**Association for Postgraduate Physical Sciences Students (APPSS) Symposium Abstract Form**

The 2021 APPSS symposium will be held on the ***3rd December***across the Kerr Grant Lecture Theatre and Room 121, Physics Building. To be involved in this event, please fill out and submit the abstract template on the next page. Please email your completed form to:

[appssadelaide@gmail.com](mailto:appssadelaide@gmail.com) by the ***12th November***.

Your discipline indicates which discipline within the School of Physical Sciences you are in (Earth Sciences, Chemistry, or Physics). To indicate your presentation preference (abstract, abstract and poster, or abstract and talk), please consider the following:

* **1st year and above** PhD and MPhil students are able to submit an **abstract.**
* **1st year and above** PhD and MPhil students are able to submit an **abstract and poster**. Due to COVID limitations on the day, we ask that you prepare your poster in an A3 format. We also ask you to prepare a 1 minute accompanying flash talk for your poster which will be presented to the entire cohort during the day. To get material ready for the day, we ask that you please send through a PDF version of your poster to the above email by ***26th November***.
* **3rd year and above** PhD students are able to submit an **abstract and talk**. The talk will run for 12 minutes and allow an extra 3 minutes for question time. Please note that there is only time for 3 research talks from each discipline. If there is an excess of students within a discipline that apply for this option, the talks selected will be based off of the abstracts. Unsuccessful applicants will be informed and given the opportunity to present a poster.

When writing your abstract, please consider that this event is comprised of students from separate disciplines to yours, so present them in a clear and coherent way that a reader with a general scientific background can understand.

More details will be supplied as we get closer to the event. In the meantime, if you have any questions, please don’t hesitate to contact us at the above email, or contact us through the APPSS Facebook group: <https://www.facebook.com/groups/994343141069399>.

We look forward to your involvement in the event!

Kind regards,

Association for Postgraduate Physical Sciences Students

|  |
| --- |
| **Surname:**  **McIntyre** |
| **Given name(s):**  **Melissa Anne** |
| **Discipline:**  **Physics** |
| **Program:**  **Doctor of Philosophy** |
| **Year of candidature:**  **1** |
| **Supervisor(s):**  **Dr Ayse Kizilersu, Prof Anthony Thomas** |
| **Research topic:**  **Particle Therapy** |
| **Presentation preference:**  **Poster** |
| **Abstract title:**  **Reducing Uncertainty in Dose-Response Modelling for Particle Therapy** |
| **Abstract (maximum 300 words):**  The advantages of proton therapy compared to conventional, photon-based radiation treatments are well known amongst the radiation therapy community. Studies have shown that as low as 11% of cancer patients that receive proton therapy experience severe health side effects compared with 28% of photon cancer treatment patients. Currently, a clinical proton radiobiological effectiveness (RBE) of 1.1 is assumed for all radiation and biological conditions – suggesting that protons are more biologically effective by a factor of 1.1 compared to conventional radiotherapy treatments. This is despite clear evidence that RBE is strongly correlated with numerous physical and biological parameters. Additionally, the uncertainty in the RBE increases with the linear energy transfer (LET) of the radiation used. During proton therapy treatment planning, using the incorrect RBE can result in over/under-prescribed dose to the patient.    As part of our study, we investigated how current radiobiological models perform on a statistical basis. We found that the most prevalent model in the literature, the Linear-Quadratic (LQ) Model, is statistically inadequate at describing dose-response data in the high-LET region. We concluded that using a statistically inadequate model introduces unnecessary uncertainty into the RBE predictions. To resolve this issue, we have developed a model that can describe high-LET dose-response data.  The model was tested on a range of experimental data obtained from the literature, as well as Monte Carlo simulated dose response data generated using the TOPAS-nBio software toolkit. Its performance was compared with current established radiobiological models has greatly improved. We conclude that using the correct model when making proton therapy RBE predictions can decrease the uncertainty in the high-LET region. |