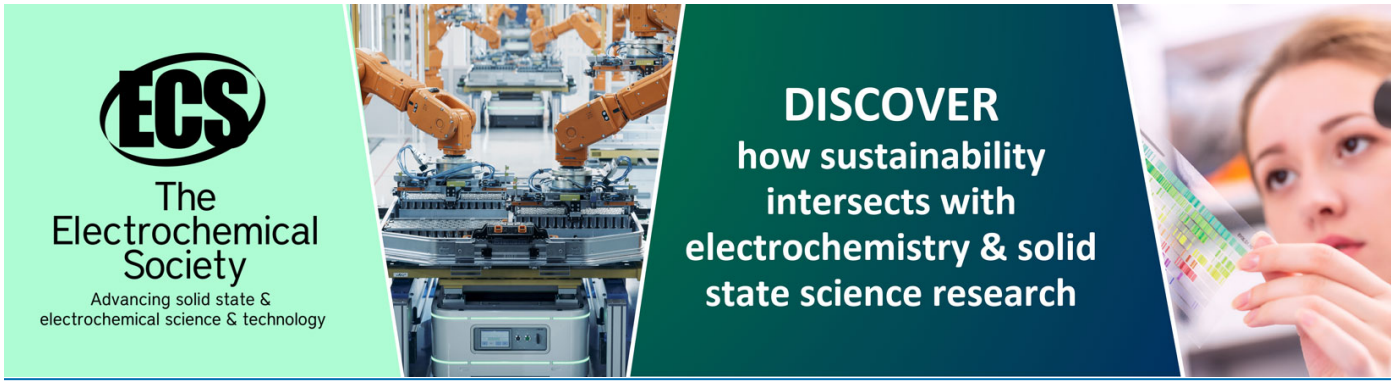
PREFACE • **OPEN ACCESS**

10th International LISA Symposium



Proceedings of the 10th International LISA Symposium
University of Florida, FL, USA
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Preface:

The LISA Symposia have become a mainstay of the gravitational wave community. Held every two years, they are the prime opportunity for our community to discuss the exciting science, technology, mission designs, and progress of the Laser Interferometer Space Antenna. The 8th LISA symposium, held at Stanford University in the summer of 2010 was the largest symposium so far and was dominated by progress and hopes that the LISA mission will soon excel following the expected launch of the LISA pathfinder (LPF), no later than 2012, and the expected prioritization by the Decadal survey which was released 6 weeks later. The following years were challenging. Although the Decadal survey ranked LISA very high, NASA's budget issues, mostly due to the cost increase of the James Webb Space Telescope, and continued delays in LPF put too much stress on the LISA project and it officially ended in 2011. The LISA International Science Team (LIST), the core group of LISA scientists and technologists, was dissolved and the community in the U.S. was struggling to maintain cohesion.

In the wake of these events, ESA started a new selection process for their next three large missions, L1, L2, and L3, and the European LISA team developed the New Gravitational wave Observatory (NGO), an evolved LISA concept, as an ESA only L1 candidate. A few weeks before the 9th LISA Symposium, held in Paris in May 2012, ESA announced its decision to select JUICE, a planetary mission to Jupiter and its moons, as its next large science mission (L1). Despite having the highest ranked science case, NGO was not selected due to further delays in LPF and the general feeling outside the GW community that the technology is perhaps too challenging to be pulled off in time for the L1 launch in 2022. Many U.S. members of the LISA community cancelled their travel plans and the mood at that symposium ranged from resignation to defiance. Hope for a somewhat timely launch of a LISA-like mission rested upon L2, the next large mission in Europe, and a potential comprehensive technology development program followed by a number one selection in the 2020 Decadal Survey in the U.S.

The selection of L2 was combined with the selection of L3 and the newly formed eLISA consortium submitted an updated NGO concept under the name eLISA, or Evolved LISA, to the competition. It was widely believed that the launch date of 2028 for L2, would be seen by the selection committee as providing sufficient time to retire any remaining technological risks for LISA. However, the committee selected the 'Hot and Energetic Universe', an X-ray mission, as the science theme for L2 and the 'Gravitational Universe', the eLISA science theme, for L3. Although very disappointed, it was not a surprising decision. LPF did experience further delays just prior to and during the selection process, which may have influenced the decision.

The strong technology program in the U.S. never materialized because WFIRST, the highest priority large mission in the 2010 Decadal following JWST, not only moved ahead but was also up-scoped significantly. The L3 selection, the WFIRST schedule, and the missing comprehensive technology development in the U.S. will make a launch of a GW mission in the 2020s very difficult. Although many in the LISA community, including ourselves, did not want to accept this harsh reality, this was the situation just prior to the 10th LISA symposium. However, despite all of this, the LISA team is now hopeful!

In May of 2014 the LISA community gathered at the University of Florida in Gainesville to discuss progress in both the science and technology of LISA. The most notable plenary and contributed sessions included updates on the progress of LISA Pathfinder, which remains on track for launch in the second half of 2015(!), the science of LISA which ranges from super-massive black hole mergers and cosmology to the study of

compact binaries within our own galaxy, and updates from other programs that share some of LISA's science or technology. Plenary talks from the pulsar timing and ground-based laser interferometer groups told of the reasonable expectation of gravitational wave detection within the next 4 to 8 years. We also heard about the GRACE Follow-on mission, which will demonstrate a precision laser ranging system in space in 2017, using technology that is somewhat similar to that of LISA. Presentations on the Large Synoptic Survey Telescope, Athena, the Cherenkov Telescope Array, and WFIRST provided data on the landscape in which LISA will live in the 2030s.

Beyond the 10th symposium there is much to look forward to. There is high-expectation that LISA Pathfinder will launch in 2015, prior to the 11th symposium in Zürich, which, for the first time, will be dedicated to the results of LPF and not its preparation. Ground-based gravitational wave observatories, especially Advanced LIGO, are rapidly approaching their required sensitivities and could make the first direct detection before the 12th LISA symposium. Advanced VIRGO and KAGRA, and the pulsar timing community are also hopeful that they will reach the required sensitivity within this decade or shortly thereafter. These events will dramatically improve the perception of gravitational wave science by the broader astronomy and astrophysics communities. The U.S. LISA team is also embolden by the announcement that NASA is now planning to join ESA in the gravitational wave L3 mission as a junior partner and will begin funding a technology development program to support this partnership. A space-based gravitational wave mission is inevitable.

At the time of the 10th LISA Symposium, it was not clear if the gradient of LISA's trajectory was perceived as positive or negative. But in hindsight, 2014 will hopefully be seen as a time when LISA regained some of the ground recently lost and began accelerating towards launch.

Acknowledgements:

No conference of the size of a LISA Symposium is organized by a single person. It always requires many helping hands, thinking heads, and the always welcome and badly needed financial support. We gratefully acknowledge the financial support from the Alachua County Tourist Development Council; although the associated paperwork looked initially like an insurmountable obstacle, it turned out to be fairly straightforward and simple thanks to the help of Nancy Fisher and John Pricher in the county office. We also appreciate the generous support from the Florida Space Grant Consortium. There probably has never been a LISA Symposium which did not receive financial support from the Albert Einstein Institute in Germany or a large gravitational wave meeting in the US without support from the LIGO Lab. We highly appreciate and acknowledge their support. The entire University of Florida shared the honor (and some of the financial burden) to host the symposium; financial support was provided by the Institute of High Energy Physics and Astrophysics (IHEPA), the Departments of Physics and of Mechanical and Aerospace Engineering, the College of Liberal Arts and Sciences, and the Office of Sponsored Research. Still, the cost per participant including travel and hotel is always high and we appreciate the support all participants received from their respective funding agencies and the tax payers who continue to invest money into our dreams.

We also like to thank the international organizing committee who provided us with invaluable advice during the organization of the scientific program of the symposium. Our local organizing committee, Steve Eikenberry, David Tanner, Cliff Will and Bernard Whiting, helped in more ways we can list here and this includes the food and wine selection during the banquet. Representative of all graduate students, we like to thank in particular Anh Nguyen, Taiwo Olatunde, Andrew Chilton and Ryan Shelley for their help. We know that many other students provided much needed additional help but we can't list you all; in some

cases a student from another group might even have jumped in when needed and we don't even know. We are very grateful to all of you. You are the future.

Last but not least, this would have been impossible without the help of the two VIPs in the Department of Physics: Janet Germany and Kristin Nichola. There is no way we would have taken this on without you.

Giacomo Ciani, John W. Conklin, Guido Mueller