

# Guide to the East Asian ALMA Regional Center (EA ARC)

Japan (EA ARC), Taiwan (EA ARC node),  
and Korea (EA ARC node).



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ALMA is a partnership of ESO (representing its member states), NSF (USA) and NINS (Japan), together with NRC (Canada), NTSC and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile. The Joint ALMA Observatory is operated by ESO, AUI/NRAO and NAOJ.

## User Support:

For further information or to comment on this document, please contact your regional Helpdesk through the ALMA User Portal at [www.almascience.org](http://www.almascience.org). Helpdesk tickets will be directed to the appropriate ALMA Regional Center at ESO, NAOJ or NRAO.

## Revision History:

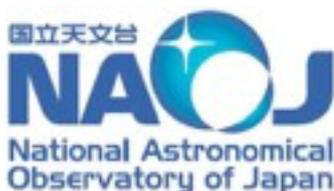
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Doc/Ver.	Date	Editors
1.1-Cycle0	04/22/2011	Daniel Espada, Sachiko Okumura, Kazuya Saigo, Erik Muller
1.2	12/16/2011	Daniel Espada
1.7.1.0	04/05/2012	Erik Muller
1.7.1.1	06/28/2012	Erik Muller
1.7.1.2	10/22/2012	Erik Muller
1.8	08/29/2014	Erik Muller
1.9	02/08/2015	Erik Muller
4.0	03/02/2016	Erik Muller
5.0	03/03/2016	Erik Muller
6.0	12/12/2017	Hiroshi Nagai, Yu-Nung Su, A-ran Lyo, Fumi Egusa, Kouichiro Nakanishi, Daniel Espada, Eiji Akiyama
7.7/1.0	03/01/2019	Misato Fukagawa, Yu-Nung Su, A-ran Lyo
8.7/1.0	03/02/2020	Misato Fukagawa, Yu-Nung Su, Woojin Kwon
9.7/1.0	03/07/2022	Misato Fukagawa, Yu-Nung Su, Jihyun Kang, Koichiro Nakanishi, Patricio Sanhueza, Yu-Ting Wu
10.7/1.0	03/07/2023	Misato Fukagawa, Yu-Nung Su, Jihyun Kang
11.7/1.2	02/26/2024	Akiko Kawamura, Yu-Nung Su, Jihyun Kang, Yu-Ting Wu, Misato Fukagawa
12.7/1.0	02/21/2025	Akiko Kawamura, Yu-Nung Su, Seokho Lee, Kouichiro Nakanishi, Takuma Izumi

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East Asian ALMA Regional Center



In publications, please refer to this document as:

**User's Guide to the East Asian ALMA Regional Center (EA ARC)**

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## Scope

This document explains the role, structure, duties and function of the East Asian ALMA Regional Center based at the National Astronomy Observatory of Japan (NAOJ), ALMA Project at the Mitaka Campus in Tokyo, Japan; the Taiwanese node at the Academia Sinica Institute of Astronomy and Astrophysics (ASIAA) in Taipei; and the Korean node at the Korea Astronomy and Space Science Institute (KASI) in Daejeon.

## Web Resources

- ALMA Science Portal  
<https://almascience.org>
- ALMA Helpdesk  
<https://help.almascience.org>
- EA ARC Webpage  

<a href="https://researchers.alma-telescope.jp/j/ea-arc/">https://researchers.alma-telescope.jp/j/ea-arc/</a>	(NAOJ, Japanese)
<a href="https://researchers.alma-telescope.jp/e/ea-arc/">https://researchers.alma-telescope.jp/e/ea-arc/</a>	(NAOJ, English)
<a href="https://alma.asiaa.sinica.edu.tw">https://alma.asiaa.sinica.edu.tw</a>	(Taiwanese node, English)
<a href="https://alma.kasi.re.kr">https://alma.kasi.re.kr</a>	(Korean node)
- EA ARC workshops & events information  
<https://researchers.alma-telescope.jp/e/event/>
- ALMA Observing Tool (proposal preparation tool)  
<http://almascience.org/tools/observing-tool>
- CASA (Data reduction)  
<https://casa.nrao.edu/>

## 1. ALMA and EA ARC mission goals

The ALMA telescope is a global collaboration involving East Asia, Europe, North America and the host country, Chile. ALMA comprises 66 high-precision antennas. Fifty of these are 12-meter dishes in the 12-m Array, used for sensitive, high-resolution imaging. The remaining sixteen form the Atacama Compact Array (ACA), used to enhance wide-field imaging: twelve are closely spaced 7-meter antennas (7-m Array), and four are 12-meter antennas for single-dish observations (the Total Power Array, TP Array). The wavelengths covered by ALMA range from 0.32 mm to 8.5 mm (frequency coverage of 35 GHz to 950 GHz), with angular resolutions as high as 5 milli-arcseconds. Using a fully dynamic scheduling system and innovative calibration strategies, the ALMA system allows us to make the best use of the atmospheric conditions on the Chajnantor plateau, at 5000 m altitude in the Atacama Desert.

The highest quality science produced with ALMA in the mm/submm bands is enabled through competitive proposal applications, incorporating the widest possible user community, comprehensively supported by the ALMA Regional Centers (ARCs) at each stage, from proposal submission to data-delivery and data analysis. The ARCs also manage local data distribution and data archiving.

The East Asian ARC (EA ARC) is based at NAOJ with Taiwanese and Korean nodes in Taipei and Deajeon, to help users fully exploit the capabilities of ALMA and maximize ALMA's scientific return. ALMA appeals to a much broader range of astronomers than the conventional mm/submm community, and ALMA users of all levels and backgrounds are encouraged to take advantage of the assistance and expertise available at the EA ARC.

## 2. The East Asian ALMA Regional Center (EA ARC)

The EA ARC comprises a core office located at the NAOJ Mitaka campus in Japan, the Taiwanese node at ASIAA, and the Korean node at KASI. The offices in Japan, Taiwan, and Korea are coordinated through close collaboration among their respective managers and local staff. While the three sites have strong focus on their respective local user-bases, the services and facilities are largely consistent throughout.

### 2.1 The EA ARC services

#### 1. EA ARC user and observatory support

EA ARC is composed of people engaged in scientific support, computer hardware and software support, archive maintenance, education, and public outreach. The roles of user support and observatory support are detailed in section 2.2 and 2.3. Information about the EA ARC staff can be found at:

<https://researchers.alma-telescope.jp/e/ea-arc/> (NAOJ)

<https://alma.asiaa.sinica.edu.tw> (Taiwanese node)

<https://alma.kasi.re.kr> (Korean node)

#### 2. Tutorials, workshops and training

The EA ARC holds ALMA users meetings, regional town meetings, joint workshops organized in collaboration among Japan, Korea, and Taiwan, and provides up-to-date information in conferences, workshops and astronomical society meetings. At these workshops, information on current and proposed capabilities is shared. Tutorials and hands-on sessions using the ALMA Observing Tool and CASA for proposal preparation and data reduction are also provided for the community. Feedback is specifically solicited from the user community to improve the ALMA operations during these meetings, although feedback is welcome at any time. A list of tutorial and workshop events is maintained at:

<https://researchers.alma-telescope.jp/e/event/> (NAOJ)

[https://alma.asiaa.sinica.edu.tw/twarc\\_tutorials.php](https://alma.asiaa.sinica.edu.tw/twarc_tutorials.php) (ASIAA)

<https://alma.kasi.re.kr/index.php> (KASI)

### 3. Face-to-face support

A small number of visitors can be accommodated at NAOJ, ASIAA or KASI, for face-to-face support. Typically, this is data processing assistance provided by EA ARC support staff. Limited funding is available to cover travel and accommodation expenses (see also section 3.4). Requests for face-to-face support should be submitted via the Helpdesk system as described in section 3.3.

## 2.2 EA ARC user support roles

The EA ARC offices in Japan, Taiwan, and Korea are staffed by a number of active scientists and postdoctoral fellows, who together provide comprehensive support to research scientists, at all stages of proposal preparation, as well as data processing. The EA-ARC staff have wide experience in mm/submm astronomy such as interferometer mosaicking, single-dish data processing, combination of interferometric data and single dish data, polarimetry, solar observations and data processing, and advanced data analysis. The EA ARC scientific staff, their research interests and support roles are introduced at:

<https://researchers.alma-telescope.jp/e/ea-arc/staff.html> (NAOJ)

[https://alma.asiaa.sinica.edu.tw/people\\_arc.php](https://alma.asiaa.sinica.edu.tw/people_arc.php) (ASIAA)

[https://alma.kasi.re.kr/people\\_staff.php](https://alma.kasi.re.kr/people_staff.php) (KASI)

Each ARC staff member has a unique set of task allocations, serving as a primary lead in various ALMA subsystems, and cognizant roles (i.e. a regional expert and contact person) in some systems - e.g. the 'Archive Cognizant lead' will represent the EA ARC within the ALMA-wide Archive working group and contribute when cross-ALMA discussions and decisions are taking place.

The core tasks of the EA ARC scientific staff include

*Contributing to the preparation and distribution of user documentation.*

Given the diverse expertise of ARC staff, all members contribute to the development of user documentation and user support materials.

*Organizing training material, tutorials, workshops, user's meetings, and visitor support.*

As the ARCs have wide representation in many ALMA subsystems, the expertise is diverse. Knowledge transfer from the cognizant leads to the user community, and within the ARC nodes themselves is an important function (please see sections 3.4 for more details).

*Responding to ALMA Helpdesk queries.*

EA ARC Helpdesk Cognizant leads determine the initial response to incoming Helpdesk tickets. Helpdesk lead may choose to defer the response to a different ARC staff member or even to a different ARC that might be in a better position to respond quickly and usefully. A meaningful response to any Helpdesk submission is guaranteed within 48 working hours, and for this reason, users are encouraged to use the Helpdesk for queries to the ARCs, and not private email to the staff, which cannot be managed by the Helpdesk team.

*Performing support duties to PIs on a personal level, as their 'contact scientist.'*

Each successful ALMA observing project will be assigned to an ARC Contact Scientist from amongst the EA ARC staff, relevant to their node. Communication between the Contact Scientist and the PI should be made via the Helpdesk. Contact Scientists will contact users *after* notification of the proposal submission outcome, primarily to discuss and finalize the observing process (called "phase 2", see section 4.4 for more details), and will remain through the observations until the end of the quality assurance process and final delivery of the data products to the user.

*Generating, verifying, correcting and describing observing scheduling blocks ('Phase 2').*

Phase 2 refers to the process where the project proposal is converted into observing instructions. The PIs will not be exposed to the Phase 2 aspect. What was previously the “phase 2 checking” stage will involve only the confirmation of the Phase 1 content, and adjustment where necessary, prior to committing the project to the observations queue (see section 4.4 for more detail).

#### *Supporting Archive Research.*

A mirror site of ALMA science data archive is kept at NAOJ. Raw data, synthesized images, calibration and imaging scripts, and some additional files will be available through this archive mirror after the quality assurance. After the specific proprietary period, all the data will be public for users. Any users are welcome to exploit the public data for their science. EA ARC can assist users in using the archive, including face-to-face consultation.

## 2.3 EA ARC Observatory support roles

*Serve as Astronomers-on-Duty (AoD) for on-site observations monitoring.*

ARC staff serve as astronomers-on-duty at the Operations Support Facility or at the Santiago Central Office of Joint ALMA Observatory (JAO) in Chile. This is a core responsibility for all Executives. The ARC staff are therefore up to date in the operations of ALMA, develop and maintain continuing face-to-face communication between the ARCs, and JAO.

*Undertake data reduction, data quality assurance (QA) and enable distribution of data to PIs.*

ALMA is responsible for processing the PIs' data to assure the data quality. Processing by ALMA Data reduction Pipeline (calibration and imaging) have been fully commissioned for most observing modes employed in previous Cycles but some fraction of observing projects will still be calibrated and imaged manually using standard scripts (e.g., full polarization, Solar, VLBI data). The data processing will be done using a combination of the ALMA Pipeline and manual analysis using CASA. The ALMA Pipeline calibration and imaging can be run both at the ARC and JAO. Almost all manual data processing will be done at the ARC.

## 2.4 EA users

EA users primarily supported by EA ARC staff include all researchers affiliated with any Japanese, Taiwanese or Korean research institutions or universities. Additionally, PIs from institutions or universities outside any Executives who select EA ARC as their preferred ARC are also supported by the EA ARC. Taiwan-based researchers have the option to select their principal support through the ALMA Science Portal, choosing *either* the East Asian ARC, or North American ARC. Further information about the office in Taiwan can be found at: <https://alma.asiaa.sinica.edu.tw>.

## 3. User communication, information, news and help

### 3.1. The ALMA Science Portal

The Science Portal serves as a nexus for all ALMA-related matters

- Proposal information: building and submitting your proposals.
- Archive access: a data repository and portal for delivered and archived data.
- ALMA proposal-development and data-reduction tools.
- Documentation on policy and operation, as well as operation of ALMA software and tools.
- Access to SnooPI to monitor the progress of observations.
- Helpdesk for users' FAQs and questions/help requests.

The East Asia ALMA Science Portal website can be found at: <http://almascience.org/>

### 3.2. East Asian ARC and node information

Regional East Asian ARC information page contains similar contents to the Science Portal site but places a strong emphasis on regional information such as about tutorials, meetings and local staff details.

<https://researchers.alma-telescope.jp/j/ea-arc/> (Japanese)

<https://researchers.alma-telescope.jp/e/ea-arc/> (English)

<https://alma.asiaa.sinica.edu.tw> hosts information for the Taiwanese node.

<https://alma.kasi.re.kr/> hosts information for the Korean node.

### 3.3. The ALMA Helpdesk

The ALMA Helpdesk is the primary means for communication between users and ALMA. Interaction occurs via a ticketing system, which automatically tracks user submissions (called “tickets”) and related communications across the entire global community. Users can access the Helpdesk either through the ALMA Science Portal or directly to the Helpdesk system: <https://help.almascience.org>.

The ALMA Helpdesk hosts a library of [Knowledgebase](#) articles that address common issues and questions. The Knowledgebase articles also guide the users to relevant documentation in the Science Portal. If the user cannot find any answers in the Knowledgebase articles or documentation, they can submit a ticket to the Helpdesk. It is necessary to login before submitting a ticket, but users can access the Knowledgebase articles and Science Portal documentation without logging in.

Helpdesk tickets are automatically redirected to the user’s respective ARC for an initial response. For example, queries from East Asian users are addressed by the EA ARC staff. Tickets are triaged to ensure the most efficient response path, either by local ARC staff (User Support Specialists - USS) or redirected to the global Helpdesk for input from international experts.

The EA ARC supports East Asian users in both English and Japanese and users can generally expect a response within two business days. The Helpdesk opens "Emergency Proposal Submission Department" 72 hours before a proposal deadline to address issues that may block the submission of proposals. The three ARCs share responsibility for handling tickets submitted to this department to provide answers as quickly as possible. To facilitate rapid replies, users are encouraged to submit tickets in English, enabling any available ARC staff worldwide to contribute.

Once the ticket has been satisfactorily answered, the ARC staff will mark the ticket as ‘Resolved.’

In general, users are not expected to contact the Operation staff directly (e.g., via private email). Helpdesk-submitted tickets are triaged to on-hand staff, ensuring efficient resource allocation and allowing ALMA to build its database. This will ultimately help ALMA staff provide more effective support to the users.

### 3.4. Support for travel to Mitaka and the nodes

For users needing or wishing to attend the ARC or nodes to discuss or re-attempt the processing of their observations, travel and accommodation support provided by the nearby ARC and nodes is available. In general, support for visits to the ARC and nodes is at a domestic level only.

The NAOJ campus hosts a dedicated networked visitor work room with rapid access to ALMA archives and to ALMA data reduction software support (Astronomy Data Center at NAOJ, see <https://www.adc.nao.ac.jp/E/index-e.htm>). Working disk space is also provided for raw and processed data, as using a laptop may be impractical, given the ~1 TB size of ALMA data files. Users can request face-to-face support via a Helpdesk inquiry (see section 3.3).

## **4. EA ARC roles in proposal preparation, observations & data processing**

### **4.1. Call for Proposals**

A Call for Proposals (CfP) will be issued for each scheduling period. The EA ARC is responsible for distributing the CfP among the East Asian user community, along with any supporting material and software tools. The CfP informs the community about the available capabilities and provide necessary information for the submission of proposals. The EA ARC staff identify areas of work prior to the call, update webpages, and issue announcements. The EA ARC contributes to the various stages in the entire process, “Phase 1” and “Phase 2”, data processing and delivery in the following ways.

### **4.2. Phase 1: Proposal preparation**

Phase 1 involves proposal preparation and submission. ALMA proposals must be prepared with ALMA OT (requiring registration in the Science Portal), and must include scientific and technical justifications, targets and spectral settings, sensitivity and integration time estimation, atmospheric conditions requirements (e.g. transparency and atmospheric conditions).

### **4.3. Proposal assessment**

ARC involvement of the proposal assessment is minimal and restricted to assisting with proposal handling duties. Although ARC staff will be allowed to become the scientific reviewer, such an involvement is made by individual effort basis, not by an ARC duty. Users can refer to ALMA Proposal Review Process document for the detailed and latest information on the review process (<http://almascience.org/proposing/alma-proposal-review>).

### **4.4. Phase 2: Preparation for observations**

The Phase 2 stage is the conversion of the project requirements into observational parameters (e.g., frequency tunings, calibration schemes, etc.) In Cycles 0-4, this was performed by ARC staff or the PI. From Cycle 5 to Cycle 7, however, the process was simplified, and the PIs were no longer required to examine the (typically information-rich) Phase 2 process. Instead, successful PIs simply accessed their project after approval and confirmed that the observational information was correct and resubmitted it back to the observatory. From Cycle 8 2021 onwards, the Phase 2 process has been further simplified. PIs are no longer required to resubmit their projects to the observatory. Each approved project is assigned an ARC Contact Scientist (CS), and a project Helpdesk ticket is opened on behalf of the PI for communication with the CS and others. Minor changes may be requested through this Helpdesk ticket and will be implemented by the P2G group in the ARC if they do not impact the science scope or increase the total execution time. Any significant changes require first the approval of the Change Request Standing Committee, and a Helpdesk ticket should be submitted outlining the changes and including a complete justification. Requests for significant changes may result in long delays in completing the Phase 2 information and in committing the Scheduling Block to the observing queue. Up-to-date Phase 2 information can be found at <http://almascience.org/observing/phase-2>.

### **4.5. Data reduction & data software and archive support**

During and after observations are completed, JAO and the ARCs execute a series of quality assurance (QA) checks. As ALMA matures, an increasing quantity of data is expected to be processed using the automated ALMA pipeline processing. Remaining data will continue to be processed manually, using processing scripts. The complete data product package

containing raw data, calibration tables, scripts, QA reports, logs, and data products will be made available to the PI from the ALMA Science Archive through password-protected, web-based data distribution. PIs can continue to request assistance in how to make use of the data product package or further information e.g., issues with the data download, data quality, running calibration and imaging scripts from their contact scientist via the Helpdesk system after data delivery, or a direct or virtual face-to-face meeting request can be made, again via the Helpdesk (see section 3.3).

## 5. ARC nodes

Taiwanese and Korean ARC nodes make efforts to support the users in each country and contribute to the EA ARC core functions. Each node has its own areas of expertise. Users are encouraged to visit the individual ARC node web pages to obtain the most up-to-date information.

### 5.1. The Taiwanese ARC node at ASIAA in Taipei

Located in ASIAA, the Taiwanese ARC node ([http://alma.asiaa.sinica.edu.tw/twarc\\_intro.php](http://alma.asiaa.sinica.edu.tw/twarc_intro.php)) was established in November 2009, as a branch of the NA ARC and EA ARC. The role of the ARCs is classified into two categories, "core functions" and "enhanced functions", and the Taiwanese ARC node collaborates with the EA ARC for the core functions and with the NA ARC for the enhanced functions. The Taiwanese ARC node serves all the ALMA user community at universities and research institutes in Taiwan and offers support for the ALMA proposal and observational preparation, data reduction and data analysis. It also offers the opportunity to provide the best possible training for the staff from universities. The Taiwanese node provides face-to-face support and accepts inquiries through email and telephone. This support is in particular reaching out to the Universities in Taiwan.

The Taiwanese ARC node provides several powerful data reduction workstations with memory up to 1.5 TB and a Lustre file system with total capacity more than 1.7 PB mounted on ALMA servers via 100Gb/s Infiniband for our users to reduce and analyze their ALMA data.

### 5.2. The Korean ARC node at KASI in Daejeon

The Korea Astronomy and Space Science Institute (KASI) established the ALMA group in 2015 to serve as the Korean node (<https://alma.kasi.re.kr>) of the East Asian ALMA Regional Center. The Korean ARC node supports the Korean astronomical community in all activities related to ALMA, including observation preparation, data reduction, and analysis. We support universities and institutions in Korea by providing lectures upon request and organizing meetings, such as proposal preparation meetings and summer schools, to promote the submission of proposals and to encourage graduate students and postdocs to engage with ALMA archive data. The Korean ARC node is equipped with several CASA servers and 600 TB of storage, which are utilized for Quality Assurance Phase 2 by Korean ARC members and for ALMA data reduction by users in Korea.



The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of the European Organisation for Astronomical Research in the Southern Hemisphere (ESO), the U.S. National Science Foundation (NSF) and the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Republic of Chile.

ALMA is funded by ESO on behalf of its Member States, by NSF in cooperation with the National Research Council of Canada (NRC) and the National Science and Technology Council (NSTC) in Taiwan and by NINS in cooperation with the Academia Sinica (AS) in Taiwan and the Korea Astronomy and Space Science Institute (KASI).

ALMA construction and operations are led by ESO on behalf of its Member States; by the National Radio Astronomy Observatory (NRAO), managed by Associated Universities, Inc. (AUI), on behalf of North America; and by the National Astronomical Observatory of Japan (NAOJ) on behalf of East Asia. The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.

