14.1.1 GAIA_SOURCE

This table has an entry for every Gaia observed source as listed in the Main Database accumulating catalogue version from which the catalogue release has been generated. It contains the basic source parameters, that is only final data (no epoch data) and no spectra (neither final nor epoch).

Columns description:

SOLUTION_ID : Solution Identifier (long)

All Gaia data processed by the Data Processing and Analysis Consortium comes tagged with a solution identifier. This is a numeric field attached to each table row that can be used to unequivocally identify the version of all the subsystems that where used in the generation of the data as well as the input data used. It is mainly for internal DPAC use but is included in the published data releases to enable end users to examine the provenance of processed data products. To decode a given solution ID visit `https://gaia.esac.esa.int/decoder/solnDecoder.jsp`

DESIGNATION : Unique source designation (unique across all Data Releases) (string)

A source designation, unique across all Gaia Data Releases, that is constructed from the prefix “Gaia DRx ” followed by a string of digits corresponding to source_id (3 space–separated words in total). Note that the integer source identifier source_id is **not** guaranteed to be unique across Data Releases; moreover it is not guaranteed that the same astronomical source will always have the same source_id in different Data Releases. Hence the only safe way to compare source records between different Data Releases in general is to check the records of proximal source(s) in the same small part of the sky.

SOURCE_ID : Unique source identifier (unique within a particular Data Release) (long)

A unique numerical identifier of the source, encoding the approximate position of the source (roughly to the nearest arcmin), the provenance (data processing centre where it was created), a running number, and a component number.

The approximate equatorial (ICRS) position is encoded using the nested HEALPix scheme at level 12 (Nside = 4096), which divides the sky into $\simeq$ 200 million pixels of about 0.7 arcmin^2.

The source ID consists of a 64-bit integer, least significant bit = 1 and most significant bit = 64, comprising:

- a HEALPix index number (sky pixel) in bits 36 - 63; by definition the smallest HEALPix index number is zero.
- a 3-bit Data Processing Centre code in bits 33 - 35; for example `MOD(source_id / 4294967296, 8)` can be used to distinguish between sources initialised via the Initial Gaia Source List by the Torino DPC (code = 0) and sources otherwise detected and assigned by Gaia observations (code > 0)
- a 25-bit plus 7 bit sequence number within the HEALPix pixel in bits 1 - 32 split into:
  - a 25 bit running number in bits 8 - 32; the running numbers are defined to be positive, i.e. never zero
  - a 7-bit component number in bits 1 - 7

This means that the HEALpix index level 12 of a given source is contained in the most significant bits. HEALpix index of 12 and lower levels can thus be retrieved as follows:

- HEALpix level 12 = source_id / 34359738368
- HEALpix level 11 = source_id / 137438953472
- HEALpix level 10 = source_id / 549755813888
- HEALpix level n = source_id / $2^{35} \times 4^{(12-\text{level})}$

Additional details can be found in the Gaia DPAC public document *Source Identifiers — Assignment and Usage throughout DPAC* (document code GAIA–C3–TN–ARI–BAS–020) available from `https://www.cosmos.esa.int/web/gaia/public-dpac-documents`

RANDOM_INDEX : Random index used to select subsets (long)

Random index which can be used to select smaller subsets of the data that are still representative. The column contains a random permutation of the numbers from 0 to N-1, where N is the number of sources in the table.

The random index can be useful for validation (testing on 10 different random subsets), visualization (displaying 1% of the data), and statistical exploration of the data, without the need to download all the data.

REF_EPOCH : Reference epoch (double, Time[Julian Years])

Reference epoch to which the astrometric source parameters are referred, expressed as a Julian Year in TCB.

At DR2 this reference epoch is always J2015.5 but in future releases this will be different and not necessarily the same for all sources.

RA : Right ascension (double, Angle[deg])

Barycentric right ascension α of the source in ICRS at the reference epoch `ref_epoch`

RA_ERROR : Standard error of right ascension (double, Angle[mas])

Standard error $\sigma_{\alpha*} \equiv \sigma_\alpha \cos\delta$ of the right ascension of the source in ICRS at the reference epoch `ref_epoch`.

DEC : Declination (double, Angle[deg])

Barycentric declination δ of the source in ICRS at the reference epoch `ref_epoch`

DEC_ERROR : Standard error of declination (double, Angle[mas])

Standard error σ_δ of the declination of the source in ICRS at the reference epoch `ref_epoch`

PARALLAX : Parallax (double, Angle[mas])

Absolute stellar parallax ϖ of the source at the reference epoch `ref_epoch`

PARALLAX_ERROR : Standard error of parallax (double, Angle[mas])

Standard error σ_ϖ of the stellar parallax at the reference epoch `ref_epoch`

PARALLAX_OVER_ERROR : Parallax divided by its error (float)

Parallax divided by its standard error

PMRA : Proper motion in right ascension direction (double, Angular Velocity[mas/year])

Proper motion in right ascension $\mu_{\alpha*} \equiv \mu_\alpha \cos\delta$ of the source in ICRS at the reference epoch `ref_epoch`. This is the local tangent plane projection of the proper motion vector in the direction of increasing right ascension.

PMRA_ERROR : Standard error of proper motion in right ascension direction (double, Angular Velocity[mas/year])

Standard error $\sigma_{\mu\alpha*}$ of the local tangent plane projection of the proper motion vector in the direction of increasing right ascension at the reference epoch `ref_epoch`

PMDEC : Proper motion in declination direction (double, Angular Velocity[mas/year])

Proper motion in declination μ_δ of the source at the reference epoch `ref_epoch`. This is the projection of the proper motion vector in the direction of increasing declination.

PMDEC_ERROR : Standard error of proper motion in declination direction (double, Angular Velocity[mas/year])

Standard error $\sigma_{\mu\delta}$ of the proper motion component in declination at the reference epoch `ref_epoch`

RA_DEC_CORR : Correlation between right ascension and declination (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\alpha, \delta)$ between right ascension and declination, a dimensionless quantity in the range [-1,+1]

RA_PARALLAX_CORR : Correlation between right ascension and parallax (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\alpha, \varpi)$ between right ascension and parallax, a dimensionless quantity in the range [-1,+1]

RA_PMRA_CORR : Correlation between right ascension and proper motion in right ascension (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\alpha, \mu_{\alpha*})$ between right ascension and proper motion in right ascension, a dimensionless quantity in the range [-1,+1]

RA_PMDEC_CORR : Correlation between right ascension and proper motion in declination (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\alpha, \mu_\delta)$ between right ascension and proper motion in declination, a dimensionless quantity in the range [-1,+1]

DEC_PARALLAX_CORR : Correlation between declination and parallax (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\delta, \varpi)$ between declination and parallax, a dimensionless quantity in the range [-1,+1]

DEC_PMRA_CORR : Correlation between declination and proper motion in right ascension (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\delta, \mu_{\alpha*})$ between declination and proper motion in right ascension, a dimensionless quantity in the range [-1,+1]

DEC_PMDEC_CORR : Correlation between declination and proper motion in declination (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\delta, \mu_\delta)$ between declination and proper motion in declination, a dimensionless quantity in the range [-1,+1]

PARALLAX_PMRA_CORR : Correlation between parallax and proper motion in right ascension (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\varpi, \mu_{\alpha*})$ between parallax and proper motion in right ascension, a dimensionless quantity in the range [-1,+1]

PARALLAX_PMDEC_CORR : Correlation between parallax and proper motion in declination (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\varpi, \mu_\delta)$ between parallax and proper motion in declination, a dimensionless quantity in the range [-1,+1]

PMRA_PMDEC_CORR : Correlation between proper motion in right ascension and proper motion in declination (float, Dimensionless[see description])

Correlation coefficient $\rho\,(\mu_{\alpha*}, \mu_\delta)$ between proper motion in right ascension and proper motion in declination, a dimensionless quantity in the range [-1,+1]

ASTROMETRIC_N_OBS_AL : Total number of observations AL (int)

Total number of AL observations (= CCD transits) used in the astrometric solution of the source, independent of their weight. Note that some observations may be strongly downweighted (see `astrometric_n_bad_obs_al`).

ASTROMETRIC_N_OBS_AC : Total number of observations AC (int)

Total number of AC observations (= CCD transits) used in the astrometric solution of the source, independent of their weight. Nearly all sources having G < 13 will have AC observations from 2d windows, while fainter than that limit only $\sim 1\%$ of transit observations (the so–called 'calibration faint stars') are assigned 2d windows resulting in AC observations.

ASTROMETRIC_N_GOOD_OBS_AL : Number of good observations AL (int)

Number of AL observations (= CCD transits) that were not strongly downweighted in the astrometric solution of the source. Strongly downweighted observations (with downweighting factor $w < 0.2$) are instead counted in `astrometric_n_bad_obs_al`. The sum of `astrometric_n_good_obs_al` and `astrometric_n_bad_obs_al` equals `astrometric_n_obs_al`, the total number of AL observations used in the astrometric solution of the source.

ASTROMETRIC_N_BAD_OBS_AL : Number of bad observations AL (int)

Number of AL observations (= CCD transits) that were strongly downweighted in the astrometric solution of the source, and therefore contributed little to the determination of the astrometric parameters. An observation is considered to be strongly downweighted if its downweighting factor $w < 0.2$, which means that the absolute value of the astrometric residual exceeds 4.83 times the total uncertainty of the observation, calculated as the quadratic sum of the centroiding uncertainty, excess source noise, and excess attitude noise.

ASTROMETRIC_GOF_AL : Goodness of fit statistic of model wrt along-scan observations (float)

Goodness-of-fit statistic of the astrometric solution for the source in the along-scan direction. This is the 'gaussianized chi-square', which for good fits should approximately follow a normal distribution with zero mean value and unit standard deviation. Values exceeding, say, $+3$ thus indicate a bad fit to the data.

This statistic is computed according to the formula

$$\text{astrometric\_gof\_al} = (9\nu/2)^{1/2}\left[(\chi^2/\nu)^{1/3} + 2/(9\nu) - 1\right]$$

where $\chi^2 = \texttt{astrometric\_chi2\_al}$ is the AL chi-square statistic and

$$\nu = \texttt{astrometric\_n\_good\_obs\_al} - N$$

is the number of degrees of freedom for a source update. Here $N = 5$ is the number of astrometric parameters. Note that only 'good' (i.e. not strongly downweighted) observations are included in χ^2 and ν.

The above formula is the well-known cube-root transformation of the chi-square variable (E.B. Wilson & M.M. Hilferty 1931, Proc. National Academy of Science, 17, 684). It is usually quoted to be valid for $\nu > 30$, but is in fact useful for much smaller ν. This transformation of (χ^2, ν) eliminates the inconvenience of having the distribution (and hence the significance levels) depend on the additional variable ν, which is generally not the same for different sources.

An alternative indicator of bad fits is the **`astrometric_excess_noise`**. In AGIS the source update deals with bad fits by adding **`astrometric_excess_noise`** to the formal observation noise. This reduces the weight of the observations and inflates the covariance of the estimated astrometric parameters correspondingly. However, the chi-square values used to calculate **`astrometric_gof_al`** do not take into account the **`astrometric_excess_noise`**, and **`astrometric_gof_al`** can therefore always be used as a goodness-of-fit indicator of the source solution in AGIS.

ASTROMETRIC_CHI2_AL : AL chi-square value (float)

Astrometric goodness-of-fit (χ^2) in the AL direction.

χ^2 values were computed for the 'good' AL observations of the source, without taking into account the **`astrometric_excess_noise`** (if any) of the source. They do however take into account the attitude excess noise (if any) of each observation.

ASTROMETRIC_EXCESS_NOISE : Excess noise of the source (double, Angle[mas])

This is the excess noise ϵ_i of the source. It measures the disagreement, expressed as an angle, between the observations of a source and the best-fitting standard astrometric model (using five astrometric parameters). The assumed observational noise in each observation is quadratically increased by ϵ_i in order to statistically match the residuals in the astrometric solution. A value of 0 signifies that the source is astrometrically well-behaved, i.e. that the residuals of the fit statistically agree with the assumed observational noise. A positive value signifies that the residuals are statistically larger than expected.

The significance of ϵ_i is given by `astrometric_excess_noise_sig` (D). If $D \leq 2$ then ϵ_i is probably not significant, and the source may be astrometrically well-behaved even if ϵ_i is large.

The excess noise ϵ_i may absorb all kinds of modelling errors that are not accounted for by the observational noise (image centroiding error) or the excess attitude noise. Such modelling errors include LSF and PSF calibration errors, geometric instrument calibration errors, and part of the high-frequency attitude noise. These modelling errors are particularly important in the early data releases, but should decrease as the astrometric modelling of the instrument and attitude improves over the years.

Additionally, sources that deviate from the standard five-parameter astrometric model (e.g. unresolved binaries, exoplanet systems, etc.) may have positive ϵ_i. Given the many other possible contributions to the excess noise, the user must study the empirical distributions of ϵ_i and D to make sensible cutoffs before filtering out sources for their particular application.

The excess source noise is further explained in Sects. 3.6 and 5.1.2 of Lindegren et al. (2012).

ASTROMETRIC_EXCESS_NOISE_SIG : Significance of excess noise (double)

A dimensionless measure (D) of the significance of the calculated `astrometric_excess_noise` (ϵ_i). A value $D > 2$ indicates that the given ϵ_i is probably significant.

For good fits in the limit of a large number of observations, D should be zero in half of the cases and approximately follow the positive half of a normal distribution with zero mean and unit standard deviation for the other half. Consequently, D is expected to be greater than 2 for only a few percent of the sources with well-behaved astrometric solutions.

In the early data releases ϵ_i will however include instrument and attitude modelling errors that are statistically significant and could result in large values of ϵ_i and D. The user must study the empirical distributions of these statistics and make sensible cutoffs before filtering out sources for their particular application.

The excess noise significance is further explained in Sect. 5.1.2 of Lindegren et al. (2012).

ASTROMETRIC_PARAMS_SOLVED : Which parameters have been solved for? (byte)

This is a binary code indicating which astrometric parameters were estimated for the source. A set bit means the parameter was estimated. The least-significant bit represents α, the next bits δ, ϖ, $\mu_{\alpha*}$, and μ_δ. For Gaia DR2 the only relevant values are

- **astrometric_params_solved** $= 31$ (binary 11111): all five astrometric parameters were estimated
- **astrometric_params_solved** $= 3$ (binary 11): only position (α, δ) was estimated

ASTROMETRIC_PRIMARY_FLAG : Primary or seconday (boolean)

Flag indicating if this source was used as a primary source (`true`) or secondary source (`false`). Only primary sources contribute to the estimation of attitude, calibration, and global parameters. The estimation of source parameters is otherwise done in exactly the same way for primary and secondary sources.

ASTROMETRIC_WEIGHT_AL : Mean astrometric weight of the source (float, Angle[mas^{-2}])

Mean astrometric weight of the source in the AL direction.

The mean astrometric weight of the source is calculated as per Eq. (119) in Lindegren et al. (2012).

ASTROMETRIC_PSEUDO_COLOUR : Astrometrically determined pseudocolour of the source (double, Misc[μm^{-1}])

Colour of the source assumed in the final astrometric processing.

The `astrometric_pseudo_colour` is defined to be equivalent to the effective wavenumber of the photon flux distribution in the astrometric (G) band, and is measured in μm^{-1}. The value given in this field was astrometrically determined in a preliminary solution, using the chromatic displacement of image centroids calibrated by means of the effective wavenumbers (ν_{eff}) of primary sources calculated from BP and RP magnitudes. The field is empty when no such determination was possible, in which case a default value of 1.6 μm^{-1} was assumed.

ASTROMETRIC_PSEUDO_COLOUR_ERROR : Standard error of the pseudocolour of the source (double, Misc[μm^{-1}])

Standard error $\sigma_{pseudocolour}$ of the astrometrically determined pseudocolour of the source.

MEAN_VARPI_FACTOR_AL : Mean Parallax factor AL (float)

Mean parallax factor in the AL direction, computed from all the good observations of the source processed in the astrometry.

The AL parallax factor for an individual observation is defined as $\partial\eta/\partial\varpi$, where η is the AL field angle of the source and ϖ its parallax, and is constrained to $[-0.73, +0.73]$ by the scanning law. The value given in this field is typically in the range $[-0.23, +0.32]$ (1st and 99th percentiles). A value outside this range indicates a distribution of observations that is unfavourable for the determination of the parallax, and the calculated parallax could then be more vulnerable to errors, e.g. from the calibration model, not reflected in the formal uncertainties. See Lindegren et al. (2018) for a discussion of other astrometric quality indicators.

ASTROMETRIC_MATCHED_OBSERVATIONS : Matched FOV transits used in the AGIS solution (short)

The number of FOV transits matched to this source, counting only the transits containing CCD observations actually used to compute the astrometric solution.

This number will always be equal to or smaller than the matched_observations, the difference being the FOV transits that were not used in the astrometric solution because of bad data or excluded time intervals.

VISIBILITY_PERIODS_USED : Number of visibility periods used in Astrometric solution (short)

Number of visibility periods used in the astrometric solution.

A visibility period is a group of observations separated from other groups by a gap of at least 4 days. A source may have from one to tens of FOV transits in a visibility period, but with a small spread in time, direction of scanning, and parallax factor. From one visibility period to the next these variables have usually changed significantly. A high number of visibility periods is therefore a better indicator of an astrometrically well-observed source than a large number of FOV transits (`matched_observations` or `astrometric_matched_observations`) or CCD transits (`astrometric_n_obs_al`). A small value (e.g. less than 10) indicates that the calculated parallax could be more vulnerable to errors, e.g. from the calibration model, not reflected in the formal uncertainties. See Lindegren et al. (2018) for a discussion of this and other astrometric quality indicators.

ASTROMETRIC_SIGMA5D_MAX : The longest semi-major axis of the 5-d error ellipsoid (float, Angle[mas])

The longest principal axis in the 5-dimensional error ellipsoid.

This is a 5-dimensional equivalent to the semi-major axis of the position error ellipse and is therefore useful for filtering out cases where one of the five parameters, or some linear combination of several parameters, is particularly ill-determined. It is measured in mas and computed as the square root of the largest singular value of the scaled 5×5 covariance matrix of the astrometric parameters. The matrix is scaled so as to put the five parameters on a comparable scale, taking into account the maximum along-scan parallax factor for the parallax and the time coverage of the observations for the proper motion components. If C is the unscaled covariance matrix, the scaled matrix is SCS, where $S = \mathrm{diag}\,(1, 1, \sin\xi, T/2, T/2)$, $\xi = 45^\circ$ is the solar aspect angle in the nominal scanning law, and T the time coverage of the data used in the solution. $T = 1.75115$ yr for Gaia DR2.

`astrometric_sigma5d_max` is given for both 5-parameter and 2-parameter solutions, as its size is one of the criteria for accepting or rejecting the 5-parameter solution. In case of a 2-parameter solution (`astrometric_params_solved` = 3) it gives the value for the rejected 5-parameter solution, and can then be arbitrarily large.

FRAME_ROTATOR_OBJECT_TYPE : The type of the source mainly used for frame rotation (int)

This field is non-zero if the source was used to define the reference frame of the positions and proper motions.

The values used are:

0: An ordinary source not used for the reference frame determination

2: The optical counterpart of an extragalactic radio source with accurately known VLBI position in ICRF. This is used to determine the orientation of the reference frame at the reference epoch, but also contributes to the determination of a non-rotating frame.

3: An extragalactic source (AGN or quasar) that was used to determine a kinematically non-rotating celestial frame.

MATCHED_OBSERVATIONS : Amount of observations matched to this source (short)

The total number of FOV transits matched to this source.

DUPLICATED_SOURCE : Source with duplicate sources (boolean)

During data processing, this source happened to be duplicated and only one source identifier has been kept. Observations assigned to the discarded source identifier(s) were not used. This may indicate observational, cross-matching or processing problems, or stellar multiplicity, and probable astrometric or photometric problems in all cases. In Gaia DR1 and DR2, for close doubles with separations below some 2 arcsec, truncated windows have not been processed, neither in astrometry nor photometry. The transmitted window is centred on the brighter part of the acquired window, so the brighter component has a better chance to be selected, even when processing the fainter transit. If more than two images are contained in a window, the result of the image parameter determination is unpredictable in the sense that it might refer to either (or neither) image, and no consistency is assured.

PHOT_G_N_OBS : Number of observations contributing to G photometry (int)

Number of observations (CCD transits) that contributed to the G mean flux and mean flux error.

PHOT_G_MEAN_FLUX : G-band mean flux (double, Flux[e-/s])

Mean flux in the G-band.

PHOT_G_MEAN_FLUX_ERROR : Error on G-band mean flux (double, Flux[e-/s])

Standard deviation of the G-band fluxes divided by sqrt(phot_g_n_obs)

PHOT_G_MEAN_FLUX_OVER_ERROR : G-band mean flux divided by its error (float)

Mean flux in the G-band divided by its error.

PHOT_G_MEAN_MAG : G-band mean magnitude (float, Magnitude[mag])

Mean magnitude in the G band. This is computed from the G-band mean flux applying the magnitude zero-point in the Vega scale.

No error is provided for this quantity as the error distribution is only symmetric in flux space. This converts to an asymmetric error distribution in magnitude space which cannot be represented by a single error value.

PHOT_BP_N_OBS : Number of observations contributing to BP photometry (int)

Number of observations (CCD transits) that contributed to the integrated BP mean flux and mean flux error.

PHOT_BP_MEAN_FLUX : Integrated BP mean flux (double, Flux[e-/s])

Mean flux in the integrated BP band.

PHOT_BP_MEAN_FLUX_ERROR : Error on the integrated BP mean flux (double, Flux[e-/s])

Error on the mean flux in the integrated BP band (errors are computed from the dispersion about the weighted mean of input calibrated photometry).

PHOT_BP_MEAN_FLUX_OVER_ERROR : Integrated BP mean flux divided by its error (float)

Integrated BP mean flux divided by its error.

PHOT_BP_MEAN_MAG : Integrated BP mean magnitude (float, Magnitude[mag])

Mean magnitude in the integrated BP band. This is computed from the BP-band mean flux applying the magnitude zero-point in the Vega scale.

No error is provided for this quantity as the error distribution is only symmetric in flux space. This converts to an asymmetric error distribution in magnitude space which cannot be represented by a single error value.

PHOT_RP_N_OBS : Number of observations contributing to RP photometry (int)

Number of observations (CCD transits) that contributed to the integrated RP mean flux and mean flux error.

PHOT_RP_MEAN_FLUX : Integrated RP mean flux (double, Flux[e-/s])

Mean flux in the integrated RP band.

PHOT_RP_MEAN_FLUX_ERROR : Error on the integrated RP mean flux (double, Flux[e-/s])

Error on the mean flux in the integrated RP band (errors are computed from the dispersion about the weighted mean of input calibrated photometry).

PHOT_RP_MEAN_FLUX_OVER_ERROR : Integrated RP mean flux divided by its error (float)

Integrated RP mean flux divided by its error.

PHOT_RP_MEAN_MAG : Integrated RP mean magnitude (float, Magnitude[mag])

Mean magnitude in the integrated RP band. This is computed from the RP-band mean flux applying the magnitude zero-point in the Vega scale.

No error is provided for this quantity as the error distribution is only symmetric in flux space. This converts to an asymmetric error distribution in magnitude space which cannot be represented by a single error value.

PHOT_BP_RP_EXCESS_FACTOR : BP/RP excess factor (float)

BP/RP excess factor estimated from the comparison of the sum of integrated BP and RP fluxes with respect to the flux in the G band. This measures the excess of flux in the BP and RP integrated photometry with respect to the G band. This excess is believed to be caused by background and contamination issues affecting the BP and RP data. Therefore a large value of this factor for a given source indicates systematic errors in the BP and RP photometry.

For more details see Riello et al. (2018).

PHOT_PROC_MODE : Photometry processing mode (byte)

This flag indicates different calibration procedures in place. The following possible values are defined for Gaia DR2:

- 0: this corresponds to the procedure applied for the generation of the ”gold” photometric dataset. Sources in this dataset have been used to establish the internal photometric system and to compute all calibrations.
- 1: this corresponds to the procedure applied for the generation of the ”silver” photometric dataset. Sources in this dataset have no reference photometry. The processing of these sources is an iterative process, where calibrations computed using the ”gold” dataset are applied initially to raw fluxes and at each iteration a new set of reference photometry is obtained from the accumulation of all calibrated epoch photometry.
- 2: this corresponds to the procedure applied for the generation of the ”bronze” photometric dataset. Sources in this dataset lack complete colour information in the Gaia data. A default colour is therefore used to apply the calibrations computed using the ”gold” dataset. For Gaia DR2 it is expected that all sources that were calibrated using a default colour will have only G band photometry available (no integrated BP or RP).

More details about the different calibration procedures are available in Chapter 5 of the Gaia DR2 on-line documentation and in Riello et al. (2018).

BP_RP : BP - RP colour (float, Magnitude[mag])

BP - RP colour: phot_bp_mean_mag - phot_rp_mean_mag

BP_G : BP - G colour (float, Magnitude[mag])

BP - G colour: phot_bp_mean_mag - phot_g_mean_mag

G_RP : G - RP colour (float, Magnitude[mag])

G - RP colour: phot_g_mean_mag - phot_rp_mean_mag

RADIAL_VELOCITY : Radial velocity (double, Velocity[km/s])

Spectroscopic radial velocity in the solar barycentric reference frame.

The radial velocity provided is the median value of the radial velocity measurements at all epochs.

RADIAL_VELOCITY_ERROR : Radial velocity error (double, Velocity[km/s])

The radial_velocity_error is the error on the median to which a constant noise floor of 0.11 km/s has been added in quadrature to take into account the calibration contribution.

In detail, radial_velocity_error = $\sqrt{\sigma_{V_{\rm rad}}^2 + 0.11^2}$ where $\sigma_{V_{\rm rad}}$ is the error on the median:

$$\sigma_{V_{\rm rad}} = \sqrt{\frac{\pi}{2}} \cdot \frac{\sigma\left(V_{\rm rad}^{\rm t}\right)}{\sqrt{\texttt{rv\_nb\_transits}}}$$

where $\sigma\left(V_{\rm rad}^{\rm t}\right)$ is the standard deviation of the epoch radial velocities and **rv_nb_transits** the number of transits for which a $V_{\rm rad}^{\rm t}$ has been obtained.

RV_NB_TRANSITS : Number of transits used to compute radial velocity (int)

number of transits (epochs) used to compute radial_velocity

RV_TEMPLATE_TEFF : Teff of the template used to compute radial velocity (float, Temperature[K])

Effective temperature of the synthetic spectrum template used to determine radial_velocity. N.B. the purpose of this parameter is to provide information on the synthetic template spectrum used to determine radial_velocity, and not to provide an estimate of the stellar effective temperature of this source.

RV_TEMPLATE_LOGG : logg of the template used to compute radial velocity (float, GravitySurface[log cgs])

log g of the synthetic spectrum template used to determine radial_velocity. N.B. the purpose of this parameter is to provide information on the synthetic template spectrum used to determine radial_velocity, and not to provide an estimate of the log g of this source.

RV_TEMPLATE_FE_H : Fe/H of the template used to compute radial velocity (float, Abundances[dex])

Fe/H of the synthetic spectrum template used to determine radial_velocity. N.B. the purpose of this parameter is to provide information on the synthetic template spectrum used to determine radial_velocity, and not to provide an estimate of the stellar atmospheric Fe/H of this source.

PHOT_VARIABLE_FLAG : Photometric variability flag (string, Dimensionless[see description])

Flag indicating if variability was identified in the photometric data:

- ”NOT_AVAILABLE”: source not processed and/or exported to catalogue
- ”CONSTANT”: Source not identified as variable
- ”VARIABLE”: source identified and processed as variable, see Vari* tables.

Note that for this data release only a subset of (variable) sources was processed and/or exported, so for many (known) variable sources this flag is set to ”NOT AVAILABLE”. No ”CONSTANT” sources were exported either.

L : Galactic longitude (double, Angle[deg])

Galactic Longitude of the object at reference epoch ref_epoch, see Section 3.1.7 of the release documentation for conversion details.

B : Galactic latitude (double, Angle[deg])

Galactic Latitude of the object at reference epoch ref_epoch, see Section 3.1.7 of the release documentation for conversion details.

ECL_LON : Ecliptic longitude (double, Angle[deg])

Ecliptic Longitude of the object at reference epoch ref_epoch, obtained from the equatorial coordinates using the transformation defined in Section 1.5.3 of ‘The Hipparcos and Tycho Catalogues’, ESA SP-1200, Volume 1 (ESA, 1997).

ECL_LAT : Ecliptic latitude (double, Angle[deg])

Ecliptic Latitude of the object at reference epoch ref_epoch, obtained from the equatorial coordinates using the transformation defined in Section 1.5.3 of ‘The Hipparcos and Tycho Catalogues’, ESA SP-1200, Volume 1 (ESA, 1997).

PRIAM_FLAGS : flags for the Apsis-Priam results (long, Dimensionless[see description])

Flags describing the status of the astrophysical parameters Teff, A_G and E[BP-RP] (i.e. those determined by Apsis-Priam). They are described in Chapter 8 of the release documentation.

TEFF_VAL : stellar effective temperature (float, Temperature[K])

Estimate of Teff from Apsis-Priam

TEFF_PERCENTILE_LOWER : teff_val lower uncertainty (float, Temperature[K])

Uncertainty (lower) on Teff estimate from Apsis-Priam. This is the 16th percentile of the PDF over Teff.

TEFF_PERCENTILE_UPPER : teff_val upper uncertainty (float, Temperature[K])

Uncertainty (upper) on Teff estimate from Apsis-Priam. This is the 84th percentile of the PDF over Teff.

A_G_VAL : line-of-sight extinction in the G band, A_G (float, Magnitude[mag])

Estimate of extinction in the G band from Apsis-Priam

A_G_PERCENTILE_LOWER : a_g_val lower uncertainty (float, Magnitude[mag])

Uncertainty (lower) on A_G estimate from Apsis-Priam. This is the 16th percentile of the PDF over A_G.

A_G_PERCENTILE_UPPER : a_g_val upper uncertainty (float, Magnitude[mag])

Uncertainty (upper) on A_G estimate from Apsis-Priam. This is the 84th percentile of the PDF over A_G.

E_BP_MIN_RP_VAL : line-of-sight reddening E(BP-RP) (float, Magnitude[mag])

Estimate of redenning E[BP-RP] from Apsis-Priam.

E_BP_MIN_RP_PERCENTILE_LOWER : e_bp_min_rp_val lower uncertainty (float, Magnitude[mag])

Uncertainty (lower) on E[BP-RP] estimate from Apsis-Priam. This is the 16th percentile of the PDF over E[BP-RP].

E_BP_MIN_RP_PERCENTILE_UPPER : e_bp_min_rp_val upper uncertainty (float, Magnitude[mag])

Uncertainty (upper) on E[BP-RP] estimate from Apsis-Priam. This is the 84th percentile of the PDF over E[BP-RP].

FLAME_FLAGS : Flags for the Apsis-FLAME results (long, Dimensionless[see description])

Flags describing the status of the astrophysical parameters radius and luminosity (i.e. those determined by Apsis-FLAME). They are described in Chapter 8 of the release documentation. Note that at DR2 there is just one value of this field defined for the entire catalogue.

RADIUS_VAL : stellar radius (float, Length & Distance[Solar Radius])

Estimate of radius from Apsis-FLAME

RADIUS_PERCENTILE_LOWER : radius_val lower uncertainty (float, Length & Distance[Solar Radius])

Uncertainty (lower) on radius estimate from Apsis-FLAME. This is the 16th percentile of the PDF over radius.

RADIUS_PERCENTILE_UPPER : radius_val upper uncertainty (float, Length & Distance[Solar Radius])

Uncertainty (upper) on radius estimate from Apsis-FLAME. This is the 84th percentile of the PDF over radius.

LUM_VAL : stellar luminosity (float, Luminosity[Solar Luminosity])

Esimate of luminosity from Apsis-FLAME

LUM_PERCENTILE_LOWER : lum_val lower uncertainty (float, Luminosity[Solar Luminosity])

Uncertainty (lower) on luminosity estimate from Apsis-FLAME. This is the 16th percentile of the PDF over luminosity.

LUM_PERCENTILE_UPPER : lum_val upper uncertainty (float, Luminosity[Solar Luminosity])

Uncertainty (upper) on luminosity estimate from Apsis-FLAME. This is the 84th percentile of the PDF over luminosity.