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Stark Widths of Spectral Lines of Neutral Neon

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Abstract. In order to complete Stark broadening data for Ne I spectral lines which are needed for analysis of stellar atmospheres, collisional widths and shifts (the so-called Stark broadening parameters) of 29 isolated spectral lines of neutral neon have been determined within the impact semiclassical perturbation method. Calculations have been performed for the broadening by collisions with electrons, protons and ionized helium for astrophysical applications, and for collisions with ionized neon and argon for laboratory plasma diagnostics. The shifts have been compared with existing experimental values. The obtained data will be included in the STARK-B database, which is a part of the Virtual Atomic and Molecular Data Center – VAMDC.

Key words. Stark broadening—atomic data—Ne I: line profiles.

1. Introduction

Atomic data for neon are of particular astrophysical importance since it is among the most abundant chemical elements in the universe after hydrogen, helium, oxygen and carbon. Moreover, neon burning in massive stars starts after the hydrogen–, helium–, and carbon–burning periods (Trimble 1991). Stark broadening data are of particular interest for white dwarfs (see e.g. Tankosić *et al.* 2003, Milovanović *et al.* 2004, Simić *et al.* 2013). In the case of main sequence stars, the best plasma conditions for Stark broadening are for A-type stars. This is demonstrated for example in

Popović *et al.* (2001), where the influence of Stark broadening has been analysed for stars of B, A, F and G types. It has been shown that Stark broadening may be of interest also for late B and early F type stars (see Fig. 5 in Popović *et al.* (2001)). However, since Stark broadening increases with the principal quantum number it could be of interest for Rydberg lines even in solar spectrum (see e.g. Van Regemorter & Hoang Binh 1993). Moreover Stark broadening is also of significance for the modelling and investigation of subphotospheric layers even in cooler stars (Seaton 1988). Neon spectral lines are present and often observed in stellar spectra. As one of numerous examples, the determination of neon abundances from Ne I lines in late- to mid-B stars (Sigut 1999) may be cited, where Stark broadening has been taken into account.

Due to the significance of neon, Stark broadening of its spectral lines has been often experimentally investigated and critically selected results may be found in reviews of Konjević & Roberts (1976), Konjević *et al.* (1984), Konjević & Wiese (1990), Konjević *et al.* (2002) and Lesage (2009). The most complete semiclassical calculations of Ne I Stark line widths and shifts are given in Griem (1974).

In Milosavljević *et al.* (2004), we determined within the frame of the impact semiclassical perturbation approach, Stark widths due to collisions with electrons and protons for 25 isolated spectral lines of neutral neon. At that time, we used available energy levels from Bashkin & Stoner (1975). Since newer and more complete data of Saloman & Sansonetti (2004) exist, by using the same impact semiclassical perturbation method (SCP, Sahal-Bréchot 1969a, b), we have determined Stark broadening parameters for 29 spectral lines of neutral neon in the present paper. Namely, widths and shifts due to electron, protons and ionized helium collisions for astrophysical applications, and due to collisions with ionized neon and argon for laboratory plasma diagnostics. The obtained results for the shifts have been compared to critically selected experimental values and with theoretical data of Griem (1974).

2. Results and discussions

The impact of semiclassical perturbation method (Sahal-Bréchot 1969a, b), applied here for the theoretical determination of Stark broadening parameters of neutral neon isolated spectral lines, has been reviewed with different innovations and optimizations in Sahal-Bréchot *et al.* (2014). Since it was many times shortly described in previous articles, we will not repeat it here again.

Stark broadening parameters (full widths at half intensity maximum (FWHM) and shifts) have been calculated for 29 spectral lines of neutral neon. The colliders are electrons, protons and ionized helium, which are the main perturbers in stellar atmospheres, and additionally, ionized neon and argon, which are the principal carrier gases in most of the existing experiments. So these data are of interest, in particular, for laboratory plasma diagnostics.

The atomic energy levels have been taken from Saloman & Sansonetti (2004). Oscillator strengths have been calculated by using the method of Bates & Damgaard (1949) and the tables of Oertel & Shomo (1968), while for higher levels, the method of Van Regemorter *et al.* (1979) has been used. The calculations have been performed for a perturber density of 10^{16} cm^{-3} and for temperatures from 2500 K to 50000 K. The obtained results are shown in Table 1 for electron-, proton- and He II-impact line widths (FWHM) and shifts, and in Table 2 for Ne II- and Ar II-impacts.

Table 1. The electron-, proton- and helium ion-impact broadening parameters for Ne I lines, for a perturber density of 10^{16} cm^{-3} and temperatures from 2500 to 50000 K are given. Parameter C, when divided with the corresponding Stark width, gives an estimate for the maximal pertuber density for which the line may be treated as isolated. W_e: electron-impact full width at half maximum of intensity, d_e: electron-impact shift, W_p: proton-impact full width at half maximum of intensity, d_p: proton-impact shift, W_HeII: helium ion-impact full width at half maximum of intensity, d_HeII: helium ion-impact shift.

Transition	T (K)	W_e (Å)	d_e (Å)	W_p (Å)	d_p (Å)	W_HeII (Å)	d_HeII (Å)
Ne I	2500	0.296E-01	0.162E-01	0.154E-01	0.426E-02	0.152E-01	0.341E-02
3s–3p	5000	0.322E-01	0.197E-01	0.156E-01	0.489E-02	0.154E-01	0.394E-02
[3/2]1−[1/2]0	10000	0.357E-01	0.207E-01	0.157E-01	0.557E-02	0.155E-01	0.450E-02
6074.3 Å	20000	0.438E-01	0.205E-01	0.160E-01	0.631E-02	0.156E-01	0.510E-02
$C = 0.29$E+20	30000	0.508E-01	0.176E-01	0.161E-01	0.677E-02	0.157E-01	0.549E-02
	50000	0.621E-01	0.143E-01	0.163E-01	0.739E-02	0.158E-01	0.599E-02
Ne I	2500	0.305E-01	0.467E-02	0.168E-01	0.135E-02	0.167E-01	0.109E-02
3s–3p	5000	0.310E-01	0.423E-02	0.168E-01	0.153E-02	0.168E-01	0.124E-02
[3/2]1−[1/2]1	10000	0.343E-01	0.238E-02	0.168E-01	0.173E-02	0.168E-01	0.140E-02
7245.2 Å	20000	0.447E-01	0.852E-03	0.169E-01	0.195E-02	0.168E-01	0.158E-02
$C = 0.55$E+20	30000	0.541E-01	0.336E-03	0.169E-01	0.209E-02	0.168E-01	0.169E-02
	50000	0.681E-01	-0.246E-03	0.169E-01	0.228E-02	0.168E-01	0.185E-02
Ne I	2500	0.290E-01	0.581E-02	0.158E-01	0.152E-02	0.158E-01	0.122E-02
3s–3p	5000	0.294E-01	0.513E-02	0.159E-01	0.172E-02	0.158E-01	0.139E-02
[3/2]2−[1/2]1	10000	0.323E-01	0.366E-02	0.159E-01	0.195E-02	0.159E-01	0.158E-02
7032.4 Å	20000	0.418E-01	0.191E-02	0.159E-01	0.220E-02	0.159E-01	0.178E-02
$C = 0.52$E+20	30000	0.505E-01	0.140E-02	0.159E-01	0.235E-02	0.159E-01	0.191E-02
	50000	0.635E-01	0.641E-03	0.159E-01	0.257E-02	0.159E-01	0.208E-02
Ne I	2500	0.292E-01	0.139E-01	0.156E-01	0.359E-02	0.155E-01	0.288E-02
3s–3p	5000	0.310E-01	0.169E-01	0.157E-01	0.411E-02	0.156E-01	0.332E-02
[3/2]1−[3/2]1	10000	0.341E-01	0.171E-01	0.158E-01	0.468E-02	0.157E-01	0.378E-02
6383.0 Å	20000	0.427E-01	0.154E-01	0.160E-01	0.529E-02	0.158E-01	0.429E-02
$C = 0.35$E+20	30000	0.504E-01	0.129E-01	0.161E-01	0.567E-02	0.158E-01	0.461E-02
	50000	0.626E-01	0.106E-01	0.162E-01	0.619E-02	0.159E-01	0.503E-02
Ne I	2500	0.280E-01	0.136E-01	0.148E-01	0.351E-02	0.147E-01	0.282E-02
3s–3p	5000	0.298E-01	0.165E-01	0.149E-01	0.402E-02	0.148E-01	0.324E-02
[3/2]2−[3/2]1	10000	0.326E-01	0.167E-01	0.151E-01	0.457E-02	0.149E-01	0.369E-02
6217.3 Å	20000	0.405E-01	0.154E-01	0.152E-01	0.518E-02	0.150E-01	0.419E-02
$C = 0.33$E+20	30000	0.475E-01	0.129E-01	0.153E-01	0.555E-02	0.150E-01	0.451E-02
	50000	0.589E-01	0.105E-01	0.154E-01	0.606E-02	0.151E-01	0.491E-02
Ne I	2500	0.292E-01	0.145E-01	0.156E-01	0.376E-02	0.154E-01	0.302E-02
3s–3p	5000	0.313E-01	0.177E-01	0.157E-01	0.431E-02	0.155E-01	0.347E-02
[3/2]1−[3/2]2	10000	0.344E-01	0.179E-01	0.158E-01	0.490E-02	0.156E-01	0.396E-02
6304.8 Å	20000	0.429E-01	0.167E-01	0.160E-01	0.555E-02	0.157E-01	0.449E-02
$C = 0.33$E+20	30000	0.504E-01	0.141E-01	0.161E-01	0.596E-02	0.158E-01	0.483E-02
	50000	0.624E-01	0.115E-01	0.162E-01	0.650E-02	0.159E-01	0.527E-02
Ne I	2500	0.281E-01	0.141E-01	0.148E-01	0.367E-02	0.146E-01	0.294E-02
3s–3p	5000	0.300E-01	0.172E-01	0.149E-01	0.420E-02	0.148E-01	0.339E-02
[3/2]2−[3/2]2	10000	0.330E-01	0.175E-01	0.150E-01	0.478E-02	0.148E-01	0.386E-02
6143.1 Å	20000	0.407E-01	0.166E-01	0.152E-01	0.542E-02	0.149E-01	0.438E-02
$C = 0.32$E+20	30000	0.476E-01	0.140E-01	0.153E-01	0.581E-02	0.150E-01	0.471E-02
	50000	0.587E-01	0.114E-01	0.155E-01	0.634E-02	0.151E-01	0.514E-02

Table 1. (Continued).

Transition	T (K)	$W_{\rm e}$ (Å)	$d_{\rm e}$ (Å)	$W_{\rm p}$ (Å)	$d_{\rm p}$ (Å)	$W_{\rm HeII}$ (Å)	$d_{\rm HeII}$ (Å)
Ne I	2500	0.291E-01	0.129E-01	0.157E-01	0.332E-02	0.156E-01	0.267E-02
3s–3p	5000	0.307E-01	0.144E-01	0.158E-01	0.380E-02	0.157E-01	0.306E-02
[3/2]1−[5/2]2	10000	0.338E-01	0.157E-01	0.159E-01	0.431E-02	0.158E-01	0.349E-02
6506.5 Å	20000	0.425E-01	0.133E-01	0.160E-01	0.488E-02	0.159E-01	0.395E-02
C = 0.37E+20	30000	0.505E-01	0.111E-01	0.161E-01	0.523E-02	0.159E-01	0.424E-02
	50000	0.630E-01	0.925E-02	0.162E-01	0.571E-02	0.160E-01	0.463E-02
Ne I	2500	0.279E-01	0.127E-01	0.149E-01	0.326E-02	0.148E-01	0.262E-02
3s–3p	5000	0.294E-01	0.152E-01	0.150E-01	0.373E-02	0.149E-01	0.301E-02
[3/2]2−[5/2]2	10000	0.322E-01	0.154E-01	0.151E-01	0.424E-02	0.150E-01	0.343E-02
6334.4 (Å)	20000	0.402E-01	0.134E-01	0.152E-01	0.480E-02	0.151E-01	0.388E-02
C = 0.36E+20	30000	0.476E-01	0.112E-01	0.153E-01	0.514E-02	0.151E-01	0.417E-02
	50000	0.592E-01	0.927E-02	0.154E-01	0.561E-02	0.152E-01	0.455E-02
Ne I	2500	0.279E-01	0.117E-01	0.150E-01	0.311E-02	0.149E-01	0.250E-02
3s–3p	5000	0.293E-01	0.135E-01	0.151E-01	0.356E-02	0.150E-01	0.287E-02
[3/2]2−[5/2]3	10000	0.321E-01	0.146E-01	0.152E-01	0.404E-02	0.151E-01	0.327E-02
6402.2 (Å)	20000	0.401E-01	0.123E-01	0.153E-01	0.458E-02	0.151E-01	0.371E-02
C = 0.37E+20	30000	0.477E-01	0.102E-01	0.153E-01	0.490E-02	0.152E-01	0.398E-02
	50000	0.595E-01	0.854E-02	0.154E-01	0.535E-02	0.152E-01	0.434E-02
Ne I	2500	0.268E-01	0.128E-01	0.141E-01	0.331E-02	0.140E-01	0.265E-02
3s – 3p′	5000	0.284E-01	0.155E-01	0.142E-01	0.379E-02	0.141E-01	0.305E-02
[3/2]1−[1/2]1	10000	0.312E-01	0.157E-01	0.143E-01	0.431E-02	0.142E-01	0.348E-02
6030.0 (Å)	20000	0.389E-01	0.143E-01	0.145E-01	0.488E-02	0.143E-01	0.395E-02
C = 0.31E+20	30000	0.458E-01	0.120E-01	0.146E-01	0.523E-02	0.143E-01	0.424E-02
	50000	0.568E-01	0.988E-02	0.147E-01	0.571E-02	0.144E-01	0.463E-02
Ne I	2500	0.257E-01	0.133E-01	0.135E-01	0.324E-02	0.133E-01	0.260E-02
3s–3p′	5000	0.274E-01	0.152E-01	0.136E-01	0.371E-02	0.134E-01	0.299E-02
[3/2]2−[1/2]1	10000	0.299E-01	0.154E-01	0.137E-01	0.422E-02	0.135E-01	0.341E-02
5881.9 (Å)	20000	0.370E-01	0.143E-01	0.138E-01	0.478E-02	0.136E-01	0.387E-02
C = 0.29E+20	30000	0.434E-01	0.121E-01	0.139E-01	0.513E-02	0.137E-01	0.416E-02
	50000	0.536E-01	0.983E-02	0.140E-01	0.559E-02	0.137E-01	0.453E-02
Ne I	2500	0.267E-01	0.120E-01	0.142E-01	0.308E-02	0.141E-01	0.247E-02
3s–3p′	5000	0.281E-01	0.144E-01	0.143E-01	0.353E-02	0.142E-01	0.284E-02
[3/2]1−[3/2]1)	10000	0.309E-01	0.146E-01	0.144E-01	0.401E-02	0.143E-01	0.324E-02
6128.5 (Å)	20000	0.387E-01	0.126E-01	0.145E-01	0.454E-02	0.143E-01	0.367E-02
C = 0.33E+20	30000	0.458E-01	0.105E-01	0.146E-01	0.486E-02	0.144E-01	0.394E-02
	50000	0.571E-01	0.877E-02	0.147E-01	0.530E-02	0.144E-01	0.430E-02
Ne I	2500	0.267E-01	0.123E-01	0.142E-01	0.316E-02	0.141E-01	0.253E-02
3s–3p′	5000	0.282E-01	0.148E-01	0.143E-01	0.361E-02	0.142E-01	0.291E-02
[3/2]1−[3/2]2	10000	0.310E-01	0.150E-01	0.144E-01	0.410E-02	0.142E-01	0.332E-02
6096.2 (Å)	20000	0.387E-01	0.132E-01	0.145E-01	0.465E-02	0.143E-01	0.376E-02
C = 0.32E+20	30000	0.458E-01	0.110E-01	0.146E-01	0.498E-02	0.144E-01	0.404E-02
	50000	0.570E-01	0.913E-02	0.147E-01	0.544E-02	0.144E-01	0.441E-02
Ne I	2500	0.256E-01	0.117E-01	0.135E-01	0.303E-02	0.134E-01	0.243E-02
3s–3p′	5000	0.270E-01	0.142E-01	0.136E-01	0.347E-02	0.135E-01	0.279E-02
[3/2]2−[3/2]1	10000	0.295E-01	0.144E-01	0.137E-01	0.394E-02	0.136E-01	0.318E-02
5975.5 (Å)	20000	0.367E-01	0.127E-01	0.138E-01	0.446E-02	0.136E-01	0.361E-02
C = 0.31E+20	30000	0.433E-01	0.107E-01	0.139E-01	0.478E-02	0.137E-01	0.388E-02
	50000	0.538E-01	0.878E-02	0.140E-01	0.522E-02	0.137E-01	0.423E-02

Table 1. (Continued).

Transition	T (K)	W_{e} (Å)	d_{e} (Å)	W_{p} (Å)	d_{p} (Å)	W_{HeII} (Å)	d_{HeII} (Å)
Ne I	2500	0.257E-01	0.120E-01	0.135E-01	0.310E-02	0.134E-01	0.249E-02
3s–3p′	5000	0.271E-01	0.145E-01	0.136E-01	0.355E-02	0.135E-01	0.286E-02
[3/2]2−[3/2]2	10000	0.297E-01	0.147E-01	0.137E-01	0.403E-02	0.136E-01	0.326E-02
5944.8 (Å)	20000	0.368E-01	0.132E-01	0.138E-01	0.456E-02	0.136E-01	0.369E-02
C = 0.31E+20	30000	0.433E-01	0.111E-01	0.139E-01	0.489E-02	0.137E-01	0.397E-02
	50000	0.537E-01	0.912E-02	0.140E-01	0.534E-02	0.137E-01	0.433E-02
Ne I	2500	0.285E-01	0.140E-01	0.148E-01	0.364E-02	0.147E-01	0.292E-02
3s′–3p′	5000	0.303E-01	0.170E-01	0.149E-01	0.416E-02	0.148E-01	0.336E-02
[1/2]0−[1/2]1	10000	0.330E-01	0.173E-01	0.150E-01	0.473E-02	0.149E-01	0.383E-02
6163.6 (Å)	20000	0.406E-01	0.162E-01	0.152E-01	0.537E-02	0.150E-01	0.434E-02
C = 0.32E+20	30000	0.474E-01	0.137E-01	0.153E-01	0.576E-02	0.150E-01	0.467E-02
	50000	0.584E-01	0.111E-01	0.155E-01	0.628E-02	0.151E-01	0.509E-02
Ne I	2500	0.285E-01	0.128E-01	0.149E-01	0.342E-02	0.147E-01	0.274E-02
3s′–3p′	5000	0.300E-01	0.149E-01	0.150E-01	0.391E-02	0.149E-01	0.315E-02
[1/2]0−[3/2]1	10000	0.327E-01	0.162E-01	0.151E-01	0.445E-02	0.149E-01	0.359E-02
6266.5 (Å)	20000	0.403E-01	0.145E-01	0.152E-01	0.503E-02	0.150E-01	0.408E-02
C = 0.34E+20	30000	0.473E-01	0.121E-01	0.153E-01	0.540E-02	0.151E-01	0.438E-02
	50000	0.587E-01	0.992E-02	0.154E-01	0.589E-02	0.151E-01	0.478E-02
Ne I	2500	0.336E-01	0.208E-01	0.165E-01	0.554E-02	0.162E-01	0.442E-02
3s′–3p′	5000	0.375E-01	0.252E-01	0.168E-01	0.639E-02	0.164E-01	0.514E-02
[1/2]1−[1/2]0	10000	0.421E-01	0.284E-01	0.171E-01	0.729E-02	0.166E-01	0.589E-02
5852.5 (Å)	20000	0.507E-01	0.269E-01	0.175E-01	0.828E-02	0.169E-01	0.669E-02
C = 0.22E+20	30000	0.575E-01	0.254E-01	0.178E-01	0.891E-02	0.170E-01	0.720E-02
	50000	0.685E-01	0.207E-01	0.182E-01	0.972E-02	0.173E-01	0.789E-02
Ne I	2500	0.318E-01	0.150E-01	0.169E-01	0.387E-02	0.168E-01	0.311E-02
3s′–3p′	5000	0.337E-01	0.169E-01	0.170E-01	0.443E-02	0.169E-01	0.357E-02
[1/2]1−[1/2]1	10000	0.371E-01	0.184E-01	0.172E-01	0.504E-02	0.170E-01	0.407E-02
6600.8 (Å)	20000	0.465E-01	0.162E-01	0.173E-01	0.570E-02	0.171E-01	0.462E-02
C = 0.37E+20	30000	0.550E-01	0.136E-01	0.174E-01	0.611E-02	0.171E-01	0.496E-02
	50000	0.683E-01	0.112E-01	0.176E-01	0.667E-02	0.172E-01	0.541E-02
Ne I	2500	0.318E-01	0.136E-01	0.170E-01	0.360E-02	0.169E-01	0.289E-02
3s′–3p′	5000	0.334E-01	0.157E-01	0.172E-01	0.412E-02	0.170E-01	0.332E-02
[1/2]1−[3/2]1	10000	0.368E-01	0.170E-01	0.172E-01	0.468E-02	0.171E-01	0.378E-02
6718.9 (Å)	20000	0.464E-01	0.142E-01	0.174E-01	0.530E-02	0.172E-01	0.429E-02
C = 0.39E+20	30000	0.552E-01	0.118E-01	0.174E-01	0.568E-02	0.172E-01	0.461E-02
	50000	0.689E-01	0.988E-02	0.176E-01	0.620E-02	0.173E-01	0.503E-02
Ne I	2500	0.318E-01	0.139E-01	0.170E-01	0.369E-02	0.169E-01	0.296E-02
3s′–3p′	5000	0.335E-01	0.161E-01	0.171E-01	0.422E-02	0.170E-01	0.341E-02
[1/2]1−[3/2]2	10000	0.369E-01	0.174E-01	0.172E-01	0.480E-02	0.171E-01	0.388E-02
6678.3 (Å)	20000	0.464E-01	0.148E-01	0.173E-01	0.543E-02	0.171E-01	0.440E-02
C = 0.39E+20	30000	0.551E-01	0.124E-01	0.174E-01	0.582E-02	0.172E-01	0.473E-02
	50000	0.687E-01	0.103E-01	0.176E-01	0.636E-02	0.173E-01	0.516E-02
Ne I	2500	0.327E-01	0.746E-02	0.177E-01	0.190E-02	0.176E-01	0.154E-02
3s′–3p	5000	0.331E-01	0.671E-02	0.177E-01	0.216E-02	0.177E-01	0.175E-02
[1/2]0−[1/2]1	10000	0.362E-01	0.532E-02	0.178E-01	0.245E-02	0.177E-01	0.198E-02
7438.9 (Å)	20000	0.464E-01	0.299E-02	0.178E-01	0.276E-02	0.178E-01	0.224E-02
C = 0.58E+20	30000	0.559E-01	0.213E-02	0.178E-01	0.296E-02	0.178E-01	0.240E-02
	50000	0.703E-01	0.129E-02	0.178E-01	0.323E-02	0.178E-01	0.262E-02

Table 1. (Continued).

Transition	T (K)	W_e (Å)	d_e (Å)	W_p (Å)	d_p (Å)	W_{HeII} (Å)	d_{HeII} (Å)
Ne I	2500	0.353E-01	0.192E-01	0.185E-01	0.503E-02	0.182E-01	0.403E-02
3s′–3p	5000	0.383E-01	0.234E-01	0.186E-01	0.577E-02	0.184E-01	0.465E-02
[1/2]1−[1/2]0	10000	0.425E-01	0.242E-01	0.188E-01	0.657E-02	0.186E-01	0.531E-02
6652.1 (Å)	20000	0.524E-01	0.237E-01	0.191E-01	0.745E-02	0.187E-01	0.602E-02
C = 0.34E+20	30000	0.609E-01	0.203E-01	0.193E-01	0.799E-02	0.188E-01	0.648E-02
	50000	0.748E-01	0.164E-01	0.195E-01	0.872E-02	0.190E-01	0.707E-02
Ne I	2500	0.378E-01	0.443E-02	0.209E-01	0.140E-02	0.208E-01	0.113E-02
3s′–3p	5000	0.384E-01	0.350E-02	0.209E-01	0.159E-02	0.209E-01	0.128E-02
[1/2]1−[1/2]1	10000	0.427E-01	0.132E-02	0.209E-01	0.179E-02	0.209E-01	0.145E-02
8082.5 (Å)0	20000	0.559E-01	-0.270E-03	0.210E-01	0.202E-02	0.210E-01	0.164E-02
C = 0.68E+20	30000	0.678E-01	-0.102E-02	0.210E-01	0.216E-02	0.210E-01	0.175E-02
	50000	0.853E-01	-0.155E-02	0.210E-01	0.236E-02	0.210E-01	0.191E-02
Ne I	2500	0.312E-01	0.153E-01	0.164E-01	0.397E-02	0.162E-01	0.318E-02
3s′–3p	5000	0.332E-01	0.186E-01	0.165E-01	0.455E-02	0.164E-01	0.366E-02
[1/2]0−[3/2]1	10000	0.362E-01	0.188E-01	0.167E-01	0.517E-02	0.165E-01	0.418E-02
6532.9 (Å)	20000	0.446E-01	0.175E-01	0.168E-01	0.586E-02	0.166E-01	0.474E-02
C = 0.37E+20	30000	0.522E-01	0.147E-01	0.169E-01	0.628E-02	0.166E-01	0.509E-02
	50000	0.645E-01	0.119E-01	0.171E-01	0.685E-02	0.167E-01	0.556E-02
Ne I	2500	0.350E-01	0.160E-01	0.189E-01	0.425E-02	0.188E-01	0.341E-02
3s′–3p	5000	0.372E-01	0.185E-01	0.190E-01	0.486E-02	0.189E-01	0.392E-02
[1/2]1−[3/2]1	10000	0.410E-01	0.201E-01	0.192E-01	0.552E-02	0.190E-01	0.447E-02
7024.0 (Å)	20000	0.515E-01	0.176E-01	0.193E-01	0.626E-02	0.191E-01	0.506E-02
C = 0.42E+20	30000	0.611E-01	0.147E-01	0.194E-01	0.670E-02	0.191E-01	0.544E-02
	50000	0.761E-01	0.121E-01	0.196E-01	0.732E-02	0.192E-01	0.594E-02
Ne I	2500	0.350E-01	0.172E-01	0.188E-01	0.445E-02	0.186E-01	0.357E-02
3s′–3p	5000	0.374E-01	0.209E-01	0.189E-01	0.510E-02	0.188E-01	0.411E-02
[1/2]1−[3/2]2	10000	0.413E-01	0.211E-01	0.191E-01	0.579E-02	0.189E-01	0.468E-02
6931.4 (Å)	20000	0.516E-01	0.191E-01	0.192E-01	0.656E-02	0.190E-01	0.531E-02
C = 0.40E+20	30000	0.609E-01	0.161E-01	0.194E-01	0.704E-02	0.190E-01	0.571E-02
	50000	0.756E-01	0.132E-01	0.195E-01	0.768E-02	0.191E-01	0.623E-02
Ne I	2500	0.351E-01	0.148E-01	0.191E-01	0.392E-02	0.190E-01	0.315E-02
3s′–3p	5000	0.369E-01	0.171E-01	0.192E-01	0.448E-02	0.191E-01	0.362E-02
[1/2]1−[5/2]1	10000	0.407E-01	0.169E-01	0.193E-01	0.509E-02	0.192E-01	0.412E-02
7173.9 (Å)	20000	0.515E-01	0.150E-01	0.195E-01	0.576E-02	0.193E-01	0.467E-02
C = 0.46E+20	30000	0.615E-01	0.125E-01	0.195E-01	0.617E-02	0.193E-01	0.501E-02
	50000	0.769E-01	0.101E-01	0.197E-01	0.674E-02	0.194E-01	0.547E-02

Since the results of semiclassical perturbation calculations of Stark widths have been compared with available experimental results in Milosavljević *et al.* (2004), and since the new results obtained here do not change the conclusions, we show in Table 3 the comparison with selected experimental data for line shifts, and with the corresponding semiclassical results of Griem (1974). In critical reviews of Konjević & Roberts (1976), Konjević *et al.* (1984), Konjević & Wiese (1990), Konjević *et al.* (2002) and Lesage (2009), there are five papers with which the comparison of our results for neon line shifts is possible (Miller *et al.* 1971; Purić *et al.* 1987, 1988; Döhrn & Helbig 1996; del Val *et al.* 1999). In these critical reviews

Table 2. The ionized neon- and ionized argon-impact broadening parameters for Ne I lines, for a perturber density of 10^{16} cm^{-3} and temperatures from 2500 to 50000 K are given. Parameter C, when divided with the corresponding Stark width, gives an estimate for the maximal perturber density for which the line may be treated as isolated. W_{NeII}: ionized neon-impact full width at half maximum of intensity, d_{NeII}: ionized neon-impact shift, W_{ArII}: ionized argon-impact full width at half maximum of intensity, d_{ArII}: ionized argon-impact shift.

Transition	T (K)	W_{NeII} (Å)	d_{NeII} (Å)	W_{ArII} (Å)	d_{ArII} (Å)
Ne I	2500	0.150E-01	0.279E-02	0.150E-01	0.265E-02
3s–3p	5000	0.152E-01	0.324E-02	0.152E-01	0.309E-02
[3/2]1−[1/2]0	10000	0.153E-01	0.372E-02	0.153E-01	0.354E-02
6074.3 Å	20000	0.154E-01	0.423E-02	0.154E-01	0.403E-02
C = 0.29E+20	30000	0.155E-01	0.455E-02	0.155E-01	0.434E-02
	50000	0.156E-01	0.499E-02	0.155E-01	0.476E-02
Ne I	2500	0.166E-01	0.900E-03	0.166E-01	0.858E-03
3s–3p	5000	0.168E-01	0.103E-02	0.168E-01	0.978E-03
[3/2]1−[1/2]1	10000	0.168E-01	0.116E-02	0.168E-01	0.111E-02
7245.2 Å	20000	0.168E-01	0.116E-02	0.168E-01	0.111E-02
C = 0.55E+20	30000	0.168E-01	0.141E-02	0.168E-01	0.134E-02
	50000	0.168E-01	0.154E-02	0.168E-01	0.147E-02
Ne I	2500	0.157E-01	0.101E-02	0.156E-01	0.963E-03
3s–3p	5000	0.158E-01	0.115E-02	0.158E-01	0.110E-02
[3/2]2−[1/2]1	10000	0.158E-01	0.131E-02	0.158E-01	0.125E-02
7032.4 Å	20000	0.159E-01	0.148E-02	0.159E-01	0.141E-02
C = 0.52E+20	30000	0.159E-01	0.159E-02	0.159E-01	0.151E-02
	50000	0.159E-01	0.173E-02	0.159E-01	0.165E-02
Ne I	2500	0.154E-01	0.237E-02	0.153E-01	0.225E-02
3s–3p	5000	0.155E-01	0.274E-02	0.155E-01	0.261E-02
[3/2]1−[3/2]1	10000	0.156E-01	0.313E-02	0.156E-01	0.298E-02
6383.0 Å	20000	0.157E-01	0.355E-02	0.156E-01	0.339E-02
C = 0.35E+20	30000	0.157E-01	0.382E-02	0.157E-01	0.364E-02
	50000	0.158E-01	0.418E-02	0.157E-01	0.399E-02
Ne I	2500	0.146E-01	0.231E-02	0.145E-01	0.220E-02
3s–3p	5000	0.147E-01	0.267E-02	0.147E-01	0.255E-02
[3/2]2−[3/2]1	10000	0.148E-01	0.306E-02	0.148E-01	0.291E-02
6217.3 Å	20000	0.149E-01	0.347E-02	0.149E-01	0.331E-02
C = 0.33E+20	30000	0.149E-01	0.374E-02	0.149E-01	0.356E-02
	50000	0.150E-01	0.408E-02	0.149E-01	0.390E-02
Ne I	2500	0.153E-01	0.248E-02	0.152E-01	0.235E-02
3s–3p	5000	0.154E-01	0.286E-02	0.154E-01	0.273E-02
[3/2]1−[3/2]2	10000	0.155E-01	0.328E-02	0.155E-01	0.312E-02
6304.8 Å	20000	0.156E-01	0.372E-02	0.156E-01	0.355E-02
C = 0.33E+20	30000	0.156E-01	0.401E-02	0.156E-01	0.382E-02
	50000	0.157E-01	0.438E-02	0.157E-01	0.418E-02
Ne I	2500	0.145E-01	0.241E-02	0.145E-01	0.229E-02
3s–3p	5000	0.147E-01	0.279E-02	0.146E-01	0.266E-02
[3/2]2−[3/2]2	10000	0.147E-01	0.320E-02	0.147E-01	0.305E-02
6143.1 Å	20000	0.148E-01	0.363E-02	0.148E-01	0.346E-02
C = 0.32E+20	30000	0.149E-01	0.391E-02	0.148E-01	0.373E-02
	50000	0.149E-01	0.427E-02	0.149E-01	0.408E-02

Table 2. (Continued).

Transition	T (K)	W_{NeII} (Å)	d_{NeII} (Å)	W_{ArII} (Å)	d_{ArII} (Å)
Ne I	2500	0.155E-01	0.219E-02	0.155E-01	0.208E-02
3s–3p	5000	0.157E-01	0.253E-02	0.156E-01	0.241E-02
[3/2]1−[5/2]2	10000	0.157E-01	0.289E-02	0.157E-01	0.275E-02
6506.5 Å	20000	0.158E-01	0.328E-02	0.158E-01	0.313E-02
C = 0.37E+20	30000	0.158E-01	0.352E-02	0.158E-01	0.336E-02
	50000	0.159E-01	0.385E-02	0.158E-01	0.368E-02
Ne I	2500	0.147E-01	0.215E-02	0.147E-01	0.205E-02
3s–3p	5000	0.149E-01	0.248E-02	0.148E-01	0.237E-02
[3/2]2−[5/2]2	10000	0.149E-01	0.283E-02	0.149E-01	0.270E-02
6334.4 (Å)	20000	0.150E-01	0.322E-02	0.150E-01	0.307E-02
C = 0.36E+20	30000	0.150E-01	0.346E-02	0.150E-01	0.330E-02
	50000	0.150E-01	0.378E-02	0.150E-01	0.361E-02
Ne I	2500	0.148E-01	0.205E-02	0.147E-01	0.196E-02
3s–3p	5000	0.149E-01	0.237E-02	0.149E-01	0.226E-02
[3/2]2−[5/2]3	10000	0.150E-01	0.270E-02	0.150E-01	0.258E-02
6402.2 (Å)	20000	0.150E-01	0.307E-02	0.150E-01	0.293E-02
C = 0.37E+20	30000	0.151E-01	0.330E-02	0.151E-01	0.315E-02
	50000	0.151E-01	0.360E-02	0.151E-01	0.344E-02
Ne I	2500	0.139E-01	0.218E-02	0.139E-01	0.207E-02
3s–3p′	5000	0.140E-01	0.252E-02	0.140E-01	0.240E-02
[3/2]1−[1/2]1	10000	0.141E-01	0.288E-02	0.141E-01	0.275E-02
6030.0 (Å)	20000	0.142E-01	0.327E-02	0.142E-01	0.312E-02
C = 0.31E+20	30000	0.142E-01	0.352E-02	0.142E-01	0.336E-02
	50000	0.143E-01	0.385E-02	0.142E-01	0.367E-02
Ne I	2500	0.132E-01	0.213E-02	0.132E-01	0.203E-02
3s–3p′	5000	0.134E-01	0.246E-02	0.133E-01	0.235E-02
[3/2]2−[1/2]1	10000	0.134E-01	0.282E-02	0.134E-01	0.269E-02
5881.9 (Å)	20000	0.135E-01	0.320E-02	0.135E-01	0.305E-02
C = 0.29E+20	30000	0.135E-01	0.345E-02	0.135E-01	0.329E-02
	50000	0.136E-01	0.377E-02	0.136E-01	0.360E-02
Ne I	2500	0.140E-01	0.203E-02	0.139E-01	0.193E-02
3s–3p′	5000	0.141E-01	0.235E-02	0.141E-01	0.224E-02
[3/2]1−[3/2]1)	10000	0.142E-01	0.268E-02	0.142E-01	0.256E-02
6128.5 (Å)	20000	0.142E-01	0.304E-02	0.142E-01	0.290E-02
C = 0.33E+20	30000	0.143E-01	0.327E-02	0.142E-01	0.312E-02
	50000	0.143E-01	0.357E-02	0.143E-01	0.341E-02
Ne I	2500	0.139E-01	0.208E-02	0.139E-01	0.198E-02
3s–3p′	5000	0.141E-01	0.240E-02	0.141E-01	0.229E-02
[3/2]1−[3/2]2	10000	0.142E-01	0.275E-02	0.141E-01	0.262E-02
6096.2 (Å)	20000	0.142E-01	0.312E-02	0.142E-01	0.297E-02
C = 0.32E+20	30000	0.142E-01	0.335E-02	0.142E-01	0.320E-02
	50000	0.143E-01	0.367E-02	0.143E-01	0.350E-02
Ne I	2500	0.133E-01	0.200E-02	0.133E-01	0.190E-02
3s–3p′	5000	0.134E-01	0.231E-02	0.134E-01	0.220E-02
[3/2]2−[3/2]1	10000	0.135E-01	0.263E-02	0.135E-01	0.251E-02
5975.5 (Å)	20000	0.135E-01	0.299E-02	0.135E-01	0.285E-02
C = 0.31E+20	30000	0.136E-01	0.322E-02	0.136E-01	0.307E-02
	50000	0.136E-01	0.352E-02	0.136E-01	0.336E-02

Table 2. (Continued).

Transition	T (K)	W_{NeII} (Å)	d_{NeII} (Å)	W_{ArII} (Å)	d_{ArII} (Å)
Ne I	2500	0.133E-01	0.204E-02	0.132E-01	0.194E-02
3s–3p′	5000	0.134E-01	0.236E-02	0.134E-01	0.225E-02
[3/2]2–[3/2]2	10000	0.135E-01	0.270E-02	0.135E-01	0.257E-02
5944.8 (Å)	20000	0.135E-01	0.306E-02	0.135E-01	0.292E-02
C = 0.31E+20	30000	0.136E-01	0.329E-02	0.135E-01	0.314E-02
	50000	0.136E-01	0.360E-02	0.136E-01	0.344E-02
Ne I	2500	0.145E-01	0.239E-02	0.145E-01	0.227E-02
3s′–3p′	5000	0.147E-01	0.277E-02	0.147E-01	0.264E-02
[1/2]0–[1/2]1	10000	0.148E-01	0.317E-02	0.147E-01	0.302E-02
6163.6 (Å)	20000	0.148E-01	0.360E-02	0.148E-01	0.343E-02
C = 0.32E+20	30000	0.149E-01	0.387E-02	0.148E-01	0.369E-02
	50000	0.149E-01	0.423E-02	0.149E-01	0.404E-02
Ne I	2500	0.146E-01	0.225E-02	0.146E-01	0.214E-02
3s′–3p′	5000	0.148E-01	0.260E-02	0.148E-01	0.248E-02
[1/2]0–[3/2]1	10000	0.149E-01	0.297E-02	0.148E-01	0.284E-02
6266.5 (Å)	20000	0.149E-01	0.338E-02	0.149E-01	0.322E-02
C = 0.34E+20	30000	0.149E-01	0.363E-02	0.149E-01	0.347E-02
	50000	0.150E-01	0.397E-02	0.150E-01	0.379E-02
Ne I	2500	0.159E-01	0.361E-02	0.159E-01	0.343E-02
3s′–3p′	5000	0.162E-01	0.422E-02	0.161E-01	0.402E-02
[1/2]1–[1/2]0	10000	0.164E-01	0.486E-02	0.163E-01	0.463E-02
5852.5 (Å)	20000	0.165E-01	0.554E-02	0.165E-01	0.529E-02
C = 0.22E+20	30000	0.166E-01	0.597E-02	0.166E-01	0.569E-02
	50000	0.168E-01	0.655E-02	0.167E-01	0.624E-02
Ne I	2500	0.166E-01	0.255E-02	0.166E-01	0.242E-02
3s′–3p′	5000	0.168E-01	0.295E-02	0.168E-01	0.281E-02
[1/2]1–[1/2]1	10000	0.169E-01	0.337E-02	0.169E-01	0.321E-02
6600.8 (Å)	20000	0.170E-01	0.383E-02	0.169E-01	0.365E-02
C = 0.37E+20	30000	0.170E-01	0.412E-02	0.170E-01	0.393E-02
	50000	0.171E-01	0.450E-02	0.170E-01	0.429E-02
Ne I	2500	0.168E-01	0.238E-02	0.167E-01	0.226E-02
3s′–3p′	5000	0.170E-01	0.274E-02	0.169E-01	0.261E-02
[1/2]1–[3/2]1	10000	0.170E-01	0.313E-02	0.170E-01	0.299E-02
6718.9 (Å)	20000	0.171E-01	0.356E-02	0.171E-01	0.339E-02
C = 0.39E+20	30000	0.171E-01	0.382E-02	0.171E-01	0.365E-02
	50000	0.172E-01	0.417E-02	0.171E-01	0.399E-02
Ne I	2500	0.167E-01	0.243E-02	0.167E-01	0.232E-02
3s′–3p′	5000	0.169E-01	0.281E-02	0.169E-01	0.268E-02
[1/2]1–[3/2]2	10000	0.170E-01	0.321E-02	0.170E-01	0.306E-02
6678.3 (Å)	20000	0.170E-01	0.364E-02	0.170E-01	0.348E-02
C = 0.39E+20	30000	0.171E-01	0.392E-02	0.171E-01	0.374E-02
	50000	0.171E-01	0.428E-02	0.171E-01	0.409E-02
Ne I	2500	0.175E-01	0.127E-02	0.175E-01	0.121E-02
3s′–3p	5000	0.177E-01	0.145E-02	0.177E-01	0.138E-02
[1/2]0–[1/2]1	10000	0.177E-01	0.164E-02	0.177E-01	0.157E-02
7438.9 (Å)	20000	0.178E-01	0.186E-02	0.177E-01	0.178E-02
C = 0.58E+20	30000	0.178E-01	0.199E-02	0.178E-01	0.190E-02
	50000	0.178E-01	0.217E-02	0.178E-01	0.208E-02

Table 2. (Continued).

Transition	T (K)	W_{NeII} (Å)	d_{NeII} (Å)	W_{ArII} (Å)	d_{ArII} (Å)
Ne I	2500	0.180E-01	0.330E-02	0.180E-01	0.314E-02
3s′–3p	5000	0.183E-01	0.383E-02	0.182E-01	0.365E-02
[1/2]1−[1/2]0	10000	0.184E-01	0.439E-02	0.184E-01	0.418E-02
6652.1 (Å)	20000	0.185E-01	0.499E-02	0.185E-01	0.476E-02
C = 0.34E+20	30000	0.186E-01	0.537E-02	0.185E-01	0.512E-02
	50000	0.187E-01	0.588E-02	0.186E-01	0.561E-02
Ne I	2500	0.207E-01	0.935E-03	0.207E-01	0.891E-03
3s′–3p	5000	0.209E-01	0.106E-02	0.208E-01	0.102E-02
[1/2]1−[1/2]1	10000	0.209E-01	0.121E-02	0.209E-01	0.115E-02
8082.5 (Å)0	20000	0.209E-01	0.136E-02	0.209E-01	0.130E-02
C = 0.68E+20	30000	0.209E-01	0.146E-02	0.209E-01	0.139E-02
	50000	0.210E-01	0.159E-02	0.210E-01	0.152E-02
Ne I	2500	0.161E-01	0.261E-02	0.161E-01	0.248E-02
3s′–3p	5000	0.163E-01	0.302E-02	0.162E-01	0.288E-02
[1/2]0−[3/2]1	10000	0.164E-01	0.345E-02	0.163E-01	0.329E-02
6532.9 (Å)	20000	0.164E-01	0.392E-02	0.164E-01	0.374E-02
C = 0.37E+20	30000	0.165E-01	0.422E-02	0.164E-01	0.403E-02
	50000	0.165E-01	0.462E-02	0.165E-01	0.441E-02
Ne I	2500	0.186E-01	0.280E-02	0.185E-01	0.266E-02
3s′–3p	5000	0.188E-01	0.323E-02	0.188E-01	0.308E-02
[1/2]1−[3/2]1	10000	0.189E-01	0.369E-02	0.189E-01	0.352E-02
7024.0 (Å)	20000	0.190E-01	0.420E-02	0.189E-01	0.400E-02
C = 0.42E+20	30000	0.190E-01	0.451E-02	0.190E-01	0.431E-02
	50000	0.191E-01	0.493E-02	0.190E-01	0.471E-02
Ne I	2500	0.184E-01	0.293E-02	0.184E-01	0.278E-02
3s′–3p	5000	0.186E-01	0.339E-02	0.186E-01	0.323E-02
[1/2]1−[3/2]2	10000	0.187E-01	0.387E-02	0.187E-01	0.369E-02
6931.4 (Å)	20000	0.188E-01	0.440E-02	0.188E-01	0.420E-02
C = 0.40E+20	30000	0.189E-01	0.473E-02	0.188E-01	0.452E-02
	50000	0.189E-01	0.518E-02	0.189E-01	0.494E-02
Ne I	2500	0.188E-01	0.259E-02	0.188E-01	0.246E-02
3s′–3p	5000	0.190E-01	0.298E-02	0.190E-01	0.284E-02
[1/2]1−[5/2]1	10000	0.191E-01	0.341E-02	0.191E-01	0.325E-02
7173.9 (Å)	20000	0.192E-01	0.387E-02	0.192E-01	0.369E-02
C = 0.46E+20	30000	0.192E-01	0.416E-02	0.192E-01	0.397E-02
	50000	0.193E-01	0.454E-02	0.192E-01	0.433E-02

their accuracy is denoted by letters A (uncertainty $\leq 15\%$), B ($\leq 30\%$), C ($\leq 50\%$) and D ($> 50\%$).

The average ratio of the experimental shifts of Miller *et al.* (1971) and our results is 1.17 and their ratio to the semiclassical shifts of Griem (1974) is 1.61. These ratios are 1.00 and 1.08 for lower temperatures and 1.10 and 1.05 for higher temperatures for experimental values of Purić *et al.* (1987) and Purić *et al.* (1988). For experimental values of Döhrn & Helbig (1996), ratios with our results and values of Griem (1974) are 0.88 and 1.05 respectively, and for results of del Val *et al.* (1999), it is 0.94 and 1.03. The average agreement between experimental values of del Val *et al.* (1999) (accuracies A and B+), Döhrn & Helbig (1996) (accuracy B+)

Table 3. Comparison between Stark line shifts calculated here, d_{th}, with the critically selected experimental results, d_{m} and with the semiclassical results of Griem (1974), d_{G}. The estimated accuracy of experimental results from Konjević & Roberts (1976), Konjević *et al.* (1984), Konjević & Wiese (1990), Konjević *et al.* (2002) and Lesage (2009) is also given under 'Acc', as well as the references for experimental results.

Transition	T (K)	N_{e} (10^{17} cm^{-3})	d_{m} (Å)	$d_{\mathrm{m}}/d_{\mathrm{G}}$	$d_{\mathrm{m}}/d_{\mathrm{th}}$	Acc.	References
Ne I							
3s–3p	10000–25000	1.0	0.12–0.14		0.51–0.61	C^{+}	Purić *et al.* (1987)
[3/2]1−[1/2]0	18000	1.0	0.142		0.55	B^{+}	del Val *et al.* (1999)
6074.3 Å	22500–28000	0.28–0.56	0.045–0.080		0.67–0.65	C	Purić *et al.* (1988)
Ne I							
3s–3p	10000–25000	1.0	0.09–0.08	2.07–2.14	2.65–4.21	C^{+}	Purić *et al.* (1987)
[3/2]1−[1/2]1	18000	1.0	0.077	1.92	3.06	B^{+}	del Val *et al.* (1999)
7245.2 Å							
Ne I							
3s–3p	10000–25000	1.0	0.09–0.07	1.26–1.18	1.88–2.33	C^{+}	Purić *et al.* (1987)
[3/2]2−[1/2]1	18000	1.0	0.074	1.09	1.95	B^{+}	del Val *et al.* (1999)
7032.4 Å							
Ne I							
3s–3p	10000–25000	1.0	0.24–0.18		1.21–1.73	C^{+}	Purić *et al.* (1987)
[3/2]1−[3/2]1	18000	1.0	0.152		0.76	A	del Val *et al.* (1999)
6383.0 Å	27700–28000	0.39-0.56	0.039–0.058		0.58–0.61	C	Purić *et al.* (1988)
Ne I							
3s–3p	10000–25000	1.0	0.12–0.125		0.63–0.74	C^{+}	Purić *et al.* (1987)
[3/2]2−[3/2]1	18000	1.0	0.156		0.79	B^{+}	del Val *et al.* (1999)
6217.3 Å							
Ne I							
3s–3p							
[3/2]1−[3/2]2	18000	1.0	0.168		0.76	A	del Val *et al.* (1999)
6304.8 Å							

Table 3. (Continued).

Transition	T (K)	N_e (10^{17} cm^{-3})	d_m (Å)	d_m/d_G	d_m/d_{th}	Acc.	References
Ne I							
3s–3p	10000–25000	1.0	0.24–0.227		1.2–1.22	C$^+$	Purić *et al.* (1987)
[3/2]2–[3/2]2	18000	1.0	0.171		0.81	B$^+$	del Val *et al.* (1999)
6143.1 Å	27700–28000	0.39-0.56	0.0.061–0.078		0.85–0.76	C	Purić *et al.* (1988)
Ne I							
3s–3p	11650	1.0	0.23	1.30	1.34	C	Miller *et al.* (1971)
[3/2]1–[5/2]2	18000	1.0	0.155	0.89	0.89	B$^+$	del Val *et al.* (1999)
6506.5 Å							
Ne I							
3s–3p	10000–25000	1.0	0.10–0.133		0.56–0.88	C$^+$	Purić *et al.* (1987)
[3/2]2–[5/2]2	18000	1.0	0.136		0.77	A	del Val *et al.* (1999)
6334.4 (Å)							
Ne I							
3s–3p	10000–25000	1.0	0.170–0.132	0.98–0.77	1.00–0.94	C$^+$	Purić *et al.* (1987)
[3/2]2–[5/2]3	18000	1.0	0.170	0.98	1.04	B$^+$	del Val *et al.* (1999)
6402.2 (Å)	28000–35200	0.56–1.42	0.074-0.111	0.77–0.50	0.96–0.61	C$^+$	Purić *et al.* (1987)
Ne I							
3s–3p′	10000–25000	1.0	0.14–0.16		0.78–0.99	C$^+$	Purić *et al.* (1987)
[3/2]1–[1/2]1	18000	1.0	0.150		0.81	B$^+$	del Val *et al.* (1999)
6030.0 (Å)							
Ne I							
3s–3p′							
[3/2]2–[1/2]1	10000	0.1	0.015		0.83	B$^+$	Döhrn & Helbig (1996)
5881.9 (Å)	10000–25000	1.0	0.15–0.15		0.85–0.94	C$^+$	Purić *et al.* (1987)
Ne I							
3s–3p′							
[3/2]1–[3/2]1)	18000	1.0	0.154		0.93	B	del Val *et al.* (1999)
6128.5 (Å)							

Table 3. (Continued).

Transition	T (K)	N_e (10^{17} cm^{-3})	d_m (Å)	d_m/d_G	d_m/d_{th}	Acc.	References
Ne I							
3s–3p′	10000	0.1	0.015	0.85	0.83	B^+	Döhrn & Helbig (1996)
[3/2]1–[3/2]2	10000–25000	1.0	0.13–0.166	0.71–0.93	0.76–1.11	C^+	Purić *et al.* (1987)
6096.2 (Å)	18000	1.0	0.138	0.74	0.80	B^+	del Val *et al.* (1999)
Ne I							
3s–3p′							
[3/2]2–[3/2]1	18000	1.0	0.133		0.80	B^+	del Val *et al.* (1999)
5975.5 (Å)							
Ne I							
3s–3p′	10000	0.1	0.016	0.90	0.94	B^+	Döhrn & Helbig (1996)
[3/2]2–[3/2]2	10000–25000	1.0	0.170–0.170	0.91–0.91	1.01–1.13	C^+	Purić *et al.* (1987)
5944.8 (Å)	18000	1.0	0.134	0.71	0.78	B^+	del Val *et al.* (1999)
Ne I							
3s′–3p′	10000–25000	1.0	0.32–0.20		1.61–1.10	C^+	Purić *et al.* (1987)
[1/2]0–[1/2]1	18000	1.0	0.147		0.68	B^+	del Val *et al.* (1999)
6163.6 (Å)							
Ne I							
3s′–3p′	10000–25000	1.0	0.16–0.174	0.86–0.90	0.86–1.07	C^+	Purić *et al.* (1987)
[1/2]0–[3/2]1	18000	1.0	0.150	0.77	0.80	B^+	del Val *et al.* (1999)
6266.5 (Å)							
Ne I							
3s′–3p′	10000	0.1	0.029		0.87	B^+	Döhrn & Helbig (1996)
[1/2]1–[1/2]0	10000–25000	1.0	0.23–0.25		0.72–0.78	C^+	Purić *et al.* (1987)
5852.5 (Å)	27700–28000	0.39-0.56	0.071–0.080		0.57–0.45	C^+	Purić *et al.* (1987)
	39000	0.39	0.046		0.41	C	Purić *et al.* (1988)

Table 3. (Continued).

Transition	T (K)	N_e (10^{17} cm^{-3})	d_m (Å)	d_m/d_G	d_m/d_{th}	Acc.	References
Ne I							
3s′–3p′	11650	1.0	0.20	1.43	0.97	C	Miller *et al.* (1971)
[1/2]1–[1/2]1	18000	1.0	0.160		0.75	B$^+$	del Val *et al.* (1999)
6600.8 (Å)							
Ne I							
3s′–3p′	11650	1.0	0.25	1.79	1.35	C	Miller *et al.* (1971)
[1/2]1–[3/2]1	18000	1.0	0.164		0.87	B$^+$	del Val *et al.* (1999)
6718.9 (Å)							
Ne I							
3s′–3p′	10000	0.1	0.019	1.41	0.92	B$^+$	Döhrn & Helbig (1996)
[1/2]1–[3/2]2	11650	1.0	0.25	1.79	1.30	C	Miller *et al.* (1971)
6678.3 (Å)							
Ne I							
3s′–3p							
[1/2]0–[1/2]1	18000	1.0	0.070		1.30	B	del Val *et al.* (1999)
7438.9 (Å)							
Ne I							
3s′–3p							
[1/2]0–[3/2]1	18000	1.0	0.160	0.80	0.71	A	del Val *et al.* (1999)
6532.9 (Å)							
Ne I							
3s′–3p							
[1/2]1–[3/2]1	18000	1.0	0.156		0.64	B	del Val *et al.* (1999)
7024.0 (Å)							
Ne I							
3s′–3p	11650	1.0	0.27	1.93	1.11	C	Miller *et al.* (1971)
[1/2]1–[3/2]2	18000	1.0	0.183	1.34	0.74	B$^+$	del Val *et al.* (1999)
6931.4 (Å)							

Table 3. (Continued).

Transition	T (K)	N_e (10^{17} cm^{-3})	d_m (Å)	d_m/d_G	d_m/d_{th}	Acc.	References
Ne I 3s′–3p [1/2]1–[5/2]1 7173.9 (Å)	10000–25000	1.0	0.21–0.163		1.06–0.95	C$^+$	Purić *et al.* (1987)
	18000	1.0	0.134		0.67	B$^+$	del Val *et al.* (1999)
Ne I 3s′–3p′ [1/2]1–[1/2]1 6699.0 (Å)	11650	1.0	0.20	1.43	0.97	C	Miller *et al.* (1971)

and Purić *et al.* (1987, 1988) (accuracies C+ and C) and both theories is very good. For Miller *et al.* (1971), the ratios of 1.17 and 1.61 are also acceptable since they are the oldest and since the calculation of the shifts is less accurate than for the widths, especially when the shift is much smaller than the corresponding width. Namely, all the contributions to the width are positive, while in the case of shift we have terms with different signs. If the shift is much smaller than the width, this is the sign that there is a mutual cancellation of important contributions with different signs, so that the accuracy of the theoretical result is smaller. If we look at the particular ratios in Table 3, we can see an exceptional disagreement for the line 7245.2 Å. In this case, ratios of measured and theoretical values are from 2.07 up to 4.21. If we look at the theoretical results of Table 1, we can see that for $T = 20000$ K, the electron-impact width of the line 7245.2 Å is 0.0447 Å and the shift is 0.000852 Å. This is just the above mentioned case when due to mutual cancellation of important contributions with different signs, the result of calculation is of much lower accuracy.

3. Conclusions

In order to provide Stark broadening data for Ne I spectral lines to astrophysicists, needed for analysis and modelling of stellar atmospheres, calculations of opacities, determination of abundances etc., e-, p-, He II-, Ne II- and Ar II-impact widths and shifts for 29 spectral lines of Ne I have been calculated by using the semiclassical perturbation method. Stark broadening parameters for collisions with neon and argon ions have also been determined for the purpose of laboratory plasma diagnostics. The Stark line shifts have been compared with existing experimental values, and with the theoretical results of Griem (1974).

The results obtained in this investigation will be implemented, in computer readable form, in the STARK-B database, (Sahal-Bréchot *et al.* 2015a, b) which is devoted principally for diagnostics, modelling and investigations of stellar atmospheres, but also for diagnostics of laboratory plasmas and investigation, analysis and modelling of laser produced, inertial fusion plasma as well as for plasma technologies. This database is a part of Virtual Atomic and Molecular Data Center - VAMDC (Dubernet *et al.* 2010; Rixon *et al.* 2011).

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