Adam Martin (1996 Fellow)

A new technique is being investigated for the design of high efficiency power combining amplifiers and low phase noise oscillators for spaceborne communications systems. A theoretical foundation will be set for this technique , and the technique will be experimentally tested.

In spite of today's advanced technology where most communication equipment uses solid state devices like transistors and integrated circuits, there are still space applications for which vacuum tubes are used. Transistors simply have more to offer in terms of reliability, durability, size, and power consumption. Satellites can be made much smaller and more inexpensive with the implementation of transistor power ampilfiers. Power combining is the usual technique for generating adequate power levels in such long distance communications links. A single transistor cannot provide such power itself. It can, however, be an integral part of a larger structure designed to combine the power from many transistors. Conventional power combining architectures have major drawbacks when incorporating the services of many devices. Transmission line lengths in these structures become very long, creating additional loss in the circuit. The power generated by the combiner must overcome this loss in acheiving sufficient output power. Therefore, minimizing circuit loss in power combining structure is cruical.

The power combining structure currently being investigated is based on a new extended resonance technique. This technique provides a design that utilizes shorter lengths of transmission lines than do conventional combiners. The goal is to design a structure based on extended resonance that meets the performance standards of conventional combiners and is in addition, less susceptable to loss.