

Supplementary data

Table S1. Energy (in cm⁻¹) for the fine-structure levels of Ge-like Te²⁰⁺ ion.

Index	Configuration	(<i>LS</i>) ^{<i>p</i>}	<i>J</i>	This work	Ref [10]	Ref [12]
1	4s ² 4p̄ ²	³ P ₀ ^e	0	0	0	0
2	4s ² 4p̄4p	³ P ₁ ^e	1	87293	87506	87445
3	4s ² 4p̄4p	³ P ₂ ^e	2	107830	106473	106247
4	4s ² 4p ²	¹ D ₂ ^e	2	211634	208907	208276
5	4s ² 4p ²	¹ S ₀ ^e	0	261899	255756	254124
6	4s4p̄ ² 4p	⁵ S ₂ ^o	2	425089	441507	439289
7	4s4p̄ ² 4p	³ D ₁ ^o	1	504886	513288	511761
8	4s4p ² 4p̄	³ D ₂ ^o	2	527812	540065	537328
9	4s4p ² 4p̄	³ D ₃ ^o	3	558720	569415	566674
10	4s4p ² 4p̄	³ P ₀ ^o	0	600408	609588	607038
11	4s4p ² 4p̄	³ P ₁ ^o	1	614683	621766	620119
12	4s4p ² 4p̄	³ P ₂ ^o	2	622611	628567	626404
13	4s4p ² 4p̄	³ S ₁ ^o	1	682206	671343	676893
14	4s4p ² 4p̄	¹ D ₂ ^o	2	698876	707408	702695
15	4s ² 4p̄4d	³ F ₂ ^o	2	739079	731944	739354
16	4s ² 4p̄4d	³ F ₃ ^o	3	775764	781404	776760
17	4s4p ³	¹ P ₁ ^o	1	791113	785953	787912
18	4s ² 4p̄4d	³ P ₂ ^o	2	809259	810864	804520
19	4s ² 4p̄4d	³ P ₁ ^o	1	820008	813074	814273
20	4s ² 4p4d	³ F ₄ ^o	4	852182	858164	852877
21	4s ² 4p4d	¹ D ₂ ^o	2	889263	887452	882183
22	4s ² 4p4d̄	³ P ₀ ^o	0	896285	894333	891880
23	4s ² 4p4d	¹ F ₃ ^o	3	905989	902735	900277
24	4s ² 4p̄4d̄	³ D ₁ ^o	1	906609	905764	901133
25	4s ² 4p̄4d	³ D ₂ ^o	2	921138	920588	914516
26	4s ² 4p4d̄	³ D ₃ ^o	3	969924	964355	962484
27	4s ² 4p4d	¹ P ₁ ^o	1	984377	982530	976524

Table S2. Energy (in cm⁻¹) for the fine-structure levels of Ge-like Sb¹⁹⁺ ion.

Index	Configuration	(<i>LS</i>) ^{<i>p</i>}	J	This work	Ref [12]
1	4s ² 4p̄ ²	³ P ₀ ^e	0	0	0
2	4s ² 4p̄4p	³ P ₁ ^e	1	76431	76588
3	4s ² 4p̄4p	³ P ₂ ^e	2	96068	94554
4	4s ² 4p ²	¹ D ₂ ^e	2	188470	185230
5	4s ² 4p ²	¹ S ₀ ^e	0	237317	229687
6	4s4p̄ ² 4p	⁵ S ₂ ^o	2	396011	410310
7	4s4p̄ ² 4p	³ D ₁ ^o	1	473903	480866
8	4s4p ² 4p̄	³ D ₂ ^o	2	491684	500908
9	4s4p ² 4p̄	³ D ₃ ^o	3	519790	527676
10	4s4p ² 4p̄	³ P ₀ ^o	0	560070	566695
11	4s4p ² 4p̄	³ P ₁ ^o	1	572796	578377
12	4s4p ³	³ P ₂ ^o	2	580967	585009
13	4s4p ² 4p̄	³ S ₁ ^o	1	641233	635895
14	4s4p ² 4p̄	¹ D ₂ ^o	2	650878	654195
15	4s ² 4p̄4d̄	³ F ₂ ^o	2	698334	698793
16	4s ² 4p̄4d̄	³ F ₃ ^o	3	732470	733506
17	4s4p ³	¹ P ₁ ^o	1	739316	735581
18	4s ² 4p4d̄	³ P ₂ ^o	2	766310	761596
19	4s ² 4p̄4d	³ P ₁ ^o	1	777096	771897
20	4s ² 4p4d	³ F ₄ ^o	4	799542	800276
21	4s ² 4p4d	¹ D ₂ ^o	2	837397	830413
22	4s ² 4p4d̄	³ P ₀ ^o	0	844043	839767
23	4s ² 4p̄4d̄	³ D ₁ ^o	1	853492	848189
24	4s ² 4p4d	¹ F ₃ ^o	3	853883	848212
25	4s ² 4p̄4d	³ D ₂ ^o	2	866410	860016
26	4s ² 4p4d̄	³ D ₃ ^o	3	914476	907206
27	4s ² 4p4d	¹ P ₁ ^o	1	927777	920133

Table S3. Energy (in cm⁻¹) for the fine-structure levels of Ge-like Sn¹⁸⁺ ion.

Index	Configuration	$(LS)^p$	J	This work	Ref [12]	Ref [11]
1	$4s^2 4\bar{p}^2$	$^3P_0^e$	0	0	0	0
2	$4s^2 4\bar{p} 4p$	$^3P_1^e$	1	66576	66736	67488
3	$4s^2 4\bar{p} 4p$	$^3P_2^e$	2	85297	83851	82685
4	$4s^2 4p^2$	$^1D_2^e$	2	167323	164188	165995
5	$4s^2 4p^2$	$^1S_0^e$	0	214739	207242	203035
6	$4s 4\bar{p}^2 4p$	$^5S_2^o$	2	368079	382410	375664
7	$4s 4\bar{p}^2 4p$	$^3D_1^o$	1	444087	451084	460318
8	$4s 4p^2 4\bar{p}$	$^3D_2^o$	2	457630	466522	481353
9	$4s 4p^2 4\bar{p}$	$^3D_3^o$	3	482945	490706	508270
10	$4s 4p^2 4\bar{p}$	$^3P_0^o$	0	521826	528391	528117
11	$4s 4p^2 4\bar{p}$	$^3P_1^o$	1	533066	538726	543194
12	$4s 4p^2 4\bar{p}$	$^3P_2^o$	2	541198	545459	561141
13	$4s 4p^2 4\bar{p}$	$^3S_1^o$	1	602252	596865	588671
14	$4s 4p^2 4\bar{p}$	$^1D_2^o$	2	605330	608104	638917
15	$4s^2 4\bar{p} 4\bar{d}$	$^3F_2^o$	2	659261	659842	654625
16	$4s 4p^3$	$^1P_1^o$	1	689885	685835	680368
17	$4s^2 4\bar{p} 4\bar{d}$	$^3F_3^o$	3	690459	691487	693918
18	$4s^2 4p 4d$	$^1D_2^o$	2	724592	719862	700351
19	$4s^2 4\bar{p} 4d$	$^3P_1^o$	1	735662	730732	712165
20	$4s^2 4p 4d$	$^3F_4^o$	4	749094	749809	753990
21	$4s^2 4p 4d$	$^3P_2^o$	2	787503	780579	763809
22	$4s^2 4p 4\bar{d}$	$^3P_0^o$	0	793756	789564	780721
23	$4s^2 4\bar{p} 4\bar{d}$	$^3D_1^o$	1	802449	797263	782786
24	$4s^2 4p 4d$	$^1F_3^o$	3	803689	798022	785025
25	$4s^2 4\bar{p} 4d$	$^3D_2^o$	2	813920	807696	786908
26	$4s^2 4p 4\bar{d}$	$^3D_3^o$	3	861113	853966	846787
27	$4s^2 4p 4d$	$^1P_1^o$	1	873349	865854	844703

Table S4. Energy (in cm⁻¹) for the fine-structure levels of Ge-like In¹⁷⁺ ion.

Index	Configuration	(<i>LS</i>) ^{<i>p</i>}	J	This work	Ref [12]
1	4s ² 4p ²	³ P ₀ ^e	0	0	0
2	4s ² 4p ² 4p	³ P ₁ ^e	1	57668	57816
3	4s ² 4p ² 4p	³ P ₂ ^e	2	75454	74071
4	4s ² 4p ²	¹ D ₂ ^e	2	148074	145021
5	4s ² 4p ²	¹ S ₀ ^e	0	194043	186668
6	4s4p ² 4p	⁵ S ₂ ^o	2	341270	355635
7	4s4p ² 4p	³ D ₁ ^o	1	415394	422439
8	4s4p ² 4p	³ D ₂ ^o	2	425505	434106
9	4s4p ² 4p	³ D ₃ ^o	3	448068	455727
10	4s4p ² 4p	³ P ₀ ^o	0	485557	492081
11	4s4p ² 4p	³ P ₁ ^o	1	495385	501130
12	4s4p ³	³ P ₂ ^o	2	503241	507752
13	4s4p ² 4p	¹ D ₂ ^o	2	562303	564587
14	4s4p ² 4p	³ S ₁ ^o	1	565132	559739
15	4s ² 4p ² 4d	³ F ₂ ^o	2	621494	622166
16	4s4p ³	¹ P ₁ ^o	1	642945	638736
17	4s ² 4p ² 4d	³ F ₃ ^o	3	649655	650667
18	4s ² 4p ² 4d	³ P ₂ ^o	2	684012	679260
19	4s ² 4p ² 4d	³ P ₁ ^o	1	695339	690572
20	4s ² 4p ² 4d	³ F ₄ ^o	4	700696	701384
21	4s ² 4p ² 4d	¹ D ₂ ^o	2	739452	732586
22	4s ² 4p ² 4d	³ P ₀ ^o	0	745292	741173
23	4s ² 4p ² 4d	³ D ₁ ^o	1	753327	748238
24	4s ² 4p ² 4d	¹ F ₃ ^o	3	755273	749603
25	4s ² 4p ² 4d	³ D ₂ ^o	2	763508	757434
26	4s ² 4p ² 4d	³ D ₃ ^o	3	809679	802639
27	4s ² 4p ² 4d	¹ P ₁ ^o	1	820938	813569

Table S5. Energy (in cm⁻¹) for the fine-structure levels of Ge-like Cd¹⁶⁺ ion.

Index	Configuration	$(LS)^p$	J	This work	Ref [9]	Ref [13]
1	4s ² 4p ²	³ P ₀ ^e	0	0	0	
2	4s ² 4p ² 4p	³ P ₁ ^e	1	49648	50622	50279
3	4s ² 4p ² 4p	³ P ₂ ^e	2	66481	65490	65493
4	4s ² 4p ²	¹ D ₂ ^e	2	130610	128378	128382
5	4s ² 4p ²	¹ S ₀ ^e	0	175112		168304
6	4s4p ² 4p	⁵ S ₂ ^o	2	315557		333415
7	4s4p ² 4p	³ D ₁ ^o	1	387772	396359	396072
8	4s4p ² 4p	³ D ₂ ^o	2	395154	406314	405595
9	4s4p ² 4p	³ D ₃ ^o	3	415039	425385	424760
10	4s4p ² 4p	³ P ₀ ^o	0	451139		458921
11	4s4p ² 4p	³ P ₁ ^o	1	459639		466466
12	4s4p ² 4p	³ P ₂ ^o	2	467031	472709	472562
13	4s4p ² 4p	¹ D ₂ ^o	2	521716	517151	518029
14	4s4p ² 4p	³ S ₁ ^o	1	529732	524051	523932
15	4s ² 4p ² 4d	³ F ₂ ^o	2	584816		585538
16	4s4p ³	¹ P ₁ ^o	1	598429	588233	589147
17	4s ² 4p ² 4d	³ F ₃ ^o	3	609979		611274
18	4s ² 4p ² 4d	³ P ₂ ^o	2	644476		635724
19	4s ² 4p ² 4d	³ F ₄ ^o	4	654206		
20	4s ² 4p ² 4d	³ P ₁ ^o	1	655944		646362
21	4s ² 4p ² 4d	¹ D ₂ ^o	2	693116		682472
22	4s ² 4p ² 4d	³ P ₀ ^o	0	698520		691539
23	4s ² 4p ² 4d	³ D ₁ ^o	1	705980		697289
24	4s ² 4p ² 4d	¹ F ₃ ^o	3	708499		698208
25	4s ² 4p ² 4d	³ D ₂ ^o	2	715017		705021
26	4s ² 4p ² 4d	³ D ₃ ^o	3	760016		746953
27	4s ² 4p ² 4d	¹ P ₁ ^o	1	770387		758112

Table S6. Transition wavelengths (in Å) and oscillator strengths for the transition between the energy levels of Ge-like Te²⁰⁺ ion.

Lower level	Upper level	Transition wavelength			Oscillator strength		
		This work	Ref [10]	Ref [12]	This work	Ref [10]	Ref [12]
4s ² 4p ² ³ P ₀ ^e	4s4p ² 4p ³ D ₁ ^o	198.58	194.82	195.40	3.969E-1	3.738E-1	3.610E-1
	4s4p ² 4p ³ P ₁ ^o	163.11	160.83	161.26	5.814E-2	5.526E-2	5.669E-2
	4s4p ² 4p ³ S ₁ ^o	146.97	148.96	147.73	2.737E-1	1.756E-1	2.108E-1
	4s4p ³ ¹ P ₁ ^o	126.40	127.23	126.92	1.975E-1	3.320E-2	1.462E-1
	4s ² 4p4d ³ P ₁ ^o	121.95	122.99	122.81	1.630E+01	1.605	1.711
	4s ² 4p4d ³ D ₁ ^o	110.59	110.40	110.97	9.430E-3	3.464E-3	4.372E-3
	4s ² 4p4d ¹ P ₁ ^o	101.85	101.78	102.40	7.800E-3	8.163E-3	1.016E-2
4s ² 4p4p ³ P ₁ ^e	4s4p ² 4p ⁵ S ₂ ^o	296.82	282.48	284.22	2.623E-2	2.650E-2	2.669E-2
	4s4p ² 4p ³ D ₁ ^o	240.10	234.86	235.67	6.110E-4	1.066E-3	9.233E-4
	4s4p ² 4p ³ D ₂ ^o	227.60	220.96	222.28	1.140E-1	1.022E-1	9.880E-2
	4s4p ² 4p ³ P ₀ ^o	195.40	191.54	192.46	4.903E-2	4.415E-2	4.520E-2
	4s4p ² 4p ³ P ₁ ^o	190.11	187.17	187.73	1.532E-1	1.575E-1	1.458E-1
	4s4p ³ ³ P ₂ ^o	186.80	184.82	185.54	2.360E-3	2.560E-3	4.49E-3
	4s4p ² 4p ³ S ₁ ^o	168.53	171.28	169.65	1.899E-1	1.310E-1	1.468E-1
	4s ² 4p4d ³ F ₂ ^o	153.42	155.17	153.40	4.650E-3	7.096E-4	2.758E-2
	4s4p ² 4p ¹ D ₂ ^o	163.51	161.32	162.54	3.541E-2		4.490E-3
	4s ² 4p4d ³ P ₁ ^o	136.48	137.82	137.58	9.124E-2	2.271E-2	1.268E-1
	4s ² 4p4d ³ P ₂ ^o	138.51	138.24	139.46	6.610E-1	4.136E-1	5.55E-1
	4s4p ³ ¹ P ₁ ^o	142.08	143.17	142.76	1.809E-1	3.697E-2	7.587E-2
	4s ² 4p4d ¹ D ₂ ^o	125.02	124.99	125.83	4.744E-1	4.762E-1	4.876E-1
	4s ² 4p4d ³ P ₀ ^o	122.37	122.19	124.31	1.920E-1	4.762E-1	1.657E-1
	4s ² 4p4d ³ D ₁ ^o	122.05	122.21	122.90	3.999E-1	1.596E-1	1.268E-1
	4s ² 4p4d ³ D ₂ ^o	120.24	120.02	120.91	1.330E-1	2.910E-1	1.072E-1
	4s ² 4p4d ¹ P ₁ ^o	111.76	111.71	112.48	1.519E-2	7.190E-2	1.190E-2
4s ² 4p4p ³ P ₂ ^e	4s4p ² 4p ⁵ S ₂ ^o	315.20	298.48	300.26	1.110E-2	1.099E-2	1.118E-2
	4s4p ² 4p ³ D ₁ ^o	251.85	245.81	246.60	1.370E-2	1.440E-2	1.372E-2
	4s4p ² 4p ³ D ₂ ^o	238.11	230.63	231.97	2.583E-3	2.464E-3	2.354E-3
	4s4p ² 4p ³ D ₃ ^o	221.78	216.01	217.19	5.293E-2	4.808E-2	4.504E-2
	4s4p ² 4p ³ P ₁ ^o	197.30	194.06	194.60	5.453E-3	2.032E-3	3.884E-3
	4s4p ³ ³ P ₂ ^o	194.26	191.54	192.25	1.847E-1	1.831E-1	1.703E-1
	4s4p ² 4p ³ S ₁ ^o	174.10	177.03	175.24	3.248E-1	2.489E-1	2.698E-1
	4s ² 4p4d ³ F ₂ ^o	158.42	159.88	157.95	6.100E-4	3.953E-2	8.070E-2
	4s4p ² 4p ¹ D ₂ ^o	169.19	166.41	167.66	9.027E-2	2.437E-3	1.001E-4
	4s ² 4p4d ³ F ₃ ^o	149.72	148.16	149.14	1.518E-1	1.347E-1	1.378E-1
	4s ² 4p4d ³ P ₁ ^o	140.41	141.52	141.24	6.750E-4	1.302E-2	6.882E-3
	4s ² 4p4d ³ P ₂ ^o	142.57	141.97	143.21	2.514E-1	2.124E-1	2.050E-1
	4s4p ³ ¹ P ₁ ^o	146.35	147.17	146.70	5.896E-3	2.065E-3	3.176E-3
	4s ² 4p4d ¹ D ₂ ^o	127.97	128.04	128.88	3.449E-1	3.027E-1	2.568E-1
	4s ² 4p4d ³ D ₃ ^o	125.29	125.59	125.94	1.038	8.252E-1	8.504E-1
	4s ² 4p4d ³ D ₁ ^o	125.19	125.11	125.80	7.406E-2	5.611E-2	5.936E-2
	4s ² 4p4d ³ D ₂ ^o	122.95	122.83	123.72	8.623E-2	5.481E-2	8.390E-2
	4s ² 4p4d ¹ F ₃ ^o	116.00	116.57	116.79	1.824E-2	1.421E-1	1.722E-1

	4s ² 4p4d ¹ P _{1°}	114.08	114.15	114.91	6.280E-4	3.977E-5	5.324E-5
4s ² 4p ² ¹ D _{2°}	4s4p ² 4p ⁵ S _{2°}	468.48	429.92	439.26	7.320E-4	7.093E-4	8.322E-4
	4s4p ² 4p ³ D _{1°}	341.00	328.54	333.19	3.140E-3	2.689E-3	3.152E-3
	4s4p ² 4p ³ D _{2°}	316.28	301.97	307.04	2.966E-3	2.720E-3	2.94E-3
	4s4p ² 4p ³ D _{3°}	288.11	277.39	281.66	5.205E-2	4.602E-2	5.63E-2
	4s4p ² 4p ³ P _{1°}	248.11	242.21	244.81	6.440E-4	1.255E-3	4.85E-3
	4s4p ³ ³ P _{2°}	243.32	238.29	241.10	1.368E-2	1.608E-2	1.251E-4
	4s4p ² 4p ³ S _{1°}	212.51	216.25	214.93	9.276E-2	1.068E-2	3.372E-1
	4s ² 4p4d ³ F _{2°}	189.59	191.19	189.49	1.271E-1	1.296E-2	1.008E-1
	4s4p ² 4p ¹ D _{2°}	205.24	200.60	203.64	5.884E-2	1.369E-1	1.376E-2
	4s ² 4p4d ³ F _{3°}	177.26	174.67	176.95	1.753E-3	1.983E-3	1.882E-3
	4s ² 4p4d ³ P _{1°}	164.37	165.52	165.94	2.543E-1	1.16E-2	9.454E-2
	4s ² 4p4d ³ P _{2°}	167.33	166.12	168.67	3.035E-2	2.861E-2	2.162E-2
	4s4p ³ ¹ P _{1°}	172.57	173.30	172.52	2.346E-1	2.361E-1	2.342E-1
	4s ² 4p4d ¹ D _{2°}	147.57	147.37	148.39	9.397E-2	5.448E-2	7.130E-2
	4s ² 4p4d ³ D _{3°}	144.02	144.13	144.51	1.518E-1	1.157E-1	1.331E-1
	4s ² 4p4d ³ D _{1°}	143.89	143.50	145.03	1.098E-1	1.198E-1	2.648E-2
	4s ² 4p4d ³ D _{2°}	140.94	140.51	141.59	5.926E-1	5.130E-1	4.814E-1
	4s ² 4p4d ¹ F _{3°}	131.88	132.37	132.59	1.140	9.137E-1	2.153E-1
	4s ² 4p4d ¹ P _{1°}	129.41	129.26	130.17	2.528E-3	6.0E-4	6.655E-5
4s ² 4p ² ¹ S _{0°}	4s4p ² 4p ³ D _{1°}	412.63	388.30	388.14	2.528E-3	2.3E-3	2.988E-3
	4s4p ² 4p ³ P _{1°}	284.21	273.22	273.23	3.450E-2	2.84E-2	3.001E-2
	4s4p ² 4p ³ S _{1°}	238.55	240.62	236.54	7.893E-2	6.38E-2	6.082E-2
	4s ² 4p4d ³ P _{1°}	179.18	179.43	178.53	2.918E-1	4.86E-2	4.263E-3
	4s4p ³ ¹ P _{1°}	188.96	188.61	187.34	1.292E-2		2.715E-3
	4s ² 4p4d ³ D _{1°}	155.11	153.84	154.56	3.260E-3	7.80E-3	2.627E-3
	4s ² 4p4d ¹ P _{1°}	138.41	137.59	138.43	2.288		1.879

Table S7. Transition wavelengths (in Å) and oscillator strengths for the transition between the energy levels of Ge-like Sb¹⁹⁺ ion.

Lower level	Upper level	Transition wavelength		Oscillator strength	
		This work	Ref [12]	This work	Ref [12]
4s ² 4p ² ³ P _{0°}	4s4p ² 4p ³ D _{1°}	211.57	208.50	3.841E-1	3.489E-1
	4s4p ² 4p ³ P _{1°}	175.04	173.35	5.858E-2	5.709E-2
	4s4p ² 4p ³ S _{1°}	156.36	157.67	2.808E-1	2.169E-1
	4s4p ³ ¹ P _{1°}	135.61	136.30	2.052	1.811
	4s ² 4p4d ³ P _{1°}	129.02	129.89	1.995E-1	5.810E-3
	4s ² 4p4d ³ D _{1°}	117.47	118.21	1.233E-2	1.810E-2
	4s ² 4p4d ¹ P _{1°}	108.06	108.96	8.440E-3	8.435E-3
4s ² 4p ² 4p ³ P _{1°}	4s4p ² 4p ⁵ S _{2°}	313.73	300.30	2.286E-2	2.353E-2
	4s4p ² 4p ³ D _{1°}	252.25	247.91	2.065E-4	4.356E-4
	4s4p ² 4p ³ D _{2°}	241.45	236.20	1.194E-1	1.034E-1

	4s4p ² 4p̄ ³ P ₀ ^o	207.31	204.51	4.905E-2	4.520E-2
	4s4p ² 4p̄ ³ P ₁ ^o	201.99	199.75	1.483E-1	1.410E-1
	4s4p ³ ³ P ₂ ^o	198.72	197.14	1.540E-3	5.990E-3
	4s4p ² 4p̄ ³ S ₁ ^o	177.52	179.21	1.968E-1	1.533E-1
	4s4p ² 4p̄ ¹ D ₂ ^o	174.54	173.53	3.044E-2	2.354E-2
	4s ² 4p̄4d̄ ³ F ₂ ^o	161.22	161.10	6.240E-3	1.500E-3
	4s4p ³ ¹ P ₁ ^o	151.25	152.11	1.518E-1	9.023E-2
	4s ² 4p4d̄ ³ P ₂ ^o	145.33	146.33	6.668E-1	5.560E-1
	4s ² 4p̄4d ³ P ₁ ^o	143.09	144.16	1.182E-1	1.095E-1
	4s ² 4p4d ¹ D ₂ ^o	131.75	132.98	5.855E-1	4.986E-1
	4s ² 4p4d̄ ³ P ₀ ^o	130.61	131.35	1.961E-1	1.690E-1
	4s ² 4p̄4d̄ ³ D ₁ ^o	129.03	129.91	4.179E-1	3.590E-1
	4s ² 4p̄4d ³ D ₂ ^o	126.92	127.95	1.549E-1	1.240E-1
	4s ² 4p4d ¹ P ₁ ^o	117.77	118.83	1.516E-2	1.184E-2
4s ² 4p̄4p ³ P ₂ ^e	4s4p̄ ² 4p ⁵ S ₂ ^o	334.27	319.06	9.840E-3	9.990E-3
	4s4p̄ ² 4p ³ D ₁ ^o	265.36	260.56	1.173E-2	1.186E-2
	4s4p ² 4p̄ ³ D ₂ ^o	253.43	247.66	2.520E-3	2.350E-3
	4s4p ² 4p̄ ³ D ₃ ^o	236.62	232.30	5.514E-2	4.670E-2
	4s4p ² 4p̄ ³ P ₁ ^o	210.31	207.88	5.750E-3	4.180E-3
	4s4p ³ ³ P ₂ ^o	206.77	205.06	1.848E-1	1.711E-1
	4s4p ² 4p̄ ³ S ₁ ^o	183.91	185.73	3.339E-1	2.766E-1
	4s4p ² 4p̄ ¹ D ₂ ^o	180.71	179.64	8.272E-2	2.660E-3
	4s ² 4p̄4d̄ ³ F ₂ ^o	166.47	166.35	4.870E-3	7.454E-2
	4s ² 4p̄4d̄ ³ F ₃ ^o	157.54	157.29	1.391E-1	1.266E-1
	4s4p ³ ¹ P ₁ ^o	155.87	156.78	6.920E-3	1.940E-3
	4s ² 4p4d̄ ³ P ₂ ^o	149.59	150.65	2.613E-1	2.136E-1
	4s ² 4p̄4d ³ P ₁ ^o	147.22	148.35	7.545E-3	7.900E-3
	4s ² 4p4d ¹ D ₂ ^o	135.24	136.53	3.335E-1	2.452E-1
	4s ² 4p̄4d̄ ³ D ₁ ^o	132.37	133.30	1.961E-1	6.238E-2
	4s ² 4p4d ¹ F ₃ ^o	132.30	133.30	7.797E-2	8.716E-1
	4s ² 4p̄4d ³ D ₂ ^o	130.15	131.24	1.047E-1	9.974E-1
	4s ² 4p4d̄ ³ D ₃ ^o	122.51	123.60	1.068	1.855E-1
	4s ² 4p4d ¹ P ₁ ^o	120.55	121.67	6.403E-4	6.082E-5
4s ² 4p ² ¹ D ₂ ^e	4s4p̄ ² 4p ⁵ S ₂ ^o	483.10	451.96	7.416E-4	8.428E-4
	4s4p̄ ² 4p ³ D ₁ ^o	351.27	342.90	3.330E-3	3.330E-3
	4s4p ² 4p̄ ³ D ₂ ^o	330.67	320.91	2.690E-3	2.170E-3
	4s4p ² 4p̄ ³ D ₃ ^o	302.62	295.58	5.100E-2	4.422E-2

	$4s4p^24\bar{p} \ ^3P_1^o$	260.88	257.15	3.063E-4	3.996E-4
	$4s4p^3 \ ^3P_2^o$	255.45	252.84	1.099E-2	1.156E-2
	$4s4p^24\bar{p} \ ^3S_1^o$	221.45	224.09	7.800E-3	7.740E-3
	$4s4p^24\bar{p} \ ^1D_2^o$	216.83	215.28	4.620E-2	1.323E-1
	$4s^24\bar{p}4\bar{d} \ ^3F_2^o$	196.64	196.47	1.510E-1	3.714E-2
	$4s^24\bar{p}4\bar{d} \ ^3F_3^o$	184.30	183.95	1.360E-3	1.530E-3
	$4s4p^3 \ ^1P_1^o$	182.01	183.26	3.638E-2	2.522E-1
	$4s^24p4\bar{d} \ ^3P_2^o$	173.51	174.94	3.290E-2	2.376E-2
	$4s^2 \ 4\bar{p}4d \ ^3P_1^o$	170.33	171.85	2.848E-1	1.645E-2
	$4s^2 \ 4p4d \ ^1D_2^o$	154.50	156.18	1.160E-1	8.740E-2
	$4s^24\bar{p}4\bar{d} \ ^3D_1^o$	150.76	151.98	1.165E-2	9.040E-2
	$4s^2 \ 4p4d \ ^1F_3^o$	150.68	151.97	1.045E-1	1.453E-1
	$4s^2 \ 4\bar{p}4d \ ^3D_2^o$	147.89	149.30	5.846E-1	4.738E-1
	$4s^24p4\bar{d} \ ^3D_3^o$	138.10	139.50	1.652E-1	9.664E-1
	$4s^2 \ 4p4d \ ^1P_1^o$	135.61	137.03	2.410E-3	4.284E-7
$4s^24p^2 \ ^1S_0^e$	$4s4\bar{p}^24p \ ^3D_1^o$	423.79	411.68	2.670E-3	3.138E-3
	$4s4p^24\bar{p} \ ^3P_1^o$	298.87	293.97	3.173E-2	2.793E-2
	$4s4p^24\bar{p} \ ^3S_1^o$	248.23	251.55	8.052E-2	6.070E-2
	$4s4p^3 \ ^1P_1^o$	199.73	201.22	3.530E-3	9.159E-5
	$4s^2 \ 4\bar{p}4d \ ^3P_1^o$	185.75	187.55	3.129E-1	2.843E-1
	$4s^24\bar{p}4\bar{d} \ ^3D_1^o$	162.72	164.13	2.300E-1	3.185E-3
	$4s^2 \ 4p4d \ ^1P_1^o$	145.21	146.83	2.344	1.921

Table S8. Transition wavelengths (in Å) and oscillator strengths for the transition between the energy levels of Ge-like Sn¹⁸⁺ ion.

Lower level	Upper level	Transition wavelength				Oscillator strength		
		This work	Ref [12]	Ref [11]	Ref [4]	This work	Ref [12]	Ref [4]
$4s^24\bar{p}^2 \ ^3P_0^e$	$4s4\bar{p}^24p \ ^3D_1^o$	225.18	221.69	217.24		3.709E-1	3.364E-1	
	$4s4p^24\bar{p} \ ^3P_1^o$	187.59	185.62	184.10		5.983E-2	5.808E-2	
	$4s4p^24\bar{p} \ ^3S_1^o$	166.04	167.54	169.87		2.892E-1	2.239E-1	
	$4s^24\bar{p}4d \ ^3P_1^o$	135.93	136.85	140.42		5.469E-1	6.243E-1	
	$4s4p^3 \ ^1P_1^o$	144.95	145.81	146.98		1.622E-2	6.107E-2	
	$4s^2 \ 4\bar{p}4\bar{d} \ ^3D_1^o$	124.43	125.31	127.38	140.38 ^(c) ,138.43 ^(d)	1.659	1.873	1.690
	$4s^2 \ 4p4d \ ^1P_1^o$	114.50	115.49	118.38		9.07E-3	1.199E-2	
$4s^24\bar{p}4p \ ^3P_1^e$	$4s4\bar{p}^24p \ ^5S_2^o$	331.67	316.78	324.49		1.958E-2	2.040E-2	
	$4s4\bar{p}^24p \ ^3D_1^o$	264.89	260.18	254.56		-	1.190E-4	

	4s4p ² 4p̄					1.245E-1	1.079E-1	
	³ D _{2°}	255.72	250.13	241.62				
	4s4p ² 4p̄ ³ P _{0°}	219.66	216.61	217.09		4.906E-2	4.520E-2	
	4s4p ² 4p̄ ³ P _{1°}	214.37	211.87	210.21		1.433E-1	1.360E-1	
	4s4p ³ ³ P _{2°}	210.69	208.89	202.57		8.45E-4	8.440E-4	
	4s4p ² 4p̄					2.037E-1	1.597E-1	
	³ S _{1°}	186.68	188.63	191.87				
	4s ² 4p̄4d̄ ³ F _{2°}	168.73	168.60	170.32		7.114E-3	2.074E-3	
	4s4p ² 4p̄					2.685E-2	6.780E-3	
	¹ D _{2°}	185.61	184.72	174.99				
	4s ² 4p̄4d ³ P _{1°}	149.46	150.60	155.12	139.98 ^(c) , 138.03 ^(d)	3.342E-1	3.726E-1	3.370E-1
	4s ² 4p4d̄ ³ P _{2°}	151.97	153.11	158.01		6.712E-1	5.553E-1	
	4s4p ³ ¹ P _{1°}	160.43	161.53	163.16		1.346E-1	9.767E-2	
	4s ² 4p4d ¹ D _{2°}	138.71	140.09	143.61		5.964E-1	5.103E-1	
	4s ² 4p4d̄ ³ P _{0°}	137.52	138.35	140.21		2.006E-1	1.725E-1	
	4s ² 4p̄4d̄ ³ D _{1°}	135.66	136.75	139.37		1.366E-1	3.726E-1	
	4s ² 4p̄4d̄ ³ D _{2°}	133.81	134.96	139.00		1.803E-1	1.432E-1	
	4s ² 4p4d ¹ P _{1°}	123.95	125.14	128.66		1.501E-2	1.169E-2	
4s ² 4p̄4p ³ P _{2°}	4s4p̄ ² 4p ⁵ S _{2°}	353.52	334.94	341.32		8.635E-3	8.832E-3	
	4s4p̄ ² 4p̄					9.886E-3	1.014E-2	
	³ D _{1°}	278.64	272.31	264.81				
	4s4p ² 4p̄ ³ D _{2°}	268.51	261.32	250.84		2.387E-3	2.278E-3	
	4s4p ² 4p̄ ³ D _{3°}	251.42	245.79	234.97		5.745E-2	4.838E-2	
	4s4p ² 4p̄ ³ P _{1°}	223.28	219.84	217.15		6.091E-3	4.514E-3	
	4s4p ³ ³ P _{2°}	219.30	216.63	209.01		1.829E-1	1.701E-1	
	4s4p ² 4p̄ ³ S _{1°}	193.41	194.93	197.63		3.434E-1	2.836E-1	
	4s ² 4p̄4d̄ ³ F _{2°}	174.20	173.61	174.84		1.066E-1	6.768E-2	
	4s4p ² 4p̄ ¹ D _{2°}	192.26	190.75	179.78		7.447E-2	6.646E-3	
	4s ² 4p4d̄ ³ F _{3°}	165.22	164.57	163.60		1.268E-1	1.155E-1	
	4s ² 4p4d̄ ³ P _{1°}	153.74	154.59	158.86		-	6.566E-2	
	4s ² 4p4d̄ ³ P _{2°}	156.40	157.23	161.90	161.51 ^(c) ,158.33 ^(d)	2.725E-1	2.234E-1	8.520E-2
	4s4p ³ ¹ P _{1°}	165.38	166.12	167.31		7.813E-3	1.188E-3	
	4s ² 4p4d ¹ D _{2°}	142.39	143.53	146.82	147.60 ^(c) ,144.61 ^(d)	3.194E-1	2.316E-1	7.260E-2
	4s ² 4p4d̄ ³ D _{3°}	139.42	140.17	142.84	142.79 ^(c) , 141.20 ^(d)	1.101E-1	--	7.682E-1
	4s ² 4p̄4d̄ ³ D _{1°}	139.18	140.02	142.38		8.224E-2	8.640E-3	
	4s ² 4p̄4d̄ ³ D _{2°}	137.23	138.15	142.00		1.263E-1	1.178E-1	
	4s ² 4p4d̄ ¹ F _{3°}	128.88	129.85	130.87		2.090E-1	1.983E-1	
	4s ² 4p4d̄ ¹ P _{1°}	126.88	127.88	131.23		6.510E-4	1.355E-5	
4s ² 4p ² ¹ D _{2°}	4s4p̄ ² 4p ⁵ S _{2°}	498.12	458.25	476.94		7.340E-4	8.368E-4	
	4s4p̄ ² 4p̄ ³ D _{1°}	361.32	348.56	339.76		3.492E-3	3.48E-3	
	4s4p ² 4p̄ ³ D _{2°}	344.46	330.76	317.10		2.434E-3	1.940E-3	
	4s4p ² 4p̄ ³ D _{3°}	316.83	306.26	292.16		4.969E-2	4.320E-2	
	4s4p ² 4p̄ ³ P _{1°}	273.42	267.00	265.11		9.200E-5	1.501E-4	
	4s4p ³ ³ P _{2°}	267.47	262.28	253.07		8.346E-3	9.280E-3	
	4s4p ² 4p̄					6.255E-3	6.710E-3	
	³ S _{1°}	229.92	231.12	236.59				
	4s ² 4p̄4d̄ ³ F _{2°}	228.31	225.27	211.45		1.696E-1	3.072E-2	
	4s4p ² 4p̄ ¹ D _{2°}	203.28	201.75	204.65		3.856E-2	1.475E-1	

	4s ² 4p̄4d ³ P _{1°}	175.95	176.51	183.09		3.035E-1	1.246E-2	
	4s ² 4p̄4d̄ ³ F _{3°}	191.15	189.65	189.42		4.923E-3	1.190E-3	
	4s ² 4p̄4d̄ ³ P _{2°}	179.45	179.96	187.14	159.64 ^(c) ,156.46 ^(d)	2.649E-2	2.680E-2	2.874E-1
	4s4p ³ ¹ P _{1°}	191.36	191.70	194.41		2.754E-2	2.636E-2	
	4s ² 4p̄4d ¹ D _{2°}	161.24	162.23	167.28		1.422E-1	1.061E-1	
	4s ² 4p̄4d̄ ³ D _{3°}	157.14	157.77	161.54		1.780E-1	1.572E-1	
	4s ² 4p̄4d̄ ³ D _{1°}	157.45	157.96	162.13		9.954E-2	8.664E-2	
	4s ² 4p̄4d ³ D _{2°}	154.66	155.40	161.05		5.741E-1	4.644E-1	
	4s ² 4p̄4d ¹ F _{3°}	144.14	144.97	146.89	146.34 ^(c) ,146.98 ^(d)	1.104	9.868E-1	1.026
	4s ² 4p̄4d ¹ P _{1°}	141.64	142.52	147.34		2.366E-3	6.492E-6	
4s ² 4p ² ¹ S _{0°}	4s4p̄ ² 4p̄ ³ D _{1°}	436.02	410.10	388.68		2.767E-3	3.255E-3	
	4s4p ² 4p̄ ³ P _{1°}	314.14	301.67	293.98		2.900E-2	2.584E-2	
	4s4p ² 4p̄ ³ S _{1°}	258.06	256.66	259.31		8.228E-2	6.057E-2	
	4s ² 4p̄4d ³ P _{1°}	191.97	191.03	196.41		3.259E-1	1.830E-4	
	4s4p ³ ¹ P _{1°}	210.46	208.95	209.50		7.940E-2	2.935E-1	
	4s ² 4p̄4d̄ ³ D _{1°}	170.15	169.49	172.49		1.567E-3	2.340E-3	
	4s ² 4p̄4d ¹ P _{1°}	151.83	151.83	155.84	156.08 ^(c) ,154.12 ^(d)	1.406	1.966	1.518

^(c)Theoretical and ^(d)experimental results [4]

Table S9. Transition wavelengths (in Å) and oscillator strengths for the transition between the energy levels of Ge-like In¹⁷⁺ ion.

Lower level	Upper level	Transition wavelength		Oscillator strength	
		this work	Ref [12]	this work	Ref [12]
4s ² 4p̄ ² ³ P _{0°}	4s4p̄ ² 4p̄ ³ D _{1°}	241.37	237.34	3.574E-1	3.236E-1
	4s4p ² 4p̄ ³ P _{1°}	202.39	200.07	6.136E-2	5.973E-2
	4s4p ² 4p̄ ³ S _{1°}	178.31	179.12	2.973E-1	2.316E-1
	4s4p ³ ¹ P _{1°}	155.94	156.97	1.220E-1	5.042E-2
	4s ² 4p̄4d ³ P _{1°}	144.19	145.19	2.241	1.926
	4s ² 4p̄4d̄ ³ D _{1°}	133.09	134.00	2.150E-2	1.039E-2
	4s ² 4p̄4d ¹ P _{1°}	122.13	123.24	9.670E-3	1.291E-2
4s ² 4p̄4p ³ P _{1°}	4s4p̄ ² 4p̄ ⁵ S _{2°}	353.53	336.49	1.649E-2	1.736E-2
	4s4p ² 4p̄ ³ D _{2°}	272.57	266.35	1.291E-1	1.120E-1
	4s4p ² 4p̄ ³ P _{0°}	234.32	230.80	4.909E-2	4.523E-2
	4s4p ² 4p̄ ³ P _{1°}	229.06	226.09	1.380E-1	1.309E-1
	4s4p ³ ³ P _{2°}	225.02	222.76	3.264E-4	3.440E-4
	4s4p ² 4p̄ ¹ D _{2°}	198.68	197.79	7.530E-3	7.200E-3
	4s4p ² 4p̄ ³ S _{1°}	197.57	199.70	2.107E-1	1.664E-1
	4s ² 4p̄4d̄ ³ F _{2°}	177.82	177.61	2.411E-2	1.868E-2

	$4s4p^3\ ^1P_1^o$	171.31	172.55	1.456E-1	1.024E-1
	$4s^2\ 4\bar{p}4d\ ^3P_1^o$	157.23	158.41	1.227E-1	9.340E-2
	$4s^2\ 4p4\bar{d}\ ^3P_2^o$	160.07	161.30	6.745E-1	5.533E-1
	$4s^2\ 4p4d\ ^1D_2^o$	147.06	148.55	6.068E-1	5.233E-1
	$4s^2\ 4p4\bar{d}\ ^3P_0^o$	145.81	146.69	2.054E-1	1.763E-1
	$4s^2\ 4\bar{p}4\bar{d}\ ^3D_1^o$	144.12	145.19	4.564E-1	3.870E-1
	$4s^2\ 4\bar{p}4d\ ^3D_2^o$	142.05	143.28	2.096E-1	1.651E-1
	$4s^2\ 4p4d\ ^1P_1^o$	131.36	132.64	1.476E-2	1.147E-2
$4s^2\ 4\bar{p}4p\ ^3P_2^e$	$4s4\bar{p}^2\ 4p\ ^5S_2^o$	377.19	357.85	7.510E-3	7.720E-3
	$4s4p^2\ 4\bar{p}\ ^3D_2^o$	286.42	279.55	2.170E-3	2.130E-3
	$4s4p^2\ 4\bar{p}\ ^3D_3^o$	269.08	263.66	5.989E-2	5.020E-2
	$4s4p^2\ 4\bar{p}\ ^3P_1^o$	238.76	235.54	6.490E-3	4.890E-3
	$4s4p^3\ ^3P_2^o$	234.37	231.93	1.793E-1	1.678E-1
	$4s4p^2\ 4\bar{p}\ ^1D_2^o$	205.94	204.98	3.532E-1	1.100E-2
	$4s4p^2\ 4\bar{p}\ ^3S_1^o$	204.75	207.03	6.642E-2	6.100E-2
	$4s^2\ 4\bar{p}4\bar{d}\ ^3F_2^o$	183.62	183.39	1.677E-2	2.908E-1
	$4s4p^3\ ^1P_1^o$	176.68	178.00	1.148E-1	1.678E-1
	$4s^2\ 4\bar{p}4\bar{d}\ ^3F_3^o$	174.61	174.30	8.820E-3	9.400E-3
	$4s^2\ 4p4\bar{d}\ ^3P_2^o$	164.75	166.05	2.850E-1	2.346E-1
	$4s^2\ 4\bar{p}4d\ ^3P_1^o$	161.74	163.00	4.124E-4	9.400E-3
	$4s^2\ 4p4d\ ^1D_2^o$	151.00	152.57	3.025E-1	2.160E-1
	$4s^2\ 4\bar{p}4\bar{d}\ ^3D_1^o$	147.91	149.02	2.206E-1	6.930E-2
	$4s^2\ 4p4d\ ^1F_3^o$	147.48	148.72	8.694E-2	9.202E-1
	$4s^2\ 4\bar{p}4d\ ^3D_2^o$	145.72	147.01	1.513E-1	1.385E-1
	$4s^2\ 4p4\bar{d}\ ^3D_3^o$	136.55	137.88	1.138	2.102E-1
	$4s^2\ 4p4d\ ^1P_1^o$	134.49	135.83	6.629E-4	7.288E-5
$4s^2\ 4p^2\ ^1D_2^e$	$4s4\bar{p}^2\ 4p\ ^5S_2^o$	518.97	483.06	7.096E-4	8.124E-4
	$4s4\bar{p}^2\ 4p\ ^3D_1^o$	375.07	365.44	3.610E-3	3.590E-3
	$4s4p^2\ 4\bar{p}\ ^3D_2^o$	361.40	350.53	2.200E-3	1.740E-3
	$4s4p^2\ 4\bar{p}\ ^3D_3^o$	334.22	325.90	4.811E-2	4.198E-2
	$4s4p^3\ ^3P_2^o$	282.30	278.76	5.930E-3	7.070E-3
	$4s4p^2\ 4\bar{p}\ ^1D_2^o$	242.05	240.72	1.850E-1	1.599E-1
	$4s4p^2\ 4\bar{p}\ ^3S_1^o$	240.40	243.55	4.680E-3	5.620E-3
	$4s^2\ 4\bar{p}4\bar{d}\ ^3F_2^o$	211.78	211.48	3.364E-2	2.684E-2
	$4s4p^3\ ^1P_1^o$	202.60	204.34	3.174E-1	2.728E-1
	$4s^2\ 4\bar{p}4\bar{d}\ ^3F_3^o$	199.89	199.49	6.530E-4	8.728E-4
	$4s^2\ 4p4\bar{d}\ ^3P_2^o$	187.08	188.75	4.128E-2	3.096E-2

	$4s^2 4\bar{p}4d \ ^3P_1^o$	183.21	184.82	2.308E-2	1.058E-2
	$4s^2 4\bar{p}4\bar{d} \ ^3D_1^o$	165.65	167.06	9.473E-2	8.308E-2
	$4s^2 4p4d \ ^1F_3^o$	165.12	166.68	1.897E-1	1.684E-1
	$4s^2 4\bar{p}4d \ ^3D_2^o$	162.91	164.54	5.604E-1	4.530E-1
	$4s^2 4p4\bar{d} \ ^3D_3^o$	151.54	153.17	1.226	1.010
	$4s^2 4p4d \ ^1P_1^o$	149.01	150.66	2.380E-3	1.594E-5
$4s^2 4p^2 \ ^1S_0^e$	$4s4\bar{p}^2 4p \ ^3D_1^o$	452.96	438.99	2.830E-3	3.280E-3
	$4s4p^2 4\bar{p} \ ^3P_1^o$	332.72	326.50	2.635E-2	2.374E-2
	$4s4p^2 4\bar{p} \ ^3S_1^o$	270.19	274.17	8.427E-2	6.044E-2
	$4s4p^3 \ ^1P_1^o$	223.35	225.46	3.355E-1	3.013E-1
	$4s^2 4\bar{p}4\bar{d} \ ^3D_1^o$	179.27	180.91	1.020E-3	1.690E-3
	$4s^2 4p4d \ ^1P_1^o$	159.93	161.84	2.47301	2.017

Table S10. Transition wavelengths (in Å) and oscillator strengths for the transition between the energy levels of Ge-like Cd¹⁶⁺ ion.

Lower level	Upper level	Transition wavelength			Oscillator strength	
		This work	Ref [13]	Ref [9]	This work	Ref [13]
$4s^2 4\bar{p}^2 \ ^3P_0^e$	$4s4\bar{p}^2 4p \ ^3D_1^o$	257.88	252.48	252.30	3.427E-1	3.109E-1
	$4s4p^2 4\bar{p}^3 P_1^o$	217.56	214.38		6.377E-2	6.025E-2
	$4s4p^2 4\bar{p} \ ^3S_1^o$	188.77	193.04	193.34	3.077E-1	2.089E-1
	$4s^2 4p4\bar{d} \ ^3P_1^o$	152.45	154.71		1.103E-1	
	$4s4p^3 \ ^1P_1^o$	167.10	169.74		2.313E-1	3.090E-1
	$4s^2 4p4\bar{d} \ ^3D_1^o$	142.02	143.41		2.867E-2	
	$4s^2 4p4d \ ^1P_1^o$	130.14	131.91		1.021E-2	
$4s^2 4\bar{p} 4p \ ^3P_1^e$	$4s4\bar{p}^2 4p \ ^5S_2^o$	377.06	353.19		1.364E-2	1.523E-2
	$4s4\bar{p}^2 4p \ ^3D_1^o$	296.53	289.19		3.520E-2	3.653E-2
	$4s4p^2 4\bar{p} \ ^3D_2^o$	290.19	281.44	281.22	1.331E-1	1.103E-1
	$4s4p^2 4\bar{p} \ ^3P_0^o$	249.73	244.71		4.910E-2	4.293E-2
	$4s4p^2 4\bar{p} \ ^3P_1^o$	244.55	240.28		1.325E-1	1.267E-1
	$4s4p^3 \ ^3P_2^o$	240.22	236.81		4.000E-5	1.559E-4
	$4s4p^2 4\bar{p} \ ^3S_1^o$	208.84	213.79	214.35	2.177E-1	1.599E-1
	$4s^2 4\bar{p} 4\bar{d} \ ^3F_2^o$	186.86	186.83		7.659E-3	
	$4s4p^2 4\bar{p} \ ^1D_2^o$	211.83	211.12		2.188E-2	
	$4s^2 4\bar{p} 4d \ ^3P_1^o$	164.94	167.76		1.548E-1	
	$4s^2 4p4\bar{d} \ ^3P_2^o$	168.12	170.81		6.761E-1	
	$4s4p^3 \ ^1P_1^o$	182.22	185.57		1.133E-1	8.756E-2
	$4s^2 4p4d \ ^1D_2^o$	155.81	158.18		6.166E-1	
	$4s^2 4p4\bar{d} \ ^3P_0^o$	154.11	155.94		2.106E-1	

	4s ² 4p4d ³ D _{1°}	151.78	154.34		4.776E-1	
	4s ² 4p4d ³ D _{2°}	150.69	152.73		2.434E-1	
	4s ² 4p4d ¹ P _{1°}	139.11	141.28		1.439E-2	
4s ² 4p4p ³ P _{2°}	4s4p ² 4p ⁵ S _{2°}	402.54	373.24		6.463E-3	7.096E-3
	4s4p ² 4p ³ D _{1°}	312.06	302.50		6.672E-3	7.780E-3
	4s4p ² 4p ³ D _{2°}	305.05	294.03		1.876E-3	2.046E-3
	4s4p ² 4p ³ D _{3°}	287.65	278.34	277.86	6.245E-2	4.908E-2
	4s4p ² 4p ³ P _{1°}	255.02	249.39		6.959E-3	3.724E-3
	4s4p ³ ³ P _{2°}	250.31	245.66	245.57	1.745E-1	1.625E-1
	4s4p ² 4p ³ S _{1°}	216.43	220.98	221.40	2.632E-1	2.696E-1
	4s ² 4p4d ³ F _{2°}	192.93	192.29		2.260E-2	
	4s4p ² 4p ¹ D _{2°}	219.67	218.13		5.874E-2	1.383E-2
	4s ² 4p4d ³ P _{1°}	169.65	172.16		1.220E-3	
	4s ² 4p4d ³ F _{3°}	183.99	183.22		1.032E-1	
	4s ² 4p4d ³ P _{2°}	173.01	175.37		2.986E-1	
	4s4p ³ ¹ P _{1°}	187.99	190.97		7.300E-4	1.103E-3
	4s ² 4p4d ¹ D _{2°}	159.58	162.08		2.826E-1	
	4s ² 4p4d ³ D _{3°}	155.76	158.05		1.178	
	4s ² 4p4d ³ D _{1°}	156.78	158.28		9.210E-2	
	4s ² 4p4d ³ D _{2°}	154.19	156.37		1.822E-1	
	4s ² 4p4d ¹ F _{3°}	144.19	146.74		2.302E-1	
	4s ² 4p4d ¹ P _{1°}	142.06	144.38		6.740E-4	
4s ² 4p ² ¹ D _{2°}	4s4p ² 4p ⁵ S _{2°}	540.70	487.73		6.670E-4	7.962E-4
	4s4p ² 4p ³ D _{1°}	389.88	373.57		3.665E-3	3.474E-2
	4s4p ² 4p ³ D _{2°}	379.01	360.73		2.001E-3	1.674E-3
	4s4p ² 4p ³ D _{3°}	352.51	337.41	336.69	4.621E-2	3.990E-2
	4s4p ² 4p ³ P _{1°}	304.72	295.78		3.300E-5	3.096E-5
	4s4p ³ ³ P _{2°}	298.03	290.55		3.879E-3	6.934E-3
	4s4p ² 4p ³ S _{1°}	251.21	256.64		3.157E-3	6.180E-3
	4s ² 4p4d ³ F _{2°}	220.16	218.74		1.983E-1	
	4s4p ² 4p ¹ D _{2°}	255.68	252.81	252.73	3.025E-2	1.625E-1
	4s ² 4p4d ³ P _{1°}	190.36	193.06		3.288E-1	
	4s ² 4p4d ³ F _{3°}	208.61	207.09		3.470E-4	
	4s ² 4p4d ³ P _{2°}	194.60	197.11		4.744E-2	
	4s4p ³ ¹ P _{1°}	213.76	217.03	217.46	2.067E-1	2.576E-1
	4s ² 4p4d ¹ D _{2°}	177.78	180.48		2.083E-1	
	4s ² 4p4d ³ D _{3°}	173.04	175.49		1.998E-1	
	4s ² 4p4d ³ D _{1°}	173.04	175.49		8.988E-2	
	4s ² 4p4d ³ D _{2°}	171.11	173.42		5.433E-1	
	4s ² 4p4d ¹ F _{3°}	158.88	161.66		1.263	
	4s ² 4p4d ¹ P _{1°}	156.30	158.80		2.456E-3	
4s ² 4p ² ¹ S _{0°}	4s4p ² 4p ³ D _{1°}	471.47	439.04		2.834E-3	
	4s4p ² 4p ³ P _{1°}	352.39	335.39		2.377E-2	

4s4p ² 4p̄ ³ S _{1°}	282.73	285.94	8.647E-2	5.495E-2
4s ² 4p4d̄ ³ P _{1°}	207.97	209.18	3.427E-1	
4s ² 4p4d̄ ³ D _{1°}	187.48	188.71	6.360E-4	
4s ² 4p4d ¹ P _{1°}	167.99	169.55	2.545	

Table S11. Cross sections (cm²) for Ge-like Te²⁰⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and at scattered electron energies 50 – 5000 eV.

Transition		50	100	150	200	400	600	800	1000	1500	2000	2500	3000	3500	4000	4500	5000
<i>i</i>	<i>f</i>																
1	7	1.022E-17	7.354E-18	5.825E-18	4.860E-18	3.038E-18	2.278E-18	1.852E-18	1.572E-18	1.1635E-18	9.575E-19	8.083E-19	7.023E-19	6.226E-19	5.603E-19	5.103E-19	4.691E-19
1	11	9.835E-19	7.328E-19	5.917E-19	5.001E-19	3.205E-19	2.432E-19	1.991E-19	1.699E-19	1.2679E-19	1.043E-19	8.852E-20	7.721E-20	6.866E-20	6.196E-20	5.655E-20	5.208E-20
1	13	3.699E-18	2.807E-18	2.289E-18	1.949E-18	1.266E-18	9.669E-19	7.949E-19	6.804E-19	5.1E-19	4.194E-19	3.571E-19	3.122E-19	2.781E-19	2.513E-19	2.296E-19	2.117E-19
1	17	3.117E-18	2.431E-18	2.016E-18	1.736E-18	1.154E-18	8.922E-19	7.388E-19	6.357E-19	4.8012E-19	3.946E-19	3.377E-19	2.964E-19	2.648E-19	2.399E-19	2.197E-19	2.029E-19
1	19	1.639E-17	1.287E-17	1.072E-17	9.260E-18	6.197E-18	4.804E-18	3.985E-18	3.434E-18	2.5992E-18	2.125E-18	1.813E-18	1.589E-18	1.420E-18	1.287E-18	1.179E-18	1.090E-18
1	24	6.609E-20	5.273E-20	4.432E-20	3.853E-20	2.615E-20	2.040E-20	1.700E-20	1.469E-20	1.1182E-20	9.175E-21	7.847E-21	6.893E-21	6.170E-21	5.597E-21	5.135E-21	4.751E-21
1	27	4.687E-20	3.781E-20	3.201E-20	2.796E-20	1.916E-20	1.500E-20	1.253E-20	1.085E-20	8.2907E-21	6.813E-21	5.834E-21	5.132E-21	4.598E-21	4.174E-21	3.831E-21	3.547E-21
2	6	1.500E-18	1.008E-18	7.714E-19	6.294E-19	3.775E-19	2.775E-19	2.229E-19	1.876E-19	1.3688E-19	1.125E-19	9.416E-20	8.128E-20	7.170E-20	6.427E-20	5.834E-20	5.348E-20
2	7	4.896E-20	3.133E-20	2.264E-20	1.752E-20	8.922E-21	5.948E-21	4.495E-21	3.635E-21	2.5086E-21	1.989E-21	1.642E-21	1.407E-21	1.237E-21	1.108E-21	1.006E-21	9.231E-22
2	8	3.913E-18	2.748E-18	2.148E-18	1.777E-18	1.093E-18	8.132E-19	6.580E-19	5.566E-19	4.0968E-19	3.371E-19	2.836E-19	2.457E-19	2.174E-19	1.954E-19	1.777E-19	1.632E-19
2	10	1.218E-18	8.793E-19	6.976E-19	5.827E-19	3.650E-19	2.739E-19	2.228E-19	1.892E-19	1.4017E-19	1.153E-19	9.742E-20	8.467E-20	7.508E-20	6.759E-20	6.157E-20	5.661E-20
2	11	3.606E-18	2.614E-18	2.079E-18	1.739E-18	1.092E-18	8.212E-19	6.685E-19	5.681E-19	4.2112E-19	3.465E-19	2.928E-19	2.546E-19	2.259E-19	2.034E-19	1.853E-19	1.704E-19
2	12	7.560E-20	5.289E-20	4.079E-20	3.326E-20	1.952E-20	1.414E-20	1.126E-20	9.442E-21	6.8675E-21	5.585E-21	4.694E-21	4.066E-21	3.598E-21	3.253E-21	2.959E-21	2.718E-21
2	13	3.477E-18	2.573E-18	2.070E-18	1.744E-18	1.111E-18	8.411E-19	6.875E-19	5.860E-19	4.3648E-19	3.591E-19	3.044E-19	2.653E-19	2.358E-19	2.126E-19	1.940E-19	1.786E-19
2	14	1.035E-19	7.503E-20	5.921E-20	4.912E-20	2.999E-20	2.218E-20	1.788E-20	1.511E-20	1.1114E-20	9.068E-21	7.659E-21	6.657E-21	5.906E-21	5.351E-21	4.875E-21	4.484E-21
2	15	6.210E-19	4.654E-19	3.765E-19	3.185E-19	2.040E-19	1.546E-19	1.262E-19	1.075E-19	8.0011E-20	6.539E-20	5.541E-20	4.824E-20	4.284E-20	3.903E-20	3.557E-20	3.272E-20
2	17	1.159E-18	8.839E-19	7.230E-19	6.166E-19	4.018E-19	3.073E-19	2.529E-19	2.166E-19	1.6259E-19	1.337E-19	1.139E-19	9.967E-20	8.883E-20	8.030E-20	7.340E-20	6.768E-20
2	18	7.672E-18	5.890E-18	4.837E-18	4.139E-18	2.718E-18	2.088E-18	1.723E-18	1.478E-18	1.1122E-18	9.143E-19	7.803E-19	6.834E-19	6.097E-19	5.517E-19	5.047E-19	4.657E-19
2	19	2.060E-18	1.583E-18	1.301E-18	1.113E-18	7.314E-19	5.618E-19	4.634E-19	3.977E-19	2.9921E-19	2.459E-19	2.099E-19	1.838E-19	1.640E-19	1.484E-19	1.358E-19	1.253E-19
2	21	5.289E-18	4.137E-18	3.435E-18	2.962E-18	1.975E-18	1.528E-18	1.266E-18	1.090E-18	8.2447E-19	6.776E-19	5.803E-19	5.095E-19	4.554E-19	4.127E-19	3.780E-19	3.492E-19
2	22	1.737E-18	1.361E-18	1.131E-18	9.760E-19	6.516E-19	5.045E-19	4.183E-19	3.602E-19	2.7244E-19	2.239E-19	1.918E-19	1.684E-19	1.505E-19	1.364E-19	1.250E-19	1.154E-19
2	24	3.510E-18	2.755E-18	2.293E-18	1.981E-18	1.325E-18	1.027E-18	8.521E-19	7.342E-19	5.5561E-19	4.543E-19	3.876E-19	3.397E-19	3.036E-19	2.750E-19	2.521E-19	2.330E-19
2	25	1.133E-19	8.971E-20	7.495E-20	6.485E-20	4.352E-20	3.377E-20	2.806E-20	2.421E-20	1.8376E-20	1.506E-20	1.287E-20	1.130E-20	1.011E-20	9.170E-21	8.412E-21	7.781E-21
2	27	1.133E-19	8.971E-20	7.495E-20	6.485E-20	4.352E-20	3.377E-20	2.806E-20	2.421E-20	1.8376E-20	1.506E-20	1.287E-20	1.130E-20	1.011E-20	9.170E-21	8.412E-21	7.781E-21
3	6	7.214E-19	4.792E-19	3.643E-19	2.960E-19	1.761E-19	1.289E-19	1.033E-19	8.684E-20	6.3182E-20	5.190E-20	4.337E-20	3.740E-20	3.297E-20	2.954E-20	2.680E-20	2.456E-20
3	7	5.788E-19	3.991E-19	3.090E-19	2.541E-19	1.544E-19	1.143E-19	9.216E-20	7.777E-20	5.7007E-20	4.685E-20	3.933E-20	3.402E-20	3.007E-20	2.700E-20	2.454E-20	2.252E-20
3	8	1.170E-19	7.965E-20	6.084E-20	4.942E-20	2.903E-20	2.108E-20	1.682E-20	1.410E-20	1.0246E-20	8.375E-21	7.016E-21	6.063E-21	5.355E-21	4.813E-21	4.374E-21	4.013E-21
3	9	1.775E-18	1.247E-18	9.744E-19	8.053E-19	4.935E-19	3.665E-19	2.963E-19	2.505E-19	1.8429E-19	1.515E-19	1.275E-19	1.105E-19	9.781E-20	8.790E-20	7.996E-20	7.343E-20
3	11	1.474E-19	1.053E-19	8.290E-20	6.882E-20	4.246E-20	3.162E-20	2.561E-20	2.169E-20	1.6E-20	1.314E-20	1.108E-20	9.627E-21	8.532E-21	7.681E-21	6.994E-21	6.429E-21
3	12	4.602E-18	3.320E-18	2.633E-18	2.199E-18	1.376E-18	1.032E-18	8.397E-19	7.130E-19	5.2792E-19	4.344E-19	3.668E-19	3.188E-19	2.827E-19	2.545E-19	2.318E-19	2.131E-19
3	13	6.371E-18	4.690E-18	3.761E-18	3.165E-18	2.010E-18	1.518E-18	1.240E-18	1.056E-18	7.8588E-19	6.466E-19	5.477E-19	4.770E-19	4.237E-19	3.820E-19	3.483E-19	3.206E-19
3	14	4.955E-20	3.485E-20	2.685E-20	2.184E-20	1.262E-20	8.999E-21	7.053E-21	5.838E-21	4.1568E-21	3.298E-21	2.731E-21	2.335E-21	2.042E-21	1.921E-21	1.731E-21	1.576E-21
3	15	1.459E-18	1.090E-18	8.814E-19	7.454E-19	4.780E-19	3.628E-19	2.971E-19	2.536E-19	1.8937E-19	1.556E-19	1.321E-19	1.153E-19	1.026E-19	9.268E-20	8.461E-20	7.795E-20
3	16	2.134E-18	1.612E-18	1.311E-18	1.114E-18	7.220E-19	5.508E-19	4.525E-19	3.870E-19	2.8987E-19	2.380E-19	2.026E-19	1.771E-19	1.577E-19	1.427E-19	1.304E-19	1.202E-19
3	17	2.204E-20	1.601E-20	1.258E-20	1.038E-20	6.207E-21	4.514E-21	3.587E-21	2.997E-21	2.1663E-21	1.731E-21	1.448E-21	1.248E-21	1.100E-21	1.023E-21	9.275E-22	8.492E-22
3	18	3.189E-18	2.431E-18	1.989E-18	1.696E-18	1.106E-18	8.468E-19	6.970E-19	5.971E-19	4.4812E-19	3.683E-19	3.138E-19	2.746E-19	2.447E-19	2.214E-19	2.034E-19	1.866E-19
3	19	1.078E-19	8.098E-20	6.536E-20	5.513E-20	3.488E-20	2.621E-20	2.128E-20	1.805E-20	1.3352E-20	1.083E-20	9.164E-21	7.964E-21	7.062E-21	6.483E-21	5.901E-21	5.422E-21
3	21	3.412E-18	2.654E-18	2.196E-18	1.889E-18	1.252E-18	9.665E-19	7.996E-19	6.876E-19	5.1886E-19	4.265E-19	3.648E-19	3.200E-19	2.858E-19	2.589E-19	2.370E-19	2.188E-19
3	23	9.631E-18	7.529E-18	6.249E-18	5.388E-18	3.591E-18	2.779E-18	2.303E-18	1.983E-18	1.4989E-18	1.232E-18	1.054E-18	9.261E-19	8.279E-19	7.503E-19	6.871E-19	6.348E-19
3	24	7.006E-19	5.468E-19	4.533E-19	3.904E-19	2.595E-19	2.005E-19	1.660E-19	1.428E-19	1.0789E-19	8.863E-20	7.586E-20	6.658E-20	5.950E-20	5.393E-20	4.939E-20	4.561E-20
3	25	7.960E-19	6.230E-19	5.173E-19	4.460E-19	2.971E-19	2.298E-19	1.903E-19	1.637E-19	1.237E-19	1.015E-19	8.691E-20	7.629E-20	6.818E-20	6.190E-20	5.668E-20	5.235E-20
3	26	1.454E-18	1.150E-18	9.620E-19	8.333E-19	5.612E-19	4.363E-19	3.625E-19	3.127E-19	2.371E-19	1.941E-19	1.657E-19	1.454E-19	1.300E-19	1.178E-19	1.080E-19	9.987E-20
3	27	3.186E-20	2.433E-20	1.976E-20	1.669E-20	1.047E-20	7.753E-21	6.198E-21	5.187E-21	3.745E-21	2.969E-21	2.465E-21	2.110E-21	1.846E-21	1.641E-21	1.480E-21	1.349E-21
4	6	9.534E-20	5.983E-20	4.430E-20	3.547E-20	2.055E-20	1.486E-20	1.182E-20	9.877E-21	7.110E-21	5.831E-21	4.843E-21	4.158E-21	3.652E-21	3.263E-21	2.954E-21	2.701E-21
4	7	2.319E-19	1.524E-19	1.154E-19	9.360E-20	5.552E-20	4.061E-20	3.252E-20	2.731E-20	1.984E-20	1.629E-20	1.360E-20	1.172E-20	1.032E-20	9.250E-21	8.389E-21	7.684E-21

4	8	2.108E-19	1.384E-19	1.042E-19	8.411E-20	4.906E-20	3.557E-20	2.834E-20	2.373E-20	1.717E-20	1.408E-20	1.174E-20	1.012E-20	8.917E-21	7.987E-21	7.244E-21	6.637E-21
4	9	2.820E-18	1.905E-18	1.461E-18	1.194E-18	7.191E-19	5.297E-19	4.260E-19	3.588E-19	2.620E-19	2.155E-19	1.804E-19	1.558E-19	1.375E-19	1.232E-19	1.119E-19	1.026E-19
4	11	3.655E-20	2.419E-20	1.808E-20	1.443E-20	8.090E-21	5.729E-21	4.501E-21	3.736E-21	2.678E-21	2.170E-21	1.811E-21	1.561E-21	1.377E-21	1.236E-21	1.123E-21	1.031E-21
4	12	5.640E-19	3.893E-19	3.012E-19	2.473E-19	1.496E-19	1.104E-19	8.889E-20	7.494E-20	5.488E-20	4.505E-20	3.781E-20	3.271E-20	2.891E-20	2.599E-20	2.362E-20	2.167E-20
4	13	2.828E-19	2.006E-19	1.576E-19	1.308E-19	8.083E-20	6.026E-20	4.882E-20	4.133E-20	3.047E-20	2.506E-20	2.110E-20	1.830E-20	1.621E-20	1.458E-20	1.327E-20	1.219E-20
4	14	3.572E-18	2.551E-18	2.012E-18	1.674E-18	1.040E-18	7.776E-19	6.310E-19	5.349E-19	3.951E-19	3.251E-19	2.741E-19	2.380E-19	2.108E-19	1.896E-19	1.726E-19	1.586E-19
4	15	1.402E-18	1.015E-18	8.069E-19	6.745E-19	4.229E-19	3.175E-19	2.583E-19	2.194E-19	1.625E-19	1.337E-19	1.129E-19	9.821E-20	8.712E-20	7.846E-20	7.148E-20	6.574E-20
4	16	6.428E-20	4.540E-20	3.522E-20	2.884E-20	1.706E-20	1.239E-20	9.861E-21	8.258E-21	5.993E-21	4.844E-21	4.059E-21	3.505E-21	3.092E-21	2.831E-21	2.569E-21	2.354E-21
4	17	4.914E-18	3.621E-18	2.906E-18	2.445E-18	1.554E-18	1.174E-18	9.591E-19	8.170E-19	6.079E-19	5.001E-19	4.237E-19	3.691E-19	3.279E-19	2.956E-19	2.696E-19	2.482E-19
4	18	5.535E-19	4.100E-19	3.300E-19	2.782E-19	1.774E-19	1.342E-19	1.097E-19	9.356E-20	6.968E-20	5.732E-20	4.859E-20	4.235E-20	3.763E-20	3.395E-20	3.097E-20	2.851E-20
4	19	9.835E-19	7.310E-19	5.893E-19	4.976E-19	3.181E-19	2.411E-19	1.972E-19	1.682E-19	1.254E-19	1.032E-19	8.755E-20	7.634E-20	6.787E-20	6.124E-20	5.588E-20	5.145E-20
4	21	1.381E-18	1.043E-18	8.486E-19	7.206E-19	4.651E-19	3.539E-19	2.902E-19	2.479E-19	1.852E-19	1.520E-19	1.292E-19	1.128E-19	1.003E-19	9.096E-20	8.304E-20	7.650E-20
4	23	2.006E-18	1.524E-18	1.244E-18	1.059E-18	6.888E-19	5.263E-19	4.326E-19	3.703E-19	2.775E-19	2.279E-19	1.941E-19	1.697E-19	1.512E-19	1.369E-19	1.251E-19	1.153E-19
4	24	1.407E-18	1.071E-18	8.755E-19	7.463E-19	4.864E-19	3.722E-19	3.063E-19	2.624E-19	1.969E-19	1.618E-19	1.379E-19	1.206E-19	1.075E-19	9.727E-20	8.892E-20	8.202E-20
4	25	7.191E-18	5.501E-18	4.508E-18	3.851E-18	2.521E-18	1.933E-18	1.593E-18	1.366E-18	1.026E-18	8.441E-19	7.198E-19	6.301E-19	5.620E-19	5.083E-19	4.648E-19	4.288E-19
4	26	1.181E-17	9.149E-18	7.555E-18	6.488E-18	4.295E-18	3.312E-18	2.739E-18	2.354E-18	1.775E-18	1.459E-18	1.247E-18	1.093E-18	9.770E-19	8.847E-19	8.098E-19	7.477E-19
4	27	9.098E-20	6.892E-20	5.585E-20	4.719E-20	2.980E-20	2.222E-20	1.787E-20	1.504E-20	1.095E-20	8.768E-21	7.322E-21	6.294E-21	5.5274E-21	5.202E-21	4.697E-21	4.286E-21
5	7	2.587E-19	1.659E-19	1.242E-19	1.001E-19	5.884E-20	4.285E-20	3.423E-20	2.868E-20	2.075E-20	1.705E-20	1.419E-20	1.220E-20	1.073E-20	9.597E-21	8.692E-21	7.954E-21
5	11	1.834E-18	1.239E-18	9.501E-19	7.760E-19	4.658E-19	3.426E-19	2.753E-19	2.317E-19	1.691E-19	1.390E-19	1.164E-19	1.005E-19	8.872E-20	7.957E-20	7.225E-20	6.625E-20
5	13	2.963E-18	2.066E-18	1.610E-18	1.329E-18	8.142E-19	6.048E-19	4.888E-19	4.132E-19	3.036E-19	2.499E-19	2.100E-19	1.818E-19	1.608E-19	1.444E-19	1.313E-19	1.205E-19
5	17	6.867E-18	4.980E-18	3.961E-18	3.314E-18	2.081E-18	1.564E-18	1.273E-18	1.082E-18	8.021E-19	6.602E-19	5.578E-19	4.850E-19	4.302E-19	3.874E-19	3.529E-19	3.245E-19
5	19	2.845E-19	2.078E-19	1.658E-19	1.389E-19	8.735E-20	6.565E-20	5.345E-20	4.544E-20	3.370E-20	2.775E-20	2.346E-20	2.040E-20	1.810E-20	1.630E-20	1.484E-20	1.365E-20
5	24	7.162E-20	5.114E-20	3.981E-20	3.264E-20	1.926E-20	1.399E-20	1.118E-20	9.405E-21	6.889E-21	5.602E-21	4.735E-21	4.121E-21	3.660E-21	3.299E-21	3.009E-21	2.770E-21
5	27	2.654E-17	2.038E-17	1.674E-17	1.432E-17	9.411E-18	7.230E-18	5.965E-18	5.118E-18	3.850E-18	3.165E-18	2.701E-18	2.366E-18	2.111E-18	1.910E-18	1.747E-18	1.612E-18

Table S12. Cross sections (cm²) for Ge-like Sb¹⁹⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and at scattered electron energies 50 – 5000 eV.

Transition		50	100	150	200	400	600	800	1000	1500	2000	2500	3000	3500	4000	4500	5000
<i>i</i>	<i>f</i>																
1	7	1.092E+03	7.798E-18	6.153E-18	5.123E-18	3.193E-18	2.391E-18	1.942E-18	1.648E-18	1.218E-18	1.002E-18	8.454E-19	7.339E-19	6.502E-19	5.85E-19	5.325E-19	4.894E-19
1	11	1.113E-18	8.216E-19	6.604E-19	5.566E-19	3.552E-19	2.690E-19	2.200E-19	1.876E-19	1.398E-19	1.150E-19	9.750E-20	8.496E-20	7.550E-20	6.808E-20	6.211E-20	5.718E-20
1	13	4.190E-18	3.154E-18	2.563E-18	2.177E-18	1.409E-18	1.075E-18	8.831E-19	7.555E-19	5.658E-19	4.654E-19	3.958E-19	3.457E-19	3.077E-19	2.779E-19	2.538E-19	2.339E-19
1	17	2.135E-18	1.651E-18	1.363E-18	1.170E-18	1.170E-18	5.980E-19	4.945E-19	4.251E-19	3.207E-19	2.638E-19	2.254E-19	1.976E-19	1.764E-19	1.597E-19	1.461E-19	1.349E-19
1	19	1.943E-17	1.517E-17	1.259E-17	1.086E-17	7.256E-18	5.624E-18	4.663E-18	4.017E-18	3.039E-18	2.499E-18	2.140E-18	1.878E-18	1.679E-18	1.521E-18	1.393E-18	1.287E-18
1	23	9.482E-20	7.515E-20	6.296E-20	5.465E-20	3.696E-20	2.883E-20	2.400E-20	2.074E-20	1.577E-20	1.293E-20	1.106E-20	9.708E-21	8.686E-21	7.875E-21	7.221E-21	6.677E-21
1	27	5.564E-20	4.459E-20	3.761E-20	3.280E-20	2.239E-20	1.752E-20	1.462E-20	1.266E-20	9.661E-21	7.933E-21	6.795E-21	5.970E-21	5.347E-21	4.852E-21	4.452E-21	4.118E-21
2	6	1.422E-18	9.492E-19	7.237E-19	5.896E-19	3.526E-19	2.589E-19	2.079E-19	1.749E-19	1.275E-19	1.046E-19	8.751E-20	7.551E-20	6.658E-20	5.967E-20	5.415E-20	4.963E-20
2	7	3.788E-20	2.295E-20	1.577E-20	1.165E-20	5.070E-21	3.017E-21	2.103E-21	1.603E-21	1.007E-21	7.534E-22	6.026E-22	5.074E-22	4.420E-22	3.937E-22	3.563E-22	3.263E-22
2	8	4.479E-18	3.122E-18	2.433E-18	2.010E-18	1.233E-18	9.168E-19	7.415E-19	6.271E-19	4.612E-19	3.791E-19	3.187E-19	2.760E-19	2.441E-19	2.193E-19	1.994E-19	1.830E-19
2	10	1.334E-18	9.561E-19	7.560E-19	6.302E-19	3.938E-19	2.953E-19	2.401E-19	2.038E-19	1.508E-19	1.240E-19	1.046E-19	9.091E-20	8.057E-20	7.251E-20	6.602E-20	6.069E-20
2	11	3.837E-18	2.760E-18	2.187E-18	1.826E-18	1.144E-18	8.590E-19	6.989E-19	5.936E-19	4.396E-19	3.616E-19	3.053E-19	2.653E-19	2.352E-19	2.117E-19	1.928E-19	1.773E-19
2	12	6.119E-20	4.186E-20	3.177E-20	2.559E-20	1.457E-20	1.039E-20	8.210E-21	6.843E-21	4.940E-21	4.000E-21	3.352E-21	2.899E-21	2.561E-21	2.316E-21	2.106E-21	1.933E-21
2	13	3.889E-18	2.860E-18	2.294E-18	1.931E-18	1.228E-18	9.288E-19	7.590E-19	6.468E-19	4.815E-19	3.960E-19	3.355E-19	2.922E-19	2.596E-19	2.340E-19	2.134E-19	1.964E-19
2	14	1.414E-19	1.020E-19	8.043E-20	6.675E-20	4.096E-20	3.043E-20	2.461E-20	2.083E-20	1.537E-20	1.258E-20	1.063E-20	9.250E-21	8.210E-21	7.417E-21	6.761E-21	6.221E-21
2	15	5.943E-19	4.424E-19	3.567E-19	3.011E-19	1.922E-19	1.453E-19	1.185E-19	1.008E-19	7.493E-20	6.115E-20	5.172E-20	4.498E-20	3.989E-20	3.639E-20	3.314E-20	3.046E-20
2	17	1.644E-18	1.245E-18	1.015E-18	8.640E-19	5.616E-19	4.293E-19	3.531E-19	3.023E-19	2.267E-19	1.865E-19	1.587E-19	1.387E-19	1.236E-19	1.117E-19	1.020E-19	9.408E-20

2	18	8.219E-18	6.281E-18	5.150E-18	4.401E-18	2.889E-18	2.220E-18	1.831E-18	1.571E-18	1.182E-18	9.720E-19	8.290E-19	7.257E-19	6.473E-19	5.855E-19	5.355E-19	4.940E-19
2	19	1.834E-18	1.403E-18	1.151E-18	9.840E-19	6.455E-19	4.959E-19	4.090E-19	3.509E-19	2.641E-19	2.171E-19	1.852E-19	1.621E-19	1.446E-19	1.308E-19	1.196E-19	1.104E-19
2	21	5.813E-18	4.521E-18	3.745E-18	3.225E-18	2.146E-18	1.661E-18	1.375E-18	1.184E-18	8.951E-19	7.361E-19	6.298E-19	5.526E-19	4.937E-19	4.472E-19	4.095E-19	3.781E-19
2	22	1.913E-18	1.490E-18	1.236E-18	1.065E-18	7.096E-19	5.494E-19	4.553E-19	3.920E-19	2.964E-19	2.437E-19	2.086E-19	1.830E-19	1.635E-19	1.481E-19	1.356E-19	1.253E-19
2	23	3.960E-18	3.092E-18	2.567E-18	2.213E-18	1.478E-18	1.145E-18	9.498E-19	8.181E-19	6.190E-19	5.091E-19	4.358E-19	3.826E-19	3.420E-19	3.098E-19	2.838E-19	2.621E-19
2	25	1.431E-18	1.119E-18	9.301E-19	8.026E-19	5.363E-19	4.158E-19	3.448E-19	2.971E-19	2.249E-19	1.848E-19	1.583E-19	1.390E-19	1.242E-19	1.126E-19	1.032E-19	9.534E-20
2	27	1.220E-19	9.599E-20	7.996E-20	6.909E-20	4.624E-20	3.589E-20	2.981E-20	2.571E-20	1.951E-20	1.599E-20	1.367E-20	1.199E-20	1.072E-20	9.724E-21	8.917E-21	8.244E-21
3	6	6.967E-19	4.594E-19	3.480E-19	2.823E-19	1.674E-19	1.225E-19	9.812E-20	8.240E-20	5.991E-20	4.912E-20	4.103E-20	3.537E-20	3.117E-20	2.792E-20	2.532E-20	2.320E-20
3	7	5.336E-19	3.656E-19	2.823E-19	2.318E-19	1.406E-19	1.039E-19	8.377E-20	7.067E-20	5.177E-20	4.250E-20	3.565E-20	3.083E-20	2.724E-20	2.446E-20	2.222E-20	2.039E-20
3	8	1.264E-19	8.522E-20	6.476E-20	5.243E-20	3.063E-20	2.221E-20	1.770E-20	1.483E-20	1.077E-20	8.794E-21	7.361E-21	6.359E-21	5.614E-21	5.045E-21	4.583E-21	4.205E-21
3	9	2.033E-18	1.417E-18	1.103E-18	9.104E-19	5.565E-19	4.129E-19	3.337E-19	2.820E-19	2.073E-19	1.703E-19	1.432E-19	1.240E-19	1.097E-19	9.857E-20	8.963E-20	8.230E-20
3	11	1.706E-19	1.209E-19	9.484E-20	7.857E-20	4.836E-20	3.599E-20	2.914E-20	2.467E-20	1.819E-20	1.493E-20	1.259E-20	1.092E-20	9.678E-21	8.709E-21	7.927E-21	7.285E-21
3	12	5.047E-18	3.614E-18	2.857E-18	2.381E-18	1.486E-18	1.114E-18	9.056E-19	7.686E-19	5.686E-19	5.686E-19	3.946E-19	3.427E-19	3.037E-19	2.733E-19	2.488E-19	2.287E-19
3	13	7.073E-18	5.174E-18	4.139E-18	3.477E-18	2.204E-18	1.664E-18	1.358E-18	1.157E-18	8.604E-19	7.077E-19	5.990E-19	5.214E-19	4.629E-19	4.172E-19	3.803E-19	3.500E-19
3	14	1.409E-19	1.012E-19	7.975E-20	6.614E-20	4.051E-20	3.000E-20	2.418E-20	2.042E-20	1.499E-20	1.221E-20	1.027E-20	8.902E-21	7.871E-21	7.169E-21	6.514E-21	5.977E-21
3	15	1.434E-18	1.065E-18	8.592E-19	7.255E-19	4.643E-19	3.523E-19	2.884E-19	2.461E-19	1.837E-19	1.509E-19	1.281E-19	1.117E-19	9.937E-20	8.973E-20	8.189E-20	7.543E-20
3	16	2.099E-18	1.577E-18	1.280E-18	1.086E-18	7.023E-19	5.357E-19	4.398E-19	3.761E-19	2.817E-19	2.313E-19	1.967E-19	1.718E-19	1.530E-19	1.384E-19	1.264E-19	1.165E-19
3	17	1.285E-20	8.874E-21	6.687E-21	5.324E-21	2.876E-21	1.964E-21	1.495E-21	1.212E-21	8.367E-22	6.461E-22	5.280E-22	4.475E-22	3.889E-22	3.706E-22	3.328E-22	3.021E-22
3	18	3.522E-18	2.673E-18	2.182E-18	1.859E-18	1.211E-18	9.275E-19	7.633E-19	6.538E-19	4.907E-19	4.034E-19	3.436E-19	3.004E-19	2.677E-19	2.421E-19	2.212E-19	2.040E-19
3	19	1.315E-19	9.831E-20	7.921E-20	6.675E-20	4.224E-20	3.178E-20	2.581E-20	2.191E-20	1.623E-20	1.318E-20	1.114E-20	9.681E-21	8.582E-21	7.870E-21	7.164E-21	6.582E-21
3	21	3.565E-18	2.757E-18	2.275E-18	1.954E-18	1.293E-18	9.974E-19	8.246E-19	7.089E-19	5.348E-19	4.398E-19	3.758E-19	3.294E-19	2.941E-19	2.663E-19	2.437E-19	2.249E-19
3	23	7.969E-19	6.183E-19	5.113E-19	4.397E-19	2.917E-19	2.253E-19	1.864E-19	1.604E-19	1.211E-19	9.956E-20	8.513E-20	7.466E-20	6.669E-20	6.042E-20	5.531E-20	5.107E-20
3	24	1.067E-17	8.297E-18	6.872E-18	5.915E-18	3.936E-18	3.046E-18	2.523E-18	2.171E-18	1.641E-18	1.350E-18	1.154E-18	1.013E-18	9.053E-19	8.201E-19	7.508E-19	6.934E-19
3	25	1.040E-18	8.095E-19	6.706E-19	5.773E-19	3.840E-19	2.970E-19	2.458E-19	2.115E-19	1.598E-19	1.312E-19	1.122E-19	9.850E-20	8.799E-20	7.983E-20	7.308E-20	6.748E-20
3	26	1.679E-18	1.322E-18	1.102E-18	9.542E-19	6.414E-19	4.987E-19	4.142E-19	3.572E-19	2.708E-19	2.219E-19	1.894E-19	1.660E-19	1.483E-19	1.344E-19	1.231E-19	1.138E-19
3	27	3.520E-20	2.665E-20	2.154E-20	1.813E-20	1.130E-20	8.356E-21	6.668E-21	5.578E-21	4.027E-21	3.187E-21	2.642E-21	2.258E-21	1.974E-21	1.755E-21	1.582E-21	1.440E-21
4	6	1.004E-19	6.279E-20	4.642E-20	3.715E-20	2.148E-20	1.552E-20	1.234E-20	1.031E-20	7.424E-21	6.073E-21	5.043E-21	4.330E-21	3.803E-21	3.398E-21	3.076E-21	2.813E-21
4	7	2.541E-19	1.666E-19	1.260E-19	1.021E-19	6.057E-20	4.430E-20	3.548E-20	2.979E-20	2.164E-20	1.775E-20	1.481E-20	1.276E-20	1.124E-20	1.007E-20	9.134E-21	8.368E-21
4	8	2.053E-19	1.339E-19	1.004E-19	8.084E-20	4.692E-20	3.395E-20	2.703E-20	2.261E-20	1.636E-20	1.338E-20	1.116E-20	9.616E-21	8.469E-21	7.585E-21	6.879E-21	6.301E-21
4	9	2.948E-18	1.981E-18	1.516E-18	1.238E-18	7.447E-19	5.483E-19	4.409E-19	3.713E-19	2.711E-19	2.226E-19	1.863E-19	1.608E-19	1.418E-19	1.272E-19	1.154E-19	1.058E-19
4	11	2.532E-20	1.611E-20	1.165E-20	9.044E-21	4.689E-21	3.177E-21	2.430E-21	1.982E-21	1.386E-21	1.107E-21	9.170E-22	7.877E-22	6.936E-22	6.224E-22	5.651E-22	5.183E-22
4	12	4.922E-19	3.370E-19	2.596E-19	2.126E-19	1.279E-19	9.417E-20	7.573E-20	6.379E-20	4.666E-20	3.823E-20	3.207E-20	2.773E-20	2.450E-20	2.202E-20	2.001E-20	1.836E-20
4	13	2.515E-19	1.775E-19	1.392E-19	1.154E-19	7.121E-20	5.307E-20	4.298E-20	3.639E-20	2.682E-20	2.203E-20	1.855E-20	1.608E-20	1.424E-20	1.281E-20	1.165E-20	1.070E-20
4	14	4.576E-18	3.249E-18	2.556E-18	2.123E-18	1.317E-18	9.843E-19	7.986E-19	6.769E-19	4.997E-19	4.109E-19	3.463E-19	3.004E-19	2.660E-19	2.393E-19	2.177E-19	2.001E-19
4	15	1.146E-18	8.273E-19	6.565E-19	5.484E-19	3.438E-19	2.582E-19	2.101E-19	1.785E-19	1.322E-19	1.087E-19	9.184E-20	7.983E-20	7.079E-20	6.376E-20	5.808E-20	5.341E-20
4	16	6.219E-20	4.326E-20	3.319E-20	2.695E-20	1.562E-20	1.123E-20	8.882E-21	7.407E-21	5.345E-21	4.297E-21	3.587E-21	3.090E-21	2.720E-21	2.501E-21	2.265E-21	2.073E-21
4	17	5.920E-18	4.337E-18	3.471E-18	2.917E-18	1.850E-18	1.398E-18	1.141E-18	9.722E-19	7.231E-19	5.948E-19	5.035E-19	4.384E-19	3.893E-19	3.509E-19	3.199E-19	2.944E-19
4	18	6.230E-19	4.602E-19	3.700E-19	3.119E-19	1.989E-19	1.506E-19	1.232E-19	1.050E-19	7.826E-20	6.436E-20	5.455E-20	4.753E-20	4.223E-20	3.809E-20	3.475E-20	3.199E-20
4	19	6.568E-19	4.868E-19	3.921E-19	3.309E-19	2.116E-19	1.605E-19	1.313E-19	1.121E-19	8.361E-20	6.877E-20	5.833E-20	5.085E-20	4.520E-20	4.078E-20	3.721E-20	3.426E-20
4	21	1.783E-18	1.783E-18	1.089E-18	9.247E-19	5.971E-19	4.547E-19	3.729E-19	3.187E-19	2.383E-19	1.956E-19	1.662E-19	1.451E-19	1.291E-19	1.169E-19	1.067E-19	9.831E-20
4	23	1.418E-18	1.075E-18	8.770E-19	7.468E-19	4.863E-19	3.722E-19	3.063E-19	2.624E-19	1.969E-19	1.619E-19	1.379E-19	1.206E-19	1.074E-19	9.716E-20	8.880E-20	8.189E-20
4	24	2.296E-18	1.738E-18	1.416E-18	1.205E-18	7.834E-19	5.988E-19	4.923E-19	4.214E-19	3.160E-19	2.596E-19	2.210E-19	1.931E-19	1.720E-19	1.557E-19	1.423E-19	1.312E-19
4	25	7.538E-18	5.739E-18	4.696E-18	4.007E-18	2.621E-18	2.010E-18	1.656E-18	1.420E-18	1.067E-18	8.778E-19	8.778E-19	6.546E-19	5.836E-19	5.277E-19	4.824E-19	4.450E-19
4	26	1.275E-17	9.844E-18	8.117E-18	6.965E-18	4.608E-18	3.556E-18	2.940E-18	2.527E-18	1.906E-18	1.567E-18	1.339E-18	1.174E-18	1.048E-18	9.490E-19	8.685E-19	8.017E-19
4	27	9.981E-20	7.510E-20	6.064E-20	5.112E-20	3.215E-20	2.392E-20	1.919E-20	1.614E-20	1.174E-20	9.377E-21	7.811E-21	6.701E-21	5.875E-21	5.532E-21	4.992E-21	4.550E-21
5	7	2.810E-19	1.798E-19	1.345E-19	1.085E-19	6.376E-20	4.644E-20	3.710E-20	3.249E-20	1.844E-20	1.535E-20	1.320E-20	1.160E-20	1.038E-20	9.401E-21	8.602E-21	
5	11	1.819E-18	1.221E-18	9.332E-19	9.332E-19	4.558E-19	3.349E-19	2.690E-19	2.263E-19	1.651E-19	1.355E-19	1.134E-19	9.791E-20	8.639E-20	7.745E-20	7.032E-20	6.447E-20
5	13	3.184E-18	2.211E-18	1.720E-18	1.418E-18	8.688E-19	6.453E-19	5.216E-19	4.409E-19	3.240E-19	2.663E-19	2.238E-19	1.937E-19	1.712E-19	1.538E-19	1.398E-19	1.283E-19
5	17	7.966E-18	5.741E-18	4.554E-18	3.803E-18	2.384E-18	1.790E-18	1.457E-18	1.238E-18	9.171E-19	7.544E-19	6.371E-19	5.536E-19	4.908E-19	4.418E-19	4.024E-19	3.699E-19
5	19	8.556E-20	6.199E-20	4.922E-20	4.110E-20	2.563E-20	1.918E-20	1.559E-20	1.323E-20	9.800E-21	8.065E-21	6.809E-21	5.916E-21	5.243E-21	4.717E-21	4.294E-21	3.946E-21
5	23	6.140E-20	4.278E-20	3.270E-20	2.642E-20	1.504E-20	1.074E-20	8.500E-21	7.111E-21	5.170E-21	4.189E-21	3.533E-21	3.071E-21	2.724E-21	2.454E-21	2.237E-21	2.058E-21
5	27	2.887E-17	2.206E-17	1.809E-17	1.547E-17	1.015E-17											

Table S13. Cross sections (cm²) for Ge-like Sn¹⁸⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and at scattered electron energies 50 – 5000 eV.

Transition		50	100	150	200	400	600	800	1000	1500	2000	2500	3000	3500	4000	4500	5000
<i>i</i>	<i>f</i>																
1	7	1.168E-17	8.264E-18	6.497E-18	5.398E-18	3.355E-18	2.512E-18	2.039E-18	1.729E-18	1.276E-18	1.049E-18	8.839E-19	7.667E-19	6.789E-19	6.105E-19	5.556E-19	5.105E-19
1	11	1.274E-18	9.318E-19	7.456E-19	6.268E-19	3.985E-19	3.016E-19	2.463E-19	2.100E-19	1.562E-19	1.284E-19	1.087E-19	9.462E-20	8.402E-20	7.572E-20	6.904E-20	6.354E-20
1	13	4.754E-18	3.552E-18	2.876E-18	2.437E-18	1.573E-18	1.200E-18	9.844E-19	8.419E-19	6.296E-19	5.178E-19	4.399E-19	3.839E-19	3.415E-19	3.083E-19	2.814E-19	2.593E-19
1	16	1.762E-18	1.351E-18	1.111E-18	9.515E-19	6.273E-19	4.835E-19	3.994E-19	3.431E-19	2.585E-19	2.126E-19	1.814E-19	1.589E-19	1.417E-19	1.282E-19	1.173E-19	1.082E-19
1	19	2.211E-17	1.717E-17	1.422E-17	1.225E-17	8.165E-18	6.330E-18	5.247E-18	4.519E-18	3.419E-18	2.811E-18	2.405E-18	2.109E-18	1.884E-18	1.707E-18	1.563E-18	1.443E-18
1	23	1.369E-19	1.079E-19	9.008E-20	7.806E-20	5.264E-20	4.106E-20	3.416E-20	2.951E-20	2.243E-20	1.838E-20	1.570E-20	1.377E-20	1.232E-20	1.117E-20	1.024E-20	9.556E-21
1	27	6.567E-20	5.228E-20	4.396E-20	3.827E-20	2.602E-20	2.035E-20	1.698E-20	1.470E-20	1.121E-20	9.198E-21	7.868E-21	6.910E-21	6.187E-21	5.612E-21	5.148E-21	4.706E-21
2	6	1.333E-18	8.824E-19	6.704E-19	5.453E-19	3.253E-19	2.388E-19	1.914E-19	1.610E-19	1.172E-19	9.602E-20	8.025E-20	6.921E-20	6.100E-20	5.466E-20	4.959E-20	4.544E-20
2	7	3.430E-20	1.973E-20	1.288E-20	9.035E-21	3.186E-21	1.546E-21	8.906E-22	5.690E-22	2.392E-22	1.222E-22	7.249E-23	4.884E-23	3.663E-23	2.964E-23	2.527E-23	2.227E-23
2	8	5.107E-18	3.534E-18	2.746E-18	2.264E-18	1.387E-18	1.031E-18	8.331E-19	7.044E-19	5.173E-19	4.248E-19	3.569E-19	3.089E-19	2.731E-19	2.452E-19	2.229E-19	2.046E-19
2	10	1.464E-18	1.041E-18	8.202E-19	6.825E-19	4.256E-19	3.192E-19	2.592E-19	2.200E-19	1.626E-19	1.336E-19	1.126E-19	9.776E-20	8.660E-20	7.790E-20	7.091E-20	6.517E-20
2	11	4.078E-18	2.911E-18	2.299E-18	1.915E-18	1.197E-18	8.986E-19	7.303E-19	6.202E-19	4.586E-19	3.769E-19	3.180E-19	2.761E-19	2.447E-19	2.201E-19	2.004E-19	1.842E-19
2	12	4.690E-20	3.104E-20	2.297E-20	1.812E-20	9.771E-21	6.778E-21	5.258E-21	4.336E-21	3.081E-21	2.473E-21	2.062E-21	1.777E-21	1.583E-21	1.419E-21	1.289E-21	1.182E-21
2	13	4.345E-18	3.177E-18	2.542E-18	2.136E-18	1.356E-18	1.026E-18	8.380E-19	7.142E-19	5.311E-19	4.367E-19	3.697E-19	3.218E-19	2.857E-19	2.575E-19	2.348E-19	2.161E-19
2	14	1.739E-19	1.244E-19	9.772E-20	8.095E-20	4.963E-20	3.692E-20	2.987E-20	2.530E-20	1.868E-20	1.529E-20	1.292E-20	1.124E-20	9.984E-21	8.995E-21	8.199E-21	7.544E-21
2	15	5.829E-19	4.310E-19	3.463E-19	2.918E-19	1.856E-19	1.402E-19	1.142E-19	9.705E-20	7.198E-20	5.863E-20	4.951E-20	4.299E-20	3.868E-20	3.479E-20	3.166E-20	2.909E-20
2	16	2.052E-18	1.543E-18	1.254E-18	1.065E-18	6.904E-19	5.277E-19	4.336E-19	3.712E-19	2.781E-19	2.287E-19	1.945E-19	1.698E-19	1.512E-19	1.365E-19	1.247E-19	1.149E-19
2	18	8.799E-18	6.696E-18	5.480E-18	4.680E-18	3.070E-18	2.361E-18	1.947E-18	1.671E-18	1.257E-18	1.033E-18	8.808E-19	7.707E-19	6.872E-19	6.214E-19	5.681E-19	5.241E-19
2	19	1.727E-18	1.315E-18	1.077E-18	9.194E-19	6.027E-19	4.634E-19	3.821E-19	3.279E-19	2.467E-19	2.028E-19	1.729E-19	1.513E-19	1.350E-19	1.221E-19	1.116E-19	1.030E-19
2	21	6.391E-18	4.945E-18	4.086E-18	3.514E-18	2.335E-18	1.807E-18	1.496E-18	1.288E-18	9.733E-19	8.004E-19	6.841E-19	5.999E-19	5.357E-19	4.850E-19	4.439E-19	4.099E-19
2	22	2.113E-18	1.637E-18	1.354E-18	1.165E-18	7.751E-19	6.003E-19	4.973E-19	4.281E-19	3.236E-19	2.661E-19	2.275E-19	1.995E-19	1.782E-19	1.614E-19	1.477E-19	1.364E-19
2	23	4.470E-18	3.472E-18	2.875E-18	2.477E-18	1.651E-18	1.280E-18	1.061E-18	9.134E-19	6.910E-19	5.682E-19	4.860E-19	4.264E-19	3.809E-19	3.450E-19	3.158E-19	2.917E-19
2	25	1.801E-18	1.401E-18	1.161E-18	1.001E-18	6.676E-19	5.178E-19	4.293E-19	3.698E-19	2.799E-19	2.301E-19	1.969E-19	1.727E-19	1.544E-19	1.399E-19	1.281E-19	1.183E-19
2	27	1.306E-19	1.021E-19	8.484E-20	7.320E-20	4.888E-20	3.795E-20	3.151E-20	2.719E-20	2.063E-20	1.690E-20	1.443E-20	1.266E-20	1.132E-20	1.026E-20	9.406E-21	8.807E-21
3	6	6.696E-19	4.380E-19	3.306E-19	2.678E-19	1.584E-19	1.158E-19	9.258E-20	7.771E-20	5.642E-20	4.619E-20	3.856E-20	3.322E-20	2.927E-20	2.621E-20	2.377E-20	2.177E-20
3	7	4.862E-19	3.309E-19	2.547E-19	2.088E-19	1.264E-19	9.344E-20	7.523E-20	6.345E-20	4.642E-20	3.806E-20	3.191E-20	2.759E-20	2.438E-20	2.187E-20	1.987E-20	1.823E-20
3	8	1.332E-19	8.878E-20	6.706E-20	5.409E-20	3.139E-20	2.272E-20	1.808E-20	1.514E-20	1.097E-20	8.948E-21	7.486E-21	6.463E-21	5.714E-21	5.125E-21	4.655E-21	4.270E-21
3	9	2.334E-18	1.613E-18	1.252E-18	1.031E-18	6.287E-19	4.666E-19	3.766E-19	3.183E-19	2.336E-19	1.918E-19	1.611E-19	1.395E-19	1.233E-19	1.107E-19	1.006E-19	9.238E-20
3	11	1.986E-19	1.396E-19	1.091E-19	9.022E-20	5.542E-20	4.126E-20	3.338E-20	2.826E-20	2.081E-20	1.708E-20	1.438E-20	1.247E-20	1.105E-20	9.933E-21	9.040E-21	8.305E-21
3	12	5.488E-18	3.900E-18	3.072E-18	2.556E-18	1.592E-18	1.193E-18	9.687E-19	8.221E-19	6.072E-19	4.991E-19	4.208E-19	3.651E-19	3.234E-19	2.909E-19	2.648E-19	2.433E-19
3	13	7.854E-18	5.711E-18	4.556E-18	3.822E-18	2.420E-18	1.828E-18	1.491E-18	1.270E-18	9.430E-19	7.753E-19	6.558E-19	5.705E-19	5.063E-19	4.561E-19	4.157E-19	3.825E-19
3	14	2.876E-19	2.067E-19	1.633E-19	1.359E-19	8.429E-20	6.298E-20	5.103E-20	4.326E-20	3.192E-20	2.613E-20	2.203E-20	1.911E-20	1.704E-20	1.532E-20	1.394E-20	1.281E-20
3	15	1.387E-18	1.024E-18	8.237E-19	6.944E-19	4.437E-19	3.368E-19	2.755E-19	2.351E-19	1.754E-19	1.440E-19	1.221E-19	1.065E-19	9.472E-20	8.545E-20	7.796E-20	7.179E-20
3	16	1.281E-20	8.607E-21	6.351E-21	4.969E-21	2.555E-21	1.695E-21	1.268E-21	1.016E-21	6.891E-22	5.275E-22	4.279E-22	3.606E-22	3.361E-22	2.966E-22	2.656E-22	2.408E-22
3	17	2.059E-18	1.538E-18	1.245E-18	1.055E-18	6.811E-19	5.197E-19	4.264E-19	3.646E-19	2.729E-19	2.241E-19	1.904E-19	1.662E-19	1.482E-19	1.338E-19	1.222E-19	1.126E-19
3	18	3.911E-18	2.955E-18	2.407E-18	2.049E-18	1.334E-18	1.022E-18	8.411E-19	7.206E-19	5.407E-19	4.445E-19	3.783E-19	3.306E-19	2.946E-19	2.662E-19	2.432E-19	2.243E-19
3	19	1.542E-19	1.147E-19	9.224E-20	7.767E-20	4.917E-20	3.704E-20	3.011E-20	2.558E-20	1.896E-20	1.540E-20	1.301E-20	1.131E-20	1.020E-20	9.179E-21	8.355E-21	7.679E-21
3	21	3.694E-18	2.841E-18	2.339E-18	2.005E-18	1.324E-18	1.022E-18	8.444E-19	7.258E-19	5.473E-19	4.501E-19	3.842E-19	3.366E-19	3.004E-19	2.718E-19	2.486E-19	2.294E-19
3	23	9.089E-19	7.014E-19	5.786E-19	4.968E-19	3.290E-19	2.543E-19	2.103E-19	1.809E-19	1.365E-19	1.122E-19	9.587E-20	8.403E-20	7.505E-20	6.794E-20	6.216E-20	5.738E-20
3	24	1.186E-17	9.172E-18	7.578E-18	6.515E-18	4.329E-18	3.351E-18	2.775E-18	2.388E-18	1.805E-18	1.484E-18	1.268E-18	1.112E-18	9.932E-19	8.993E-19	8.231E-19	7.599E-19
3	25	1.353E-18	1.047E-18	8.653E-19	7.440E-19	4.941E-19	3.823E-19	3.165E-19	2.723E-19	2.057E-19	1.690E-19	1.444E-19	1.266E-19	1.132E-19	1.025E-19	9.378E-20	8.657E-20
3	26	1.925E-18	1.508E-18	1.255E-18	1.085E-18	7.280E-19	5.663E-19	4.703E-19	4.056E-19	3.075E-19	2.517E-19	2.147E-19	1.882E-19	1.682E-19	1.524E-19	1.396E-19	1.306E-19
3	27	3.887E-20	2.916E-20	2.345E-20	1.968E-20	1.220E-20	8.993E-21	7.165E-21	5.991E-21	4.324E-21	3.414E-21	2.824E-21	2.412E-21	2.108E-21	1.874E-21	1.687E-21	1.574E-21
4	6	1.044E-19	6.497E-20	4.794E-20	3.834E-20	2.212E-20	1.598E-20	1.269E-20	1.059E-20	7.623E-21	6.222E-21	5.167E-21	4.435E-21	3.896E-21	3.480E-21	3.150E-21	2.881E-21
4	7	2.766E-19	1.808E-19	1.365E-19	1.106E-19	6.557E-20	4.799E-20	3.840E-20	3.224E-20	2.341E-20	1.917E-20	1.600E-20	1.379E-20	1.215E-20	1.088E-20	9.862E-21	9.034E-21
4	8	2.007E-19	1.298E-19	9.695E-20	7.781E-20	4.493E-20	3.246E-20	2.580E-20	2.157E-20	1.558E-20	1.273E-20	1.061E-20	9.137E-21	8.047E-21	7.204E-21	6.532E-21	5.984E-21
4	9	3.076E-18	2.055E-18	1.570E-18	1.281E-18	7.64E-19	5.667E-19	4.553E-19	3.833E-19	2.796E-19	2.293E-19	1.918E-19	1.655E-19	1.460E-19	1.308E-19	1.187E-19	1.088E-19
4	11	1.814E-20	1.085E-20	7.408E-21	5.457E-21	2.385E-21	1.440E-21	1.017E-21	7.846E-22	5.038E-22	3.816E-22	3.079E-22	2.607E-22	2.288E-22	2.041E-22	1.848E-22	1.692E-22

4	12	4.125E-19	2.796E-19	2.141E-19	1.747E-19	1.043E-19	7.658E-20	6.142E-20	5.169E-20	3.771E-20	3.085E-20	2.585E-20	2.234E-20	1.977E-20	1.774E-20	1.611E-20	1.478E-20
4	13	2.143E-19	1.505E-19	1.178E-19	9.747E-20	6.006E-20	4.477E-20	3.623E-20	3.067E-20	2.258E-20	1.853E-20	1.560E-20	1.352E-20	1.197E-20	1.076E-20	9.787E-21	8.989E-21
4	14	5.557E-18	3.920E-18	3.075E-18	2.551E-18	1.581E-18	1.182E-18	9.581E-19	8.122E-19	5.988E-19	4.920E-19	4.144E-19	3.593E-19	3.181E-19	2.860E-19	2.602E-19	2.390E-19
4	15	9.989E-19	7.183E-19	5.691E-19	4.752E-19	2.980E-19	2.240E-19	1.822E-19	1.549E-19	1.147E-19	9.422E-20	7.957E-20	6.914E-20	6.133E-20	5.521E-20	5.029E-20	4.624E-20
4	16	6.803E-18	4.955E-18	3.956E-18	3.320E-18	2.103E-18	1.589E-18	1.297E-18	1.105E-18	8.207E-19	6.747E-19	5.708E-19	4.967E-19	4.409E-19	3.972E-19	3.621E-19	3.332E-19
4	17	6.089E-20	4.158E-20	3.147E-20	2.528E-20	1.428E-20	1.013E-20	7.944E-21	6.591E-21	4.718E-21	3.766E-21	3.129E-21	2.685E-21	2.442E-21	2.179E-21	1.970E-21	1.800E-21
4	18	7.200E-19	5.303E-19	4.259E-19	3.589E-19	2.291E-19	1.737E-19	1.420E-19	1.212E-19	9.025E-20	7.419E-20	6.286E-20	5.475E-20	4.867E-20	4.388E-20	4.002E-20	3.684E-20
4	19	5.166E-19	3.818E-19	3.073E-19	2.592E-19	1.659E-19	1.260E-19	1.031E-19	8.804E-20	6.565E-20	5.398E-20	4.578E-20	3.990E-20	3.546E-20	3.199E-20	2.918E-20	2.687E-20
4	21	2.292E-18	1.719E-18	1.394E-18	1.182E-18	7.635E-19	5.823E-19	4.776E-19	4.084E-19	3.054E-19	2.507E-19	2.130E-19	1.858E-19	1.657E-19	1.496E-19	1.365E-19	1.258E-19
4	23	1.434E-18	1.082E-18	8.811E-19	7.496E-19	4.879E-19	3.738E-19	3.075E-19	2.635E-19	1.977E-19	1.625E-19	1.383E-19	1.209E-19	1.077E-19	9.735E-20	8.896E-20	8.202E-20
4	24	2.610E-18	1.968E-18	1.601E-18	1.361E-18	8.848E-19	6.771E-19	5.567E-19	4.767E-19	3.575E-19	2.936E-19	2.498E-19	2.183E-19	1.947E-19	1.759E-19	1.607E-19	1.481E-19
4	25	7.876E-18	5.971E-18	4.876E-18	4.157E-18	2.717E-18	2.086E-18	1.718E-18	1.474E-18	1.107E-18	9.103E-19	7.754E-19	6.781E-19	6.043E-19	5.463E-19	4.993E-19	4.605E-19
4	26	1.383E-17	1.063E-17	8.754E-18	7.507E-18	4.966E-18	3.836E-18	3.171E-18	2.726E-18	2.057E-18	1.691E-18	1.444E-18	1.265E-18	1.130E-18	1.022E-18	9.353E-19	8.632E-19
4	27	1.109E-19	8.289E-20	6.670E-20	5.611E-20	3.515E-20	2.610E-20	2.092E-20	1.757E-20	1.277E-20	1.016E-20	8.446E-21	7.234E-21	6.703E-21	5.965E-21	5.378E-21	4.902E-21
5	7	3.028E-19	1.932E-19	1.445E-19	1.165E-19	6.847E-20	4.991E-20	3.984E-20	3.338E-20	2.415E-20	1.977E-20	1.645E-20	1.414E-20	1.244E-20	1.112E-20	1.007E-20	9.213E-21
5	11	1.800E-18	1.200E-18	9.138E-19	7.441E-19	4.446E-19	3.267E-19	2.621E-19	2.205E-19	1.606E-19	1.316E-19	1.101E-19	9.501E-20	8.380E-20	7.512E-20	6.818E-20	6.251E-20
5	13	3.435E-18	2.375E-18	1.844E-18	1.521E-18	9.311E-19	6.921E-19	5.591E-19	4.727E-19	3.470E-19	2.851E-19	2.394E-19	2.072E-19	1.831E-19	1.644E-19	1.494E-19	1.372E-19
5	16	9.001E-18	6.444E-18	5.097E-18	4.251E-18	2.661E-18	1.999E-18	1.625E-18	1.381E-18	1.021E-18	8.396E-19	7.085E-19	6.152E-19	5.452E-19	4.906E-19	4.467E-19	4.106E-19
5	19	2.426E-20	1.719E-20	1.343E-20	1.108E-20	6.695E-21	4.940E-21	3.980E-21	3.367E-21	2.474E-21	2.031E-21	1.710E-21	1.482E-21	1.310E-21	1.176E-21	1.069E-21	9.811E-22
5	23	5.366E-20	3.626E-20	2.706E-20	2.145E-20	1.163E-20	8.101E-21	6.323E-21	5.250E-21	3.773E-21	3.041E-21	2.558E-21	2.219E-21	1.966E-21	1.770E-21	1.612E-21	1.483E-21
5	27	3.150E-17	2.398E-17	1.963E-17	1.677E-17	1.100E-17	8.460E-18	6.977E-18	5.987E-18	4.504E-18	3.704E-18	3.157E-18	2.762E-18	2.462E-18	2.227E-18	2.036E-18	1.878E-18

Table S14. Cross sections (cm²) for Ge-like In¹⁷⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and at scattered electron energies 50 – 5000 eV.

Transition		50	100	150	200	400	600	800	1000	1500	2000	2500	3000	3500	4000	4500	5000
<i>i</i>	<i>f</i>																
1	7	1.246E-17	8.754E-18	6.856E-18	5.668E-18	3.526E-18	2.639E-18	2.138E-18	1.812E-18	1.131E-18	1.097E-18	9.237E-19	9.237E-19	7.086E-19	6.369E-19	5.579E-19	5.322E-19
1	11	1.473E-18	1.068E-18	8.508E-19	7.133E-19	4.520E-19	3.418E-19	2.788E-19	2.373E-19	1.770E-19	1.448E-19	1.224E-19	1.065E-19	9.452E-20	8.514E-20	7.760E-20	7.138E-20
1	14	5.398E-18	4.004E-18	3.231E-18	2.732E-18	2.865E-18	1.340E-18	1.099E-18	9.394E-19	7.026E-19	5.770E-19	5.770E-19	4.269E-19	3.796E-19	3.424E-19	3.125E-19	2.878E-19
1	16	1.639E-18	1.246E-18	1.021E-18	8.720E-19	8.720E-19	4.411E-19	3.639E-19	3.639E-19	2.358E-19	2.358E-19	2.358E-19	2.358E-19	1.284E-19	1.160E-19	1.061E-19	1.061E-19
1	19	2.483E-17	1.918E-17	1.585E-17	1.363E-17	9.078E-18	7.038E-18	5.832E-18	5.021E-18	3.797E-18	3.123E-18	2.669E-18	2.339E-18	2.089E-18	1.891E-18	1.730E-18	1.597E-18
1	23	1.991E-19	1.558E-19	1.298E-19	1.123E-19	7.557E-20	5.892E-20	4.901E-20	4.231E-20	3.213E-20	2.632E-20	2.247E-20	1.970E-20	1.760E-20	1.596E-20	1.462E-20	1.365E-20
1	27	7.698E-20	6.089E-20	5.104E-20	4.434E-20	3.004E-20	2.349E-20	1.959E-20	1.695E-20	1.291E-20	1.059E-20	9.059E-21	7.950E-21	7.111E-21	6.451E-21	5.917E-21	5.525E-21
2	6	1.233E-18	8.105E-19	6.133E-19	4.979E-19	2.960E-19	2.172E-19	1.738E-19	1.461E-19	1.043E-19	8.688E-20	7.257E-20	6.255E-20	5.512E-20	4.937E-20	4.478E-20	4.478E-20
2	8	5.793E-18	3.982E-18	3.084E-18	2.539E-18	1.553E-18	1.154E-18	9.321E-19	7.877E-19	5.618E-19	4.741E-19	3.980E-19	3.442E-19	3.042E-19	2.730E-19	2.481E-19	2.277E-19
2	10	1.607E-18	1.134E-18	8.910E-19	7.401E-19	4.607E-19	3.454E-19	2.802E-19	2.377E-19	1.734E-19	1.440E-19	1.213E-19	1.052E-19	9.321E-20	8.381E-20	7.627E-20	7.008E-20
2	11	4.325E-18	3.064E-18	2.411E-18	2.005E-18	1.251E-18	9.389E-19	7.622E-19	6.468E-19	4.724E-19	3.924E-19	3.307E-19	2.869E-19	2.541E-19	2.285E-19	2.080E-19	1.911E-19
2	12	3.479E-20	2.190E-20	1.553E-2	1.180E-20	5.718E-21	3.719E-21	2.770E-21	2.223E-21	1.319E-21	1.191E-21	9.801E-22	8.381E-22	7.498E-22	6.697E-22	6.063E-22	5.548E-22
2	13	2.027E-19	1.436E-19	1.123E-19	9.275E-20	5.668E-20	4.215E-20	3.408E-20	2.886E-20	2.140E-20	1.743E-20	1.472E-20	1.279E-20	1.136E-20	1.023E-20	9.325E-21	8.578E-21
2	14	4.850E-18	3.526E-18	2.813E-18	2.361E-18	1.498E-18	1.133E-18	9.253E-19	7.881E-19	5.855E-19	4.814E-19	4.072E-19	3.542E-19	3.144E-19	2.832E-19	2.582E-19	2.376E-19
2	15	5.827E-19	4.280E-19	3.427E-19	2.881E-19	1.827E-19	1.378E-19	1.120E-19	9.514E-20	7.087E-20	5.728E-20	4.828E-20	4.188E-20	3.770E-20	3.388E-20	3.081E-20	2.829E-20
2	16	2.448E-18	1.827E-18	1.480E-18	1.254E-18	8.119E-19	6.203E-19	5.093E-19	4.357E-19	3.269E-19	2.681E-19	2.277E-19	1.987E-19	1.768E-19	1.595E-19	1.457E-19	1.342E-19
2	18	9.422E-18	7.138E-18	5.832E-18	4.975E-18	3.264E-18	2.511E-18	2.071E-18	1.776E-18	1.342E-18	1.099E-18	9.360E-19	8.186E-19	7.296E-19	6.596E-19	6.029E-19	5.560E-19
2	19	1.675E-18	1.269E-18	1.037E-18	8.851E-19	5.801E-19	4.462E-1	3.680E-19	3.157E-19	2.383E-19	1.953E-19	1.664E-19	1.455E-19	1.297E-19	1.173E-19	1.072E-19	9.892E-20
2	21	7.030E-18	5.409E-18	4.461E-18	3.829E-18	2.542E-18	1.968E-18	1.629E-18	1.401E-18	1.059E-18	8.708E-19	7.437E-19	6.51E-19	5.816E-19	5.264E-19	4.816E-19	4.445E-19
2	22	2.339E-18	1.803E-18	1.488E-18	1.278E-18	8.496E-19	6.580E-19	5.449E-19	4.689E-19	3.546E-19	2.915E-19	2.489E-19	2.182E-19	1.947E-19	1.763E-19	1.613E-19	1.489E-19
2	23	5.056E-18	3.905E-18	3.227E-18	2.775E-18	1.847E-18	1.432E-18	1.187E-18	1.021E-18	7.727E-19	6.356E-19	5.431E-19	4.761E-19	4.251E-19	3.848E-19	3.522E-19	3.251E-19
2	25	2.267E-18	1.754E-18	1.451E-18	1.248E-18	8.318E-19	6.452E-19	5.348E-19	4.605E-19	3.481E-19	2.865E-19	2.449E-19	2.147E-19	1.918E-19	1.737E-19	1.590E-19	1.468E-19
2	27	1.389E-19	1.079E-19	8.947E-20	7.705E-20	5.135E-20	3.989E-20	3.312E-20	2.856E-20	2.167E-20	1.775E-20	1.515E-20	1.328E-20	1.187E-20	1.076E-20	9.867E-21	9.212E-21

3	6	6.405E-19	4.157E-19	3.125E-19	2.526E-19	1.489E-19	1.087E-19	8.685E-20	7.286E-20	5.238E-20	4.317E-20	3.601E-20	3.101E-20	2.731E-20	2.445E-20	2.217E-20	2.030E-20
3	7	4.372E-19	2.956E-19	2.268E-19	1.856E-19	1.121E-19	8.288E-20	6.664E-20	5.618E-20	4.123E-20	3.362E-20	2.817E-20	2.434E-20	2.150E-20	1.929E-20	1.752E-20	2.030E-20
3	8	1.362E-19	8.969E-20	6.724E-20	5.399E-20	3.106E-20	2.242E-20	1.779E-20	1.488E-20	1.084E-20	8.767E-21	7.328E-21	6.323E-21	5.590E-21	5.012E-21	4.550E-21	4.173E-21
3	9	2.680E-18	1.839E-18	1.422E-18	1.168E-18	7.118E-19	5.281E-19	4.258E-19	3.597E-19	2.547E-19	2.162E-19	1.815E-19	1.570E-19	1.387E-19	1.245E-19	1.132E-19	1.039E-19
3	11	2.326E-19	1.623E-19	1.264E-19	1.043E-19	6.400E-20	4.765E-20	3.851E-20	3.259E-20	2.340E-20	1.966E-20	1.655E-20	1.434E-20	1.269E-20	1.141E-20	1.038E-20	9.356E-20
3	12	5.921E-18	4.177E-18	3.279E-18	2.723E-18	1.693E-18	1.268E-18	1.029E-18	8.726E-19	6.338E-19	5.287E-19	4.453E-19	3.862E-19	3.419E-19	3.074E-19	2.797E-19	2.570E-19
3	13	4.729E-19	3.382E-19	2.668E-19	2.220E-19	1.381E-19	1.035E-19	8.398E-20	7.124E-20	5.168E-20	4.311E-20	3.635E-20	3.155E-20	2.805E-20	2.523E-20	2.296E-20	2.110E-20
3	14	8.721E-18	6.306E-18	5.017E-18	4.203E-18	2.658E-18	2.008E-18	1.637E-18	1.393E-18	1.035E-18	8.501E-19	7.185E-19	6.247E-19	5.541E-19	4.991E-19	4.547E-19	4.183E-19
3	15	1.331E-18	9.776E-19	7.839E-19	6.598E-19	4.210E-19	3.196E-19	2.613E-19	2.228E-19	1.670E-19	1.363E-19	1.155E-19	1.006E-19	8.956E-20	8.076E-20	7.367E-20	6.782E-20
3	16	2.104E-20	1.442E-20	1.088E-20	8.709E-21	4.838E-21	3.400E-21	2.654E-21	2.196E-21	1.441E-21	1.248E-21	1.039E-21	8.934E-22	8.063E-22	7.208E-20	6.528E-22	5.972E-22
3	17	2.013E-18	1.495E-18	1.207E-18	1.020E-18	6.585E-19	5.024E-19	4.120E-19	3.521E-19	2.653E-19	2.162E-19	1.836E-19	1.601E-19	1.427E-19	1.288E-19	1.176E-19	1.083E-19
3	18	4.361E-18	3.279E-18	2.667E-18	2.268E-18	1.477E-18	1.132E-18	9.313E-19	7.977E-19	6.014E-19	4.919E-19	4.184E-19	3.655E-19	3.256E-19	2.941E-19	2.686E-19	2.476E-19
3	19	1.803E-19	1.335E-19	1.071E-19	9.018E-20	5.716E-20	4.312E-20	3.508E-20	2.981E-20	2.220E-20	1.798E-20	1.518E-20	1.319E-20	1.189E-20	1.069E-20	9.740E-21	8.952E-21
3	21	3.791E-18	2.898E-18	2.380E-18	2.037E-18	1.343E-18	1.036E-18	8.565E-19	7.359E-19	5.557E-19	4.561E-19	3.890E-19	3.405E-19	3.037E-19	2.747E-19	2.512E-19	2.317E-19
3	23	1.040E-18	7.984E-19	6.571E-19	5.633E-19	3.726E-19	2.879E-19	2.381E-19	2.047E-19	1.546E-19	1.270E-19	1.083E-19	9.492E-20	8.474E-20	7.667E-20	7.013E-20	6.472E-20
3	24	1.322E-17	1.017E-17	8.387E-18	7.199E-18	4.779E-18	3.700E-18	3.063E-18	2.635E-18	1.992E-18	1.637E-18	1.398E-18	1.225E-18	1.093E-18	9.898E-19	9.056E-19	8.359E-19
3	25	1.751E-18	1.347E-18	1.111E-18	9.542E-19	6.331E-19	4.900E-19	4.055E-19	3.487E-19	2.634E-19	2.164E-19	1.848E-19	1.619E-19	1.446E-19	1.309E-19	1.197E-19	1.105E-19
3	26	2.187E-18	1.705E-18	1.416E-18	1.222E-18	8.198E-19	6.379E-19	5.297E-19	4.567E-19	3.452E-19	2.846E-19	2.436E-19	2.137E-19	1.912E-19	1.732E-19	1.586E-19	1.465E-19
3	27	4.286E-20	3.185E-20	2.547E-20	2.131E-20	1.313E-20	9.659E-21	7.686E-21	6.423E-21	4.633E-21	3.648E-21	3.015E-21	2.572E-21	2.245E-21	1.995E-21	1.796E-21	1.637E-21
4	6	1.067E-19	6.615E-20	4.868E-20	3.888E-20	2.236E-20	1.615E-20	1.280E-20	1.069E-20	7.624E-21	6.260E-21	5.197E-21	4.460E-21	3.917E-21	3.499E-21	3.167E-21	2.896E-21
4	7	2.986E-19	1.945E-19	1.466E-19	1.187E-19	7.033E-20	5.149E-20	4.117E-20	3.456E-20	2.512E-20	2.050E-20	1.711E-20	1.474E-20	1.298E-20	1.162E-20	1.054E-20	9.659E-21
4	8	1.971E-19	1.264E-19	9.396E-20	7.518E-20	4.314E-20	3.112E-20	2.469E-20	2.063E-20	1.429E-20	1.213E-20	1.011E-20	8.703E-21	7.664E-21	6.860E-21	6.219E-21	5.696E-21
4	9	3.194E-18	2.124E-18	1.618E-18	1.319E-18	7.919E-19	5.835E-19	4.683E-19	3.942E-19	2.784E-19	2.352E-19	1.967E-19	1.697E-19	1.496E-19	1.340E-19	1.216E-19	1.114E-19
4	12	3.307E-19	2.213E-19	1.681E-19	1.363E-19	8.045E-20	5.878E-20	4.697E-20	3.945E-20	2.887E-20	2.342E-20	1.960E-20	1.693E-20	1.498E-20	1.343E-20	1.220E-20	1.119E-20
4	13	6.562E-18	4.602E-18	3.600E-18	2.983E-18	1.847E-18	1.381E-18	1.118E-18	9.479E-19	6.861E-19	5.733E-19	4.825E-19	4.181E-19	3.700E-19	3.325E-19	3.025E-19	2.778E-19
4	14	1.718E-19	1.200E-19	9.362E-20	7.737E-20	4.756E-20	3.543E-20	2.864E-20	2.424E-20	1.767E-20	1.461E-20	1.229E-20	1.064E-20	9.429E-21	8.472E-21	7.705E-21	7.075E-21
4	15	9.127E-19	6.539E-19	5.173E-19	4.316E-19	2.707E-19	2.037E-19	1.656E-19	1.408E-19	1.042E-19	8.559E-20	7.225E-20	6.277E-20	5.567E-20	5.011E-20	4.564E-20	4.196E-20
4	16	7.683E-18	5.564E-18	4.430E-18	3.712E-18	2.350E-18	1.776E-18	1.448E-18	1.233E-18	9.159E-19	7.524E-19	6.361E-19	5.531E-19	4.908E-19	4.421E-19	4.028E-19	3.706E-19
4	17	6.072E-20	4.054E-20	3.018E-20	2.394E-20	1.309E-20	9.135E-21	7.086E-21	5.837E-21	4.113E-21	3.270E-21	2.702E-21	2.309E-21	2.111E-21	1.878E-21	1.694E-21	1.544E-21
4	18	8.513E-19	6.251E-19	5.015E-19	4.224E-19	2.699E-19	2.049E-19	1.675E-19	1.429E-19	1.067E-19	8.749E-20	7.410E-20	6.453E-20	5.734E-20	5.169E-20	4.714E-20	4.339E-20
4	19	4.512E-19	3.325E-19	2.672E-19	2.254E-19	1.444E-19	1.098E-19	8.988E-20	7.672E-20	5.742E-20	4.703E-20	3.987E-20	3.474E-20	3.087E-20	2.784E-20	2.540E-20	2.339E-20
4	21	2.935E-18	2.192E-18	1.775E-18	1.504E-18	9.726E-19	7.425E-19	6.092E-19	5.208E-19	3.914E-19	3.199E-19	2.715E-19	2.368E-19	2.111E-19	1.905E-19	1.739E-19	1.601E-19
4	23	1.452E-18	1.090E-18	8.865E-19	7.533E-19	4.903E-19	3.758E-19	3.091E-19	2.648E-19	1.997E-19	1.633E-19	1.389E-19	1.214E-19	1.081E-19	9.768E-20	8.925E-20	8.227E-20
4	24	2.942E-18	2.209E-18	1.795E-18	1.525E-18	9.917E-19	7.596E-19	6.245E-19	5.347E-19	4.032E-19	3.294E-19	2.801E-19	2.447E-19	2.181E-19	1.970E-19	1.799E-19	1.658E-19
4	25	8.199E-18	6.187E-18	5.044E-18	4.295E-18	2.807E-18	2.156E-18	1.776E-18	1.522E-18	1.149E-18	9.407E-19	8.007E-19	6.999E-19	6.235E-19	5.634E-19	5.149E-19	4.747E-19
4	26	1.506E-17	1.153E-17	9.486E-18	8.128E-18	5.378E-18	4.157E-18	3.437E-18	2.954E-18	2.233E-18	1.833E-18	1.564E-18	1.370E-18	1.222E-18	1.106E-18	1.01E-18	9.339E-19
4	27	1.246E-19	9.256E-20	7.423E-20	6.232E-20	3.891E-20	2.883E-20	2.307E-20	1.937E-20	1.396E-20	1.116E-20	9.257E-21	7.920E-21	7.328E-21	6.517E-21	5.875E-21	5.350E-21
5	7	3.228E-19	2.055E-19	1.535E-19	1.238E-19	7.274E-20	5.306E-20	4.232E-20	3.547E-20	2.444E-20	2.095E-20	1.743E-20	1.498E-20	1.317E-20	1.177E-20	1.066E-20	9.759E-21
5	11	1.774E-18	1.175E-18	8.920E-19	7.252E-19	4.322E-19	3.174E-19	2.543E-19	2.139E-19	1.553E-19	1.273E-19	1.064E-19	9.185E-20	8.099E-20	7.258E-20	6.587E-20	6.037E-20
5	14	3.719E-18	2.561E-18	1.985E-18	1.636E-18	1.002E-18	7.454E-19	6.018E-19	5.087E-19	3.629E-19	3.063E-19	2.571E-19	2.224E-19	1.966E-19	1.764E-19	1.603E-19	1.471E-19
5	16	1.006E-17	7.161E-18	5.647E-18	4.702E-18	2.940E-18	2.208E-18	1.794E-18	1.523E-18	1.107E-18	9.250E-19	7.799E-19	6.768E-19	5.995E-19	5.393E-19	4.909E-19	4.511E-19
5	23	4.822E-20	3.139E-20	2.274E-20	1.759E-20	8.918E-21	6.000E-21	4.592E-21	3.766E-21	2.583E-21	2.130E-21	1.785E-21	1.544E-21	1.366E-21	1.238E-21	1.118E-21	1.028E-21
5	27	3.451E-17	2.615E-17	2.137E-17	1.823E-17	1.196E-17	9.208E-18	7.593E-18	6.514E-18	4.921E-18	4.029E-18	3.432E-18	3.001E-18	2.674E-18	2.418E-18	2.210E-18	2.038E-18

Table S15. Cross sections (cm²) for Ge-like Cd¹⁶⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and at scattered electron energies 50 – 5000 eV.

Transition		50	100	150	200	400	600	800	1000	1500	2000	2500	3000	3500	4000	4500	5000
<i>i</i>	<i>f</i>																
1	7	1.330E-17	9.270E-18	7.235E-18	5.987E-18	3.705E-18	2.771E-18	2.244E-18	1.903E-18	1.428E-18	1.148E-18	9.652E-19	8.360E-19	7.394E-19	6.644E-19	6.042E-19	5.548E-19
1	11	1.720E-18	1.236E-18	9.804E-19	8.199E-19	5.179E-19	3.912E-19	3.187E-19	2.714E-19	2.042E-19	1.651E-19	1.394E-19	1.211E-19	1.074E-19	9.670E-20	8.809E-20	8.101E-20
1	14	6.130E-18	4.515E-18	3.632E-18	3.064E-18	1.969E-18	1.500E-18	1.229E-18	1.050E-18	7.921E-19	6.438E-19	5.456E-19	4.754E-19	4.224E-19	3.809E-19	3.475E-19	3.199E-19
1	16	1.653E-18	1.247E-18	1.017E-18	8.664E-19	5.674E-19	4.363E-19	3.596E-19	3.086E-19	2.332E-19	1.906E-19	1.622E-19	1.417E-19	1.262E-19	1.140E-19	1.042E-19	9.603E-20
1	20	2.777E-17	2.134E-17	1.761E-17	1.512E-17	1.006E-17	7.798E-18	6.459E-18	5.560E-18	4.209E-18	3.457E-18	2.951E-18	2.585E-18	2.307E-18	2.088E-18	1.910E-18	1.763E-18
1	23	2.828E-19	2.202E-19	1.831E-19	1.582E-19	1.065E-19	8.309E-20	6.916E-20	5.973E-20	4.542E-20	3.721E-20	3.178E-20	2.787E-20	2.488E-20	2.256E-20	2.066E-20	1.929E-20
1	27	9.239E-20	7.256E-20	6.061E-20	5.250E-20	3.543E-20	2.766E-20	2.303E-20	1.990E-20	1.512E-20	1.238E-20	1.057E-20	9.269E-21	8.275E-21	7.500E-21	6.868E-21	6.417E-21
2	6	1.129E-18	7.361E-19	5.549E-19	4.494E-19	2.662E-19	1.950E-19	1.559E-19	1.310E-19	9.768E-20	7.760E-20	6.477E-20	5.580E-20	4.915E-20	4.401E-20	3.991E-20	3.656E-20
2	7	6.216E-20	3.679E-20	2.508E-20	1.850E-20	8.292E-21	5.184E-21	3.777E-21	2.988E-21	2.042E-21	1.562E-21	1.280E-21	1.093E-21	9.583E-22	8.562E-22	7.756E-22	7.101E-22
2	8	6.541E-18	4.468E-18	3.450E-18	2.837E-18	1.733E-18	1.288E-18	1.039E-18	8.784E-19	6.583E-19	5.269E-19	4.420E-19	3.821E-19	3.375E-19	3.029E-19	2.752E-19	2.524E-19
2	10	1.766E-18	1.238E-18	9.695E-19	8.040E-19	4.996E-19	3.744E-19	3.036E-19	2.576E-19	1.935E-19	1.557E-19	1.310E-19	1.136E-19	1.005E-19	9.033E-20	8.218E-20	7.549E-20
2	11	4.579E-18	3.222E-18	2.527E-18	2.098E-18	1.306E-18	9.795E-19	7.946E-19	6.747E-19	5.069E-19	4.080E-19	3.436E-19	2.979E-19	2.637E-19	2.370E-19	2.157E-19	1.981E-19
2	12	2.770E-20	1.639E-20	1.098E-20	7.910E-21	3.181E-21	1.802E-21	1.213E-21	9.037E-22	5.492E-22	3.936E-22	3.090E-22	2.722E-22	2.343E-22	2.064E-22	1.848E-22	1.675E-22
2	13	2.291E-19	1.606E-19	1.249E-19	1.028E-19	6.253E-20	4.645E-20	3.752E-20	3.179E-20	2.375E-20	1.916E-20	1.617E-20	1.405E-20	1.246E-20	1.122E-20	1.022E-20	9.402E-21
2	14	5.413E-18	3.915E-18	3.116E-18	2.612E-18	1.656E-18	1.253E-18	1.022E-18	8.713E-19	6.560E-19	5.310E-19	4.489E-19	3.903E-19	3.463E-19	3.119E-19	2.842E-19	2.614E-19
2	15	5.910E-19	4.312E-19	3.441E-19	2.886E-19	1.825E-19	1.374E-19	1.115E-19	9.468E-20	7.044E-20	5.674E-20	4.775E-20	4.215E-20	3.726E-20	3.346E-20	3.041E-20	2.790E-20
2	16	2.867E-18	2.126E-18	1.716E-18	1.452E-18	9.375E-19	7.159E-19	5.873E-19	5.026E-19	3.792E-19	3.087E-19	2.619E-19	2.283E-19	2.030E-19	1.832E-19	1.672E-19	1.539E-19
2	18	1.009E-17	7.614E-18	6.213E-18	5.295E-18	3.475E-18	2.675E-18	2.205E-18	1.893E-18	1.431E-18	1.170E-18	9.958E-19	8.705E-19	7.756E-19	7.009E-19	6.405E-19	5.906E-19
2	20	1.648E-18	1.244E-18	1.015E-18	8.649E-19	5.669E-19	4.363E-19	3.597E-19	3.088E-19	2.333E-19	1.909E-19	1.625E-19	1.421E-19	1.266E-19	1.145E-19	1.046E-19	9.649E-20
2	21	7.730E-18	5.918E-18	4.871E-18	4.176E-18	2.770E-18	2.144E-18	1.775E-18	1.527E-18	1.155E-18	9.481E-19	8.089E-19	7.083E-19	6.319E-19	5.717E-19	5.229E-19	4.825E-19
2	22	2.598E-18	1.992E-18	1.641E-18	1.408E-18	9.348E-19	7.240E-19	5.993E-19	5.158E-19	3.903E-19	3.204E-19	2.734E-19	2.394E-19	2.136E-19	1.933E-19	1.768E-19	1.632E-19
2	23	5.731E-18	4.403E-18	3.633E-18	3.119E-18	2.075E-18	1.609E-18	1.332E-18	1.147E-18	8.683E-19	7.132E-19	6.088E-19	5.334E-19	4.760E-19	4.307E-19	3.941E-19	3.637E-19
2	25	2.853E-18	2.196E-18	1.813E-18	1.558E-18	1.037E-18	8.046E-19	6.667E-19	5.741E-19	4.345E-19	3.570E-19	3.049E-19	2.672E-19	2.385E-19	2.159E-19	1.975E-19	1.823E-19
2	27	1.445E-19	1.116E-19	9.229E-20	7.937E-20	5.289E-20	4.110E-20	3.414E-20	2.945E-20	2.238E-20	1.832E-20	1.564E-20	1.372E-20	1.225E-20	1.110E-20	1.017E-20	9.498E-21
3	6	6.107E-19	3.932E-19	2.944E-19	2.374E-19	1.393E-19	1.016E-19	8.106E-20	6.800E-20	5.061E-20	4.013E-20	3.346E-20	2.880E-20	2.535E-20	2.269E-20	2.057E-20	1.884E-20
3	7	3.881E-19	2.607E-19	1.994E-19	1.629E-19	9.812E-20	7.245E-20	5.821E-20	4.909E-20	3.667E-20	2.928E-20	2.452E-20	2.119E-20	1.870E-20	1.677E-20	1.523E-20	1.397E-20
3	8	1.347E-19	8.742E-20	6.496E-20	5.183E-20	2.946E-20	2.116E-20	1.675E-20	1.400E-20	1.033E-20	8.201E-21	6.849E-21	5.920E-21	5.220E-21	4.679E-21	4.247E-21	3.894E-21
3	9	3.085E-18	2.102E-18	1.619E-18	1.329E-18	8.078E-19	5.991E-19	4.828E-19	4.080E-19	3.055E-19	2.445E-19	2.051E-19	1.773E-19	1.566E-19	1.405E-19	1.277E-19	1.171E-19
3	11	2.746E-19	1.903E-19	1.477E-19	1.217E-19	7.453E-20	5.549E-20	4.483E-20	3.796E-20	2.844E-20	2.284E-20	1.921E-20	1.664E-20	1.472E-20	1.322E-20	1.203E-20	1.104E-20
3	12	6.354E-18	4.451E-18	3.482E-18	2.887E-18	1.791E-18	1.342E-18	1.087E-18	9.225E-19	6.928E-19	5.572E-19	4.689E-19	4.063E-19	3.596E-19	3.231E-19	2.940E-19	2.700E-19
3	13	6.881E-19	4.890E-19	3.848E-19	3.199E-19	1.991E-19	1.493E-19	1.211E-19	1.029E-19	7.714E-20	6.218E-20	5.240E-20	4.559E-20	4.037E-20	3.631E-20	3.304E-20	3.036E-20
3	14	9.685E-18	6.966E-18	5.530E-18	4.627E-18	2.924E-18	2.209E-18	1.800E-18	1.534E-18	1.154E-18	9.331E-19	7.881E-19	6.848E-19	6.073E-19	5.467E-19	4.981E-19	4.580E-19
3	15	1.272E-18	9.283E-19	7.423E-19	6.238E-19	3.975E-19	3.016E-19	2.465E-19	2.104E-19	1.583E-19	1.285E-19	1.088E-19	9.484E-20	8.423E-20	7.592E-20	6.924E-20	6.373E-20
3	16	4.007E-20	2.802E-20	2.161E-20	1.763E-20	1.041E-20	7.598E-21	6.078E-21	5.115E-21	3.777E-21	3.029E-21	2.545E-21	2.226E-21	1.968E-21	1.768E-21	1.608E-21	1.476E-21
3	17	1.963E-18	1.449E-18	1.167E-18	9.854E-19	6.350E-19	4.843E-19	3.969E-19	3.394E-19	2.566E-19	2.080E-19	1.765E-19	1.542E-19	1.371E-19	1.237E-19	1.129E-19	1.040E-19
3	18	4.880E-18	3.654E-18	2.968E-18	2.521E-18	1.642E-18	1.259E-18	1.036E-18	8.875E-19	6.700E-19	5.468E-19	4.647E-19	4.059E-19	3.613E-19	3.263E-19	2.980E-19	2.746E-19
3	20	2.129E-19	1.569E-19	1.258E-19	1.058E-19	6.721E-20	5.078E-20	4.135E-20	3.520E-20	2.625E-20	2.125E-20	1.795E-20	1.583E-20	1.403E-20	1.263E-20	1.150E-20	1.057E-20
3	21	3.844E-18	2.922E-18	2.395E-18	2.047E-18	1.348E-18	1.040E-18	8.589E-19	7.380E-19	5.580E-19	4.571E-19	3.894E-19	3.407E-19	3.036E-19	2.745E-19	2.510E-19	2.315E-19
3	23	1.195E-18	9.120E-19	7.492E-19	6.413E-19	4.239E-19	3.276E-19	2.708E-19	2.328E-19	1.760E-19	1.443E-19	1.230E-19	1.078E-19	9.609E-20	8.690E-20	7.946E-20	7.331E-20
3	24	1.479E-17	1.132E-17	9.321E-18	7.991E-18	5.303E-18	4.105E-18	3.397E-18	2.923E-18	2.212E-18	1.815E-18	1.549E-18	1.356E-18	1.210E-18	1.094E-18	1.001E-18	9.238E-19
3	25	2.255E-18	1.726E-18	1.421E-18	1.218E-18	8.079E-19	6.252E-19	5.172E-19	4.449E-19	3.364E-19	2.760E-19	2.355E-19	2.064E-19	1.841E-19	1.665E-19	1.523E-19	1.405E-19
3	26	2.462E-18	1.909E-18	1.584E-18	1.365E-18	9.152E-19	7.121E-19	5.912E-19	5.097E-19	3.858E-19	3.177E-19	2.716E-19	2.385E-19	2.130E-19	1.929E-19	1.766E-19	1.631E-19
3	27	4.710E-20	3.465E-20	2.756E-20	2.298E-20	1.408E-20	1.032E-20	8.200E-21	6.849E-21	4.933E-21	3.872E-21	3.196E-21	2.723E-21	2.378E-21	2.111E-21	1.896E-21	1.725E-21
4	6	1.073E-19	6.616E-20	4.854E-20	3.871E-20	2.218E-20	1.600E-20	1.267E-20	1.058E-20	7.834E-21	6.171E-21	5.122E-21	4.395E-21	3.860E-21	3.448E-21	3.120E-21	2.853E-21
4	7	3.196E-19	2.074E-19	1.561E-19	1.263E-19	7.468E-20	5.466E-20	4.369E-20	3.670E-20	2.734E-20	2.171E-20	1.811E-20	1.560E-20	1.374E-20	1.230E-20	1.116E-20	1.022E-20
4	8	1.953E-19	1.242E-19	9.177E-20	7.316E-20	4.169E-20	3.000E-20	2.377E-20	1.986E-20	1.469E-20	1.163E-20	9.689E-21	8.339E-21	7.340E-21	6.595E-21	5.955E-21	5.453E-21
4	9	3.304E-18	2.186E-18	1.662E-18	1.354E-18	8.114E-19	5.977E-19	4.795E-19	4.038E-19	3.018E-19	2.403E-19	2.008E-19	1.731E-19	1.526E-19	1.367E-19	1.240E-19	1.136E-19

4	11	1.972E-20	1.115E-20	7.258E-21	5.114E-21	1.920E-21	1.036E-21	6.735E-22	4.873E-22	2.849E-22	1.991E-22	1.549E-22	1.296E-22	1.118E-22	9.880E-23	8.887E-23	8.095E-23
4	12	2.543E-19	1.671E-19	1.253E-19	1.007E-19	5.820E-20	4.213E-20	3.349E-20	2.807E-20	2.076E-20	1.651E-20	1.380E-20	1.195E-20	1.054E-20	9.448E-21	8.577E-21	7.864E-21
4	13	7.626E-18	5.318E-18	4.151E-18	3.435E-18	2.124E-18	1.588E-18	1.286E-18	1.090E-18	8.185E-19	6.576E-19	5.530E-19	4.791E-19	4.238E-19	3.807E-19	3.462E-19	3.179E-19
4	14	1.259E-19	8.736E-20	6.786E-20	5.593E-20	3.423E-20	2.546E-20	2.055E-20	1.739E-20	1.302E-20	1.044E-20	8.775E-21	7.612E-21	6.729E-21	6.044E-21	5.495E-21	5.044E-21
4	15	8.634E-19	6.164E-19	4.869E-19	4.059E-19	2.546E-19	1.917E-19	1.559E-19	1.326E-19	9.964E-20	8.046E-20	6.790E-20	5.900E-20	5.229E-20	4.706E-20	4.286E-20	3.941E-20
4	16	8.606E-18	6.199E-18	4.924E-18	4.121E-18	2.607E-18	1.970E-18	1.606E-18	1.368E-18	1.030E-18	8.329E-19	7.036E-19	6.115E-19	5.423E-19	4.883E-19	4.449E-19	4.092E-19
4	17	6.216E-20	4.046E-20	2.954E-20	2.308E-20	1.216E-20	8.306E-21	6.364E-21	5.202E-21	3.661E-21	2.843E-21	2.331E-21	2.098E-21	1.826E-21	1.619E-21	1.455E-21	1.323E-21
4	18	1.027E-18	7.521E-19	6.029E-19	5.076E-19	3.246E-19	2.467E-19	2.017E-19	1.722E-19	1.298E-19	1.053E-19	8.915E-20	7.765E-20	6.895E-20	6.215E-20	5.667E-20	5.215E-20
4	20	4.229E-19	3.107E-19	2.495E-19	2.103E-19	1.349E-19	1.026E-19	8.403E-20	7.180E-20	5.413E-20	4.398E-20	3.726E-20	3.246E-20	2.884E-20	2.601E-20	2.373E-20	2.184E-20
4	21	3.744E-18	2.785E-18	2.253E-18	1.908E-18	1.234E-18	9.431E-19	7.739E-19	6.623E-19	4.992E-19	4.065E-19	3.449E-19	3.013E-19	2.679E-19	2.417E-19	2.206E-19	2.032E-19
4	23	1.469E-18	1.099E-18	8.917E-19	7.570E-19	4.928E-19	3.779E-19	3.108E-19	2.664E-19	2.011E-19	1.642E-19	1.396E-19	1.219E-19	1.085E-19	9.801E-20	8.952E-20	8.251E-20
4	24	3.287E-18	2.459E-18	1.995E-18	1.694E-18	1.102E-18	8.445E-19	6.943E-19	5.950E-19	4.489E-19	3.663E-19	3.113E-19	2.721E-19	2.422E-19	2.187E-19	1.998E-19	1.841E-19
4	25	8.494E-18	6.382E-18	5.195E-18	4.420E-18	2.889E-18	2.220E-18	1.828E-18	1.568E-18	1.185E-18	9.679E-19	8.233E-19	7.193E-19	6.405E-19	5.787E-19	5.287E-19	4.874E-19
4	26	1.649E-17	1.258E-17	1.033E-17	8.848E-18	5.860E-18	4.531E-18	3.747E-18	3.222E-18	2.438E-18	1.999E-18	1.705E-18	1.492E-18	1.331E-18	1.204E-18	1.101E-18	1.016E-18
4	27	1.418E-19	1.046E-19	8.362E-20	7.008E-20	4.362E-20	3.226E-20	2.579E-20	2.164E-20	1.572E-20	1.241E-20	1.028E-20	9.292E-21	8.119E-21	7.217E-21	6.501E-21	5.916E-21
5	7	3.404E-19	2.162E-19	1.613E-19	1.300E-19	7.640E-20	5.573E-20	4.444E-20	3.725E-20	2.774E-20	2.194E-20	1.825E-20	1.569E-20	1.379E-20	1.233E-20	1.116E-20	1.021E-20
5	11	1.746E-18	1.148E-18	8.686E-19	7.048E-19	4.189E-19	3.074E-19	2.461E-19	2.070E-19	1.544E-19	1.228E-19	1.026E-19	8.849E-20	7.800E-20	6.988E-20	6.341E-20	5.811E-20
5	14	4.045E-18	2.775E-18	2.148E-18	1.769E-18	1.083E-18	8.062E-19	6.508E-19	5.506E-19	4.128E-19	3.307E-19	2.775E-19	2.400E-19	2.120E-19	1.903E-19	1.729E-19	1.586E-19
5	16	1.119E-17	7.913E-18	6.224E-18	5.175E-18	3.231E-18	2.427E-18	1.970E-18	1.674E-18	1.258E-18	1.014E-18	8.539E-19	7.406E-19	6.557E-19	5.896E-19	5.366E-19	4.930E-19
5	20	4.764E-21	2.824E-21	1.894E-21	1.376E-21	5.730E-22	3.393E-22	2.424E-22	1.925E-22	1.288E-22	9.969E-23	8.405E-23	7.285E-23	6.434E-23	5.797E-23	5.300E-23	4.872E-23
5	23	4.492E-20	2.803E-20	1.960E-20	1.471E-20	6.831E-21	4.375E-21	3.255E-21	2.624E-21	1.824E-21	1.431E-21	1.192E-21	1.028E-21	9.070E-22	8.143E-22	7.405E-22	6.801E-22
5	27	3.795E-17	2.864E-17	2.338E-17	1.993E-17	1.308E-17	1.007E-17	8.299E-18	7.124E-18	5.385E-18	4.403E-18	3.748E-18	3.276E-18	2.918E-18	2.637E-18	2.410E-18	2.222E-18

Table S16. Fitting coefficients for Ge-like Te²⁰⁺ ion

Lower level	Upper level	b ₀	b ₁	b ₂	b ₃	c ₀	c ₁	c ₂	d ₀	d ₁
2	6	2.784	1.124E-1	1.501E-4		2.484E+1	1.615E+1	3.022E-1	-5.540E-3	6.941E-2
3	6	2.214E+2	1.135E+1			3.938E+3	2.811E+3	7.729E+1	1.444E-4	3.137E-2
4	6	2.546	1.104E-1			2.737E+2	2.774E+2	6.049	1.380E-3	3.200E-3
1	7	6.695E+1	2.568			1.067E+2	4.691E+1	7.620E-1	-3.585E-1	6.660E-1
2	7	9.106E+1	1.768E+1	1.592E+37		2.769E+4	1.623E+4	3.796E+3	1.350E-3	9.016E-4
3	7	5.664	2.193E-1			1.422E+2	7.916E+1	1.381	-7.540E-3	3.018-2
4	7	2.169E+41	1.195E+40			1.150E+43	8.889E+42	2.620E+41	6.805E-4	9.700E-3
5	7	1.009E+43	4.644E+41			4.355E+44	3.888E+44	8.629E+42	2.440E-3	9.720E-3
2	8	5.947E+1	2.287			2.325E+2	1.167E+2	1.970	-8.411E-2	2.242E-1
3	8	1.105	1.838E-2			1.359E+2	7.277E+1	5.278E-1	-4.656E-4	5.200E-3
4	8	6.934E+2	1.890E+1			4.167E+4	2.901E+4	3.871E+2	1.000E-3	8.290E-3
3	9	1.050E+16	3.677E+14	7.496E-2		9.109E+16	4.475E+16	6.928E+14	-3.790E-2	1.008E-1
4	9	9.701E+2	5.282E+1			4.648E+3	3.053E+3	8.686E+1	-1.561E-2	1.341E-1
2	10	-5.320	3.180			-7.498E+1	1.783E+1	1.714E+1	-4.507E-2	8.069E-2
1	11	6.286E+42	2.368E+41			1.132E+44	4.094E+43	6.219E+41	-5.916E-2	7.746E-2

2	11	6.880E+1	2.612			3.169E+2	1.333E+2	2.122	-1.432E-1	2.443E-1
3	11	4.681E+7	1.456E+6			5.119E+9	2.251E+9	3.041E+7	-4.380E-3	9.020E-3
4	11	8.798E+24	-3.561E+22			3.231E+27	1.886E+27	-1.201E+25	3.184E-4	1.250E-3
5	11	2.396	9.213E-2			1.785E+1	1.114E+1	1.982E-1	-9.700E-3	8.646E-2
2	12	4.686	2.191E-2			9.694E+2	4.209E+2	-1.203E-1	-8.278E-4	3.600E-3
3	12	7.760E+1	2.922			2.770E+2	1.193E+2	1.900	-1.681E-1	3.035E-1
4	12	5.615	1.900E-1			1.460E+2	7.875E+1	1.218	-6.940E-3	2.896E-2
1	13	6.195E+1	2.272			3.088E+2	1.005E+2	1.446	-2.846E-1	3.229E-1
2	13	7.261E+1	2.686			3.647E+2	1.362E+2	2.055	-1.892E-1	2.631E-1
3	13	1.628E+2	6.162			4.406E+2	1.703E+2	2.644	-3.209E-1	4.690E-1
4	13	7.427E+17	2.755E+16			4.134E+19	1.947E+19	3.153E+17	-7.270E-3	1.692E-2
5	13	6.781E+4	3.611E+3	5.499		3.407E+5	1.865E+5	5.066E+3	-5.343E-2	1.640E-1
2	15	5.985E+22	9.620E+20			9.772E+24	3.665E+24	2.326E+22	-3.210E-3	6.290E-3
3	15	2.676E+1	-1.373E-1			8.626E+3	3.461E+3	-2.343E+1	1.280E-3	1.720E-3
4	15	6.072E+1	2.272			2.722E+2	1.237E+2	1.990	-1.079E-1	2.228E-1
2	14	3.593E+1	1.631	1.930E-3		1.037E+3	3.720E+2	8.007	-3.255E-2	4.760E-2
3	14	8.788E+42	3.177E+41			1.074E+44	3.796E+43	5.519E+41	-9.125E-2	1.163E-1
4	14	9.395E+1	3.487			1.111E+3	4.679E+2	7.329	-5.376E-2	9.393E-2
3	16	3.373E+2	1.254E+1			2.885E+3	9.664E+2	14.12	-1.581E-1	1.825E-1
4	16	4.976	3.559E-2			1.240E+3	5.129E+2	8.678E-1	-2.045E-4	3.010E-3
1	19	8.872E+1	3.242			5.549E+2	1.550E+2	2.119	-3.426E-1	3.221E-1
2	19	1.271E+42	4.570E+40			2.045E+43	6.447E+42	9.043E+40	-9.478E-2	1.039E-1
3	19	-4.859E+40				-3.790E+43	-1.288E+43	4.274E+40	4.339E-5	1.050E-3
4	19	9.314E+1	3.487			3.277E+2	1.256E+2	1.928	-2.515E-1	3.636E-1
5	19	1.853E+2	6.987			4.491E+2	1.881E+2	2.979	-2.717E-1	4.651E-1
2	18	9.111	3.444E-1			2.240E+1	6.898	9.950E-2	-7.025E-1	7.240E-1
3	18	1.919E+1	7.048E-1			1.120E+2	3.555E+1	5.077E-1	-2.624E-1	2.866E-1
4	18	8.753E+1	4.313	6.470E-3		2.755E+3	1.071E+3	2.504E+1	-3.019E-2	4.201E-2
1	17	7.338	2.693E-1			8.834	2.381	3.225E-2	-1.613	1.682
2	17	1.260E+3	4.607E+1			1.158E+4	3.514E+3	4.909E+1	-1.900E-1	1.950E-1
3	17	1.235E+41	2.216E+39	-1.022E+37	5.317E+34	2.086E+43	6.541E+42	2.809E+40	-4.360E-3	7.660E-3
4	17	1.755E+16	8.526E+14	1.231E+12		3.134E+17	1.195E+17	2.720E+15	-5.693E-2	7.625E-2
5	17	8.231	3.919E-1	6.402E-4		4.887E+2	2.025E+2	4.809	-1.186E-2	1.966E-2
2	21	5.347E+1	1.961			1.981E+2	5.461E+1	7.438E-1	-6.048E-1	5.571E-1
3	21	1.802E+1	6.52E-1			1.023E+2	2.902E+1	3.955E-1	-3.614E-1	3.459E-1

4	21	1.637					2.274E+1	5.754	-3.538E-2	-9.351E-2	1.148E-1
2	22	1.532E+6	5.615E+4				1.733E+7	4.736E+6	6.433E+4	-2.017E-1	1.845E-1
3	26	1.223E+1	4.530E-1				2.483E+1	6.889	9.469E-2	-1.097	1.012
4	26	3.417E+2	1.237E+1				3.152E+3	1.014E+3	1.443E+1	-1.568E-1	1.761E-1
1	24	-1.896E+37					-6.095E+39	-1.075E+39	6.732E+36	-8.240E-3	7.560E-3
2	24	1.700E+1	6.222E-1				9.557E+1	2.578E+1	3.484E-1	-3.440E-1	3.593E-1
3	24	-4.727	-1.957E-1	-1.657E-4			-1.315E+2	-3.743E+1	-6.392E-1	-7.724E-2	7.243E-2
4	24	3.618E+9	1.628E+8	1.839E+5			4.760E+10	1.577E+10	3.106E+8	-1.150E-1	1.259E-1
5	24	2.411E+34	-7.755E+30				5.548E+36	2.099E+36	-8.558E+33	-1.800E-3	3.850E-3
2	25	9.884E+1	4.021	3.050E-3			1.718E+3	4.673E+2	7.664	-1.136E-1	1.174E-1
3	25	-1.051E+10	1.889E+9	3.495E+7	-2.061E+5		-2.614E+11	-1.292E+10	1.259E+10	-8.929E-2	8.320E-2
4	25	8.426	3.160E-1				2.194E+1	6.878	9.923E-2	-6.265E-1	6.630E-1
3	23	6.194E+4	2.531E+3	1.838			8.523E+5	2.245E+5	3.658E+3	-1.563E-1	1.557E-1
4	23	1.034E+1	3.894E-1				1.681E+1	4.924	6.965E-2	-1.212	1.177
1	27	8.645E+41	3.566E+40	4.194E+37			3.828E+44	9.001E+43	1.513E+42	-6.640E-3	5.740E-3
2	27	3.109E+3	9.867E+1				5.508E+5	1.378E+5	1.585E+3	-1.294E-2	1.227E-2
3	27	6.511E+40	1.501E+39	5.103E+35			3.890E+43	1.086E+43	1.563E+41	2.300E-3	1.280E-3
4	27	6.989E+41	3.072E+40	3.703E+37			1.426E+44	4.615E+43	1.213E+42	3.897E-4	5.290E-3
5	27	8.807	3.329E-1				6.262	1.925	2.779E-2	-2.430	2.505

Table S17. Fitting coefficients for Ge-like Sb¹⁹⁺ ion.

Lower level	Upper level	b ₀	b ₁	b ₂	b ₃	b ₅	c ₀	c ₁	c ₂	d ₀	d ₁
1	7	4.431E+26	8.871E+23	5.131E+19			2.303E+43	4.117E+41	4.037E+38	-1.973E-15	5.210E-16
1	11	-5.803E+28	-9.800E+26				-2.136E+46	-1.268E+45	-4.407E+42	-2.557E-16	6.374E-17
1	13	8.507E+28	7.092E+27				-4.695E+45	1.780E+45	8.178E+42	-1.110E-15	2.681E-16
1	17	5.089E+2	3.339	1.320E-3	-2.603E-7		1.612E+20	2.704E+18	8.667E+15	-6.950E-16	1.608E-16
1	19	-6.257E+26	-2.901E+27	-1.633E+24	3.448E+20		1.601E+44	-1.107E+44	-9.307E+41	-6.832E-15	1.557E-15
1	23	-1.585E+24	-1.335E+22	-5.897E+18	1.155E+15		-1.185E+43	-2.047E+41	-7.317E+38	-3.492E-17	8.005E-18
1	27	-2.646E+25	-1.320E+24	-3.620E+20			-2.753E+44	-2.240E+43	-1.129E+41	-2.223E-17	5.018E-18
2	6	1.110E+18	2.296E+15	1.249E+11			3.624E+15	9.466E+13	1.037E+11	-1.600E+4	4.823E+3
2	7	2.947E+4	3.119E+1				3.734E+3	7.392E+1	3.050E-1	1.019E+2	6.559
2	8	1.578E+7	3.167E+4	1.795			1.877E+4	3.809E+2	3.861E-1	-6.840E+4	1.887E+4
2	10	1.052E+7	2.109E+4	1.224			4.518E+4	7.925E+2	7.744E-1	-2.476E+4	6.495E+3
2	11	1.442E+7	2.855E+4	1.649			2.179E+4	3.724E+2	3.578E-1	-7.326E+4	1.907E+4

2	12	4.788E+4	-9.101				4.146E+3			-6.214E+2	1.864E+2
2	13	2.673E+7	5.138E+4	2.960			4.215E+4	6.353E+2	5.766E-1	-8.691E+4	2.179E+4
2	14	-2.828E+21	-1.232E+18	1.993E+14			-1.196E+40	-1.690E+38	-4.206E+33	-2.583E-17	6.694E-18
2	15	-2.091E+23	-5.734E+20	-1.061E+17	1.819E+13		-2.219E+41	-3.319E+39	-5.083E+36	-1.291E-16	3.303E-17
2	17	-5.656E+25	-1.058E+23	-5.987E+18			-2.253E+43	-2.898E+41	-2.450E+38	-4.542E-16	1.087E-16
2	18	-1.509E+17	-2.843E+14	-1.447E+10			-1.224E+34	-1.510E+32	-1.231E+29	-2.467E-15	5.800E-16
2	19	6.355E+1	3.458E-1	1.272E-4	-2.508E-8		2.297E+19	3.722E+17	1.061E+15	-5.529E-16	1.298E-16
2	21	1.679E+27	-2.005E+26	-5.939E+22			3.183E+44	-2.591E+43	-1.935E+41	-1.985E-15	4.551E-16
2	22	1.423E-1	9.878E-4	4.032E-7	-7.987E-11		5.103E+16	8.540E+14	2.800E+12	-6.604E-16	1.510E-16
2	23	4.059E+8	7.265E+5	3.377E+1			7.146E+25	7.761E+23	5.788E+20	-1.391E-15	3.171E-16
2	25	-1.655E+4	-2.870E+1	-1.250E-3			-8.099E+21	-8.640E+19	-6.209E+16	-5.082E-16	1.155E-16
2	27	-1.990E+24	-1.765E+22	-8.107E+18	1.588E+15		-1.146E+43	-2.049E+41	-8.003E+38	-4.263E-17	9.826E-18
3	6	1.440E+28	5.712E+26	1.095E+23			3.543E+45	7.827E+44	7.705E+42	-7.165E-17	2.217E-17
3	7	5.87889E+23	1.158E+21	6.300E+16			5.586E+41	1.240E+40	1.264E+37	-7.187E-17	2.051E-17
3	8	-4.693E+25	-4.876E+21	4.324E+18			-1.864E+44	-3.769E+42	7.585E+38	-1.363E-17	4.085E-18
3	9	-1.295E-1	-1.757E-4				-3.429E+16	-6.546E+14	-3.926E+11	-3.072E-16	8.479E-17
3	11	-4.955E+25	-7.340E+22	-2.883E+18			-1.637E+44	-2.860E+42	-2.077E+39	-2.874E-17	7.679E-18
3	12	-4.420E+27	-1.138E+27	-5.719E+23	1.280E+20		-1.366E+44	-1.504E+44	-1.908E+42	-9.313E-16	2.445E-16
3	13	4.887E+28	3.907E+27				-2.446E+45	5.869E+44	2.997E+42	-1.522E-15	3.853E-16
3	14	-1.199E+26	2.545E+26	4.912E+22			-7.219E+45	1.264E+45	1.369E+43	-2.228E-17	6.129E-18
3	15	9.044E+14	4.935E+12	1.731E+9	-3.430E+5		3.920E+32	7.178E+30	2.177E+28	-3.442E-16	8.484E-17
3	16	-1.402E+11	-2.024E+8				-4.310E+28	-5.543E+26	-3.127E+23	-5.524E-16	1.334E-16
3	17	-7.456E+3	-2.058E+1	-2.150E-3			-3.424E+23	-5.404E+21	-1.916E+19	-1.385E-19	1.890E-19
3	18	3.703E+7	6.852E+4	3.600			6.917E+4	8.786E+2	7.225E-1	-9.930E+4	2.365E+4
3	19	1.291E+5	1.358E+2				6.329E+3	7.818E+1	3.627E-2	-2.712E+3	7.034E+2
3	21	2.567E+7	4.671E+4	2.408			4.925E+4	5.643E+2	4.419E-1	-1.158E+5	2.680E+4
3	23	4.695E+6	8.292E+3	3.910E-1			4.059E+4	4.537E+2	3.401E-1	-2.655E+4	6.115E+3
3	24	-2.416E+7	1.066E+5	8.651E+1	-1.965E-2		-1.581E+4	-7.143E+1	7.718E-1	-3.639E+5	8.342E+4
3	25	-1.146E+8	7.084E+5	6.034E+2	-1.817E-1	1.245E-8	-7.692E+5	-2.133E+3	5.147E+1	-3.524E+4	8.094E+3
3	26	-2.441E+8	1.297E+6	1.262E+3	-4.234E-1	3.735E-8	-1.033E+6	-3.225E+3	5.833E+1	-5.751E+4	1.341E+4
3	27	-2.967E-14	2.782E-16	8.916E-20	-3.308E-23	3.720E-30	-5.648E+5	-3.430E+2	5.619E+1	-1.253E-18	-1.253E-18
4	6	-2.330E+27	-1.971E+25	-3.121E+21			-7.171E+45	-4.171E+44	-2.026E+42	-7.003E-18	2.494E-18
4	7	8.487E+26	9.796E+25	2.322E+22			-6.077E+44	2.773E+44	3.833E+42	-2.537E-17	7.945E-18
4	8	-6.638E-2	-1.230E-3	-4.336E-7	9.041E-11		-1.388E+17	-6.494E+15	-6.584E+13	-1.839E-17	5.895E-18
4	9	-2.284E+24	-9.755E+21	-2.525E+18	5.178E+14		-3.633E+41	-1.021E+40	-2.722E+37	-3.497E-16	1.038E-16

4	11	1.928E+28	-1.658E+27				-9.040E+46	-7.025E+45	-8.285E+44	-9.575E-19	4.157E-19
4	12	-1.450E+9	7.980E+6	4.759E+3	-1.17		-1.528E+27	-2.068E+25	1.800E+23	-6.399E-17	1.837E-17
4	13	3.012E+7	1.581E+5	5.025E+1	-1.017E-2		6.557E+25	1.486E+24	4.715E+21	-4.137E-17	1.118E-17
4	14	1.090E+24	1.583E+21				1.343E+41	2.350E+39	1.462E+36	-7.914E-16	2.112E-16
4	15	1.658	8.790E-3	2.895E-6	-5.802E-10		8.379E+17	1.730E+16	5.328E+13	-2.221E-16	5.762E-17
4	16	6.311E+25	-2.114E+25	-4.552E+21	5.233E+17		-9.744E+43	-1.598E+44	-3.229E+42	-5.977E-18	1.913E-18
4	17	4.364E+10	2.375E+8	8.032E+4	-1.601E+1		4.425E+27	8.650E+25	2.640E+23	-1.286E-15	3.248E-16
4	18	4.867E+25	4.867E+25	9.919E+19	-1.970E+16		4.781E+43	9.221E+41	2.948E+39	-1.427E-16	3.562E-17
4	19	-1.235E+26	-2.373E+23	-1.369E+19			-1.174E+44	-1.700E+42	-1.525E+39	-1.550E-16	3.840E-17
4	21	5.586E+24	3.066E+22	1.063E+19	-2.083E+15		2.007E+42	3.482E+40	1.036E+38	-4.584E-16	1.116E-16
4	23	4.217E+25	7.762E+22	3.951E+18			1.949E+43	2.494E+41	2.027E+38	-3.987E-16	9.497E-17
4	24	-6.644E+26	-1.165E+24	-5.240E+19			-1.894E+44	-2.412E+42	-1.865E+39	-6.328E-16	1.514E-16
4	25	-2.432E+27	-1.199E+25	-4.115E+21	8.037E+17		-2.117E+44	-3.391E+42	-8.874E+39	-2.195E-15	5.194E-16
4	26	-2.434E+10	-4.474E+7	-2.098E+3			-1.297E+27	-1.513E+25	-1.174E+22	-4.121E-15	9.546E-16
4	27	9.559E+24	7.625E+21	-1.851E+18	5.665E+14		6.290E+43	7.230E+41	1.991E+38	-1.250E-17	4.110E-18
5	7	-7.276E+6	3.894E+4	2.880E+1	-8.360E-3		-1.054E+25	-2.600E+23	1.932E+21	-2.369E-17	7.895E-18
5	11	-4.730E+1	-1.990E-1	-5.247E-5	1.070E-8		-1.223E+19	-3.402E+17	-9.190E+14	-2.120E-16	6.311E-17
5	13	3.724E+4	1.884E+2	5.698E-2	-1.167E-5		6.072E+21	1.496E+20	4.582E+17	-4.724E-16	1.314E-16
5	17	-2.434E+8	-4.816E+5	-2.843E+1			-1.780E+25	-3.010E+23	-2.900E+20	-1.533E-15	3.986E-16

Table S18. Fitting coefficients for Ge-like Sn¹⁸⁺ ion.

Lower l	Upper level	b ₀	b ₁	b ₂	b ₃	c ₀	c ₁	c ₂	d ₀	d ₁
2	6	2.328	1.018E-1			2.211E+1	1.600E+1	3.261E-1	2.820E-3	5.750E-2
3	6	1.181E+1	4.950E-1			2.145E+2	1.654E+2	3.303	3.810E-3	2.708E-2
4	6	2.794	1.246E-1			2.638E+2	2.842E+2	6.437	1.850E-3	3.330E-3
1	7	4.869E+1	2.107			6.473E+1	3.201E+1	5.858E-1	-3.020E-1	7.080E-1
2	7	1.336E-1	-1.180E-3			4.889E+1	2.673E+1	2.614	1.740E-3	-3.219E-4
3	7	8.769E+1	4.781	6.330E-3		2.488E+3	1.576E+3	4.375E+1	-3.610E-3	2.394E-2
4	7	1.437	6.442E-2			6.261E+1	4.932E+1	1.045	1.630E-3	1.123E-2
5	7	-2.117E+4	3.086E+3	6.407E+1	-5.139E-1	-7.832E+5	-5.407E+5	1.092E5+	3.830E-3	1.105E-2
2	8	2.275E+1	9.880E-1			6.494E+1	3.640E+1	6.914E-1	-7.365E-2	2.750E-1

3	8	1.057	1.643E-2			1.070E+2	6.488E+1	4.238E-1	1.044E-4	5.410E-3
4	8	7.629E+38	1.650E+37	-1.238E+34		4.576E+40	3.447E+40	3.225E+38	1.750E-3	7.300E-3
3	9	2.768	1.101E-1			1.733E+1	9.576	1.684E-1	-3.293E-2	1.240E-1
4	9	-3.159E+3	5.6004E+2	5.794		-1.435E+4	-5.400E+3	1.512E+3	-2.090E-3	1.393E-1
2	10	1.046				1.207E+1	4.370	-2.848E-2	-4.168E-2	9.096E-2
1	11	-1.776E+4	2.538E+3	5.592E+1	-3.901E-1	-2.377E+5	-5.091E+4	1.442E+4	-5.976E-2	9.219E-2
2	11	6.615	2.838E-1			2.576E+1	1.213E+1	2.176E-1	-1.252E-1	2.585E-2
3	11	1.443E+6	5.154E+4			1.117E+8	5.514E+7	8.537E+5	-4.500E-3	1.143E-2
4	11	6.682E-2	2.590E-3			4.799E+1	2.723E+1	3.541	6.656E-4	8.066E-5
5	11	4.693	1.945E-1			3.390E+1	2.331E+1	4.487E-1	-1.569E-4	7.981E-2
2	12	-6.733E+40	-2.291E+39	-4.052E+37	2.610E+35	-2.084E+43	-1.072E+43	-6.119E+41	4.759E-4	1.400E-3
3	12	2.982E+1	1.271			8.537E+1	4.114E+1	7.390E-1	-1.538E-1	3.393E-1
4	12	2.380	7.463E-2			8.041E+1	4.759E+1	6.908E-1	-2.210E-3	1.925E-2
1	13	8.277	3.430E-1			3.091E+1	1.127E+1	1.821E-1	-3.067E-1	3.877E-1
2	13	7.219	3.013E-1			2.806E+1	1.152E+1	1.942E-1	-2.026E-1	3.134E-1
3	13	4.857E+1	2.073			1.029E+2	4.379E+1	7.597E-1	-3.351E-1	5.504E-1
4	13	4.499E+3	1.796E+2			3.207E+5	1.622E+5	2.815E+3	-4.420E-3	1.229E-2
5	13	4.912E+1	2.155			2.077E+2	1.173E+2	2.255	-4.698E-2	1.839E-1
2	15	2.881	6.787E-2			2.695E+2	1.135E+2	1.097	-5.800E-3	1.068E-2
3	15	4.530E+9	1.489E+8			2.574E+11	1.104E+11	1.575E+9	-8.410E-3	1.789E-2
4	15	3.165E+1	1.343			8.774E+1	4.398E+1	7.964E-1	-1.316E-1	3.297E-1
2	14	5.174E+1	2.679	3.550E-3		1.538E+3	6.101E+2	1.522E+1	-2.347E-2	4.136E-2
3	14	-1.539E+1	2.782	5.467E-2	-3.522E-4	-1.945E+2	-2.943E+1	1.346E+1	-7.624E-2	1.057E-1
4	14	1.641E+5	1.939E+4	1.590E+2	-8.862E-1	2.629E+6	1.430E+6	9.866E+4	-3.488E-2	6.550E-2
2	19	1.513E+3	6.234E+1			1.329E+4	4.677E+3	7.441E+1	-1.440E-1	1.733E-1
4	19	5.075E+1	2.146			1.247E+2	5.249E+1	9.011E-1	-2.980E-1	4.806E-1
1	19	3.021E+6	1.253E+5			3.221E+7	1.019E+7	1.574E+5	-1.621E-1	1.680E-1
5	19	4.537E+1	1.924			8.077E+1	3.731E+1	6.603E-1	-2.880E-1	5.779E-1
3	19	4.342E-2	5.130E-3			5.570E+1	2.490E+1	4.018	6.123E-4	1.837E-4
3	17	4.854E+2	2.022E+1			4.181E+3	1.531E+3	2.473E+1	-1.362E-1	1.687E-1
4	17	1.845	-1.548E-2			4.456E+2	2.138E+2	-2.106	7.870E-4	2.130E-3
2	21	8.667E+2	3.698E+1			1.817E+3	6.056E+2	9.666	-7.460E-1	8.065E-1
3	21	6.536E+1	2.718			3.039E+2	1.045E+2	1.661	-2.960E-1	3.408E-1
4	21	8.329E+34	3.479E+33			1.987E+36	7.845E+35	1.312E+34	-3.704E-2	5.389E-2
1	16	1.022E+1	4.257E-1			8.902	2.634	3.981E-2	-2.400	2.284

2	16	7.727E+5	3.182E+4			8.279E+6	2.721E+6	4.200E+4	-1.480E-1	1.587E-1
3	16	2.601	8.147E-2			2.993E+2	1.050E+2	1.430	-6.470E-3	1.095E-2
4	16	8.946E+1	4.714	6.300E-3		2.986E+3	1.204E+3	2.863E+1	-2.846E-2	3.957E-2
5	16	-1.074E+41	-1.019E+39	5.524E+36		-7.098E+43	-2.974E+43	1.875E+40	-4.231E-4	1.330E-3
2	18	1.950E+2	8.140			5.832E+2	1.763E+2	2.685	-6.638E-1	6.455E-1
3	18	4.223E+1	1.732			2.159E+2	6.720E+1	1.021	-3.516E-1	3.577E-1
4	18	1.267E+2	5.148			9.900E+2	3.525E+2	5.633	-1.490E-1	1.880E-1
2	22	4.676E+3	1.943E+2			4.245E+4	1.271E+4	1.924E+2	-2.229E-1	2.151E-1
3	23	8.867	3.725E-1			1.427E+1	4.333	6.636E-2	-1.229	1.196
4	23	1.612E+1	6.638E-1			1.119E+2	3.882E+1	6.139E-1	-1.927E-1	2.245E-1
1	23	2.704E+42	1.359E+41	1.734E+38		3.900E+44	1.110E+44	2.243E+42	-1.569E-2	1.495E-2
2	23	1.035E+2	4.303	6.118E+1	-3.346E-1	4.458E+2	1.319E+2	1.990	-4.853E-1	4.617E-1
3	26	3.579E+4	5.761E+3			7.391E+5	3.270E+5	2.630E+4	-9.070E-2	8.996E-2
4	26	6.955E+6	3.590E+5	4.485E+2		8.762E+7	3.161E+7	7.015E+5	-1.085E-1	1.247E-1
5	26	7.270E+36	1.466E+35	4.960E+33	-3.386E+31	2.085E+39	9.226E+38	4.279E+37	-1.876E-4	1.910E-3
2	25	-2.470E+6	4.249E+5	8.536E+3	-5.020E+1	-2.690E+7	-1.762E+6	1.302E+6	-1.994E-1	1.877E-1
3	25	1.325E+34				1.981E+35	4.225E+34	-2.759E+32	-1.393E-1	1.361E-1
4	25	2.154E+2	9.126			5.006E+2	1.699E+2	2.715	-6.325E-1	7.045E-1
3	24	1.117E+5	4.604E+3			1.136E+6	3.202E+5	4.736E+3	-2.002E-1	2.012E-1
4	24	8.480	3.613E-1			1.154E+1	3.641	5.699E-2	-1.337	1.348
1	27	-1.116E+5	2.031E+4	4.059E+2	-2.334	-3.477E+7	-7.759E+5	1.541E+6	-8.010E-3	7.520E-3
2	27	-1.081	6.504E-1	1.119E-2	-6.420E-5	-1.660E+2	6.245E+1	2.474E+1	-1.434E-2	1.373E-2
3	27	4.337E+42				2.080E+45	5.669E+44	-2.015E+42	2.960E-3	1.400E-3
4	27	3.129E+41	1.873E+40	2.912E+37		5.070E+43	1.870E+43	6.752E+41	1.090E-3	5.990E-3
5	27	1.480E+1	6.325E-1			8.675	2.885	4.614E-2	-2.671	2.889

Table S19. Fitting coefficients for Ge-like In¹⁷⁺ ion.

Lower level	Upper level	b ₀	b ₁	b ₂	b ₃	b ₅	c ₀	c ₁	c ₂	d ₀	d ₁
1	7	-5.757E+28	-3.449E+27				1.081E+45	-3.033E+44	-1.735	-2.321E-15	5.892E-16
1	11	-4.362E+25	8.456E+23	5.418E+20	-1.290E+17		-1.833E+43	1.171E+41	4.992E+39	-2.930E-16	7.648E-17
1	14	7.220E+26	2.746E+24	7.426E+20	-1.429E+17		8.259E+43	1.396E+42	2.847E+39	-1.298E-15	3.219E-16
1	16	-1.725E-12	8.683E-15	1.002E-17	-3.836E-21	4.060E-28	-6.946E+5	-3.962E+3	4.814E+1	-4.710E-16	1.128E-16
1	19	1.221E+29	-2.630E27	-9.195E+23			3.725E+45	-5.207E+43	-6.367E+41	-8.239E-15	1.905E-15
1	23	-2.463E+24	-2.509E+22	-1.195E+19	2.451E+15		-8.456E+42	-1.725E+41	-6.937E+38	-6.951E-17	1.608E-17

1	27	-2.230E+23	-2.102E+23	-1.228E+20	2.537E+16		1.742E+42	-2.100E+42	-1.604E+40	-2.909E-17	6.621E-18
2	6	4.593	-8.930E-3	-8.190E-6	2.237E-9		1.678E+18	3.890E+16	-1.108E+14	-1.4611E-16	4.162E-17
2	8	1.929E+26	2.344E+23	-2.987E+19			1.705E+43	3.586E+41	1.304E+38	-9.991E-16	2.534E-16
2	10	-1.205E+25	-1.966E+22	5.16879E17			-4.125E+42	-7.720E+40	-5.008E+37	-2.960E-16	7.634E-17
2	11	7.1313E+15	-6.219E+13	-4.744E+10	1.315E+7		9.327E+32	6.659E+30	-1.451E+29	-8.154E-16	2.091E-16
2	12	1.569E+25	-7.801E+21	2.200E+19	-8.820E+15		2.175E+44	4.222E+42	5.072E+39	-3.036E-18	6.948E-19
2	13	-3.597E+25	-3.1506E+22				-1.008E+44	-1.658E+42	-5.770E+38	-3.351E-17	8.981E-18
2	14	7.967E+28	-8.216E+27	-1.051E+25	3.556E+21		-2.150E+45	-5.176E+44	-1.828E+43	-1.017E-15	2.597E-16
2	15	-1.866E+6	-2.598E+3	4.067E-1	-1.497E-4		-1.958E+24	-2.863E+22	-1.361E+19	-1.086E-16	2.936E-17
2	16	2.238E+2	-3.146	-2.150E-3	5.048E-7		5.957E+19	-1.750E+17	-1.032E+16	-6.119E-16	1.508E-16
2	18	-8.924E+28	-2.135E+27	-9.337E+23	1.637E+20		-5.509E+45	-2.387E+44	-1.439E+42	-2.647E-15	6.373E-16
2	19	4.330E+28	2.187E+27				-5.725E+44	1.538E+45	5.723E+42	-4.757E-16	1.139E-16
2	21	1.932E+27	4.083E+24	2.244E+20			1.850E+44	2.279E+42	1.987E+39	-2.258E-15	5.262E-16
2	22	1.937E-1	1.230E-3	4.880E-7	-9.825E-11		5.520E+16	9.460E+14	2.869E+12	-7.603E-16	1.767E-16
2	23	-6.163E-2	-1.012E-4				-8.306E+15	-9.493E+13	-5.603E+10	-1.677E-15	3.879E-16
2	25	-4.032E+27	-7.048E+26	-1.997E+23			1.274E+44	-2.674E+44	-1.716E+42	-7.643E-16	1.759E-16
2	27	-5.958E+24	-7.976E+22	-4.143E+19	8.504E+15		-2.899E+43	-6.958E+41	-3.423E+39	-4.689E-17	1.084E-17
3	6	8.649E+26	1.787E+26	8.598E+22	-2.273E+19		3.175E+43	1.533E+44	3.174E+42	-6.358E-17	1.953E-17
3	7	5.466E+8	1.003E+6	3.866	1.324E-2		6.053E+26	1.455E+25	1.272E+22	-5.172E-17	1.557E-17
3	8	8.358E-1	-5.190E-3	-1.620E-6	2.142E-10		2.853E+18	4.887E+16	-4.386E+14	-1.174E-17	3.837E-18
3	9	3.046E+5	-5.1855E+3	-3.503	1.080E-3		5.967E+22	1.056E+20	-2.049E+19	-4.744E-16	1.1790E-16
3	11	-1.566E+5	-2.657E+2				-3.593E+23	-7.137E+21	-5.529E+18	-4.280E-17	1.070E-17
3	12	-1.205E+23	-1.783E+20	9.540E+15			-1.120E+40	-2.075E+38	-1.135E+35	-1.114E-15	2.836E-16
3	13	1.885E+3	9.255E+1	5.117E-2	-1.392E-5		2.129E+21	1.535E+20	1.693E+18	-9.548E-17	2.374E-17
3	14	-2.441E+28	-4.083E+27	-2.169E+24	4.923E+20		-6.258E+44	-3.337E+44	-3.805E+42	-1.744E-15	4.517E-16
3	15	8.591E+24	1.741E+22	9.195E+17	7.587E+13		3.922E+42	6.091E+40	5.619E+37	-2.890E-16	7.382E-17
3	16	-3.205E+25	2.939E+24	1.673E+20			-3.793E+44	4.799E+43	1.384E+42	-3.029E-18	7.155E-19
3	17	-2.499E+9	-3.852E+6				-7.783E+26	-1.086E+25	-6.339E+21	-4.766E-16	1.195E-16
3	18	1.789E+20	4.108E+17	3.189E+13			2.627E+37	3.707E+35	3.817E+32	-1.142E-15	2.796E-16
3	19	-1.372E-1	-2.238E-4	-1.209E-8			-4.768E+17	-6.660E+15	-5.366E+12	-3.657E-17	9.547E-18
3	21	1.083E+27	-2.043E+26	-1.212E+23	2.644E+19		2.755E+44	-3.690E+43	-3.671E+41	-1.144E-15	2.704E-16
3	23	6.966E+25	3.746E+23	1.356E+20	-2.664E+16		4.439E+43	7.209E+41	1.934E+39	-3.249E-16	7.615E-17
3	24	-2.656E+8	-5.726E+5	-3.284E+1			-1.351E+25	-1.676E+23	-1.494E+20	-4.248E-15	9.897E-16
3	25	-1.021E+26	-5.823E+23	-2.203E+20	4.458E+16		-3.889E+43	-6.379E+41	-1.786E+39	-5.626E-16	1.309E-16
3	26	-3.371E+26	-3.381E+24	-1.642E+21	3.576E+17		-1.045E+44	-2.139E+42	-8.697E+39	-7.881E-16	1.785E-16

3	27	-6.276E+25	-3.475E+25	-6.458E+21	9.669E+17		-3.560E+43	-5.612E+44	-5.705E+42	-7.303E-19	1.052E-18
4	6	-1.818E+10	-7.026E+7	-1.727E+4	4.567		-5.791E+28	-2.574E+27	-6.828E+24	-7.467E-18	2.600E-18
4	7	6.957E+18	1.571E+16	1.189E+12	-1.306E+8		9.843E+36	3.032E+35	3.731E+32	-2.769E-17	8.975E-18
4	8	-1.846E+23	3.461E+19	5.351E+16	-7.431E+12		-3.945E+41	-1.097E+40	6.326E+36	-2.261E-17	6.075E-18
4	9	2.608E+26	6.236E+24	3.476E+21	-1.105E+18		3.455E+43	1.9187E+42	2.057E+40	-4.551E-16	1.202E-16
4	12	8.365E+25	-1.688E+25	-6.951E+21	1.412E+18		1.450E+44	-2.283E+43	-5.417E+41	-3.401E-17	1.059E-17
4	13	9.521E+26	1.202E+27	7.083E+23	-1.970E+20		-2.071E+44	1.107E+44	1.697E+42	-1.198E-15	3.060E-16
4	14	3.804E+25	-6.083E+25	-1.493E+22			1.912E+45	-2.470E+44	-2.900E+42	-2.815E-17	7.500E-18
4	15	2.378E+24	6.343E+21	1.119E+18	-2.171E+14		1.486E+42	2.741E+40	3.940E+37	-1.714E-16	4.491E-17
4	16	-1.211E+27	-2.476E+24	-1.081E+20			-9.245E+43	-1.555E+42	-1.429E+39	-1.559E-15	4.018E-16
4	17	1.840E+25	-9.636E+22	1.485E+19	-1.052E+16		1.524E+44	2.191E+42	-1.514E+40	-3.400E-18	1.306E-18
4	18	-1.133E+27	-1.713E+26	-9.383E+22	2.108E+19		-4.799E+44	-1.461E+44	-1.563E+42	-1.871E-16	4.754E-17
4	19	-3.202E+25	-6.915E+22	-4.461E+18			-4.341E+43	-6.717E+41	-6.610E+38	-1.0184E-16	2.573E-17
4	21	-1.214E+26	-3.463E+23	-5.738E+19	7.369E+15		-2.604E+43	-3.971E+41	-5.699E+38	-7.147E-16	1.780E-16
4	23	-4.077E+23	-1.063E+21	-1.444E+17			-1.790E+41	-2.610E+39	-3.249E+36	-3.794E-16	9.287E-17
4	24	-2.284E+16	-5.729E+13	-6.857E+9	5.562E+5		-4.949E+33	-7.158E+31	-8.494E+28	-7.605E-16	1.867E-16
4	25	4.308E+17	1.287E+15	2.288E+11	-3.067E+7		3.377E+34	4.975E+32	7.2586E+29	-2.223E-15	5.399E-16
4	26	1.774E+28	-1.688E+27	-5.375E+23			1.226E+45	-8.136E+43	-6.696E+41	-4.662E-15	1.095E-15
4	27	-6.150	-1.260E-2	-4.148E-7			-3.128E+19	-4.359E+17	-5.223E+14	-1.525E-17	4.9423E-18
5	7	3.377E+21	-4.272E+20	-2.681E+17	9.390E+13		6.190E+39	-4.551E+38	-1.647E+37	-3.985E-17	1.0566E-17
5	11	-2.485E+5	-3.908E+2				-6.363E+22	-1.686E+21	-1.238E+18	-1.913E-16	5.8263E-17
5	14	-2.35223E24	-2.888E+21	3.632E+17			-3.256E+41	-6.782E+39	-2.508E+36	-6.476E-16	1.6399E-16
5	16	-6.039E+3	-1.128E+1				-3.360E+20	-6.152E+18	-4.919E+15	-2.007E-15	5.038E-16
5	23	4.831E+25	1.273E+23	2.966E+19			5.438E+44	9.575E+42	4.512E+40	-3.826E-18	1.0567E-18
5	27	-2.577E+5	-4.195E+2				-4.888E+21	-6.189E+19	-3.695E+16	-9.701E-15	2.3361E-15

Table S20. Fitting coefficients for Ge-like Cd¹⁶⁺ ion.

Lower level	Upper level	b ₀	b ₁	b ₂	b ₃	c ₀	c ₁	c ₂	d ₀	d ₁
2	6	9.757E+34	3.500E+33			1.043E+36	8.067E+35	1.264E+34	3.403E-2	3.969E-2
3	6	1.289	4.322E-2			2.441E+1	2.017E+1	2.997E-1	2.00E-2	1.997E-2
4	6	1.580	5.149E-2			1.415E+2	1.554E+2	2.384	4.490E-3	2.740E-3
1	7	1.114E+1	4.567E-1			1.246E+1	6.691	1.099E-1	4.961E-2	6.923E-1
2	7	9.171E-2	7.200E-3			1.957E+1	1.093E+1	2.194	2.060E-3	4.877E-4
3	7	3.419	1.249E-1			1.178E+2	7.639E+1	1.180	7.420E-3	1.624E-2

4	7	1.953	7.219E-2			7.238E+1	5.791E+1	9.418E-1	9.870E-3	1.102E-2
5	7	1.207	5.157E-2			3.801E+1	3.606E+1	6.950E-1	1.340E-2	1.034E-2
2	8	1.971E+2	7.902			4.228E+2	2.534E+2	4.178	9.397E-2	3.012E-1
3	8	1.233	6.490E-3			1.138E+2	7.847E+1	-5.041E-2	3.020E-3	4.340E-3
4	8	1.621	4.674E-2	1.548E-4		9.430E+2	7.862E+1	1.463	6.210E-3	5.700E-3
3	9	4.034	3.178E-1	1.170E-3		1.791E+1	1.200E+1	5.318E-1	4.469E-2	1.395E-1
4	9	4.803	4.559E-1	1.79E-3		1.780E+1	1.477E+1	8.049E-1	8.926E-2	1.265E-1
2	10	2.439	1.009E-1			2.089E+1	1.085E+1	1.788E-1	-4.085E-4	9.556E-2
1	11	-7.264	1.278	2.660E-2	-1.666E-4	-6.930E+1	-1.507E+1	5.540	-2.977E-2	1.081E-1
2	11	9.580	3.943E-1			3.193E+1	1.628E+1	2.659E-1	-1.025E-2	2.526E-1
3	11	5.324E+30	1.819E+29			2.857E+32	1.533E+32	2.114E+30	1.100E-3	1.376E-2
4	11	1.864E-2	1.669E-4			1.151E+1	6.687	8.876E-1	7.246E-4	-4.299E-5
5	11	3.594	2.994E-1	1.170E-3		2.504E+1	2.053E+1	1.029	4.638E-2	6.455E-2
2	12	6.703E-2	1.260E-3			3.251E+1	1.629E+1	2.170	1.060E-3	2.091E-6
3	12	2.797E+2	1.138E+1			6.643E+2	3.461E+2	5.626	4.470E-3	3.406E-1
4	12	8.905E+10	8.308E+8	-1.626E+6		4.509E+12	2.944E+12	2.580E+9	5.110E-3	8.950E-3
2	15	2.243	4.971E-2			1.509E+2	7.135E+1	5.828E-1	-2.910E-3	1.244E-2
3	15	7.926E+34	2.835E+33			1.818E+36	8.507E+35	1.215E+34	-6.540E-3	3.968E-2
4	15	2.455E+2	9.872			4.804E+2	2.560E+2	4.135	2.729E-2	3.969E-1
1	14	3.602E+2	1.545E+1			1.007E+3	4.022E+2	6.490	-2.422E-1	4.511E-1
2	14	1.381E+1	5.773E-1			4.186E+1	1.837E+1	2.954E-1	-1.225E-1	3.541E-2
3	14	3.075E+2	1.299E+1			5.138E+2	2.330E+2	3.808	-1.743E-1	6.128E-1
4	14	6.743E+41	4.644E+40	1.601E+38		7.829E+43	4.574E+43	1.771E+42	6.641E-4	6.250E-3
5	14	1.846E+2	7.420			6.496E+2	3.793E+2	6.242	5.166E-2	1.907E-1
2	13	6.857	4.597E-1	1.030E-3		1.933E+2	8.713E+1	2.960	-1.274E-2	3.787E-2
3	13	1.212E+12	5.355E+10	-1.346E+8	1.729E+6	1.592E+13	6.776E+12	1.063E+11	-4.439E-2	8.913E-2
4	13	4.898E+13	1.851E+12	-1.050E+10	1.062E+8	8.957E+14	4.241E+14	4.618E+12	-1.201E-2	5.215E-2
1	20	-3.454E+6	5.875E+5	1.270E+4	-7.765E+1	-3.851E+7	-4.610E+6	2.245E+6	-1.117E-1	1.429E-1
2	20	3.422E+1	1.481			2.077E+2	8.018E+1	1.295	-1.328E-1	2.202E-1
3	20	3.891E+40	4.569E+41	2.970E+39		2.228E+43	1.785E+44	7.933E+43	-1.263E-4	1.890E-3
4	20	4.0424E+2	1.703E+1			7.623E+2	3.428E+2	5.582	-1.660E-1	5.494E-1
5	20	1.783E+1	7.274E-1			2.471E+1	1.219E+1	0.1966E-1	-5.203E-2	6.33E-1
3	17	4.537E+5	1.995E+4			3.980E+6	1.579E+6	2.607E+4	-9.485E-2	1.497E-1
4	17	6.690E-3	1.713E-1			1.784E+1	2.317E+1	2.482E+1	1.890E-3	1.320E-3
2	18	9.111E+3	4.261E+2			1.629E+4	5.838E+4	9.873E+1	-7.161E-1	8.842E-1

3	18	1.034E+1	4.642E-1	1.662E+8		3.768E+1	1.390E+1	2.296E-1	-2.925E-1	4.034E-1	
4	18	4.729E+38	2.017E+37			7.782E+39	3.204E+39	5.203E+37	-3.411E-2	7.252E-2	
1	16	1.104E+1	5.244E-1			7.459	2.426	4.085E-2	-2.657	2.738	
2	16	1.318E+12	8.359E+10			1.435E+13	5.466E+12	1.489E+11	-1.202E-1	1.450E-1	
3	16	9.513E+4	3.461E+3			7.736E+6	2.944E+6	4.428E+4	-8.160E-3	1.496E-2	
4	16	6.307E+1	2.674			2.5427E+3	1.026E+3	1.641E+1	-1.607E-2	3.071E-2	
5	27	5.270E-3	2.609E-4			1.576E+1	7.053	1.458	4.056E-5	5.279E-5	
2	21	3.695E+2	1.741E+1			8.904E+2	2.950E+2	4.947	-6.986E-1	7.441E-1	
3	21	5.886E+1	2.673			2.813E+2	9.583E+1	1.571	-3.039E-1	3.510E-1	
4	21	1.697E+2	7.417			7.946E+2	3.016E+2	4.950	-1.876E-1	2.930E-1	
2	22	8.382E+2	3.956E+1			6.026E+3	1.980E+3	3.325E+1	-2.393E-1	2.522E-1	
1	23	4.950E+2	2.332E+1			3.375E+4	1.020E+4	1.644E+2	-3.043E-2	2.995E-2	
2	23	1.310E+1	6.218E-1			4.290E+1	1.395E+1	2.347E-1	-5.489E-1	5.652E-1	
3	23	5.754E+42	2..656E+41			8.912E+43	2.985E+43	4.955E+41	-1.024E-1	1.123E-1	
4	23	1.251E+5	8.317E+3	1.857E+1	1.495E+6	6.044E+5	1.775E+4	-8.946E-2	1.215E-1		
5	23	1.466E-1	1.806E-2	2.953E+2	5.177E+1	2.168E+1	5.923	7.756E-4	7.022E-4		
3	26	2.357E+6	1.556E+5		2.944E+6	1.056E+6	2.893E+4	-1.340	1.425		
4	26	4.265E+1	1.906		2.299E+2	8.535E+1	1.407	-1.983E-1	2.708E-1		
2	25	3.557E+2	1.679E+1		2.347E+3	7.557E+2	1.264E+1	-2.822E-1	2.846E-1		
3	25	6.235E+3	2.932E+2		5.155E+4	1.704E+4	2.867E+2	-2.051E-1	2.170E-1		
3	25	3.964E+2	1.825E+1		8.348E+2	3.045E+2	5.106	-5.551E-1	7.228E-1		
3	24	5.655E+3	2.715E+2		4.395E+4	1.361+4	2.299E+2	-2.764E-1	2.592E-1		
3	24	7.459	3.575E-1		8.352	2.835	4.839E-2	-1.429	1.558		
1	27	9.798E+40	4.282E+39		2.086E+43	5.869E+42	8.966E+40	-9.970E-3	9.930E-3		
2	27	6.291E+17	2.639E+16		8.288E+19	2.540E+19	3.674E+17	-1.481E-2	1.471E-2		
3	27	2.820E+40	7.383E+37		-5.015E+36	3.410E+34	1.050E+43	3.448E+42	-2.370E+40	4.180E-3	1.39E-3
4	27	-2.186E+42	1.122E+42		1.049E+40	-6.984E+37	-2.791E+44	5.811E+43	4.587E+43	2.450E-3	7.110E-3
5	27	1.610E+1	7.527E-1			7.660	2.739	4.632E-2	-2.678	3.324	

Table S21. Rate coefficient (cm³/sec) for Ge-like Te²⁰⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and electron temperature 1 – 40 eV.

Transitions		1	2	5	10	20	30	40
<i>i</i>	<i>f</i>							
1	7	4.350E-37	1.217E-23	1.121E-15	4.231E-13	7.029E-12	1.659E-11	2.457E-11
1	11	6.025E-44	1.502E-27	8.158E-18	1.193E-14	3.892E-13	1.149E-12	1.902E-12
1	13	2.802E-45	9.214E-29	6.178E-18	2.086E-14	1.032E-12	3.500E-12	6.208E-12
1	17	1.401E-45	1.000E-31	3.863E-19	5.034E-15	4.887E-13	2.074E-12	4.117E-12
1	19	5.605E-45	7.688E-32	9.564E-19	1.839E-14	2.169E-12	9.828E-12	2.014E-11
1	24	1.401E-45	2.251E-36	5.620E-22	2.935E-17	5.699E-15	3.046E-14	6.782E-14
1	27	3.554E-14	9.904E-14	1.996E-13	2.764E-13	3.441E-13	3.722E-13	3.841E-13
2	6	4.610E-29	4.154E-20	7.796E-15	3.772E-13	2.269E-12	3.835E-12	4.809E-12
2	7	9.531E-35	1.207E-23	4.362E-17	5.585E-15	5.364E-14	1.045E-13	1.396E-13
2	8	4.479E-34	2.302E-22	1.932E-15	3.290E-13	3.684E-12	7.635E-12	1.059E-11
2	10	1.925E-38	8.896E-25	1.106E-16	4.612E-14	8.052E-13	1.932E-12	2.885E-12
2	11	9.616E-39	1.092E-24	2.330E-16	1.161E-13	2.217E-12	5.481E-12	8.302E-12
2	12	7.780E-41	1.455E-26	4.181E-18	2.294E-15	4.565E-14	1.138E-13	1.725E-13
2	13	2.278E-42	1.724E-26	4.560E-17	5.251E-14	1.519E-12	4.312E-12	6.996E-12
2	14	9.809E-45	1.977E-28	9.511E-19	1.333E-15	4.238E-14	1.236E-13	2.028E-13
2	15	1.401E-45	9.965E-29	2.148E-18	4.972E-15	2.036E-13	6.480E-13	1.112E-12
2	17	2.802E-45	7.592E-30	1.149E-18	5.092E-15	2.883E-13	1.022E-12	1.855E-12
2	18	1.401E-45	2.544E-30	7.449E-19	4.109E-15	2.595E-13	9.544E-13	1.762E-12
2	19	1.401E-45	2.410E-30	1.042E-18	6.552E-15	4.419E-13	1.661E-12	3.102E-12
2	21	1.401E-45	8.941E-32	5.100E-19	7.568E-15	7.841E-13	3.401E-12	6.823E-12
2	22	1.401E-45	1.884E-32	1.408E-19	2.285E-15	2.477E-13	1.090E-12	2.204E-12
2	24	1.401E-45	2.027E-32	2.223E-19	4.101E-15	4.737E-13	2.130E-12	4.352E-12
2	25	4.203E-45	3.274E-33	5.498E-20	1.168E-15	1.448E-13	6.669E-13	1.378E-12
2	27	5.605E-45	6.362E-36	1.176E-21	5.555E-17	1.024E-14	5.378E-14	1.185E-13
3	6	2.846E-28	6.998E-20	6.036E-15	2.259E-13	1.198E-12	1.942E-12	2.386E-12
3	7	1.358E-32	4.697E-22	7.827E-16	7.799E-14	6.697E-13	1.271E-12	1.689E-12
3	8	1.608E-34	2.369E-23	9.394E-17	1.245E-14	1.227E-13	2.431E-13	3.291E-13
3	9	5.653E-35	5.564E-23	6.891E-16	1.334E-13	1.592E-12	3.367E-12	4.718E-12
3	11	5.180E-39	1.603E-25	1.568E-17	6.034E-15	1.010E-13	2.390E-13	3.539E-13
3	12	5.972E-38	3.049E-24	4.026E-16	1.712E-13	3.018E-12	7.267E-12	1.086E-11
3	13	5.473E-41	1.129E-25	1.369E-16	1.217E-13	3.097E-12	8.422E-12	1.337E-11
3	14	5.605E-44	3.290E-28	7.470E-19	8.145E-16	2.276E-14	6.342E-14	1.014E-13
3	15	1.121E-44	7.971E-28	8.122E-18	1.465E-14	5.300E-13	1.619E-12	2.726E-12
3	16	1.401E-45	1.277E-28	5.016E-18	1.418E-14	6.419E-13	2.113E-12	3.692E-12
3	17	2.802E-45	5.418E-31	3.752E-20	1.276E-16	6.292E-15	2.118E-14	3.727E-14
3	18	2.802E-45	2.420E-29	3.349E-18	1.440E-14	8.035E-13	2.836E-12	5.131E-12
3	19	1.401E-45	4.401E-31	8.985E-20	4.389E-16	2.602E-14	9.350E-14	1.703E-13
3	21	2.802E-45	1.979E-31	5.334E-19	6.164E-15	5.636E-13	2.345E-12	4.606E-12
3	23	1.401E-45	1.981E-31	1.002E-18	1.429E-14	1.451E-12	6.257E-12	1.251E-11
3	24	9.809E-45	1.977E-28	9.511E-19	1.333E-15	4.238E-14	1.236E-13	2.028E-13
3	25	1.401E-45	6.123E-33	5.643E-20	9.822E-16	1.101E-13	4.906E-13	9.969E-13
3	26	1.401E-45	8.161E-33	9.252E-20	1.726E-15	2.005E-13	9.042E-13	2.324E-12
3	27	5.605E-45	4.954E-36	5.015E-22	1.932E-17	3.200E-15	1.614E-14	3.476E-14
4	6	9.993E-24	4.121E-18	2.284E-15	8.358E-14	2.410E-13	3.209E-13	3.580E-13
4	7	1.563E-27	9.032E-20	3.276E-15	9.219E-14	4.252E-13	6.590E-13	7.919E-13
4	8	9.257E-29	2.164E-20	1.811E-15	6.707E-14	3.532E-13	5.705E-13	6.989E-13
4	9	2.939E-29	4.589E-20	1.196E-14	6.456E-13	4.098E-12	7.049E-12	8.919E-12

4	11	4.054E-34	2.090E-23	4.415E-17	4.743E-15	4.200E-14	8.011E-14	1.062E-13
4	12	2.256E-33	1.918E-22	5.477E-16	6.521E-14	6.110E-13	1.193E-12	1.606E-12
4	13	8.418E-37	2.749E-24	6.988E-17	1.718E-14	2.308E-13	5.079E-13	7.258E-13
4	14	1.335E-36	1.245E-23	5.939E-16	1.800E-13	2.682E-12	6.109E-12	8.882E-12
4	15	3.744E-39	4.253E-25	9.071E-17	2.297E-14	8.629E-13	2.132E-12	3.229E-12
4	16	2.075E-42	2.233E-27	1.831E-18	1.424E-15	3.370E-14	8.902E-14	1.388E-13
4	17	2.331E-41	6.493E-26	9.429E-17	8.897E-14	2.331E-12	6.402E-12	1.021E-11
4	18	2.690E-43	2.369E-27	6.856E-18	8.136E-15	2.389E-13	6.815E-13	1.108E-12
4	19	1.317E-43	2.225E-27	9.508E-18	1.284E-14	4.024E-13	1.172E-12	1.928E-12
4	21	1.401E-45	4.597E-29	2.587E-18	8.241E-15	3.958E-13	1.328E-12	2.343E-12
4	23	1.401E-45	2.372E-29	2.507E-18	9.850E-15	5.254E-13	1.826E-12	3.279E-12
4	24	2.802E-45	1.581E-29	1.722E-18	6.836E-15	3.666E-13	1.277E-12	2.295E-12
4	25	2.802E-45	3.332E-29	6.226E-18	2.958E-14	1.735E-12	6.229E-12	1.136E-11
4	26	1.401E-45	2.854E-30	3.223E-18	2.788E-14	2.207E-12	8.754E-12	1.679E-11
4	27	1.401E-45	9.327E-33	1.804E-20	1.862E-16	1.602E-14	6.510E-14	1.260E-13
5	7	8.174E-25	2.032E-18	1.126E-14	1.709E-13	5.841E-13	8.219E-13	9.421E-13
5	11	9.637E-30	2.134E-20	6.861E-15	3.966E-13	2.603E-12	4.526E-12	5.754E-12
5	13	3.987E-33	5.876E-22	2.332E-15	3.099E-13	3.069E-12	6.110E-12	8.310E-12
5	17	1.502E-38	1.886E-24	4.272E-16	2.173E-13	4.189E-12	1.038E-11	1.576E-11
5	19	1.774E-41	1.346E-26	8.970E-18	6.529E-15	1.503E-13	3.953E-13	6.172E-13
5	24	2.802E-45	1.875E-29	3.078E-19	6.479E-16	2.511E-14	7.798E-14	1.317E-13
5	27	1.401E-45	5.595E-29	1.689E-17	9.415E-14	5.983E-12	2.205E-11	4.079E-11

Table S22. Rate coefficient (cm³/sec) for Ge-like Sb¹⁹⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and electron temperature 1 – 40 eV.

Transition		1	2	5	10	20	30	40
<i>i</i>	<i>f</i>							
1	7	1.216E-35	5.010E-23	1.473E-15	3.854E-13	5.467E-12	1.248E-11	1.839E-11
1	11	6.584E-42	1.244E-26	1.443E-17	1.280E-14	3.335E-13	9.311E-13	1.516E-12
1	13	5.6056E-45	7.242E-28	1.069E-17	2.211E-14	8.770E-13	2.814E-12	4.910E-12
1	17	0	9.326E-31	5.278E-19	3.673E-15	2.666E-13	1.045E-12	2.015E-12
1	19	0	8.469E-31	1.952E-18	2.169E-14	1.987E-12	8.419E-12	1.686E-11
1	23	0	3.884E-35	1.533E-21	4.385E-17	6.435E-15	3.185E-14	6.895E-14
1	27	0	2.423E-37	2.423E-37	1.086E-17	2.520E-15	1.451E-14	3.387E-14
2	6	2.602E-28	7.536E-20	7.209E-15	2.821E-13	1.560E-12	2.610E-12	3.291E-12
2	7	4.982E-34	1.793E-23	3.061E-17	3.075E-15	2.653E-14	5.044E-14	6.693E-14
2	8	6.659E-33	7.236E-22	2.409E-15	3.057E-13	3.027E-12	6.139E-12	8.523E-12
2	10	4.500E-37	3.387E-24	1.430E-16	4.218E-14	6.352E-13	1.479E-12	2.201E-12
2	11	2.714E-37	4.493E-24	3.043E-16	1.050E-13	1.709E-12	4.086E-12	6.157E-12
2	12	1.561E-39	4.287E-26	3.922E-18	1.489E-15	2.519E-14	6.057E-14	9.111E-14
2	13	6.139E-41	7.069E-26	6.093E-17	4.898E-14	1.213E-12	3.334E-12	5.384E-12
2	14	6.754E-43	1.414E-27	1.741E-18	1.573E-15	4.117E-14	1.148E-13	1.864E-13
2	15	8.407E-45	3.325E-28	2.392E-18	3.892E-15	1.369E-13	4.219E-13	7.212E-13
2	17	0	7.593E-29	2.506E-18	6.775E-15	3.070E-13	1.029E-12	1.836E-12

2	18	0	7.330E-29	6.601E-18	2.492E-14	1.334E-12	4.729E-12	8.672E-12
2	19	0	8.465E-30	1.138E-18	4.909E-15	2.807E-13	1.017E-12	1.885E-12
2	21	0	6.781E-31	8.582E-19	7.808E-15	6.477E-13	2.654E-12	5.231E-12
2	22	0	1.487E-31	2.410E-19	2.381E-15	2.058E-13	8.550E-13	1.696E-12
2	23	0	1.730E-31	3.982E-19	4.422E-15	4.051E-13	1.715E-12	3.436E-12
2	25	0	2.837E-32	1.056E-19	1.375E-15	1.364E-13	5.933E-13	1.203E-12
2	27	0	5.665E-35	2.061E-21	5.735E-17	8.295E-15	4.083E-14	8.810E-14
3	6	1.407E-27	1.207E-19	5.577E-15	1.715E-13	8.426E-13	1.354E-12	1.674E-12
3	7	7.791E-32	8.332E-22	6.918E-16	5.536E-14	4.362E-13	8.198E-13	1.095E-12
3	8	2.089E-33	6.718E-23	1.077E-16	1.070E-14	9.346E-14	1.811E-13	2.452E-13
3	9	1.069E-33	1.964E-22	8.957E-16	1.261E-13	1.314E-12	2.708E-12	3.789E-12
3	11	1.341E-37	6.578E-25	2.147E-17	5.811E-15	8.371E-14	1.919E-13	2.831E-13
3	12	1.457E-36	1.186E-23	5.248E-16	1.572E-13	2.385E-12	5.569E-12	8.295E-12
3	13	1.247E-39	4.251E-25	1.766E-16	1.113E-13	2.447E-12	6.459E-12	1.022E-11
3	14	7.533E-42	4.667E-27	2.771E-18	1.964E-15	4.559E-14	1.222E-13	1.946E-13
3	15	2.270E-43	2.660E-27	9.228E-18	1.178E-14	3.676E-13	1.089E-12	1.827E-12
3	16	5.605E-45	4.869E-28	6.006E-18	1.170E-14	4.504E-13	1.431E-12	2.484E-12
3	17	0	1.857E-30	2.939E-20	6.177E-17	2.437E-15	7.724E-15	1.329E-14
3	18	0	1.039E-28	4.509E-18	1.335E-14	6.330E-13	2.155E-12	3.872E-12
3	19	0	1.982E-30	1.283E-19	4.334E-16	2.189E-14	7.594E-14	1.375E-13
3	21	0	1.377E-30	8.398E-19	5.991E-15	4.403E-13	1.733E-12	3.347E-12
3	23	0	1.152E-31	1.278E-19	1.112E-15	9.030E-14	3.673E-13	7.211E-13
3	24	0	1.509E-30	1.699E-18	1.486E-14	1.209E-12	4.926E-12	9.677E-12
3	25	0	6.837E-32	1.226E-19	1.252E-15	1.100E-13	4.596E-13	9.141E-13
3	26	0	5.869E-33	6.286E-20	1.164E-15	1.376E-13	6.341E-13	1.324E-12
3	27	0	5.215E-35	9.141E-22	1.989E-17	2.533E-15	1.191E-14	2.505E-14
4	6	1.571E-23	4.422E-18	6.705E-15	6.710E-14	1.902E-13	2.554E-13	2.885E-13
4	7	3.020E-27	1.055E-19	2.847E-15	7.337E-14	3.303E-13	5.163E-13	6.294E-13
4	8	2.788E-28	2.929E-20	1.526E-15	4.880E-14	2.437E-13	3.933E-13	4.864E-13
4	9	1.283E-28	7.686E-20	1.136E-14	5.135E-13	3.051E-12	5.225E-12	6.669E-12
4	11	1.673E-33	2.671E-23	2.807E-17	2.412E-15	1.943E-14	3.640E-14	4.822E-14
4	12	1.192E-32	3.161E-22	4.520E-16	4.329E-14	3.723E-13	7.198E-13	9.750E-13
4	13	3.749E-36	4.164E-24	5.584E-17	1.125E-14	1.400E-13	3.063E-13	4.414E-13
4	14	2.091E-35	4.220E-23	8.097E-16	1.837E-13	2.428E-12	5.415E-12	7.884E-12
4	15	1.543E-38	5.901E-25	6.601E-17	2.691E-14	4.757E-13	1.168E-12	1.784E-12
4	16	1.242E-41	3.934E-27	1.559E-18	9.645E-16	2.082E-14	5.428E-14	8.506E-14
4	17	5.195E-40	2.518E-25	1.291E-16	8.739E-14	1.987E-12	5.307E-12	8.451E-12
4	18	1.982E-42	5.121E-27	7.165E-18	6.767E-15	1.817E-13	5.125E-13	8.386E-13
4	19	5.549E-43	2.799E-27	5.848E-18	6.310E-15	1.810E-13	5.220E-13	8.636E-13
4	21	1.401E-45	1.924E-28	3.782E-18	8.600E-15	3.575E-13	1.164E-12	2.047E-12
4	23	0	5.752E-29	2.055E-18	5.706E-15	2.620E-13	8.827E-13	1.577E-12
4	24	0	9.082E-29	3.293E-18	9.186E-15	4.227E-13	1.424E-12	2.547E-12
4	25	0	1.391E-28	8.041E-18	2.618E-14	1.302E-12	4.505E-12	8.161E-12
4	26	0	1.257E-29	4.336E-18	2.559E-14	1.712E-12	6.533E-12	1.242E-11
4	27	0	4.259E-32	2.405E-20	1.669E-16	1.205E-14	4.705E-14	9.028E-14
5	7	1.287E-24	2.186E-18	9.686E-15	1.377E-13	4.638E-13	6.591E-13	7.665E-13
5	11	4.759E-29	3.689E-20	6.363E-15	3.025E-13	1.841E-12	3.179E-12	4.071E-12
5	13	1.901E-32	1.023E-21	2.237E-15	2.468E-13	2.281E-12	4.521E-12	6.207E-12
5	17	2.819E-37	6.619E-24	5.528E-16	5.528E-16	3.446E-12	8.332E-12	1.262E-11
5	19	2.915E-41	7.116E-27	2.418E-18	1.425E-15	3.025E-14	7.886E-14	1.240E-13
5	23	1.401E-45	4.689E-29	2.715E-19	4.090E-16	1.371E-14	4.128E-14	6.939E-14
5	27	0	2.485E-28	2.287E-17	8.697E-14	4.673E-12	1.658E-11	3.042E-11

Table S23. Rate coefficient (cm³/sec) for Ge-like Sn¹⁸⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and electron temperature 1 – 40 eV.

Transitions		1	2	5	10	20	30	40
<i>i</i>	<i>f</i>							
1	7	8.431E-34	8.431E-34	5.255-15	9.375E-13	1.075E-11	2.248E-11	3.135E-11
1	11	1.700E-39	2.730E-25	7.170E-17	3.834E-14	7.583E-13	1.899E-12	2.897E-12
1	13	1.304E-42	1.526E-26	5.242E-17	6.590E-14	1.994E-12	5.752E-12	9.413E-12
1	16	0	2.720E-29	2.428E-18	9.029E-15	4.694E-13	1.620E-12	2.902E-12
1	19	0	2.088E-29	6.854E-23	6.703E-14	4.625E-12	1.755E-11	3.295E-11
1	23	0	2.197E-33	1.288E-20	1.931E-16	2.012E-14	8.758E-14	1.760E-13
1	27	0	1.392E-35	1.139E-21	4.104E-17	6.625E-15	3.332E-14	7.199E-14
2	6	3.425E-27	3.231E-19	1.572E-14	4.875E-13	2.358E-12	3.715E-12	4.501E-12
2	7	9.758E-33	1.017E-22	8.217E-17	6.370E-15	4.725E-14	8.375E-14	1.058E-13
2	8	2.405E-31	5.822E-21	7.836E-15	7.279E-13	6.044E-12	1.136E-11	1.502E-11
2	10	8.080E-35	3.485E-23	1.356E-15	1.040E-13	1.277E-12	3.852E-12	4.635E-12
2	11	1.900E-35	4.925E-23	1.090E-15	2.563E-13	3.370E-12	1.051E-11	1.273E-11
2	12	8.681E-38	3.721E-25	1.109E-17	2.862E-15	3.895E-14	8.530E-14	1.208E-13
2	13	4.216E-39	7.957E-25	2.301E-16	1.270E-13	2.553E-12	6.427E-12	9.829E-12
2	14	1.183E-40	2.703E-26	8.754E-18	5.009E-15	1.020E-13	2.572E-13	3.928E-13
2	15	5.212E-43	3.372E-27	8.114E-18	9.055E-15	2.580E-13	7.284E-13	1.178E-12
2	16	4.203E-44	1.830E-27	1.374E-17	2.242E-14	7.728E-13	2.326E-12	3.890E-12
2	18	2.802E-45	9.463E-28	2.583E-17	6.476E-14	2.766E-12	8.945E-12	1.550E-11
2	19	0	9.486E-29	7.867E-23	1.122E-14	5.132E-13	1.697E-12	2.974E-12
2	21	0	1.484E-29	4.202E-18	2.294E-14	1.445E-12	5.320E-12	9.839E-12
2	22	0	3.350E-30	1.196E-18	7.062E-15	4.623E-13	1.723E-12	3.208E-12
2	23	0	4.170E-30	2.057E-18	1.352E-14	9.344E-13	3.546E-12	6.660E-12
2	25	0	8.353E-31	6.314E-19	4.781E-15	3.545E-13	1.377E-12	2.617E-12
2	27	0	1.646E-33	4.984E-21	1.770E-16	1.889E-14	8.275E-14	1.667E-13
3	6	1.671E-26	4.947E-19	1.203E-14	2.969E-13	1.284E-12	1.950E-12	2.320E-12
3	7	1.175E-30	3.854E-21	1.566E-15	9.790E-14	6.683E-13	1.177E-12	1.508E-12
3	8	6.327E-32	4.799E-22	7.131E-16	2.370E-14	1.7464E-13	3.144E-13	4.059E-13
3	9	4.934E-32	1.796E-21	3.086E-15	3.108E-13	2.684E-12	5.108E-12	6.795E-12
3	11	9.216E-36	7.488E-24	8.266E-17	1.541E-14	1.805E-13	3.796E-13	5.304E-13
3	12	9.340E-35	1.256E-22	1.877E-15	3.874E-13	4.775E-12	1.022E-11	1.442E-11
3	13	7.559E-38	4.471E-24	6.451E-16	2.827E-13	5.065E-12	1.227E-11	1.842E-11
3	14	1.922E-39	1.376E-25	2.224E-17	1.011E-14	1.841E-13	4.477E-13	6.723E-13
3	15	1.230E-41	2.492E-26	2.991E-17	2.650E-14	6.734E-13	1.831E-12	2.910E-12
3	16	2.802E-45	3.943E-29	1.468E-19	1.880E-16	5.652E-15	1.603E-14	2.577E-14
3	17	3.951E-43	5.543E-27	2.121E-17	2.764E-14	8.517E-13	2.470E-12	4.053E-12
3	18	1.121E-44	1.317E-27	1.793E-17	3.565E-14	1.356E-12	4.219E-12	7.171E-12
3	19	0	2.702E-29	5.543E-19	1.261E-15	5.113E-14	1.620E-13	2.775E-13
3	21	0	2.692E-29	3.799E-18	1.645E-14	9.230E-13	3.267E-12	5.925E-12
3	23	0	2.662E-30	6.549E-19	3.412E-15	2.099E-13	7.664E-13	1.411E-12
3	24	0	3.214E-29	8.280E-18	4.382E-14	2.717E-12	9.951E-12	1.835E-11
3	25	0	1.967E-30	7.412E-19	4.452E-15	2.940E-13	1.099E-12	2.048E-12
3	26	0	1.570E-31	3.421E-19	3.686E-15	3.259E-13	1.342E-12	2.626E-12
3	27	0	1.581E-33	5.413E-21	6.748E-17	6.366E-15	2.662E-14	5.222E-14
4	6	5.195E-23	9.602E-18	1.129E-14	1.033E-13	2.766E-13	3.598E-13	3.968E-13
4	7	1.430E-26	2.916E-19	5.677E-15	1.302E-13	5.437E-13	8.163E-13	9.660E-13
4	8	2.038E-27	9.611E-20	3.086E-15	8.335E-14	3.759E-13	5.773E-13	6.897E-13
4	9	1.419E-27	3.210E-19	2.635E-14	9.709E-13	5.114E-12	8.283E-12	1.017E-11

4	11	2.099E-32	1.056E-22	5.524E-17	3.718E-15	2.584E-14	4.506E-14	5.672E-14
4	12	1.600E-31	1.335E-21	9.495E-16	7.133E-14	5.323E-13	9.645E-13	1.250E-12
4	13	4.762E-35	1.746E-23	3.051E-16	1.907E-14	2.066E-13	4.238E-13	5.852E-13
4	14	8.448E-34	3.749E-22	2.882E-15	4.771E-13	5.271E-12	1.088E-11	1.508E-11
4	15	2.066E-37	2.593E-24	1.477E-16	4.752E-14	7.300E-13	1.680E-12	2.458E-12
4	16	3.295E-38	2.758E-24	4.901E-16	2.301E-13	4.268E-12	1.046E-11	1.578E-11
4	17	2.925E-40	2.535E-26	4.587E-18	2.155E-15	3.958E-14	9.586E-14	1.429E-13
4	18	4.940E-41	3.555E-26	2.294E-17	1.654E-14	3.796E-13	9.987E-13	1.561E-12
4	19	9.121E-42	1.303E-26	4.365E-17	1.049E-14	2.576E-13	6.932E-13	1.095E-12
4	21	7.006E-44	2.478E-27	1.657E-17	1.163E-14	8.785E-13	2.626E-12	4.376E-12
4	23	7.006E-45	6.230E-28	7.262E-18	1.371E-14	5.082E-13	1.567E-12	2.653E-12
4	24	1.121E-44	1.053E-27	1.285E-17	2.463E-14	9.197E-13	2.843E-12	4.817E-12
4	25	9.809E-45	1.699E-27	3.034E-17	6.603E-14	2.628E-12	8.301E-12	1.422E-11
4	26	1.401E-45	1.680E-28	1.734E-17	6.769E-14	3.606E-12	1.255E-11	2.258E-11
4	27	1.401E-45	6.614E-31	1.073E-19	4.856E-16	2.770E-14	9.819E-14	1.776E-13
5	7	4.810E-24	5.213E-18	1.760E-14	2.272E-13	7.186E-13	9.868E-13	1.118E-12
5	11	5.999E-28	1.604E-19	1.455E-14	5.541E-13	2.964E-12	4.822E-12	5.935E-12
5	13	2.492E-31	4.843E-21	8.122E-15	3.125E-13	4.132E-12	7.713E-12	1.016E-11
5	16	2.492E-31	4.843E-21	5.715E-15	5.083E-13	4.132E-12	7.713E-12	9.071E-12
5	19	1.476E-40	1.116E-26	1.863E-18	8.550E-16	1.560E-14	3.789E-14	5.679E-14
5	23	9.668E-44	4.587E-28	9.124E-19	9.488E-16	2.573E-14	7.063E-14	1.117E-13
5	27	8.407E-45	3.268E-27	9.121E-17	2.303E-13	9.872E-12	3.197E-11	5.545E-11

Table S24. Rate coefficient (cm³/sec) for Ge-like In¹⁷⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and electron temperature 1 – 40 eV.

Transition		1	2	5	10	20	30	40
<i>i</i>	<i>f</i>							
1	7	1.823E-32	1.998E-21	6.692E-15	8.512E-13	8.450E-12	1.716E-11	2.386E-11
1	11	1.177E-37	1.8359E-24	1.199E-16	4.093E-14	6.633E-13	1.584E-12	2.388E-12
1	14	8.222E-41	9.660E-26	8.430E-17	6.809E-14	1.693E-12	4.661E-12	7.541E-12
1	16	1.401E-45	2.569E-28	4.045E-18	8.552E-15	3.434E-13	1.107E-12	1.939E-12
1	19	0	1.599E-28	1.765E-17	7.137E-14	3.958E-12	1.421E-11	2.624E-11
1	23	0	3.730E-32	3.555E-20	2.945E-16	2.334E-14	2.904E-14	6.086E-14
1	27	0	2.320E-34	2.728E-21	5.214E-17	6.264E-15	2.904E-14	6.086E-14
2	6	1.831E-26	5.711E-19	1.440E-14	3.632E-13	1.618E-12	2.522E-12	3.071E-12
2	8	2.879E-30	1.657E-20	9.499E-15	6.728E-13	4.996E-12	9.218E-12	1.221E-11
2	10	5.078E-34	1.207E-22	6.429E-16	9.540E-14	1.022E-12	2.129E-12	2.997E-12
2	11	4.092E-34	2.299E-13	1.372E-15	2.299E-13	2.616E-12	5.558E-12	7.903E-12
2	12	1.236E-36	8.774E-25	8.943E-18	1.628E-15	1.893E-14	3.986E-14	5.577E-14
2	13	5.163E-39	1.427E-25	1.313E-17	5.009E-15	8.545E-14	2.069E-13	3.133E-13
2	14	8.788E-38	2.896E-24	2.965E-16	1.174E-13	2.049E-12	5.017E-12	7.655E-12
2	15	1.036E-41	1.123E-26	9.339E-18	7.416E-15	1.826E-13	5.004E-13	8.071E-13
2	16	3.137E-42	1.285E-26	2.371E-17	2.457E-14	6.919E-13	1.984E-12	3.276E-12
2	18	7.707E-44	4.061E-27	3.449E-17	5.941E-14	2.154E-12	6.719E-12	1.156E-11
2	19	1.915E-13	3.616E-28	4.678E-18	9.266E-15	3.600E-13	1.148E-12	1.999E-12
2	21	0	1.033E-28	6.895E-18	2.357E-14	1.202E-12	4.200E-12	7.649E-12
2	22	0	2.410E-29	1.997E-18	7.339E-15	3.881E-13	1.371E-12	2.513E-12
2	23	0	3.191E-29	3.565E-18	1.447E-14	8.042E-13	2.889E-12	5.336E-12
2	25	0	7.689E-30	1.254E-18	5.773E-15	3.415E-13	1.252E-12	2.336E-12

2	27	0	7.689E-30	1.254E-18	5.773E-15	3.415E-13	1.252E-12	2.336E-12
3	6	8.338E-26	8.645E-19	1.128E-14	2.290E-13	9.170E-13	1.379E-12	1.649E-12
3	7	6.620E-30	6.766E-21	1.377E-15	6.922E-14	4.335E-13	7.557E-13	9.731E-13
3	8	5.999E-31	1.146E-21	3.389E-16	1.922E-14	1.270E-13	2.245E-13	2.902E-13
3	9	7.424E-31	5.744E-21	3.929E-15	2.950E-13	2.253E-12	4.194E-12	5.581E-12
3	11	1.948E-34	2.829E-23	1.120E-16	1.506E-14	1.534E-13	3.139E-13	4.378E-13
3	12	1.893E-33	4.474E-22	2.374E-15	3.518E-13	3.767E-12	7.845E-12	1.104E-11
3	13	1.074E-37	2.544E-18	4.693E-17	1.439E-14	2.209E-13	5.177E-13	7.722E-13
3	14	1.404E-36	1.536E-23	8.123E-16	2.583E-13	4.042E-12	9.544E-12	1.430E-11
3	15	2.112E-40	7.601E-26	1.339E-15	2.080E-14	4.597E-13	1.216E-12	1.928E-12
3	16	2.312E-43	3.143E-28	2.980E-19	2.457E-16	6.100E-15	1.661E-14	2.654E-14
3	17	1.005E-41	2.072E-26	2.533E-17	2.288E-14	6.016E-13	1.686E-12	2.752E-12
3	18	3.194E-43	5.546E-27	2.432E-17	3.360E-14	1.091E-12	3.283E-12	5.550E-12
3	19	2.802E-45	1.137E-28	7.590E-19	1.204E-15	4.179E-14	1.281E-13	2.184E-13
3	21	0	1.233E-22	5.669E-18	1.555E-14	7.107E-13	2.393E-12	4.279E-12
3	23	0	1.939E-29	1.118E-18	3.642E-15	1.813E-13	6.281E-13	1.139E-12
3	24	0	2.192E-28	1.359E-17	4.535E-14	2.286E-12	7.952E-12	1.445E-11
3	25	0	2.192E-28	1.359E-17	4.535E-14	2.286E-12	7.952E-12	1.445E-11
3	26	0	1.314E-30	6.158E-19	4.027E-15	2.838E-13	1.102E-12	2.118E-12
3	27	0	1.238E-32	8.796E-21	6.582E-17	4.926E-15	1.942E-14	3.742E-14
4	6	9.492E-23	1.100E-17	9.833E-15	8.283E-14	2.161E-13	2.161E-13	3.148E-13
4	7	3.234E-26	3.680E-19	5.081E-15	1.050E-13	4.246E-13	6.407E-13	7.678E-13
4	8	6.253E-27	1.330E-19	2.667E-15	6.221E-14	2.659E-13	4.074E-13	4.910E-13
4	9	6.401E-27	5.509E-19	2.550E-14	7.860E-13	3.869E-12	6.232E-12	7.717E-12
4	12	1.106E-32	1.128E-21	3.620E-15	4.539E-13	4.473E-12	9.061E-12	1.258E-11
4	13	1.106E-32	1.128E-21	3.620E-15	4.539E-13	4.473E-12	9.061E-12	1.258E-11
4	14	2.047E-34	2.487E-23	8.861E-17	1.149E-14	1.151E-13	2.344E-13	3.260E-13
4	15	1.079E-36	4.314E-24	1.246E-16	3.243E-14	4.589E-13	1.047E-12	1.544E-12
4	16	6.539E-37	9.871E-24	6.328E-16	2.146E-13	3.466E-12	8.270E-12	1.246E-11
4	17	2.216E-39	5.061E-26	4.142E-18	1.512E-15	2.500E-14	5.948E-14	8.883E-14
4	18	4.674E-40	8.997E-26	2.653E-17	1.494E-14	3.106E-13	8.055E-13	1.265E-12
4	19	6.166E-41	2.394E-26	1.075E-17	6.966E-15	1.552E-13	4.119E-13	6.543E-13
4	21	1.775E-42	1.0619E-26	2.458E-17	2.746E-14	8.025E-13	2.329E-12	3.868E-12
4	23	1.597E-43	2.258E-27	8.757E-18	1.161E-14	3.698E-13	1.104E-12	1.860E-12
4	24	2.550E-43	4.064E-27	1.693E-17	2.301E-14	7.413E-13	2.222E-12	3.751E-12
4	25	2.592E-43	6.867E-27	3.887E-17	5.850E-14	1.983E-12	6.049E-12	1.029E-11
4	26	1.401E-45	7.581E-28	2.388E-17	6.362E-14	2.866E-12	9.608E-12	1.714E-11
4	27	0	3.083E-30	1.472E-19	4.494E-16	2.156E-14	7.351E-14	1.319E-13
5	7	9.406E-24	6.222E-18	1.571E-14	1.859E-13	1.859E-13	7.915E-13	9.077E-13
5	11	3.016E-27	2.823E-19	1.374E-14	4.302E-13	2.132E-12	3.440E-12	4.262E-12
5	14	1.241E-30	8.740E-21	5.651E-15	4.166E-13	3.156E-12	5.862E-12	7.794E-12
5	16	2.413E-34	2.110E-22	2.453E-15	4.717E-13	5.748E-12	1.249E-11	1.796E-11
5	23	1.426E-42	1.163E-27	8.108E-19	6.011E-16	1.405E-14	3.728E-14	5.859E-14
5	27	2.662E-43	1.439E-26	1.247E-16	2.163E-13	7.870E-12	2.457E-11	2.457E-11

Table S25. Rate coefficient (cm³/sec) for Ge-like Cd¹⁶⁺ for the transitions from initial to final levels with respective indices '*i*' and '*f*' and electron temperature 1 – 40 eV.

Transitions		1	2	5	10	20	30	40
<i>i</i>	<i>f</i>							
1	7	9.254E-31	1.827E-20	2.192E-14	1.958E-12	1.598E-11	2.990E-11	3.950E-11
1	11	1.832E-35	3.108E-23	5.339E-16	1.155E-13	1.460E-12	3.157E-12	4.480E-12

1	14	1.218E-38	1.592E-24	3.697E-16	1.899E-13	3.687E-12	9.190E-12	1.399E-11
1	16	7.174E-43	6.622E-27	3.342E-28	4.012E-25	1.189E-23	3.410E-23	5.571E-23
1	20	9.809E-45	3.356E-27	8.488E-17	2.075E-13	8.772E-12	2.831E-11	4.907E-11
1	23	0	1.621E-30	2.634E-19	1.196E-15	6.885E-14	2.462E-13	4.492E-13
1	27	0	1.049E-32	1.868E-20	1.882E-16	1.609E-14	6.560E-14	1.276E-13
2	6	2.176E-25	2.257E-18	2.936E-14	5.901E-13	2.313E-12	3.404E-12	3.991E-12
2	7	2.073E-30	1.885E-21	3.541E-16	1.699E-14	1.000E-13	1.653E-13	2.026E-13
2	8	7.885E-29	1.135E-19	2.822E-14	1.500E-12	9.478E-12	1.630E-11	2.066E-11
2	10	2.300E-32	1.063E-21	2.109E-15	2.230E-13	1.977E-12	3.804E-12	5.093E-12
2	11	2.115E-32	1.654E-21	4.498E-15	5.279E-13	4.929E-12	9.644E-12	1.302E-11
2	12	6.039E-35	7.449E-24	2.642E-17	3.345E-15	3.163E-14	6.080E-14	8.010E-14
2	13	1.456E-36	5.338E-24	1.455E-16	3.671E-14	5.008E-13	1.110E-12	1.594E-12
2	14	4.725E-36	2.845E-23	1.044E-15	2.906E-13	4.162E-12	9.377E-12	1.358E-11
2	15	5.828E-40	1.091E-25	3.143E-17	1.732E-14	3.478E-13	8.748E-13	1.337E-12
2	16	5.517E-40	2.346E-25	1.105E-16	7.182E-14	1.567E-12	4.062E-12	6.307E-12
2	18	6.811E-42	5.027E-26	1.311E-16	1.505E-13	4.365E-12	1.243E-11	2.024E-11
2	20	2.732E-43	4.100E-27	1.637E-17	2.166E-14	6.735E-13	1.962E-12	3.230E-12
2	21	1.261E-44	1.998E-27	3.177E-17	6.659E-14	2.605E-12	8.195E-12	1.402E-11
2	22	2.802E-45	4.832E-28	9.395E-18	2.104E-14	8.514E-13	2.707E-12	4.659E-12
2	23	1.401E-45	6.768E-28	1.736E-17	4.266E-14	1.807E-12	5.836E-12	1.011E-11
2	25	0	1.945E-28	6.982E-18	1.918E-14	8.589E-13	2.825E-12	4.943E-12
2	27	1.401E-45	3.412E-31	9.586E-20	5.219E-16	3.280E-14	1.206E-13	2.228E-13
3	6	8.968E-25	3.295E-18	2.305E-14	3.779E-13	1.341E-12	1.910E-12	2.203E-12
3	7	8.950E-29	2.875E-20	2.912E-15	1.150E-13	6.278E-13	1.029E-12	1.272E-12
3	8	1.310E-29	6.646E-21	8.832E-16	3.805E-14	2.153E-13	3.553E-13	4.391E-13
3	9	2.572E-29	4.475E-20	1.245E-14	6.874E-13	4.419E-12	7.643E-12	9.703E-12
3	11	9.990E-33	2.753E-22	4.006E-16	3.820E-14	3.214E-13	6.069E-13	8.046E-13
3	12	9.296E-32	4.052E-21	7.761E-15	8.111E-13	7.151E-12	1.372E-11	1.835E-11
3	13	1.267E-35	1.636E-23	2.386E-16	4.884E-14	5.998E-13	1.283E-12	1.809E-12
3	14	6.632E-35	1.407E-22	2.764E-15	6.252E-13	8.079E-12	1.759E-11	2.506E-11
3	15	3.471E-39	2.295E-25	3.771E-17	1.920E-14	4.512E-13	1.403E-12	4.071E-12
3	16	6.409E-41	9.592E-27	2.409E-18	1.265E-15	2.462E-14	6.096E-14	9.208E-14
3	17	7.239E-40	2.218E-25	8.587E-17	5.227E-14	1.103E-12	2.827E-12	4.365E-12
3	18	2.606E-41	6.776E-26	9.452E-17	8.814E-14	2.302E-12	6.332E-12	1.013E-11
3	20	2.844E-43	1.502E-27	3.205E-18	3.436E-15	9.592E-14	2.689E-13	4.335E-13
3	21	5.184E-44	2.773E-27	2.358E-17	4.013E-14	1.414E-12	4.297E-12	7.225E-12
3	23	2.802E-45	3.940E-28	5.406E-18	1.078E-14	4.115E-13	1.283E-12	2.186E-12
3	24	3.082E-44	4.175E-27	6.291E-17	1.295E-13	5.022E-12	1.575E-11	2.691E-11
3	25	1.401E-45	4.285E-28	8.227E-18	1.835E-14	7.406E-13	2.353E-12	4.047E-12
3	26	1.401E-45	3.017E-29	3.085E-18	1.201E-14	6.399E-13	2.230E-12	4.017E-12
3	27	2.802E-45	3.251E-31	4.871E-20	2.143E-16	1.202E-14	4.229E-14	7.611E-14
4	6	3.539E-22	2.462E-17	1.619E-14	1.227E-13	3.003E-13	3.798E-13	4.132E-13
4	7	1.761E-25	1.067E-18	1.006E-14	1.821E-13	6.782E-13	9.819E-13	1.141E-12
4	8	4.505E-26	4.309E-19	5.333E-15	1.052E-13	4.074E-13	5.952E-13	6.936E-13
4	9	6.671E-26	2.187E-18	5.658E-14	1.426E-12	6.248E-12	9.540E-12	1.139E-11
4	11	2.049E-30	1.060E-21	1.419E-16	6.075E-15	3.365E-14	5.425E-14	6.548E-14
4	12	9.561E-30	7.838E-21	1.388E-15	6.585E-14	3.911E-13	6.563E-13	8.186E-13
4	13	3.536E-31	1.158E-14	1.077E-12	8.971E-12	1.689E-11	2.238E-11	2.596E-11
4	14	2.211E-33	8.823E-23	1.602E-16	1.643E-14	1.433E-13	2.739E-13	3.652E-13
4	15	1.797E-35	2.176E-23	3.053E-16	6.175E-14	7.543E-13	1.611E-12	2.273E-12
4	16	3.372E-35	9.494E-23	2.209E-15	5.286E-13	7.024E-12	1.543E-11	2.208E-11
4	17	6.555E-38	3.768E-25	1.338E-17	3.655E-15	5.102E-14	1.123E-13	1.593E-13
4	18	1.430E-38	6.987E-25	8.993E-17	3.797E-14	6.689E-13	1.613E-12	2.418E-12
4	20	1.444E-39	1.436E-25	2.831E-17	1.377E-14	2.602E-13	6.426E-13	9.741E-13

4	21	1.339E-40	1.334E-25	1.046E-16	8.056E-14	1.912E-12	5.094E-12	8.020E-12
4	23	1.083E-41	2.394E-26	3.029E-17	2.734E-14	7.029E-13	1.922E-12	3.066E-12
4	24	1.780E-41	4.599E-26	6.390E-17	5.949E-14	1.553E-12	4.268E-12	6.827E-12
4	25	2.062E-41	7.977E-26	1.412E-16	1.425E-13	3.876E-12	1.080E-11	1.740E-11
4	26	1.597E-43	1.002E-26	9.448E-17	1.664E-13	5.971E-12	1.825E-11	3.079E-11
4	27	1.401E-45	4.766E-29	6.592E-19	1.314E-15	4.986E-14	1.544E-13	2.613E-13
5	7	4.007E-23	1.546E-17	2.821E-14	2.982E-13	8.573E-13	1.142E-12	1.277E-12
5	11	3.505E-26	1.155E-18	3.000E-14	7.567E-13	3.312E-12	5.051E-12	6.025E-12
5	14	1.605E-29	4.065E-20	1.417E-14	8.425E-13	5.623E-12	9.852E-12	1.259E-11
5	16	1.013E-32	1.811E-21	8.077E-15	1.117E-12	1.131E-11	2.272E-11	3.109E-11
5	20	4.196E-39	2.746E-26	1.050E-18	2.921E-16	4.065E-15	8.850E-15	1.238E-14
5	23	9.116E-41	1.273E-26	3.054E-18	1.565E-15	2.963E-14	7.167E-14	1.059E-13
5	27	2.422E-41	1.839E-25	4.877E-16	5.632E-13	1.637E-11	4.667E-11	7.604E-11