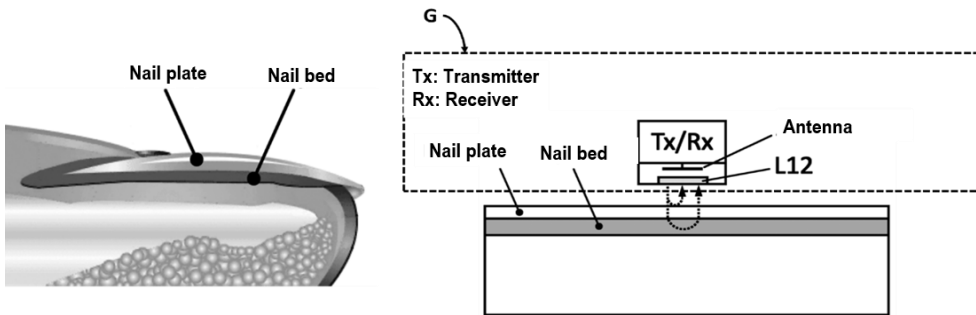


# Non-invasive glucose measurement

## THz-based determination of blood sugar values through the fingernail

### Invention

Regular blood sugar measurement is important for diagnosing and treating diabetes mellitus, a metabolic disorder characterized by high blood sugar. Blood sugar can be measured in a variety of ways, but the current method of choice is invasive: a small blood sample to determine sugar concentration.



Fingernail bed structure (left); sample performance schematic (right)

Current non-invasive approaches have proven too imprecise in practice. This is due, among other things, to pronounced variation in the electrical behavior of the outer skin layer. The University of Duisburg-Essen has now developed a procedure for determining blood sugar through the fingernail. It uses THz reflectometry to measure blood sugar in the perfused fingernail bed. The nail bed has three important advantages over the skin. First, its tissue structure is much simpler, stronger, and more densely supplied with blood. Second, the transition to the nail is very smooth and well-defined. Third, it is naturally protected from environmental influences by the nail. The THz frequencies used indicate a maximum absorption in the 0.2 to 0.4 range, which makes the integration of a very compact antenna system possible.

### Commercial Opportunities

The setup for precise blood sugar value determination can be very compact. The technology can produce a tightly encased blood sugar measurement system that is easy to carry (in a pants pocket, for instance). It can even be integrated into a smart watch. In addition to use for diabetics, the glucose sensor can be employed as a fitness tracker for monitoring exercise or to monitor blood sugar during conscious nutritional changes.

### Current Status

It has been registered with the German Patent and Trade Mark Office, and other subsequent international applications can be made in the priority year. We are offering interested companies the opportunity to license and refine the technology in collaboration with the University of Duisburg-Essen.

### Relevant Publications

M. Jalali, A. Prokscha, Y. Yun, T. Kubiczek, J. T. Svejda, S. Preu, J. Balzer, T. Kaiser, and D. Erni, "Non-invasive glucose sensing via the fingernail bed using THz radiation," *Current Directions in Biomedical Engineering (CDBME)*, vol. 9, no. 1, pp. 507-510, Sept. 2023, doi: [10.1515/cdbme-2023-1127](https://doi.org/10.1515/cdbme-2023-1127).

An invention of the University of Duisburg-Essen.

### Competitive Advantages

- Very simple, compact setup
- Reliable measurement
- No skin surface injury

### Technology

#### Readiness Level

123456789

Technology concept formulated

### Industries

- Medical technology

### Ref. No.

6818

### Contact

Martin van Ackeren

E-mail: [ma@provendis.info](mailto:ma@provendis.info)

Phone: +49(0)208-94105-34

