



Fraunhofer-Stepanov-Forschungslabor Laser-Optical Diagnostics

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- 1. History**
- 2. Competence und mission**
- 2. Organisation and funding**
- 3. Example of Projects and Collaboration**
- 4. Strategic orientation for R&D in ISL-LOD**

History

20. July 2003: First Agreement NASB and FhG

29. Juni 2004: Inauguration of ISL-LOD

President NAWRB, Acad. M. Myasnikovich, Prof. M. Kröning und ISTC Director N. Jousten

11/04 and 5/06: First Bord Meetings in Saarbrücken and Minsk

2004-010: Mutual visits in Minsk, SB und DD

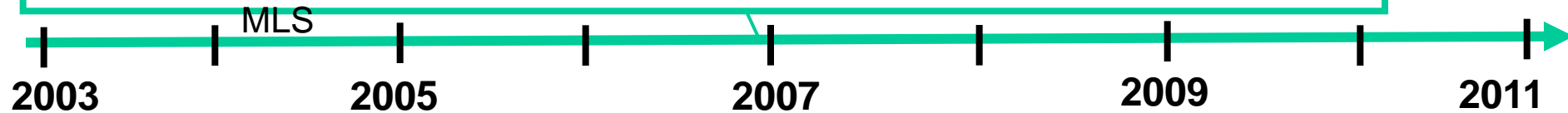
12/04: Start of regular LOD-Workshops

5. Juli 2005: Signature of the contract between ISTC, Stepanov-Institute and IZFP

2006: 3 Partner projects (178 T€) and two industrial projects (20 and 380 T€)

2006-2010: ~170 € project financing per year were going from Germany to Belarus

2010: Joint organisation of the Int. Conf. On Opt. Techniques and Nano-Tools for



LOD-Competence und Mission

Minsk

- Femtosecond Laser-technology
- Bessel-beam techniques
- Heterodyne und Speckle-interferometry
- Other Methods and competence (SNOM, photonic crystals, spectroscopy, nanotechnology)
- Simulations for optical Systems

Dresden/Saarbrücken

- Laser-Vibrometry und Laser-Acoustics
- Laser-Fluorescence-Technique
- Micromirror-array application (in cooperation with Fraunhofer IPMS)
- Nano-Raman Spectroskopie
- Optische Kohärenz-Tomographie
- Simulation

Excellence at the Stepanov-Institute in basic research, closely integrated into Russian research cooperation and the expertise in applied research at

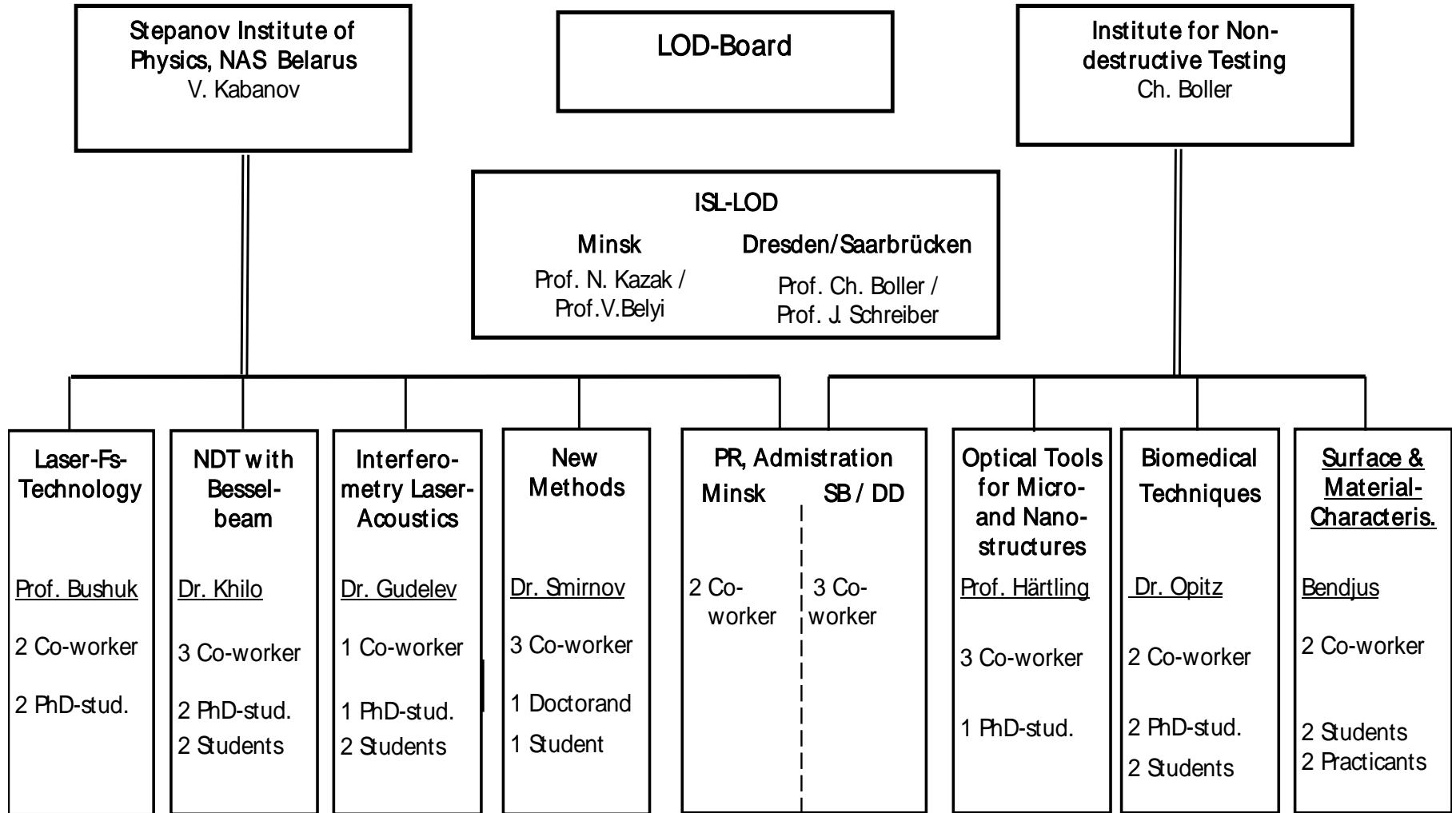
Fraunhofer IZFP

Resources und Chances

Centre of Excellence in applied Photonics and optical Metrology

Potent partners at east and western markets

Organisation



Regularly take place workshops (2 times a year) and management meetings, mutual working visits

Projects at the Beginning

ISTC Project B1065 (2006 – 2008) *Development of the basis for NDT and medical diagnostics of the next generation*
0.7 Mio €

Femtosecond-Laser-Technology

(Material treatment, medical Therapy, Photo acoustics)

Bessel-Laser beam

(diffraction free beam, Microscopy, optical Tomography and nanotechnology)

Heterodyne und Speckle-Interferometrie

(Innovative Methods to characterize surfaces and microstructures, stress and vibration analysis)

BMBF project (2005-2008)
ca. 0.6 Mio € for IZFP&IPMS

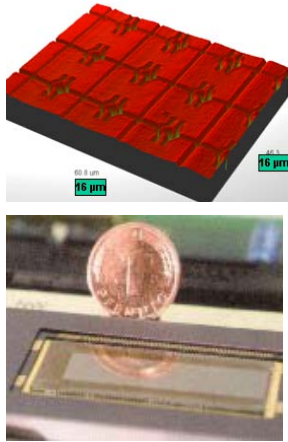
Innovative opto-micromechanical Measuring system (IOMM) 3D-Measurments for Microsystems

First IZFP-LOD-Partner projects
58/50/20 T€

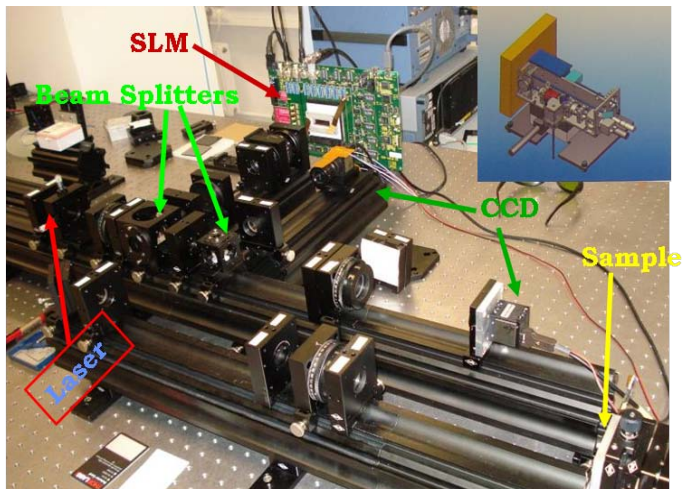
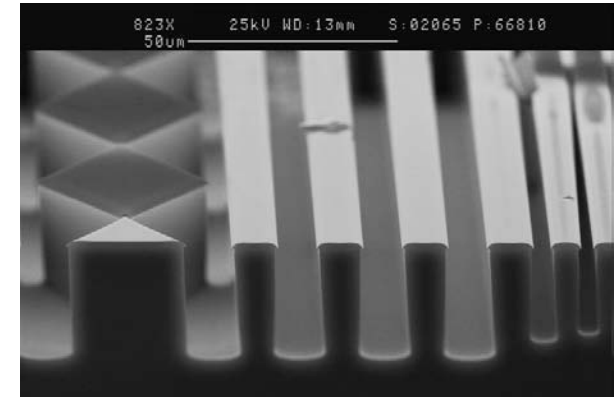
- a) ***Infrastructure development***
- b) ***Opto-acoustic transducer and***
- c) ***3D-Measuring Technique***

Examples of Collaboration

Innovative opto-micromechanical systems (IOMM)



Application of micro-mirror-arrays for new concepts to investigate 3D-Micro-Structures: A learning process for both sides!



Substantial activities by Dr. A. Smirnov (2 joint patents, Support in experiments) Fruitful long term contacts to SENTECH

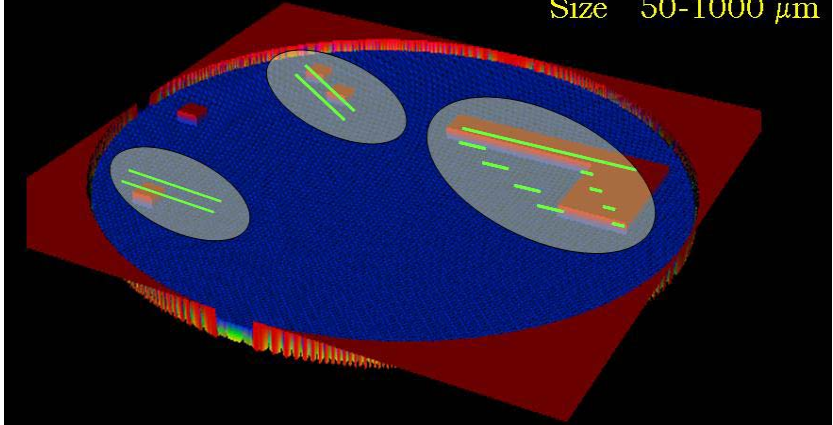


IOMM – First Application

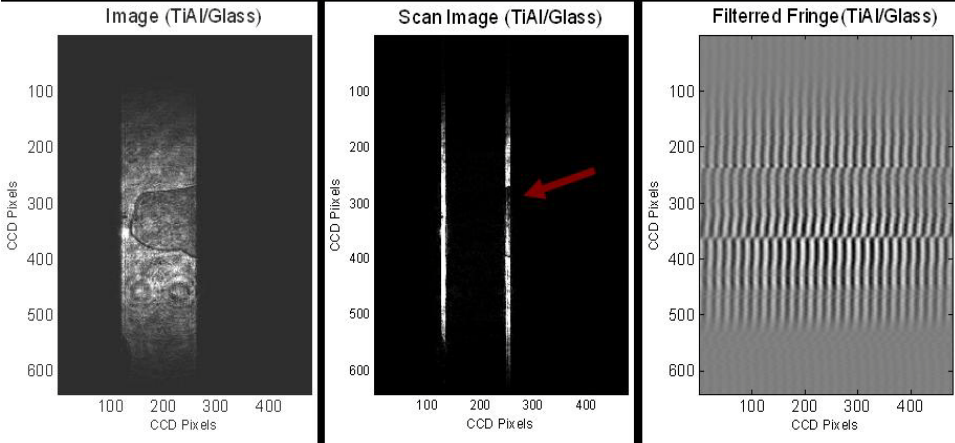
Application for in-situ plasma etching control

- To control etching process structured test zones are required

Size 50-1000 μm



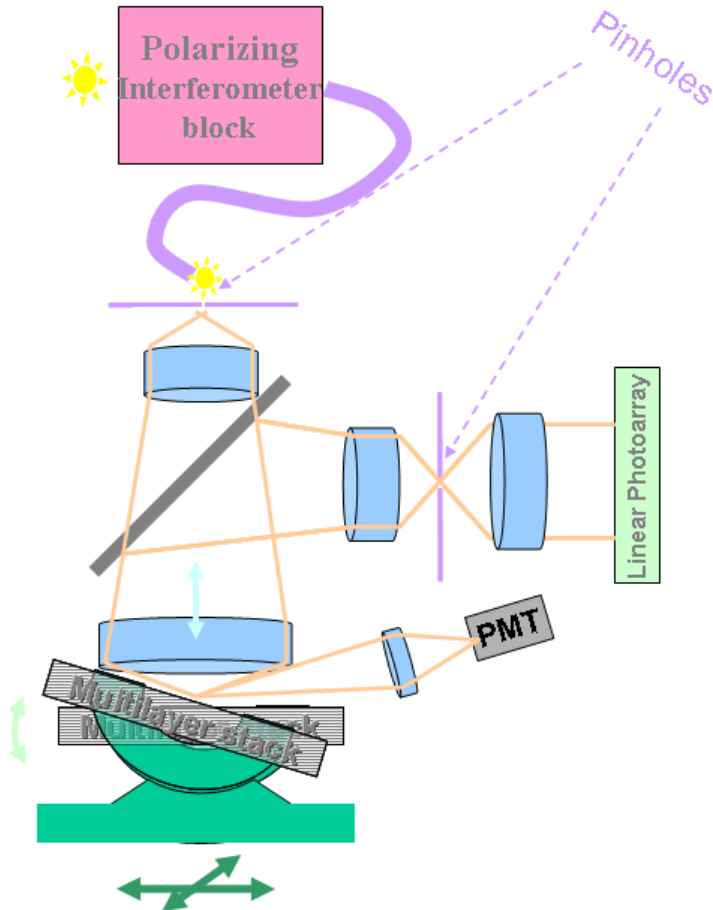
Procedure for profile measurements: selecting reference areas



In-depth resolution	5-15 nm
Spatial resolution	100 μm (11 μm)
Working distance	30 cm (1.5 cm)

Space-resolved wavelength multiplexing ellipsometry

New idea developed by Dr. A. Smirnov



Direct Contract "Feasibility study on spectral microellipsometry» SENTECH Instruments GmbH

ISTC Partner (IZFP) Project B-1569p "Development of space-resolved wavelength multiplexing ellipsometry method for UV-VIS range and its application to multilayer structure characterization"

APPLICATIONS

- **Multilayer characterization of patterned structures**
- **Measurement within small boxes**
- **Depth discrimination + autofocus = 3-D polarization-sensitive imaging (usefull for biological applications)**
- **Angular resolved scatterometry for CD metrology**

Existing and executing main joint researches

- a) Development of high resolution ellipsometer (ISTC-partner project)
Partners:IZFP + SENTECH Instruments Berlin
Funding: 130 + 85 T€
Duration: 2 years

- b) Development of high resolution X-ray detectors based on nanoscaled AOA
(ISTC-partner project)
Partners:IZFP+ IIS Erlangen + IPMS Dresden
Funding: 200 T\$
Duration: 21/2 years

- c) Development of Laser-acoustic emission and detection system
(optical sampling phased array system) (Ordinary ISTC-project with IZFP-support)
Partners:IZFP+ IIS Erlangen + IPMS Dresden
Funding: 300 T\$ (150 T\$ -Korea + 150 T\$ -IZFP)
Duration: 3 years

Example of planned projects

Country	Topic	Funding	Total [€]	LOD [T€]	Weight [%]
Germany	New-Ellipsometer	BMBF/Sentech	300-500	~200	50
	Research on CaNDiT	BMBF or DFG	~300	~ 75	10
	Hardness-Gradient	AiF/DFG	~100	~ 30	10
Korea	Cancer Diagnostics	IM/Governm.	~400	~75	50
	Nano-Sensors	NUDA Medical	~400	~150	50
Russia	Anticorrosive Coatings	UAC	150- 500	10-150	30
Luxemburg	Bessel beam optics	University	30-50	30-50	30
	→Selling of corresponding product		10x40	400	10

Strategic orientation for R&D in ISL-LOD

Based on the existing background, market analysis, available funding approaches and expected impact the

ISL has identified three major priorities or business areas

for the next evolution phase:

- On-line non-destructive testing of quality of products and control of fabrication processes;
- Functional characterization of materials and structural health monitoring;
- Express (Point of Care Testing) medical diagnostics & human health monitoring

Strategic plan for R&D in ISL-LOD

The fundamental objective of the proposed development is to create conditions for the sustainable existence of the International Scientific Laboratory and support the realization of its business and scientific missions. The later implies

- to expand the capacities of self-realization for the ISL scientists by involving them into a multidisciplinary research framework for development of multiparametric sensors and miniaturized sensing devices,
- to increase the ISL competence into the fields of nanostructuring, nanocharacterization, biotechnologies and medical diagnostics,
- to build effective management system for continuous strategic planning, acquiring new research projects, and pushing results to the market;
- to provide the succession of the science culture, experience and excellence by attracting the young generation.

Practical tasks

1. Improvement of the Scientific and Business Management
 - we have to learn better to understand the need of industry and society
 - organizing of international associations (EU, Korea, Russian, East Europe)
2. Increase of the implementation of existing solutions
 - joint marketing activities
3. Generation of new knowledge basis
 - working together closely with new Attract-group at IZFP (Dr. Härtling) dealing with plasmonic spectrometer and sensors
4. Attract young scientists
 - further exchange of students and postdocs