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**|SRON| – SPEX**

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**List of  
Input Line Parameters**

**SRON/SPEX/TRPB04a**

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prepared by

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## APPENDIX A

### LIST OF INPUT LINE PARAMETERS

#### 1 Introduction

In the subroutine LINEM the line emissivities in an optically thin plasma are calculated. The algorithm calculates individual line emissivities for all lines included in a data file 'PARLIN'. This file is converted from the original data input file LINEPAR.ASC which is written in ASCII-format and contains many atomic parameters. For a description of the line parameter input file LINEPAR.ASC see document SRON/SPEX/TRPB04 §2.1. For storage purposes, the file LINEPAR.ASC is split up into 6 sub-files, listed in the tabular below. These files are available on diskette.

| File       | Line #      | Wavelength range        |
|------------|-------------|-------------------------|
| line1.asc  | 1 - 1499    | 1.16219 - 6.19780 (Å)   |
| line2.asc  | 1500 - 2999 | 6.19810 - 28.8360 (Å)   |
| line3a.asc | 3000 - 3634 | 28.8360 - 60.8000 (Å)   |
| line3b.asc | 3635 - 4499 | 60.80700 - 180.1000 (Å) |
| line4a.asc | 4500 - 5116 | 180.2900 - 315.6500 (Å) |
| line4b.asc | 5117 - 5876 | 315.6500 - 1908.734 (Å) |

#### 2 Example

The parameter file contains 26 columns and 9 flags ERDSIPCMN which are set nonzero if the corresponding process is active (E = excitation, R = radiative recombination, etc).

The first eight columns are (for example):

| (1)  | (2) | (3) | (4) | (5) | (6) | (7)         | (8)     |
|------|-----|-----|-----|-----|-----|-------------|---------|
| LNUM | Z   | EL  | IO  | IE  | S   | TRANS       | LAMBDA  |
| 1    | 28  | Ni  | 28  | 1   | 0   | H10_L10-___ | 1.16219 |
| 2    | 28  | Ni  | 27  | 2   | 0   | H10*_____   | 1.16219 |
| 3    | 28  | Ni  | 28  | 1   | 0   | H9_L9_____  | 1.16494 |
| 4    | 28  | Ni  | 27  | 2   | 0   | H9*_____    | 1.16494 |

The first column is the line number, the second the atomic number  $Z$ , the third the element letter notation, the fourth the ionization stage (1=neutral atom, 2=first ion, etc.; e.g. Ni 28=Ni XXVIII= $\text{Ni}^{+27} \equiv Z^{+z}$  with  $Z=28$  and  $z=IO-1=27$ ); 5th column:  $IE=Z-IO+1=nr.$  of iso-el. sequence (e.g.  $IE=1,2,3$  for H I, He I, Li I seq., respectively); 6th column indicates a satellite line with principal quantum number  $n$  for the 'spectator' electron (e.g.  $S=2$  is a  $n=2$  satellite); the 7th column gives the transition; 8th column: line wavelength  $\lambda$  in Å. We note that TRANS is not used in the program but is given only for additional information in the ASCII parameter file.

Columns 9-19:

| (9)    | (10)   | (11)  | (12)  | (13)  | (14) | (15) | (16) | (17) | (18)  | (19) |
|--------|--------|-------|-------|-------|------|------|------|------|-------|------|
| F'     | F      | BR    | CC    | aEX   | aDR  | A    | B    | C    | D     | E    |
| .00194 | .00803 | .2410 | 1.000 | 1.000 | .000 | .270 | .030 | .000 | .0000 | .276 |
| .00194 | .00803 | .2410 | 1.000 | 1.000 | .000 | .000 | .000 | .000 | .0000 | .000 |
| .00056 | .00222 | .2540 | 1.000 | 1.000 | .000 | .270 | .030 | .000 | .0000 | .276 |
| .00056 | .00222 | .2540 | 1.000 | 1.000 | .000 | .000 | .000 | .000 | .0000 | .000 |

The columns contain: the corrected oscillator strength  $f'$ , the absorption oscillator strength  $f_{ij}$ , the branching ratio  $B$ , the cascade correction  $C$ , the ratio  $a_{EX}$  = excitation energy/line energy (= 1 for resonance and  $> 1$  for non-resonance transitions), and the corresponding ratio  $a_{DR}$  for DR satellites ( $< 1$  in this case). Finally, the last five columns give the excitation Gaunt factor parameters  $A$ ,  $B$ , etc. The excitation parameters are described in SRON/SPEX/TRPB04 §2.2.

Columns 20-26:

| (20)  | (21) | (22)  | (23)  | (24)  | (25) | (26) |
|-------|------|-------|-------|-------|------|------|
| AREC  | ETA  | CDR   | CII   | ALPHA | BETA | GAM  |
| .0650 | .700 | .0000 | .0000 | .000  | .000 | .00  |
| .0000 | .000 | .0000 | .0000 | .000  | .000 | .00  |
| .0224 | .700 | .0000 | .0000 | .000  | .000 | .00  |
| .0000 | .000 | .0000 | .0000 | .000  | .000 | .00  |

These columns contain: parameters  $AREC$  and  $\eta$  in the formula for radiative recombination (TRPB04 §2.3.),  $CDR$  for dielectronic recombination (TRPB04 §2.5.), and  $C_{II}$  the branching ratio for innershell ionization (TRPB04 §2.6). Finally, the parameters  $\alpha$ ,  $\beta$ , and  $\gamma$  are used in formulae describing the density corrections (TRPB04 §3).

Finally, there are nine additional columns that contain the flags:

| E | R | D | S | I | P | C | M | N |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 |

The first line belongs to a spectral line that has a contribution from collisional excitation (E=1) and radiative recombination (R=1). The second line refers to an 'unresolved' (from the main resonance line) dielectronic recombination (DR) satellite (S = 2). For more information see SRON/SPEX/TRPB04 §2.1.