Gain

Image Intensifier Tubes work by collecting low levels of light, amplifying them to levels that can be easily observed. The tube gain (which is also referred to as brightness gain or luminance gain) is the magnitude, or number of times the image intensifier amplifies the light input. Gain is calculated as the ratio of light output divided by light input and typically has a value[1] of 15,000 cd/m²/lx, with a maximum of 22,000 cd/m²/lx. In all night vision systems, the gain is reduced by the system's lenses and is affected by the quality of optics and filters, therefore system gain is an important measure of performance for the end user.

The typical ratio between tube gain and system gain, for a 1x magnification monocular, is given by $G_{tube} \approx 10 \times G_{system}$ where the gain of the system (G_{system}) is expressed in fL/fL and the gain of the tube (G_{tube}) in fL/fc (in CGS system, in lumen/lumen and cd/m²/lx respectively).

Tube gain should be set at a value that would best match the given night vision device in which it shall be integrated. Therefore tube gain is generally a characteristic to be set at the factory by the tube manufacturer as per the request of the Original Equipment Manufacturer of the NV device. Figures below show the difference of the image in the same NV device using a low gain tube and a high gain tube, in the same night conditions.

Advances

Low Gain

High Gain

Advances in tube gain have greatly expanded the mobility of the soldier by improving the speed and accuracy of night-time maneuverability. Survivability has increased with an improved ability to detect and recognize targets from a greater distance.