We aim to develop the next-generation deblended far-IR and sub-mm catalogues in deep extragalactic survey fields, by extracting photometry at the positions of known sources. Our progressive deblending uses the Monte Carlo Markov Chain (MCMC)-based Bayesian probabilistic framework XID+. The deblending process starts from the *Spitzer*/MIPS 24 μm data, using an initial prior list of sources selected from the COSMOS2020 catalogue and radio catalogues from the VLA and the MeerKAT surveys, based on spectral energy distribution (SED) modelling which predicts fluxes of the known sources at the deblending wavelength. After deblending the 24 μm data, we proceed to the *Herschel* PACS (100 & 160 μm) and SPIRE bands (250, 350 & 500 μm). Each time we construct a tailor-made prior list, taking into account the deblended photometry from the previous steps. For details of the performance of our deblending pipeline, please refer to the paper Wang L., La Marca A., Gao F. et al. 2024 "Probalilistic and progressive deblended far-infrared and sub-millimetre point source catalogues I. Methodology and first application in the COSMOS field".

We publicly release two versions of our deblended point source catalogue. The long version of the catalogue contains the full information, including source ID, positions, best estimates of the source flux densities and uncertainties, background estimates, residual confusion noise, total noise (formed by adding flux uncertainties and residual confusion noise in quadrature), and 3000 samplings from the full posterior probability distribution functions (PDFs) for each source (see Table 1). As the long version of the catalogue is a large file ($>$ 11 GB), we also provide a short version (see Table 2). The main difference between the long and short version of the catalogue is that the short verison does not contain the 3000 samplings of the posterior PDF.

Table 1: Columns contained in the long version of our XID+ deblended far-IR and sub-mm point source photometric catalogue. σ^+ can be calculated from the difference of the 84th percentile and the median. σ^- can be calculated from the difference between the median and the 16th percentile. The 1σ uncertainty can be derived from the maximum of σ^+ and σ^-. For a final estimate of the flux uncertainty, one can use the total error derived from combining the 1σ uncertainty and the residual confusion noise in quadrature.

Name	Unit	Description
ID	-	The COSMOS2020 ID (negative numbers for radio sources)
R.A.	-	Right Ascension from COSMOS2020 (or radio positions)
Dec	-	Declination from COSMOS2020 (or radio positions)
F_24	mJy	24 μm flux density (median)
FErr_24_u	mJy	24 μm flux density (84th Percentile);
FErr_24_l	mJy	24 μm flux density (16th Percentile);
FErr_24_1σ	mJy	maximum of σ^+ and σ^-
Bkg_24	mJy/Beam	Fitted Background of 24 μm map (median)
Sig_conf_24	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_24	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_24})^2 + (\text{FErr\_24\_1}\sigma)^2}$
Rhat_24	-	Convergence Statistic (ideally < 1.2)
n_eff_24	-	Number of effective samples (ideally > 40)
Post_24	mJy	3000 samplings from the posterior PDF of the 24 μm flux density
tile_MIPS	-	tile number
F_100/160	mJy	100/160 μm flux density (median)
FErr_100/160_u	mJy	100/160 μm flux density (84th Percentile)
FErr_100/160_l	mJy	100/160 μm flux density (16th Percentile)
FErr_100/160_1σ	mJy	maximum of σ^+ and σ^-
Bkg_100/160	mJy/Beam	Fitted Background of 100/160 μm map (median)
Sig_conf_100/160	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_100/160	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_100/160})^2 + (\text{FErr\_100/160\_1}\sigma)^2}$
Rhat_100/160	-	Convergence Statistic (ideally < 1.2)
n_eff_100/160	-	Number of effective samples (ideally > 40)
Post_100/160	mJy	3000 samplings from the posterior PDF of the 100/160 μm flux density
tile_PACS	-	tile number
F_250/350/500	mJy	250/350/500 μm flux density (median)
FErr_250/350/500_u	mJy	250/350/500 μm flux density (84th Percentile)
FErr_250/350/500_l	mJy	250/350/500 μm flux density (16th Percentile)
FErr_250/350/500_1σ	mJy	maximum of σ^+ and σ^-
Bkg_250/350/500	mJy/Beam	Fitted Background of 250/350/500 μm map (median)
Sig_conf_250/350/500	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_250/350/500	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_250/350/500})^2 + (\text{FErr\_250/350/500\_1}\sigma)^2}$
Rhat_250/350/500	-	Convergence Statistic (ideally < 1.2)
n_eff_250/350/500	-	Number of effective samples (ideally > 40)
Post_250/350/500	mJy	3000 samplings from the posterior PDF of the 250/350/500 μm flux density
tile_SPIRE	-	tile number
F_850	mJy	850 μm flux density (median)
FErr_850_u	mJy	850 μm flux density (84th Percentile)
FErr_850_l	mJy	850 μm flux density (16th Percentile)
FErr_850_1σ	mJy	maximum of σ^+ and σ^-
Bkg_850	mJy/Beam	Fitted Background of 850 μm map (median)
Sig_conf_850	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_850	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_850})^2 + (\text{FErr\_850\_1}\sigma)^2}$
Rhat_850	-	Convergence Statistic (ideally < 1.2)
n_eff_850	-	Number of effective samples (ideally > 40)
Post_850	mJy	3000 samplings from the posterior PDF of the 850 μm flux density
tile_SCUBA	-	tile number

Table 2: Columns contained in the short version of our XID+ deblended far-IR and sub-mm point source photometric catalogue.

Name	Unit	Description
ID	-	The COSMOS2020 ID (negative numbers for radio sources)
R.A.	-	Right Ascension from COSMOS2020 (or radio positions)
Dec	-	Declination from COSMOS2020 (or radio positions)
F_24	mJy	24 μm flux density (median)
FErr_24_1σ	mJy	maximum of σ^+ and σ^-
Bkg_24	mJy/Beam	Fitted Background of 24 μm map (median)
Sig_conf_24	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_24	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_24})^2 + (\text{FErr\_24\_1}\sigma)^2}$
Rhat_24	-	Convergence Statistic (ideally < 1.2)
n_eff_24	-	Number of effective samples (ideally > 40)
F_100/160	mJy	100/160 μm flux density (median)
FErr_100/160_1σ	mJy	maximum of σ^+ and σ^-
Bkg_100/160	mJy/Beam	Fitted Background of 100/160 μm map (median)
Sig_conf_100/160	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_100/160	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_100/160})^2 + (\text{FErr\_100/160\_1}\sigma)^2}$
Rhat_100/160	-	Convergence Statistic (ideally < 1.2)
n_eff_100/160	-	Number of effective samples (ideally > 40)
F_250/350/500	mJy	250/350/500 μm flux density (median)
FErr_250/350/500_1σ	mJy	maximum of σ^+ and σ^-
Bkg_250/350/500	mJy/Beam	Fitted Background of 250/350/500 μm map (median)
Sig_conf_250/350/500	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_250/350/500	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_250/350/500})^2 + (\text{FErr\_250/350/500\_1}\sigma)^2}$
Rhat_250/350/500	-	Convergence Statistic (ideally < 1.2)
n_eff_250/350/500	-	Number of effective samples (ideally > 40)
F_850	mJy	850 μm flux density (median)
FErr_850_1σ	mJy	maximum of σ^+ and σ^-
Bkg_850	mJy/Beam	Fitted Background of 850 μm map (median)
Sig_conf_850	mJy/Beam	Fitted residual noise component due to confusion (median)
Sig_tot_850	mJy/Beam	total error = $\sqrt{(\text{Sig\_conf\_850})^2 + (\text{FErr\_850\_1}\sigma)^2}$
Rhat_850	-	Convergence Statistic (ideally < 1.2)
n_eff_850	-	Number of effective samples (ideally > 40)