

GWIC Meeting Summary

University of Maryland, 17 June 2006

Warren Johnson	ALLEGRO
Massimo Cerdonio	AURIGA
Eugenio Coccia	EXPLORER/NAUTILUS
Karsten Danzmann, Jim Hough	GEO 600
Jay Marx, Peter Saulson, Stan Whitcomb	LIGO
Tom Prince, Stefano Vitale	LISA
Benoit Mours	Virgo
Cliff Will	Theory Community
Beverly Berger, Tom Carruthers	NSF
Alberto Lobo	2008 LISA Symposium Bid
Sam Finn	GWIC Executive Secretary

Action Items

The following action items were identified during the meeting:

1. Stebbins & Prince will craft an endorsement of LISA, which GWIC will modify as appropriate and send to the AAAC describing the international gravitational wave detection community's keen interest in LISA.
2. Marx, Prince and Hough will work with Rowan to prepare a list of recommendations that Rowan can carry to the IAU roadmap meeting.¹
3. Coccia and Whitcomb will draft a statement of support, which GWIC will consider sending to INFN, for the continuation of support for the operation of the operating Italian acoustic detectors through the period of the interferometer upgrades.
4. Finn will ensure that the agenda of the next GWIC meeting, which will be held in conjunction with the Amaldi meeting in Sydney, will include a discussion of the GWDAW meeting series goals and mission.
5. On behalf of GWIC, Finn will communicate to the Amaldi Scientific Organizing Committee that the meeting should include a minimum of two space-based detector sessions.
6. On behalf of GWIC, Finn will communicate to Dave McClelland GWIC's decisions regarding the Amaldi meeting plenary speakers and their charges:
 - 6.1. Maria Alessandra Papa will be asked to speak on "Doing Astronomy with Gravitational Waves". Her charge will include astronomy with ground- and space-based detectors.
 - 6.2. Stan Whitcomb will be asked to speak on the status of ground-based detectors and results from the analysis of ground-based detector data.
 - 6.3. Daniel Shaddock will be asked to speak on the status of space-based detector technology.
 - 6.4. Sathyaprakash will be asked to speak on "Understanding Gravity using Gravitational Waves", which will focus on probing and testing gravity using both ground- and space-based gravitational wave detector observations.
7. Stebbins and Prince will mentor Shaddock in the development of his Amaldi presentation, to insure that it presents a balanced portrayal of all of the efforts in the US and Europe.
8. Will, Schutz and Finn will craft a statement for GWIC's consideration regarding the need for broad funding agency support of gravitational wave theory in support of the detection of gravitational waves.
9. Saulson will summarize involve members of GWIC in a discussion of how a global network may be established and how detectors could be added to the agreement. GWIC encourages as a goal for such a network that a single page attachment to a standing MoU would activate a specific search involving specific groups.
10. Hough will organize a study group that will be charged with collecting and summarizing the technologies and proposals for advanced detectors (both interferometric and acoustic, and both ground- and space-based) beyond Advanced LIGO and Advanced Virgo, DUAL, and LISA. Young researchers will be involved in and play a major role in the study group.
11. Finn and Whitcomb will proceed to set-up the GWIC Thesis prize, arranging accounting with the International Society for General Relativity and Gravitation, contacting donors and soliciting donations to build the endowment, and announcing the establishment of the prize.

¹ After learning more about the IAU road-mapping meeting, Hough, Prince and Marx in consultation with Rowan decided that given the nature (benign) of the roadmapping meeting, recommendations from GWIC would not be beneficial to the GWIC community

Minutes

1. Chair's Remarks

1.1. Welcomes

- 1.1.1. Massimo Cerdonio, GWIC Chair, welcomes to the GWIC Jay Marx as the new Director of LIGO.
- 1.1.2. Cerdonio welcomes invited visitors Beverley Berger (NSF Gravity Program Director), Tom Carruthers (NSF LIGO Program Manager), and Alberto Lobo (University of Barcelona).

1.2. IUPAP Affiliation: GWIC is permanent sub-committee of PaNAGIC, which is Working Group 4 of IUPAP. As a sub-committee, the GWIC chair is an ex Officio member of PaNAGIC, as PaNAGIC has recently decided. Currently Massimo Cerdonio serves as a member of PaNAGIC in two capacities: as a member elected a few years ago and as chair of GWIC. He serves also as a link with IUPAP Associated Commission 2. He will be stepping down from the former post this year, to be replaced by Eugenio Coccia, who is Director of the Gran Sasso Lab and also a member of GWIC. When Cerdonio will rotate out also of GWIC chair by Amaldi 7th, the next GWIC Chair will be automatically a PaNAGIC member

2. Report from Projects

2.1. Europe:

- 2.1.1. The Framework Programme (FP) is the European Union's main instrument for funding research and development. The current FP is FP6, which runs to the end of 2006. FP7 has been funded at 45 billion euros and, unlike previous FP's, will run for seven years. FP6 includes funding for Km3; which was in the queue immediately before the EGO Proposal for a Design Study for a 3rd generation interferometer.
- 2.1.2. FP7 includes for the first time a new EU program - IDEAS - funds pure basic research. IDEAS within FP7 can support (in some areas) the same research; nevertheless, they are independent funding channels and applications to one do not compete against applications to the other. A letter of intent to support construction of a prototype of DUAL has been submitted to IDEAS.
- 2.1.3. Beyond the Framework Programme, the INFN and ApEC roadmaps both include recommendations concerning gravitational waves. The IAU roadmap committee has invited Prof. Sheila Rowan to present at the August IAU meeting in Prague. Rowan contacted GWIC - the invitation was made to her directly and not through GWIC.
 - 2.1.3.1. *Action: Marx, Prince and Hough will work with Rowan to prepare a list of recommendations that Rowan can carry to the IAU roadmap meeting.*

- 2.1.4. The formulation of the INFN roadmap involved all the gravitational wave groups in Italy. Over the next five years, the roadmap strategy for gravitational waves focuses heavily on the Virgo and the LIGO/Virgo partnership, with a Virgo upgrade to improve low-frequency response. In the area of acoustic detectors, the DUAL approach is endorsed as a path to remain competitive with the interferometers at higher frequencies. A significant research push in the area of spherical detectors was not endorsed at this time, in part because the LIGO S5 run results may change the relevance and competitiveness of spherical detectors in the proposed frequency range. Finally, INFN is considering, as part of its roadmap process, whether to keep the three operating bars active, or whether one should be cut and two continue active. In this connection, the Italian bar detector community asks GWIC to consider a statement of support for the continuation of the bar detector program over the next several years through the period of the interferometer upgrades.
 - 2.1.5. ApEC includes MPI, PPARC, CNRS, and INFN. The current roadmap is to cover the next ten years in outlook; however, funding will only be for the first five years of the program. One section of the draft roadmap focuses on gravitational waves. In this area consensus was quickly attained. The roadmap includes Virgo+, Advanced Virgo, and GEO HF. Beyond these upgrades, the roadmap includes a beginning work on a third-generation interferometric detector facility, continuing support of the LISA activity, and research and development on DUAL. As it stands the complete roadmap recommends activities whose total costs are 2.5 times what is available; so, the hard decisions have yet to be made.
 - 2.1.6. PPARC may be disbanded or absorbed into a larger research council that includes larger laboratories. This is not expected to affect UK participation in GEO HF or Advanced LIGO. There is a general concern in the UK that combining the large labs with the smaller programs that PPARC traditionally supports could lead to an imbalance as large science costs erode support for smaller science programs; however, Jim Hough feels that this transformation will not damage gravitational wave research in the UK. In particular, LISA a strategic priority so funding is not likely to be badly affected.
- 2.2. United States/NSF (Beverly Berger)
- 2.2.1. An interagency committee, charged with making recommendations for large facilities involving the Department of Energy, the NSF and NASA, recently issued its report. This report included, among its recommendations, support for advanced LIGO, LISA, and numerical relativity research in support of these.
 - 2.2.2. The President's budget request to Congress includes funding for Advanced LIGO with a Fiscal Year 2008 start. Should this recommendation remain with the next budget request, which will be made in February 2007, and approved by Congress, then Advanced LIGO funding will begin.

- 2.3. ALLEGRO's current mission is to collaborate with IGEC and LIGO for several runs. The funding for ALLEGRO will need to be renewed soon and the project is examining is considering the role of ALLEGRO and its future mission in light of current scientific activity worldwide and national priorities for science funding in the United States.
- 2.4. AURIGA/DUAL: AURIGA is participating in the current IGEC runs. AURIGA is also working with radio astronomers to carry-out a phase coherent search, over at least a one year timescale, for gravitational waves from an accreting pulsar. Current AURIGA is funded for maintenance and operations: it will not, at this time, be upgraded to ultra-cryogenic operations and so won't keep pace with LIGO and Virgo. A DUAL R&D program has been funded as a three year project, whose goal is to demonstrate the feasibility of a DUAL detector and that it could have the sensitivity to contribute positively to an international detector network.
- 2.5. EXPLORER/NAUTILUS:
 - 2.5.1. The current plan is that both EXPLORER and NAUTILUS will continue taking data continuously; however, INFN is considering whether funding for the operation of one bar should be cut. For this reason a GWIC statement of support for continued funding of the Italian acoustic detector efforts would be helpful. EXPLORER/NAUTILUS currently have collaborative agreements with AURIGA and ALLEGRO, through IGEC, with Virgo for joint analysis of one days data taken from the Virgo C7 run, and with LIGO.
 - 2.5.2. *Action: Coccia and Whitcomb will draft a statement of support, which GWIC will consider sending to INFN, for the continuation of support for the operation of the operating Italian acoustic detectors through the period of the interferometer upgrades.*
- 2.6. IGEC II inaugurated a joint search involving data taken in the May-Dec 2005 period, which covers an interval while LIGO was off-line and thus no interferometric detector gravitational wave data are available. The participating groups (AURIGA, ALLEGRO, EXPLORER/NAUTILUS) have prepared event lists and are ready to begin the analysis.
- 2.7. GEO has participated in the LIGO S5 run during weekends since the beginning of 2006 and has participated 100% of the time since May. GEO's duty cycle is better than 99%. The funding situation for GEO is good, with work on advanced LIGO contributions beginning and GEO HF work expected to begin in 2008.
- 2.8. LIGO:
 - 2.8.1. LIGO has been in its S5 run, operating at design sensitivity, since November 2005. At its present duty cycle S5 is expected to continue through summer 2007. Current analysis activity is focused on previous runs and early data from S5. LIGO is currently examining options for post-S5 operations and enhancements. The most significant enhancements being considered are a factor of 3 increase in laser power, DC readout at the dark port and an output mode cleaner to reduce "junk light". It is expected these enhancements could be completed in time for a second long science run in

2009-10 while Advanced LIGO instrumentation is under construction. In this scenario LIGO would shut-down for Advanced LIGO installation in 2011.

2.8.2. LIGO and VIRGO have made great strides towards the completion of MoU that will define the longterm basis for future cooperation in data analysis and coordination of data runs and shutdowns. Two fundamental precepts of the draft MoU are that LIGO and Virgo should not be competitive enterprises, and that the cooperative analysis agreement should be open to new partners if and when their data add scientific value to the joint enterprise.

2.9. LISA:

2.9.1. United States/NASA:

2.9.1.1. The President's budget proposal for FY2007 and the NASA operating plan for FY2006, released simultaneously in February 2006, have significantly affected the US LISA Project. The budget plan for the outyears also referenced a "competition" for a FY2009 new mission start to take place between Con-X, JDEM and LISA. The details of the competitive review, including its basis, have not been determined nor has the review been scheduled; however, the budget proposal shows each of these three projects going to zero-funding in FY2009 with the new project starting funding then.

2.9.1.2. The timing of the review is difficult in several respects. LISA Pathfinder is scheduled to launch in October 2009, which is after the decision is currently scheduled to be made. Additionally, the National Academy of Sciences decadal review would normally take place in 2010 and, as we approach that date there will be increasing pressure to defer any decision on large missions until the decadal survey can weigh-in with its priority recommendations. There is discussion that the decadal review may be moved forward. Even if this is so, there is currently an ambiguity over whether the decadal review will prioritize programs (e.g., Beyond Einstein) or specific missions (e.g., Con-X, LISA, JDEM, etc.)

2.9.2. Europe/ESA:

2.9.2.1. Within ESA there is a big push to make an opening for a new mission. This is leading to a reassessment of ESA priorities. Schutz is the chair of the Fundamental Physics Advisory Group (FPAG) and so also a member of the ESA Space Sciences Advisory Committee (SSAC), both of which are involved in the priority reassessment exercise. There are three competitors for a new mission start in 2009: Solar Orbiter, LISA, and a mission TBD.

2.9.2.2. The ESA Science Program Committee (SPC) has issued its report on priorities, which states that LISA is a cornerstone of the ESA fundamental physics program and must be completed as expeditiously as possible, subject to two caveats: first, that LISA Pathfinder be

successful, and second, pending - but not subject to - the decision of NASA in its review of LISA. There is strong and broad support for LISA in the European system.

2.9.3. *Action: Stebbins & Prince will craft an endorsement of LISA, which GWIC will modify as appropriate and send to the AAAC describing the international gravitational wave detection communities keen interest in LISA.*

2.10. TAMA:

2.10.1. TAMA300 is currently undergoing a seismic isolation upgrade. Installation in one arm has been completed and performance tests are underway. It is expected that installation will be complete in both arms in October 2006 and that TAMA operations will restart in December.

2.10.2. Despite the strong endorsement of GWIC and the strong interest and recommendations at lower review levels, the proposal for continuing the research activities at TAMA300 and CLIO was not approved. NAOJ is providing minimum support to continue TAMA300 operations.

2.10.3. The review of the LCGT proposal for an FY2007 start is still underway. LCGT has been reviewed by the University of Tokyo administration, which has forwarded a positive recommendation to the Ministry of Education. One hearing on LCGT has already been held at the Ministry and a formal budget has been requested by the University. The Ministry of Education will submit its requests to the Ministry of Finance no later than the end of August, with a final decision to be made in December. It is not known at this point whether LCGT will be part of the Ministry of Education's request to the Ministry of Finance.

2.11. Virgo:

2.11.1. Virgo commissioning is currently focusing on improving the injection power. Virgo currently has 250W on the beam splitter and its high frequency shot noise performance should match LIGO's. Not all the control loops are closed; so, the detector is still unstable. It is anticipated that the remaining control loops should be closed and the detector should be able to operate stably, and within a factor of 2 of design sensitivity, by the end of summer 2006.

2.11.2. Virgo+ (last stage of mirror replaced by monolithic suspension, 50W input laser) construction is underway and on track for 2008 installation.

2.11.3. In the area of data analysis Virgo's priority is to prepare for joint analysis activities in collaboration with LIGO, through the draft LIGO/Virgo MoU.

2.11.4. The Virgo Collaboration is being joined by a group from NIKHEF and other proposals for membership are being considered.

- 2.11.5. Advanced VIRGO will require a new site. One possibility that is being discussed is that the next generation facility may be an international enterprise, with the site to be chosen competitively.
- 2.12. ACIGA: To be provided.
- 2.13. Spheres/miniGRAIL: To be provided.
3. Meeting Reports:
 - 3.1. GWDAAW 11:
 - 3.1.1. GWDAAW will be held 18-21 December 2006. It will be hosted by the AEI and take place at the Dorint Hotel in central Potsdam, a **** hotel. The negotiated room rate is 80 Euros/night and the estimated registration fee is well under 300 Euro. The registration fee will include WiFi, lunch and break service (but not dinner). The current expectation is that there will be approximately 150 participants.
 - 3.1.2. The more recent GWDAAW meetings have taken the form of heavily programmed conferences, with many talks and little time for questions and/or discussion. There is some interest in moving the GWDAAW meeting back to its roots as a workshop, with fewer presentations and more time for questions and discussions. Whether this will indeed take place will depend on the scientific organizing committee.
 - 3.1.3. GWIC is divided in its recommendations for this meeting. Some GWIC members support the existing format of many short presentations, which allows for an overview (albeit not an in-depth one) of analysis activity in the field, while other members are supportive of moving back to the workshop format. Some GWIC members would like to discourage the announcement of results at GWDAAW meetings, which takes away from its ability to act as a working meeting of the analysis community. The LISA project is very concerned that LISA analysis problems, which have assumed major importance in the minds of potential reviewers, have not received enough attention at this meeting and feel that at least 1.5 days needs to be devoted to LISA analysis problems. Some GWIC members are concerned that not all projects are well-represented in the programming of the meeting, which perhaps may be a result of an imbalance in the choice of scientific organizing committee for the last several meetings. GWIC shares a general sense that the GWDAAW meeting does not have a clear mission, goal or focus.
 - 3.1.4. *Action: Finn will ensure that the agenda of the next GWIC meeting, which will be held in conjunction with the Amaldi meeting in Sydney, will include a discussion of the GWDAAW meeting series goals and mission.*
 - 3.2. LISA Symposium:
 - 3.2.1. The LISA Symposium is being held on the GSFC campus. Owing to a US Government ruling late in the symposium planning process the LISA Project

has been forced to handle all symposium expenses and no registration fee is being charged to the meeting participants. This Symposium program includes several innovations: a set of taking tutorials immediately before the first meeting session and a set of sessions taking place in parallel on the last day of the meeting.

- 3.2.2. Whitcomb reminded GWIC that GWIC had previously recommended that each LISA Symposium have at least 2 sessions focused on ground-based detectors and that each Amaldi meeting have at least 2 sessions focused on space-based detectors. Despite recommendations, which were agreed to by the organizing committees of both LISA and Amaldi, this did not happen at this LISA Symposium. Stebbins agreed that this was the case and indicated that the organizing committee had been unresponsive to his reminders and complaints. Whitcomb and Stebbins both pointed out that several GWIC members were on the organizing committee.

3.2.2.1. *Action: On behalf of GWIC, Finn will communicate to the Amaldi Scientific Organizing Committee that the meeting should include a minimum of two space-based detector sessions.*

- 3.3. GWADW: The 2006 GWADW meeting was held on Elba. It was regarded as moderately successful; however, some felt that the emphasis had shifted too far from advanced detectors.

3.4. Amaldi Meeting:

- 3.4.1. GWIC discussed and finalized its choices for the four Amaldi Meeting Plenary sessions that had been agreed to when the joint GR/Amaldi meeting was planned.

3.4.2. *Action: On behalf of GWIC, Finn will communicate to Dave McClelland GWIC's decisions regarding the Amaldi meeting plenary speakers and their charges:*

3.4.2.1. *Maria Alessandra Papa will be asked to speak on "Doing Astronomy with Gravitational Waves". Her charge will include astronomy with ground- and space-based detectors.*

3.4.2.2. *Stan Whitcomb will be asked to speak on the status of ground-based detectors and results from the analysis of ground-based detector data.*

3.4.2.3. *Daniel Shaddock will be asked to speak on the status of space-based detector technology.*

3.4.2.4. *Sathyaprakash will be asked to speak on "Understanding Gravity using Gravitational Waves", which will focus on probing and testing gravity using both ground- and space-based gravitational wave detector observations.*

3.4.3. *Action: Stebbins and Prince will mentor Shaddock in the development of his Amaldi presentation, to insure that it presents a balanced portrayal of all of the efforts in the US, and in Europe.*

4. Committees:

4.1. The Statistics Committee was formed by GWIC in 2003 and charged with coordinating between the projects a set of statistical measures that could be calculated consistently among the projects and would aid in the comparison of results obtained by the different projects. Despite the agreement of the projects to form the committee and charge it as such, the committee has not been able to gain the cooperation of the GWIC projects in fulfilling its charge. Lacking interest or participation by the projects in this effort the committee is disbanded.

4.2. Theory Needs:

4.2.1. Will surveyed a broad cross-section of the theory community to assess their perception of the status and effort needed in theoretical analysis in support of gravitational wave detection. Will circulated a brief report on his findings to the GWIC earlier in the year, together with the conclusion that no formal document, issued by GWIC, is needed to focus the attention of theorists on theoretical problems important to gravitational wave research related to detection.

4.2.2. GWIC discussed whether a report would be helpful in securing additional funding from different funding agencies to support the theoretical work going on in the field. Berger (NSF) emphasized that as effort in an area grows, so do the areas infrastructure needs grow. This needs to be articulated to the funding agencies: a report, describing the (theoretical) infrastructure upon which the detection enterprise relies and justifying its support, is needed to insure that adequate funding is available to meet the broad (theory) infrastructure needs.

4.2.3. *Action: Will, Schutz and Finn will craft a statement for GWIC's consideration regarding the need for broad funding agency support of gravitational wave theory in support of the detection of gravitational waves.*

5. Multi-lateral MoUs for joint analysis activities:

5.1. Saulson introduced a brief discussion of what actions GWIC might take to support analysis collaborations that reach more broadly across many projects. Pointing to the proposed LIGO/Virgo MoU he reported that this is happening on its own and that there is no need for GWIC to become involved.

5.2. *Action: Saulson will summarize for GWIC how the LIGO/Virgo MoU initiative will develop into a global network agreement and, in particular, how detectors could be added to the agreement. GWIC encourages as a goal for such a network that a single page attachment to a standing MoU would activate a specific search involving specific groups.*

6. Beyond Advanced LIGO and Advanced Virgo

- 6.1. GWIC began a discussion of what possibilities exist, and what opportunities might be created, for advanced detectors beyond these two second generation interferometers. A study group, that would be charged with cataloguing all known initiatives, placing them in the context of current and future technology and theory, was proposed. The report of this study group would be a “high-level” document, science driven but politically conscious. The principal audience would be GWIC and the broader community itself: i.e., the purpose of the document would be to help GWIC and the field understand the possibilities and, thus, enable both to move forward toward creating its own future.
- 6.2. Several GWIC members urged that such a study group should include a significant number of younger researchers, representative of those whose future this process will be the initial steps in defining.
- 6.3. *Action: Hough will organize a study group that will be charged with collecting and summarizing the technologies and proposals for advanced detectors (both interferometric and acoustic, and both ground- and space-based) beyond Advanced LIGO and Advanced Virgo, DUAL, and LISA. Young researchers will be involved in and play a major role in the study group.*

7. GWIC Thesis Prize

- 7.1. Finn and Whitcomb report that the International Society of General Relativity and Gravitation is willing to maintain the endowment for a GWIC-awarded thesis prize.
- 7.2. GWIC discussed how the endowment might be raised. Among the possibilities that were described were donations, either from community members or private individuals.
- 7.3. *Action: Finn and Whitcomb will proceed to set-up the GWIC Thesis prize, arranging accounting with the International Society for General Relativity and Gravitation, contacting donors and soliciting donations to build the endowment, and announcing the establishment of the prize.*