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Prof. Kenneth D. Mease
Chair, Holmes Fellowship Committee

I wish to express my deep appreciation for the financial support of my education at The Henry Samueli School of Engineering at the University of California, Irvine. Thank you for selecting me as one of the recipients of the Holmes Fellowship for graduate study in Spring ’08 and Summer’ 08.

The Holmes fellowship gave me opportunity to do research in the area of Technology and Theory of Navigational and Guidance Devices. Many future Flight Vehicles will benefit greatly from autonomous precision navigational systems. Large-scale atomic gyroscopes have previously demonstrated accuracies surpassing state-of-the-art ring laser gyroscopes. However, large-scale devices are costly, difficult to manufacture and difficult to maintain. To this end, the innovative development of chip-scale atomic gyroscopes with an eye towards future integration into a complete inertial navigation system was explored within this research.

High performance micromachined spin polarized atomic gyroscopes have not been previously demonstrated. By measuring nuclear spin, it is possible to make precision quantum measurements that could surpass accuracies of state-of-the-art ring laser gyroscopes while reducing cost and drawbacks of many mechanical gyroscopes. To enable long-term autonomous flight, a chip-scale atomic device would need to have a very low bias drift rate and very low random drift; therefore, investigation into the system design and control techniques was performed within this research. Proposed design accounts for external temperature variation, laser source instability, and provide a means of rejection any external noise that could interfere with the gyroscope's operation. Lastly, a creative design is believed to have low cost, reliability, ease of manufacturing, 1 cc size and low power consumption to ensure long-life battery operation.

Future work will include demonstration of the first chip-scale atomic gyroscope, development of processes for the device assembly, and implementation of the embedded control electronics for the high-performance device operation.

Sincerely yours,

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at Microsystems Laboratory,
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