

## Direct Light to RF Fiber Antenna

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We are developing an antenna that directly converts a modulated optical signal to microwave radiation. This is useful as an element in a Phased Array Antenna (PAA). Currently signals to each element of a PAA are supplied through an optical fiber. The signal is detected, converted to an electronic form, amplified and applied to the antenna element. The direct optical conversion system eliminates the microwave amplifier at each antenna element. The antenna element consists of a single mode optical fiber that has two dissimilar semiconductor layers at the core cladding boundary as shown in Fig. 1. Since the two semiconductor layer structure does not have inversion symmetry there will be a first order non linear effect which is much larger than higher order non linear effects used in conventional non linear fibers. Two optical signals that differ in frequency by the microwave frequency propagate through the fiber. The large nonlinearity of the fiber causes mixing of the signals. Signals at the sum and difference frequency are obtained. The difference frequency is the microwave frequency. The fiber will not guide signals at the microwave frequency. These will be radiated by the fiber section. Thus the fiber becomes a microwave antenna. The sum signal is radiated out at the top of the fiber.

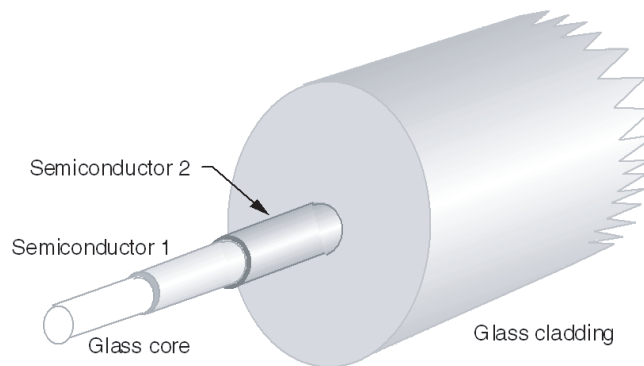


Figure 1: Optical fiber with two thin semiconductor layers at the core cladding boundary.

### REFERENCES

1. Zamuda, H., et al., "Photonic generated true time delay phased array applications," USAF Rome Lab Report, No. A532853, Decdmbler 1998.