SRON – SPEX

List of
Input Line Parameters

SRON/SPEX/TRPB04a

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Contents

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 pusposes, 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=$Ni^{+27}\equiv Z^{+z}$ 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 λ 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 $a_{\rm EX}$ = 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 η in the formula for radiative recombination (TRPB04 §2.3.), $C_{\rm DR}$ for dielectronic recombination (TRPB04 §2.5.), and $C_{\rm II}$ the branching ratio for innershell ionization (TRPB04 §2.6). Finally, the parameters α, β, and γ 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.