1．6 特別招聘外国人研究員報告

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Introduction

I visited Yamaguchi University on kind invitation of Prof. Ikuo Awai, Department of Electrical and Electronic Engineering, in the frame of the Venture Business Laboratory with financial support of the Japanese Ministry of Education. The aim was to join experiences concerning the development of new artificial materials for microwave application, both in theoretical studies and experiments, the education of students, new research strategies, and consideration possible future co-operation. This was a great chance for me to learn more about Japanese education, culture and get a better understanding of Japanese thinking and approach to problems. I hope also that I was able to say something interesting about my country to many people I met.

Research

At present, my field of research mainly involves artificial microwave bianisotropic materials. This subject is very topical. Now we are witnesses to a vast number of publications concerning different aspects of the electromagnetic theory of these media. At the same time, the lack of microwave experiments is evident. Moreover, no known microwave devices based on artificial microwave bianisotropic materials work as such. In my recent publications a novel class of artificial bianisotropic materials has been conceptualized. These are particulate composites based on small ferromagnetic magnetostatic-wave resonators with a special-form surface metallization. Such artificial materials can be realized based on the modern technology of magnetostatic-wave devices. A vast number of fundamental problems and applications are emerging from theoretical and experimental works based on these composite materials.

Professor Awai is awell known expert in the field of magnetostatic wave propagation in ferromagnetic films. He is also a well known expert in the field of microwave solid-state resonators. I think that his great experience in these fields of research let him to understand all the potential significance of my proposition of new artificial materials and gave me, as a result, an opportunity to advance my ideas in common investigations in his laboratory. Many productive discussions, both at personal talks with Professor Awai and at scientific seminars, were very useful in understanding fundamental problems and new potential applications of complex microwave materials. After our discussions we made a common, with Professor Awai, presentation of a paper to the domestic annual conference of the IEICE.

During this my stay at Yamaguchi University we were successful to obtain new very important experimental results. Together with students of Professor Awai's laboratory, Mr.Saha and Mr. Yamagata, We were able to show experimentally that a ferromagnetic resonator with a special-form surface metallization can really be considered as a structural element for new microwave artificial materials. This is very exciting for me since this experimental results verifies my main theoretical propositions concerning bianisotropic media. Now we have submitted a paper to the forthcoming European Microwave Conference with description of these important experimental data. We also plan to publish the results in a joint paper.

Teaching students, education

During my tay at Yamaguchi University I delivered a lecture course "Foundation for Microwave Engineering" for graduate students. There

were some difficulties since because of their rather bad English, the students were rather shy. For this reason the "feedback" was hampered and it was very difficult for me to organize any discussions. At the same time, I could see that in spite of their bad spoken English, the students are able to read the textbooks written in English. So my way to deliver a lecture was the following : all the main positions of the lecture were paralleled with the brief text formulations that were projected on a screen.

Apart from my lecturing I gave the Department Seminar on application of complex microwave materials for academic staffs, engineers and students and also several small seminars on special properties of bianisotropic media.

Japanese meetings

My stay at Yamaguchi University gave me a chance to participate at the domestic Scientific Meetings and Seminars at other universities in Japan. I delivered a talk at 1998 Electromagnetic Theory Symposium in Nikko, organized by IEE Japan (November 10-12, 1998). I gave a Special Seminar on macroscopic electrodynamics of bianisotropic media at Chuo University, Tokyo (Seminar Organizer Prof. K. Kobayashi). I had an invited talk on 2nd Asia-Pacific Engineering Research Forum on Microwaves and Electromagnetic Theory in Kyushu University, Fukuoka (December 5-6,1998 ; General Chairman Prof. K. Yasumoto). I participated at panel discussions and had a presentation (with Prof. I.Awai) at the annual Conference of IEICE, Japan (March 25-28, 1999).

These meetings was a rather unique opportunity to meet some well known Japanese scientists again and to have new personal contacts with people known to me only by publications before. Numerous discussions at these scientific meetings were very productive for me.

Future co-operation

It is evident that the electrodynamics of bianisotropic media is a very topical sphere of research. The fact that in a medium we may have an additional (with respect to the Maxwell equations) coupling between the electric and magnetic fields promises to produce very attractive fundamental problems and new unexpected applications. Since in a microwave region bianisotropic media can be realized only as artificial materials, investigations of small resonance structures -bianisotropic particles-are very urgent. The theoretical investigations published in my recent papers and our common experimental results obtained in Prof. Awais laboratory during my stay at Yamaguchi University, show that we can be rather optimistic in our estimations to use ferromagnetic resonators with a special-form surface metallization as bianisotropic particles for future microwave complex materials. I got the feeling that Prof. I.Awai is very much interested in these topics as well and that we should found a way to strengthen our co-operation much more.

Summary

This stay had a great impact on my understanding of Japanese university research and approach to basic and device related topics. Looking back I feel that my visit to Yamaguchi University, Department of Electrical and Electronic Engineering was very fruitful for me. I gained a lot from the scientific discussions with Prof. I. Awai, we successfully carried out joint experiment. I was able to be in touch with students of Yamaguchi University. I will always remember the warm welcome in Japan. I have to acknowledge the support of the Japanese Ministry of Education. I would like to express my deep thanks to Prof. Ikuo Awai for inviting me and undertaking all the organization of my visit. I am grateful to the President of Yamaguchi University and the Dean of the Faculty for accepting me at the Faculty and the Venture Business Laboratory. Finally, I would like to thank Prof. H.Kubo, Prof. S.Hattori, Mr. A.Saha and all the students of Prof. Awais group for their general support and fruitful discussions.

I hope that this my visit will turn out to be the beginning of our future joint research in realization and application of new microwave artificial materials.