Curriculum Vitæ

Vincenzo Laporta

Ph.D.

[redacted]

Researcher

Istituto per la Scienza e Tecnologia dei Plasmi · Consiglio Nazionale delle Ricerche

[redacted]

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Degrees

Qualification, Ministère de l'Éducation nationale, Enseignement sup. et Recherche, France
Professeur - Section 30 - Milieux dilués et optique (23130204582) 2023–2027
Professeur - Section 30 - Milieux dilués et optique (18130204582) 2018–2022
Maître de Conférences - Section 30 - Milieux dilués et optique (17230204582) 2017–2021
Maître de Conférences - Section 29 - Constituants élémentaires (10229204582) 2010–2015

Habilitation à Diriger les Recherches, Université du Havre, France, 11/12/2017
Title of dissertation: "*Collisions entre électrons et molécules: Mécanismes réactionnels, modèles théoriques et applications aux plasmas hors-équilibre*"
https://hal-normandie-univ.archives-ouvertes.fr/tel-01773785
Garant scientifique: Prof. Ioan F. Schneider

Abilitazione Scientifica Nazionale, Ministero dell'Istruzione, Università e Ricerca, Italy
Associate professor - Section 02/B2 - Fisica teorica della materia, 2017–2028
Associate professor - Section 03/A2 - Modelli e metodologie per le scienze chimiche, 2017–2028

Ph.D. in physics, Università di Bari, Italy, 09/05/2007
Thesis: "*On the calculation of some two-body non-leptonic B decays*"
Supervisor: Prof. Giuseppe Nardulli

Master of Science (*Laurea*) in physics, Università di Bari, Italy, 23/07/2003
Title of dissertation: "*Studio degli accoppiamenti del mesone J/ψ a stati charmati di parità positiva [Study of the J/ψ couplings to the positive parity charmed meson]*"
Advisor: Prof. Giuseppe Nardulli

Academic positions

Researcher, Consiglio Nazionale delle Ricerche (CNR), Bari, Italy, 12/2018–to date
Postdoctoral Research, Lab. Ondes et Milieux Complexes, CNRS-Université du Havre, France, 02/2017–03/2019
Postdoctoral Research, NANOTEC, CNR, Bari, Italy, 11/2015–10/2016
Consultant, Ohio Aerospace Inst. and Air Force Res. Lab., Dayton (OH), USA, 02/2015–10/2015
Postdoctoral Research, Ist. Metodologie Inorganiche e Plasmi, CNR, Bari, Italy, 12/2013–01/2015
Postdoctoral Research, Dept. of Physics and Astronomy, Univ. College London, UK, 10/2011–10/2013
Postdoctoral Research, Ist. Metodologie Inorganiche e Plasmi, CNR, Bari, Italy, 09/2010–09/2011
A.T.E.R. (full time 192h), Inst. de Physique Nucl. de Lyon, Université Claude Bernard Lyon-1, France, 09/2009–08/2010
Postdoctoral fellow, Dip. interateneo di fisica, INFN-Università di Bari, Italy, 11/2007–08/2009
Postdoctoral fellow, Centre de Physique Théorique, CNRS-École Polytechnique, Palaiseau, France, 11/2006–10/2007

Visiting positions

Invited researcher, IPR, Université de Rennes, France, October 2023 (STSM supported by COSY - COST action)
Visiting professor, LSAMA, Department of Physics, Université de Tunis El Manar, Tunisia, July 2023
Invited professor, Lab. Ondes et Milieux Complexes, CNRS-Université du Havre, France, July 2022
Invited professor, Institut de recherche Energie Propulsion & Environnement (I-EPE), CNRS-Normandie Université, Le Havre, France, Nov. 2019
Visiting scholar, Aerospace Engineering Dept., Univ. of Illinois at Urbana-Champaign (IL), USA, April–June 2019, June 2017 and June 2016
Invited researcher, Ames Res. Center, NASA, Moffett Field (CA), USA, July 2014 and July 2013

Education

Visiting Ph.D. student, Inst. de Physique Nucl. de Lyon, Université Claude Bernard Lyon-1, France, 01/2005–07/2005
Visiting Ph.D. student, Division Théorique du CERN, Genève, Switzerland, May and Nov. 2004
Ph.D. student, Dip. interateneo di fisica, INFN-Università di Bari, Italy, 11/2003–10/2006

Teaching experiences

Politecnico di Bari, Italy, 2015-2016 (in Italian):
– Tutorial, *Chimica e Complementi di Chimica* (20h)

University College London, UK, 2011-2013 (in English):
– Tutorial, *Mathematical methods II* (PHAS1246, 10h)
– Tutorial, *Thermal physics* (PHAS1228, 10h)

Université Claude Bernard Lyon-1, France, 2009-2010 (in French language):
– TD[1], *Soutien en outils Mathématiques* (Licence, 14h)
– TD and TP, *Électricité et Optique* (PHY1004L, 27h)
– TP, *Thermodynamique 1 et transferts thermiques* (PHY1001L, 30h)
– TD, *Physique général* (PHY1003L, 76h)
– TD, *Physique microscopique et Relativiste* (PHY2004L, 20h)
– TD and TICE, *Astrophysique* (PHY2003L, 54h)

Scientific projects

Principal Investigator for the projects:

"EMoPlaF: Energétique Moléculaire dans les Plasmas Froids" (LABEX EMC3-2016-Attract), **Co-Investigator** (€ 147904,80), 2017–2018
Laboratoire d'Excellence 'Energy, Materials and Clean Combustion Center', France

"State-to-state kinetics of oxygen molecules in their ground electronic state, in presence of free electrons", ($ 2,000), 2016.
University of Illinois at Urbana-Champaign (IL), USA

"State-to-state rate coefficients for elementary processes in oxygen for hypersonic flow simulations" (project #WE202270), ($ 46,104), 2015
Ohio Aerospace Institute and Wright Patterson Air Force Base, Dayton (OH), USA

I also participated to the following projects:
– *"NBTF (Neutral Beam Test Facility)"*, (NBTF-RFX-BFA-AWP2021_2023), ISTP-CNR, 2021–to date, Italy
– *"ACCESS (Advanced Computational Center for Entry System Simulation)"*, (P.I.: Iain Boyd of University of Colorado Boulder), 2021–to date, NASA, USA (https://www.access-nstri.org/)

[1] TD = Travaux Dirigés (theoretical exercises); TP = Travaux Pratiques (laboratory); TICE = Technologies de l'Information et de la Communication pour l'Education

– *"CO_2 VIRIDIS"* (FEDER 17P04109), 2018–2019, C.O.R.I.A., Rouen, France
– *"APULIA SPACE"* (PON 03PE-00067.6), 2015–2016, Distretto Tecnologico Aerospaziale Puglia S.C.A.R.L., Bari, Italy
– *"Phys4Entry"* (FP7-SPACE-2009-1 242311), 2010–2014, 7TH Framework Programme EU Research Funding 2007–2013
– *"Development of a diamond film detector for ultra-violet radiation"* (Project PS-136), 2007–2009, Regione Puglia, Bari, Italy

Databases

I contributed to setting up the following databases of cross sections useful for the low-temperature plasma community:
– LXCat projet: A France-based database for electron-molecule chemical reactions.
http://www.lxcat.net/Laporta
– PHYS4ENTRY project: An Italian-based database for planetary entry modelling.
http://phys4entrydb.ba.imip.cnr.it/Phys4EntryDB/
– Quant*e*mol project: An UK-based database for plasma chemistry.
https://www.quantemoldb.com/
– IAEA database for fusion.
https://db-amdis.org/hcdb/

Incarichi / Organization of scientific events

May 2024 Local organizer of the 3° symposium **Futuro**IN**AREA**, CNR, Bari, Italy
Oct 2023 Local organizer of the 2° symposium **Futuro**IN**AREA**, CNR, Bari, Italy
May 2022 Local organizer of the 1° symposium **Futuro**IN**AREA**, CNR, Bari, Italy
May 2019–to date Member of consortium "**Futuro**IN**AREA**", CNR - Bari which promote scientific vulgarization seminars
April 2018 Local organizer of the workshop for the project RIN "CO_2 viridis", Université du Havre, France

Referee for journals[2]

APS physics: PHYSICAL REVIEW A
IOP science: Plasma Sources Science and Technology; EPL (Europhysics Letters); Plasma Science

[2] https://publons.com/a/1574696/

and Technology; Nanotechnology
Elsevier: Physics Letters A
World Scientific Publishing: Modern Physics Letters A
AIP Publishing: Physics of Plasmas; Journal of Applied Physics
Springer: Plasma Chemistry and Plasma Processing
Canadian Science Publishing: Canadian Journal of Physics
MDPI: Molecules; Atoms; Electronics

Student training

Ph.D. students supervision and co-supervision:
- Emerance DJUISSI (2018–2022) "*Cinétique électronique dans les plasmas de bord: collisions avec cations d'hydrures, de nitrures et de gaz rares*", Université du Havre, France. The results are contained in the paper [8, C4]
- Abdillah ABDOULANZIZ (2017–2021) "*Collisions réactives pilotés par les électrons en astrophysique et dans les plasmas froids*", co-training with Prof. I.F. Schneider, Université du Havre, France [6, 7, 8, 12, C4]
- Youssef MOULANE (2017, 4 months) "*Electron-molecule collisions in cometary atmospheres*", co-training with Prof. I.F. Schneider, Université du Havre, France [12, 13]
- Duncan A. LITTLE (2012–2013) "*R-matrix calculations for electron-N_2 cross sections*", co-training with Prof. J. Tennyson, University College London, UK [25]

Master internship supervision:
- Clément ARGENTIN (2018, 4 months), Université du Havre, France [8, C4]
- Emerance DJUISSI (2018, 4 months), Université du Havre, France
- Abdillah ABDOULANZIZ (2017, 6 months), Université du Havre, France
- Kevin L. HERITIER (2013) "*Electron-vibrational energy exchange in nitrogen- and oxygen-contained non-equilibrium plasmas*", co-training with Prof. M. Panesi, University of Illinois at Urbana-Champaign (IL), USA [19, 24]

Research experiences and international networks

Non-equilibrium molecular plasmas modelling

My present researches are concentred in modelling of non-equilibrium molecular plasmas physics, the so-called 'cold plasmas'. Generally speaking, plasmas are made of ionized gases which contain equal amounts of positive and negative charges (global null electric charge). They are often considered the fourth state of matter. Positive charges are carried by positive ions. Negative charges are usually supplied by electrons but in some cases negative ions can have a non-negligible contribution. Plasmas are broadly classified into two classes. One is a high-temperature, fully ionized plasma. The other is a low-temperature, weakly ionized one. Most regions of the Universe are in a state of plasma. A stellar atmosphere, for example, is a kind of high-density and high-temperature plasmas (> 1000 K). On the opposite side, interstellar space is filled with very-low density matter ($10^2 - 10^4$ cm^{-3}) and low temperature ($10-100$ K). The degree of ionization is very low ($\sim 10^{-8}$), but the charged particles still play a significant role.

Looking for molecular plasmas, one of the typical examples existing in Nature is the ionosphere on the Earth and other planets. In the ionosphere, atoms and molecules are ionized mainly by the UV or X-ray solar radiation. On the other hand, in recent decades, the interest in molecular plasmas for a wide range of industrial and technological applications is growing up. They range goes from the chemistry for the hypersonic flows in aerospace to plasma assistant combustion and Micro Electro-Mechanical Systems sensors just to name a few.

From thermodynamics point of view plasmas are distinguished between 'thermal' and 'cold plasmas'. The first class is characterized by local-thermodynamic-equilibrium, the second class by non-equilibrium between the different degrees of freedom of the system, including the internal (*e.g.* vibration and rotation for molecules; electronic excited states for atoms and molecules) and chemical (*i.e.* reactions between different of same species take place) ones. The characterization of non-equilibrium plasmas can be performed using more or less sophisticated approaches, depending on the particular process under investigation, commonly based on statistical thermodynamics, kinetic theory and quantum chemistry.

My contribution in researches for non-equilibrium plasmas can be divided basically into two branches. In the first one, I am focused on the theoretical calculations of state-resolved elementary processes for electron-impact collisions involving vibrationally and rotationally excited molecules and ions. In particular, my work consists on the calculations of the cross sections and the corresponding rate coefficients for vibrational excitation, dissociative electron attachment, dissociative recombination and dissociative excitation processes. This is commonly called the dynamical characterization of plasmas, *i.e.* it consists in the study of the interactions between the constituents of the plasma. The results are obtained by using *ab initio* quantum chemistry codes MOLPRO and UK–R-Matrix, within the theoretical approaches of Bardsley's local-complex-potential model, adiabatic-nuclei approximation and multi-quantum-defect-theory.

The second aspect concerns the study of collisional-radiative kinetic models where thermal properties for non-equilibrium plasmas are investigated in the framework of the so-called 'state-to-state' (StS) approach. The StS approach take into account, for each chemical species, the internal degrees of freedom (vibrational, rotational, electronic excitation...) and they are considered as independent

species. For this reason, StS approaches are the only models that offer the opportunity to get access to energy exchange between internal degree of freedom of the system and to get detailed information including distribution functions affecting thermodynamics, transport coefficients, relaxation times and kinetics. In collisional dynamics, Boltzmann equation is solved for electrons self-consistently coupled to the chemical species (atoms, ions, molecules) reproducing very interesting features of strongly non-equilibrium internal distributions characterizing plasmas. In this context, the cross sections I calculated for the molecular dynamics represent the input data for kinetic models.

In the framework of "*Phys4Entry*" project, an European network aimed to the development of chemical-physical advanced in plasma models of hypersonic flows generated by spacecrafts in re-entry conditions in planetary atmospheres, I studied the electron-molecules scattering for the main components of the Earth atmosphere, *i.e.* N_2, O_2 and NO (papers [23, 25, 31, 32] in the list of publications), Jupiter and Mars atmospheres, *i.e.* H_2, CO and CO_2 [17, 20, 28, 33]. These researches have been conducted among Department of Physics and Astronomy of University College London (UK), DICATECh of Politecnico di Bari and CNR–IMIP (Bari, Italy). The paper in Ref. [31] on vibrational-excitation in electron-oxygen scattering, has been one of the 10 highlighted paper of 2013 of "Plasma Source Science and Technology" journal[3]. The paper in Ref. [R1] is an invited topical review on "Atomic and molecular data for spacecraft re-entry plasmas" for Plasma Source Science and Technology journal.

The database of cross sections and rate coefficients obtained for "*Phys4Entry*" project have been used, in collaboration with CNR-Nanotec (Bari, Italy) for the project *"APULIA SPACE"*, in collisional-radiative kinetics models for plasma containing N_2 [22, 27, 29, 30, 34], CO [27] and CO_2 [18] molecules for re-entry simulations, plasma-assisted combustion and environment applications.

In collaboration with NASA Ames Research Center (Moffett Field (CA), USA) and Department of Aerospace Engineering of University of Illinois (Champaign (IL), USA), I studied StS electron-rovibrational exchange energy models for nitrogen- [24] and oxygen- [19] containing plasma flows for re-entry problem linked to the shuttle shield spacecraft. Even in conditions of weak ionization, as they occur in Earth entries at orbital speed or in Mars entries, excitation by electron-impact is a very efficient mechanism for populating vibrationally excited molecules. In addition, the aerospace community shows a growing interest for flows with sensibly higher ionization degrees. This is due to the interest in superorbital speed Earth entries as they happen in the return phase from lunar and Martian exploration missions and to the investigation of plasma flow control concepts.

In collaboration with Ohio Aerospace Institute and Wright-Patterson Air Force Base (Dayton (OH), USA), within the *"State-to-state rate coefficients for elementary processes in oxygen for hypersonic flow simulations"* projet where I was principal investigator, I studied zero- and one-dimensional kinetic models for oxygen-containing hypersonic flows in aerospace applications [C7, C8, C9].

For the nuclear fusion community, in collaboration with International Atomic Energy Agency (Vienna, Austria) and with 'Laboratoire Ondes et Milieux Complexes', Université du Havre (France), I calculated the cross sections involving electrons collision with H_2 molecule [28], for the He_2^+ ion [21] and for BeH^+ and BeD^+ ions [14, 16]. These data are useful to model cooling plasma in tokamak divertors and to model the wall material of ITER.

[3] http://iopscience.iop.org/0963-0252/page/Highlights-of-2013.

Prebiotic chemistry and astrobiology

Earth's chemical evolution and the origin of life represent two of the most important issues in astrochemistry and astrobiology. According to exogeneous delivery model and Panspermia theory, prebiotic molecules have reached the Earth surface by means of comets, meteors and asteroids.

On the opposite side, the endogenous synthesis approach, carried out in the 50s and 60s and dating back to the Miller-Urey experiments, speculates that primordial atmospheres of terrestrial planets were filled up with methane, ammonia, and hydrogen and it theorizes that the primordial clouds provide the necessary chemical and energetic conditions to activate small molecules and link them into bigger molecules, in order to synthesize the building blocks of life.

A my recent research activity [4, B1], in the framework of the endogenous synthesis, focuses on how recent developments in theoretical modeling of chemical reactions and kinetics theory of transport – in thermodynamic non-equilibrium conditions – can shed a new light on the studies on the synthesis of prebiotic molecules in the primordial atmosphere. Actually, in my view, contributions from delivery mechanisms are not completely ruled out. In fact, I propose a third way, mixing of the two previous theories: some organic molecules could be delivered from space by meteor impacts, this happened for Earth as well as most of the planets of the solar system and their satellites, but only on Earth local special physical conditions (distance form the Sun, temperature, presence of liquid water...) favored triggering for the chemical reactions need for abiogenesis and their keeping over time.

Condensed matter physics

For the project "*Development of a diamond film detector for ultra-violet radiation*" conducted at Department of physics of University of Bari, I studied the electrical properties of an ultra-violet radiation detector based on a thin film of diamond, grown by using the technique of Chemical-Vapor-Deposition (CVD) [35, 36].

My principal task was the development of a 0-D and 1-D Monte Carlo code for the simulation of the electron-hole cascade by photon absorption in diamond, and for the determination of sensor's quantum-efficiency. The simulation provided the mean number of electron-hole pairs and the number of phonons as a function of the incident photon energy. Moreover, the code was formulated in order to obtain the output electric signal of the sensor that takes into account the drift, the diffusion and the finite size of the grains of the diamond film.

For the project I took care also of the experimental electronic part. In particular, I developed a code written in LabVIEW to drive all the electronic instrumentations, needed to detect and elaborate the signal from the CVD detector, *via* USB or GPIB port of the computer.

High-energy physics

My first scientific activity, corresponding to the Ph.D. studentship and the first post-doc position, has been devoted to the phenomenology of elementary particle physics. In particular, I investigated the interactions and decays of heavy mesons in the framework of the quantum effective field theories of Quantum-Cromo-Dynamics (QCD) by means of chiral-perturbation-theory (χPT) and heavy-quark-effective-theory (HQET). These researches has been conducted in collaboration with Dipartimento

di Fisica of University of Bari (Italy), Istituto Nazionale di Fisica Nucleare (INFN, Italy), Institut de Physique Nucléaire de Lyon of Université Claude Bernard Lyon–1 (France) and theoretical division of CERN (Geneva, Switzerland).

The Refs. [37, 38, 40, 42] in the list of publications, concern my research on the phenomenology of B physics. These works were inspired by the results of BaBar, Belle and Cleo experiments. In Ref. [37] I studied the rescattering effects in three-bodies barionic B decay, in particular the channel $B \to p\bar{p}\pi$, to understand the enhancement effect in barion-antibarion system. In Ref. [38] some theoretical predictions about branching ratios of B decays into axial mesons are been performed using an effective Hamiltonian approach in the scheme of naive factorization. These estimations will be useful in the future experiments as LHCb at CERN. In the Refs. [40, 42] I calculated the effects of final state interactions in B decays into two vector mesons and into two pions respectively, using the Regge theory. I have shown that some experimental branching ratio can be reproduced if the rescattering effects are take in account.

In the paper in Ref. [41] the J/ψ strong coupling to vector mesons was studied in order to compute the cross sections for the processes $J/\psi\,\rho \to D^{(*)}D^{(*)}$ and $J/\psi\,\phi \to D^{(*)}D^{(*)}$. The calculation was performed using results from HQET, χPT and constituent-quark–meson model. These results proved to be useful in the problem of the J/ψ absorption by the hot hadron gas formed during high-energy collisions of heavy-ions and the problem to detect quark-gluon plasma in experiment at LHC at CERN.

Another subject of my interest has been the phase diagram of QCD at finite temperature and density. In particular I considered the effect of leptonic chemical potential on color superconductivity phase of QCD using an approach of effective field theory. The results were applied, in astrophysical contest, to the study of neutrino trapping inside a hot pulsar assuming the existence in the star of quark matter Fulde-Ferrell-Larkin-Ovchinnikov phase of QCD [39].

References

Arnaud Bultel, Maître de conférences
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Richard L. Jaffe, Full Professor
NASA Ames Research Center
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Marco Panesi, Associate Professor
University of Illinois at Urbana-Champaign
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Le Havre - France

Jonathan Tennyson, Full Professor
University College London
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London - UK

Invited conferences and meetings

Workshop "*The Decennial IAEA Technical Meeting on Atomic, Molecular and Plasma-Material Interaction Data for Fusion Science and Technology*", Helsinki (Finland), July 2024
Workshop "*QRS 2024: 17th Quantum Reactive Scattering Workshop* ", Istanbul (Turkey), June 2024
Workshop "*Physical and Chemical processes of astrophysical interest: Towards the detection of new species*", Saint Florent (Corsica / France), June 2023
27^{th} biennial meeting of the Data Centres Network, IAEA, Vienna, May 2023
Workshop "*The Ionization Fraction of the Interstellar Medium*", Université Le Havre Normandie, France, November 2021
26^{th} biennial meeting of the Data Centres Network, IAEA, Vienna, September 2021 (Virtual) [C1]
Technical Meeting "*Collisional-Radiative Properties of Tungsten and Hydrogen in Edge Plasma of Fusion Devices*", IAEA, Vienna, March 2021 (Virtual)
Workshop "*Dynamic Methods for Cold Molecules*", Institut Pascal, Université Paris-Saclay, Orsay, France, November 2019
Workshop "*Challenges in Plasmas and Catalysis*", Université du Havre, France, October 2019
25^{th} biennial meeting of the Data Centres Network, IAEA, Vienna, October 2019 [C3]
Meeting "Observatory for Astrochemical Kinetics and Related Aspects", Accademia Nazionale delle Scienze, Rome, June 2019 [B1]
Consultancy Meeting on "Evaluation of Fundamental Data on Beryllium-containing Species for Edge Plasma Modelling", IAEA, Vienna, June 2019
7th International Conference on Advanced Plasma Technologies (ICAPT-7), Hue, Vietnam, February 2019
Workshop PREMiERE "*CO2 Plasmas: a fRIendly MEdium for Renewable Energy*", Ericeira, Portugal, November 2018
3^{rd} International Workshop on Dissociative Electron Attachment, Prague, Czech Republic, April 2018
International School on Quantum Electronics, 61st Course: "*Hypersonic Meteoroid Entry Physics*", Ettore Majorana Foundation, Erice, Italy, October 2017 [B2]
Workshop "The new view of comet coma processes after Rosetta: The importance of electrons", Bratislava, Slovakia, May 2017
Workshop "Oxygen Plasma Kinetics", Reykjavik, Iceland, September 2016
Seminar Laboratoire Ondes et Milieux Complexes, Université du Havre, France, May 2016
Workshop on "*Plasma Simulation and Modeling*", Ames Research Center, NASA, Moffett Field (CA), USA, July 2014
Meeting Ames Research Center, NASA, Moffett Field (CA), USA, July 2013
International School on Quantum Electronics, 53rd Course: "*Molecular Physics and Plasmas in Hypersonics: II*", Ettore Majorana Foundation, Erice, Italy, September 2012 [26]
Workshop CECAM "*Theoretical and Computational Astrochemistry*", Scuola Normale Superiore, Pisa, Italy, August 2012

List of publications

Total number of articles: 53
Total number of citations: 1036
Total number of citations without self-citations: 882
h-index: 18
Bibliometric indexes according WEB OF SCIENCE^{TM} database

Publications in peer-reviewed journals[4]

1. E. Djuissi, J. Boffelli, R. Hassaine, N. Pop, **V. Laporta**, K. Chakrabarti, M. Ayouz, A. Bultel, J.Z. Mezei and I.F. Schneider, *"Reactive collisions between electrons and BeH^+ above dissociation threshold"*, Phys. Chem. Chem. Phys. **26**, 18311 (2024)

2. E. Djuissi, A. Bultel, J. Tennyson, I.F. Schneider, and **V. Laporta***, *"High energy electron collisions with ArH^+ molecular ions"*, Plasma Sources Sci. Technol. **31**, 114012 (2022)

3. **V. Laporta***, L. Vialetto, V. Guerra, *"Vibrational excitation cross sections for non-equilibrium nitric oxide-containing plasma"*, Plasma Sources Sci. Technol. **31**, 054001 (2022)

4. G. Micca Longo, L. Vialetto, P. Diomede, S. Longo, **V. Laporta**, *"Plasma modeling and prebiotic chemistry: a review of the state of the art and perspectives"*, Molecules **26**, 3663 (2021)

5. **V. Laporta***, R. Agnello, G. Fubiani, I. Furno, C. Hill, D. Reiter, and F. Taccogna, *"Vibrational excitation and dissociation of deuterium molecule by electron impact"*, Plasma Phys. Control. Fusion **63**, 085006 (2021)

6. N. Pop, F. Iacob, S. Niyonzima, A. Abdoulanziz, **V. Laporta**, D. Reiter, I.F. Schneider, J.Zs. Mezei, *'Reactive collisions between electrons and BeT^+: Complete set of thermal rate coefficients up to 5000 K"*, At. Data Nucl. Data Tables **139**, 101414 (2021)

7. A. Abdoulanziz, C. Argentin, **V. Laporta**, K. Chakrabarti, A. Bultel, J. Tennyson, I. F. Schneider, and J. Zs. Mezei, *"Low-energy electron impact dissociative recombination and vibrational transitions of N_2^+"*, J. Appl. Phys. **129**, 053303 (2021)

8. E. Djuissi, R. Bogdan, A. Abdoulanziz, N. Pop, F. Iacob, C. Argentin, M.D. Epee Epee, O. Motapon, **V. Laporta**, J.Z. Mezei, I.F. Schneider, *"Electron driven reactive processes involving H_2^+ and HD^+ molecular cations in the Early Universe"*, Romanian Astron. J. **30**, 101 (2020)

[4] *=Corresponding author

9. **V. Laporta***, I.F. Schneider and J. Tennyson, *"Dissociative electron attachment cross sections for ro-vibrationally excited NO molecule and N^- anion formation"*, Plasma Sources Sci. Technol. **29**, 10LT01 (2020)

10. **V. Laporta***, J. Tennyson and I.F. Schneider, *"Vibrationally resolved NO dissociative excitation cross sections by electron impact"*, Plasma Sources Sci. Technol. **29**, 05LT02 (2020)

11. K. Chakrabarti, **V. Laporta** and J. Tennyson, *"Calculated cross sections for low energy electron collision with OH"*, Plasma Sources Sci. Technol. **28**, 085013 (2019)

12. A. Abdoulanziz, F. Colboc, D.A. Little, Y. Moulane, J.Zs. Mezei, E. Roueff, J. Tennyson, I.F. Schneider and **V. Laporta***, *"Theoretical study of ArH^+ dissociative recombination and electron-impact vibrational excitation"*, MNRAS **479**, 2415 (2018)

13. Y. Moulane, J.Zs. Mezei, **V. Laporta**, E. Jehin, Z. Benkhaldoun and I.F. Schneider, *"Reactive collision of electrons with CO^+ in cometary coma"*, A&A **615**, A53 (2018)

14. S. Niyonzima, N. Pop, F. Iacob, Å. Larson, A.E. Orel, J.Zs. Mezei, K. Chakrabarti, **V. Laporta**, K. Hassouni, D. Benredjem, A. Bultel, J. Tennyson, D. Reiter, I.F. Schneider, *"Low-energy collisions between electrons and BeD^+"*, Plasma Sources Sci. Technol. **27**, 025015 (2018)

15. R. Celiberto, M. Capitelli, G. Colonna, G. D'Ammando, F. Esposito, R.K. Janev, **V. Laporta**, A. Laricchiuta, L.D. Pietanza, M. Rutigliano, J.M. Wadehra, *"Elementary processes and kinetic modeling for hydrogen and helium plasmas"*, Atoms **5**, 18 (2017)

16. **V. Laporta***, K. Chakrabarti, R. Celiberto, R.K. Janev, J.Zs. Mezei, S. Niyonzima, J. Tennyson and I.F. Schneider, *"Theoretical resonant electron-impact vibrational excitation, dissociative recombination and dissociative excitation cross sections of ro-vibrationally excited BeH^+ ion"*, Plasma Phys. Control. Fusion **59**, 045008 (2017)

17. **V. Laporta***, J. Tennyson and R. Celiberto, *"Calculated low-energy electron-impact vibrational excitation cross sections for CO_2 molecule"*, Plasma Sources Sci. Technol. **25**, 06LT02 (2016)

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