

D R A F T

Thursday, January 07, 1999

MEMORANDUM OF UNDERSTANDING

between

The National Science Foundation of the United States of America

and

The European Co-ordination Committee of

European Southern Observatory

Centre National de la Recherche Scientifique

Max-Planck-Gesellschaft

Netherlands Foundation for Radio Astronomy

United Kingdom Particle Physics and Astronomy Research Council

**Concerning the design, development, construction, and operation of a millimeter-wave
interferometer on the Llano de Chajnantor, Chile, to be known as the Large Millimeter
Array**

7 January, 1999

**MEMORANDUM OF UNDERSTANDING:
DESIGN AND DEVELOPMENT OF A LARGE MILLIMETER ARRAY**

Resolution:

In common recognition of:

- The scientific potential of a synthetic aperture array telescope capable of precision imaging of astronomical objects at millimeter and submillimeter wavelengths;
- The interest of our scientific communities in developing such an instrument;
- The necessity to locate the instrument at a high altitude site above most of the atmospheric water vapor that degrades the performance of the instrument and distorts its images;
- The identification of a suitable telescope site in an undeveloped region of the Altiplano in northern Chile;
- The need to develop the site and design the technology for the array to take greatest scientific advantage of the site;
- The advantages of sharing the design and development effort necessary to make the array a reality

the National Science Foundation of the United States of America, hereinafter known as the NSF, and the European Coordinating Committee, hereinafter known as the ECC, and representing

the European Southern Observatory, hereinafter known as ESO;
the Centre National de la Recherche Scientifique, hereinafter known as CNRS;
the Max-Planck-Gesellschaft, hereinafter known as the MPG;
the Netherlands Foundation for Research in Astronomy/Nederlandse
Onderzoekschool Voor Astronomie, hereinafter known as NfRA/NOVA;
and the United Kingdom Particle Physics and Astronomy Research Council,
hereinafter known as PPARC,

hereby resolve to establish an organization to design, build, and operate a millimeter-wavelength interferometer on the Llano de Chajnantor in the Republic of Chile, to be called the Large Millimeter Array (LMA).

NSF and the ECC, hereinafter referred to as “the partners”, agree as follows:

Article 1

Scope and Purpose

- 1.1 That the partners will use their best efforts to obtain approval and all necessary funding for their joint collaborative participation in the LMA project, to develop, design, build, own, and subsequently operate a millimeter-wave interferometer to be situated on the Llano de Chajnantor in northern Chile.
- 1.2 That for reference purposes in this agreement the LMA shall be assumed to consist of 50 antennas, each 12m in diameter and coupled to a high-speed digital correlator; each antenna shall be equipped with dual channel cooled receivers to cover each atmospheric frequency window from approximately 30 GHz to 900 GHz. The cost of the LMA is estimated to be approximately \$400M in FY 1998 U.S. dollars.
- 1.3 That the final configuration and cost of the LMA shall be established at a later date, by mutual agreement (**Article 11**) between the partners.
- 1.4 That the partners recognize the potential interest of Japan in further expanding the capabilities of the LMA, and resolve to work toward an ultimately tripartite partnership if that opportunity presents itself.

Article 2

Period of Applicability

- 2.1 That it will remain in effect through the design and development phase of the LMA project, until June 2001;
- 2.2 That upon approval of both the NSF and the ECC's member bodies to embark upon construction of the LMA, this MOU will automatically pertain to both the construction and operation of the array.

Article 3

Underlying Principle of Allocation

- 3.1 That to confer full intellectual and economic benefits to the partners, there should be a fair and equitable division of responsibilities and benefits consistent with their material contributions and with the timely and cost-effective execution of the project, and with the timely and cost-effective support of LMA operations.

Article 4

Resource Allocation and Limitations

- 4.1 That the partners will seek the resources necessary for them to contribute equally to the total cost of constructing the LMA and to the annual operations costs as well.
- 4.2 That the total cost of construction the LMA shall be understood to include buildings in Chile, site infrastructure, services, and instrumentation.
- 4.3 That, insofar as possible, contributions to the project shall be valued in terms of delivered hardware, and that currency contributions be valued as agreed to in the project Agreement (**Article 11**).
- 4.4 That, consistent with the instructions of the U.S. National Science Board, the total cost to the United States not exceed 80% of the total cost estimated by NRAO for the U.S.-only Millimeter Array Project, as specified in the cost estimate delivered to NSF no later than April 1999.

Article 5

Telescope Time Allocation

- 5.1 That the allocation of observing time on the LMA should recognize the interests of Chilean astronomers, and that, therefore, according to the agreements currently in force between the U.S. and European representatives of the project and the University of Chile, Chilean astronomers shall receive 10% of the LMA's observing time.
- 5.2 That, subject to the financial contributions being as described in **Article 4**, the remaining observing time be divided equally amongst the partners
- 5.3 That, in the event that the partners' relative contributions to the LMA project differ from those described in **Article 4**, observing time should be allocated proportionally to those contributions, after 10% of the total time has been reserved for Chilean astronomers.

Article 6

LMA Project Board

- 6.1 That the partners will establish an LMA Project Board, hereinafter known as “the Board”.
- 6.2 That the Board shall comprise 2 members appointed by NSF and 2 members appointed by the ECC; in addition, there will be one member representing the interests of the Republic of Chile, appointed by the Comision Nacional de Investigacion Cientifica y Tecnologica (CONICYT).
- 6.3 That each partner designate a single Board member with authority to speak for that partner.
- 6.4 That the Board will be:
 - (a) charged with the governance of the project in both its construction and operations phases. After construction is complete, the Board shall be redesignated the LMA Observatory Board.
 - (b) responsible for reviewing and approving
 - (i) the annual budget for the project, ideally to be split 50/50 between the partners.
 - (ii) initiatives, opportunities, or special needs brought to its attention by the Project Director (*e.g.*, for new hardware).
 - (iii) the appointment and performance of the Project Director, as well as the conditions and terms of that appointment.

Article 7

Project Office and Director

- 7.1 That the LMA Project Office shall be located in the U.S. and established by the NRAO. The Project Office will function within the NRAO.
- 7.2 That the Project Office shall provide the overall management of construction, and later, the operation of the LMA.
- 7.3 That during the design and construction phases of the LMA project, the Project Director will be an employee of the NRAO, to be nominated by AUI after consultation with the ECC. The Project Director’s appointment must be confirmed by the LMA Board.
- 7.4 That the Project Director will be assisted by two deputies, the U.S. Project Manager and the European Project Manager.

- 7.5 That the Project Director has the responsibility to coordinate and manage the efforts of the U.S. Project Office and the European Project Office by assigning tasks to the two offices as necessary.
- 7.6 That after LMA operations commence, the Directorship will rotate every 5 years between candidates proposed by AUI and the ECC. The first LMA Observatory Director will be an ECC candidate.
- 7.7 That the Project Director's performance will be subject to annual review by the Board.
- 7.8 That the staff of the Project Office will consist, as far as possible, of equal numbers of individuals seconded to the Office by NRAO and the ECC's member organizations.
- 7.9 That the Project Office has the responsibility to construct the Work Breakdown Structure for the project and to establish the Project Management Plan.

Article 8

Project Executives

- 8.1 That the NSF will be the primary Executive Agency to act on behalf of the partners to carry out the project through the LMA Project Office. Through its support of the LMA project, NSF will also fund the U.S. Project Office (**Article 9**).
- 8.2 That all funds supplied by NSF and other institutions to the LMA Project shall be treated as strictly separate funds, and shall in no case be used for any purposes save the LMA project.
- 8.3 The ECC will appoint a European Project Executive Agency to fund, administer, and otherwise carry out the work assigned to the European Project Office (**Article 10**).
- 8.4 That the work of the Project Office will be carried out within the NRAO, and managed for NSF by Associated Universities, Inc., the organization which presently present manages the NRAO for NSF.
- 8.5 That should NSF decide to designate another organization to mange the NRAO, said successor organization shall assume all roles of carried out by AUI within the LMA project.

Article 9

U.S. Project Office

- 9.1 That the NRAO will establish and staff a Project Office in the U.S.
- 9.2 That the U.S. Project Office will carry out those tasks assigned to it by the LMA Project Office.
- 9.3 That the U.S. Project Office shall be funded by the NSF through its cooperative agreement with AUI to support the NRAO.
- 9.4 That staff members of the U.S. Project Office shall be employees of AUI/NRAO.

Article 10

European Project Office

- 10.1 That the ECC will establish and staff a Project Office in Europe.
- 10.2 That the European Project Office will carry out those tasks assigned to it by the LMA Project Office.
- 10.3 That the European Project Office will be funded by the ECC through its contributions from participating member countries and institutions.
- 10.4. That staff members of the European Project Office shall be employees of ECC member institutions.

Article 11

Final Agreement

- 11.1 That the partners negotiate an Agreement by December 31, 1999.
- 11.2 That this Agreement will:
 - (a) specify the baseline LMA instrument, including the number of antennas to be built, their diameter, receivers, and so on.
 - (b) specify the nature and quantity of the partner for both the LMA's Design and Development and Construction phases.
 - (c) specify the organizational details of the LMA project.
 - (d) establish agreed procedures for the protection and allocation of intellectual property rights.
 - (e) specify the ownership of the LMA.

Article 12

Disclaimer

- 12.1 That this MOU is not intended to create obligations which are binding under international law.

Article 13

Lapse of MOU

- 13.1 That if the Agreement referred to in **Article 14** is not signed by December 31, 1999, this MOU will lapse unless it is extended by both partners for a further specified period.

Article 14

Effectiveness

- 14.1 That this MOU will be effective upon signature by NSF and ECC representatives.

Signed this day of 1999 by:

For ECC

For NSF