The \texttt{HEP-MATH-FONT} package*

Extended Greek and sans-serif math

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Abstract

The \texttt{HEP-MATH-FONT} package adjust the math fonts to be italic sans-serif if the document is sans-serif. Additionally Greek letters are redefined to be always italic and upright in math and text mode, respectively. Some math font macros are adjusted to give more consistently the naively expected results.

The package is loaded using \texttt{\usepackage{hep-math-font}}.

If the document \texttt{\familydefault} font is switched to the sansserif \texttt{\sfdefault} font the math font is adjusted accordingly using fonts compatible to latin modern (LM) and computer modern (CM). In order to be able to easily switch large chucks of math from serif to sans-serif documents the meaning of \texttt{\mathrm} and \texttt{\mathsf} is adjusted in this case so that the first generates upright sans-serif math and the second serif math. This is is neither the literal meaning of the macros nor the best behaviour if a single large document is written in sans-serif. However, it simplifies working in an environment where one copies pieces of math between serif and sans-serif documents e.g. publications vs. talks and funding applications.

Using the \texttt{fixmath} [1] and \texttt{textalpha} [2] packages Greek letter are adjusted so that they are always italic and upright in math and text mode, respectively. Greek letters can be written by using their unicode characters.

The \texttt{symbols=⟨family⟩} class option sets the family of the symbol fonts. \texttt{symbols=ams} loads the two AMS fonts [3] and the BM bold fonts. The default \texttt{symbols=true} replaces additionally the blackboard font with the \texttt{dsfont} [4]. \texttt{symbols=minion} switches the symbol fonts to the Adobe MinionPro companion font from the MnSymbol package [5]. \texttt{symbols=false} deactivates loading any additional symbol fonts, effectively restricting the package to only switch the math font according to the sans-serif property of the main text.

1 Macros

\texttt{\text} The \texttt{\mathrm{⟨math⟩}} macro and the \texttt{\text{⟨text⟩}} macro from \texttt{amstext} [6] are

\texttt{\mathrm} *This document corresponds to \texttt{HEP-MATH-FONT} v1.1.

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adjusted to produce upright Greek letters, i.e. \( Ab\Gamma\delta Ab\Gamma\delta \), by adjusting the code from the \texttt{alphabet} \texttt{7} package.

\texttt{\textbf{mathbf}} Bold math, via \texttt{\textbf{mathbf}} is improved with the \texttt{bm} package \texttt{8}, i.e. \( Ab\Gamma\delta Ab\Gamma\delta \). Macros switching to \texttt{bfseries} such as \texttt{\section\{text\}} are ensured to also typeset math in bold.

\texttt{\textsf{mathsf}} The math sans-serif alphabet is redefined to be italic sans-serif if the main text is serif and italic serif if the main text is sans-serif, i.e. \( Ab\Gamma\delta Ab\Gamma\delta \). Ensuring that the distinction between these fonts is also kept if the (sans-)serif option of the document is switched.

\texttt{\textscr{mathscr}} The \texttt{\textcal{mathcal}} font i.e. \( ABCD \) is accompanied by the \texttt{\textscr{mathscr}} font i.e. \( ABCD \).

\texttt{\texttt{mathtt}} The \texttt{\texttt{mathbb}} font is improved by the \texttt{doublestroke} package \texttt{4} and adjusted depending on the (sans-)serif option of the document i.e. \( Ab\Gamma\delta Ab\Gamma\delta \).

\texttt{\textfrak{mathfrak}} Finally, the \texttt{\textfrak{mathfrak}} font is also available i.e. \( Ab\Gamma\delta Ab\Gamma\delta \).

Details about the font handling in \TeX{} can be found in reference \texttt{9}.

## 2 Math alphabet allocation

Of the 16 available math alphabets, \TeX{} loads four by default

- \texttt{OT1} Text (latin, upper case greek, numerals, text symbols)
  
  The text font \texttt{0} of CM is \texttt{cmr} \texttt{OT1/cmr/m/n/10}, which is replaced by LM to be \texttt{lmr} \texttt{OT1/lmr/m/n/10}, the \texttt{sansserif} option uses \texttt{rm-lmss} \texttt{OT1/lmss/m/n/10}.

- \texttt{OML} Math Italic (latin, greek, numerals, text symbols)
  
  The italic math font \texttt{1} of CM is \texttt{cmmi} \texttt{OML/cmm/m/it/10}, and is replaced by LM to be \texttt{lmmi} \texttt{OML/lmm/m/it/10}, the \texttt{sansserif} options uses \texttt{cmssmi} \texttt{OML/cmssrm/m/it/10} from the \texttt{sansmathfonts} package \texttt{10}.

- \texttt{OMS} Symbol (\texttt{mathcal}, operators)
  
  The symbol font \texttt{2} of CM is \texttt{cmm} \texttt{OMS/cmsy/m/n/10}, and is replaced by LM to be \texttt{lmsy} \texttt{OMS/lmsy/m/n/10}, the \texttt{sansserif} options uses \texttt{cmssmi} \texttt{OMS/cmssrm/m/it/10} from the \texttt{sansmathfonts} package \texttt{10}.

- \texttt{OMX} Math Extension (big operators, delimiters)
  
  The extension font \texttt{3} of CM is \texttt{cmex} \texttt{OMX/cmex/m/n/5}, and is replaced by the \texttt{exscale} package \texttt{11} to be \texttt{cmex} \texttt{OMX/cmex/m/n/10}, the \texttt{sansserif} option loads \texttt{cmsssex} \texttt{OMX/cmsssex/m/n/10}.

The \texttt{amssymb} (\texttt{amsfonts}) packages \texttt{12} load two more symbol fonts
Figure 1: Basic math fonts
Figure 2: Math extension fonts
Figure 3: Minion symbol fonts
4) \textbf{msam10} \texttt{\msam/n/10} AMS symbol font A (special math operators)

5) \textbf{msbm10} \texttt{\msbm/n/10} AMS symbol font B (\texttt{\mathbb}, negated operators)

The \texttt{sansserif} option replaces them with \texttt{ssmsam10 \msa/n/10} and \texttt{ssmsbm10 \msb/n/10} from the \texttt{sansmathfonts} package [10], respectively.

The \texttt{BM} package [8] loads the bold version for the fonts 0) to 2).

Other math alphabets are only loaded on demand, e.g. \texttt{\mathsf} uses a sans-serif font and \texttt{\mathbf} without the \texttt{BM} package uses a bold font. The \texttt{\mathscr} macro uses the script font from the \texttt{mathrsfs} package [13]

9) \textbf{rsfs10} \texttt{\rsfs/n/10} Math script font (capital letters)

The \texttt{\mathbf} macro loads the double stroke font from the \texttt{dsfont} package [4], this can be prevented with the \texttt{symbols=ams} option.

10) \textbf{dsrom10} \texttt{\dsrom/n/10} Double stroke font

The \texttt{\mathfrak} macro loads the fractur font from the \texttt{amssymb} package [12]

11) \textbf{eufm10} \texttt{\euf/n/10} Math fraktur (Basic Latin)

The \texttt{hep-math-font} package uses nine of the available 16 math alphabets. This number can be reduced by three using \texttt{\newcommand\bmmax{0}} from the \texttt{BM} package [8] and brought down to the default of four with the option \texttt{symbols=false}.

The \texttt{symbols=minion} options replaces the fonts 2) to 5) with corresponding fonts from the \texttt{MnSymbol} package [5]. Additionally, two more symbol alphabets are allocated, the \texttt{BM} package [8] loads one more font and now \texttt{\mathcal} triggers the use of one additional alphabet. Hence, the minion option uses three to four more math alphabets than a usual setup.

References


[9] \LaTeX\ Team. ‘\LaTeX\ 2ε font selection: Documentation of \LaTeX\ font commands’ (1995). CTAN: fntguide.