

SE-04-05

# Application of quantum annealing to quantum sensing

**Yuichiro Matsuzaki***Chuo University*

---

## Abstract

In biology, it is important to detect weak signals associated with biological processes such as neural activity and chemical reactions. Quantum sensing is a promising way to detect such signals, and so an improvement of the sensitivity of quantum sensing plays a crucial role to understand the mechanism of life. Importantly, we can in principle use entanglement to enhance the sensitivity of quantum sensors. However, it is not straightforward to generate metrologically useful entanglement in realistic systems. Here, we propose a way to generate an entanglement between quantum sensors by using the principle of quantum annealing. We drive the systems by external fields, and gradually change the amplitude and detuning. As long as there is an Ising-type interaction between quantum sensors, we can prepare the so-called GHZ states, which is one of the most useful states in quantum metrology. We discuss possible implementations of our scheme by using nitrogen vacancy centers in diamond.