



ARC Centre of Excellence for Gravitational Wave Discovery

The View from Australia

As seen by David McClelland

The Australian National University

26 May 2019



THE UNIVERSITY OF
WESTERN AUSTRALIA



Australian Government sources

No change from 2018!

- *Department of Industry, Innovation and Science*
 - funds major research infrastructure along with CSIRO
 - already heavily committed and occupied with engagement in SKA and ESO
(timescale for these investments?)
 - **funding is ad hoc**: no funding stream to get a new thing like the SKA off the ground.
 - Has a representative in the GSO group.
- *Australian Research Council*
 - very supportive of GWs
 - funded OzGrav (now 190 people)
 - Australian Partnership in aLIGO and A+
 - *funding Australian participation in Global 3G planning activities*

Astronomy Australia Ltd (AAL) (<http://www.astronomyaustralia.org.au>)

- **Mission:** to facilitate access for Australian-based astronomers to the best research infrastructure, encourage the sharing of astronomical technical capabilities to maximise their value to the nation, and inspire Australians with these astronomical achievements.
- secured \$2M for GW Data facility (likely further investment)
- may lobby for a 3G scoping study to be funded

Mid-term review of the Astronomy Decadal Plan in 2020

- *Eric Thrane is on the writing team*
- support from Astronomy community is growing
- need to work out our strategy

Possibilities for Australian contribution

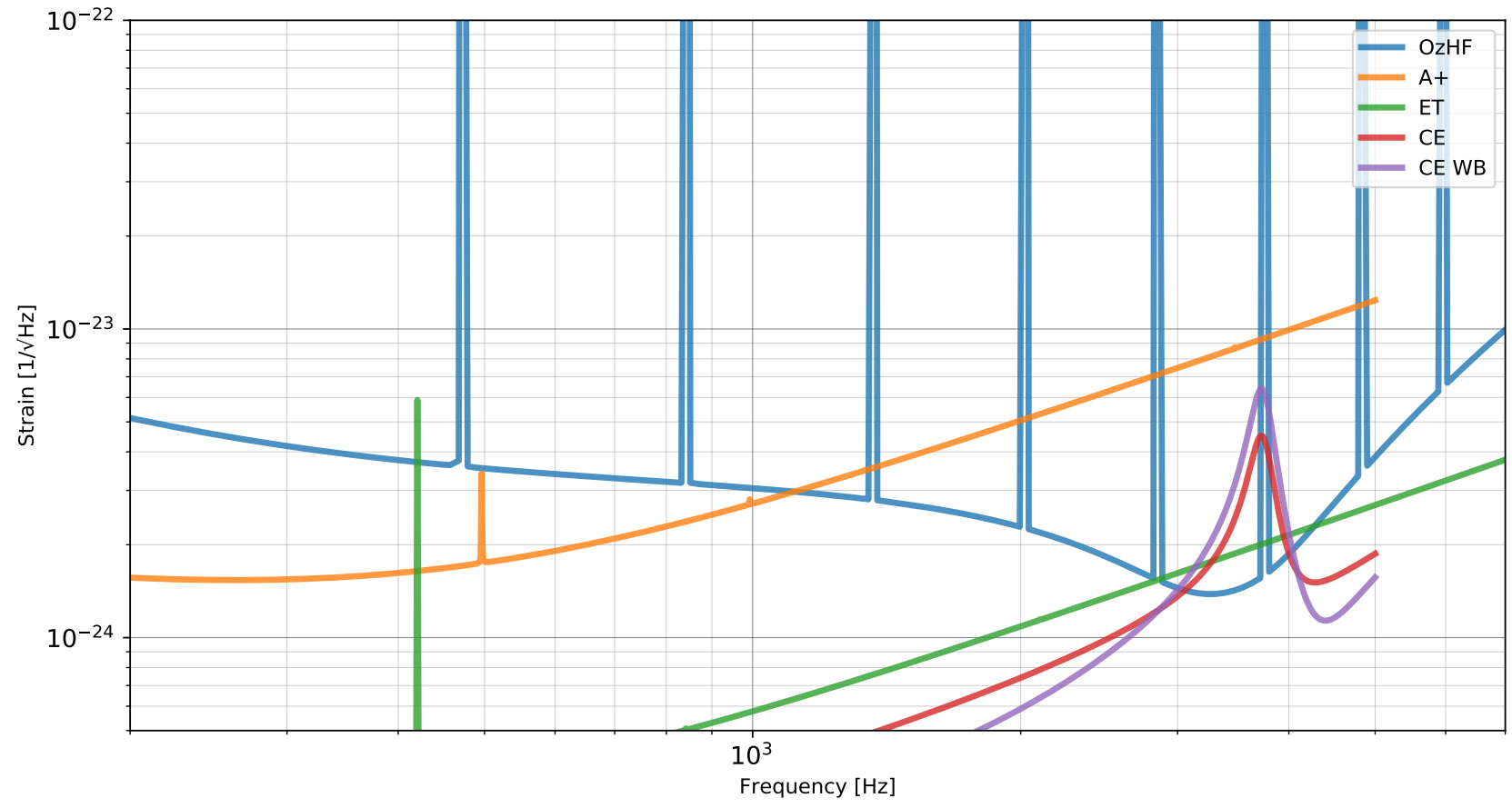
- Prospect for Australian 'community support' for mid-scale Australian investment in an international facility
 - could be sited in Australia
 - mid-scale meaning \$10s of millions
 - Are there conditions under which this could be pushed to +\$100M scale for an onshore 3G facility?
 - an emphatic science case
 - our astronomers getting really excited
 - drivers for Australian technology, industry, employment
 - strategic regional positioning
- major international funding contributions for both construction and operation*

Process towards Hosting 3G in Oz:

- propose early ... 15-20 years before big dollars are needed
 - > large investment is then in the distant future
- Socialise within government
- secure funds for pre-studies
 - Continue developing 3G technologies
 - science case; Scope out 3G sites, etc

-> investment leads to government dept taking ownership; giving advice
- Continue international support to build potential *investors in Oz3G*
 - support A+..+..+
 - LIGO India
 - KAGRA upgrade
 - coating facility
 - Voyager technologies

- **OzGravHF (Voyager Light) (\$100M - \$200M)**
 - OzGrav undertaking an initial feasibility study
 - '3G sensitivity' 2-5 kHz
 - Neutron star EoS; Cosmology; unknown.
 - Voyager technology testbed
 - Operational late 2020s to early 2030s
 - Continue operation in 3G era in support of CE to 'fill in the gap'
 - If built in Australia, international investors sought
 - *there is a role for such an instrument in a global plan but it can be anywhere. Eg convert an existing facility.*



| Parameter | LIGO HF | OZHF (long SRC) | OZHF (new untuned) | aLIGO |
|---------------------------------|---------|-----------------|--------------------|---------|
| Wavelength | 1064 nm | 2 μ m | 2 μ m | 1064 nm |
| Mirror Mass | 40 kg | 40 kg | 40 kg | 40 kg |
| Arm Gain | 270 | 364 | 364 | 270 |
| Arm length | 4 km | 2 km | 2 km | 4 km |
| Power recycling gain | 60 | 54 | 60 (approx) | 50 |
| Signal recycling transmissivity | 0.030 | 0.048 | 0.048 | 0.32 |
| Signal recycling length | 356 m | 500 m | 500 m | 56 m |
| Input power | 500 W | 500 W | 500 W | 125 W |
| Power on beamsplitter | 30 kW | 27 kW | 33 kW | 6.2 kW |
| Arm cavity power | 4.0 MW | 5.0 MW | 3.8 MW | 0.8 MW |
| Squeezing level | 10 dB | 10 dB | 10 dB | - |

