Attachment DAT to the Memorandum of Understanding LIGO-M060110-00 between the Maryland Gravitational-Wave Group (MaGWG) and the Laser Interferometer Gravitational Wave Observatory (LIGO)

For The Period August 15, 2007 - August 14, 2008

This Attachment DAT to the Memorandum of Understanding LIGO-M060110-00 defines the role of the Maryland Gravitational-Wave Group (MaGWG) as a Member of the LIGO Scientific Collaboration (LSC). In particular, it addresses data analysis activitites in support of the initial LIGO interferometers. The period of performance for the activities in this Attachment is from August 15, 2007 - August 14, 2008.

1. Collaboration

Together, the LIGO Laboratory and the LIGO Scientific Collaboration (LSC) are responsible for implementing and exploiting the initial LIGO detector through its science data runs. The LSC has organized the data analysis effort into search groups which coordinate analysis, review, and publication on behalf of the collaboration. LSC groups are encouraged to participate in one or more of these groups.
MOU Attachment DAT defines the contributions of each participating group to the data analysis development groups.

2. Participation

During the period August 15, 2007 - August 14, 2008, the members of MaGWG will participate in the analysis of initial LIGO data in the following areas:

a. Binary Inspirals

Alessandra Buonanno and postdoctoral scholar Yi Pan will continue the work of comparing post-Newtonian and numerical relativity waveforms. Their goal is to improve the effective-one-body model of spinning, precessing binary black holes so that it can reach high matching performances against numerical-relativity waveforms and be used for coherent searches of inspiral-merger-ringdown signals, injections, follows up and efficiency studies.

Pan will continue the design and implementation of the physical template family (PTF) search of spinning binary black holes for S5 and future runs. Pan will implement the metric code in LAL. The metric has been shown to be near singular in

the template parameter space and double precision routines will be used to ensure accuracy of the metric code in LAL. Based on the metric code, Pan will develop (in collaboration with other members of the IULG) template placement methods for the PTF, and the resulted template banks will be tested with injections in Gaussian noise and real playground data.

Graduate student Evan Ochsner will complete the implementation in LAL of the stationary-phase-approximation template family at higher PN orders, notably 3.5PN order and pseudo 4PN order, adding the possibility of having a variable cutoff frequency. Evan will test within the CBC pipeline the efficiency of the stationary-phase-approximation template family at those higher PN orders with the variable cutoff frequency. Ochsner and Pan will also implement in LAL the merger-ringdown phase in the effective-one-body model, include higher PN-order terms, notably the pseudo 4PN order term, and do efficiency studies within the CBC pipeline against other template families and numerical-relativity waveforms. These studies will determine whether the improved stationary-phase-approximation and effective-one-body template families can be employed for coherent searches of inspiral-merger-ringdown signals with real data in future LIGO/VIRGO/GEO runs.

b. Bursts

Shawhan will continue to co-lead the LSC-Virgo Burst Group for as long as it is appropriate to do so.

Shawhan and graduate student Kanner will help develop and carry out LIGO-GEO-Virgo joint analysis.

Kanner and Shawhan will continue to develop techniques for rapid analysis of burst event candidates and triggering follow-ups by optical and/or X-ray observations. In particular, Kanner will draft a white paper based on the experience of the LOOC_UP project. The LOOC_UP team will probably write a short-author-list methods paper, perhaps for the GWDAW proceedings; the possibility of writing an LSC full-author-list observational results paper from analysis of the LOOC_UP data has also been discussed. Kanner and/or Shawhan will find out more about how to prepare for making use of observing resources for the S6/VSR2 run and beyond.

Graduate student Sean McWilliams primarily works with the numerical relativity group at Goddard Space Flight Center, developing and running binary merger simulations. Sean has created a method to smoothly match an analytical post-Newtonian inspiral waveform onto a numerically calculated merger/inspiral inspiral, and has figured out how to run the BurstMDC code (created by Keith Thorne and Amber Stuver of Penn State) to put the total signal into the MDC frame format used by the LSC-Virgo Burst Group. Sean is currently figuring out how to run the Q Pipeline search code (created by Shourov Chatterji and others) to test the detectability of these signals in LIGO S5 data.

An additional graduate student or a postdoctoral scholar will probably be recruited in the coming year to work on burst data analysis.

c. Stochastic

Not Applicable

d. Continuous

Shawhan will continue to serve on the CW internal review committee.

e. Other Contributions

Shawhan will continue to maintain software tools in LIGOtools, as well as the LIGOtools software distribution system, on a best effort basis.

3. Resource Sharing

The LIGO Laboratory will contribute resources including allocation of appropriate scientific and engineering personnel, research facilities, and funding in support of the effort in Item No. 2, as indicated below.

a. Research accommodations for MaGWG group members while on LIGO research assignment at any LIGO Laboratory site.

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b) Access to LIGO data through established LSC channels in support of this work.

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Not Applicable

4. Coordination and Reporting

MaGWG will perform research within the structures established by the LIGO Laboratory and the LSC where appropriate.
In particular, with reference to activities described above:

2a will be carried out within the LSC Inspiral Search Group.

2b will be carried out within the LSC Burst Search Group.

2c will be carried out within the LSC Stochastic Search Group.

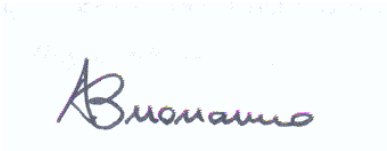
2d will be carried out within the LSC Continuous Waves search Group.

This includes keeping the Group leaders informed of activities and plans, reporting to the group at meetings and telecons, and through technical documents submitted to the LIGO Document Control Center.
In addition, an annual report will be submitted with the update to this Attachment, giving a summary status on research by topic as indicated in Item No. 2, including progress against the milestones if any, significant accomplishments such as new insights/discoveries or publications, issues of concern if any, and an indication of invested time.
This Attachment will be updated at least annually with a plan of activities for the succeeding one-year period. These documents will be due one month before the close of the period of performance under this Attachment.

5. Computer Code

All computer code delivered to the LSC under this Attachment must be developed in consultation with the LSC Data Analysis Software Working Group (DASWG) and archived, documented and reviewed as determined by that group.

Jay Marx
LIGO Laboratory Director



Alessandra Buonanno
Principal Investigator(s)
MaGWG

David Reitze
LSC Spokesperson