White Paper for *Frontiers of Plasma Science Panel*

Date of Submission:	**14 June 2015**

Indicate the primary (P) and secondary (S) areas this white paper addresses

	"P", "S"
• Plasma Atomic physics and the interface with chemistry and biology	P
• Turbulence and transport	
• Interactions of plasmas and waves	
• Plasma self-organization	
• Statistical mechanics of plasmas	

Indicate type of presentation desired at Town Hall Meeting.

	"X"
Oral	
Poster	
Either Oral or Poster	
Will not attend	X

Title:	The Plasma Data Exchange Project
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- ***Describe the research frontier* and importance of the scientific challenge.**

This project aims to address, at least in part, the well-recognized needs for the low-temperature-plasma-science community to organize the means of collecting, evaluating and sharing data both for modeling and for interpretation of experiments.

- ***Describe the approach to advancing the frontier and indicate if new research tools or capabilities are required.***

The Plasma Data Exchange Project is a community-based project that was initiated as a result of a public discussion held at the 2010 Gaseous Electronics Conference (GEC), a leading international meeting for the Low-Temperature Plasma community. This is now a dynamic website, evolving as contributors add or upgrade data, but has transformational potential as a global platform for facilitating students and scientists, individually and collectively, and their formal collaborations.

At the heart of the Plasma Data Exchange Project is LXcat (pronounced "elecscat"), an open-access web-based platform for collecting, displaying, and downloading electron and ion scattering cross sections, swarm parameters (mobility, diffusion coefficient, etc.), reaction rates, energy distribution functions, etc. and other data required for modeling low temperature plasmas. The available data bases have been contributed by members of the community and are indicated by the contributor's chosen title.

Future directions and needs:

1. Maintaining ongoing activities: Uploading new data, documenting data on LXCat in scientific publications.

2. Expanding scope to include new data types: Example: recent inclusion of generalized oscillator strength data.

3. Development of new tools, standardization of formats.
4. Insisting on proper referencing:
Example: "Phelps database, www.lxcat.net, retrieved 26 May 2015"
5. Setting up a structure to assure survivability
6. Occasional one-time support for implementing improved features of the platform and continuous partial (25%) Full-Time-Equivalent support for either a computer database manager, an administrative assistant, or both. This support could be provided in the form of a U.S.-based affiliate from a U.S. university or U.S. national laboratory.

Professor Klaus Bartschat and his collegue Oleg Zatsarinny at Drake University in Iowa have been very active in the LXCat project since its inception. Their quantum calculations for electron + rare gas scattering yield cross section datasets are internally consistent and sufficiently complete for most modeling purposes. The accuracy of these theoretical predictions has been shown to be at least comparable, but often exceeding that of experiment.

The Plasma Data Exchange Project would like to get more of Drake University's data on LXCat, but it's a considerable effort for them to extract "cross sections" suitable for uploading to LXCat from their results. With some funding earmarked LXCat, this could be accomplished, and it would be a great service to the low temperature plasma modeling community.

Multiple examples of one-time uploading and feature expansion for LXCat would make annual funding at a $30,000 - $100,000 per year level worthwhile, globally available, and exceptionally leveraged.

- ***Describe the impact of this research on plasma science and related disciplines and any potential for societal benefit***.

The data that continuously needs to be collected, evaluated, and shared both for modeling and for interpretation of experiments:

Electron + neutral cross sections / swarm parameters
Ion + neutral cross sections / interaction potentials / swarm parameters
Neutral / ion chemistry Plasma-surface interactions Radiation

* * * *

An oral presentation is not desired.

Primary Workshop Topic: Low-Temperature Plasmas

Primary Workshop Panel: Plasma atomic physics and the interface with chemistry and biology

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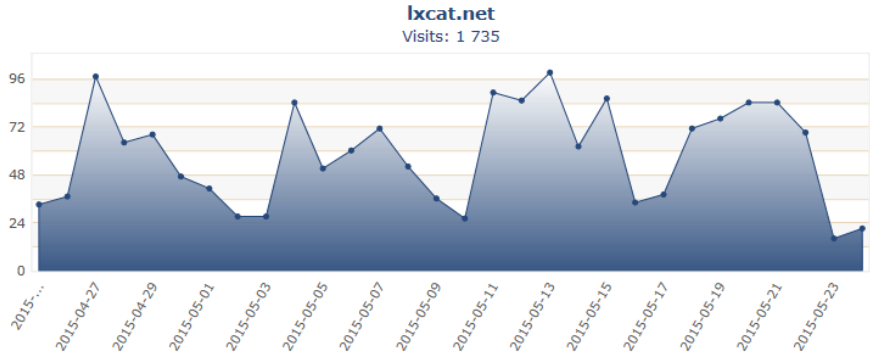
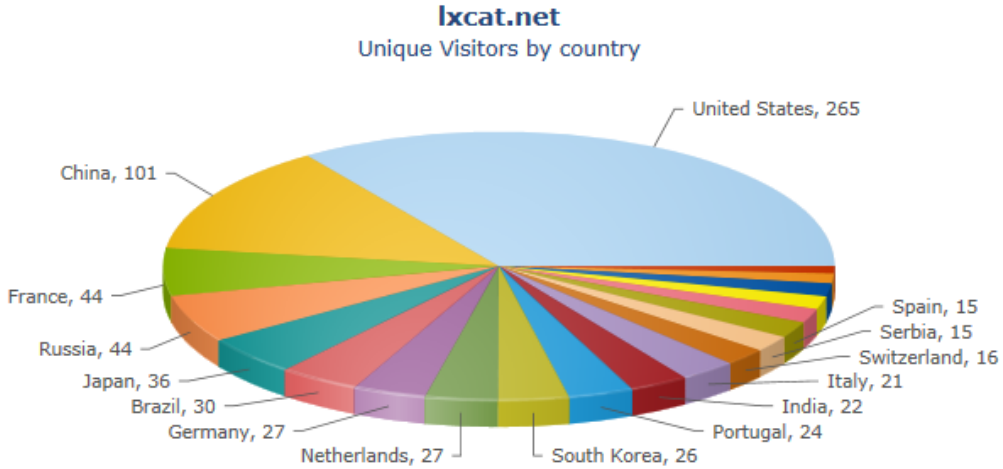
on behalf of the LXCat team.

WEBSITE: Homepage of LXCat.

IMPACT: On average 58 unique visitors per day (25April – 24May 2015).



IMPACT: World Geographical Distribution of LXCat users