

Lyon Center UDL/STARMAJ Internship Experience Report

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Supervisor	Prof. Uchimoto Tetsuya
Research Topic	The Modelling of the Eddy Current Magnetic Signature of Electrical Steel
Internship Period	September 4 th to November 20 th
Internship Affiliation	Le LGEF (Laboratoire de Génie Electrique et Ferroélectricité), INSA Lyon
Supervisor in Lyon	Prof. Benjamin Ducharne

I was so honored to have the chance to attend the internship in LGEF, INSA de Lyon from 4th, September to 20th, November. Lyon is a beautiful city setting on a hilly site at the confluence of the Rhône and Saône rivers. Here you can sense the romantic and pleasant atmosphere of Southern France. In addition, the transportation system is in considerate organization with tramway and the subway working in coordination, and our students can apply for the one-month pass ticket, which is very convenient for hanging out in Lyon. I stayed there from the end of summer to the winter, which giving me the chance to experience the pleasant picnic in summer and a little bit Christmas atmosphere in the beginning of winter. Lyon is really a livable city.

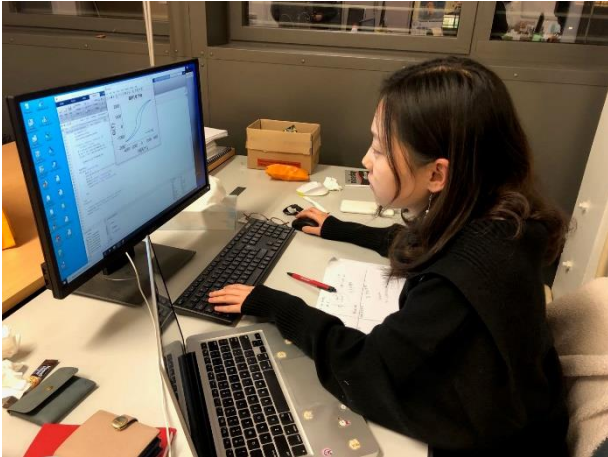
In the period of this internship, I carried out the research concerning to the modelling of the Eddy Current Magnetic Signature by using the electrical steel sheet as the target material. By solving this topic, it is better to understand the loss separation in DC brushless motors, which is important for improving the efficiency of the energy usage in Japan. At first, with the assistance of my lab-mate, I plotted the hysteresis loop to test the frequency dependence characteristic of the electrical steel and investigated the threshold frequency. With the guide of Prof. Ducharne, I began to get to know the process and the idea of choosing an optimal model and developing it in MATLAB. We were trying to investigate the relationship between one parameter ρ and the magnetic flux density, which aiming at combining the numerical analytical meaning with the physics meaning so as to find a solution for reducing the loss in the motor during working time.

In the period of my staying, during November 13rd and 15th, I attended the conference on "NDT in Aerospace" in Paris-Saclay and made an oral presentation about the proposal of a new length sizing method for carbon steel. This is a topic I majored before I went to Lyon. This conference helped me to make a conclusion about the research topic and the communication with professors and many excellent students gave me more idea to improve the results.

The internship experience in INSA let me get much no matter in the way of study or in the way of life. There, I studied how to build a numerical analytic model to verify the correction of the results of the experiment. In addition, I also studied trying to find the solution by building a model for the problem which is difficult to perform by experiments. In the case of life, I made a lot of new friends who come from different countries. And in these 3 months, I also felt the different thinking way of people who come from different cultures. It

helps me to consider problems from different viewpoint for research and daily life. I also travelled a lot in this period by this valuable chance. This is my first time to go to Europe and I really enjoyed the beautiful scenery. I was often felt amazing about the design of the excellent churches, the charming lake and mountain.

I really appreciate for my professor-Uchimoto Professor, Professor Ducharne and ElyT Max giving me this chance. And I also feel grateful for the accompany of my friends in INSA.



Performing the simulation



Farewell party for Dr. Gupta with labmates



With professor Ducharne in the NDT in Aerospace



Sightseeing in the city hall of Lyon