

Foreword

THE PROCEEDINGS OF THE SECOND INTERNATIONAL CONFERENCE ON SUBMILLIMETER WAVES AND THEIR APPLICATIONS—PART I: DETECTION AND MEASUREMENTS

THE success of the San Juan Conference (Submillimeter II) has assured the continuance of the series. They will be held alternately, hereafter, in Europe and in North America. Thus Submillimeter III will be held at the University of Surrey, Guildford, England, March 28–April 1, 1978. Guildford is just 30 minutes, by train, southwest of London's Waterloo Station. Then, Submillimeter IV will be held again in North America, December 10–15, 1979. By choosing such dates and locations, it has been shown that a foreign conference need not be as prohibitively expensive as when held at a big city hotel in high season.

The most startling surprise in the technical program of the San Juan Conference was the extent of the progress reported on the gyrotron (the cyclotron resonance maser) and the sources based on relativistic electron beam phenomenology. More than half of the following TRANSACTIONS is devoted to the description of the principles and practical applications of this technology. We had only a hint of the importance of the latter topic at the First Submillimeter Conference (V. L. Granatstein, M. Herndon, R. K. Parker, and S. P. Schlesinger, *IEEE Trans. Microwave Theory Tech.*, vol. MTT-22, pp. 1000–1005, Dec. 1974) and nothing at all on the gyrotron. This time, Schlesinger and Granatstein agreed to organize a Winter School Colloquium of invited lecturers and also a session of 14 shorter invited "contributed" papers. It was not a success; it was a triumph. Granatstein has also organized the *Proceedings* papers that are to be found herein.

Why have these new sources of submillimeter radiation taken us so much by surprise? Personally, I have no excuse because, in 1966, I had to learn about J. L. Hirshfield's work (at Yale University) on the gyrotron (a somewhat similar device was known in England at that time as Bott's bottle) in order to give an URSI lecture on submillimeter waves. Perhaps some have considered these devices to be too cumbersome, but it is not fundamentally necessary to do everything on a large scale or in the extreme relativistic regime. Moreover, the high-intensity steady magnetic fields required are no longer inconvenient, especially for the generation of microwaves or harmonic submillimeter waves.

The members of the Administrative Committee of the IEEE Microwave Theory and Techniques Society should be recognized for their farsighted attitude in risking the financial sponsorship of conferences on emerging technologies in the areas of millimeter and submillimeter waves. The authors of the papers in this TRANSACTIONS would not have been able to confer for a full week in December 1976 without this kind of enlightened encouragement. More importantly, they would hardly have been able to spring their surprises on the remainder of us who specialize in

related areas of the microwaves, millimeter waves, and submillimeter waves. When a conference is such a resounding success as the San Juan Submillimeter Conference proved to be, much credit must go to the individuals whose vote for sponsorship has made it possible. It must also be made a part of the record that both past conferences (and also the forthcoming Fourth Submillimeter-Wave Conference, December 10–15, 1979) have received the unanimous approval of the ADCOM. We are grateful that, so far, there has been no apparent financial loss. The publication costs of this TRANSACTIONS are so high, however, it is not clear that there has been a net financial gain despite the absence of red ink on the statements of income and direct expenses.

Part of the Conference Proceedings is being published in our "sister" publication, the IEEE JOURNAL OF QUANTUM ELECTRONICS, June 1977. (This JOURNAL is published by the Quantum Electronics Council, which consists of four members from MTT-S and four members from the IEEE Electron Devices Society.) The papers dealing directly with laser theory and design were diverted to the JQE in order to seek a more specialized audience for their authors and also to ease the burden of publication costs on the MTT TRANSACTIONS. Similarly, the June 1977 issue of the *Journal of the Optical Society of America* is devoted to the papers on submillimeter-wave spectroscopy of materials, measurement of fundamental optical properties, and review papers on the history and current status of submillimeter-wave research. Nevertheless, it should be noted that this present issue of the MTT TRANSACTIONS contains the papers describing the recent developments in detectors, mixers, and receivers. There are also some invited papers on spectroscopy and dielectric measurements. The paper by R. Geick on phenomena in magnetic materials is outstanding.

The members of the organizing committee are grateful to Robert A. Rivers, John B. Horton, H. Warren Cooper, G. P. Rodrigue, Lawrence R. Whicker, and Harold Sobol who led the Administrative Committee of the IEEE Society on Microwave Theory and Techniques during the periods when sponsorship was sought for the first, second, and fourth Conferences. We also wish to thank the referees of the *Proceedings*, who must remain unidentified. We shall identify the members of the working committees as follows: *Conference Committee*: James J. Gallagher, *Chairman*, Kenneth J. Button, *Program Chairman*, Sidney Perkowitz, *Publications Chairman*, R. G. Shackleford, *Treasurer*, J. W. Dees, *Executive Secretary*; *International Advisory Committee*: G. W. Chantry, L. Genzel, A. Hadni, F. Kneubühl, G. Landwehr, W. Low, D. H. Martin, A. M. Prokhorov, K. Shimoda, and H. Yoshinaga; *North American*

Advisory Committee: K. M. Evensen, T. Hartwick, D. P. Hutchinson, Robert Lontz, F. W. Quelle, G. P. Rodrigue, S. P. Schlesinger, P. E. Tannenwald, and L. R. Whicker; and the *Program Committee:* Paul D. Coleman, V. L. Granatstein, E. D. Palik, S. Perkowitz, Paul L. Richards, and E. A. Vinogradov.

So far, the IEEE Microwave Theory and Techniques Society has taken the lead in promoting the submillimeter conference activities. Additional activities are taking place which confirm the wisdom of the MTT decisions. For example, the Society of Photo-Optical Instrumentation Engineers (SPIE) has held a symposium at Reston, VA, April 20-21, 1977, and the Optical Society of America will include three invited lectures at its annual meeting in Toronto, Canada, October 10-14, 1977. These lectures will be on Submillimeter-Wave Astronomy, Schottky-Barrier Diodes and Heterodyne Detection, and Submillimeter-Wave Phenomena in Solids. The Max-Planck Institute for Radio Astronomy held a three-day workshop on submillimeter astronomy and related topics in Bonn, Germany, March 8-10, 1977. The next event of interest to us is the five-day Submillimeter III to be held at Guildford, England, near London, March 28-April 1, 1978. An information package is now being mailed to 700 Americans on the mailing list. It contains an announcement of III and IV, information on reduced rate air fares to London, explanation of the new income tax law for deducting travel expenses to foreign conferences, and an IEEE membership application blank. Also, a series of books will be published under

the general title, *Infrared and Submillimeter Waves*. As each volume appears, it will contain chapters written on specialized topics by some of the authors who have contributed short articles to this Proceedings.

We take pride in being able to offer the *Digest of Technical Papers* and also the *Proceedings* at a nominal cost to those who could not attend the conference. The *Digest* is available from

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by asking for Publication Number 76 CH 1152-8 MTT at a cost of \$10 to IEEE members or \$15 to nonmembers. The part of the *Proceedings* appearing in the June 1977 issues of the IEEE JOURNAL OF QUANTUM ELECTRONICS and the IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES can also be obtained from the same address for the price of a single issue. A copy of the June 1977 issue of *The Journal of the Optical Society of America* may be obtained for \$7 from the American Institute of Physics, 335 East 45 Street, New York, NY 10017.

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KENNETH J. BUTTON
Guest Editor

