OPTICON WP6
FP7-I Concluding Remarks

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What did we promise

- This WP focuses on new types of optically-active materials of potential astronomical application, moving beyond glass and steel, to organic, photosensitive and polymer materials. The objective is both to identify and characterise those new materials of most practical promise, and also to prove the viability of laboratory and industrial scale processes which are essential to turn their promise into practical technologies.

Quoted from the contract Annex

Architectu

- Novel VPHGs-based Devices
  - Slanted Fringes Devices, Multi-Order Devices and Echelletes, Piled Devices,
- Photochromic and Photosensitive Materials and Devices
  - DCG Replacement, Photochromic Based Devices
- New Materials and Processes for the fabrication of reflective and Refractive Optics
  - Polymer Lenses and Mirrors, Complex Shape optical devices, auto-mounted optics

Even

- Original Purpose of WP6 was to explore the application of new materials and processes BEYOND the traditional VPHGs.... These were assumed as “granted and available” at the beginning of the program.
- The Bankrupt of ATHOL brought the traditional VPHGs back into the program, specially looking forward to the E-ELT (most of the proposed instruments have VPHGs in their preliminary designs

“New” Architectu

- Novel VPHGs-based Devices

  2010SPIE.7739E..26P 2010SPIE.7739E.149B

  - Slanted Fringes Devices, Multi-Order Devices and Echelletes, Piled Devices,

  Baseline VPHGs Fabrication

- Photochromic and Photosensitive Materials and Devices
  - DCG Replacement, Photochromic Based Devices
- New Materials and Processes for the fabrication of reflective and Refractive Optics

  Measurement

  - Polymer Lenses and Mirrors, Complex Shape optical devices, auto-mounted optics

  2010SPIE.7735E.247B

VPHO

- DCG Chemical Post-processing is so difficult that requires a “Guru” to be done properly. This limits the number of players in the market and the possible area of application.
- Attempt to set-up an “New-ATHOL” experience appeared very risky.
- Concentrate on DCG alternatives (without neglecting the few DCG “gurus” around).

Photopolyme

- SUBARU has Pho-Pol VPHGs in instruments (Ebizuka, NAOJ and Women University of Tokyo)

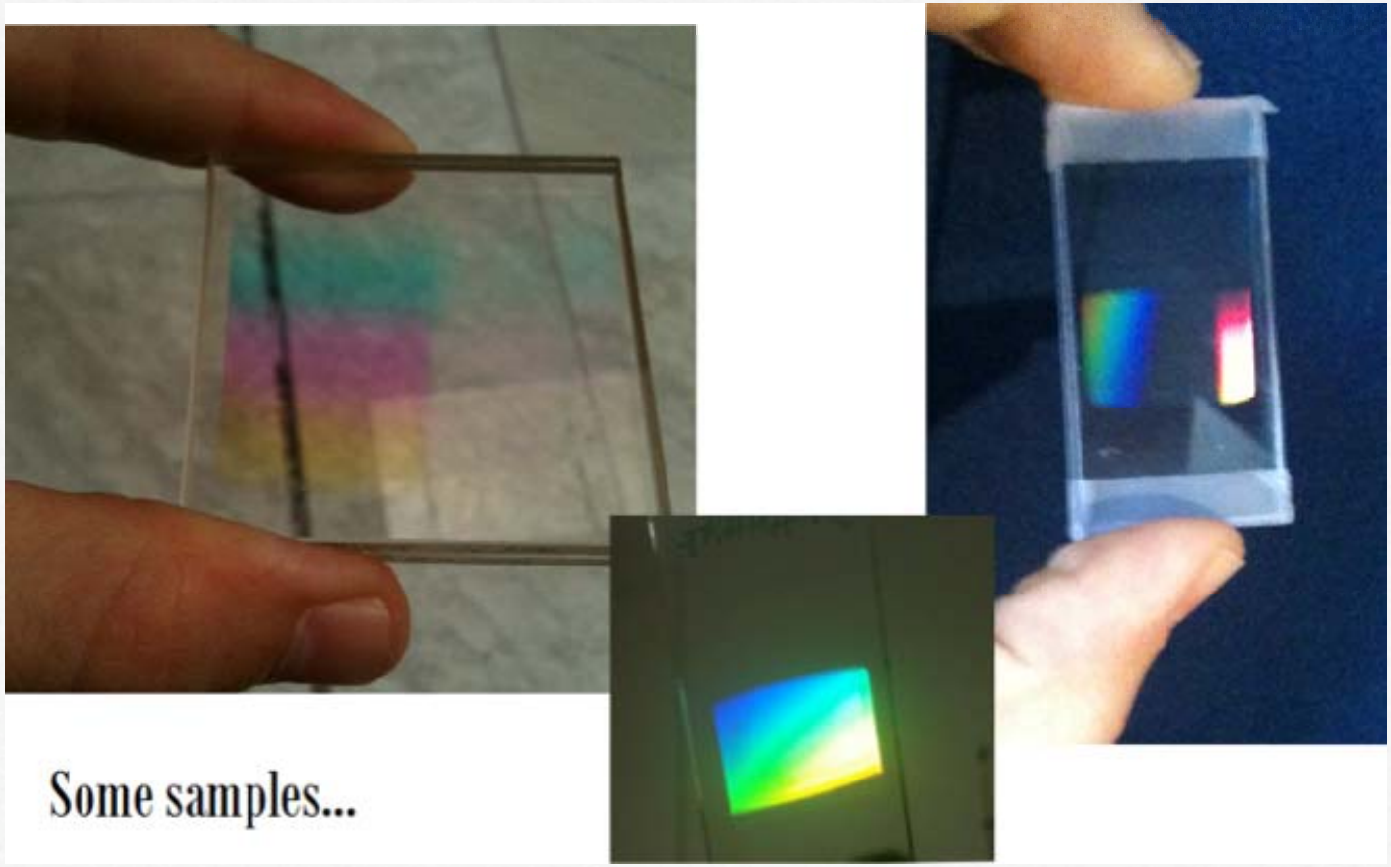
QuickTime™ and a
decompressor
are needed to see this picture.

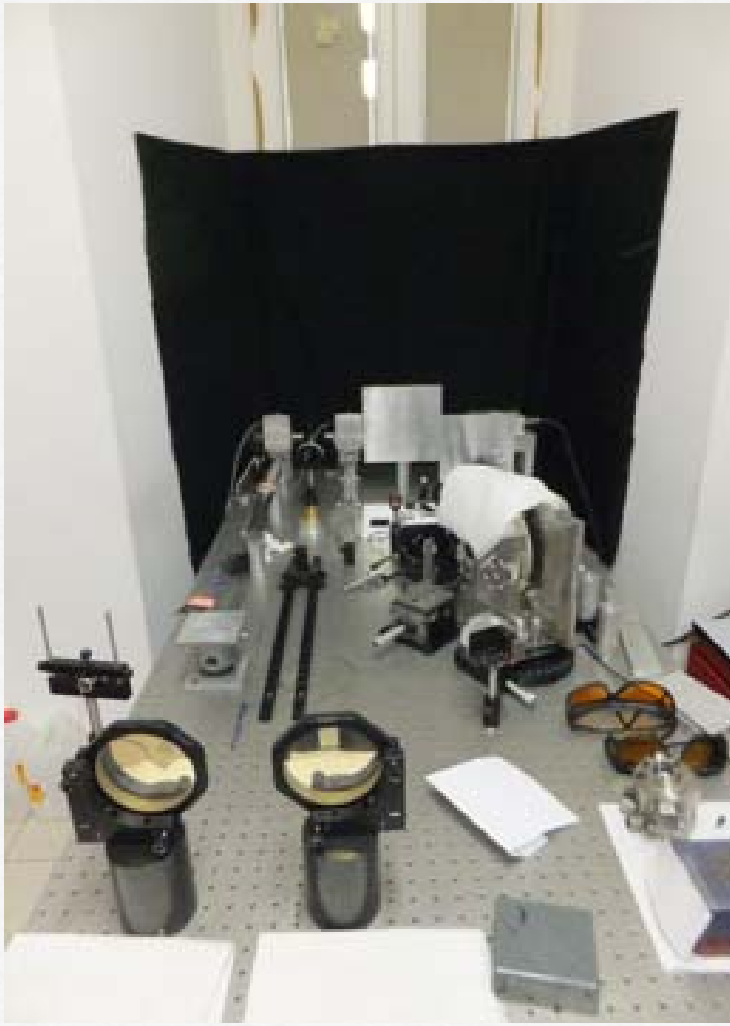
Polymer Supplie

- The Polymer used was from NIPPON Paint who ceased production provisionally in 2010 and indefinitely after the Fukushima Power supply cut.
- Polygrama from Sao Paulo (BR), a small lab developing photopolymers on customer specs accepted to produce some following a POLIMI recipe.
- After (now 4) Iteration high-grade gratings where made with “brazilian Picanha in Sushi Sauce”.

Polygrama VPHG

- We produced at Brera VPHGs with Polygrama polymers from very small test samples to 5x5 cm size.



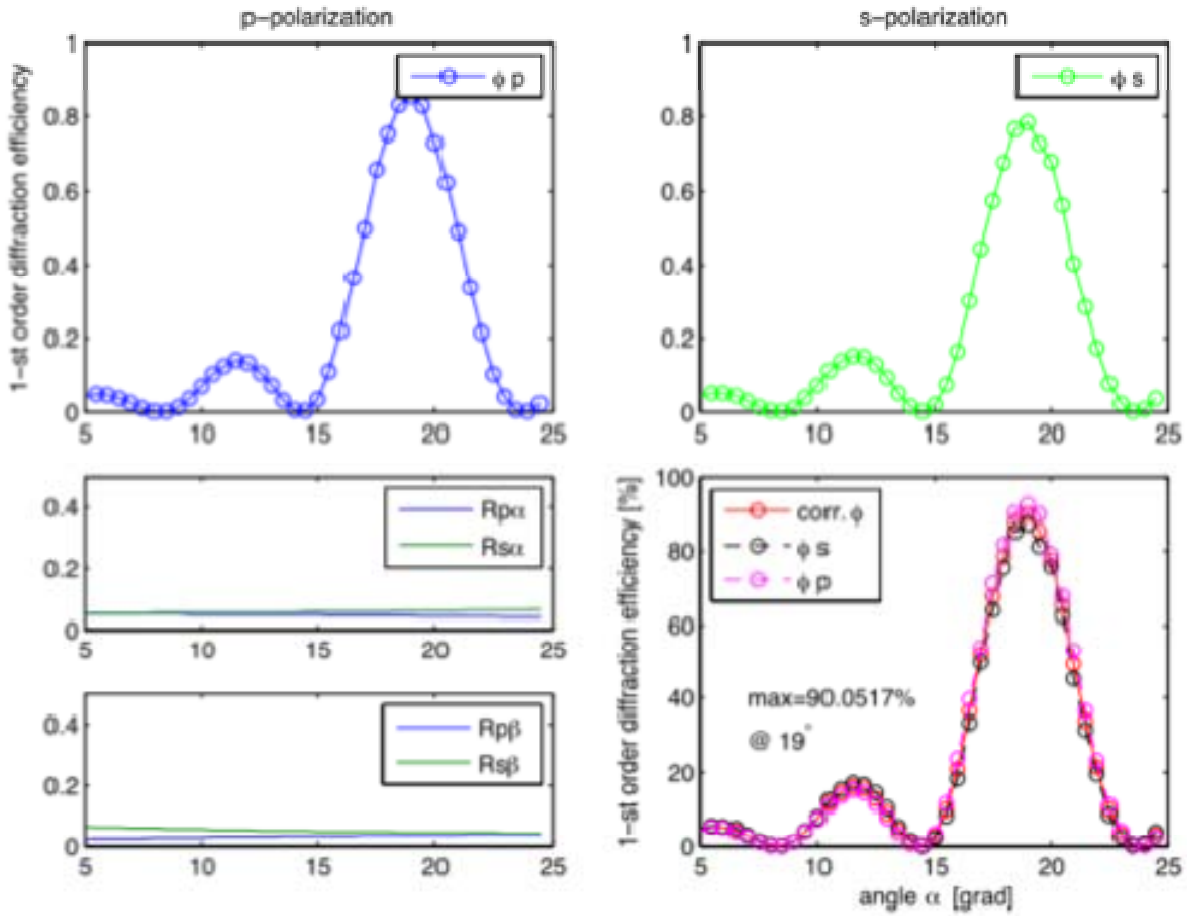


Bayer Photopolym

- in Late 2011 BAYER contacted us offering the baseline version of their photopolymer films and an agreement to customize them at our needs (with some non-disclosure agreement etc.)
- Their “Interest” behind is link to the solar energy business, Astronomy is however a niche of “high visibility” (and we really don’t care what they do with the polymer as far as they keep it in production)
- The Film comes in rolls of METERS size.....

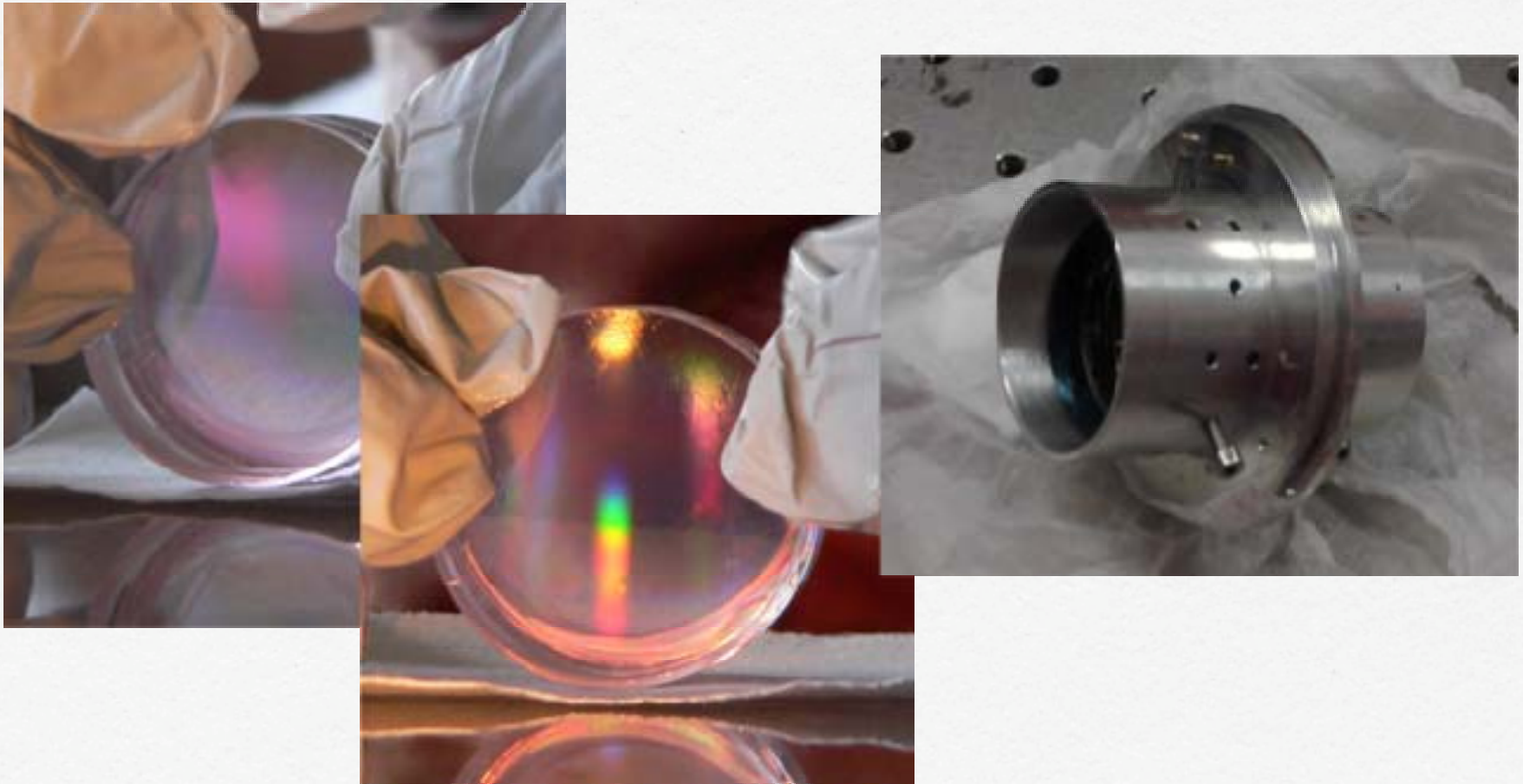
Bayer VPHG

- 8x8 Cm VPHG made in Brera with the BAYER Polymer film



On-Sl

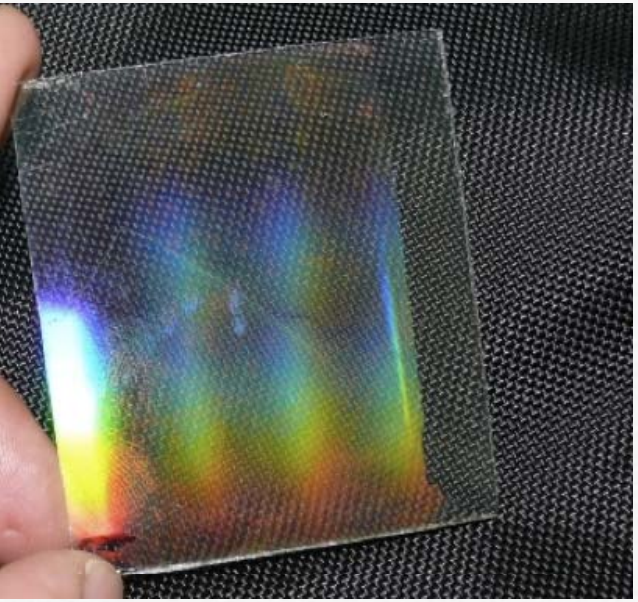
- 300 l/mm Mounted at ASIAGO 1.9 Telescope (AFOSC)- September 2012.... waiting for characterization

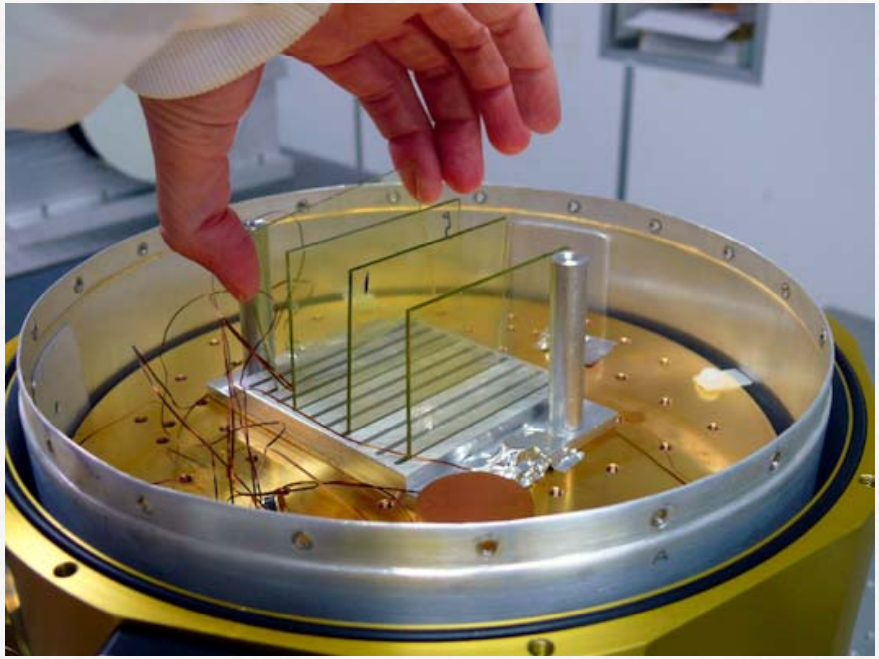


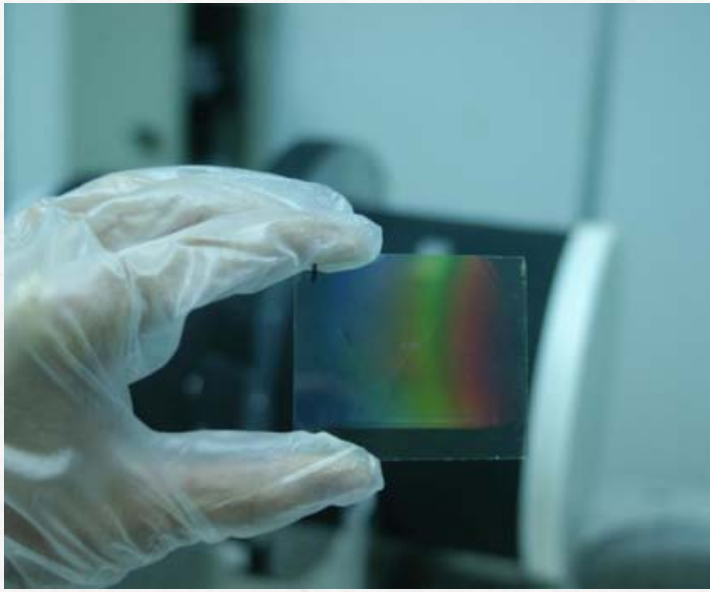
The Elche (DCG) Grat

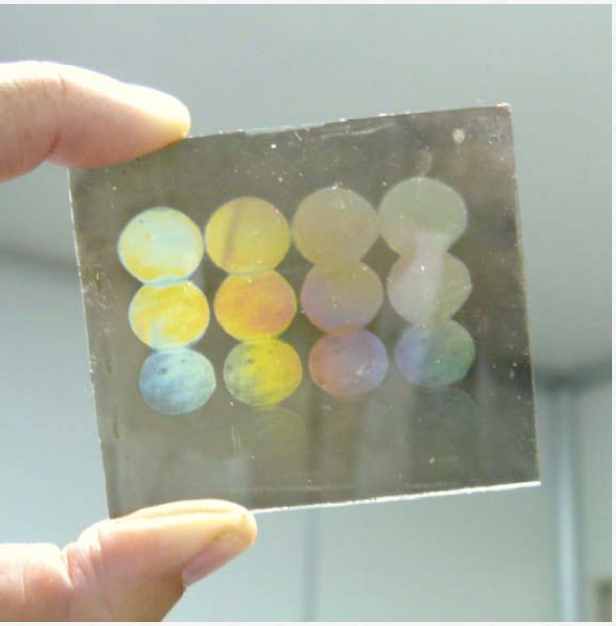
- IAC back in 2010 got in contact with Elche University... They were manufacturing DCG-based gratings for Laser Applications
- Tuned on a specific application.... only one size.... only one frequency.... but with excellent appearance and efficiency
- IAC obtained samples to test

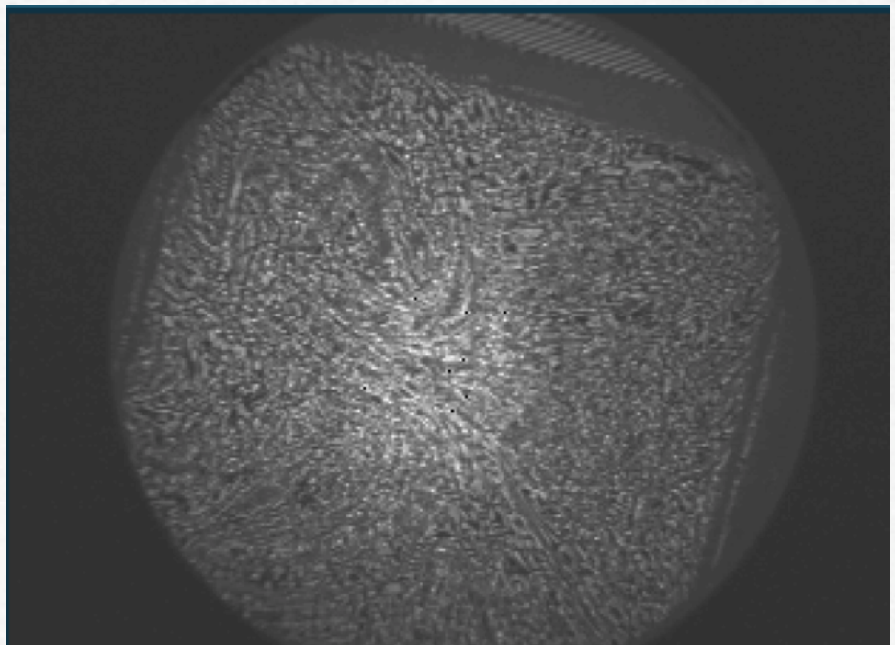
Elche-IAC gratin

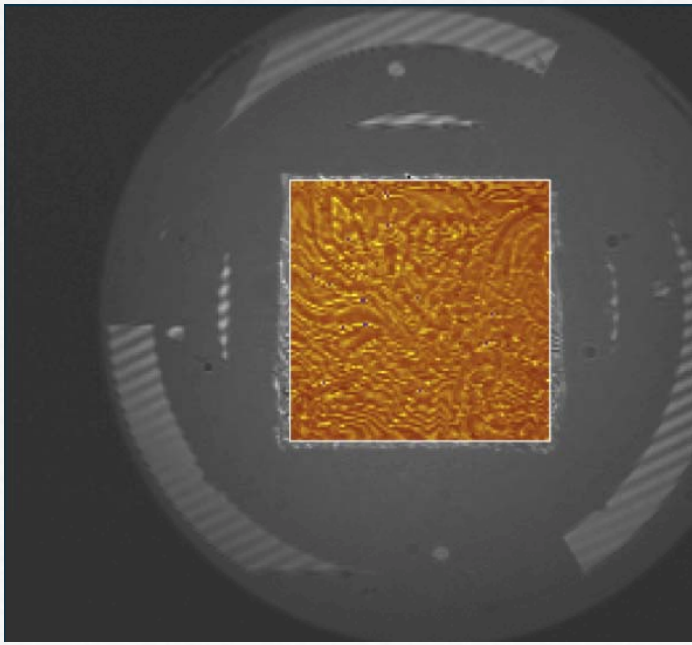




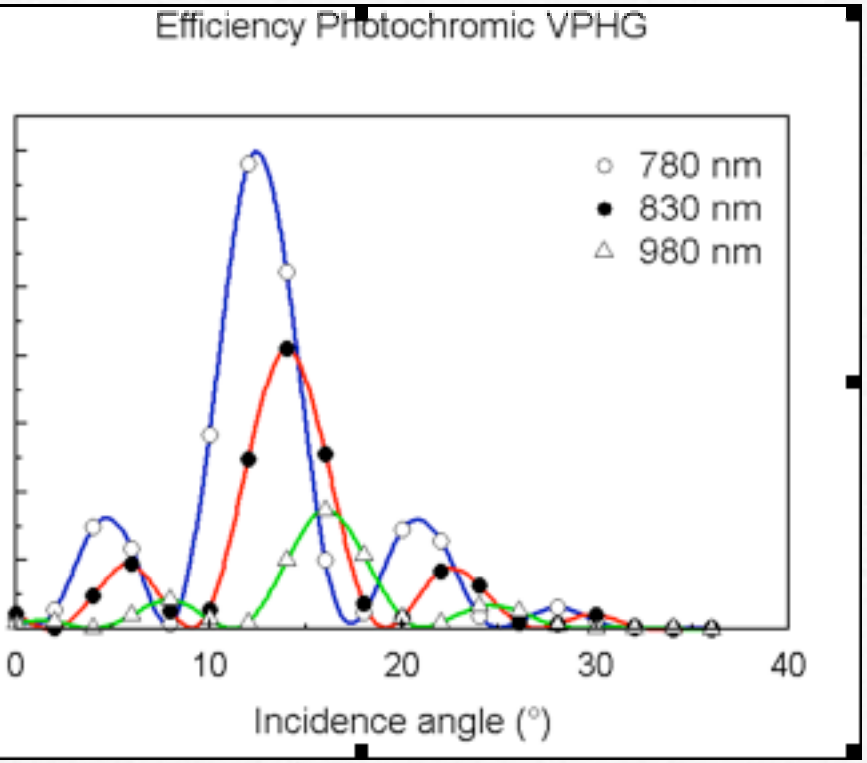




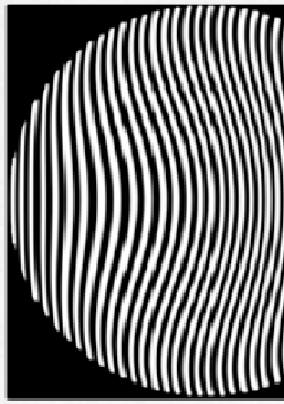




and Pho-Pol VPHGs

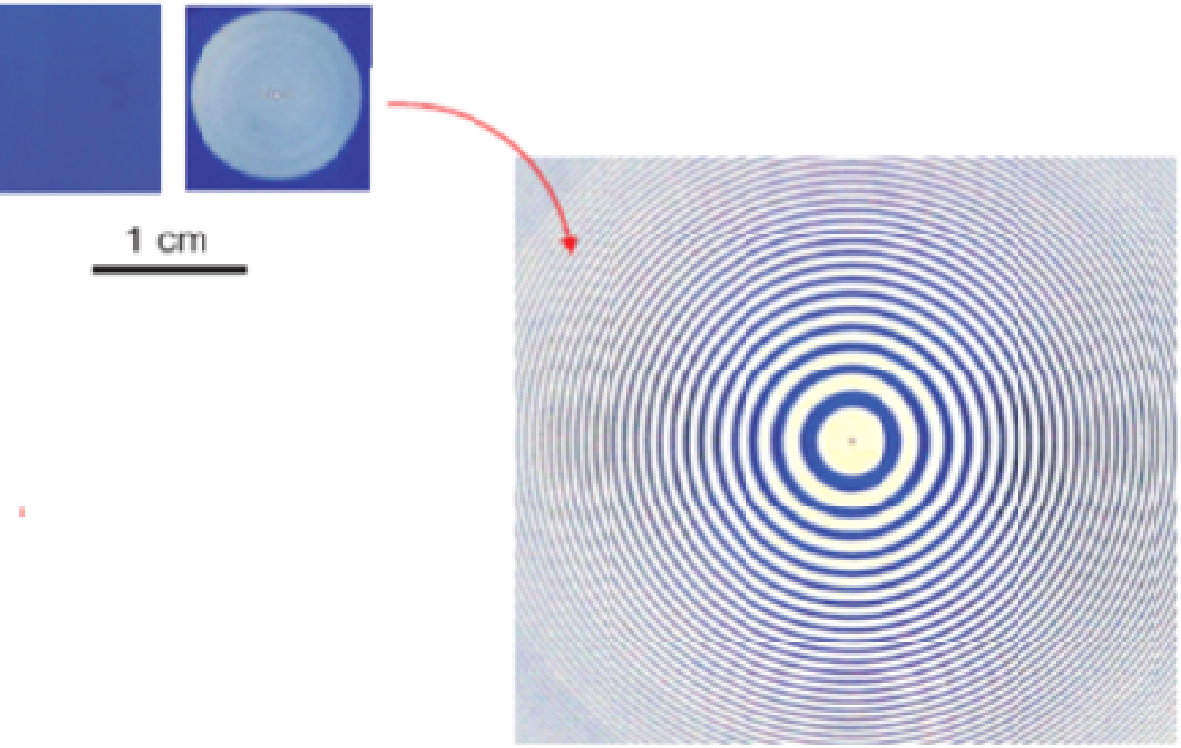


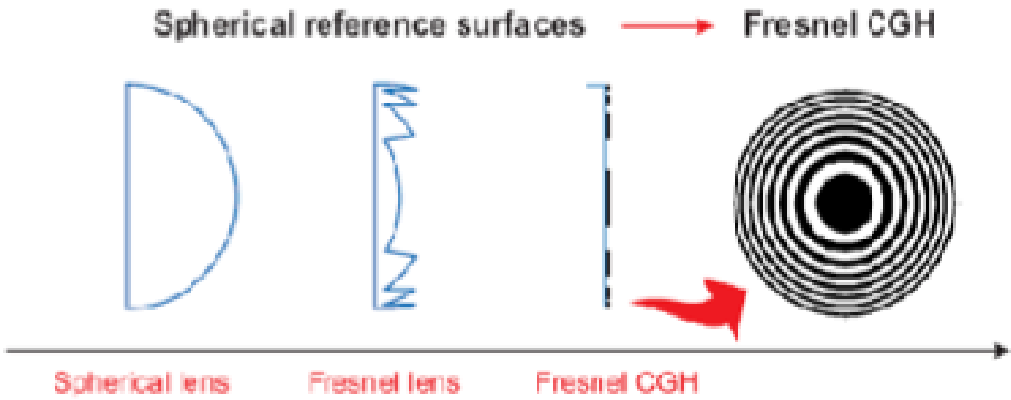
- The Efficiency of Pho-Pol VPH
is too poor and there is no way
improve it substantially. There a
possible niche application wher
re-writeability is important.
- Applications to other Holo-
elements is instead very promis



Photochromic CG

- Home made photochromic Fresnel Zonr Plate 30cm focal length 1 cm in size

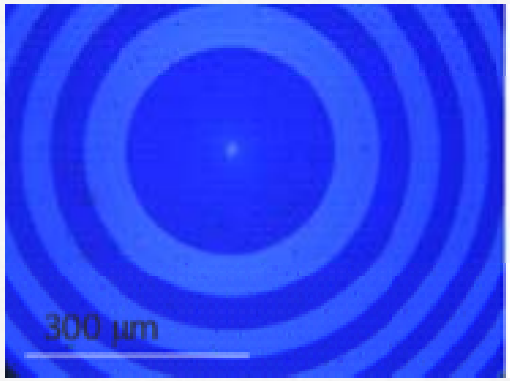


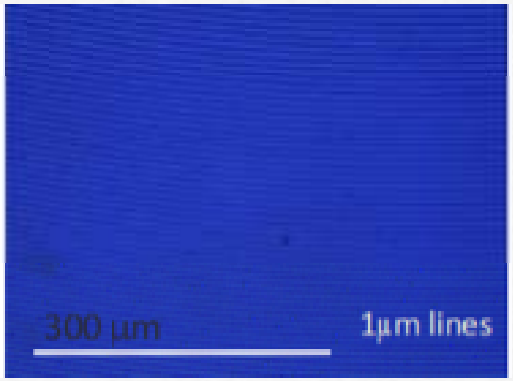


- All worked but application limited to the writing resolution of the laser writer beam

Photochromic CG

- New Fresnel Zone Plate 3 cm focal length F/1.5 (!!), in collaboration with Institut fuer Technische Optik - UNI-Stuttgart



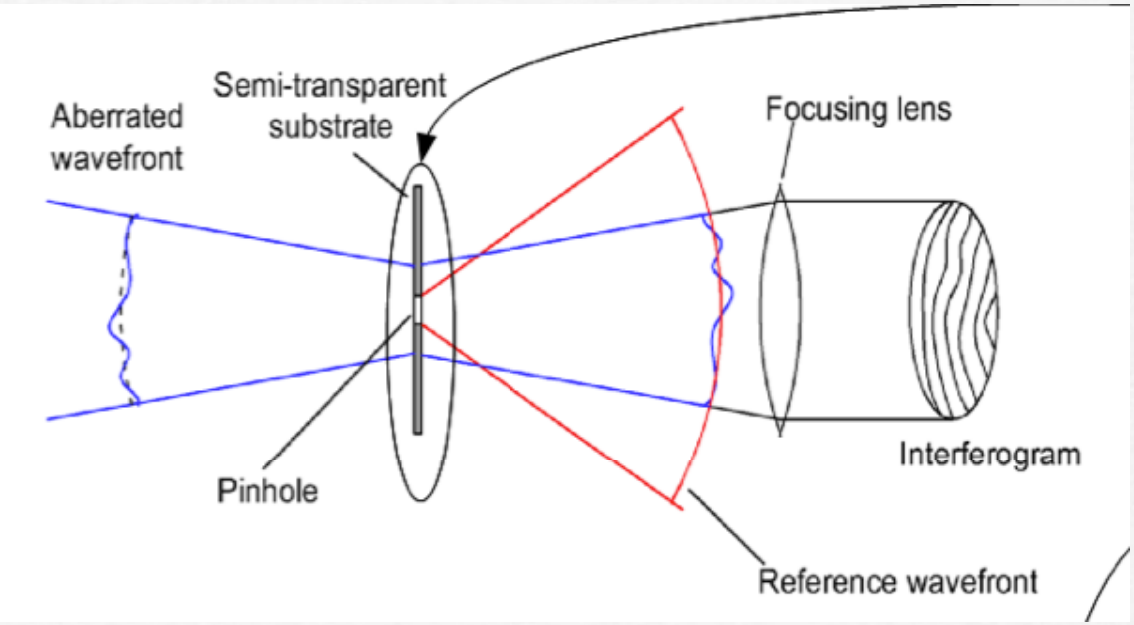


- Writing Precision (Optical Lithography Machine) below 1 micron. “Application Level” reached !

Presented at SPIE 2010

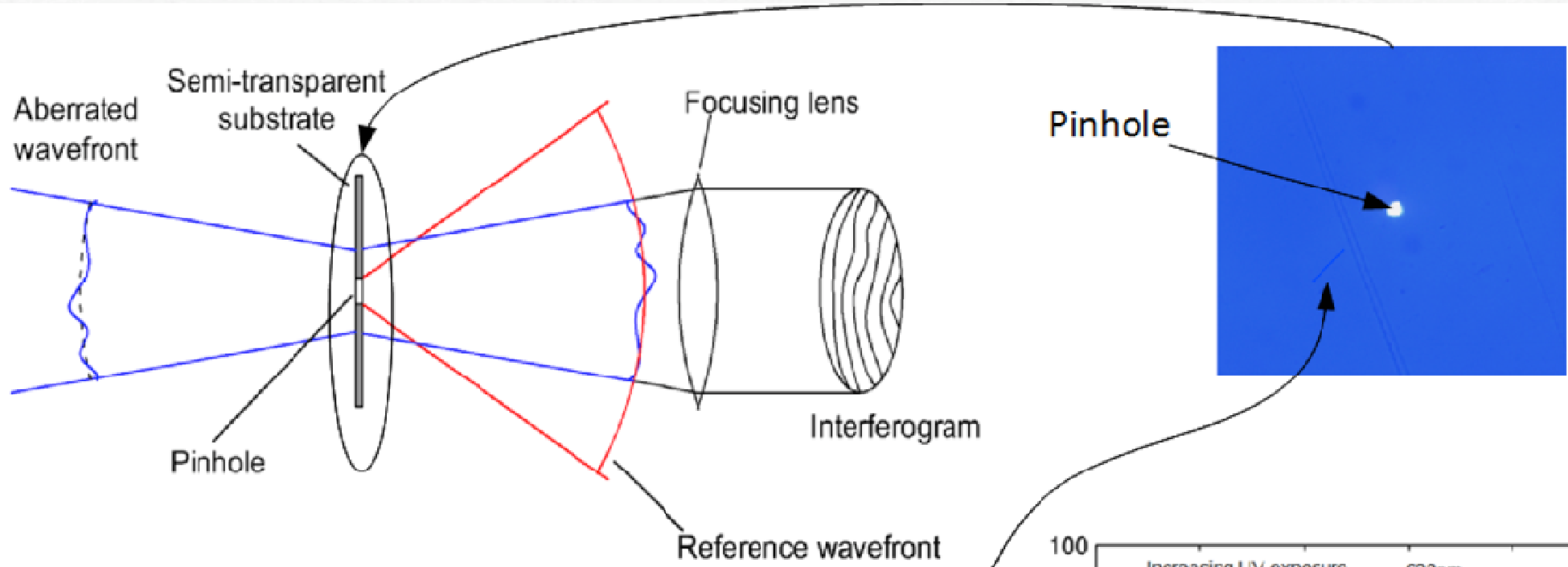
Photochromic P

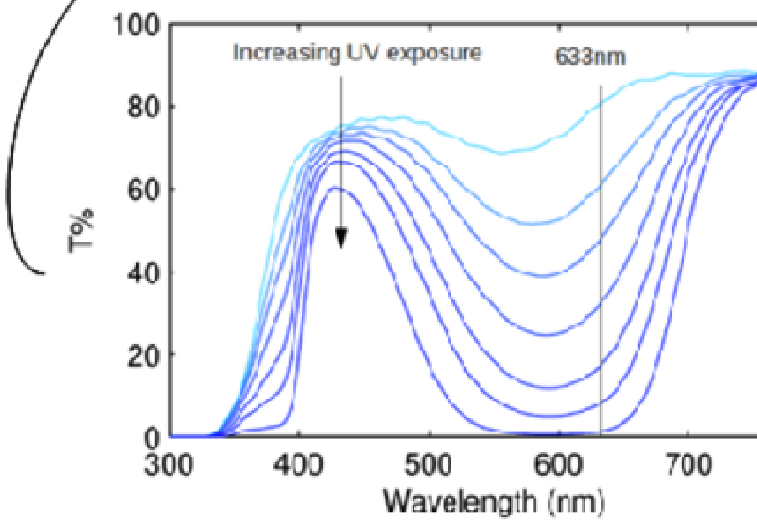
- A Point Diffraction Interferometer is a Common-Path Inteferometric testing Facility based on a semi-transparent plate with a pin-hole



- The flux of the reference and aberrated WF must be kept the same in order the game to work.

Photochromic P

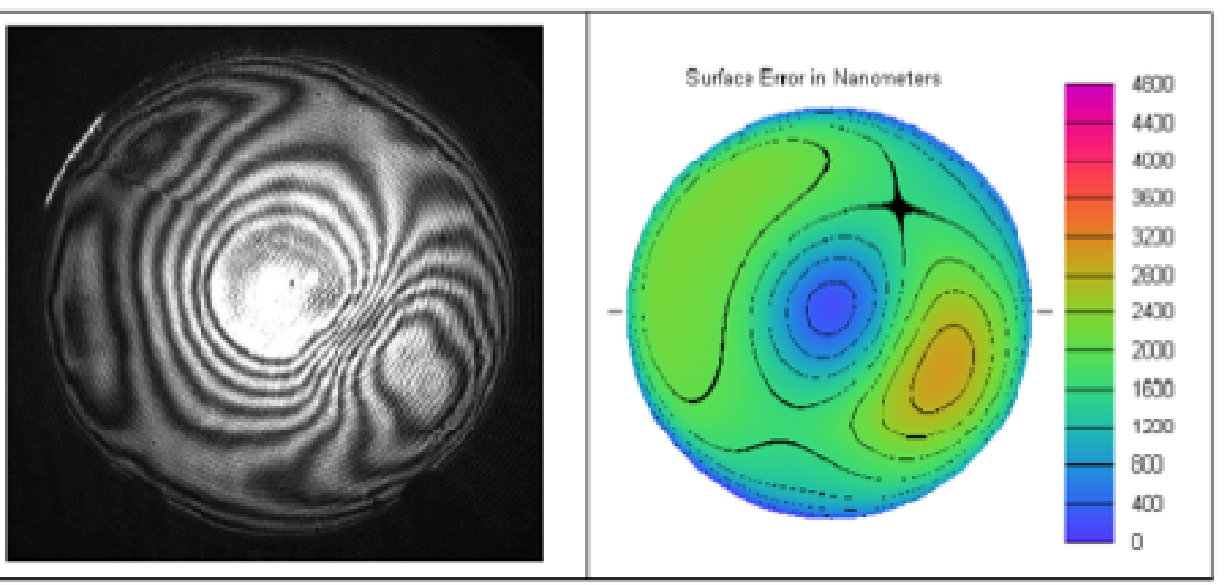


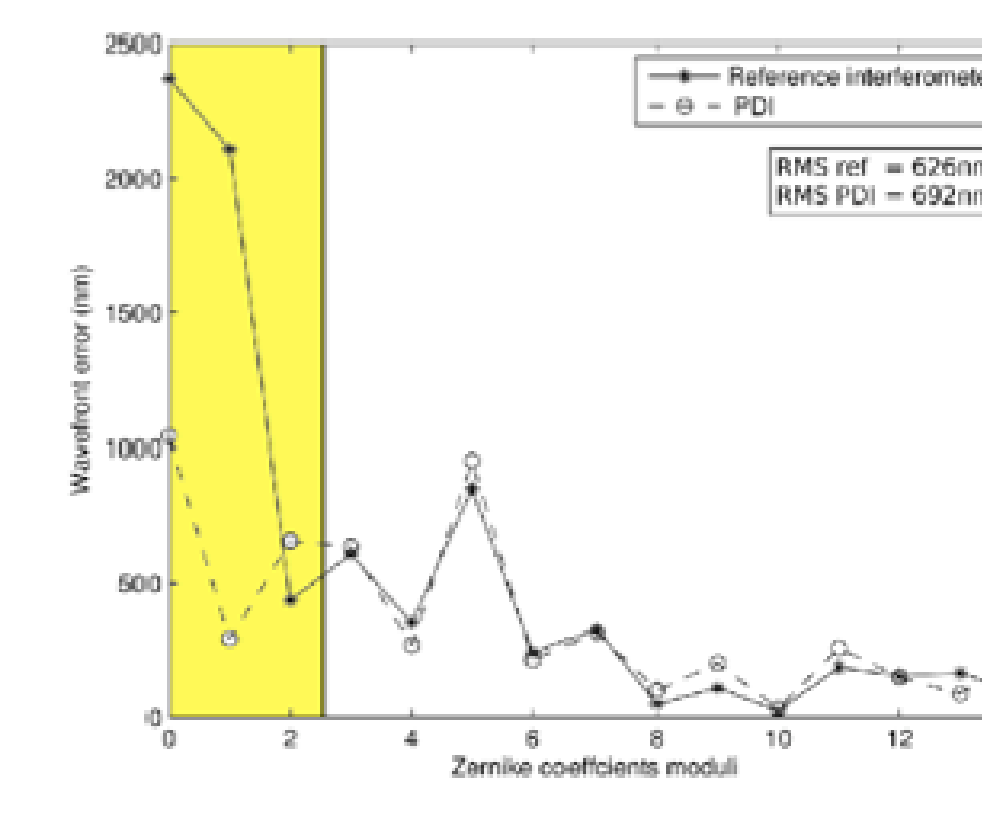


- The idea is to use phC-Pol for the plate tuning at the same time and in real time the pinhole and the transparency of the plate until best match is achieved.

Photochromic P

- Tested on a “Very” aberrated surface demonstrated to be in good agreement with a Fizeau





Presented at SPIE 2010

Conclusion

- VPHGs up-and-running again..... accomplished
- DCG replacement.... accomplished (at this stage)
- New tools for optics characterization... accomplished
  - Holograph running in Merate
  - CGH lithography running in Merate (2013)
  - Specific new Synthesis lab in Milano
  - Cryo-Vac WF and Transmission Charact.Lab in Tenerife
  - Publications, successful “related” funding proposals

We will be proud of our final report