# EOS Conference on Optomechanical Engineering (EOSOME 2015)

World of Photonics Congress 2015

Munich, Germany
22-25 June 2015

ISBN: 978-1-5108-1781-4

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Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571


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Printed by Curran Associates, Inc. (2016)



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| **Date: Wednesday, June 24** | |
| 14:00 - 15:30<br>Room 2, Ground Floor, Congress Centre | **Optomechanical Engineering 1** |
| 16:35 - 18:00<br>Room 2, Ground Floor, Congress | **Optomechanical Engineering 2, Plenary Session** |
| **Date: Thursday, 25/Jun/2015** | |
| 8:30 - 10:00<br>Room 2, Ground Floor, Congress Centre | **Optomechanical Engineering 3** |
| 10:30 - 11:50<br>Room 2, Ground Floor, Congress Centre | **Optomechanical Engineering 4** |

## 14:00-15:30 Optomechanical Engineering 1

*Location:* Room 2, Ground Floor, Congress Centre

Invited Talk **14:00 Micro-optics an approach to optomechanics** N/A

**Hans Peter Herzig**
Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland

**14:30 Studying the stability of thermal and mechanical properties of Astrositall in production of astronomical mirrors** 1

**Aleksandr P. Semenov, Magomed A. Abdulkadyrov, Sergey P. Belousov, Nikolay S. Dobrikov, Aleksandr N. Ignatov, Aleksey P. Patrikeev**
LZOS,JSC, Russian Federation
The technology of production of astronomical and space mirrors from Astrositall, including its properties and stability of these properties in the course of time is described, the results of long-term material tests are presented.

**14:50 Study of surface harmonics on an electrowetting-based liquid lens** 3

**Matthias Strauch, H. Paul Urbach**
TU Delft, The Netherlands
Liquid lenses using the electrowetting effect can be used to manufacture small-sized autofocus and zoom cameras. We extend the tunability to non-spherical surfaces by inducing oscillations of the liquid--liquid interface and will explore its possibilities in a wider range of applications.

**15:10 Design of lightweight primary mirror made by SiC and metering structure for spaceborne telescope** 5

**Haeng-Bok Lee[1], Jin-Young Suk[2]**
[1]Agency for Defense Development(South Korea); [2]Chungnam National University(South Korea)
Silicon carbide is the best material for various telescope mirrors since it is high stiffness, low density, high thermal stability and fine surface optical quality. This paper describes a conceptual design trade studies that explores the structural views for the lightweight primary mirror made by SiC as well s the metering structure in half-metric GSD class telescope for space applicati-on.

15:30– 16:00 COFFEE BREAK

**16:00-16:20 LIGHT 2015 AWARDS CEREMONY**
*Location:* Room 2, Ground Floor, Congress Centre

The European Optical Society and the LIGHT2015 project present the LIGHT2015 Young Photonics Entrepreneur Award and The LIGHT2015 Young Women in Photonics Awards.
Both awards consist of a diploma and an honorarium of 2500 EUR.

Information about the LIGHT 2015 project: www.europe.light2015.org

**16:20– 16:35 EOS FELLOWS CEREMONY**
*Location:* Room 2, Ground Floor, Congress Centre

## 16:35-18:00 Optomechanical Engineering 2, Plenary Session

**16:35 Challenges in Integrated Optomechanical Analysis**
**Victor Genberg**
Sigmadyne, Inc., United States of America

Computational analysis is commonly accepted in both optical design and mechanical design. Integrating the two diverse fields to predict optical performance under mechanical environments presents several challenges which will be adressed in this paper.



**17:20 Opto-mechanical design solutions for mounting cryogenic optics** 20
**Gabby Aitink-Kroes[1], Jan Kragt[1], Niels Tromp[1], Hiddo Hanenburg[2], Eddy Elswijk[1], Rik Ter Horst[1]**
[1]NOVA, The Netherlands; [2]ASTRON, The Netherlands
Mounting optics is always a compromise between firmly fixing the optics and preventing stresses within the optics. The fixing should ensure mechanical stability and thus accurate positioning in various gravity orientations, temperature ranges, during launch, transport or earthquake. However, the fixings can induce stresses, deformations and birefringence in the optics and thus cause optical errors. Cracking or breaking of especially the brittle infrared optical materials are a risk, where differential expansion of various materials amounts easily to several millimeters per meter. Special opto-mechanical design solutions are therefore needed to ensure both accurate positioning and low stress.

**17:40 Low-cost hexapod system for small telescopes** 22
**Santiago Royo[1,2], Vincent Suc[2,3], Francisco Azcona[1], Miguel Ares[1], Andrés Jordán[2,3]**
[1]UPC-BarcelonaTech, Centre for Sensors, Instruments and Systems Development (CD6) Spain; [2]ObsTech SpA, Santiago, Chile; [3]Instituto de Astronomía & Centro de Astroingeniería, Pontifícia Universidad Católica de Chile
We propose the concept of a new low cost unit to enable hexapod capabilities in telescopes under the 2m class. Precise compensation of tilt, pitch and centering without compromising telescope performance is presented. The approach may be extended to other active optical systems undergoing slow changes.

**18:15 - 20:30 EOS Annual General Assembly (AGA), Room 22**

## 8:30– 10:00 Optomechanical Engineering 3

*Location:* Room 2, Ground Floor, Congress Centre

**Invited Talk** **8:30 Opto-Mechanics in Harsch Environments** 24

**Ramon Navarro**
NOVA, The Netherlands

In some cases it is inevitable to operate optics in harsh environments, such as in space, in the mining industry and in process engineering. Both vacuum and high pressure applications are considered, as well as extreme low and extreme high temperatures, the presence of hazardous materials, an ionizing radiation environment, vibration loads and limited access. The challenge is to combine optics, mechanics and sometimes mechanisms and electronics, while ensuring adequate performance and reliability. Aspects to take into account are material properties, design principles and practical solutions. This presentation provides an overview of considerations for the concept design and development of optical systems in such harsh environments.

**9:00 Environmental testing of low strain laser soldered and adjustment turned lenses in mounts** 26

**Thomas Burkhardt[1], Marcel Hornaff[1], Andreas Kamm[1], Diana Burkhardt[1], Erik Schmidt[1], Erik Beckert[1], Ramona Eberhardt[1], Andreas Tünnermann[1,2]**
[1]Fraunhofer Institute for Applied Optics and Precision Engineering IOF, Germany; [2]Institute of Applied Physics, Friedrich-Schiller-University, Jena, Germany

Low strain mounted lenses, fabricated by a flux-free laser soldering technique using liquid solder droplets followed by a high precision adjustment turning process are presented. The process shows all inorganic, adhesive free bonding of optical components and support structures suitable for optical assemblies and instruments especially for aerospace applications and harsh environmental conditions.

**9:20 MATISSE Cold Optics development: recognizing inherent complexity as a project variable instead of a risk** 28

**Niels Tromp, Felix Bettonvil, Gabby Aitink-Kroes, Tibor Agocs, Ramón Navarro**
NOVA Optical–Infrared Instrumentation Group at ASTRON, The Netherlands

MATISSE is a mid-infrared spectro-interferometer combining up to four UT/AT beams of the VLTI. There are two independent cryogenic Cold Optics Box (COB) modules in MATISSE for the LM and N band spectral ranges, mounted inside two separate cryostats. Building a cryogenic spectro-interferometer combining four sources in phase is inherently complex but this complexity can be used as a tool instead of viewing it as a project risk. This proceeding presents the way in which the high level of opto-mechanical complexity and risks were distributed and dealt with during the MATISSE Cold Optics Bench instrument development.

**9:40 Silicon nitride membranes for inclusion in optomechanical devices** 30

**Enrico Serra[1,2], Antonio Borrielli[1,3], Lorenzo Marconi[4], Francesco Marin[4,5,6], Francesco Marino[5,6,7], Salvatore Forte[2,8], Gregory Pandraud[2], Antonio Pontin[4,5], Giovanni Andrea Prodi[1,8], Michele Bonaldi[1,3]**
[1]Istituto Nazionale di Fisica Nucleare (INFN), TIFPA,Italy; [2]DIMES, Delft University of Technology, The Netherlands; [3]CNR-IMEM, Nanoscience-Trento-FBK Division, Italy; [4]Dipartimento di Fisica e Astronomia, Università di Firenze, Italy; [5]Istituto Nazionale di Fisica Nucleare (INFN), Italy; [7]LENS, Italy; [8]Dipartimento di Fisica, Italy

We describe the DRIE production process of Silicon nitride stressed membranes for use in optomechanical devices. The use of DRIE is useful to allow the inclusion of the membranes in more complex devices, but poses some problems of process yield.

10:00-10:30 COFFEE BREAK

## 10:30– 11:50 Optomechanical Engineering 4

*Location:* Room 2, Ground Floor, Congress Centre

**10:30 Use of Optical Design Tools in CAD for the development of a Laser Headlamp** 32

**Günther Hasna, Erik Vasilisin**
OPTIS GmbH, Germany

This article shows the importance of using optical design tools in CAD. By combination of optical design with CAD it is possible to integrate a tolerancing analysis as well as a thermal analysis already in the design showing the effect of variations of geometry and material to the final product. Finally we show how the headlamp can be virtually tested including manufacturing tolerances on a virtual test drive using a night driving simulator.

**10:50 Multi-physical Simulation of Electro-optical Printed Circuit Boards with Multimodal Polymer-based Waveguides** 34

**Dennis Hohlfeld, Haldor Hartwig, Vaibhav Balapuram**
University of Rostock, Germany

This work presents a universal simulation approach for all relevant physical effects in electro-optical circuit boards. Such printed circuit boards integrated in addition to electrical connections and components also optical waveguides as signal lines for applications in data transmission and sensing. Because of the diverse interactions of these simulation domains, it turns out to be particularly advantageous that the studies are conducted in a single simulation environment; even if the various spatial discretization schemes require very different densities. The modelling includes heat distribution, thermal and mechanical stress, mode shapes within straight and curved waveguides and a consideration of ray tracing.

**11:10 Influence of electrode structure on thermal performance of high power LED** 36

**Paul Fulmek[2], Johann Nicolics[2], Wolfgang Nemitz[1], Susannne Schweitzer[1], Christian Sommer[1], Franz Peter Wenzl[1]**
[1]JOANNEUM RESEARCH Forschungsges.m.b.H; [2]Vienna University of Technology

The temperature distribution within a LED chip is studied in a microscopic scale on the base of a 2D-model and by thermography in the context with long-term stability and light quality of high-power LED luminaires. Findings include temperature variations caused by the electrode structure. Consequences are also discussed in detail.

**11:30 - 11:50 Elastomeric diffractive gratings: Research on mechanical induced efficiency change** 38

**Benjamin Ryba, Erik Förster, Robert Brunner**
Ernst-Abbe-Hochschule Jena, Germany

In this contribution the mechanical deformation of soft material (PDMS) blazed gratings is investigated. We compare a combined mechanical and rigorous optical simulation based on microscopic profile data with an efficiency measurement. The results of these real and simulated stretched grating lead to some general properties of elastomeric gratings.