

# POWER DIGEST

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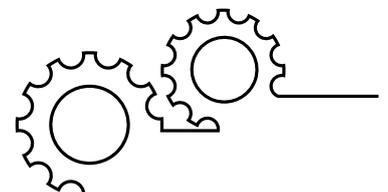
## DUT SPACE SCIENCE PROGRAMME HOSTED THE 1ST SPACE SCIENCE & CNS SYMPOSIUM



From first row bottom left: Mr Bonginkosi Gumede, Mr Mthobisi Tshomela, Mr Phillip Gyasi-Agyei, Mr Thabo Nkhoma. From second row left: Ms Sindi Malanda, Ms Nompumelelo Chili, Ms Nomihla Ndlela, Ms Ntombenhle Mazibuko, Prof Sibusiso Moyo (DVC-RIE), Prof Inno Davidson (Program Leader), Prof Sanja Bauk, Dr Albert Agbenyegah, Ms Ntombezinhle Kweyama, Ms Nomusa Zakuza, Ms Namhla Mtukushe. Last row from left: Mr Joe Dlamini, Dr Elutunji Buraimoh, Mr Jean Pitot, Mr Vusani Nemudzivhadi and Mr Siphso Lafeni.  
Photographer: Invenclick Media

The DUT Space Research Program, which is a university partnership with the South African Government, Department of Science and Innovation (DSI), South African National Space Agency (SANSa) and Air Traffic Navigation Services (ATNS), hosted the 1st Space Science and CNS Symposium on Monday, 25 October 2021 at Durban University of Technology, Ritson Hotel School.

The purpose of the Symposium was to bring together researchers from various institutions across South Africa, who are engaged in Space Science and Technology, to share their research activities and findings with one another as well as economic sectors and stakeholders. The Program is in line with the government's initiative and vision towards a 100% Digital Economy and readiness for Industry 4.0 challenges and opportunities. The South African Government is committed to the transformation of the South African Economy into a Digital Economy.



The program is a targeted capacity building initiative to train and develop a critical mass of requisite local expertise in Satellite Communication, Navigation/e-Navigation, and Surveillance (CNS), through graduate studies and research in SS and CNS for national economic development, with applications in various sectors of the economy such as telecommunication, power and energy, mining, marine navigation, and air-traffic. The program is open to all, but gives priority funding support to students from previously under-represented groups. It seeks to address the needs of Entrepreneurs, Small-, Medium- and Micro-Enterprises (SMMEs) amongst other sectors and stakeholders. Sub-themes of the Symposium included:

- Communications, Navigation and Surveillance Systems (CNS)
- Nanosatellite technology
- Innovative Small Satellite Technology and Applications
- Astrophysics and Cosmology
- Global Navigation Satellite System (GNSS) for positioning, navigation, and timing (PNT)
- Space Segment, Space Applications, and Industrialization of Space
- Unmanned Vehicles, Port Automation, Marine and Mining
- Extragalactic Astronomy, Large-scale structures, and clusters of galaxies
- ICT for Space and Geographic Information System (GIS)
- GNSS time Synchronization and Smart Grid
- GNSS application in Ground Mapping and Transportation
- Precision Agriculture and Machine Control
- Construction, Surveying, Defense and Aerial Photogrammetry
- Global positioning system (GPS) for satellite navigation, wireless internet.
- Relativistic Astrophysics, including the study of compact objects

The proceedings of the 1st Space Science and CNS Symposium included an opening address by the DVC-RIE, Prof Sibusiso Moyo and a DUT Space Program address by Prof IE Davidson. The opening address by Prof Sibusiso Moyo, DVC-RIE, was titled: "The role of Space Science Research and its alignment to National and Regional Priorities". Beginning with the application of satellites in providing the viable way to monitor the environment of the entire earth, land, sea, and air, she expounded on the strategic alignment of Space Science and CNS with ENVISION2030 and 4IR technologies. Prof Moyo stressed the need to develop new skills, and to increase local female students participating in Engineering and Space Research program, for the socio-economic development of South Africa. She said, the DSI (SA) is committed to developing strategic innovation to support creation of an environment for industrial development, manufacturing, commercialization of research and developmental R&D. This will enable new technologies, products and services for South Africa, and expand into new markets, job creation and sustainability. The national space strategy is to promote peaceful use of space technology, while advancing South Africa's share in the global market.

The DUT Space Project Leader, Professor Inno Davidson gave a holistic overview of the program. He emphasized that Space Research is a matter of national security and priority with focus to address the needs of South African government and local industry. In addition, he highlighted that DSI-DUT Space Science Program is funded and supported by DSI, SANSA and ATNS. In the last 3 years, the program has received funding of (R1.51m – 2019), (R1.51m - 2020) and (R3.2m - 2020/2021). DUT Space Science Program currently funds 9 Masters students and 6 PhD from various faculties at DUT (Engineering & the Built Environment, Management Science, Accounting & Informatics). 4 Masters and 1 PhD student have completed their studies in 2021. Furthermore, the program is in a process of developing offices, laboratory and research infrastructure at DUT.

This was followed by 7 presentations by researchers from the South African Universities Space Programs, who presented their research work, namely:

- [1] Performance Analysis of precoding schemes for massive MIMO by Ms. Nompumelelo Chili.
- [2] The performance of LDPC Codes for satellite communication in ka band by Mr. Bonginkosi Gumede.
- [3] Performance analysis of low-density parity check code for satellite communication in ka-band by Mr. Jonas Dakora.
- [4] Public-private partnerships for enhancing border security through space technology in South Africa by Mr. Moses Thabo Nkhoma.
- [5] Converging for human and social wealth in the fourth industrial revolution (4IR) realm by Ms. Ntombezinhle Kweyama.
- [6] Transient Fault Analysis of a VSC-Based Multi-Terminal HVDC Scheme – Space Power Systems." By Ms. Sindisiwe Malanda.
- [7] Apparatus for tracking containers in land and sea transportation presented by Prof Sanja Bauk on behalf of Mr. Radoje Džankić.

The University of KwaZulu-Natal's Aerospace Systems Research Group (ASReG), based at the discipline of Mechanical Engineering gave an overview of the UKZN

Aerospace Systems Research Group's Phoenix Hybrid Rocket Programme. The programme has been conducting wide-ranging applied research in the area of aerospace propulsion and vehicle systems design for over a decade.

Mr. Phillip Gyasi-Agyei said that the Phoenix Hybrid Program pursues the development of suborbital rockets propelled by hybrid propellant rocket motors to facilitate human capital and technology development. He further explained the technological fundamentals, outlining the program's prior ground and flight test activities and introduced the next Phoenix flight test campaign - provisionally scheduled to take place towards the end of 2022.

The supervisor and team leader, Dr Jean Pitot graced the event, and expressed his profound appreciation for this laudable initiative by DUT Space Program, and invited DUT to collaborate with the UKZN program.



University of KwaZulu-Natal's Aerospace Systems Research Group (ASReG) Team: Dr Jean Pitot, Mr Mthobisi Tshomela and Mr Phillip Gyasi-Agyei.

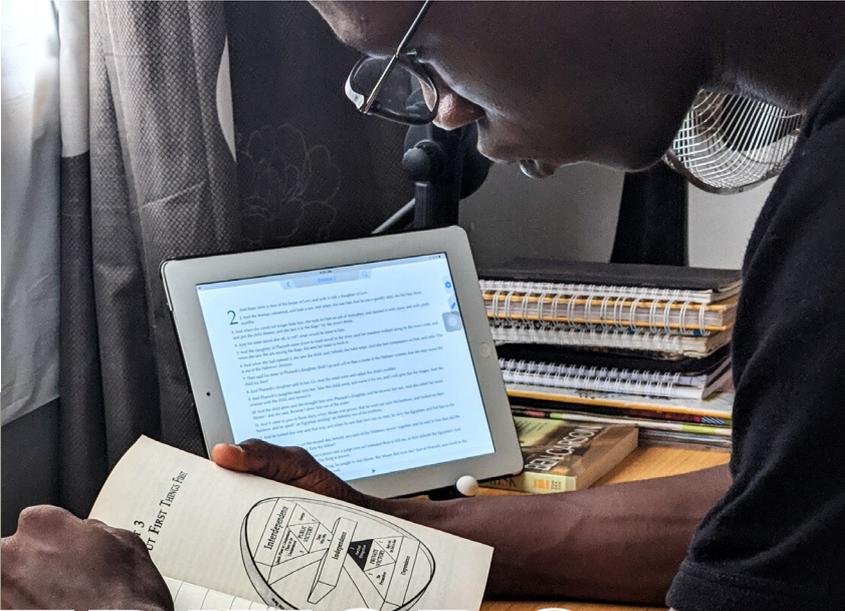
In closing, Prof Davidson expressed his thanks to the presenters and Space Program Supervisors who are at the forefront to ensure that the program produces requisite expertise in Space Science and Technology, including Satellite Communication, Navigation and Surveillance (CNS). He further conveyed his gratitude to all the attendees.

He recognized every supervisor, guest visitors and presenter, and gave special thanks to the University of KwaZulu-Natal's Aerospace Systems Research Group (ASReG) for honouring the invitation and encouraged esteemed researchers to continue doing more work in contributing towards the government's initiatives and the South African nation at large.

The 2nd Space Science & CNS Symposium is scheduled to take place in the latter part of 2022. Details will be announced in due course. The proceedings and book of abstracts will be published at the DUT Space Science website and made available to all participants.

## RESEARCH GRANTS

- [1] Prof IE Davidson has received US\$10000 (R148, 980.00) from tertiary Education Trust Fund (TETFUND) for the International PhD Student from Covenant University, Nigeria. Mr. Dele Alausa to carry out his PhD benchwork at DUT Department of Electrical Power Engineering.
- [2] Smart Grids RFA received R300 000.00 from the DUT Research Directorate for research equipment to support the Opal-RT Simulator.
- [3] Space Science RFA received R180 000.00 from the DUT Research Directorate as top-up funding to support 4 Masters' degree students in the DUT-DSI Space Program, to complete their studies.



## JOURNAL ARTICLES

- [1] Kapidani, N; Bauk, S.; and Davidson, I.E., "Digitalization in Developing Maritime Business Environments towards Ensuring Sustainability", *Energies* Nov 2020. doi: 10.3390/su12219235
- [2] Akinyemi, A.S., Kabeya, M. and Davidson, I.E., "Voltage Rise Regulation with a Grid Connected Solar Photovoltaic System", *Energies* 2021, 14, 7510. <https://doi.org/10.3390/en14227510>
- [3] Kapidani, N; Bauk, S.; Davidson, I.E., "Deploying Blockchain in Maritime: Developing Environments' Concerns", *Journal of Marine Science and Engineering – an Open Access Journal by MDPI*, ISSN 2077-1312, October 2021.

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