

**Attachment Number 5**  
**to the**  
**Memorandum of Understanding (LIGO-M979123-02-M)**  
**between the**  
**Virgo**  
**and the**  
**Laser Interferometer Gravitational Wave Observatory (LIGO) Project**  
**May 2005**

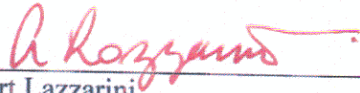
This Attachment No. 5 (agreement) to the Memorandum of Understanding (MOU) LIGO-M979123-02-M between Virgo and LIGO covers sharing of data collected by Virgo and by the detectors affiliated with the LSC (the LIGO and GEO600 detectors), collaboration in data analysis, and joint publication of scientific results from the collaborative data analysis. The period of performance for the activities in this agreement is from May 2005 to February 2006. This period may be modified and extended by an agreement to a revision of this Attachment No. 5.

1. The motivation for this agreement is to enable the initial joint work between Virgo and LIGO in areas where the combined analysis of data from both experiments can potentially yield significant added scientific reach over either standalone detector for the detection of gravitational waves. This attachment is for work toward binary inspiral detection and other attachments will address work on other research topics.
2. The scope of the envisioned collaborative work will include developing optimized methods for sustained coincident observations between Virgo and LIGO, including data sharing and joint analysis and publication, while maintaining scientific independence as determined by each group. We also plan to jointly develop detector diagnostic and analysis software and simulation tools that can be used on both Virgo and LIGO data, which will allow checks and validation of the software and of scientific results.
3. This joint work will be done through joint working groups that will be open to all Virgo scientists and all members of the LIGO Scientific Collaboration. Specifically, this attachment represents an agreement to form a joint working group for binary inspiral analysis. This working group is expected take on the task of defining its activities, methods and milestones and future plans toward data exchange and scientific analysis for such sources. A white paper has been written, laying out the plans for proceeding toward eventual coincidence running and data exchange. (The white paper is labeled LIGO-T040137-08-Z and VIRGO-PLA-DIR-1000-201.) The work of this working group will be coordinated under the direction of Albert Lazzarini for LIGO and of the Virgo data analysis coordinator for Virgo, Fulvio Ricci at the present time.

4. The joint working group is tasked to develop the proposed criteria for determining the criteria for search sensitivity that is sufficient to produce a meaningful joint analysis that is expected to lead to new publishable scientific results. As we approach the point where these criteria are met, a joint proposal will be submitted from the working group to Virgo and to LIGO managements that details the proposed physics goals, data to be used or exchanged, protocols for exchange, and the list of participants in this analysis with their commitments to this activity. Any proposed analysis project will require the explicit approval by the Principal Investigator of LIGO and the Virgo Spokesperson before proceeding with data exchange or actual joint analysis. Even early exchange of data for testing purposes will need a specific proposal and approval by the Principal Investigator of LIGO and the Virgo Spokesperson.
5. We encourage the participation of members of each organization at open analysis meetings of the other organization, recognizing that this will not be possible for closed meetings involving sensitive information regarding the actual analysis and results from each group. In general, each experiment is expected to continue to maintain its own organization for data analysis. Joint analysis of data should involve people from the LSC and from Virgo working together. We recognize the value of independent analysis pipelines for cross-checking results, so we encourage the continued use of software developed by both Virgo and the LSC. However, it is important that analysis of data never become removed from intimate knowledge of the idiosyncrasies of the instrument that produced it. Thus, we require that any team analyzing joint data sets include among its active members at least one member from the instrument team of each instrument that produced the data being analyzed, to guide the analysis on questions involving vetoing of spurious events. In addition, we require that any team analyzing joint data sets include at least one data analysis specialist from each collaboration, to ensure that differences in analysis techniques can be clearly understood when it is time to produce a final joint result.
6. The working group is expected to look at broader questions that will help determine networking requirements for Virgo and LIGO exchange, possible areas of common simulation work, etc. However, both groups recognize the importance of maintaining the ability to cross check and validate each group's simulation programs through comparisons with results using the other group's programs and such studies can be carried out as part of this agreement.
7. Any form of dissemination of the results of the analysis of the data covered by this agreement to persons outside the projects may be made only with the permission of both the Principal Investigator of LIGO and the Virgo Spokesperson. Scientific publications describing such results will be jointly authored by individuals identified by each project. Any press releases based on the analysis of data under this agreement will be issued jointly and simultaneously by LIGO and Virgo.
8. The LIGO/LSC members of this initial working group for joint binary inspiral detection are Nelson Christenson (Carleton) and Stephen Fairhurst (UWM). The Virgo Members are Frédérique Marion (LAPP Annecy) and Andrea Viceré (Urbino).



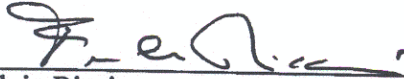
Approved:



Albert Lazzarini  
LIGO Data & Computing Group Leader

5 July 2005

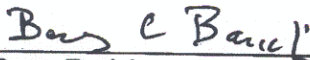
Date



Fulvio Ricci  
Virgo Data Analysis Coordinator

23 June 2005

Date



Barry Barish  
LIGO Laboratory Director/LIGO Principal Investigator

23-June-05

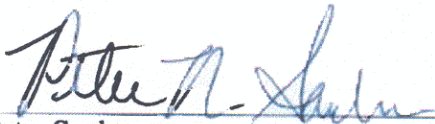
Date



Benoit Mours  
Virgo Collaboration Spokesperson

23 June 2005

Date



Peter Saulson  
LIGO Scientific Collaboration Spokesperson

23 June 2005

Date



Bernard Schutz  
GEO 600 Principal Investigator for Data Analysis

04.07.2005

Date