# CUMPC 2023 Guidelines for Abstracts

Thanks for your interest in participating in the second annual Canadian Undergraduate Medical Physics Conference (CUMPC).

In this document we have assembled a guide to helping you to develop your abstract and submit it for consideration with confidence. If this is your first time submitting an abstract to a conference, don't worry! Our guidelines and sample abstracts are here to help you learn the anatomy of a good abstract. **We encourage applicants to submit an abstract at any stage of their research.**

## 1 General Requirements

- As our name suggests, we prioritize submissions from individuals studying at or affiliated with Canadian universities and institutions at the undergraduate level.
- The submitted abstract should be original, based on research conducted in the area of medical physics, and reflect the applicant's contributions to the research.
- There is a limit of *one* unique submission per applicant. There is no requirement on the amount of progress made on the research.
- If your abstract is accepted, any work completed between the time of submission and your presentation time can also be included in the presentation.
- The abstract should be limited to **300 words** with or without **1 Figure** and/or **1 Table**, and have the following structure: *Title, Purpose, Methods, Results,* and *Conclusions*.
- Additionally you may choose to include a *Statement of Time Invested* at the end of your abstract document to indicate the time investment that your research represents.
- Word count included from the Title, Figure and Table captions, and the Statement of Time Invested does **not** count towards the 300 word limit. The abstract should be limited to **two pages**.
- Your name, institution, and other identifiers will be collected from the webform during the online submission process when you upload your abstract – **do not include them in the abstract document.**
- Abstract submission is open **July 4** and submission deadline is **August 4**, any abstracts submitted after this date will not be accepted.

## 2 Submission Instructions

- Before submitting your abstract, please go to the conference's website www.cumpc.ca to create a user account. **Note:** Creating an account does **not** register you for the conference itself. The registration process is separate from the user account creation process.
- After creating an account, you can sign into the conference website. You will then find a link to "Abstract Submission" on the home page near the sign-in button.
- **Upload your abstract in PDF format by saving it as a .pdf file.** In Microsoft Word, go to File > Save As in the Toolbar and select .pdf as the file format. In Google Docs, go to File >

Download in the Toolbar and select PDF. No file naming convention is required. Other formats will not be accepted and you will be asked to re-upload the abstract in the correct format.

- During the submission window (July 4 thru August 4), you will be able to update your abstract submission by making a subsequent submission. **However**, you should assume that your previous submission will be overwritten. Therefore it is in your best interest to save your own local versions of your abstract.
- If technical difficulties arise during the submission process, please contact the CUMPC 2023 organizing committee at organizers.cumpc@gmail.com.

## 3 After Submission

*3.1 Abstract Call Window*

The abstract submission window is July 4 to August 4. After the end of the submission window, no further submissions or updates will be accepted.

After August 4, we will begin evaluating abstracts, selecting successful applicants, and notifying you about our decision regarding your submission. Therefore we ask you to stay tuned for more information as it becomes available!

*3.2 Stay Tuned for Updates*

After submitting your abstract, please stay tuned for important information from the CUMPC Organizing Committee. We may contact you via email and be sure to add organizers.cumpc@gmail.com to your allow-list and keep an eye on your junk/spam folder. We also encourage you to follow us on

- Twitter: @CUMPConference
- LinkedIn: Canadian Undergraduate Medical Physics Conference

*3.3 Update Your Submission*

Science is under constant revision! If you make edits to your abstract, be sure to resubmit with the latest version following the same steps as required during the initial submission. You should assume that only the latest version will be stored on our web server, and therefore make every effort to keep local copies of all versions of your abstract for your own records.

## 4 Contact and Troubleshooting

- For any questions or if the presenter is having difficulty signing into the webpage or with abstract submission, please email the CUMPC 2023 organizing committee at organizers.cumpc@gmail.com with a relevant subject line and a description of the problem you are facing.

## 5 Writing Guidelines

The following is a breakdown of the components of an abstract with the intention of providing you with guidelines that will help to improve your abstract content and style. **If you are writing an abstract for the first time, don't be discouraged!** Here we have provided advice on what to write

and how to write it regarding the key components: title, purpose, methods, results, conclusions, and captions for figures and tables. You may also find it helpful to read sample abstracts that have been reproduced below from successful applicants from last year's CUMPC 2022.

In addition to these guidelines, your research supervisor(s) and other collaborators in your research group could be excellent sources of feedback during the writing process. We encourage you to revise and edit your abstract and welcome you to submit updated versions during the submission window (July 4 to August 4).

Overall, the goal of an abstract is to summarize the main results of a research project or paper succinctly with emphasis on why the work was done, how it was done, what the outcomes were and what they mean in the broader context of the relevant field – in this case, medical physics.

*5.1 General Guidelines*

☑ See also the **General Requirements** section at the beginning of this document.

An abstract is typically written in past tense. Your goal is to succinctly report what *was* done in the research and what *were* the results, with perhaps the exception of the conclusions that may be written to explain what future work *will* be done. Secondly, an abstract is typically written in the passive voice: "the data was collected," as opposed to "I collected the data". Sometimes research articles are written using the collective "we," as in: "we collected the data", in which case you are referring to you and any others involved in the research program as a team, where appropriate. This is also acceptable in an abstract. Finally, your abstract should be succinct, yet detailed enough to stand alone from your presentation.

*5.2 Dos, and Don'ts*

Do…
- be specific;
- be quantitative (where possible and appropriate);
- be concise;
- stay within the 300 word count;
- edit your work for proper spelling, grammar, punctuation, and syntax;

Don't…
- include your name, institution, associations, or any obvious identifiers (the online submission form will have a place for this!)
- use references (this is not a typical practice and is often discouraged for abstracts!)

*5.3 Style*

We recommend using Arial font size 12, single space, which is the same style that this document has been prepared with.

*5.4 Title and Subtitles*

☑ Do not contribute to the word count.

The title of the abstract should, in isolation, reflect the aims and approaches of the study, and should not report results or conclusions. Avoid abbreviations and acronyms and be sure to use

up-to-date terminology that readers experienced in that area of research would recognize. The goal is twofold: accurately represent your research topic and attract interest using just a handful of words.

Subtitles refer to the words “Purpose”, “Methods”, “Results”, and “Conclusions” that are used to delineate their respective paragraphs. This style is typically used for the abstract submissions to many conferences and several academic journals.

*5.5 Purpose*

- ☑ Contributes to the word count.
- ☑ New paragraph beginning with “Purpose: ”

The purpose of a research project or paper is the reason behind doing it in the first place.

Consider the following…

- What was the objective of your research? Was there a goal to make a particular measurement, collect a certain data set, analyze existing data, build on an existing theory, or conduct a literature search or review?

*5.6 Methods*

- ☑ Contributes to the word count.
- ☑ New paragraph beginning with “Methods:”

Physics research is typically conducted according to a method, whether it is experimental, analytical, or some combination of those two. The method is a description of what was actually done in the research: describe the key equipment, apparatuses, or theoretical considerations that were used to obtain, analyze, or interpret data or models that led to the results of the work.

Consider the following…

- What chemicals, radionuclides, or energy sources (x-ray, gamma ray, particulate, nuclear, etc.) were used, if any at all? Include the amount or energy of each if it is critical to the experimental results.
- What equipment, including hardware and software, was used, created, or modified in the course of the research, if any at all? Were any human or animal subjects involved?
- What were the conditions or parameters of any experimental or theoretical (e.g. computer simulations) work that was done?
- What were the methods of analyses used, if any? What kinds of statistical analysis were used?
- Details such as the manufacturer of key equipment (e.g. linear accelerator) may be necessary to help the audience contextualize your work.
- Data sets may have been used in the course of your research, whether obtained through collaborators, privately, or through open source platforms. **Typically abstracts do not contain references, and in general we discourage from using them in an abstract**, therefore in this special case we suggest using the official or common name of the data set (e.g. CanCOLD, which is well-known by this acronym).

*5.7 Results*

- ☑ Contributes to the word count.
- ☑ New paragraph beginning with “Results:”

The outcomes of an experiment, simulation, theoretical calculation, or literature search may be many and varied. The abstract is intended to highlight the key results that translate into the significance, importance, and impact of the work. The results section should be the bulk of your abstract, such as the detail and length should not be compromised due to other sections. Typically the results section contains only the most important quantitative statements. Occasionally these can be summarized in a sentence or two, but often they are best represented in table or graphical form. Your abstract can include figures, tables, and captions (see Figures subsection ahead).

Consider the following…

- Report the results that answer your primary objective, followed by any results that address any other objectives stated. If any, report negative results that failed to support the objective.
- Reporting “Gene expression significantly varied between malignant and benign tissues.” is not very specific, whereas “Gene expression was significantly higher in malignant tissue than benign tissue (75% vs 10%, respectively; $p < 0.05$)” is more detailed. Use numbers!!

*5.8 Conclusions*

- ☑ Contributes to the word count.
- ☑ New paragraph beginning with “Conclusions:”

The conclusion of your abstract should clearly, yet concisely, indicate the main implications of your findings. Most conclusions are one to three sentences long. This section has the most impact on the reader, so you should ensure that your take-home message is clear and demonstrated by your results (i.e., don’t make inferences that your reported data does not indicate).

*5.9 Figures, Tables, and Captions*

- ☑ Optional.
- ☑ Does not contribute to the word count.

Figures are a great way to display trends, mechanisms, and items, which may entail images, data plots, or schematics, however all should be accompanied by a clear legend and concise caption. Ensure to include the following, where appropriate:

- Scale bars
- Labels on axes, curves, important items
- Specified units and appropriate font size

Tables are an effective method to display large amounts of data using legends, clear category names, sufficient spacing, appropriate font size, and provided units.

Captions should be concise but detailed enough to explain the figure or table in isolation from the abstract and often contain a legend. By convention, the caption for a table should be written above the table, while for a figure the caption should be written below the figure.

*5.10 Statement of Time Invested*

- ☑ Optional.
- ☑ Does not contribute to the word count.

We recognize that applicants may come with varying amounts of time invested in their research project. For this reason, we encourage you to include a statement that may explain how much time has been put into the project, and whether it is part of continuing research. This can help the CUMPC Organizing Committee during the review process when gauging the quality and quantity of research represented by the abstract.

## 6 Submission Checklist

Before submitting, use this checklist to ensure a successful submission that meets our requirements to help make yours a competitive submission.

- ☐ You have read and understood the **General Requirements** (Section 1 above).
- ☐ You have read and understood the **Submission Instructions** (Section 2 above).
- ☐ You reviewed your PDF file to ensure that it was converted properly from any document format it was originally processed with.
- ☐ You are following our social media channels for updates as laid out in **After Submission** (Section 3 above).

## 7 Sample Abstracts

*Sample #1 (Reproduced with permission from the author, Alana Lopes.)*

**In vivo dosimetry for superficial high dose rate brachytherapy with optically stimulated luminescence dosimeters**

**Purpose**: To calibrate and commission optically-stimulated luminescence dosimeters (OSLDs) for in vivo measurements in contact based treatments for superficial high dose rate (HDR) brachytherapy in place of metal-oxide-semiconductor field-effect transistors (MOSFETs).

**Methods**: Five dosimetric characteristics were tested using Landauer nanoDotTM OSLDs. To evaluate dose linearity, single OSLDs were placed in a fixed location while the dwell time varied. For dose rate dependence, the dwell time was held constant and a single OSLD was placed at varying source-to-OSLD distances. Next, a group of OSLDs were readout 34 consecutive times to test readout depletion while OSLDs were optically annealed using a mercury lamp light source for 34.7 hours. Angular dependence was measured using a solid water phantom with a circular hole machined into the center for OSLD rotation. End-to-end tests were performed using a Freiburg flap and Valencia applicator in two separate cases for pacemaker and lens patients respectfully. OSLD measurements were compared to both MOSFETs and the expected treatment planning system (TPS) dose.

**Results**: A supralinear response of OSLDs was observed for doses above 275 cGy. OSLDs were found to be independent of dose rate and exhibited minimal readout depletion with 0.05% reduction in signal per readout. OSLDs were successfully optically annealed to 0.01% of their original signal after 24 hours of illumination while angular dependence was found to only be significant in edge-on scenarios where a reduction in signal was as much as 16%. Measured doses were compared to those of the TPS and found to be in agreement for pacemaker patients to within measurement uncertainty. For lens patients, OSLDs were found to be the more accurate system with a maximum disagreement with the TPS being 0.09%.

**Conclusion**: OSLDs can successfully be used in place of MOSFETs for in vivo dosimetry for superficial HDR brachytherapy.

*To date, time spent on the project has been 4 months with the expectation of an additional 4 months for project completion.*

*Sample #2 (Reproduced with permission from the author, Rajan Leung.)*

**A novel Fourier ptychography microscope for malaria diagnosis**

**Purpose**: This project aims to develop a low-cost (< $150 USD) microscope that uses Fourier Ptychography Microscopy (FPM) to diagnose malaria in rural areas. FPM differs from conventional microscopy in image acquisition as it uses a range of illumination angles and sums the Fourier transform of each into a single, high-bandwidth image. FPM overcomes the intrinsic tradeoff between having a high-resolution (1μm) and a large field of view (FOV) (4x4mm), making it well suited for malaria diagnosis, which requires high-resolution to detect parasites in red blood cells and a wide FOV to observe many cells.

**Methods**: The FPM microscope was built using 3D printed components, a Raspberry Pi microcomputer, a camera module, and a 16x16 LED matrix, following a design proposed by Aidukas et al. 2018.[1] The microscope captures 256 images of the sample from multiple illumination angles by switching the activated LEDs. The images are run through a modified version of a Quasi-Newton algorithm developed by Le Tian 2014.[2] The algorithm iteratively combines the high frequency values of the image in the Fourier domain in order of lowest to highest numerical aperture, generating a wide-FOV, high-resolution image.

**Results**: Reconstruction using a modified algorithm was validated using an open-source dataset (Rogalski et al. 2021).[3] Characterizing the resolution using a full width at half-maximum estimate indicates that the reconstruction process improved the resolution of the real data by a factor of 5. The prototype was validated by acquiring low-resolution images and is currently being calibrated for high-resolution imaging.

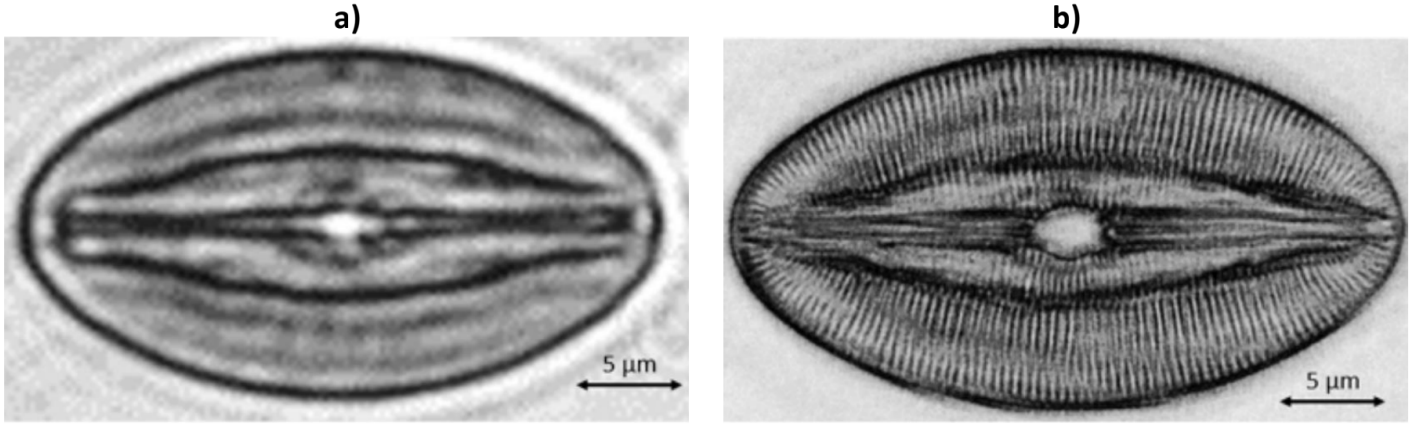


**Figure 1**: Comparison of the resolution of the conventional image (a), 0.5 μm, with the resolution of the reconstructed image (b), 0.1 μm, of a Navicula Elliptica organism, from an open-source dataset, with an FOV of 0.25 mm.

**Conclusion**: The FPM approach has the potential to enable point-of-care malaria diagnosis in rural Africa. A prototype FPM microscope has been validated and is capable of the wide field-of-view and high-resolution needed for malaria diagnosis. Further steps include performing the comparison with laboratory-grade images for malaria diagnosis with colleagues in Uganda.

**References**:


1. Aidukas, T., Eckert, R., Harvey, A.R. et al. Low-cost, sub-micron resolution, wide-field computational microscopy using opensource hardware. Sci Rep 9, 7457 (2019). https://doi.org/10.1038/s41598-019-43845-9

2. Lei Tian, Xiao Li, Kannan Ramchandran, and Laura Waller, "Multiplexed coded illumination for Fourier Ptychography with an LED array microscope," Biomed. Opt. Express 5, 2376-2389 (2014)
3. Mikołaj Rogalski, Piotr Zdańkowski, Maciej Trusiak, FPM app: an open-source MATLAB application for simple and intuitive Fourier ptychographic reconstruction, Bioinformatics, Volume 37, Issue 20, 15 October 2021, Pages 3695–3696, https://doi.org/10.1093/bioinformatics/btab237


*To date, the time spent on the project has been 4 months with the expectation of an additional 8 months for project completion.*

*Sample #3 (Reproduced with permission from the author, Josephine Brewster.)*

**Fast kilovoltage dose calculations using a superposition/convolution algorithm**

**Purpose**: To develop a fast dose calculation algorithm for a novel kilovoltage radiation therapy system intended for use in lower income areas and developing countries.

**Method**: The presented superposition/convolution algorithm determines the total energy released in matter (TERMA) and then superimposes material-specific energy deposition kernels. These kernels were created using TOPAS Monte Carlo (MC) code. Comparisons were made between the results of the SC algorithm and simulations in TOPAS using a 120 kVp pencil beam entering blocks of water, cortical bone, and lung tissue, respectively. Additionally, a 120 kVp comparison was made in a phantom consisting of 2 cm layers of water and bone, and a 1 cm layer of lung. The results of the SC dose calculation algorithm were compared to TOPAS using mean absolute difference in percent of maximum dose along the central-axis depth dose curves.

**Results**: For a 120 kV pencil beam in water and in lung, both results had a mean difference between the SC algorithm and MC of 0.006%. For cortical bone, the dose differed from the TOPAS MC simulation by a multiple of 1.5 everywhere. After correction, the SC and MC results had a mean difference of 0.015%. In the test of the water, lung, and bone phantom (Figure 1), the mean dose difference for all materials was 0.009%. The SC algorithm showed a significant speed advantage. For the simple case of a pencil beam in a 50 x 50 x 50 voxel water phantom, run with $10^8$ particles, TOPAS MC took approximately 2 hours, while this algorithm took 18s to execute on a CPU.

**Conclusion**: The presented SC algorithm showed excellent agreement with TOPAS MC and is considered a viable option for fast dose calculations for kilovoltage therapy, with speeds enabling inverse treatment planning.

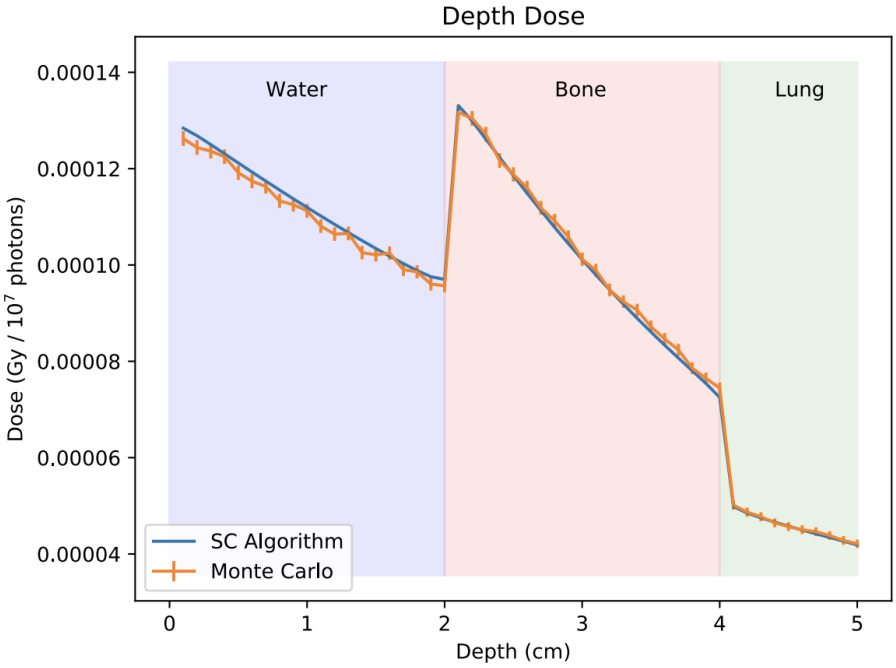


**Figure 1**: Depth dose curve for a 120 kVp pencil beam entering a phantom consisting of 2 cm layers of water and bone, and a 1 cm layer of lung. SC algorithm shown in blue and Monte Carlo shown in orange with error bars showing a 95% confidence interval.