

V118a Work for ALMA band 2+ and band 2+3 receiver optics at NAOJ

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The ALMA band 2 (67-90 GHz) is the last of the baseline ALMA bands to be implemented in the array. The ALMA band 2 slot in the ALMA cryostat does not have a 4K stage and the receiver covering band 2 must be based on HEMT amplifiers cooled down to 15K. In recent years, two different studies have been initiated by NRAO (National Radio Astronomy Observatory) and ESO (European Southern Observatory).

NRAO, in the United States, has successfully developed a prototype of a Band 2 (67-90 GHz) receiver based on MIC LNAs. NAOJ has supported this development with receiver optics simulations and lens designs. New MMIC LNAs have been fabricated and show improved noise temperature performance up to around 95 GHz. A frequency extension of the Band 2 receiver from 90 to 95 GHz, renamed Band 2+, provides new science cases and it is thus of interest. NAOJ has designed a corrugated horn and dielectric lens to fully satisfy ALMA specifications in the extended ALMA Band 2+ (67-95 GHz), with the goal of ease of fabrication. Prototypes have been fabricated and integrated in the ALMA band 2+ prototype, with good preliminary results.

ESO has coordinated the efforts to establish an international consortium, of which NAOJ is part, to initiate studies to assess the possibility of developing a HEMT-based receiver which covers ALMA bands 2 and 3 simultaneously (67-116 GHz). NAOJ has provided receiver optics designs and studies for these activities.