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Measurement of bio-magnetic field in cell tissues utilizing pT resolution micro magnetic sensor based on magneto impedance element

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Any living systems that are electrical excitable induce magnetic field. Numerous tissues and organs generating spontaneous electric activity are distributed over the body. Therefore magnetic sensors with sufficiently high sensitivity would provide a non-invasive detection of their activity, which is therefore thought to be useful in a wide range of biology and medicine. Superconducting quantum interference device (SQUID) with the sensitivity of a femto tesla (fT) level has so far been employed to detect magnetic activity in the brain and heart of humans. However, technologies based on superconductivity require extremely low temperature condition. The SQUID sensor coils are mounted in a probe with circulating liquid helium in usual, so that SQUID sensor head is hardly semi-contacted to the small pieces of the living tissues at a body temperature for increase of the sensitivity for extremely small local magnetic field. We have developed the measurement system for bio-magnetic field in small cell tissues using pico-Tesla (pT) sensitivity micro magnetic sensor owing to magneto-impedance (MI) element. The MI sensor is consisted of thin amorphous magnetic wire; thereby it is operated at a body temperature and is accessible very close to the small biological sample. We can measure bio-magnetic field in the small tissue by putting preparations on the sensor head, even across a thin cover plate for microscopy. In this study the measurement results for bio-magnetic fields in cell tissues (such as guinea-pig taenia caeci, guinea-pig stomach and mouse heart) will be reported.

Biography

Tsuyoshi Uchiyama has completed his PhD (Engineering) from Nagoya University. He is presently an Associate Professor of Intelligent Device, Department of Electrical Engineering and Computer Science, Graduate School of Engineering, Nagoya University, Japan.

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