Assessing Future EHT Observational Capabilities and Image Recovery

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Event Horizon Telescope (EHT)

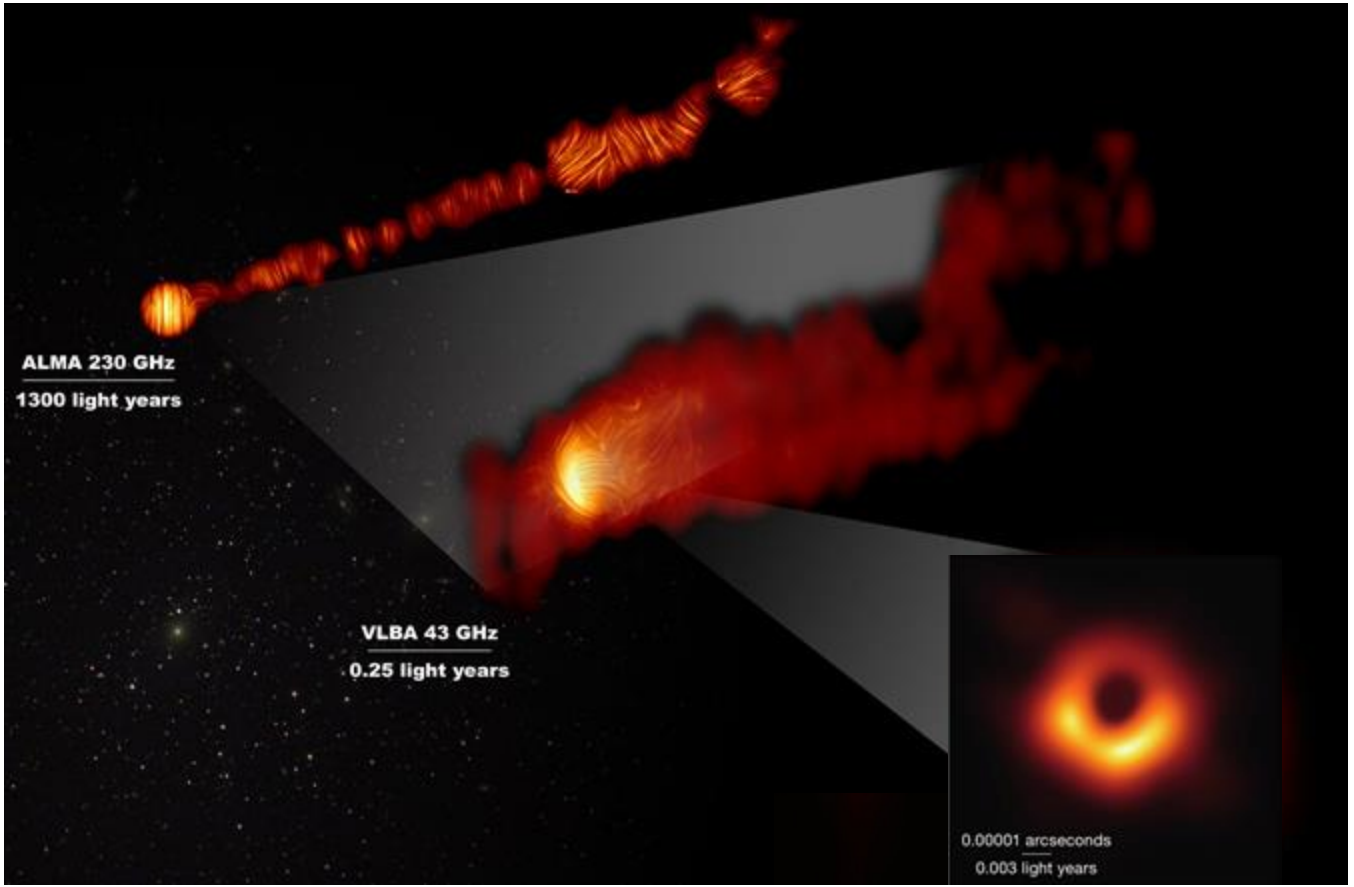
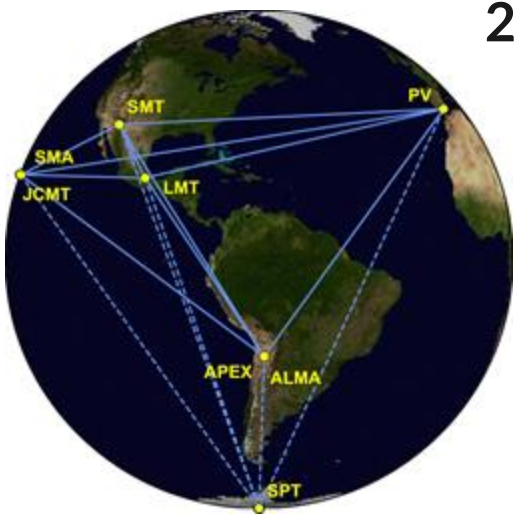
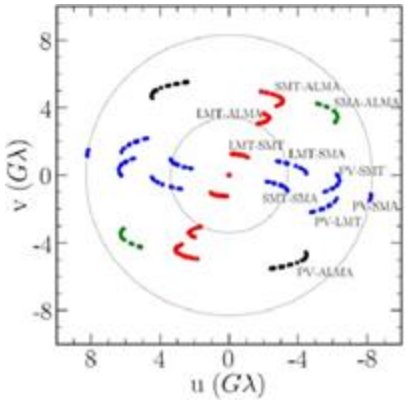


Image Source

Future EHT Configuration

2017

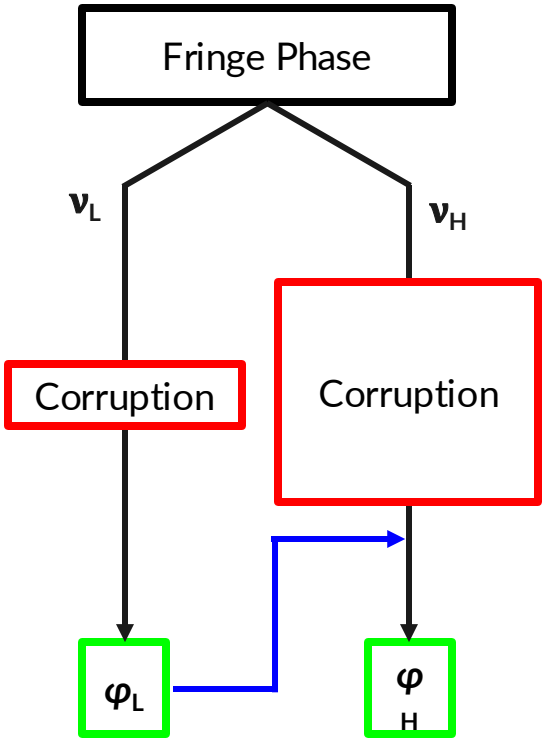


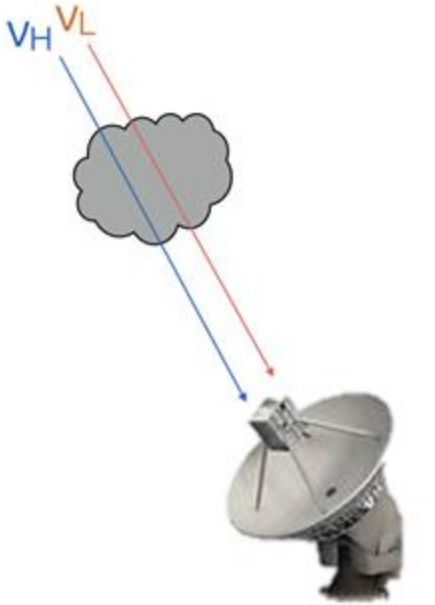


2017 EHT

- 6 Geographical Sites
  - 5 For M87 (SPT excl.)
- 10-15 unique baselines
- Single Frequency @ 230 GHz

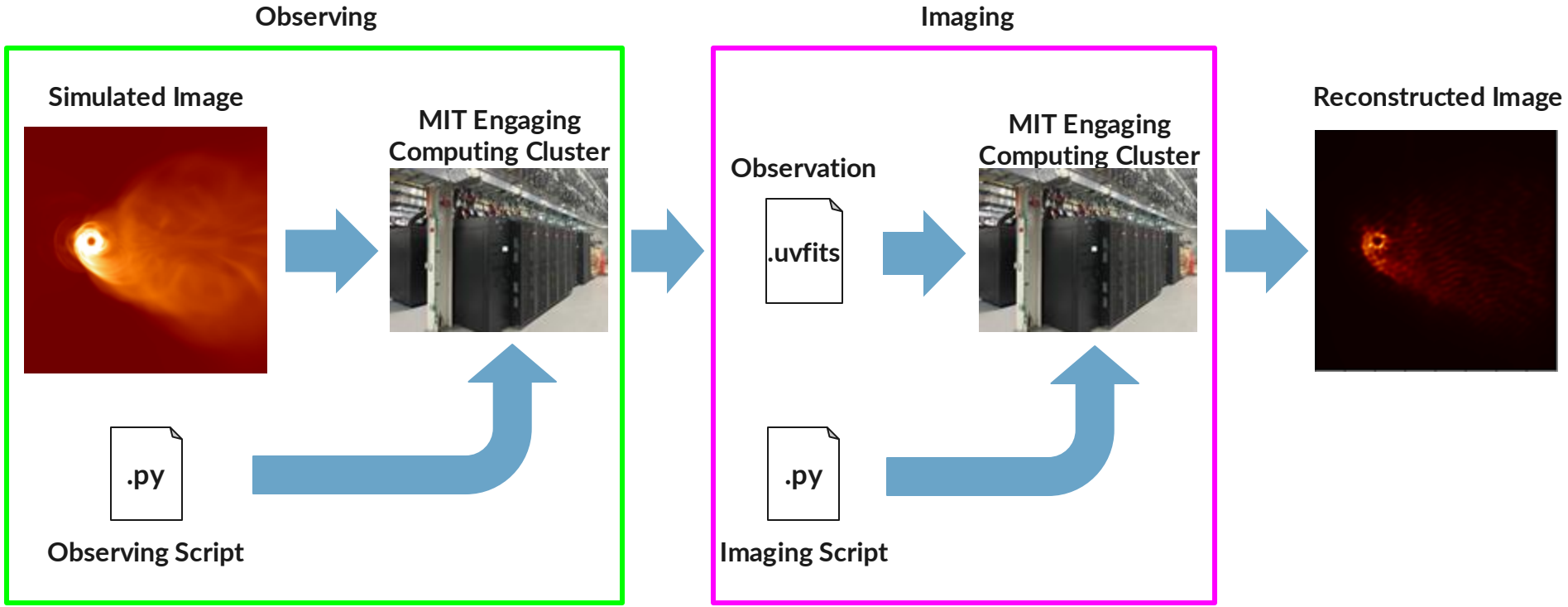
Frequency Phase Transfer (FPT)



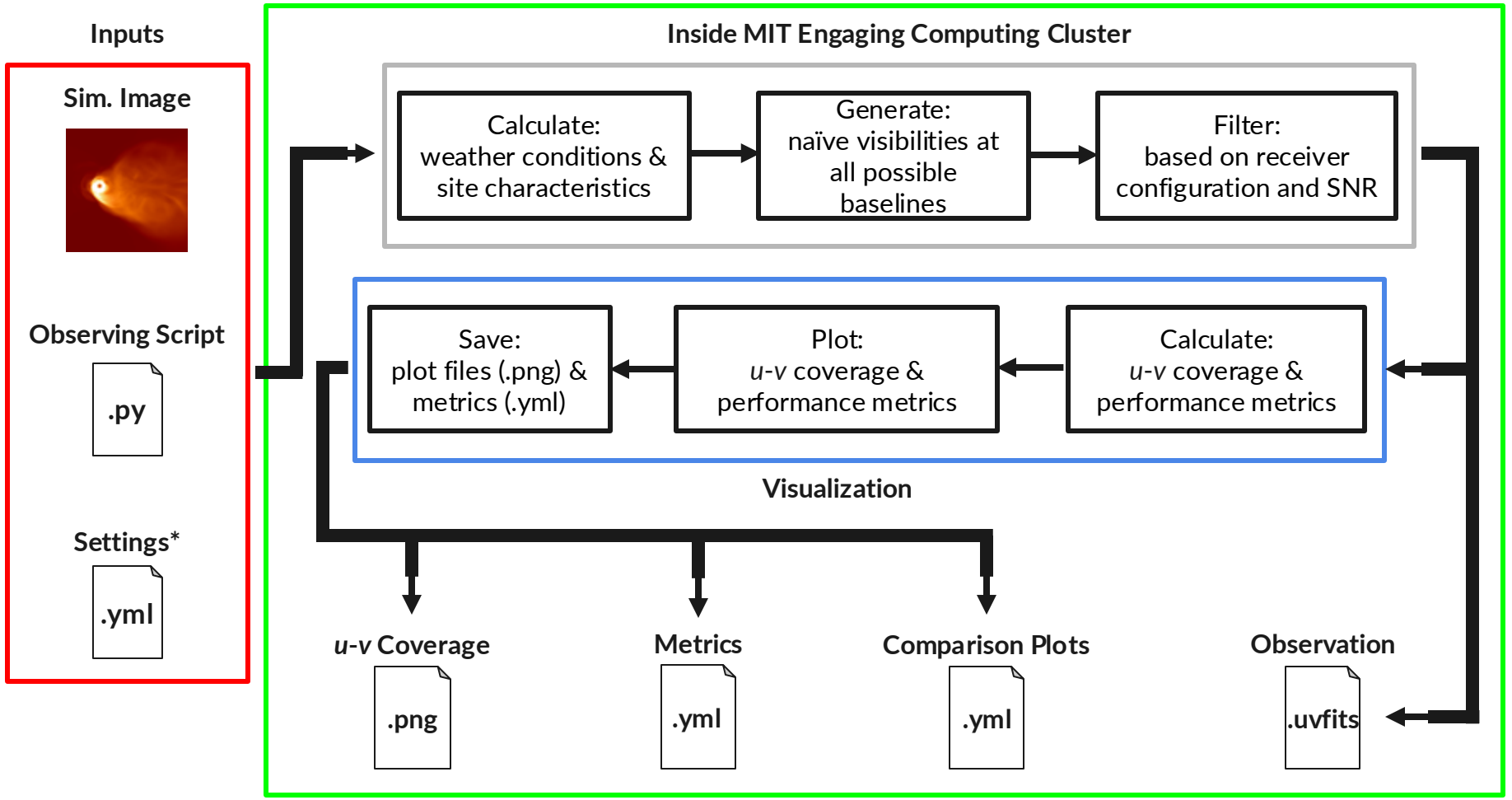


Phase coherence time $\propto 1/\nu$

Methodology

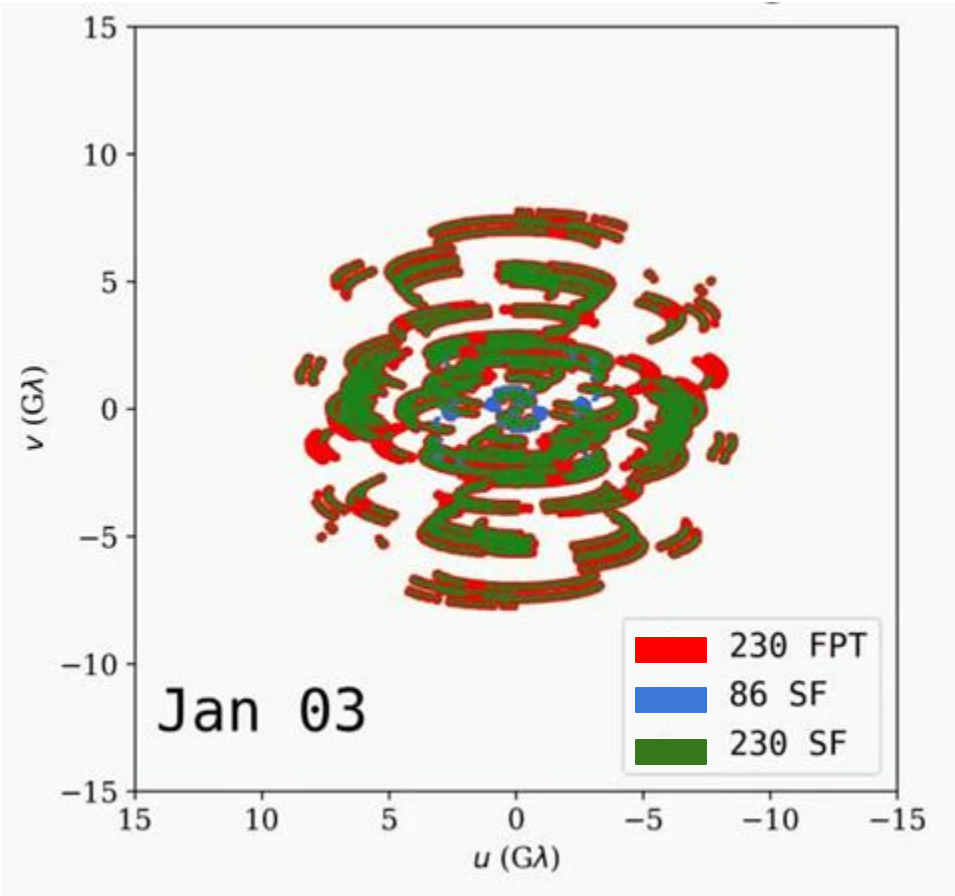


Methodology: Observing

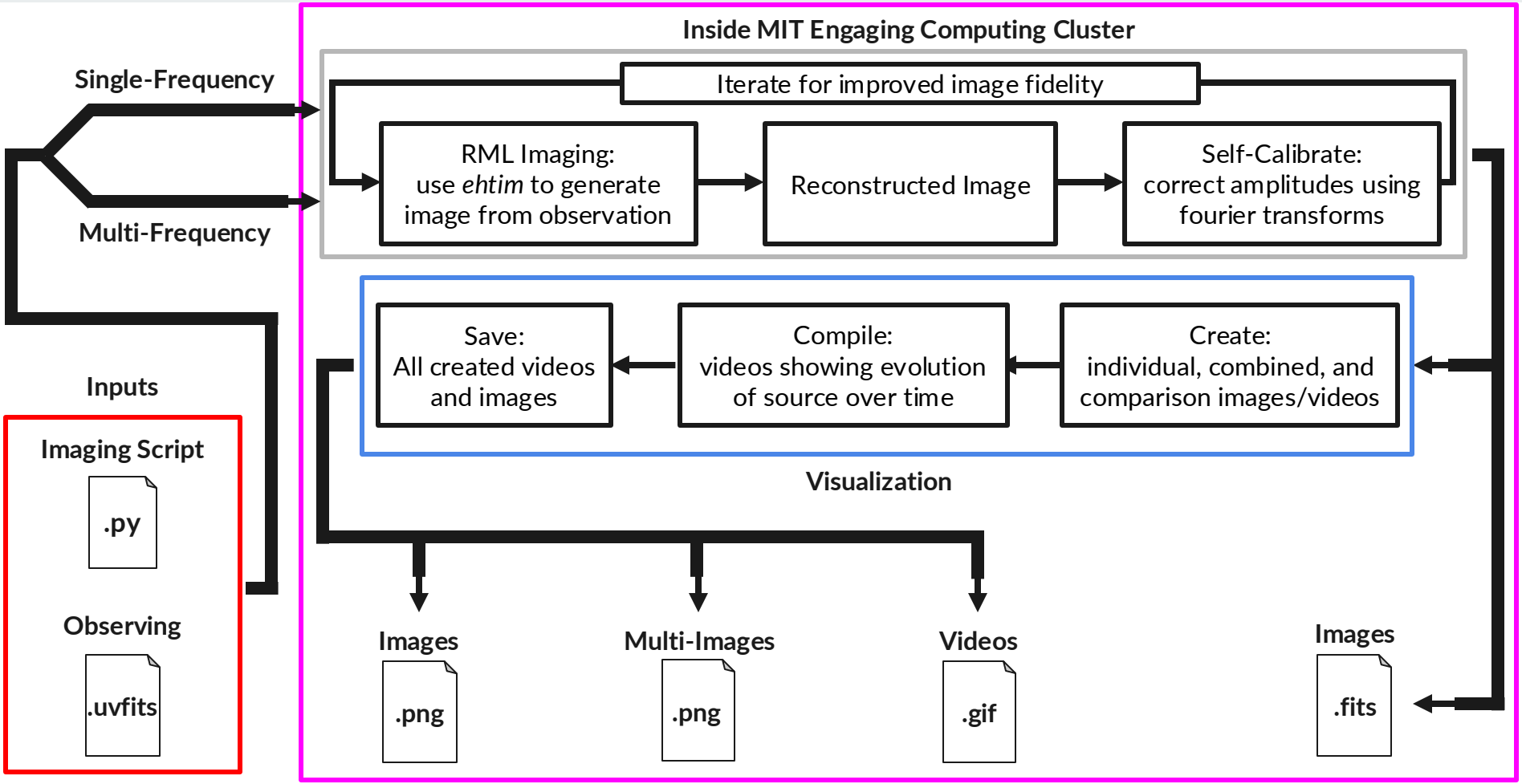


2030 EHT M87 *u-v* Coverage

86 + 230 GHz



Methodology: Imaging



GRRMHD Simulation Images for M87

- **G**eneral **R**elativitsic **R**adiation **M**agneto-**H**ydro**D**yamic Simulations
  - Generated by Chael et al. (2019)
  - Simulated image at 86, 230, and 345 GHz (left to right)

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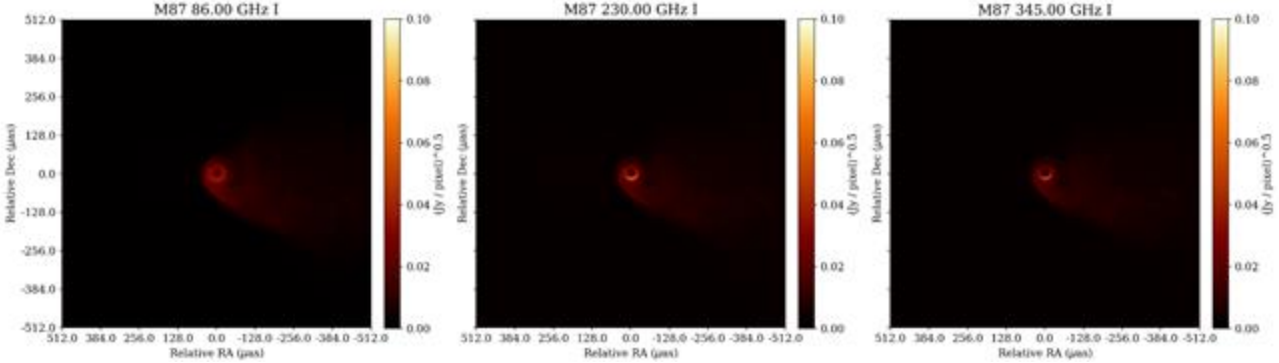

- Flattening the intensity scale…
  - Detailed substructure is present in the jet emission
  - Low freqs show detail
  - Intensity scale of the ring is less apparent

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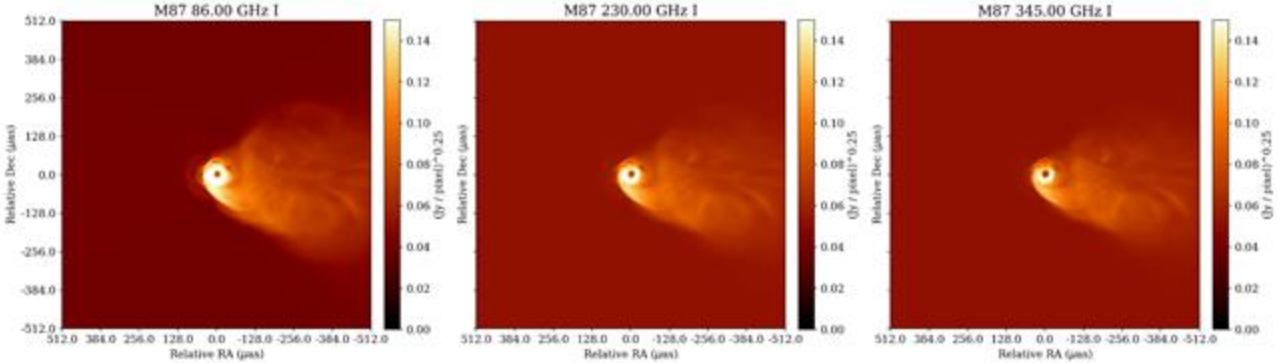
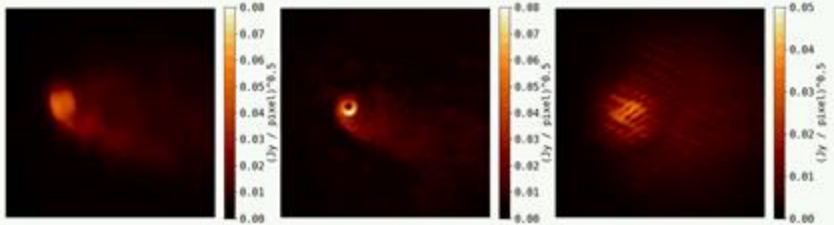


Reconstructed Images of M87

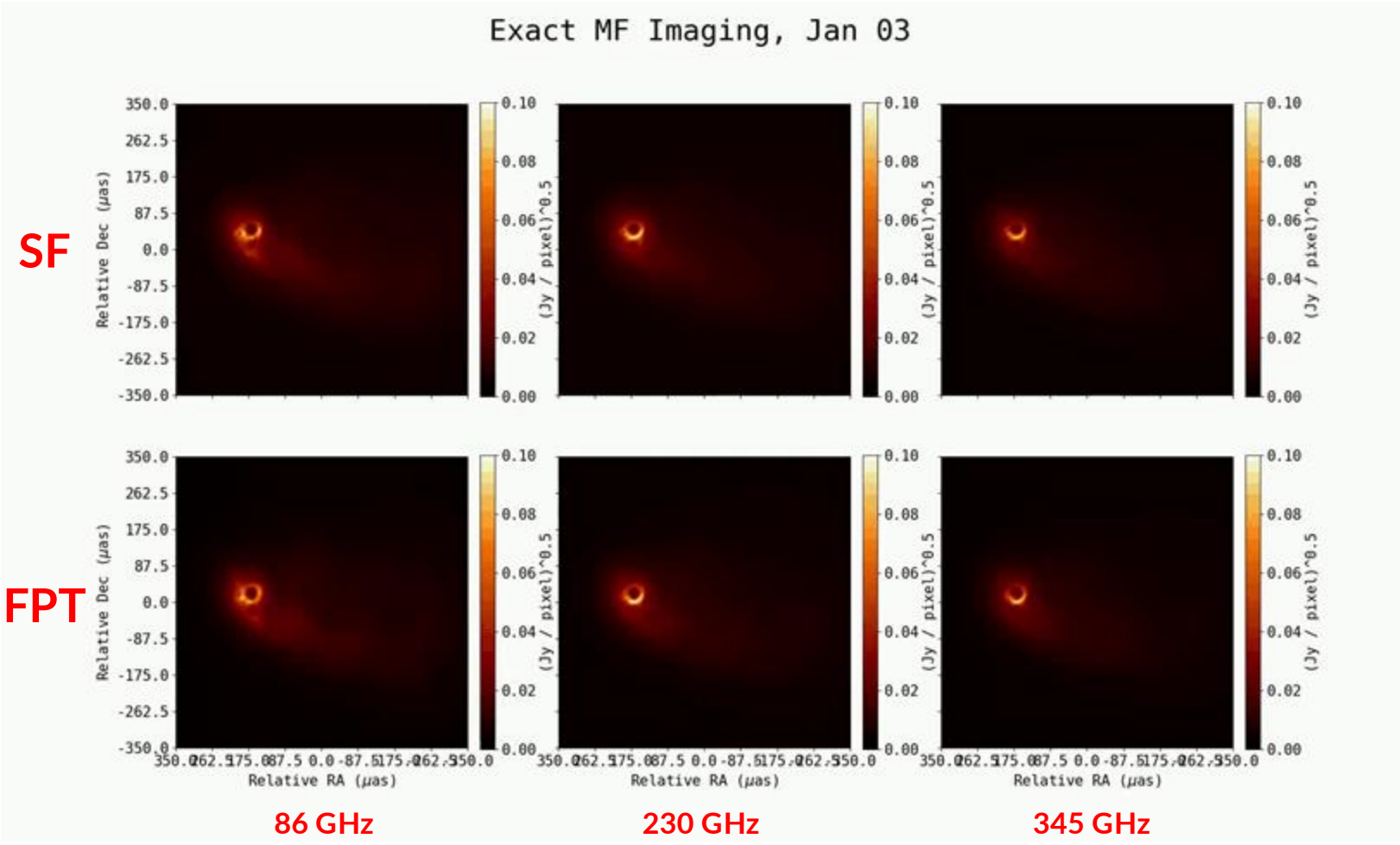
Single-Frequency Observing

SF



86 GHz 230 GHz 345 GHz

Multi-Frequency Imaging of M87

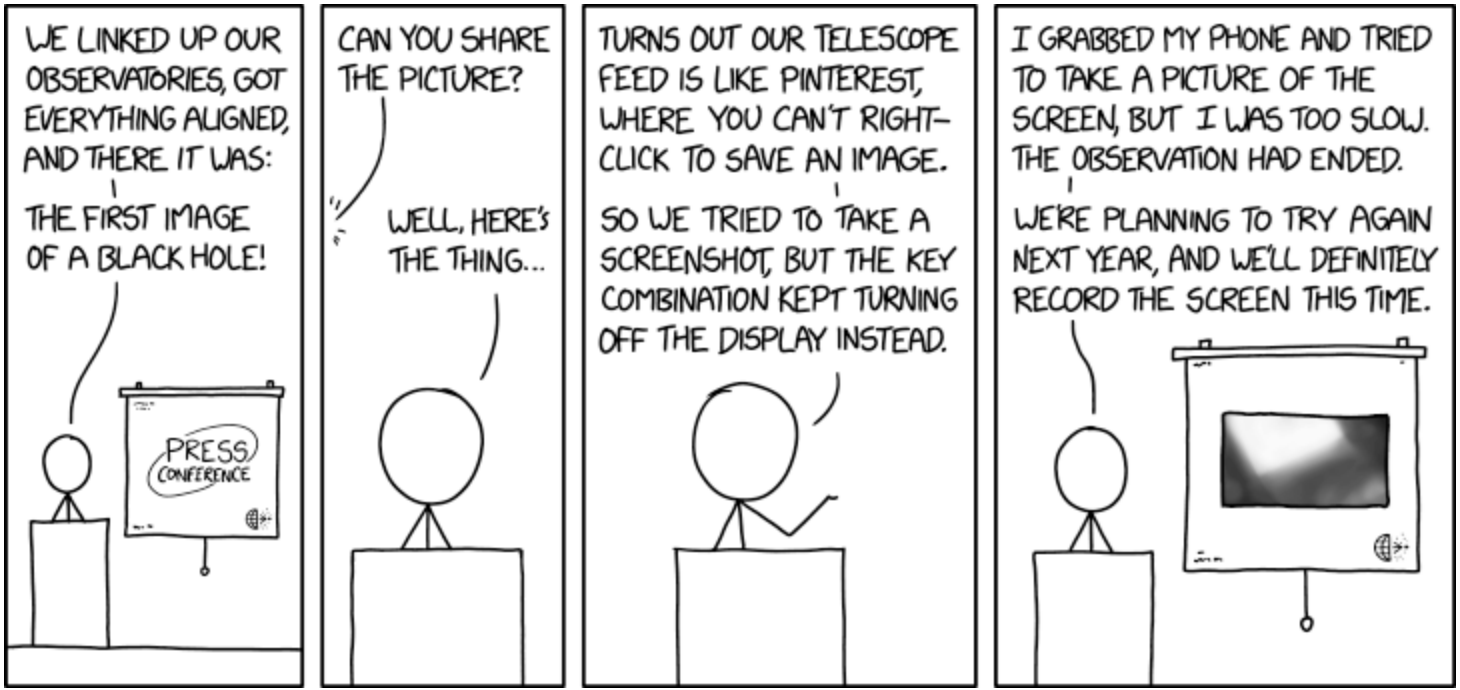


Conclusions...

- New sites improve recovery at all scales
- 345 GHz is achievable with FPT
  - Improved r_{SC}-scale structure recovery
  - Minimized loss to jet structure with MF-Imaging
- FPT & MF-I
  - FPT determines detectability
  - MF-I determines image fidelity

	FPT	SF
MF-I	Strong Sensitivity & High-Fidelity Images	Weaker Sensitivity & High-Fidelity Images (if detection is made)
SF-I	Strong Sensitivity & Unresolved Images (at higher frequencies)	Weaker Sensitivity & Unresolved Images

Questions?



https://xkcd.com/2133/