

MEMORANDUM OF AGREEMENT

Regarding collaboration in the scientific exploitation of data acquired with the Large Synoptic Survey Telescope (LSST) by specified Principal Investigators (PI) and scientists in Brazil as per contributions to the LSST fiber optic networks connecting South America and North America during LSST survey operations.

BETWEEN

LABORATORIO INTERINSTITUCIONAL DE E-ASTRONOMIA
hereinafter referred to as “LineA”

AND

LABORATORIO NACIONAL DE ASTROFISICA
hereinafter referred to as “LNA”

AND

REDE NACIONAL DE ENSINO E PESQUISA
hereinafter referred to as “RNP”

AND

ACADEMIC NETWORK AT SAO PAULO
hereinafter referred to as “ANSP”,

AND

AMERICAS PATHWAYS
hereinafter referred to as “AMPATH”,

AND

THE LARGE SYNOPTIC SURVEY TELESCOPE CORPORATION,
a United States 501(c)3 non-profit corporation
incorporated in the State of Arizona
hereinafter referred to as “LSSTC”,

AND

**THE LARGE SYNOPTIC SURVEY TELESCOPE PROJECT OFFICE
OF THE ASSOCIATION OF UNIVERSITIES FOR RESEARCH IN ASTRONOMY**
hereinafter referred to as “LSSTPO”,

all hereinafter referred to collectively as “the Parties” or individually as “the Party.”



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RECITALS

WHEREAS the LSSTC is a not-for-profit corporation established as a consortium of universities, United States national laboratories and other organizations to develop the LSST project and to raise private and federal funding, principally from United States agencies, to support LSST, and

WHEREAS the LSST Project is being developed by the LSSTPO in order to advance the science of astronomy and physics, and

WHEREAS LSSTC wishes to enter into agreements with international institutes (hereinafter called "Affiliates") for partial support of LSST observatory operations costs, and for the mutual scientific benefit of all parties, and

WHEREAS the Research Units of the Brazilian Ministry of Science, Technology and Innovation (MCTI) here represented, LNA, and RNP, have a fundamental interest in the scientific mission of the LSST and have indicated their commitment to support operations of the LSST, and also the participation of scientists from different Brazilian institutions covering a wide spectrum of scientific topics,

WHEREAS LIneA is responsible for the development of software tools of interest to LSST, and has previously signed a technical collaboration agreement with LSST's data management team,

WHEREAS LNA has an interest in exploiting LSST data for scientific purposes and, in conjunction with LIneA, has explored alternatives for Brazilian participation in LSST,

WHEREAS RNP has supported the deployment and operations of fiber optic networks supporting research in South America and collaboration with researchers in North America,

WHEREAS ANSP has supported the deployment and operations of fiber optic networks supporting research in South America and collaboration with researchers in North America,

WHEREAS AMPATH has supported the deployment and operations of fiber optic networks supporting research in South America and collaboration with researchers in North America,



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The Parties Understand and Agree As Follows:

Article 1 Purpose

The purpose of this MOA is to enable participation by specified Principal Investigator (PI) scientists in the scientific exploitation of data and data products produced by LSST before and during its operations phase and to specify the terms of the contributions made by RNP and ANSP to the LSST fiber optic networks connecting South America and North America during the survey operations of the instrument. For purposes of this document, Principal Investigators are senior scientists with long-term positions at Brazilian research institutions.

Article 2 Contribution and Financial Agreement

The Brazilian parties commit to provide data links over certain optic networks for LSST use during operations, and AMPATH commits to provide the Brazilian parties with access to spectrum on the Monet submarine cable¹ as well as rights to Brazilian PI scientists:

- ANSP commits to continued funding of deployment and operations of fiber optic networks connecting North and South America, in collaboration with AMPATH, at current levels through the end of 2032. ANSP will be granted control by AMPATH of 100 GHz of spectrum on the Monet cable from Santos, Brazil, to near Boca Raton, FL, from when this cable becomes operational. The operations of this spectrum will be addressed through a separate MOA;
- RNP commits to provide a Sao Paulo - Santiago data link with a total capacity of 2 x 100 Gigabits per second (Gbps) by the start of LSST commissioning (September 30, 2019), including 100 Gbps committed for LSST, and an additional 100 Gbps available for brief bursts, through September 30, 2032. RNP will be granted control by AMPATH of 100 GHz of spectrum on the Monet cable from Santos to near Boca Raton, FL, from when this cable becomes operational. The operations of this spectrum will be addressed through a separate MOA.

The net ANSP and RNP contributions have been assigned a total value of \$2,150,000 in 2013 US dollars. This valuation is based on an assessment of the additional US operations costs required to provide additional alert processing capability, should this be deemed necessary for operational reliability, rather than the net cost to ANSP and RNP on increased bandwidth to the US.

The LSST Board of Directors has approved the policy granting data rights for a total of \$200,000 (in 2013 US dollars) for each identified Principal Investigator (PI), plus any incremental costs of accessing the data at LSST Data Access Centers. Contributions are designated for the support of LSST operations, commencing no later than the beginning of LSST commissioning and continuing through end of the nominal LSST operations phase. **On this basis**, the ANSP and RNP contributions, assigned as a total value of \$2,150,000 (2013 USD) would permit ten (10) such PIs within Brazilian research institutes with the rights as defined in Article 4, including incremental costs of accessing the data at LSST Data Access Centers.

¹ [https://en.wikipedia.org/wiki/Monet_\(submarine_cable\)](https://en.wikipedia.org/wiki/Monet_(submarine_cable))



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This commitment by ANSP and RNP is contingent on the availability of funds to those parties and upon the success of the LSST Project in obtaining United States federal funding for construction and operations and in obtaining concurrence by U.S. federal agencies to this agreement.

Article 3 Personnel and Their Assignment

In exchange for the above contributions, the Brazilian parties will identify a group of ten (10) PI scientific staff that will be active participants in the scientific exploitation of the LSST database. The staff so identified will have benefits equivalent to U.S.-based collaborators, including full access to LSST survey data and data products. PIs will be selected by a committee appointed jointly by LIneA and LNA, and announced by the Brazilian Astronomical Society (SAB), from proposals following an Announcement of Opportunity submitted by interested parties within Brazilian research institutions.

The list of Principal Investigators and their associated junior researchers (see Article 4) shall be updated by LIneA and LNA on an annual basis with written notice given to LSSTC. This MOA only allows for a maximum of ten (10) identified PIs at any time up until the end of LSST operations. Additional PIs would require the execution of a separate MOA. If due to unforeseen circumstances the number of identified PIs drops below ten (10), it is expected that RNP, ANSP, and LIneA will continue to honor their original obligations.

Article 4 Rights of Principal Investigators

Upon execution of this MOA, starting during the LSST construction phase each identified PI will be entitled to: (i) have full access to LSST simulated data and to data products produced through processing of the simulated data; (ii) attend at their own expense LSST meetings open to U.S. and Chilean scientists who are directly participating in the LSST project.

During LSST operations, each identified PI shall: (i) have full access to LSST image data, daily release catalogs, and annual data release catalogs, equivalent to U.S. and Chilean scientists; (ii) have access to LSST-operated Data Access Centers equivalent to what is provided to U.S. and Chilean scientists, with the same privileges and responsibilities conferred; and (iii) have access to products prepared for Education and Public Outreach activities.

The rights above of each PI shall be extended to up to four (4) junior researchers working under the supervision of the PI. The junior researchers can be any mixture of graduate students and postdoctoral researchers, with the restrictions that: (i) the mix shall include no more than three (3) postdoctoral researchers at any given time; and (ii) the junior researchers must be present at and associated with the Brazilian institution.

If a PI or any of his/her junior researchers leave his/her institution and joins an institution outside Brazil, all of the above rights thereupon become null and void for the person who leaves. As noted above, if the PI leaves after the start of LSST commissioning, this does not alter the financial commitment to LSSTC as defined above.



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Article 5 Responsibilities of Principal Investigators

At no time may PIs or their junior associates: (i) redistribute LSST data, data products, or their own derived catalogs for a sizeable fraction of the LSST survey beyond their postdoctoral and graduate students and other authorized users, except in summary form as part of a scientific publication in the open literature; (ii) apply for additional computational resources at U.S. sponsored LSST-operated Data Access Centers except in collaboration with a U.S. scientist as PI on the proposal or unless financial arrangements have been made to support those computational resources; or (iii) make third party agreements to redistribute or reassign LSST data and access rights that are provided to the PI through this MOA.

Article 6 Effective Date and Duration

This MOA will be effective from the dates set forth below and remain in full force and effect through the end of the LSST survey operations or until it is superseded by an amendment, replaced by a new MOA, or terminated.

Possible support and data access for an extended LSST mission phase (additional telescope operations and/or data processing) would be the subject of future negotiation.

Article 7 Implementation Plan

This MOA is a statement of principles governing the relationship between the LSSTC and LIneA, LNA, RNP, ANSP, and AMPATH. It will be followed by an Implementation Plan that covers specific arrangements including such items as:

1. Names of PIs and their scientific interests;
2. Expected type of engagement during the survey (access to catalog data only; creation of local data access center, etc.);
3. Ramp-up plan of the ANSP and RNP networks for LSST prior to the start of its full operation and commencing no later than the beginning of LSST commissioning. The "commissioning date" used throughout the MOA is always the estimated commissioning date as written in the MOA implementation plan.

Article 8 Assignment

This MOA shall inure to the benefit of and shall be binding upon the respective successors and assigns of the parties hereto, but may not be voluntarily assigned in whole or in part by any of the parties without the prior written consent of the others. However, this MOA may be assigned to a third party should LSSTC be succeeded by some other organization to raise and manage international funds for LSST operations.

Article 9 Termination

The Brazilian partners who are signatories of this MOA may terminate this MOA upon two years' prior written notice to LSSTC. All Brazilian signatories must sign the written notice for termination. All rights received under the terms of this MOA will be forfeited upon termination.



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Should the Brazilian partners fail to deliver the full contribution as described in Article 2, LSSTC shall have the right to restrict the number of authorized Principal Investigators and their associates as defined in Article 3, to a number less than 10 and proportional to the contribution value as assessed by LSSTC.

LSSTC shall have the right to terminate this MOA at any time for any of the other parties' default by notifying such party in writing. If LSSTC so desires, the defaulting party shall have thirty (30) days after the receipt of written notice of the nature of the default, to correct the same, before such termination is given by the non-defaulting party.

Any party shall have the right to terminate this MOA at any time prior to the start of LSST commissioning upon 1 year prior written notice to the other parties.

Article 10 Settlement of Disputes

In the event of any dispute or difference arising out of the interpretation or implementation or application of the provisions of this MOA, the Parties shall settle it amicably through consultation or negotiation that may result in appropriate amendments to this MOA.

IN WITNESS WHEREOF:

The undersigned authorized institutional representatives have executed this Memorandum of Agreement

FOR LSSTC:

SIGNATURE:



NAME: David MacFarlane

TITLE: Chair of the Board

Date: 9/14/15

FOR LSSTPO:

SIGNATURE:

NAME: Dr. Steven Kahn

TITLE: Director

Date: Steven M. Kahn

FOR LNA:

SIGNATURE:



NAME: Dr. Bruno Castilho
BRUNO VAZ CASTILHO DE SOUZA

TITLE: Laboratório Nacional de Astrofísica
PO/MCT 347/11 E 407/06

Date: July 27 2015

FOR LIneA:

SIGNATURE:



NAME: Dr. Luiz Nicolaci da Costa

TITLE: LIWEA COORDINATOR

Date: July 17 2015



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FOR ANSP:
SIGNATURE:

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NAME: Dr. Luis Fernandez Lopez
TITLE: Principal Investigator
Date: August, 12th 2015

FOR RNP:
SIGNATURE:

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NAME: Nelson Simões da Silva
TITLE: Director General
Date: 20/08/2015

FOR AMPATH:
SIGNATURE:

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NAME: D.A. Chip Cox, III, Ph.D
TITLE: Research Asst. Professor, Department of
Physics and Astronomy, Vanderbilt University
Co-Principal Investigator and International Lead for
AMLIGHTFIU

Date: 25/4/15



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