The two-faced properties of high-z *Herschel* starbursts: insights from the FMOS-COSMOS survey

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Most of galaxies at all redshifts build their stellar mass in long time-scales along the main sequence (MS) but outliers with exceptional star formation rates (SFRs) exist, possibly indicating the existence of an alternative mode of star formation with enhanced efficiency. The occurrence of such "starburst mode" is still questioned as the high SFRs measured in starburst galaxies (SBs) may also arise from an exceptional cold gas reservoir.

To shed light on this issue, we constrained the ionized gas properties of twelve *z~1.6* SBs with SFR elevated by ×8, on average, above the MS through rest-frame optical spectroscopy from the FMOS-COSMOS survey, that specifically targeted these rare sources. We found that our SBs have a metal content consistent with the M_* -Metallicity relation at *z~1.6* (the MZR, Fig. 1 left) and are metal-rich outliers from the metallicity-SFR anticorrelation (the FMR, Fig. 1 right) observed at fixed M_* for the MS population.

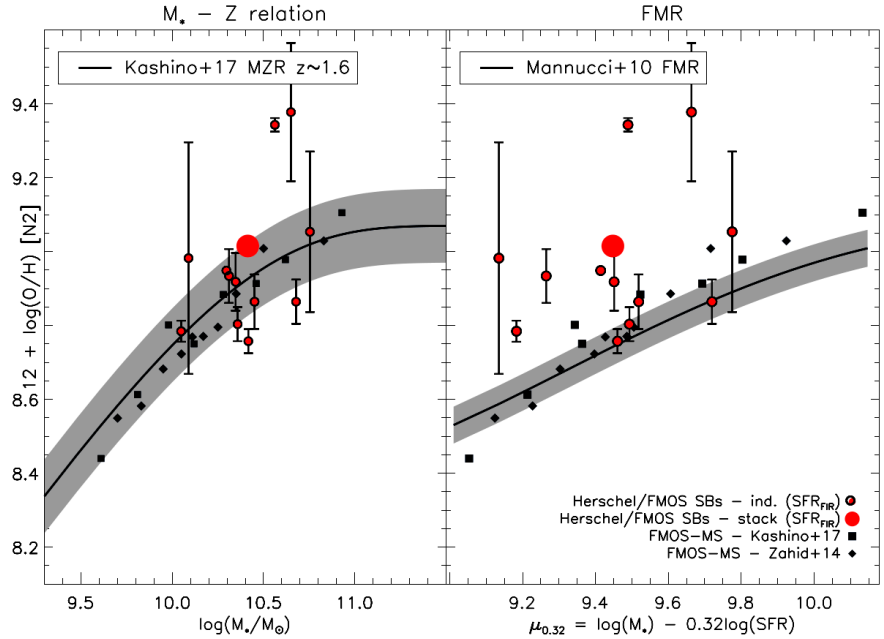

Fig. 1: Left: *Metallicity as a function of M_* for the SB sample based on individual and stacked spectra, compared with the MZR and data points at z ~ 1.6 from the FMOS-MS sample of Kashino et al. (2017a) and Zahid et al. (2014). The shaded area marks a range of ~0.1 dex, roughly the scatter of this relation.* ***Right****: FMR for SB galaxies compared with the Mannucci et al. (2010) equation and its scatter of ~ 0.05 dex.*

When measuring their nebular dust attenuation A_{Ha} we found a strong tension between different indicators. In particular, the Balmer Decrement (BD, Halpha/Hbeta ratio) yields a much lower dust attenuation than the IRX (L_{FIR}/L_{Ha} ratio) for the same sources. This implies that ~90% of the vigorous star-forming activity in our SBs is buried in heavily obscured regions with $A_{Ha} > 4.5$ *mag*. As such, optical emission lines sample the less obscured regions of these galaxies only, and give no information about the starbursting core which is revealed only in the far-IR.

This study corroborates our findings from ALMA measurements of the cold gas content that the extreme SFRs of these sources is driven by major mergers enhancing their SFE and their metal content and generating optically thick starburst cores, similarly to what is observed in local ULIRGs.

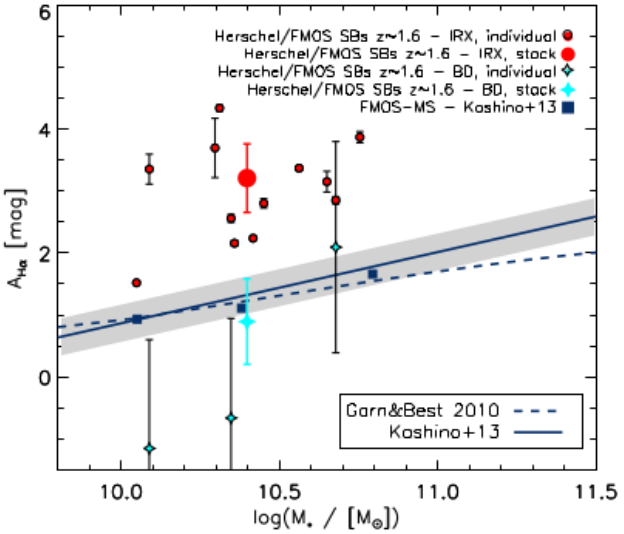

Fig 2*: A_{Ha} as a function of M_* for z ~ 1.6 SBs versus the MS-trend at z~1.6 and in the local Universe (solid and dashed lines respectively)*

I will present this study, discussing our results in the context of the average galaxy population at the same redshift as well as the implications for our understanding of these elusive systems at high-z.