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GWADW 2013

Important message

THAT WAS GREAT. LETS DO IT AGAIN NEXT YEAR

Courtesy Peter Murray

Sources

del Pozzo, Messenger, Wen

- Nice reminder of our connections to GR
- An independent probe of cosmology and dark energy is important regardless of whether it sets new error bounds
- Multi-messenger astronomy

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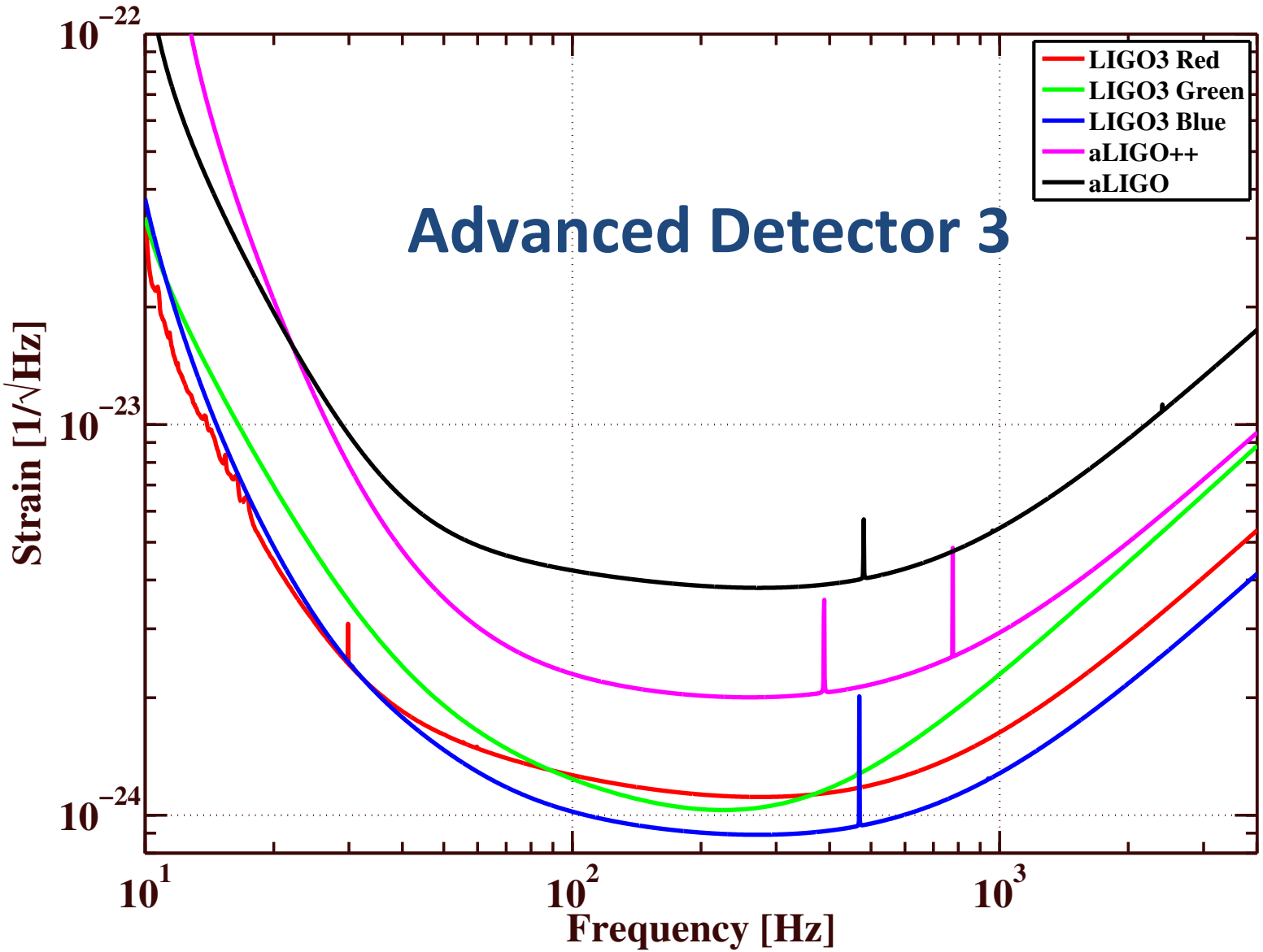
Current and Future LBIs

Sigg, Miyakawa, Dooley, Degallaix, Barsotti, Hild, Adhikari, Puntaro, Rabeling, Harms, Nawrodt, Grote, Majorana

- Exchanging information and working together to accelerate commissioning
- Squeezing is a 'no brainer'
  - But much remains to be done
- LIGO3G R&D needs to ramp up prior to downselect
  - But not at the expense of making aLIGO work
- ET R&D required
- *WHAT SHOULD WE DO TO WITH PROTOTYPES?*



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Magenta: we all agree will be done; red, green, blue : should we now define the R&D and remove the labeling?

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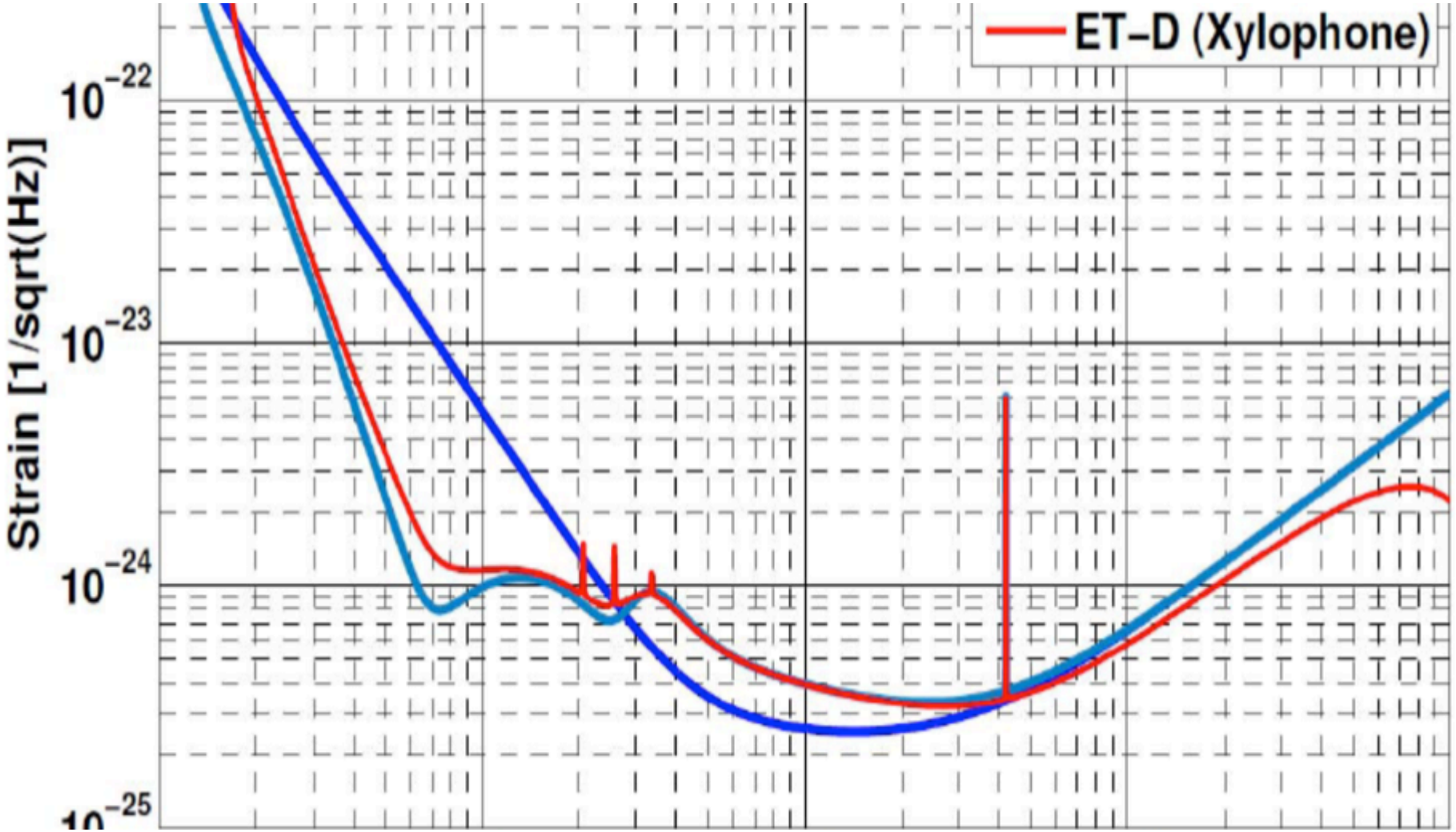
ET



Thermal Noise

Rowan, Kroker, Cole, Lin, Flaminio, Lazzaro, Abernathy, Yamamoto, Hoffman, Ballmer, Puppo

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- Emperical Measurement, Understand the physics, Construction – *Beware The unknown, unknowns*
  - *Or fool me once…*
- Silicon, sapphire substrates and the construction challenge
- Amorphous vs crystalline vs waveguides
  - Amorphous improvements are incremental
  - 10 times less coating thermal noise using alternatives?
  - Where are we in the cycle?
  - ***How and when should a decision be made?***
- Thermal noise reduced Configurations – keep the ideas coming
  - *But bigger is better*
- Should we be worried about non-equilibrium thermal noise corrections?

Light Sources and Topologies

Schnabel, Hild, Danilishin, Wang, Tarabrin, Gordon

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- Squeezed vacuum states are the optimal quantum states for LBGWDs
  - But much work needs to be done in preparation
- Continued to be fascinated by the richness of the opto-mechanics in coupled resonators
- Sagnac speed meters are on the rise
  - Such topologies need to be explored to uncover the real issues
- *But we have yet to observe quantum radiation pressure noise let alone reach or breach the SQL*

Cryogenics

Somiya, Hennes, Sakakibara, Smith-Lefebvre, Komma, Granata

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- For thermal noise reduction and higher power handling
- Emperical measurement absorption, scatter, losses
- Remarkable progress both for silicon and sapphire
- Is 120K a good compromise?
- Is high sensitivity prototyping needed?
  - KAGRA for sapphire
  - Si?

Simulations

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Yamamoto, Vinet, Zweizeg, Freise, Izumi, Vajente, Day, Pichot, Evans,

- Have and will play key role in commissioning and understanding
- many and varied: Finesse, Optikle, e2e, Siesta, DarkF, MIST, OSCAR, FOG, SIS, GWINC,…
- Need radiation pressure included in many
  - *Andreas made a commitment… 'in 1 year from now..'*
- Like an FEA/Levin/non-equilibrium thermal noise simulator
- tweak the models we have, and combine the outputs, to answer some important unsolved problems
- develop a repository of 5 or so 'industry standard' different codes

Atom Interferometers

Kasevich, Boyuer, Sorrentino, Mueller, Vicere

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- Atom interferometers have solved the laser noise problem……*?*
- AI/LI hybrid – the superradiant LIGO
  - Are there other ideas?
- They have a long way to go, a bit like laser interferometers in the 1970s???
- How do we connect the LI and AI communities for the common good?
  - What are the key issues and the best ways to address them?
  - When will a new approach be essential?

Pulsar Timing Arrays

McLaughlin, Karuppusamy, Kondratiev, Passneti, Wen

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- Time of arrival: push on bandwidth, collecting area, integration time, system T
  - BW reaching limits set by dish area
  - Computational power
- Number of MSPs in the analysis
- Drawing on ground detector network analysis
- PPTA most recent UL => detection of background is not imminent.

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Space Antennae

Weber, di Fiore, Mueller V., Buchman, Conklin, Mueller G.

- update of LISA Pathfinder
- new configurations
- LISA 2020
- eLISA

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Thank you

- **Syd Meshkov and Francesco Fidecaro**
- Session Convenors:
  - Gonzalez, Losurdo, Adhikari, Lueck, Tino, Vetrano, Possenti, Cagnoli, Gustafson, Rowan, Day, Yamamoto, Sathya, Schnabel, , Yamamoto K., Mueller G.
- And an invite you to

The Australasian Conference on General Relativity and Gravitation

– Hamilton Island, The Great Barrier Reef

Early December 2013.