What else?

David Shoemaker
MIT LIGO/CE/LISA

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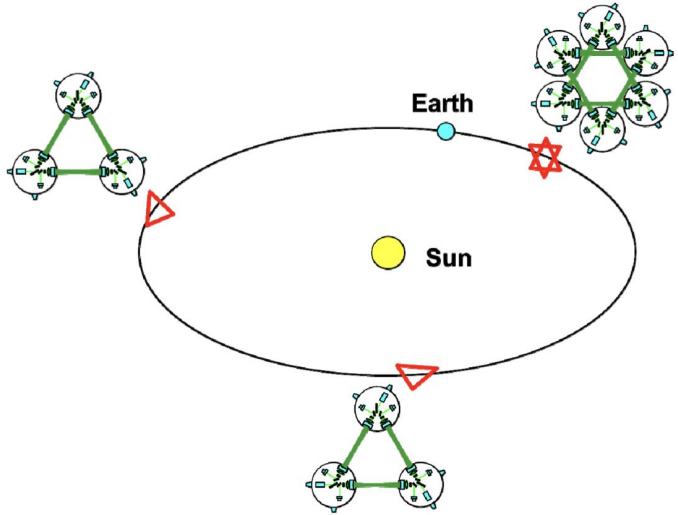
(5 minutes on) What other approaches to GW observation?

- Different sensors
- Different frequency regimes
- …here organized by nascent projects

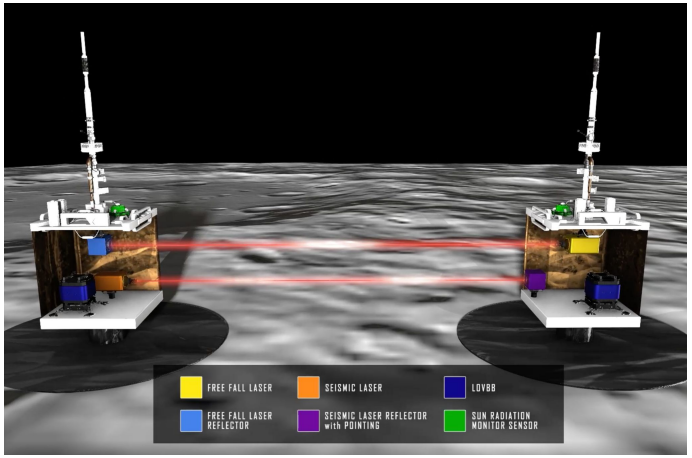
Full interferometry, free-flying in space

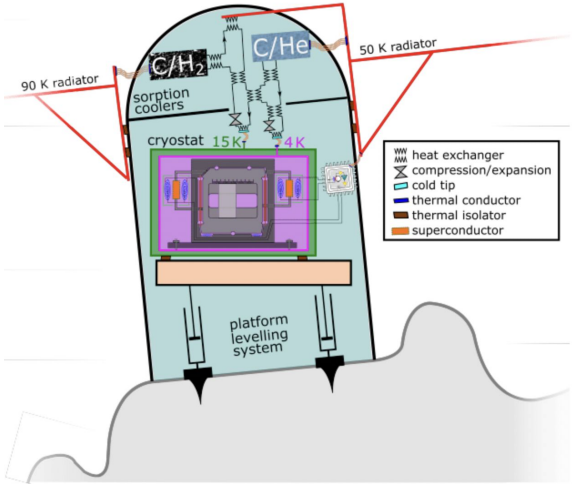
- Many predicted signals in the frequency range between LISA and ground-based detectors
- Most intriguingly the Cosmic Background, in a minimum of binary background
- **DECIGO** as an example proposal
- Multiple triangular constellations foreseen
- LIGO/Virgo/KAGRA-like interferometry
- Using all the current technical approaches to achieve a sensitivity sufficient for the Cosmic Background
- Sample reference: https://arxiv.org/abs/2006.13545



Using the Moon

- Moon believed to be seismically very quiet
  - Should avoid gravity gradient noise
- 1) as a base for LVK-style interferometry – **LILA**
  - Could allow the frequency band to be extended to lower frequencies
  - Vertical thermal noise of suspensions is a problem
- 2) using the Moon as the detector – **LGWA**
  - Solid-body modes are excited by passing GWs
  - Monitored by very-low-noise seismometers
  - Complex transfer function (and interesting per se); not fully broadband
- But both approaches being pursued
  - Nations want to show capability to put humans and stuff on the moon…
- Sample reference: https://arxiv.org/abs/2404.09181

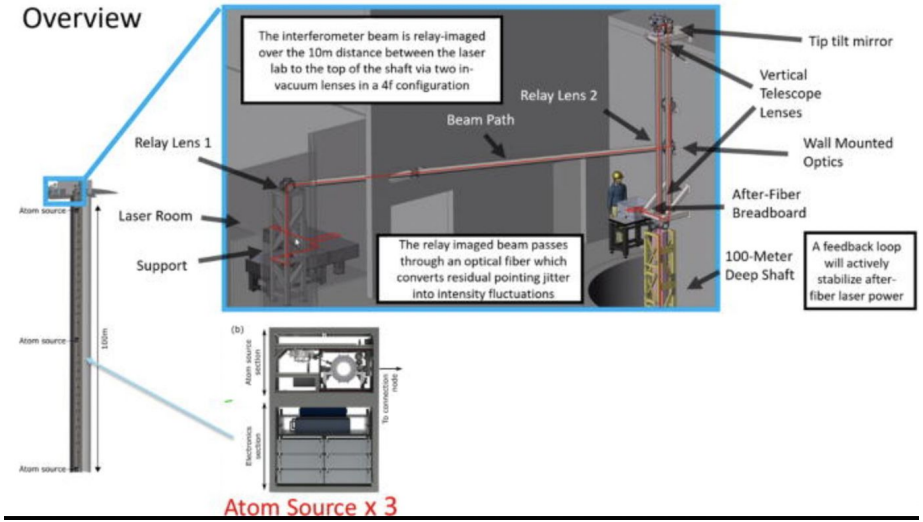




Artificial pulsar network

- Artificial Precision Timing Array (**APTA**)
- Atomic clocks are ever more ‘quiet’, compact, and portable
- Can now envision a constellation of clocks in orbit, sufficiently quiet, targeting the 0.1–10 Hz frequency range
- Sample reference: https://arxiv.org/abs/2401.13668

Atom Interferometry

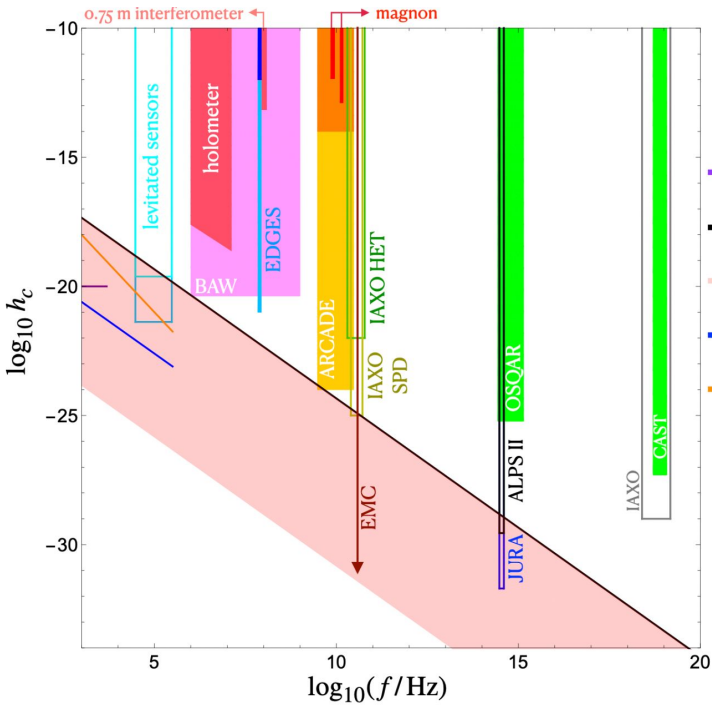


- Matter-wave Atomic Gradiometer
- Interference of atomic wave packets
- High sensitivity in principle; complex to realize
- Generally target DeciHz range

- **MAGIS-100**; In Europe, **MIGA**
- Proposals for a range of more ambitious instruments:
  - ELGAR (European Laboratory for Gravitation and Atom-interferometric Research), an underground detector with horizontal 32 km arms
  - ZAIGA (Zhaoshan long-baseline Atom Interferometer Gravitation Antenna), a set of 300 m vertical shafts
  - AION (Atom Interferometer Observatory and Network), to develop technologies for a full-scale kilometer-baseline
- TVLBAI collaboration in formation
- Sample reference: https://arxiv.org/abs/2310.08183

High-frequency GW searches

- From a workshop on HF detectors: “A strong motivation to explore higher frequencies from the theoretical perspective is that there are no known astrophysical objects which are small and dense enough to emit at frequencies beyond 10 kHz.”



- …but a number of possible sources from QCD, Cosmic Strings, etc.
- It is obviously good to search!
- Some development of some experimental techniques underway
- Scientists interested in the domain meeting periodically
- Sample reference: https://arxiv.org/pdf/2011.12414