

Near Infrared Spectroscopy for paraplegics

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Motivation

- Each year, approximately 2.5 million patients develop pressure ulcers in acute care settings in the U.S.
- They impose \$9.1 to \$11.6 billion to the U.S. health care system each year.
- 6000 patients die per year due to pressure ulcer.
- They are open lesions and high risk for serious infection.
- 85% of paraplegics develop pressure ulcers in their lifetime.

*U.S. Department of Health & Human Services, Agency for health care research and quality



Figure 1. Pressure ulcer developed in a paraplegic patient. Picture credit: SPC

Hardware design

- 4 light paths,
- 2 different wavelengths (690 nm, 830 nm),
- 2 source-detector separations (SDS = 15 & 22 mm),
- PCB thickness: 0.8 mm,
- Dimensions:
 - (a): 8.5 * 12.2 mm
 - (b): 12.1 * 12.2 mm
 - (c): 6.8 * 12.2 mm

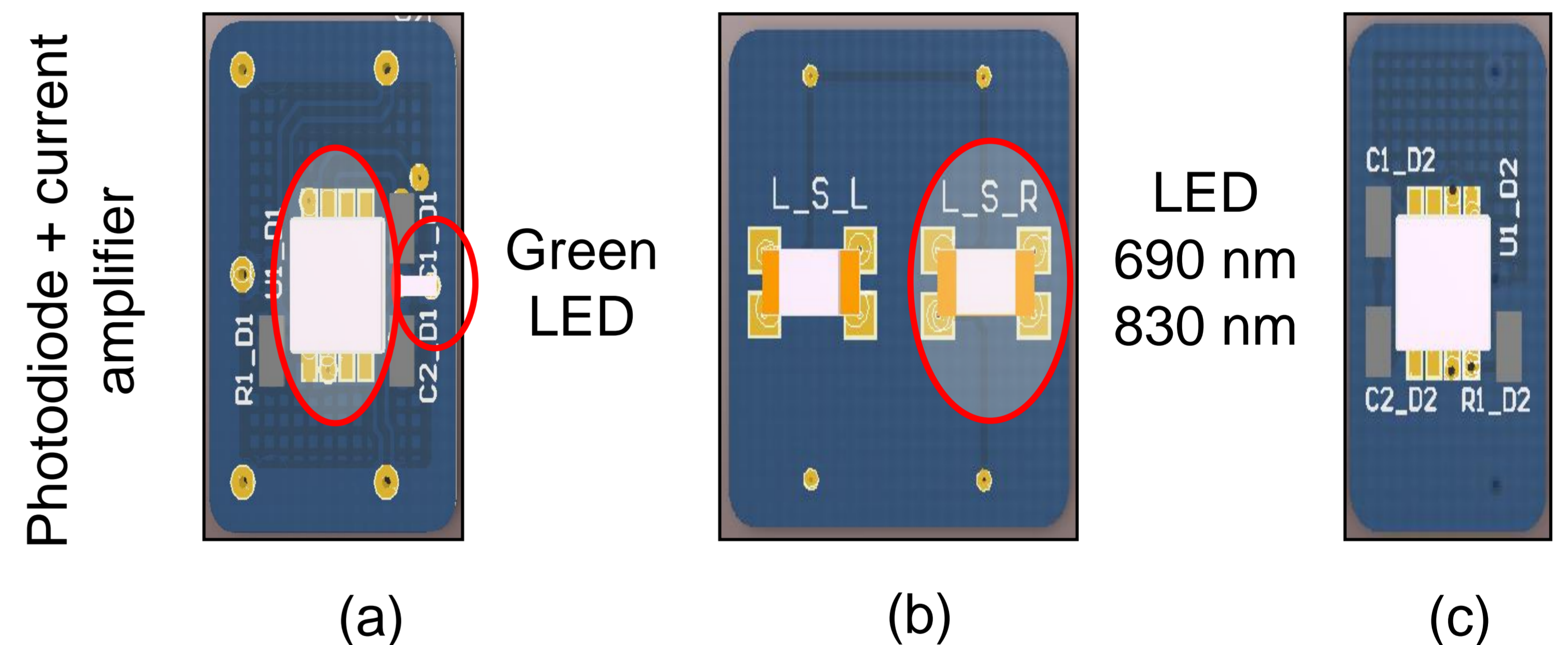


Figure 2. source (b) and detector (a,c) PCBs.

Integration into textile

Figure 3 shows the textile after connecting through its embedded connector to the electronics box and figure 4 shows the signal from the finger of a subject, recorded by the textile based NIRS.

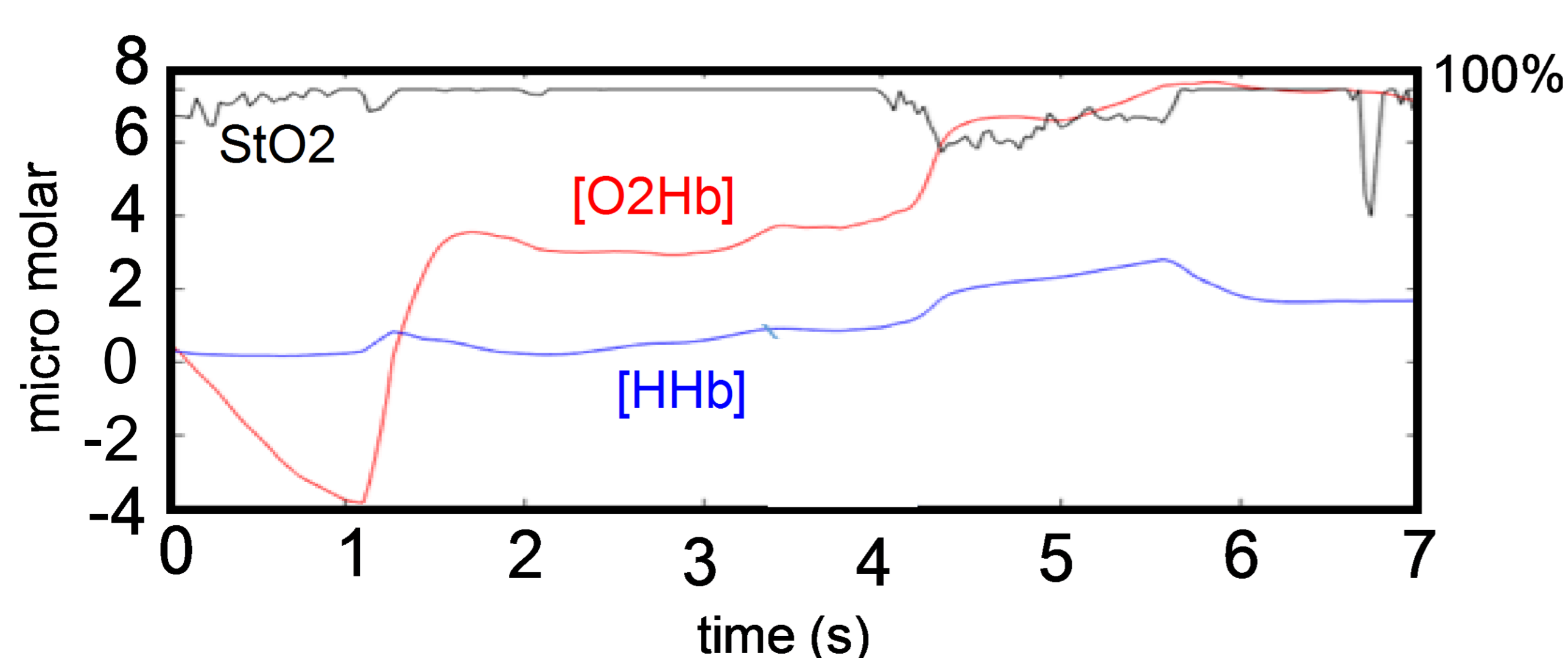


Figure 4. Signal recorded from the finger of a subject and corresponding [O₂Hb], [HHb], and StO₂.

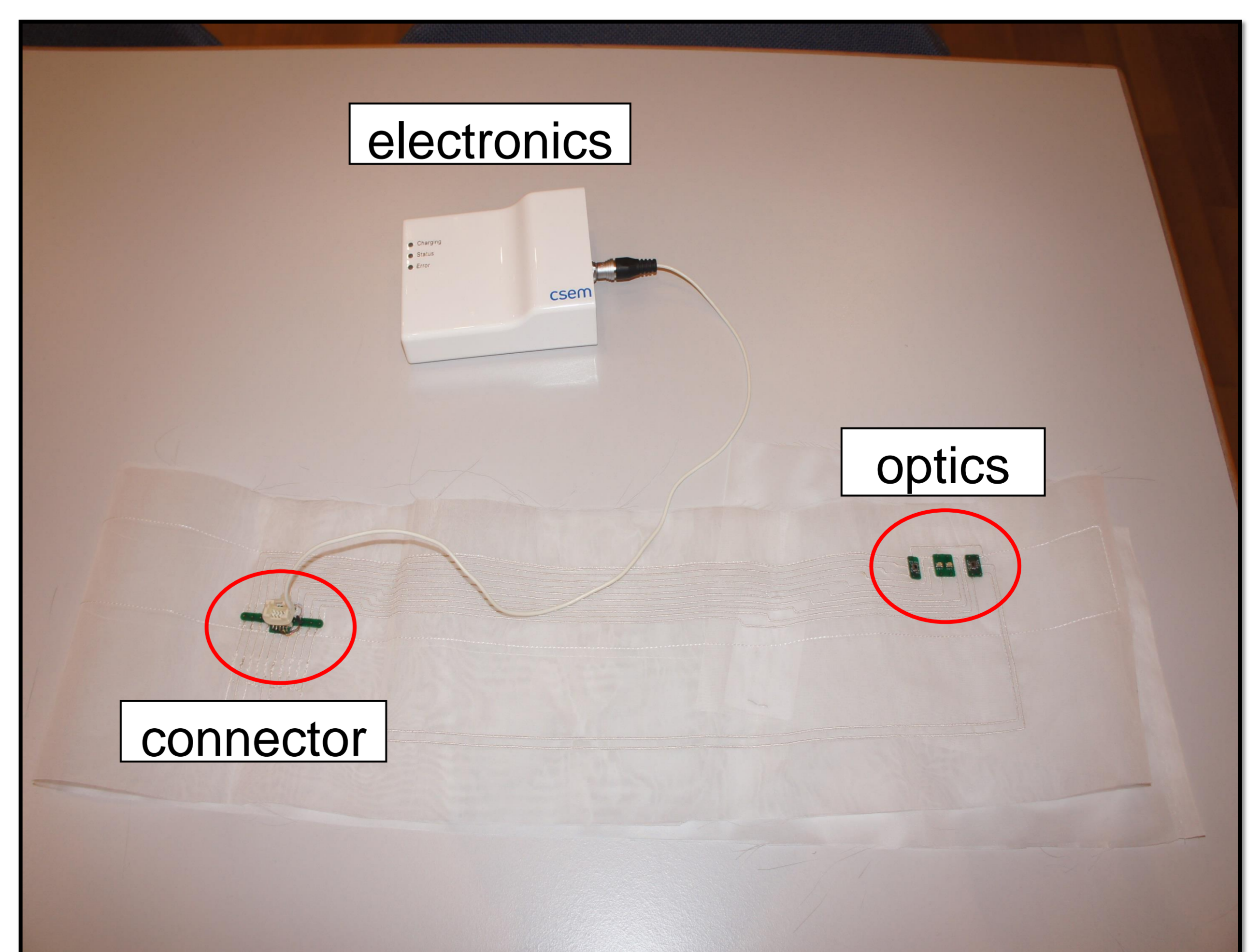


Figure 3. NIRS textile connected to the electronics box.