

AGREEMENT

CONCERNING THE CONSTRUCTION OF THE ENHANCED

**ATACAMA LARGE
MILLIMETER/SUBMILLIMETER ARRAY**

(ALMA)

BETWEEN

**THE EUROPEAN ORGANISATION for ASTRONOMICAL RESEARCH in the
SOUTHERN HEMISPHERE and THE NATIONAL SCIENCE FOUNDATION of THE
UNITED STATES**

and

THE NATIONAL INSTITUTES OF NATURAL SCIENCES of JAPAN

WHEREAS

- the European Organisation for Astronomical Research in the Southern Hemisphere (hereinafter ESO) is an international organisation with its headquarters in Garching, Munich, Federal Republic of Germany, dedicated to the design, construction, and exploitation of an astronomical Observatory in the Southern Hemisphere and to support and assist cooperation in astronomical research amongst its member states;
- the National Science Foundation (hereinafter NSF) is an independent agency of the United States Government whose mission is to promote the progress of science, to advance the national health, prosperity and welfare;
- the National Radio Astronomy Observatory, managed for NSF by Associated Universities, Inc. (hereinafter AUI), is dedicated to the design, construction, and operation of large radio telescope facilities for use by the scientific community;
- the bilateral ALMA project is funded in North America by the NSF in cooperation with the National Research Council of Canada (NRC), and in Europe by ESO and Spain;
- the National Institutes of Natural Sciences (hereinafter NINS) is an independent agency of the Government of Japan whose mission is to promote natural science especially in the areas of astronomy, material science, energy science, and life science, and is granted judicial personality under the special law;
- the National Astronomy Observatory of Japan (hereinafter NAOJ) is one of the divisions of NINS dedicated to astronomy and related research, and in charge of the implementation of NINS contributions to Enhanced ALMA;
- NSF and ESO have completed a Bilateral Agreement for the Construction and Operation of ALMA, signed in Washington by NSF on 7 February 2003 and by ESO on 25 February 2003, and have produced a Project Plan for ALMA, endorsed by the ALMA Board on 26 February 2003;
- the Bilateral Agreement is now being implemented, the necessary permissions and access to the land have been obtained from the Republic of Chile, and work has started on the construction of ALMA;
- ESO, NSF, and NINS recognise the scientific value of enhancing the capabilities of ALMA and enlarging the international scope of the project;
- NSF, ESO, and NAOJ have identified and agreed upon those enhancements which would be of the greatest scientific benefit;
- NINS has received funding to contribute specific enhancements to ALMA, and their scientific value has been welcomed by ESO and NSF and endorsed by the ALMA Board on 31 March 2004;
- Article 11 of the Bilateral Agreement authorizes NSF and ESO to conclude appropriate formal arrangements with organizations representing new participants in ALMA;

ESO and NSF jointly agree with NINS as follows:

ARTICLE 1: DEFINITIONS

- 1 "This Agreement" means the Articles which follow, any Annexes referred to in those Articles, and any amendments to those Articles and Annexes which have become effective.

- 2 **"The Signatories"** means ESO, NSF, and NINS.
- 3 **"Bilateral Agreement"** means the "Agreement Concerning the Joint Construction and Operation of the Atacama Large Millimeter Array (ALMA)" between NSF and ESO, signed by NSF on 7 February 2003, and by ESO on 25 February 2003.
- 4 **"ALMA"** means the bilateral project described in the Project Plan of 26 February 2003, and any subsequent updates approved by the ALMA Board;
- 5 **"Enhanced ALMA"** means ALMA enhanced as a result of the additional contributions made by NINS as set out in this Agreement;
- 6 **"Value"** has the same meaning as in the Bilateral Agreement.

ARTICLE 2: OBJECTIVE OF ENHANCED ALMA

The goal of Enhanced ALMA is to provide a single Joint ALMA Observatory in Chile based on Enhanced ALMA with additional facilities and capabilities which result directly from the NAOJ contributions and made available to the astronomical communities of Europe, North America, and Japan.

ARTICLE 3: SCOPE

1. This Agreement covers Construction only and provides the framework whereby NINS contributes to Enhanced ALMA. Through this Agreement NINS participates with ESO and NSF in the construction of Enhanced ALMA.
2. Once this Agreement becomes effective, ESO and NSF will negotiate with NINS and agree upon the details of the deliverables to be contributed by NAOJ to Enhanced ALMA, finalize their Value according to the established ALMA costing model, and the share of Observing Time to be awarded to NAOJ in return for each accepted deliverable. These negotiations will be concluded by 30 June 2005, and this Agreement shall then be amended as appropriate.
3. ESO and NSF will carry out their obligations under this Agreement under the provisions of the Bilateral Agreement, which shall take precedence over this Agreement.

ARTICLE 4: NINS PARTICIPATION IN ENHANCED ALMA

1. NINS shall carry out its obligations under this Agreement subject to its applicable national laws and regulations.
2. NINS may act through NAOJ, and may delegate such powers and responsibilities to NAOJ as it deems appropriate. Where such delegation takes place the terms of this Agreement shall equally apply to NAOJ.

Chile

3. NINS shall secure the appropriate permissions from the Chilean authorities to participate in Enhanced ALMA.
4. Except for legal issues in which the AUI, ESO, and NINS must represent themselves, Enhanced ALMA will present itself to the Chilean authorities as a single project; and AUI, ESO, and NINS will participate jointly in all interactions concerning Enhanced ALMA with the Chilean government and other authorities.
5. The land purchased for the Operations Support Facility (OSF) and the Right of Way purchased for the access road to the OSF shall remain the joint property of ESO and AUI. AUI and ESO shall ensure that NINS have the rights of access and use of the land and road.
6. The ALMA Land Concession shall remain in the name of Radioastronomy Chajnantor Ltda. (RCL), which will continue to be wholly owned by AUI and ESO. RCL and NINS shall conclude an agreement which shall provide for the exploitation the Land Concession for Enhanced ALMA. This agreement with RCL shall specify any payments to be made by NINS which shall include a proportional contribution to annual concession payments and any other corresponding charges.
7. There shall be a single ALMA Office in Santiago which shall accommodate the Joint ALMA Office (hereinafter JAO), AUI, ESO and NINS staff, and local staff employed for Enhanced ALMA. NINS shall contribute proportionately to the cost of maintaining the ALMA Office in Santiago.
8. Local staff required in Chile for the Construction of Enhanced ALMA shall be employed by or through AUI and/or ESO, and will be made available to NINS under separate agreements with AUI and/or ESO.
9. NINS agrees to install equipment and to carry out activities related to ALMA on the ALMA site after consultation with AUI and ESO and with the agreement of the JAO.

Contributions and other costs

10. The contributions made by NINS to Enhanced ALMA shall be through deliverables Valued according to the ALMA costing model. Contributions shall be deemed delivered when accepted by the ALMA Board upon the recommendation of the ALMA Director. Values obtained from the costing model may be adjusted by the ALMA Board according to the delivery schedule achieved.
11. All equipment supplied for Enhanced ALMA shall be built and supplied to ALMA technical specifications, standards and interfaces. The JAO shall be responsible for setting and maintaining project standards and shall solely be responsible for determining conformity to project interfaces and specifications.
12. The contributions to be made by NINS toward enhanced ALMA, along with their corresponding Value, are listed in Annex A, attached to this agreement.
13. Detailed specifications of the contributions to be made by NINS shall be negotiated between ESO and NSF and NINS, and referenced in an amendment to this Agreement

to be concluded between ESO and NSF on the one hand and NINS on the other no later than 30 June 2005. The amendment shall also specify the delivery schedule for the enhancements.

14. ESO and/or AUI may provide goods and services to NINS as part of Enhanced ALMA. Such goods and services shall be the subject of separate agreements, contracts, or arrangements between NAOJ and AUI/ESO, as appropriate, which shall be subject to the approval of the ALMA Director and acceptance by the ALMA Board. These goods and services, as well as their costs, shall be fully described in the amendment referenced in Article 4.13.
15. The cost of supplying such goods and services shall be paid by NINS. The Value of any contribution made to Enhanced ALMA by NINS shall not be affected by the cost of any goods or services supplied by AUI/ESO.
16. Deliverables supplied by NINS shall be the property of NINS. Material property delivered to, or developed for, Enhanced ALMA shall not be disposed of, in whole or in part, during the duration of this Agreement without the written consent of ESO, NSF, and NINS.
17. The Signatories acknowledge that exports from Japan, the United States and Europe will be subject to the requirements of applicable export regulations. Such controlled exports may involve either material or intellectual property transferred from Japan, the United States or Europe to foreign countries, foreign entities or foreign nationals for the purpose of Construction, Commissioning, Early Operations, or Operations.
18. The inventor or creator of Intellectual Property or his or her assignee or employer shall own or have the option to own all Intellectual Property arising out of the Work done pursuant to this Agreement.
19. The Signatories, as appropriate, shall provide and obtain a non-exclusive, non-transferable, irrevocable, paid-up license (1) for use in Enhanced ALMA and (2) for each of the above to use or have used on their behalf throughout the world for non-commercial research purposes of any Intellectual Property created during Work under this Agreement.
20. The Signatories will ensure that comprehensive general liability insurance is procured and maintained as appropriate.
21. Signatories shall not be liable for damages of any nature, direct or indirect, to the property of other Signatories receiving information, materials, or supplies from them, or to any third party resulting from the use by the Signatories of the information, materials, or supplies received from other Signatories.

Operations

22. A separate agreement between ESO and NSF on one hand, and NINS on the other, shall be concluded on or before 31 December 2005 to cover Early Operations and Operations of Enhanced ALMA. An outline of this agreement, reflecting the principles of NINS participation in Early Operations and Operations, shall be concluded and referenced in the amendment referred to in Article 4.13.

ALMA Board and other bodies

23. NINS shall initially appoint one observer and one member to the ALMA Board. The member shall be entitled to vote on all matters concerning the contributions of NINS to Enhanced ALMA, and on all scientific matters concerning Enhanced ALMA. This entitlement shall be reviewed in the amendments and agreements referenced in Article 4.13 and 4.22, with the expectation that NINS representation shall increase in accordance with the agreed schedule of delivery.
24. NINS may appoint up to two observers to the ALMA Management Advisory Committee (AMAC), and up to three members to the ALMA Science Advisory Committee (ASAC).

ARTICLE 5: OBSERVING TIME

1. NINS shall be awarded Observing Time in proportion to the Value of the contributions made to Enhanced ALMA and accepted by the ALMA Board. NINS shall be awarded a share of Early Observing Time according to the planned schedule of deliverables and their Value. The details will be specified in the amendments and agreements referenced in Articles 4.13 and 4.22.
2. The Observing Time available during Early Operations and Operations shall be allocated by the ALMA Director in accordance with policies and procedures determined by the ALMA Board as specified in Article 15.5 of the Bilateral Agreement.

ARTICLE 6: AMENDMENT

This Agreement may be amended at any time. An amendment of this Agreement or its Annexes must specifically state the intention to amend this Agreement and shall become effective when signed and dated by NSF, ESO, and NINS.

ARTICLE 7: DURATION AND TERMINATION

1. This Agreement shall become effective when it has been signed and dated by ESO, NSF, and NINS.
2. This Agreement will terminate upon the completion of Enhanced ALMA, or otherwise by mutual agreement between the Signatories.

ARTICLE 8: DISPUTES

This Agreement is not intended to create binding obligations under international law. The resolution of any disputes regarding the interpretation, implementation or application of this Agreement shall be sought by consultation between the Signatories.

ARTICLE 9: AUTHENTIC TEXTS

1. English shall be the working language of Enhanced ALMA.
2. This Agreement is signed in three original versions in English, all being authentic and of equal validity.

**For the National
Science Foundation
of the United States:**

**For the European
Organisation for
Astronomical Research in
the Southern Hemisphere:**

**For the National
Institutes of
Natural Sciences of
Japan:**

Arden L. Bement

Arden L. Bement
Acting Director
NSF

C. Cesarsky

Catherine Cesarsky
Director General
ESO

Yoshiro Shimura

Yoshiro Shimura
President
NINS

5-8-04

Date

25 August 2004

Date

14 September, 2004

Date

Washington, D.C.

Place

Garching

Place

Tokyo

Place

ANNEX A

List of Deliverables to be Provided by NINS and their Maximum Values

TASK	MAXIMUM VALUE (kUSD of year 2000)
Contribution to Power Plant ²	11,200
Administration of ALMA-J Project Office	4,030
ACA	
ACA Infrastructure	16,000
ACA Antenna	
Management for Antenna Tasks	3,299
Four 12m Antennas	12,790
Twelve 7m Antennas	24,960
ACA Front End Costs	
Front End Subsystem Management & Engineering (8yr) (Excluding Band 10 related)	2,230
Cartridge Test Cryostats already delivered to NAEU	696
Integration Task for ACA Front End (excluding Band 10 related)	3,012
Other Front End Items (WVR)	489
ACA Front End ³	18,401
ACA Correlator	
ACA correlator	2,821
ACA Computing	
Software Costs associated with ACA	7,573
Hardware Costs associated with ACA	1,175
ACA backend	14,965
ACA, Total	108,411
New Frequency Bands	
Integration Task for Bands 4,8 (Band 10 Integration inc. below)	2,753
Band 4	
Cartridges, LO materials	13,279
Band 8	
Cartridges, LO materials	15,798
Band 10⁴	
Cartridges, LO materials (includes D&D, management, integration) , not to exceed	20,816
New Frequency Bands Total	52,646
System Engineering & Integration	2,014
Science (5yr)	2,000
Total (subject to notes below and final agreement by 30 June 2005)	180,301

Notes:

¹ All Values are as agreed by representatives from JAO, ESO, NRAO and NAOJ on 8 July 2004 and are subject to delivery on or before the final milestone set out in Annex C of the Bilateral Agreement. Details of deliverables are to be set out in an Amendment to be completed no later than 30 June 2005.

² Payment schedule is to be determined by 30 June 2005. A revised payment schedule could alter the agreed Value, due to the effects of inflation.

³ Includes FE cryostat and optics, FE electronics, costs of 16 cartridges for baseline bands, etc.

⁴ Band 10 is currently in an R&D phase. Production decision is subject to approval by ALMA Board, on recommendation of JAO and NAOJ. The Delivered Value shall not exceed the amount tabulated.