

Attachment DAT to the
Memorandum of Understanding (LIGO-M 060011 -00-M)
between the
Louisiana State University Experimental Relativity Group (LSUERG)
and the
Laser Interferometer Gravitational Wave Observatory (LIGO)
August 15, 2006

This Attachment DAT to the Memorandum of Understanding LIGO-M 060011 -00-M defines the role of the **Louisiana State University Experimental Relativity Group** as a Member of the LIGO Scientific Collaboration (LSC), in particular, its activities in data analysis in support of the initial LIGO interferometers. The period of performance for the activities in this Attachment is from August 15, 2006 to August 15, 2007.

1. 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 the analyses, perform detailed reviews, and prepare publications on behalf of the collaboration. LSC groups are encouraged to participate in one or more of these groups. MOU Attachments define the contributions of each participating group to the data analysis groups.
2. During the period August 15, 2006 to August 15, 2007, the members of **LSUERG** will participate in the analysis of initial LIGO data in the following areas:

a) Binary Inspirals

Gabriela Gonzalez will continue to co-chair the working group for at least another year (or as appointed by the LSC Spokesperson).

Andres Rodriguez will prepare a publication documenting his work on a new signal based veto based on the analysis of the χ^2 time series of template matching techniques. He will also study the application of this veto for binary black hole searches using Postnewtonian templates in S5 data.

Chad Hanna will finish developing another signal-based veto, based on the study of trigger structure in the template banks used in the searches. We hope this veto will be able to reduce false alarm triggers in those searches where χ^2 is not as useful (such as black hole searches). This work will form part of his PhD thesis.

Chad Hanna and Andres Rodriguez will study new strategies for reducing the computational cost of future primordial black hole searches, making them possible in S5 data.

Chad Hanna, Ravi Kumar and Gabriela Gonzalez will document the work done on galaxy catalogs used in the S3/S4 searches, and prepare a technical paper (with participation of several other LSC members).

Gabriela Gonzalez, Jeff Kissel and Jacob Slutsky will be involved in the study of instrumental vetoes for the different searches done in the group. They will also work in the development of an automated way of some of the investigations for estimating the confidence on the final candidates in the searches (the "follow ups").

A new postdoc, Romain Gouaty, will be involved in investigations of the estimates of the backgrounds for the different searches.

b) Bursts

Warren Johnson and Myungkee Sung are active participants in the LSC data analysis group dedicated to search for transient ("burst") sources.

Johnson and Sung will finish a signal detection pipeline that uses optimal filtering. The steps to follow are: clustering of adjacent samples into raw candidate events, the coherent combination of the three interferometer signals to make a joint test statistic, and the construction of a realistic "receiver operating characteristic" for each filter. The latter will allow the tradeoff between false alarms and missed detection. Finally, when more than one template shows a big response, they will compare amplitudes to determine which is closest in shape to the signal candidate.

They will compare these results with other methods used by the burst group which are believed to find burst-type events that are not well characterized in their waveshape.

c) Stochastic

Warren Johnson will continue to collaborate in the joint LIGO-ALLEGRO search for a stochastic background of gravitational waves. A Collaboration paper is in preparation about results from previous Science Runs.

e) Other Contributions

Luis Lehner, in collaboration with Patrick Brady and Frans Pretorius are taking a close look at the interface between waveforms generated via numerical simulations and its translation to a form useful to the data analysis effort. In particular the connection between frames employed at the simulation level and those naturally defined at the detector and ways to extract main features of the waveform.

Joel Tohline will continue to simulate dynamically evolving astrophysical fluid systems and binary systems that are likely sources of gravitational radiation. In collaboration with Luis Lehner, he will continue the extension of the Newtonian and post-Newtonian treatment of such systems to include fully relativistic hydrodynamical models. Tohline will continue to participate as an active internal reviewer of LSC papers that focus on a search for burst sources; he will also continue to serve as a contact point at LSU for high-bandwidth network connections between LLO and Caltech.

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 **LSUERG** group members while on LIGO research assignment at any LIGO Laboratory site,
 - b) Access to LIGO data through established LSC channels in support of this work.
 - c) Not Applicable

4. Coordination and Reporting -

LSUERG will perform this research within the structures established by the LIGO Laboratory and the LSC where appropriate. In particular activities described in Item 2a) will be carried out within the LSC Inspiral Search Group, Item 2b) will be carried out within the LSC Burst Search Group, Item 2c) will be carried out within the LSC Stochastic Search Group and Item 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 on-year period. These documents will be due one month before the close of the period of performance under this Attachment.

5. 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.

Approved:

Jay Marx
LIGO Laboratory Director

Peter Saulson
LSC Spokesperson

Gabriela
Gonzalez

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