IRAS2, IRAS3, and IRAS4, respectively) can be considered as an additional, independent source of uncertainty.

A.8. Planck/HFI

The calibration of the HFI data used by C18 is presented by Planck Collaboration XI (2016). The two short wavelength bands (350 and 550 µm) are calibrated on Neptune and Uranus. The uncertainty on the model is 5% including 2% spectrally independent. The statistical errors on the observations of the calibrators are 1.4% and 1.1%, respectively, which can be considered independent. The models of Neptune used here and for SPIRE (Appendix A.5) are the ESA3 and ESA4 models[28], respectively. Both models differ only by 0.3–0.6% in the SPIRE and HFI bands. They will thus induce correlation. To simplify, we assume that the HFI calibration factors derived from Neptune (correlated with SPIRE) and Uranus (not correlated with SPIRE) are averaged. We obtain calibration uncertainties ≃30% lower than Planck Collaboration XI (2016), as they have opted for the more conservative, linear addition of independent errors. We choose here the more rigorous quadratrical addition.

The four long wavelength bands of HFI are calibrated on the CMB dipole. The first source of uncertainty is the scatter of individual bolometers: 0.78%, 0.16%, 0.07%, and 0.09% at 850 µm, 1.38, 2.1, and 3.0 mm. The second source of uncertainty comes from the gain variations: 0.03%, 0.04%, 0.05%, and 0.05%, respectively. These different uncertainties can be considered independent.

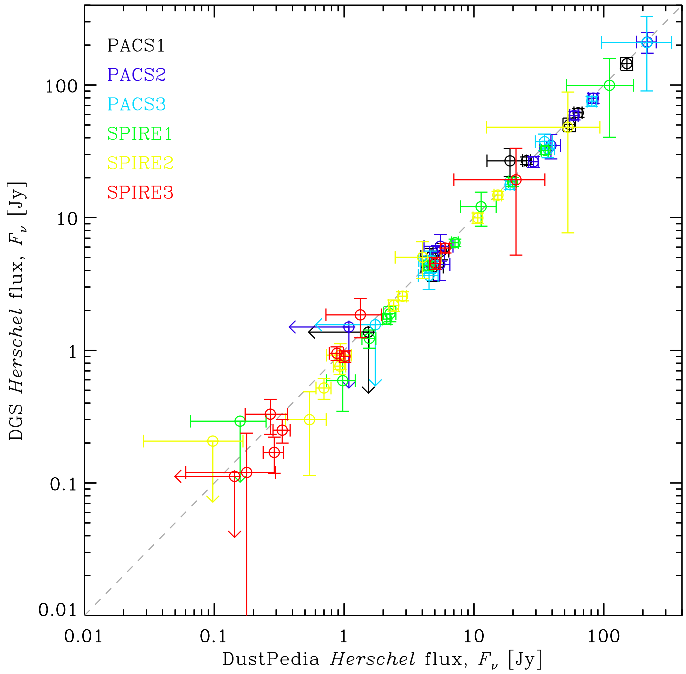

Fig. B.1. Comparison between the DustPedia and DGS photometry. The 13 sources of the DGS which are part of the DustPedia catalog are compared in the three PACS and three SPIRE bands (one color per filter). The x axis shows the photometry estimated by C18, while the y axis shows the photometry estimated by Rémy-Ruyer et al. (2015). The dashed line represents the 1:1 relation.

Appendix B: Homogeneity of the sample

B.1. DustPedia and DGS photometry

Figure B.1 displays the comparison, in the six *Herschel* bands, of the photometry of the sources of the DGS that are part of the DustPedia sample. The DustPedia photometry has been estimated by C18 (cf. Sect. 2.1.1), and the DGS photometry, by Rémy-Ruyer et al. (2015, cf. Sect. 2.1.2). Both are in very good agreement.

B.2. Derivation of the stellar mass

To further investigate the discrepancy between the CIGALE fits of N20 and Eskew et al. (2012) approximation used by Madden et al. (2014), discussed in Sect. 2.2.1, we have compared the two estimators on our sample. To close the controversy, we have modeled the UV-to-mm SED of the 35 DGS galaxies that were not in DustPedia, with CIGALE, using the same settings as Nersesian et al. (2019, i.e., using two stellar populations). We therefore have CIGALE-derived $M_\star$ for our whole sample. This is shown in panel a of Fig. B.2. The stellar mass derived using CIGALE with two stellar populations are in very good agreement with the Eskew et al. (2012) approximation.

Panel b of Fig. B.2 compares the same CIGALE-two-population estimates with the values of $M_\star$ reported by N20. The main differences are the following, noting that the stellar masses quoted by N20 come from the SED modeling presented by Burgarella et al. (2020). Firstly, Nersesian et al. (2019) used the UV-optical photometry of Clark et al. (2018), which have been homogenized (cf. Sect. 2.1), whereas Burgarella et al. (2020) gathered UV-optical data from the NASA/IPAC Extragalactic Database (NED). The latter is a compilation of data from the literature that can be inhomogeneous in terms of photometric aperture, extinction correction and removal of foreground stars. Secondly, Nersesian et al. (2019) used CIGALE with two stellar populations: (i) an old exponentially decreasing SFH; (ii) a young burst. In contrast, Burgarella et al. (2020) used a single delayed SFH, which can lead to underestimating the mass, because of the outshining effect of the recent star formation (e.g., Lopes et al. 2020). For instance, Buat et al. (2014) conducted a large comparison of stellar mass estimates and concluded that models using two stellar populations were providing the best fits. This can explain why the IRAC1 and IRAC2 fluxes are systematically underestimated by the mean model of N20 (cf. their Fig. A.1), while it is not the case for Nersesian et al. (2019)[29]. Yet, these bands sample the spectral range where the bulk of the stellar mass dominates the emission. In addition, most of the galaxies of the DGS are blue compact dwarf galaxies (BCD). These galaxies are known to be actively forming stars and have an old underlying stellar population (e.g., Hunter & Gallagher 1989; Grebel 1999; Kunth & Östlin 2000; Aloisi et al. 2007; Janowiecki et al. 2017). Finally, Nersesian et al. (2019) used a Salpeter (1955) IMF, whereas Burgarella et al. (2020) used a Chabrier (2003) IMF leading to a systematic scaling by a factor 0.61. The comparison of these two estimates, in panel b of Fig. B.2, shows that the stellar masses of N20 are most of the time systematically lower than those of Nersesian et al. (2019), sometimes drastically.

[28] `ftp://ftp.sciops.esa.int/pub/hsc-calibration/PlanetaryModels/`

[29] `http://dustpedia.astro.noa.gr/Cigale`