MICROWAVE RESEARCH IN CHINA

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Abstract

China needs microwave research to realize its grand goal of four modernizarions.

Microelectronics, bioengineering, new materials, new sources of energy, oceanographic engineering and astronavigation have shown their importance and will boost our productive forces in the future.

Microwave research in China plays an active role in all these fields, is an area where talented people temper themselves through new experience and enjoys good prospects.

China needs research and development to realize its grand goal of four modernizations, especially the scientific research and development of microwaves, which in our opinion consists of microwave and lightwave theory and techniques and which in turn is embraced by microelectronics.

Many of the researchers in lightwave technology were formerly those in microwave, so operational technique and principles of devices and system used in lightwave technology such as guided modes, directional conplers, traveling-wave modulators and optical filters are almost exaclty those used in microwaves. We can look forward to a wider transfer of idea and methods from the microwaves to the lightwave technology, and vice versa. Microelectronics emphasizes on miniaturization of electrical devices and system while optical fiber offers long transmission circuit with cross-section of minute size. Microelectronics is therefore vital in those fields that will boost the productive forces of our country, such as bioengineering, new materials, new sources of energy, oceanographic engineering and astronavigation. We are aware that we should cope with the increasing production needs and decreasing energy and materials resource availability in our country as elsewhere. We have worked hard ever since early 1950's, we have now more than a thonsand universities and several thonsand research institutes throughout the country. Still, our institutes and universities are sending more students abroad. A growing number of foreigners are learning and teaching in China, in Shanghai, now 235 foreign scholars and professors are teaching in various colleges and more than 50 them have been awarded honorary professorships by Fudan, Tongji and Jiaotong Universities. Fourteen Shanghai universities have signed agreements on academic exchanges with 127 universities in France, Britain, Federal Germany, Japan, the United States and other countries.

China is now embarking on an ambitious programme in educational development and aims to increase her annual output of graduates sixfold by 1990 to six million.

Beijing hosts the first large-scale international defence exhibition ever held in China, opened January 28, 1986, catering to country's drive to modernize its defence system and aiming to introduce advanced technology and to provide opportunities for co-operation between Chinese and foreign firms, with products on display of aviation, missiles, defence electronics, conventional weapons worth some $10 million, of which 83 million are for sale.

A division manager of Hughes Aircraft Company where many well known microwave people are being employed is quotted to have come to establish additional contacts with Chinese departments and to make a survey of the country and then to negotiate with his Chinese counter parts on some specific co-operative projects.

To some scholars from outside of our country, laboratory tours in some universities show experimental facilities that place China closer to the state of the art than they had believed they would find us to be.[1] We microwave people are now tackling many things in current media, such as microstrip, fiber-optics, MM wave work, laser, optical telescope used for tracking artificial satellites, silicon and gallium arsenide microwave and optical devices,[2] gyrotrons[3],[4],[5] radars[6] in our researches to be caught up in as

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many different areas as possible. Civil role for radar industry, nuclear industry and aviation industry is growing in addition to meeting the defence needs.

Today we make both coax and waveguide instruments up to 100 GHz. In Shanghai, visitors found in the 26th. radio-factory [1] that all the 50 milling machines and 50 lathes, looking much like the standard industrial equipments used over the years in manufacturing microwave components in the US are made by Chinese in China but one Italian lathe.

We enlisled graduate students again in year 1978, in its Ph.D. graduate ceremony in year 1985, the Chengdu Institute of Radio Engineering conferred eight Ph.D. degrees[7], I myself was the mentor of four of the students who received the Ph.D. degree at that ceremony, having as guests a group from the Arizona State University headed by the vice president for academic affairs. Part or whole of the research work of these eight doctoral students has been published [7]-[14].

We are going to accept post doctoral graduate students in 73 research institutes and some of our key universities including Chengdu Institute of Radio Engineering, in 103 disciplines.

Microwave research in China now is going smoothly mainly in the following areas

(1) Microwave and light wave source developments[15]-[21] , mostly for laboratory use, most of which are similar to what might be found in the United States, (1,3) for instance we make 3 mm Oscillator employing 8 mm Gunn Diode, based on the Van der Pol model[11], with an output of 10 mW CW at 96 GHz,

(2) Light wave Theory and Techniques, drawing heavy attendion in China[22]-[30], a Sino-Japanese Joint Meeting on Optical Fiber Science and Electromagnetic Theory having been held in May, 1985 in Beijing and a Sino-British Joint Meeting on Optical Fiber Communication being scheduled on May, 1986. A Sino-French Joint Meeting on Optical Fiber Science is being contemplated late this year or early mext year in Chengdu.

(3) TEM Transmission Line, a propular area of research in China[31]-[40] ;

(4) Microwave Networks, viewed as an integral part of microwave field theory and covering a wide range of application problems[41]-[51] ;

(5) Microwave field theory researches always attract interest of theoreticians in our land[52]-[69].

Concluding remarks: Listed are some of the research works recently we have done, yet from colleagues outside our mother land, we still have much to learn.

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