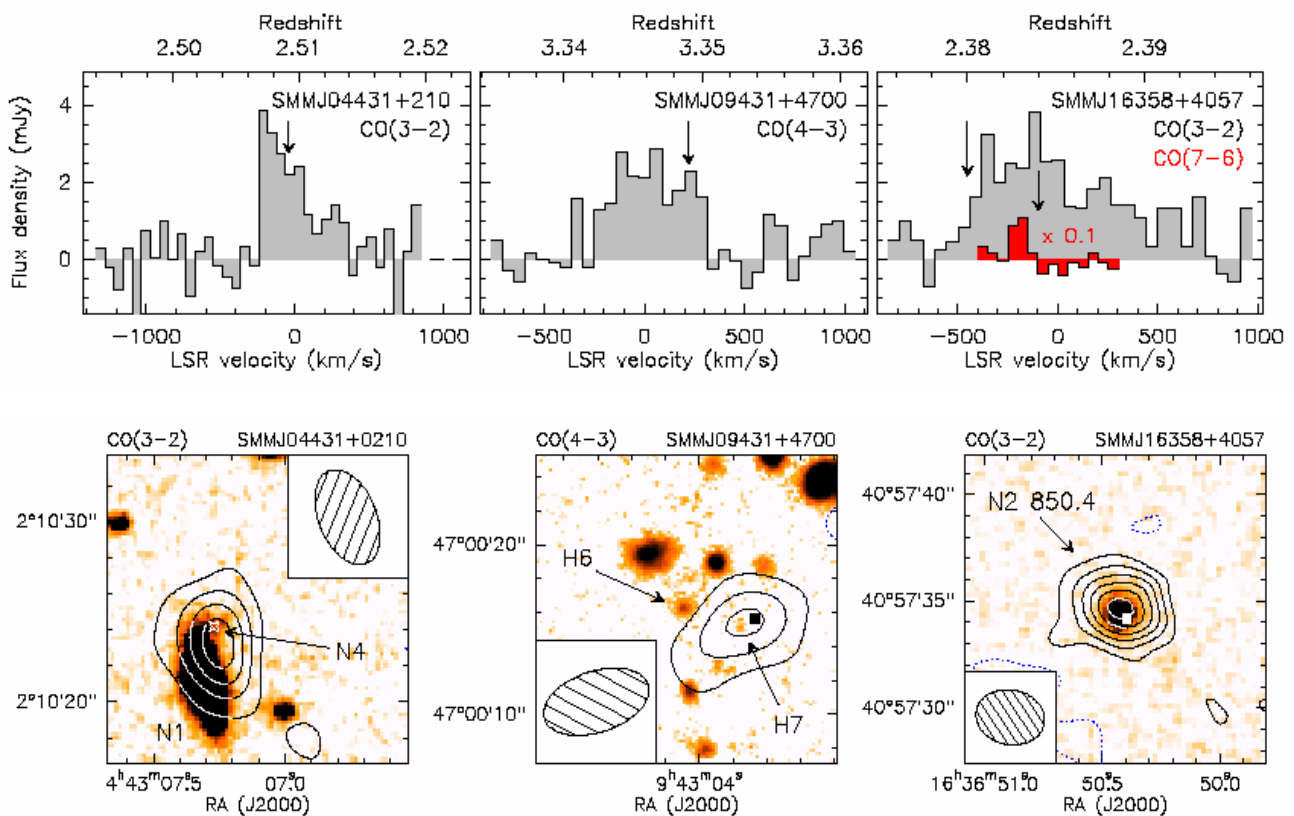


**Together with researchers from the IRAM community, the US and the UK we have initiated a survey of CO emission of high redshift submm galaxies using the IRAM Plateau de Bure interferometer, which brings to 12 the number of submillimeter galaxies with CO detections.** These CO line observations confirm the optical redshifts, which lie in the range  $z=1$  to 3.5, and indicate very large molecular gas (few  $\times 10^{10} M_{\odot}$ ) and dynamical ( $>10^{11} M_{\odot}$ ) masses. The derived total gas and stellar masses imply that the SMGs are very massive systems, dominated by baryons in their inner  $R < 10$  kpc. This is similar to what is observed for local giant ellipticals and consistent with numerical simulations of the formation of the most massive ellipticals. We derive a lower limit to the comoving number density of such massive objects at high redshift that is well above the number density of massive objects predicted from recent semi-analytical models of galaxy formation. This discrepancy highlights the critical open questions concerning the detailed cooling and feedback processes governing the formation of a massive galaxy in the framework of hierarchical structure formation.



Top: CO spectra of three of the submillimeter galaxies observed with the IRAM PdBI. Bottom: Velocity integrated CO maps, overlaid on K band (left and right) or I-band (center) images. The beam size is indicated.

### Publications from this work:

- Neri, R., Genzel, R., Ivison, R.J., Bertoldi, F., Blain, A.W., Chapman, S.C., Cox, P., Greve, T.R., Omont, A., Frayer, D.T. 2003, ApJ, 597, L113
- Greve, T., Bertoldi, F., Smail, I., Neri, R., Blain, A.W., Ivison, R.J., Chapman, S.C., Genzel, R., Omont, A., Cox, P., Tacconi, L.J., Kneib, J.-P. 2004, MNRAS, submitted

**In collaboration with: F. Bertoldi, A. Blain, S. Chapman, P. Cox, T. Greve, R. Ivison, R. Neri, A. Omont, I. Smail**