65th Annual Conference of the South African Institute of Physics

SAIP

Conference Proceedings

Edited by
Prof Aletta Prinsloo

2021

SOUTH AFRICAN INSTITUTE OF PHYSICS

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NORTH-WEST UNIVERSITY
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PROCEEDINGS EDITOR-IN-CHIEF: Prof Aletta Prinsloo, University of Johannesburg

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SAIP2021

Proceedings of SAIP2021

The 65th Annual Conference of the South African Institute of Physics (Virtual Conference)

Hosted by the North-West University

20 July 2021 to 30 July 2021

Edited By
Prof Aletta Prinsloo

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Editorial

North-West University (NWU) became the first institute to host the annual South African Institute of Physics (SAIP) conference virtually. Against the backdrop of the ongoing limitations due to the Covid-19 pandemic NWU successfully ran a memorable virtual 65th conference in the series of SAIP. Some papers from this online meeting are collected in this peer-reviewed volume. Submissions for the proceedings of SAIP2021 were handled by an Editorial Board headed by an Editor-in-Chief and Associate Editors with responsibility for submissions in different subject tracks.

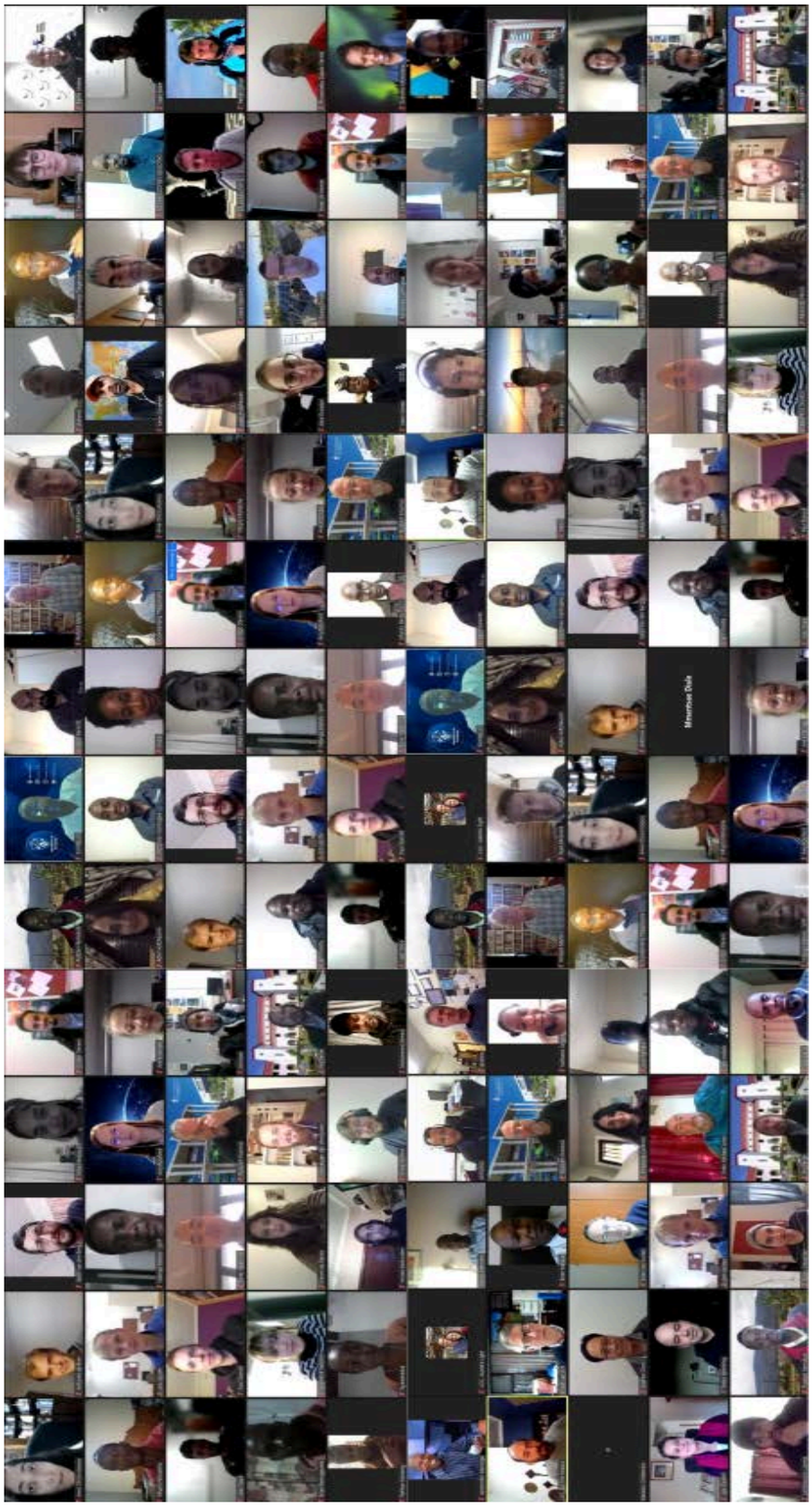
The Editor Board of the SAIP2021 Proceedings received 123 manuscripts for consideration by the deadline of 30 August 2021. A total of 112 of these manuscripts met the relevant criteria and were submitted to a full peer-review process involving 177 individual reviewers (some reviewed more than one manuscript). The style of these proceedings is that of the (British) Institute of Physics Conference Series, similar to the styling used in previous SAIP Proceedings.

Authors were requested to ensure that the defined layout were adhered to in their submitted pdf documents. At the start of the reviewing process, an initial layout review was conducted by the Associate Editors on each manuscript. It was noted that there were small deviations between the layout templates available in MSWord and Latex – both of these formats were accepted by the Associate Editors. Manuscripts that deviated considerably from the specified layout specifications, while still broadly appropriate in their composition, were referred back to the authors for major layout corrections before being forwarded to knowledgeable content reviewers as a second step in the review process. This year the Editorial Board aimed to reduce the time between the submissions and publication, with the authors being informed of the outcome of their submissions before the closure for the December holiday.

The publication of the SAIP Proceedings are highly dependent on the efficiency of the Associate Editors and the goodwill of Reviewers from the scientific community in South Africa. The Editor-in-Chief wishes to acknowledge the hard work of the Associate Editors who spent much time considering the papers and reviewer reports in order to ensure that acceptable academic standards were met during peer-review for the proceedings to be credible. The majority of the content reviews received were done with great care and diligence and to the highest standards. The Editorial Board wishes to voice their sincere thanks to the participating Reviewers for their pro bono work, specifically to those Reviewers that read more than one paper. The meticulous reviewing process described above has ensured that these proceedings contain thoroughly peer-reviewed manuscripts of a high professional standard, which report on novel work that has not been published elsewhere.

The Editor-in-Chief also wishes to recognise and thank Mr Mokhine from the SAIP offices for his support and help in preparing these proceedings. His technical skills were essential throughout the entire process and his patient assistance much appreciated.

Finally, the Editorial Board wishes to thank all of the authors for submitting their research work to this proceedings to undergo the rigorous review process. It is our sincere hope that the final product offered here constitutes a due outcome of their hard work.



Delegates to the 2021 South African Institute of Physics Virtual Conference.

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Message from The Conference Organizers

The 65th South African Institute of Physics (SAIP) Annual Conference will always be remembered as the first virtual SAIP conference. We, as the LOC from the North-West University, are proud of the initiative, as well as the innovative solutions adopted to make this new conference format feasible during the most trying of times. This would, however, not have been possible without all the conference participants who, by engaging actively on new and unfamiliar platforms, made this conference a success.

We would like to thank all participants who submitted papers to the conference proceedings, editors and reviewers for assistance with the peer-review process, and especially Prof Aletta Prinsloo for her guidance as editor-in-chief. During the conference, a lot of excellent science was presented and discussed, and we hope that this proceedings volume archives these new discoveries and insights for future generations.

Eugene Engelbrecht (SOC Chair) and Du Toit Strauss (LOC Chair)

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Proceedings of SAIP2021

Editor-in-Chief

Aletta Prinsloo

Aletta Prinsloo is a Professor of Physics in the Department of Physics at the University of Johannesburg. She is an NRF rated research physicist in the field of experimental solid state physics. Her research is focused on the magnetism of chromium-based bulk alloys, thin films and nanomaterials.

Associate Editors

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Andrew Venter is the head of the Diffraction Section (Neutron and X-ray) at Necsa SOC Ltd. and has an Adjunct Professor appointment within the MC Centre for Applied Radiation Science and Technology of the North-West University. He is a NRF rated researcher with specialities in the application of diffraction techniques in powder diffraction (nuclear and magnetic systems) and residual stress investigation of materials.

Division for Astrophysics: Prof C Venter

Christo Venter is a Professor of Physics in the School of Physical and Chemical Sciences and the Director of the Centre for Space Research at the North-West University. He is an NFR B-rated scientist in the field of Gamma-ray Astronomy. His research focuses on pulsars, pulsar wind nebulae, globular clusters and cosmic rays.

Division Theoretical and Computational Physics: Prof WA Horowitz

Will Horowitz is an Associate Professor of Physics at the University of Cape Town. Among other honours, Prof Horowitz has received the Claude Leon Merit Award for Early-Career Researchers and the Meiring Naudé Medal for Outstanding Early Career Contributions to Science from the Royal Society of South Africa. Prof Horowitz research explores the non-trivial emergent many-body properties of the strong force using the methods of perturbative quantum field theory and the AdS/CFT correspondence.

Division for Physics for Development, Education and Outreach: Dr MG Phalwane

Grace Phalwane is a Dental Doctor and Health Professions Educationalist in the Department of Community Dentistry at the Sefako Makgatho Health Sciences University. Her research interest is focused on the Service Learning (SL), Problem-Based Learning (PBL) and Inter-Professional Education (IPE).

Division for Nuclear, Particle and Radiation Physics: Dr M Kumar

Mukesh Kumar is a Lecturer of Physics in the School of Physics at the University of the Witwatersrand. He is an NRF Y-rated research physicist in the field of high energy particle physics. His research is focused on Higgs boson, top quarÛ, and darÛ matter physics at the Large Hadron Collider ĜCERNĞ including the future e-p and e+e -colliders. He is a member of TileCal Speaker committee for ATLAS detector at CERN.

Division for Photonics and Space Science: Dr J Bosco Habarulema

John Bosco Habarulema is a research physicist at the South African National Space Agency. He is a B2-rated research scientist by the National Research Foundation in the field of Space Physics. His research interests include ionospheric modelling and characterisation using various approaches including machine learning; ionospheric electrodynamics; and studies of Atmospheric Gravity Waves especially during geomagnetic storms.

Division for Physics of Condensed Matter and Materials: Prof CJ Sheppard

Charles Sheppard is an Associate Professor and a member of the Cr Research Group in the Physics Department at the University of Johannesburg. His current research interest focuses on the various physical properties observed in bulk Cr alloys, Cr thin films, and chrome oxide magnetic nano-materials.

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