



*LIGO Laboratory / LIGO Scientific Collaboration*

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**Report on Gingin Advisory Committee Meeting of  
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LIGO Science Collaboration

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## LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

In attendance: Committee – Gregg Harry, Matt Evans, Josh Smith

Gingin – David Blair, Ju Li, Chunnong Zhao, Dave Ottaway

Dave Reitze tendered his resignation from the committee. Two new members (Muzammil Arain and Stefan Gossler) have been recruited to replace him.

The Gingin team lead the committee through slides, G1000022-v1.

Specific topics and committee observations:

### 1. Extension of Gingin East Arm for high optical power, high finesse test of parametric instability.

The Gingin team successfully completed some infrastructure changes to accommodate the silica mirrors and other issues. These changes were to move the end vacuum tank, including vibration isolator inside, by 1.4 m, inserted a new section of pipe, and rotated the 80 m of pipe so it would connect correctly with new section. This was all accomplished successfully.

The committee commends the team for their success.

### 2. Change in springs in east arm seismic isolation.

The previous vertical isolation was seen to have significant creep, so new springs are planned to be put in place. These new springs will be at less 60% of their yield stress and were cold worked to minimize creep. All springs have been received and about half are cleaned and baked. They are planned to be installed in a few weeks. There is also design work on a new design using maraging steel that will eliminate this problem.

The committee supports this dual approach of upgrading the existing hardware while doing design work on an improved solution.

### 3. Adelaide high power laser

Graduate student Lucienne Merrill from UWA spent a month in Adelaide learning about the high power laser there that is planned to be installed in Gingin. There are concerns that the laser enclosure at Gingin is not well temperature controlled may not be clean enough and that these may lead to different laser performance than seen at Adelaide. The air filters in the Gingin laser room are being changed to improve this without introducing excess vibrations. The designs for these changes are complete and machining of new parts will begin soon. There is also a design effort to improve laser safety using interlocks that is nearly done. The 50 W laser will be installed at Gingin as soon as it is delivered from Adelaide.

The committee supports this effort to make the Gingin laser room as similar to the one at Adelaide as possible.

### 4. Change in digital control system

A new digital control system, meant to be more like that used by LIGO, has been built at ANU (both hardware and software) and is at UWA ready for installation at Gingin. This work should help facilitate closer collaboration with researchers used to the LIGO system.



The committee supports this change in control systems, feels good progress is being made, and encourages both Gingin and LIGO to explore closer collaboration on digital controls and related issues.

#### 5. Seismic survey

A summer student has started a seismic survey of the site to begin to provide long term data that can be correlated with other environmental data. They have found that the silica sand in the ground provides good dissipation of seismic noise, and that there is a highly repeatable transfer function between waves in the Indian Ocean and the local microseism.

The committee supports this effort and encourages the team to make seismic data easily accessible.

#### 6. Change in control of mass in suspension

A modeling effort has been started by a summer student to study changing how forces are applied to the test mass, moving away from using the suspension frame as the reference mass and instead using the more seismically isolated upper mass.

The committee feels this is a very valuable effort and steps should be taken to ensure it can continue past the summer if it looks promising.

#### 7. Tabletop parametric instability experiment at UWA

Continuing progress is being made on the 3-mode parametric instability experiment on campus at UWA. There were problems discovered involving misalignment of the silicon nitride membrane, but a 400 kHz minimum mode spacing was achieved. This is about a factor of 2 higher than desired. Better performance with improved alignment of the membrane and higher finesse will be pursued.

The committee supports this effort, finds that good progress is being made, and supports the approach to solving the identified problems.