Charter for
The L3 Study Team for NASA participation in the
ESA-led L3 Gravitational Wave mission
December 7, 2015

1. Preamble

The purpose of the 'L3 Study' is to understand how NASA might participate in ESA's L3 gravitational wave mission to inform NASA's engagement through the mission's earliest stages and to prepare for the 2020 decadal survey.

This study is motivated by the recommendation for a NASA-led new start of LISA in *New Worlds, New Horizons in Astronomy and Astrophysics (the 2010 decadal survey),* and by NASA's decision, described in the *Astrophysics Implementation Plan*, to participate as a minority partner in an ESA-led gravitational wave astrophysics mission. This study, which was endorsed by the NAC's Astrophysics Subcommittee in fall 2015, will draw on the extensive study of LISA and other gravitational wave mission concepts, to understand how NASA might participate as a minority partner in ESA's L3 gravitational wave mission.

2. Structure of the L3 study

Phase 1 (FY16-17): Analyze the options for NASA participation in the L3 mission and work with the European L3 consortium on proposals to ESA.

Phase 2 (FY17-18): Prepare a report to the 2020 decadal survey on NASA's participation, including possible options, in the L3 mission as a minority partner.

This document focuses on the Charter for Phase 1. As more technical and programmatic information becomes available in the next year, and after the ESA's Mission AO release, details for Phase 2 will be added to this Charter.

3. The L3 Study Team

3.1 Phase 1 Statement of Work

Working with the NASA L3 Study Office within the Physics of the Cosmos Program Office at NASA Goddard Space Flight Center (GSFC), the L3ST shall provide the following:

- Analysis of potential NASA hardware contributions to L3;
- Assessment of the technology development needed for potential NASA hardware contributions to L3 including cost and schedule;
- Assessment of their total delivery cost, science, and risk consequences;
- Analysis of benefits from full participation in L3 science; and
- Participation in the European L3 consortium as representatives of the U.S.

gravitational wave astrophysics community and of NASA's interest in the L3 mission and payload.

The L3ST will leverage existing strategic documents such as the GW Technology Roadmap, the 2012 Community Study Team report, progress reports from funded technology development activities, and the interim GOAT report to identify and analyze NASA's hardware contributions within the nominal cost cap of $100-150M.

The L3ST will assume a LISA-like laser interferometry mission, as recommended for implementation for L3 by the GOAT, with the main mission variables for study including number of links and arms (likely 3 arms/6 links and 2 arms/4 links) and arm length (which necessarily relates to telescope size and laser power). Other mission configurations will not be studied for Phase 1.

3.2 Deliverables and Timeline

The main deliverable of the L3ST during Phase 1 will be:

- An interim debrief to NASA Astrophysics Director ~3 months after the start of the L3 study to describe the L3ST's work plan including objectives, milestones, schedule, etc., and
- A Phase 1 report, due to NASA no later than September 2016 (TBR), to describe work to date and adjustments to the plan in response to ESA's L3 mission formulation activities including plans for U.S. participation in the European L3 consortium's activities. This report will be the starting point for further work to be done in Phase 2.

3.3 Organization and Functions of the L3ST

i. The L3 Study Office at GSFC will manage the L3 study. The Study Office will perform the technical and cost assessments in response to the L3ST as appropriate. The L3ST will provide scientific input and parameters for the technical assessments. The L3ST will be responsible for the study's outcomes (reports).

ii. The L3ST may seek input from scientists and technologists external to the L3ST or utilize existing NASA analysis groups (PAGs and associated SIGs); albeit permission is not required, the L3ST will inform the Study Office and the NASA HQ L3 Program Scientist when utilizing external input. Any scientific inputs and discussions needed by the Study Office should flow through the L3ST only. The Study Office may seek internal technical perspectives from NASA scientists for help in developing mission concepts based on the findings of the L3ST. The L3ST Chair(s) will act as the official point of contact between the L3ST members and NASA HQ and the Study Office for any issue of programmatic, technical, or budgetary nature.

iii. The initial meeting of the L3ST will occur on a schedule determined by the Chair(s) in consultation with the NASA HQ L3 Program Scientist, L3 Program Executive, and the L3 Study Office. The L3ST will also have phone-in meetings

on a regular basis. Meetings will be called by the L3ST Chair(s), and the agendas will be set by the Chair(s) in coordination with NASA HQ and the L3 Study Office to ensure that planned activities are aligned with programmatic needs and expectations.

iv. All meetings of the L3ST are open to nonmembers as observers subject to export control restrictions.

v. Ex-officio observers, including from partner Agencies, appointed with NASA HQ concurrence, are allowed to attend L3ST meetings subject to export control restrictions.

vi. All reports and other output of the L3ST studies will be made publicly available subject to export control restrictions.

vii. Financial support for travel only will be provided by NASA to the L3ST members through the Study Office.

4. Points of Contact

The NASA HQ point of contact for the L3 study is the L3 Program Scientist, Dr. Rita Sambruna, Rita.M.Sambruna@nasa.gov, office phone 202-385-2166.

The L3 Study Scientist in the GSFC L3 Study Office is Dr. Robin (Tuck) Stebbins, Robin.T.Stebbins@nasa.gov, office phone 301-286-3642.

The L3 Study Manager in the GSFC L3 Study Office is Steven Horowitz, Steven.J.Horowitz@nasa.gov, office phone 301-286-4620.