]{2378.42}  & \numRF[2]{998.934} \\
  Single top \(s\)           & \numRF[3]{297.591}  & \numRF[2]{12.4988} \\
  Single top \(t\)           & \numRF[3]{3936.98}  & \numRF[2]{165.353} \\
  \(t\bar{t}\)               & \numRF[3]{9386.28}  & \numRF[2]{901.083} \\
  \midrule
  Expected                   & \numRF[2]{63243}    & \numRF[2]{13968.5} \\
  Data                       & \multicolumn{2}{l}{\num{73062}} \\
  \bottomrule
\end{tabular}
```

Table 1: Example event yields spread over several orders of magnitude.

Channel	Selected events	
WW, WZ, ZZ	943 $\pm$	94
QCD multijets	2 800 $\pm$	1 400
$Wc\bar{c}, Wb\bar{b}, Wc$	31 000 $\pm$	13 000
W + jets	10 600 $\pm$	4 400
Single top Wt	1 700 $\pm$	150
Z + jets	2 400 $\pm$	1 000
Single top s	298 $\pm$	12
Single top t	3 940 $\pm$	170
$t\bar{t}$	9 390 $\pm$	900
Expected	63 000 $\pm$	14 000
Data	73 062	

```
    \caption{Simple table using \Option{S} column.}
    \label{tab:example0a}
    \centering
\begin{tabular}{
  S[table-format=2.2, table-number-alignment=center]
  S[table-format=2.2, table-number-alignment=right]
}
  \toprule
  {Align Centre} & {Align Right} \\
  \midrule
  0.76 & 0.76 \\
  83.1 & 83.1 \\
  \bottomrule
\end{tabular}
```

Table 2: Simple table using S column.

Align Centre	Align Right
0.76	0.76
83.1	83.1

longtable is included if you load atlaspackage with the option full. You may also need to rotate a big table. The rotating package can be used for this.

In order to shorten commands when doing rounding in tables, it is useful to define a few extra macros. Typical definitions can be found in the file ../atlas_doc-defs.sty.

If you use siunitx to format your numbers, you may have to adjust the option group-minimum-digits.

N: 04-00-00 The default value of group-minimum-digits is set to 5. Hence 1234 will not have a space after the thousands digit, whereas 12 345 will have. This is fine in text, but in tables, you probably want to use the option \siseteup{group-minimum-digits=4}, see Tables 8(a) to 8(b).

```
\caption{Simple table for numbers with signs using \Option{S} column.
  Vertical lines are included to show alignment (problems) --
  see the first column.}
\label{tab:example0b}
\centering
\begin{tabular}{
  |S[table-format=2.2]
  |S[table-format=-2.2]
  |S[table-format=-2.2, table-number-alignment=center]
  |S[table-format=+2.2, table-number-alignment=left]|
}
  \toprule
  {W/o} & {With} & {Align centre} & {Align left} \\
  \midrule
  0.76  & 0.76  & -0.76 & +0.76 \\
  82.0  & 82.0  &  82.0 &  82.0 \\
  +83.1 & +83.1 & -83.1 & +83.1 \\
  -84.2 & -84.2 & +84.2 & +84.2 \\
  \bottomrule
\end{tabular}
```

Table 3: Simple table for numbers with signs using S column. Vertical lines are included to show alignment (problems) – see the first column.

W/o	With	Align centre	Align left
0.76	0.76	−0.76	+0.76
82.0	82.0	82.0	82.0
+83.1	+83.1	−83.1	+83.1
−84.2	−84.2	+84.2	+84.2

```latex
\caption[Present FCNC top quark decays experimental limits]{Present
  experimental limits at \qty{95}{\%} \textit{confidence level}
on the branching fractions of the FCNC top quark decay channels established by
  experiments of the LEP, HERA, Tevatron and LHC accelerators.}%
\label{tab:intro:presentlimits}
\centering
\begin{tabular}{llllll}
  \toprule
  Coupling & \multicolumn{2}{c}{LEP} & \multicolumn{2}{c}{HERA} \\
  \midrule
  \(\BR(t\to q\gamma)\) & \num{2.4E-2} &                          &
  \num{6.4E-3} & (\(tu\gamma\))\\
  \(\BR(t\to qZ)\)      & \num{7.8E-2} &                          &
  \num{49E-2} & (\(tuZ\))\\
  \(\BR(t\to qg)\)      & \num{17E-2}  &                          &
  \num{13E-2} & \\
  \bottomrule
  Coupling & \multicolumn{2}{c}{Tevatron}                        &
  \multicolumn{2}{c}{LHC} \\
  \midrule
  \(\BR(t\to q\gamma)\) & \num{3.2E-2} &                          &
  \multicolumn{1}{c}{---} \\
  \(\BR(t\to qZ)\)      & \num{3.2E-2} &                          &
  \num{7.0E-4}\\
  \(\BR(t\to qg)\)      & \num{2.0E-4} & (\(tug\)), \((2 \to 2)\) &
  \multicolumn{1}{c}{---} \\
                        & \num{3.9E-3} & (\(tcg\)), \((2 \to 2)\) &
  \multicolumn{1}{c}{---} \\
                        & \num{3.9E-4} & (\(tug\)), \((2 \to 1)\) &
  \num{5.7E-5} & (\(tug\)), \((2 \to 1)\)\\
                        & \num{5.7E-3} & (\(tcg\)), \((2 \to 1)\) &
  \num{2.7E-4} & (\(tcg\)), \((2 \to 1)\)\\
  \bottomrule
\end{tabular}
```

Table 4: Present experimental limits at 95% confidence level on the branching fractions of the FCNC top quark decay channels established by experiments of the LEP, HERA, Tevatron and LHC accelerators.

Coupling	LEP		HERA	
$\mathcal{B}(t \to q\gamma)$	2.4×10^{-2}		6.4×10^{-3}	$(tu\gamma)$
$\mathcal{B}(t \to qZ)$	7.8×10^{-2}		49×10^{-2}	(tuZ)
$\mathcal{B}(t \to qg)$	17×10^{-2}		13×10^{-2}	
Coupling	Tevatron		LHC	
$\mathcal{B}(t \to q\gamma)$	3.2×10^{-2}		—	
$\mathcal{B}(t \to qZ)$	3.2×10^{-2}		7.0×10^{-4}	
$\mathcal{B}(t \to qg)$	2.0×10^{-4}	$(tug), (2 \to 2)$	—	
	3.9×10^{-3}	$(tcg), (2 \to 2)$	—	
	3.9×10^{-4}	$(tug), (2 \to 1)$	5.7×10^{-5}	$(tug), (2 \to 1)$
	5.7×10^{-3}	$(tcg), (2 \to 1)$	2.7×10^{-4}	$(tcg), (2 \to 1)$

```latex
\caption{Top quark event MC samples used for this analysis. The cross-section
  column includes \(k\)-factors and branching ratios.}%
\label{tab:mcsamples}
\centering
\renewcommand{\arraystretch}{1.2}
\scriptsize
\begin{tabular}{lSlS[table-format=9.0]SS[table-format=6.0]}
  \toprule
    & {\(\sigma\) [\unit{\pb}]} & Generator
    & \multicolumn{1}{c}{\(N_{MC}\)} & \multicolumn{1}{c}{\(k\)-factor} &
  \multicolumn{1}{c}{Dataset ID}\\
  \midrule
  \(Wt\) all decays                     & 22 & \POWHEG + \PYTHIA &   1000000
& 1.09 & 110140\\
  \(t\)-channel (lepton+jets) top     & 18  & \POWHEG + \PYTHIA &   5000000
& 1.05 & 110090\\
  \(s\)-channel (lepton+jets) antitop & 1.8 & \POWHEG + \PYTHIA &   5000000
& 1.06 & 110091\\
  \(t\bar{t}\) no fully hadronic       & 114 & \POWHEG + \PYTHIA & 100000000
& 1.12 & 117050\\
  \bottomrule
\end{tabular}
```

Table 5: Top quark event MC samples used for this analysis. The cross-section column includes k-factors and branching ratios.

	σ [pb]	Generator	N_{MC}	k-factor	Dataset ID
Wt all decays	22	Powheg + Pythia	1 000 000	1.09	110 140
t-channel (lepton+jets) top	18	Powheg + Pythia	5 000 000	1.05	110 090
s-channel (lepton+jets) antitop	1.8	Powheg + Pythia	5 000 000	1.06	110 091
$t\bar{t}$ no fully hadronic	114	Powheg + Pythia	100 000 000	1.12	117 050

```latex
\caption[Monte Carlo purities in the single lepton sample]{%
  Monte Carlo estimates of the fraction of each process in the single
  lepton data sample. This table uses ''S'' format from \texttt{siunitx} and
  ''\texttt{\(\,\pm\,\)}'' as the intercolumn separator.}%
\label{tab:example1}
\centering
\begin{tabular}{l S[table-format=2.1]@{\(\;\pm\;\)}S[table-format=1.1]@{\,}s
  S[table-format=3.1]@{\,}s}
  \toprule
  Category            & \multicolumn{3}{c}{\(\mu\)} &
  \multicolumn{2}{c}{\(e\)}\\
  \midrule
  \(b \to \ell\)          &    65.2 & 0.4 & \%   &  79.3 & \% \\
  \(b \to c \to \ell\) &     7.8 & 0.3 & \%   &   5.4 & \% \\
  Total               &    73.0 & 0.2 & \%   &   9.1 & \% \\
  \bottomrule
\end{tabular}
```

Table 6: Monte Carlo estimates of the fraction of each process in the single lepton data sample. This table uses "S" format from `siunitx` and " ± " as the intercolumn separator.

Category	μ	e
$b \to \ell$	$65.2 \pm 0.4\,\%$	$79.3\,\%$
$b \to c \to \ell$	$7.8 \pm 0.3\,\%$	$5.4\,\%$
Total	$73.0 \pm 0.2\,\%$	$9.1\,\%$

```
\caption{Monte Carlo estimates of the fraction of each process in
the single lepton data sample.
This table uses \texttt{\textbackslash phantom}.}%
\label{tab:example2}
\centering
\begin{tabular}{lcc}
  \toprule
  Category             & \multicolumn{1}{c}{\(\mu\)} &
  \multicolumn{1}{c}{\(e\)}\\
  \midrule
  \(b \to \ell\)        & \(     65.2 \pm 0.4\,\%\)   &      79.3\,\% \\
  \(b \to c \to \ell\)  & \(\pho 7.8 \pm 0.3\,\%\)    & \pho 5.4\,\% \\
  Total                 & \(     73.0 \pm 0.2\,\%\)   & \pho 9.1\,\% \\
  \bottomrule
\end{tabular}
```

Table 7: Monte Carlo estimates of the fraction of each process in the single lepton data sample. This table uses \phantom.

Category	μ	e
$b \to \ell$	$65.2 \pm 0.4\,\%$	$79.3\,\%$
$b \to c \to \ell$	$7.8 \pm 0.3\,\%$	$5.4\,\%$
Total	$73.0 \pm 0.2\,\%$	$9.1\,\%$

```
\caption{Tables comparing different \Option{group-minimum-digits} values
for the package \Package{siunitx}.}
\label{tab:minimum-digits}
\centering
\subfloat[Table with \Option{group-minimum-digits=4}.]{%
\sisetup{group-minimum-digits=4}
\begin{tabular}{lS[table-format=5.2]}
  Quantity & \multicolumn{1}{c}{Value}\\
  \midrule
  Value1 & 1234.56\\
  Value2 & 98765.43
\end{tabular}
\label{tab:minimum-digits1}
}
\qquad
\subfloat[Table with \Option{group-minimum-digits=5}.]{%
\sisetup{group-minimum-digits=5}
\begin{tabular}{lS[table-format=5.2]}
  Quantity & \multicolumn{1}{c}{Value}\\
  \midrule
  Value1 & 1234.56\\
  Value2 & 98765.43
\end{tabular}
\label{tab:minimum-digits2}
}
```

Table 8: Tables comparing different group-minimum-digits values for the package siunitx.

(a) Table with group-minimum-digits=4.		(b) Table with group-minimum-digits=5.	
Quantity	Value	Quantity	Value
Value1	1 234.56	Value1	1234.56
Value2	98 765.43	Value2	98 765.43

3 Rounding and numbers with asymmetric errors

Two things that are currently not built into the `siunitx` package are separate statistical and systematic errors and asymmetric errors. In addition it may be desirable to round the numbers. From the author I got some suggestions on how to define such things. Such macros are included in the `atlasmisc` package. Several new macros are defined there:

- \numR, \numRF and \numRP for rounding numbers. \numRF uses a fixed number of digits, whose value can be given as an optional argument. \numRP does the same, but with a fixed number of decimal places. For \numR you specify the rounding mode (and any other options) using \sisetup before calling it.

- \numpmerr can be used to pass the rounding precision as the first optional argument and the mode as the second optional argument.

- \numerrt, \numpmerrx and \numpmerrt can be used to write errors with a description, which are asymmetric and both, respectively. Any `sisetup` options can be passed as the first (optional) argument.

- The corresponding macros for values and errors are \qtypmerr, \qtyerrt, \qtypmerrx and \qtypmerrt. For the macros whose names end with 't', you also have to provide the descriptive text.

- If you have two errors then use \qtyerrtt or \qtypmerrtt, which have one or two more arguments, respectively.

- For the standard case of statistical and systematic errors, you can use the macros \qtyerrs and \qtypmerrs.

For all the macros except \numRF, \numRP \numpmerr and \qtypmerr the first (optional) argument can be used to pass any options you like to the \num command.

N: 15.0.0 Backwards incompatible changes were made to the \numR, \numRF, \numRP and \numpmerr macros. The precision is now an optional argument for \numR, \numRF and \numRP. The precision and rounding mode are optional arguments for \numpmerr. The macros \numpmRF and \numpmRP have been removed, as \numpmerr can easily be used instead. For most flexibility, the \numpmerrx can be used to set the precision and rounding options and more. You can use the previous versions by passing the option `version=14` to `atlasdoc`.

Examples of the rounding macros' usage are:

```
\sisetup{round-precision=3}
\begin{tabular}{ll}
  \numR{1234.5678}\\
  \numRF{1234.5678} & \numRF[2]{1234.5678}\\
  \numRP{1234.5678} & \numRP[2]{1234.5678}\\
\end{tabular}
```

```
1234.5678
1230        1200
1234.568    1234.57
```

Examples of the asymmetric error macros are:

```
\renewcommand{\arraystretch}{1.4}
\begin{equation*}
\begin{array}{lll}
  \numpmerr{+0.1234}{-0.4567} & \numpmerr[2][places]{+0.1234}{-0.4567} &
  \numpmerrx[round-mode=places, round-precision=2]{+0.1235}{-0.4568}\\
  \numpmerrt{+0.1234}{-0.4567}{stat.} &
    \numpmerr[2]{+0.1236}{-0.4569}\,\text{(stat.)} &
  \numpmerrt[round-mode=places, round-precision=2]{+0.1237}{-0.4560}{sys.}\\
\end{array}
\end{equation*}
```

$$
\begin{array}{lll}
+0.1234\atop-0.4567 & +0.12\atop-0.46 & +0.12\atop-0.46 \\
{+0.1234\atop-0.4567}\,(\text{stat.}) & {+0.1236\atop-0.4569}\,(\text{stat.}) & {+0.12\atop-0.46}\,(\text{sys.})
\end{array}
$$

Examples of the quantities macros are:

```
\begin{align*}
  \sigma & = \qtyerrs{3.42}{0.46}{0.32}{\pico\barn} & \Macro{qtyerrs}\\
  \sigma & = \qtyerrs[round-mode=places,
    round-precision=1]{3.43}{0.46}{0.32}{\pico\barn} & \Macro{qtyerrs}\\
  \sigma & = \qtyerrt[round-mode=places,
    round-precision=2]{3.43}{0.46}{stat.}{\pico\barn} & \Macro{qtyerrt}\\
  \sigma & = \qtyerrtt{3.43}{0.46}{stat.}{0.32}{sys.}{\pico\barn} &
    \Macro{qtyerrtt}\\
  \sigma & = \qtypmerr{3.44}{+0.46}{-0.32}{\pico\barn} & \Macro{qtypmerr}\\
  \sigma & = \qtypmerr[2][figures]{3.45}{+0.46}{-0.32}{\pico\barn} &
    \Macro{qtypmerr}\\
  \sigma & = \qtypmerrx[round-mode=figures,
    round-precision=2]{3.46}{+0.46}{-0.32}{\pico\barn} & \Macro{qtypmerrs}\\
  \sigma & = \qtypmerrt{3.47}{+0.46}{-0.32}{stat.}{\pico\barn} &
    \Macro{qtypmerrt}\\
  \sigma & = \qtypmerrs{3.48}{+0.46}{-0.32}{+0.06}{-0.04}{\pico\barn} &
    \Macro{qtypmerrs}\\
  \sigma & =
    \qtypmerrtt{3.49}{+0.46}{-0.32}{stat.}{+0.06}{-0.04}{sys.}{\pico\barn} &
    \Macro{qtypmerrtt}
\end{align*}
```

$$\sigma = 3.42 \pm 0.46 \,(\text{stat.}) \pm 0.32 \,(\text{sys.}) \,\text{pb} \qquad \texttt{\textbackslash qtyerrs}$$

$$\sigma = 3.4 \pm 0.5 \,(\text{stat.}) \pm 0.3 \,(\text{sys.}) \,\text{pb} \qquad \texttt{\textbackslash qtyerrs}$$

$$\sigma = 3.43 \pm 0.46 \,(\text{stat.}) \,\text{pb} \qquad \texttt{\textbackslash qtyerrt}$$

$$\sigma = 3.43 \pm 0.46 \,(\text{stat.}) \pm 0.32 \,(\text{sys.}) \,\text{pb} \qquad \texttt{\textbackslash qtyerrtt}$$

$$\sigma = 3.44 \,^{+0.46}_{-0.32} \,\text{pb} \qquad \texttt{\textbackslash qtypmerr}$$

$$\sigma = 3.5 \,^{+0.46}_{-0.32} \,\text{pb} \qquad \texttt{\textbackslash qtypmerr}$$

$$\sigma = 3.5 \,^{+0.46}_{-0.32} \,\text{pb} \qquad \texttt{\textbackslash qtypmerrs}$$

$$\sigma = 3.47 \,^{+0.46}_{-0.32} \,(\text{stat.}) \,\text{pb} \qquad \texttt{\textbackslash qtypmerrt}$$

$$\sigma = 3.48 \,^{+0.46}_{-0.32} \,(\text{stat.}) \,^{+0.06}_{-0.04} \,(\text{sys.}) \,\text{pb} \qquad \texttt{\textbackslash qtypmerrs}$$

$$\sigma = 3.49 \,^{+0.46}_{-0.32} \,(\text{stat.}) \,^{+0.06}_{-0.04} \,(\text{sys.}) \,\text{pb} \qquad \texttt{\textbackslash qtypmerrtt}$$

The last two examples use \qtypmerrs and \qtypmerrtt just to show that they can both give the same output. If you need even more complicated combinations of errors, or more errors, have a look at the definitions, e.g.

```
\begin{equation*}
  \sigma_{t\bar{t}} = (\num{164.6}%
  \valuesep\numerrt{8.7}{stat.}%
  \valuesep\numpmerrt{+6.4}{-5.3}{sys.}%
  \valuesep\numerrt{8.2}{lumi.})%
  \valuesep\unit{\pico\barn}
\end{equation*}
```

$$\sigma_{t\bar{t}} = (164.6 \pm 8.7\,(\text{stat.})\ {}^{+6.4}_{-5.3}\,(\text{sys.})\ \pm 8.2\,(\text{lumi.}))\ \text{pb}$$

Rounding is very nice and works well, but can slow down compilation considerably, especially in big INT notes.

Details of the arguments for all the macros can be found in Tables 9 and 10.

Table 9: Arguments of error macros. 'prec' is short for the rounding-precision, 'mode' for the rounding-mode. Columns that start with 'm' mean mandatory arguments.

Macro	Options	m1	m2	m3
\numR	[sisetup]	value	error	
\numRF	[prec]	value	error	
\numRP	[prec]	value	error	
\numpmerr	[prec] [mode]	value	err+	err-
\numpmerrx	[siunitx]	value	err+	err-

Table 10: Arguments of quantity macros. 'prec' is short for the rounding-precision, 'mode' for the rounding-mode, 'desc' is short for the description of what the error is, 'stat.' is short for statistical error, 'sys.' is short for systematic error/ Columns that start with 'm' mean mandatory arguments.

Macro	Options	m1	m2	m3	m4	m5	m6	m7	m8
\qtypmerr	[prec] [mode]	value	err+	err-	unit				
\qtypmerrx	[sisetup]	value	+err	err-	unit				
\qtyerrt	[sisetup]	value	error	desc	unit				
\qtyerrtt	[sisetup]	value	error	desc	error	desc	unit		
\qtypmerrt	[sisetup]	value	err+	err-	desc	unit			
\qtypmerrtt	[sisetup]	value	err+	err-	desc	err+	err-	desc	unit
\qtyerrs	[sisetup]	value	stat.	sys.	unit				
\qtypmerrs	[sisetup]	value	stat.+	stat.-	sys.+	sys-	unit		

3.1 Asymmetric uncertainties

Those of you with sharp eyes may spot that the width of '+' and '−' are different in the default font used by ATLAS (newtx). This leads to the numbers in the subscripts and superscripts not being aligned. For some examples see Table 11.

The option numpmcorr in the atlasphysics package can be used to make the superscript and the subscript have the same width. This option is enabled by default as pdfLaTeX has this problem with the

default ATLAS font, `newtx`. It is not needed (and slows things down) for LuaLaTeX and XeLaTeX. A macro `\supsub` has been defined that ensures that the width of the boxes for subscripts and superscripts is the same. For example, if the numpmcorr option is set, the macro `\numpmerr` uses `\supsub` with two optional arguments: the first one specifies the rounding precision, while the second the rounding mode (places or figures).

```
    \caption{Numbers with asymmetric uncertainties.}%
    \label{tab:asym}
    \centering
    \renewcommand{\arraystretch}{1.4}
    \begin{tabular}{cc}
      \toprule
      No macro & \Macro{numpmerr} \\
      \midrule
      \(^{\num{+0.223}}_{\num{-0.123}}\) & \numpmerr{+0.223}{-0.123} \\
      \(^{\num{+0.281}}_{\num{-0.215}}\) &
      \numpmerrx[round-precision=2]{+0.281}{-0.215}
    \end{tabular}
```

Table 11: Numbers with asymmetric uncertainties.

No macro	\numpmerr
+0.223 −0.123	+0.223 −0.123
+0.281 −0.215	+0.281 −0.215

4 Tables and rounding

Further examples of tables can be found in the note discussing the ATLAS recommendations on rounding [1]. A selection of those tables are also reproduced here. The LaTeX code for the examples given below can be found in Appendix A.

The tables shown earlier in this document were also created with `siunitx`. A few more examples of how to steer the formatting are given here. Table 12 compares two different approaches to how this can be done in `siunitx`, even for asymmetric errors. Note that although these tables look almost identical, the syntax used to create them is different (see Appendix A). While the form may appear to be a bit clumsy at first, it is easy enough to get a program to write out the lines. In the left-hand table `\numRP` is used in column 3, while the full syntax of `\num` in shown in column 4 for illustration purposes only. The syntax to change the precision of a single number is shown in the first line of the left-hand part of the table. This is seen to be rather trivial, but the alignment on the decimal point is now no longer perfect. While this is probably OK for internal notes etc., papers (should) have more stringent requirements. Another way of achieving the same thing and avoiding the use of round-mode and round-precision is shown in the code for the right-hand table. Note the use of options for the S format and the use of `\num` enclosed in braces to format the row that requires a different precision. The macro `\tablenum` is available to achieve alignment

in complicated situations, such as within a \multicolumn or \multirow. It is, in effect, a macro version of the S option. See the siunitx [2] manual for more details.

Table 12: A selection of cross-section measurements. Note that for numbers with asymmetric errors, the option \sisetup {retain-explicit-plus} is used to stop siunitx from dropping the plus signs on the positive errors. (Although these tables look almost identical, the syntax used to create them is different — see Appendix A).

η_{jet}	$\mathrm{d}\sigma^b/\mathrm{d}\eta^b$ [pb]		η_{jet}	$\mathrm{d}\sigma^b/\mathrm{d}\eta^b$ [pb]	
$-1.60:-1.10$	$0.574 \;\pm 0.094$	$^{+0.035}_{-0.031}$	$-1.60:-1.10$	$0.574 \;\pm 0.094$	$^{+0.035}_{-0.031}$
$-1.10:-0.80$	$1.21 \;\pm 0.21$	$^{+0.16}_{-0.16}$	$-1.10:-0.80$	$1.21 \;\pm 0.21$	$^{+0.16}_{-0.16}$
$-0.80:-0.50$	$2.14 \;\pm 0.22$	$^{+0.22}_{-0.12}$	$-0.80:-0.50$	$2.14 \;\pm 0.22$	$^{+0.22}_{-0.12}$
$-0.50:-0.20$	$2.33 \;\pm 0.21$	$^{+0.28}_{-0.21}$	$-0.50:-0.20$	$2.33 \;\pm 0.21$	$^{+0.28}_{-0.21}$
$-0.20:+0.10$	$2.64 \;\pm 0.22$	$^{+0.28}_{-0.23}$	$-0.20:+0.10$	$2.64 \;\pm 0.22$	$^{+0.28}_{-0.23}$
$+0.10:+0.50$	$3.16 \;\pm 0.21$	$^{+0.23}_{-0.17}$	$+0.10:+0.50$	$3.16 \;\pm 0.21$	$^{+0.23}_{-0.17}$
$+0.50:+1.40$	$2.88 \;\pm 0.15$	$^{+0.20}_{-0.30}$	$+0.50:+1.40$	$2.88 \;\pm 0.15$	$^{+0.20}_{-0.30}$

Cross-sections vs. η are usually not so difficult to format, as the magnitudes of the numbers do not change much from one bin to the next. The situation is different for cross-sections as a function of E_{T} or x. Tables 13 and 14 show examples of such tables.

round-mode=figures is in general best for cross-sections and their errors. A precision of 2 digits for the uncertainties is a good starting point, but will then have to be reduced to 1 digit in some cases. For the cross-section values, more digits (typically 3) probably have to be specified and the precision of some values will again have to be adjusted by hand. In Table 13(b) some of the rounding is adjusted by hand so that the numbers conform to the rules. For the asymmetric errors, round-mode=places is used and the precision of each asymmetric uncertainty is then set by hand. This works well if the cross-sections should all be shown with decimal points, but does not work if used to round a number such as 182. Hence the first row uses round-mode=figures. Even with the tools offered by \siunitx getting things exactly right is non-trivial.

Table 14 is probably the most challenging to format correctly, as the bin boundaries also vary by several orders of magnitude. Table 14(a) gives the numbers with the option scientific-notation=fixed to illustrate the problem of what the table would look like if the cross-sections are output in pb. In Table 14(b) the exponential format of numbers is used to rescale the cross-section from pb to nb. \phantom had to be used in more places than we really like in order to get the final alignment correct. It may be possible to use the \tablenum instead, but this has not been tested.

Table 13: Cross-section vs. E_{T}.

(a) No special formatting and round-mode=figures. This is the starting point for more refined formatting.

E_{T}	$\mathrm{d}\sigma/\mathrm{d}E_{\mathrm{T}}$ [pb GeV^{-1}]		
4 : 8	3 630	± 110	$^{+200}_{-180}$
8 : 11	719	± 22	$^{+43}_{-40}$
11 : 14	215	± 9.7	$^{+21}_{-20}$
14 : 17	85.8 ±	6.0	$^{+10}_{-9.0}$
17 : 20	35.4 ±	3.9	$^{+5.5}_{-5.4}$
20 : 25	14.1 ±	2.7	$^{+3.5}_{-3.2}$
25 : 35	2.38 ±	0.97	$^{+0.85}_{-0.86}$

(b) Numbers adjusted according to the recommendations. round-mode=places is used for asymmetric errors (except the first row). Some judicious use of \phantom is applied to get improved, but not yet perfect, alignment.

E_{T} [GeV]	$\mathrm{d}\sigma/\mathrm{d}E_{\mathrm{T}}$ [pb GeV^{-1}]		
4 : 8	3 630	± 110	$^{+200}_{-180}$
8 : 11	719	± 22	$^{+0}_{+0}$
11 : 14	210	± 10	$^{+0}_{+0}$
14 : 17	86	± 6	$^{+0}_{+0}$
17 : 20	35.4	± 3.9	$^{+6}_{-5}$
20 : 25	14.1 ±	2.7	$^{+3}_{-3}$
25 : 35	2.4 ±	1	$^{+0.8}_{-0.9}$

Table 14: Cross-section vs. x.

(a) No special formatting or rounding. Option scientific-notation=fixed used.

x		$\mathrm{d}\sigma/\mathrm{d}x$		
		[pb]		
0.00008	: 0.0002	$10\,800\,000 \pm 870\,000$	$^{+760\,000}_{-650\,000}$	
0.0002	: 0.0006	$10\,800\,000 \pm 390\,000$	$^{+570\,000}_{-440\,000}$	
0.0006	: 0.002	$4\,970\,000 \pm 140\,000$	$^{+260\,000}_{-230\,000}$	
0.002	: 0.005	$1\,220\,000 \pm\ \ 31\,000$	$^{+69\,000}_{-62\,000}$	
0.005	: 0.01	$257\,000 \pm\ \ 12\,000$	$^{+18\,000}_{-16\,000}$	
0.01	: 0.1	$10\,700 \pm\ \ \ \ \ 790$	$^{+910}_{-820}$	

(b) Several fixes including rescaled cross-section. Quite a lot of \phantom commands are applied to get alignment correct.

x		$\mathrm{d}\sigma/\mathrm{d}x$			
		[nb]			
0.00008	: 0.0002	$11\,000$	$\pm\,900$	$^{+800}_{-600}$	
0.0002	: 0.0006	$10\,800$	$\pm\,400$	$^{+600}_{-400}$	
0.0006	: 0.0016	$4\,970$	$\pm\ \ 140$	$^{+260}_{-230}$	
0.0016	: 0.005	$1\,217$	$\pm\ \ 31$	$^{+69}_{-62}$	
0.005	: 0.01	257	$\pm\ \ 12$	$^{+18}_{-16}$	
0.01	: 0.1	10.7	$\pm\ \ 0.8$	$^{+0.9}_{-0.8}$	

History

2014-11-25: Ian Brock First version of the document released.

2018-02-15: Ian Brock Moved table captions above tables to follow common convention.

2020-08-03: Ian Brock Removed code for TEX Live version older than 2013. More use of listings with `tcolorbox`. Added a bit of information on the use of `\tablenum` macro.

202-12-09: Ian Brock Added some examples of the usage of table-number-alignment. Add macros for equal width subscripts and superscripts.

References

[1] H. Abramowicz et al., *Rounding – ATLAS Recommendations*,
      URL: https://cds.cern.ch/record/1668799 (cit. on pp. 2, 15).

[2] *The International System of Units (SI)*,
      URL: http://www.ctan.org/tex-archive/macros/latex/contrib/siunitx (cit. on p. 16).

A LaTeX code for tables

This appendix gives the LaTeX code including the raw data used for Tables 12 to 14. These files can be found in the doc/atlas_tables directory of the atlaslatex package.

A.1 Table 12

The files are: cross-sections_charm-eta1.tex and cross-sections_charm-eta2.tex:

```
\renewcommand{\arraystretch}{1.4}
\sisetup{round-mode=places}
\centering
\begin{tabular}{%
S@{\,:\,}S
r@{\,}@{$\pm$}@{\,}l@{\,}l
}
\toprule
\multicolumn{2}{c}{\etajet} & \multicolumn{3}{c}{\diffetab} \\
\multicolumn{2}{c}{} & \multicolumn{3}{c}{[\unit{\pico\barn}]} \\
\midrule
{\num{-1.6}} & -1.1 & \numRP[3]{0.574} & \num[round-precision=3]{0.094} &
$^{\numRP[3]{+0.035}}_{\numRP[3]{-0.031}}$ \\
{\num{-1.1}} & -0.8 & \numRP[2]{1.213} & \num[round-precision=2]{0.211} &
$^{\numRP[2]{+0.162}}_{\numRP[2]{-0.162}}$ \\
{\num{-0.8}} & -0.5 & \numRP[2]{2.141} & \num[round-precision=2]{0.219} &
$^{\numRP[2]{+0.223}}_{\numRP[2]{-0.123}}$ \\
{\num{-0.5}} & -0.2 & \numRP[2]{2.326} & \num[round-precision=2]{0.210} &
$^{\numRP[2]{+0.284}}_{\numRP[2]{-0.214}}$ \\
{\num{-0.2}} & +0.1 & \numRP[2]{2.641} & \num[round-precision=2]{0.220} &
$^{\numRP[2]{+0.283}}_{\numRP[2]{-0.233}}$ \\
{\num{+0.1}} & +0.5 & \numRP[2]{3.160} & \num[round-precision=2]{0.211} &
$^{\numRP[2]{+0.232}}_{\numRP[2]{-0.172}}$ \\
{\num{+0.5}} & +1.4 & \numRP[2]{2.881} & \num[round-precision=2]{0.154} &
$^{\numRP[2]{+0.201}}_{\numRP[2]{-0.301}}$ \\
\bottomrule
\end{tabular}
```

```
\renewcommand{\arraystretch}{1.4}
\sisetup{round-mode = places, round-precision = 2}
\centering
\begin{tabular}{%
    S[table-format=3.2, table-number-alignment=right]@{\,:\,}S
    S[round-mode=places, round-precision=2,
    table-format=1.3, table-number-alignment=right]
    @{\(\,\pm\,\)}
    S[round-mode=places, round-precision=2,
    table-format=1.3, table-number-alignment=left]
    @{\,}l
    }
\toprule
\multicolumn{2}{c}{\etajet} & \multicolumn{3}{c}{\diffetab} \\
\multicolumn{2}{c}{} & \multicolumn{3}{c}{[\unit{\pico\barn}]} \\
\midrule
-1.6 & -1.1 & {\numRP[3]{0.574}} & {\numRP[3]{0.094}} & \(^{\numRP[3]{+0.035}}_{\numRP[3]{-0.031}}\) \\
-1.1 & -0.8 & 1.213 & 0.211 & \(^{\num{+0.162}}_{\num{-0.162}}\) \\
-0.8 & -0.5 & 2.141 & 0.219 & \(^{\num{+0.223}}_{\num{-0.123}}\) \\
-0.5 & -0.2 & 2.326 & 0.210 & \(^{\num{+0.284}}_{\num{-0.214}}\) \\
-0.2 & +0.1 & 2.641 & 0.220 & \(^{\num{+0.283}}_{\num{-0.233}}\) \\
+0.1 & +0.5 & 3.160 & 0.211 & \(^{\num{+0.232}}_{\num{-0.172}}\) \\
+0.5 & +1.4 & 2.881 & 0.154 & \(^{\num{+0.201}}_{\num{-0.301}}\) \\
\bottomrule
\end{tabular}
```

A.2 Table 13

The files are: `cross-sections_charm-ET1.tex` and `cross-sections_charm-ET2.tex`:

```
% Charm differential cross sections d sigma / dY in bins of ET
\sisetup{round-mode=figures, round-precision=2,
  group-digits=integer, group-minimum-digits=4}
\begin{tabular}{%
    S[table-format=2.0, table-number-alignment=right,
    round-mode=places, round-precision=0]@{$\,:\,$}
    S[table-format=2.0, table-number-alignment=left,
    round-mode=places, round-precision=0]
    S[table-format=4.2, table-number-alignment=right,
    round-mode=figures, round-precision=3]@{$\,\pm\,$}
    S[table-format=3.2, table-number-alignment=right,
    round-mode=figures, round-precision=2]@{$\,$}l}
  \toprule
  \multicolumn{2}{c}{\ET} &
  \multicolumn{3}{c}{$\dif\sigma / \dif\ET$}\\
  \multicolumn{2}{c}{\mbox{}} & \multicolumn{3}{c}{[\unit{\pico\barn\per\GeV}]}\\
  \midrule
 4.2 & 8.0  & 3634.06 & 114.491  & \numpmerr[2]{+201.404 }{-181.511} \\
 8.0 & 11.0 & 719.458 & 21.9334  & \numpmerr[2]{+43.3087 }{-39.7824} \\
11.0 & 14.0 & 214.572 & 9.71991  & \numpmerr[2]{+20.5413 }{-19.6464} \\
14.0 & 17.0 & 85.7584 & 6.03401  & \numpmerr[2]{+10.0875 }{-8.99952} \\
17.0 & 20.0 & 35.4095 & 3.91591  & \numpmerr[2]{+5.5349  }{-5.41347} \\
20.0 & 25.0 & 14.1253 & 2.72552  & \numpmerr[2]{+3.46528 }{-3.22476} \\
25.0 & 35.0 & 2.37786 & 0.968562 & \numpmerr[2]{+0.849647}{-0.855525} \\
  \bottomrule
\end{tabular}
```

```
% Charm differential cross sections d sigma / dY in bins of ET
\sisetup{round-mode=figures, round-precision=2,
  group-digits=integer, group-minimum-digits=4}
\begin{tabular}{%
    S[table-format=2.0, table-number-alignment=right,
    round-mode=places, round-precision=0]@{$\,:\,$}
    S[table-format=2.0, table-number-alignment=left,
    round-mode=places, round-precision=0]
    S[table-format=4.1, table-alignment=right,
    round-mode=figures, round-precision=3]@{$\,\pm\,$}
    S[table-format=3.1, table-alignment=right,
    round-mode=figures, round-precision=2]@{$\,$}r}
  \toprule
  \multicolumn{2}{c}{\ET} &
  \multicolumn{3}{c}{$\dif\sigma / \dif\ET$}\\
  \multicolumn{2}{c}{[\unit{\GeV}]} & \multicolumn{3}{c}{[\unit{\pico\barn\per\GeV}]}\\
  \midrule
 4.2 & 8.0  & 3634.06                    & 114.491
& \numpmerr[2][figures]{+201.404 }{-181.511 }  \\
 8.0 & 11.0 & 719.458                    & 21.9334
& \numpmerr[0]{+43.3087 }{-39.7824 } \\
11.0 & 14.0 & {\numRF[2]{214.572}\phdo}  & {\numRF[1]{9.71991}\phdo}
& \numpmerr[0]{+20.5413 }{-19.6464 } \\
14.0 & 17.0 & {\numRF[2]{85.7584}\phdo}  & {\numRF[1]{6.03401}\phdo}
& \numpmerr[0]{+10.0875 }{-8.99952 } \\
17.0 & 20.0 & {\numRF[3]{35.4095}}       & {\numRF[2]{3.91591}}
& \numpmerr[1]{+5.5349   }{-5.41347 } \\
20.0 & 25.0 & 14.1253                    & 2.72552
& \numpmerr[1]{+3.46528 }{-3.22476 } \\
25.0 & 35.0 & {\numRF[2]{2.37786}}       & {\numRF[1]{0.968562}}
& \numpmerr[1]{+0.849647}{-0.855525} \\
  \bottomrule
\end{tabular}
```

A.3 Table 14

The files are: `cross-sections_charm-x1.tex` and `cross_sections-charm-x2.tex`:

```
% Charm differential cross sections d sigma / dY in bins of xda
\sisetup{round-mode=figures, round-precision=2,
  group-digits=integer, group-minimum-digits=4}
\sisetup{scientific-notation=fixed, fixed-exponent=0}
\begin{tabular}{%
    S[table-format=1.5, table-number-alignment=right,
    round-mode=figures, round-precision=1]@{$\,:\,$}
    S[table-format=1.5, table-number-alignment=left,
    round-mode=figures, round-precision=1]
    S[table-format=8.0, table-number-alignment=right,
    round-mode=figures, round-precision=3]@{$\,\pm\,$}
    S[table-format=6.0, table-number-alignment=right,
    round-mode=figures, round-precision=2]@{$\,$}
    r
  }
  \toprule
  \multicolumn{2}{c}{$x$} &
  \multicolumn{3}{c}{$\dif\sigma / \dif x$}\\
  \multicolumn{2}{c}{\mbox{}} & \multicolumn{3}{c}{[\unit{\pico\barn}]}\\
  \midrule
0.00008 & 0.00020 & 1.08474e+07 & 867945  & \numpmerr[2]{+761437 }{-647690 }  \\
0.00020 & 0.00060 & 1.08385e+07 & 388976  & \numpmerr[2]{+567443 }{-441257 }  \\
0.00060 & 0.00160 & 4.974e+06   & 135404  & \numpmerr[2]{+256385 }{-233376 }  \\
0.00160 & 0.00500 & 1.21664e+06 & 31162.1 & \numpmerr[2]{+68948.1}{-62459.6} \\
0.00500 & 0.01000 & 256870      & 12232.7 & \numpmerr[2]{+18363.7}{-16463.7} \\
0.01000 & 0.10000 & 10652.6     &  791.21 & \numpmerr[2]{+913.118}{-815.675} \\
  \bottomrule
\end{tabular}
```

```
% Charm differential cross sections d sigma / dY in bins of xda
\sisetup{round-mode=figures, round-precision=2,
  group-digits=integer, group-minimum-digits=4}
\sisetup{scientific-notation=fixed, fixed-exponent=0}
\begin{tabular}{%
    S[table-format=1.5, table-number-alignment=right,
    round-mode=figures, round-precision=1]@{$\,:\,$}
    S[table-format=1.5, table-number-alignment=left,
    round-mode=figures, round-precision=1]
    S[table-format=5.1, table-alignment=right,
    round-mode=figures, round-precision=4]@{$\,\pm\,$}
    S[table-format=3.1, table-alignment=right,
    round-mode=figures, round-precision=2]@{$\,$}
    r
  }
  \toprule
  \multicolumn{2}{c}{$x$} &
  \multicolumn{3}{c}{$\dif\sigma / \dif x$}\\
  \multicolumn{2}{c}{\mbox{}} & \multicolumn{3}{c}{[\unit{\nano\barn}]}\\
  \midrule
0.00008 & 0.00020            & {\numRF[2]{1.08474e+04}\phdo}
& {\numRF[1]{867945e-3}\phdo}  & \numpmerr[1]{+761437 e-3}{-647690 e-3} \\
0.00020 & 0.00060            & {\numRF[3]{1.08385e+04}\phdo}
& {\numRF[1]{388976e-3}\phdo}  & \numpmerr[1]{+567443 e-3}{-441257 e-3} \\
0.00060 & {\numRF[2]{0.0016}\pho} & {\numRF[3]{4.974e+03}\phdo}
& 135404e-3                 & \numpmerr[2]{+256385 e-3}{-233376 e-3} \\
{\numRF[2]{0.0016}\pho} & 0.00500 & {\numRF[4]{1.21664e+03}\phdo}
& 31162.1e-3                & \numpmerr[2]{+68948.1e-3}{-62459.6e-3} \\
0.00500 & 0.01000            & {\numRF[3]{256870e-03}\phdo}
& 12232.7e-3                & \numpmerr[2]{+18363.7e-3}{-16463.7e-3} \\
0.01000 & 0.10000            & {\numRF[3]{10652.6e-03}}
& {\numRF[1]{791.21e-3}}    & \numpmerr[1]{+913.118e-3}{-815.675e-3} \\
  \bottomrule
\end{tabular}
```