



**HAL**  
open science

# Virtual Laboratory Astrophysics and the STARK-B database VAMDC node: a resource for electron and ion impact widths and shifts of isolated lines

S Sahal-Bréchet, N Moreau, Milan S Dimitrijevi

► **To cite this version:**

S Sahal-Bréchet, N Moreau, Milan S Dimitrijevi. Virtual Laboratory Astrophysics and the STARK-B database VAMDC node: a resource for electron and ion impact widths and shifts of isolated lines. Journal of Physics: Conference Series, 2020, 1412, pp.132052. 10.1088/1742-6596/1412/13/132052 . hal-02968203

**HAL Id: hal-02968203**

**<https://hal.sorbonne-universite.fr/hal-02968203v1>**

Submitted on 15 Oct 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

PAPER • OPEN ACCESS

## Virtual Laboratory Astrophysics and the STARK-B database VAMDC node: a resource for electron and ion impact widths and shifts of isolated lines

Recent citations

- [Forty Years of the Applications of Stark Broadening Data Determined with the Modified Semiempirical Method](#)  
Milan S. Dimitrijevi

To cite this article: S Sahal-Bréchet *et al* 2020 *J. Phys.: Conf. Ser.* **1412** 132052

View the [article online](#) for updates and enhancements.



**IOP | ebooks™**

Bringing together innovative digital publishing with leading authors from the global scientific community.

Start exploring the collection—download the first chapter of every title for free.

## Virtual Laboratory Astrophysics and the STARK-B database VAMDC node: a resource for electron and ion impact widths and shifts of isolated lines

S Sahal-Bréchet<sup>1\*</sup>, M S Dimitrijević<sup>2,1 †</sup> and N Moreau<sup>1</sup>

<sup>1</sup>Sorbonne Université, Observatoire de Paris, Université PSL, CNRS, LERMA, F-92190 Meudon, France

<sup>2</sup>Astronomical Observatory, Volgina 7, 11060 Belgrade, Serbia

**Synopsis** Stark broadening theories and calculations can now be considered as mature. The fast computers allow to calculate a great number of atomic data needed for accurate spectroscopic diagnostics and modeling, such as for stellar atmospheres and envelopes, laboratory and technological plasmas, and laser equipments. Thus the access to these data via an on line database is essential. The STARK-B database is intended to meet this need. It contains calculated widths and shifts of isolated atomic lines due to electron and ion impacts. It is still under development and will be presented at the Conference.

Stark broadening theories and calculations have been very much developed for about 50 years. The theory can now be considered as mature for many applications, especially for accurate spectroscopic diagnostics and modelling. This requires the knowledge of numerous collisional line profiles, in particular for low abundant atoms and ions which are now also used as probes for current spectroscopic diagnostics in astrophysics. Thus, the access to such data via an on line database becomes essential. STARK-B [1] was created for fulfilling this need. It is a collaborative project between the Astronomical Observatory of Belgrade (AOB) and the LERMA. This database is maintained and developed at the Paris Observatory and contains our calculated widths and shifts of isolated lines of neutral and ionized atoms due to electron and ion impacts. Our calculations are based on the impact Semi-Classical-Perturbation method (SCP) [2] and earlier papers cited therein, and on the Modified Semi Empirical method (MSE) [3]. Our quantum calculations based on the Superstructure and Distorted Wave method [4] are not yet implemented, this will be for a future stage. STARK-B is devoted to modeling and spectroscopic diagnostics of stellar atmospheres and envelopes, laboratory plasmas, laser equipments and technological plasmas. Thus the domain of temperatures and densities covered by the tables is wide and depends on the ionization degree of the considered ion. STARK-B is a node of VAMDC (Virtual Atomic and Molecular Data Centre) [5], which is an European Union funded collaboration between groups involved in the generation and use of atomic

and molecular data. The aim of VAMDC is to build a secure, documented, flexible and interoperable e-science environment-based interface to existing atomic and molecular data. It complies with the standards of the Virtual Observatories. One can access to the 33 current VAMDC databases via the portal of its home page [6].

STARK-B opened at the end of 2008. Today, the database contains our calculated data for a varied number of transitions of more than 130 neutral or ionized atoms, published in international refereed journals (more than 150 papers). We continue to implement our already published data, and the new calculated ones, as our work progresses and published. We do not implement unpublished data.

At the Conference, the key points of the methods and assumptions used in the calculations will be highlighted, The database, its current developments and an outlook of our ongoing work will be presented.

### References

- [1] <http://stark-b.obspm.fr>
- [2] Sahal-Bréchet S Dimitrijević M S and Ben Nessib N 2014 *Atoms* **2** 225
- [3] Dimitrijević M S and Konjevic J 1980 *JQSRT* **24** 451
- [4] Elabidi H Ben Nessib N and Sahal-Bréchet S 2004 *J Phys B : At Mol Opt Phys* **37** 63
- [5] Dubernet M L et al. 2016 *J. Phys. B: At. Mol. Opt. Phys.* **49** 074003
- [6] <http://www.vamdc.org/>

\* E-mail: [sylvie.sahal-brechet@obspm.fr](mailto:sylvie.sahal-brechet@obspm.fr)

† E-mail: [mdimitrijevic@aob.rs](mailto:mdimitrijevic@aob.rs)

