The \hepparticles package for \LaTeX

Describing \hepparticles version 2.0

Andy Buckley, andy@insectnation.org

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Abstract

This package provides macros for typesetting high energy physics particle names in a consistent, semantic and aesthetically pleasing manner, as well as fixing problems with math-mode boldness problems in section titles. You may also be interested in the \heppennames and \hepnicenames packages, which use this one to provide a large set of pre-existing particle names. This document describes version 2.0, which significantly improves the output quality over versions 1.x, removes several macros & package options, and changes dependencies.

1 Motivation

Typesetting the names of high-energy fundamental particles (and their elementary composites) is well-defined by a set of rules:

- The basic particle name consists of a large Roman or Greek symbol with optional following sub- and super-scripts.

- Depending on convention, the symbols for particles are either italic or upright. Using the latter convention, the symbols should be upright when describing a specific particle; if describing a generic class of particles they should be italicised (where possible). In italic and bold contexts the symbols should adapt by becoming bold and italic themselves where possible.

- Anti-particles are written with a bar on top of the main symbol (but for aesthetic reasons the bar does not extend above the sub- and super-scripts.)
• Supersymmetric partners of Standard Model particles are written as for anti-particles but with a tilde in place of the bar. SUSY anti-particles (though the use of symbols to represent them is currently uncommon) may be written with a bar above the tilde.

• Resonant states may sport an extra resonance specifier consisting of a value in parentheses and optional following sub- and super-scripts. This follows the main particle name.

Several issues arise when typesetting these particle names in standard \LaTeX: for starters the requirement of sub- and super-scripts and the need to use Greek symbols forces us into math mode. But math mode does not usually follow the surrounding text context for boldness and italicism: this has been fixed in this specific case by use of the maybe\texttt{math} package. Secondly, the positions of super-scripts with overlines and tildes are affected: this is also corrected by this package. By request, the particle typesetting conventions may be specified as a package option. All the \texttt{hepparticles} commands may be used either in or out of math mode.

2 Commands

• For generic particle names e.g. all positively charged leptons:
  \HepGenParticle{main}{subscript}{superscript}
  \HepGenAntiParticle{main}{subscript}{superscript}

• For concrete particle names:
  \HepParticle{main}{subscript}{superscript}
  \HepAntiParticle{main}{subscript}{superscript}

• For supersymmetric “sparticles”:
  \HepGenSusyParticle{main}{subscript}{superscript}
  \HepSusyParticle{main}{subscript}{superscript}
  \HepGenSusyAntiParticle{main}{subscript}{superscript}
  \HepSusyAntiParticle{main}{subscript}{superscript}

• For resonance specifiers (just the extra terms):
  \HepResonanceMassTerm{mainterm}{subscript}{superscript}
  \HepResonanceSpecTerm{mainterm}{subscript}{superscript}
For a full particle name and resonance specification:
\HepParticleResonance\{name\}\{mass\}\{massSub\}\{massSup\}
\HepParticleResonanceFull\{main\}\{sub\}\{sup\}\{mass\}\{massSub\}\{massSup\}
\HepParticleResonanceFormal\{name\}\{mass\}\{massSub\}\{massSup\}\{spec\}\{specSub\}\{specSup\}
\HepParticleResonanceFormalFull\{main\}\{sub\}\{sup\}\{mass\}\{massSub\}\{massSup\}\{spec\}\{specSub\}\{specSup\}

(hurrah, we hit the \TeX 9-argument limit!)

And finally, for containing processes describing particle evolution:
\HepProcess\{iParticles\ \to\ fParticles\}.

These commands respectively typeset particle names like this:

- Normal particles: \Bd, \Bd
- Generic particles: \qd, \ell\mu
- SUSY particles: \tilde{\chi}_1, \tilde{q}_2
- Resonances: \Jpsi(1S)^*
- Process: \Bd \to \K\pi^+.

3 Package options

By request, the package can typeset particles in italic as well as upright convention. The choice of convention can be made when the package is loaded with the italic option, i.e. \usepackage[italic]{hepparticles}. The default mode is upright.

The forceit, maybess and noss options have been removed in version 2.0.

4 Installation

Requirements: You will need to be using a \ Eis system to use hepparticles. Hopefully this isn’t a problem — I wasn’t feeling up to writing a Plain \TeX version! hepparticles 2.0 requires the subdepth package.
To install, simply copy the `hepparticles.sty` file into a location in your `LATEXINPUTS` path. Tada!

5 Credit where it’s due...

Thanks to Viet-Trung Luu for providing the initial “way forward” when writing this package: his solution, in expanded form, made its way into what is now the `maybemath` package. Thanks also to Heiko Oberdiek and Donald Arseneau for showing how to stop the \textbackslash mspace from turning up in PDF bookmarks generated by `hyperref`. Philip Ratcliffe provided the hack that moves over-lines slightly to the right for use with italic particle symbols. In version 2.0 I owe a great deal to the `subdepth` package.

Any feedback is appreciated! Email to andy@insectnation.org, please.