

Design of a Simplified Controlled Phased Array for Focused Beams and Beamforming

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With the increasing demand for large-scale phased arrays such as space solar power station [1], effectively and simply controlling the beam of a phased array has become a crucial challenge. In previous studies, series-fed phased arrays were used[2], but the losses and errors of the phase shifters would accumulate and result in suboptimal beamforming. This paper proposes a novel method for simple control of phased arrays. In a parallel-fed circuit, the angles of the array elements for a specific beam have a linear or square ratio relationship.

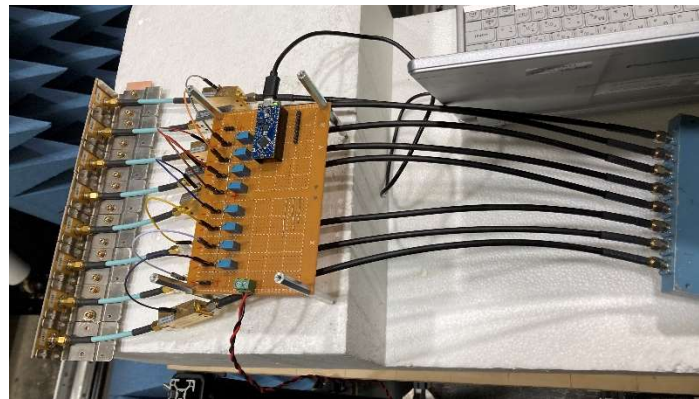


Figure 1. Photo of simplified controlled phased array.

Therefore, the proposed control system for the phased array can be achieved by centrally controlling each phase shifter in the circuit. Figure 1 shows an experimental photo of a simple controlled phased array. The control voltage and angle of the analog phase shifter have a close to linear relationship. When the beam is deflected, the angle of the array element is proportional, so the voltage of the control phase shifter is also proportional. By connecting a series of resistors in series, the proportional voltage sequence can be obtained and linked to the control terminal of the phase shifter to realize control of all phase shifters by controlling the voltage at both ends. Based on this principle, two control voltages are used to deflect the beam to the left and right, and three control voltages are used to form a focused beam.

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References

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