



# ATLAS Note

12th April 2018



## Symbols defined in `atlasphysics.sty`

Ian C. Brock

University of Bonn

This note lists the symbols defined in `atlasphysics.sty`. These provide examples of how to define your own symbols, as well as many symbols that are often used in ATLAS documents.

This document was generated using version 05-04-00 of the ATLAS  $\text{\LaTeX}$  package. The  $\text{\TeX}$  Live version is set to 2016. It uses the option `atlasstyle`, which implies that the standard ATLAS preprint style is used.

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## 1 atlasphysics.sty style file

The `atlasphysics.sty` style file implements a series of useful shortcuts to typeset a physics paper, such as particle symbols.

Options are parsed with the `kvoptions` package, which is included by default. The style file can be included in the preamble of your paper with the usual syntax:

```
\usepackage{\ATLASLATEXPATH atlasphysics}
```

As of version 01-00-00 the file is actually split into smaller files, which can be included or not using options. The following options are available, where the default setting is given in parentheses:

**BSM** (false) BSM and SUSY particles.

**hion** (false) Useful macros for heavy ion physics.

**jetetmiss** (false) Useful macros for Jet/Etmiss publications.

**journal** (true) Journal abbreviations and a few other definitions for references.

**math** (false) A few extra maths definitions.

**misc** (true) Miscellaneous definitions that are often used.

**other** (false) Definitions that used to be in `atlasphysics.sty`, but are probably too specialised to be needed by most people.

**particle** (true) Standard Model particles and some combinations.

**hepparticle** (false) Standard Model particles and some combinations using the `hepparticle` package. This option will supersede `particle` at some time.

**process** (false) Some example processes. These are not included by default as the current choice is rather arbitrary and certainly not complete.

**hepprocess** (false) Some example processes using the `hepparticle` package. These are not included by default as the current choice is rather arbitrary and certainly not complete. This option will supersede `process` at some time.

**unit** (true) Units that used to be defined – not needed if you use `siunitx` or `hepunits`.

**xref** (true) Useful abbreviations for cross-references.

**texlive=YYYY** (2016) Set if you use an older version of  $\text{\TeX}$  Live like 2009.

**texmf** Use the syntax `\usepackage{package}` instead of `\usepackage{\ATLASLATEXPATH package}` to include packages. This is needed if you install `atlaslatex` centrally, rather than in a `latex` subdirectory.

Note that `BSM` and `BSM=true` are equivalent. Use the syntax `option=false` to turn off an option.

If the option `texmf` is included, the subfiles are included using the command: `\RequirePackage{atlasparticle}` etc. instead of `\RequirePackage{\ATLASLATEXPATH atlasparticle}`. This is useful if you install the `ATLAS LATEX` package in a central directory such as `${HOME}/texmf/tex/latex`.

All definitions are done in a consistent way using `\newcommand*`. All definitions use `\ensuremath` where appropriate and are terminated with `\xspace`, so you can simply write `\ttbar production` instead of `\ttbar\ production` or `\ttbar{} production` to get ‘*t* $\bar{t}$  production’.

The `hepparticles` [1] package has uniform definitions for many Standard Model and BSM particles. In fact you should use the package `heppennames` and/or `hepnice names`, which contain many predefined particles. These packages load `hepparticles`, which can then be used to define more particles if you need them. One very nice feature of these packages is that you can switch between italic and upright symbols via an option.

See Section 16 for details on changes that were introduced when going from version 00-04-05 of `atlasnote` to version 01-00-00 of `atlaslatex`. Let me know if you spot some other changes that are not documented here!

Changes to the contents that might affect existing documents are given in Section 15.

The following sections list the macros defined in the various files.

## 2 atlasparticle.sty

Turn on including these definitions with the option `particle=true` and off with the option `particle=false`.

As an alternative you can use the `hepparticles` [1] package, which has uniform definitions for many Standard Model and BSM particles.

Use the `hepparticle=true` instead of `particle=true` to use the `hepparticle` definitions.

This version of the document uses the `hepparticle` and `hepprocess` options and so does not show the definitions made using the `particle` and `process` options.

Generic macros `\taup[1]` and `\Ups[1]` are available. They are defined such that `\taup{3}` produces  $\tau_{3\text{-prong}}$  and `\Ups{3}` produces  $\Upsilon(3S)$ .

## 3 atlashepparticle.sty

Turn on including these definitions with the option `hepparticle=true` and off with the option `hepparticle=false`.

These definitions use the `hepparticles` [1] package, which has uniform definitions for many Standard Model and BSM particles. The names used are those in `heppennames`. The package loads `hepparticles`, which can then be used to define more particles if you need them. One very nice feature of these packages is that you can switch between italic and upright symbols via an option.

|                     |                |
|---------------------|----------------|
| <code>\pp</code>    | $pp$           |
| <code>\pbar</code>  | $\bar{p}$      |
| <code>\ppbar</code> | $p\bar{p}$     |
| <code>\tbar</code>  | $\bar{t}$      |
| <code>\ttbar</code> | $t\bar{t}$     |
| <code>\bbar</code>  | $\bar{b}$      |
| <code>\bbbar</code> | $b\bar{b}$     |
| <code>\cbar</code>  | $\bar{c}$      |
| <code>\ccbar</code> | $c\bar{c}$     |
| <code>\sbar</code>  | $\bar{s}$      |
| <code>\ssbar</code> | $s\bar{s}$     |
| <code>\ubar</code>  | $\bar{u}$      |
| <code>\uubar</code> | $u\bar{u}$     |
| <code>\dbar</code>  | $\bar{d}$      |
| <code>\ddbar</code> | $d\bar{d}$     |
| <code>\fbar</code>  | $\bar{f}$      |
| <code>\ffbar</code> | $f\bar{f}$     |
| <code>\qbar</code>  | $\bar{q}$      |
| <code>\qqbar</code> | $q\bar{q}$     |
| <code>\nbar</code>  | $\bar{\nu}$    |
| <code>\nnbar</code> | $\nu\bar{\nu}$ |
| <code>\ee</code>    | $e^+e^-$       |
| <code>\epm</code>   | $e^\pm$        |
| <code>\epem</code>  | $e^+e^-$       |

|                         |                         |
|-------------------------|-------------------------|
| <code>\mumu</code>      | $\mu^+\mu^-$            |
| <code>\tautau</code>    | $\tau^+\tau^-$          |
| <code>\leplep</code>    | $\ell^+\ell^-$          |
| <code>\ellell</code>    | $\ell^+\ell^-$          |
| <code>\enu</code>       | $e\nu$                  |
| <code>\munu</code>      | $\mu\nu$                |
| <code>\lnu</code>       | $\ell\nu$               |
| <code>\Zzero</code>     | $Z$                     |
| <code>\Zboson</code>    | $Z$                     |
| <code>\Wplus</code>     | $W^+$                   |
| <code>\Wminus</code>    | $W^-$                   |
| <code>\Wboson</code>    | $W$                     |
| <code>\Wpm</code>       | $W^\pm$                 |
| <code>\Wmp</code>       | $W^\mp$                 |
| <code>\taulep</code>    | $\tau_{\text{lep}}$     |
| <code>\tauhad</code>    | $\tau_{\text{had}}$     |
| <code>\tauhadvis</code> | $\tau_{\text{had-vis}}$ |
| <code>\pizero</code>    | $\pi^0$                 |
| <code>\piplus</code>    | $\pi^+$                 |
| <code>\piminus</code>   | $\pi^-$                 |
| <code>\pipm</code>      | $\pi^\pm$               |
| <code>\pimp</code>      | $\pi^\mp$               |
| <code>\etaprime</code>  | $\eta'$                 |
| <code>\Kzero</code>     | $K^0$                   |
| <code>\Kzerobar</code>  | $\bar{K}^0$             |
| <code>\kaon</code>      | $K$                     |
| <code>\Kplus</code>     | $K^+$                   |
| <code>\Kminus</code>    | $K^-$                   |
| <code>\KzeroL</code>    | $K_L^0$                 |
| <code>\Kzerol</code>    | $K_L^0$                 |
| <code>\Klong</code>     | $K_L^0$                 |
| <code>\KzeroS</code>    | $K_S^0$                 |
| <code>\Kzeros</code>    | $K_S^0$                 |
| <code>\Kshort</code>    | $K_S^0$                 |
| <code>\Kstar</code>     | $K^*$                   |
| <code>\jpsi</code>      | $J/\psi$                |
| <code>\Jpsi</code>      | $J/\psi$                |
| <code>\psip</code>      | $\psi(2S)$              |

|                      |                     |
|----------------------|---------------------|
| <code>\chic</code>   | $\chi_c$            |
| <code>\UoneS</code>  | $\Upsilon(1S)$      |
| <code>\chib</code>   | $\chi_b$            |
| <code>\Dstar</code>  | $D^*$               |
| <code>\Bd</code>     | $B_d^0$             |
| <code>\Bs</code>     | $B_s^0$             |
| <code>\Bu</code>     | $B_u$               |
| <code>\Bc</code>     | $B_c$               |
| <code>\Lb</code>     | $\Lambda_b$         |
| <code>\Bstar</code>  | $B^*$               |
| <code>\BoBo</code>   | $B^0-\bar{B}^0$     |
| <code>\BodBod</code> | $B_d^0-\bar{B}_d^0$ |
| <code>\BosBos</code> | $B_s^0-\bar{B}_s^0$ |

Generic macros `\taup[1]` and `\Ups[1]` are available. They are defined such that `\taup{3}` produces  $\tau_{3\text{-prong}}$  and `\Ups{3}` produces  $\Upsilon(3S)$ .

## 4 atlasjournal.sty

Turn on including these definitions with the option `journal=true` and off with the option `journal=false`.

|                      |                      |
|----------------------|----------------------|
| <code>\AcPA</code>   | Acta Phys. Austriaca |
| <code>\ARevNS</code> | Ann. Rev. Nucl. Sci. |
| <code>\CPC</code>    | Comp. Phys. Comm.    |
| <code>\EPJ</code>    | Eur. Phys. J.        |
| <code>\EPJC</code>   | Eur. Phys. J. C      |
| <code>\FortP</code>  | Fortschr. Phys.      |
| <code>\IJMP</code>   | Int. J. Mod. Phys.   |
| <code>\JETP</code>   | Sov. Phys. JETP      |
| <code>\JETPL</code>  | JETP Lett.           |
| <code>\JaFi</code>   | Jad. Fiz.            |
| <code>\JMP</code>    | J. Math. Phys.       |
| <code>\MPL</code>    | Mod. Phys. Lett.     |
| <code>\NCim</code>   | Nuovo Cimento        |
| <code>\NIM</code>    | Nucl. Instrum. Meth. |
| <code>\NP</code>     | Nucl. Phys.          |
| <code>\NPB</code>    | Nucl. Phys. B        |
| <code>\PL</code>     | Phys. Lett.          |
| <code>\PLB</code>    | Phys. Lett. B        |
| <code>\PR</code>     | Phys. Rev.           |
| <code>\PRC</code>    | Phys. Rev. C         |
| <code>\PRD</code>    | Phys. Rev. D         |
| <code>\PRL</code>    | Phys. Rev. Lett.     |
| <code>\PRep</code>   | Phys. Rep.           |
| <code>\RMP</code>    | Rev. Mod. Phys.      |
| <code>\ZfP</code>    | Z. Phys.             |
| <code>\collab</code> | Collaboration        |

## 5 atlasmisc.sty

Turn on including these definitions with the option `misc=true` and off with the option `misc=false`.

|                       |                     |
|-----------------------|---------------------|
| <code>\pT</code>      | $p_T$               |
| <code>\pt</code>      | $p_T$               |
| <code>\ET</code>      | $E_T$               |
| <code>\eT</code>      | $E_T$               |
| <code>\et</code>      | $E_T$               |
| <code>\HT</code>      | $H_T$               |
| <code>\pTsqr</code>   | $p_T^2$             |
| <code>\MET</code>     | $E_T^{\text{miss}}$ |
| <code>\met</code>     | $E_T^{\text{miss}}$ |
| <code>\sumET</code>   | $\sum E_T$          |
| <code>\EjetRec</code> | $E_{\text{rec}}$    |
| <code>\PjetRec</code> | $p_{\text{rec}}$    |
| <code>\EjetTru</code> | $E_{\text{true}}$   |
| <code>\PjetTru</code> | $p_{\text{true}}$   |
| <code>\EjetDM</code>  | $E_{\text{DM}}$     |
| <code>\Rcone</code>   | $R_{\text{cone}}$   |
| <code>\abseta</code>  | $ \eta $            |
| <code>\Ecm</code>     | $E_{\text{cm}}$     |
| <code>\rts</code>     | $\sqrt{s}$          |
| <code>\sqs</code>     | $\sqrt{s}$          |
| <code>\Nevt</code>    | $N_{\text{evt}}$    |
| <code>\zvtx</code>    | $z_{\text{vtx}}$    |
| <code>\dzero</code>   | $d_0$               |
| <code>\zzsth</code>   | $z_0 \sin(\theta)$  |
| <code>\RunOne</code>  | Run 1               |
| <code>\RunTwo</code>  | Run 2               |
| <code>\RunThr</code>  | Run 3               |
| <code>\kt</code>      | $k_t$               |
| <code>\antikt</code>  | anti- $k_t$         |
| <code>\Antikt</code>  | Anti- $k_t$         |
| <code>\pileup</code>  | pile-up             |
| <code>\Pileup</code>  | Pile-up             |
| <code>\pileup</code>  | pile-up             |

|                         |                   |
|-------------------------|-------------------|
| <code>\Pileup</code>    | Pile-up           |
| <code>\btag</code>      | $b$ -tagging      |
| <code>\btagged</code>   | $b$ -tagged       |
| <code>\bquark</code>    | $b$ -quark        |
| <code>\bquarks</code>   | $b$ -quarks       |
| <code>\bjet</code>      | $b$ -jet          |
| <code>\bjets</code>     | $b$ -jets         |
| <code>\mh</code>        | $m_h$             |
| <code>\mW</code>        | $m_W$             |
| <code>\mZ</code>        | $m_Z$             |
| <code>\mH</code>        | $m_H$             |
| <code>\ACERMC</code>    | ACERMC            |
| <code>\ALPGEN</code>    | ALPGEN            |
| <code>\GEANT</code>     | GEANT             |
| <code>\Herwigpp</code>  | Herwig++          |
| <code>\HERWIGpp</code>  | Herwig++          |
| <code>\Herwig</code>    | Herwig            |
| <code>\HERWIG</code>    | HERWIG            |
| <code>\JIMMY</code>     | JIMMY             |
| <code>\MADSPIN</code>   | MADSPIN           |
| <code>\MADGRAPH</code>  | MADGRAPH          |
| <code>\MGMCatNLO</code> | MADGRAPH5_aMC@NLO |
| <code>\MCatNLO</code>   | MC@NLO            |
| <code>\AMCatNLO</code>  | aMC@NLO           |
| <code>\MCFM</code>      | MCFM              |
| <code>\METOP</code>     | MEtop             |
| <code>\POWHEG</code>    | POWHEG            |
| <code>\POWHEGBOX</code> | POWHEG-Box        |
| <code>\POWPYTHIA</code> | POWHEG+PYTHIA     |
| <code>\PROTOS</code>    | PROTOS            |
| <code>\PYTHIA</code>    | PYTHIA            |
| <code>\SHERPA</code>    | SHERPA            |
| <code>\Comphep</code>   | CompHEP           |
| <code>\Perugia</code>   | Perugia           |
| <code>\Prospino</code>  | Prospino          |
| <code>\LO</code>        | LO                |
| <code>\NLO</code>       | NLO               |
| <code>\NLL</code>       | NLL               |

|                         |                                 |
|-------------------------|---------------------------------|
| <code>\NNLO</code>      | NNLO                            |
| <code>\muF</code>       | $\mu_F$                         |
| <code>\muR</code>       | $\mu_R$                         |
| <code>\ra</code>        | $\rightarrow$                   |
| <code>\la</code>        | $\leftarrow$                    |
| <code>\rarrow</code>    | $\rightarrow$                   |
| <code>\larrow</code>    | $\leftarrow$                    |
| <code>\lapprox</code>   | $\lesssim$                      |
| <code>\rapprox</code>   | $\gtrsim$                       |
| <code>\gam</code>       | $\gamma$                        |
| <code>\stat</code>      | (stat.)                         |
| <code>\syst</code>      | (syst.)                         |
| <code>\radlength</code> | $X_0$                           |
| <code>\StoB</code>      | $S/B$                           |
| <code>\alphas</code>    | $\alpha_S$                      |
| <code>\NF</code>        | $N_F$                           |
| <code>\NC</code>        | $N_C$                           |
| <code>\CF</code>        | $C_F$                           |
| <code>\CA</code>        | $C_A$                           |
| <code>\TF</code>        | $T_F$                           |
| <code>\Lms</code>       | $\Lambda_{\overline{MS}}$       |
| <code>\Lmsfive</code>   | $\Lambda_{\overline{MS}}^{(5)}$ |
| <code>\kperp</code>     | $k_{\perp}$                     |
| <code>\Vcb</code>       | $ V_{cb} $                      |
| <code>\Vub</code>       | $ V_{ub} $                      |
| <code>\Vtd</code>       | $ V_{td} $                      |
| <code>\Vts</code>       | $ V_{ts} $                      |
| <code>\Vtb</code>       | $ V_{tb} $                      |
| <code>\Vcs</code>       | $ V_{cs} $                      |
| <code>\Vud</code>       | $ V_{ud} $                      |
| <code>\Vus</code>       | $ V_{us} $                      |
| <code>\Vcd</code>       | $ V_{cd} $                      |

A length `\figwidth` is defined that is 2 cm smaller than `\textwidth`.

Most Monte Carlo generators also have a form with a suffix ‘V’ that allows you to include the version, e.g. `\PYTHIAV{8}` to produce PYTHIA 8 or `\PYTHIAV{8 (v8.160)}` to produce PYTHIA 8 (v8.160).

A generic macro `\twomass` is defined, so that for example `\twomass{\mu}{\mu}` produces  $m_{\mu\mu}$  and `\twomass{\mu}{e}` produces  $m_{\mu e}$ .

A macro `\dk` is also defined which makes it easier to write down decay chains. For example

`\[\eqalign{a \to & b+c\}`

```

& \dk & e+f \\
&& \dk g+h}
\]

```

produces

$$\begin{array}{c}
 a \rightarrow b + c \\
 \quad \longrightarrow e + f \\
 \quad \quad \longrightarrow g + h
 \end{array}$$

Note that `\eqalign` is also redefined in this package so that `\dk` works.

The following macro names have been changed:  
`\ptsq`  $\rightarrow$  `\pTsq`.

## 6 atlasxref.sty

Turn on including these definitions with the option `xref=true` and off with the option `xref=false`.

The following macros with arguments are also defined:

|                               |                    |
|-------------------------------|--------------------|
| <code>\App{1}</code>          | Appendix 1         |
| <code>\Eqn{1}</code>          | Eq. 1              |
| <code>\Fig{1}</code>          | Figure 1           |
| <code>\Ref{1}</code>          | Ref. 1             |
| <code>\Sect{1}</code>         | Section 1          |
| <code>\Tab{1}</code>          | Table 1            |
| <code>\Apps{1}{4}</code>      | Appendices 1 and 4 |
| <code>\Eqns{1}{4}</code>      | Eqs. 1 and 4       |
| <code>\Figs{1}{4}</code>      | Figures 1 and 4    |
| <code>\Refs{1}{4}</code>      | Refs. 1 and 4      |
| <code>\Sects{1}{4}</code>     | Sections 1 and 4   |
| <code>\Tabs{1}{4}</code>      | Tables 1 and 4     |
| <code>\Apprange{1}{4}</code>  | Appendices 1–4     |
| <code>\Eqnrange{1}{4}</code>  | Eqs. 1–4           |
| <code>\Figrange{1}{4}</code>  | Figures 1–4        |
| <code>\Refrange{1}{4}</code>  | Refs. 1–4          |
| <code>\Sectrange{1}{4}</code> | Sections 1–4       |
| <code>\Tabrange{1}{4}</code>  | Tables 1–4         |

The idea is that you can adapt these definitions according to your own preferences (or those of a journal).



## 7 atlasbsm.sty

Turn on including these definitions with the option BSM and off with the option BSM=false.

The macro `\susy` simply puts a tilde ( $\tilde{\phantom{x}}$ ) over its argument, e.g. `\susy{q}` produces  $\tilde{q}$ .

For  $\tilde{q}$ ,  $\tilde{t}$ ,  $\tilde{b}$ ,  $\tilde{\ell}$ ,  $\tilde{e}$ ,  $\tilde{\mu}$  and  $\tilde{\tau}$ , L and R states are defined; for stop, sbottom and stau also the light (1) and heavy (2) states. There are four neutralinos and two charginos defined, the index number unfortunately needs to be written out completely. For the charginos the last letter(s) indicate(s) the charge: ‘p’ for +, ‘m’ for −, and ‘pm’ for  $\pm$ .

|                          |                      |
|--------------------------|----------------------|
| <code>\Azero</code>      | $A^0$                |
| <code>\hzero</code>      | $h^0$                |
| <code>\Hzero</code>      | $H^0$                |
| <code>\Hboson</code>     | $H$                  |
| <code>\Hplus</code>      | $H^+$                |
| <code>\Hminus</code>     | $H^-$                |
| <code>\Hpm</code>        | $H^\pm$              |
| <code>\Hmp</code>        | $H^\mp$              |
| <code>\ggino</code>      | $\tilde{\chi}$       |
| <code>\chinop</code>     | $\tilde{\chi}^+$     |
| <code>\chinom</code>     | $\tilde{\chi}^-$     |
| <code>\chinopm</code>    | $\tilde{\chi}^\pm$   |
| <code>\chinomp</code>    | $\tilde{\chi}^\mp$   |
| <code>\chinoonep</code>  | $\tilde{\chi}_1^+$   |
| <code>\chinoonem</code>  | $\tilde{\chi}_1^-$   |
| <code>\chinoonepm</code> | $\tilde{\chi}_1^\pm$ |
| <code>\chinotwop</code>  | $\tilde{\chi}_2^+$   |
| <code>\chinotwom</code>  | $\tilde{\chi}_2^-$   |
| <code>\chinotwopm</code> | $\tilde{\chi}_2^\pm$ |
| <code>\nino</code>       | $\tilde{\chi}^0$     |
| <code>\ninoone</code>    | $\tilde{\chi}_1^0$   |
| <code>\ninotwo</code>    | $\tilde{\chi}_2^0$   |
| <code>\ninothree</code>  | $\tilde{\chi}_3^0$   |
| <code>\ninofour</code>   | $\tilde{\chi}_4^0$   |
| <code>\gravino</code>    | $\tilde{G}$          |

|                          |                  |
|--------------------------|------------------|
| <code>\Zprime</code>     | $Z'$             |
| <code>\Zstar</code>      | $Z^*$            |
| <code>\squark</code>     | $\tilde{q}$      |
| <code>\squarkL</code>    | $\tilde{q}_L$    |
| <code>\squarkR</code>    | $\tilde{q}_R$    |
| <code>\gluino</code>     | $\tilde{g}$      |
| <code>\stop</code>       | $\tilde{t}$      |
| <code>\stopone</code>    | $\tilde{t}_1$    |
| <code>\stoptwo</code>    | $\tilde{t}_2$    |
| <code>\stopL</code>      | $\tilde{t}_L$    |
| <code>\stopR</code>      | $\tilde{t}_R$    |
| <code>\sbottom</code>    | $\tilde{b}$      |
| <code>\sbottomone</code> | $\tilde{b}_1$    |
| <code>\sbottomtwo</code> | $\tilde{b}_2$    |
| <code>\sbottomL</code>   | $\tilde{b}_L$    |
| <code>\sbottomR</code>   | $\tilde{b}_R$    |
| <code>\slepton</code>    | $\tilde{\ell}$   |
| <code>\sleptonL</code>   | $\tilde{\ell}_L$ |
| <code>\sleptonR</code>   | $\tilde{\ell}_R$ |
| <code>\sel</code>        | $\tilde{e}$      |
| <code>\sell</code>       | $\tilde{e}_L$    |
| <code>\selR</code>       | $\tilde{e}_R$    |
| <code>\smu</code>        | $\tilde{\mu}$    |
| <code>\smuL</code>       | $\tilde{\mu}_L$  |
| <code>\smuR</code>       | $\tilde{\mu}_R$  |
| <code>\stau</code>       | $\tilde{\tau}$   |
| <code>\stauL</code>      | $\tilde{\tau}_L$ |
| <code>\stauR</code>      | $\tilde{\tau}_R$ |
| <code>\stauone</code>    | $\tilde{\tau}_1$ |
| <code>\stautwo</code>    | $\tilde{\tau}_2$ |
| <code>\snu</code>        | $\tilde{\nu}$    |

## 8 atlasheavyion.sty

Turn on including these definitions with the option `hion=true` and off with the option `hion=false`. The heavy ion definitions use the package `mhchem` to help with the formatting of chemical elements. This package is included by `atlasheavyion.sty`.

|                        |                                   |
|------------------------|-----------------------------------|
| <code>\NucNuc</code>   | $A+A$                             |
| <code>\nn</code>       | $nn$                              |
| <code>\pn</code>       | $pn$                              |
| <code>\np</code>       | $np$                              |
| <code>\PbPb</code>     | $Pb+Pb$                           |
| <code>\AuAu</code>     | $Au+Au$                           |
| <code>\CuCu</code>     | $Cu+Cu$                           |
| <code>\pNuc</code>     | $p+A$                             |
| <code>\pdA</code>      | $p/d+A$                           |
| <code>\dAu</code>      | $d+Au$                            |
| <code>\pPb</code>      | $p+Pb$                            |
| <code>\Npart</code>    | $N_{\text{part}}$                 |
| <code>\avgNpart</code> | $\langle N_{\text{part}} \rangle$ |
| <code>\Ncoll</code>    | $N_{\text{coll}}$                 |
| <code>\avgNcoll</code> | $\langle N_{\text{coll}} \rangle$ |
| <code>\TA</code>       | $T_A$                             |
| <code>\avgTA</code>    | $\langle T_A \rangle$             |
| <code>\TPb</code>      | $T_{\text{Pb}}$                   |
| <code>\avgTPb</code>   | $\langle T_{\text{Pb}} \rangle$   |
| <code>\TAA</code>      | $T_{AA}$                          |
| <code>\avgTAA</code>   | $\langle T_{AA} \rangle$          |
| <code>\TAB</code>      | $T_{AB}$                          |
| <code>\avgTAB</code>   | $\langle T_{AB} \rangle$          |
| <code>\TpPb</code>     | $T_{p\text{Pb}}$                  |
| <code>\avgTpPb</code>  | $\langle T_{p\text{Pb}} \rangle$  |
| <code>\G1</code>       | Glauber                           |
| <code>\GG</code>       | Glauber–Gribov                    |
| <code>\sqn</code>      | $\sqrt{s_{\text{NN}}}$            |
| <code>\lns</code>      | $\ln(\sqrt{s})$                   |
| <code>\sumETPb</code>  | $\Sigma E_{\text{T}}^{\text{Pb}}$ |
| <code>\sumETp</code>   | $\Sigma E_{\text{T}}^p$           |

|                        |                                       |
|------------------------|---------------------------------------|
| <code>\sumETA</code>   | $\Sigma E_{\text{T}}^A$               |
| <code>\RAA</code>      | $R_{AA}$                              |
| <code>\RCP</code>      | $R_{\text{CP}}$                       |
| <code>\RpA</code>      | $R_{pA}$                              |
| <code>\RpPb</code>     | $R_{p\text{Pb}}$                      |
| <code>\dif</code>      | $d$                                   |
| <code>\dNchdeta</code> | $dN_{\text{ch}}/d\eta$                |
| <code>\dNevtdET</code> | $dN_{\text{evt}}/dE_{\text{T}}$       |
| <code>\ystar</code>    | $y^*$                                 |
| <code>\ycms</code>     | $y_{\text{CM}}^{\text{Pb}}$           |
| <code>\ygappb</code>   | $\Delta\eta_{\text{gap}}^{\text{Pb}}$ |
| <code>\ygapp</code>    | $\Delta\eta_{\text{gap}}^p$           |
| <code>\fgap</code>     | $f_{\text{gap}}$                      |

## 9 atlasjetetmiss.sty

Turn on including these definitions with the option `jetetmiss=true` and off with the option `jetetmiss=false`.

|                        |                                    |
|------------------------|------------------------------------|
| <code>\topo</code>     | topo-cluster                       |
| <code>\Topo</code>     | Topo-cluster                       |
| <code>\topos</code>    | topo-clusters                      |
| <code>\Topos</code>    | Topo-clusters                      |
| <code>\insitu</code>   | in situ                            |
| <code>\Insitu</code>   | In situ                            |
| <code>\LS</code>       | LS                                 |
| <code>\NLOjet</code>   | NLOJET++                           |
| <code>\Fastjet</code>  | FASTJET                            |
| <code>\TwoToTwo</code> | $2 \rightarrow 2$                  |
| <code>\largeR</code>   | large- $R$                         |
| <code>\LargeR</code>   | Large- $R$                         |
| <code>\akt</code>      | anti- $k_t$                        |
| <code>\Akt</code>      | Anti- $k_t$                        |
| <code>\AKT</code>      | anti- $k_t$                        |
| <code>\AKTFat</code>   | anti- $k_t$ , $R = 1.0$            |
| <code>\AKTPrune</code> | anti- $k_t$ , $R = 1.0$ (pruned)   |
| <code>\AKTFilt</code>  | anti- $k_t$ , $R = 1.0$ (filtered) |
| <code>\KTSix</code>    | $k_t$ , $R = 0.6$                  |
| <code>\ca</code>       | Cambridge–Aachen                   |
| <code>\CamKt</code>    | C/A                                |
| <code>\CASix</code>    | C/A, $R = 0.6$                     |
| <code>\CAFat</code>    | C/A, $R = 1.2$                     |
| <code>\CAPrune</code>  | C/A, $R = 1.2$ (pruned)            |
| <code>\CAFilt</code>   | C/A, $R = 1.2$ (filtered)          |
| <code>\htt</code>      | HEPTopTagger                       |
| <code>\mcut</code>     | $m_{\text{cut}}$                   |
| <code>\Nfilt</code>    | $N_{\text{filt}}$                  |
| <code>\Rfilt</code>    | $R_{\text{filt}}$                  |
| <code>\ymin</code>     | $y_{\text{min}}$                   |
| <code>\fcut</code>     | $f_{\text{cut}}$                   |
| <code>\Rsub</code>     | $R_{\text{sub}}$                   |

|                       |                                 |
|-----------------------|---------------------------------|
| <code>\mufrac</code>  | $\mu_{\text{frac}}$             |
| <code>\Rcut</code>    | $R_{\text{cut}}$                |
| <code>\zcut</code>    | $z_{\text{cut}}$                |
| <code>\ftile</code>   | $f_{\text{Tile0}}$              |
| <code>\fem</code>     | $f_{\text{LAr3}}$               |
| <code>\fpres</code>   | $f_{\text{PS}}$                 |
| <code>\fhec</code>    | $f_{\text{HEC0}}$               |
| <code>\ffcal</code>   | $f_{\text{FCal1}}$              |
| <code>\central</code> | $0.3 \leq  \eta  < 0.8$         |
| <code>\ecap</code>    | $2.1 \leq  \eta  < 2.8$         |
| <code>\forward</code> | $3.6 \leq  \eta  < 4.5$         |
| <code>\Npv</code>     | $N_{\text{PV}}$                 |
| <code>\Nref</code>    | $N_{\text{PV}}^{\text{ref}}$    |
| <code>\Navg</code>    | $\langle N_{\text{PV}} \rangle$ |
| <code>\avgmu</code>   | $\langle \mu \rangle$           |
| <code>\JES</code>     | JES                             |
| <code>\JMS</code>     | JMS                             |
| <code>\EMJES</code>   | EM+JES                          |
| <code>\GCWJES</code>  | GCW+JES                         |
| <code>\LCWJES</code>  | LCW+JES                         |
| <code>\EM</code>      | EM                              |
| <code>\GCW</code>     | GCW                             |
| <code>\LCW</code>     | LCW                             |
| <code>\GSL</code>     | GSL                             |
| <code>\GS</code>      | GS                              |
| <code>\MTF</code>     | MTF                             |
| <code>\MPF</code>     | MPF                             |
| <code>\Njet</code>    | $N_{\text{jet}}$                |
| <code>\njet</code>    | $N_{\text{jet}}$                |
| <code>\ETjet</code>   | $E_{\text{T}}^{\text{jet}}$     |
| <code>\etjet</code>   | $E_{\text{T}}^{\text{jet}}$     |
| <code>\pTavg</code>   | $p_{\text{T}}^{\text{avg}}$     |
| <code>\ptavg</code>   | $p_{\text{T}}^{\text{avg}}$     |
| <code>\pTjet</code>   | $p_{\text{T}}^{\text{jet}}$     |
| <code>\ptjet</code>   | $p_{\text{T}}^{\text{jet}}$     |
| <code>\pTcorr</code>  | $p_{\text{T}}^{\text{corr}}$    |
| <code>\ptcorr</code>  | $p_{\text{T}}^{\text{corr}}$    |
| <code>\pTjeti</code>  | $p_{\text{T},i}^{\text{jet}}$   |

|                         |                                |                                 |   |
|-------------------------|--------------------------------|---------------------------------|---|
| <code>\ptjeti</code>    | $p_{T,i}^{\text{jet}}$         | <code>\Rcalo</code>             | $\mathcal{R}^{\text{jet}}$                          |
| <code>\pTrecoil</code>  | $p_T^{\text{recoil}}$          | <code>\Rcalom</code>            | $\mathcal{R}_m^{\text{jet}}$                        |
| <code>\ptrecoil</code>  | $p_T^{\text{recoil}}$          | <code>\RcaloEM</code>           | $\mathcal{R}_{\text{EM}}^{\text{jet}}$              |
| <code>\pTleading</code> | $p_T^{\text{leading}}$         | <code>\RMPF</code>              | $\mathcal{R}_{\text{MPF}}^{\text{jet}}$             |
| <code>\ptleading</code> | $p_T^{\text{leading}}$         | <code>\EcaloCALIB</code>        | $E^{\text{jet}}$                                    |
| <code>\pTjetEM</code>   | $p_{T,\text{EM}}^{\text{jet}}$ | <code>\RcaloCALIB</code>        | $\mathcal{R}^{\text{jet}}$                          |
| <code>\ptjetEM</code>   | $p_{T,\text{EM}}^{\text{jet}}$ | <code>\EcaloEMJES</code>        | $E_{\text{EM+JES}}^{\text{jet}}$                    |
| <code>\pThat</code>     | $\hat{p}_T$                    | <code>\RcaloEMJES</code>        | $\mathcal{R}_{\text{EM+JES}}^{\text{jet}}$          |
| <code>\pthat</code>     | $\hat{p}_T$                    | <code>\EcaloGCWJES</code>       | $E_{\text{GCW+JES}}^{\text{jet}}$                   |
| <code>\pTprobe</code>   | $p_T^{\text{probe}}$           | <code>\RcaloGCWJES</code>       | $\mathcal{R}_{\text{GCW+JES}}^{\text{jet}}$         |
| <code>\ptprobe</code>   | $p_T^{\text{probe}}$           | <code>\EcaloLCWJES</code>       | $E_{\text{LCW+JES}}^{\text{jet}}$                   |
| <code>\pTref</code>     | $p_T^{\text{ref}}$             | <code>\RcaloLCWJES</code>       | $\mathcal{R}_{\text{LCW+JES}}^{\text{jet}}$         |
| <code>\ptref</code>     | $p_T^{\text{ref}}$             | <code>\Rtrack</code>            | $\mathcal{R}^{\text{track jet}}$                    |
| <code>\pToff</code>     | $O$                            | <code>\rtrk</code>              | $r_{\text{trk}}$                                    |
| <code>\ptoff</code>     | $O$                            | <code>\Rtrk</code>              | $R_{\text{trk}}$                                    |
| <code>\pToffjet</code>  | $O^{\text{jet}}$               | <code>\rtrackjet</code>         | $r_{\text{calo / track jet}}$                       |
| <code>\ptoffjet</code>  | $O^{\text{jet}}$               | <code>\rtrackjetiso</code>      | $r_{\text{calo / track jet}}^{\text{iso}}$          |
| <code>\pTZ</code>       | $p_T^Z$                        | <code>\rtrackjetnoniso</code>   | $r_{\text{calo / track jet}}^{\text{non-iso}}$      |
| <code>\ptZ</code>       | $p_T^Z$                        | <code>\rtrackjetisoratio</code> | $r_{\text{calo / track jet}}^{\text{non-iso/iso}}$  |
| <code>\pTtrue</code>    | $p_T^{\text{true}}$            | <code>\gammaajet</code>         | $\gamma\text{-jet}$                                 |
| <code>\pttrue</code>    | $p_T^{\text{true}}$            | <code>\deltaphijetgamma</code>  | $\Delta\phi_{\text{jet-}\gamma}$                    |
| <code>\pTtruth</code>   | $p_T^{\text{true}}$            | <code>\rapjet</code>            | $y$   |
| <code>\pttruth</code>   | $p_T^{\text{true}}$            | <code>\etajet</code>            | $\eta$  |
| <code>\pTreco</code>    | $p_T^{\text{reco}}$            | <code>\phiijet</code>           | $\phi$  |
| <code>\ptreco</code>    | $p_T^{\text{reco}}$            | <code>\etadet</code>            | $\eta_{\text{det}}$                                 |
| <code>\pTtrk</code>     | $p_T^{\text{track}}$           | <code>\etatrk</code>            | $\eta^{\text{track}}$                               |
| <code>\pttrk</code>     | $p_T^{\text{track}}$           | <code>\Rmin</code>              | $R_{\text{min}}$                                    |
| <code>\ptrk</code>      | $p^{\text{track}}$             | <code>\DeltaR</code>            | $\Delta R$  |
| <code>\pTtrkjet</code>  | $p_T^{\text{track jet}}$       | <code>\DetaDphi</code>          | $\sqrt{(\Delta\eta)^2 + (\Delta\phi)^2}$            |
| <code>\pttrkjet</code>  | $p_T^{\text{track jet}}$       | <code>\Deta</code>              | $ \Delta\eta $                                      |
| <code>\ntrk</code>      | $n_{\text{track}}$             | <code>\Drap</code>              | $ \Delta y $  |
| <code>\EoverP</code>    | $E/p$                          | <code>\DetaOneTwo</code>        | $ \Delta\eta(\text{jet1, jet2}) $                   |
| <code>\Etrue</code>     | $E^{\text{true}}$              | <code>\DyDphi</code>            | $\sqrt{(\Delta y)^2 + (\Delta\phi)^2}$              |
| <code>\Etruth</code>    | $E^{\text{true}}$              | <code>\DeltaRdef</code>         | $\Delta R = \sqrt{(\Delta\eta)^2 + (\Delta\phi)^2}$ |
| <code>\Ecalo</code>     | $E^{\text{jet}}$               | <code>\DeltaRydef</code>        | $\Delta R = \sqrt{(\Delta y)^2 + (\Delta\phi)^2}$   |
| <code>\EcaloEM</code>   | $E_{\text{EM}}^{\text{jet}}$   | <code>\DeltaRtrk</code>         | $\Delta R(\text{trk}_1, \text{trk}_2)$              |
| <code>\asym</code>      | $\mathcal{A}$                  | <code>\JVF</code>               | JVF   |
| <code>\Response</code>  | $\mathcal{R}$                  | <code>\cJVF</code>              | corrJVF   |

|                            |   |
|----------------------------|---|
| <code>\RpT</code>          | $R_{p_T}$   |
| <code>\JVT</code>          | $J_V T$   |
| <code>\ghostpt</code>      | $g_t$   |
| <code>\ghostptavg</code>   | $\langle g_t \rangle$   |
| <code>\ghostfm</code>      | $g_\mu$   |
| <code>\ghostfmi</code>     | $g_{\mu,i}$   |
| <code>\ghostdensity</code> | $\nu_g$   |
| <code>\ghostrho</code>     | $\nu_g \langle g_t \rangle$   |
| <code>\Aghost</code>       | $A_g$   |
| <code>\Amu</code>          | $A_\mu$   |
| <code>\Amui</code>         | $A_{\mu,i}$   |
| <code>\jetarea</code>      | $A^{\text{jet}}$  |
| <code>\jetareaafm</code>   | $A_\mu^{\text{jet}}$  |
| <code>\jetareaai</code>    | $A_i^{\text{jet}}$  |
| <code>\Rkt</code>          | $R_{k_t}$   |
| <code>\pTmuslope</code>    | $\partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle$          |
| <code>\ptmuslope</code>    | $\partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle$          |
| <code>\pTnpvslope</code>   | $\partial \langle \Delta p_T \rangle / \partial N_{PV}$                       |
| <code>\ptnpvslope</code>   | $\partial \langle \Delta p_T \rangle / \partial N_{PV}$                       |
| <code>\pTmuunc</code>      | $\Delta (\partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle)$ |
| <code>\ptmuunc</code>      | $\Delta (\partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle)$ |
| <code>\pTnpvunc</code>     | $\Delta (\partial \langle \Delta p_T \rangle / \partial N_{PV})$              |
| <code>\ptnpvunc</code>     | $\Delta (\partial \langle \Delta p_T \rangle / \partial N_{PV})$              |
| <code>\sumPt</code>        | $\sum \vec{p}_T$  |
| <code>\sumpt</code>        | $\sum \vec{p}_T$  |
| <code>\sumptTrk</code>     | $\sum p_T^{\text{track}}$   |
| <code>\sumpttrk</code>     | $\sum p_T^{\text{track}}$   |
| <code>\nPUtrk</code>       | $n_{\text{trk}}^{\text{PU}}$  |
| <code>\mjet</code>         | $m^{\text{jet}}$  |
| <code>\mlead</code>        | $m_1^{\text{jet}}$  |
| <code>\mleadavg</code>     | $\langle m_1^{\text{jet}} \rangle$  |
| <code>\Mjet</code>         | $m^{\text{jet}}$  |
| <code>\massjet</code>      | $m^{\text{jet}}$  |
| <code>\masscorr</code>     | $m^{\text{corr}}$   |
| <code>\mthresh</code>      | $M_{\text{threshold}}$  |
| <code>\mjetavg</code>      | $\langle m^{\text{jet}} \rangle$  |
| <code>\masstrkjet</code>   | $m^{\text{track jet}}$  |
| <code>\width</code>        | $w$   |

|                          |                                       |
|--------------------------|---------------------------------------|
| <code>\wcalo</code>      | $w^{\text{calo}}$                     |
| <code>\wtrk</code>       | $w^{\text{track}}$                    |
| <code>\shapeV</code>     | $\mathcal{V}$                         |
| <code>\pTsubject</code>  | $p_T^{\text{subject}}$                |
| <code>\ptsubject</code>  | $p_T^{\text{subject}}$                |
| <code>\sjone</code>      | $j_1$                                 |
| <code>\sjtwo</code>      | $j_2$                                 |
| <code>\msubjone</code>   | $m^{j_1}$                             |
| <code>\msubjtwo</code>   | $m^{j_2}$                             |
| <code>\pTsubji</code>    | $p_T^i$                               |
| <code>\ptsubji</code>    | $p_T^i$                               |
| <code>\pTsubjone</code>  | $p_T^{j_1}$                           |
| <code>\ptsubjone</code>  | $p_T^{j_1}$                           |
| <code>\pTsubjtwo</code>  | $p_T^{j_2}$                           |
| <code>\ptsubjtwo</code>  | $p_T^{j_2}$                           |
| <code>\Rsubjects</code>  | $R_{j_1, j_2}$                        |
| <code>\DRsubjects</code> | $\Delta R_{j_1, j_2}$                 |
| <code>\yij</code>        | $y_{ij}$                              |
| <code>\dcut</code>       | $d_{\text{cut}}$                      |
| <code>\dmin</code>       | $d_{\text{min}}$                      |
| <code>\dij</code>        | $d_{ij}$                              |
| <code>\Dij</code>        | $\sqrt{d_{ij}}$                       |
| <code>\Donetwo</code>    | $\sqrt{d_{12}}$                       |
| <code>\Dtwothr</code>    | $\sqrt{d_{23}}$                       |
| <code>\yonetwo</code>    | $y_1$                                 |
| <code>\ytwothr</code>    | $y_2$                                 |
| <code>\yonetwoDef</code> | $y_1 = \sqrt{d_{12}}/m^{\text{jet}}$  |
| <code>\ytwothrDef</code> | $y_2 = \sqrt{d_{23}}/m^{\text{jet}}$  |
| <code>\xj</code>         | $x_J$                                 |
| <code>\jetFunc</code>    | $J^{(eik),c}(m^{\text{jet}}, p_T, R)$ |
| <code>\tauone</code>     | $\tau_1$                              |
| <code>\tautwo</code>     | $\tau_2$                              |
| <code>\tauthr</code>     | $\tau_3$                              |
| <code>\tauN</code>       | $\tau_N$                              |
| <code>\tautwoone</code>  | $\tau_{21}$                           |
| <code>\tauthrtwo</code>  | $\tau_{32}$                           |
| <code>\dip</code>        | $\mathcal{D}$                         |
| <code>\diponetwo</code>  | $\mathcal{D}_{12}$                    |

|                            |                    |
|----------------------------|--------------------|
| <code>\diptwothr</code>    | $\mathcal{D}_{23}$ |
| <code>\diponethr</code>    | $\mathcal{D}_{13}$ |
| <code>\mtaSup</code>       | $m^{\text{TA}}$    |
| <code>\mcalo</code>        | $m^{\text{calo}}$  |
| <code>\mcomb</code>        | $m^{\text{comb}}$  |
| <code>\ECFOne</code>       | $ECF_1$            |
| <code>\ECFTwo</code>       | $ECF_2$            |
| <code>\ECFThr</code>       | $ECF_3$            |
| <code>\ECFThrNorm</code>   | $e_3$              |
| <code>\DTwo</code>         | $D_2$              |
| <code>\CTwo</code>         | $C_2$              |
| <code>\FoxWolfRatio</code> | $R_2^{\text{FW}}$  |
| <code>\PlanarFlow</code>   | $\mathcal{P}$      |
| <code>\Angularity</code>   | $a_3$              |
| <code>\Aplanarity</code>   | $A$                |
| <code>\KtDR</code>         | $KtDR$             |
| <code>\Qw</code>           | $Q_w$              |
| <code>\NConst</code>       | $N^{\text{const}}$ |

The macro `\etaRange` produces what you would expect: `\etaRange{-2.5}{+2.5}` produces  $-2.5 \leq |\eta| < +2.5$  while `\AetaRange{1.0}` produces  $|\eta| < 1.0$ . The macro `\avg` can be used for average values: `\avg{\mu}` produces  $\langle \mu \rangle$ .

## 10 atlasmath.sty

Turn on including these definitions with the option `math=true` and off with the option `math=false`.

`\boxsq`  $\square^2$   
`\grad`  $\nabla$

The macro `\spinor` is also defined. `\spinor{u}`

produces  $\begin{pmatrix} u_1 \\ u_2 \\ u_3 \\ u_4 \end{pmatrix}$ .

## 11 atlasother.sty

Turn on including these definitions with the option `other` and off with the option `other=false`.

|                       |  |
|-----------------------|--|
| <code>\etpt</code>    | $1/p_T - 1/E_T$                            |
| <code>\etptsig</code> | $(1/p_T - 1/E_T)/(\sigma(1/p_T))$          |
| <code>\begL</code>    | $10^{31} \text{ cm}^{-2} \text{ s}^{-1}$   |
| <code>\lowL</code>    | $10^{33} \text{ cm}^{-2} \text{ s}^{-1}$   |
| <code>\highL</code>   | $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$   |
| <code>\Epsb</code>    | $\epsilon_b$                               |
| <code>\Epsc</code>    | $\epsilon_c$                               |
| <code>\Mtau</code>    | $m_\tau$                                   |
| <code>\swsq</code>    | $\sin^2 \theta_W$                          |
| <code>\swel</code>    | $\sin^2 \theta_{\text{eff}}^{\text{lept}}$ |
| <code>\swsqb</code>   | $\sin^2 \theta_W$                          |
| <code>\swsqon</code>  | $\sin^2 \theta_W \equiv 1 - m_W^2/m_Z^2$   |
| <code>\gv</code>      | $g_V$                                      |
| <code>\ga</code>      | $g_A$                                      |
| <code>\gvbar</code>   | $\bar{g}_V$                                |
| <code>\gabbar</code>  | $\bar{g}_A$                                |
| <code>\Zzv</code>     | $Z^*$                                      |
| <code>\Abb</code>     | $A_{b\bar{b}}$                             |
| <code>\Acc</code>     | $A_{c\bar{c}}$                             |
| <code>\Aqq</code>     | $A_{q\bar{q}}$                             |
| <code>\Afb</code>     | $A_{\text{FB}}$                            |
| <code>\GZ</code>      | $\Gamma_Z$                                 |
| <code>\GW</code>      | $\Gamma_W$                                 |
| <code>\GH</code>      | $\Gamma_H$                                 |
| <code>\GamHad</code>  | $\Gamma_{\text{had}}$                      |
| <code>\Gbb</code>     | $\Gamma_{b\bar{b}}$                        |
| <code>\Rbb</code>     | $R_{b\bar{b}}$                             |
| <code>\Gcc</code>     | $\Gamma_{c\bar{c}}$                        |
| <code>\Gvis</code>    | $\Gamma_{\text{vis}}$                      |
| <code>\Ginv</code>    | $\Gamma_{\text{inv}}$                      |

## 12 atlasprocess.sty

Turn on including these definitions with the option `process` and off with the option `process=false`.

As an alternative you can use the `hepparticles` [1] package, which has uniform definitions for many Standard Model and BSM particles. Use the `hepprocess=true` instead of `process=true` to use the `hepparticle` definitions.

This version of the document uses the `hepparticle` and `hepprocess` options and so does not show the definitions made using the `particle` and `process` options.

### 13 atlashepprocess.sty

Turn on including these definitions with the option `hepprocess` and off with the option `hepprocess=false`.

The packages `heppennames` and/or `hepniceNames` contain many predefined particles, so you do not need to define them yourself. These packages load `hepparticles`, which can then be used to define more particles if you need them. One very nice feature of these packages is that you can switch between italic and upright symbols via an option.

|                       |                                    |
|-----------------------|------------------------------------|
| <code>\btol</code>    | $b \rightarrow \ell$               |
| <code>\ctol</code>    | $c \rightarrow \ell$               |
| <code>\btoctol</code> | $b \rightarrow c \rightarrow \ell$ |
| <code>\Jee</code>     | $J/\psi \rightarrow e^+ e^-$       |
| <code>\Jmm</code>     | $J/\psi \rightarrow \mu^+ \mu^-$   |
| <code>\Jmumu</code>   | $J/\psi \rightarrow \mu^+ \mu^-$   |
| <code>\Wjj</code>     | $W \rightarrow jj$                 |
| <code>\tjjb</code>    | $t \rightarrow jjb$                |
| <code>\Hbb</code>     | $H \rightarrow b\bar{b}$           |
| <code>\Hgg</code>     | $H \rightarrow \gamma\gamma$       |
| <code>\Hllll</code>   | $H \rightarrow \ell\ell\ell\ell$   |
| <code>\Hmmmm</code>   | $H \rightarrow \mu\mu\mu\mu$       |
| <code>\Heeee</code>   | $H \rightarrow eeee$               |
| <code>\Zll</code>     | $Z \rightarrow \ell\ell$           |
| <code>\Zlplm</code>   | $Z \rightarrow \ell^+ \ell^-$      |
| <code>\Zee</code>     | $Z \rightarrow ee$                 |
| <code>\Zepem</code>   | $Z \rightarrow e^+ e^-$            |
| <code>\Zmm</code>     | $Z \rightarrow \mu\mu$             |
| <code>\Zmpmm</code>   | $Z \rightarrow \mu^+ \mu^-$        |
| <code>\Ztt</code>     | $Z \rightarrow \tau\tau$           |
| <code>\Ztptm</code>   | $Z \rightarrow \tau^+ \tau^-$      |
| <code>\Zbb</code>     | $Z \rightarrow b\bar{b}$           |
| <code>\Wln</code>     | $W \rightarrow \ell\nu$            |
| <code>\Wen</code>     | $W \rightarrow e\nu$               |
| <code>\Wmn</code>     | $W \rightarrow \mu\nu$             |
| <code>\Wlnu</code>    | $W \rightarrow \ell\nu$            |

|                       |   |
|-----------------------|---|
| <code>\Wenu</code>    | $W \rightarrow e\nu$                          |
| <code>\Wmunu</code>   | $W \rightarrow \mu\nu$                        |
| <code>\Wqqbar</code>  | $W \rightarrow q\bar{q}$                      |
| <code>\Amm</code>     | $A \rightarrow \mu\mu$                        |
| <code>\Ztautau</code> | $Z \rightarrow \tau\tau$                      |
| <code>\Wtaunu</code>  | $W \rightarrow \tau\nu$                       |
| <code>\Atautau</code> | $A \rightarrow \tau\tau$                      |
| <code>\Htautau</code> | $H \rightarrow \tau\tau$                      |
| <code>\tWb</code>     | $t \rightarrow Wb$                            |
| <code>\Wjets</code>   | $W + \text{jets}$                             |
| <code>\Zjets</code>   | $Z + \text{jets}$                             |
| <code>\Brjl</code>    | $\text{Br}(J/\psi \rightarrow \ell^+ \ell^-)$ |



## 14 atlasunit.sty

Turn on including these definitions with the option `unit` and off with the option `unit=false`.

```
\TeV      TeV
\GeV      GeV
\MeV      MeV
\keV      keV
\TeV      TeV
\GeV      GeV
\MeV      MeV
\keV      keV
\TeV      TeV
\GeV      GeV
\MeV      MeV
\keV      keV
\TeV      TeV/c
\GeVc     GeV/c
\MeVc     MeV/c
\keVc     keV/c
\TeVc     TeV/c
\GeVcc    GeV/c2
\MeVcc    MeV/c2
\keVcc    keV/c2
\TeVcc    TeV/c2
\GeVcc    GeV/c2
\MeVcc    MeV/c2
\keVcc    keV/c2
\TeVcc    TeV/c2
\ifb      fb-1
\ipb      pb-1
\inb      nb-1
\degr     °
\TeVc     TeV/c
\GeVc     GeV/c
\MeVc     MeV/c
\keVc     keV/c
\TeVc     TeV/c
\GeVcc    GeV/c2
\MeVcc    MeV/c2
\keVcc    keV/c2
\TeVcc    TeV/c2
\GeVcc    GeV/c2
\MeVcc    MeV/c2
\keVcc    keV/c2
```

```
\TeVcc    TeV/c2
\ifb      fb-1
\ipb      pb-1
\inb      nb-1
\degr     °
\TeVc     TeV/c
\GeVc     GeV/c
\MeVc     MeV/c
\keVc     keV/c
\TeVc     TeV/c
\GeVcc    GeV/c2
\MeVcc    MeV/c2
\keVcc    keV/c2
\TeVcc    TeV/c2
\GeVcc    GeV/c2
\MeVcc    MeV/c2
\keVcc    keV/c2
\TeVcc    TeV/c2
\ifb      fb-1
\ipb      pb-1
\inb      nb-1
\degr     °
```

Lower case versions of the units also exist, e.g. `\tev`, `\gev`, `\mev`, `\kev`, and `\ev`.

As mentioned above, it is highly recommended to use a units package instead of these definitions. `siunitx` is the preferred package; a good alternative is `hepunits`. If either of these packages are used `atlasunit.sty` is not needed.

Most units that are needed in ATLAS documents are already defined by `siunitx` or are defined in `atlaspackage.sty`. A selection of them is given below. In order to use them in your document the unit should be included in `\si` or `\SI`:

```
\si{\TeV}      TeV
\si{\GeV}      GeV
\si{\MeV}      MeV
\si{\keV}      keV
\si{\TeVc}     TeV/c
\si{\GeVc}     GeV/c
\si{\MeVc}     MeV/c
\si{\keVc}     keV/c
\si{\TeVcc}    TeV/c2
\si{\GeVcc}    GeV/c2
\si{\MeVcc}    MeV/c2
```

|                           |                  |
|---------------------------|------------------|
| <code>\si{\keVcc}</code>  | $\text{keV}/c^2$ |
| <code>\si{\eVcc}</code>   | $\text{eV}/c^2$  |
| <code>\si{\nb}</code>     | nb               |
| <code>\si{\pb}</code>     | pb               |
| <code>\si{\fb}</code>     | fb               |
| <code>\si{\per\fb}</code> | $\text{fb}^{-1}$ |
| <code>\si{\per\pb}</code> | $\text{pb}^{-1}$ |
| <code>\si{\per\nb}</code> | $\text{nb}^{-1}$ |
| <code>\si{\ifb}</code>    | $\text{fb}^{-1}$ |
| <code>\si{\ipb}</code>    | $\text{pb}^{-1}$ |
| <code>\si{\inb}</code>    | $\text{nb}^{-1}$ |
| <code>\si{\Hz}</code>     | Hz               |
| <code>\si{\kHz}</code>    | kHz              |
| <code>\si{\MHz}</code>    | MHz              |
| <code>\si{\GHz}</code>    | GHz              |
| <code>\si{\degr}</code>   | °                |
| <code>\si{\m}</code>      | m                |
| <code>\si{\cm}</code>     | cm               |
| <code>\si{\mm}</code>     | mm               |
| <code>\si{\um}</code>     | μm               |
| <code>\si{\micron}</code> | μm               |

## 15 Changes

**Version 01-08-01** of `atlaslatex` includes quite a few definitions from the Jet/ETmiss group. A new style file has been created `atlasjetetmiss.sty` that is not included by default. Some of the definitions from the Jet/ETmiss group are of more general use and so have been merged into existing style files:

**atlasmisc.sty** List of Monte Carlo generators expanded: `\POWHEGBOX`, `\POWPYTHIA`. Add MC macros with suffix ‘V’ for version number. `\kt`, `\antikt`, `\Antikt`, `\LO`, `\NLO`, `\NLL`, `\NNLO`, `\muF`, `\muR`. Added macros `\Runone`, `\Runtwo`, `\Runthr`. Added `\radlength` and `\StoB`. Added some standard *b*-tagging terms: `\btag`, `\btagged`, `\bquark`, `\bquarks`, `\bjet`, `\bjets`.

**atlasparticle.sty** Now includes `\pp`, `\enu`, `\munu`,

**atlasprocess.sty** Added `\Zbb`, `\Ztt`, `\Zlplm`, `\Zepem`, `\Zmpmm`, `\Ztptm`, `\tWb`, `\Wqqbar`, `\Wlnu`, `\Wenu`, `\Wmunu`, `\Wjets`, `\Zjets`. The definition of `\Hllll` was corrected.

**atlasheavyion.sty** `\pp` moved to `atlasparticle.sty`.

This version also introduced the (optional) use of the `heppennames` package. The style files `atlashepparticle.sty` and `atlashepprocess.sty` are intended to replace `atlasparticle.sty` and `atlasprocess.sty`. Several particle definitions were removed from the `atlasparticle` package, as they just enable a few Greek letters:  $\pi$ ,  $\eta$  and  $\psi$  to be used directly in text mode. In addition, the primed  $\Upsilon$  resonances, e.g.  $\Upsilon''$ , as well as  $D^{**}$  were removed. as the official names are  $\Upsilon(3S)$  etc.,

The definitions of MeV, GeV etc. in `atlasunit.sty` were updated in order to remove the `if` tests in them. The `if` tests caused a problem in a paper draft, although the reason was not understood. The new definitions do not introduce extra space before the unit in math mode.

## 16 Old macros

With the introduction of `atlaslatex` several macro names have been changed to make them more consistent. A few have been removed. The changes include:

- Kaons now have a capital ‘K’ in the macro name, e.g. `\Kplus` for  $K^+$ ;
- `\Ztau`, `\Wtau`, `\Htau` `\Atau` have been replaced by `\Ztautau`, `\Wtautau`, `\Htautau` `\Atautau`;
- `\Ups` replaces `\ups`; the use of `\ups` to produce  $\Upsilon$  in text mode has been removed;
- `\cm` has been removed, as it was the only length unit defined for text and math mode;
- `\mass` has been removed, as `\twomass` can do the same thing and the name is more intuitive;
- `\mA` has been removed as it conflicts with `siunitx` Version 1, which uses the name for milliamp.
- `\mathcal` rather than `\mathscr` is recommended for luminosity and aplanarity.

Quite a few macros are more related to  $Z$  physics than they are to LHC physics and have been moved to the `atlasother.sty` file, which is not included by default. There are also macros for various decay processes, `atlasprocess.sty` which are not included by default, but may be useful for how you can define your favourite process.

It used to be the case that you had to use `\MET{}` rather than just `\MET` to get the spacing right, as somehow `xspace` did not do a good job for  $E_T^{\text{miss}}$ . However, with the latest version of the packages both forms work fine. You can compare  $E_T^{\text{miss}}$  and  $E_T^{\text{miss}}$  and see that the spacing is correct in both cases.

## References

- [1] A. Buckley, *The hepparticles package for L<sup>A</sup>T<sub>E</sub>X*,  
URL: <https://www.ctan.org/pkg/hepparticles>.