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## Scientists Disagree on Bioeffects of mm-Waves

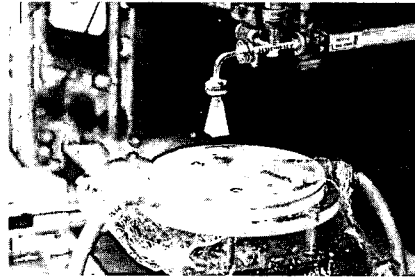
Researchers at the Max Planck Institute, Stuttgart, Germany, recently reported fluctuations in growth rates for yeast cells after millimeter wave irradiation.

H. Fröhlich et al. reported that yeast exhibits sharp growth rate fluctuations at specific frequencies in the 41.6-41.8-GHz range. Fröhlich postulates that DNA proteins absorb energy at resonant frequencies in the millimeter wave region. Yeast cells were irradiated at power levels of a few milliwatts.

Similar millimeter wave studies were conducted by Berteaud et al. at the Center for Non-ionizing Radiation Studies, Thiais, France. Bacteria called *E. Coli* were irradiated at 70-75-GHz frequencies and distinct growth rate fluctuations were observed.

However, Dr. Om Gandhi of the University of Utah, Salt Lake City, is skeptical about the European results. "We have duplicated the French experiment, taking extreme care to maintain the *E. Coli* at constant temperature, and no changes were found in the growth rate," states Gandhi.

The French team also reported differences in spectral absorption for cancerous and normal cells. Such an absorption difference would be a valuable diagnostic tool. However, Gandhi set up a millimeter wave



Yeast under millimeter wave irradiation at University of Utah. No unusual changes in growth rate were observed during duplication of French tests.

spectral absorption system and observed no differences in absorption for cancerous and normal cells. Research at the University of Utah is to continue for at least another year.

"This type of research in millimeter waves is relatively new, and replication of experiments must be emphasized," states Gandhi. "In dealing with biological systems one must be extremely careful about maintaining constant temperature during irradiation," adds Gandhi.

Validity of the German results is also questioned. Dr. Herman Schwan of the University of Pennsylvania, Philadelphia, was invited to analyze the German experiment, and he is skeptical of the results. A member of Schwan's staff said that "the German data is suspect because of insufficient data points, and the frequency drift of their oscillator was unacceptable." This experiment has yet to be duplicated, but until it is, investigators will remain skeptical.



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*Microwave Systems News 8(11): 22 only (Nov. '78)*

## Japan Developing Solid State Power for Ovens

Japanese researchers are developing solid state power sources that may be used in microwave ovens by 1980, according to a study conducted by Siliconix Inc., Santa Clara, Calif. "I am certain that the Japanese will have an all solid state oven by 1980," states a Siliconix engineer. Microwave power will be provided by static induction transistors (SIT), which the Japanese have been steadily improving.

At the 1978 Microwave Theory and Techniques Symposium (MTT-S), Yasuya Kajiwara et al. of Mitsubishi Electric Corp., Itami, Japan, reported achieving 100 W output power with 42% efficiency at 1 GHz using four SITs. "There are increasing demands for alternatives to elec-

tron tubes in the microwave frequency ranges," states Kajiwara in the introduction of his paper. At last year's MTT-S he reported achievement of 13 W at 1 GHz using a single transistor, and 20 W from a discrete device was reported at the 1977 European Microwave Conference.

Prof. J. Nishizawa, now with the University of Tohoku, Sendai, Japan, developed the static induction transistor in the late 1960s. According to a U.S. associate of Prof. Nishizawa, he achieved nearly 200 W at 2 GHz last year using a single transistor.

In the United States, TRW also is developing analog SITs for high-power RF applications, although thermal constraints appear to be a major hurdle. "We are not yet sure how to solve the heat-sinking problems," states a TRW engineer.

U.S. microwave oven manufacturers are skeptical about the cost effectiveness of solid state power sources. Litton, which has 30% of the U.S.

market, has been keeping a watchful eye on solid state power devices for years. However, at about \$50 apiece, magnetrons will remain the preferred device for some time. "Eight years ago I predicted solid state power would arrive in five years. Today I'm still predicting that it's five years off," states a Litton employee.

Members of U.S. industry believe the Japanese are pushing solid state power sources in order to develop an alternative to the imported magnetrons; also, SITs could provide increased reliability, and "it simply seems logical to advance the technology and device performance."

Two million microwave ovens were sold in the United States in 1977, and projections for 1978 indicate sales of 2.4 million units. Sales are strongest for the most expensive, top-of-the-line models. Japanese consumers bought 800,000 microwave ovens last year. Sales in 1985 are predicted at 6 million. ■

# RADAR OPEN HOUSE

## THE RIR 778 COMPUTER BASED RADAR

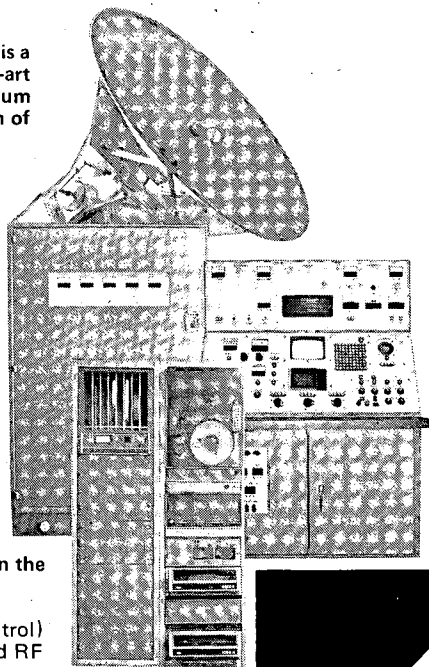
The computer based RIR 778 is a highly versatile state-of-the-art Radar providing maximum sophistication with a minimum of hardware.

### Features:

- Automatic Dynamic Calibration
- Automatic Go/No-Go Checkout
- Remote Control Checkout
- Automatic Star Calibration
- Fixed or Mobile Configuration
- Conical Scan or Monopulse
- C, X or Ka Band

The RIR 778 can collect data in the following Modes:

- Full auto track (RF)
- Vector track (Computer Control)
- Optical track (TV) angles and RF range
- Vector track with any above combination



### FEATURING

35 GHz Computer Based Radar  
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and

X-Band Computer Based Radar  
on a Scientific-Atlanta Pedestal  
and

No Drop Bomb Scoring Capability

In the very near future Vitro Electronics Systems will host an Open House with a hands-on demonstration of our Ka-Band and X-Band Computer Based Instrumentation Radars. Everyone will have an opportunity to operate and calibrate both systems and compare capabilities of each.

A demonstration of the Computer Based Radar's capability to provide No Drop Bomb Scoring will also be featured.

If you are interested in participating in this rare occurrence contact Bill Pryor or Sarah Miller at (904) 244-7746.

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