CHARM
A Catalogue of High Angular Resolution Measurements

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Changes record

Version	Date	Changes
Evaluation	September 13, 2000	All
Release 1.0	March 19, 2001	Column "Angular Distance" Column "Visibility"
Release 2.0	November 8, 2001	Added Functionalities, corrections. Change of title and references, to complement the paper submitted to A&A
2.1	November 21, 2001	Added Kc, notes, est diam.
2.2	November 30, 2001	Added description of Geo
2.3	February 19, 2002	Debugging, public release

Introduction.

This document describes the contents of CHARM Catalogue (previously known as the ESO VLTI Main Catalogue) and the structure of the related files. It is available in electronic format, and it has links or references to the following documents:

main.doc	This document
CHARM.xls	The CHARM Table, full format
publicat.doc	List of publications
maint.doc	Archive update instructions (internal use only)

The CHARM Catalogue is an Excel spreadsheet with links to the documents above, as well as to the actual Data Archive. The Data Archive and some link functionalities might not be fully available for general distribution.

The CHARM Catalogue CHARM.xls includes several worksheets. They are briefly described below, and a full explanation is provided separately in the remainder of this document.

Table	Main Catalogue Table
Stats	Statistical summary, magnitude histograms, etc
AD Map	Sky distribution of the sources
Update	Directory root names (compiler use only)
Coords	Format for Catalog updates (compiler use only)
TCS Catalog	Format for TCS Catalog updates (compiler use only)
Geo	Geometry, baselines, visibility, plots
Hidden sheets	Used for internal computations

Part I: Main Table

N.   Sequential order in the table. This is a free index, which is updated when the table is sorted or regenerated. See also: Ser.

Ser.   Serial order in the table. This is an index fixed at the time of release. See also: N.

Source   Link to the directory which contains the source data. The name is chosen arbitrarily, although care has been taken to use the designation of the original paper from which the source was extracted (lowercase, stripped of +/– and special symbols). Clicking on the link will open the directory. See also: Cross-Identifications, Update.

Number of VLTI observations. CHARM v2.3 is updated through February 12, 2002.

Type   A short abbreviation to identify the type of the source. The types introduced with the first release of the catalogue are given in Table 1, but additional codes may be introduced since this is an arbitrary field.

Table 1. Codes for the source types.

Code	Source measurement in the corresponding reference
UR	Unresolved (upper limit may be given)
Diam	Stellar diameter resolved
Bin	Binary or multiple star
Com	Complex source. Examples: shell, binary + diameter, etc.
Cal	Calibrator

Cross-Identifications A multi-column field (4 fields in the first release, but the actual number in the next versions may change). The choice of identifications is arbitrary, but as a rule of thumb 1-2 are from visual catalogues (usually SAO and HD when available), and 1-2 are from IR surveys (usually IRC and IRAS when available). In case of a bright or famous object, HR numbers or Flamsteed names may be used.

Method   A code to identify the method of observation used for the determination reported in the table. The codes are listed in Table 2.

Table 2. Codes for the Observation Methods

Code	Method of Observation
LO	Lunar Occultation
LBI	Long-Baseline Interferometry
SPE	Speckle Interferometry (all methods)
Radio	Radio Measurements (incl. mm, sub-mm)
EST	Estimated diameter
AM	Aperture Masking
FGS	HST Fine Guidance Sensors
IND	Indirect Methods (Spectrophotometry)

Lambda   Wavelength of observation, if given in the paper. This is listed in different ways, depending on the type of measurement:
- one or two numbers, in which case it means λ (and $\Delta\lambda$) in μm;
- a filter type. The usual standard photometric names apply (for instance: V, K, N)
- a symbol, for special or narrow filters. Examples can be: CVF (Circular Variable Filter, i.e. a narrow bandwidth filter used in the near-IR), Hα, Brγ.
- "mult" indicates that the observations has been carried out at multiple wavelengths simultaneously.

UD Diameter   Uniform disk angular diameter, if available, as reported in the paper. This entry has 3 columns, where the values are all expressed in milliarcseconds (mas). These are the the angular diameter, its error, and an upper limit estimate, respectively. The entries for the angular diameter and the upper limit should be mutually exclusive, and the error is not always given. See also LD Diameter, Visibility.

LD Diameter   Limb-darkened angular diameter, if available, as reported in the paper. This entry has two columns, which list the angular diameter and its error in units of mas. See also: UD Diameter.

Shell   Marks the presence of a circumstellar shell, either as a flag "Y", or with a characteristic size in mas.

Binary   In case the source is a binary or multiple star, the following entries are listed:

sep: separation in mas, as reported in the reference. For LO measurements, this is often only the projected separation along the occultation PA (see below). In case of multiplicity (triple and higher), only one entry is reported, without a specific rule. In general, the result listed is the one which constituted the specifi contribution of the corresponding reference. See also PA and Type.

<u>PA</u>:   position angle in degrees. This can be the true position angle, or the angle of the projection in case of 1-D measurements such as is in general the case for LO. In case of a multiple star, only one entry is present and the same considerations apply as for <u>sep</u>.

<u>R</u>:   brightness ratio (brighter to fainter), at the observation wavelength as reported in <u>lambda</u> and/or in the corresponding reference. In case of a multiple star, only one entry is present and the same considerations apply as for <u>sep</u>.

<u>Typ</u>:   The type of binary. At the time of the initial release of the catalogue, the codes used are: D (double), T (triple), Q (quadruple), M (multiple, i.e. triple or higher), ND (not detected, in case of a source reported as binary or multiple in the literature). S indicates a single star (the binary star is disclaimed, typically due to poor observations), while B? indicated that the binary is doubtful. A missing <u>Typ</u> entry implicitly indicates a double star.

<mark>Computed Diameter</mark>   Angular diameter and its error, computed on the basis of a formula as described in <u>Method</u>. An error is included whenever possible. The values entered in this column should be used with caution.

<mark>Method</mark>   A formula which combines different entries in the catalogue, to yield a theoretical angular diameter and possibly its associated error. See also: <u>Computed Diameter</u>.
The methods currently included are:
<u>BV</u>: Bartholdi (thesis, 1976) relationship based on (B-V) and V. Well-suited for main sequence stars hotter than K.
<u>VB</u>: Van Belle (priv. comm. 2000) relationship based on (V-K) and luminosity class. The apparent angular sizes versus V-K color are estimated in the case of :
-   Main Sequence stars with a V-K from –0.5 to 0.5
-   Giant and Super Giant with a V-K from 2.0 to 8.0
-   Evolved Sources : Variable stars with V-K from 5.5 to 13.0
Well suited for cool main sequence stars, late-type giant stars, AGB stars.

For what concern the errors, we have assumed a fixed error on B, V, K photometry, which has been arbitrarily set to 0.1mag. This assumption is, in many cases, not very realistic and the derived errors must be taken with caution.

<mark>Comments</mark>   Comments extracted from the reference or inserted by the catalogue compiler.

<mark>Coordinates</mark>   Source coordinates. The five columns list right ascension, declination, proper motions and epoch, respectively. The format of right ascension is hh.mmsss. The format of declination is (-)dd.mmssss. The proper motions values are set to zero when not available. Proper motions are expressed in "/year. See also the worksheet <u>Coords</u> for an alternate coordinate format. See also: <u>Ang. Dist</u>.

Quick Reference Data This field has several columns, whose number and nature can vary in future releases as needed on the basis of practical experience. At this time, they include the fields described in Table 3. Entries are compiled from different sources. In the most common case, they are extracted from the *Simbad* database. They can also include data from the corresponding reference, or from private unpublished data. See also Simbad, Phot, Spec, References.

Simbad   This is a link to the information on the specific source, as listed in the Simbad database. It can be a local file on disk (code D), or a URL that allows to look up Simbad directly (code U). Both codes can be present. A code N, or empty, means that no Simbad entry is available for the source. The choice to have both stored information and an active link allows for the maximum flexibility: D links are immediate, and should have most of the information always available with a click. U links provide always complete and updated information (expecially for what concerns literature references), but require Internet connection and can be slow. See also: Chart, Update.

Phot   Link to a private compilation of photometric data on the source. The data may be unpublished. See also Spec, Update.

Spec   Same as Phot, for spectroscopic data.

Chart   Link to a finding chart, if available. The chart is an image of Digital Sky Survey (DSS) in JPG format, covering 10'x10'. DSS-1 is used, but extensions to DSS-2 can be foreseen and therefore a code D1 is used. Future extensions might add the D2B and D2R codes (blue and red). See also: Simbad.

Table 3. Quick Reference Data Fields.

Col	Field	Data
1	B	Blue Magnitude
2		Code for B
3	V	Visual Magnitude
4		Code for V
5	K	K Magnitude
6		Code for K
7	Kc	Correlated K magnitude (incl. visibility^2)
8	Spectrum	Spectral Type
9	Var. Type	Variability type (from Simbad)
10	Parallax	
11	Rad. Vel.	Radial velocty in km/s

References   Publications which include the source under consideration. This is usually a code with a sequential number. For the sake of convenience, this is usually also

a link to the list of publications publicat.doc. In turn, this has a link to the corresponding publication in electronic format (available only in the full implementation of the archive).

Ang. Dist.   Angular distance (in degrees) computed from a reference point whose right ascension and declination are set by the user in row 2 and 3, in this order, of the same column. Note that no corrections are made for different epochs between the reference point and the coordinates of each entry. Note: there are 9 hidden columns in front of Ang.Dist. See also: coordinates.

Visibility   Visibility of the source, with the baseline (expressed in meters) and the wavelength (expressed in microns) defined by the user at the top of the column. For each entry, the four columns list an angular diameter (when applicable), its error, the computed visibility and relative error. The angular diameter can be set by the user: by default, it is taken from the UD Diameter , LD Diameter, Shell ,Upper limit, Computed Diameter columns, in this order when available. Only in the first two cases and in the last one, can the error on the angular diameter be provided in CHARM. If present, then in addition to the visibility also the relative error on the visibility is computed. Note that this is an approximated error: it is computed as $(vis(\varphi+\Delta\varphi)-vis(\varphi))/vis(\varphi)$. All visibilities are computed as $sqrt((2J_0(x)/x)^2)$, and errors are relative errors.

Part II: Secondary Worksheets

Stats   This worksheet displays some summary statistics. Included are histograms of:
- V and K magnitudes
- Angular diameter
- Total number and source types
- Statistics on bibliographical references

AD Map   This worksheet displays a plot of the source positions in the sky, according to the coordinates computed in Coords (note: this worksheet must be filled). No correction for precession is applied. The limits are set by the view available from VLTI at Paranal.

Update   This worksheet is used to store the root names of the directories in the Data Archive. It is intended for internal management only.

The columns in this worksheet are:

Subdir Location: the directory which holds the source data (raw data files, results of analysis, log files, etc)

Root: the name displayed in the Main File (see also Source). This is generally fixed by the authors according to VLT-TRE-ESO-15000-2746.

Simbad Data: the file with the data retrieved from the Simbad database (see also Simbad).

Own Photometry: File with photometric information (see also Phot).

Finding Chart: File with the finding chart (see also Chart).

Simbad Name: name used for Simbad queries.

Update: date of last update of source data.

A macro button (gen structure) allows to fill the full worksheet, starting from the names provided in column root. The user should take care of filling manually the entries in Simbad Name and Update.

Coords   This worksheet is used to store the source coordinates and other information in a format specific for updates of the VLTI Standard Format Catalog. It is intended for internal management only. Two macro buttons permit to clear the worksheet (when not needed, in order to save space on the total size of charm.xls), and to regenerate it automatically. For this, the last row of the worksheet must be identical with the last row of the main Table.

TCS Catalog   This worksheet is used to store the source coordinates and other information in a format that can be converted into a TCS Catalog. It is intended for internal management only. Two macro buttons permit to clear the worksheet (when not needed, in order to save space on the total size of charm.xls), and to regenerate it automatically. For this, the last row of the worksheet must be identical with the last row of the main Table.

Geo This worksheet is used to perform computations regarding observational parameters of the sources present in CHARM. Dates and times can be set, as well as coordinates of an observatory and of sources, to compute quantities such as baselines projection and position angle, sidereal times, airmass, visibility and related error, etc.
Plots can also be generated.