Learning from our bodies
How SoftPulse® electrodes can augment user devices with bio-potential detection

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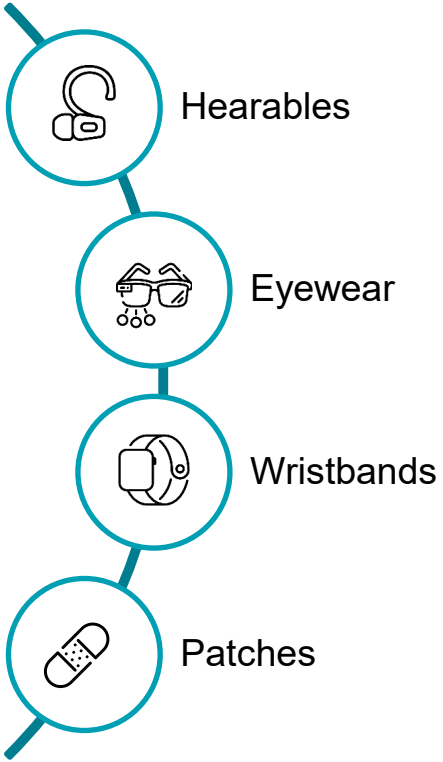
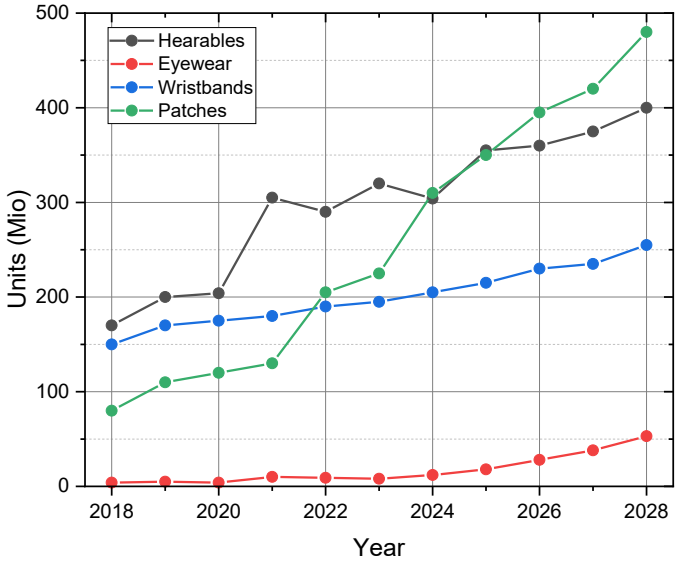
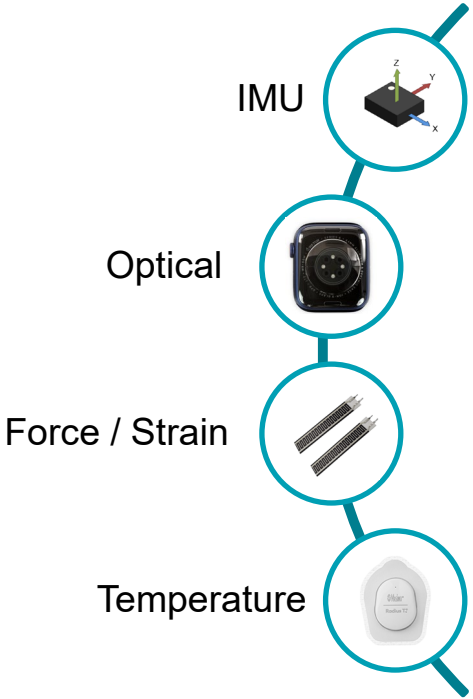
Wearables

Where do we stand?





Ref: WT | Wearable Technologies (2024)



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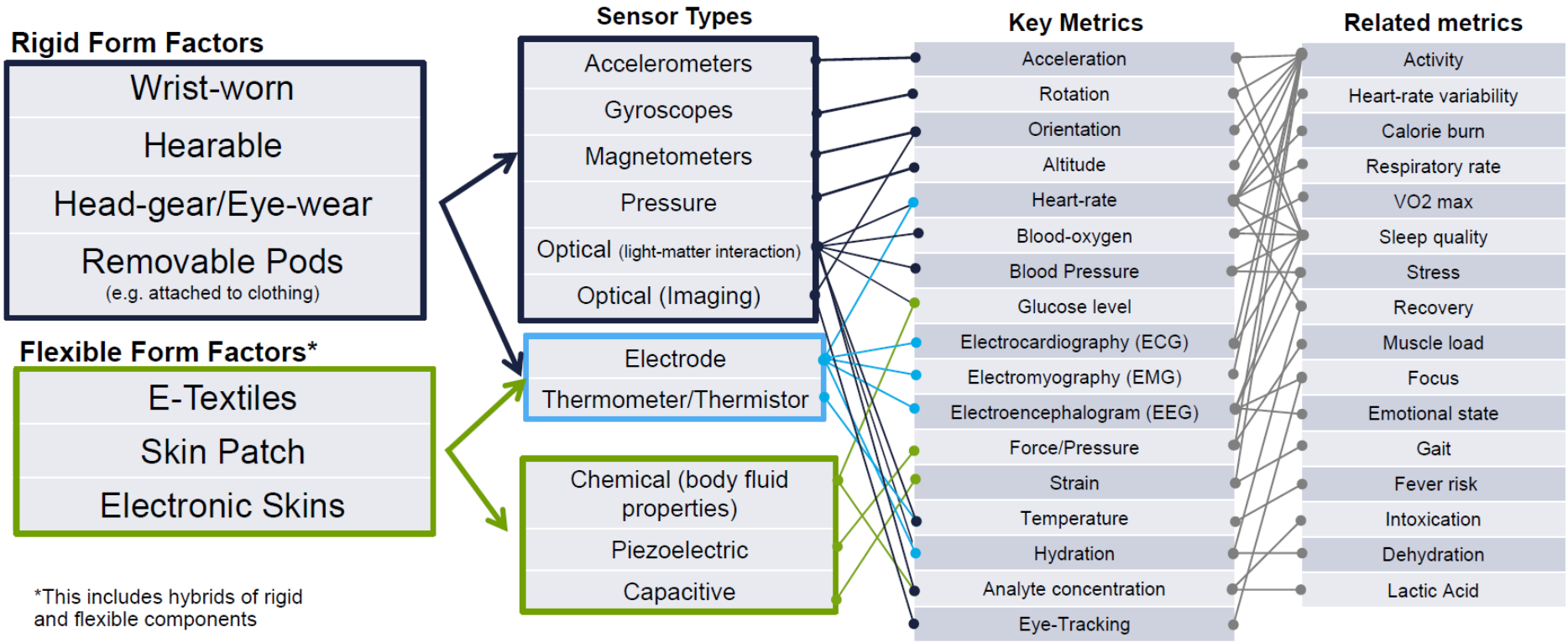

Ref: IDTechX Research "Wearable Sensors 2023-2033"

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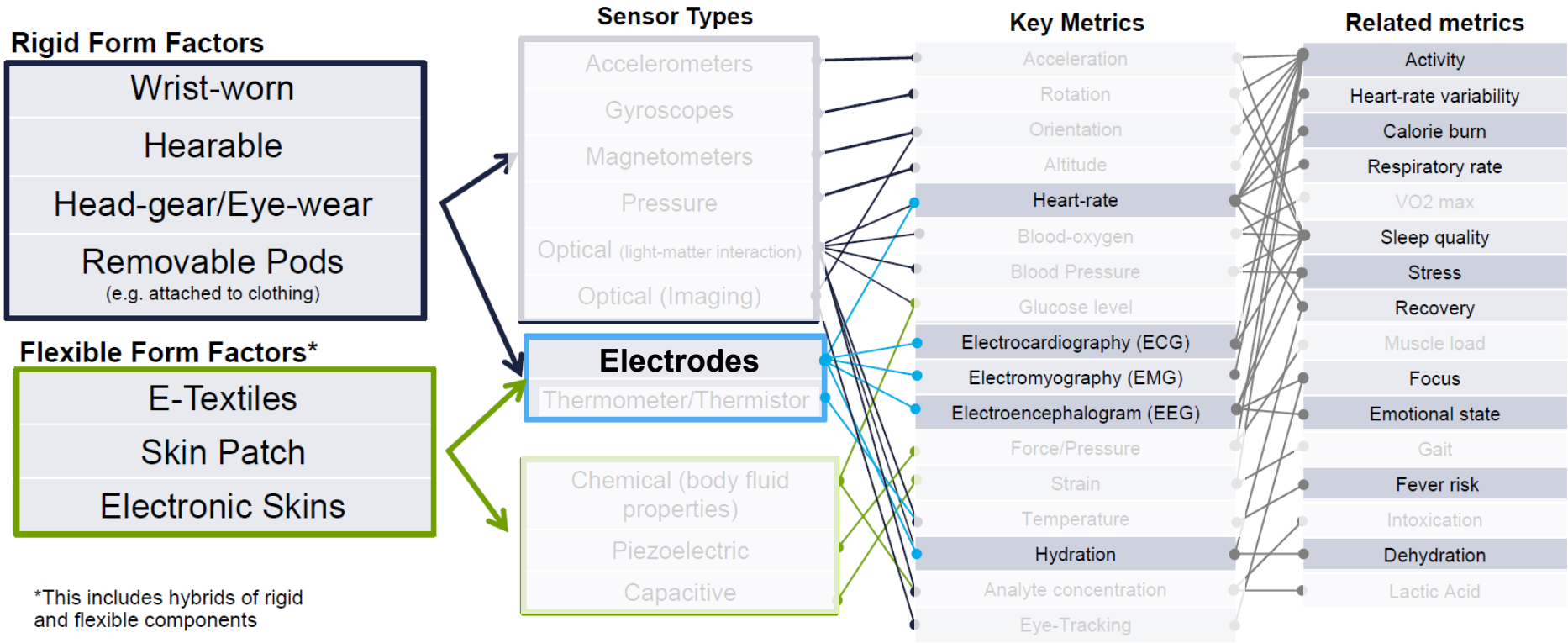

Ref: IDTechX Research "Wearable Sensors 2023-2033"

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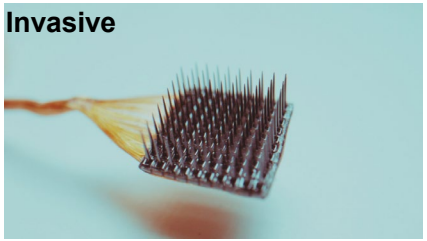
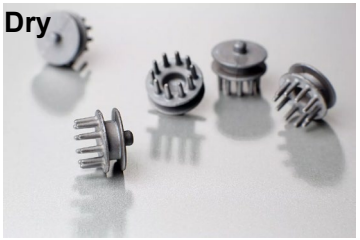
Electrodes

Types & Requirements

Electrodes for biopotential sensing are sensors that detect and measure electrical signals generated by biological activity by creating an interface between the body and electronic equipment.

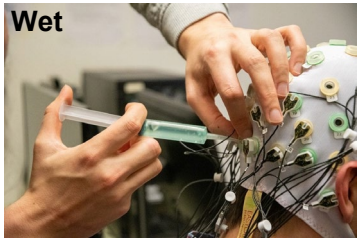


Ref: https://blackrockneurotech.com/products/neuroport-array/

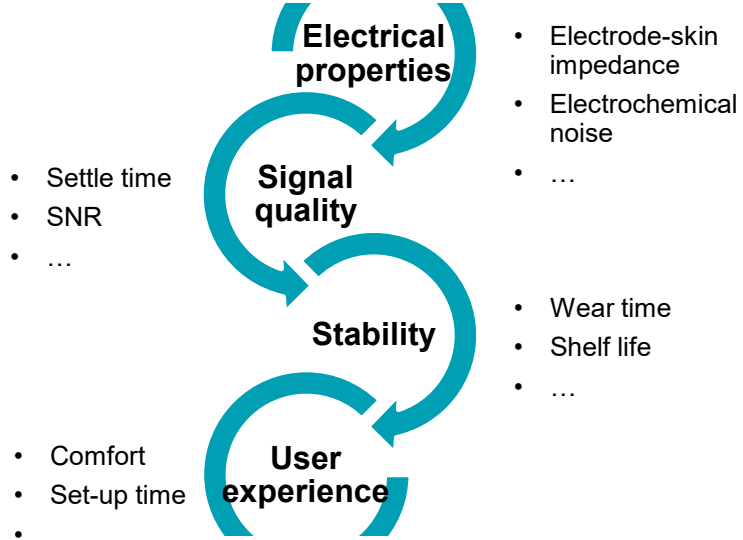


Ref: https://www.neuroelectrics.com/solutions

Ref: https://www.cadwell.com/electrodes-accessories/



Ref: https://imotions.com/blog/learning/best-practice/eeg/



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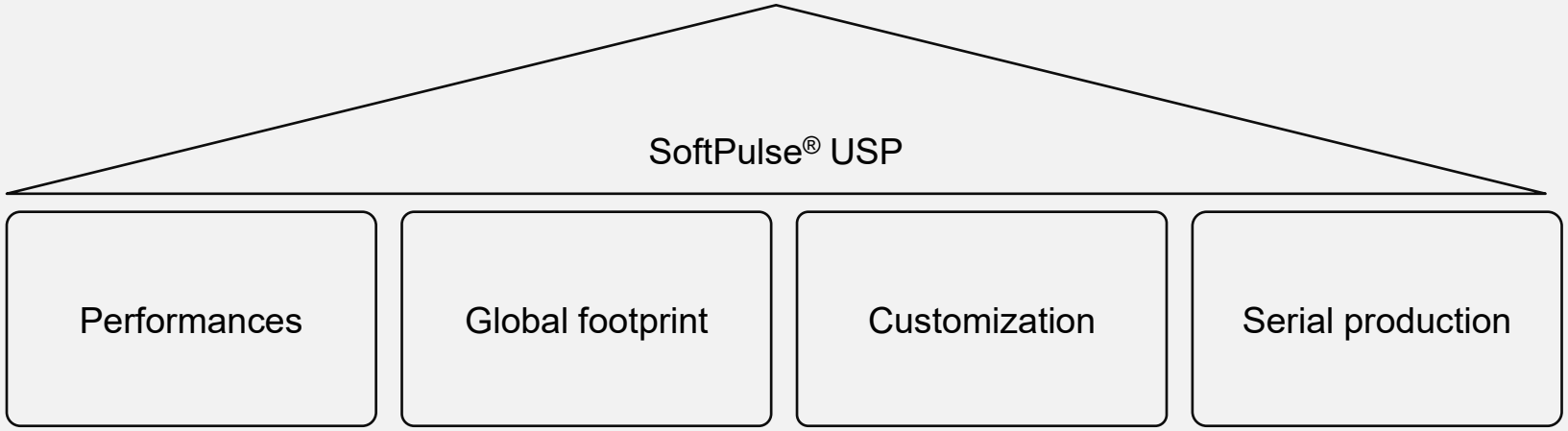
SoftPulse® electrodes – best-in-class solution for comfortable and dry bio-signal acquisition

- Latex-free elastomer based
- Soft feeling
- High electrical conductivity
- No skin preparation required

- No need of gel for signal acquisition
- Biocompatible
- Customized designs possible
- Production from prototype to serial volumes


SoftPulse® USP
Performances
Global footprint
Customization
Serial production

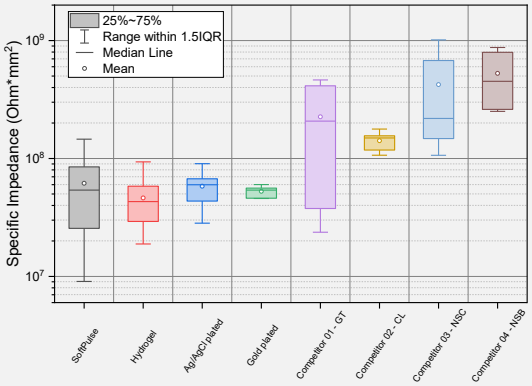
SoftPulse® USP

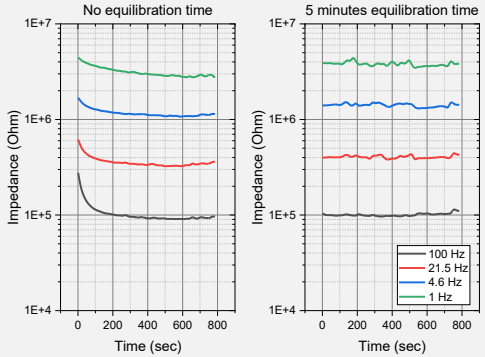
Performances

Global footprint

Customization

Serial production





- Low electrode-skin impedance (ETI)
- ETI comparable to alternative technologies
- Short equilibration time
- Low modulus for highest comfort

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SoftPulse® USP

Performances | **Global footprint** | Customization | Serial production

- > 1’000 global customers
- > 1’100 Mio CHF yearly revenue
- > 8’000 associates worldwide
- > 25 production site
- > 100 million components per day

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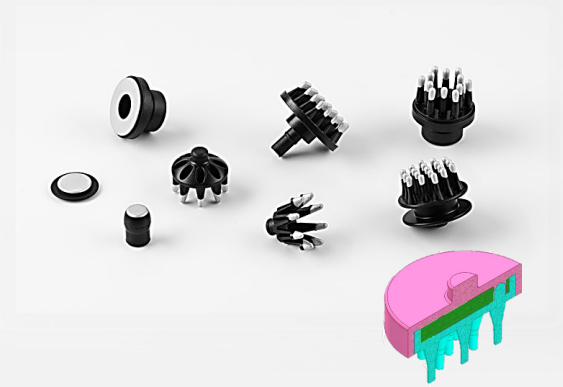
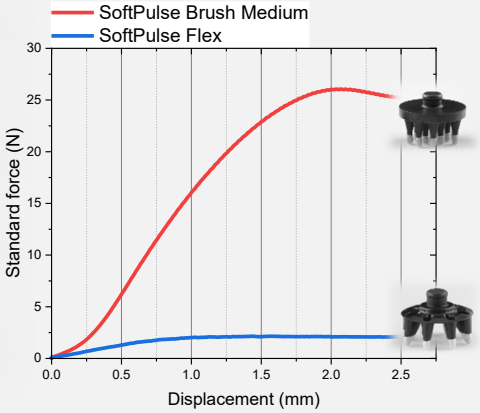
SoftPulse® USP

Performances | Global footprint | **Customization** | Serial production





- Extreme design flexibility
- Specific physical behaviours for special designs
- Combination of multiple materials
- Integration of electrical components

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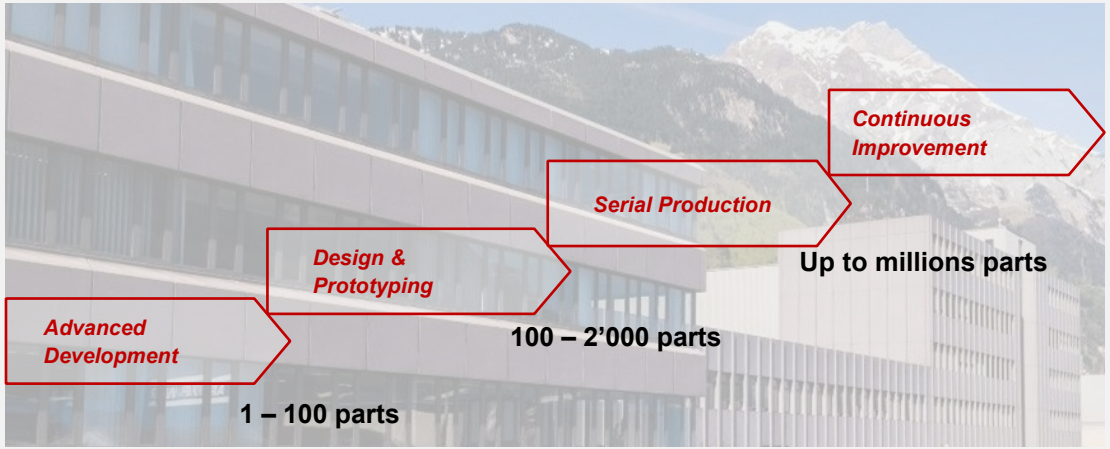
SoftPulse® USP

Performances

Global footprint

Customization

Serial production



- Access to automotive production facilities
- Certified quality system
- Flexible production concept from idea to serial volumes
- In-house tool shop

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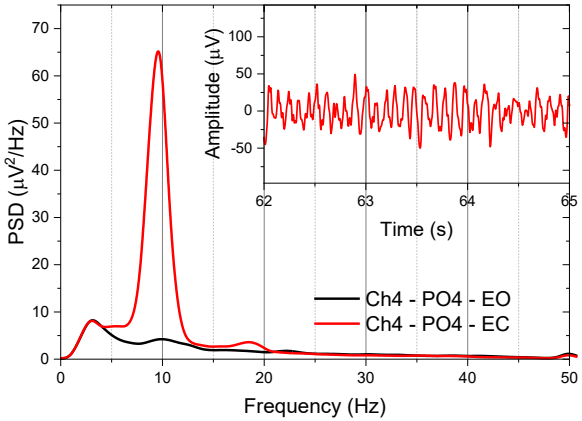
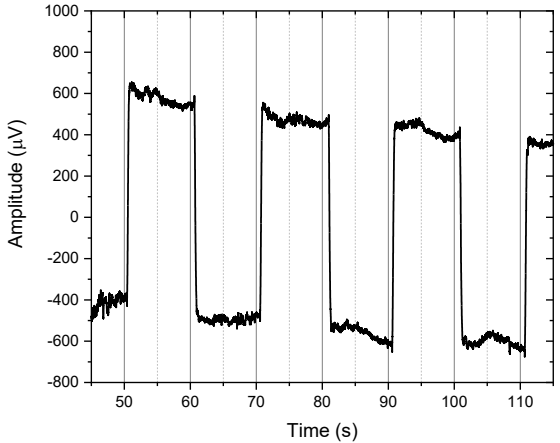
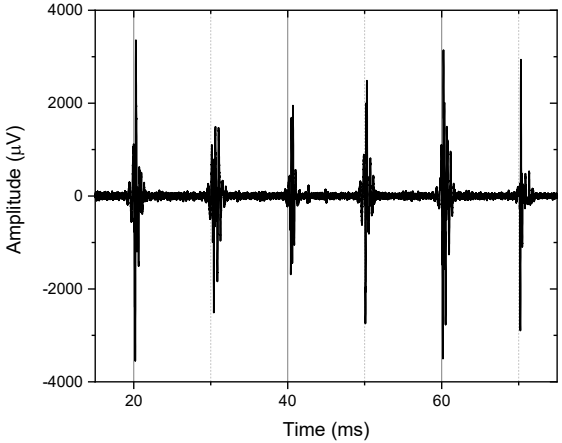


EEG

EOG

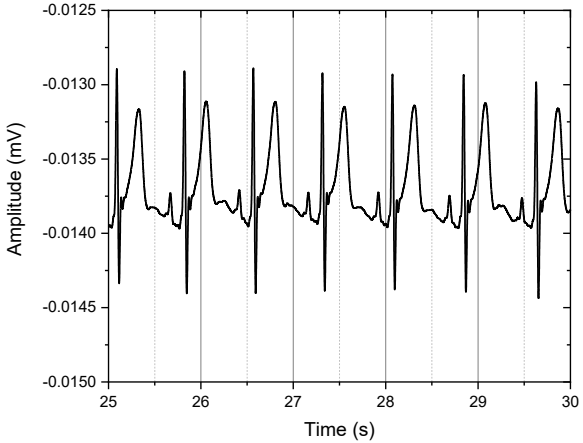


SoftPulse® have been successfully validate for the most common protocols for bio-signal acquisition

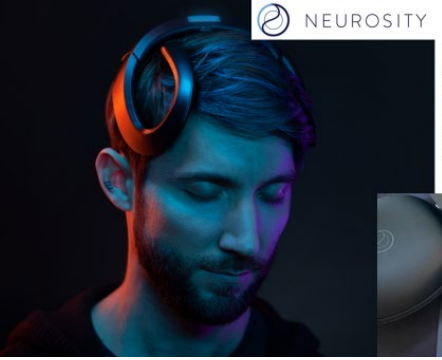


EMG

ECG



NEUROSITY



"The Crown helps you boost your brain's concentration by measuring your brain waves and playing music that increases your focus."

Standard SoftPulse® electrodes to easily access serial volumes.

WISEAR

"Earphones powered by neural interface offering full hands-free and voice-free control of any XR device."

SoftPulse® In-ear electrodes for best contact in the ear canal.

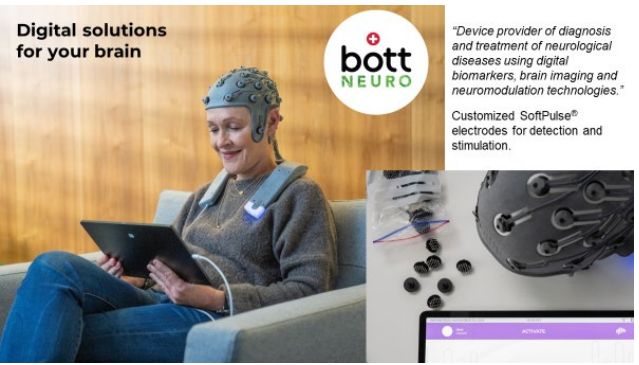
Bambi Medical

"The Bambi Belt - skin-friendly wireless vital signs monitoring for neonates."

Customized SoftPulse® design to achieve maximum comfort.

Digital solutions for your brain

bott NEURO



"Device provider of diagnosis and treatment of neurological diseases using digital biomarkers, brain imaging and neuromodulation technologies."

Customized SoftPulse® electrodes for detection and stimulation.

NAQI LOGIX

"technology platform that transforms inconspicuous micro-gestures into a nearly limitless set of commands to control all the devices where we work, live, or play."

Customised, multi-components SoftPulse® In-ear electrodes for biopotential detection.

"Axon is a cutting-edge neurofeedback device designed for home use, providing a drug-free and side-effect-free solution for chronic pain relief."

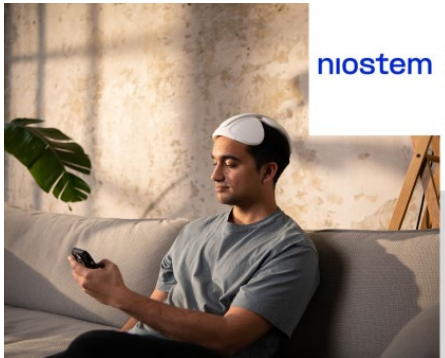
Standard SoftPulse® electrodes for performances and fast set-up time.

exsurgo

Brainhero
Be your own hero

"Treat symptoms of autism or ADHD. From home."

Standard SoftPulse® design for home use at scale.



niostem

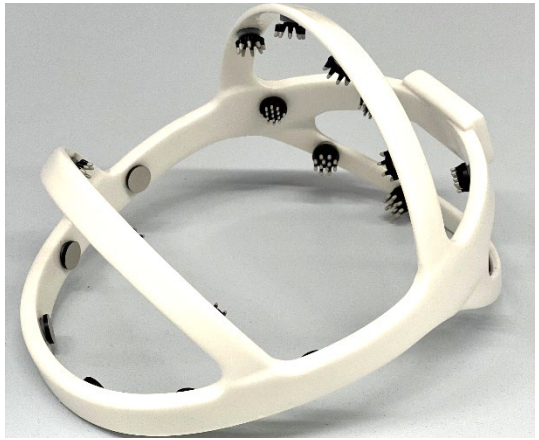
"First device to reverse hair loss through Stem Cell Reactivation Technology (SCRT)"

Newly designed SoftPulse® Flex for best performances and improved comfort.

HEADSAFE

"Nurochek is an FDA-cleared medical device that provides an objective concussion assessment in just 2 minutes."

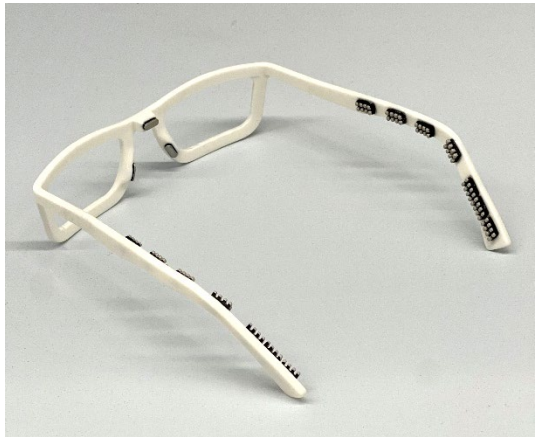
Standard SoftPulse® electrodes for best performances and scalability.



Headsets

Headbands

Wristbands



Glasses

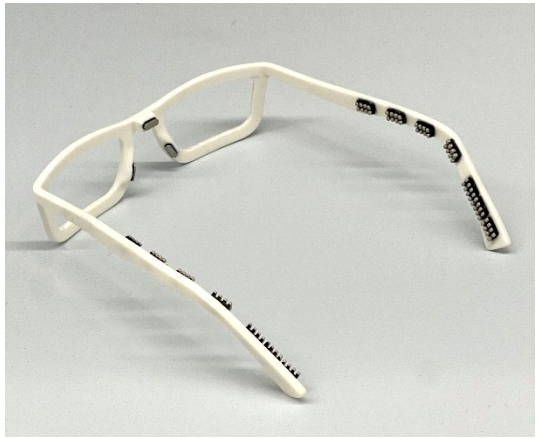
Earbuds

Watches

Headsets

Headbands

Wristbands



Glasses

Earbuds

Watches

SoftPulse® for earbuds

ULTEEMear validation

BLE data streaming and download

Single-channel EEG acquisition (80601-2-26 compliant)

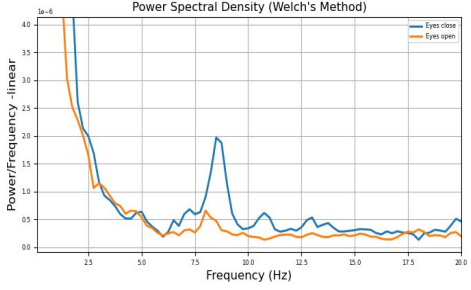
USB recharge and download

SoftPulse® In-ear & Flat dry electrodes

CSEM's active dry electrode technology

Alpha waves

Closed and open eyes states for 80 seconds each. A strong increase for the alpha band is evident when the subject was instructed to close the eyes.



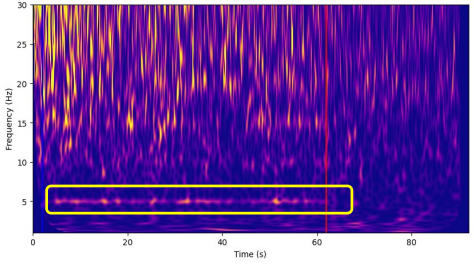
Auditory Steady-State Responses (ASSR)

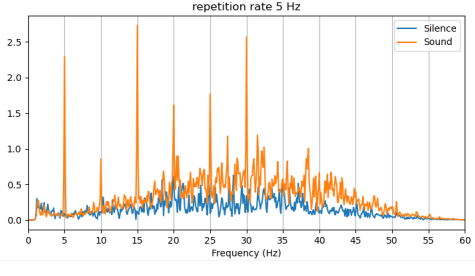
60 seconds of repeated bursts of white noise

- 100 / 125 ms of noise
- 100 / 125 ms of silence (repetition rate of 5 / 4 Hz)

30 seconds of silence

Streamed data and power spectra show the presence of clear evoked signals at the expected frequencies.





SoftPulse® for earbuds

Cognitive engagement with ULTEEMear

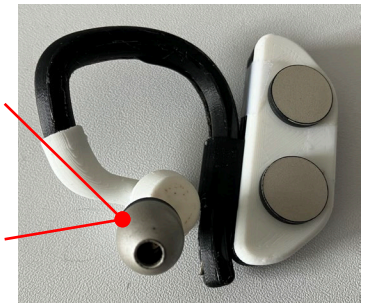
BLE data streaming and download

Single-channel EEG acquisition (80601-2-26 compliant)

USB recharge and download

SoftPulse® In-ear & Flat dry electrodes

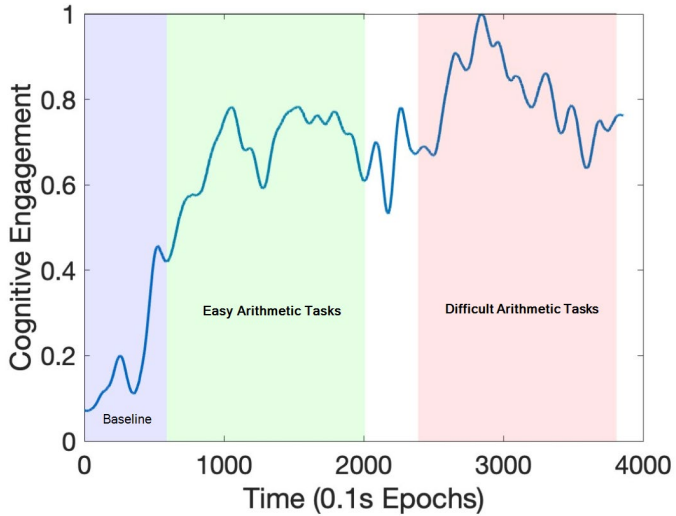
CSEM's active dry electrode technology



Cognitive engagement

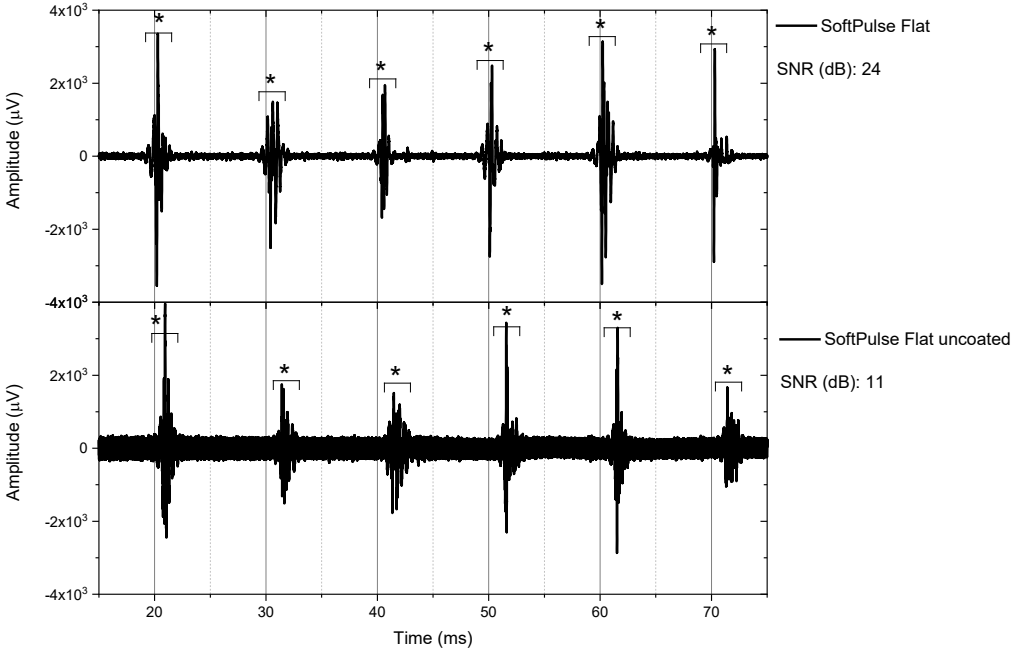
The participant first completed a baseline measurement by calmly looking at a fixation cross. Following this, they performed two blocks of mental arithmetic tasks with increasing difficulty.

The graph depicts changes in EEG frequency power, reflecting the participant's cognitive engagement as they transitioned from baseline to increasingly challenging mental tasks.



SoftPulse® for wristbands

Gesture recognition with STM technology



EMG detection

SoftPulse® electrodes can be reliably used to detect EMG from different body locations.

SoftPulse® Dome have been integrated with STM components to detect hand gesture from a wristband device.

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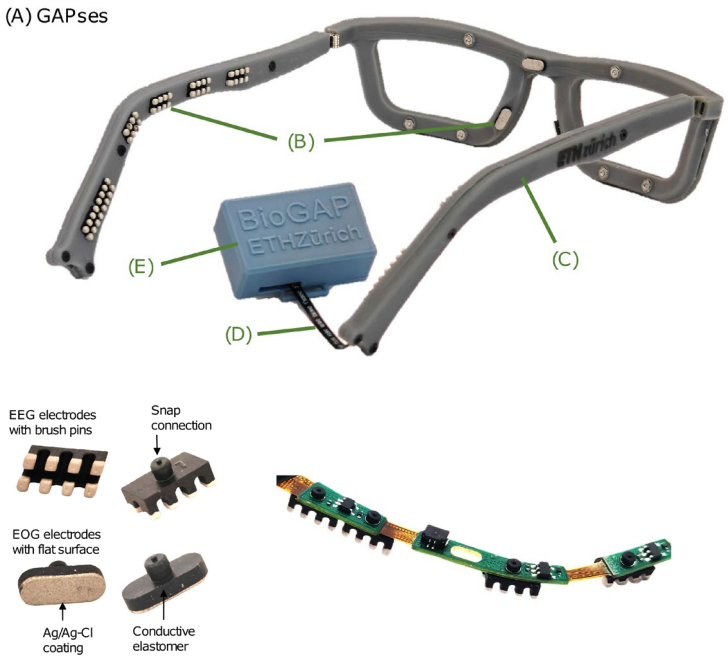
SoftPulse® for smart-glasses

GAPses validation



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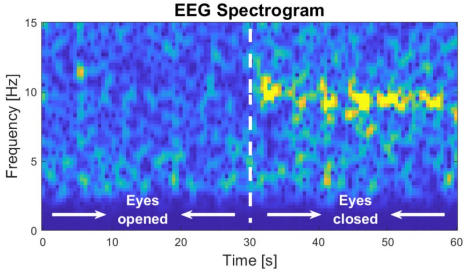
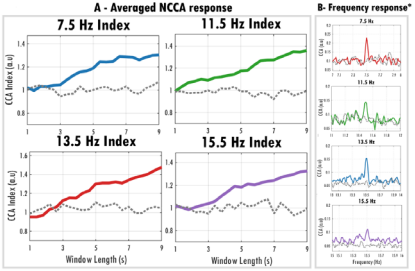


SSVEP

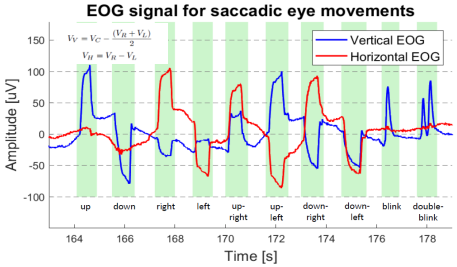
Frequency-and-phase-locked EEG response to repetitive visual stimuli.

Stimuli, consisting of sinusoidal on-off patterns with 100% contrast.



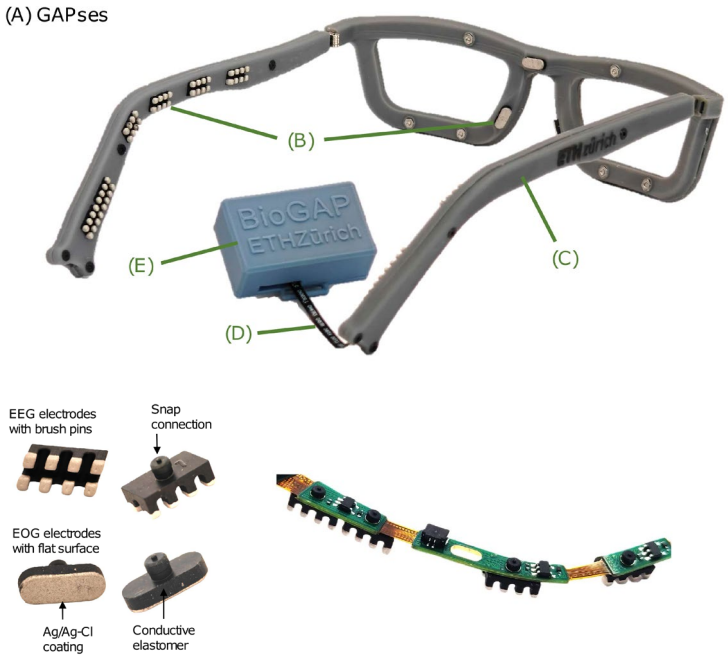
EOG classification

The classification task is based on a modified version of the EPIDENET network, adapted to EOG signals. Classification accuracy while walking (91.2%) and in rest condition (97.4%)



SoftPulse® for smart-glasses

User identification with GAPses



BrainMetrics

We trained a dedicated model for each subject, specialized in identifying whether the EEG signature belongs to the particular subject it's trained on.

BRAINMETRICS ACCURACY, SENSITIVITY AND, SPECIFICITY SCORES FOR SUBJECT-SPECIFIC MODELS.

Metric	Subject	Mean (8 channels)	Mean (4 Channels)
Accuracy	S0	99.91 ± 0.04	99.93 ± 0.05
Accuracy	S1	99.57 ± 0.15	99.57 ± 0.15
Accuracy	S2	99.89 ± 0.04	99.89 ± 0.04
Accuracy	S3	99.84 ± 0.14	99.84 ± 0.14
Accuracy	S4	99.32 ± 0.16	99.30 ± 0.12
Accuracy	S5	99.92 ± 0.07	99.91 ± 0.10
Accuracy	mean	99.74 ± 0.11	99.74 ± 0.11
Sensitivity	S0	99.74 ± 0.19	99.79 ± 0.22
Sensitivity	S1	99.80 ± 0.20	99.80 ± 0.21
Sensitivity	S2	99.36 ± 0.25	99.27 ± 0.24
Sensitivity	S3	98.07 ± 1.83	98.07 ± 1.83
Sensitivity	S4	96.76 ± 0.96	96.51 ± 0.96
Sensitivity	S5	99.49 ± 0.29	99.49 ± 0.29
Sensitivity	mean	98.87 ± 0.87	98.82 ± 0.87
Specificity	S0	99.96 ± 0.05	99.98 ± 0.04
Specificity	S1	99.48 ± 0.14	99.48 ± 0.14
Specificity	S2	99.98 ± 0.04	100.00 ± 0.00
Specificity	S3	99.97 ± 0.04	99.97 ± 0.04
Specificity	S4	99.79 ± 0.09	99.81 ± 0.11
Specificity	S5	99.97 ± 0.07	99.95 ± 0.10
Specificity	mean	99.86 ± 0.08	99.87 ± 0.09

- SoftPulse® electrodes are **best-in-class solution for dry comfortable detection of biopotential**
- With Dätwyler **global presence** and **capabilities in engineering**, SoftPulse® are ready for global market
- Thanks to our customization opportunities, **SoftPulse® can be integrated in any wearable device**

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