

# Report of the 40 m TAC 8th January 2009 LIGO-T090005-00-R

K.A. Strain for the 40m TAC

January 16, 2009

## Presentation

Rana led a presentation to update the committee on recent progress at the 40 m and to review the short and medium term schedule. The presentation can be found on the 40 m wiki

[http://lhocds.ligo-wa.caltech.edu:8000/40m/TAC\\_Meeting-Jan\\_09](http://lhocds.ligo-wa.caltech.edu:8000/40m/TAC_Meeting-Jan_09)

## Notes on the presentation

The seismic disturbance from the new IT building (see slide 3) has reduced the rate of progress particularly relating to attempts to lock on the positive spring state, which is, for an unknown reason, much harder to acquire than the anti-spring state. The difference appears to be in initial acquisition, but not due to some of the more obvious explanations such as mode coincidences with modulation frequencies.

It was suggested (and supported by the TAC) that the main focus should be on understanding the anti-spring case where lock could be acquired in a reasonable time.

Slide 6 shows the lock sequence which seems quite well understood, with a tolerably short non-deterministic initial phase taking, typically, a couple of minutes (anti-spring case).

Triple frequency demodulation, as shown on slides 9, 10, is considered worth investigating as a backup to the other methods. The earlier work carried out at the 40 m should resume, though not at the highest level of priority.

The next section of the talk is concerned with the major upgrade to allow more in-depth testing of the Advanced LIGO scheme. Progress is being made on the auxiliary locking which will feed into the 40 m program in the medium term. The upgrade schedule was presented (on the two slides numbered 12).

In an addendum to the presentation Rana reviewed the expectations for noise in the upgraded 40 m (following revisions to the simulation code). The most significant noise above 100 Hz should be shot noise (setting technical noise aside), the level with 3 W in should be around  $2 \times 10^{-19} \text{ m}/\sqrt{\text{Hz}}$ .

## Q&A

There was some discussion about the choice of modulation frequencies for the post-upgrade experiments: should 9/45 MHz be adopted no matter how inconvenient or should (say) 11/55 MHz be chosen if aspects of layout etc. are simplified? The recommendation was that 9/45 should remain the baseline but the option of changing this a little should be kept very much in mind if it would allow simplification (and hence acceleration of the program). The frequency ratio needs to be 1 : 5.

There was discussion of the dichroic coating designs (to allow the auxiliary interferometer) and the good news that such coatings appear to be practical (and have the side bonus of having low thermal noise as the lossy layers are thinner – not an important point for the 40 m in the near term).

There was a little discussion about 3f demodulation, including the possibility of using 3 times the higher frequency (which at around 150 MHz is back in the inconveniently high range). Note added during review of this document (email from Peter Fritschel) "the 3f acquisition sensing scheme should get more attention/higher priority, given that it is the baseline scheme for AdLIGO. It looks like Lisa Barsotti will spend some time at the 40m in March on this, but if there is room for the 40m team to spend more time on this too that would be great." Rana later confirmed that he was in agreement with an acceleration of this work.

## Summary

The gap between TAC meetings has grown too long and we agreed to strive for around 4 month periodicity. Unfortunately there were many clashes in the April-May period and so the next meeting is set for June 4th.