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**FOR
INFORMATION**

COUNCIL

99th Meeting

Garching, 17 and 18 December, 2002

Report of Council ALMA Working Group

REPORT OF ALMA COUNCIL WORKING GROUP

Executive Summary

- 1. The Working Group had the mandate from ESO Council Resolution set out in Attachment 1 to Cou-841 conf., 9 July 2002: to review the outcome of ALMA Phase I, the overall legal framework for ALMA in Chile, the long term projections for construction and operational costs, and the long term staffing plan, recruitment and status.**
- 2. The Group met two times, chaired by the President of Council. It considered and discussed written input from the ESO management and the ALMA management, seeking further clarification and input as required.**
- 3. The Group concludes by expressing itself as satisfied with the progress achieved in Phase 1. Having examined financial and strategic issues, and various structural options, the Group agrees with the bilateral collaboration structure currently proposed for ALMA, supplemented by a service company established jointly by AUI and ESO in Chile.**
- 4. Based on the input from the European and Joint ALMA Offices, the Group is satisfied with the quality of work done to produce the long term projections for construction and operational costs and the long term staffing plan and recruitment.**
- 5. Based on conclusions 3 and 4, the Council Working Group has therefore been able to meet its mandate and unanimously recommends to Council to proceed with Phase 2 of ALMA according to current plans and projections, with the addition of a Chilean limited liability company to provide services under contract to ESO and AUI in Chile, and employ the local staff.**

Introduction

1. The Council Resolution Attachment 1 to Cou-841 conf. which established the Working Group is attached at Annex 1. Point 5 sets out the mandate of the Group.
2. Delegations were invited by letter on 12 July to nominate members of the Working Group by 19 July. An e-mail reminder was sent to all delegations on 19 July, with a further reminder on 9 August.
3. Meetings took place on 16 September and 14 October. Attendees are given in Annex 2. Both meetings were chaired by the President of Council. Informal notes of the two meetings have been written by the ESO Management and distributed to the attendees.

The following papers were submitted for discussion:

- Legal Structure of ALMA in Chile
 - Results of ALMA Phase 1 Design and Development
 - Draft ALMA Project Plan of 26 August 2002 and updated version of 9 September 2002
 - European Phase 2 Project Plan (including Proposal for Phase 2 Construction and Operations), Executive Summary, 5 June 2002
 - Letter from Dr. W. van Citters, NSF, dated 10 September 2002
 - E-mail from Prof. R. Giacconi, AUI, dated 11 September 2002
 - Effect of Taxation in Chile
 - Staffing and Financial Profiles for ALMA Early Operations
 - ALMA Division Organization and Construction Staffing
 - ALMA Health and Safety Issues
 - Limited Liability Company
 - Legal opinion by Dr. Kunz-Hallstein on new Agreement with Chile.
4. An oral report of the conclusions was given by the Chair to the Committee of Council on 15 October.

Review of outcome of Phase 1

5. The products of Phase 1 were to include:
- Scientific rationale reflected in unambiguous top-level science requirements;
 - Technical approach and preliminary design validated by demonstrated performance on prototype components or subsystems, and on single antenna prototype systems provided by North America and Europe;
 - Management approach and a precise division of responsibilities for deliverables embodied in executed agreements between the participants;
 - Schedule and cost-to-completion derived from a detailed work breakdown structure with commitments by the participants to deliver the elements for which they are responsible for the estimated cost.
6. The Group has reviewed the progress made in Phase 1 through the report “Results of ALMA Phase 1 Design and Development” presented by the European Project Manager, which was based on updated material presented to the ALMA Management Advisory Committee in June 2002. This covered progress in the following areas: Antennas, Front End, Local Oscillator, Back End, Software and Computing, Site and Science.
7. The Group notes that a formal Phase 1 End Review would not take place, but that reviews by various bodies, such as AMAC and STC, and similar reviews in the United States and Canada, provided the necessary assurances.
8. Having reviewed the information provided, seeking further information and clarification from ALMA project management, the Group concludes that Phase 1 has achieved its objectives within budget, but the Group wishes to express concern over the progress of the European prototype antenna. It also urges the

ESO management to take all actions necessary to ensure a fair competition between the American and European prototype antenna.

Overall Legal Framework for ALMA in Chile

9. The Group exchanged at length views on the text and intent of the Acuerdo between ESO and Chile which gave ESO permission to install ALMA as a new site for observation. This had been agreed with Chile and approved by 9 delegations, with France voting against. The Group took note of the opinion expressed by the ESO legal adviser that the approval of the Acuerdo by Council required only a simple majority vote, at variance with the French position, which held that unanimity was required. The Working Group discussed possible approaches to mitigate France's concerns, as outlined in a letter sent by the French authorities to the ESO Director General on August 29.
10. The Foreign Minister Alvear had proposed to ESO that the formal signing of the Acuerdo take place in Santiago on October 21. In discussion, it was suggested that the speech to be given by the Director General at the signing ceremony, and the response by Minister Alvear, while not as binding as a formal exchange of letters, could go towards meeting the purpose of such an exchange.
11. This speech could contain key phrases such as Chile “giving permission needed to establish a new centre for observation under the provisions and within the legal regime established and confirmed in the 1963 Convention and the 1995 Agreement” and granting “AUI and ESO stable long term access to the land required for ALMA through arrangements which enable ESO to participate in the construction and operation of ALMA within the provisions of this present Agreement and the 1963 Convention and 1995 Agreement.” The draft of this speech would be sent to the Chilean Government in advance, as dictated by normal protocol. These issues were subsequently taken up by the Committee of Council.
12. The Group noted the structure and hierarchy of agreements required, as set out in the diagram attached at [Annex 3](#). These are:
 - The Decree for AUI
 - The Acuerdo for ESO
 - The Concessionary Decree to AUI/ESO
 - The Articles of the Concessionary Limited Liability Company
 - The Concessionary Contract between Bienes Nacionales and the Concessionary Limited Liability Company
 - The Contract between AUI/ESO and the Concessionary Limited Liability Company (this could also set the powers of the General Manager)
 - An Agreement between AUI/ESO and CONICYT
 - An Agreement between AUI/ESO and Region II.
13. Because of the different legal status of AUI and ESO in Chile, and the legal limitations on the powers of individual Ministries, it has proved impossible to construct a single legal document to describe all elements of the relationship between Chile and ESO in relation to ALMA. The Working Group recognizes that the overall set of agreements listed above will provide ESO with a

framework that will guarantee stable conditions to build and operate ALMA. It also recognizes that the legal difference between the status of AUI and ESO in Chile prevents a single document for the whole ALMA project. The present solution, with two separate agreements, a presidential decree for AUI and a new Acuerdo for ESO, secures the high level authorisation needed from the Government of Chile to install ALMA, while lower level agreements, like the land concession or the relation with CONICYT done in common by AUI and ESO provide the necessary security while maintaining the parity between the two organizations.

14. In addition, AUI and ESO need the approval of the Environmental Impact Study by the COREMA (the Regional Environmental Committee) and the assignment of a range of radio frequencies through the Ministry of Telecommunications (Subtel) in order to protect the ALMA spectrum of observations.
15. The Working Group recognizes the complexity of all these negotiations, and the difficulties of having them proceed in parallel. The need to have better visibility of progress in almost real time was expressed by the Working Group. The Group noted that the ESO Management had agreed to provide a status report to the Council delegates every two weeks.
16. The Group discussed the options for the legal structure of ALMA in Chile, based on a paper submitted by ESO Management, and reviewed the draft Articles and role of the proposed concessionary company.
17. The option of creating a new international treaty level organisation for ALMA, which would then be recognised by Chile through a separate Acuerdo, was reviewed. It was rejected because it would require new and potentially lengthy negotiations with the Chilean government on privileges and immunities, with the real risk that these could be reduced, and because such a structure was likely to meet with serious delays and objections in USA.
18. The option of creating a new non-Chilean legal entity for ALMA and then seeking Chilean status analogous to AUI was reviewed. The Group noted that this approach would be difficult for ESO because in April 2001 Chile stated that ESO would not be permitted to participate in ALMA under law 15.172 but would require the specific permission foreseen in the 1995 Acuerdo. By inference, ESO would also require this permission to participate in ALMA via a third party entity formed with AUI.
19. A new non-Chilean legal entity was seen to offer no practical advantages over using AUI itself, which was the only variant of this option that NSF/AUI considered acceptable. However, this route could not be pursued because it would undermine Europe's role and status in ALMA and in Chile, and because Chile would probably view such an approach via AUI as an attempt by ESO to circumvent the provisions of the 1995 Acuerdo.
20. Three basic options for ALMA in Chile were then considered:

- AUI and ESO do the work themselves and employ all the necessary staff, including local staff, and place all contracts, operating under current immunities and privileges;
 - AUI and ESO form a Chilean limited liability company which provides services under contract to AUI/ESO and employs all the local staff required, under normal Chilean labour law. This company could also place other contracts on behalf of AUI/ESO;
 - AUI and ESO form a Chilean limited liability company which employs all the staff (Chilean and non-Chilean) and places the contracts necessary to construct, commission and operate ALMA.
21. The principle advantage of using a Chilean company as the intermediary is that it avoids any direct relationship between AUI/ESO, Chilean staff and service contractors. However, a Chilean company would be subject to Chilean law and taxation, and would not enjoy ESO's privileges and immunities. It is also considered to be a high risk configuration for the long term stability of ALMA.
22. Taking into account the constraints as well as the advantages of the legal status of ESO and AUI in Chile, the Group is agreed that the second option above is the most suitable approach to be explored and developed. In reaching this conclusion, the Group notes advantages in terms of cost, taxation, flexibility of employment conditions, and compatibility with Chilean legislation, as well as the preservation of rights, immunities, and privileges.

Long Term Projections for Construction and Operational Costs

23. The Group reviewed the Project Plan dated September 9, 2002, the latest version of this 'living document', and requested further information from the ALMA project management. Questions were raised about various issues, including contingency, areas of risk, the detailed structure of the Joint ALMA Office and its location, and Health and Safety. The Group examined the figures for consistency with the ESO Long Range Plan and likely extrapolations beyond 2006.
24. The Group reviewed with care the cost and staffing plan for the early operation phase, starting in 2007, and increasing progressively up to routine operation with ALMA at its final extend in 2012.
25. The Group were pleased to note that there would be one set of safety standards and rules for ALMA and that the ALMA Safety Committee had already been formed and would meet in October. There will be only one safety officer on the site.
26. Following these discussions, the Group can express itself satisfied with the quality of the work done to produce the financial projections and the level of contingency.

Long Term Staffing

27. Staffing figures for construction and operations from the project plan as well as early operation were reviewed and additional information sought from ESO and ALMA Management.
28. The Group noted the figures for ESO staff, attached as Annex 4, which show that the maximum number of new ESO recruits would be 9 (4 international staff, 4 local staff, and 1 on short term contract), and that the long term staffing estimates for bilateral project operations (171 FTE by 2011) were good to about ± 10 FTE.
29. In conclusion, the Group agreed that the staffing and recruitment plans were realistic and feasible within the constraints of the ESO Long Range Plan.

Conclusions

30. The Group found the additional material presented and the discussions extremely useful in arriving at a better understanding of the planning and analysis that has gone into ALMA.
31. The Group concludes by expressing itself as satisfied with the progress achieved in Phase 1. Having examined financial and strategic issues, and various structural options, the Group agrees with the collaboration structure as described in the Bilateral Agreement for the construction phase of ALMA. It recommends the creation by AUI and ESO of a service company, formed under Chilean law, to hire local staff in Chile, and to provide services under contract with AUI and ESO. The detailed purpose and the exact organizational structure of this company should be decided as soon as possible.
32. Based on the input from the European and Joint ALMA Offices the Group is satisfied that the long term projections for construction and operational costs and the long term staffing plan and recruitment are soundly based, realistic, and adequate to meet the scientific and technical objectives.

Recommendation

33. **The Group unanimously recommends that Council proceed with Phase 2 of ALMA according to the collaborative structure established through the Bilateral Agreement, the current plans and projections described in the ALMA Project Plan, as presented to Council in July 2002 and subsequently updated. It recommends the establishment by AUI and ESO of a Chilean limited liability company to provide services under contract to AUI/ESO and employ the local staff under normal Chilean law.**

Annex 1

Council Resolution on ALMA Phase II

Council,

Recognising

- the potential of large interferometric arrays operating at millimeter and submillimeter wavelengths to contribute to the study of a wide range of astronomical problems;
- the interest of the astronomical communities of Europe and of North America in the joint development of such an array;
- the advantages of combining these aspirations in a single global project, the Atacama Large Millimeter Array (ALMA), within which ESO would represent European interests;
- the interest of other astronomical communities in participating in ALMA, under terms to be set out in separate agreements;
- the extensive joint Design and Development (Phase I) program carried out in preparation for the construction and operation of ALMA under a Memorandum of Understanding (MoU) between NSF, NRC, and ESO with a consortium of European organisations and institutes;
- the confirmation of North American participation in ALMA Phase II through the letter from the US National Science Foundation dated 7 May 2002 and the letter from the Canadian National Research Council dated 27 May 2002;
- the commitment expressed by the Minister of Science and Technology of Spain by letter dated 3 April 2002 concerning participation at the 7.5% level of European involvement, and the progress made in completing a formal Agreement with Spain on such participation;
- the provision in the ESO Long Range Plan for participation in the baseline Bilateral ALMA Phase II as the next major investment for European ground based astronomy with a total European share of 50%, corresponding to a ceiling cost of 294 million Euro at 2002 price levels, with 7.5% of this European share taken by Spain;
- the definition of the baseline Phase II (Construction, Commissioning and Operations) of ALMA and of the European Participation in ALMA in the Executive Summary dated 5 June 2002 of the Proposal for Phase II, and the preparation of the ALMA Bilateral Agreement setting out the arrangements for the funding, management and oversight of ALMA Phase II;
- the selection of a site which matches the requirements of ALMA in a region of the Altiplano in northern Chile known as Zona Chajnantor–Cerro Chascon;

- the progress made in negotiating with the Government of the Republic of Chile for stable and secure long term access to this site under terms which protect ESO's rights, privileges and immunities;
 - the support for Phase II approval, and other recommendations, given by the ALMA Management Advisory Committee on 25 June 2002;
1. approves European participation through ESO in the baseline Bilateral ALMA Phase II at the 50% level, based on the Proposal for Phase II and the terms of the ALMA Bilateral Agreement;
 2. authorises the Director General to sign (a) the ESO-Spain Agreement on ALMA after completion of the negotiations on the basis of the draft version (Cou-836) and approval of the final version by written procedure, and (b) the Bilateral Agreement (Cou-835);
 3. authorises the Director General to make all necessary arrangements to ensure that ESO enjoys the rights and meets its commitments under the Bilateral Agreement to the agreed Project Time Schedule and within the agreed Schedule of Values;
 4. requests the Director General to:
 - a) complete, through the Joint ALMA-Chile Negotiating Team, for the endorsement of Council, agreements with Chile which provide secure and stable access to, and appropriate use of, the land for the period required by ALMA and which retain and protect ESO's rights, privileges, and immunities;
 - b) refrain from placing major commercial contracts, and in particular civil engineering contracts, until such time as the necessary agreements have been endorsed by Council;
 - c) implement the European ALMA Board, as set out in Cou-837 rev;
 - d) report regularly to Council on progress with ALMA.
 5. establishes a Council Working Group to:
 - a) review the outcome of ALMA Phase I, the overall legal framework for ALMA in Chile, the long term projections for construction and operational costs, and the long term personnel staffing plan, recruitment and status;
 - b) submit a written report to Council not later than 1 November 2002.

Annex 2

Attendees

September 16:

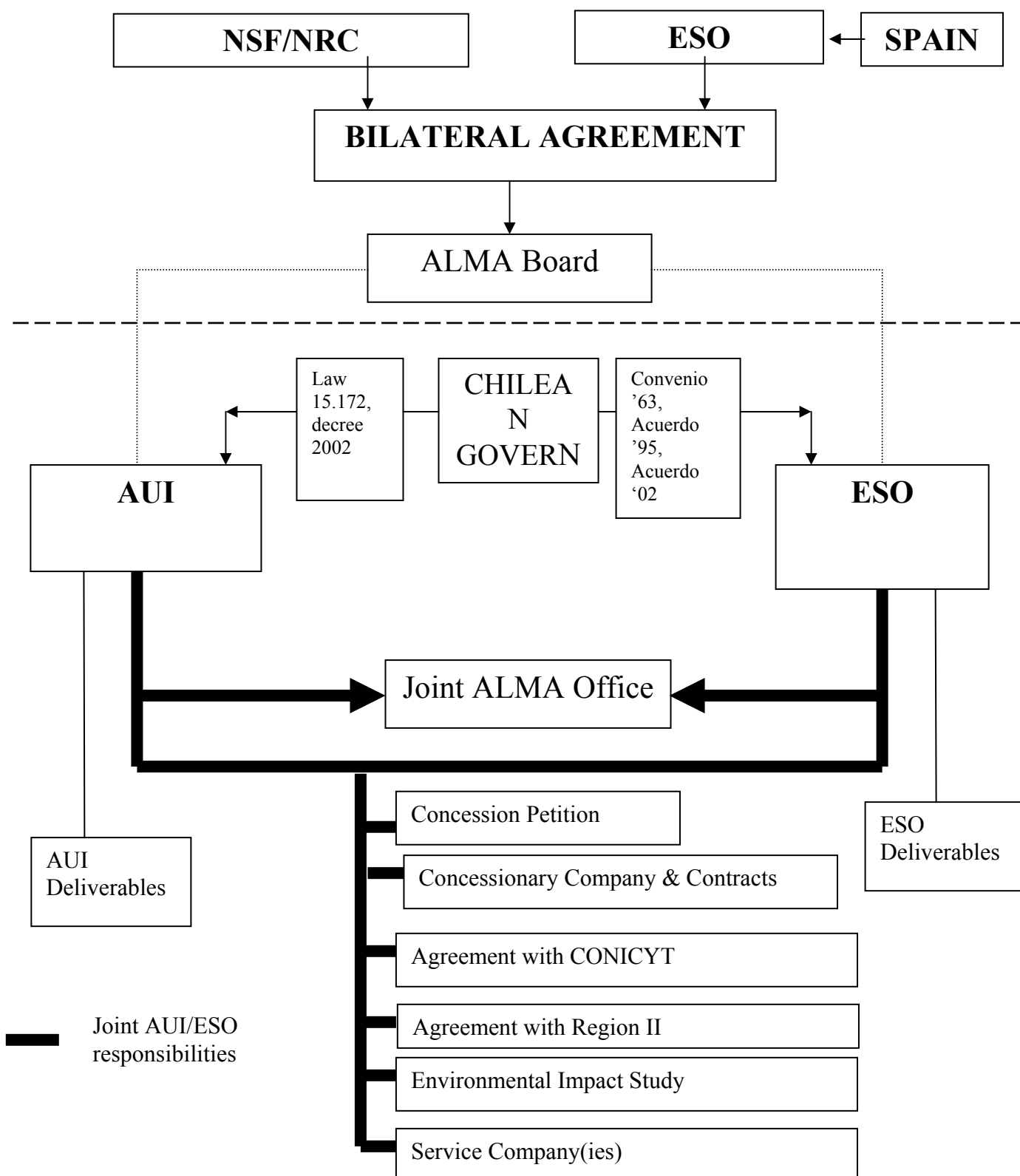
A Freytag (Chair), P Barré, E v Dishoeck, J-M Dufour, F Karlsson, M Metzger, M Steinacher, L Vigroux, R Wade, Director General, P Vanden Bout, M Tarenghi, R Kurz, I Corbett. **Via telephone** (part time) D Hofstadt.

October 14:

A Freytag (Chair), R Booth, E v Dishoeck, J-M Dufour, M Metzger, M Steinacher, G Tofani, L Vigroux, R Wade, Director General, M Tarenghi, R Kurz, I Corbett.

Annex 3

Diagram of the higher level structure of ALMA to show the role of AUI and ESO with regard to the necessary subsidiary agreements



Annex 4

ALMA Division Organization and Construction Staffing

The proposed organization for the ALMA Division (MAP) includes the ALMA European Project Office, plus several persons who will be approximately 100% dedicated to ALMA for the foreseeable future.

The specific positions in the ALMA Division are listed below. In this listing a position ID of EMA indicates an International Staff Member, LMA indicates a Local Staff Member - Chile, PMA indicates a Paid Associate, and NN designates new positions to be created for ALMA with the year in which they are to be filled.

<u>Position ID</u>	<u>European Position</u>	<u>Staff Name</u>
EMA001	Project Manager	R. Kurz (PMA001)
EMA003	Project Secretary	E. Zuffanelli (EID002)
(50%)		
PMA004	Project Engineer	J. Baars
LMA003	Field Supervisor	A. Otarola
(LDG108)		
EMA014	Project Scientist	NN (2003)
EMA002	Senior Astronomer	P. Shaver (50%)
PMA005	Site Characterization Engineer	NN (2003)
LMA008	Site Tester	M. Rivera
EMA009	Site Development Manager	J. Eschwey
LMA004	Construction Supervisor	NN (2003)
EMA015	Antenna Subsystem Manager	S. Stanghellini(ETD410)
EMA005	Front End Subsystem Manager	G.H. Tan
EMA010	Front End Subsystem Engineer	H. Rudolf
EMA013	Computing Subsystem Manager	G. Raffi (ETD601)
EMA004	Software Manager	J. Schwarz
EMA012	System Engineering & Integration Manager	C. Haupt
EMA011	System Engineer	E. Pangole
LMA005	System Integrator	NN (2004)
LMA006	System Integrator	NN (2005)
LMA007	System Integrator	NN (2005)

The staff filling the following ALMA positions, currently under recruitment, will be assigned to the divisions indicated:

EMA006	Archive Software Developer (DMD)	NN (2003)
EMA007	Software Engineer (TEC)	NN (2003)
EMA008	Software Integrator (TEC)	NN (2003)

Other persons at ESO supporting ALMA will be assigned to the ALMA Project for an appropriate fraction of their time, but will remain in their present organizations - either the Technical Division (TEC) or the Data Management and Operations Division (DMD).

Hence, the new posts to be created at ESO for ALMA construction are four International Staff Members, four Local Staff Members, and one Paid Associate. A breakdown of the ESO staffing plan for ALMA construction into existing staff and new posts from the ALMA Division and from other Divisions is tabulated below.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Existing Staff									
ALMA Div	11.5	14.1	15.0	15.4	15.0	15.0	15.0	15.0	7.1
Other Div	11.4	13.8	13.0	11.7	10.8	9.8	9.8	6.4	2.0
New Posts									
ALMA Div	3.0	1.0	2.0						
Other Div	3.0								
Total	28.9	28.9	30.0	27.1	25.8	24.8	24.8	21.5	9.1

The remaining category of staffing for ALMA is ESO's share of the Joint ALMA Office (JAO). The total staff of the JAO through most of the construction is planned to consist of six international staff positions (Project Director, Project Manager, Project Scientist, Project Engineer, Project Controller, and Administrative Assistant) and two local staff positions (Project Administrator and Secretary). Assuming 50% of these positions are ESO staff, three international staff positions and one local staff position will be created.

The planned ESO staffing profile for the JAO is:

JAO	3.0	4.0	4.0	4.0	4.0	4.0	2.5	1.5	1.0
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At present M. Tarenghi and S. Guilloteau fill two of these positions on an interim basis.

Staffing and Financial Profiles for ALMA Early Operations

A description of ALMA operations is given in Chapter 6 of the Project Plan. The staffing and financial planning for ALMA early operations, starting in 2006 and building up to full-scale steady-state operations in 2012, is summarized in the table below. The top section of the table shows the total staffing profile for the various elements of the operations organization. The European 50% of this total is shown in the next section of the table, broken down into ESO (international and local staff) and staff at other European organizations. The lower section of the table shows first the total cost profile and then the European 50% with the division between ESO and Spain. Complete details of the operations cost estimate are given in Volume 6, Operations, of the European Proposal for ALMA Phase 2 Construction and Operations.

RAMP-UP PLAN FOR BILATERAL PROJECT OPERATIONS

	2006	2007	2008	2009	2010	2011	2012
Staffing							
Directorate	3	6	9	11	14	14	14
Antennas/Instr.	8	20	34	48	61	72	72
Admin	5	7	9	10	11	12	12
Logistics	2	3	3	3	3	3	3
Facilities	2	2	2	4	6	6	6
Computer	4	6	6	6	6	6	6
Operations	4	10	12	14	16	16	16
Data Mgmt.	2	5	9	14	18	22	22
RSCs	2	4	8	12	16	20	20
Year-end	32	63	92	122	151	171	171
Labor (FTE)	16	47.5	77.5	107	136.5	161	171
Europe							
ESO Staff	7	21.8	34.8	47.5	60.3	70.5	75.5
Int'l Staff	1.6	5.6	8.4	11.1	13.8	15.8	17.4
Local Staff	5.4	16.2	26.4	36.4	46.4	54.7	58.1
Non-ESO	1	2	4	6	8	10	10
Cost							
Labor (k\$)	1215	3607	5885	8125	10365	12226	12985
Materials	155	461	751	1037	1323	1561	1658
Services	756	2244	3662	5056	6450	7607	8080
Development	0	1000	2000	4000	6000	8000	10068
Total (K\$ ₂₀₀₁)	2126	7312	12298	18218	24139	29394	32791
Europe (K€₂₀₀₂)							
ESO (92.5%)	1109	3813	6414	9500	12588	15329	17099
Spain (7.5%)	1026	3527	5933	8788	11644	14179	15817
Spain (7.5%)	83	286	481	713	944	1150	1282