Achievement of technologies and testing methods for resilient mirrors under high power laser pulse, suitable for CETAL and ELI infrastructures / REMI

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Project Abstract:

Achievement of technologies and testing methods for resilient mirrors under high power laser pulse, suitable for CETAL and ELI infrastructures / REMI

The proposed research intends to achieve and test, in gradual steps, the appropriate technology in order to perform reflective optics that is needed for beam transport related to CETAL and ELI infrastructures.

After 14.5 months of developing the execution technologies in terms of big optical surfaces processing

(generating, refinement and polishing), and a reliable reflective coating, the final deliverable will be designed, manufactured and tested, until the end of the project (26.5 months).

The final objective of the project is to become able to perform mirrors suitable for CETAL and ELI infrastructures, but, until this level, we have to reach several technological intermediary objectives, mentioned in the list below:

Obj1: to find the best technological way to generate big plane optical surfaces with deviations the smallest possible, having the target of $\lambda/20$ and to find the best technological way to polish these surfaces in order to obtain the smallest possible roughness, the target being less than 2nm;

Obj2: to find the best technological way to polish pre-shaped aspheric surfaces in order to obtain as small as possible shape deviations and roughness on the aspheric surfaces;

Obj3: to establish a coating design and technology in order to manufacture reliable mirrors with high reflectivity (R>99.9% @ 800nm ± 10nm, $\alpha = 45^o$).

Obj4: to establish methods for optical measurements and reliability tests, generally divided in:

- measurements and tests performed during the technological chain;

- measurements and tests performed to characterize the final product.

The involved team are employees from a private company (Pro Optica S.A.), experienced in optomechanical design and execution, optical coating, optical measurements etc. They will work organized in 3 work-packages, as follows:

WP1: Opto-mechanical design and glass processing;

WP2: Optical coatings (design and execution);

WP3: Optical measurements and tests assurance.

Regarding the testing sessions, an important contribution was made by collaborating with specialists from INFLPR (CETAL), experienced in laser physics and all associated sciences.

The final deliverables are functional mirrors, including their mounts.