

## Planck intermediate results: XLIII. Spectral energy distribution of dust in clusters of galaxies

Adam R., Ade P., Aghanim N., Ashdown M., Aumont J., Baccigalupi C., Banday A., Barreiro R., Bartolo N., Battaner E., Benabed K., Benoit-Lévy A., Bersanelli M., Bielewicz P., Bikmaev I., Bonaldi A., Bond J., Borrill J., Bouchet F., Burenin R., Burigana C., Calabrese E., Cardoso J., Catalano A., Chiang H., Christensen P., Churazov E., Colombo L., Combet C., Comis B., Couchot F., Crill B., Curto A., Cuttaia F., Danese L., Davis R., De Bernardis P., De Rosa A., De Zotti G., Delabrouille J., Désert F., Diego J., Dole H., Doré O., Douspis M., Ducout A., Dupac X., Elsner F., Enßlin T., Finelli F., Forni O., Frailis M., Fraisse A., Franceschi E., Galeotta S., Ganga K., Génova-Santos R., Giard M., Giraud-Héraud Y., Gjerløw E., González-Nuevo J., Górski K.

*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

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### Abstract

© ESO 2016. Although infrared (IR) overall dust emission from clusters of galaxies has been statistically detected using data from the Infrared Astronomical Satellite (IRAS), it has not been possible to sample the spectral energy distribution (SED) of this emission over its peak, and thus to break the degeneracy between dust temperature and mass. By complementing the IRAS spectral coverage with Planck satellite data from 100 to 857 GHz, we provide new constraints on the IR spectrum of thermal dust emission in clusters of galaxies. We achieve this by using a stacking approach for a sample of several hundred objects from the Planck cluster sample. This procedure averages out fluctuations from the IR sky, allowing us to reach a significant detection of the faint cluster contribution. We also use the large frequency range probed by Planck, together with component separation techniques, to remove the contamination from both cosmic microwave background anisotropies and the thermal Sunyaev-Zeldovich effect (tSZ) signal, which dominate at  $\nu \leq 353$  GHz. By excluding dominant spurious signals or systematic effects, averaged detections are reported at frequencies  $353 \text{ GHz} \leq \nu \leq 5000 \text{ GHz}$ . We confirm the presence of dust in clusters of galaxies at low and intermediate redshifts, yielding an SED with a shape similar to that of the Milky Way. Planck's resolution does not allow us to investigate the detailed spatial distribution of this emission (e.g. whether it comes from intergalactic dust or simply the dust content of the cluster galaxies), but the radial distribution of the emission appears to follow that of the stacked SZ signal, and thus the extent of the clusters. The recovered SED allows us to constrain the dust mass responsible for the signal and its temperature.

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### Keywords

Diffuse radiation, Galaxies: clusters: general, Galaxies: clusters: intracluster medium, Infrared: general