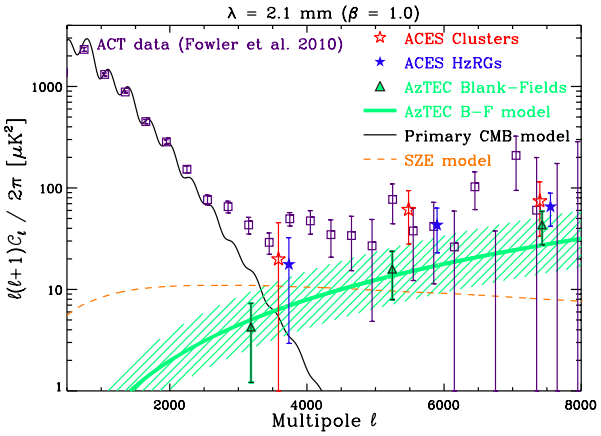

Fig. 1. Extrapolation of the 1.1 mm AzTEC power spectra to 2.1 mm assuming an emissivity index $\beta = 1$. The shaded region corresponds to the extrapolations of a 1.1 mm blank field simulation assuming $0.5 \leq \beta \leq 1.5$. The squares and the dashed curve show the ACT measurements of Fowler et al. (2010) and the SZE APS predicted by Komatsu & Seljak (2002) for $\Omega_b = 0.0441, h = 0.722$, and $\sigma_8 = 0.8005$.

2. SAMPLE AND METHOD

Our sample consists of deep ($\sigma_{\rm rms}$ ∼1.5–0.5 mJy/beam) observations of 8 blank fields that cover a total area of $A_{\rm tot} \sim 2$ sq.deg, and the AzTEC Cluster Environment Survey (ACES, $A_{\rm tot} \sim 2$ sq.deg) with observations towards 23 galaxy clusters ($0.05 \lesssim z \lesssim 1.0$) and 17 High-$z$ Radio Galaxies (HzRGs, $0.5 \lesssim z \lesssim 6.3$). The AzTEC data reduction pipeline (Scott et al. 2008) is designed to eliminate most of the extended features from the maps and optimize the detection of point-like structures (e.g. unresolved SMGs).

The size of the individual maps allows us to apply a small angle approximation, and therefore the APS can be estimated through Fourier analysis instead of a complete spherical harmonic decomposition. The effects of noise and shape of the maps are taken into account, and through simulations we find that our measurements are secure for $3500 \lesssim \ell \lesssim 10000$.

To compare against other observations and models we extrapolate our results to different wavelengths assuming that the (sub-)mm flux of SMGs scales with frequency as $F_\nu \propto \nu^{2+\beta}$.

3. RESULTS AND DISCUSSION

Figure 1 shows the averaged APS of the galaxy clusters, HzRGs, and 3 of the blank fields (COSMOS, SEP, and GOODS-s) in our sample. Our results are extrapolated to 2.1 mm, a common waveband to most of the new SZE experiments, assuming an emissivity index $\beta = 1$. Also shown are: the APS of a simulated population of SMGs randomly distributed in space and following the integrated number counts measured in the AzTEC blank fields, the ACT 2.1 mm measurements from Fowler et al. (2010), and the theoretical SZE APS predicted by Komatsu & Seljak (2002).

The averaged APS of the ACES clusters and HzRGs show an excess of power compared to the 3 blank fields ($A \sim 1.1$ sq.deg). This excess can be explained, in the case of the galaxy clusters, by gravitational lensing magnification of the background population of SMGs and possibly residual SZE signal that is not removed by the reduction process. On the other hand, HzRGs are expected to reside in potentially over dense regions of the Universe, increasing the probability of finding an excess of SMGs towards these fields (see Zeballos et al. 2011).

Given this bias, we chose to compare our blank-field APS with other wide-area surveys. The amplitude of our averaged blank field APS is a factor 1.3–4.7 lower than other observational results, e.g. ACT (2.1 and 1.4 mm, Fowler et al. 2010; Das et al. 2010), APEX (2.1 mm, Reichardt et al. 2009), SPT (2.1 mm, Hall et al. 2010), but consistent within the errors. These discrepancies could result in a reduced estimation of the SZE APS, which would therefore produce 5–20% lower predictions of σ_8. On the other hand, results from different models (e.g. Negrello et al. 2007; Sehgal et al. 2010; Lagache et al. 2004), extrapolated to 2.1 mm, overpredict the amplitude of the SMGs APS by factors of ∼3–100 compared to our measurements.

Recent optimizations of the AzTEC reduction pipeline, improvements in our procedure to estimate the APS, and the analysis of the complete AzTEC sample, will result in a more precise estimation of the SMGs APS, and may allow us to test predictions of the clustering strength of this population of galaxies.

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