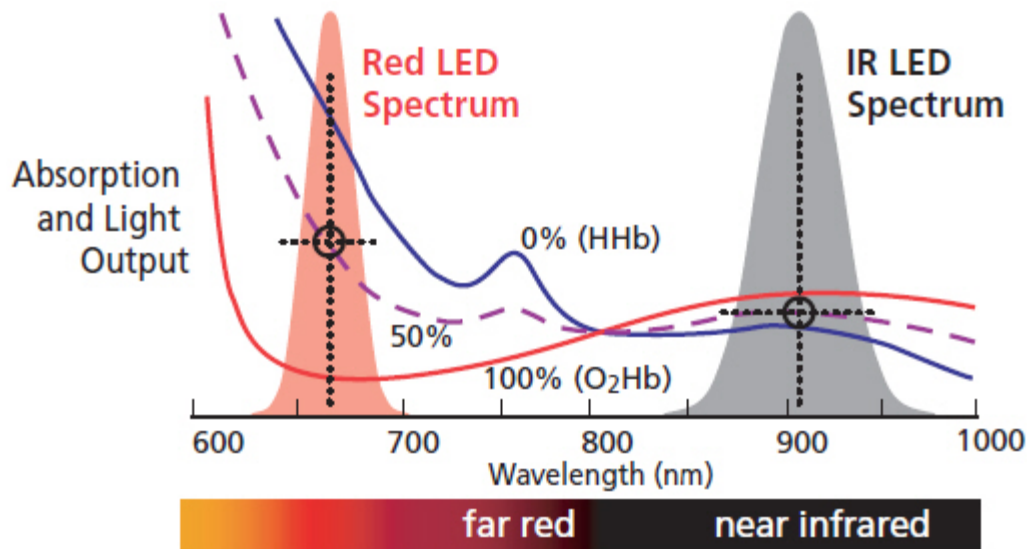


The following figure illustrates the relative light absorption spectra of oxygenated and deoxygenated haemoglobin with an overlay of the red (660nm) and infrared (900nm) light spectra emitted by the LEDs. The dashed purple line corresponds to a blood mixture that is near 50% oxygen saturation.

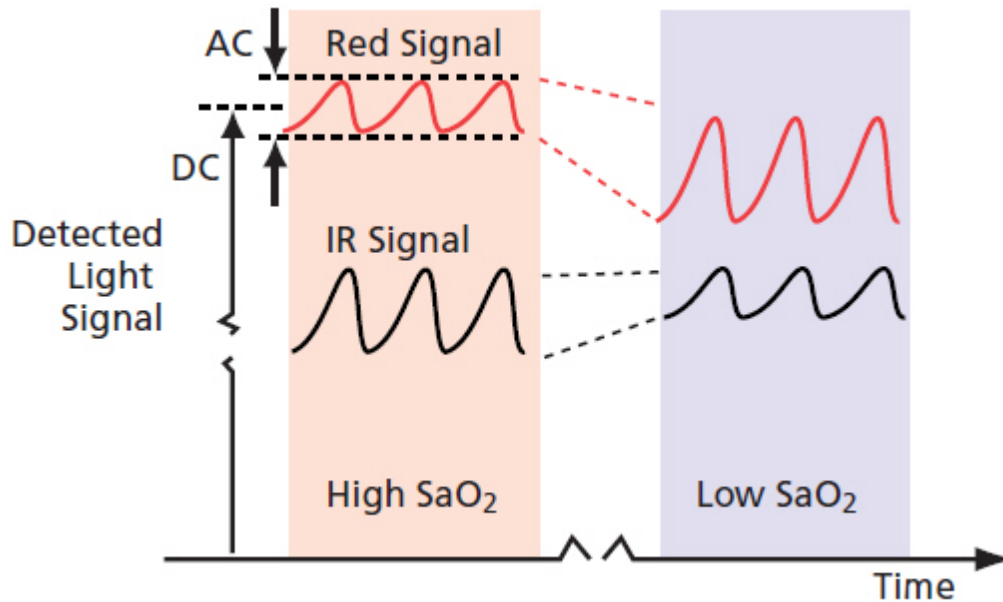


Reference: "A technology overview of the Nellcor OxiMax pulse oximetry system," Nellcor Puritan Bennet Inc., 2003

Oxygenated Haemoglobin absorbs less red light than infrared (IR) light and so the blood volume at high saturation has less impact on the detected red signal than on the IR signal. That is, the AC component of the Red Signal is smaller than that of the IR signal.

Deoxygenated Haemoglobin absorbs less IR light than red light and so the blood volume at low saturation has less impact on the detected IR signal than on the red signal. That is, the AC component of the IR signal is smaller than that of the red signal.

The below figure illustrated the red and IR light signals at high and low oxygen saturation. At high saturation, the red 'pulse amplitude' (AC/DC) is smaller than the IR pulse amplitude.



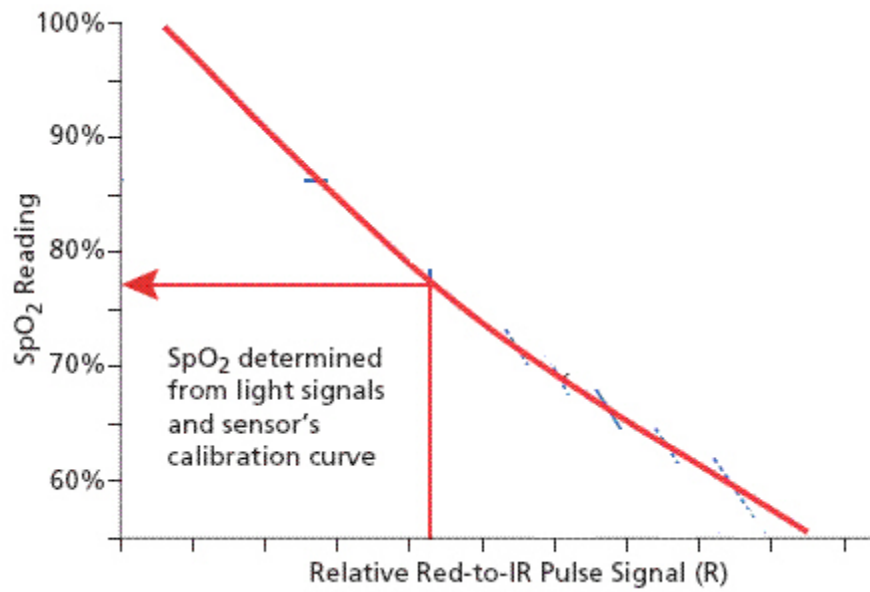
Reference: "A technology overview of the Nellcor OxiMax pulse oximetry system," Nellcor Puritan Bennet Inc., 2003

SpO2 estimation is based on computing the "ratio of ratios" or Pulse Modulation ratio R. In the context of Red and IR LEDs it is defined as:

$$R = \frac{\frac{AC_{red}}{DC_{red}}}{\frac{AC_{ir}}{DC_{ir}}}$$

where the AC component is defined as a peak-to-peak distance of the heart beat signal, and DC component is defined as the middle value between the min and max peaks as demonstrated in the previous figure.

The below figure illustrates the relationship between R and SpO2 that follows a smooth curve that serves as the sensor calibration curve.



Since the light absorption of the oxygenated and deoxygenated haemoglobin is significantly wavelength-dependent, the relationship between R and SpO₂ strongly depends on the specific emission characteristics of the sensor's LEDs. Accurate measurements of saturation require the sensor's calibration curve.