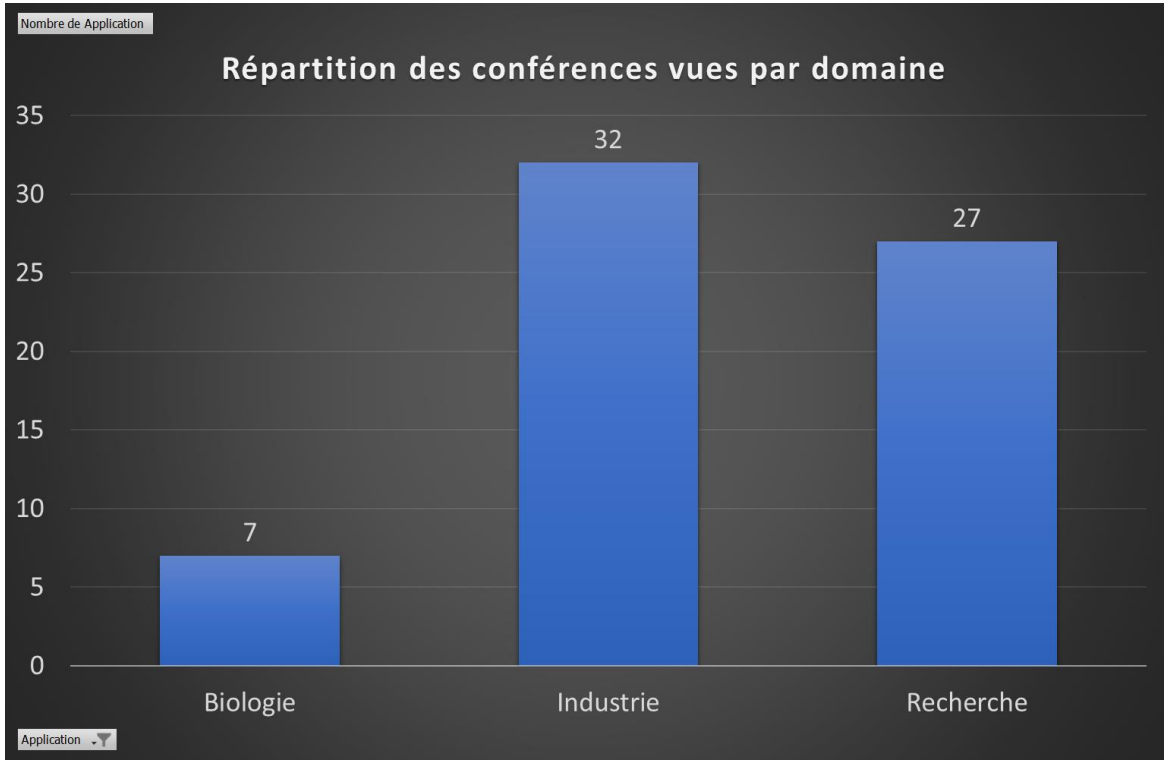
SYNTHÈSE CONFERENCES PW2023

Design-moi une surface

www.manutech-usd.fr

STATISTIQUES DIVERSES

- Environ 75 conférences suivies (Yoan + Julien) => **+50% vs 2022**
- Environ 2 sans implications directes sur Manutech (Culture générale) **=> -80% vs 2022**



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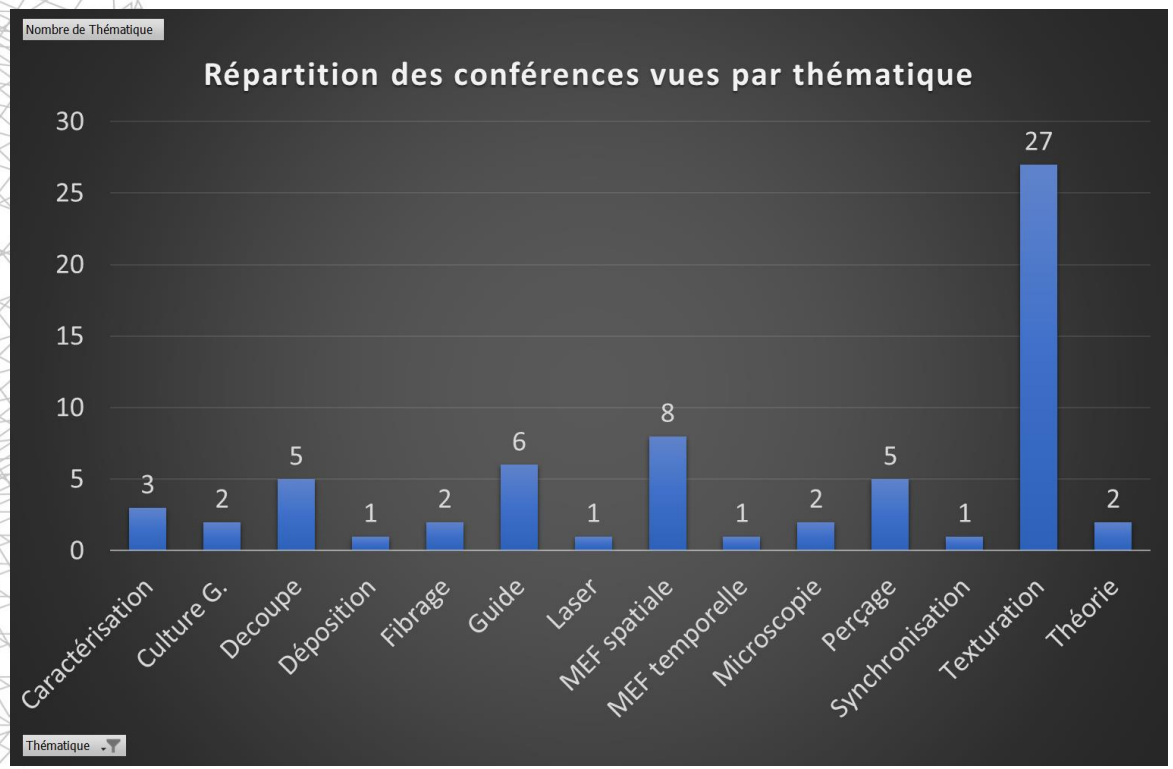

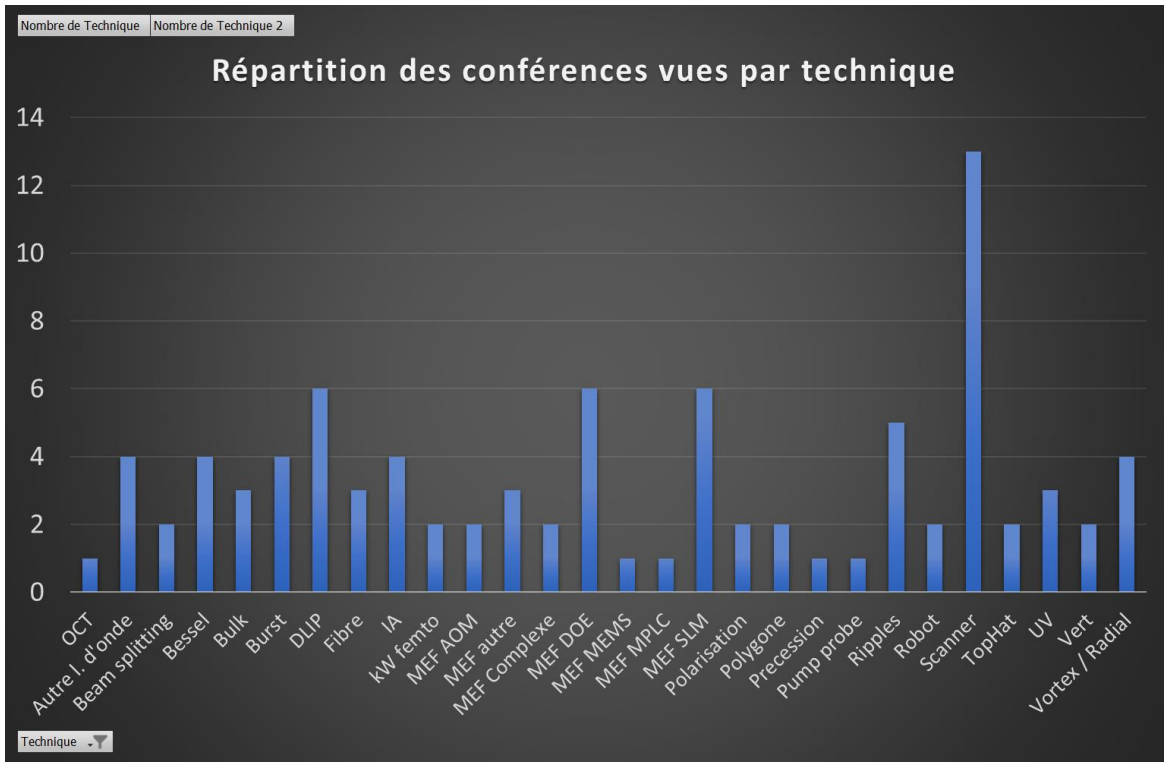

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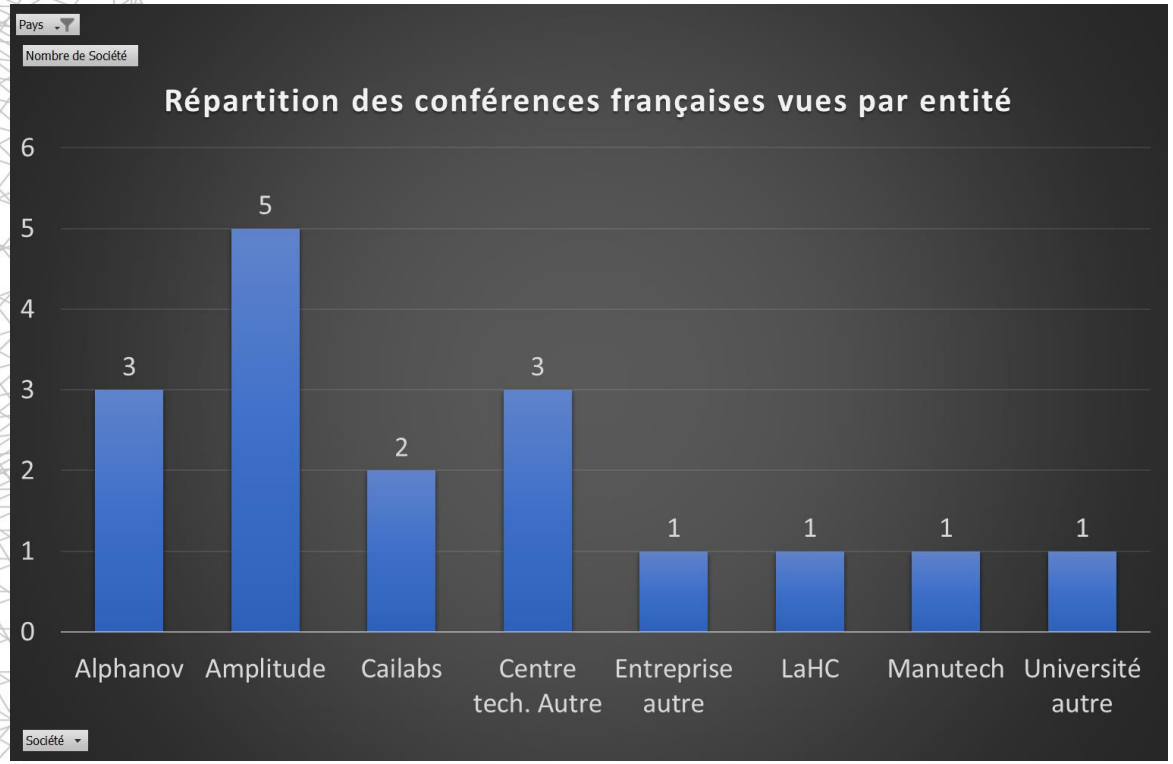
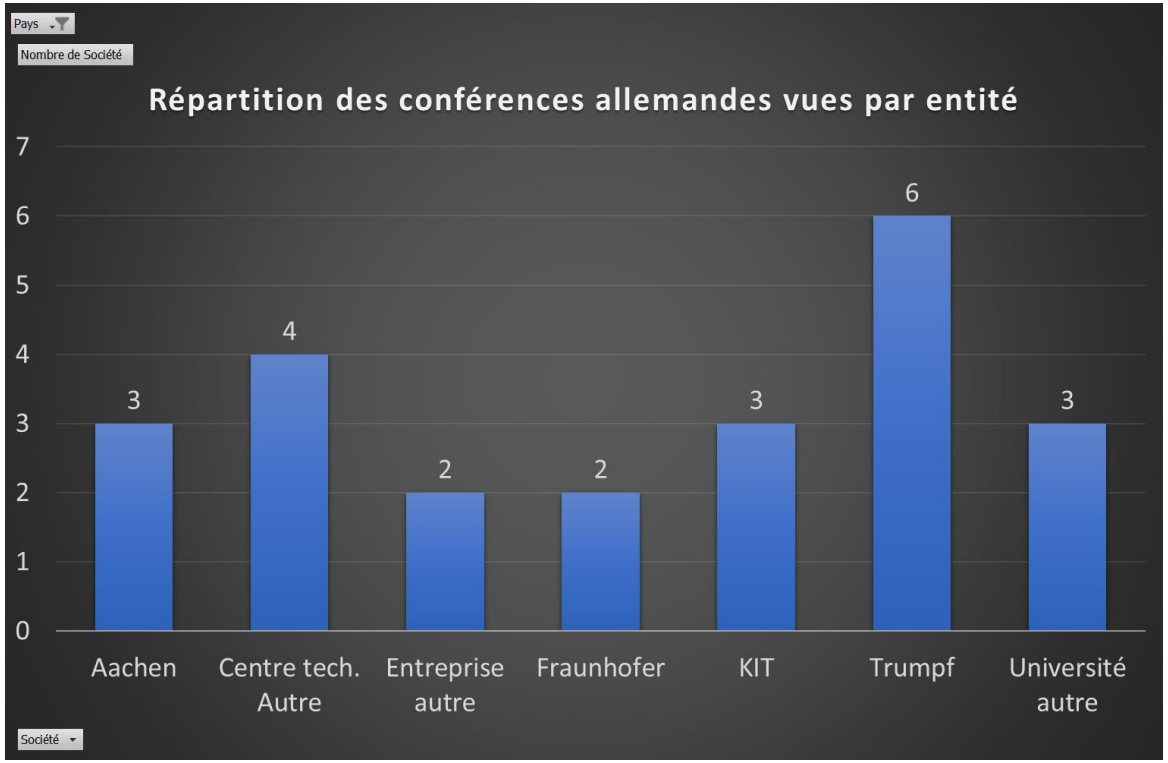




Dimanche 29-01-2023

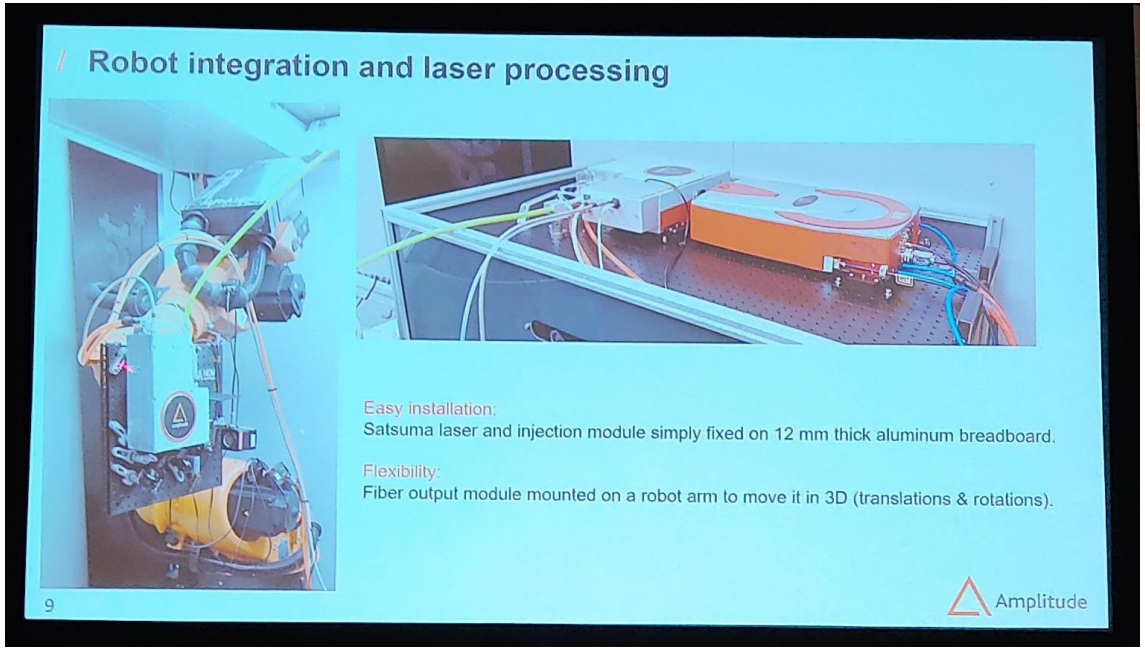
29/01/2023 12411-2

Femtosecond fiber delivery for industrial applications

Auteur(s) S. Guillemet

Soc. / Lab. Amplitude (Fr.)

Intérêts
- Laser fibering + robot demonstration



Informations clés *1 photos*

- Glo (complete watercooling) + Satsuma 20W – 60µJ
- + bras robot (Alphanov)
- 1-Couplage Power and analyse de faisceau sur la tete du robot
- Video live : few Y beam deviation but quite stable P – XY
- 2-Processing un echantillon H et un V demo Alphanov + Amplitude logo : ripples très similaires
- To demonstrate : 300W Tangor Laser
- Questions : watercooling (Yes) ; Z axis precision (ok) ; M^2 (1.2 demonstrated, slight decrease). Thinking of integrating injection inside the laser. Loss of 5% (during propagation) ; Pulse duration preserved (demosntrated 267fs)

29/01/2023 N°12411-3

Title : Versatile phase & amplitude pulse shaping with SLM

Auteur(s) Lingxia Yang

Soc. / Lab. Illinois Biophotonics university (USA)

Intérêts

Informations clés *0 photos*

- Multiphoton microscopy
- Grating disperser + focal + SLM + SLM + Grating compressor
- Custom SLM (15k$, higher speed)
- Half waveplate + SLM + return half wave plate + polar filter…

29/01/2023 N°12411-6

Black marking for medical industry with USP lasers at different pulse durations

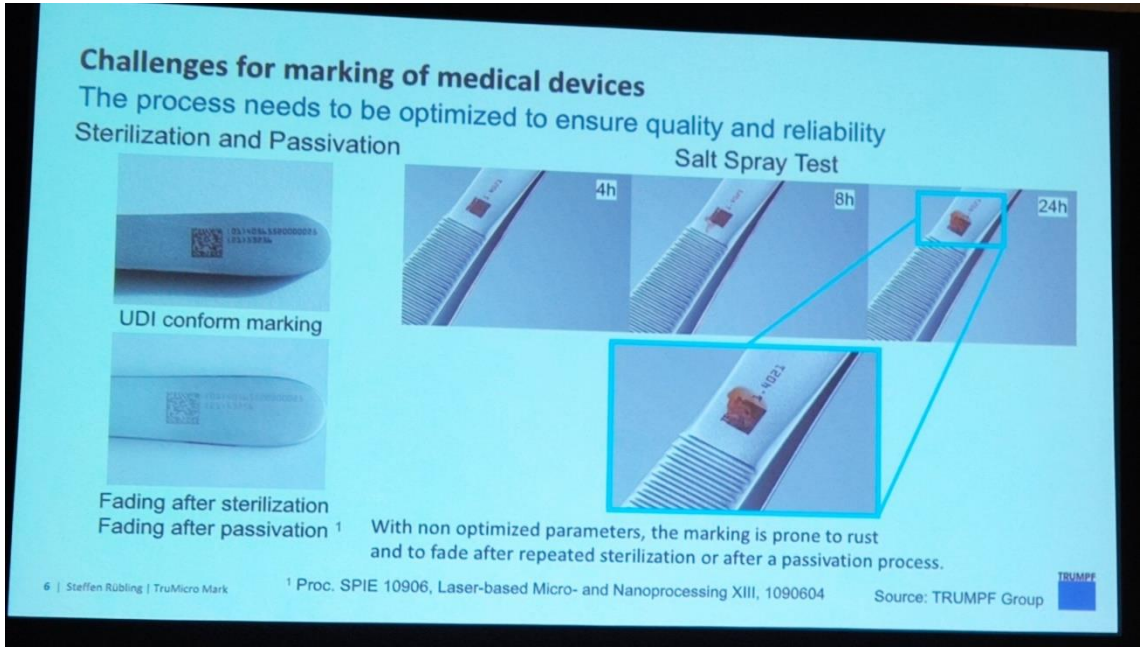
Auteur(s) Steffen Rübling

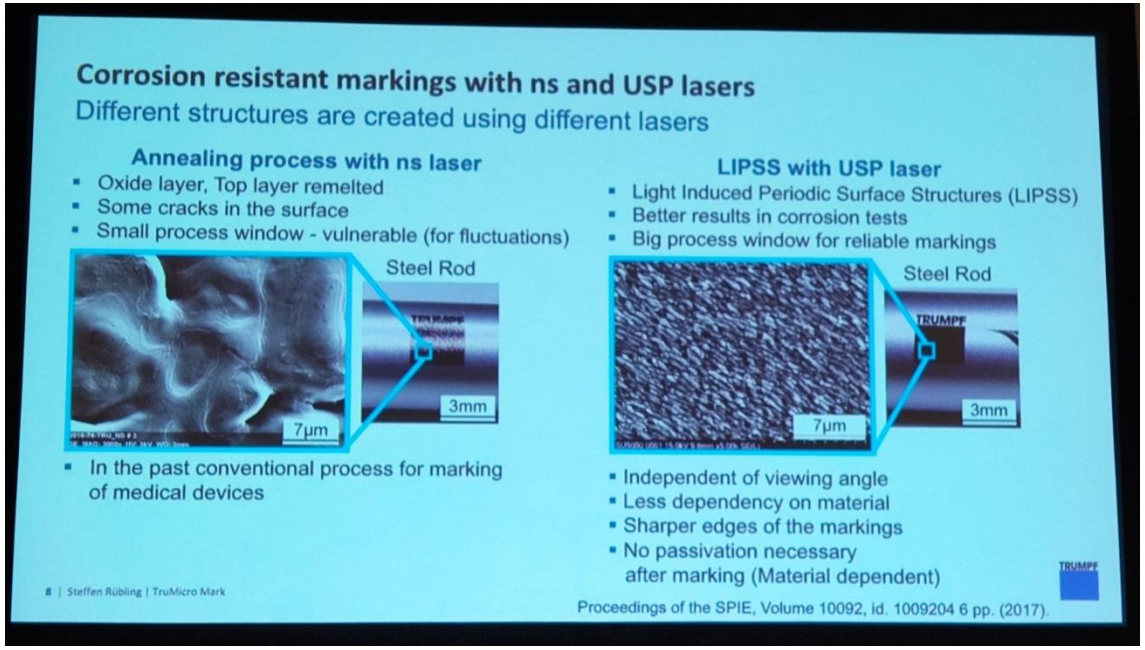
Soc. / Lab. Trumpf (Fr.)

Intérêts
- Complete solution for Pharma Id
- Black marking with ripples…

Informations clés *2 photos*

- Complete supply chain from identification to marking and processing data
- Process definition to avoid fading after sterilization and passivation ranging from ns to fs.
- USP Lipss = black marking and better corrosion effects
- Laser+Vision+Eclairage+Pointer all in one solution for product identification. Medical conform markings
- Question : black marking on glass?





Towards precision tumour surgery with picosecond lasers

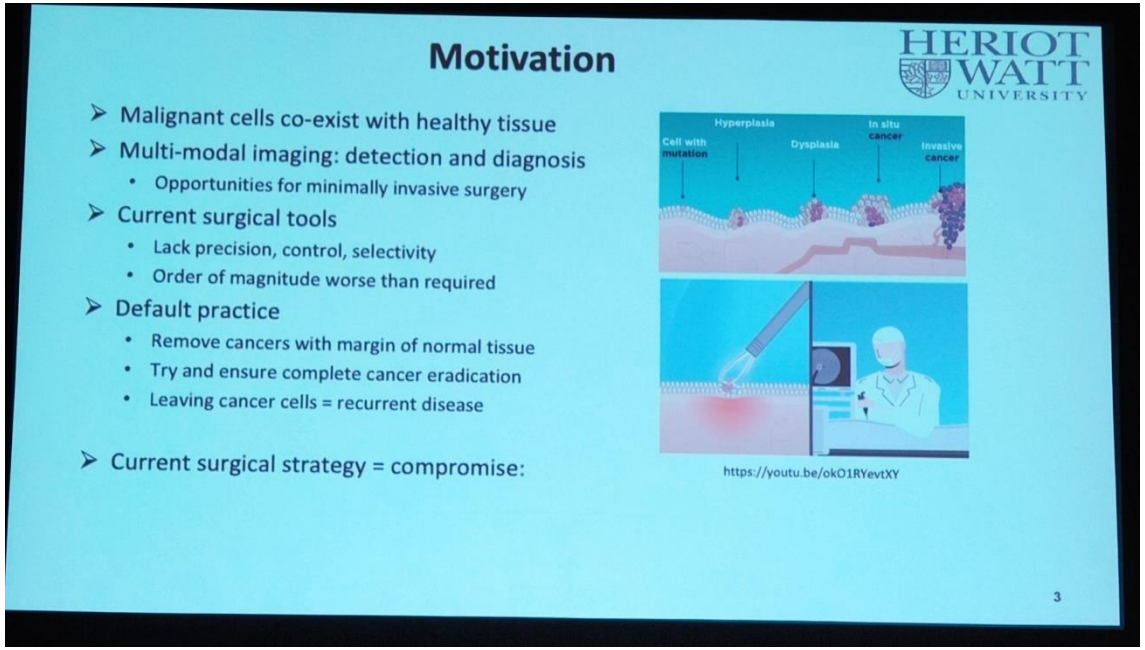
Auteur(s) Jon Shepard

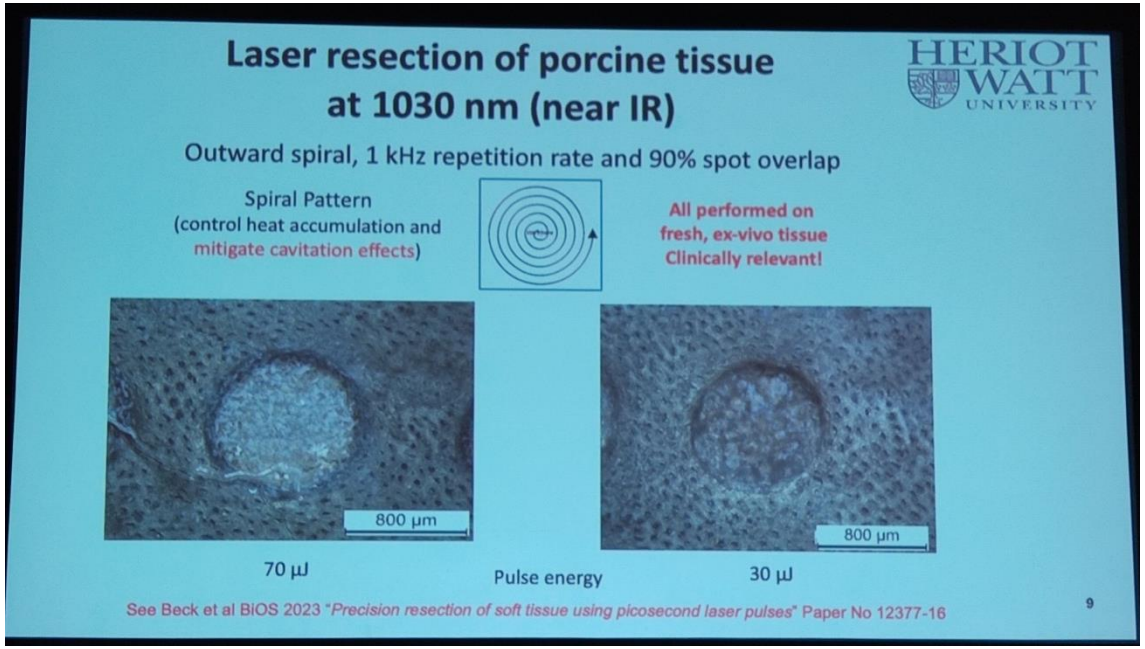
Soc. / Lab. Heriot Watt University (Angl.)

Intérêts
- Thématique : Usinage de tissues vivants cancérigènes

Informations clés *3 photos*

- Control of ablation on alive tissues to remove cancer cells.
- Demonstration on fresh colorectal tissues. 90% recovering. Up to 600µm deep ablation depending on energy (few 10s µJ
- Speed upscaling : be careful of deep thermal effects
- Fibering delivery issues, new cores





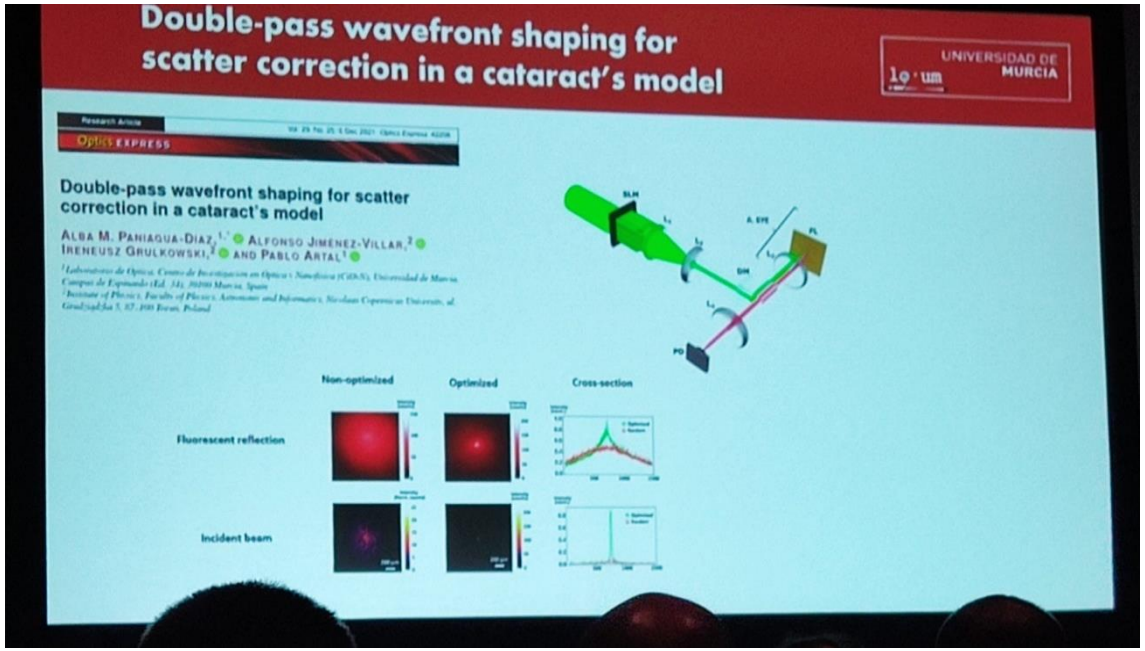
29/01/2023 N° 12360-35

Wavefront shaping and optical memory effect of excised crystalline lenses

Auteur(s) Alba Paniagua

Soc. / Lab. Universidad de murcia (Esp.)

Intérêts
- Travaux sur le cristallin



Informations clés *1 photos*

- Optimisation of the Point Spread Function when view blurring due to cataract effects
- Use of Beam shaping to improve vision
- Excised human caractous lenses
- 12360-60 poster

29/01/2023 N° 12360-36

OCT images of the human cristalline lens reveal local changes in the morphology and transparency with ageing

Auteur(s) Danniel Ruminski

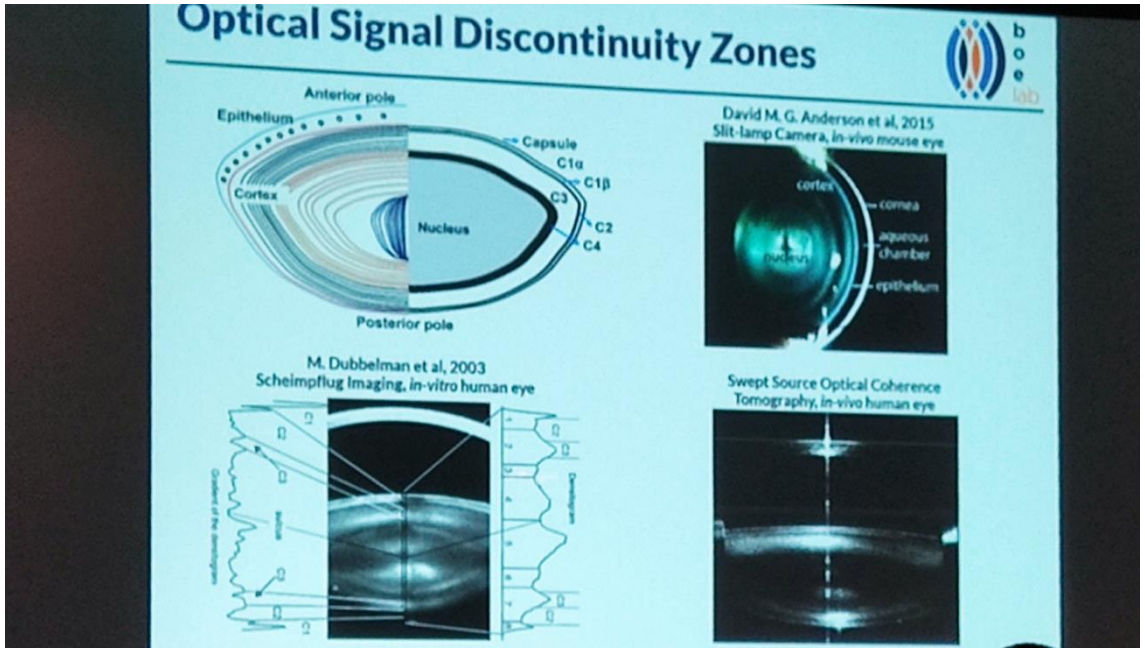
Soc. / Lab. Nicolaus Copernicus Univ., BOE Lab, (Pol.)

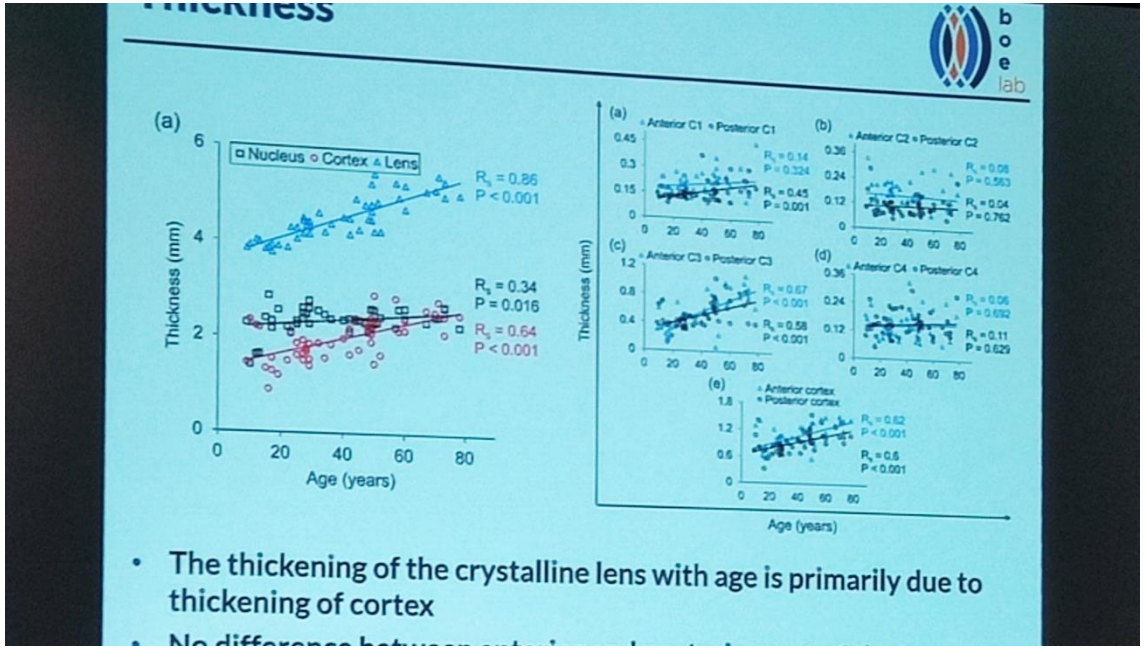
Intérêts
- Travaux sur le cristallin

Informations clés

6 photos

- Thickening of cristalline lens with age, mainly due to cortex
- More convex also and less transparent
- Experts in OCT for cristalline analysis
- In vivo analyze of age dependency of geometry and light back scattering





29/01/2023 12411-10

Ultrafast ablation of bone tissue : process optimisation and species dependence

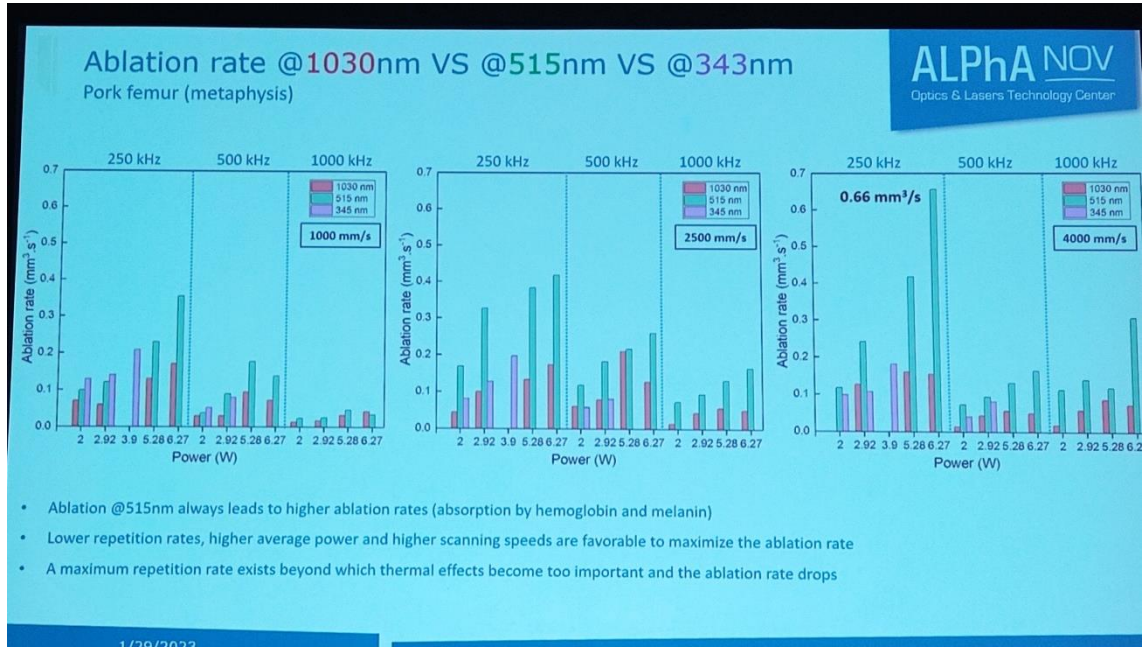
Auteur(s) Laura Gemini

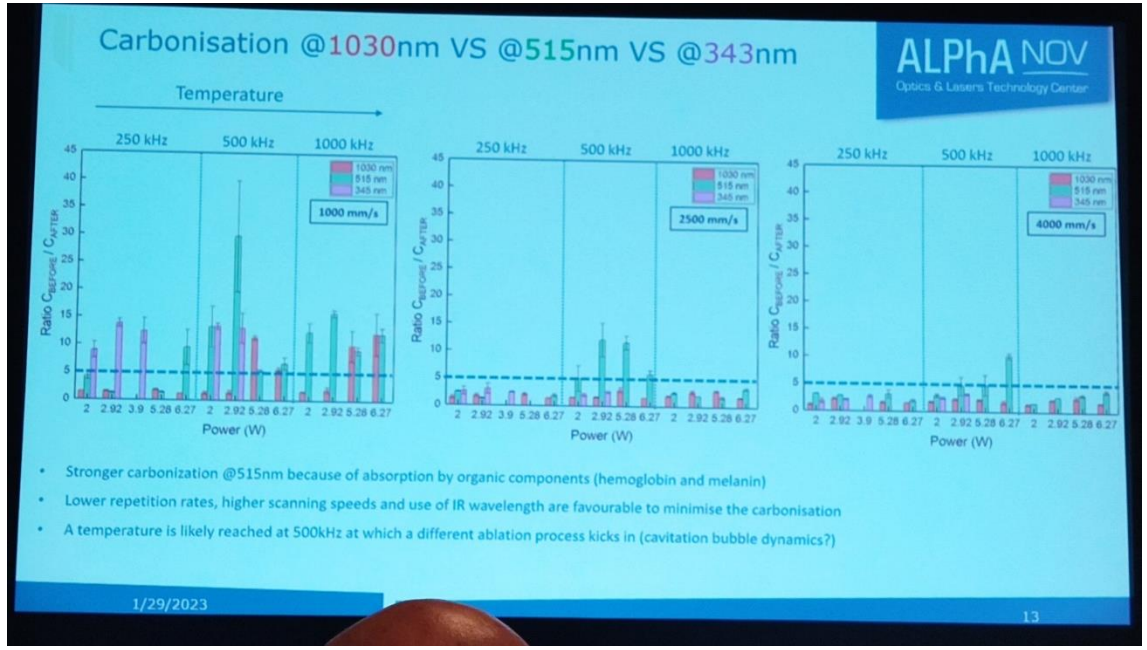
Soc. / Lab. Alphanov (Fr.)

Intérêts
- Projets Alphanov dans l'usinage de tissues vivants

Informations clés *5 photos*

- Cutting of bones with femtosecond laser to avoid thermal effects compared to Ns lasers
- Today : low ablation rate of fs (<0.15mm3/s) depending also on the origin of the bone (for animal tests for instance)
- Better ablation rate in Green, 6W, high speed (4m/s)
- But IR, 500kHz 1m/s, Green, 3W also better for lower carbonization
- Better in Air rather than water or air knife or water spray for ablation rate but better for carbonization (LIBS analysis)
    - BioTIS : bone patterning for better osteointegration
    - Project LARA (Laser Robotic Application) 3 years





Lundi 30-01-2023

30/01/2023 12408-1

Deep learning based simulator for femtosecond laser micromachining

Auteur(s) Shuntaro Kani

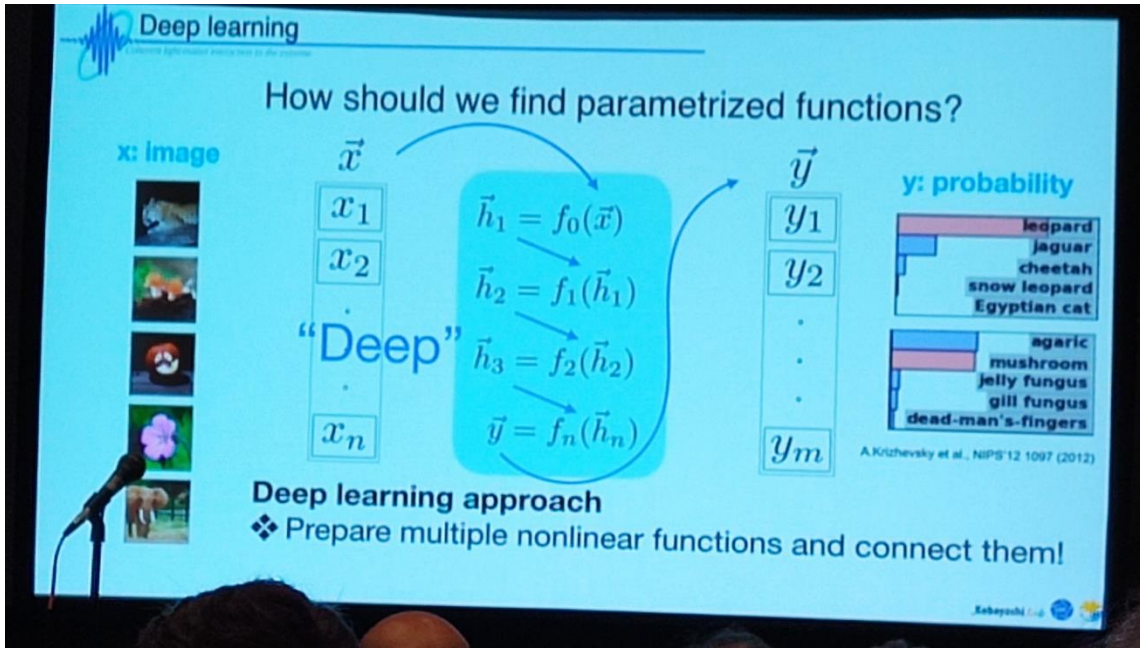
Soc. / Lab. University of Tokyo (Jap.)

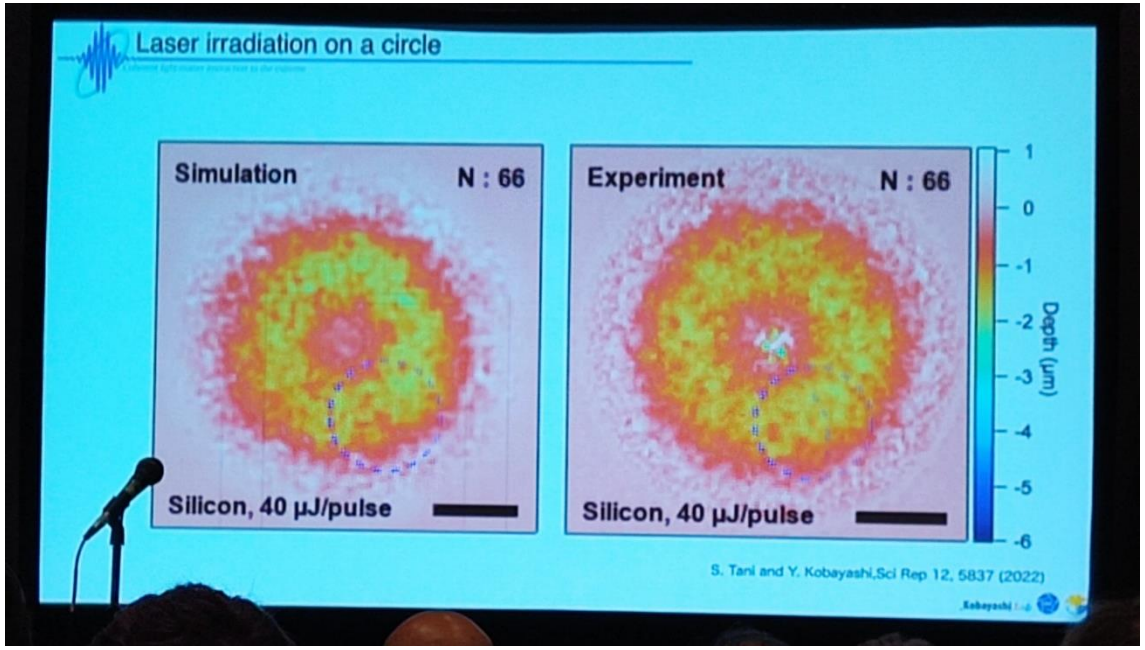
Intérêts
- Utilisation d'IA H24 pour BdD d'anticipation des usinages

Informations clés

5 photos

- Deep learning basé sur une somme de fonctions simple
- Model 2D basé sur des vecteurs locaux pour tenir compte de la rugosité
- Appliqué aux multi pulses
- Appliqué à l'optimisation des paramètres
- Meister data generator : system tournant H24 laser+carac pour cumuler des données
- Metals hard to predict because based on roughness and amorphisation surface difficult to estimate.
- Question : rep rate? One shot data. Did not take into account accumulation effects yet
- From 1 material, transferable to another material? Not as easy but trying





30/01/2023 12411-20

High-quality cutting of heat-sensitive polymers with a high-power femtosecond UV laser

Auteur(s) Jim Bovatsek

Soc. / Lab. MKS Instruments

Intérêts
- Usinage UV

Informations clés

0 photos

- Laser 40 W – 1 MHz – UV
- Bonne qualité d'usinage sur des échantillons polymères transparents
- Découpe de PI épaisseur 75 µm
- Avantage de l'UV sur des matériaux polymères

30/01/2023 12411-22

Generation of micro pillars by ultrafast first order bessel beam

Auteur(s) Valeria Viviana Belloni

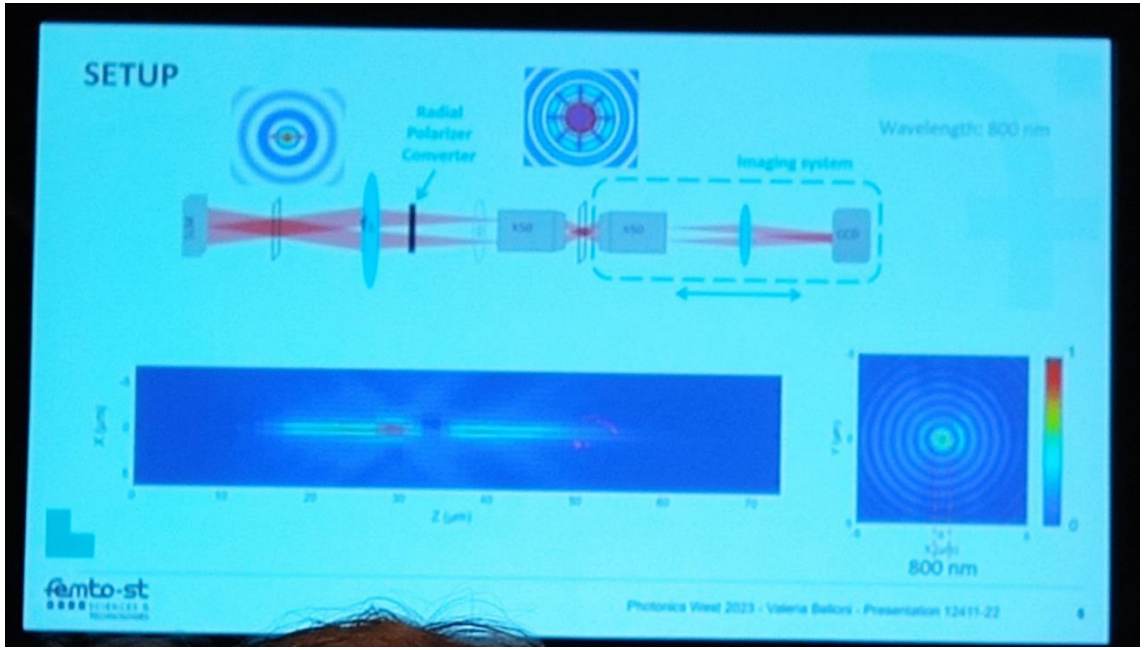
Soc. / Lab. Femto st (Fr.)

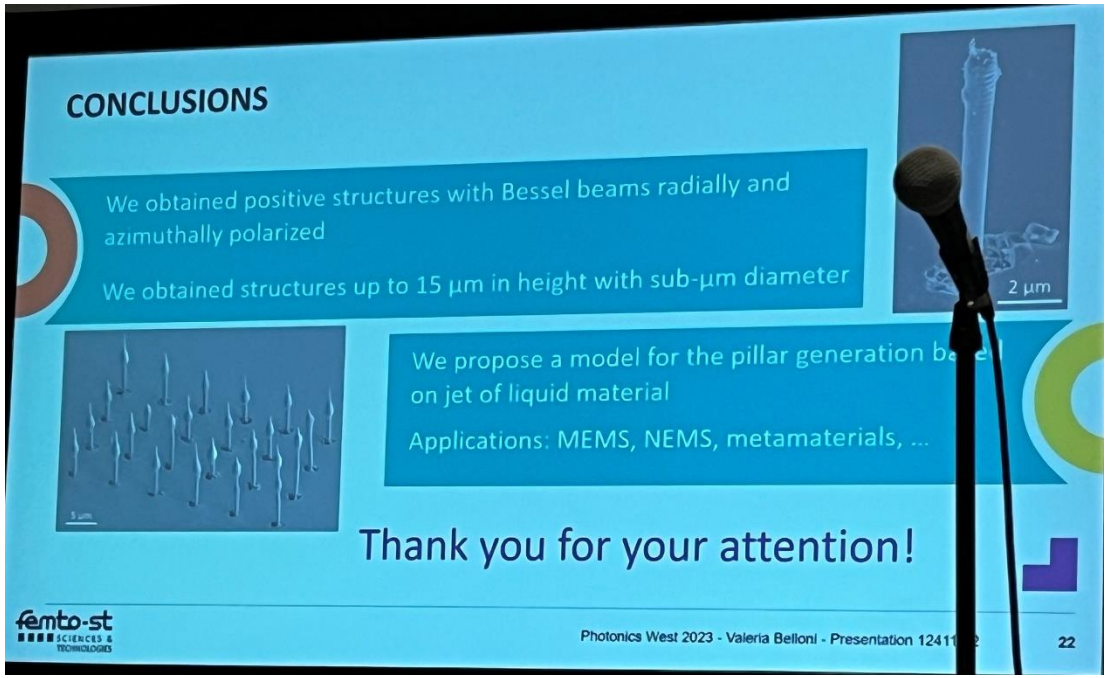
Intérêts
- Couplage de MEF sur verre pour fabrication de nano pilliers sur verre

Informations clés

3 photos

- Vortex beams / Bessel beams
- Bessel beams : 8mm thick glass cutting / Nanorprotusions
- Higher order bessel beams (bessel + vortex phase). SLM + focale + radial polarizer converter + focale + echantillon
- => pilliers protubérants de quelques 100aine de nm de large et dizaine de microns de haut.
- Testé jusqu'à 1ps : ok ; 1kHz ;
- Matrix of pillars : 7µm spaced
- Surface anti-bactérienne mais temps d'usinage très long





30/01/2023 12411-23

Time-resolved measurement of stress wave profile during femtosecond laser processing of synthetic silica glass

Auteur(s) Junya Hattori

Soc. / Lab. University of Tokyo (Jap.)

Intérêts
- Observation d’ondes de choc dans le verre

Informations clés

0 photos

- Laser on glass : in air = shock wave ; in glass = stress wave. Optics express 27(20) . Fs laser drilling : stress wave causes cracks. Shock peening : residual stress due to stress wave improves material properties.

30/01/2023 12408-4

Advanced laser processing and its optimization with machine learning

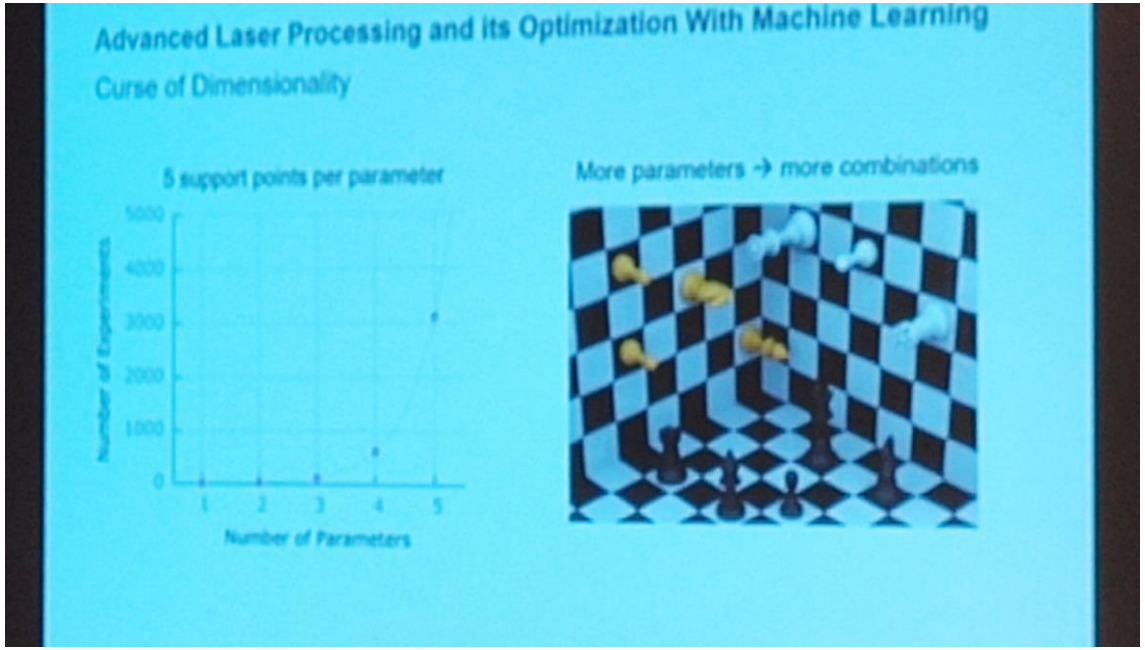
Auteur(s) Andreas Michalowski (Ger.)

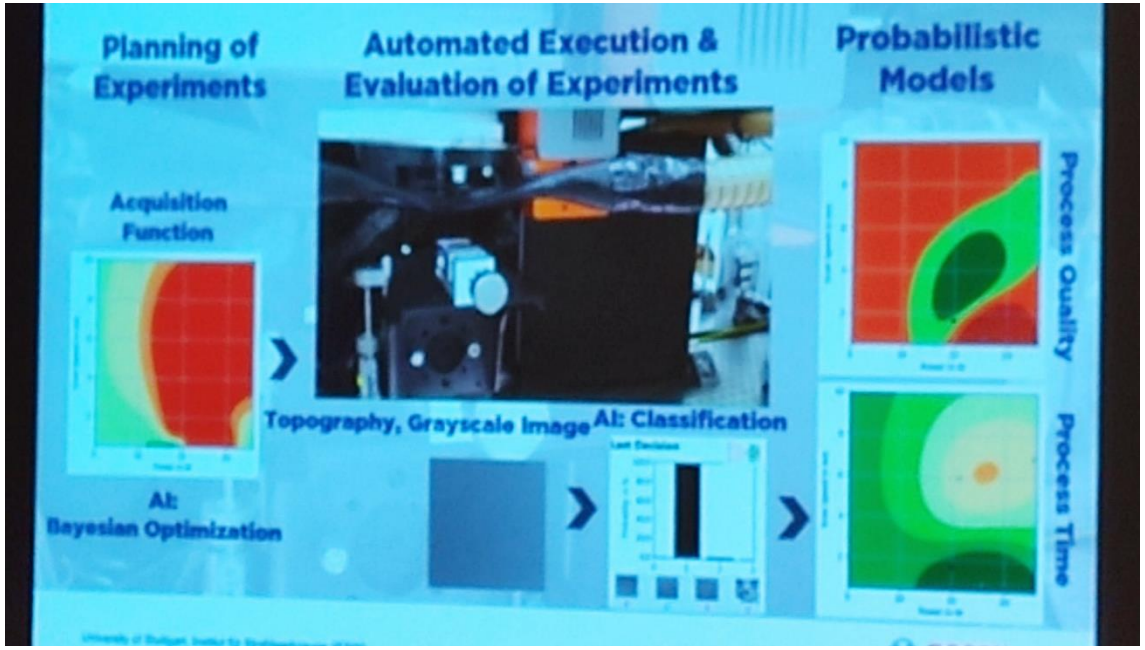
Soc. / Lab. IFSW

Intérêts
- Approche IA pour usinage optimisé

Informations clés *5 photos*

- Qq noms de fusion bionic
- High power usp can work now continuously : one laser for all kind of processes + today Each kind process requires knowledge. => Deep learning aims at changing that
- New project addsub mix of 3D and laser ablation
- Photonics res 2200045 (2022) : smoothing with burst
- Step by step milling + smoothing
- Civan ultra fast beam shaping at kW
- High number of exp depending on number of param (expo). Can AI help?
- Bosh





30/01/2023 12411-24

Ultrafast laser microfabrication of guided wave components for spatial mode manipulation

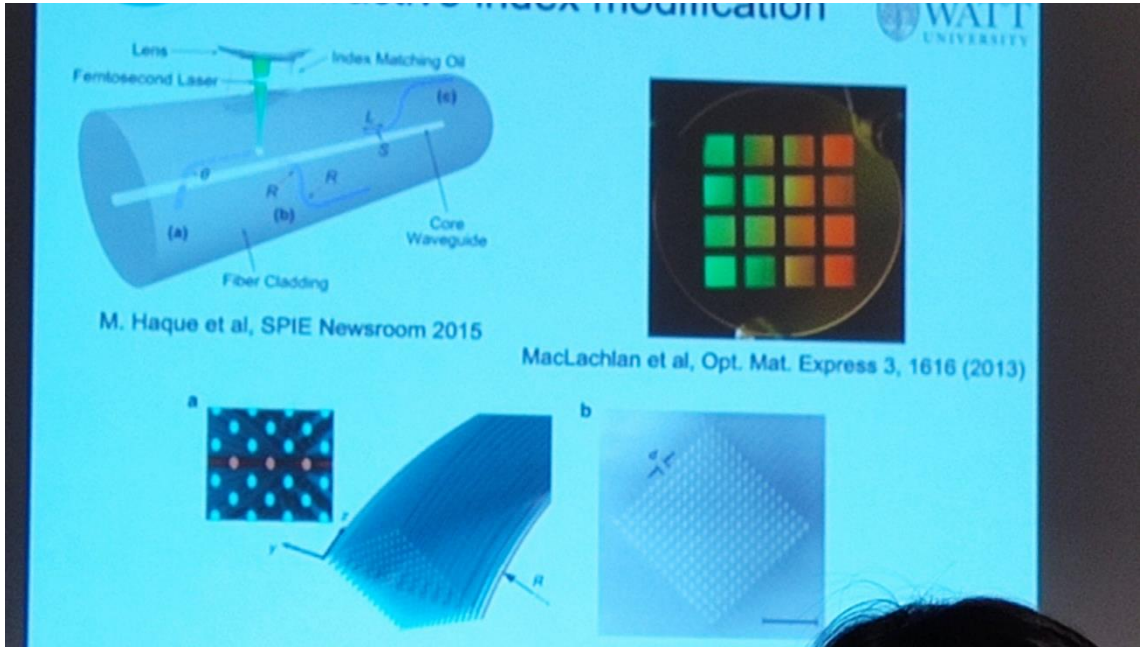
Auteur(s) Robert Thomson

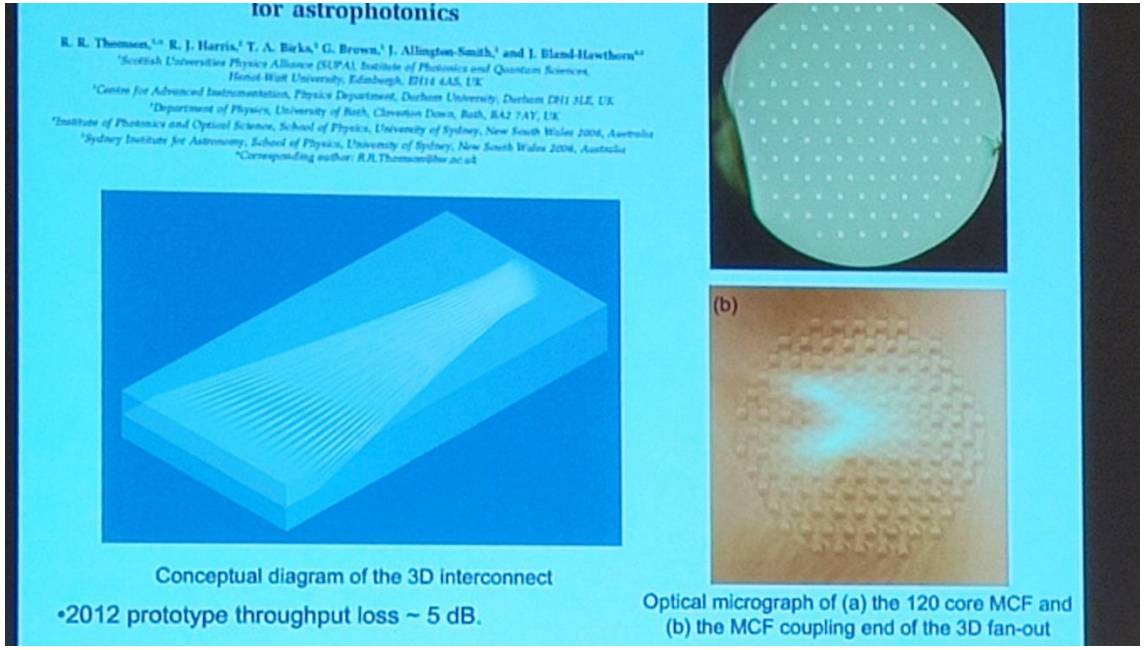
Soc. / Lab. Heriott Watt Univ. (UK)

Intérêts
- Usinage dans la masse de verre pour du guide d'onde

Informations clés *4 photos*

- Challenges for multiplex / demultiplex fibers => Use of USP laser bulk inscription of fused silica for integrated coupling systems
- MCF : Multi Core Fiber
- 3rd harmonic to see the refractive index change





30/01/2023 12411-25

Comparative study of laser-assisted etching using femtosecond laser pulses emitted at IR (1030 nm) and UV (343 nm) wavelengths

Auteur(s) Benedikt Hermann

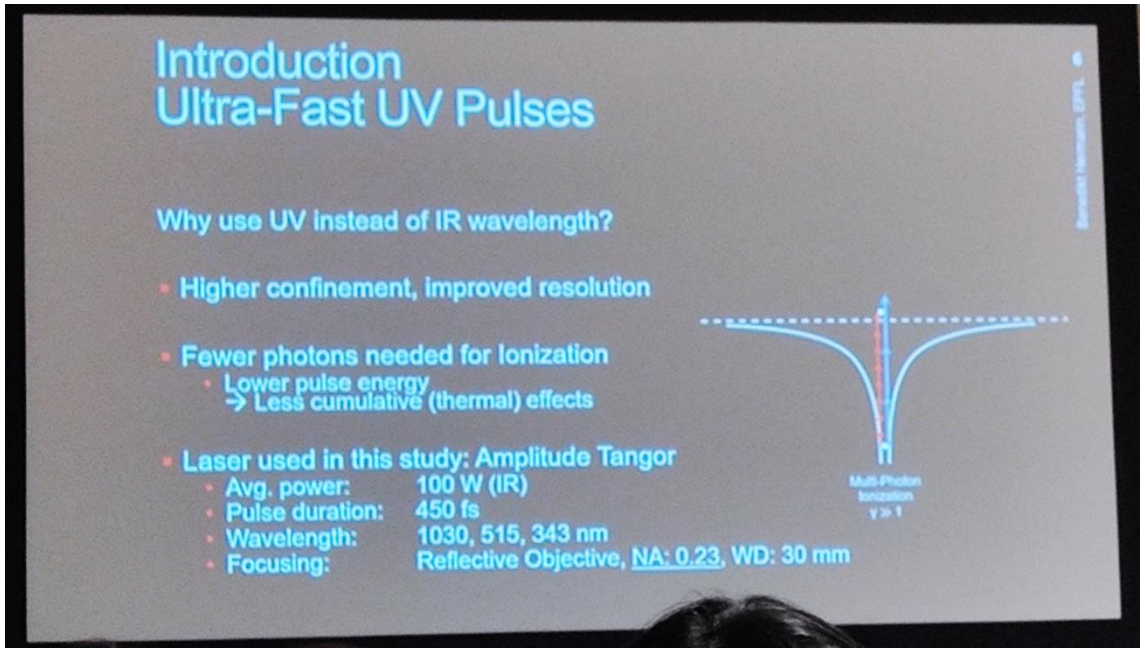
Soc. / Lab. EPFL (Suisse) Polytechnique Lausanne

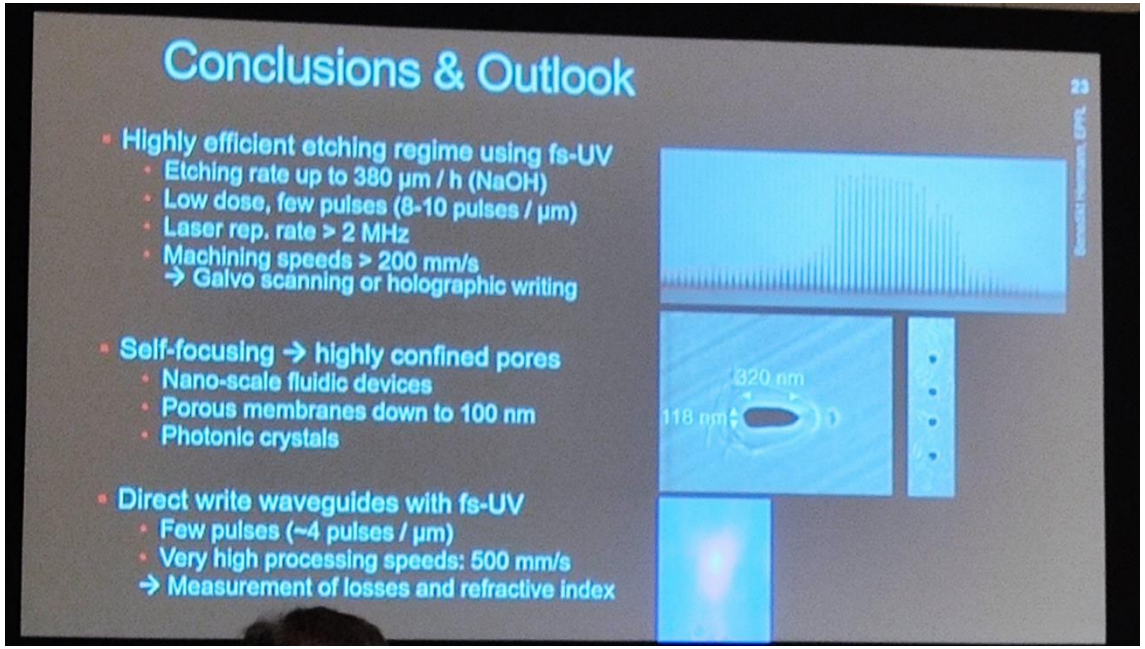
Intérêts
- Usinage du verre sous UV + Etching

Informations clés

5 photos

- IR / UV use for photoinscription in Glass
- HF or NaOH etching solvant
- 100nJ / pristine material / NA 0.23 30mm working distance





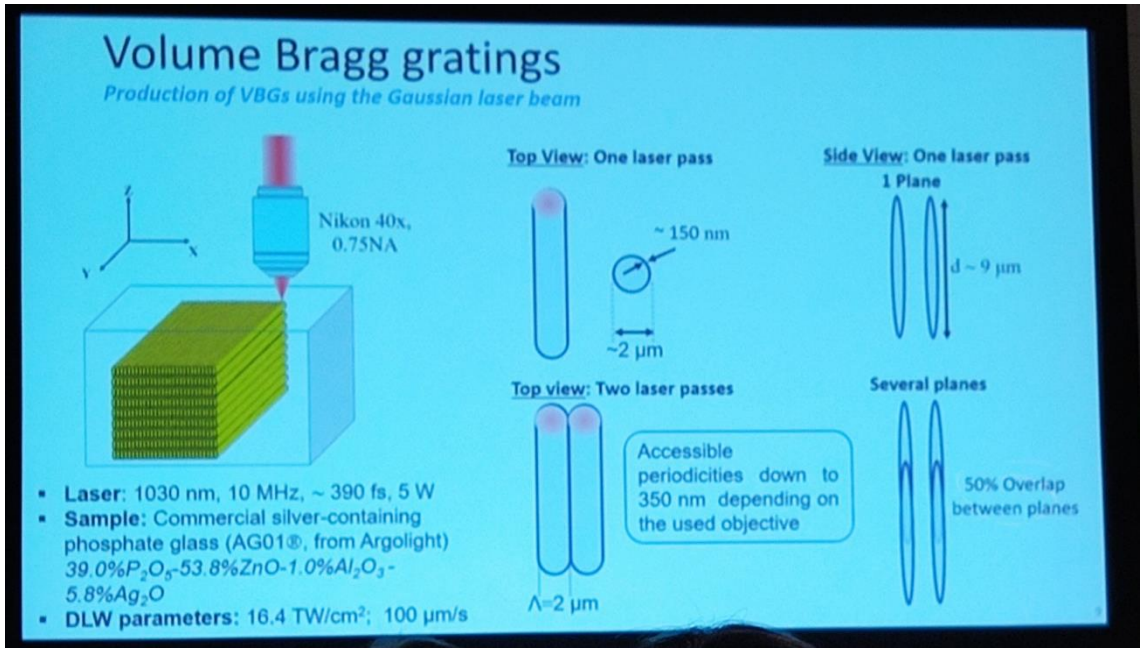
30/01/2023 12411-27

First demonstration of a type 1 volume Bragg grating for the Vis-NIR applications

Auteur(s) Lauris Talbot

Soc. / Lab. Univ. Laval (Can.)

Intérêts
- Comparaison Gaussien / Bessel pour gravure de grating dans la masse de verre



Informations clés *1 photos*

- Fs IR writing of phosphate glasses (french company ArgoLight) never done but interesting because can be mixed with silver ions. High refractive index change
- New type of modification Type A
- Gaussian beam : Objective 40x, 16.4TW/cm² ; 100µm/s ; beam diameter 2µm with tangential lines. 3D gratings. So 9µm distance between horizontal planes, repeated to attain 45µm depth
- Fluorescence images excitation ar 375nm to see the index change
- Comparison with Bessel beam : axicon alpha 2°, focale 100mm, x40 obj => 336µm depth bessel ; Helium Neon diffraction characterization ; 20µm/s – 5TW/cm² . Much faster (1pass for all the depth) ; Almost 95% diffraction efficiency
- Eu project FUN GLASS

30/01/2023 12408-7

Picosecond laser shock micro-forming of stainless steel

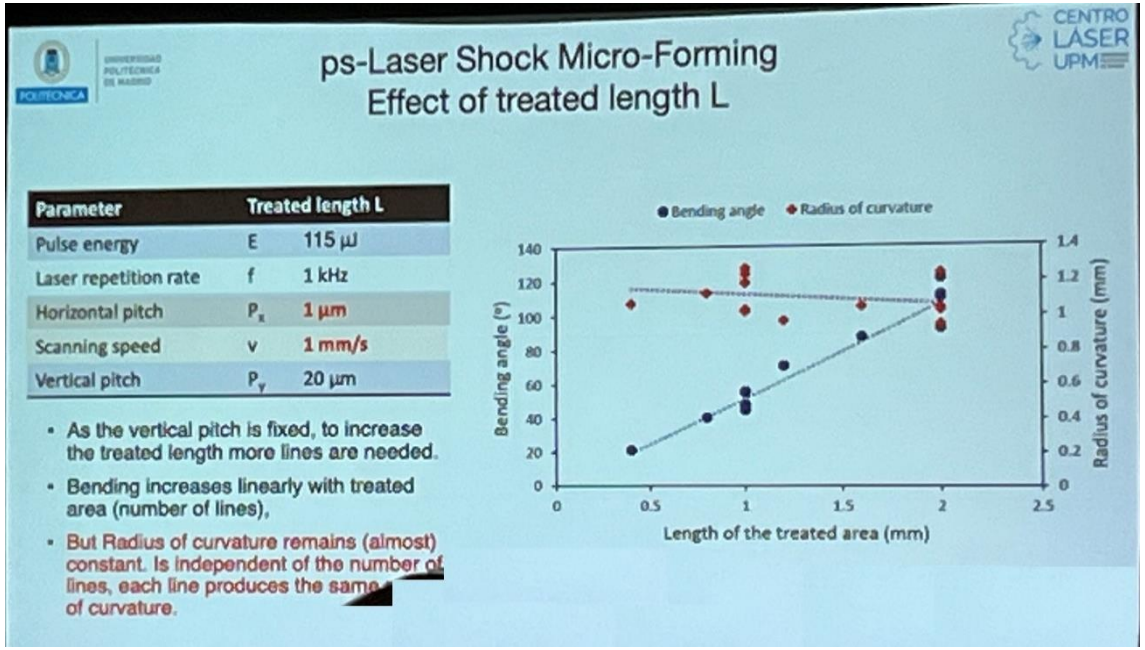
Auteur(s)

Soc. / Lab. Politecnica Madrid (Espagne)

Intérêts
- Shock Pinning

Informations clés *1 photos*

- Utilisation du shock pinning pour améliorer la souplesse de l'Inox – mesure de la déformation après pliage
- Paramètres accessibles avec les outils Manutech



30/01/2023 12411-29

Beam shaping of high-energy beams for laser micromachining of transparent materials

Auteur(s) Vytaukas Jukna

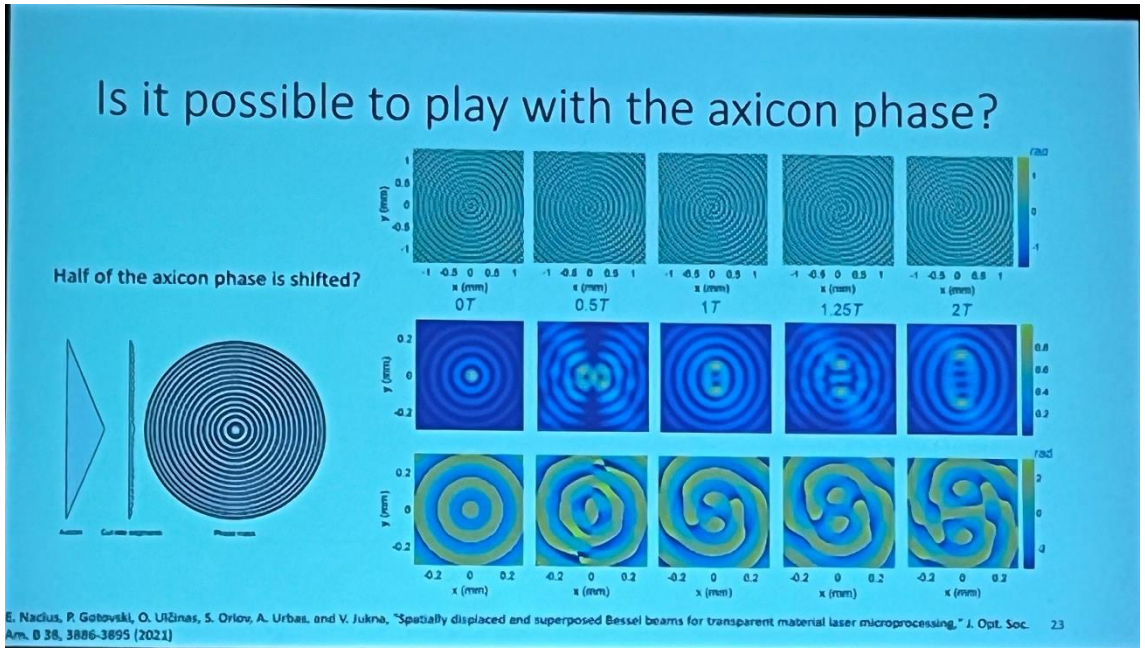
Soc. / Lab. Vilnius Univ. (Lit.)

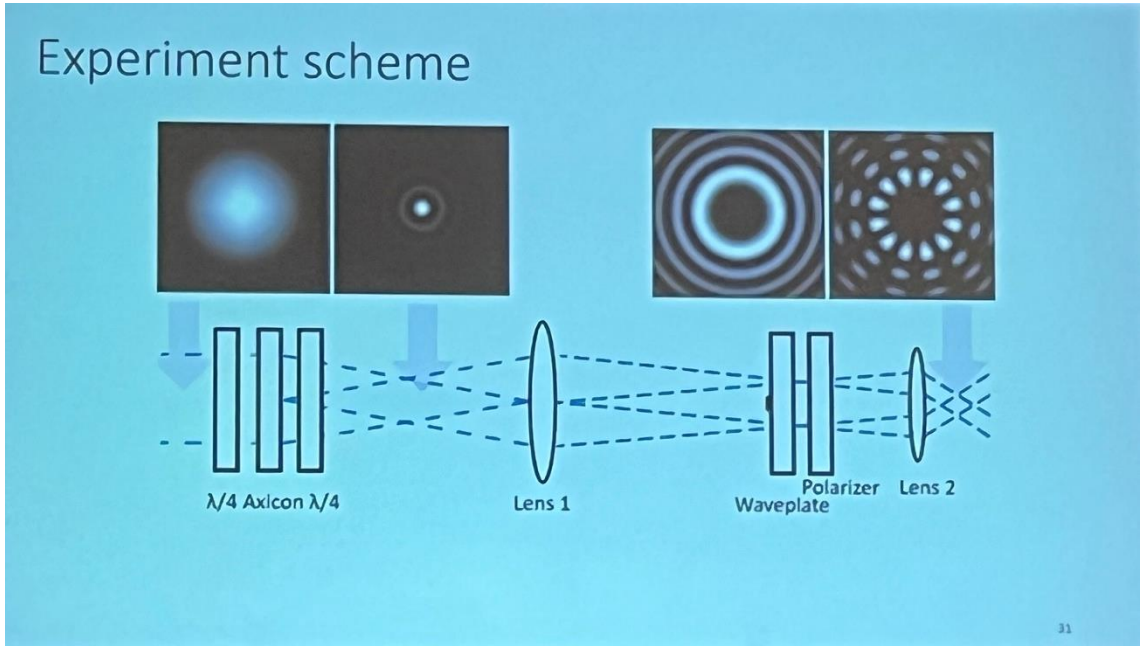
Intérêts
- Nouvelles formes spatiales

Informations clés

6 photos

- How making higher order beams? Annular slits with vortex beam
- Amélioration des défauts du a l'angle des axicon en mettant un filtre circulaire (et pas disque) au niveau du cercle.
- Well, review of original beams





Laser glass cutting of complex contours with tailored edges

Auteur(s) Daniel Flamm

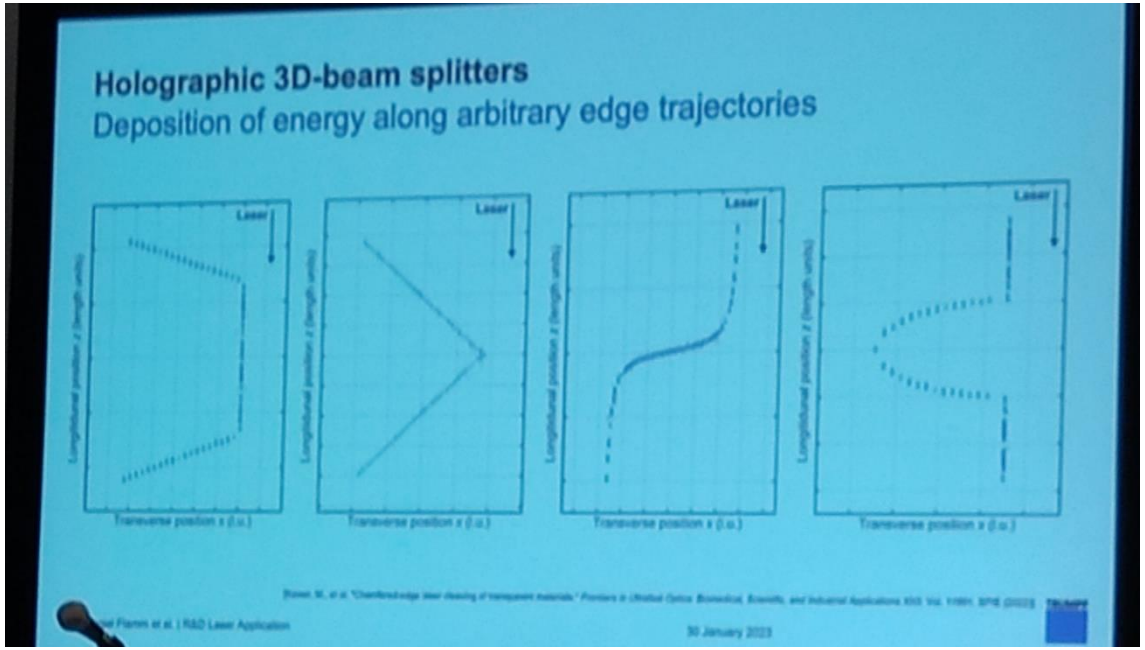
Soc. / Lab. Trumpf (Ger.)

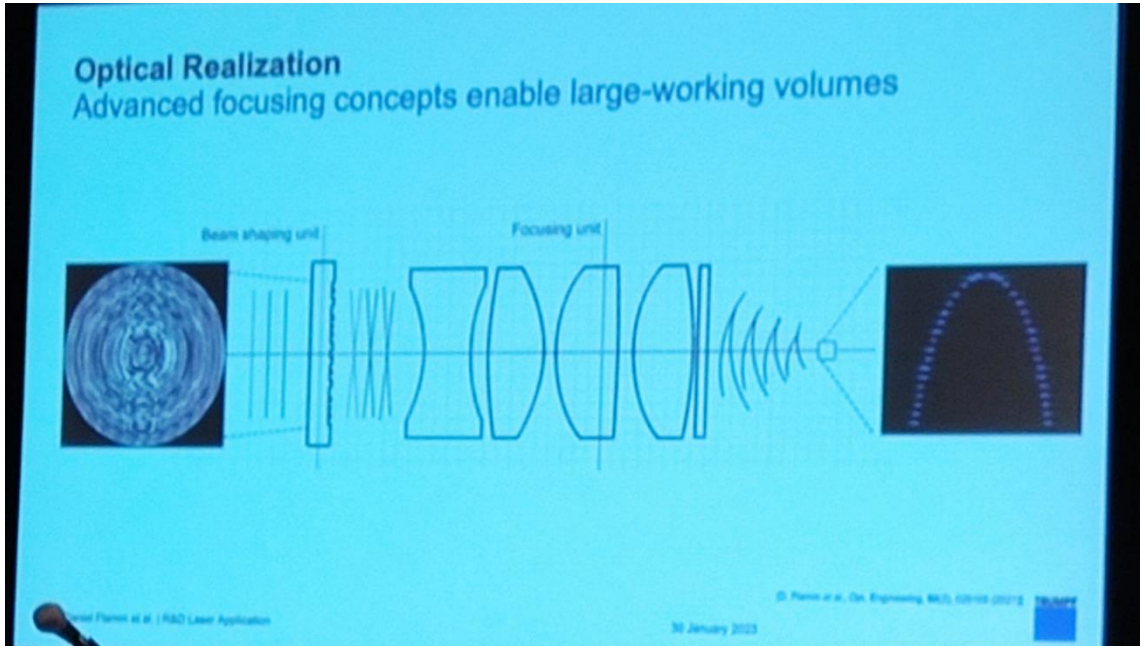
Intérêts
- Multi point 3D dans la masse pour découpe de verre

Informations clés *3 photos*

- 8mm thickness Soda lime glass. Demo 10cm large in few seconds. 2 step process. 1 laser top cleave + CO2 laser

- Multipoint gaussien pour faire des courbes de découpe
- SLM first then DOE fabrication by 3D lithography in fused silica. Good DOE very small amount of zero order (~%)
- 200µJ Burst. NA 0.4, Single pass, rotation of workpiece during process
- Selective laser etching. CO2 laser aims at replacing chemical etching





30/01/2023 12411-32

High power shaped femtosecond beams for riblets manufacturing

Auteur(s) Clemens Hönninger

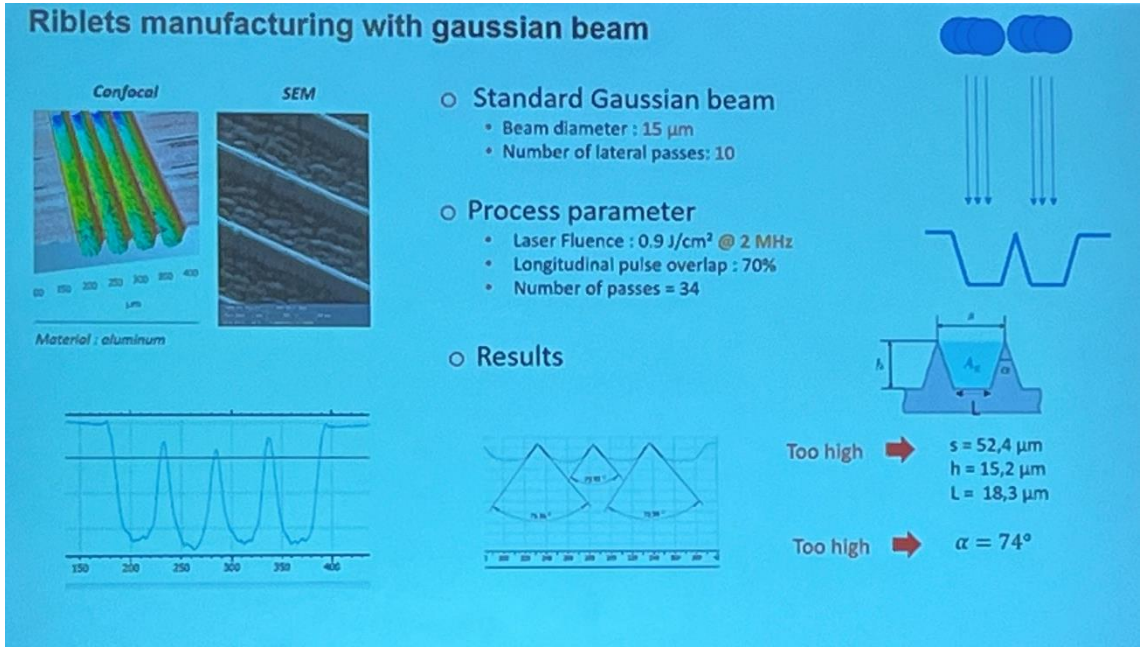
Soc. / Lab. Amplitude (Fr)

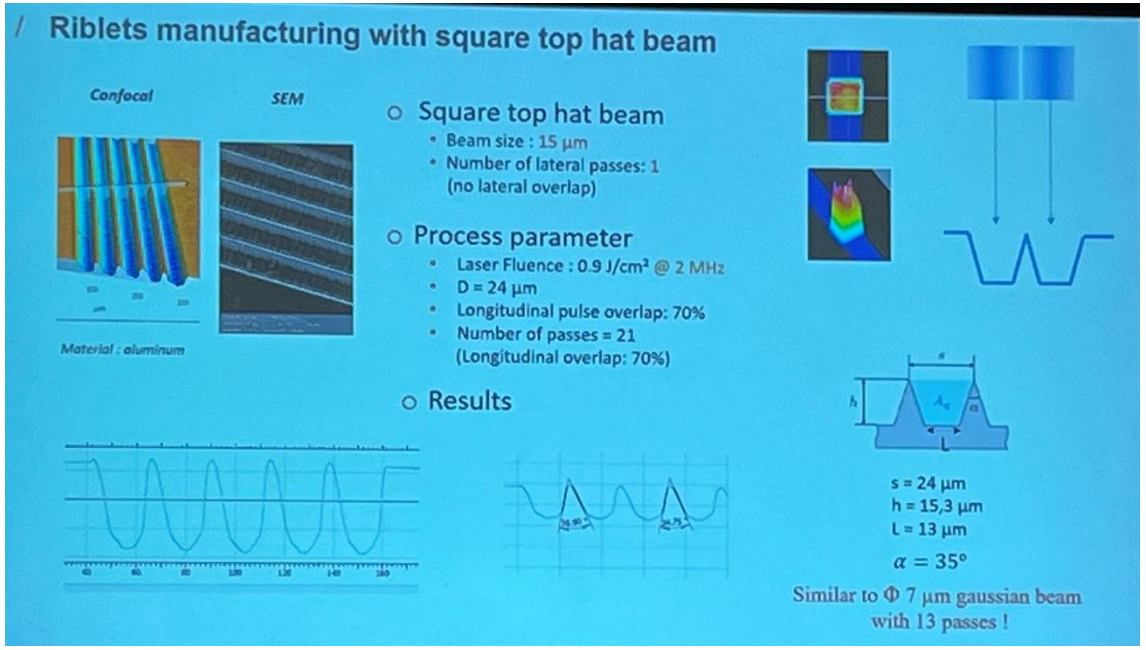
Intérêts
- MEF Cailabs pour application aéro (riblets)

Informations clés

6 photos

- CHASSEUR Research project (french) : Cailabs / Onera / Alphanov / Amplitude
- Riblets : tens of microns grooves triangular shapes. Improves friction air flows aerodynamics
- 300W IR and 100W UV. Roadmap : 10mJ / 1kW laser
- Comparison Gaussian vs Beam Shaping : beam shaping more qualitative and time efficient
- Other laser : MultiPoint EU Project. 1kW laser





Mardi 31-01-2023

Ultrashort pulse laser processing of silicon

Auteur(s) Stefan Nolte

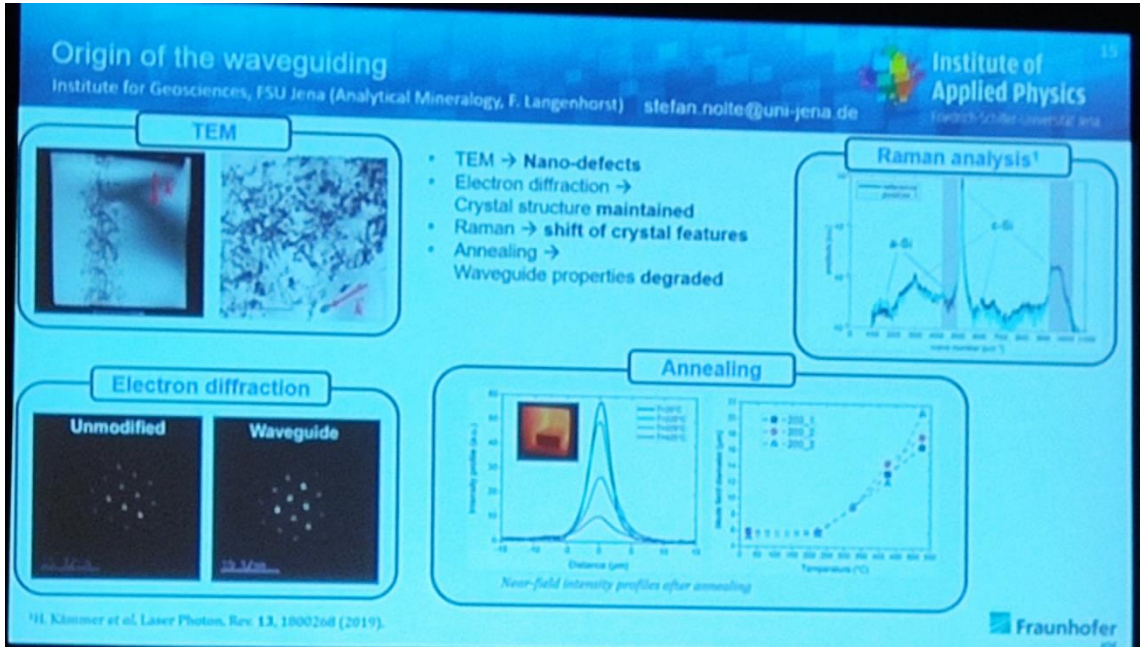
Soc. / Lab. University of Jena (Autr.)

Intérêts
- Nouvelle longueur d'onde pour usinage dans la masse de silicium

Informations clés

- G. Matthaus Optics express 26 24089 (2018)
- 1.55µm, 800fs, 400kHz, 20µm/s, <200nJ for waveguide photoinscription inside Silicon
- Guiding @1.55µm
- Generation of nanodefects in the monocryst material observed by TEM / shift of crystalline structure by Raman / Annealing
- InGaAs camera observation
- Perspectives Metal/semicond. Welding

2 photos



31/01/2023 12408-15

Laser micro-drilling of glass materials with high-speed laser modulation and real-time monitoring toward data-driven laser processing

Auteur(s)

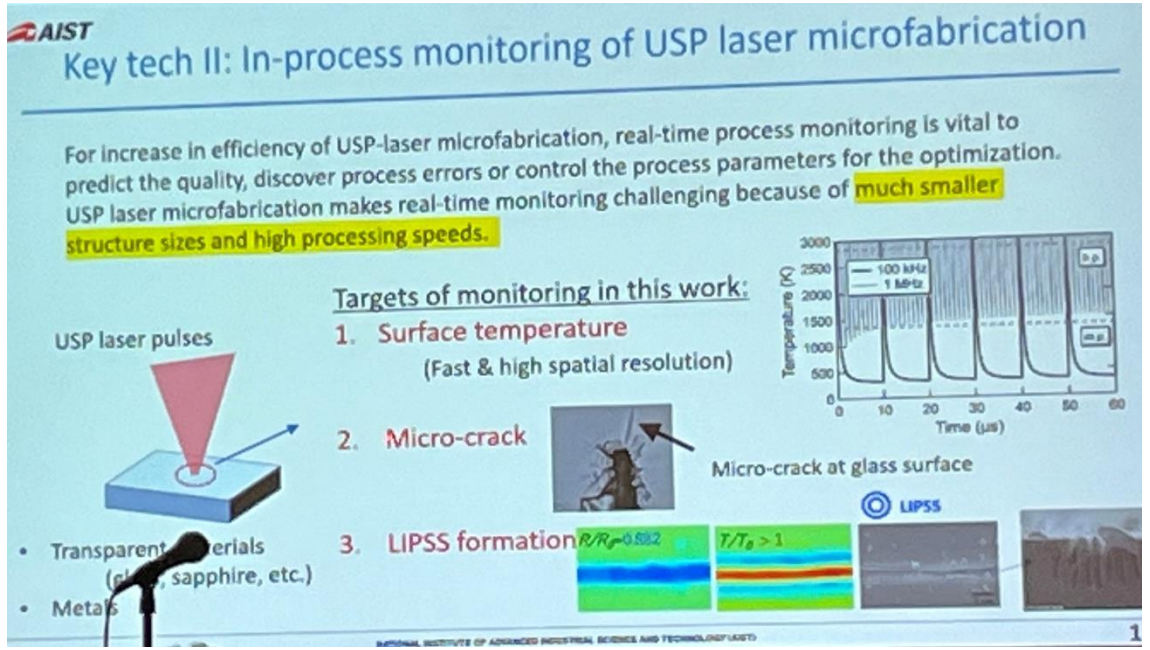
Soc. / Lab. National Instituteof Advanced Industrial Science and Technology (Japon)

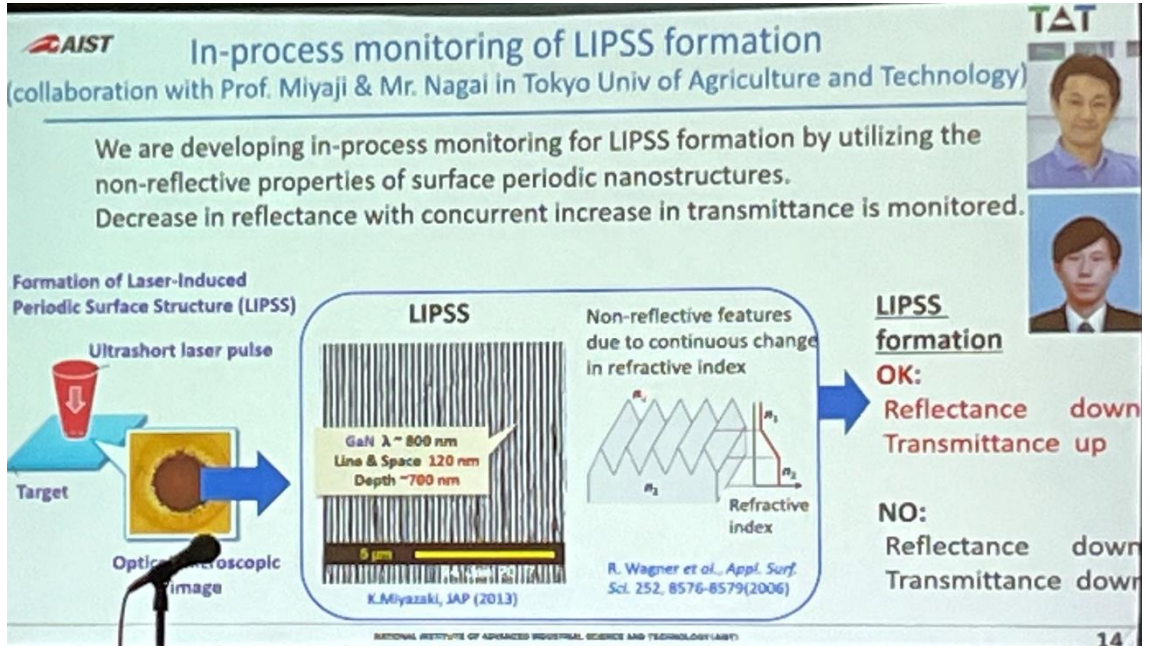
Intérêts
- Contrôle du Process en direct

Informations clés

2 photos

- Mesure de la température à la surface de la matière
- Différents modes de burst en MHz, avec énergies par pulse au sein du burst croissantes ou décroissantes
- Monitoring de la formation des LIPSS





31/01/2023 12408-14

Laser fabrication of length controlled sub µm periodic structures in the bulk of fused silica

Auteur(s) Nicolas Sanner

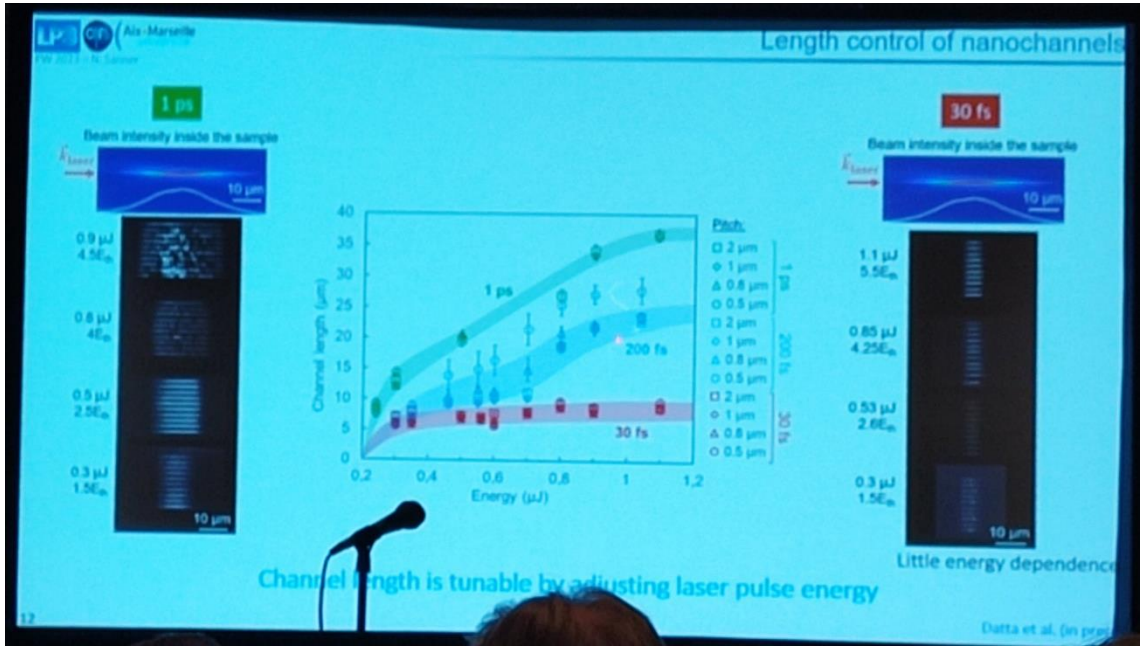
Soc. / Lab. LP3 (Fr.)

Intérêts
- Bessel dans la masse de verre

Informations clés

6 photos

- Fused silica
- Shaping customized bessel beams : principle introduction of a ring to filter just after the axicon : modify the length of the beam
- 1ps (longer interaction) / 200fs / 30fs. 1 channel = 1 shot
- µchannel inscription. Comparison of 1ps/300fs/30fs and nuancier Energy vs pitch between bessel engraved grooves
- Motivation : creation of metasurfaces / photonic crystals due to good spatial dimensions of inscription



31/01/2023 12408-15

Laser micro drilling of glass materials with high speed laser modulation and real time monitoring toward data driven laser processing

Auteur(s) Aiko Narazaki

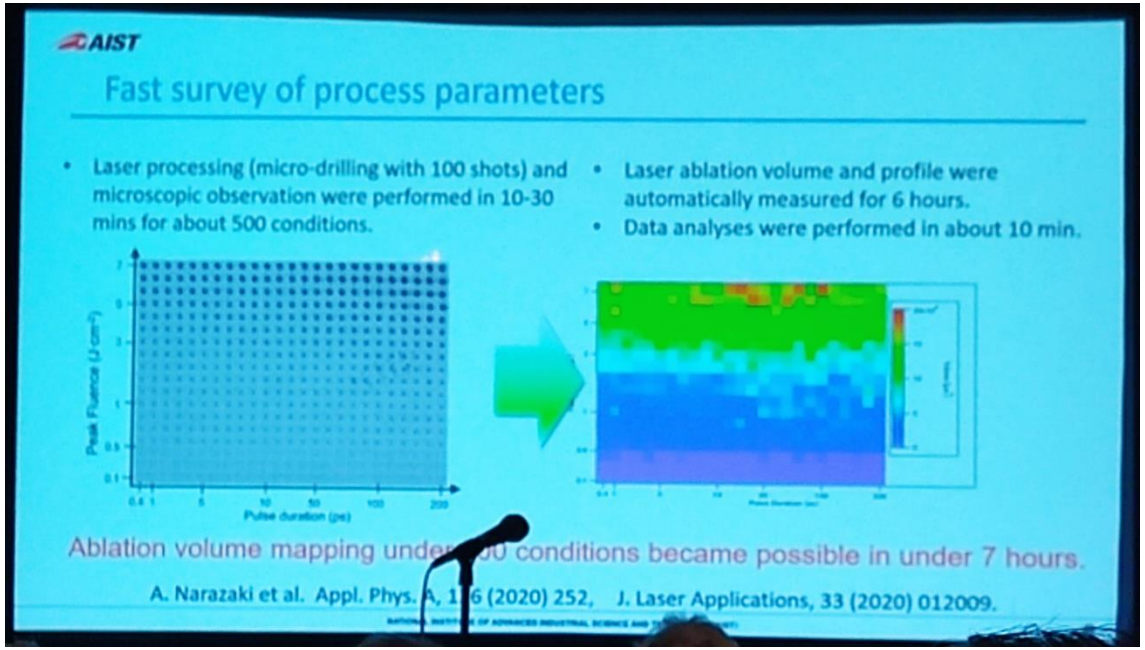
Soc. / Lab. AIST (Jap.)

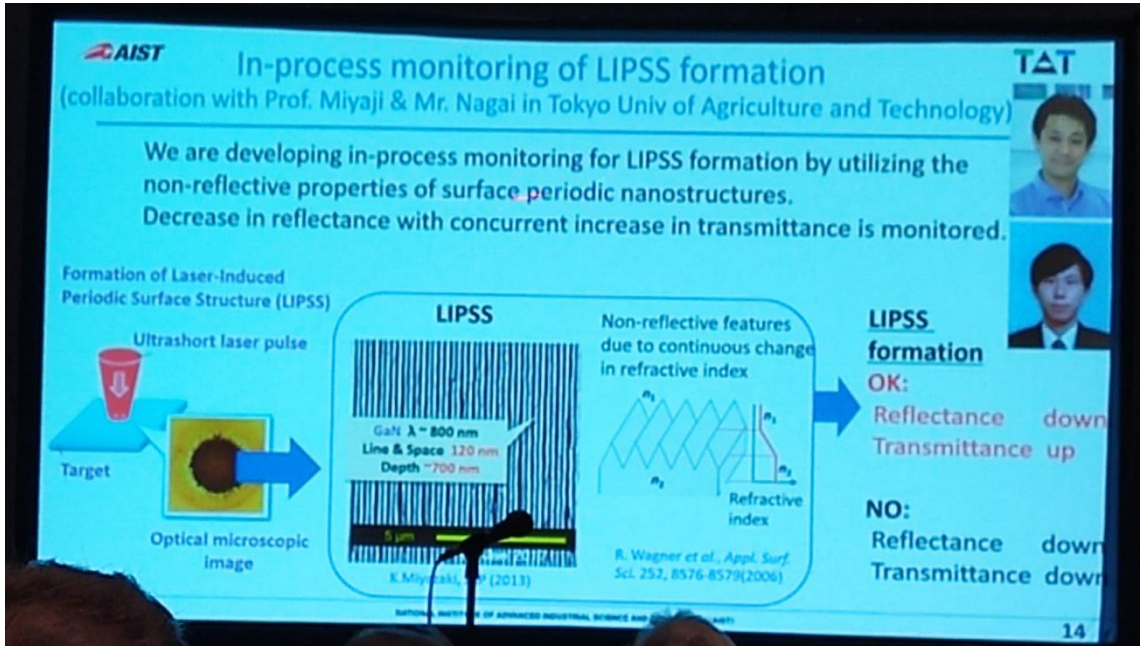
Intérêts
- Assistance à l'usinage de verre par BdD AI

Informations clés

- DDALP : data driven active laser processing : processing => real time monitoring => AI => parameter optimization
- Ex 1 glass : Cost effective, efficient, robust… but µcracks, brittle…
- Home made laser : 1 laser 400fs to 400ps. MHz…
- Nuancier => carac ablation volume & profile in 6h and data analysis in 1h.
- Applied to GHz burst. Ramp up / down 1MHz. Down more efficient on ablation <50 pulses
- Ex 2 LIPSS formation on glass: reflectance down / transmittance up if LIPSS formation => In process monitoring of LIPSS formation successful

4 photos





31/01/2023 12408-16

Fs GHz burst laser processing for percussion drilling applications

Auteur(s) Clemens Hönninger

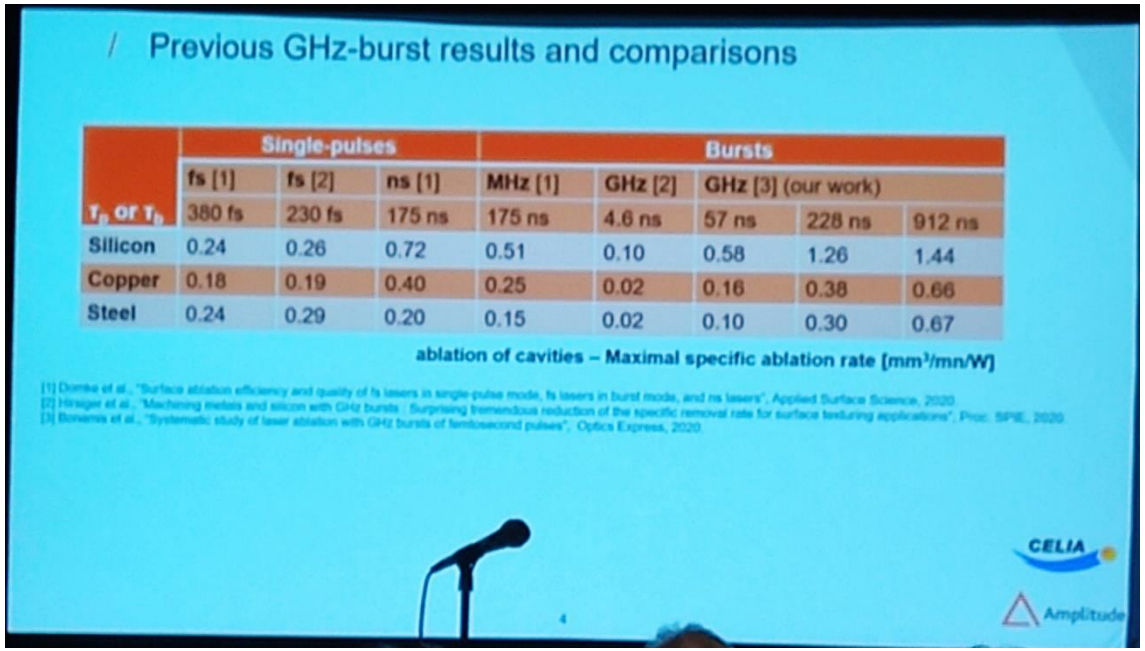
Soc. / Lab. Amplitude (Fr.)

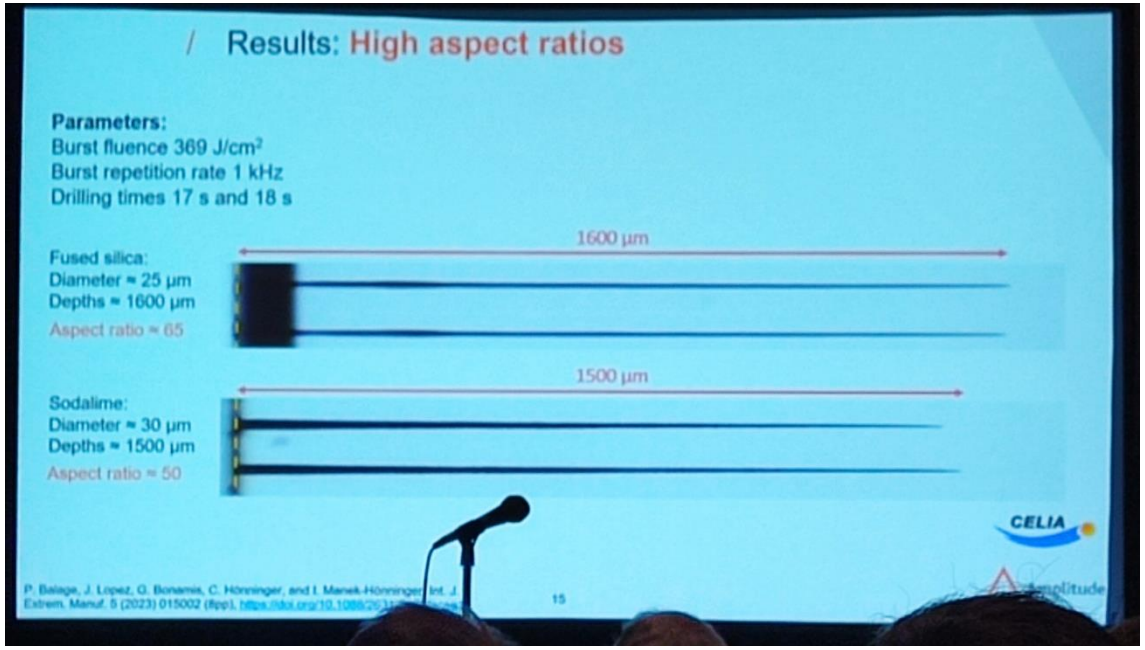
Intérêts
- Efficacité du burst sur verre

Informations clés

9 photos

- Metals :
  - Shorter GHz bursts are less efficient thant single fs shots
  - Inverted trend with longer bursts.
- High speed drilling up to 1mm deep with adapted GHz in glass
- 3 régimes : Surface ablation / Deep ablation / Saturation
- Observation of the number of burst per shot :





31/01/2023 12409-4

A study on the incubation effect during multi-shot fs laser ablation of quartz

Auteur(s)

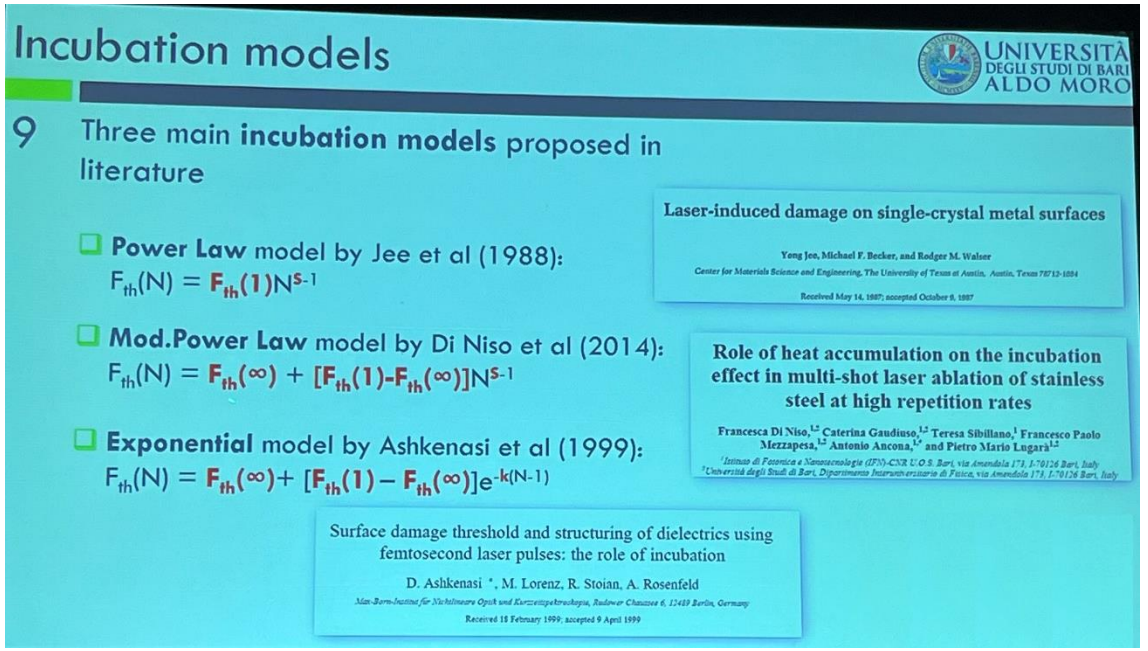
Soc. / Lab. Univ degli Studi di Bari Aldo Moro (Italie)

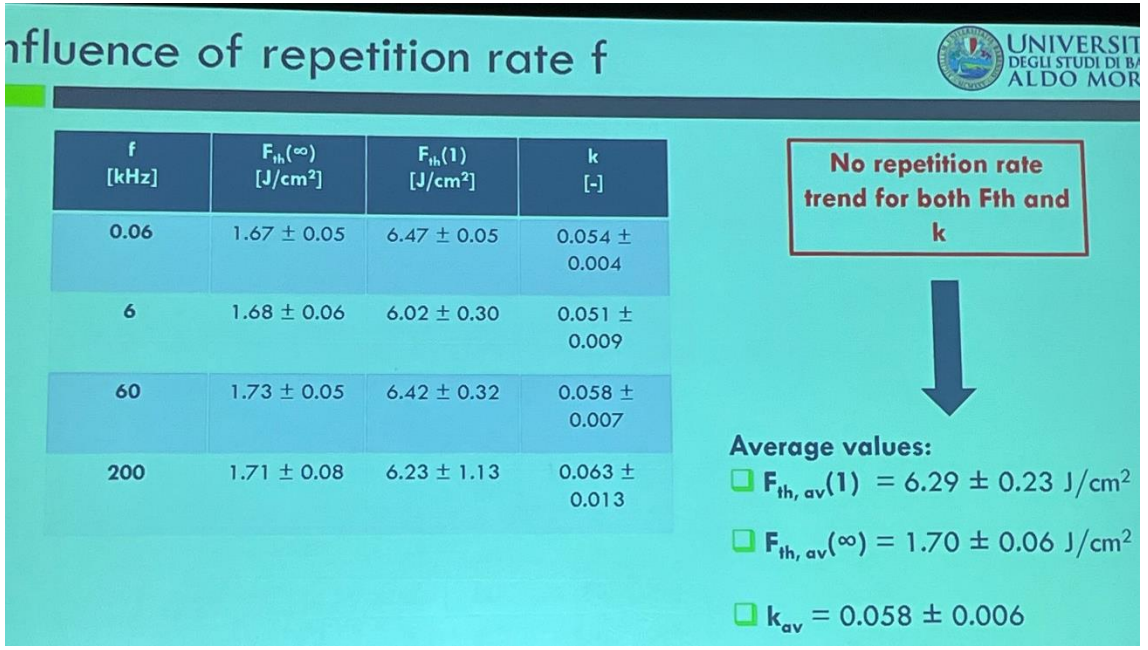
Intérêts
- Influence de la cadence

Informations clés

2 photos

- Laser Pharos de Light Conversion
- F-théta de 100 mm
- Cadence 100 kHz
- Réalisation de nuanciers sur échantillon de Quartz





31/01/2023 12408-17

Advanced high res. Cylinder structuring with parallel bessel beams under use of UV fs laser irradiation

Auteur(s) Martin Osbild

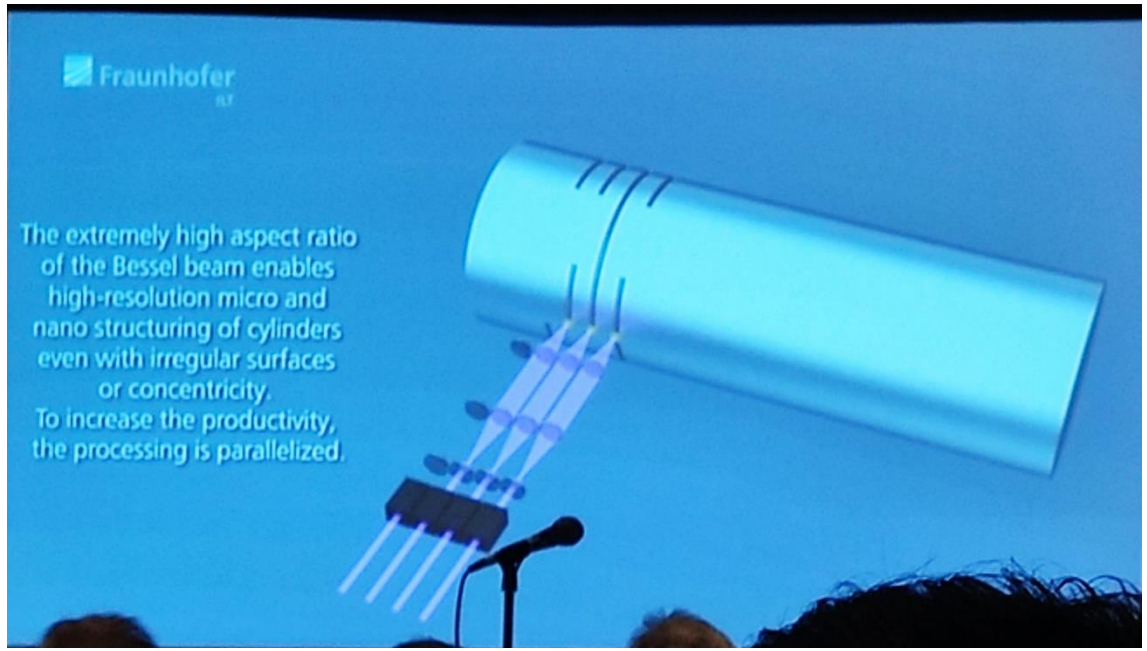
Soc. / Lab. Fraunhofer ILT (Ger.)

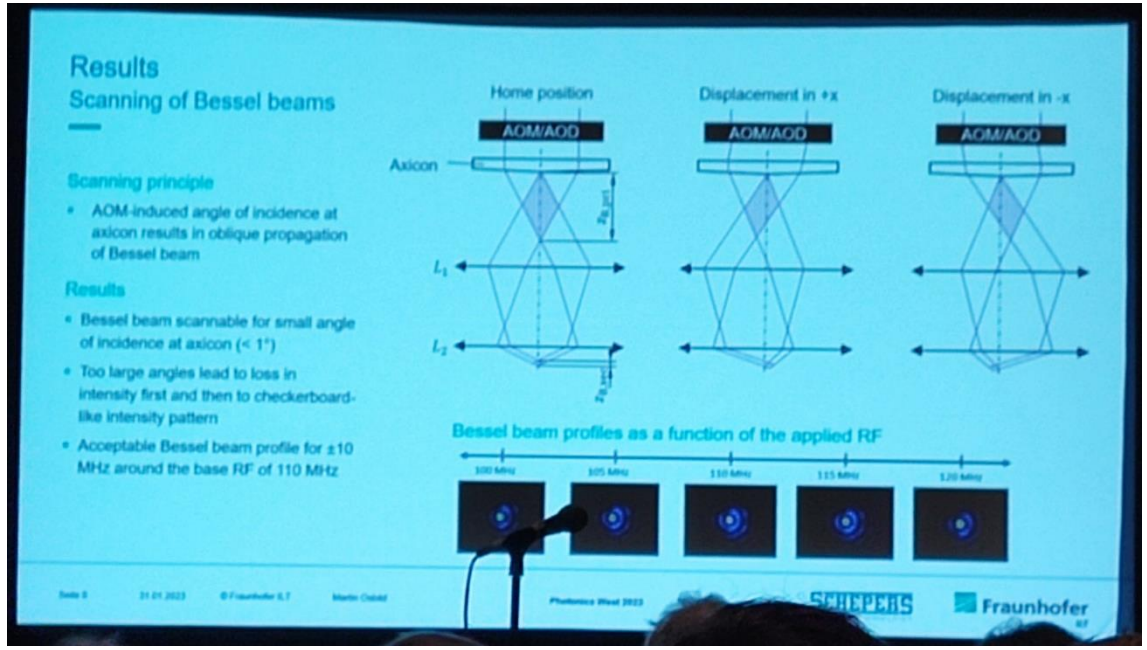
Intérêts
- Mise en forme haute vitesse de Bessel par AOM

Informations clés

5 photos

- Green wavelength / Beam splitting with AOM
- Cylinder texturing as bone screws
- To avoid spiral misalignments during continuous rotation/translation of the processing, use of deflection high speed AOM to correct
- Upgrading with 1µm bessel beam (hard to achieve with gaussian with high tolerance) Axicon 170°, f75mm + 25mm asphere
- Bessel beam characterization : x20microscope + f400mm+camera : Gaussian fit of the center => Formule calcul de fluence (PROCEEDING)
- Metamorpha project
- UKP Workshop (26-27 / 04 / 2023) & AKL 17-19 / 04 / 2024





31/01/2023 12408-18

Ultrafast nanostructuring utilizing interference technics and plamonics effects

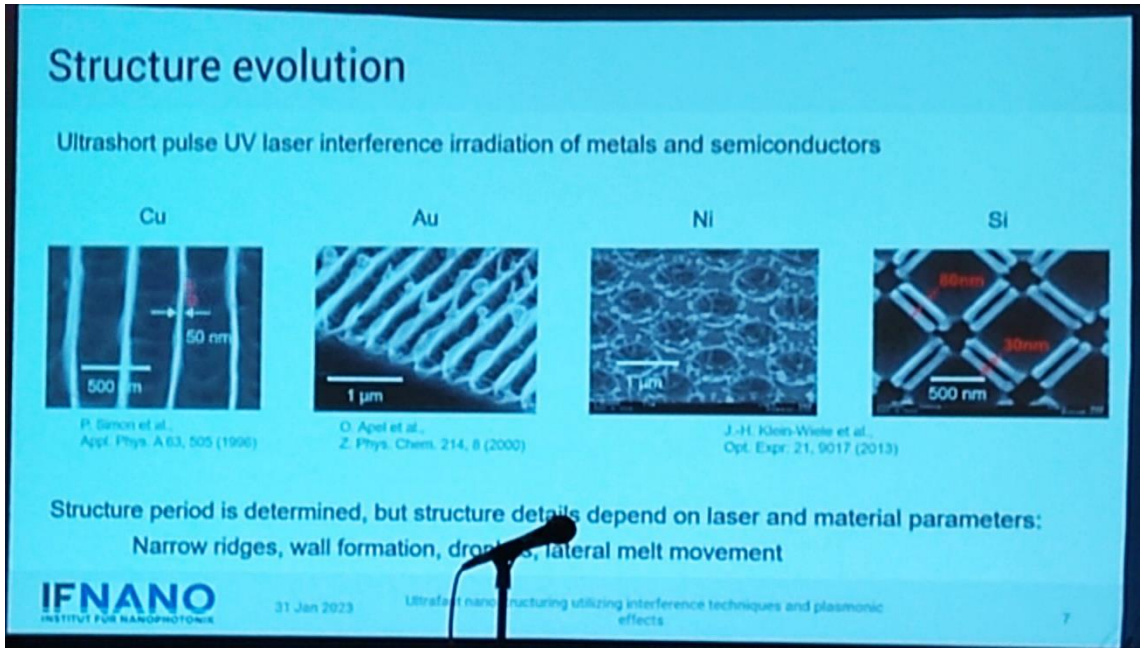
Auteur(s) Jürgen Ihlemann

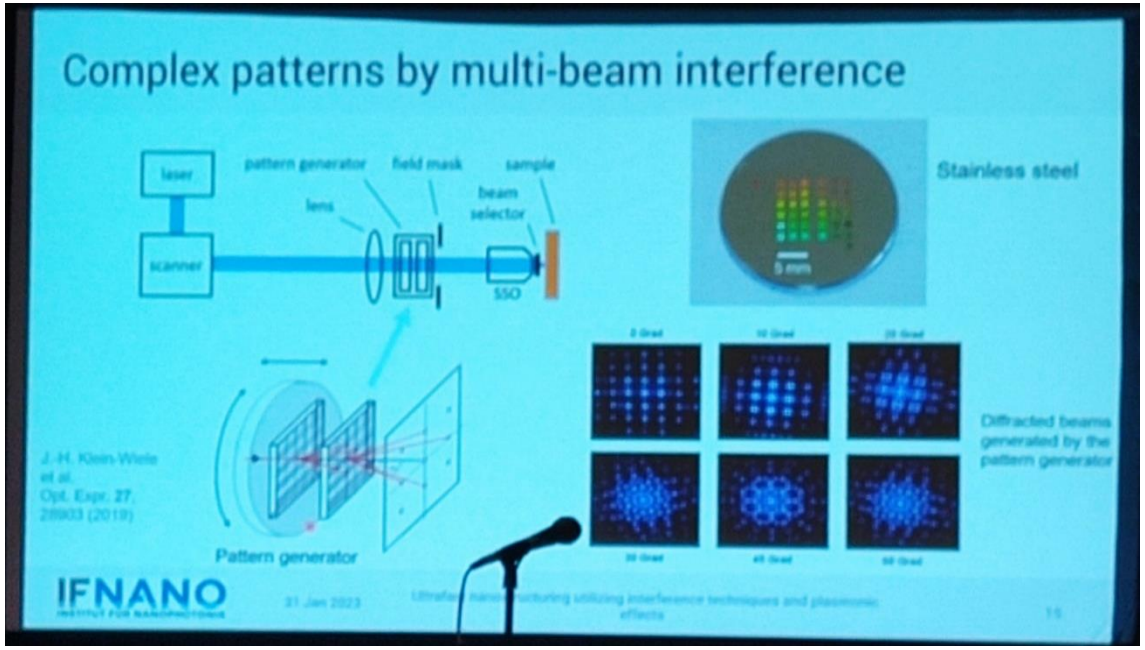
Soc. / Lab. IFNANO (Institute for nanophotonik, Ger.)

Intérêts
- DLIP UV
- Autre technique de génération DLIP par réseaux

Informations clés *5 photos*

- UV DLIP
  - 2 gratings : one for diffraction / one for recombination
  - Gold : sharp linear walls <100nm opened from a bump groove. With water, bump groove stays without bursting
  - Complex interference : Opt. Exp. 27, 28903 (2019)
- LIPSS theory : Interference with surface plasmon polariton (SPP) due to defects





31/01/2023 12409-5

Ultrafast laser processing of flexible ultrathin glass

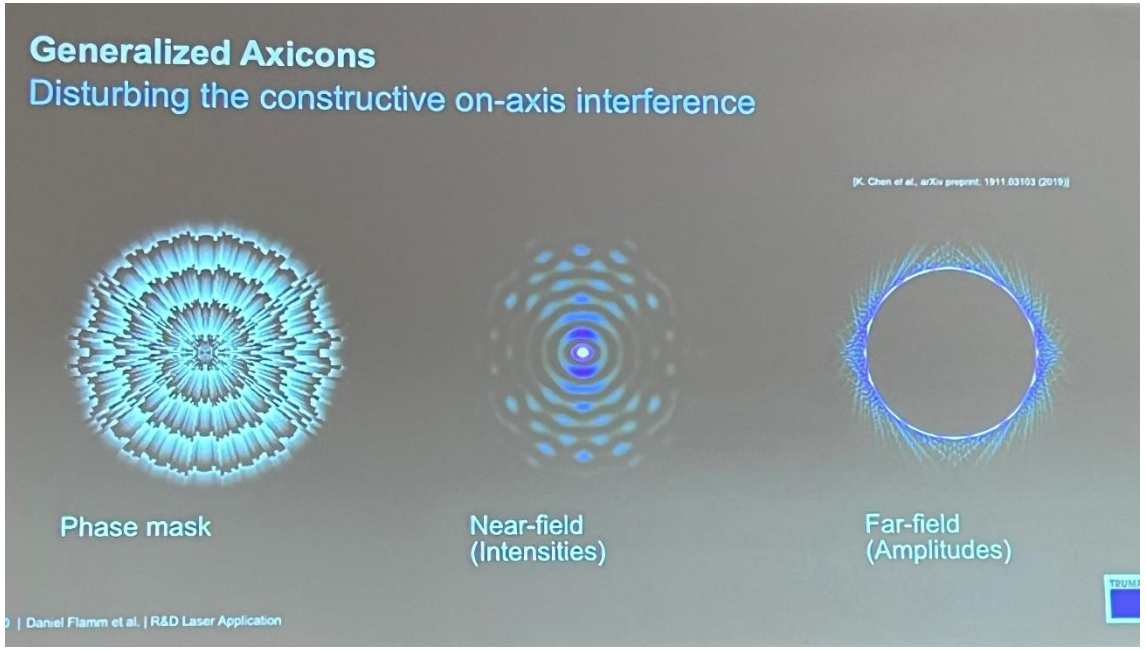
Auteur(s)

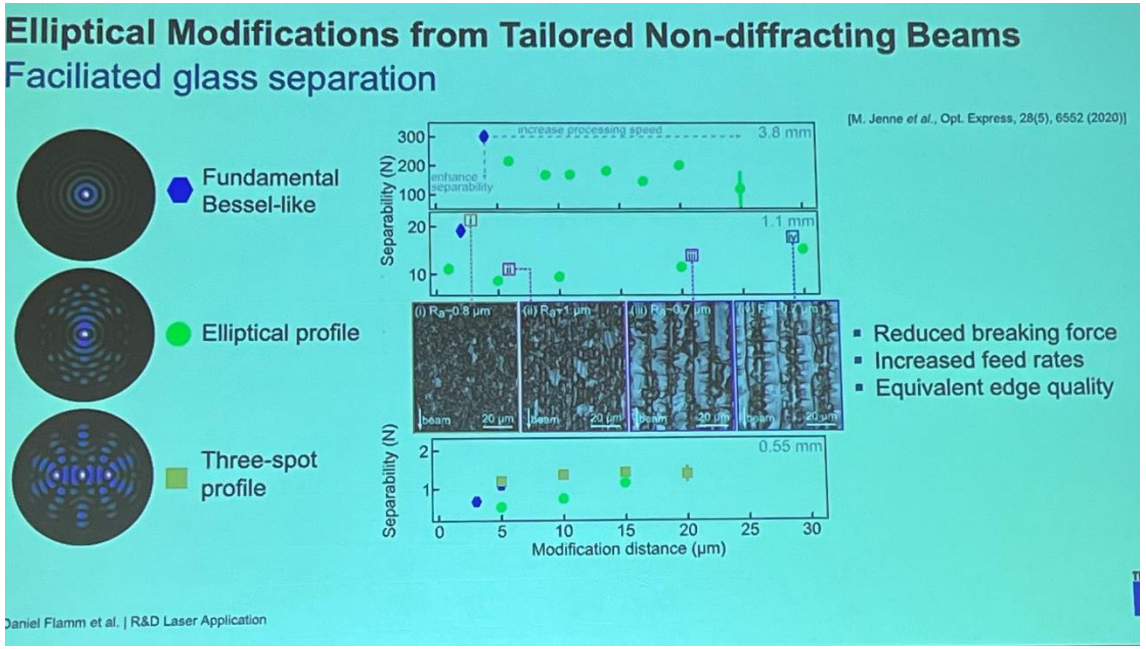
Soc. / Lab. Trumpf (filiale Chinoise)

Intérêts
- Découpe du verre

Informations clés *5 photos*

- Il est important d'avoir un faisceau circulaire, l'astigmatisme favorise les cracks de matière
- Dans le cadre d'un faisceau ovale, il faut écarter les spots pour une meilleure qualité
- Axicon diffractif fabrique via grey-tone en lithographie
- Création de faisceaux de bessel par mise en forme, en jouant sur le masque de phase, ils obtiennent des profils différents, qui peuvent favoriser la propagation des cracks et donc du clivage. Un bessel elliptique favorise la coupe et la qualité de la coupe du verre





31/01/2023 12409-6

The formation of ultrafast laser-induced periodic nano- and micro-ripples on fused silica

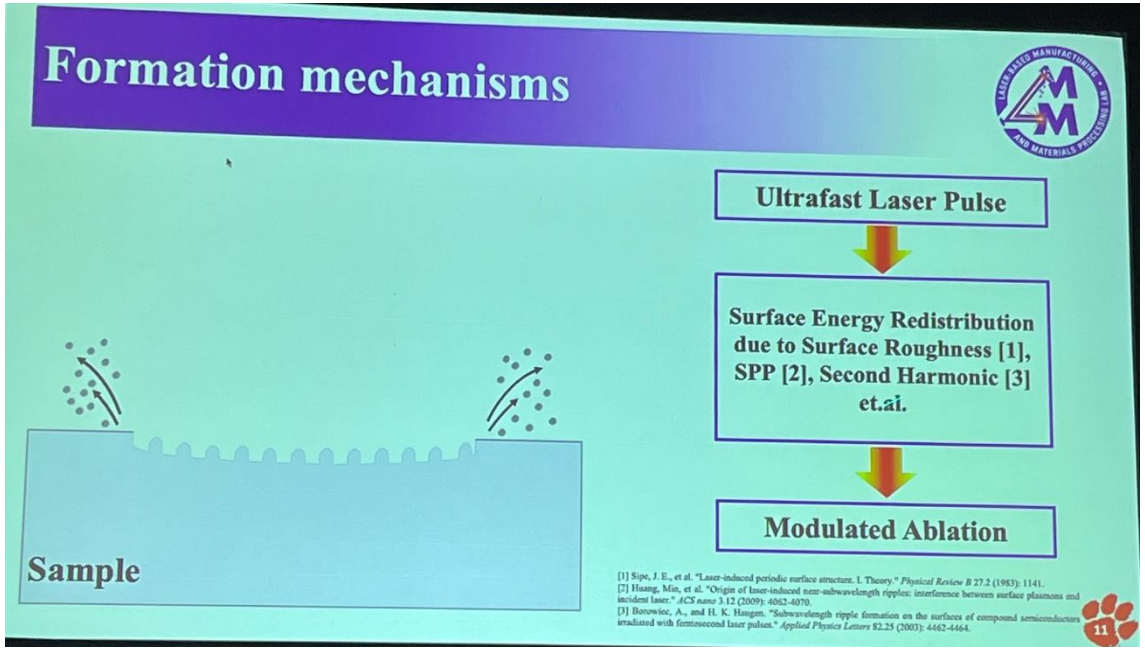
Auteur(s)

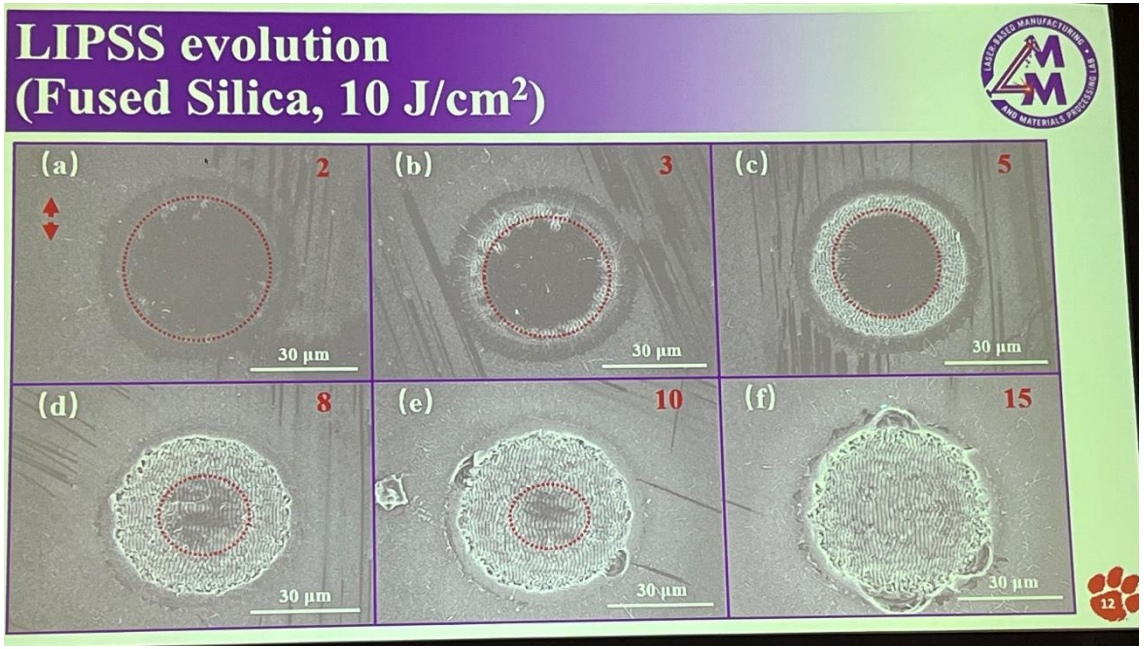
Soc. / Lab. Univ Clemson USA

Intérêts
- LIPPS sur verre

Informations clés *3 photos*

- Laser Pharos @ 1030 nm
- Sur le Fused Silica, les LIPSS sont parallèles à la polarisation
- Applications de mouillage sur du verre, hydrophile, super-hydrophile
- En rouge sur la photo, c'est le nombre d'impulsions qui évolue, on voit l'apparition des ripples. La zone centrale qui n'a pas de ripples est une zone fondue





31/01/2023 12411-41

Active and passive new optical fibers for laser development and beam delivery

Auteur(s) Eric Mottay

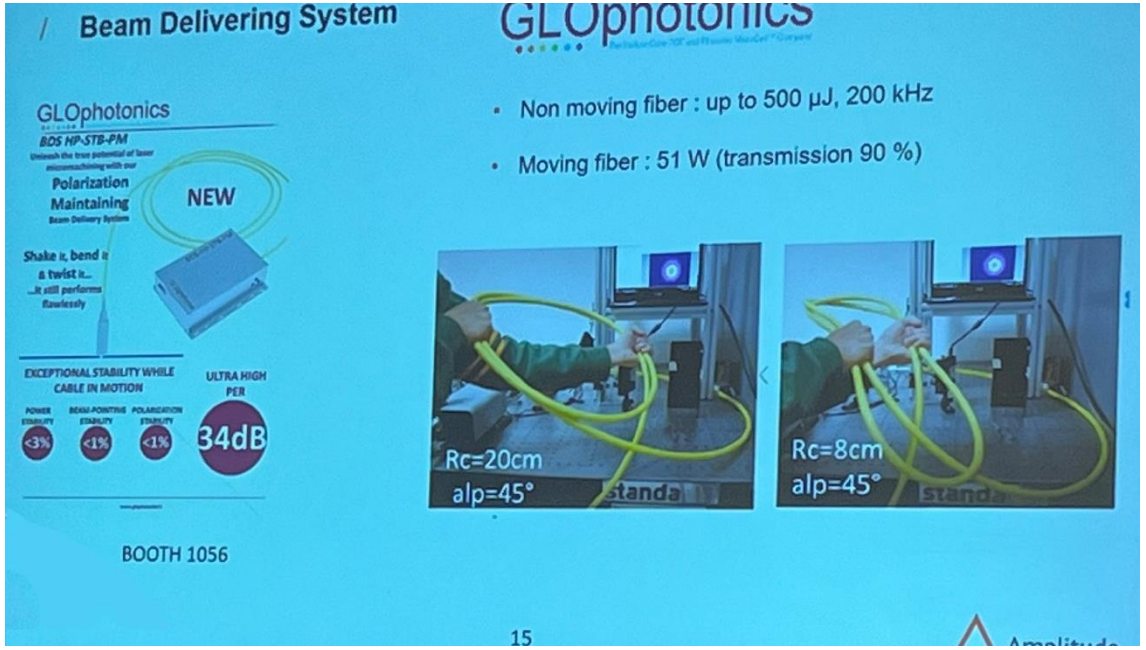
Soc. / Lab. Amplitude (Fr.)

Intérêts
- Tenue au flux fibres femto
- 2 axes fibres pleines (cavité) et creuses (transport)

Informations clés

3 photos

- Single mode polarisation maintaining fiber
- Fibrage Satsuma chez Alphanov avec bras robot, marquage de LIPSS en mouvement robot pour valider que la polarisation en sortie de fibre est stable
- High efficiency transmission
- 2 tests :
  - Non moving fiber : can handle 500µJ
  - Moving fiber : up to 50W



31/01/2023 12408-19

Surface functionalization of transparent materials : high throughput meet high resolutions

Auteur(s) Laura Gemini

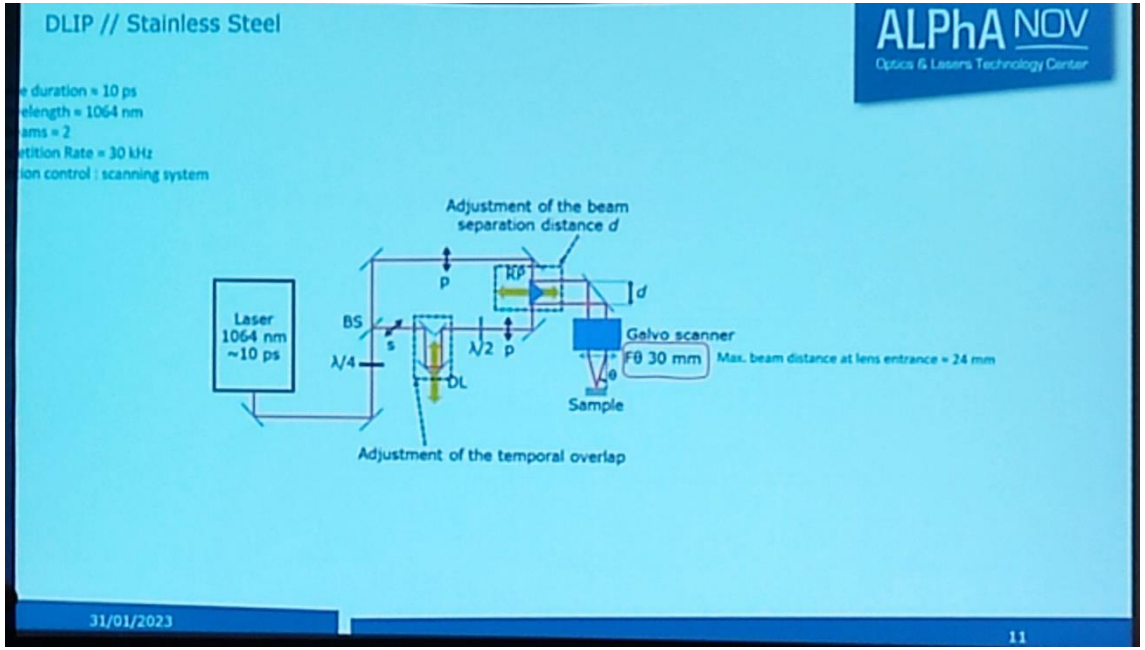
Soc. / Lab. Alphanov (Fr.)

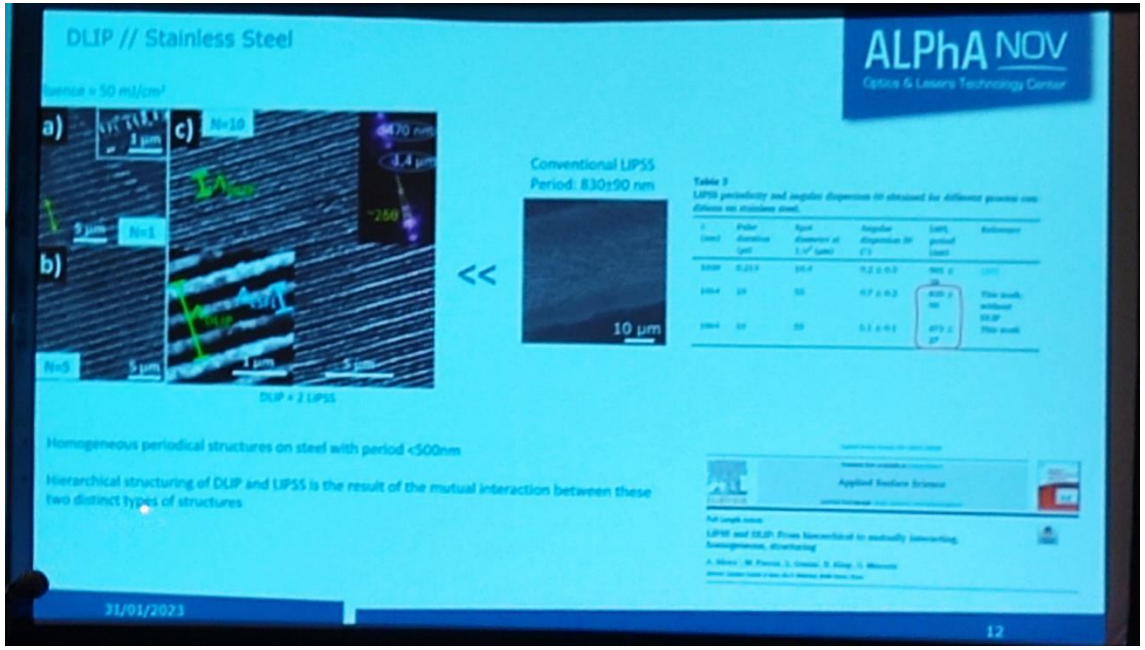
Intérêts
- DLIP IR et UV sur du sapphire

Informations clés

- DLIP IR 2 faisceaux : interplay LIPSS + DLIP
- DLIP uv 4 faisceaux on sapphire
- Constraint of a large focusing lens!

4 photos





31/01/2023 12408-20

Novel surface nanostructuring by fs laser with GHz pulses

Auteur(s) Shota Kawabata

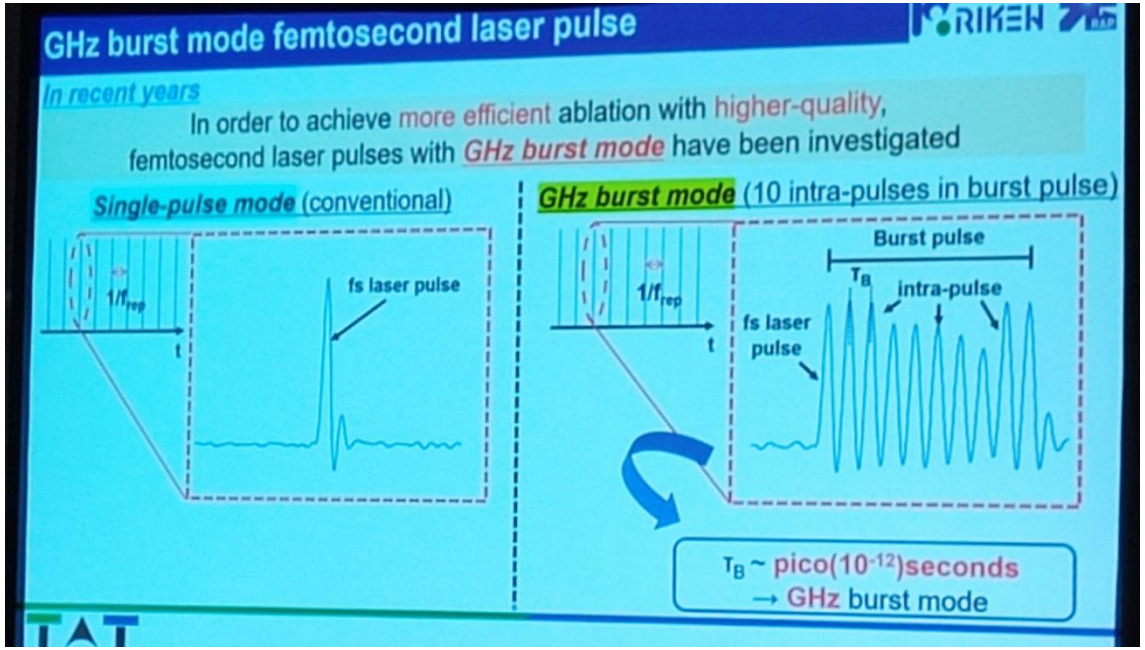
Soc. / Lab. Riken (Jap.)

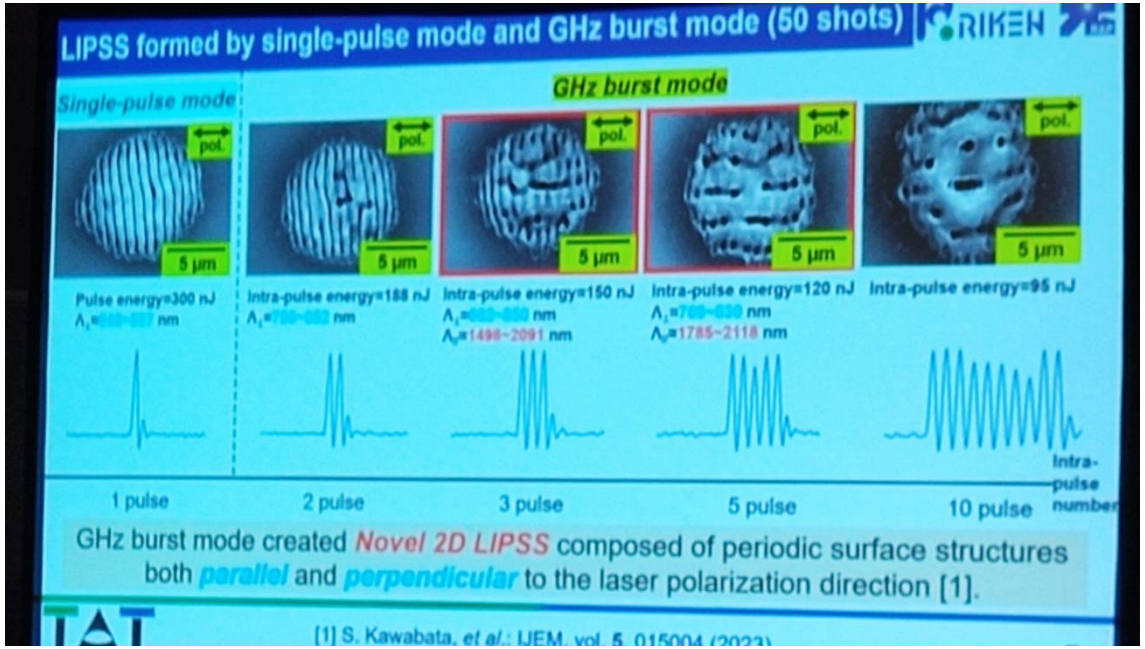
Intérêts
- Effet du burst

Informations clés

- Not so much

2 photos





31/01/2023 12411-43

Femtosecond UV laser for industrial applications : recent advances and challenges

Auteur(s) Aurimas Augus

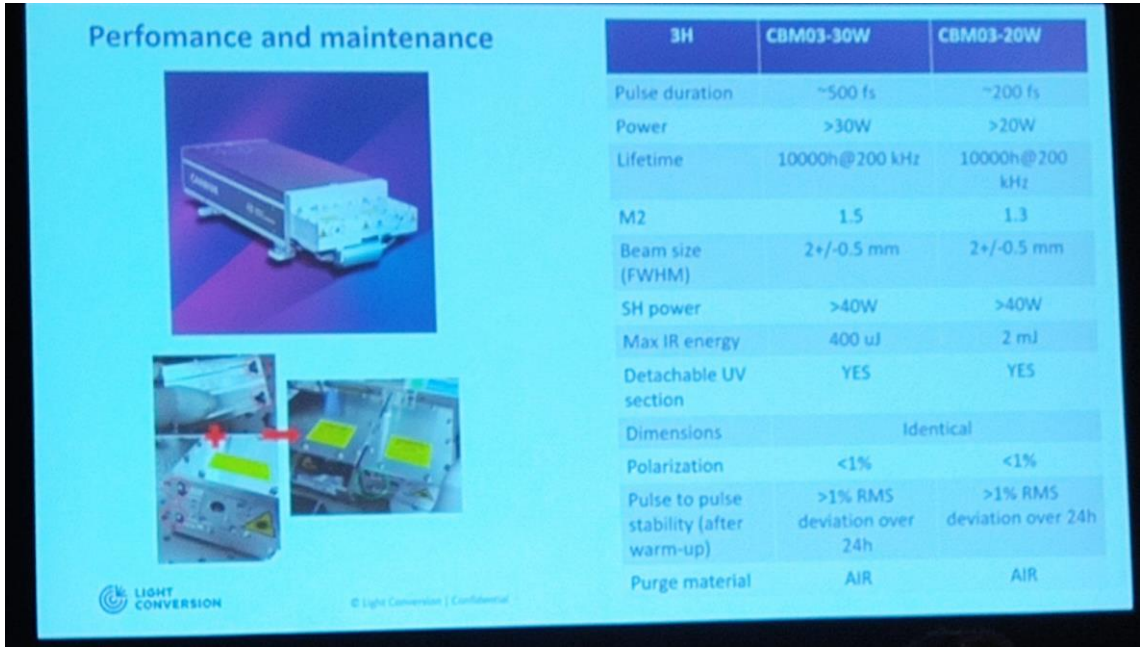
Soc. / Lab. Light conversion (Lit.)

Intérêts
- Lasers UV de chez Light Conversion

Informations clés

- Laser catalog in UV and deep UV
- 257nm square beam shaping
- 172nm

2 photos



31/01/2023 12411-44

300W femtosecond laser with USP compressed

Auteur(s) Clemens Hönninger

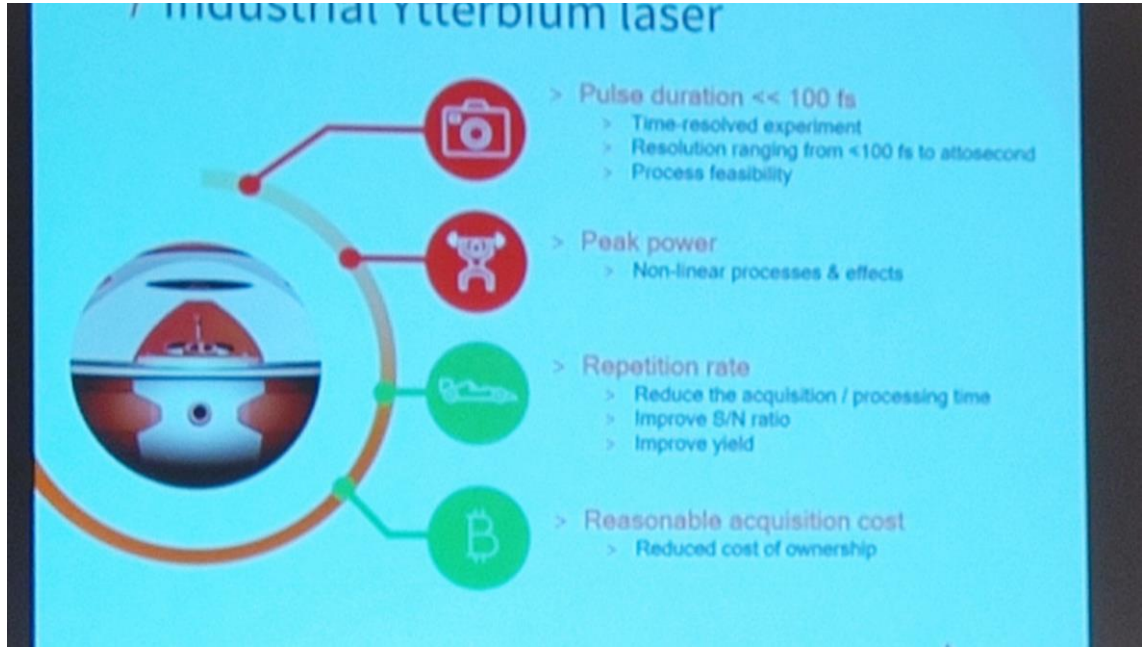
Soc. / Lab. Amplitude (Fr.)

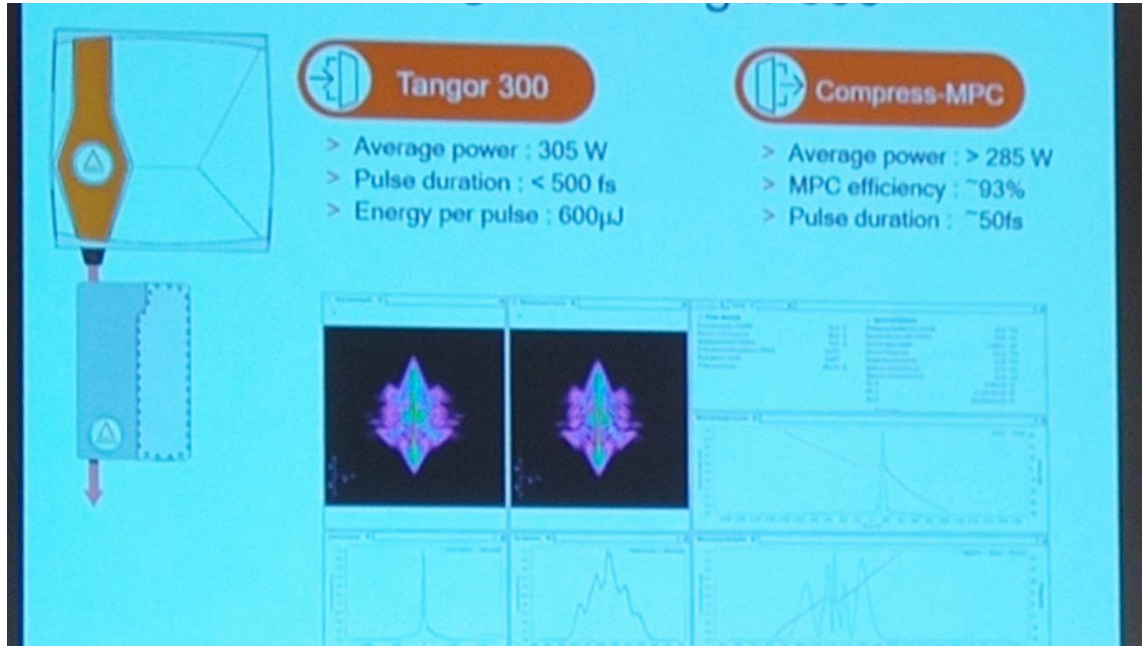
Intérêts
- Module de compression post laser des impulsions

Informations clés

3 photos

- Try to decrease pulse duration despite difficult with Ytterbium lasers => Development of a module for <50fs and >>100W
- Use of compress MPC (Multipass Cells) technology
- Demonstration with 300W station, 5days, 93% efficiency, 50fs, caustic a little bit degradated
- 100 W @ 343 nm





31/01/2023 12409-12

Towards mass production of functionalized plastic components via multi-beam nanostructuring of moulds

Auteur(s) Petr Hauschwitz

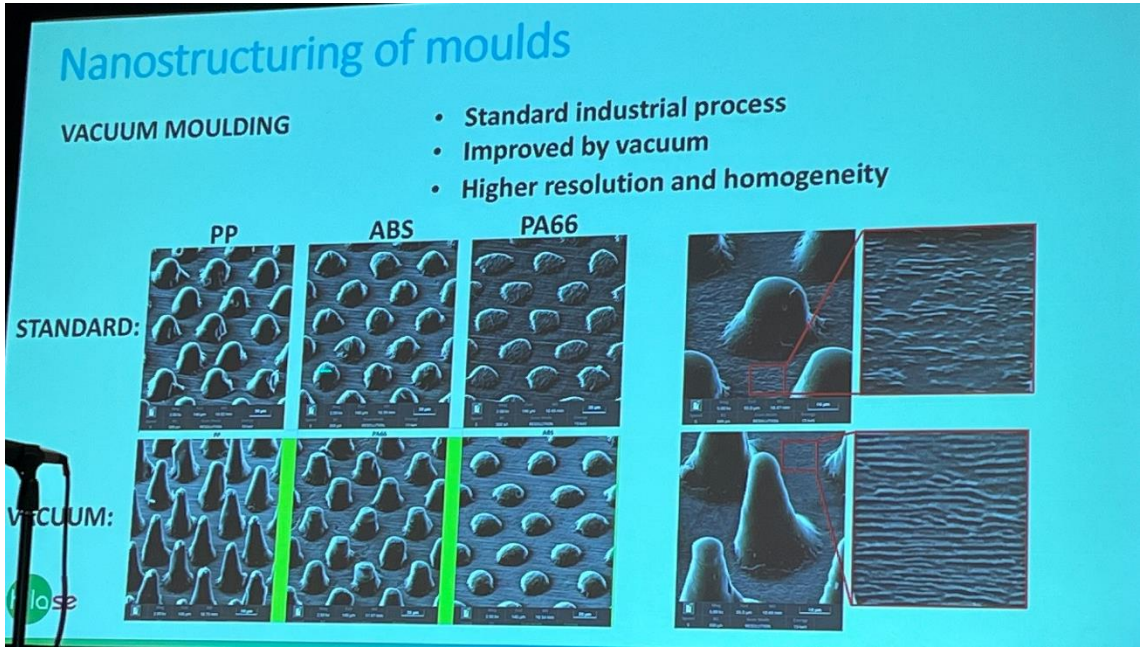
Soc. / Lab. Hilase (Rep. Tech.)

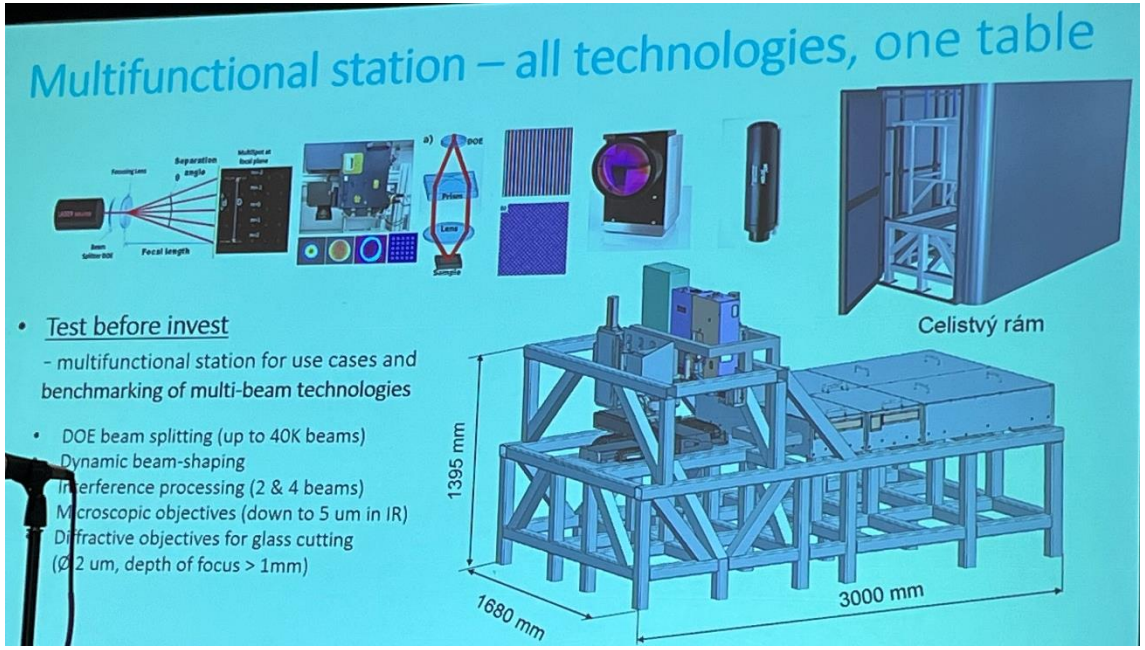
Intérêts
- Machine multi MEF
- Impact des conditions de démoulage

Informations clés

6 photos

- Hydrophobic :micro pillars 30-40µm pitch
- Parallel processing : DOE splitter / Interf. / DLIP Pulsar
- 900cm²/min with SLM ripples texturing on large field
- PP vaccum better moulding following of the nanostructures
- Antibacterial properties / Enhancement of cells migration by mimicking the native morphology of human tissue
- Soft touch feel surfaces
- New machine that groups all beam shaping technics





31/01/2023 12409-13

High precision drilling with aspect ratios 1:40 from laser source to application

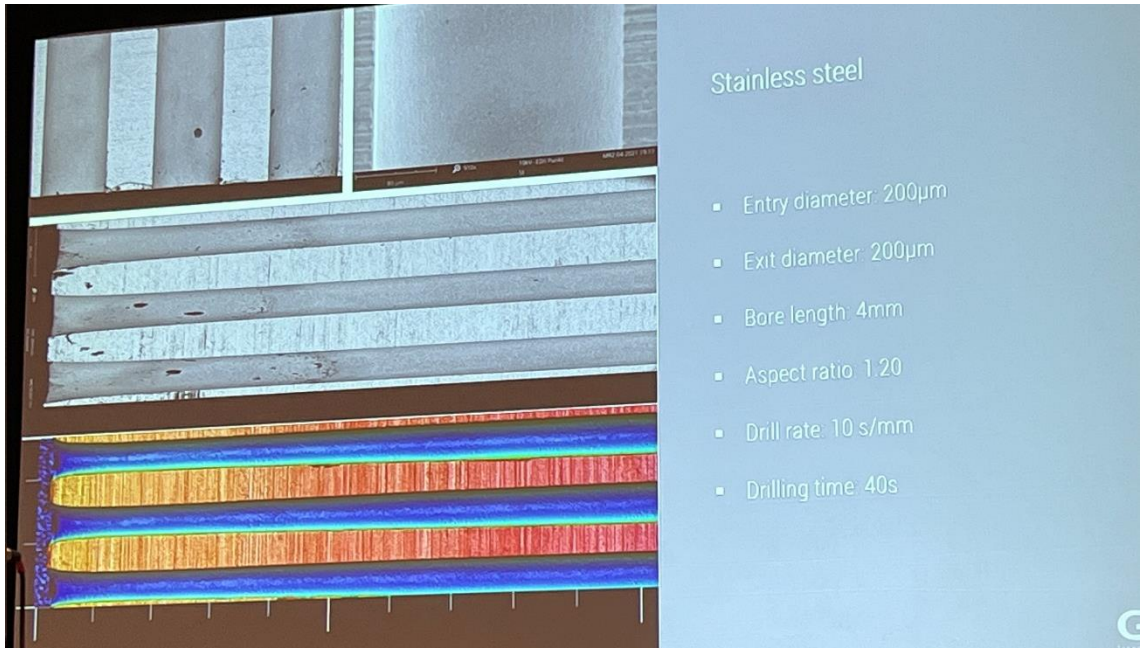
Auteur(s) Florian Lendner

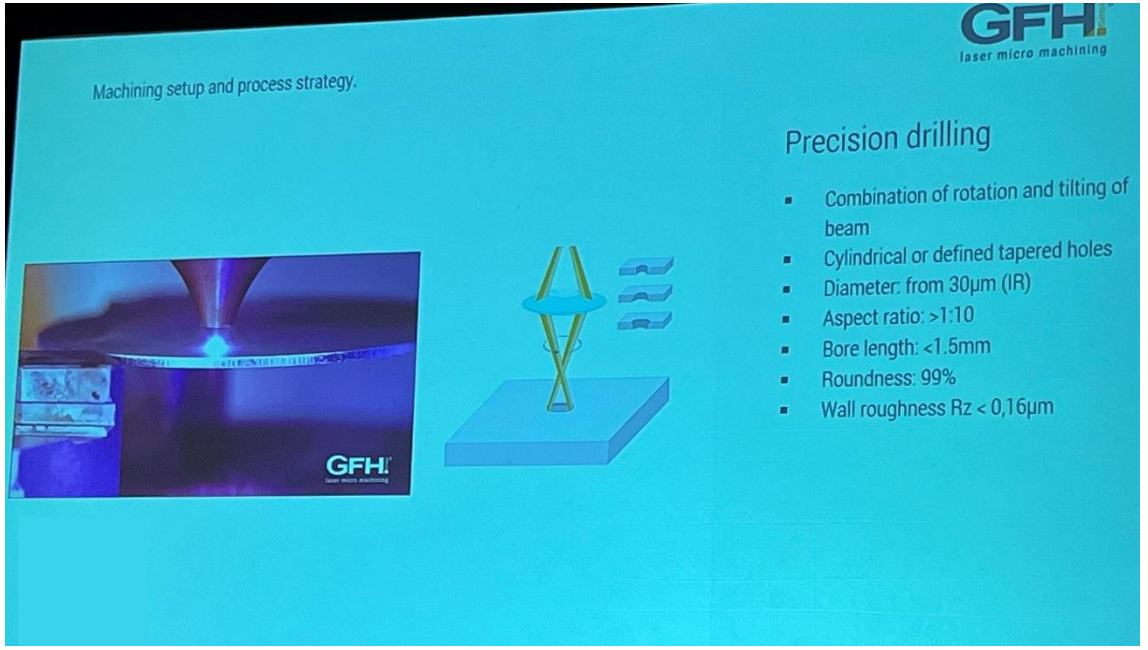
Soc. / Lab. GFH laser micro machining (Ger.)

Intérêts
- Nouveau système de précession
- Vendue uniquement avec une machine…

Informations clés *4 photos*

- Système de trépanation GL Trepan system. 30krpm
- Up to now, limited on the thickness. Now working with longer focusing (75µm that enables much longer depth (f250)). Done now that energies are sufficient (2mJ, 200W to get 20-25J/cm²)
- GL Trepan handles tens of mJ
- Z shifting mandatory
- Examples at 3ps, 2mJ, up to 6mm, 8-15s per mm. Around 300µm diameter : 30s 2mm Al2O3 ; Carbide 5mm 40s ;





31/01/2023 12409-14

Ultrashort pulse laser system for nanostructuring the inner copper surface of up to 15m long vaccum tubes

Auteur(s) Elena Bez

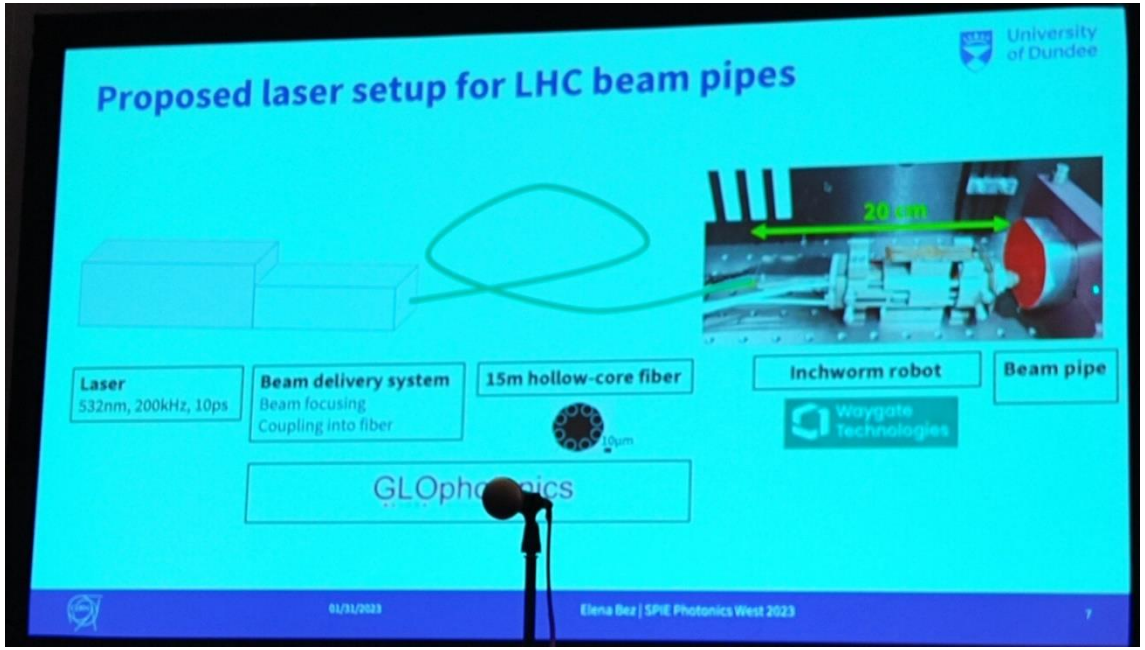
Soc. / Lab. CERN (Suisse) / Univ Leipzig

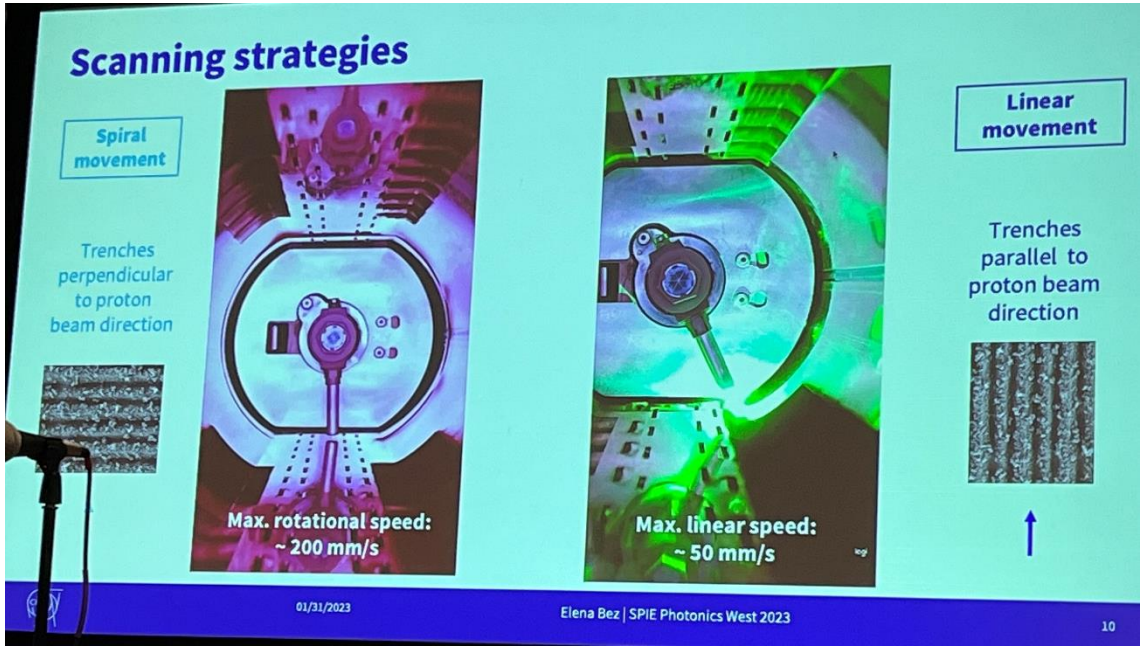
Intérêts
- Texturation ps intra-cylindre
- Fibrage laser

Informations clés

6 photos

- Improve signal quality of vaccum Cu tubes of CERN where protons are accelerated at around the speed of light : future upgrade of LHC phase in 2026.
- Technical challenge : 46mm diameter in 15m long
- Laser ps vert injecté par fibre dans un robot qui focalise + translate + rotate en même temps.
- Usinage de rainures de 50µm de pitch, 5-30µm profond
- Processing time : Few days per m





31/01/2023 12408-25

Stress control during USP laser for glass machining

Auteur(s) Hyungsik Kim

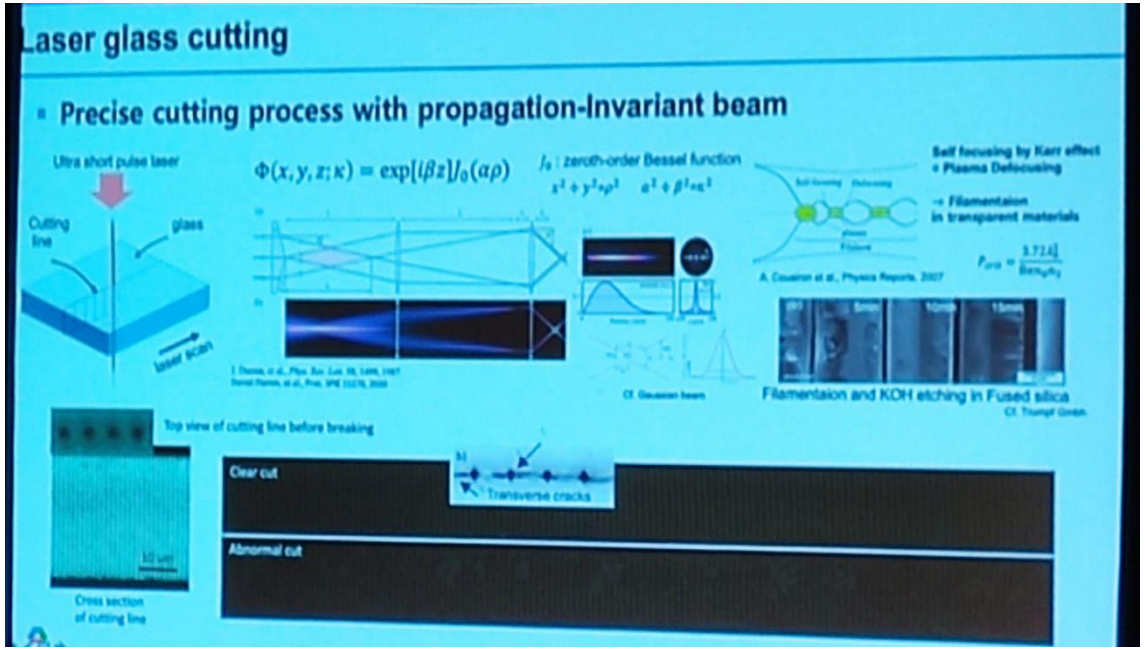
Soc. / Lab. Samsung Display (Cor.)

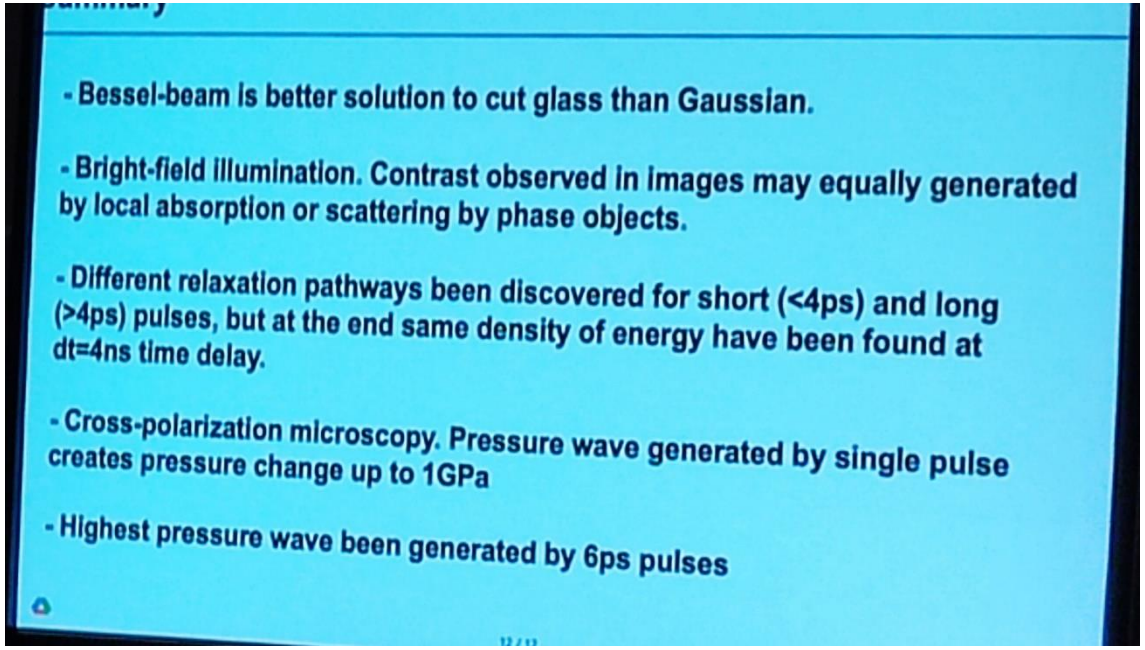
Intérêts
- Bessel Vert pour la découpe de verre
- Suite aux travaux de K. Mishchik

Informations clés

3 photos

- Bessel par SLM + prod in green 20µJ 300fs=>5ps NA0.3
- Time resolved plasma generation observation at high speed
- Crossed polarized light : direct stress visualization





31/01/2023 12408-26

Tailored edge laqser flass cleaving supported by thermal separation

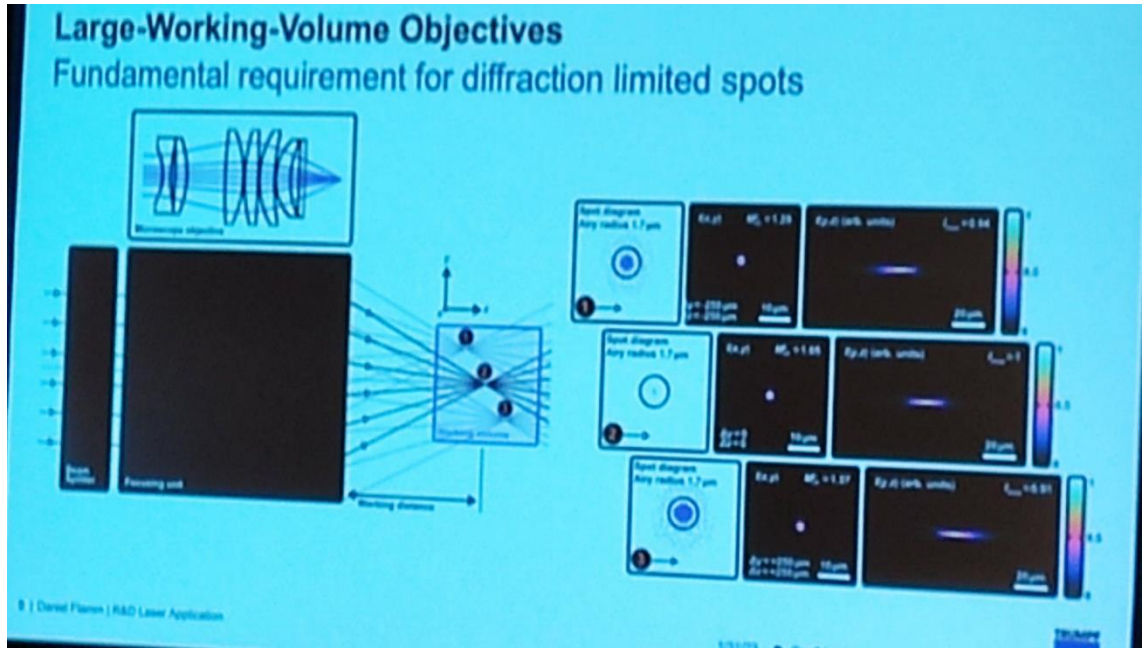
Auteur(s) Daniel Flamm

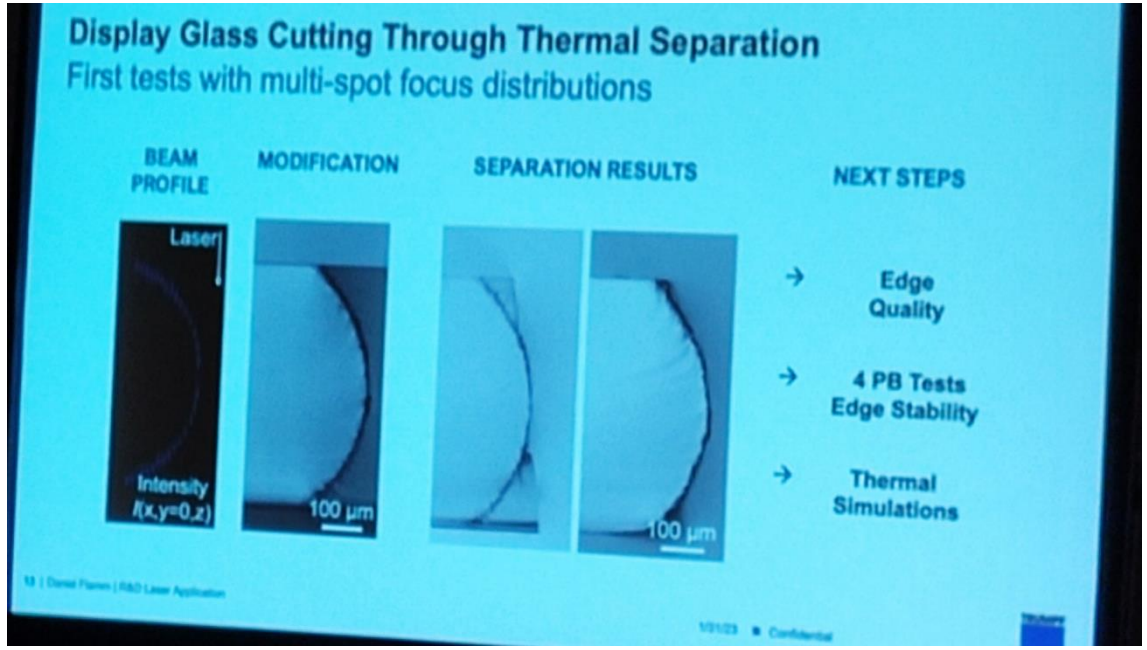
Soc. / Lab. Trumpf (Ger.)

Intérêts
- Découpe de verre par multipoint 3D
- Clivage par thermique laser CO2

Informations clés *7 photos*

- Multi foc dev en SLM puis DOE pour indus
- Faisceaux courbes non envisageables car requiert NA=1 dans les cas utiles.
- Objectif de microscope de focalisation dev sur mesure (7 lentilles) pour compenser les défauts d'aberrations pour la MEF 3D
- Résultats cleavage par CO2 par encore parfait sur des formes courbes





31/01/2023 12409-56

Increasing the ablation efficiency of metals using femtosecond fiber laser

Auteur(s) Bogus Stepak

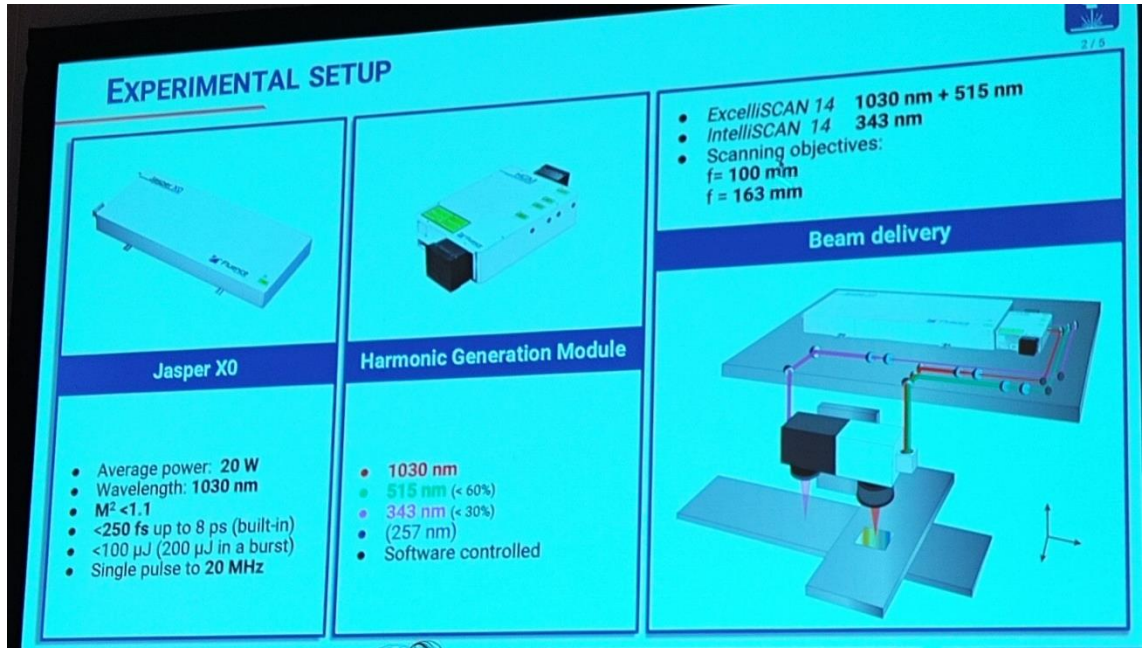
Soc. / Lab. Fluence technology (Pol.)

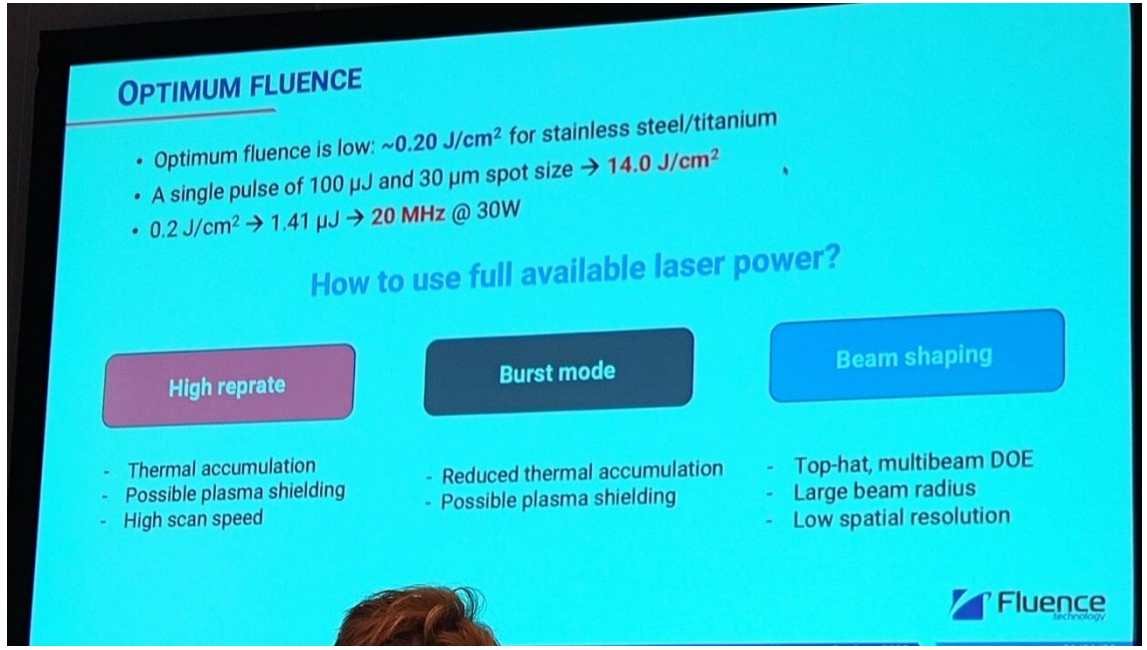
Intérêts
- Fournisseur laser non référencé

Informations clés

- Fluence technology company : laser & processing
- Steel milling : better ablation efficiency with 1spot rather than burst MHz (250fs)
- Ablation efficiency of steel (mm3/(W.min)) ref B. Neuesschwander

2 photos





31/01/2023 Inc.

Directional broadband emissivity with fin-shaped microstructures produced via femtosecond laser surface processing

Auteur(s)

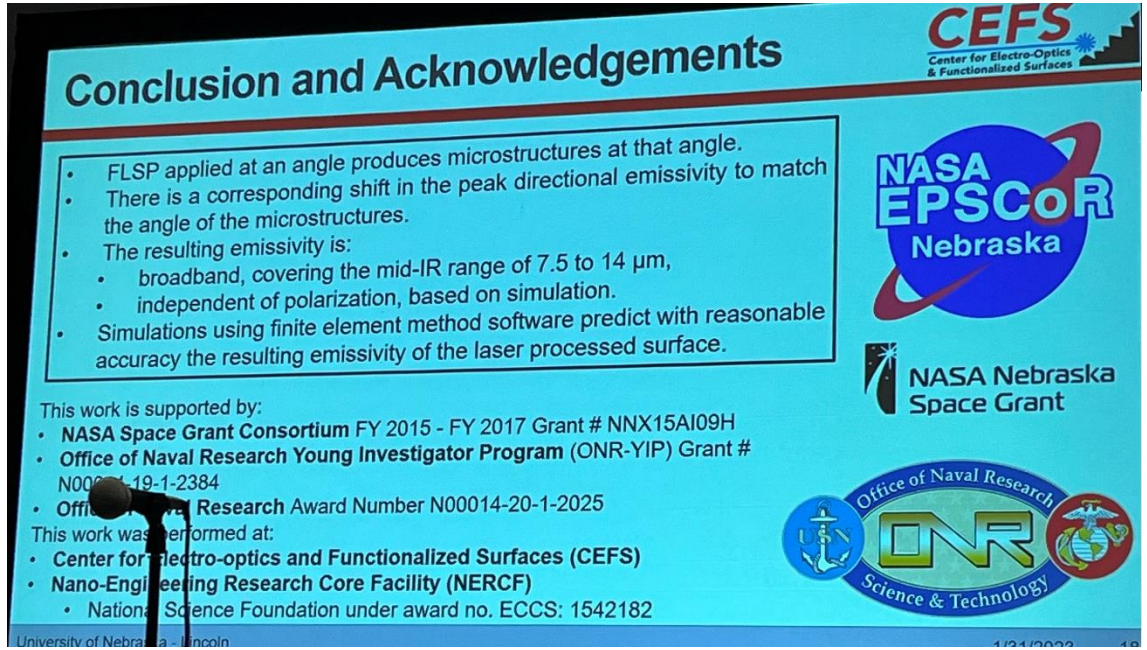
Soc. / Lab. CEFS Nebraska (US.)

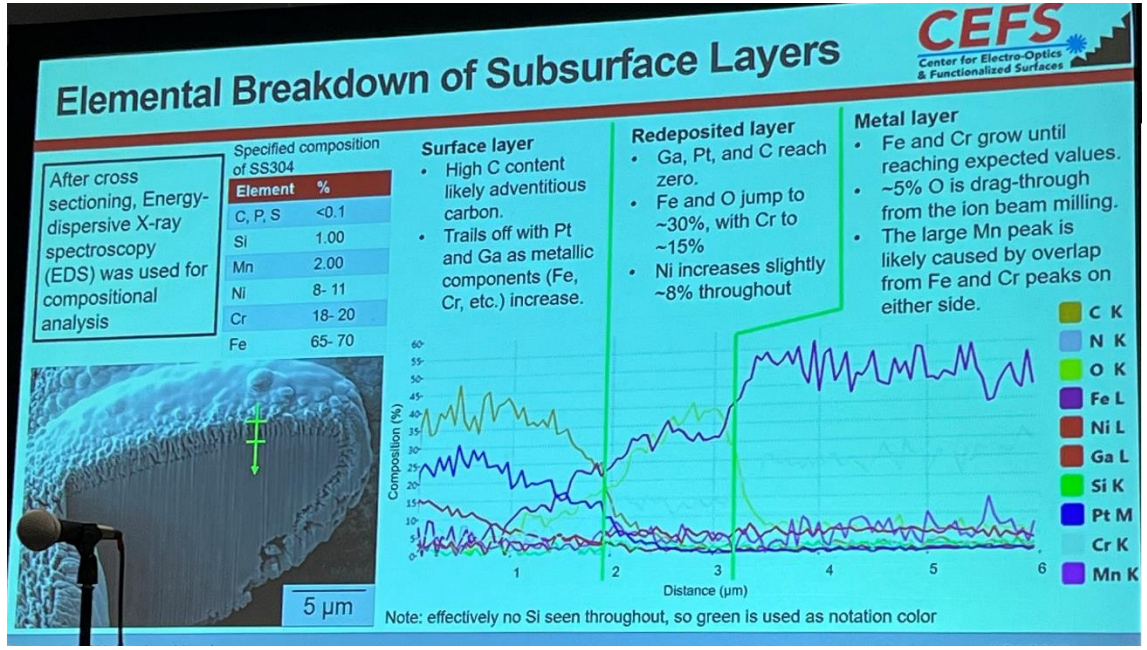
Intérêts
- Moyen de caractérisation sub surface

Informations clés

1 photos

- EDS : energy dispersive X ray spectoscopy (EDS) powerful to measure element composition of the textured surface with sub µm resolution





31/01/2023 12409-56

Increasing the ablation efficiency of metals using femtosecond fiber laser

Auteur(s)

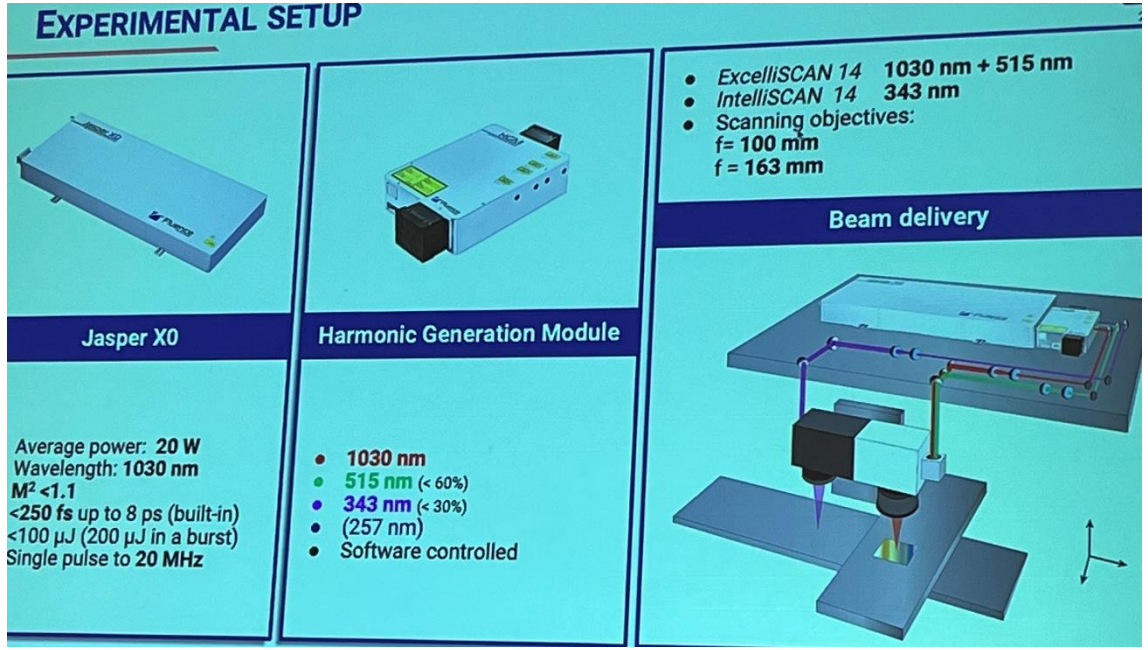
Soc. / Lab. Fluence Technology – Pologne

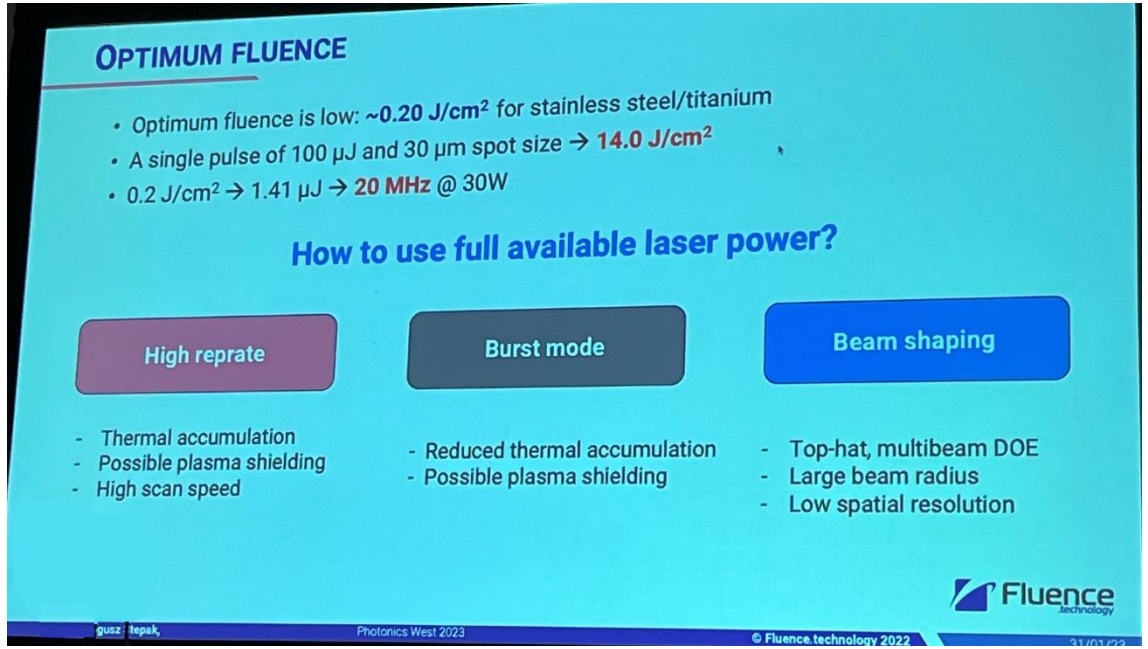
Intérêts
- Fabricants de lasers femtosecondes

Informations clés

- Essais en burst 20 MHz (seeder). Ils partent du principe que pour l'inox on a besoin de 0,2 J/cm² hors on peut avoir avec leur setup jusqu'à 10 J/cm² donc ils passent en Burst Mhz pour gagner en efficacité et balayent entre 2 et 4 m/s.

2 photos





31/01/2023 12408-28

Metallic microdots patterning with laser induced forward transfer

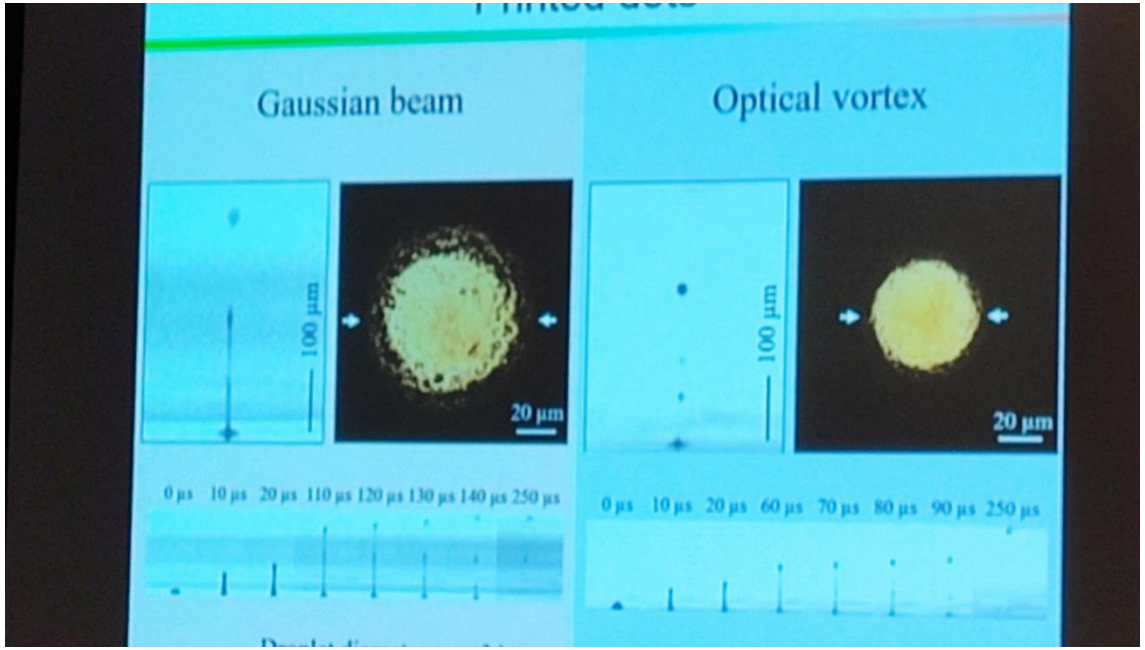
Auteur(s) Haruki Kawaguchi

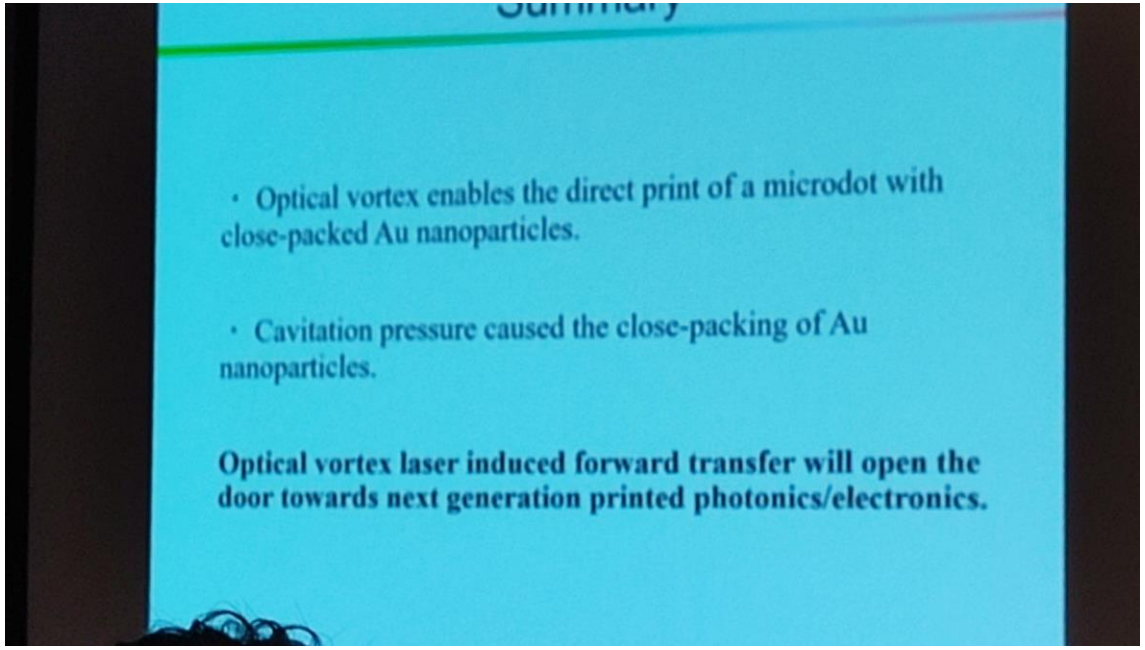
Soc. / Lab. Chiba Univ. (Jap.)

Intérêts
- LIFT technique
- Utilité du vortex

Informations clés *2 photos*

- LIFT technic. Depot de microdroplets (Laser Induced Forward Transfer). Tir laser dans le dos d'une cible. Ejection de matière et dépôt sur une seconde surface
- Vortex améliore la résolution de la bille vs gaussian => perspectives d'amélioration et de dépasser l'existant par de tels vortex





30/1/2023 12401-501

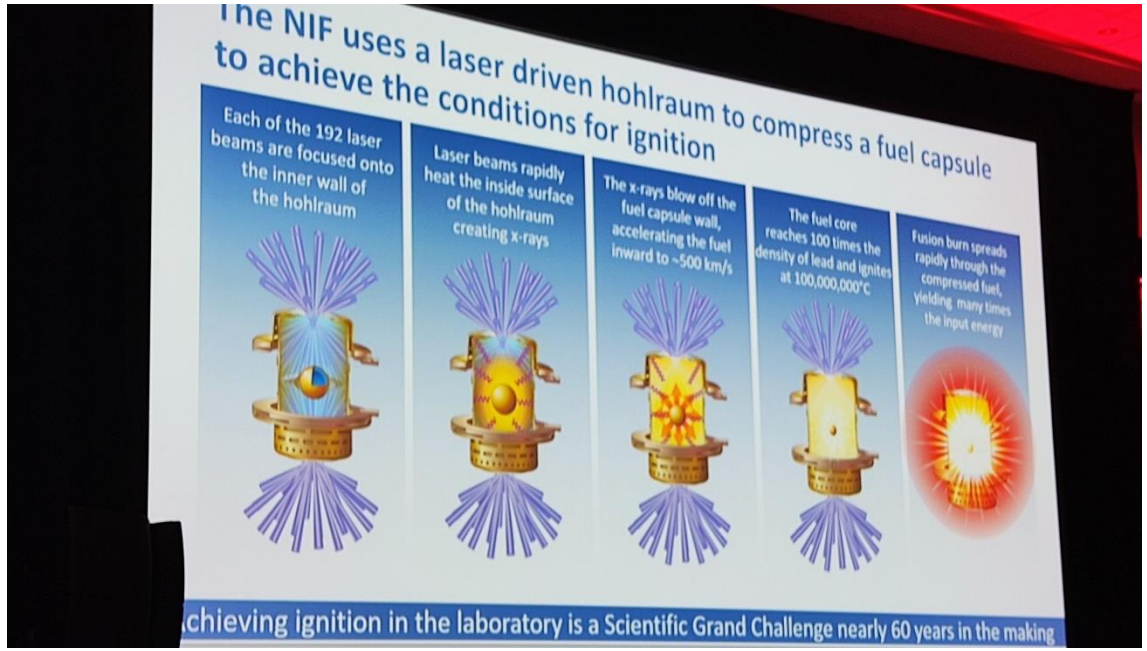
First demonstration of fusion ignition at NIF

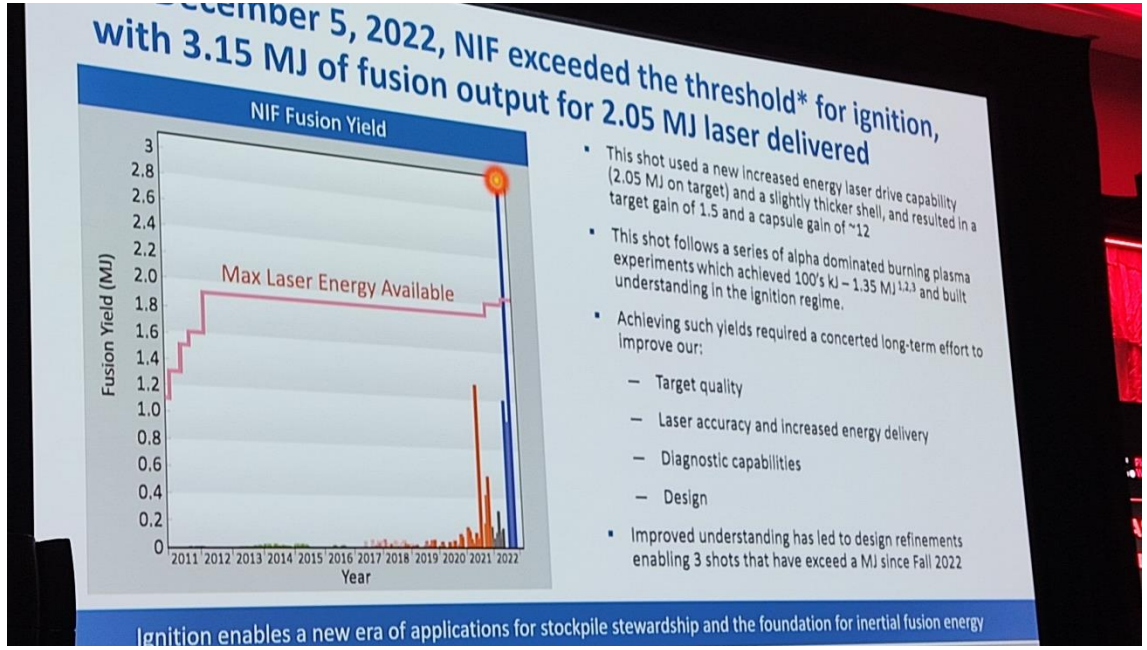
Auteur(s) Jean Michel Di Nicola

Soc. / Lab. NIF

Intérêts
- Derniers résultats de fusion nucléaire

Informations clés *10 photos*





Mercredi 01-02-2023

01/02/2023 12401-1

LMJ 2023 Facility status

Auteur(s) Vincent Denis

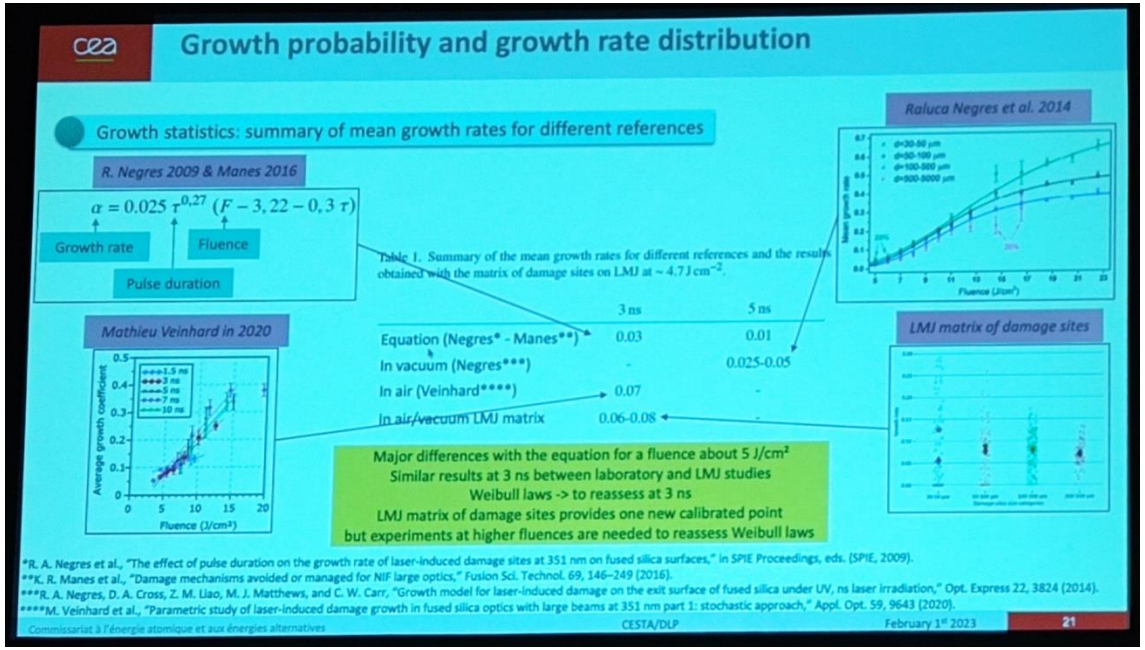
Soc. / Lab. IOGS (Fr.)

Intérêts
- Résultats d'avancement

Informations clés

1 photos

- Décevant



Optical vortex laser material processing technologies

Auteur(s) Takashige Omatsu

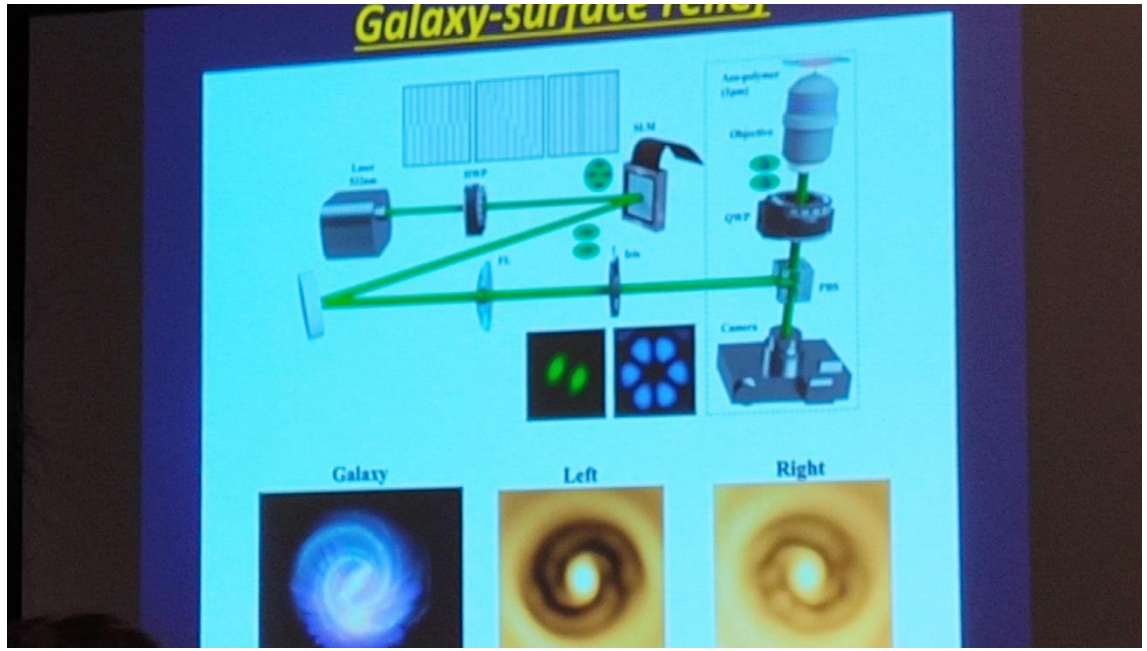
Soc. / Lab. Chiba University (Jap.)

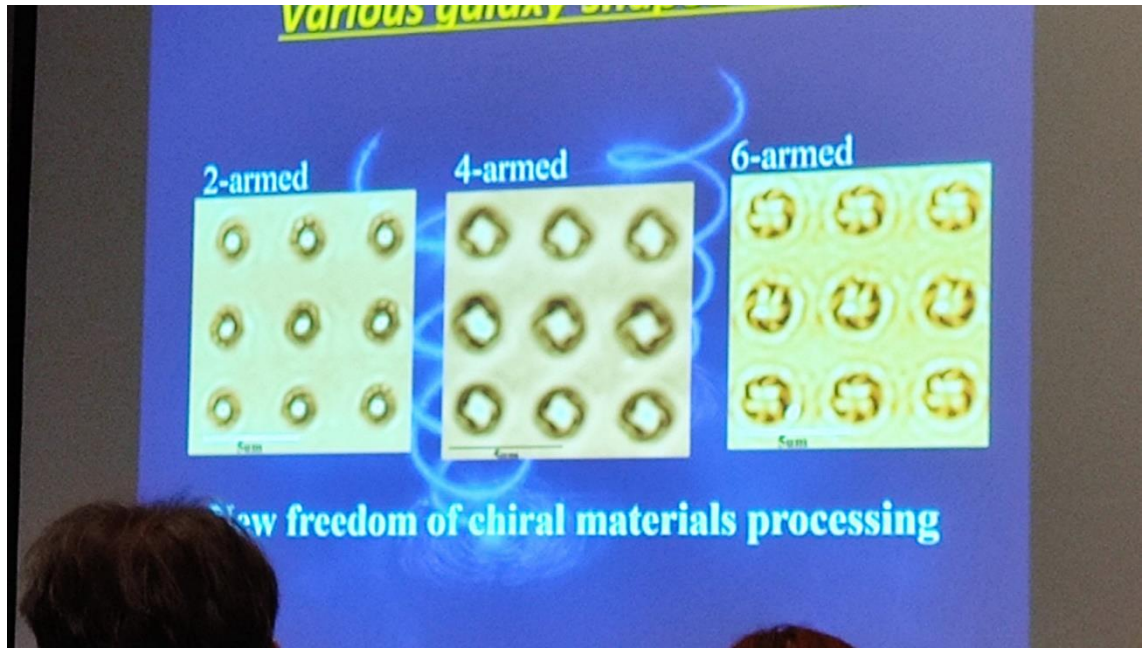
Intérêts
- Référence dans l'utilisation de faisceaux vortex

Informations clés

6 photos

- Spiral wavefront
- Green light – hundreds of mW
- ! Linear polarized laser do not enable creating chiral structures
- Mainly biological applications : chiral crystallisation, trapping, achiral crystals. Also LIFT (cf conf precedente liée)
- LIFT : shoot a l'arrière d'une surface et recup de la particule sur une seconde surface.
- NA 0.05 => NA 0.35 : dropplets of down to 7µm diameter
- Interested of collaborations with big JAPANESE project
- Question : what pulse duration to enable printing of chiral? Typical 5-10ps to have the time to imprint the chirality





01/02/2023 12408-32

Creating effiencient nanogratings buried in silicon through laser nano lithography

Auteur(s) Alperen Satik

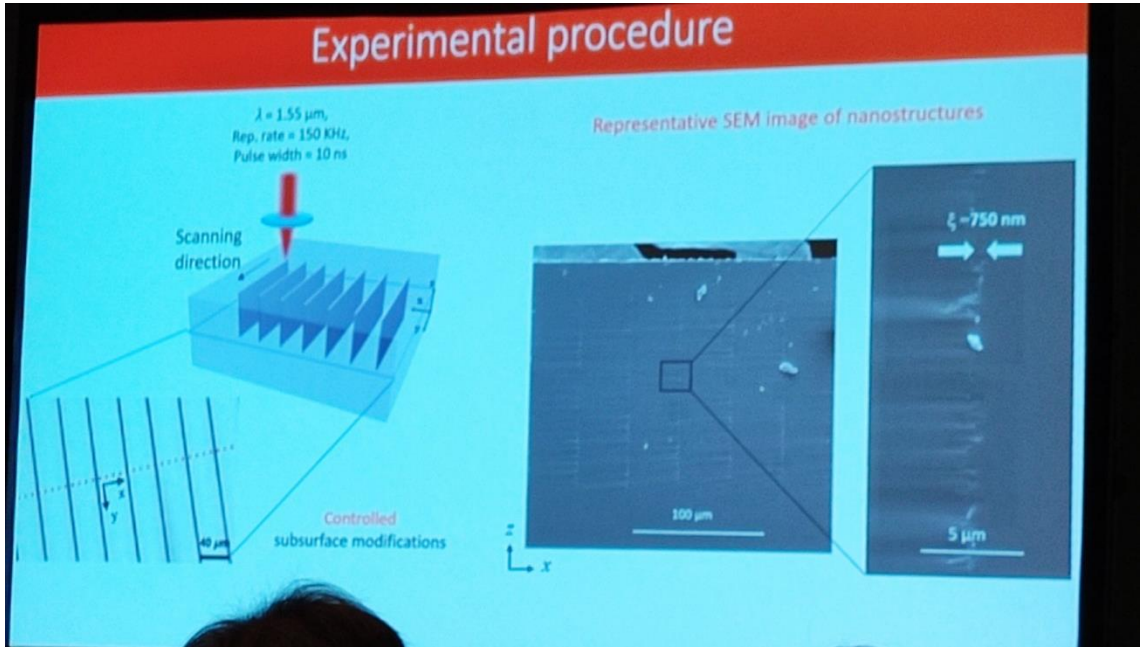
Soc. / Lab. Bilkent University, Turk

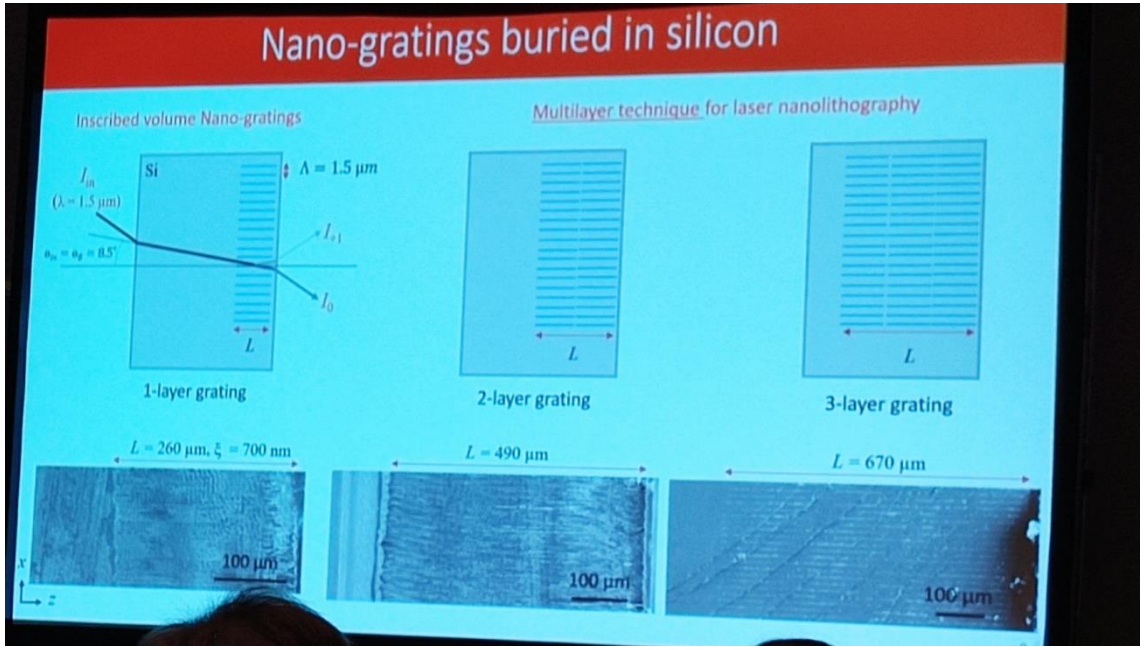
Intérêts
- Bessel @1,55µm pour Silicium

Informations clés

- Use of SLM for a Bessel beam generation
- Inside marking of Silicon + Chem. Etching => 100nm large channels with high aspect ratios.
- Patent a nano-scale lithography method US 17840023 2022
- Periodicity of 7µm => grating a bragg diffractive pattern @1.55µm
- Periodicity of 1.5µm and 600µm deep => diffraction efficiency 82%

4 photos





01/02/2023 12408-33

Tribological properties improvement of stainless steel and nickel samples at large scale thanks to beam splitting with a fs laser

Auteur(s) Gwenn Pallier

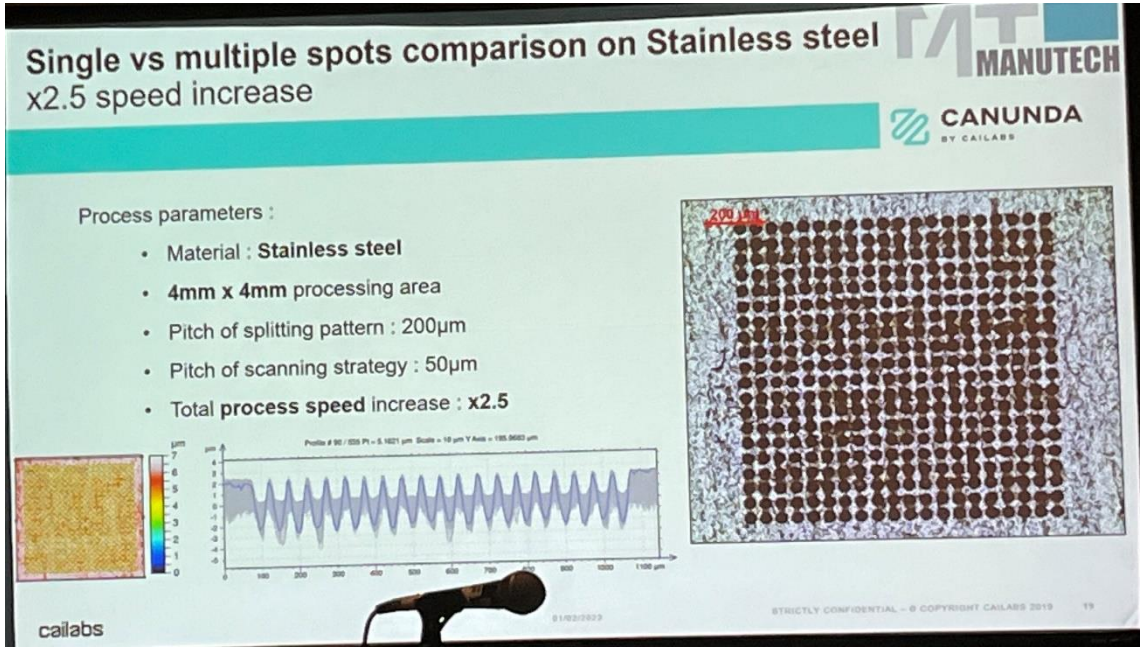
Soc. / Lab. CAILabs

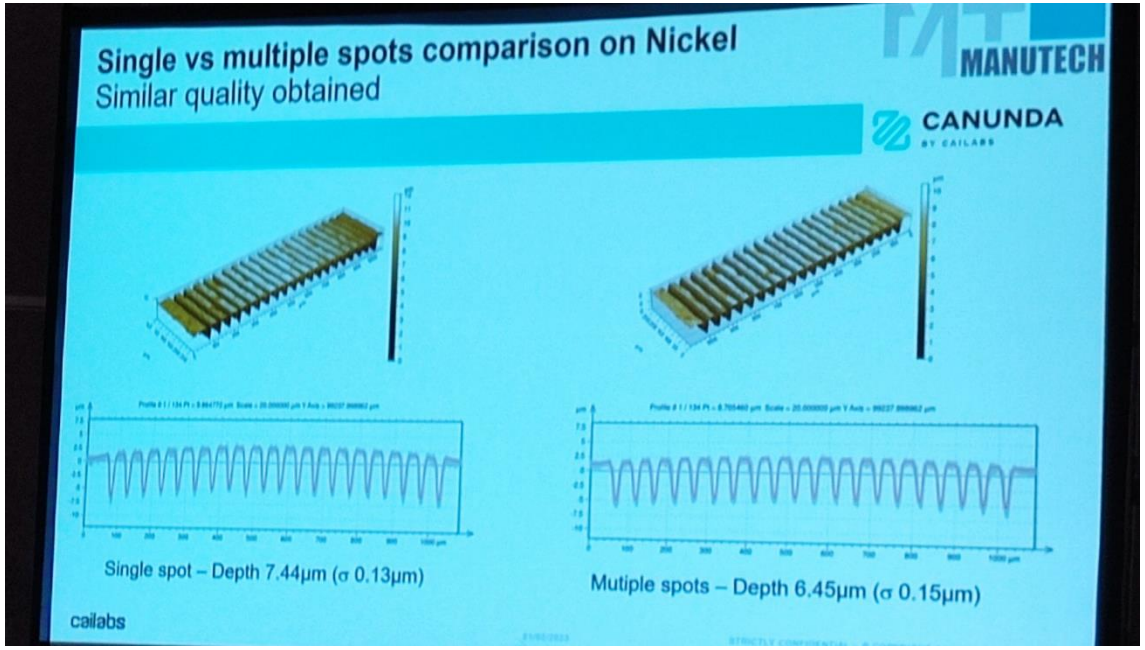
Intérêts
- Résultats Manutech Multipoint MPLC

Informations clés

- Question : pulse duration comparison to be tested

5 photos





01/02/2023 12408-34

Ultrafast laser plateform providing dynamic peak and energy deposition control : from laser source to industrialisation

Auteur(s) Steffen Ruebling

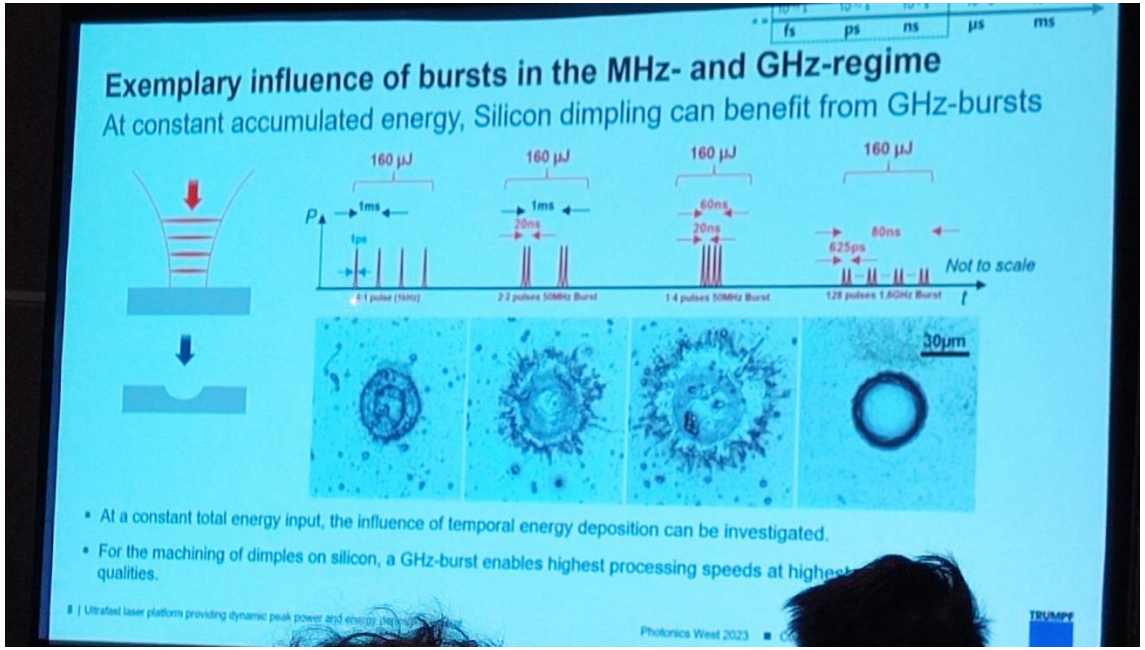
Soc. / Lab. Trumpf (Ger.)

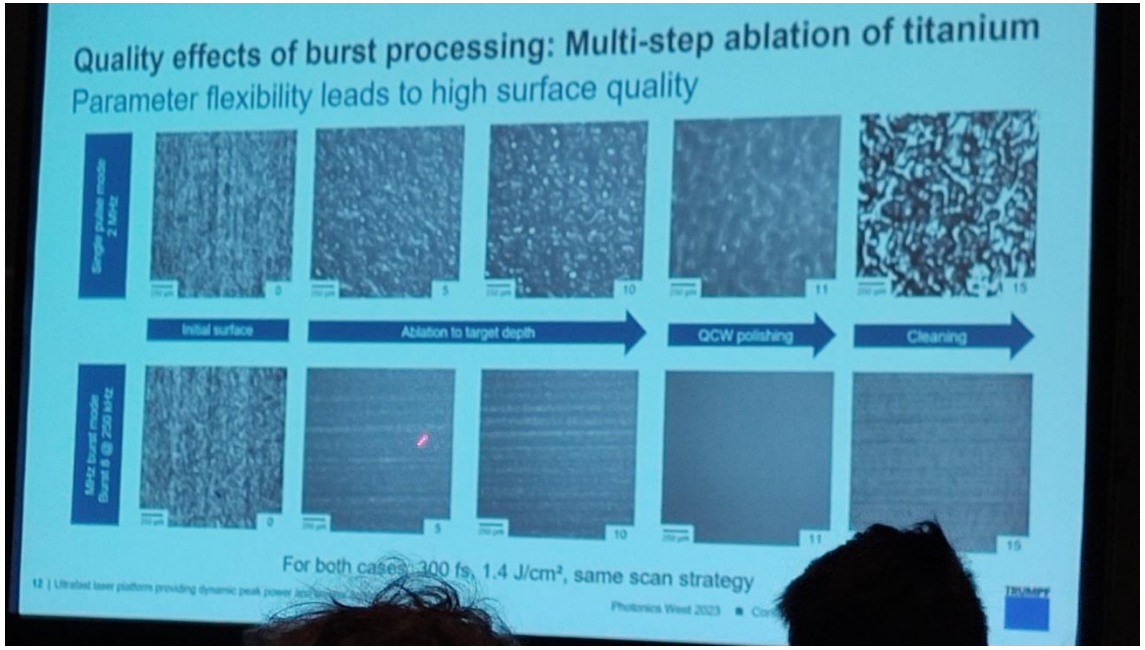
Intérêts
- GHz Burst pour le polissage

Informations clés

3 photos

- Silicon : GHz burst regime better quality (160µJ) (<ns pulses)
- ! Depending on materials, GHz burst not far from ns pulse durations
- Titanium polishing more efficient with MHz/GHz bursts. (QCW polishing = high frequency) => Decrease of the roughness





01/02/2023

Femtosecond GHz-burst laser processing for percu

Auteur(s)

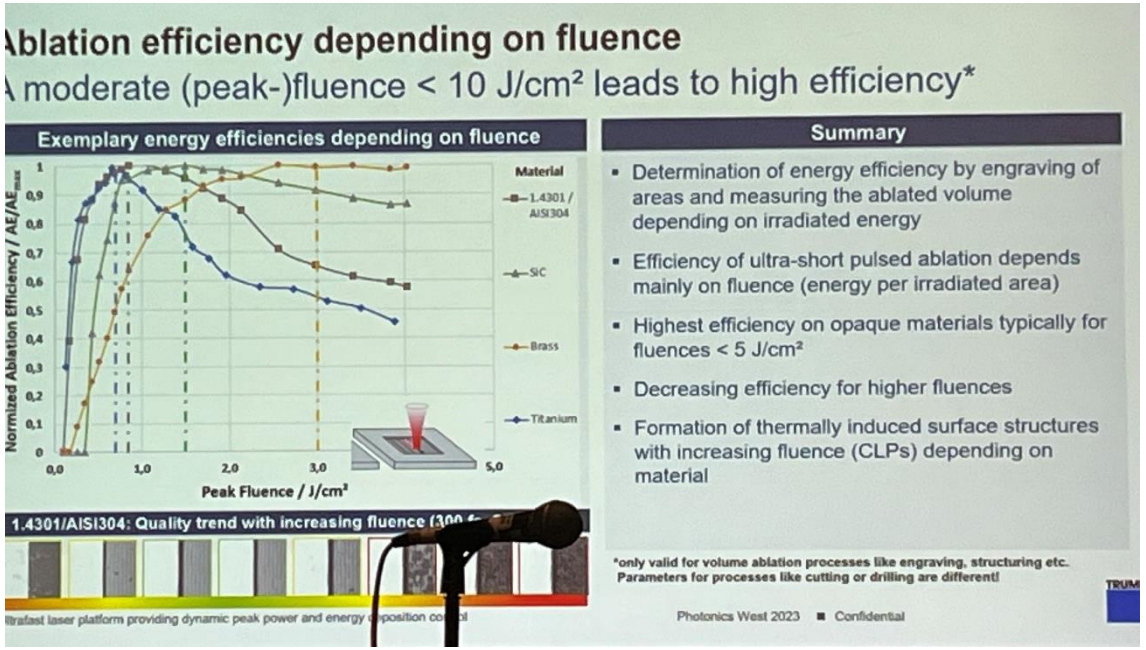
Soc. / Lab. Trumpf

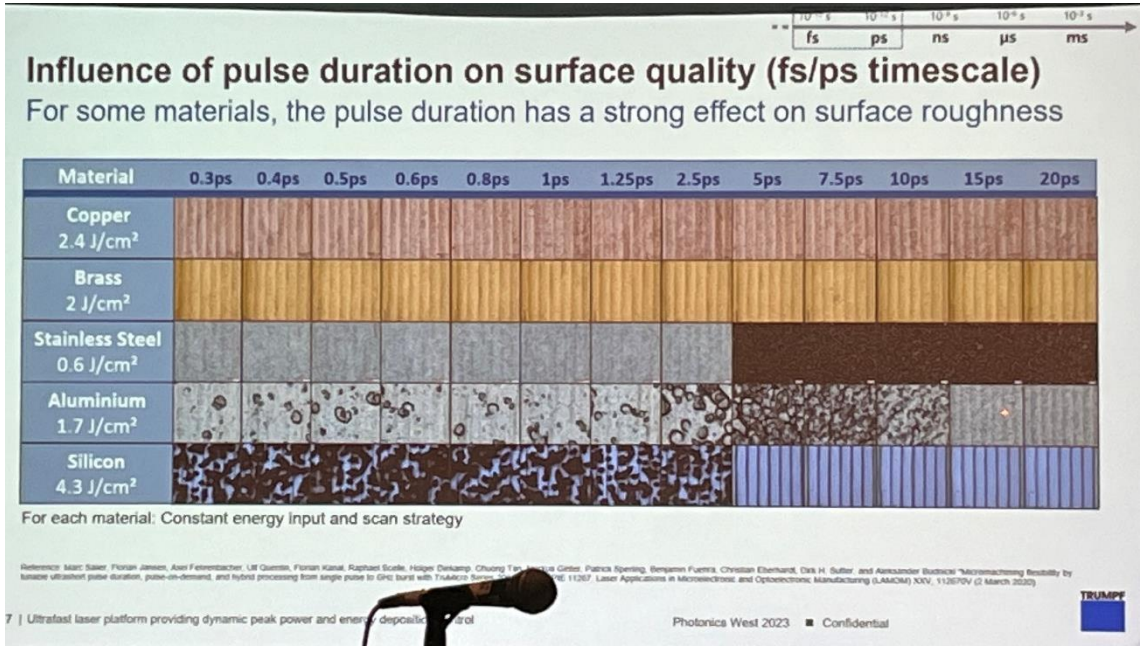
Intérêts
- Burst / Taux d'ablation

Informations clés

5 photos

- En fonction des matériaux, un gros impact de la durée d'impulsion. En Pico, on voit que 5 J/cm² c'est suffisant





01/02/2023 12408-35

Microstructuring in metals using a UV laser microspot scanning system

Auteur(s) Astrid Sassmannshausen

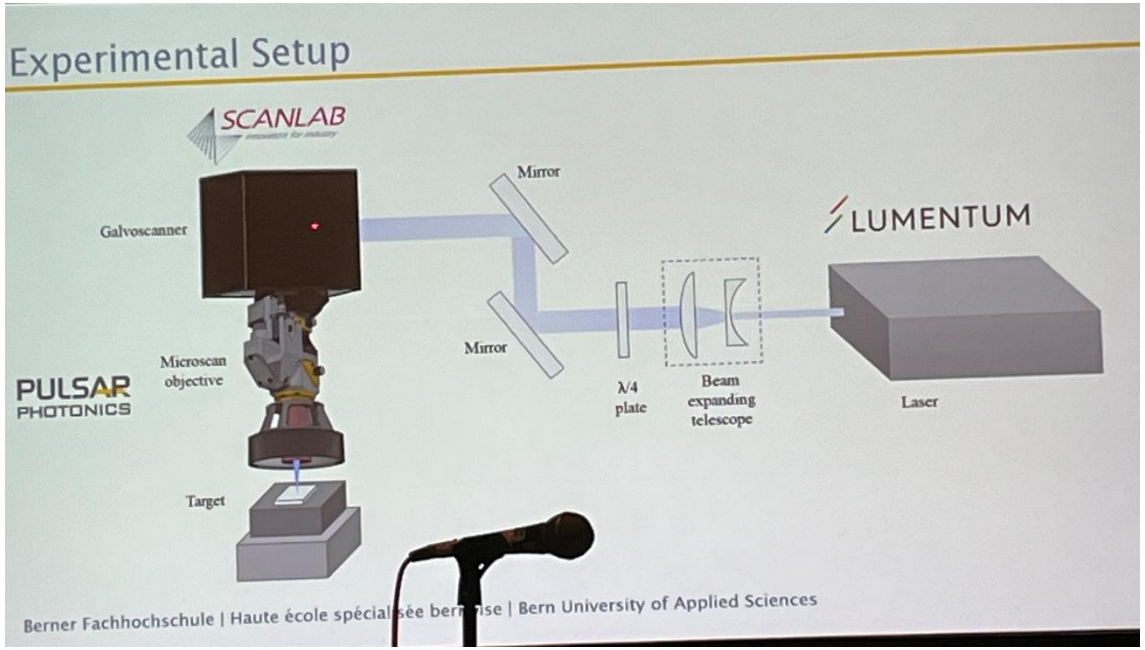
Soc. / Lab. RWTH Aachen (Ger.)

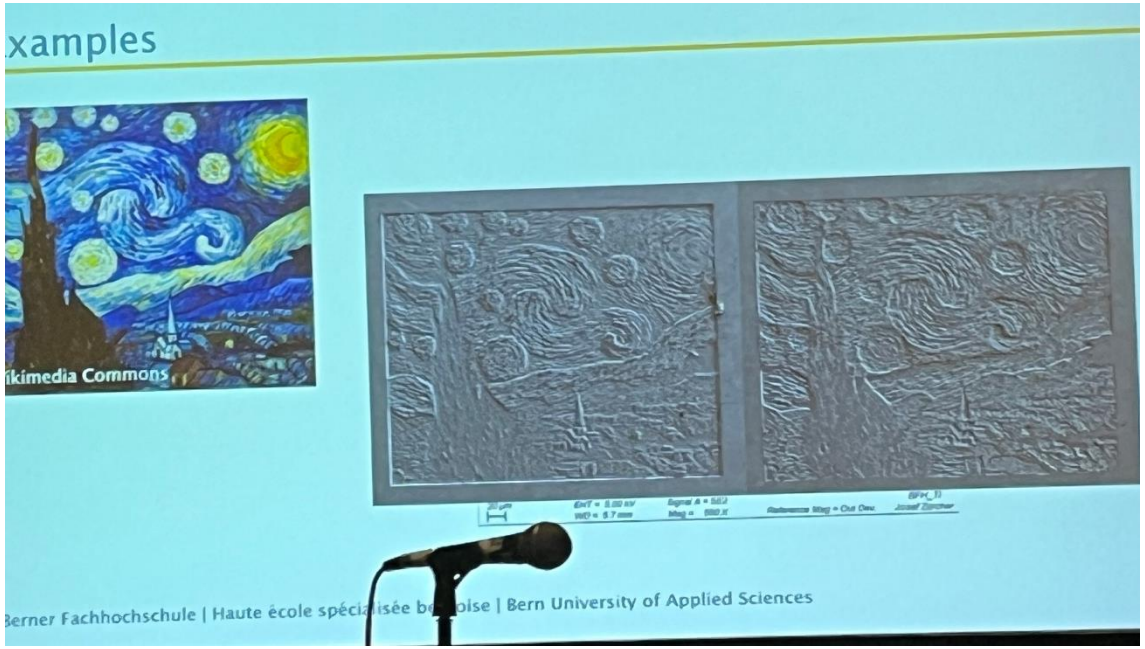
Intérêts
- Taille d'impact min pour usinage

Informations clés

6 photos

- How small can we reach with single spot ablation
- Laser Lumentum + Microscan 10mm objective UV (Pulsar Photonics)
- Focal spot radius of 0.78µm!
- 1MHz – 40Layers – 4.4J/cm² Switzerland 400µm large
- Percussion drilling <1.6µm in 10µm foils
- Field microscan : 500x500µm
- B. Neuenschwander, Physics Procedia 41, 787-794, 2011





01/02/2023 12409-24

Laser structuring of électrodes in roll to roll environment using multibeam processing : process upscaling and its perspectives

Auteur(s) Alexandra Meyer

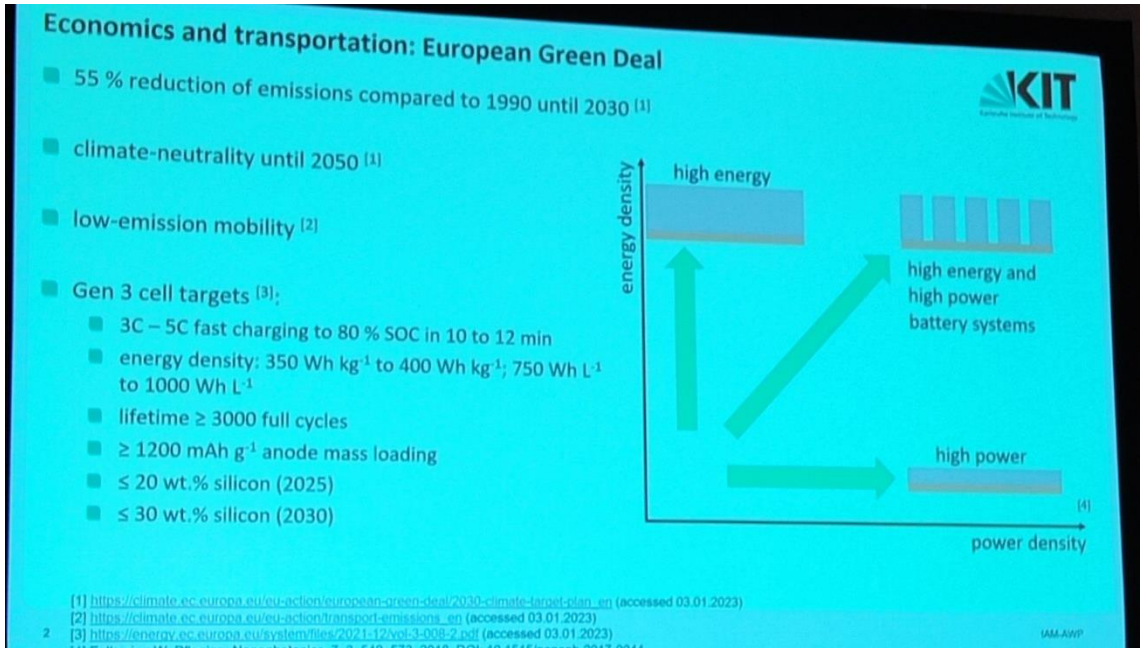
Soc. / Lab. KIT Karlsruhe Institute of Technology (Ger.)

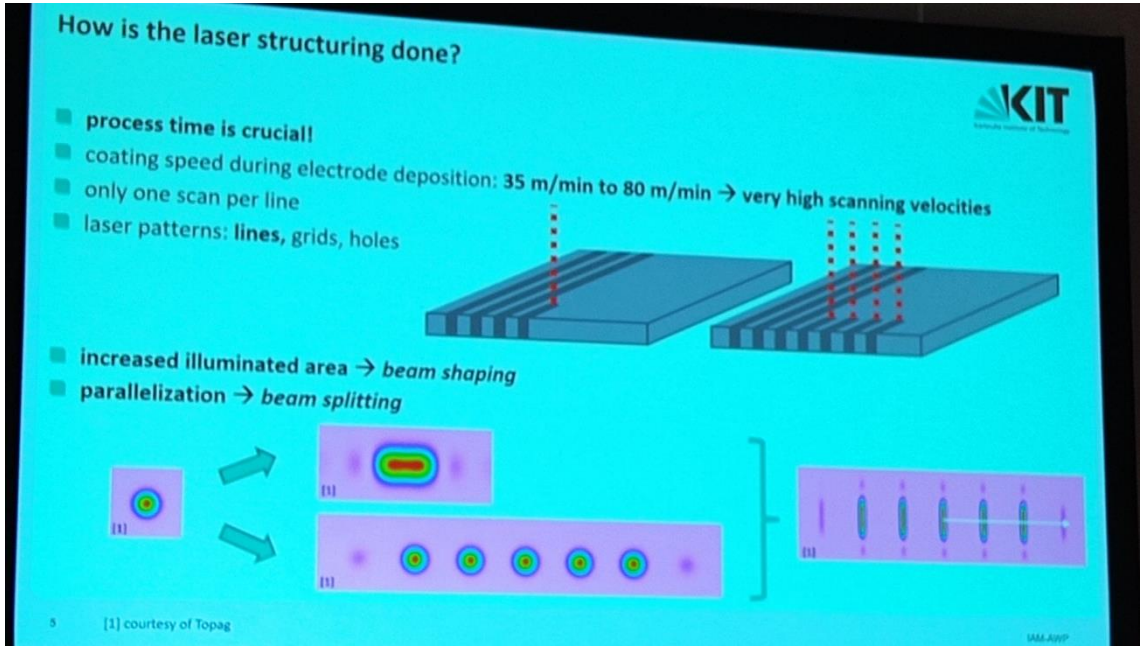
Intérêts
- Thématique batteries
- Upscaling par MEF

Informations clés

8 photos

- 3 batt next gen project
- USP to PS range to limit thermal effects
- Edgewave FX600 600fs 300W M^2<1.1 f420mm 3mm output beam
- 2 setups : one single spot (S1) ; 2 beam shaped (S2 small line ; S3 : same but with beam splitting)
- Several graphs of ablation depths / aspect ratio vs rep.rate & power
- S4 : ps test ; S5 : ns Ghz bursts





021/02/2023

Surface functionalisation of transparent materials by selective laser etching

Auteur(s)

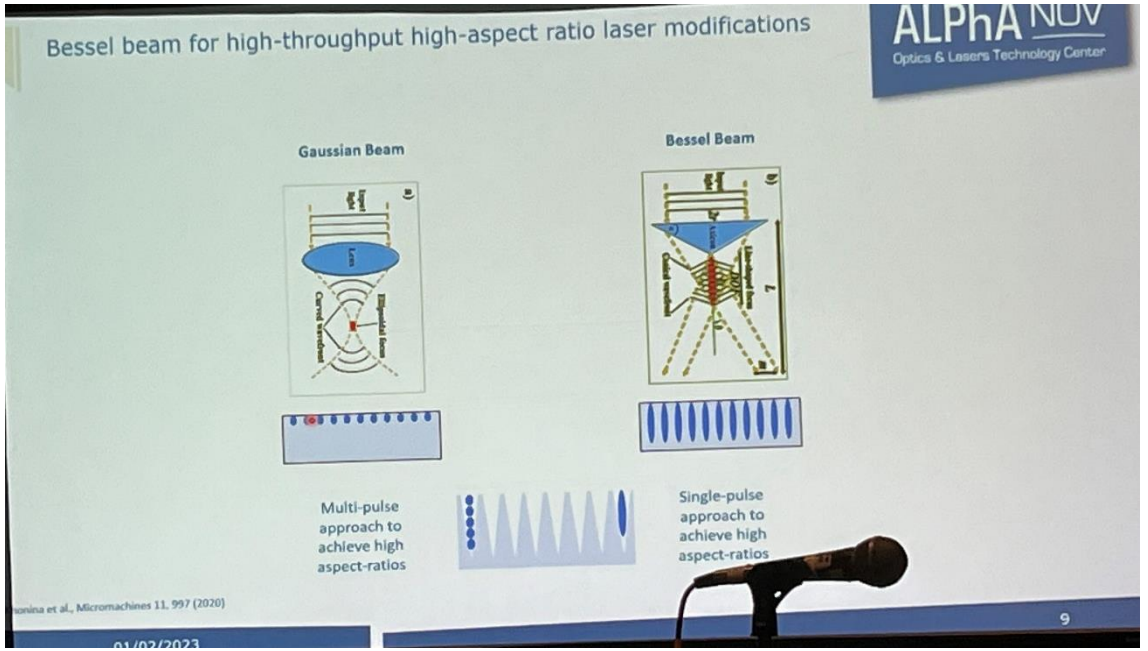
Soc. / Lab. Alphanov

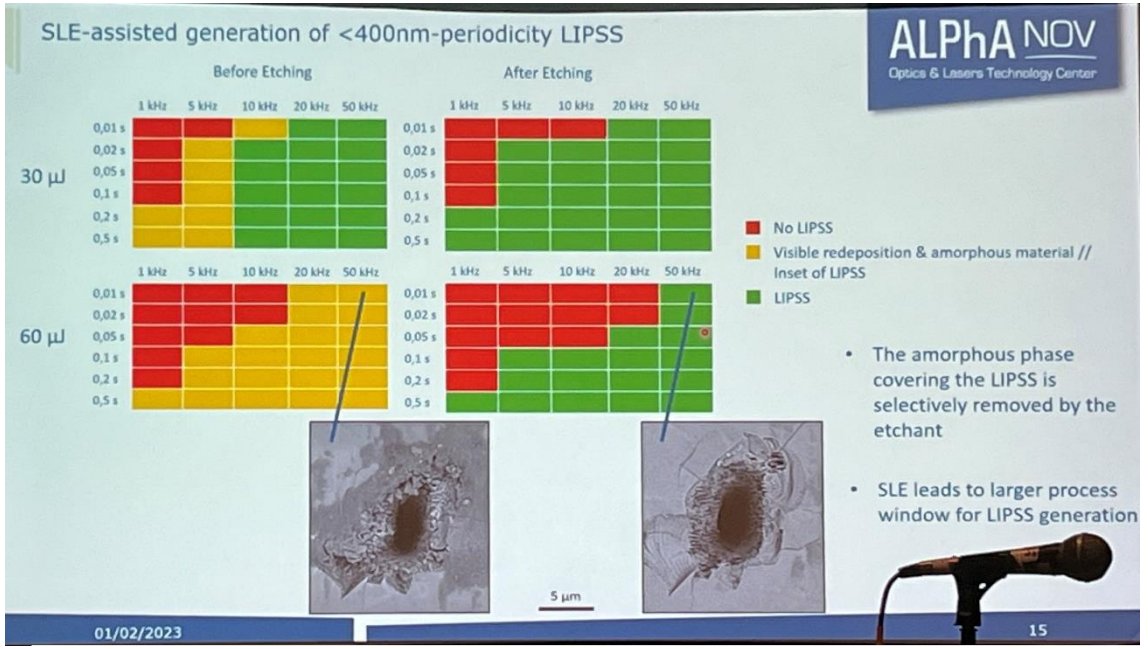
Intérêts
- Faisceau de Bessel

Informations clés

5 photos

- Gravure sur sapphire à base de faisceaux de Bessel en IR, avec un Yuja.
- Les premières gravures sont plus longues à réaliser que les suivantes.
- Apparition de ripples dans des configurations particulières.
- Process assez long qui ne permet pas de traiter de grandes surfaces





01/02/2023 12409-25

Laser patterning and electrochemical characterization of thick cathodes for lithium ion batterie

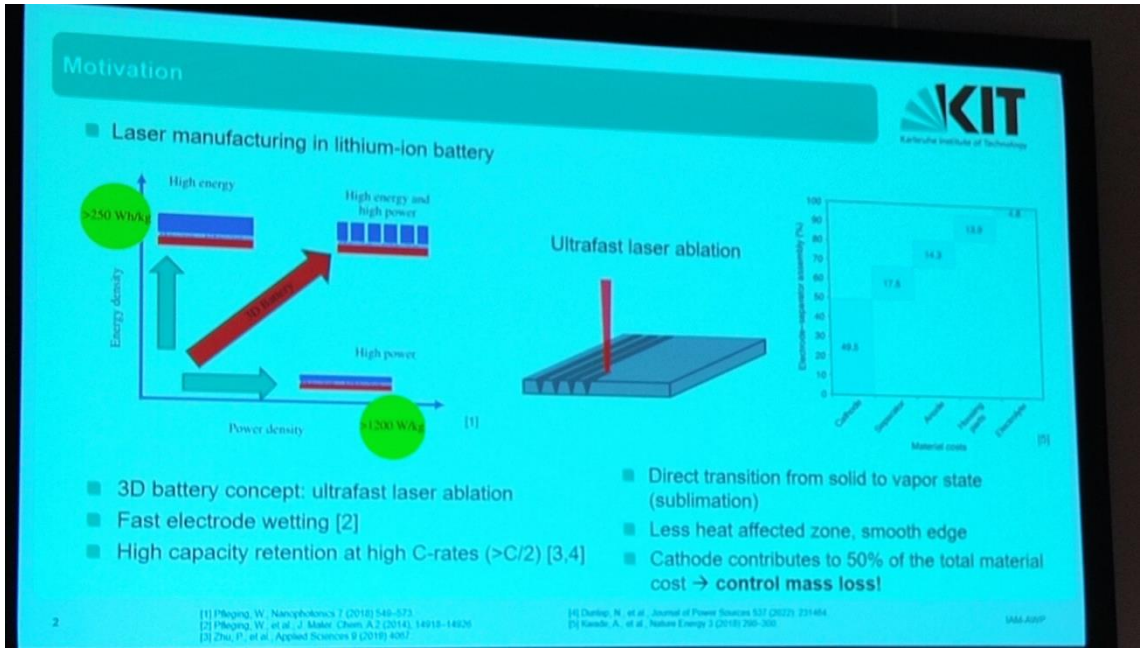
Auteur(s) Penghui Zhu

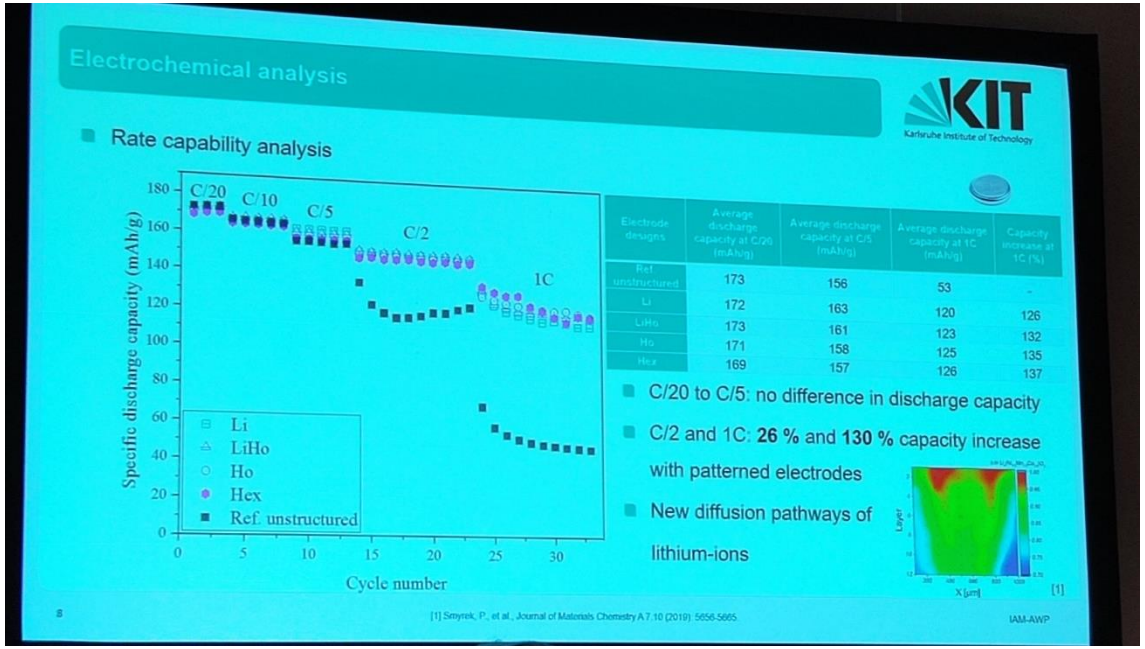
Soc. / Lab. KIT (Ger.)

Intérêts
- Thématique batteries
- Impact de l'usinage laser sur l'efficacité

Informations clés *5 photos*

- 3D shaped LI Ion batteries to improve efficiency but be carefull of material loss due to /12 cost of the all battery cost
- NMC 622 cathode thickness state of the art of 40-70µm. Here 157µm
- Different textures grooves, holes, grooves + holes + hexagones. For grooves : 155µm deep with around 20µm large
- Cycling stability tests : no obvious differences with textures but 26% to 130% capacity increase after >15 cycles compared to no texturing. Final grooves + Holes more efficient after more cycles (>100)
- Smyrek et al. Journal of materials A 7 10 2019 5656 5665
- New project Bat-Wo-Man





01/02/2023 12409-27

High throughput battery foil cutting : a comparison of different pulse laser approaches

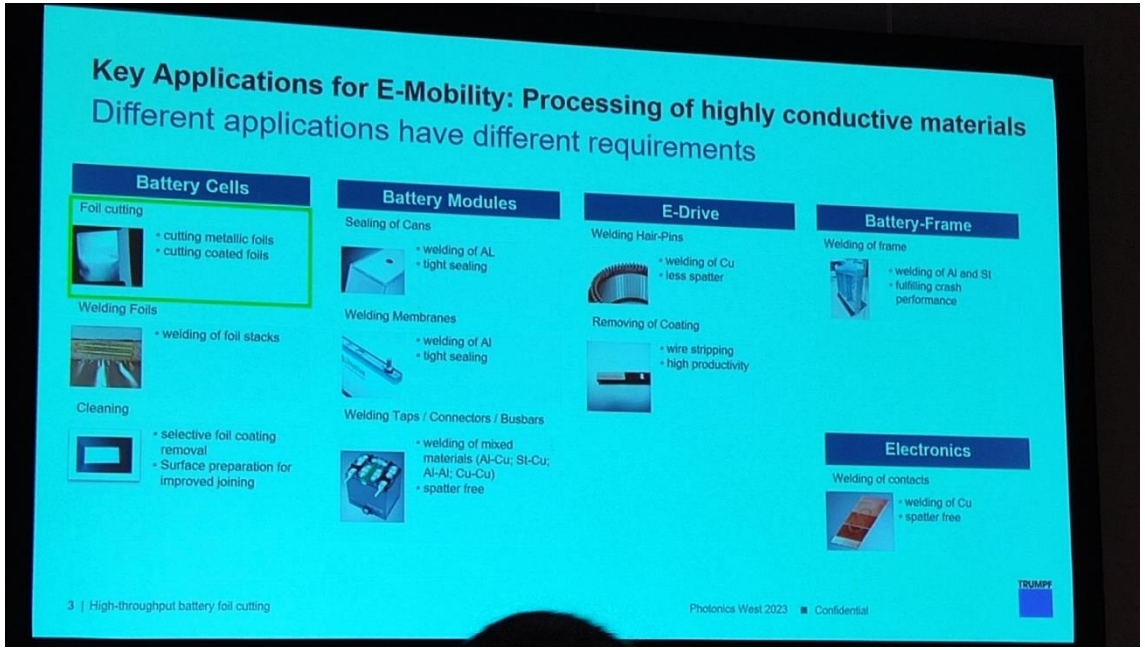
Auteur(s) Daniel Murillo

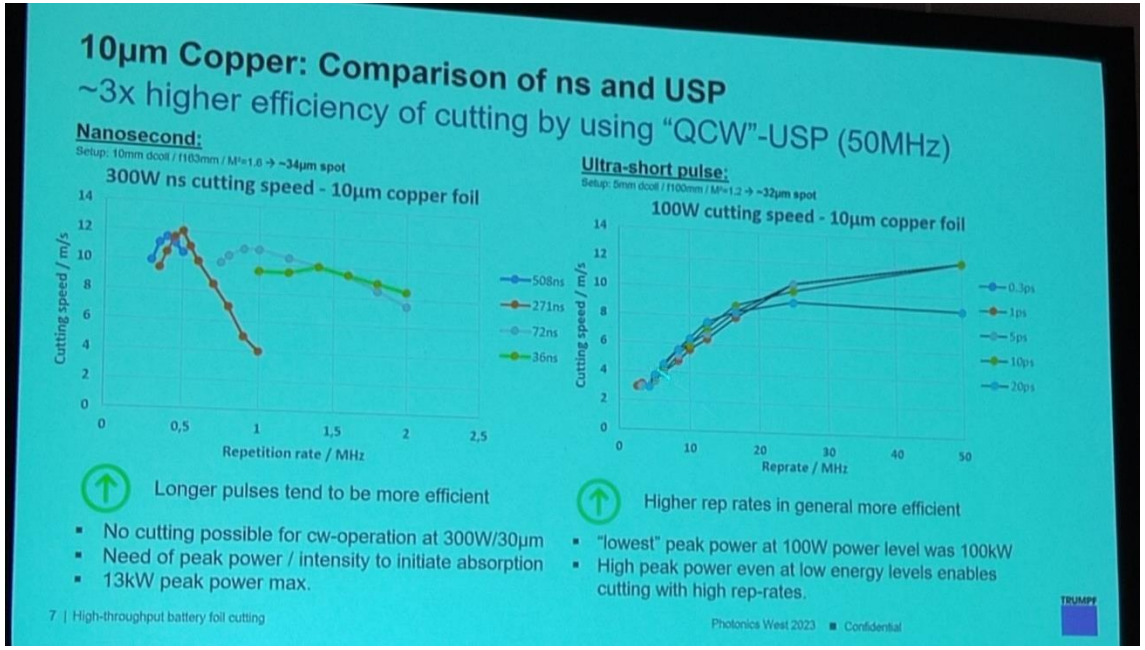
Soc. / Lab. Trumpf (Ger.)

Intérêts
- Foil cutting for batteries

Informations clés *4 photos*

- Laser cutting of foils : ns vs fs vs ps vs burst
- 10µm copper foils : 3x higher efficiency with « QCW » mode USP (50MHz), <10ps, 32µm spot ; 8 to 50MHz, better qualitative appearance
- For copper + graphite anode : ns cut faster (3m/s) high rep rate USP do not provide high quality but recast / melting
- Aluminium + LFP cathode : 3ps faster vs ns ; better quality at 50kHz





01/02/2023 12409-29

Extending the 3D battery concept large area USP structuring of multilayered electrode coatings

Auteur(s) Yannic Sterzl

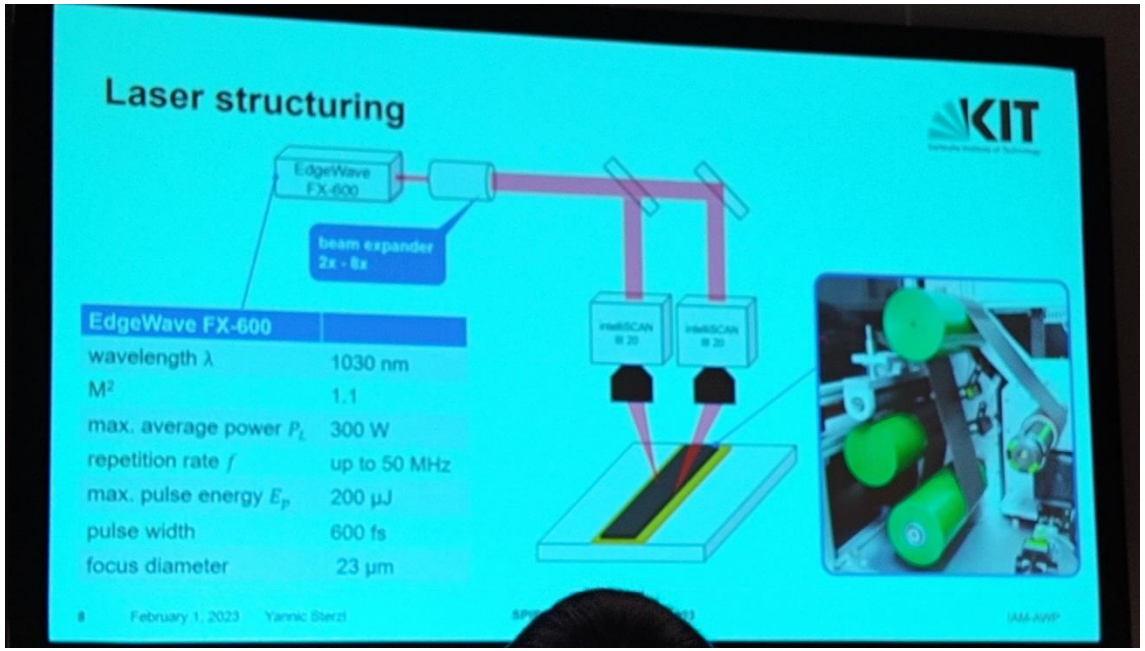
Soc. / Lab. KIT (Ger.)

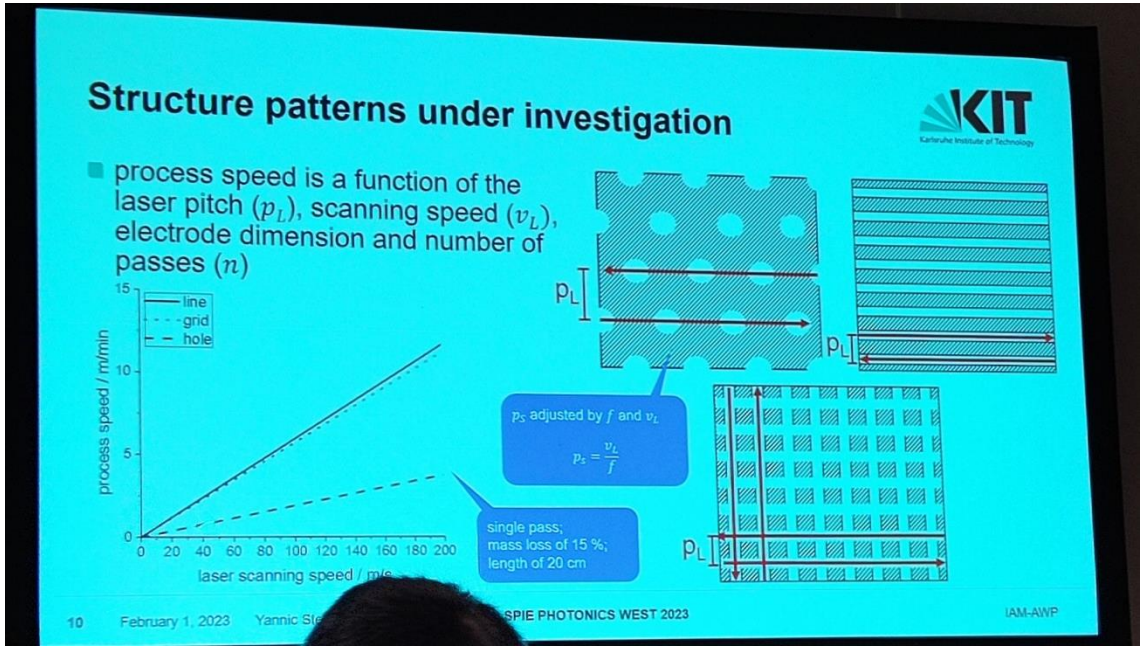
Intérêts
- Application batteries
- Roll to roll high speed x2 tête

Informations clés

6 photos

- LIB : Lithion Ion Battery
- Laser Texturing of électrodes to enable multiple material composites
- EdgeWave FX600, roll to roll. 2 parallel scanners
- Compromise : texturing type / matter loss / speed





01/02/2023 12408-38

Precision Figuring and Finishing of Glass Using Femtosecond Lasers

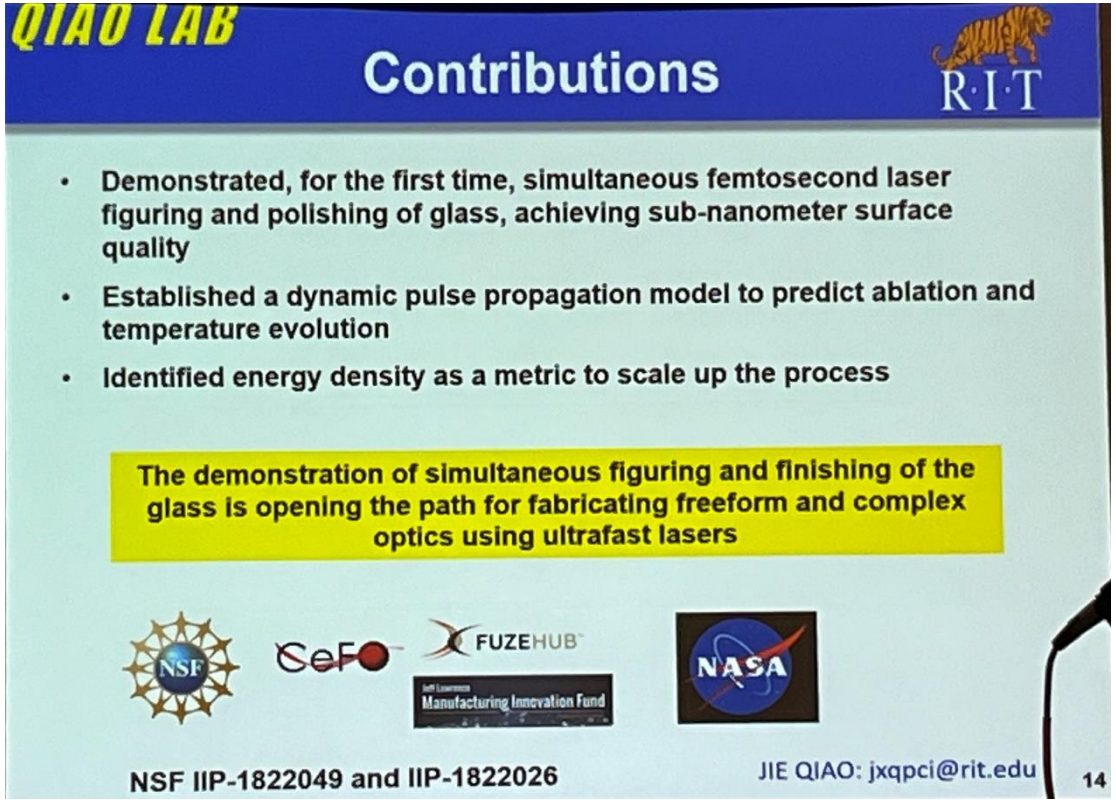
Auteur(s)

Soc. / Lab. Rochester Institute of Technology (US)

Intérêts
- Polissage

Informations clés *1 photos*

- 2 types d'usinage pour faire du polissage, ablation ou soudure. Ils essayent par le calcul de trouver les limites de taux d'ablation, ainsi que la température associée aux process, afin de déterminer la meilleure paramétrie pour enlever le plus délicatement de la matière, et du coup diminuer le Ra.



01/02/2023 12409-31

Direct laser interference patterning of cemented tools

Auteur(s)

Soc. / Lab.

Intérêts

Informations clés

photos

01/02/2023 12414-2

High energy ultrafast surface texturing with variable multispot pattern

Auteur(s) Daniel Flamm

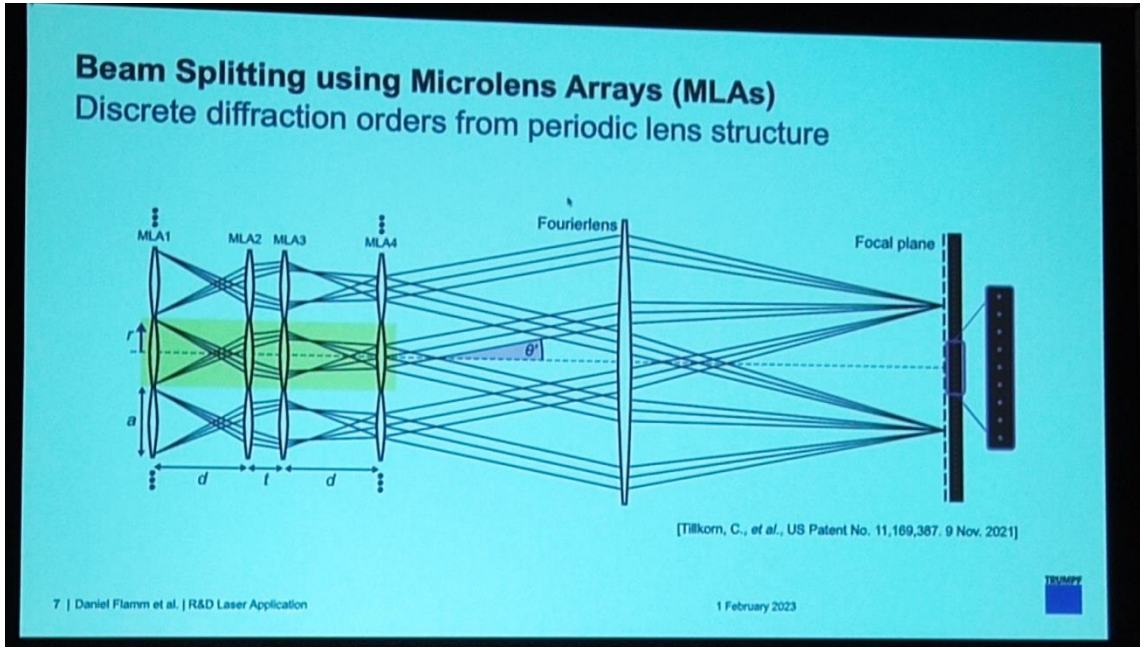
Soc. / Lab. Trumpf (Ger.)

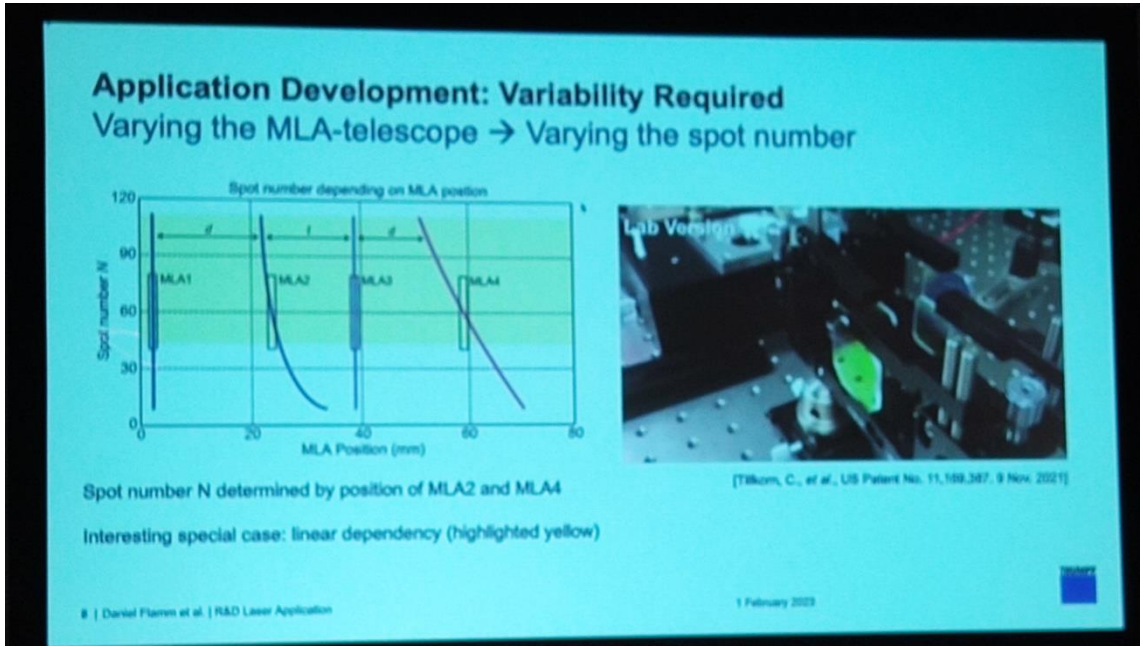
Intérêts
- Nouvelle technique de beam splitting

Informations clés

4 photos

- Opt Engineering 60 2 025105 2021
- MLA microlens arrays used generally as homogeneizers for UV lasers can be used as multispot.
- Coupling of 4 MLAs with relative movements + fourrier lens gives the possibility to play with the number of dots visible (up to a hundred)
- Add of a birefringent cristal to add spot inbetween existing. Crossed polarized to avoid interferences.





GHz burst mode processing: ablation, LIPSS, TPP, LIPAA

Auteur(s)

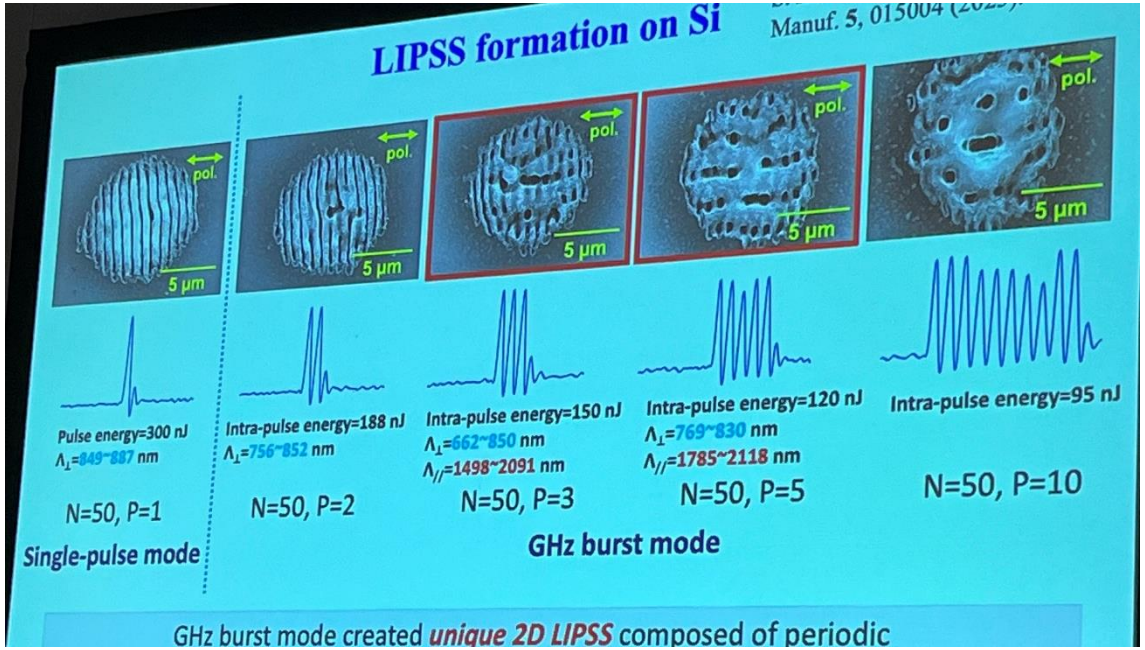
Soc. / Lab. RIKEN Ctr (Japon)

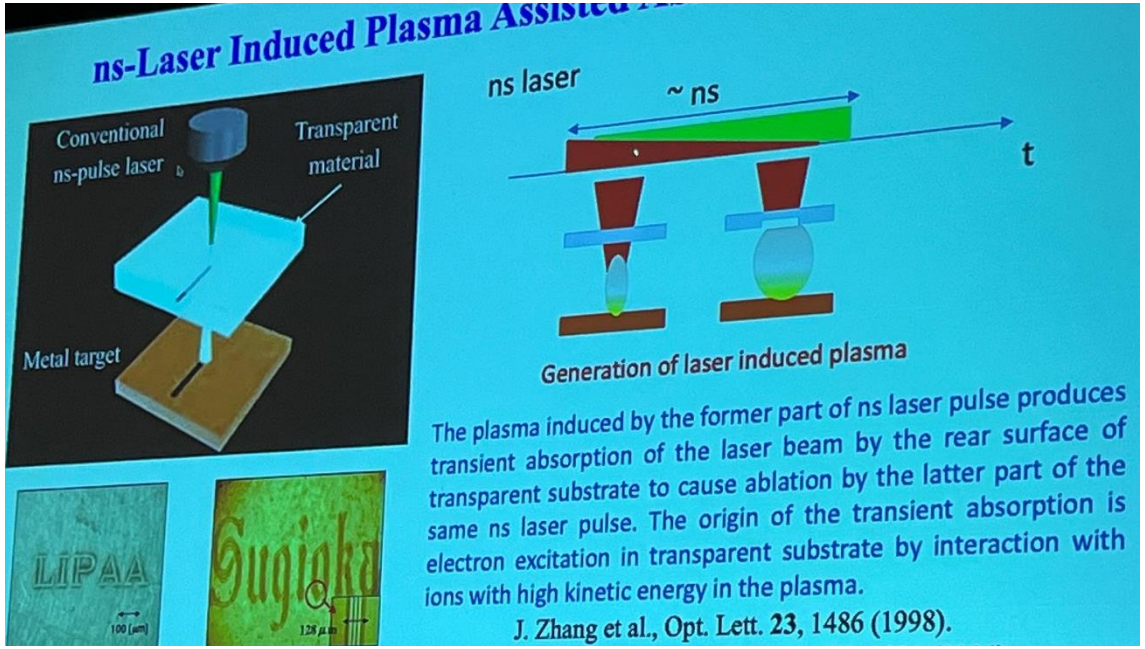
Intérêts
- GHz Burst
- LIPSS

Informations clés

3 photos

- Amélioration du taux d'ablation en Burst GHz, el LIPAA Laser Induced Plasma Assisted Ablation





Laser structured électrodes for battery production

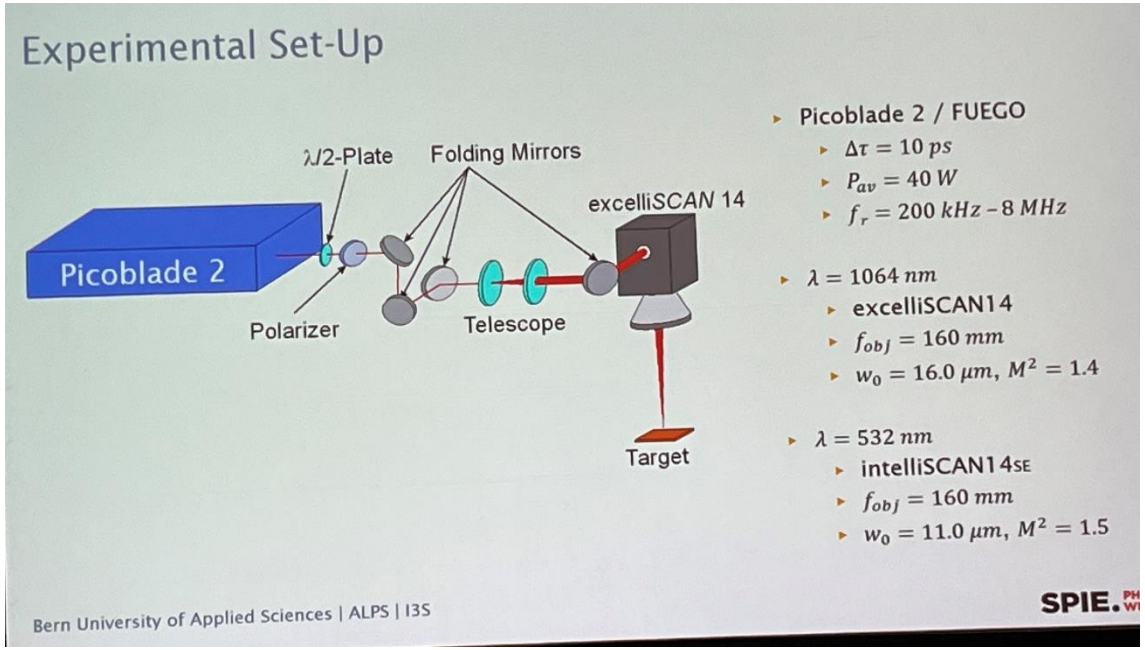
Auteur(s) Beat Neuenschwander

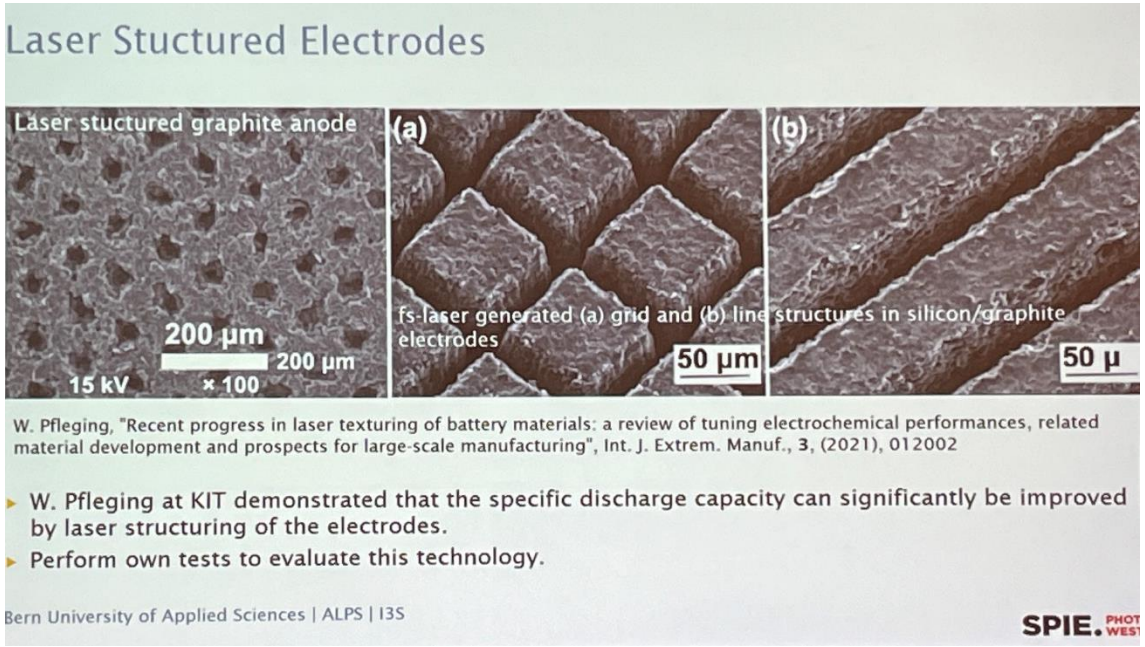
Soc. / Lab. Bern university (Ger.)

Intérêts
- Usinage classique

Informations clés *11 photos*

- Plusieurs texturations : trous, trous rapprochés, rainures
- Espacements 60µm et 30µm et largeurs d'usinage /2.
- Laser IR et Vert, ps
- structuration de lignes est le plus performant dans le cadre de recharges lentes





Forming of metal sheets textured by LIPSS

Auteur(s) Girolamo Mincuzzi

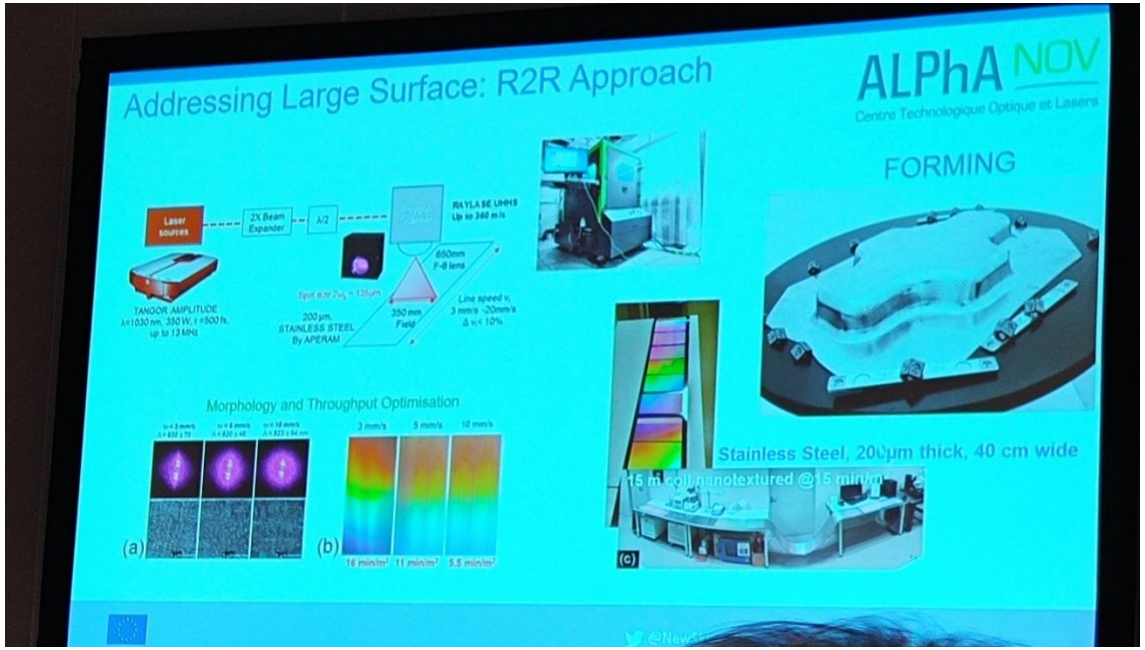
Soc. / Lab. Alphanov (Fr.)

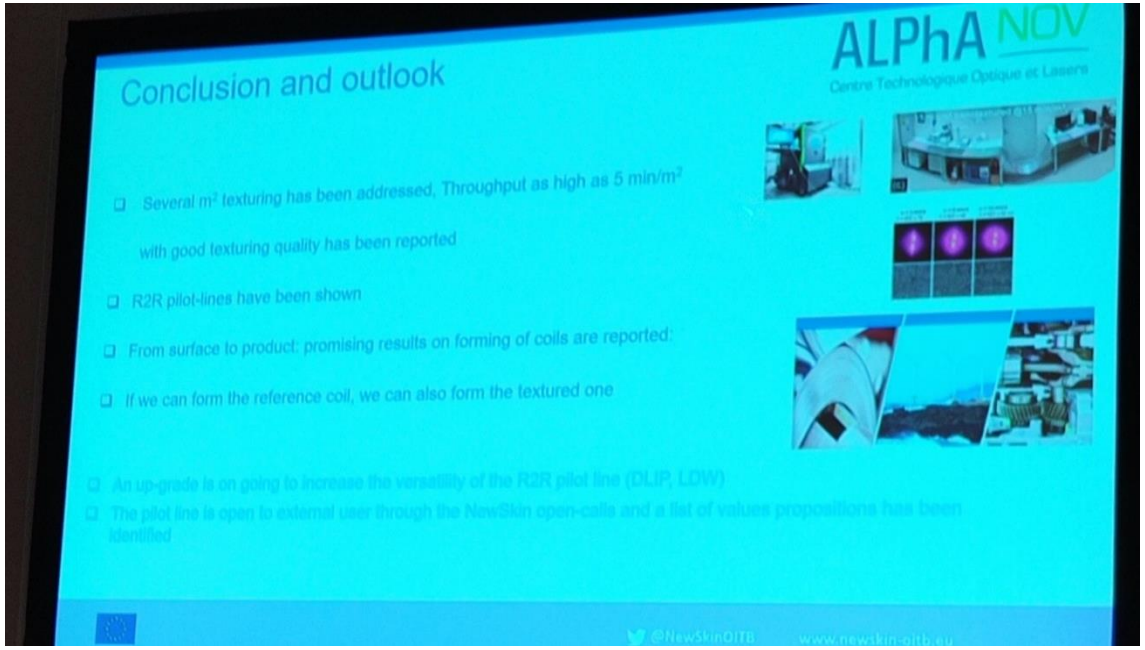
Intérêts
- Texturation Ripples par polygone & Roll to Roll

Informations clés

3 photos

- Par rapport a l'année dernière, ajout de l'étude des ripples sur la mecanique des foils 250µm d'épais.
- Tests de traction / fatigue des échantillons texturés. Impact de l'orientation des ripples en fonction du sens de l'étirement. Pas de différence significative notée.





01/02/2023 12408-53

Radial scanning strategies leading to substantial improvements in processing time

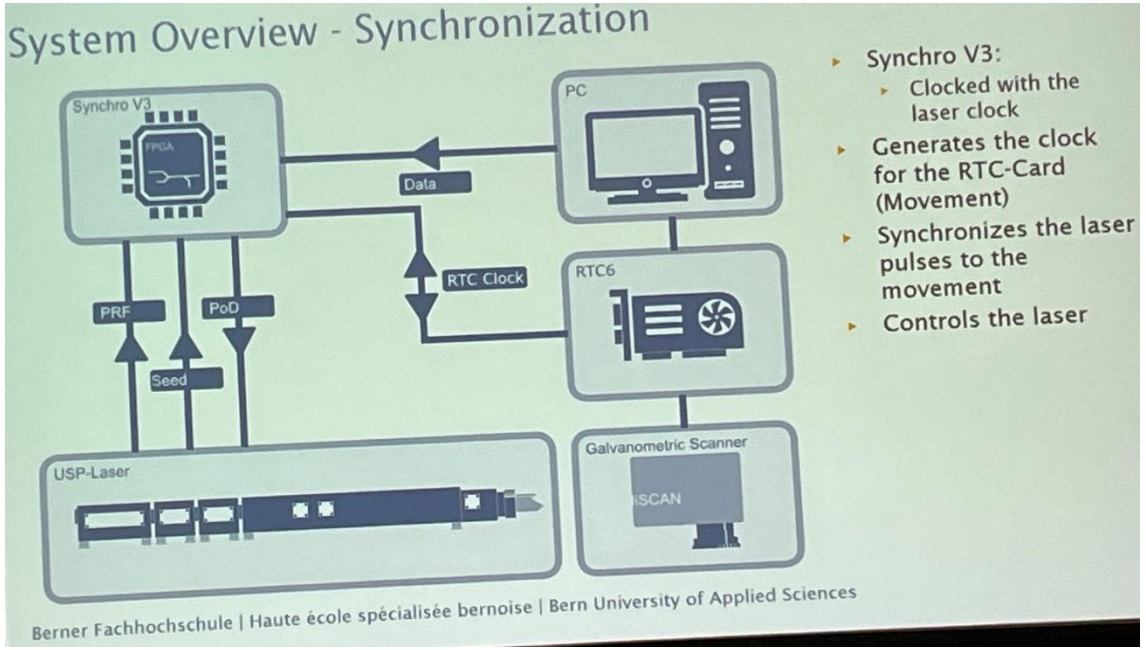
Auteur(s) Dominic Von Bergen

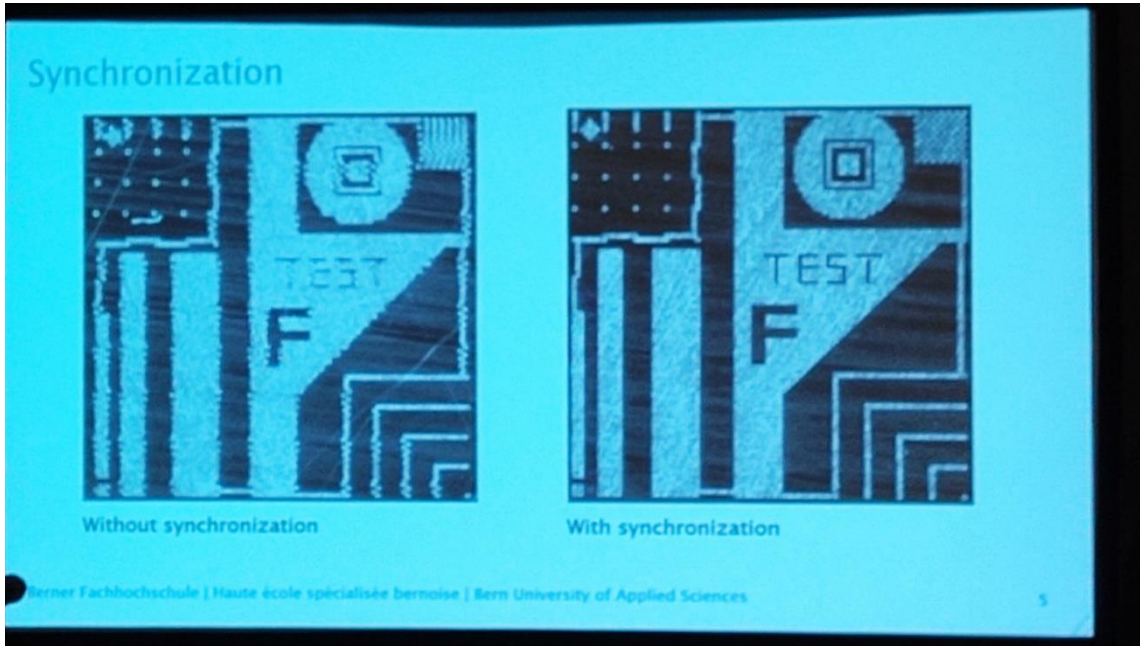
Soc. / Lab. Berner Fachhochschule Tech. & Info. (Suisse)

Intérêts
- Synchro laser et nouvelle méthode d'ussinage

Informations clés *8 photos*

- Dev d'une carte de pilotage en interne pour la synchro mais manque d'efficacité a cause des temps mort de va et vient sur une trajectoire scanner
- Nouveau concept de pilotage par cercles concentriques ou spirale. Fait suite aux pertes de temps lors d'une trajectoire scanner
- Défauts notables : cercle minimum (res scanner), gestion de la position des pixels, vitesse de rotation accessible vs RR utilisé, trajectoire de redémarrage après chaque cercle, répartition uniforme des points en s'eloignant du centre d'une spirale…





01/02/2023 12409-34

Initial surface roughness influence on the generation of LIPSS on Ti and SS and their effect on Cell/bacteria viability

Auteur(s) Lamborghini Sotelo

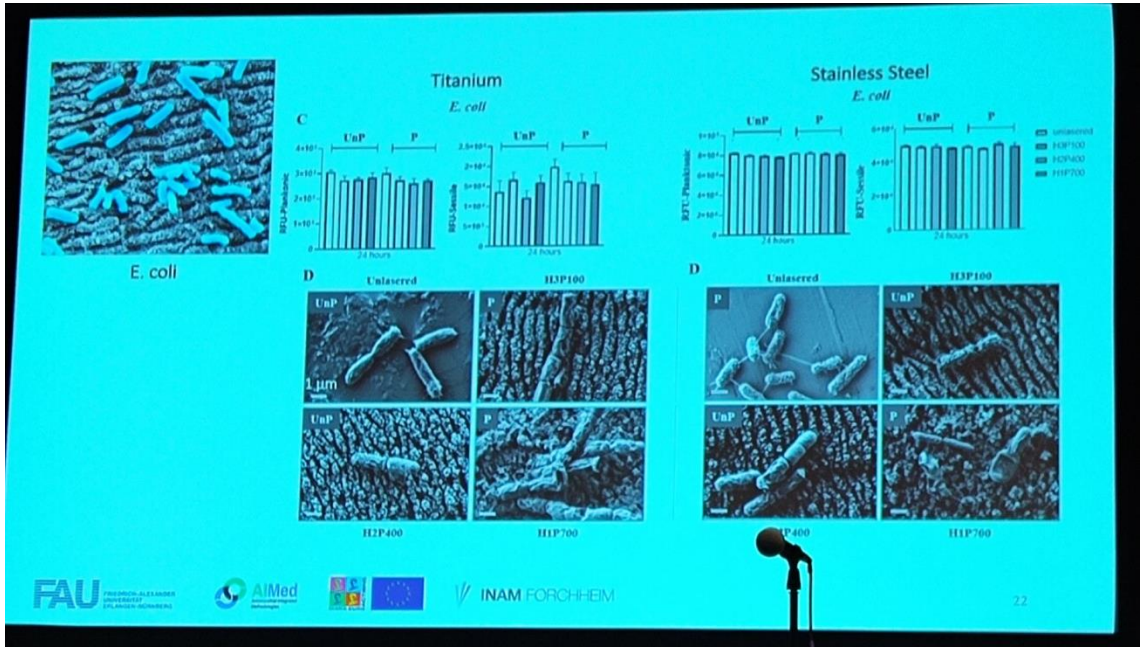
Soc. / Lab. AIMED (Ger.)

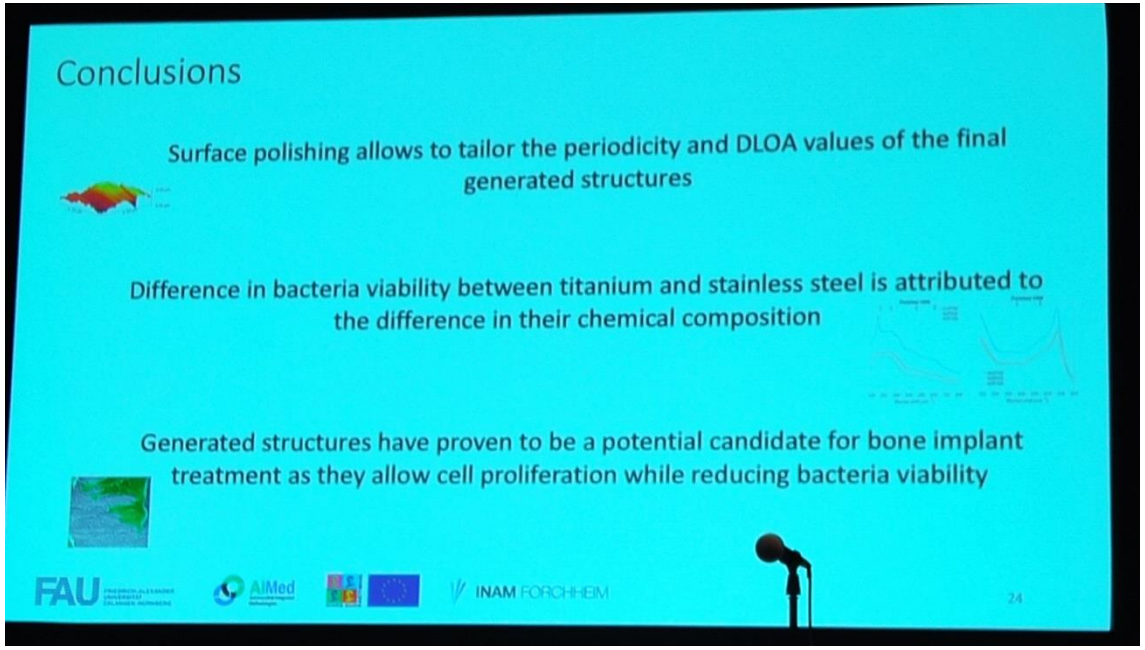
Intérêts
- Impact des textus ripples sur les bactéries

Informations clés

2 photos

- Impact of polishing/RA on wettability / lipss formation on Ti and SS. No clear effect
- On cells : impact
- Question : Blood rather than water for wettability tests in the context of medical applications?





01/02/2023 12409-35

Vizualisation of LIPSS beyond optical resolution by non invasive optical method

Auteur(s) Jose Alberto Aguilar Mora

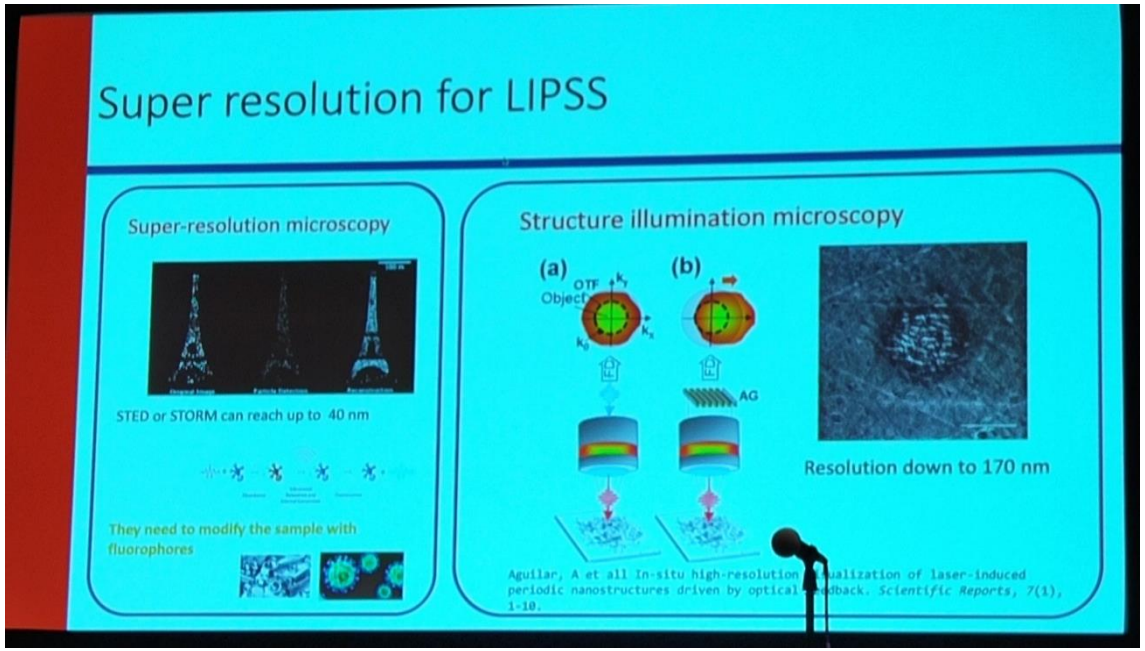
Soc. / Lab. XLIM (Fr.)

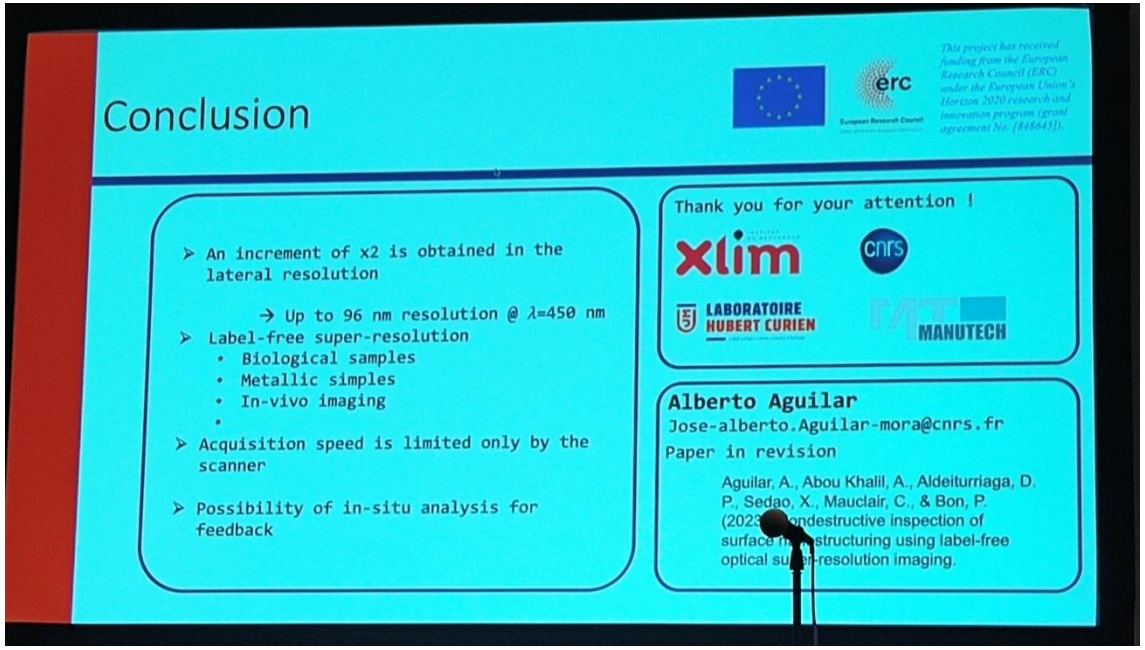
Intérêts
- Participation de Manutech

Informations clés

5 photos

- New technic based on confocal microscopy
- Resolution below 100nm, interesting for LIPSS observation
- Demo with NA 1.37
- Use as a standard microscope, so implemenable with other microscopic technics.
- More adapted to reflective materials





01/02/2023 12409-36

Dynamics of development of LIPSS on Ti alloys

Auteur(s) Hans Hamler

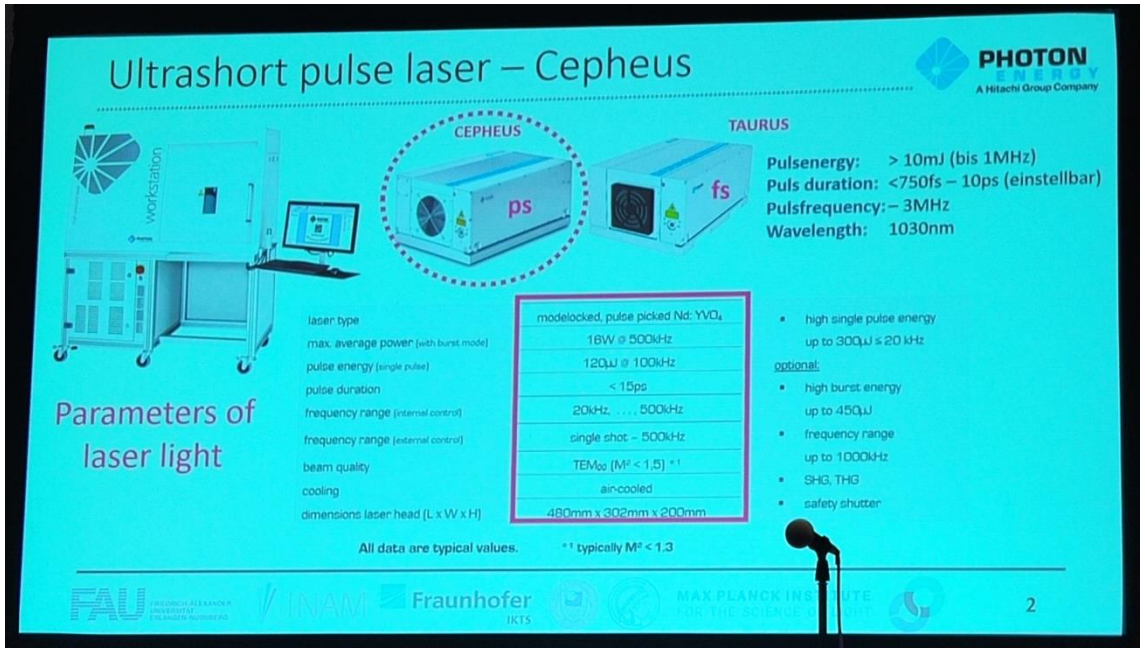
Soc. / Lab. Photon Energy (Ger.)

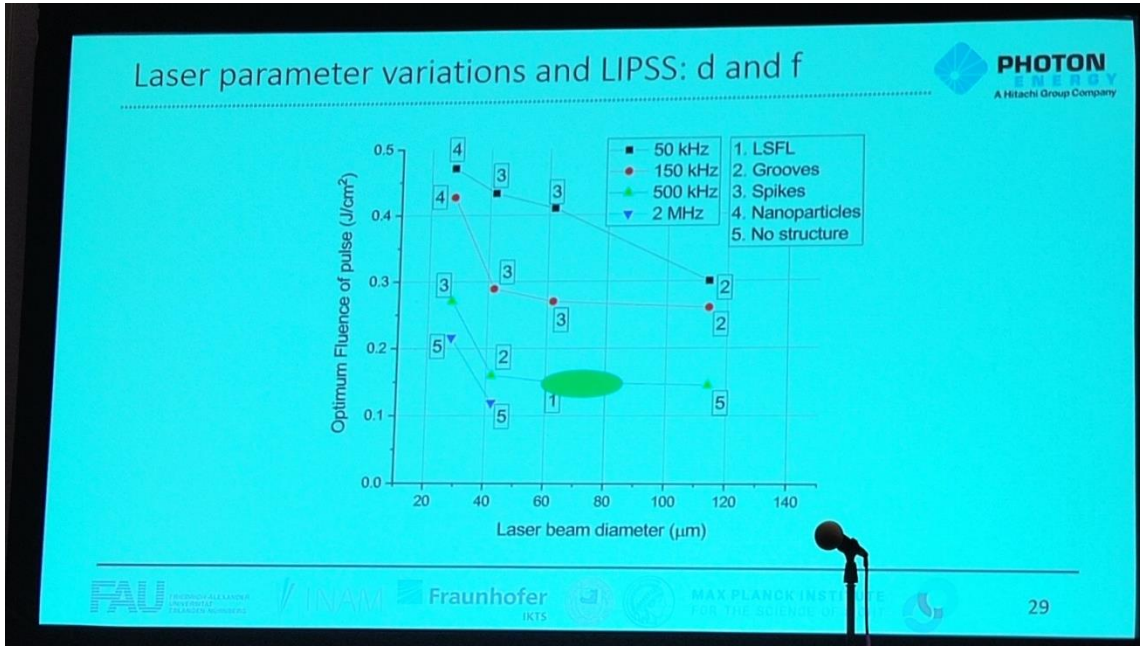
Intérêts
- Nouveau laser femto non référencé
- Spikes et Lipss paramétrage

Informations clés

7 photos

- Analysis of parameter windows at 12ps on Ti Alloys
- CEO Photon Energy





01/02/2023 12408-54

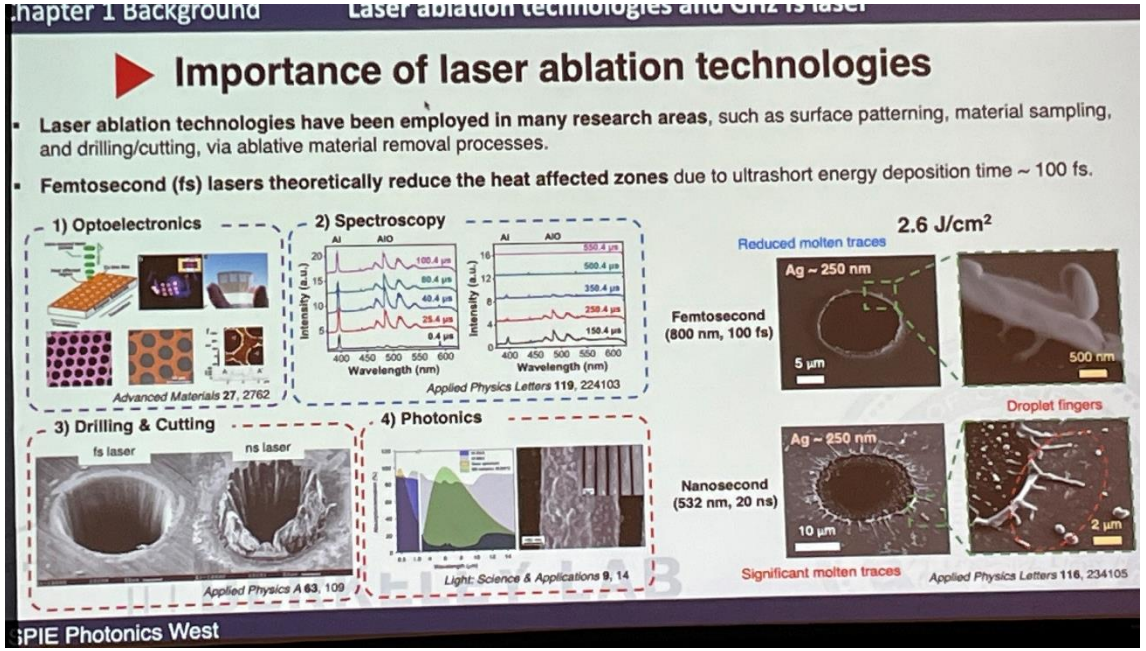
Ultrafast ablation dynamics of Cu by single pulse and GHz fs laser

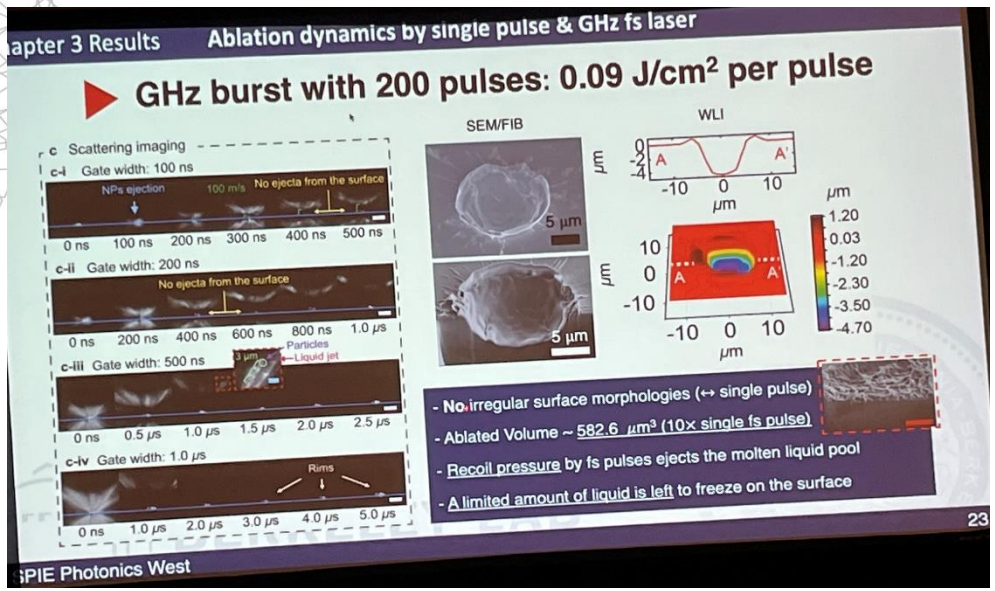
Auteur(s)

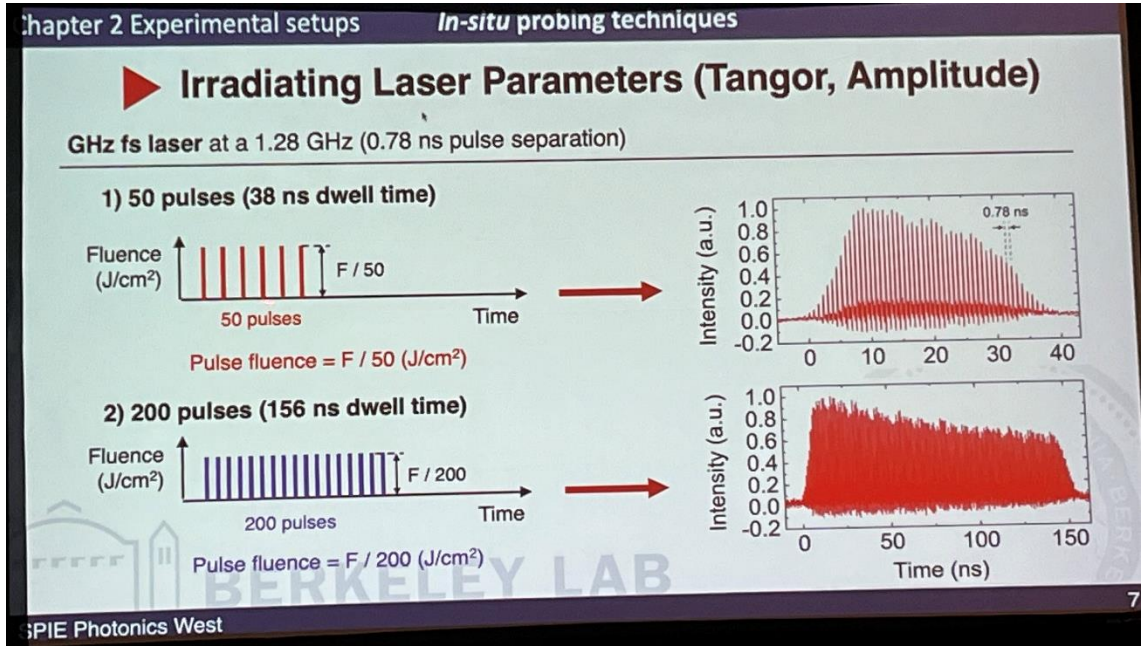
Soc. / Lab. Lawrence Berkeley National Lab

Intérêts
- GHz Burst

Informations clés *10 photos*







Real time holo 3D beam manipulation for USP processing

Auteur(s) Bastian Kaiser

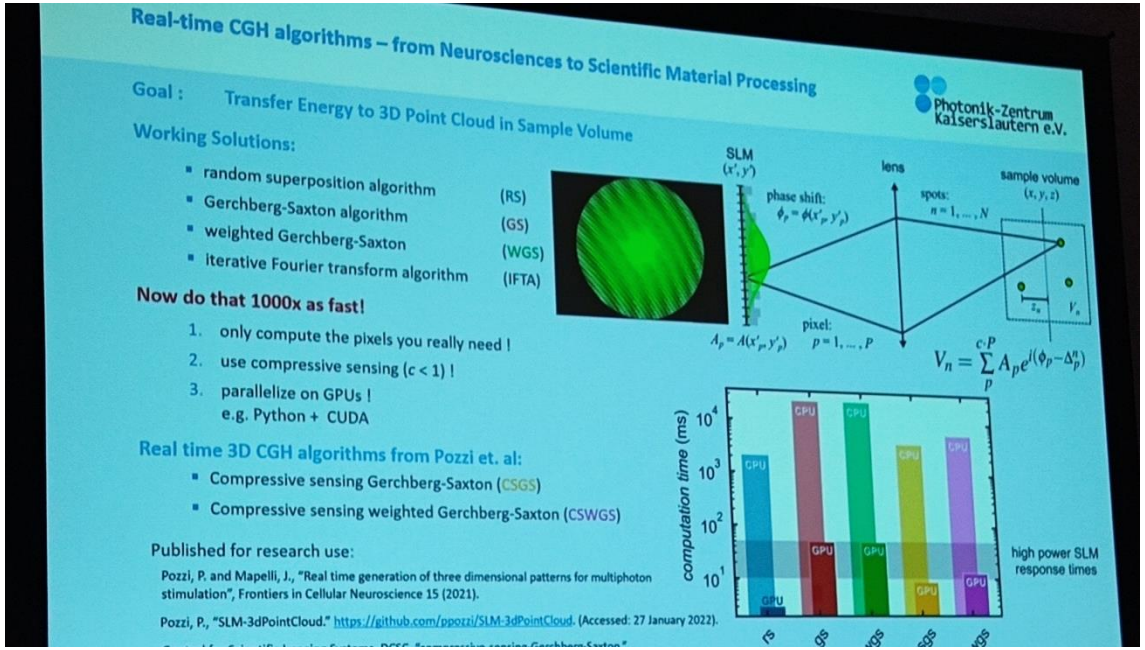
Soc. / Lab. Photonic Center Kaiserslautern (Ger.)

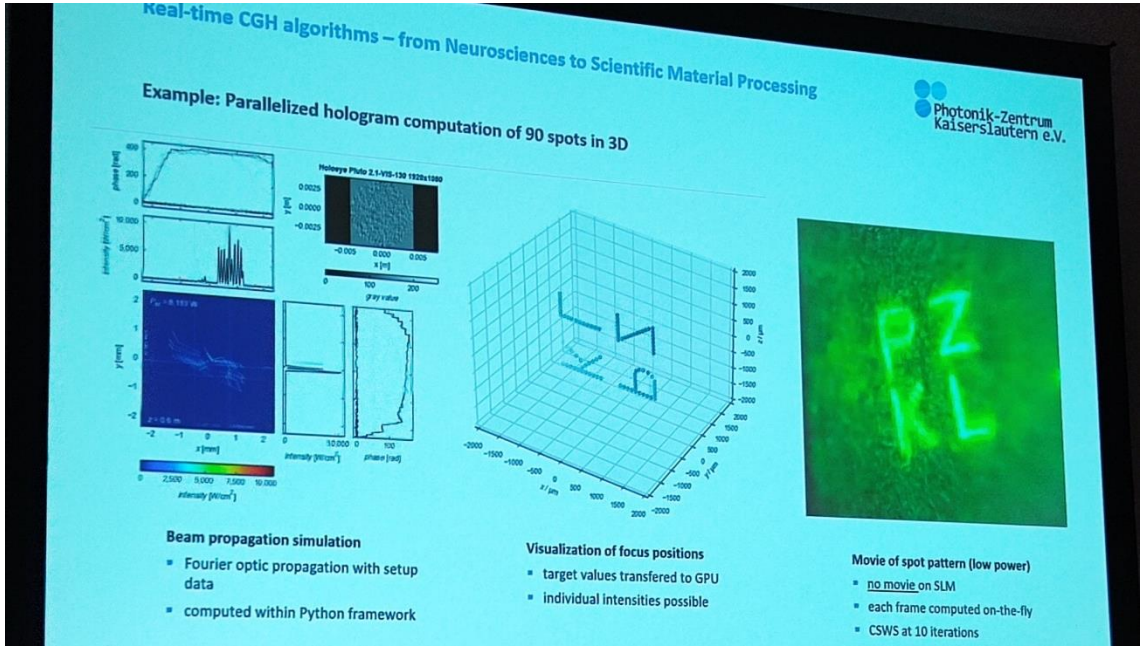
Intérêts
- MEF 3D SLM Haute vitesse

Informations clés

- High speed CGH. : compute only required pixels + compression + parallelization (CSGS – CSWGS) Pozzi 2021
- Holoeye SLM
- Demo movie on the fly calculation of 3D hologram spot Text
- 10it ~50ms. Test of marking to compare calculation speed vs liquid cristal response. Ok!
- Zero order is here

3 photos





01/02/2023 12414-11

UV and IR fs laser irradiation on PET and PA66 textiles for liquid repellent clothing

Auteur(s) XXX Sedao

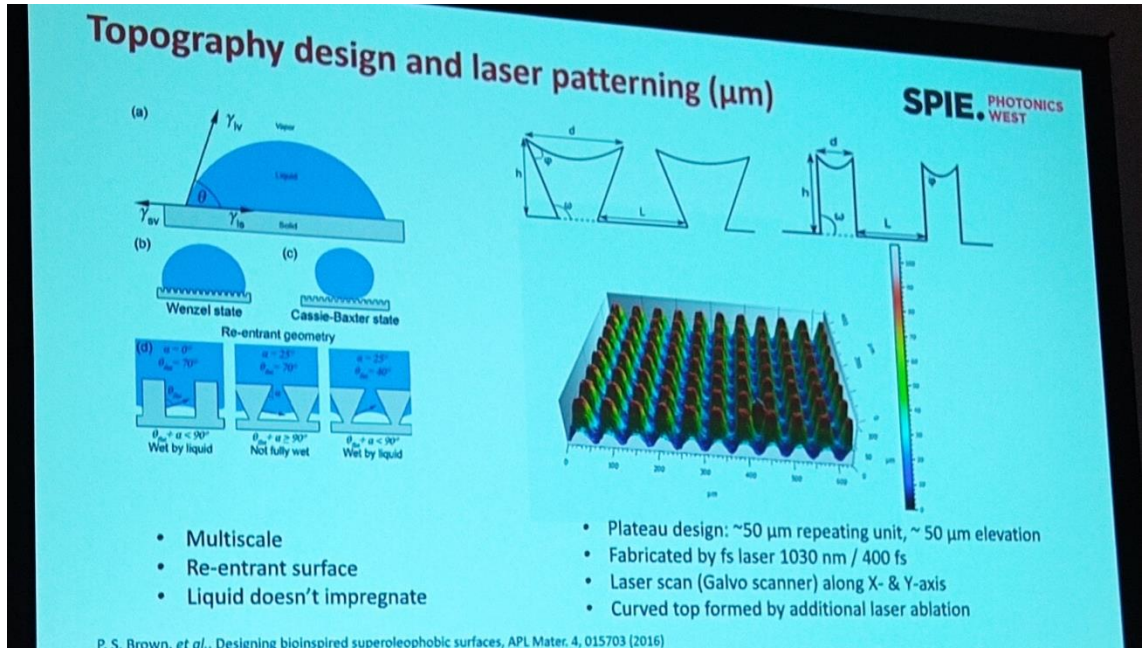
Soc. / Lab. LaHC (Fr.)

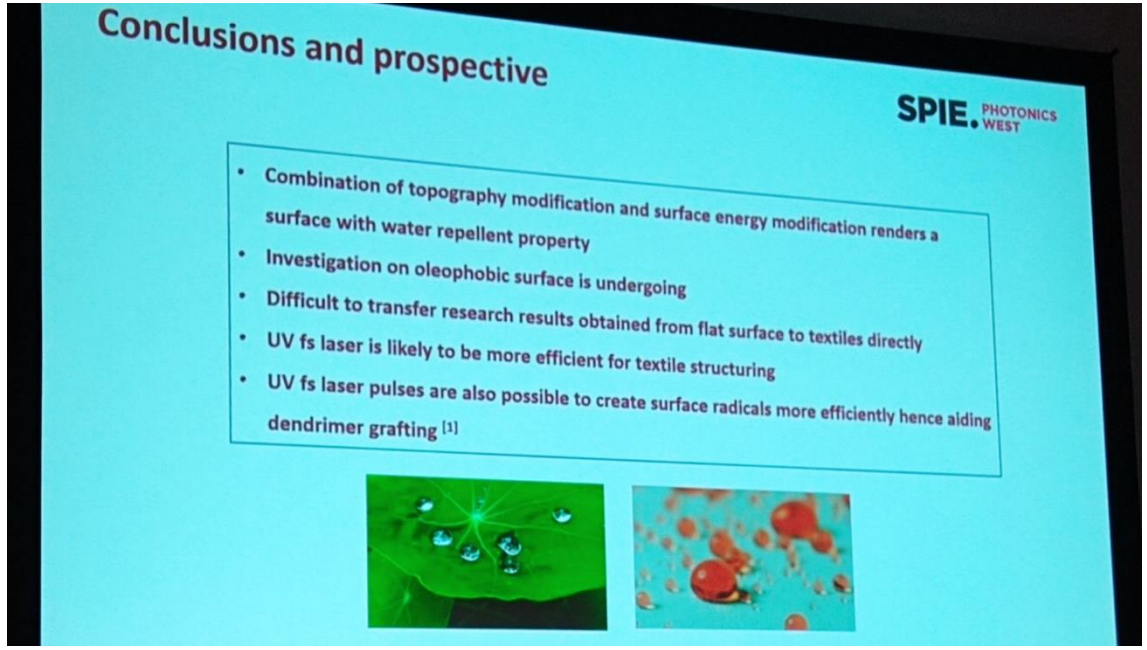
Intérêts
- Participation de Manutech
- Deperflex

Informations clés

3 photos

- Deperflex
- Water repellent surfaces 10µm peaks in nature.
- Optimized Hydrophobicity when inverted peaks
- Laser texture + dendrimer = superhydrophobic
- Transfer to fabrics (maillage) : damage of mechanical strength, touch and appearance => Not acceptable
- Water penetration time on the textile increase with textile + dendrimer + texturing





Jeudi 02-02-2023

02/02/2023 12409-38

kW level USP lasers for high rep. Rate drilling of airplanes structures

Auteur(s) Emeric Biver

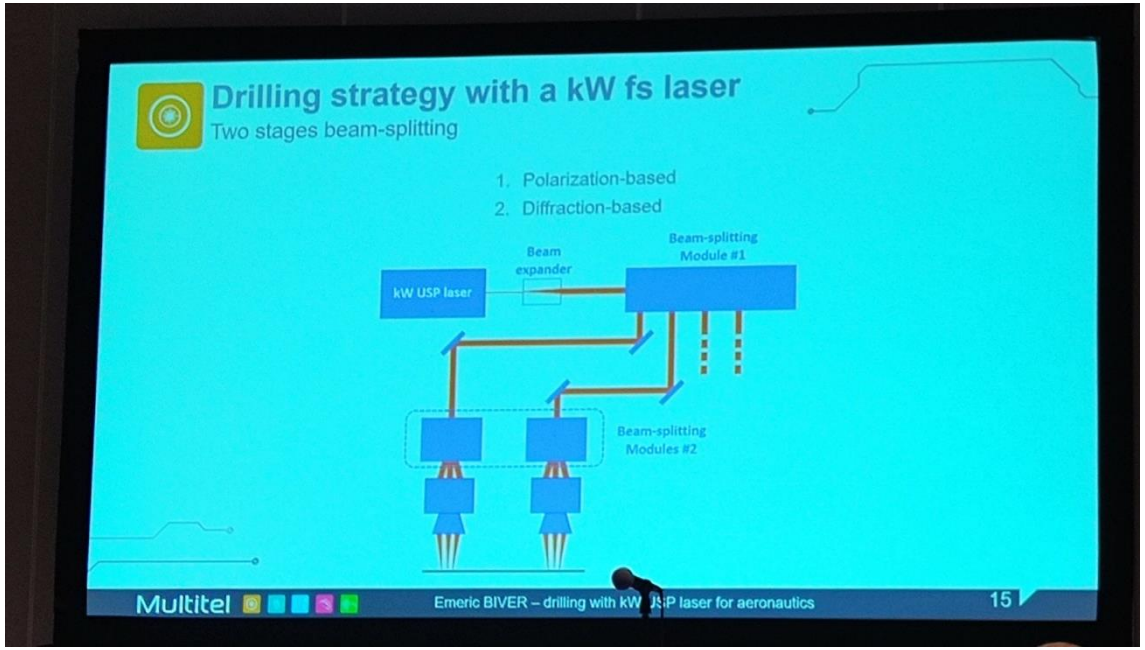
Soc. / Lab. Multitel (Bel.)

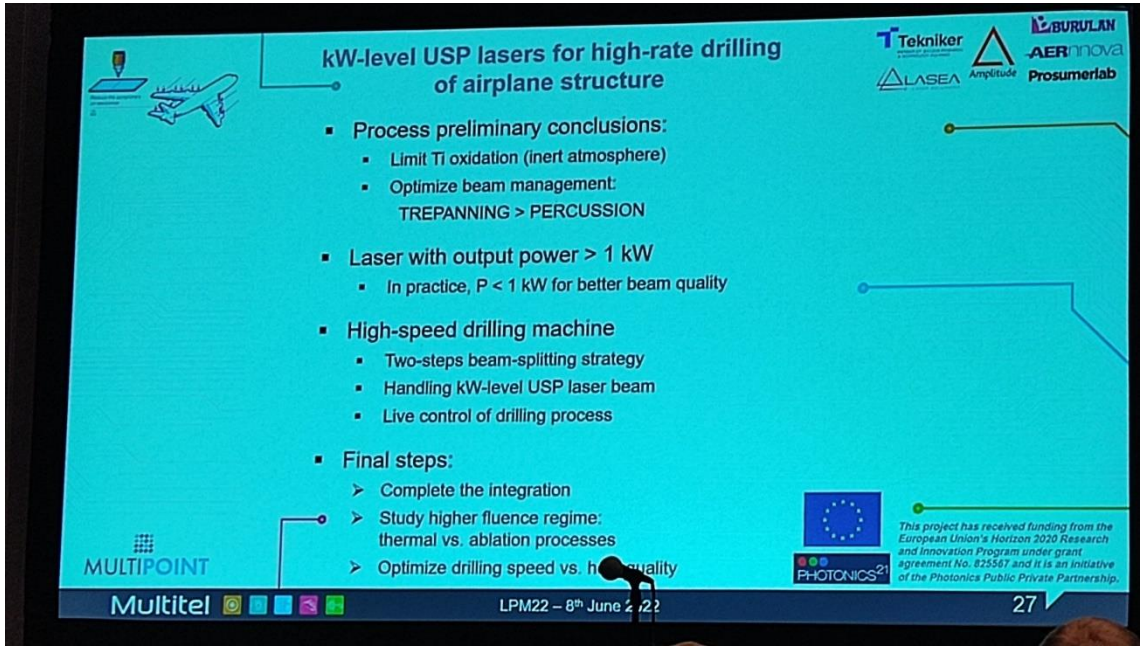
Intérêts
- kW + Split + Multi-têtes + DOE

Informations clés

7 photos

- Multipoint EU project
- kW femto laser (amplitude) for aeronautic drilling applications
- Better quality with trepanation but much longer
- 570fs – 7mJ
- 2 splitting modules : one for different optical paths, one just before focusing : DOE. Multitel developped the splitting strategy based on polarisation
- Machine 2m width (Lasea + Tekniker)
- Standard scanner : Laser. High pressure assisted gas scanner : Tekniker
- 500µm Ti foils : 15s / 5 holes
- Questions : DOE transmission (15% losses)





Thermal accumulation and its threshold repetition rate in ultrafast laser materials processing

Auteur(s) Xin Zhao

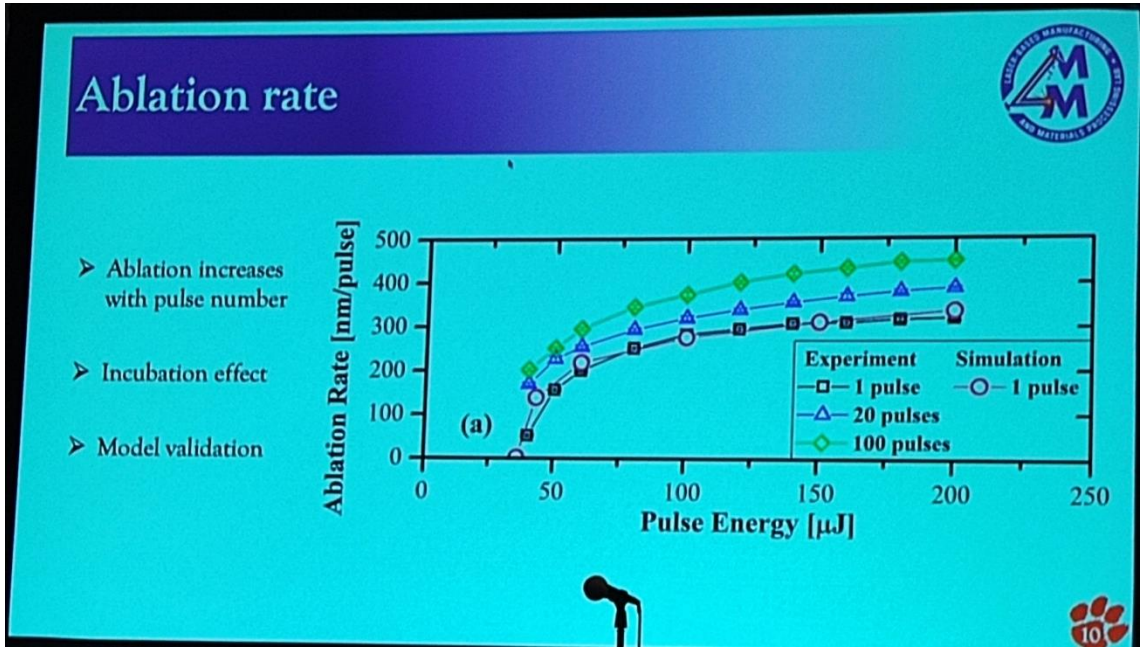
Soc. / Lab. Clemson Univ (USA)

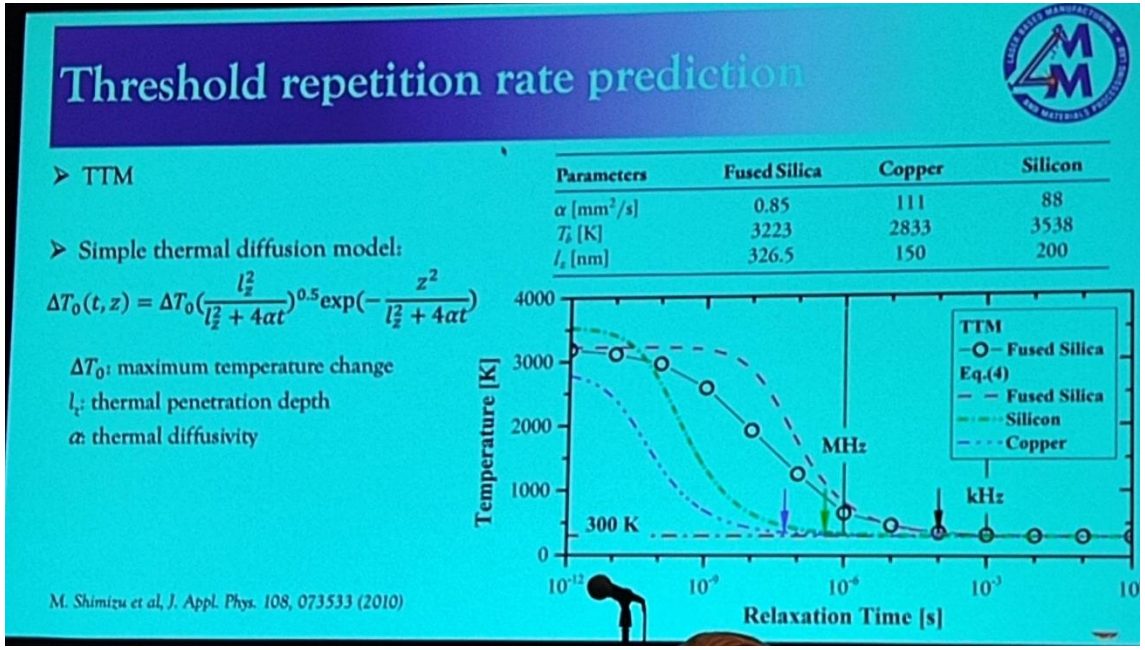
Intérêts
- Temps de relaxation matériaux et accumulation thermique

Informations clés

9 photos

- Laser 190fs, fused silica
- 2 temperature model
- First step : valence => conduction few fs, then valence excitation => heating
- With thermal accumulation : increase of ablation rate even at low rep. Rate. Then >100Hz, increase of heat and even more ablationr ate
- Thermal relaxation ms range : fit with heat influence at 1kHz
- 10kHz : increase of temperature
- Copper : >1MHz thermal accumulation occurs (very different from glass)
- Thermal diffusivity is the number one factor for thermal diffusion





02/02/2023 12409-40

High speed processing with ultrafast lasers and resonnant scanning systems

Auteur(s) Bastian Kaiser

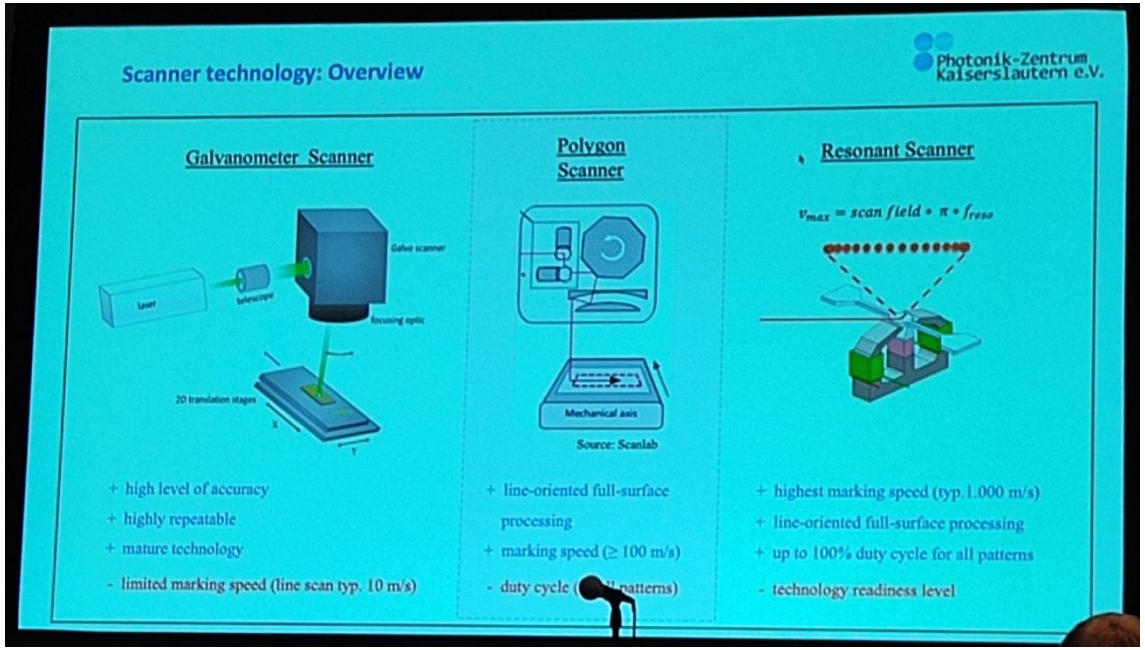
Soc. / Lab. Photonic Center Kaiserslautern (Ger.)

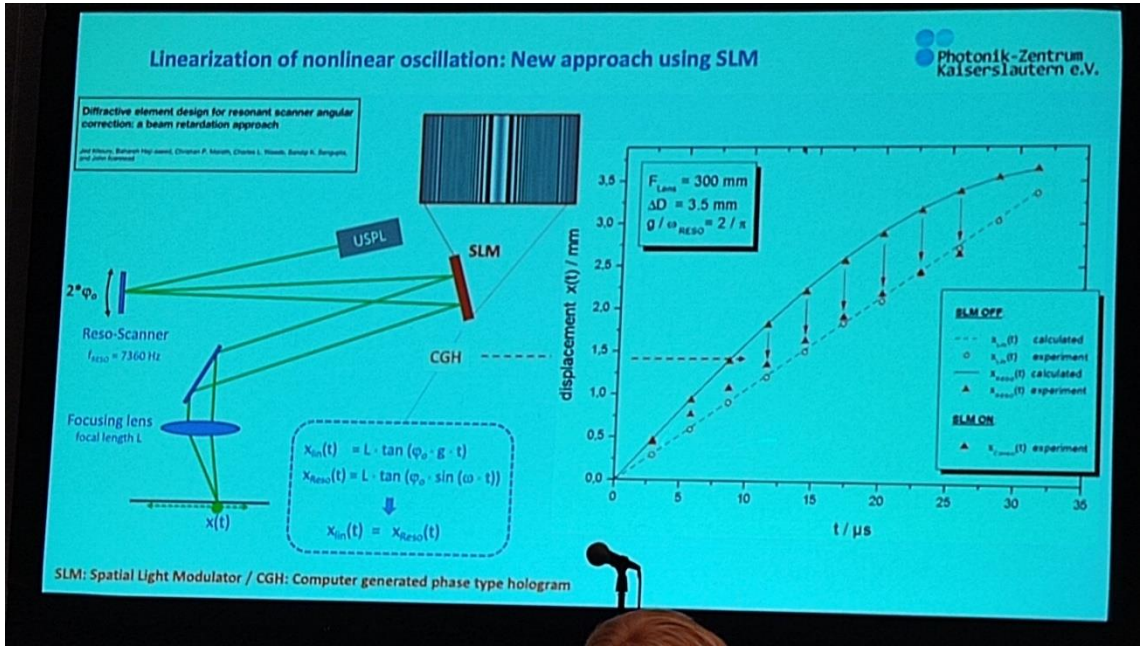
Intérêts
- Scanner résonnant et correction de trajectoire par SLM

Informations clés

6 photos

- Previous RESOMACH project Femtotech gmbh dev resonant scanner
- Now how to apply it for processing applications
- Resonnant scanner : SF : scanning field size PO : pulse overlap
- Non linearity of the speed to carry out.
- Resonnant scanner : fill the gap between speed and small area. (polygon scanner not efficient for small areas)
- Use of an SLM to correct the non linearity of the positioning! Ref : Diffrzctive element design for resonnant scanner angular correction : a beam retardation approach
- Resonnant vs galvo ablation coherent.





02/02/2023 12442-16

Characteristics of large active area phase only SLM with dielectric mirror

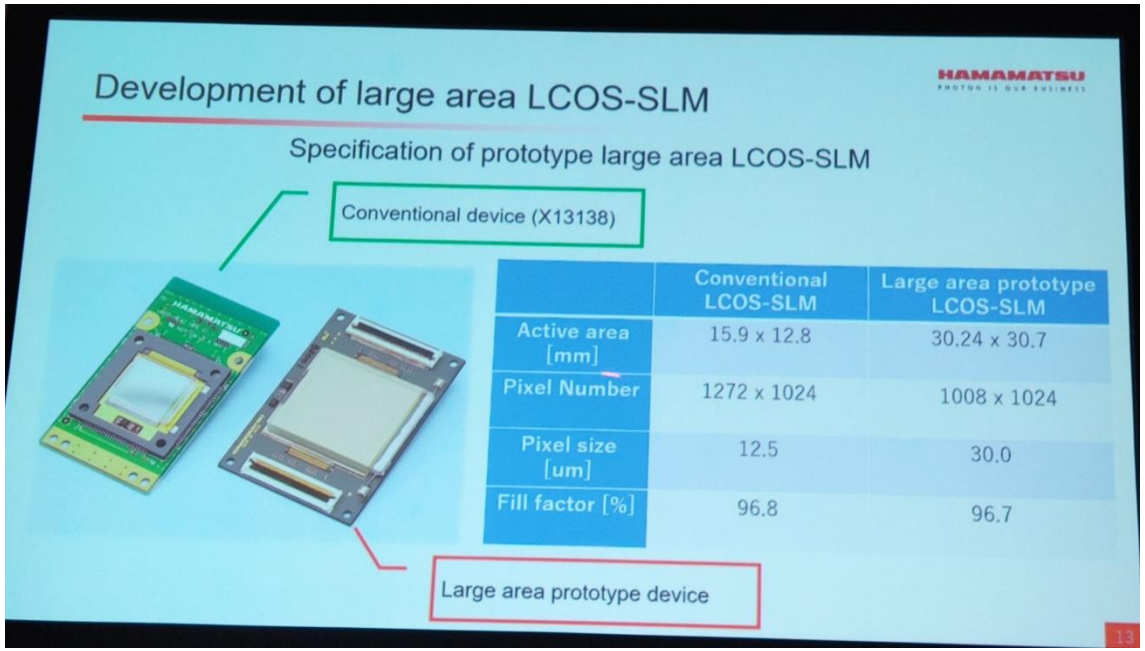
Auteur(s) Hiroshi Tanaka

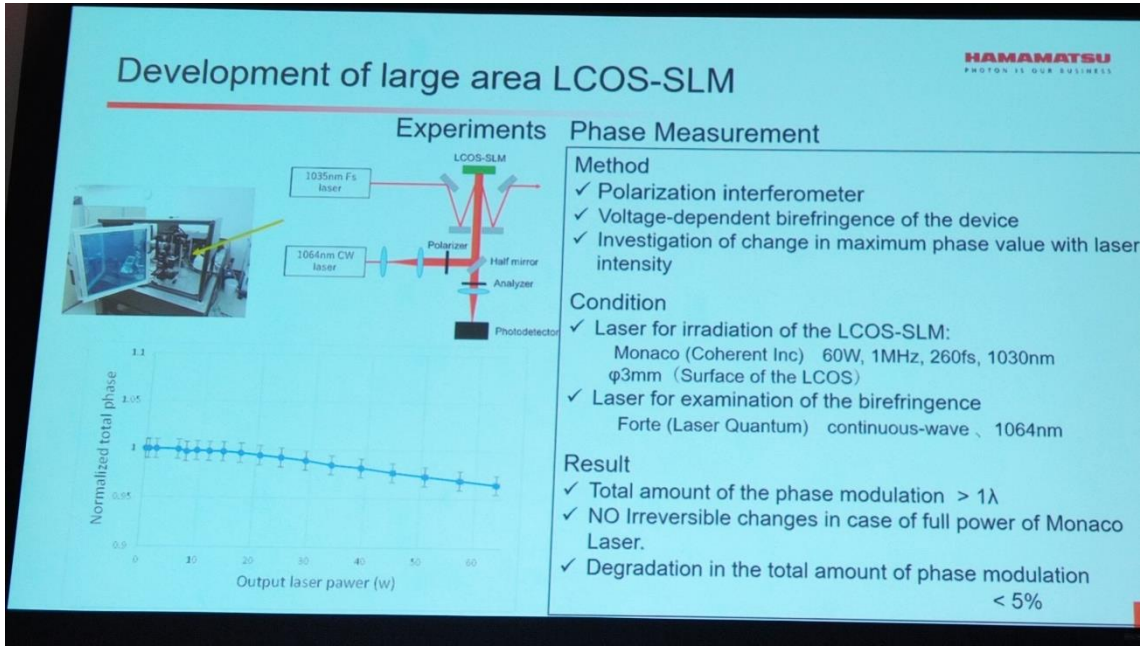
Soc. / Lab. Hamamatsu (Jap.)

Intérêts
- Nouveau SLM 30x30mm
- 60W démontré sur femto

Informations clés *4 photos*

- Application pour l'aeronautic et high number of data management
- High laser power irradiation improvments to take into account
- SLM 30x30mm to improve laser damage. Pitch 30µm, 96% efficiency
- Test sur Monaco 260fs, 60W, 1MHz, IR
- Still 60Hz





02/02/2023 12409-42

Microprocessing with MPLC beam shaper & a 515nm fs laser

Auteur(s) Pu Jian

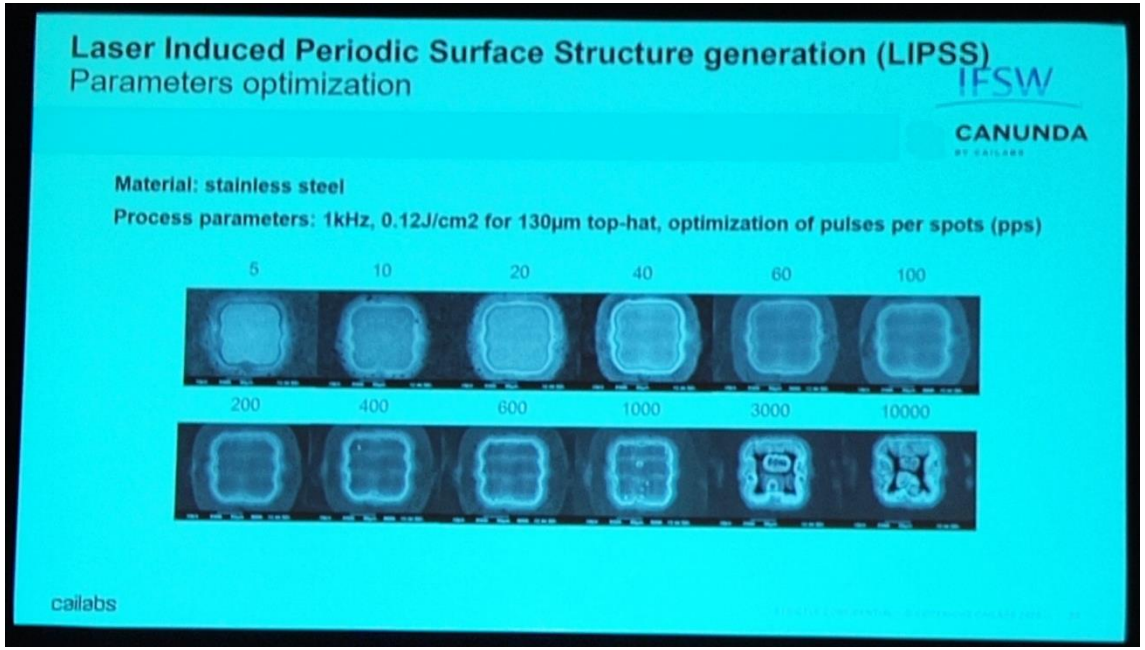
Soc. / Lab. CAILabs (Fr.)

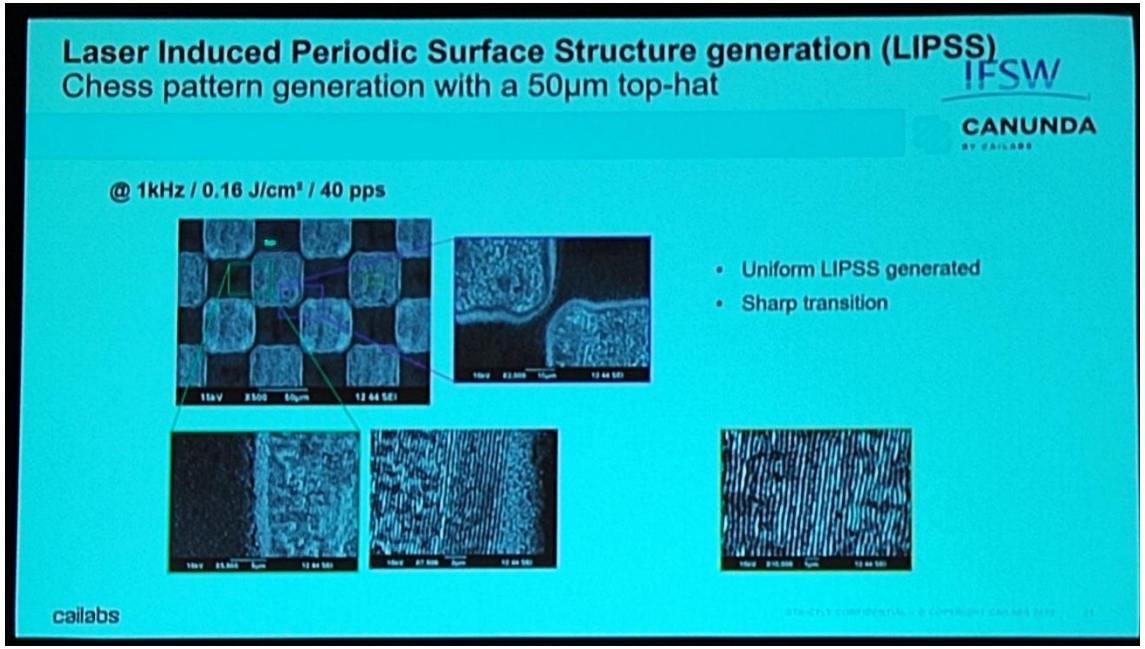
Intérêts
- MEF TopHat par MPLC en Vert

Informations clés

0 photos

- 3W 500fs 515nm f100mm & 260mm





Sub µm structuring of surfaces with DUV lasers

Auteur(s) Serhiy Danylyuk

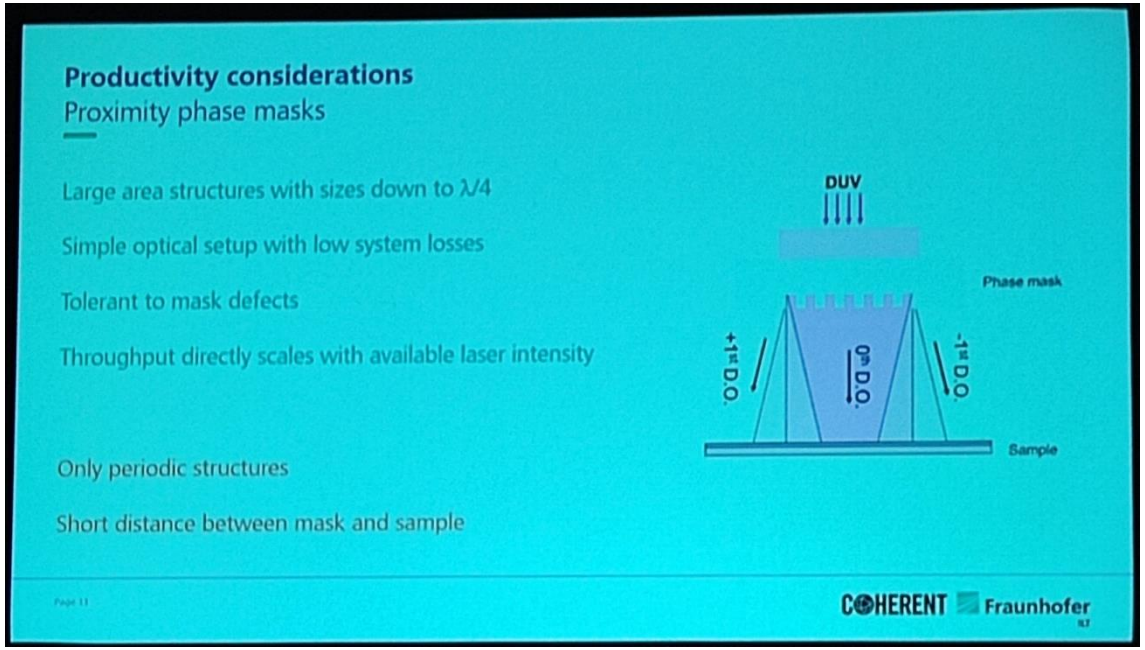
Soc. / Lab. Fraunhofer ILT (Ger.)

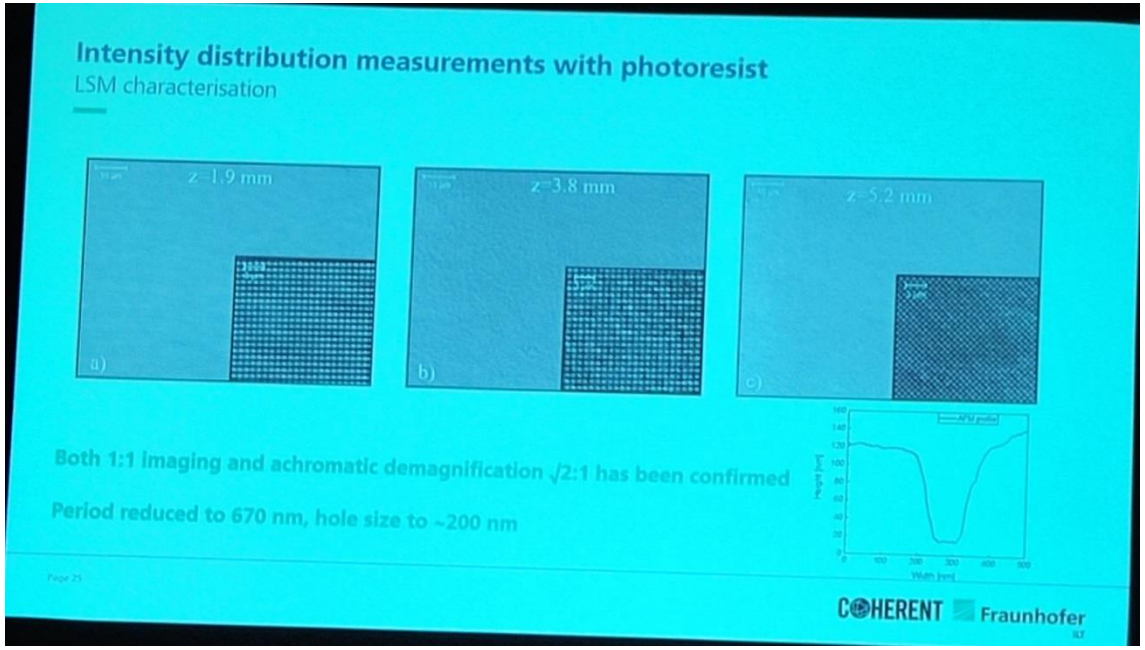
Intérêts
- DOE UV sur mesure

Informations clés

- Multiflex project
- Dev d'un DOE champ proche pour se rapprocher d'une configuration de lithographie en DUV

7 photos





Application of machine learning to overcome challenges of generating phase masks for dynamic beam shaping in complex optical elements

Auteur(s) Robin Kurth

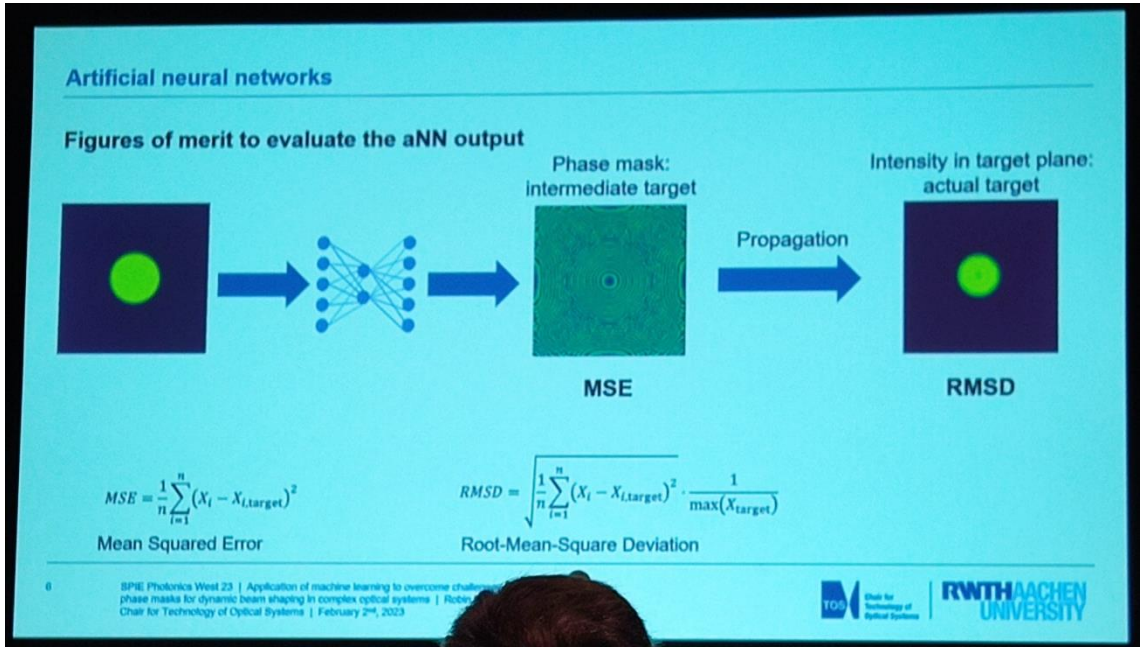
Soc. / Lab. Aachen Univ (Ger.)

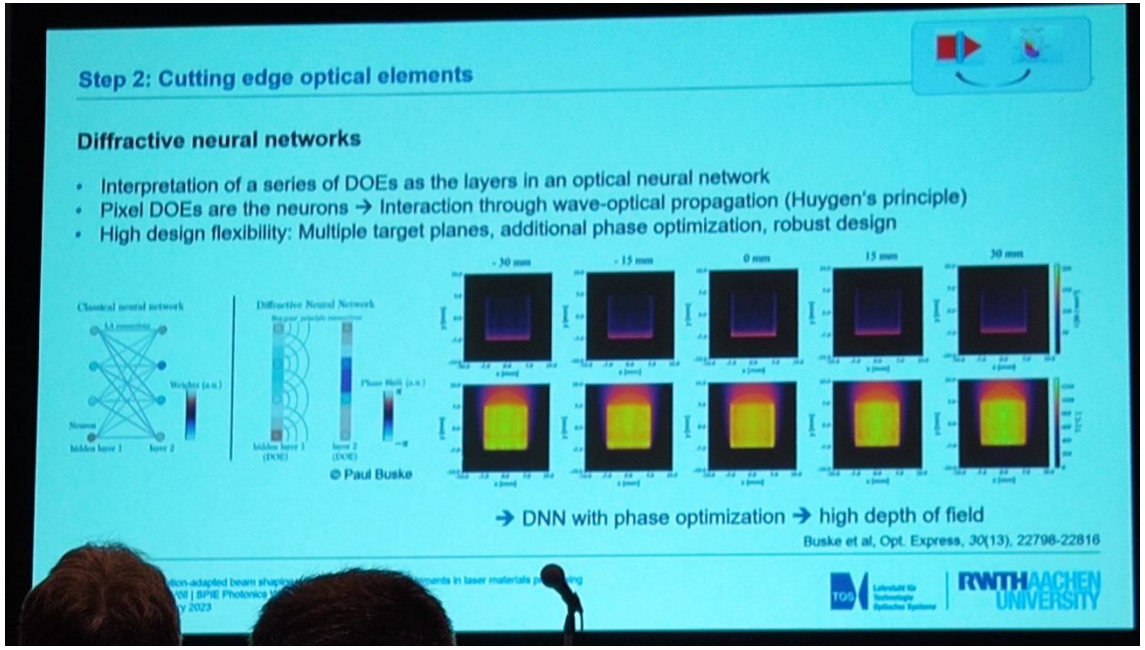
Intérêts
- Couplage IA + SLM + TopHat adaptation

Informations clés

2 photos

- Motivation : Retroaction for SLM (phase retrieval)
- Iterative calculation or neural/machine learning
- Artificial Neural Network approximates function to determine phase masks without prior knowledge of optical system = « 1 iteration ». But results highly dependent on the training process and time consuming to train
- Goal : arbitrary beam shapes
- Tophat : much better theoretical fit for continuous phases than discontinued (pi 0->255)…





02/02/2023 12414-29

High throughput SLM based multibeam laser marking system

Auteur(s) Gregory Jacob

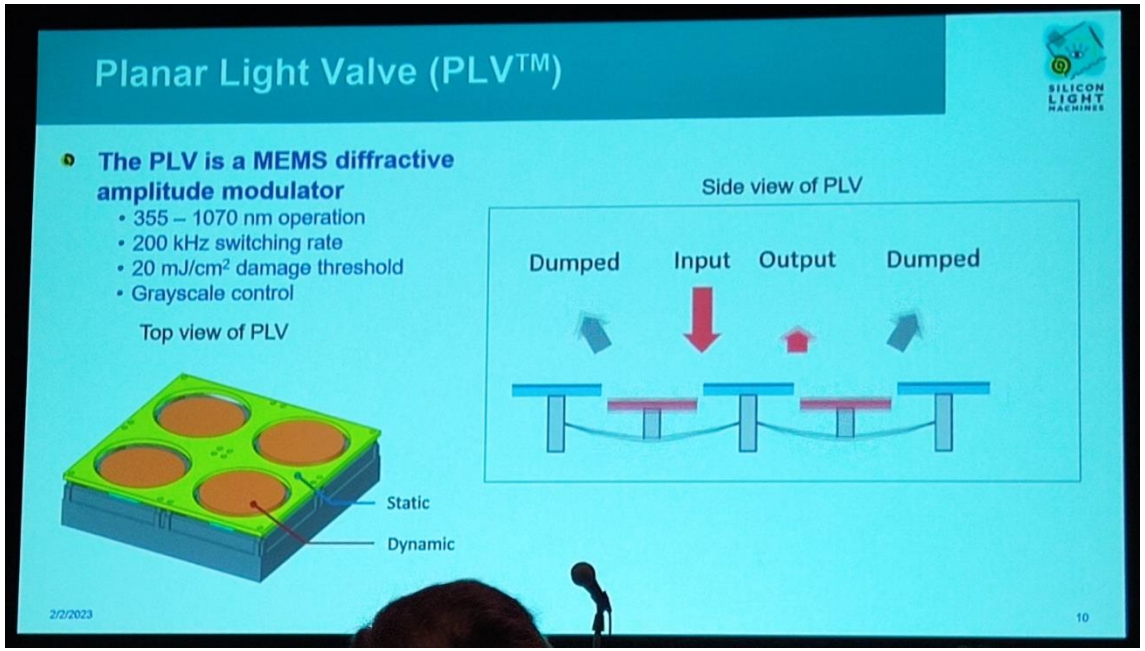
Soc. / Lab. Silicon Light Machines (USA)

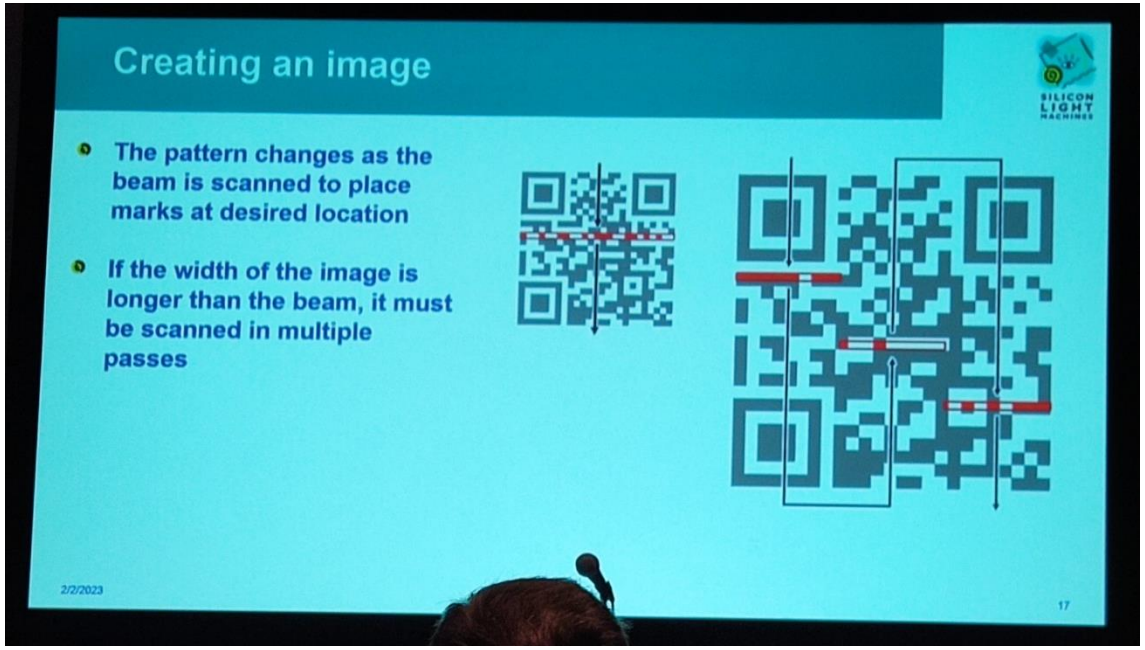
Intérêts
- Nouveau type de modulateur mécanique
- Stratégie d'usinage par bande

Informations clés

10 photos

- MEMS piston SLM
- Grayscale control / 20mJ/cm² threshold
- 1088x40 pistons (27x1mm)
- 90W 10ps 200µJ
- High speed demonstration of black marking by bands





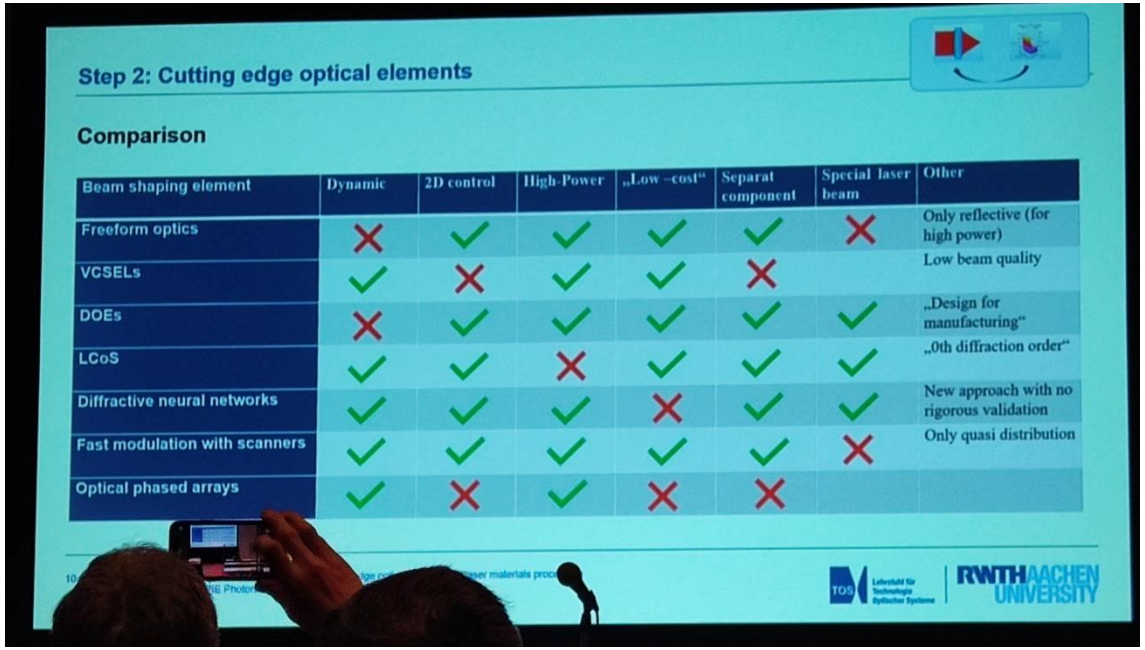
02/02/2023 12414-32

Application adapted beam shaping with cutting edge optical elements in laser materials processing

Auteur(s) Annika Völl

Soc. / Lab. Aachen Univ. (Ger.)

Intérêts
- MEF neuronale



Informations clés *1 photos*

- Adaptation of tophat répartition with répartition of temperature on sample
- Diffractive neural network
- Buske Opt Express 30 (13) 22798 22816

RÉVISIONS

Révision	Date	Description / Modifications
A	06/02/2023	Création du document

Avec le soutien de

Partenaires