The UHECR Snowmass White Paper
Goals, Organization and General Outline

Fred Sarazin (Colorado School of Mines) on behalf of the white paper coordinators and lead conveners

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Goals of the white paper

- The UHECR Snowmass white paper aims at identifying the scientific goals of the community looking out two decades in the future.
  - UHECR: for the purpose of this document E > 100 PeV
  - Why two decades? Current experiments are going to operate for another decade, while most planned experiments are about one decade out and will need to operate 5-10 years.
- The white paper also aims at being a baseline roadmap for the community and therefore need to be international and (reasonably) thorough. We are aiming for a 70 - 100 pages document.

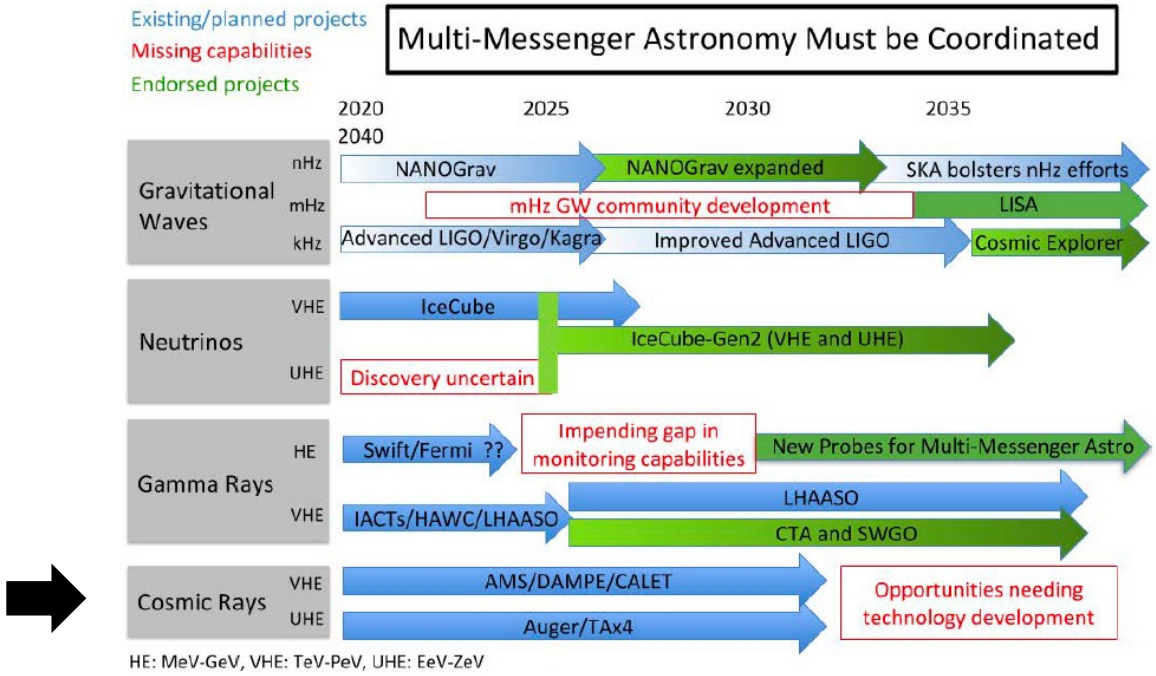

FIGURE L.4 Schematic high-level view of capabilities in different messengers over decades (blue: existing or planned, red: missing capabilities, green: endorsed new projects, dated by construction starts). Gradient shading indicates projects that can start taking data as construction proceeds. Not shown are many promising potential projects for which technology development is needed. With each messenger, the discovery prospects are outstanding; with multi-messenger observations, they could be transformative.

Organizational structure

WP Coordinators: Fred Sarazin, Frank Schroeder, Tonia Venters

Lead Conveners: Alan Coleman, Johannes Eser, Eric Mayotte, Dennis Soldin

TASKS (2-3 conveners per task)

- **Spectrum** — A. Coleman / Y. Tsunesada
- **Composition** — D. Bergman / E. Mayotte
- **Anisotropy** — L. Caccianaga / G. Golup / P. Tinyakov
- **Hadronic interactions** — H. Dembinski / T. Pierog / D. Soldin
- **Multimessengers** — J. Alvarez-Muniz / J. Eser / L. Lu
- **Astrophysics** — F. Oikonomou / T. Venters
- **Magnetic fields*** — T. Jaffe / M. Unger
- **BSM (dark matter,…)*** — R. Aloiso / O. Deligny
- **Computation*** — J.Glombitza / E.Santos
- **Interdisciplinary** — M.Bertaina / R.Mussa

EXPERIMENTS (1 representative per experiment)

- **Auger** — A. DiMatteo
- **Ice Cube (incl. Gen 2)** — J. Kelley
- **Telescope Array** — J. Matthews
- **GCOS** — J. Hoerandel
- **GRAND** — P. Denton
- **POEMMA (& EUSO)** — J. Krizmanic

- About 50 participants
- Very positive overall
- Specific feedback:
  - Add an Interdisciplinary Science section to the WP
  - Work with other WPs to develop a consistent view, outline synergies and cross reference the efforts.
  - Explore the societal (human, environmental…) impact of doing UHECR research

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Preliminary Outline

Executive Summary (1 page)

1. The Big Questions
2. The UHECR Paradigm Shift
3. Physics at the Energy Frontier – the synergy between UHECRs and Particle Physics
4. Pinpointing the Most Extreme Physical Processes in the Universe
5. Stepping Up to the New Challenges
6. The Next Generation Experiments
7. Interdisciplinary science

Questions for each task:

- What is the current status of the field? [Guidance: 3-5 pages]
- Where are we going to be 10 years from now (considering the continued operation of existing experiments)? [Guidance: 1-2 pages]
- What are the questions that will remain to be answered by the new generation UHECR observatories the following decade? [Guidance: 1-3 pages]

The inputs from the tasks will then be folded in the WP.

Shorter contributions expected from tasks with a *

How are the existing and next-generation experiments going to contribute to the science case in the next two decades?

- Brief description of the experiment / known or projected performance [1 pages per experiment]
- Ability to address the science case advanced by the science tasks [2-3 pages per experiment]

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Writing the white paper

- One master Overleaf document editable only by the WP coordinators and lead conveners
- Template Overleaf provided for each task / experiment but maintained by the conveners and representatives
- Snowmass Slack channel #uhecr-whitepaper for communication between coordinators, (lead) conveners and contributors
- To contribute, please contact directly the relevant coordinators, conveners and/or experiment representatives (emails are provided in each relevant section of the WP)

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Timeline

• White paper coordinators and lead conveners named	Sept 15 ✓
• Identify & contact the conveners and experiment representatives	Oct 10 ✓
• Create an outline of the white paper. Inform the community. What is the best structure to be also used for a community-wide roadmap document? Encourage contributions from the community!	Oct 20 ✓ (mini-workshop)
• Deadline for individual contributions to the various tasks → We are here!	Nov 20
• Report from each science tasks (<10 pages) & experiments (<5 pages) due	Dec 10
• Update the suggested requirements on future experiments based on the science task and experiment reports. Request information from the experiment representatives to make (comparative) plots.	Dec 15 to Jan 15
• Include new plots, update experiment section and conclusion of paper.	Jan 20
• Draft of the white paper is released for general review	Jan 31
• Solicit external reviews	Mar 1
• Submit to Snowmass CF7	Mar 15

THE END

Snowmass flow

Slightly modified from Peter Denton, NuTau2021 white paper

- White papers like this one inform the Frontier Topical reports (CF7 in this case)
- Frontier topical reports inform Frontier reports (Cosmic Frontier in this case)
- Frontier reports inform the Snowmass report
- Snowmass report eventually informs the P5 report
- P5 report is the guide for HEP funding in the US for the next decade