

**Attachment DAT to the  
Memorandum of Understanding (LIGO-M050242-00-M)  
between the  
Inter-University Centre for Astronomy and Astrophysics (IUCAA) and the  
Laser Interferometer Gravitational Wave Observatory (LIGO)  
August 15, 2005**

This Attachment DAT to the Memorandum of Understanding LIGO-M050242-00-M defines the role of the Inter-University Centre for Astronomy and Astrophysics Group (IUCAA) 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, 2005 to August 15, 2006.

1. Together, the LIGO Laboratory and the LIGO Scientific Collaboration 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, 2005 to August 15, 2006, the IUCAA Gravitational Wave Data Analysis Group will focus on the following two tasks:
  - a) The detection and mapping of the anisotropy in stochastic GW background bears strong semblance to the analysis of the cosmic microwave background (CMB) anisotropy and polarization which is also a stochastic field statistically described in terms of its correlation properties. The first goal of the IUCAA group will be to identify the key features that would allow us to adapt appropriate techniques from CMB analysis.
  - b) The raw sky map of the GW background is the signal convolved with antennae pattern. The IUCAA group will explore and compare the various image reconstruction techniques for the application to the the GW background. The first step is to compute the kernel analytically and study its properties and structure. We will also compute it numerically and check whether these results agree with the ones so far obtained. The structure will be investigated with the help of angular basis functions. Unraveling the structure is extremely important from the point of deciding the appropriate inversion technique. There are a suite of such methods developed in allied fields such as radio astronomy, CMB etc. A promising method is the maximum entropy method which gives the most likely distribution of intensity consistent with the available data. The eventual goal of the IUCAA group will be to identify and develop an efficient method to reconstruct the true sky map.
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 IUCAA 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.
4. Coordination and Reporting – IUCAA Group will perform this research within the structures established by the LIGO Laboratory and the LSC where appropriate. In particular activities described in Item 2) will be carried out within the LSC Stochastic Search Group. Coordination will include 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:

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Barry Barish  
LIGO Laboratory Director

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Sanjeev Dhurandhar  
IUCAA Principal Investigator

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Peter Saulson  
LSC Spokesperson

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LSC Stochastic Search Group Leader

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Albert Lazzarini  
LIGO Laboratory Data and Computing  
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