

## ENHANCING SMALL VIVALDI-ARRAY PERFORMANCE WITH BAFFLES

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Vivaldi notch antennas are a popular choice for wide-band arrays. These antennas have a number of attractive features, including mechanical simplicity and a surprisingly symmetric endfire radiation pattern from a flat structure. Although Vivaldi notch-antennas remain relatively unexplored from an analytical point of view, there have been a number of recent numerical parameter studies that have provided helpful guidance for designing both single elements and arrays.

One interesting property reported by these studies is that the low-frequency return loss performance of a Vivaldi element improves when it is embedded in a large, linear array of identical elements. In this case, mutual coupling effects shift the minimum operating frequency downward, thus allowing the use of shorter and narrower elements for a given bandwidth requirement. This reduction in element dimensions is attractive, since, for a given bandwidth requirement, tighter element spacings can be realized. Unfortunately, this advantage is largely lost for small arrays, because of the well-known truncation effect. As a result, the element dimensions required for small arrays tend to be larger than those required for arrays with more elements.

This paper presents a novel technique for improving the performance of small-to medium-sized arrays of Vivaldi elements. The guiding idea for this technique follows from the periodic structure viewpoint, which shows that the mutual coupling effects in an infinite array have the effect of making each element think it is radiating into an infinite waveguide. This suggests that, for small Vivaldi arrays, metal baffles can be used to emulate the coupling effect of the missing elements of the infinite array.

We will show that attaching metal baffles to the edges of small, E-plane Vivaldi arrays can significantly reduce the truncation effects, thus improving return-loss performance. Results will be presented that show small, baffled arrays of Vivaldi elements exhibit return-loss characteristics similar to infinite arrays of the same elements, while retaining essentially the same radiation patterns as un-baffled Vivaldi arrays.

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