7th CORNET Call for Collective Research Proposals

--- Project Idea ---

pre-proposal deadline: March 6th, 2009

full proposal deadline: April 30th, 2009

Subject:	**OPTASENS, Combination and evaluation of different optical and tactile sensors and measuring methods for the analysis and global form-measurement on optical surfaces**
Coordinator:	Germany
Other applicant(s):	- F.O.M., **Germany** (association) - University Passau, **Germany** (research performer) - University of applied sciences Deggendorf, **Germany** (research performer) - Universität Munich, **Germany** (research performer) - Department of Mechatronics**,** Optics and Engineering Informatics, **Hungary** (research performer)
Sector/target group:	Optics industry, production industry
Proposal summary:	Combination and evaluation of different optical and tactile sensors and measuring methods for the analysis and global form-measurement on optical surfaces Objective and technical project summary: The manufacturing of optical components more often requires grinding and polishing of non rotational symmetric aspheres or freeform surfaces. Although there are measurement techniques available for small diameters of some 10 mm the measuring of larger surfaces is not or only by extreme efforts feasible. The results of earlier tests show clearly that it is necessary to use different methods for measuring in different stages of the manufacturing process. As larger parts – especially after the last manufacturing step – should not be transported, the used measurement technology should be applicable within the machine tool. The technical target of the project is the combination of different measurement methods in order to proof the accuracy of large (up to 800mm in diameter) optical surfaces for the final zonal correction polishing such as MRF. This could be established by using tactile methods as i.e. from companies like Taylor Hobson, Werth or others and optical methods as they are described by different principles (confocal microscopy, interferometry, Shack-Hartmann-Sensors, deflectometry or others). In this complementary combination the tactile system would be used to characterise the macro geometry and the non-tactile methods to measure the local geometry with high precision in several stages. The measurement of the global form of the optical parts together with high precision local information requires this hierarchical measurement setup. The stitching of local measurement patches will be

	based on the knowledge from previous stages about the global surface form. Major tasks and work packages in realisation are: I. Mathematical and algorithmic combination of the different measurement methods by stitching of local measurement patches in order to get a high precision global form of the surface II. Design and test on known surfaces by different metrology systems usable in a manufacturing surrounding III. Simulation and design of the components in terms of i.e. stiffness and thermal accuracy IV. Integration and test
Advantages for trade and industry:	Manufacturing, especially in Europe, is facing high pressure to perform in terms of operating efficiency and quality. Innovative production concepts, as well as high performance technologies are needed in order to keep up with rising international competition. The request of freeforms in highest possible quality for optical application is increasing. These elements are used in small up to large quantities in special applications such as telescopes or head up displays. The manufacturing process is in case of high accuracy (lamba/20 or better) due to the significant cost driver measurement process, extremely expensive or not feasible. For standard sized elements the optical industry has to refer to commercially available extremely expensive US or Japanese measuring machines. For the newly requested larger size of optical elements, which is the main focus in this project, the optical industry has no access to the existing technology in Japanese and US universities or the big companies in Europe. The results of the project offer the ability to develop further on their own measuring equipment for their production requests to the project partners – widely independent of the size of the optical elements. The machine tool and measurement device manufacturers (mostly SME's) can use the results as an evaluation of modules that can be built into their products. The European optical industry consists of few big and a lot of SM-Enterprises. Investigations performed in this project cannot be carried out by any one of the SME companies due to their volume and complexity. But the results would offer the access for machine manufacturers and as well for optics manufacturers as users of the developed measurement technology to a newly emerging market of high precision freeform optical elements which today is closed for them due to the missing measurement technology. Thus the recommended project in hand represents particular importance especially for the SME's as they usually do not have access to the results of measurement technology improvements gained by the big companies and they are not able to carry out the development of this process besides their business.
Dissemination concepts:	Not worked out in detail yet, but will involve publications, conferences & workshops and/or seminars, pilot production, staff exchange.
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