Revealing the Powerful Particle Accelerator in the Galactic Center

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Image Credit:
NRAO & MeerKAT, SARAO

Collaborating with: Daniel Wang (UMass-Amherst), Maica Clavel (CNRS)
MeerKAT observed >100 radio filaments within 430 parsecs of Galactic Center: Tracing locally and globally ordered magnetic field and relativistic particles

What are they? Why are they here? How did they form? What powers them?
Recent Deep Chandra Galactic Center Observations Revealed New X-ray Filaments

- > 10 X-ray filaments captured, about half newly discovered

- New deep *NuSTAR* observation came in this spring (PI: Zhang)

Zhang et al. in prep.

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Multi-wavelength Studies on Galactic Center Filaments

Chandra X-ray Image of Filament G0.173-0.4

MeerKAT radio Image of Filament G0.173-0.4 overlaid with Chandra X-ray contours

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The Galactic Center Supermassive Black Hole as Engine of Relativistic Particles Lightening up Filaments

**Global mechanism:** Origin of relativistic electrons from hadronic process, connected to Black Hole activity (Zhang et al. 2014, 2020)

Heywood et al. 2019

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- Filaments serve as probes for powerful particle accelerator(s) in the Galactic center

- Discovered new X-ray filaments in the Galactic center region

- Proposed a global mechanism for the filaments: Supermassive black hole is the engine!

- Systematic multi-wavelength studies on the filaments is the key to further test the mechanism

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