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IDENTIFICATION OF HIGH-Z GALAXIES THROUGH SUBMILLIMETRE DROP-OUTS

E. Aguilar,[1] I. Aretxaga,[1] D. H. Hughes,[1] G. Wilson,[2] K. S. Scott,[3] and the AzTEC/ASTE Team

We propose a sample of submillimeter galaxies in the GOODS-S field that, through colour selection, are likely to be at high redshift ($z > 3$). We search the AzTEC catalog of sources at 1.1 mm (Scott et al. 2010) and cross-correlate it with the BLAST catalog at 250, 350 and 500 μm (Devlin et al. 2009) to select those that, due to their low fluxes (S/N $< 3.5\sigma$), have not been included at the BLAST catalogs but of which we do have a signal below the formal limit of detectability (drop-outs).

In order to identify the drop-outs, we first have to consider the positional uncertainty of sources in the respective (sub-)mm maps. We use the respective point spread functions and scale them to simulate artificial sources of S/N=3, that are inserted into source-free areas of the 250, 350, 500 and 1100 μm maps. Artificial sources are then recovered with the same source extraction algorithm as that used to create the catalogs, and the distance to the original inserted position is measured. We adopt the 95 per cent confidence interval for the measured positional uncertainty in those simulations. The resulting search radii for BLAST counterparts around AzTEC sources is the combination of BLAST and AzTEC uncertainty radii added in quadrature. Typical values for these radii, which depends on the S/N of the AzTEC detections, range in the intervals 37.7–39.2, 34.3–35.8, and 50.2–51.3 arcsec at 250, 350 and 500 μm, respectively. We find 13 AzTEC sources with no BLAST counterparts at 250, 350 nor 500 μm and we calculate the 3σ BLAST flux density upper limits for each one of them.

Figure 1 represents the sub-mm colour-colour diagram of the BLAST drop-outs. For comparison we represent a mock catalog of sub-mm galaxies designed to reproduce the 850 μm number counts in blank fields. The colours of the mock galaxies as a function of redshift are derived at random from a spectral energy distribution library that contains 20 local ultra-luminous infrared galaxies, active galactic nuclei and starbursts with a wide range of spectral shapes (Aretxaga et al. 2003).

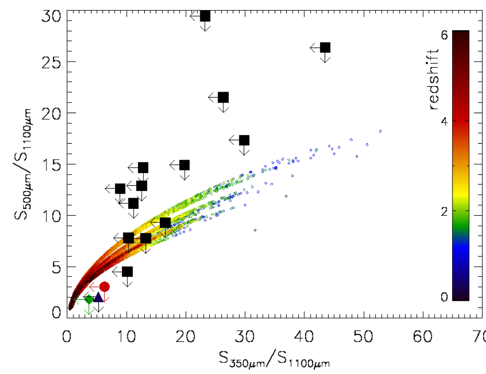

Fig. 1. Colour-colour plot of the 13 BLAST dropouts of the AzTEC map in the GOODS-S field (squares with arrow bars), considering their 3σ flux density upper limits. The diamond represents the colors of the stacked flux density for the 13 drop-outs. The circle represents the stacked flux density for the drop-outs that have radio counterpart and the triangle represents the stacked flux density for the drop-outs that do not have radio counterparts.

In order to derive more stringent constraints on the colours of the drop-outs, we can compute the stacked flux density at 250, 350 and 500 μm of the AzTEC sources in the drop-out catalog. We made sub-samples considering different selection criteria. The resulting stacked upper limits to the flux at 3σ are represented in Figure 1 and show that a large fraction of these are likely high redshift galaxies.

Assuming that the high FIR luminosities of these galaxies are due to the star formation activity which is related with the presence of molecular gas, we should be able to confirm their redshifts by means of CO emission lines with the LMT.

[1]Instituto Nacional de Astrofísica, Óptica y Electrónica, Apdo. Postal 51 y 216, 72840 Puebla, Puebla, México (eaguilar, itziar, dhughes@inaoep.mx).

[2]Department of Astronomy, University of Massachusetts, Amherst, MA 01003, USA (wilson@astro.umass.edu).

[3]Department of Physics and Astronomy, University of Pennsylvania, Philadelphia, PA 19104, USA (scoki@sas.upenn.edu).

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