X46a Dust Attenuation of Star-Forming Galaxies in the first 2 Gyr of the Universe from the COSMOS ALMA Archive (A^{3}COSMOS)

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The development of sensitive mm/submm telescopes (e.g. ALMA, NOEMA) opened a new window to the far infrared continuum (FIR) emitted by dust, which enables us to investigate the obscured star-formation history of the Universe. Using these new facilities, early studies revealed unexpected results, as high-redshift galaxies show much lower FIR emission than expected. However, these first results were based on small samples selected from small sky fields. Here, we take the next steps based on the ALMA archive in the COSMOS field (1544 pointings, 243 arcmin^2) in the collaboration with the A^{3}COSMOS team (Liu et al. in prep.), and present new results on the dust attenuation of a large sample of galaxies at $z \sim 2.5 - 4.0$. In particular, we study the relationship between the stellar mass (M_*), the UV spectral slope ($\beta_{\rm UV}$), and the infrared excess (IRX= $L_{\rm IR}/L_{\rm UV}$). In total, our study is based on a sample of ~ 1100 galaxies ($\sim$10% of which are individually detected) at $z = 2.5 - 4.0$. In the IRX-$\beta_{\rm UV}$ relation, our main sequence sample is perfectly consistent with that of local star-forming galaxies, and the high-redshift starbursts generally have ~ 0.5 dex larger IRX. However, the individual detections and the stacks show that the IRX-M_* relation of our sample has a steeper slope than found from previous studies. The steeper slope implies an evolution of the obscured fraction of star-formation at $z > 2.5$, which was observed to be constant from $z \sim 0 - 2.5$ in Whitaker et al 2017.