

An Integrated SIS Multibeam Receiver for Terahertz Astronomical Observation

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As expanding of the field of view of next generation single-dish Terahertz telescope, multibeam heterodyne receivers with pixel number up to 1000 are desired. This large format arrays can hardly be assembled with single elements, because the complexity of electrical wiring for biasing of SIS mixers, LNAs and electromagnetic coils will significantly decrease the operational reliability. Therefore, an integrated multibeam frontend unit with all wiring embedded in a single block should have apparent advantage in system stability and reliability. In this paper, we introduce a concept design of an integrated SIS multibeam receiver frontend. It features a single assembled block composed of machined layers, including horn antenna array, LO distribution network, SIS mixer and chip LNA mount, wiring layer, each of which performs a dedicated function. The assembled single block has common connectors for bias of all pixels in the array. In addition, since the array can be made very compact, it may allow LO distributed in a waveguide transmission line network with acceptable transmission loss. Waveguide LO distribution can largely simplify the optical design of the frontend and make the receiver compatible for space or unmanned ground-based telescope applications.