

PHOTONICS

magazine

The road to:



Knowledge



Design



Manufacturing



Application

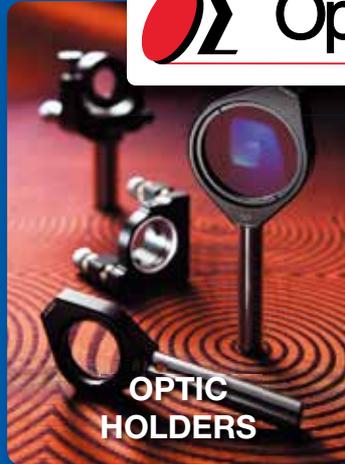
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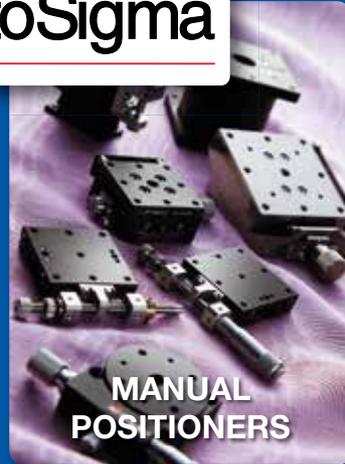
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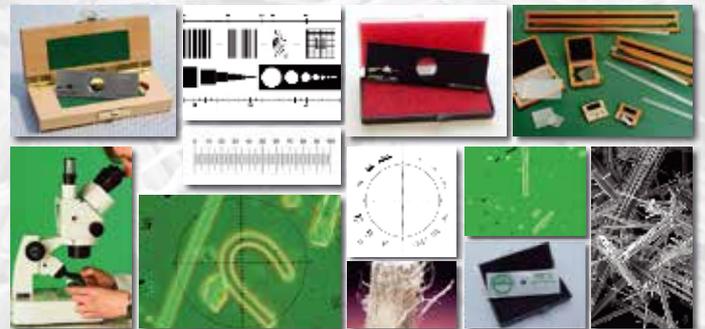
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Dear PhotonicsNL Magazine reader,

Welcome to the last magazine of 2021 for PhotonicsNL.

In 2021 we have all experienced how the world has changed in COVID times, vaccination campaigns started, the world opening up for travel and events again, but somehow slower and more careful than expected. For PhotonicsNL a reason to postpone our yearly DutchPhotonicsEvent to spring 2022 instead of the originally planned early December 2021.



Benno Oderkerk

For the photonics business 2021 was for most companies a year of growth, compensating 2020. We see many new applications for our technology contributing to this growth. The main bottleneck in the growth is now the supply chain problems and the shortage of personnel.

For PhotonicsNL 2021 was also a busy year with many on-line events, and in the summer we were invited in Berlin to contribute to the State Visit of our King and Queen. This was a special opportunity to present our German-Dutch collaboration in Photonics to the Royal Couple.

Other European collaborations have been with France, where an innovation mission with all French Photonics Clusters has started in September.

On 8 December we had a strategic session with the PhotonicsNL team and board to discuss plans for further growth of our organization, adding more value for our members.

We are preparing now for Photonics West, 25-27 January 2022 as the first worldwide physical Photonics event that will actually take place. The Dutch pavilion is completely filled with 15 participants. I am personally looking forward to seeing most of you again in real life, after all these digital meetings.

Finally, I would like to welcome our new members, Optics11, IDEX Optical Technologies and MicroAlign that have joined our growing organization.

I wish all of you a Merry Christmas and Happy New Year, together with your beloved ones.

Please stay safe and healthy during winter months and find enough time to read this Magazine and get inspired.

Benno Oderkerk

Chairman of the Board
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Dear PhotonicsNL members and partners,

After the restricted start of 2021 we fortunately saw some of the COVID-19 restrictions being lifted, giving us a window of opportunity to continue building the photonics network in physical meetings. In this magazine I am happy to share a few great examples of these physical events in the second half of 2021 and the road leading up to them.



Ron van der Kolk

After an extensive period of online preparations we were able to make a contribution to the State Visit of our King and Queen in Berlin on 7 July. During a unique event in the TU Berlin we established a terrific promotion of photonics. In this magazine you can read all about the event, the signing of the MoU with OpTecBB and the parallel stations with 4 important elements of Dutch and German collaboration in Photonics. All resulting in a great advocacy effort for Photonics, congratulated by our national and international network.

This collaboration boost between Germany and the Netherlands on 7 July was surrounded by other events. Ranging from webinars before the event to another physical meeting between our ecosystems in October in Berlin during the Photonics Days Berlin Brandenburg. Intending to continue the German and Dutch collaboration on the international stage during Photonics West in San Francisco and the Laser World of Photonics in Munich. And certainly also during the next DutchPhotonicsEvent which is planned for the end of spring 2022.

Another important European collaboration that we set up was between the Netherlands and France. As part of a year long innovation mission we were able to organize a few Dutch French collaborative webinars leading up to a round table meeting in Paris on 17 November. During this round table meeting the Dutch Photonics Ecosystem, represented by PhotonicsNL, PhotonDelta, Dutch Optics Centre, our Dutch Enterprise Agency and the Innovation Attachés, got acquainted with the 6 major French Photonics clusters: Photonics France, Pôle Optitec, Photonics Bretagne, Systematic, Minalogic and ALPHA RLH.

The round table meeting took place at the Ambassador's residence in Paris, where all participants gave a presentation about their cluster and the expertise that they have. Afterwards there were fruitful discussions about the possibilities for future collaboration between the Netherlands and France. A detailed article can be found further on in the magazine.

While writing this magazine our preparations are in full swing for Photonics West at the end of January 2022, the Laser World of Photonics in Munich at the end of April 2022 and our next and biggest DutchPhotonicsEvent at the end of spring 2022. You can read more about the latter in this magazine.

The digital meetings have a certain efficiency but they can't compete with the real events. That is why I hope to see many of you when we continue to facilitate future connections and collaborations throughout our ecosystem. From education and research to commercialization and application of photonics by end users. And bridging photonics, as an important enabling technology, with multiple application areas and technologies, for example Quantum Technologies and Artificial Intelligence. All this combined with the increased interactions between the Dutch Photonics Ecosystem and our international partners, give a very positive outlook.

And that is why I want to thank you all for your continued support and partnership. I wish you all a Merry Christmas and a Happy New Year.

Ron van der Kolk
Director PhotonicsNL



Knowledge



Design



Manufacturing



Application



Update DutchPhotonicsEvent

Ron van der Kolk and Petra Wicherink

Do you remember the last physical DutchPhotonicsEvent in Delft? We do! But it seems like it was in the previous century. Due to the COVID-19 regulations the 2020 edition was an online event.

The four webinars that we organised were very successful. As we all might have experienced, it's easy to step into a webinar from behind your computer, with

no travel time, listening to very interesting presentations and taking part in the discussion of the end of each meeting. However we really missed essential parts that make the DutchPhotonicsEvent so great: the connecting and networking at the exhibition and throughout the whole day.

Although we all were getting used to our 'online lives', it was great that during 2021 we got more freedom and in fact we hoped to be able to organize a physical DutchPhotonicsEvent, ending 2021 with a great success. While the meetings with our Program Commission were in full swing, a fascinating conference program was in the pipelines. Main challenge however, was finding a location, as the rules around COVID-19 could change any moment. We had found some very nice locations and we also had good conversations with those parties, but in the end we were never able to finalize this.

As the restrictions came back hard in the second half of 2021 we had to make a tough decision to postpone the 2021 edition of the DutchPhotonicsEvent to 2022. Though the good news is that for this 15th edition, we found a very special location where we will be able to build the event in its full glory!

New location in the picture

We are in conversation with a fantastic party to present the biggest DutchPhotonicsEvent you have seen thus far, with many interesting elements that belong to the event. What about the conference with many gripping topics, exhibition with participants from the complete value chain that will show their latest developments, Poster Award for students/ PhD's/PostDocs, many opportunities to network and meet your partners, your (potential) customers, a delegation from Germany and from France, your photonics colleagues, your future employees, or just those you haven't seen or spoken for a long time. And last but not least a *free lunch* as the inner human part also needs to be pampered. We will start early in the year to approach the Golden Sponsors. Let us know if you want to make an early reservation so your space will be guaranteed!

Those who have read the above text carefully might have noticed that one important topic is missing, namely the Women in Photonics Lunch. We haven't forgotten to mention it but it has become such a big success that the normal networking lunch would fall apart in two separate groups: a 'Men in Photonics Lunch' and a 'Women in Photonics Lunch'. Networking is important, with and for every attendee of this day, therefore it makes sense that the Women in Photonics Lunch will become a separate event on a different date.





Conference

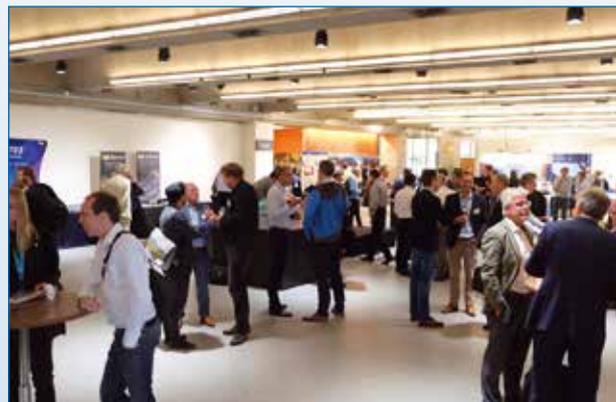
We are already at an advanced stage on the program of the conference. Together with the Program Commission, consisting of Johannes de Boer, Silke Diedenhofen, Frans Harren, Femius Koenderink, Herman Offerhaus, Gerrit Polder, Eddy Schipper, Jorn Smeets, Carlas Smith, Bart Snijders, Patty Stabile, Ruud Verdaasdonk, we've had some brainstorm sessions to get clear what the current 'hot' photonics topics of today are, from research and development to application level. As there are too many interesting topics to put in the program for one day, we will have to make choices which we will do within the next months.

With the start of two international collaborations this year, namely with Germany and France, it is a logical next step to also connect these two countries with the DutchPhotonicsEvent where they will be visible during the whole day. Because international contacts and partners are very important for the Dutch photonics industry.

See you live

We can't wait to meet you all in person to present the 15th DutchPhotonicsEvent. Keep an eye on your mailbox with the invitation and the program or check the website at www.dutchphotonicevent.nl

Impression DutchPhotonicsEvent edition 2019



PhotonicsNL news

Petra Wicherink

New 'roadmaptrekker' Photonics.

For many years the role of photonics 'roadmaptrekker' has been executed by Hans van den Vlekkert (CEO of QuiX Quantum and former CEO of Lionix International), a very familiar face in many photonics related matters. Sometimes it's time to move more to the sideline and Hans meant that now he has achieved this point. But of course only with the knowledge that there will be a good successor: Benno Oderkerk (former CEO Avantes). Benno also has an incredible experience and history in photonics and we think with Benno in this position, Dutch photonics and it's market will keep on growing and developing!



Proud of our new logo.

In different communications you already might have seen it: our new PhotonicsNL logo. After propagating our logo for many years we looked for a better connection with the other logo's that we had made during the last years and that are also part of PhotonicsNL. We believe that with the addition of the colors it is more in unity with these logo's: 'another Day of Photonics' and 'DutchPhotonicsEvent'. We are proud to carry out these three logo's!

P h o t o n i c s N L



N E T H E R L A N D S



Dutch Photonics Event



another Day of Photonics



Advancing Dutch – German collaboration

Ron van der Kolk and Petra Wicherink

2021 is a year with many focus points. One of these focus points is to strengthen the collaboration between the Netherlands and Germany in Photonics and Quantum Technologies.

Why a collaboration boost? We intend to stimulate, strengthen and increase the economic growth of the German and Dutch regions. In this example the Berlin Brandenburg region in particular.

A unique event took place on 7 July in Berlin, setting up the collaboration boost. Prominent guests on this festive day were His Majesty King Willem-Alexander and Her Majesty Queen Máxima. And of course many more dignitaries were present: Minister of Defence Ank Bijleveld, State Secretary for Economic Affairs and Climate Policy Mona Keijzer, German excellencies Michael Müller, governing Mayor of Berlin and Senator for Higher Education and Research, Steffen Krach, State Secretary for Higher Education and Research and other dignitaries from both countries. Of course key figures of the Photonics ecosystems were also present, amongst others Frank Lerch of OptecBB, Ron van der Kolk and Benno Oderkerk of PhotonicsNL, Ewit Roos of PhotonDelta, Paul Urbach of Dutch Optics Centre and Eddy Schipper of the Dutch Enterprise Agency. And surely Bart Sattler and Kimberley Klein Meulekamp of the Embassy of the Netherlands with whom we did all the preparatory work to realize this unforgettable day.

Introduction to importance of collaboration

The event started with welcome speeches given by the two hosts Prof. Dr. Christian Thomsen, President of the TU Berlin and Prof. Dr. Martin Schell, Executive Director Fraunhofer HHI and Benno Oderkerk, our chairman.



Prof. Thomsen stated that since the inauguration of the building over 130 years ago, the Atrium of the TU Berlin (Lichthof) has always radiated a symbolic quality and at its historic core it stands for the dawn of the technological age and represents change, progress and innovation. This inquisitive drive has established the TU Berlin as a world leading center for scientific and applied research and collaboration. Prof. Thomsen further stated that we are together to celebrate advancement, because the future is made of light. Photonics, the scientific and economic use of light, is already used in many technologies.

And with Quantum technologies and Integrated Photonics on the rise the collaboration between the Netherlands and the Berlin region takes a leading and pioneering role. By officially strengthening this partnership, we hope to further connect our two countries and together pave the way to solve the many societal challenges we face today and will face in the future.



Prof. Martin Schell then proceeded with his speech and explained more about our advancing scientific collaboration. He showed the audience how Photonics is important in Material Processing, e.g. cutting materials in centimeters, but also processing on the nanometer scale. He showed how Photonics is also sensing and he referred to sensors in Aerospace and Automotive. How Photonics has entered Agriculture. How Photonics is Communication. And above all, how Photonics is about people. Great example is how Prof. em. Meint Smit, the father of the 10 year collaboration between the University of Eindhoven and Fraunhofer HHI. And how Photonics is also represented by the cluster OpTecBB, the initiative of companies and scientific institutions for together exploring Photonics and the collaboration with the Netherlands.

Our Chairman of PhotonicsNL, Benno Oderkerk, then proceeded the plenary part with his speech about the importance of Photonics and the collaboration on network level. The geopolitical situation is constantly changing and so it is important for Europe to unite and work together, to make sure that we, with our technologies like photonics and quantum technologies, that are very innovative and key enabling as we call them, have the whole value chain within Europe. This is essential for employment and future economic growth and solving societal challenges. Therefore the collaborations between the clusters and their members is important.

Purpose and signing of the MoU

With the signing of the agreement between the clusters we intend to stimulate, strengthen and increase the economic growth of the Berlin-Brandenburg region and the Dutch regions. We can achieve this by increasing innovation and competitiveness of the regional industries and of the research and development potential of the mentioned regions, especially in the fields of Optics, Photonics, Opto-Electronics and Quantum Technologies and their related application fields.

Furthermore we want to initiate and support research and business cooperation between members of the clusters of both countries. Exchanging information on innovation challenges and solutions for the clusters, by jointly organizing activities (e.g. trainings, workshops, exhibitions, seminars and conferences) and joint participation in branch trade fairs of the regions and other fairs of international reach. Overall the MoU is essential for the next level of collaboration in Photonics between Germany and the Netherlands.

Visit of the Royal Couple to parallel stations

After the signing of the MoU we showed the Royal Couple and all dignitaries 4 major elements of Dutch and German collaboration.

Frank Lerch guided His Majesty the King to the first station where we showed the collaboration between the Netherlands and Germany on the **Commercialization** of Tech and Research into Start-ups. This very important element will strengthen and build the value chain of Integrated Photonics. The way we are able to do this in the Netherlands with the PhotonDelta ecosystem as frontrunner is of great interest for our German partners.

After this another very important aspect that we showed is the collaboration between the **large internationals**. In this station





ASML and Berliner Glas presented how they have merged into a very competitive combination.

On the **Science and Career route** Ron van der Kolk guided Her Majesty the Queen and showed her how TU Berlin and Dutch Optics Centre/TU Delft focus on Photonics in education and how this leads to careers in Photonics. Queen Máxima referred to the importance of women in science to be able to meet the demand for specialists. Inside joke is that sometimes the scientists of both the Berlin university as well as the TU Delft University claim to have the highest amount of female



PhD candidates. The Dutch and German universities will explore the possibility of a joint education and/or exchange program, as has been successfully done between TU Delft and the University of Jena/Thüringen. All photonics specialists will be of great value for future workforce.

And last but not least we showed Queen Máxima some of the developments of **Photonics in Quantum Technologies**. TU Berlin showed the projects they are working on and QuantumDelta presented their approach in starting collaborations.

The future of the MoU and collaboration

The signing of the MoU is the advancement of a long-term professional and pleasant route to give shape to the German-Dutch collaboration. E.g. the application of Photonics in various sectors such as AgriFood, Medical, Automotive, etc. where we, together with PhotonDelta and Dutch Optics Centre, are aiming for. We will organize workshops together and share challenges to reach joint solutions. We will also strengthen each other on trade fairs and seminars of end users.

Events as part of the collaboration

Before the official signing of the MoU we already had a collaborative preview on 2 June where we enjoyed the webinar 'Photonics for Medical Applications: Dermatology'. In this broader international webinar, where OpTecBB (OpTec-BerlinBrandenburg) was the host, different photonics applications that already are used in dermatology were highlighted and explained. On this subject each cluster brought two speakers with their own expertise. From the Netherlands, the presentations were given by Richelle Hoveling from Quest Medical and Albert Wolkerstorfer from Amsterdam UMC.

The first event after the MoU signing, which was finally a hybrid live event, were the Photonics Days Berlin Brandenburg, from 4 – 7 October. In the program there were 2 large Dutch contributions. On Wednesday 6 October the topic was 'Photonics for AgriFood applications' with a Dutch contribution, as we have a substantial expertise in this field. Photonics for AgriFood is an important topic, as today, the agricultural production is facing important challenges, triggered by global warming and an increasing awareness of the consumer. Photonic technologies are already implemented in precision crop production, livestock



management, and global food supply chains. So far, the potential of these applications is still restricted by (1) limited data generation, (2) limited ability of multi-dimensional approaches, (3) the variability of biological samples, (4) the costs of these innovative technologies and (5) the transfer costs requested to implement these new technologies. Photonics helps monitoring the agricultural production and provide useful data for farmers to make better strategic crop management decisions. Therefore, new technological approaches, multi-sensor data fusion, and novel data management systems are still needed. Agricultural production is essential for a growing world population and also still the main livelihood from a global point of view. In this regard, the use of photonics in smart farming processes makes agricultural processes more sustainable, secure, and predictable. During the morning program of 6 October, the scientific part was highlighted, with the input of different universities, amongst others from Gerrit Polder (WUR). The afternoon session was more business oriented, with speakers from start-ups as well as from established companies. Dutch speakers here were Maurangelo Petruzella (MantriSpectra) and Emilie Kernén (Photonis Netherlands B.V.).

On Thursday 7 October the topic ‘Advances in Optical Metrology’ was chaired by Prof. Dr. Paul Urbach (TU Delft).

Optical metrology is facing big challenges regarding pushing the limits of resolution and sensitivity. This is particularly the case for metrology applied in the high tech Semicon industry, where nano-structures need to be measured with extremely high precision. To be able to satisfy the strong demands for high resolution and sensitivity, shorter wavelengths such as soft x-rays are increasingly used. However, realizing high performance optical systems to shape and direct x-ray fields, is a very challenging task of its own. Another trend in optical metrology is the increase in using new methods developed in computational optics. For example, phase retrieval methods are applied to retrieve aberration coefficients and shapes of free form optical components. In the session these new developments have been addressed. With ASML as an important player in this field they had a large contribution, where Armand Koolen (ASML Research) and Arie den Boef (ASML Research and ARCNL Amsterdam) were two Dutch speakers.

More events as part of this Dutch – German collaboration will follow in the upcoming years. In which the DutchPhotonicsEvent will be an important podium to bring a German delegation to the Netherlands. Keep an eye on your mailbox where you will receive more information about this event and the German participation. ♦





RAAK-MKB AutoCue Project: Automatic Alignment tool for Point-of-Care devices

Gerald Ebberink • Cas Damen • Jonathan Montanes - Saxion University of Applied Sciences

Interferometric measurement is one of the most sensitive sensing techniques. But currently bulky setups with complicated machinery are required to utilize its full potential. Photonic Integrated Chips (PICs) can achieve the same results on a micrometer scale. This means that PICs are very sensitive sensors, and numerous applications, such as for point-of-care devices have been proposed. PIC sensors are very generic and have to be made application-specific by coating with a properly chosen bio-functionalized layer. This makes them suitable for many different diagnostic tests, either in the lab or at the point of care. Due to these characteristics of easy adaption to a specific use-case and a wide range of application areas, sensors are being developed by several companies each with their own background.

Many of these companies struggle with the same "valley of death" challenge. In order to further develop their sensing application, they rely on the technological readiness of easy and reproducible read-out systems.

Here the challenge lies in the optical coupling of the active components (light source and detector) to the (disposable) photonic sensor chip. For the technology to be commercially viable, the price of the disposable photonic sensor chip should be as low as possible, which makes it logical to leave the active components out of the disposable cartridge and integrate them in the readout device. The challenge now changes to having a reproducible, automatic coupling between these components and the sensor chip, every time a measurement needs to be performed. The coupling of light from the source to the photonic sensor chip and back to the detectors requires a positioning accuracy of *less* than 1 micrometer in *two* directions, which is a tremendous challenge.

A consortium of a large number of partners, among which end users, technology suppliers, engineering companies and scientific researchers, and headed by the NanoPhysics research group at the Saxion University of Applied Sciences have set up a research project aimed at finding solutions to this specific challenge of the automated light coupling.

Having partners from across the supply chain involved in the conception of the project was instrumental. For a start, it was identified that it was a necessity to investigate which of the six degrees of freedom (three translational and three rotational) are the most crucial when aligning photonic sensor chips with the external active components. Knowing these degrees of freedom and their respective range it was possible to develop and test an automated alignment tool which can realize photonic sensor chip alignment reproducibly and fully autonomously. Below the various aspects of the project are explained in a little more detail.

In a study carried out between the University of Twente and Saxion UAS, a special setup was used to find the light coupling efficiency between an optical single-mode fiber and the waveguide on a photonic chip, provided by LioniX International. In Figure 1 the results for the three linear displacements are shown. The accuracy in the lateral directions have a measured FWHM on the order of 3 micron, whereas for the in-line direction a FWHM of 40 micron is found. In the same experiments (and not shown), it was also found that angular misalignments up to several degrees do not have a serious effect on the coupling, as long as the lateral position can be adjusted.

Based on these results a technical solution for automatic coupling can be developed.

The end goal of the project is to deliver a demonstrator where adequate optical coupling of the passive photonic chip with the external active components is realized fully automatically, without the need of operator intervention.



Gerald Ebberink is a researcher in the NanoPhysics group at the Saxion UAS and project leader. He has been working with lasers of most types in both public and private organizations since 2002. His latest research focusses on the implementation, assembly and testing of photonic biosensors.

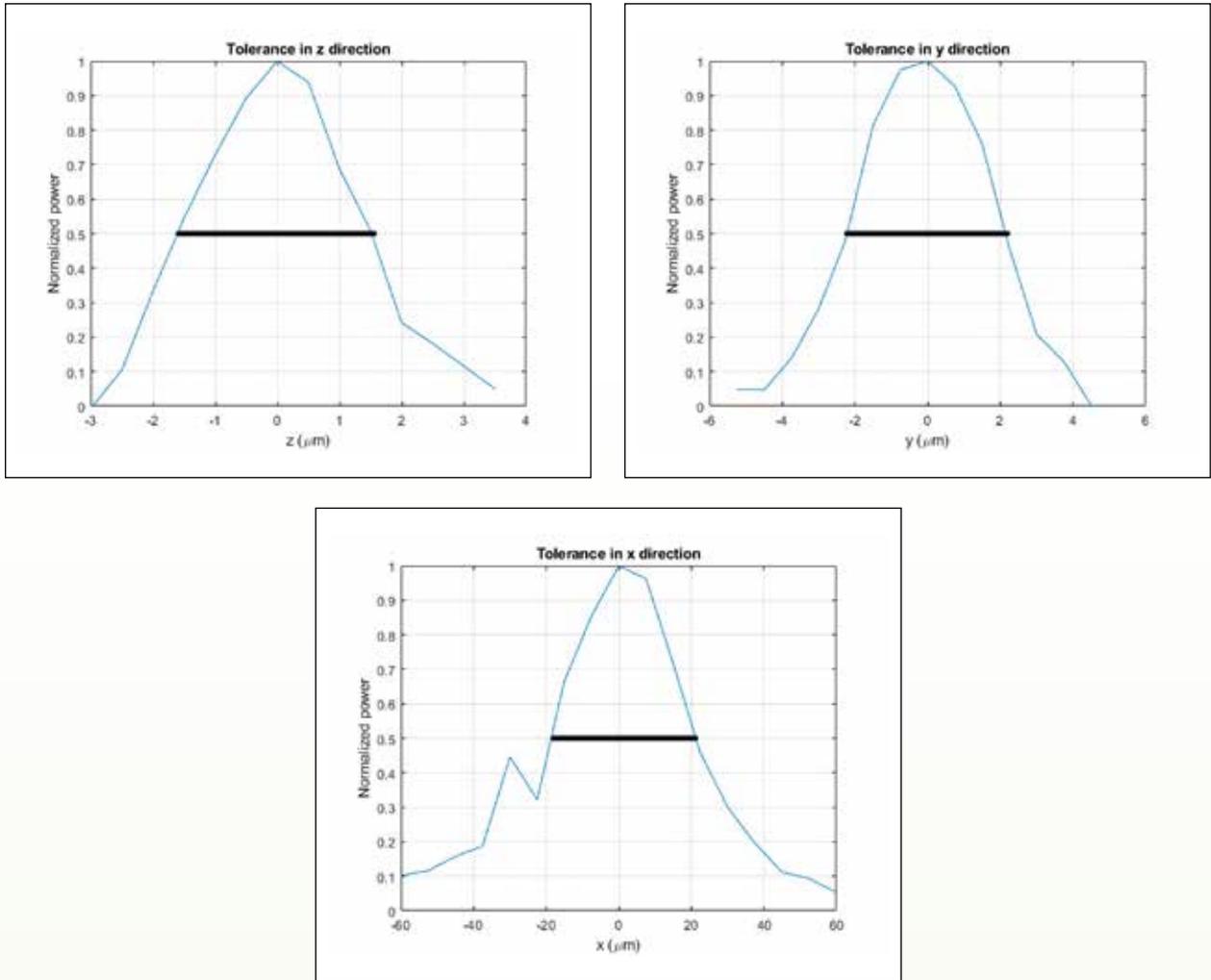


Figure 1: results from measurements to determine the optical coupling between a fibre and a PIC for deviations in the three linear degrees of freedom.

To this end an overall optical system has been designed as shown in Figure 2. For the light input, an input fiber coupling into the chip through a lens system will be employed. This lens system provides a relatively large working distance between the alignment system and the chip, which yields two key advantages compared to traditional end facet contact coupling. Firstly, it completely eliminates the wear of optical interfaces. This not only means significantly longer life time of the fiber but also means no system realignment needed due to fiber replacement. Secondly, it provides a collision free environment during auto alignment process. This leads to simpler and faster auto alignment procedure.

The light outputs from the chip are imaged via an output imaging system by a detector array. This design not only provides the non-contact advantages as mentioned for the input coupling but also provides the ability to reduce chip size. This is due to the fact that with an N times magnification imaging system, the chip output channel spacing could be

N times smaller than the pitch of the detector array. This allows chip size reduction along the edge parallel to the detector array. Chip size reduction leads to lower cost per chip. In addition,

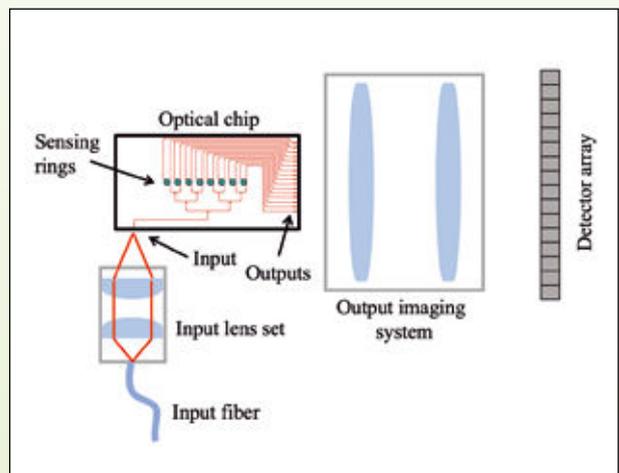


Figure 2: The overall optical system design



the chip design has been made such that the outputs are under a 90 degree angle with the input to minimize stray light entering the detector array.

On the newly designed chips to comply with this setup, the input and output waveguides have been designed with an inverted taper to enlarge the mode size from a sub-micrometer to a few micrometers. For the input coupling, this leads to higher coupling efficiency and larger alignment tolerances. This means reduced constraints on the alignment stages, as well as better power coupling stability during sensing measurements. For the output coupling, the enlarged mode size leads to smaller beam divergence, which leads to a lower numerical aperture requirement of the output imaging system. To comply with this setup, a chip has been designed which has 8 sensing rings on 8 independent sensing channels. The input light splits to all 8 channels with cascaded Y splitters. The Y splitters and the chip input coupler do not have 100% efficiency which leads to stray light generation. As mentioned before, the output waveguides and the detector array are arranged under 90 degrees from these structures to minimize unwanted background.

The detector array can use larger sensors which reduces the alignment tolerance. In addition, by having only one optical input port, most of the rotational degrees of freedom have very loose tolerances and they can be neglected in the alignment procedure.

The solution for alignment now consists of two steps. First, a passive alignment method is used for coarse alignment,

followed by an active procedure to obtain the required accuracy. The passive alignment is the initial step towards optical coupling between the photonic chip and external components, specifically the light source. As the term suggests, this is done passively during the introduction of the cartridge into the readout unit. The main idea is to use a combination of single-use cartridges, which include the photonic chip, and a corresponding acceptor slot. These should be designed in such a way that every inserted cartridge will be located as much as possible in the same position. In other words, the reproducibility of inserting the cartridge into the acceptor slot should be high. The goal here is to always achieve first light, which means that there is at least some optical coupling between the light source and the input waveguide on the chip. The tolerances of achieving first light have been presented in Figure 1 and were found to be on the order of a few micron. Consequently, the designed components have to have tolerances on the micron scale as well. This makes both materials choices and the production method important factors.

The last step to achieve optimal optical coupling is the active alignment. In the current concept the input fiber and coupling optics are moved in at least the two lateral directions. This is to avoid any mechanical stress on the manipulators during loading of the cartridge. A procedure for optimizing the maximum coupling has been developed where the output signal on the detectors is used to change the manipulators towards the position where maximum coupling is obtained.

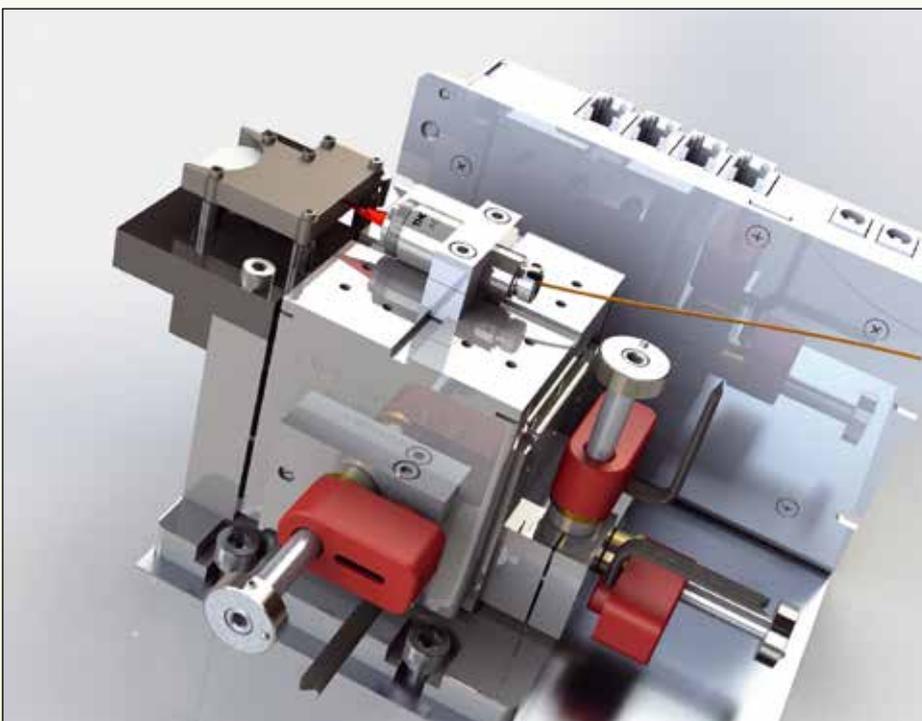


Figure 3: render of the design of the full demonstrator setup



The project just entered its second (and final) year and the current status is that a first design for the prototype setup has been made. At the same time, measurements on the accuracy of the proposed passive alignment solution (cartridge and acceptor designs) are being carried out. This system design is currently being evaluated and adjustment will be made based on the results of the passive alignment test.

It is expected that after Christmas, the system design will be finalized and in spring the demonstrator setup will be assembled and tested.

This research was co-financed by Regieorgaan SIA, part of the Netherlands Organization for Scientific Research (NWO).

The partners involved in this project are: Saxion University of Applied Sciences (research groups NanoPhysics and Mechatronics), Beta Applied Research, Delta Diagnostics B.V., Huygens Engineers B.V., Integrated Mechanization Solutions B.V., LioniX International B.V., PHIX B.V., PhotonicsNL, Qurin Diagnostics B.V., Salland Engineering B.V., Surfix B.V. and the University of Twente. ♦



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New members

Welcome **MicroAlign** and **Optics11** as new members.

Connect more optical fibers to your PIC with MicroAlign

The requirement of high speed and low energy photonic devices within data centers is paramount to enable the energy efficient management of the nowadays data traffic. Increasing the number of optical fibers connected to a photonic device is a promising technique to achieve higher speed performance. The connection of multiple optical fibers with a photonic device is a critical operation in the photonic manufacturing industry for both testing and assembly applications. MicroAlign is developing a revolutionary alignment solution to optimally connect multiple optical fibers and photonic integrated chips. MicroAlign technology aims to optimize the quality of each optical fiber-to-chip connection, for tens of optical fibers and with sub-micrometer accuracy, by means of a novel micro-electromechanical system. MicroAlign was founded in 2021 in the Netherlands and is a spin-off of the Eindhoven University of Technology.



Check out the MicroAlign website www.microalign.nl and do not hesitate to get in touch to know more about the proposed solution.

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MicroAlign





News from our members and partners

Ron van der Kolk en Petra Wicherink

- **AMOLF**

AMOLF researchers unravel how nano-antennas enhance chemical reactions.

The chemical industry consumes a lot of energy, not only to initiate reactions but also to separate products from by-products. In a promising emerging field of research, scientists worldwide are trying to use nanoscale antennas to capture and concentrate light into tiny volumes in order to initiate chemical reactions more efficiently and sustainably.

Read the complete news item on https://bit.ly/AMOLF_News

- **MicroAlign awarded with the Take-Off II from NWO**

NWO (Dutch Research Council) provides Dutch startups with the possibility to apply for the Take-Off grant. The Take-Off is a subsidy program meant for two possible startup phases: Feasibility study (Take-Off phase 1) and Early phase trajectory (Take-Off phase 2). After being awarded with the Feasibility study grant in 2019, MicroAlign has been recently awarded with the Early phase trajectory grant!!! This further success will enable MicroAlign to further speed up the R&D development and shorten the time to market!

https://bit.ly/MicroAlign_News

- **Optics11**

Founded in 2011 Optics11 celebrates its 10th anniversary this year. A promising technology based on fiber-top sensing lead to the start of Optics11. The company is founded as a university spin-off (Vrije Universiteit Amsterdam) by experimental physics professor Davide Iannuzzi and entrepreneur Hans Brouwer. Nowadays Optics11 is a mature company where they believe that optical fiber sensing provides a unique solution for many applications that involve precise measurements in challenging environments. On to the next 10 years!

www.optics11.com

- **Nedinsco**

Nedinsco celebrates its 100th anniversary. At the beginning of 1921, the “Nederlandse Instrumenten Compagnie” was founded by the German firm Carl Zeiss from Jena. At the time, this happened in an old disused chocolate factory.

Read more on https://bit.ly/Nedinsco_News

- **LioniX International**

LioniX International celebrated its 20th anniversary. They looked back with pride at 20 years of innovation and technology leadership in integrated photonics and customized microsystems solutions.

Have fun with their LinkedIn Video Tribute on

https://bit.ly/LioniX_News



member



- **Promis Electro Optics (PEO)**

With a new logo, a new corporate design and the launch of their new website PEO put themselves a fantastic update. Have a look and judge for yourself!
www.gotopeo.com/photronics



- **PHIX starts Qmode project with QuiX**

Both companies started a collaboration in this project to overcome the packaging challenges of connecting large-scale quantum photonic processors to the outside world. QuiX and PHIX work together to connect a large quantum photonic processor of ≥ 50 input/output modes to the outside world, requiring new techniques in integrated photonics packaging and assembly. Read the full press release on this page https://bit.ly/PHIX_News

- **QuiX Quantum**

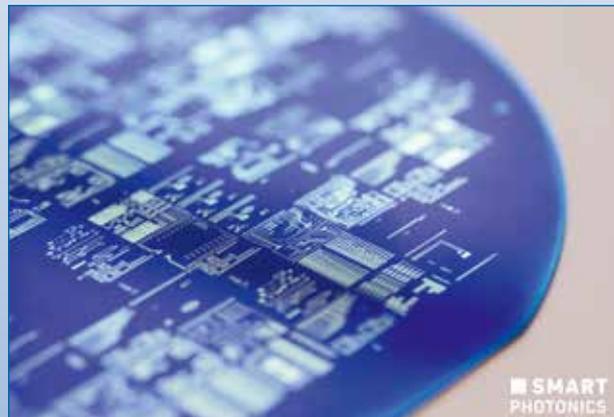
QuiX made it to the 'Silicon 100: Startups Worth Watching in 2021'
 QuiX has realized a position in the "Silicon 100: Startups Worth Watching in 2021". A great achievement, congratulations!
https://bit.ly/QuiX_News

QuiX' photonic processor is published!

In a scientific paper published in Materials for Quantum Technology, QuiX Quantum demonstrates the world's largest universal quantum photonic processor, which shows excellent performance for quantum information processing and computing applications. Read the paper in 'Materials for Quantum Technology' on https://bit.ly/QuiX_MoreNews

- **SMART Photonics**

SMART Photonics received a new loan from Rabobank worth up to 13M. This financing will be provided by Rabobank and will primarily be used to further support the scale up of production of photonics chips and to strengthen SMART Photonics' role in the growing photonics ecosystem. Read this news item on https://bit.ly/SMARTPhotonics_News





- **Wageningen University & Research**

The ultimate aim of plant breeding has always been to make plants resistant to drought and diseases. That could help eliminate hunger around the world. This is no longer a distant thought, thanks to a technology called CRISPR-Cas.

Wageningen University & Research (WUR) announces it will provide potential partners with free licenses to work on its patented CRISPR technology.

Read the complete news item on https://bit.ly/WUR_News



- **PhotonDelta**

In spring quite unexpectedly PhotonDelta announced the leave of Giuseppe Coppola, one of the faces of PhotonDelta. But new faces have strengthened their team: Nilufar Bulut (Program Manager) and Erik van Oorschot (Ecosystem Manager). We are also happy with this asset and look forward to our future national and international endeavours!

Meet them at https://bit.ly/PhotonDelta_News



Member jobs

Find job openings, internships and postdoc positions at our member companies and organizations on our website https://bit.ly/PNL_MemberJobs

member



Innovation Mission France

Ron van der Kolk



During the last months you've probably seen it several times: Together with the Dutch Enterprise Agency and the Dutch Embassy in Paris we started an innovation mission to France, that will last until October 2022. With this mission we want to strategically connect the Dutch photonics ecosystem to the French ecosystem. Together with Dutch Optics Centre and PhotonDelta we look for connections and collaborations with the 6 most important French photonics clusters and their members. The innovation mission will consist of many different elements: webinars, a digital marketplace, physical meeting to Paris, physical company visits in both countries, trainings, workshops, exhibitions, seminars, conferences and join participation in branch trade fairs of the regions and other fairs of international reach. With these activities we are building on all the connections that are needed for future business and partnerships.

Reason of this innovation mission

In Europe Photonics is seen as one of the essential technologies for the digital transformation and the green transition of Europe. France and the Netherlands play important roles in these transformations with top positions in Europe, in Photonics production and Photonics employees.

Both countries want to learn from each other, look for common economic benefits and technical/research challenges in the field of photonic technologies, to stay frontrunner thanks to new photonics enabled innovations. And possibly share forces in the value chain(s) and start new projects and businesses.

A one year innovation event

Up to October 2022 a series of events will be organized by PhotonicsNL (together with PhotonDelta and Dutch Optics Centre) in collaboration with our Dutch Enterprise Agency (RVO) and the Dutch Innovation Attachés at the Embassy in Paris.

The 6 most important photonics entities in France will be our partners during this innovation event: Photonics France, Photonics Bretagne, Pôle Optitec, ALPHA RLH, Systematic and Minalogic.



In September we launched the digital innovation and matchmaking platform, followed by the first webinars, in a series of many, on specific photonic applications and technologies.

On 14 September we started with the webinar *Photonics for Agrifood* where both Dutch and French speakers informed the audience about, amongst others, recent developments of imaging and spectroscopy in agriculture and horticulture, practical applications of spectral imaging in the agri-food sector, innovative solutions in the Agrifood market like deep learning in machine vision and compact industry-grade spectroscopy. Have you missed this webinar? Take the opportunity and look it back <https://bit.ly/YTWebinar140921>.

On 14 October it was followed by the second webinar *Photonics in Security and Defence*. Topics that came up were, amongst others: What can the government do for you? How can SME's help solving your questions? How can you start or deepen your relationship with the French companies in this market? You can also look back this webinar <https://bit.ly/YTWebinar141021>.

Who should participate in the 'France - Netherlands Photonics Innovation Cooperation Event'?

To make this Innovation Mission successful we depend on you. With the involvement of every segment of the photonics value chain we can make this mission a huge success. Basically, every company or institute working in or on photonics can participate:

- Photonic Companies, institutes/universities interested in photonics technology development and research.
- Industrial stakeholders looking for new (photonic) enabled technologies in applications in France and the Netherlands.
- Companies, SMEs, start-ups, clusters and associations as well as research institutes, universities and policy makers who are interested to establish and play an active part in this cooperation.

Objectives:

- work together on cross-border solutions in photonics
- get in contact with new research and business partners and explore business & technological developments
- exchange views and share experiences at European level.

On-site visit to Paris

Although we've all learned to live with ZOOM and Teams there's nothing more important than to meet in person. We are very glad that this was possible on 17 November where all Dutch representatives (PhotonicsNL, PhotonDelta, DOC, RVO, IA network Paris) came together in Paris, where they met the six French photonics entities (Photonics France, Photonics Bretagne, Pôle Optitec, Minalogic, Alpha RLH and Systematic). With this visit we physically connected all Dutch and French delegates, we mutually presented our cluster competences and, last but not least, shared our challenges in which we can strengthen each other.

During and after the presentations we had an extensive round table discussion to explore the possibilities for collaboration. And there are many. The French Photonics ecosystem is large and diverse. Our rich history and capabilities in Optics and Photonics made a need for bilateral meetings in areas like Agriculture, Quantum, Space, Security and Defense, Industry 4.0, Smart cities & intelligent mobility, Medical & life science technologies, Special lasers, Imaging and Custom optical fibers.

We agreed that communication of Photonics to a broad audience and especially our youth is of great importance. Both the Netherlands and France see a huge challenge when it comes to Human Capital. All current and future developments in Photonics require a lot more people.

Furthermore, the French are very interested in the PhotonDelta ecosystem, in our Dutch companies that are able to design and develop, to fabricate, to package and supply various



components. Further exploring the PIC landscape in France, their industrial connections and also Human Capital is of great interest.

Other subjects that were discussed are setting up B2B contacts in the Paris region, the option to host a Dutch delegation visiting the Photonics companies in Marseille, signing an MoU with Photonics France, collaborating in EU projects and many more.

We will keep you informed of our next steps and please contact us when you want to be actively involved in one or more of the before mentioned subjects and activities.

Digital innovation and matchmaking platform

Networking is one of the basics of business. To be able to be working on this during the whole event we invite you therefore to participate in our digital innovation and matchmaking platform. Apart from specific events the platform will provide an excellent networking opportunity by offering the possibility to get in contact with new research and business partners as well as explore and identify business opportunities from both countries. The digital platform is also a marketplace, where supply and demand from Dutch and French partners can be matched.

It would be particularly interesting to match available technology with application needs. Therefore, you are invited



to present what you can offer and what you are looking for specifically.

Take this opportunity and register now on <https://bit.ly/b2matchDutchFrance2021>.

This platform will stay open during the whole duration of this Innovation Mission.

More events

With almost a year to go there will be more events. Of course we will inform you about all upcoming events as part of this mission. As a member, partner or relation you will automatically receive an e-mail. But you can also find actual information on our website

<https://bit.ly/DutchFrenchMission2021>. ♦





STAY UPDATED WITH THE PHOTONICS EVENTS ON OUR WEBSITE:
<http://bit.ly/photonics-calendar>

Photonics West 2022

25 - 27 January | San Francisco, CA, USA

<https://bit.ly/PNL-PhotonicsWest>

After we had to miss one year with a physical event, we're happy that Photonics West 2022 will be a live event as we have known it for years. Visit the Holland High Tech Pavilion or join one of the side show events we and our partners organize.

Do you want to stay updated about these activities? Send an e-mail to: petra.wicherink@photonicsnl.org.

DutchPhotonicsEvent

Spring 2022 | Location TBD soon

www.dutchphotonicevent.nl

After a digital 2020/2021 edition we are very happy to announce a physical DutchPhotonicsEvent in spring 2022.

A new edition, with a new program, and again 'Something for everyone'. Keep an eye on your mailbox or check the website for the latest information and the invitation for this great national event in photonics.

SPIE Photonics Europe

3 - 7 April 2022 | Strasbourg, France

<https://spie.org/conferences-and-exhibitions/photonics-europe>

Present your research at the only cross-disciplinary event highlighting compelling optics and photonics technologies — from digital optics to quantum technologies to optical imaging, sensing, and metrology. Additional topics include THz photonics, 3D printed optics, photonic glasses, photosensitive materials, and biophotonics.

Laser World of Photonics**26 – 29 April 2022 | Messe München, Germany****www.photonicsnl.org/events/laser-world-of-photonics/**

Join the Holland Avenue at this edition, there are still free spaces. For information and signing on visit our website www.photonicsnl.org/events/laser-world-of-photonics/ or send an e-mail to: petra.wicherink@photonicsnl.org.

'Another Day of Photonics' with Start-ups**Spring 2022 | Location TBD****www.photonicsnl.org/another-day-of-photonics/**

We plan to organize 'Another Day of Photonics' in spring, where the photonic start-ups play a central role. We will see various pitches from start-ups. We will invite market-experts and of course, the knowledge of the already experienced SME's, being part of PhotonicsNL.

Furthermore we will collaborate with PhotonDelta on this day, as they have defined a program to support start-ups interested to leverage the established integrated photonics supply chain. The program provides participants with access to coaching, market and funding for (pre)seed-stage start-ups.

You will hear from us soon with a more detailed program.

6th PIC International Conference**28 & 29 June 2022 | Brussels, Belgium****<https://picinternational.net/>**

The 6th PIC International conference will build on the success of its predecessors, with industry-leading insiders delivering more than 30 presentations spanning five sectors.

15th Optatec**27 – 29 September 2022 | Frankfurt, Germany****www.optatec-messe.de/en**

Optatec focuses on the industry's innovation potential like no other event of its kind. In cooperation with technological and institutional partners including the SPECTARIS association for the high-tech industries, Optence and OptecNet, Optatec offers an international showcase for advanced technologies. Exhibitors from Europe and all over the world display future technologies from the field of industrial optics and take advantage of Optatec to present their innovations and product premieres. With its targeted offerings for development and production, as well as industrial use of optical components, optomechanics, optoelectronics, fibre-optics, fibre-optic cables, laser components and manufacturing systems, Optatec has become well-established within the industry sector and provides a top-level platform which brings suppliers and users together.

New project BestPhoRM21

Ron van der Kolk



The BestPhoRM21 project is there to provide the decisive support to the Horizon Europe "Photonics Partnership" by developing and implementing an European Photonics Industry strategy.

As mentioned in our previous magazine the BestPhorm21 project has 4 major goals, each with their own intended impact: ranging from support to an industrial strategy for Photonics in Europe, to strengthening the link to end users industry, to triggering cross-member state and cross regional investments in photonics and providing access to risk finance for photonics start-ups and SMEs.

PhotonHub Europe

In order to accelerate the uptake of photonics technologies by European industry, and thereby help to boost competitiveness and to foster new business and business models, PhotonHub Europe has established a unique European full-service one-stop-shop Photonics Innovation Hub in a manner which is deeply rooted within the wider ecosystem of innovation hubs and manufacturing right across the European continent for maximum coverage, leverage, impact and long-term sustainability. PhotonHub Europe has received funding from the European Union's Horizon 2020 research and innovation program under the Grant Agreement n°101016665, in Public Private Partnership with Photonics21.

While PhotonHub Europe provides European photonics and non-photonics companies, in particular SMEs and mid-caps, with open access and guided orientation to a broad range of services and capabilities, it is their challenge and goal to cover:

- "test-before-invest" innovation support capabilities along the full TRL and MRL value chain such as expertise, design, prototyping, experimentation, engineering and pilot manufacturing with further guidance to manufacturing in Europe.
- training and upskilling opportunities for both technology- and application-specific learning using lecture-based tutorials and hands-on lab-based training within the hub's competence centres, and even extended to virtual classrooms.
- business support services including IP advice, business coaching, and support to find investment from venture capital and other public and private regional and European sources of innovation funding
- seamless links to targeted value-adding opportunities in the wider innovation ecosystem across all European regions, cluster organizations and digital hub networks.



The services of the hub are accessible as a one-stop-shop through its central front office based in Brussels. The front office can be easily contacted by completing their application form on

www.photonhub.eu

Photonics Clusters and Technology platforms come together in Paris

Thursday 18 and Friday 19 November were dedicated to the first European Photonics Clusters event organized jointly by Photonics21 and PhotonHub Europe and hosted by Photonics France - fédération française de la Photonique.

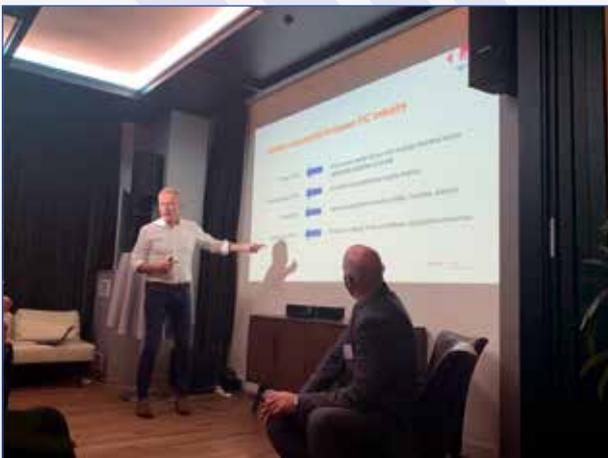
During these days many talks and presentations were given, showcasing interregional collaboration in the photonics sector, expert views on INTERREG Europe, an extensive overview

on the funding opportunities for photonics in Europe, Market data and an industry report on European Photonics, Photonics Partnership in Horizon Europe and the PhotonHub project.

From the Netherlands a great presentation was given by Ewit Roos on how PhotonDelta makes the entire supply chain work together on integrated photonics.

All this was combined with good opportunities to catch up with more than 40 photonics colleagues representing national technology platforms and photonics clusters from all around Europe.

This event will probably become an annual meeting point of European photonics platforms and clusters. In the meantime we all plan to bring together also the regional authorities in Q2 2022. ♦





Jan M. Broeders

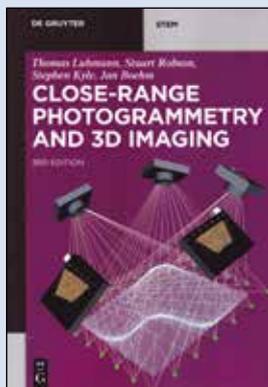
An den Eichen 6

D-46325 Borken-Burlo

Germany

www.optischefenomenen.nl

In the section Book Review Jan Broeders discusses a book related to photonics every quarter. Books with a focus on physics, but also books more related to a psychological approach of optical perception, are being discussed in detail. Next to actual content a guidebook is being given for the use of the book in educational settings.



Multi-measuring station (Leica Nova) for photogrammetry applications. Described in textbook Close-Range Photogrammetry and 3D Imaging.

Analyzing 3D shapes by near photogrammetry

With the publication of the study and reference book **"Close-Range Photogrammetry and 3D Imaging"**, publisher Walter de Gruyter has now launched already a third edition of the well-known guide to photogrammetry. In an extremely practical way the extensive textbook provides a thorough presentation of the methods, the mathematical foundations, the available systems and the most modern applications of the near-photogrammetry frequently used in various fields.

This precise imaging technique is in use to measure, interpret, analyze and describe very closely three-dimensional shapes from a wide variety of already manufactured and natural objects. The method and technique of photogrammetry in general is used in fields such as archaeology, architecture, civil engineering, forensics and various branches of medicine.

The new edition is again an updated version of the original edition of the German-language guide **"Nahbereichsphotogrammetrie"**. Popular new methods such as SfM (structure-from-motion), SGM (semi-global matching) and SLAM (simultaneous localization and mapping) have been presented and elaborated in detail in all editions of this highly requested textbook.

The new content also includes descriptions of cheaper 3D sensors, robotic driven metrology systems and point cloud registrations, to highlight a number of topics. Three-dimensional information obtained from the use of image sensors

is widely used and accepted. The field of photogrammetry, 3D optical metrology and 3D imaging is still growing, especially in those areas that have no traditional link with photogrammetry and geodesy.

Although 3D imaging methods are well established in many scientific communities, photogrammetry is still an engineering-driven technique where quality and accuracy play an important role.

The structure of the book assumes different levels of existing knowledge among readers, students, teachers, and other users, from beginner to scientific expert. For this reason, the content of the book also discusses a number of fundamental techniques and methods in mathematics, tuning techniques, physics, optics and image processing and editing.

Although this information is often also provided in other reference and textbooks, the aim is to realize a convenient link between different fields of work with a common notation for equations and parameters. Each of the eight chapters is subdivided in detail into terms and topics and concludes with an extensive literature overview and index of keywords. Even for experts in the field of photogrammetry, this book offers a great wealth of the latest theoretical approaches and practical information.

ISBN 978-3-11-060724-6,
"Close-Range Photogrammetry and 3D Imaging", Thomas Luhmann, Stuart Robson, Stephen Kyle and Jan Boehm, Verlag Walter de Gruyter, 2020, 3rd print, 822 pages, € 99,95.



LASER 2000

Lasers and Photonics...

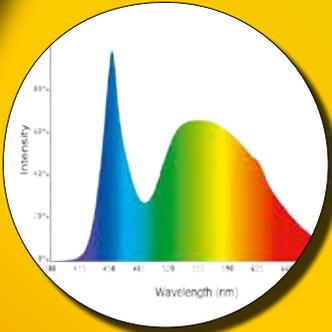
tunable fs lasers



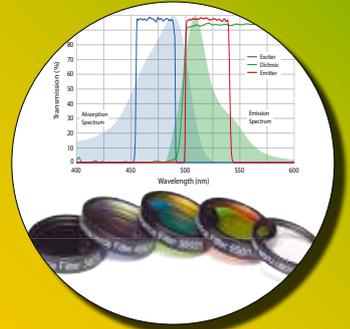
diode and DPSS lasers



light metrology



fluorescence and bandpass filters



advanced glove boxes



solid state light engines

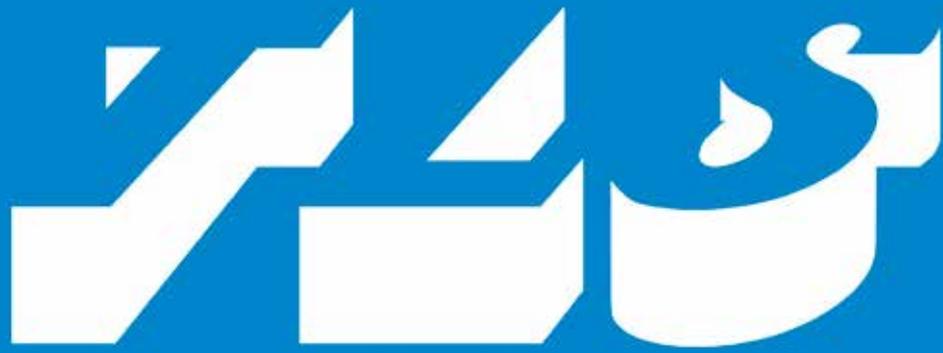


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