

## **ATLAS Note**

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# 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 03-01-00 of the ATLAS LATEX package. The 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 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 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 LATEXPATH atlasparticle as \$\{\text{HOME}\/\text{texmf/tex/latex}.

All definitions are done in a consistent way using  $\mbox{newcommand}^*$ . All definitions use  $\mbox{ensuremath}$  where appropriate and are terminated with  $\mbox{xspace}$ , so you can simply write  $\mbox{ttbar}$  production instead of  $\mbox{ttbar}$  production or  $\mbox{ttbar}$ } production to get ' $\mbox{tt}$  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 hepnicenames, 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 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.

A generic macro \Ups[1] is available. It is defined such that \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.

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

\mumu	$\mu^+\mu^-$
\tautau	$ au^+ au^-$
\leplep	$\ell^+\ell^-$
\ellell	$\ell^+\ell^-$
\enu	ev
\munu	$\mu \nu$
\lnu	$\ell \nu$
\Zzero	Z
\Zboson	Z
\Wplus	$W^+$ $W^ W$
<b>\Wminus</b>	$W^{-}$
\Wboson	W
\Wpm	$W^{\pm}$
\Wmp	$W^{\mp}$
\pizero	$\pi^o$
\piplus	$\pi^{+}$
\piminus	$\pi^-$
\pipm	$\pi^{\pm}$
\pimp	$\pi^{\mp}$
\etaprime	$\pi^+$ $\pi^ \pi^\pm$ $\pi^\mp$ $\eta'$
\Kzero	$K^{O}$
\Kzerobar	$\frac{K^0}{K^0}$
\kaon	K
\Kplus	$K^{+}$
\Kminus	$K^{-}$
\KzeroL	$K_L^0$
\Kzerol	$K_{I}^{0}$
\Klong	$K_I^{D}$
\KzeroS	$K_{\rm c}^{D}$
\Kzeros	$K_{\sigma}^{0}$
\Kshort	$\kappa^0$
\Kstar	$K^*$
\jpsi	$J/\psi$
\Jpsi \Jpsi	$J/\psi$
\psip	$\psi(2S)$
\chic	$\psi(2S)$ $\chi_c$
\UoneS	$\gamma_{c}$
\chib	` ′
CIIID	$\chi_b$

```
\begin{array}{lll} \texttt{\begin{tikzpicture}(10,0) \put(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0){\line(0,0)
```

A generic macro \Ups[1] is available. It is defined such that \Ups{3} produces  $\Upsilon(3S)$ .

## 4 atlasjournal.sty

## 5 atlasmisc.sty

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

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

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

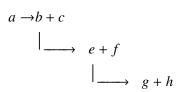
\pT	$p_{ m T}$
\pt	$p_{\mathrm{T}}$
\ET	$E_{\mathrm{T}}$
\eT	$E_{ m T}$
\et	$E_{\mathrm{T}}$
\HT	$H_{\mathrm{T}}$
\pTsq	$H_{ m T} \ p_{ m T}^2$
\MET	$E_{ m T}^{ m miss}$ $E_{ m T}^{ m miss}$
\met	$E_{ m T}^{ m miss}$
\sumET	$\sum E_{ m T}$
\EjetRec	$E_{\rm rec}$
\PjetRec	$p_{\rm rec}$
\EjetTru	$E_{ m truth}$
\PjetTru	$p_{\rm truth}$
\EjetDM	$E_{ m DM}$
\Rcone	$R_{\rm cone}$
\abseta	$ \eta $
\Ecm	$E_{\rm cm}$
\rts	$\sqrt{s}$
\sqs	$\sqrt{s}$
\Nevt	$N_{\rm evt}$
\zvtx	$z_{ m vtx}$
\dzero	$d_0$
$\zzsth$	$z_0 \sin(\theta)$
\Run0ne	Run 1
\RunTwo	Run 2
$\RunThr$	Run 3
\kt	$k_t$
\antikt	anti- $k_t$
<b>\Antikt</b>	Anti- $k_t$
\btag	b-tagging
\btagged	b-tagged
\bquark	<i>b</i> -quark

\bquarks	<i>b</i> -quarks	\la	$\leftarrow$
\bjet	<i>b</i> -jet	\rarrow	$\rightarrow$
\bjets	<i>b</i> -jets	\larrow	$\leftarrow$
\mh	$m_h$	\lapprox	≲
\mW	$m_W$	\rapprox	≳
$\mbox{mZ}$	$m_Z$	\gam	γ
\mH	$m_H$	\stat	(stat.)
\ACERMC	AcerMC	\syst	(syst.)
<b>\ALPGEN</b>	Alpgen	\radlength	$X_0$
\GEANT	Geant	\StoB	S/B
\Herwigpp	Herwig++	\alphas	$lpha_{ m S}$
\HERWIGpp	Herwig++	\NF	$N_{ m F}$
\Herwig	Herwig	\NC	$N_{\rm C}$
\HERWIG	Herwig	\CF	$C_{ m F}$
\JIMMY	Jimmy	\CA	$C_{ m A}$
\MADSPIN	MadSpin	\TF	$T_{ m F}$
<b>\MADGRAPH</b>	MadGraph	\Lms	$\Lambda_{\overline{ ext{MS}}}$
\MGMCatNLO	MadGraph5_aMC@NLO	\Lmsfive	$\Lambda_{\overline{MS}} \ \Lambda_{\overline{MS}}^{(5)}$
\MCatNLO	MC@NLO	\KT	$k_{\perp}$
\AMCatNLO	aMC@NLO	\Vcb	$ V_{cb} $
\MCFM	MCFM	\Vub	$ V_{ub} $
\METOP	МЕтор	\Vtd	$ V_{td} $
\POWHEG	Роwнес	\Vts	$ V_{ts} $
<b>\POWHEGBOX</b>	Powheg-Box	\Vtb	$ V_{tb} $
\POWPYTHIA	Powheg+Pythia	\Vcs	$ V_{cs} $
\PROTOS	Protos	\Vud	$ V_{ud} $
<b>\PYTHIA</b>	Рутніа	\Vus	$ V_{us} $
\SHERPA	Sherpa	\Vcd	$ V_{cd} $
\Comphep	CompHEP		
\Perugia	Perugia		width is defined that is 2 cm smaller
\Prospino	Prospino	than \textwid	ith.
\L0	LO	Most Monte Ca	arlo generators also have a form with
\NLO	NLO		nat allows you to include the ver-
\NLL	NLL		THIAV{8} to produce Pythia 8 or
\NNLO	NNLO	_	(v8.160)} to produce Pythia 8 (v8.160).
\muF	$\mu_{\scriptscriptstyle  ext{F}}$		-
\muR	$\mu_{ exttt{R}}$	_	ro \twomass is defined, so that for
\ra	$\rightarrow$		mass{\mu}{\mu} produces $m_{\mu\mu}$ and
		\mu	$\{e\}$ produces $m_{\mu e}$ .

A macro \dk is also defined which makes it easier

to write down decay chains. For example

produces



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:

i ne ionowing macros with arguments are also de			
\App{1}	Appendix 1		
$Eqn{1}$	Eq. 1		
$Fig{1}$	Figure 1		
$\Ref{1}$	Ref. 1		
\Sect{1}	Section 1		
\Tab{1}	Table 1		
$\Lambda pps{1}{4}$	Appendices 1 and 4		
\Eqns{1}{4}	Eqs. 1 and 4		
$Figs{1}{4}$	Figures 1 and 4		
$\Refs{1}{4}$	Refs. 1 and 4		
\Sects{1}{4}	Sections 1 and 4		
\Tabs{1}{4}	Tables 1 and 4		
$\Lambda pprange{1}{4}$	Appendices 1–4		
$\Eqnrange{1}{4}$	Eqs. 1–4		
$Figrange{1}{4}$	Figures 1–4		
$\Refrange{1}{4}$	Refs. 1–4		
$\Sectrange{1}{4}$	Sections 1–4		
$Tabrange{1}{4}$	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 ( $\tilde{}$ ) 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 ±.

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

\Zprime	Z'
\Zstar	$Z^*$
\squark	$ ilde{q}$
\squarkL	$ ilde{q}_{ m L}$
\squarkR	$ ilde{q}_{ m R}$
\gluino	$rac{ ilde{g}}{ ilde{t}}$
\stop	
\stopone	$\tilde{t}_1$
\stoptwo	$\tilde{t}_2$
\stopL	$ ilde{t}_{ m L}$
\stopR	$\tilde{t}_{ m R}$
\sbottom	b
\sbottomone	$ ilde{b}_1$
\sbottomtwo	$ ilde{b}_2$
\sbottomL	$ ilde{b}_{ m L}$
\sbottomR	$ ilde{b}_{ m R}$
\slepton	$ ilde{\ell}$
\sleptonL	$egin{array}{l}  ilde{\ell}_{ m L} \  ilde{\ell}_{ m R} \  ilde{e} \end{array}$
\sleptonR	$\tilde{\ell}_{ m R}$
\sel	
\selL	$ ilde{e}_{ m L}$
\selR	$ ilde{e}_{ m R}$
\smu	$ ilde{\mu}$
\smuL	$ ilde{\mu}_{ m L}$
\smuR	$ ilde{\mu}_{ m R}$
\stau	$ ilde{ au}$
\stauL	$ ilde{ au}_{ m L}$
\stauR	$ ilde{ au}_{ m R}$
\stauone	$ ilde{ au}_1$
\stautwo	$ ilde{ au}_2$
\snu	$\tilde{\mathcal{V}}$

## ${\bf 8}$ 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.

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

\sumETA	$\Sigma E_{\mathrm{T}}^{\mathrm{A}}$
\RAA	$R_{\mathrm{AA}}$
\RCP	$R_{\rm CP}$
\RpA	$R_{pA}$
\RpPb	$\hat{R_{p}_{ ext{Pb}}}$
\dif	ď
\dNchdeta	$\mathrm{d}N_\mathrm{ch}/\mathrm{d}\eta$
\dNevtdET	$dN_{\rm evt}/dE_{\rm T}$
\ystar	<i>y</i> *
\ycms	$y_{\text{CM}}$
\ygappb	$\Delta\eta_{ m gap}^{ m Pb}$
\ygapp	$\Delta\eta_{ m gap}^{ar{p}^{ T}}$
\fgap	$f_{\rm gap}$

## 9 atlasjetetmiss.sty

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

\topo	topo-cluster
\Topo	Topo-cluster
\topos	topo-clusters
\Topos	Topo-clusters
\pileup	pile-up
\Pileup	Pile-up
\insitu	in-situ
\Insitu	In-situ
\LS	LS
\NLOjet	NLOJet++
\Fastjet	FastJet
\TwoToTwo	$2 \rightarrow 2$
\largeR	large-R
\LargeR	Large-R
\akt	anti- $k_t$
\Akt	Anti- $k_t$
\AKT	anti- $k_t$
\AKTFat	anti- $k_t$ , $R = 1.0$
\AKTPrune	anti- $k_t$ , $R = 1.0$ (pruned)
\AKTFilt	anti- $k_t$ , $R = 1.0$ (filtered)
\KTSix	$k_t, R = 0.6$
\ca	Cambridge-Aachen
\CamKt	C/A
\CASix	C/A, R = 0.6
\CAFat	C/A, R = 1.2
\CAPrune	C/A, $R = 1.2$ (pruned)
\CAFilt	C/A, $R = 1.2$ (filtered)
\Rfilt	$R_{ m filt}$
\ymin	$\mathcal{Y}_{\min}$
\fcut	$f_{ m cut}$
\Rsub	$R_{ m sub}$
\mufrac	$\mu_{ m frac}$

```
\Rcut
                     R_{\rm cut}
\zcut
                     z_{\rm cut}
\ftile
                     f_{\text{Tile}0}
\fem
                     f_{\rm LAr3}
\fpres
                     f_{PS}
\fhec
                     f_{\rm HEC0}
\ffcal
                     f_{\text{FCal1}}
                     0.3 \le |\eta| < 0.8
\central
                     2.1 \le |\eta| < 2.8
\ecap
\forward
                     3.6 \le |\eta| < 4.5
\Npv
                     N_{\rm PV}
                     N_{\rm PV}^{\rm ref}
\Nref
\Navg
                     \langle N_{\rm PV} \rangle
\avgmu
                     \langle \mu \rangle
\JES
                     JES
\JMS
                     JMS
\EMJES
                     EM+JES
\GCWJES
                     GCW+JES
                     LCW+JES
\LCWJES
\backslash EM
                     EM
\GCW
                     GCW
                     LCW
\LCW
                     GSL
\GSL
\GS
                     GS
                     MTF
\MTF
\MPF
                     MPF
\Njet
                     N_{\rm jet}
                     \begin{array}{c} N_{\rm jet} \\ E_{\rm T}^{\rm jet} \\ E_{\rm T}^{\rm det} \\ p_{\rm avg}^{\rm avg} \\ p_{\rm T}^{\rm jet} \\ p_{\rm T}^{\rm jet} \\ p_{\rm T}^{\rm corr} \\ p_{\rm T}^{\rm corr} \\ p_{\rm T}^{\rm corr} \end{array}
\njet
\ETjet
\etjet
\pTavg
\ptavg
\pTjet
\ptjet
\pTcorr
\ptcorr
\pTjeti
```

\ptjeti

\pTrecoil	$p_{\mathrm{T}}^{\mathrm{recoil}}$	\RcaloM	$\mathcal{R}_{M}^{ ext{jet}}$
\ptrecoil	$p_{ m T}^{ m recoil}$	\RcaloEM	$\mathcal{R}_{ ext{EM}}^{ ext{jet}}$
\pTleading	$p_{ m T}^{ m leading}$	\RMPF	$\mathcal{R}_{ ext{MPF}}$
\ptleading	$p_{ m T}^{ m feading}$	\EcaloCALIB	$E^{\rm Jet}$
\pTjetEM	pet P <sub>T, EM</sub>	\RcaloCALIB	$\mathcal{R}^{ ext{jet}}$
\ptjetEM	jet P <sub>T, EM</sub>	\EcaloEMJES	E <sub>EM+JES</sub>
\pThat	$\hat{p}_{ ext{T}}$	\RcaloEMJES	$\mathcal{R}_{\mathrm{EM+JES}}^{\mathrm{jet}}$ $E_{\mathrm{GCW+JES}}^{\mathrm{Jet}}$
\pthat	$\hat{p}_{\mathrm{T}}$	<b>\EcaloGCWJES</b>	$E_{\text{GCW+JES}}^{\text{jet}}$
\pTprobe	$p_{ m T}^{ m robe}$	\RcaloGCWJES	$\mathcal{R}_{ ext{GCW+JES}}^{ ext{jet}}$
\ptprobe	$p_{\mathrm{T}}^{\mathrm{PT}}$	\EcaloLCWJES	E <sub>LCW+JES</sub>
\pTref	$p_{ m T}^{ m ref}$	\RcaloLCWJES	$\mathcal{R}_{\text{LCW+JES}}^{\text{jet}}$
\ptref	$p_{ m T}^{ m ref}$	\Rtrack	R <sup>track</sup> jet
\pToff	<i>O</i>	\rtrk	$r_{ m trk}$
\ptoff	0	\Rtrk	$R_{\mathrm{trk}}$
\pToffjet	O <sup>jet</sup>	\rtrackjet	r calo / track jet
\ptoffjet	O <sup>jet</sup>	\rtrackjetiso	calo / track jet
\pTZ	$p_{ m T}^Z$	\rtrackjetnoniso	r · ·
\ptZ	$p_{\mathrm{T}}^{Z}$	\rtrackjetisoratio	r
\pTtrue	p <sub>T</sub> true	\gammajet	' non-iso/iso γ-jet
\pttrue	$p_{\mathrm{T}}^{\mathrm{rrue}}$	\deltaphijetgamma	$\Delta\phi_{ ext{jet-}\gamma}$
\pTtruth	$p_{ m T}^{ m true}$	\rapjet	y jet-y
\pttruth	p <sub>T</sub> true	\etajet	$\eta$
\pTreco	$p_{\mathrm{T}}^{\mathrm{reco}}$	\phijet	$\phi$
\ptreco	$p_{\mathrm{T}}^{\mathrm{feco}}$	\etadet	$\eta_{ m det}$
\pTtrk	$p_{ m T}^{ m track}$	\etatrk	$\eta^{ ext{track}}$
\pttrk	p <sub>r</sub> track	\Rmin	$R_{\min}$
\ptrk	p <sup>track</sup>	\DeltaR	$\Delta R$
\pTtrkjet	$p_{\mathrm{T}}^{\mathrm{track}}$ jet	\DetaDphi	$\sqrt{\left(\Delta\eta\right)^2+\left(\Delta\phi\right)^2}$
\pttrkjet	$p_{ m T}^{ m track~jet}$	\Deta	$ \Delta\eta $
\ntrk	$n_{ m track}$	\Drap	$ \Delta y $
\EoverP	E/p	\DetaOneTwo	$ \Delta\eta(\text{jet1},\text{jet2}) $
\Etrue	$E^{ m truth}$	\DyDphi	
<b>\Etruth</b>	$E^{ m truth}$	/руррпт	$\gamma(\Delta y) + (\Delta \phi)$
\Ecalo	$E^{ m jet}$	\DeltaRdef	$\sqrt{(\Delta y)^2 + (\Delta \phi)^2}$ $\Delta R = \sqrt{(\Delta \eta)^2 + (\Delta \phi)^2}$ $\Delta R = \sqrt{(\Delta y)^2 + (\Delta \phi)^2}$
\EcaloEM	$E_{ m EM}^{ m jet}$	\DeltaRydef	$\Delta R = \sqrt{(\Delta v)^2 + (\Delta \phi)^2}$
\asym	${\mathcal A}$	\DeltaRtrk	$\Delta R(\text{trk}_1, \text{trk}_2)$
\Response	$\mathcal{R}_{int}$	\JVF	JVF
\Rcalo	$\mathcal{R}^{jet}$	\cJVF	corrJVF
		\RpT	$R_{ m pT}$
			r -

$\begin{array}{llllllllllllllllllllllllllllllllllll$	\mthresh \mjetavg	$\begin{array}{c} v_g \langle g_t \rangle \\ A_g \\ A_{\mu} \\ A_{\mu,i} \\ A_{jet} \\ A_i^{jet} \\ A_i^{jet} \\ A_i^{jet} \\ R_{k_r} \\ \partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle \\ \partial \langle \Delta p_T \rangle / \partial N_{PV} \\ \partial \langle \Delta p_T \rangle / \partial N_{PV} \\ \Delta \left( \partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle \right) \\ \Delta \left( \partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle \right) \\ \Delta \left( \partial \langle \Delta p_T \rangle / \partial \langle \mu \rangle \right) \\ \Delta \left( \partial \langle \Delta p_T \rangle / \partial N_{PV} \right) \\ \Delta \left( \partial \langle \Delta p_T \rangle / \partial N_{PV} \right) \\ \sum \vec{p}_T \\ \sum \vec{p}_T \\ \sum \vec{p}_T \\ \sum p_{Track}^{track} \\ \sum p_{Track}^{Track} \\ \sum p_{Track}^{Track} \\ m_i^{pet} \\ m_i^{get} \\ m_$	\tauN \tautwoone	$ au_N \  au_{21}$
\mthresh $M_{ m threshold}$ \tauN $ au_N$ \mjetavg $ au_{ m per}^{ m jet}$ \tautwoone $ au_{ m 21}$	<pre>\mthresh \mjetavg \masstrkjet \width</pre>	$M_{ m threshold} \ \langle m^{ m jet}  angle \ m^{ m track jet} \ w$	\tauN \tautwoone \tauthrtwo \dip	$ au_N \  au_{21} \  au_{32} \  au$

\diponethr  $\mathcal{D}_{13}$ 

The macro \etaRange produces what you would expect: \etaRange{-2.5}{+2.5} produces  $-2.5 \le |\eta| < +2.5$  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 
$$\Box^2$$
 \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.

```
1/p_{\rm T} - 1/E_{\rm T}
\etpt
                           (1/p_{\rm T} - 1/E_{\rm T})/(\sigma(1/p_{\rm T}))
10^{31} \,{\rm cm}^{-2} \,{\rm s}^{-1}
\etptsig
\begL
                           10^{33} \,\mathrm{cm}^{-2} \,\mathrm{s}^{-1}
10^{34} \,\mathrm{cm}^{-2} \,\mathrm{s}^{-1}
\lowL
\highL
\Epsb
                           \epsilon_b
\Epsc
                           \epsilon_c
\Mtau
                           m_{\tau}
                           \sin^2 \theta_W
\swsq
                           \sin^2 \theta_{\text{eff}}^{\text{lept}}
\swel
                           \sin^2 \overline{\theta}_W
\swsqb
                          \sin^2 \theta_W \equiv 1 - m_W^2 / m_Z^2
\swsqon
\gv
                           g_{V}
\ga
                           g_{A}
\gvbar
                           \bar{g}_{\mathrm{V}}
\gabar
                           \bar{g}_{A}
                           Z^*
\Zzv
                           A_{b\overline{b}}
\Abb
\Acc
                           A_{c\overline{c}}
\Aqq
                           A_{q\overline{q}}
\Afb
                           A_{fb}
                           \Gamma_Z
\GZ
\GW
                           \Gamma_W
\GH
                           \Gamma_H
                           \Gamma_{\text{had}}
\GamHad
                           \Gamma_{b\overline{b}}
\Gbb
\Rbb
                           R_{b\overline{b}}
\Gcc
                           \Gamma_{c\overline{c}}
                          \Gamma_{vis}\,
\Gvis
\Ginv
                           \Gamma_{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.

```
\btol
                     b \to \ell
                     c \to \ell
\ctol
\btoctol
                     b \to c \to \ell
                     J/\psi \rightarrow e^+e^-
\Jee
                     J/\psi \rightarrow \mu^+ \mu^-
\Jmm
                     J/\psi \rightarrow \mu^+ \mu^-
\Jmumu
                     W \rightarrow jj
\Wjj
                     t \rightarrow jjb
\tjjb
\Hbb
                     H \rightarrow b\overline{b}
                     H \rightarrow \gamma \gamma
\Hgg
\H1111
                     H \to \ell\ell\ell\ell
\Hmmmm
                     H \rightarrow \mu\mu\mu\mu
\Heeee
                     H \rightarrow eeee
                     Z \to \ell \ell
\Z11
                     Z \to \ell^+ \ell^-
\Zlplm
                     Z \rightarrow ee
\Zee
\Zepem
                     Z \rightarrow e^+ e^-
                     Z \rightarrow \mu\mu
\Zmm
\Zmpmm
                     Z \rightarrow \mu^{+}\mu^{-}
                     Z \rightarrow \tau \tau
\Ztt
                     Z \rightarrow \tau^+ \tau^-
\Ztptm
                     Z \to b\overline{b}
\Zbb
                     W \to \ell \nu
\Wln
                     W \rightarrow e \nu
\Wen
\Wmn
                     W \rightarrow \mu \nu
\Wlnu
                     W \to \ell \nu
```

```
\Wenu
                  W \rightarrow e \nu
                  W \rightarrow \mu \nu
\Wmunu
                  W \to q \overline{q}
\Wqqbar
\Amm
                  A \rightarrow \mu\mu
\Ztautau
                 Z \to \tau \tau
\Wtaunu
                  W \rightarrow \tau \nu
                 A \rightarrow \tau \tau
\Atautau
\Htautau
                 H \to \tau \tau
\tWb
                  t \to Wb
\Wjets
                  W+ jets
                  Z + iets
\Zjets
                  Br(J/\psi \to \ell^+\ell^-)
\Brjl
```

### 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
          eV
\eV
          TeV
\TeV
\GeV
          GeV
\MeV
          MeV
\keV
          keV
\eV
          eV
\TeVc
          TeV/c
\GeVc
          GeV/c
\MeVc
          MeV/c
          keV/c
\keVc
\eVc
          eV/c
          \text{TeV}/c^2
\TeVcc
\GeVcc
          GeV/c^2
          MeV/c^2
\MeVcc
          \text{keV}/c^2
\keVcc
\eVcc
          eV/c^2
          fb^{-1}
\ifb
          pb^{-1}
\ipb
          nb^{-1}
\inb
\degr
\TeVc
          TeV/c
\GeVc
          GeV/c
\MeVc
          MeV/c
\keVc
          keV/c
\eVc
          eV/c
          \text{TeV}/c^2
\TeVcc
          \text{GeV}/c^2
\GeVcc
          \text{MeV}/c^2
\MeVcc
          \text{keV}/c^2
\keVcc
```

```
eV/c^2
\eVcc
           fb^{-1}
\ifb
           pb^{-1}
\ipb
           nb^{-1}
\inb
\degr
           \text{TeV}/c
\TeVc
           GeV/c
\GeVc
\MeVc
           MeV/c
\keVc
           keV/c
\eVc
           eV/c
           \text{TeV}/c^2
\TeVcc
           \text{GeV}/c^2
\GeVcc
           MeV/c^2
\MeVcc
           keV/c^2
\keVcc
           eV/c^2
\eVcc
           fb^{-1}
\ifb
           pb^{-1}
\ipb
           nb^{-1}
\inb
\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:

```
TeV
\si{\TeV}
               GeV
\si{\GeV}
               MeV
\si{\MeV}
              keV
si{\keV}
si{eV}
              eV
\si{\TeVc}
              TeV/c
               GeV/c
\si{\GeVc}
               MeV/c
\si{\MeVc}
               keV/c
\si{\keVc}
si{\eVc}
              eV/c
              \text{TeV}/c^2
\si{\TeVcc}
              \text{GeV}/c^2
\si{\GeVcc}
              MeV/c^2
\si{\MeVcc}
```

```
\text{keV/}c^2
\si{\keVcc}
                 eV/c^2
\si{\eVcc}
\si\{\nb\}
                 nb
si{pb}
                 pb
\si{\tb}
                 fb
                {\rm fb}^{-1}
\si{\per\fb}
                 pb^{-1}
si{per\pb}
                 nb^{-1}
\si{\per\nb}
                 fb^{-1}
\si{\ifb}
                 pb^{-1}
\si\{\ipb\}
                 nb^{-1}
\si\{\inb\}
si{Hz}
                 Hz
\si\{\kHz\}
                 kHz
                 MHz
si{MHz}
\si{\GHz}
                 GHz
\si{\degr}
\si\{\mbox{m}\}
                 m
si{cm}
                 cm
\si\{\mbox{mm}\}
                 mm
\si\{\um\}
                 μm
\si{\micron}
                 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 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 Υ 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  $E_{\rm T}^{\rm miss}$ . However, with the latest version of the packages both forms work fine. You can compare  $E_{\rm T}^{\rm miss}$  and see that the spacing is correct in both cases.

#### References

[1] A. Buckley, *The hepparticles package for LTEX*, URL: https://www.ctan.org/pkg/hepparticles.