Paper Submission Form - SAIP2025 Proceedings

Sections A, C, D, and E must be completed by all authors (including students) who submit papers. Section B is compulsory for students who submit manuscript(s).

Section A: Paper Submission Information

Paper/Abstract ID	338
Paper title	Structural and Magnetic Properties of a Novel Double Perovskite Oxide Sm_2MgRuO_6
Corresponding Author Name & Surname:	Sondezi Buyisiwe
Corresponding Author Email Address:	bmsondezi@uj.ac.za

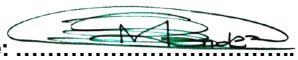
Section B: For Students & Supervisors

Supervisor Name & Surname:	Sondezi Buyisiwe
Supervisor Email Address:	bmsondezi@uj.ac.za

For this paper, the supervisor must agree/disagree with the following statements.

	Yes	No
1. I am aware that the above-mentioned paper is being submitted for possible publication in the Proceedings of the SAIP Conference. I am satisfied that the presented work is that of the listed authors. I hereby give consent to the submission	X	
2. I have proof-read the manuscript	X	
3. I am satisfied that the manuscript is written in appropriate English and is sufficiently free of grammatical and spelling errors	X	
4. I am familiar with the required manuscript format ("House Style"), and I am satisfied that this manuscript meets the criteria. I am aware that manuscripts not conforming with House Style may be desk rejected	X	
5. I am satisfied that the scientific content of this manuscript is of sufficient standard for it to be considered for publication in the Proceedings of the South African Institute of Physics Conference Proceedings	X	

Student Name & Surname: Irénée Brice M. Mouadje **Signature: Mouadje** **Date: 31-07-2025**

Supervisor Name & Surname: Sondezi Buyisiwe **Signature:**  **Date: 31-07-2025**

Section C: Suggested Reviewers

Obtaining the two referee reports necessary for DHET subsidy is an onerous task.

Please provide the names and contact details of three qualified South African and/or international referees. Referees should have a PhD and expertise in the relevant area of Physics. Do not recommend referees who have co-authored a work with any of the authors on the manuscript within the past five (5) years. Manuscripts without three recommended referees may be subject to desk rejection.

Suggested Reviewers in your Research Field (Both local & international)		
	Reviewer Names & Surname	**Reviewer's Email Address(es)**
Suggested reviewer #1	Somnath Bhattacharyya	somnath.bhattacharyya@wits.ac.za
Suggested reviewer #2	Rudolph Erasmus	rudolph.erasmus@wits.ac.za
Suggested reviewer #3	Mark Blumenthal	mark.blumenthal@uct.ac.za

Section D: Declaration of Novelty and Use of AI

How is this submitted manuscript scientifically novel?

The double perovskite Sm_2MgRuO_6 exhibits remarkable scientific novelty due to its unique combination of a main-group cation (Mg^{2+}) and a 4d transition metal (Ru^{4+}) in a rock-salt ordered structure, which is rare among perovskites. This configuration creates unconventional electronic interactions between Mg's closed-shell ($2p^6$) and Ru's open-shell ($4d^4$) states, leading to emergent properties like competing spin-orbit-coupled states in Ru^{4+} and potential Kondo-like screening from Sm^{3+}'s $4f^5$ electrons. Its high-pressure synthesis stabilizes metastable ordering, while the non-centrosymmetric monoclinic ($P\ 2_1/n$) structure suggests possible multiferroicity through magnetoelectric coupling. The interplay between Ru's strong spin-orbit interactions and Sm's localized 4f moments offers a platform for spin-orbitronics and topological quantum phenomena, distinct from conventional 3d-3d perovskites**.** The system's unresolved questions—such as the nature of Mg-O-Ru superexchange and 4d-4f magnetic coupling—highlight its potential to uncover new physics in correlated quantum materials.

Please see the Author Guidelines for the AI use policy.

How was AI used in the generation of this manuscript?

This manuscript was generated with the assistance of AI language models to enhance its structure, clarity, and technical accuracy. AI contributed to drafting initial versions of sections, synthesizing complex scientific concepts (e.g., spin-orbit coupling in Sm_2MgRuO_6), and optimizing language for readability while maintaining scientific rigor. It also aided in formatting tables, suggesting analogies (e.g., "Kondo-like screening"), and ensuring consistent terminology. However, all AI-generated content was carefully reviewed, fact-checked, and refined by human experts to validate accuracy, particularly for critical discussions on novel material properties and unresolved research questions. The collaboration between AI and human expertise improved efficiency in organizing and presenting the research while preserving the depth and originality required for scientific discourse.

Section E: Plagiarism

	Yes
I am aware that plagiarism detection software may be used on my manuscript.	X