

# VALD

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## ABSTRACT

VALD is a collection of atomic transition parameters and supporting extraction software. VALD services are available via EMail (VALD-EMS) and the Web interface. Different kinds of requests are useful for several needs like abundance analyses, radial velocity measurements, or line identification. Since 1994, the early days of VALD, the database was constantly improved and the release of VALD-3 – incorporating, e.g., molecular data and new line lists – is in preparation. With meanwhile more than 5 000 000 requests VALD developed to a much appreciated tool.

Key words: VALD - atomic data base - stellar atmospheres.

## 1. INTRODUCTION

The current version of VALD (VALD-2) contains atomic transition parameters for more than 40 000 000 spectral lines. The integrated software package enables the extraction of line parameters according to the chosen request type (see section 4). The extracted information can be used for different scientific applications such as identification of spectral lines, radial velocity measurements, calculation of model atmospheres or abundance analysis.

## 2. INSIDE VALD

Depending on the amount of required information the VALD output formats are Short format (Sf) or Long format (Lf). The Lf provides extensive information about the upper and the lower levels as well as the term designation.

Elm Ion	WL(Å)	Excit(eV)	log(gf)	Damping Parameters			Landé factor
				Rad.	Stark	Waals	
'Fe 2',	4500.1340,	9.6940,	-3.851,	8.461,	-6.296,	-7.920,	0.520,'
'Cr 1',	4500.2780,	3.0790,	-0.350,	7.834,	-5.921,	-7.612,	0.830,'

*Table 1. This is an example for a Short format output. In contrast to the Long format this data do not include term designation and only provide effective Landé factor.*

Number sequences, which are added at the end of every line correspond to references given at the end of the output, which can not be seen in Table 1 due to the lack of space. The data base contains entries from several sources with different accuracy, so specific source lists can be chosen and all transition parameter values are ranked.

## 3. HOW TO ACCESS VALD

### 3.1. EMS - Web Interface

The main interface for accessing VALD by external users is the VALD EMail Service (VALD-EMS). A Web interface allows interactive submission of a request to VALD-EMS. The VALD websites at <http://ams.astro.univie.ac.at/vald/>, or <http://www.astro.uu.se/~vald/> contain further information. It is necessary to register first as a VALD-client via an email to the administrator. Submission of a request is possible via a specially formatted email (instructions, e.g., at the VALD websites) to [vald@astro.univie.ac.at](mailto:vald@astro.univie.ac.at) or [vald@astro.uu.se](mailto:vald@astro.uu.se), or via the Web Interface. Within less than 20 minutes a request is processed and the extracted data returned to the user. To avoid size limitations for email it is now also possible to obtain data via FTP.

### 3.2. Mirror sites

In 1998 two mirror sites became operational: Uppsala Astronomical Observatory and the Astrophysics Data Facility at NASA Goddard Space Flight Center. The latter is not providing EMS, but is used for Virtual Observatory developments. Two years ago an additional mirror site at the Astronomical Institute of the Russian Academy of Sciences, Moscow, was put into service. Twice a day all mirror sites are automatically synchronised. Mirror site local users have additional advantages of not being limited by the maximum number of transitions per request and they also have special extraction modes not available via VALD-EMS.

## 4. OPTIONS IN VALD

### 4.1. Request types

#### 1. Show Line:

All information contained in VALD about a specific transition of the same species in a wavelength range of up to 5 Å can be extracted. Different transition parameters originating from different sources can be displayed.

#### 2. Extract Element:

This type of request extracts the atomic parameters with the highest ranking for all the spectral lines of a particular element or ion in a specified wavelength range.

#### 3. Extract All:

Extract All does the same as Extract Element, but for all elements and ions in a specified wavelength range.

#### 4. Extract Stellar:

Different astrophysical parameters, like effective temperature, microturbulence and surface gravity have to be provided by the user. All spectral lines with the highest ranked transition parameters and producing significant absorption are extracted. This type of request is designed for preparing spectrum synthesis.

Figure 1 shows the distribution of the VALD workload over the four request types.

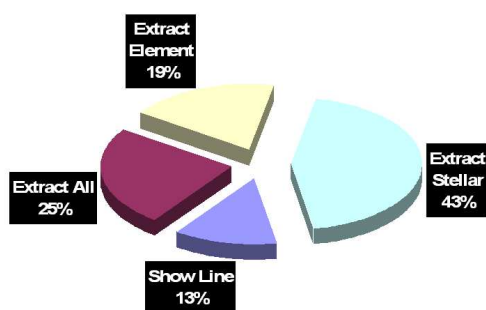


Figure 1. VALD workload

### 4.2. Customisation Options

For personalising one's VALD requests several customisation options can be set. The default configuration file containing a selection of the atomic line lists can be altered according to specific needs. This personal configuration file will be stored by VALD-EMS and can be edited through the VALD Web interface. If specifically damping constants (radiative, Stark, Van der Waals), Landé factors and/or term designations are requested, the corresponding Web interface options have to be chosen.

### 4.3. Extraction software

The VALD extraction tools are SHOW LINE, PRESELECT and SELECT. Data of a specified wavelength range is extracted, the best quality values are combined and filtered according to the specifications of the requests by PRESELECT. This program is used for Extract Element, Extract All and Extract Stellar. SELECT solves the Radiative-Transfer-Equation for the central wavelength of each line, based on a model atmosphere with effective temperature, surface gravity, chemical composition, and microturbulent velocity set by the user. It is only used for the Extract Stellar request.

## 5. THE FUTURE OF VALD

VALD is continuously updated with new atomic line data. The next release, VALD 3, is scheduled for end of 2007. Besides better partition functions, an advanced molecular and ionisation equilibrium solver to estimate line strengths will be available. VALD 3 will contain new grids of model atmospheres and extensive line lists (100 millions of lines) for most abundant diatomic molecules. The output of each VALD request will contain the references to the original sources in BibTeX format.

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