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

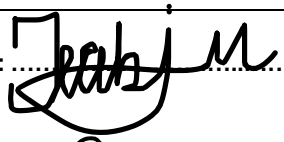
Paper/Abstract ID	ID 417
Paper title	Piston-Driven Shock Wave Test Problem for Validating Magnetohydrodynamic Models in Astrophysics
Corresponding Author Name & Surname:	Magdeline M. Seabi
Corresponding Author Email Address:	S226052184@mandela.ac.za, mellens56@gmail.com

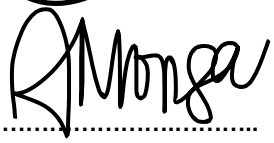
Section B: For Students & Supervisors

Supervisor Name & Surname:	Azwinndini Muronga
Supervisor Email Address:	azwinndini.muronga@mandela.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	✓	
2. I have proof-read the manuscript	✓	
3. I am satisfied that the manuscript is written in appropriate English and is sufficiently free of grammatical and spelling errors	✓	
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	✓	
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	✓	

Student Name & Surname: Magdeline Seabi **Signature:**  **Date:** 31 July 2025

Supervisor Name & Surname: Azwinndini Muronga **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	Amare Abebe	amareabebe.gidelew@nwu.ac.za
Suggested reviewer #2	Bhargav Vaidya	bvaidya@iiti.ac.in
Suggested reviewer #3	Dawit Worku	dawitsol.worku@gmail.com

Section D: Declaration of Novelty and Use of AI

How is this submitted manuscript scientifically novel?
This manuscript is scientifically novel in that it introduces an analytically guided, piston-driven shock tube model specifically tailored to mimic the bounce stage dynamics of magnetised core-collapse supernovae (CCSNe). Unlike other standard tests, whose model captures key physical processes, shock formation, magnetic field amplification, and anisotropic stress evolution, within a setup that is both computationally simple and physically relevant. Its integration with Newtonian MHD and potential for relativistic extension offers a unique, scalable benchmark for validating complex RMHD codes, bridging the gap between idealised test problems and realistic astrophysical conditions.

How was AI used in the generation of this manuscript?
The primary scientific contributions of this manuscript are that the conceptual design, physical modelling, and numerical implementation of the piston-driven shock tube for probing magnetised core-collapse supernovae (CCSNe) dynamics were conceived and developed by the authors. Artificial intelligence served as a supplementary tool, assisting with the refinement of technical language, structural organisation of the manuscript, and occasional debugging or verification of ideas that were already formulated by the researcher. The novel application of a piston-driven model to emulate shock production, propagation, and magnetic field amplification in CCSNe originates entirely from the authors' original insight. AI's role was limited to enhancing the clarity, coherence, and efficiency of communicating these innovations.

Please see the Author Guidelines for the AI use policy.

Section E: Plagiarism

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