Carelight™ Weartech

Modelling light-tissue interaction

Optical sensing performance depends on how light travels through skin, blood and underlying tissue. Variations in tissue composition and skin tone can distort pulsatile signals and reduce measurement accuracy.

OPM applies tissue-aware light modelling to optimise signal capture across wavelengths and physiological states. The following section outlines how this approach is validated using pulsatile signal analysis and controlled oxygen desaturation data.

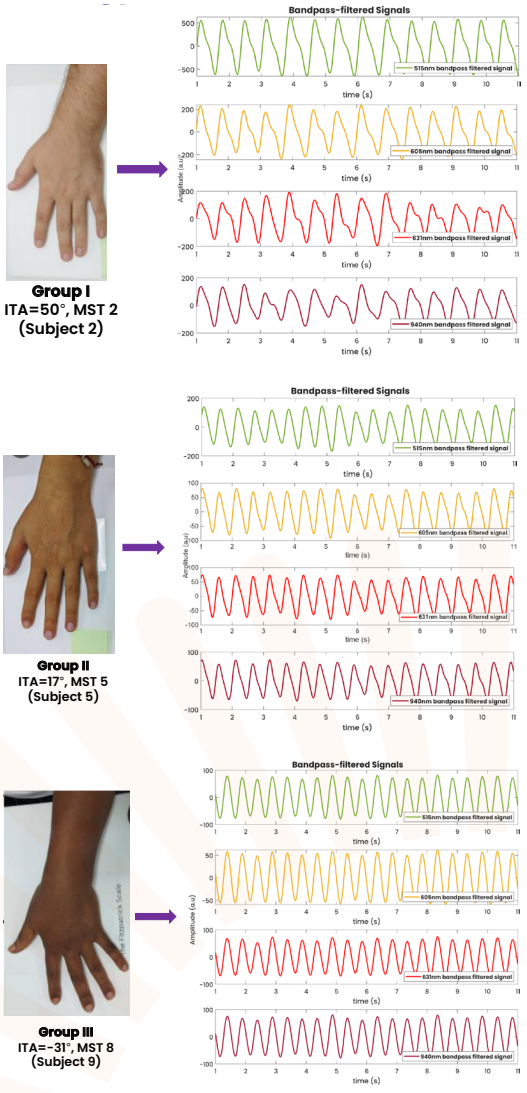
Tissue-aware light modelling

Carelight's OPM sensor technology applies spectral analysis and tissue-aware light modelling to account for how light interacts with skin, blood and underlying tissue. This approach enables optimisation of illumination and signal processing for individual users.

The proprietary optical design and user optimisation ensure pulsatile signal quality is maintained across the full skin tone range for all illumination wavelengths, including the red wavelength that is critical for reliable SpO_2 measurement. Stable pulsatile waveforms are observed across skin tone groups and wavelengths, as shown in the accompanying signal plots.

Signal accuracy for a wrist-worn Weartech device was evaluated in a controlled hypoxia study based on ISO standard 80601-2-61:2017 for pulse oximeters, with the protocol expanded to include 24 subjects evenly distributed across light, medium and dark skin tones.

Pulsatile signal quality across skin tone groups and illumination wavelengths.



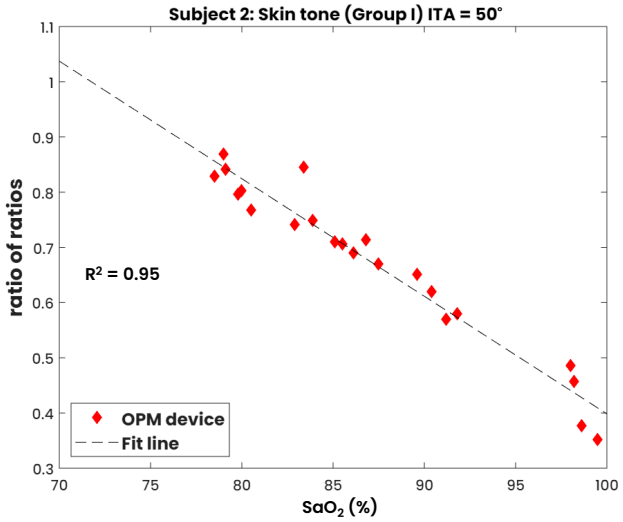
Group I
ITA=50°, MST 2
(Subject 2)

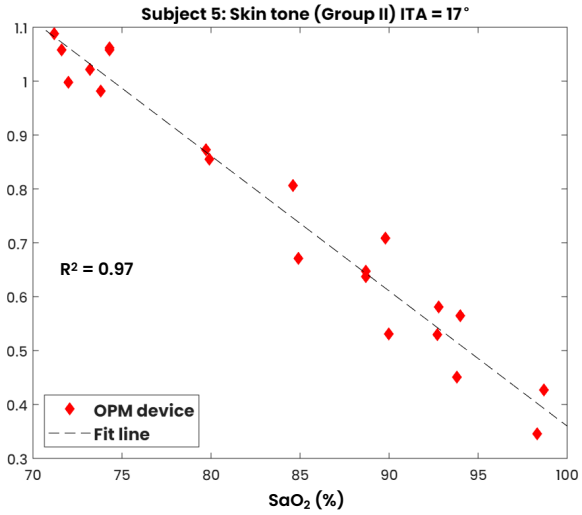
Group II
ITA=17°, MST 5
(Subject 5)

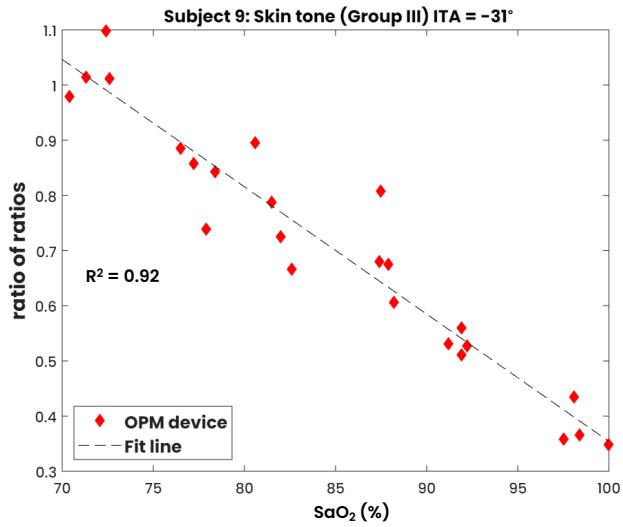
Group III
ITA=-31°, MST 8
(Subject 9)

Controlled oxygen desaturation performance across skin tone groups.

As demonstrated in the controlled desaturation data, Weartech devices detect peripheral blood perfusion variations with equivalent performance across all three skin tone groups, across four illumination wavelengths, and throughout the oxygen desaturation range from 100% to 70% as shown in the graphs here.







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