Development of a 16-pixel monolithic 1.9 THz superconducting waveguide HEB mixer

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Abstract—Compact heterodyne imaging receivers are needed for future science instruments for aircraft, balloon-borne and space instruments that have limited observing time. Obviously, increasing the number of pixels affords a proportional increase in mapping speed provided that the sensitivity remains the same. In recent years, we have worked towards this goal by building modular linear 4-pixel waveguide mixer arrays that can be stacked with little difficulty to fill a focal plane. At the same time, we have built local oscillators in the same manner, and successfully built several local oscillator chains with 4 output pixels. Similarly, we have designed and built a 4 channel low-noise amplifier. With these components in hand, it is a straightforward exercise to expand the array. In the current configuration the mixer and local oscillator arrays are simply imaged through a beam splitter as in a conventional heterodyne receiver.

Currently, our efforts involve expanding the system to a 4 x 4 array receiver by conceptually stacking the linear components. In this talk, we focus our discussion on the mixer: in contrast to the sparsely spatially populated linear array we have previously built, we have designed and produced a compact 16-pixel mixer block more suitable for practical operation by direct drilling an array of feed horns into a block (Figure 1). Noise performance and beam measurements will be presented.

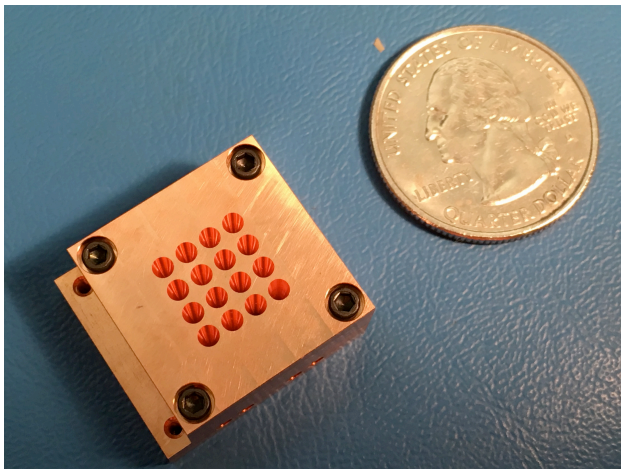

Figure 1. A 16-pixel mixer block next showing the horn array. The horn spacing is 2.5 mm.