## *SIGMA standard data*

Prefix of a standard data filename is S1A. The file is composed of three standard header lines and following data lines. The structure of the third header line is explained in Tables 5.2 and 5.3. The data line consists of 78 numeric values. Most of these are presented as whole numbers and a few contain a point-separated decimal part. The data columns are explained in Tables 5.2 and 5.3. The content of the columns 29...60 depends on the parameter *clusterregime* of the control file SIGMA1A.INI. *Clusterregime* = 0 initiates the full mobility range and *clusterregime* = 1 initiates the cluster ion regime. Columns 1...28 and 61-78 are universal and do not depend on the parameter *clusterregime*. A decade of mobility is logarithmically uniformly divided into 8 standard fractions in the regime of full mobility range and into 16 narrow fractions in the cluster ion regime.

Table 5.2. Columns of the standard data table in case of full mobility range

| No | Excel | Header | Value | Sign | Range, nm or $cm^2V^{-1}s^{-1}$ |
|---|---|---|---|---|---|
| 1 | A | YYMMDD | Date YYMMDD | | |
| 2 | B | HHMM | Time HHMM (center of the interval) | | |
| 3 | C | DAY | Day of year (4 decimal places) | | |
| 4 | D | T:C | Temperature, ºC (1 decimal place) | | |
| 5 | E | RH:% | Rel. humidity, % (1 decimal place) | | |
| 6 | F | p:mb | Air pressure, mb (2 decimal places) | | |
| 7 | G | noise+ | Index of zero level noise, $cm^{-3}$ | | |
| 8 | H | noise- | Index of zero level noise, $cm^{-3}$ | | |
| 9 | I | D+0.487 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 0.42−0.56 |
| 10 | J | D+0.649 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 0.56−0.75 |
| 11 | K | D+0.866 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 0.75−1.00 |
| 12 | L | D+1.155 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 1.00−1.33 |
| 13 | M | D+1.540 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 1.33−1.78 |
| 14 | N | D+2.054 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 1.78−2.37 |
| 15 | O | D+2.738 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 2.37−3.16 |
| 16 | P | D+3.652 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 3.16−4.22 |
| 17 | Q | D+4.870 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 4.22−5.62 |
| 18 | R | D+6.494 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | + | 5.62−7.50 |
| 19 | S | D–0.487 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 0.42−0.56 |
| 20 | T | D–0.649 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 0.56−0.75 |
| 21 | U | D–0.866 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 0.75−1.00 |
| 22 | V | D–1.155 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 1.00−1.33 |
| 23 | W | D–1.540 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 1.33−1.78 |
| 24 | X | D–2.054 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 1.78−2.37 |
| 25 | Y | D–2.738 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 2.37−3.16 |
| 26 | Z | D–3.652 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 3.16−4.22 |
| 27 | AA | D–4.870 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 4.22−5.62 |
| 28 | AB | D–6.494 | $f_{\log d} = dn / d \log d$, $cm^{-3}$ | − | 5.62−7.50 |
| 29 | AC | Z+0.037 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.032–0.042 |
| 30 | AD | Z+0.049 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.042–0.056 |
| 31 | AE | Z+0.065 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.056–0.075 |
| 32 | AF | Z+0.087 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.075–0.100 |
| 33 | AG | Z+0.115 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.100–0.133 |
| 34 | AH | Z+0.154 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.133–0.178 |
| 35 | AI | Z+0.205 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.178–0.237 |
| 36 | AJ | Z+0.274 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.237–0.316 |

| No | Excel | Header | Value | Sign | Range, nm or $cm^2V^{-1}s^{-1}$ |
|---|---|---|---|---|---|
| 37 | AK | Z+0.365 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 0.316–0.422 |
| 38 | AL | Z+0.487 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 0.422–0.562 |
| 39 | AM | Z+0.649 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 0.562–0.750 |
| 40 | AN | Z+0.866 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 0.75–1.00 |
| 41 | AO | Z+1.155 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 1.00–1.33 |
| 42 | AP | Z+1.540 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 1.33–1.78 |
| 43 | AQ | Z+2.054 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 1.78–2.37 |
| 44 | AR | Z+2.738 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | + | 2.37–3.16 |
| 45 | AS | Z–0.037 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.032–0.042 |
| 46 | AT | Z–0.049 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.042–0.056 |
| 47 | AU | Z–0.065 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.056–0.075 |
| 48 | AV | Z–0.087 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.075–0.100 |
| 49 | AW | Z–0.115 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.100–0.133 |
| 50 | AX | Z–0.154 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.133–0.178 |
| 51 | AY | Z–0.205 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.178–0.237 |
| 52 | AZ | Z–0.274 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.237–0.316 |
| 53 | BA | Z–0.365 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.316–0.422 |
| 54 | BB | Z–0.487 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.422–0.562 |
| 55 | BC | Z–0.649 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.562–0.750 |
| 56 | BD | Z–0.866 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 0.75–1.00 |
| 57 | BE | Z–1.155 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 1.00–1.33 |
| 58 | BF | Z–1.540 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 1.33–1.78 |
| 59 | BG | Z–2.054 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 1.78–2.37 |
| 60 | BH | Z–2.738 | $f_{\log Z}$ = d$n$ / d log $Z$, $cm^{-3}$ | – | 2.37–3.16 |
| 61 | BI | supply | Supply voltage, V | | |
| 62 | BJ | filt+ | Filter voltage +, V | + | |
| 63 | BK | filt– | Filter voltage −, V | – | |
| 64 | BL | batt+ | Battery voltage +, V | + | |
| 65 | BM | batt– | Battery voltage −, V | – | |
| 66 | BN | bias+ | Electrometer bias +, mV | + | |
| 67 | BO | bias– | Electrometer bias −, mV | – | |
| 68 | BP | pre% | 100 × frt [1]) / (frt [2] – frt [1])) | | |
| 69 | BQ | tau | HV relaxation time constant, ms | | |
| 70 | BR | asym | HV asymmetry, promille | | |
| 71 | BS | N+ | Concentration of aerosol ions +, $cm^{-3}$ | + | 0.032–0.49 |
| 72 | BT | N– | Concentration of aerosol ions −, $cm^{-3}$ | – | 0.032–0.49 |
| 73 | BU | n+ | Concentration of cluster ions +, $cm^{-3}$ | + | 0.49−3.16 |
| 74 | BV | n– | Concentration of cluster ions −, $cm^{-3}$ | – | 0.49−3.16 |
| 75 | BW | Z+ | $Z_{average}$ of cluster ions +, $cm^2V^{-1}s^{-1}$ | + | 0.49−3.16 |
| 76 | BX | Z– | $Z_{average}$ of cluster ions −, $cm^2V^{-1}s^{-1}$ | – | 0.49−3.16 |
| 77 | BY | ovl&sc | Complex index (explanation see 5.4 ) | | |
| 78 | BZ | regime | Complex index (explanation see 5.4 ) | | |

The concentrations of aerosol ions (variables 71 and 72) and cluster ions (variables 73 and 74) are calculated according to the measured mobility distribution, where ions of the mobility of less than 0.5 $cm^2V^{-1}s^{-1}$ are considered as aerosol ions and ions of the mobility of above this threshold are considered as cluster ions.

The index *ovl&sc* is composed as

10000 × (number of positive electrometer overloads in the cycle) +

100 × (number of negative electrometer overloads in the cycle) +
1 × (number of scans in the cycle).

The index *regime* is composed as:

100000 × (structure, 0, 1 or 2) +
10000 × (simulated measurement, 0 or 1) +
1000 × (noise regime, 0 or 1) +
100 × (extracorrection 0 = no, 1 = dust pulses, 2 = transfer, 3 = both) +
10 × (external meteodata used, 0 or 1) +
1 × (mark, which was manually set using keys 0…9 during measurements)

The subindex *structure* of the regime is defined as:

0 = 16-fraction full range mobility distribution,
1 = 16-fraction cluster range mobility distribution,
2 = 35-fraction extended mobility distribution

*Mark* = *regime* mod 10

In the last program version SIGMA1A2 the values 7..9 of mark are associated with the status of external device A. If mark = 7 then external device was off, if mark = 8 or 9 then on.

Table 5.3. Columns 29...60 of the standard data table in case of *clusterregime* = 1.

| No | Excel | Header | Value | Sign | Range, $cm^2V^{-1}s^{-1}$ |
|---|---|---|---|---|---|
| 29 | AC | Z+0.45 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.42–0.49 |
| 30 | AD | Z+0.52 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.49–0.56 |
| 31 | AE | Z+0.60 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.56–0.65 |
| 32 | AF | Z+0.70 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.65–0.75 |
| 33 | AG | Z+0.81 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.75–0.87 |
| 34 | AH | Z+0.93 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 0.87–1.00 |
| 35 | AI | Z+1.07 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 1.00–1.15 |
| 36 | AJ | Z+1.24 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 1.15–1.33 |
| 37 | AK | Z+1.43 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 1.33–1.54 |
| 38 | AL | Z+1.65 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 1.54–1.78 |
| 39 | AM | Z+1.91 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 1.78–2.05 |
| 40 | AN | Z+2.21 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 2.05–2.37 |
| 41 | AO | Z+2.55 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 2.37–2.74 |
| 42 | AP | Z+2.94 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 2.74–3.16 |
| 43 | AQ | Z+3.40 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 3.16–3.65 |
| 44 | AR | Z+3.92 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | + | 3.65–4.22 |
| 45 | AS | Z–0.45 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 0.42–0.49 |
| 46 | AT | Z–0.52 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 0.49–0.56 |
| 47 | AU | Z–0.60 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 0.56–0.65 |
| 48 | AV | Z–0.70 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 0.65–0.75 |
| 49 | AW | Z–0.81 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 0.75–0.87 |
| 50 | AX | Z–0.93 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 0.87–1.00 |
| 51 | AY | Z–1.07 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 1.00–1.15 |
| 52 | AZ | Z–1.24 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 1.15–1.33 |
| 53 | BA | Z–1.43 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 1.33–1.54 |
| 54 | BB | Z–1.65 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 1.54–1.78 |
| 55 | BC | Z–1.91 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 1.78–2.05 |
| 56 | BD | Z–2.21 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 2.05–2.37 |
| 57 | BE | Z–2.55 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 2.37–2.74 |
| 58 | BF | Z–2.94 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 2.74–3.16 |
| 59 | BG | Z–3.40 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 3.16–3.65 |
| 60 | BH | Z–3.92 | $f_{\log Z} = dn / d \log Z$, $cm^{-3}$ | – | 3.65–4.22 |