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ALMA mixer development at the HIA

Following discussions with NRAO staff we have embarked on a program of mixer development work aimed at contributing to the ALMA project. This note details our understanding of the work to be undertaken.

In the relatively short term we will supply three 230 GHz SIS mixers for use in the antenna evaluation receivers. These will be delivered later this year. In the longer term we will develop a sideband-separating mixer design which is based on waveguide. This will complement the stripline approach currently being studied by the NRAO. We are starting this work now and expect that it will take about two years to complete. It will involve the tasks listed below:

- The use of CAD software to develop a waveguide-based quadrature-hybrid design which both meets the mixer performance requirements and is readily fabricated.
- Verification of the performance with a scale model
- The design, fabrication and test of a prototype balanced mixer at 230 GHz. This would probably use existing SIS chip designs and external IF amplifiers
- Extend this design to the more complicated sideband-separating version
- Fabricate and test this design
- Further extend this design to improve the IF bandwidth by including an integral first-stage amplifier
- Demonstrate a 230 GHz mixer which meets ALMA performance specifications
- Scale this design to higher frequencies