

# Corporate Internship Report on MERIT program

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Period : 2017/1/10~2017/2/3

Host Institution : Ricoh Company

## Outline of the Internship :

I worked at Ricoh Company in Central Research Laboratories (Yokohama, Kanagawa) as an internship student from 10<sup>th</sup> January to 3<sup>rd</sup> February in 2017. Ricoh inherited the photocopy paper business from Rikkaku office, which was established to industrialize the research and development of RIKEN in 1936. In these days, there are three major businesses, each of which is based on multifunction machines, semiconductors, cameras. At the Central Research Laboratories, one of Ricoh's R & D bases, I designed and evaluated the optical MEMS which is the theme just before the product. Ricoh is known as a company that supports researchers trying to acquire new knowledge and skills. So I applied this internship program, even though optical MEMS is not my specialty directly.

## Activities :

We changed the theme every 2 weeks in this internship program. Firstly, I tried to design the optical MEMS by ANSYS which is a design tool. The MEMS acts to continuously lean silicon base in one direction caused by PZT. Design does not merely satisfy specifications. It is necessary to make the process easier while satisfying the specifications. So, I researched the relationship between the amount of displacement and each parameter, device and PZT length. It is the greatest result of the design to formulate the relation obtained from it and prove the mathematical expression physically. Therefore, we can know the amount of displacement by just substituting numerical values for each parameter without using ANSYS. Then, we proposed the design that best matches the process. This design was confirmed by simulation that the resonance frequency was also less than the specification.

Secondly, I estimated the optical MEMS. This was the actually measurements such as durability of the device tests by voltage and temperature, research of improve device performance by the special treatments. Especially for the search for device improvement, we obtained the best value by my proposal treatments from a viewpoint of solid physics which is my specialty. We could also propose and confirm the method for more efficient treatment and its physical grounds. Finally, we were able to propose the solution method of the big problem in this work from my expert knowledge.

**Summery :**

In this internship, it was the greatest result that I could feel the difference between research of university and company. Each person had expert knowledge and they respected each other expertly in the Central Research Laboratories. So, they also trusted my opinion from my specialty.

My friends with expert knowledge were great helpful in this research and development. Of course, confidentiality is important, so we could not give any specific consultation. However I knew which knowledge was lacking so we could solve the problem quickly by asking the base part with the mobile phone. The conduction of friend network with knowledge of different fields in MERIT's activities was truly important, I believe.

The results of this activities were highly appreciated as they could be patented. I got a good comment that I was aggressively going to the laboratory and I have the ability of reporting logically and easily my opinions to other people.

I was allowed to live in an employee dormitory except for working time. Because I was in the same bath as employees, I was able to listen to life stories that I usually would not get information, it was very exciting. It was good experience for my future career.

**Acknowledgement :**

We would like to express our sincere gratitude to Ricoh Company, the host company of this internship program, for acceptance of this internship program. Mr. Sakai, Fujishima, and Hashiguchi who belong the host company spent a lot of times to the guidance for me, even while they were very busy. I would also like to express my gratitude to Professor for my joining the internship program. Finally, I would like to express my sincere gratitude to the GPMS and MERIT program for giving me valuable learning opportunities.