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120GHz Silicon Monolithic Schottky Diode Mixers

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Abstract – Single balanced direct mixers for a millimeter-wave radar front end have been realized using a standard Silicon technology with a lithography resolution of 1 μm combined with molecular beam epitaxy. The integration compatible technology provides low-barrier Schottky diodes with aluminum/nickel-silicide contacts. Subjecting the Silicon on insulator wafers to an anisotropic etching process leads to precise substrate membranes allowing for low-loss microstrip lines. Two single balanced mixer designs using different coupler structures were realized in this low-cost technology. A minimum conversion loss of 14.7 dB for a branch-line coupler mixer design at a LO frequency of 122.5GHz with only -3 dBm of LO power and up to 1GHz of intermediate frequency was achieved.