

# A Guide to the North American ALMA Regional Center and the NAASC

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[www.almascience.org](http://www.almascience.org)

## 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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## Contributors



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# 1 Introduction

This document describes services provided to the observing community by the North American ALMA Science Center (NAASC), which is operated by the National Radio Astronomy Observatory (NRAO) in Charlottesville, Virginia, in collaboration with Canada's National Research Council - Herzberg Institute of Astrophysics (NRC-HIA) and the Academia Sinica Institute of Astronomy and Astrophysics (ASIAA) in Taiwan. The NAASC supports the science use of ALMA by the North American community and supports research and development for future ALMA upgrades.



Figure 1: NRAO Headquarters and location of the NAASC

The following websites provide additional information on ALMA and the NAASC, and connect users to resources and tools they will need to use the telescope.

The ALMA Science Portal

<http://almscience.nrao.edu>

The NAASC website

<http://science.nrao.edu/alma>

The ALMA Helpdesk, which is also linked from the Science Portal and the NAASC website

<http://alma-help.nrao.edu>

The Canadian ALMA website

<http://www.almatelescope.ca>

The Taiwanese ALMA website

<http://alma.asiaa.sinica.edu.tw>

## 2 About ALMA

The Atacama Large Millimeter/submillimeter Array (ALMA) will enable transformational research into the physics of the cold universe, where the sky is dark in the visible part of the spectrum but shines brightly at (sub)millimeter wavelengths. ALMA is a global collaboration involving partners in North America, Europe, and East Asia, in cooperation with the Republic of Chile. The telescope is being built in the Chajnantor plain of the Chilean Andes, 5000 m above sea level. When completed in 2013, the telescope will have 66 high-precision antennas, providing unprecedented sensitivity and imaging the sky at a resolution as fine as 0.005". ALMA will operate at frequencies between 30 GHz and 1000 GHz.

An "Early Science" observing period will provide astronomers the opportunity to use the telescope while it is still under construction. Early Science Cycle 0 is expected to begin on September 30, 2011 and span 9 months. Early Science will then continue with Cycles 1 and 2 until the ALMA array is complete. Even during Cycle 0, the telescope's capabilities are substantial. Users will have at least 16 antennas, providing resolution as fine as 0.3". Observations during Cycle 0 can make use of four receiver bands, covering select frequencies between 84 GHz and 720 GHz. More details on the capabilities of ALMA during Cycle 0 are given in the Proposer's Guide, available at the ALMA Science Portal website.

## 3 Organization and Role of the ARCs and the NAASC

Being an international facility, ALMA will serve a worldwide community of astronomers. To interface with the geographically distributed user community, the three partners have established ALMA Regional Centers, or ARCs. They are the North American ARC (NA ARC), based in Charlottesville, VA; the East Asian ARC (EA ARC), based in Mitaka, Japan; and the European ARC (EU ARC), based in Garching, Germany. The ARCs are staffed by scientists with expertise in radio astronomy, millimeter/submillimeter astronomy, and interferometry, and their purpose is to work with the community of astronomers to maximize the scientific productivity of the telescope. The NA ARC is part of the NAASC, concentrating on internationally agreed core ALMA functions.

Each astronomer who uses ALMA is assigned a single ARC for user support at the time they register with the ALMA Science Portal. Astronomers in North America, Japan, or Europe are assigned to that region's ARC. Astronomers from Taiwan can select to use either the NA ARC or the EA ARC. Astronomers elsewhere in the world can select any one of the three ARCs.

The NAASC is located at NRAO Headquarters, on the Grounds of the University of Virginia (UVa), and a short walk from the UVa Department of Astronomy. NRAO and UVa Astronomy share colloquia, journal clubs, and lunch talks. Several NAASC staff have joint or adjunct appointments at UVa. A listing of NAASC staff, including research interests, is available here:

<http://science.nrao.edu/alma/ALMApeople/people.shtml>

The key services provided by the NAASC to the North American astronomical community include:

- Organizing training workshops and tutorials
- Visiting institutions to train astronomers to use ALMA
- Helping to prepare and distribute the Call for Proposals and other user documentation

- Assisting users with the preparation and submission of ALMA proposals
- Helping users prepare their scheduling blocks, the observing scripts used to control the telescope
- Hosting visits by ALMA observers to assist with data reduction and analysis
- Maintaining a local copy of the ALMA data archive and operating a copy of the ALMA data processing pipeline
- Staffing the ALMA Helpdesk
- Developing user-oriented observing and analysis tools, such as the spectral line catalog (Splatalogue), and the CASA-based observing simulator (*SIMdata*)
- Providing opportunities for student funding, and page charge support for U.S. investigators
- Organizing and hosting ALMA-themed science meetings
- Supporting future development of the telescope
- Helping investigators with education and public outreach activities

## 4 Essential Resources

### 4.1 The ALMA Science Portal

The Science Portal is the primary access point to ALMA for all science users. The website is:

<http://almascience.nrao.edu>

At the Science Portal, users can:

- Access the Call for Proposals, the Proposer’s Guide, the Technical Handbook, the Early Science Primer, and other documentation
- Download the Observing Tool, which is used to prepare and submit ALMA proposals, and access its documentation
- Search and access public data from the science data archive
- Access “Knowledgebase” articles from the Helpdesk
- Access software tools, including a sensitivity calculator, *SIMdata*, and Splatalogue

Astronomers can also register with the Science Portal. Indeed, every astronomer who intends to submit an ALMA proposal, or appear on one as an investigator, must register. Once registered and logged in, users at the Science Portal will be able to:

- Submit tickets to the Helpdesk
- Use the Project Tracker to follow the status of observations in the queue
- Access their proprietary data from the archive

### 4.2 The NAASC Website

The NAASC website provides up-to-date news and information of particular use to North American ALMA users. The website is: <http://science.nrao.edu/alma>

At the NAASC website, users get information on:

- ALMA and NAASC news and events
- Workshops and tutorials
- Financial support for travel and publications
- Visiting the NAASC
- Student and postdoc programs
- Education and outreach activities
- NAASC staff

### 4.3 The Helpdesk

The ALMA Helpdesk is the main user resource for getting help. The Helpdesk is a website that can be accessed from the Science Portal, from the NAASC website, or directly at: <http://alma-help.nrao.edu>

The Helpdesk includes a library of “Knowledgebase” articles that address a number of common issues and questions. To submit a ticket, users must first log in. As the user types a question, knowledgebase articles are searched in real time and relevant articles are presented to the user, sorted by relevance, as the question is being typed. If the question is not answered by one of the articles suggested, the user can submit the ticket. While it is necessary to log in before submitting a ticket, users can browse and search the knowledgebase articles without logging in.

Helpdesk staff will make every effort to respond to tickets promptly. During normal operations, users can expect a response within 2 business days. During the week prior to a proposal deadline, extra staff will be assigned to the Helpdesk and every effort will be made to address time-critical questions in a rapid manner.

Some Helpdesk tickets may require iteration with staff to resolve the issue. The Helpdesk interface allows users to reply to Helpdesk staff and view the full thread associated with a ticket. Each ticket has an associated status that can be changed either by the user or the Helpdesk staff. While the ticket is active, the status will be shown as “Open”. Once the question is answered, the Helpdesk staff will mark the ticket as “Resolved”. At that point, if satisfied with the response, the user should change the status to “Closed”. Tickets identified as “Resolved” will be automatically closed after two weeks, unless reopened by the user.

## 5 Getting Help from the NAASC at Each Step of Your Project

The NAASC provides user support through all stages of an ALMA project, from learning the telescope’s capabilities through the publication of results.

### 5.1 Learning about ALMA: Documentation, Workshops, and Community Days

Preparing for an ALMA project begins with learning the telescope’s capabilities and learning the tools needed to design observations, prepare proposals, and submit proposals. The NAASC provides user documentation, including “Observing with ALMA: A Primer for Early Science,” at the Science Portal.

The NAASC organizes workshops periodically in the USA and Canada to promote ALMA to the astronomical community and teach the tools needed to write proposals. During the early part of 2011, these workshops

will be focused specifically on preparation for the Cycle 0 observing period. They feature talks on the telescope's capabilities, mm/submm interferometry observing techniques, and the tools required to design effective ALMA observations. Users will learn to use the Observing Tool, the software used to prepare and submit observing proposals. They will also learn about *SIMdata*, a CASA task for simulating ALMA observations. Attendees will have the opportunity to get hands-on training as well.

In addition to the workshops described above, the NAASC supports "Community Days" events, which are one or two day ALMA workshops organized and hosted by university groups or research institutes. During 2011, these Community Days events will also focus on promoting Early Science and teaching the tools needed to write effective proposals. Community Days typically feature several ALMA-themed science talks by local astronomers. These are joined by talks from NAASC staff to describe ALMA capabilities, NAASC support services, and ALMA user tools. The training provided at Community Days is comparable to that given at the NAASC-hosted workshops, and in some cases includes hands-on work focused on the Observing Tool and *SIMdata*.

Space may be limited at Community Days, and local participants will be given preference, particularly for hands-on sessions. Those not local to a Community Days tutorial should seek to attend one of the NAASC-hosted workshops in the USA or Canada.

Visit the NAASC website for an up-to-date list of workshops and Community Days events, or visit the workshops page directly at: <http://science.nrao.edu/alma/community1.shtml>

Registration is required for these events, and is available on the website.

## 5.2 Proposal Preparation

A Call for Proposals will be issued prior to each scheduling period. The Call and supporting documents will be made available by the NAASC on the Science Portal. These documents will describe the capabilities of the telescope for the upcoming cycle and the policies and procedures for submitting proposals.

ALMA proposals are prepared using the ALMA Observing Tool, an application that can be downloaded from the Science Portal. Proposals must include a scientific and technical justification, a list of targets and frequencies to be observed, and the sensitivities required to meet the science goals. The Observing Tool includes a sensitivity and exposure time calculator. Users must be registered with the Science Portal to submit proposals with the Observing Tool.

NAASC staff are available to help users learn the Observing Tool and prepare proposals. We emphasize here that the Observing Tool is used not only to assemble and submit the scientific and technical justifications, but also to design and fully specify the observations, so users are encouraged to become familiar with the Observing Tool well in advance of the proposal deadline. The Helpdesk is the primary resource for those seeking assistance. It may be possible to arrange face-to-face assistance at the NAASC for particularly challenging projects.

The CASA task *SIMdata* allows users to simulate an ALMA observation of a target based on a model with a given source structure and brightness. *SIMdata* also helps one understand how different antenna configurations and track durations affect an observation. Users can get hands-on experience with *SIMdata*

at one of the NAASC workshops or Community Days events. More information on *SIMdata* is available at the CASA and casaguides websites:

<http://casa.nrao.edu>

<http://casaguides.nrao.edu>

### 5.3 Preparing and Tracking Your Observations

ALMA proposals are reviewed for scientific and technical merit, and the outcome of these reviews will be emailed to the investigators. Proposers eligible for scheduling will be notified if telescope operations require additional information before the project can be observed. When additional preparation is needed, project members will work with NAASC staff to generate the detailed observing instructions (scheduling blocks) used by the telescope. For particularly complex observations, users may arrange a visit to the NAASC to prepare the scheduling blocks. Preparation of scheduling blocks is again accomplished using the Observing Tool.

Observers do not travel to Chile or elsewhere to take part in the observation, itself. ALMA observations will be scheduled dynamically, taking into account the weather conditions, instrument status, availability of the targets, proposal ranking, and so on. Users can follow the status of their observations with the Project Tracker, a tool available from the Science Portal. The Project Tracker gives the status of each scheduling block: which ones have been observed, which are still in the queue, which still need work before they can be submitted. If any problems should arise during an observation, observers will be notified by email and the problems will be logged in the Project Tracker as well.

### 5.4 Reducing Your Data

The challenge posed by storing and processing ALMA data will be formidable. The NAASC will host a copy of the ALMA data archive that will serve as the primary data access point for North Americans, and will provide a backup of the archive in Santiago. Users can access the data archive from the Science Portal.

ALMA data will be processed initially by data reduction scripts, handling a wide variety of observing modes. For each project, the raw data, the processed data, and the scripts will be available for download from the data archive. However, because of the complexity of the calibration and data reduction schemes, users will get the best results by refining the scripts and reprocessing the data themselves, with assistance from NAASC staff.

The NAASC will have computers with ample resources to reduce ALMA data, including powerful desktops and a cluster machine. Users are encouraged to visit the NAASC to use these computing resources and get help with their data processing. For Cycle 0, remote access to data reduction computers at the NAASC will not be available. The NAASC is developing recommendations for computing capabilities required to process ALMA data outside of the NAASC, including benchmarking of example desktop systems. This information will be provided on the NAASC website.

The primary software package used to process ALMA data is CASA. The CASA website is:

<http://casa.nrao.edu>

Note in particular the *casaguides* link available from this site. The *casaguides* site provides a collection of data reduction recipes and step-by-step processing and analysis examples.

A data reduction pipeline is currently in development but will not be available for Cycle 0. The pipeline will be run in Santiago, and a copy will run in Charlottesville on the NAASC computing cluster.

## 5.5 Visiting the NAASC

The NAASC welcomes short-term visits to Charlottesville from investigators of successful ALMA Early Science programs for expert assistance with processing and analyzing their ALMA data. Visits for data reduction are expected to last about a week. Student visitors must be accompanied by an experienced investigator, usually their academic advisor. Visitors will have access to an office and a computer with ample resources to process their data. Investigators on accepted projects can apply to the NAASC for assistance with travel expenses. To request a visit, send a ticket to the Helpdesk using the “Face to Face Support” category. More details are available at: <http://science.nrao.edu/alma/visitors-shortterm.shtml>

## 5.6 Publishing Your Results

The NAASC provides financial support for page charges according to the NRAO policy. If requested, NRAO will pay 100% of page charges for authors at U.S. institutions when the publication reports observations made with ALMA (or any NRAO telescope). The paper may report either original observations made by the authors, or original research made with archival data. Details on the page charge support policy are here: <http://www.nrao.edu/library/pagecharges.shtml>

## 5.7 Promoting ALMA Science

The NAASC sponsors ALMA-themed science conferences on roughly an annual basis. A listing of previous ALMA conferences and information on upcoming conferences is available at the following site: <http://science.nrao.edu/alma/workshops.shtml>

NAASC activities and ALMA results are publicized in the NRAO eNews and the ALMA newsletter:

<http://science.nrao.edu/enews>

<http://www.almaobservatory.org/en/outreach/newsletter>

The NAASC is also involved in community outreach through special ALMA sessions at American Astronomical Society meetings. Here we provide attendees with an overview of NAASC user support, the current status of ALMA, and the proposal submission and data analysis tools.

The Education and Public Outreach (EPO) team at NRAO will work with investigators of successful Cycle 0 projects on press releases and other outreach products, if their project is selected for publicity. In addition to providing expertise and advice on outreach activities, the EPO team can work with investigators to develop images and other visuals to promote science results.

## 6 Working with the Community to Improve ALMA

The NAASC encourages involvement from the user community to develop and improve ALMA. Through the NRAO visitor program, the NAASC offers financial support for approved long-term visits that can range from a few weeks to several months. NRAO particularly encourages long-term visits that could lead to new and innovative instrumentation on ALMA, and visits to develop innovative new software or techniques. Full details on the visitor program are available on the NAASC website.

The NAASC also engages the community with periodic workshops to promote and plan the development of new instruments, capabilities, and software. Refer to the NAASC website for upcoming ALMA development workshops.

## 7 Student Support

The NAASC supports student involvement in ALMA through the NRAO student programs. NRAO has a Summer Student Program aimed at introducing undergraduate and graduate students to forefront research. A Student Observing Support Program funds graduate students working on accepted NRAO projects, including eligible ALMA proposals. Additionally, a graduate Pre-Doctoral Program is available to give students the opportunity to conduct thesis research at NRAO sites under the supervision of an NRAO scientist. Details on the student programs are available at:

<http://science.nrao.edu/opportunities/studentprograms.shtml>

## 8 Addresses for the NAASC, NRC-HIA, and ASIAA

The North American ALMA Science Center  
520 Edgemont Rd.  
Charlottesville, VA 22903  
USA

Phone: 434-296-0211

Directions: <http://science.nrao.edu/alma/edgemont.shtml>

National Research Council  
Herzberg Institute of Astrophysics  
5071 West Saanich Road  
Victoria, BC V9E 2E7  
Canada

Phone: 250-363-0001

Directions: <http://www.nrc-cnrc.gc.ca/eng/locations/directions/victoria.html>

Institute of Astronomy and Astrophysics, Academia Sinica.  
11F of Astronomy-Mathematics Building, National Taiwan University  
No.1, Roosevelt Rd, Sec. 4 Taipei 10617, Taiwan, R.O.C.

Phone: +886-2-3365-2200

Directions: <http://www.asiaa.sinica.edu.tw/guide/transport.php>

## 9 Map of the Area Near NRAO Headquarters and the NAASC

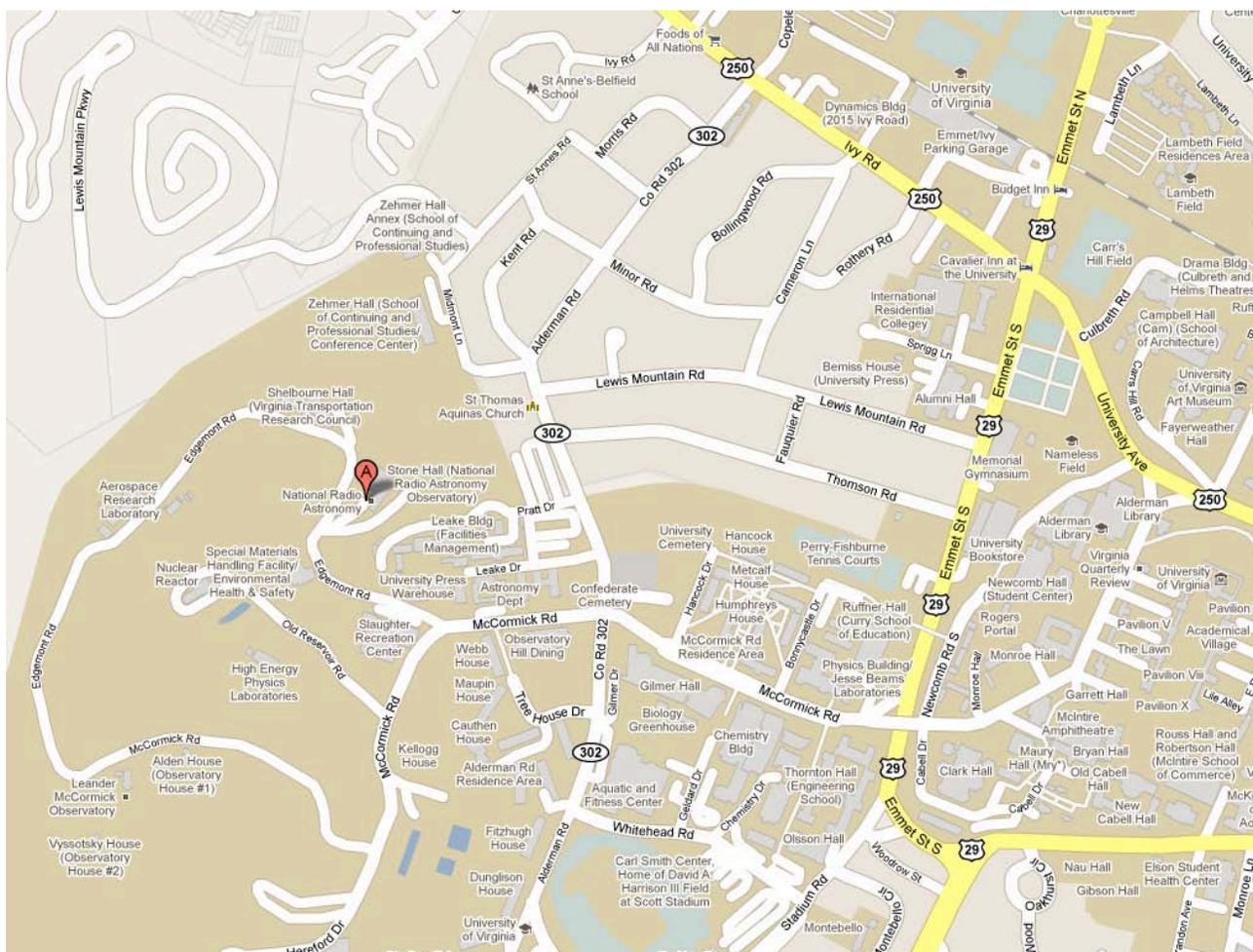


Figure 2: NRAO headquarters and the NAASC are located by the red marker labeled "A"



The Atacama Large Millimeter/submillimeter Array (ALMA), an international astronomy facility, is a partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. ALMA is funded in Europe by the European Organization for Astronomical Research in the Southern Hemisphere (ESO), in North America by the U.S. National Science Foundation (NSF) in cooperation with the National Research Council of Canada (NRC) and the National Science Council of Taiwan (NSC) and in East Asia by the National Institutes of Natural Sciences (NINS) of Japan in cooperation with the Academia Sinica (AS) in Taiwan. ALMA construction and operations are led on behalf of Europe by ESO, on behalf of North America by the National Radio Astronomy Observatory (NRAO), which is managed by Associated Universities, Inc. (AUI) and on behalf of East Asia by the National Astronomical Observatory of Japan (NAOJ). The Joint ALMA Observatory (JAO) provides the unified leadership and management of the construction, commissioning and operation of ALMA.

