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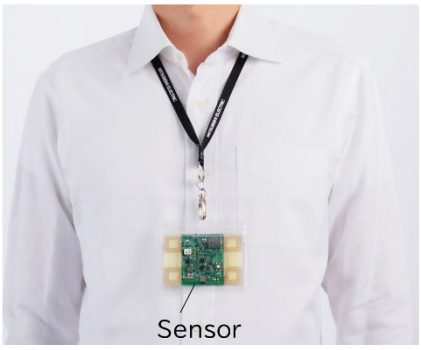
Mitsubishi Electric Develops New Contactless Body Sensor Allowing High-Precision Monitoring of Vital Body Data

Uses radio waves to monitor and track data, will help enhance health and general well-being



Example Deployment – Embedded in Employee ID Card

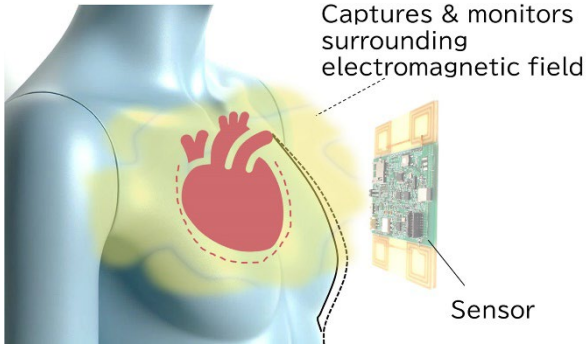


Illustration of Sensing Range

TOKYO, September 30, 2025 – Mitsubishi Electric Corporation (TOKYO: 6503) announced today that it has developed a new type of contactless body data sensor that can detect minute variations in heart rates, respiration, and other vital body indicators[1] with high precision.[2] It will enable the continuous and accurate daily measurement of such data in situations where the use of contact-type sensors, such as smartwatches, may be difficult. The new sensor will help enhance people's health, security and well-being by facilitating self-management and monitoring of key body indicators, particularly among the elderly.

In recent years, the widespread use of smartwatches and other monitoring devices has led to increasing numbers of people checking their own body data on a daily basis, allowing them to assess their own physical and mental condition for health management purposes. Companies are also increasingly seeing a link between their employees' health and their productivity levels. There is accordingly growing interest in new solutions that utilize vital body data to allow employees to monitor their physical and mental states, and help companies to provide appropriate working environments for them, as well as identify aspects of these that can be improved.

1 This sensor can detect both external shape changes and internal physical changes, such as those occurring in the structure of the heart.
2 This sensor is intended for wellness and everyday health management purposes, and is not designed for medical use such as diagnosis, treatment, or prevention of diseases.

The effective collection, analysis and utilization of vital body data obtained through daily biosensing is additionally seen as a key means of helping to achieve the Japanese government's goal of extending healthy life expectancy by more than three years by 2040.[3] The effectiveness of wearable contact-type sensors such as smartwatches may be hampered in certain situations due to issues such as wearer discomfort, skin irritation or the need to ensure the safety of the wearer. As a result, there is growing interest in the use of non-contact sensors capable of measuring vital body indicators with a high degree of accuracy.

The new sensor is a unique type of non-contact device capable of measuring heart rate and other vital body signs. It captures minute variations in measurements of the surface of the human body and internal organs, using weak radio waves to detect changes in the surrounding electromagnetic field. The sensor itself detects unique features of the wearer such as their body composition and the position of their sensor, automatically optimizing its sensitivity to ensure stable monitoring at all times. Sensing accuracy is further enhanced by the ability of the device to detect heartbeats transmitted through clothing and to sense changes in the electromagnetic field. This allows for the high-precision measurement of vital data without direct skin contact, even through clothing.

Furthermore, by employing multimodal sensing and leveraging a heartbeat interval extraction algorithm based on machine-learning, the sensor achieves accuracy comparable to contact-type devices such as smartwatches.[4] Mitsubishi Electric aims to expand the application of vital sensing technology by enabling users to select the most suitable sensor device from a variety of options according to the usage scenario and their individual condition and preferences.[5]

Going forward, Mitsubishi Electric will continue its research and development of solutions that enhance workplace productivity by using highly precise vital organ data to analyze employees' psychological states and allowing companies to use the results to provide more customized work environments. Additionally, by progressing its research into the application of this sensing technology beyond heartbeat interval measurement, the company aims to help boost people's well-being and peace of mind in the workplace.

Product Features

1) ***Novel type of vital sensor capable of non-contact vital data measurement by detecting changes in the electromagnetic field around the sensor***
   - The newly developed sensor captures minute variations in measurements taken of the body surface and internal organs by using weak radio waves to detect changes in the electromagnetic field.
   - The sensor is capable of accurately measuring vital data such as heart rates and respiratory rates as, unlike devices that use long-range radio waves or optical sensors, it is not affected by noise generated by the movement of surrounding objects or by the influence of external light.

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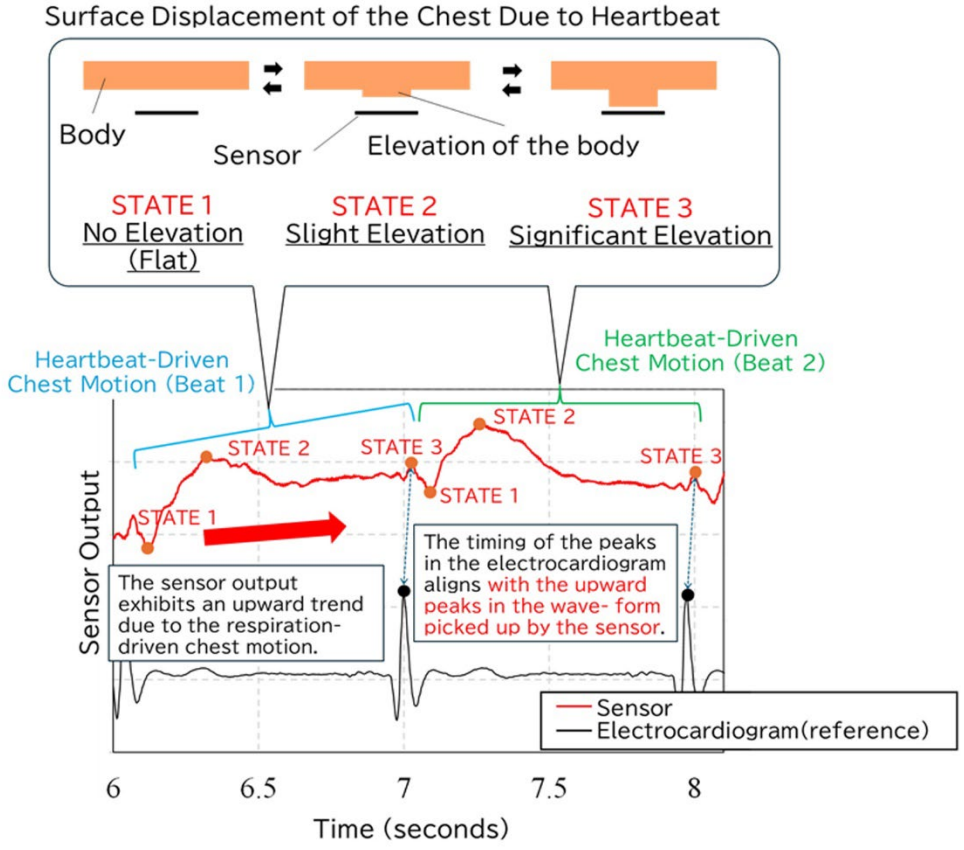
3 Healthy Life Expectancy Extension Plan published by the Ministry of Health, Labour and Welfare.

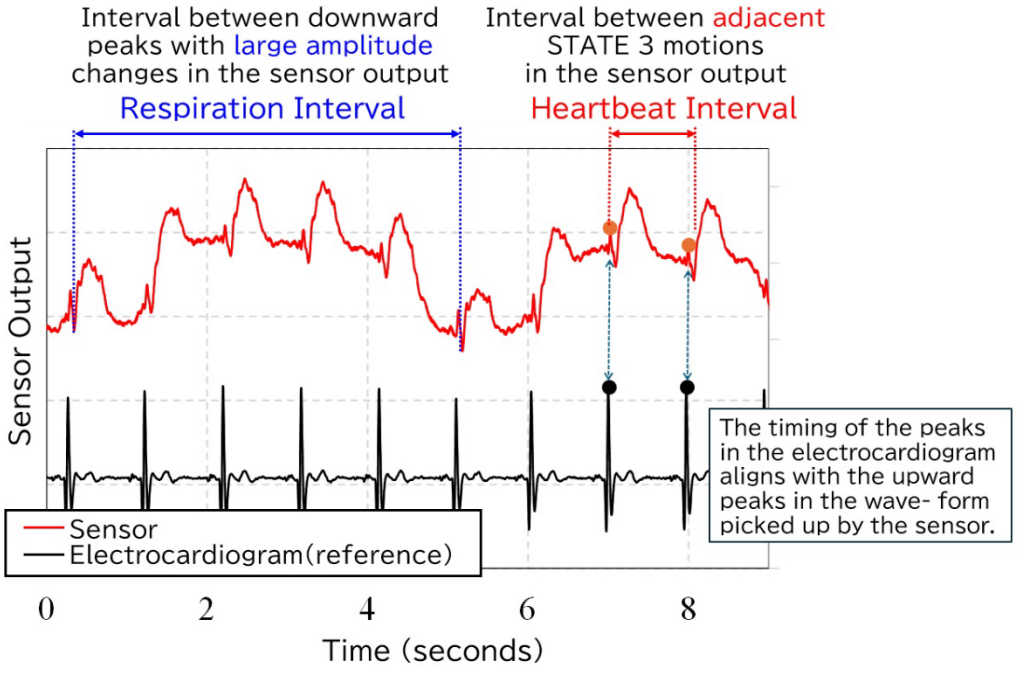
4 Based on measurements conducted by Mitsubishi Electric.

5 In a web-based survey conducted by Mitsubishi Electric (1,000 respondents), the company asked participants which form of wearable device—contact or non-contact—they would be comfortable using to measure activity/mobility and health data. The results showed that 37% preferred contact-type devices, 25% preferred non-contact-type devices, and 38% had no preference. These findings confirm that approximately one in four respondents favor non-contact devices, indicating a certain level of demand for such technology.

- The sensor deploys radio waves with frequencies that easily penetrate the body, allowing it to measure minute variations without any physical contact, not only on the surface of the body itself but also in key internal organs such as the heart.



Sensor Output Waveform Variations Caused by Heartbeat and Respiration: a Conceptual Illustration of the Correlation between Signal Waveforms and Body Surface Conditions



Example of Sensor Output Waveforms: Measurement of Heartbeat and Respiration Intervals

2) Automatically adjusts sensor characteristics according to unique factors such as placement and wearer's body composition, thereby enhancing sensitivity

- A circuit automatically adjusts the sensor characteristics, optimizing the sensitivity of the electromagnetic field detection process around it.[6] As a result, the impact on measurement sensitivity of local factors such as sensor placement and body composition is reduced, leading to enhanced sensitivity. This enables the measurement of vital data without direct contact with the skin, even through clothing.
- The overall size of the sensor, including its automatic adjustment circuitry, electromagnetic field-sensing transmission and reception circuits, antennas, and control units, is a compact 90mm x 60mm x 4mm.[7] This allows users to wear the device unobtrusively, for example by slipping it into a chest pocket or attaching it to their workplace identification card.

3) Accuracy of heartbeat interval measurement is equivalent to that of a typical smartwatch

- Multimodal sensing is achieved by combining data from a radio wave sensor that measures minute changes in the surface and internal organs of the body associated with the functioning of the heart, and by means of an accelerometer that can detect the vibrations caused by heartbeats transmitted through clothing. Additionally, a machine learning-based estimation method has been adopted to accurately extract heartbeat intervals from waveforms that exhibit significant individual differences.
- Mitsubishi Electric validated the accuracy of the heart rate measurement process used to estimate stress levels and detect illnesses. The average measurement error for a typical smartwatch[8] was 28.5 milliseconds,[9] whereas that of the new sensor was 27.0 milliseconds.[10]

Future Development

Mitsubishi Electric aims to provide solutions that will boost companies' productivity by allowing them to monitor and utilize high-precision vital organ data to analyze their employees' psychological states and stress levels. Specifically, the company will focus on improving understanding of health and mental conditions, thereby helping companies to provide optimized work environments for their employees, and to identify work processes that require improvement. Through these efforts, the company aims to help boost economic activity in societies with a declining population and create safe and secure working environments for everyone. Additionally, Mitsubishi Electric will collaborate with external partners in research into the application of this sensing method beyond heartbeat interval measurement, thereby expanding the application of this technology.

Mitsubishi Electric is actively seeking development and co-creation partners interested in improving health and productivity through the use of the new sensor. Through these efforts, the company aims to expand the application of non-contact sensing technologies capable of detecting morphological and physical changes in hard-to-assess areas such as the condition of internal organs. It also envisages the deployment of these to

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6 The circuit that monitors changes in the characteristics of the antenna embedded in the sensor, which may occur due to individual differences such as the sensor's placement and the user's physique. This circuit automatically adjusts the antenna characteristics to ensure high sensitivity of the sensor.

7 Excludes battery and housing.

8 A widely used commercially available smartwatch was used in this validation.

9 A thousandth of a second.

10 The results were based on the median error obtained from 20 subjects performing a desk-based task.

capture and measure data in other environments that is difficult to capture with traditional sensors; for example the condition of items inside packaging.

Technical details of the new solution will be presented at the MEMS SENSING & NETWORK SYSTEM 2026, which will be held January 28–30, 2026 at Tokyo Big Sight, Japan.

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About Mitsubishi Electric Corporation

With more than 100 years of experience in providing reliable, high-quality products, Mitsubishi Electric Corporation (TOKYO: 6503) is a recognized world leader in the manufacture, marketing and sales of electrical and electronic equipment used in information processing and communications, space development and satellite communications, consumer electronics, industrial technology, energy, transportation and building equipment. Mitsubishi Electric enriches society with technology in the spirit of its "Changes for the Better." The company recorded a revenue of 5,521.7 billion yen (U.S.$ 36.8 billion*) in the fiscal year ended March 31, 2025. For more information, please visit www.MitsubishiElectric.com

*U.S. dollar amounts are translated from yen at the rate of ¥150=U.S.$1, the approximate rate on the Tokyo Foreign Exchange Market on March 31, 2025