

# Using the CM Bright typeface with L<sup>A</sup>T<sub>E</sub>X

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(v8.1 – 2005/04/13)

## 1 The CM Bright fonts

‘Computer Modern Bright’ is a sans serif typeface family, based on Donald Knuth’s ‘Computer Modern’. It comprises OT1, T1 and TS1 encoded text fonts of various shapes as well as all the fonts necessary for mathematical typesetting, including the AMS symbols.

CM Bright has been designed as a well legible standalone font. It is ‘lighter’ and less obtrusive than CM Sans Serif, which, in contrast, is more appropriate for markup purposes within a CM Roman environment.

Together with CM Bright there comes a family of typewriter fonts, named ‘CM Typewriter Light’, which look better in combination with CM Bright than the ordinary `cmtt` fonts would do.

The present document is typeset using the CM Bright and CM Typewriter Light typefaces. Samples of mathematical formulas are provided in section 4.

## 2 The macro package ‘cmbright’

### 2.1 Basics

The macro package `cmbright` supports the use of the typeface family CM Bright with L<sup>A</sup>T<sub>E</sub>X: Loading the package

```
\usepackage{cmbright}
```

effects the following:

- The default sans serif font family for typesetting text and math is changed to `cmbr` (CM Bright).
- The sans serif font family is made the default one for the whole document.
- The packages `amsfonts` or `amssymb`, when loaded additionally, will use the ‘CM Bright’ versions of the AMS symbol fonts.
- The default typewriter font family is changed to `cmt1` (CM Typewriter Light).

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## 2.2 Line spacing



Because of the large x-height of the CM Bright typeface, it is often necessary to enlarge the line spacing, as compared with the default setting of the standard L<sup>A</sup>T<sub>E</sub>X document classes. By default, the package `cmbright` increases the line spacing (`\baselineskip`) for the font sizes 8–12 pt to approx.  $1.25 \times$  size. However, this behavior may cause obscure problems, particularly in conjunction with other macro packages or with ‘moving arguments’. Furthermore, in narrow columns no changes to the default line spacing may be necessary at all.

To stop the package from altering the line spacing, it can be loaded with the option `standard-baselineskips`. You may still influence the line spacing yourself, for instance, by using the command `\linespread{...}` in the preamble.

## 2.3 Greek letters in math mode

When the macro package is loaded using the option `slantedGreek`, uppercase Greek letters in math mode will, by default, be slanted. Regardless of the option, the new commands `\upGamma`, `\upDelta` ... `\upOmega` provide upright uppercase Greek letters:  $\Gamma, \Delta \dots \Omega$  still.

## 2.4 Bold type in math mode



A new mathematical alphabet `\mathbold` provides bold slanted letters, including uppercase and lowercase Greek. Emboldening of complete formulas through the command `\mathversion` is, however, not possible, because because there is no comprehensive set of bold math fonts.

## 2.5 Scaling of the ‘large’ math symbols

In order to achieve proper scaling of the ‘large’ math symbols, it is recommended to load the standard package `exscale` in addition to `cmbright`. This is redundant, if you are using the package `amsmath`, which includes the required functionality, too.

# 3 NFSS classification of the fonts

Table 1 lists the font series and shapes available in the CM Bright and CM Typewriter Light families. Notice, that

- the `bx` series of the text fonts is available with sizes of 9 pt and above only;
- there is no special CM Bright font for the ‘extensible math symbols’, so that `OMX/cmex` is used instead;
- the font definitions for the AMS fonts are part of the package `cmbright`; there are no separate `.fd` files for them.

Table 1: NFSS classification of the fonts

encoding	family	series	shape(s)
<i>CM Bright</i>			
OT1, T1, TS1	cmbr	m	n, sl
T1, TS1	cmbr	sb	n, sl
OT1, T1, TS1	cmbr	bx	n
<i>CM Typewriter Light</i>			
OT1, T1, TS1	cmtl	m	n, sl
<i>CM Bright Math</i>			
OML	cmbrm	m, b	it
OMS	cmbrs	m	n
<i>CM Bright AMS A, B</i>			
U	msa, msb	m	n

## 4 Sample Formulas

**From the METAFONT book, p. 298**

[...] If  $n > 2$ , the identity

$$t[u_1, \dots, u_n] = t[t[u_1, \dots, u_{n-1}], t[u_n, \dots, u_n]]$$

defines  $t[u_1, \dots, u_n]$  recursively, and it can be shown that the alternative definition

$$t[u_1, \dots, u_n] = t[t[u_1, u_2], \dots, t[u_{n-1}, u_n]]$$

gives the same result. Indeed, we have

$$t[u_1, \dots, u_n] = \sum_{k=1}^n \binom{n-1}{k-1} (1-t)^{n-k} t^{k-1} u_k,$$

a Bernstein polynomial of order  $n - 1$ .

**From the METAFONT book, p. 59**

$$\frac{x_1 + 20}{x_2 - 20} + \sqrt{a^2 - \frac{2}{3}\sqrt{b}}$$

**From the T<sub>E</sub>X book, exercise 19.13**

$$\int_{-\infty}^{+\infty} e^{-x^2} dx = \sqrt{\pi}$$

## 5 The package code

We require a sufficiently recent L<sup>A</sup>T<sub>E</sub>X.

```
1 (*package)
2 \NeedsTeXFormat{LaTeX2e}[1995/06/01]
```

### 5.1 Text font families

The sans serif font family is made the default one:

```
3 \renewcommand{\familydefault}{\sfdefault}
```

CM Bright is to be used as the default sans serif font family:

```
4 \renewcommand{\sfdefault}{cmbr}
```

CM Typewriter Light is to be used as the default typewriter font family, because the CM Typewriter fonts look too dark in combination with CM Bright:

```
5 \renewcommand{\ttdefault}{cmtl}
```

### 5.2 Mathematical fonts

Default definitions which remain unchanged are commented out:

```
6 \DeclareSymbolFont      {operators} {OT1}{cmbr}{m}{n}
7 \DeclareSymbolFont      {letters}   {OML}{cmbrm}{m}{it}
8 \SetSymbolFont          {letters}{bold} {OML}{cmbrm}{b}{it}
9 \DeclareSymbolFont      {symbols}   {OMS}{cmbrs}{m}{n}
10 % \DeclareSymbolFont {largesymbols} {OMX}{cmex}{m}{n}
11 %
12 % \DeclareSymbolFontAlphabet {\mathrm} {operators}
13 % \DeclareSymbolFontAlphabet{\mathnormal} {letters}
14 % \DeclareSymbolFontAlphabet {\mathcal} {symbols}
15 %
16 \DeclareMathAlphabet{\mathit} {OT1}{cmbr}{m}{sl}
17 \DeclareMathAlphabet{\mathbf} {OT1}{cmbr}{bx}{n}
18 \DeclareMathAlphabet{\mathtt} {OT1}{cmtl}{m}{n}
```

Despite its name, `\mathrm` is not a font with serifs, but it is, what the user expects it to be: the upright font used, e.g., for operator names.

We make a bold slanted mathematical alphabet available:

```
19 \DeclareMathAlphabet{\mathbold}{OML}{cmbrm}{b}{it}
```

The command `\mathbold` should act on lowercase Greek, too:

```
20 \DeclareMathSymbol{\alpha}{\mathalpha}{letters}{11}
21 \DeclareMathSymbol{\beta}{\mathalpha}{letters}{12}
22 \DeclareMathSymbol{\gamma}{\mathalpha}{letters}{13}
23 \DeclareMathSymbol{\delta}{\mathalpha}{letters}{14}
24 \DeclareMathSymbol{\epsilon}{\mathalpha}{letters}{15}
25 \DeclareMathSymbol{\zeta}{\mathalpha}{letters}{16}
26 \DeclareMathSymbol{\eta}{\mathalpha}{letters}{17}
27 \DeclareMathSymbol{\theta}{\mathalpha}{letters}{18}
28 \DeclareMathSymbol{\iota}{\mathalpha}{letters}{19}
29 \DeclareMathSymbol{\kappa}{\mathalpha}{letters}{20}
30 \DeclareMathSymbol{\lambda}{\mathalpha}{letters}{21}
31 \DeclareMathSymbol{\mu}{\mathalpha}{letters}{22}
32 \DeclareMathSymbol{\nu}{\mathalpha}{letters}{23}
```

```

33 \DeclareMathSymbol{\xi}{\mathalpha}{letters}{24}
34 \DeclareMathSymbol{\pi}{\mathalpha}{letters}{25}
35 \DeclareMathSymbol{\rho}{\mathalpha}{letters}{26}
36 \DeclareMathSymbol{\sigma}{\mathalpha}{letters}{27}
37 \DeclareMathSymbol{\tau}{\mathalpha}{letters}{28}
38 \DeclareMathSymbol{\upsilon}{\mathalpha}{letters}{29}
39 \DeclareMathSymbol{\phi}{\mathalpha}{letters}{30}
40 \DeclareMathSymbol{\chi}{\mathalpha}{letters}{31}
41 \DeclareMathSymbol{\psi}{\mathalpha}{letters}{32}
42 \DeclareMathSymbol{\omega}{\mathalpha}{letters}{33}
43 \DeclareMathSymbol{\varepsilon}{\mathalpha}{letters}{34}
44 \DeclareMathSymbol{\vartheta}{\mathalpha}{letters}{35}
45 \DeclareMathSymbol{\varpi}{\mathalpha}{letters}{36}
46 \DeclareMathSymbol{\varrho}{\mathalpha}{letters}{37}
47 \DeclareMathSymbol{\varsigma}{\mathalpha}{letters}{38}
48 \DeclareMathSymbol{\varphi}{\mathalpha}{letters}{39}

```

The slantedGreek option:

```

49 \DeclareOption{slantedGreek}{%
50   \DeclareMathSymbol{\Gamma}{\mathalpha}{letters}{0}
51   \DeclareMathSymbol{\Delta}{\mathalpha}{letters}{1}
52   \DeclareMathSymbol{\Theta}{\mathalpha}{letters}{2}
53   \DeclareMathSymbol{\Lambda}{\mathalpha}{letters}{3}
54   \DeclareMathSymbol{\Xi}{\mathalpha}{letters}{4}
55   \DeclareMathSymbol{\Pi}{\mathalpha}{letters}{5}
56   \DeclareMathSymbol{\Sigma}{\mathalpha}{letters}{6}
57   \DeclareMathSymbol{\Upsilon}{\mathalpha}{letters}{7}
58   \DeclareMathSymbol{\Phi}{\mathalpha}{letters}{8}
59   \DeclareMathSymbol{\Psi}{\mathalpha}{letters}{9}
60   \DeclareMathSymbol{\Omega}{\mathalpha}{letters}{10}
61 }

```

Save the default definitions of the upright uc Greek characters under new names:

```

62 \let\upDelta\Delta
63 \let\upOmega\Omega
64 \let\upGamma\Gamma
65 \let\upTheta\Theta
66 \let\upLambda\Lambda
67 \let\upXi\Xi
68 \let\upPi\Pi
69 \let\upSigma\Sigma
70 \let\upUpsilon\Upsilon
71 \let\upPhi\Phi
72 \let\upPsi\Psi

```

### 5.3 Leading

The `\baselineskip` should be larger than with CM Roman. For text sizes, i.e., 8–12 pt, a value of  $1.25 \times \text{size}$  is recommended. In order to overwrite the `\baselineskip` defined in the commands like `\normalsize`, `\small`, etc., we use a trick from Frank Jensen’s package `beton` (v1.3). First we set up a table containing our `\baselineskip` values:

```

73 \def\bright@baselineskip@table

```

```
74  {\<\viiipt>10<\@ixpt>11.25<\@xpt>12.5<\@xipt>13.7<\@xiipt>15}
```

All the standard L<sup>A</sup>T<sub>E</sub>X size-changing commands are defined in terms of the `\@setfontsize` macro. This macro is called with the following three arguments: #1 is the size-changing command; #2 is the font size; #3 is the `\baselineskip` value. We modify this macro to check the above `\bright@baselineskip@table` for an alternative `\baselineskip` value:

```
75 \def\bright@setfontsize#1#2#3%
76  {\edef\@tempa{\def\noexpand\@tempb####1<#2}%
77   \@tempa>##2<##3\@nil{\def\bright@baselineskip@value{##2}}}%
78   \edef\@tempa{\noexpand\@tempb\bright@baselineskip@table<#2}%
79   \@tempa><\@nil
80   \ifx\bright@baselineskip@value\@empty
81     \def\bright@baselineskip@value{#3}%
82   \fi
83   \old@setfontsize{#1}{#2}\bright@baselineskip@value}
```

Finally, we save the default meaning of `\@setfontsize`...

```
84 \let\old@setfontsize=\@setfontsize
```

...and declare an option to set up the enlarged line space:

```
85 \DeclareOption{enlarged-baselineskips}{%
86   \let\@setfontsize=\bright@setfontsize}
```

The `\baselineskip` values specified in the above table should be appropriate for most purposes, i.e., for one-column material in the normal article/report/book formats. However, it is sometimes desirable to turn off the above automatic mechanism:

```
87 \DeclareOption{standard-baselineskips}{%
88   \let\@setfontsize=\old@setfontsize}
```

## 5.4 Missing symbols

The OT1 encoded CM Bright fonts do not contain the symbol £. We must therefore redefine the commands `\textsterling` and `\mathsterling`, so that they use the roman text font family:

```
89 \DeclareTextCommand{\textsterling}{OT1}{%
90   \ifdim \fontdimen\@ne\font >\z@
91     \fontfamily{\rmdefault}\fontshape{it}\selectfont
92   \else
93     \fontfamily{\rmdefault}\fontshape{ui}\selectfont
94   \fi
95   \char'\$}}
```

The following is not entirely correct, because the size will be wrong in super- or subscripts:

```
96 \def\mathsterling{\textsl{\textsterling}}
```

## 5.5 Declaring the AMS symbol fonts

In case the package `amsfonts` is loaded additionally, the CM Bright versions of the AMS symbol fonts are to be used. The `amsfonts` package, when loaded with the `[psamsfonts]` option, will issue its own font definition commands, so

we have to defer ours after loading of the packages, so as not to let them be overwritten.

```

97 \AtBeginDocument{%
98   \DeclareFontFamily{U}{msa}{}
99   \DeclareFontShape{U}{msa}{m}{n}{%
100    <-9>cmbras8%
101    <9-10>cmbras9%
102    <10->cmbras10%
103   }{}
104   \DeclareFontFamily{U}{msb}{}
105   \DeclareFontShape{U}{msb}{m}{n}{%
106    <-9>cmbrbs8%
107    <9-10>cmbrbs9%
108    <10->cmbrbs10%
109   }{}
110 }
```

## 5.6 Logos

The definitions of the T<sub>E</sub>X and L<sup>A</sup>T<sub>E</sub>X logos must be adapted to work with the CM Bright fonts:

```

111 \def\TeX{T\kern-.19em\lower.5ex\hbox{E}\kern-.05emX\@}
112 \DeclareRobustCommand{\LaTeX}{L\kern-.3em%
113   {\sbox\z@ T%
114     \vbox to\ht\z@{\hbox{\check@mathfonts
115       \fontsize\sf@size\z@
116       \math@fontsfalse\selectfont
117       A}%
118     \vss}%
119   }%
120   \kern-.15em%
121   \TeX}
122 \DeclareRobustCommand{\LaTeXe}{\mbox{\m@th
123   \if b\expandafter\@car\f@series\@nil\boldmath\fi
124   \LaTeX\kern.15em2$_{\textstyle\varepsilon}$}}
```

## 5.7 Processing the options

```

125 \ExecuteOptions{enlarged-baselineskips}
126 \ProcessOptions\relax
```

## 5.8 Initialization

We ensure that any package loaded after `cmbright` will find the (possibly) changed value of the line space, as well as the changed default font.

```

127 \normalfont\normalsize
128 \endpackage
```

# 6 The font definition files

## 6.1 CM Bright, OT1 encoding

```

129 ⟨*cm⟩
130 \DeclareFontFamily{OT1}{cmbr}{\hyphenchar\font45}
131 \DeclareFontShape{OT1}{cmbr}{m}{n}{%
132 <-9>cmbr8%
133 <9-10>cmbr9%
134 <10-17>cmbr10%
135 <17->cmbr17%
136 }{}
137 \DeclareFontShape{OT1}{cmbr}{m}{sl}{%
138 <-9>cmbrsl8%
139 <9-10>cmbrsl9%
140 <10-17>cmbrsl10%
141 <17->cmbrsl17%
142 }{}
143 \DeclareFontShape{OT1}{cmbr}{m}{it}{%
144 <->ssub*cmbr/m/sl%
145 }{}
146 \DeclareFontShape{OT1}{cmbr}{b}{n}{%
147 <->ssub*cmbr/bx/n%
148 }{}
149 \DeclareFontShape{OT1}{cmbr}{bx}{n}{%
150 <-9>sub*cmbr/m/n%
151 <9->cmbrbx10%
152 }{}
153 ⟨/cm⟩

```

## 6.2 CM Bright, T1 encoding

```

154 ⟨*ec⟩
155 \DeclareFontFamily{T1}{cmbr}{}
156 \DeclareFontShape{T1}{cmbr}{m}{n}{%
157 <-9>ebmr8%
158 <9-10>ebmr9%
159 <10-17>ebmr10%
160 <17->ebmr17%
161 }{}
162 \DeclareFontShape{T1}{cmbr}{m}{sl}{%
163 <-9>ebmo8%
164 <9-10>ebmo9%
165 <10-17>ebmo10%
166 <17->ebmo17%
167 }{}
168 \DeclareFontShape{T1}{cmbr}{m}{it}{%
169 <->ssub*cmbr/m/sl%
170 }{}
171 \DeclareFontShape{T1}{cmbr}{sb}{n}{%
172 <-9>ebsr8%
173 <9-10>ebsr9%
174 <10-17>ebsr10%
175 <17->ebsr17%
176 }{}
177 \DeclareFontShape{T1}{cmbr}{sb}{sl}{%
178 <-9>ebso8%
179 <9-10>ebso9%
180 <10-17>ebso10%

```



```

181 <17->ebso17%
182 }{}
183 \DeclareFontShape{T1}{cmbr}{sb}{it}{%
184 <->ssub*cmbr/sb/sl%
185 }{}
186 \DeclareFontShape{T1}{cmbr}{b}{n}{%
187 <->ssub*cmbr/bx/n%
188 }{}
189 \DeclareFontShape{T1}{cmbr}{bx}{n}{%
190 <-9>sub*cmbr/sb/n%
191 <9->ebbx10%
192 }{}
193 </ec>

```

### 6.3 CM Typewriter Light, OT1 encoding

```

194 <*otlcmtl>
195 \DeclareFontFamily{OT1}{cmtl}{\hyphenchar\font\m@ne}
196 \DeclareFontShape{OT1}{cmtl}{m}{n}{%
197 <->cmtl10%
198 }{}
199 \DeclareFontShape{OT1}{cmtl}{m}{sl}{%
200 <->cmsltl10%
201 }{}
202 \DeclareFontShape{OT1}{cmtl}{m}{it}{<->ssub*cmtl/m/sl}{}
203 </otlcmtl>

```

### 6.4 CM Typewriter Light, T1 encoding

```

204 <*t1cmtl>
205 \DeclareFontFamily{T1}{cmtl}{\hyphenchar\font\m@ne}
206 \DeclareFontShape{T1}{cmtl}{m}{n}{%
207 <->ebt110%
208 }{}
209 \DeclareFontShape{T1}{cmtl}{m}{sl}{%
210 <->ebto10%
211 }{}
212 \DeclareFontShape{T1}{cmtl}{m}{it}{<->ssub*cmtl/m/sl}{}
213 </t1cmtl>

```

### 6.5 CM Bright Math Inclined, OML encoding

```

214 <*omlcbrm>
215 \DeclareFontFamily{OML}{cbrm}{\skewchar\font 127}
216 \DeclareFontShape{OML}{cbrm}{m}{it}{%
217 <-9>cbrmi8%
218 <9-10>cbrmi9%
219 <10->cbrmi10%
220 }{}
221 \DeclareFontShape{OML}{cbrm}{b}{it}{%
222 <->cbrmb10%
223 }{}
224 </omlcbrm>

```

### 6.6 CM Bright Symbols, OMS encoding

```

225 <*omscbrs>

```

```

226 \DeclareFontFamily{OMS}{cmbrs}{\skewchar\font 48}
227 \DeclareFontShape{OMS}{cmbrs}{m}{n}{%
228 <-9>cmbrsy8%
229 <9-10>cmbrsy9%
230 <10->cmbrsy10%
231 }{}
232 \omscmbrs)

```

## 6.7 CM Bright, OML encoding

We need this for some special tex symbols which may be taken from the 'math italic' font.

```

233 (*omlcubr)
234 \DeclareFontFamily{OML}{cubr}{\skewchar\font 127}
235 \DeclareFontShape{OML}{cubr}{m}{it}{<->ssub*cubrm/m/it}{}
236 \DeclareFontShape{OML}{cubr}{sb}{it}{<->ssub*cubrm/b/it}{}
237 \DeclareFontShape{OML}{cubr}{bx}{it}{<->ssub*cubrm/b/it}{}
238 \omlcubr)

```

## 6.8 CM Bright, OMS encoding

We need this for some special text symbols which may be taken from the mathematical symbol font.

```

239 (*omscubr)
240 \DeclareFontFamily{OMS}{cubr}{\skewchar\font 48}
241 \DeclareFontShape{OMS}{cubr}{m}{n}{<->ssub*cubrs/m/n}{}
242 \omscubr)

```

## 6.9 CM Bright, TS1 encoding

```

243 (*ts1cubr)
244 \DeclareFontFamily{TS1}{cubr}{\hyphenchar\font\m@ne}
245 \DeclareFontShape{TS1}{cubr}{m}{n}{%
246 <-9>tubr8%
247 <9-10>tubr9%
248 <10-17>tubr10%
249 <17->tubr17%
250 }{}
251 \DeclareFontShape{TS1}{cubr}{m}{sl}{%
252 <-9>tubo8%
253 <9-10>tubo9%
254 <10-17>tubo10%
255 <17>tubo17%
256 }{}
257 \DeclareFontShape{TS1}{cubr}{m}{it}{%
258 <->ssub*cubr/m/sl}{}
259 \DeclareFontShape{TS1}{cubr}{sb}{n}{%
260 <-9>tubr8%
261 <9-10>tubr9%
262 <10-17>tubr10%
263 <17->tubr17%
264 }{}
265 \DeclareFontShape{TS1}{cubr}{sb}{sl}{%
266 <-9>tubo8%

```

```

267 <9-10>tbso9%
268 <10-17>tbso10%
269 <17->tbso17%
270 }{}
271 \DeclareFontShape{TS1}{cmbr}{sb}{it}{<->ssub*cmbr/sb/sl}{}
272 \DeclareFontShape{TS1}{cmbr}{b}{n}{<->ssub*cmbr/bx/n}{}
273 \DeclareFontShape{TS1}{cmbr}{bx}{n}{%
274 <-9>sub*cmbr/sb/n%
275 <9->tbbx10%
276 }{}
277 </tslcmbr>

```

## 6.10 CM Typewriter Light, TS1 encoding

```

278 <*tslcmntl>
279 \DeclareFontFamily{TS1}{cmtl}{\hyphenchar\font\m@ne}
280 \DeclareFontShape{TS1}{cmtl}{m}{n}{%
281 <->tbt110%
282 }{}
283 \DeclareFontShape{TS1}{cmtl}{m}{sl}{%
284 <->tbt010%
285 }{}
286 \DeclareFontShape{TS1}{cmtl}{m}{it}{<->ssub*cmtl/m/sl}{}
287 </tslcmntl>

```

The next line of code prevents DocStrip from adding the character table to all modules:

```
288 \endinput
```