AASTeX6.0: New Table Features

AASTeX v6.0 introduces five new table features that are designed to make table construction easier and the resulting display better for AAS Journal authors. The items are:

1. Declaring math mode in specific columns,

2. Column decimal alignment,

3. Automatic column header numbering,

4. Hiding columns, and

5. Splitting wide tables into two or three parts.

Each of these new features are illustrated in following Table examples. All five features work with the regular LaTeX tabular environment and in AASTeX's deluxetable environment. The examples in this manuscript also show where the two process differ.

1.1.1. *Column math mode*

Both the LaTeX tabular and AASTeX deluxetable require an argument to define the alignment and number of columns. The most common values are "c", "l" and "r" for center, left, and right justification. If these values are capitalized, e.g. "C", "L", or "R", then that specific column will automatically be in math mode meaning that $s are not required. Note that having embedded dollar signs in the table does not affect the output. The third and forth columns of Table 2 shows how this math mode works.

1.1.2. *Decimal alignment*

Aligning a column by the decimal point can be difficult with only center, left, and right justification options. It is possible to use phantom calls in the data, e.g. `\phn`, to align columns by hand but this can be tedious in long or complex tables. To address this AASTeX introduces the `\decimals` command and a new column justification option, "D", to align data in that column on the decimal. In deluxetable the `\decimals` command is invoked before the `\startdata` call but can be anywhere in LaTeX's tabular environment.

Two other important thing to note when using decimal alignment is that each decimal column *must end with a space before the ampersand*, e.g. "&&" is not allowed. Empty decimal columns are indicated with a decimal, e.g. ".". Do not use deluxetable's `\nodata` command.

The "D" alignment token works by splitting the column into two parts on the decimal. While this is invisible to the user one must be aware of how it works so that the headers are accounted for correctly. All decimal column headers need to span two columns to get the alignment correct. This can be done with a multicolumn call, e.g `\multicolumn2c{}` or `\multicolumn{2}{c}{}`, or use the new `\twocolhead{}` command in deluxetable.

```
\begin{table}[h!]
\renewcommand{\thetable}{\arabic{table}}
\centering
\caption{Decimal alignment made easy} \label{tab:decimal}
\begin{tabular}{cD@{$\pm$}D}
\tablewidth{0pt}
\hline
\hline
Column & \multicolumn2c{Value} & \multicolumn2c{Uncertainty}\\
\hline
\decimals
A & 1234      & 100.0      \\
B &  123.4    &  10.1      \\
C &  12.34    &   1.01     \\
D &   1.234   &   0.101    \\
E &     .1234 &   0.01001  \\
F &   1.0     &    .       \\
\hline
\multicolumn{5}{c}{NOTE. - Two decimal aligned columns}
\end{tabular}
\end{table}
```

Table 1. Decimal alignment made easy

Column	Value		Uncertainty
A	1234	±	100.0
B	123.4	±	10.1
C	12.34	±	1.01
D	1.234	±	0.101
E	.1234	±	0.01001
F	1.0	±	

NOTE. - Two decimal aligned columns

1.1.3. *Automatic column header numbering*

The command \colnumbers can be included to automatically number each column as the last row in the header. Per the AAS Journal table format standards, each column index numbers will be surrounded by parentheses. In a LaTeX tabular environment the \colnumbers should be invoked at the location where the author wants the numbers to appear, e.g. after the last line of specified table header rows. In deluxetable this command has to come before \startdata. \colnumbers will not increment for columns hidden by the "h" command, see Section 1.1.4. Table 1 uses this command to automatically generate column index numbers.

Note that when using decimal alignment in a table the command \decimalcolnumbers must be used instead of \colnumbers and \decimals. Table 2 illustrates this specific functionality.

1.1.4. *Hiding columns*

Entire columns can be hidden from display simply by changing the specified column identifier to "h". In the LaTeX tabular environment this column identifier conceals the entire column including the header columns. In AASTEX's deluxetables the header row is specifically declared with the \tablehead call and each header column is marked with \colhead call. In order to make a specific header disappear with the "h" column identifier in deluxetable use \nocolhead instead to suppress that particular column header.

Authors can use this option in many different ways. Since column data can be easily suppressed authors can include extra information and hid it based on the comments of co-authors or referees. For wide tables that will have a machine readable version, authors could put all the information in the LaTeX table but use this option to hid as many columns as needed until it fits on a page. This concealed column table would serve as the example table for the full machine readable version. Regardless of how columns are obscured, authors are responsible for removing any unneeded column data or alerting the editorial office about how to treat these columns during production for the final typeset article.

Table 2 provides some basic information about the first ten Messier Objects and illustrates how many of these new features can be used together. It has automatic column numbering, decimal alignment of the distances, and one concealed column. The Common name column is the third in the LaTeX deluxetable but does not appear when the article is compiled. This hidden column can be shown simply by changing the "h" in the column identifier preamble to another valid value. This table also uses \tablenum to renumber the table because a LaTeX tabular table was inserted before it.

```
\begin{deluxetable}{cchlDlc}
\tablecaption{Fun facts about the first 10 messier objects\label{tab:messier}}
\tablehead{
\colhead{Messier} & \colhead{NGC/IC} & \nocolhead{Common} & \colhead{Object} &
\multicolumn2c{Distance} & \colhead{} & \colhead{V} \\
\colhead{Number} & \colhead{Number} & \nocolhead{Name} & \colhead{Type} &
\multicolumn2c{(kpc)} & \colhead{Constellation} & \colhead{(mag)}
}
\decimalcolnumbers
\startdata
M1 & NGC 1952 & Crab Nebula & Supernova remnant & 2 & Taurus & 8.4 \\
M2 & NGC 7089 & Messier 2 & Cluster, globular & 11.5 & Aquarius & 6.3 \\
M3 & NGC 5272 & Messier 3 & Cluster, globular & 10.4 & Canes Venatici &  6.2 \\
M4 & NGC 6121 & Messier 4 & Cluster, globular & 2.2 & Scorpius & 5.9 \\
M5 & NGC 5904 & Messier 5 & Cluster, globular & 24.5 & Serpens & 5.9 \\
M6 & NGC 6405 & Butterfly Cluster & Cluster, open & 0.31 & Scorpius & 4.2 \\
M7 & NGC 6475 & Ptolemy Cluster & Cluster, open & 0.3 & Scorpius & 3.3 \\
M8 & NGC 6523 & Lagoon Nebula & Nebula with cluster & 1.25 & Sagittarius & 6.0 \\
M9 & NGC 6333 & Messier 9 & Cluster, globular & 7.91 & Ophiuchus & 8.4 \\
M10 & NGC 6254 & Messier 10 & Cluster, globular & 4.42 & Ophiuchus & 6.4 \\
\enddata
\tablecomments{This table ``hides'' the third column in the \latex\ when compiled.
The Distance is also centered on the decimals.  Note that when using decimal
alignment you need to include the {\tt\string\decimals} command after
{\tt\string\startdata} and all of the values in that column have to have a
space before the next ampersand.}
\end{deluxetable}
```

Table 2. Fun facts about the first 10 messier objects

Messier Number	NGC/IC Number	Object Type	Distance (kpc)	Constellation	V (mag)
(1)	(2)	(3)	(4)	(5)	(6)
M1	NGC 1952	Supernova remnant	2	Taurus	8.4
M2	NGC 7089	Cluster, globular	11.5	Aquarius	6.3
M3	NGC 5272	Cluster, globular	10.4	Canes Venatici	6.2
M4	NGC 6121	Cluster, globular	2.2	Scorpius	5.9
M5	NGC 5904	Cluster, globular	24.5	Serpens	5.9
M6	NGC 6405	Cluster, open	0.31	Scorpius	4.2
M7	NGC 6475	Cluster, open	0.3	Scorpius	3.3
M8	NGC 6523	Nebula with cluster	1.25	Sagittarius	6.0
M9	NGC 6333	Cluster, globular	7.91	Ophiuchus	8.4
M10	NGC 6254	Cluster, globular	4.42	Ophiuchus	6.4

NOTE—This table "hides" the third column in the LaTeX when compiled. The Distance is also centered on the decimals. Note that when using decimal alignment you need to include the \decimals command after \startdata and all of the values in that column have to have a space before the next ampersand.

1.1.5. *Splitting a table into multiple horizontal components*

Since the AAS Journals are now all electronic with no print version there is no reason why tables can not be as wide as authors need them to be. However, there are some artificial limitations based on the width of a print page. The old way around this limitation was to use landscape mode with the `\rotate` command and the smallest available table font sizes, e.g. `\tablewidth`, to get the table to fit. Unfortunately, this was not alway enough but now along with the hide column option outlined in Section 1.1.4 there is a new way to break a table into two or three components so that it flows down a page by invoking a new table type, splittabular or splitdeluxetable. Within these tables a new "B" column separator is introduced. Much like the vertical bar option, "|", that produces a vertical table lines, e.g. Table 1, the new "B" separator indicates where to B̲reak a table. Up to two "B"s may be included.

Table 3 shows how to split a wide deluxetable in half with the `\splitdeluxetable` command. The `\colnumbers` option is on to show how the automatic column numbering carries through the second table component, see Section 1.1.3. The last example, Table 4, shows how to split the same table but with a regular LaTeX tabular call and into three parts. Decimal alignment is included in the third column and the "Component" column is hidden to illustrate the new features working together.

```latex
\begin{splitdeluxetable*}{lcccccBcccccc}
\tabletypesize{\scriptsize}
\tablecaption{Measurements of Emission Lines: 1 break \label{tab:deluxesplit}}
\tablehead{\colhead{Model} & \colhead{Component}& \colhead{Shift} & \colhead{FWHM} &
\multicolumn{10}{c}{Flux} \\
\colhead{} & \colhead{} & \colhead{($\rm
km~s^{-1}$)}& \colhead{($\rm km~s^{-1}$)} & \multicolumn{10}{c}{($\rm
10^{-17}~erg~s^{-1}~cm^{-2}$)} \\
\cline{5-14}
\colhead{} & \colhead{} &
\colhead{} & \colhead{} & \colhead{Ly$\alpha$} & \colhead{N\,{\footnotesize
V}} & \colhead{Si\,{\footnotesize IV}} & \colhead{C\,{\footnotesize IV}} &
\colhead{Mg\,{\footnotesize II}} & \colhead{H$\gamma$} & \colhead{H$\beta$}
& \colhead{H$\alpha$} & \colhead{He\,{\footnotesize I}} &
\colhead{Pa$\gamma$}}
\colnumbers
\startdata
& BELs& -97.13 & 9117$\pm 38$& 1033$\pm 33$&$<$ 35$&$<166$&637$\pm
31$&1951$\pm 26$& 991$\pm 30$& 3502$\pm 42$&20285$\pm
80$&2025$\pm116$& 1289$\pm 107$\\ {Model 1}& IELs& -4049.123 &
1974$\pm 22$& 2495$\pm 30$&$<$ 42$&$<$ 109$& 995$\pm 186$& 83$\pm 30$&
75$\pm 23$& 130$\pm 25$& 357$\pm 94$& 194$\pm 64$& 36$\pm 23$\\
& NELs& \nodata &     641$\pm      4$&      449$\pm 23$&$<$      6$&$<
9$&      -- &     275$\pm      18$& 150$\pm      11$&     313$\pm
12$&     958$\pm 43$ &     318$\pm 34$& 151$\pm      17$\\
\hline
& BELs& -85 & 8991$\pm 41$& 988$\pm 29$&$<$ 24$&$<$ 173$& 623$\pm 28$ &
1945$\pm 29$& 989$\pm 27$& 3498$\pm 37$& 20288$\pm 73$& 2047$\pm 143$&
1376$\pm 167$\\
{Model 2}& IELs& -51000 & 2025$\pm  26$& 2494$\pm 32$&$<$ 37$&$<124$&
1005$\pm     190$&      72$\pm 28$&      72$\pm      21$&
113$\pm   18$&   271$\pm   85$& 205$\pm   72$& 34$\pm      21$\\
& NELs& 52 &     637$\pm      10$&     477$\pm 17$&$<$      4$&$<
8$&      --             &     278$\pm      17$& 153$\pm      10$&
317$\pm  15$ & 969$\pm  40$&  325$\pm 37$&  147$\pm      22$\\
\enddata
\tablecomments{This is an example of how to split a deluxetable. You can
split any table with this command into two or three parts.  The location of
the split is given by the author based on the placement of the ``B''
indicators in the column identifier preamble.  For more information please
look at the new \aastex\ instructions.}
\end{splitdeluxetable*}
```

Table 3. Measurements of Emission Lines: 1 break

Model	Component	Shift (km s^{-1})	FWHM (km s^{-1})	Flux (10^{-17} erg s^{-1} cm^{-2})		
				Lyα	N V	Si IV
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	BELs	-97.13	9117±38	1033±33	< 35	< 166
Model 1	IELs	-4049.123	1974±22	2495±30	< 42	< 109
	NELs	⋯	641±4	449±23	< 6	< 9
	BELs	-85	8991±41	988±29	< 24	< 173
Model 2	IELs	-51000	2025±26	2494±32	< 37	< 124
	NELs	52	637±10	477±17	< 4	< 8

C IV	Mg II	Hγ	Hβ	Hα	He I	Paγ
(8)	(9)	(10)	(11)	(12)	(13)	(14)
637±31	1951±26	991±30	3502±42	20285±80	2025±116	1289±107
995±186	83±30	75±23	130±25	357±94	194±64	36±23
−	275±18	150±11	313±12	958±43	318±34	151±17
623±28	1945±29	989±27	3498±37	20288±73	2047±143	1376±167
1005±190	72±28	72±21	113±18	271±85	205±72	34±21
−	278±17	153±10	317±15	969±40	325±37	147±22

NOTE—This is an example of how to split a deluxetable. You can split any table with this command into two or three parts. The location of the split is given by the author based on the placement of the "B" indicators in the column identifier preamble. For more information please look at the new AASTeX instructions.

This example shows both `\colnumbers` as well as splitting the table into three parts, and using decimal columns.

```
\begin{table}[h!]
\caption{Measurements of Emission Lines:\label{tab:tablesplit}}
\begin{splittabular}{lhDcBcccccccBcccc}
\hline
\hline
Model & Component & \multicolumn2c{Shift} & FWHM &
\multicolumn{10}{c}{Flux} \\
 & & \multicolumn2c{($\rm km~s^{-1}$)} & {($\rm km~s^{-1}$)} &
\multicolumn{10}{c}{($\rm 10^{-17}~erg~s^{-1}~cm^{-2}$)} \\
\cline{5-15}
 & & & & & {Ly$\alpha$} & {N\,{\footnotesize V}} &
{Si\,{\footnotesize IV}} & {C\,{\footnotesize IV}} &
{Mg\,{\footnotesize II}} & {H$\gamma$} & {H$\beta$}
 & {H$\alpha$} & {He\,{\footnotesize I}} & {Pa$\gamma$} \\
\hline
\decimals
\colnumbers
 & BELs& -97.13 & 9117$\pm 38$& 1033$\pm 33$&$< 35$&$< 166$& 637$\pm
31$& 1951$\pm 26$& 991$\pm 30$& 3502$\pm 42$& 20285$\pm 80$& 2025$\pm
116$& 1289$\pm 107$\\
Model 1 & IELs& -4049.123 & 1974$\pm 22$& 2495$\pm 30$&$< 42$&$< 109$&
995$\pm 186$& 83$\pm 30$& 75$\pm 23$& 130$\pm 25$& 357$\pm 94$&
194$\pm 64$& 36$\pm 23$\\
 & NELs& . & 641$\pm 4$& 449$\pm 23$&$< 6$&$< 9$& -- & 275$\pm 18$&
150$\pm 11$& 313$\pm 12$& 958$\pm 43$& 318$\pm 34$& 151$\pm 17$\\
\hline & BELs& -85 & 8991$\pm 41$& 988$\pm 29$&$< 24$&$< 173$& 623$\pm
28$& 1945$\pm 29$& 989$\pm 27$& 3498$\pm 37$& 20288$\pm 73$& 2047$\pm
143$& 1376$\pm 167$\\
Model 2 & IELs& -51000 & 2025$\pm 26$& 2494$\pm 32$&$< 37$&$< 124$&
1005$\pm 190$& 72$\pm 28$& 72$\pm 21$& 113$\pm 18$& 271$\pm 85$&
205$\pm 72$& 34$\pm 21$\\
 & NELs& 52 & 637$\pm 10$& 477$\pm 17$&$$< 4$&$< 8$& -- & 278$\pm 17$&
153$\pm 10$& 317$\pm 15$& 969$\pm 40$& 325$\pm 37$& 147$\pm 22$\\
\hline
\end{splittabular}
\end{table}
```

Table 4. Measurements of Emission Lines

Model	Shift (km s^{-1})	FWHM (km s^{-1})
(1)	(2)	(3)
	−97.13	9117±38
Model 1	−4049.123	1974±22
		641±4
	−85	8991±41
Model 2	−51000	2025±26
	52	637±10

Flux (10^{-17} erg s^{-1} cm^{-2})					
Lyα	N V	Si IV	C IV	Mg II	Hγ
(4)	(5)	(6)	(7)	(8)	(9)
1033±33	< 35	< 166	637±31	1951±26	991±30
2495±30	< 42	< 109	995±186	83±30	75±23
449±23	< 6	< 9	–	275±18	150±11
988±29	< 24	< 173	623±28	1945±29	989±27
2494±32	< 37	< 124	1005±190	72±28	72±21
477±17	< 4	< 8	–	278±17	153±10

Hβ	Hα	He I	Paγ
(10)	(11)	(12)	(13)
3502±42	20285±80	2025±116	1289±107
130±25	357±94	194±64	36±23
313±12	958±43	318±34	151±17
3498±37	20288±73	2047±143	1376±167
113±18	271±85	205±72	34±21
317±15	969±40	325±37	147±22