

Neoxa 3

Project Approach

Reference: HBS_PNXX_DP003

Version: 1.0

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Class: D - Restricted



Sofiatech

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Disclosure or transfer possible upon SOFIATECH approval

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Project Scope

Neoxa 3

- Neoxa 3 is the upgraded version of the previous Neoxa 2.
- The main goal is to improve the current version by addressing its limitations and the areas needing some improvement.
- What Neoxa 3 adds compared to Neoxa 2:
 - **Mechanical enhancement:** miniaturized design and wireless setup,
 - **New features:** PPG sensing (in addition to EEG), on-board processing and bone conduction audio (to be confirmed),
 - **System optimization and hardening:** reliable connectivity (BLE), robust sensing (signal quality), energy efficiency
- Project deadline: December 2025 (5 prototypes)
- Next big milestone: CES 2026

Technical challenges

Design considerations for Neoxa 3

Mechanical aspects:

- Form factor (size)
- Ergonomics and comfort of use
- Choice of materials

Functional aspects:

- BLE connectivity
- EEG/PPG sensing
- Signal processing (features extraction, filtering, ...)
- Data processing (compression, formatting, storage, ...)

Non-functional aspects:

- Signal quality (signal noise, motion impact, interference)
- Communication reliability (range, throughput, latency, security)
- Power management (components selection, battery selection, operating modes, ...)



Design criteria to consider for Neoxa 3:

Prioritized:

- Optimization ↗
- Reliability and Robustness ↗
- Energy consumption ↘

Acceptable Trade-offs:

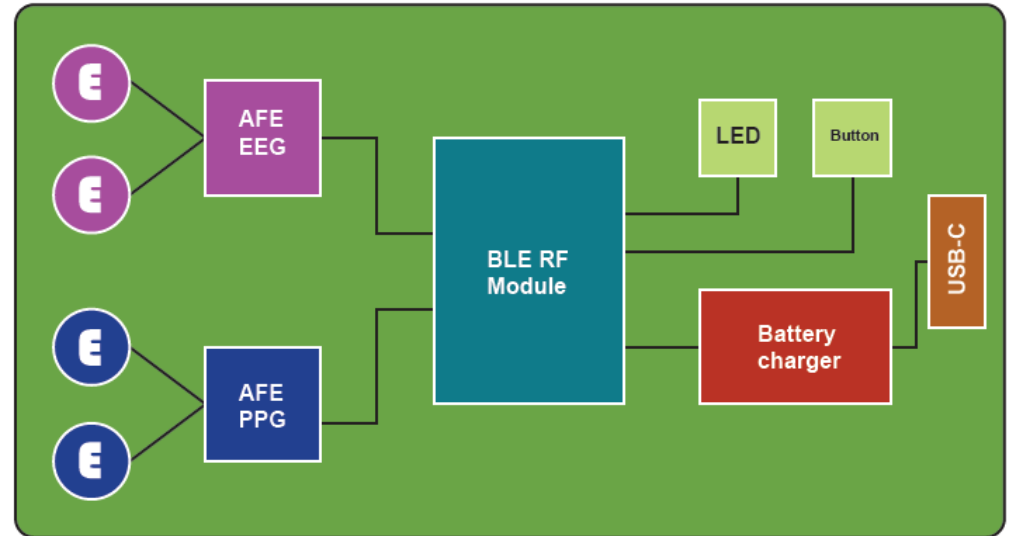
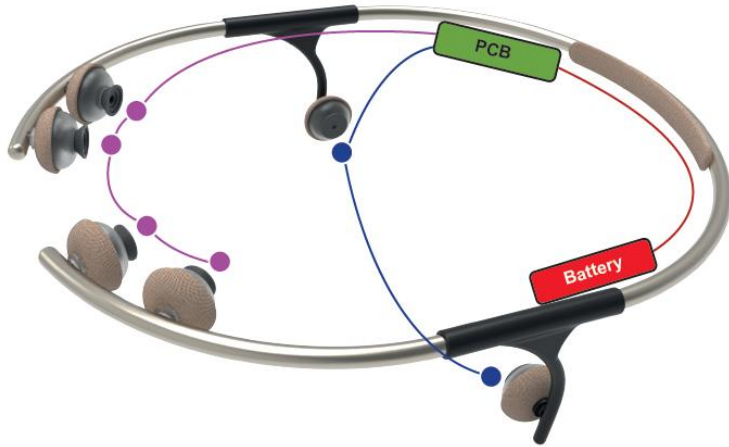
- Average performance →
- Average responsiveness →
- Memory usage ↗

To keep in mind:

- Portability
- Maintainability
- Scalability

Preliminary Architecture*

*: To Be Confirmed Post-Analysis/Detailed Design



- How many EEG electrodes should be used ?
- How many PPG electrodes should be used ?
- Are EEG and PPG signals acquired simultaneously ?

Preliminary Technical Choices*

*: To Be Confirmed Post-Analysis/Detailed Design

Hardware components:

- MCU → NXP NHS52504 (Evaluation Kit: NHS52S04EVK **\$412.00**)
- EEG AFE → TI ADS1299 (Evaluation Kit: ADS1299EEGFE-PDK **\$199.00**)
- PPG AFE → AD MAX86176 (Evaluation Kit: MAX86176EVKIT **\$170,13**)

Software components:

- Sensor drivers (Serial driver, EEG driver, PPG driver)
- Filtering and noise reduction algorithm
- Memory management (Embedded filesystem)
- BLE stack + Custom Profile for EEG/PPG data
- RTOS (for system orchestration)

NHS52S04: Ultra-Low-Power Bluetooth® Low Energy Solution With Arm® Cortex®-M33 TrustZone® for Medical IoT

NHS52S04 Receive alerts @



Ultra-Low Power / Optimized for Medical IoT / Integrated Security / Small Form Factor / BLE 5.3 / Direct Battery Support / 3 FlexComm interfaces

ADS1299 ✓ ACTIVE

Low-Noise, 8-Channel, 24-Bit Analog-to-Digital Converter for Biopotential Measurements



Low Noise / Multiple Channels / SPI and I2C interfaces / Low Power Consumption



Analog Devices / Maxim Integrated MAX86176 PPG and ECG Analog Front-End (AFE)



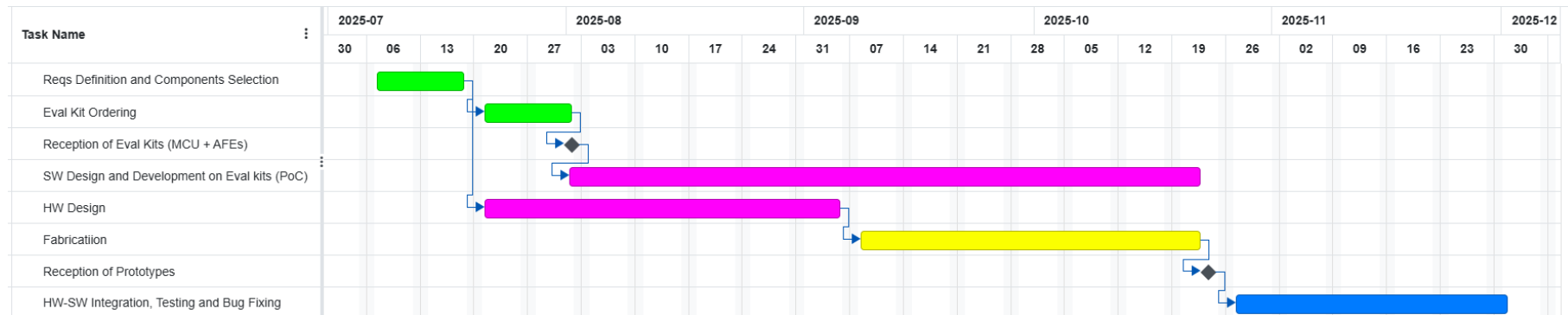
Dedicated PPG AFE / Designed for Wearable Applications / SPI interface / Low Power Consumption



Since we're still in the prototyping phase, we'll **skip the RF certification for now**. This can be **handled later** for the final design of the product.

Preliminary Project Timeline

Assumptions & Constraints



Milestone	Date	Risk	Impact/Mitigation Plan
Start of Work	07/07/2025	–	–
Reception of Evaluation Kits (MCU + AFEs)	01/08/2025	Delayed reception of Eval Kits	Project overtime / Allocate enough time (10 days) for shipment process
Reception of Prototypes	24/10/2025	HW Design delay due to mechanical constraints Signal issues for EEG and PPG on prototype	Project overtime / Synchronization meetings with OVA Design Non-useful prototype / Bypass the PPG AFE by hardware design
End of Work	01/12/2025	–	–

Project organization

We propose to manage the project with several successive packages:

Package 1: Requirements definition and components selection

Objectives: Co-design workshops to define priority functionalities and requirements and establishment of the product backlog.

Package 2 : Design and Development (HW and SW) and FAB

Objectives: Design of the HW and development of the SW POC on eval kits.

Package 3: Integration, Validation and Bug fixing

Objectives: Finalization of the solution and final testing.

The estimation of the project workload is not possible in this stage of the project. We suggest to proceed in a man and material model.



Thank you

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