**Formulae for converting to and from astronomy-relevant units**

*(meaning of abbreviations below)*

1 candela/m²:
- = 0.0001 Stilb
- = 0.3142 MilliLambert
- = 0.2919 Footlambert
- = 12.58 magnitudes/arcsec²

*From candela/m² → magnitudes/arcsec²*

\[ B = -2.5 \log \left( \frac{C}{108000} \right) \text{ or } 12.58 - 2.5 \log(C) \]

*From magnitudes/arcsec² → candela/m²*

\[ C = 108000 \cdot 10^{-0.4B} \text{ or } 10^{\frac{12.58-B}{2.5}} \]

1 Lux:
- intensity of 1 candela on surface orthogonal to the light ray’s of the source, at 1 meter distance from the source
- = 1 lumen/area (m²)
- = 0.093 Footcandles
- = -14.18 Stellar magnitudes*

*From Lux → stellar magnitude*

\[ M_v = -14.18 - 2.5 \log(L) \]

*From stellar magnitude → Lux*

\[ 10^{\frac{-14.18-M_v}{2.5}} \]

*From footcandles → stellar magnitudes*

\[ -16.8 - 2.5 \log(Fe) \]

*From stellar magnitudes → footcandles*

\[ 10^{\frac{-16.8-M_v}{2.5}} \]

1 footLambert:
- = 11.25 magnitudes/arcsec²

*From footLambert → magnitudes/arcsec²*

\[ M_v = 11.25 - 2.5 \log(F) \]

*From magnitudes/arcsec² → footLambert*

\[ 10^{\frac{11.25-M_v}{2.5}} \]
Formulae derived from Schaefer 1989, formulae 2,16, 17

*From millimicroLambert (nanoLambert) → magnitudes/arcsec$^2$*

B = 26.33 - 2.5Log(M)

*From magnitudes/arcsec$^2$ → millimicroLambert (nanoLambert)*

M = $10^{-0.4(B-26.33)}$

**Limiting vis. magnitude for background brightness in magnitudes/arcsec$^2 ≤ 18.4 (= photopic)**

Mv = 4.11 - 5Log($1 + 10^{2.316 - B/5}$)

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**Background Brightness in magnitudes/arcsec$^2$ photopic vision (for Mv ≤ 4.00)**

B = 11.58 - 5Log($10^{0.822 - Mv/5} - 1$)

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**Background Brightness in magnitudes/arcsec$^2$ for scotopic vision (derived by Nils Olof Carlin, [see here](http://w1.411.telia.com/~u41105032/visual/Schaefer.htm)) and adapted by myself for a maximum darkness of 22 magnitudes/arcsec$^2$**

B = 22 - 5Log($10^{1.7 - Mv/5} - 1$)

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**Limiting vis. magnitude for background brightness in magnitudes/arcsec$^2$ for scotopic vision (idem, Nils Olof Carlin)**

Mv = 8.5 - 5Log($1 + 10^{4.4 - B/5}$)
B = Background brightness (BB) in magnitudes/arcsec^2
M = BB in nanoLambert
Mv = visual limiting magnitude
C = candela’s
L = Lux
F = footLambert
Fc = footcandle
Log has base 10
* -14.18 = magnitude of 1 Lux. Other values: -14.04 or -13.89 (see Martynov, 1959; De Vaucouleurs, 1964)

(Jan van Gastel, May 2009)
Comments are welcome