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A TEXTILE-BASED TISSUE OXYGENATION SENSOR USING MULTI-WAVELENGTH NEAR-INFRARED SPECTROSCOPY

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Sensawear is a University of Bern-spinoff collaborating with OST Buchs to commercialize near-infrared electronics to power a wearable, textile-based sensor for continuous tissue oxygenation (StO_2) monitoring for the prevention of pressure injuries developed during a SNF/Innosuisse Bridge Discovery grant. The in-herently-low emission power of a textile-based sensor requires high-output light sources and highly-sensitive photo detectors, while the use as a continuous monitor in healthcare requires low noise, repeata-bility, safety, and ease-of-use. The collaborative work has resulted in a functional demonstrator soon to be used for pilot studies, with measurement quality comparable to industry standard devices used for research purposes.

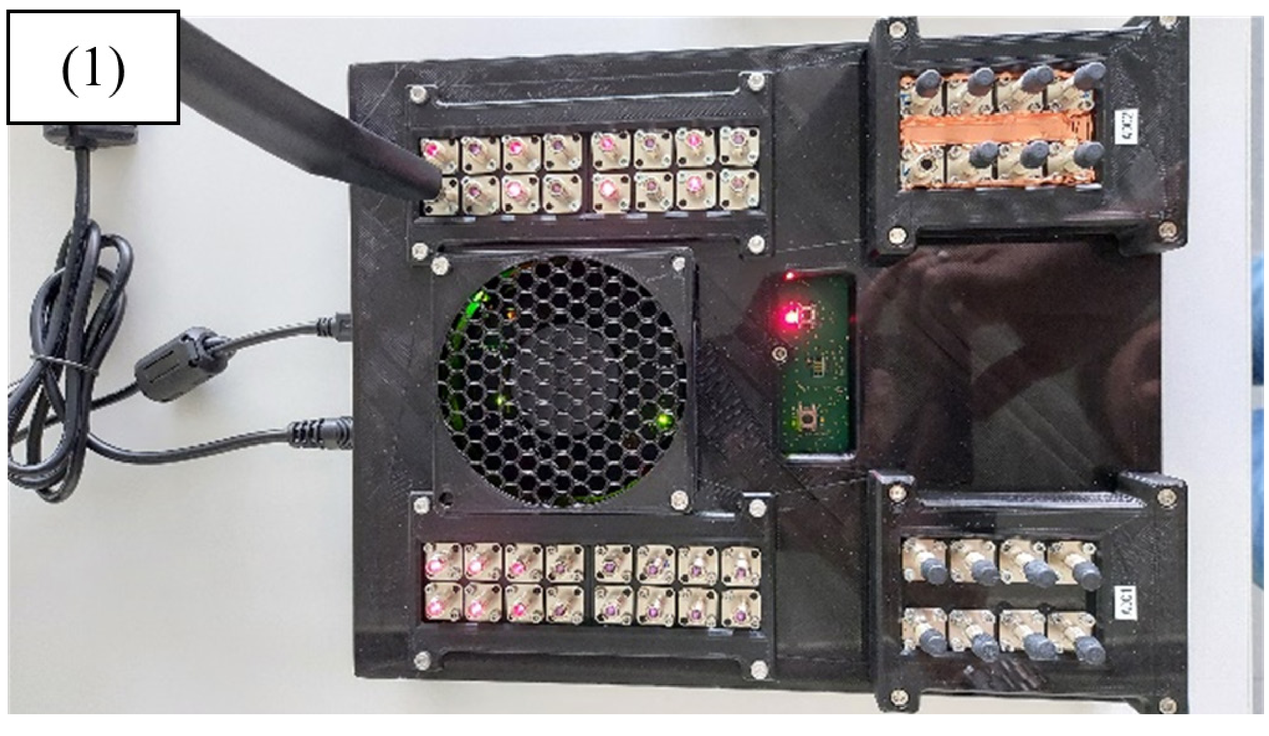

Figure 1: The ResearchBox uses high-powered LEDs as light sources and transmits light via optical fibers to the sensors in four different NIRS wavelengths, also optimized for increased StO_2 reconstruction.

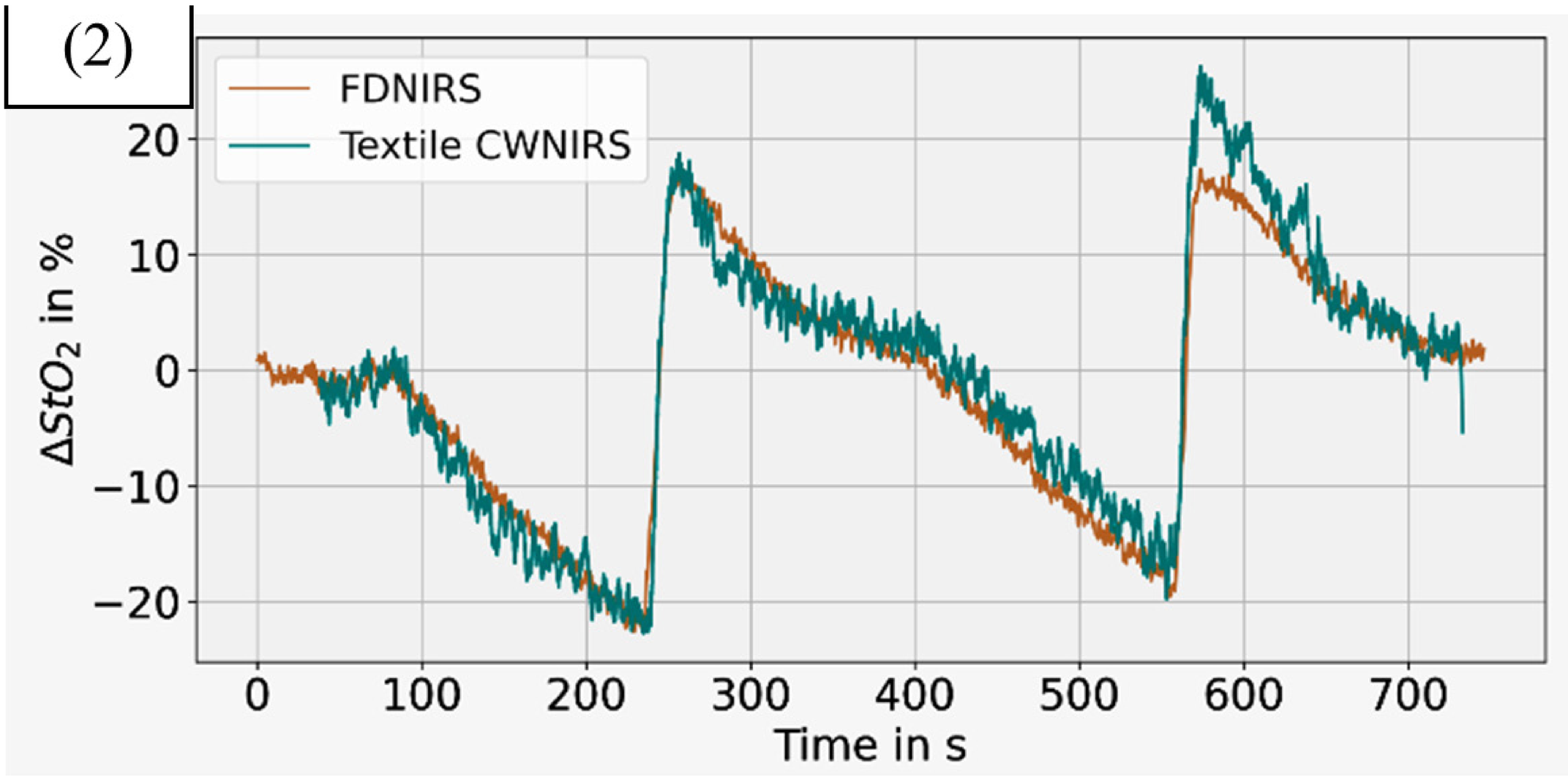

Figure 2: Initial testing of the ResearchBox when connected to the ProTex textile-based NIRS sensors showed strong performance over the measurement distances required for deep StO_2 monitoring. The high sampling rate allowed clean filtering while retaining near real-time monitoring of changes in StO_2. The ResearchBox's ambient light filtering algorithm kept signals constant regardless of environment, and thermal drift during measurement periods was minimal thanks to a cooling fan. Measurements of changes in StO_2 were precise and repeatable, with high accuracy when compared to an industry standard frequency-domain NIRS de-vice. sources and transmits light via optical fibers to the sensors in four different NIRS wavelengths, also optimized for increased StO_2 reconstruc-tion.