



ESO - EUROPEAN SOUTHERN OBSERVATORY

# EUROPEAN SOUTHERN OBSERVATORY

Organisation Européenne pour des Recherches Astronomiques dans l'Hémisphère Austral  
Europäische Organisation für astronomische Forschung in der südlichen Hemisphäre

## VERY LARGE TELESCOPE

### The VLT Main Source Catalogue

VLT-TRE-ESO-15000-2416

Issue 1.0  
14 December, 2000  
13 pages

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## CHANGE RECORD

<b>Issue</b>	<b>Date</b>	<b>Affected Paragraphs(s)</b>	<b>Reason/Initiation/Remarks</b>
1.0	11-12-2000		First Release

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## **1. SCOPE**

This document describes the contents of ESO VLTI Main Source Catalogue, and the structure of the related files. The Catalogue has been designed and created to serve as a tool for the selection of sources useful for the tasks of commissioning and verification of the VLTI.

A description is provided of the criteria adopted for the source selection, as well as guidelines for the use of the Catalogue. Due to its intrinsic nature, the Catalogue needs to be updated frequently to include new entries from the literature, and new information from the Simbad database that might become available for the sources already included. Additionally, at the time of writing the Catalogue does not yet include all identified sources of reference.

The aim of the present document is mainly to provide a description of the Catalogue structure and fields. The actual contents of the Catalogue are available separately from the author as a CD-Rom.

### **1.1 Reference Documents**

VLT-SPE-ESO-17230-0640, 1.0, 06/12/94 'VLT Software - Requirements and Star Catalogue System'

### **1.2 List of Abbreviations/Acronyms**

DSS	The Digital Sky Survey (digitization of Palomar POSS plates)
Simbad	The database of the Centre for Astronomical Data in Strasbourg
VLTI	Very Large Telescope Interferometer

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## 2. DESCRIPTION

This document describes the contents of ESO VLTI Main Catalogue, and the structure of the related files. It is available also in an electronic format version, which has clickable links or references to the following documents:

<a href="#">main.doc</a>	This document
<a href="#">archive.xls</a>	The Archive Table
<a href="#">publicat.doc</a>	List of publications
<a href="#">maint.doc</a>	Archive update instructions (internal use only)

The Main Catalogue is an Excel spreadsheet with clickable 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 Main Catalogue [archive.xls](#) includes several worksheets. They are briefly described below, and a full explanation is provided separately in the remainder of this document.

<a href="#">Table</a>	Main Catalogue Table
<a href="#">Stats</a>	Statistical summary, magnitude histograms, etc
<a href="#">AD Map</a>	Sky distribution of the sources
<a href="#">Update</a>	Directory root names (compiler use only)
<a href="#">Coords</a>	Format for Catalog updates (compiler use only)

## 3. SOURCE SELECTION

The Catalogue is aimed at including all sources with a published angular diameter, up to date. For this, literature databases have been scanned, using a suitable set of keywords to identify papers with results from lunar occultations, long-baseline interferometry, speckle interferometry, and indirect estimate methods.

At present, the compilation is approximately complete for the results by lunar occultation and indirect methods, and approximately 80% complete for the results by long-baseline interferometry. Inclusion of results by speckle interferometry has not yet started. It is expected that the Catalogue should be complete by March 2001.

A total of approximately 2,300 entries are included at present. A significant fraction of the sources have multiple entries, which correspond to independent measurements: this approach has been chosen to

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allow the maximum flexibility in the use of the Catalogue. The sources are generally identified by the name used in the original paper from which the measurement was extracted. As this may cause some apparent confusion, a record of the 4 most commonly used cross-identifications is kept.

## 4. CONTENTS

The Catalogue includes a number of fields, which are described in the Sects. Part I and Part II below. All fields are hyperlinked to this document, at the point in which the field is explained.

Ideally, the fields include most of the known information on the source. This includes information on some of the possible cross-identifications, positional information (coordinates and proper motions), photometric information in B, V and K, and fundamental quantities such as parallaxes, radial velocities, variability codes, etc.

One of the interesting features of the Catalogue in its Excel version, is the possibility to click on links to access the full Simbad file for each source, the finding charts, and the original paper from which the source has been selected.

The Catalogue contains the published result on each source, in a tabular format covering the cases of uniform and limb-darkened disk angular diameters, circumstellar shells and binary stars. Also the wavelength of the original measurement is included when possible. The sources are labelled with different codes, to facilitate the identification of sources suitable for calibration or for science verification purposes.

## 5. USE

The Catalogue has two main modes in which it can be used, interactive and as a standard VLT catalogue.

### 5.1 Interactive Use

In this mode, the user can open the full version of the Catalogue as an Excel file. The typical worksheet of interest would be the first one, with the table of sources.

The Excel structure permits to sort the sources according to any choice of column, and to filter the entries to select those which satisfy a number of criteria. In this way, the user has a very powerful tool to select interactively those sources which best satisfy the need of the moment. For this, some experience with Excel worksheets is required.

*Note: it is recommended that the user do not edit the contents of the Excel cells. Several cells contain embedded links to other parts of the Excel file, as well as to external documents, which could be lost.*

### 5.2 Use as a Standard VLT Catalogue

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The Catalogue is automatically replicated, in a more condensed form, as an ASCII table which is periodically used to generate a standard VLT TCS catalogue. In this form, the observer can use the source name to instruct the telescopes of the VLTI to point and track a source.

A Tcs catalog row always contains the columns described in Table 1.

Check also: <http://arcdev.eso.org/~archeso/skycat/cat/cat.13.html#pgfId=10511>.

**Table 1.** Standard VLT TCS catalog fields.

Column	Type	Description
id	char*	Object catalog id
ra	double	Alpha coordinate for the target in decimal degrees
dec	double	Delta coordinate for the target in decimal degrees
cooSystem	char*	Equinox system and equinox ("B1950" or "J2000")
epoch	double	Epoch expressed as decimal year
pma	double	Proper Motion Alpha in radians/year (-10.0 to 10.0)
pmd	double	Proper Motion Delta in radians/year (-10.0 to 10.0)
radvel	double	Radial velocity in km/sec (-200000 to 200000)
parallax	double	Parallax in arcseconds (-10000 to 10000)
cooType	char*	Coordinate type as "M" for mean or "A" for apparent character
band	char*	Magnitude wavelength band ("V")
mag	double	Object's magnitude in given band
more	char*	An HTTP URL pointing to more info on the object
preview	char*	An HTTP URL pointing to an image of the object
distance	double	Distance to center of the field
pa	double	Position angle based on center of the field

The fields used for this version of the Catalogue are:

- name of the source (as listed in the Excel file)
- right ascension and declination, in hours and degrees (decimal format)
- proper motions and epoch (in the Simbad style)
- V and K magnitudes, spectrum (blank entry when missing)

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A total of nine columns should be present for each source. Missing columns are set to a predefined null value. The ASCII table is in free format. The interface to the standard VLT TCS catalogue is currently being developed by A. Wicenec at ESO.

## 6. HOW TO ADD ENTRIES TO THE CATALOGUE

The Catalogue should be updated regularly at ESO with new entries from the literature.

External users are welcome to add compilation of sources for inclusion in the Catalogue, or to create additional catalogues of their own which conform to the same format.

To create catalogues with the same Excel structure as the Main VLTI Catalogue, please send a list of valid Simbad names to [arichich@eso.org](mailto:arichich@eso.org). The corresponding Excel and ASCII files will be generated automatically, but the user should be prepared to supply additional information if needed.

To generate only a catalogue in the VLT standard format, please send an ASCII free-format list with the entries detailed in Sect 5.2, to [awicenec@eso.org](mailto:awicenec@eso.org).

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## 7. PART I: MAIN TABLE COLUMN DESCRIPTION

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**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. The catalogue is generated with this number set to zero for all sources. It is expected that the corresponding entries will progressively increase as observations are carried out.

**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 2, but additional codes may be introduced since this is an arbitrary field. The calibrator codes (C1...C3) refer to sources which have a well-determined angular diameter, and no known variability. Some of the sources in the other classes can be used as calibrators too, depending on the specific application under consideration.

**Table 2.** 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.
C1	Calibrator - high quality
C2	Calibrator - medium quality
C3	Calibrator - low quality
Cat	Catalogue

**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.

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**Method** A code to identify the method of observation used for the determination reported in the table. The codes are listed in Table 3.

**Table 3.** Codes for the Observation Methods

Code	Method of Observation
LO	Lunar Occultation
LBI	Long-Baseline Interferometry
SI	Speckle Interferometry (all methods)
IM	Imaging (including post-processing)
AO	Adaptive Optics
AM	Aperture Masking
SP	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  $\lambda$  (and  $\Delta\lambda$ ) in  $\mu\text{m}$ ;
- 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),  $H\alpha$ , Br $\gamma$ .

**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](#).

**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 "shell"), 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 specific contribution of the corresponding reference. See also [PA](#) and [Type](#).

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**PA:** 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 [sep](#).

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

**Typ:** 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). A missing **Typ** entry implicitly indicates a double star.

**Computed Diameter** Angular diameter and its error, computed on the basis of a formula as described in [Method](#).

**Method** A formula which combined different entries in the catalogue, to yield a theoretical angular diameter and possibly its associated error. See also: [Computed Diameter](#).

**Comments** Comments extracted from the reference or inserted by the catalogue compiler.

**Coordinates** Source coordinates. The five columns list right ascension, declination, proper motions and epoch, respectively. The proper motions values are set to zero when not available. The format of right ascension is hh.mmss. The format of declination is (-)dd.mmssss. Proper motions are expressed in "/year. See also the worksheet [coords](#) for an alternate coordinate format.

**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 4. 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 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 (especially for what concerns literature references), but require Internet connection and can be slow. The Simbad directories are used to store also other database information, such as finding charts. 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.

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**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 4.** 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	Spectrum	Spectral Type
8	Var. Type	
9	Parallax	
10	Rad. Vel.	

**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).

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## 8. PART II: SECONDARY WORKSHEETS

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#### **Stats**

This worksheet displays some summary statistics. Included are histograms of:

- V and K magnitudes
- Angular diameter
- Total number and source types

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#### **AD Map**

This worksheet displays a plot of the source positions in the sky, according to the coordinates computed in [Coords2](#). No correction for precession is applied. The limits are set by the view available from VLTI at Paranal.

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#### **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](#)).

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

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

Simbad Name: name used for Simbad queries.

Update: date of last update of source data.

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#### **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.

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