

V104a **A Compact 4-beam Dual-polarization Balanced SIS Receiver Frontend at ALMA Band 4**

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Driven by wide FoV survey and imaging, SIS focal plane array receiver technology is increasingly advanced in millimeter and submillimeter astronomical observation. To enable a large number of pixel counts, a compact architecture in the construction of arrays has been established. In this method, the conventional rectangular waveguide components are replaced by their planar circuit counterparts realized by using superconducting transmission lines. Because the circuits are fabricated onto silicon wafers by using photolithographic method, they are more precisely defined and the performances are better predicted than conventionally constructed ones with metallic waveguide components.

We have been conducting this integrated multibeam receiver development in NAOJ. In 2018 spring ASJ annual meeting we have presented a dual polarization balanced mixer on a single chip operating at a frequency range of $125\text{--}163\text{ GHz}$. The low receiver noise ($< 50\text{ K SSB}$) and the low-level cross-polarization ($< -20\text{ dB}$) of this device were reported. In 2019 spring ASJ annual meeting we reported on the balanced mixing performance, showing that a noise rejection ratio as high as 15 dB can be achieved with this integrated circuit. In this ASJ meeting, we will report a four-beam array using the planar circuit that we have developed, including its design and the performance that have been measured so far.