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G. Auger, P. Binétruy and E. Plagnol, eds.


# Introduction to the 9th LISA Symposium

K. Danzmann
*Max-Planck-Institut für Gravitationsphysik, Hannover, Germany.*
*Leibniz Universität , Hannover, Germany.*

LISA 9 in Paris was a very special event, not just because it was in Paris and brilliantly organized, but also because of two other reasons: LISA 9 happened almost exactly 20 years after the first LISA proposal was written in 1992 and LISA 9 happened in the year of the L1 large mission selection by ESA, even though that selection did not quite go as we expected.

Twenty years ago, in 1992, in Huerta Grande in the Chilean mountains, an international group of scientists gathered for the 13th International Conference on General Relativity and Gravitation (GR 13). That was a time when work on the large ground-based gravitational wave detectors had just started, and, after early studies in the 80s, the time was right to make a move into space. During that conference, a small group of enthusiasts decided to prepare the first LISA proposal in response to ESAs M3 call for medium mission proposals. In the M3 proposal, LISA had two arms and four spacecraft, but in 1995, LISA was proposed again as a Cornerstone mission with six spacecraft and three arms. From the beginning, LISA has always been entertained by a truly international and self-appointed science team and it was this LISA Study Team that in 1997 came up with the concept of a joint ESA/NASA LISA mission with 3 spacecraft in heliocentric orbit that has been the baseline ever since. Even though many variants of the 1997 LISA mission have been studied in the meantime, it has become customary to use the trademark LISA mission or LISA-like mission for any gravitational wave detector in space that uses laser interferometry on million kilometer baselines between drag-free spacecraft in heliocentric orbit. After further refinement by the LISA Study Team, the two agencies ESA and NASA finally reached agreement in August 2004 (the August Agreement) to implement LISA as a joint mission in equal partnership. Mission Formulation with industrial support began in January 2005 and, by the time of the Mission Consolidation review at the end of 2010, produced a well-consolidated mission with 6540 pages of documentation.

Then, in the Spring of 2011, it became obvious that NASA would not have the budget for a major participation in any of the proposed joint large missions with ESA on a time scale of at least a decade. ESA decided to launch a rescoping exercises for LISA, IXO and Laplace, the three large missions under consideration for L1, the next launch slot for a large mission in ESAs program. All three of these were originally foreseen to be carried out in equal partnership between ESA and NASA. The goal of this exercise was to rescope these missions to be carried out as European-only, within the budget envelope of an ESA L mission, with payload contributions by the ESA member states.

While at first this seemed like a daunting task, it quickly became apparent that after some bold measures this was actually possible and the result of this rescoping

is the mission concept officially called NGO by ESA, whereas the scientists usually referred to it as eLISA, for evolved LISA. This concept is relying on 3 spacecraft with 20 cm telescopes forming a two-arm interferometer with 1 million kilometer armlength in a heliocentric slow drift away orbit. It was a great relief to the LISA team to see that even this drastically rescoped LISA mission retained most of the fascinating science of the original LISA. A lot of these study results are presented in these proceedings.

With the rescoping exercise being so successful, the LISA team went in good spirits into the ESA L1 mission selection process in 2012. But in April 2012, ESAs Space Science Advisory Committee (SSAC) recommended differently, and in June 2012 the SPC of ESA selected Juice, the rescoped Laplace, a mission to Jupiter, as the L1 mission to be launched in 2022. It is widely known that the SSAC unanimously voted NGO/eLISA to be scientifically the most interesting mission, but nevertheless decided in favor of Juice, because of the perceived higher programmatic and technological risk of NGO. This was a disappointing setback, but not a disaster. LISA Pathfinder, the technology demonstrator mission for LISA, is making good progress towards launch. After a successful LISA Pathfinder flight most of the LISA hardware will be available off the shelf. And with the LISA science case continuing to grow even further, it will be hard to beat a LISA mission when it comes to the selection of L2, ESAs next large mission, maybe as early as 2015. To prepare for this, the European partners have formed the eLISA Consortium as a single point of contact for the agencies. The eLISA Consortium will continue to evolve the LISA mission and optimize it for the L2 selection.

It may even turn out to be an advantage that the LISA launch will take place later. In the US, the LISA community is reorganizing and NASA has sponsored a comparative study of low-cost gravitational wave observatory missions, comprising LISA-like and non-LISA like concepts. This work is now continued in the NASA-appointed Gravitational Wave Science Analysis Group (GWSAG). It is hoped that NASA will be able to make a contribution to a future ESA L2 LISA mission on the order of 10-20%, a contribution that is explicitly welcomed by ESA. And finally, there is now growing interest in space-based gravitational wave detection in China, and, for the first time, there was a large Chinese group of scientists participating in LISA 9. It is not unlikely that on the timescale of an L2 mission opportunity, a Chinese contribution might become reality.

LISA science and technology is fascinating and the science case has been ever growing in the last two decades. These proceedings are a snapshot of the status of LISA in 2012 and with the joint spirit of the international LISA community we will make LISA a reality. We can look forward to a successful LISA Pathfinder launch and a selection of LISA as an ESA L2 mission with international participation.