



Stepping up to the new challenges

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Synopsis:

Discoveries over the next 10 years will be driven by a combination of enhanced statistics and refined analyses made possible through upgraded observatories, new computational techniques and advances in multi-messenger astronomy

Outline

- **Upgrades to the current generation** - New data from the ongoing upgrades and the ascendance of radio will enhance the measurements from section 2, answer some questions from sections 3/4 and lead us to new puzzles to be faced by the next generation of detectors.
- **Computation: better, faster, stronger** - DNNs will learn to reach new levels of resolution and open-up new pathways for analysis, but how will we provide the training data that they require?
- **'Multi-wavelength' pictures of the cosmic ray sky** - Composition data with much higher statistics will allow direct combination of arrival direction, spectrum and primary mass which, with a better understanding of the GMF, will reinvigorate charged particle astronomy.
- **Leveraging and expanding multi-messenger observation** - Better particle discrimination from the upgrades will couple with annoyingly frequent GW, gamma and neutrino alerts to illuminate sources.
- **Open science and data** - The democratization of science will lead to more eyes on more data and therefore more insights and more questions.

Experiment Representatives and contributing tasks

Telescope Array Collaboration - J. Matthews inm@cosmic.utah.edu

Pierre Auger Collaboration - A. DiMatteo armando.dimatteo@to.infn.it

Contributing Science Tasks

- **Spectrum** - A. Coleman, Y. Tsunesada
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- **Mass Composition** - D. Bergman, E. Mayotte
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- **Anisotropy** - L. Caccianiga, G. Golup, P. Tinyakov
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- **Multi-messenger** - J. Alvarez-Muniz, J. Eser, L. Lu
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- **Computational Horizon** - J. Glombitza, E. Santos, TBD
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More volunteers are welcome!