



**Attachment DAT to the
Memorandum of Understanding LIGO-M000125-00
between the Carleton College Relativity Group (CCRG)
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-M000125-00 defines the role of the Carleton College Relativity Group (CCRG) as a Member of the LIGO Scientific Collaboration (LSC). In particular, it addresses data analysis activities 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 CCRG will participate in the analysis of initial LIGO data in the following areas:

a. Binary Inspirals

Members of the CCRG will continue to study instrumental disturbances (glitches) with the intent of developing vetoes and data quality flags for the binary inspiral searches. The research will proceed with direction and supervision from the LSC Compact Binary Coalescence Group. This veto-glitch work will also be done with input and advice LSC glitch group, and the LSC Detector Characterization group. Efforts will be made to understand the physical mechanisms that generate the detected glitch events.

The CCRG will continue to develop and apply their Markov chain Monte Carlo (MCMC) parameter estimation codes as part of the the inspiral search. Currently

the CCRG has developed a single interferometer 2.0 post-Newtonian (PN) stationary phase frequency domain 5-parameter MCMC, a single interferometer 3.5 PN phase and 2.5 PN amplitude time domain 6-parameter MCMC, and a multiple interferometer 3.5 PN phase and 2.5 PN amplitude time domain 9-parameter MCMC. All of these parameter estimation programs will be used on candidate events, and hardware injections in the LIGO data. The MCMC will continue to be incorporated into the follow-up studies of binary inspiral triggers. The CCRG will work on better incorporating these inspiral parameter estimation programs into the binary inspiral search and detection pipelines, and the LIGO/LSC Analysis Library (LAL).

The CCRG group will continue to collaborate with researchers at Northwestern and Birmingham on the development of a MCMC parameter estimation code for spinning black hole binary inspiral signals. Like the other MCMC inspiral routines, we will work on making this code useful for follow-up studies on spinning black hole binary triggers.

b. Bursts

The CCRG will continue to work on the development of a MCMC parameter estimation program for burst signals using realistic physical supernova waveforms. This work will be done in collaboration with Virgo burst group members at CNRS-Orsay, and statisticians at the University of Auckland.

c. Stochastic

Christensen will continue to serve on the LSC Stochastic Review Committee, and will execute all of the tasks required.

d. Continuous

The CCRG will continue to calculate the coherence between the LIGO interferometers' output, and PEMs. These results will be used to try and determine if signals observed by pulsar searches might be caused by environmental noise. This work will also be coordinated through the LSC Detector Characterization Group.

e. Other Contributions

Detector Characterization Group The CCRG will continue to calculate the coherence between the LIGO interferometers' output, and PEMs. This work will be coordinated through the LSC Detector Characterization Group. The CCRG will attempt to identify and determine the cause of noise lines in the LIGO data.

Glitch Working Group The CCRG will conduct research on identifying and characterizing glitches that appear in the LIGO interferometer output data. Specific attention will be given to identifying the cause of events that appear as triggers in the the LSC binary inspiral search pipeline. Inspiral vetoes will be developed. This work will be coordinated with both the LSC Glitch Working Group, and the LSC Inspiral Group.

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 CCRG group members while on LIGO research assignment at any LIGO Laboratory site.

Not Applicable

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

Not Applicable

4. Coordination and Reporting

CCRG 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



Nelson Christensen
**Principal Investigator(s)
CCRG**



David Reitze
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