

Title of Project: Development of a new file format for MARS Camera and Medipix chip readouts

Project Number: 272

University Project Leaders/Departments: Professor Phil Butler; Physics and Astronomy

Brief outline of project

Aim:

To implement a suitable file format for the latest generation of the MARS camera and the Medipix chip.

Project Significance and Outline:

The MARS-CT project is at the cutting edge of technology, using the Medipix family of chips (developed by CERN) as part of the design of a spectral CT scanner. The scanners are constructed in Christchurch and are developed by collaborating partners from the Universities of Canterbury and Otago, as well as the Canterbury District Health Board. Currently four scanners are in Christchurch (in different stages of construction) and an additional three scanners are located in research labs overseas. Majority of facilities have multiple cameras available for use in the MARS-CT scanner.

The latest generation of the Medipix chip is able to sample different energy levels in a single capture, up to eight different counters in total. However the current readout format will only record the information for the first two counters. In addition, recent camera designs has meant that multiple chips are now being used on a single camera board, where the current saved image format records the information from each chip separately. It is desired to save image formats such that all chips and all counters are stored in the single file for a single frame, but to achieve this the current MARS camera file format needs to be restructured.

This project will examine the current file format for the MARS camera and implement a new structure that will allow for foreseeable future developments in the Medipix chip design. The student will be working in conjunction with system developers of the MARS camera, the CT scanner and post-processing systems.

Expected Outcomes:

The project is expected to achieve the following tasks:

- Become familiar with the MARS camera readout key functionality as it is used by the latest generation of the Medipix chip (MP3) and the earlier generation MXR chip.
- Define an image file format that will accommodate currently used cameras and foreseeable future designs. Specifically: multi-chip cameras using all available energy counters.
- Implement and facilitate necessary programming changes to acquisition software.
- Document image file format as implemented.
- Produce written report and presentation.

Specific student requirements:

Please indicate below any specific academic requirements you have for the summer scholarship student (e.g., specific level; specific courses, or equivalents, completed)

Student is to have completed 300 level study in technical sciences such as maths, physics, computing or engineering. The student will also be expected to have a working knowledge of C++ and Python.

Special condition:

n/a