

SUMMARY OF NSTF/CSIR DISCUSSION FORUM ON LIGHT-BASED TECHNOLOGIES INNOVATION

Advances in Photonics

South Africa has contributed substantially to the world in terms of the science of photonics and light, and this country has the expertise (particularly in terms of laser) and the potential to build a strong photonics industry. Photonics was an enabler for numerous other sectors.

Africa did not have a hyper-precise atomic clock and European and American time was used for purposes of Global Positioning Systems (GPS) and in Africa. This should be addressed by the DST, the NLC and the African Laser Centre.

Advanced Manufacturing Technology Roadmap Project: Photonics

Photonics was one of the six key enabling technologies defined by the European Union (EU) and extensive growth in the photonics market was expected. There is an abundance of opportunities for growth in the area of photonics in South Africa. The photonics roadmap addressed the four potential areas to be pursued (Systems, Sensors and Sources, Renewable Energy (particularly South African grown PV panels), Industrial Manufacturing and Life Sciences and Health) and there were opportunities to grow the Lighting and Displays, ICT and Emerging Technologies photonics sectors in this country. Market penetration and skills and capacity development remain problematic.

Further inputs to the draft document are welcomed. The roadmap was a living document that will adapt to changes over time and be updated regularly.

PPF

The facility serves the photonics community and bridges the innovation chasm with a focus on translating research into the commercialisation space and the opportunities in this regard

Limited collaboration between HEIs and industry, a lack of automation in manufacturing processes and of manufacturing capabilities, domination by imports, low local content, a lack of uptake of South African technology and minimum RDI in the country were reasons for the low impact of the photonics industry in South Africa.

The PPF would play a role in assisting the photonics community to overcome the challenges in the photonics industry, and the PPF's activity will be integrated into the photonics roadmapping initiative.

A call for proposals will be sent out during mid-2016 and approved projects will commence early in 2017.

Fibre Optics and Communication

The CSIR was researching technology that would substantially increase the speed of internet broadband. Technology advances would be put to the test in transmitting high volumes of data for large programmes such as the SKA.

The potential of the ICT photonics sector should be considered for inclusion in the Photonics Roadmap as an area to be pursued with vigour.

Luminescent Nanomaterials and their Application

Research at UFS was based on nanoscience and nanotechnology in the preparation and application of phosphors, creating new and different types of phosphors that are chemically stable in order to improve light emissions or the output of phosphors, which could lead to more cost effective, better performing and durable light emitting devices. The research has the potential to be taken further. Potential socio-economic benefits of the new and different types of phosphors created include low cost lighting, rural electrification, reduced cost of electricity and improved quality of life.

Technology Commercialisation

The DTI's National Technology Commercialisation Strategy was developed with stakeholders in the NSI and addresses the innovation chasm.

As part of the strategy, the DTI provides programmes that address the innovation gap and the commercialisation phase of the innovation value chain. Areas for further interaction with the DTI regarding various photonics related programmes (PPF, Photonic Roadmap) were identified.

Emerging Photonics Research at Universities in South Africa

South Africa has a very vibrant photonics community that has grown over the years, but the good research being done is not being taken forward and the photonics industry does not have the capacity to compete internationally.

The photonics community needed to work together to resolve this problem and PISA needed to be revived.

The African Laser Centre has been established and supports various education and research programmes in Africa, but faces immense challenges.

Biophotonics

Biophotonics is applied in areas such as Life Sciences, Medicine, Agriculture and Environmental Sciences.

The NLC focussed on the medical application of biophotonics through specific techniques.

Panel Discussions

Additive Manufacturing

- Global market for AM in terms of service and products has shown significant growth. The fastest growing markets are in the aerospace and dental and medical sectors. The use of AM in final part production has grown tremendously.
- The potential of AM should be realised in all markets and there is a wide scope for new process technology development.
- Industry-led research is essential for AM to succeed.
- The plans to use titanium in AM are still in the development stage and there is a risk if these plans do not come to fruition.
- A focus area for AM should cater for low-end AM and people involved in the lower-end of AM and in the makerspace should receive support as entrepreneurs. More makerspaces are needed
- The skills set required could be a barrier to the use of AM, particularly in terms of the low-end application. People should not only be consumers of 3D printer materials but also be involved in the production of these products.
- AM, NDT and material science all need considerable investment in order to be successful. The DTI should invest in this important area and scale of production should be a consideration.
- The qualification and certification process relating to the manufactured products through NDT was a barrier to AM. A substantial investment would have to be made in this area in order for in-line inspections to be available.
- Research chairs and internships in NDT, as a crucial, but currently neglected component of the broad manufacturing process, should be established.
- The AM industry has an active association, RAPDASA.

Solar Energy

- South Africa should focus on niche areas in CSP technology in terms of photonics.
- The solution to South Africa's energy problems, particularly in the rural areas, is integrated, renewable energy from solar.
- Technology using PV and artificial photosynthesis is effective in producing off-the-grid electricity.
- There is a need to coordinate the currently fragmented activities within the photonics landscape, and to improve interaction between scientists and policy-makers.
- More focus should be placed on patenting research and commercialisation of solar energy related products of R&D.

- Performance and reliability issues with respect to application of PV in local conditions are being addressed by the CSIR. Investor confidence had to be established. There is potential export PV and opportunities presented in the AM sector and in research on luminescent nanomaterials should be pursued.
- The solar component (CSP innovation and human capital development) should be part of platforms such as PISA and RAPDASA.

Fibre Optics and Communication

- Current built bandwidth capacity is high but the demand is low. Current installations are intended mainly for business Fibre-to-home would require substantial funding and presented opportunities for SMME development and job creation. Digital decoding should be investigated as an alternative to fibre optics for home use. Most of the fibres laid are imported.
- Fibre optics and communication should be included in the Photonics Roadmap
- The fibre optics programme should be more holistic as many aspects have to be addressed in order to spin-out technology. The work being done in certain areas is not enough to start a company. It is necessary to have people to look at integrated sources and the interface to the data.
- The focus in communication should be on technology to do encoding and decoding of information on long fibres and fibres-to-home.
- The CSIR is involved in developing fibre lasers. There was good potential within this area to create spin-out and there was a need for more market driven research.
- Many of the fibre optics tools and technologies present in South Africa are imported, even though there are scientists and engineers in this country who are able to work in this space and develop products, thereby benefitting the economy of the country.
- Building capacity in fibre optics remained a problem and should be addressed.
- Duplication of technology (such as making fibres) could be implemented in programmes such as the SKA. Bringing together the technologies and the people working on them would help resolve problems in relation to transmission of high volumes of data.
- Research leaders should take responsibility to bring together the photonics community and to convince policy-makers of the consequences of the lack of capacity and the lack of impact of photonics.

Conclusion

Steps would be taken to:

- Revive PISA as a representative body for the broad photonics community in South Africa.
- Support the inclusion of fibre optics and communication into the Photonic Roadmap, as one of the main focus areas.