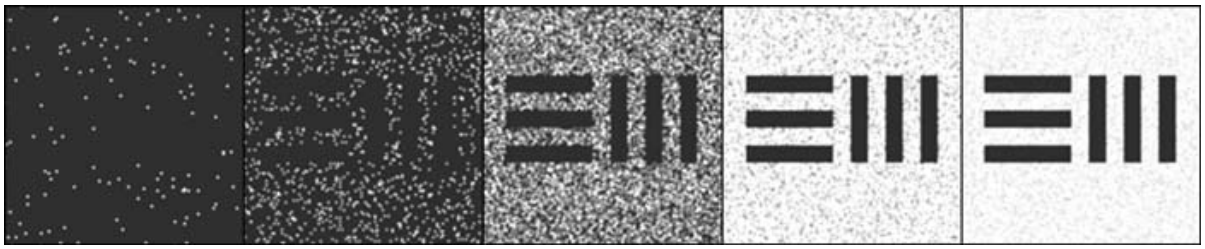
Signal-to-Noise Ratio (SNR)

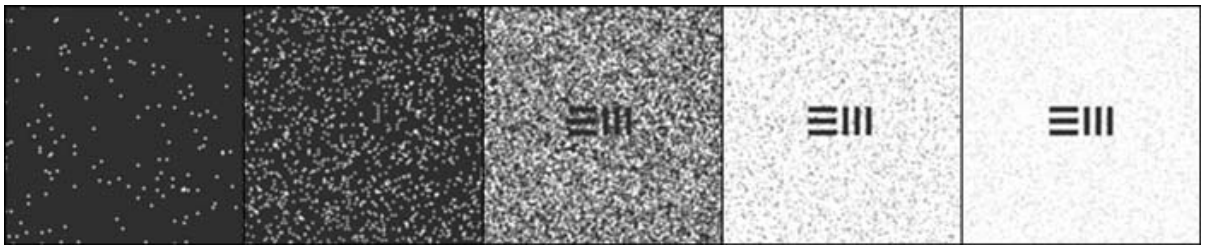
The **Signal-to-Noise Ratio (SNR)** is the key parameter to predict the performances of an I2 tube in **low light conditions**. In the lowest light conditions, the image quality is highly dependent upon the light level. When it is very dark (below highly overcast starlight), even with the best tubes there is almost no image and mainly noise scintillation. The SNR is a function of the light level; in order to compare tubes, the world standard is to measure the SNR at a given fixed light level of 108 µlx (in International Units) or 10-5 foot candle (in American Units).

At a given light level, the SNR characteristic quantifies how much the signal is corrupted by the noise introduced by the tube; and the lower that noise, the higher the SNR and the better the image.

In very simple terms, a tube with a SNR of 17 will show a very noisy image at overcast starlight compared to a tube with a SNR of 25 which would show a similar noise effect only at levels below highly overcast starlight, hence ten times lower at least.



A simulated larger target, approximately 20 lp/mm, intensified at v



A simulated smaller target of approximately 60 lp/mm, intensified at various light levels

Figure 1 shows an outdoor scene at low light level, seen through a NVG using a medium SNR I2 tube. In this case, the image is noisy with scintillation. The graininess of the image is due to a high level of noise randomly distributed in time and space when compared to the useful information in the image.

Figure 2 shows the same scene, using a high SNR I2 tube. The image is clearer; the information in the image is only slightly affected by the noise, which results in a higher definition of vision.

Figure 1 - Low SNR image

Figure 2 - High SNR image

As can be seen from these two figures, the I2 tube with the high SNR provides the difference between mere detection to recognition, giving the soldier a much clearer image with more details on the surrounding terrain as well as the detected threat.

For optimal vision, the selection of an I2 tube should be made by matching the SNR to the anticipated light levels found in the environment where they are to be used. In operational environments where it is almost certain that the light levels will never reach highly overcast starlight, then tubes with a minimum SNR of 20 such as the XD-4™ would perform well.

If light conditions could worsen or if the user does not want to compromise at all on image quality, then the highest SNR tube, together with a high resolution, should be selected. The PHOTONIS XR5™ range of products offer a minimum SNR of 25 and are today's unrivalled premium choice for modern armies and Special Operations Command.