

## Conversion of NVG MTF values

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In some of the documents describing the spatial filtering properties of night vision goggles (NVGs), the modulation transfer function is plotted as MTF as a function of spatial frequency, where spatial frequency is in units of “lp/mm”. In *discrim*, the MTF needs to be a function of retinal spatial frequency, since that is what matters as far as the human vision model is concerned, and hence in units of cycles/degree. To make the conversion between these two units, there is some ambiguity. I assume that the units intended by lp/mm are “line pairs per mm on the tube”. A line pair is the same thing as a cycle. However, one needs to convert from mm on the tube to deg on the retina. However, it is also possible, although unlikely, that the intent was to cite “line pairs per mm on the retina”.

If the former is true (it’s lp/mm on the tube), one first converts from image size on the tube to image size on the retina. This conversion depends on the optics between the tube and the eye:

$$f_{cycles/degree} = f_{lp/mm} * \frac{EFL_i}{22.89M} * 0.3,$$

where  $EFL_i$  is the input optic focal length in mm, 22.89 is the focal length of the eye in mm,  $M$  is the optic magnification factor, and the final 0.3 converts from cycles/mm on the retina to cycle/degree.

If the latter is true (it’s lp/mm on the retina), then the frequencies need only be multiplied by 0.3