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*CREMLIN: CONNECTING RUSSIAN AND
EUROPEAN MEASURES FOR LARGE-SCALE
RESEARCH INFRASTRUCTURES*

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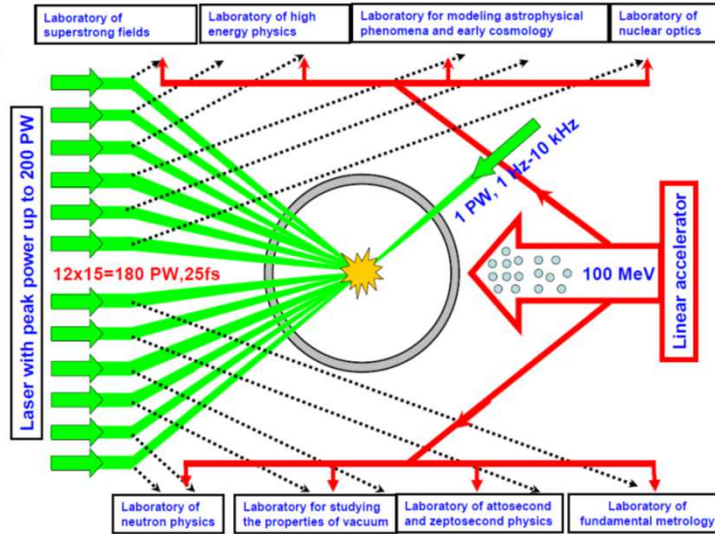
WP6 – Science cooperation with XCELS in the field of high power laser research

**CREMLIN Closing Conference
DESY, Hamburg, Germany
June 5, 2018**



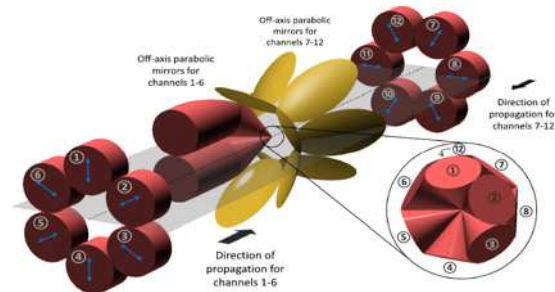
Magascience project XCELS

Laser source for XCELS



XCELS is based on the 200 Petawatt (2×10^{17} Watt) laser facility that exceeds the current record power level by 100 times. It comprises 12 amplification channels, each producing a laser pulse with 400 J energy and 25 femtosecond pulse duration.

A specially designed focusing system provides the ascent to the highest intensity level of $10^{25} - 10^{26}$ W/cm² by combining 12 laser beams. The resulting energy density in the focal area attains 10^{16} J/cm³, several orders of magnitude higher than in the center of the Sun.



XCELS - Exawatt Center for Extreme Light Studies

Examples of activities WP6

- WP6: 200 PW High Power Laser Project XCELS at the Institute of Applied Physics RAS, Nizhniy Novgorod
- Partners: CEA (FR), IAP-RAS (RU), ELI-DC AISBL (BE)
- Events:
 - Workshop “Novel applications of Exawatt laser sources”: 17-23 July 2016 at Nizhny Novgorod-St. Petersburg (River cruise boat "Nizhny Novgorod")
 - Workshop on “Key technological issues in construction and exploitation of 100PW-class lasers I” organized 4-7 October 2016 by CEA within the ISUIL Conference on Lasers, in Cassis, France
 - Workshop "Key technological issues in construction and exploitation of 100 PW class lasers II“, July 22 - 28, 2017, by IAP on board the river boat cruising from Moscow to St.-Petersburg, Russia
 - Round Table on “Internationalization of XCELS”, organized by the CEA at ELI-NP, 7-8 December 2017, Bucharest, Romania
 - Workshop on “Involvement of European Industry in the XCELS project” 11-12 December 2017, organized by CEA at IHP, Paris, France



S&T aspects

Political aspects

R&D strategy aspects

Recommendations for the collaboration around the High-power laser XCELS

For the further elaboration of a technical design for XCELS, it will be of special relevance to carry out joint EU-Russian research and development efforts in high-field physics:

- Relativistic plasma mirrors development: a tool to reach extreme light intensities (e.g. for non-linear QED experiments);
- Custom design of plasma mirrors as temporal filters / beam shapers (e.g. for temporal laser pulse cleaning);
- Ultrahigh-intensity laser beam diagnostics: Spatio-temporal laser field diagnostics including dipolar electric fields at focus

The production of a 2-channel prototype for XCELS may be achieved.

It is furthermore recommended to have a stepwise approach, and perhaps seek integration into the existing European networks, like for instance the Laserlab Europe, or the Extreme-Light Infrastructure (ELI).

A business plan for XCELS needs to be developed in order to ensure the financial sustainability of the project.

Informal XCELS' views on the nearest few years needs

One of the major issues for further EU-Russian research and development efforts related to the XCELS infrastructure is to organize meetings and address pending issues, both technical and financial ones, possibly at the **intergovernmental level**.

It is planned to continue collaboration with the key European partners – CEA and ELI – **and invite new ones**, among which IAP expects to see industry representatives such as THALES Optronique, but also DESY, GSI and others.

The scientific case of XCELS is **constantly upgraded**, and all the changes will be incorporated in the developed in the detailed design and business plan.

THANK YOU FOR YOUR ATTENTION

