

# Aktiia Bracelet: Monitoring of Blood Pressure using Off-the-shelf Optical Sensors

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**Abstract**— The performance of the Aktiia OBPM algorithms to measure blood pressure at the wrist was investigated in this study. For two months, six volunteers recorded blood pressure values at the arm using a brachial cuff. Simultaneously, optical signals at the wrist were recorded using off-the-shelf PPG sensors. At the end of the study, the optical signals were processed by the Aktiia OBPM algorithms to generate blood pressure estimations. The algorithms were initialized using the first brachial blood pressure value recorded at the inclusion day. The blood pressure readings estimated by the Aktiia OBPM algorithms fell within the AAMI/ISO81060-2 requirements up to two months after the initialization procedure.

## I. INTRODUCTION

Hypertension is the largest epidemic ever known to mankind, affecting 30% of the adult population, and killing 9 million people per year around the world. In order to reduce the worldwide impact of hypertension, the early detection and the optimized management of elevated blood pressure are to be rethought. Based on 15 years of research [1] Aktiia SA is preparing the deployment of a bracelet that will allow the measurement of blood pressure around the clock, and that will easily integrate into people's life by reducing the use of inflation cuffs [2]. Aktiia SA is currently optimizing its library of OBPM algorithms that will process PPG signals acquired by off-the-shelf optical sensors at the wrist. The current study investigated the performance of Aktiia OBPM algorithms, demonstrating their stability after initialization.

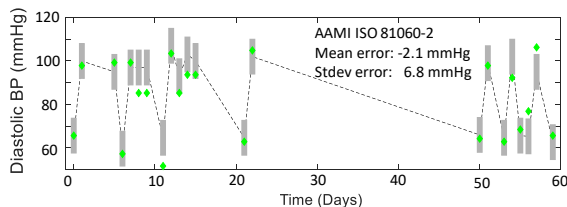


Fig. 1: Evolution of blood pressure in a healthy volunteer during two months. Grey boxes depict diastolic oscillometric measurements ( $\pm 8$  mmHg), green dots are estimates from Aktiia OBPM algorithms. Only the first measurement at Day 0 was used to initialize estimates.

## II. METHODS

For two months, six healthy volunteers recorded simultaneous blood pressure readings at the brachial artery (OMRON M6), and contralateral reflective PPG signals at the wrist via an off-the-shelf optical sensor (OSRAM SFH 7072). Isometric leg extensions were also performed in order to induce large blood pressure variations. The PPG signals recorded during the study were retrospectively analyzed by the Aktiia OBPM algorithms. For each volunteer, initialization of the algorithms

was performed based on the first blood pressure reading at the inclusion day (used to re-offset Aktiia OBPM estimations).

## III. RESULTS

Fig. 1 illustrates an example of two-month evolution of oscillometric diastolic blood pressure measurements (study reference) compared to cuffless estimates from Aktiia OBPM algorithms. Table 1 summarizes overall performances in terms of AAMI/ISO81060-2 requirements [3], and Fig. 2 illustrates Bland-Altman plot for the entire study.

TABLE I. OVERALL PERFORMANCE OF AKTIIA OBPM ALGORITHMS

	Up to two weeks after initialization (N=60 recordings)		Up to two months after initialization (N=130 recordings)	
	Mean error	Standard deviation of error	Mean error	Standard deviation of error
AAMI requirements	$\leq \pm 5$ mmHg	$< 8$ mmHg	$\leq \pm 5$ mmHg	$< 8$ mmHg
Aktiia OBPM algorithms	-1.9	6.72	-0.7	7.31

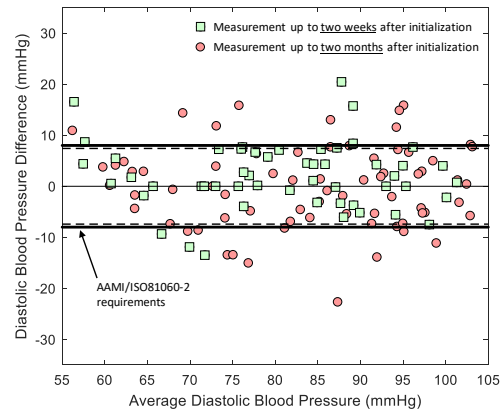


Fig. 2: Study Bland-Altman plot, with measurements performed until two weeks (green boxes), and two months after initialization (red dots).

## IV. DISCUSSION & CONCLUSION

For this study, Aktiia OBPM algorithms were able to calculate blood pressure estimates falling within the requirements of AAMI/ISO81060-2 up to two months after their initialization.

## REFERENCES

- [1] J. Solà *et al*, IEEE Pulse 2018, doi: [10.1109/MPUL.2018.2856960](https://doi.org/10.1109/MPUL.2018.2856960).
- [2] Aktiia SA website 2019, [www.aktiia.com](http://www.aktiia.com)
- [3] AAMI/ISO, 2018, [AAMI/ISO 81060-2:2018](https://www.aami.org/standards/AAMI-ISO-81060-2-2018).