ESSILOR Smartglasses

Development Goals for EEG Smart Glasses

- **Active EEG Electrodes**
  - It improves signal quality with **less noise** and **in-situ amplification** for more accurate brain activity monitoring.
  - **Evaluate different electrode materials** such as conductive printed elastomeric electrodes, or advanced materials like graphene, to optimize signal quality, comfort, and manufacturing scalability.
- **PPG Nosepad Sensor**
  - Integrate a **PPG sensor in the nosepad** to enable further feature extraction from a stable facial contact point.
- **Frontal Reference Electrode**
  - Position the **reference electrode at the front** of the frame for consistent and low-impedance referencing (temporal electrodes will become crucial for neural information)
- **EOG Electrodes (Optional)**
  - Explore the integration of EOG electrodes for eye movement tracking, depending on technical feasibility and alignment with Essilor’s eye-tracking roadmap. This feature may be omitted if alternative eye-tracking technologies are provided by Essilor.
- **Bone Conduction Audio**
  - Add **bone conduction technology** for discreet, open-ear audio playback (e.g., for future project **HABS music)**

Development Goals for EEG Smart Glasses

- **Miniaturized Electronics**
  - Miniaturize the PCB and processors to ensure seamless integration into the temple arms of the glasses, preserving comfort, aesthetics, and wearability.
  - Local storage to ensure privacy. Communication via wifi or Bluetooth to retrieve data
- Enable on-device processing of EEG and PPG data to reduce communication latency, enhance real-time responsiveness, and ensure sensitive data is processed locally instead of being sent externally.

Key points target

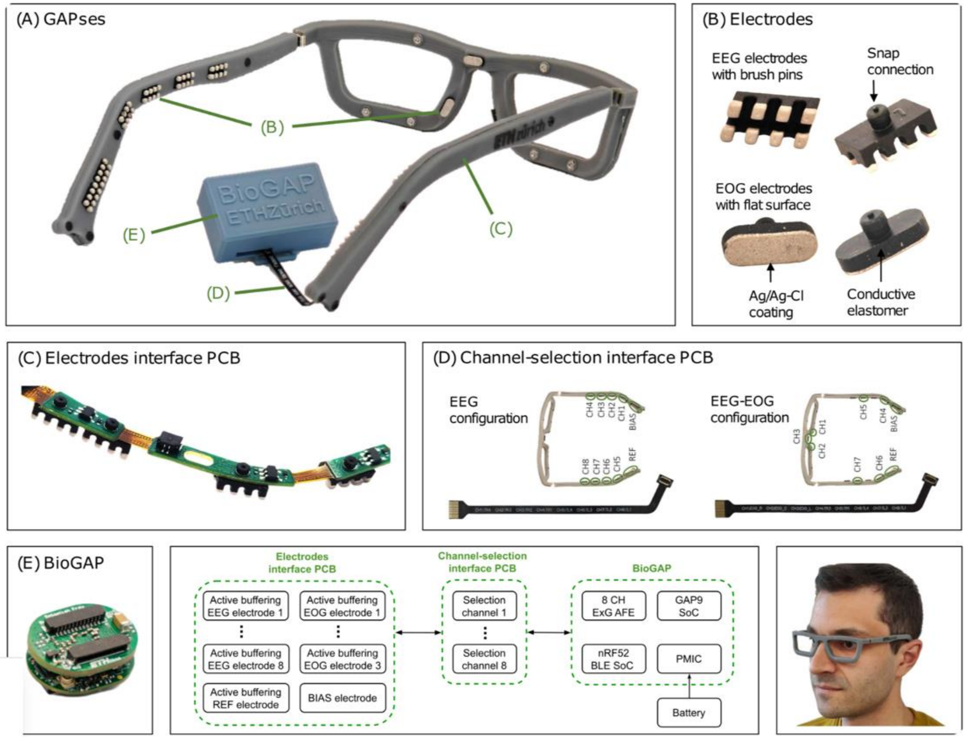
Ergonomics
Weight
Comfort
Aesthetics
Durability

Performance
Good signal
Accurate positioning of electrodes
Electronics integration

Communication
On device data processing
Storage
Safety and privacy

- **Which processes is HABS involved in?**
- **What level of decision-making authority does HABS have?**
- **How much internal development is handled by Essilor?**
- **Is HABS responsible only for software, or also hardware?**

Gapses



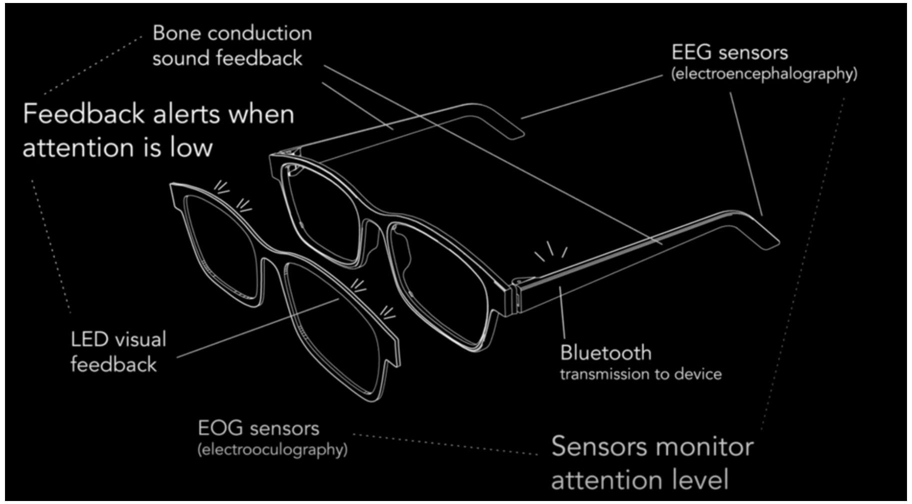
Custom Dry Electrodes: Made from conductive elastomer with silver-silver chloride coating, allowing extended wear without gels or skin irritation. Flat electrodes for EOG, brush-style for EEG to penetrate hair and ensure skin contact.

BioGAP Platform: Features two SoCs—GAP9 for DSP and machine learning, and a Nordic BLE chip—plus the ADS1298 AFE, enabling 24-bit resolution across up to 8 EEG channels.

On-Edge Processing: The GAP9 RISC-V processor enables local signal processing, enhancing privacy and reducing wireless transmission. Includes smart power management (clock gating, voltage scaling) for extended battery life.

S. Frey et al., "GAPses: Versatile Smart Glasses for Comfortable and Fully-Dry Acquisition and Parallel Ultra-Low-Power Processing of EEG and EOG," in IEEE Transactions on Biomedical Circuits and Systems, vol. 19, no. 3, pp. 616-628, June 2025, doi: 10.1109/TBCAS.2024.3478798. keywords: {Electroencephalography;Electrooculography;Electrodes;Glass;Smart glasses;Wireless communication;Biomedical monitoring;Wireless sensor networks;Sensors;Monitoring;BCI;EEG;embedded deployment;EOG;HMI;smart glasses;wearable devices},

Attentiv U V2



AttentivU V2

Key Features:

•EEG and EOG sensors

•Operates **standalone and offline**, ensuring **data privacy**.

•Local data storage

•Lighter design for improved comfort

• Small PCB

•Integrated Bone conduction

•WiFi connectivity alongside Bluetooth

https://www.attentivu.com/glasses-v2

Aria Gen 2

https://www.extremetech.com/electronics/meta-unveils-aria-gen-2-smart-glasses-with-built-in-heart-rate-monitor

Key highlights

- **PPG Sensor in Nosepad**
- **Advanced Sensor Suite:** Includes RGB camera, 6DOF SLAM cameras for spatial tracking, eye-tracking cameras, spatial microphones, IMUs, barometer, magnetometer, and GNSS for precise location and motion sensing.
- **On-Device Processing:** Custom chips enable SLAM enhancing privacy and responsiveness.
- **Lightweight & Portable**
- **Audio Features:** Open-ear speakers with noise cancellation and a contact microphone

NO EEG SENSOR