The LXCat Project

Wouter Graef on behalf of the LXCat team

LT1.00008

What Is LXCat

- An open-access, web-based platform for storing, exchanging and manipulating data for modeling the electron and ion components of low-temperature, non-equilibrium plasmas.
- We support electron and ion scattering cross sections and rate coefficients, electron and ion swarm/transport parameters, ion-neutral interaction potentials, and optical oscillator strengths.
- Online tools allow for searching, graphical display, and downloading of data, and an online Boltzmann solver allows users to calculate electron transport and rate coefficients in arbitrary gas mixtures if "complete" sets of cross sections for the individual components are available in the databases.
- Visit us at www.lxcat.net

LXCat History

- 2009, Toulouse: Researchers at LAPLACE initiated the LXCat project
- 2010 GEC: Involvement by the community
- 2013, Eindhoven: Mirror server
- 2015: Founding of Association: Data for modeling plasmas
- 2017: Formation of technical support team
- 2019, Drake: Mirror server

LXCat Contributors

- Database contributors retain ownership and are responsible for the contents and maintenance of the individual databases
- New contributors are welcome and can request an account and receive instructions for setting up a password-protected database
- LXCat does not recommend data
- Contributors:

  Leanne C. Pitchford, Luís L. Alves, Klaus Bartschat, Stephen F. Biagi, Marie-Clause Bordage, Igor Bray, Chris E. Brion, Michael J. Brunger, Stephen Buckman, Laurence Campbell, Alise Chachereau, Bhaskar Chaudhury, Zhi-Wen Cheng, Sanchita Chowdhury, Loucas G. Christophorou, Emile Carbone, Uwe Czarnetzki, Jan van Dijk, J. Dutton, Nikolay A. Dyatko, Christian M. Franck, Dmitry V. Fursa, Reetesh K. Gangwar, Vasco Guerra, Pascal Haefliger, Gerjan J.M. Hagelaar, Malte Hildebrandt, Andreas Hoesl, Felix Iacob, Yukikazu Itikawa, Indrek Jogi, Igor V. Kochetov, Vincenzo Laporta, Robert P. McEachran, W. Lowell Morgan, Anatoly P. Napartovich, Sergey Pancheshnyi, Yi-Kang Pu, Vincent Puech, Mohamed Rabie, Lalita Sharma, Rajesh Srivastava, Allan D. Stauffer, Jacob Stephens, Jonathan Tennyson, Tsanko Vaskov Tsankov, Jaime de Urquijo, Larry A. Viehland, Mark C. Zammit, Oleg Zatsarinny, Yan-Fei Wang, Yang Wang, Da-Ren Yu, Xi-Ming Zhu

LXCat Team

Outreach Team

Emile Carbone (Germany), Leanne Pitchford (France),

Klaus Bartschat (USA), Yi-Kang Pu (China)

Tech Team

Sergey Pancheshnyi (France, 2009-2017)

Wouter Graef, Diana Mihailova, Jan van Dijk (Netherlands),

Matthew Hopkins, Benjamin Yee, Jacob Stephens (USA)

LXCat Statistics

- 30 contributor databases:

  Scattering cross sections: 26 databases | 103 x 517 species | 24.2k records

  Differential scattering cross sections: 4 databases | 29 species | 517 records

  Interaction potentials: 1 database | 91 x 7 species | 660 records

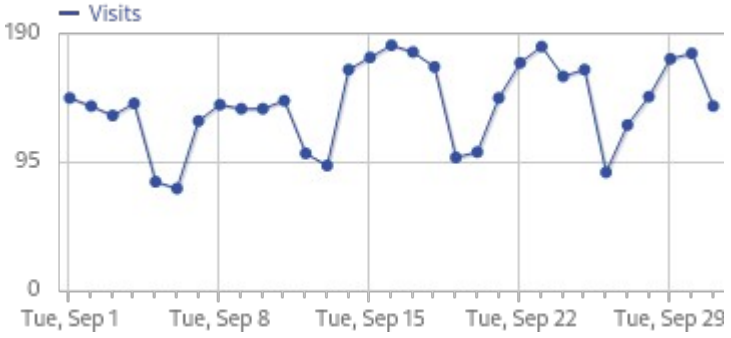
  Oscillator strengths: 1 database | 65 species | 150 records

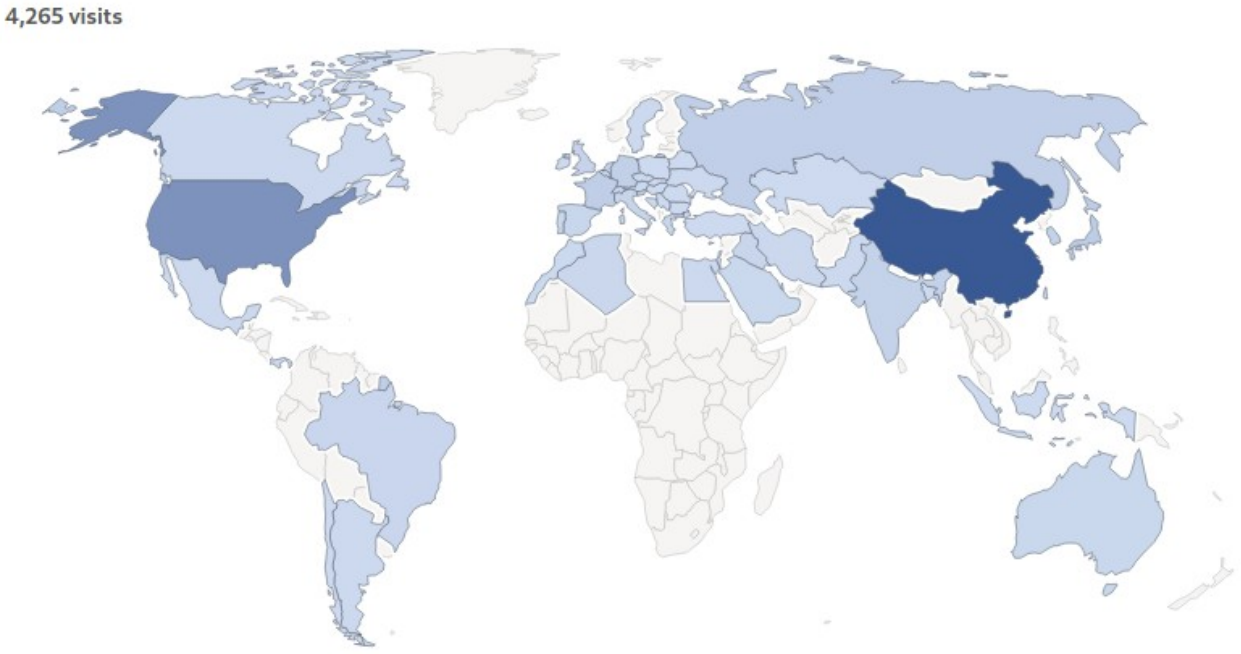
  Swarm / transport data: 16 databases | 430 x 114 species | 193k records

  Publications, notes and reports: 5 databases | 35 records
- 1280 citations

LXCat Statistics

- 3 servers: Eindhoven University of Technology & Drake University
- 150 daily visits

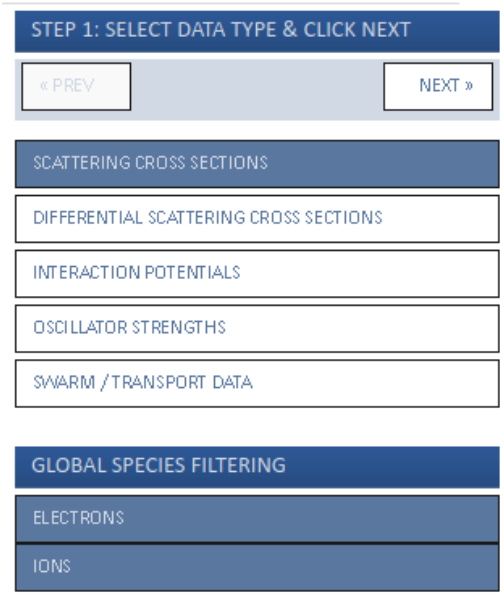


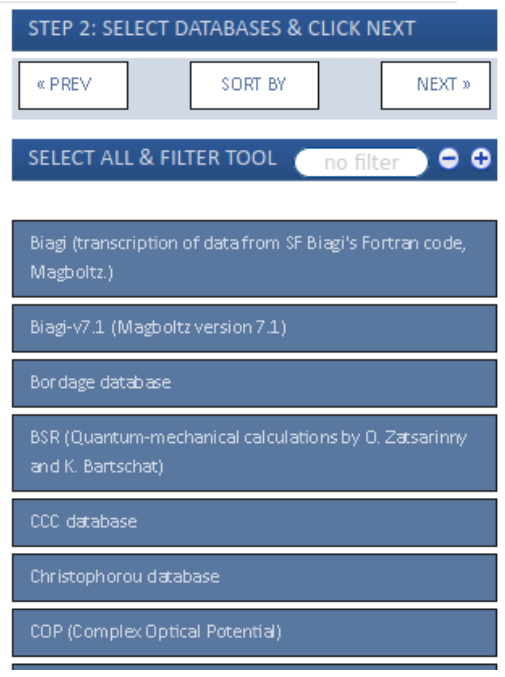


How It Works

Data Retrieval

Select data type and database

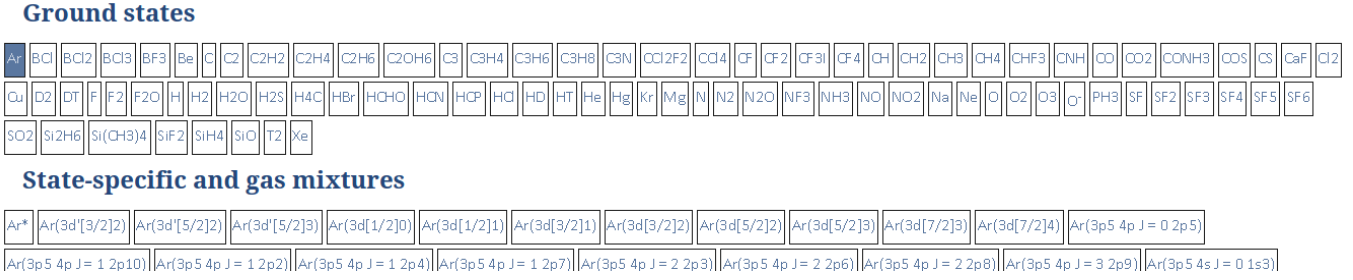




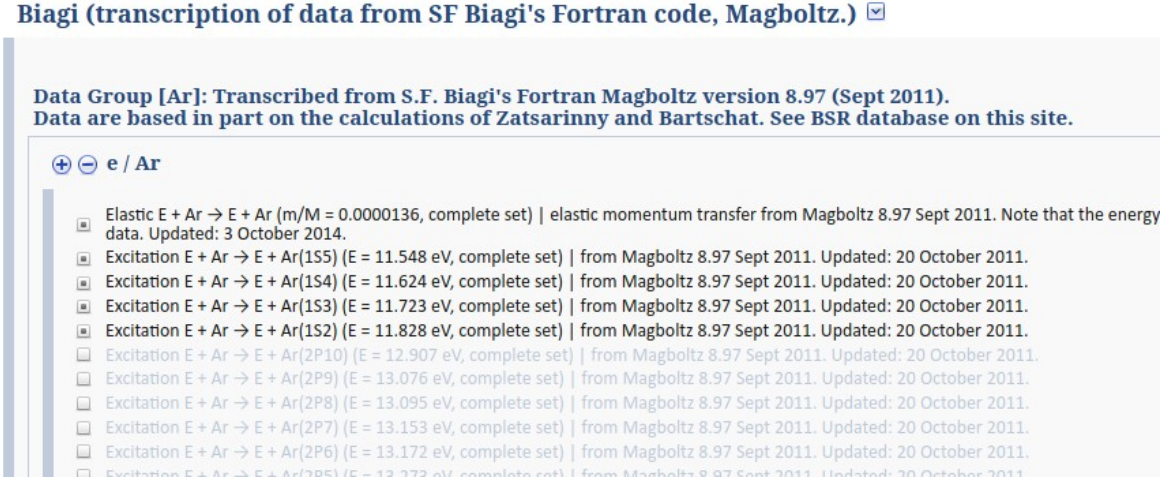
How It Works

Data Retrieval

Select species



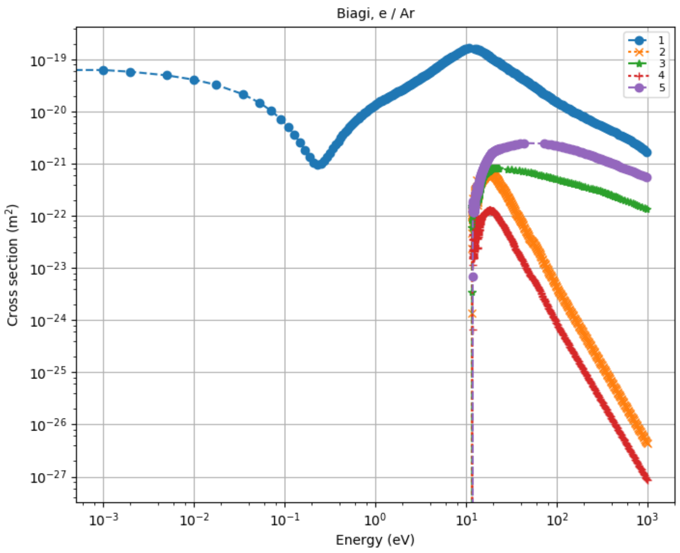
Select processes



How It Works

Data Retrieval

Output plots and ASCII files




```
xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx
DATABASE:         Biagi (transcription of data from SF Biagi's Fortran code, Magboltz.)
PERMLINK:         www.lxcat.net/Biagi
DESCRIPTION:      These data were transcribed from S.F. Biagi's FORTRAN code, MagBoltz, versions 8.9 and later. The
                  exact version number is given for each species.   At this time, the Biagi database contains cross
                  sections for rare gases, for a few simple molecules, and for SF6. The transcription of cross sections
                  for other gases is in progress. These data were compiled for use a Monte Carlo simulation (or
                  multi-term Boltzmann code), but their use in a 2-term Boltzmann solver gives reasonably accurate
                  results in most cases. The the LXCat data tables do not always have the same energy resolution as the
                  original data in the MagBoltz code. This limited energy resolution can introduce small (1%)
                  differences in the calculated drift velocity at low E/N.
                  For history and detailed notes, see http://consult.cern.ch/writeup/magboltz/

                  Oct 2011 : update of Ar and Kr data taken from MagBoltz version 8.97 Nov 2011 : small changes in Xe
                  ionization cross sections, taken from MagBoltz v8.97
                  March 2015: cross sections for SF6 were transcribed from Magboltz version 10.6 from February 2014.
CONTACT:          email Stephen.biagi@@hotmail.co.uk
HOW TO REFERENCE: Fortran program, MAGBOLTZ, S.F. Biagi.  The version number of MAGBOLTZ from which the cross sections
                  were transcribed is provided in the comment for each species.  This version number must be included in
                  the reference.
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COMMENT: Transcribed from S.F. Biagi's Fortran Magboltz version 8.97 (Sept 2011).
         Data are based in part on the calculations of Zatsarinny and Bartschat.  See BSR database on this site.

************************************************** Ar *************************************************

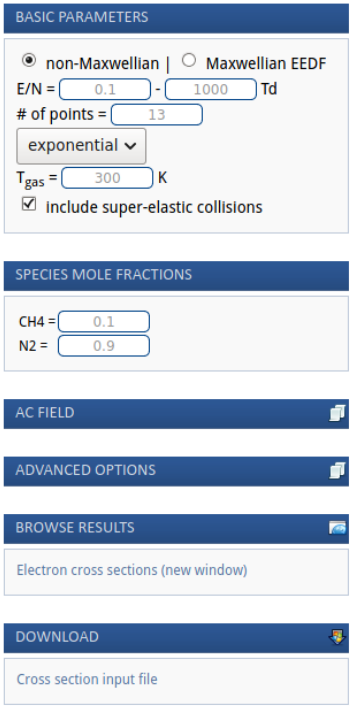
ELASTIC
Ar
 1.360000e-5
SPECIES: e / Ar
PROCESS: E + Ar -> E + Ar, Elastic
PARAM.:  m/M = 0.0000136, complete set
COMMENT: elastic momentum transfer from Magboltz 8.97 Sept 2011.  Note that the energy resolution
COMMENT: in the LXCat tables for energy < 1 eV is less than for the original data.
UPDATED: 2014-10-03 16:39:59
COLUMNS: Energy (eV) | Cross section (m2)
-----------------------------
 0.000000e+0    6.298400e-20
 1.000000e-3    6.298400e-20
 2.000000e-3    5.835000e-20
 5.000000e-3    4.977500e-20
 1.000000e-2    4.113000e-20
 1.741900e-2    3.290600e-20
 3.514200e-2    2.144900e-20
 5.317400e-2    1.474100e-20
 7.151900e-2    1.032600e-20
 9.018400e-2    7.273200e-21
 1.091700e-1    5.117000e-21
 1.285000e-1    3.589000e-21
```

How It Works
Online BOLSIG+ Calculation

Select from available complete sets

	CH4	N2
Hayashi	☐	
IST-Lisbon	☐	☐
Morgan	◉	◉
TRINITI	☐	☐
Biagi		☐
Phelps		☐
SIGLO		☐
Publications		

Select settings

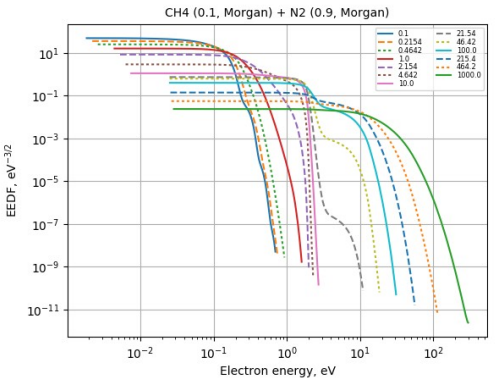


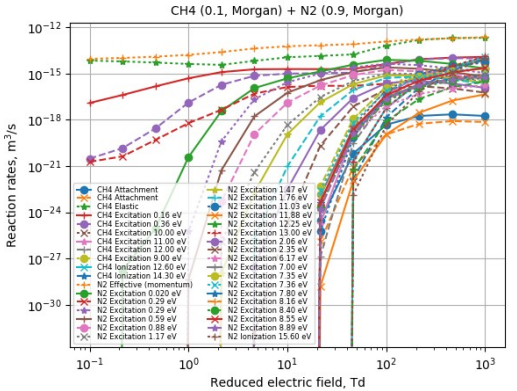
How It Works

Online BOLSIG+ Calculation

EEDF's &

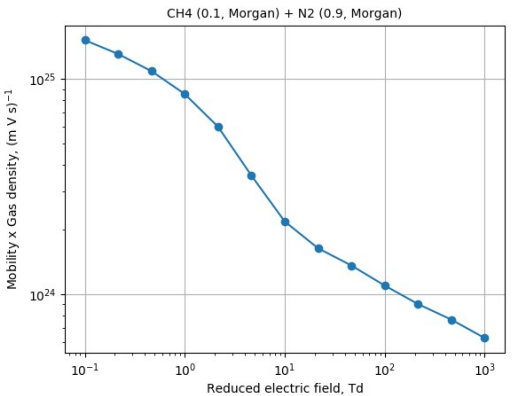
Rate coefficients

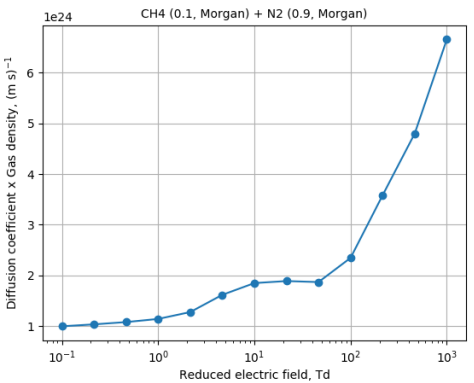




Mobility &

Diffusion coefficient





Results can be compared to database

Referencing

Users of LXCat **MUST** properly reference used material

Website:

Terms of use

Users acknowledge understanding that LXCat is a community-based project with open-access databases being freely provided by individual contributors.

Proper referencing of material retrieved from this site is essential for the survival of the project.

Users further accept that the databases on this site remain property of their respective contributors and are not to be distributed by third parties or used for commercial purposes. All questions regarding copyright should be addressed to the LXCat team.

Output files:

```
HOW TO REFERENCE: Fortran program, MAGBOLTZ, S.F. Biagi.  The version number of MAGBOLTZ from which the cross sections
                  were transcribed is provided in the comment for each species.  This version number must be included in
                  the reference.
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Resources

- Online quick start guides
- Discussion board hosted on Google groups
- Links to various software related to LXCat and software by and for the LTP community:

  BOLSIG+, ZDPlasKin, EEDF, BOLOS, PumpKin, METHES, MultiBolt, LoKI-B, THERMCAT, ELEM, MOBION

LXCat In The Future

- Species naming scheme, allowing for proper categorization of data
- In addition to current output format, output in XML/JSON with schemas
- API for direct data access
- Additional online services, such as cross section calculator for interaction potentials

Get Involved

- Become a contributor
- Share your ideas and wishes
- Help future development

https://www.lxcat.net

info@lxcat.net