

## **Plans for an ALMA Band-6 Receiver Upgrade**

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We propose to upgrade the current ALMA Band 6 receivers to achieve more uniform sensitivity across the full 211-275 GHz band while increasing the IF bandwidth from the current 16 GHz (4 GHz per sideband per polarization) to 32 GHz. The increased IF bandwidth will allow full advantage to be taken of the planned second-generation ALMA correlator. Additional improvements will be made to reduce the sidelobe level and the cross-polarization.

The current Band-6 SIS mixers will be replaced with a new design using Nb/AlN/Nb SIS junctions. This will allow the use of smaller SIS junctions with higher critical current density and smaller capacitance, hence wider RF bandwidth. To improve reliability and ease of assembly, the mixer substrates will be silicon membranes with beamleads.

The IF amplifiers will be replaced with balanced 4-12 GHz amplifiers, thus reducing the variation of receiver noise across the IF band caused by interaction between the mixers and the present amplifiers. The balanced amplifiers will use a pair of superconducting quadrature hybrid on 3 x 1 mm quartz chips, and will incorporate a circuit to provide bias to an SIS mixer connected to the amplifier.

To reduce the contribution of LO sideband noise present in some of the Band-6 LO modules, the feasibility of using balanced sideband-separating mixers will be investigated. This requires four elemental SIS mixers per balanced sideband-separating mixer.

The original Band-6 feed horn and orthomode transducer can have a trapped mode resonance near the middle of the band. This will be eliminated in a new horn and OMT design. A new OMT without a septum will be developed, which will be less difficult to assemble and more reproducible.