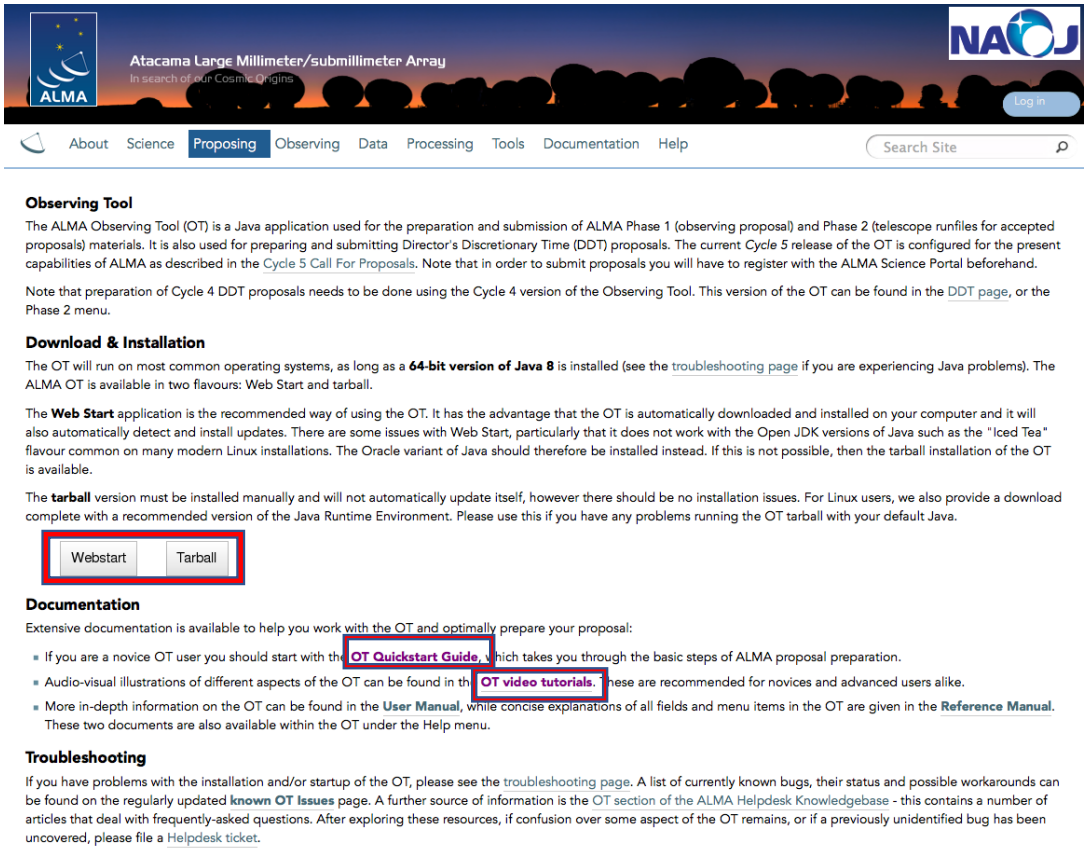
ALMA Cycle-5 Observing Tool (OT)

1. ALMA Science Portal

(http://www.almascience.org → http://almascience.nao.ac.jp)

Proposing → Observing Tool



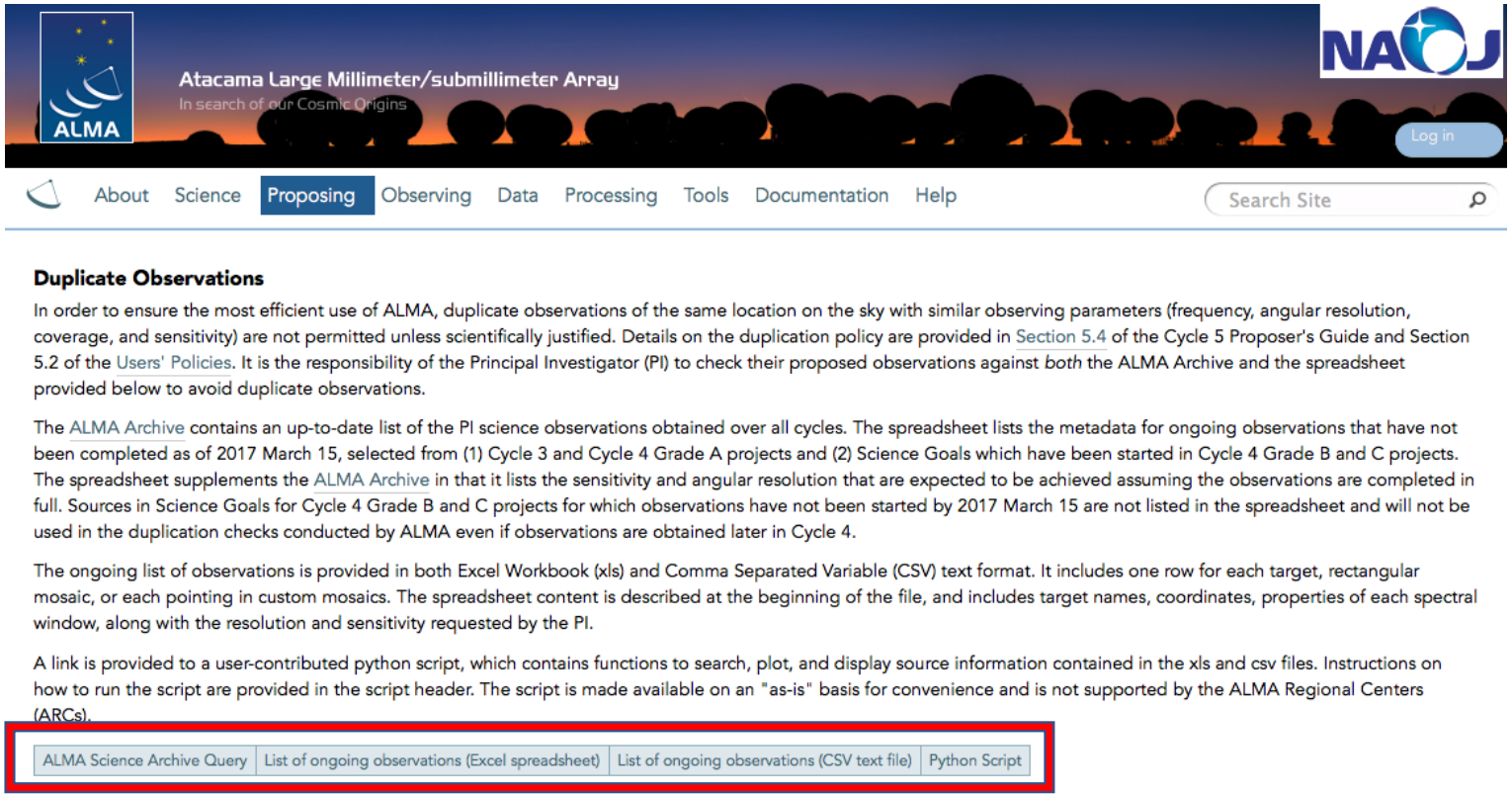
2. Proposing → Proposal Template

- Scientific Justification (LaTex template: including figures, tables and references)
  - 4 pages : Regular, DDT, ToO, Solar, mm-VLBI proposals
  - 6 pages : Large Program proposals

- Other formats are also okay, like Word, as long as they can be turned into a pdf file and use at least 12pt characters.

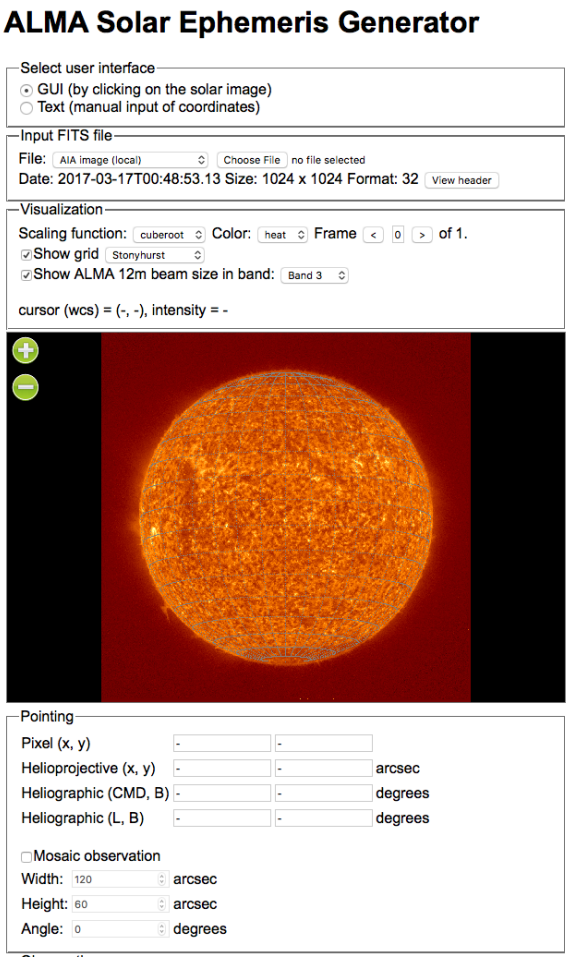
3. Duplication check ! (Proposal → Duplicate Observations)

- Same targets, frequency, angular resolution, coverage, sensitivity
- Check : ALMA archive, spreadsheet provided below to avoid duplicate observations



Tip 1. ALMA Solar Ephemeris Generator

(http://celestialscenes.com/alma/coords/CoordTool.html)



Tip 2. ASCII file : Field Setup

```
Name, RA(sex), Dec(sex), PMRA(mas/yr), PMDec(mas/yr), vel(km/s), Ref frame, Doppler type,
peak cont flux(mJy), peak line flux(mJy), cont pol(%), line pol(%), line width(km/s)
--   This signals end of the header

ngc253, 00:47:33.134, -25:17:19.68, 0.0, 0.0, 258.688, lsrk, RADIO, 200, 1000, 2, 0, 1500
ngc1068, 02:42:40.771, -00:00:47.84, 0.0, 0.0, 1142.075, topo, OPTICAL, 1100.0, 30, 0, 0, 20
```

Tip 3. Estimate the Peak flux density per beam using flux measurement from other observations (https://help.almascience.org/index.php?/Knowledgebase/Article/View/286)

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

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Knowledgebase

How can I estimate the Peak Flux Density per synthesised beam using flux measurements in Jy or K from other observatories?

27 February 2015 12:37 PM

In the 'Expected Source Properties' section of the 'Field Setup' editor you are required to enter an estimate for the continuum and/or line peak flux density per synthesized beam for each source defined. These fluxes will guide your choice of requested sensitivity and are used by the OT to calculate the S/N achieved. Therefore, it is important that they are as reliable as possible.

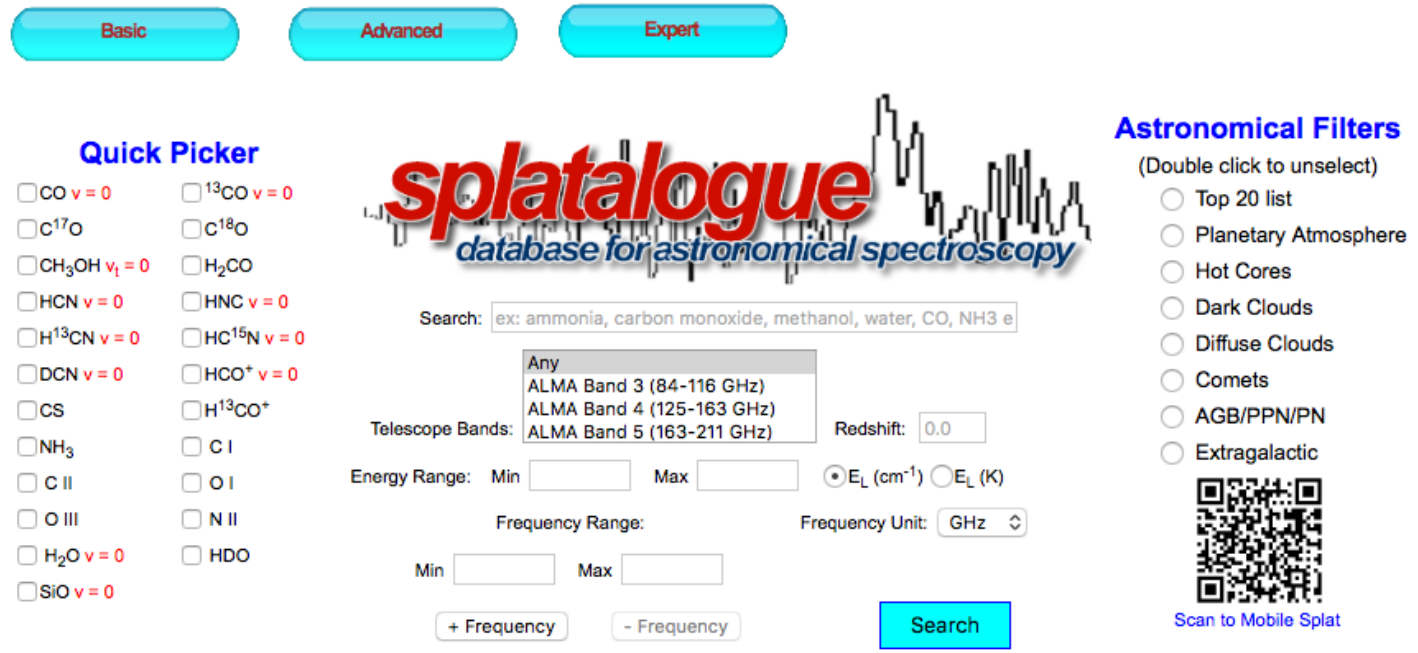
In many cases, measurements of your sources will already exist based on data from other observatories. Here, we assume these measurements are peak fluxes/temperatures reported in Jy or K - for information on how to interpret line-integrated fluxes given in Jy km/s or K km/s, please see How do I convert flux measurements given in Jy km/s or K km/s into the peak flux density required by the OT?. You should first check the observing frequency of these observations and if necessary adjust the measurements to your ALMA observing frequency using a spectral index or more detailed spectral model of your source. You will then need to consider the angular size and spatial distribution of the source.

In the OT, the fluxes must be entered in Jy/beam, i.e. you must provide the peak flux density of the source estimated within one synthesised ALMA beam. This means that if the source is resolved with ALMA you will need to correct the previously measured peak flux (in Jy) of the source by the ratio of the area of the source to the area of the synthesised beam. A source is considered resolved if the angular resolution requested is smaller than the largest angular scale of the emission, and the synthesised beam should be assumed to be the angular resolution requested.

For example, suppose you have a JCMT observation of a sub-mm galaxy, and have measured a flux density of 32 mJy within the JCMT beam (where of course the galaxy is spatially unresolved). From other evidence you believe that the angular size of the galaxy is about 2", and you'd like to observe it with ALMA at an angular resolution of 0.5". That 2" wide galaxy would be spread over $(2"/0.5")^2$=16 ALMA beams in area. The expected flux density in the ALMA beam would thus be only 32 mJy/16 = 2 mJy/beam. It is this value that should be entered in the Expected Source Properties and be used to estimate the sensitivity required. In this example, a 5 sigma detection of the source would require a sensitivity of 0.4 mJy per pointing. Note that you may need to correct existing flux measurements even if they come from previous ALMA data, since the synthesised beam was quite likely different due to a different configuration and/or a different observing frequency.

The situation is more complex if your previous measurements are given in terms of brightness temperature in Kelvin, which is often the case of measurements from single dish telescopes. The simplest way to use an antenna temperature to estimate an ALMA flux density is to first convert the antenna temperature into a source flux density. The flux density S_ν is then given by

$S_\nu = 3514\ T_{SD} / (\nu_a * D^2)$ Jy,

where ν_a is the aperture efficiency (you should be able to find this in the documentation for the single dish telescope in question), D is the diameter of the single dish telescope in m, and T_{SD} is the brightness temperature measured from the single dish telescope in Kelvins.

Tip 4. Splatalogue
(http://www.cv.nrao.edu/php/splat/)