Dataset Tahkuse_1993_1994

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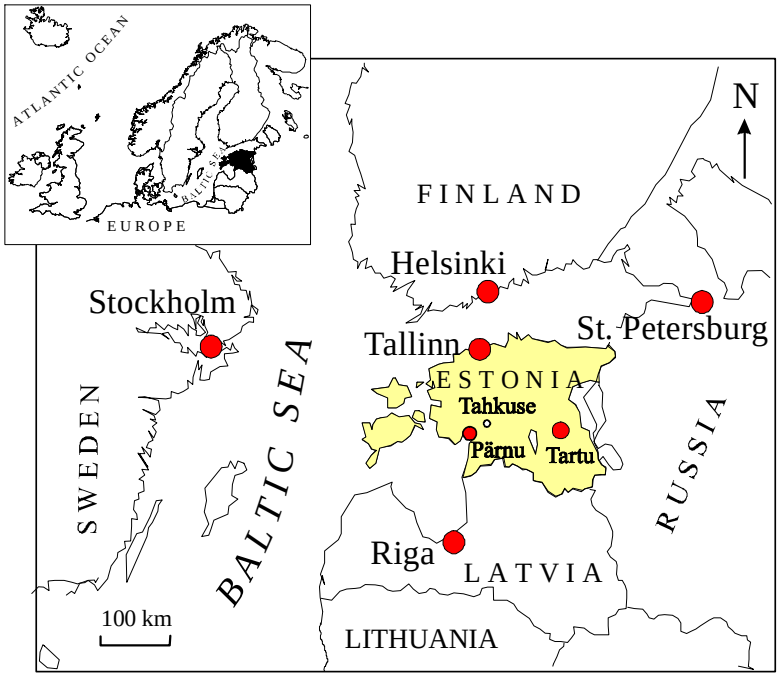
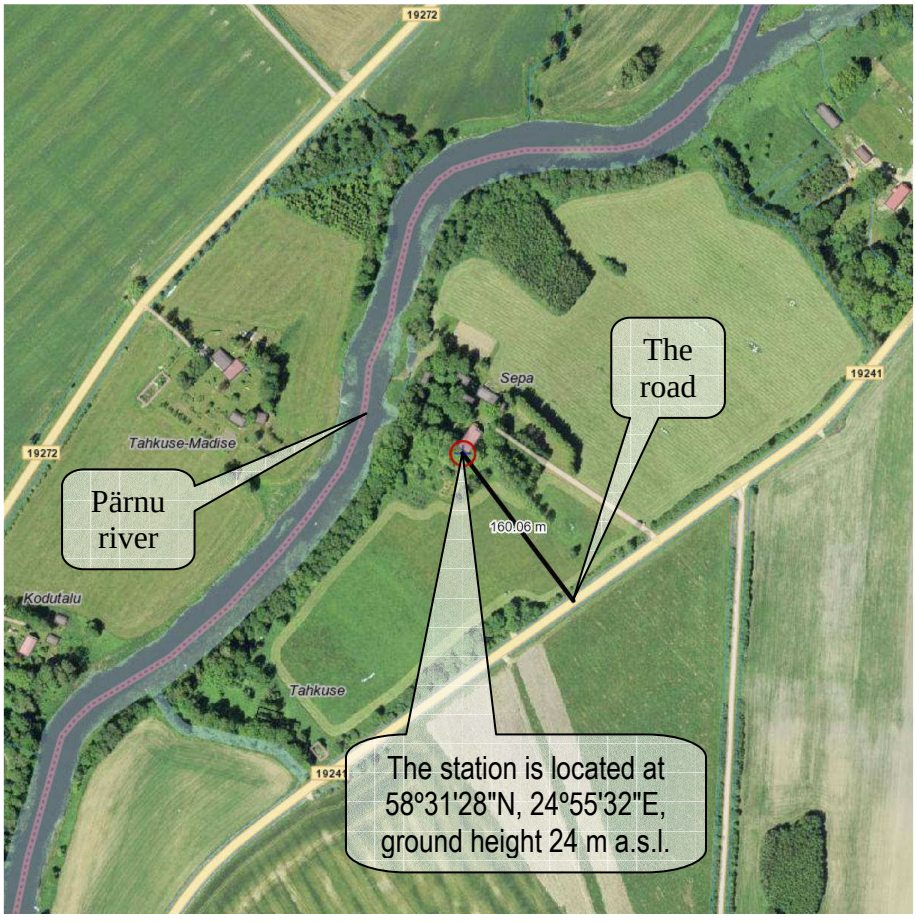
Introduction

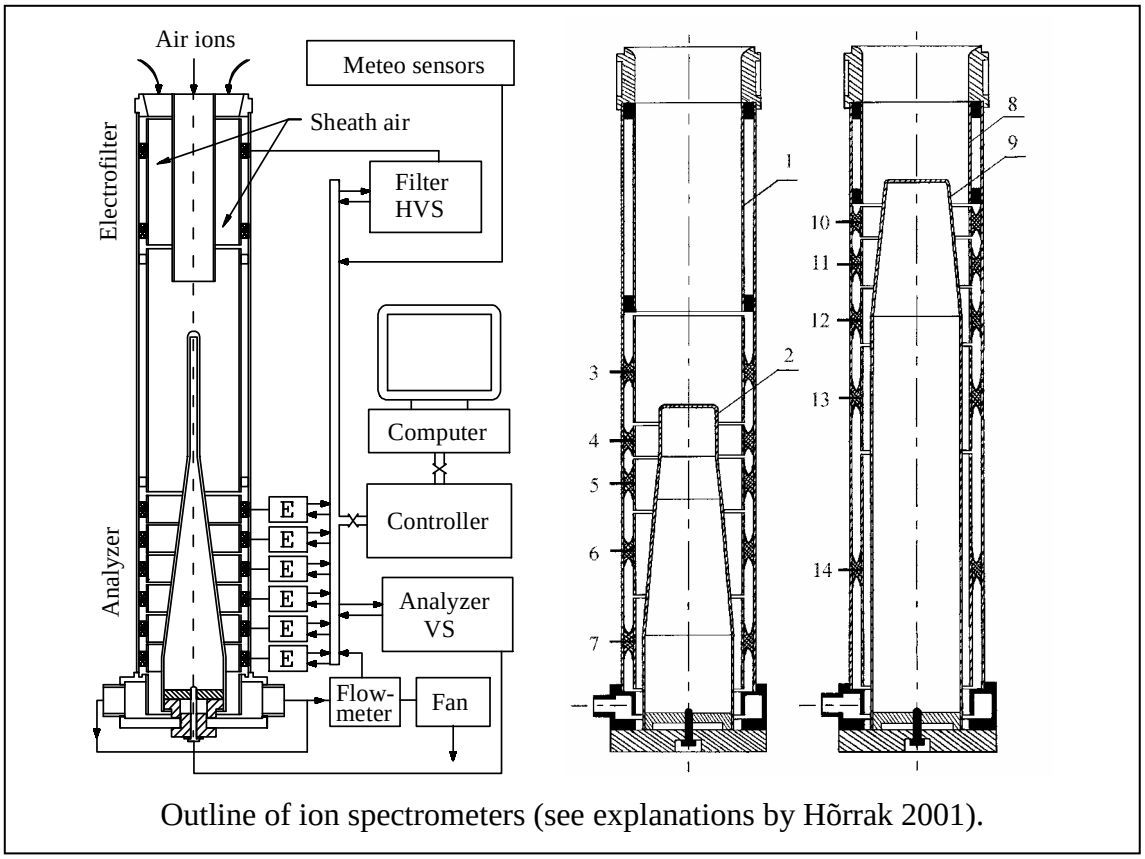
The dataset makes available measurements, which were used when analyzing the air ions mobility distributions in publications by Hõrrak et al. (2000) and Hõrrak (2001).

The Tahkuse Air Monitoring Station is located in the Sepa farmhouse in Tahkuse village about 27 km northeast of the city of Pärnu, Estonia. The farmhouse is surrounded with flat open landscape with some tree groups, grassland and agricultural land. Neighboring farmhouses are separated with distances of few hundreds of meter. Few cars per hour pass along the road about 160 m from the station. A detailed description of the landscape, station, and instruments is presented in the PhD thesis by Hõrrak (2001).



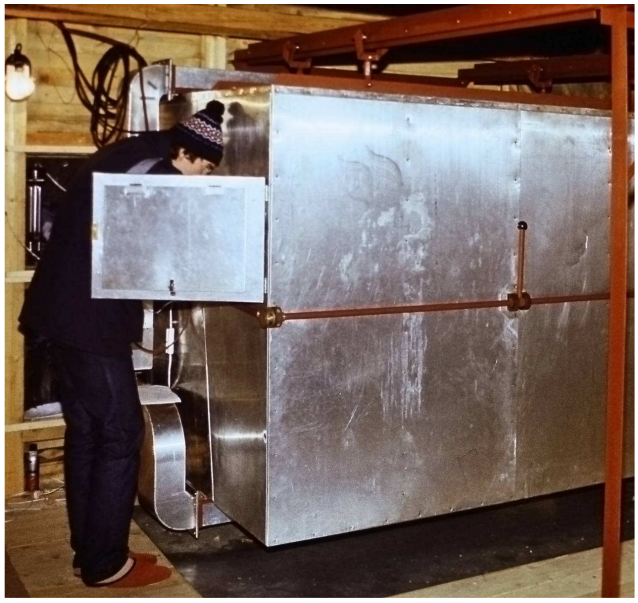


The first natural air ion mobility spectrometer was installed in Tahkuse June 10, 1985. An extended instrumentation for measurements of the air ion spectra in a wide mobility range was set up in July 1988. The air ion mobility spectrometers are installed in a thermostat container in the attic of the building. The air intake is at a height of 5 m above ground. The ion mobility spectrometers and arrangement of measurements is described by Hõrrak et al. (1990, 2001) and Tammet (1990). An analyzer of atmospheric NO_2, designed and manufactured in the University of Turku, Finland, was installed 1991. Additionally were recorded wind speed, wind direction, air temperature, and relative humidity.



Outline of ion spectrometers (see explanations by Hõrrak 2001).

Air intake in the Sepa farmhouse



Service of instruments through a door in the container.

Data structure

The data is saved as a tab-separated ANSI text file *Tahkuse_1993_1994_data.xls*, which includes measurements from 11.09.1993 to 23.10.1994. The file can be immediately opened and analyzed using MS Excel as well as by means of different computer programs, which are able to open and process the ANSI text. The extension of the filename "xls" facilitates usage of Excel. If the user changes the extension to "txt" then the double click on the file icon will open the file in the MS Notepad window.

The content of the file is a table, which consists of 59 columns and 9793 rows. The columns correspond to the variables and rows to the measurement hours. The first row is the header composed of short names of the variables. Following 9792 rows contain numbers, which present one-hour average values of the variables. The rows are written without omissions for 24 hours per day even when the measurements were stopped or failed and the values of variables are unknown. The cells with missing or unknown values are filled with the code –99. If the user will prefer different code then the value –99 may be easily replaced with any specific code using the "replace" operation in MS Excel. This code can be numeric or not, e.g. expressions "NaA" or "NA", the symbol "?" as well as the empty cell "" are acceptable.

A copy of first 12 columns of the first 9 rows of the data table is presented below:

year	month	day	hour	weekday	NO2:ug/m3	T:C	RH%	v:m/s	v:deg	n+2.51-3.14	n+2.01-2.51
1993	9	11	0	6	-99	7	78.4	2.1	79	7	17
1993	9	11	1	6	-99	6.2	82.8	1.3	80	5	15
1993	9	11	2	6	-99	5.3	86.8	0.9	80	7	15
1993	9	11	3	6	-99	3.9	91.4	0.7	62	7	18
1993	9	11	4	6	-99	3.2	94.1	0.5	86	5	18
1993	9	11	5	6	-99	2.7	95.9	0.4	60	5	15
1993	9	11	6	6	-99	2.7	96.7	1.5	65	5	18
1993	9	11	7	6	-99	2.9	96.8	2	67	7	20

Five first variables show the time of measurement. The hours in a day are counted 0...23 and the weekdays 1..7, where 1 is Monday and 7 is Sunday. Air ion concentration is everywhere expressed in cm^{-3} and the ion mobility is expressed in $cm^2V^{-1}s^{-1}$. The air temperature is measured close to the air inlet and the humidity in distance of about 10 m at a height of 2 m. The wind sensor was installed above the flat open grassland on a mast in distance about 120 m from the building. Variables 6...59 are briefly explained in the next page. Definition of fraction concentrations is explained in chapter 3 of the thesis by Hõrrak (2001).
The quality of large ion measurements is characterized with variable number 59 called "disorder". High value of this variable shows high instrumental noise in large ion measurements. The measurements with *disorder* > 199 were disqualified and replaced with code –99 in the present dataset.

References

Hõrrak, U. (2001) *Air ion mobility spectrum at a rural area*. Dissertationes Geophysicales Universitatis Tartuensis, vol. **15**, 157 pp., Tartu Univ. Press, Tartu, Estonia. https://dspace.ut.ee/handle/10062/50218.

Hõrrak, U., Miller, F., Mirme, A., Salm, J., Tammet, H. (1990) Air ion observatory at Tahkuse: Instrumentation. *Acta Comm. Univ. Tartu* **880**, 33–43. http://hdl.handle.net/10062/34419.

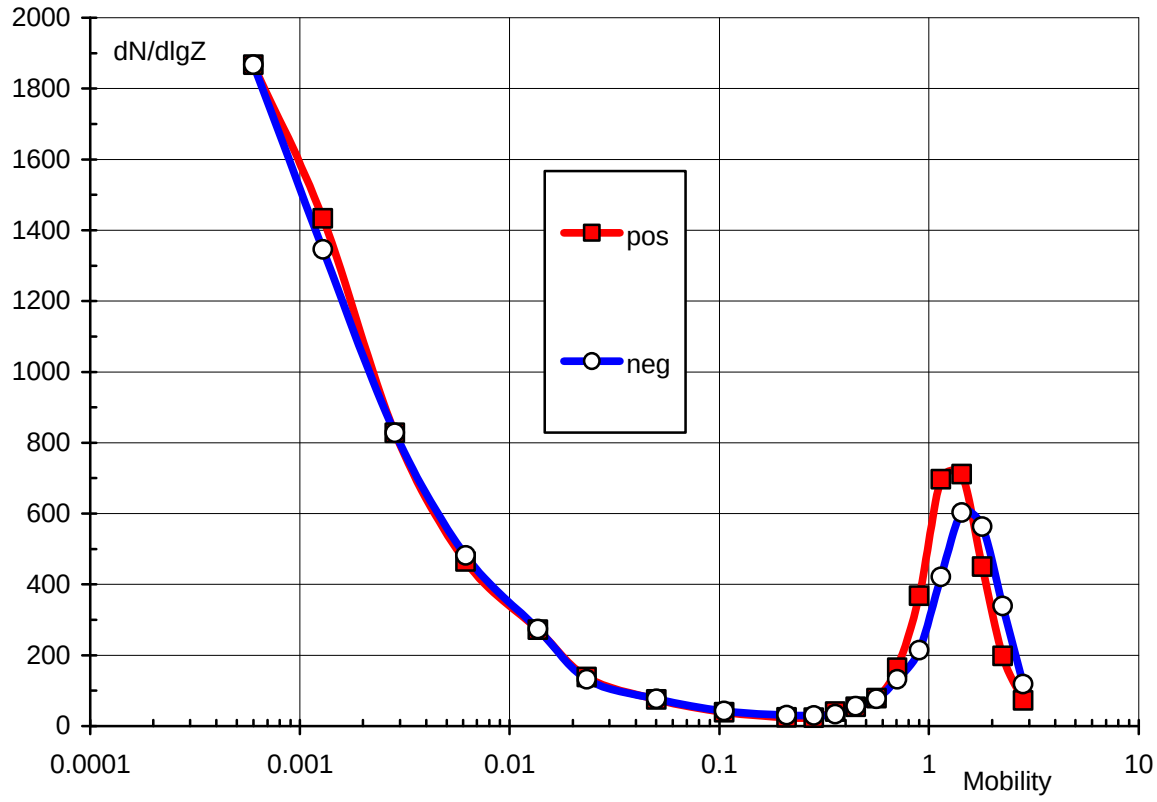
Hõrrak, U., Salm, J., Tammet, H. (2000). Statistical characterization of air ion mobility spectra at Tahkuse Observatory: Classification of air ions. *J. Geophys. Res. Atmospheres*, **105**, 9291–9302. http://onlinelibrary.wiley.com/doi/10.1029/1999JD901197/pdf.

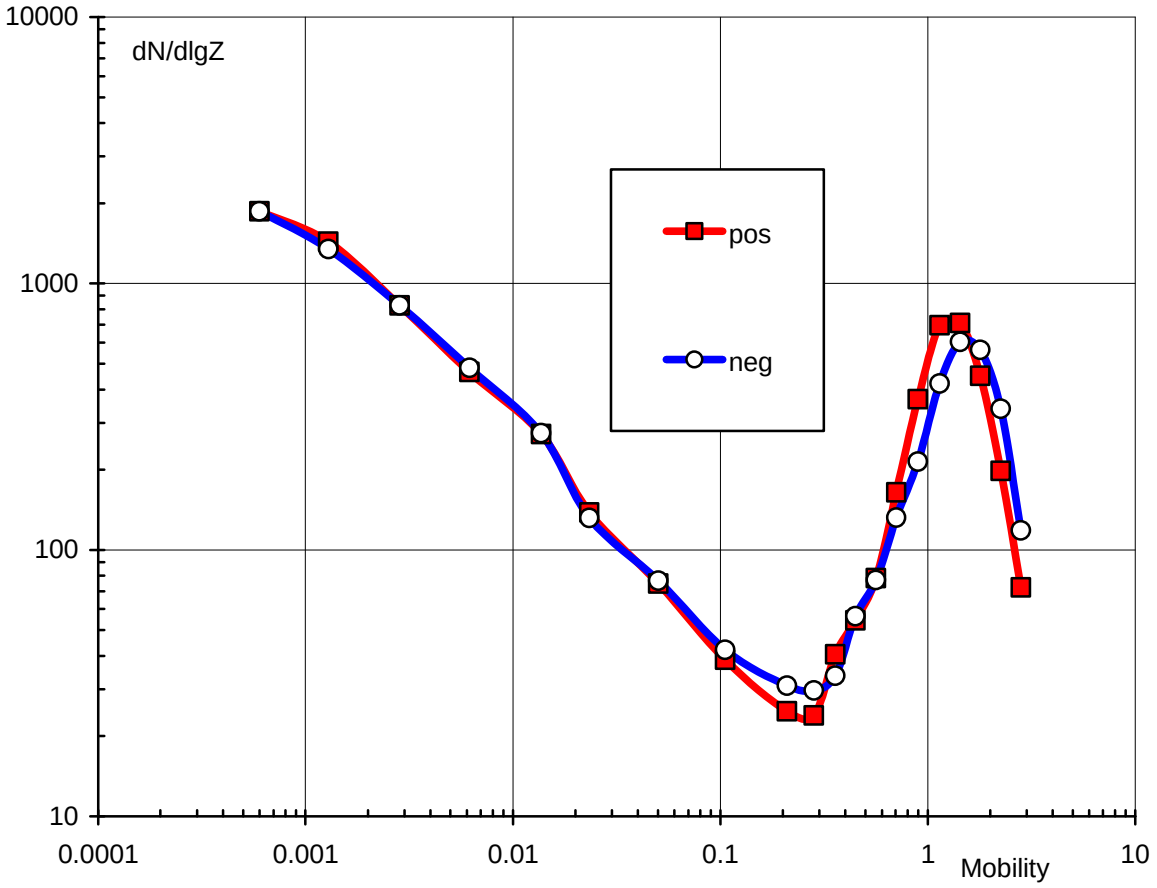
Tammet, H. (1990) Air Ion Observatory at Tahkuse: Software. *Acta Comm. Univ. Tartu* **880**, 44–51. http://hdl.handle.net/10062/34419.

Variables in the file Tahkuse_1993_1994_data.xls

Variable # and name	Col	Min	Max	Median	Ave	Std	Comments
6) NO2:ug/m3	F	-2.2	36.5	2.5	3.11	2.46	concentration of nitrogen dioxide in air, µg/m^3
7) T:C	G	-27.5	36.3	5.4	5.58	9.96	temperature of the outside air
8) RH%	H	18.8	101.8	87.9	80.7	18.71	relative humidity of the outside air
9) v:m/s	I	0	8.7	2.2	2.32	1.64	wind speed in height of 12 m
10) v:deg	J	0	360	200	187.8	97.6	wind direction in height of 12 m
11) n+2.51-3.14	K	-2	37	7	6.96	3.38	fraction concentration of positive ions
12) n+2.01-2.51	L	2	97	17	18.96	7.94	fraction concentration of positive ions
13) n+1.60-2.01	M	9	207	41	44.2	16.06	fraction concentration of positive ions
14) n+1.28-1.60	N	13	303	64	68.4	23.3	fraction concentration of positive ions
15) n+1.02-1.28	O	15	284	66	68.1	23.9	fraction concentration of positive ions
16) n+0.789-1.02	P	6	154	38	40.4	15.91	fraction concentration of positive ions
17) n+0.631-0.789	Q	1	74	14	16.02	7.98	fraction concentration of positive ions
18) n+0.502-0.631	R	-2	45	6	7.77	4.58	fraction concentration of positive ions
19) n+0.401-0.502	S	-1	48	5	5.23	3.84	fraction concentration of positive ions
20) n+0.320-0.401	T	-6	37	3	3.91	3.16	fraction concentration of positive ions
21) n+0.251-0.320	U	0	42	2	2.55	2.85	fraction concentration of positive ions
22) n+0.150-0.293	V	1	116	5	7.19	7.83	fraction concentration of positive ions
23) n+0.074-0.150	W	1	250	8	11.85	14.52	fraction concentration of positive ions
24) n+0.034-0.074	X	3	437	18	25.2	29.3	fraction concentration of positive ions
25) n+0.016-0.034	Y	3	810	34	45	46.5	fraction concentration of positive ions
26) n+0.0091-0.0205	Z	10	1684	74	96	93.1	fraction concentration of positive ions
27) n+0.0042-0.0091	AA	16	1852	128	155.1	122.5	fraction concentration of positive ions
28) n+0.00192-0.00420	AB	32	2172	246	278	168.4	fraction concentration of positive ions
29) n+0.00087-0.00192	AC	69	2626	460	490	232	fraction concentration of positive ions
30) n+0.00041-0.00087	AD	27	3124	562	608	303	fraction concentration of positive ions
31) n-2.51-3.14	AE	0	65	10	11.47	4.93	fraction concentration of negative ions
32) n-2.01-2.51	AF	9	177	29	32.5	12.63	fraction concentration of negative ions
33) n-1.60-2.01	AG	14	258	51	55.2	19.59	fraction concentration of negative ions
34) n-1.28-1.60	AH	13	252	55	57.8	20.3	fraction concentration of negative ions
35) n-1.02-1.28	AI	8	157	38	41.1	18.07	fraction concentration of negative ions
36) n-0.789-1.02	AJ	2	107	21	23.6	14.05	fraction concentration of negative ions
37) n-0.631-0.789	AK	0	83	10	12.93	8.86	fraction concentration of negative ions
38) n-0.502-0.631	AL	-1	84	6	7.67	5.55	fraction concentration of negative ions
39) n-0.401-0.502	AM	-6	131	5	5.43	4.69	fraction concentration of negative ions
40) n-0.320-0.401	AN	-4	177	2	3.24	4.28	fraction concentration of negative ions
41) n-0.251-0.320	AO	0	275	2	3.18	5.08	fraction concentration of negative ions
42) n-0.150-0.293	AP	0	665	6	8.95	13.48	fraction concentration of negative ions
43) n-0.074-0.150	AQ	2	396	8	12.95	17.17	fraction concentration of negative ions
44) n-0.034-0.074	AR	4	447	18	25.9	29.5	fraction concentration of negative ions
45) n-0.016-0.034	AS	4	806	31	43	45.8	fraction concentration of negative ions
46) n-0.0091-0.0205	AT	10	1673	74	96.8	89.5	fraction concentration of negative ions
47) n-0.0042-0.0091	AU	21	1874	134	161.1	118.7	fraction concentration of negative ions
48) n-0.00192-0.00420	AV	32	2139	251	279	163	fraction concentration of negative ions
49) n-0.00087-0.00192	AW	27	2604	428	461	230	fraction concentration of negative ions
50) n-0.00041-0.00087	AX	32	3119	562	608	307	fraction concentration of negative ions
51) n+0.5-3.2	AY	58	1167	257	271	92.8	concentration of positive small ions
52) Z+:cm2/Vs	AZ	0.35	1.59	1.36	1.36	0.065	average mobility of positive small ions
53) c+1:fS/m	BA	1.22	26.3	5.57	5.9	2.02	conductivity caused by positive small ions
54) c+2:fS/m	BB	1.38	26.7	5.77	6.12	2.05	conductivity caused by all positive ions
55) n-0.5-3.2	BC	61	990	229	242	85.4	concentration of negative small ions
56) Z-:cm2/Vs	BD	0.38	1.78	1.55	1.53	0.106	average mobility of negative small ions
57) c-1:fS/m	BE	1.48	25.9	5.56	5.9	2.03	conductivity caused by negative small ions
58) c-2:fS/m	BF	1.71	26.1	5.78	6.12	2.05	conductivity caused by all negative ions
59) disorder	BG	0	199	32	40.7	36.1	characteristic of noise in ion measurements

The fraction concentrations correspond to the mobility ranges shown in the variable name.





Average air ion mobility distribution according to all measurements presented in the file Tahkuse_1993_1994_data.xls