Science at the Arizona Radio Observatory with ALMA-Style Frontends

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Over the past few years, the Arizona Radio Observatory (ARO) has been incorporating ALMA-style sideband-separating mixers into their receivers. In 2006, ARO implemented a 1mm ALMA-Band 6 (215-275 GHz) receiver at the Submillimeter Telescope (SMT) on Mt. Graham in collaboration with the National Radio Astronomy Observatory (NRAO). This new receiver has given record-breaking sensitivities with total system temperatures at 1mm as low as T_{sys} ~ 106 K, single sideband, on the sky at moderate elevations. Image rejection typically has been 15-20 dB with excellent baseline stability. This receiver has subsequently become a dual polarization facility instrument at the ARO-SMT featuring a steerable 4-8 GHz IF and the option of 2 or 4 IF channels for simultaneous observations of both upper and lower sidebands in both polarizations, if desired. Since its installation, this receiver has been producing a wide variety of novel results, ranging from detection of new interstellar molecules at the mK level in the 1mm band (e.g. PO, PH_3, and A1O) to extragalactic observations of HCN towards ULIRGS. This system has also played a critical role in the 1mm VLBI detection of SgrA* with 40 microarcsecond resolution. It has been used to make sensitive images of Bok globules in CO and ^{13}CO and to probe the structure of circumstellar shells of supergiant stars such as VY Canis Majors. These scientific results will be discussed. In Spring 2008, the ARO also implemented a new 0.4 mm Band 9 receiver at the SMT based on ALMA-type mixers provided by Space Research Organization Netherlands (SRON), as well as a new 3 mm Band 3 receiver employing ALMA-type mixers supplied by Herzberg Institute for Astrophysics (HIA). Preliminary data taken with these systems showed excellent improvement in sensitivity, as well. These two receivers are currently being upgraded to dual polarization facility instruments. New scientific results from these receivers will be presented.