

## Fast cardiovascular condition assessment

An easy-to-use and affordable system able to determine several cardiovascular parameters from unsupervised measurements easily obtained at hands or feet.

### The challenge

Cardiovascular diseases are the leading cause of death yet plenty of patients remain undiagnosed until acute stages of the disease. Population screenings with existing equipment are unaffordable hence there is a need for comfortable easy-to-use devices intended for personal periodic monitoring of cardiovascular monitoring that do not interfere with daily routines and can be used anywhere.

### The technology

The hands and the feet are very convenient interfaces for cardiovascular measurements and have long been used to obtain the heart rate and the ECG by establishing a contact with a conductive electrode on each hand. Further, volumetric changes that result from the arrival of the blood pulse to different arteries of the body can be detected from the changes in electrical impedance measured between both hands through the so-called impedance plethysmogram (IPG). We have designed a measurement system able to simultaneously obtain the ECG and the IPG by using only four conductive contacts, which can be for example two contacts with two different fingers of each hand, or two contacts with fingers in one hand and two contacts with two points on the opposite wrist. Time intervals between different features of the ECG and the IPG yield the Pulse Arrival Time (PAT), which can be used to assess autonomic nervous system activation and changes in blood pressure, and the Pre-Ejection Period (PEP), which can be used to assess myocardial contractility, sympathetic activity or to diagnose certain cardiovascular diseases from abnormal durations. Furthermore, an extra sensor at the hands or the feet, such as a PPG system, an additional IPG measurement using the same electrodes, or a BCG obtained from a weighing scale, allows us to obtain the Pulse Transit Time (PTT) and evaluate arterial stiffness, which can be related to factors such as ageing, hypertension, and risk of cardiovascular events.

### Innovative advantages

- No gel or cream, nor contacts with the thorax or any body part other than the hands or the feet are required.
- No auxiliary personnel are required to apply it.
- Provides information about both the heart and the major blood vessels and in a short time.
- Can be adapted to any wireless technology.

### Current stage of development

A laboratory sensor prototype is available.

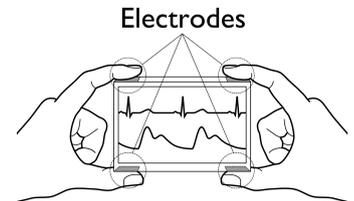
### Applications and target market

Health promotion programs, groups screening, primary care centers, community health centers, personal health care, physical activity monitoring, remote physiological monitoring, home health care, drug testing, drug dose adjustment, fitness, m-health, e-health, emergency medical technicians, first responders, rescue workers, retirement and nursing homes, sports medicine, labor medicine, fitness centers, hotels and spas, smart watches, wristbands, or TV remote controls.

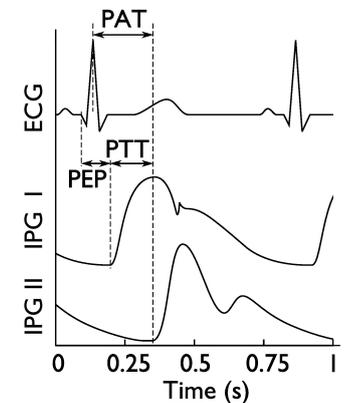
### Reference number

MKTXXXXXX\_H

### Cardiovascular condition assessment from a handheld device based on finger contacts



### The ECG and two different IPG can be recorded from four electrodes



### The pre-ejection period, pulse arrival time and pulse transit time can be obtained from the three signals

### Business Opportunity

Technology available for licensing with technical cooperation

### Patent Status

Priority application

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