FIVE QUESTIONS WITH DRA. EMILIA CRUZ

LHC Upgrades: the next steps after the Higgs discovery

High energy physicists use particle accelerators as the most effective tool to explore they physics in the smallest scale. A good example of this, is the Large Hadron Collider (**LHC**), a 27 km circular accelerator located in the border of France and Switzerland, and managed by the European Organization of Nuclear Research (CERN) [1]. In 2012, CERN announced the breakthrough observation of a new particle which was consistent with "Higgs Boson" (an elementary particle of the Standard Model of Particles Physics, which explains why the particles have mass) [2]. After that discovery however, many questions still remain open as well as many new ones. To face those challenges, more ambitious projects (larger, higher energy, higher luminosity, etc.) are under development [3,4,5].

Could you introduce yourself?

My name is *Emilia Cruz*; I am a Mexican scientist living in Geneva, Switzerland.

Figure 1. Dra. Emilia Cruz at CERN.

Could you tell me about your institute and research topic?

I have recently moved to scientific publishing, but before that, I was an accelerator physicist. I did my PhD in the University of Liverpool, then a postdoc in the University of Oxford, and back to the University of Liverpool for a second postdoc. However, that, second time, I was based at CERN in Switzerland. My research consisted in the design and analysis of stability of different possible upgrades of the **LHC**.

How or why did you choose this topic?

I moved to accelerator physics because I was interested in doing my PhD in a more applied field. Working for the possible upgrades of the **LHC** was very interesting in many ways, the scale of the projects and the implications that they might have in the future of particle physics just to name a few. Nevertheless, I was also interested in that subject in a personal way, since I did my masters project in particle physics in the A Large Ion Collider Experiment (ALICE) detector, also at CERN, when the first collisions of the LHC started. This would now be an opportunity to follow its progress and its future from another point of view.

Right now, what is the biggest challenge of your work, and what do you think will be the future of you research area?

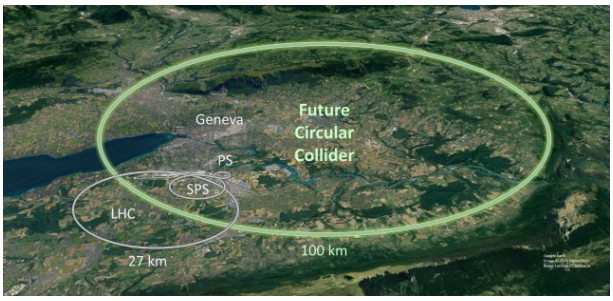

Figure 2. FCC accelerator complex scheme. Courtesy of CERN.

I see both the challenges and the future sort of interlinked, as the main challenge of the field is which future option, if any, to pursue. Making a machine of the scale of the **LHC**, not to say much larger, is a big challenge. More from the economic and political point of view, as it can be very controversial to try to pursue such a large machine without a strong case for particle physics, as the Higgs boson was for the **LHC**. Technologically, I am more comfortable that with the knowledge that we currently have, we would be able to do large machines, even one of the size of the Future Circular Collider (FCC) (a large proposed accelerator with ~100 Km of circumference). However, with the time it takes to build such a machine, together the time it takes to go through design and decision phases, it might result in losing the last generation that built large colliders, which will be a costly loss, and this time not an economical one. For such reasons, I think it is so important to do the conceptual design reports, now that we have the momentum of the success of the **LHC**, and the impact and knowledge of this generation of accelerator physicists is still tangible.

References

[1] CERN main page, https://home.cern/

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