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|  | Titre du document :<br><b>N2 data description</b><br><br>Auteurs : F. Baudin, L. Jorda,<br>R. Samadi, E. Michel | Référence : <b>COROT.LESIA. .08.002</b><br><br>Version: 1.5<br><br>Date 02/07/12 <b>Nb de pages : 34</b> |
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## N2 data : description

|                          |                                                                     |  |
|--------------------------|---------------------------------------------------------------------|--|
| <b>Préparé par:</b>      | <b>Frederic Baudin, Laurent Jorda,<br/>Reza Samadi, Eric Michel</b> |  |
| <b>Accepté par:</b>      | <b>Michel Auvergne</b>                                              |  |
| <b>Pour application:</b> | <b>Annie Baglin</b>                                                 |  |

### HISTORIQUE DES MODIFICATIONS DU DOCUMENT

| Ed. | Rév. | Date     | Modifications/                                                                                                             | Visa |
|-----|------|----------|----------------------------------------------------------------------------------------------------------------------------|------|
| 1   | 2    | 5/12/07  |                                                                                                                            |      |
| 1   | 4    | 25/02/09 | <i>Addition to the product : EN2_STAR_IMAG</i>                                                                             |      |
| 1   | 5    | 02/07/12 | <i>Changes in the keywords of EN2_STAR<br/>Addition of keywords related to température correction<br/>(S .Chaintreuil)</i> |      |

### DOCUMENTS DE REFERENCES

| Repère | Référence    | Titre du document                          |
|--------|--------------|--------------------------------------------|
| DR1:   | to be issued | CoRoT Ground Processing : Reference Manual |
| DR2    |              |                                            |

|                                                                                   |                                                                                                                          |                                                                                                            |
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## N2 data : description

20-FEB-2009 V1.3b

Tout ce que vous avez toujours voulu savoir sur le N2...

...ne figure pas encore dans ce doc mais on y travaille

Frédéric Baudin & Laurent Jorda  
with the help of Réza Samadi & Eric Michel  
and Sylviane Chaintreuil

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## 1 N2 CONTENTS

### 1.1 General philosophy for N2 products

This data level corresponds to data « ready to use » by a scientist without a priori knowledge of the instrument. This means that data of this level should be easy to handle, and do not require the use of auxiliary data to use the main product : the Light Curves (LC). One consequence is that there should be much less different products at level N2 than at level N1.

However, some auxiliary information is always necessary. Some are gathered with the LC in the form of binary tables, or put in the header of the LC files. They provide information on observation timing, sky background, applied corrections, astrophysical characteristics of the target (spectral type, etc...).

To make the handling of data easy, the main products (the LC: AN2\_STAR\_\*.FITS, EN2\_STAR\_MON\*.FITS, EN2\_STAR\_CHR\*.FITS) include, in addition to the LC, some tables :

- observation time-stamping,
- LC of the associate sky background (already subtracted),
- correction applied to the star LC,
- etc...

and tables of flags indicating :

- spurious points in the time series,
- discontinuities detected in the time series,
- observation during SAA ,
- information on CCD windows and templates used for the observation.

The header of the \*N2\_STAR\* files include :

- indexes of characterisation of the signal (activity index for EP data for ex.)
- astrophysical characteristics of the target (spectral type etc...)
- information on data treatment (pipeline version, etc...)

All N2 files are FITS files.

### 1.2 Warning

The process of data treatment will evolve with time (and with an improving knowledge of the data and the instrument). Thus the data format may also evolve with time. This document will be updated each time a modification in the data format appears.

|                                                                                   |                                                                                                                 |                                                                                                     |
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### 1.3 N2 product list

|                                           |                                                                                       |
|-------------------------------------------|---------------------------------------------------------------------------------------|
| AN2_STAR_<COROTID>_<START>_<END>          | AS Light Curves, 32s sampling, extracted from AN1_STAR data                           |
| AN2_WINDESCRIPTOR_<COROTID>_<START>_<END> | Characteristics and history of the window observation                                 |
| EN2_STAR_CHR_<COROTID>_<START>_<END>      | EP chromatic Light Curves, 32 or 512s sampling, extracted from EN1_STAR_CHR* data     |
| EN2_STAR_MON_<COROTID>_<START>_<END>      | EP monochromatic Light Curves, 32 or 512s sampling, extracted from EN1_STAR_MON* data |
| EN2_WINDESCRIPTOR_<COROTID>_<START>_<END> | Characteristics and history of the window observation                                 |
| AN2_STAR_IMAG_<COROTID>_<START>_<END>     | Light Curves from the "imagettes", extracted from AN1_IMAGETTE data.                  |
| EN2_STAR_IMAG_<COROTID>_<START>_<END>     | Light Curves from the "imagettes", extracted from EN1_IMAGETTE data.                  |
| N2_CONTEXT_<START>_<END>                  | Time series of context variables (Satellite position, LOS...)                         |

### 1.4 Acronyms

AS : asteroseismology (channel)  
EP : exo-planet (channel)

LR : Long Run  
SR : Short Run  
IR : Initial Run

CDC: Corot Data Center  
EMI: Electro-Magnetic Interferences  
LC : Light Curve

|                                                                                   |                                                                                                                 |                                                                                                     |
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LOS: Line Of Sight  
SAA : South Atlantic Anomaly  
TBS : To Be Specified

### 1.5 Standard data types

The standard data types assumed throughout this entire document are the following:

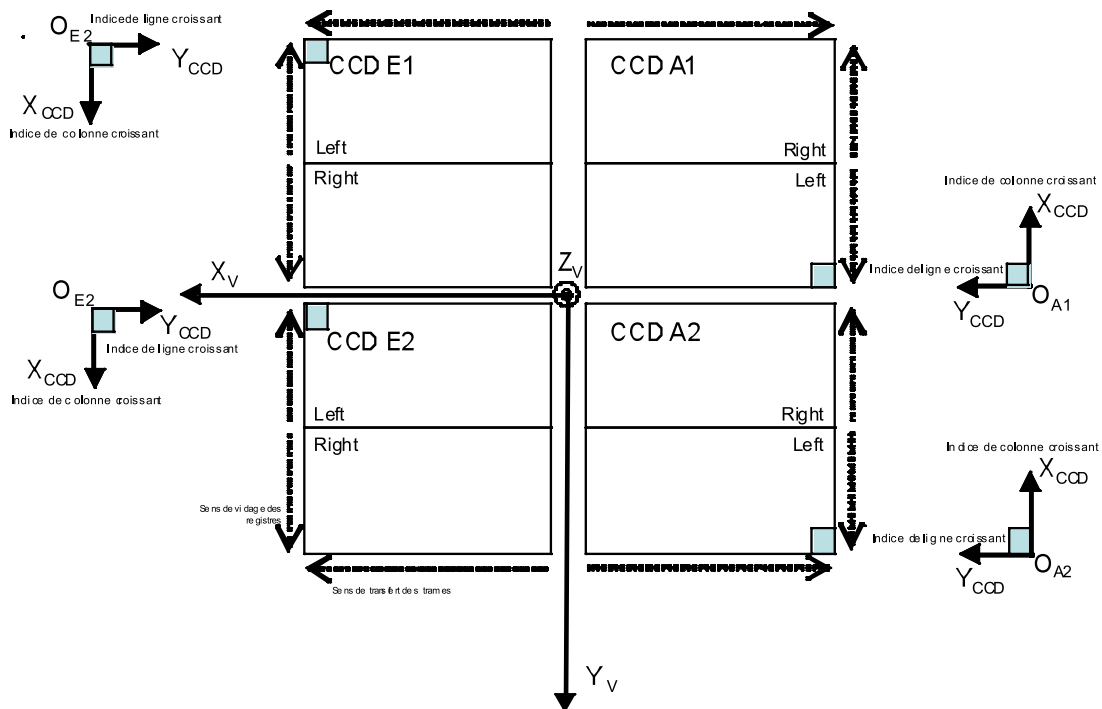
| Type   | Meaning                          | Size                                            |
|--------|----------------------------------|-------------------------------------------------|
| Double | Floating point, double precision | 64 bits                                         |
| Float  | Floating point, simple precision | 32 bits                                         |
| Long64 | Long 64bits integer              | 64 bits                                         |
| Long   | Long integer                     | 32 bits                                         |
| Int    | (short) Integer                  | 16 bits                                         |
| Byte   | Byte                             | 8 bits                                          |
| String | String                           | Up to 70 chars in the headers of the FITS files |

### 1.6 Coordinates in the CCD frame.

The CCD coordinates are defined in COR-SP-0.3-567-CNES.

All of the images or 'imagettes' are shown from the top of the CCD. The CCD coordinates are defined as shown in the following figure:

|                                                                                   |                                                                                                                          |                                                                                                            |
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For each CCD, the coordinate system  $R_{\text{CCD}}$  ( $O_{\text{CCD}}$ ,  $X_{\text{CCD}}$ ,  $Y_{\text{CCD}}$ ,  $Z_{\text{CCD}}$ ) appears as follows:

Origin  $O_{\text{CCD}}$  is at the center of the pixel located at the corner of the image surface, as displayed above

1. Axis  $X_{\text{CCD}}$  with a positive orientation from left to right;
2. Axis  $Y_{\text{CCD}}$  is directed opposite to the direction of the frame transfer
3. Axis  $Z_{\text{CCD}}$  is the third axis of the triad and is directed toward space, *i.e.* toward the observer.

A given pixel is identified by its coordinates  $(x,y)$  where  $x$  is the subscript for the raw number and  $y$  is the line number.

For each CCD:  $1 \leq x \leq 2048$   $1 \leq y \leq 2048$

The numbering of lines follows the direction of the frame: The first line is the first to be transferred into the buffer, and the first to be next transferred into the reader storage.



|                                                                                   |                                                                                                                 |                                                                                                     |
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## 2 COMMON KEYWORDS FOR \*N2\_STAR PRODUCTS

### TELESCOP

**Description:** Telescope name

**Type:** string

**Value (fixed):** 'COROT'

### ORIGIN

**Description:** processing site

**Type:** string

**Value (fixed):** 'CDC'

### CREA\_DAT

**Description:** File generation date.

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

### FILENAME

**Description:** name of the file

**Type:** string

### PIPE\_VER

**Description:** Name and version of the process that generated the product.

**Type:** string

**Format:** -TBS-

### N2\_VER

**Description:** Name and version of the N2 data format

**Type:** string

**Format:** -TBS-

### STARTDAT

**Description:** UT date of the first measurement.

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

|                                                                                   |                                                                                                                          |                                                                                                                  |
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## END\_DATE

**Description:** UT date of the last measurement

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

## COROTID

**Description:** ID of the CoRoT target.

**Type:** long integer

**Range:** Astero channel: 1 – 20 000; Exo Channel: 100 000 000 - 225 002 508 (from the EXODAT catalog: 100 000 000 - 199 000 000; from the USNO catalog: Center : 200 000 000 - 216 209 057 and Anti-center: 217 000 000 - 225 002 508).

## RUN\_CODE

**Description:** code of run during which the target was observed

**Type:** string, empty string if unknown

**Format:** <type>R<d><nn>, where <type> is a char and refers to the type of the run ('S': short, 'L': long, 'I': initial), 'R' refers to 'RUN', <d> refers to the direction with respect to the center of the Galaxy ('a': anticenter direction, 'c': center direction) and <nn> are two digits corresponding to the run number. In the case of tests and qualification tests, the format of this field is: <type><nnn> where <type> can be 'EQ' for test or 'VS' for a qualification test and <nnn> are three digits corresponding to the test number.

**Examples:** "LRa01", "LRa02", "SRc01", "IRa01", etc...

## HLFCCDID

**Description:** reference of the half CCD from which the products originate.

**Type:** string with four chars

**Example:** 'E1R' for the right (**R**) CCD Number **1** of the **Exo**-planet channel.

## ALPHA, DELTA

**Description:** Right ascension and declination of the star (Equinox 2000 TBC)

**Type:** double

**Unit:** degree (decimal)

|                                                                                   |                                                                                                                 |                                                                                                    |
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### 3 COMMON BINARY TABLE EXTENSIONS FOR \*N2\_STAR PRODUCTS

#### DATEJD

**Description:** dates of the end of the measurements in the satellite reference frame, in CoRoT Julian day, 32s or 512s (exo) sampling. For EN2\* products, this date corresponds to the end of the 32 sec exposure for 32 sec products and the end of the 1<sup>st</sup> exposure (of 16) of 32 sec in the case of 512 sec products.

**Type:** double float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

#### DATEJDHEL

**Description:** dates of the end of the measurements in the heliocentric reference frame (giving an irregular sampling), in CoRoT Julian day, 32s mean sampling (astero) or 32 and 512 sec (exo). For EN2\* products, this date corresponds to the end of the 32 sec exposure for 32 sec products and the end of the 1<sup>st</sup> exposure (of 16) of 32 sec in the case of 512 sec products.

**Type:** double float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

#### DATEJDHELREG

**Description:** dates of the measurements in the heliocentric reference frame, in CoRoT Julian day, with a strict regular 32s sampling

**Type:** double

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

### 4 AN2\_STAR PRODUCT

#### 4.1 Filename

AN2\_STAR\_<COROTID>\_<START>\_<END>

#### 4.2 AN2\_STAR header

It includes the common keywords (see § 2. for more information)

|                                                                                   |                                                                                                                 |                                                                                                      |
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**TELESCOP**

**ORIGIN**

**CREA\_DAT**

**FILENAME**

**PIPE\_VER**

**N2\_VER**

**STARTDAT**

**END\_DATE**

**COROTID**

**RUN\_CODE**

**HLFCCDID**

**ALPHA, DELTA**

plus the following keywords :

**STARNAME**

**Description:** usual name of the star, from EXODAT/COROTSKY database

**Type:** string (20 char)

**Example:** alphaCen or HD456345

**MAGNIT\_V**

**Description:** star magnitude V, from EXODAT/COROTSKY database

**Type:** float

**ABSM\_V**

**Description:** absolute star magnitude V, from EXODAT/COROTSKY database

**Type:** float

**COL\_B-V**

**Description:** color difference, from EXODAT/COROTSKY database

**Type:** float

|                                                                                   |                                                                                                                 |                                                                                                      |
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## SPECTYPE

**Description:** spectral type, from EXODAT/COROTSKY database

**Type:** string (5 char)

**Ex:** O, B, A...

## SUBCLASS

**Description:** spectral subclass, from EXODAT/COROTSKY database

**Type:** string (5 char)

**Ex :** 1, 2, 3...

## LUMCLASS

**Description:** luminosity class of the star, from EXODAT/COROTSKY database

**Type:** string (5 char)

**Ex :** I, II, III, ...

## TEFF

**Description:** star effective temperature, from EXODAT/COROTSKY database

**Type:** float

**Unit :** Kelvin

## GRAVITY

**Description:** star gravity, from EXODAT/COROTSKY database

**Type:** float

**Unit :** none (  $\log(g[\text{m/s}^2])$  )

## METAL

**Description:** star metallicity, from EXODAT/COROTSKY database

**Type:** float

**Unit :** dex? (  $\log(\text{Fe}/\text{H})/[\log(\text{Fe}/\text{H})]_{\text{Sun}}$  )

## LC\_MEAN

**Description:** mean of the light curve (FLUXHELREG)

**Type:** float

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Unit:** electrons/sec

## LC\_RMS

**Description:** RMS of the light curve (FLUXHELREG)

**Type:** float

**Unit:** electrons/sec

## NBHOTPIX

**Description:** number of hot pixels detected in the mask

**Type:** integer

## 4.3 AN2\_STAR binary table extensions

In addition of the common binary table extension (DATEJD, DATEHEL), it includes the following :

**DATEJD:** see Section 3

## RAWFLUX

**Description:** raw (N1) star intensity light curve sampled at 32s, summed all 1s measurements and then divided by valid exposures, yielding electron/sec), corresponding to time measurements in DATEJD

**Type:** double

**Unit:** electrons/sec

## RAWFLUXDEV

**Description:** standard deviation of star intensity measurements at 1s, used to compute RAWFLUX.

**Type:** double

**Unit:** electrons/sec

## RAWSTATUS:

**Description:** flags indicating the status of measurements corresponding to DATEJD, following the generic description of STATUS (see below)

|                                                                                   |                                                                                                                 |                                                                                                      |
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## BG

**Description:** background light curve (already subtracted), corresponding to time measurements in DATEJD. Normalised to yield electron/px/sec.

**Type:** float

**Unit:** electrons/px/sec

**DATEJDHEL :** see Section 3

## FLUXHEL

**Description:** star intensity light curve, corresponding to time measurements in DATEJDHEL (irregular sampling, 32s in average)

**Type:** double

**Unit:** electrons/sec

## FLUXDEVHEL

**Description:** standard deviation of star intensity measurements at 1s, used to compute FLUXHEL.

**Type:** double

**Unit:** electrons/sec

## STATUSHEL

**Description:** flags indicating the status of measurements corresponding to DATEJDHEL, following the generic description of STATUS (see below)

## DATEJDHELREG

**Description:** dates of the measurements in the heliocentric reference frame, in CoRoT Julian day, with a strict regular 32s sampling

**Type:** double

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

## FLUXHELREG

**Description:** star intensity light curve, corresponding to time measurements in DATEJDHELREG (regular sampling of 32s)

**Type:** double

**Unit:** electrons/sec

|                                                                                   |                                                                                                                 |                                                                                                      |
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## FLUXDEVHELREG

**Description:** standard deviation of star intensity measurements at 1s, used to compute FLUXHELREG.

**Type:** double

**Unit:** electrons/sec

## STATUSHELREG

**Description:** flags indicating the status of measurements corresponding to DATEJDHELREG, following the generic description of STATUS (see below)

## STATUS (description valid for RAWSTATUS, STATUSHEL, etc...)

**Description:** flags indicating the status of measurements corresponding to DATEJD

**Type:** unsigned long integer (32 bits)

|       |           |        |                                                                                                                                                                   |
|-------|-----------|--------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| bit 0 | « false » | (0)    | The data are valid flux measurement                                                                                                                               |
| bit 0 | « true »  | (1)    | The data are considered as out of range (e.g. energetic particle impact or glitch). Corresponds to OVER=1 in N1 products                                          |
| bit1  | « true »  | (2)    | The data is invalid. Either the original value was a spare value (default value) or no images were accumulated (EXPORANK=0). Corresponds to OVER=2 in N1 products |
| bit2  | « true »  | (4)    | Flux acquired when crossing SAA                                                                                                                                   |
| bit3  | « true »  | (8)    | Interpolated measurement                                                                                                                                          |
| bit4  | « true »  | (16)   | Discontinuity detected in the Light Curve                                                                                                                         |
| bit5  | « true »  | (32)   | Discontinuity due to change of CCD mask                                                                                                                           |
| bit6  | « true »  | (64)   | Flux extracted from imagette                                                                                                                                      |
| bit7  | « true »  | (128)  | New hot pixel detected                                                                                                                                            |
| bit8  | « true »  | (256)  | At the time of the data, the satellite was entering earth penombra (orbital event 3 : light to penombra transition). Corresponds to OVER=8 in N1 products         |
| bit9  | « true »  | (512)  | At the time of the data, the satellite was entering light (orbital event 6 : penombra to light transition). Corresponds to OVER=16 in N1 products                 |
| bit10 | « true »  | (1024) | The jitter excursion was greater than the maximum authorized value. The original value is replaced by a calculated value. Corresponds to OVER=32 in N1 products   |



|                                                                                   |                                                                                                                 |                                                                                                      |
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**Unit:** none

**Remark:** STATUS is a bit mask. This means that all these values can be combined. For instance STATUS = 13 means that the measurement is considered out of range, it was acquired when crossing the SAA, and is replaced by an interpolated value.

## 5 AN2\_WINDESCRIPTOR PRODUCT

This product aims at a rapid description of the characteristic and history of the observation. It will be produced only once per run for a given target. Thus, despite having a similar name than a N1 product, it is quite different from the latter.

### 5.1 Filename

AN2\_WINDESCRIPTOR\_<COROTID>\_<START>\_<END>

<START> and <END> are the start and end times of the observation run.

### 5.2 Header

It includes the common keywords (TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, COROTID, RUN\_CODE, HLFCCDID, plus the following:

#### STARTDAT

**Description:** UT date of the beginning of the run

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

#### END\_DATE

**Description:** UT date of the end of the run

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

### 5.3 Binary table extension

**T\_START\_WIN:** list of start time for the use of a given window for the target COROTID

|                                                                                   |                                                                                                                          |                                                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
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|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|

**Type:** double float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

**T\_END\_WIN:** list of end time for the use of a given window for the target COROTID

**Type:** double float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

**WIN\_ID:** list of the ID of the target windows.

**Type:** long

**Range:** Astero channel: 0 - 2047.

**SIZEX/Y:** window size along the X direction and the Y direction. SIZEX corresponds to the number of columns and SIZEY to the number of rows

**Type:** integer

**ORIGINX/Y:** origin of the target window on the CCD

**Type:** integer

**MASK\_ID:** ID of the photometric mask associated with the target

**Type:** integer

**Range:** 1-5

**MASK\_SIZE:** total number of pixel within the photometric mask

**Type:** integer

**Unit:** pixel

**CCD\_WINREF :** Sub-image, of size (NXIMGREF, NYIMGREF) which pixel values represent the signal of the pixels inside the mask for a given target. Pixels not inside the mask have a signal equal to 0.E0. Pixel values are deduced from the 2 full images (A1 and A2) of the AS channel acquired at the beginning of each run. These images are corrected from the offset, gain and EMIs. The aim of this image is: (i) to get an accurate view of the contamination inside the mask, and (ii) to easily access the shape of the mask used for a given target.

**Type :** integer

**Unit:** electron/px/s

|                                                                                   |                                                                                                                 |                                                                                                      |
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**NX/YIMGREF:** size of the sub-image **CCD\_WINREF**

**Type:** integer

**POSX/YIMGREF:** X,Y position on the CCD of the bottom left corner of **CCD\_WINREF**

**Type:** integer

## 6 AN2\_STAR\_IMAG PRODUCT

This product is mainly an intermediate product as the “imagerettes” (when they exist, and with a poorer time sampling than plain light curves) will be used to build a light-curve which may be of better quality than the on-board computed LC as some better treatment may be applied.

### 6.1 Filename

AN2\_STAR\_IMAG\_<COROTID>\_<START>\_<END>

### 6.2 AN2\_STAR\_IMAG header

In addition to the common keywords (TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, STARTDAT, END\_DATE, COROTID, RUN\_CODE, HLFCCDID, ALPHA, DELTA, SPECTYPE), it includes the following :

#### STARNAME

**Description:** usual name of the star, from EXODAT/COROTSKY database

**Type:** string (20 char)

**Example:** alphaCen or HD456345

#### LC\_MEAN

**Description:** mean of the light curve

**Type:** float

**Unit:** electrons

#### LC\_RMS

**Description:** RMS of the light curve

**Type:** float

|                                                                                   |                                                                                                                          |                                                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
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**Unit:** electrons

**ORIGINX/Y:** origin of the target window on the CCD

**Type:** integer

**SIZEX/Y:** size of the target window on the CCD

**Type:** integer

### 6.3 AN2\_STAR\_IMAG binary table extension

The common binary table extension (DATE, DATEJD) plus the following :

#### STARINTENSITY\_IMAG

**Description:** star intensity light curve extracted from imagerettes, 32s sampling

**Type:** double

**Unit:** electrons

#### BG\_IMAG

**Description:** background light curve extracted from imagerettes, 32s sampling

**Type:** float

**Unit:** electrons

## 7 EN2\_STAR PRODUCTS

### 7.1 Filenames

EN2\_STAR\_CHR\_<COROTID>\_<START>\_<END>,  
EN2\_STAR\_MON\_<COROTID>\_<START>\_<END>,

### 7.2 EN2\_STAR common header

It includes the common keywords (see §2 for more information) :

TELESCOP

|                                                                                   |                                                                                                                 |                                                                                                      |
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**ORIGIN**

**CREA\_DAT**

**FILENAME**

**PIPE\_VER**

**N2\_VER**

**STARTDAT**

**END\_DATE**

**COROTID**

**RUN\_CODE**

**HLFCCDID**

**ALPHA, DELTA**

**plus the following :**

**WIN\_ID**

**Description:** WinID of the target when unique (-1 otherwise)

**Type:** long

**Unit:** no unit

**MAGNITUD**

**Description:** star magnitude R, from EXODAT/COROTSKY database through N1 products. It is supposed to be equal MAGNIT\_R (see below) as it has the same original source.

**Type:** float

**CONTFAC**

**Description:** contamination factor [0,1]

**Type:** float

**Unit:** no unit

**EXPTIME**

**Description:** exposure time (32s or 512s)

**Type:** integer

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Unit:** sec

#### **CHRDEG**

**Description:** degree of chromaticity

**Type:** float

**Unit:** none

#### **ACTILEV**

**Description:** level of activity

**Type:** float

**Unit:** none

#### **VARCLAS1/2/3**

**Description:** star variability classification extracted from the EXODAT data base.  
(exact definition to be included).

**Type:** string

#### **PRBCLAS1/2/3**

**Description:** probability associated to VARCLAS1/2/3

**Type:** float

#### **MAGNIT\_B/V/R/I**

**Description:** star magnitude B/V/R/I, from EXODAT/COROTSKY database

**Type:** float

#### **COLTEMP**

**Description:** star color temperature, from EXODAT/COROTSKY database

**Type:** float

**Unit :** Kelvin

#### **SPECTYPE**

**Description:** star spectral type, from EXODAT/COROTSKY database. In case  
no spectral type is available, either "K5III" or "UNKNOWN".

**Type:** string (8 char)

**Example :** O, B, A...

|                                                                                   |                                                                                                                 |                                                                                                      |
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## LUMCLASS

**Description:** star luminosity class, from EXODAT/COROTSKY database

**Type:** string (8 char)

**Example :** I, II, III...

## NBHOTPIX

**Description:** number of hot pixels detected in the template

**Type:** integer

## NB\_CONSI (V3.1 and later)

**Description:** Number of temperature jumps in the run ; the temperature jumps are due to requested changes of the thermal regulation.

This value is the true number of jumps that occurred in the whole run. If this number is bigger than 6, the behaviour of the six first jumps will be given thereafter.

**Type:** integer

## DAT\_TPE1/2/3/4/5/6 (V3.1 and later)

**Description:** Julian date of the 1<sup>st</sup> /2<sup>nd</sup>/3<sup>rd</sup>/4<sup>th</sup>/5<sup>th</sup>/6<sup>th</sup> jump

**Type:** float

## COR\_TPE1/2/3/4/5/6 (V3.1 and later)

**Description:** status of the correction of the 1<sup>st</sup> /2<sup>nd</sup>/3<sup>rd</sup>/4<sup>th</sup>/5<sup>th</sup>/6<sup>th</sup> jump

= 0 when the correction was normally done (see [DR1])

= -1= when the correction is not done,

= 1= when the correction is done but with warnings

**Type:** signed integer

## 7.3 EN2\_STAR\_MON specific header

In addition to TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, STARTDAT, END\_DATE, COROTID, RUN\_CODE, HLFCCDID, ALPHA, DELTA, SPECTYPE and CONTACT, EXPTIME, CHRDEG, ACTILEV, EN2\_STAR\*MON header includes the following :

## LC\_MEAN

**Description:** mean of the light curve

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Type:** float

**Unit:** electrons/sec

## LC\_RMS

**Description:** RMS of the light curve

**Type:** float

**Unit:** electrons/sec

## 7.4 EN2\_STAR\_MON binary table extensions

The common binary table extension (DATEJD, DATEHEL, STATUS) plus the following :

### WHITEFLUX

**Description:** The integrated white flux, 32 or 512s sampling. If partial oversampling at 32s in a product sampled at 512s, resampling at 512s. Then normalised to yield electron/sec.

**Type:** float

**Unit:** electron/sec

### WHITEFLUXDEV

**Description:** standard deviation of star intensity measurements at 32s, used to compute WHITEFLUX when sampled at 512s.

**Type:** float

**Unit:** electrons/sec

### BG

**Description:** background light curve (already subtracted), 32s or 512s sampling. If partial oversampling at 32s in a product sampled at 512s, resampling at 512s. Then normalised to yield electron/sec.

**Type:** float

**Unit:** electrons/px/sec

### RAWFLUX

**Description:** raw (N1) star intensity light curve, corresponding to time measurements in DATEJD

**Type:** float



|                                                                                   |                                                                                                                 |                                                                                                      |
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**Unit:** electrons/sec

## STATUS

**Description:** flags indicating the status of measurements corresponding to DATEJD

**Type:** unsigned long integer (32 bits)

|       |           |        |                                                                                       |
|-------|-----------|--------|---------------------------------------------------------------------------------------|
| bit0  | « false » | (0)    | The data is a valid flux measurement                                                  |
| bit0  | « true »  | (1)    | Cosmic event detected by the N0-N1 pipeline                                           |
| bit1  | « true »  | (2)    | Spare value detected by the N0-N1 pipeline                                            |
| bit2  | « true »  | (4)    | Flux acquired when crossing SAA (N0-N1)                                               |
| bit3  | « true »  | (8)    | Flux perturbed by Earth eclipse (inbound)                                             |
| bit4  | « true »  | (16)   | Flux perturbed by Earth eclipse (outbound)                                            |
| bit5  | « true »  | (32)   | Flux acquired when crossing SAA (N1-N2)                                               |
| bit7  | « true »  | (128)  | New hot pixel detected                                                                |
| bit10 | « true »  | (1024) | Flux flagged as an "incorrect value" by the flight s/w (VALIDFLUX=1, when applicable) |
| bit11 | « true »  | (2048) | Flux flagged as an "incorrect value" by the flight s/w (VALIDFLUX=2, when applicable) |

**Unit:** none

## 7.5 EN2\_STAR\_CHR specific header

In addition to TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, STARTDAT, END\_DATE, COROTID, RUN\_CODE, HLFCCDID, ALPHA, DELTA, SPECTYPE and CONTFAC, EXPTIME, CHRDEG, ACTILEV, EN2\_STAR\*CHR header includes :

### LC\_MEAN\_R/G/B

**Description:** mean of the light curve in R/G/B channel

**Type:** float

**Unit:** electrons/sec

### LC\_RMS\_R/G/B

**Description:** RMS of the light curve in R/G/B channel

**Type:** float

**Unit:** electrons/sec

## 7.6 EN2\_STAR\_CHR binary table extensions

|                                                                                   |                                                                                                                          |                                                                                                                  |
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The common binary table extension (DATEJD, DATEHEL, STATUS) plus the following :

## REDFLUX

**Description:** The integrated red flux, 32 or 512s sampling. If partial oversampling at 32s in a product sampled at 512s, resampling at 512s. Then normalised to yield electron/sec.

**Type:** float

**Unit:** electrons/sec

## GREENFLUX

**Description:** The integrated green flux, 32 or 512s sampling. If partial oversampling at 32s in a product sampled at 512s, resampling at 512s. Then normalised to yield electron/sec.

**Type:** float

**Unit:** electrons/sec

## BLUEFLUX

**Description:** The integrated blue flux, 32 or 512s sampling. If partial oversampling at 32s in a product sampled at 512s, resampling at 512s. Then normalised to yield electron/sec.

**Type:** float

**Unit:** electrons/sec

## BLUE/GREEN/REDFLUXDEV

**Description:** Standard deviation of the 16 exposures of 32 sec added onboard in the three colored channels (for 512s sampling).

**Type:** float

**Unit:** electrons/sec

## BG

**Description:** background light curve (already subtracted), 32s or 512s sampling. If partial oversampling at 32s in a product sampled at 512s, resampling at 512s. Then normalised to yield electron/sec.

**Type:** float

**Unit:** electrons/px/sec

## RAW\_RED/GREEN/BLUE

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Description:** difference between the corresponding N1 light curve and RED/GREEN/BLUEFLUX (when applicable, -999. If not)

**Type:** float

**Unit:** electrons/sec

## STATUS

**Description:** flags indicating the status of measurements corresponding to DATEJD. Data points with STATUS=0 are valid measurements. Data points with STATUS=64 have been interpolated in the N0-N1 pipeline.

**Type:** unsigned long integer (32 bits)

|       |           |        |                                                                                       |
|-------|-----------|--------|---------------------------------------------------------------------------------------|
| bit0  | « false » | (0)    | The data is a valid flux measurement                                                  |
| bit0  | « true »  | (1)    | Cosmic event detected by the N0-N1 pipeline                                           |
| bit1  | « true »  | (2)    | Spare value detected by the N0-N1 pipeline                                            |
| bit2  | « true »  | (4)    | Flux acquired when crossing SAA (N0-N1)                                               |
| bit3  | « true »  | (8)    | Flux perturbed by Earth eclipse (inbound)                                             |
| bit4  | « true »  | (16)   | Flux perturbed by Earth eclipse (outbound)                                            |
| bit5  | « true »  | (32)   | Flux acquired when crossing SAA (N1-N2)                                               |
| bit6  | « true »  | (64)   | Interpolated data point due to a large jitter                                         |
| bit7  | « true »  | (128)  | New hot pixel detected                                                                |
| bit10 | « true »  | (1024) | Flux flagged as an "incorrect value" by the flight s/w (VALIDFLUX=1, when applicable) |
| bit11 | « true »  | (2048) | Flux flagged as an "incorrect value" by the flight s/w (VALIDFLUX=2, when applicable) |

**Unit:** none

## 8 EN2\_WINDESCRIPTOR PRODUCT

This product aims at a rapid description of the characteristic and history of the observation. It will be produced only once per run for a given target. Thus, despite having a similar name than a N1 product, it is quite different from the latter.

### 8.1 Filename

EN2\_WINDESCRIPTOR\_<COROTID>\_<START>\_<END>

<START> and <END> are the start and end times of the observation run.

### 8.2 Header

It includes the common keywords (TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, N2\_VER, COROTID, RUN\_CODE, HLFCCDID, plus the following:

### STARTDAT

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Description:** UT date of the beginning of the run

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

## END\_DATE

**Description:** UT date of the end of the run

**Type:** string

**Format:** yyyy-mm-ddThh:mm:ss

## 8.3 Binary table extension

**T\_START\_WIN:** list of start time for the use of a given window for the target COROTID

**Type:** float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

**T\_END\_WIN:** list of end time for the use of a given window for the target COROTID

**Type:** float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

**EXPTIME:** exposure time, indicating if the series is oversampled or not. If during the run, a change occurs in sampling (shifting from 512 to 32 or the converse), EXPTIME is set to -1.

**Type:** float

**Unit:** sec

**WIN\_ID:** ID of the target window.

**Type:** long

**Range:** Exo Channel: 0 – 8191

**SIZEX/Y :** window size along the X direction and the Y direction. SIZEX corresponds to the number of columns and SIZEY to the number of rows

**Type:** integer

**ORIGINX/Y:** origin of the target window on the CCD

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Type:** integer

**TPL\_ID:** ID of the template associated with the (exo) target

**Type:** integer

**Range:** 0 – 255

**TPL\_SIZE:** total number of pixels within the template (i.e. total number of pixels used for the photometry)

**Type:** integer

**Unit:** pixel

**TEMPLATE:** Image of the template used to create the photometric lighthcurve.

Pixels with values of 1 are inside the mask.

**NRPIX :** number of “red” pixels (-1 if MONochromatic window)

**Type:** integer

**Unit:** pixel

**NGPIX :** number of “green” pixels (-1 if MONochromatic window)

**Type:** integer

**Unit:** pixel

**NBPIX :** number of “blue” pixels (-1 if MONochromatic window)

**Type:** integer

**Unit:** pixel

**NB:** location of the right edge of the blue part of the spectrum. The value is set to -1 if the photometric window is a MONochromatic window or if the lighthcurve has been extracted from imgettes data.

The blue part extends from  $N = 1$  to  $N = NB$ .

The green part lies between  $N = NB + 1$  and  $N = NR - 1$

**Type:** integer

**NBFRAC:** location of the right edge of the blue part of the spectrum if the lighthcurve has been extracted from imgettes data, and -1.0 otherwise.

|                                                                                   |                                                                                                                          |                                                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
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The blue part extends from  $N = 1.0$  to  $N = NB$ .

The green part lies between  $N = NB + 1.0$  and  $N = NR - 1.0$

**Type:** float

**NR** : location of the left edge of the red part of the spectrum. The value is set to -1 if the photometric window is a MONochromatic window or if the lightcurve has been extracted from imgettes data.

The red part extends from  $N = NR$  to  $N = 15$ .

The green part lies between  $N = NB + 1$  and  $N = NR - 1$

**Type:** integer

**NRFRAC**: location of the left edge of the red part of the spectrum if the lightcurve has been extracted from imgettes data, and -1.0 otherwise.

The red part extends from  $N = NR$  to  $N = 15.0$

The green part lies between  $N = NB + 1.0$  and  $N = NR - 1.0$

**Type:** integer

**CCD\_WINREF** :Pre-processed image of the neighbourhood of the target extracted from the full image acquired at the beginning of the run, of size (NXIMGREF, NYIMGREF) which pixel values represent the signal of the pixels inside the mask for a given target. Pixels not inside the mask have a signal equal to 0.E0. Pixel values are deduced from the 2 full images (E1 and E2) of the EP channel acquired at the beginning of each run. These images are corrected from the offset, gain and EMIs in the EXOWIND tool. The aim of this image is: (i) to get an accurate view of the contamination inside the mask, and (ii) to easily access the shape of the mask used for a given target.

**Type** : integer

**Unit:** electron/px/s

**NX/YIMGREF**: size of the sub-image **CCD\_WINREF**

**Type:** integer

**POSX/YIMGREF**: X,Y position on the CCD of the bottom left corner of **CCD\_WINREF**

**Type:** integer

## 9 EN2\_STAR\_IMAG PRODUCT

This product is mainly an intermediate product as the “imgettes” (when they exist, and with a poorer time sampling than plain light curves) will be used to build a light-curve which may

|                                                                                   |                                                                                                                 |                                                                                                      |
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be of better quality than the on-board computed LC as some better treatment may be applied.

### 9.1 *Filename*

EN2\_STAR\_IMAG\_<COROTID>\_<START>\_<END>

### 9.2 *EN2\_STAR\_IMAG header*

In addition to the common keywords to all products (TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, STARTDAT, END\_DATE, COROTID, RUN\_CODE, HLFCCDID, ALPHA, DELTA, SPECTYPE) plus the common EN2\_STAR keywords (CONTFAC, CHRDEG, ACTILEV), it includes the following :

#### **LC\_MEAN\_R/G/B**

**Description:** mean of the light curve in R/G/B channel

**Type:** float

**Unit:** electrons

#### **LC\_RMS\_R/G/B**

**Description:** RMS of the light curve in R/G/B channel

**Type:** float

**Unit:** electrons

**ORIGINX/Y:** origin of the target window on the CCD

**Type:** integer

**SIZEX/Y:** size of the target window on the CCD

**Type:** integer

### 9.3 *EN2\_STAR\_IMAG binary table extension*

The common binary table extension (DATEJD, STATUS) plus the following :

#### **REDFLUX\_IMAG**

**Description:** The integrated red flux extracted from imagerettes, 32s sampling.

|                                                                                   |                                                                                                                 |                                                                                                      |
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**Type:** double

**Unit:** electrons

### GREENFLUX\_IMAG

**Description:** The integrated green flux extracted from imagerettes, 32s sampling.

**Type:** double

**Unit:** electrons

### BLUEFLUX\_IMAG

**Description:** The integrated blue flux extracted from imagerettes, 32s sampling.

**Type:** double

**Unit:** electrons

### BG\_IMAG

**Description:** background light curve used to subtract the background in the imagerettes data, 32s sampling.

**Type:** float

**Unit:** electrons/px

### STATUS

**Description:** flags indicating the status of measurements corresponding to DATEJD. Data points with STATUS=0 are valid measurements. Data points with STATUS=64 have been interpolated in the N0-N1 pipeline.

**Type:** unsigned long integer (32 bits)

|       |           |        |                                                                                       |
|-------|-----------|--------|---------------------------------------------------------------------------------------|
| bit0  | « false » | (0)    | The data is a valid flux measurement                                                  |
| bit0  | « true »  | (1)    | Cosmic event detected by the N0-N1 pipeline                                           |
| bit1  | « true »  | (2)    | Spare value detected by the N0-N1 pipeline                                            |
| bit2  | « true »  | (4)    | Flux acquired when crossing SAA (N0-N1)                                               |
| bit3  | « true »  | (8)    | Flux perturbed by Earth eclipse (inbound)                                             |
| bit4  | « true »  | (16)   | Flux perturbed by Earth eclipse (outbound)                                            |
| bit5  | « true »  | (32)   | Flux acquired when crossing SAA (N1-N2)                                               |
| bit6  | « true »  | (64)   | Interpolated data point due to a large jitter                                         |
| bit7  | « true »  | (128)  | New hot pixel detected                                                                |
| bit10 | « true »  | (1024) | Flux flagged as an "incorrect value" by the flight s/w (VALIDFLUX=1, when applicable) |
| bit11 | « true »  | (2048) | Flux flagged as an "incorrect value" by the flight s/w (VALIDFLUX=2, when applicable) |

**Unit:** none



|                                                                                   |                                                                                                                 |                                                                                                      |
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## 10 N2\_CONTEXT PRODUCT

### 10.1 Filename

N2\_CONTEXT\_<START>\_<END>

### 10.2 N2\_CONTEXT header

It includes some common keywords : TELESCOP, ORIGIN, CREA\_DAT, FILENAME, PIPE\_VER, STARTDAT, END\_DATE, RUN\_CODE.

### 10.3 N2\_CONTEXT binary table extensions

#### DATEJD

**Description:** dates of the end of the measurements in the satellite reference frame, in CoRoT Julian day, 32s or 512s (exo) sampling

**Type:** double float

**Unit:** CoRoT Julian day (origin 1 January 2000 12:00.00)

#### SATPOSX

**Description:** position of the satellite – X geocentric equ. J2000 (double)

**Type:** double

**Unit:** km

#### SATPOSY

**Description:** position of the satellite – Y geocentric equ. J2000 (double)

**Type:** double

**Unit:** km

#### SATPOSZ

**Description:** position of the satellite – Z geocentric equ. J2000 (double)

**Type:** double

**Unit:** km

|                                                                                   |                                                                                                                 |                                                                                                      |
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### SATLON

**Description:** longitude of the sub-Earth point (float)

**Type:** double

**Unit:** degree

### SATLAT

**Description:** latitude of the sub-Earth point (float)

**Type:** double

**Unit:** degree

### LOS

**Description:** line of sight vector [Psi,Theta,Phi] or [RA,DEC,ROLL] (to be checked with Fabio)

**Type:** double

**Unit:** degree