

Fig. 1.

well, but with enough energy to greatly increase the possibility of tunneling to another well. This type of rotational tunneling has been demonstrated in a number of different circumstances for ionic defects in crystals [5]. Both of these effects lead to the same type of structural changes; covalent molecular structure remains unchanged, but the relative position of one segment of the molecule with respect to the remainder of the molecule is altered. Furthermore, in the interior of large molecules, the infrequency of collisions will increase the probability of multiple excitations and resultant structural changes.

There are many biological processes that depend on steric structure. The molecular absorption, with the resulting change in non-covalent chemical structure outlined above, provides a model for the direct interference of microwave radiation with biomolecular func-

tion, where the internal three-dimensional structure of the absorbing molecule is critical to its biological function. The effect of microwave radiation on these processes will depend on the details of the process itself. From our previous discussion we would expect any effect to be frequency dependent, and if allowed a long enough time, to be reversible. Biological considerations, however, may not allow enough time for reversibility to become apparent.

CONCLUSION

In this letter, a possible mechanism for the direct influence of microwave radiation on biomolecular processes has been elucidated. Intermolecular interactions that are dependent on steric conformation in regions essentially shielded from collisions are the processes one would expect to be influenced.

ACKNOWLEDGMENT

The author wishes to thank Dr. M. Eisenbud for suggesting the topic of this paper and for many discussions that led to the concepts outlined here.

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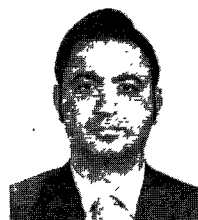
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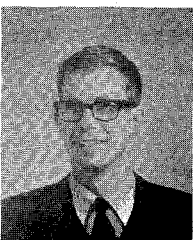


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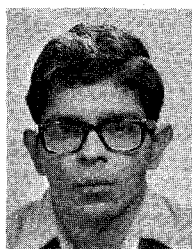
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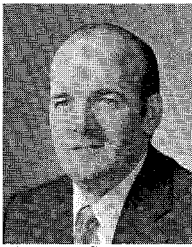
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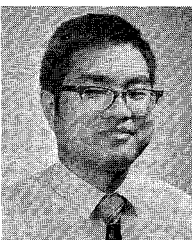
He joined the ITT Federal Laboratories in 1950, where he worked in the Chemical Department, the Countermeasures Department, and the Microwave Tube Department. From 1958 to 1961 he was assigned to the Associated Testing Laboratories as a representative

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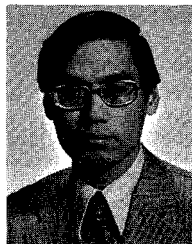
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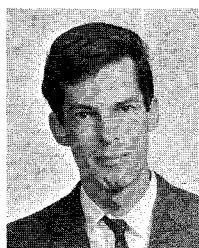
Dr. Lin is a member of ANSI C-95 Subcommittee IV on radiation hazard with respect to personnel. He is the current Secretary of Seattle Chapter of the IEEE Society on Microwave Theory and Techniques.



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transistors.



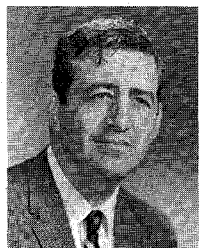
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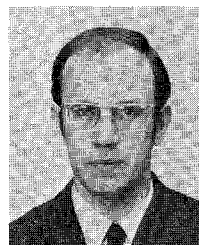
Since joining the Technical Staff of RCA Laboratories, Princeton, N. J., in June 1959, he has been engaged in research in phase-locked oscillators as a microwave logic device. He has specialized in research relating to microwave phenomena in gaseous plasmas, solid-state microwave devices, and is now engaged in research on solid-state microwave integrated circuits. His work in collaboration with Dr. G. Swartz on amplification at 24 GHz by the interaction of an electron beam with a cesium plasma was cited by *Industrial Research Magazine* as one of the 100 most important achievements in 1963. He was the recipient of RCA Laboratories Achievement Awards in 1963, 1965, and 1968. He has published or presented several papers concerned with plasmas, solid-state microwave devices, and microwave integrated circuits.

Mr. Napoli is a member of Sigma Xi, Tau Beta Pi, and Eta Kappa Nu.



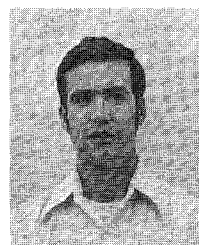
Lottfollah Shafai (S'67-M'69) was born in Maragheh, Azarbaijan, Iran, on March 17, 1941. He received the B.S. degree from the University of Tehran, Tehran, Iran, in 1963 and the M.A. and Ph.D. degrees from the University of Toronto, Toronto, Ont., Canada, in 1966 and 1969, respectively, all in electrical engineering.

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