

Gamma-Ray White Paper

The Future of Gamma-Ray Facilities in the MeV-EeV Range

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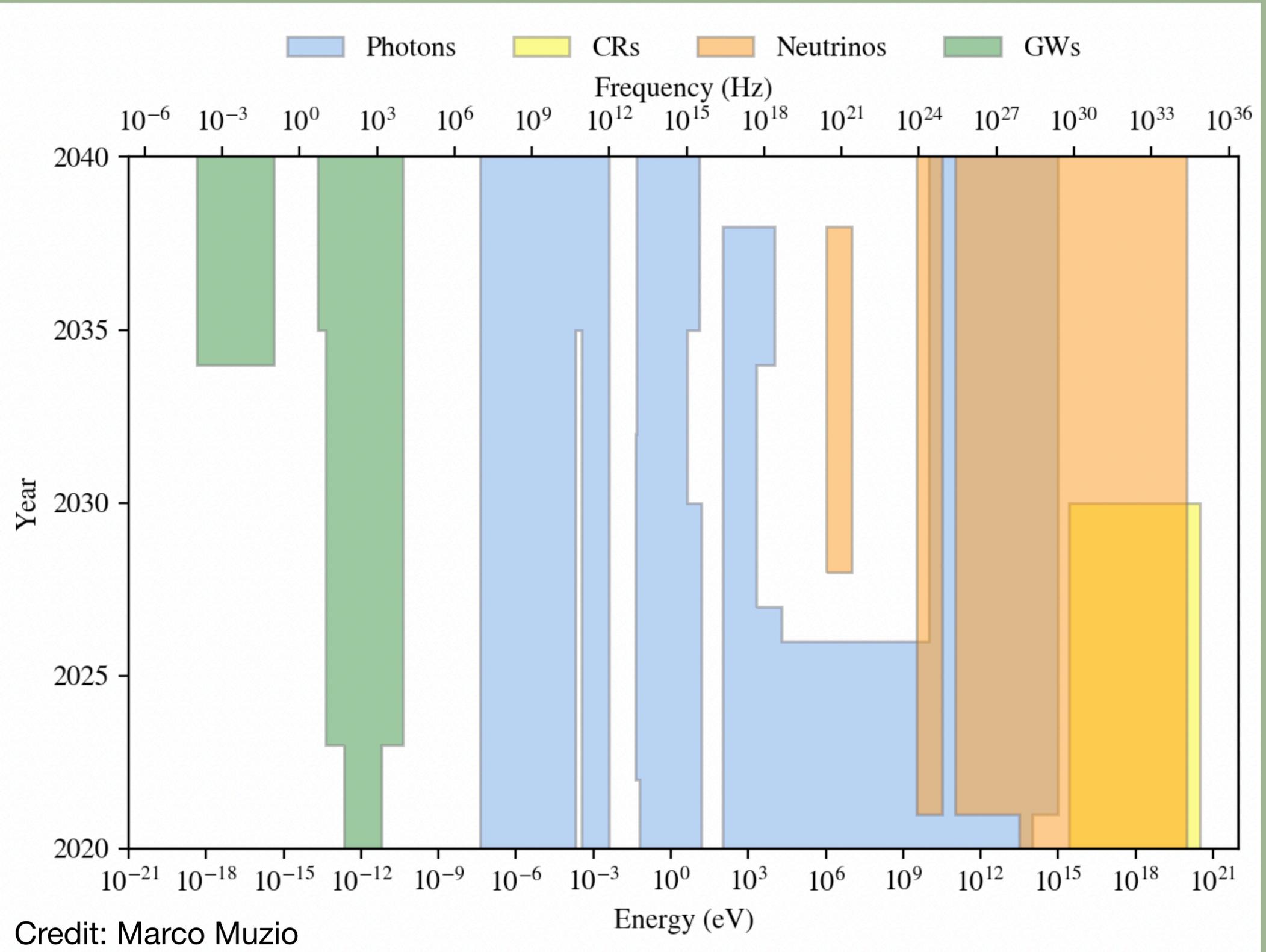
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Themes

- Gamma-Rays are intrinsically important to questions of fundamental physics
- Gamma-Rays are part of a complete multiwavelength spectrum
- Gamma-Rays are part of a complete set of messengers for multimessenger science
- Gamma-Rays fit into Snowmass more so than the Decadal because the topics they probe are more aligned with the goals of DOE and NSF-Physics than NSF-Astronomy. (NASA is more involved in the Decadal, but pays attention to both community planning processes.)
- There are some organizational and community practices emerging in gamma-ray astrophysics that might serve as a model for best practice or interconnectivity between experiments more broadly.

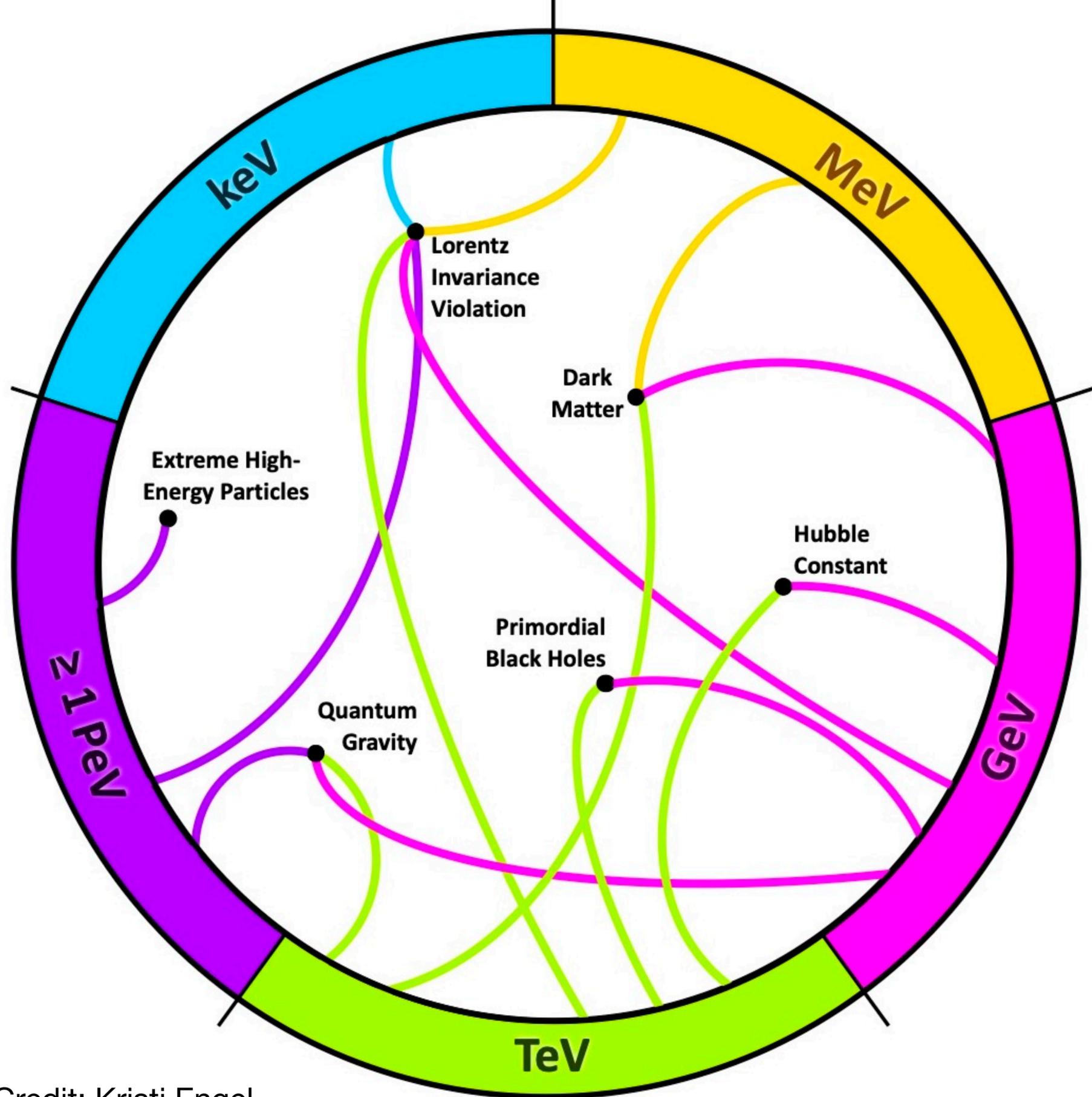
Theme Plots

- Timeline Spectrum (Borrowed from a MM plot draft)
- As GW and neutrino facilities expand and advance, MeV & GeV gamma-rays are scheduled to sunset under current plans by the mid-2020s.



Theme Plots

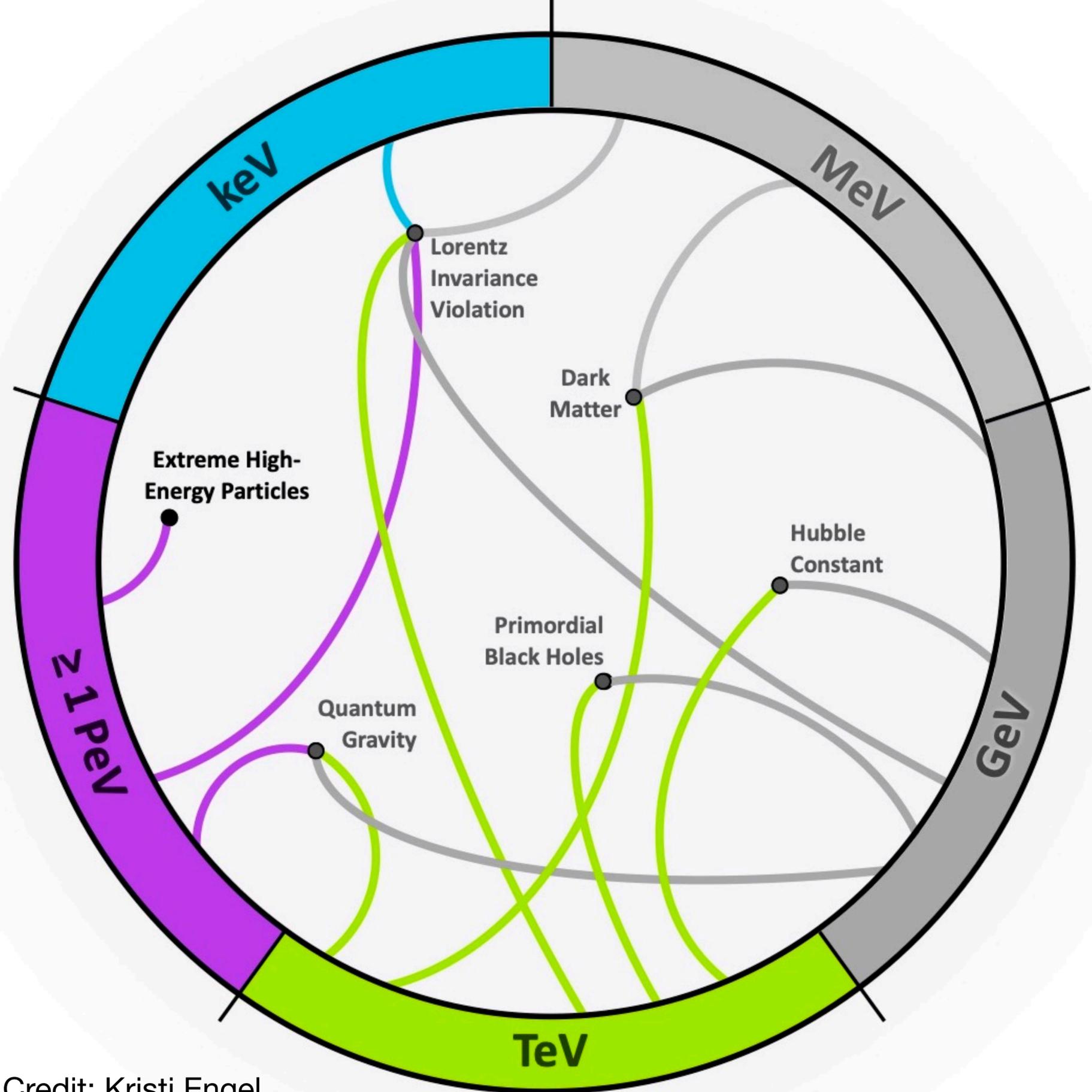
- Cord plot of high-energy photons that probe important questions in fundamental physics.



Credit: Kristi Engel

Theme Plots

- As early as the mid-2020s our ability to probe many of these areas may be significantly diminished.
- Ongoing support for gamma-ray facilities and technology development is imperative to continued progress and collaboration across wavelengths and messengers.



Credit: Kristi Engel

Priorities

- We have put fundamental physics drivers first, and asked all of the authors to keep in mind that the target agencies are DOE and NSF-Physics
- DOE supports the Cosmic Frontier and goals aligned with the study of Dark Matter, Dark Energy and Cosmology.
- NSF-Physics is heavily invested in multimessenger astrophysics as primary support for IceCube and LIGO. Neither of those facilities can do multimessenger work without gamma-ray facilities. Their stated priorities are to study dark matter, dark energy, cosmology, and particle astrophysics.
- All of the funding agencies have also requested that Snowmass point them toward ways they can collaborate and cost-share. To that end, we have a chapter on technologies (including software) which may have other applications in particle physics.

Working Process

- This paper was solicited by the CF7 conveners as an “umbrella” paper and is therefore quite broad
- The editors set up an outline, and set up a workshop (Dec 1) to solicit feedback and ask for authors to sign up. This was well attended and productive.
- The editors set up a signup sheet and view-only overleaf. We identified people with expertise in each subsection of the outline and invited them contribute a paragraph to 2 pages by 4 Feb.
- Almost all of our invitations were well received and we have draft or final submissions in .tex and .bib files for about half of our outline, which have been included in the main document as they arrive.
- We are corresponding with the remaining authors, and confident that contributions will continue to arrive.

Timeline

- Feb 4 is the main deadline for contributions
- Feb 11 the editors will meet to distribute the editing work.
- Feb 18 the editors will have first drafts of individual chapters (except intro and conclusion) - in consultation with relevant authors and filling in chapter headings, cross-references, etc
- Feb 25 editors will have drafts of the Introduction & Conclusion. (A full rough draft) - this gets circulated to all of the participating authors
- Mar 4 incorporating edits, reading through the full draft for coherence, write Executive Summary
- Mar 11 upload to arXiv (or shortly thereafter)
- We will continue to accept comments on the document and upload a second version if necessary later, but the semi-final white paper is on track for a timely submission.

Other Points

- Document Formatting
 - Authorship
 - Endorsers
 - Document Link: <https://www.overleaf.com/read/mqnzzpfbjrgj>
 - Slack Channel: #wp-cf07-gamma-ray-exp
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- Big Questions Colloquium series plans to cover the Cosmic Frontier in late March (stay tuned for announcements!)