**ABSTRACT:** We exploit the deepest existing 100- and 160-µm data obtained by PEP in the GOODS-N to derive for the first time the evolution of the rest-frame 60-µm, 90-µm and total IR Luminosity Function (LF) up to unprecedented high redshifts (z~3).

The PEP sources (216 and 237 to S(3z)~3 and 5.7 mJy at 100 and 160 µm respectively) have been fully characterised through a SED-fitting analysis and divided into five main classes: spiral galaxies, starbursts (SB), composite AGN+SB, AGN2, AGN1 (several templates for each class). Their LFs have been computed separately and compared to the Gruppioni & Pozzi (2010, in preparation: GP2010) backward evolution model predictions.

Spiral galaxies dominate the LF and the Star-formation Density (SFD) only at low redshifts (z~0.3), when moderate SF galaxies with AGN2 SEDs start to prevail up to z~1.5. Then SB galaxies, dominating the bright end of the LF at any z, become the prevalent population up to the highest redshifts.

Our PEP total IR LF agrees well with previous determinations (from either data or models). We find luminosity evolution as (log L)**2.5-3** up to z=1.5±0.3 (though degeneracy is found between luminosity evolution and both density and luminosity). At 1.5≤z≤2.5-3 the evolution rate appears to keep ~constant.

**CONCLUSIONS:** We make use of the deepest Herschel PEP 100- and 160-µm data in the GOODS-N to characterise the evolution of the galaxy and AGN FIR LF and SFD at 0≤z≤3, finding that strong evolution is required at least up to z~2, with the different IR populations showing different evolutionary behaviours.