<u>2. ABSTRACT</u>:

Satellite and mobile communications depend on the design of phased array antennas, where microwave phase shifters are used to electronically steer the antenna beams or nulls in the desired direction without physically re-positioning the antenna. However, due to the requirement of large number of phase shifters and the related high cost, electronically scanned phased array antennas are often expensive compared to the traditional reflector antennas used in microwave and millimeter-wave frequency band.

Ferrite phase shifters are widely used in array antennas to vary the phase input of the spatial radiating elements in order to control the beam steering characteristics. Although lightweight and small-size, the high cost and frequency limitation of ferrite material has limited their use to military applications. Recently, magnetized semiconductors have drawn much attention due to their higher frequency bandwidth, smaller size and lower biasing field requirement to tune the differential phase shift. So far, the predicted performances of the microstrip semiconductor phase shifters have been obtained by exploiting the interaction between the linearly polarized propagating signal and the gyroelectric properties of the magnetized semiconductor substrate.

In this study, a novel microstrip-line semiconductor phase shifters will be designed, where circularly polarized electromagnetic waves will be generated in the structure to maximize the differential phase shift per unit length and the related phase tuning properties. The amplitude and phase feed requirements of the microstrip-radiating array will be generated using a novel method of genetic algorithm. A coupling technique will be proposed to integrate the planar semiconductor phase shifters with the radiating elements to anticipate a compact and mechanically sturdy micro/millimeter-wave phased array antenna.