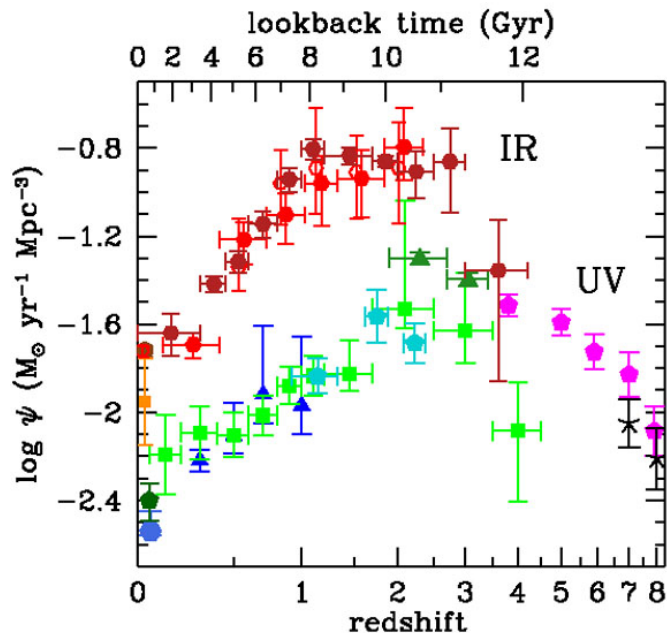


# The missing fraction of star-formation:

The obscured side of the star formation history:  
the contribution of high- $z$  optically dark galaxies

*Ref. C. Gruppioni (INAF-OAS, room 4W8)*

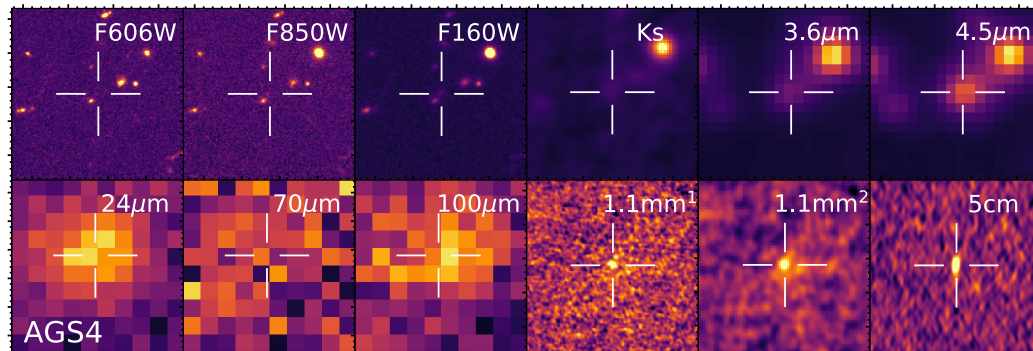
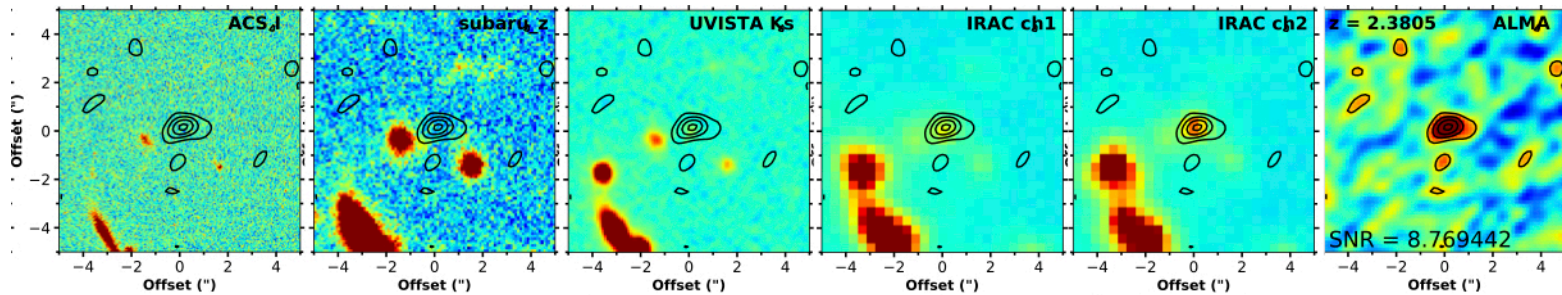


The evolution of the star formation rate density (SFRD) with redshift tells us how many stars are formed by galaxies during the Universe life

At  $z < 3$  we know the SFRD is dominated by obscured galaxies emitting in the IR.

At  $z > 3$  all we know comes from optical/UV (unobscured) surveys: we still miss the obscured fraction of star formation likely produced by the most massive galaxies at high- $z$ .

Thanks to the superb sensitivity of ALMA and its possibility to perform blind surveys, we are now finding extremely red galaxies, detected only from mid-IR to sub-mm, totally invisible even in the deepest HST images.

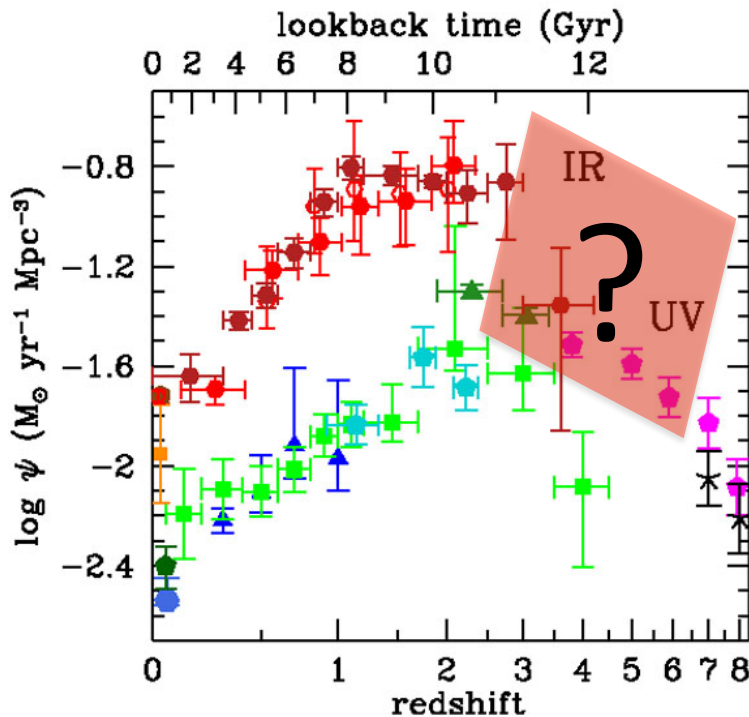


These galaxies, called HST-dark, are massive high-z ( $>3$ ) objects.

The contribution of the HST-dark galaxies to the SFRD at high-z can be significant and needs to be quantified.

## THESIS GOAL

The main goal of this thesis is to obtain a complete census of optically dark galaxies by analysing the existing ALMA deep survey results, deriving average properties (e.g., SED, mass, SFR, redshift) for the entire population by performing stacking on the available multi-wavelength images.



Through this study we plan to estimate the fraction of SFRD obscured by dust, in particular to derive the contribution of the optically-dark population, that can be as large as the optical/UV one, and even more, at  $z \sim 3-7$ .

**This will have strong implications on our understanding of galaxy formation and evolution**