NIST Atomic Spectra Database

https://physics.nist.gov/asd

- World's primary source of critically evaluated data for atomic parameters
  - Energy levels
  - Wavelengths
  - Transition probabilities, oscillator strengths
  - Ionization potentials
  - Extended bibliography (3 databases)
- Regularly updated, v.5.10 (Oct 2022)
- However, many species/ions are either outdated or even missing

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v. 5.10

- Energy levels, spectral lines, and transition probabilities updated and extended for C II, Fe VII, Ac I-III.
- Energy levels and spectral lines inserted for ^{12}C II, ^{13}C II, and ^{14}C II.
- A typo in the energy of the $1s^2 2s9p\ ^1P^o_1$ level in Be I has been corrected.
- A misprint in the Landé g-factor value of one Yb II level (22960.80 cm^{-1}) has been corrected.
- Transition probabilities of Rb I updated.
- Ionization energies of C II, Fe VII, Se I, Dy I, Tm I, Rn II, Ac I, Cf I, Ni XX, Ge XXIII updated.
- A misprint in the $4d^{10}5s5d\ ^3D_3$ energy level of Cd I corrected.
- Configuration labels corrected for several levels in Ni II, Rb IV, Rh II-III, In III, Ba III, Nd II, Hf I, Y IV, Xe II, Bi II. These errors were detected by Jon Grumer of Lund University, Sweden, whose help is gratefully acknowledged.
- Energy levels and spectral lines updated/extended for Ni XIX-XX, Kr IX, Kr XVIII-XXXVI and for all hydrogen-like spectra of elements from He to Ds, including the isotope ^{3}He. For all H-like spectra, transition probabilities have been updated or added from the data of O. Jitrik and C. Bunge 2004 (JPCRD **33**, 1059), which have been rescaled to the 2018 CODATA values of the fundamental constants and to the AME2016 atomic masses (M. Wang et al. 2017, Chin. Phys. C **41**, 030003) with the use of the same isotopes as in the energy-level calculations of V. A. Yerokhin and V. M. Shabaev 2015, JPCRD 44, 033103.
- Energy units of Hartree and GHz added to the choice of units for output of energy levels in Levels, Lines (including the multiplet layout and Grotrian diagram), and Ionization Energies sections of ASD.
- A new option added for the intensity scale choice in LIBS and Saha-LTE plots (energy flux or photon counts). The new default setting is to display spectral intensities on a scale proportional to energy flux. Prior to this change, intensities displayed by both the Saha-LTE and LIBS plots were proportional to photon counts.
- Lines and levels Holdings pages updated to display the ASD content for isotopes.
- Several minor bugs fixed.
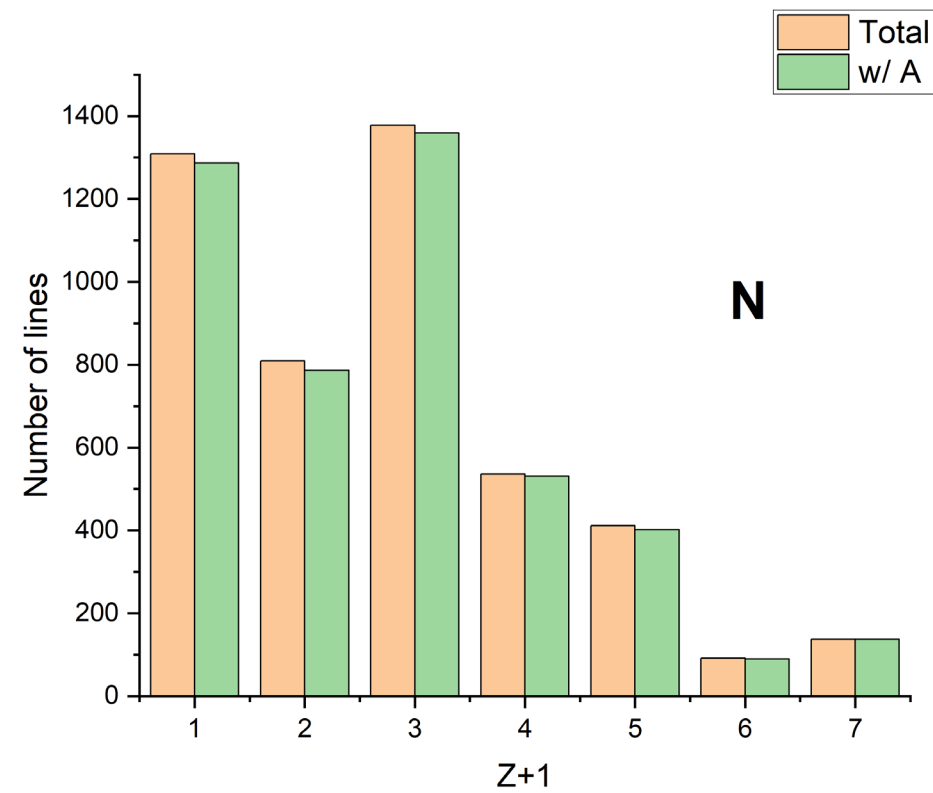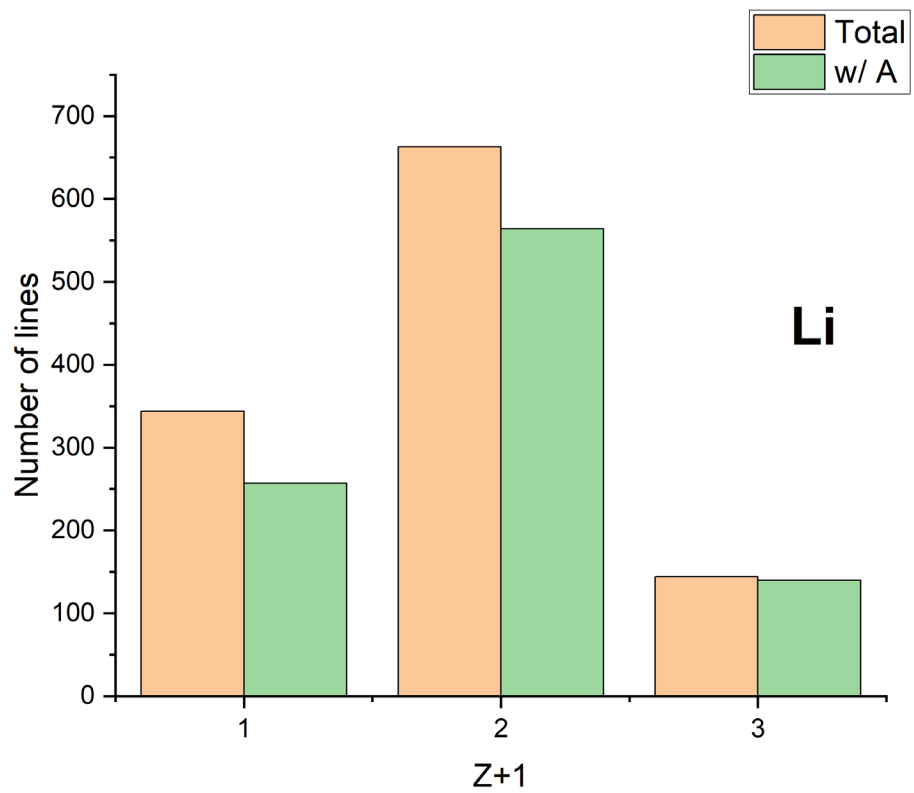
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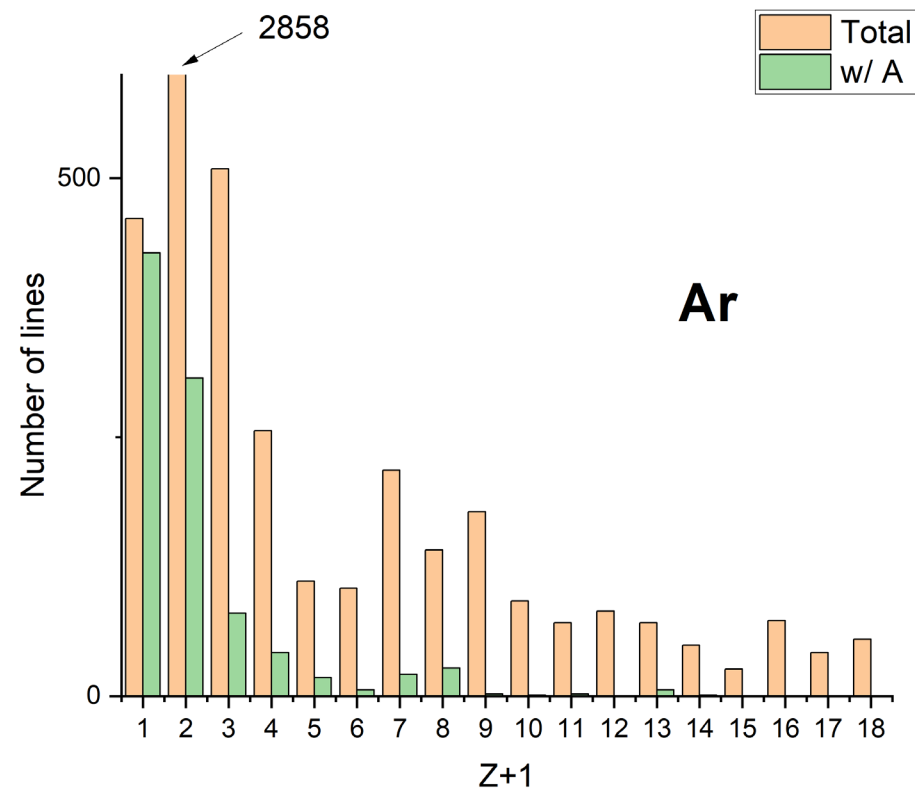Standards and Technology
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Levels:
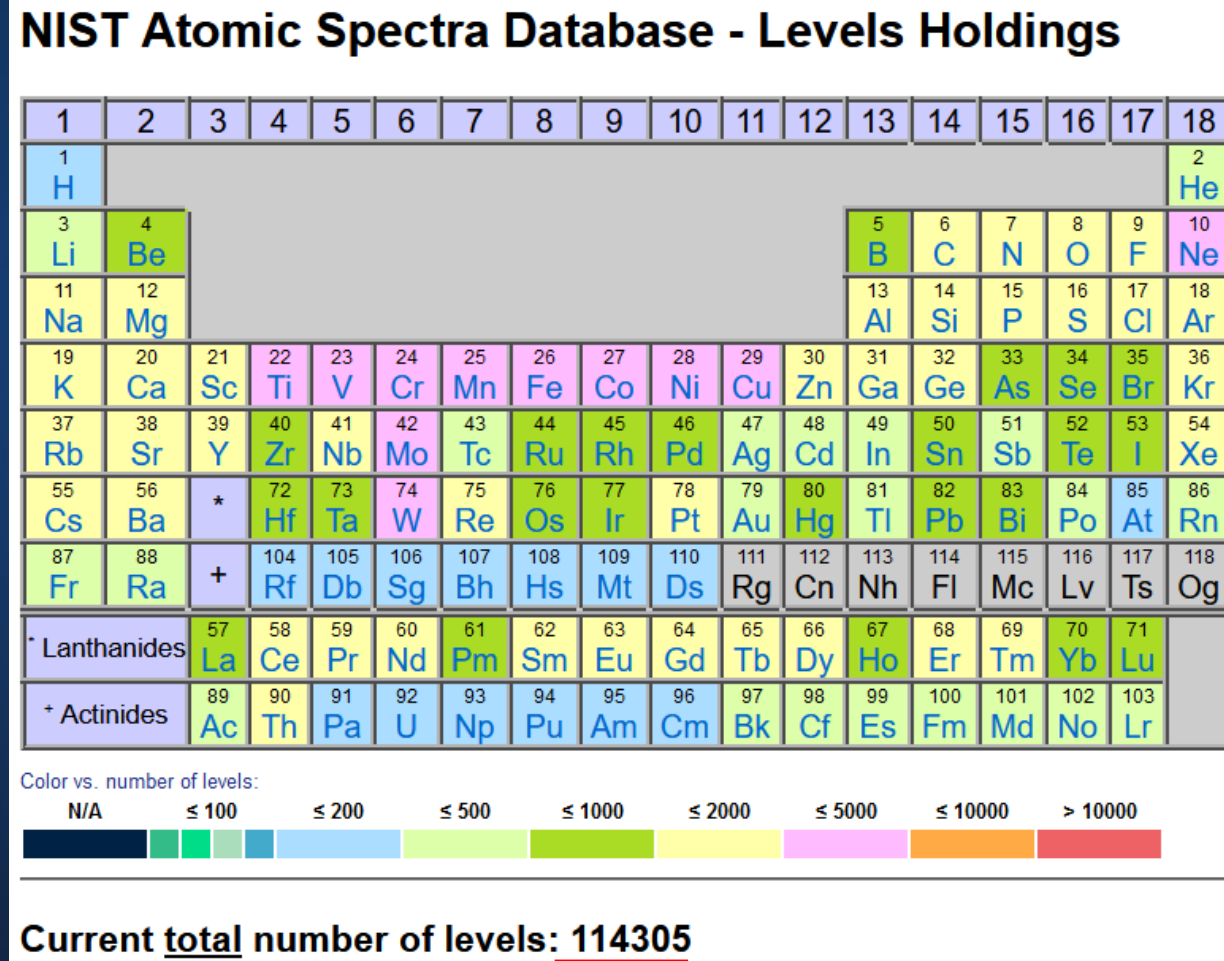
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Lines:
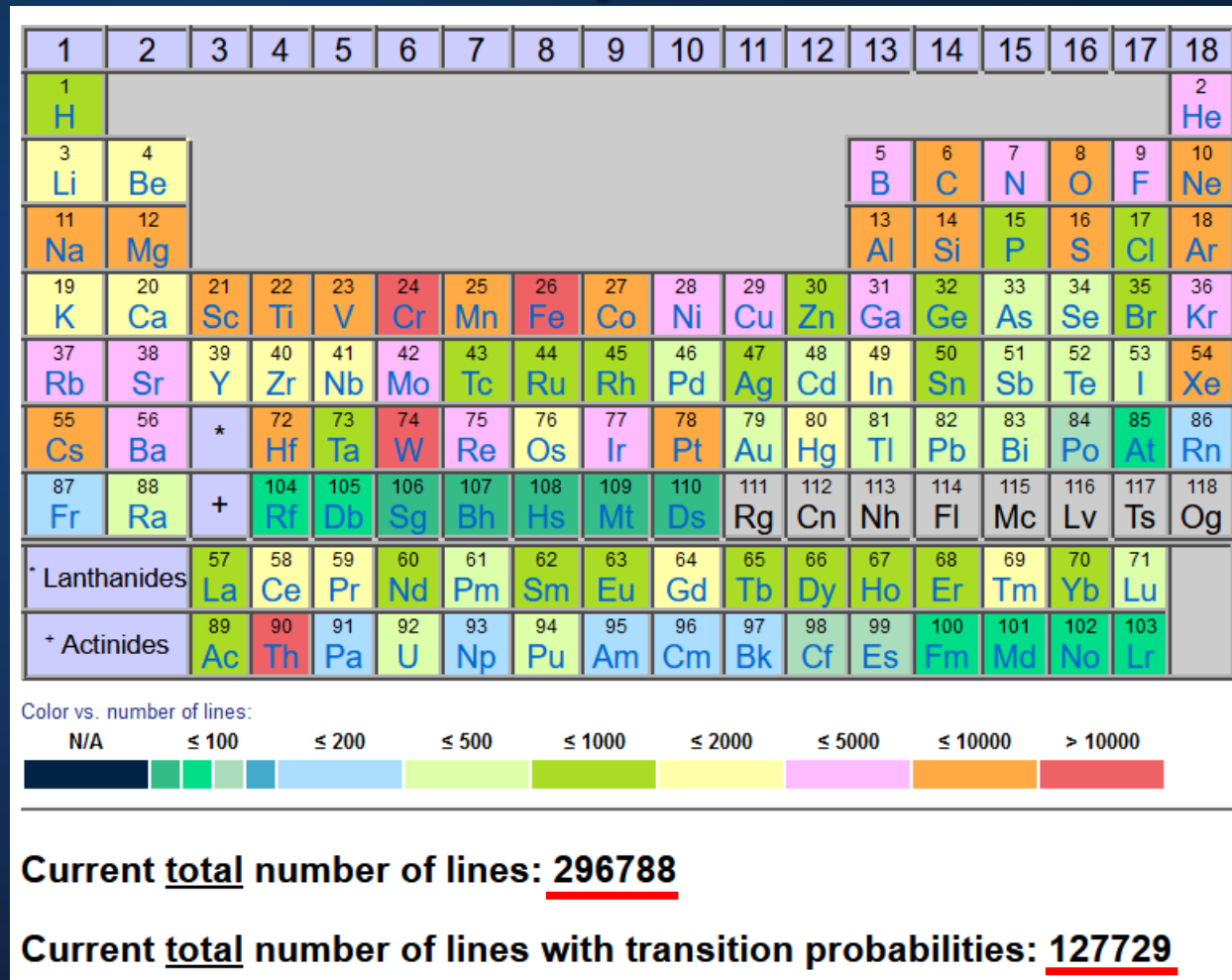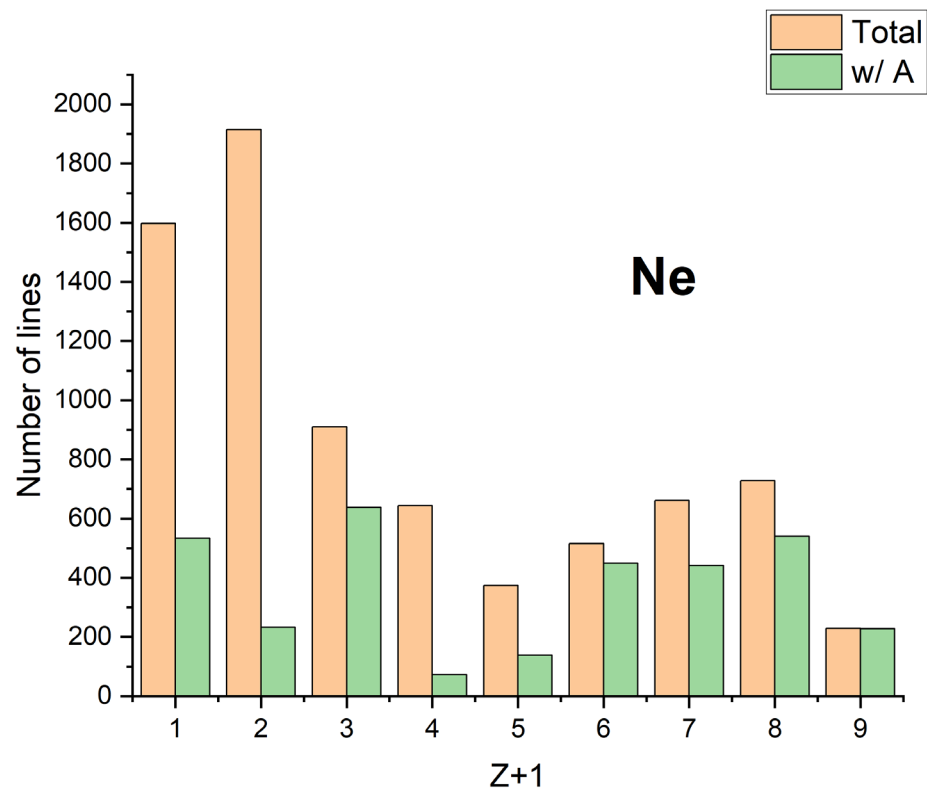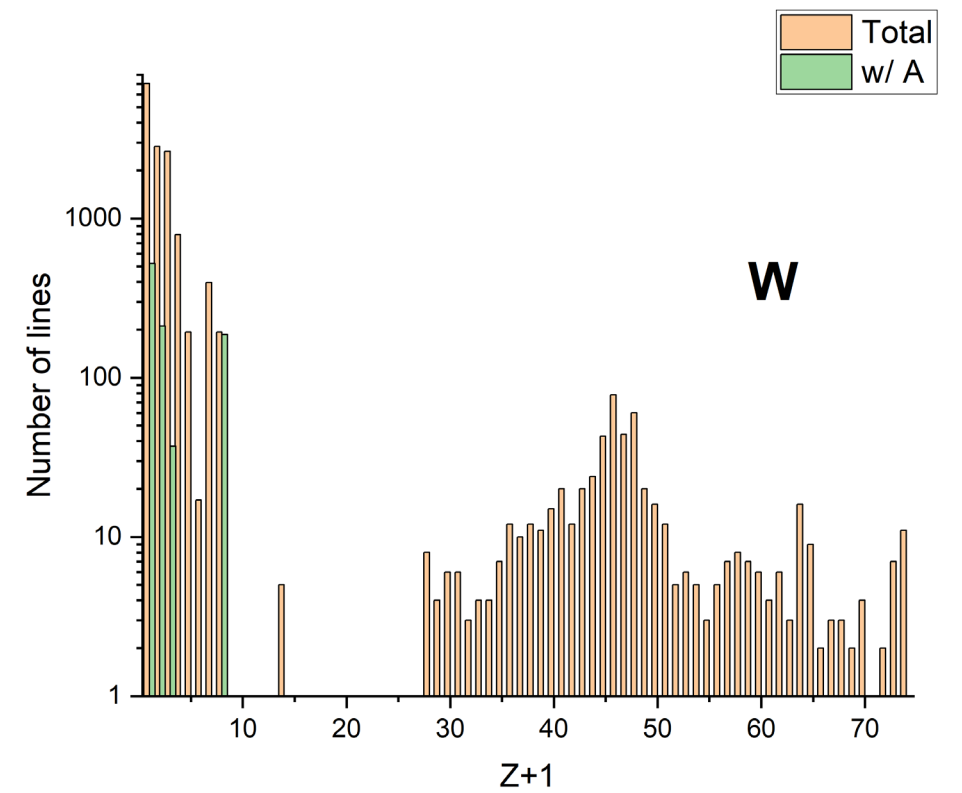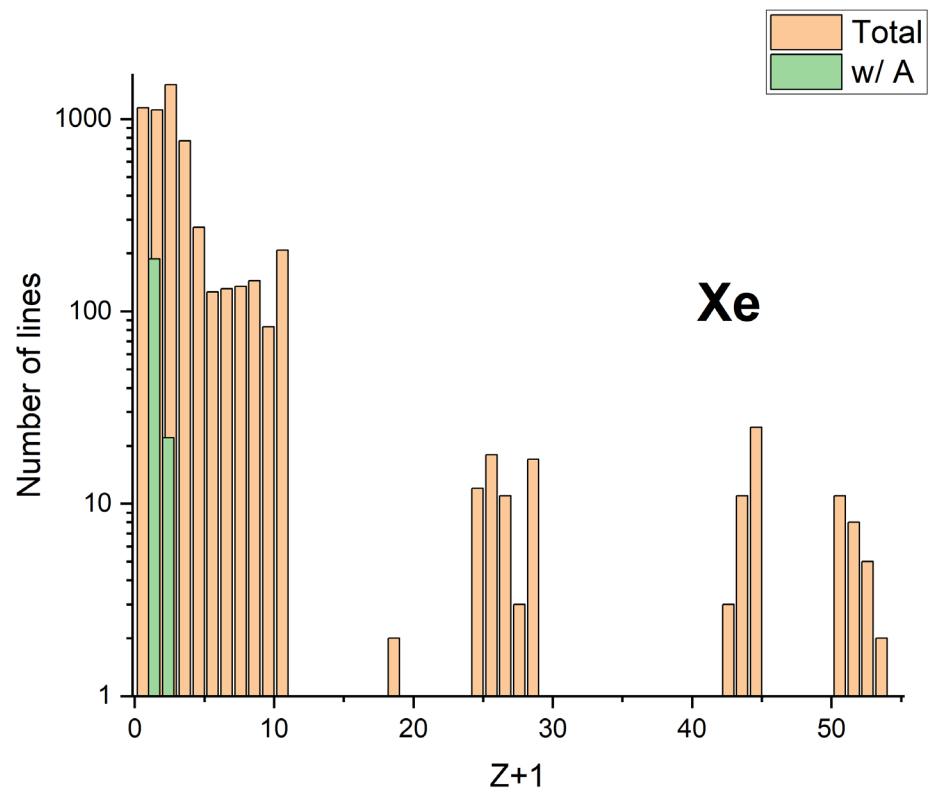
The data source may be old:

Li I	1980	Ne I	2004	Ar I	1980
Li II	1980	Ne II	2006	Ar II-XVIII	2010
N I	1980	Ne III	2006	Xe	2004
N II	1980	Ne IV	2012	W I-II	2006
N III	1980	Ne V	1999	W III-LXXIV	2009,2011
N IV	1980	Ne VI	1999		
N V	1980	Ne IX	1980		

Number of publications since 2000

Element	Energies/wavelengths (experiment only)	Transition probabilities
Li	79/80	77/81
N	77/77	179/188
Ne	150/152	206/213
Ar	248/251	283/289
Xe	174/178	254/261
W	152/156	288/299

Ar X: 71 energy level, 92 lines, 1 transition probability

Observed Wavelength Vac (nm)	Unc. (nm)	Ritz Wavelength Vac (nm)	Unc. (nm)	Rel. Int. (?)	A_{ki} (s^{-1})	Acc.	E_i (cm^{-1})	E_k (cm^{-1})	Lower Level Conf., Term, J			Upper Level Conf., Term, J			Type	TP Ref.	Line Ref.
2.7938	0.0009	2.7938	0.0009	2			0.000 –	3 579 400	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^3P)6d$	^2D	$^5/_2$			L12134
2.8101	0.0008	2.8101	0.0008	1			0.000 –	3 558 600	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^3P)6d$	^4F	$^5/_2$			L12134
2.9110	0.0009	2.9110	0.0009	3			0.000 –	3 435 200	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^3P)5d$	^2D	$^5/_2$			L12134
3.09590	0.00010	3.09259	0.00004	7bl			0.000 –	3 233 538	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^1D)4d$	^2F	$^5/_2$			L12134
3.1491	0.0006	3.15343	0.00005	5bl			0.000 –	3 171 153	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^3P)4d$	^4F	$^3/_2$			L12134
3.1641	0.0006	3.17150	0.00005	4bl			18 067.494 –	3 171 153	$2s^22p^5$	$^2P^o$	$^1/_2$	$2s^22p^4(^3P)4d$	^4F	$^3/_2$			L12134
3.2740	0.0010	3.28075	0.00004	1			0.000 –	3 048 079	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^3P)4s$	^4P	$^3/_2$			L1334
3.6553	0.0003	3.6553	0.0003	5			0.000 –	2 735 750	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^1S)3d$	^2D	$^5/_2$			L12134
3.6758	0.0009	3.6758	0.0009	2			18 067.494 –	2 738 560	$2s^22p^5$	$^2P^o$	$^1/_2$	$2s^22p^4(^1S)3d$	^2D	$^3/_2$			L12134
3.7431	0.0002	3.74310	0.00020	16bl			0.000 –	2 671 580	$2s^22p^5$	$^2P^o$	$^3/_2$	$2s^22p^4(^1D)3d$	^2D	$^5/_2$			L12134

Ar X

Since 2010 compilation – only one good spectral line

A-values: MCDHF, FAC+MBPT

SUMMARY

- Due to legal issues, NIST Atomic Spectroscopy Group is not a full participant in the CRP yet. Hopefully, this problem will be resolved shortly.
- We will work on updated compilations of critically evaluated atomic data for several impurity elements, e.g., N, Ne, and Ar.
- We will be interested in collaborating with other groups on these projects.

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