<u>プログラム名:量子人工脳を量子ネットワークでつなぐ高度知識社会基盤の実現</u> <u>PM名:山本喜久</u> <u>プロジェクト名:量子人工脳</u>

委託研究開発

実施状況報告書(成果)

<u>平成 29 年度</u>

研究開発課題名:

Pursuit of the novel working principle of quantum artificial brain

研究開発機関名:

<u>スタンフォード大学</u>

<u>研究開発責任者</u> <u>Martin M. Fejer</u>

1. Activities, Accomplishment and Findings

We have two primary research activities during this time:

- Benchmarking of the measurement-feedback Coherent Ising Machine against the D-Wave 2000Q system at NASA
 - We defined a set of benchmarking problems (both Sherrington-Kirkpatrick problems and unweighted-MAX-CUT problems) and ran the identical problems on the Stanford MF-CIM as well as coordinated their running on the D-Wave 2000Q quantum annealer at NASA Ames, and the MF-CIM at NTT.
 - We analyzed the data and managed to show that the CIMs see speedups of over 1,000,000x versus the D-Wave 2000Q, most likely due to the very big difference in internal connectivity between the two classes of machine.
- Construction of an all-optical, free-space, low-loss Coherent Ising Machine
 - We have succeeded in stabilizing the carrier-offset-envelope frequency of the 1-GHz Ti:Saph pump laser by using f-2f interference and feedback to the laser via a control loop.
 - We have built the machine cavity for the science optical parametric oscillator (OPO), and have observed OPO oscillations (i.e., above-threshold signal generation).
 - We have stabilized the science OPO cavity through the use of a CW laser and a Pound-Drever-Hall setup.
- 2. Outreach, Events and Other Activities

None.