e-Book

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This e-Book comprises the list of :

- *Papers published by ESRs*
- *Manuscripts available on line for uploading*

1. Publication List (peer-reviewed papers)

1. **Marina Fetisova**, Natalia Kryzhanovskaya, Igor Reduto, Valentina Zhurikhina, Olga Morozova, Aleksandr Raskhodchikov, Matthieu Roussey, Ségolène Pélisset, Marina Kulagina, Yulia Guseva, Andrey Lipovskii, Mikhail Maximov, and Alexey Zhukov, *"Strip-loaded horizontal slot waveguide for routing microdisk laser emission*," **J. Opt. Soc. Am. B** 37, 1878-1885 (2020)
https://doi.org/10.1364/JOSAB.391993
IF=1.9

2. **Janis Zideluns**, Fabien Lemarchand, Detlef Arhilger, Harro Hagedorn, and Julien Lumeau, "*Automated optical monitoring wavelength selection for thin-film filters*," **Opt. Express 29**, 33398-33413 (2021)
https://doi.org/10.1364/OE.439033
IF=3.83

3. **M. Stehlik**, F. Wagner, **J. Zideluns**, F. Lemarchand, J. Lumeau, L. Gallais, 'Beam-size effects on the measurement of sub-picosecond intrinsic laser induced damage threshold of dielectric oxide coatings', **Applied Optics 60**, 8569 (2021)https://doi.org/10.1364/AO.433935
IF=1.9

4. Marwan Abdou Ahmed, Frieder Beirow, André Loescher, Tom Dietrich, **Danish Bashir**, **Denys Didychenko**, **Anton Savchenko**, Christof Pruss, **Marina Fetisova**, **Fangfang Li**, Petri Karvinen, Markku Kuittinen and Thomas Graf, "High-power thin-disk lasers emitting beams with axially-symmetric polarizations" **Nanophotonics,** vol. 11, no. 4, 2022, pp. 835-846.
https://doi.org/10.1515/nanoph-2021-0606
IF = 7.5

5. **Ayoub Boubekraoui**, Frieder Beirow, Thomas Graf & Marwan Abdou Ahmed "*Intra-cavity wavelength multiplexing of high-brightness thin-disk laser beams*". **Appl. Phys. B 128**, 120 (2022).
https://doi.org/10.1007/s00340-022-07836-5
IF=2.1

6. Yuwei Chai, **Fangfang Li**, Junyi Wang, Petri Karvinen, Markku Kuittinen, and Guoguo Kang, "Enhanced sensing performance from trapezoidal metallic gratings fabricated by laser interference lithography", **Opt. Letters** 47(4), pp. 1009-1012 (2022)
https://doi.org/10.1364/OL.450151
IF=3.6

7. **Muhammad Ghawas**, Valerian Freysz, Lukas Müller, Sébastien Cassagnère, and Eric Freysz, "*High power ytterbium rod-type fiber laser delivering tunable picosecond pulses*," **Opt. Express 30**, 44569-44579 (2022)
https://doi.org/10.1364/OE.476353
IF=3.83

8. **Marek Stehlik**, **Goby Govindassamy**, **Janis Zideluns**, Fabien Lemarchand, Frank Wagner, Julien Lumeau, Jacob Mackenzie, Laurent Gallais, "Sub-picosecond 1030 nm laser-induced damage threshold evaluation of pulsed-laser deposited sesquioxide thin films," **Opt. Eng. 61**(7) 071603 (2022) https://doi.org/10.1117/1.OE.61.7.071603

IF=1.35

9. **Goby A. Govindassamy,** Jake J. Prentice, James. G. Lunney, Robert W. Eason & Jacob I. Mackenzie Effect of laser repetition rate on the growth of Sc2O3 via pulsed laser deposition. **Appl. Phys. A 128**, 577 (2022). https://doi.org/10.1007/s00339-022-05698-4
   IF=2.7

10. **Ratish Rao Nagaraj Rao**, Florian Bienert, Michael Moeller, **Danish Bashir**, Alina Hamri, Frederic Celle, Emilie Gamet, Marwan Abdou Ahmed, and Yves Jourlin, "*Quantitative investigation on a period variation reduction method for the fabrication of large-area gratings using two-spherical-beam laser interference lithography,*" **Opt. Express 31**, 371-380 (2023)
    https://doi.org/10.1364/OE.478688
    IF=3.83

11. **Capraro, G.**, Lipkin, M., Möller, M., Bolten, J. and Lemme, M.C., *Phase Mask Pinholes as Spatial Filters for Laser Interference Lithography*. **Adv. Photonics Res., 4**: 2300225 (2023)
    https://doi.org/10.1002/adpr.202300225
    IF=3.7

12. **Georgia Mourkioti, Danish Bashir, Goby A. Govindassamy, Fangfang Li,** Robert W. Eason, Thomas Graf, Marwan Abdou Ahmed & Jacob I. Mackenzie, "Sc2O3 on sapphire all-crystalline grating–waveguide resonant reflectors" **Appl. Phys. B** 129, 66 (2023).
    https://doi.org/10.1007/s00340-023-08009-8
    IF=2.1

13. **Fangfang Li**, Shawn Lapointe, Théo Courval, **Marina Fetisova**, Thomas Kämpfe, Isabelle Verrier, Yves Jourlin, Petri Karvinen, Markku Kuittinen and Jean-François Bisson, "*A chiral microchip laser using anisotropic grating mirrors for single mode emission*" **Nanophotonics, vol. 12**, no. 9, 2023, pp. 1741-1752.
    https://doi.org/10.1515/nanoph-2022-0783
    IF = 7.5

14. **M. Stehlik**, **J. Zideluns**, C. Petite, V. Allard, M. Minissale, A. Moreau, A. Lereu, F. Lemarchand, F. Wagner, J. Lumeau, L. Gallais, 'Investigation of laser-induced contamination on dielectric thin films in MHz sub-ps regime', **Adv. Opt. Technol. 12**, 1261267 (2023)
    https://doi.org/10.3389/aot.2023.1261267
    IF=1.8

15. **Janis Zideluns**, Fabien Lemarchand, Detlef Arhilger, Harro Hagedorn, and Julien Lumeau, "*Strategies for in-situ thin film filter monitoring with a broadband spectrometer*," **Opt. Express 31**, 9339-9349 (2023)
    https://doi.org/10.1364/OE.484333
    IF=3.83

16. **Denys Didychenko**, Stefan Esser, Frieder Beirow, **Anton Savchenko**, Christof Pruss, Thomas Graf & Marwan Abdou Ahmed, "*Generation of a radially polarized beam in a polycrystalline ceramic Yb:Lu2O3 thin-disk laser*". **Appl. Phys. B** 129, 146 (2023).

https://doi.org/10.1007/s00340-023-08089-6
IF=2.1

17. **Adrian Grande**, Dia Darwich, Valerian Freysz, Johan Boullet, and Eric Cormier, "*Sub-100 fs all-fiber polarization maintaining widely tunable laser at 2 µm*," **Opt. Lett. 48**, 5237-5240 (2023)
https://doi.org/10.1364/OL.502511
IF=3.6

18. **Danish Bashir, Ayoub Boubekraoui, Georgia Mourkioti, Fangfang Li,** Petri Karvinen, Markku Kuittinen, Jacob. I. Mackenzie, Thomas Graf & Marwan Abdou Ahmed, "*Sapphire-based resonant waveguide-grating mirrors: advancing their intra-cavity power density capability*". **Appl. Phys. B** 130, 4 (2024).
https://doi.org/10.1007/s00340-023-08144-2
IF=2.1

2. PhD Manuscripts

1. Janis ZIDELUNS, September 2022

« Optical monitoring methods and strategies for magnetron sputtered thin-film filters », supervised by Julien LUMEAU and Fabien LEMARCHAND from RCMO team of the Institute Fresnel.

In this thesis the optical monitoring methods and strategies for magnetron sputtered thin film filters are described in great detail. As with any technologies, the requirements for the performance of the thin film filters increases, the number of layers in the designs grows and therefore the accurate monitoring of the deposited thicknesses becomes more and more crucial. Up to this day, there is no universal solution for the thin film thickness control, therefore depending on the design and application, one must choose how to control the thicknesses of the layers. Or in other words, one must determine a monitoring strategy before fabricating the filter. In order to determine the monitoring strategy, deep knowledge about the monitoring setup and the thin film filter itself is required. By carefully studying the deposition and monitoring processes and the filters themselves, we have highlighted multiple variables that can be used in order to determine the monitoring strategies automatically, aiming for a universal solution for the thin film thickness monitoring. The developed thought process for the strategy determination has been validated on various thin film filter designs.

Pdf Manuscript available: https://www.theses.fr/2022ECDM0004

2. Marek STEHLIK, October 2022

« Laser damage resistance of coating materials and structures for grating-waveguides », supervised by Laurent Gallais and Frank Wagner from ILM team of the Institut Fresnel.

The laser-induced damage and laser-induced contamination are phenomena limiting reliable operation of coating-based optical components in ultrashort pulse high-power lasers. To enhance the damage resistance of optical coatings, testing of various coating materials, development of optimized coating designs, and comparison between deposition methods have been done. Despite the efficient excitation of dielectric materials in sub-ps regime, indicating that laser-induced damage threshold (LIDT) should not be dependent on beam size, we found that this statement is not unequivocal in the published literature. Our work on metrology with 500-fs 1030-nm laser source underlines the difficulty of LIDT measurement by very focused laser beams and we suggest beam deformation due to self-focusing in the lens as a possible explanation. We performed LIDT tests with pulsed-laser deposited crystalline sesquioxides (Sc_2O_3, Y_2O_3, Lu_2O_3) and amorphous metal oxides (HfO_2, Nb_2O_5, SiO_2) coated by magnetron sputtering. We found that the LIDTs of sesquioxides are comparable to each other and in the multiple pulse test regime show values close to those of widely used HfO_2 coatings. Since manufacturers of diffractive optical components frequently use Ti adhesion promoter and Cr hard mask forming thin layers on optical surfaces, we analyzed effect of such treatment on LIDT. We observed that the LIDTs of treated surfaces are close to the untreated ones, when they are tested by 100 pulses. Using 700-fs 515-nm 3.3-MHz setup we studied laser-induced contamination (LIC) growth in dependence on coating material, its deposition technique and its thickness. We found a nearly linear relationship between LIC deposit thickness and SiO_2 and HfO_2 coating thicknesses, indicating that the LIC growth might be connected to thermal effects caused by absorption in the coatings.

Keywords: Laser-induced damage threshold, Laser-induced contamination, Oxide coatings, Sub-ps pulses.

Pdf Manuscript available: https://www.theses.fr/2022ECDM000

3. Ratish Rao Nagaraj RAO, December 2022 :

« Fabrication of grating waveguide structures for spectral (and linear polarization) stabilization and wavelength multiplexing for 976 nm, 1030 nm, and 2000 nm wavelength range » , supervised by Prof Yves Jourlin and Emilie Gamet from Micro and Nanostructuring team of the Laboratoire Hubert Curien.

This Ph.D. work is part of the European project GREAT (Grating Reflectors Enabled Applications and Training). The project focuses on exploring production technologies through appropriate control of the manufacturing process of Grating Waveguide Structures (GWS) for high-power laser systems. The objective of this thesis is to develop GWS for spectral stabilization and wavelength multiplexing of a 976 nm emitting laser diode and a 1 µm emitting solid-state laser. The main focus of this work is on GWS fabrication by Laser Interference Lithography (LIL) and on optimizing this technique to obtain a better uniformity of the grating period. The LIL fabrication of GWS on multilayers is detailed from the fabrication of the multilayer to the final etching step. The fabricated gratings are then characterized optically and geometrically. The GWS sample used for a solid-state laser system emitting at 1 µm showed a diffraction efficiency of 92%. The fabrication of silicon (Si) molds is also detailed. This development is motivated by their eventual use as a buffer in the nanoimprint lithography (NIL) technique to produce GWSs faster and at a lower cost. An important result of this work is based on the quantitative study of an established technique, namely, the deformation of the substrate during the interferential lithography step to reduce the period variation due to the use of divergent exposure beams. Experimental results show an average reduction of about 85% in period variation for a 4-inch diameter substrate.

Pdf Manuscript available: https://www.theses.fr/2022STET0049

4. Muhammad GHAWAS, December 2023:

«Picosecond and femtosecond ytterbium fiber laser source and its applications», supervised by Prof. Eric Freysz and Prof. Jérôme Degert, from Laboratoire Ondes et Matière d'Aquitaine (LOMA), University of Bordeaux.

Abstract:
Ultrashort laser pulses in both industrial and research applications progressively rely on fiber laser technology, guided by its intrinsic benefits, for instance, stability, compact nature, excellent beam quality, robustness, and easy operation. In this PhD work, a detailed study has been done to investigate picosecond fiber laser working in an all-normal-dispersion (ANDi) regime for the application of parametric generation in photonic crystal fiber. In summary, we have developed a high-power fiber laser source delivering picosecond pulses with tunability both in central wavelength and spectral width. At the central wavelength of ∼ 1030 nm and with a repetition of 78 MHz, this laser delivers picosecond pulses with an average power of up to 25 W. The pulse duration can be continuously adjusted from ∼ 1.8 ps to ∼ 4.5 ps and pulse energy from ∼ 320 nJ and ∼ 225 nJ, respectively. Additionally, we have also demonstrated that the central wavelength of the laser pulse can be finely tuned from 1010 nm to 1060 nm while keeping the pulse energy above ∼ 150 nJ. The output of this fiber oscillator is propagated through the photonic crystal fiber for the parametric generation of the signal (higher frequencies than the pump) and idler (lower frequencies than the pump). The fiber OPO singly-resonant cavity was built in such a way that only signal wavelengths are allowed to propagate through it. The conversion efficiency for the signal was close to 20 % in the fiber OPO. Based on the dispersion profile of the photonic crystal fiber and our homebuilt tunable

pump laser, the signal wavelength (resp. idler) was tuned from ∼ 770 nm to ∼ 1000 nm (∼ 1130 nm to ∼ 1590 nm) for the corresponding pump wavelengths of ∼ 1024 nm to ∼ 1059 nm.

Keywords: Fiber-laser, Picosecond, High-power, Self-modelocked, Fiber-OPO

Pdf Manuscript available: coming soon

5. **Adrian GRANDE, February 2024**

"Femtosecond High Power Tm:Ho Fiber Laser at 2050 nm"

6. **Goby GOVINDASSAMY, February 2024**