V122a Comparison of LO Distribution Schemes for Multi-Beam Heterodyne Receivers Using Y-Junction, Branch-Line Coupler, and Magic-T

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We are investigating a compact and robust LO distribution network for multi-beam heterodyne receivers, achieved by embedding cascaded waveguide power dividers directly into the mixer holder. Such receivers are essential for next-generation wide field-of-view radio astronomical observations at millimeter and submillimeter wavelengths. We experimentally evaluated three fundamental waveguide power divider types, namely Y-junction, branch-line coupler, and magic-T—as building blocks for binary-tree distribution networks. Measurements at 2 mm wavelengths were performed using SIS junctions as power detectors. The Y-junction exhibited significant cross-polarization due to poor isolation between output ports. The branch-line coupler offered improved isolation but suffered from limited bandwidth. In contrast, the magic-T provided the best overall performance, demonstrating superior uniformity, high isolation, and broad bandwidth.