

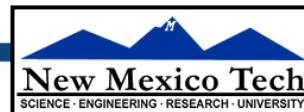
# An Introduction to the ALMA Observing Tool



How to turn that great idea into an ALMA proposal...



Sixteenth Synthesis Imaging Workshop  
16-23 May 2018



# An Introduction to the ALMA Observing Tool



How to turn that great idea into an ALMA proposal...



**Rachel Friesen**

*With thanks to Arielle Moullet & Harvey Liszt*





# What is ALMA?

- A global partnership to deliver a revolutionary millimeter/submillimeter telescope array by **North America, Europe, East Asia**, in collaboration with Chile
- 66 reconfigurable, high precision antennas
- $\lambda \sim 0.32 - 8.5\text{mm}$
- Array configurations between 150 meters and >16 kilometers:
  - ◆ Main Array: 50 x 12m antennas
  - ◆ Total Power Array: 4 x 12m antennas
  - ◆ Atacama Compact Array (ACA): 12 x 7m antennas
  - ◆ TP + ACA (Morita Array)
- Array Operations Site is located at 5000m elevation in the Chilean Andes
- Provides unprecedented imaging\* & spectroscopic capabilities at mm/submm  $\lambda$



# ALMA in a Nutshell...



- ◆ Angular resolution down to 0.015" (at 300 GHz)
- ◆ Sensitive, precision imaging 84 to 950 GHz (3 mm to 320  $\mu\text{m}$ )
- ◆ State-of-the-art low-noise, wide-band receivers\* (8 GHz bandwidth)
- ◆ Flexible correlator with high spectral resolution at wide bandwidth
- ◆ Full polarization capabilities including circular.
- ◆ Estimated 1 TB/day data rate
- ◆ All science data archived
- ◆ Pipeline processing





- Construction Project ended in September 2014
- Science observing has been out to **> 16 km baselines (C43–10)** thanks to the highly successful Long Baseline Campaigns in 2014 and 2015
- **All 66 antennas accepted**
  - Currently all 66 antennas are at the high site (AOS), of which ~47 on average (up to max ~54) are being used for Cycle 5 observations
  - Some construction and verification items remain to be finished (e.g., wide-field polarization; various observing modes)
- The ACA (Atacama Compact Array) or Morita Array – up to 12x7m antennas and 4x12m antennas for TP observations
  - currently being used for Cycle 5 observations

The Cycle 6 capabilities are fully described in Appendix A of the ALMA Proposers Guide available at:

<https://almascience.nrao.edu/documents-and-tools>

**In summary:**

- **Number of antennas**
  - At least forty-three (43) antennas in the 12-m Array
  - At least ten (10) 7-m antennas (for short baselines) and three (3) 12-m antennas (for making single-dish maps) in the ACA
- **Receiver bands**
  - Receiver Bands 3, 4, 5, 6, 7, 8, 9, and 10 (wavelengths of about 3.1, 2.1, 1.6, 1.3, 0.87, 0.74, 0.44, and 0.35 mm, respectively)
- **12-m Array Configurations**
  - Maximum baselines for the antenna configurations between 0.15 km and 16 km
  - Maximum baselines of 3.6 km for Bands 8, 9 and 10
  - Maximum baselines of 8.5 km for Band 7
  - Maximum baselines of 16 km for Bands 3, 4, 5 and 6

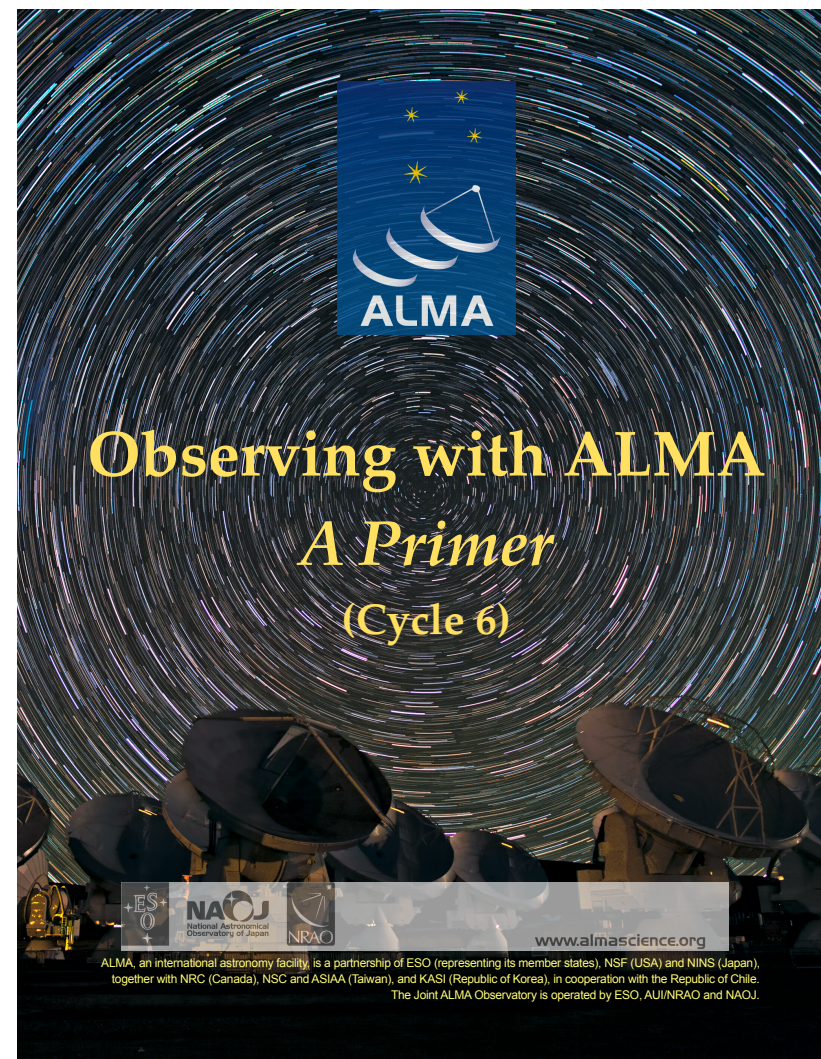


- **Spectral line, continuum, and mosaic observations**
  - Spectral line and continuum observations with the 12-m Array and the 7-m Array in all bands
  - Single field interferometry (all bands) and mosaics (Bands 3 to 9) with the 12-m Array and the 7-m Array
  - Single-dish spectral line observations in Bands 3 to 8
- **Polarization**
  - Single pointing, on axis, full (including circular) polarization for both continuum and full-spectral-resolution observations in Band 3, 4, 5, 6, and 7 are offered on the 12-m Array. (min polarization percentage of 1.8% of the peak flux for circular polarization; only for sources that are on-axis with an angular size less than 10% of the FWHM primary beam).
- **Observing Time:**
  - 4000 hours for successful proposals of PI programs expected on the 12m Array (includes DDT, Cycle 4 Carryover and resubmissions)
  - 3000 hours available on the ACA
  - 3000 hours available on the Total Power Array

- Read relevant documentation (CfP Guide, Primer, etc.)
- Create an ALMA account by registering at the Science Portal ([almascience.org](http://almascience.org))
- Download the Observing Tool (OT) & related guides
- Prepare the Science Case
  - Note the new capabilities for the current cycle!
- Prepare Science Goals (sources, frequency & correlator setup, integration times) within the OT
- Make use of the Helpdesk & the Knowledgebase



- Call for Proposals
- Proposer's Guide
- ALMA Primer
- OT Guide
- ALMA Tech Handbook
- Timeline for Cycle 6
  - ~~Mar. 20~~ — ~~Call for Proposals~~
  - ~~Apr. 19~~ — ~~Proposal Deadline~~
  - End July — Results to PIs
  - Aug. 2018 — PIs submit SBs
  - Oct. 2018 — Start of Cycle 6
  - Sept. 2019 — End of Cycle 6



- Read relevant documentation (CfP Guide, Primer, etc.)
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- **Prepare the Science Case**
  - Note the new capabilities for the current cycle!
- Prepare Science Goals (sources, frequency & correlator setup, integration times) within the OT
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# Before you start the OT...



## From your science case:

- Source(s):
  - single pointings or mosaics?
  - what angular resolution do you need?
  - what is the largest angular size of your source(s)?
- Spectral configuration:
  - continuum or spectral lines?
  - frequency: which band?
- Are you doing polarization?
  - what is the expected polarization fraction?
- Sensitivity:
  - what rms do you need to achieve your science goals?
  - over what bandwidth? i.e., 3 km/s, or 1.875 GHz, etc.



# ALMA configuration schedule



- The configuration schedule may determine when an object will be observed
- In Cycle 6, for example:
  - C43-1,2 January, March
  - C43-3,4 December, April
  - C43-5 October only
  - C43-8..10 June, July
- Some combinations of object + configuration may not be available for night-time observing

Table 1: Cycle 6 configuration schedule

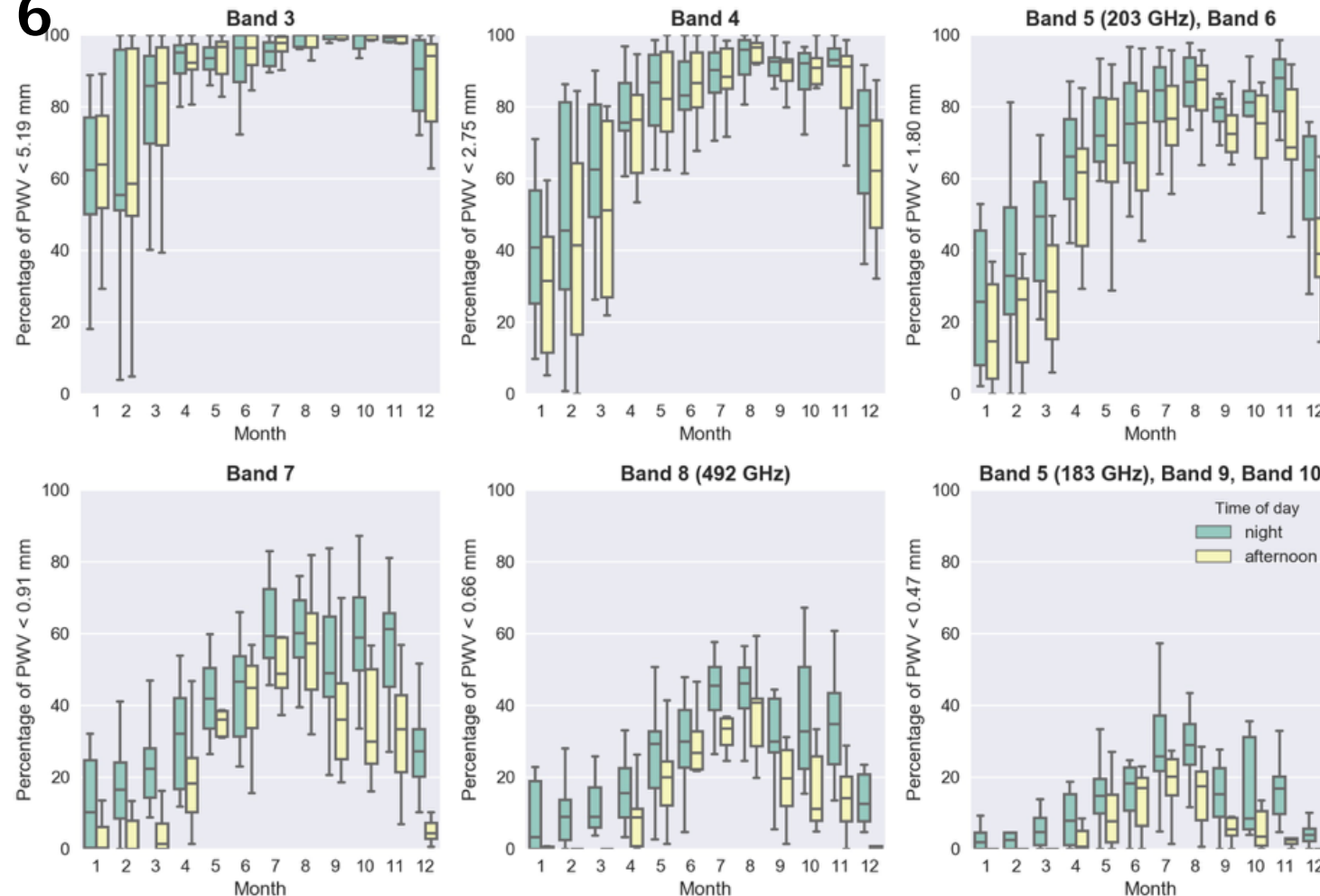
Start date	Configuration	Longest baseline	LST for best observing conditions
2018 October 1	C43-6	2.5 km	~ 22h – 10h
2018 October 15	C43-5	1.4 km	~ 0h – 12h
2018 November 25	C43-4	0.78 km	~ 2h – 14h
2018 December 15	C43-3	0.50 km	~ 4h – 15h
2019 January 5	C43-2	0.31 km	~ 5h – 16h
2019 January 20	C43-1	0.16 km	~ 6h – 17h
2019 February 1-28	No observations due to February shutdown		
2019 March 1	C43-1	0.16 km	~ 8h – 21h
2019 March 15	C43-2	0.31 km	~ 8h – 22h
2019 April 1	C43-3	0.50 km	~ 9h – 23h
2019 April 15	C43-4	0.78 km	~ 10h – 0h
2019 May 1	No observations due to major antenna relocation		
2019 June 1	C43-10	16.2 km	~ 13h – 3h
2019 June 20	C43-9	13.9 km	~ 14h – 5h
2019 July 10	C43-8	8.5 km	~ 16h – 6h
2019 August 1	C43-7	3.6 km	~ 18h – 8h
2019 September 5	C43-6	2.5 km	~ 20h – 9h

# ALMA Observing Strategies

ALMA



## Cycle 6



- Box and whisker plots of the percentage of time that the precipitable water vapor (PWV) is less than the thresholds adopted for the various ALMA bands versus the month of the year. Results are shown for both night time (green) and mid-afternoon (yellow), and assume a source elevation of 60 degrees. The horizontal line within a box indicates the median, the boundaries of a box indicate the 25<sup>th</sup>- and 75<sup>th</sup>-percentile of the distribution, and the whiskers indicate the highest and lowest values of the distribution. The PWV measurements were obtained by the APEX weather stations between 2007 and 2017.

## From your science case:

- Source(s):
  - single pointings or mosaics?
  - what angular resolution do you need?

## On to the Observing Tool!

- Spectral configuration:
  - continuum or spectral lines?
  - frequency: which band?
- Are you doing polarization?
  - what is the expected polarization fraction?
- Sensitivity:
  - what rms do you need to achieve your science goals?
  - over what bandwidth? i.e., 3 km/s, or 1.875 GHz, etc.



# Downloading the ALMA OT



<https://almascience.nrao.edu>



Atacama Large Millimeter/submillimeter Array  
In search of our Cosmic Origins



Log in



About

Science

Proposing

Observing

Data

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Tools

Documentation

Help

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## Observing Tool

The ALMA Observing Tool (OT) is a Java application used for the preparation and submission of ALMA Phase 1 (observing proposal) and Phase 2 (telescope runfiles for accepted proposals) materials. It is also used for preparing and submitting Director's Discretionary Time (DDT) proposals. The current *Cycle 6* release of the OT is configured for the present capabilities of ALMA as described in the [Cycle 6 Call For Proposals](#). Note that in order to submit proposals you will have to register with the ALMA Science Portal beforehand.

Note that preparation of Cycle 5 DDT proposals needs to be done using the Cycle 5 version of the Observing Tool. This version of the OT can be found in the [DDT page](#), or the Phase 2 menu.

## Download & Installation

The OT will run on most common operating systems, as long as a **64-bit version of Java 8** is installed (see the [troubleshooting page](#) if you are experiencing Java problems). The ALMA OT is available in two flavours: Web Start and tarball.

The **Web Start** application is the recommended way of using the OT. It has the advantage that the OT is automatically downloaded and installed on your computer and it will also automatically detect and install updates. There are some issues with Web Start, particularly that it does not work with the Open JDK versions of Java such as the "Iced Tea" flavour common on many modern Linux installations. The Oracle variant of Java should therefore be installed instead. If this is not possible, then the tarball installation of the OT is available.

The **tarball** version must be installed manually and will not automatically update itself, however there should be no installation issues. For Linux users, we also provide a download complete with a recommended version of the Java Runtime Environment. Please use this if you have any problems running the OT tarball with your default Java.

Webstart

Tarball

## Documentation

Extensive documentation is available to help you

- If you are a novice OT user you should start with the [Getting Started](#) guide.
- Audio-visual illustrations of different aspects of the OT can be found in the [OT video tutorials](#). These are recommended for novices and advanced users alike.
- More in-depth information on the OT can be found in the [User Manual](#), while concise explanations of all fields and menu items in the OT are given in the [Reference Manual](#). These two documents are also available within the OT under the Help menu.

## Troubleshooting

If you have problems with the installation and/or startup of the OT, please see the [troubleshooting page](#). A list of currently known bugs, their status and possible workarounds can be found on the regularly updated [known OT Issues](#) page. A further source of information is the [OT section of the ALMA Helpdesk Knowledgebase](#) - this contains a number of articles that deal with frequently-asked questions. After exploring these resources, if confusion over some aspect of the OT remains, or if a previously unidentified bug has been uncovered, please file a [Helpdesk ticket](#).

Using webstart is easier and has the advantage that it checks for and will download a newer version at startup



Atacama Large Millimeter/submillimeter Array  
In search of our Cosmic Origins



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Search Site




## OT Video Tutorials

The OT video tutorials provide an audio-visual demonstration of different aspects of proposal preparation in the OT. Novice users should start with the first video and work their way down, while more experienced users may want to jump straight to one of the specialised videos.

### OT Video Tutorial 1: Useful to Know

This video will help you get started with the OT and introduce you to some handy tips and tricks. Topics covered include navigating the OT, using the help function, the template library, time estimation, validation, opening & submitting projects including re-submissions, and the concept of non-standard modes. **Note:** this video is from Cycle 4, some things have changed slightly in Cycle 5. In particular, time constraints can now also include simultaneous 12-m and 7-m observations, and re-submissions are no longer defined by the user. Also, the time estimate interface has changed a bit.



Video 1:  
Useful to Know



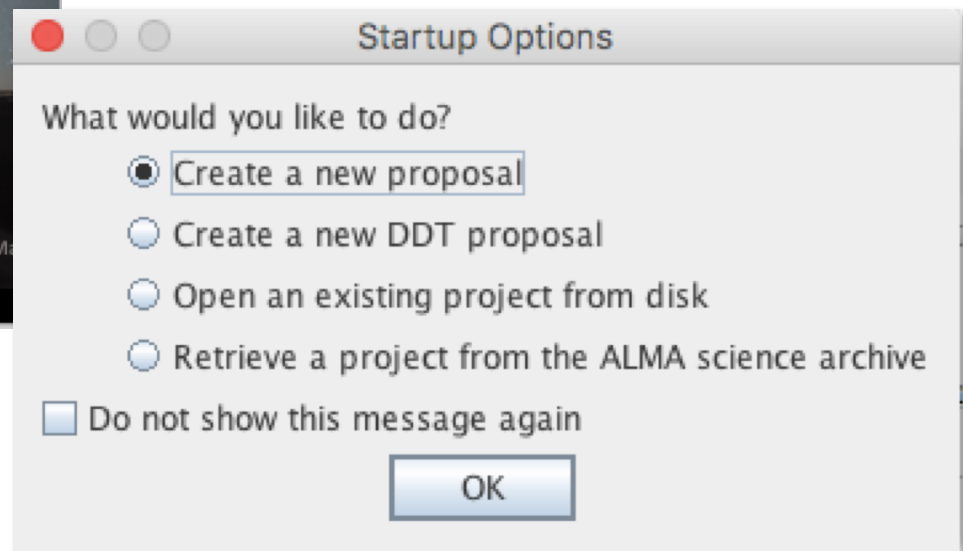
# When the ALMA OT starts



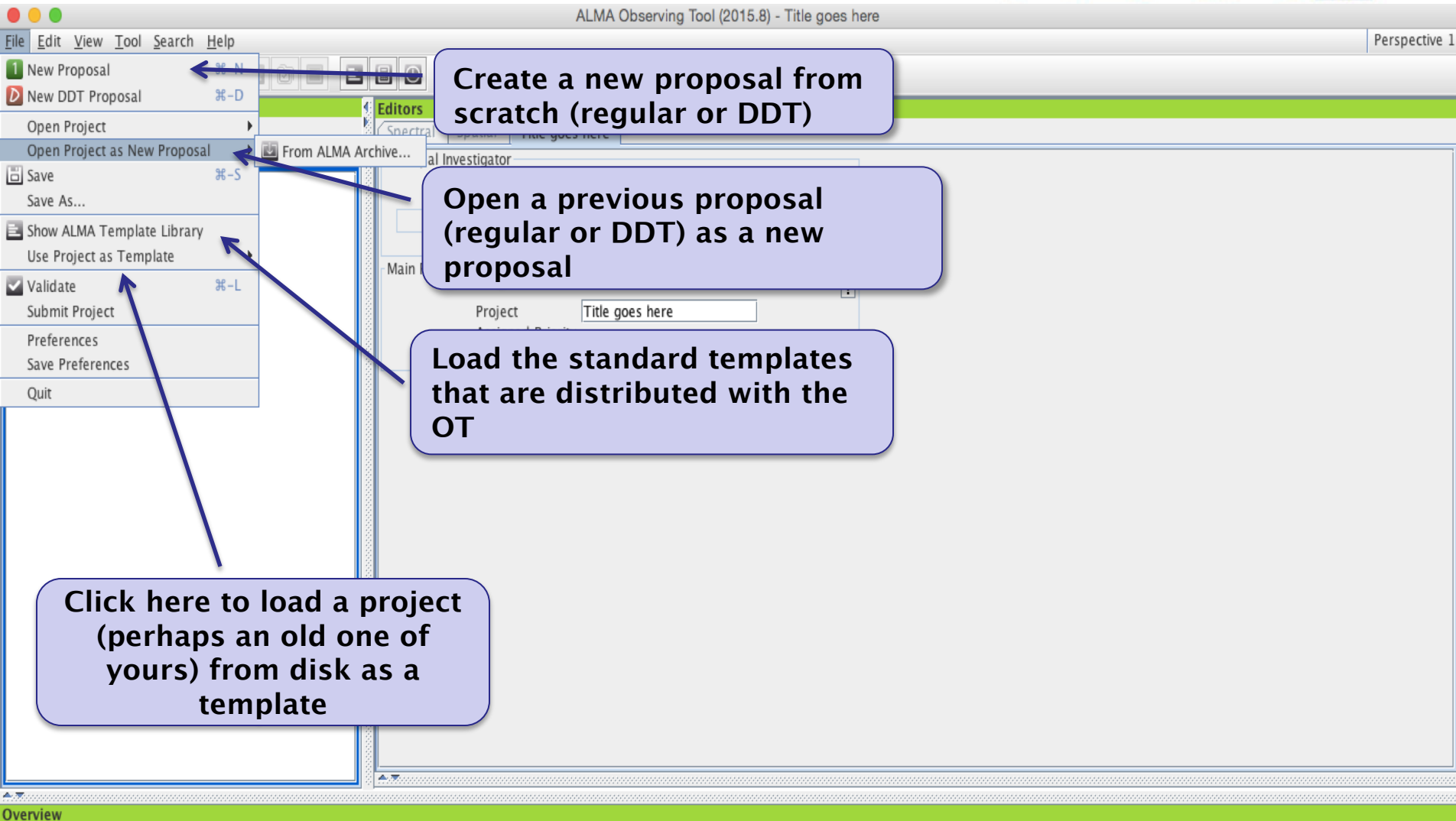
First you see this



Then you see this




# Creating a new proposal



The screenshot shows the ALMA Observing Tool (2015.8) interface. The menu bar includes File, Edit, View, Tool, Search, and Help. The File menu is open, showing options like New Proposal, New DDT Proposal, Open Project, Open Project as New Proposal, Save, Save As..., Show ALMA Template Library, Use Project as Template, Validate, Submit Project, Preferences, Save Preferences, and Quit. Callouts point to specific menu items and toolbar icons:

- Create a new proposal from scratch (regular or DDT)**: Points to the 'New Proposal' menu item.
- Open a previous proposal (regular or DDT) as a new proposal**: Points to the 'Open Project as New Proposal' menu item.
- Load the standard templates that are distributed with the OT**: Points to the 'Show ALMA Template Library' menu item.
- Click here to load a project (perhaps an old one of yours) from disk as a template**: Points to the 'Use Project as Template' menu item.

## Contextual Help

1. Please ensure you and your co-Is are registered with the [ALMA Science Portal](#)
2. Create a new proposal by either:
  - Selecting **File > New Proposal**
  - Clicking on the  icon in the toolbar
  - Or clicking on this [link](#)

## Phase I: Science Proposal



Click on the overview steps to view the contextual help



# Proposal front page



ALMA Observing Tool (Cycle5(Phase2)u2) - Your snazzy title

File Edit View Tool Search Help

Perspective 1

Project Structure

- Unsubmitted Proposal
  - Your snazzy title
    - Proposal

Editors

Spectral Spatial **Proposal**

Proposal Information

Proposal Title: Your snazzy title

Proposal Cycle: 2017.1

Abstract (max. 1200 characters):  
Not too abstract, please!

Proposal Type

- ☒ Regular
- ☐ Target Of Opportunity
- ☐ VLBI
- ☐ Large Program

Scientific Category

- ☒ Cosmology and the High Redshift Universe
- ☐ Galaxies and Galactic Nuclei
- ☐ ISM, star formation and astrochemistry
- ☐ Circumstellar disks, exoplanets and the solar system
- ☐ Stellar Evolution and the Sun

Keywords (max. 2 keywords):

- Lyman Alpha Emitters/Blobs (LAE/LAB)
- Lyman Break Galaxies (LBG)
- Starburst galaxies
- Sub-mm Galaxies (SMG)
- High-z Active Galactic Nuclei (AGN)

Student project: ☐

Related Proposals:

Previous Proposals:

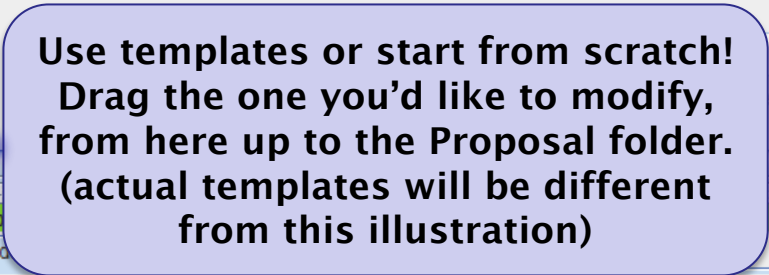
Investigators

Feedback

Validation Validation History Log

Description	Suggestion

**ALMA**



Hint: you can also drag&drop or copy&paste elements between Science Goals in your project

# Before you start the OT...



## From your science case:

- Source(s):
  - single pointings or mosaics?
  - What angular resolution do you need?
  - What is the largest angular size of your source(s)?
- Spectral configuration:
  - continuum or spectral lines?
  - Frequency: which band?
- Are you doing polarization?
  - What is the expected polarization fraction?
- Sensitivity:
  - what rms do you need to achieve your science goals?
  - over what bandwidth? i.e., 3 km/s, or 1.875 GHz, etc.



# Set your targets: Field Setup



ALMA Observing Tool (Cycle6(UserTest)) - Casting Light on Chameleon's Dark CO

File Edit View Tool Search Help Perspective 1

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

**Project Structure**

Proposal Program

Unsubmitted Proposal

✚ Casting Light on Chameleon's Dark CO

✚ Proposal

✚ Planned Observing

✚ ScienceGoal (Chameleon's dark CO)

✚ General

**Editors**

Spectral Spatial **Field Setup**

Source Name J1136-6827-0.4 Resolve

Choose a Solar System Object? ☐ Name of object Unspecified

System ICRS Sexagesimal display? ☒ Parallax 0.00000 mas

Source Coordinates RA 11:36:02.0970 PM RA 0.00000 mas/yr

Dec -68:27:05.810 PM DEC 0.00000 mas/yr

Source Radial Velocity 0.000 km/s lsrk z 0.000000000 Doppler Type RADIO

Target Type ☒ Individual Pointing(s) ☐ 1 Rectangular Field

Expected Source Properties

Peak Continuum Flux Density per Synthesized Beam 1.00000 Jy

Continuum Linear Polarization 4.0 per cent

Continuum Circular Polarization 0.0 per cent

Peak Line Flux Density per Synthesized Beam 0.10000 Jy

Line Width 3.5 km/s

Line Linear Polarization 0.0 per cent

Line Circular Polarization Percentage 2.0 per cent

Field Center Coordinates

Coord Type ☒ Relative ☐ Absolute

Offset Unit arcsec

#Pointings 1

RA [arcsec]	Dec [arcsec]
0.00000	0.00000

**Feedback**

Validation Validation History Log

**Source name, position, proper motion, velocity, velocity rest frame.**

**Rectangular mosaic or 1/more offset pointings?**

**The expected source properties are used with the spectral setup, desired angular resolution, rms, to set the S/N, dynamic range and overall project viability**

**When you resolve a name check all returned info**



# Set your targets: Mosaics

**ALMA Observing Tool (Cycle6) - Project**

File Edit View Tool Search Help

Perspective 1

**Project Structure**

- Proposal
- Program
- Unsubmitted Proposal
- Project
  - Planned Observing
    - ScienceGoal (Copy of Bright molecular gas tracers in NGC1232)
      - General
      - Field Setup**
      - Spatial Setup
      - Configuration Setup
      - Control and Performance
      - Technical Justification

**Editor**

Spectral Spatial Field

**Spatial Image**

NGC3256

Source Name: NGC3256

Choose a Solar System Object? ☐ Name of object: Unspecified

System: ICRS Sexagesimal display? ☒

Source Coordinates: RA: 10:27:51.2839 Dec: -43:54:13.550

Resolved by cds.wu-strasbourg.fr (SIMBAD)

Source Radial Velocity: 2794.200 km/s hel z: 0.009364291 Doppler Type: RELATIVISTIC

Target Type: ☐ Individual Pointing(s) ☒ 1 Rectangular Field

Expected Source Properties

Peak Continuum Flux Density per Synthesized Beam: 0.00000 Jy

Continuum Linear Polarization: 0.0 per cent

Continuum Circular Polarization: 0.0 per cent

Peak Line Flux Density per Synthesized Beam: 35.00000 mJy

Line Width: 15.00000 km/s

Line Linear Polarization: 0.0 per cent

Line Circular Polarization: 0.0 per cent

Rectangle

File

Onset (Latitude): 0.00000 arcsec

p length: 1.50000 arcmin

q length: 1.50000 arcmin

Position Angle: 0.00000 deg

Spacing: 0.51093 fraction of antenna beamsize Reset to Nyquist

#Pointings: 12m Array 126 7m Array 39 Export

**When you click on this node you will land on the visualizer tab**

**The Spatial tab gives a graphical visualization of the Field Setup.**

**Select a background image from an online image server**

FOV Parameters

Representative Frequency (Sky): 337.605 GHz

Antenna Diameter: ☒ 12m ☐ 7m

Antenna Beamsize (HPBW): 17.248 arcsec

Show Antenna Beamsize: ☒

Image Query

Image Server: Digitized Sky (Version II) at ESO

Image Size(arcmin): 10.0 Query

Feedback

Validation Validation History Log

Description	Suggestion

Overview

# Set your targets: Mosaics

**Editors**

Spectral Spatial **Field Setup**

Setting up the mosaic in the Field Setup

Define the length, width and position angle of the region to mosaic. Default is to separate the field centers by about 48% of the primary beam (the Nyquist rate). HPBW for the 12m antennas are  $1.13\lambda/D$

Line Width 0.00000 km/s

Line Polarization Percentage 0.0 %

Rectangle

Coords Type ☐ ABSOLUTE ☒ RELATIVE

System J2000

Field Center Coordinates

Offset(Longitude) 0.00000

Offset(Latitude) 0.00000

p length 2.0 arcmin

q length 2.0 arcmin

Position Angle 0.00000 deg

Spacing 0.48113 fraction of main beam

#Pointings 12m Array 105 7m Array 39

Estimated number of 7m Array pointings

No more than 150 12m Array pointings.

Image Filename emijan\jsky3\cache\jsky9043341093951517820.fits

FOV Parameters

Representative Frequency (Sky) 231.546 GHz

Antenna Diameter ☒ 12m ☐ 7m

Antenna Beamsize (HPBW) 26.706 arcsec

Show Antenna Beamsize ☒

Image Query

Image Server Digitized Sky (Version II)

Image Size(arcmin) 10.0

10:27:35.522, -43:56:25.99 (J2000)

1x 469, 175 13357.0

Reset to Nyquist

Export

# Before you start the OT...



## From your science case:

- Source(s):
  - single pointings or mosaics?
  - What angular resolution do you need?
  - What is the largest angular size of your source(s)?
- Spectral configuration:
  - continuum or spectral lines?
  - Frequency: which band?
- Are you doing polarization?
  - What is the expected polarization fraction?
- Sensitivity:
  - what rms do you need to achieve your science goals?
  - over what bandwidth? i.e., 3 km/s, or 1.875 GHz, etc.



# Spectral setup

ALMA Observing Tool (FEB2017) - Project

File Edit View Tool Search Help

Perspective 1

**Project Structure**

- Unsubmitted Proposal
  - Project
    - Proposal
      - Planned Observing
        - ScienceGoal (Copy of Chamneon's data)
          - General
          - Field Setup
          - Spectral Setup**
          - Calibration Setup
          - Control and Performance
          - Technical Justification

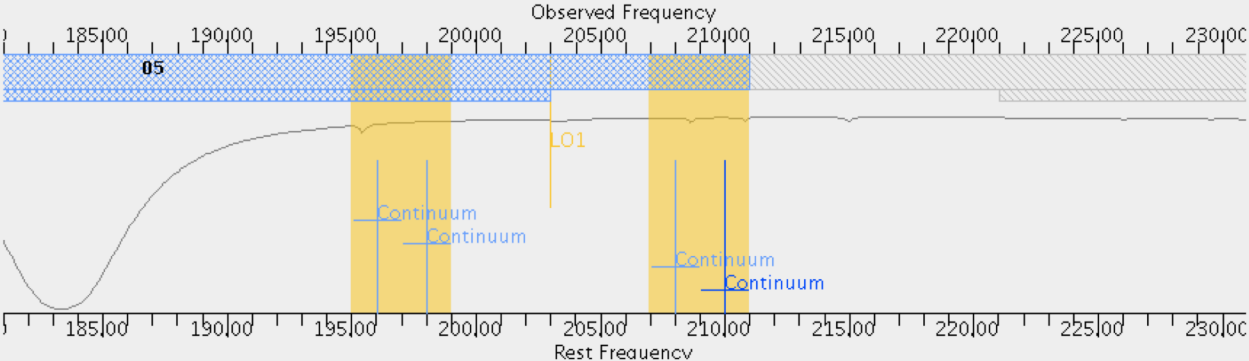
**Editors**

Spectral Spatial Spectral Setup

Note that for bands 3 to 8, it is not possible to put 3 basebands in one sideband and the fourth one in the other.

Left/right click to zoom in/out, grab sliding bar to pan

Note: Moving LO1 here is for experimentation only - actual setup determined by the windows



Observed Frequency

Rest Frequency

Overlays: ☒ Receiver Bands ☒ Transmission ☒ DSB Image ☐ Spectral Lines Select Lines to Overlay

Water Vapour Column Density: ☒ Automatic Choice ☐ Manual Choice 1.796mm (5th Octile)

Viewport: Pan to Spectral Window Zoom to Band Reset

Spectral Type

Spectral Type

☐ Spectral Line

☒ Single Continuum

☐ Spectral Scan

Produce image sidebands (Bands 9 and 10 only) ☐

Polarization products desired ☐ XX ☒ DUAL ☐ FULL

Spectral Setup Errors

Single Continuum

Receiver Band 5 [163.0-211.0 GHz]

Reset to Standard Frequency

Obs. Frequency 203.00000 GHz

When you click on this node you will land on the visualizer tab



# Adding spectral windows

ALMA Observing Tool (FEB2017) - Project

File Edit View Tool Search Help

Perspective 1

**Project Structure**

- Unsubmitted Proposal
  - Project
    - Proposal
      - Planned Observing
        - ScienceGoal (Copy of Chameleon's data)
          - General
          - Field Setup
          - Spectral Setup
          - Calibration Setup
          - Control and Performance
          - Technical Justification

**Editors**

Spectral Spatial Spectral Setup

**Spectral Line**

Baseband-1

Fraction	Centre Freq (rest,lsrk)	Centre Freq (sky,bar)	Transition	Bandwidth, Resolution (smoothed)	Spec. Avg.	Representative Window
1(Full)	98.70000 GHz	98.69607 GHz	continuum	1875.000 MHz( 5695 km/s), 31.250 MHz(94.923 km/s)	1	<input type="radio"/>

Add spectral window centred on a spectral line Add spectral window manually Delete ☐ Show image spectral windows

Baseband-2

1/2	97.99517 GHz	97.99127 GHz	I-C3H v=0 J=9...	58.594 MHz( 179 km/s), 70.557 kHz( 0.216 km/s)	2	<input type="radio"/>
1/2	97.98095 GHz	97.97705 GHz	CS v=0 2-1	58.594 MHz( 179 km/s), 61.035 kHz( 0.187 km/s)	1	<input type="radio"/>

Add spectral window centred on a spectral line Add spectral window manually Delete ☐ Show image spectral windows

Baseband-3

1/2	86.67076 GHz	86.66731 GHz	HCO 1(0,1)-0(...	58.594 MHz( 203 km/s), 61.035 kHz( 0.211 km/s)	1	<input type="radio"/>
1/2	87.31690 GHz	87.31342 GHz	CCH v=0 N=1-...	58.594 MHz( 201 km/s), 61.035 kHz( 0.210 km/s)	1	<input type="radio"/>

Add spectral window centred on a spectral line Add spectral window manually Delete ☐ Show image spectral windows

Baseband-4

v=0 J=1-0	58.594 MHz( 198 km/s), 61.035 kHz( 0.206 km/s)	1	<input checked="" type="radio"/>
v=0 1-0	58.594 MHz( 198 km/s), 61.035 kHz( 0.206 km/s)	1	<input type="radio"/>

Add spectral window centred on a spectral line Add spectral window manually Delete ☐ Show image spectral windows

**Representative Frequency**

The representative frequency is used in conjunction with the sensitivity entered on the 'Control and Performance' page to estimate the required observing time and to set the size of the antenna beam shown in the 'Spatial Visual' editor. If the transition you are most interested in does

**This option will call up a version of the spectral line picker. Windows added this way retain line id and other info from the splatalog**

**Frequencies may also be entered by hand**

# Using the spectral line catalog



Select Spectral Lines

Transition Filter  
CO\*

☒ Include description

Frequency Filters  
ALMA Band  
1 2 3 4 5 6 7 8 9 10

Sky Frequency (GHz)  
Min 31.3 Max 950

Receiver/Back End Configuration  
☐ Hide unobservable lines  
☒ Filtering unobservable lines

Maximum Upper-state Energy (K)  
0 20 40 60 80 100 ∞

Molecule Filter / Environment  
Show all atoms and molecules

Can't find the transition you're looking for in the offline pool? Find more in the online Splatalogue.  
Find More...

Reset Filters

Transitions matching your filter settings:  
(double-click column header for primary sort, single-click subsequent columns for secondary sorting. Single clicks will reverse sort order of already sorted columns.)

Transition	Description	Rest Frequency	Sky Frequency	Upper-state Energy	Lovas Intensity
CO v=2 1-0	Carbon Monoxide	113.172 GHz	113.172 GHz	6134.675 K	0.01
CO v=1 1-0	Carbon Monoxide	114.222 GHz	114.222 GHz	3089.154 K	0.01
CO v=0 1-0	Carbon Monoxide	115.271 GHz	115.271 GHz	5.532 K	60 0.01
CO v=2 2-1	Carbon Monoxide	226.34 GHz	226.34 GHz	6145.538 K	0.02
CO v=1 2-1	Carbon Monoxide	228.439 GHz	228.439 GHz	3100.118 K	0.62 0.02
CO v=0 2-1	Carbon Monoxide	230.538 GHz	230.538 GHz	16.596 K	70 0.02
CO+ J=2-1, F=3/2-1/2	Carbon Monoxide Ion	235.79 GHz	235.79 GHz		0.1 0.66
CO+ J=2-1, F=5/2-3/2	Carbon Monoxide Ion	236.063 GHz	236.063 GHz		0.1 1.21
CO v=2 3-2	Carbon Monoxide	339.5 GHz	339.5 GHz	6161.831 K	0.03
CO v=1 3-2	Carbon Monoxide	342.648 GHz	342.648 GHz	3116.561 K	0.71 0.03
CO v=0 3-2	Carbon Monoxide	345.796 GHz	345.796 GHz	33.192 K	70 0.03
CO+ J=3-2, F=5/2-3/2	Carbon Monoxide Ion	353.741 GHz	353.741 GHz		0.1 1.21
CO+ J=3-2, F=7/2-5/2	Carbon Monoxide Ion	354.014 GHz	354.014 GHz		0.18 1.71
CO v=2 4-3	Carbon Monoxide	452.645 GHz	452.645 GHz	6183.555 K	0.04
CO v=1 4-3	Carbon Monoxide	456.843 GHz	456.843 GHz	3138.486 K	0.04
CO v=0 4-3	Carbon Monoxide	461.041 GHz	461.041 GHz	55.317 K	60 0.04
CO v=2 5-4	Carbon Monoxide	565.774 GHz	565.774 GHz	6210.707 K	0.06
CO v=1 5-4	Carbon Monoxide	571.021 GHz	571.021 GHz	3165.891 K	0.06
CO v=0 5-4	Carbon Monoxide	576.268 GHz	576.268 GHz	82.974 K	0.06
CO v=1 6-5	Carbon Monoxide	678.88 GHz	678.88 GHz	6243.288 K	0.07
CO v=0 6-5	Carbon Monoxide	685.176 GHz	685.176 GHz	3198.774 K	0.07
CO v=1 7-6	Carbon Monoxide	691.473 GHz	691.473 GHz	116.159 K	100 0.07
CO v=0 7-6	Carbon Monoxide	691.96 GHz	691.96 GHz	6281.296 K	0.08
CO v=1 7-6	Carbon Monoxide	799.306 GHz	799.306 GHz	3237.134 K	0.08
CO v=0 7-6	Carbon Monoxide	806.652 GHz	806.652 GHz	154.872 K	110 0.08
CO v=2 8-7	Carbon Monoxide	905.009 GHz	905.009 GHz	6324.729 K	0.09

Add to Selected Transitions

Selected transitions

Transition	Description	Rest Frequency	Sky Frequency
CO v=0 2-1		230.538 GHz	230.538 GHz

Remove from Selected Transitions

Select a line from the list

Filters can be used to narrow the search

# Before you start the OT...



## From your science case:

- Source(s):
  - single pointings or mosaics?
  - What angular resolution do you need?
  - What is the largest angular size of your source(s)?
- Spectral configuration:
  - continuum or spectral lines?
  - Frequency: which band?
- Are you doing polarization?
  - What is the expected polarization fraction?
- Sensitivity:
  - what rms do you need to achieve your science goals?
  - over what bandwidth? i.e., 3 km/s, or 1.875 GHz, etc.



# Control & Performance

ALMA Observing Tool (FEB2017) - Project

File Edit View Tool Search Help

Project Structure

- Unsubmitted Proposal
  - Project
    - Proposal
      - Planned Observing
        - ScienceGoal (Copy of Chameleon's data)
          - General
          - Field Setup
          - Spectral Setup
          - Calibration Setup
          - Control and Performance**
          - Technical Justification

Editors

- Spectral
- Spatial
- Control and Performance**

These parameters are used to control various aspects of the observations, including the required antenna configurations and integration times.

Control and Performance

Configuration Information

Antenna Beamsize ( $1.13 * \lambda / D$ )	12m	38.309 arcsec	7m	65.672 arcsec	
Number of Antennas	12m	43	7m	10	TP 3
		ACA 7m configuration	Most compact 12m configuration	Most extended 12m configuration	
Longest baseline		0.049 km	0.161 km	16.197 km	
Synthesized beamsize		10.103 arcsec	2.906 arcsec	0.033 arcsec	
Shortest baseline		0.009 km	0.015 km	0.256 km	
Maximum recoverable scale		47.725 arcsec	24.192 arcsec	0.409 arcsec	

Desired Angular Resolution (Synthesized Beam) ☒ Single ☐ Range ☐ Any ☐ Standalone ACA

3.00000 arcsec

Largest Angular Structure in source 0.00000 arcsec

Desired sensitivity per pointing 0.00350 Jy equivalent to 20.581 mK

Bandwidth used for Sensitivity AggregateBandWidth Frequency Width 7.500000 GHz

Science goal integration time estimate Time Estimate

Override OT's sensitivity-based time estimate (must be justified) ☐ Yes ☒ No

Are the observations time-constrained? ☐ Yes ☒ No

Array properties summarized: what resolution and angular scales are observable?

Control and Performance defines the required angular resolution, sensitivity, largest angular scale, etc.

# Time-constrained observing



Project - Observing Tool for ALMA, version Cycle2Test2

File Edit View Tool Search Help

Perspective 1

**Project Structure**

- Proposal
- Program
- Unsubmitted Proposal
  - Project
    - Proposal
      - Planned Observing
        - ScienceGoal (Copy)
          - General
          - Field Setup
          - Spectral Setup
          - Calibration Setu
          - Control and Perf
          - Technical Justi

**Editors**

Spectral Spatial **Control and Performance**

Do you request complementary ACA Observations? ☐ Yes ☒ No Suggest

Science goal integration time estimate Time Estimate

Is more time required due to u,v coverage issues? (must be justified) ☐ Yes ☒ No

Are the observations time-constrained? ☒ Yes ☐ No ☒ Specific Dates ☐ Multiple Epochs ☐ Continuous Monitoring

Number of time windows specified : 1

Start Date/Time (UTC)	End Date/Time (UTC)
2013-10-02 13:17	2013-10-02 13:18

Please specify one or more suitable time windows for your observation

Your observation will be scheduled once during

**Entering Time Constrained observations – Dates, Epochs or Monitoring**

**Justification or additional information**

**A file format is defined in the help to import a list of time constraints**

Template library. Turn the keys on...

- Proposal
- Planned Observing
  - ScienceGoal (B3)
  - ScienceGoal (B7)
  - ScienceGoal (B7)
  - ScienceGoal (B9)
  - ScienceGoal (B3)
  - ScienceGoal (B3)
  - ScienceGoal (B6)
  - ScienceGoal (B7)
  - ScienceGoal (B6)
  - ScienceGoal (B3)
  - ScienceGoal (B6)

Overview

Phase I: Science Proposal



# Science Goal time estimates



ALMA Observing Tool (2015.8) - Debris Disk Structure around Nearby Sun-like Stars (2015)

File Edit View Tool Search Help

Project Structure

- Debris Disk Structure around Nearby Sun-like Stars
  - Science Plan
    - ScienceGoal (HD 10647) - generat
      - General
      - Field Setup
      - Spectral Setup
      - Calibration Setup
      - Control and Performance
      - Technical Justification
      - SG OUS (HD 10647)
        - Group OUS
          - Member OUS (HD\_10647)
            - HD\_10647\_a\_06\_TE
              - Group 1 : Calibra

Editors

Spectral Spatial Control and Performance

These parameters are used to control various aspects of the observations, including the

Control and Performance

Configuration Information

Antenna Beamsize ( $1.13 * \lambda / D$ )	12m 25.260 arcsec	7m 43.3
Number of Antennas	12m 40	7m 10
ACA 7m configuration Most compact		
Longest baseline	0.049 km	0.157 km
Synthesized beamsize	5.712 arcsec	1.721 arcsec
Shortest baseline	0.009 km	0.015 km
	19.709 arcsec	12.765 arcsec

0.60000 arcsec

9.0 arcsec

0.00001 Jy

AggregateBandWidth

Science goal integration time estimate

Override OT's sensitivity-based time estimate (must be justified) ☐ Yes ☒ No

Are the observations time-constrained? ☐ Yes ☒ No

Time Estimate

Feedback

Validation Validation History Log

Description

Click the time estimate to see how much time you need and get a breakdown by array and on-source vs. overhead for the 12m synthesis

Time Estimate

Note: The time in brackets is that required to reach the sensitivity. Operational requirements often mean that the actual observed time is longer, especially for mosaics. Please see the User Manual for more details.

**Input Parameters**

Requested sensitivity	0.01400 mJy
Bandwidth used for sensitivity	7.500 GHz
Representative frequency (sky, first source)	230.52 GHz

**Estimated Total time for Science Goal** 6.02 h

SB-1

**Input Parameters**

Precipitable water vapour (all sources)	1.796mm (5th Octile)
<b>Time required for C40-3</b>	
Time on source per pointing (first source)	1.44 h [1.43 h]
Total number of pointings (all sources)	1
Number of tunings	1
Total time on source	1.44 h [1.43 h]
Total calibration time	49.50 min
Other overheads	14.30 min
Total time for 1 SB execution	1.25 h
Number of SB executions	2
<b>Total time to complete SB</b>	<b>2.51 h</b>

**Calibration Breakdown per SB execution**

3 x Pointing	36.00 s
1 x SidebandRatio	1.58 min
1 x Amplitude	2.50 min
1 x Bandpass	5.00 min
6 x Phase	3.00 min
2 x CheckSource	2.00 min
7 x Atmospheric	4.67 min
<b>Calibration overheads</b>	<b>5.40 min</b>

**Additional Arrays**

ACA 7-m time (t <sub>12m</sub> x 1.40)	3.51 h
Total ACA time (max(t <sub>7-m</sub> , t <sub>TP</sub> ))	3.51 h

**Estimated total time for SB-1** 6.02 h

# Science Goal time estimates

ALMA Observing Tool (2015.8) - Debris Disk Structure around Nearby Sun-like Stars (2015.8)

Time Estimate

Note: The time in brackets is that required to reach the sensitivity. Operational requirements often mean that the actual observed time is longer, especially for mosaics. Please see the User Manual for more details.

**Input Parameters**

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Bandwidth used for sensitivity	7.500 GHz
Representative frequency (sky, first source)	230.52 GHz

**Estimated Total time for Science Goal** 6.02 h

**Input Parameters**

Precipitable water vapour (all sources) 1.796mm (5th Octile)

**Time required for C40-3**

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Total number of pointings (all sources)	1
Number of tunings	1
Total time on source	1.44 h [1.43 h]
Total calibration time	49.50 min
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Total time for 1 SB execution	1.25 h
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7 x Atmospheric	4.67 min
Calibration overheads	5.40 min

**Additional Arrays**

ACA 7-m time (t <sub>12m</sub> x 1.40)	3.51 h
Total ACA time (max{t <sub>7-m</sub> , t <sub>TP</sub> })	3.51 h

**Estimated total time for SB-1** 6.02 h

Click the time estimate to see how much time you need and get a breakdown by array and on-source vs. overhead for the 12m synthesis

This project needs 12m + 7m synthesis owing to the combination of angular resolution and largest angular scale

# View the project time summary

ALMA Observing Tool (2014.6) – Bulge Asymmetries and Dynamical Evolution (BAaDE) (2013.1.01180.S last submitted 2014-11-14 17:52:31)

File Edit View **Tool** Search Help

Project Structure

Proposal

ScienceGoal (MSXiiiRA16b1)

ScienceGoal (MSXiiiRA16b2)

Display Project Time Summary

Bulge Asymmetries and Dynamical Evolution (BAaDE)

Project Time Estimates

## Total and Calibration Times

Science Goal	12-m Ext.		12-m Compact		12-m Ext. + Compact		ACA 7-m		ACA TP		Overall		Non-standard Mode
	Tot.	Cal.	Tot.	Cal.	Tot.	Cal.	Tot.	Cal.	Tot.	Cal.	Tot.	Cal.	
MSXiiiRA16a1	51.12 min	24.75 min	-	-	51.12 min	24.75 min	-	-	-	-	51.12 min	24.75 min	No
MSXiiiRA16a2	51.12 min	24.75 min	-	-	51.12 min	24.75 min	-	-	-	-	51.12 min	24.75 min	No
MSXiiiRA16a3	51.97 min	24.75 min	-	-	51.97 min	24.75 min	-	-	-	-	51.97 min	24.75 min	No
MSXiiiRA16a4	51.12 min	24.75 min	-	-	51.12 min	24.75 min	-	-	-	-	51.12 min	24.75 min	No
MSXiiiRA16b1	1.29 h	29.95 min	-	-	1.29 h	29.95 min	-	-	-	-	1.29 h	29.95 min	No
MSXiiiRA16b2	1.29 h	29.95 min	-	-	1.29 h	29.95 min	-	-	-	-	1.29 h	29.95 min	No
Overall	6.01 h	2.65 h	-	-	6.01 h	2.65 h	-	-	-	-	6.01 h	2.65 h	

## Data Volumes and Data Rates

Science Goal	Data Volume			Data Rate		
	12-m	ACA 7-m	ACA TP	12-m	ACA 7-m	ACA TP
MSXiiiRA16a1	54.85 GB	-	-	18.31 MB/s	-	-
MSXiiiRA16a2	54.85 GB	-	-	18.31 MB/s	-	-
MSXiiiRA16a3	55.77 GB	-	-	18.31 MB/s	-	-
MSXiiiRA16a4	54.85 GB	-	-	18.31 MB/s	-	-
MSXiiiRA16b1	83.35 GB	-	-	18.31 MB/s	-	-
MSXiiiRA16b2	83.35 GB	-	-	18.31 MB/s	-	-
Overall	387.01 GB	-	-			

OK

# Technical justification



ALMA Observing Tool (2014.6) - Observing Tool for ALMA Cycle3 Groundhog Day Test

File Edit View Tool Search Help

Perspective 1

Project Structure

- Proposal
- Program
- Unsubmitted Proposal
  - Observing Tool for ALMA Cycle3 Groundhog Day Test
    - Proposal
      - Planned Observing
        - ScienceGoal (Science Goal)
          - General
          - Field Setup
          - Spectral Setup
          - Calibration Setup
          - Control and Performance
          - Technical Justification

Editors

Spectral Spatial Technical Justification

Enter a Technical Justification for this Science Goal, paying special attention to the parameters reproduced below.

Sensitivity

Requested RMS over 2.4414062500000005E-4 GHz is 3.00 mJy For a peak flux density of 30.00 mJy, the achieved S/N is 10.0

Achieved RMS over the total 351.56 MHz bandwidth is 111.80 uJy For a continuum flux density of 100.00 mJy, the achieved S/N is 894.4

For a peak line flux of 30.00 mJy, the achieved S/N over 1/3 of the source line width ( 30.00 km/s / 3 = 10.00 km/s ) is 26.1

Line width / bandwidth used for sensitivity 30.00 km/s / 731.92 m/s = 40.99

Dynamic Range: 33.33

Justify your requested RMS and resulting S/N for the spectral line and/or continuum observations.

For line observations also justify the bandwidth used for the sensitivity calculation.

Here would be the standard required justification of the sensitivity parameters

There are separate standard sections for Sensitivity, Imaging and Correlator and another may appear to allow you to justify some of the parameter choices you may have made

Each requires its own 50+ word justification

Each standard section comes with a summary of the requested input information to detail the different technical aspects of your program.

# Ready? Validate & submit!



Project - Observing Tool for ALMA, version Cycle2Test2

Note the spiffy new icons!

Click here to make sure that your project can be validated by the OT. If it doesn't validate the archive will reject it.

When you are satisfied that your proposal is complete, click here to submit your proposal to the archive.

Contextual Help

1. Please ensure you and your co-Is are registered with the [ALMA Science Portal](#)
2. Create a new proposal by either:
  - Selecting *File > New Proposal*
  - Clicking on the **1** icon in the toolbar
  - Or clicking on this [link](#)
3. Click on the **proposal** tree node and complete the relevant fields.

Phase I: Science Proposal

New Science Proposal → Create Science Goals → Validate Science Proposal → Submit Science Proposal

Click on the overview steps to view the contextual help

Importing And Exporting Template Library Need More Help? View Phase 2 Steps



# User support

# ALMA



Atacama Large Millimeter/submillimeter Array  
In search of our Cosmic Origins



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## Observatory News

Additional Information for Cycle 5 Proposals  
Feb 01, 2017

Release of a New Installment of Science Verification Data  
Jan 18, 2017

RadioNet: Calls for financial support - OPEN  
Jan 16, 2017

[More news...](#)

## NRAO News

American Astronomical Society Meeting  
Jun 04, 2017

2017 Astrobiology Graduate Conference  
Jun 05, 2017

Women in Astronomy IV: The Many Faces of Women Astronomers  
Jun 09, 2017

[More...](#)

## Status

[ALMA Cycle 5 Pre-Announcement](#)

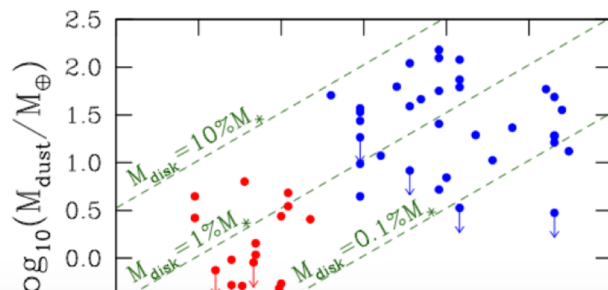
Refereed publications:

Last observed source:

Current configuration: C40-2

[More...](#)

## Science Highlights - Possible Disk Truncation in Ophiuchus Brown Dwarfs



The sensitivity, resolution and the wavelength coverage of ALMA makes it an ideal tool for studying the properties of the cold outer disks of young stars and low mass objects. Such observations can aid us in understanding the formation of their central objects and their likelihood of ultimately hosting planets. In a recent [Astronomy & Astrophysics paper](#), Dr. Testi and his collaborators made use of ALMA Band 7 to observe an unbiased sample of spectroscopically confirmed Ophiuchus brown dwarfs with infrared excesses.



[www.almascience.org](http://www.almascience.org)  
**ALMA Science Portal @ NRAO**

# I could use a hand...

*Have no fear, the ALMA Helpdesk is here...*

# ALMA

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Live Chat Software by Kayako

[SEARCH](#)

## Knowledgebase

### General ALMA Queries (13)

- Can I submit a ticket in Japanese?
- How close can ALMA observe to the Sun?

### Project Planning (14)

- What should I include for the content of the Technical Justification and in what format should I submit it?
- Where can I find the online ALMA observing simulator developed by the University of Manchester?

### Early Science - Cycle 1 (31)

- Can I use "breakpoints" in ALMA cycle 1?
- The Cycle 1 Technical Handbook has some gaps in its discussion of ALMA receivers (SSB, 2SB, DSB). What else can you tell me about them?

### ALMA Observing Tool (OT) (29)

- What do I do if I can't get the OT to work?
- How do I deal with targets with unspecified coordinates in the OT?

### Resources & Observer Support (12)

- How do I arrange a visit to one of the ARCs?
- Where can I find ALMA documentation and manuals?

### Proposal Handling (5)

- May I submit an identical proposal to more than one category, e.g. submitting a proposal on distant galaxies both to cosmology and to galaxy categories?
- Which category should I submit a proposal on distant galaxies: "cosmology/high-z" or "Galaxies/Nudei"?





**For more info:**  
<https://almascience.nrao.edu/>

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 and operation of ALMA.