Greetings, I am John Ming Ngo, an undergraduate at the University of Calgary.

I am here to present the Cosmic Watch Android application which interfaces with a cheap and portable muon detector. The overall goal of this application is to make the combined system simple and portable enough for ‘high school’ level education and research.

In prior years, Jordan Hanania, a former undergraduate at the University of Calgary, designed a cheap and portable muon detector under the supervision of Professor Jason Donev, with inspiration from MIT. That detector is right here. [SHOW THE DETECTOR]

However, whilst the detector itself is small, it was hamstrung by the need to be tethered to a PC to operate.

Almost all PCs are relatively large and lacking in portability and easy deployment. Furthermore, there was a lack of a user-friendly GUI to make using the detector accessible.

Professor Donev recognized these flaws and figured that if it were possible to replace the PC with a mobile device, such as an android based phone, the complete package would be convenient and portable enough for high school level usage.

All this said, what are muons, and why do we care about them? [SCROLL DOWN]

Muons are an elementary particle generated when high energy cosmic rays strike the upper atmosphere. They are a natural source of ionizing radiation, with an extremely short lifespan made longer from our perspective due to time dilation due to near-light speed velocities.

That is, muons are a good demonstration of the ubiquity of natural background radiation, its interaction with matter and location, and can validate one of Einstein’s theories.

How does this application work? I’ll demonstrate on my tablet: [RUN DOWN THE PROCESS, switch cam]

Firstly, powering, detection, and connection. Simply plug it in like this, and then start up the application, and go to the main screen like so.

Next, actively displaying the detection data as it is coming in. This data you can see here is live – this really is the muons striking the detector and being counted by the application here.

Finally, there are some basic data logging features, although they are currently buggy and in development. The recorded data is also saved as a CSV file on the device, for further analysis as desired.

I conducted some simple experiments with this setup, to prove that it was convenient enough to work with.

In the first experiment, all there was to it was to plug in the android device, and then conduct a recording every hour. All that needs to be done is to tap start every hour, with the recording length saved and remembered. The results told me that time of day did not apparently matter, which meant the sun was not an apparent source of these muons.

The second experiment was where it got interesting. Knowing that the source of cosmic muons was from above, and that ionizing radiation can be partially blocked by matter in the way, I set about utilizing the floors of a building as a proxy for the matter in the way. That entailed picking up this system, going up another floor, finding a suitable location, and then taking another recording, all the way from the basement to the top floor of the Earth Sciences building at the University of Calgary.

I confirmed that this was building material cover and not altitude by conducting another text a ground level, outside, where the readings were the highest of them all.

From the results of this experiment, I could see very clearly that the amount of material cover has a linear relationship with the number of muons detected, as expected from matter intercepting ionizing radiation.

Both experiments were as simple as hitting buttons, and so, I feel, completely appropriate for education or research purposes at the high-school level.

Thank you for listening to my presentation, I hope you enjoyed it.