Manual for Processing of the Coravel – Type Observations

Vilnius 2002

Content

Quick Guide for Using Zurkon II

The Zurkon II analyzes database of individual observations and rejects flaw scans. The program imports "*.idz" files (this file is generated by the "acora.exe") and creates "*.dat" files.

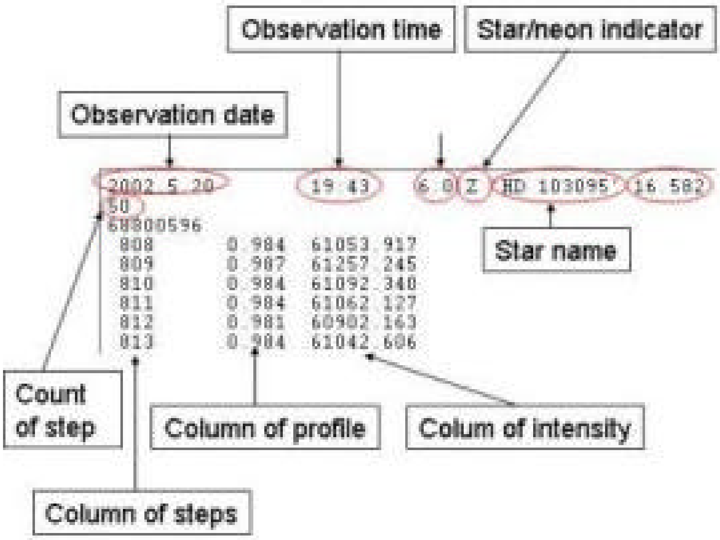

Figure 1 Structure of the "*.dat" file

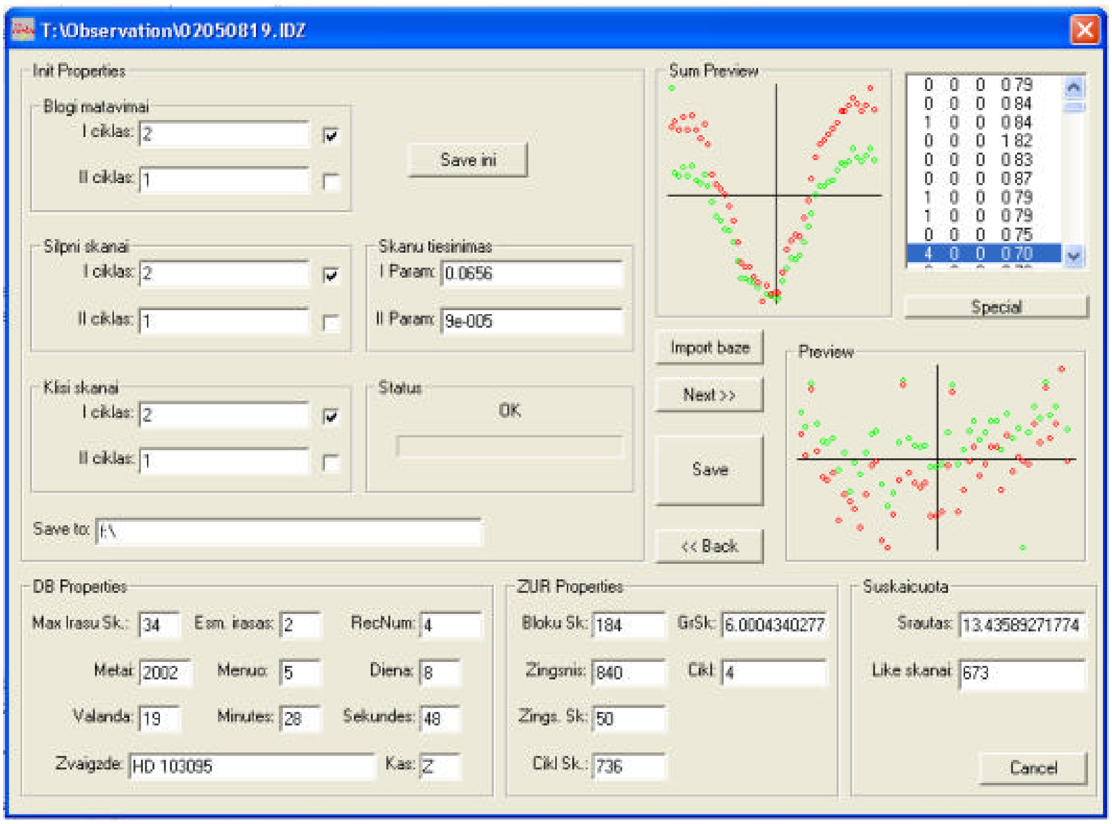

Figure 2 Interface of the Zurkon

ZurkonII analysis

There are three methods to analyze individual scans:

1. Bad measurements.

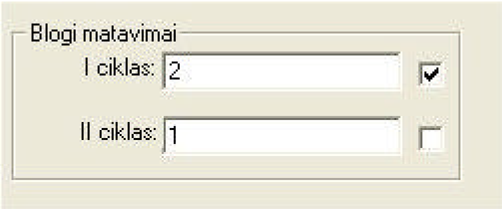

Figure 3 Parameters of bad measurements

When the left-hand part of the following inequality is larger than the right-hand part, then this measurement is treated to be wrong and it is substituted by the interpolated value between the nearest points:

$$\left| n_{ij} - \frac{1}{J_n} \sum_j n_{ij} \right| < C \cdot \sqrt{\frac{\sum_j \left(\frac{1}{J_n} \sum_j n_{ij} - n_{ij} \right)^2}{J_n - 1}},$$

where i is the index of the step, j is the index of the scan, n_{ij} is the individual measure, J_n is the number of scans, and C is the constant from the CORAVEL interface. There are two iterations foreseen in this method (if both check boxes are marked) so that two different constants (I ciklas) and (II ciklas) can be used.

2. Weak scan:

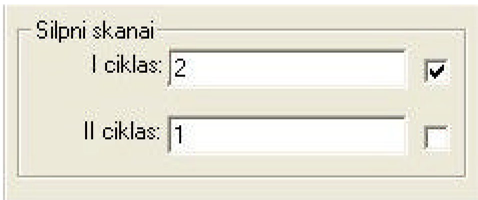

Figure 4 Parameters of weak scans

When the left-hand part of the following inequality is larger than the right-hand part, then the scan is too weak due to low S/N ratio and it is rejected:

$$\left| \frac{\sum_j \sum_i n_{ij}}{J_n} - \sum_i n_{ij} \right| < C \cdot \sqrt{\frac{\sum \left(\frac{\sum_j \sum_i n_{ij}}{J_n} - \sum_i n_{ij} \right)^2}{J_n - 1}},$$

where i is the index of the step, j is the index of the scan, n_{ij} is the individual measure, J_n is the number of scans, and C is the constant from the CORAVEL interface. There are two iterations foreseen in this method (if both check boxes are marked) so that two different constants (I ciklas) and (II ciklas) can be used.

3. <u>The noisy scan</u>:

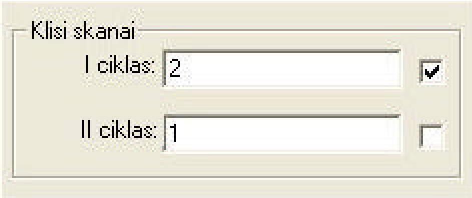

Figure 5 Parameters of noisy scan

When the left-hand part of the following inequality is larger than the right-hand part then this scan is rejected as noisy.

$$\left| \frac{\sum_j \frac{A_j}{B_j}}{J_n} - \frac{A_j}{B_j} \right| < C \cdot \sqrt{\frac{\sum \left(\frac{\sum_j \frac{A_j}{B_j}}{J_n} - \frac{A_j}{B_j} \right)^2}{J_n - 1}},$$

where i is the index of the step, j is the index of the scan, n_{ij} is the individual measure, J_n is the number of the scans and C is the constant from the interface and

$$A_j = \sum_{i=1}^{10} n_{ij}, \; B_j = \sum_{i=J_n-10}^{J_n} n_{ij}.$$

There are two iterations foreseen in this method (if both check boxes are marked) so that two different constants (I ciklas) and (II ciklas) can be used.

4. <u>The straightening of the scan</u>:

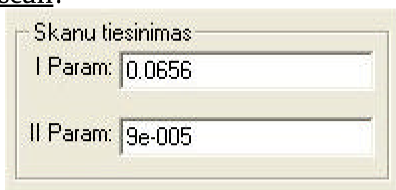

Figure 6 Parameters of straightening of scan

$$n_{ij}^{new} = n_{ij} \cdot \left(1 + \frac{STEP_i - STEP_0}{100} \cdot \left([IParam] - [IIParam] \cdot STEP_0 \right) \right)^{-1},$$

where i is the index of the step, j is the index of the scan, n_{ij} is the individual measure and $STEP_i$ is the number of the steps.

ZurkonII preview

There are two preview windows, the “sum preview” and the “preview”:

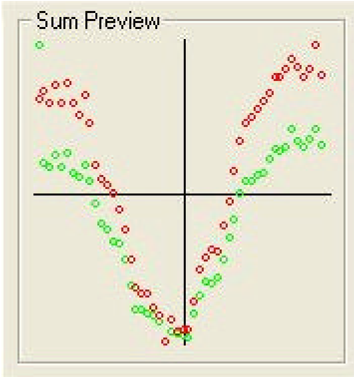

Figure 7 The "sum preview" window

The "Sum preview" window shows the sum of the individual cross correlation functions.

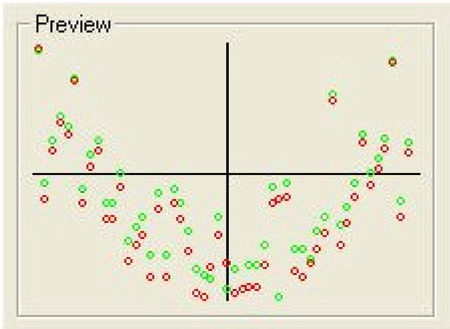

Figure 8 The "preview" window

The "preview" window shows the individual cross correlation function. Green circles indicate results from the initial data, and red circles marks the data after the scan analysis and correction.

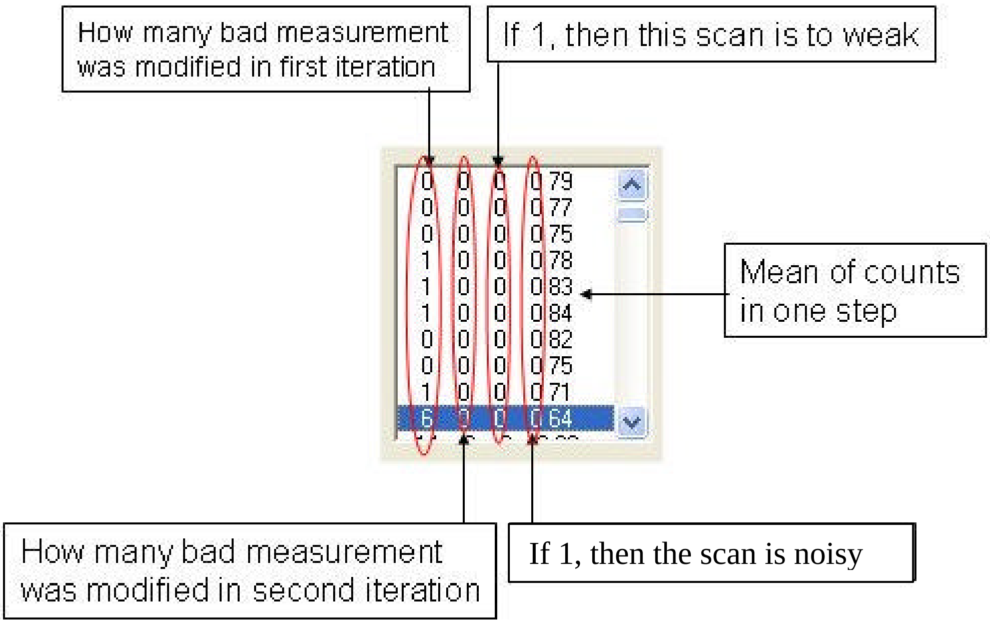

Figure 9 The individual measurement

The sequence of the program execution

1. Open the ZurkonII program window.
2. Set desirable analysis parameters and click **Save ini.**
3. Click **Import baze** to import the data.
4. Click **Save**.
5. Repeat step 4 down to the end of the file.

Quick Guide for Using jr2

This program uses data from "*.dat" files, fits them with Gaussian profile and finds cross correlation function parameters: the radial velocity, the depth and the width (FWHM). Results of this program are saved to the "*.jr2" files.

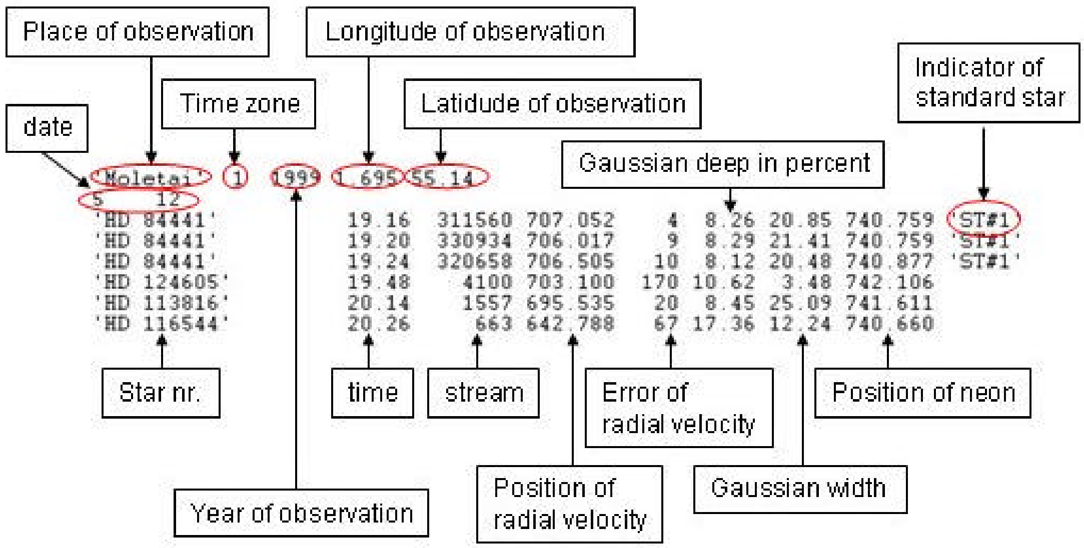

Figure 10 Structure of the "*.jr2" file

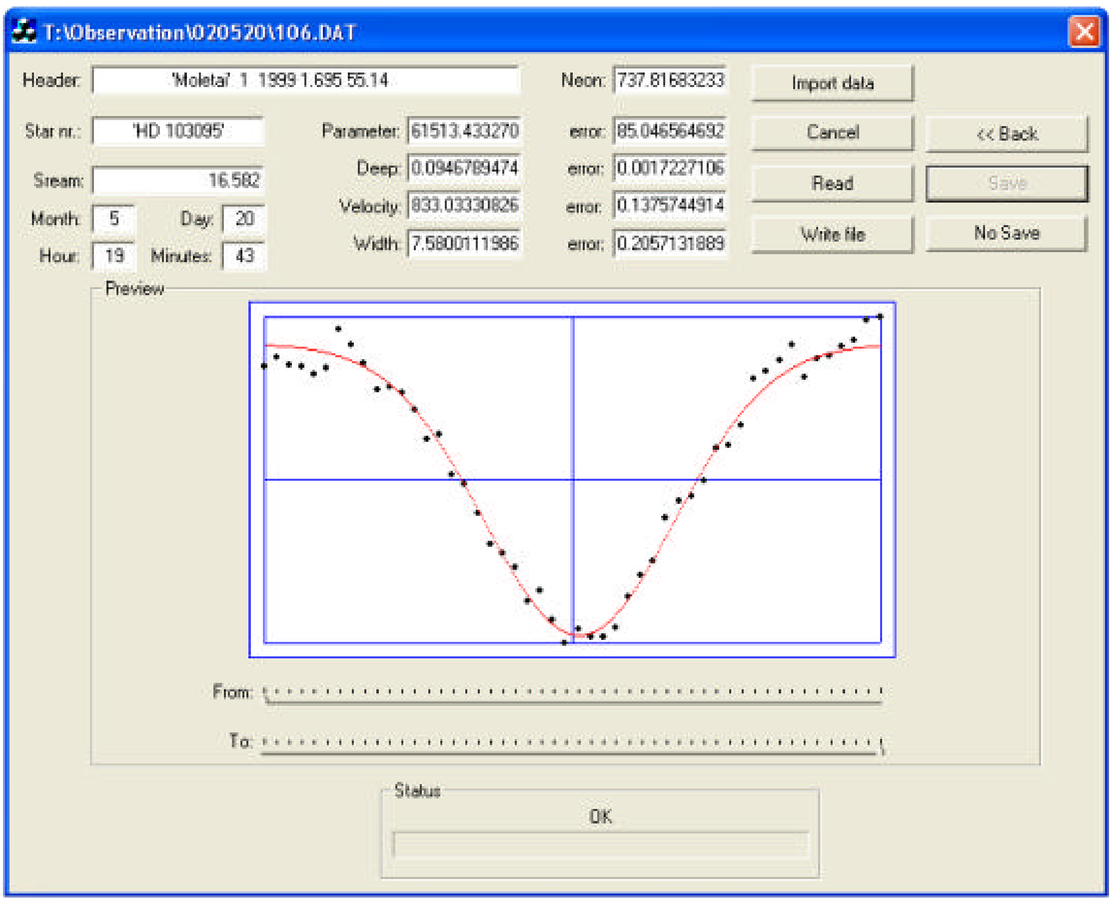

Figure 11 Interface of jr2

The sequence of the program execution

1. Open the jr2 program window.
2. Click **Import data**.
3. Select the observational data files of the night to be processed in the browse window.
4. Click **Save** to fit the Gaussian profile and save the result.
5. Click **Read** to read the next record.
6. Repeat 4 and 5 steps down to the end of the file.
7. Save results.

Quick Guide for Using Sphinx

Sphinx calculates radial velocities from “*.jr2” and creates the file “*.lst”.

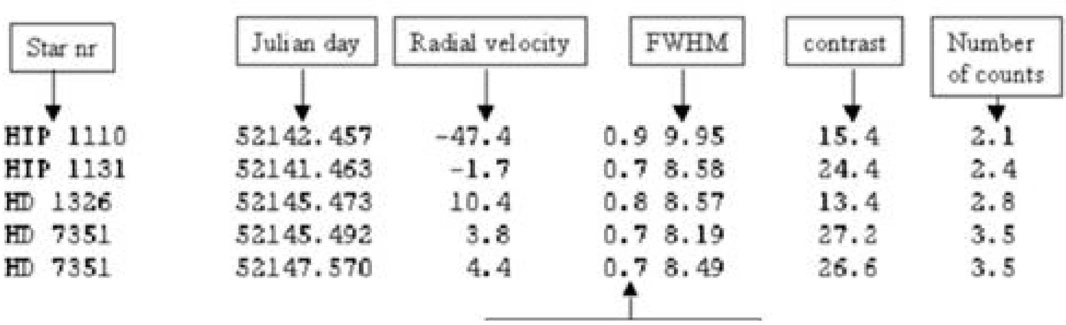

Figure 12 Structure of the "*.lst" file

The sequence of the program execution

1. Load Sphinx program. Click **File**, then click **Open**, or press F3.

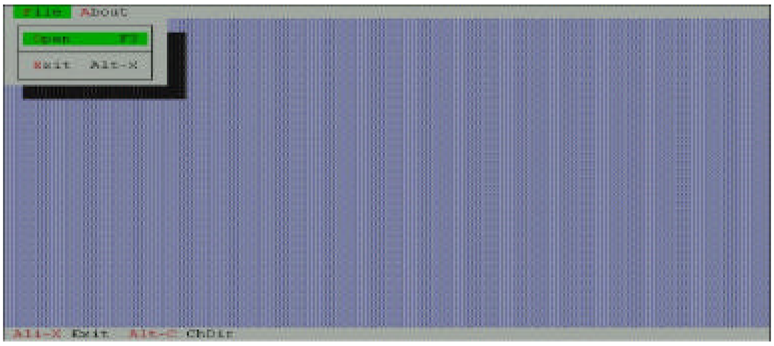

Figure 13 Interface of sphinx

2. Browse the *.jr2 file and click **OK**. The sphinx will import your jr2 file and display in the window. If necessary you can modify data in this window, then click **Calculation**.

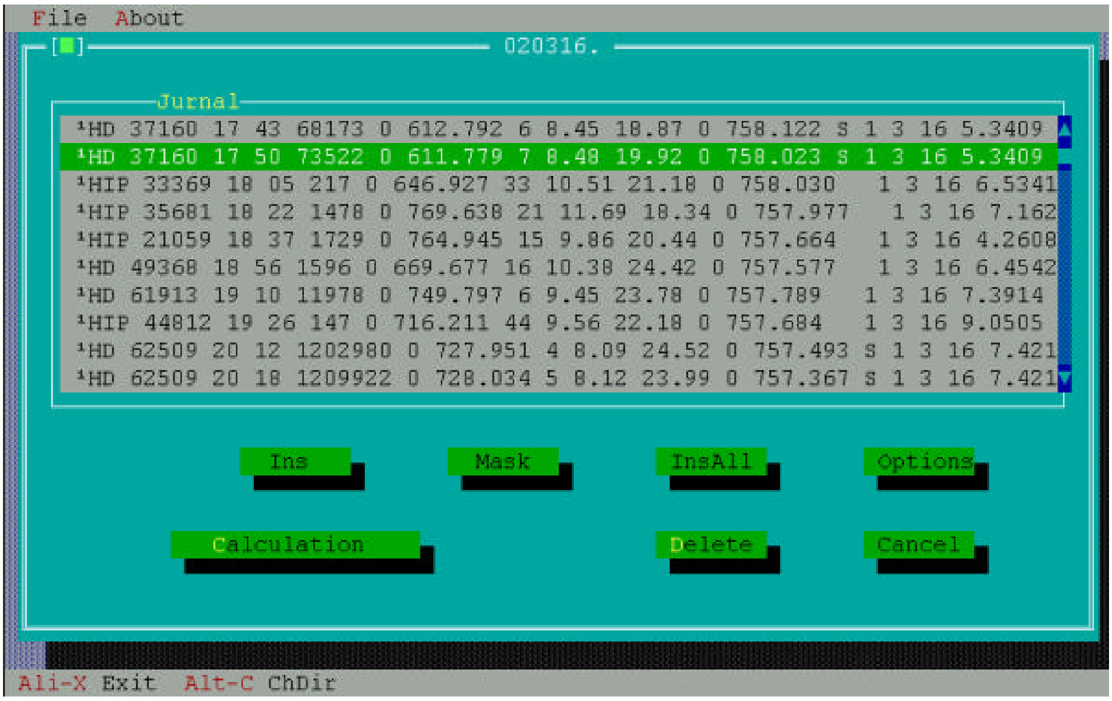

Figure 14 Journal view window in the sphinx

3. In Output window you can view all calculated results. Then click **Save**.

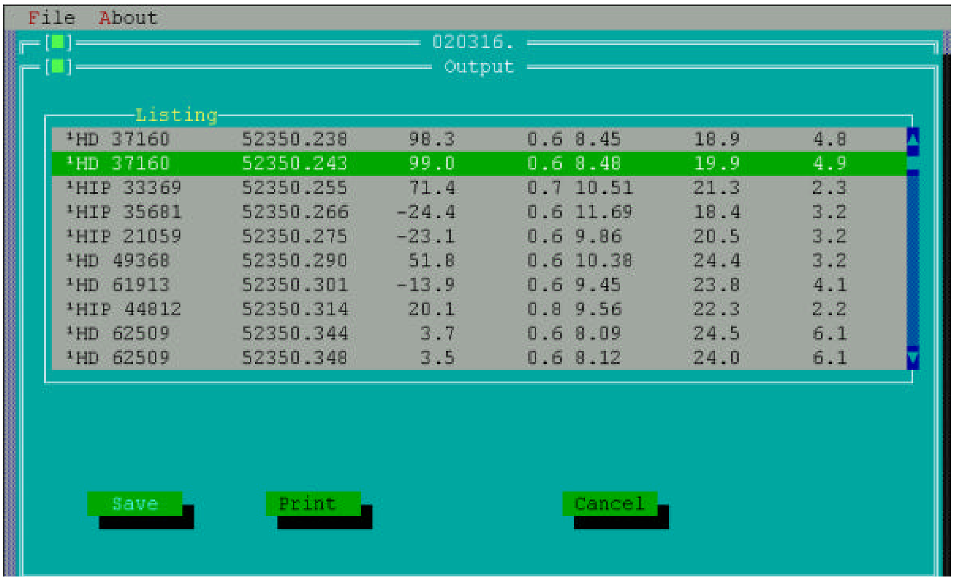

Figure 15 Sphinx output window

4. Click **Cancel** to quit the output window, then click **Cancel** to quit the Journal window. Repeat all steps or press **Alt+x** to quit the program.

Other programs

<u>Libsp2.exe</u>

This program sorts all records in the increasing order of RA and excludes the standard stars. Program load format:

```
libsp2.exe data.lst
```

where `data.lst` – any "*.lst" type file.

<u>Radvid.exe</u>

This program calculates the average radial velocity for every star.
Program load format:

```
radvid.exe data.lst result.vid
```

where `data.lst` – "*.lst" type file and `result.vid` – result file.

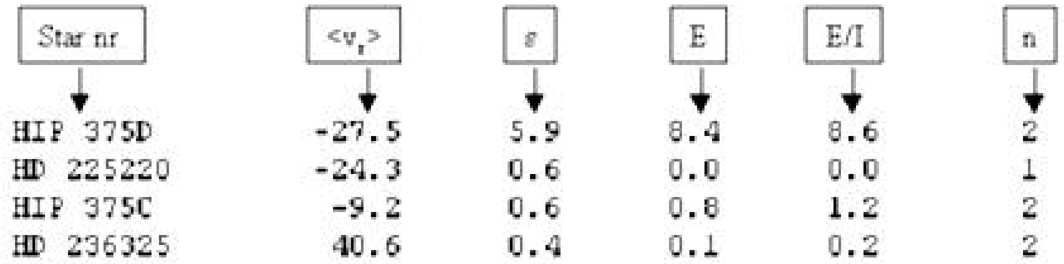

Figure 16 Structure of "*.vid" type file

Values given in the columns are calculated using formulas presented below.

where w_i is the weight of a measurement, v_r is the weighted mean velocity for N

$$w_i = \frac{1}{e_i^2}$$

$$< v_r > = \frac{\sum w_i v_{ri}}{\sum w_i}$$

$$E = \sqrt{\frac{\sum w_i (v_{ri} - < v_r >)^2}{\frac{n-1}{n}\sum w_i}}$$

$$I = \frac{\sum w_i e_i}{\sum w_i}$$

$$e_i = \sqrt{e_i^{'2} + e_i^{''2} + s_{st}^2}$$

measurements, E is the standard deviation of the observed velocities (external error), I is the weighted mean uncertainty of the measurements of a specific star (internal error), $e_i^{'}$ is the radial velocity error from the Gaussian profile fit, $e_i^{''}$ is the error of the repeatability, s_{st} is the zero point error determined from the measurements of the radial velocity of the standard stars.